INDEX

AUTOMATIC TRANSMISSION SERVICE GROUP

SEMINARS 1990

TRANSMISSION TECHNOLOGY SIMPLIFIED

This booklet contains information on the Chrysler A-604 computer checking procedures. The E40D computer and mechanical information on it's operation is covered.

Information on the Jeep with the AW-4 (A-340E) transmission in car checks and adjustments.

Mercedes transmission coverage is basic on units from 1968 thru 1987.

We have added some late tech bulletins in the back of this booklet.

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E4OD TRANSMISSION

The E40D is an electronically controlled, rear wheel drive, four-speed automatic transmission with 4th gear overdrive. It is used in Ford Motor Company's >8500 GVW light truck applications beginning in the 1989 model year. The design of the E40D was based on the C6 transmission, continuing its heritage of reliability and toughness while incorporating state-of-the-art and industry leading features.

The E40D utilizes electronic controls for shift scheduling, pressure regulation, and torque converter clutch control, providing high quality shifts as well as optimizing fuel economy and performance. The electronic control also features powertrain system diagnostic capabilities. Both engine and transmission are continuously monitored during vehicle operation with on demand diagnostic testing available through the VIP (Quick) test.

E4OD FEATURES

Transmission Description

- High Torque Capacity Automatic Four-Speed with Overdrive 4th Gear
- Torque Converter Clutch with Spring Damped Piston Plate
- All Non-Synchronous Shifts
- Shift Scheduling Via On/Off Solenoids
- Pressure Control Via Current Proportional Variable Force Solenoid

Torque Capacity

- 420 lb-ft Engine Torque
- 836 lb-ft Input Torque

Applications - Current and Future

- 4.9 L, 5.0, 5.8, 7.5 Gas Engines
- 7.3 L Diesel Engine
- Econoline, F-Series, & Bronco

Gear Ratios

1st - 2.710 Rev - 2.176
2nd - 1.538
3rd - 1.000
4th - 0.712

Drive Configuration

-Both 4x2 and 4x4 Configurations Offered

Transmission Weight Including Fluid

- Approx. 270 lbs. Depending on Application

Maximum Input/Output Speed

- Up to 6000 RPM (Actual Shift Speeds Depend on Application)

Maximum Gross Combined Vehicle Weight

- 26,000 lbs 1/

Maximum Trailer Towing Capability

- 20,000 lbs 1/

Gear Selector Positions

P, R, N, D, 2, 1

- Dash-mounted Overdrive Control Switch for Customer Convenience
- Manual 2 Start-up and Hold Capability

Planetary Gears

- High Contact Ratio Gears and Improved Gear Manufacturing Techniques for Quiet Operation

Park Mechanism

- Increased Torque Capacity Compatible with Motorhomes and Other Applications up to 16,000 lbs.

Manufacturing Location

- Sharonville, Ohio

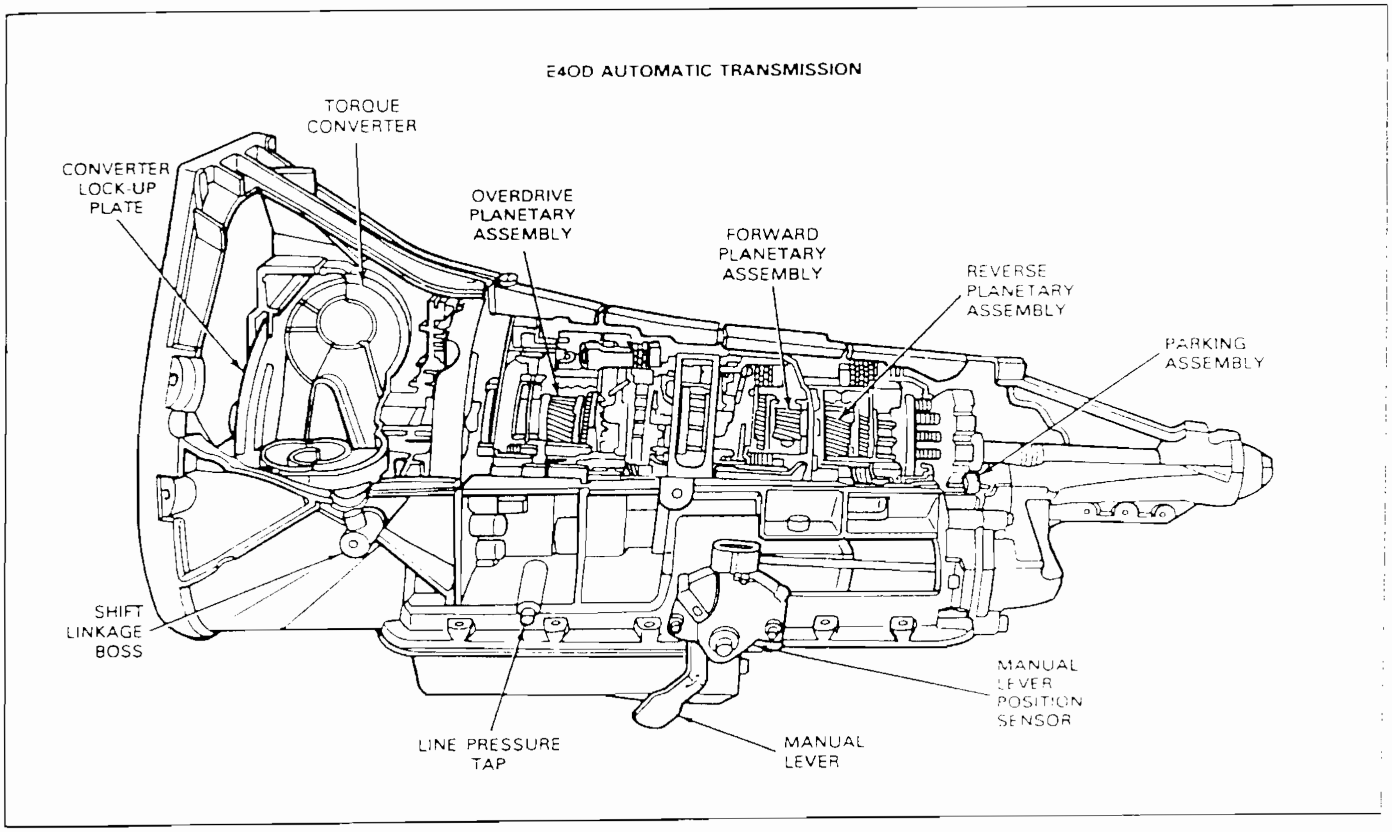
Manufacturing Capacity

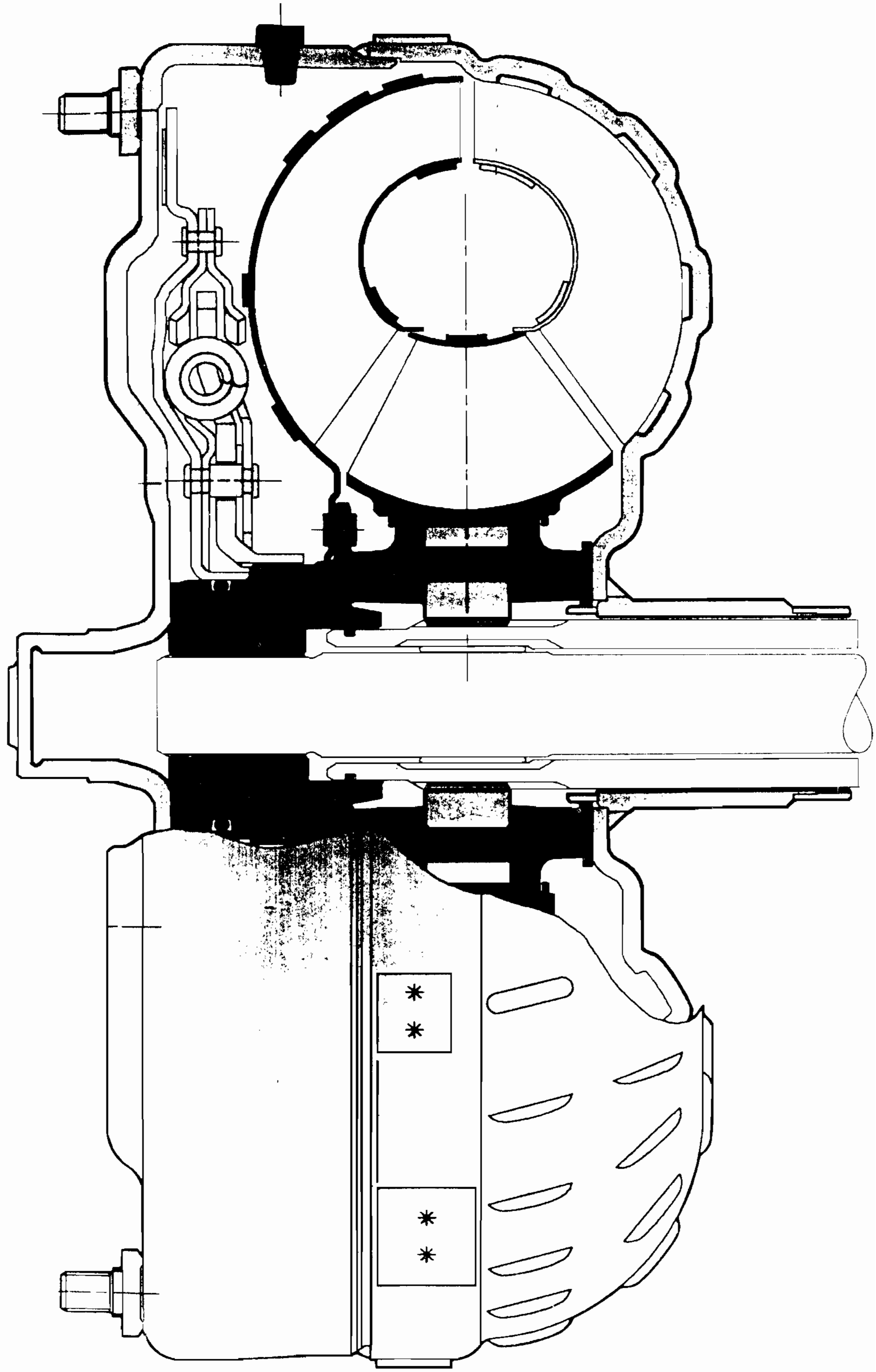
- 500,000 Per Year

1/ When installed in the proper vehicle

CLUTCH APPLICATION CHART

GEAR	GEAR SEL. POSITION	FRICTION ELEMENTS: COAST	INTERMED	DIRECT	FORWARD	REVERSE	OVERDRIVE	BAND	CONVERTER	ONE-WAY CLUTCHES DRIVE: OVERDRIVE	INTERMED	LOW-REVER	ONE-WAY CLUTCHES COAST: OVERDRIVE	INTERMED	LOW-REVER	GEAR RATIO	ENGINE BRAKING?
1	D				X				•	X		X	O/R		O/R	2.710	NO
2	D		X		X				•	X	X	O/R	O/R	O/R	O/R	1.538	NO
3	D		X	X	X				•	X	O/R	O/R	O/R	O/R	O/R	1.000	NO
4	D		X	X	X		X		•	O/R	O/R	O/R	O/R	O/R	O/R	0.712	YES
1	1	X			X	X										2.710	YES
2	2	X	X		X			X	•			O/R			O/R	1.538	YES
R	R	X		X		X					O/R			O/R		2.176	YES
	D WITH																
1	OVERDRIVE	X			X				•			X			O/R	2.710	NO
2	CANCEL	X	X		X				•		X	O/R		O/R	O/R	1.538	NO
3	PRESSED	X	X	X	X				•		O/R	O/R		O/R	O/R	1.000	YES





E40D SOLENOID ASSEMBLY

Electronic control by the E40D transmission is accomplished by four on/off solenoids and one variable force solenoid (VFS) housed in the Transmission Solenoid Body Assembly. The functions of these solenoids are as follows:

On/Off Solenoids	2 (Solenoid 1 and 2) Provides Gear Selection of first through fourth gears 1 (Solenoid 3) Provides Converter Clutch Control 1 (Solenoid 4) Provides Coast Clutch Control
Variable Force Solenoid	The VFS is an electrohydraulic actuator combining a solenoid and a regulating valve. The VFS produces Electronic Pressure Control (EPC) which regulates transmission line pressure to control static and dynamic torque capacity.

Solenoids 1 and 2 provide the pressure to control the three shift valves. Solenoid 3 is controlled by a strategy in the EEC-IV control system and it shifts the converter clutch control valve. Solenoid 4 shifts the coast clutch shift valve. Solenoid 4 can be activated by either pressing the Overdrive Cancel Switch or by selecting the R, 1, or 2 range with the transmission selector lever.

The VFS produces the Electronic Pressure Control (EPC). The EPC regulates line pressure by producing a resisting force to the main regulator valve. The EPC also regulates line modulator pressure by producing a resisting force to the line modulator valve. These two modified pressures control the clutch application pressures.

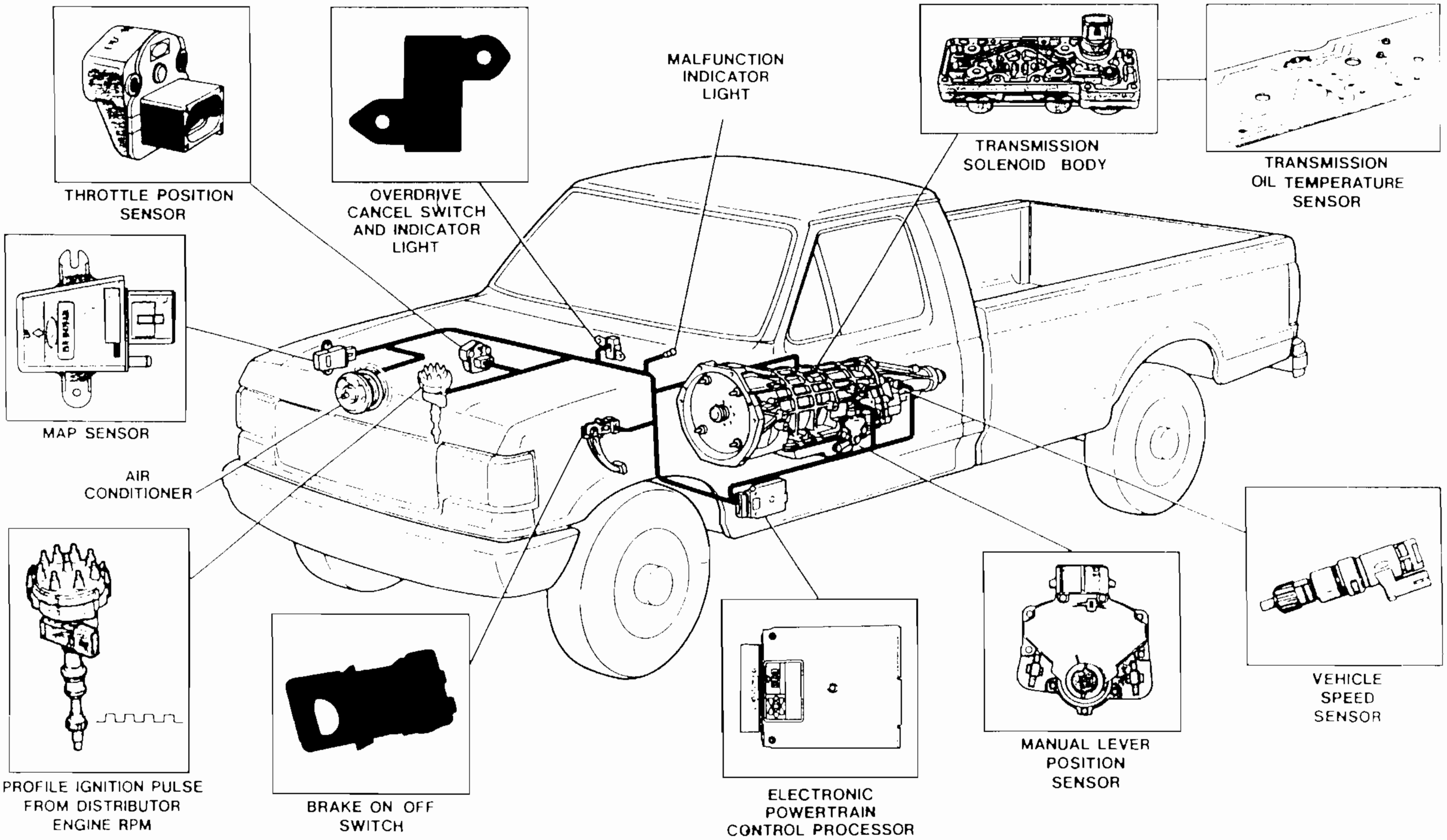
The Solenoid Body Assembly contains the TOT (Transmission Oil Temperature) Sensor. This sensor provides a temperature dependent resistance which serves as an input into the EEC-IV control system. The EEC-IV

determines the transmission oil temperature.

SOLENOID APPLICATIONS CHART

GEAR SELECTOR POSITION	GEAR	SHIFT CONTROL SOL. 1	SHIFT CONTROL SOL. 2	CONVERTER CLUTCH CONTROL SOL. 3	COAST CLUTCH CONTROL SOL. 4
D	4	OFF	OFF	ON/OFF BASED ON EEC-IV STRATEGY	OFF
	3	OFF	ON		OFF
	2	ON	ON		OFF
	1	ON	OFF		OFF
D OVERDRIVE CANCEL SWITCH PRESSED	3	OFF	ON		ON
	2	ON	ON		ON
	1	ON	OFF		ON
2	2	OFF	OFF		OFF
1	1	ON	OFF	OFF	OFF

E4OD TRANSMISSION ELECTRONIC CONTROL SYSTEMS, ACTUATORS, AND SENSORS



THE FOLLOWING SHOWS THE STATES OF THE ON/OFF SOLENOIDS FOR NORMAL E4OD TRANSMISSION OPERATION:

MLPS	OCS	SS1	SS2	CCC	CCS	GEAR	ENGINE BRAKING
P	X	XN	XF	OFF	XF	-	N
R	X	XN	XF	XF	XF	R	Y
N	X	XN	XF	OFF	XF	-	N
OD	X	ON	OFF	EC	XF	1	N
OD	X	ON	ON	EC	XF	2	N
OD	OFF	OFF	ON	EC	OFF	3	N
OD	ON	OFF	ON	EC	ON	3	Y
OD	OFF	OFF	OFF	EC	XF	4	Y
2	X	XF	XF	EC	XN	2	Y
1	X	OFF	XF	XF	XN	2	Y
1	X	ON	XF	XF	XN	1	Y

ON - ELECTRICALLY ON.
OFF- ELECTRICALLY OFF.
XN - NO EFFECT ON OR OFF - TURNED ON.
XF - NO EFFECT ON OR OFF - TURNED OFF.
X - NO EFFECT ON OR OFF - INDETERMINATE.
EC - ELECTRONICALLY CONTROLLED - CALIBRATION DEPENDENT.

SHIFT SOLENOID FAILURE MODES:

SS1 ALWAYS ON:

GEAR COMMANDED	OBTAINED OD	2	1
1	1	2	1
2	2	2	1
3	2	2	1
4	1	2	1

SS2 ALWAYS ON:

GEAR COMMANDED	OBTAINED OD	2	1
1	2	2	1
2	2	2	1
3	3	2	2
4	3	2	2

SS1 ALWAYS OFF:

GEAR COMMANDED	OBTAINED OD	2	1
1	4	2	2
2	3	2	2
3	3	2	2
4	4	2	2

SS2 ALWAYS OFF:

GEAR COMMANDED	OBTAINED OD	2	1
1	1	2	1
2	1	2	1
3	4	2	2
4	4	2	2

CONTROL SYSTEM CHECK BALLS AND BALL SHUTTLES

The following information describes the function of the valve body and main control check balls and ball shuttles. The location of the different check balls and ball shuttles are shown in the following figure.

There are 10 rubber balls and 1 steel ball (BS5) in the case and 2 rubber balls in 7A100 main control.

CB1: Feeds reverse flow through 4-3-2 shift timing valve.

CB6: Forces direct clutch to exhaust through orifice during 3-2 downshift.
CB7: Forces overdrive clutch to exhaust through orifice during 4-3 downshift.
CB8: Forces coast clutch feed fluid through orifice for 4-3 downshift and manual 1 or 2 pull-ins while allowing free exhaust.
CB9: Forces band servo apply pressure through orifice while bypassing the orifice on exhaust.

CB12: Facilitates fast exhaust of direct clutch when coming out of reverse.
CB13: (Main Control Body) Forces forward engagement pressure throughorifice while allowing free exhaust.
CB14: Forces intermediate clutch to exhaust through orifice during 2-1 downshift.
BS1: Separates manual two flow and reverse flow to the 4-3-2 timing valve and the coast clutch shift valve.
BS2: (Main Control Body) Separates manual two flow and solenoid two flow into the 1-2 manual transition valve which supplies flow to prevent 1-2 shift valve from shifting.
BS3: Separates solenoid four flow from either the manual two flow or the reverse flow which shifts the coast clutch shift valve.

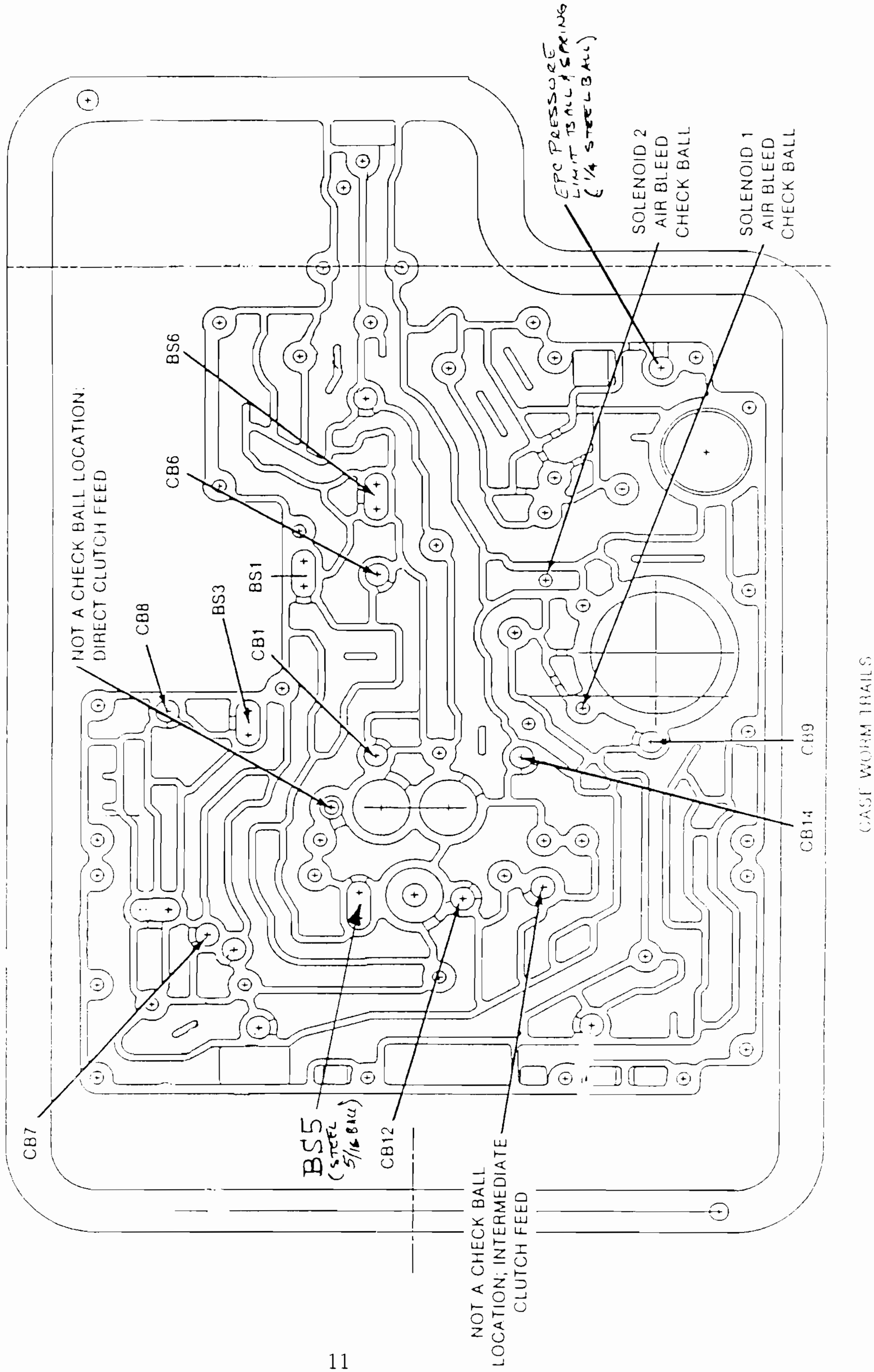
BS5: Separates reverse flow and direct clutch accumulator flow into the direct clutch. (steel)
BS6: Separates two and reverse flow at low reverse modulator valve.

RELIEF VALVES

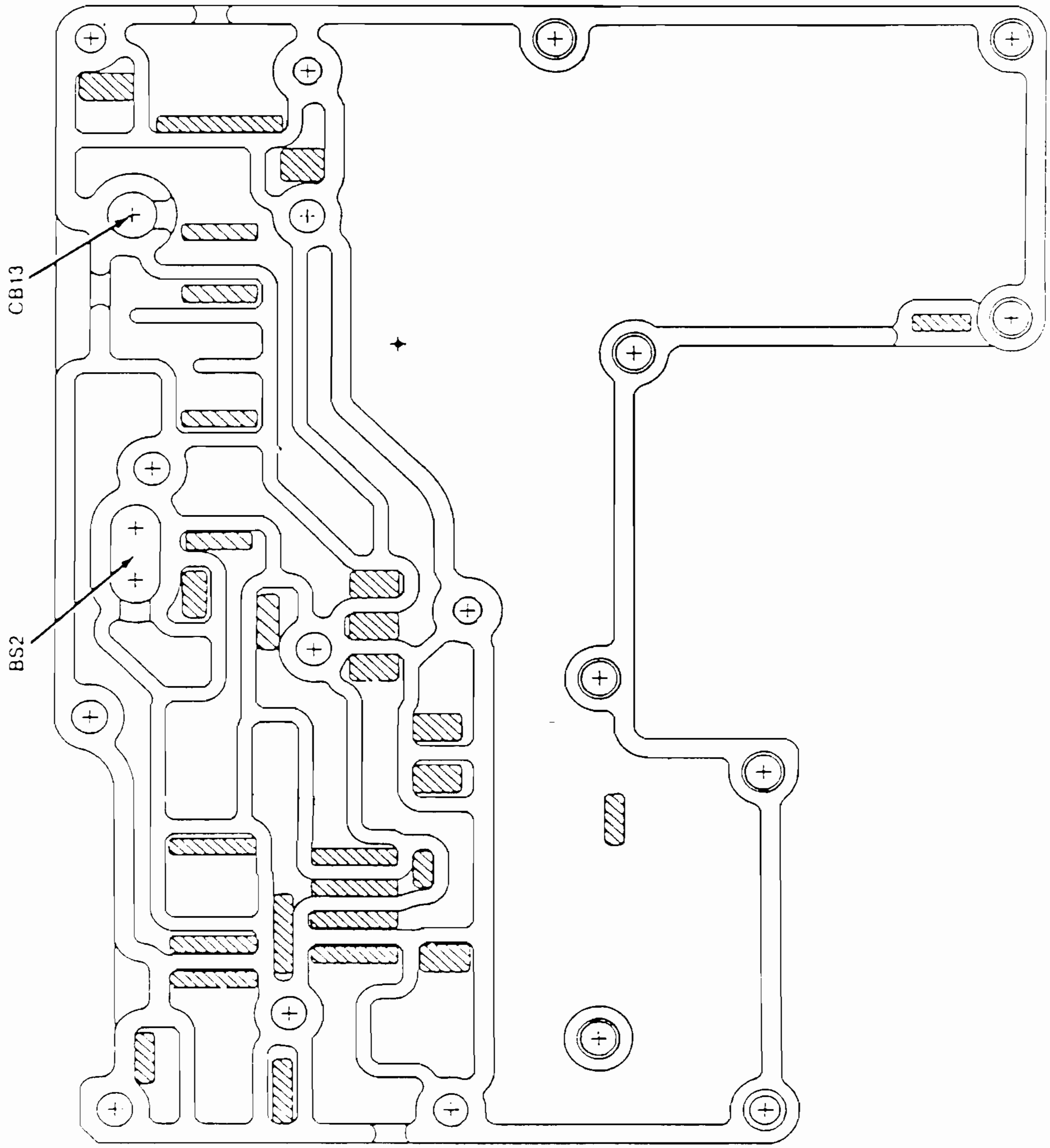
Electronic Pressure Control Blowoff Valve controls EPC pressure to a maximum of 100 psi.

AIR BLEED CHECK BALLS

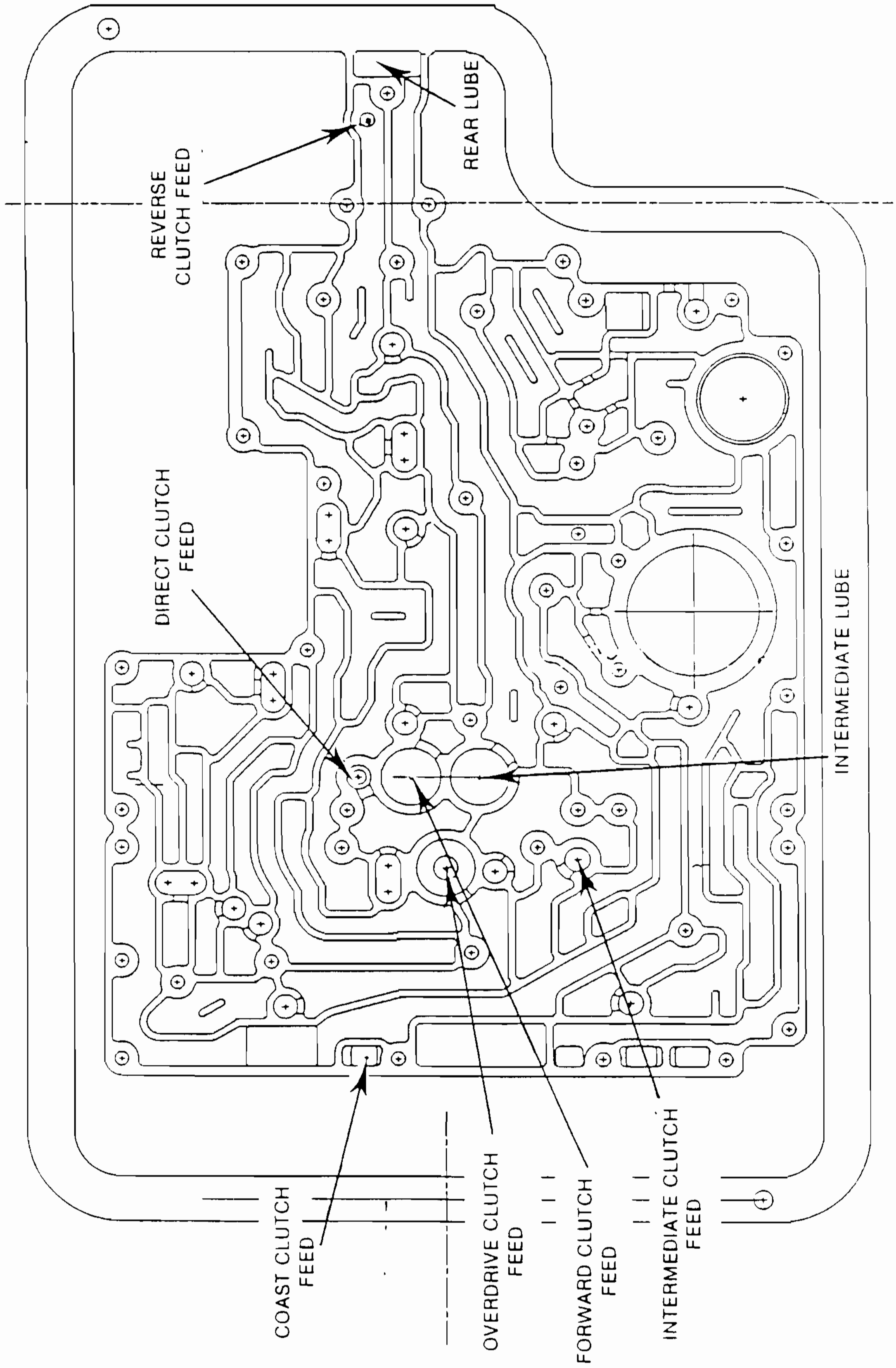
Solenoid 1, solenoid 2 and electronic pressure control lines have air bleed check balls. Their purpose is to rid the lines of air and ensure an immediate response at startup.



EPC PRESSURE LIMIT BALL & SPRING (1/4 STEEL BALL)
SOLENOID 2 AIR BLEED CHECK BALL
SOLENOID 1 AIR BLEED CHECK BALL
BS6
CB6
BS1
BS3
CB1
CB8
NOT A CHECK BALL LOCATION: DIRECT CLUTCH FEED
CB9
CB14
CAST WORM TRAILS
CB7
BS5 (STEEL 5/16 BALL)
CB12
NOT A CHECK BALL LOCATION; INTERMEDIATE CLUTCH FEED


CB13
BS2

AIR PRESSURE CHECK LOCATIONS



Drive Cycle Test

After performing the EEC-IV Quick Test, the following drive cycle test for checking E40D continuous codes should be performed.

NOTE: Faults have to appear 4 times consecutively for continuous codes 49, 59 and 69 to be set.

1. Record and zero EEC-IV Quick Test codes.
2. Verify that the transmission fluid level is correct.
3. Warm engine to operating temperature.
4. With transmission in D range, press the Overdrive Cancel Switch (LED light should illuminate) and moderately accelerate from stop to 64 km/hr (40 mph). This will allow the transmission to shift into third gear. Hold speed and throttle opening steady for a minimum of 15 seconds (30 seconds above 4000 feet altitude).
5. Press Overdrive Cancel Switch (LED light should turn off) and accelerate from 64 km/hr (40 mph) to 80 km/hr (50 mph). This will allow the transmission to shift into fourth gear. Hold speed and throttle position steady for a minimum of 15 seconds.
6. With transmission in fourth and maintaining steady speed and throttle opening, lightly apply and release brakes (to operate stop lamps). Then hold speed and throttle steady for an additional 5 seconds minimum.
7. Brake to a stop and remain stopped for a minimum of 20 seconds with the transmission in D range.
8. Repeat steps 4-6 at least five times.
9. Perform EEC-IV Quick Test and record continuous codes.

If the codes appear, refer to the pinpoint test charted below for the appropriate service code.

NOTE: If any other service codes appear, service those codes first as they could affect the electrical operation of the transmission.

NOTE: After the servicing of any error codes resulting from the Quick Test, the Quick Test should be repeated.

ERROR CODES	PINPOINT TEST
49	AA
56	BB
59	AA
62	CC
66	BB
67	EE
69	AA
91	GG
92	GG
93	GG
94	GG
98	HH
99	HH

ELECTRICAL DIAGNOSTIC TESTS

When referred to this section, perform the Electronic Engine Control (EEC-IV) Quick Test in Section 14 of the Engine/Emissions Diagnosis Manual Volume H first. This will determine if any service codes for the transmission appear.

The following codes may appear during the EEC-IV Quick Test. Service these codes first and repeat the EEC-IV Quick Test before continuing with the transmission diagnosis.

EEC-IV Quick Test Service Codes

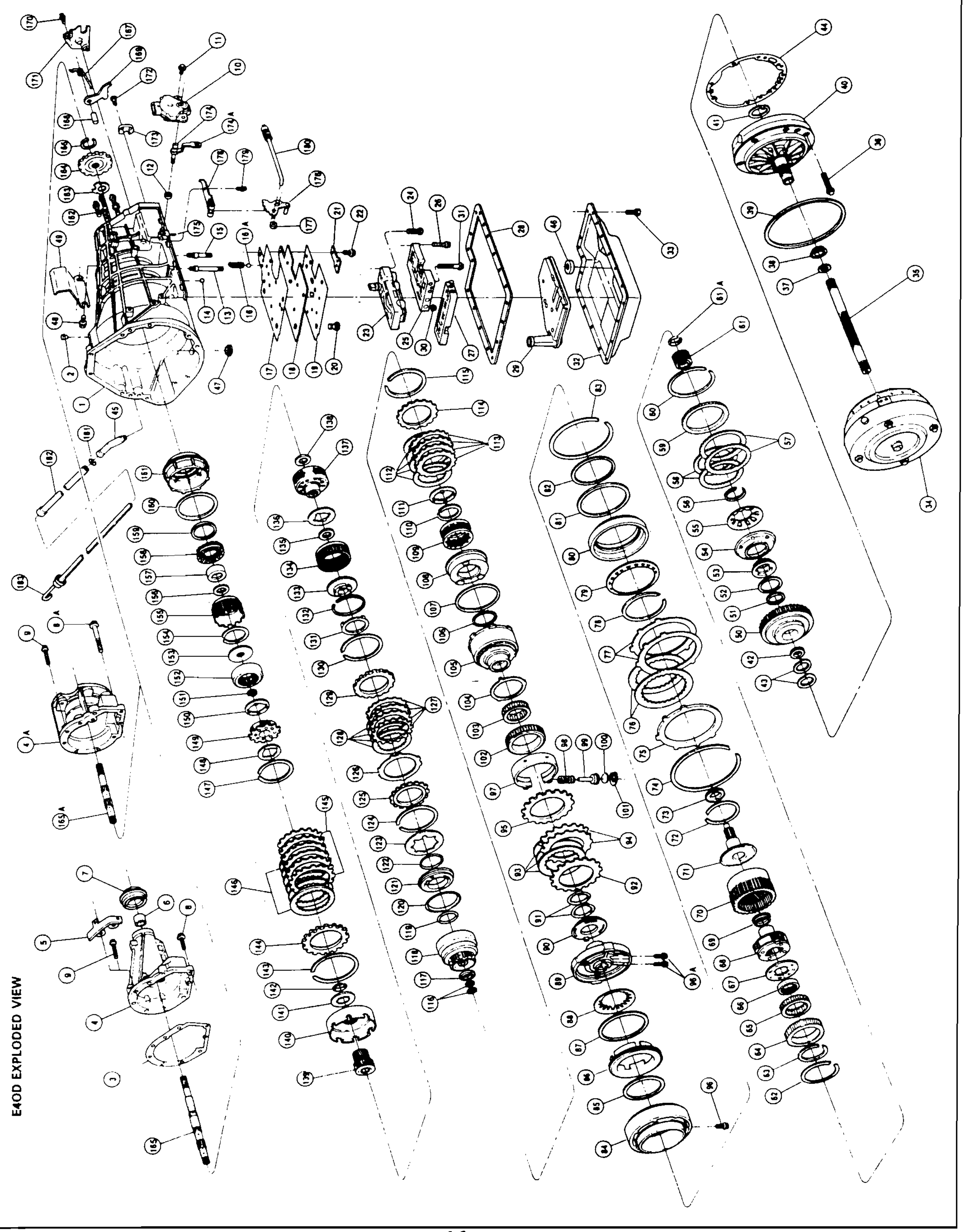
- 26 TOT out of self-test range: The TOT (transmission oil temperature) sensor registers a temperature not in the allowable range of testing. The test should be repeated with the transmissionat thecorrect testing temperature listed in the Section 14 of the Engine/Emissions Diagnosis Manual Volume H.
- 47 4 X 4 Switch closed: Transmission transfer case is activated into four-wheel drive. Release four-wheel drive and repeat test.
- 65 Overdrive Cancel Switch not changing state: Operation of the Overdrive Cancel Switch is not recorded during the Engine On Quick Test. Service this switch as outlined in the Pin Point Tests in Engine/Emissions Diagnosis Shop Manual Volume H.
- 67 MLPS Out of range / AC on: If AC on during test, this code will appear. Shut off air conditioning unit and rerun test. If the AC unit was off during the test, go to the code in the following section.

If any of the following service codes appear during the EEC-IV Quick Test, perform the Drive Cycle Test for continuous codes as outlined.

Transmission Quick Test Service Codes

- 49 1-2 shift error: Engine speed drop between the 1 to 2 shift does not meet limit.
- 56 -40 degree F indicated TOT, sensor circuit open: Voltage drop across the TOT (transmission oil temperature) sensor exceeds the scale set for the temperature of -40 degrees F.
- 59 2-3 shift error: Engine speed drop between the 2 to 3 shift does not meet limit.
- 62 Converter clutch failure: The EEC-IV module picks up excessive amount of converter slip while converter is scheduled to be locked up.
- 66 315 degree F indicated TOT, sensor circuit grounded: Voltage drop across the TOT (transmission oil temperature) sensor does not reach the scale set for the temperature of 315 degrees F.
- 67 MLPS out of range / AC on: Indicated voltage drop across the MLPS (Manual Lever Position Sensor) exceeds the limit established for all gears. AC on: Fault results from the air conditioning unit being on during Quick Test.
- 69 3-4 shift error: Engine speed drop between the 3 to 4 shift does not meet limit.
- 91 Shift Solenoid 1 Circuit Failure: Solenoid 1 circuit fails to provide voltage drop across solenoid. Circuit open or shorted.
- 92 Shift Solenoid 2 Circuit Failure: Solenoid 2 circuit fails to provide voltage drop across solenoid. Circuit open or shorted.
- 93 CCS Solenoid Circuit Failure: Solenoid 4 (Coast Clutch Solenoid) fails to provide voltage drop across solenoid. Circuit open or shorted.
- 94 CCC Solenoid Circuit Failure: Solenoid 3 (Converter Clutch Control Solenoid) fails to provide voltage drop across solenoid. Circuit open or shorted.
- 98 Fail Mode and Effect Management Failure / Failed EPC Output Driver: During the Quick Test, the voltage through the EPC (Electronic Pressure Control) solenoid is checked and compared to a voltage through the solenoid after a time delay. An error will be noted if the tolerance change is exceeded.
- 99 EPC Solenoid Circuit Failure / Short: Voltage measured across the EPC (Electronic Pressure Control) solenoid is less than a calculated minimum voltage.

