FORD AX4N

INDEX

AUTOMATIC TRANSMISSION SERVICE GROUP
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INTRODUCTION
FORD AX4N

The Ford Motor Co. AX4N automatic transaxle is a four speed unit with total electronic controls and is designed for operation in a transverse powertrain for front wheel drive vehicles. Currently found in Taurus, Sable and Windstar vehicles. The electronic system controls the transaxle shift speeds and torque converter clutch apply and release with solenoid actuated valves. These shift solenoids, when energized, coupled with the hydraulic systems valve body, actuate various multi-plate clutch packs and bands to control the various gear ratios through the planetary gear train. Line pressure is also electronic controlled with a solenoid and controlled by the Powertrain Control Module. The PCM moniters numerous input sensors and sends the proper signals for the gear ratio desired to produce optimum driveability.

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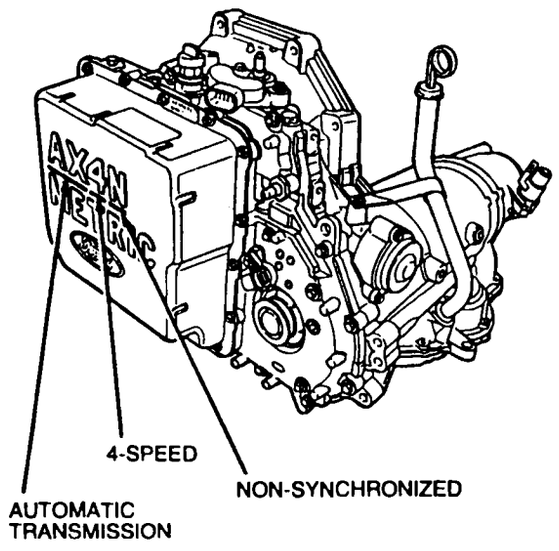
DESCRIPTION AND OPERATION

AX4N Automatic Transaxle

The AX4N automatic transaxle is a four-speed unit with electronic shift control. It is designed for operation in a transverse powertrain for front-wheel drive vehicles.



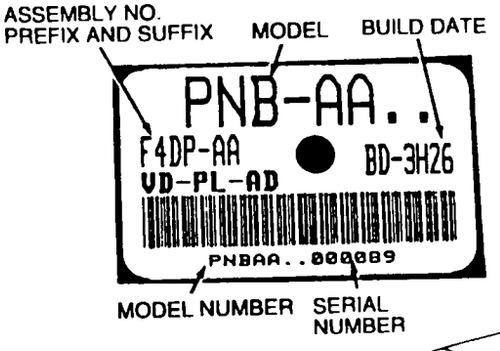
AX4N Automatic Transaxle—Sectional View

The AX4N transaxle has the following major components:

- Case with chain cover.
- Torque converter.
- Chain drive.
- Apply components:
  - — Two friction bands: Overdrive, Coast.
  - — Five friction clutches: Forward, Direct, Intermediate, Reverse, Low-intermediate.
  - — Three one-way clutches: Low, Direct, Low-intermediate.
- Two simple planetary gearsets:
  - — Front.
  - — Rear.
- Final drive planetary gearset.
- Differential.
- Oil pump.
- Main control.

Transaxle Identification

When servicing the automatic transaxle, refer to the identification tag located on top of the converter housing.



VEHICLE APPLICATION

Taurus, Sable—3.0L

DIAGNOSIS AND TESTING

SPECIAL TESTING PROCEDURES

Engine Idle Speed Check

– Refer to Specification Section in the Engine Service Manual.

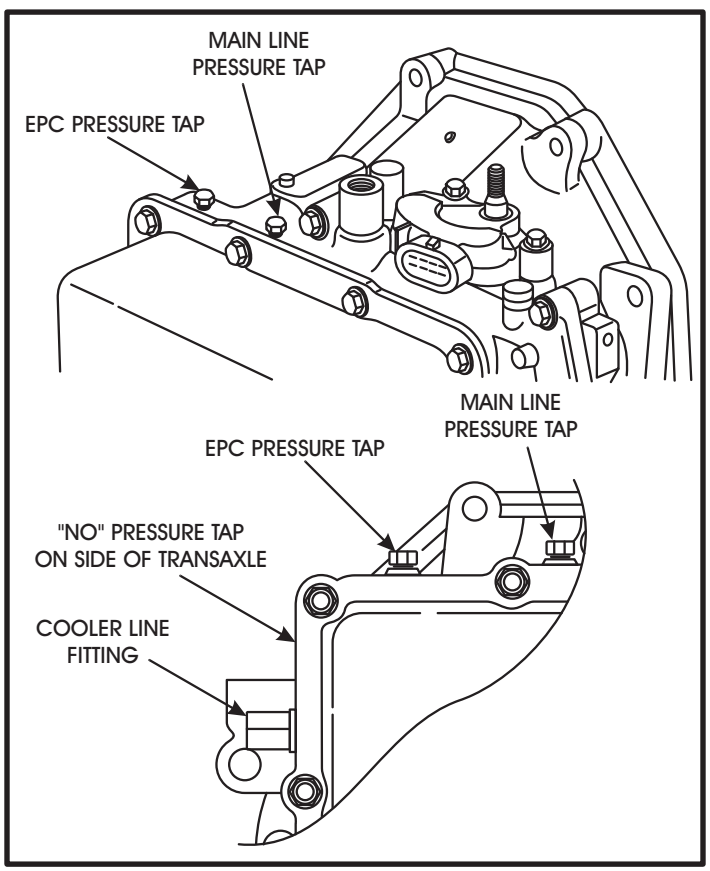
Line Pressure Test

This test verifies that the line pressure is within specifications.

CAUTION: The Transmission Tester MUST BE REMOVED and the vehicle harness installed when verifying these pressures.

CAUTION: Perform Line Pressure Test prior to performing Stall Speed Test. If line pressure is low at stall, do not perform Stall Speed Test or further transaxle damage will occur. DO NOT MAINTAIN WIDE–OPEN THROTTLE in any gear range FOR MORE THAN FIVE (5) SECONDS.

1. Connect 0–300 psi pressure gauge to line pressure tap.



NOTE: The vehicle harness must be installed at the transaxle connector to verify these pressures.

CAUTION: Do not install Transaxle Tester when verifying these pressures.

#401 — DIAGNOSTIC PRESSURE CHART

Pressures at Idle ***

GEAR	EPC	LINE
##	## 40-60	## 130-180
P		56–84
R	10-20	70–108
N	10-20	56–84
Ⓓ	10-20	56–84
D	10-20	56–84
1	10–20	56–84

Pressure at Wide–Open Throttle (WOT) Stall ***

GEAR	EPC	LINE
P	– – – –	– – – –
R	70-90	265-300
N	– – – –	– – – –
Ⓓ	70-90	218–242
D	70-90	218–242
1	70–90	218–242

*SPECIAL NOTE:* This condition will occur when the TRANSAXLE FLUID TEMPERATURE is below 150°F AND PRIOR to the INITIAL engagement.

***** All pressures are in PSI and are approximate.**

DIAGNOSIS AND TESTING

3. If line pressure is not within specifications, perform On–Board Diagnostics. Perform Air Pressure Test and service main control or pump assembly as required.
4. If line pressure is not within specifications after mechanical checks and there are no DTCs, Electronic Pressure Control (EPC) solenoid may be mechanically malfunctioning.
5. Connect pressure gauge to EPC pressure tap. Start engine and check EPC pressure. Refer to Line Pressure Diagnostic Chart for specifications. If EPC is not correct, replace EPC solenoid. If EPC pressure is O.K., refer to Line Pressure Diagnosis Chart for symptom definition.

