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INTRODUCTION
FORD F4-EAT, F4E-III

The F4EAT transaxle is a completely automatic, electronic controlled, four speed transaxle and uses a single compound planetary gear-set to give the unit four speed capability. The F4EAT transaxle is found in Ford Motor Companys Escort, Tracer, and Capri vehicles. This transaxle is also found in the Mazda 323, but Mazda refers to it as the F4AEL. This manual will provide the procedures necessary to repair, overhaul and service this unit.

We wish to thank Ford Motor Company for the information and illustrations that have made this booklet possible.

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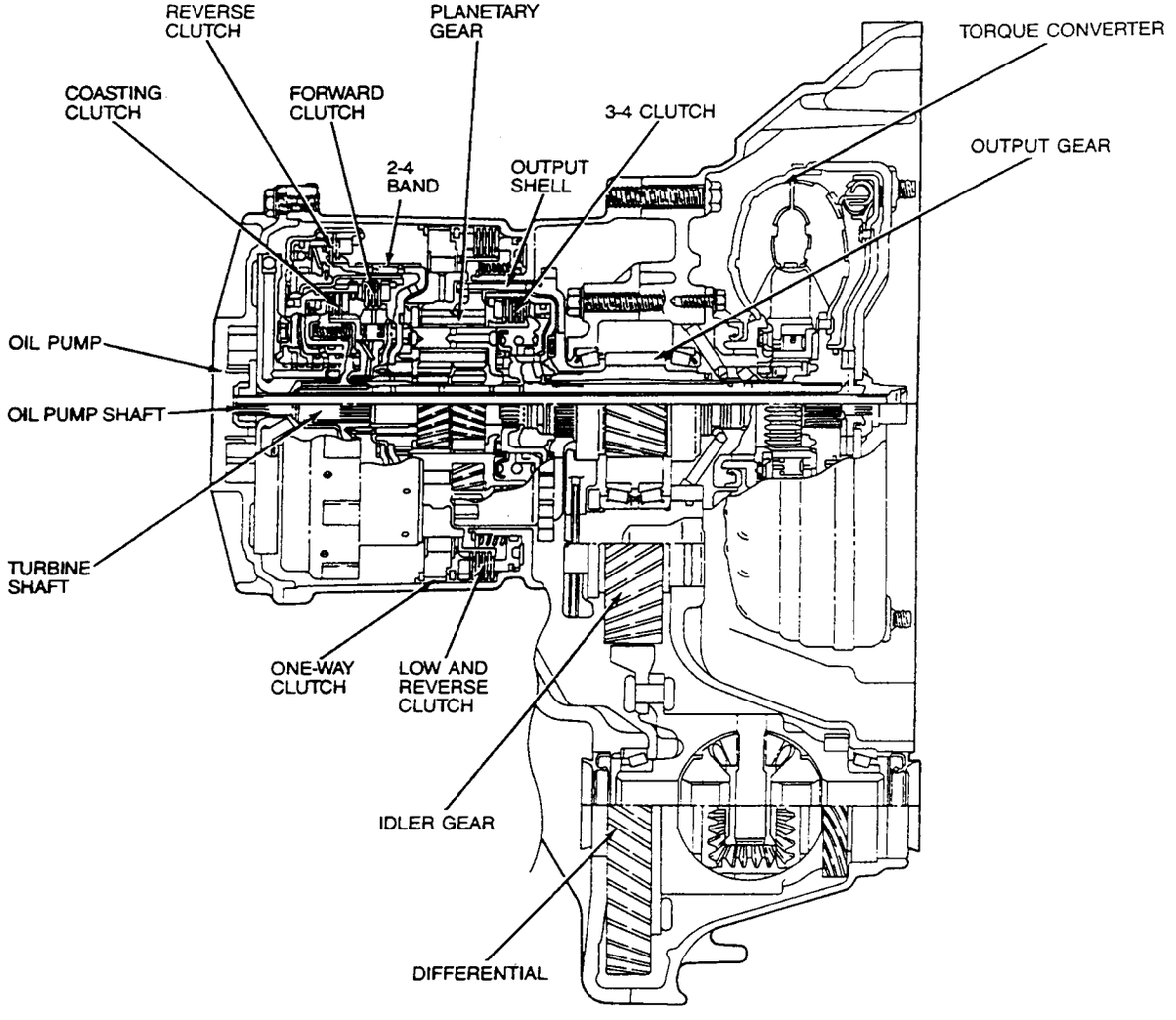
VEHICLE APPLICATION

Escort / Tracer

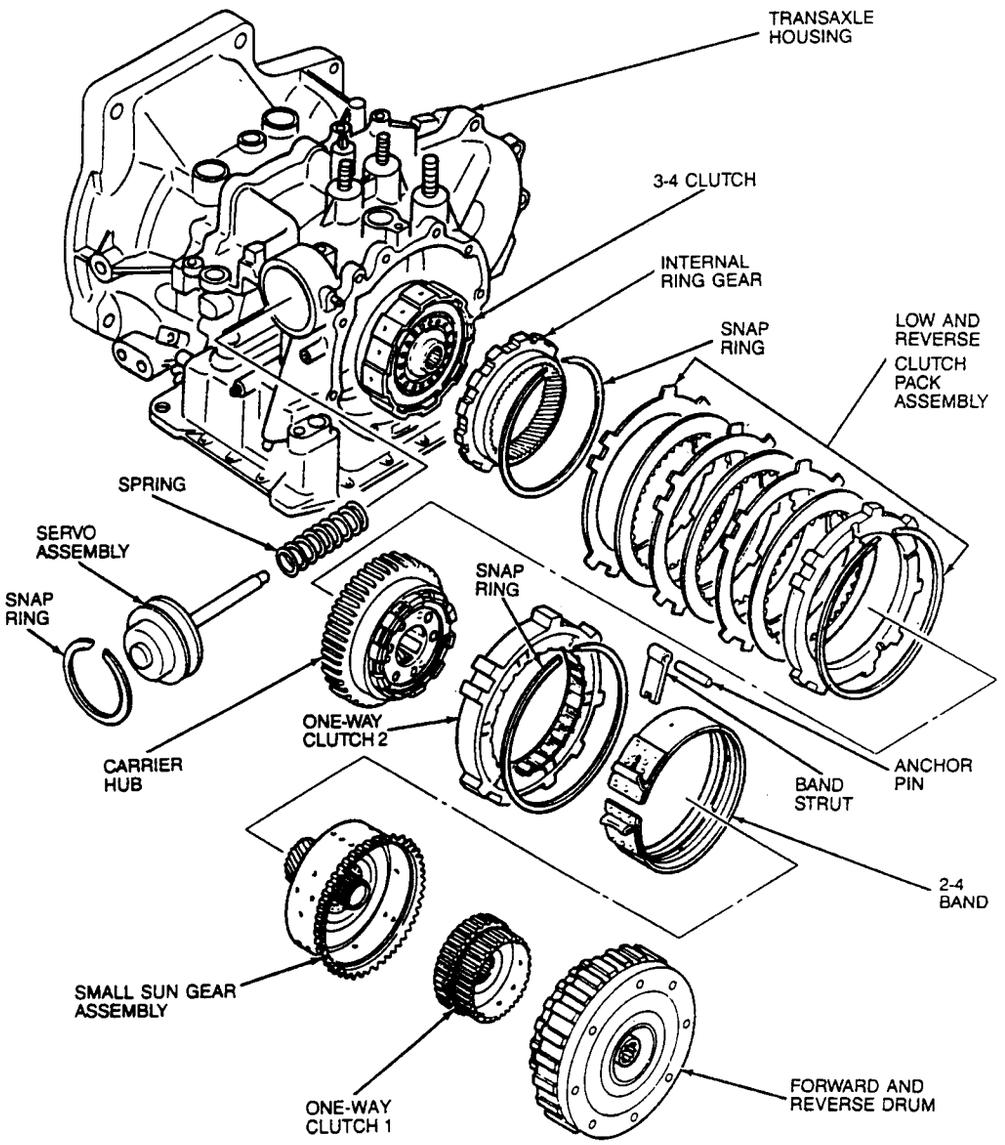
DESCRIPTION AND OPERATION

The Type F 4EAT is an electronically controlled automatic transaxle featuring a combination of electronic and mechanical systems for controlling forward gear shifting, torque converter lockup for quietness and fuel economy, and self-diagnosis capability for simplifying troubleshooting procedures. This transaxle has a 163 N-m (120 lb-ft) torque capacity.

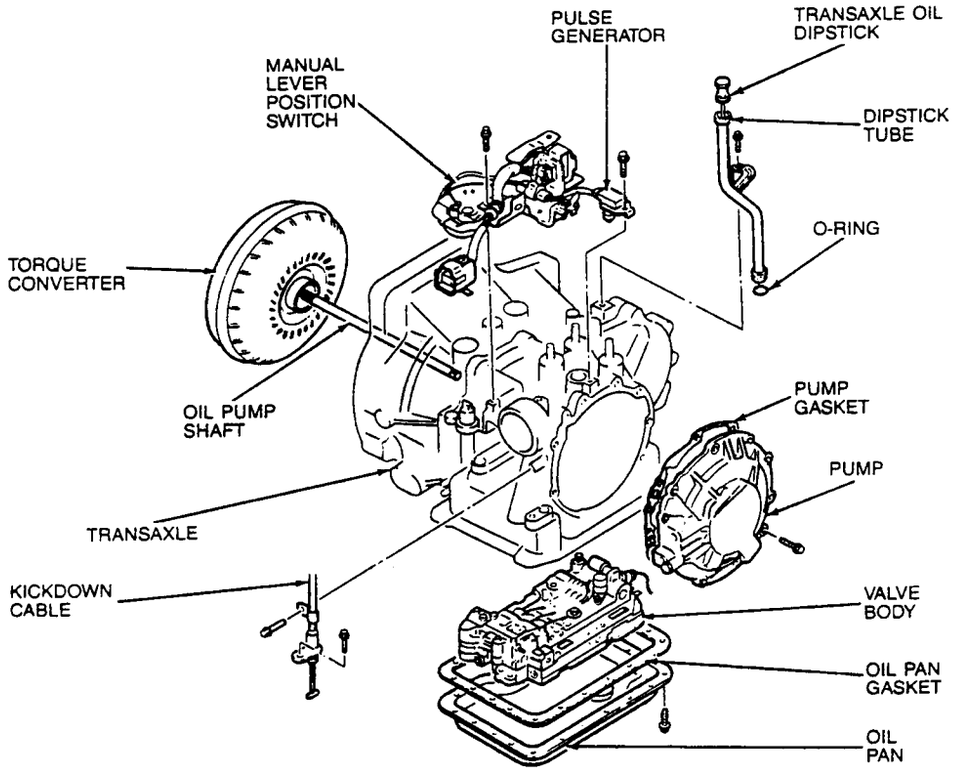
A notable mechanical feature of the 4EAT is a single compact combination-type planetary gear (4-speed capability) instead of two planetary gears used in previous 3-speed transaxles, making a reduction in overall size possible. Also, a new variable-capacity rotor-type oil pump is used which provides a constant oil quantity at and above a medium speed, and reduces the power losses resulting from pumping more oil than necessary at higher speeds.



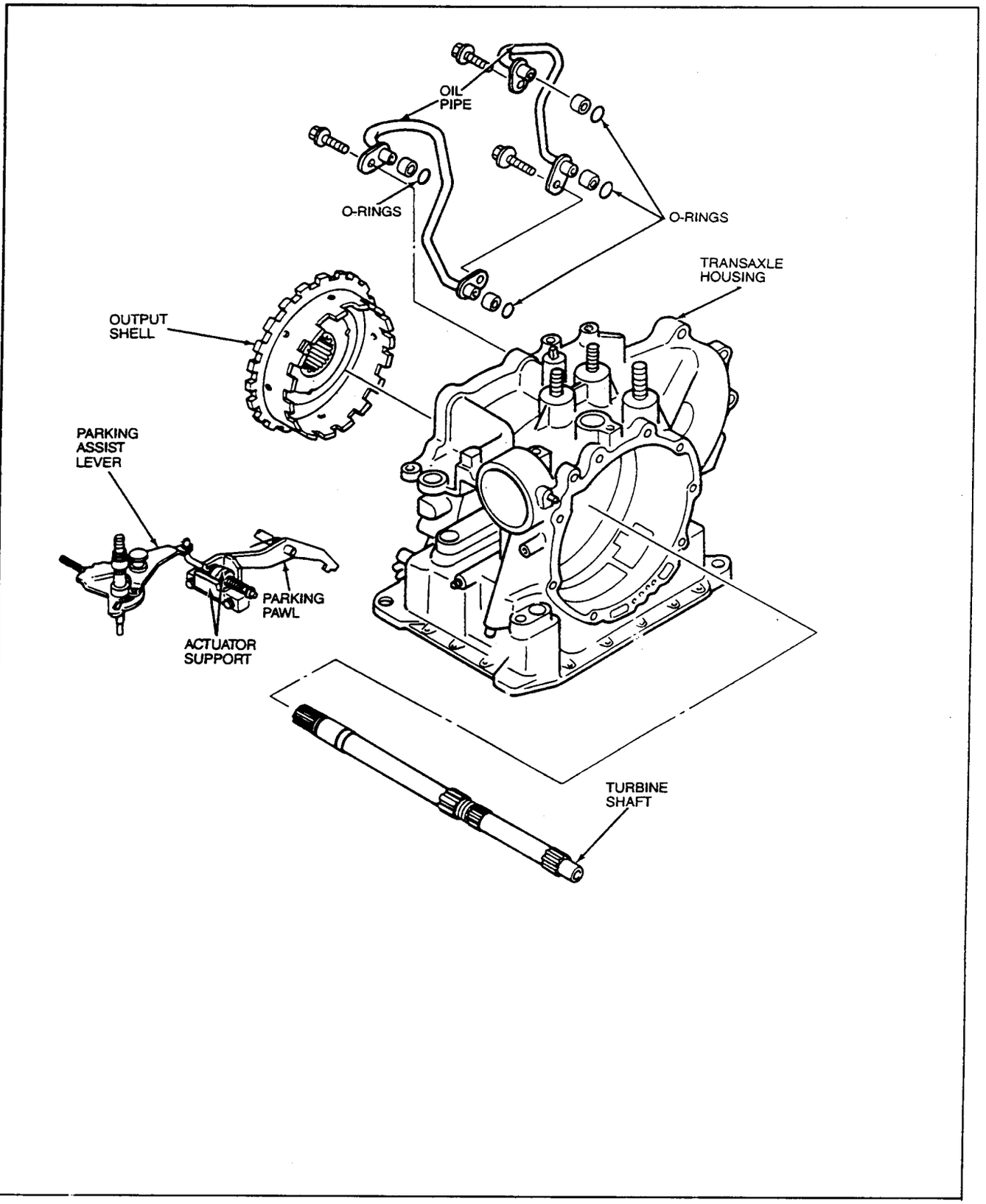
DESCRIPTION AND OPERATION (Continued)



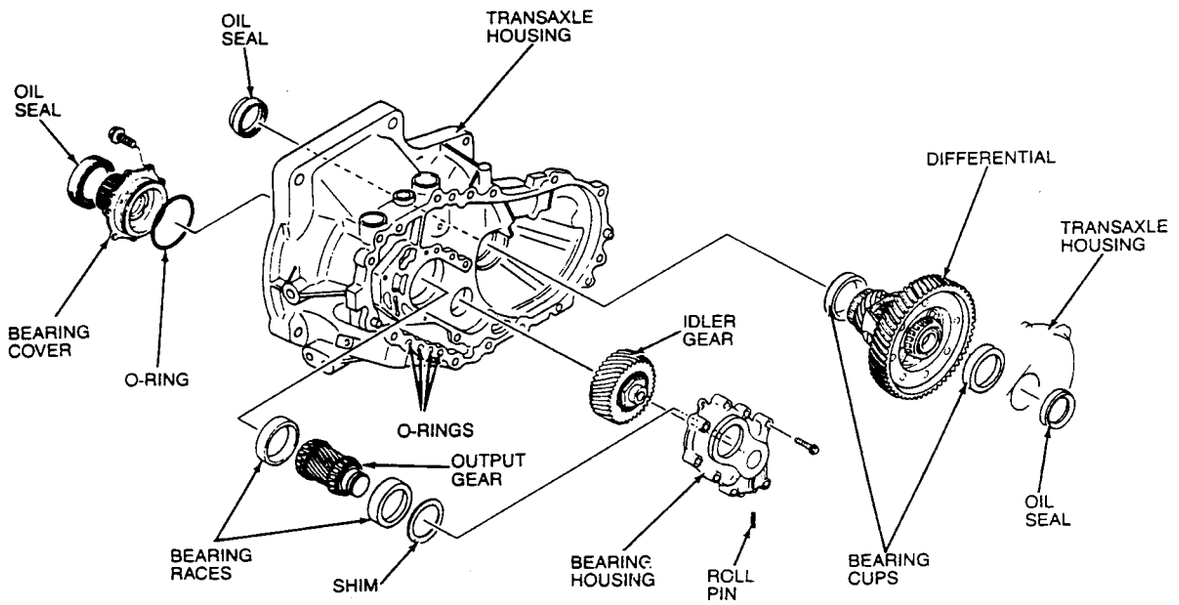
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DESCRIPTION AND OPERATION (Continued)



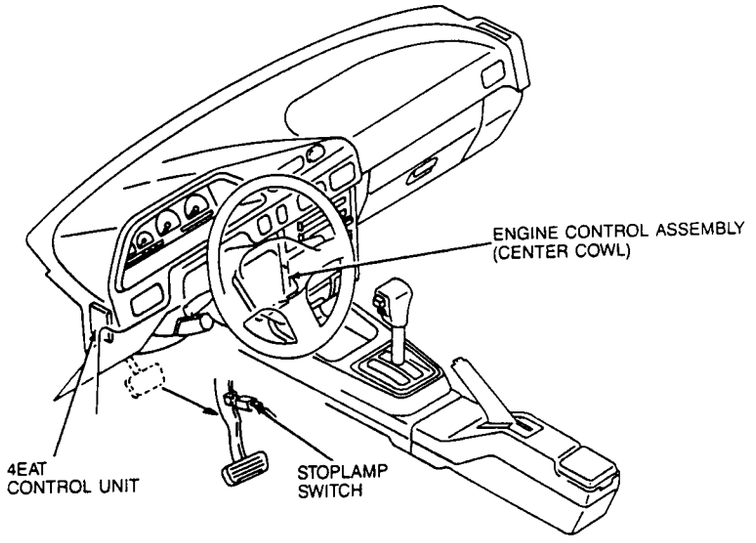
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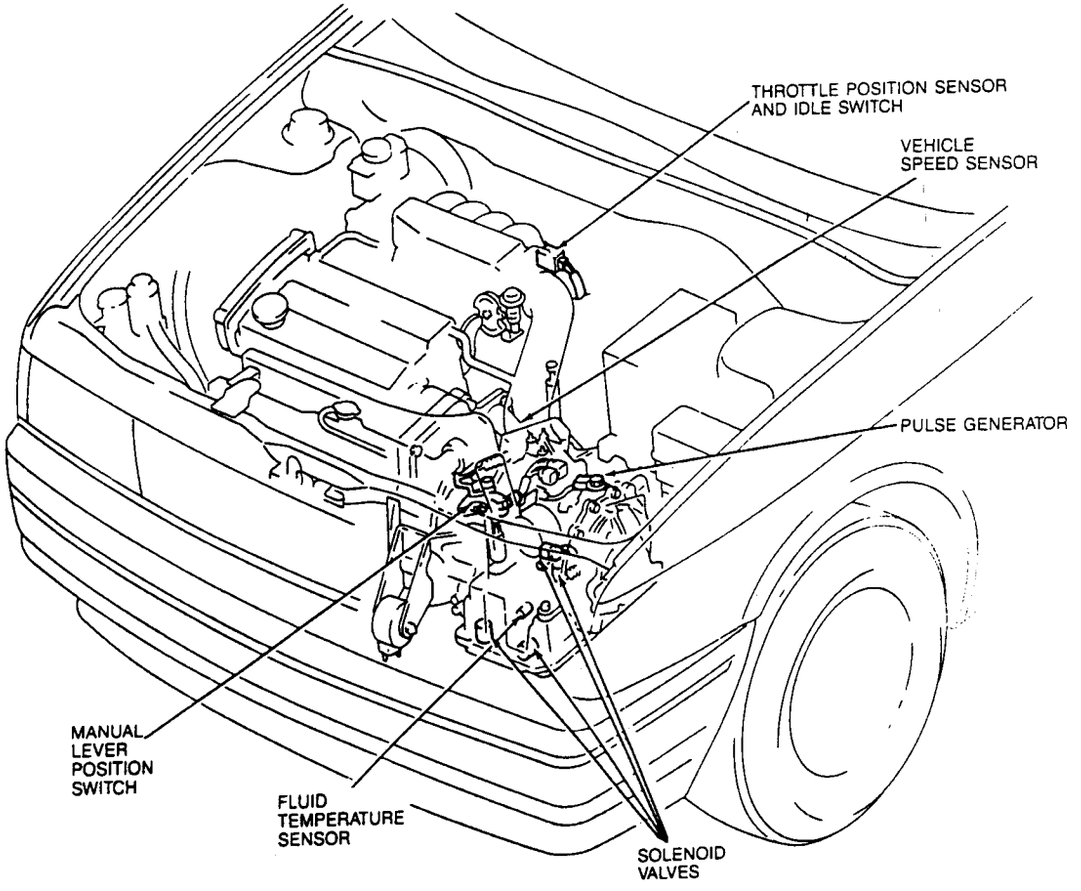


An electronic system controls the transaxle shifting in forward speeds and torque converter lockup by means of electric solenoid-operated valves. The shift timing and lockup events are regulated by the control unit in programmed logic and in response to input sensors and switches in order to produce optimum driveability.

Component	4EAT Control Unit-Input/Output
Pulse Generator	Input
Vehicle Speed Sensor	Input
Throttle Sensor	Input
Idle Switch	Input
Manual Lever Position Switch	Input
Stoplamp Switch	Input
Water Thermo Signal	Input
Fluid Temperature Sensor	Input
1-2 Solenoid Shift Valve	Output
2-3 Solenoid Shift Valve	Output
3-4 Solenoid Shift Valve	Output
Solenoid Lockup Valve	Output

DESCRIPTION AND OPERATION (Continued)





DESCRIPTION AND OPERATION (Continued)

Electrical System

The electronically controlled automatic transaxle (4EAT) features a combination of electronic and mechanical systems that control forward gear shifting speeds and torque converter lockup for quietness and economy. The 4EAT also has a self-diagnosis capability that simplifies troubleshooting procedures.

Unique mechanical features of the 4EAT transaxle include a single compact combination-type planetary gear (4-speed capability). Also a variable capacity oil pump is used which provides a constant oil quantity at and above a specified engine speed and reduces the power losses that result from pumping more oil than necessary at higher speeds.

The electronic system controls transaxle forward shifting speeds and torque converter lockup by means of solenoid-operated valves. When energized, these solenoid valves actuate friction elements (clutches and band) to control shifting in the planetary gear. Shift timing and lockup events are regulated by the control unit in programmed logic and in response to input sensors and switches in order to produce optimum driveability.

The 4EAT diagnostic procedure consists of a preliminary inspection for obvious defects and a Quick Test for service codes (seven total), Pinpoint Tests or operational tests performed in a logical sequence, and post-operational tests if required.

Electronic control problems are diagnosed in Pinpoint Tests in the Non-NAAO Engine / Emission Diagnosis Manual.

DIAGNOSIS AND TESTING

Preliminary Inspection

1. Visually inspect the 4EAT transaxle from above and below the vehicle.
   Look for:

Mechanical	Electrical
1. Fluid leaks. 2. Loose engine or transaxle mounts. 3. CV joints and halfshafts loose, worn or damaged. 4. Shift linkage binding or damaged. 5. Front brakes excessively worn or damaged. 6. Incorrect tire pressure.	1. Blown fuses. 2. Stretched, open, or damaged wiring. 3. Corroded or loose connectors.

2. Check the accelerator linkage and the throttle valve linkage for freedom of travel.
3. Activate the emergency override button, and then manually shift the selector lever through all ranges to check for ease of movement, obvious binding, or poor adjustment.
4. Check the oil cooler (mounted in the side tank of the radiator) for free air flow and leakage.

   This diagnostic procedure is to be used on 4EAT transaxle-equipped Escort and Tracer vehicles only.
5. Drive the vehicle to verify the customer's complaint.

To help locate problems with the transaxle, the following sequence should be followed (except when directed otherwise by the symptom menu):

1. **Perform Preliminary Inspection.** This step will help to find possible problems that are obvious, easy to check, and easy to repair.
2. **Review Symptom Chart.** This step provides basic direction for test procedures. The Symptom Chart only covers problems that are easy to relate to a customer complaint. Follow the directions given in the "Action to Take" column. Directions are given in the recommended order of testing. More detailed symptoms are covered in the operational tests and the road test sections to isolate problems found while driving, or for problems that need specific analysis.
3. **Perform Switch Monitor Test.** This test step checks input signals from the individual input switches to the 4EAT control module.

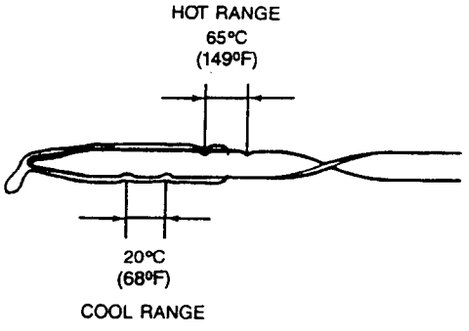
DIAGNOSIS AND TESTING (Continued)

4. **Perform Operational Tests.** This step determines the causes of most basic problems that may exist. Follow the directions to repair any faults. When directed to perform operational tests and a road test for the same symptom, always perform the operational tests first; this will prevent possible damage to the transaxle during driving.
5. **Performance Evaluation.** This test evaluates the driveability of the 4EAT transaxle. The results of the test may require major disassembly, therefore this test should always be performed last. During the test, the powertrain may also show problems that can cause the transaxle to malfunction, or be confused with transaxle problems. If no problems are found during the test, it is likely that the problem is intermittent. Since the problem may not reoccur, the symptom should be evaluated with the customer present.

NOTE: After any repair is made, test the transaxle again to check if the symptom is still present. If the symptom reoccurs, further testing must be performed to isolate the problem. Whenever fluid is drained from the transaxle, be certain the proper type and amount of fluid is replaced.

Engine problems or driveline problems can affect transaxle performance; therefore, other systems may have to be serviced before the transaxle, such as the engine or halfshafts.

TEST STEP	RESULT ►	ACTION TO TAKE
P11 ATF LEVEL CHECK		
• Park the vehicle on a level surface. • Warm the engine at idle. • Place the selector lever in the PARK position. • Apply the brakes and shift the selector lever through the entire shift range twice. • Remove the dipstick, wipe it clean, and replace it (make certain the dipstick is completely sealed in the tube). • Remove the dipstick again and inspect the fluid level. • Is the fluid level between "F" and "L" marks on the proper scale?	Yes ► No ►	GO to **PI2** . ADD the ATF as required.



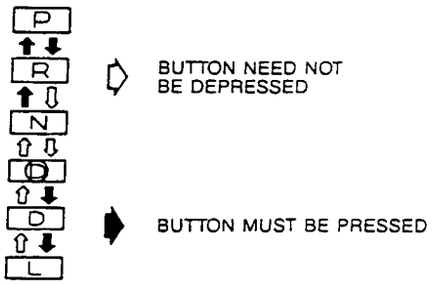
DIAGNOSIS AND TESTING (Continued)

TEST STEP		RESULT ►	ACTION TO TAKE
P12	ATF CONDITION CHECK.		
• Park the vehicle on a level surface. • Place the selector lever in the PARK position. • Warm the engine at idle. • Remove the dipstick. • Inspect the ATF for: 1. Burnt ARF 2. Unusual smell 3. Discoloration 4. Contamination (improper type of fluid, etc.) • Are any of these concerns evident?		Yes ► No ► Burnt ATF ►	DRAIN and REPLACE the ATF. **Note:** If particles are evident in ATF or there is other contamination, (water, dirt, foam, etc.) the transaxle oil pan must be removed for further inspection. If contamination is present, the transaxle must be disassembled, flushed and cleaned. GO to **P13**. GO to the symptom chart.

TEST STEP		RESULT ►	ACTION TO TAKE
P13	IDLE SPEED INSPECTION		
Note: If idle speed is to be checked, ignition timing must be checked also. 1.9L • (Refer to the Engine/Emissions Diagnosis Manual). 1.8L • Warm the engine. • Place the transaxle in the PARK range. • Using a jumper wire, connect the ground terminal to the TEN terminal on the diagnosis connector. • Using the tachometer, check the vehicle's idle speed. The idle speed should be between 700-800 rpm. **Note:** When the parking brake is not applied, the idle speed for automatic transaxle vehicles (Canadian vehicles) is approximately 800 rpm. • If the idle speed is not within specification, adjust the idle speed by turning the idle speed adjusting screw until the idle speed is within the specification. • Is the idle speed within specification?		Yes ► No ►	GO to **P14**. Adjust the idle speed as required.

DIAGNOSIS AND TESTING (Continued)

TEST STEP	RESULT ►	ACTION TO TAKE
PI4 SELECTOR LEVER INSPECTION		
• Move the selector lever through every range. • Turn the ignition switch to ON and apply the brake pedal. • Check that the button must be pushed to engage DRIVE, REVERSE and PARK ranges but not NEUTRAL, or OVERDRIVE ranges. • Check that the selector lever position matches the indicator position. • Check for proper operation of the button (smooth operation and "clicks" in each position). • Does the selector lever operate properly?	Yes ► No ►	GO to **PI5** . ADJUST or SERVICE the selector lever as required.



TEST STEP	RESULT ►	ACTION TO TAKE
PI5 TRANSAXLE FLUID LEAKAGE CHECKS		
• Park the vehicle on a level surface. • Check the speedometer cable connection at the transaxle. **Note:** Leakage at the oil pan gasket often can be stopped by tightening the attaching bolts to specification. • Check the fluid filler tube connection at the transaxle case. • Check the fluid lines and fittings between the transaxle and the cooler for looseness, wear, or damage. **Note:** Oil soluble aniline or fluorescent dyes premixed at the rate of 2.5ml (½ teaspoon) of dye powder to 0.23L (½ pint) of transaxle fluid are helpful when locating the source of fluid leakage. • Check the power steering gear system. The power steering gear system is positioned over the transaxle, and is filled with transmission fluid. Leaks from the power steering gear may pool on the transaxle before dripping onto the ground, thus giving the appearance of transaxle fluid leaking. • Are any concerns evident?	Yes ► No ►	SERVICE or REPLACE the leaking gasket or component. **Note:** Do not try to stop an oil leak by increasing any bolt or fitting torque beyond specification. This may cause damage to the transaxle case threads. GO to **PI6**

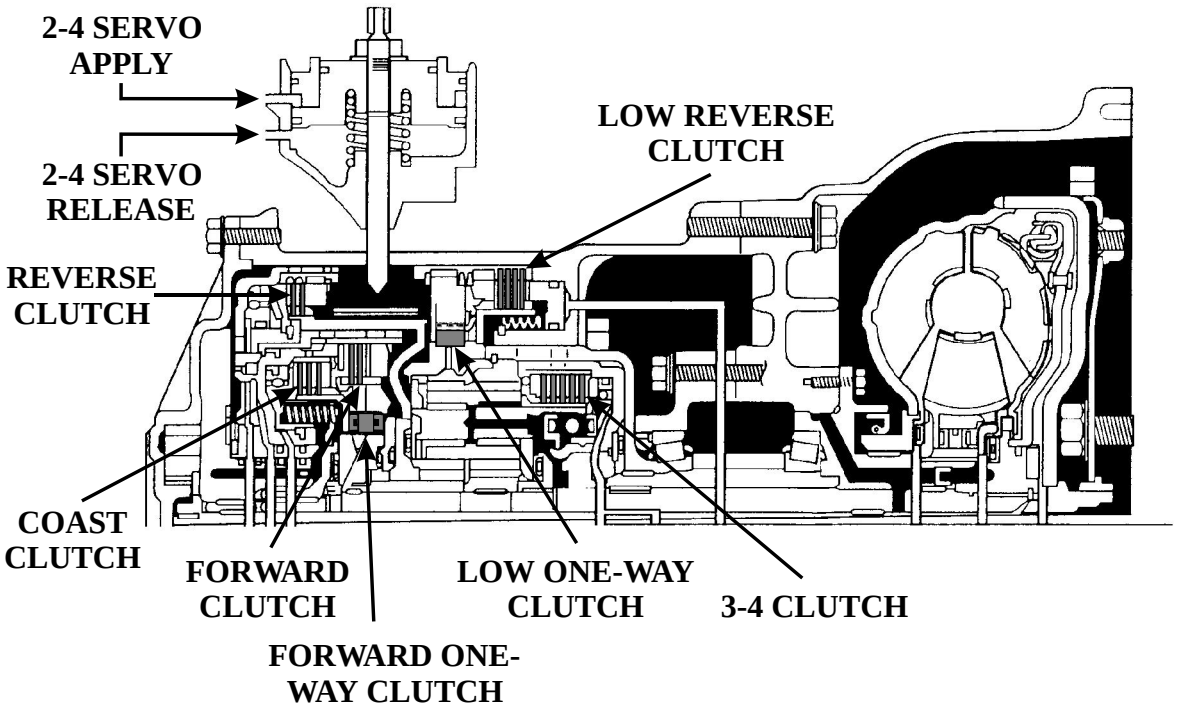
DIAGNOSIS AND TESTING (Continued)

TEST STEP		RESULT ►	ACTION TO TAKE
PI6	KICKDOWN CABLE INSPECTION		
• Turn the engine OFF. • Place the transaxle in the PARK range. • Check for smooth operation of the kickdown cable from idle to WOT. • Does the cable operate smoothly?		Yes ► No ►	GO to **PI7** . SERVICE or REPLACE kickdown cable as required.

TEST STEP		RESULT ►	ACTION TO TAKE
PI7	THROTTLE CABLE INSPECTION		
• Turn the engine OFF. • Place the transaxle in the PARK range. • Check for smooth operation of the throttle cable from idle to WOT. • Does the cable operate smoothly?		Yes ► No ►	GO to **PI8** . ADJUST or REPLACE as required.

TEST STEP		RESULT ►	ACTION TO TAKE
PI8	TIRE PRESSURE CHECK		
• Turn the engine OFF. • Place the transaxle in the PARK range. • Check the tire pressures (cold). • Are all tires inflated to the proper pressure?		Yes ► No ►	GO to the symptom chart. INFLATE to the proper level.

TRANSAXLE CLUTCH AND BAND APPLICATION CHART

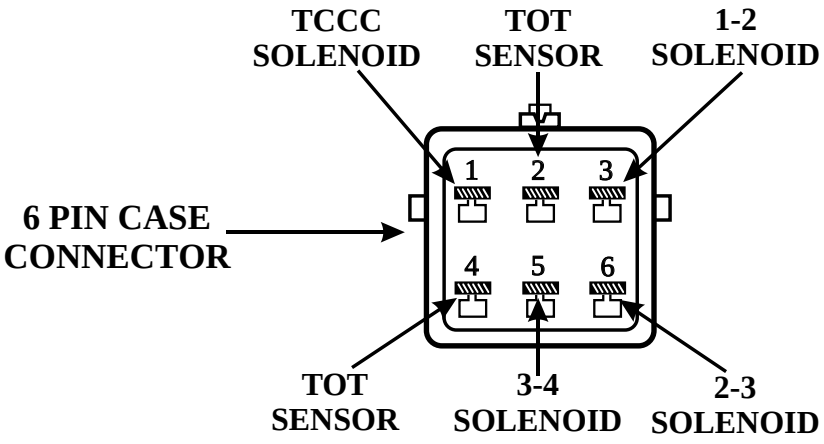


RANGE	2-4 BAND	REVERSE CLUTCH	3-4 CLUTCH	FORWARD CLUTCH	FORWARD ONE-WAY CLUTCH		COAST CLUTCH	LOW REVERSE CLUTCH	LOW ONE-WAY CLUTCH	
					DRIVE	COAST			DRIVE	COAST
REVERSE		ON						ON		
D 1st				ON	H	O/R			H	O/R
D 2nd	ON			ON	H	O/R				
D 3rd			ON	ON	H	H	A*			
D 4th	ON		ON	**	O/R	O/R				
2 2nd	ON			ON	H	H	A*			
1 1ST				ON	H	H	A*	ON*	H	H

H = HOLDING
O/R = OVERRUNNING
**** = APPLIED BUT INEFFECTIVE**
A* = APPLIED FOR ENGINE BRAKING ONLY
ON* = HOLDING FOR ENGINE BRAKING ONLY

TRANSAXLE CONTROL SYSTEM
SOLENOID OPERATIONAL STRATEGIES

RANGE	1-2	2-3	3-4	TCCC
PARK	OFF/ON[1]	OFF	ON/OFF[2]	OFF
REVERSE	ON/OFF[3]	ON/OFF[4]	OFF/ON[5]	OFF
NEUTRAL	OFF/ON[1]	OFF	ON/OFF[2]	OFF
D-1st	OFF	ON	ON/OFF[6]	OFF
D-2nd	ON	ON	ON	OFF
D-3rd	OFF/ON[7]	OFF	OFF	OFF
D-4th	ON	OFF	ON	OFF
D-4th L.U.	ON	OFF	ON	ON
2-2nd	ON	ON	OFF	OFF
1-1st	OFF	ON	OFF	OFF



OFF/ON [1] = ON in Neutral above 5 km/h (3 mph). 91-95 ESCORT/TRACER

ON/OFF [2] = OFF in Neutral above 5 km/h (3 mph). 91-95 ESCORT/TRACER

ON/OFF [3] = ON 1.8L Models. OFF 1.9L Models

ON/OFF [4] = ON 91-92 1.9L Models ONLY. OFF other Models

OFF/ON [5] = OFF 1.8L Models. ON 1.9 Models.

ON/OFF [6] = OFF in 1st gear 93-95 1.8L OD and D ranges ESCORT/TRACER

OFF/ON [7] = ON above 20 mph. or below operating temp. 93-95 1.8L. ON above 16mph. or below operating temp. 91-95 1.9L. ON in 3rd 91-92 1.8L

TCCC = Torque Converter Clutch Control Solenoid

DIAGNOSIS AND TESTING (Continued)

Symptom Chart

SYMPTOM	POSSIBLE CAUSE	ACTION
• Noise in All Gears—Does Not Change Power to Coast	• Defective speedometer gears. • Bearings worn or damaged. • Planetary gearset worn.	• EXAMINE/REPLACE the speed drive or driven gear. • EXAMINE/REPLACE. • SERVICE the planetary gearset.
• Harsh Shifts (Any Gears)	• Kickdown cable out of adjustment. • Valve body. • Sticking accumulators. • CV joints. • Engine mounts loose. • Throttle valve sticking. • Band adjustment. • Band servo.	• CHECK the kickdown cable adjustment. • INSPECT the valve body. • INSPECT the accumulators. • SERVICE as required. • INSPECT the throttle valve. • CHECK the band adjustment. • INSPECT the band servo.
• Soft Shifts (Any Gears)	• Kickdown cable out of adjustment. • Oil pump worn. • Internal ATF leakage. • Band adjustment. • Band servo. • Pressure regulator valve damaged. • ATF level. • Valve body. • Sticking accumulators. • Throttle valve sticking.	• CHECK the kickdown cable adjustment. • INSPECT the oil pump. • INSPECT the transaxle. • CHECK the band adjustment. • INSPECT the band servo. • INSPECT the pressure regulator. • CHECK and FILL. • INSPECT the valve body. • INSPECT the accumulators. • INSPECT the throttle valve.

DIAGNOSIS AND TESTING (Continued)

Symptom Chart

SYMPTOM	POSSIBLE CAUSE	ACTION
• Erratic Shifting, Incorrect Shift Points, Incorrect Shift Sequence	• Kickdown cable out of adjustment. • Control valves. • 4EAT control module. • Band adjustment. • Clutches slipping. • Fluid level and quality.	• CHECK the kickdown cable adjustment. • GO to switch monitor test SMA. • CHECK the band adjustment. • INSPECT the clutches. • CHECK and FILL.
• Improper Lockup	• Control valves. • 4EAT control module. • Torque converter.	• GO to switch monitor test SMA. • INSPECT the torque converter.
• Skipping Gears (For Example, Shift 1st to 3rd, or 2nd to OVERDRIVE)	• Control valves. • 4EAT control module. • ATF temperature switch. • Valve body. • 2-4 band.	• GO to switch monitor test SMA. • INSPECT the valve body. • CHECK the band adjustment.
• Transaxle Overheating	• Improper fluid level. • Poor engine performance. • Worn clutch, incorrect band application, or poor oil pressure control. • Restriction in cooler lines. • Clogged cooler.	• CHECK the fluid level. • ADJUST according to specifications. • GO to operational test OPA. • CHECK the cooler lines for kinks and damage. CLEAN, SERVICE, or REPLACE the cooler lines. • INSPECT the cooler for plugging. SERVICE as required.
NOTE: Excessive overheating may cause damage to the internal components. Always retest the 4EAT for other symptoms after the overheating problem is resolved and the burned fluid is replaced.		

DIAGNOSIS AND TESTING (Continued)

Symptom Chart

SYMPTOM	POSSIBLE CAUSE	ACTION
• Drags in REVERSE Like Parking Brake Is Applied	• 2-4 band adjustment incorrect. • Brakes partially applied.	• INSPECT the band adjustment. • GO to Section 06-00.
• Drags in Forward Gears Like Parking Brake Is Applied	• 2-4 band adjustment incorrect. • Brakes partially applied.	• INSPECT the band adjustment. • GO to Section 06-00.
• Engine Runaway or Flare-up on Upshift	• Fluid level low. • Valve body damaged or sticking valves. • Oil pump pressure inadequate. • Damaged bypass valve. • Clutches slipping.	• CHECK the fluid level. • INSPECT the valve body and solenoid valves. • INSPECT the oil pump and pressure. • INSPECT the bypass valve. • INSPECT the clutches.
• Engine Runaway or Flare-up on Downshift	• Coasting bypass valve sticking. • Clutches slipping. • Fluid level inadequate. • Oil pump pressure inadequate.	• GO to operational test OPA. • INSPECT the clutches. • CHECK the fluid level. • INSPECT the oil pump.
• Excessive Creep	• Torque converter. • Kickdown cable out of adjustment. • Ignition timing and idle speed. • Manual valve misadjusted.	• INSPECT the torque converter. • INSPECT the kickdown cable adjustment. • CHECK and ADJUST as necessary. • ADJUST manual valve.
• No Creep	• ATF level and condition. • Kickdown cable out of adjustment. • Selector lever. • Valve body. • Control valves. • Forward clutch. • REVERSE clutch. • Oil pump. • Brakes partially applied.	• CHECK the level and condition. • INSPECT the kickdown cable adjustment. • CONFIRM the selector linkage adjustment and operation. • INSPECT the valve body. • INSPECT the control valves. • INSPECT the clutches. • INSPECT the oil pump. • INSPECT brake adjustment.
• Engine Stalls when put into Gear	• Torque converter. • Valve body. • Control valves. • 4EAT control.	• INSPECT the torque converter. • INSPECT the valve body. • GO to switch monitor Test SMA.

DIAGNOSIS AND TESTING (Continued)

TEST STEP	RESULT ►	ACTION TO TAKE
SMA SWITCH MONITOR TEST A		
• Perform the Quick Test to determine if any trouble codes are present. Refer to the Engine/Emissions Manual. If codes are present, service the vehicle as necessary. If no codes are present, perform the following switch monitor test with the test equipment listed.	Yes ►	GO to **SMB** .
	No ►	GO to the Pinpoint Tests in the Engine/Emissions Manual.

Tester	Vehicle Application	Adapter #	Overlay #
4EAT Tester	1.8L/1.9L	007-00095	3122-690

- With the correct tester connected verify that the following LEDs are illuminated with the key OFF:

1.8L/1.9L

20 MEMORY POWER
1E CHECK CONNECT

Note: Other LEDs may also be illuminated if an input is under the right condition. For example, if the coolant temperature is above 72°C (162°F), then the LED for the engine coolant temperature sensor will be illuminated.

- Are the LEDs illuminated as indicated?

DIAGNOSIS AND TESTING (Continued)

TEST STEP	RESULT ►	ACTION TO TAKE
SMB SWITCH MONITOR TEST B		
• With the test equipment connected from the previous step, check the condition of each switch listed below under the following conditions: • Key ON, engine OFF. **Note:** Also verify all conditions with the engine running. • Are all the switches ok?	Yes ► No ►	GO to **SMC** . GO to Pinpoint Tests. Refer to NE/ED Manual.

PIN #	Description	LED or VOM	Condition
1F	BOO/(BRAKE LIGHT)	ON Above 10V OFF Below 1.5V	Brake pedal depressed Brake pedal released
1O	IDL/(IDLE) (1.8L Only)	ON Above 10V OFF Below 1.5V	Accelerator pedal depressed Accelerator pedal released
2H	MLPL/(L)	ON Above 10V OFF Below 1.5V	Trans. in L range Other ranges
2F	MLPD/(D)	ON Above 10V OFF Below 1.5V	Trans. in D range Other ranges
2D	MLPOD/(OD)	ON Above 10V OFF Below 1.5V	Trans. in OD range Other ranges
2B	MLP/N OR P	ON Below 1.5V OFF Above 10V	Trans. in P or N ranges Other ranges
1H	MMS/MANUAL SWITCH (1.8L only)	ON Above 10V OFF Below 1.5V	Manual switch depressed Manual switch released
1B	MML/MANUAL IND. (1.8L only)	ON Below 1.5V OFF Above 10V	Manual shift ON Manual shift OFF
	Throttle Position Sensor	– – 4.0-5.5V – – 0.5V – – Changes 0.5V	Accelerator fully depressed Accelerator pedal released Every 1/8 position change

DIAGNOSIS AND TESTING (Continued)

TEST STEP	RESULT ►	ACTION TO TAKE
SMC SWITCH MONITOR TEST C		
• With the test equipment connected from the previous step, check the following switches with the engine running under the conditions specified. • Are all the switches ok?	Yes ► No ►	GO to **OPA** . GO to the Pinpoint Tests. Refer to NE/ED Manual.

PIN #	Description	LED or VOM	Condition
1N	ECT/(WATER TEMP)	ON Above 10V OFF Below 1.5V	Above 72° C (162°F) Below 65° C (149°F)
1D	NA/(NO LOAD SIG.) (1.9L Only)	ON Below 1.5V OFF Above 10V	In N or P range In any gear
1G	TOT/(ATF TEMP)	ON Below 1.5V OFF Above 10V	ATF temp. above 143°C (289°F) ATF temp. below 105°C (302°F)

Operational Tests

Description

Operational test procedures serve as pre-road test checks. The procedures are conducted with the engine operating in the service facility using minimal time and less effort than the road test. These procedures determine the causes of (and provide the corrective actions for) the transaxle malfunctions most likely to occur. These include the torque converter, the powertrain, the friction elements (clutches and bands), the hydraulic system, and the associated regulating valves and controls.

Preparation:

1. Check the following items:
   - Coolant level and condition.
   - ATF level and condition.
   - Idle speed.
2. Prepare the vehicle:
   - Place the selector lever in PARK position.
   - Block the wheels.
   - Apply the parking brake.
   - Warm the engine to 50-80°C (122-176°F).
3. Perform each operational test and then use the evaluation sheet for direction.

