THM 4L60-E

INDEX

AUTOMATIC TRANSMISSION SERVICE GROUP
18639 S.W. 107TH AVENUE
MIAMI, FLORIDA 33157
(305) 670-4161

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INTRODUCTION
THM 4L60-E

This booklet contains general description and the procedures necessary to repair, overhaul, or service the new THM 4L60-E electronic automatic overdrive transmission. The 4L60-E is a fully automatic rear wheel drive transmission. This unit is basically a THM 700-R4 with electronic controls added to the valve body. The shift pattern is controlled electronically with 2 shift solenoids that recieve a ground signal from the Powertrain Control Module (PCM). The PCM will vary shift points, as it is constantly interpreting numerous electronic signals from various operational sensors located on the vehicle.

The PCM also controls the apply and release of the Torque Converter Clutch (TCC). This transmission also recieved another PWM solenoid in 1995 to control TCC apply feel. Line pressure and shift feel are controlled electronically with a Pressure Control Solenoid (PCS), located on the valve body and dependent on TPS and VSS signals.

Note: There have been many engineering changes in this transaxle since its introduction in 1993. ATSG also has available an "Update Handbook" which includes the many changes and is required along with this manual for a proper overhaul or repair.

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The information and part numbers contained in this booklet have been carefully compiled from industry sources known for their reliability, but ATSG does not guarantee its accuracy.

DALE ENGLAND
FIELD SERVICE CONSULTANT

WAYNE COLONNA
TECHNICAL SUPERVISOR

PETER LUBAN
TECHNICAL CONSULTANT

JON GLATSTEIN
TECHNICAL CONSULTANT

JERRY GOTT
TECHNICAL CONSULTANT

GERALD CAMPBELL
TECHNICAL CONSULTANT

JIM DIAL
TECHNICAL CONSULTANT

ED KRUSE
TECHNICAL CONSULTANT

GREGORY LIPNICK
TECHNICAL CONSULTANT

DAVID CHALKER
TECHNICAL CONSULTANT

MIKE SOUZA
TECHNICAL CONSULTANT

ROLAND ALVAREZ
TECHNICAL CONSULTANT

AUTOMATIC TRANSMISSION SERVICE GROUP
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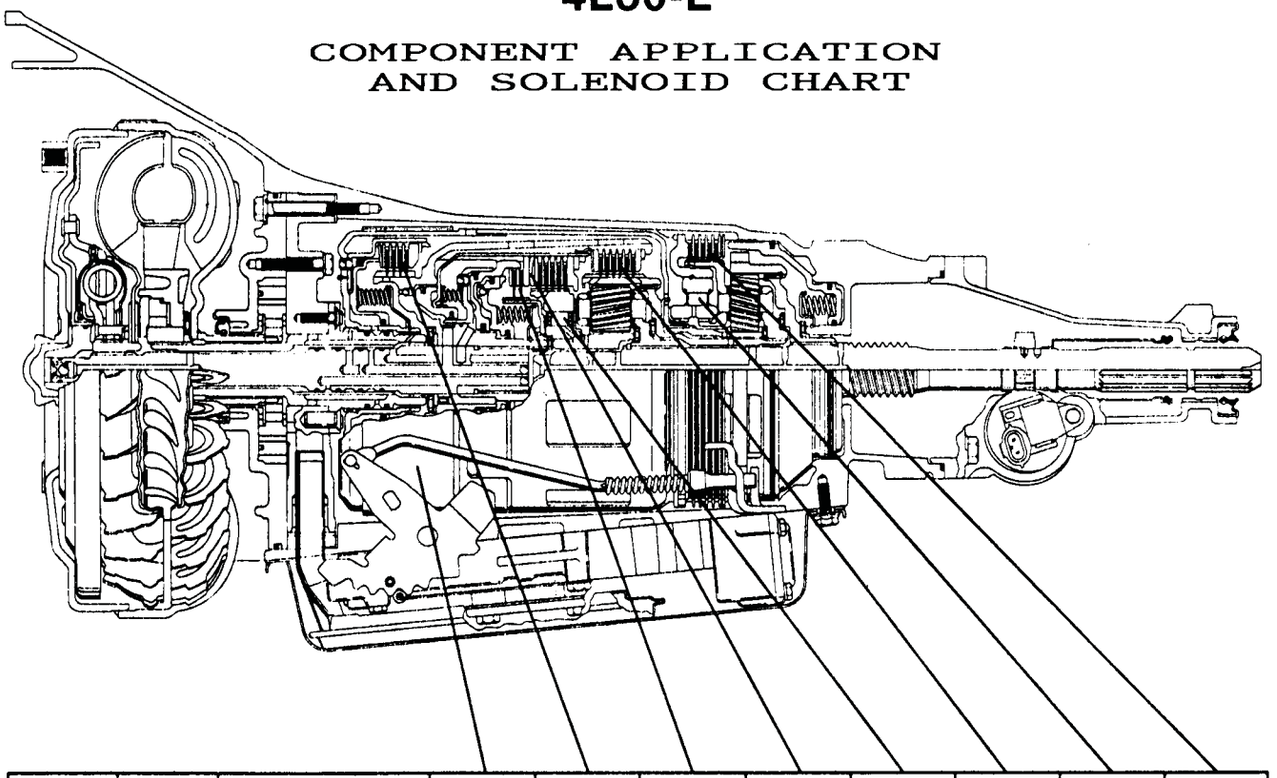
MIAMI, FLORIDA 33157
(305) 670-4161

4L60-E

COMPONENT APPLICATION AND SOLENOID CHART



RANGE	GEAR	SHIFT SOLENOID "A"	SHIFT SOLENOID "B"	2-4 BAND	REVERSE INPUT CLUTCH	OVERRUN CLUTCH	FORWARD CLUTCH	FORWARD SPRAG CL. ASSEMBLY	3-4 CLUTCH	LO/ROLLER CLUTCH	LO/REV. CLUTCH
PARK		ON*	ON*								APPLIED
REVERSE		ON*	ON*		APPLIED						APPLIED
NEUTRAL		ON*	ON*								
(D)	1st	ON	ON				APPLIED	HOLDING		HOLDING	
	2nd	OFF	ON	APPLIED			APPLIED	HOLDING			
	3rd	OFF	OFF				APPLIED	HOLDING	APPLIED		
	4th	ON	OFF	APPLIED			APPLIED		APPLIED		
D	1st	ON	ON			APPLIED	APPLIED	HOLDING		HOLDING	
	2nd	OFF	ON	APPLIED		APPLIED	APPLIED	HOLDING			
	3rd	OFF	OFF			APPLIED	APPLIED	HOLDING	APPLIED		
2	1st**	ON	ON			APPLIED	APPLIED	HOLDING		HOLDING	
	2nd	OFF	ON	APPLIED		APPLIED	APPLIED	HOLDING			
1	1st	ON	ON			APPLIED	APPLIED	HOLDING		HOLDING	APPLIED
	2nd***	OFF	ON	APPLIED		APPLIED	APPLIED	HOLDING			

* SHIFT SOLENOID STATE IS A FUNCTION OF VEHICLE SPEED AND MAY CHANGE IF VEHICLE SPEED INCREASES SUFFICIENTLY IN PARK, REVERSE OR NEUTRAL. HOWEVER, THIS DOES NOT AFFECT TRANSMISSION OPERATION.

** MANUAL SECOND – FIRST GEAR IS ELECTRONICALLY PREVENTED UNDER NORMAL OPERATING CONDITIONS.

*** MANUAL FIRST – SECOND GEAR IS ONLY AVAILABLE ABOVE APPROXIMATELY 48 TO 56 KM/H (30 TO 35 MPH).

Figure 1

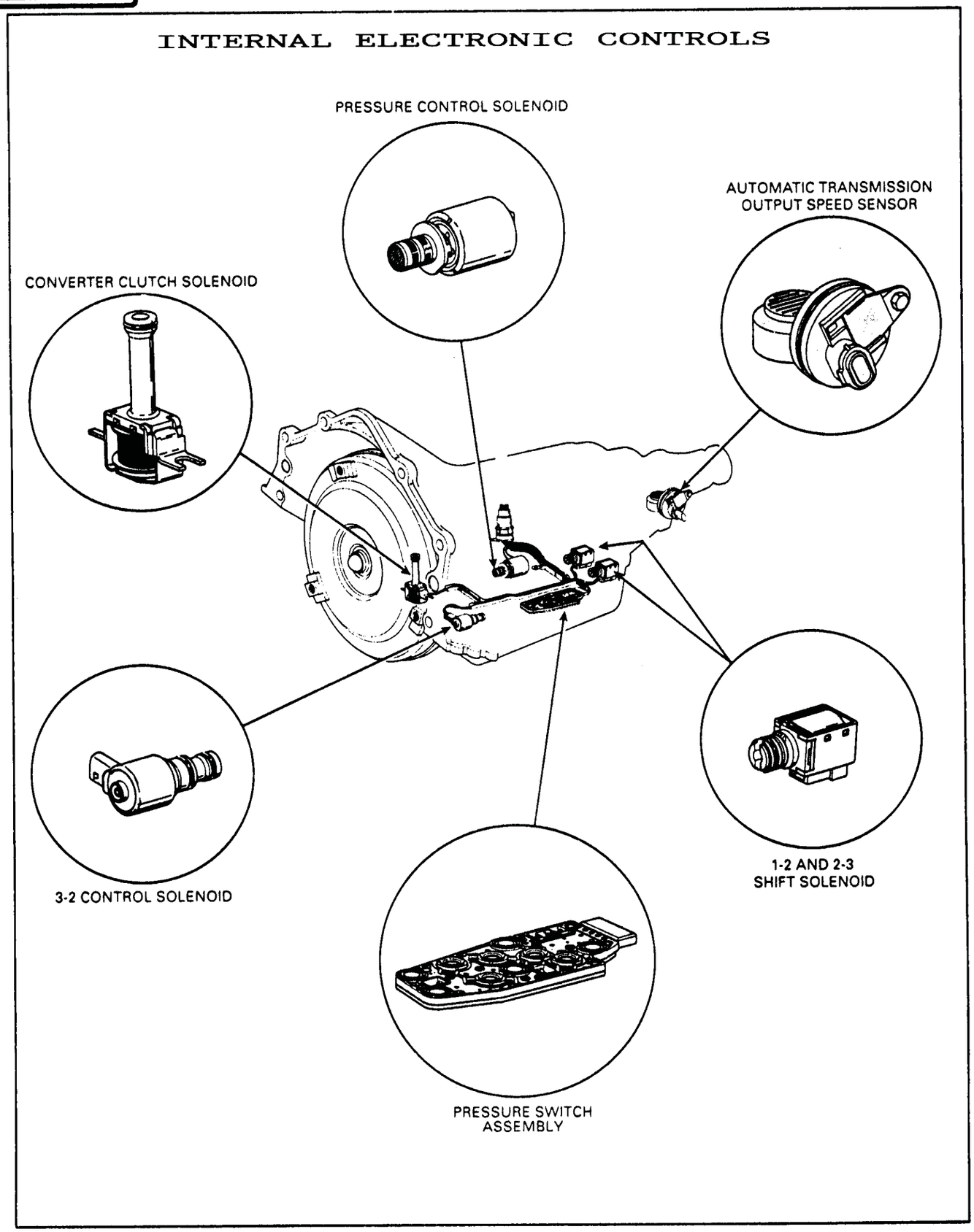


Figure 2

Torque Converter Clutch Solenoid

The torque converter clutch solenoid is a normally open exhaust valve that is used to control torque converter clutch apply and release.

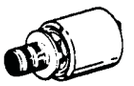
When grounded (energized) by the PCM, the TCC solenoid stops converter signal oil from exhausting. This causes converter signal oil pressure to increase and shift the TCC valve to shift into the apply position

The brake switch is an input to the PCM, and the PCM directly controls TCC apply based on the brake switch status.

If a fault is detected in the TCC circuit, code 067 or 069 will set.

TCC solenoid resistance should be 20-40 ohms minimum when measured at 20°C (68°F). Maximum solenoid current flow should not exceed 1.5 amps.

Transmission Pressure Control Solenoid



The transmission pressure control solenoid (or force motor) is an electronic pressure regulator that controls pressure based on current flow through its coil winding. The magnetic field produced by the coil moves the solenoid's internal valve which varies pressure to the pressure regulator valve.

The PCM controls the pressure control solenoid by commanding current between 0 and 1.1 amps. This changes the duty cycle of the solenoid, which can range between 0 % and 60 %. 1.1 amps corresponds to minimum line pressure, and 0 amps is maximum line pressure (if solenoid loses power, transmission will still have maximum line pressure).

Line pressure values are calculated by the PCM using inputs such as the throttle position sensor.

The pressure control solenoid takes the place of the throttle valve that was used on past model transmissions.

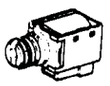
If there is a difference between the amperage commanded by the PCM and the actual amperage, diagnostic trouble code 073 will set.

Unlike the pressure control solenoid on the HYDRA-MATIC 4L80-E, the 4L60-E pressure control solenoid does not pulse every 10 seconds for a cleaning cycle.

Force High	Force Low	Line Pressure
+ 0% Duty Cycle	0 Amps	Maximum
+ 60% Duty Cycle	1.1 Amps @ 4-5 V	Minimum

Transmission Pressure Control Solenoid resistance should measure 3.5 - 4.6 ohm when measured at 20°C (68°F).

1-2 and 2-3 Shift Solenoids



The 1-2 and 2-3 shift solenoids (also called A and B solenoids) are identical solenoid devices that control the movement of the 1-2 and 2-3 shift valves (the 3-4 shift valve is not directly controlled by a shift solenoid). The solenoids are normally open exhaust valves that work in four combinations to shift the transmission into different gears (see chart).

The PCM energizes each solenoid by grounding it through an internal quad driver. This sends current through the coil winding in the solenoid and moves the internal plunger out of the exhaust position. When 'ON', the solenoid redirects fluid to move a shift valve.

PCM controlled shift solenoids eliminate the need for TV and governor pressures to control shift valve operation.

Note: The manual valve can hydraulically override the shift solenoids. Only in D4 are the shift solenoid states totally determining what gear the transmission is in. In the other manual valve positions, the transmission shifts hydraulically and the shift solenoid states 'catch up' when throttle position and vehicle speed fall into the correct ranges.

Diagnostic trouble codes 081 and 082 indicate shift solenoid circuit voltage faults.

Shift solenoid resistance should measure 20-40 ohms minimum when measured at 20°C (68°F). Shift solenoid current flow should not exceed 0.75 amps. The shift solenoid should energize at a voltage of 7.5 volts or more (measured across the terminals). The shift solenoid should de-energize when voltage is one volt or less.

If both solenoids lose power, third gear only will result.

Figure 3

Transmission Fluid Pressure Switch Assembly

The transmission fluid pressure switch assembly (PSA) is a set of five pressure switches on the valve body that sense whether fluid pressure is present in five different valve body passages. The combination of which switches are open and closed is used by the PCM to determine actual manual valve position. The PSA assembly however cannot distinguish between Park and Neutral because the monitored valve body pressures are identical in both cases.

The switches are wired to provide three signal lines that are monitored by the PCM. These inputs are used to help control line pressure, torque converter clutch apply and shift solenoid operation. Voltage at each of the signal lines will be either zero or twelve volts.

To monitor PSA assembly operation, the PCM compares the actual voltage combination of the switches to a PSA combination chart stored in the its memory. If the PCM sees one of two 'illegal' voltage combinations (see chart) a code 028 will result.

PSA assembly signal voltage can be measured from each pin to ground, and compared to the combination chart. On the transmission wiring harness, pin N is 'range signal A', pin R is 'range signal B', and pin P is 'range signal C'. With the wiring harness connected and engine running, a voltage measurement of these three lines will indicate a 'high' reading (near 12 volts) when a circuit is open, and a low (zero volts) when the circuit is switched to ground.

The transmission temperature sensor is part of the transmission fluid pressure switch assembly.

Seven valid combination and two invalid combinations are available from the TPS: Valid combinations for Circuits A, B and C are shown below. Invalid combinations are A=0V, B=0V AND C=0V; OR A=0V, B=12V AND C=0V.

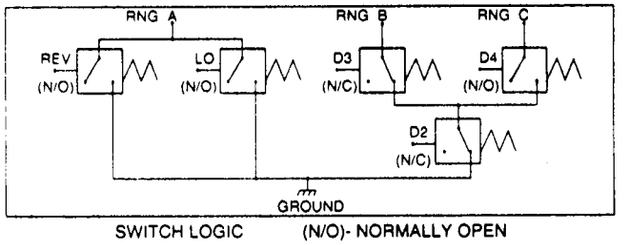
RANGE INDICATOR	OIL PRESSURE REV	D4	D3	D2	LO
PARK					
REVERSE	■				
NEUTRAL					
D4		■			
D3		■	■		
D2		■	■	■	
D1		■	■	■	■

■ OIL PRESSURE PRESENT

VALID TPS COMBINATION CHART

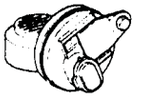
	"A"	"B"	"C"
PARK	12	0	12
REVERSE	0	0	12
NEUTRAL	12	0	12
D4	12	0	0
D3	12	12	0
D2	12	12	12
D1	0	12	12
ILLEGAL	0	12	0
ILLEGAL	0	0	0

EXPECTED VOLTAGE READINGS



SWITCH LOGIC (N/O)- NORMALLY OPEN

Vehicle Speed Sensor



The vehicle speed sensor (or transmission output speed sensor) is used to control shift points and calculate TCC slip.

The speed sensor contains a coil that gives off a continuous magnetic field. A rotor rotates past the sensor, and the rotor teeth break the magnetic field. Each break in the field sends a pulse to the VSSB (Vehicle Speed Sensor Buffer). The VSSB sends two signals to the PCM, the first is a 2002 pulse per mile (PPM) signal used by the engine. The second is the transmission/transfer case 40 pulse per revolution (PPR) signal used to control the transmission.

In two wheel drive (2WD) applications, the vehicle speed sensor is located on the transmission extension housing.

Sensor resistance should be 1260-1540 ohms when measures at 20°C (68°F). Output voltage will vary with speed from a minimum of 0.5 Volts AC at 100 RPM, to more than 100 Volts AC at 8000 RPM.

Four wheel drive (4WD) applications use a vehicle speed sensor located on the transfer case.

In 2WD or 4WD Hi, trans output speed = transfer case speed

In 4WD Lo, trans output speed = transfer case speed x constant

Codes 024 or 072 will set if a fault exists in the vehicle speed sensor circuit 40 PPR line.

3-2 Control Solenoid

The 3-2 control solenoid is a pulse width modulated solenoid used to improve the 3-2 downshift. The solenoid regulates the release of the 3-4 clutch and 2-4 band apply.

The solenoid uses duty cycle to regulate pressures that smoothly release the clutch and apply the band. Duty cycle is normally about 0% in first gear, 90% in all other drive gears and drops during the 3-2 downshift. Throttle position, vehicle speed and the commanded gear are used to determine duty cycle.

3-2 Control solenoid resistance should be a minimum of 9-14 ohms at 20°C (68°F). It is operated using pulse width modulation at a frequency of 50 Hz.

If a voltage fault is detected in the 3-2 control solenoid circuit, diagnostic trouble code 066 will set.

Figure 4

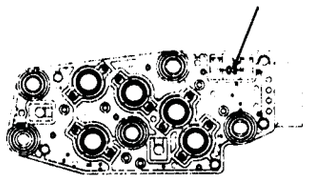
Transmission Fluid Temperature Sensor

The transmission fluid temperature sensor is part of the transmission fluid pressure switch assembly and is used to help control torque converter clutch apply and shift quality.

The temperature sensor is a resistor (thermister) which changes value based on temperature. At low temperatures the resistance is high, and at low temperatures the resistance is low.

The PCM sends a 5 volt signal to the temperature sensor and measures the voltage drop in the circuit. This means you will measure a high voltage when the transmission is cold, and a low voltage when the transmission is hot.

If the temperature sensor circuit has a fault, code 058 or 059 will set. Code 079 will set if the transmission is operating at a high temperature for a period of time.



TRANSMISSION SENSOR – TEMPERATURE TO RESISTANCE TO VOLTAGE (approximate)

°C	°F	RESISTANCE	VOLTS
-40	-40	100544	5
-28	-21	52426	4.78
-16	10	18580	4.18
-4	23	12300	3.84
0	32	9379	3.45
7	40	7270	3.20
19	68	3520	2.56
31	86	2232	1.80
43	110	1200	1.10
55	131	858	3.25
67	145	675	2.88
79	176	333	2.24
91	194	241	1.70
103	213	154	1.28
115	239	115	.96
127	260	79	.64
139	284	60	.32
151	302	47	.00

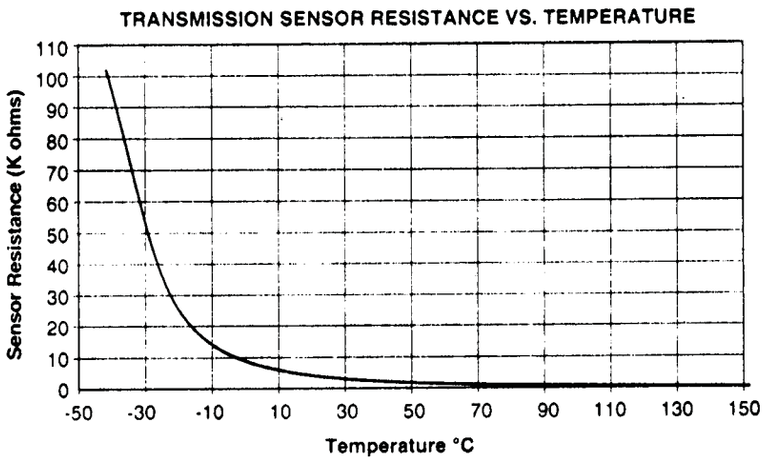


Figure 5

1993 HYDRA-MATIC 4L60-E SHIFT SPEED CHART

ENGINE	BODY	AXLE RATIO	1-2 SHIFT +/- 250 RPM						2-3 SHIFT +/- 200 RPM					3-4 SHIFT +/- 150 RPM					4-3 +/- 100 RPM	3-2 +/- 100 RPM	2-1 +/- 100 RPM
			TPS	10	20	30	40	50	10	20	30	40	50	10	20	30	40	50	0-10	0-10	0-10
5.7L (L05)	C10/G	3.08		466	622	738	816	894	835	1126	1282	1495	1670	1243	1554	1981	*	*	1127	699	369
	C20/K	3.42																			
	C10/G	3.42		466	678	762	889	953	847	1228	1440	1652	1800	1270	1567	2054	*	*	1122	762	381
	C20/K	3.73																			
	C10/G	3.73		514	700	817	911	981	934	1284	1518	1705	1845	1307	1635	2101	*	*	1121	841	373
	C/K	4.10																			

ENGINE	BODY	AXLE RATIO	1-2 SHIFT +/- 250 RPM						2-3 SHIFT +/- 200 RPM					3-4 SHIFT +/- 150 RPM					4-3 +/- 100 RPM	3-2 +/- 100 RPM	2-1 +/- 100 RPM
			TPS	10	20	30	40	50	10	20	30	40	50	10	20	30	40	50	0-10	0-10	0-10
5.0L (L03)	C10/G	3.08		486	660	758	855	893	835	1146	1360	1632	1768	1243	1535	1943	2311	*	1126	699	369
	C20/K	3.42																			
	C10/G	3.42		510	744	893	978	957	851	1233	1446	1680	1808	1276	1574	1914	2297	*	1127	765	383
	C20/K	3.73																			
	G	3.73		560	793	910	1004	980	934	1237	1517	1704	1844	1307	1611	1914	2311	*	1120	840	373
	C/K	4.10																			

ENGINE	BODY	AXLE RATIO	1-2 SHIFT +/- 250 RPM						2-3 SHIFT +/- 200 RPM					3-4 SHIFT +/- 150 RPM					4-3 +/- 100 RPM	3-2 +/- 100 RPM	2-1 +/- 100 RPM
			TPS	10	20	30	40	50	10	20	30	40	50	10	20	30	40	50	0-10	0-10	0-10
6.2L DIESEL (LH6)	C	3.08		369	369	505	582	757	757	757	893	1184	1437	1359	1359	1359	*	*	1223	679	330
	C20/K	3.42																			
	C10	3.42		361	382	489	595	744	744	744	872	1170	1425	1340	1340	1340	*	*	1212	680	319
	C20/K	3.73																			
	C10	3.73		373	373	467	607	747	747	747	887	1190	1424	1354	1354	1354	*	*	1214	677	326
	C/K	4.10																			
	G	3.08		352	389	519	556	723	723	723	871	1057	1317	1298	1298	1298	*	*	1168	649	315
		3.42		349	369	472	513	719	719	719	863	1068	1315	1294	1294	1294	*	*	1171	657	308
		3.73		359	381	516	561	718	718	718	853	1077	1324	1302	1302	1302	*	*	1167	651	314

ENGINE	BODY	AXLE RATIO	1-2 SHIFT +/- 250 RPM						2-3 SHIFT +/- 200 RPM					3-4 SHIFT +/- 150 RPM					4-3 +/- 100 RPM	3-2 +/- 100 RPM	2-1 +/- 100 RPM
			TPS	10	20	30	40	50	10	20	30	40	50	10	20	30	40	50	0-10	0-10	0-10
4.3L (L35)	M/L	3.42/3.73		566	784	828	893	915	981	1482	1656	1765	1787	1395	1918	3488	*	*	1242	588	348
	S/T	3.08/3.42		545	784	828	893	915	981	1460	1656	1765	1787	1438	2005	3488	*	*	1242	588	348
4.3L (LB4)	M/L	3.23/3.42		392	545	588	675	784	784	1111	1242	1417	1613	1395	1700	1918	*	*	1242	632	348
		3.73		479	719	937	1002	1046	850	1308	1526	1787	1940	1395	1765	1983	*	*	1242	654	348
	G	3.42/3.73		479	741	937	1002	1046	850	1329	1569	1787	1940	1395	1787	2005	*	*	1242	654	348
	S/T	3.08/3.42		436	545	588	675	784	784	1090	1220	1417	1613	1395	1678	1918	*	*	1242	654	348
	C10	3.08/3.42		479	588	654	741	784	850	1177	1308	1460	1613	1395	1678	1918	*	*	1242	654	348
		3.73/4.10		501	654	719	763	784	915	1242	1373	1526	1613	1395	1678	1918	*	*	1242	654	348

* SHIFT NOT AVAILABLE AT THIS TPS

1. ALL SPEEDS ARE GIVEN IN TRANSMISSION OUTPUT SHAFT RPM
2. SPEEDS ARE BASED ON PERCENT THROTTLE POSITION SENSOR (TPS) DATA
3. USE A TECH 1 OR OTHER SCAN TOOL TO MONITOR THIS DATA
4. ALL SHIFT SPEEDS ARE APPROXIMATE

Figure 6

HYDRA-MATIC 4L60-E LINE PRESSURE CHECK PROCEDURE

Line pressures are calibrated for two sets of gear ranges – Drive-Park-Neutral and Reverse. This allows the transmission line pressure to be appropriate for different pressure needs in different gear ranges:

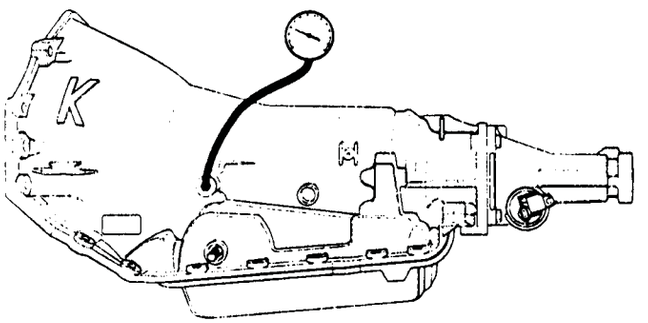
Gear Range	Line Pressure Range
Drive, Park or Neutral	55 - 189 PSI
Reverse	64 - 324 PSI

Before performing a line pressure check, verify that the pressure control solenoid is receiving the correct electrical signal from the PCM:

1. Install a scan tool.
2. Start the engine and set parking brake.
3. Check for a stored pressure control solenoid diagnostic trouble code, and other diagnostic trouble codes.
4. Repair vehicle if necessary.

   Inspect
   - Fluid level (see Section 7A)
   - Manual linkage

   Install or Connect
   - TECH 1 Scan tool
   - Oil pressure gage at line pressure tap



5. Put gear selector in Park and set the parking brake.
6. Start engine and allow it to warm up at idle.
7. Access the "PCS Control" test on the TECH 1 scan tool.
8. Increase DESIRED PCS in 0.1 Amp increments and read the corresponding line pressure on the pressure gage. (Allow pressure to stabilize for 5 seconds after each current change.)
9. Compare data to the Drive-Park-Neutral line pressure chart below.

***NOTICE** Total test running time should not exceed 2 minutes, or transmission damage could occur.

CAUTION Brakes must be applied at all times to prevent unexpected vehicle motion.

If pressure readings differ greatly from the line pressure chart, refer to the Diagnosis Charts contained in this section.

The TECH 1 scan tool is only able to control the pressure control solenoid in Park and Neutral with the vehicle stopped. This protects the clutches from extremely high or low pressures in Drive or Reverse ranges.

Pressure Control Solenoid Current (Amp)	Line Pressure (PSI)
0.02	170 - 190
0.10	165 - 185
0.20	160 - 180
0.30	155 - 175
0.40	148 - 168
0.50	140 - 160
0.60	130 - 145
0.70	110 - 130
0.80	90 - 115
0.90	65 - 90
0.98	55 - 65

Pressures at 15 RPM and 66°C (150°F)

Figure 7

CONDITION	INSPECT COMPONENT	FOR CAUSE
OIL PRESSURE HIGH OR LOW (Verify With Gage – Refer To Line Pressure Check Procedure)	• Oil Pump Assembly (4)	– Pressure regulator valve (216) stuck. – Pressure regulator valve spring (217). – Rotor guide (211) omitted or misassembled. – Rotor (212) cracked or broken. – Reverse boost valve (219) or sleeve (220) stuck, damaged or incorrectly assembled. – Orifice hole in pressure regulator valve (217) plugged. – Sticking slide (203) or excessive rotor clearance. – Pressure relief ball (228) not seated or damaged. – Porosity in pump cover or body. – Wrong pump cover. – Pump faces not flat. – Excessive rotor clearance.
	• Oil Filter (72)	– Intake pipe restricted by casting flash. – Cracks in filter body or intake pipe. – O-ring seal (71) missing, cut or damaged. – Wrong grease used on rebuild.
	• Valve Body (60)	– Manual valve (340) scored or damaged. – Spacer plate (48) or gaskets (47 and 52) incorrect, misassembled or damaged. – Face not flat. – 2-3 Shift valve (369) stuck. – Checkballs omitted or misassembled.
	• Pressure Control Solenoid (377)	
	• System Voltage	
	• Pressure Switch Assembly (69)	
	• Case (8)	– Case to valve body face not flat.
	• Possible Codes: - 24 Vehicle Speed Sensor Signal Low - 52 Long System Voltage High - 53 System Voltage High - 72 Vehicle Speed Sensor Loss - 73 Pressure Control Solenoid Current - 75 System Voltage Low - 81 2-3 Shift Solenoid Circuit Fault - 82 1-2 Shift Solenoid Circuit Fault	
HARSH SHIFTS	• Possible Codes: - 21 Throttle Position Sensor Circuit (High) - 22 Throttle Position Sensor Circuit (Low) - 28 Fluid Pressure Switch Assembly Fault - 73 Pressure Control Solenoid Current	

ALL ILLUSTRATION NUMBERS REFERENCE HYDRA-MATIC 4L60-E UNIT REPAIR SECTION

Figure 8

CONDITION	INSPECT COMPONENT	FOR CAUSE
HARSH SHIFTS Continued)	• Throttle Position Sensor • Vehicle Speed Sensor (36) • Pressure Switch Assembly (69) • Trans Fluid Temperature Sensor (69) • Engine Coolant Temperature Sensor • Pressure Control Solenoid (377)	
INACCURATE SHIFT POINTS	• Oil Pump Assembly (4)	– Stuck pressure regulator valve (216). – Sticking pump slide (203).
	• Valve Body Assembly (60)	– Spacer plate (48) or gaskets (47 and 52) misassembled, damaged or incorrect.
	• Case (8)	– Porous or damaged valve body pad. – 2-4 Servo Assembly (12-29) a. 2-4 accumulator porosity. b. Damaged servo piston seals. c. Apply pin damaged or improper length. – 2-4 Band Assembly (602). a. Burned. b. Anchor pin not engaged.
	• Throttle Position Sensor	– Disconnected. – Damage.
	• Vehicle Speed Sensor (36)	– Disconnected. – Damaged. – Bolt not tightened.
	• 4WD Low Switch	– Disconnected. – Damaged.
EARLY SHIFTS	• Possible Codes: - 69 TCC Stuck "ON"	
FIXED SHIFT POINTS	• Possible Codes: - 21 Throttle Position Sensor Circuit (High) - 22 Throttle Position Sensor Circuit (Low)	
1ST GEAR RANGE ONLY – NO UPSHIFT	• Valve Body (60)	– 1-2 Shift valve (366) sticking. – Spacer plate (48) or gaskets (47 and 52) mispositioned or damaged.
	• Case (8)	– Case to valve body face not flat or damaged.
	• Shift Solenoids (379)	– Stuck or damaged. – Electrical connection.
	• 2-4 Servo Assembly (12-29)	– Restricted or blocked apply passages case. – Nicks or burrs on servo pin (13) or pin bore in case – 4th Servo piston (25) in backwards.

ALL ILLUSTRATION NUMBERS REFERENCE HYDRA-MATIC 4L60-E UNIT REPAIR SECTION

Figure 9

CONDITION	INSPECT COMPONENT	FOR CAUSE
1ST GEAR RANGE ONLY - NO UPSHIFTS (Continued)	• 2-4 Band Assembly (602)	- 2-4 Band (602) worn or damaged. - Band anchor pin not engaged.
SLIPS IN 1ST GEAR	• Forward Clutch Assembly	- Clutch plates (649) worn. - Porosity or damage in forward clutch piston (630). - Forward clutch piston inner and outer seals (629) missing, cut or damaged. - Input housing to forward clutch housing O-ring seal (622) missing, cut or damaged. - Damaged forward clutch housing (628). - Forward clutch housing retainer and ball assembly (627) not sealing or damaged.
	• Forward Clutch Accumulator	- Piston seal (353) missing, cut or damaged. - Piston (354) out of its bore. - Porosity in the piston or valve body (350). - Stuck abuse valve (357).
	• Input Housing and Shaft Assembly (621)	- Turbine shaft seals (619) missing, cut or damaged.
	• Valve Body (60)	- 1-2 Accumulator valve (371) stuck. - Face not flat, damaged lands or interconnected passages. - Spacer plate (48) or gaskets (47 and 52) incorrect, mispositioned or damaged.
	• Low Roller Clutch (678)	- Damage to lugs or inner ramps. - Rollers not free moving. - Inadequate spring tension. - Damage to inner splines. - Lube passage plugged.
	• Torque Converter (1)	- Stator roller clutch not holding.
	• 1-2 Accumulator Assembly (54-59)	- Porosity in piston (56) or 1-2 Accumulator cover and pin assembly (57). - Damaged ring grooves on piston. - Piston seal (55) missing, cut or damaged. - Valve body to spacer plate gasket (52) at 1-2 Accumulator cover, missing or damaged. - Leak between piston and pin. - Broken 1-2 Accumulator spring (54).
	• Line Pressure	- (See Causes of High or Low Oil Pressure.)
	• 2-4 Servo Assembly (12-29)	- 4th Servo piston (25) in backwards.

ALL ILLUSTRATION NUMBERS REFERENCE HYDRA-MATIC 4L60-E UNIT REPAIR SECTION

Figure 10

CONDITION	INSPECT COMPONENT	FOR CAUSE
SLIPPING OR ROUGH 1-2 SHIFT	• Valve Body Assembly (60)	– 1-2 Shift valve train (365-366) stuck. – Gaskets (47 and 52) or spacer plate (48) incorrect, mispositioned or damaged. – 1-2 Accumulator valve (371) stuck. – Face not flat.
	• 2-4 Servo Assembly (12-29)	– Apply pin (13) too long or too short. – 2nd servo apply piston seal missing, cut or damaged. – Restricted or missing oil passages. – Servo bore in case damaged.
	• 2nd Accumulator (54-59)	– Porosity in 1-2 accumulator housing (57) or piston (56). – Piston seal or groove damaged. – Nicks or burrs in 1-2 accumulator housing. – Missing or restricted oil passage.
	• 2-4 Band (602)	– Worn or mispositioned.
	• Oil Pump Assembly (4) or Case (8)	– Faces not flat.
NO 2-3 SHIFT OR 2-3 SHIFT SLIPPING, ROUGH OR HUNTING	• Converter (1)	– Internal damage.
	• Oil Pump (4)	– Stator shaft (214) sleeve scored or off location.
	• Valve Body (60)	– 2-3 Valve train (268-269) stuck. – Accumulator valve (371) stuck. – Spacer plate (48) or gaskets (47 and 52) incorrect, mispositioned or damaged.
	• Input Housing Assembly (621)	– Clutch plates worn [3-4 (654) or forward (649)]. – Excessive clutch plate travel. – Cut or damaged piston seals [3-4 (624) or forward (629)]. – Porosity in input clutch housing (621) or piston (623). – 3-4 Piston checkball (620) stuck, damaged or not sealing. – Restricted apply passages. – Forward clutch piston retainer and ball assembly (627) not seating. – Sealing balls loose or missing.
	• Case (8)	– 3rd Accumulator retainer and ball assembly not seating.
	• 2-4 Servo Assembly (12-29)	– 2nd Apply piston seals (18 and 19) missing, cut or damaged.
	• Possible Codes: - 24 Vehicle Speed Sensor Signal Low - 72 Vehicle Speed Sensor Loss	

ALL ILLUSTRATION NUMBERS REFERENCE HYDRA-MATIC 4L60-E UNIT REPAIR SECTION

Figure 11

CONDITION	INSPECT COMPONENT	FOR CAUSE
2ND AND 3RD GEARS ONLY OR 1ST AND 4TH GEARS ONLY	• Possible Codes: - 82 1-2 Shift Solenoid Circuit Fault	
	• Shift Solenoids (379)	– Sediment – Electrical Connection
THIRD GEAR ONLY	• Possible Codes: - 52 Long System Voltage High - 53 System Voltage High - 66 3-2 Control Solenoid Circuit Fault - 75 System Voltage Low - 81 2-3 Shift Solenoid Circuit Fault	
	• System Voltage	
	• 3-2 Control Solenoid (394)	
3-2 FLARE OR TIE-UP	• 3-2 Control Solenoid (394)	– Shorted or damaged.
NO 3-4 SHIFT/SLIPPING OR ROUGH 3-4 SHIFT	• Oil Pump Assembly (4)	Faces not flat. – Pump cover retainer and ball assembly omitted or damaged.
	• Valve Body Assembly (60)	– Valves stuck. • 2-3 Shift valve (368-369) train. • Accumulator valve (371). • 1-2 Shift valve train (365-366). • 3-2 Control valve (391). – Spacer plate (48) or gaskets (47 and 52) incorrect, mispositioned or damaged.
	• 2-4 Servo Assembly (12-29)	– Incorrect band apply pin (13). – Missing or damaged servo seals (26 and 27). – Porosity in pistons, cover or case. – Damaged piston seal grooves. – Plugged or missing orifice cup plug (11).
	• Case (8)	– 3rd Accumulator retainer and ball assembly leaking. – Porosity in 3-4 accumulator piston (44) or bore. – 3-4 Accumulator piston seal (45) or seal grooves damaged. – Plugged or missing orifice cup plug. – Restricted oil passage.
	• Input Housing Assembly (621)	– Refer to Slipping 2-3 Shift.
	• 2-4 Band Assembly (602)	– Worn or misassembled.

ALL ILLUSTRATION NUMBERS REFERENCE HYDRA-MATIC 4L60-E UNIT REPAIR SECTION

Figure 12

CONDITION	INSPECT COMPONENT	FOR CAUSE
NO 3-4 SHIFT/SLIPPING OR ROUGH 3-4 SHIFT (Continued)	• Possible Codes: - 21 Throttle Position Sensor Circuit (High) - 22 Throttle Position Sensor Circuit (Low) - 28 Fluid Pressure Switch Assembly Fault - 37 Brake Switch Stuck "ON" - 38 Brake Switch Stuck "OFF" - 67 TCC Solenoid Circuit Fault	
[R] NO REVERSE OR SLIPS IN REVERSE	• Input Housing Assembly (621)	– 3-4 Apply ring (625) stuck in applied position. – Forward clutch not releasing. – Turbine shaft seals (619) missing, cut or damaged.
	• Manual Valve Link (705)	– Disconnected.
	• Oil Pump Assembly (4)	– Retainer and ball assembly missing or damaged. – Stator shaft seal rings (230) or ring grooves damaged. – Stator shaft sleeve scored or damaged. – Reverse boost valve (219) stuck, damaged or misassembled. – Cup plug missing. – Restricted oil passage. – Faces not flat. – Converter clutch valve (224) stuck.
	• Valve Body Assembly (60)	– 2-3 Shift valve (369) stuck. – Manual linkage (705) not adjusted. – Spacer plate (48) and gaskets (47 and 52) incorrect, mispositioned or damaged. – Lo overrun valve (361) stuck. – Orificed cup plug restricted, missing or damaged.
	• Reverse Input Clutch Assembly (605)	– Clutch plate (612) worn. – Reverse input housing and drum assembly (605) cracked at weld. – Clutch plate retaining ring out of groove. – Return spring assembly retaining ring (610) out of groove. – Seals (608) cut or damaged. – Restricted apply passage. – Porosity in piston (607). – Belleville plate (611) installed incorrectly. – Excessive clutch plate travel. – Oversized housing.
	• Lo And Reverse Clutch	– Clutch plates (682) worn. – Porosity in piston (695). – Seals (696) damaged. – Return spring assembly retaining ring (693) mispositioned. – Restricted apply passage.

ALL ILLUSTRATION NUMBERS REFERENCE HYDRA-MATIC 4L60-E UNIT REPAIR SECTION

Figure 13

CONDITION	INSPECT COMPONENT	FOR CAUSE
NO PART THROTTLE OR DELAYED DOWNSHIFTS	• 2-4 Servo Assembly (12-29)	– Servo cover retaining ring (29) omitted or misassembled. – 4th Apply piston (25) damaged or misassembled. – Servo inner housing (20) damaged or misassembled.
	• Valve Body Assembly (60)	– 3-2 Downshift valve (389) stuck. – 4-3 Sequence valve body channel blocked.
HARSH GARAGE SHIFT	• Valve Body Assembly (60)	– Orifice cup plug missing. – Checkball missing.
NO OVERRUN BRAKING – MANUAL 3-2-1	• External Linkage	– Not adjusted properly.
	• Valve Body Assembly (60)	– 4-3 Sequence valve (382) stuck. – Checkball mispositioned. – Spacer plate (48) and gaskets (47 and 52) incorrect, damaged or mispositoned.
	• Input Clutch Assembly (621)	– Turbine shaft oil passages plugged or not drilled. – Turbine shaft seal rings (619) damaged. – Turbine shaft sealing balls loose or missing. – Porosity in forward (630) or overrun clutch piston (632). – Overrun piston seals (631) cut or damaged. – Overrun piston checkball (633) not sealing.
NO TORQUE CONVERTER CLUTCH APPLY	• Electrical	– 12 Volts not supplied to transmission. – Outside electrical connector damaged. – Inside electrical connector, wiring harness or solenoid damaged. – Electrical short (pinched solenoid wire). – Solenoid not grounded.
	• TCC Solenoid	
	• Engine Speed Sensor	
	• Converter (1)	– Internal damage.
	• Engine Coolant Temperature Sensor	
	• Oil Pump Assembly (4)	– Converter clutch valve (224) stuck or assembled backwards. – Converter clutch valve retaining ring (222) mispositioned. – Pump to case gasket (6) mispositioned. – Orifice cup plug restricted or damaged. – Solenoid O-ring seal (67) cut or damaged. – High or uneven bolt torque (pump body to cover).

ALL ILLUSTRATION NUMBERS REFERENCE HYDRA-MATIC 4L60-E UNIT REPAIR SECTION

Figure 14

CONDITION	INSPECT COMPONENT	FOR CAUSE
NO TORQUE CONVERTER CLUTCH APPLY (Continued)	• Trans Fluid Temperature Sensor (69)	
	• Input Housing and Shaft (621)	– Turbine shaft O-ring seal (618) cut or damaged. – Turbine shaft retainer and ball assembly (617) restricted or damaged.
	• Brake Switch	
	• Pressure Switch Assembly (69)	
	• Valve Body Assembly (60)	– TCC signal valve (380) stuck. – Solenoid O-ring leaking.
	• Solenoid Screen	– Blocked.
	• Possible Codes: - 21 Throttle Position Sensor Circuit (High) - 22 Throttle Position Sensor Circuit (Low) - 28 Fluid Pressure Switch Assembly Fault - 37 Brake Switch Stuck "ON" - 38 Brake Switch Stuck "OFF" - 52 Long System Voltage High - 53 System Voltage High - 67 TCC Solenoid Circuit Fault - 75 System Voltage Low - 81 2-3 Shift Solenoid Circuit Fault	
TORQUE CONVERTER CLUTCH SHUDDER	• Torque Converter Assembly (1)	– Internal damage.
	• Oil Pump Assembly (4)	– Converter clutch valve (224) stuck. – Restricted oil passage.
	• Oil Filter (72)	– Crack in filter body. – Flash restricting filter neck. – O-ring seal (71) cut or damaged.
	• Miscellaneous	– Low oil pressure. – Engine not tuned properly.
	• Input Housing and Shaft Assembly (621)	– Turbine shaft O-ring (618) cut or damaged. – Turbine shaft retainer and ball assembly (617) restricted or damaged.
TCC APPLY WITH A COLD ENGINE	• Possible Codes: - 14 Engine Coolant Temp Sensor Circuit (High) - 15 Engine Coolant Temp Sensor Circuit (Low)	

ALL ILLUSTRATION NUMBERS REFERENCE HYDRA-MATIC 4L60-E UNIT REPAIR SECTION

Figure 15

CONDITION	INSPECT COMPONENT	FOR CAUSE
NO TORQUE CONVERTER CLUTCH RELEASE	• TCC Solenoid	– External ground. – Clogged exhaust orifice.
	• Converter (1)	– Internal damage.
	• Valve Body Assembly (60)	– Converter clutch apply valve stuck in apply position.
	• Oil Pump Assembly (4)	– Converter clutch valve (224) stuck.
	• PCM	– External ground.
TCC ON IN ALL GEARS	• Possible Codes: - 69 TCC Stuck "On"	
DRIVES IN NEUTRAL	• Forward Clutch	– Not releasing.
	• Manual Valve Link (705)	– Disconnected.
	• Case (8)	– Face not flat. – Internal leakage.
2ND GEAR START (DRIVE RANGE)	• Forward Clutch Sprag Assembly (642)	– Sprag assembly installed backwards.
NO PARK	• Parking Linkage (63, 79-90)	– Actuator rod assembly (85) bent or damaged. – Actuator rod spring binding or improperly crimped. – Actuator rod not attached to inside detent lever (788). – Parking lock bracket (86) damaged or not torqued properly. – Inside detent lever (88) not torqued properly. – Detent roller and spring assembly (63) mispositioned or not torqued properly. – Parking pawl (81) binding or damaged.
RATCHETING NOISE	• Parking Pawl (81)	– Parking pawl return spring (80) weak, damaged or misassembled.
OIL OUT THE VENT	• Oil Pump (4)	– Chamfer in pump body rotor pocket too large.
	• Miscellaneous	– Fluid level - overfilled.

ALL ILLUSTRATION NUMBERS REFERENCE HYDRA-MATIC 4L60-E UNIT REPAIR SECTION

Figure 16

CONDITION	INSPECT COMPONENT	FOR CAUSE
VIBRATION IN REVERSE AND WHINING NOISE IN PARK	• Oil Pump (4)	– Broken vane rings (210).
NO DRIVE IN ALL RANGES	• Torque Converter (1)	– Converter to flex plate bolts missing.
NO DRIVE IN DRIVE RANGE	• Torque Converter (1)	– Stator roller clutch not holding. – Converter not bolted to flex plate.
FRONT OIL LEAK	• Torque Converter (1)	– Welded seam leaking. – Damaged converter hub.
	• Torque Converter Seal (243)	– Damaged seal assembly. – Missing garter spring.
DELAY IN DRIVE AND REVERSE	• Torque Converter (1)	– Converter drainback.

ALL ILLUSTRATION NUMBERS REFERENCE HYDRA-MATIC 4L60-E UNIT REPAIR SECTION

Figure 17

DIAGNOSTIC TROUBLE CODES AND DEFAULT ACTIONS

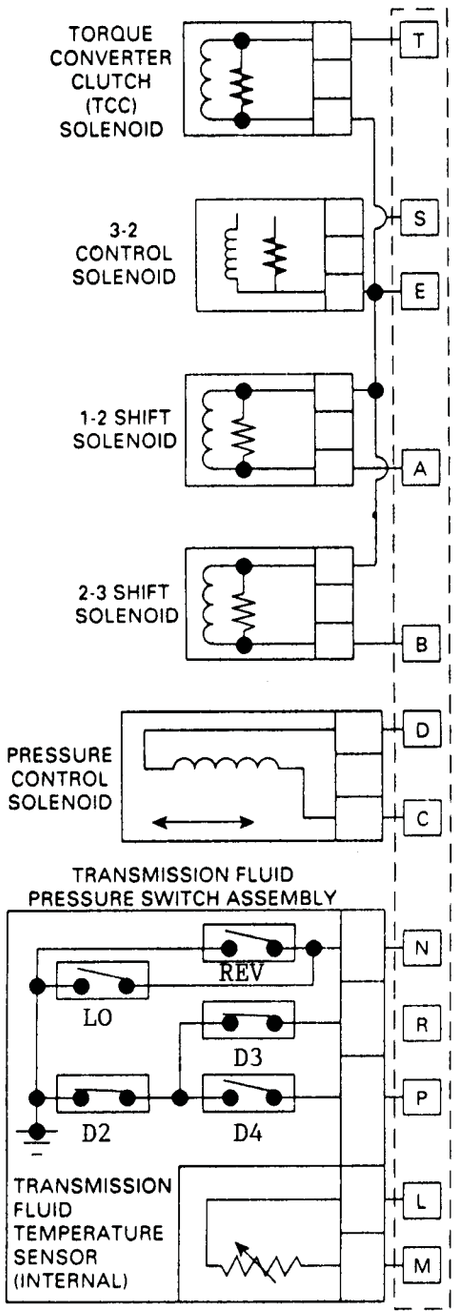
TROUBLE CODE	CODE PARAMETERS	DEFAULT ACTION
14 Engine Coolant Temp Sensor Circuit (High)	Engine coolant temp over 145°C (293°F) for 1/2 second.	• TCC apply cold.
15 Engine Coolant Temp Sensor Circuit (Low)	Engine coolant temp less than -33°C (-27°F) for 1/2 second.	• TCC apply cold.
21 Throttle Position Sensor Circuit (High)	TP voltage greater than 4.88 volts for four seconds.	• No TCC. • Fixed shift points. • Harsh shifts. • Maximum line pressure. • No fourth gear in hot mode.
22 Throttle Position Sensor Circuit (Low)	With engine running, TP voltage less than .06 volts for four seconds. (Diesel is less than .16 volts.)	• No TCC. • Fixed shift points. • Harsh shifts. • Maximum line pressure. • No fourth gear in hot mode.
24 Vehicle Speed Sensor Signal Low	In Drive or Reverse with engine speed greater than 3000 rpm, output speed is less than 250 rpm for three seconds. (MAP is 100-255 kPa, TP is 10-100%)	• Maximum line pressure. • Second gear only.
28 Fluid Pressure Switch Assembly Fault	PCM detects one of two "invalid" combinations of PSM signals for five seconds.	• No TCC. • Harsh shifts. • No fourth gear in hot mode.
37 Brake Switch Stuck "ON"	With brake on, vehicle speed is 5-20 mph for six seconds; then vehicle speed is >20 mph for six seconds. This must happen seven times.	• No TCC. • No fourth gear in hot mode.
38 Brake Switch Stuck "OFF"	With brake off, vehicle speed is >20 mph for six seconds, then vehicle speed is 5-20 mph for six seconds. This must happen seven times.	• No TCC. • No fourth gear in hot mode.
52 Long System Voltage High	Generator voltage is greater than 16 volts for 109 minutes.	• No TCC. • Maximum line pressure. • Third gear only.
53 System Voltage High	Generator voltage is greater than 19.5 volts for two seconds.	• No TCC. • Maximum line pressure. • Third gear only.
58 Transmission Fluid Temp Sensor Circuit (High)	Transmission fluid temperature is greater than 154°C (309°F) for one second.	• No default action.
59 Transmission Fluid Temp Sensor Circuit (Low)	Transmission fluid temperature is below -33°C (-54°F) for one second.	• No default action.