LINE PRESSURE DIAGNOSIS CHART

TEST RESULTS	POSSIBLE SOURCE
HIGH at IDLE – ALL RANGES	• Wiring Harnesses • EPC Solenoid • Main Regulator Valve
LOW at IDLE – ALL RANGES	• Low Fluid Level • Fluid Inlet Filter/Seal • Main Control Body • Cross Leaks • Gaskets • Pump • Separator Plate
LOW in PARK ONLY	• Valve Body
LOW in REVERSE ONLY	• Separator Plate • Reverse Clutch • Valve Body • Forward Clutch
LOW in NEUTRAL ONLY	• Valve Body
LOW in OVERDRIVE ONLY	• Forward Clutch • Valve Body
LOW in DRIVE ONLY	• Forward Clutch
LOW in MANUAL 1ST ONLY	• Forward Clutch • Valve Body

DIAGNOSIS AND TESTING

Stall Speed Test

This test checks operation of the following items:

- Torque Converter Clutch
- Forward Clutch
- Low OWC Assembly
- Engine Performance

NOTE: The stall speed test should be performed with the engine and transaxle at normal operating temperatures.

CAUTION: Always perform Line Pressure Test procedures prior to performing the Stall Speed Test. If line pressure is LOW at stall, DO NOT perform Stall Speed Test or further transaxle damage will occur.

WARNING: **APPLY THE PARKING BRAKE FIRMLY WHILE PERFORMING EACH STALL TEST.**

1. Connect tachometer to the engine.

CAUTION: After testing each of the following ranges (Ⓓ, D, 1, R move the transaxle range selector lever to N (NEUTRAL) and run engine for about 15 SECONDS to allow the torque converter to cool before testing the next range.

CAUTION: DO NOT MAINTAIN W.O.T. in any range for more than FIVE (5) seconds.

NOTE: Prolonged use of this procedure may set Diagnostic Trouble Code 638 or 657. After performing Stall Test procedures run OBD Test and clear DTCs from memory.

2. Press accelerator pedal to floor (WOT) in each range. Record RPM reached in each range. Stall speeds should be as follows:

Engine	Stall Speed (RPM)
3.0L	1870 – 2196 rpm

CAUTION: If the engine rpm recorded by the tachometer exceeds maximum specified rpm, RELEASE the accelerator pedal IMMEDIATELY. Clutch or band slippage is indicated.

If stall speeds were too HIGH, refer to the following Stall Speed Diagnosis Chart. If stall speeds were too LOW, first check the engine idle speed and tune up. If engine is OK, remove torque converter and check the torque converter clutch for slippage.

Stall Speed Diagnosis Chart

Range	Possible Source
Ⓓ, D, 1	Forward Clutch. Low/Intermediate One–Way Clutch. Low/Intermediate Band or Servo.
R	Forward Clutch. Low/Intermediate One–Way Clutch. Reverse Clutch.

Air Pressure Tests

A NO DRIVE condition can exist, even with correct transaxle fluid pressure, because of inoperative clutches or bands. An erratic shift can be located through a series of checks by substituting air pressure for fluid pressure to determine the location of the malfunction.

When the transaxle range selector lever is in a forward gear range (Ⓓ, D, 1), a NO DRIVE condition may be caused by an inoperative forward clutch, overrunning or low/intermediate band. No manual 1st gear may be caused by an inoperative direct clutch or direct one–way clutch.

Failure to drive in R (REVERSE) could be caused by a malfunctioning reverse clutch, forward clutch, or One–Way clutch.

Follow the procedure to determine the location of the inoperative clutch or band by introducing air pressure into the various test plate passages.

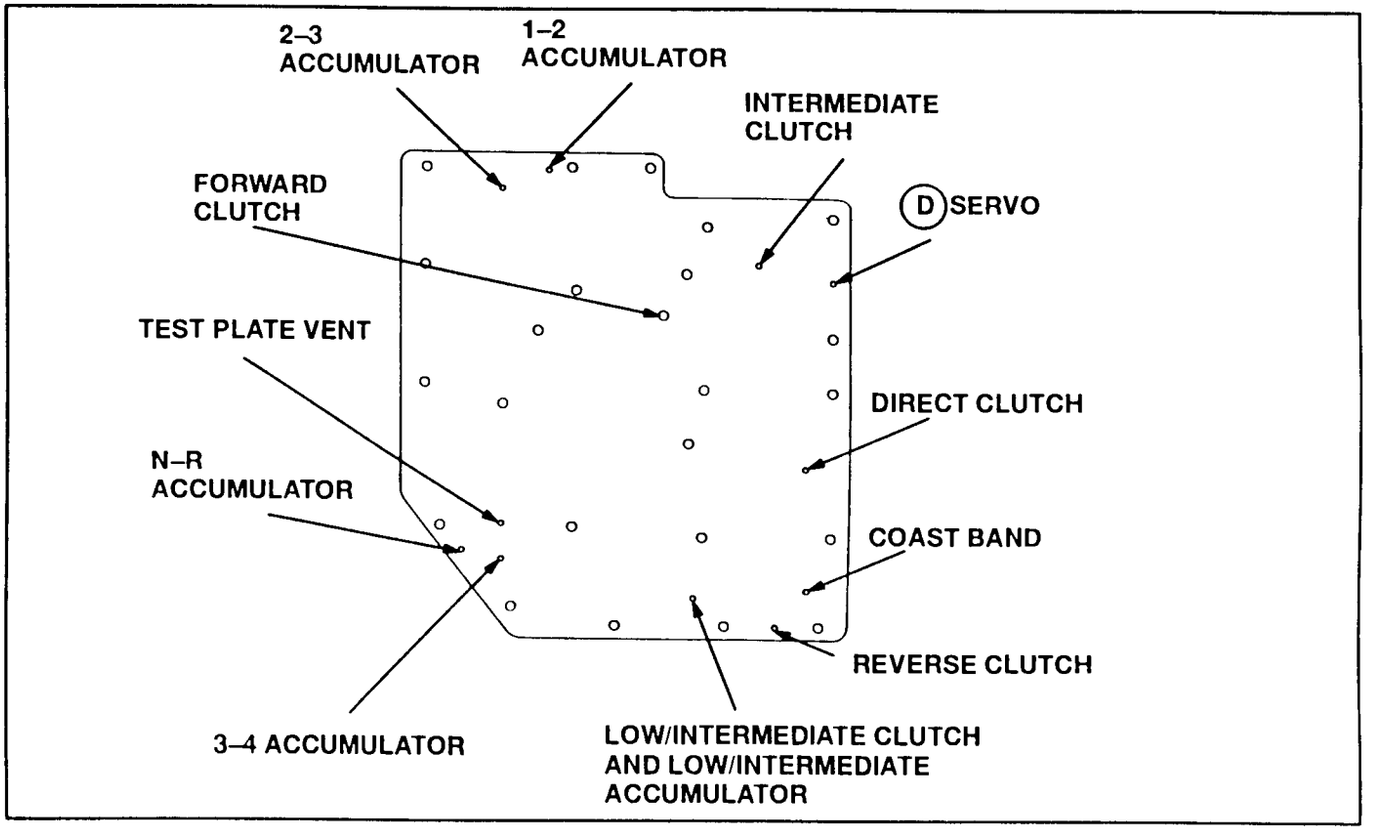
DIAGNOSIS AND TESTING

NOTE: Cover vent in test plate with a clean, lint free shop towel to prevent spray when air is applied. Plugging vent hole during testing will result in inaccurate results.

NOTE: Use onlu dry regulated air pressure 276kPa (40 PSI) max. A dull thud should be heard when the clutch or band applies. There should be no hissing sound when band or clutch applies.

1. Drain transaxle fluid and remove transaxle oil pan.
2. Remove main control cover. Then remove oil pump and main control valve body.
3. Install the air pressure plate (T94P–77001–EH) and gasket (53923).
4. Apply air pressure to appropriate clutch port (refer to diagram). A dull thud may be heard or movement felt when clutch is applied or released. If clutch seals or check balls are leaking a hissing sound may be heard.

CAUTION: Do not apply air to test the vent.



Air Pressure Plate Test Ports

- Reverse Clutch
- Forward Clutch
- Intermediate Clutch
- Direct Clutch
- Overdrive Servo
- Low Intermediate Clutch and Low/Intermediate Accumulator
- 1–2, 2–3, 3–4, N–R Accumulators
- Coast Band

DIAGNOSIS AND TESTING

Air Pressure Test Results
If test results find that the servos do not operate, disassemble, clean, and inspect them to locate the source of the concern.