E4OD Automatic Transmission



DESCRIPTION (Continued)

E4OD EXPLODED VIEW LEGEND

1.	7005	CASE ASSEMBLY
2.	7034	VENT ASSEMBLY
3.	7086	GASKET — EXTENSION HOUSING
4.	7A039-CB	EXTENSION ASSEMBLY (4X2)
#	7A041	— EXTENSION & BUSHING ASSY.
#	7A040	— EXTENSION
4A.	7A039-DA	EXTENSION ASSEMBLY (4X4)
	7A039-EA	EXTENSION ASSEMBLY (SUPERDUTY)
#5.	7H102	BRACKET — WIRING
6.	7A034	BUSHING — EXTENSION HOUSING (4X2)
7.	7052	SEAL — EXTENSION HOUSING (4X2)
8.	N605802-S36	BOLT — EXTENSION (4X2 BOTTOM) (2 PCS.) M10X1.5X35MM
8A.	N606569-S36	BOLT — EXTENSION (SUPERDUTY & 4X4 BOTTOM) (2 PCS.) M10X1.5X90MM
9.	N605803-S36	BOLT — EXTENSION (TOP) (7 PCS.) M10X1.5X40MM
10.	7F293	SENSOR — MANUAL LEVER POSITION
11.	N805312-S100	BOLT ASSEMBLY (2 PCS.) M6X1.0X30MM
12.	7B498	SEAL — MANUAL LEVER
13.	N805331-S	STUD — CASE TO SOLENOID BODY (1 PC.) M6X1.0X79MM
14.	7E195	BALL — RUBBER CHECK (10 PCS.) (2 IN MAIN CONTROL)
	379581-S	BALL — STEEL CHECK (1 PC.)
15.	N805330-S	STUD — CASE TO CONTROL ASSEMBLY (4 PCS.) M6X1.0X61.25MM
16.	7D017	EPC BLOW-OFF SPRING
16A.	353078-S	EPC BLOW-OFF BALL
17.	7D100	GASKET — SEPARATOR
#18.	7A008	PLATE — SEPARATOR
19.	7C155	GASKET — SEPARATOR
20.	7G308	SCREEN — SOLENOID
#21.	7F282	PLATE — SEPARATOR PLATE REINFORCING
22.	N605772-S	BOLT (3 PCS.) M6X1.0X16MM
23.	7G391	SOLENOID BODY ASSEMBLY
24.	N805329-S	BOLT — TORX HEAD (9 PCS.) M6X1.0X40MM
25.	7A100	MAIN CONTROL BODY ASSEMBLY
26.	N805326-S	BOLT (18 PCS.) M6X1.0X42.5MM
27.	7G422	ACCUMULATOR BODY ASSEMBLY
28.	7A191	GASKET — OIL PAN
29.	7G186-AA	FILTER AND SEAL ASSEMBLY (4X2)
	7G186-BA	FILTER AND SEAL ASSEMBLY (4X4)
30.	N805328-S	NUT (5 PCS.) M6X1.0
31.	N805327-S	BOLT (7 PCS.) M6X1.0X66MM
32.	7A264-FA	PAN — OIL (4X2)
	7A264-GA	PAN — OIL (4X4)
33.	N605902-S36	BOLT — OIL PAN (20 PCS.) M8X1.25X12MM
34.	7902	TORQUE CONVERTER ASSEMBLY
	87650-S2	— PLUG — CONVERTER DRAIN 1/8 IN-27
35.	7017	SHAFT — INPUT
36.	N805260-S	BOLT & WASHER ASSEMBLY — PUMP (9 PCS.) M8X1.25X65MM
	7G379	— WASHER — REPLACEMENT (9 PCS.)
37.	7L323	SEAL RING — TEFLON
38.	7A248	SEAL — CONVERTER HUB
39.	7D441	SEAL — SQUARE CUT O.D. PUMP
40.	7A103	PUMP ASSEMBLY
41.	7D014	WASHER — PUMP THRUST
42.	7E486	NEEDLE BEARING ASSEMBLY
43.	7G402	SEAL RING — TEFLON (2 PCS.)
44.	7A136	GASKET — PUMP
45.	7N463	STUB TUBE
46.	7L027	MAGNET — PAN
47.	7N171	PLUG — CONVERTER ACCESS
48.	N605770-S36	BOLT — HEAT SHIELD (2 PCS.)
49.	7A434	HEAT SHIELD — SOLENOID BODY CONNECTOR
50.	7G387	COAST CLUTCH CYLINDER ASSEMBLY
51.	7A548-JA	SEAL — INNER
52.	7A548-EA	SEAL — OUTER
53.	7G419	PISTON
54.	7N519	RING — PISTON APPLY
55.	7B070-EA	SPRING — PISTON RETURN
56.	N804949-S	RING — RETAINING
57.	7B442-CA	PLATE — COAST CLUTCH EXTERNAL SPLINE
58.	7B164-CA	PLATE — COAST CLUTCH INTERNAL SPLINE
59.	7B437-CA	PLATE — COAST CLUTCH PRESSURE
60.	N804950-S	RING — RETAINING (SELECTIVE FIT)
	N804951-S	RING — RETAINING
	N804952-S	RING — RETAINING
61.	7670	GEAR — OVERDRIVE SUN
61A.	377300-S	RING — RETAINING
62.	377155-S	RING — RETAINING (OUTER RACE TO OVERDRIVE RING GEAR)
63.	377135-S	RING — RETAINING (OVERDRIVE OWC TO OUTER RACE)
*64.	7G389	RACE — OVERDRIVE ONE WAY CLUTCH OUTER
*65.	7G381	CLUTCH ASSEMBLY — OVERDRIVE ONE WAY
*66.	7G388	RACE — OVERDRIVE ONE WAY CLUTCH INNER
67.	7G400	WASHER — THRUST
68.	7E031	CARRIER ASSEMBLY — OVERDRIVE PLANETARY
#	7L676	— CARRIER
#	7D008-CA	— PLANET GEARS (4 PCS.)
#	7A238-CA	— PLANET SHAFTS (4 PCS.)
#	7A242-AA	— THRUST WASHERS (8 PCS.)
#	7D037-BA	— NEEDLE BEARINGS (80 PCS.)
#	380225-S	— RETAINING PINS (4 PCS.)
#	7E486	— NEEDLE BEARING ASSEMBLY
69.	7G128	NEEDLE BEARING ASSEMBLY
70.	7653	GEAR — OVERDRIVE RING
71.	7G382	CENTER SHAFT
72.	7G375	RING — RETAINING (CENTER SHAFT TO OVERDRIVE RING GEAR)
73.	7G178	NEEDLE BEARING ASSEMBLY
74.	7B421	RING — OVERDRIVE RETAINING
75.	7B066-BB	PLATE — OVERDRIVE CLUTCH PRESSURE
76.	7B164-EA	PLATE — OVERDRIVE CLUTCH INTERNAL SPLINE
77.	7B442-DA	PLATE — OVERDRIVE CLUTCH EXTERNAL SPLINE
78.	N804948-S	RING — RETURN SPRING RETAINING
79.	7B070-CA	SPRING — OVERDRIVE RETURN
80.	7G418	PISTON — OVERDRIVE
81.	7A548	SEAL — OVERDRIVE OUTER
82.	7F225	SEAL — OVERDRIVE INNER (SAME AS INTERMEDIATE INNER)
83.	7B421	RING — INT./O.D. CYLINDER RETAINING
84.	7G385	CYLINDER — INTERMEDIATE/OVERDRIVE
85.	7F225	SEAL — INTERMEDIATE INNER
86.	7E005	PISTON — INTERMEDIATE
87.	7F224	SEAL — INTERMEDIATE OUTER
88.	7B070-DB	SPRING — INTERMEDIATE RETURN
89.	7G033	SUPPORT ASSEMBLY — CENTER
90.	7L326	WASHER — THRUST
91.	7D429-A	SEAL — DIRECT CLUTCH CAST IRON (2 PCS.)
92.	7B066-CA	PLATE — INTERMEDIATE CLUTCH APPLY
93.	7F219	PLATE — INTERMEDIATE CLUTCH INTERNAL SPLINE
94.	7B442	PLATE — INTERMEDIATE CLUTCH EXTERNAL SPLINE
95.	7B437	PLATE — INTERMEDIATE CLUTCH PRESSURE
96.	N805310-S101	BOLT — CYLINDER HYDRAULIC FEED (1 PC.) M10X1.5X24MM
96A.	N805311-S101	BOLT — CENTER SUPPORT HYDRAULIC FEED (2 PCS.) M12X1.75X31MM
97.	7D034	BAND ASSEMBLY
98.	7D028	SPRING — SERVO RETURN
99.	7E221	PISTON ASSEMBLY — SERVO

#NOT SERVICED
*SERVICED IN KITS ONLY

DESCRIPTION (Continued)

E4OD EXPLODED VIEW LEGEND (CONTINUED)

100.	7D027	PLATE — SERVO COVER
101.	N660246-S	RING — SERVO RETAINING
*102.	7G380	RACE — INTERMEDIATE ONE WAY CLUTCH OUTER
*103.	7F271	CLUTCH ASSEMBLY — INTERMEDIATE ONE WAY
104.	7G401	WASHER — THRUST (LG. DIA.)
105.	7D044	DRUM ASSY. — INTERMEDIATE BRAKE
106.	7A548-GA	SEAL — INNER
107.	7A548-FA	SEAL — OUTER
108.	7A262	PISTON ASSEMBLY
#	7A258	— PISTON
#	375393-S	— CHECK BALL (7/32 INCH DIA.)
#	7E220	— BALL RETAINER
109.	7G298	SPRING — PISTON RETURN
110.	N804817-S	RING — SPRING RETAINING
111.	7D428	WASHER — THRUST (SMALL DIA.)
112.	7B164-GA	PLATE — DIRECT CLUTCH INTERNAL SPLINE
113.	7B442-FA	PLATE — DIRECT CLUTCH EXTERNAL SPLINE
114.	7B066-BA	PLATE — DIRECT CLUTCH PRESSURE
115.	377126-S	RING — RETAINING (SELECTIVE FIT)
	377127-S	RING — RETAINING
	377128-S	RING — RETAINING
	377437-S	RING — RETAINING
	377444-S	RING — RETAINING
116.	7D019	SEAL RING — TEFLON (2 PCS.)
117.	7F374	NEEDLE BEARING ASSEMBLY
118.	7D424	CYLINDER — FORWARD CLUTCH ASSEMBLY
119.	7E244	SEAL — INNER
120.	7A548	SEAL — OUTER
121.	7A262	PISTON ASSEMBLY
#	7A258	— PISTON
#	375393-S	— CHECK BALL
#	7E220	— BALL RETAINER
122.	7D256	RING — PISTON APPLY
123.	7B070-AA	SPRING — PISTON RETURN
124.	377127-S	RING — RETAINING (FOR RETURN SPRING)
125.	7B066-AA	PLATE — FORWARD CLUTCH PRESSURE
126.	7E457	SPRING — CUSHION
127.	7B442-FA	PLATE — FORWARD CLUTCH EXTERNAL SPLINE
128.	7E311-AA	PLATE — FORWARD CLUTCH INTERNAL SPLINE
129.	7B066-BA	PLATE — FORWARD CLUTCH PRESSURE
130.	377127-S	RING — RETAINING (SELECTIVE FIT)
	377437-S	RING — RETAINING
	377444-S	RING — RETAINING
	386841-S	RING — RETAINING
	386842-S	RING — RETAINING
131.	7D090	WASHER — PLASTIC THRUST
132.	377132-S	RING — RETAINING
133.	7D393	HUB — FORWARD
134.	7D392	GEAR — FORWARD RING
135.	7F078	NEEDLE BEARING ASSEMBLY
136.	7D423	WASHER — THRUST
137.	7A398	CARRIER ASSEMBLY — FORWARD PLANETARY
#	7D055	— CARRIER
#	7D008-AB	— PLANET GEARS (4 PCS.)
#	7A238-AA	— PLANET SHAFTS (4 PCS.)
#	7A242-AA	— THRUST WASHERS (8 PCS.)
#	7D037-CA	— NEEDLE BEARINGS (68 PCS.)
#	380225-S	— RETAINING PINS (4 PCS.)
138.	7F078	NEEDLE BEARING ASSEMBLY
139.	7D063	GEAR — FORWARD/REVERSE SUN ASSEMBLY
140.	7D064	INPUT SHELL
141.	7D066	WASHER — THRUST
142.	377300-S	RING — RETAINING
143.	N805207-S	RING — RETAINING
144.	7D408	PLATE — REVERSE CLUTCH PRESSURE
145.	7B442-EA	PLATE — REVERSE CLUTCH EXTERNAL SPLINE
146.	7E312	PLATE — REVERSE CLUTCH INTERNAL SPLINE
147.	377155-S	RING — RETAINING
148.	7D423	WASHER — THRUST
149.	7D006	CARRIER ASSEMBLY — REVERSE PLANETARY
#	7D007	— CARRIER
#	7D008-BB	— PLANET GEARS (4 PCS.)
#	7A238-BA	— PLANET SHAFTS (4 PCS.)
#	7A242-BA	— THRUST WASHERS (8 PCS.)
#	7D037-CA	— NEEDLE BEARINGS (84 PCS.)
#	380225-S	— RETAINING PINS (4 PCS.)
150.	7D423	WASHER — THRUST
151.	387031-S	RING — RETAINING (FOR OUTPUT SHAFT) (1-1/2 IN DIA.)
152.	7A153	GEAR — REVERSE RING
153.	7D164	HUB — OUTPUT SHAFT
154.	377132-S	RING — RETAINING
155.	E7AP-7E193-AA	REVERSE HUB AND CLUTCH ASSY (4X2)
	E7TP-7E193-AA	REVERSE HUB AND CLUTCH ASSY (4X4)
#	E7AP-7D390-AA	— HUB ASSEMBLY (4X2)
#	E7TP-7D390-AA	— HUB ASSEMBLY (4X4)
#	7E392	— SPRING ASSEMBLY
#	7190	— ROLLER — OVERRUNNING CLUTCH
#	377135-S	— RING — RETAINING (2 PCS.)
#	7E194	— BUSHING — OVERRUNNING CLUTCH
156.	7E413	NEEDLE BEARING ASSEMBLY
157.	7D171	RACE — LOW/REVERSE ONE WAY CLUTCH INNER
158.	7F153	SPRING — PISTON RETURN
159.	7D404	SEAL — INNER
160.	7D403	SEAL — OUTER
161.	7D402	PISTON
162.	7D167	BOLTS (5 PCS.) 5/16 IN-24 (ONE WAY CLUTCH TO CASE)
163.	7B368	WASHER — THRUST
164.	7A233	PARKING GEAR
165.	7060-AA	OUTPUT SHAFT ASSEMBLY (4X2)
165A.	7060-CA	OUTPUT SHAFT ASSEMBLY (4X4)
166.	387035-S	RING — RETAINING (1-9/16 IN DIA.)
167.	7D070	SPRING — PARKING PAWL RETURN
168.	387640-S	PIN — PARKING PAWL
169.	7A441	PARKING PAWL
170.	N805232-S	BOLT AND WASHER ASSEMBLY (2 PCS.)
171.	7D419	PLATE — PARKING ROD GUIDE
172.	N805261-S190	BOLT (1 PC.)
173.	7G101	ABUTMENT — PARKING PAWL ACTUATING
174.	7A256	LEVER ASSEMBLY — MANUAL CONTROL
174A.	7341	INSULATOR
175.	7B210	PIN — MANUAL LEVER RETAINING
176.	7A115	LEVER — INNER DETENT
177.	N800287-S36	NUT — INNER DETENT LEVER M14X1.5 HEX
178.	7E332	SPRING ASSEMBLY — MANUAL VALVE DETENT
179.	N805503-S	BOLT — HEX FLANGE HEAD M6X1.0X16.5MM
180.	7D410	ROD ASSEMBLY — PARKING PAWL ACTUATING
181.	87034-94	O-RING FILLER TUBE
182.	7A228	TUBE ASSY. — OIL FILLER
183.	7A020	INDICATOR ASSY. — OIL LEVEL

#NOT SERVICED
*SERVICED IN KITS ONLY

1989 STALL SPEED SPECIFICATION

TRUCK VEHICLES

Vehicle Application	Engine Disp.	Trans. Type	Converter	Stall Speed	
			Size	Min.	Max.
Ranger (4x2)	2.3L TPH	A4LD	10-1/4″	2437	2833
Aerostar	3.0L	A4LD	10-1/4″	2720	3165
Ranger (4x2, 4x4) Bronco II (4x2, 4x4)	2.9L	A4LD	10-1/4″	2781	3288
E/F Series; Bronco	4.9L EFI	C6	12″	1610	1868
F150; Bronco	5.0L EFI	C6	12″	2092	2443
E/F Series; Bronco	5.8L EFI	C6	12″	2312	2666
E Series Over 8500 GVW	4.9L EFI	C6	12″	1594	1850
E/F Series Over 8500 GVW	7.5L EFI	C6	12″	2049	2362
E/F Series E/F Series; Bronco	4.9L EFI 5.0L EFI	AOD AOD	12″ 12″	2055 2098	2361 2456
E/F Series E/F Series E/F Series	5.8L 7.3L 7.5L	E4OD E4OD E4OD	12″ 12″ 12″	2100 1650 1840	2600 2010 2270

1989 STALL SPEED SPECIFICATION

PASSENGER VEHICLES

Vehicle Application	Engine Disp.	Trans. Type	Converter Size	Stall Speed Min.	Stall Speed Max.
Escort/Lynx/EXP	1.9L CFI	ATX	9-1/4″	2996	3460
Tempo/Topaz 2WD	2.3L HSC CFI	ATX	9-1/4″	2067	2450
Tempo/Topaz 4WD	2.3L HSC CFI	ATX	9-1/4″	2086	2483
Tempo/Topaz	2.3L HSC IV	ATX	9-1/4″	2067	2450
Mustang	2.3L OHC EFI	A4LD	10-1/4″	2437	2827
T'Bird/Cougar MN 12	3.8L EFI	AOD	12″	2156	2510
T'Bird/Cougar MN 12	3.8L S.C.	AOD	12″	2295	2676
Mustang	5.0L HO SEFI	AOD	12″	2098	2479
Ford/Mercury	5.0L SEFI	AOD	12″	2014	2326
Lincoln Town Car	5.0L SEFI	AOD	12″	2012	2324
Mark	5.0L HO + EFI	AOD	12″	2087	2465
T'Bird/Cougar/Mark VII LSC	5.0L SEFI	AOD	12″	2087	2465
Ford Mercury	5.8L HO	AOD	12″	1552	1862
Taurus/Sable	2.5L HSC CFI	CLC	9-1/4″	2312	2685
Taurus/Sable	3.0L EFI	AXOD	10-1/4″	1980	2271
Taurus/Continental	3.8L EFI	AXOD	10-1/4″	1956	2283

*Job #1 — 1989

Introduction

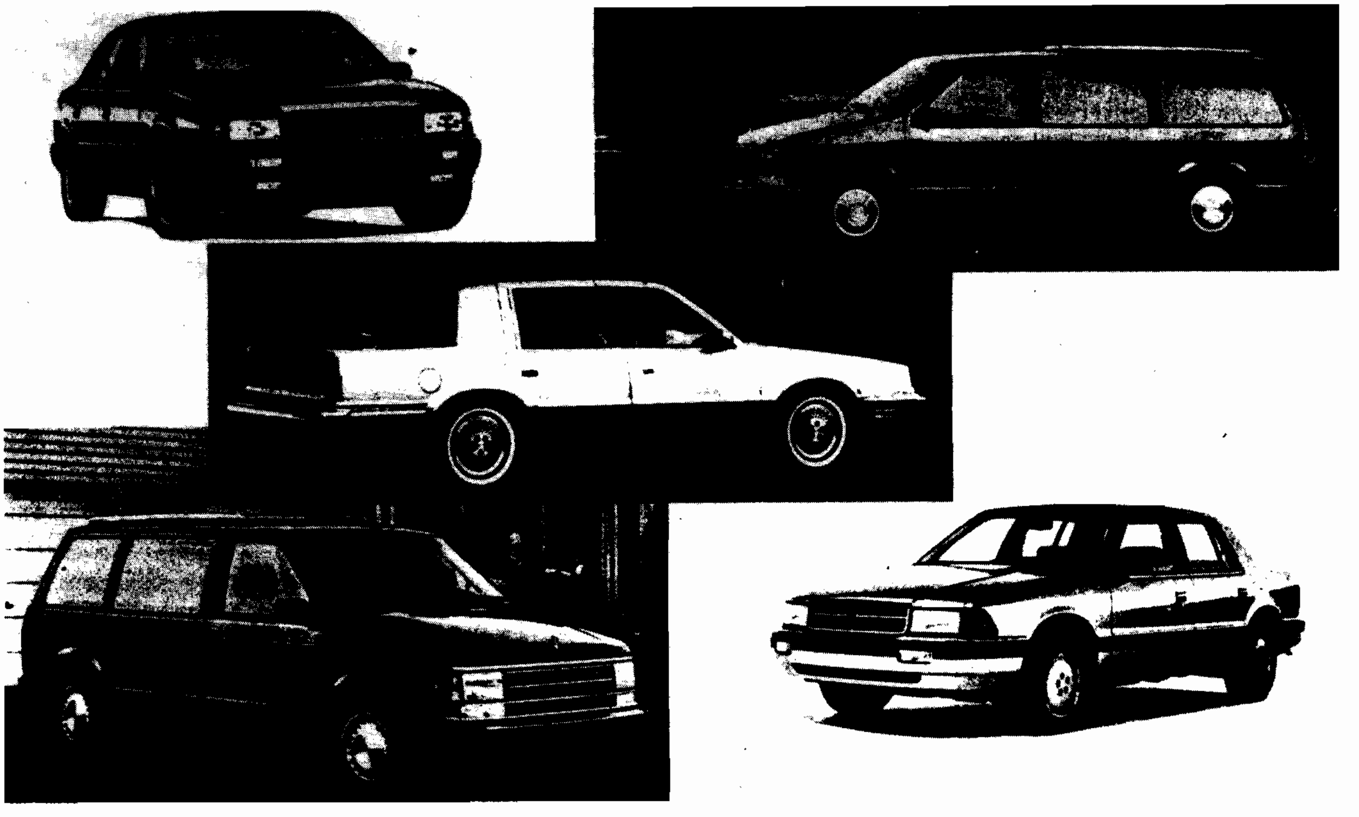


Fig.1 — Here are some of the various models on which the new four-speed automatic transaxle is available.

In racing, finding the right gear for the appropriate condition is essential to finding success on the track. While everyday passenger vehicles are not held to such a strict standard, all drivers appreciate efficient power, which is often the result of a well-designed transaxle.

For 1989, an all-new electronically controlled four-speed automatic transaxle is available with the 3.0L V-6 engine on the New Yorker, New Yorker Landau, Dynasty, Spirit, Acclaim, Caravan LE, all Grand Caravan models, Voyager LE, and all Grand Voyager models (Fig. 1).

This all-new transaxle (Fig. 2) has been designed to be very smooth and provides reduced noise, improved fuel economy, faster and smoother response, and improved shift quality. The transaxle provides faster acceleration in conjunction with a 3.43:1 final-drive ratio, a ratio 6 percent to 23 percent higher than the ratio used with previous three-speed transaxles. When the transaxle shifts into fourth gear, which is overdrive, the overall ratio drops to 2.36:1, providing reduced engine rpm, which contributes to quieter operation and various other benefits. To provide good fuel economy in conjunction with the lower overall ratio, the torque converter locks in fourth gear, thereby eliminating slippage.

Fig.2 — The new A-604 automatic transaxle.

Chrysler Motors' use of fully adaptive electronic transaxle controls in its new four-speed automatic transaxle is a worldwide industry first.

Also, the electronic adaptive controls provide kick-down shifts with a smoothness that is unmatched by any previous unit, making the power train feel more responsive without increasing harshness (Fig. 3). Being adaptive, these controls automatically compensate for changes in engine torque and provide good, *consistent* shift quality for the life of the transaxle.

Fig.3 - Smooth power is a noticeable characteristic on this new transaxle.

In this month's Master Tech Reference Book release, you will read about the operation of the new 1989 A-604 four-speed electronic automatic transaxle. After a description of the operation of this new transaxle, you will read about the advantages of electronics and the components that make this technological advance possible.

There is a section in this Reference Book on the system's self-diagnostic capability and conditions that are present when the system isn't working properly.

Following system self-diagnostics, there will be an examination of the new DRBII, which is a sophisticated, invaluable tool in the diagnostic process.

The last segment of this Reference Book will be on how to employ the DRBII by using the *diagnostic test procedure manual,* and there will be a sample problem to demonstrate how all this works.

Operation

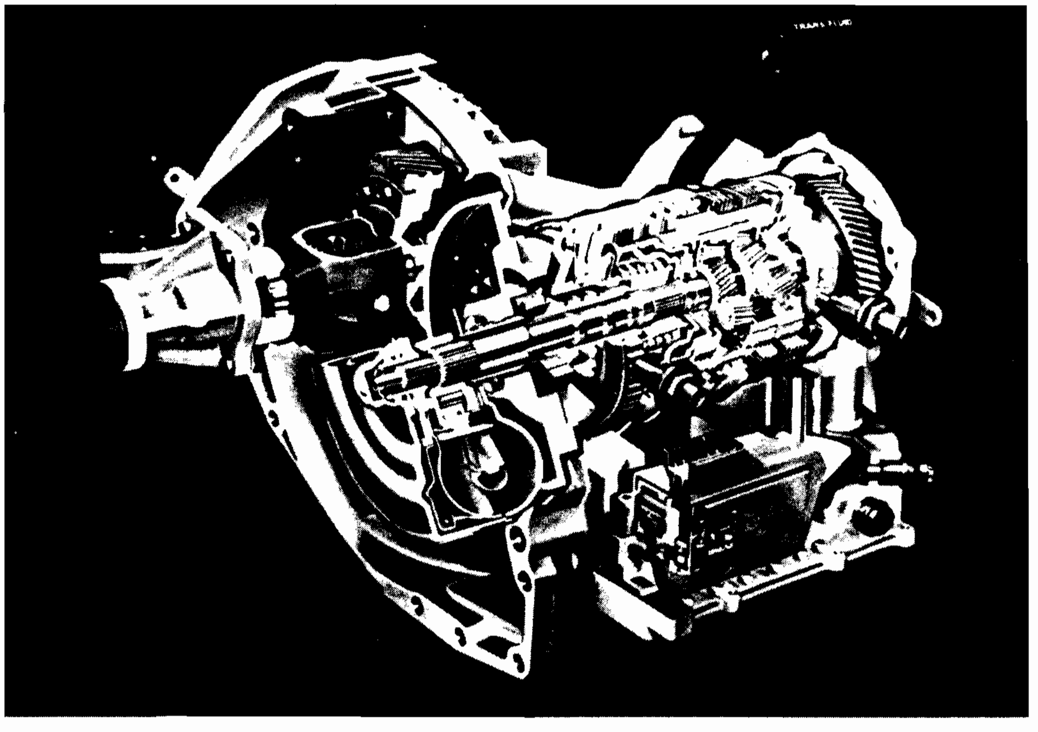
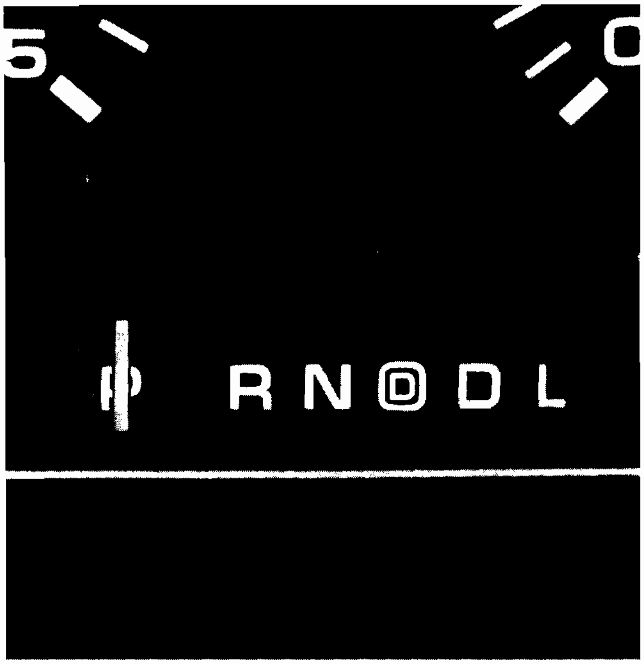


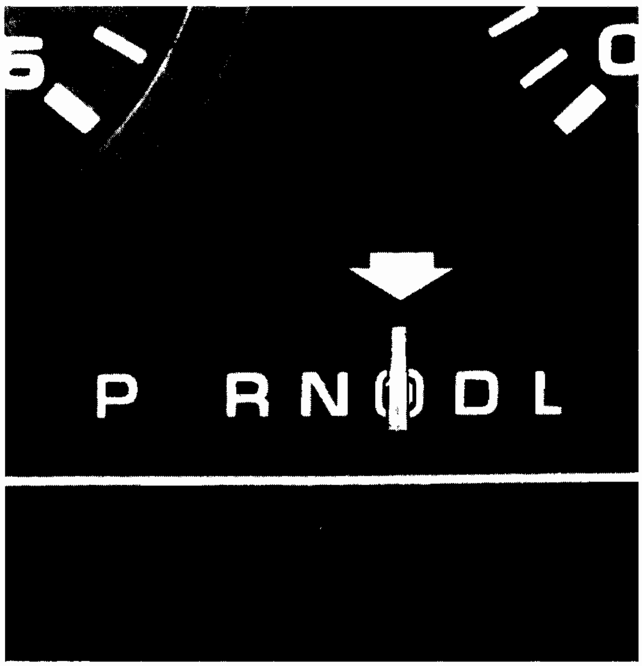
Fig.4 — The transaxle cutaway shows the various gears.

The revolutionary new A-604 provides forward ratios of 2.84, 1.57, 1.0, and 0.69. The reverse ratio is 2.21 (Fig. 4).

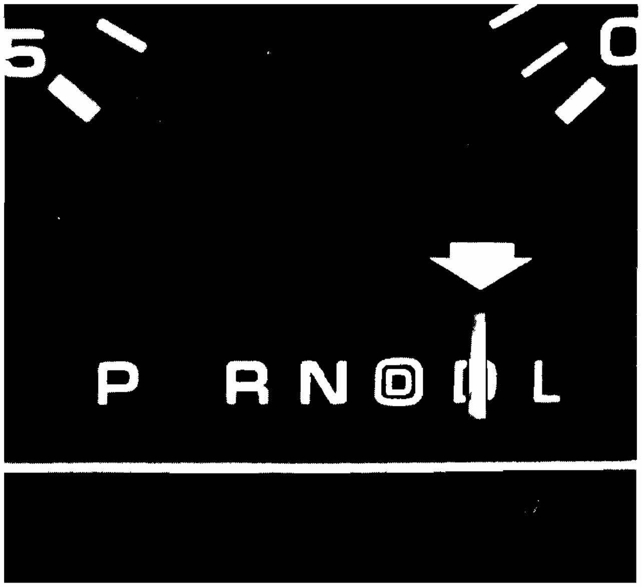
The shift selection indicator has six positions: P, R, N, OD, D, and L.



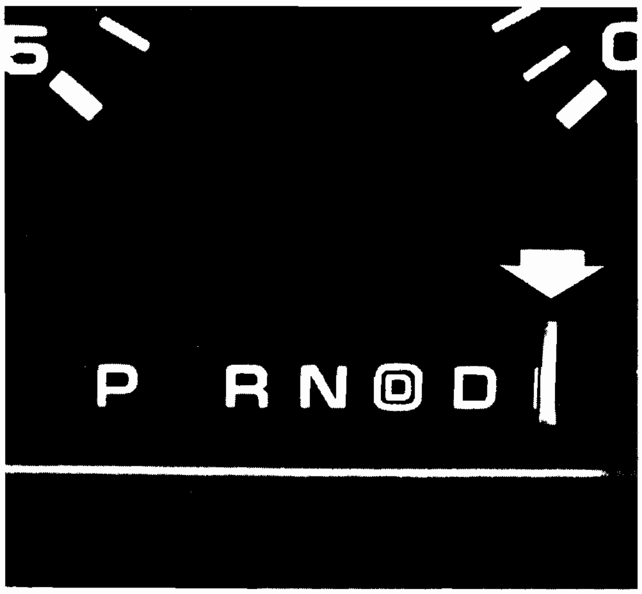
The OD position is actually a "D" inside an "O" to indicate overdrive operation. When OD is selected, the transaxle shifts normally through all four speeds. It is recommended for most driving.



The D position is used for hilly or mountainous driving. When D is selected, the transaxle uses only first, second, and third gears.



The L position provides maximum engine braking for descending steep grades. Unlike most automatic transaxles, it will provide second or third at peak engine speeds if the accelerator is depressed. This provides engine overspeed protection and maximum performance.



When operating in the D position, torque converter lockup also occurs in second or third gears for improved transaxle cooling when towing trailers on steep grades and in recognition of the heavier loads these vehicles carry.

The concept for this transaxle is unique in a number of ways. All automatic transaxles use planetary gear sets to produce several different gear reduction ratios. This depends on which parts are held and which parts rotate freely. Parts are held by bands and clutches that are controlled by hydraulic pressure. As the output shaft turns faster, a valve called a "governor" sends more hydraulic pressure to the valve body. Valves that control the bands and clutches open and the transaxle shifts to a higher gear. The new A-604 eliminates the bands, the overrunning clutch, and governor found on conventional hydraulically controlled transaxles. Instead, an external controller applies and releases the clutches via an electrohydraulic valve body. The result is solenoid-regulated reliability and precision. Shift decisions are made by the controller, which compares data from two sensors: input speed and output speed.

Shift quality is not affected by a poorly performing engine. The electronic adaptive controls provide a number of additional features; they inherently compensate for changes in engine or friction element torque. The expected shift quality calibration that is now required for each model, engine, and year will be unnecessary because all units will shift alike.

The single-board electronic controls are packaged underhood in a potted die-cast aluminum housing. Electrical connections are through a sealed 60-way connector (Fig. 5). The transaxle control module shares information with the engine control module by way of Chrysler's multiplexing collision detection (C^2D) link.

The controller uses inputs from shift position switches, turbine speed sensor, transaxle output speed sensor, pressure switches contained in the solenoid assembly, throttle position sensor, and engine speed signal to provide control of the transaxle function by driving four direct-acting solenoids (Fig. 6).

Variables such as coolant temperature and ambient temperature affect how and when the transaxle shifts.

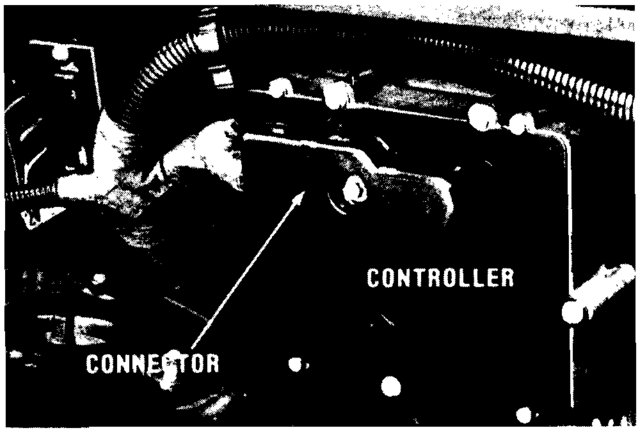


Fig.5 — The controller and 60-way connector are the brains and the messenger of the system.

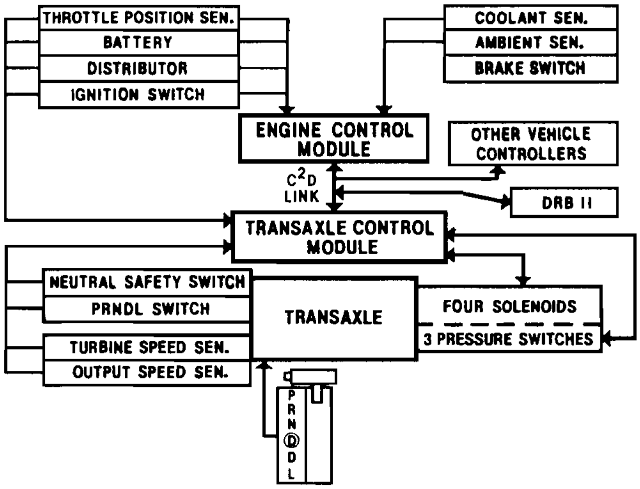


Fig.6 — This chart represents the different inputs that control the transaxle.

Applying the brake pedal activates the brake switch. This sends a signal to the transaxle control module to unlock the torque converter.

The controller "learns" the characteristics of the particular transaxle to optimize vehicle shift quality performance. Under normal conditions, this learning occurs during, approximately, the first 10 shifts.

A-604 Electronic Control

Now that you have read about some of the features of this transaxle, let's discuss the series of electronic functions that contribute to the unique operation of this system.

The ignition switch powers up the controller (Fig. 7). Then the distributor pulses give the controller the speed of the engine. The battery voltage is monitored to determine if there is enough power to run the system or if there is too much voltage, which could damage the system.

Fig. 7 — The transaxle's electronic controller is put into action by simply turning the ignition switch on.

The throttle position sensor (TPS) gives an indication of how much torque is being requested by the driver. This will establish the shift pattern and the initial torque capacity of the clutches during transaxle engagement.

The coolant temperature sensor and ambient temperature sensor prevent torque converter lockup before the engine reaches normal operating temperature.

The controller receives input from the three pressure switches that are contained in the solenoid assembly and indicate pressure in the low-reverse clutch, 2-4 clutch, and the overdrive clutch.

Gear selector data is provided by the neutral safety switch and PRNDL switch.

Internal rotational speeds are provided by the turbine speed sensor and the output speed sensor.

The controller will actuate the four solenoids that are mounted on the outside of the transaxle case. Two are single purpose: one controls the underdrive clutch and the other the overdrive clutch. The other two serve a dual purpose: in park, neutral or low, the low-reverse solenoid controls the low-reverse clutch; in second, third, or fourth, the same solenoid controls the torque converter lockup clutch. The other dual-purpose solenoid controls the 2-4 clutch, except in reverse when it controls the low-reverse clutch. This dual purpose is made possible by the solenoid switch valve located in the transaxle valve body.

If the controller detects a problem, it can shut down power to the solenoids for a fail-safe limp-in mode of operation, which provides park, reverse, neutral, and second.

Normal system operation can be restored by recycling the ignition switch. This will be in effect until a fault is detected again.

For vehicles equipped with the electronic vehicle information center (EVIC) system, a "check trans" message will appear in the display when the solenoids shut down (Fig. 8).

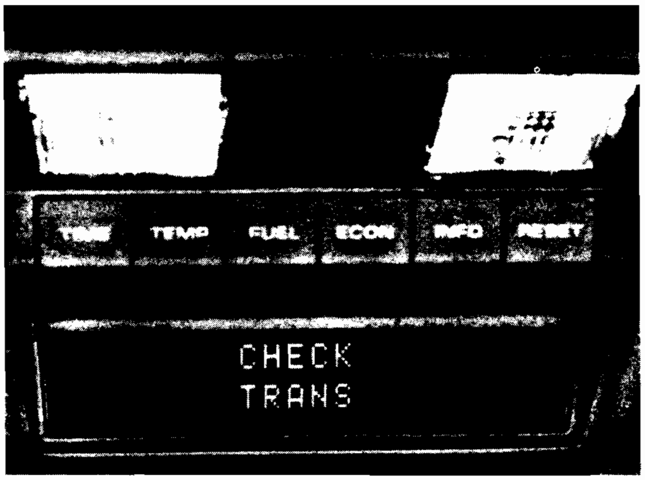


Fig. 8 — The message in the EVIC will visually let the driver know that there may be a transaxle problem.

Components

Now that we've read about some of the electronics, let's examine the components that carry out the system's orders.

The **diagnostic connector** (Fig. 9) is a light blue six-way male connector. This connector allows the DRBII diagnostic tool access to the C²D.

Fig. 9 — The diagnostic connector allows the DRBII to perform its diagnostic function.

With the DRBII connected, the technician can perform diagnostic tests on:

- The A-604 transaxle
- The body computer (EVIC)
- The security alarm system (SAM)
- The electronic instrument cluster

On the C and Y bodies, the connector is located inside the vehicle, under the instrument panel just to the right of the steering column.

On the S and A bodies, the connector is located inside the vehicle, under the instrument panel, on the extreme left, behind the fuse access panel (Fig. 10).

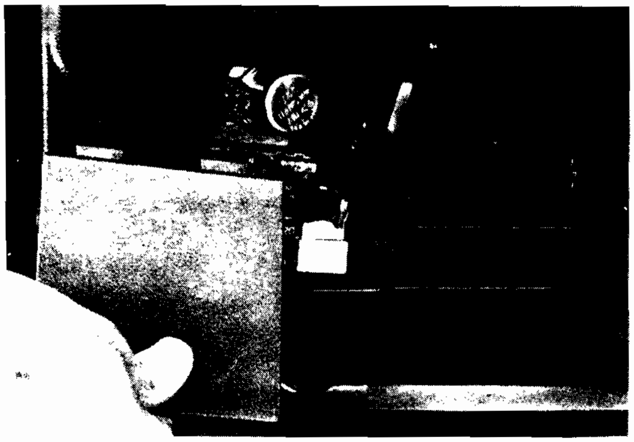


Fig.10 — By removing this cover, the diagnostic connector will be revealed.

The **A-604 transaxle controller** is a computer that controls the transaxle. It has a 60-way connector that is shaped similar to the one on the engine controller (Fig. 11). It contains on-board diagnostics and fault code memory, which is also accessed by the DRBII diagnostic tool.

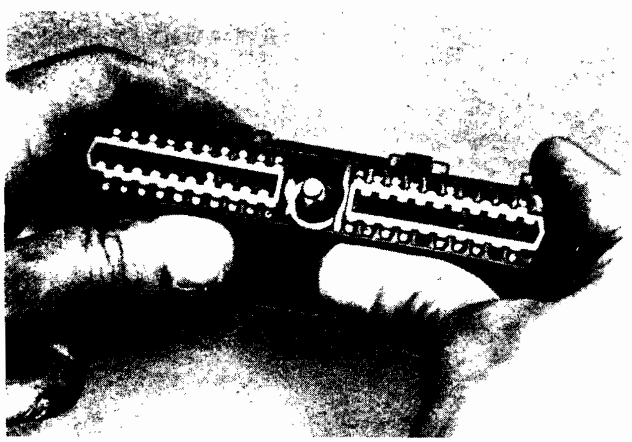


Fig.11 — The 60-way connector attaches to the transaxle controller.

The A-604 controller is located in the right front fender shield on C, Y, and A bodies (Fig. 12).

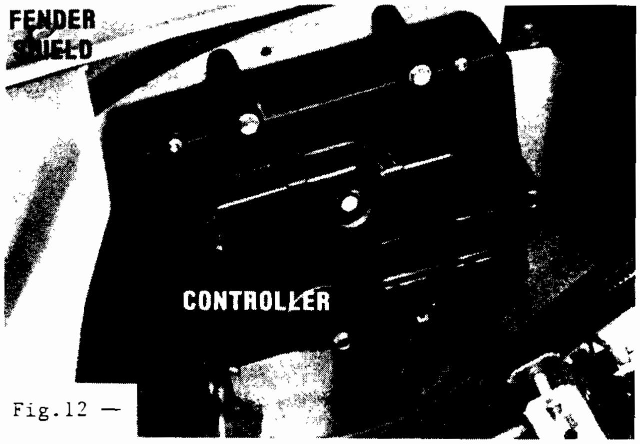


Fig.12 — The controller for the New Yorker Dynasty and the Spirit Acclaim is located on the front fender shield.

The S body's controller is mounted near the right strut tower (Fig. 13).