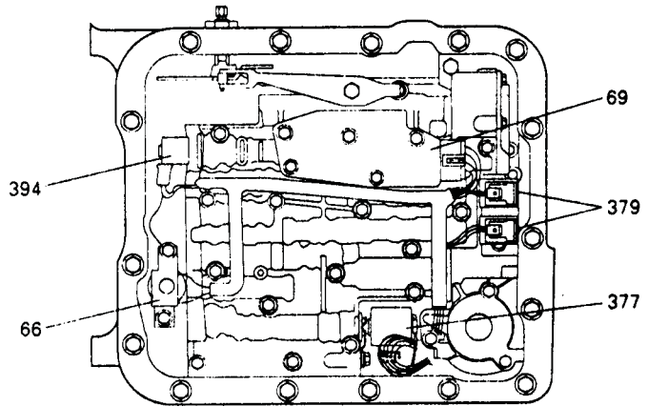
Figure 18

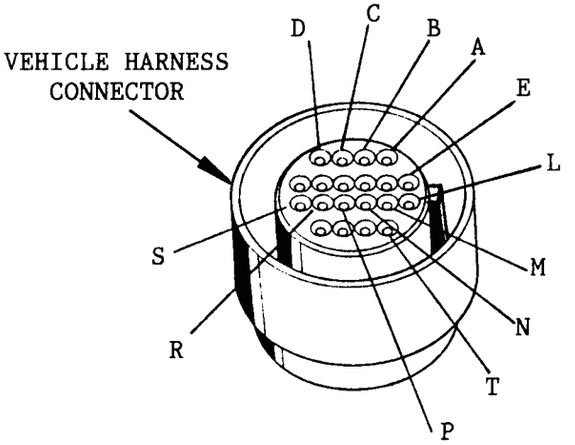
DIAGNOSTIC TROUBLE CODES AND DEFAULT ACTIONS

TROUBLE CODE	CODE PARAMETERS	DEFAULT ACTION
66 3-2 Control Solenoid Circuit Fault	At high duty cycle, the circuit voltage high -OR- at low duty cycle the circuit voltage is low for four seconds.	• Third gear only
67 TCC Solenoid Circuit Fault	TCC is commanded on, but circuit is high -OR- TCC is commanded off but circuit voltage is low for two seconds.	• No TCC. • No fourth gear in hot mode.
69 TCC Stuck "ON"	With gear selector in a drive range, transmission in 2nd, 3rd or 4th, TP Sensor greater than 25% and TCC unlocked - slip is between -20 and 20 RPM.	• TCC "ON" in all gears. • Early shifts.
72 Vehicle Speed Sensor Loss	Two successive speed readings have a difference of more then 1000 RPM. (Difference must be more than 1500 RPM in P and N.)	• Maximum line pressure. • Second gear only.
73 Pressure Control Solenoid Current	Pressure control solenoid return amperage varies more than .16 amp from commanded amperage for one second.	• Harsh shifts. • Maximum line pressure.
75 System Voltage Low	System voltage is less than 7.3 V at high temps and less than 11.7 V at high temps for four seconds.	• No TCC. • Maximum line pressure. • Third gear only.
79 Transmission Fluid Overtemp	Transmission temp is higher than 150°C (302°F) for six seconds.	
81 2-3 Shift Solenoid Circuit Fault	2-3 Shift Solenoid is commanded "ON" by PCM but circuit voltage is high for two seconds OR 2-3 Shift Solenoid is commanded "OFF" by PCM but circuit voltage is low for two seconds.	• No TCC • Maximum line pressure. • Second or third gear only.
82 1-2 Shift Solenoid Circuit Fault	1-2 Shift Solenoid is commanded "ON" by PCM but circuit voltage is high for two seconds OR 1-2 Shift Solenoid is commanded "OFF" by PCM but circuit voltage is low for two seconds.	• Maximum line pressure. • Second or third gear only OR • First and fourth gears only.

Figure 19





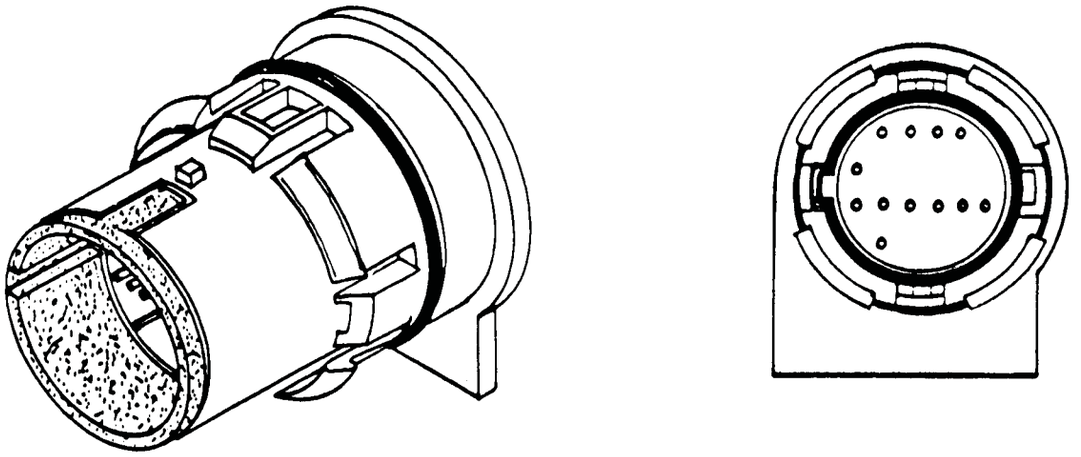


CAVITY	FUNCTION
A	1-2 SHIFT SOLENOID (LOW)
B	2-3 SHIFT SOLENOID (LOW)
C	PRESSURE CONTROL SOLENOID (HIGH)
D	PRESSURE CONTROL SOLENOID (LOW)
E	BOTH SHIFT SOLENOIDS, TCC SOLENOID, AND 3-2 CONTROL SOLENOID (HIGH)
L	TRANSMISSION FLUID TEMPERATURE (HIGH)
M	TRANSMISSION FLUID TEMPERATURE (LOW)
N	RANGE SIGNAL "A"
P	RANGE SIGNAL "C"
R	RANGE SIGNAL "B"
S	3-2 CONTROL SOLENOID (LOW)
T	TCC SOLENOID (LOW)

WIRING SCHEMATIC

Figure 20

TRANSMISSION CASE CONNECTOR



NOTE: THE TRANSMISSION CASE CONNECTOR AND THE LOCK-UP SOLENOID ARE INTREGAL PARTS OF THE TRANSMISSION WIRING HARNESS AND MUST BE REPLACED AS AN ASSEMBLY.

VIEW LOOKING INTO
TRANSMISSION CASE CONNECTOR

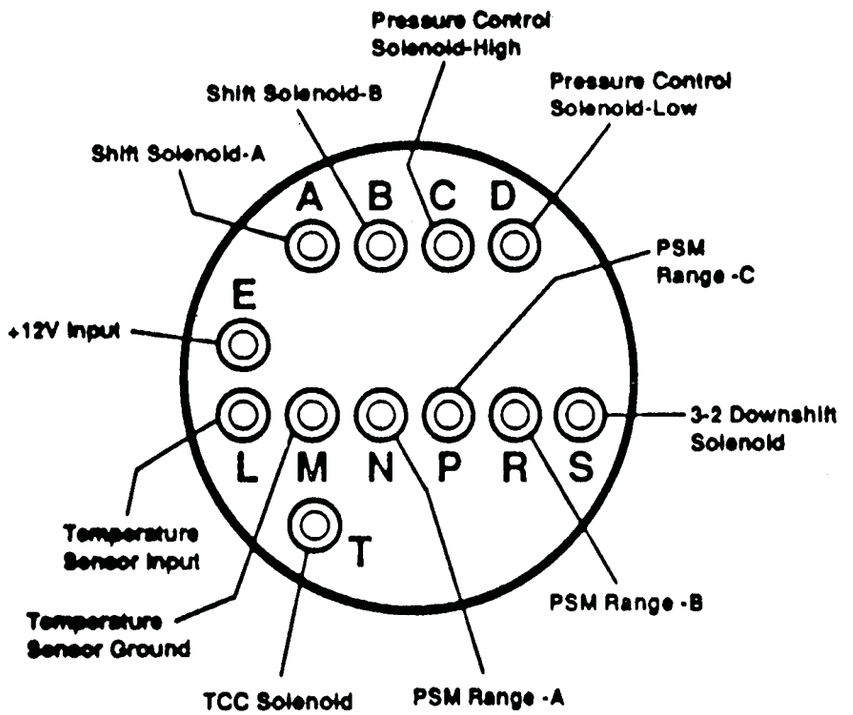
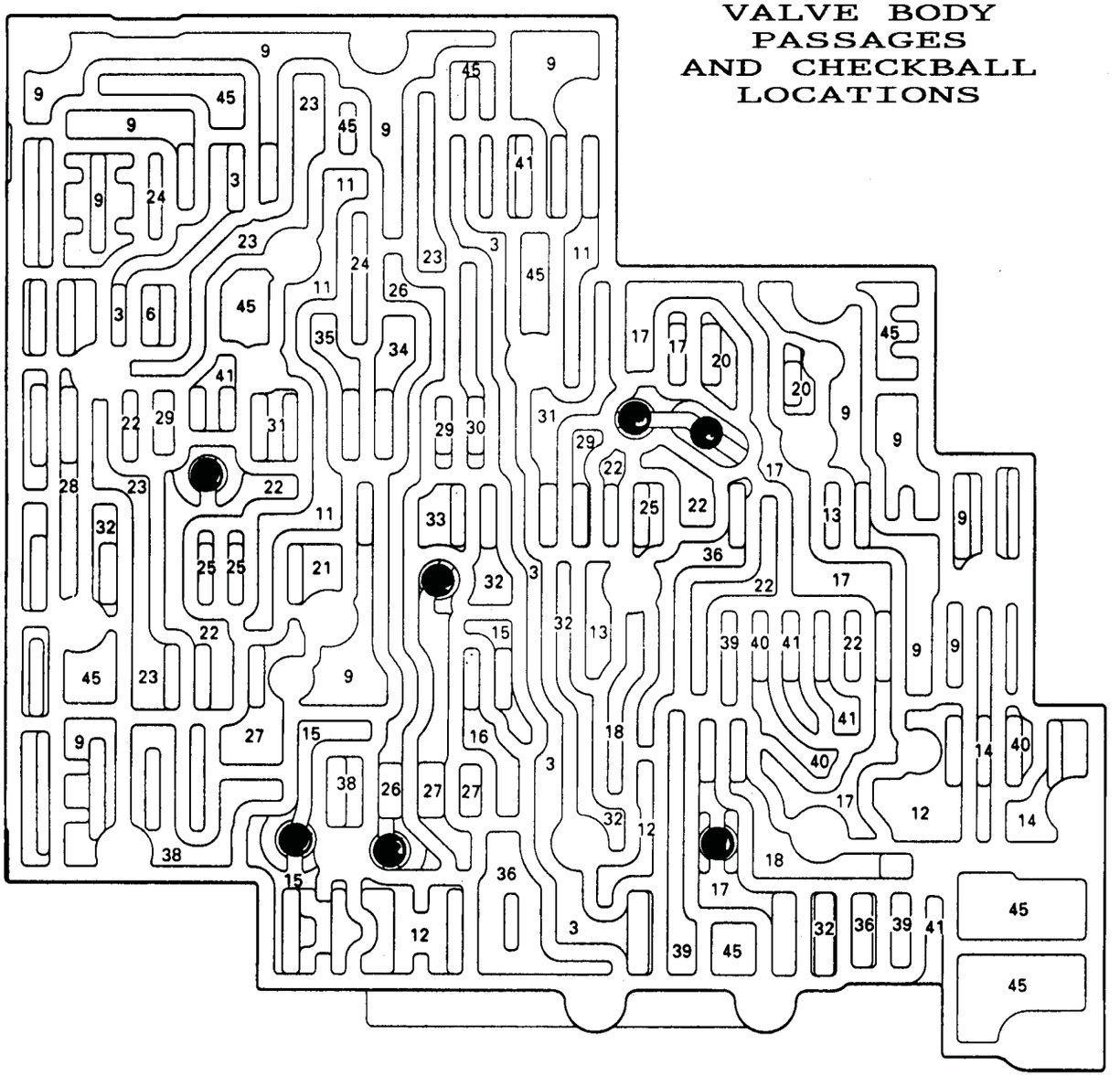
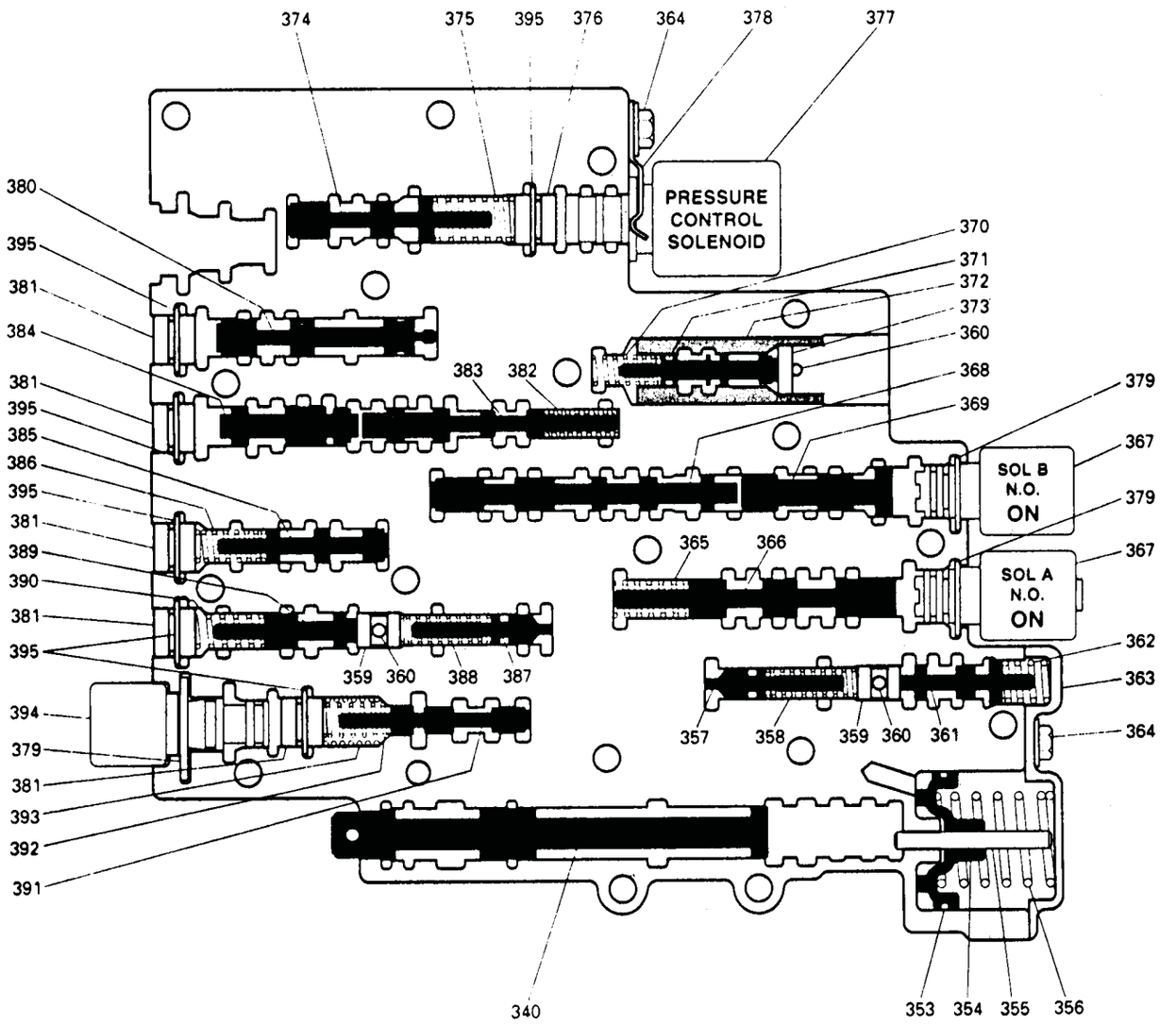


Figure 21



ILL. NO.	DESCRIPTION
1	SUCTION (INTAKE)
2	DECREASE
3	LINE
4	CONVERTER FEED
5	RELEASE
6	APPLY (REG APPLY)
7	TO COOLER
8	LUBE FROM COOLER
9	ACTUATOR FEED LIMIT
10	FILTERED ACTUATOR FEED
11	TORQUE SIGNAL
12	PR
13	D4-3-2
14	LO/REVERSE
15	REVERSE
16	REVERSE INPUT (REV. CL.)
17	D4
18	FORWARD CLUTCH FEED
19	REAR LUBE
20	ACCUMULATOR
21	SIGNAL A
22	2ND
23	2ND CLUTCH
24	C.C. SIGNAL
25	3-4 SIGNAL
26	3RD ACCUM
27	3-4 CLUTCH
28	4TH SIGNAL
29	SERVO FEED
30	4TH
31	3-4 ACCUM
32	D3
33	OVERRUN
34	OVERRUN CLUTCH FEED
35	OVERRUN CLUTCH
36	D2
37	ORIFICED D2
38	3-2 SIGNAL
39	LO
40	LO/1ST
41	EXHAUST
42	ORIFICED EXHAUST
43	VENT
44	SEAL DRAIN
45	VOID
46	LINE PRESSURE TAP

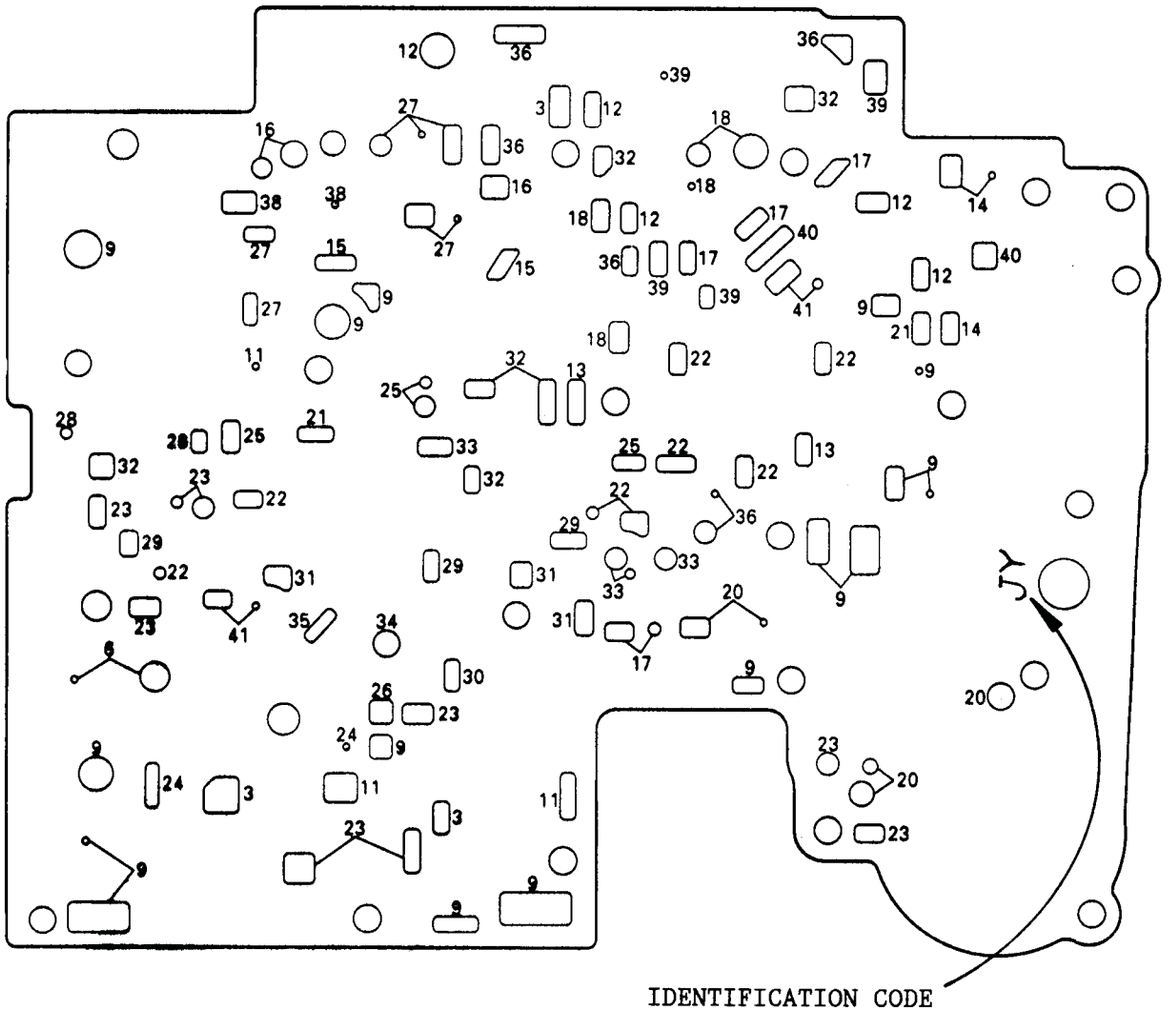
Figure 22



340	VALVE, MANUAL
353	SEAL, FORWARD ACCUMULATOR OIL
354	PISTON, FORWARD ACCUMULATOR
355	PIN, FORWARD ACCUMULATOR
356	SPRING, FORWARD ACCUMULATOR
357	VALVE, FORWARD ABUSE
358	SPRING, FORWARD ABUSE VALVE
359	PLUG, BORE
360	PIN, COILED SPRING
361	VALVE, LOW OVERRUN
362	SPRING, LOW OVERRUN VALVE
363	COVER, FORWARD ACCUMULATOR
364	BOLT, FORWARD ACCUMULATOR COVER
365	SPRING, 1-2 SHIFT VALVE
366	VALVE, 1-2 SHIFT
367-A	1-2 SHIFT SOLENOID (A)
367-B	2-3 SHIFT SOLENOID (B)
368	VALVE, 2-3 SHIFT
369	VALVE, 2-3 SHUTTLE
370	SPRING, 1-2 ACCUMULATOR VALVE
371	VALVE, 1-2 ACCUMULATOR
372	SLEEVE, 1-2 ACCUMULATOR VALVE
373	PLUG, BORE
374	VALVE, ACTUATOR FEED LIMIT
375	SPRING, ACTUATOR FEED LIMIT VALVE
376	PLUG, BORE
377	PRESSURE CONTROL SOLENOID
378	RETAINER, PRESSURE CONTROL SOLENOID
379	RETAINER, SOLENOID
380	VALVE, CONVERTER CLUTCH SIGNAL
381	PLUG, BORE
382	SPRING, 4-3 SEQUENCE VALVE
383	VALVE, 4-3 SEQUENCE
384	VALVE, 3-4 RELAY
385	VALVE, 3-4 SHIFT
386	SPRING, 3-4 SHIFT VALVE
387	VALVE, REVERSE ABUSE
388	SPRING, REVERSE ABUSE VALVE
389	VALVE, 3-2 DOWNSHIFT
390	SPRING, 3-2 DOWNSHIFT VALVE
391	VALVE, 3-2 CONTROL
392	SPRING, 3-2 CONTROL VALVE
393	SPRING, BORE PLUG
394	3-2 CONTROL SOLENOID
395	RETAINER, BORE PLUG

Figure 23

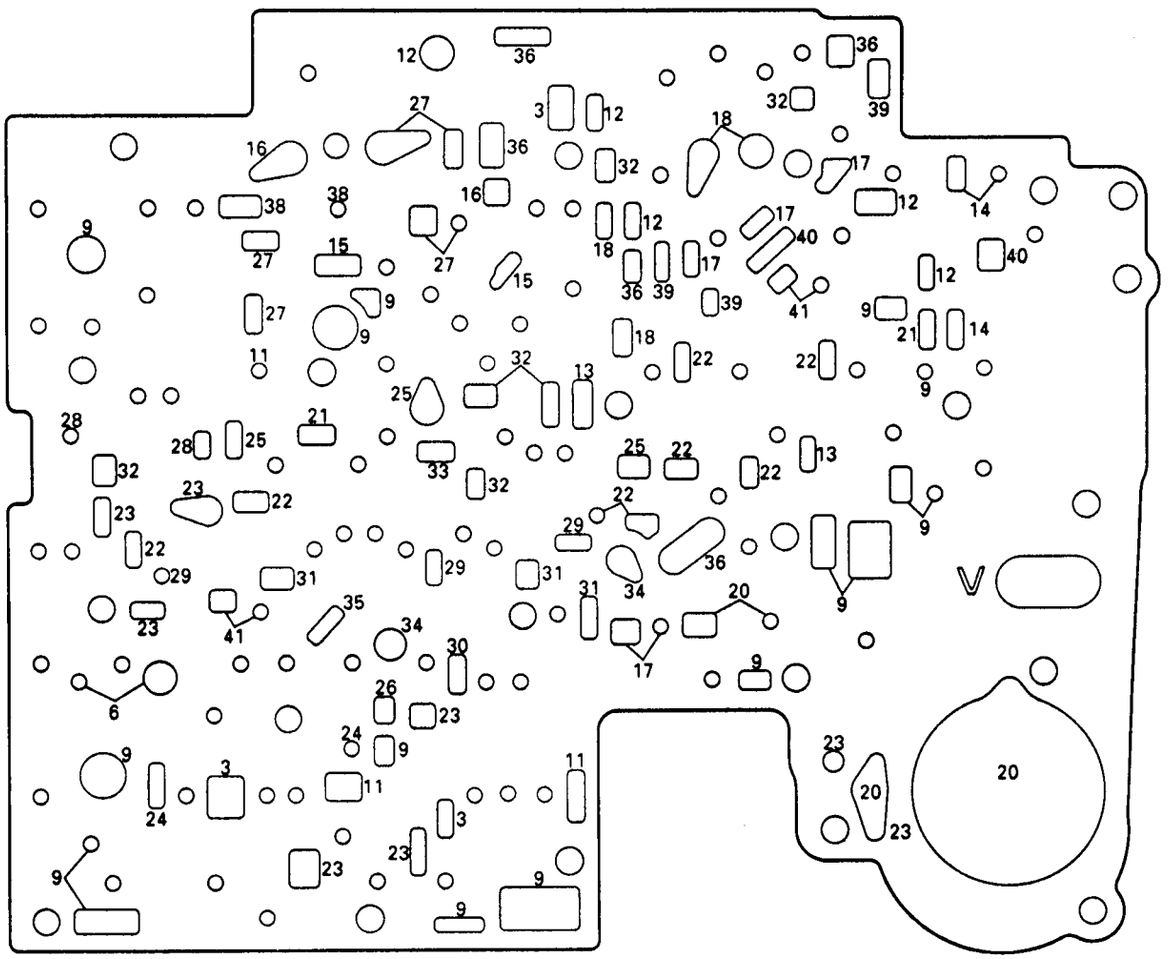
SPACER PLATE PASSAGES



ILL. NO.	DESCRIPTION
1	SUCTION (INTAKE)
2	DECREASE
3	LINE
4	CONVERTER FEED
5	RELEASE
6	APPLY (REG APPLY)
7	TO COOLER
8	LUBE FROM COOLER
9	ACTUATOR FEED LIMIT
10	FILTERED ACTUATOR FEED
11	TORQUE SIGNAL
12	PR
13	D4-3-2
14	LO/REVERSE
15	REVERSE
16	REVERSE INPUT (REV. CL.)
17	D4
18	FORWARD CLUTCH FEED
19	REAR LUBE
20	ACCUMULATOR
21	SIGNAL A
22	2ND
23	2ND CLUTCH
24	C.C. SIGNAL
25	3-4 SIGNAL
26	3RD ACCUM
27	3-4 CLUTCH
28	4TH SIGNAL
29	SERVO FEED
30	4TH
31	3-4 ACCUM
32	D3
33	OVERRUN
34	OVERRUN CLUTCH FEED
35	OVERRUN CLUTCH
36	D2
37	ORIFICED D2
38	3-2 SIGNAL
39	LO
40	LO/1ST
41	EXHAUST
42	ORIFICED EXHAUST
43	VENT
44	SEAL DRAIN
45	VOID
46	LINE PRESSURE TAP

Figure 24

VALVE BODY TO SPACER PLATE GASKET



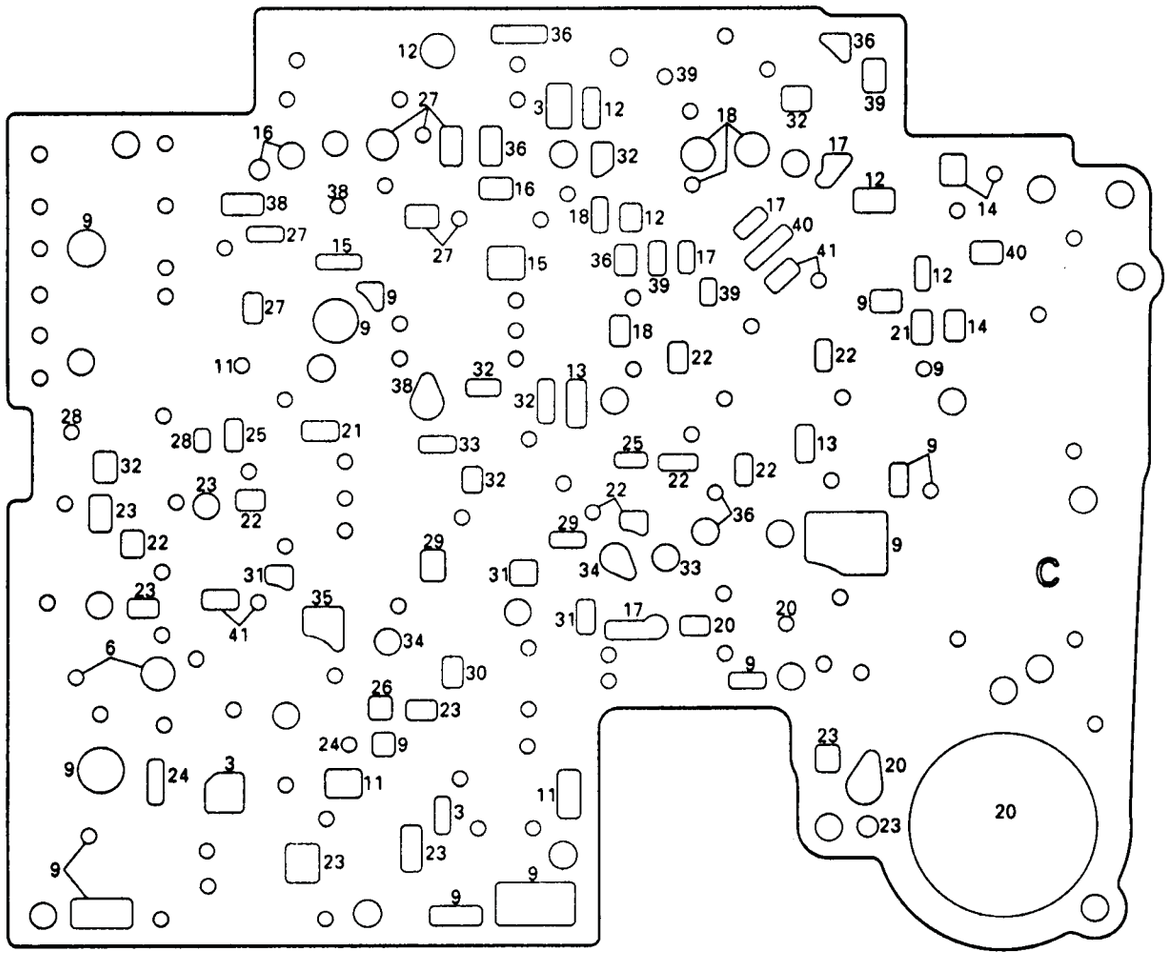
ILL. NO.	DESCRIPTION
1	SUCTION (INTAKE)
2	DECREASE
3	LINE
4	CONVERTER FEED
5	RELEASE
6	APPLY (REG APPLY)
7	TO COOLER
8	LUBE FROM COOLER
9	ACTUATOR FEED LIMIT
10	FILTERED ACTUATOR FEED
11	TORQUE SIGNAL
12	PR
13	D4-3-2
14	LO/REVERSE
15	REVERSE
16	REVERSE INPUT (REV. CL.)

ILL. NO.	DESCRIPTION
17	D4
18	FORWARD CLUTCH FEED
19	REAR LUBE
20	ACCUMULATOR
21	SIGNAL A
22	2ND
23	2ND CLUTCH
24	C.C. SIGNAL
25	3-4 SIGNAL
26	3RD ACCUM
27	3-4 CLUTCH
28	4TH SIGNAL
29	SERVO FEED
30	4TH
31	3-4 ACCUM
32	D3

ILL. NO.	DESCRIPTION
33	OVERRUN
34	OVERRUN CLUTCH FEED
35	OVERRUN CLUTCH
36	D2
37	ORIFICED D2
38	3-2 SIGNAL
39	LO
40	LO/1ST
41	EXHAUST
42	ORIFICED EXHAUST
43	VENT
44	SEAL DRAIN
45	VOID
46	LINE PRESSURE TAP

Figure 25

SPACER PLATE TO CASE GASKET

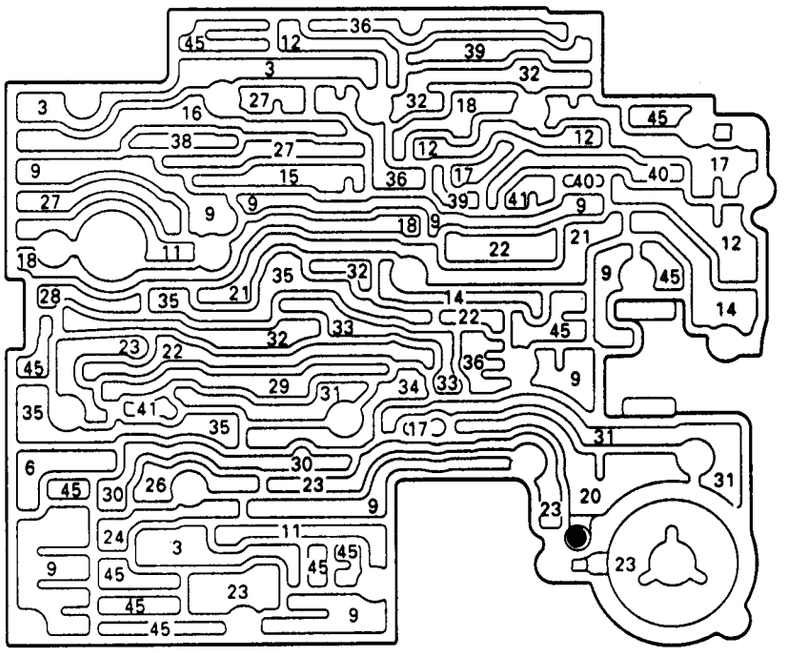


ILL. NO.	DESCRIPTION
1	SUCTION (INTAKE)
2	DECREASE
3	LINE
4	CONVERTER FEED
5	RELEASE
6	APPLY (REG APPLY)
7	TO COOLER
8	LUBE FROM COOLER
9	ACTUATOR FEED LIMIT
10	FILTERED ACTUATOR FEED
11	TORQUE SIGNAL
12	PR
13	D4-3-2
14	LO/REVERSE
15	REVERSE
16	REVERSE INPUT (REV. CL.)
17	D4
18	FORWARD CLUTCH FEED
19	REAR LUBE
20	ACCUMULATOR
21	SIGNAL A
22	2ND
23	2ND CLUTCH
24	C.C. SIGNAL
25	3-4 SIGNAL
26	3RD ACCUM
27	3-4 CLUTCH
28	4TH SIGNAL
29	SERVO FEED
30	4TH
31	3-4 ACCUM
32	D3
33	OVERRUN
34	OVERRUN CLUTCH FEED
35	OVERRUN CLUTCH
36	D2
37	ORIFICED D2
38	3-2 SIGNAL
39	LO
40	LO/1ST
41	EXHAUST
42	ORIFICED EXHAUST
43	VENT
44	SEAL DRAIN
45	VOID
46	LINE PRESSURE TAP

Figure 26

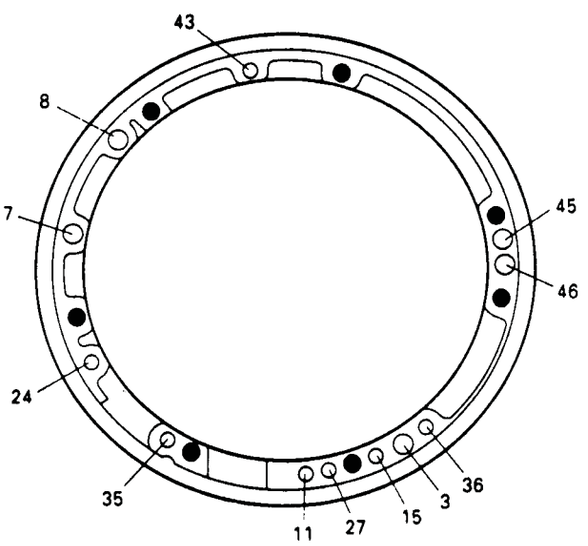
PASSAGES

3 LINE
6 APPLY (REG APPLY)
9 ACTUATOR FEED LIMIT
11 TORQUE SIGNAL
12 PR
13 D4-3-2
14 LO/REVERSE
15 REVERSE
16 REVERSE INPUT (REV. CL.)
17 D4
18 FORWARD CLUTCH FEED
20 ACCUMULATOR
21 SIGNAL A
22 2ND
23 2ND CLUTCH
24 C.C. SIGNAL
26 3RD ACCUM
27 3-4 CLUTCH
28 4TH SIGNAL
29 SERVO FEED
30 4TH
31 3-4 ACCUM
32 D3
33 OVERRUN
34 OVERRUN CLUTCH FEED
35 OVERRUN CLUTCH
36 D2
38 3-2 SIGNAL
39 LO
40 LO/1ST
41 EXHAUST
45 VOID



CASE PASSAGES AND CHECKBALL LOCATIONS

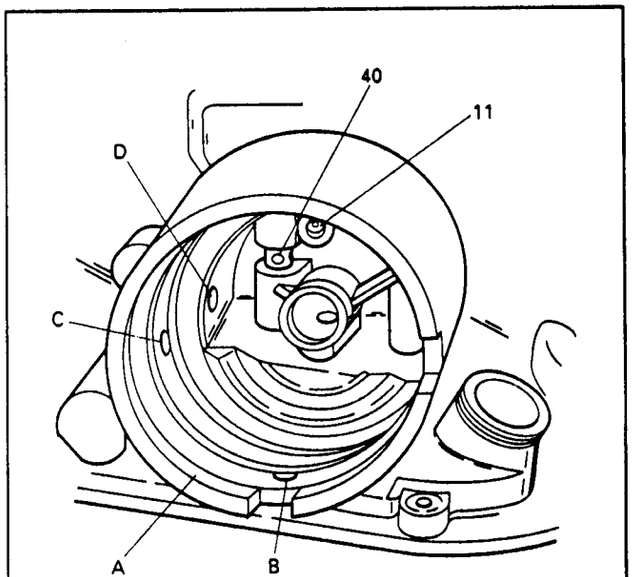
Figure 27



3 LINE
7 TO COOLER
8 LUBE FROM COOLER
11 TORQUE SIGNAL
15 REVERSE
24 C.C. SIGNAL
27 3-4 CLUTCH
35 OVERRUN CLUTCH
36 D2
43 VENT
45 VOID
46 LINE PRESSURE TAP

CASE PUMP PASSAGES

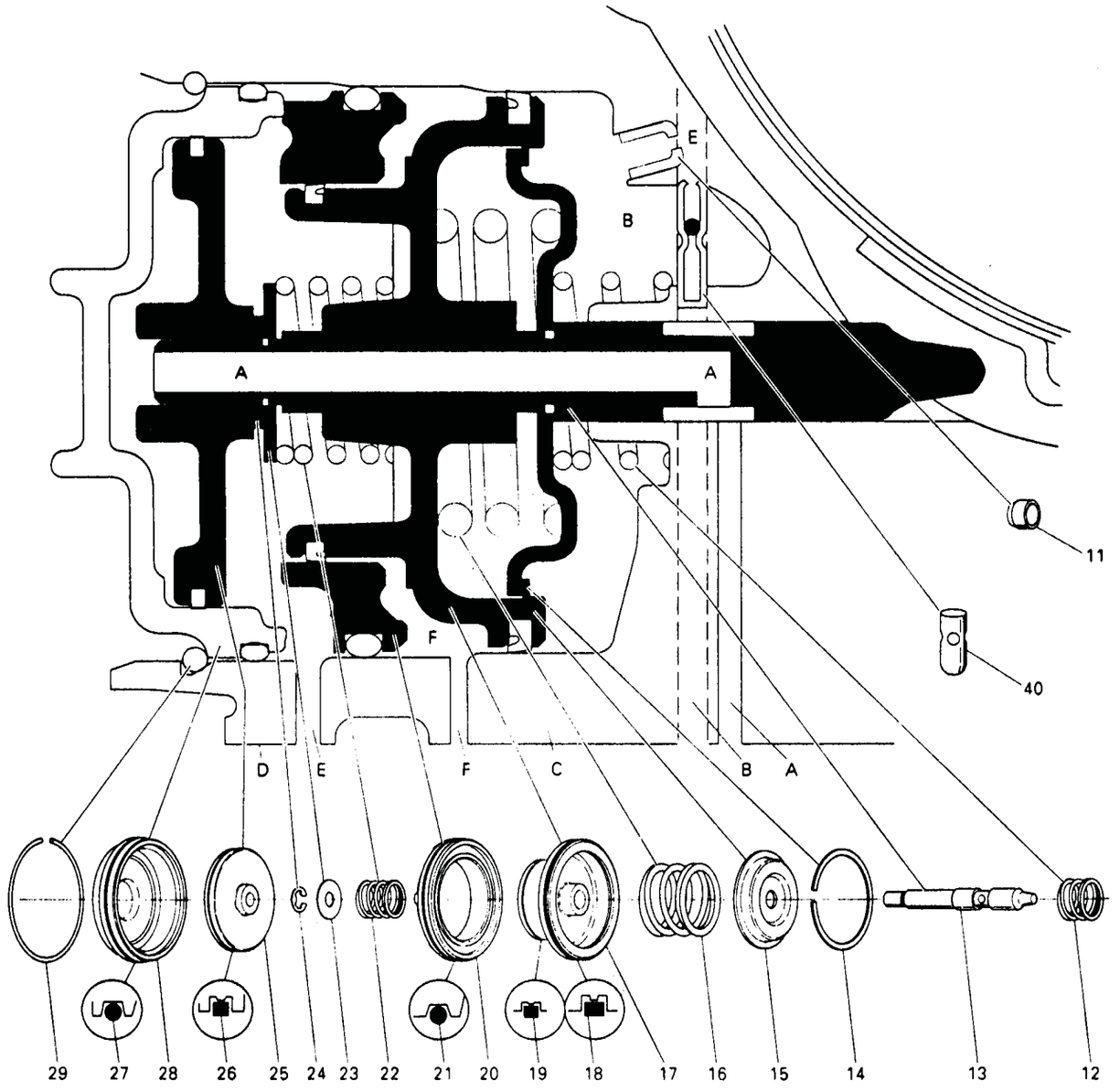
Figure 28



A 2-4 SERVO BORE
B SERVO EXHAUST HOLE
C 2ND 7 4TH BAND APPLY PASSAGE
D 3RD ACCUM. PRESSURE TAP PASSAGE
11 PLUG, CASE SERVO
40 RETAINER AND BALL ASSEMBLY, 3RD ACCUM.

2-4 SERVO PASSAGES

Figure 29

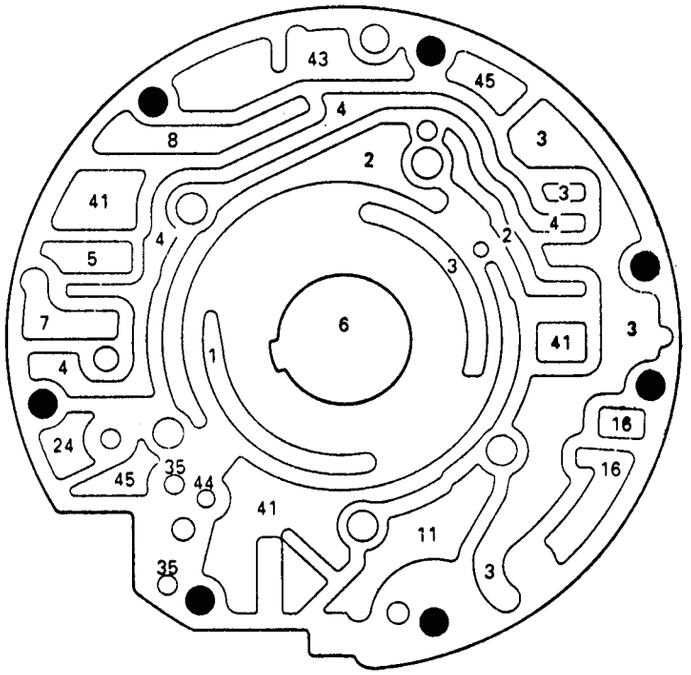


A 4TH OIL
B 3RD ACCUMULATOR OIL
C VALVE BODY FACE
D OIL PAN FLANGE
E EXHAUST
F 2ND OIL
11 PLUG, CASE SERVO
12 SPRING, SERVO RETURN
13 PIN, 2ND APPLY PISTON
14 RING, RETAINER (2ND APPLY PISTON)
15 RETAINER, SERVO CUSHION SPRING
16 SPRING, SERVO CUSHION
17 PISTON, 2ND APPLY
18 RING, OIL SEAL (2ND APPLY PISTON - OUTER)
19 RING, OIL SEAL (2ND APPLY PISTON - INNER)
20 HOUSING, SERVO PISTON (INNER)
21 SEAL, O-RING
22 SPRING, SERVO APPLY PIN
23 WASHER, SERVO APPLY PIN
24 RING, RETAINER (APPLY PIN)
25 PISTON, 4TH APPLY
26 RING, OIL SEAL (4TH APPLY PISTON - OUTER)
27 SEAL, O-RING (2-4 SERVO COVER)
28 COVER, 2-4 SERVO
29 RING, SERVO COVER RETAINING
40 RETAINER AND BALL ASSEMBLY, 3RD ACCUM.

2-4 SERVO PASSAGES

Figure 30

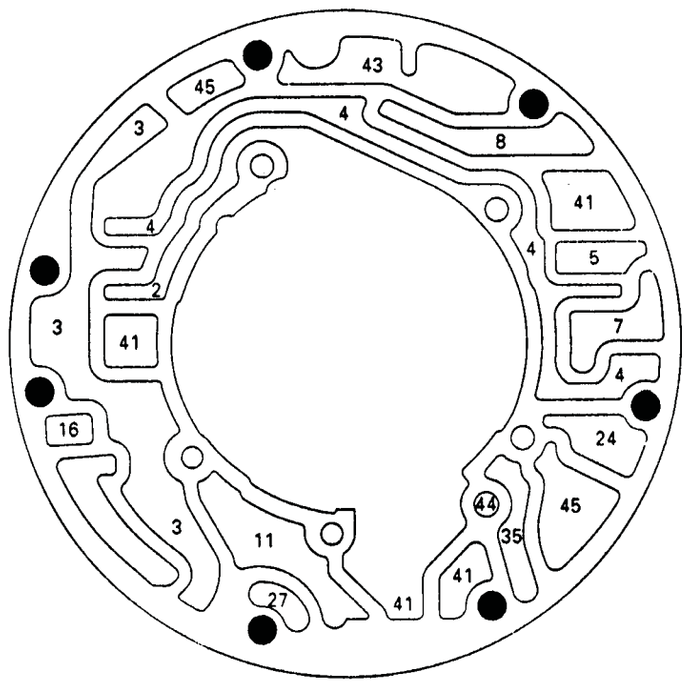
1 SUCTION (INTAKE)
2 DECREASE
3 LINE
4 CONVERTER FEED
5 RELEASE
6 APPLY (REG APPLY)
7 TO COOLER
8 LUBE FROM COOLER
11 TORQUE SIGNAL
16 REVERSE INPUT (REV. CL.)
24 C.C. SIGNAL
35 OVERRUN CLUTCH
41 EXHAUST
43 VENT
44 SEAL DRAIN
45 VOID



PUMP COVER PASSAGES

Figure 31

2 DECREASE
3 LINE
4 CONVERTER FEED
5 RELEASE
7 TO COOLER
8 LUBE FROM COOLER
11 TORQUE SIGNAL
16 REVERSE INPUT (REV. CL.)
24 C.C. SIGNAL
27 3-4 CLUTCH
35 OVERRUN CLUTCH
41 EXHAUST
43 VENT
44 SEAL DRAIN
45 VOID



PUMP BODY PASSAGES

Figure 32

TRANSMISSION DISASSEMBLY

1. Thoroughly clean the exterior of the transmission case.
2. Install holding fixture J-8763-02 onto the transmission case as shown in Figure 33.
3. Install holding fixture into the base as shown in Figure 33.
4. Drain the transmission fluid out the extension housing by rotating so the bell housing is facing up.
5. Rotate transmission so that bottom pan is facing up (See Figure 34).
6. Install servo cover compressor shown in Figure 34 if necessary.
7. Remove servo cover snap ring and the 2-4 servo cover (See Figure 34).
8. If the servo cover seems to be hung on the "O" ring, cut and remove the "O" ring seal before removing cover.
9. Remove the 2-4 servo assembly (See Figure 34).
10. As a diagnostic aid, the servo pin length should be checked at this time to determine if it is too short or too long.
11. Install band apply pin tool J-33037 with the apply pin (See Figure 35).
12. Install servo cover retaining ring to secure tool (See Figure 35).
13. Apply 98 in.lb. of torque, and if the white line "A" appears in gage slot "B" the pin length is correct (Figure 35).
14. Use pin selection chart in Figure 35 to determine correct pin length if new pin is required.
15. Install piston compressor J-22269-01 and remove retaining ring as shown in Figure 36.

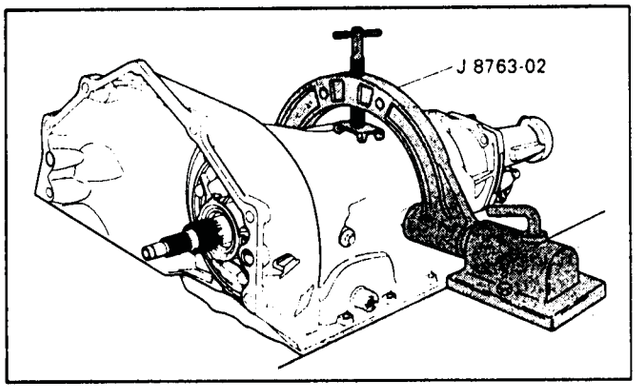
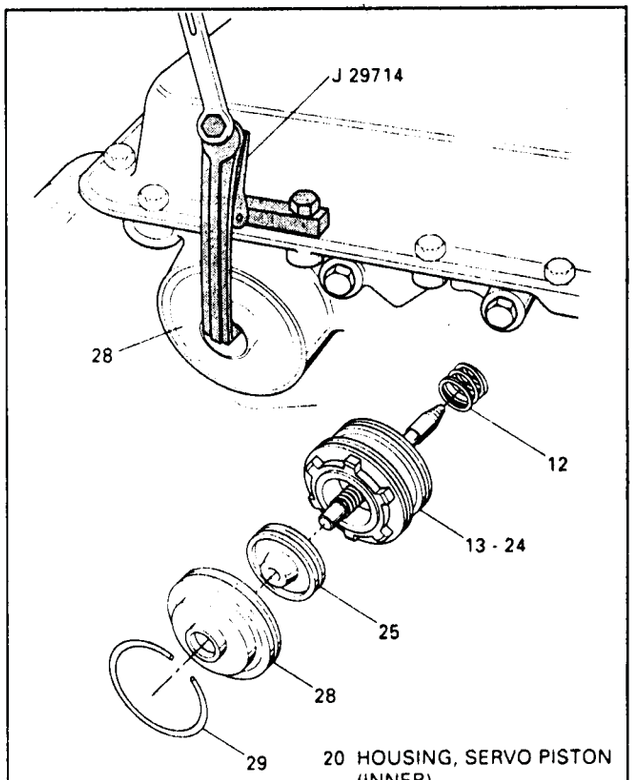


Figure 33

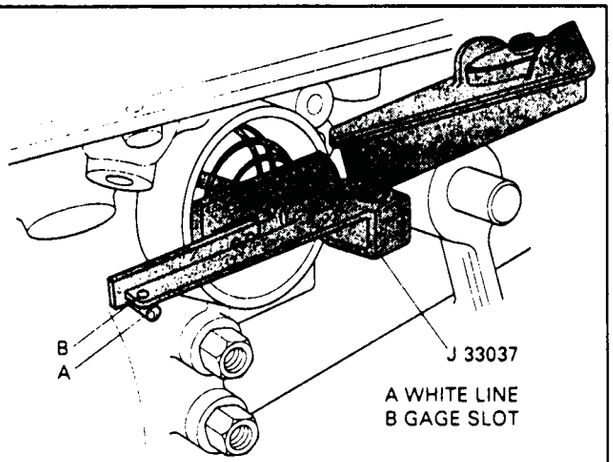


12 SPRING, SERVO RETURN
13 PIN, 2ND APPLY PISTON
14 RING, RETAINER (2ND APPLY PISTON)
15 RETAINER, SERVO CUSHION SPRING
16 SPRING, SERVO CUSHION
17 PISTON, 2ND APPLY
18 RING, OIL SEAL (2ND APPLY PISTON - OUTER)
19 RING, OIL SEAL (2ND APPLY PISTON - INNER)
20 HOUSING, SERVO PISTON (INNER)
21 SEAL, O-RING
22 SPRING, SERVO APPLY PIN
23 WASHER, SERVO APPLY PIN
24 RING, RETAINER (APPLY PIN)
25 PISTON, 4TH APPLY
28 COVER, 2-4 SERVO
29 RING, SERVO COVER RETAINING

Figure 34

16. Remove cushion spring retainer, cushion spring from 2nd apply piston.
17. Use Figure 37 for parts identification and disassembly procedures.