DIAGNOSIS AND TESTING (Continued)

TEST STEP	RESULT ►	ACTION TO TAKE
OPA POWERTRAIN FUNCTION CHECK (STALL TEST)		
• Check for slippage of the clutches, bands, and the torque converter capacity as follows: 1. Stall test procedure With the selector lever set to REVERSE, and the foot brake firmly applied, steadily increase the engine speed to its maximum, then quickly read and note to the highest rpm. Release the accelerator. **CAUTION: This procedure must be completed within 5 seconds, followed by cooling the ATF in NEUTRAL range idling for at least one minute.** 2. Repeat the test, followed by the cooling step for each of the selector lever ranges OVERDRIVE, DRIVE, and LOW. 3. Use the following "Stall Test Evaluation" to verify the test results, and the corresponding action to take.		SEE "Stall Test Evaluation" Chart.

DIAGNOSIS AND TESTING (Continued)

TEST STEP		RESULT ►	ACTION TO TAKE
OPA	POWERTRAIN FUNCTION CHECK (STALL TEST) — CONTINUED		

STALL TEST EVALUATION

Test Result	Range	Possible Cause		Action to Take
Above specification*	In all ranges	Insufficient line pressure	Worn oil pump	REPLACE.
			Oil leakage from oil pump, control valve, and/or transmission case	DISASSEMBLE, INSPECT, and REPAIR or REPLACE as required.
			Stuck pressure regulator valve	
	In OVERDRIVE range	One-way clutch #2 slipping		DISASSEMBLE, INSPECT, and REPAIR or REPLACE as required.
	In forward ranges	Forward clutch slipping, one-way clutch #1 slipping		
	In DRIVE and LOW ranges	Coasting clutch slipping		
	In OVERDRIVE and DRIVE ranges	2-4 band slipping		ADJUST and RETEST.
	In REVERSE and LOW ranges	LOW and REVERSE slipping		DISASSEMBLE, INSPECT, REPAIR/REPLACE as required.

*Specification—Stall Speed

	1.9L	1.8L
OVERDRIVE, DRIVE, LOW, REVERSE	2400-2700 rpm	2200-2500 rpm

DIAGNOSIS AND TESTING (Continued)

TEST STEP		RESULT ►	ACTION TO TAKE
OPA	POWERTRAIN FUNCTION CHECK (STALL TEST)—CONTINUED		

STALL TEST EVALUATION

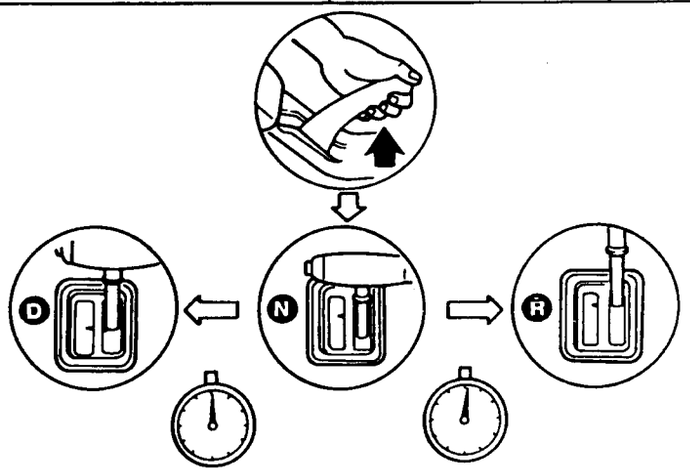
Test Result	Range	Possible Cause	Action to Take
Above specification	In REVERSE range	LOW and REVERSE brake slipping REVERSE clutch slipping	PERFORM the road test to determine whether problem is LOW and REVERSE brake or REVERSE clutch. a) Engine brake applied in 1st . . . REVERSE clutch b) Engine brake not applied in 1st . . . LOW and REVERSE brake REPAIR or REPLACE as required.
Within specification*		All shift control elements within transmission are functioning normally	GO to **OPB** .
Below specification*		Engine out of tune	TUNE the engine before running stall test.
		One-way clutch slipping within torque converter	DISASSEMBLE, INSPECT, REPAIR or REPLACE as required.

*Specification—Stall Speed:

	1.9L	1.8L
OVERDRIVE, DRIVE, LOW Range	2400-2700 rpm	2200-2500 rpm

DIAGNOSIS AND TESTING (Continued)

TEST STEP	RESULT ►	ACTION TO TAKE
OPB HYDRAULIC CONTROL SYSTEM TIME LAG CHECK		
• Check the time lag between selector lever positions using a stopwatch. • **Time Lag Test Procedure:** 1. With the engine idling at 750 ± 50 rpm, in PARK range, shift from NEUTRAL range to DRIVE range and measure the elapsed time until engagement is felt, using the stopwatch. 2. Idle the engine in NEUTRAL range for one minute (minimum) to cool the ATF. 3. Repeat step 1 procedure for NEUTRAL to DRIVE range, and NEUTRAL to REVERSE range. 4. Repeat steps 1 through 3, three times and average the results. 5. Use the following "Time Lag Evaluation" to verify, and follow the corresponding action to take.		SEE "Time Lag Evaluation" Chart.



DIAGNOSIS AND TESTING (Continued)

TEST STEP		RESULT ►	ACTION TO TAKE
OPB	HYDRAULIC CONTROL SYSTEM TIME LAG CHECK—CONTINUED		

TIME LAG EVALUATION

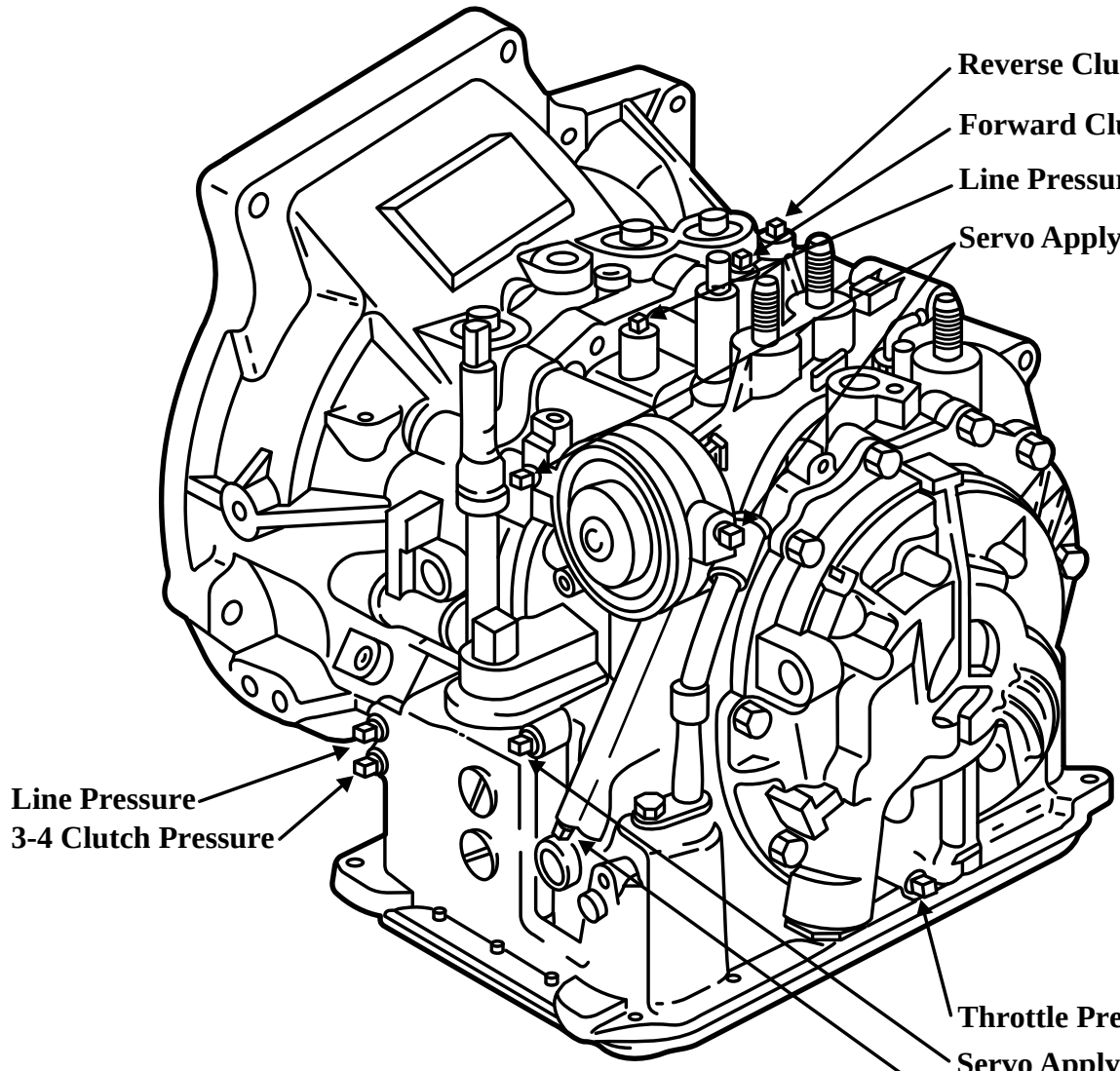
Shift	Range	Possible Cause	Action to Take
NEUTRAL-OVERDRIVE	More than specification*	Insufficient line pressure	GO to **OPC** .
		Forward clutch slipping One-way clutch #1 slipping One-way clutch #2 slipping	DISASSEMBLE, INSPECT and REPAIR; REPLACE as required.
	Less than specification*	NEUTRAL-DRIVE accumulator not operating properly	
		Excessive line pressure	GO to **OPC** .
NEUTRAL-REVERSE	More than specification*	Insufficient line pressure	GO to **OPC** .
		LOW and REVERSE brake slipping REVERSE clutch slipping	DISASSEMBLE, INSPECT, and REPAIR or REPLACE as required.
	Less than specification*	NEUTRAL-REVERSE accumulator not operating properly	
		Excessive line pressure	GO to **OPC** .

*Specification Time Lag:

NEUTRAL to OVERDRIVE range .5-.6 second
NEUTRAL to REVERSE range .6-.7 second

MAZDA/FORD F4A-EL AND F4EAT

LINE PRESSURE SPECIFICATIONS AND PRESSURE TAP LOCATIONS



Line Pressure
Ⓓ,2,1 idle = 53-65 psi
Ⓓ,2,1 stall = 136-155 psi
"R" idle = 85-107 psi
"R" stall = 220-253 psi

Throttle Pressure
Ⓓ,2,1 idle = 5-15 psi
Ⓓ,2,1 stall = 78-96 psi

DIAGNOSIS AND TESTING (Continued)

TEST STEP		RESULT ►	ACTION TO TAKE
OPC	OIL PRESSURE AND CONTROL CHECK—CONTINUED		

LINE PRESSURE TEST EVALUATION

Pressure Test Result	Range	Possible Location of Problem	Action to Take
Low	All	Worn oil pump, fluid leaking from oil pump, control valve body or transaxle case, pressure regulator valve sticking	DISASSEMBLE, INSPECT, REPAIR or REPLACE as required the complete pump, valve assembly, or components.
Low	OVERDRIVE DRIVE	Fluid pressure leakdown from hydraulic circuit of forward clutch	DISASSEMBLE, INSPECT, REPAIR or REPLACE components as required.
Low	REVERSE	Fluid pressure leakdown from hydraulic circuit of LOW and REVERSE band or REVERSE clutch	DISASSEMBLE, INSPECT, REPAIR or REPLACE components as required.
High	All	Throttle valve sticking or out of adjustment, throttle modulator valve sticking, pressure regulator valve sticking	DISASSEMBLE, INSPECT, REPAIR or REPLACE components as required.
Within Specified Limits	All	—	GO to **OPD**

DIAGNOSIS AND TESTING (Continued)

TEST STEP	RESULT ►	ACTION TO TAKE
OPD THROTTLE PRESSURE TEST • Check the line pressure for the hydraulic components and for improper throttle cable adjustments as follows: • Connect the pressure tester at the throttle pressure inspection hole (square head plug "T"). • Procedure: 1. With the engine idling at 750 ± 50 rpm in PARK range, shift the selector lever to the OVERDRIVE range, then read the throttle pressure at idle. With the foot brake firmly applied, steadily increase the engine rpm to its maximum, quickly read and note the throttle pressure. Release the accelerator. **CAUTION: Step 1 must be completed within five seconds, followed by cooling the ATF in NEUTRAL range idling for at least one minute.**		SEE "Throttle Pressure Test Evaluation" Chart.

2. Specification—Throttle Pressure

Throttle Pressure kPa (kg/cm²psi)

Range	OVERDRIVE
Idle	32-101 (.33-1.03, 5-15)
Stall Speed	543-660 (5.53-6.73, 78-96)

DIAGNOSIS AND TESTING (Continued)

TEST STEP		RESULT ►	ACTION TO TAKE
OPD	THROTTLE PRESSURE TEST—CONTINUED		

THROTTLE PRESSURE TEST EVALUATION

Pressure Test Result	Possible Location of Problem	Action to Take
Not within specified limits.	Throttle valve sticking Pressure Regulator Valve	DISASSEMBLE, INSPECT, REPAIR, CLEAN or REPLACE the valve(s) as required.
	Improper adjustment of throttle cable	REMOVE, INSPECT for damage and freedom of movement, REPLACE and ADJUST per shop manual as required.
Within specified limits.	—	GO to Road Test.

Performance Evaluation

Description

This test evaluates the 4EAT performance. The test should be run only at the direction of the 4EAT Symptom Menu. This test is a driving evaluation of the transaxle shifting quality, ability and timing. Shift problems will be directed to a list of symptoms for appropriate actions to take. These symptom menus are Upshift, Downshift, and Shift Feel for the various symptoms encountered.

1. Drive the vehicle and attempt to recreate the symptom.
2. **Safety.** It is important that the road test be performed with safety issues in mind. Use the seat belts and operate the vehicle in a safe manner.
3. Two people should participate in this test. One person should drive the vehicle, and the other should observe the conditions and symptoms encountered during the road test.
4. **Alternatives.** In some cases it may not be necessary or desirable to perform an actual road test. If the symptom occurs at starting, idling or high rpm idling conditions, perform the test at the operating condition that applies to the situation.
5. If several symptoms are found, service them in the order they occur.
6. Begin the test with step SP1.

DIAGNOSIS AND TESTING (Continued)

TEST STEP	RESULT ►	ACTION TO TAKE
SP1 SHIFT POINT CHECK		
• Warm engine to operating temperature (above 162°F). • Cruise control OFF. • Selector lever in DRIVE range. • Drive vehicle: 1. Accelerate at 1/2 throttle. 2. Accelerate at full throttle. • Compare the shift point with the chart. • Is the shift point correct?	Yes ►	GO to **SP2** .
	No (problem on upshift) ►	GO to the upshift symptom menu.
	No (problem on downshift) ►	GO to the downshift symptom menu.

Engine					
		1.9L		1.8L	
Throttle Position (Throttle Position Sensor Voltage)	Shifting (Gears)	Drum Speed (rpm)	Vehicle Speed (mph)	Drum Speed (rpm)	Vehicle Speed (mph)
Fully Opened (4.0V)	1 2 2 3 3 2 2 1	4600-5150 4850-5300 2900-3200 1950-2250	30-34 58-63 54-59 24-27	5900-6500 5550-5950 3350-3650 2850-3200	38-42 66-71 61-66 34-38
Half Throttle (1.6-2.2V)	1 2 2 3	2600-3200 2800-3400	17-21 33-41	3300-3900 3650-4300	22-25 43-51

DIAGNOSIS AND TESTING (Continued)

TEST STEP	RESULT ►	ACTION TO TAKE
SP2 SHIFT POINT CHECK		
• Warm engine to operating temperature (above 162°F). • Cruise control OFF. • Selector lever in LOW range. • Drive vehicle: 1. Accelerate at 1/2 throttle. 2. Accelerate at full throttle. • Compare the shift point with the chart. • Is the shift point correct?	Yes ►	GO to **SP3**
	No (problem on upshift) ►	GO to the upshift symptom menu.
	No (problem on downshift) ►	GO to the downshift symptom menu.

Engine					
		1.9L		1.8L	
Throttle Position (Throttle Position Sensor Voltage)	Shifting (Gears)	Drum Speed (rpm)	Vehicle Speed (mph)	Drum Speed (rpm)	Vehicle Speed (mph)
Fully Opened (4.0V)	2 1	2200-2500	27-30	2250-2550	27-30
Half Throttle (1.6-2.2V)	1 2	4050-4600	27-30	4100-4650	27-30

DIAGNOSIS AND TESTING (Continued)

TEST STEP	RESULT ►	ACTION TO TAKE
SP3 SHIFT POINT CHECK		
• Warm engine to operating temperature (above 162°F). • Selector lever in OVERDRIVE range. • Cruise control OFF. • Drive vehicle: 1. Accelerate at 1/2 throttle. 2. Accelerate at full throttle. 3. Operate kickdown (sudden acceleration). • Compare the shift point with the chart. • Is the shift point correct?	Yes ►	GO to **SP4**.
	No (problem on upshift) ►	GO to the upshift symptom menu.
	No (problem on downshift) ►	GO to the downshift symptom menu.

Engine					
		1.9L		1.8L	
Throttle Position (Throttle Position Sensor Voltage)	Shifting (Gears)	Drum Speed (rpm)	Vehicle Speed (mph)	Drum Speed (rpm)	Vehicle Speed (mph)
Fully Opened (4.0V)	1 2	4600-5150	30-34	5900-6500	38-42
	2 3	4850-5300	58-63	5550-5950	66-71
Half Throttle (1.6-2.2V)	1 2	2600-3200	17-21	3300-3900	22-25
	2 3	2800-3400	33-41	3650-4300	43-51
	3 OD	2750-3300	51-61		
	Lockup On (3rd)	2200-2800	41-52		
	Lockup Off (3rd)	2250-2550	42-47		
	Lockup On (OD)	1900-2300	50-61		
	Lockup Off (OD)	1850-2050	50-55	2300-2500	60-65
Fully Opened (Kickdown) (4.0V)	3 2	2900-3200	54-59	3400-3650	61-66
	2 1	2000-2300	24-27	2900-3200	34-38

DIAGNOSIS AND TESTING (Continued)

TEST STEP		RESULT ►	ACTION TO TAKE
SP4	CHECK SLIPPAGE		
• Warm engine to operating temperature (above 162°F). • Connect 4EAT tester • Connect the tachometer. • Drive the vehicle. • Compare the vehicle speed (and engine speed) to the four indicated vehicle speeds. • Is the vehicle speed (or engine speed) above or below the indicated speed?		Yes ► Yes (All speeds are incorrect) ► No ►	Follow the directions given in the chart. Inspect the forward clutch. GO to **OD1** .

Driving Conditions		Drum Speed (rpm)								
		1000	2000	3000	4000	1000	2000	3000	4000	
Gear	**Range**	**1.9L**				**1.8L**				**Action to Take**
1st	LOW Range	7	13	20	26	6	13	19	26	Inspect LOW and REVERSE Brake
1st	OVERDRIVE Range	7	13	20	26	6	13	19	26	Inspect 1-Way Clutch
2nd	DRIVE Range	12	24	36	47	12	24	35	47	Inspect 2-4 Brake Bond
3rd	DRIVE Range	19	37	55		18	36	55		Inspect Coasting Clutch
OD	OVERDRIVE Range	26	53			26	52			Inspect 3-4 Clutch

DIAGNOSIS AND TESTING (Continued)

TEST STEP	RESULT ►	ACTION TO TAKE
OD1 SHIFT FEEL CHECK		
• Warm engine to operating temperature (above 162°F). • Selector lever in OVERDRIVE range. • Cruise control OFF. • Drive vehicle from closed throttle to wide open throttle. • Does the shift feel excessively harsh or slushy?	Yes ► No ►	GO to the shift feel symptom menu. GO to **OD2** .

TEST STEP	RESULT ►	ACTION TO TAKE
OD2 ENGINE BRAKING CHECK		
• Warm engine to operating temperature (above 162° F). • Selector lever in OVERDRIVE range. • Cruise control OFF. • Drive vehicle until 3rd gear is obtained. • Shift selector lever into DRIVE range. • Is the engine braking felt?	Yes ► No ►	GO to **D1** . GO to the downshift symptom menu.

TEST STEP	RESULT ►	ACTION TO TAKE
D1 ENGINE BRAKING CHECK		
• Warm engine to operating temperature (above 162°F). • Cruise control OFF. • Selector lever in LOW range. • Drive vehicle until second gear is obtained. • Is the engine braking felt?	Yes ► No ►	GO to **D2** . GO to the downshift symptom menu.

DIAGNOSIS AND TESTING (Continued)

TEST STEP	RESULT ►	ACTION TO TAKE
D2 ENGINE BRAKING CHECK		
• Warm engine to operating temperature (above 162°F). • Cruise control OFF. • Selector lever in DRIVE range. • Drive vehicle until third gear is obtained. • Shift selector into LOW range. • Is the engine braking felt immediately?	Yes ► No ►	GO to **P1** . GO to the downshift symptom menu.

TEST STEP	RESULT ►	ACTION TO TAKE
P1 VEHICLE STOPPING TEST		
• Drive vehicle on level surface (engine temperature above 162°F). • Maximum speed of 2 mph. • Shift selector lever into PARK range. • Does the vehicle stop?	Yes ► No ►	GO to shift feel symptom menu. PERFORM parking pawl inspection.

DIAGNOSIS AND TESTING (Continued)

SYMPTOM	POSSIBLE CAUSE	ACTION
• Shift Shock in All Ranges	• Kickdown cable out of adjustment.	• INSPECT the cable adjustment.
	• Throttle valve sticking or damaged.	• CLEAN, SERVICE or REPLACE.
	• Control valves.	• CHECK for clogging blockage; SERVICE as required.
	• Coasting clutch.	• CHECK for wear; SERVICE or REPLACE.
	• LOW and REVERSE brake.	• CHECK for adjustment, wear, and damage; SERVICE as required.
	• Tire pressure.	• INFLATE to the correct pressure.
	• Accumulators.	• CLEAN, SERVICE or REPLACE.
	• 3-4 clutch.	• INSPECT, SERVICE or REPLACE.
	• CV joints or engine mounts.	• SERVICE or REPLACE.
	• 2-4 band and servo.	• CHECK the adjustment.
	• Pressure regulator valve sticking or damaged.	• CLEAN, SERVICE or REPLACE.
• Harsh 1-2 Shift	• Kickdown cable broken or out of adjustment.	• CHECK the kickdown adjustment.
• Harsh Engagement NEUTRAL-REVERSE	• NEUTRAL-REVERSE accumulator sticking or damaged.	• INSPECT, SERVICE or REPLACE.
• Harsh Engagement NEUTRAL-OVERDRIVE	• NEUTRAL-OVERDRIVE accumulator sticking or damaged.	• INSPECT, SERVICE or REPLACE.

DIAGNOSIS AND TESTING (Continued)

SYMPTOM	POSSIBLE CAUSE	ACTION
• 2-3 Shift Shock	• 2-3 accumulator sticking or damaged. • 1-2 accumulator sticking or damaged.	• INSPECT and SERVICE or REPLACE. • INSPECT and SERVICE or REPLACE.
• Erratic Shifts	• Kickdown cable broken or out of adjustment. • Pulse generator not functioning.	• INSPECT the cable adjustment. • INSPECT the pickup and torque converter.
• Soft Shift in All Ranges	• Kickdown cable broken or out of adjustment. • Throttle valve sticking or damaged. • Tire pressure. • Pressure regulator valve sticking or damaged.	• INSPECT the cable adjustment. • CLEAN, SERVICE or REPLACE. • INFLATE to the correct pressure. • CLEAN, SERVICE or REPLACE.
• 1-2 Soft Shift	• Valve body. • 2-4 band is too loose.	• INSPECT the valve body and solenoid valves. • INSPECT the adjustment.
• 2-3 Soft Shift	• 2-3 accumulator sticking or damaged. • Valve body.	• CLEAN, SERVICE or REPLACE. • INSPECT the valve body and solenoid valves.
• NEUTRAL-REVERSE Soft Shift	• NEUTRAL-REVERSE accumulator sticking or damaged.	• CLEAN, SERVICE or REPLACE.
• No Lockup	• Lockup valve sticking or damaged.	• CLEAN, SERVICE or REPLACE.
• Drags in Reverse Like Parking Brake is Applied	• 2-4 band is too tight.	• CHECK adjustment.
• Slow to Engage in Reverse	• Reverse clutch.	• INSPECT for damage or wear; SERVICE or REPLACE.

DIAGNOSIS AND TESTING (Continued)

SYMPTOM	POSSIBLE CAUSE	ACTION
• Engine has Momentary Runaway During 3-2 Downshift	• Coasting bypass valve sticking or damaged. • 2-4 band and servo.	• INSPECT, SERVICE or REPLACE. • INSPECT adjustment, SERVICE or REPLACE.
• Hesitation in 3-2 Shift	• Valve body.	• INSPECT the valve body and solenoid valves.
• No Engine Braking OVERDRIVE to DRIVE	• Fluid blockage to coasting clutch or failed coasting clutch. • Valve body.	• CHECK for blockage and coasting clutch condition. • INSPECT the valve body and solenoid valves.
• No Engine Braking DRIVE to LOW	• Fluid blockage to coasting clutch or failed coasting clutch. • 2-4 band and servo. • Valve body. • Control valve.	• INSPECT coasting clutch for blockage or damage. • CHECK adjustment and INSPECT condition. • INSPECT the valve body and solenoid valves. • INSPECT, CLEAN or SERVICE.

DIAGNOSIS AND TESTING (Continued)

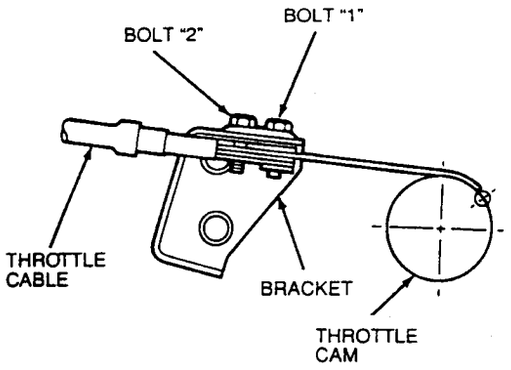
SYMPTOM	POSSIBLE CAUSE	ACTION
• No 2-3 Upshift	• 3-4 clutch spring. • Valve body.	• CHECK clutch adjustment and damage. • INSPECT the valve body and solenoid valves.
• No 2nd Gear (Transmission Shifts 1-3)	• Valve body. • Loose 2-4 band.	• INSPECT the valve body and solenoid valves. • ADJUST.
• No Lockup	• Lockup solenoid not functioning. • Torque converter.	• INSPECT the solenoid and related hydraulic circuit. • INSPECT the torque converter.
• Shift Points Incorrect	• Valve body. • 2-4 band out of adjustment. • Damaged or worn forward clutch.	• INSPECT the valve body and solenoid valves. • CHECK 2-4 band adjustments. • INSPECT and SERVICE or REPLACE.
• Engine Runaway When Upshifting	• Neutral safety switch. • Valve body. • One way clutch #1. • 2-4 band and servo. • 3-4 clutch. • Bypass valve sticking or damaged. • Forward clutch.	• CHECK the adjustment and condition. • CLEAN, SERVICE or REPLACE. • INSPECT, SERVICE or REPLACE. • CHECK the adjustment and condition. • CHECK the condition and SERVICE. • CLEAN, SERVICE or REPLACE. • INSPECT, SERVICE or REPLACE.
• No Upshift into OVERDRIVE	• One way clutch #1. • Valve body. • Linkage.	• CHECK clutch #1. • CHECK orifices, solenoid valves and valve body.
• Delayed 1-2 Shift	• Valve body.	• INSPECT valve body and solenoid valves.

ADJUSTMENTS

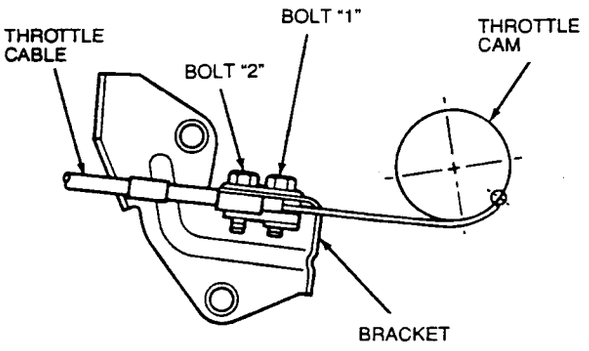
Line Pressure

NOTE: The following line pressure adjustment procedure can be used for both 1.8L and 1.9L vehicles. Make sure to refer to the following illustrations for the proper throttle cable and bracket configurations.

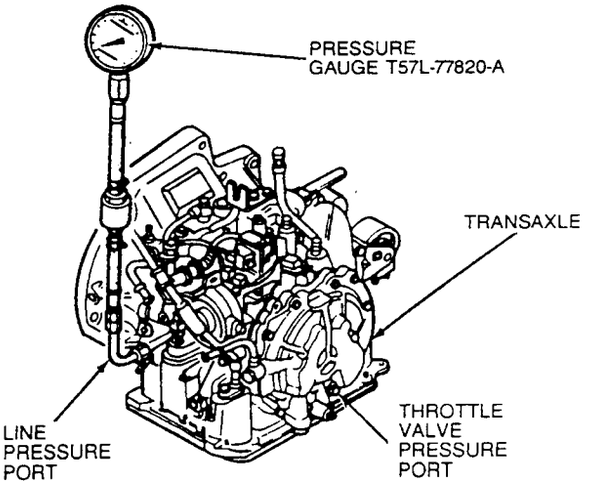
1.8L ENGINE



1.9L ENGINE



1. If necessary, install the ends of the throttle cable to the transaxle and the throttle cam.
2. If necessary, install the throttle cable bracket to the intake plenum bracket.
3. Tighten bolt "1" to 7-9 N·m (61-87 lb-in).
4. Remove the splash shield next to the front left tire.
5. Remove the square head plug (marked "L") and install Transmission Test Adapters D87C-77000-A and Pressure Gauge T57L-77820-A or equivalents.



6. Warm up the engine and run it at idle.
7. Adjust the throttle cable until the line pressure reaches the following specifications:

   1.8L Engine: 393-413 kPa (57-60 psi)

   1.9L Engine: 490-510 kPa (71-74 psi)
8. Loosely tighten bolt "2".
9. Turn off the engine and verify that the throttle cable moves smoothly.
10. Restart the engine and press the accelerator slightly, then run the engine at idle.
11. Verify that the line pressure is within the following specifications:

    1.8L Engine: 352-441 kPa (51-64 psi)

    1.9L Engine: 448-537 kPa (65-78 psi)

    If the line pressure is not within specifications, repeat the procedure beginning with Step 7.
12. After the line pressure is within the specifications shown in Step 11, tighten bolt "2" to 7-9 N·m (61-87 lb-in).
13. Turn off the engine.
14. Install a new square head plug and tighten it to 5-10 N·m (43-87 lb-ft).

ADJUSTMENTS (Continued)

Servo Assembly

Adjustment

If the existing servo piston assembly is not within the proper specification as explained in Servo Assembly Inspection in this Section, select the correct length stem from the following chart.

95.0 mm (3.740 IN)	95.5 mm (3.760 IN)	96.0 mm (3.780 IN)
96.5 mm (3.799 IN)	97.0 mm (3.819 IN)	97.5 mm (3.839 IN)
98.0 mm (3.858 IN)	98.5 mm (3.878 IN)	99.0 mm (3.898 IN)

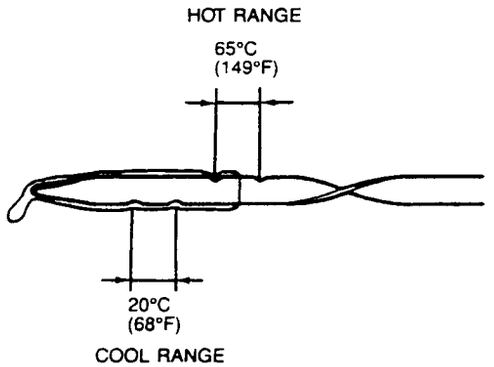
GENERAL SERVICE OPERATIONS

Transaxle Fluid Level Inspection

Use the following procedure to check the transaxle fluid level:

1. Apply the parking brake and block the drive wheels.
2. Run the engine to its normal operating temperature to warm up the transaxle fluid.
3. While the engine is idling, shift the selector lever from PARK to LOW, then shift back to PARK.
4. Pull out the dipstick and be sure that the transaxle fluid level is between the LOW and FULL marks using the high temperature scale, 65°C (149°F). If necessary, add the specified transaxle fluid.

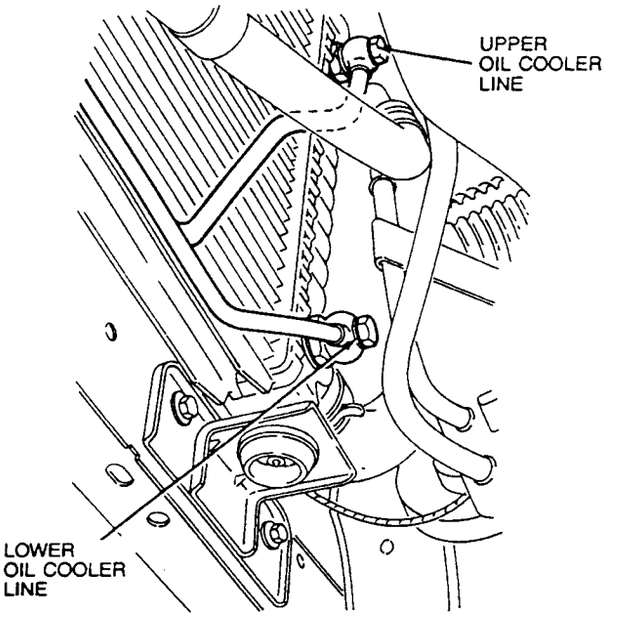
   NOTE: The cool temperature scale 20°C (68° F) should be used as a reference only.



Oil Cooler Inspection and Flush

The 1.8L and 1.9L engines utilize a crossflow radiator which incorporates the oil cooler in the side tank, located on the passenger's side of the vehicle.

1. Place a drain pan under the radiator tank which incorporates the oil cooler.
2. Remove the upper and lower transaxle oil cooler lines located on the radiator.



3. Inspect the oil cooler for clogging or restrictions.
4. Flush the oil cooler as necessary.
5. If it is necessary to remove the radiator, refer to Section 03-03.
6. Install the oil cooler lines, washers, and bolts.
7. Check that the oil cooler lines do not interfere with any underhood components.
8. Start the engine and allow it to reach its normal operating temperature.
9. Check the cooler lines for possible leaks.
10. Check the transaxle fluid level as explained in this Section.

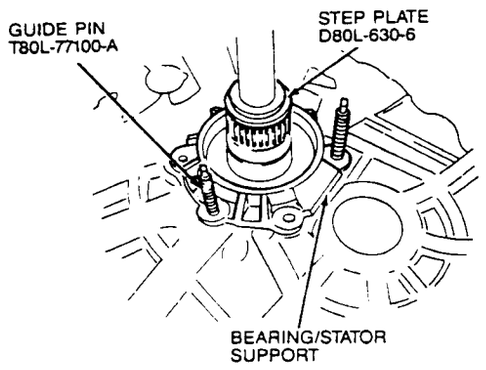
Bearing Preload and Shim Selection

NOTE: Whenever the transaxle is disassembled, the bearing preload must be adjusted. The output gear and differential bearing preload are adjusted by selecting shim(s) to insert under the bearing cups. To determine the correct thickness of the shim(s), use the appropriate shim selection set along with the following procedure.

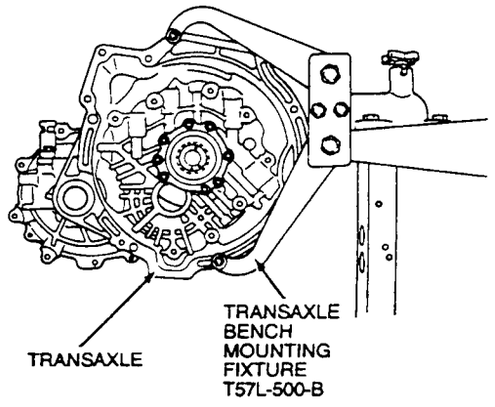
GENERAL SERVICE OPERATIONS (Continued)

Output Gear

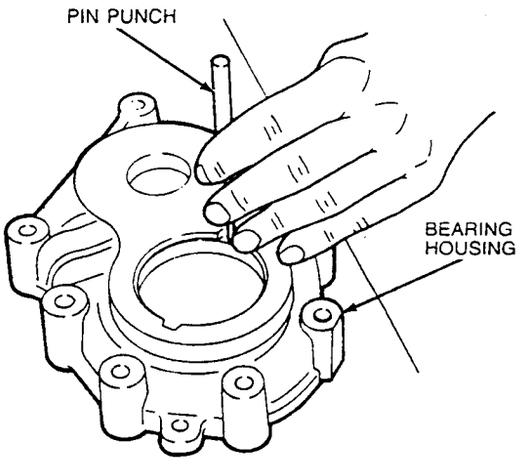
1. Align the bearing / stator support using Guide Pins T80L-77100-A or equivalent, then press the support into the converter housing using Step Plate D80L-630-6 or equivalent. Tighten the bolts to 11-14 N·m (8-10 lb-ft).



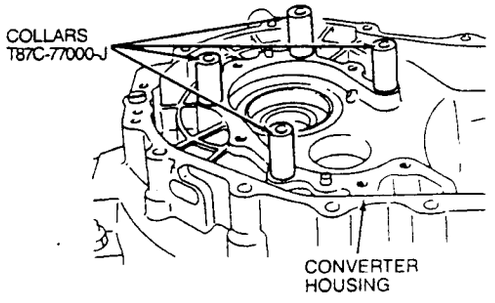
2. Install the converter housing onto Transaxle Bench Mounting Fixture T57L-500-B or equivalent.



3. Remove the bearing cup and adjustment shim(s) from the bearing housing.



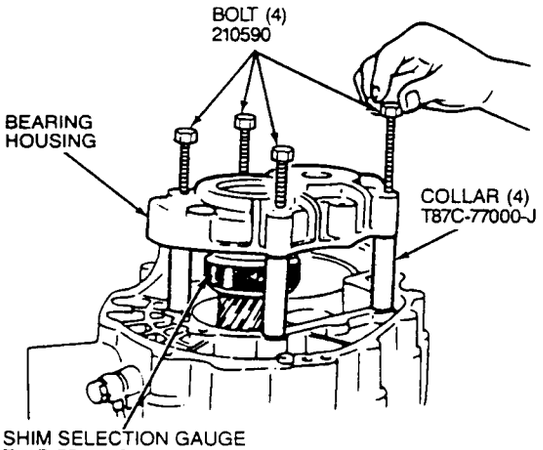
4. Place the output gear into the converter housing.
5. Place the bearing cup over the output gear bearing.
6. Place four Collars T87C-77000-J or equivalent on the converter housing at the positions shown.



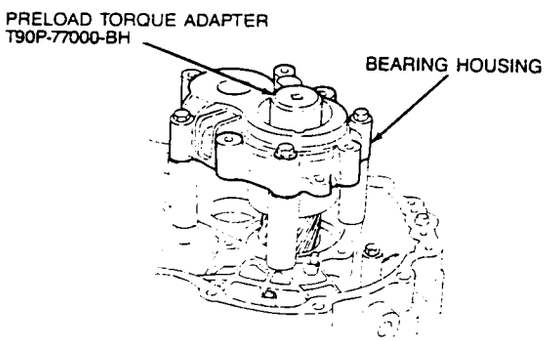
7. Place Shim Selection Gauge T91P-77000-B or equivalent on the output gear. Turn the two halves of the gauge to eliminate any gap between them.

GENERAL SERVICE OPERATIONS (Continued)

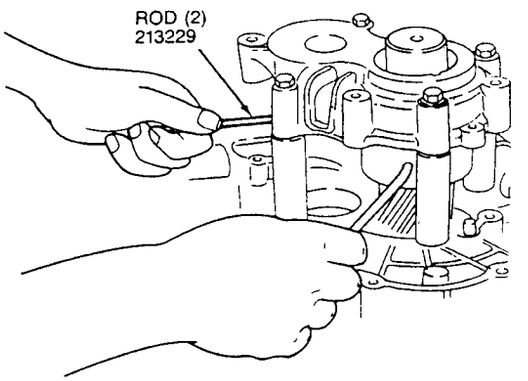
8. Place the bearing housing on the collars, then install four Bolts 210590 or equivalent with washers. Tighten the bolts to 19-26 N·m (14-19 lb-ft).



9. Place Preload Torque Adapter T90P-77000-BH or equivalent on the output gear.

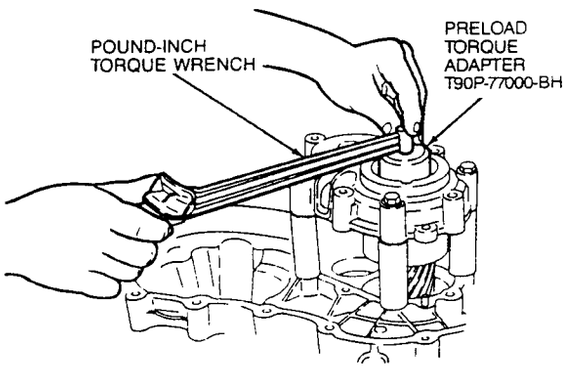


10. Using Rods 213229 or equivalent, loosen the gauge halves until all of the free play is removed and the bearing cup is seated. Then thread the gauge halves back together.



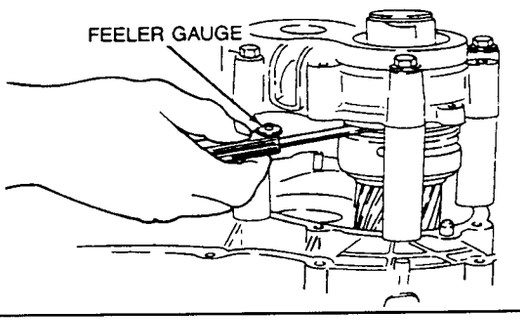
11. Attach a pound-inch torque wrench to the Torque Adapter T90P-77000-BH or equivalent. Measure the drag on the output gear bearing.

    NOTE: Read the preload when the output gear starts to turn.



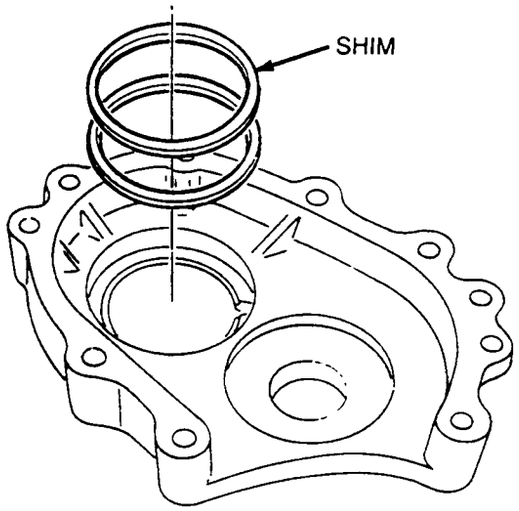
12. Using the rods, turn the gauge until a reading of 0.03-0.9 N·m (0.26-7.8 lb-in) is obtained on the torque wrench.

13. Use a feeler gauge to measure the gap between the two halves of the shim selection gauge. Measure the gap at four spots at 90 degree intervals. Use the largest measurement.

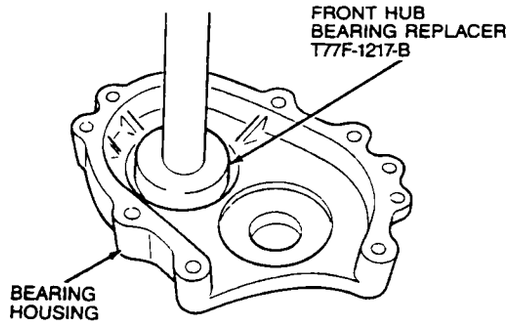


GENERAL SERVICE OPERATIONS (Continued)

14. Select the shim(s) that is closest (or slightly larger) to the measured value of the gauge gap.
    NOTE: Use no more than seven shims.



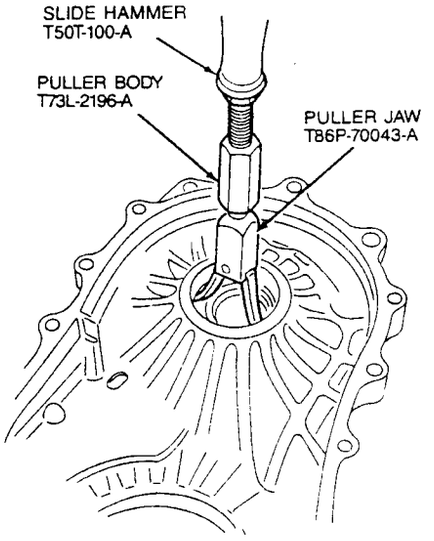
15. Remove the bolts, washers, bearing housing, gauge, and bearing cup.
16. Press the selected shim(s) and bearing cup into the bearing housing using Front Hub Bearing Replacer T77F-1217-B or equivalent.



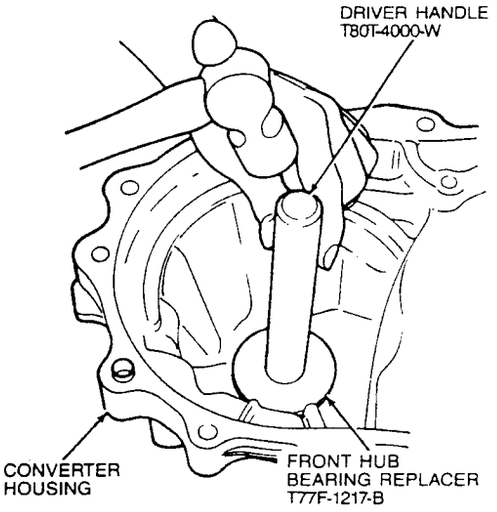
17. Install the bearing housing. Tighten the retaining bolts to 19-26 N·m (14-19 lb-ft).
18. Measure the bearing preload. The preload should be 0.03-0.9 N·m (0.26-7.81 lb-in). Repeat the gauging process if the preload measurement is not within specification.
19. When the proper preload specification has been obtained, remove the bearing housing.

Differential

1. Remove the rear bearing cup and shims from the transaxle case using Puller Jaw T86P-70043-A, Puller Body T73L-2196-A, and Slide Hammer T50T-100-A or equivalents.



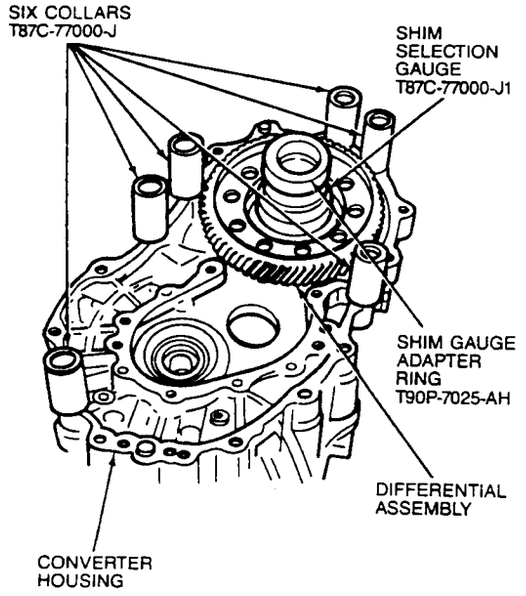
2. Install the front bearing cup into the converter housing using Driver Handle T80T-4000-W and Front Hub Bearing Replacer T77F-1217-B or equivalents.