If air pressure applied to the clutch passages fails to operate a clutch, or operates clutch simultaneously, remove and with air pressure, check the fluid passages in the chain cover, front support, driven sprocket, and clutches to detect obstructions.

If air pressure applied to the accumulator passages fails to operate an accumulator, remove, and with air pressure, check the fluid passages in the chain cover to detect obstructions.

Leakage Inspection
Check the Vehicle Speed Sensor (VSS) and the speedometer cable connection at the transaxle. Replace rubber seal if necessary.

Leakage at the transaxle oil pan to case gasket often can be stopped by tightening the attaching bolts to 14–16 N•m (10–12 lb–ft). If necessary, replace the oil pan to case gasket.

Check the fluid filler tube connection at the transaxle case. If leakage is found here, install a new grommet.

Check fluid lines and fittings between the transaxle and the cooler in the radiator tank for looseness, wear, or damage. If leakage cannot be stopped by tightening a fluid tube nut, replace the damaged parts. When fluid is found leaking between the case and cooler line fitting, check for missing or damaged O–ring, then tighten the fitting to maximum specification.

CAUTION: Do not try to stop the fluid leak by increasing the torque beyond specification.This may cause damage to the case threads.

If the leak continues, replace cooler line fitting and tighten to specification. The same procedure should be followed for fluid leaks between the radiator cooler and the cooler line fittings, refer to Transaxle Cooler Line Replacement for procedures.

Check the engine coolant in the radiator. If transaxle fluid is present in the coolant, the cooler in the radiator is probably leaking.

The cooler can be further checked for leaks by disconnecting the lines for the cooler fittings and applying no more than 345 kPa (50 psi) air pressure to the fittings. Remove the radiator cap to relieve the pressure buildup at the exterior of the oil cooler tank. If the cooler is leaking and/or will not hold pressure, replace the cooler.

If leakage is found at the manual lever, replace the seal.

Check for fluid leaking from the differential seal. Leakage may result from damaged seal, missing garter spring or worn halfshaft/ linkshaft. Replace seal assembly and/or halfshaft as necessary.

Check the steering gear system. The power steering gear is positioned over the rear of the transaxle and is filled with transmission fluid. Leaks from the steering gear may pool on the transaxle before dripping on the ground, thus giving the appearance of a transaxle fluid leak.

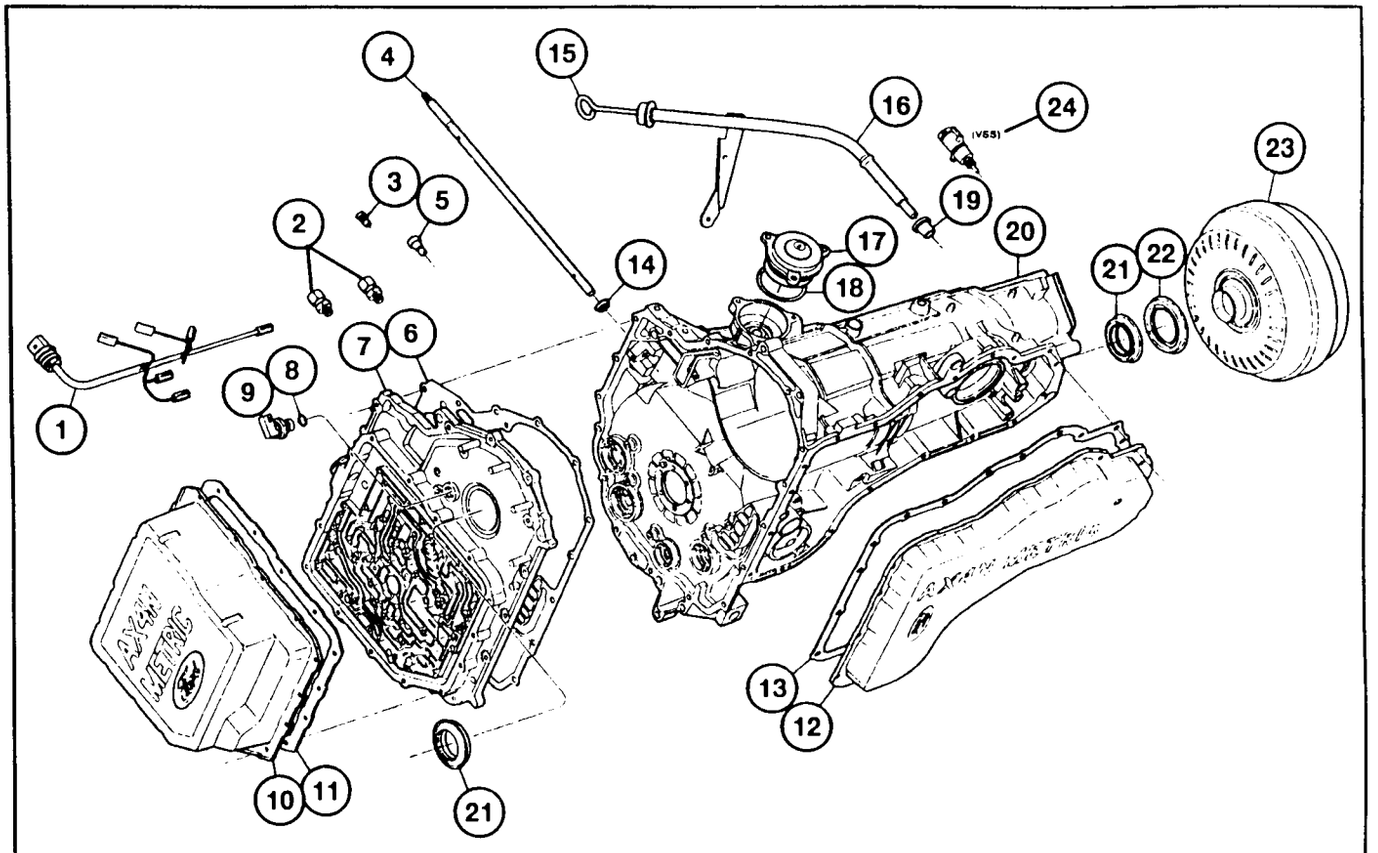
Check the chain cover gasket.

Check the wiring connector at the chain cover. Replace the wiring connector assembly if necessary.

DIAGNOSIS AND TESTING

External Sealing

The AX4N transaxle has the following parts to prevent external fluid leakage:

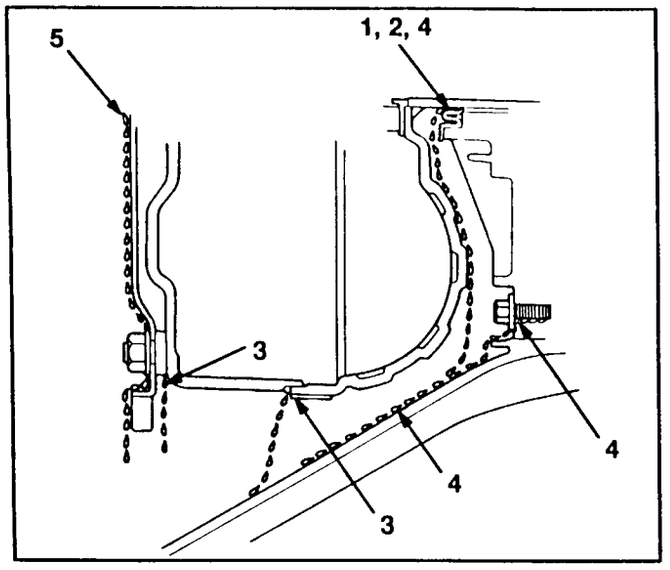


1. 7G276 – BULKHEAD ASSEMBLY – WIRING CONNECTOR
2. 7D273 – CONNECTOR ASSEMBLY – OIL COOLER 5/16 (2 REQ'D)
3. 390685–S36 – PLUG – 1/8–27 HEX HEAD SPECIAL PILOT (2 REQ'D)(PRESSURE TAP PLUGS FOR CHAIN COVER & PUMP ASSEMBLY)
4. 7C493 – SHAFT – MANUAL CONTROL LEVER
5. 7034 – VENT ASSEMBLY – CASE
6. 7G303 – GASKET – CHAIN COVER
7. 7G188 – COVER ASSEMBLY – CHAIN
8. 7Z101 – SEAL – 14.0 X 1.78 O–RING (2 REQ'D)
9. 7M101 – SENSOR – TURBINE SHAFT SPEED
10. 7G004 – COVER – MAIN CONTROL
11. 7F396 – GASKET – MAIN CONTROL COVER
12. 7A194 – PAN – OIL
13. 7A191 – GASKET – OIL PAN
14. 7F337 – SEAL ASSEMBLY – MANUAL CONTROL SHAFT
15. 7A020 – INDICATOR ASSEMBLY – OIL LEVEL
16. 7A228 – TUBE ASSEMBLY – OIL FILLER
17. 7D027 – COVER – OVERDRIVE SERVO PISTON
18. 7D024 – SEAL – OVERDRIVE SERVO COVER
19. 7N243 – GROMMET – OIL FILLER TUBE
20. 7005 – CASE ASSEMBLY
21. 1177 – SEAL ASSEMBLY – DIFFERENTIAL (2 REQ'D)
22. 7F401 – SEAL ASSEMBY – CONVERTER IMPELLER HUB
23. 7902 – CONVERTER ASSEMBLY
24. 9E731 – VEHICLE SPEED SENSOR

Fluid Leakage in Torque Converter Area

In diagnosing and correcting fluid leaks in the torque converter area, use the following procedures to locate the exact cause of the leakage. Leakage at the front of the transaxle, as evidenced by fluid around the converter housing, may have several sources. By careful observation it is possible, in many instances, to pinpoint the source of the leak before removing the transaxle from the vehicle. The paths which the fluid can take to reach the bottom of the converter housing are as follows:

DIAGNOSIS AND TESTING



1. Fluid leaking by the torque converter impeller hub seal lip tends to move along the converter impeller hub and onto the back of the impeller housing. Except in the case of a total seal failure, fluid leakage is deposited on the inside of the converter housing only, near the outside diameter of the converter housing.
2. Fluid leakage by the outside diameter of the converter hub seal and the case follows the same path which the leaks by the inside diameter of the seal follow.
3. Fluid leakage from the torque converter to the flywheel stud weld appears at the outer diameter of the torque converter on the back face of the flywheel (6375), and in the converter housing only near the flywheel. If a converter–to–flywheel stud leak is suspected, remove the torque converter and pressure check as outlined.
4. Fluid leakage from the pump flows down the back of the converter housing. Leakage may be from loose or missing pump bolts, a torn or damaged pump–to–case gasket, and/or a worn pump bushing.
5. Engine oil leaks are sometimes improperly diagnosed as transaxle pump seal leaks. The following areas of possible leakage should also be checked to determine if engine fluid leakage is causing the problem.
   a. Leakage at the valve cover may allow engine fluid to flow over the converter housing or seep down between the converter housing and block causing fluid to be present in or at the bottom of the converter housing.
   b. Oil plug leaks allow fluid to flow down the rear face of the block to the converter housing.
   c. Leakage at the crankshaft seal works back to the flywheel, and then into the converter housing.

Leak Check Test

The following procedures should be used to determine the cause of the leakage before service is made:

1. Remove the transaxle oil level indicator and note color of the fluid. Original factory fill fluid is dyed red to aid in determining if leakage is from the engine or transaxle. Unless a considerable amount of makeup fluid has been added or the fluid has changed, the red color should assist in pinpointing the leak.
2. Remove the converter housing cover. Clean off any fluid from the top and bottom of the converter housing, front of the transaxle case, and rear face of the engine and pan. Clean the converter area by washing with suitable nonflammable solvent, and blow dry with compressed air.
3. Wash out the converter housing and front of the flywheel. The converter housing may be washed out using clean solvent and a squirt–type fluid can. Blow all washed areas dry with compressed air.
4. Start and run the engine until the transaxle reaches its normal operating temperature. Observe the back of the block and top of the converter housing for evidence of fluid leakage. Raise the vehicle on a hoist and position suitable safety stands under the vehicle. Run the engine at fast idle, then at

DIAGNOSIS AND TESTING

engine idle, occasionally shifting to DRIVE and REVERSE range to increase pressure within the transaxle. Observe the front of the flywheel, back of the block (in as far as possible), and inside the converter housing and front of the transaxle case. Run the engine until fluid leakage is evident and the probable source of leakage can be determined.

Leak Check Test with Black Light

Oil soluble aniline or flourescent dyes premixed at the rate of 2.5ml ($^1/_2$ teaspoon) of dye powder to 0.24L ($^1/_2$ pint) of transmission fluid have been proven helpful in locating the source of fluid leakage. Such dyes may be used to determine whether an engine oil or transmission fluid leak is present, or if the fluid in the cooler leaks into the engine coolant system. A black light must be used with the fluorescent dye solution.

Transaxle Oil Cooler Flow Test

NOTE: The transaxle linkage/cable adjustment, fluid level, and line pressure must be within specifications before performing this test. Refer to service procedures as outlined.

1. Remove oil level indicator from oil filler tube.
2. Place funnel in oil filler tube.
3. Raise vehicle on hoist and position suitable safety stands under vehicle.
4. Remove cooler return line (rear fitting) from fitting on transaxle case.
5. Connect one end of hose to cooler return line and route other end of hose up to a point where it can be inserted into funnel at oil filler tube.
6. Remove safety stands and lower vehicle. Insert end of hose into funnel.
7. Start engine and run at idle with transaxle in NEUTRAL range.
8. When fluid flowing from hose is all liquid, an adequate amount of fluid should be observed, approximately $^1/_2$ quart delivered in 30 seconds. If adequate flow is observed, test is completed.
9. If flow is not adequate, stop engine. Disconnect hose from cooler return line and connect it to converter–out line (front fitting) on transaxle case.
10. Repeat Steps 7 and 8. If flow is now adequate, refer to appropriate section for diagnosis of transaxle oil cooler. If flow is not adequate, service pump and/or converter assembly.

Transaxle Oil Cooler

CAUTION: Whenever a transaxle has been disassembled to replace worn or damaged parts or because the valve body sticks from foreign material, the transaxle oil cooler MUST be cleaned by using the Rotunda Torque Converter/Oil Cooler Cleaner 014–00028 or equivalent. Under NO circumstances should torque converters be cleaned by hand agitation with solvent.

When internal wear or damage has occurred in the transaxle, metal particles, clutch plate material, or band material may have been carried into the transaxle cooler. These contaminants are a major cause of recurring transaxle concerns and **MUST** be removed from the system before the transaxle is put back into service.

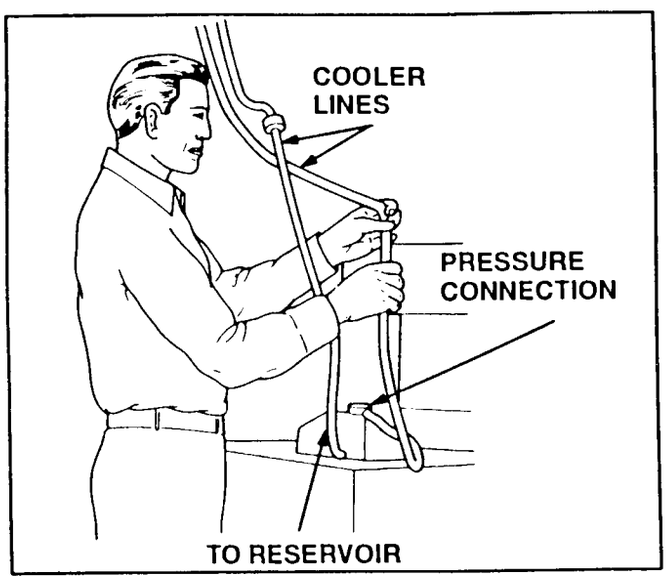
Transaxle Cooler Lines, Back Flushing and Cleaning

1. Conduct back flushing with Rotunda Model 014–00028 Torque Converter Cleaner or equivalent. Test your equipment to make sure that a vigorous fluid flow is present before proceeding. Replace the system filter if flow is weak or contaminated.
2. To aid in attaching the cleaner to the transaxle steel cooler lines, connect two additional rubber hoses to the transaxle end of the steel transaxle cooler lines as described below.