(Continued on Page 34)

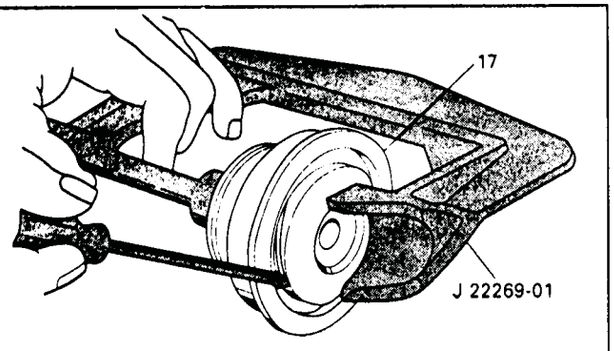


PIN IS PRESET AT FACTORY AND MUST NOT BE READJUSTED

2-4 SERVO PIN SELECTION

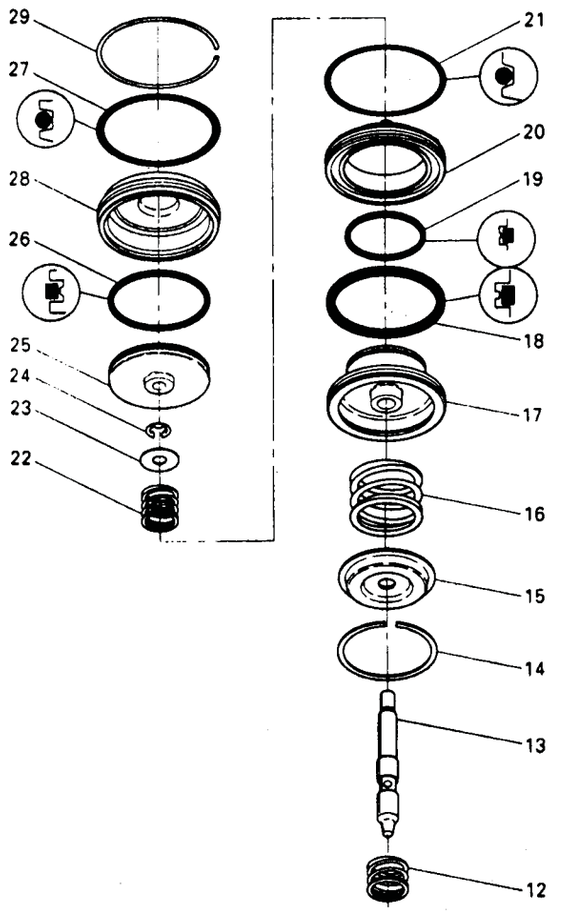
PIN LENGTH		PIN I.D.
MM	INCH	
65.82-66.12	2.59-2.60	1 GROOVE
67.23-67.53	2.65-2.66	2 GROOVES
68.64-68.94	2.70-2.71	NO GROOVE

Figure 35



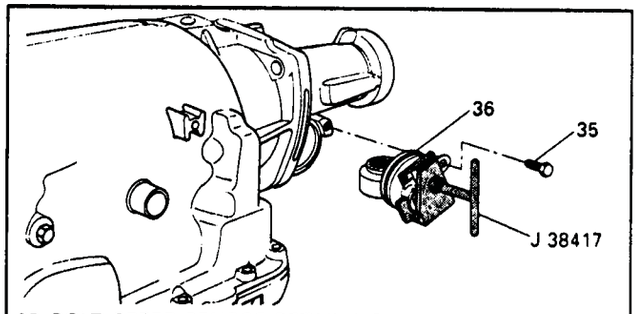
17 SECOND APPLY PISTON

Figure 36



ILL. NO.	DESCRIPTION
12	SPRING, SERVO RETURN
13	PIN, 2ND APPLY PISTON
14	RING, RETAINER (2ND APPLY PISTON)
15	RETAINER, SERVO CUSHION SPRING
16	SPRING, SERVO CUSHION
17	PISTON, 2ND APPLY
18	RING, OIL SEAL (2ND APPLY PISTON - OUTER)
19	RING, OIl. SEAL (2ND APPLY PISTON - INNER)
20	HOUSING, SERVO PISTON (INNER)
21	SEAL, O-RING
22	SPRING, SERVO APPLY PIN
23	WASHER, SERVO APPLY PIN
24	RING, RETAINER (APPLY PIN)
25	PISTON, 4TH APPLY
26	RING, OIL SEAL (4TH APPLY PISTON - OUTER)
27	SEAL, O-RING (2-4 SERVO COVER)
28	COVER, 2-4 SERVO
29	RING, SERVO COVER RETAINING

Figure 37



35 BOLT, SPEED SENSOR RETAINING
36 SPEED SENSOR, INTERNAL TRANSMISSION

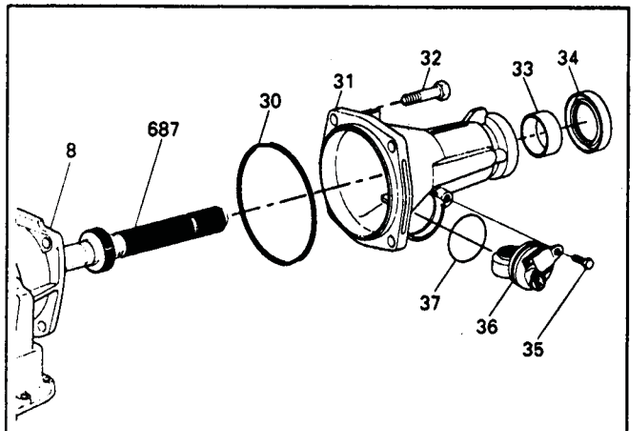
Figure 38

Continued from Page 32.

18. Remove speed sensor retaining bolt if so equipped. Four wheel drive speed sensor is located in Transfer Case.
19. Remove speed sensor assembly and the "O" ring seal using J-38417 tool as shown in Figure 38.
20. Remove 4 extension housing bolts, extension housing and "O" ring seal as shown in Figure 39.
21. Remove output shaft sleeve and the "O" ring, if so equipped. Not all models use an output shaft sleeve and seal.
22. Remove the bottom pan bolts, oil pan, and the bottom pan gasket as shown in Figure 40.
23. Remove the oil filter and filter seal. Filter seal may be stuck in pump bore.

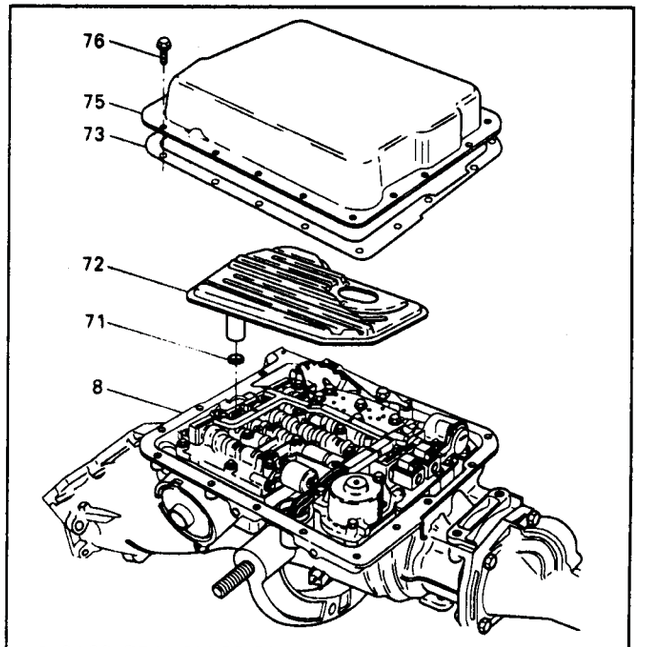
NOTE:
Open the bottom pan filter by prying the metal crimping away from the top of the filter (Black Section) and seperate. The filter may contain some evidence for root cause diagnosis, such as clutch material, bronze chips indicating bushing wear, or steel particles.

(Continued on next Page).



ILL. NO.	DESCRIPTION
8	CASE, TRANSMISSION
30	SEAL, CASE EXTENSION TO CASE
31	EXTENSION, CASE
32	BOLT, CASE EXTENSION TO CASE
33	BUSHING, CASE EXTENSION
34	SEAL ASSEMBLY, CASE EXTENSION OIL
35	BOLT, SPEED SENSOR RETAINING
36	SPEED SENSOR, INTERNAL TRANSMISSION
37	SEAL, O-RING (ITSS TO CASE EXTENSION)
687	SHAFT, OUTPUT

Figure 39



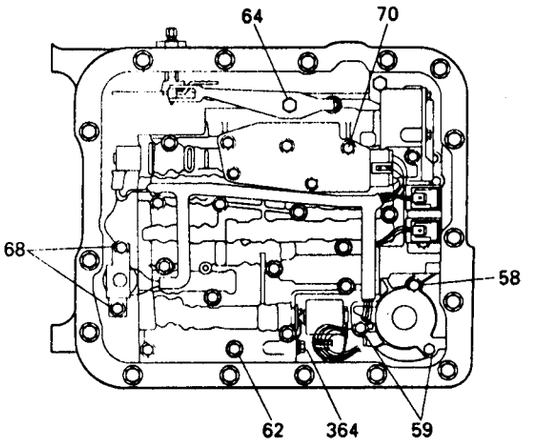
8 CASE, TRANSMISSION
71 SEAL, FILTER
72 FILTER ASSEMBLY, TRANSMISSION OIL
73 GASKET, TRANSMISSION OIL PAN
75 PAN, TRANSMISSION OIL
76 SCREW, TRANSMISSION OIL PAN

Figure 40

Continued from Page 34

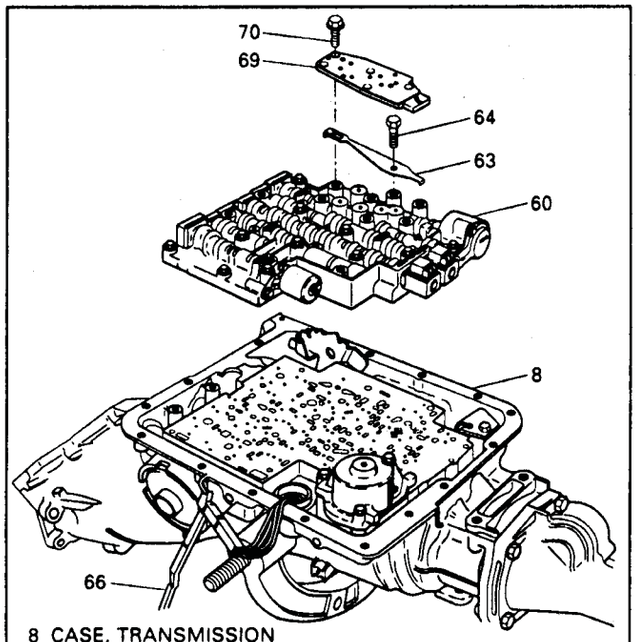
24. Disconnect electrical connectors from shift solenoids, force motor, 3-2 downshift solenoid, pressure switch assembly.
    NOTE: Use extreme care when removing these connectors so as not to break them.
25. Remove the 3 wiring harness retaining bolts, and gently remove the case connector from the case bore.
26. Remove the lock-up solenoid retaining bolts, and remove the solenoid from the pump.
27. Remove the wiring harness and lock-up solenoid assembly from the case.
28. Remove the pressure switch assembly retaining bolts, and the pressure switch assembly.
29. Remove the manual lever detent spring retaining bolt and the detent spring.
30. Remove the remaining valve body bolts and lift the valve body from the case while manuvering the valve body to disconnect the manual link from the manual valve.
31. Refer to Figures 41 and 42.

(Continued on Page 36).



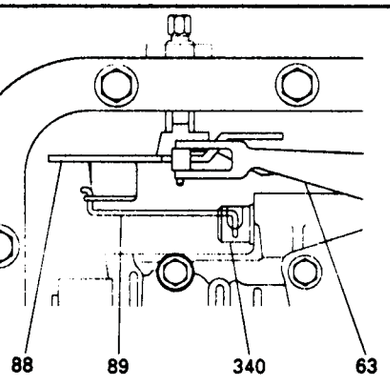
58 BOLT, ACCUMULATOR COVER
59 BOLT, ACCUMULATOR COVER
62 BOLT, VALVE BODY
64 BOLT, MANUAL DETENT SPRING
68 BOLT, HEX WASHER HEAD (SOLENOID)
70 BOLT, PRESSURE SWITCH ASSEMBLY
364 BOLT, FORWARD ACCUMULATOR COVER

Figure 41



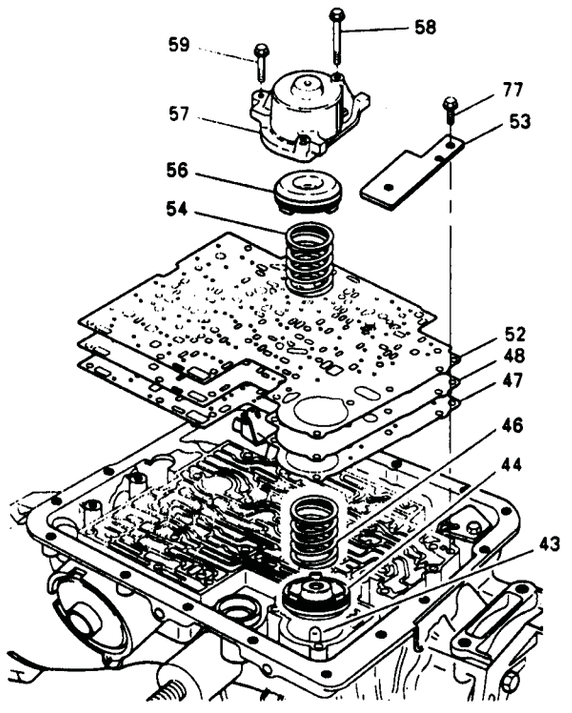
8 CASE, TRANSMISSION
60 VALVE ASSEMBLY, CONTROL BODY
63 SPRING ASSEMBLY, MANUAL DETENT
64 BOLT, MANUAL DETENT SPRING
66 SOLENOID ASSEMBLY, WIRING HARNESS AND
69 SWITCH ASSEMBLY, TRANSMISSION PRESSURE
70 BOLT, PRESSURE SWITCH ASSEMBLY

Figure 42



63 SPRING ASSEMBLY, MANUAL DETENT
88 LEVER, INSIDE DETENT
89 LINK, MANUAL VALVE
340 VALVE, MANUAL

Figure 43



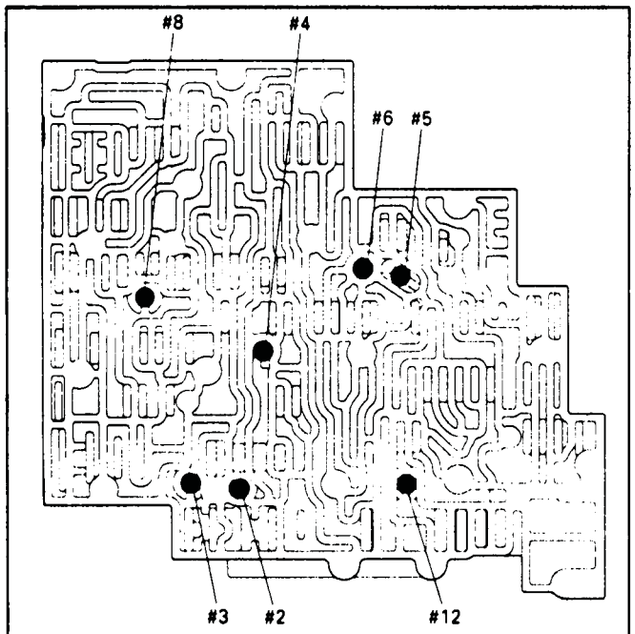
43 PIN, ACCUMULATOR PISTON
44 PISTON, 3-4 ACCUMULATOR
46 SPRING, 3-4 ACCUMULATOR
47 GASKET, SPACER PLATE TO CASE
48 PLATE, VALVE BODY SPACER
52 GASKET, SPACER PLATE TO VALVE BODY
53 PLATE, SPACER PLATE SUPPORT
54 SPRING, 1-2 ACCUMULATOR
56 PISTON, 1-2 ACCUMULATOR
57 COVER AND PIN ASSEMBLY, 1-2 ACCUMULATOR
58 BOLT, ACCUMULATOR COVER
59 BOLT, ACCUMULATOR COVER
77 BOLT, SPACER PLATE SUPPORT

Figure 44

Continued from Page 35.

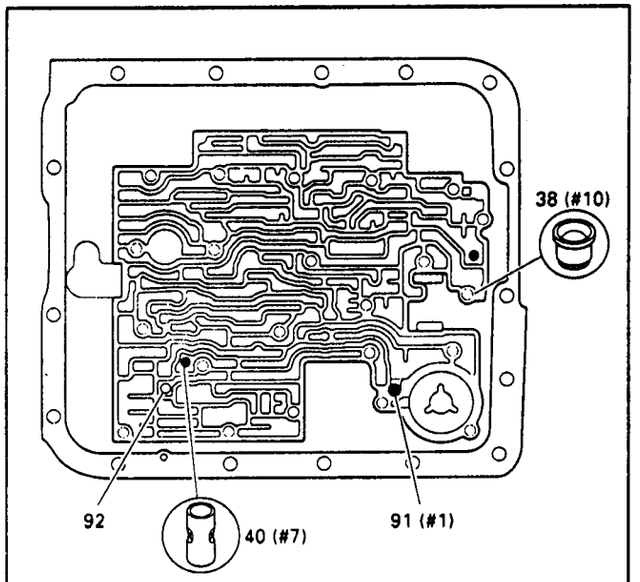
32. Remove 3 bolts from spacer plate support plate, and remove support plate.
33. Remove the 1-2 accumulator bolts, and remove the accumulator assembly.
34. Remove the 3-4 accumulator spring and 3-4 accumulator piston from the case.
35. Refer to Figure 44.
36. There are seven checkballs located in the valve body, all of which are .250" in diameter, and their locations are shown in Figure 45.
37. There is only one checkball located in the case, which is also .250" diameter, and its location is shown in Figure 46.

(Continued on Page 38).



2 3RD ACCUMULATOR
3 REVERSE INPUT
4 3-4 CLUTCH EXHAUST
5 OVERRUN CLUTCH FEED
6 OVERRUN CLUTCH CONTROL
8 1-2 UPSHIFT
12 FORWARD CLUTCH ACCUM.

Figure 45



38 PLUG, TRANSMISSION CASE (ACCUM. BLEED)
40 RETAINER AND BALL ASSEMBLY, 3RD ACCUM.
91 NO. 10 CHECKBALL
92 SCREEN, TCC

Figure 46

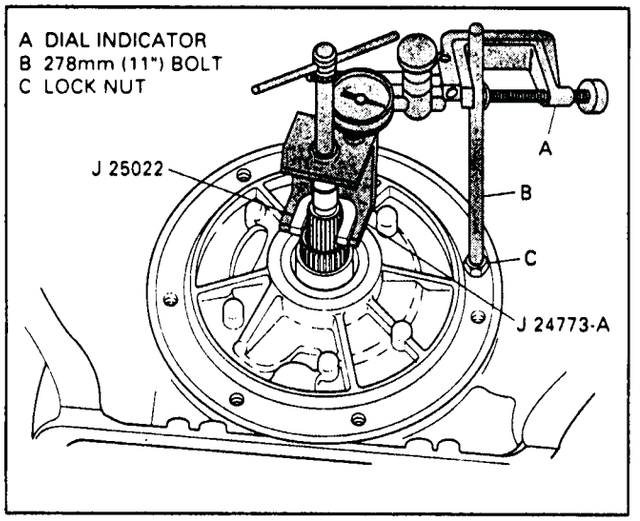


Figure 47

Continued from Page 36.

38. Rotate transmission to an upright (Pump Facing Up) as shown in Figure 47.
39. As a diagnostic aid, transmission end play should be checked before removing the oil pump. If the end play is not within specifications, you should watch for possible worn or misassembly of parts during disassembly.
40. Install dial indicator using adapter as needed (Figure 48) and lifting tool J-24773-A as shown in Figure 47.
41. Set dial indicator to zero.
42. Pull up on lifting tool J-24773-A, and observe reading.
43. End play should be .015" to .036".
    NOTE: NEVER set end play any closer than .015", because aluminum pump will expand or "Grow" and you could end up with a negative end play.
44. Record end play reading.
45. Remove "O" ring seal from the turbine shaft if you have not already done so.
46. Install oil pump remover and adapter as shown in Figure 49.
47. Remove all oil pump retaining bolts and "O" rings.
48. Remove oil pump assembly using the J-37789 remover (Figure 49).

(Continued on next Page).

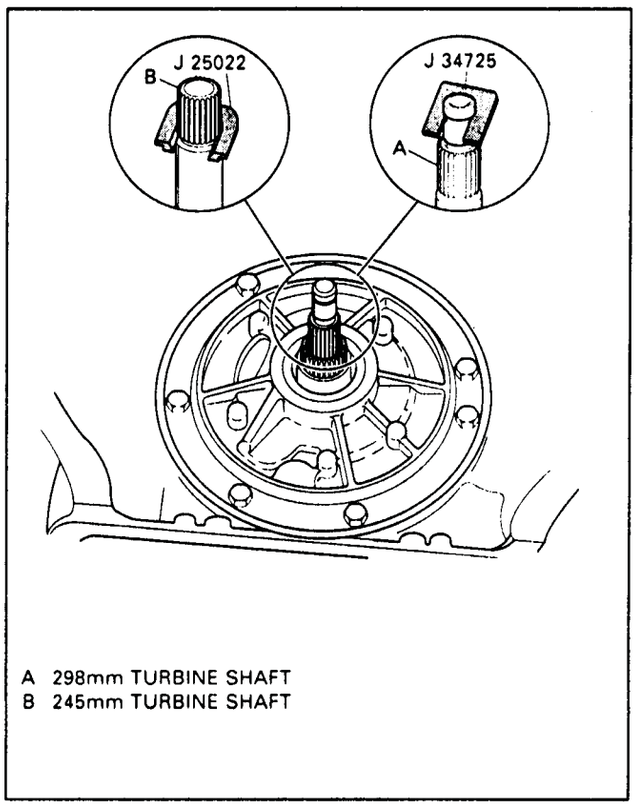


Figure 48

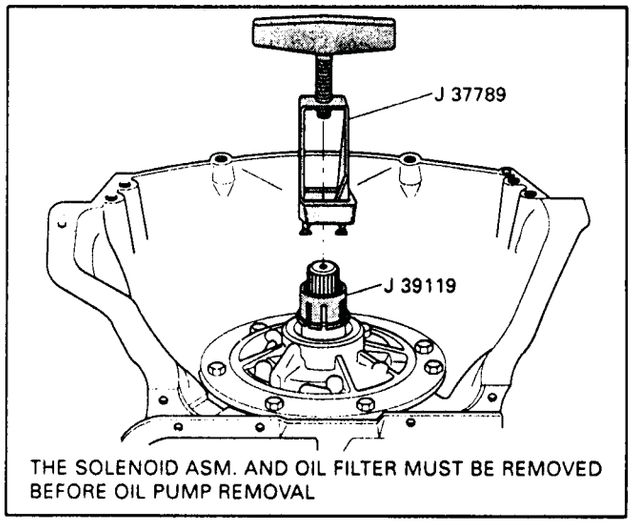
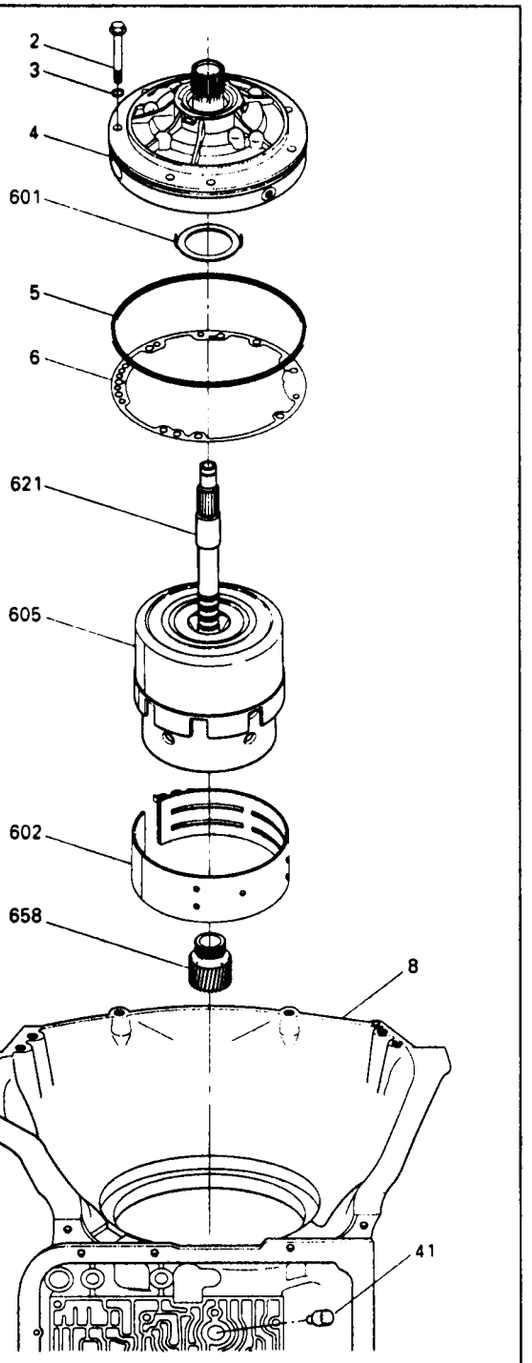
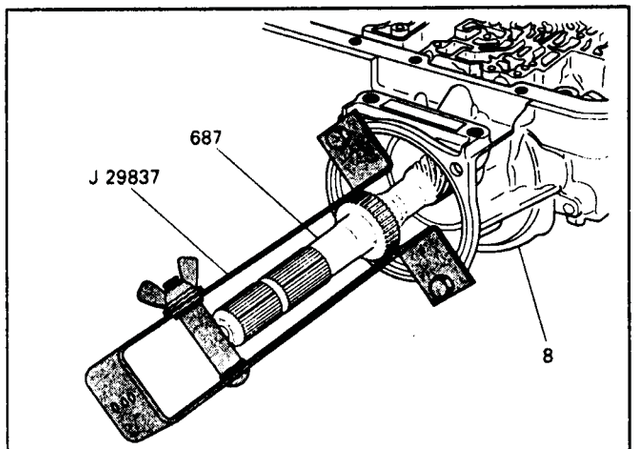


Figure 49



2 BOLT, PUMP TO CASE
3 O-RING, PUMP TO CASE BOLT
4 PUMP ASSEMBLY, OIL
5 SEAL, OIL (PUMP TO CASE)
6 GASKET, PUMP COVER TO CASE
8 CASE, TRANSMISSION
41 PIN, BAND ANCHOR
601 WASHER, THRUST (PUMP TO DRUM)
602 BAND ASSEMBLY, 2-4
605 HOUSING AND DRUM ASSEMBLY, REVERSE INPUT CLUTCH
621 HOUSING AND SHAFT ASSEMBLY, INPUT
658 GEAR, INPUT SUN

Figure 50

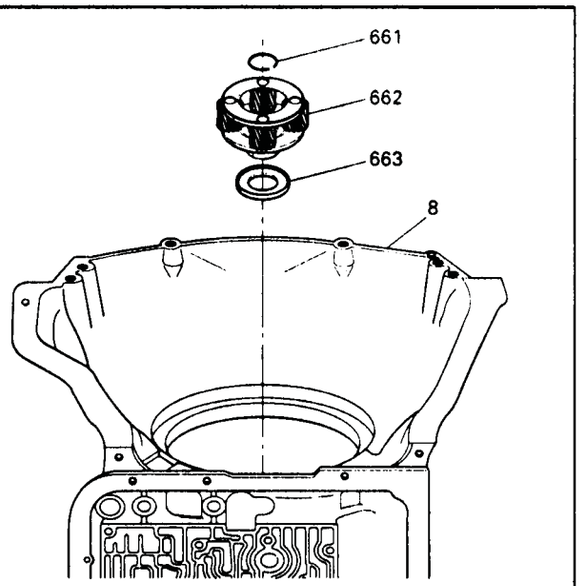


8 CASE, TRANSMISSION
687 SHAFT, OUTPUT

Figure 51

49. Remove band anchor pin from valve body side of case (See Figure 50).
50. Remove the input housing and reverse input housing together by grasping the turbine shaft and lifting (Figure 50).
51. Remove the 2-4 band assembly.
52. Remove the input sun gear from the input carrier.
53. Set the oil pump, input housing, and reverse input housing aside for the component disassembly.
54. Install J-29837 on case as shown in Figure 51, to protect output shaft from falling out during disassembly when the next snap ring is removed.

(Continued on Page 40).

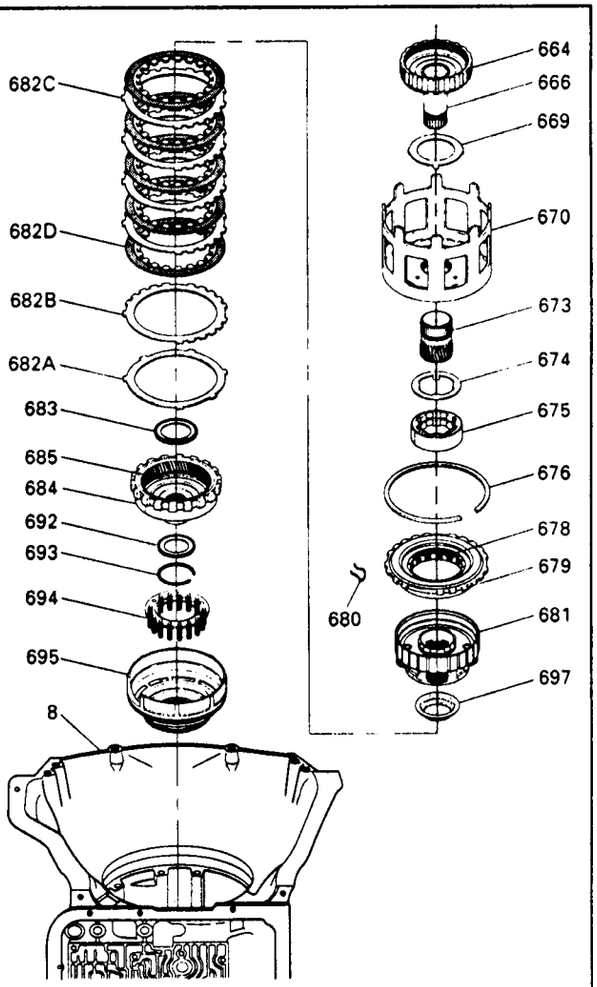


8 CASE, TRANSMISSION
661 RET., OUTPUT SHAFT TO INPUT CARRIER
662 CARRIER ASSEMBLY, INPUT (COMPLETE)
663 BEARING ASSEMBLY, THRUST (INPUT CARRIER TO REACTION SHAFT)

Figure 52

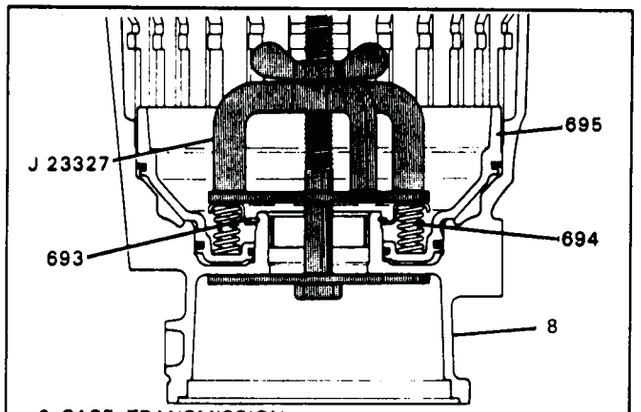
Continued from Page 39.

55. Remove the snap ring from the output shaft that is retaining the input carrier (See Figure 52).
56. Remove the output shaft at this time. NOTE: The manufacturer assembles the output shaft and reaction ring gear with adhesive, or a staking process for ease of assembly. If these parts have not become seperated during use, the output shaft will come out later along with the reaction ring gear.
57. Remove the input carrier and thrust bearing as shown in Figure 52.
58. Remove input ring gear and the thrust washer as shown in Figure 53.
59. Remove the reaction sun shell and the reaction sun gear (See Figure 53).
60. Remove thrust washer from the top of low roller clutch inner race as shown in Figure 53.
61. Remove snap ring from case that is retaining the low roller clutch support as shown in Figure 53.
62. Remove the low roller clutch assembly from the case.



8 CASE, TRANSMISSION
664 GEAR, INPUT INTERNAL
666 SHAFT, REACTION CARRIER
669 WASHER, THRUST (REACTION SHAFT/SHELL)
670 SHELL, REACTION SUN
673 GEAR, REACTION SUN
674 WASHER, THRUST (RACE/REACTION SHELL)
675 RACE, LO AND REVERSE ROLLER CLUTCH
676 RING, LO AND REVERSE SUPPORT TO CASE RETAINER
678 CLUTCH ASSEMBLY, LO AND REVERSE ROLLER
679 SUPPORT ASM., LO AND REVERSE CLUTCH
680 SPRING, TRANSMISSION (LO AND REVERSE CLUTCH SUPPORT RETAINER)
681 CARRIER ASSEMBLY, REACTION
682A PLATE, LO AND REVERSE CLUTCH (WAVED)
682B PLATE, SPACER LO AND REVERSE CLUTCH (SELECTIVE)
682C PLATE ASSEMBLY, LO AND REVERSE CLUTCH (FIBER)
682D PLATE, LO AND REVERSE CLUTCH (STEEL)
683 BEARING ASSEMBLY, THRUST (REACTION CARRIER/ SUPPORT)
684 GEAR, INTERNAL REACTION
685 SUPPORT, INTERNAL REACTION GEAR
692 BRG., REACTION GEAR SUPPORT TO CASE
693 RING, LO AND REVERSE CLUTCH RETAINER
694 SPRING ASSEMBLY, LO AND REVERSE CLUTCH
695 PISTON, LO AND REVERSE CLUTCH
697 DEFLECTOR, OIL (HIGH OUTPUT MODELS ONLY)

Figure 53



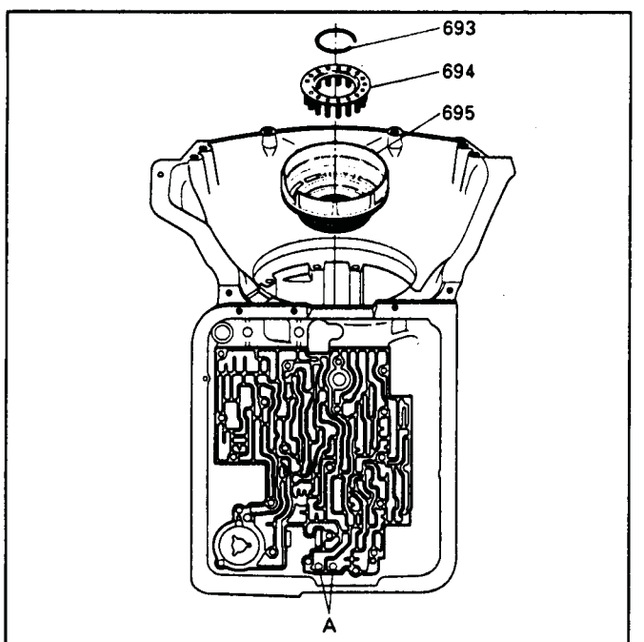
8 CASE, TRANSMISSION
693 RING, LO AND REVERSE CLUTCH RETAINER
694 SPRING ASSEMBLY, LO AND REVERSE CLUTCH
695 PISTON, LO AND REVERSE CLUTCH

Figure 54

63. Remove the anti-clunk spring from the case (See Figure 53).
64. Remove the low/reverse clutch plates from the case (See Figure 53).
65. Remove the reaction carrier, output shaft (If Still Attached), and the reaction ring gear at one time by lifting up on shaft.
66. Remove reaction ring gear bearing from case, or it may be stuck to the back of reaction ring gear.
67. Remove bolts from parking bracket and remove the parking lock bracket.
68. Install clutch spring compressor tool J-23327 as shown in Figure 54.
69. Compress the return spring and remove the snap ring from case boss.
70. Remove the spring compressor and the low/reverse return spring assembly.
71. Remove the low/reverse clutch piston by applying regulated air pressure to the case apply passages marked "A" in Figure 55.

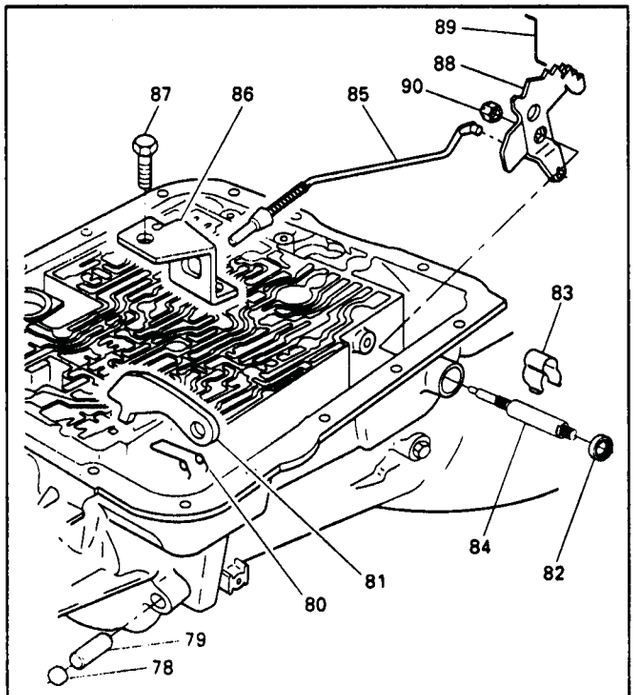
IF NECESSARY:

72. Remove the manual shaft inside nut.
73. Remove the manual shaft retainer and the manual shaft.
74. Remove the inside detent lever that we call the rooster comb, and the parking lock actuator assembly.
75. Remove the manual shaft seal from the case with small screwdriver.
76. Refer to Figure 56.



A APPLY AIR PRESSURE HERE TO REMOVE LO AND REVERSE PISTON FROM THE CASE
693 RING, LO AND REVERSE CLUTCH RETAINER
694 SPRING ASSEMBLY, LO AND REVERSE CLUTCH
695 PISTON, LO AND REVERSE CLUTCH

Figure 55



78 PLUG, STEEL CUP
79 SHAFT, PARKING BRAKE PAWL
80 SPRING, PARKING PAWL RETURN
81 PAWL, PARKING BRAKE
82 SEAL, MANUAL SHAFT
83 RETAINER, MANUAL SHAFT
84 SHAFT, MANUAL
85 ACTUATOR ASSEMBLY, PARKING LOCK
86 BRACKET, PARKING LOCK
87 BOLT, PARKING LOCK BRACKET
88 LEVER, INSIDE DETENT
89 LINK, MANUAL VALVE
90 NUT, HEX HEAD

Figure 56

CLEANING PROCEDURE

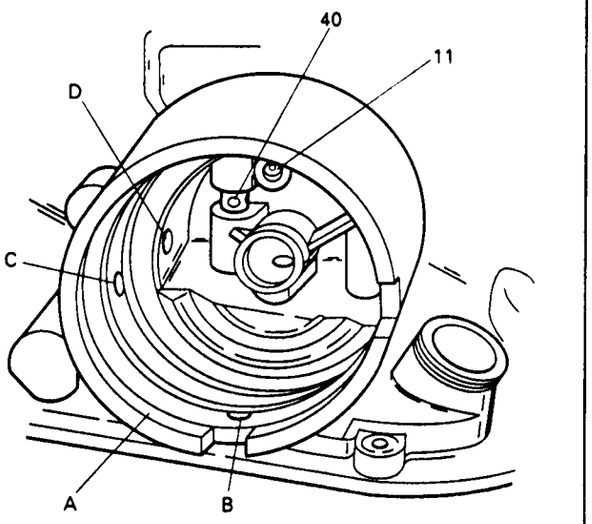
1. Completely disassemble all components and clean all parts thoroughly with solvent or the equivalent.
2. Dry all parts with compressed air, DO NOT wipe clean with cloth.

TRANSMISSION REASSEMBLY AND COMPONENT REBUILD PROCEDURE

1. The assembly of some components will require use of an assembly lube. It is recommended that "TransJel" or the equivalent be used during assembly.

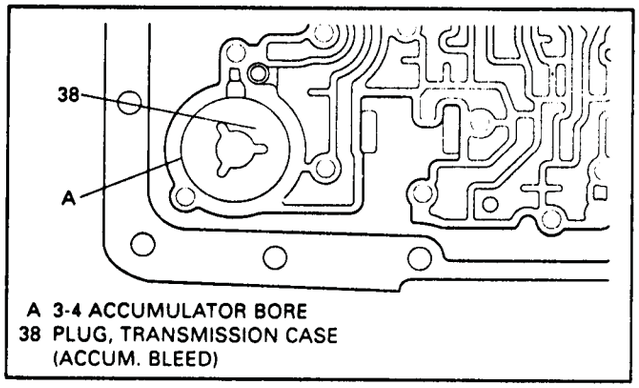
NOTE: Do not use any type of grease to retain any parts during assembly of this unit. Greases other than the recommended assembly lube will change fluid characteristics and cause undesirable shift conditions and/or filter clogging.

2. Thoroughly inspect the case assembly for any damage, including all case passages and bores.
3. Repair any damaged threaded holes with heli-coils.
4. Insure that the orifice cup plugs are still in the servo bore, and the 3-4 accumulator bore (See Figures 57 & 59).
5. Replace case bushing as necessary.
6. Install both cooler line fittings and torque to 28 ft.lb.
7. INSPECT 3RD ACCUM CAPSULE FOR LEAKAGE.
   1. Install the servo assembly into the servo bore and install snap ring.
   2. Pour a suitable solvent into the accumulator bore from the valve body side.
   3. Watch for leakage inside the barrel of the case.
   4. If leakage is observed, replace the 3rd accumulator capsule assembly.
   5. Refer to Figure 58.
8. IF REPLACEMENT IS NECESSARY.
   1. Remove the old capsule assembly with a number 4 screw extractor.
   2. Install the new capsule assembly using a 3/8" diameter metal rod shown in Figure 60.
   3. Install capsule so that "Windows" in the capsule are as shown in Figure 57, viewed thru the servo bore
   4. Depth from case should be Approx. 1.653" (See Figure 60).



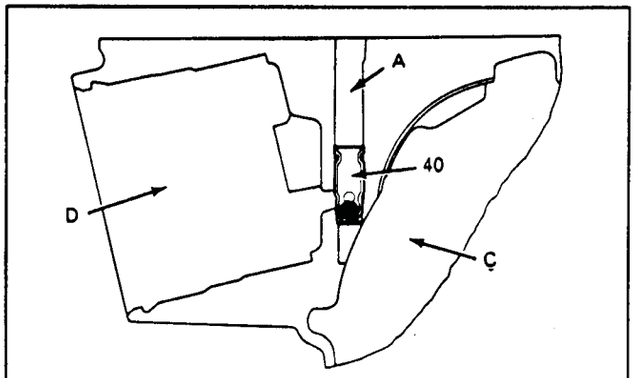
A 2-4 SERVO BORE
B SERVO EXHAUST HOLE
C 2ND 7 4TH BAND APPLY PASSAGE
D 3RD ACCUM. PRESSURE TAP PASSAGE
11 PLUG, CASE SERVO
40 RETAINER AND BALL ASSEMBLY, 3RD ACCUM.

Figure 57



A 3-4 ACCUMULATOR BORE
38 PLUG, TRANSMISSION CASE (ACCUM. BLEED)

Figure 59



A 3RD ACCUMULATOR BORE
C CASE INTERIOR
D 2-4 SERVO BORE
40 RETAINER & BALL ASSEMBLY, 3RD ACCUM.

Figure 58

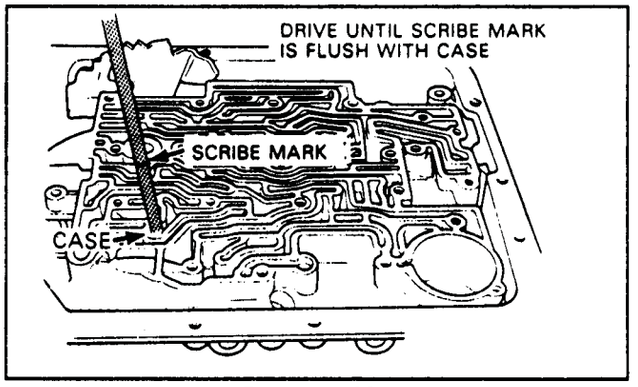
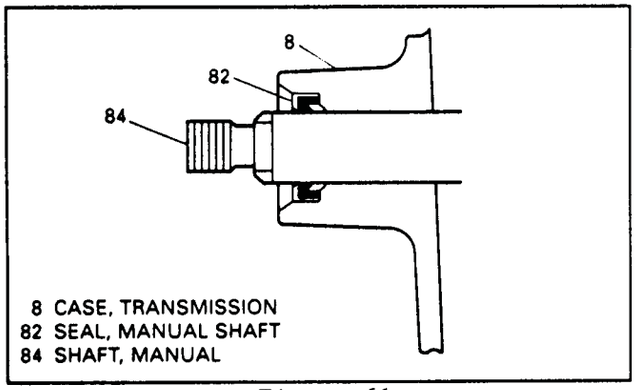


Figure 60

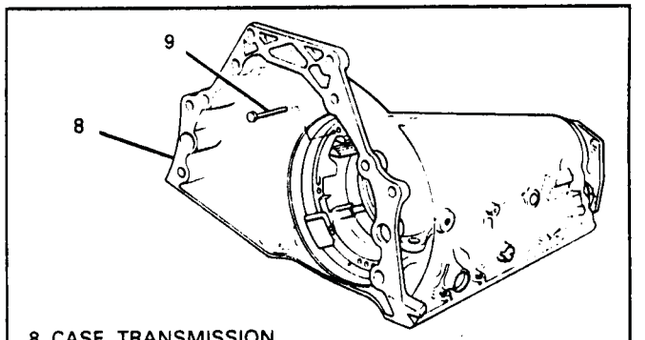
9. Install new manual shaft seal into the case with a 9/16" deep socket, and ensure that it is recessed as shown in Figure 61.
10. Lubricate manual shaft with TransJel and install into the case bore.
11. Install parking rod into the rooster comb and install on manual shaft on the inside, making sure that the flats are engaged on the manual shaft.
12. Install the inside manual shaft nut on the manual shaft and torque to 23 ft.lb.
13. Install the manual shaft retainer onto the manual shaft.
14. Refer to Figure 56 for assembly.

(Continued on next Page).



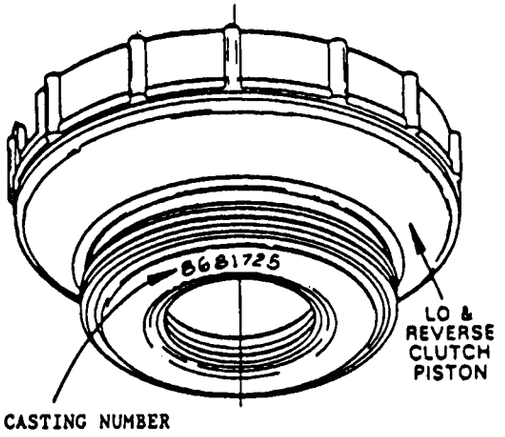
8 CASE, TRANSMISSION
82 SEAL, MANUAL SHAFT
84 SHAFT, MANUAL

Figure 61



8 CASE, TRANSMISSION
9 VENT ASSEMBLY, TRANSMISSION

Figure 62

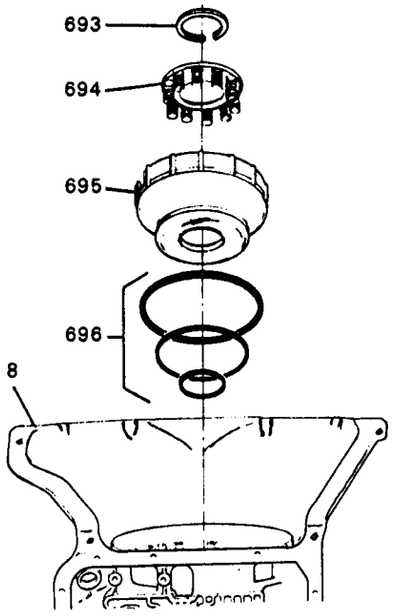


NEVER RE-USE CASTING NUMBER 8681725.

ALWAYS REPLACE THE LOW/REVERSE PISTON WITH CASTING NUMBER 8685550.

OEM PART NUMBER 8685549

Figure 63

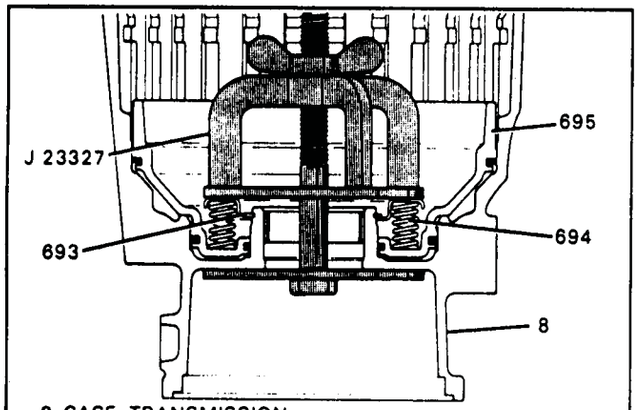


8 CASE, TRANSMISSION
693 RING, LO AND REVERSE CLUTCH RETAINER
694 SPRING ASSEMBLY, LO AND REVERSE CLUTCH
695 PISTON, LO AND REVERSE CLUTCH
696 SEAL, TRANSMISSION (LO AND REVERSE CLUTCH - OUTER, CENTER, INNER)

Figure 64

Continued from Page 43.

15. Inspect the casting number on the Low/Reverse piston. If it has casting number 8681725, replace it with one that has casting number 8685550. It is available under OEM part number 8685549 (See Figure 63).
16. Install 3 new seals on the Low/Rev piston assembly and lubricate with TransJel.
17. Lubricate the case with TransJel.
18. Install the Low/Reverse piston into the case, while indexing the tab on piston with the notch in case.
19. Install the Low/Reverse piston return spring assembly onto the piston as shown in Figure 64.
20. Set snap ring on top of the spring retainer.
21. Install spring compressor J-23327 as shown in Figure 65, and compress the spring assembly past the snap ring groove in case hub.



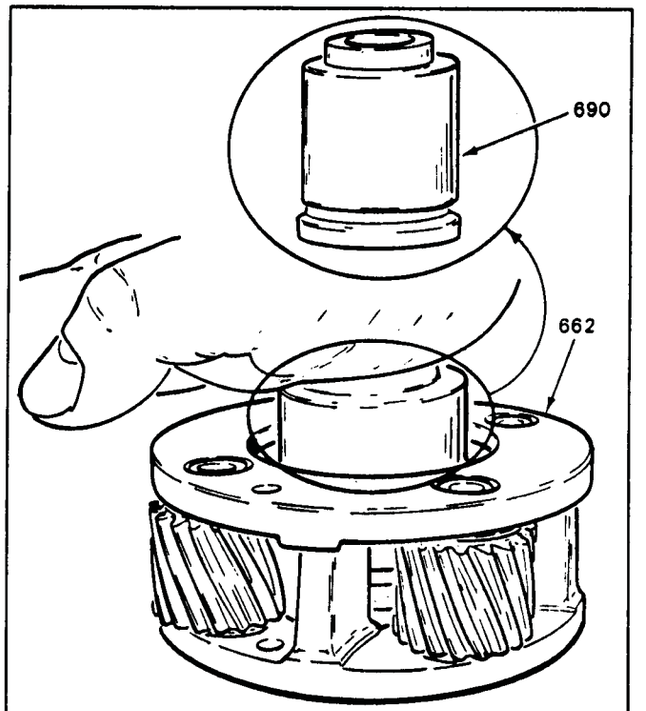
8 CASE, TRANSMISSION
693 RING, LO AND REVERSE CLUTCH RETAINER
694 SPRING ASSEMBLY, LO AND REVERSE CLUTCH
695 PISTON, LO AND REVERSE CLUTCH

Figure 65

22. Install the snap ring into the groove in the case hub and ensure that it is fully seated (See Figure 65).
23. Remove spring compressor J-23327 from transmission case.

REACTION GEAR SET AND LOW/REVERSE CLUTCH

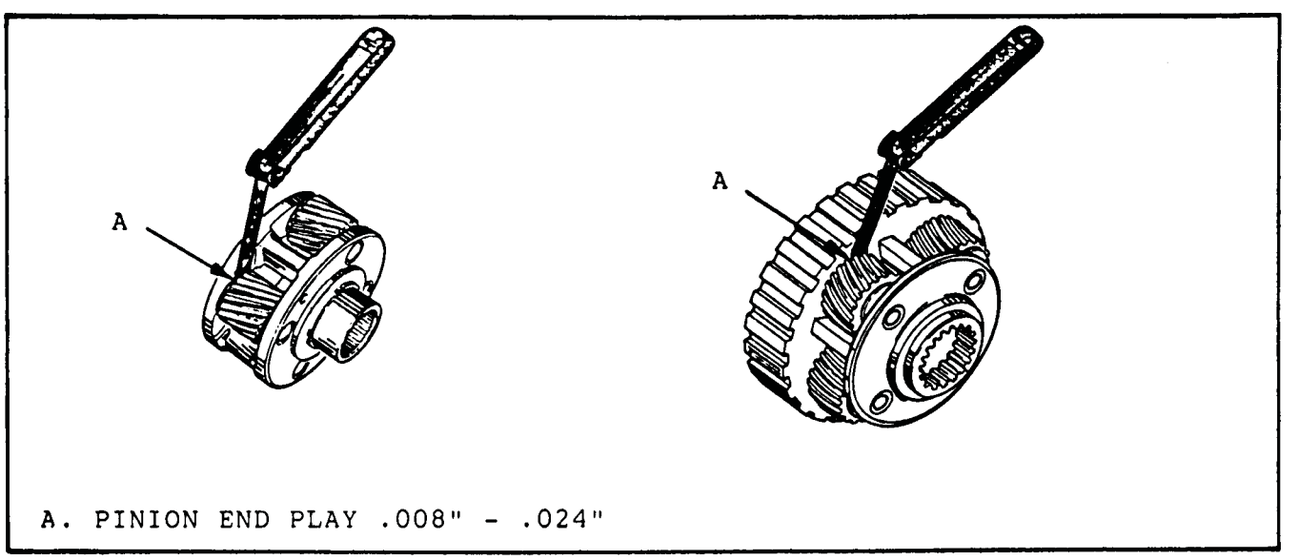
1. Inspect the reaction carrier and the input carrier for proper pinion end play as shown in Figure 67.
2. Proper end play is .008" to .024".
3. Inspect the trapped bearings in the carriers by placing a bushing or output shaft sleeve on the bearing race (Do not contact pinion gears), and turn it with the palm of your hand. Any imperfections will be felt through the sleeve (See Figure 66).