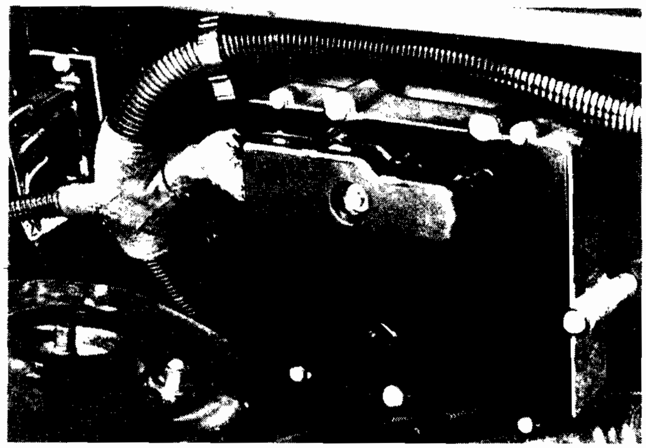


Fig.13 — The controller on the Voyager Caravan is very accessible.

The **EATX relay** is operated by the controller. Its purpose is to make operating voltage available to the solenoids and switches located in the solenoid assembly.

When the controller opens the relay, voltage is shut off to the solenoids and the transaxle goes into a default-to-second-gear mode.

While in this mode, only second gear, reverse, neutral, and park are available.

The **reverse lamp relay** is operated by the neutral safety switch and the PRNDL switch.

ts purpose is to make operating voltage available to :he reverse lamps (Fig. 14).

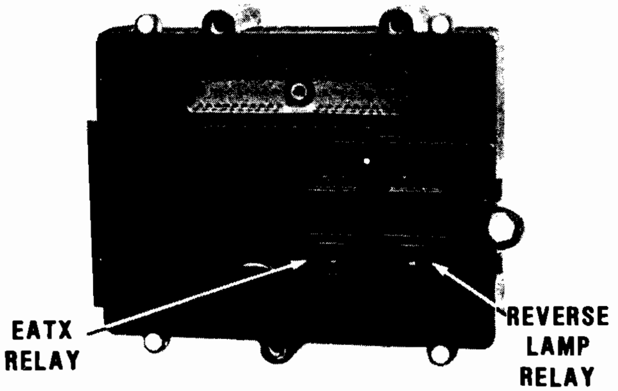


Fig.14 — The EATX relay and the reverse lamp relay are located next to one another.

On the C, Y, and A bodies, both the reverse lamp relay and the EATX relay are mounted on a bracket that is bolted to the A-604 controller.

Both the S body's reverse lamp relay and EATX relay are mounted to the right inner fender shield next to the right strut tower.

Both relays are identical except that the reverse lamp relay has a white and a violet wire and the EATX relay has a red and a light green wire in their respective connectors (Fig. 15).

Fig.15 — The wire colors help determine which relay is which.

The **solenoid assembly** (Fig. 16) is an electrical assembly that has an eight-way connector. It contains four electromagnetic solenoids that are used to control (under the direction of the controller) the hydraulic circuits within the transaxle.

Also inside are three pressure switches that are used to sense when hydraulic pressure is present in various circuits. The solenoid assembly bolts to the outside of the transaxle and is covered with a rubber sound shield.

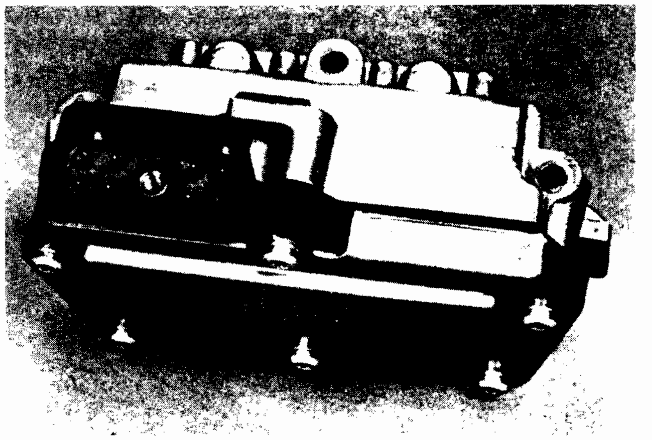


Fig.16 — The solenoid assembly mounts on the transaxle

The **output speed sensor** (Fig. 17) is a two-wire magnetic pickup device used to detect the output speed of the transaxle, while the **turbine speed sensor** (Fig. 18) detects the input speed of the transaxle.

Fig.17 —

The output speed sensor is vital to the operation of the system.

Fig.18

Input speed is monitored by the turbine speed sensor.

Because there are two speed sensors on the transaxle that look alike, it is important to know that the turbine speed sensor is the one closest to the engine and the output speed sensor is the one farthest from the engine (Fig. 19)

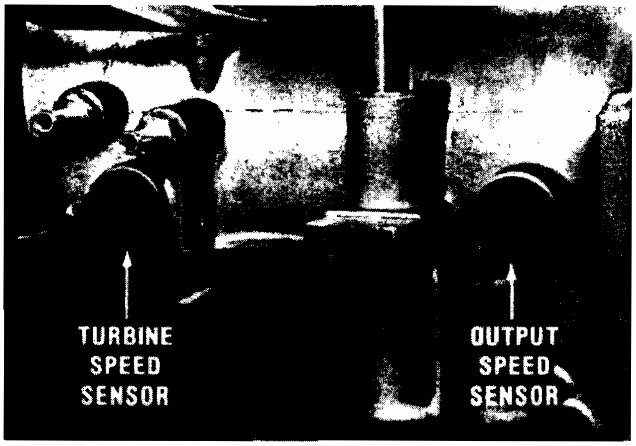


Fig. 19 — The proximity of the sensors to the engine tells you which one is which.

The **PRNDL switch** is similar in appearance to the neutral safety switch, but is identified by its plastic tab (Fig. 20). Its purpose is to help the transaxle controller sense the shifter position.

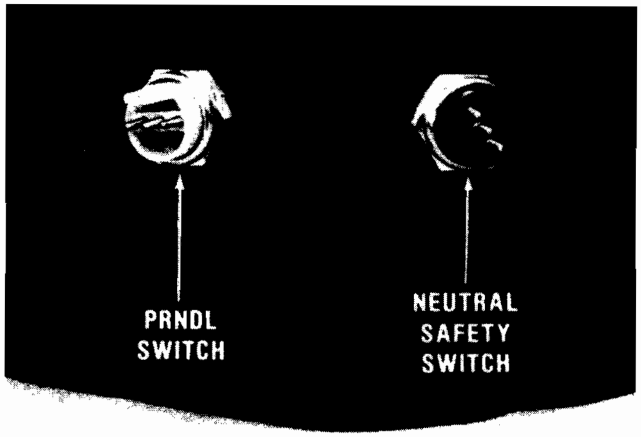


Fig. 20 — The plastic tab on the PRNDL switch helps identify it from the neutral safety switch.

Although the **neutral safety switch** is wired differently, this part has been carried over from previous transmissions and transaxles. The pins are still part of the reverse lamp and neutral safety switch circuit, but helping determine shifter position is an added duty.

The PRNDL and the neutral safety switch look alike, so it's important to remember that the PRNDL switch is the one closest to the engine and the neutral safety switch is the one farthest away.

A-604 Self-Diagnostics

The advantages of the new computer-controlled automatic transaxle are many; smoother shifts and a built-in diagnostic capability are at the top of the list.

The A-604 transaxle controller monitors critical input and output circuits relating to the control of the transaxle. Some of these circuits are tested continuously, and others are checked only during normal driving conditions.

FAULT CODES

If the A-604 controller senses that one of its circuits is not functioning properly, a fault code will be stored in the controller's memory. Each monitored circuit has its own designated fault code. Any stored fault code will remain in memory until erased by the technician. Fault codes are two-digit numbers that identify which circuit is malfunctioning. In most cases, they do not pinpoint a specific component as defective. It is important to keep in mind that fault codes can be set for hydraulic and mechanical reasons as well as electrical problems.

There are two types of fault codes. The first is a hard fault code, which is any fault code that comes back soon after recycling the ignition key and duplicating the conditions that caused the default.

A soft fault code accounts for the majority of intermittent failures that may be caused by wiring or connector problems. Defects that come and go like this are the most difficult to diagnose.

The A-604 controller is sensitive to electrical and internal transaxle problems. When a problem is sensed, the controller will store a fault code and, for all but six of these fault codes, cause the transaxle to default.

An operating characteristic of a vehicle in default will be that it shifts into and remains in second gear in all forward gearshift positions. No upshifts or downshifts are allowed. The position of the manual valve alone allows the selections that are available. Although vehicle performance will be limited while in this mode, it allows the owner to drive his vehicle in for service.

The DRBII™

As described in the May Master Tech, using the DRBII to diagnose problems can be an enormous help and, in the same light, the DRBII must be used to diagnose problems related to the A-604 system as well (Fig. 21).

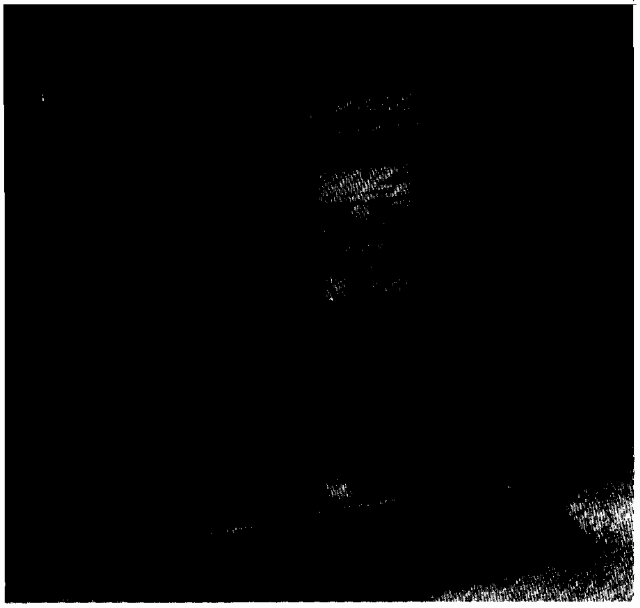


Fig. 21 — The expanded use of the DRBII also allows for transaxle diagnostics.

When using the tester for the transaxle, make sure it's connected to the Chrysler C^2D diagnostic connector located under the instrument panel. It is important to remember not to mistakenly use the engine diagnostic connector located under the hood.

Some of the capabilities of the DRBII are:

- The **diagnostic test** that allows you to read and erase fault codes stored in the A-604 controller's memory.
- The **circuit actuation test** enables you to turn on and off certain A-604 components. This allows easier and more accurate testing of these circuits.
- There is a **switch test** that lets you view various changing switch positions as seen by the controller.
- The **sensor test** allows the capability of monitoring the A-604 sensors on the DRBII display.
- The **engine running test** displays various sensor signals received by the A-604 controller. Also, certain A-604 components may be actuated during this mode.

What's very impressive about the DRBII is that all of these tests just mentioned can be conducted without a road test. Also, it is important to remember that A-604 diagnostics are available only through equipment that can communicate on Chrysler's C^2D bus circuit. A diagnostic test procedure manual for the A-604 has been designed specifically to be used with Chrysler's DRBII.

Operation of the DRBII Using the A-604 Diagnostic Procedure Manual

The diagnostic test procedure manual is designed to accompany and interpret the readings received by the DRBII.

The manual begins with an introduction section that describes the A-604 (Fig. 22).

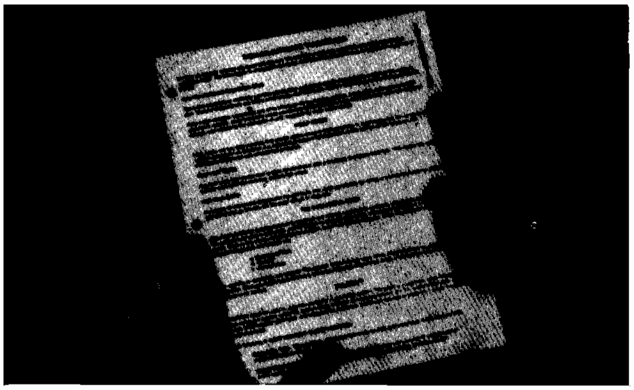


Fig. 22 — The introduction section gives an overview of how different areas of the system work.

There is a fault code list (Fig. 23) and flowcharts (Fig. 24) to help find what the problem is and how to fix it based on the fault code received.

A-604
DIAGNOSTIC FAULT CODES

FAULT	CODE	LIMP-IN
Internal A-604 controller	11	Yes
Battery was disconnected	12	No
Internal A-604 controller	13	Yes
Relay output always on	14	Yes
Relay output always off	15	Yes
Internal A-604 controller	16	Yes
Internal A-604 controller	17	Yes
Engine speed sensor circuit	18	Yes
Bus communication with SMEC	19	No
Switched battery	20	Yes
OD pressure switch circuit	21	Yes
2-4 pressure switch circuit	22	Yes
2-4/OD pressure switch circuit	23	Yes
LR pressure switch circuit	24	Yes
LR/OD pressure switch circuit	25	Yes
LR/2-4 pressure switch circuit	26	Yes
All pressure switch circuits	27	Yes
Illegal shifter positions	28	No
Throttle position signal	29	No
OD hydraulic pressure switch	31	Yes
2-4 hydraulic pressure switch	32	Yes
OD/2-4 hydraulic pressure switch	33	Yes
Solenoid switch valve	37	No
Lockup control	38	No
Turbine/trans output speed circuit	39	Yes
LR solenoid circuit	41	Yes
2-4 solenoid circuit	42	Yes
OD solenoid circuit	43	Yes
UD solenoid circuit	44	Yes

Fig.23 — Fault code list interprets what the fault code numbers indicate.

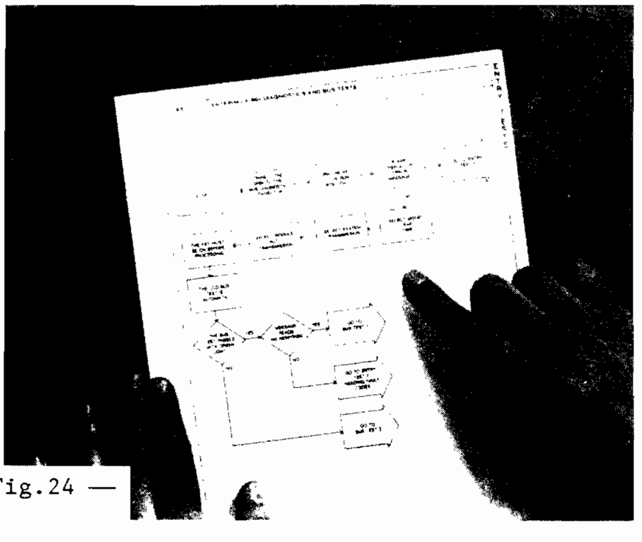


Fig.24 — The manual has flowcharts that are road maps to fixing the problem.

The manual has a section on visual inspections that includes fluid level and condition inspection, a linkage inspection, and an electrical connection inspection (Fig. 25).

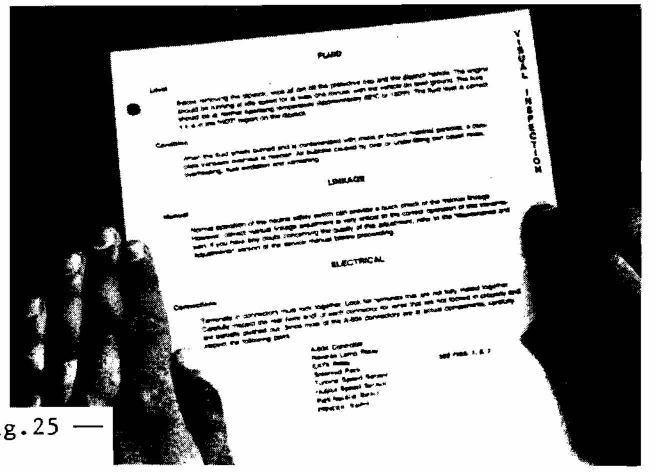


Fig.25 — A visual inspection is critical and is laid out in the diagnostic test procedure manual.

There is a section on component descriptions, pressure tests, and entry tests that consists of where to connect the DRBII, reading fault codes, shift lever tests, DRBII error messages, and intermittent fault codes.

The section on transmission tests basically consists of flowcharts that lead you through various measures to arrive at the solution to the problem encountered using the DRBII.

The final section in the manual is on bus tests that test for "no response" and a "failed bus message" index (Fig. 26).

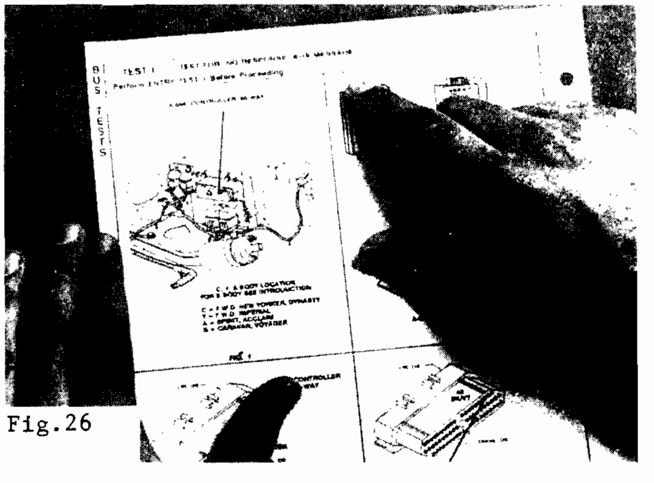


Fig.26 If there is a problem in the bus, the manual addresses that also.

The DRBII is connected through the bus connector located under the instrument panel (Fig. 27).

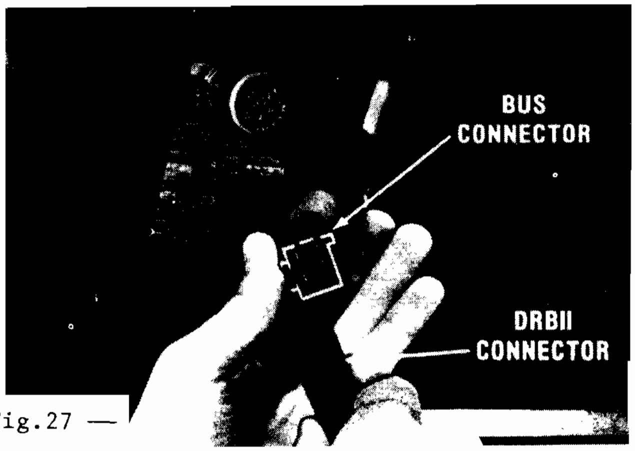


Fig. 27 — Connect the DRBII to the bus connector to diagnose the system.

A special adapter cable supplied with the DRBII is needed to interface with the bus connector. No other power supply or connection is needed.

This blue connector must not be confused with the familiar diagnostic connector found under the hood, which is used to access the engine controller.

Once the DRBII is connected to the bus connector, insert the 1989 cartridge (Fig. 28).

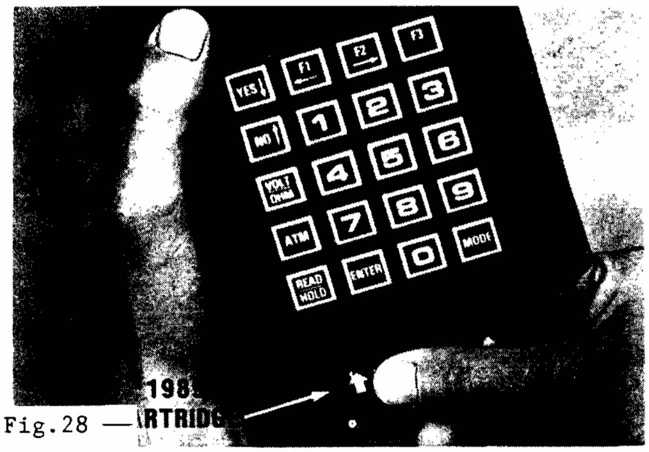


Fig. 28 — There is a specific 1989 cartridge for the DRBII.

Then turn the ignition switch to the "run" position (Fig. 29).

A Chrysler logo and system level number will be displayed. Also notice that the revision level is subject to change.

Fig. 29 — Turning the ignition switch to the "run" position will start the diagnostic process.

After a few seconds, the display will change to read "select model year 1989."

Once the display reads 1989, press the "down" or "yes" key (Fig. 30).

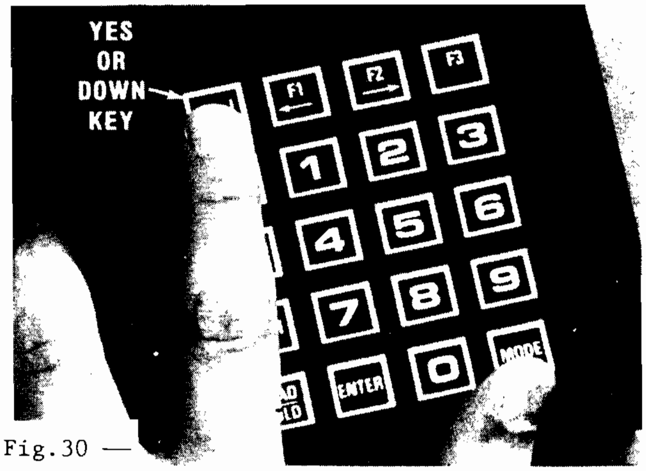


Fig. 30 — Select the model year by pressing the "down" or "yes" key.

After the model year is selected, the DRBII display will read "select system."

All system tests are available at this level. Use the F1 or F2 key to select transmission. Now press the "down" or "yes" button to engage the transmission test.

The DRBII display will now read "select module A-604 transmission."

Then press the "down" or "yes" key. After selecting the A-604 transmission, the bus circuit testing begins. This display is automatic. After the bus testing is finished, the display will read that the test of C²D bus is completed and the bus is operational.

If the bus test screen were to indicate a "bus fail" message, the red LED on the DRBII would come on and further testing of the automatic transmission will be blocked and "failed bus" diagnostics would have to be performed.

After a successful bus test, the DRBII will automatically display "auto transmission version 0_2" followed by the "automatic transmission controller part number."

After a short pause, the DRBII will automatically display "select test display."

From this point, you may drop into a display of stored transmission fault codes by pressing the "yes" key. If there is more than one code in memory, the fault that occurred most recently will be displayed farthest to the right. Pressing the "no" button from here moves you back up to the "select test" level. Moving right or left while at this level will make the various tests available. These tests are:

- The **display of fault codes** that allows you to view any stored fault code.
- The **shift lever test** that allows you to view the shift lever position as seen by the A-604 controller.
- The **shift lever status.** In this test, the controller displays the gear it thinks the transmission is in and shows it on the DRBII display.
- The **pressure switch tests** let you view the A-604 pressure switches as seen by the A-604 controller.
- The **sensor tests** that test the output of various sensors and switches.
- The **rpm display** reads engine, turbine, and output speed sensors simultaneously.
- The **pressure tests** command various hydraulic circuits through the electronics of the A-604 controller.
- And finally, **clear fault codes.** This area is used to erase stored fault codes.

Once the DRBII is in the "automatic transmission" section, it will constantly monitor the A-604 controller to see if the system is in default. If transmission limp-in occurs, the DRBII will turn on its LED indicator (Fig. 31).

There are several fault codes that are listed in the manual that cause the transaxle to go into default. There are also codes listed that will not cause the transaxle to go into default (Fig. 32).

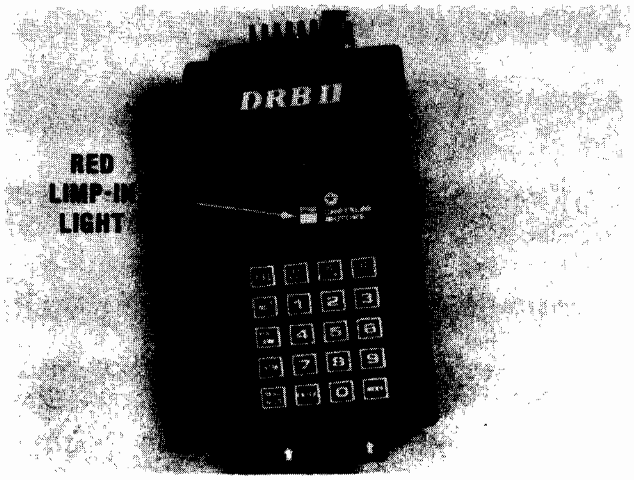


Fig. 31 — The DRBII has a red indicator light when limp-in occurs.

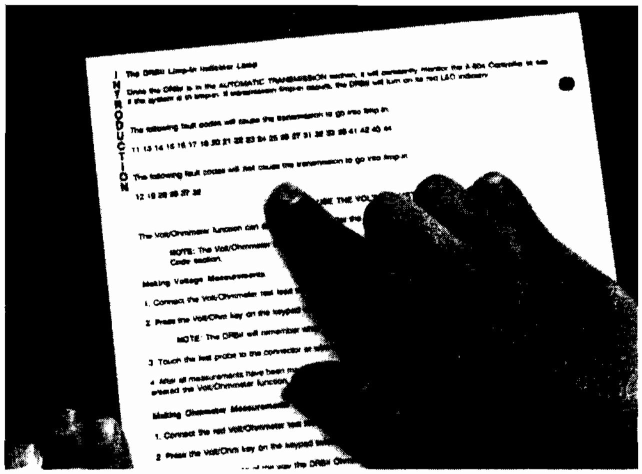


Fig. 32 — The introduction section lists fault codes that will and will not cause limp-in to occur.

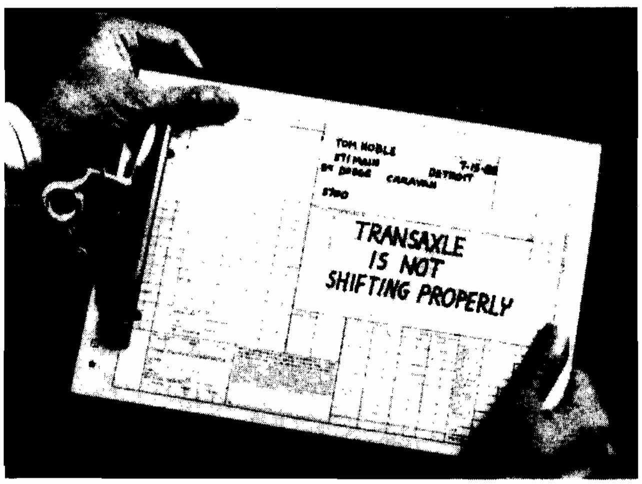


Fig. 33 — This complaint would lead you to the DRBII and the diagnostic test procedure manual.

Now that we know what the DRBII is all about, let's put it and the procedure manual to work.

If you receive a customer complaint of a transaxle that isn't shifting properly, it would obviously lead you to believe that the transaxle may have a problem (Fig. 33).

The first step in a situation of this nature would be to read the introductory information in the diagnostic manual, then go to "entry test one" and connect the DRBII as indicated on the flowchart.

This step, along with the others listed in test one, will enable the reading, recording, and erasing of any fault code received. This will also enable a technician to determine if he has received a soft or hard fault code.

By continuing to use the flowcharts on the following pages, the manual will direct the user to a test that will provide a corrective measure.

For example, if a code 29 was received, it would indicate a hard fault code. After the code is erased and the vehicle is road tested again, and if the code reoccurs, it would lead the reader to transmission test 13.

Test 13 is begun by disconnecting the A-604 controller connector.

Inspect the connector for spread or pushed out terminals (Fig. 34).

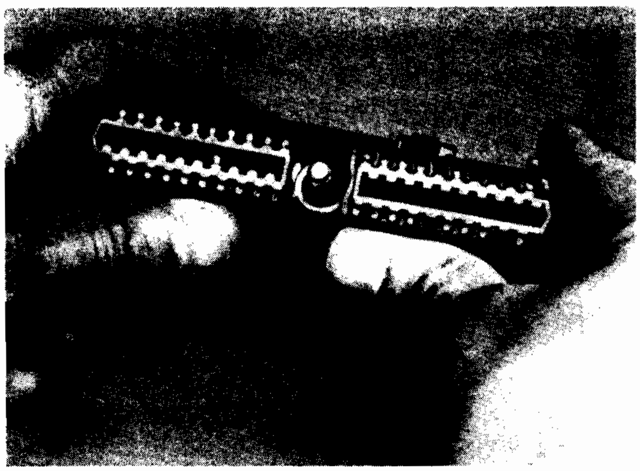


Fig. 34 — A damaged terminal could alter the effectiveness of the connector.

Following the test to the next step, turn the ignition to the "run" position and measure the voltage at the orange and dark blue wire in cavity 12 (Fig. 35), using the DRBII as a voltmeter as described in the May Master Tech.

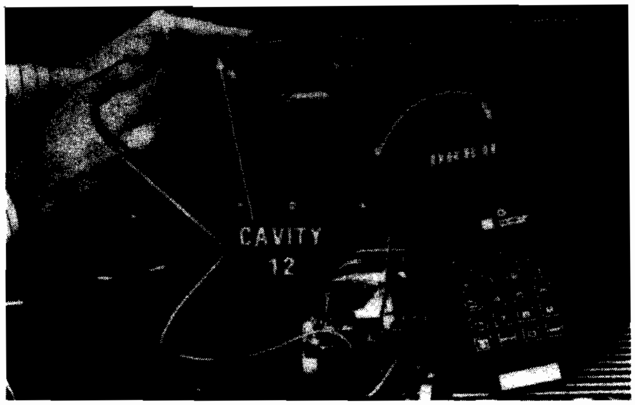


Fig. 35 — The DRBII also serves as a voltmeter.

If the meter doesn't read near one volt, the open in the wire between the controller and the throttle position sensor would have to be repaired.

If the voltmeter does read near one volt, you continue by testing the black with a light blue tracer wire in cavity 51 for continuity to ground.

If the meter does show high resistance to ground, repair of the black with light blue tracer wire between the A-604 controller and ground would be necessary (Fig. 36).

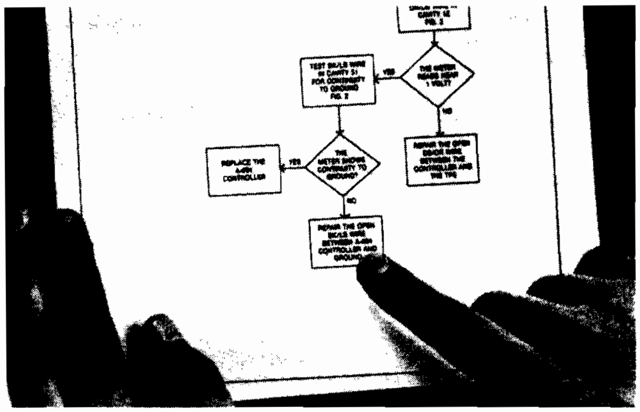


Fig. 36 — In this scenario, the manual's flowchart will lead to a wire repair between the controller and ground.

Remember: After completing all repairs, be sure to road test the vehicle to make sure the problem has been corrected. If the battery or the controller has been disconnected, drive the vehicle for 10 shifts.

Well, now you've had a chance to read about the new A-604 electronic transaxle. You'll agree it's a very fascinating innovation — an innovation that, with the DRBII and the support materials mentioned, will allow customers to enjoy smooth-operating performance for many years to come.

Diagnostic Fault Codes

Fault	Code	Limp-in
Internal A-604 controller	11	Yes
Battery was disconnected	12	No
Internal A-604 controller	13	Yes
Relay output always on	14	Yes
Relay output always off	15	Yes
Internal A-604 controller	16	Yes
Internal A-604 controller	17	Yes
Engine speed sensor circuit	18	Yes
Bus communication with SMEC	19	No
Switched battery	20	Yes
OD pressure switch circuit	21	Yes
2-4 pressure switch circuit	22	Yes
2-4/OD pressure switch circuit	23	Yes
LR pressure switch circuit	24	Yes
LR/OD pressure switch circuit	25	Yes
LR/2-4 pressure switch circuit	26	Yes
All pressure switch circuits	27	Yes
Illegal shifter positions	28	No
Throttle position signal	29	No
OD hydraulic pressure switch	31	Yes
2-4 hydraulic pressure switch	32	Yes
OD/2-4 hydraulic pressure switch	33	Yes
Solenoid switch valve	37	No
Lockup control	38	No
Turbine/trans output speed circuit	39	Yes
LR solenoid circuit	41	Yes
2-4 solenoid circuit	42	Yes
OD solenoid circuit	43	Yes
UD solenoid circuit	44	Yes

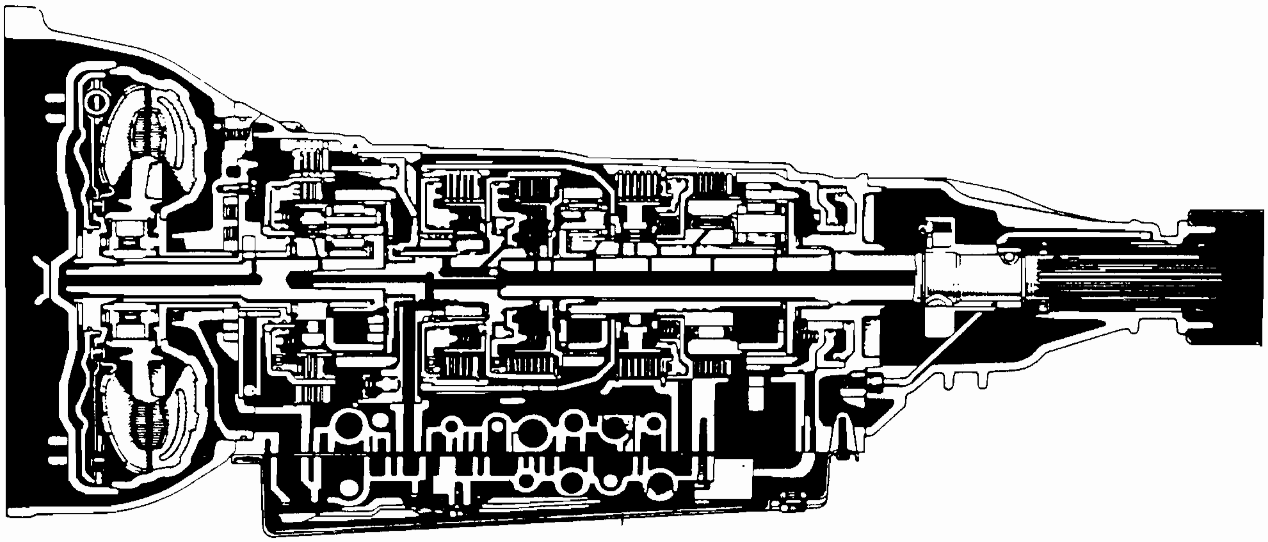
AW-4 AUTOMATIC TRANSMISSION

DESCRIPTION

The AW-4 is a four-speed, electronically controlled automatic transmission (Fig. 1). Running gear consists of a lockup torque converter; oil pump; three planetary gear sets; clutch and brake units; hydraulic accumulators; and a valve body controlled by electrical solenoids and a transmission computer unit (TCU).

The valve body solenoids are activated by signals from the TCU. Signal sequence is determined by vehicle speed and throttle position.

Fourth gear is an overdrive range. Ratio is 0.705:1. First, second, third and reverse gear are conventional. Third gear ratio is 1:1. A separate planetery gear set provides overdrive operation in fourth gear.



Cables are used for transmission shifting and throttle pressure control. A neutral safety switch permits engine starting in Park and Neutral range only.

GEAR SHIFT POSITIONS

The AW-4 transmission has six gear shift lever positions. Park, Reverse and Neutral positions are conventional and mechanically operated. The 1-2, 3 and D ranges provide electronically controlled shifting.

The 1-2 position provides first and second gear only. The 3 position provides first, second and third gear. The D range provides first through fourth gear. Overdrive fourth gear range is available only when the shift lever is in D position (Fig. 2).

TRANSMISSION IDENTIFICATION

The transmission I.D. plate is attached to the case (Fig. 3). The plate contains the transmission serial and model numbers. Refer to the information on the plate when ordering service replacement parts.

COMPONENTS AND OPERATION

Electronic Controls

The AW-4 is electronically controlled in the forward gear ranges. The controls include the computer unit (TCU), valve body solenoids and sensors that monitor vehicle speed, throttle opening, shift lever position and brake pedal application.

TCU

The TCU determines shift and converter lockup timing based on signals from the sensors. The valve body solenoids are activated/deactivated accordingly.

Two separate shift modes are programmed into the TCU. The Comfort mode provides normal shift speeds and points. The Power mode provides higher engine speeds and shift points when extra acceleration and torque are needed. The shift modes are activated by a switch in the instrument panel.

The TCU has a self diagnostic program. Component and circuitry malfunctions can be diagnosed with the DRB II™ tester. Once a malfunction is noted and stored in TCU memory, it is retained even after the problem has been corrected. To cancel a stored malfunction, simply disconnect and reconnect the "Trans." fuse in the TCU harness.

Valve Body Solenoids

The solenoids are mounted on the valve body and operated by the TCU. The solenoids control operation of the converter lockup and shift valves in response to input signals from the TCU.

Sensors

The sensors include the throttle position sensor (TPS), the speed sensor, the neutral safety switch and the brake pedal application switch.

The throttle position sensor is mounted on the throttle body. It electronically determines throttle position and relays this information to the TCU to control shift points and converter lockup.

The speed sensor consists of a rotor and magnet on the transmission output shaft and a switch in the extension housing or adapter. The sensor switch is activated each time the rotor and magnet complete one revolution. Sensor signals are transmitted to the TCU.

The neutral safety switch is mounted on the valve body manual shaft. The switch signals shift linkage and

P	PARK
R	REVERSE
N	NEUTRAL
D	FIRST THROUGH FOURTH GEAR (FOURTH GEAR OVERDRIVE)
3	THIRD GEAR (MANUAL)
1-2	FIRST-SECOND GEAR (MANUAL)

Fig. 2 Gear Shift Positions

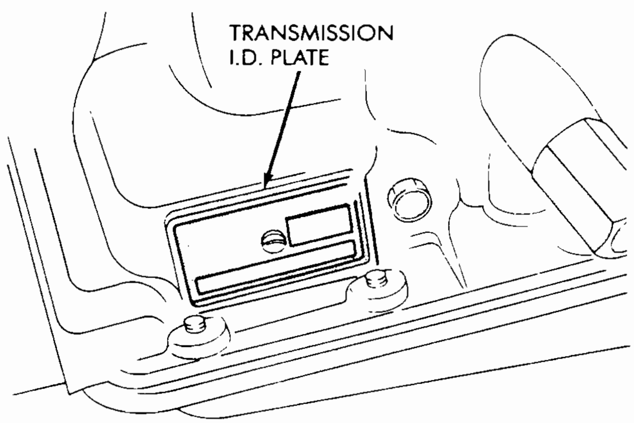


Fig. 3 Transmission Identification

manual valve position to the TCU through an interconnecting harness. The switch prevents engine starting in all gears other than Park or Neutral.

The brake application switch releases the lock-up clutch in the torque converter whenever the brakes are applied. The switch is mounted on the brake pedal bracket and signals the TCU when the pedal is pressed or released.

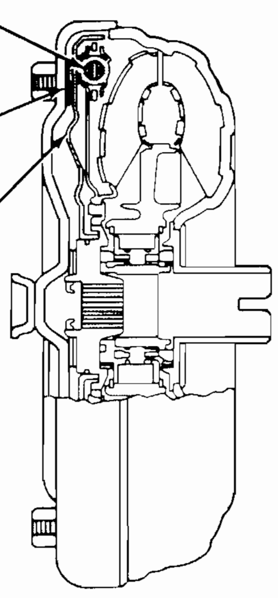


Fig. 4 Lockup Torque Converter

TORQUE CONVERTER

A lockup torque converter is used for all applications. The lockup mechanism consists of a sliding clutch piston, clutch springs and the clutch disc material (Fig. 4).

The disc is attached to the converter front cover. The clutch piston and clutch springs are attached to the turbine hub. The springs dampen engine firing impulses and loads during the initial phase of converter lockup.

Lockup is controlled by valve body solenoid number three and by the lockup relay valve. At lockup speed, the solenoid channels line pressure to the lockup clutch through the relay valve.

Torque converter lockup occurs in: Ssecond gear in 1-2 position; third gear in 3 position; third and fourth gear in D position.

FOURTH GEAR OVERDRIVE COMPONENTS

The overdrive system consists of the input shaft, one-way clutch, planetary sun gear-ring gear, planetary carrier, direct clutch and overdrive brake (Fig. 5). The overdrive elements are controlled and applied through valve body solenoid number two.

In overdrive fourth gear, the brake prevents the overdrive sun gear from turning. During operation, the overdrive elements operate as follows:

The overdrive input shaft and planetary carrier rotate as a unit. The sun gear and overdrive direct clutch drum are in mesh and operate as a single unit. The direct clutch splines function as the hub for the overdrive brake. The one-way clutch outer race is in mesh with the planetary carrier. The inner race is fixed to the sun gear shaft.

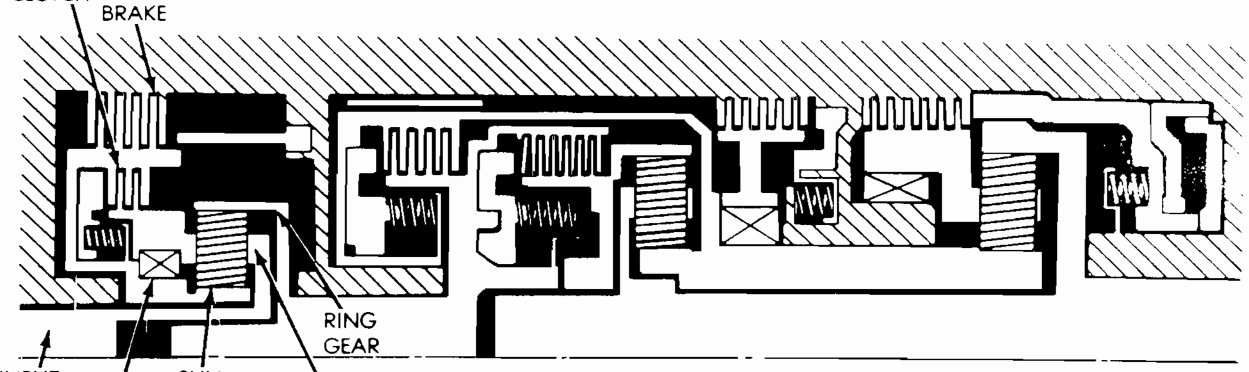


Fig. 5 Fourth Gear Overdrive Components

FIRST-THIRD AND REVERSE GEAR COMPONENTS

First-third and reverse gear components are outlined in Figure 6.

First through third and the reverse gear elements operate as follows: The input shaft is meshed with the direct clutch hub and the forward clutch drum. These elements rotate as a unit. The forward clutch hub rotates as a unit with the front planetary ring gear. The direct clutch drum is meshed with the forward end of the planetary sun gear.

The second brake hub serves as the outer race of the one-way clutch No. 1. The clutch inner race is locked with the front/rear sun gear. The inner race of one-way clutch No. 2 is splined to the transmission case and is locked. The outer race rotates as a unit with the rear planetary carrier.