DIAGNOSIS AND TESTING

- Connect the cleaner tank pressure line to the steel transaxle cooler return line (longest line).
- Connect a tank return hose to the steel transaxle cooler pressure line (shorter line). Place the outlet end of this hose into the solvent tank reservoir.

3. Turn on the solvent pump and allow the solvent to circulate a minimum of 5 minutes (cycling the switch on and off will help dislodge contaminants in the cooler system).
4. Switch off the solvent pump and disconnect the solvent pressure hose from the transaxle cooler return line.
5. Use compressed air to blow out the cooler(s) and lines (blow air into the transaxle cooler return line) until all solvent is removed.
6. Remove the rubber return hose from the remaining steel cooler line.



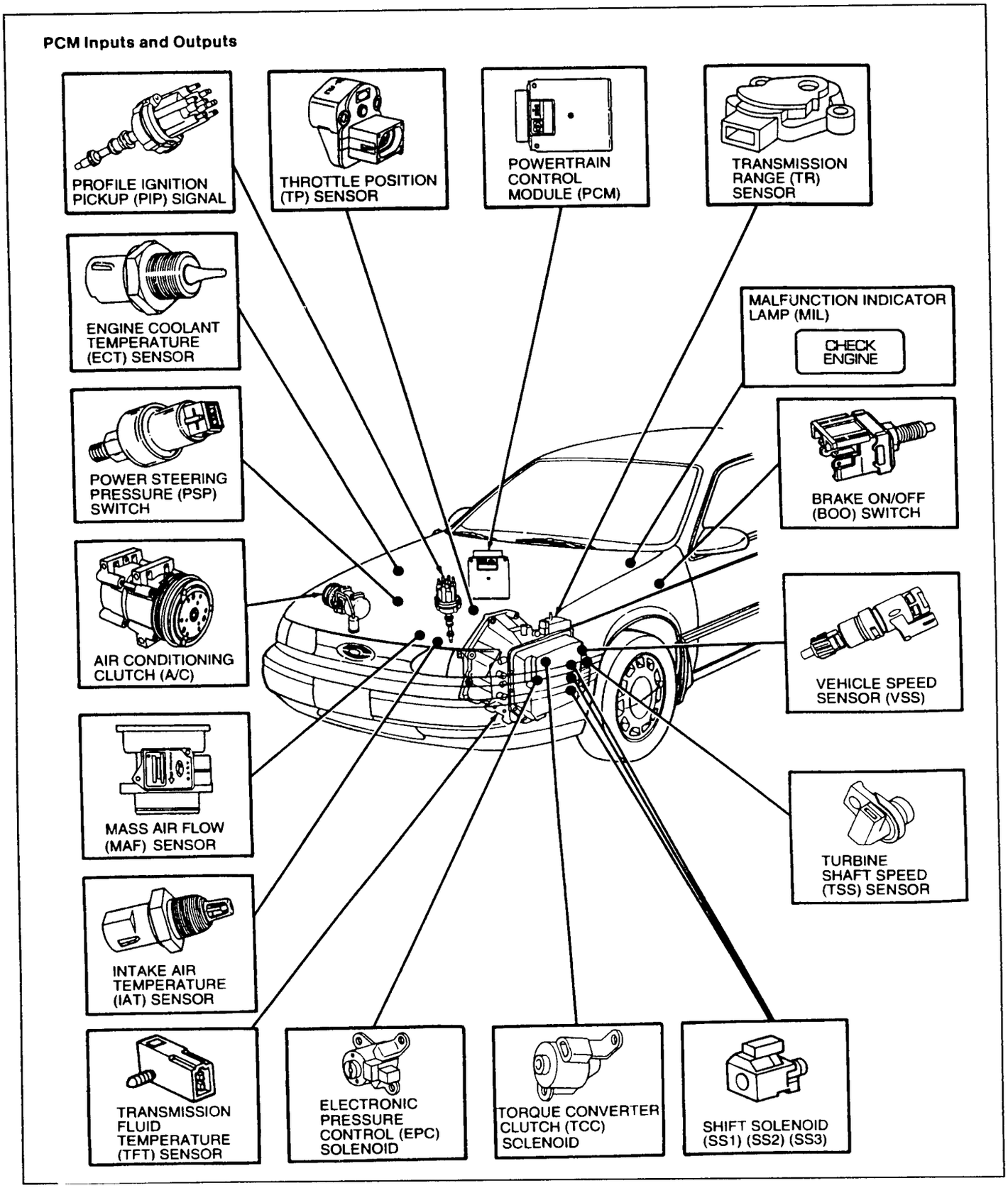
Transaxle Oil Cooler Tube Replacement

When fluid leakage is found at the transaxle oil cooler, the transaxle oil cooler must be replaced.

When transaxle oil cooler steel lines must be replaced, each replacement line must be fabricated from the same size inside diameter and length steel line as the original line.

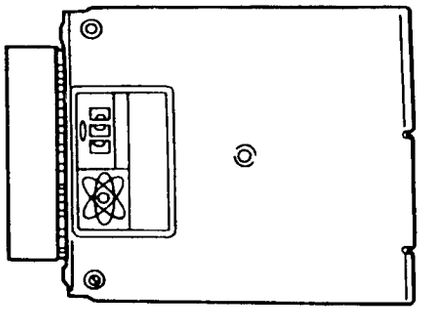
Using the old line as a guide, bend the new line as required. Add the necessary fittings and install the line.

After the fittings have been tightened, check and add fluid as necessary. Check for fluid leaks.


PCM Inputs and Outputs
PROFILE IGNITION PICKUP (PIP) SIGNAL
THROTTLE POSITION (TP) SENSOR
POWERTRAIN CONTROL MODULE (PCM)
TRANSMISSION RANGE (TR) SENSOR
ENGINE COOLANT TEMPERATURE (ECT) SENSOR
MALFUNCTION INDICATOR LAMP (MIL)
CHECK ENGINE
POWER STEERING PRESSURE (PSP) SWITCH
BRAKE ON/OFF (BOO) SWITCH
AIR CONDITIONING CLUTCH (A/C)
VEHICLE SPEED SENSOR (VSS)
MASS AIR FLOW (MAF) SENSOR
TURBINE SHAFT SPEED (TSS) SENSOR
INTAKE AIR TEMPERATURE (IAT) SENSOR
TRANSMISSION FLUID TEMPERATURE (TFT) SENSOR
ELECTRONIC PRESSURE CONTROL (EPC) SOLENOID
TORQUE CONVERTER CLUTCH (TCC) SOLENOID
SHIFT SOLENOID (SS1) (SS2) (SS3)

Powertrain Control Module (PCM) 12A650:

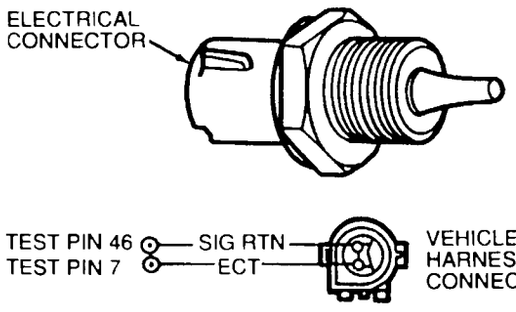
Controls operation of the AX4N automatic transaxle. Many input sensors provide information to the powertrain control module. The powertrain control module then controls the actuators which affect transaxle operation.



DTCs: 511, 512, 513

Engine Coolant Temperature (ECT) Sensor 12A648:

Detects the temperature of engine coolant and supplies the information to the powertrain control module. The ECT sensor is threaded into the heater outlet fitting or cooling passage on the engine. For automatic transmission applications, the ECT is used to control torque converter clutch solenoid operation. For engine control applications, the ECT signal is used to modify ignition timing, EGR flow, and air-to-fuel ratio as a function of engine coolant temperature. On electronic instrument cluster applications, the ECT output is used to control a coolant temperature indicator.