662 CARRIER ASSEMBLY, INPUT (COMPLETE)
690 SLEEVE, OUTPUT SHAFT

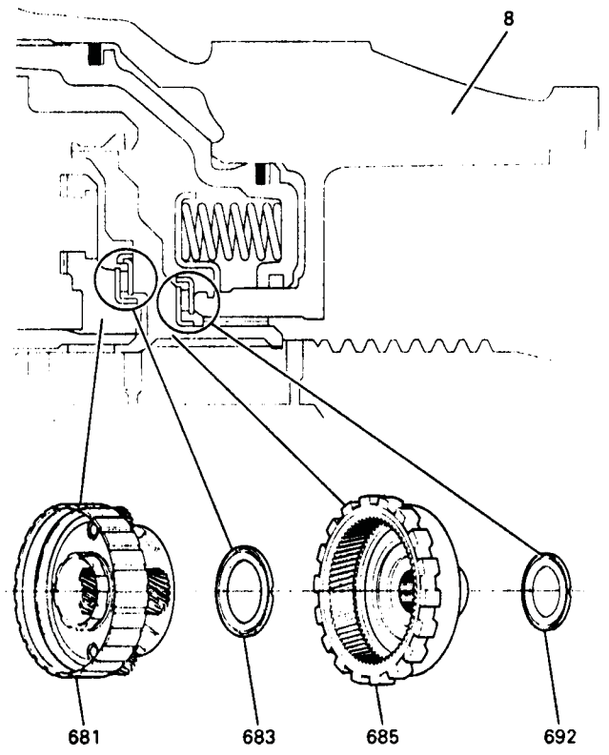
Figure 66

4. Install the reaction ring gear onto the output shaft with lock-tite adhesive and let it dry.
5. Install thrust bearing on back of the ring gear support and retain with a small amount of TransJel (Figure 68).
6. Install thrust bearing into front side of ring gear support as shown in Figure 68.



A. PINION END PLAY .008" - .024"

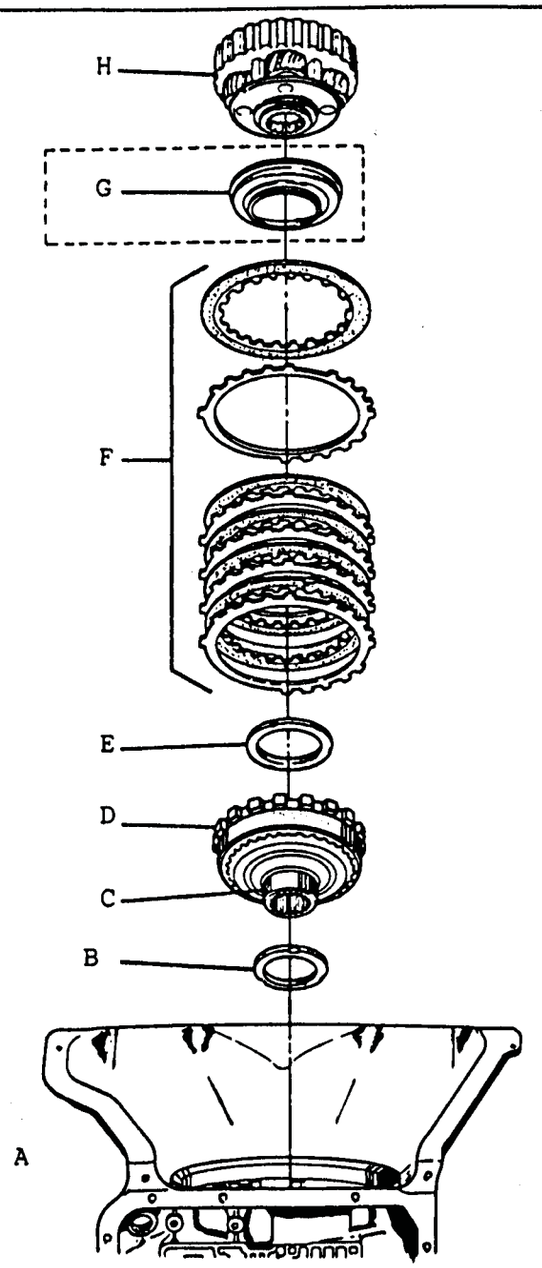
Figure 67



8 CASE, TRANSMISSION
681 CARRIER ASSEMBLY, REACTION
683 BEARING ASSEMBLY, THRUST (REACTION CARRIER/ SUPPORT)
685 SUPPORT, INTERNAL REACTION GEAR
692 BRG., REACTION GEAR SUPPORT TO CASE

Figure 68

7. Install inspected reaction carrier in ring gear and output shaft assembly by rotating into position.
8. Install the complete assembly into the transmission case and verify that it turns freely.
9. Now would be a good time to inspect the parking linkage by placing the manual shaft in the park position to verify that the parking pawl engages the lugs on the ring gear.
10. See Low/Reverse Clutch selection beginning on next page.



A. TRANSMISSION CASE
B. REACTION RING GEAR/CASE BRG.
C. REACTION RING GEAR SUPPORT
D. REACTION RING GEAR
E. REACTION CARRIER/SUPPORT BRG.
F. LOW-REVERSE CLUTCH PLATES
G. OIL DEFLECTOR (USED ON HIGH PERFORMANCE MODELS ONLY)
H. REACTION CARRIER ASSEMBLY

Figure 69

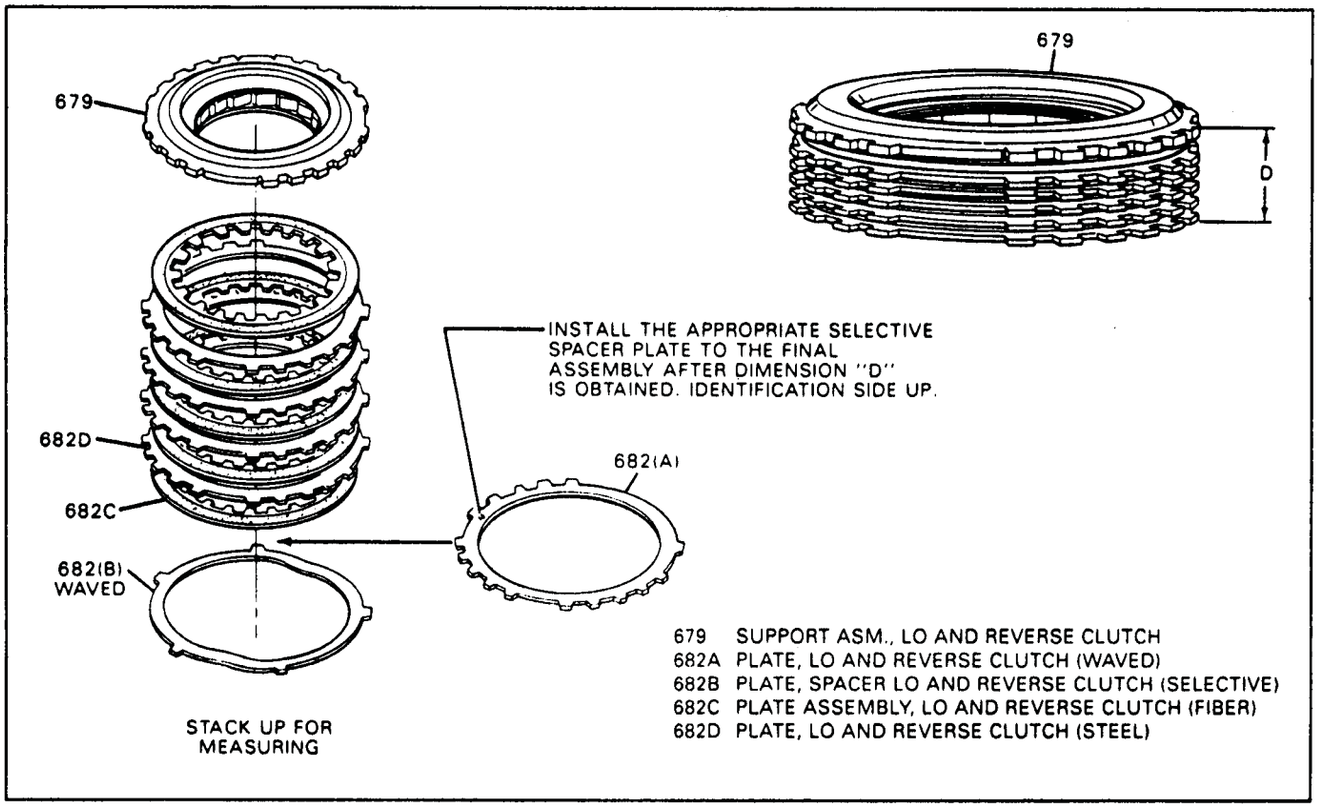


Figure 70

LOW/REVERSE CLUTCH SELECTIVE PLATE

1. To measure for the proper selective spacer plate, stack the lo/reverse assembly on a flat work surface, as shown in Figure 70, in the following order:
   1. One waved plate (682B).
   2. Five lined and four steel plates starting with a lined plate on the waved, and alternating with steel.
   3. Lo/Reverse clutch support.
2. Apply an evenly distributed load to the top of the Lo/Reverse support assembly with your hand. Approx 5 lbs.
   NOTE: Excessive pressure will start to flatten the wave plate and will result in an inaccurate measurement.
3. Measure the height of the clutch pack from the work surface to the top of the Lo/Reverse clutch support. This will be dimension "D", as shown in Figure 70.
4. Use dimension "D" to select the proper thickness selective plate from the chart in Figure 72.
5. Now install the proper selective plate between the wave plate and the first lined plate, with the identification side facing up.
6. THE OVERALL HEIGHT FOR DIMENSION "D" WITH THE SELECTIVE PLATE INCLUDED, SHOULD BE 1.200" TO 1.240".
7. When this dimension has been achieved the Low/Reverse clutch pack is ready to install.

LO AND REVERSE CLUTCH		
	QTY.	THICKNESS
PLATE - WAVED	1	2.42mm (.096")
PLATE - SELECTIVE	1	See Fig. 72
PLATE - COMP. FACED	5	2.25mm (.088")
PLATE - FLAT STEEL	4	1.75mm (.069")

Figure 71

LO AND REVERSE CLUTCH SPACER PLATE SELECTION CHART				
IF GAGE DIMENSION "D" IS		USE THIS SELECTIVE PLATE		
FROM	TO	IDENTIFICATION	PLATE THICKNESS	
29.559mm (1.164")	28.844mm (1.136")	NONE	1.684mm (.066")	1.829mm (.072")
30.087mm (1.185")	29.347mm (1.155")	0	1.314mm (.052")	1.168mm (.046")
29.057mm (1.144")	28.317mm (1.115")	1	2.198mm (.087")	2.344mm (.092")

Figure 72

INSTALL LOW/REVERSE CLUTCH PLATES

1. Install the Lo/Reverse clutch waved plate into the case first against the piston (See Figure 74).
2. Install the correct selective plate on top of the waved plate.
3. Install a lined plate while engaging the teeth with the lugs on reaction carrier, and alternate with steel plate, until you have installed five friction and four steel plates. You should wind up with a friction plate going in last.
4. Index the external teeth of the steel plates in the case as shown in Figure 73.

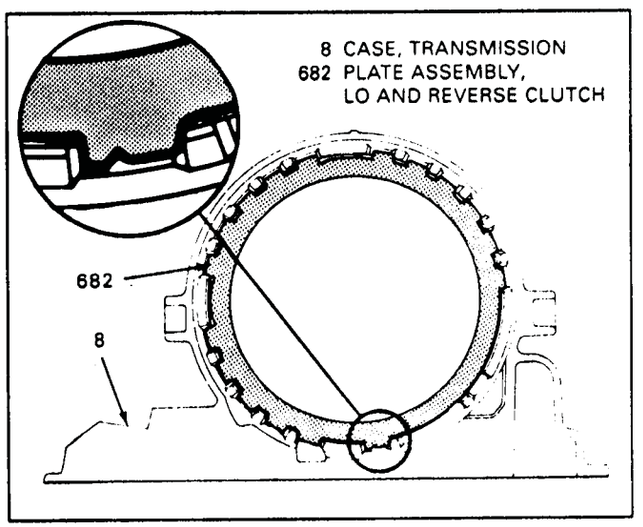


Figure 73

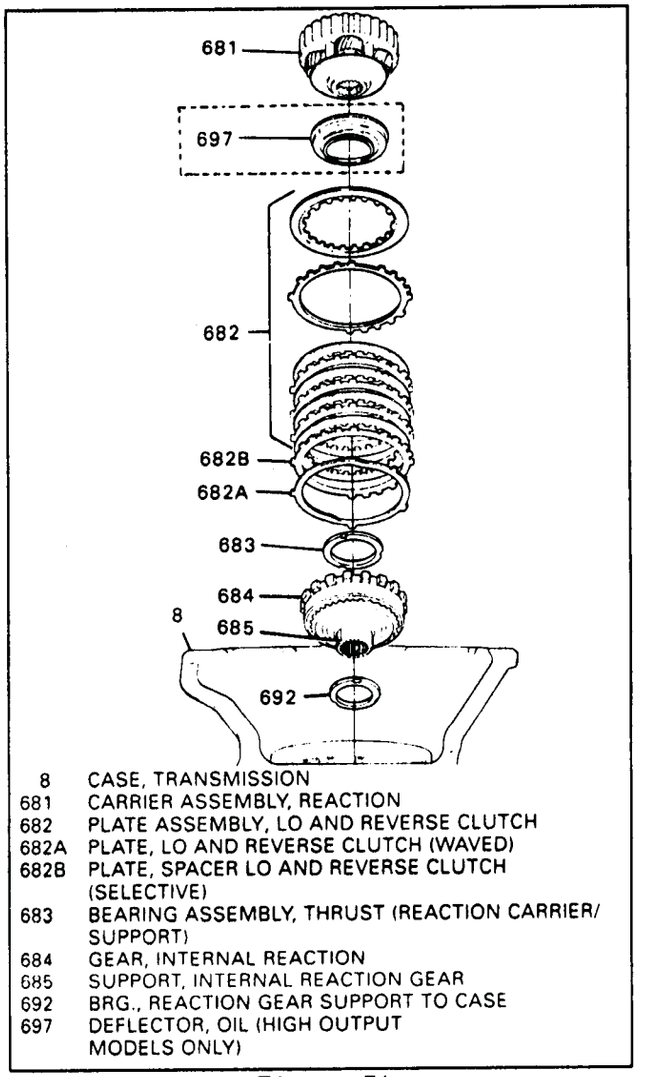
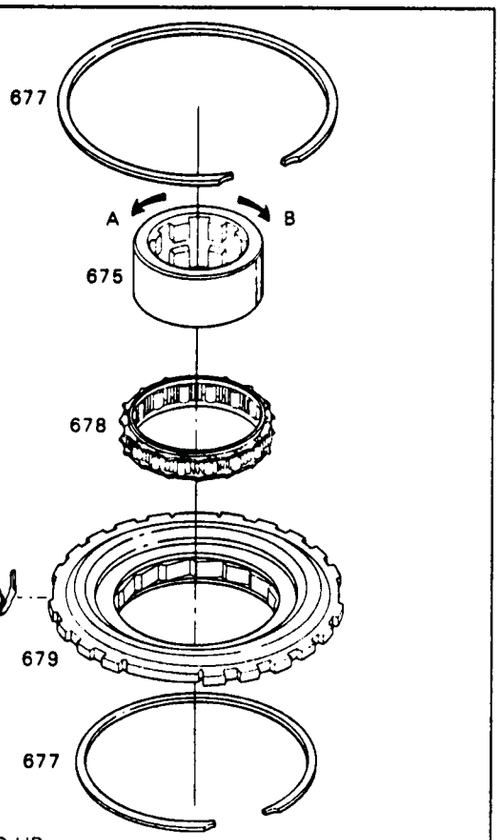


Figure 74



A LOCKED UP
B FREE WHEELS
675 RACE, LO AND REVERSE ROLLER CLUTCH
677 RING, LO AND REVERSE RETAINER (ROLLER ASSEMBLY/CAM)
678 CLUTCH ASSEMBLY, LO AND REVERSE ROLLER
679 SUPPORT ASM., LO AND REVERSE CLUTCH
680 SPRING, TRANSMISSION (LO AND REVERSE CLUTCH SUPPORT RETAINER)

Figure 75

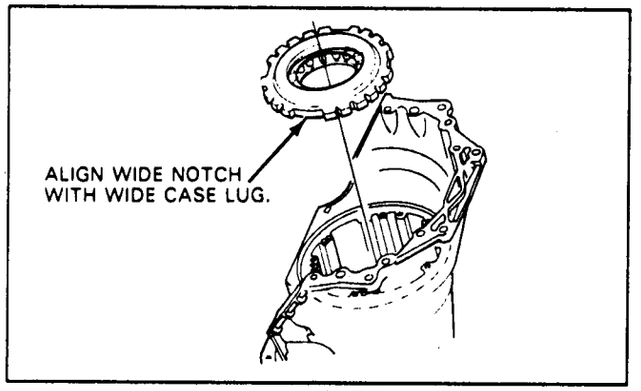
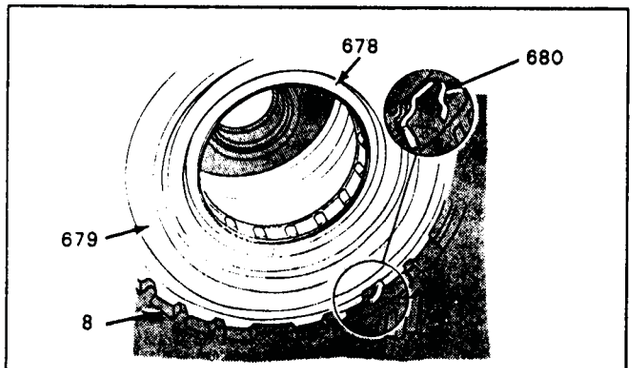


Figure 76

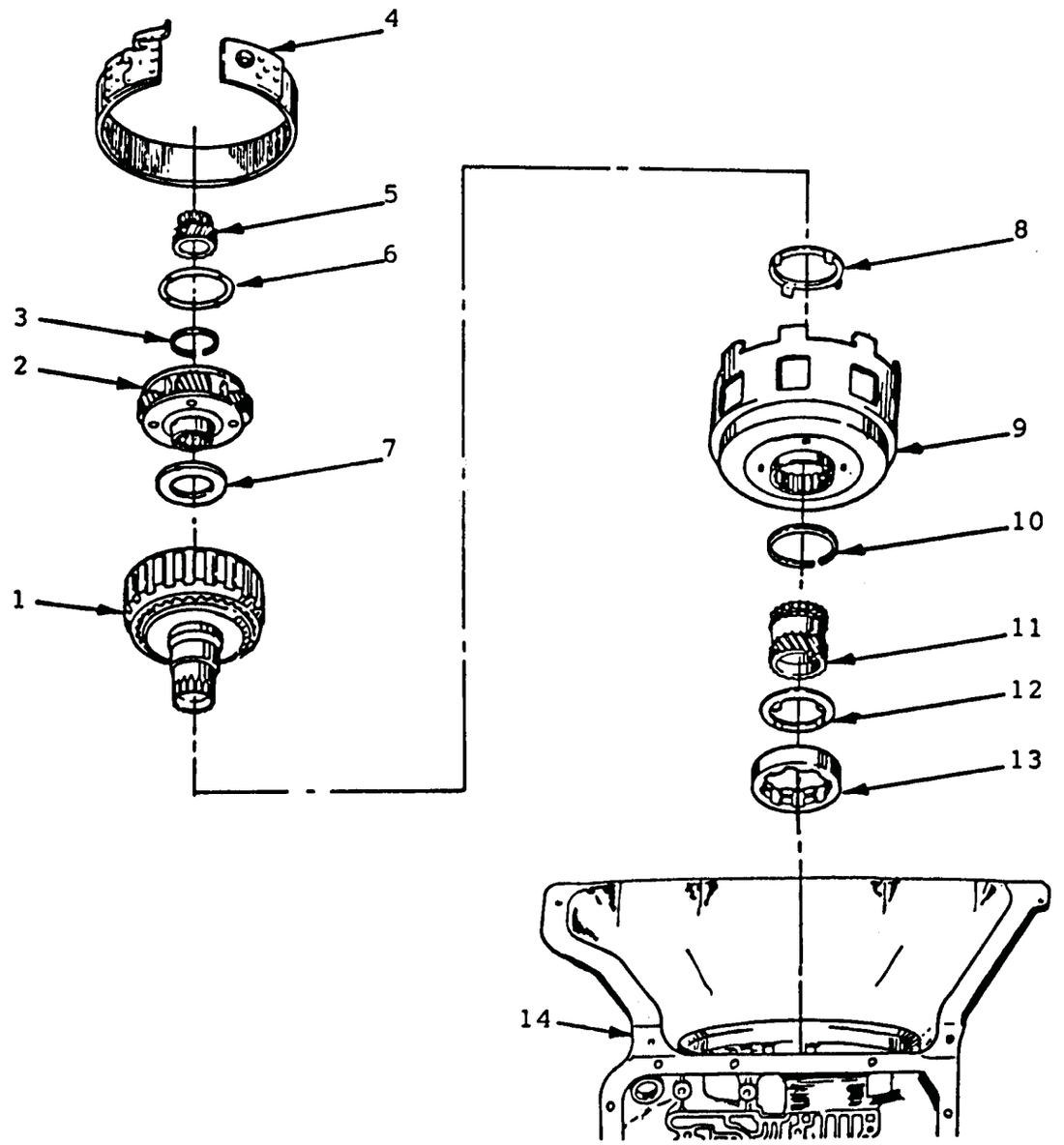


8 CASE, TRANSMISSION
678 CLUTCH ASSEMBLY, LO AND REVERSE ROLLER
679 SUPPORT ASM., LO AND REVERSE CLUTCH
680 SPRING, TRANSMISSION (LO AND REVERSE CLUTCH SUPPORT RETAINER)

Figure 77

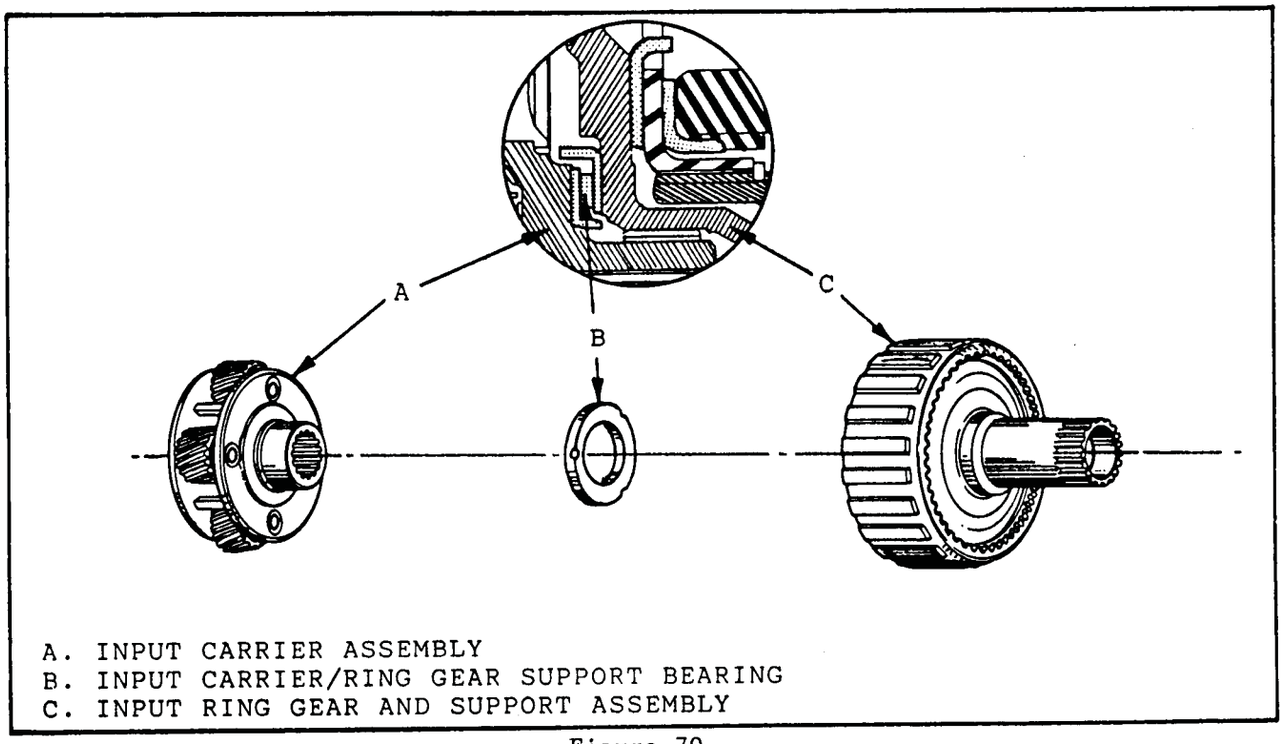
LOW/REVERSE SUPPORT ASSEMBLY

1. Inspect the low roller clutch Asm. for any wear and/or damage.
2. Install the roller clutch assembly in the cam and support assembly.
3. Install the snap rings if so equipped. Most of these units should have a plastic caged roller clutch that does not require snap rings as they snap into the support assembly with tabs on the plastic cage.
4. Install the roller clutch inner race by rotating clockwise with a little downward pressure.
5. Push down for full engagement onto the tangs on the reaction carrier.
6. Check for proper operation by rotating the inner race as shown in Figure 75.
7. The inner race should lock when turn counterclockwise and should freewheel when turned clockwise (See Figure 75).
8. Install the anti-clunk spring into the case as shown in Figure 77, and retain with TransJel.
9. Install the complete support assembly into the case as shown in Figure 76, and tap into place with light hammer.
10. Install the snap ring on top of the support, and into the case groove.
    NOTE: Orient the snap ring around the anti-clunk spring as shown in Figure 77.
11. Push inner race down and rotate until engaged on lugs on reaction carrier.



1. INPUT RING GEAR
2. INPUT CARRIER
3. INPUT CARRIER SNAP RING
4. 2-4 BAND ASSEMBLY
5. INPUT SUN GEAR
6. INPUT CARRIER THRUST WASHER
7. INPUT CARRIER BEARING
8. SUN GEAR SHELL/RING GEAR WASHER
9. SUN GEAR SHELL
10. REACTION SUN GEAR SNAP RING
11. REACTION SUN GEAR
12. SUN GEAR/INNER RACE WASHER
13. LOW ROLLER CLUTCH INNER RACE
14. TRANSMISSION CASE

Figure 78

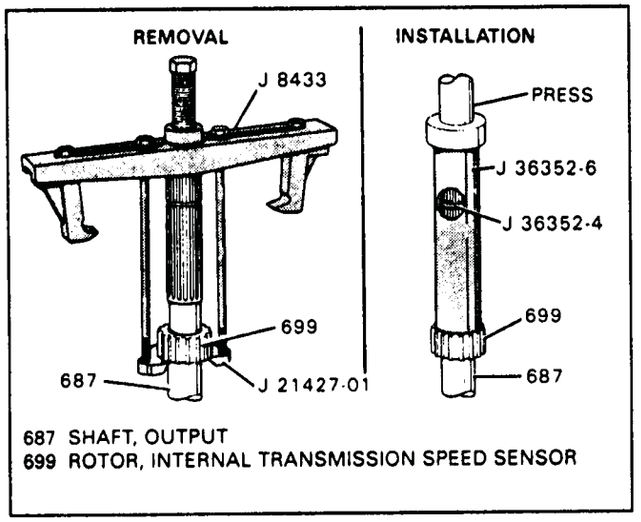


A. INPUT CARRIER ASSEMBLY
B. INPUT CARRIER/RING GEAR SUPPORT BEARING
C. INPUT RING GEAR AND SUPPORT ASSEMBLY

Figure 79

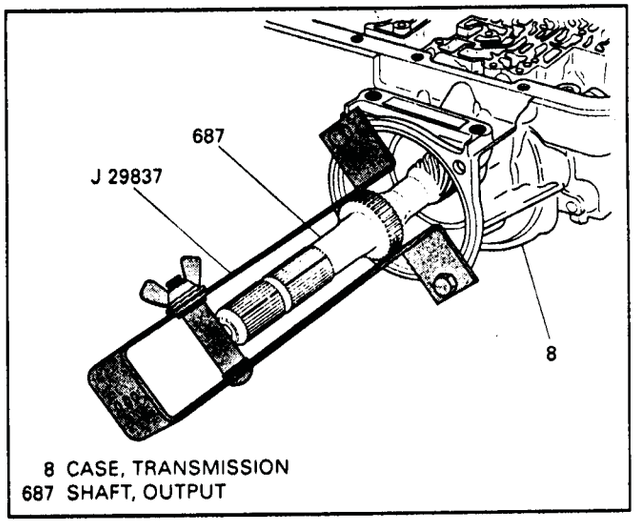
REACTION SUN GEAR AND SHELL

1. Install the low roller inner race thrust washer into the inner race and retain with TransJel.
2. Inside tangs of the thrust washer should engage in four slots of the inner race (See Figure 78).
3. Install the reaction sun gear with the snap ring on gear, by rotating into position.
4. Install the reaction sun gear shell onto the splines of reaction sun gear (See Figure 78).
5. Install sun gear shell thrust washer, with four outside tangs, engaged into slots of sun shell and retain with TransJel.
6. Install input ring gear and support by turning to insure ring gear support splines are engaged into the reaction carrier.
7. Install the thrust bearing into the input ring gear support with outer race toward the support as shown in Figure 79.
8. Install the input carrier into the input ring gear by rotating into position.
9. If output shaft has not yet been installed, install speed sensor rotor, and install the output shaft into transmission by turning to index the splines with the mating parts.
10. Use the output shaft retaining tool if necessary.
11. Removal and installation of the speed sensor rotor is shown in Figure 80.
12. Install the input carrier snap ring on the output shaft, using J-29837 tool if necessary.
13. After snap ring is installed, remove the output shaft tool if previously used.
14. Install the input sun gear into the input carrier by rotating into position.



687 SHAFT, OUTPUT
699 ROTOR, INTERNAL TRANSMISSION SPEED SENSOR

Figure 80

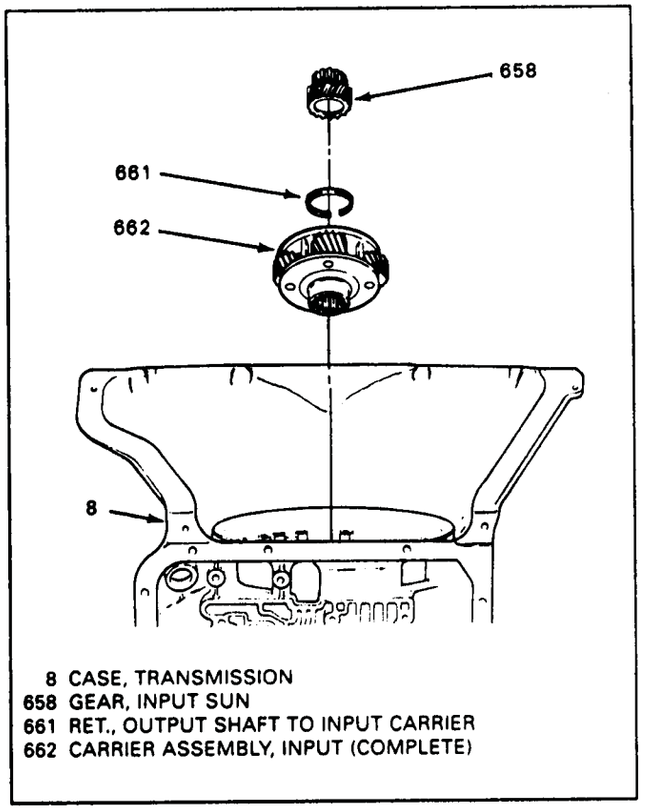


8 CASE, TRANSMISSION
687 SHAFT, OUTPUT

Figure 81

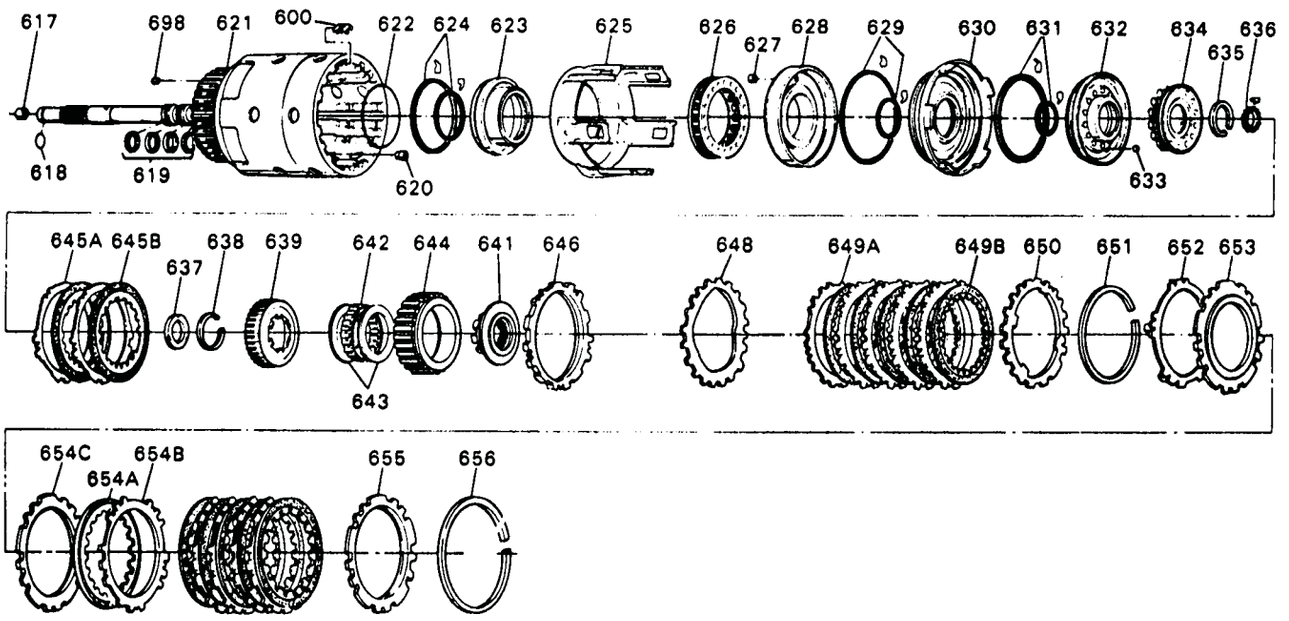
INPUT HOUSING DISASSEMBLY

1. Use Figure 83 to disassemble the input housing.
2. A spring compressor or foot press will be required during disassembly.
3. Remove and discard all lip seals, all solid teflon seals, "O" ring, and the housing to output shaft seal.
4. Clean all parts thoroughly in solvent.



8 CASE, TRANSMISSION
658 GEAR, INPUT SUN
661 RET., OUTPUT SHAFT TO INPUT CARRIER
662 CARRIER ASSEMBLY, INPUT (COMPLETE)

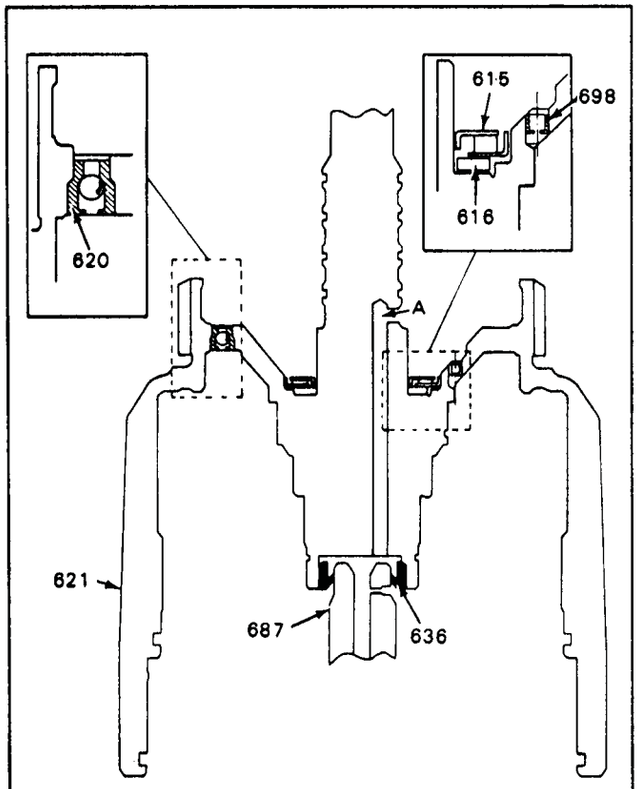
Figure 82



600 SPRING ASM, 3-4 CLUTCH BOOST
617 BALL CAPSULE, TURBINE SHAFT
618 "O" RING, TURBINE SHAFT
619 SOLID OIL SEAL, TURBINE SHAFT
620 BALL CAPSULE, INPUT HOUSING
621 HOUSING AND SHAFT ASM, INPUT
622 SEAL, "O" RING, INPUT TO FWD HSG
623 PISTON, 3-4 CLUTCH
624 LIP SEAL, 3-4 CLUTCH
625 RING, 3-4 CLUTCH APPLY
626 RETURN SPRING, 3-4 CLUTCH
627 BALL CAPSULE, FWD CLUTCH HSG
628 HOUSING, FORWARD CLUTCH
629 LIP SEALS, FORWARD CLUTCH
630 PISTON, FORWARD CLUTCH
631 LIP SEALS, OVERRUN CLUTCH
632 PISTON, OVERRUN CLUTCH
633 BALL CAPSULE, OVERRUN CLUTCH
634 RETURN SPRING ASM, OVERRUN CLUT
635 SNAP RING, OVERRUN CLUTCH RET.
636 SEAL, INPUT HOUSING TO OUTPUT SHFT.
637 BEARING ASM, INPUT SUN GEAR
638 SNAP RING, OVERRUN CLUTCH HUB RET.
639 HUB, OVERRUN CLUTCH
641 RETAINER AND INNER RACE, SPRAG
642 FORWARD SPRAG ASSEMBLY
643 END BEARINGS, SPRAG ASSEMBLY
644 RACE OUTER, FORWARD SPRAG
645A PLATE, OVERRUN CLUTCH STEEL
645B PLATE, OVERRUN CLUTCH FRICTION
646 PLATE, FORWARD CLUTCH APPLY
648 PLATE, FORWARD CLUTCH WAVED
649A PLATE, FORWARD CLUTCH STEEL
649B PLATE, FORWARD CLUTCH FRICTION
650 PLATE, FORWARD CLUTCH BACKING (SEL.)
651 SNAP RING, FORWARD CLUTCH BACKING
652 PLATE, 3-4 CLUTCH RING RETAINER
653 PLATE, 3-4 CLUTCH APPLY (STEPPED).
654A PLATE, 3-4 CLUTCH FRICTION
654B PLATE, 3-4 CLUTCH STEEL (THIN)
654C PLATE, 3-4 CLUTCH STEEL (THICK)
655 PLATE, 3-4 CLUTCH BACKING (SEL.)
656 SNAP RING, 3-4 CLUTCH BACKING PLATE
698 ORIFICED CUP PLUG, 3-4 CLUTCH

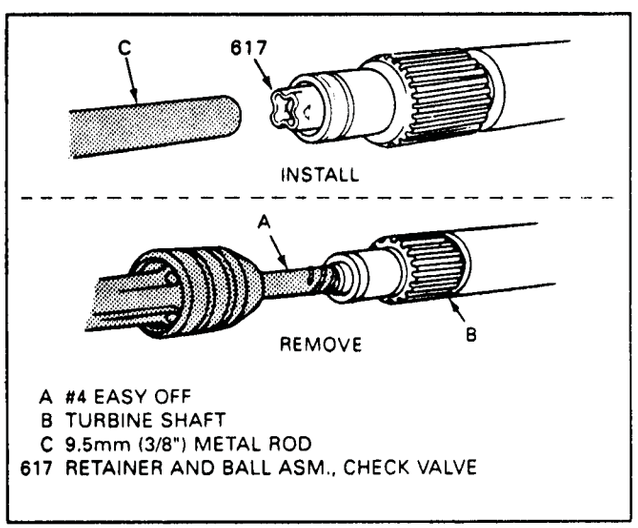
INPUT CLUTCH HOUSING ASSEMBLY

Figure 83



A LUBE PASSAGE
615 BEARING ASSEMBLY, STATOR SHAFT / SELECTIVE WASHER
616 WASHER, THRUST (SELECTIVE)
620 RETAINER AND CHECKBALL ASSEMBLY
621 HOUSING AND SHAFT ASSEMBLY, INPUT
636 SEAL, INPUT HOUSING TO OUTPUT SHAFT
687 SHAFT, OUTPUT
698 PLUG, ORIFICED CUP

Figure 84



A #4 EASY OFF
B TURBINE SHAFT
C 9.5mm (3/8") METAL ROD
617 RETAINER AND BALL ASM., CHECK VALVE

Figure 85

INPUT CLUTCH HOUSING ASSEMBLY

1. Inspect the following:
   * Input housing for porosity or damage.
   * Turbine shaft assembly for spline wear and/or damage.
   * Presence of the three balls in the back side of turbine shaft. The open hole is the lube oil passage which feeds the output shaft. See passage "A" in Figure 84.
   * Presence of orificed cup plug in the top of the input housing, Figure 84.
   * Turbine shaft oil ring grooves for damage.
   * Ball capsule assembly in the front of turbine shaft. The ball must move freely in the capsule.
   * Air check all oil feed passages.

TCC BALL CAPSULE REPLACEMENT PROCEDURE

1. Straighten the tangs of the retainer and remove the ball.
2. Remove the capsule using a #4 screw extractor as shown in Figure 85.
3. New TCC ball capsule assembly:
   * Part number for 245mm converter is 8647037.
   * Part number for 298mm converter is 8639284.
4. Install new ball capsule assembly using a 3/8" drift punch, and seat the retainer 1/8" below top surface of the turbine shaft, as shown in Figure 85.
5. Be certain that the ball is loose in the capsule after installation.
6. NOTE: The ball can be left out of the capsule on heavy duty applications only, for firmer TCC apply. Always reinstall the capsule.

INPUT HOUSING CAPSULE REPLACEMENT

1. If replacement of the ball capsule in the input housing is necessary, use Figure 86 for replacement procedures.

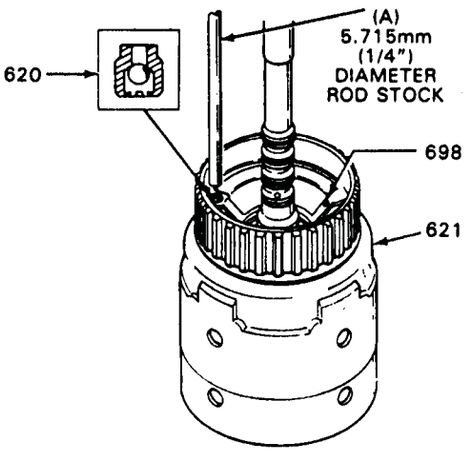
INPUT CLUTCH HOUSING ASSEMBLY

1. Place the input housing assembly on the bench, with the turbine shaft through a hole in the bench.
2. Inspect the 3-4 clutch piston for cracks or damage.
3. Install the inner and outer lip seals on the 3-4 clutch piston, lubricate with TransJel. Lip seals must face the direction shown in Figure 87.
4. Install the 3-4 clutch apply ring on top of the 3-4 clutch piston, shown in Figure 88.
5. Install new "O" ring into input housing groove as shown in Figure 88.
6. Install the 3-4 clutch return spring assembly on top of the apply ring. (See Figure 88).
7. Install the forward clutch housing into the input housing as shown in Figure 88.
8. Inspect the forward clutch piston for cracks and/or damage.
9. Install new inner and outer lip seals on the forward clutch piston. The lips on the seals must face direction shown in Figure 88.
10. Install the forward clutch piston in forward clutch housing, using tool J-29883, as shown in Figure 88.

    NOTE: The forward clutch apply legs must be indexed with the 3-4 clutch apply ring legs.

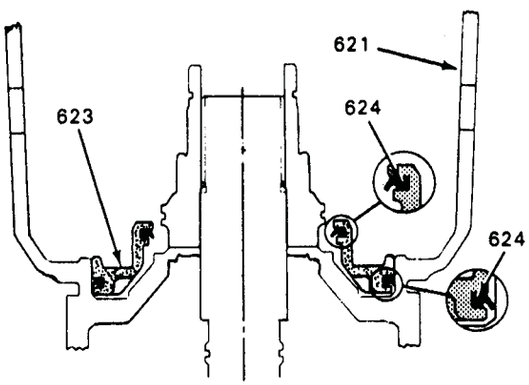
11. Firmly seat the assembly.
12. Inspect the overrun clutch piston for cracks and/or damage.
13. Install the inner and outer lip seals on the overrun clutch piston, and lubricate with TransJel. Lip seals must face direction shown in Figure 89.
14. Install the overrun clutch piston over tool J-29882, with hub facing up as shown in Figure 89.
15. Install the overrun clutch return spring assembly onto the overrun clutch piston, locating the springs on piston tabs.
16. Install spring compressor tool, shown in Figure 90, compress spring assembly and install snap ring ensuring that snap ring is seated in groove.

(Continued on next Page).



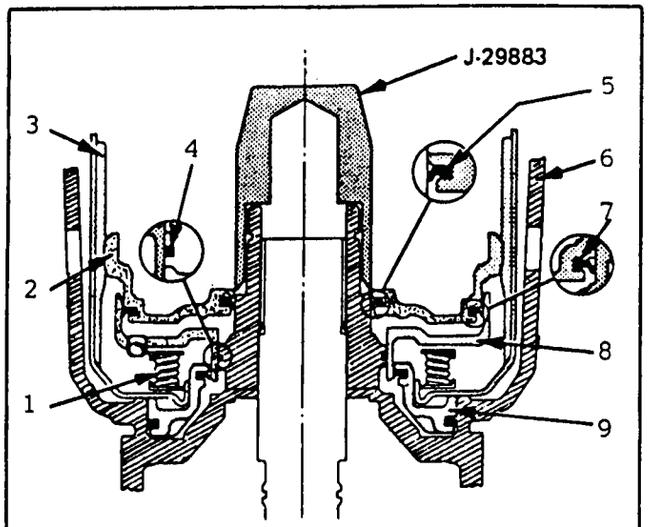
A ROD STOCK/DRIFT, 5.715mm (1/4") DIA.
620 RETAINER AND CHECKBALL ASSEMBLY
621 HOUSING AND SHAFT ASSEMBLY, INPUT
698 PLUG, ORIFICED CUP

Figure 86



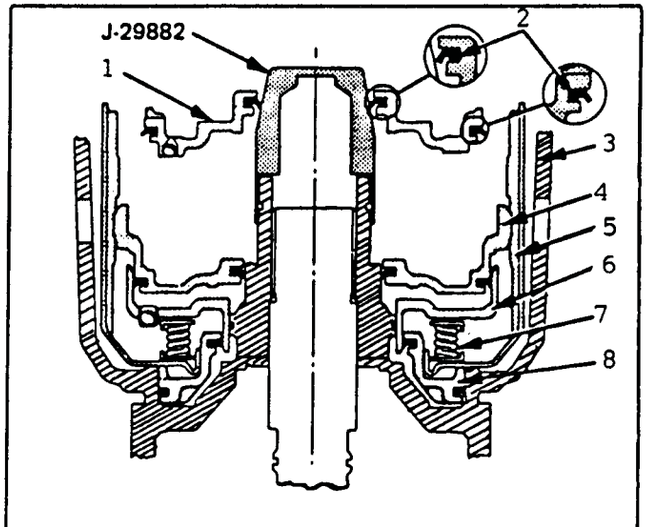
621 HOUSING AND SHAFT ASSEMBLY, INPUT
623 PISTON, 3RD AND 4TH CLUTCH
624 SEAL, 3RD AND 4TH CL. (INNER AND OUTER)

Figure 87



1. 3-4 CLUTCH RETURN SPRING ASM.
2. FORWARD CLUTCH PISTON
3. 3-4 CLUTCH APPLY RING
4. INPUT HOUSING "O" RING
5. FORWARD CLUTCH INNER SEAL
6. INPUT HOUSING
7. FORWARD CLUTCH OUTER SEAL
8. FORWARD CLUTCH HOUSING
9. 3-4 CLUTCH PISTON

Figure 88



1. OVERRUN CLUTCH PISTON
2. OVERRUN CLUTCH PISTON SEALS
3. INPUT HOUSING
4. FORWARD CLUTCH PISTON
5. 3-4 CLUTCH APPLY RING
6. FORWARD CLUTCH HOUSING
7. 3-4 CLUTCH RETURN SPRING ASM.
8. 3-4 CLUTCH PISTON

Figure 89

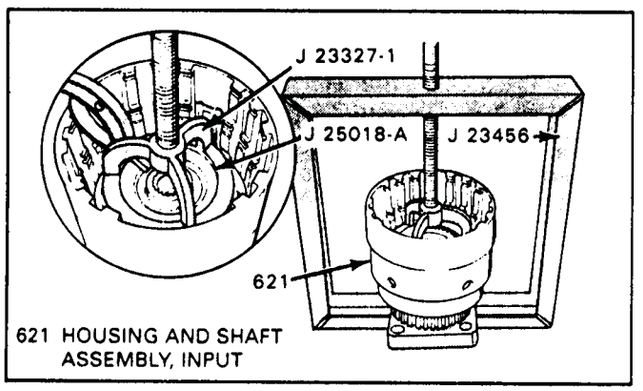


Figure 90

Continued from Page 55.

17. Remove the spring compressor tool shown in Figure 90.
18. Place the input housing assembly on the bench, with the turbine shaft through a hole in the bench, shown in Figure 91.

INPUT HOUSING ASSEMBLE OVERRUN CLUTCH

1. The overrun clutch assembly is the first of the clutch packs that go into the input housing, and they are the smallest of the clutch packs.
2. Install a overrun clutch steel plate first as shown in Figure 92.
3. Make sure the the teeth on the plate are between the legs on the piston. (See Figure 93).
4. Install the rest of the overrun clutch plates (Friction, Steel, Friction), as shown in Figure 92.
5. This clutch pack requires two steel plates and two friction plates on all models as shown in chart (Figure 93). DO NOT INSTALL ANY MORE THAN THIS!

(Continued on Page 58).

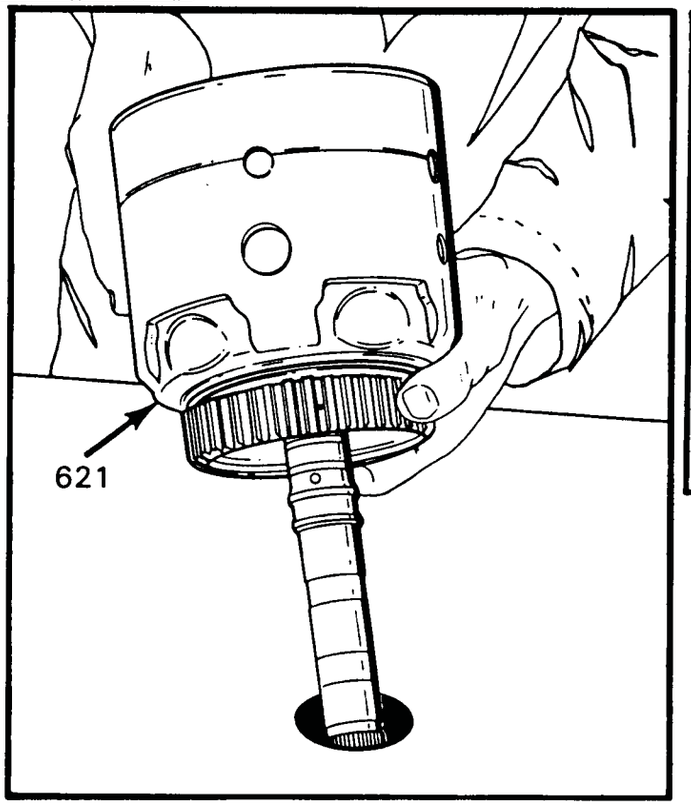


Figure 91

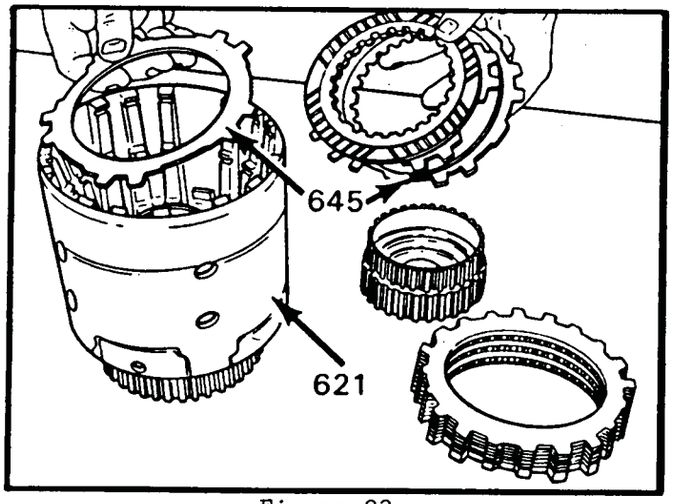
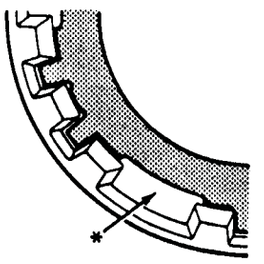


Figure 92



OVERRUN

* ALIGN WIDE NOTCHES TO CASE LUGS

OVERRUN CLUTCH

MODEL	FLAT STEEL		COMP. FACED	
	NO.	THICK-NESS	NO.	THICK-NESS
ALL MODELS	2	2.248mm - 2.400mm (.089" - .094")	2	2.03mm (.079")

Figure 93

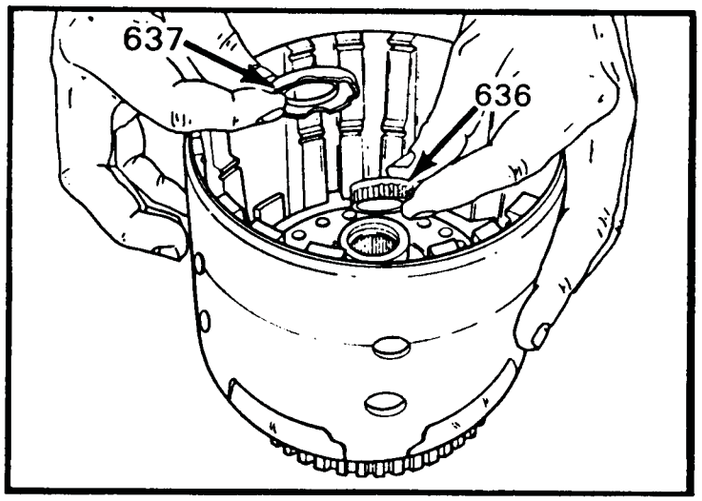


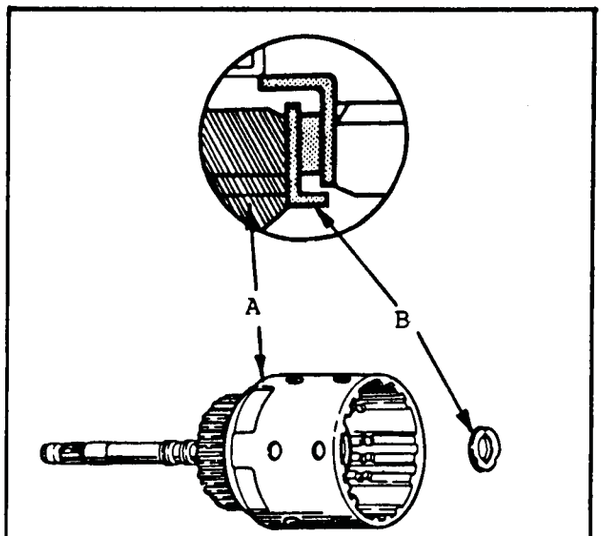
Figure 94

Continued from Page 56.