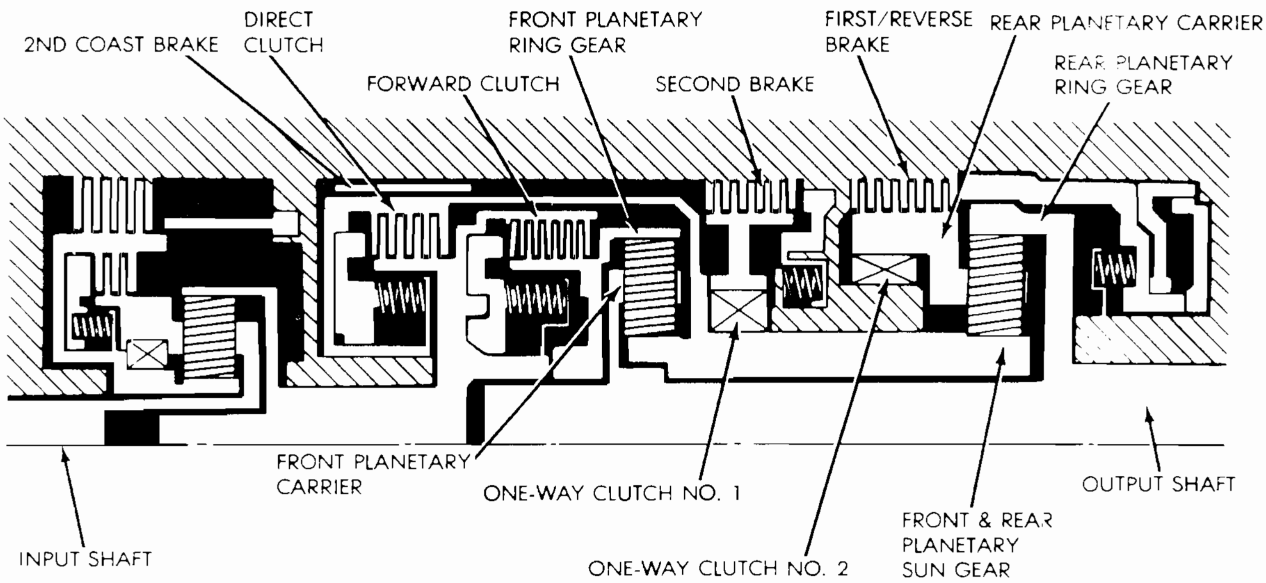


Fig. 6 First-Third And Reverse Gear Components

NOMENCLATURE	FUNCTION
Overdrive Direct Clutch	Connects overdrive sun gear and overdrive carrier
Overdrive Brake	Prevents overdrive sun gear from turning either clockwise or counterclockwise
Overdrive One-Way Clutch	When transmission is driven by engine, connects overdrive sun gear and overdrive carrier
Forward Clutch	Connects input shaft and front ring gear
Direct Clutch	Connects input shaft and front and rear sun gear
Second Coast Brake	Prevents front and rear sun gear from turning either clockwise or counterclockwise
Second Brake	Prevents outer race of No. 1 one-way clutch from turning either clockwise or counterclockwise, thus preventing front and rear sun gear from turning counterclockwise
First/Reverse Brake	Prevents rear planetary carrier from turning either clockwise or counterclockwise
One-Way Clutch No. 1	When second brake is operating, prevents front and rear sun gear from turning counterclockwise
One-Way Clutch No. 2	Prevents rear planetary carrier from turning counterclockwise

Fig. 7 Component Function Chart

The rear planetary ring gear is splined to the output shaft. The front planetary carrier and rear carrier ring gear are meshed and rotate as a unit with the output shaft.

GEARTRAIN OPERATION AND APPLICATION CHARTS

Operation and application of the first through fourth and reverse gear elements are outlined in the function and application charts.

The Component Function Chart (Fig. 7) describes basic function of various geartrain elements. The Component Application Chart (Fig. 8) outlines which elements, including valve body solenoids, are applied in the various gear ranges.

Shift Lever Position	Gear	Valve Body Solenoid No. 1	Valve Body Solenoid No. 2	OVERDRIVE CLUTCH	FORWARD CLUTCH	DIRECT CLUTCH	OVERDRIVE BRAKE	SECOND COAST BRAKE	SECOND BRAKE	FIRST/ REVERSE BRAKE	OVERDRIVE ONE-WAY CLUTCH	NO.1 ONE-WAY CLUTCH	NO.2 ONE-WAY CLUTCH
P	Park	ON	OFF	•									
R	Reverse	ON	OFF	•		•				•	•		
N	Neutral	ON	OFF	•									
D	First	ON	OFF	•	•						•		•
	Second	ON	ON	•	•				•		•	•	
	Third	OFF	ON	•	•	•			•		•		
	OD	OFF	OFF		•	•	•		•				
3	First	ON	OFF	•	•						•		•
	Second	ON	ON	•	•			•	•		•	•	
	Third	OFF	ON	•	•	•			•		•		
1-2	First	ON	OFF	•	•					•	•		•
	Second	ON	ON	•	•			•	•		•	•	

• = Applied

Fig. 8 Component Application Chart

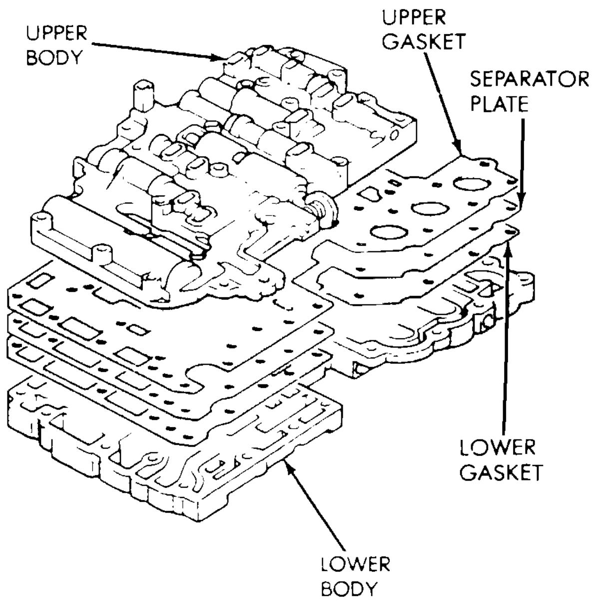


Fig. 9 Valve Body

HYDRAULIC SYSTEM

The basic hydraulic system consists of the oil pump, valve body and solenoids and four hydraulic accumulators.

The oil pump provides the necessary system lubrication and operating pressure.

The valve body controls application of the clutches, brakes, second coast band and the torque converter lockup clutch. The valve body solenoids control sequencing of the 1-2, 2-3 and 3-4 shift valves within the valve body. The solenoids are activated by signals from the TCU.

The accumulators are used in the clutch and brake feed circuits to control initial apply pressure. Spring loaded accumulator pistons modulate the initial surge of apply pressure for smooth engagement.

Oil Pump Components and Operation

A rotor-type oil pump is used in all AW-4 transmissions. The pump gears are mounted in the oil pump body. The drive gear is operated by the torque converter hub. Drive tangs on the hub engage in drive slots in the drive gear.

Valve Body Components

Transmission working pressure is supplied to the clutch and brake apply circuits through the valve body. The valve body consists of an upper body, lower body, separator plate and upper and lower gaskets (Fig. 9). The various spool valves, sleeves, plugs and springs are located within the two body sections.

The manual valve, 1-2 shift valve, primary regulator valve, accumulator control valve, check balls, solenoids and oil strainers are located in the lower body section (Fig. 10). The remaining control and shift valves plus check balls and one additional oil strainer are located in the upper body section (Fig. 11).

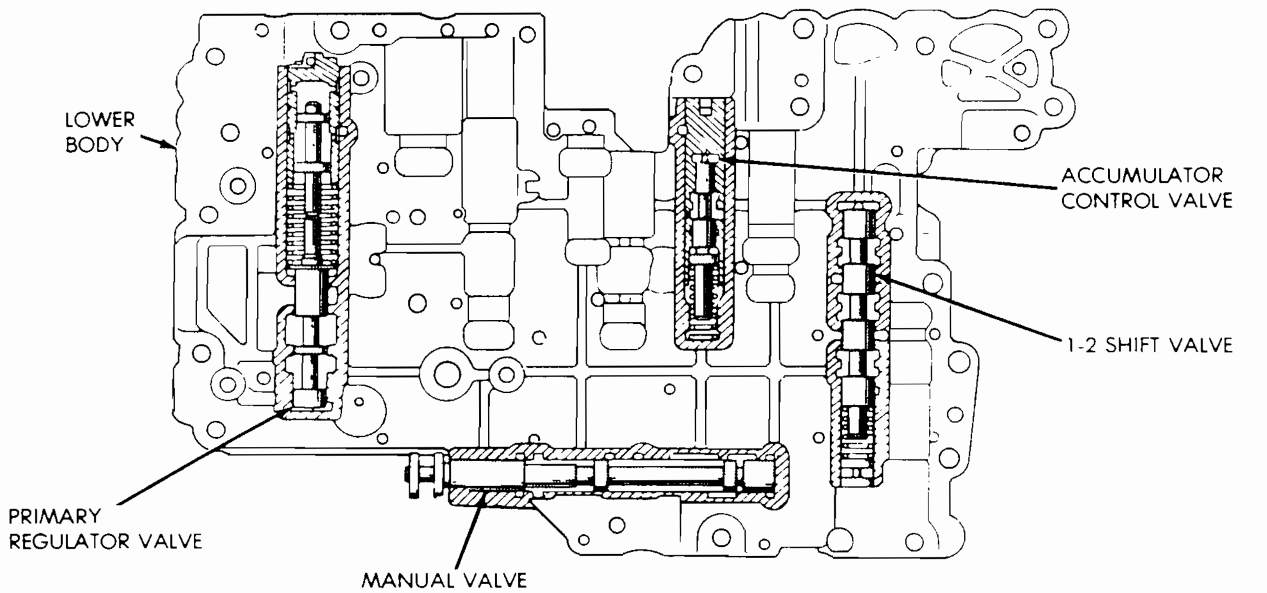


Fig. 10 Upper Body Components

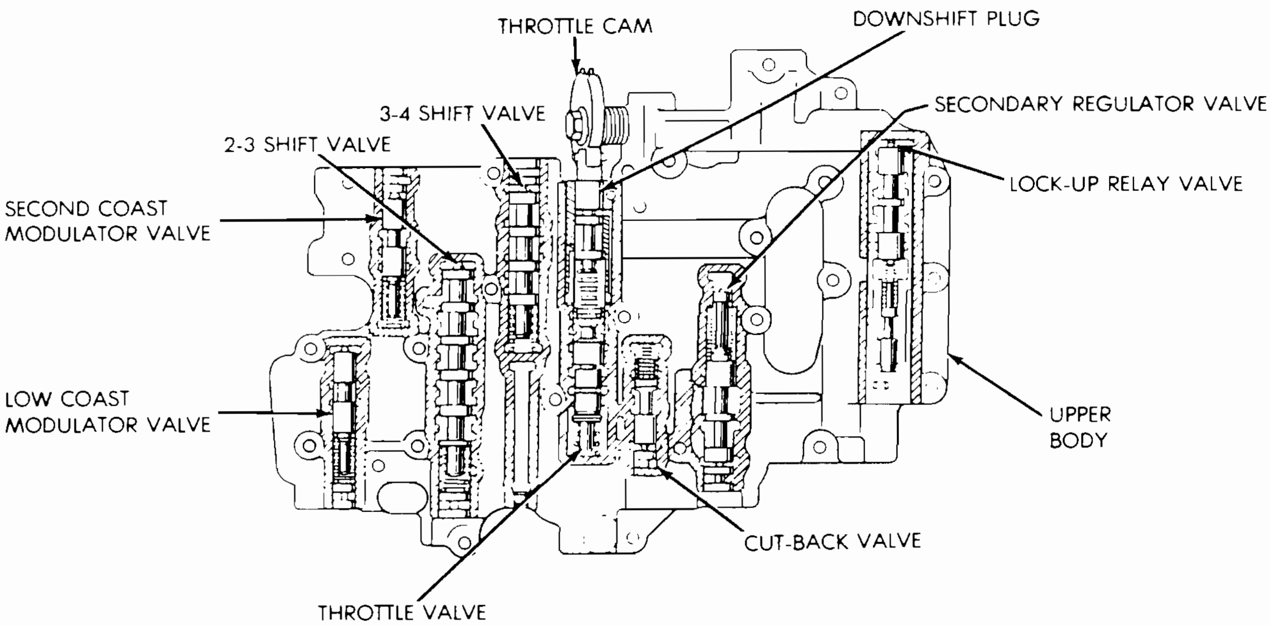


Fig. 11 Lower Body Components

Manual Valve

The manual valve is operated by the gearshift linkage. The valve diverts fluid to the apply circuits according to shift lever position.

Primary Regulator Valve

The primary regulator valve (Fig. 13) modulates line pressure to the clutches and brakes according to engine load. The valve is actuated by throttle valve pressure.

During high load operation, the valve increases line pressure to maintain positive clutch and brake engagement. At light load, the valve decreases line pressure just enough to maintain smooth engagement.

Throttle Valve and Downshift Plug

The throttle valve and downshift plug (Fig. 14) control throttle pressure to the primary regulator valve.

The downshift plug and throttle valve are operated by the throttle valve cam and line pressure cable in response to engine throttle position. Throttle valve pressure is also modulated by the cut-back valve in second, third and fourth gear ranges.

Cut-Back Valve

The cut-back valve (Fig. 15) helps prevent excessive pump pressure buildup in second, third and fourth gear. The valve is actuated by throttle pressure and by line pressure from the second brake. The valve also helps regulate line pressure by controlling the amount of cut-back pressure to the throttle valve.

Secondary Regulator Valve

The secondary regulator valve (Fig. 16) regulates converter lockup clutch and transmission lubrication pressure. When primary regulator valve pressure exceeds requirements for lockup clutch engagement or transmission lubrication, the secondary regulator valve is moved upward exposing the drain port. Excess pressure then bleeds off as needed. As pressure drops, spring tension moves the valve downward closing the drain port.

Lockup Relay Valve

The lockup relay valve (Fig. 17) controls fluid flow to the converter lockup clutch. The valve is operated by line pressure from the 1-2 shift valve and is controlled by solenoid valve number three.

1-2 Shift Valve

The 1-2 shift valve (Fig. 18) controls 1-2 upshifts and downshifts. The valve is operated by the No. 2 valve body solenoid and line pressure from the manual valve, second coast modulator valve and the 2-3 shift valve.

When the TCU deactivates the solenoid, line pressure at the top of the valve moves the valve down closing the second brake accumulator feed port. As the solenoid is activated and the drain port opens, spring force moves the valve up exposing the second brake feed port for the shift to second gear.

2-3 Shift Valve

The 2-3 shift valve (Fig. 19) controls 2-3 upshifts and downshifts. The valve is actuated by the No. 1 valve

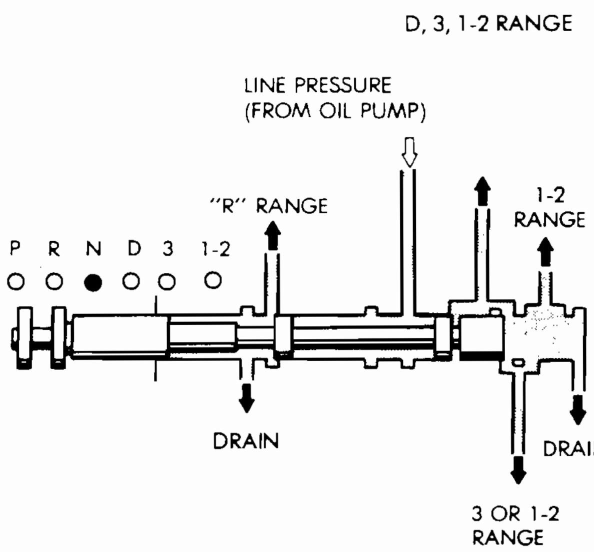


Fig. 12 Manual Valve

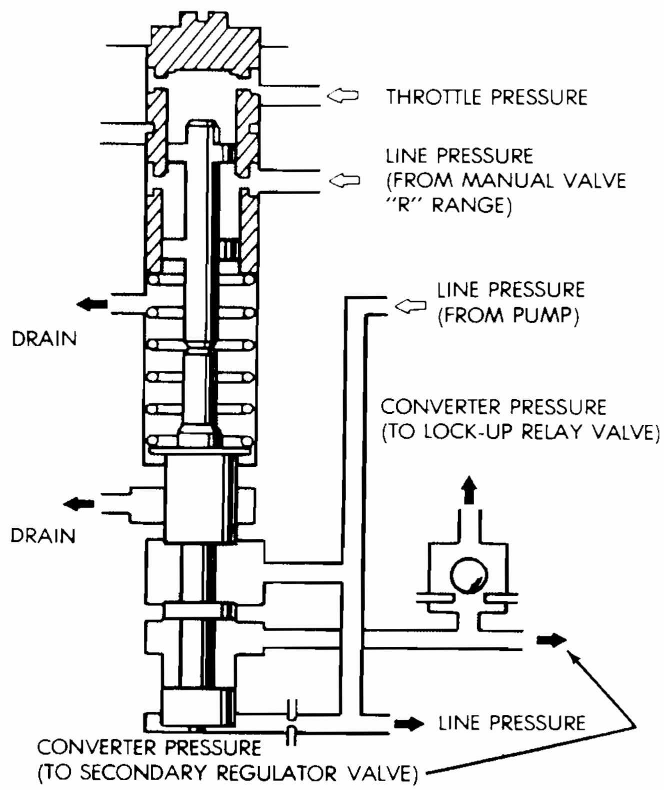


Fig. 13 Primary Regulator Valve

As the TCU activates solenoid No. 2, line pressure at the top of the 3-4 valve is released through the solenoid valve drain port. Spring tension moves the valve up exposing the overdrive clutch accumulator feed port to apply the clutch.

When the solenoid is deactivated and the drain port closes, line pressure moves the valve down exposing the overdrive brake accumulator feed port for the shift to fourth to fourth gear.

In the 1-2 or 3 gearshift lever positions, line pressure from the 2-3 shift valve is applied to the lower end of the 3-4 valve. This holds the valve up closing off the overdrive brake feed port preventing a shift into fourth gear.

Second Coast Modulator Valve

The second coast modulator valve (Fig. 21) momentarily reduces line pressure from the 1-2 shift valve to

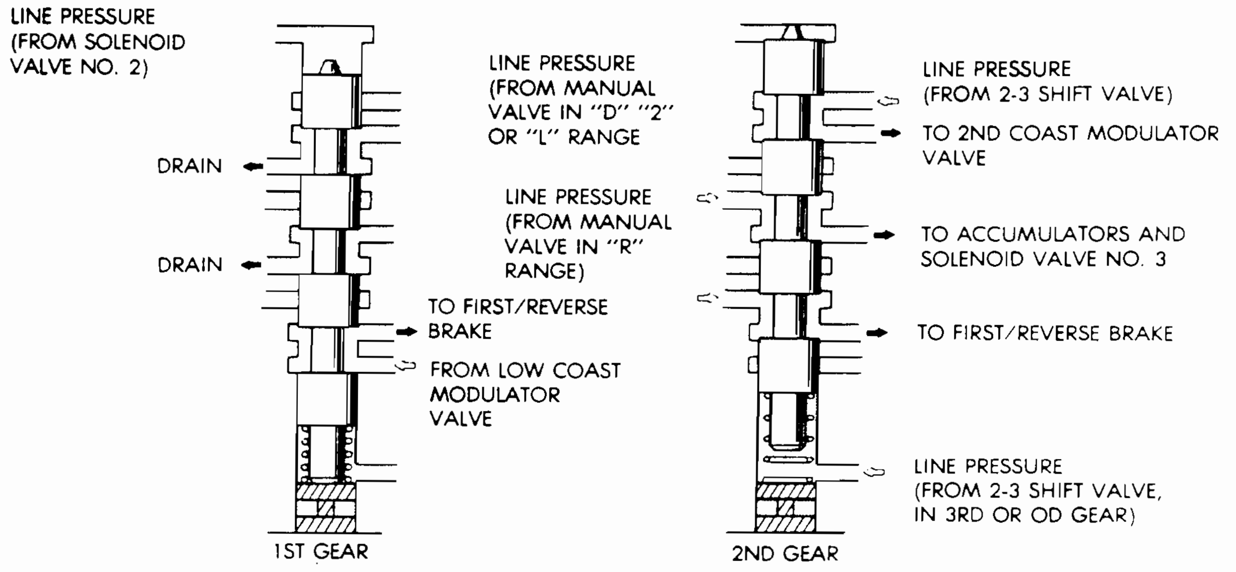


Fig. 18 1-2 Shift Valve

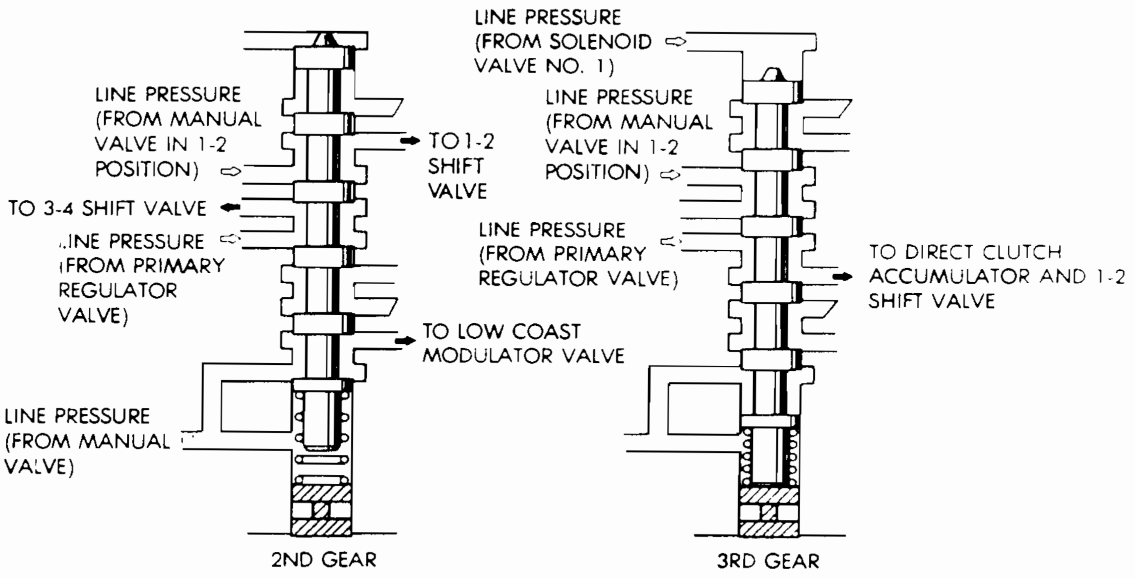


Fig. 19 2-3 Shift Valve

body solenoid and by line pressure from the manual valve and primary regulator valve.

When the TCU activates solenoid No. 1, line pressure at the top of the 2-3 valve is released through the solenoid drain port. Spring tension moves the valve up to hold the valve in second gear position. As the solenoid is deactivated, line pressure then moves the valve down exposing the direct clutch feed port for the shift to third gear.

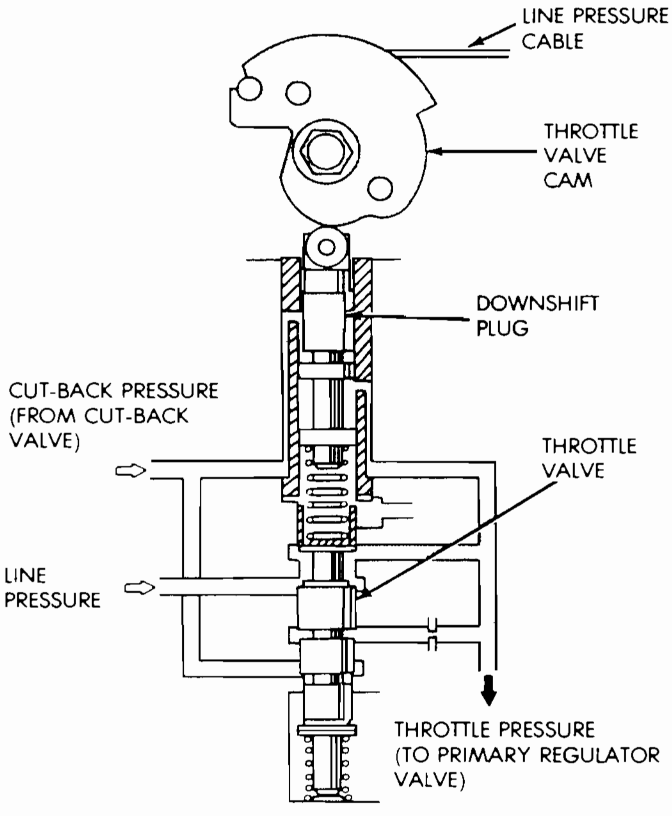


Fig. 14 Throttle Valve And Downshift Plug

3-4 Shift Valve

The 3-4 shift valve (Fig. 20) is operated by the No. 2 solenoid and by line pressure from the maual valve, 2-3 valve and primary regulator valve.

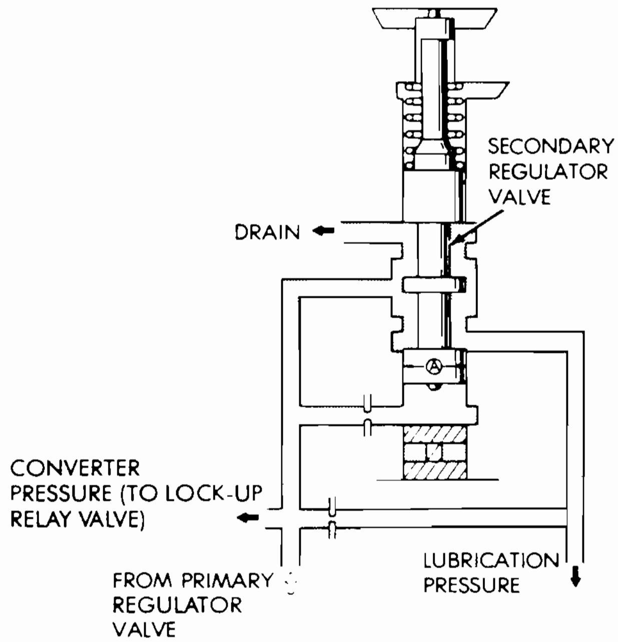


Fig. 16 Secondary Regulator Valve

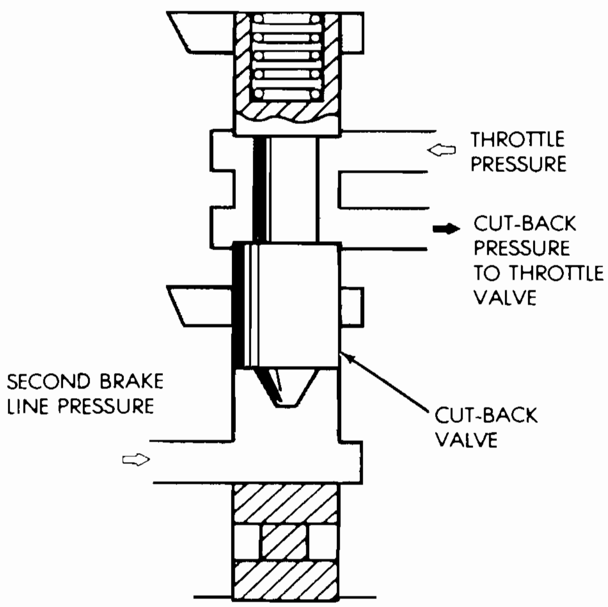


Fig. 15 Cut-Back Valve

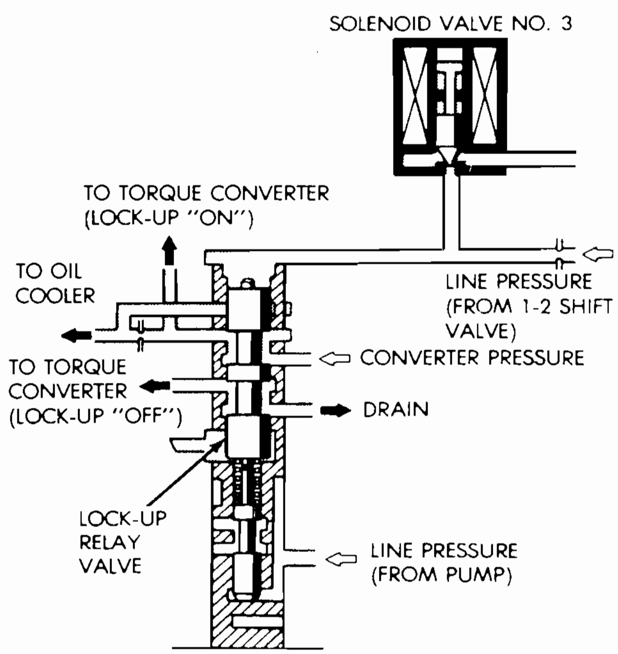


Fig. 17 Lockup Relay Valve

cushion application of the second coast brake. The valve is operative when the shift lever and manual valve are in the 3 position.

Low Coast Modulator Valve

The low coast modulator valve (Fig. 22) momentarily reduces line pressure from the 2-3 shift valve to cushion application of the first/reverse brake. The valve operates when the shift lever and manual valve are in the 1-2 position.

Accumulator Control Valve

The accumulator control valve (Fig. 23) cushions clutch and brake application by reducing back pressure to the accumulators when throttle opening is small. The valve is operated by oil pump (line) pressure and by throttle pressure.

Accumulators

Four accumulators are used to cushion application of the clutches and brakes (Fig. 24). The accumulators

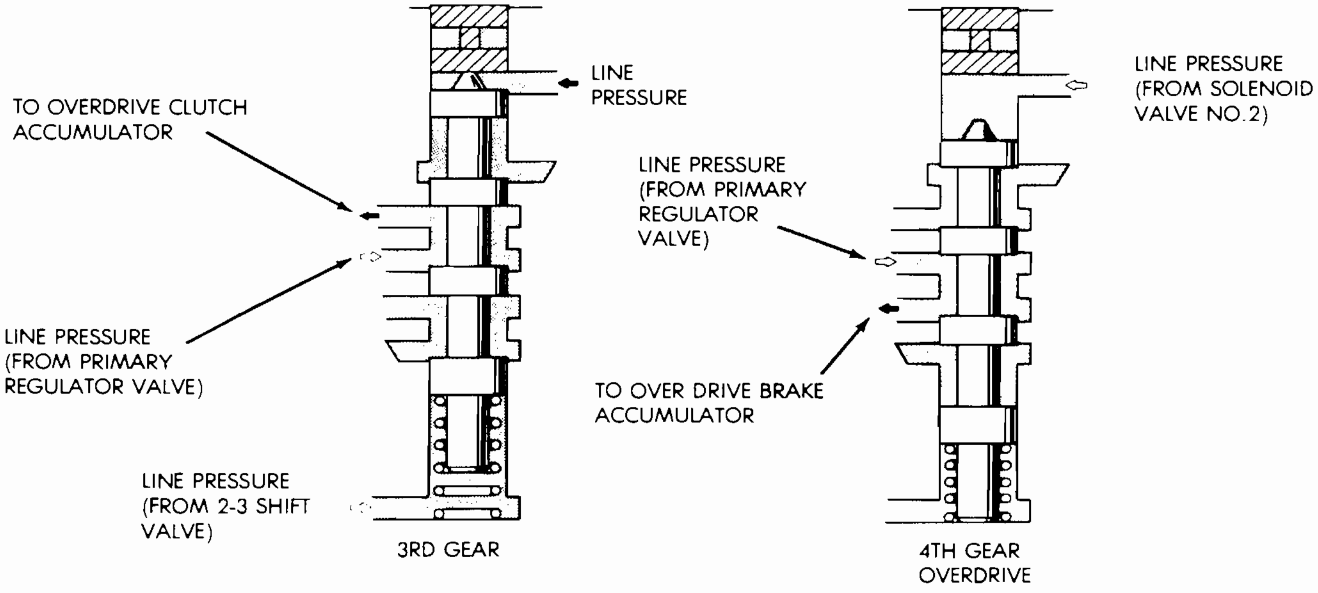


Fig. 20 3-4 Shift Valve

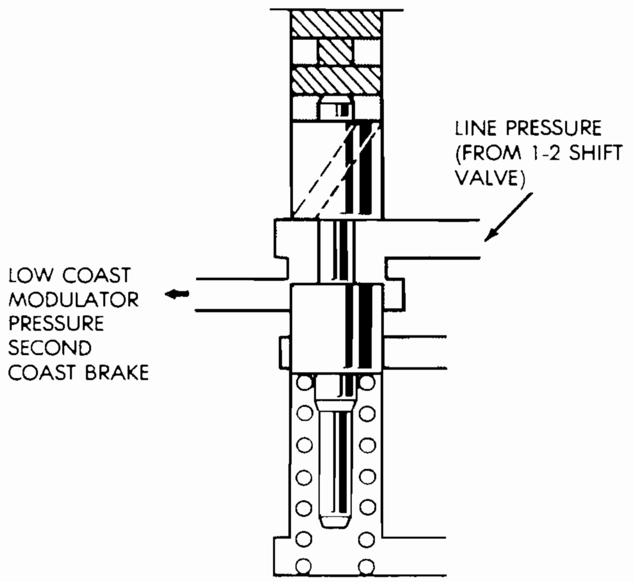


Fig. 21 Second Coast Modulator Valve

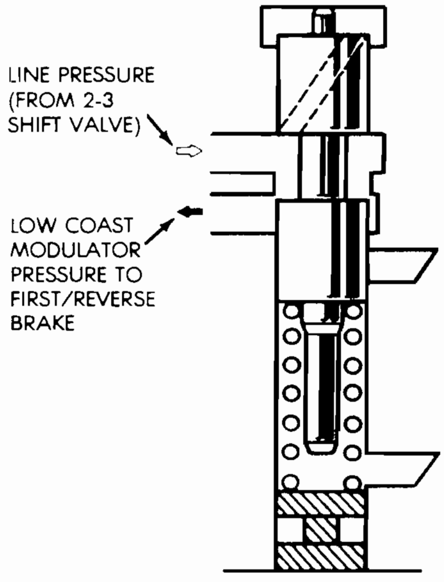


Fig. 22 Low Coast Modulator Valve

consist of spring loaded pistons which dampen the initial surge of apply pressure to provide smooth engagement during shifts.

Control pressure from the accumulator control valve is continously applied to the back pressure side of the accumulator pistons. This pressure plus spring tension holds the pistons down. As line pressure from the shift valves enters the opposite end of the piston bore, control pressure and spring tension momentarily delay application of full line pressure to cushion engagement. The accumulators are all located in the transmission case (Fig. 24).

Valve Body Solenoids

Three solenoids are used (Fig. 25). The No. 1 and 2 solenoids control shift valve operation by applying or releasing line pressure as indicated by TCU signal. The No. 3 solenoid controls operation of the converter lockup clutch in response to signals from the TCU.

When the No. 1 and 2 solenoids are activated, the solenoid plunger is moved off its seat opening the drain port to release line pressure. When either solenoid is deactivated, the plunger closes the drain port.

The No. 3 solenoid operates in reverse. When the solenoid is deactivated, the solenoid plunger is moved off its seat opening the drain port to release line pressure. When the solenoid is activated, the plunger closes the drain port.

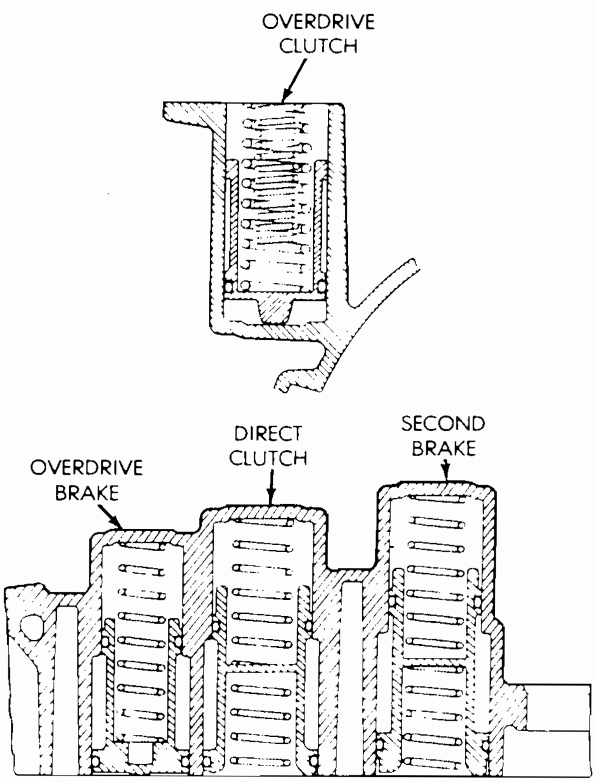


Fig. 24 Accumulators

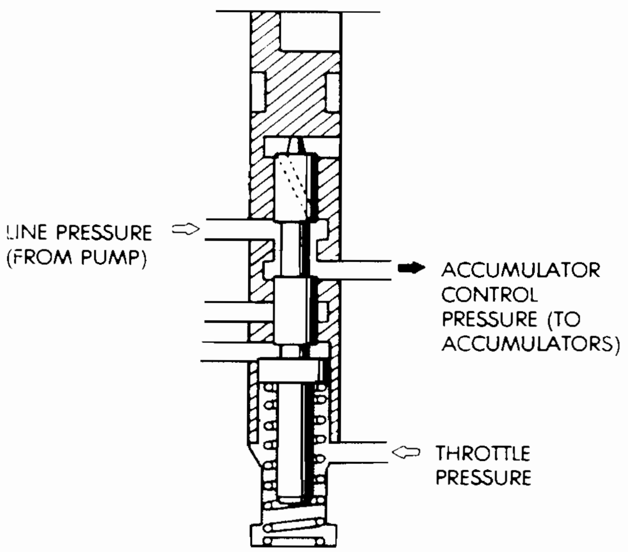


Fig. 23 Accumulator Control Valve

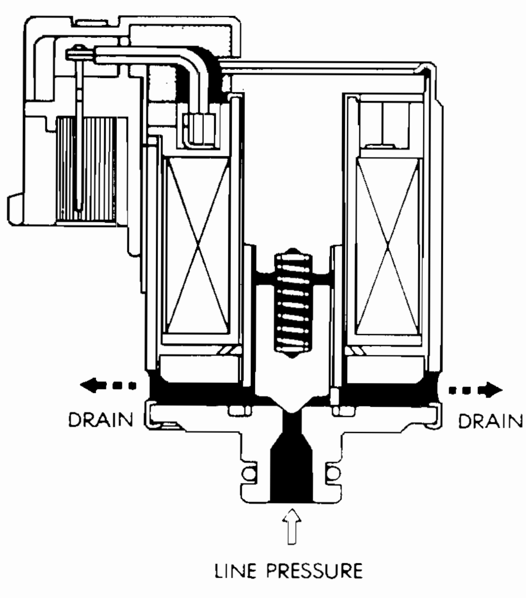


Fig. 25 Valve Body Solenoids

IN-VEHICLE SERVICE-TESTING-ADJUSTMENT

TRANSMISSION FLUID LEVEL AND CONDITION

The correct fluid level is to the Full mark on the dipstick (Fig. 1). The transmission fluid must be **cool** (85-125°F) when checking level. Check fluid level with the transmission in Park and the engine at curb idle speed. Shift the transmission Through all gear ranges and back to Park before checking fluid level. Use Mopar Mercon™ or an equivalent Dexron II™ fluid to refill or top off the fluid level.

When checking fluid level, also inspect condition and appearance of the fluid. The fluid should be clear and free of foreign material or particles. If the fluid is dark brown or black in color and smells burnt, the fluid has been overheated and should be replaced and transmission operation checked.

Transmission operation should also be checked if the fluid contains large quantities of metal particles or clutch disc friction material.

A small quantity of friction material or metal particles in the oil pan is normal. The particles are usually generated during the break-in period and indicate normal seating of the various transmission components.

TCU

Use the DRB II™ tester to diagnose TCU function whenever a fault is suspected. Replace the TCU only when the tester indicates a TCU fault.

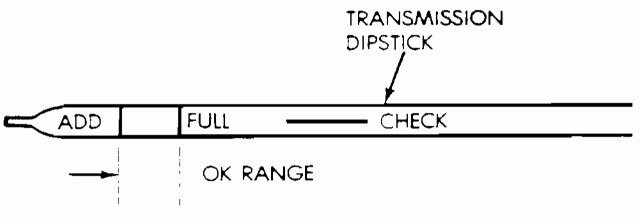


Fig. 1 Transmission Fluid Level

TCU Replacement

The TCU is located under the instrument panel on the passenger side of the vehicle (Fig. 2). Turn the ignition off. Remove the TCU by unsnapping the wire harness connector and removing the TCU from under the instrument panel. To install the replacement part, snap the wire harness connector into the new TCU and position it under the panel.

NEUTRAL SWITCH

Switch Testing

Test switch continuity with an ohmmeter. Disconnect the switch and check continuity at the connector terminal positions and in the gear ranges indicated in Figure 3. Switch continuity should be as follows:

- Continuity should exist between terminals B and C with the transmission in Park and Neutral only (Fig. 3).

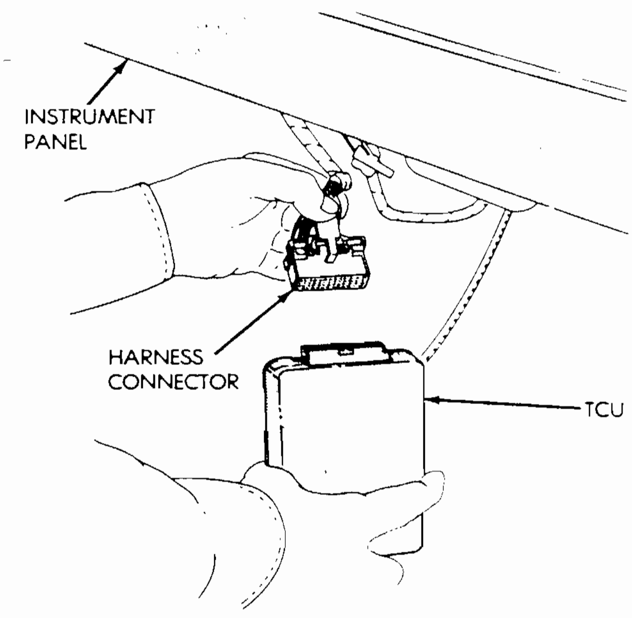


Fig. 2 TCU Removal/Installation

- Continuity should exist between terminals A and E with the transmission in Reverse (Fig. 3).
- Continuity should exist between terminals A and G with the the transmission in third gear (Fig. 3).
- Continuity should exist between terminals A and H with the transmission in first and/or second gear (Fig. 3).
- Continuity should not exist in D position.

Neutral Switch Removal

(1) Raise vehicle.
(2) Disconnect switch wire harness connector.
(3) Pry washer lock tabs upward and remove switch attaching nut and tabbed washer (Fig. 4).
(4) Remove switch adjusting bolt (Fig. 4).
(5) Slide switch off manual valve shaft.