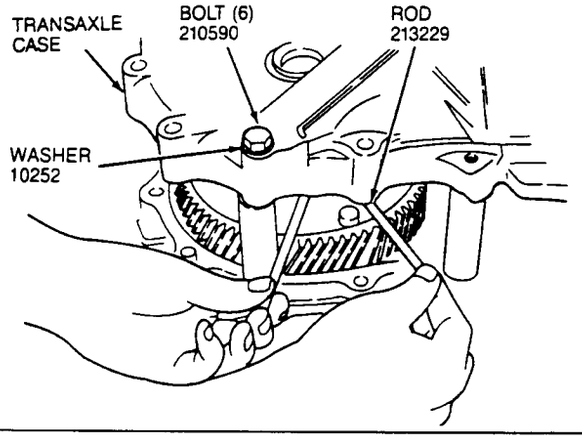
3. Place the differential into the converter housing.
4. Place six Collars T87C-77000-J or equivalent on the converter housing at the positions shown.
5. Place the rear bearing cup over the differential bearing.

GENERAL SERVICE OPERATIONS (Continued)

6. Place Shim Selection Gauge T87C-77000-J1 and Shim Gauge Adapter Ring T90P-7025-AH or equivalents on the output gear. Turn the two halves of the gauge to eliminate any gap between them.

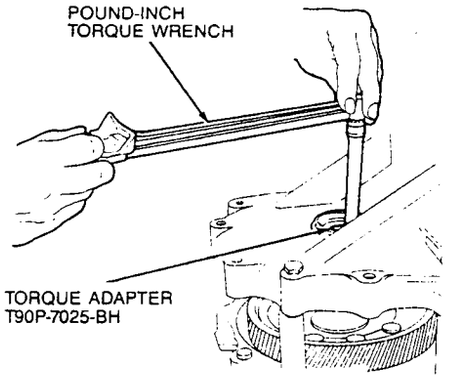


7. Place the transaxle case on the collars, then install six Bolts 210590 or equivalent with washers. Tighten the bolts to 37-52 N·m (27-38 lb-ft).
8. Using Rods 213229 or equivalent, unthread the gauge halves until the free play is removed and the bearing cup is seated. Then thread the gauge halves back together.

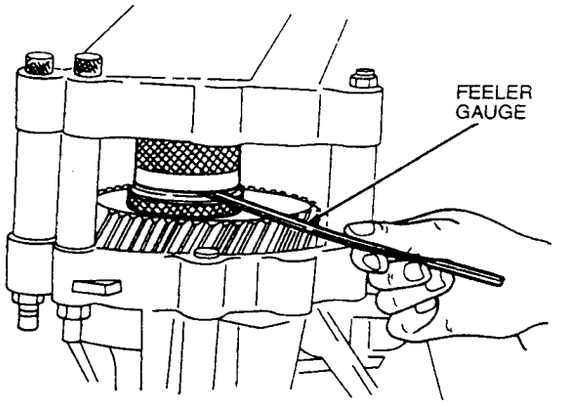


9. Engage Torque Adapter T90P-7025-BH or equivalent and attach a pound-inch torque wrench to the adapter. Measure the drag on the differential bearing.

   NOTE: Read the preload when the differential starts to turn.



10. Turn the gauge using the rods until a reading of 0.5 N·m (4.3 lb-in) is obtained on the torque wrench.
11. Use a feeler gauge to measure the gap between the two halves of the shim selection gauge. Measure the gap at four spots at 90 degree intervals. Use the largest measurement.



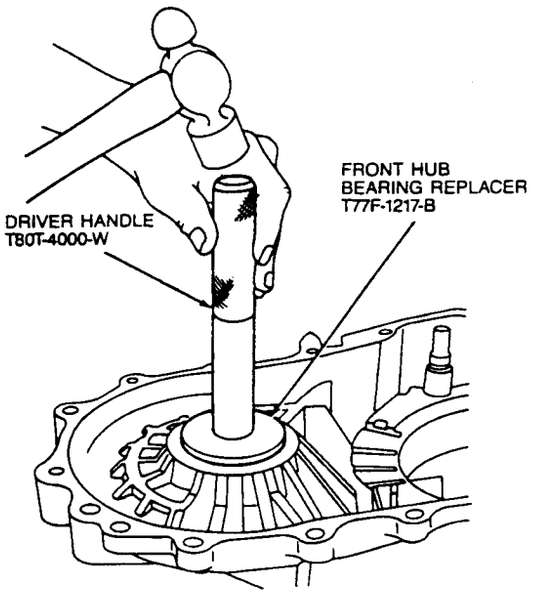
12. Add 0.3mm (0.0118 inch) to the largest measurement. Select the shim(s) closest (or slightly larger) to this final value.

    NOTE: Use no more than three shims.

GENERAL SERVICE OPERATIONS (Continued)

Thickness of shim mm (in)			
0.50 (0.020)	0.55 (0.022)	0.60 (0.024)	0.65 (0.026)
0.70 (0.028)	0.75 (0.030)	0.80 (0.032)	0.85 (0.034)
0.90 (0.035)	0.95 (0.037)	1.00 (0.039)	1.05 (0.041)
1.10 (0.043)	1.15 (0.045)	1.20 (0.047)	1.25 (0.049)
1.30 (0.051)	1.35 (0.053)	1.40 (0.055)	1.45 (0.057)

13. Remove the bolts, washers, transaxle case, gauge, and bearing cup.
14. Install the selected shim(s) and bearing cup into the transaxle case using Driver Handle T80T-4000-W and Front Hub Bearing Replacer T77F-1217-B or equivalents.



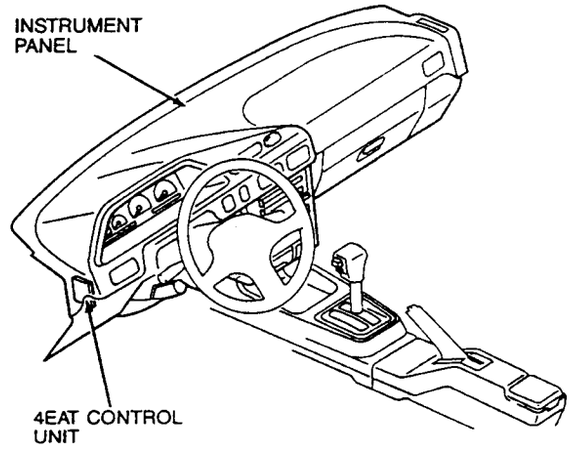
15. Install the transaxle case. Tighten the retaining bolts to 37-52 N·m (27-38 lb-ft).
16. Measure the bearing preload. The preload should be 2.9-3.9 N·m (26-35 lb-in). Repeat the gauging process if the preload measurement is not within specification.
17. When the proper preload specification has been obtained, remove the transaxle case.

REMOVAL AND INSTALLATION

4EAT Control Unit

Removal

1. Remove the three nuts located under the instrument panel on the driver's side of the vehicle securing the 4EAT control unit.
2. Disconnect the wiring connectors from the 4EAT control unit.
3. Remove the 4EAT control unit from the vehicle.



Installation

1. Position the 4EAT control unit under the instrument panel and connect the wiring connectors.
2. Mount the 4EAT control unit to the three studs and secure with nuts.
3. Test drive the vehicle to ensure that the transaxle is operating properly.

Valve Body

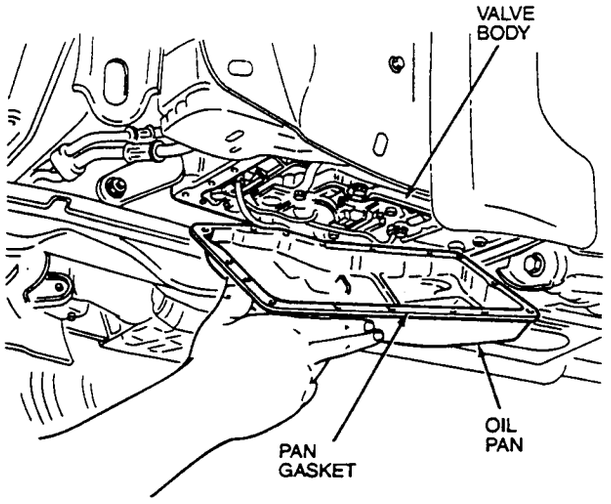
Removal

1. Raise the vehicle and support it with safety stands.
2. Place a suitable container beneath the transaxle

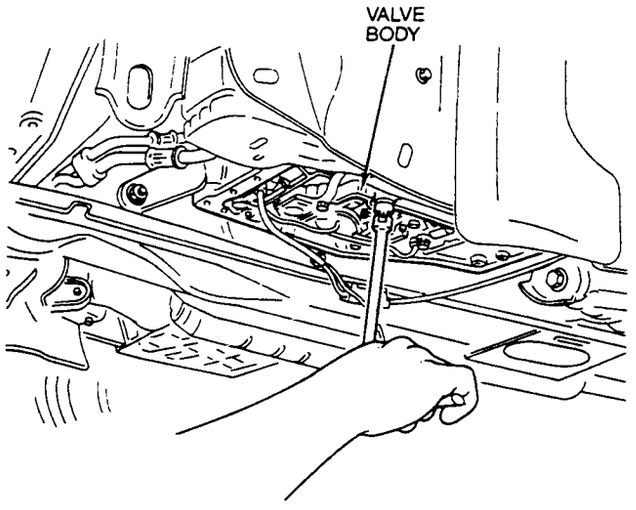
REMOVAL AND INSTALLATION (Continued)

3. Remove all the bolts securing the pan except the four corner bolts.
4. Remove two of the remaining four bolts from the rear of the transaxle and allow the fluid to drain into the container.

   WARNING: AVOID SPILLING TRANSAXLE FLUID; THE FLUID MAY BE HOT.
5. Remove the last two bolts securing the pan.
6. Remove the oil pan and pan gasket.



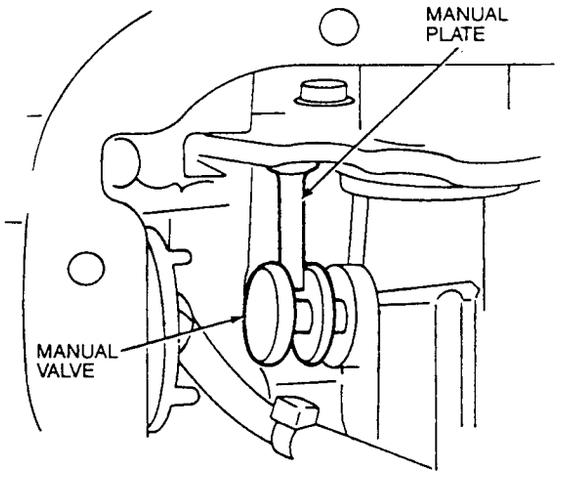
7. Remove the bolts securing the wiring clips to the valve body.
8. Disconnect the wiring connector.
9. Remove the remaining attaching bolts from the valve body and carefully remove the valve body.



Installation

NOTE: Shift the transaxle into REVERSE to place the manual plate in the correct position for installation.

1. Install the valve body using a mirror to align the groove of the manual valve with the manual plate.



2. Tighten the valve body mounting bolts to 8-11 N·m (69-95 lb-in).
3. Connect the wiring connector.
4. Install the oil pan with a new gasket. Tighten the bolts to 8.5-11 N·m (74-95 lb-in).

   NOTE: Do not use gasket sealer, RTV, etc. on the pan or gasket.
5. Lower the vehicle.
6. Add the specified transaxle fluid to the proper level and check for fluid leaks.
7. Test drive the vehicle and verify that shift points are accurate and precise.

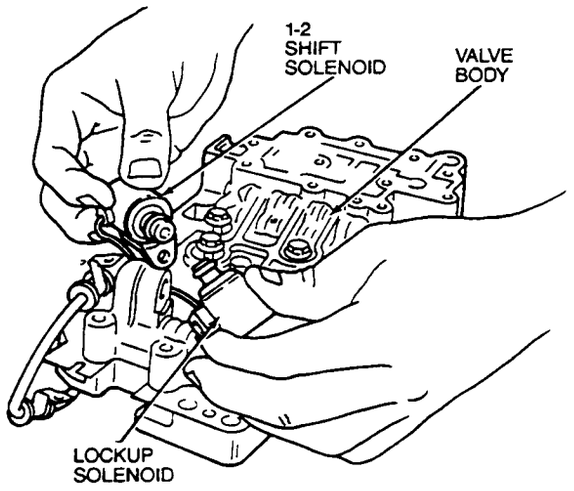
Shift and Lockup Solenoids

Removal

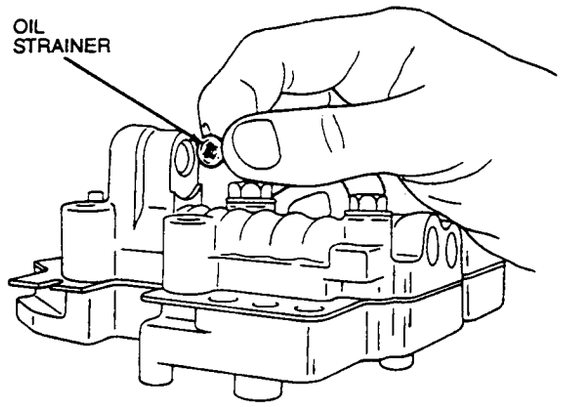
1. Remove the valve body as explained in this Section.
2. Remove the bolts securing the shift and lockup solenoids to the valve body.

REMOVAL AND INSTALLATION (Continued)

3. Remove the shift and lockup solenoids, as necessary.



4. Remove the oil strainers located in the solenoid ports.

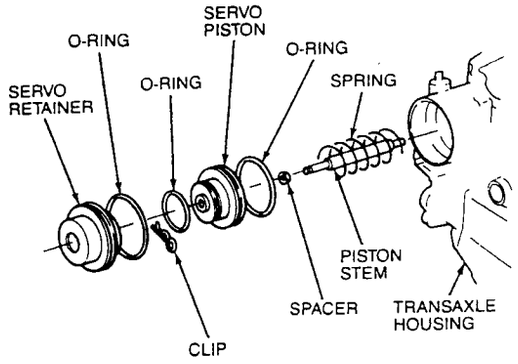


Installation

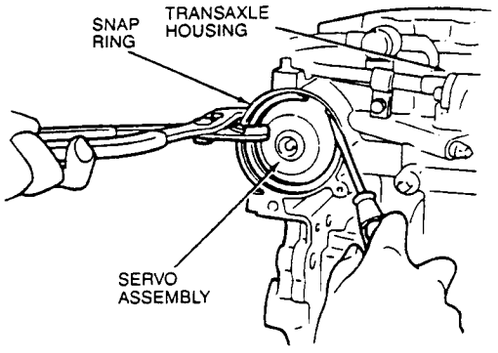
1. Install the oil strainers into the solenoid ports.
2. Position the solenoids into the valve body and secure with bolts. Tighten the bolts to 8-11 N·m (69-95 lb-in).
3. Install the valve body, as explained in this Section. Tighten the bolts to 8-11 N·m (69-95 lb-in).
4. Test drive the vehicle.

Servo Assembly

Removal



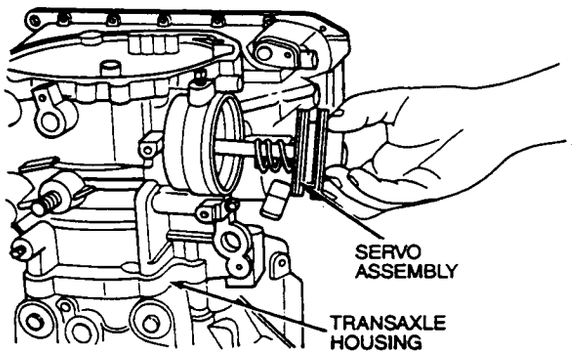
1. Remove the air cleaner assembly. Refer to Section 03-12A or 03-12B.
2. Remove the clamps and upper radiator hose.
3. Depress the servo assembly with a large pair of slide-lock (channel lock) type pliers.
4. With the servo assembly depressed, carefully remove the snap ring with a screwdriver.



5. Slowly release the tension on the servo and allow it to travel out of its bore.

REMOVAL AND INSTALLATION (Continued)

6. Remove the servo assembly.



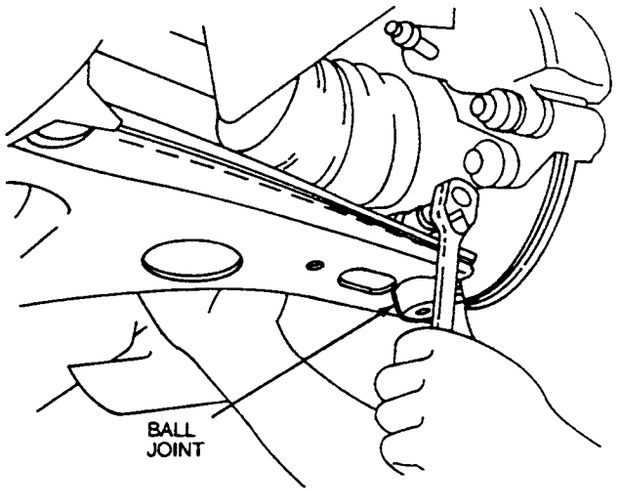
Installation

1. Apply the specified transaxle fluid to the servo seal and position the servo assembly into its bore.
2. Depress the servo assembly with a large pair of slide-lock (channel lock) type pliers.
3. With the servo assembly being held in its depressed position, install the snap ring into the servo bore.
4. Release the pliers.
5. Install the upper radiator hose and clamps.
6. Install the air cleaner assembly.
7. Start the engine and allow it to reach its normal operating temperature. Check the transaxle fluid level as explained in this Section.
8. Test drive the vehicle.

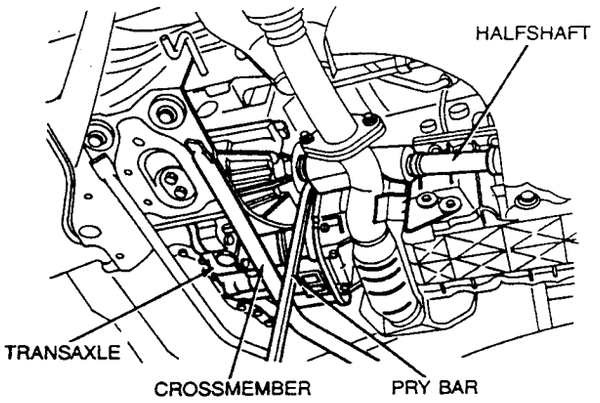
Differential Oil Seals

Removal

1. Raise the vehicle.
2. Remove the front wheels.
3. Remove the splash shields.
4. Drain the transaxle fluid from the differential.
5. Remove the tie rod nuts and cotter pins and disconnect the tie rod ends from the steering knuckles.
6. Remove the bolts and nuts from the lower control arm ball joints.



7. Pull the lower control arms downward to separate them from the knuckles.
8. Install Three Bar Engine Support D88L-6000-A or equivalent.
9. Remove the lower transaxle crossmember.
10. Remove the right-hand halfshaft bracket on vehicles equipped with a 1.8L engine.
11. Remove the halfshafts from the transaxle by using a pry bar inserted between the shaft and transaxle case. Support the halfshafts with wire.

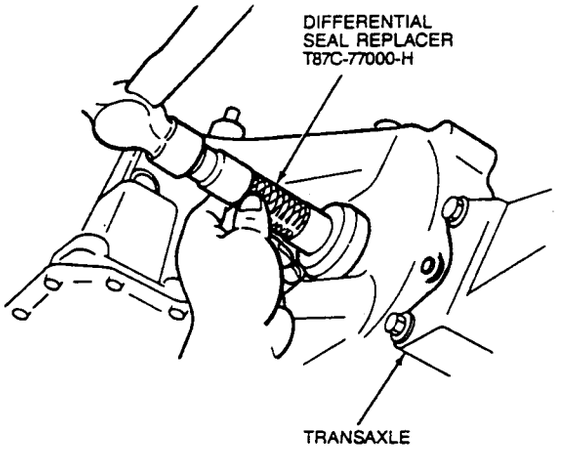


12. Remove the differential oil seals with a flat-tip screwdriver.

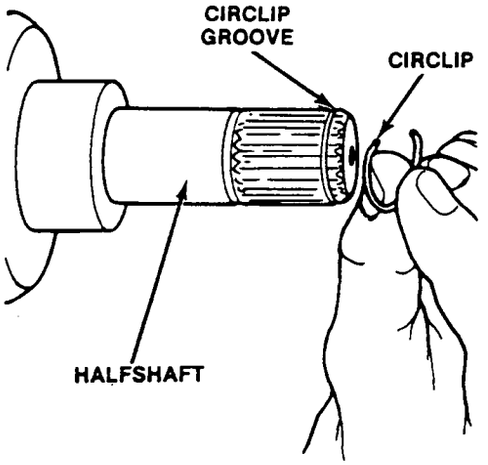
REMOVAL AND INSTALLATION (Continued)

Installation

1. Tap in the new differential oil seals using Differential Seal Replacer T87C-77000-H or equivalent.



2. Replace the circlip located on the end of each halfshaft.

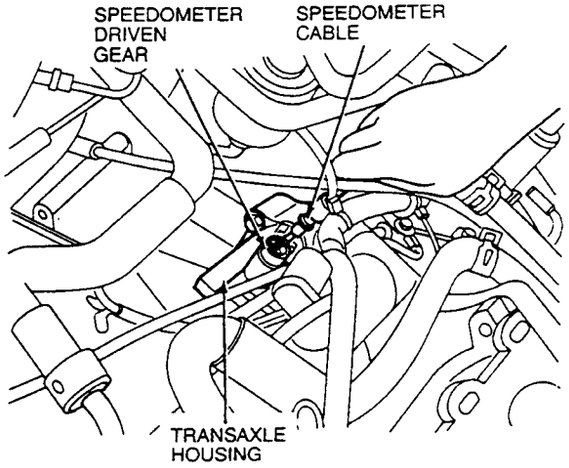


3. Install the halfshafts into the transaxle.
4. Install the lower crossmember. Tighten the nuts to 37-52 N·m (27-38 lb-ft). Tighten the bolts to 64-89 N·m (47-66 lb-ft).
5. Attach the lower control arm ball joints to the knuckles.
6. Install the tie rod ends into the knuckles and tighten the nuts to 42-57 N·m (31-42 lb-ft). Secure the nuts with new cotter pins.
7. Install the bolts and nuts securing the lower control arm ball joints to the knuckles. Tighten to 43-59 N·m (32-43 lb-ft).
8. Install the splash shields.
9. Install the front wheels and tighten the lug nuts to 88-118 N·m (65-88 lb-ft).
10. Lower the vehicle.
11. Add the specified transaxle fluid and inspect for leaks.

Transaxle

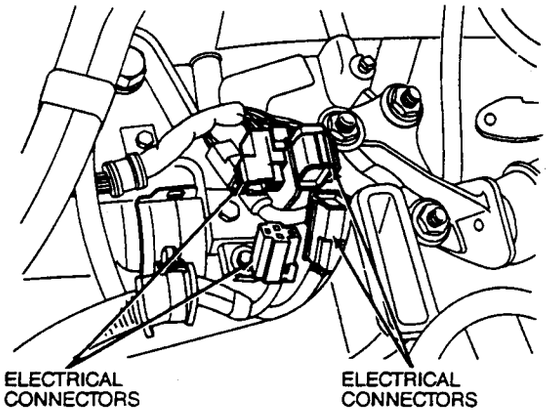
Removal

1. Disconnect the negative battery cable.
2. Remove the battery and battery tray.
3. Disconnect the wiring harness retaining clip from the battery tray.
4. Remove the air cleaner assembly.
5. Disconnect the shift control cable from the manual lever.
6. Disconnect the speedometer cable from the transaxle by unsnapping the cable at the speedometer driven gear.

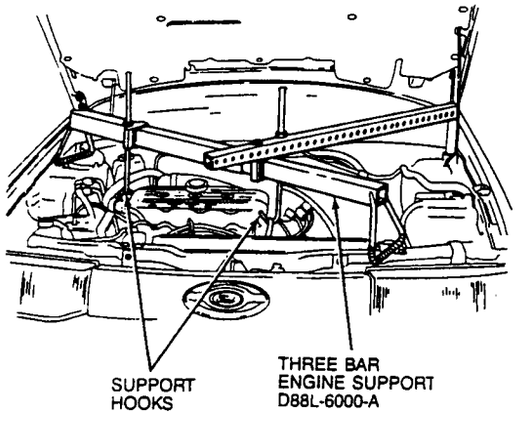


REMOVAL AND INSTALLATION (Continued)

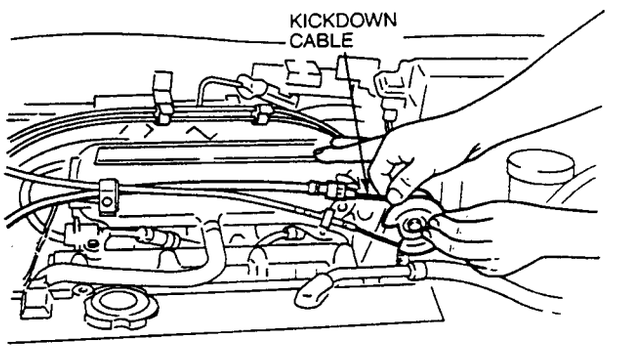
7. Disconnect the 4EAT electrical connectors and separate the 4EAT harness from the transaxle clips.



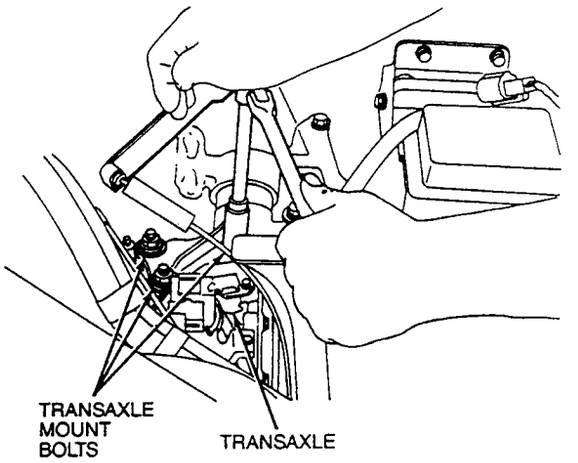
8. Remove the manual lever position switch wiring brackets from the top of the transaxle.
9. Disconnect the ground cables from the top of the transaxle.
10. Remove the starter motor.
11. Disconnect the manual lever position switch wiring connectors.
12. Install Three Bar Engine Support D88L-6000-A or equivalent.



13. Disconnect the kickdown cable at the throttle cam.



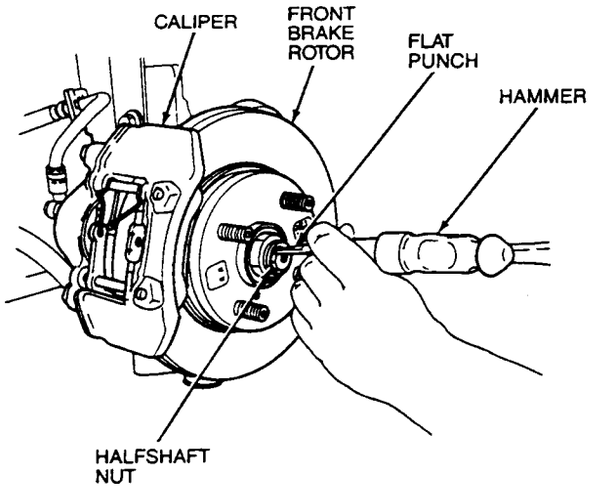
14. Place a drain pan under the transaxle and disconnect the transaxle cooler lines at the transaxle.
15. Remove the upper transaxle mount bolts and mount.



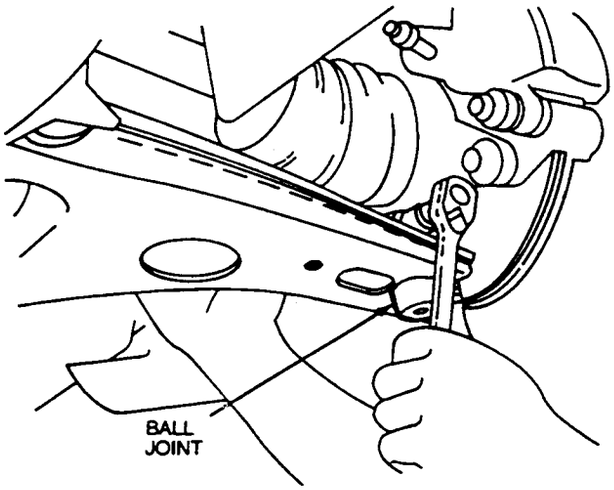
16. Remove the upper transaxle housing bolts.
17. Disconnect the EGO sensor electrical connector.
18. Disconnect the transaxle vent hose.
19. Disconnect the electrical connector at the vehicle speed sensor.
20. Raise the vehicle.
21. Remove the wheel covers.
22. Remove the wheels.

REMOVAL AND INSTALLATION (Continued)

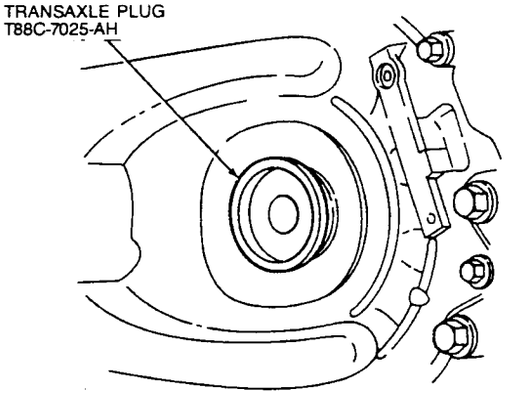
23. Using a hammer and a flat punch, straighten the detent in the halfshaft nut.



24. Remove the nuts securing the halfshafts to the steering knuckles.
25. Remove the nuts and bolts securing the lower ball joints to the steering knuckles.



26. Separate the lower ball joints from the steering knuckles.
27. Disconnect the halfshaft mid-bearing bracket from the back of the engine.
28. Remove the halfshafts from both steering knuckles.
29. Remove three engine / transaxle lower splash shields.
30. Remove the torque converter inspection plate.
31. Remove the nuts securing the torque converter to the flex plate.
32. Disconnect the lower crossmember from the vehicle chassis.
33. Disconnect the lower crossmember from the transaxle mounts.
34. Remove the driver's side halfshaft from the transaxle.
35. Remove the passenger's side halfshaft from the transaxle.
36. Install two Transaxle Plugs T88C-7025-AH or equivalent into the differential side gears.



CAUTION: Failure to install the transaxle plugs may cause the differential side gears to become improperly positioned.

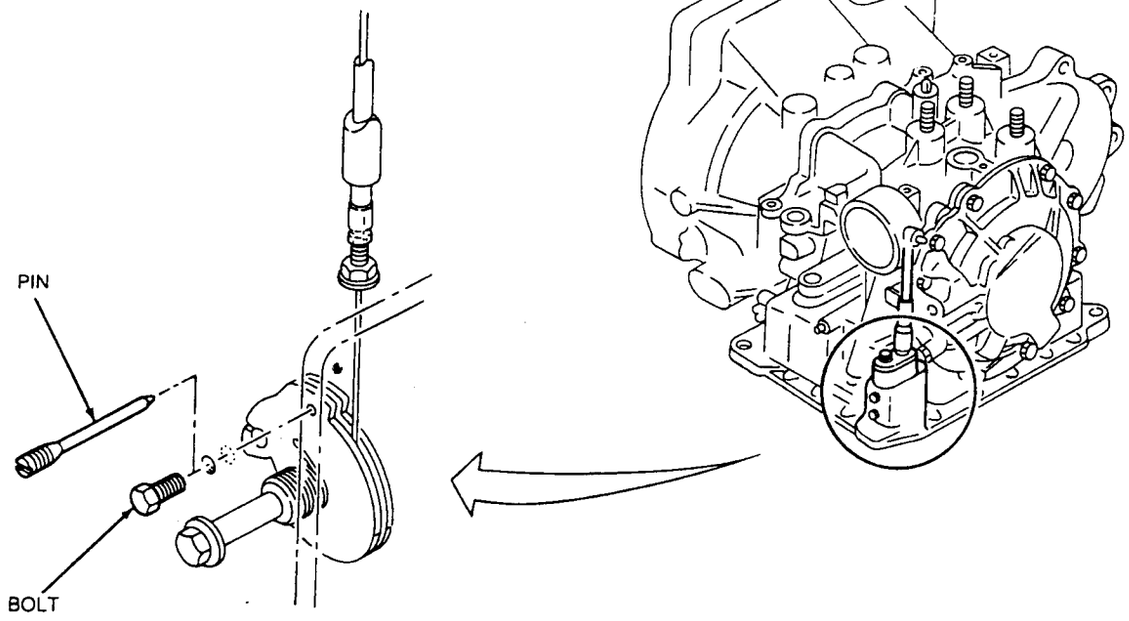
37. Remove the drainplug from the transaxle and drain the fluid from the differential cavity.
38. Remove the transaxle pan and drain the transaxle fluid.
39. Position a transaxle jack under the transaxle. Secure the transaxle to the jack.
40. Remove the lower bolts securing the transaxle to the engine.
41. Carefully lower the transaxle out of the vehicle.

Installation

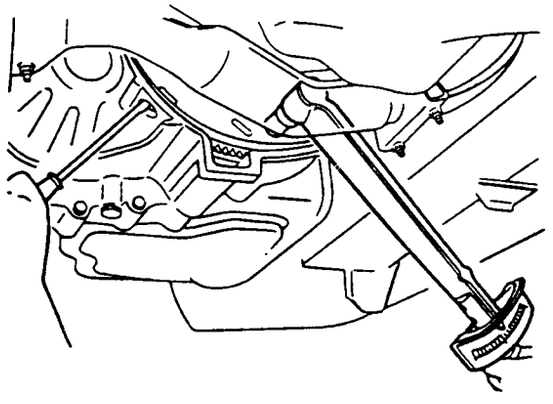
NOTE: A pin is used for securing the throttle cam in a fixed position on new and rebuilt 4EAT units. This pin must be removed to allow proper transaxle operation. If the pin is not removed, the throttle lever will remain in a fixed position.

After removing the pin, apply sealant to the bolt from the previous transaxle. Install the bolt and tighten it to 8-11 N·m (69-95 lb-in).

REMOVAL AND INSTALLATION (Continued)

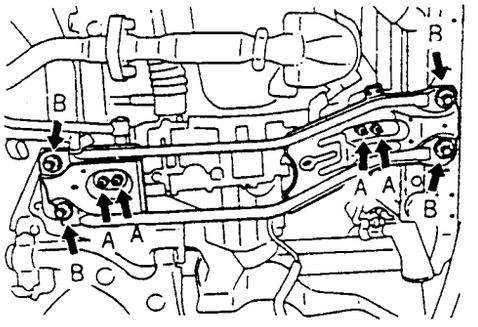


1. Secure the transaxle on a transaxle jack.
2. Raise the transaxle to the proper height under the vehicle.
3. Position the transaxle to the engine and secure it with the lower bolts. Tighten the bolts to 55-80 N·m (41-59 lb-ft).
4. Position the torque converter to the flex plate and install the nuts. Tighten the nuts to 34-49 N·m (25-36 lb-ft).



5. Install the halfshafts.
6. Secure the crossmember to the transaxle mounts. Tighten the nuts to 37-52 N·m (27-38

7. Secure the crossmember to the vehicle chassis. Tighten the nuts and bolts to 64-89 N·m (47-66 lb-ft).



Tightening torque:
A: 37–52 Nm (27–38 LB-FT)
B: 64–89 Nm (47–66 LB-FT)

8. Install the engine / transaxle splash shields to the vehicle's undercarriage.
9. Install the starter motor. Refer to Section 03-06.
10. Position the lower ball joints into the steering knuckles and secure with nuts and bolts. Tighten nuts and bolts to 43-59 N·m (32-43 lb-ft).
11. Position the tie rod end into the steering knuckles and secure with the nut. Tighten to 42-57 N·m (31-42 lb-ft).

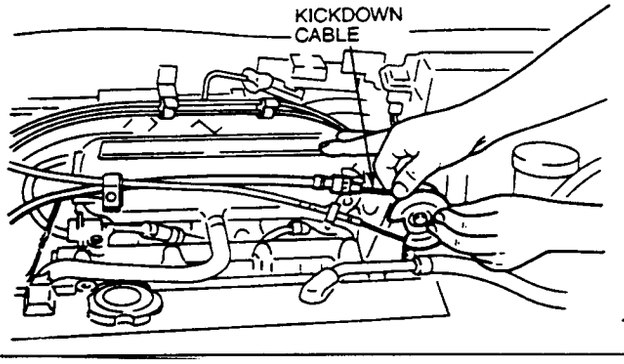
REMOVAL AND INSTALLATION (Continued)

12. Install the wheels. Tighten to 88-118 N·m(65-88 lb-ft).
13. Install the wheel covers.
14. Lower the vehicle.
15. Install transaxle-to-engine bolts. Tighten the bolts to 55-80 N·m (41-59 lb-ft).
16. Install the upper transaxle mount. Tighten the nuts to 67-93 N·m (49-69 lb-ft).
17. Connect the transaxle vent hose.
18. Connect the electrical connector at the vehicle speed sensor.
19. Connect the speedometer cable.
20. Connect the EGO sensor wiring connector.
21. Connect the transaxle cooler lines.
22. Connect the kickdown cable at the throttle body.
23. Remove the Three Bar Engine Support.
24. Connect the ground wires to the transaxle.
25. Connect the manual lever position switch bracket and wiring connectors.
26. Connect the shift control cable to the cable bracket and to the selector lever.
27. Install the battery tray and battery.
28. Install the air cleaner assembly.
29. Connect the negative battery cable.
30. Add the specified transaxle fluid as explained in this Section.
31. Check for proper operation.

Kickdown Cable

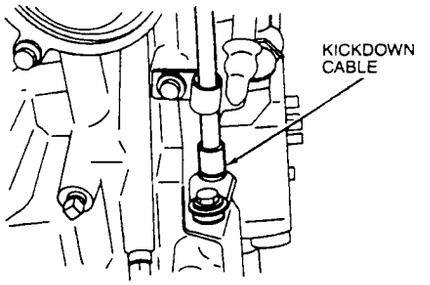
Removal

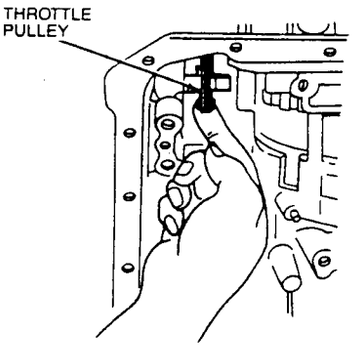
1. Loosen the nuts securing the kickdown cable to the bracket mounted on the throttle body.



2. Disengage the cable from the throttle cam.
3. Remove the cable from the bracket near the throttle cam.
4. Remove the bolts securing the cable to the transaxle.
5. Remove the valve body as explained in this Section.
6. Disengage the cable from the throttle pulley in the transaxle.

(EXTERNAL VIEW)





(INTERNAL VIEW)

Installation

1. Install the kickdown cable into the transaxle and secure the cable with a bolt.
2. Connect the cable to the pulley in the transaxle.
3. Install the valve body and the pan, then fill with the specified automatic transaxle fluid as explained in this Section.
4. Position the cable into the bracket at the throttle valve and secure.
5. Adjust the kickdown cable as explained in this Section.

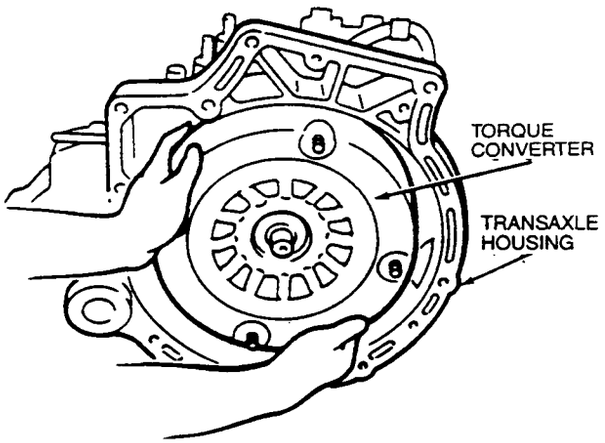
REMOVAL AND INSTALLATION (Continued)

Oil Cooler
Removal and Installation

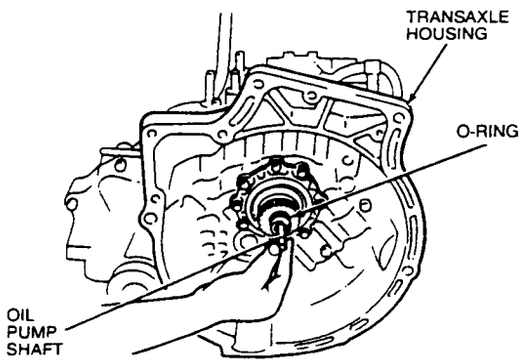
DISASSEMBLY AND ASSEMBLY

Transaxle
Disassembly

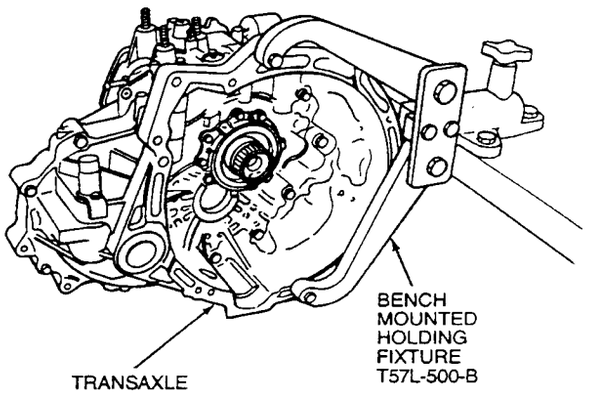
1. Remove the torque converter.
   CAUTION: The torque converter is heavy. Be careful not to drop it.



2. Remove the oil pump shaft by hand.

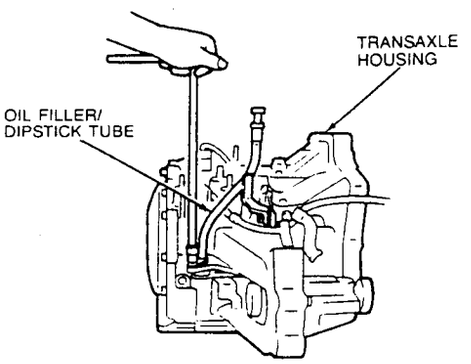


3. Mount the transaxle on Bench Mounted Holding Fixture T57L-500-B or equivalent.



NOTE: Position the transaxle on the bench mount in its normal upright position. Leaning the transaxle may cause any sediment in the pan to move throughout the geartrain.

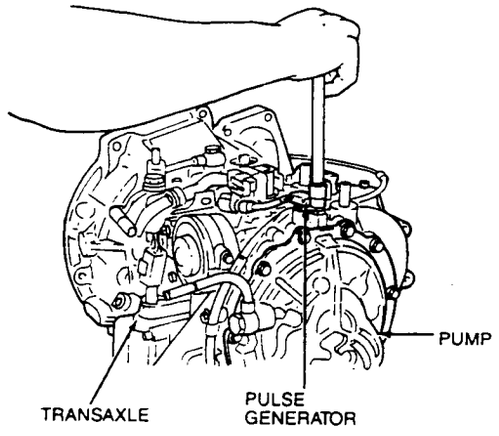
4. Remove the dipstick tube retaining bolts and pull the tube from its slot.



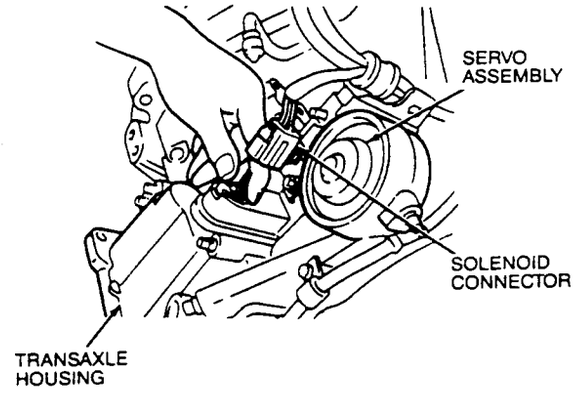
5. Remove the manual lever position switch and rubber seal.

DISASSEMBLY AND ASSEMBLY (Continued)

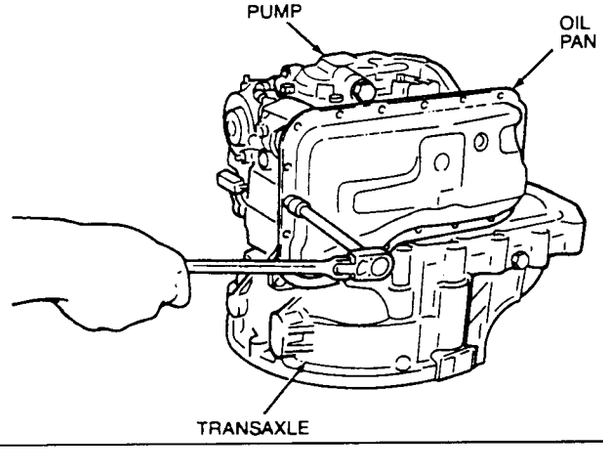
6. Remove the pulse generator.



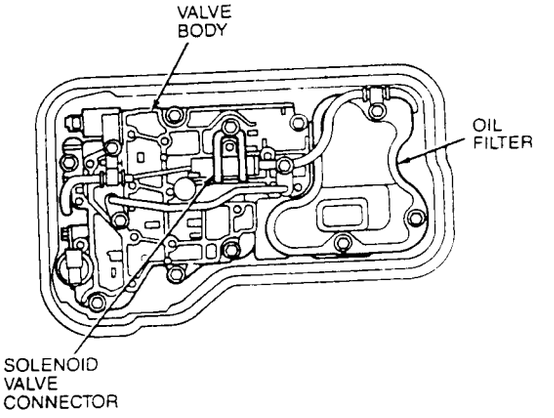
7. Disconnect the solenoid connector.



8. Remove the oil pan and gasket.

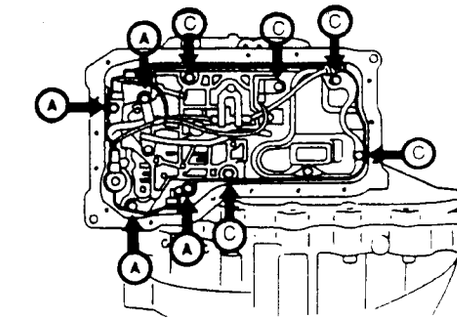


9. Remove the electric wire retaining clip.
10. Disconnect the solenoid main harness connector.



11. Remove the bolts securing the valve body assembly.

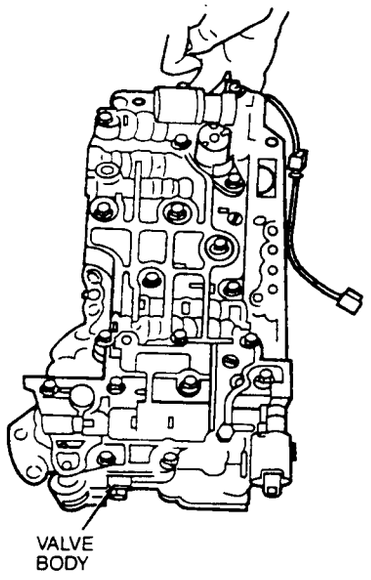
NOTE: The valve body utilizes 50mm and 30mm bolts. Refer to the following illustration for proper bolt location.