6. Install the input housing lube oil seal into the input housing , as shown in Figure 94.
7. Install the thrust bearing assembly in the input housing as shown in Figure 94.
8. Refer to Figure 95 for direction of the thrust bearing, and use a small amount of TransJel to retain in position.

FORWARD CLUTCH SPRAG ASSEMBLY

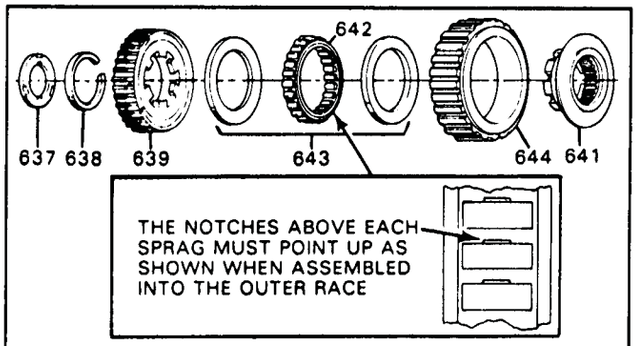
1. Disassemble the forward clutch sprag assembly and inspect the following:
   * Forward sprag for wear or damage, and/or broken ribbon tabs.
   * Overrun clutch hub for spline damage, or plugged lube holes.
   * Inner and outer sprag races for wear or damage, surface finish for wear or damage, and splines for wear or damage.
2. Install the forward sprag assembly into the outer race from the side opposite the recess, as shown in Figure 97.
3. The notches in the sprag assembly cage must face upward as shown Figure 96 and Figure 97.
4. Install the inner race into the sprag assembly. Insert the race by pushing in and turning to the left as shown in Figure 98.
5. Install the remaining wear plate.
6. Install the overrun clutch hub, and the overrun hub snap ring.



A. INPUT HOUSING ASSEMBLY
B. BEARING ASSEMBLY

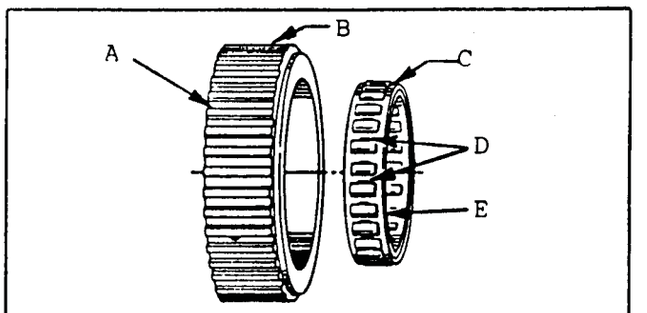
Figure 95

7. Test the forward sprsg assembly for proper operation as shown in Figure 99.
8. Install forward sprag assembly into the input housing by turning, and indexing the overrun clutch hub into the overrun clutch friction plates, as shown in Figure 100.



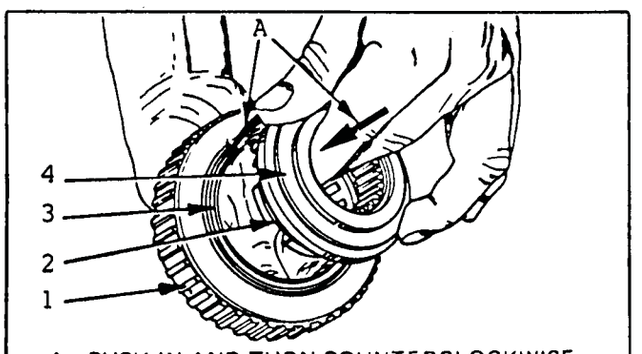
637 BEARING ASSEMBLY, INPUT SUN GEAR
638 SNAP RING, OVERRUN CL. HUB RETAINING
639 HUB, OVERRUN CLUTCH
641 RETAINER AND RACE ASSEMBLY, SPRAG
642 FORWARD SPRAG ASSEMBLY
643 RETAINER RINGS, SPRAG ASSEMBLY
644 RACE, FORWARD CLUTCH (OUTER)

Figure 96



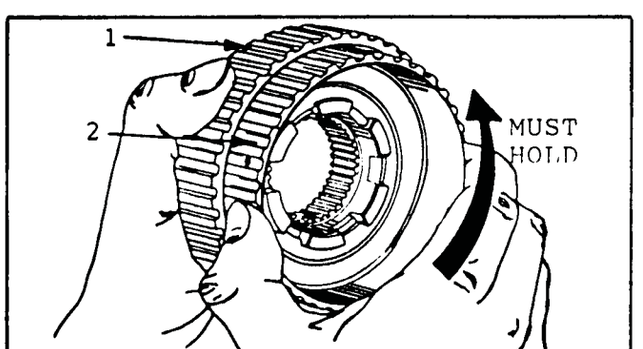
A. RECESSED EDGE
B. FORWARD SPRAG OUTER RACE
C. FORWARD SPRAG ASSEMBLY
D. NOTCHES POINT UPWARD AS SHOWN
E. LIPPED EDGE

Figure 97



A PUSH IN AND TURN COUNTERCLOCKWISE TO INSTALL
1. FORWARD SPRAG OUTER RACE
2. FORWARD SPRAG INNER RACE
3. FORWARD SPRAG ASSEMBLY
4. INNER RACE RETAINER

Figure 98



THE OVERRUN CLUTCH HUB MUST TURN CLOCKWISE, BUT NOT COUNTERCLOCKWISE

1. FORWARD SPRAG OUTER RACE
2. OVERRUN CLUTCH HUB

Figure 99

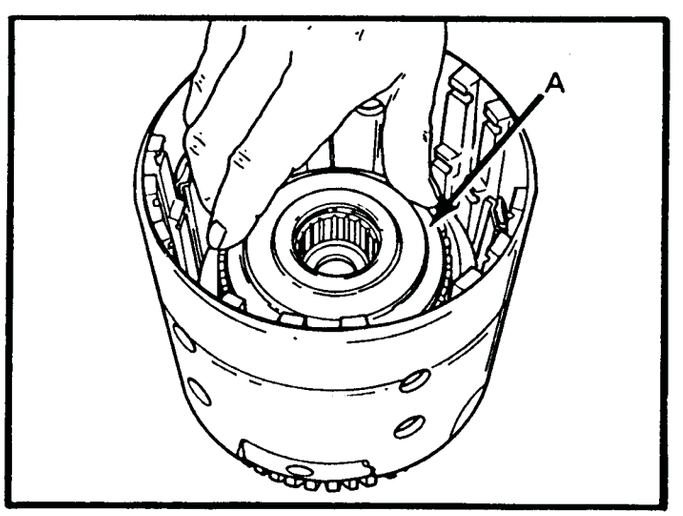


Figure 100

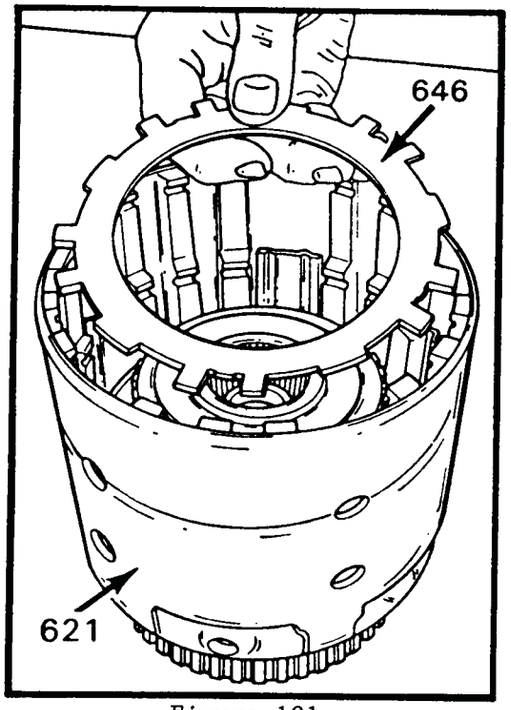


Figure 101

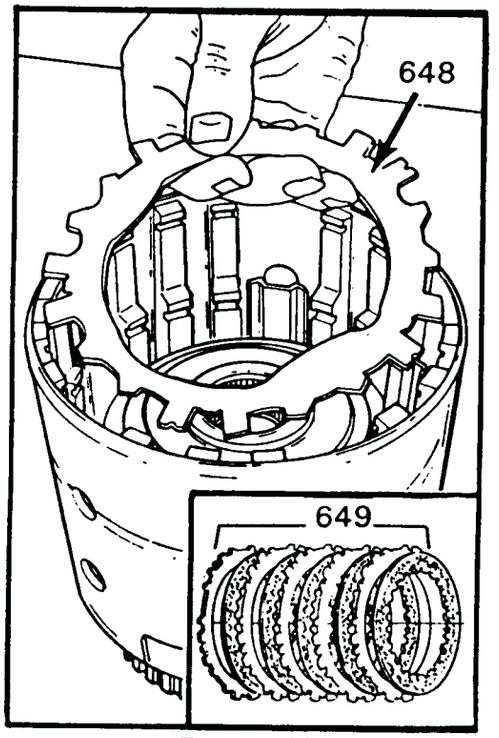


Figure 102

FORWARD CLUTCH INFORMATION CHART		
PLATE TYPE	THICKNESS	QUANTITY REQUIRED ALL MODELS
APPLY PLATE	4.30mm (.169")	1
WAVED STEEL CLUTCH PLATE	1.79mm (.070")	1
FLAT STEEL CLUTCH PLATE	2.29mm (.090")	5
COMPOSITION FACED CLUTCH PLATES	1.78mm (0.70")	5
BACKING PLATE	SELECTIVE	1

Figure 103

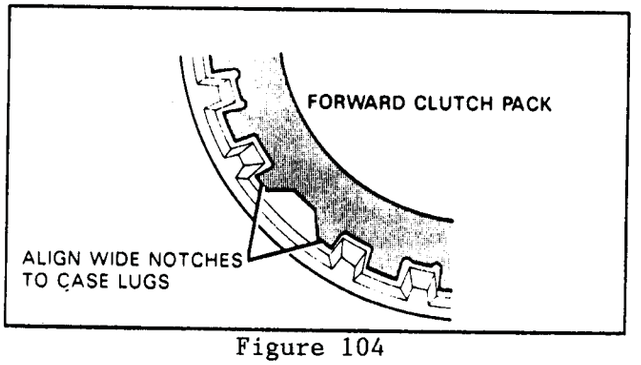


Figure 104

INPUT HOUSING ASSEMBLE FORWARD CLUTCH PACK

1. Install the forward clutch APPLY plate as shown in Figure 101. Align the teeth on the apply plate so that the wider tabs are on top of the forward clutch piston legs.
2. Note also that the apply plate is the thicker of the plates (.169") as shown in Figure 103.
3. Install the forward clutch wave plate on top of the apply plate with teeth aligned to the apply plate (Fig. 102).
4. Install a forward clutch flat steel plate on top of the wave plate and align as shown in Figure 104.

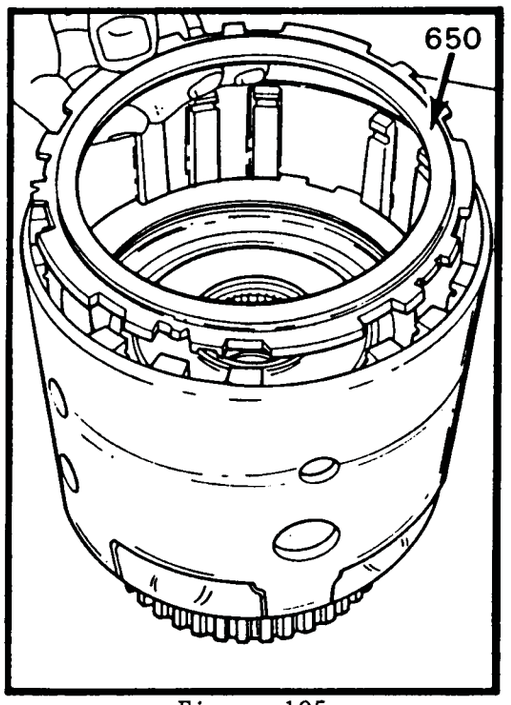


Figure 105

5. Continue installing the forward clutch plates alternating with friction and steel until you have installed five frictions and five flat steel plates.
6. Install the forward clutch backing plate as shown in Figure 105.
7. Install the forward clutch backing plate snap ring as shown in Figure 106.
8. Check forward clutch pack clearance with a feeler gage as shown in Figure 107.
9. Forward clutch clearance should be minimum .030" and maximum .063".
10. Change the forward clutch backing plate as necessary to achieve the recommended clutch clearance using the chart in Figure 107.

Continued on next Page.

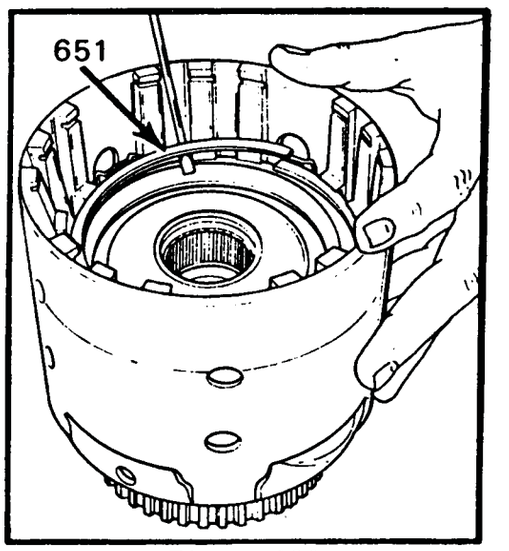
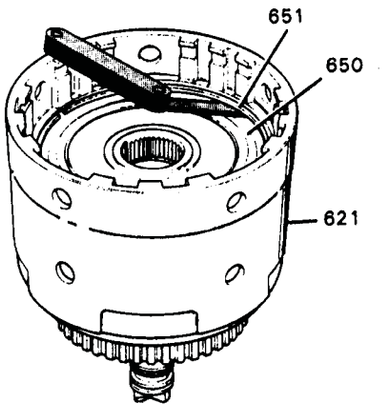


Figure 106

FORWARD CLUTCH BACKING PLATE SELECTION

ALL MODELS	
BACKING PLATE TRAVEL = .75mm - 1.60mm (.030" - .063")	
PLATE THICKNESS	**IDENTIFICATION**
6.97mm - 7.07mm (.274" - .278")	A
6.38mm - 6.48mm (.250" - .255")	B
5.79mm - 5.89mm (.227" - .232")	C
5.20mm - 5.30mm (.205" - .208")	D
4.61mm - 4.71mm (.180" - 185")	E



621 HOUSING AND SHAFT ASSEMBLY, INPUT
650 PLATE, FORWARD CLUTCH BACKING (SEL.)
651 RING, FORWARD CLUTCH BACKING PLATE RETAINER

Figure 107

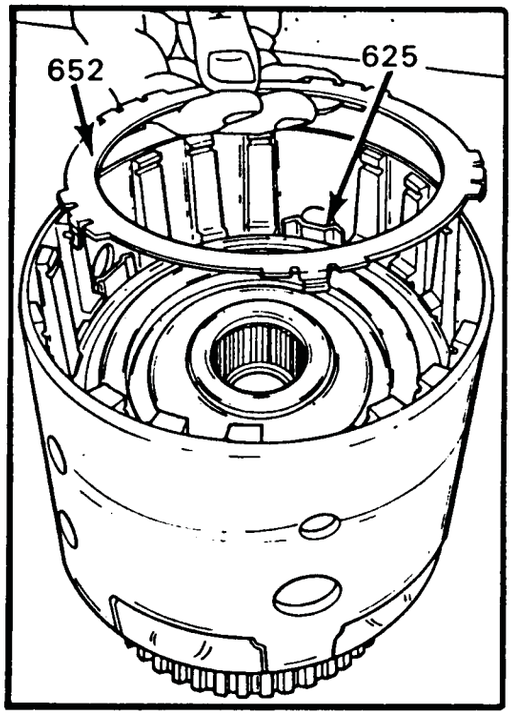


Figure 108

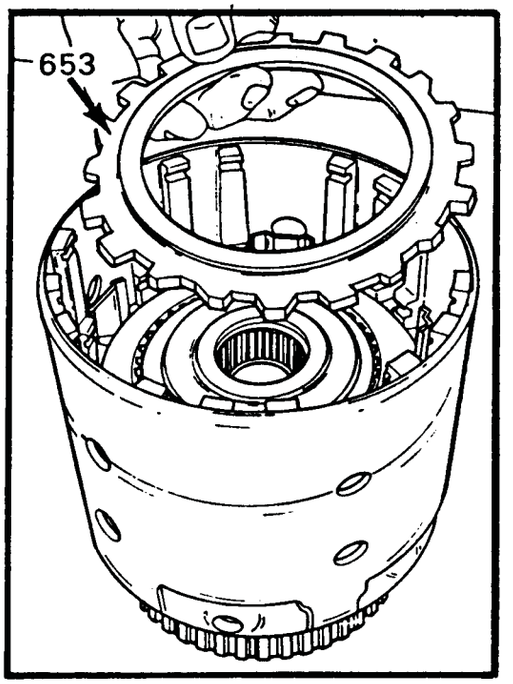
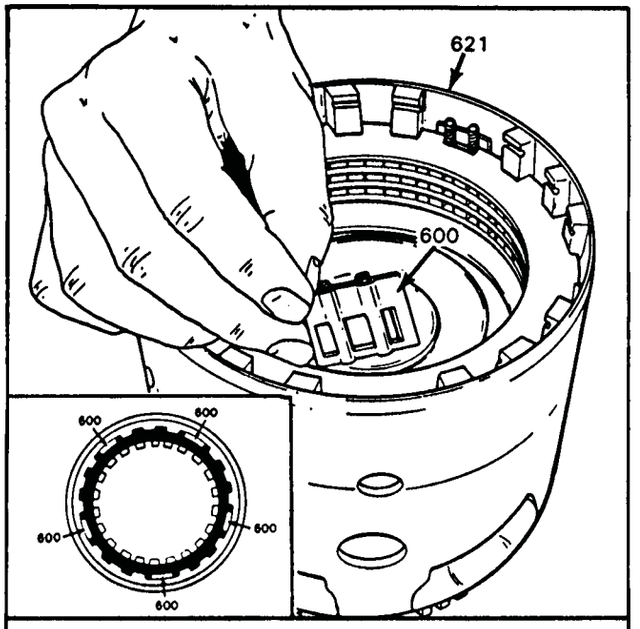


Figure 109



ATSG RECOMMENDS THAT YOU REMOVE AND DISCARD THE 3-4 LOAD RELEASE SPRING ASSEMBLIES SHOWN ABOVE, ALL MODELS, FOR A MUCH IMPROVED 2-3 SHIFT!

Figure 110

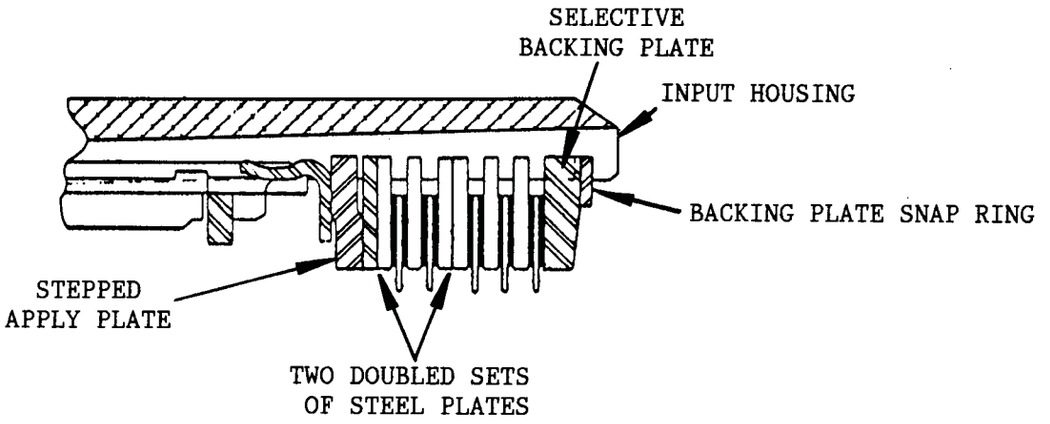
INPUT HOUSING ASSEMBLE 3-4 CLUTCH PACK

1. Install the 3-4 clutch retainer ring, as shown in Figure 108. Be sure that each tab on the retainer is snapped over the outside of the legs of the apply ring. This retainer ring is used to keep the legs of the apply ring from spreading under load.
2. Install the 3-4 "Stepped" apply plate with the stepped side facing up as shown in Figures 109 and 111.
3. THERE ARE 5 AND 6 PLATE 3-4 CLUTCH ASSEMBLIES, AS SHOWN IN FIGURE 111. TWO STEEL PLATES ARE STACKED TOGETHER ON SOME MODELS, IN TWO PLACES, TO PROVIDE THE SAME STACK-UP AS A SIX PLATE CLUTCH PACK (SEE FIGURE 111).
4. Install the 3-4 clutch plates, both lined and steel, using Figure 111 as a guide, depending on model.

NOTE: There is now available under OEM part number 8690923, an updated 3-4 clutch service package that includes the following:
1. New apply ring with shorter legs.
2. New apply plate.
3. New (THICKER) steel plates.
4. New selective backing plates.
5. Instruction sheet.

(Continued on Page 64)

5 PLATE 3-4 CLUTCH PACK



6 PLATE 3-4 CLUTCH PACK

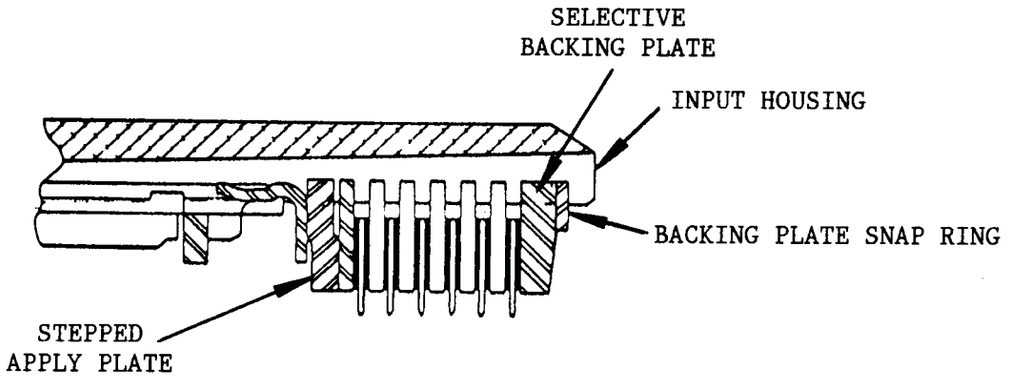


Figure 111

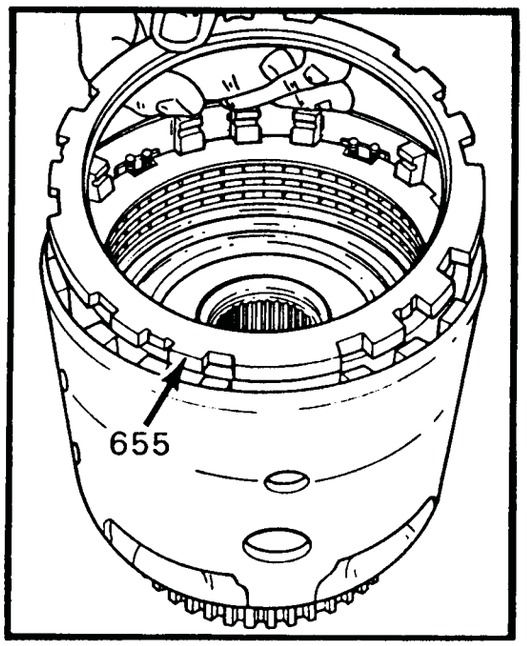


Figure 112

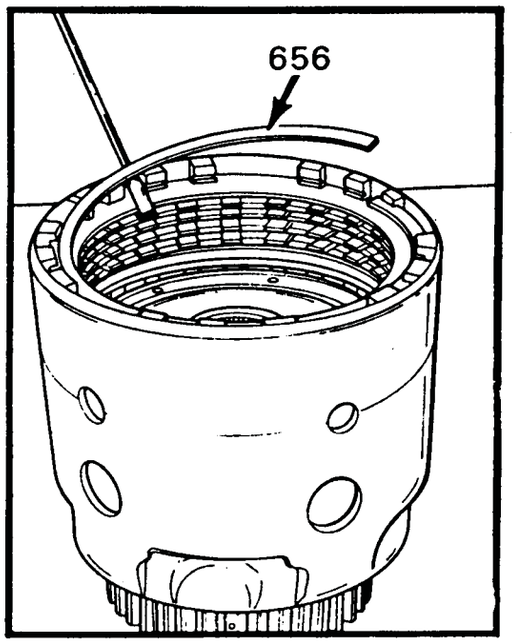


Figure 113

Continued from Page 62.

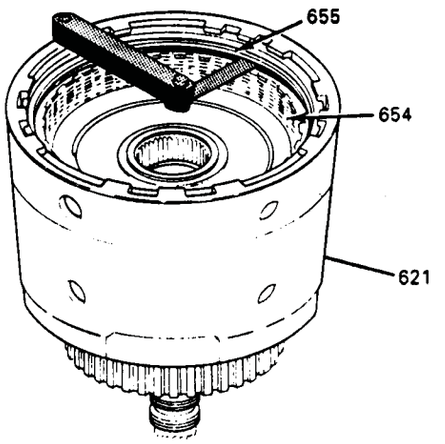
5. Install the 3-4 clutch backing plate as shown in Figure 112.
6. Install the 3-4 clutch backing plate snap ring as shown in Figure 113.
7. Check the 3-4 clutch clearance with a feeler gage, between the backing plate and the first friction plate, as shown in Figure 114.
8. Clearance should be .060" to .085".
9. Change the selective backing plate as necessary to obtain the correct 3-4 clutch clearance, using chart in Figure 114.
10. Air check the 3-4, forward, and the overrun clutches by applying air pressure at the feed holes in the turbine shaft (See Figure 117).
11. When the overrun clutch is checked air will exit the forward clutch feed hole in the turbine shaft. THIS IS NORMAL.

NOTE: ATSG RECOMMENDS THAT YOU REMOVE AND DISCARD THE 3-4 LOAD RELEASE SPRING ASSEMBLIES SHOWN ABOVE, ALL MODELS, FOR A MUCH IMPROVED 2-3 SHIFT. (SEE FIGURE 110).

(Continued on Page 66).

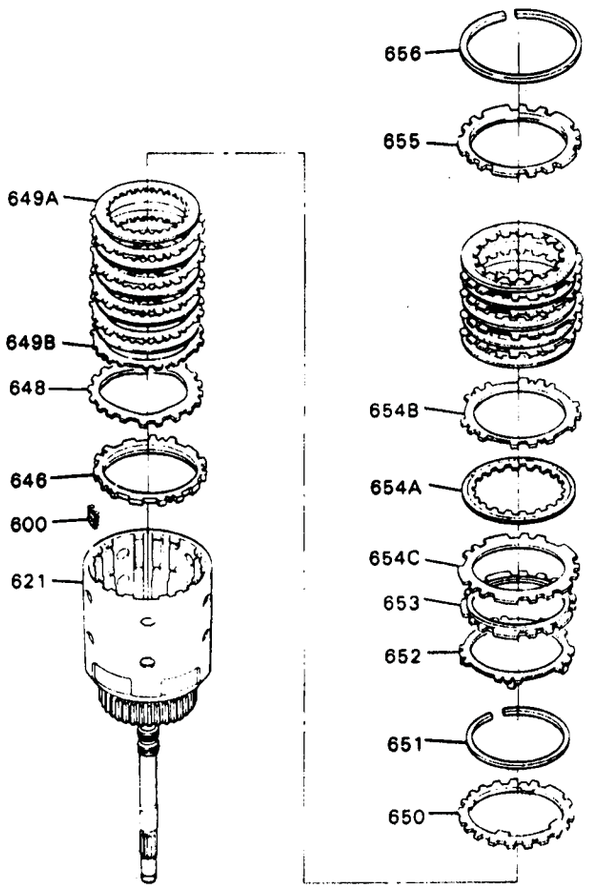
3 - 4 BACKING PLATE SELECTION

MODEL	BACKING PLATE TRAVEL	*BACKING PLATE	
		Use Backing Plate Which Gives Correct Travel	
		DIM.	I.D.
FBM, SAM	2.42mm - 1.61mm (.095" - .063")	6.58mm - 6.38mm (.259" - .251")	5
		5.75mm - 5.55mm (.226" - .218")	6
ALL OTHERS	2.40mm - 1.52mm (.094" - .060")	4.92mm - 4.72mm (.194" - .186")	7
		4.09mm - 3.89mm (.161" - .153")	8



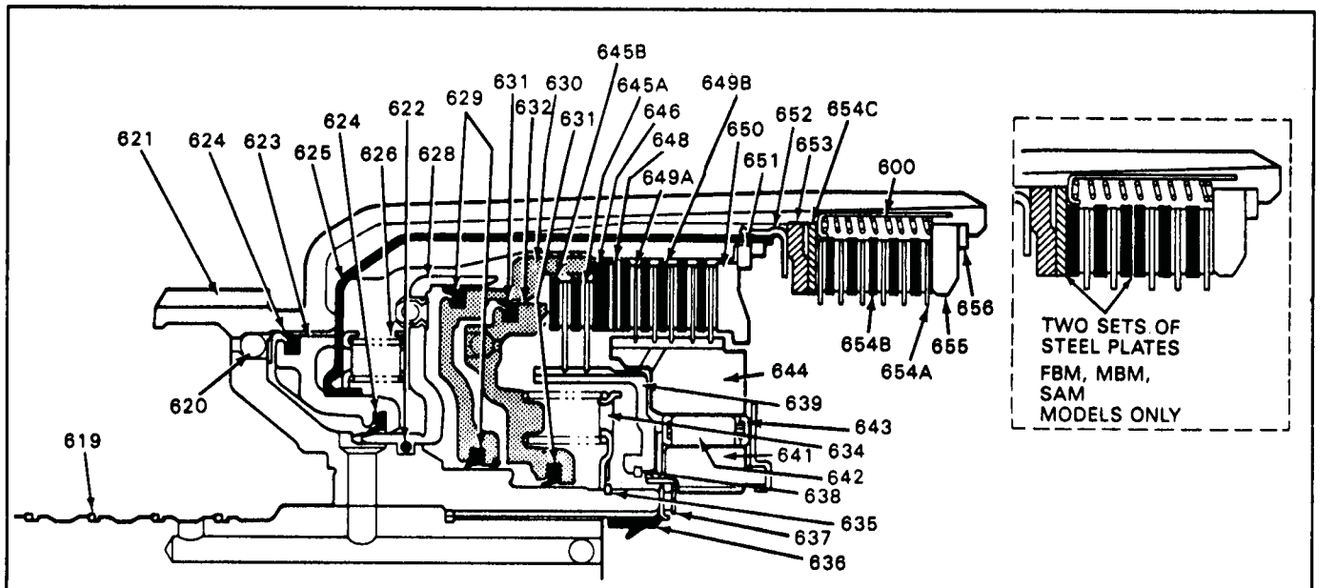
621 HOUSING AND SHAFT ASSEMBLY, INPUT
654 PLATE ASSEMBLY, 3RD AND 4TH CLUTCH
655 PLATE, 3RD AND 4TH CLUTCH BACKING (SEL.)

Figure 114



ILL. NO.	DESCRIPTION
600	SPRING ASM., 3-4 CLUTCH BOOST (5)
621	HOUSING AND SHAFT ASSEMBLY, INPUT
646	PLATE, FORWARD CLUTCH (APPLY)
648	PLATE, FORWARD CLUTCH (WAVED)
649A	PLATE ASSEMBLY, FORWARD CLUTCH (FIBER)
649B	PLATE, FORWARD CLUTCH (STEEL)
650	PLATE, FORWARD CLUTCH BACKING (SEL.)
651	RING, FORWARD CLUTCH BACKING PLATE RETAINER
652	PLATE, 3RD AND 4TH CLUTCH RING RETAINER
653	PLATE, 3RD AND 4TH CLUTCH APPLY (STEPPED)
654A	PLATE ASSEMBLY, 3RD AND 4TH CLUTCH (FIBER)
654B	PLATE, 3RD AND 4TH CLUTCH (STEEL)
654C	PLATE, 3RD AND 4TH CLUTCH (STEEL)
655	PLATE, 3RD AND 4TH CLUTCH BACKING (SEL.)
656	RING, 3RD AND 4TH CLUTCH BACKING PLATE RETAINER

Figure 115



600	SPRING ASM., 3-4 CLUTCH BOOST (5)	641	RETAINER AND RACE ASSEMBLY, SPRAG
619	RING, OIL SEAL (SOLID)	642	FORWARD SPRAG ASSEMBLY
620	RETAINER AND CHECKBALL ASSEMBLY	643	RETAINER RINGS, SPRAG ASSEMBLY
621	HOUSING AND SHAFT ASSEMBLY, INPUT	644	RACE, FORWARD CLUTCH (OUTER)
622	SEAL, O-RING INPUT TO FORWARD HSG.	645A	PLATE ASSEMBLY, OVERRUN CLUTCH (FIBER)
623	PISTON, 3RD AND 4TH CLUTCH	645B	PLATE, OVERRUN CLUTCH (STEEL)
624	SEAL, 3RD AND 4TH CL. (INNER AND OUTER)	646	PLATE, FORWARD CLUTCH (APPLY)
625	RING, 3RD AND 4TH CLUTCH (APPLY)	648	PLATE, FORWARD CLUTCH (WAVED)
626	SPRING ASSEMBLY, 3RD AND 4TH CLUTCH	649A	PLATE ASSEMBLY, FORWARD CLUTCH (FIBER)
628	HOUSING, FORWARD CLUTCH	649B	PLATE, FORWARD CLUTCH (STEEL)
629	SEAL, FORWARD CLUTCH (INNER AND OUTER)	650	PLATE, FORWARD CLUTCH BACKING (SEL.)
630	PISTON, FORWARD CLUTCH	651	RING, FORWARD CLUTCH BACKING PLATE RETAINER
631	SEAL, OVERRUN CLUTCH (INNER AND OUTER)	652	PLATE, 3RD AND 4TH CLUTCH RING RETAINER
632	PISTON, OVERRUN CLUTCH	653	PLATE, 3RD AND 4TH CLUTCH APPLY (STEPPED)
634	SPRING ASSEMBLY, OVERRUN CLUTCH	654A	PLATE ASSEMBLY, 3RD AND 4TH CLUTCH (FIBER)
635	SNAP RING, OVERRUN CLUTCH SPRING RETAINER	654B	PLATE, 3RD AND 4TH CLUTCH (STEEL)
636	SEAL, INPUT HOUSING TO OUTPUT SHAFT	654C	PLATE, 3RD AND 4TH CLUTCH (STEEL)
637	BEARING ASSEMBLY, INPUT SUN GEAR	655	PLATE, 3RD AND 4TH CLUTCH BACKING (SEL.)
638	SNAP RING, OVERRUN CL. HUB RETAINING	656	RING, 3RD AND 4TH CLUTCH BACKING PLATE RETAINER
639	HUB, OVERRUN CLUTCH		

Figure 116

Continued from Page 64.

SEALING RING INSTALLATION

1. Set input housing on bench with the turbine shaft facing up, as shown in Figure 117.
2. Install the four "Solid" turbine shaft sealing rings onto the input shaft beginning with the bottom ring, as shown in Figure 117.
3. SOLID Teflon sealing rings are mandatory in this position.
4. The solid sealing rings will require an installation tool, and re-sizing tool as shown in Figure 117.

NOTE: It would be advisable to leave the resizing tool installed on the turbine shaft sealing rings until ready for final assembly. This will ensure no damage during installation.

5. Set the input housing aside until we have the reverse input housing built and ready for installation into case.

(Continued on Page 68).

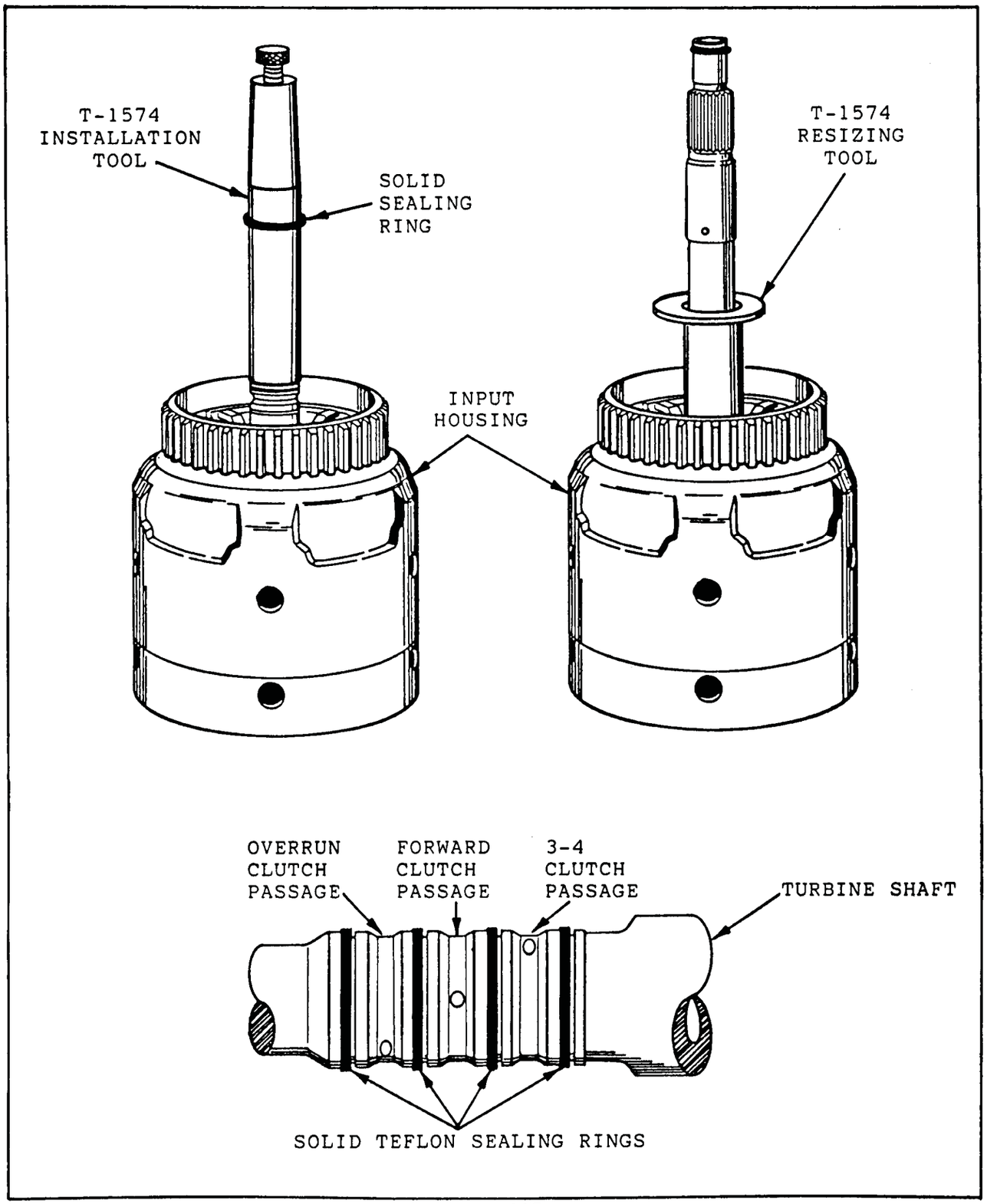


Figure 117

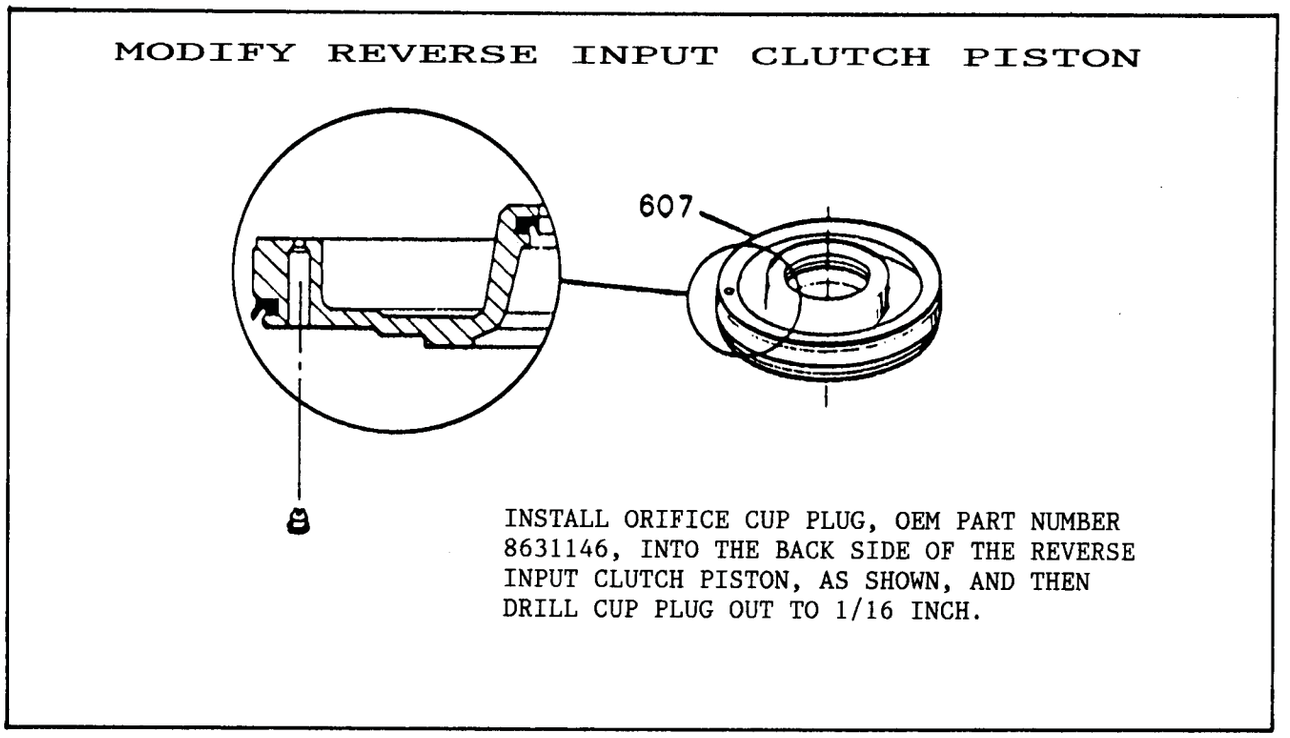


Figure 118

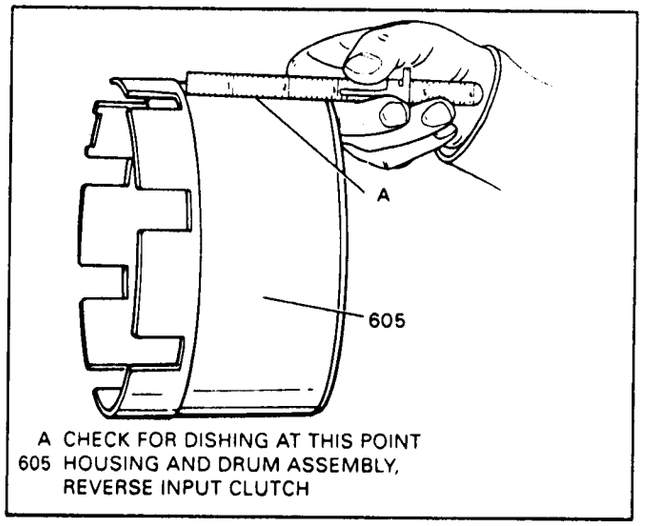
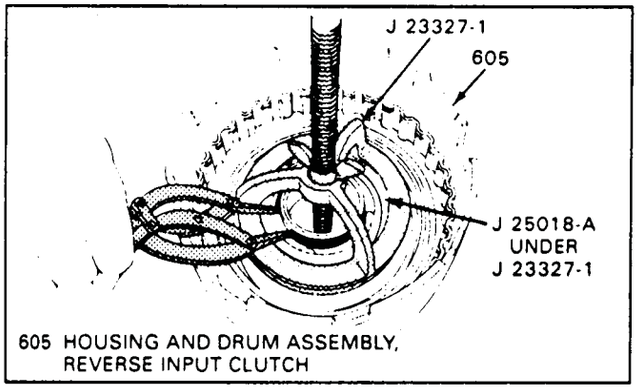


Figure 119

REVERSE INPUT HOUSING ASSEMBLE

1. Inspect all components of the reverse input clutch assembly for damage or wear.
2. Inspect the reverse input clutch housing with a straight edge, as shown in Figure 119, for flatness.
3. If the tangs of the reverse input housing and the tangs of the sun gear shell have "Flared" out, replace the input sprag assembly regardless of how good it happens to look and/or check.
4. Modify the reverse input clutch piston as shown in Figure 118, by installing orifice cup plug, OEM No. 8631146, in the back side of piston and then drill cup plug out to 1/16 inch.
5. Look carefully at the reverse input housing feed hole located between the sealing rings inside the housing. This hole has changed back to the large square in the housing, and still has the aluminum piston. The 4L60-E must use this type of housing.

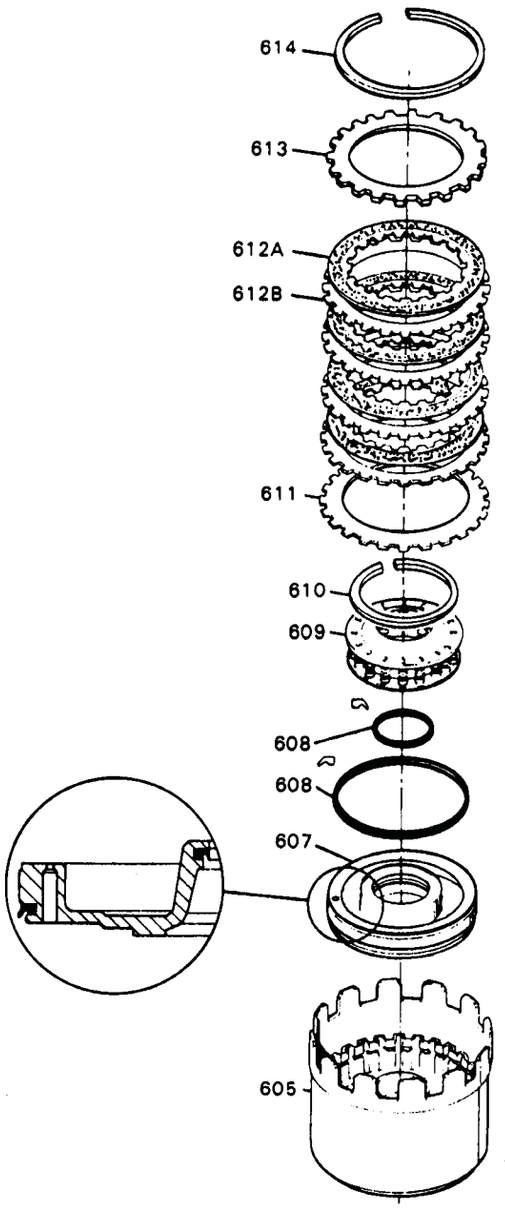


605 HOUSING AND DRUM ASSEMBLY, REVERSE INPUT CLUTCH

Figure 120

6. Install the inner and outer lip seals onto the reverse input piston, and lubricate with TransJel. Lips on the seals must face direction shown in Figure 121.
7. NOTE: Always install a "Long" lip seal in the outer position on this piston. DO NOT use a short lip seal.
8. Lubricate reverse input housing seal surfaces with TransJel.
9. Install the reverse input piston into the housing, using care not to damage the lip seals.
10. Install the return spring assembly on top of the reverse input piston.
11. Install spring compressor, as shown in Figure 120, compress the return spring assembly and install snap ring.
12. Remove the spring compressor.

(Continued on Page 70).



ILL. NO.	DESCRIPTION
605	HOUSING AND DRUM ASSEMBLY, REVERSE INPUT CLUTCH
607	PISTON ASM., REVERSE INPUT CLUTCH
608	SEALS, REVERSE INPUT CLUTCH (INNER AND OUTER)
609	SPRING ASM., REVERSE INPUT CLUTCH
610	RING, REVERSE INPUT CLUTCH SPRING RETAINER
611	PLATE, REVERSE INPUT CLUTCH (BELLEVILLE)
612A	PLATE ASM., REVERSE INPUT CLUTCH (FIBER)
612B	PLATE, REVERSE INPUT CLUTCH (STEEL)
613	PLATE, REVERSE INPUT CLUTCH BACKING (SELECTIVE)
614	RING, REVERSE INPUT CL. RETAINING

Figure 121

REVERSE INPUT CLUTCH		
	NO.	THICKNESS
BELLEVILLE PLATE	1	2.311mm (.091") 2.210mm (.087")
FLAT STEEL CLUTCH PLATE	4	2.045mm (0.81") 1.892mm (0.75")
COMPOSITION FACED CLUTCH PLATE	4	1.880mm (.074") 1.730mm (.068")
BACKING PLATE	1	SELECTIVE

Figure 122

REVERSE INPUT CLUTCH BACKING PLATE SELECTION	
ALL MODELS	
BACKING PLATE TRAVEL =	1.02mm - 1.94mm (0.40" - .076")
PLATE THICKNESS	**IDENTIFICATION**
7.249mm - 7.409mm (.285" - .292")	2
6.678mm - 6.519mm (.263" - .257")	3
5.947mm - 5.787mm (.234" - .228")	4

Figure 124

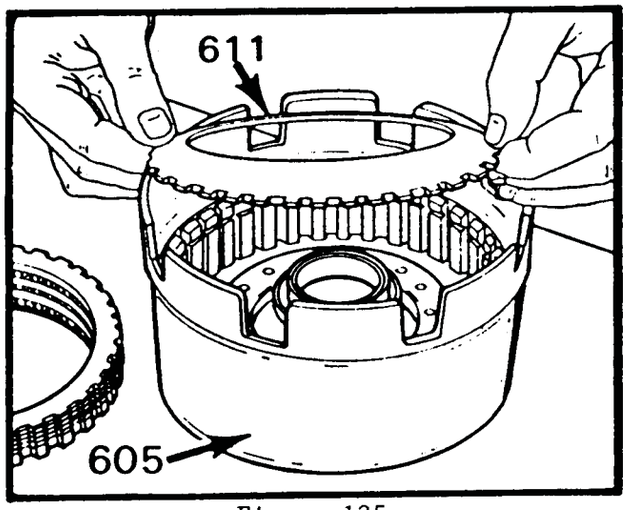
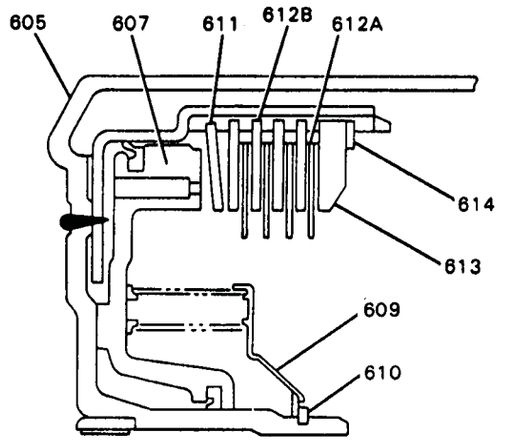


Figure 125



605 HOUSING AND DRUM ASSEMBLY, REVERSE INPUT CLUTCH
607 PISTON ASM., REVERSE INPUT CLUTCH
609 SPRING ASM., REVERSE INPUT CLUTCH
610 RING, REVERSE INPUT CLUTCH SPRING RETAINER
611 PLATE, REVERSE INPUT CLUTCH (BELLEVILLE)
612A PLATE ASM., REVERSE INPUT CLUTCH (FIBER)
612B PLATE, REVERSE INPUT CLUTCH (STEEL)
613 PLATE, REVERSE INPUT CLUTCH BACKING (SELECTIVE)
614 RING, REVERSE INPUT CL. RETAINING

Figure 123

Continued from Page 69.