Neutral Switch Installation And Adjustment

(1) Disconnect shift linkage rod from shift lever on left side of transmission.
(2) Rotate manual shift lever all the way rearward. Then rotate lever forward two detent positions to Neutral.
(3) Install switch on manual valve shaft and install switch adjusting bolt finger tight. Do not tighten bolt at this time.
(4) Install tabbed washer on manual valve shaft and install switch attaching nut. Tighten nut to 6.9 N•m (61 in-lbs) torque but do not bend washer lock tabs over nut at this time.
(5) Verify that transmission is in Neutral.
(6) Rotate switch to align neutral standard line with vertical groove on manual valve shaft (Fig. 5).
(7) Align switch standard line with groove or flat on manual valve shaft.
(8) Tighten switch adjusting bolt to 13 N•m (9 ft-lbs) torque.
(9) Bend at least two washer lock tabs over switch attaching nut to secure it.
(10) Connect shift linkage rod to shift lever on left side of case.
(11) Connect switch wires to harness and lower vehicle.
(12) Check switch operation. Engine should start in Park and Neutral only.

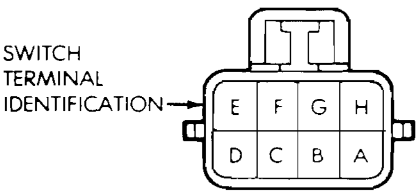
VALVE BODY SOLENOIDS

Solenoid Removal And Testing

(1) Remove transmission oil pan drain plug and drain fluid.
(2) Remove pan bolts and remove oil pan.
(3) Remove oil screen bolts and remove screen (Fig. 6) and gasket. Discard the gasket.
(4) Disconnect solenoid wire connector (Fig. 7).
(5) If all solenoids are being removed, mark or tag wires for assembly reference before disconnecting them.
(6) Remove bolt attaching solenoids to valve body and remove solenoids (Fig. 8). Do not allow any valve body components to fall out when solenoids are removed.
(7) Clean oil filter and pan with solvent and dry with compressed air.
(8) Remove old gasket material from oil pan and transmission case.

Solenoid Testing

Test solenoid resistance with an ohmmeter.



	B	C	A	E	G	H
P	O	O				
R			O	O		
N	O	O				
D						
3			O		O	
1-2			O			O

Fig. 3 Neutral Switch Terminals And Testing

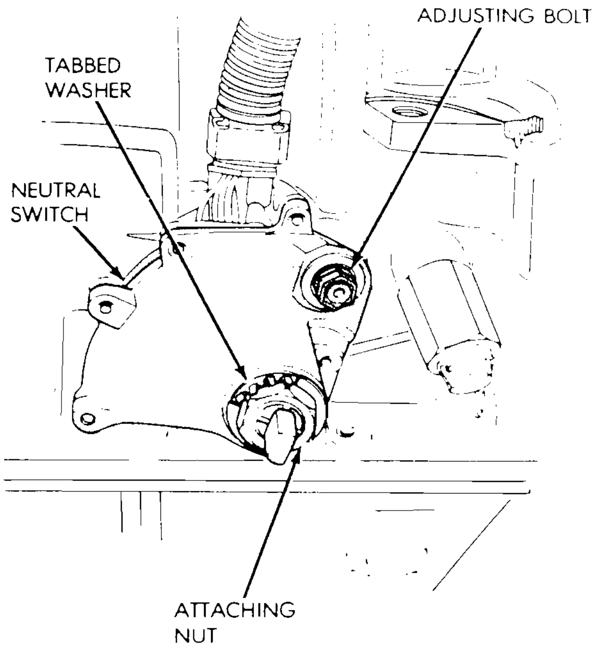


Fig. 4 Neutral Switch Removal/Installation

Connect the ohmmeter leads to the solenoid mounting bracket and to the solenoid wire terminal (Fig. 9).

Solenoid resistance should be 11-15 ohms.

Replace the solenoid if resistance is above or below the specified range.

Solenoid Installation

(1) Position solenoids on valve body and install solenoid bolts. Tighten bolts to 10 N•m (7 ft-lbs) torque.

(2) Connect feed wires to solenoids.

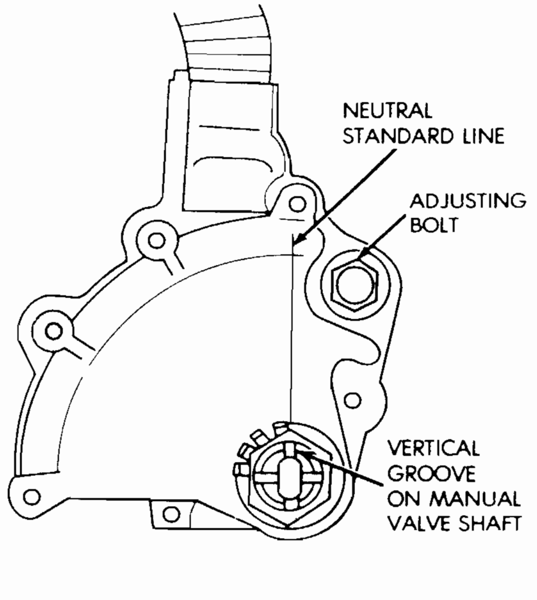


Fig. 5 Neutral Switch Adjustment

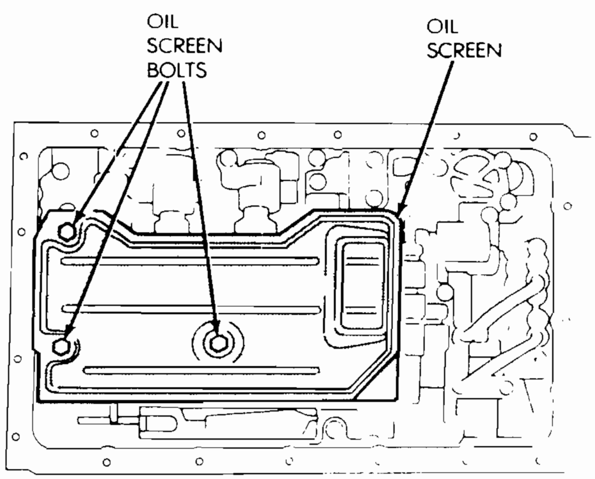


Fig. 6 Oil Screen Removal/Installation

(3) Install new gaskets on oil screen and install screen. Tighten screen bolts to 10 N•m (7 ft-lbs) torque.

(4) Apply bead of Three-Bond TB 1281 or equivalent RTV sealer to oil pan gasket surface.

(5) Install new gasket on oil pan and install pan on transmission. Tighten pan bolts to 7.4 N•m (65 in-lbs) torque.

(6) Install and tighten oil pan drain plug to 20 N•m (15 ft-lbs) torque.

(7) Fill transmission with Mopar Mercon™ or Dexron II™ transmission fluid.

Solenoid Harness Adapter Seal Replacement

(1) Remove oil pan and oil screen. Refer to Solenoid Removal procedure.

(2) Disconnect solenoid wire connectors (Fig. 7).

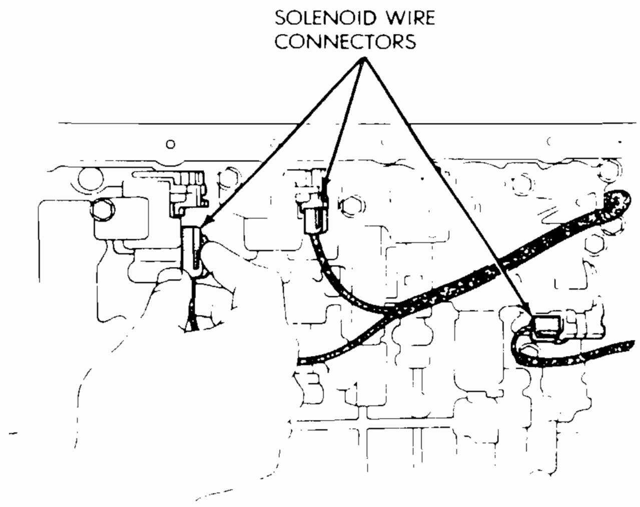


Fig. 7 Solenoid Wire Connectors

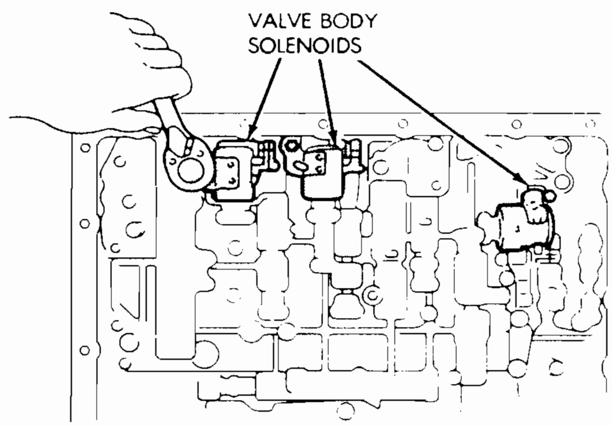


Fig. 8 Valve Body Solenoids

(3) Remove bracket securing solenoid harness adaptor (Fig. 10) to case.
(4) Pull harness adapter and wires out of case.
(5) Remove and discard adapter O-ring.
(6) Lubricate new O-ring and install it on adapter.
(7) Install solenoid wire harness and adapter in case.
(8) Install adapter bracket and bracket bolt.
(9) Connect wires to solenoids.
(10) Install oil screen and oil pan.

VALVE BODY

Removal and installation are the only valve body service procedures covered in this section. Refer to the transmission overhaul section for valve body disassembly, cleaning, inspection and reassembly.

Valve Body Removal

(1) Remove oil pan plug and drain transmission fluid.
(2) Remove oil pan and oil screen. Clean pan and screen in solvent and dry them with compressed air.

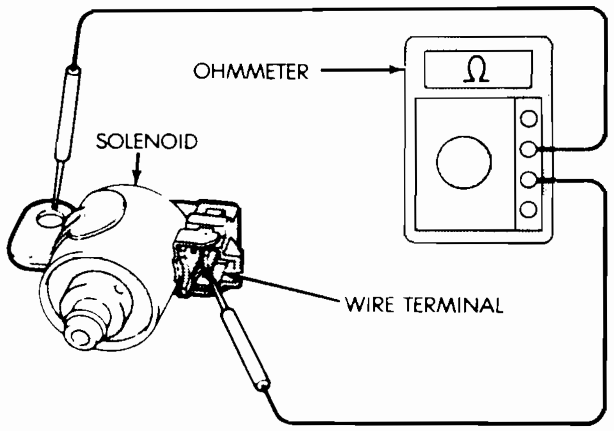


Fig. 9 Testing Valve Body Solenoid

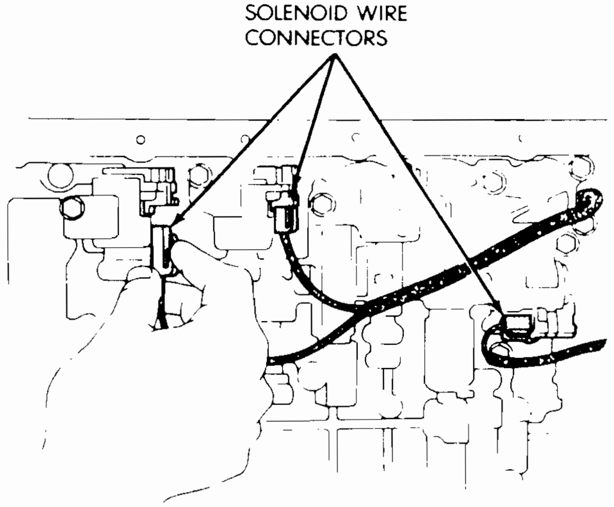


Fig. 11 Disconnect Solenoid Wires

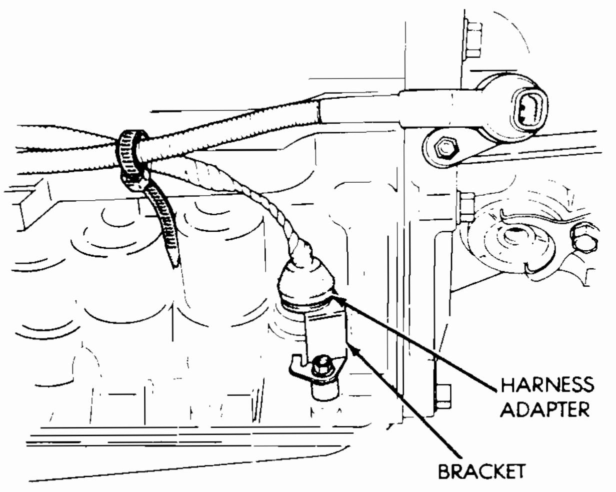


Fig. 10 Harness Adapter Removal/Installation

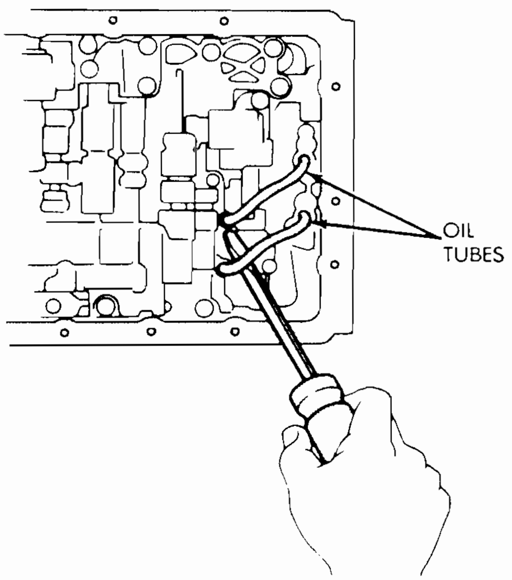


Fig. 12 Removing Valve Body Oil Tubes

(3) Disconnect solenoid wire connectors (Fig. 11). Mark wires for assembly reference.
(4) Remove valve body oil tubes (Fig. 12). Carefully pry tubes out of valve body with screwdriver.
(5) Disconnect throttle cable from throttle cam (Fig. 13).
(6) Remove valve body bolts. Locations for seventeen bolts are outlined in Figure 14.
(7) Lower valve body and remove overdrive clutch accumulator springs; direct clutch accumulator spring and spacer; second brake accumulator spring and spacer (Fig. 15)
(8) Remove valve body and check ball and spring (Fig. 16).

Valve Body Installation

(1) Connect cable to throttle cam (Fig. 13).
(2) Install check ball and spring (Fig. 16).

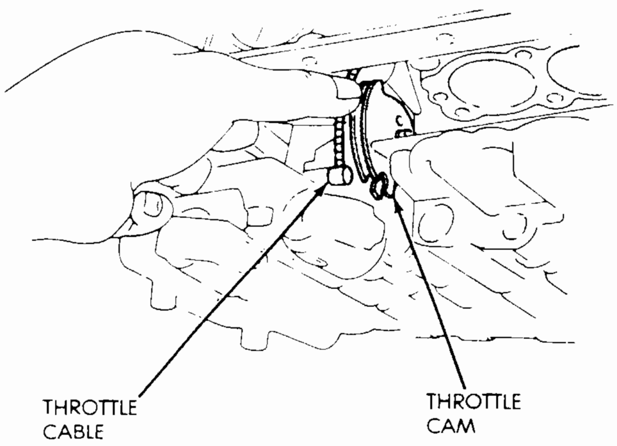


Fig. 13 Removing/Installing Throttle Cable

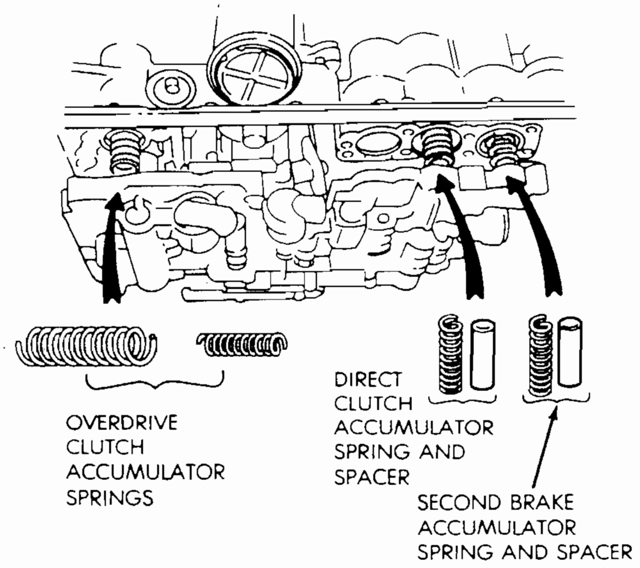


Fig. 15 Accumulator Springs

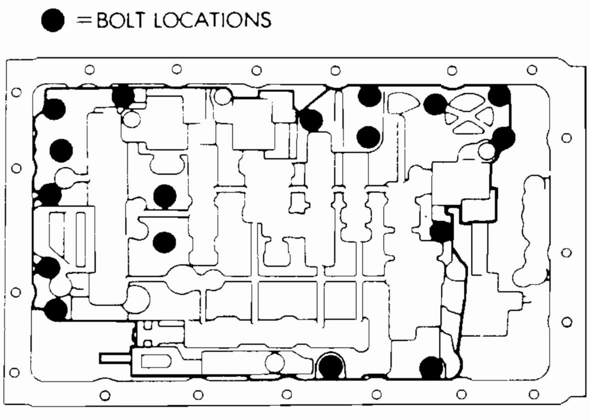


Fig. 14 Valve Body Bolt Locations

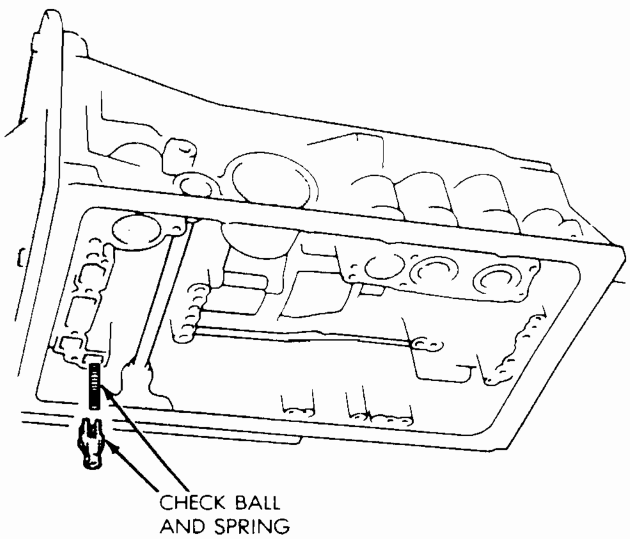


Fig. 16 Removing/Installing Valve Body Check Ball And Spring

(3) Position accumulator springs and spacers on valve body.

(4) Align valve body manual valve with shift sector (Fig. 17) and carefully position valve body on case.

(5) Install valve body bolts (Fig. 14). Tighten bolts evenly to 10 N•m (7 ft-lbs) torque.

(6) Install valve body oil tubes. Be sure tube ends (L) and (M) are installed as shown in Figure 18.

(7) Remove old gasket material from oil pan and transmission case.

(8) Clean oil screen and oil pan with solvent (if not done previously). Dry both components with compressed air only. Do not use shop towels.

(9) Apply bead of Three-Bond TB 1281 or equivalent RTV sealer to oil pan gasket surface.

(10) Install new gaskets on oil screen and install screen on the case. Tighten screen attaching bolts to 10 N•m (7 ft-lbs) torque.

(11) Install new gasket on the oil pan and install it on

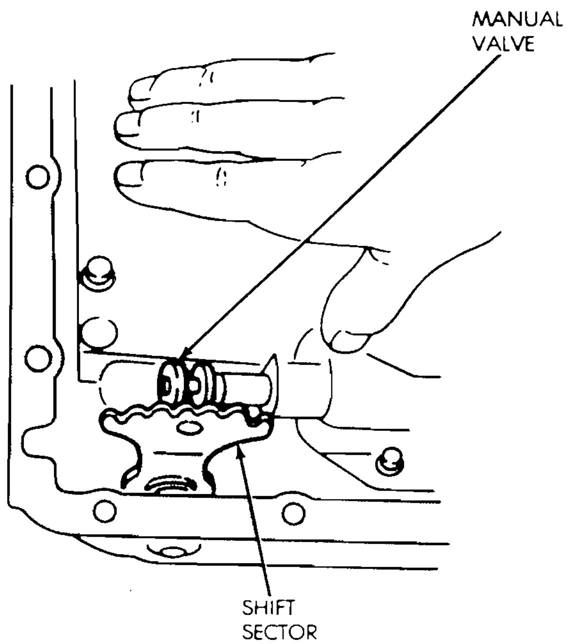


Fig. 17 Align Shift Sector And Manual Valve

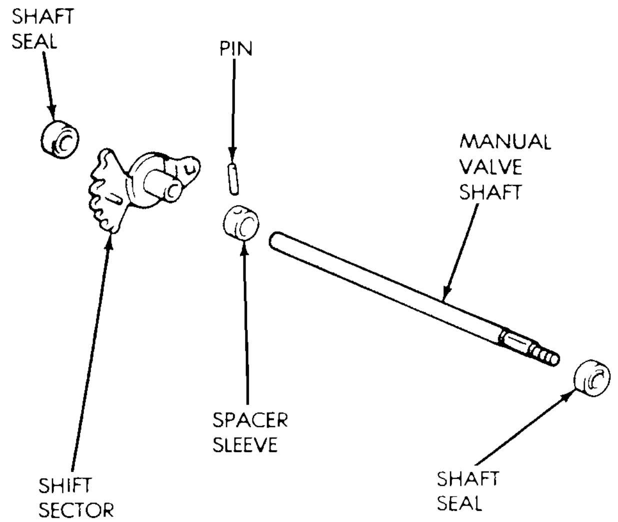


Fig. 19 Manual Valve Shaft And Seals

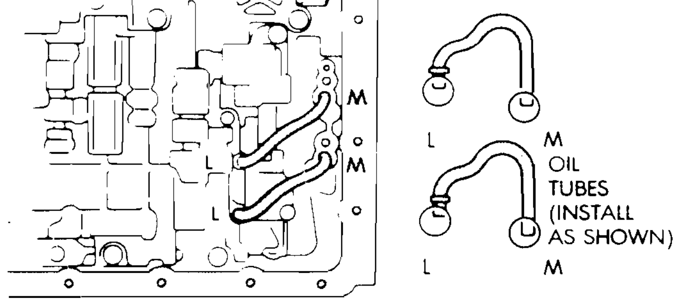


Fig. 18 Installing Valve Body Oil Tubes

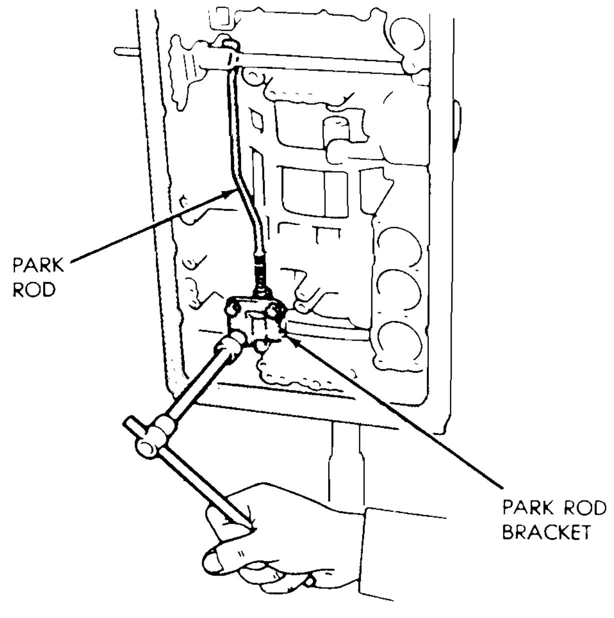


Fig. 20 Removing/Installing Park Rod Bracket

the case. Tighten the pan bolts to 7.4 N•m (65 in-lbs) torque.

(12) Install new gasket on oil pan drain plug and install plug in pan. Tighten plug to 20 N•m (15 ft-lbs) torque.

(13) Fill transmission with Mopar Mercon™ or Dexron II™ fluid.

MANUAL VALVE SHAFT SEAL REPLACEMENT

(1) Remove neutral safety switch and disconnect transmission shift lever.

(2) Remove oil pan and valve body.

(3) Remove bolts attaching park rod bracket to case (Fig. 20).

(4) Remove park rod from shift sector (Fig. 21).

(5) Cut spacer sleeve with chisel and remove it from manual valve shaft (Fig. 22).

(6) Remove pin from shaft and sector with pin punch.

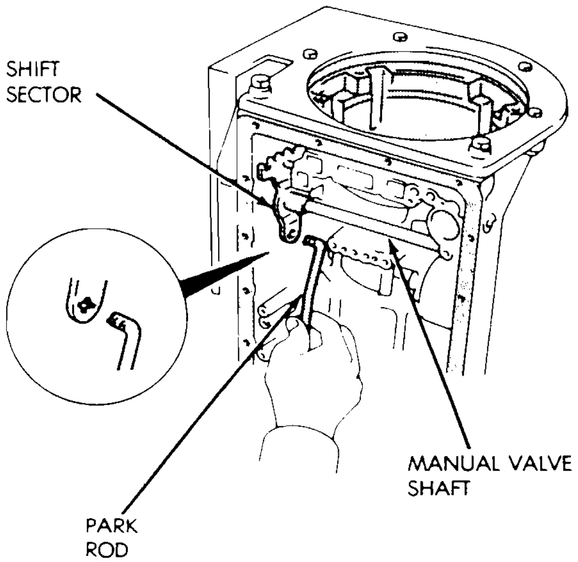


Fig. 21 Removing/Installing Park Rod

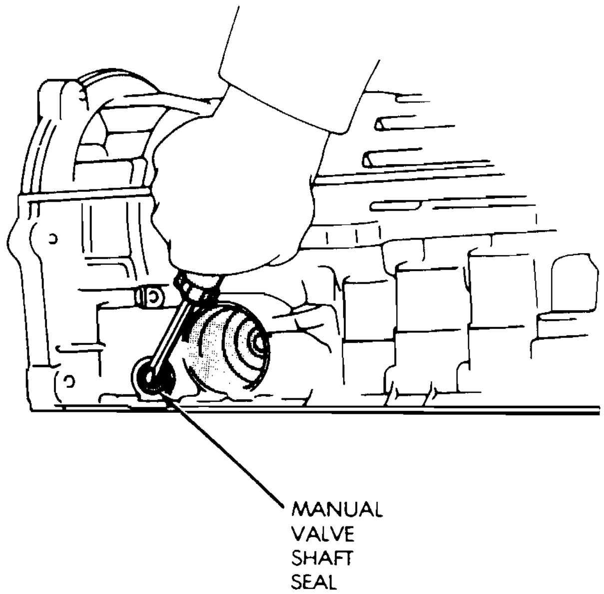


Fig. 23 Removing Manual Valve Shaft Seals

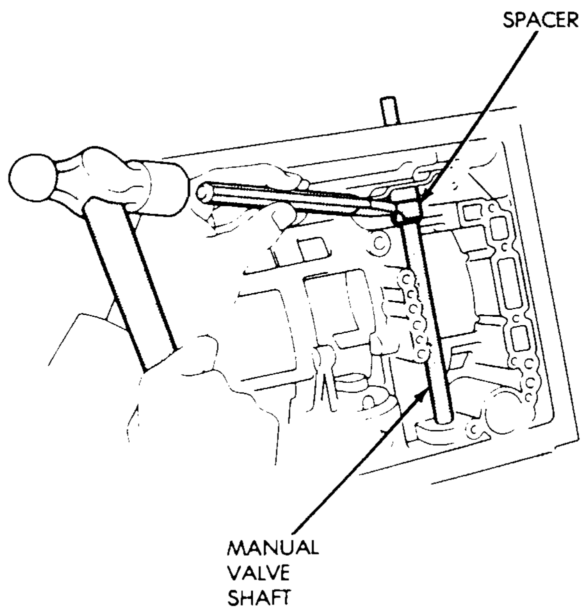


Fig. 22 Cutting Spacer Sleeve

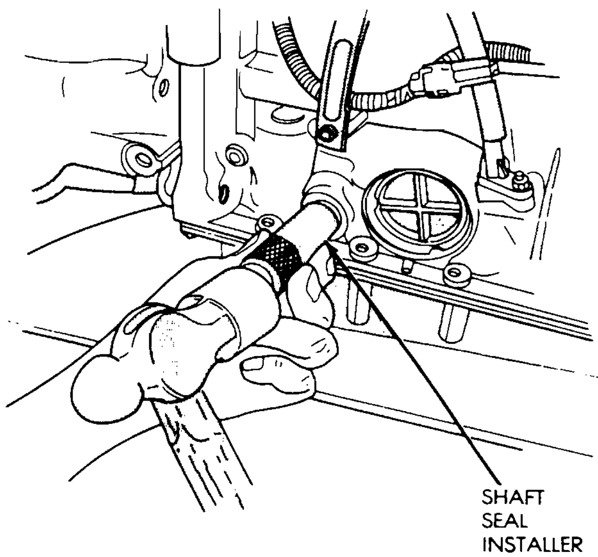


Fig. 24 Installing Manual Valve Shaft Seals

(7) Remove shaft and sector from case.
(8) Pry shaft seals out of case (Fig. 23).
(9) Inspect the manual valve shaft and sector. Replace either component if worn or damaged.
(10) Coat replacement shaft seals with petroleum jelly and seat them in the case (Fig. 24).
(11) Install new spacer sleeve on sector (Fig. 25).
(12) Lubricate manual valve shaft and install it in case.
(13) Lubricate sector and sleeve and install them on shaft.
(14) Align hole in spacer sleeve with notch in sector. Then install shift sector roll pin. Tap pin into sector and shaft and stake sleeve to sector and shaft securely.
(15) Connect park rod to sector (Fig. 21).
(16) Install park rod bracket (Fig. 26). Tighten bracket bolts to 10 N•m (7 ft-lbs) torque.
(17) Install valve body, oil screen, oil pan and neutral switch.

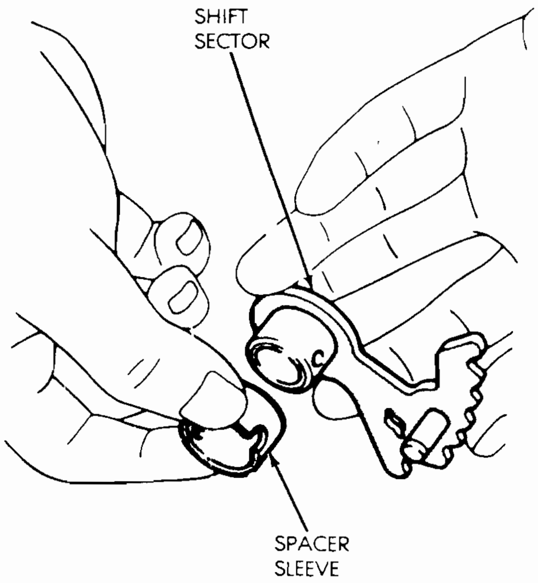


Fig. 25 Installing Spacer Sleeve On Sector

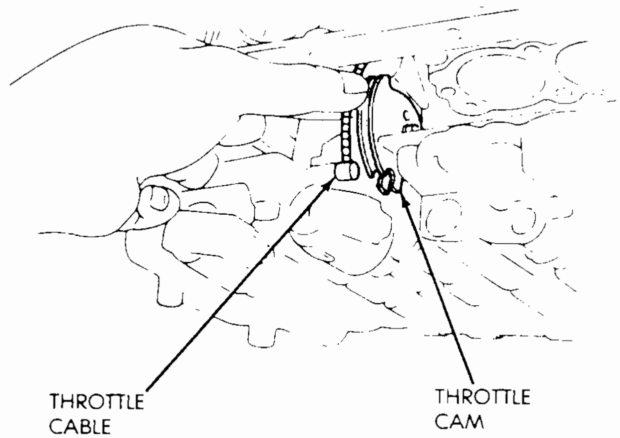


Fig. 27 Removing/Installing Throttle Cable

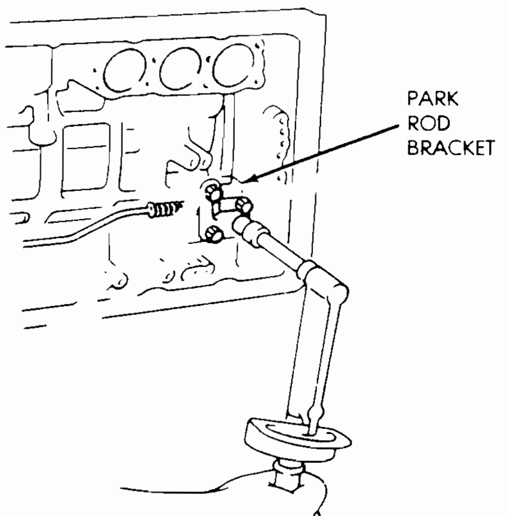


Fig. 26 Installing Park Rod Bracket

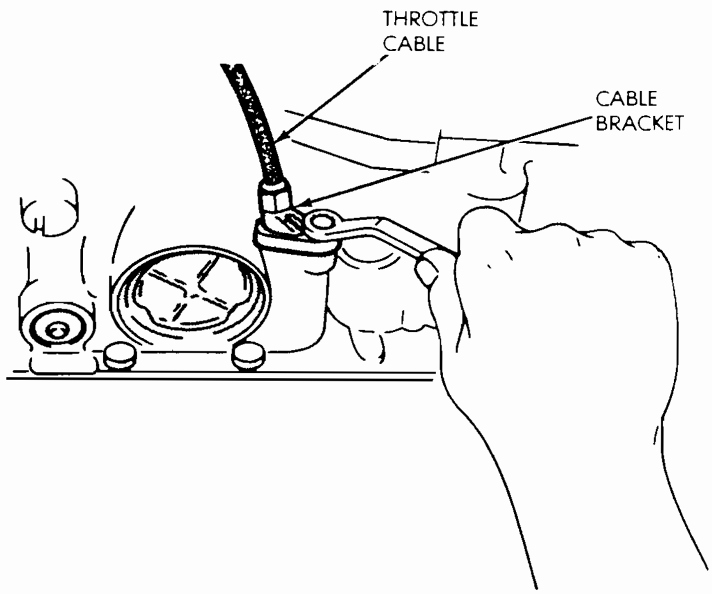


Fig. 28 Removing/Installing Cable And Bracket

THROTTLE CABLE REPLACEMENT-ADJUSTMENT

Throttle Cable Removal

(1) In engine compartment, disconnect cable from throttle linkage. Then compress cable mounting ears and remove cable from linkage bracket.

(2) Raise vehicle.

(3) Remove transmission oil pan.

(4) Disengage cable from throttle valve cam (Fig. 27).

(5) Remove cable bracket bolt and remove cable and bracket from case (Fig. 28).

(6) Remove and discard cable seal.

Throttle Cable Installation

(1) Lubricate and install new seal on cable.

(2) Insert cable in transmission case.

(3) Attach cable to throttle cam (Fig. 27).

(4) Install cable bracket on case and tighten attaching bolt to 10 N•m (7 ft-lbs) torque (Fig. 28).

(5) Remove old gasket material from oil pan and transmission case. Clean oil pan with solvent and dry it with compressed air.

(6) Install new gasket on oil pan and install pan. Tighten pan bolts to 7.4 N•m (65 in-lbs) torque.

(7) Install new gasket on oil pan drain plug. Install and tighten plug to 20 N•m (15 ft-lbs) torque.

(8) Connect cable to engine bracket and throttle linkage.

(9) Fill transmission with Mopar Mercon™ or Dexron ™ II ATF.

(10) Adjust the cable as outlined in the Line Pressure Cable Adjustment procedure.

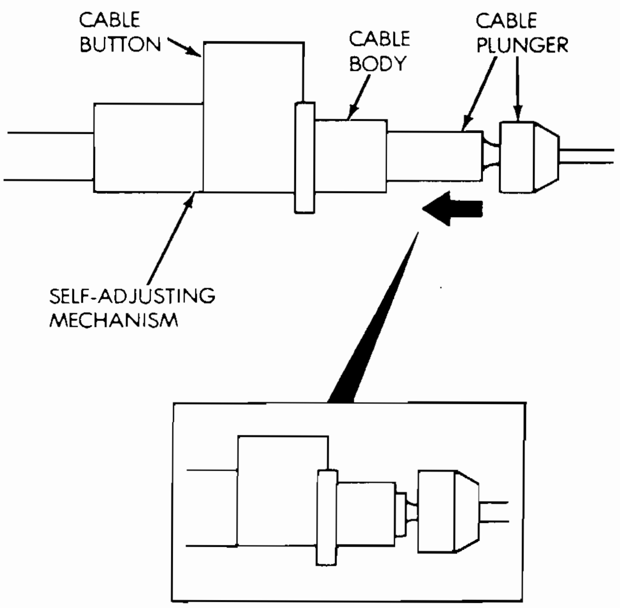


Fig. 29 Retract Throttle Cable Plunger

Throttle Cable Adjustment

(1) Turn ignition switch to Off position.

(2) Fully retract cable plunger. Press cable button all the way down. Then push cable plunger inward (Fig. 29).

(3) Rotate primary throttle lever to wide open throttle position (Fig. 30).

(4) Hold primary throttle lever in wide open position and let cable plunger extend. Release lever when plunger is fully extended. Cable is now adjusted.

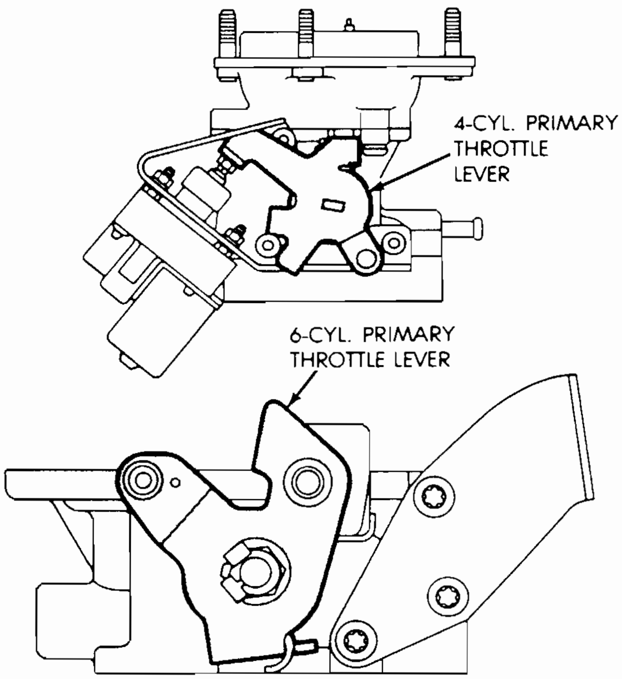


Fig. 30 Rotate Primary Throttle Lever To Wide Open Position

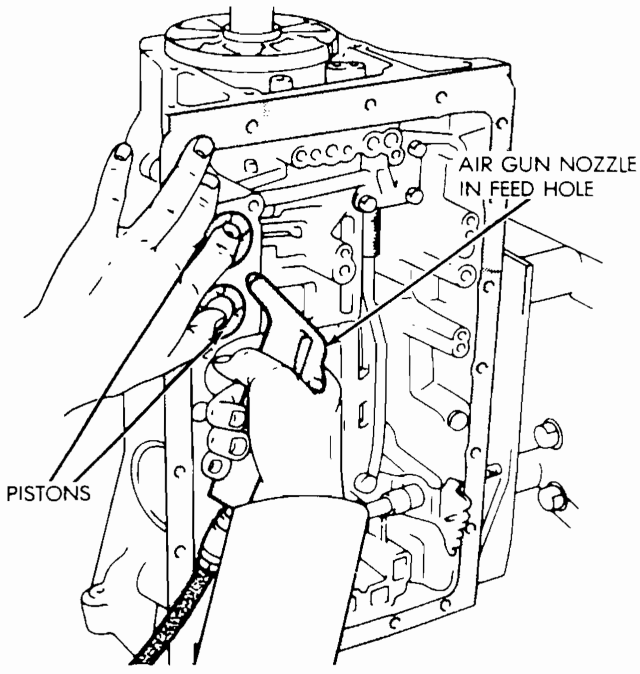


Fig. 31 Removing Accumulator Pistons

ACCUMULATOR PISTONS AND SPRINGS

Accumulator Piston and Spring Removal

(1) Remove valve body.Refer to procedure in this section.

(2) Remove accumulator pistons with compressed air (Fig. 31). Apply air through small feed hole next to each piston bore. Catch each piston in a shop towel as it exits the bore.

CAUTION: Use only enough air pressure to ease each piston out of the bore. In addition, remove the pistons one at a time and tag the pistons and springs for assembly reference. Do not intermix them.

(3) Remove and discard piston O-ring seals. Then clean the pistons and springs with solvent.

(4) Inspect the pistons and springs and the piston bores in the case. Replace worn damaged pistons. Replace broken, collapsed or distorted springs. Replace the case if the piston bores are damaged.

(5) Install new O-ring seals on pistons. Lubricate seals and pistons and piston bores with transmission fluid.

(6) Install pistons and springs (Fig. 32).

(7) Install valve body, oil screen and oil pan.

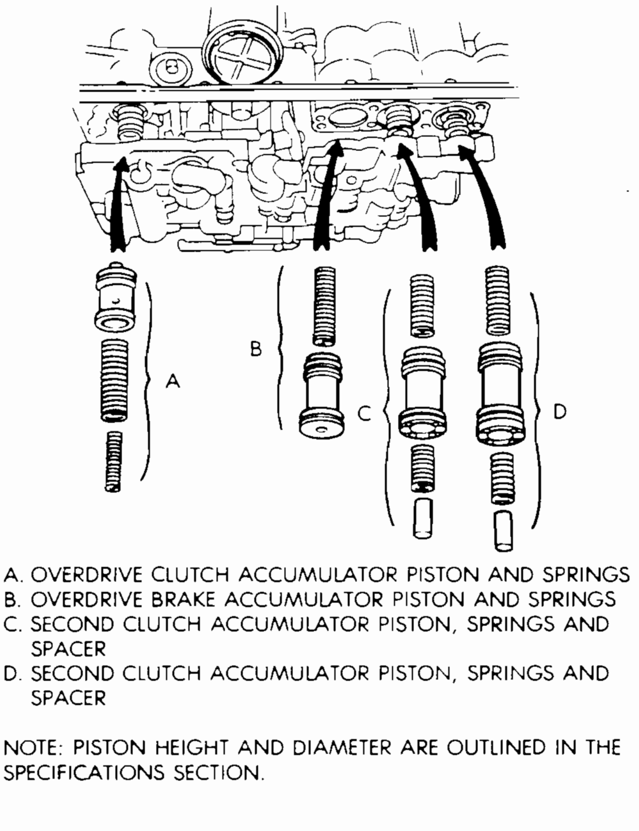


Fig. 32 Accumulator Piston-Springs-Spacers

SECOND COAST BRAKE SERVO

Servo Overhaul

(1) Remove valve body as outlined in this section.

(2) Remove servo piston cover snap ring with snap ring pliers (Fig. 33).

(3) Remove servo piston and cover with compressed air. Apply compressed air through oil hole in servo boss to ease piston out of bore (Fig. 34).