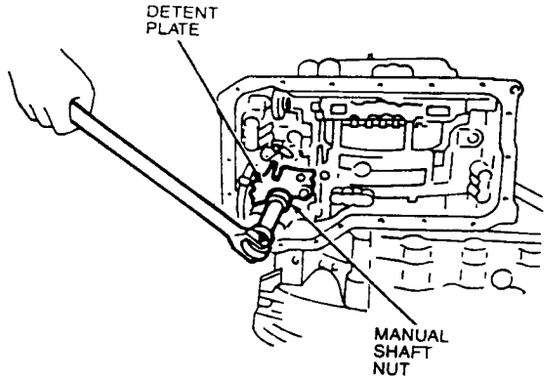
Bolt length (Measured from below the head)
A: 30mm (1.18 IN)
C: 50mm (1.97 IN)

DISASSEMBLY AND ASSEMBLY (Continued)

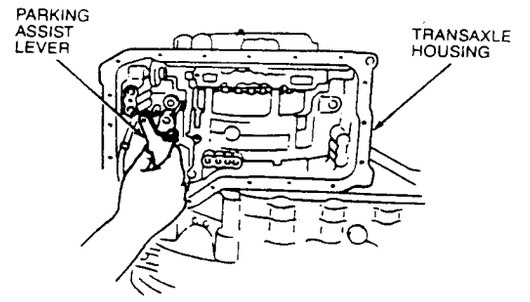
12. Remove the valve body with the oil pipe and disconnect the two solenoid electrical connectors.



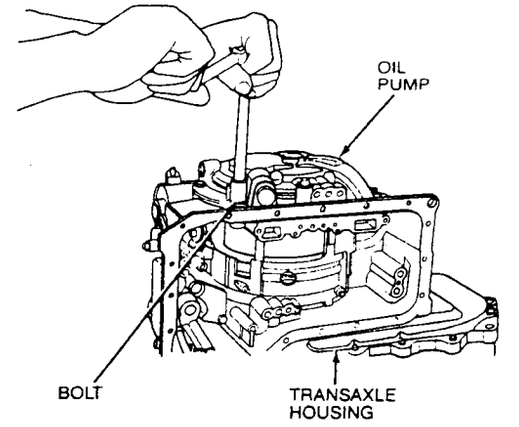
13. Rotate the transaxle on the bench fixture to gain access to the lower side of the transaxle.
14. Remove the kickdown cable attaching bolts and bracket.
15. Remove the cable from the pulley lever in the transaxle.
16. Remove the nut, washer, and detent plate securing the manual shaft.



17. Remove the manual shaft.
18. Remove the bolt and lever holder.
19. Remove the parking assist lever.

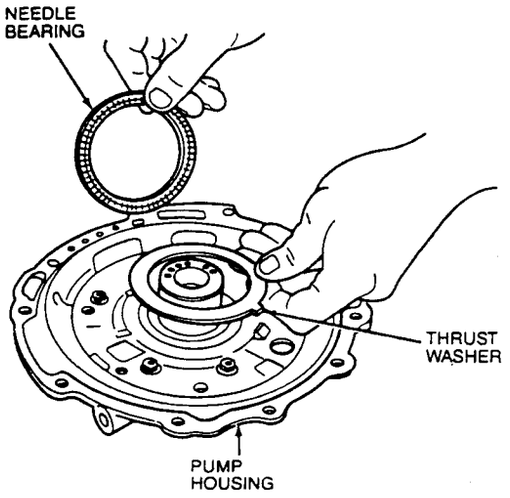


20. Remove the detent lever and return spring.
21. Remove the actuator support, parking pawl, shaft spring and clip.
22. Remove the oil pump.

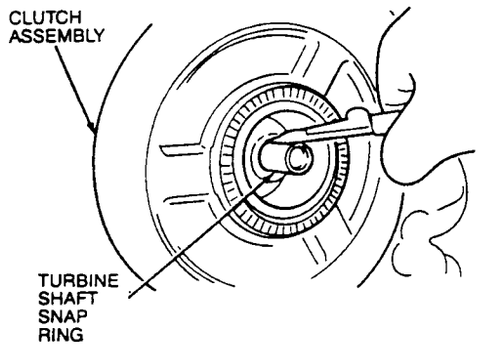


DISASSEMBLY AND ASSEMBLY (Continued)

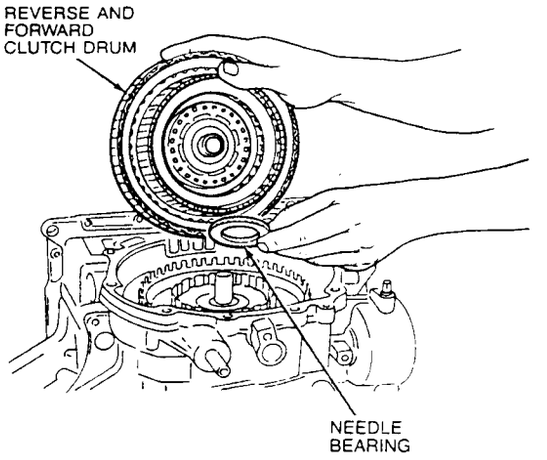
23. Remove the steel thrust washer and needle bearing.



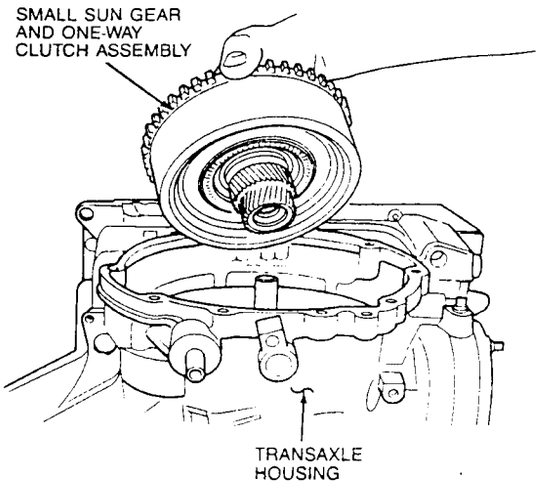
24. Remove the turbine shaft snap ring.



25. Remove the reverse and forward clutch drum assembly and needle bearing.

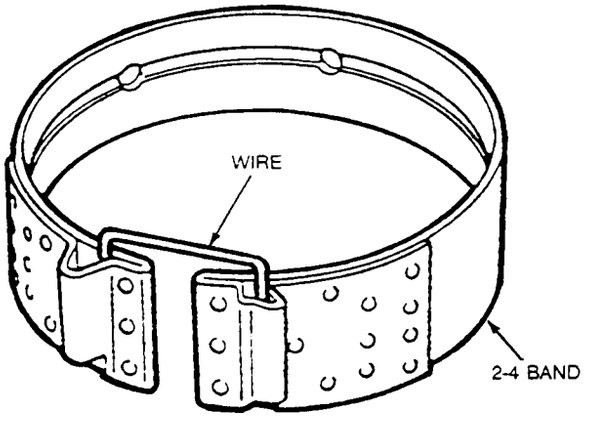


26. Remove the small sun gear and one-way clutch assembly.

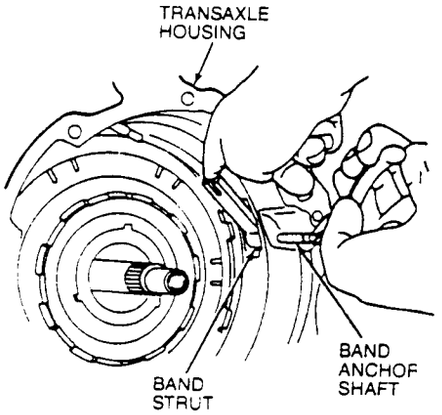


DISASSEMBLY AND ASSEMBLY (Continued)

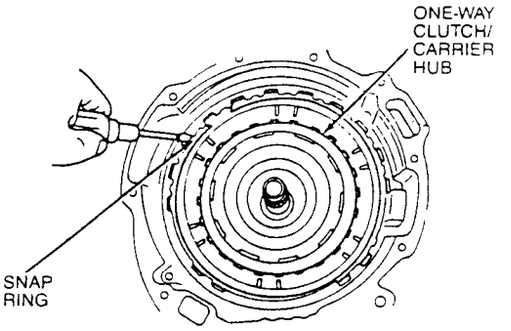
27. Remove the 2-4 band and secure it with a small piece of wire to keep the band from stretching.



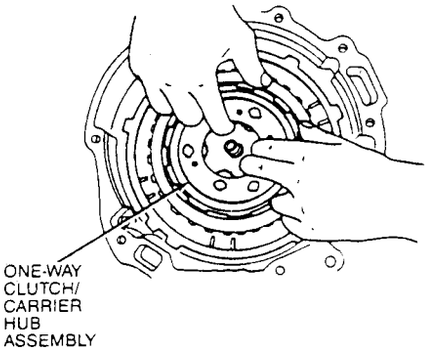
28. Remove the band anchor shaft while holding the band strut.



29. Remove the band strut.
30. Compress the servo assembly and remove the servo snap ring.
31. Remove the servo assembly and spring from its bore.
32. Remove the snap ring securing the one-way clutch in the transaxle housing.



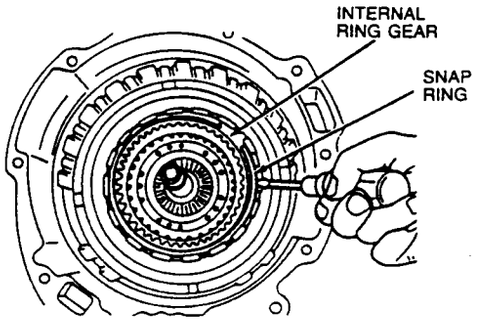
33. Remove the one-way clutch and carrier hub assembly together.



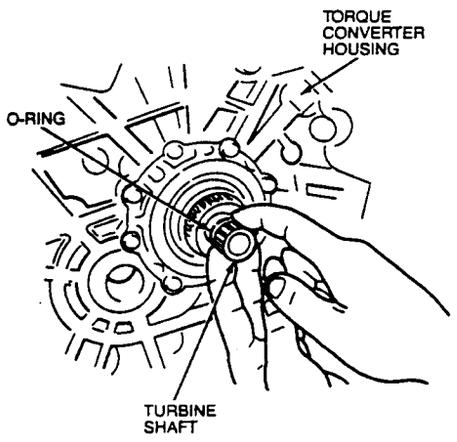
34. Remove the large wave spring from beneath the one-way clutch assembly.
35. Remove the snap ring securing the internal ring gear.

DISASSEMBLY AND ASSEMBLY (Continued)

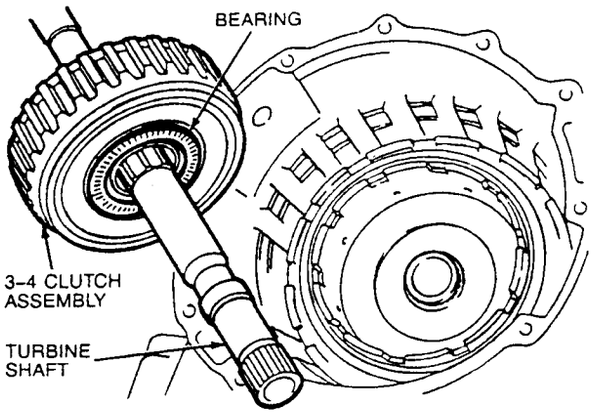
36. Remove the internal ring gear from the 3-4 clutch drum.



37. Remove the wave ring.
38. Remove the snap ring.
39. Remove the retaining plate.
40. Remove the low and reverse clutch assembly. Order of removal is steel plate, friction, steel, friction, steel, friction, steel, and friction.
41. Remove the needle bearing.
42. Remove the O-ring from the turbine shaft, located on the torque converter housing side of the transaxle.



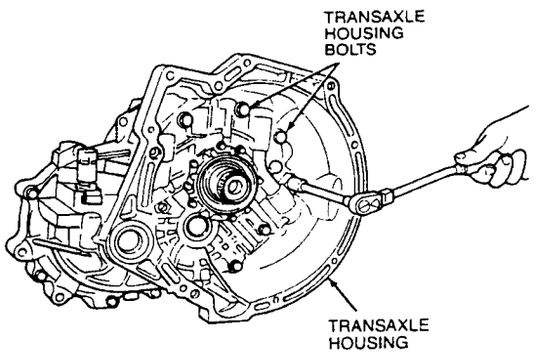
43. Pull the turbine shaft out of the pump side of the transaxle to remove the 3-4 clutch assembly.



44. Slide the 3-4 clutch assembly off of the turbine shaft.

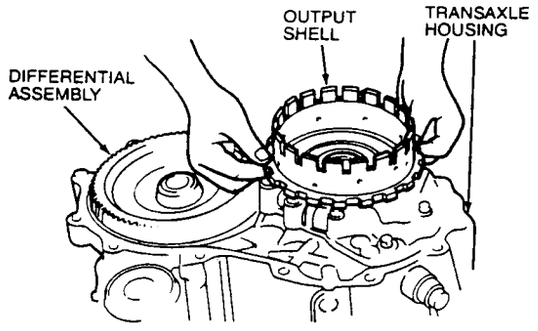
    NOTE: If you are removing the low and reverse clutch, refer to the low and reverse clutch disassembly procedure explained later in this Section.

45. Remove the bolts securing the transaxle housings together. Tap the two halves of the housing lightly with a plastic hammer to separate.

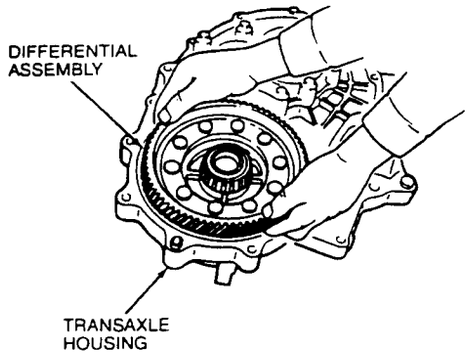


DISASSEMBLY AND ASSEMBLY (Continued)

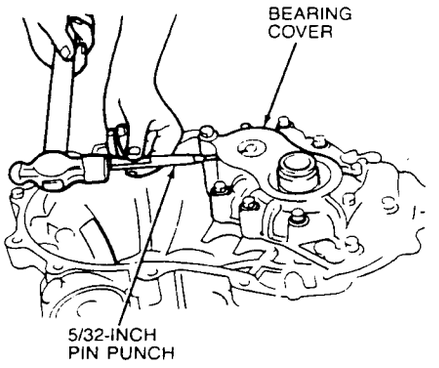
46. Remove the output shell from the output gear.



47. Remove the differential assembly.

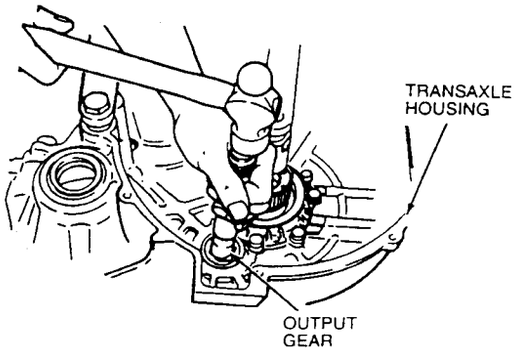


48. Remove the roll pin from the bearing housing using a 5/32 inch flat pin punch.



49. Remove the bolts and the bearing housing by tapping the housing lightly with a plastic hammer.

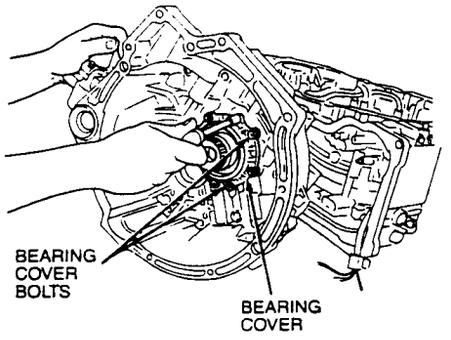
50. Remove the idler gear assembly and the output gear assembly by lightly tapping them out from the torque converter side of the transaxle housing.



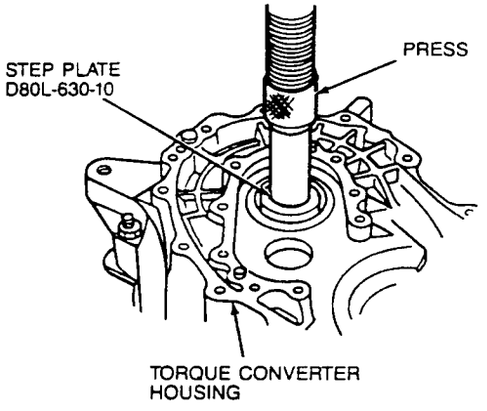
51. Remove the torque converter housing from the transaxle bench mount fixture.

DISASSEMBLY AND ASSEMBLY (Continued)

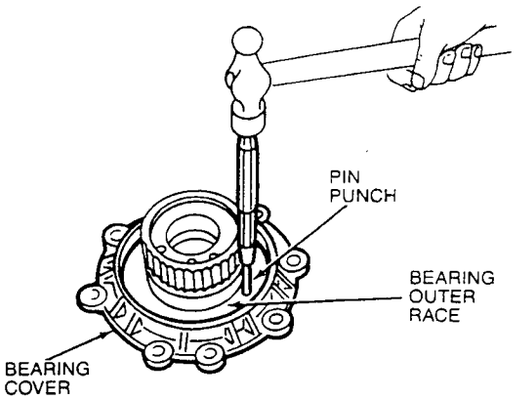
52. Remove the bearing cover bolts.



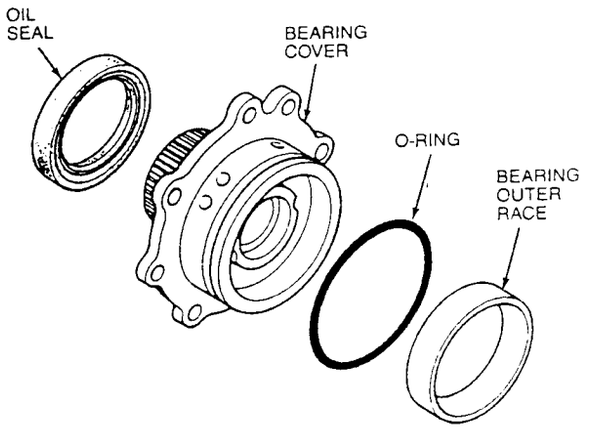
53. Press the bearing cover out of the torque converter housing using Step Plate D80L-630-10 or equivalent.



54. Remove the bearing outer race with a pin punch and a hammer.



55. Replace the oil seals and O-rings.

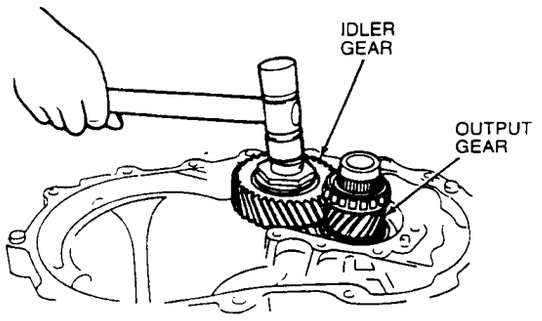


Assembly

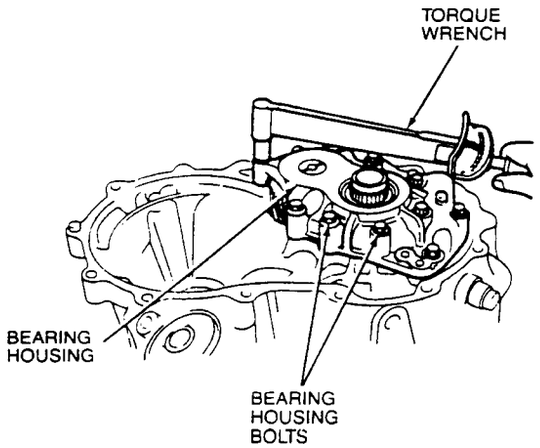
1. Align the bearing cover with guide bolts. Press the bearing cover into the torque converter housing.
2. Tighten the bearing cover bolts to 11-14 N·m(8-10 lb-ft).

DISASSEMBLY AND ASSEMBLY (Continued)

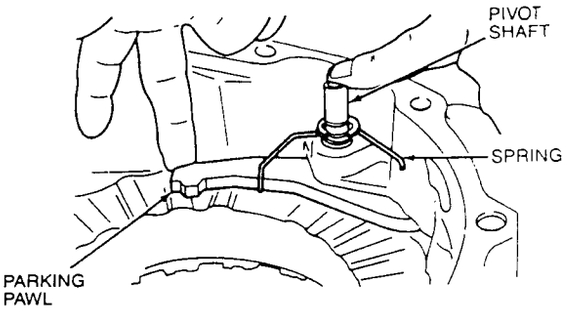
3. Install the idler gear and output gear as an assembly by lightly tapping them in with a hammer.



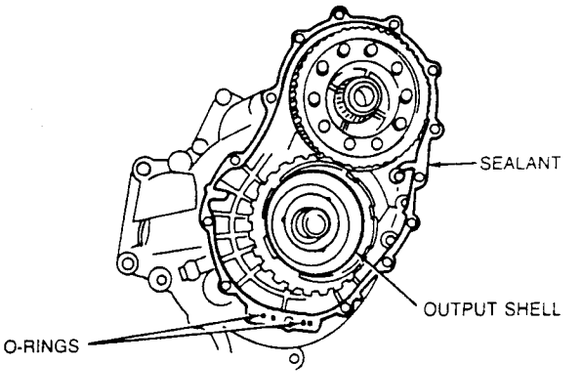
4. Install the bearing housing onto the torque converter housing.
5. Align the groove on the idler shaft with the mark on the bearing housing.
6. Install the bearing housing bolts and tighten to 19-26 N·m (14-19 lb-ft).



7. Tap a new roll pin into the bearing housing using a 5/32 inch flat pin punch and hammer.
8. Install the parking pawl and shaft.
9. Install the spring and snap clip.



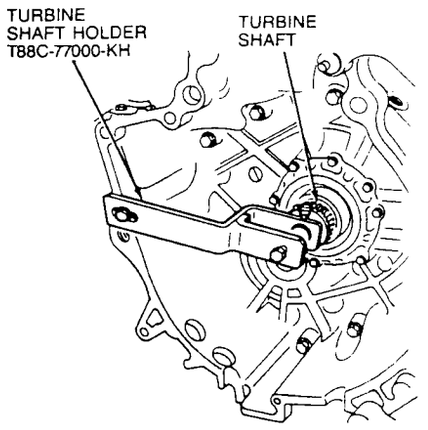
10. Install the actuator support with new bolts. Tighten the bolts to 11-14 N·m (8-10 lb-ft).
11. Install the detent lever and return spring.
12. Install the parking assist lever.
13. Install the detent lever holder and bolt. Tighten to 8-11 N·m (69-95 lb-in).
14. Install the manual shaft.
15. Install the detent plate, washer, and nut securing the manual shaft. Tighten the nuts to 41-55 N·m(30-41 lb-ft).
16. Install the output shell to the output gear.
17. Apply a thin coat of silicone sealant to the contact surfaces of the torque converter housing and transaxle housing.



18. Install new O-rings onto the oil passage ports.
19. Attach the transaxle housing to the torque converter housing. Tighten the bolts to 37-52 N·m (27-38 lb-ft).
20. If necessary, install the low and reverse clutch. Refer to the low and reverse clutch assembly procedure explained later in this Section.

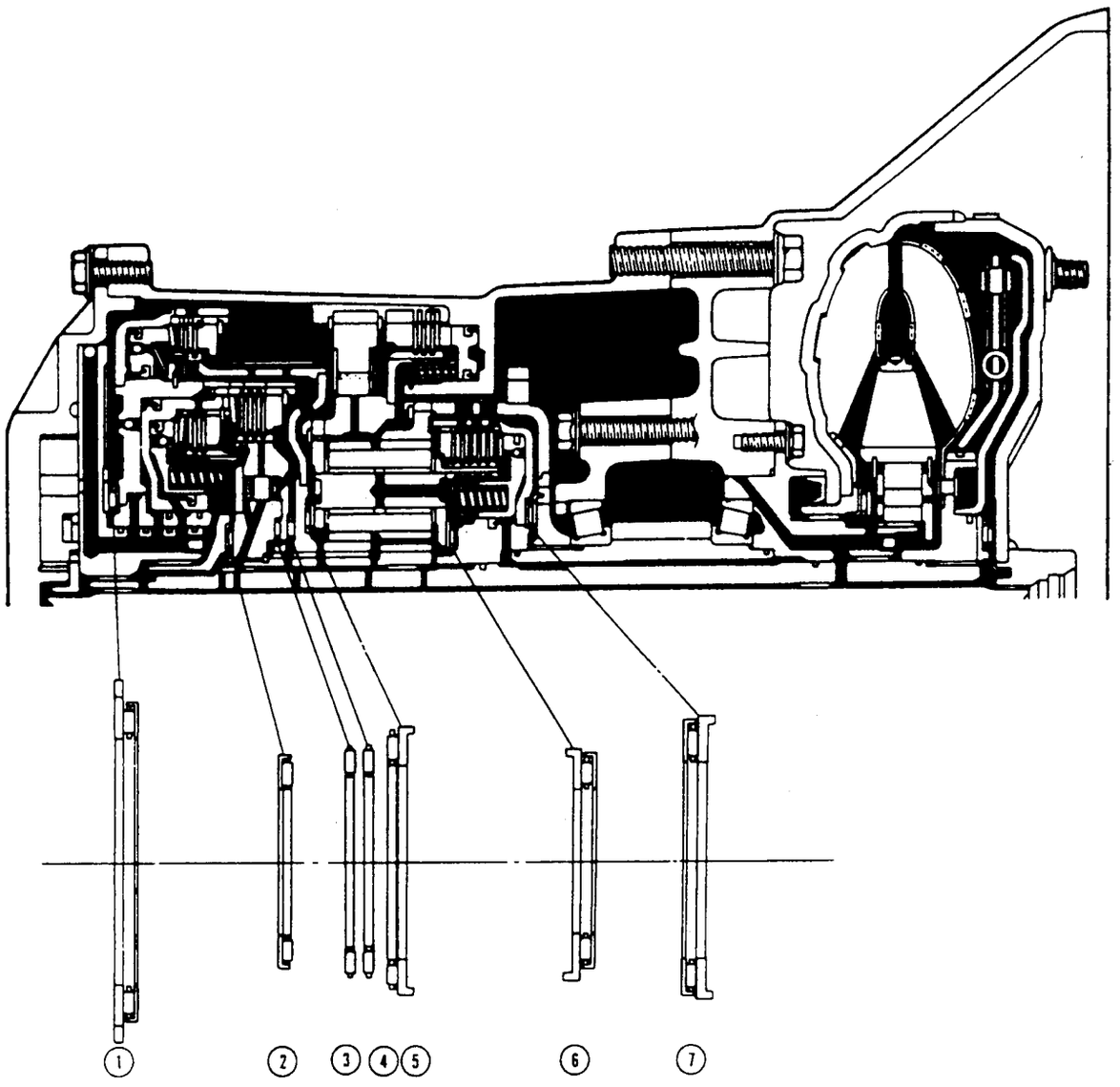
DISASSEMBLY AND ASSEMBLY (Continued)

21. Install Turbine Shaft Holder T88C-77000-KH or equivalent to the transaxle.



DISASSEMBLY AND ASSEMBLY (Continued)

Bearing and Thrust Washer (Race) Locations



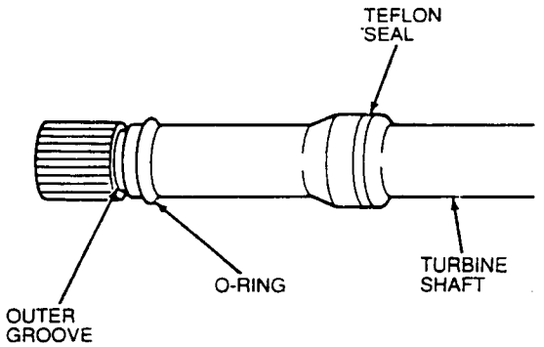
	1	2	3	4	5	6	7
Bearing mm(in)	86.0 (3.39)	56.1 (2.21)	58.0 (2.28)	58.0 (2.28)	86.0 (3.39)	56.1 (2.21)	72.1 (2.84)
Race mm(in)	88.0 (3.46)				84.0 (3.31)		

22. Assemble the turbine shaft and 3-4 clutch assembly.

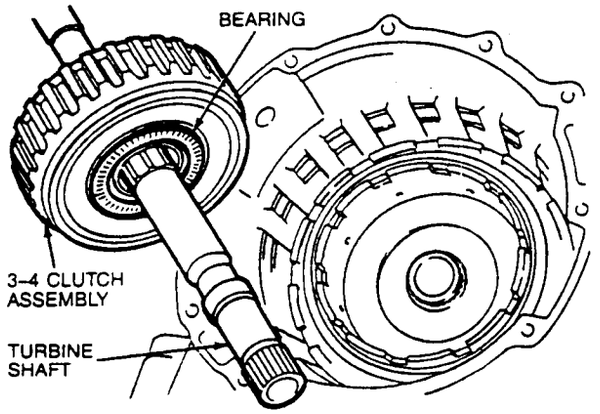
23. Position the needle bearing between the 3-4 clutch assembly and the thrust washer on the output shell.

DISASSEMBLY AND ASSEMBLY (Continued)

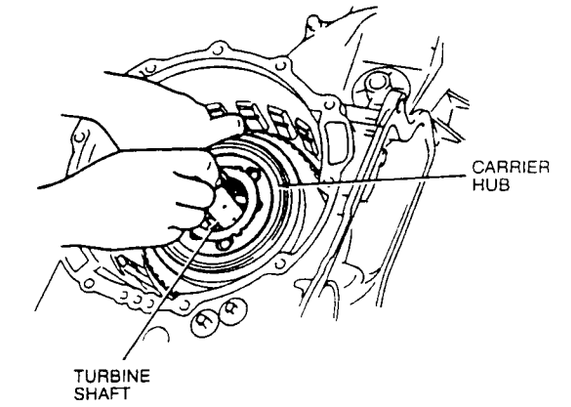
NOTE: The O-ring should be installed on the inner groove of the turbine shaft.



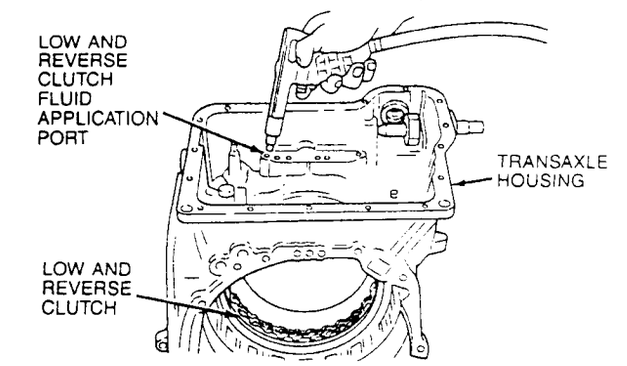
24. Install the turbine shaft and the 3-4 clutch assembly into the transaxle housing.



25. Install the internal ring gear into the 3-4 clutch assembly.
26. Install the snap ring.
27. Position the needle bearing and thrust washer between the carrier hub assembly and the 3-4 clutch drum.
28. Hold the turbine shaft with one hand.
29. Install the carrier hub into the 3-4 clutch drum by rotating it to align the carrier hub with the 3-4 clutch pack.



30. Install the low and reverse clutch assembly. Order of installation is driven plate, drive plate, driven, drive, driven, drive, driven, and drive.
31. Install the retaining plate.
32. Install the snap ring.
33. Measure the clearance between the snap ring and the pressure plate. If it is not within specification 2.1-2.4mm (0.083-0.094 inch), select the appropriate snap ring from the chart.
34. Verify the proper operation of the low and reverse clutch by applying compressed air 392 kPa (57 psi) through the fluid passage as shown.



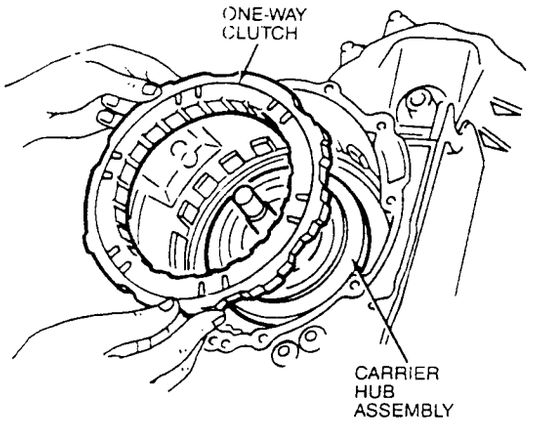
2.0 mm (0.0787 in)	2.2 mm (0.0866 in)	2.4 mm (0.0945 in)
2.6 mm (0.1024 in)	2.8 mm (0.1102 in)	3.0 mm (0.1181 in)

35. Install the wave ring.
36. Install the one-way clutch horizontally. Rotate the carrier counterclockwise while installing the

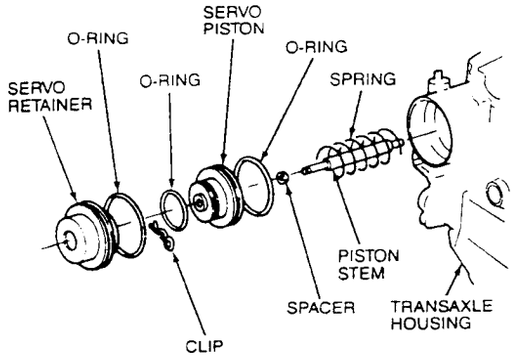
DISASSEMBLY AND ASSEMBLY (Continued)

CAUTION: The one-way clutch can be installed improperly. Be certain that after installing the one-way clutch, you can rotate the carrier by hand in a counterclockwise direction while working from the rear side of the transaxle. If the one-way clutch is installed improperly, gear ranges may not function or the geartrain may lock up. This may cause overheating of the transaxle and unnecessary overhauling of the unit.

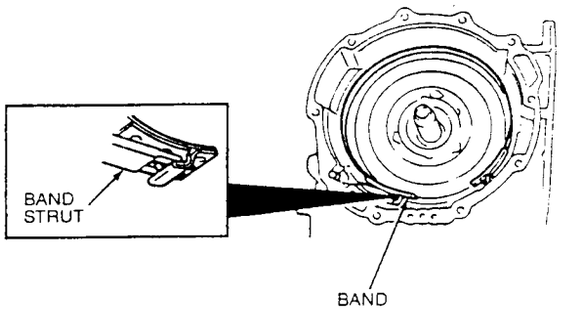
37. Install the snap ring.



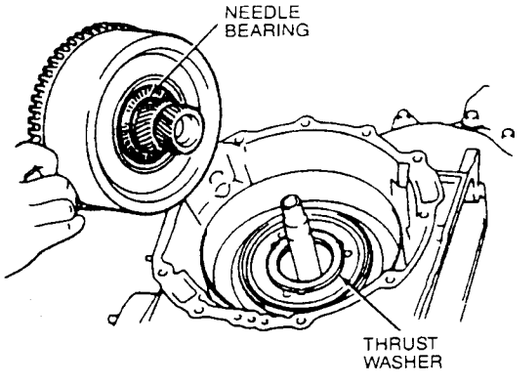
38. Install the servo assembly and spring into the transaxle housing.
39. Compress the servo assembly into its bore and install the snap ring.



40. Install the band anchor strut into the transaxle housing.
41. Install the 2-4 band into the transaxle housing so it is fully expanded.
42. Interlock the band and band strut as illustrated.



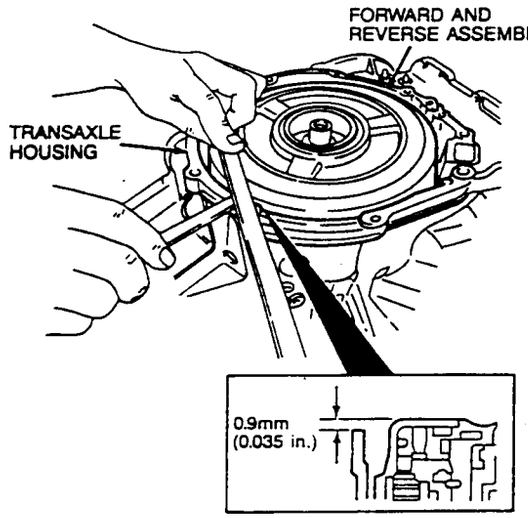
43. Position the needle bearing and the thrust washer.



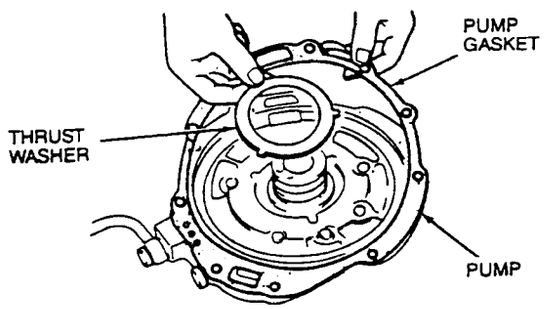
44. Install the small sun gear and clutch assembly.
45. Rotate the clutch assembly to line up the clutch pack.
46. Install thrust bearing into its correct position.
47. Install the reverse clutch assembly while rotating it to align the clutch pack.

DISASSEMBLY AND ASSEMBLY (Continued)

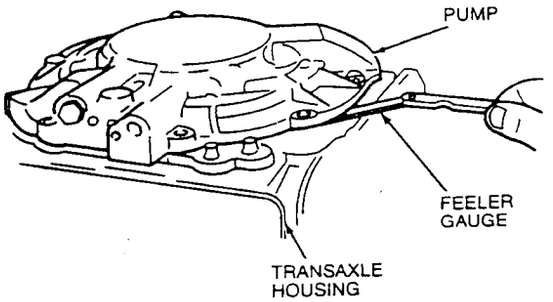
NOTE: Measure the height difference between the forward and reverse drum and the transaxle housing. Maximum clearance should be 0.9mm (0.035 inch).



48. Install the snap ring into the bottom groove of the turbine shaft.
49. To adjust the total end play, set the bearing onto the forward and reverse clutch assembly.
50. Remove the previously used thrust washer and gasket located on the pump.



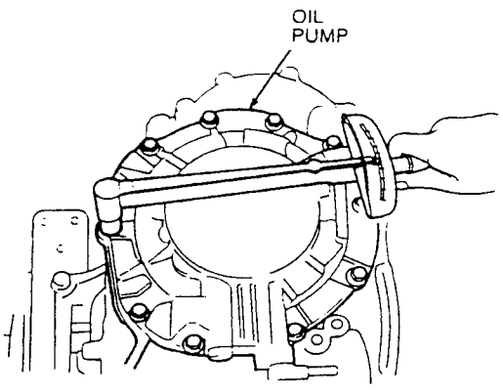
51. Set the thickest thrust washer, 2.2mm (0.087 inch), on the oil pump.
52. Set the oil pump onto the clutch assembly.
53. Using a feeler gauge, measure the clearance between the transaxle housing and the oil pump.



54. Select a suitable thrust washer.

Clearance A mm (in)	Select this thrust washer mm (in)
0.91–1.10 (0.036–0.043)	1.2 (0.047)
0.71–0.90 (0.028–0.035)	1.4 (0.055)
0.51–0.70 (0.020–0.027)	1.6 (0.063)
0.31–0.50 (0.012–0.019)	1.8 (0.071)
0.11–0.30 (0.004–0.011)	2.0 (0.078)
0–0.10 (0)	2.2 (0.087)

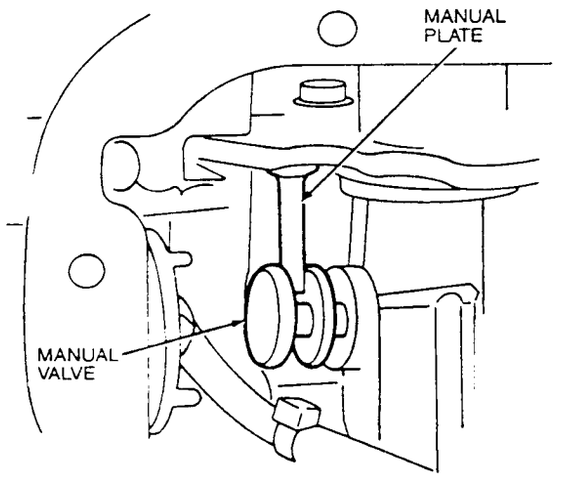
55. Remove the oil pump.
56. Place the selected thrust washer and a new gasket onto the oil pump.
57. Install the oil pump onto the clutch assembly. Secure it with bolts. Tighten the bolts to 19-26 N-m (14-19 lb-ft).



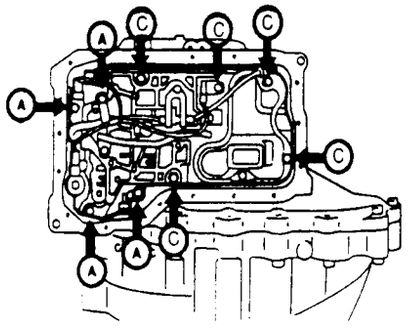
58. Install a new O-ring onto the kickdown cable bracket and insert the cable into the transaxle.
59. Connect the kickdown cable to the throttle lever in the transaxle.

DISASSEMBLY AND ASSEMBLY (Continued)

60. Install the kickdown cable bracket and secure with a bolt. Tighten the bolt to 8-11 N·m (69-95 lb-in).
61. Connect the solenoid connector.
62. Position the valve body to the transaxle housing. Align the manual valve with the pin on the manual plate.

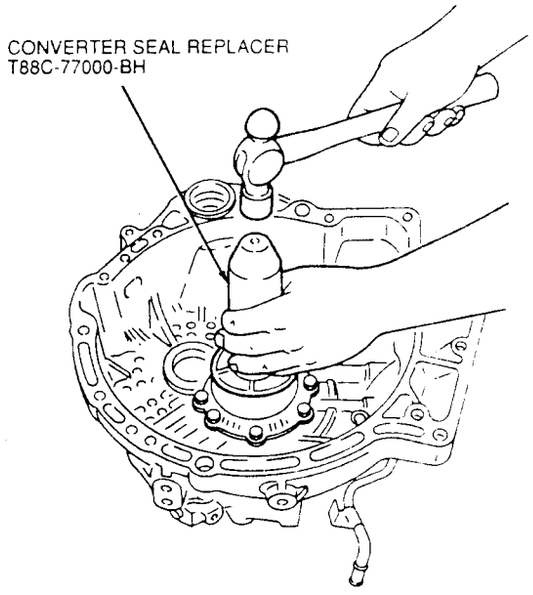


63. Install the bolts securing the valve body. Refer to the illustration for bolt lengths and positions. Tighten the bolts to 8-11 N·m (69-95 lb-in).



Bolt length (Measured from below the head)
A. 30mm (1.18 IN)
C. 50mm (1.97 IN)

64. Connect the wiring connectors on the valve body.
65. Install a new gasket onto the oil pan. Be certain to properly position the magnets in the pan.
66. Position the pan onto the transaxle. Tighten to 8-11 N·m (69-95 lb-in).
67. Install the pulse generator and solenoid valve connector. Tighten the bolt to 8-11 N·m (69-95 lb-in).
68. Install and adjust the manual lever position switch.
69. Install the remaining wiring brackets to the transaxle housing.
70. Install a new O-ring onto the transaxle dipstick tube.
71. Install the filler tube into the transaxle housing. Tighten the bolt to 8-11 N·m (69-95 lb-in).
72. Install the oil pump shaft into the transaxle.
73. Install a new O-ring on the turbine shaft.
74. Install a new torque converter hub seal onto the transaxle using Converter Seal Replacer T88C-77000-BH or equivalent.

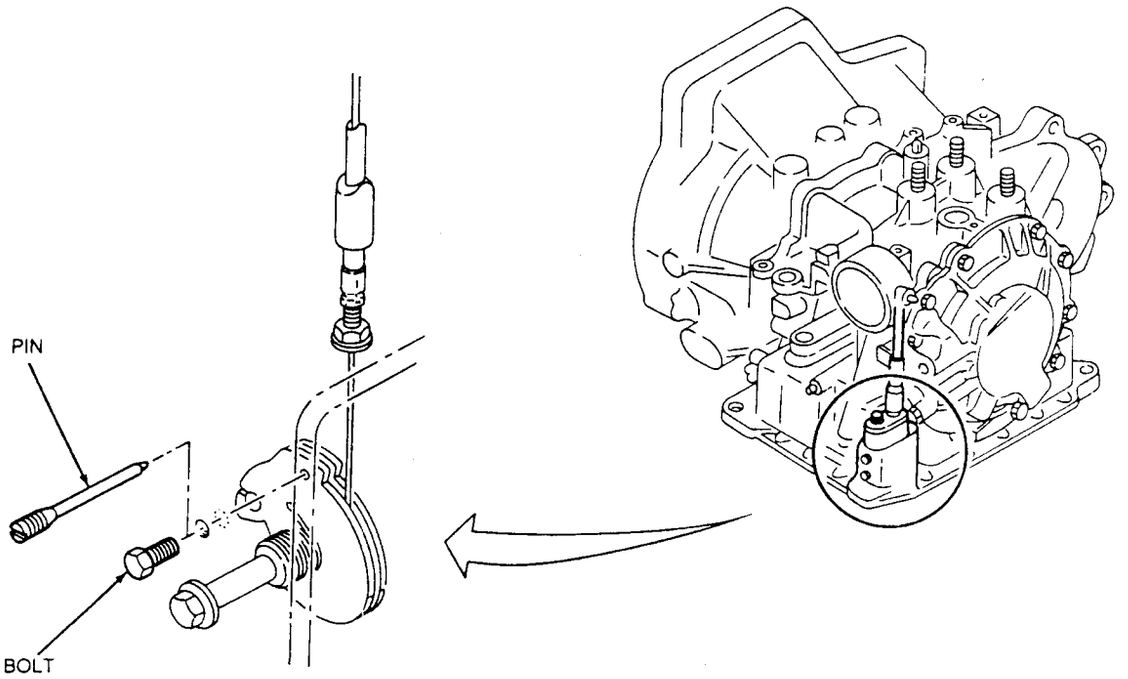


75. Position the torque converter to the torque converter housing and rotate it to align the splines.

    NOTE: A pin is used for securing the throttle cam in a fixed position on new and rebuilt 4EAT units. This pin must be removed to allow proper transaxle operation. If the pin is not removed, the throttle lever will remain in a fixed position.

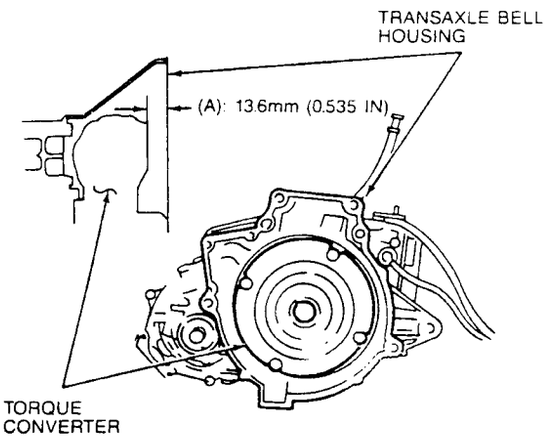
DISASSEMBLY AND ASSEMBLY (Continued)

After removing the pin, apply sealant to the bolt from the previous transaxle. Install the bolt and tighten it to 8-11 N·m (69-95 lb-in).



NOTE: The torque converter should slide into the transaxle very easily. Do not force the torque converter into the transaxle.