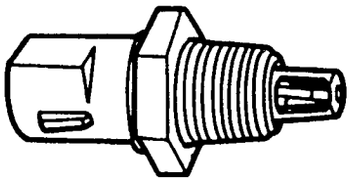


Symptoms: Torque converter clutch solenoid will always be OFF, resulting in reduced fuel economy.

DTCs: 116, 117, 118

Intake Air Temperature (IAT) Sensor 12A697:

Is used to determine the EPC pressure. It also provides the Electronic Fuel Injection System with mixture (fuel and air) temperature information. The IAT is used both as a density connector for airflow calculation and to proportion the cold enrichment fuel flow. This sensor is similar in construction to the engine coolant temperature sensor.



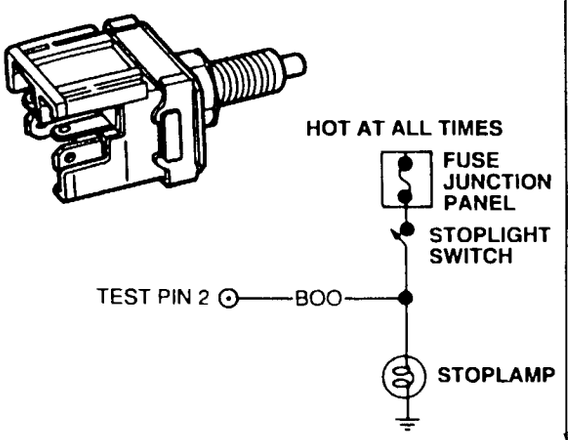
Symptoms: Incorrect EPC pressure either high or low resulting in either harsh or soft shifts.

DTCs: 114, 112, 113

Brake On/Off (BOO) Switch 13480:

The BOO (brake on/off) switch is connected to the brake pedal. When the brake pedal is pressed, the BOO switch has closed contacts allowing a voltage signal to the PCM.

The PCM releases TCC when the brakes are applied.



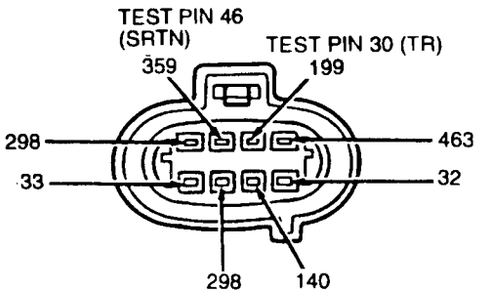
Symptoms:

- Failed "ON"—torque converter clutch will not engage at less than one-third engine throttle.
- Failed "OFF" or not connected—torque converter clutch will not release when brake is applied.

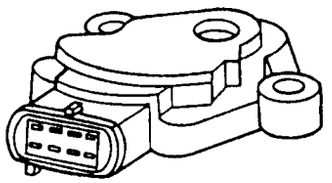
DTC: 536

Transmission Range (TR) Sensor 7A247:

The powertrain control module sends a voltage signal to the transmission range (TR) sensor. The TR sensor incorporates a series of step-down resistors which act as a voltage divider. The powertrain control module monitors this voltage which corresponds to the position of the manual control lever (P, R, N, D, 1). The TR sensor is located on the outside of the transaxle at the manual control lever. The function of the TR sensor is to determine desired gear and EPC pressure. The TR sensor also contains the park / neutral and backup lamp circuits.



VEHICLE HARNESS CONNECTOR



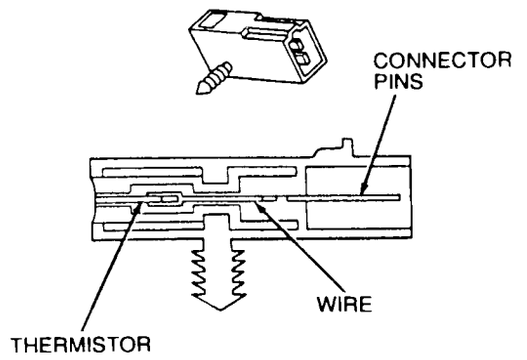
Symptoms: Harsh engagements and firm shift feel. No 3 / 4 shift. May downshift to a lower gear. No rpm rev limiter in PARK or NEUTRAL.

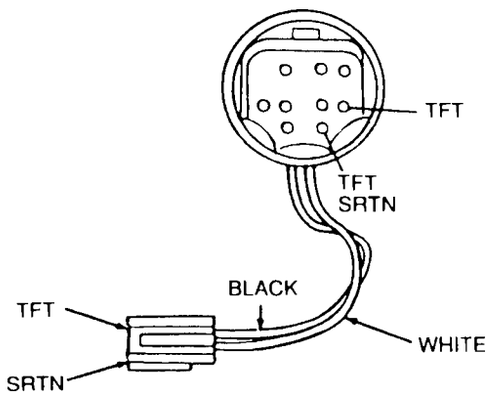
DTCs: 634, 654

Transmission Fluid Temperature (TFT) Sensor 7H141:

Is located on the transmission main control body. It is a temperature-sensitive device called a thermistor. The resistance value of the TFT will vary with temperature change. The powertrain control module monitors the voltage across the TFT to determine the temperature of the transmission fluid.

The powertrain control module uses this initial signal to determine whether a cold start shift schedule is necessary. The cold start shift schedule allows quicker shifts when the transmission fluid temperature is cold. The PCM also inhibits torque converter clutch operation at low transmission fluid temperatures. Corrects EPC pressures for temperature.



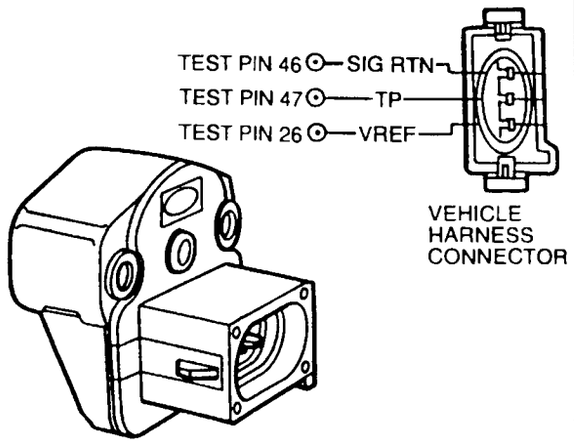


Symptoms: Torque converter clutch engagement and stabilized shift schedules happen too soon after a cold start. Harsh or soft shifts.

DTCs: 636, 637, 638, 657

Throttle Position (TP) Sensor 9B989:

Is a potentiometer mounted on the throttle body. The TP sensor detects the position of the throttle plate and sends this information to the powertrain control module as a varying voltage signal. The PCM uses the monitored voltage level of the TP sensor for control of EPC pressure, torque converter clutch operation and shift scheduling. If a malfunction occurs in the TP sensor circuit, the powertrain control module will recognize that the TP sensor signal is out of specification. The powertrain control module will then operate the AX4N transaxle in a high capacity mode to prevent transaxle damage.

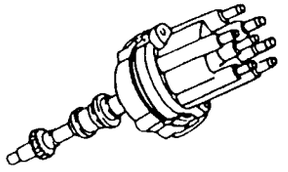


Symptoms: Harsh engagements, firm shift feel, abnormal shift schedule, torque converter clutch does not engage, torque converter clutch cycling.

DTCs: 121, 122, 123, 124, 125 and 167

Profile Ignition Pickup (PIP) Signal:

Tells the powertrain control module the engine rpm and the crankshaft position. On gasoline engines, PIP signal is produced by a stator in the distributor.



Transmission Function: Uses rpm signal in the transaxle strategy for torque converter clutch control.