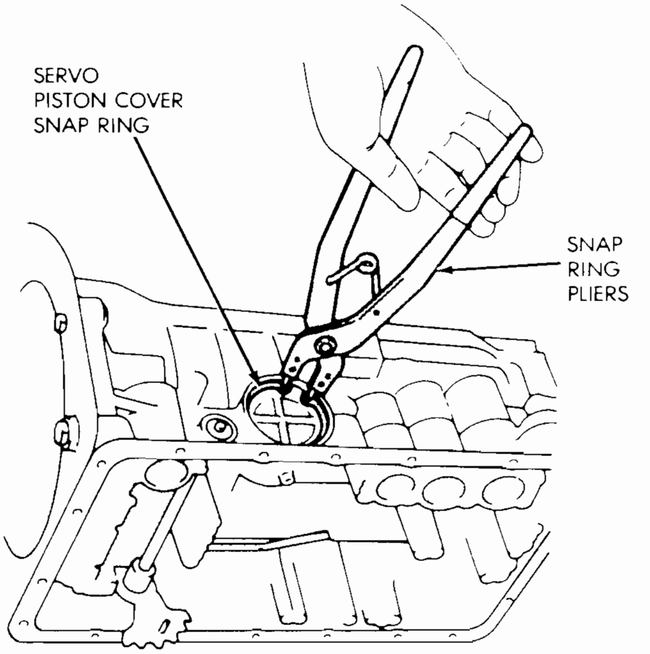


Fig. 33 Removing/Installing Servo Piston Cover Snap Ring

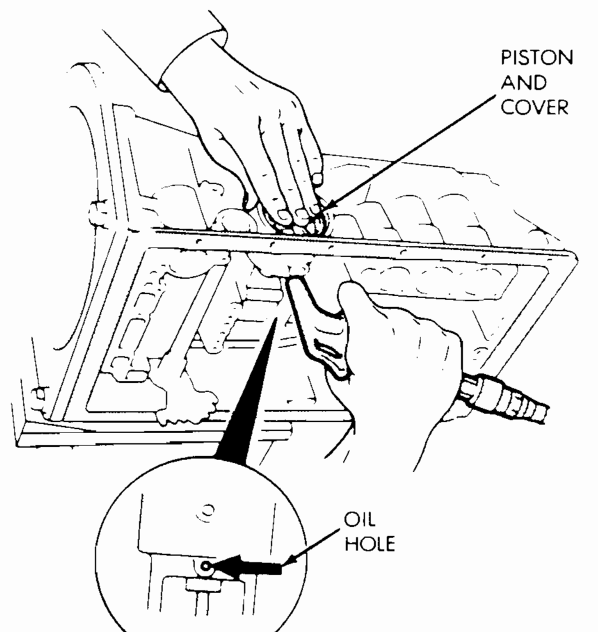


Fig. 34 Removing Servo Cover And Piston

(4) Remove and discard seal and O-rings from cover and piston (Fig. 35). Inspect E-ring, piston, spring and retainer, piston rod and piston spring. Replace worn or damaged parts.

(5) Install new seals on cover and piston.

(6) Lubricate servo components with transmission fluid.

(7) Assemble and install servo components in case. Be sure servo piston rod is properly engaged in the second coast brake band.

(8) Compress cover and piston and install cover snap ring.

(9) Install valve body, oil screen and oil pan.

PARK ROD AND PAWL

Park Rod and Pawl Removal

(1) Remove valve body as outlined in this section.

(2) Remove bolts attaching park rod bracket to case (Fig. 36).

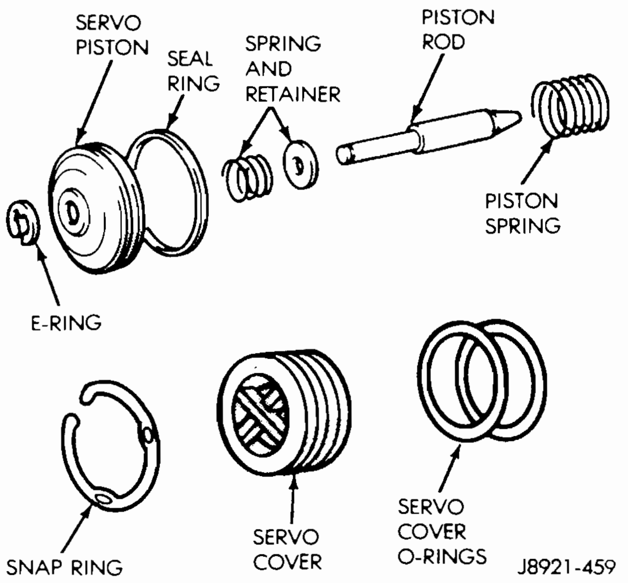


Fig. 35 Second Coast Brake Servo Components

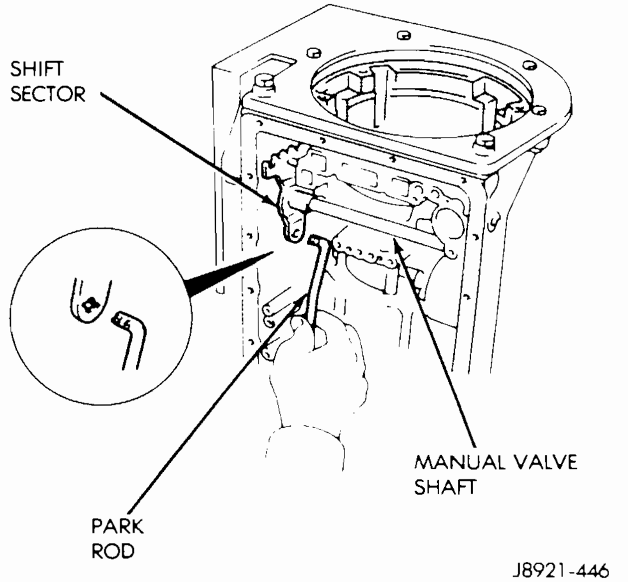


Fig. 37 Removing/Installing Park Rod

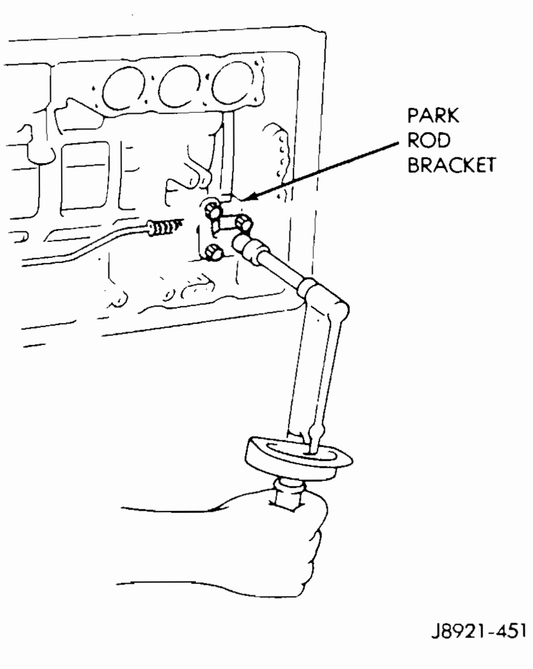


Fig. 36 Removing/Installing Park Rod Bracket

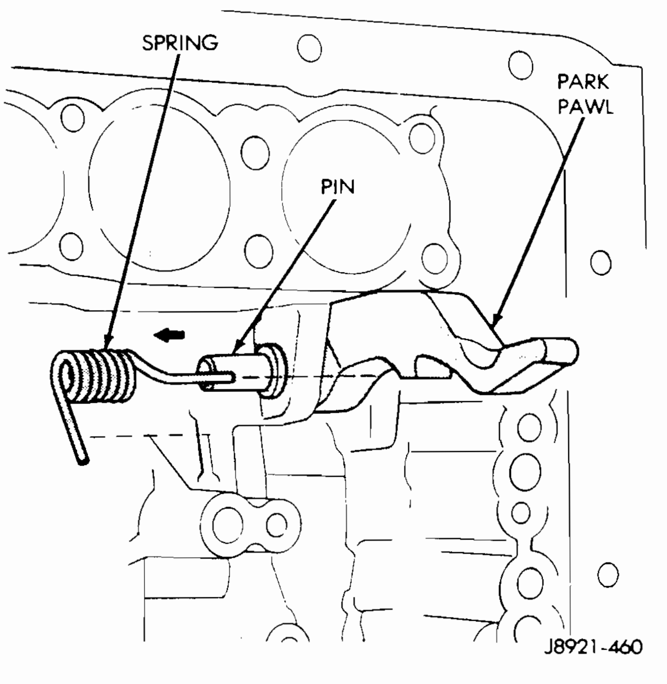


Fig. 38 Removing/Installing Park Pawl-Pin-Spring

(3) Remove park rod from manual valve shaft sector (Fig. 37).

(4) Remove park rod.

(5) Remove park pawl, pin and spring (Fig. 38).

(6) Examine park rod, pawl, pin and spring. Replace any component that is worn or damaged.

(7) Install pawl in case. Insert pin and install spring. Be sure spring is positioned as shown in Figure 38.

(8) Install park rod and bracket (Fig. 36). Tighten bracket bolts to 10 N•m (7 ft-lbs) torque.

(9) Install valve body, oil screen and oil pan as outlined in this section.

EXTENSION/ADAPTOR HOUSING SEAL REPLACEMENT

(1) Raise vehicle.

(2) On 2WD or 4WD models, disconnect or remove components necessary to gain access to the seal (e.g. propeller shaft, crossmember, shift linkage, transfer case, exhaust components, hoses, wires).

(3) On 2WD models, remove seal from adaptor housing (Fig. 39).

(4) On 4WD model, remove dust shield and remove seal from extension housing (Fig. 39).

(5) Install new seal with appropriate size seal installer. On 4WD models, also install dust shield.

(6) Reinstall components removed to gain access to seal.

(7) Top off transmission fluid if necessary.

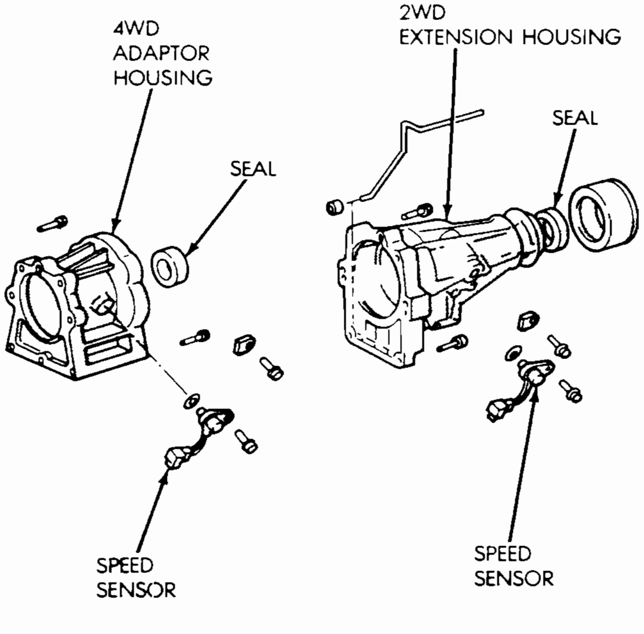


Fig. 39 Adaptor/Extension Housing Seals

SPEED SENSOR

Speed Sensor Testing

Test the speed sensor with an ohmmeter. Place the ohmmeter leads on the two terminals in the sensor connector (Fig. 40).

Rotate the transmission output shaft and observe the ohmmeter needle. The needle should deflect indicating the switch is opening/closing as the output shaft rotor moves past the sensor (Fig. 40). Replace the sensor if the

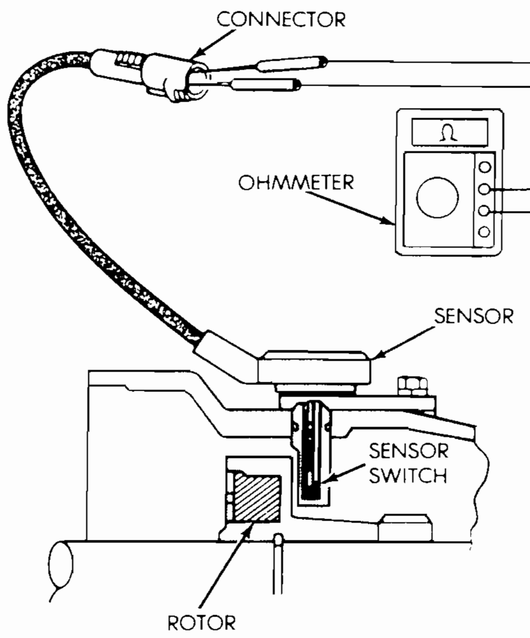


Fig. 40 Speed Sensor Testing

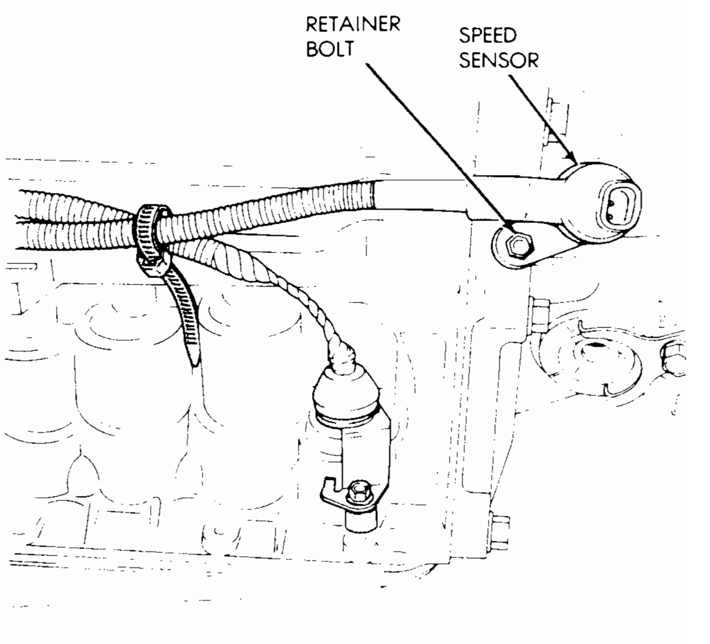


Fig. 41 Speed Sensor Removal/Installation

ohmmeter does not display any kind of reading.

If a digital ohmmeter is being used, the sensor should generate an ohmmeter readout each time the switch opens and closes.

Speed Sensor Replacement

(1) Disconnect sensor wire harness connector.

(2) Remove sensor retainer bolt and remove sensor (Fig. 41).

(3) Remove and discard speed sensor O-ring.

(4) Install new O-ring on speed sensor and install sensor in transmission case.

(5) Install sensor bracket and retainer bolt. Tighten bolt to 7.4 N•m (65 in-lbs) torque.

(6) Connect sensor wire harness connector.

SPEED SENSOR ROTOR-SPEEDOMETER DRIVE GEAR

Rotor-Drive Gear Removal

(1) Raise vehicle.

(2) Remove components necessary to gain access to rotor and drive gear (e.g. propeller shaft, transfer case, crossmember, shift linkage).

(3) Disconnect speedometer cable and/or speed sensor.

(4) Remove extension or adaptor housing.

(5) Remove speedometer drive gear snap ring (Fig. 42).

(6) Remove the speedometer drive gear and spacer (if equipped).

(7) Remove rotor by carefully prying it off output shaft with wood dowel or hammer handle (Fig. 43).

(8) Clean sealing surfaces of transmission case and extension/adaptor housing.

Rotor—Drive Gear Installation

(1) Install rotor, spacer (if equipped) and drive gear on output shaft. Then install drive gear snap ring (Fig. 42).

(2) Apply bead of Three-Bond TB 1281 or equivalent RTV sealer, to transmission case sealing surface and install extension/adaptor housing on case.

(3) Tighten extension/adaptor housing bolts to 34 N•m (25 ft-lbs) torque.

(4) Install components removed to gain access to rotor and drive gear.

THROTTLE POSITION SENSOR (TPS)

A separate throttle position sensor is used for automatic transmission applications. The transmission sensor is attached to the base of the throttle body. The 6-cyl. and 4-cyl. sensors are shown in Figure 44.

TPS input/output voltage is checked at the four-terminal, two-piece connector (Fig. 45).

If diagnosis indicates a loose or corroded connection, release the lock tab and separate the two halves of the connector. Inspect and clean the connector terminals if dirty or corroded.

Be sure the connector halves are fully seated before engaging the lock tab. This is necessary to ensure a good connection.

Testing TPS Operation

A voltmeter is used to test TPS operation. Operation is checked by measuring input and output voltage at the connector terminals.

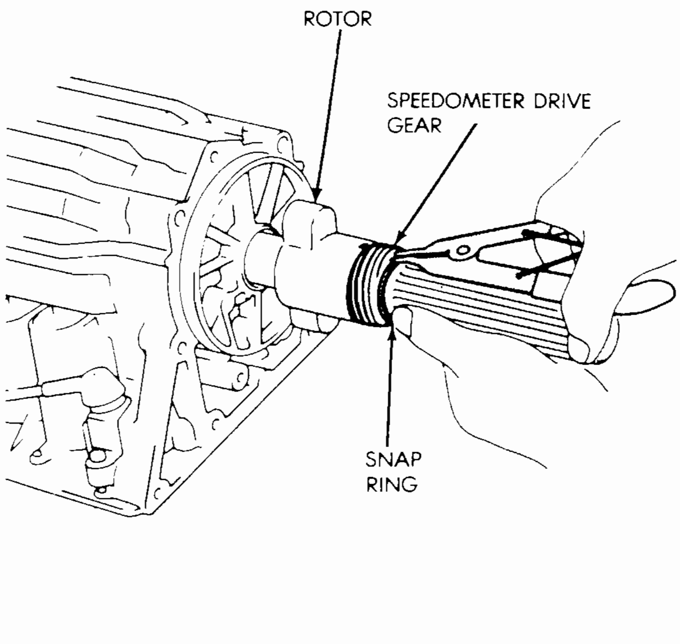


Fig. 42 Removing/Installation Speedometer Drive Gear

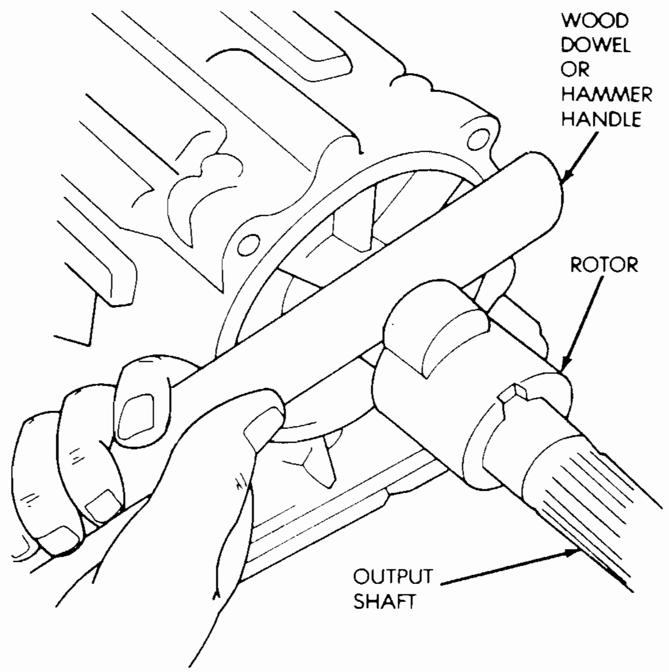


Fig. 43 Removing Speed Sensor Rotor

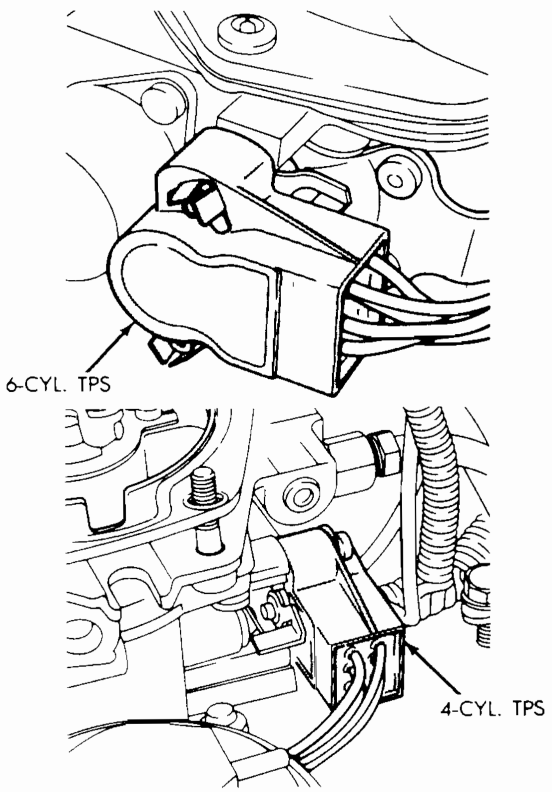


Fig. 44 Throttle Position Sensor (TPS) Identification

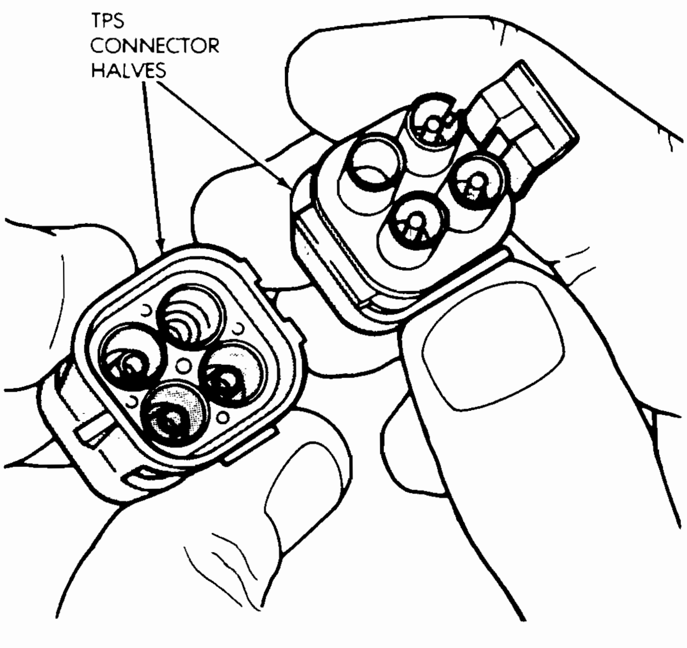


Fig. 45 TPS two-Piece Harness Connector

The connector terminals are identified by the letters A, B, C, D molded into the back of the connector (Fig. 46).

Testing Input Voltage

(1) Turn ignition key to On position.

(2) Do not disconnect the harness connectors to measure voltage in the following steps. Insert the voltmeter test leads through the back of each connector to make contact with the indicated wire terminals.

(3) Connect voltmeter negative lead to terminal D.

(4) Connect voltmeter positive lead to terminal A.

(5) Close throttle plate completely. Be sure throttle lever is seated against idle stop.

(6) Input voltage at terminals A and D should be approximately 5.0 volts on both 4-and 6-cyl. models.

(7) Leave both voltmeter leads in place and proceed t output voltage test.

Testing Output Voltage

(1) Remove voltmeter positive lead from terminal A and reconnect it to terminal B.

(2) On 4-cylinder models, move throttle plate to wide open position and note output voltage. Output voltage should be 4% of input voltage (approximately 0.2 volts).

(3) On 6-cylinder engines, hold throttle plate closed and note output voltage. Voltage should be 82% of input voltage (approximately 4.2 volts).

(4) If output voltage is not within specified range, leave voltmeter connected and proceed to TPS adjustment.

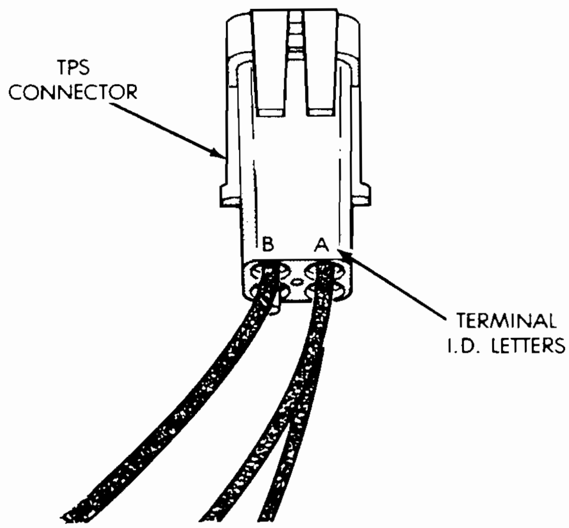
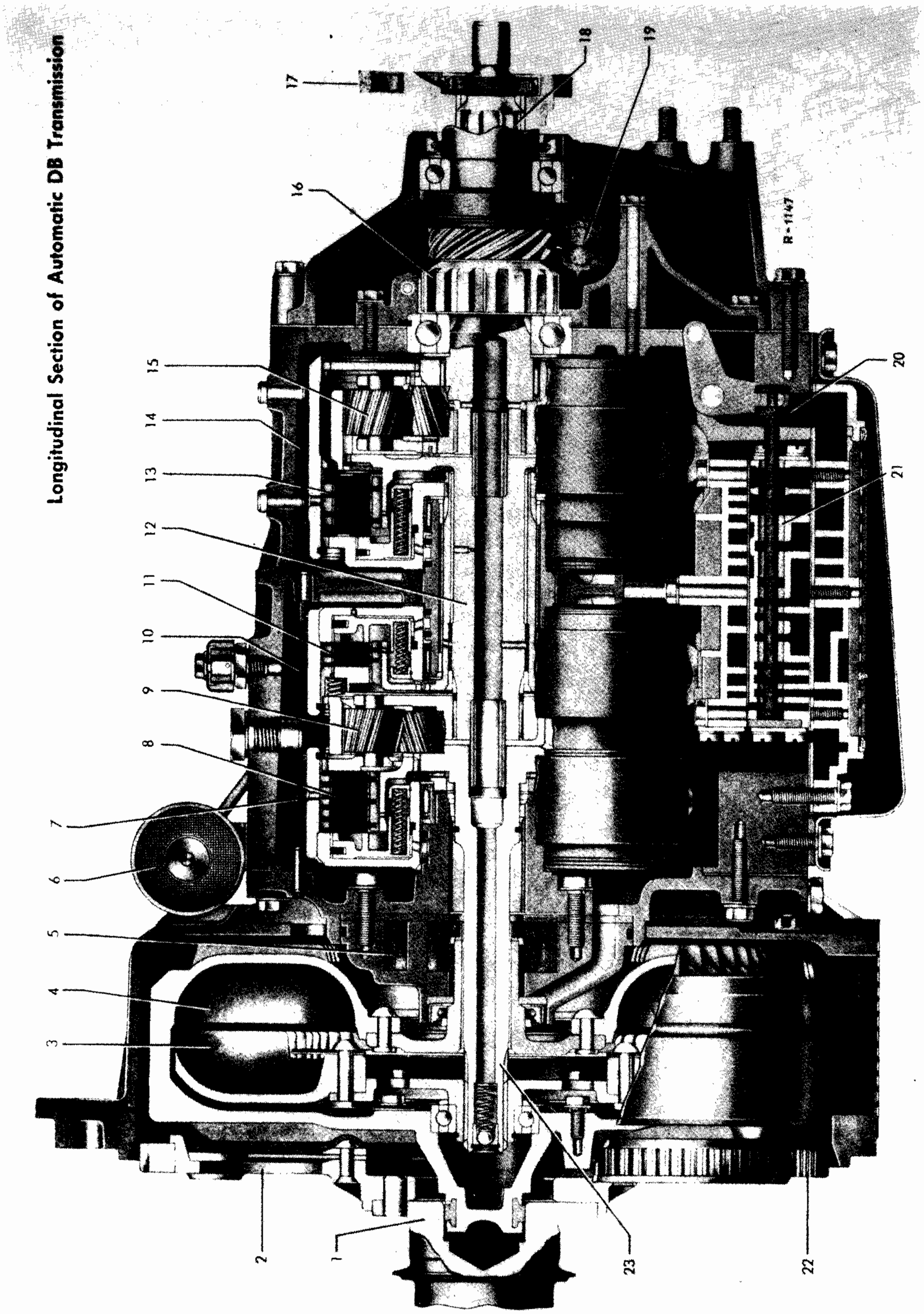


Fig. 46 TPS Connector Terminal Identification

Longitudinal Section of Automatic DB Transmission



1 Crankshaft
2 Drive plate
3 Secondary rotor
4 Primary rotor
5 Primary pump
6 Double stroke solenoid for kickdown and idling
7 Brake band B 3
8 Clutch K 1
9 Planet gear set, front
10 Brake band B 1
11 Clutch K 3
12 Intermediate shaft
13 Clutch K 2
14 Brake band B 2
15 Planet gear set, rear
16 Parking lock gear
17 Three-legged flange
18 Output shaft
19 Governor shaft
20 Selector position sleeve
21 Sleeve shift box
22 Starter ring gear
23 Drive shaft

Check: Starter should operate in selector lever positions "0" and "P" and must be locked in driving positions (R, 4, 3, 2).

Caution: Operate brake when checking.

b) Adjusting the shift rod, starter lock switch and reversing light switch (center shift)

Remove shift rod (4). Set range selector lever (6) and selector lever (1) to "0", in doing so make sure that between "0" stop of sleeve and selector lever a play of approx. 1 mm exists. Loosen fastening bolts for additional lever so far that the adjusting mark on its upper oblong hole is aligned with the center line of range selector lever (Fig. 27–4/1 b), tighten fastening bolts. The additional lever on model 230 SL is so adjusted that the center lines of both levers are aligned (Fig. 27–4/1 a). Press shift rod (4) on bearing pin on additional lever (5). Adjust adjusting lug (3) so that it coincides with the bearing pin on selector lever bottom section (2). Fine adjustment is possible on the two oblong holes of additional lever (5), if required. Press shift rod on selector lever bottom section (2) (Fig. 27–4/1 a).

The cable pulls (7) which operate the starter lock and reversing light switch, must be so adjusted that starting of the engine is only possible in selector lever positions "0" and "P". The starter must be locked in all other positions. In addition, the reversing lights should light up in selector lever position "R". If required, adjust on adjusting stop (8) (Fig. 27–4/1 a).

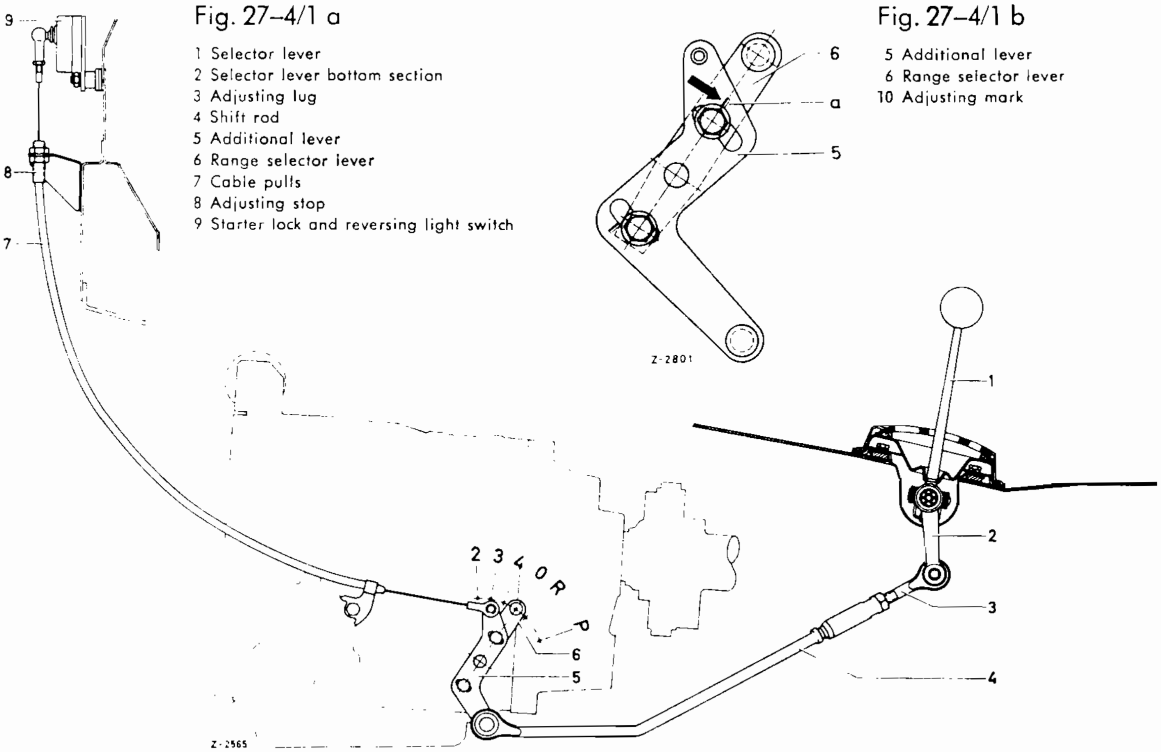


Fig. 27–4/1 a

1 Selector lever
2 Selector lever bottom section
3 Adjusting lug
4 Shift rod
5 Additional lever
6 Range selector lever
7 Cable pulls
8 Adjusting stop
9 Starter lock and reversing light switch

Fig. 27–4/1 b

5 Additional lever
6 Range selector lever
10 Adjusting mark

c) Adjusting the selector lever indication (steering wheel shift)

The selector lever indication is set in selector lever position "0". Cable pulls (3) from shift tube to selector lever indication can be set in length by the knurled nut (4) on selector lever indication (Fig. 27–4/2). For the purpose, loosen counternut (5) and retighten after the adjustment.

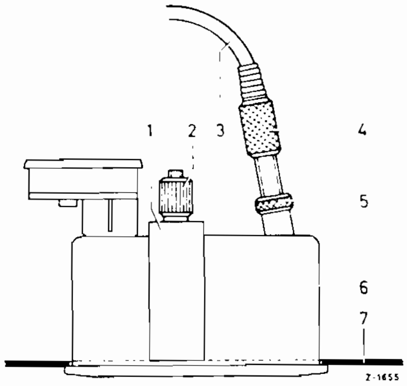


Fig. 27–4/2

1 Clamp
2 Clamp nut
3 Bowden cable
4 Knurled nut
5 Lock nut
6 Housing
7 Instrument panel

d) Adjustment of Kickdown Switch

Screw kickdown switch (4) out of cover plate (2), of the steering column jacket in the direction of the engine compartment, after loosening lock nut (3) (Fig. 27–4/4). Check gas pedal and linkage for easy operation and adjust, if required. The gas pedal should return easily to idling position from both reduced throttle and full throttle.

Screw kickdown switch into the cover plate of the steering column jacket to the point where the throttle valve lever (1) is located approx. 3/16" from the full load stop screw (2) (Fig. 27–4/3) while the gas pedal rests against the kickdown switch (position B). When the gas pedal is depressed to kickdown (position C), there should still be a play of approx. 3/64" between throttle valve lever and full load stop on the venturi control unit housing. The adjusting lever of the injection pump, on the other hand, should rest against the full load stop (only for cars with injection engines).

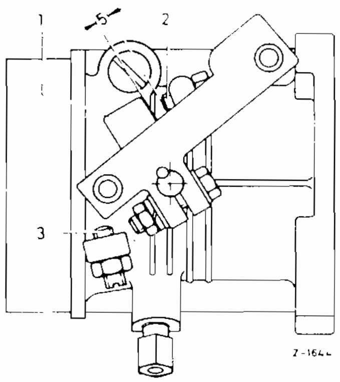
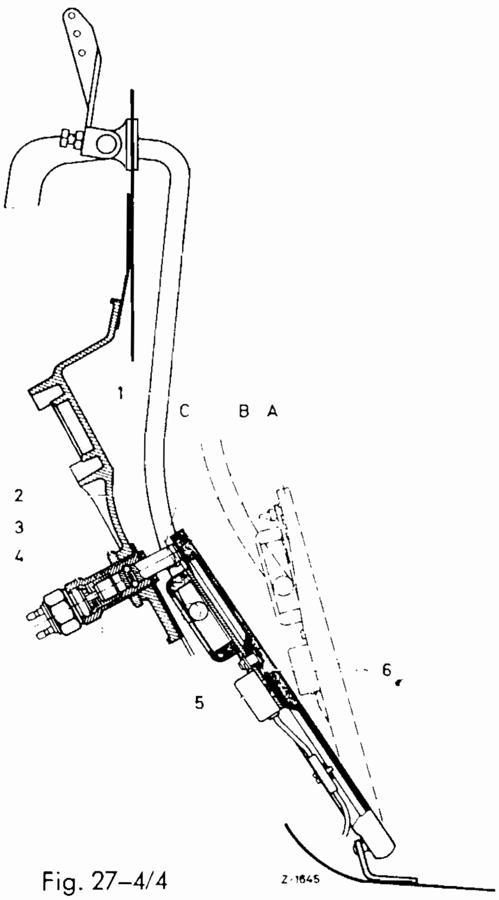
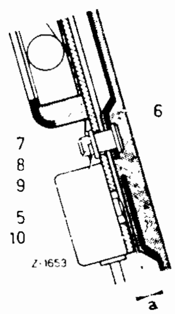


Fig. 27–4/3

1 Throttle valve lever
2 Full load stop
3 Idling load stop





1 Control lever
2 Cover plate
3 Lock nut
4 Kickdown switch
5 Idling switch
6 Foot plate
7 Compensating washer
8 Bolt
9 Cotter pin
10 Plate

A Idling position
B Full throttle position
C Kickdown position

a = .0039 to .0196" (0.1–0.5 mm)

Fig. 27–4/4

Fig. 27–4/5

e) Adjustment of Kickdown Linkage

When kickdown shifting fails, the kickdown linkage should be checked for proper functioning and the modulating pressure should be checked.

Testing of Kickdown Linkage

For this purpose, operate gas pedal, with ignition switched on and engine stopped, as follows:

With gas pedal not operated (idling position), linkage moves toward the rear.

Gas pedal slightly down (partial to full throttle position), linkage moves to central position.

Gas pedal fully down (kickdown position), linkage moves forward.

If the double-acting solenoid will not move the kickdown linkage into these three positions, there is either an electrical failure (insufficient terminal voltage, short circuit, etc.) or the operating shaft (1) for the modulating pressure control in the brake band piston cover or the modulating pressure control (4) itself s jammed (Fig. 27-4/6).

Measuring of Kickdown Modulating Pressure

For this purpose, connect pressure gauge (84 p.s.i. capacity min.) to test connection (5) (Fig. 27-4/6), disconnect vacuum line from modulating pressure control and run engine at idling speed.

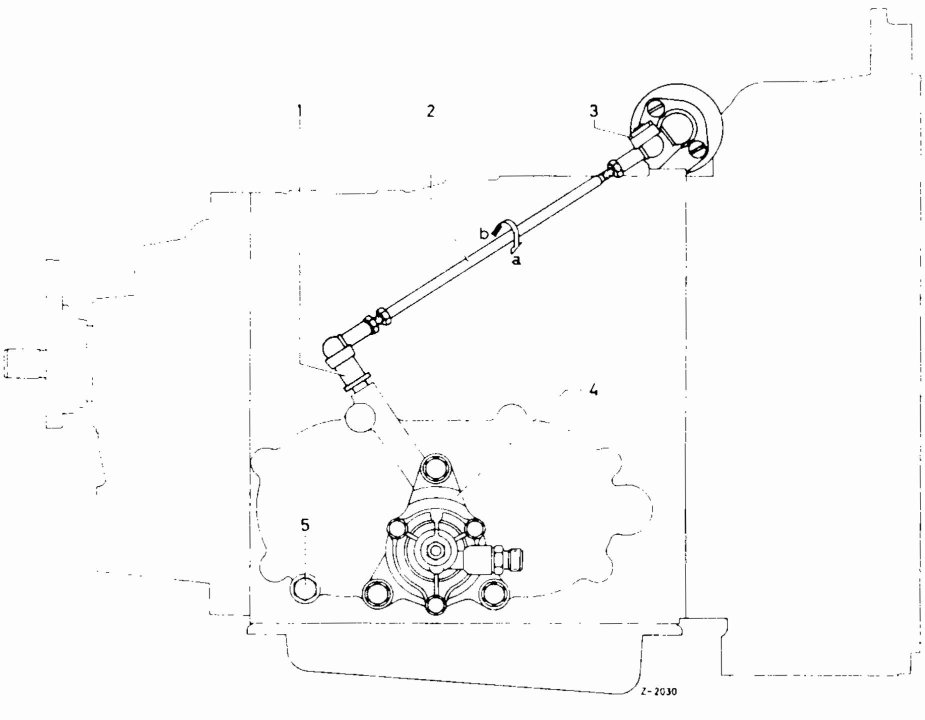


Fig. 27-4/6

1 Operating shaft
2 Linkage
3 Angle lever
4 Modulating pressure control
5 Measuring connection for modulating pressure

Move gas pedal down slightly with right foot while simultaneously operating the kickdown switch with tip of left foot. Read kickdown modulating pressure on pressure gage (for value refer to Job No. 27-0).

If the pressure is too low, either the linkage (2) or the angle lever (3) on the double-acting solenoid may be worn. Check by shaking angle lever (3) of double-acting solenoid when in kickdown position (accessible from passenger compartment through opening in transmission tunnel). If required, remove play or replace angle lever.

Kickdown modulating pressure is adjusted by increasing the length of linkage (2) by turning in direction "a" (reduction of pressure) or in direction "b" (increase of pressure). If the kickdown modulating pressure is adjusted, the basic pressure should also be tested (for values refer to Job No. 27–0); it should never exceed the upper limit.

Note: For general adjustment instructions for modulating pressure see Job No. 27–8, Section D, part a.

f) Adjustment of Idling Switch (rotary switch on throttle valve)

If the idling switch on a venturi control unit or a carburetor has been replaced it must be properly adjusted. The adjustment must be checked when there is trouble in the electrical system of the automatic transmission (e. g. racing of the engine, slipping of servo members, no braking shifts when driving down a grade at more than 1,200 m above sea level). The check can only be done with a revolution counter and a testing light. The idling switch can only be checked or adjusted when the engine is at normal working temperature, i. e. at a minimum cooling water temperature of 80° C.

Note: Disconnect the cables from the idling switch befor warming up the engine.

Checking of Idling Switch

Disconnect the two cables from the idling switch.

Connect one terminal of the idling switch to ground and connect a testing light to the other terminal. Connect the testing light to the positive terminal of the battery.

Apply the hand brake, run the engine at idling speed and move the selector lever into one of the driving positions. The testing light should now be on and should only go out under slight acceleration. (This applies also to engines equipped with a solenoid for constant engine speed.)

Connect the revolution counter to the engine and check the switch-off speed. Move the selector lever to position "0" or "P" and accelerate slowly. Watch the speed increase on the revolution counter: when the switch-off speed (see Job No. 27–0) is reached the testing light must have gone out.

If the testing light has not gone out when the switch-off speed (see Job No. 27–0) is reached, the idling switch must be adjusted.

Adjustment of Idling Switch

Slightly loosen the fixing screws of the idling switch and at an increased idling speed of approx. 1,200 r.p.m. turn idling switch until the testing light goes out.

Tighten the fixing screws and repeat the check.

Note: In injection engines the idling switch is fastened to the throttle valve part with two screws, in carburetor engines with one screw.

g) Adjustment of Control Rod

(only on Diesel cars with automatic transmission)

Checking Adjustment of Control Rod (graduated disk)

Turn the control knob of the idle adjustment cable fully to the right. Adjust the idle by means of the idle stop screw on the venturi control unit.

The ball cup of the control rod (5) must fit the ball head (4) without forcing. If this is not the case the control rod length must be corrected before any further checks-are made (Fig. 27–4/8).

The pointer (10) attached to the operating lever of the modulating pressure transmitter is set to the zero mark of the graduated disk (11) Part No. 110 589 00 21 00 (Fig. 27–4/7). When this is being done the operating lever of the modulating pressure transmitter must rest against its zero stop (set screw) and the engine throttle valve must be closed.