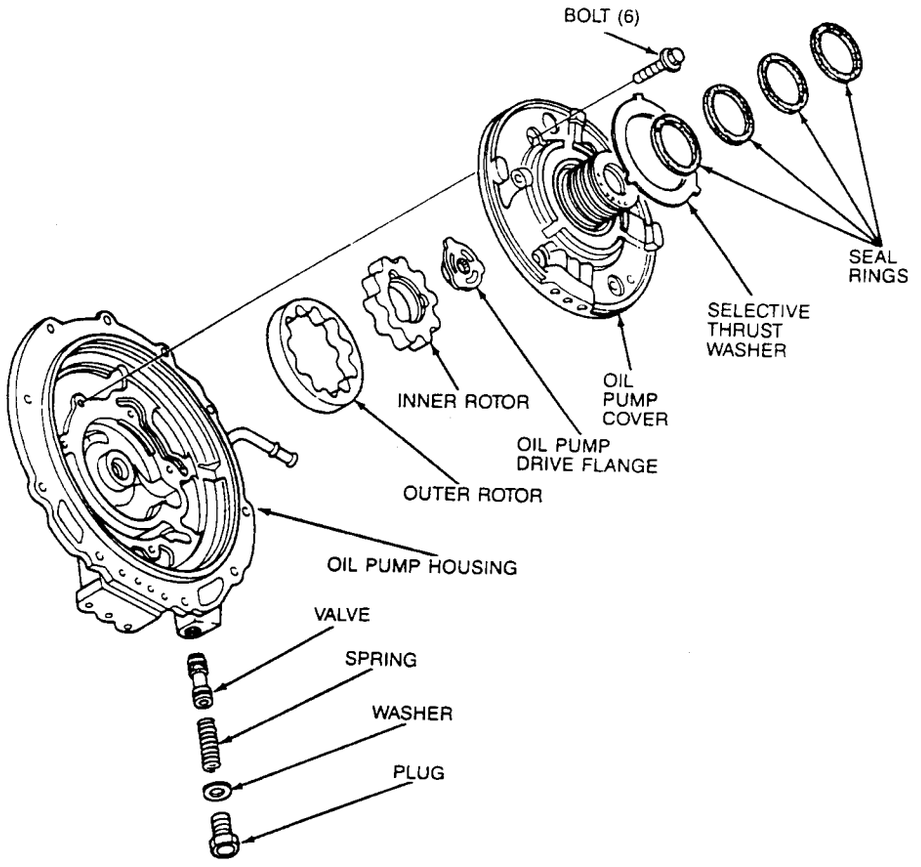
76. To ensure that the torque converter has aligned properly, measure the distance between the torque converter and the edge of the transaxle bell housing. The distance should be at least 13.6mm (0.535 inch).



DISASSEMBLY AND ASSEMBLY (Continued)

Oil Pump

Disassembly



1. Remove the selective thrust washer and seal rings.
2. Remove the oil pump cover bolts in an even order.
3. Remove the oil pump cover.
4. Remove the oil pump drive flange.

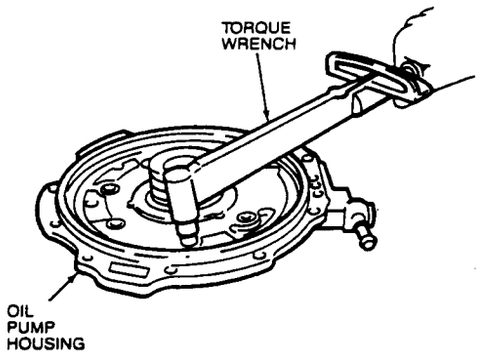
   CAUTION: Do not use a punch to mark the inner and outer rotors.
5. Mark the inner and outer rotors and separate them from the oil pump housing.
6. Remove the nut plug, washer, spring, and spool valve from the pump housing.

Assembly

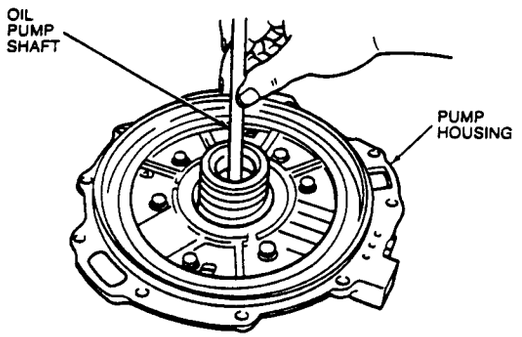
1. Install the spool valve and spring into the pump housing and verify that the spring and spool move freely.
2. Install the nut plug and a new washer. Tighten to 31-47 N·m (23-35 lb-ft).
3. Align the marks made during disassembly and install the outer and inner rotors into the pump housing.
4. Install the oil pump drive flange.
5. Mount the oil pump cover onto the oil pump housing. Tighten the bolts evenly and gradually to 8-11 N·m (69-95 lb-in).

DISASSEMBLY AND ASSEMBLY (Continued)

NOTE: Tighten cover bolts with an "X" pattern.

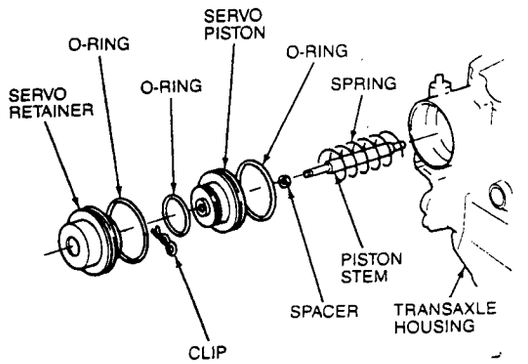


6. Install the oil pump shaft and verify smooth oil pump operation.
7. Install new seal rings.
8. Apply petroleum jelly to the selective thrust washer and secure it onto the oil pump cover.



Servo Assembly

Disassembly



NOTE: Before disassembling the servo assembly, refer to Servo Assembly Inspection in this Section.

1. Remove the servo assembly from the transaxle housing as described in this Section.
2. Remove the servo retainer from the servo assembly.
3. Remove the O-ring from the servo retainer.
4. Remove the spring from the servo piston stem.
5. Remove the clip from the servo piston stem.
6. Remove the O-ring from the servo piston.
7. Remove the spacer from the servo piston stem.

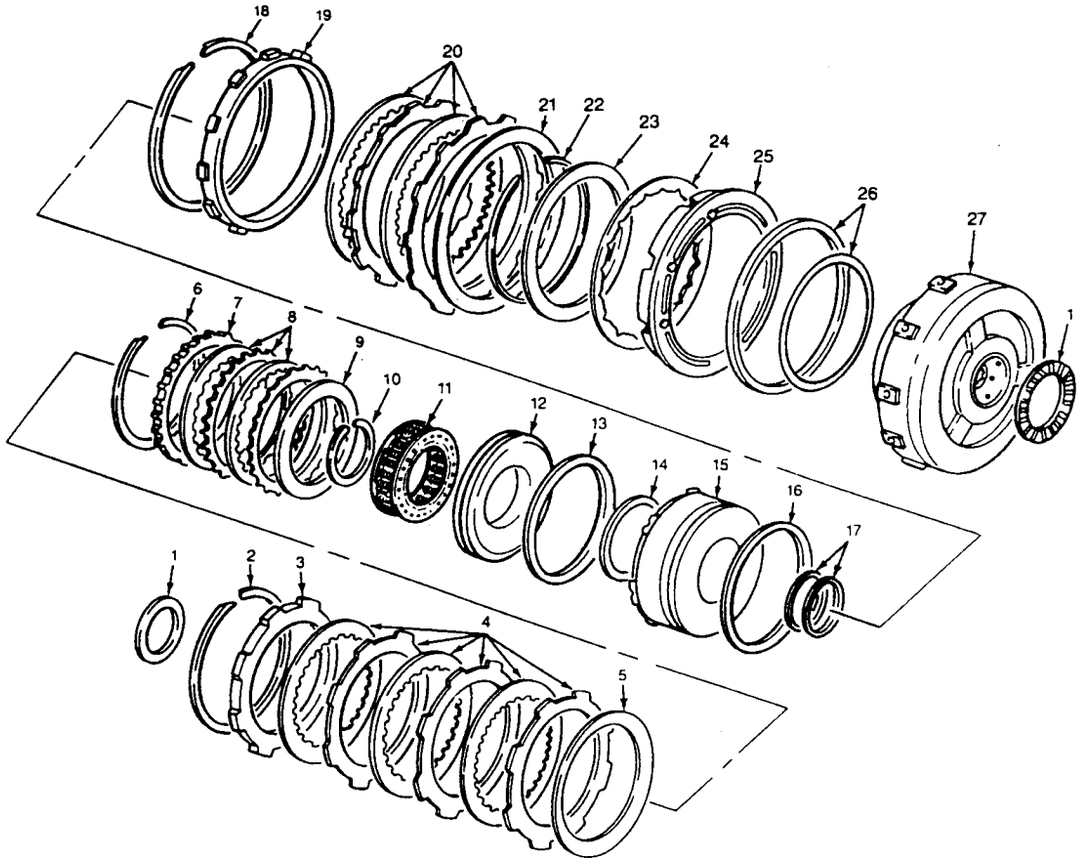
Assembly

1. Install the spacer onto the servo piston stem.
2. Install the new O-rings onto the servo piston and servo retainer. Apply a liberal coat of the appropriate ATF to the O-rings.
3. Install the servo piston onto the servo piston stem.
4. Install the clip onto the servo piston stem.
5. Install the servo retainer onto the servo piston.
6. Install the spring onto the servo piston stem.
7. Install the servo assembly into the transaxle housing as described in this Section.

   CAUTION: Verify that the 2-4 band and all related components have been installed properly.
8. Assemble the transaxle as explained in this Section.

DISASSEMBLY AND ASSEMBLY (Continued)

Forward, Coasting and Reverse Clutches



- FORWARD CLUTCH
1. NEEDLE BEARING
2. SNAP RING
3. PRESSURE PLATE
4. CLUTCH PACK
5. DISHED PLATE

- COASTING CLUTCH
6. SNAP RING
7. PRESSURE PLATE
8. CLUTCH PACK
9. DISHED PLATE
10. SNAP RING
11. RETURN SPRING AND RETAINERS
12. COASTING PISTON
13. OUTER SEAL
14. INNER SEAL
15. COASTING CLUTCH DRUM
16. OUTER SEAL
17. SEAL RINGS

- REVERSE CLUTCH
18. SNAP RING
19. PRESSURE PLATE
20. CLUTCH PACK
21. DISHED PLATE
22. SNAP RING
23. RETURN SPRING STOPPER
24. PISTON RETURN SPRING
25. REVERSE PISTON
26. SEAL RINGS
27. REVERSE AND FORWARD DRUM

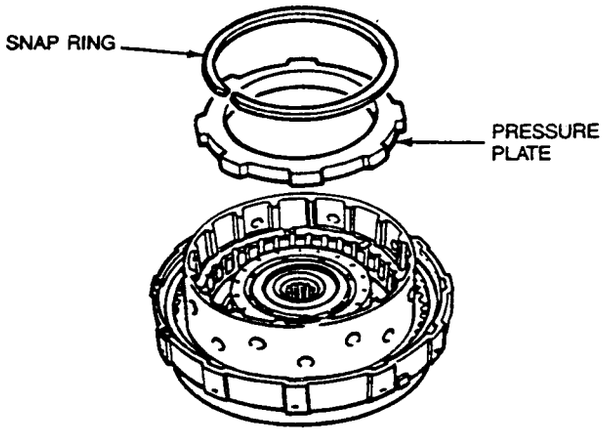
Forward Clutch

Disassembly

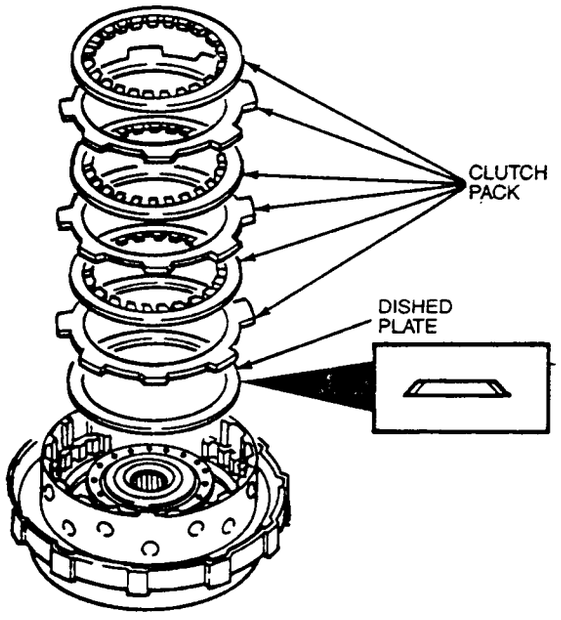
1. Remove the snap ring.

DISASSEMBLY AND ASSEMBLY (Continued)

2. Remove the pressure plate.

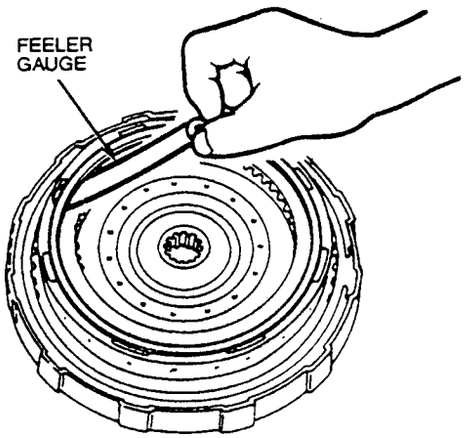


3. Remove the clutch pack.
4. Remove the dished plate.

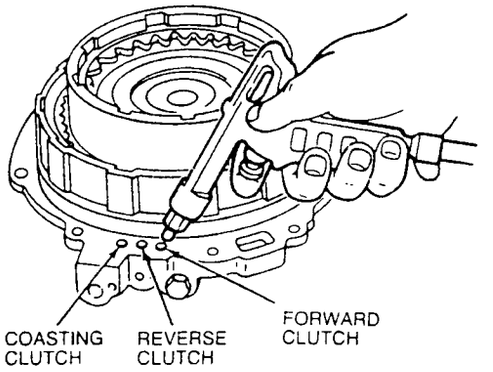


Assembly

1. Install the dished plate with the dished side face down.
2. Install the clutch pack starting with a steel disc next to the dished plate.
3. Install the pressure plate.
4. Install the snap ring.
5. Use a feeler gauge to measure the forward clutch pack clearance. Measure between the snap ring and the pressure plate. Allowable clearance is 1.0-1.2mm (0.040-0.047 inch). Choose the appropriate snap ring thickness.



6. Set the forward and reverse drum onto the oil pump. Check the forward clutch operation by applying a short burst of compressed air through the fluid passages. The air pressure should not exceed 392 kPa (57 psi).



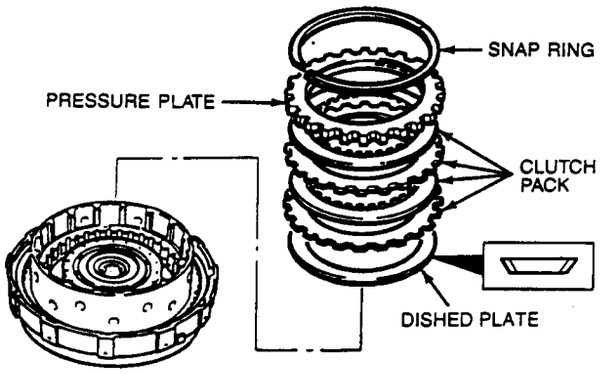
Coasting Clutch

Disassembly

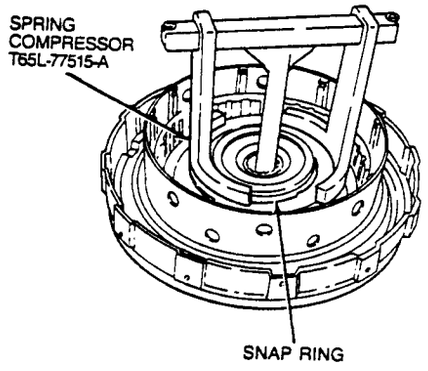
1. Remove the snap ring.
2. Remove the pressure plate.
3. Remove the coasting clutch pack.

DISASSEMBLY AND ASSEMBLY (Continued)

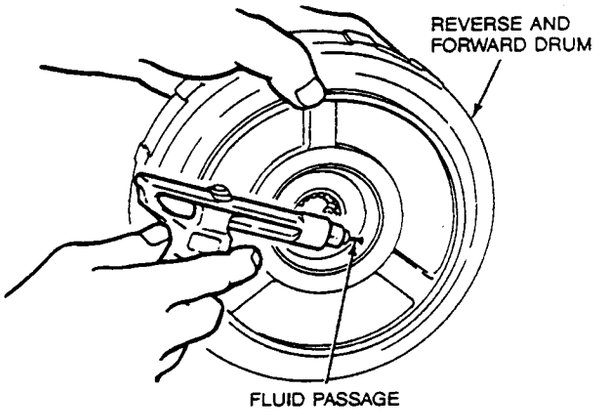
4. Remove the dished plate.



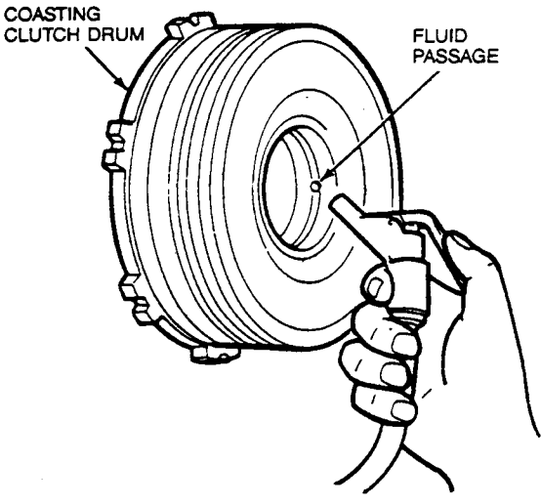
5. Install Spring Compressor T65L-77515-A or equivalent and compress the return spring and retainer.
6. Remove the snap ring.



7. Remove the spring compressor.
8. Remove the return spring retainer.
9. Remove the coasting clutch drum from the reverse and forward drum by applying compressed air through the fluid passage.



10. Remove the coasting clutch piston from the coasting clutch drum by applying compressed air through the fluid passages.

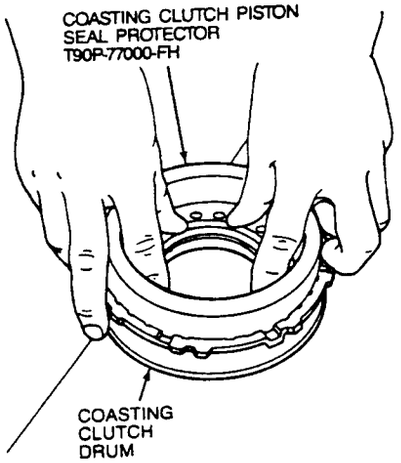


Assembly

1. Apply the specified transaxle fluid to the new seals and install them on the coasting piston.

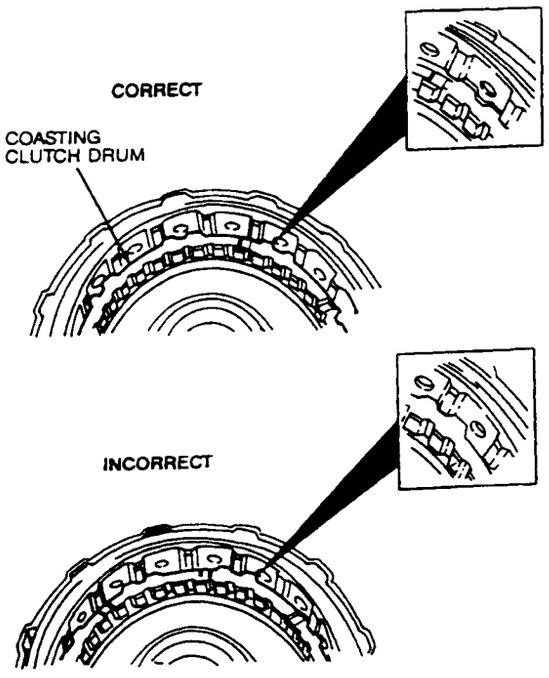
DISASSEMBLY AND ASSEMBLY (Continued)

2. Attach Coasting Clutch Piston Seal Protector T90P-77000-FH or equivalent to the coasting piston and install the coasting piston into the coasting clutch drum by pushing evenly around the circumference.

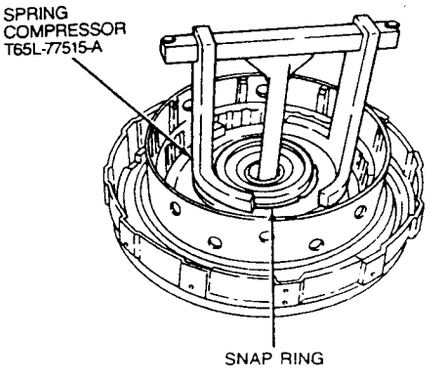


3. Apply the specified transaxle fluid to a new seal and install it on the coasting clutch drum.
4. Install the coasting clutch drum into the forward and reverse drum.

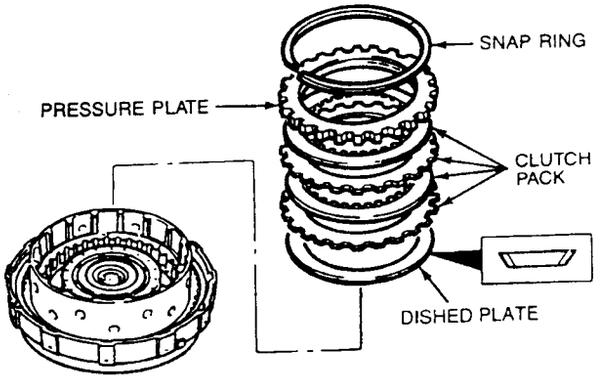
   NOTE: Install the coasting clutch drum so that the outer ridges are aligned as shown in the illustration.



5. Install the return spring retainer.
6. Install Spring Compressor T65L-77515-A or equivalent and compress the return spring and retainer.
7. Install the snap ring.



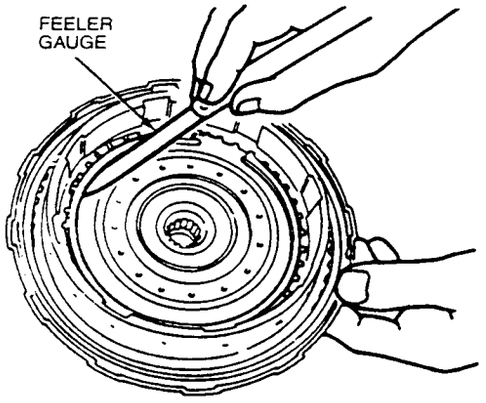
8. Remove the spring compressor.
9. Install the dished plate with the dished side upward.
10. Install the coasting clutch pack.
11. Install the pressure plate.
12. Install the snap ring.



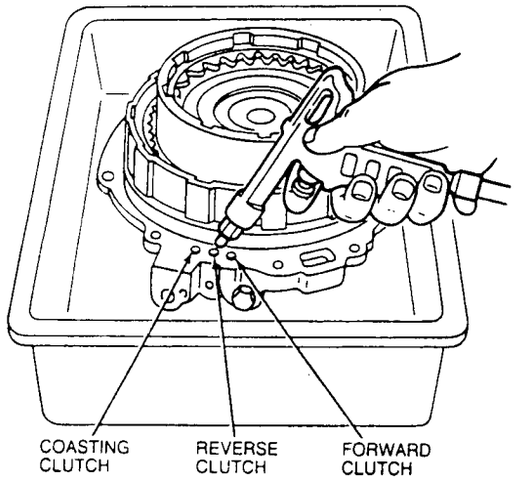
13. Use a feeler gauge to check the coasting clutch clearance. Measure between the snap ring and the pressure plate.

DISASSEMBLY AND ASSEMBLY (Continued)

If the clearance is not within 1.0-1.2mm (0.040-0.047 inch), adjust it by selecting an appropriate snap ring.



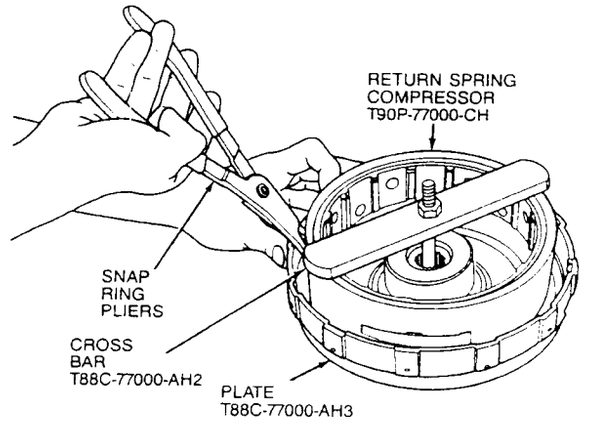
14. Position the clutch pack onto the pump.
15. Apply compressed air to the coasting clutch hole at the pump. The air pressure should not exceed 392 kPa (57 psi).



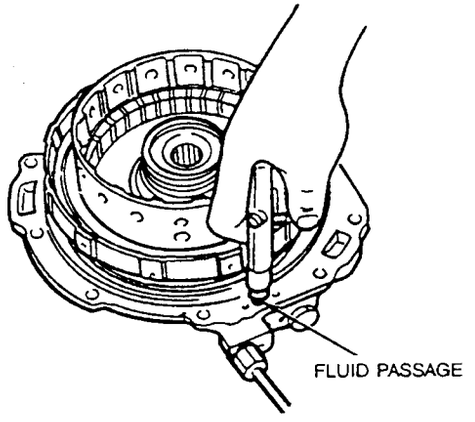
Reverse Clutch

Disassembly

1. Remove the snap ring.
2. Remove the pressure plate.
3. Remove the reverse clutch pack.
4. Remove the dished plate.
5. Compress the piston return spring using Return Spring Compressor T90P-77000-CH, Cross Bar T88C-77000-AH2, and Plate T88C-77000-AH3 or equivalents.
6. Remove one end of the snap ring from the groove with snap ring pliers. Once started, remove the snap ring with a screwdriver.



7. Remove the spring compressor, cross bar, and plate.
8. Place the clutch assembly on the oil pump.
9. Apply compressed air through the fluid passage to remove the reverse piston.

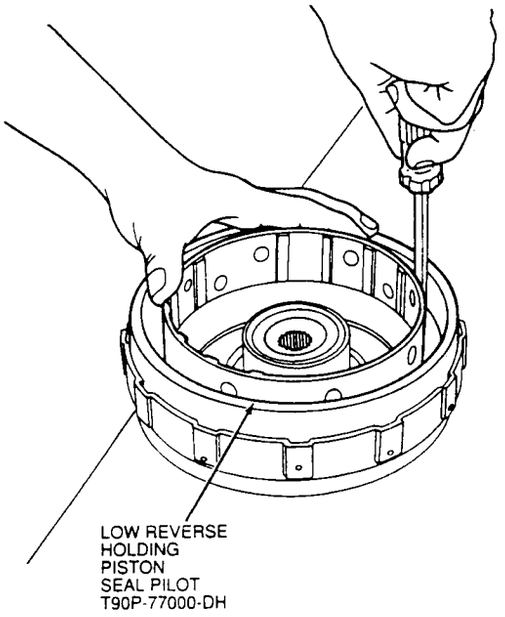


Assembly

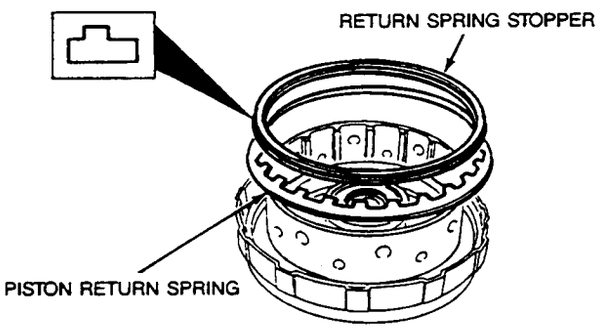
1. Apply the specified transaxle fluid to the inner and outer faces of new seals and install them on the reverse piston.

DISASSEMBLY AND ASSEMBLY (Continued)

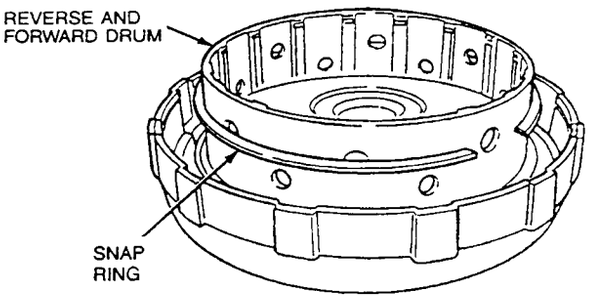
2. Attach Low Reverse Holding Piston Seal Pilot T90P-77000-DH or equivalent to the reverse piston. Install the reverse piston into the forward and reverse drum by pushing the piston evenly around its circumference. If necessary, use a screwdriver to seat the piston. Remove the seal pilot.



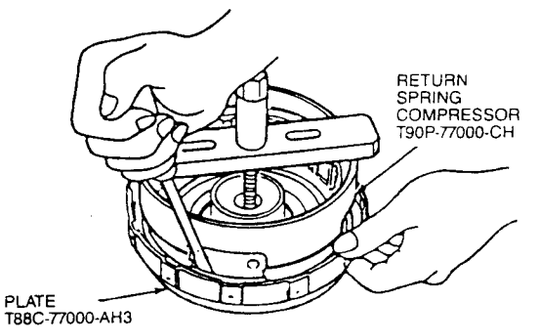
3. Install the new piston return spring with the tabs facing away from the reverse piston.
4. Install the return spring stopper with the step facing upwards.



5. Install the snap ring halfway down the forward and reverse drum.



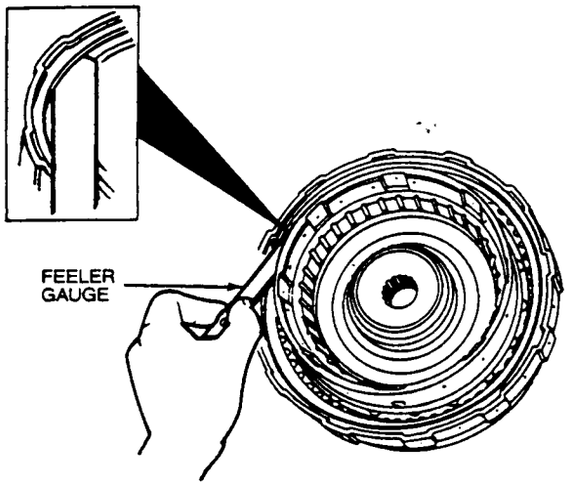
6. Compress the piston return spring using Return Spring Compressor T90P-77000-CH and Plate T88C-77000-AH3 or equivalents.
7. Install the snap ring with a screwdriver.

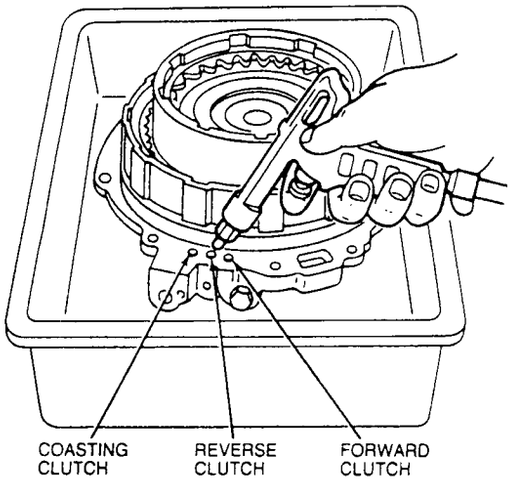


8. Remove the spring compressor and plate. Install the dished plate with the beveled side facing upward.
9. Install the reverse clutch pack.
10. Install the pressure plate with the step facing down.
11. Install the snap ring.

12. Use a feeler gauge to check the reverse clutch clearance. Measure between the snap ring and the pressure plate. If the clearance is not within 1.0-1.3mm (0.040-0.051 inch), adjust it by selecting an appropriate snap ring.

DISASSEMBLY AND ASSEMBLY (Continued)

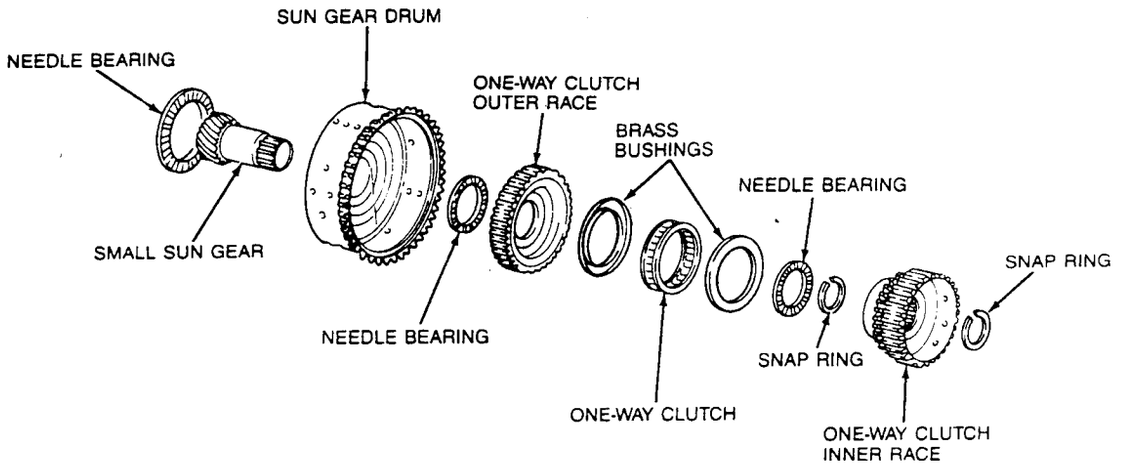




13. Position the clutch onto the pump.
14. Check the clutch pack operation by applying compressed air through the pump housing. The air pressure should not exceed 392 kPa (57 psi).

Small Sun Gear and One-Way Clutch

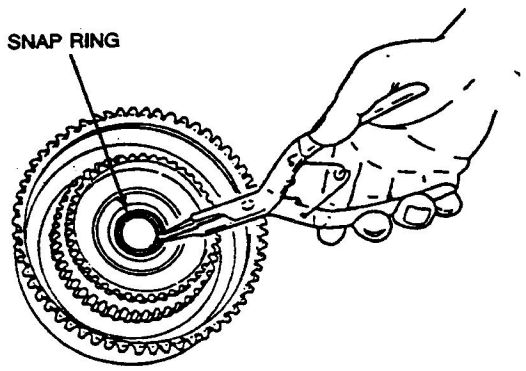
Disassembly



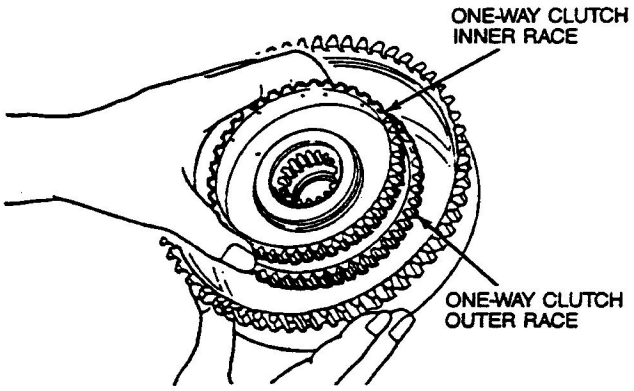
1. Remove the needle bearing from the sun gear drum.

DISASSEMBLY AND ASSEMBLY (Continued)

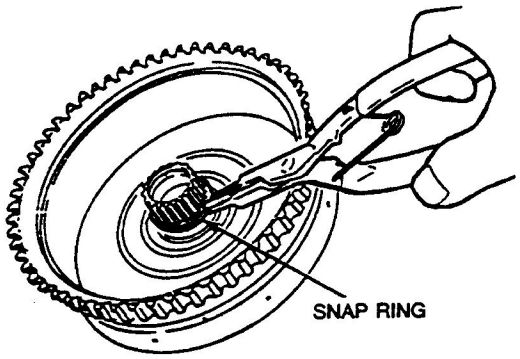
2. Remove the snap ring.



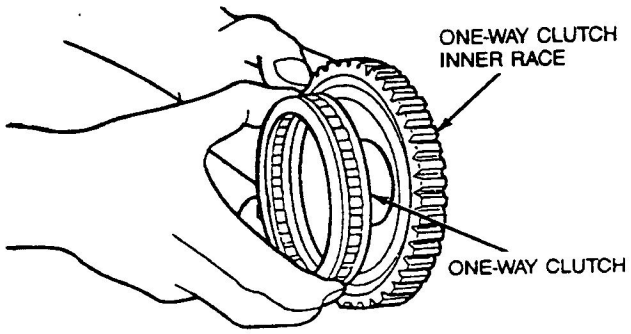
3. Remove the one-way clutch inner and outer race as an assembly.



4. Remove the needle bearing.
5. Remove the snap ring securing the small sun gear to the sun gear drum.



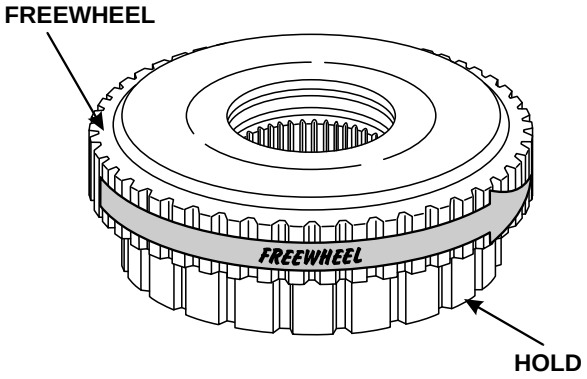
6. Remove the small sun gear from the sun gear drum.
7. Separate the inner race from the outer race.
8. Remove the needle bearing.
9. Remove the one-way clutch.
10. Remove the inner race brass bushing.
11. Remover the outer race brass bushing.



Assembly

1. Install the outer race brass bushing.
2. Install the inner race brass bushing.
3. Install the one-way clutch and needle bearing into the outer race.
4. Attach the inner race to the outer race.

THE FORWARD CLUTCH HUB MUST FREEWHEEL COUNTER CLOCKWISE AND LOCK CLOCKWISE WHEN HOLDING THE OVERRUN CLUTCH HUB

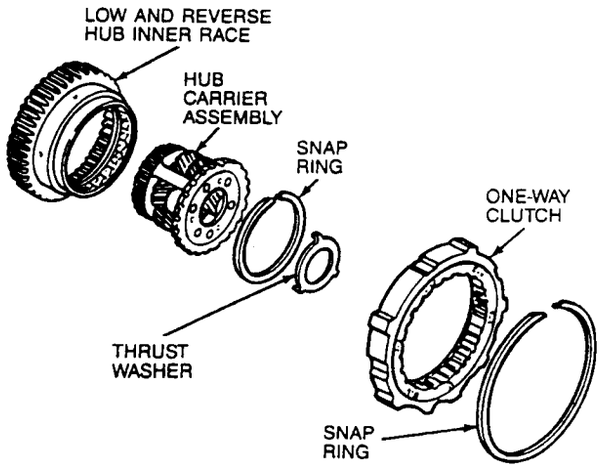


5. Position the small sun gear into the sun gear drum.
6. Install the snap ring.
7. Using petroleum jelly, position the needle bearing into the sun gear drum.
8. Install the one-way clutch inner and outer races.
9. Install the snap ring.
10. Using petroleum jelly, position the needle bearing onto the sun gear drum.

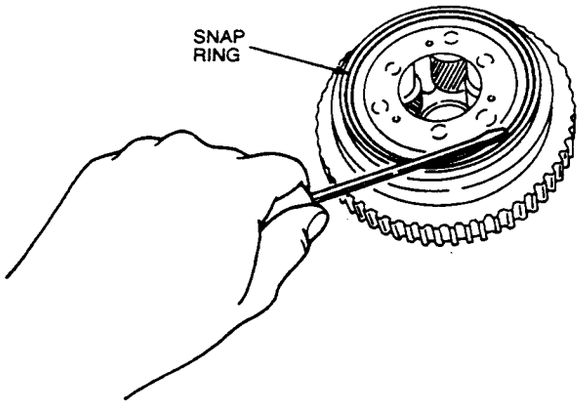
DISASSEMBLY AND ASSEMBLY (Continued)

One-Way Clutch and Planetary Carrier Assembly

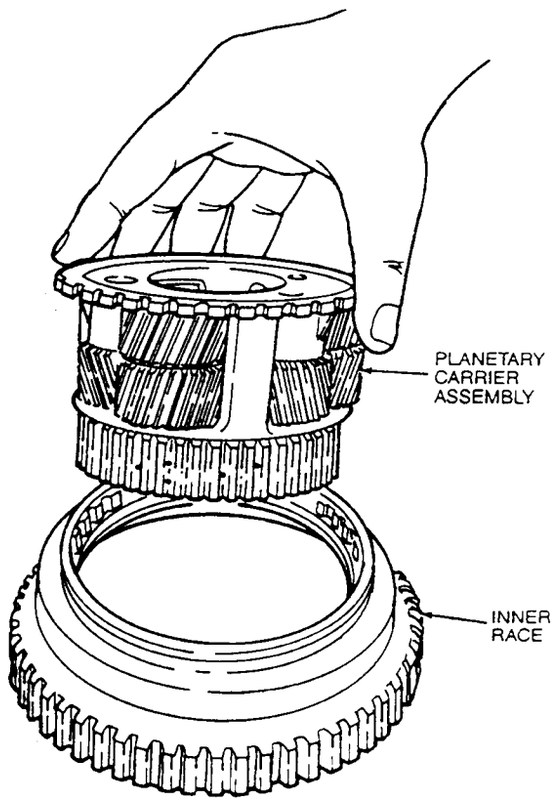
Disassembly



1. Remove the one-way clutch.
2. Remove the thrust washer.
3. Remove the snap ring.

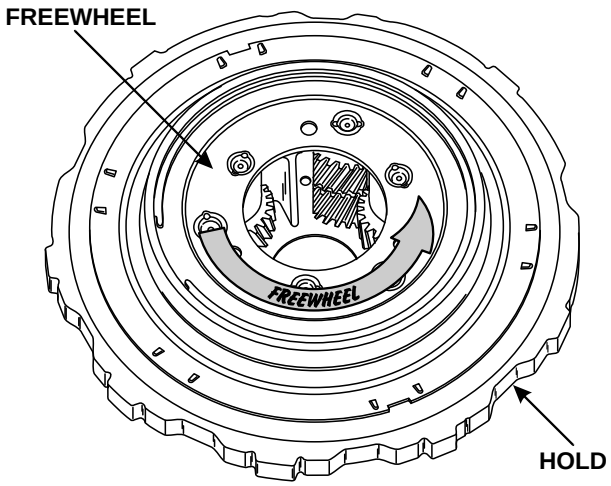


4. Remove the planetary carrier assembly from the inner race.



DISASSEMBLY AND ASSEMBLY (Continued)

PLANETARY CARRIER MUST FREEWHEEL COUNTER CLOCKWISE AND LOCK CLOCKWISE, WHEN ROLLER CLUTCH IS HELD STATIONARY

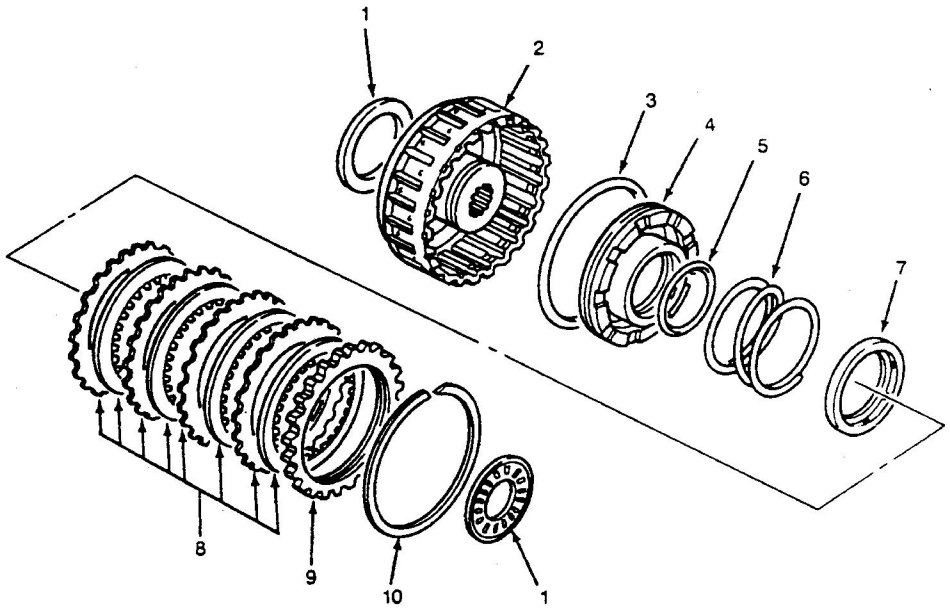


Assembly

1. Assemble the planetary carrier assembly to the inner race.
2. Install the snap ring.
3. Apply petroleum jelly to the thrust washer and install it on the planetary carrier assembly. The thrust washer outer diameter for the sun gear drum side should be 84.0mm (3.307 inch).
4. Install the one-way clutch.

3-4 Clutch

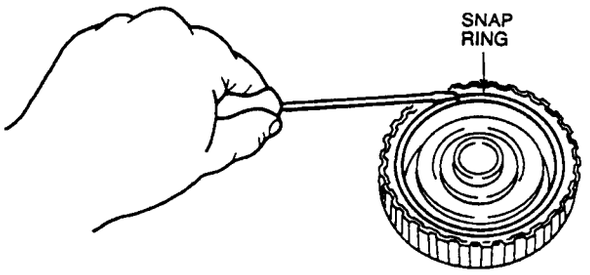
Disassembly



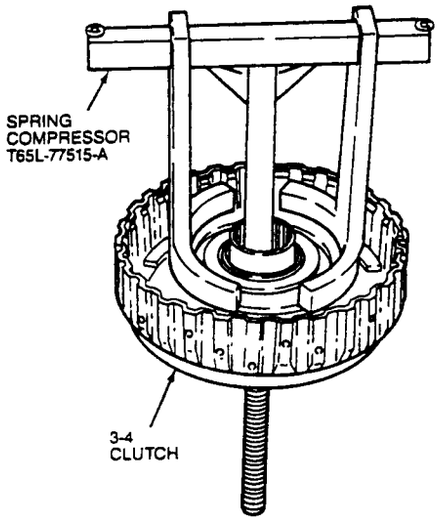
1. BEARING
2. 3-4 CLUTCH DRUM
3. OUTER SEAL
4. 3-4 CLUTCH PISTON
5. INNER SEAL
6. RETURN SPRING
7. SPRING RETAINER
8. CLUTCH PACK
9. PRESSURE PLATE
10. SNAP RING

DISASSEMBLY AND ASSEMBLY (Continued)

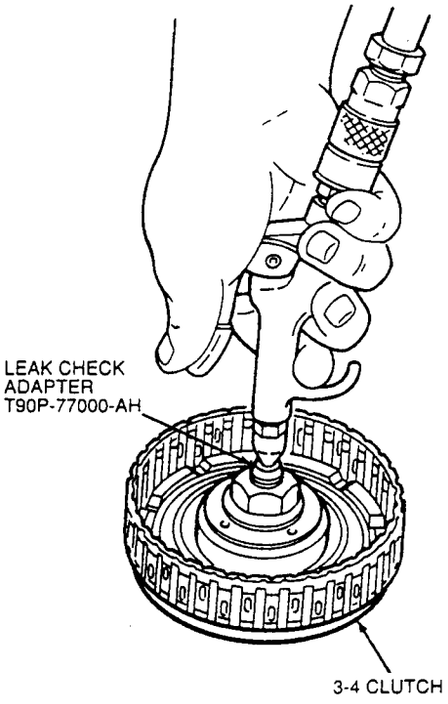
1. Remove the needle bearings.
2. Remove the snap ring.