13. Install the reverse input "Belleville" plate, Concave Side Down, into reverse input housing as shown in Figure 125.
14. Install the reverse input clutch plates beginning with a flat steel plate, as shown in Figure 126.
15. Alternate friction and steel plates until you have installed four friction and four steel plates (Figure 123).
16. All models require 4 friction and 4 steel plates (See Figure 122).
17. Install the reverse input clutch backing plate, chamfered side up, shown in Figure 127.
18. Install the reverse backing plate snap ring, as shown in Figure 129.
19. Air check reverse input housing to ensure no damage was done to lip seals during the assembly process.
20. Check the reverse input clearance with a feeler gage between the backing plate and the snap ring.
21. Clearance should be .040" to .075". Change the selective backing plate as necessary to obtain this clearance, using the chart in Figure 124.

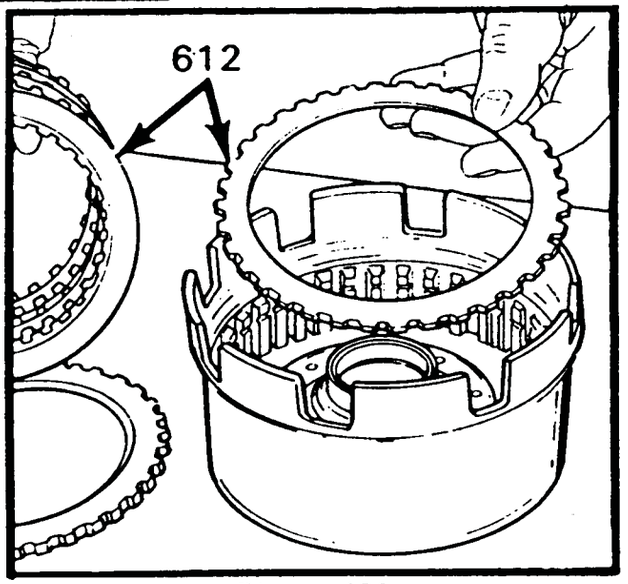


Figure 126

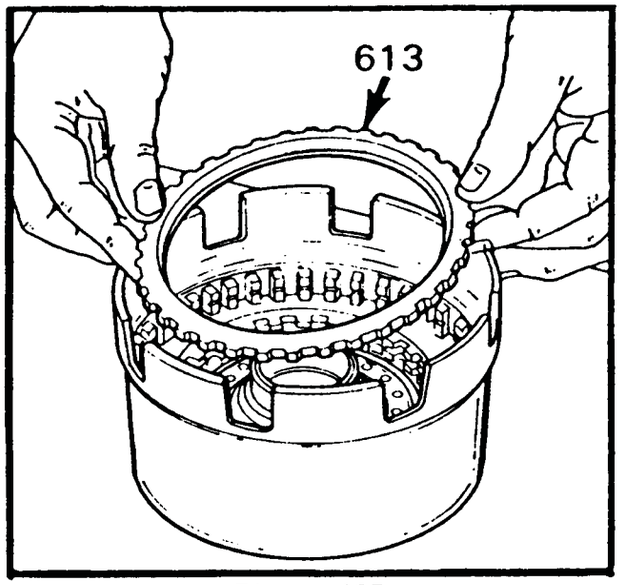


Figure 127

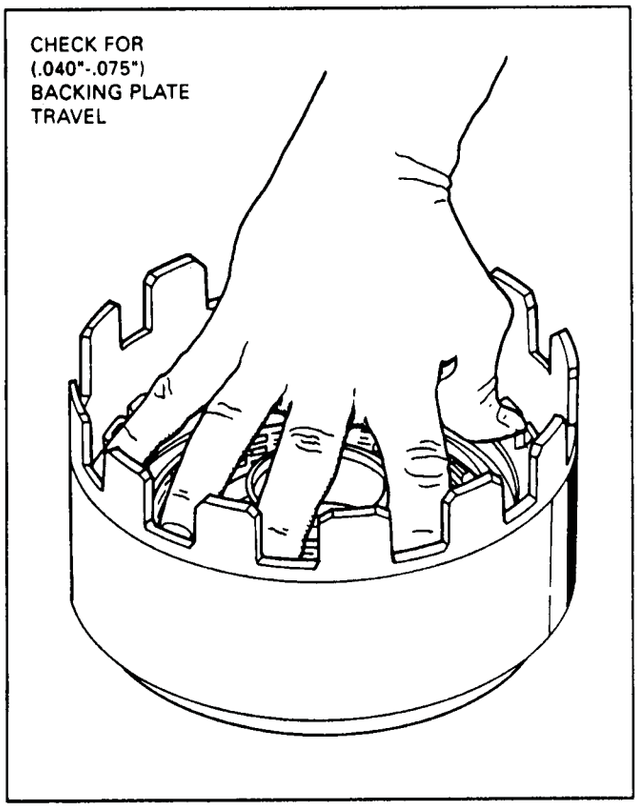


Figure 128

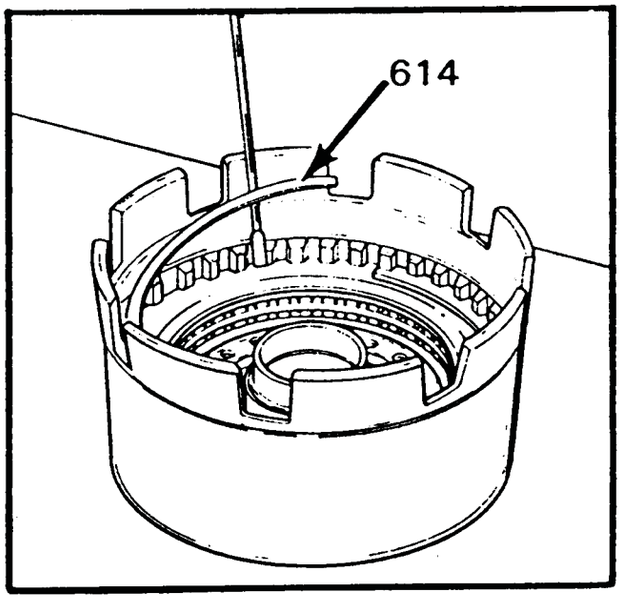
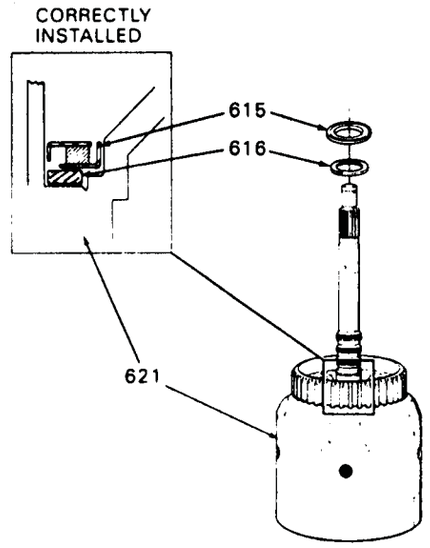
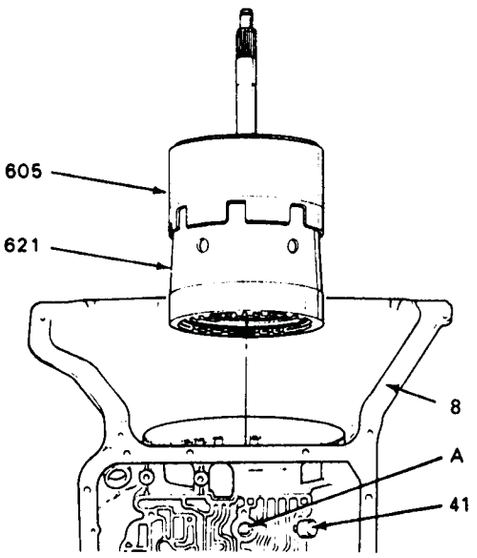


Figure 129



615 BEARING ASSEMBLY, STATOR SHAFT / SELECTIVE WASHER
616 WASHER, THRUST (SELECTIVE)
621 HOUSING AND SHAFT ASSEMBLY, INPUT

Figure 130



A BAND ANCHOR PIN LOCATION
8 CASE, TRANSMISSION
41 PIN, BAND ANCHOR
605 HOUSING AND DRUM ASSEMBLY, REVERSE INPUT CLUTCH
621 HOUSING AND SHAFT ASSEMBLY, INPUT

Figure 132

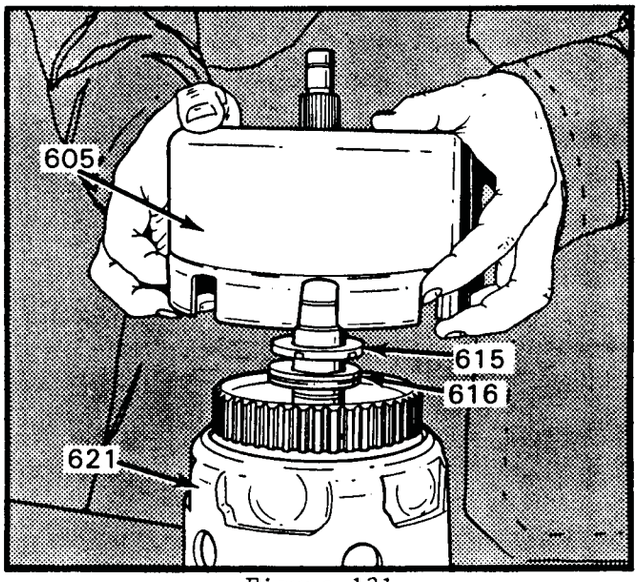


Figure 131

ASSEMBLE REVERSE INPUT CLUTCH AND INPUT CLUTCH HOUSINGS

1. Make sure that your selective washer and thrust bearing assembly have been installed properly onto the input housing, as shown in Figure 130.
2. The thrust bearing assembly should be installed with the black side facing up.
3. Install the reverse input housing onto the input clutch housing, as shown in Figure 131.
4. Rotate and index the reverse input clutch plates onto the hub of the input clutch housing.
5. When installed properly, the thrust bearing will turn with the reverse input clutch housing.
6. Install the reverse input and input clutch assembly into the transmission case as shown in Figure 132.
7. There will be three items to index properly during installation.
   * 3-4 clutch plates must be indexed onto the input ring gear.
   * Input sun gear must be indexed into the forward sprag inner race.
   * Reverse input housing tangs must be indexed into the sun gear shell.
8. Great care must be exercised to ensure that all clutch plates are fully seated.
9. When properly assembled, the reverse input housing will be located just below the case oil pump face.

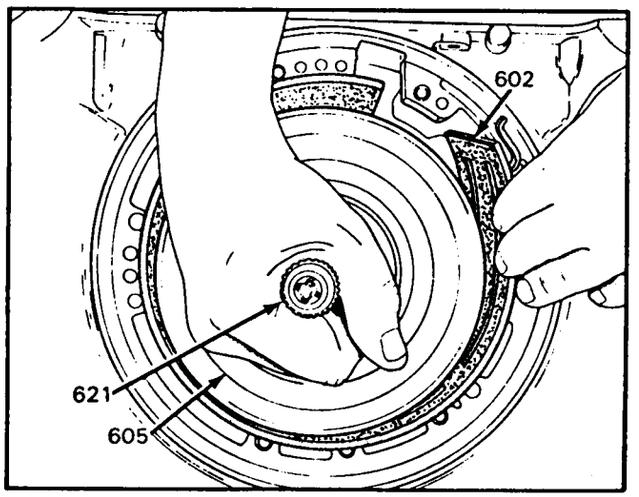
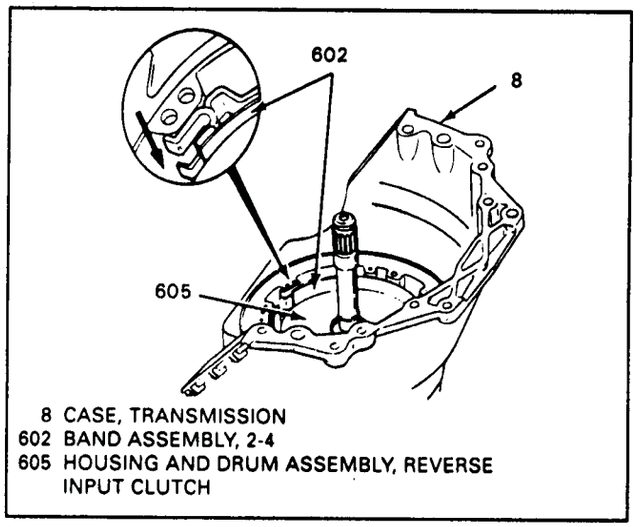


Figure 133



8 CASE, TRANSMISSION
602 BAND ASSEMBLY, 2-4
605 HOUSING AND DRUM ASSEMBLY, REVERSE INPUT CLUTCH

Figure 134

INSTALL 2-4 BAND ASSEMBLY

1. Rotate the transmission so that the case oil channels are facing up.
2. Install the 2-4 band assembly beginning as shown in Figures 133 and 134.
3. Line up the anchor pin hole in the band with the hole in the case, and the clip end of the band as shown in Figure 135.
4. Install the band anchor pin into the case hole as shown in Figure 136.
5. Index the 2-4 band onto the band anchor pin.
6. Anchor pin will be just below valve body surface when properly installed.

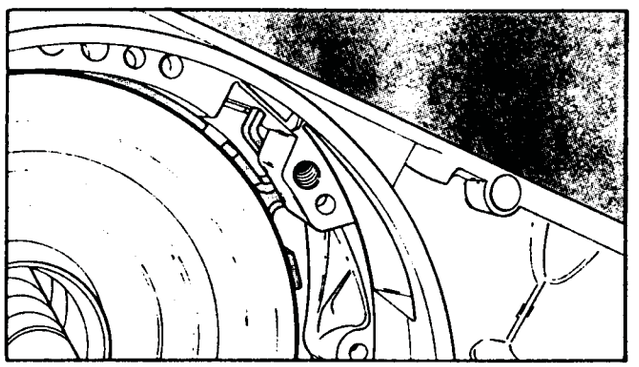


Figure 135

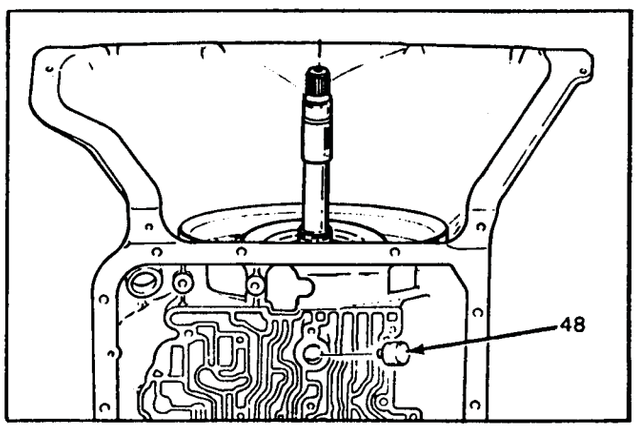
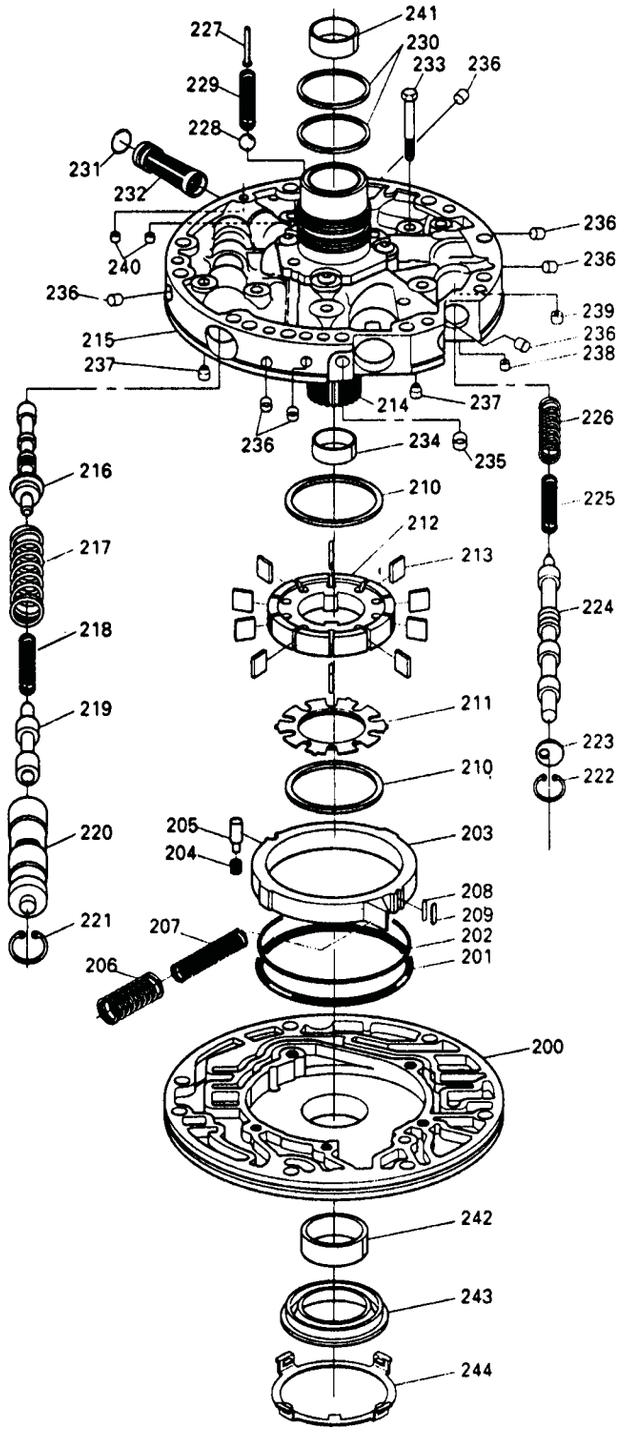


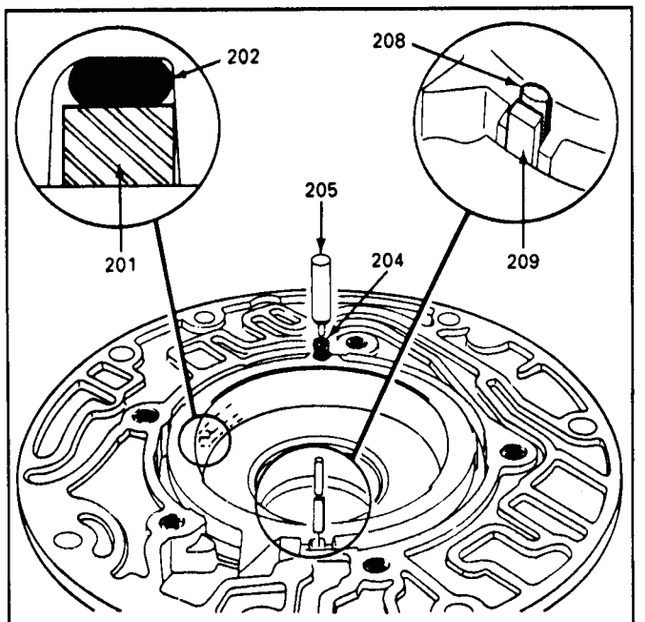
Figure 136



ILL. NO.	DESCRIPTION
200	BODY, PUMP
201	RING, OIL SEAL (SLIDE TO WEAR PLATE)
202	SEAL, O-RING (SLIDE SEAL BACK-UP)
203	SLIDE, PUMP
204	SPRING, PIVOT PIN
205	PIN, PIVOT SLIDE
206	SPRING, PUMP SLIDE (OUTER)
207	SPRING, PUMP SLIDE (INNER)
208	SUPPORT, PUMP SLIDE SEAL
209	SEAL, PUMP SLIDE
210	RING, PUMP VANE
211	GUIDE, ROTOR
212	ROTOR, OIL PUMP
213	VANE, PUMP
214	SHAFT, STATOR
215	COVER, PUMP
216	VALVE, PRESSURE REGULATOR
217	SPRING, PRESSURE REGULATOR VALVE
218	SPRING, PRESSURE REGULATOR ISOLATOR
219	VALVE, REVERSE BOOST
220	SLEEVE, REVERSE BOOST VALVE
221	RING, OIL PUMP REVERSE BOOST VALVE RETAINING
222	RING, OIL PUMP CONVERTER CLUTCH VALVE RETAINING
223	VALVE, STOP
224	VALVE, CONVERTER CLUTCH
225	SPRING, CONVERTER CLUTCH VALVE (INNER)
226	SPRING, CONVERTER CLUTCH VALVE (OUTER)
227	RIVET, PRESSURE RELIEF BOLT
228	BALL, PRESSURE RELIEF
229	SPRING PRESSURE RELIEF
230	RING, OIL SEAL (STATOR SHAFT)
231	SEAL, OIL PUMP COVER SCREEN
232	SCREEN, OIL PUMP COVER
233	BOLT, M8 X 1.25 X 40 (COVER TO BODY)
234	BUSHING, STATOR SHAFT (FRONT)
235	PLUG, OIL PUMP COVER (FWD CLUTCH FEED)
236	PLUG, OIL PUMP COVER
237	RETAINER AND BALL ASSEMBLY, CHECK VALVE
238	ORIFICE, CONVERTER CLUTCH SIGNAL (CUP PLUG)
239	ORIFICE, OIL COOLER (CUP PLUG)
240	PLUG, CUP ORIFICE
241	BUSHING, STATOR SHAFT (REAR)
242	BUSHING, PUMP BODY
243	SEAL ASSEMBLY, OIL
244	RETAINER, FRONT HELIX

OIL PUMP ASSEMBLY

Figure 137



201 RING, OIL SEAL (SLIDE TO WEAR PLATE)
202 SEAL, O-RING (SLIDE SEAL BACK-UP)
204 SPRING, PIVOT PIN
205 PIN, PIVOT SLIDE
208 SUPPORT, PUMP SLIDE SEAL
209 SEAL, PUMP SLIDE

Figure 138

ASSEMBLE PUMP BODY AND PUMP COVER

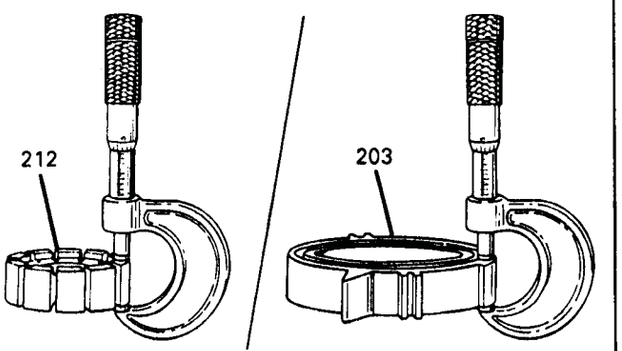
1. Install a new pump body bushing in pump body if necessary. Bushing must be driven out from the seal side of body and reinstalled from the pump pocket side of pump body.
2. Install new front pump seal, and seal retainer (See Figure 137).
3. Install "O" ring back-up and oil seal ring into the groove on the back side of the pump slide (See Figure 138).
4. Install slide seal support and the Teflon slide seal onto pump slide and retain with TransJel (Figure 138).
5. Install pump slide assembly into pump pocket being carefull not to disturb slide seals.
6. Proper selection of rotor and slide sizes are very important. Refer to the chart in Figure 139 for proper rotor and slide selection.
7. Pull the pump slide straight towards the slide seal with one hand, and with the other hand install pivot pin and spring (See Figure 138).
8. Insure that pump slide moves back and forth freely in the pump pocket.

OIL PUMP ROTOR SELECTION CHART

THICKNESS (mm)	THICKNESS (in.)
17.948 - 17.961	0.7066 - 0.7071
17.961 - 17.974	0.7071 - 0.7076
17.974 - 17.987	0.7076 - 0.7081
17.987 - 18.000	0.7081 - 0.7086
18.000 - 18.013	0.7086 - 0.7091

OIL PUMP SLIDE SELECTION CHART

THICKNESS (mm)	THICKNESS (in.)
17.948 - 17.961	0.7066 - 0.7071
17.961 - 17.974	0.7071 - 0.7076
17.974 - 17.987	0.7076 - 0.7081
17.987 - 18.000	0.7081 - 0.7086
18.000 - 18.013	0.7086 - 0.7091



203 SLIDE, PUMP
212 ROTOR, OIL PUMP

Figure 139

9. Install both of the pump slide springs (See Figure 137).
10. Install rotor guide onto pump rotor and retain with TransJel.
11. Install vane ring into pump pocket.
12. Install pump rotor and guide assembly into pump pocket with guide towards the pump pocket (Figure 137).
13. Install ten vanes into pump rotor.
14. Install remaining vane ring into the pump rotor (See Figure 137).
15. Align and install oil pump cover onto the oil pump body.
16. Install five pump cover to pump body bolts, but do not tighten.
17. Install alignment tool J-21368 onto the oil pump assembly as shown in Figure 140.

(Continued on Page 76).

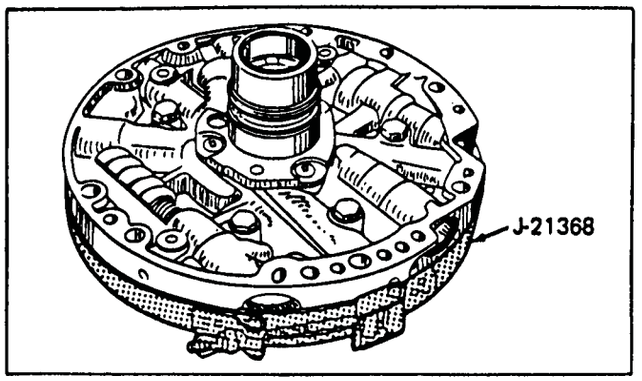


Figure 140

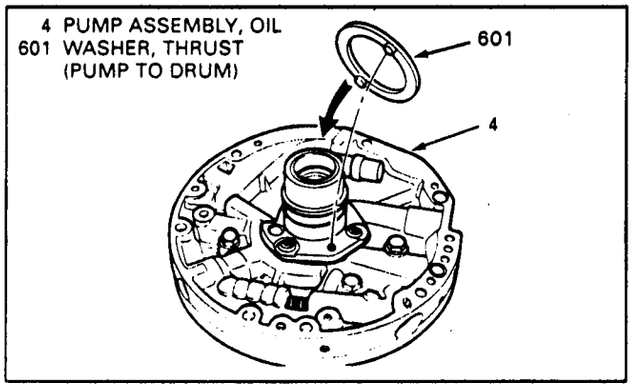


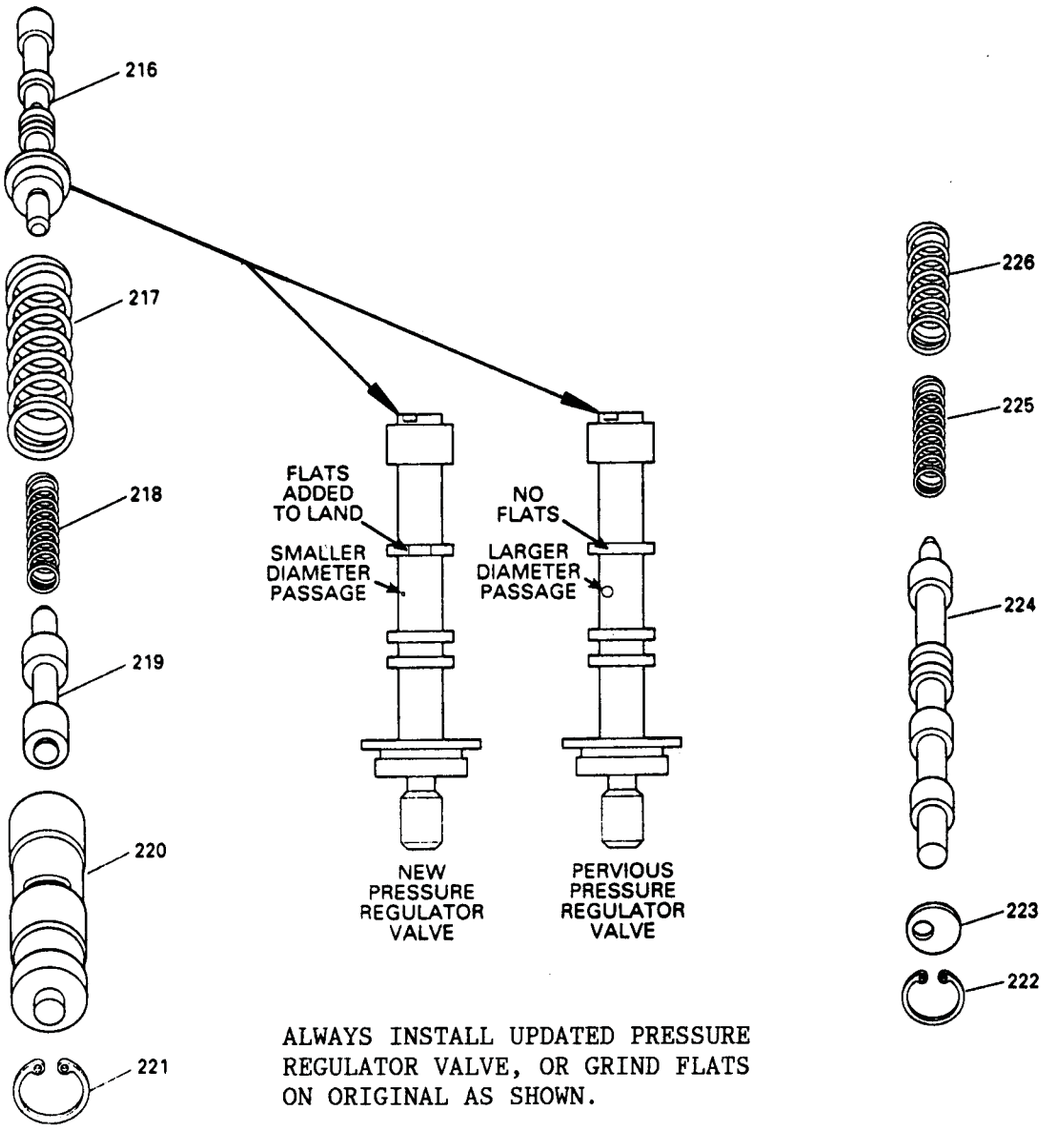
Figure 141

Continued from Page 75.

18. Torque the five pump cover to pump body bolts to 18 ft.lbs. while the alignment strap is tight.
19. Remove tool J-21368 from pump.
20. Install inner and outer converter clutch apply valve springs into the pump cover (See Figures 137 and 142).
21. Install the converter clutch apply valve into the same bore, with the valve installed exactly as shown in Figure 142.
22. Install converter clutch valve stop, push down with screwdriver, and install snap ring with the flat side facing out.
23. Grind two "Flats" on the second land of the pressure regulator valve, as shown in Figure 142, or purchase the updated pressure regulator valve.
24. Install modified pressure regulator valve into pressure regulator valve bore in the pump cover (Figure 137).
25. Insure that the valve moves freely in the pump cover bore.
26. Install pressure regulator valve springs, both inner and outer, into the same bore (Figures 137 and 142).
27. Install the boost valve into sleeve as shown in Figure 142.
28. Install boost valve and sleeve asm, into the same bore, push down with screwdriver, and install snap ring with the flat side facing out.
29. Pressure regulator valve train, and converter clutch valve train, MUST be installed "EXACTLY" as shown in Figure 142, or damage to the transmission could result.
30. Install the thrust washer on back of the pump cover, insuring that washer tabs are engaged in slots.
31. Retain thrust washer with TransJel.

(Continued on Page 78).

"UPDATED" PRESSURE REGULATOR VALVE (WITH FLATS)

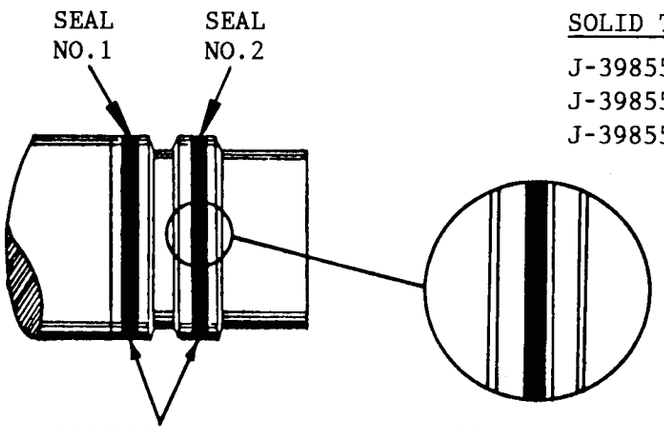


ALWAYS INSTALL UPDATED PRESSURE REGULATOR VALVE, OR GRIND FLATS ON ORIGINAL AS SHOWN.

216 VALVE, PRESSURE REGULATOR
217 SPRING, PRESSURE REGULATOR VALVE
218 SPRING, PRESSURE REGULATOR ISOLATOR
219 VALVE, REVERSE BOOST
220 SLEEVE, REVERSE BOOST VALVE
221 RING, OIL PUMP REVERSE BOOST VALVE RETAINING
222 RING, OIL PUMP CONVERTER CLUTCH VALVE RETAINING
223 VALVE, STOP
224 VALVE, CONVERTER CLUTCH
225 SPRING, CONVERTER CLUTCH VALVE (INNER)
226 SPRING, CONVERTER CLUTCH VALVE (OUTER)

Figure 142

SOLID TEFLON STATOR SEALING RINGS



SOLID TEFLON RING TOOLS FOR STATOR

J-39855-1 = INSTALLER FOR RING NO.1
J-39855-2 = INSTALLER FOR RING NO.2
J-39855-3 = RESIZER FOR BOTH RINGS

Figure 143

Continued from Page 76.

32. Install new "SOLID" Teflon sealing rings on stator shaft, using the new installation and resizing tools shown in Figure 143.
33. Install the oil pump to case "O" ring into the groove in the oil pump body.
34. The chamfered edge of the "O" ring should be facing out, and make sure that it is not twisted in groove.
35. Lubricate the "O" ring with TransJel and also the sealing rings.
36. Oil pump assembly is now ready for assembly into the transmission.
37. It is recommended to leave the resizing tool in place over the solid Teflon seals until you are ready to install the oil pump.

INSTALL OIL PUMP ASSEMBLY

1. Install oil pump to case gasket into the case and retain with TransJel.
2. Install alignment dowels into the transmission case as shown in Figure 144.
3. Lubricate case pump bore where the "O" ring rides with TransJel for ease of installation.
4. Install new "O" rings onto the front pump retaining bolts.
5. Install the complete oil pump assembly into the transmission case using the alignment dowels as shown Figure 144.
6. Install oil pump retaining bolts, and remove the alignment dowels, install the remaining bolts.
7. Torque all oil pump retaining bolts to 18 ft.lbs.
8. Install the proper "O" ring on turbine shaft AFTER end clearance is checked and properly set (See Figure 146).

CAUTION:
There should be clearance between the reverse input housing and the sun gear shell, as shown in Figure 145.

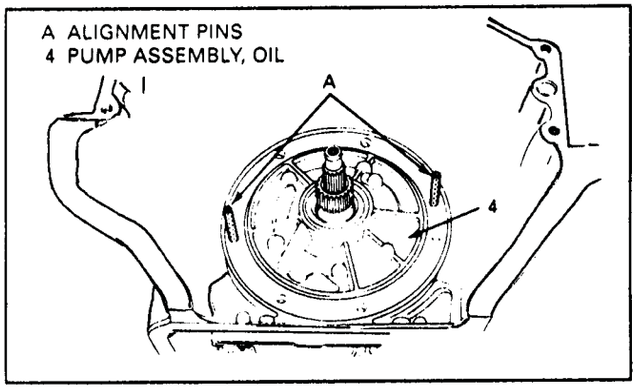
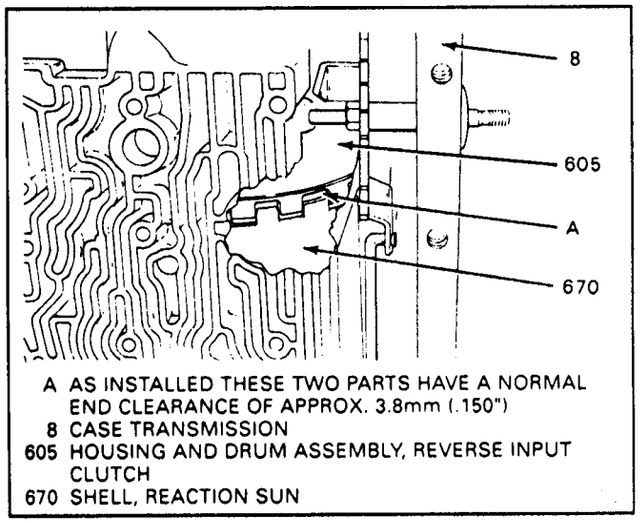


Figure 144



A AS INSTALLED THESE TWO PARTS HAVE A NORMAL END CLEARANCE OF APPROX. 3.8mm (.150")
8 CASE TRANSMISSION
605 HOUSING AND DRUM ASSEMBLY, REVERSE INPUT CLUTCH
670 SHELL, REACTION SUN

Figure 145

CAUTION:
There should be clearance between the reverse input housing and the sun gear shell, as shown in Figure 145. When installed these two parts have a normal end clearance of approximately .150". DO NOT try to shim the internal parts because of this clearance.

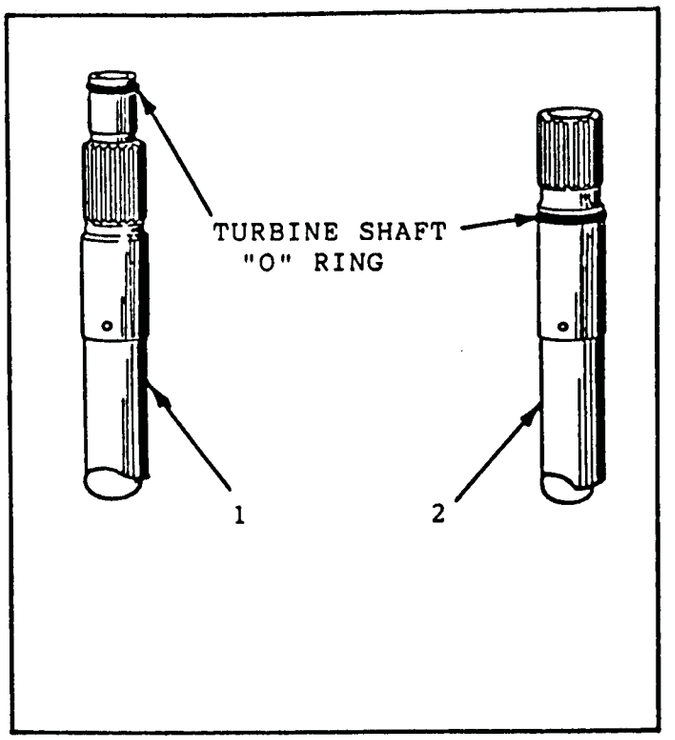
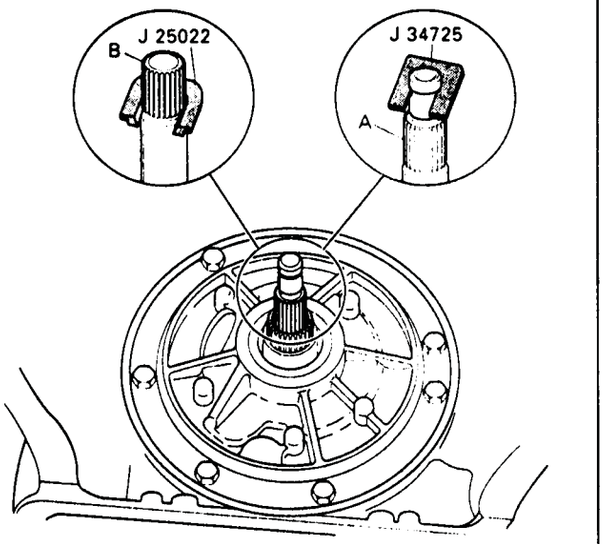


Figure 146



A 298mm TURBINE SHAFT
B 245mm TURBINE SHAFT

Figure 147

TRANSMISSION END PLAY WASHER SELECTION CHART

WASHER THICKNESS		I.D.
1.87 - 1.97 mm	(.074" - .078")	67
2.04 - 2.14 mm	(.080" - .084")	68
2.21 - 2.31 mm	(.087" - .091")	69
2.38 - 2.48 mm	(.094" - .098")	70
2.55 - 2.65 mm	(.100" - .104")	71
2.72 - 2.82 mm	(.107" - .111")	72
2.89 - 2.99 mm	(.113" - .118")	73
3.06 - 3.16 mm	(.120" - .124")	74

Figure 148

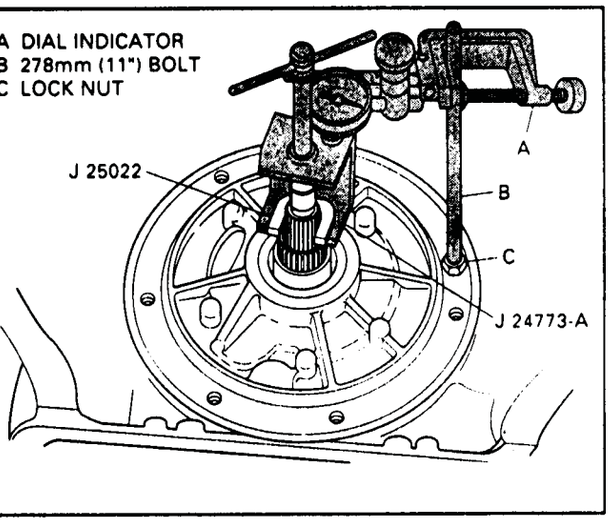
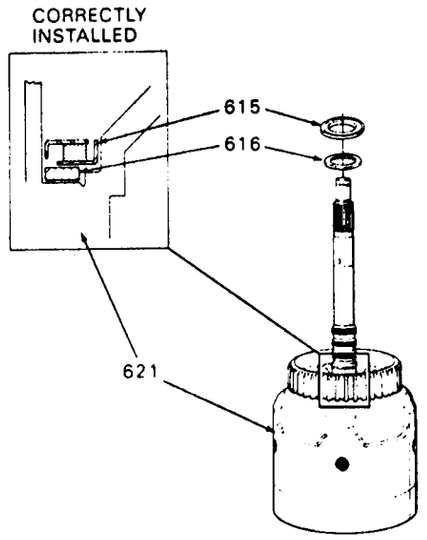


Figure 149



615 BEARING ASSEMBLY, STATOR SHAFT / SELECTIVE WASHER
616 WASHER, THRUST (SELECTIVE)
621 HOUSING AND SHAFT ASSEMBLY, INPUT

Figure 150

CHECKING TRANSMISSION END PLAY

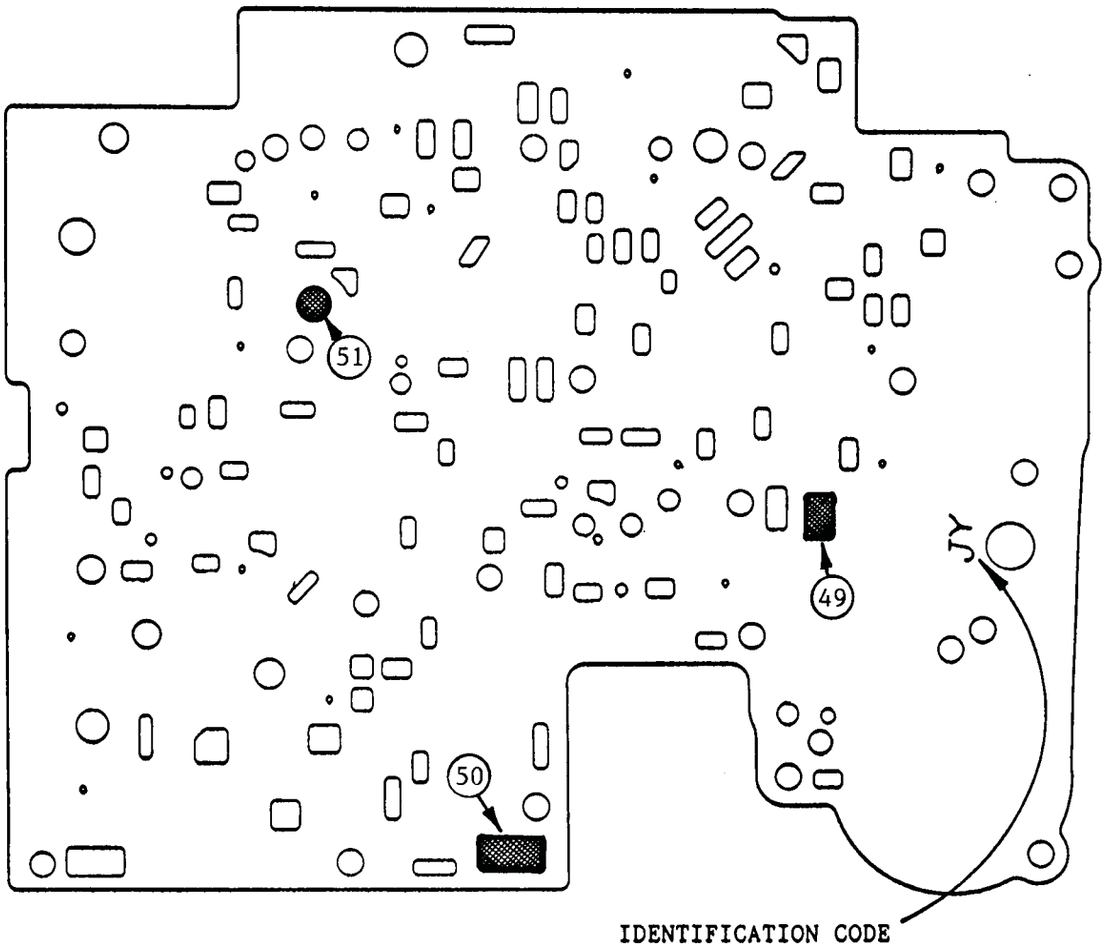
1. Remove a front pump bolt and install an 11" bolt and lock nut, as shown in Figure 149.
2. Install J-25022 adapter, or J-34725 adapter, as shown in Figure 147, on the turbine shaft.
3. Install lifting tool J-24773-A and dial indicator as shown Figure 149.
4. Set the dial indicator to zero.
5. Pull up on lifting tool J-24773-A and observe the reading.
6. Proper end play is .015" to .036".

NOTE: NEVER SET END PLAY ANY CLOSER THAN .015", BECAUSE ALUMINUM PUMP WILL EXPAND OR "GROW" AND YOU COULD END UP WITH A NEGATIVE END CLEARANCE.

NOTE:
The selective washer which controlls the end play is located between the input housing and the thrust bearing that rides on the oil pump cover hub (Figure 150). If more or less end play is required, select the proper washer from the chart in Figure 148 and install.

If dial indicator shows no end play, the selective washer and thrust bearing may have been misassembled. See Figure 150 for proper assembly.

4L60-E SPACER PLATE CHART AND SPACER PLATE SCREEN LOCATION

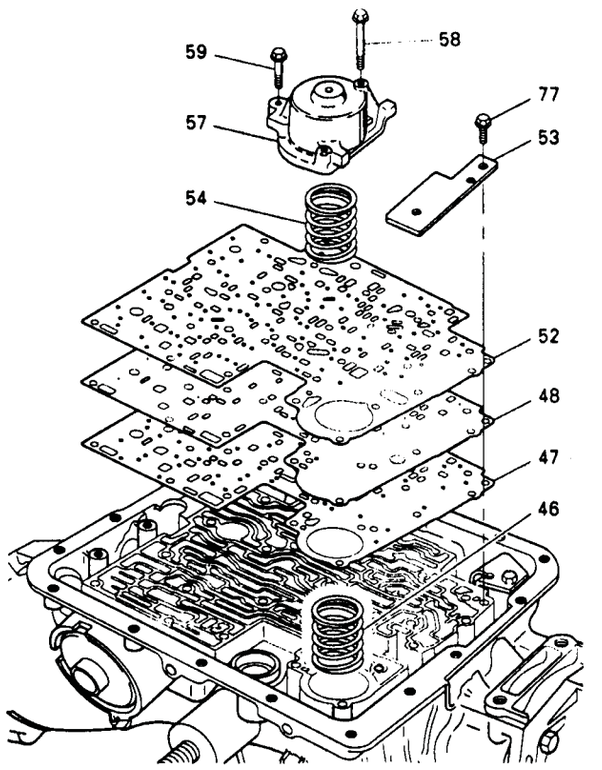


49 SPACER PLATE SCREEN SNAPS INTO PLATE FROM CASE SIDE.
50 SPACER PLATE SCREEN SNAPS INTO PLATE FROM CASE SIDE.
51 SPACER PLATE SCREEN SNAPS INTO PLATE FROM VALVE BODY SIDE (NOT USED ALL MODELS)

PART NO.	8684122	8684123	8684124	8684125	8684126
I.D. CODE	JV	JW	JX	JY	JZ
FITS THESE MODELS	MJD MND MSD TAD TBD MDD	SHD TLD CAD CBD KAD TWD	CCD CFD KBD	CHD KCD CJD	CKD CLD KDD

1993 MODEL SPACER PLATE CHART

Figure 151



46 SPRING, 3-4 ACCUMULATOR
47 GASKET, SPACER PLATE TO CASE
48 PLATE, VALVE BODY SPACER
52 GASKET, SPACER PLATE TO VALVE BODY
53 PLATE, SPACER PLATE SUPPORT
54 SPRING, 1-2 ACCUMULATOR
57 COVER AND PIN ASSEMBLY, 1-2 ACCUMULATOR
58 BOLT, ACCUMULATOR COVER
59 BOLT, ACCUMULATOR COVER
77 BOLT, SPACER PLATE SUPPORT

Figure 152

1993 MODELS	1-2 ACCUMULATOR SPRING COLOR	3-4 ACCUMULATOR SPRING COLOR
CHD, CJD, KCD	ORANGE, LT. GREEN, WHITE OR PLAIN	VIOLET
CAD, CBD, KAD, MJD, MND	ORANGE, LT. GREEN, WHITE OR PLAIN	DK. GREEN
CCD, CFD, KBD	ORANGE, LT. GREEN, WHITE OR PLAIN	RED
SHD, TLD	DK. GREEN	LT. BLUE
CKD, CLD, KDD, MDD, MSD, TAD, TBD	ORANGE, LT. GREEN, WHITE OR PLAIN	YELLOW

Figure 153

ASSEMBLE VALVE BODY RELATED PARTS

1. Rotate transmission to horizontal as shown in Figure 152.
2. Install one checkball into the proper pocket, as shown in Figure 154.
3. Install dowel pins into two locations of the valve body bolts.
4. Install the 3-4 accumulator pin into the case.
5. Install new seal on the 3-4 accumulator piston.
6. Lubricate the 3-4 accumulator bore in case with TransJel, and install the 3-4 accumulator piston into the case with the three legs facing the spacer plate.
7. Install the 3-4 accumulator spring on top of the piston, using the chart in Figure 153 to determine proper spring.
8. Install the spacer plate to case gasket identified with a "C" over the dowel pins and onto the case (Figure 152).
9. Install the three screens into the proper spacer plate. See Figure 151 for spacer plate screen locations.
10. Use the chart in Figure 151 to insure proper spacer plate usage.
11. Install proper spacer plate over the dowel pins and onto the case (Fig. 152).
12. Install the valve body to spacer plate gasket identified with a "V" over the dowel pins and onto plate (Figure 152).
13. Install the spacer plate support plate as shown in Figure 152, and torque the three retaining bolts to 8 ft.lb.
14. Install a new seal on 1-2 accumulator piston.
15. Lubricate the 1-2 accumulator housing bore with TransJel, and install the piston assembly into the housing with the three legs facing the spacer plate.
16. Install the 1-2 accumulator spring in the housing using the chart in Fig 153.
17. Install the 1-2 accumulator assembly on case and torque the three bolts to 8 ft.lbs.