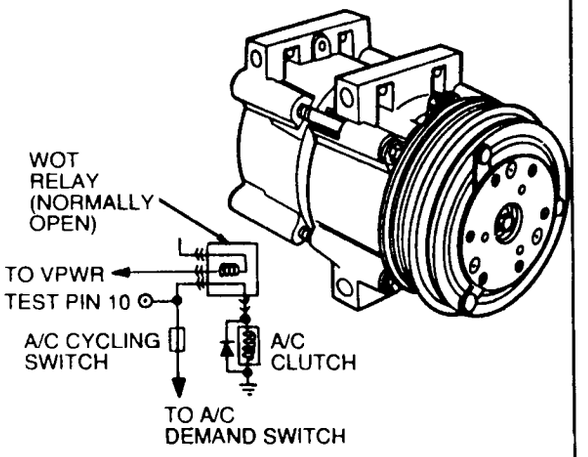
Symptoms: Engine malfunction, no torque converter clutch engagement.

DTCs: 211, 212, 213

Air Conditioning Clutch (A/C Clutch) 2884: OEM Factory Installed

The electromagnetic A/C clutch is energized when the A/C cycling switch closes. The switch is located on the suction accumulator/drier. The closing of the switch completes the circuit to the A/C clutch and draws it into engagement with the compressor driveshaft.

When engaged, the A/C clutch is an input to the PCM to adjust EPC pressure for the load on the engine. Also used to adjust torque converter clutch (TCC) modulation when the A/C clutch is engaged.



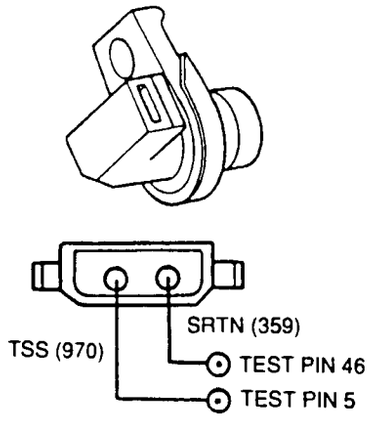
Symptoms:

- Failed ON—EPC pressure slightly low with A/C OFF.
- Failed OFF—EPC pressure slightly high with A/C ON.
- If erratic A/C operation occurs, the customer may feel improper TCC apply and release.

DTC: 539

Turbine Shaft Speed Sensor (TSS) 7M101

Is a magnetic pickup that sends a signal to the powertrain control module that indicates transaxle turbine shaft input speed. The TSS provides converter turbine speed information for torque converter clutch (TCC) strategy. Also used in determining static EPC pressure settings.

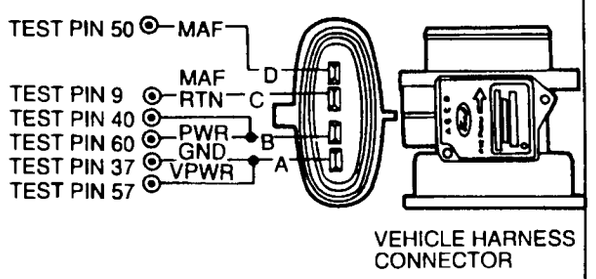


Symptoms: Increased engine rpm on engagements, harsh shifts (converter engaged), delayed shifts with hard apply (slip / bump feel).

DTC: 639

Mass Air Flow (MAF) Sensor 12B579:

Directly measures the mass of the air flowing into the engine. The sensor output is a DC (analog) signal ranging from about 0.5 volt to 5.0 volts used by the PCM to calculate the injector pulse width for stoichiometry. For transaxle strategies, the MAF sensor input is used for EPC pressure control, shift and torque converter clutch (TCC) control.

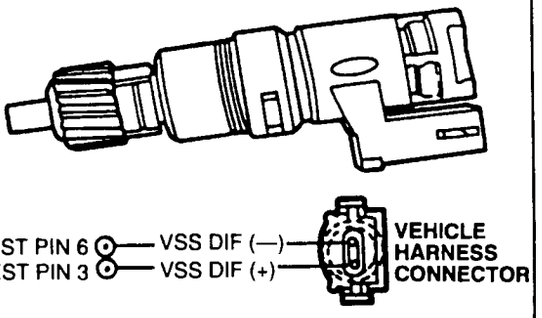


Symptoms: High / low EPC pressure, incorrect shift schedule, incorrect torque converter engagement scheduling and symptoms similar to a throttle position sensor malfunction.

DTCs: 157, 158, 159, 184 and 185

Vehicle Speed Sensor (VSS) 9E731:

A magnetic pickup that sends a signal to the powertrain control module. The VSS signal tells the powertrain control module the vehicle speed. The PCM uses this information to control shift scheduling and EPC pressure.

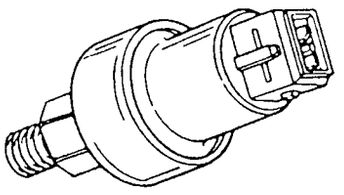


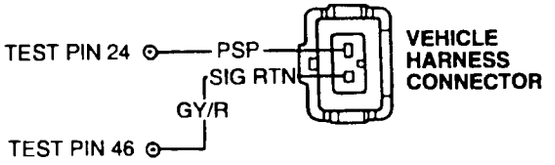
Symptoms: Harsh engagements, firm shift feel, abnormal shift schedule, unexpected downshifts may occur at closed throttle. Torque converter clutch will not engage. Elevated EPC pressures.

DTC: 452

Power Steering Pressure (PSP) Switch 3N824:

Is used on certain applications to signal the powertrain control module when the power steering pressure exceeds a specific limit. Then the powertrain control module will adjust idle speed to compensate for this added load on the engine. This increase in engine rpm is used as an input to the PCM to adjust EPC pressure to the transaxle.





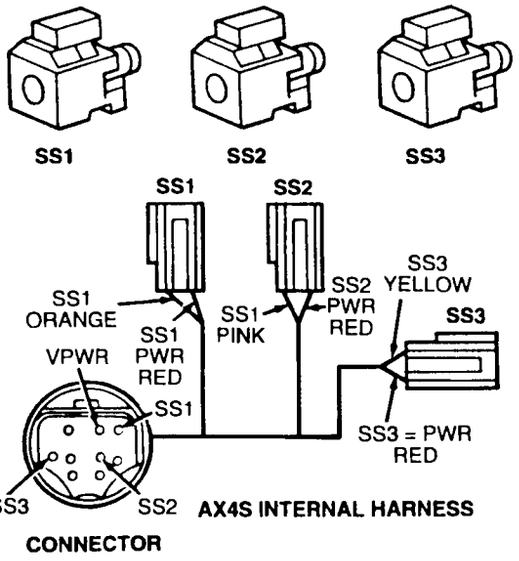
Symptoms:

- Failed ON—EPC slightly high, firm engagements, firm shifts, harsh coastdown shifts.
- Failed OFF—EPC pressure slightly low during increased loading of the vehicle power steering.

DTCs: 519, 521

Shift Solenoid Assemblies (SS1, SS2, SS3) (7G484):

Three ON / OFF solenoids are used for electronic shift scheduling. The three solenoids are located in the main control valve body. The solenoids are two-way, normally open style. Solenoids SS1, SS2, and SS3 provide gear selection of 1st through 4th by controlling the pressure of the three shift valves.



SS1 Symptoms: Improper gear selection depending on failure mode and manual lever position.

- Failed ON—3rd gear only.
- Failed OFF—1st and 2nd gear only.

DTCs: 621[a], 645[b], 647[b], 648[b]

SS2 Symptoms: Improper gear selection depending on failure mode and manual control lever position.

- Failed ON—1st and 4th gear only.
- Failed OFF—2nd and 3rd gear only.

DTCs: 622,[c] 645[b], 646[b], 647[b], 648[b]

SS3 Symptoms: Improper gear selection depending on failure mode and manual control lever position.