3. Remove the pressure plate.
4. Remove the 3-4 clutch pack.
5. Install Spring Compressor T65L-77515-A or equivalent and compress the return spring and spring retainer.



6. Remove the snap ring.
7. Remove the spring compressor.
8. Remove the return spring and spring retainer.
9. Remove the 3-4 clutch piston using compressed air applied through Leak Check Adapter T90P-77000-AH or equivalent.



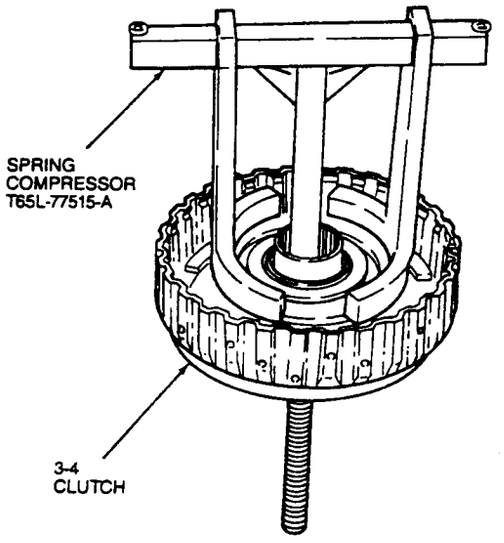
10. Remove the inner and outer seals from the 3-4 clutch piston.

Assembly

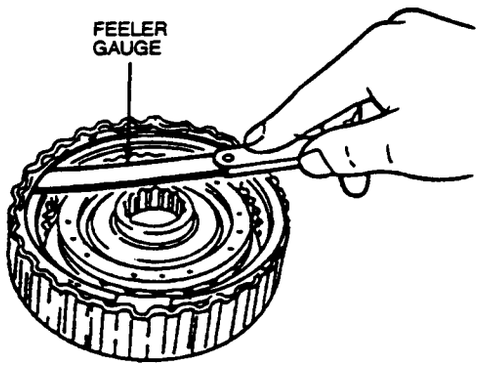
1. Apply the specified transaxle fluid to the inner and outer seals and install them onto the 3-4 clutch piston.
2. Install the 3-4 clutch piston by pushing evenly around the circumference.
3. Install the return spring and spring retainer.

DISASSEMBLY AND ASSEMBLY (Continued)

4. Install Spring Compressor T65L-77515-A or equivalent and compress the return spring and spring retainer.

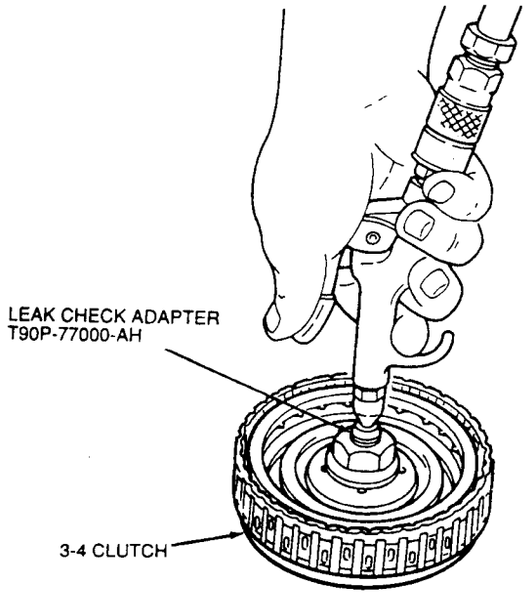


5. Install the snap ring.
6. Remove the clutch spring compressor.
7. Install the 3-4 clutch pack.
8. Install the pressure plate with the step facing upward.
9. Install the snap ring.
10. Use a feeler gauge to check the 3-4 clutch clearance. Measure between the snap ring and the pressure plate.



If the clearance is not within 1.3-1.6mm (0.051-0.063 inch), adjust it by selecting a proper snap ring.

11. Apply petroleum jelly to the needle bearings and install them on the 3-4 clutch. The outer diameter is 56.1mm (2.21 inch) for the planetary carrier side, and 72.1mm (2.84 inch) for the output shell side.
12. Install Leak Check Adapter T90P-77000-AH or equivalent and apply compressed air to check the clutch operation.



CAUTION: Do not apply over 392 kPa (57 psi) of air pressure.

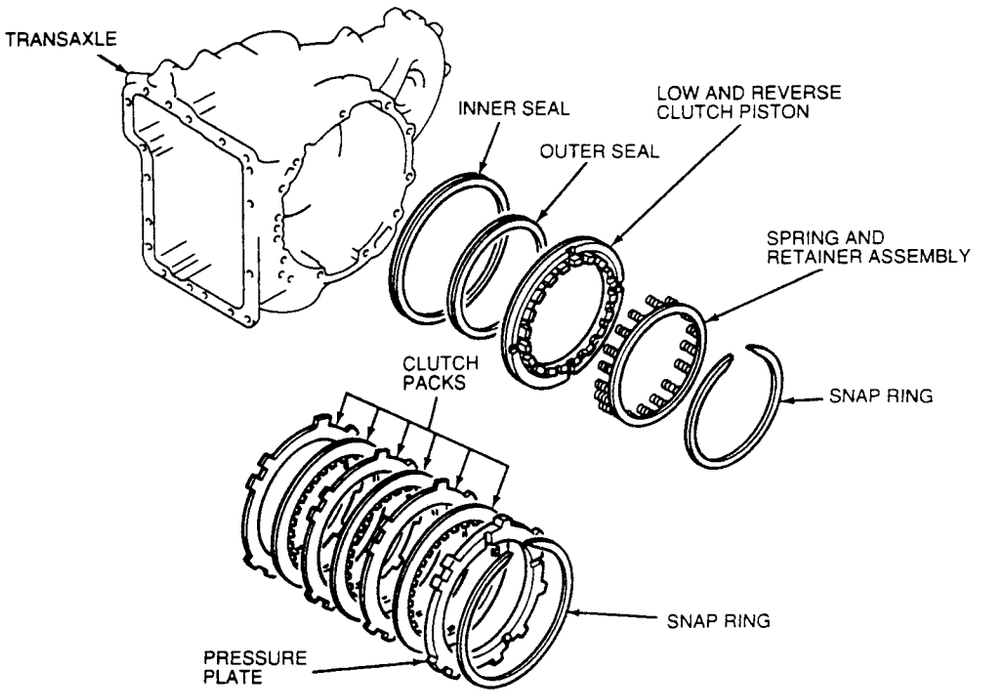
13. Pour the specified transaxle fluid into the clutch drum so the 3-4 clutch piston is fully submerged. Apply compressed air to check that no bubbles come from the clutch piston seal.

CAUTION: Do not apply over 392 kPa (57 psi) of air pressure. Do not apply the air pressure for more than three seconds.

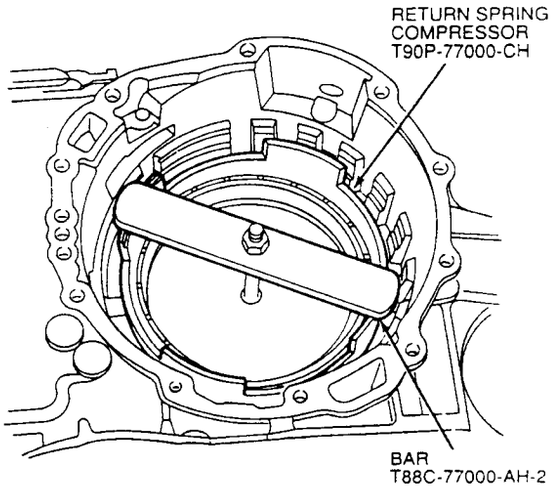
DISASSEMBLY AND ASSEMBLY (Continued)

Low and Reverse Clutch

Disassembly



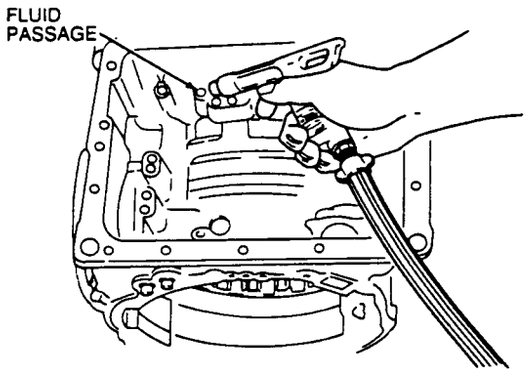
1. Refer to the transaxle disassembly procedures to gain access to the low and reverse clutch.
2. Remove the snap ring.
3. Remove the pressure plate.
4. Remove the low and reverse clutch pack.
5. Place Step Plate T88C-77000-AH-3 on the bottom of the transaxle case.
6. Position Return Spring Compressor T90P-77000-CH on the spring and retainer assembly, then install Bar T88C-77000-AH-2 on the compressor.



7. Compress the spring and remove the snap ring.
8. Remove the spring and retainer assembly.

DISASSEMBLY AND ASSEMBLY (Continued)

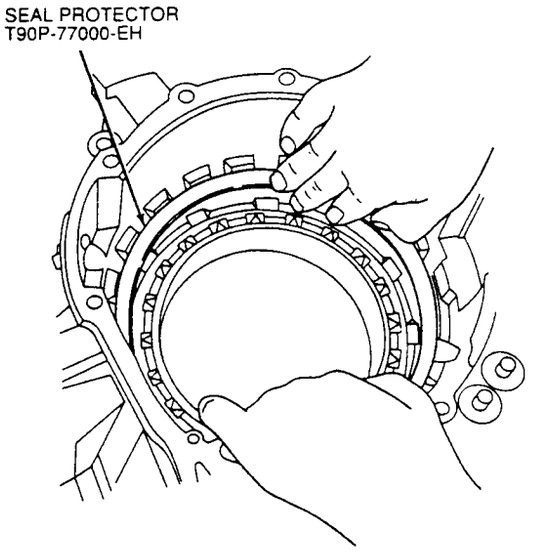
9. Apply compressed air through the fluid passage and remove the low and reverse clutch piston.



10. Remove the low and reverse clutch piston inner and outer seals.

Assembly

1. Install new inner and outer seals onto the low and reverse clutch piston.
2. Attach Seal Protector T90P-77000-EH to the low and reverse clutch piston and install the piston into the forward drum.



3. Install the spring and retainer assembly.
4. Place Step Plate T88C-77000-AH-3 on the bottom of the transaxle case.
5. Install Return Spring Compressor T90P-77000-CH and Bar T88C-77000-AH-2.
6. Compress the spring and install the snap ring.
7. Install the low and reverse clutch pack.
8. Install the pressure plate.
9. Install the snap ring.
10. Assemble the remaining transaxle components. Refer to the transaxle assembly procedures explained earlier in this Section.

Accumulators

Disassembly

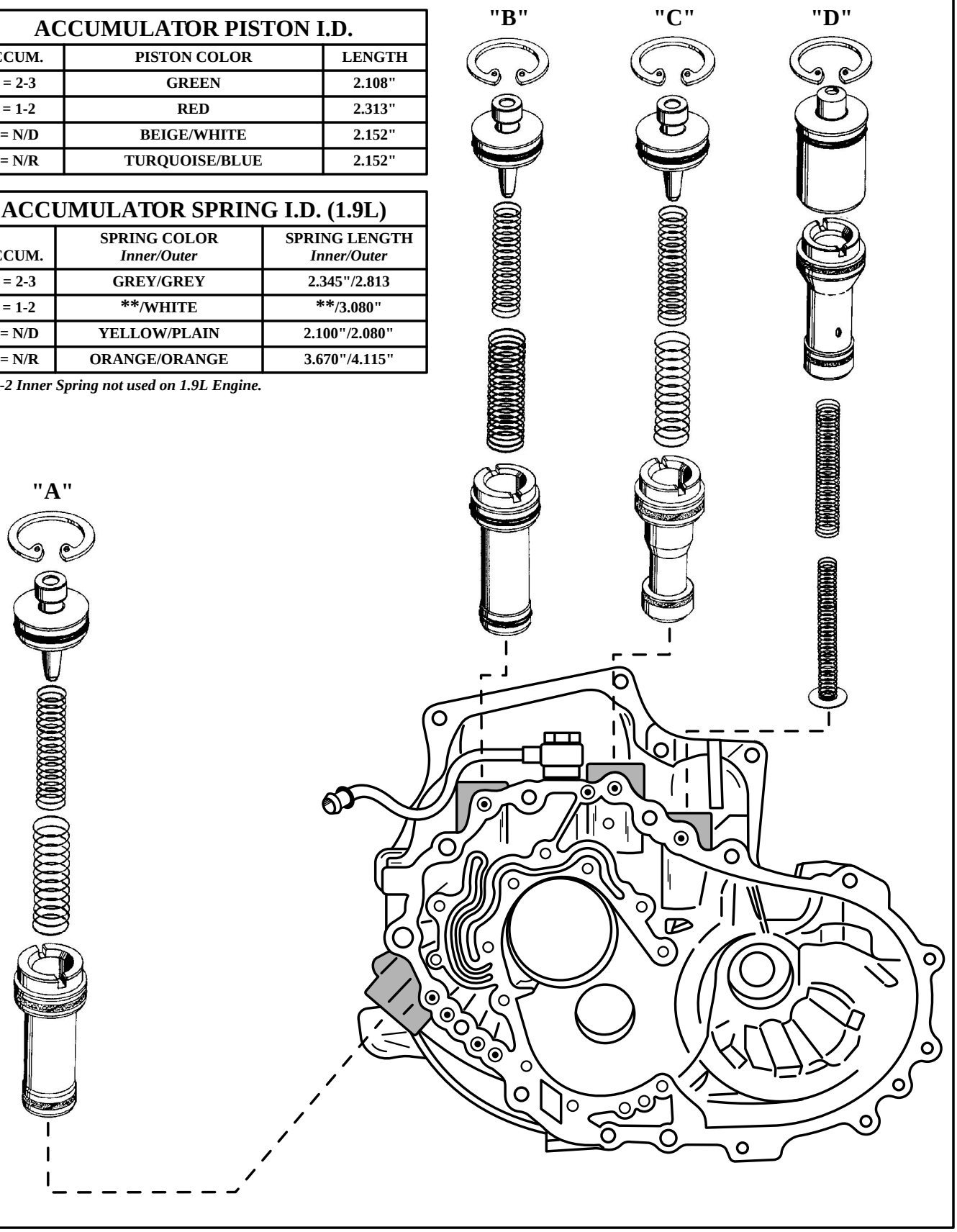
Remove the accumulator snap rings, pistons and springs from their bores by applying compressed air through the oil passages. Refer to the following illustrations and chart for the location of specific accumulators and components.

DISASSEMBLY AND ASSEMBLY (Continued)

ACCUMULATOR PISTON I.D.		
ACCUM.	PISTON COLOR	LENGTH
"A" = 2-3	GREEN	2.108"
"B" = 1-2	RED	2.313"
"C" = N/D	BEIGE/WHITE	2.152"
"D" = N/R	TURQUOISE/BLUE	2.152"

ACCUMULATOR SPRING I.D. (1.9L)		
ACCUM.	SPRING COLOR *Inner/Outer*	SPRING LENGTH *Inner/Outer*
"A" = 2-3	GREY/GREY	2.345"/2.813
"B" = 1-2	**/WHITE	**/3.080"
"C" = N/D	YELLOW/PLAIN	2.100"/2.080"
"D" = N/R	ORANGE/ORANGE	3.670"/4.115"

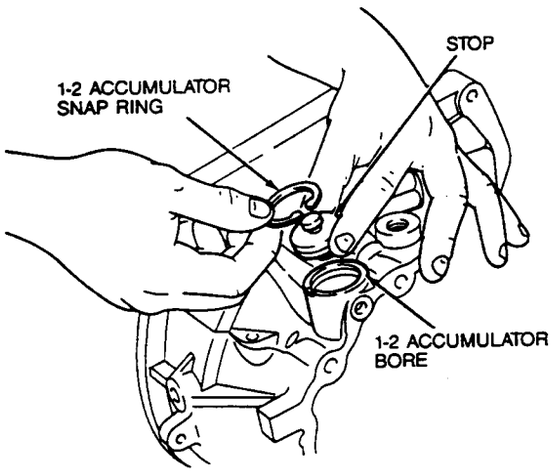
******* 1-2 Inner Spring not used on 1.9L Engine.*

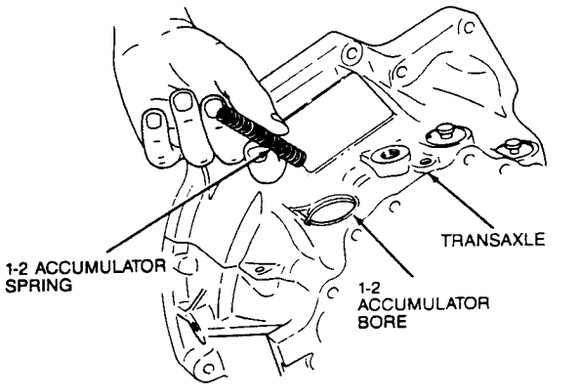


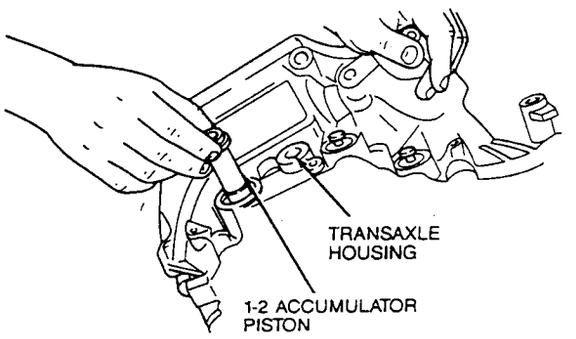
DISASSEMBLY AND ASSEMBLY (Continued)

Assembly

Install the springs, accumulators, and snap rings into their proper bores in the transaxle housing.



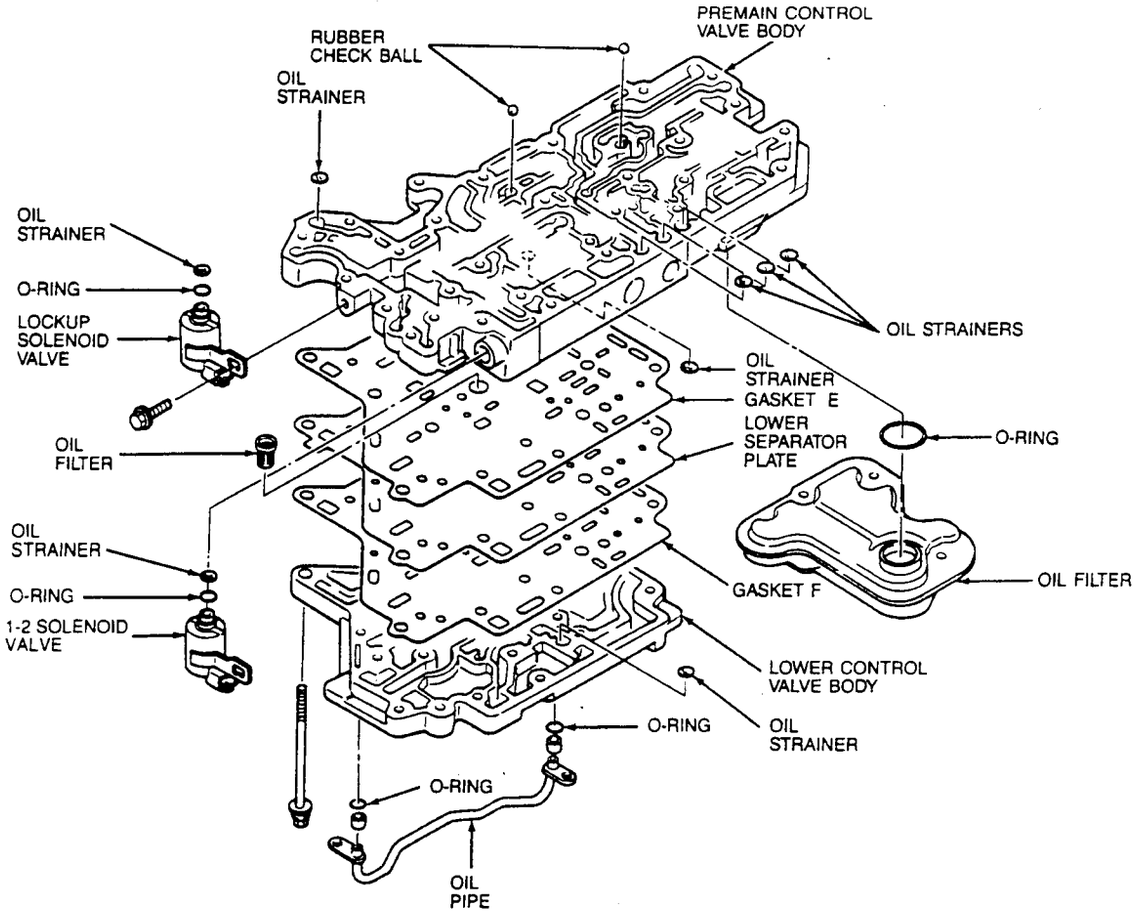




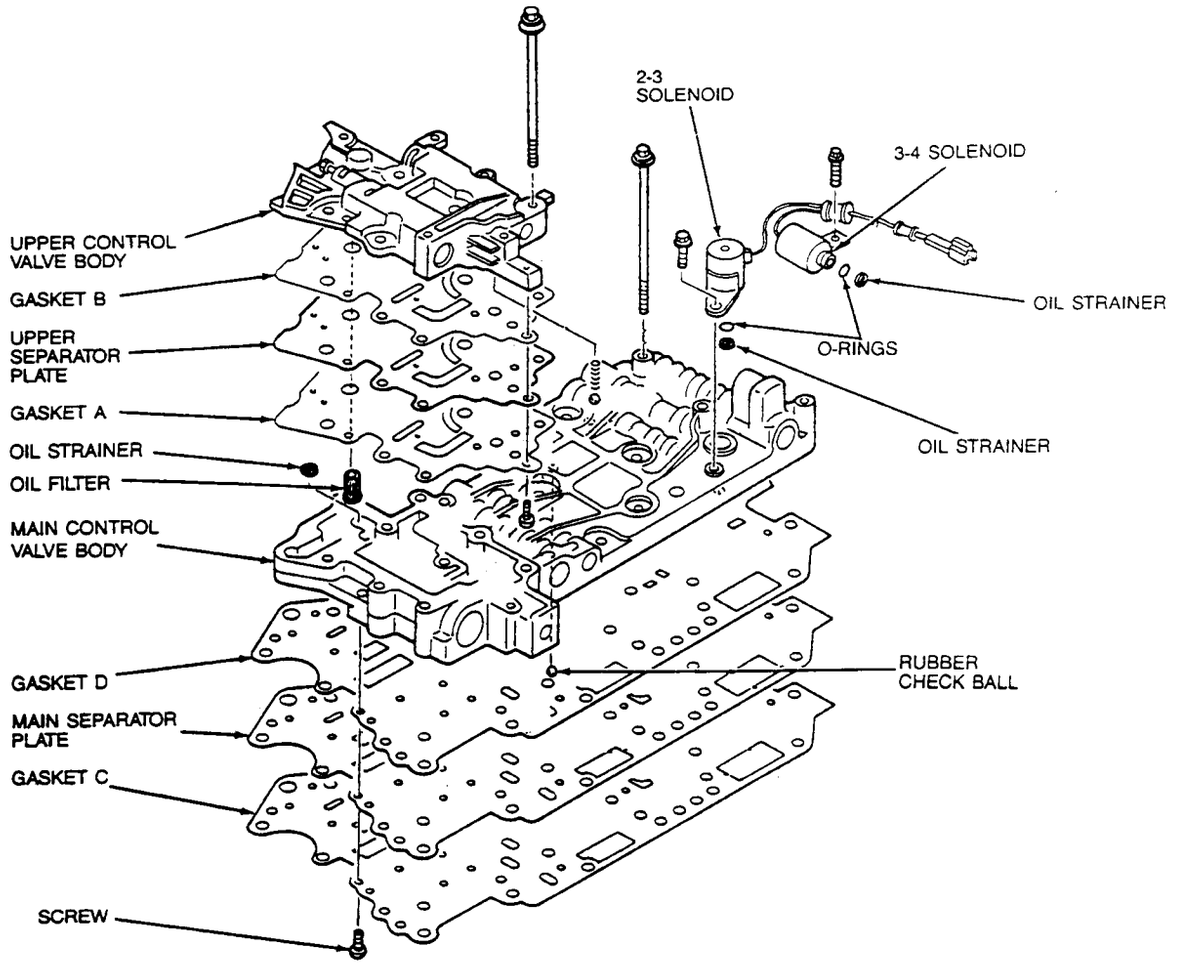
DISASSEMBLY AND ASSEMBLY (Continued)

Valve Body

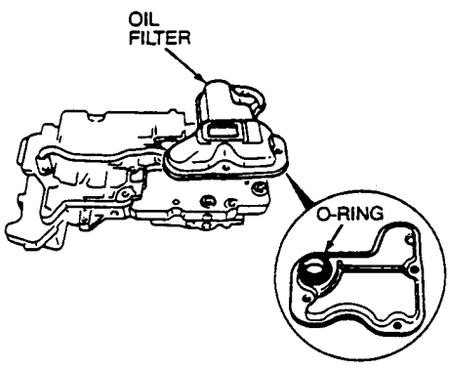
Disassembly



DISASSEMBLY AND ASSEMBLY (Continued)



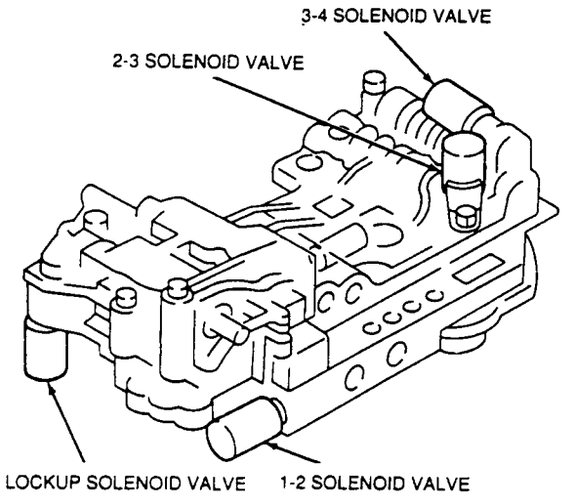
1. Remove the oil filter.
2. Remove the O-ring from the oil filter.



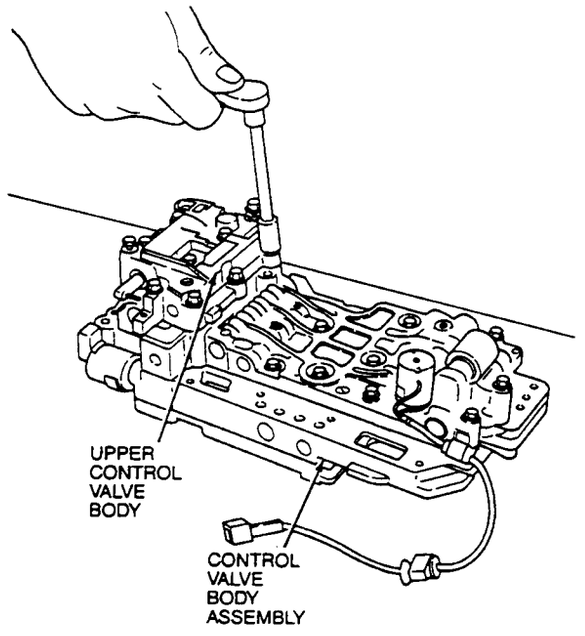
3. Remove the oil pipe assembly.
4. Remove the O-rings from the oil pipe assembly.
5. Remove the 1-2 solenoid valve and the oil strainer.
6. Remove the lockup solenoid valve and the oil strainer.

DISASSEMBLY AND ASSEMBLY (Continued)

7. Remove the 2-3 and 3-4 solenoid valves and oil strainers.

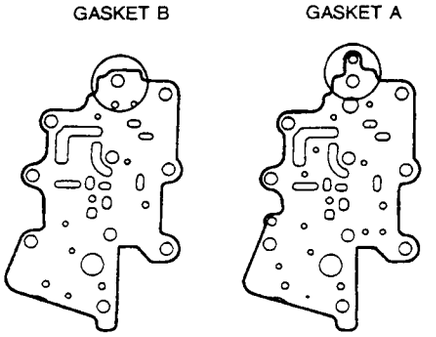


8. Remove the upper control valve body.

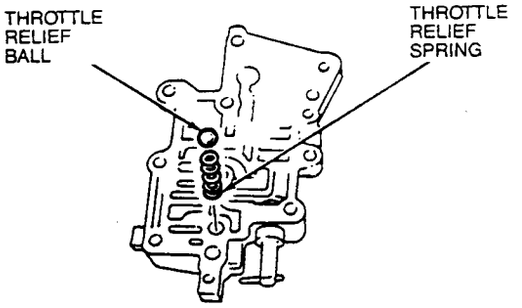


9. Remove the screws.

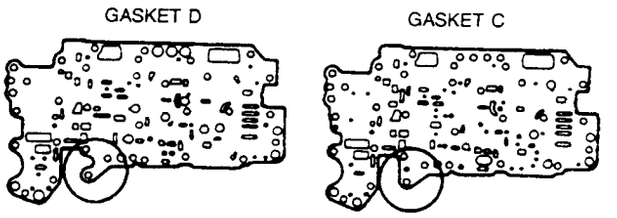
10. Remove gasket B, upper separator plate, oil filter, and gasket A.



11. Remove the throttle relief ball and the throttle relief spring from the upper valve body.

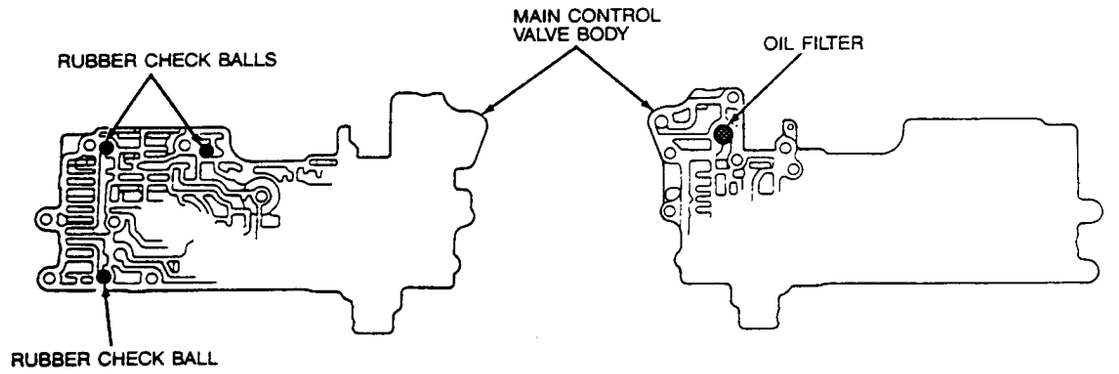


12. Remove the main control valve body.
13. Remove the screws.
14. Remove gasket D, the main separator plate, and gasket C.

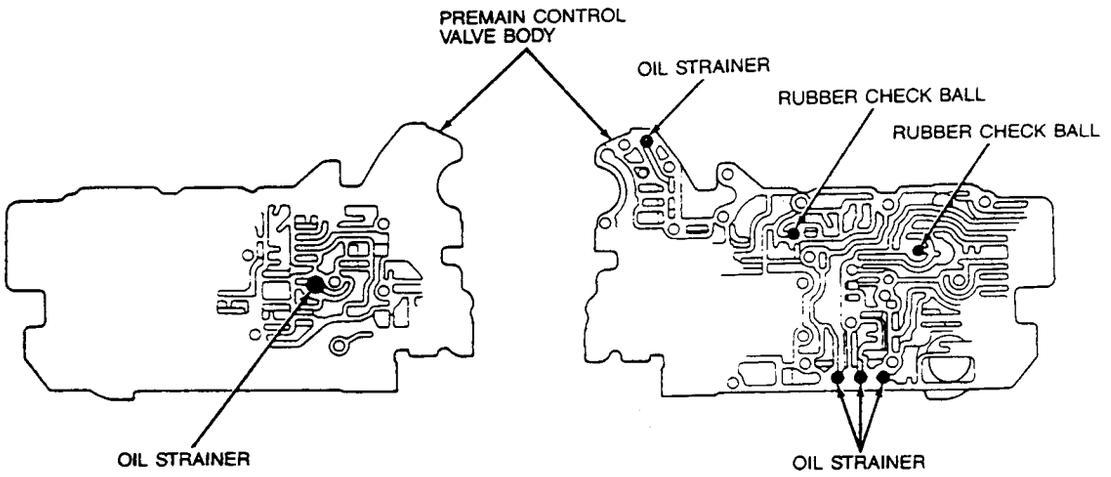


15. Remove the rubber check balls from the main control valve body.

DISASSEMBLY AND ASSEMBLY (Continued)

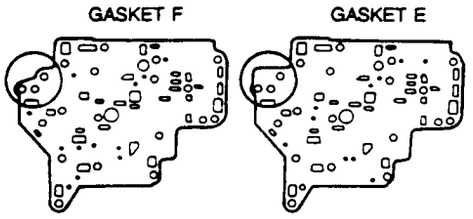


16. Remove the rubber check ball and oil strainer from the premain control valve body.

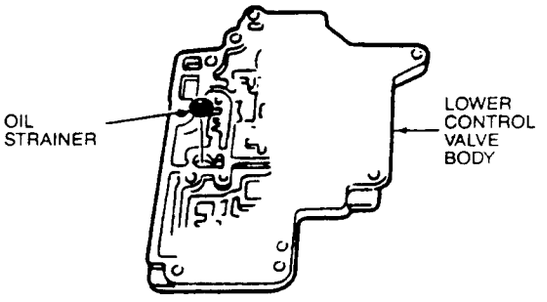


DISASSEMBLY AND ASSEMBLY (Continued)

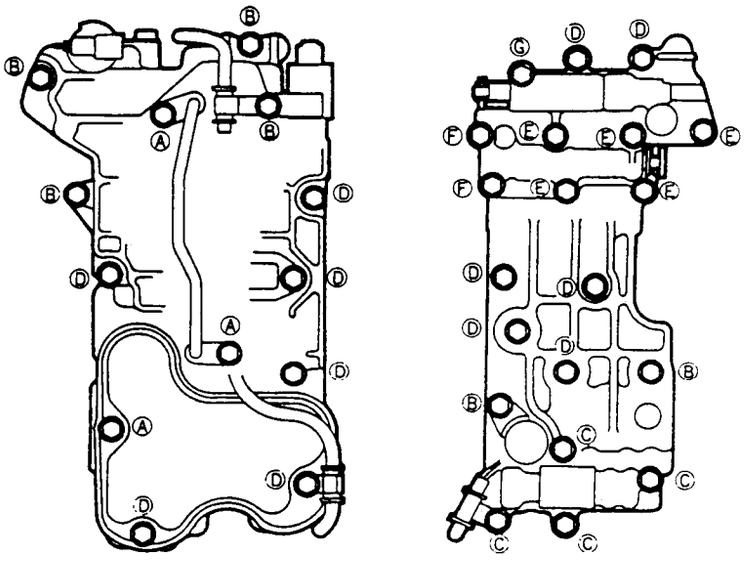
17. Remove the premain control valve body.
18. Remove gasket E, lower separator plate, oil filter, and gasket F.



19. Remove the oil strainer from the lower control valve body.



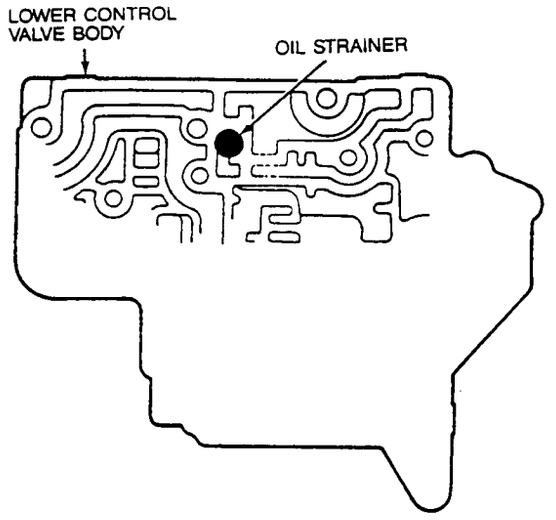
Assembly



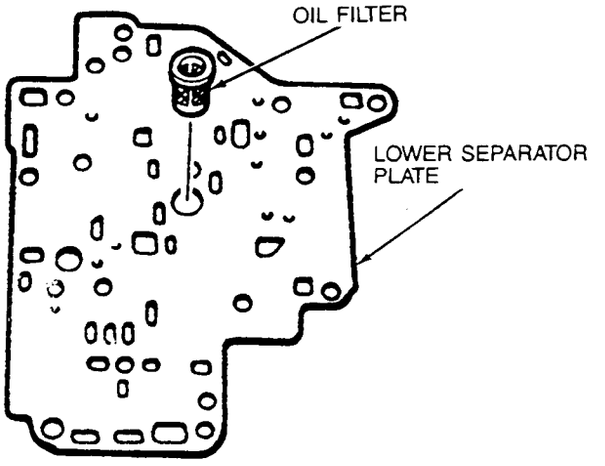
Identification mark	Bolt	Length mm (in)	Tightening torque N·m (cm-kg, in-lb)
A		14 (0.551)	7.8—11 N·m (69-95 lb-in)
B		30 (1.181)	
C		40 (1.575)	
D		50 (1.969)	
E		82 (3.228)	
F		90 (3.543)	
G		95 (3.740)	

DISASSEMBLY AND ASSEMBLY (Continued)

1. Install the oil strainer into the lower control valve body.

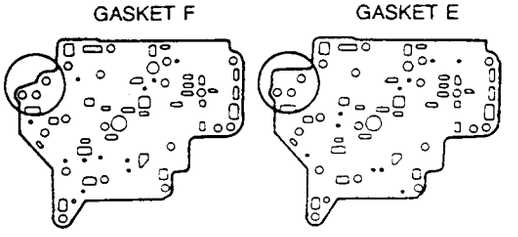


2. Set the oil filter into the lower separator plate.



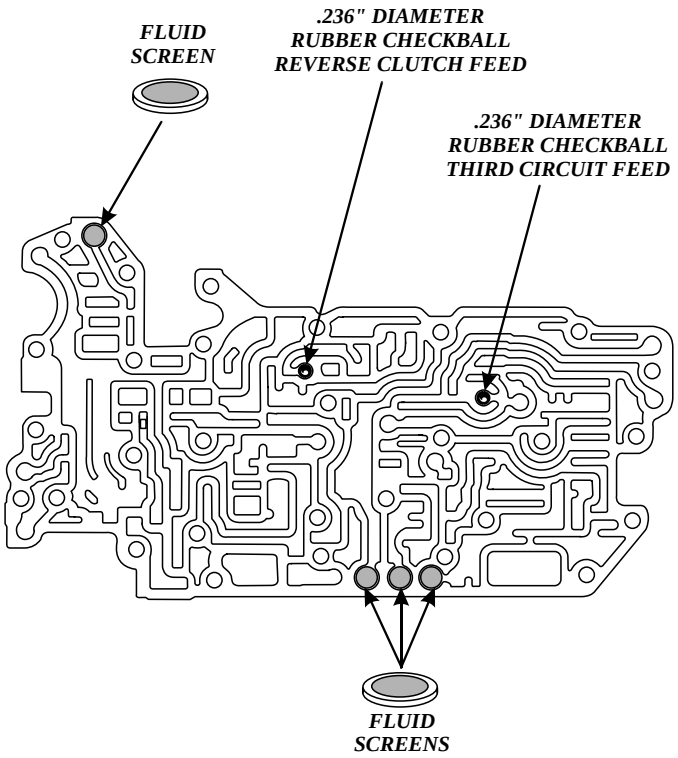
CAUTION: Do not confuse gasket F with gasket E.

3. Set the new gasket F, the lower separator plate, and the new gasket E onto the lower valve body.

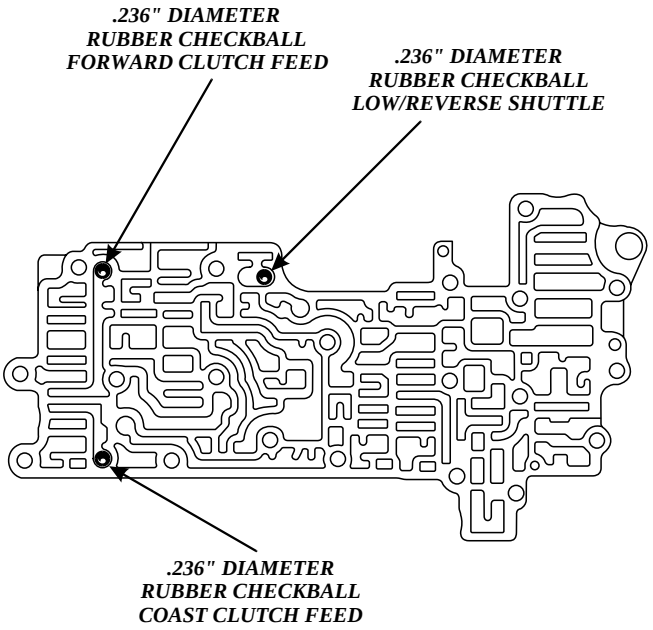


4. Set the premain control valve body onto the lower valve body.

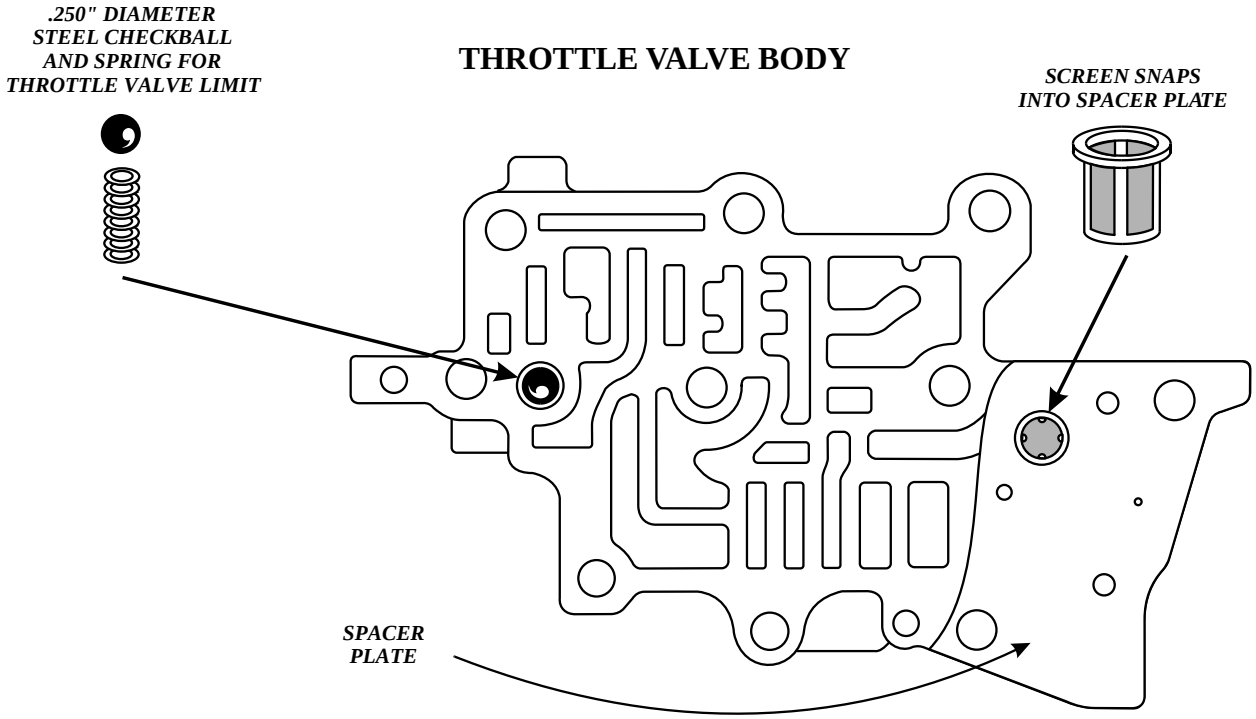
PREMAIN VALVE BODY



MAIN VALVE BODY



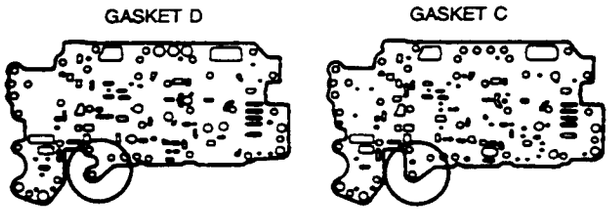
THROTTLE VALVE BODY



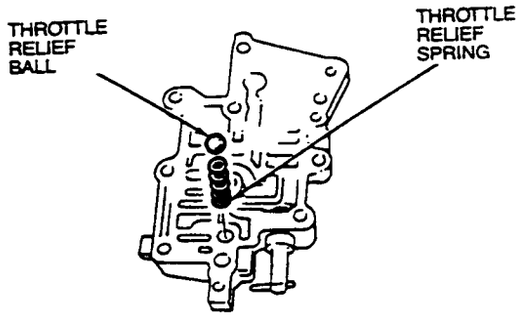
Copyright © 2003 ATSG

DISASSEMBLY AND ASSEMBLY (Continued)

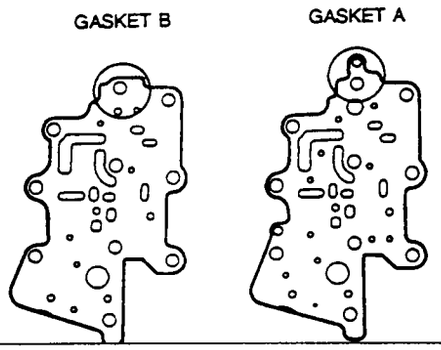
CAUTION: Do not confuse gasket C with gasket D.



7. Set the new gasket C, the main separator plate, and the new gasket D onto the main control valve body.
8. Secure the plate and gaskets to the valve body with the two screws.
9. Set the main control valve body onto the premain control valve body. Match the bolt head letters.
10. Finger tighten the bolts.
11. Install the throttle relief spring and the throttle relief ball into their proper position in the upper control valve body.
12. Position the oil filter into the upper separator plate.

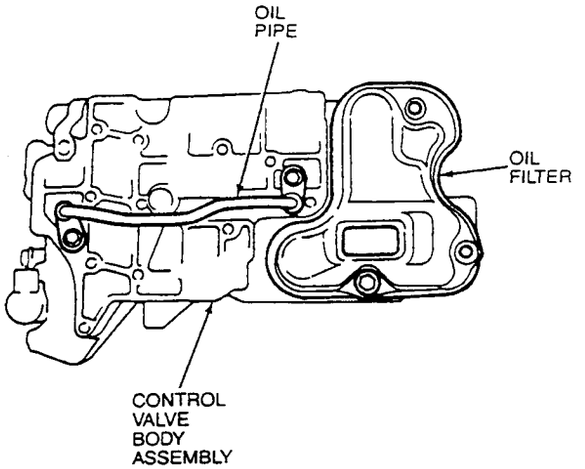


CAUTION: Do not confuse gasket A with gasket B.