4L60-E CHECKBALL LOCATIONS

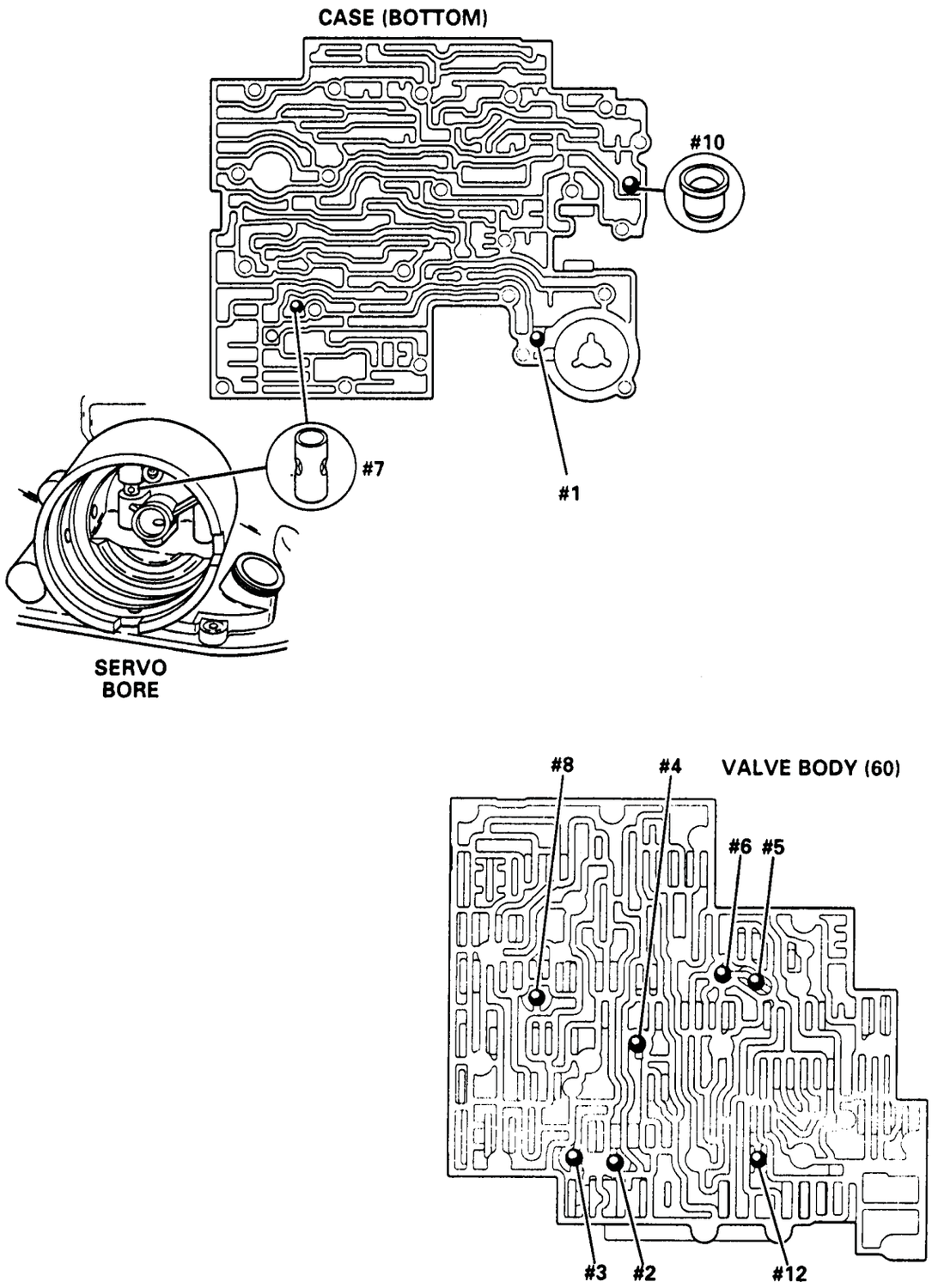
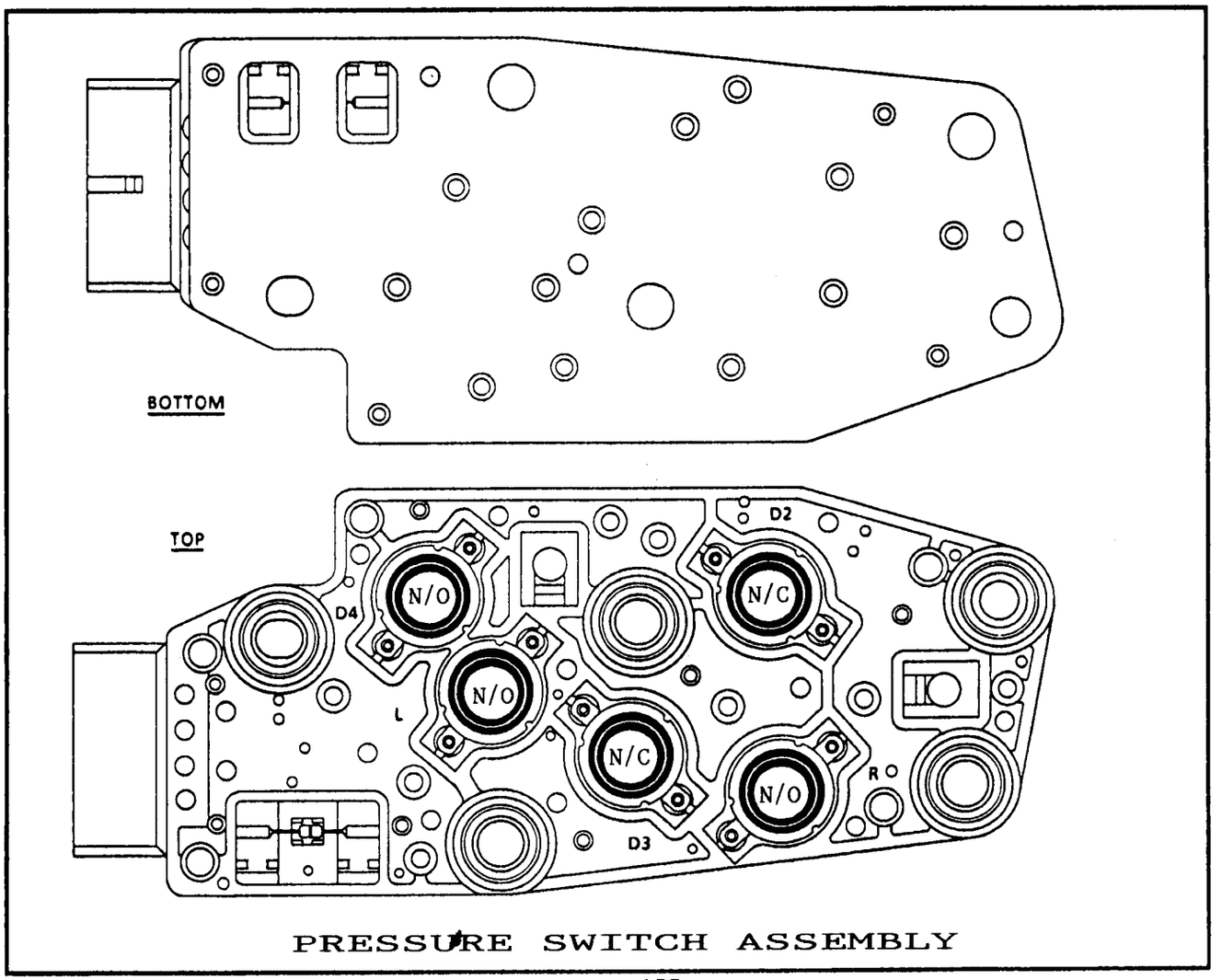


Figure 154

CHECKING THE PRESSURE SWITCH ASSEMBLY

1. Two of the five switches in the pressure switch assembly are normally closed (N/C), and the other three are normally open (N/O), as shown in Figure 155.
2. Set your ohmmeter so that it emits a "Tone" when the leads are connected.
3. Place the ohmmeter leads on the pins on each side of the D4 switch (N/O). No tone should be heard (Figure 155)
4. With the leads still in place, using a small flat punch, close the switch by carefully pushing down in center of the switch. If the switch is good a tone will now be heard from the ohmmeter.
5. Check the Lo switch (N/O) and Reverse switch (N/O) in the same manner.
6. Place the ohmmeter leads on the pins on each side of the D2 switch (N/C). A tone should be heard from ohmmeter until you push down in the center of the switch with small flat punch, and the tone will then stop.
7. Check the D3 switch (N/C) in the same manner as the D2 switch.
8. Refer to Figure 155.
9. To check the resistance values for the transmission oil temperature sensor, see Page 7 of this manual.



PRESSURE SWITCH ASSEMBLY

Figure 155

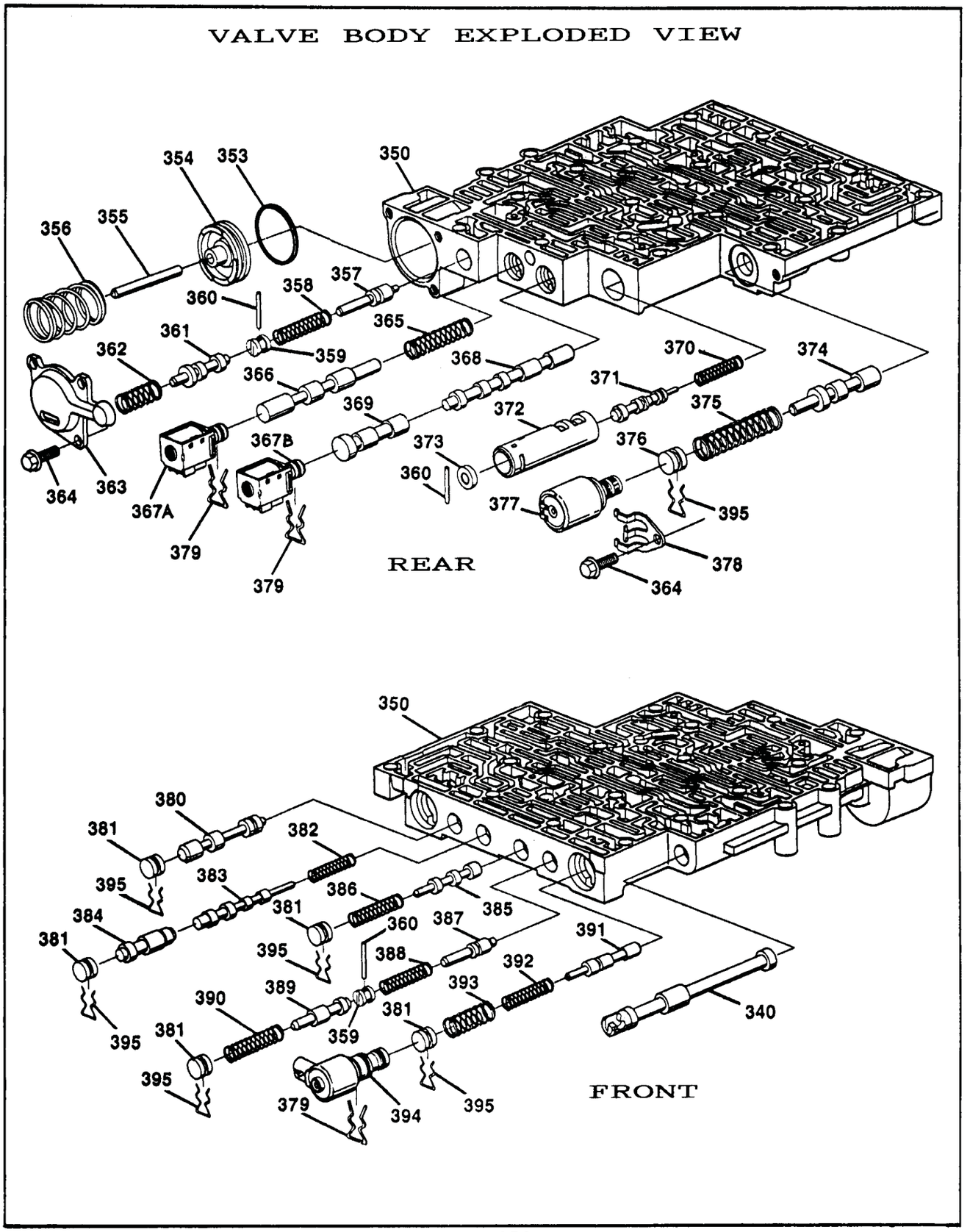


Figure 156

340 VALVE, MANUAL
350 VALVE ASSEMBLY, CONTROL BODY
353 SEAL, FORWARD ACCUMULATOR OIL
354 PISTON, FORWARD ACCUMULATOR
355 PIN, FORWARD ACCUMULATOR
356 SPRING, FORWARD ACCUMULATOR
357 VALVE, FORWARD ABUSE
358 SPRING, FORWARD ABUSE VALVE
359 PLUG, BORE
360 PIN, COILED SPRING
361 VALVE, LOW OVERRUN
362 SPRING, LOW OVERRUN VALVE
363 COVER, FORWARD ACCUMULATOR
364 BOLT, FORWARD ACCUMULATOR COVER
365 SPRING, 1-2 SHIFT VALVE
366 VALVE, 1-2 SHIFT
367A 1-2 SHIFT SOLENOID (A)
367B 2-3 SHIFT SOLENOID (B)
368 VALVE, 2-3 SHIFT
369 VALVE, 2-3 SHUTTLE
370 SPRING, 1-2 ACCUMULATOR VALVE
371 VALVE, 1-2 ACCUMULATOR
372 SLEEVE, 1-2 ACCUMULATOR VALVE
373 PLUG, BORE
374 VALVE, ACTUATOR FEED LIMIT
375 SPRING, ACTUATOR FEED LIMIT VALVE
376 PLUG, BORE
377 PRESSURE CONTROL SOLENOID
378 RETAINER, PRESSURE CONTROL SOLENOID
379 RETAINER, SOLENOID
380 VALVE, CONVERTER CLUTCH SIGNAL
381 PLUG, BORE
382 SPRING, 4-3 SEQUENCE VALVE
383 VALVE, 4-3 SEQUENCE
384 VALVE, 3-4 RELAY
385 VALVE, 3-4 SHIFT
386 SPRING, 3-4 SHIFT VALVE
387 VALVE, REVERSE ABUSE
388 SPRING, REVERSE ABUSE VALVE
389 VALVE, 3-2 DOWNSHIFT
390 SPRING, 3-2 DOWNSHIFT VALVE
391 VALVE, 3-2 CONTROL
392 SPRING, 3-2 CONTROL VALVE
393 SPRING, BORE PLUG
394 3-2 CONTROL SOLENOID
395 RETAINER, BORE PLUG

Figure 157

VALVE BODY ASSEMBLY

1. Clean the valve body assembly in clean solvent thoroughly.
2. Move the valves with a pick or a small screwdriver to ensure that any debris or dirt is dislodged.
3. Dry with compressed air.
4. Position valve body on a clean and dry flat work surface for disassembly.
5. Remove valve trains one at a time and begin in one corner of the valve body.
6. Some valves are under spring pressure so cover the end of the bore when removing roll pins and/or retainers.
7. Valves, springs, and bushings should be laid out on a clean dry surface EXACTLY the way they are removed.
8. Clean all valves, springs and bushings, then dry with compressed air.
9. Inspect all valve body parts for wear and/or damage.
10. Check all solenoids for the proper resistance value. Refer to Pages 5 and 6 for the resistance values for each solenoid assembly.
11. Use Figure 158 to identify any of the valves in valve body and pump.
12. Use Figure 159 to identify any of the springs in valve body and pump.
13. Use the illustrations in Figures 156 and 157, to reassemble the valves, springs and bushings in their proper order.
14. Replace all "O" ring seals on solenoids before re-installing in valve body.
15. NOTE: Both of the shift solenoids are the same and will interchange on this transmission.
16. Valve body is now ready for installation on the transmission.

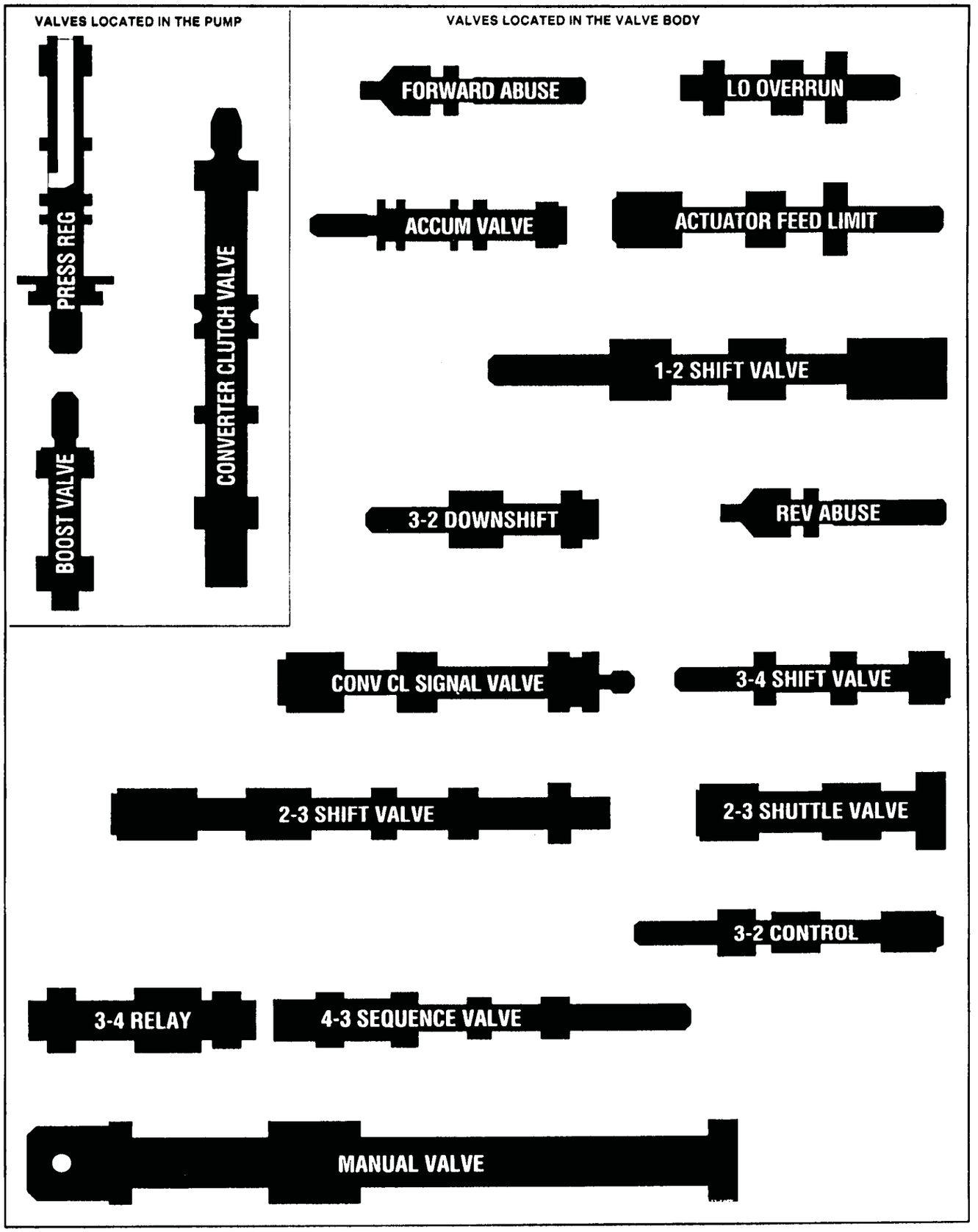


Figure 158

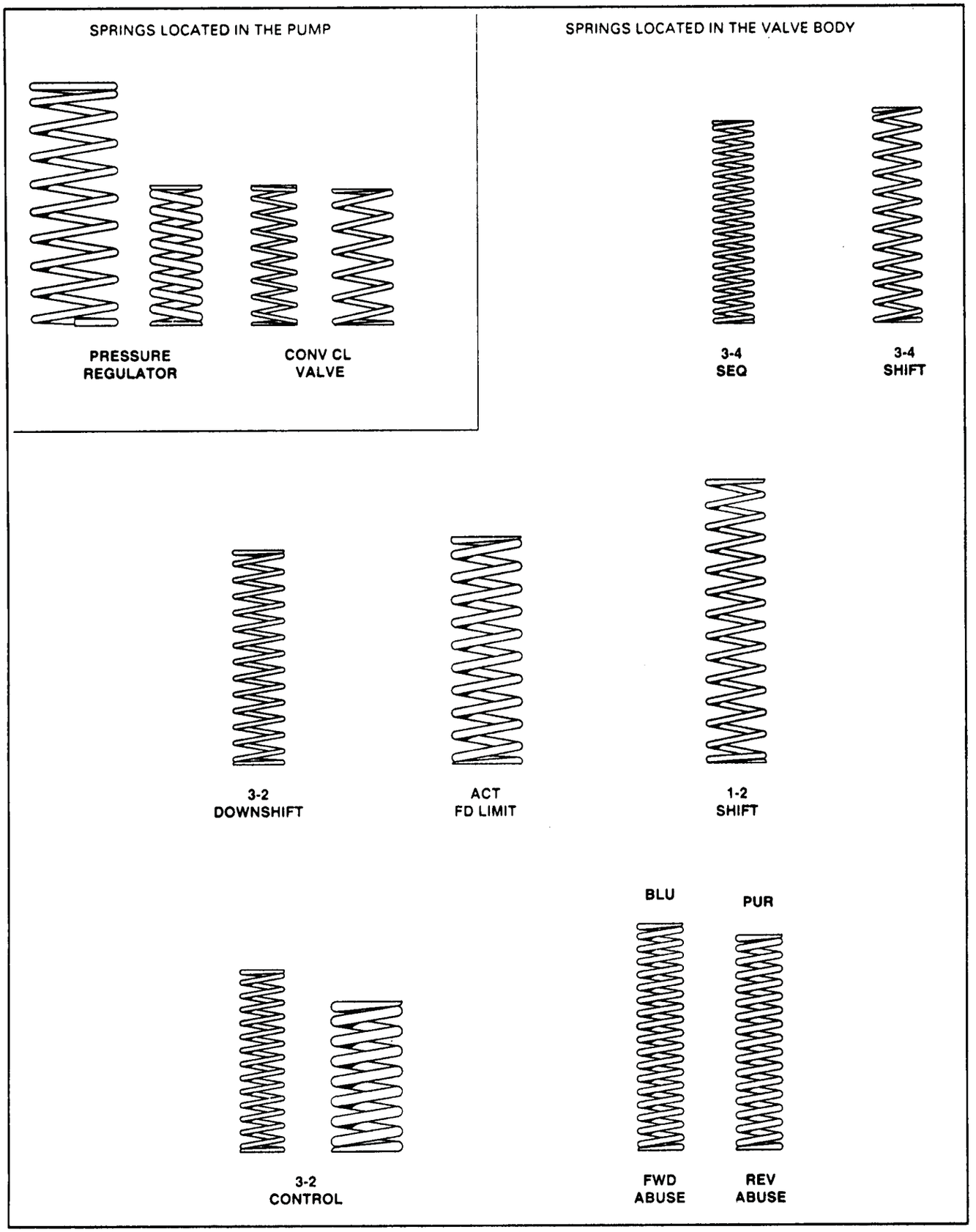
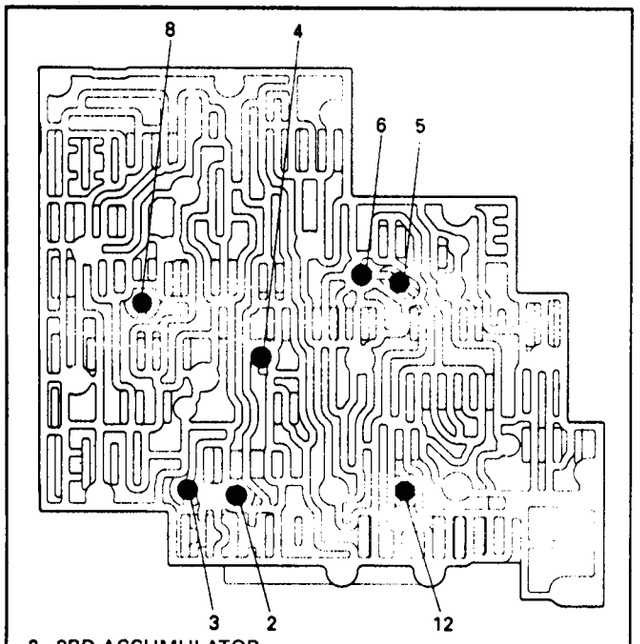
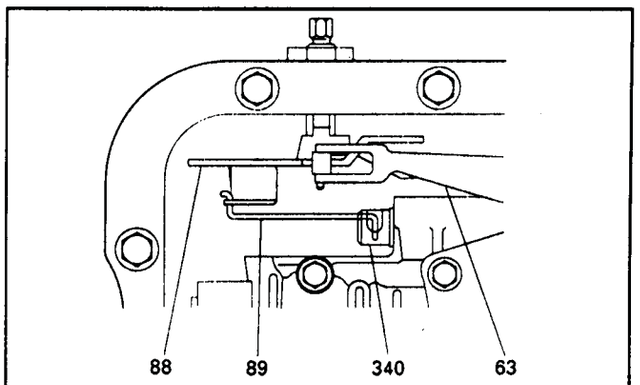


Figure 159



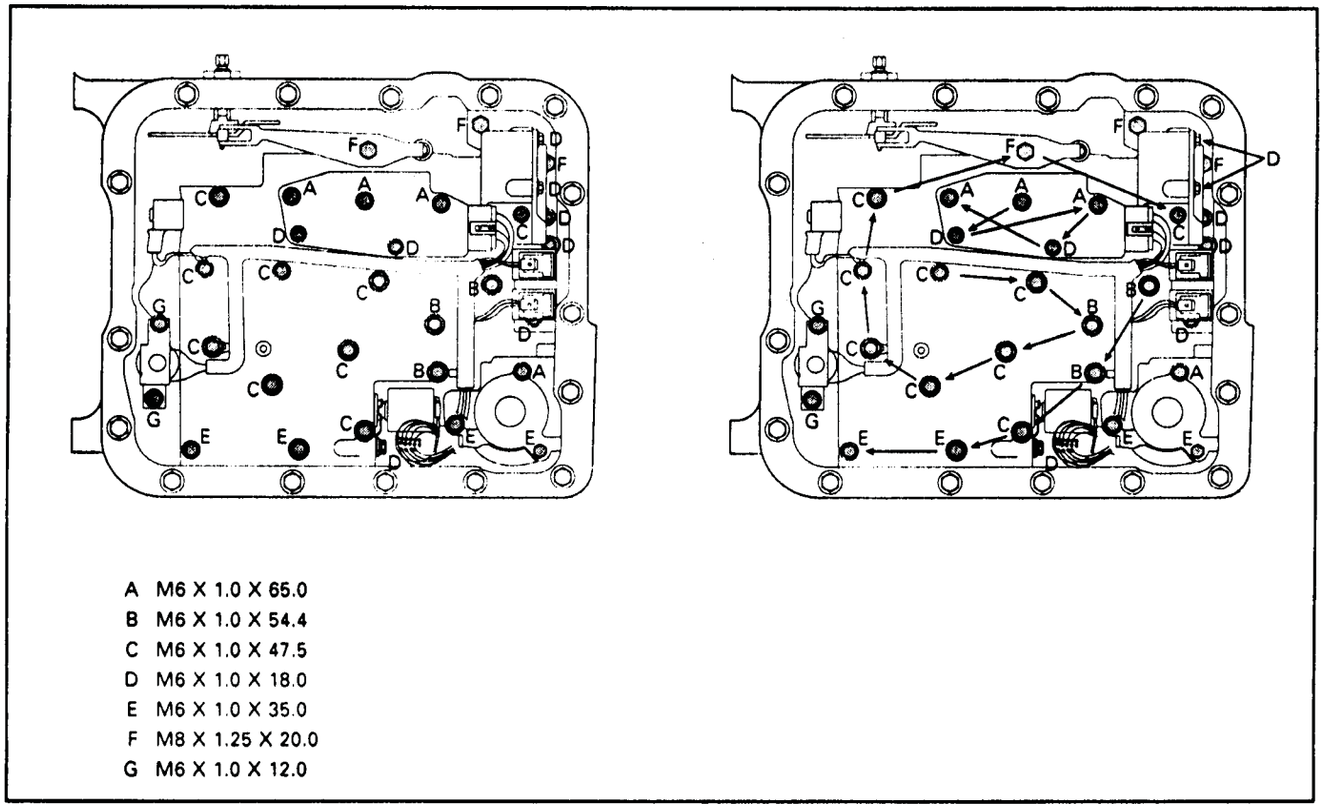
2 3RD ACCUMULATOR
3 REVERSE INPUT
4 3-4 CLUTCH EXHAUST
5 OVERRUN CLUTCH FEED
6 OVERRUN CLUTCH CONTROL
8 1-2 UPSHIFT
12 FORWARD CLUTCH ACCUM.

Figure 160



63 SPRING ASSEMBLY, MANUAL DETENT
88 LEVER, INSIDE DETENT
89 LINK, MANUAL VALVE
340 VALVE, MANUAL

Figure 161

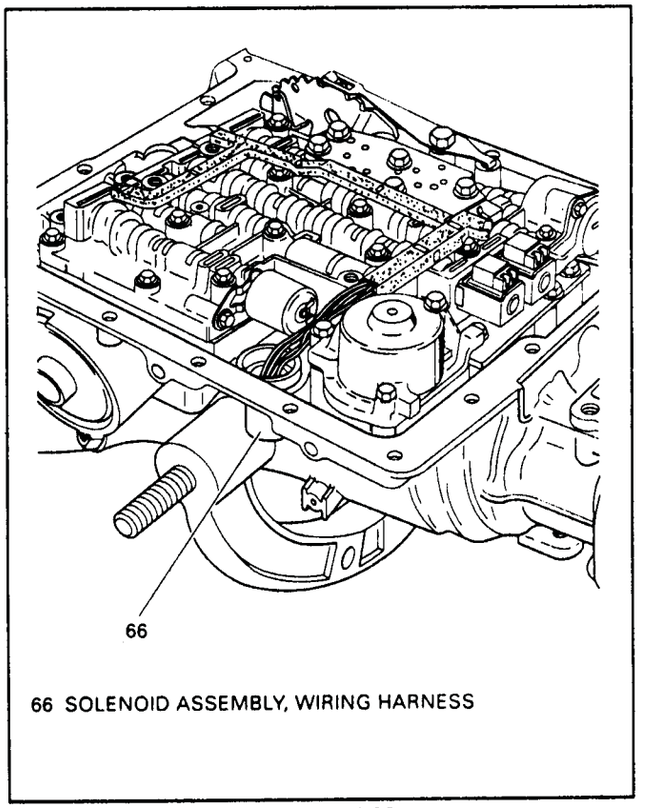


A M6 X 1.0 X 65.0
B M6 X 1.0 X 54.4
C M6 X 1.0 X 47.5
D M6 X 1.0 X 18.0
E M6 X 1.0 X 35.0
F M8 X 1.25 X 20.0
G M6 X 1.0 X 12.0

Figure 162

INSTALL VALVE BODY & WIRING HARNESS

1. Install 7 checkballs into the proper pockets in the valve body, as shown in Figure 160, and retain them with a small amount of TransJel.
2. Install the valve body on transmission and connect manual valve link to the manual vale as you install.
3. Refer to Figure 161 for correct manual valve alignment.
4. Be careful not to damage the spacer plate screens when installing the valve body.
5. Install the valve body retaining bolts except the three that also retain the wiring harness, DO NOT TIGHTEN at this time.
6. Install new "O" ring on lock-up solenoid and lubericate with TransJel.
7. Install new "O" ring on case connector and lubricate with TransJel.
8. Install case connector into case bore as shown in Figure 163.
9. Route wiring harness as shown Figure 163, and install lock-up solenoid in oil pump bore.
10. Install the two retaining bolts for lock-up solenoid and torque the bolts to 8 ft.lbs. (See Figure 162).
11. Install the three remaining valve body bolts to retain the wiring harness, and torque the valve body bolts to 8 ft.lbs. (Figure 162).
12. Start in the center of the valve body and follow the arrows in Figure 162 for torquing sequence.
13. Connect the pressure switch assembly to wiring harness and install the pressure switch assembly onto valve body.
14. Install the proper bolts (2 Short & 3 Long) in pressure switch assembly and torque to 8 ft.lbs (Fig. 162).
15. Rotate the shift solenoids so that the connector is facing up, and connect the wires to the shift solenoids.
    NOTE: The Red and Green wires go to Shift Solenoid "A", and the Red and Yellow wires go to Shift Solenoid "B" (See Figure 164).
16. Rotate the Force Motor so that the terminals are facing the pan rail (See Figure 164).



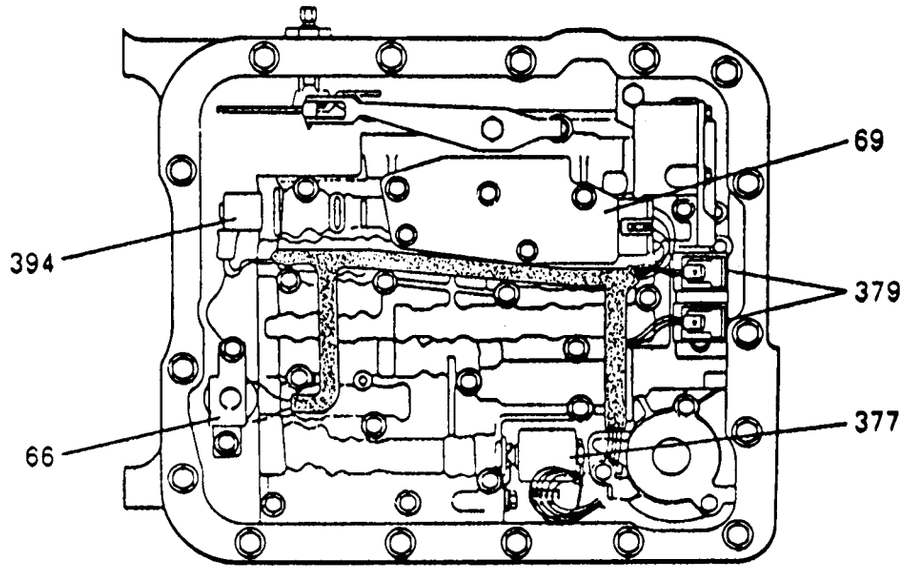
66 SOLENOID ASSEMBLY, WIRING HARNESS

Figure 163

17. Install the wiring harness connector onto the Force Motor.
18. Rotate the 3-2 Solenoid so that the terminals are facing the lock-up solenoid (See Figure 164).
19. Connect the wiring harness connector onto the 3-2 Control Solenoid, as shown in Figure 164.
20. Install the manual detent spring and torque the bolt to 18 ft.lbs.
21. Insure that the manual detent spring stays aligned with the inside detent lever (See Figure 161).

MODEL APPLICATION CHART

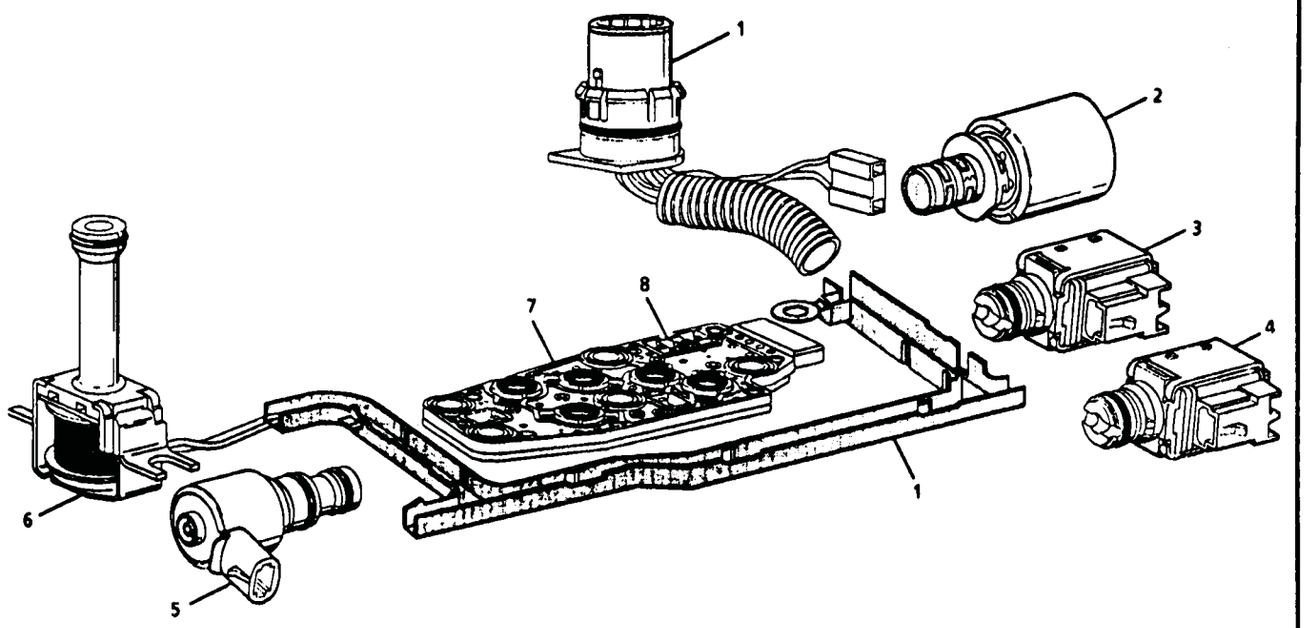
MODEL CODE	APPLICATION
3SHD	4.3L V6 S-TRUCK & UTILITY
3TLD	4.3L V6 T-TRUCK
3MJD	4.3L V6 M-VAN
3MSD	4.3L V6 M-VAN (HIGH OUTPUT)
3CAD	4.3L V6 C-TRUCK & G-VAN
3CBD	4.3L V6 C-TRUCK & G-VAN
3KAD	4.3L V6 K-TRUCK
3CCD	5.0L V8 C-TRUCK & G-VAN
3CFD	5.0L V8 C-TRUCK
3KBD	5.0L V8 K-TRUCK
3CHD	5.7L V8 C-TRUCK & G-VAN
3CJD	5.7L V8 C-TRUCK & G-VAN
3KCD	5.7L V8 K-TRUCK



ELECTRICAL COMPONENTS

66 LOCK-UP SOLENOID.
69 PRESSURE SWITCH ASSEMBLY (TOT SENSOR INSIDE).
377 FORCE MOTOR (CONTROLS LINE PRESSURE).
379 SHIFT SOLENOID "A" (CLOSEST TO FORWARD CLUTCH ACCUMULATOR).
379 SHIFT SOLENOID "B" (CLOSEST TO 1-2 ACCUMULATOR)
394 3-2 CONTROL SOLENOID (PWM)

Figure 164



ELECTRICAL COMPONENTS

1	WIRING HARNESS ASSEMBLY	5	3-2 CONTROL SOLENOID
2	PRESSURE CONTROL SOLENOID	6	TORQUE CONVERTER CLUTCH SOLENOID
3	1-2 SHIFT SOLENOID	7	FLUID PRESSURE SWITCH ASSEMBLY
4	2-3 SHIFT SOLENOID	8	TRANSMISSION FLUID TEMPERATURE SENSOR (PART OF FLUID PRESSURE SWITCH ASSEMBLY)

Figure 165

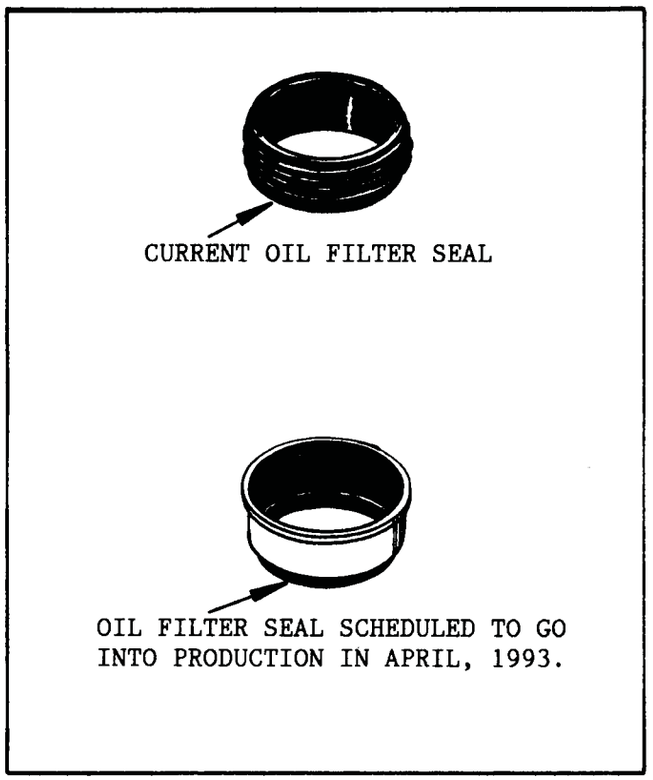


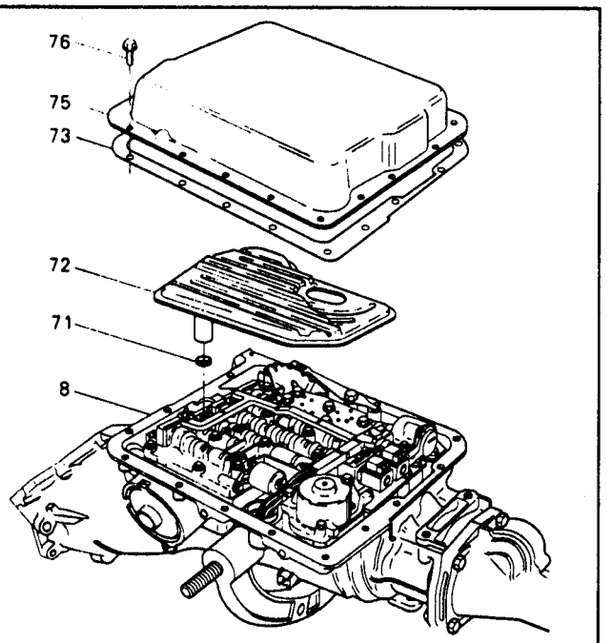
Figure 166

OIL FILTER AND BOTTOM PAN

1. Install filter seal on filter neck if you have the previous style seal. See Figure 166 above.
2. If you are using the filter seal that is scheduled for production in April 1993, install it into the filter bore in the oil pump with seal driver. See Figure 166 above.
3. Install the bottom pan oil filter.
4. Install the magnet into the bottom pan in the appropriate position.
5. Install a new bottom pan gasket on case, and install the bottom pan (See Figure 167).
6. Install 16 bottom pan retaining bolts and torque them to 9 ft.lbs. (See Figure 167).

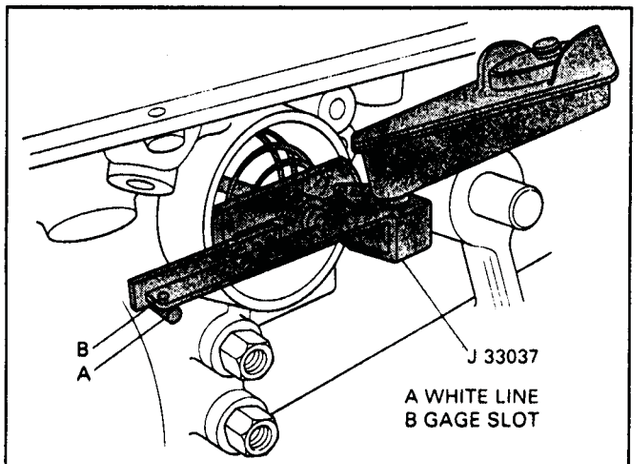
CHECK 2-4 SERVO PIN LENGTH

1. Install servo tool J-33037, as shown in Figure 168, with the servo pin you are going to use.
2. Install servo cover retaining ring to secure servo tool in bore.
3. Apply 98 in.lb. torque, as shown in Figure 168.
4. If white line "A" appears in the gage slot "B", pin length is correct (See Figure 168).
5. Use the selection chart in Figure 168 to determine the correct pin length if a new pin is needed.
6. Remove the servo tool J-33037 from the servo bore.



8 CASE, TRANSMISSION
71 SEAL, FILTER
72 FILTER ASSEMBLY, TRANSMISSION OIL
73 GASKET, TRANSMISSION OIL PAN
75 PAN, TRANSMISSION OIL
76 SCREW, TRANSMISSION OIL PAN

Figure 167

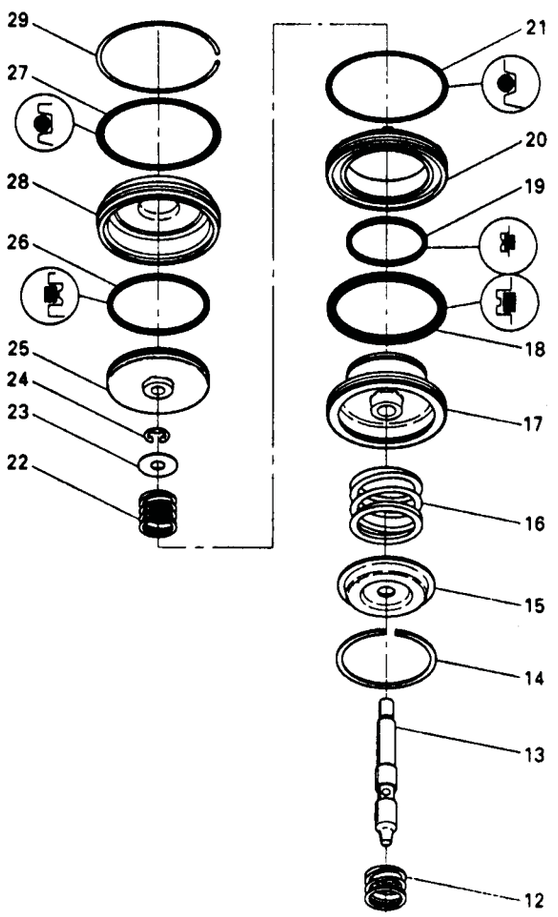


PIN IS PRESET AT FACTORY AND MUST NOT BE READJUSTED

2-4 SERVO PIN SELECTION

PIN LENGTH		PIN I.D.
MM	INCH	
65.82-66.12	2.59-2.60	1 GROOVE
67.23-67.53	2.65-2.66	2 GROOVES
68.64-68.94	2.70-2.71	NO GROOVE

Figure 168

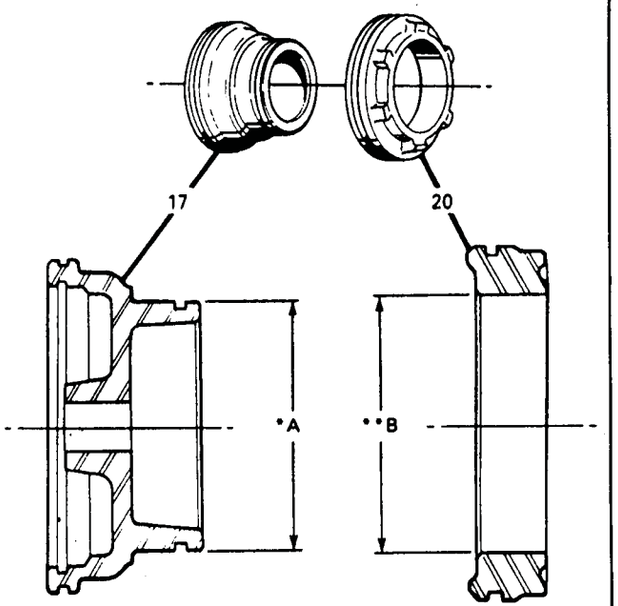


ILL. NO.	DESCRIPTION
12	SPRING, SERVO RETURN
13	PIN, 2ND APPLY PISTON
14	RING, RETAINER (2ND APPLY PISTON)
15	RETAINER, SERVO CUSHION SPRING
16	SPRING, SERVO CUSHION
17	PISTON, 2ND APPLY
18	RING, OIL SEAL (2ND APPLY PISTON - OUTER)
19	RING, OIL SEAL (2ND APPLY PISTON - INNER)
20	HOUSING, SERVO PISTON (INNER)
21	SEAL, O-RING
22	SPRING, SERVO APPLY PIN
23	WASHER, SERVO APPLY PIN
24	RING, RETAINER (APPLY PIN)
25	PISTON, 4TH APPLY
26	RING, OIL SEAL (4TH APPLY PISTON - OUTER)
27	SEAL, O-RING (2-4 SERVO COVER)
28	COVER, 2-4 SERVO
29	RING, SERVO COVER RETAINING

Figure 169

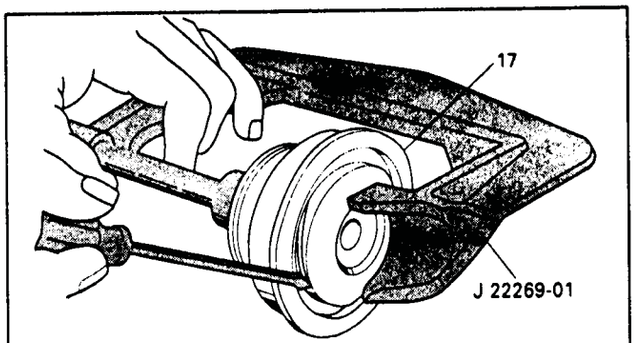
2ND APPLY PISTON AND HOUSING APPLICATION

MODEL	PISTON DIMENSION *A	HOUSING DIMENSION **B
CHD, CJD, CKD, CLD, KCD, KDD	44.64mm (1.78")	45.54mm (1.79")
CAD, CBD, CCD, CFD, KAD, KBD, MJD, MDD, MND, MSD, SHD, TAM, TBM, TLD	57.85mm (2.28")	58.74mm (2.31")



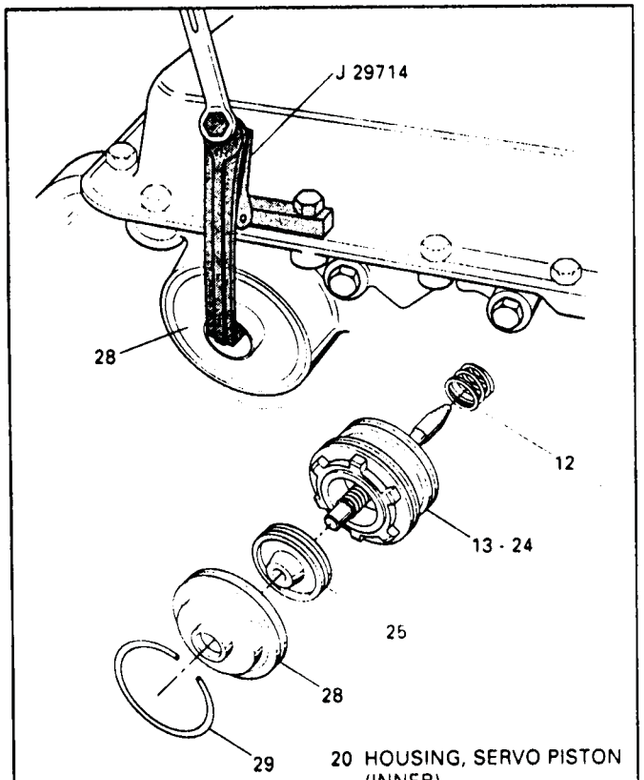
17 PISTON, 2ND APPLY
20 HOUSING, SERVO PISTON (INNER)

Figure 170



17 SECOND APPLY PISTON

Figure 171

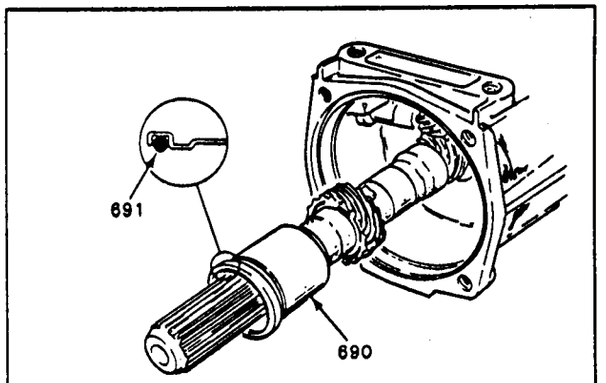


12 SPRING, SERVO RETURN
13 PIN, 2ND APPLY PISTON
14 RING, RETAINER (2ND APPLY PISTON)
15 RETAINER, SERVO CUSHION SPRING
16 SPRING, SERVO CUSHION
17 PISTON, 2ND APPLY
18 RING, OIL SEAL (2ND APPLY PISTON - OUTER)
19 RING, OIL SEAL (2ND APPLY PISTON - INNER)
20 HOUSING, SERVO PISTON (INNER)
21 SEAL, O-RING
22 SPRING, SERVO APPLY PIN
23 WASHER, SERVO APPLY PIN
24 RING, RETAINER (APPLY PIN)
25 PISTON, 4TH APPLY
28 COVER, 2-4 SERVO
29 RING, SERVO COVER RETAINING

Figure 172

ASSEMBLE 2-4 SERVO

1. Check the dimensions of the 2nd apply piston and housing, as shown Figure 170, to insure compatable parts and proper size for model your building.
2. Assemble the 2-4 servo assembly as shown in Figure 169.
3. Use tool J-22269-01, as shown in Figure 171, to compress the cushion spring, if necessary.
4. Install the servo return spring onto servo assembly, as shown in Figure 172, and install 2-4 servo into the case bore.
5. Compress the servo cover using the tool shown in Figure 172, install the snap ring.



690 SLEEVE, OUTPUT SHAFT
691 SEAL, OUTPUT SHAFT

Figure 173

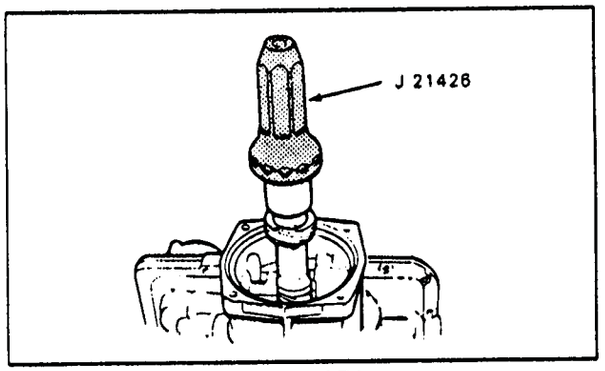
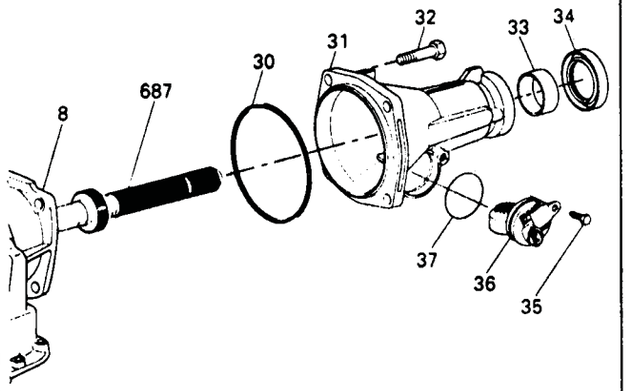


Figure 174

OUTPUT SHAFT SLEEVE

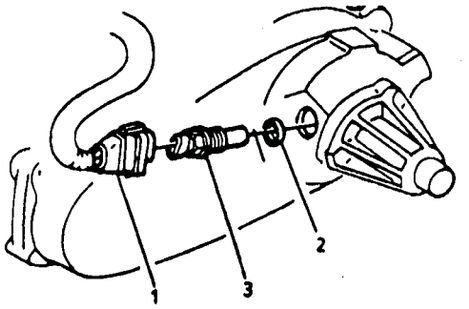
1. Install the output shaft sleeve "O" ring into the output shaft sleeve, as shown in Figure 173.
2. Lubricate the "O" ring with TransJel.
3. Install the output shaft sleeve onto the output shaft (See Figure 174).
4. Do not push the sleeve past the machined surface on the output shaft.