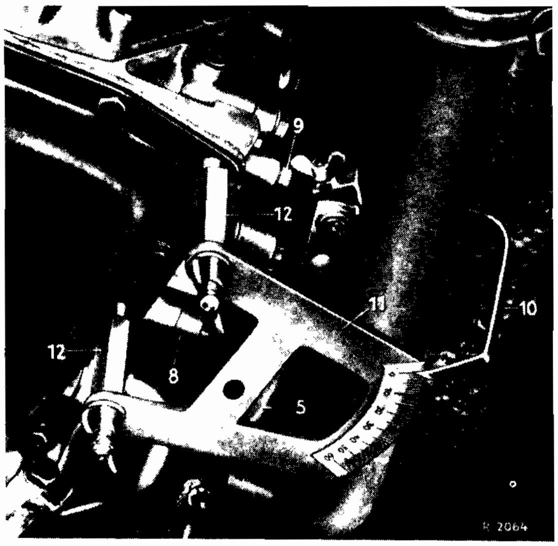


Fig. 27–4/7

5 Control rod
8 Modulating pressure control
9 Test connection for modulating pressure
10 Pointer
11 Graduated disk
12 Threaded bolt

Depress the accelerator pedal to full throttle (position B in Fig. 27–4/8). The pointer (10) on the graduated disk (11) should now point to the full-throttle value (see Job No. 27–0) and the spring-loaded valve should be fully open. For this type of test the kickdown value is of no importance. Release the accelerator pedal (7): The pointer should return to the zero mark on the graduated disk. If required free up the joints of the control rod. **The basic adjustment screw (10) has been set in our works; under no circumstances should its setting be altered (Fig. 27–4/8).**

Checking Adjustment of Control Rod (Modulating Pressure Gage)

Attach a modulating pressure gage to the test connection (9) (Figs. 27–4/7 and 8).

Turn the control knob of the idle adjustment cable fully to the right. Run the engine, move the selector lever to one of the driving positions and depress the accelerator to full throttle (position B in Fig. 27–4/8).

Caution: To prevent damage to the engine and overheating of the hydraulic clutch, the engine should be run at full throttle only for a very short time.

The pressure gage should now indicate the full throttle modulating pressure (see Job No. 27–0). The spring-loaded connecting rod should have been extended by approx. 2 to 5 mm. The throttle valve should be fully open. When the full throttle value has been readjusted, the modulating pressure will have to be checked again during a test run.

Check idle, full throttle and kickdown modulating pressure. If the idle modulating pressure is not reached, the operating lever of the modulating pressure transmitter will not return to its zero position. If required free up the joint of the control rod. **The basic adjustment screw (10) has been set in our works; under no circumstances should its setting be altered (Fig. 27–4/8).**

Adjustment of Control Rod

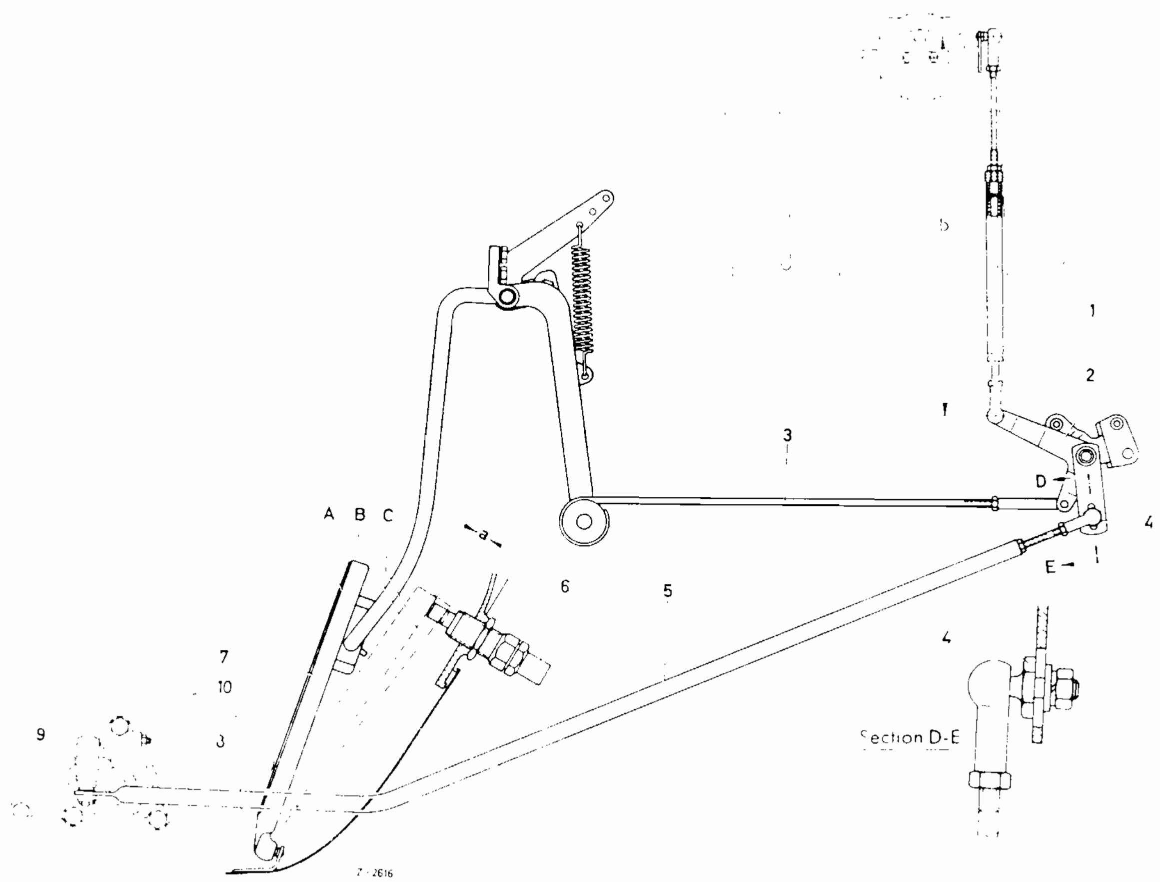


Fig. 27–4/8

1 Spring-loaded connecting rod
2 Angle lever
3 Push rod
4 Ball head
5 Control rod
6 Spring loaded stop (kickdown change-down)
7 Accelerator pedal
8 Modulating pressure transmitter
9 Test connection for modulating pressure
10 Basic adjustment screw

Positions of accelerator pedal:
A Idling B Full throttle C Kickdown
a Kickdown travel
b Non-extended length of connecting rod

If the ball cup of the control rod (5) cannot be pressed on the ball head (4) without forcing, the length of the control rod must be adjusted by means of the threaded member between ball cup and rod. If the throttle valve opens when the ball cup is being pressed on, the rod must be shortened. If the operating lever of the modulating pressure transmitter is lifted off its zero stop, the rod must be lengthened.

If the angular travel at the full throttle point or the full throttle modulating pressure is excessive, the ball head (4) must be shifted upward in its slot; if the angular travel or the full throttle modulating pressure is insufficient the ball head must be shifted downward (Fig. 27–4/8).

Basic Adjustment

A replacement modulating pressure transmitter needs adjustment.

The following tools are required:

Modulating pressure gage and graduated disk.

Turn the control knob of the idle adjustment cable fully to the left (increased idle speed).

Connect modulating pressure gage, attach graduated disk with pointer, detach spring-loaded connecting rod (1) at its lower ball head (Fig. 27–4/8) and run the engine. Detach the control rod (5), shorten it by approx. 5 mm, and reattach. Depress the accelerator pedal (7) to the point where it can be seen on the pressure gage of jumping up to the kickdown pressure. At exactly this moment set the pointer of the graduated disk to the basic adjustment value (see Job No. 27–0).

Shut off the engine, release the accelerator pedal (7), and detach the control rod (5). Let the operating lever of the modulating pressure transmitter rest against the basic adjustment screw (10) (Fig. 27–4/8). Turn the basic adjustment screw until the pointer points to the zero mark on the graduated disk (Fig. 27–4/7).

Attach the spring-loaded connecting rod (1) and adjust the control rod (see above).

Breakdown of Transmission Designations

Example: Transmission with hydraulic (fluid) coupling and transmission with torque converter

K4C 025

K	=	hydraulic (fluid) coupling
4	=	number of speeds
C	=	version
025	=	max. input torque (kpm)

W3A 040

W	=	hydraulic torque converter
3	=	number of speeds
A	=	version
040	=	max. input torque (kpm)

Transmission Identification

Possibilities:
- Part No. punched into type rating plate or transmission housing
- In vehicle, in accordance with vehicle model

Example:

Transmission with torque converter	Model 116 as from start of series production September 1972 and Model 114/115 as from novel products date August 1973
Transmission with hydraulic (fluid) coupling	All previously manufactured vehicles, with the exception of model 107.043/044 up to June 1972 and model 108.067/068, 109.057

Design

The most important components of a hydraulic (fluid) coupling are:

1. **The impeller** (A), also called the primary wheel, is rigidly connected to crankshaft of engine.

2. **The turbine** (B), also called the secondary wheel, is connected to input shaft of transmission (F).

The hydraulic (fluid) coupling is a self-contained unit. The turbine (B) rotates freely in the cover shell (D) connected to impeller (A).

Both the impeller (A) and the turbine (B) are provided with radial, flat blades (vanes) without internal flow restriction. The number of blades (vanes) differs to restrict the development of noise.

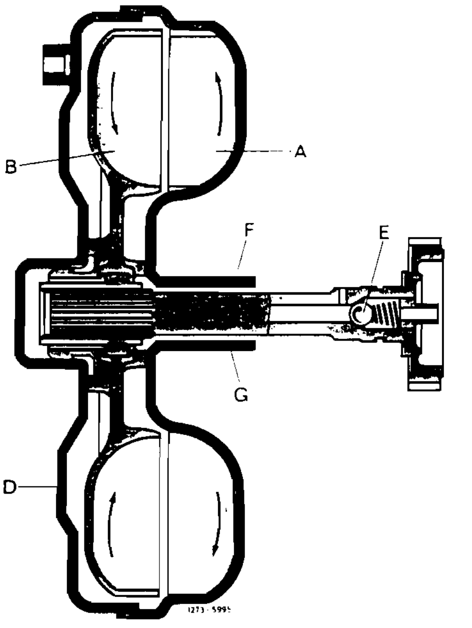


Fig. 7

A Impeller
B Turbine
D Cover shell
E Pressure holding valve
F Input shaft
G Primary pump – drive flange

Design

The most important components of a torque converter are:

1. **The impeller** (A), also called the primary wheel, which is connected to the crankshaft of the engine by means of the cover shell (D).

2. **The turbine wheel** (B), also called the secondary wheel, is connected to the input shaft (F) of the transmission.

3. **The stator** (C), also called the reaction wheel, is connected to the transmission housing by means of the one-way roller clutch (H) and the stator shaft (I).

The torque converter is a self-contained unit. The turbine (B) rotates freely in the cover shell (D) which is connected to the pump wheel (A). The stator (C) is mounted on a one-way roller clutch (H) and prevents the oil flowing into counter-rotary direction of the engine.

Contrary to a hydraulic (fluid) coupling with straight blades, the blades of the impeller, the turbine wheel and the stator are provided with pertinently associated inflow and outflow angles which are provided with relevant curves.

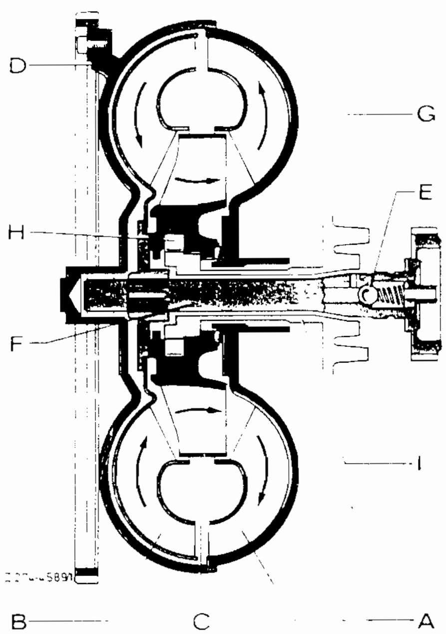


Fig. 8

A Impeller
B Turbine wheel
C Stator
D Cover shell
E Pressure holding valve
F Input shaft
G Primary pump – drive flange
H One-way roller clutch
I Stator shaft

Function

The torque converter is filled with oil. The oil is subject to a constant heat exchange, in the course of which the oil flows in between the stator shaft (I) and the primary pump drive flange (G) and flows out again through a bore in the input shaft (F) through pressure holding valve (E). The pressure holding valve in the return flow guarantees the filling pressure required in the torque converter.

When the impeller (A) rotates, the oil between the impeller blades is thrown in outward direction into the turbine wheel (B) under the influence of the prevailing centrifugal forces.

The mechanical energy provided by the engine flows to the turbine wheel in the shape of flow energy.

Inside the turbine wheel (B) the flow energy of the oil is again converted into mechanical energy (torque and speed) under the influence of the flow reversal occurring in the blade ducts.

The oil flowing out of the turbine wheel (B) opposite to the direction of rotation now encounters the stator (C) which is retained in the direction of rotation indicated by the broken arrow via the one-way roller clutch (Fig. 9). The oil is once again reversed by the stator blades and now flows in the direction of rotation of the impeller.

This reversal establishes a torque in the stator which is backed up by the housing via the one-way roller clutch (H) and the stator shaft (I) and is transmitted to the impeller via the oil.

The sum of the two torques, e.g. the input torque transmitted by the engine to the impeller and the rotary torque transmitted by the stator to the impeller by means of the oil then equals the torque transmitted to the transmission by the turbine.

The ratio between the output torque and the input torque when the vehicle is started (starting conversion) amounts to approx. 2. Conversion will continously decrease with increasing turbine speed. The direction of flow toward stator as well as the conversion within the stator will also be subject to constant change.

When the oil flow strikes against the back of the stator blades, conversion in stator will cease. The stator will start to rotate in the same direction as the impeller and the turbine wheel, the torque conversion will attain a value of 1.

At this stage, the speed ratio amounts to 0.86–0.91 and is called the coupling point. Above the coupling point, the torque converter operates as a hydraulic (fluid) coupling and will then attain a max. efficiency of approx. 98 %.

Flow pass in torque converter when moving off (Fig. 9).

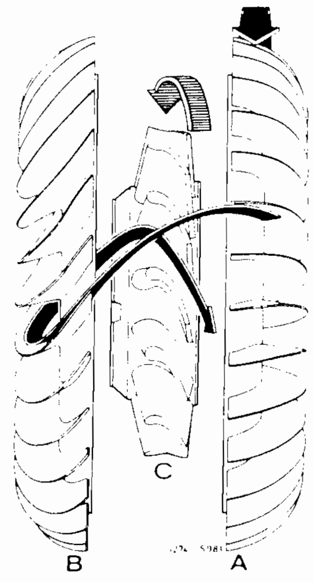


Fig. 9

A Impeller
B Turbine wheel
C Stator

General

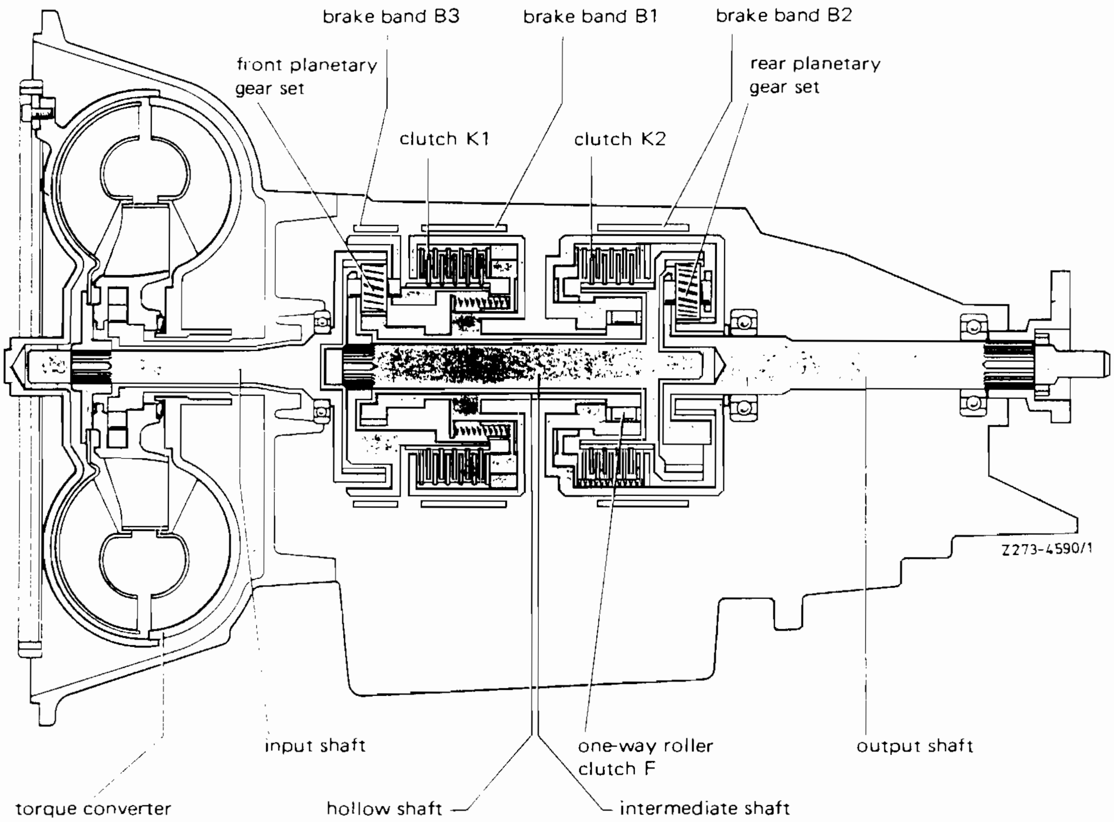


Fig. 20

In Fig. 20, all the shifting components are released. The following description shows the interaction of the individual members.

The following components are rigidly connected to each other

1. Turbine of torque converter to ring gear of front planetary gear set by means of input shaft.

2. Brake band drum B3 to inner disc carrier of clutch K1 and planetary gear carrier of front planetary gear set via intermediate shaft to ring gear of rear planetary gear set and inner disc carrier of clutch K2.

3. Brake band drum B1 to outer disc carrier of clutch K1 and sun gear of front planetary gear set to inner race of one-way roller clutch via hollow shaft.

4. Brake band drum B2 to outer disc carrier of clutch K2, sun gear of rear planetary gear set and outer race of one-way roller clutch.

5. Planetary gear carrier of rear planetary gear set to output shaft.

General

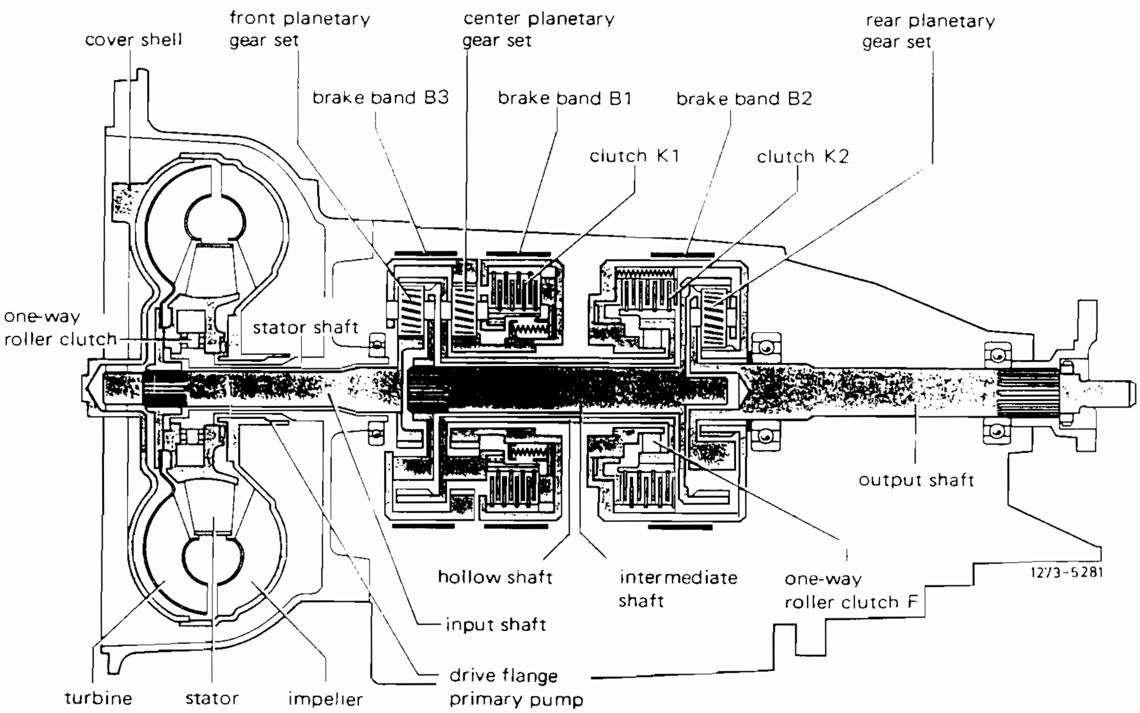


Fig. 14

In Fig. 14, all the shifting components are released. The following description shows the interaction of the individual members.

The following components are rigidly connected to each other

1. Turbine of torque converter or hydraulic (fluid) coupling via input shaft to sun gear of front planetary gear set.
2. Brake band drum B3 to ring gear of center planetary gear set, as well as to planetary gear carrier of front planetary gear set via intermediate shaft to ring gear of rear planetary gear set.
3. Ring gear of front planetary gear set to planetary gear carrier of center planetary gear set, as well as to inner disc carrier of clutch K1 via hollow shaft to outer race of one-way roller clutch and inner disc carrier of clutch K2.
4. Brake band drum B1 to outer disc carrier of clutch K1 and sun gear of center planetary gear set.
5. Brake band drum B2 to outer disc carrier of clutch K2 as well as to inner race of one-way roller clutch and sun gear of rear planetary gear set.
6. Planetary gear carrier of rear planetary gear set to output shaft.

Modulating Pressure on Transmissions with Torque Converter (Gasoline Engines)

The torque increase of the torque converter in the moving-off range requires an increase of the modulating or working pressure.

The modulating pressure is increased by means of a modified control valve modulating pressure (43a) with two control surfaces and by the installation of an additional control valve converter adaptation (43b).

The control valve modulating pressure (43a) is forced downwards in the direction of "opening" by the force of spring "c". With the engine running, the intake pipe vacuum moves into spring chamber of modulating pressure transmitter which opposes the force of spring "c" in combination with the force of the modulating pressure against the annular surface "a" and the flat surface "b".

The control valve converter adaptation (43b) reduces the pressure arriving at flat surface "b".

This pressure is determined by the force acting against control valve converter adaptation (43b) and spring "d", as well as by the governor pressure. If this pressure against surface "b" is low, the modulating pressure acting against annular surface "a" must be high.

At approx. 45 km/h, the governor pressure in dependence of the vehicle speed is so high that the control valve converter adaptation (43b) is forced against the lower stop. The modulating pressure at surfaces "a" and "b" will be uniform.

Note: On transmissions with torque converter for diesel engines the vacuum box (42) is replaced by a screw connection. A spring will exert constant pressure against control valve (43a) (refer to Fig. 31).

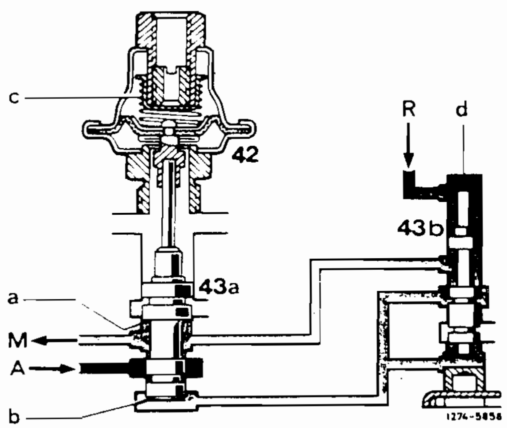


Fig. 30

42	Vacuum box
43a	Control valve modulating pressure
43b	Control valve converter adaptation
A	Working pressure
M	Modulating pressure
R	Governor pressure
a	Annular surface
b	Flat surface
c	Pressure spring
d	Pressure spring

Supply and Control of Hydraulic Pressures

Modulating Pressure on Transmissions with Hydraulic (Fluid) Clutch (Diesel Engines)

On diesel engines torque procedure does not correspond to vacuum ratings in suction pipe of engine. Therefore vacuum-controlled governing of modulating pressure is impossible and a constant pressure is adjusted over total torque range of engine.

The modulating pressure is diverted from the working pressure and controlled at the control valve (43). Control valve is constantly loaded by force of compression spring "c".

The force of compression spring "c" forces the control valve downwards in the direction of "opening". As a result, working pressure will flow through the now open connection into the modulating pressure system and through a radial bore also to face "b" of the control valve (43).

The force of the increasing modulating pressure will push the control valve (43) against the force of the pressure spring (c) upwards into the control position. This will throttle the oil inflow to the extent required or open the zero outflow (O) in the event of a pressure reduction.

The adjusting screw "d" in screw connection serves to adjust the spring "c" force and thereby the modulating pressure.

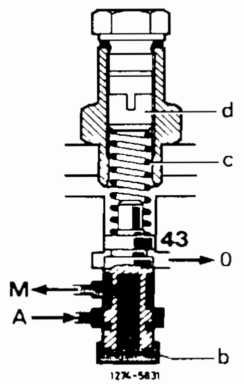


Fig. 29

43 Control valve modulating pressure

O Zero outflow
A Working pressure
M Modulating pressure
b Flat surface
c Pressure spring
d Adjusting screw

Modulating Pressure on Transmissions with Hydraulic (Fluid) Clutch (Gasoline Engines)

The modulating pressure serves the purpose of controlling the working pressure from partial to full throttle.

The modulating pressure is diverted from the working pressure and controlled at the control valve modulating pressure (43). In combination with the vacuum box (42) and in dependence of the intake pipe vacuum of the engine, a variable pressure will be established.

The force of the compression spring "c" forces the control valve downwards in the direction of "opening". As a result, working pressure will flow through the now open connection into the modulating pressure system and through a radial bore also to face "b" of the control valve (43).

The force of the increasing modulating pressure will push the control valve (43) against the force of the pressure spring (c) upwards into the control position. This will throttle the oil inflow to the extent required or open the zero outflow (O) in the event of a pressure reduction.

The vacuum in the vacuum box (42) opposes the spring pressure and will thereby reduce the oil pressure about to be controlled.

This means:

high vacuum – low engine torque – low modulating pressure

low vacuum – high engine torque – high modulating pressure

The adjusting screw "d" in modulating pressure transmitter (42) serves to adjust the spring force and thereby the modulating pressure.

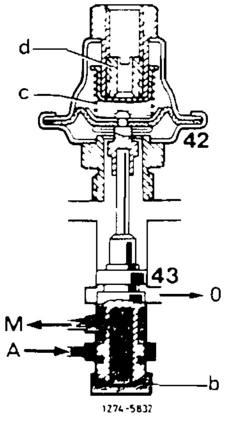


Fig. 28

42 Vacuum box
43 Control valve modulating pressure

O Zero outflow
A Working pressure
M Modulating pressure
b Flat surface
c Pressure spring
d Adjusting screw

Transmission designations

Transmission type

W4A040

- Max. input torque in Nm
- Version (internal)
- Number of forward gears
- Hydraulic torque converter

Transmission

722.307

- Version, e.g. adapted to the respective type of engine
- Transmission type e.g. W4A040
- Automatic transmission for passenger cars

Identification of new transmission

Number stamped into transmission housing

126 270 09 01 722.307 02 000761

- Production number
- Automatic transmission
- Independent for lefthand drive and righthand drive
- Transmission type
- Part number for transmission without torque converter

Mechanical construction of transmission

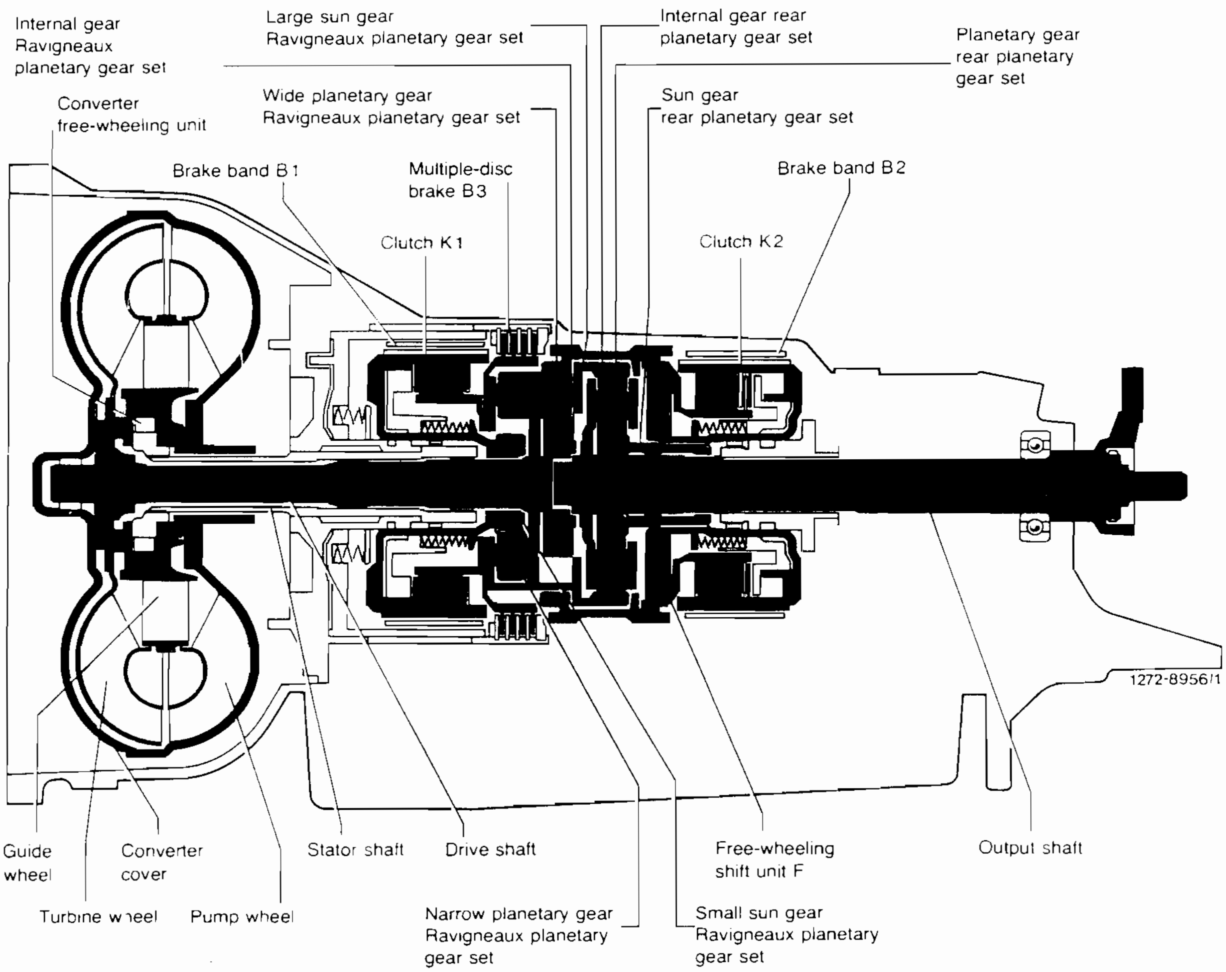


Figure 11

The mechanical part of the automatic transmission is equipped with planetary gears in two-group construction.

A Ravigneaux planetary gear set is employed as front group and a simple planetary gear set as rear group.

The individual transmission components are interconnected as follows:

1. Turbine wheel of the torque converter with the large sun gear of the Ravigneaux planetary gear set via the drive shaft.
2. Planetary gear carrier of the Ravigneaux planetary gear set with internal disc carrier K2, internal disc carrier B3 and internal gear of the rear planetary gear set.
3. Brake band drum B1 and external disc carrier K1 with small sun gear of the Ravigneaux planetary gear set.
4. Internal gear of the Ravigneaux planetary gear set via the connecting carrier with outer race of the free-wheeling shift unit F and internal disc carrier K2.
5. Brake band drum B2, external disc carrier K2 and inner race of the shift free-wheeling unit F with sun gear of the rear planetary gear set.
6. Planetary gear carrier of rear planetary gear set with the output shaft.

Transmission ratios

Transmission 722.3

Gear	Transmission	Actuated or effective shift elements	Transmission ratios i =
1st	In front (Ravigneaux) and rear planetary gear set	Brake band B 2 Free-wheeling unit[1])	3.68
2nd	In front (Ravigneaux) and rear planetary gear set	Brake band B 1 Brake band B 2	2.41
3rd	In rear planetary gear set	Clutch K 1 Brake band B 2	1.44
4th	No transmission	Clutch K 1 Clutch K 2	1
Reverse	In front (Ravigneaux) and rear planetary gear set	Disc brake B 3 Free-wheeling unit F + K 2	5.14

Transmission 722.4

Gear	Transmission	Actuated or effective shift elements	Transmission ratios i =
1st	In front (Ravigneaux) and rear planetary gear set	Brake band B 2 Free-wheeling unit F[1])	4.25
2nd	In front (Ravigneaux) and rear planetary gear set	Breke band B 1 Brake band B 2	2.40
3rd	In rear planetary gear set	Klutch K 1 Brake band B 2	1.48
4th	No transmission	Clutch K 1 Clutch K 2	1
Reverse	In front (Ravigneaux) and rear planetary gear set	Disc brake B 3 Free-wheeling unit F + K 2	5.14

[1]) In driving positions „2" and „B" clutch K 2 is additionally engaged.

Band and Clutch Applications

TYPE	FB	CB	RB	FC	CC	RC	SPRAG	RATIO
K4A025								
1ST		X	X					3.98:1
2ND		X				X		2.52:1
3RD			X	X				1.58:1
4TH				X		X		1:1
R	X				X			4.15:1
K4B050								
1ST			X				X	3.98:1
2ND		X	X					2.46:1
3RD			X	X				1.58:1
4TH				X		X		1:1
R	X						X	4.15:1
K4A040 K4C025 W4B025								
1ST			X				X	3.98:1
2ND		X	X					2.39:1
3RD			X	X				1.46:1
4TH				X		X		1:1
R	X						X	5.47:1
W3A040 W3B050								
1ST		X	X				X	2.31:1
2ND			X	X				1.46:1
3RD				X		X		1:1
R	X						X	1.84:1

TYPE	FB	RB	FC	CC	RC	SPRAG	RATIO	RATIO
W4A020 W4A040							020	040
1ST		X				X	4.25:1	3.68:1
2ND	X	X					2.40:1	2.41:1
3RD	X		X				1.48:1	1.44:1
4TH			X		X		1:1	1:1
R				X	X	X	5.14:1	5.14:1

THE TERMS USED ABOVE ARE AS FOLLOWS
FB=FRONT BAND
CB=CENTER BAND
RB=REAR BAND
FC=FRONT CLUTCH
CC=CENTER CLUTCH
RC=REAR CLUTCH
X=APPLIED OR IN USE
SPRAG=ONE-WAY ROLLER CLUTCH

VW - AUDI "E" MODE

Those of us who have been working with foreign automatics are probably familiar with the "E" mode position on the detent of some VW-Audi transmissions installed in diesel-engine-equipped vehicles or diesel and gas in VW's. The economy mode automatic transmission is a modified version of the Model 010 transmission.

With the selector placed in the "E" position on the quadrant (PRDED21), the forward clutch will disengage whenever the accelerator pedal is released. The forward clutch will re-engage when the accelerator pedal is depressed. With the selector in the "D" position, the operation will be the same as in the regular Model 010 units, meaning that the forward clutches will stay applied. So, keep in mind that in the "E" mode, the forward clutches will disengage when the vehicle is stopped at a traffic light or while you lift your foot from the accelerator pedal when coasting down a hill.

The apply and release of the forward clutches are controlled by a de-clutch valve. This valve is located in the throttle valve train. (See Figures 1 and 2, which illustrate the position of the valve in both the closed and open throttle position.)

When the accelerator is released, the de-clutch valve opens, allowing the forward clutch to release. This constant apply and release of the forward clutch leads to wear of the linings in this component.

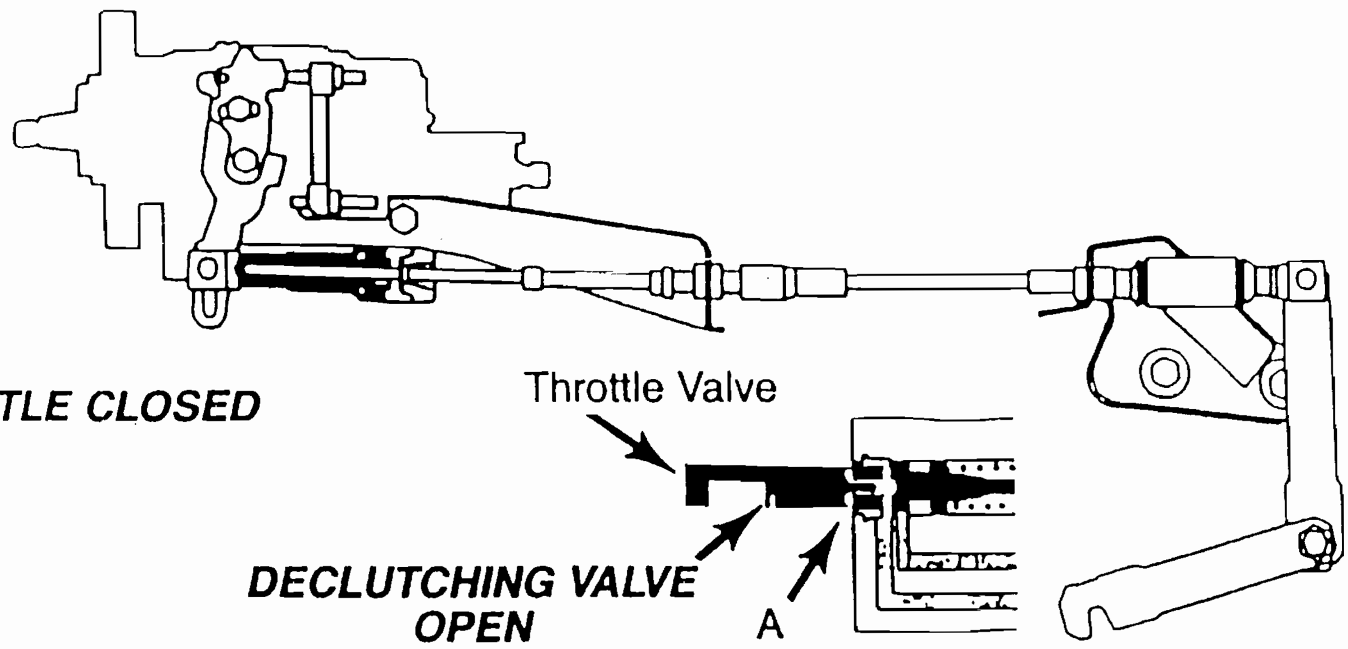
The cable adjustment must be properly set. Mis-adjustment, where the engine RPM increases before the forward clutch is fully applied, can cause clutch failure. To adjust the cable, you will need someone under the car while you watch the carburetor or injector linkage. He can watch the de-clutch valve move slowly as the accelerator pedal moves off idle position. The de-clutch valve must move inward and seal before the throttle plate moves.

Figure 1 shows a second, smaller valve in the throttle-valve line-up. With this valve open, oil entering through the main valve exhausts through Port "A". In Figure 2, the de-clutch valve is closed so that the oil cannot exhaust, and the forward clutch can apply. It would be a good idea to explain to the customer to operate the transmission in the "drive" position to prevent the "premature failure of the forward clutch assembly."

The "E" mode of the Model 010 unit can be disabled, using the following procedure (as outlined in Figure 3).

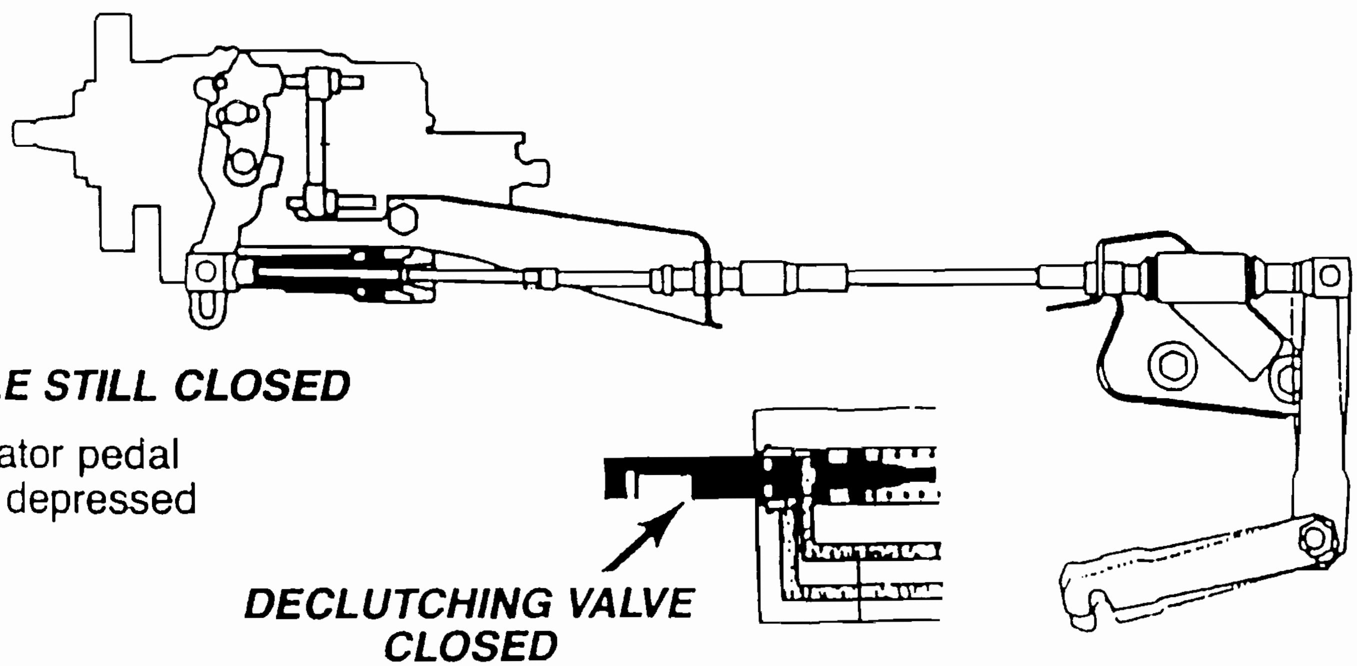
Remove the spring from the forward clutch-release valve, and install a slightly stronger spring on the opposite side of the valve. This valve is located in the main section of the valve body. Then, take the spring out of the forward clutch engagement valve and install a slightly stronger spring on the other side of this valve. Leave the spring guide in its original location. This valve is located in the lower section of the channel plate in the valve body. After making this modification, the vehicle can be driven in either the "E" or "D" position and the unit will perform without the releasing of the forward clutch assembly. Adjust the TV cable for shift feel.