13. Set the new gasket A, the upper separator plate, and the new gasket B onto the main control valve body.
14. Secure the gaskets and plate with two screws.
15. Position the upper control valve body onto the main control valve body.

    NOTE: Align the throttle plug assembly groove and the bolt hole of the upper valve body.
16. Install the bolts. Match the bolt letter head. Finger tighten the bolts.
17. Install the 2-3 and 3-4 solenoid valves, oil strainers, and bracket.
18. Tighten the mounting bolts to 8-11 N·m (69-95 lb-in).
19. Install the lockup solenoid and oil strainer. Tighten the bolts to 8-11 N·m (69-95 lb-in).
20. Install the 1-2 solenoid valve onto the upper valve body.
21. Apply automatic transaxle fluid to the new O-rings and install them onto the oil pipe assembly.
22. Install the oil pipe assembly. Tighten the bolts to 8-11 N·m (69-95 lb-in).
23. Apply automatic transaxle fluid to the O-ring and install it onto the oil filter assembly.
24. Install the oil filter assembly. Tighten the bolts to 8-11 N·m (69-95 lb-in).



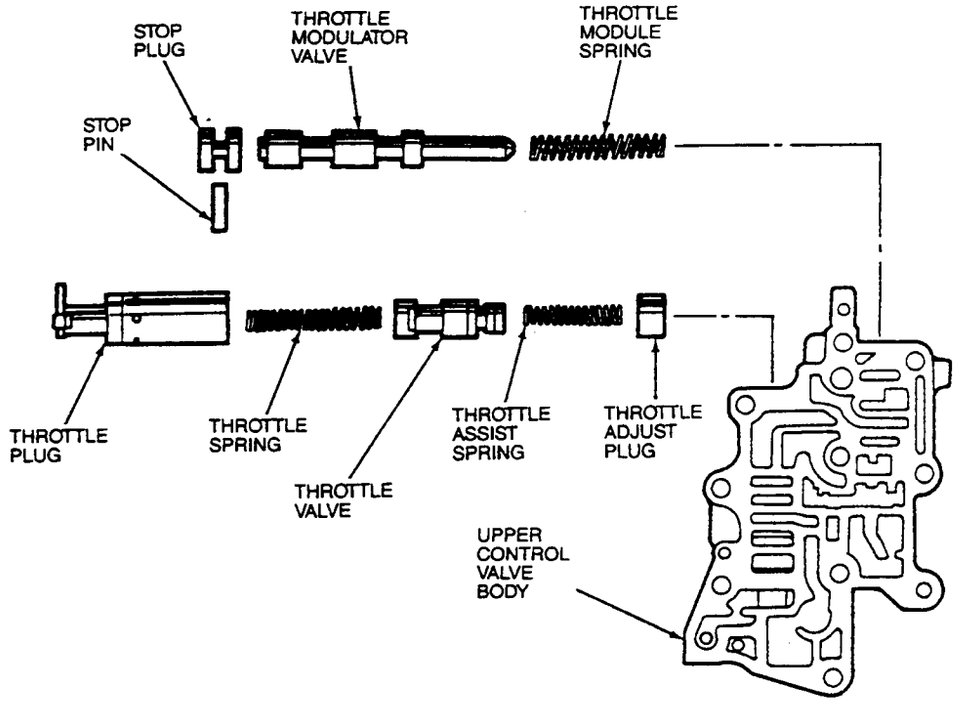
CAUTION: Each valve should slide in and out of its bore under its own weight. When a valve will not slide out under its own weight, depending on the valve, push it out with a wire or place the valve body open-side down and lightly tap it with a soft hammer. Never scratch or damage a valve bore. Do not drop the valves or use a valve that has been damaged. Before assembling the valve body, be certain that all valves are clean and lubricated with automatic transaxle fluid.

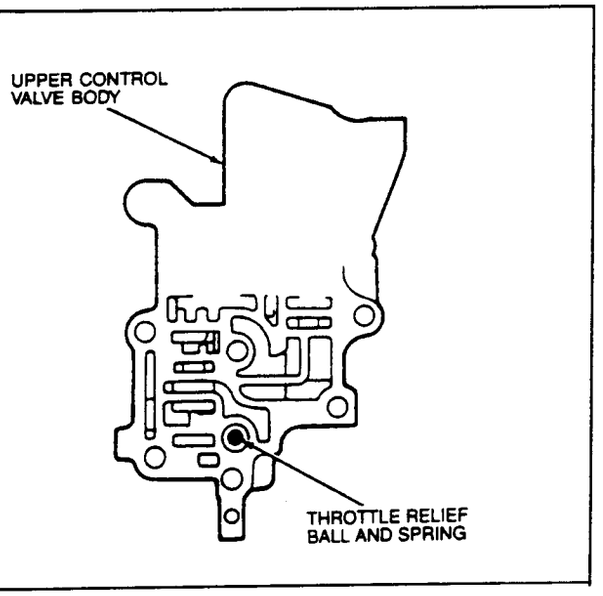
DISASSEMBLY AND ASSEMBLY (Continued)

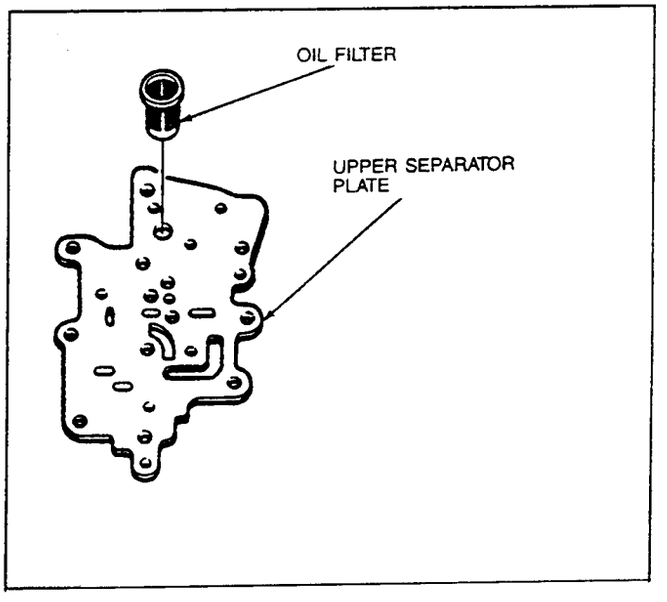
Upper Control Valve Body

Disassembly and Assembly

Refer to the following illustrations for the disassembly and assembly of the upper control valve body.





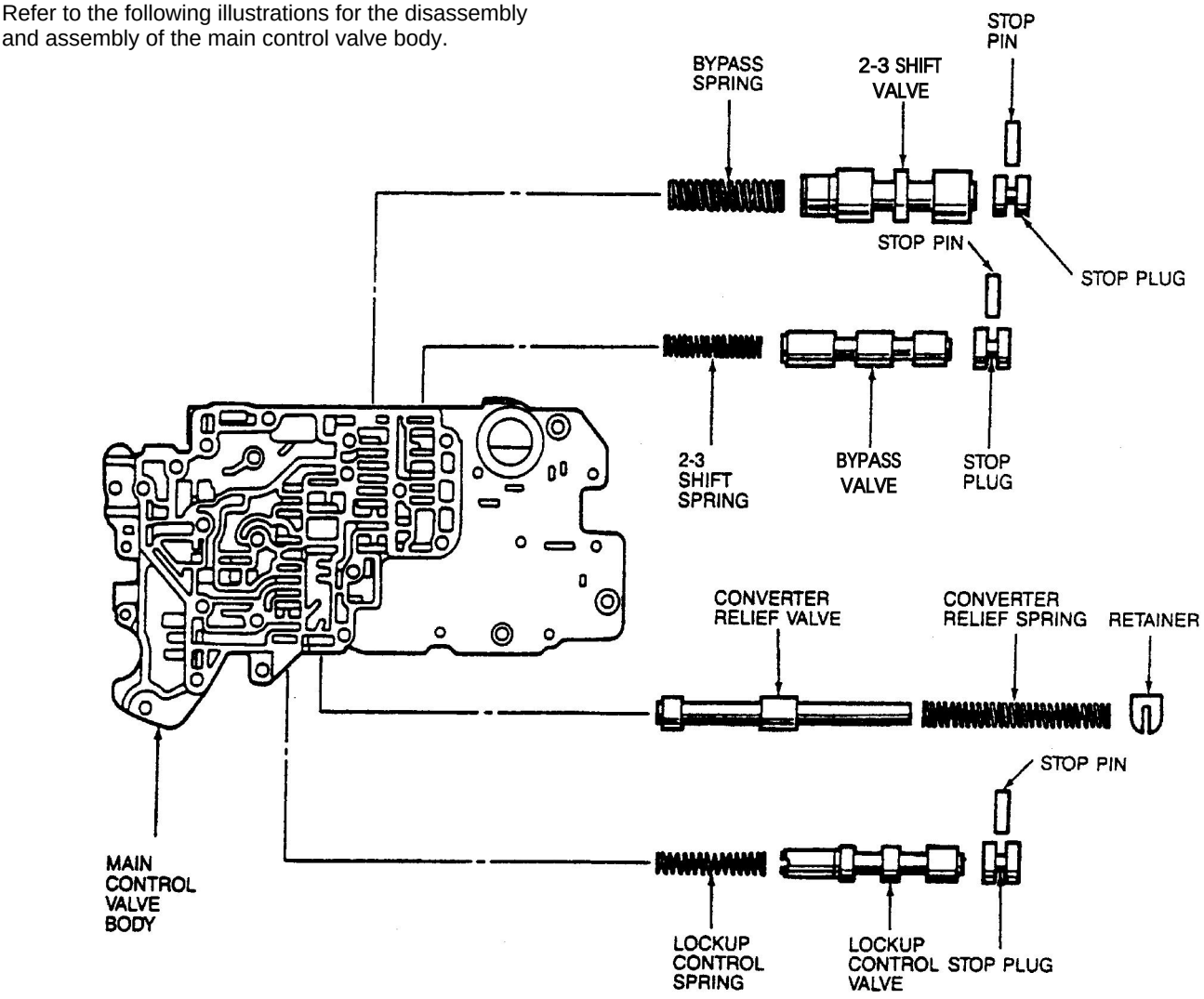


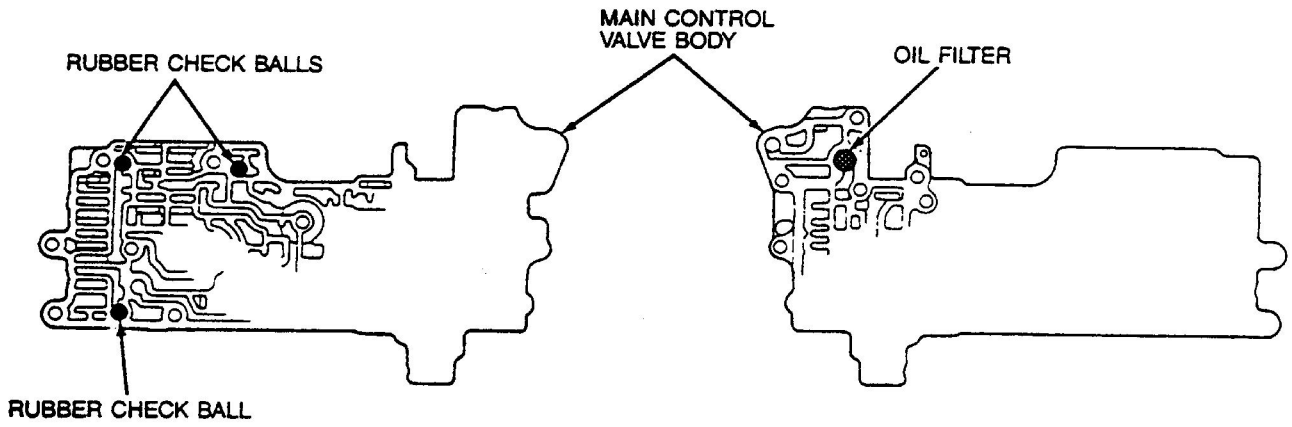
DISASSEMBLY AND ASSEMBLY (Continued)

Main Control Valve Body

Disassembly and Assembly

Refer to the following illustrations for the disassembly and assembly of the main control valve body.



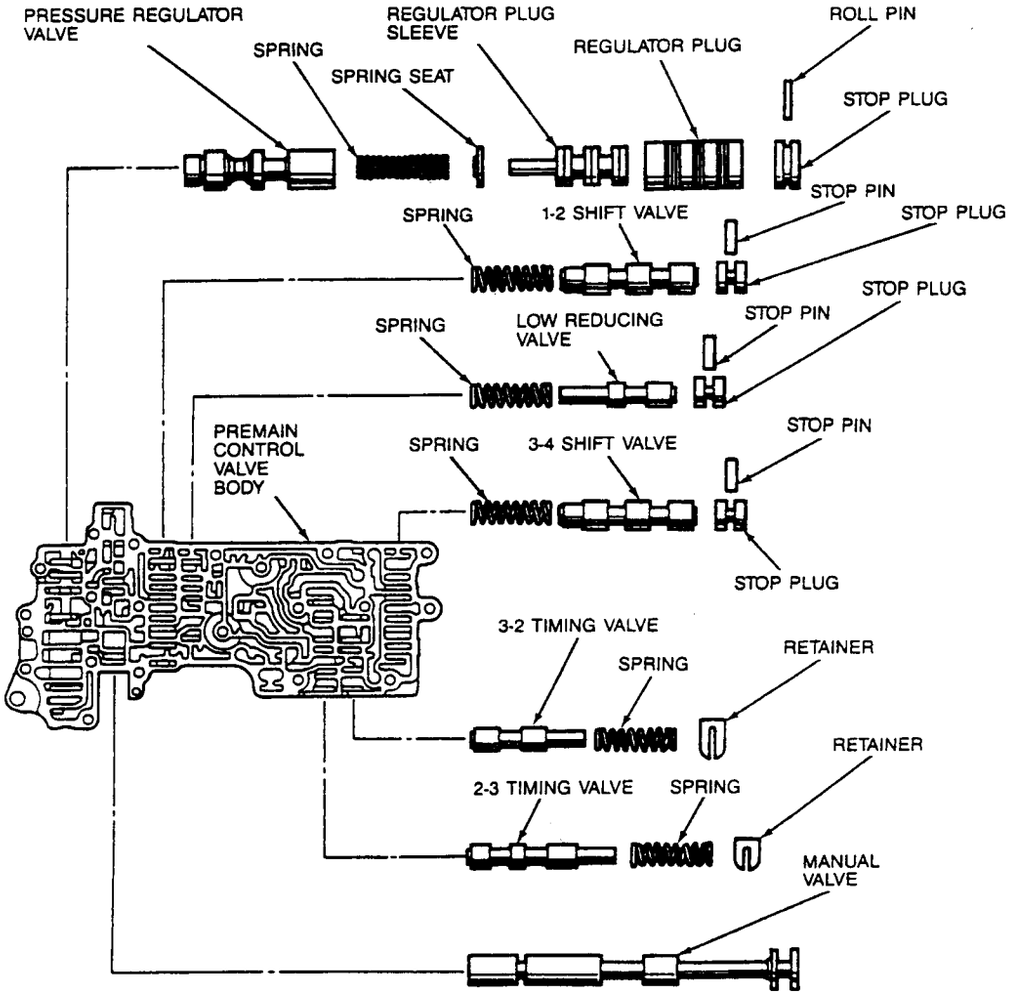


DISASSEMBLY AND ASSEMBLY (Continued)

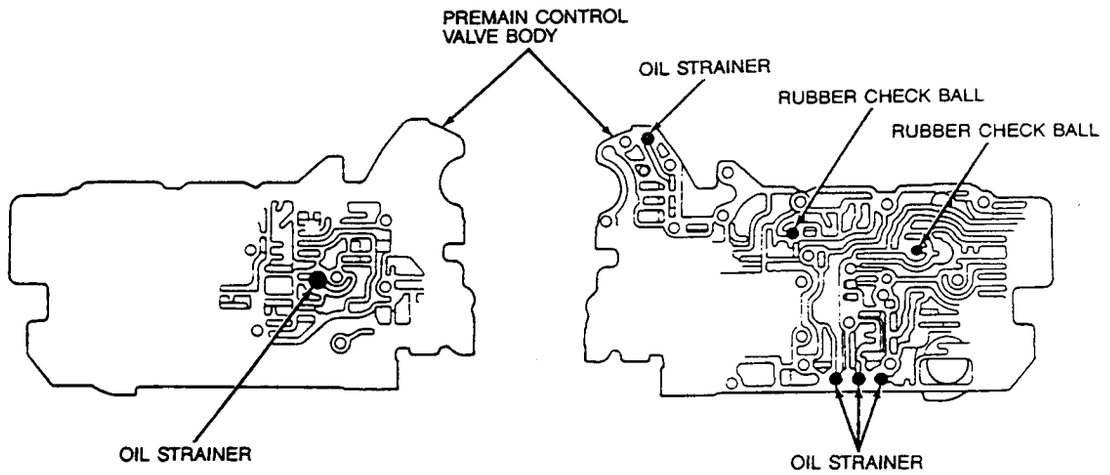
Premain Control Valve Body

Disassembly and Assembly

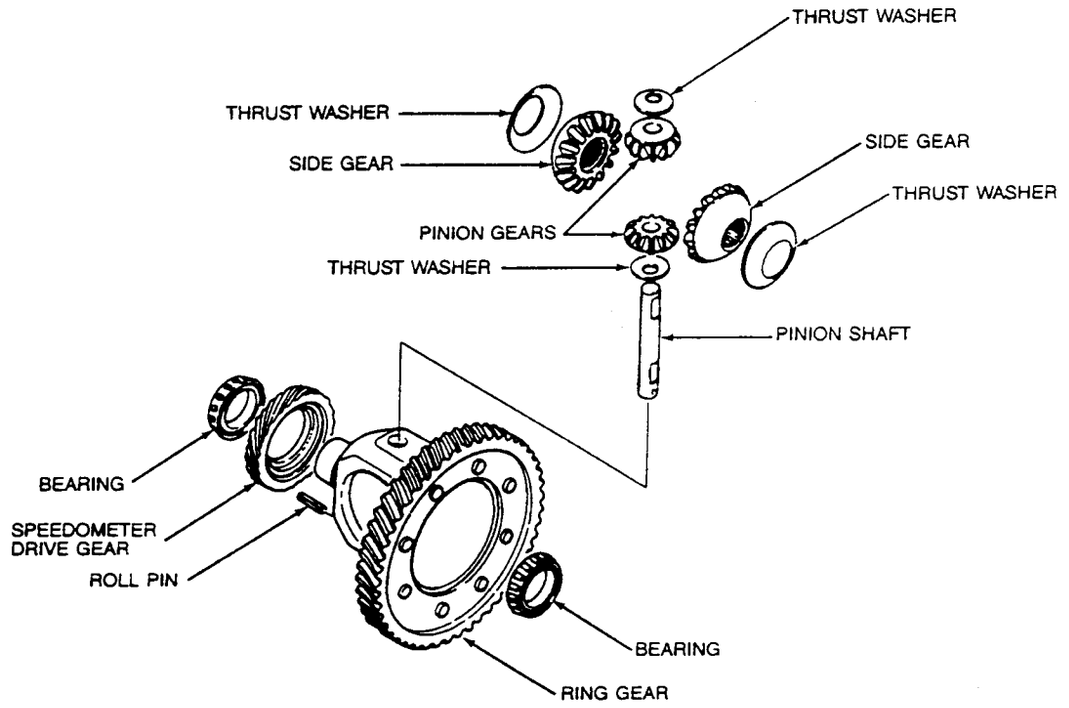
Refer to the following illustrations for the disassembly and assembly of the premain control valve body.



DISASSEMBLY AND ASSEMBLY (Continued)

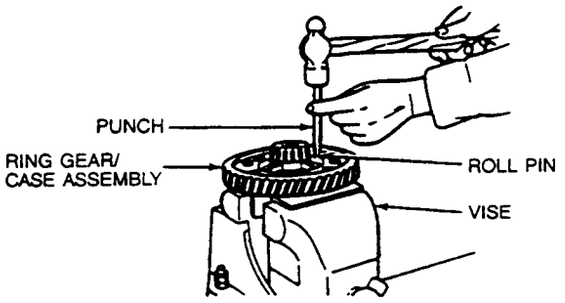


Differential
Disassembly

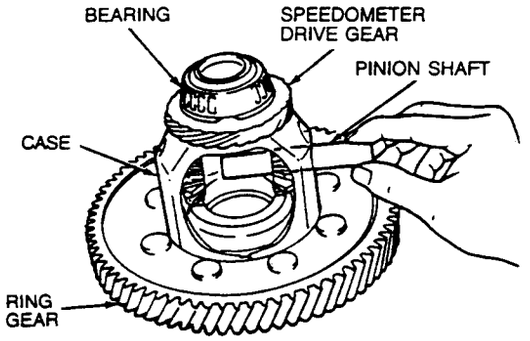


DISASSEMBLY AND ASSEMBLY (Continued)

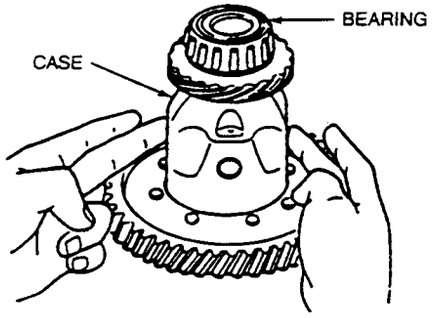
1. Remove the roll pin using a 2.0mm (0.079 inch) pin punch and hammer.



2. Remove the pinion shaft.

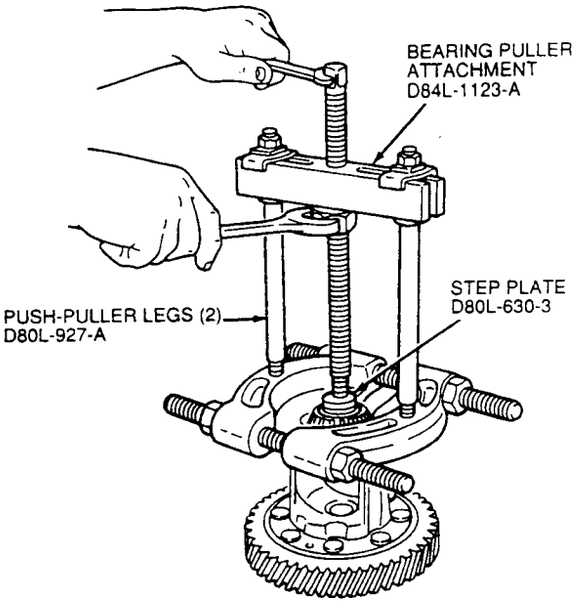


3. Remove the pinions gears, side gears, and thrust washers by rotating them out of the gear case.

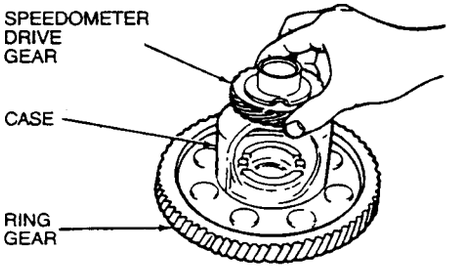


POSITIONING PINION AND SIDE GEARS

4. Remove the bearing cone (speedometer drive gear end) using Bearing Puller Attachment D84L-1123-A, Push-Puller Legs D80L-927-A, and Step Plate D80L-630-3 or equivalents.

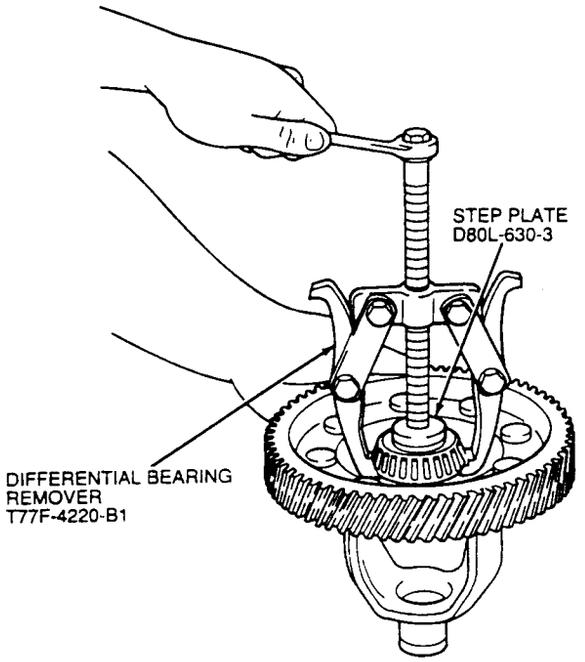


5. Remove the speedometer drive gear.



DISASSEMBLY AND ASSEMBLY (Continued)

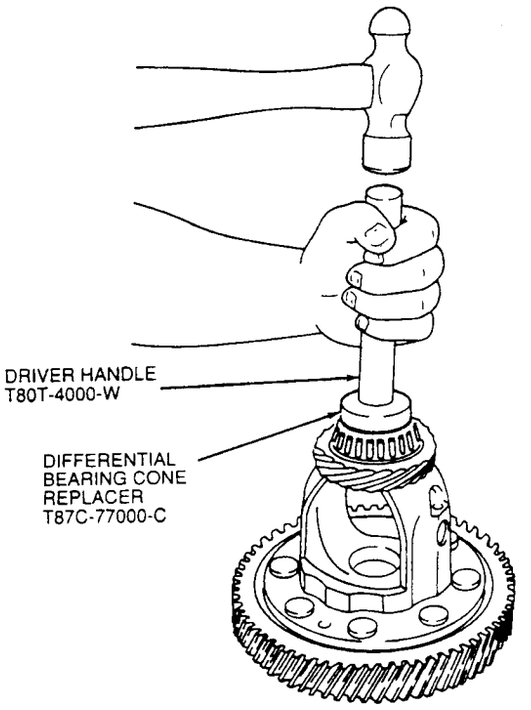
6. Remove the bearing cone (ring gear end) using Step Plate D80L-630-3 and Differential Bearing Remover T77F-4220-B1 or equivalents.



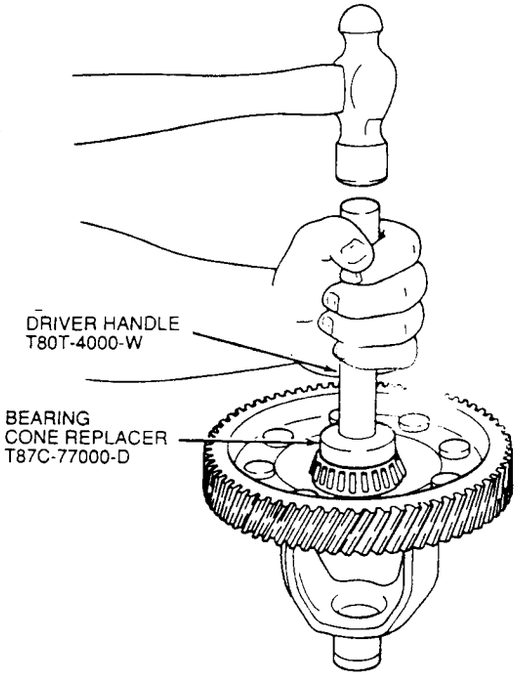
Assembly

NOTE: Whenever a bearing cone is removed, it must be replaced.

1. Install the speedometer drive gear and bearing cone using Driver Handle T80T-4000-W or press, along with Differential Bearing Cone Replacer T87C-77000-C.

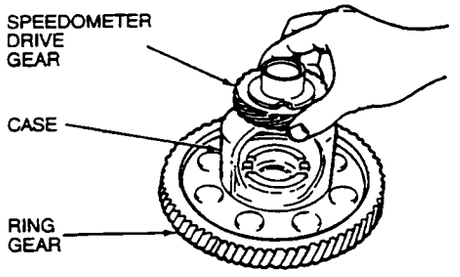


2. Install the bearing cone (ring gear end) using Driver Handle T80T-4000-W or a press, and Bearing Cone Replacer T87C-77000-D or equivalents.



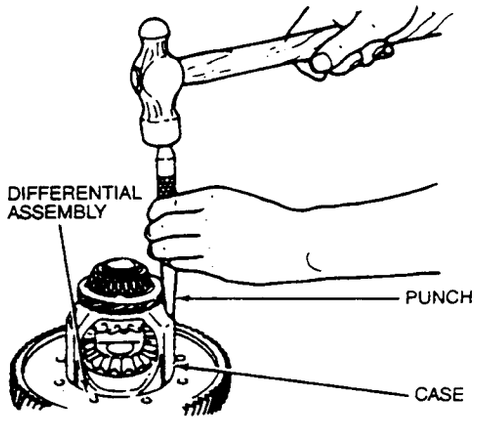
DISASSEMBLY AND ASSEMBLY (Continued)

3. Install the thrust washers, side gears, and pinion gears into the gearcase at the same time. Rotate the gears to align the pinion gears with the pinion shaft hole.



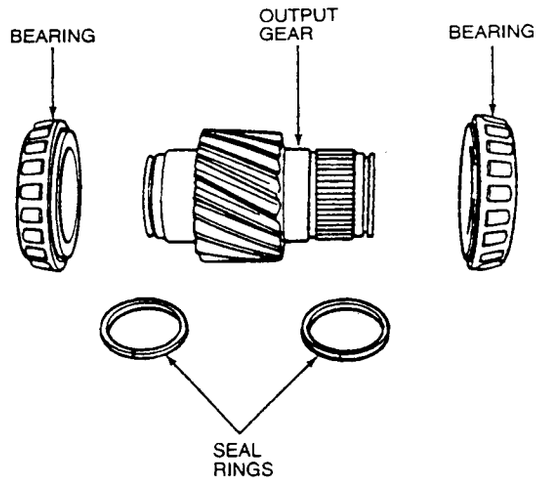
4. Install the pinion shaft.
5. Install the roll pin, then crimp it so that it cannot come out of the gearcase.

   NOTE: Refer to Cleaning and Inspection for the proper backlash procedure and setting.

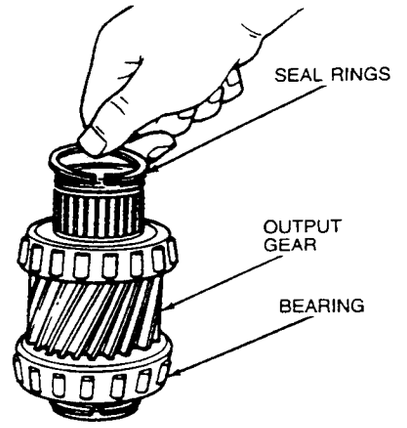


Output Gear

Disassembly

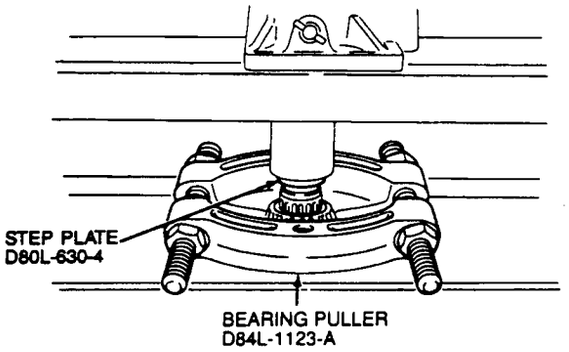


1. Remove the seal rings.



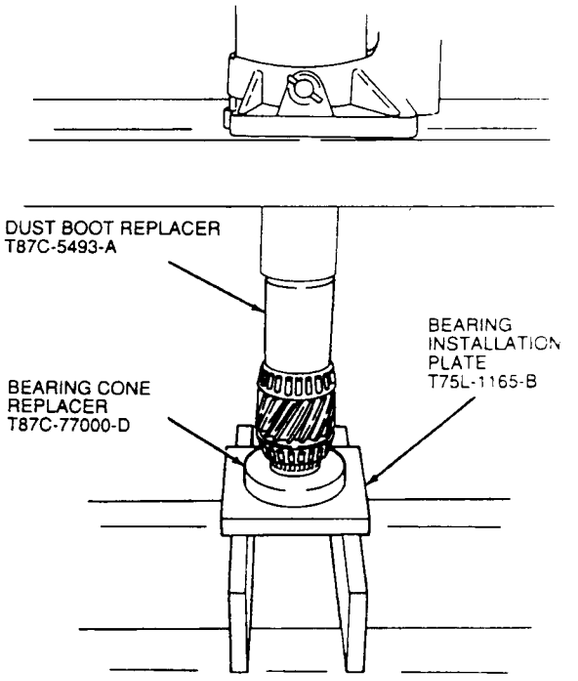
DISASSEMBLY AND ASSEMBLY (Continued)

2. Press off the output gear bearings using Step Plate D80L-630-4 and Bearing Puller D84L-1123-A or equivalents.



Assembly

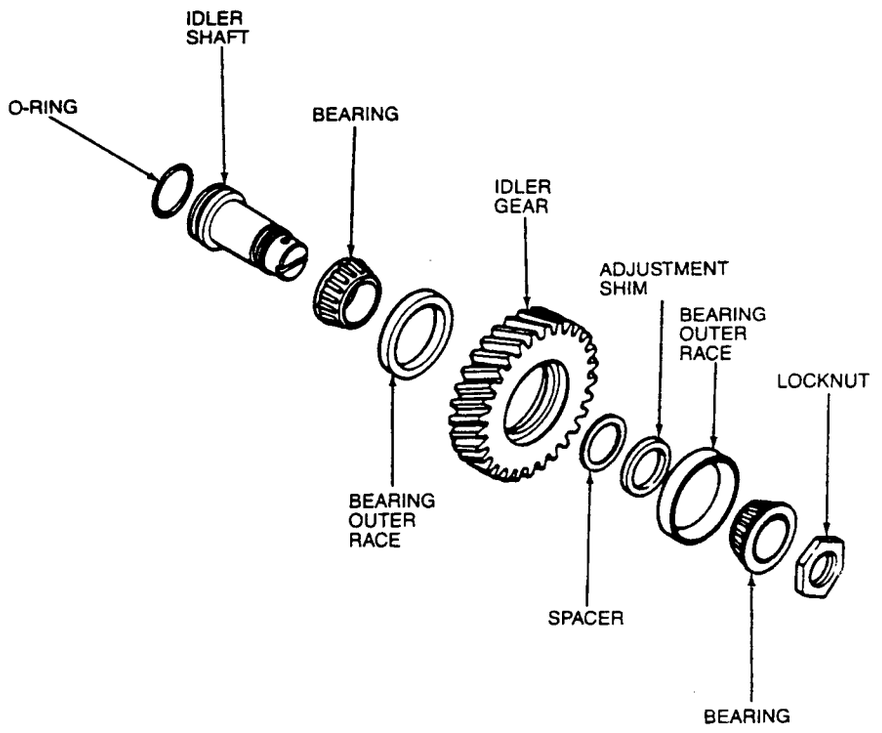
1. Press on the output gear bearings using Dust Boot Replacer T87C-5493-A, Bearing Cone Replacer T87C-77000-D, and Bearing Installation Plate T75L-1165-B.



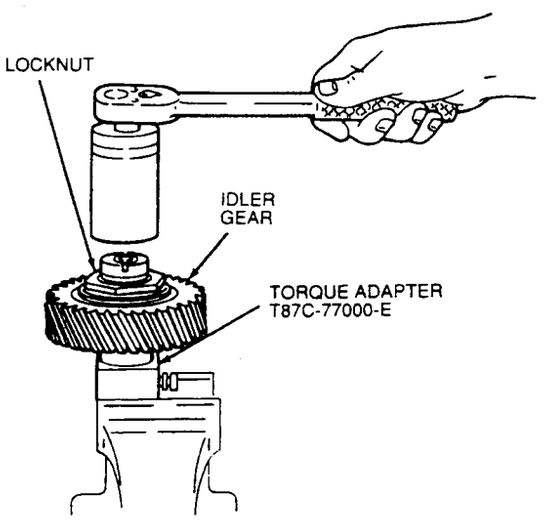
2. Install the seal o-rings.

DISASSEMBLY AND ASSEMBLY (Continued)

Idler Gear
Disassembly



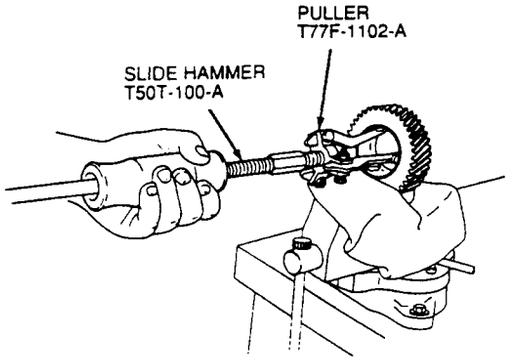
1. Secure the idler shaft in a vise using Torque Adapter T87C-77000-E or equivalent and remove the locknut.



DISASSEMBLY AND ASSEMBLY (Continued)

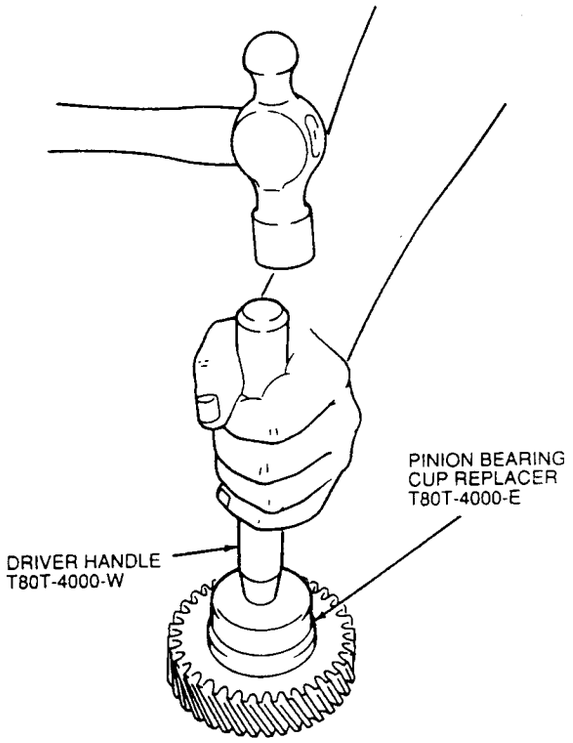
CAUTION: Use protective plates to prevent damage to the special tool.

2. Remove the bearing.
3. Remove the spacer.
4. Remove the idler gear from the idler shaft.
5. Remove the adjustment shim.
6. Remove the remaining bearing.
7. Secure the idler gear in a soft-jawed vise and remove the bearing cups using Slide Hammer T50T-100-A and Puller T77F-1102-A.



Assembly

1. Install the bearing cups into the idler gear using Driver Handle T80T-4000-W and Pinion Bearing Cup Replacer T80T-4000-E or equivalents.



2. Install the bearing onto the idler shaft.
3. Install the adjustment shim.
4. Install the spacer.
5. Install the idler gear.
6. Install the other idler gear bearing.
7. Secure the idler shaft in a vise using Torque Adapter T87C-77000-E.

   CAUTION: Use protective plates to prevent damage to the special tool.
8. Tighten the locknut to 128-177 N·m (94-130 lb-ft).
9. Turn the idler gear and adapter over and secure the gear in a vise.

   CAUTION: Use protective plates to prevent damage to the idler gear.
10. Attach a pound-inch torque wrench and measure the preload while tightening the locknut to 128-177 N·m (94-130 lb-ft). The preload should be 0.03-0.9 N·m (0.26-7.8 lb-in).

    NOTE: Read the preload when the idler shaft starts to turn.
11. If the specified preload is not reached within the specified tightening torque, select an appropriate adjustment shim(s).

DISASSEMBLY AND ASSEMBLY (Continued)

NOTE: The preload can be reduced by increasing the thickness of the shims or increased by reducing the thickness of the shims. Do not use more than seven shims.

Thickness of Shim mm (in)	
3.80 (0.150)	4.30 (0.169)
3.85 (0.152)	4.35 (0.171)
3.90 (0.154)	4.40 (0.173)
3.95 (0.156)	4.45 (0.175)
4.00 (0.158)	4.50 (0.177)
4.05 (0.159)	4.55 (0.179)
4.10 (0.161)	4.60 (0.181)
4.15 (0.163)	4.65 (0.183)
4.20 (0.165)	4.70 (0.185)
4.25 (0.167)	4.75 (0.187)

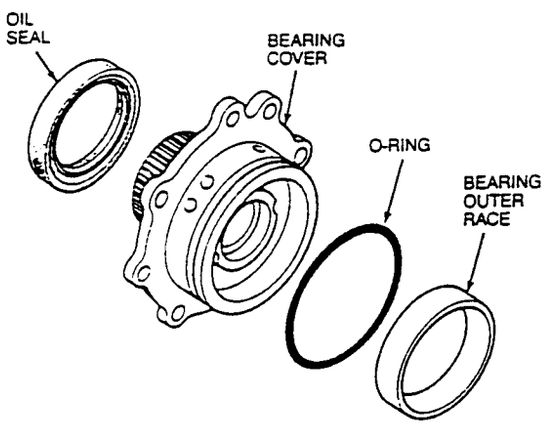
Bearing Housing

Disassembly and Assembly

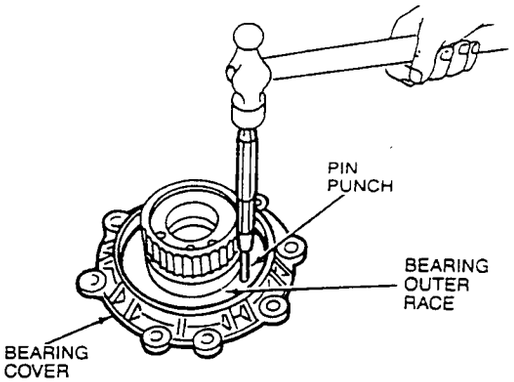
Remove and install the bearing cup and adjustment shim(s) during the bearing preload and shim selection procedure outlined earlier in this Section.

Bearing Cover

Disassembly



1. Remove the bearing race with a pin punch.
2. Remove the O-ring and oil seal.



Assembly

1. Install the O-ring and oil seal.
2. Press the bearing race into the cover using Bearing Installation Plate T80T-4000-E.

CLEANING AND INSPECTION

Transaxle

Clean the components with a suitable solvent and use compressed air to dry all parts and clean fluid passages.

CAUTION: The composition clutch plates, valve body gaskets, bands, and synthetic seals should not be cleaned in a vapor degreaser or with any type of detergent solution. To clean these parts, wipe them off with a lint-free cloth. New clutch plates or bands should be soaked in the specified transaxle fluid for two hours before being assembled.

Valve Body

1. Clean all parts thoroughly in clean solvent and blow dry with compressed air.
2. Inspect all valve and plug bores for scores. Check all fluid passages for obstructions. Inspect all mating surfaces for burrs and scores. If needed, use crocus cloth to polish valve and plugs. Avoid rounding the sharp edges of the valves and plugs with the crocus cloth.
3. Inspect all springs for distortion. Check all valves and plugs for free movement in their respective bores. Valve and plugs, when dry, must fall from their own weight into their respective bores.
4. Roll the manual valve on a clean, flat surface to check for a bent condition. Replace, if necessary.

CLEANING AND INSPECTION (Continued)

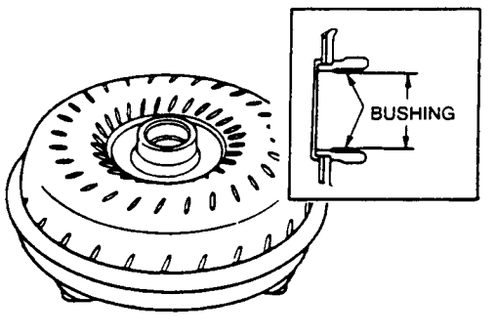
Needle Bearings

Wash the needle bearings thoroughly in cleaning solvent. Blow the bearings dry with compressed air. Lubricate with the specified transaxle fluid. Replace any bearings which show signs of pitting or roughness.

Torque Converter

The torque converter is welded together and cannot be disassembled.

1. Check the torque converter for damage or cracks and replace, if necessary.
2. Remove any rust from the pilot hub and boss of the converter.
3. Measure the inner diameter of the boss bushing. If it exceeds 53.075mm (2.090 inch), replace the torque converter.



Bushing inner diameter
Standard: 53.030mm (2.088 in)
Maximum: 53.075mm (2.090 in)

When internal wear or damage has occurred in the transaxle, contaminants such as metal particles, clutch plate material, or band material may have been carried into the converter and oil cooler. These contaminants can be a major cause of recurring transaxle troubles and must be removed from the system before the transaxle is put back into service.

Whenever the transaxle has been disassembled to replace worn or damaged parts or because the valve body sticks due to foreign material, the torque converter, oil and oil cooler lines must be cleaned and flushed using the Rotunda Torque Converter Cleaner 014-00028 or equivalent. Under no circumstances should an attempt be made to clean converters by hand.

The lack of a drain plug in the 4EAT converter increases the amount of residual flushing solvent retained in the converter after cleaning. This retained solvent is not acceptable and a method of diluting is required. The following procedure is to be used after removal of the 4EAT torque converter from the cleaning equipment.

1. **Thoroughly drain** the remaining solvent through the hub.
2. Add 0.5L (0.53 US quart) of clean transaxle fluid into the converter. Agitate by hand.
3. **Thoroughly drain** the solution through the converter hub.

Oil Pump

1. Check the oil pump for a broken or worn seal ring, weakened springs and damaged or worn sliding surfaces. Replace as required.
2. Measure the following clearances using an appropriate bar gauge and a feeler gauge. If the clearances are not within specification, replace the oil pump.

Oil Pump Housing, Outer Rotor, Inner Rotor

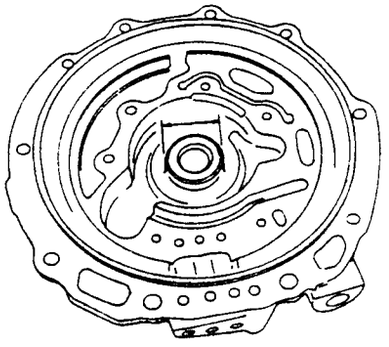
Standard Clearance: 0.02-0.04mm (0.008-0.0157 inch)

Maximum Clearance: 0.05mm (0.0196 inch)

Pump Housing Inner Diameter

Standard Clearance: 0.04-0.115mm (0.0157-0.0453 inch)

Maximum Clearance: 0.125mm (0.0492 inch)



Inner diameter
Standard: 0.04–0.115mm (0.0157–0.0453 in)
Maximum: 0.125mm (0.0492 in)

Pump Spool Valve Outer Diameter

CLEANING AND INSPECTION (Continued)

Standard Outer Diameter: 13.98mm (0.55 inch)
Maximum Outer Diameter: 14.0mm (0.551 inch)

1-2, 2-3, N-OD, and N-R Accumulators

1. Check for a damaged or worn piston or stopper plug.
2. Check for a broken or worn spring.

Small Sun Gear and One-Way Clutch

Check the sun gear drum, small sun gear, bushing, clutch hub and inner and outer races for damage or wear. Replace as required.

Planetary Carrier Assembly

Check the inner race, thrust washers, and gears for damage or wear. Replace as required.

3-4 Clutch

1. Check the drive and driven plates for damage or wear. The minimum thickness should be 1.3mm - 1.6mm (0.0515 - 0.063 inch).
2. Check the clutch piston and clutch drum and seal contact areas for damage.
3. Check for broken or worn springs. The free length of the spring should be 40.5mm (1.594 inch).