NOTE: This sleeve is not used on all model transmissions.



ILL. NO.	DESCRIPTION
8	CASE, TRANSMISSION
30	SEAL, CASE EXTENSION TO CASE
31	EXTENSION, CASE
32	BOLT, CASE EXTENSION TO CASE
33	BUSHING, CASE EXTENSION
34	SEAL ASSEMBLY, CASE EXTENSION OIL
35	BOLT, SPEED SENSOR RETAINING
36	SPEED SENSOR, INTERNAL TRANSMISSION
37	SEAL, O-RING (ITSS TO CASE EXTENSION)
687	SHAFT, OUTPUT

Figure 176

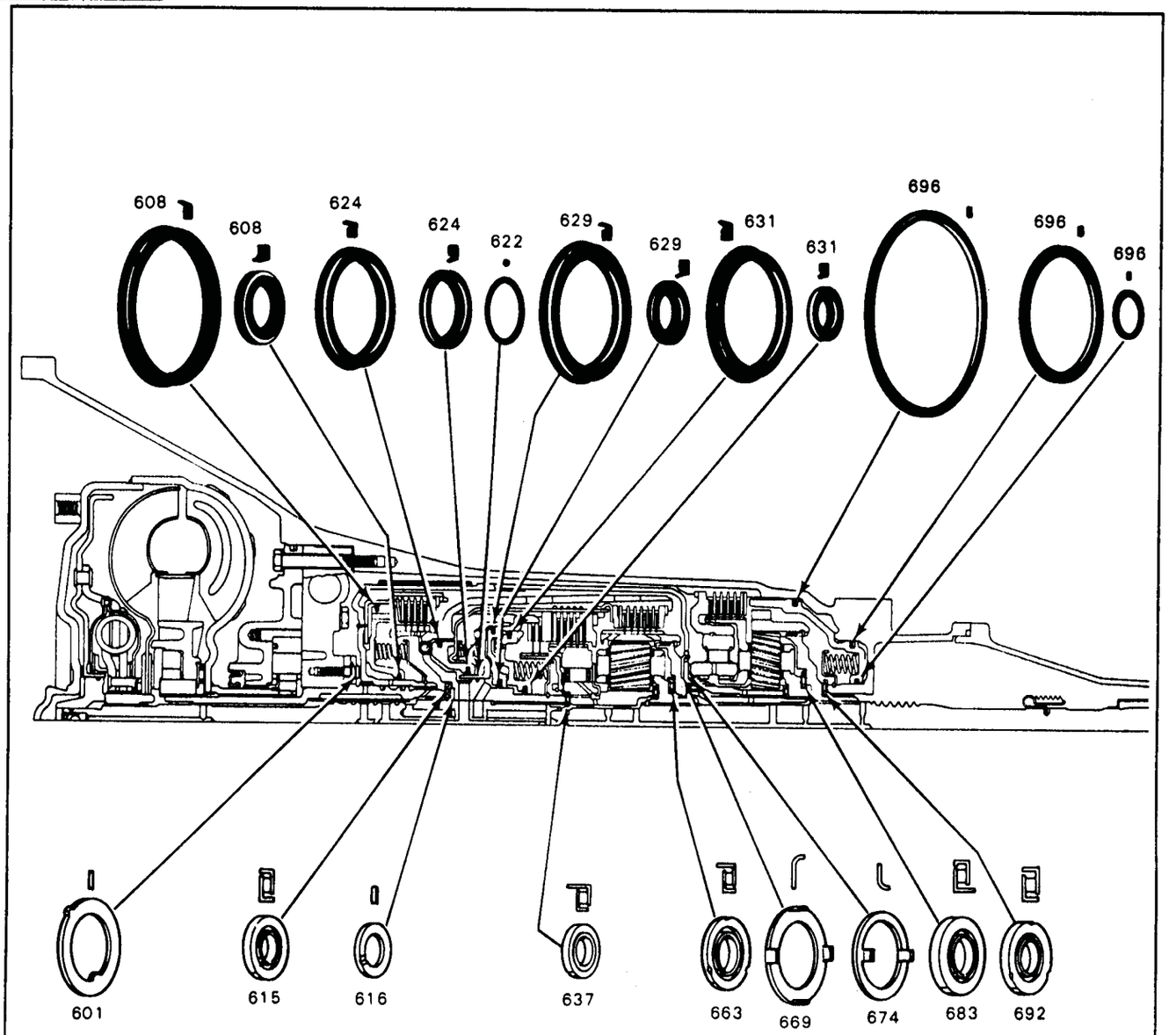


1	HARNESS CONNECTOR
2	O-RING SEAL
3	VEHICLE SPEED SENSOR (VSS)

Figure 177

EXTENSION HOUSING AND SPEED SENSOR

1. Install new bushing in extension housing if necessary.
2. Install new extension housing seal into the extension housing.
3. Install new "O" ring seal onto the extension housing, and lubricate with TransJel.
4. Install the extension housing on the transmission with four bolts, torque bolts to 26 ft.lbs.
5. Install the vehicle speed sensor, if used, and torque the retainer bolt to 8 ft.lbs.
6. The speed sensor used on four wheel drive models is shown Figure 177, and located on the transfer case.
7. Remove the transmission from fixture.



ILL. NO.	DESCRIPTION
601	WASHER, THRUST (PUMP TO DRUM)
608	SEALS, REVERSE INPUT CLUTCH (INNER & OUTER)
615	BEARING ASSEMBLY, STATOR SHAFT/ SELECTIVE WASHER
616	WASHER, THRUST (SELECTIVE)
622	SEAL, "O" RING INPUT TO FORWARD HSG.
624	SEAL, 3RD & 4TH CL. (INNER & OUTER)
629	SEAL, FORWARD CLUTCH (INNER & OUTER)
631	SEAL, OVERRUN CLUTCH (INNER & OUTER)
637	BEARING ASSEMBLY, INPUT SUN GEAR
663	BEARING ASSEMBLY, THRUST (INPUT CARRIER TO REACTION SHAFT)
669	WASHER, THRUST (REACTION SHAFT/ SHELL)
674	WASHER, THRUST (RACE/REACTION SHELL)
683	BEARING ASSEMBLY, THRUST (REACTION CARRIER/SUPPORT)
692	BRG., REACTION GEAR SUPPORT TO CASE
696	SEAL, TRANSMISSION (LO & REVERSE CLUTCH – OUTER, CENTER, INNER)

Figure 178

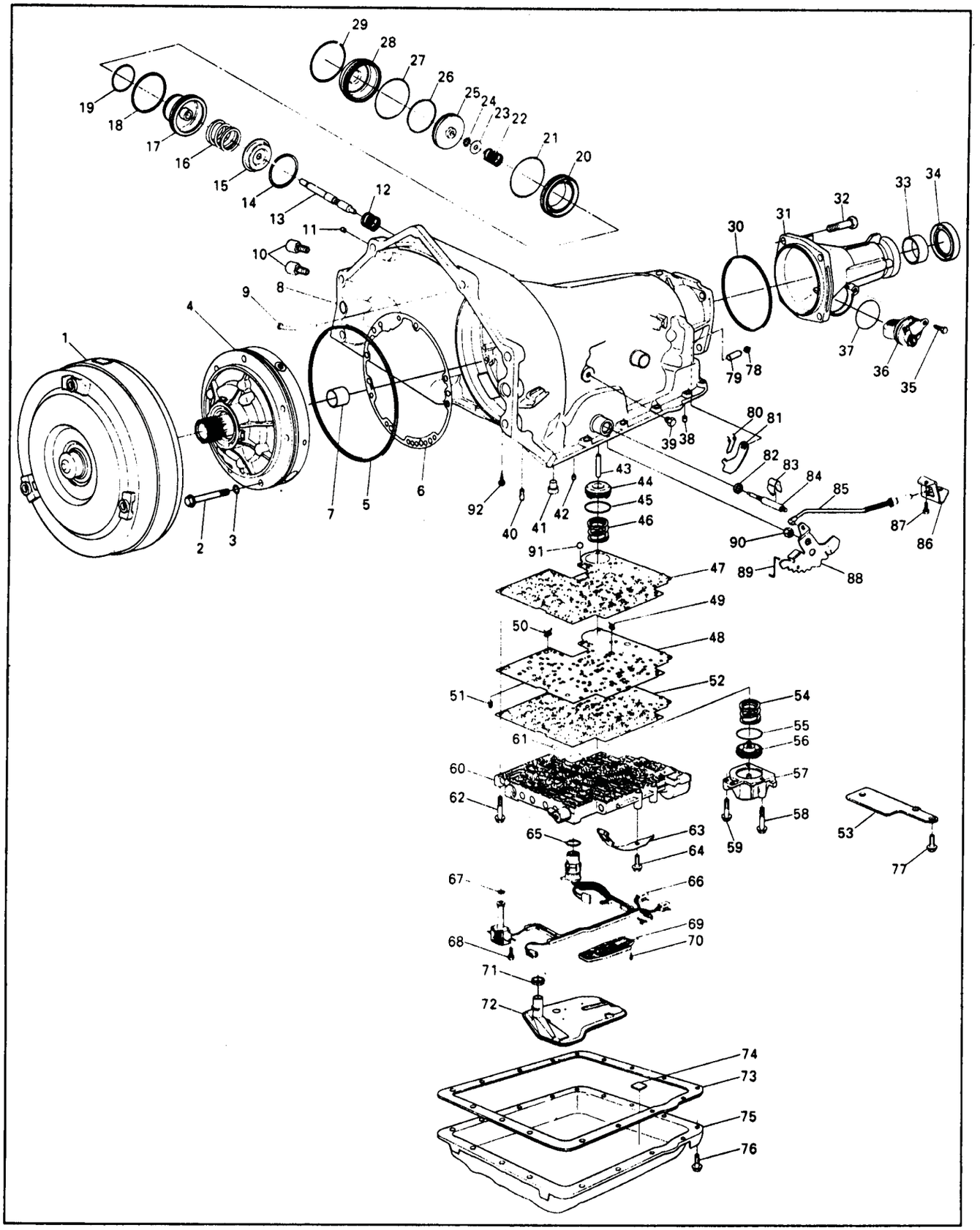


Figure 179

ILL. NO.	DESCRIPTION
1	TORQUE CONVERTER ASSEMBLY
2	BOLT, PUMP TO CASE
3	O-RING, PUMP TO CASE BOLT
4	PUMP ASSEMBLY, OIL
5	SEAL, OIL (PUMP TO CASE)
6	GASKET, PUMP COVER TO CASE
7	BUSHING, CASE
8	CASE, TRANSMISSION
9	VENT ASSEMBLY, TRANSMISSION
10	CONNECTOR, OIL COOLER PIPE
11	PLUG, CASE SERVO
12	SPRING, SERVO RETURN
13	PIN, 2ND APPLY PISTON
14	RING, RETAINER (2ND APPLY PISTON)
15	RETAINER, SERVO CUSHION SPRING
16	SPRING, SERVO CUSHION
17	PISTON, 2ND APPLY
18	RING, OIL SEAL (2ND APPLY PISTON - OUTER)
19	RING, OIL SEAL (2ND APPLY PISTON - INNER)
20	HOUSING, SERVO PISTON (INNER)
21	SEAL, O-RING
22	SPRING, SERVO APPLY PIN
23	WASHER, SERVO APPLY PIN
24	RING, RETAINER (APPLY PIN)
25	PISTON, 4TH APPLY
26	RING, OIL SEAL (4TH APPLY PISTON - OUTER)
27	SEAL, O-RING (2-4 SERVO COVER)
28	COVER, 2-4 SERVO
29	RING, SERVO COVER RETAINING
30	SEAL, CASE EXTENSION TO CASE
31	EXTENSION, CASE
32	BOLT, CASE EXTENSION TO CASE
33	BUSHING, CASE EXTENSION
34	SEAL ASSEMBLY, CASE EXTENSION OIL
35	BOLT, SPEED SENSOR RETAINING
36	SPEED SENSOR, INTERNAL TRANSMISSION
37	SEAL, O-RING (ITSS TO CASE EXTENSION)
38	PLUG, TRANSMISSION CASE (ACCUM. BLEED)
39	PLUG, PRESSURE
40	RETAINER AND BALL ASSEMBLY, 3RD ACCUM.
41	PIN, BAND ANCHOR
42	RETAINER AND BALL ASM. (DOUBLE ORIFICE)
43	PIN, ACCUMULATOR PISTON
44	PISTON, 3-4 ACCUMULATOR
45	RING, OIL SEAL (3-4 ACCUMULATOR PISTON)
46	SPRING, 3-4 ACCUMULATOR
47	GASKET, SPACER PLATE TO CASE
48	PLATE, VALVE BODY SPACER
49	SCREEN, SHIFT SOLENOIDS
50	SCREEN, PRESSURE CONTROL SOLENOID
51	SCREEN, 3-2 CONTROL SOLENOID
52	GASKET, SPACER PLATE TO VALVE BODY
53	PLATE, SPACER PLATE SUPPORT
54	SPRING, 1-2 ACCUMULATOR
55	RING, OIL SEAL (1-2 ACCUMULATOR)
56	PISTON, 1-2 ACCUMULATOR
57	COVER AND PIN ASSEMBLY, 1-2 ACCUMULATOR
58	BOLT, ACCUMULATOR COVER
59	BOLT, ACCUMULATOR COVER
60	VALVE ASSEMBLY, CONTROL BODY
61	CHECKBALL
62	BOLT, VALVE BODY
63	SPRING ASSEMBLY, MANUAL DETENT
64	BOLT, MANUAL DETENT SPRING
65	SEAL, WIRING HARNESS PASS-THRU CONNECTOR O-RING
66	SOLENOID ASSEMBLY, WIRING HARNESS
67	SEAL, O-RING (SOLENOID)
68	BOLT, HEX WASHER HEAD (SOLENOID)
69	SWITCH ASSEMBLY, TRANSMISSION PRESSURE
70	BOLT, PRESSURE SWITCH ASSEMBLY
71	SEAL, FILTER
72	FILTER ASSEMBLY, TRANSMISSION OIL
73	GASKET, TRANSMISSION OIL PAN
74	MAGNET, CHIP COLLECTOR
75	PAN, TRANSMISSION OIL
76	SCREW, TRANSMISSION OIL PAN
77	BOLT, SPACER PLATE SUPPORT
78	PLUG, STEEL CUP
79	SHAFT, PARKING BRAKE PAWL
80	SPRING, PARKING PAWL RETURN
81	PAWL, PARKING BRAKE
82	SEAL, MANUAL SHAFT
83	RETAINER, MANUAL SHAFT
84	SHAFT, MANUAL
85	ACTUATOR ASSEMBLY, PARKING LOCK
86	BRACKET, PARKING LOCK
87	BOLT, PARKING LOCK BRACKET
88	LEVER, INSIDE DETENT
89	LINK, MANUAL VALVE
90	NUT, HEX HEAD
91	NO. 10 CHECKBALL
92	SCREEN, TCC

Figure 180

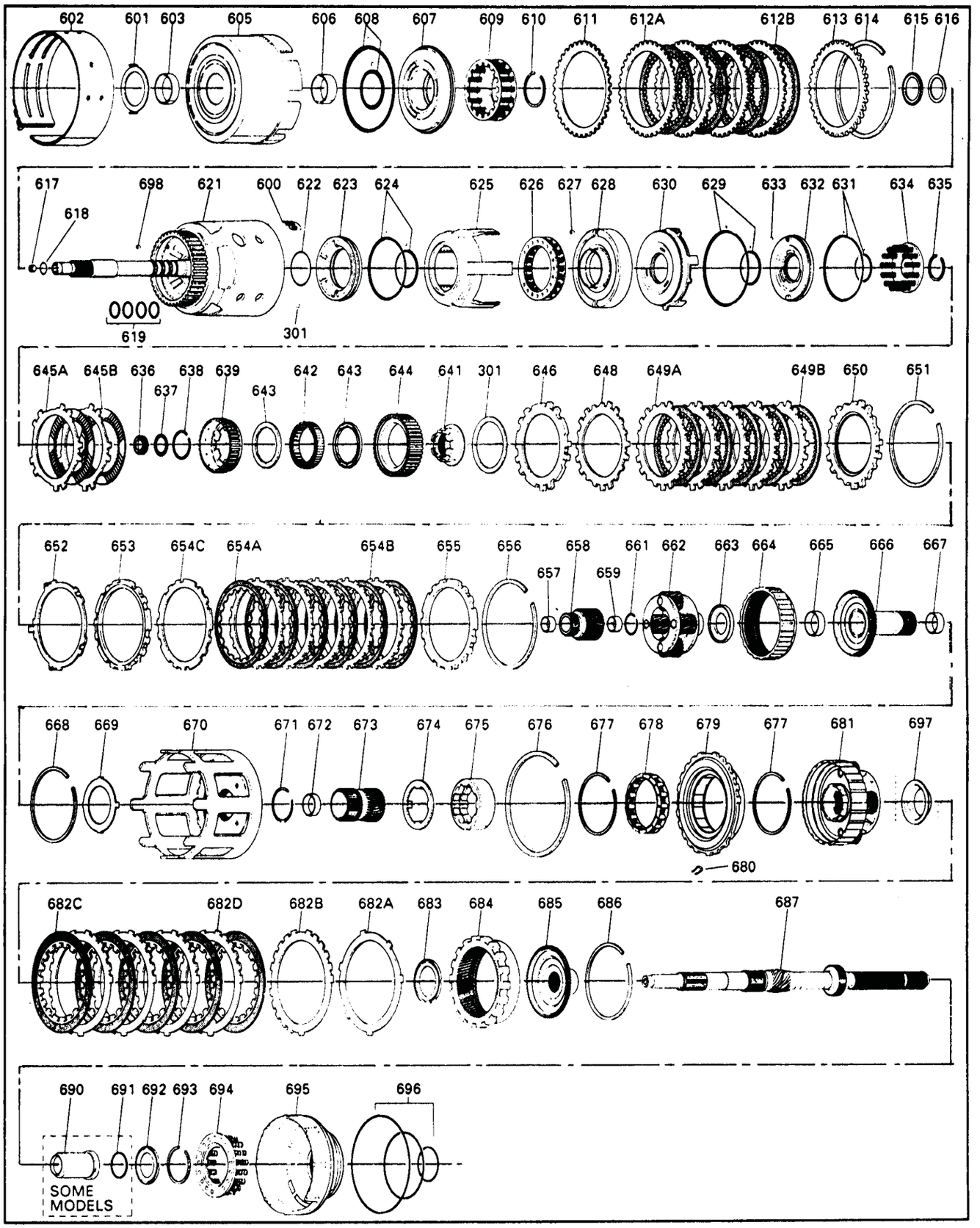


Figure 181

ILL. NO.	DESCRIPTION
600	SPRING ASM., 3-4 CLUTCH BOOST (5)
601	WASHER, THRUST (PUMP TO DRUM)
602	BAND ASSEMBLY, 2-4
603	BUSHING, REVERSE INPUT CL. (FRONT)
605	HOUSING AND DRUM ASSEMBLY, REVERSE INPUT CLUTCH
606	BUSHING, REVERSE INPUT CLUTCH (REAR)
607	PISTON ASM., REVERSE INPUT CLUTCH
608	SEALS, REVERSE INPUT CLUTCH (INNER AND OUTER)
609	SPRING ASM., REVERSE INPUT CLUTCH
610	RING, REVERSE INPUT CLUTCH SPRING RETAINER
611	PLATE, REVERSE INPUT CLUTCH (BELLEVILLE)
612A	PLATE ASM., REVERSE INPUT CLUTCH (FIBER)
612B	PLATE, REVERSE INPUT CLUTCH (STEEL)
613	PLATE, REVERSE INPUT CLUTCH BACKING (SELECTIVE)
614	RING, REVERSE INPUT CL. RETAINING
615	BEARING ASSEMBLY, STATOR SHAFT/ SELECTIVE WASHER
616	WASHER, THRUST (SELECTIVE)
617	RETAINER AND BALL ASM., CHECK VALVE
618	SEAL, O-RING (TURBINE SHAFT/ SELECTIVE WASHER)
619	RING, OIL SEAL (SOLID)
620	RETAINER AND CHECKBALL ASSEMBLY
621	HOUSING AND SHAFT ASSEMBLY, INPUT
622	SEAL, O-RING INPUT TO FORWARD HSG.
623	PISTON, 3RD AND 4TH CLUTCH
624	SEAL, 3RD AND 4TH CL. (INNER AND OUTER)
625	RING, 3RD AND 4TH CLUTCH (APPLY)
626	SPRING ASSEMBLY, 3RD AND 4TH CLUTCH
627	RETAINER AND BALL ASSEMBLY, FORWARD CLUTCH HOUSING
628	HOUSING, FORWARD CLUTCH
629	SEAL, FORWARD CLUTCH (INNER AND OUTER)
630	PISTON, FORWARD CLUTCH
631	SEAL, OVERRUN CLUTCH (INNER AND OUTER)
632	PISTON, OVERRUN CLUTCH
633	BALL, OVERRUN CLUTCH
634	SPRING ASSEMBLY, OVERRUN CLUTCH
635	SNAP RING, OVERRUN CLUTCH SPRING RETAINER
636	SEAL, INPUT HOUSING TO OUTPUT SHAFT
637	BEARING ASSEMBLY, INPUT SUN GEAR
638	SNAP RING, OVERRUN CL. HUB RETAINING
639	HUB, OVERRUN CLUTCH
641	RETAINER AND RACE ASSEMBLY, SPRAG
642	FORWARD SPRAG ASSEMBLY
643	RETAINER RINGS, SPRAG ASSEMBLY
644	RACE, FORWARD CLUTCH (OUTER)
645A	PLATE ASSEMBLY, OVERRUN CLUTCH (FIBER)
645B	PLATE, OVERRUN CLUTCH (STEEL)
646	PLATE, FORWARD CLUTCH (APPLY)
648	PLATE, FORWARD CLUTCH (WAVED)
649A	PLATE ASSEMBLY, FORWARD CLUTCH (FIBER)
649B	PLATE, FORWARD CLUTCH (STEEL)
650	PLATE, FORWARD CLUTCH BACKING (SEL.)
651	RING, FORWARD CLUTCH BACKING PLATE RETAINER
652	PLATE, 3RD AND 4TH CLUTCH RING RETAINER
653	PLATE, 3RD AND 4TH CLUTCH APPLY (STEPPED)
654A	PLATE ASSEMBLY, 3RD AND 4TH CLUTCH (FIBER)
654B	PLATE, 3RD AND 4TH CLUTCH (STEEL)
654C	PLATE, 3RD AND 4TH CLUTCH (STEEL)
655	PLATE, 3RD AND 4TH CLUTCH BACKING (SEL.)
656	RING, 3RD AND 4TH CLUTCH BACKING PLATE RETAINER
657	BUSHING, INPUT SUN GEAR (FRONT)
658	GEAR, INPUT SUN
659	BUSHING, INPUT SUN GEAR (REAR)
661	RET., OUTPUT SHAFT TO INPUT CARRIER
662	CARRIER ASSEMBLY, INPUT (COMPLETE)
663	BEARING ASSEMBLY, THRUST (INPUT CARRIER TO REACTION SHAFT)
664	GEAR, INPUT INTERNAL
665	BUSHING, REACTION CARRIER SHAFT (FRONT)
666	SHAFT, REACTION CARRIER
667	BUSHING, REACTION CARRIER SHAFT (REAR)
668	RING, REACTION SHAFT/INTERNAL GEAR RETAINER
669	WASHER, THRUST (REACTION SHAFT/SHELL)
670	SHELL, REACTION SUN
671	RING, REACTION SUN GEAR RETAINER
672	BUSHING, REACTION SUN
673	GEAR, REACTION SUN
674	WASHER, THRUST (RACE/REACTION SHELL)
675	RACE, LO AND REVERSE ROLLER CLUTCH
676	RING, LO AND REVERSE SUPPORT TO CASE RETAINER
677	RING, LO AND REVERSE RETAINER (ROLLER ASSEMBLY/CAM)
678	CLUTCH ASSEMBLY, LO AND REVERSE ROLLER
679	SUPPORT ASM., LO AND REVERSE CLUTCH
680	SPRING, TRANSMISSION (LO AND REVERSE CLUTCH SUPPORT RETAINER)
681	CARRIER ASSEMBLY, REACTION
682A	PLATE, LO AND REVERSE CLUTCH (WAVED)
682B	PLATE, SPACER LO AND REVERSE CLUTCH (SELECTIVE)
682C	PLATE ASSEMBLY, LO AND REVERSE CLUTCH (FIBER)
682D	PLATE, LO AND REVERSE CLUTCH (STEEL)
683	BEARING ASSEMBLY, THRUST (REACTION CARRIER/ SUPPORT)
684	GEAR, INTERNAL REACTION
685	SUPPORT, INTERNAL REACTION GEAR
686	RING, REACTION GEAR/SUPPORT RETAINER
687	SHAFT, OUTPUT
690	SLEEVE, OUTPUT SHAFT
691	SEAL, OUTPUT SHAFT
692	BRG., REACTION GEAR SUPPORT TO CASE
693	RING, LO AND REVERSE CLUTCH RETAINER
694	SPRING ASSEMBLY, LO AND REVERSE CLUTCH
695	PISTON, LO AND REVERSE CLUTCH
696	SEAL, TRANSMISSION (LO AND REVERSE CLUTCH - OUTER, CENTER, INNER)
697	DEFLECTOR, OIL (HIGH OUTPUT MODELS ONLY)
698	PLUG, ORIFICED CUP
699	ROTOR, INTERNAL TRANSMISSION SPEED SENSOR

Figure 182

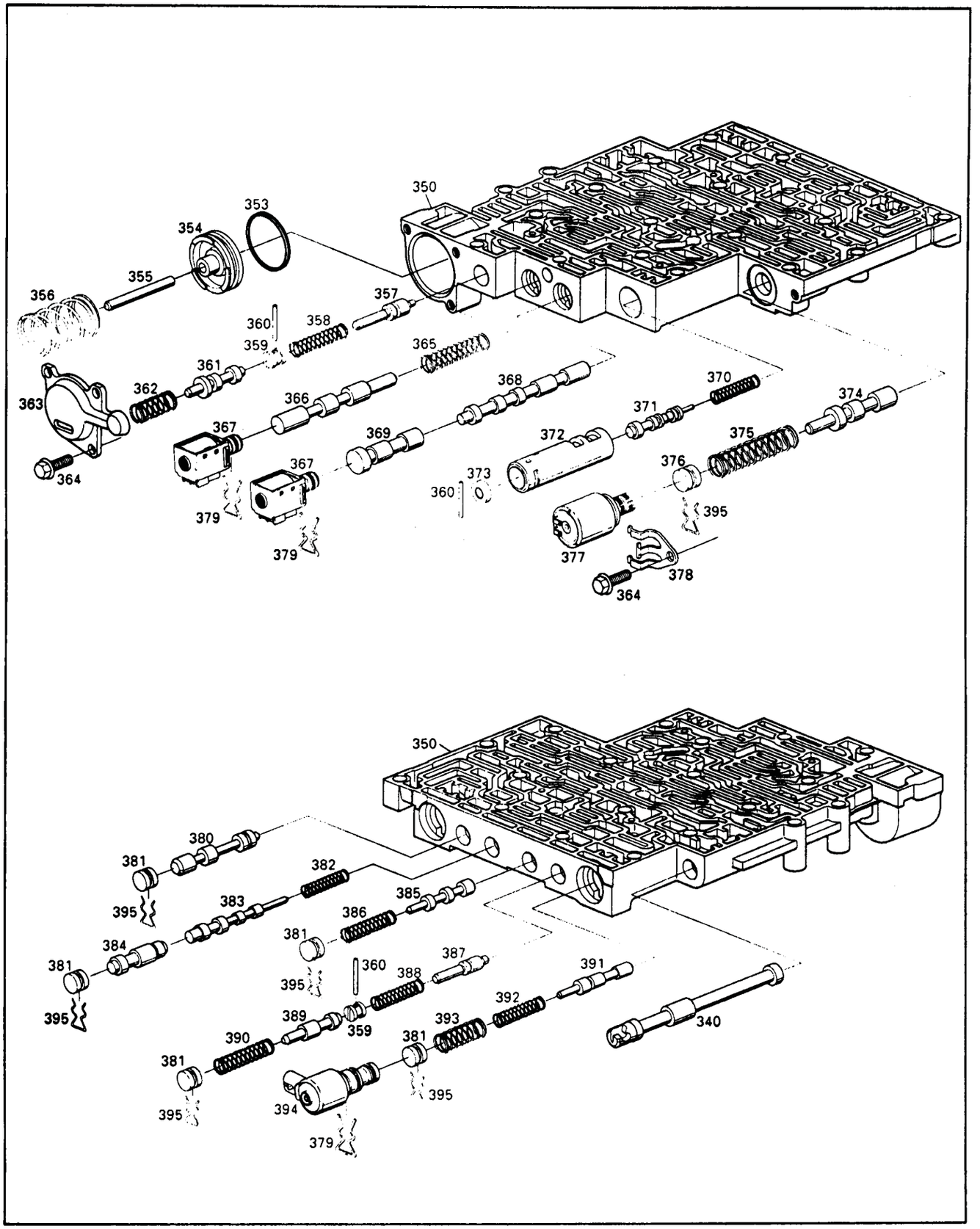
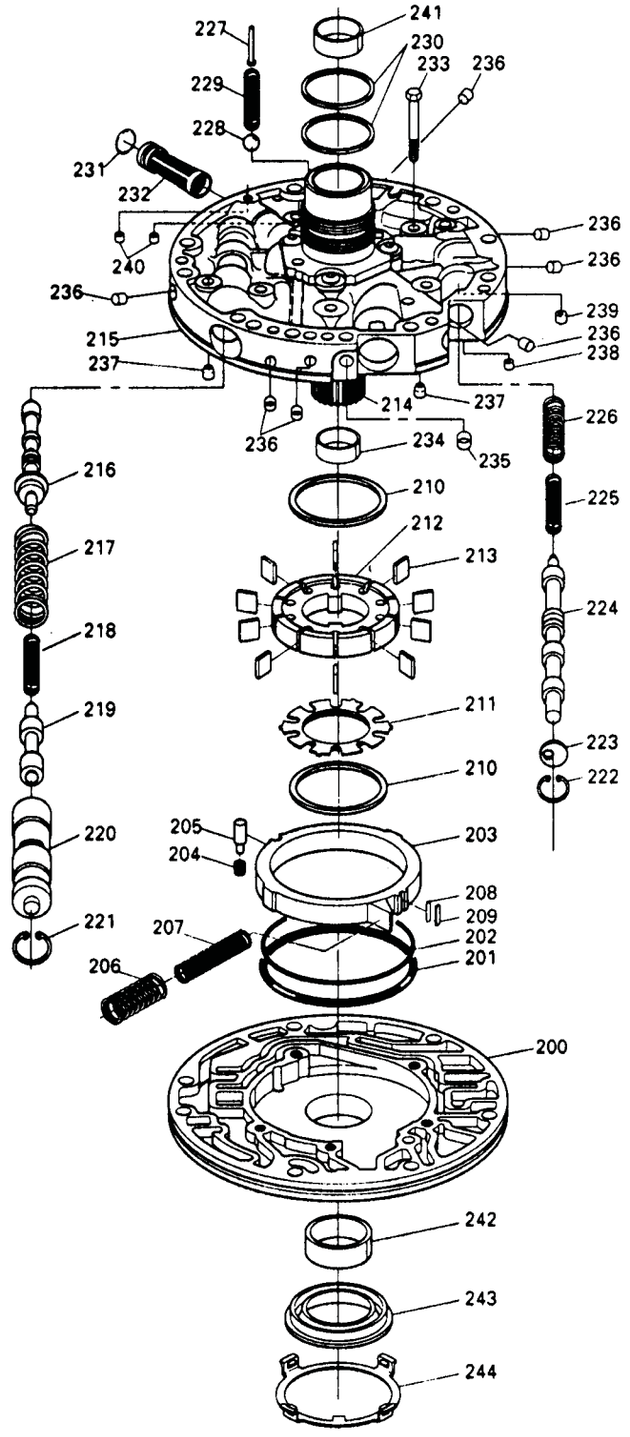


Figure 183

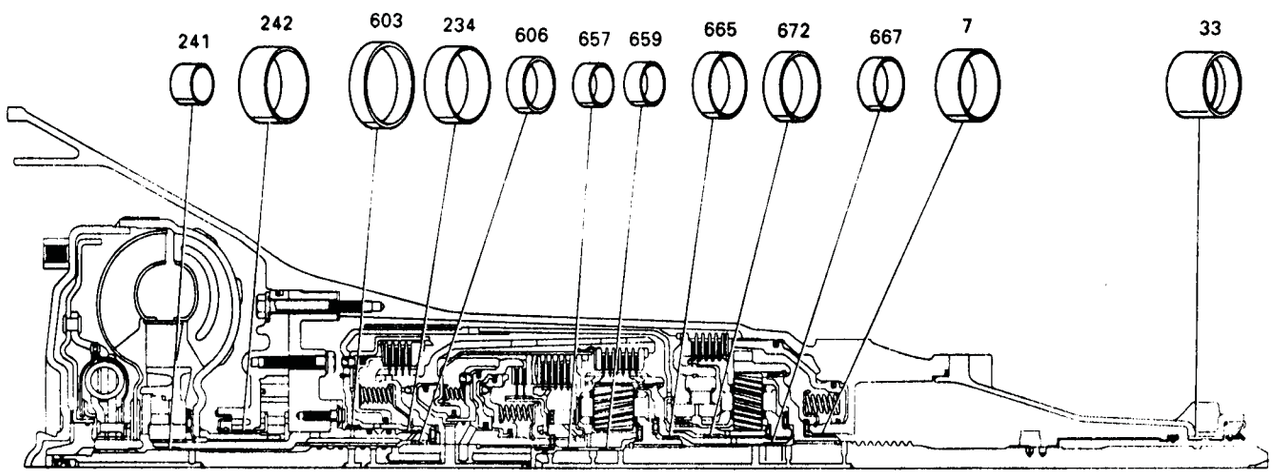
340 VALVE, MANUAL
350 VALVE ASSEMBLY, CONTROL BODY
353 SEAL, FORWARD ACCUMULATOR OIL
354 PISTON, FORWARD ACCUMULATOR
355 PIN, FORWARD ACCUMULATOR
356 SPRING, FORWARD ACCUMULATOR
357 VALVE, FORWARD ABUSE
358 SPRING, FORWARD ABUSE VALVE
359 PLUG, BORE
360 PIN, COILED SPRING
361 VALVE, LOW OVERRUN
362 SPRING, LOW OVERRUN VALVE
363 COVER, FORWARD ACCUMULATOR
364 BOLT, FORWARD ACCUMULATOR COVER
365 SPRING, 1-2 SHIFT VALVE
366 VALVE, 1-2 SHIFT
367A 1-2 SHIFT SOLENOID (A)
367B 2-3 SHIFT SOLENOID (B)
368 VALVE, 2-3 SHIFT
369 VALVE, 2-3 SHUTTLE
370 SPRING, 1-2 ACCUMULATOR VALVE
371 VALVE, 1-2 ACCUMULATOR
372 SLEEVE, 1-2 ACCUMULATOR VALVE
373 PLUG, BORE
374 VALVE, ACTUATOR FEED LIMIT
375 SPRING, ACTUATOR FEED LIMIT VALVE
376 PLUG, BORE
377 PRESSURE CONTROL SOLENOID
378 RETAINER, PRESSURE CONTROL SOLENOID
379 RETAINER, SOLENOID
380 VALVE, CONVERTER CLUTCH SIGNAL
381 PLUG, BORE
382 SPRING, 4-3 SEQUENCE VALVE
383 VALVE, 4-3 SEQUENCE
384 VALVE, 3-4 RELAY
385 VALVE, 3-4 SHIFT
386 SPRING, 3-4 SHIFT VALVE
387 VALVE, REVERSE ABUSE
388 SPRING, REVERSE ABUSE VALVE
389 VALVE, 3-2 DOWNSHIFT
390 SPRING, 3-2 DOWNSHIFT VALVE
391 VALVE, 3-2 CONTROL
392 SPRING, 3-2 CONTROL VALVE
393 SPRING, BORE PLUG
394 3-2 CONTROL SOLENOID
395 RETAINER, BORE PLUG

Figure 184



ILL. NO.	DESCRIPTION
200	BODY, PUMP
201	RING, OIL SEAL (SLIDE TO WEAR PLATE)
202	SEAL, O-RING (SLIDE SEAL BACK-UP)
203	SLIDE, PUMP
204	SPRING, PIVOT PIN
205	PIN, PIVOT SLIDE
206	SPRING, PUMP SLIDE (OUTER)
207	SPRING, PUMP SLIDE (INNER)
208	SUPPORT, PUMP SLIDE SEAL
209	SEAL, PUMP SLIDE
210	RING, PUMP VANE
211	GUIDE, ROTOR
212	ROTOR, OIL PUMP
213	VANE, PUMP
214	SHAFT, STATOR
215	COVER, PUMP
216	VALVE, PRESSURE REGULATOR
217	SPRING, PRESSURE REGULATOR VALVE
218	SPRING, PRESSURE REGULATOR ISOLATOR
219	VALVE, REVERSE BOOST
220	SLEEVE, REVERSE BOOST VALVE
221	RING, OIL PUMP REVERSE BOOST VALVE RETAINING
222	RING, OIL PUMP CONVERTER CLUTCH VALVE RETAINING
223	VALVE, STOP
224	VALVE, CONVERTER CLUTCH
225	SPRING, CONVERTER CLUTCH VALVE (INNER)
226	SPRING, CONVERTER CLUTCH VALVE (OUTER)
227	RIVET, PRESSURE RELIEF BOLT
228	BALL, PRESSURE RELIEF
229	SPRING PRESSURE RELIEF
230	RING, OIL SEAL (STATOR SHAFT)
231	SEAL, OIL PUMP COVER SCREEN
232	SCREEN, OIL PUMP COVER
233	BOLT, M8 X 1.25 X 40 (COVER TO BODY)
234	BUSHING, STATOR SHAFT (FRONT)
235	PLUG, OIL PUMP COVER (FWD CLUTCH FEED)
236	PLUG, OIL PUMP COVER
237	RETAINER AND BALL ASSEMBLY, CHECK VALVE
238	ORIFICE, CONVERTER CLUTCH SIGNAL (CUP PLUG)
239	ORIFICE, OIL COOLER (CUP PLUG)
240	PLUG, CUP ORIFICE
241	BUSHING, STATOR SHAFT (REAR)
242	BUSHING, PUMP BODY
243	SEAL ASSEMBLY, OIL
244	RETAINER, FRONT HELIX

Figure 185



7	BUSHING, CASE
33	BUSHING, CASE EXTENSION
234	BUSHING, STATOR SHAFT (FRONT)
241	BUSHING, STATOR SHAFT (REAR)
242	BUSHING, OIL PUMP BODY
603	BUSHING, REVERSE INPUT CLUTCH (FRONT)
606	BUSHING, REVERSE INPUT CLUTCH (REAR)
657	BUSHING, INPUT SUN GEAR (FRONT)
659	BUSHING, INPUT SUN GEAR (REAR)
665	BUSHING, REACTION SHAFT (FRONT)
667	BUSHING, REACTION SHAFT (REAR)
672	BUSHING, REACTION SUN GEAR

TORQUE SPECIFICATIONS

LOCATION	QTY.	SIZE	TORQUE	LOCATION	QTY.	SIZE	TORQUE
ACCUMULATOR COVER TO CASE	2	M6 1.0 x 35.0	11 N•m (8 LB.-FT.)	PARK BRAKE BRACKET TO CASE	2	M8 1.25 X 20.0	31 N•m (23 LB.-FT.)
ACCUMULATOR COVER TO CASE	1	M6 1.0 x 65.0	11 N•m (8 LB.-FT.)	PUMP COVER TO BODY	5	M8 1.25 X 40.0	24 N•m (18 LB.-FT.)
DETENT SPRING TO VALVE BODY	1	M8 1.25 x 20.0	24 N•m (18 LB.-FT.)	PUMP ASSEMBLY TO CASE	7	M8 1.25 X 60.0	24 N•m (18 LB.-FT.)
FWD ACCUM. COVER TO VALVE BODY	3	M6 1.0 x 17.7	11 N•m (8 LB.-FT.)	CASE EXTENSION TO CASE	4	M10 1.50 X 30.0	35 N•m (26 LB.-FT.)
SOLENOID ASSEMBLY TO CASE	2	M6 1.0 x 12.0	11 N•m (8 LB.-FT.)	MANUAL SHAFT TO INSIDE DETENT LEVER	1	M10 1.50 NUT	31 N•m (23 LB.-FT.)
TRANSMISSION OIL PAN TO CASE	16	M8 1.25 x 19.3	12 N•m (9 LB.-FT.)	LINE PRESSURE PLUG	1	1/8 - 27	11 N•m (8 LB.-FT.)
VALVE BODY TO CASE	2	M6 1.0 X 35.0	11 N•m (8 LB.-FT.)	CONNECTOR COOLER PIPE	2	1/4 - 18	38 N•m (28 LB.-FT.)
VALVE BODY TO CASE	9	M6 1.0 x 47.5	11 N•m (8 LB.-FT.)	PRESSURE SWITCH ASM. TO VALVE BODY	2	M6 1.0 X 17.7	11 N•m (8 LB.-FT.)
VALVE BODY TO CASE	3	M6 1.0 x 54.4	11 N•m (8 LB.-FT.)	VEHICLE SPEED SENSOR RETAINER	1	M6 1.0 X 21.7	11 N•m (8 LB.-FT.)
VALVE BODY TO CASE	3	M6 1.0 x 65.0	11 N•m (8 LB.-FT.)	SPACER PLATE SUPPORT TO CASE	3	M6 1.0 X 17.7	11 N•m (8 LB.-FT.)
PRESSURE CONTROL SOLENOID TO VALVE BODY	1	M6 1.0 X 17.7	11 N•m (8 LB.-FT.)				

Figure 186

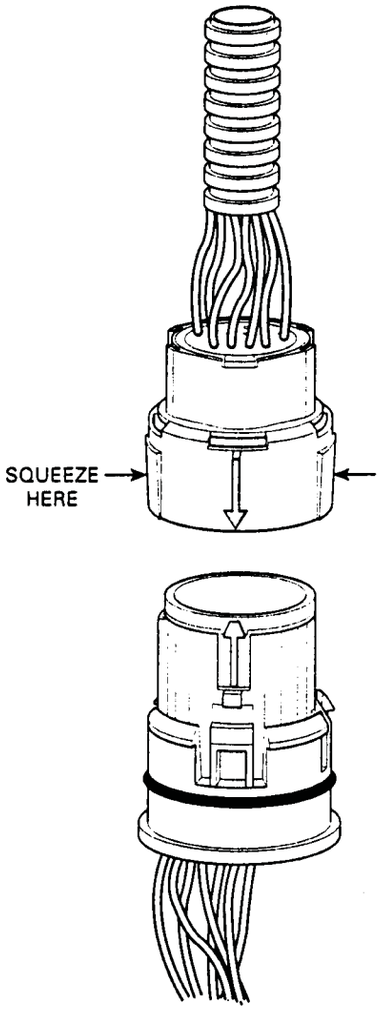
TRANSMISSION ELECTRICAL CONNECTOR

The transmission electrical connector is a very important part of the HYDRA-MATIC 4L60-E operating system. Anything that interferes with the electrical connection can cause the transmission to set Diagnostic Trouble Codes and/or operate incorrectly.

The following items can affect the electrical connection:

- Bent pins in the connector from rough handling during connection and disconnection
- Wires backing away from the pins or coming uncrimped (in either the transmission or vehicle wiring harness)
- Dirt contamination entering the connector when it is unconnected
- Pins in the connector backing out of the connector or pushed out during connection
- Excessive transmission fluid leaking into the connector, wicking up into the vehicle wiring harness and degrading the wire insulation *
- Water/moisture intrusion in the connector
- Low pin retention from excessive connection and disconnection of the wiring harness
- Pin corrosion from contamination

* The presence of transmission fluid in the transmission connector is not harmful in itself. The fluid only affects the vehicle harness wiring insulation if the fluid wicks up that far.



Points to remember when working with the transmission electrical connector:

- To remove the connector, squeeze the two tabs towards each other and pull straight up (See illustration).
- Carefully limit twisting or wiggling the connector during removal. This can bend pins.
- DO NOT pry the connector off with a screwdriver or other tool.
- To install the connector, first orient the pins by lining up the arrows on each half of the connector. Push the connector straight down into the transmission without twisting or angling the mating parts.
- The connector should click into place with a positive feel and/or noise.
- Whenever the transmission pass-thru connector is disconnected from the vehicle harness and the engine is running, multiple Diagnostic Trouble Codes will set. Be sure to clear these codes after re-connecting the pass-thru connector.

  DTC's 59, 67 and 82 will set with key on, engine off.

  DTC's 59, 66, 67, 73 and 82 will set with key on, engine on.

Figure 187

4L60-E COMPONENT RESISTANCE CHART

COMPONENT	TERMINAL	WIRE COLOR	PASS-THRU PIN	RESISTANCE @ 20°C	CKT #
1-2 SHIFT SOLENOID	A	RED	E *	20 - 40 Ohms	1149B
	B	GRN LT	A		1222
2-3 SHIFT SOLENOID	A	RED	E *	20 - 40 Ohms	1149A
	B	YEL	B		1223
3-2 CONTROL SOLENOID	A	RED	E *	9 - 14 Ohms	1149C
	B	WHT	S		897
PRESSURE CONTROL SOLENOID	A	PPL	C	3.5 - 8 Ohms	1228
	B	BLU LT	D		1229
TRANS TEMPERATURE SENSOR	A	BRN	L	2.9 - 4.0 kOhms	1227
	B	GRA	M		455
&	C	PNK	N	SEE PAGE 85	1224
PRESSURE SWITCH ASSEMBLY	D	ORN	P		1226
	E	BLUE DK	R		1225
TCC SOLENOID	A	RED	E *	20 - 40 Ohms	1149E
	B	BLACK	T		422A

* Spliced internally to Pin E.

Figure 188

TROUBLE CODES	ACTIONS
21 – Throttle Position Sensor Circuit (High) 22 – Throttle Position Sensor Circuit (Low) 28 – Fluid Pressure Switch Assembly Fault 37 – Brake Switch Stuck "ON" 38 – Brake Switch Stuck "OFF" 67 – TCC Solenoid Circuit Fault	NO 4TH GEAR IF HOT MODE
24 – Vehicle Speed Sensor Low 72 – Vehicle Speed Sensor Loss	2ND GEAR
52 – Long System Voltage High 53 – System Voltage High 66 – 3-2 Control Soelnoid Circuit Fault 75 – System Voltage Low	3RD GEAR ONLY
81 – 2-3 Shift Solenoid Circuit Fault	2ND GEAR ONLY OR 3RD GEAR ONLY
82 – 1-2 Shift Solenoid Circuit Fault	2ND AND 3RD GEARS ONLY OR 1ST AND 4TH GEARS ONLY
69 – TCC Stuck "ON"	EARLY SHIFTS

Figure 189

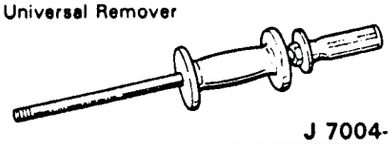
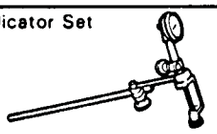
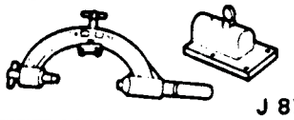
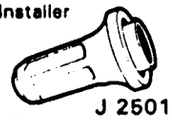
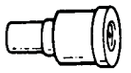
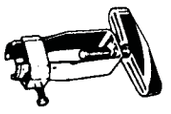
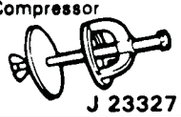
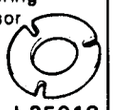
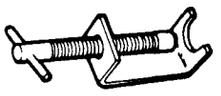
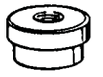
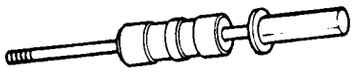
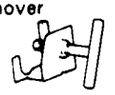
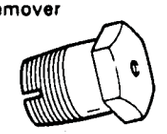
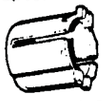
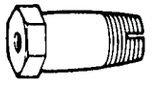
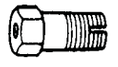
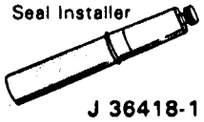
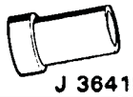
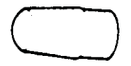
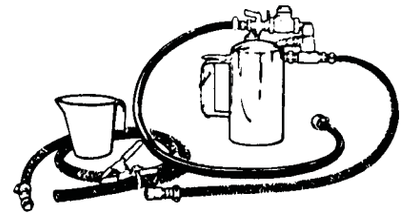
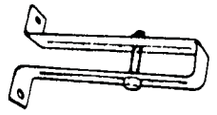
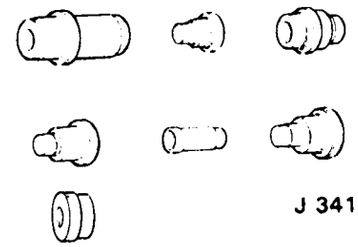
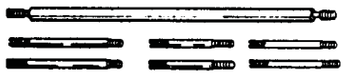
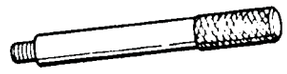
1993 HYDRA-MATIC 4L60-E DIAGNOSTIC TROUBLE CODE ACTIONS

Some malfunction codes have "actions" associated with them. This means if a particular code is set, the PCM commands the transmission to behave in a certain way. This protects the transmission components from damage, and allows the transmission to function until it can be serviced.

TROUBLE CODES	ACTIONS
14 – Engine Coolant Temp Sensor Circuit (High) 15 – Engine Coolant Temp Sensor Circuit (Low)	TCC APPLY WITH A COLD ENGINE
21 – Throttle Position Sensor Circuit (High) 22 – Throttle Position Sensor Circuit (Low) 28 – Fluid Pressure Switch Assembly Fault 37 – Brake Switch Stuck "ON" 38 – Brake Switch Stuck "OFF" 52 – Long System Voltage High 53 – System Voltage High 67 – TCC Solenoid Circuit Fault 75 – System Voltage Low 81 – 2-3 Shift Solenoid Circuit Fault	NO TCC
69 – TCC Stuck "ON"	TCC ON IN ALL GEARS
21 – Throttle Position Sensor Circuit (High) 22 – Throttle Position Sensor Circuit (Low)	FIXED SHIFT POINTS
21 – Throttle Position Sensor Circuit (High) 22 – Throttle Position Sensor Circuit (Low) 28 – Fluid Pressure Switch Assembly Fault 73 – Pressure Control Solenoid Current	HARSH SHIFTS
24 – Vehicle Speed Sensor Signal Low 52 – Long System Voltage High 53 – System Voltage High 72 – Vehicle Speed Sensor Loss 73 – Pressure Control Solenoid Current 75 – System Voltage Low 81 – 2-3 Shift Solenoid Circuit Fault 82 – 1-2 Shift Solenoid Circuit Fault	MAX LINE

Figure 190

SPECIAL TOOLS

Universal Remover  J 7004-1	Dial Indicator Set  J 8001	Rear Seal Installer  J 21426
Holding Fixture & Base  J 8763-02	Oil Pump Body & Cover Alignment Band  J 21368	Clutch Spring Compressor Press  J 23456
Pump Oil Seal Installer  J 25016	End Play Checking Fixture  J 25022	Piston Compressor  J 22269-01
Bushing Remover  J 23062-14	Pump Remover & Installer  J 37789	
Clutch Spring Compressor  J 23327	Clutch Spring Compressor Adapter  J 25018	Oil Pump Remover & End Play Checking Fixture  J 24773
Bushing Installer  J 25019-12  J 25019-9		
Universal Remover  J 23907	Bushing Remover  J 25019-4	Speed Sensor Remover  J 38417
Bushing Remover  J 25019-16		
End Play Fixture Adaptor  J 34725	Adaptor  J 39119	Bushing Remover  J 25019-14
Bushing Remover  J 24036	Servo Cover Compressor  J 29714	
Turbine Shaft Seal Installer  J 36418-1	Turbine Shaft Seal Sizer  J 36418-2	Speedometer Gear Puller & Adapter  J 21427-01 & J 8433
Inner Forward Clutch Seal Protector  J 29883		
Bushing & Universal Remover Set   J 29369-1 J 29369-2	Inner Overrun Clutch Seal Protector  J 29882	Cooler Flusher  J 35944
Output Shaft Support Fixture  J 29837	Speed Sensor Rotor Installer  J 36352	
2-4 Band Apply Pin Tools  J 33037	Speedometer Gear Installer  J 5590	Bushing Set  J 34196
Dial Indicator Stand & Guide Pin Set  J 25025-B	Handle  J 8092	