Figure 1



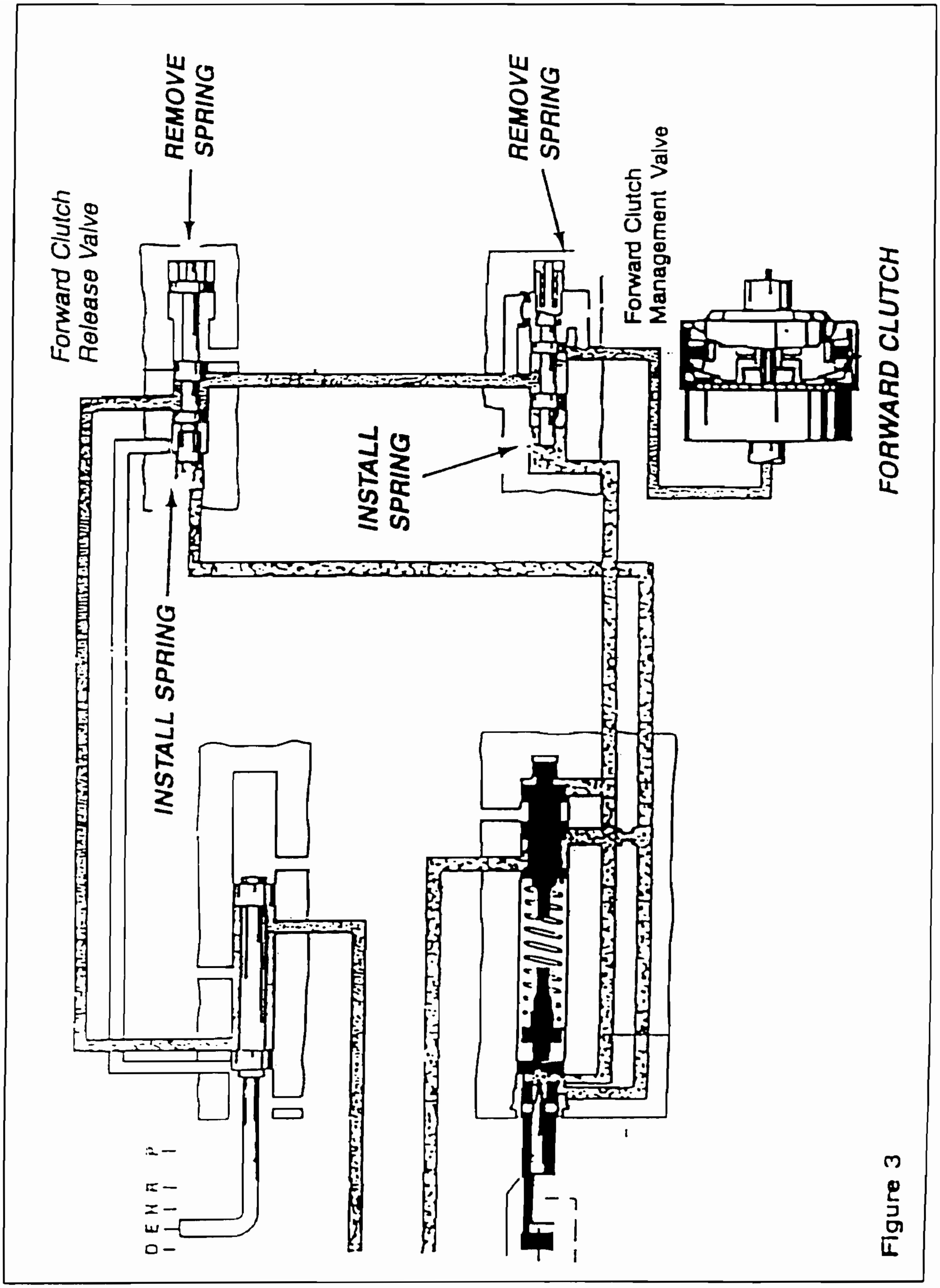
THROTTLE CLOSED

Figure 2



THROTTLE STILL CLOSED

Accelerator pedal
Slightly depressed


Forward Clutch Release Valve
REMOVE SPRING
INSTALL SPRING
INSTALL SPRING
REMOVE SPRING
Forward Clutch Management Valve
FORWARD CLUTCH
Figure 3

FORD AXOD

SWITCH IDENTIFICATION AND DIAGNOSIS

PIN #1. 4-3 Transmission Pressure Switch - This is a normally open single terminal switch used to signal the EEC-IV module when the transaxle makes a shift from third to fourth or from fourth to third. This switch will complete the circuit to ground in first, second, and third gears. This switch is calibrated to close at approximately 45 P.S.I.

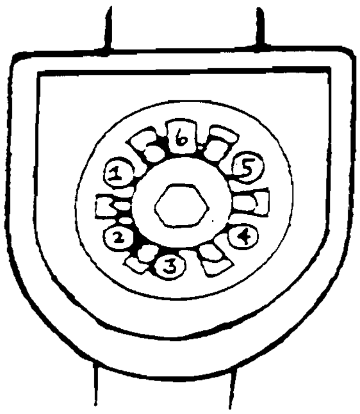
PIN #2. NPS (Neutral Pressure Switch) - This is a normally open single terminal switch used to signal the EEC-IV module when the transaxle is shifted from park or neutral to drive or reverse. This switch will complete the circuit to ground in reverse, first, second, and third. This switch is calibrated to close at approximately 45 P.S.I.

PIN #3. This is the ground wire that provides the ground signal from the EEC-IV module to the Lock-up Solenoid.

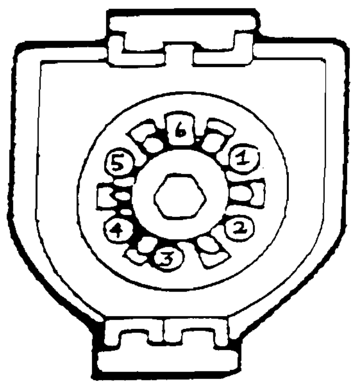
PIN #4. 3-2 Transmission Pressure Switch - This is a normally open single terminal switch used to signal the EEC-IV module when the transaxle makes a shift from second to third or from third to second gear. This switch will complete the circuit to ground in third and fourth gear. This switch is calibrated to close at approximately 45 P.S.I.

PIN #5. This is the 12-Volt wire supplying power to the Lock-up Solenoid.

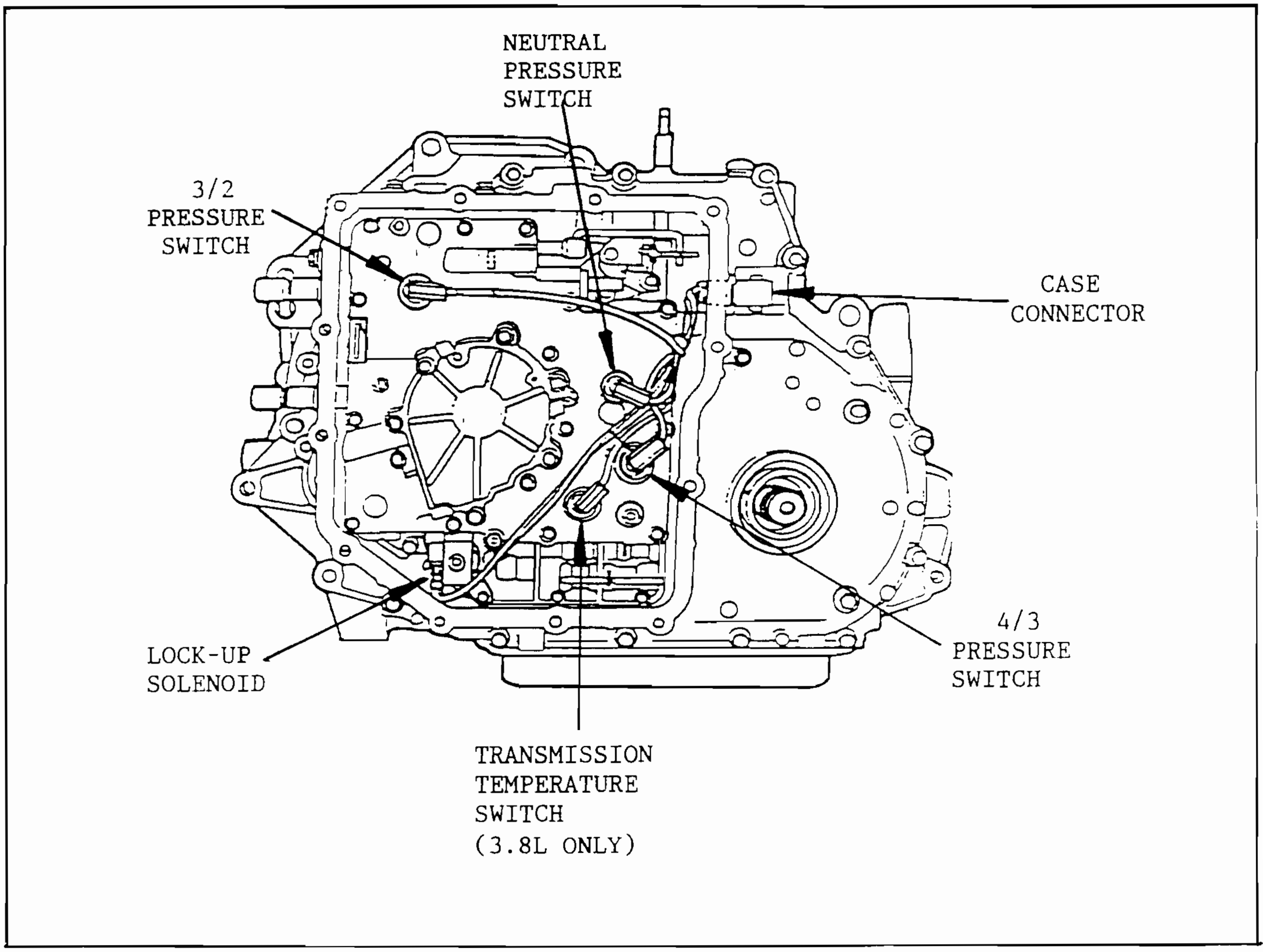
PIN #6. This is the Transaxle Temperature Switch - Its function is to inform the EEC-IV module of the transaxle oil temperature. (NOTE: This switch is found ONLY in 3.8L engine applications).

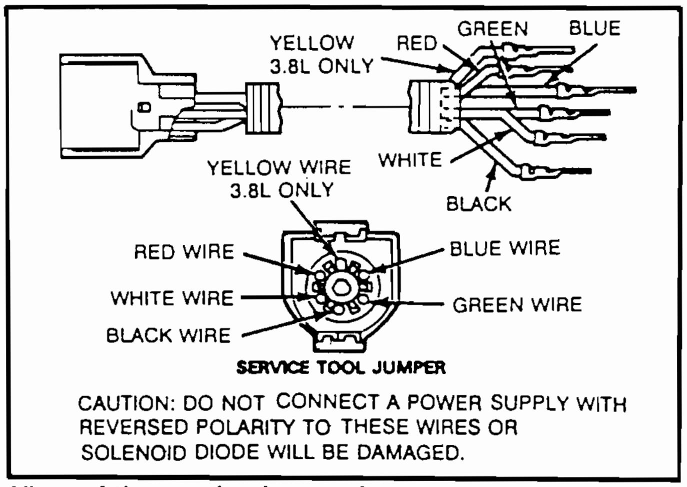


CASE CONNECTOR

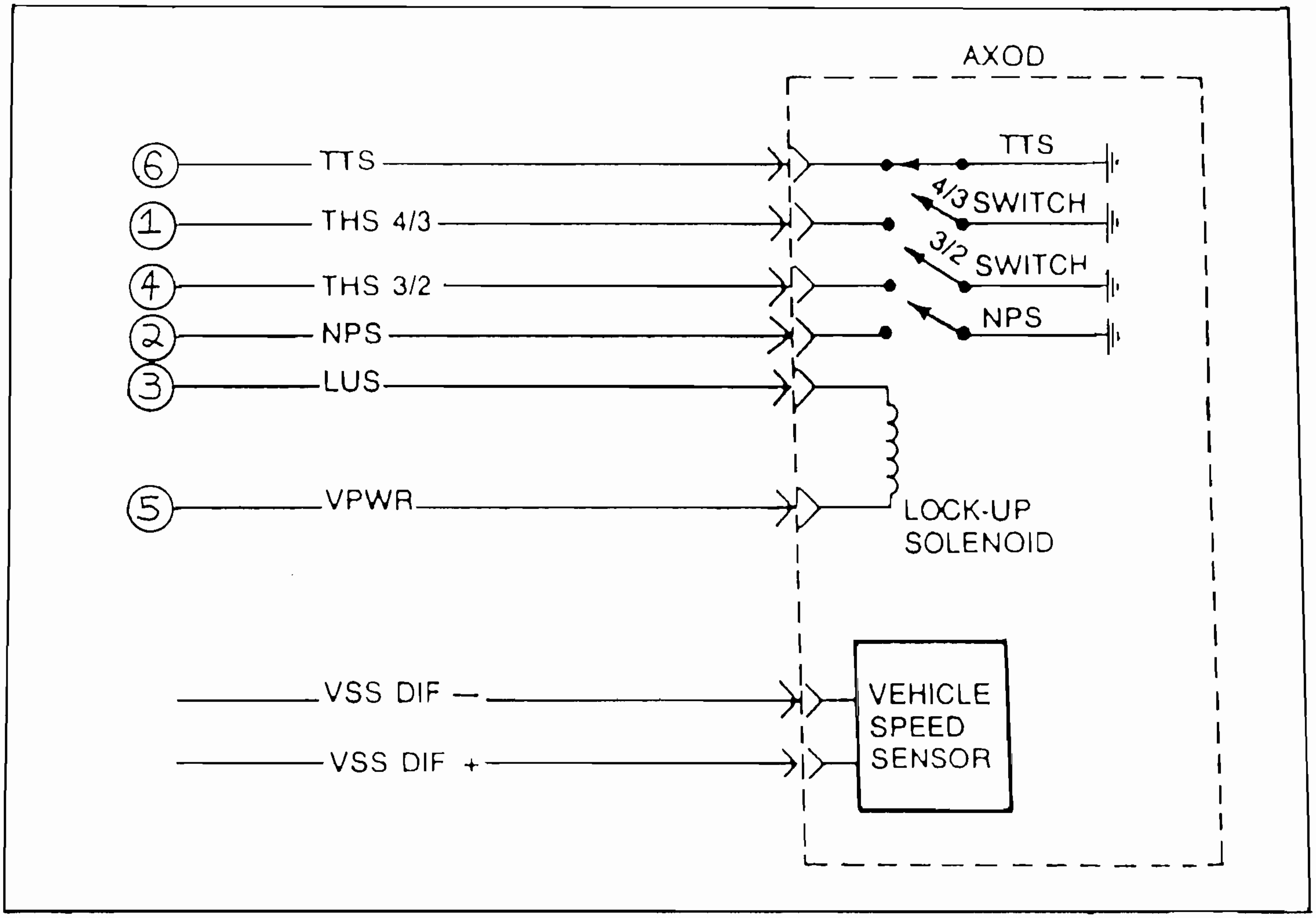


VEHICLE WIRING HARNESS





View of the service jumper harness


AXOD
6
TTS
TTS
1
THS 4/3
4/3 SWITCH
4
THS 3/2
3/2 SWITCH
2
NPS
NPS
3
LUS
5
VPWR
LOCK-UP
SOLENOID
VSS DIF —
VSS DIF +
VEHICLE
SPEED
SENSOR

THM 440-T4
HARSH 3-2 DOWNSHIFT

COMPLAINT: Harsh 3-2 part throttle, or full throttle downshift

CAUSE: Improper timing for release of the third clutch and re-application of the 1-2 band.

CORRECTION: Install a new 3-2 Control Valve Spring, now available in a service package from OEM. See "Service Information" in this bulletin for proper part numbers, and refer to Figure 1 for installation procedure.

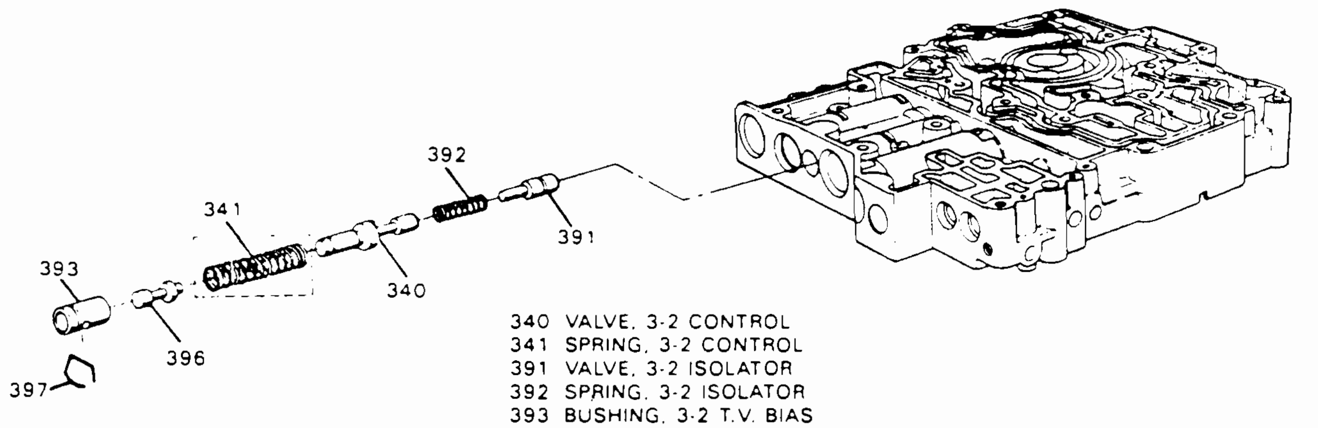


Figure 1

SERVICE INFORMATION:

HIGH ALTITUDE ONLY (Above 4000 Feet)

Transaxle Model	Part Number
8FCH	8646979
7FCH, 7FZH	8646979
6BCH, 6BDH, 6BMH, 6BZH, 6FCH, 6FZH	8646979
5BX	8646979
6BAH	8646980
6ACH, 6AWH	8646981
5AC, 5AY, 5BW	8646981
8BKH, 8FBH	8646982
7FBH, 7FKH	8646982
6AAH, 6AMH, 6AFH, 6APH, 6ASH, 6AYH, 6BBH, 6BHH, 6FBH	8646982
5AM	8646982
6CMH, 6CNH, 6CFH	8646983
5CM, 5CN	8646983
6BLH, 6BTH, 6BYH	8646992
8BJH, 8BRH, 8BTH, 8BYH, 8FJH	8646993
7FJH, 7FNH, 7FRH, 7FTH	8646993
6FTH, 6FYH	8646993
5BR, 5CP, 5CW	8646993
5BV	8646994

LOW ALTITUDE ONLY (Below 4000 Feet)

Transaxle Model	Part Number
8BJH, 8BTH, 8BYH, 8FJH	8646979
7FJH, 7FNH, 7FRH, 7FTH	8646979
6BAH, 6BLH, 6BTH, 6BYH, 6FTH, 6FYH	8646979
8BRH	8646980
6BBH	8646981
6BHH	8646982
8BKH, 8FBH	8646993
7FBH, 7FKH	8646993
6FBH	8646993
6CFH, 6CMH, 6CNH	8646994
6BCH, 6BDH, 6BMH, 6BZH	8662907
8FCH	8662932
7FCH, 7FZH	8662932
6FCH, 6FZH	8662932

THM 700-R4 (4L60)

BINDING IN REVERSE

COMPLAINT: Binding or "Tie-up" when selector lever is placed in the reverse position.

CAUSE: This condition may be caused by the 4-3 sequence valve or the 2-3 shift valve, stuck in the upshifted position, because of burrs or contamination.

CORRECTION: Clean the contamination or remove burrs from the problem valves. Refer to Figure 1 for valve location.

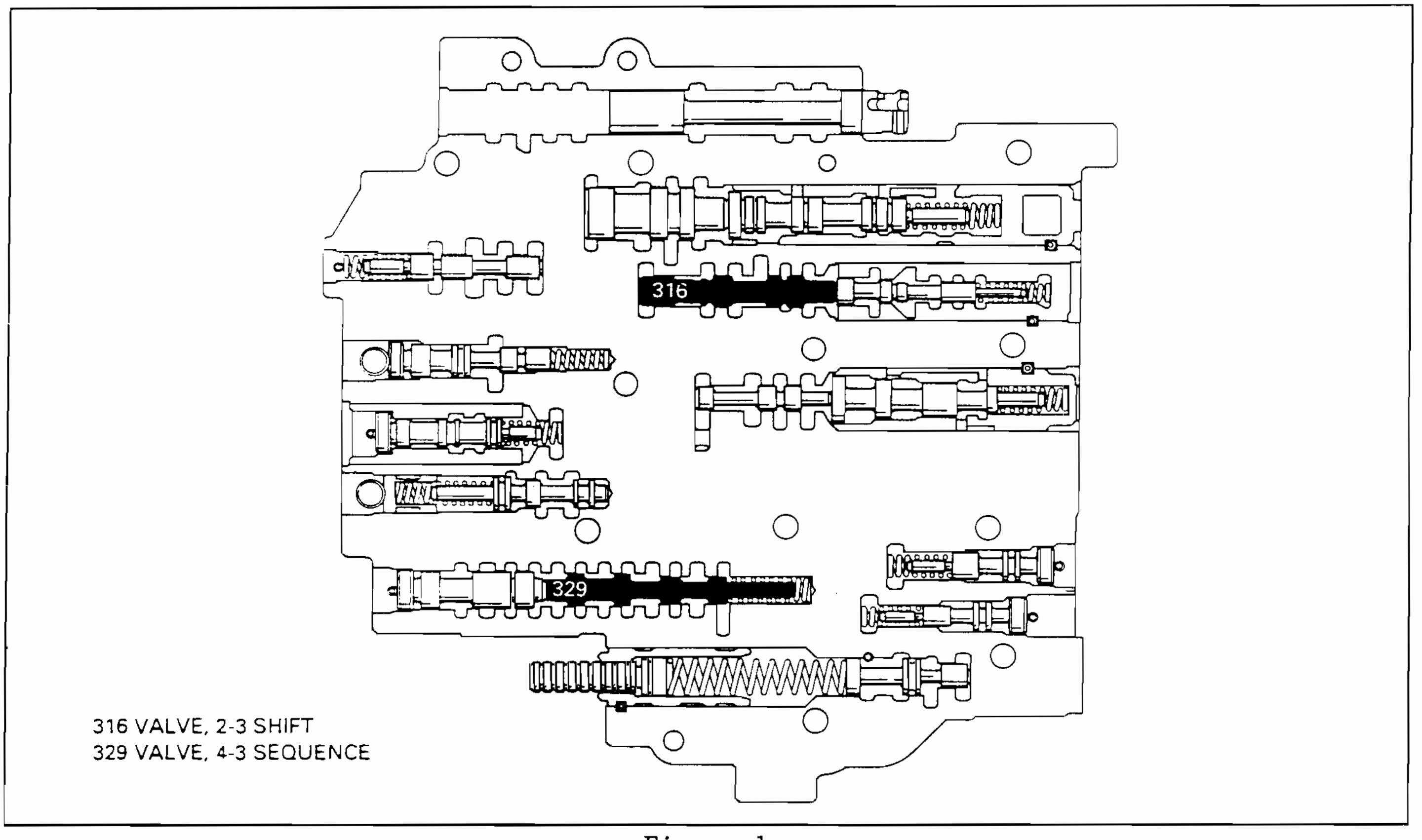


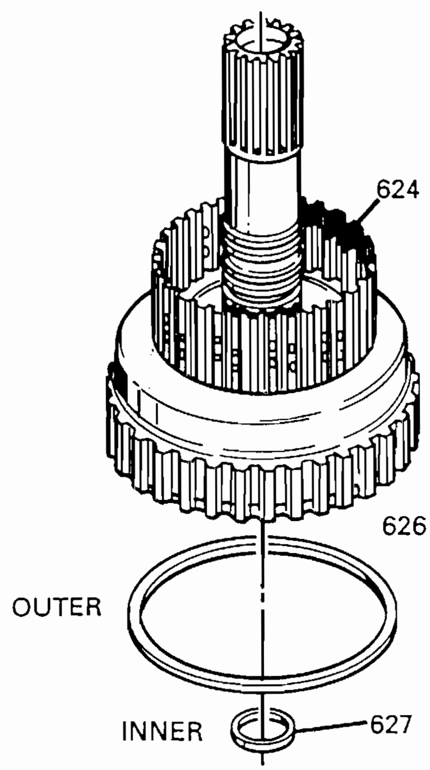
Figure 1

THM 125C (3T40)

NEW FORWARD CLUTCH PISTON SEALS

There are now new Forward Clutch Piston Seals available for the 125C (3T40), that are made of "Viton" which will withstand much more heat, before becoming brittle and taking a permanent heat set.

These new Forward Clutch Piston Seals are available in a service package, under OEM part number 8631986.



624 HOUSING ASSEMBLY, FORWARD CLUTCH
626 SEAL, LIP FORWARD CLUTCH PISTON (OUTER)
627 SEAL, LIP FORWARD CLUTCH PISTON (INNER)

THM 200-4R 1988-1989 ONLY

DELAYED REVERSE ENGAGEMENT

COMPLAINT: Some 1988-1989 THM 200-4R transmissions built after March 14, 1988 (Julian Date 074) and before July 7, 1989 (Julian Date 188) may experience a delayed engagement to reverse.

CAUSE: Valve body spacer plate calibration.

CORRECTION: Enlarge the LO/REVERSE feed orifice with a 1/8" drill bit. A revised spacer plate was used in all units produced after July 7, 1989. Refer to Figure 1 for orifice location in spacer plate.

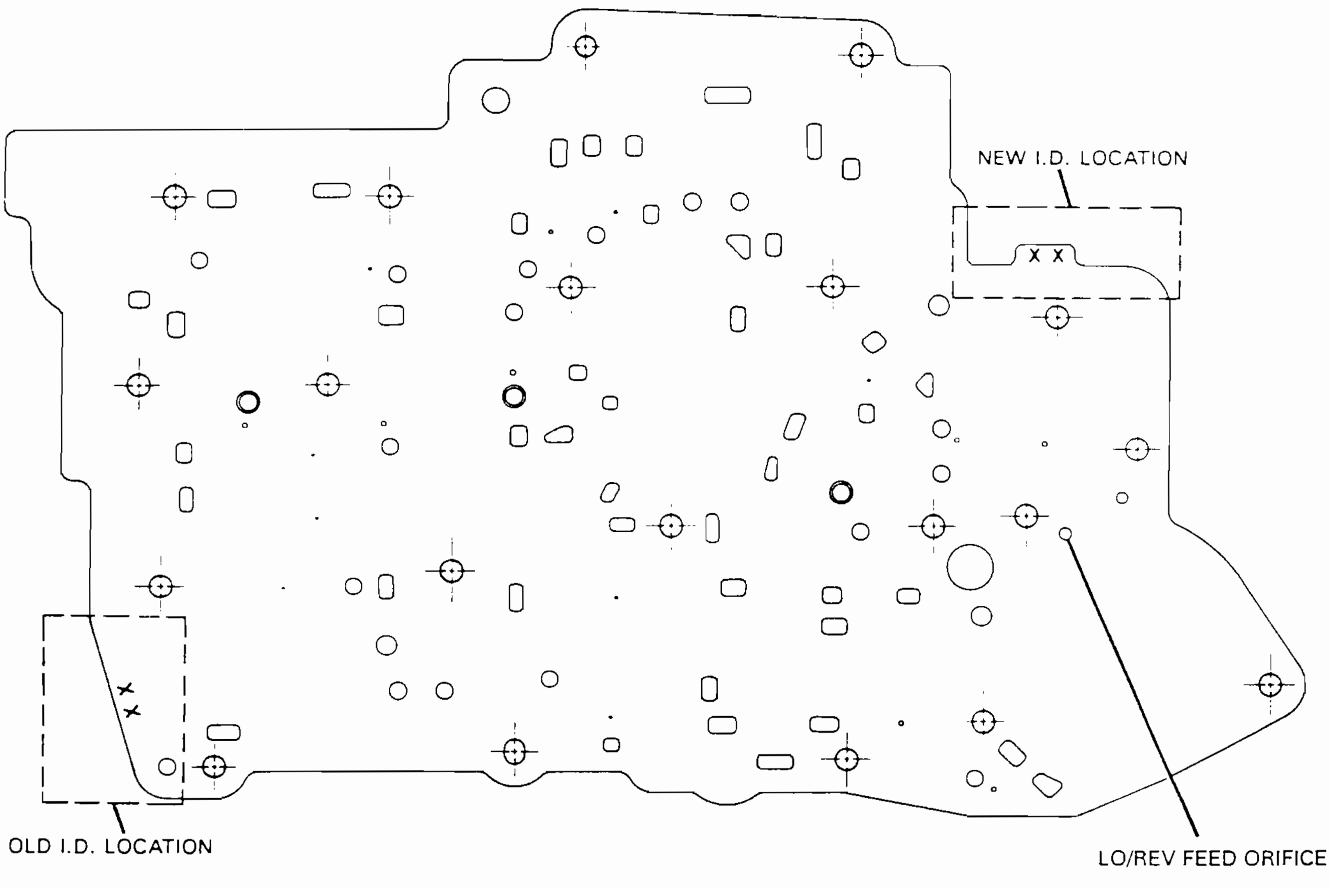


Figure 1

THM 125C (3T40)

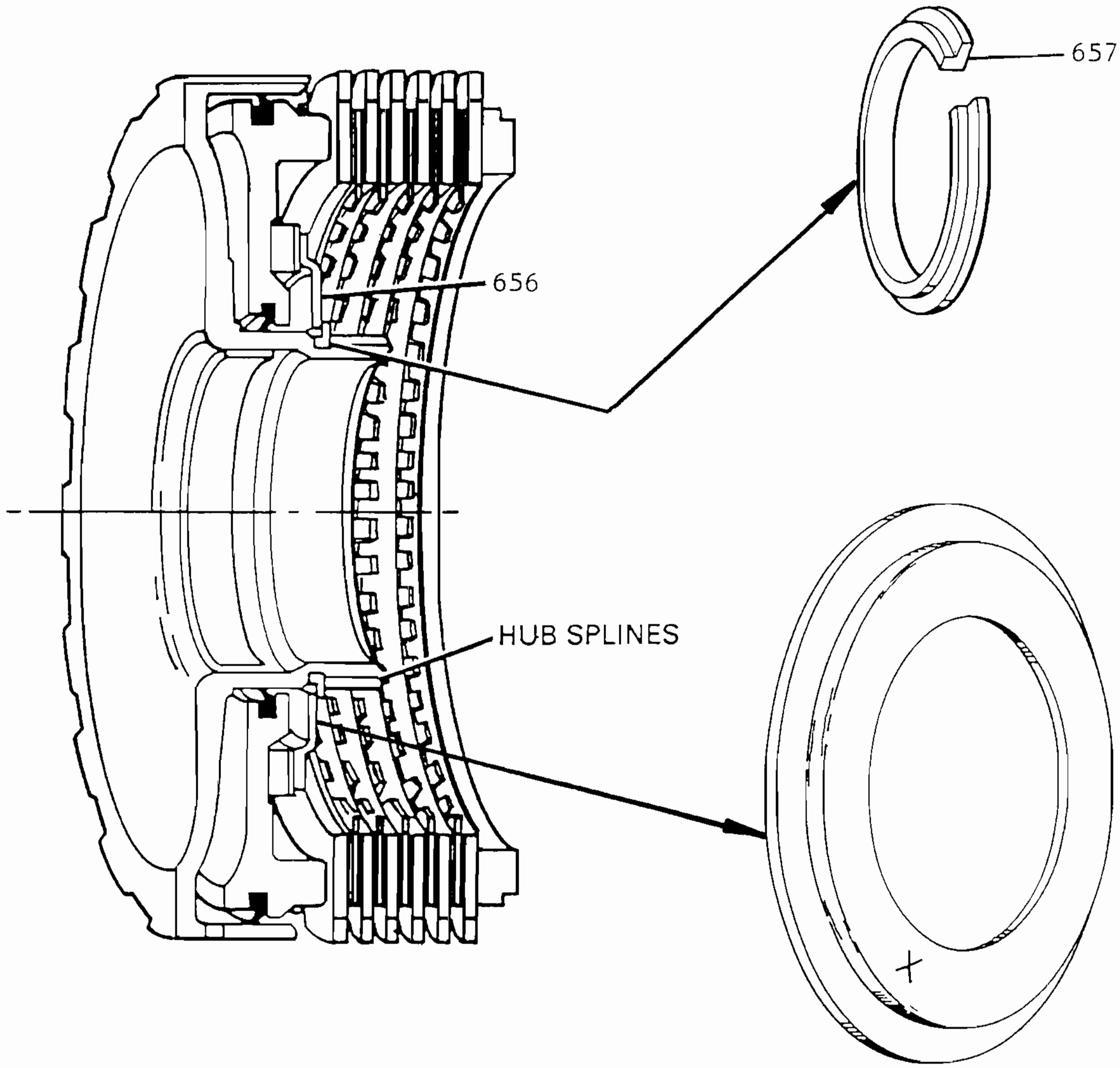
SLIP IN REVERSE/NO REVERSE

COMPLAINT: Slips in reverse and/or a no reverse condition.

CAUSE: The cause may be, the Lo/Reverse snap ring installed improperly, or a mis-match of the Lo/Reverse clutch retainer. If the snap ring is installed backwards, the retainer may limit the travel of the Lo/Reverse clutch piston.

CORRECTION: Insure that the Lo/Reverse snap ring is installed properly, with the step positioned toward the Lo/Reverse clutch retainer, as shown in Figure 1. The snap ring must rest inside the retainer bore to allow for proper piston travel.
The only Lo/Reverse clutch spring retainer that is compatable with the "Stepped" snap ring has an "X" stamped on it as shown in Figure 1.

656 LO/REVERSE CLUTCH SPRING RETAINER
657 LO/REVERSE "STEPPED" SNAP RING



NOTE: LO/REVERSE CLUTCH SPRING RETAINER WITH THE "X" STAMPED ON IT MUST BE USED WITH THE STEPPED SNAP RING.

Figure 1

HONDA 4 SPEED

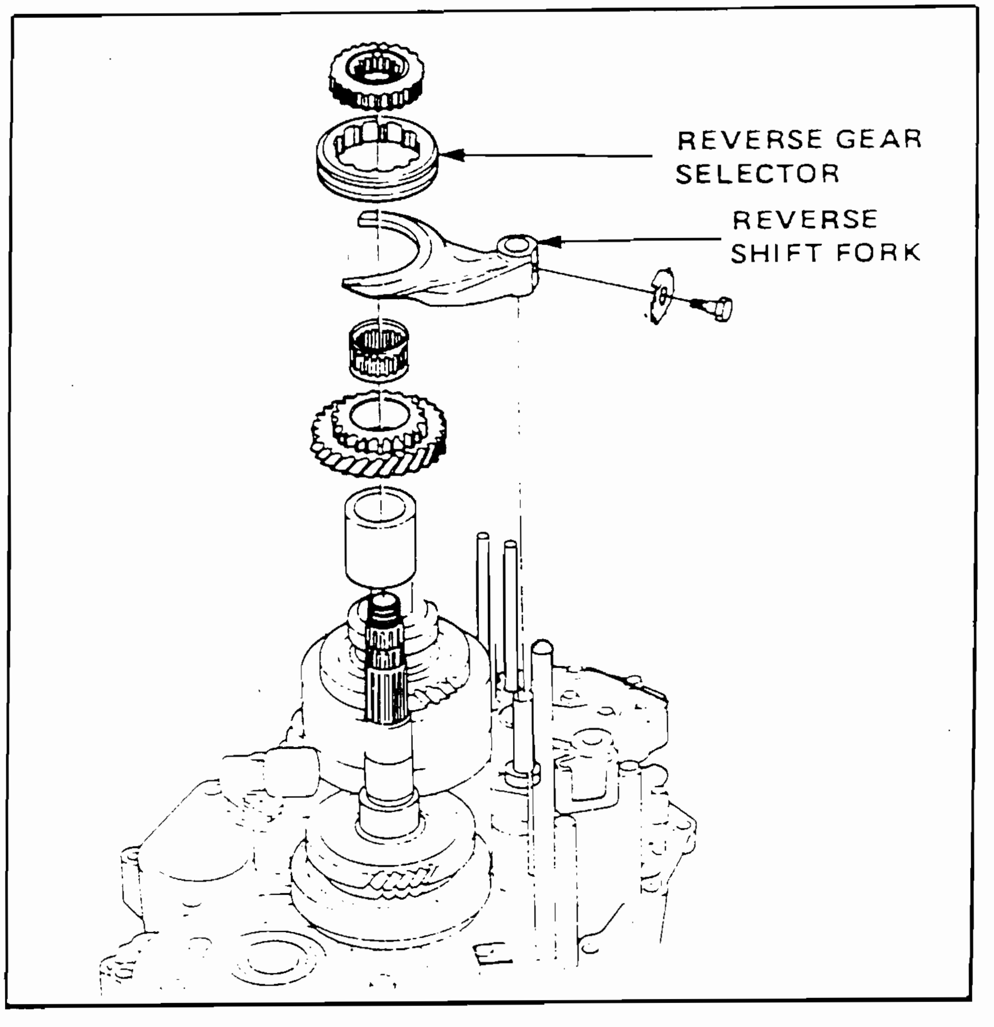
COMPLAINT: HARSH ENGAGEMENT FROM PARK TO DRIVE; DRIVE TO REVERSE; REVERSE TO DRIVE; CLANGING OR GEAR-CLASHING NOISE.

CAUSE: WORN REVERSE GEAR SELECTOR; OR WORN OR BENT FORK.

CORRECTION: REPLACE REVERSE GEAR SELECTOR AND /OR FORK.

When the inner teeth on the reverse selector gear wear down (EVEN SLIGHTLY) they won't mesh perfectly with the teeth on either the reverse hub gear, or the counter reverse gear, and will cause a harsh clanging-type noise when the reverse selector gear is moved between these two gears.

This is often overlooked when rebuilding transmissions because the wear is so slight, but it is EXTREMELY CRITICAL to smooth drive and reverse engagement.



Thm 125C Delayed Engagement

COMPLAINT: Delayed drive application, when shifting from reverse to drive, in cold operating conditions on 1989 THM 125C (3T40) or 1989 THM A-1 (3T40-A) transaxles.

CAUSE: The cause may be the Manual Valve and Thermo Element Assembly. A new Manual Valve and Thermo Element Assembly went into production on June 12, 1989 (Julian Date 163).

CORRECTION: Install new design Manual Valve and Thermo Element Assembly, available under OEM part number 8666494. The new design Manual Valve has larger diameter cross drilled holes in the manual valve, and a second "Cold Window" added to the thermal element. (See Figure 1). The new manual valve can be used on all previous model THM 125C transaxles.

SERVICE INFORMATION:

Manual Valve and Thermo Element Asy (2nd Design)......... 8666494

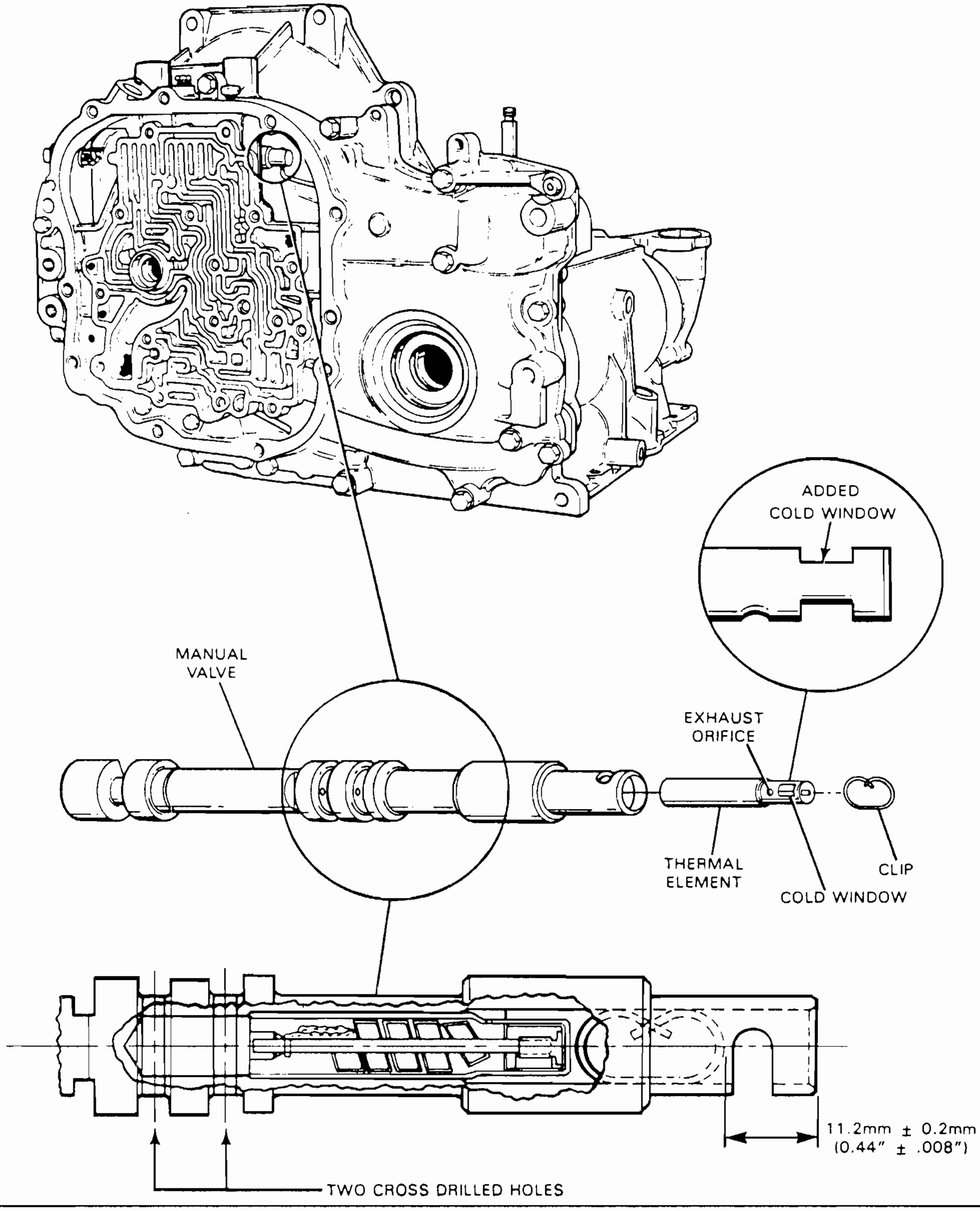

ADDED
COLD WINDOW
MANUAL
VALVE
EXHAUST
ORIFICE
THERMAL
ELEMENT
CLIP
COLD WINDOW
11.2mm ± 0.2mm
(0.44" ± .008")
TWO CROSS DRILLED HOLES

Figure 1