Differential

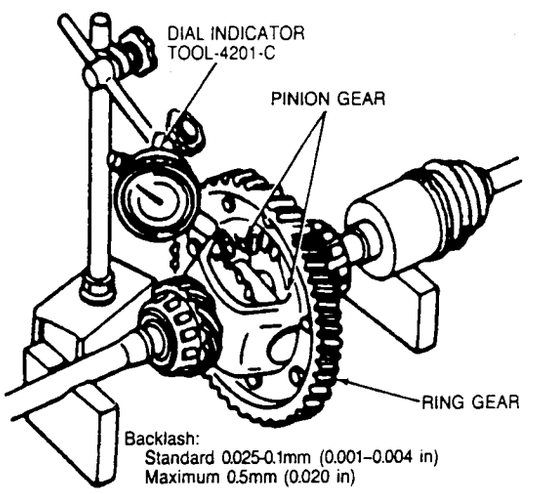
1. Check for damaged or worn gears.
2. Check for a cracked or damaged gear case.

Side Gear and Pinion Backlash Check

1. Install the left and right halfshafts into the differential.
2. Support the halfshafts on V-blocks.
3. Use Dial Indicator Tool-4201-C or equivalent with Magnetic Base / Flex Arm D78P-4201-C or equivalent to measure the backlash of both pinion gears. If the backlash is more than allowable, replace the differential as an assembly.

   Standard Backlash: 0.025 - 0.1mm (0.001 - 0.004 inch)

   Maximum Backlash: 0.5mm (0.020 inch)



Speedometer Driven Gear Assembly

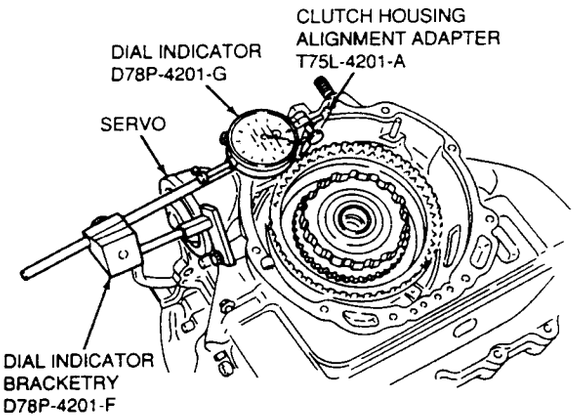
1. Worn or damaged teeth or O-ring.
2. Worn or damaged seal.

Servo Assembly

Inspection

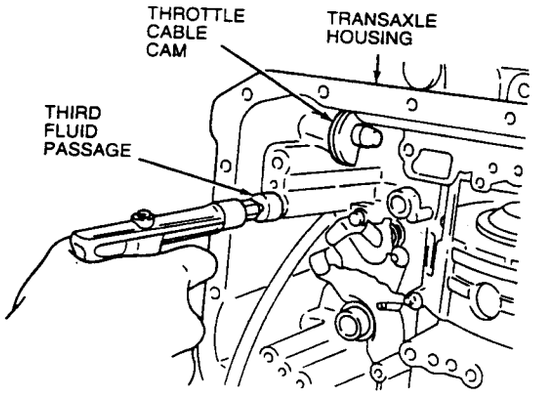
1. Disassemble the transaxle to gain access to the servo piston stem, as explained in this Section.

   NOTE: When performing this procedure, verify that the band and band servo are installed correctly.
2. Remove the valve body from the transaxle housing as described in this Section.
3. Install Dial Indicator Bracketry D78P-4201-F, Dial Indicator D78P-4201-G, and Clutch Housing Alignment Adapter T75L-4201-A onto the transaxle housing.



CLEANING AND INSPECTION (Continued)

4. Apply compressed air (4.0kg / cm2, 57 psi) to the third fluid passage beneath the throttle cable cam.



5. The servo piston stem should move 1.0-1.7mm (0.0394-0.0669 inch). If not within specification, select the correct length stem from the following chart.

95.0 mm (3.740 IN)	95.5 mm (3.760 IN)	96.0 mm (3.780 IN)
96.5 mm (3.799 IN)	97.0 mm (3.819 IN)	97.5 mm (3.839 IN)
98.0 mm (3.858 IN)	98.5 mm (3.878 IN)	99.0 mm (3.898 IN)

SPECIFICATIONS

General Specifications

Item \ Model		4EAT F-Style	
		1.9L Engine	1.8L Engine
Torque converter stall torque ratio		2.100:1	
Gear ratio	1st	2.800	
	2nd	1.540	
	3rd	1.000	
	OD	0.700	
	Reverse	2.333	
Final gear ratio		3.550	3.736
Number of drive/driven plates	Forward clutch	3/3	
	Coasting clutch	2/2	
	3-4 clutch	4/4	
	Reverse clutch	2/2	
	Low and reverse clutch	4/4	
Servo diameter (Piston outer dia./retainer inner dia.) mm (in)		70/36 (2.76/1.42)	
Automatic transaxle fluid (ATF)	Type	MERCON® or DEXRON® II	
	Capacity liters (US qt, Imp qt)	6.3 (6.7, 5.5)	

SPECIFICATIONS (Continued)

Torque Specifications

Description	N•m	Lb-Ft	Lb-In
Square Head Oil Passage Plug	5-10	—	43-87
Torque Converter Stator Support Bolts	11-14	8-10	—
Output Gear Housing Bolts	19-26	14-19	—
Parking Pawl Actuator Bolts	11-14	8-10	—
Detent Lever Bolt	8-11	—	69-95
Manual Shaft Nut	41-55	30-41	—
Transaxle Housing To Converter Housing	37-52	27-38	—
Oil Pump To Transaxle Housing	19-26	14-19	—
Throttle Cable Bracket At Transaxle	8-11	—	69-95
Valve Body To Transaxle Bolts	8-11	—	69-95
Oil Pan Gasket Bolts	8.5-11	—	74-95
Pulse Generator Bolt	8-11	—	69-95
Manual Lever Position Switch Bolts	8-11	—	69-95
Manual Lever Position Switch Screw	0.4-0.7	—	4-6
Oil Filler Tube Bolt	7-10	—	61-87
Transaxle To Engine Bolts	55-80	41-59	—
Lower Transaxle To Engine Oil Pan Bolts	37-52	27-38	—
Lower Crossmember To Vehicle Chassis	64-89	47-66	—
Lower Engine Mount To Crossmember	37-52	27-38	—
Torque Converter To Flex Plate	34-49	25-36	—
Oil Pump Valve Nut	31-47	23-35	—
Valve Body Oil Pipe	8-11	—	69-95
Transaxle Oil Filter	8-11	—	69-95
Locknut Idler Shaft	128-177	94-130	—
Shift Solenoids	8-11	—	69-95
Lockup Solenoid	8-11	—	69-95
Oil Pump Cover Bolts	8-11	—	69-95
Upper Transaxle Mount	67-93	49-69	—

FORD F4E-lll
VALVE BODY CHANGES

CHANGE: Beginning at the start of production for the 1998 model year, Escort and Tracer vehicles equipped with the new F4E-III transaxle recieved a totally new valve body assembly, with many engineering changes that will affect service.

REASON: Improved line pressure and torque converter clutch control.

PARTS AFFECTED:

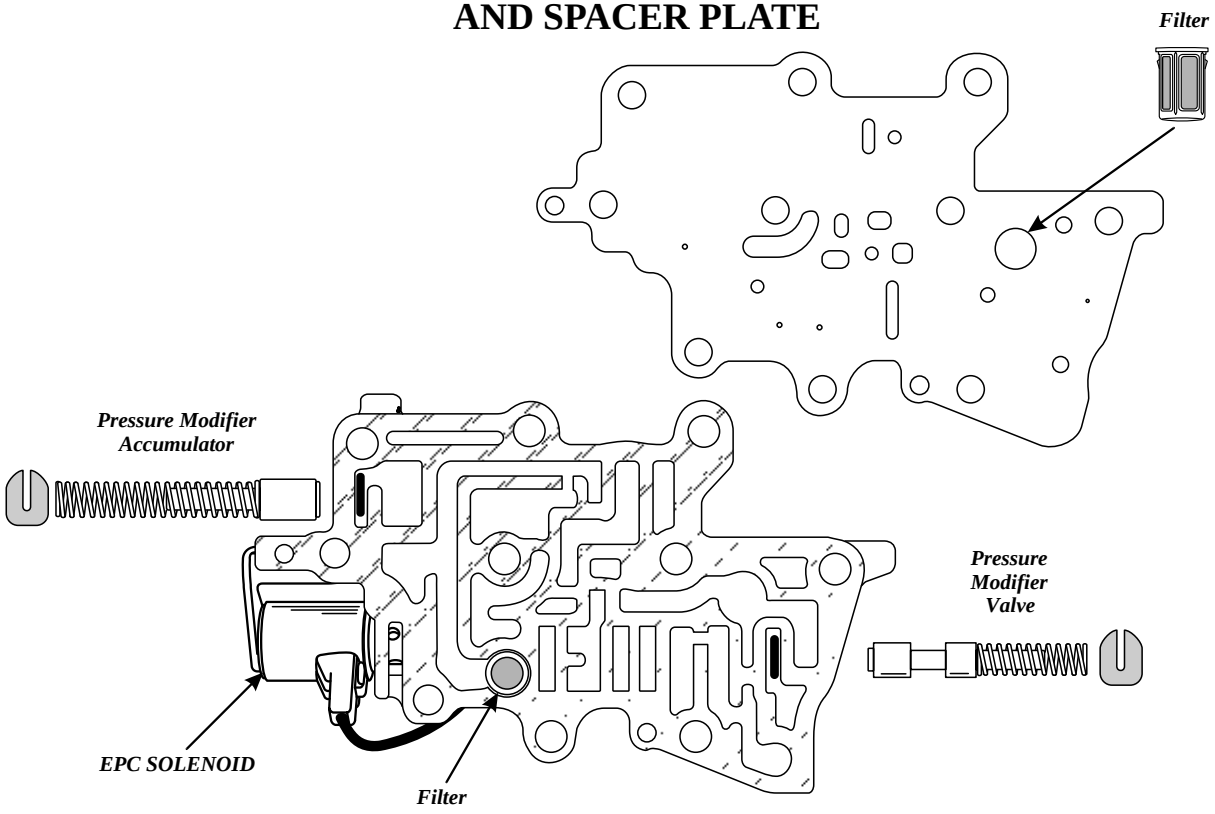
- The pressure control solenoid, solenoid body, spacer plate and gaskets were changed . The pressure modifier valve was also changed and a spring was added to the end of the valve and an adjustable bore plug replaced the old retainer. Refer to Figure 1 for the previous and new design parts, as well as the new pressure modifier valve line-up.
- The main valve body upper side worm track was changed to accomodate the new pressure control solenoid body and spacer plate, as shown in Figure 2.
- The main valve body lower side worm tracks were changed to incorperate a new solenoid reducing valve, as shown in Figure 3.
- The main valve body spacer plate and gaskets were changed to accomodate the changes in the premain valve body, as shown in Figure 4.
- The premain valve body upper side casting was changed and a screen was added in the line pressure feed passage to the solenoid reducing valve. Refer to Figure 5 for illustrations of both valve bodies. Notice the casting change and the added screen.
- The premain valve body lower side and the lock-up control valve were changed. Refer to Figure 6 for previous and new design lock-up control valve installations. NOTE: the new design valve is counter bored on the opposite side, to accomodate the new spring placement on the opposite side.
- The premain cover, spacer plate and gaskets were changed and the tube on the exterior was eliminated, as shown in Figure 7.

INTERCHANGEABILITY:

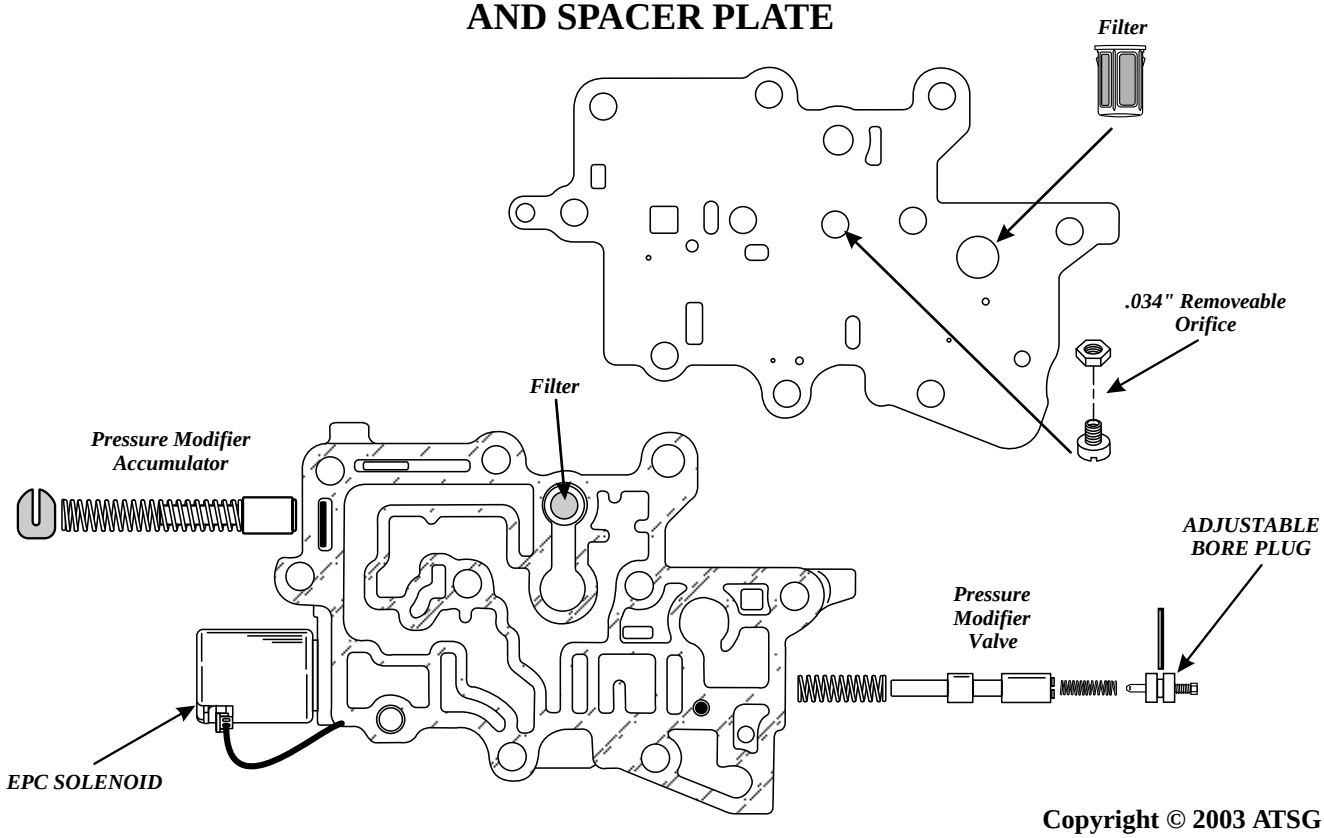
None of the parts listed above can be used in any previous models. However, when using the complete valve body as a service package, it will retro-fit back to previous models, equipped with the F4E-III transaxle.

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"97" PRESSURE CONTROL SOLENOID BODY AND SPACER PLATE



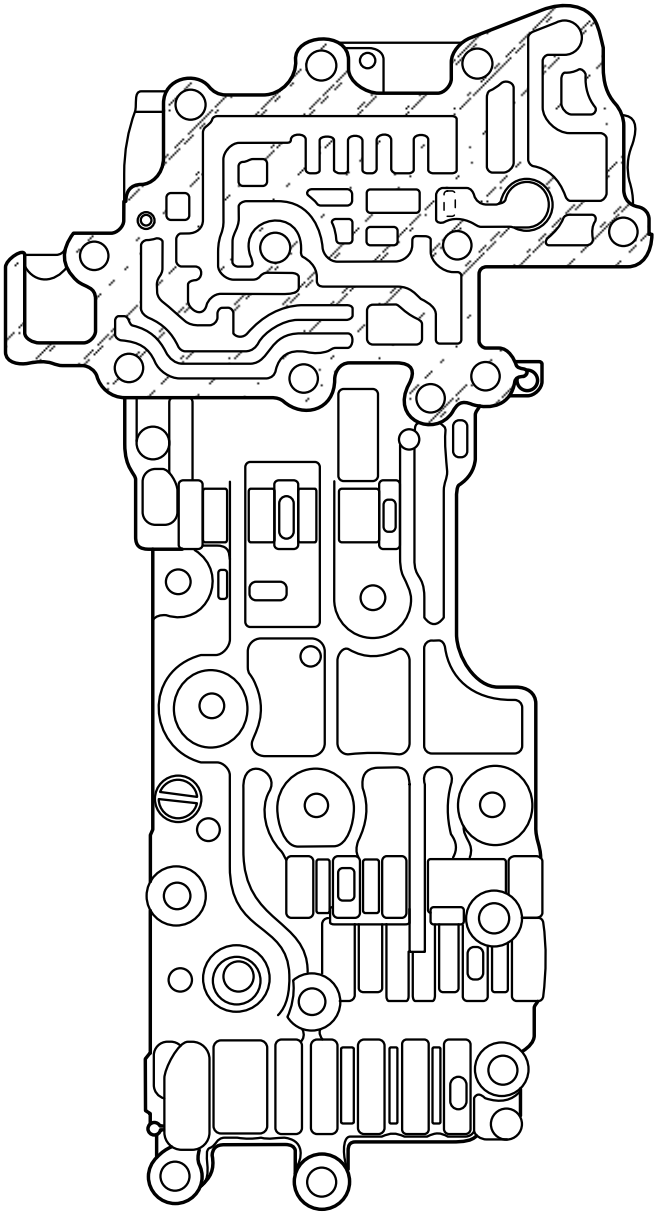
"98" PRESSURE CONTROL SOLENOID BODY AND SPACER PLATE



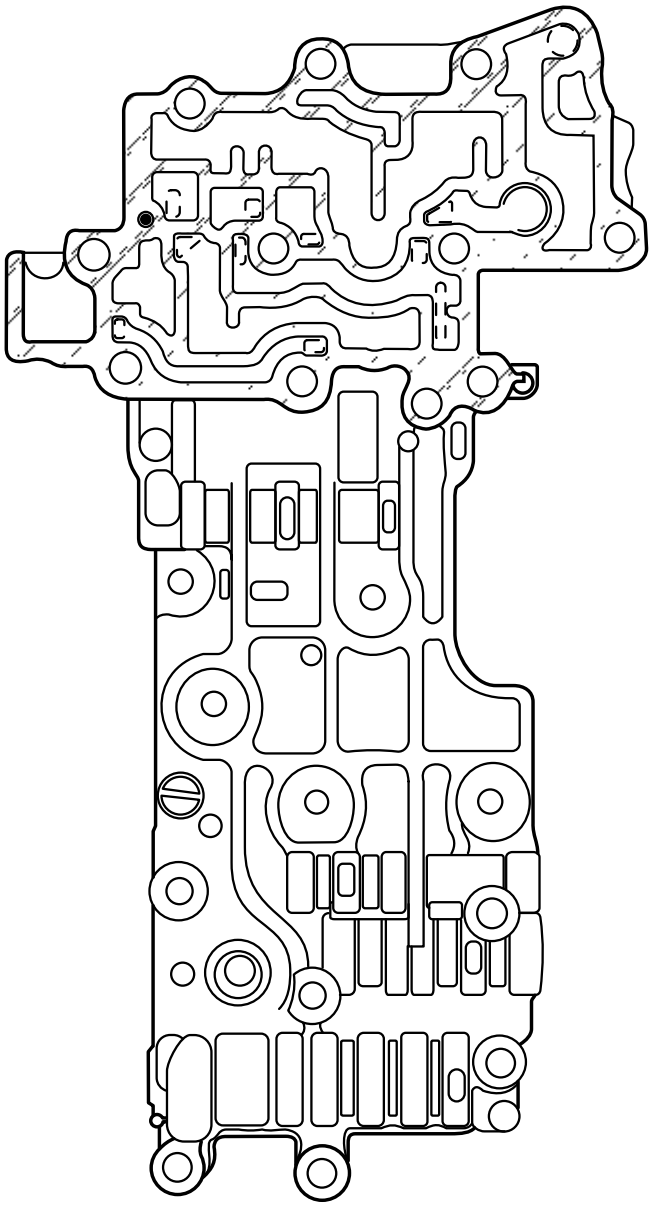
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Figure 1

"97" MAIN VALVE BODY (UPPER)



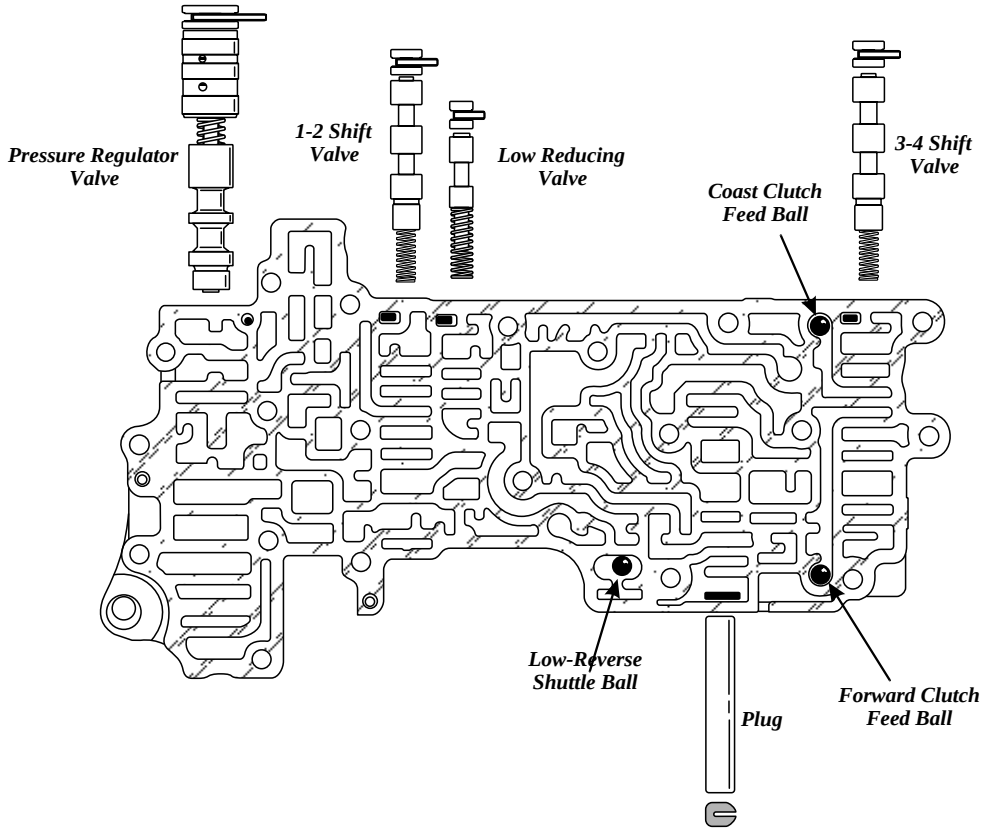
"98" MAIN VALVE BODY (UPPER)



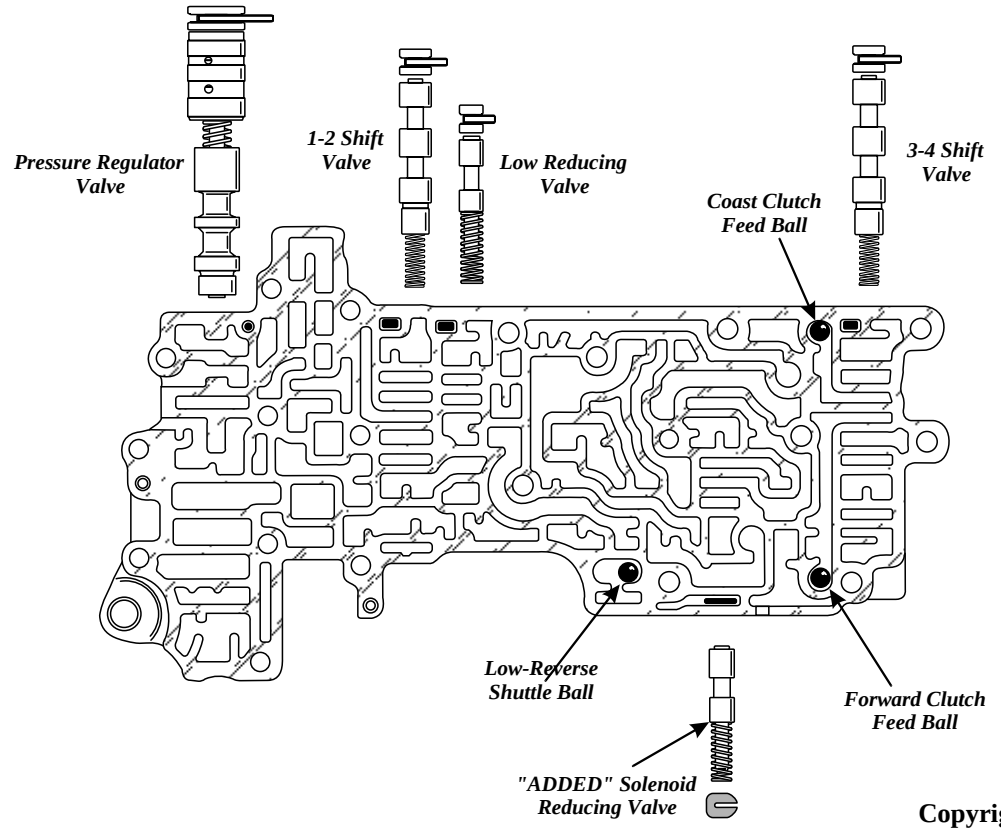
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Figure 2

"97" MAIN VALVE BODY (LOWER)



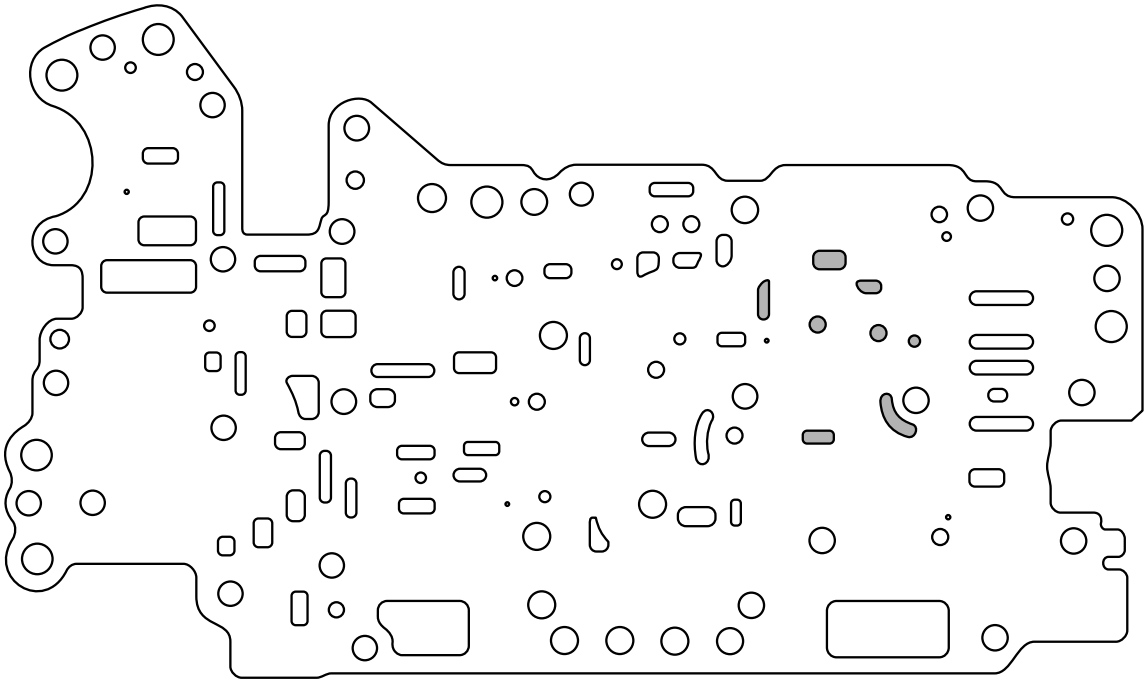
"98" MAIN VALVE BODY (LOWER)



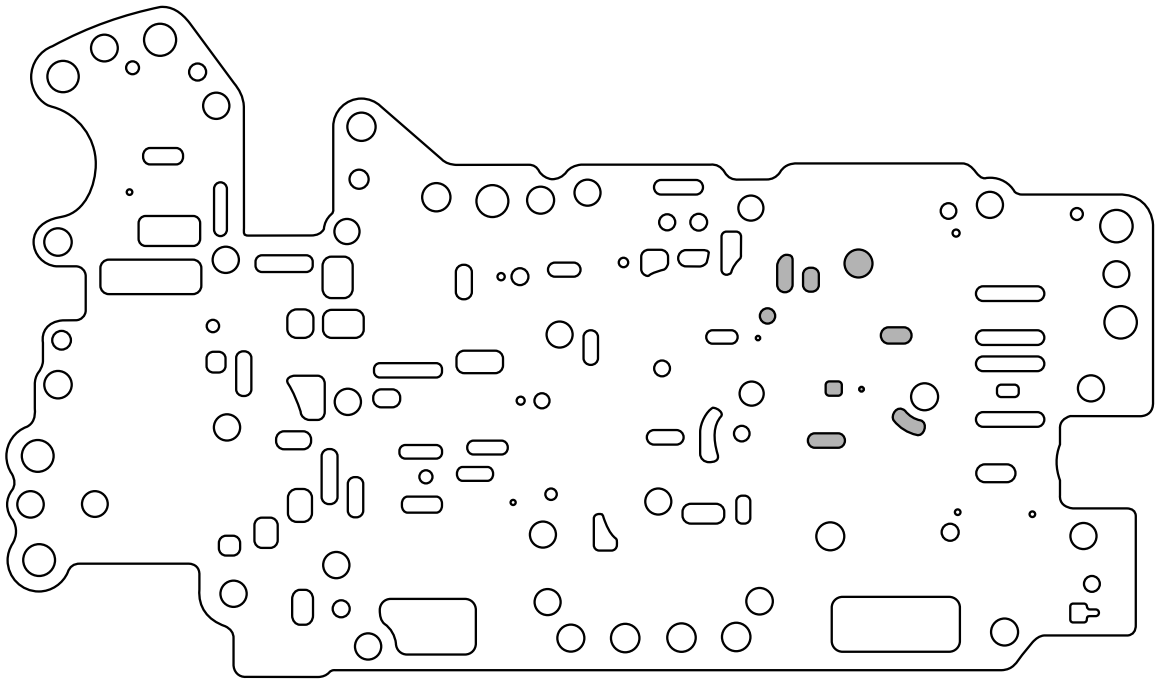
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Figure 3

"97" MAIN VALVE BODY SPACER PLATE



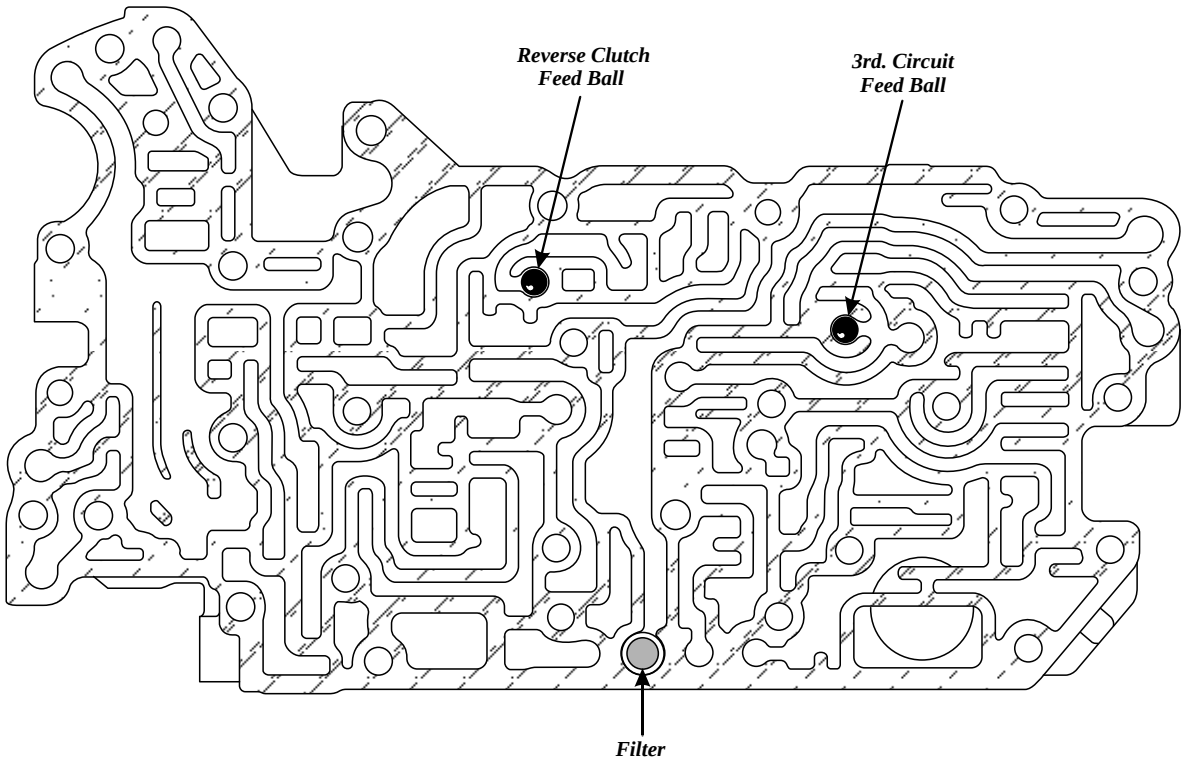
"98" MAIN VALVE BODY SPACER PLATE



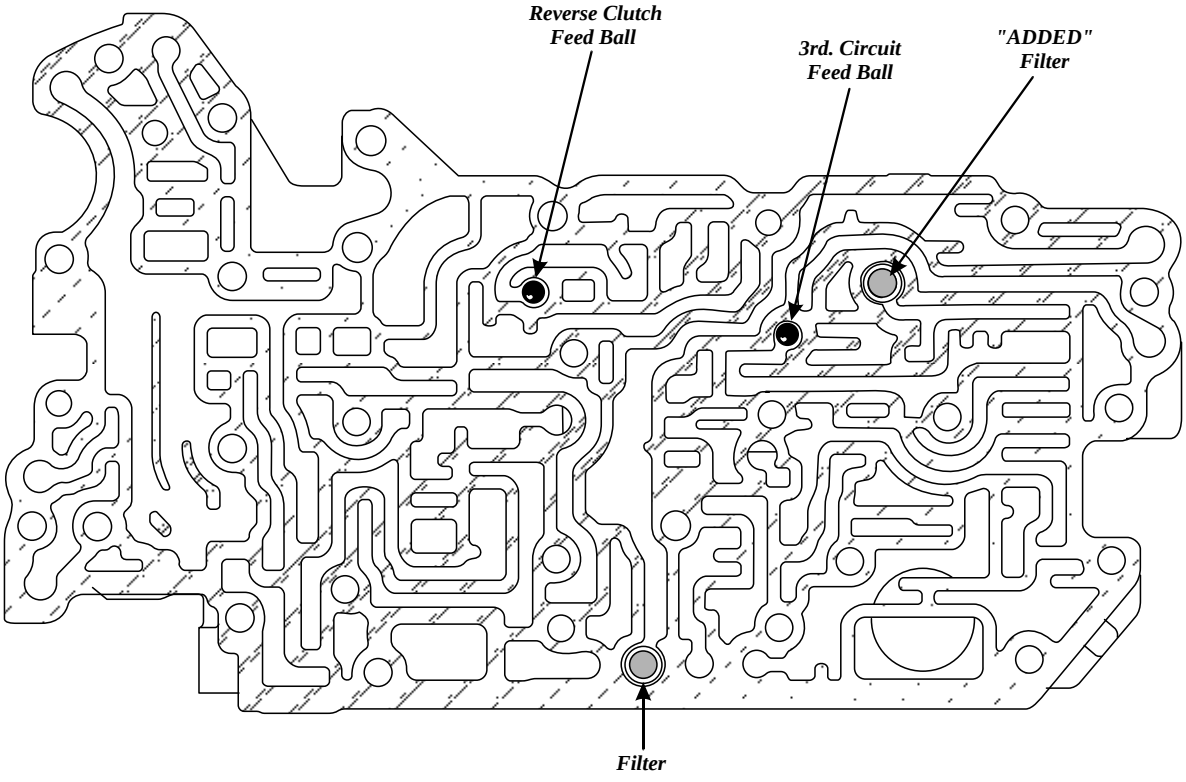
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Figure 4

"97" PREMAIN VALVE BODY (UPPER)



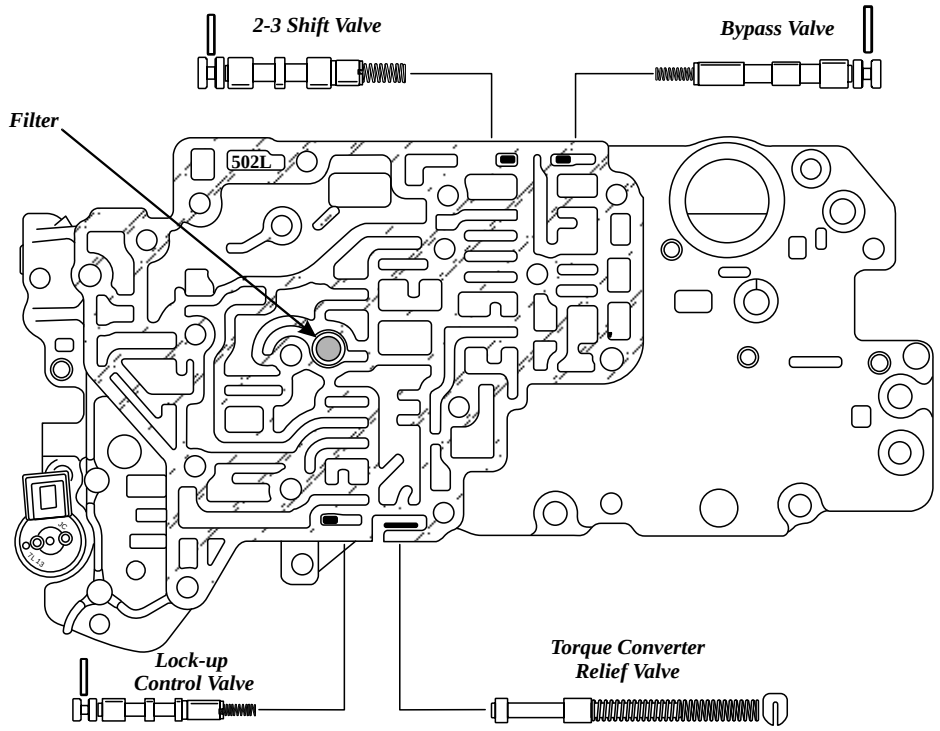
"98" PREMAIN VALVE BODY (UPPER)



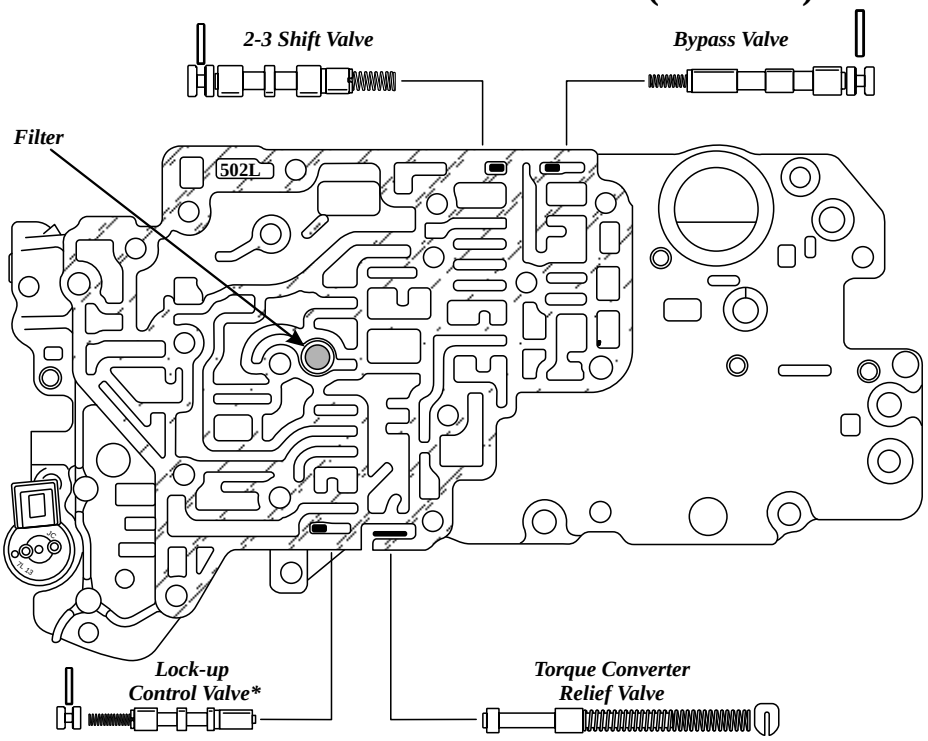
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Figure 5

"97" PREMAIN VALVE BODY (LOWER)



"98" PREMAIN VALVE BODY (LOWER)

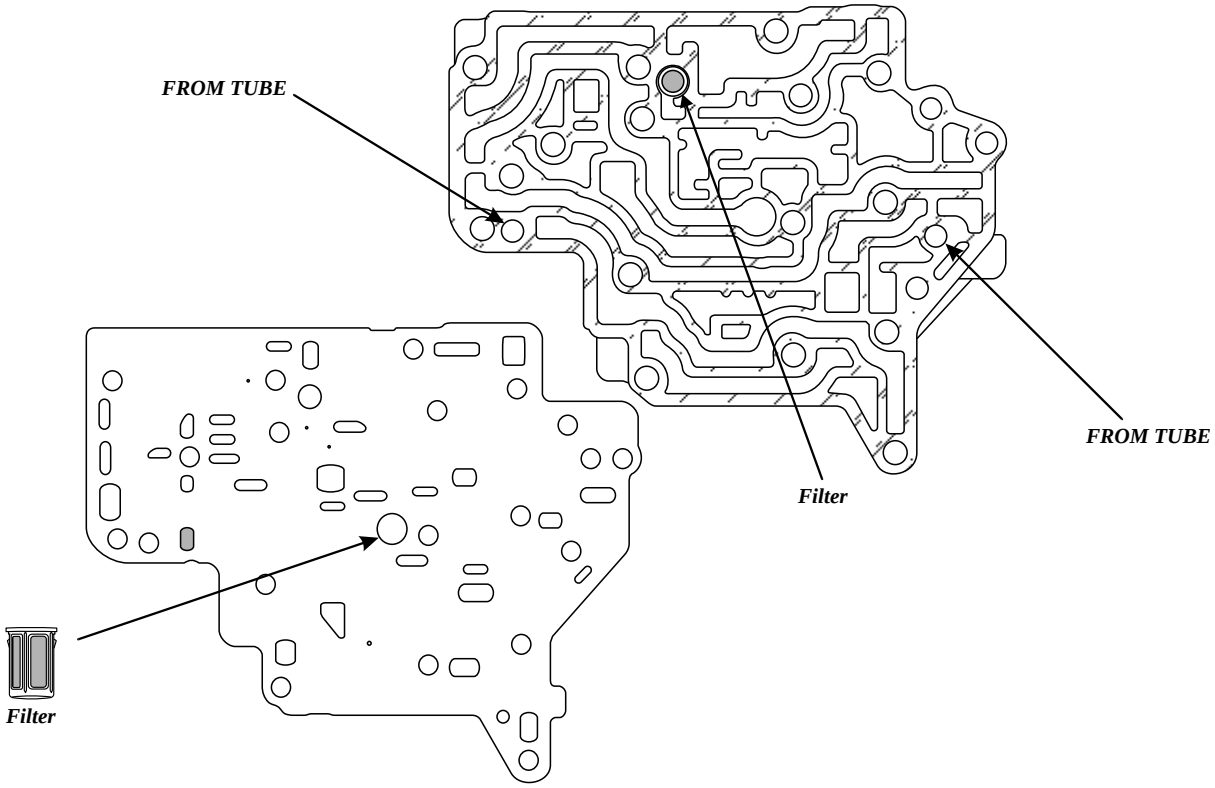


** NOTE: THE VALVE HAS THE HOLE AND THE SPRING AT THE OPPOSITE END OF THE VALVE*

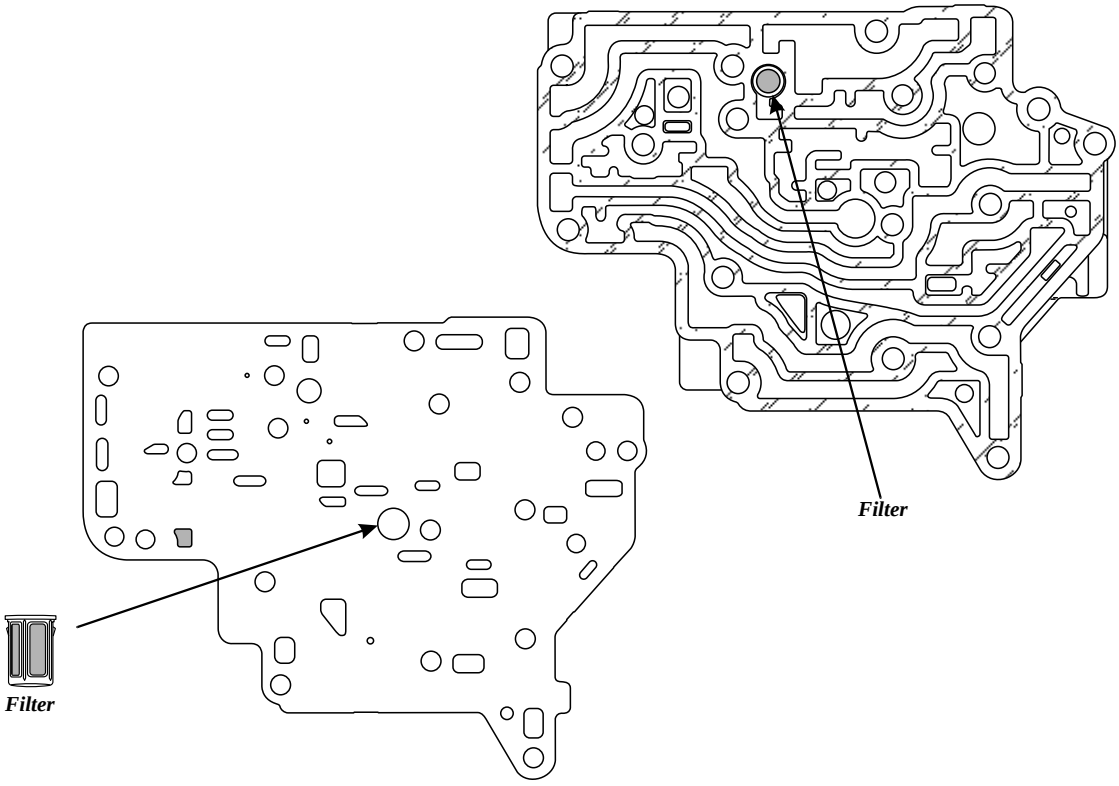
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Figure 6

"97" PREMAIN COVER AND SPACER PLATE



"98" PREMAIN COVER AND SPACER PLATE



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Figure 7