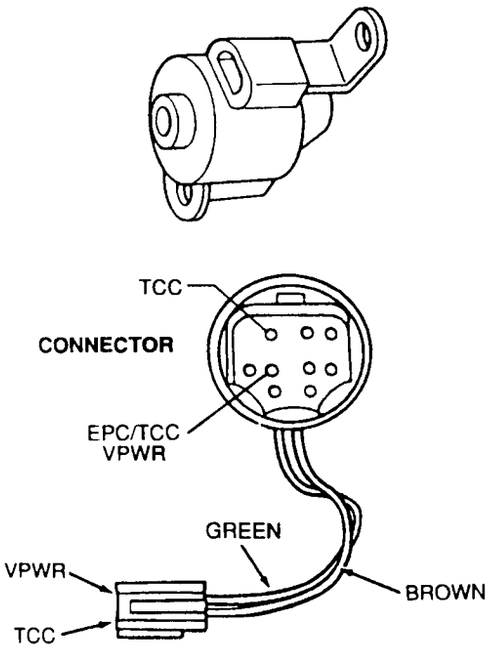
- Failed ON—No engine braking.
- Failed OFF—No 4th gear.

DTCs: 641,[d] 648[b], 647[b]

a DTC 621 is an output circuit check, generated **only** by electrical conditions.
b DTCs 645 through 648 may also be generated by some non-electrical transaxle hardware condition.
c DTC 622 is an output circuit check, generated **only** by electrical conditions.
d DTC 641 is an output circuit check, generated **only** by electrical conditions.

Torque Converter Clutch (TCC) Solenoid 7G136:

Is used in the transaxle control system to control the application, modulation and release of the torque converter clutch.



Symptoms:

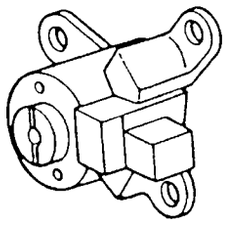
- Failed ON—engine runs rough / vehicle shudder, engine stalls in DRIVE at low idle speeds (2nd, 3rd, or 4th gear).
- Failed OFF—torque converter never engages.

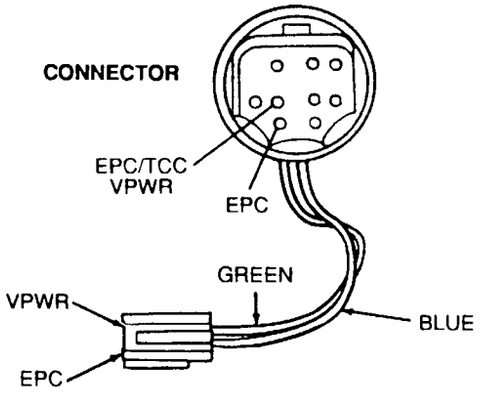
DTCs: 628[a], 652[b], 656[a]

a DTCs 628 and 656 may also be generated by some non-electrical transaxle hardware condition.
b DTC 652 is an output circuit check, generated **only** by electrical conditions.

Electronic Pressure Control (EPC) Solenoid 7G383:

Is a Variable Force Style (VFS) Solenoid. The VFS type solenoid is an electro-hydraulic actuator combining a solenoid and a regulating valve. It supplies EPC which regulates transmission line pressure and line modulator pressure. This is done by producing resisting forces to the main regulator and line modulator circuits. These two pressures control clutch application pressures.





(Continued)

Electronic Pressure Control (EPC) Solenoid 7G383: (Cont'd)

Symptoms:
- Maximum EPC pressure, harsh engagements, harsh shifts.

DTC's: 624[a], 625[a], [b]

a DTC's 624 and 625 are output circuit checks, generated **only** by electrical conditions.
b DTC generated by failure of PCM driver circuit.

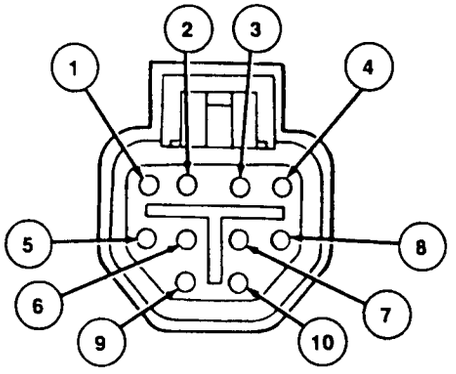
Solenoid Operation

The following Solenoid Application Chart shows normal solenoid operation for given operating modes.

SOLENOID APPLICATION CHART — AX4N

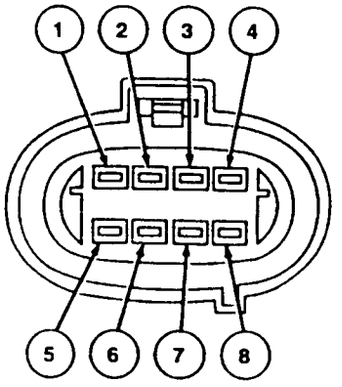
TRANSAXLE RANGE SELECTOR LEVER POSITION	POWERTRAIN CONTROL MODULE (PCM) GEAR COMMANDED	AX4N SOLENOIDS			
		ENG BRAKE	SS1	SS2	SS3
P/N	P/N	NO	OFF[a]	OFF	OFF
R	R	YES	OFF	OFF	OFF
D (OVERDRIVE)	1	NO	OFF	ON	OFF
	2	NO	OFF	OFF	OFF
	3	NO	ON	OFF	ON
	4	YES	ON	ON	ON
D (DRIVE)	1	NO	OFF	ON	OFF
	2	NO	OFF	OFF	OFF
	3	YES	ON	OFF	OFF
MANUAL 1	2[b]	YES	OFF	ON	OFF
	3[b]	YES	OFF	OFF	OFF
		YES	ON	OFF	OFF

a Not contributing to powerflow.
b When a manual pull-in occurs above calibrated speed the transaxle will downshift from the higher gear until the vehicle speed drops below this calibrated speed.



AX4N VEHICLE HARNESS CONNECTOR

Pin Number	Circuit	Circuit Function
1	237 (O/Y)	Shift Solenoid #1
2	361 (R)	Vehicle Power
3	224 (T/W) or 480 (P/Y)	Torque Converter Clutch Solenoid
4	—	Not Used
5	923 (O/BK)	Transmission Fluid Temperature Input
6	315 (P/O)	Shift Solenoid #2
7	361 (R)	Vehicle Power
8	912 (W/R) or 971 (PK/BK)	Shift Solenoid #3
9	359 (GY/R)	Signal Return
10	925 (W/Y)	Electronic Pressure Control Solenoid



TRANSMISSION RANGE (TR) SENSOR

Pin Number	Circuit	Circuit Function
1	196 (P/O)	Power Feed
2	359 (GY/R)	Sensor Signal Return
3	199 (LB/Y)	TR Sensor to PCM
4	463 (R/W)	Output to Liftgate Release Switch
5	33 (W/PK)	Starter Control to Interlock
6	298 (BK/PK)	Backup Lamps
7	140 (P/O)	Fused Accessory Feed
8	32 (R/LB)	Starter Control

DIAGNOSIS AND TESTING

MECHANICAL COMPONENTS

APPLY COMPONENTS

Clutch/Band Operation

The apply components of the AX4N transaxle work together to provide a flow of power, as the chart below shows. Coast braking occurs in 4th gear. In reverse, the overrunning action of the low-one way clutch prevents coast braking.

In manual 3rd gear, the opposing holding actions of the low one-way clutch and direct one-way clutch provide coast braking.

In manual 2nd gear, the action of the coast band provides coast braking.

In manual 1st gear, the opposing holding actions of the low one-way clutch and direct one-way clutch provide coast braking. The action of the coast band is also required for coast braking to occur in manual 1st gear.

A = APPLIED

X = APPLIED/ INEFFECTIVE

H = HOLDING

OR = OVERRUNNING

GEAR	POSITION	OVERDRIVE BAND	COAST BAND	FORWARD CLUTCH	DIRECT CLUTCH	INTERMEDIATE CLUTCH	REVERSE CLUTCH	LOW-INT CLUTCH	LOW ONE-WAY CLUTCH		DIRECT ONE-WAY CLUTCH		LOW-INT ONE-WAY CLUTCH	
									DRIVE	COAST	DRIVE	COAST	DRIVE	COAST
PARK	P			A					H					
REVERSE	R			A			A		H	OR				
NEUTRAL	N			A					H					
1ST	OD, D			A				A	H	OR			H	OR
2ND	OD, D			X		A		A	OR	OR			H	OR
3RD	OD				A	A		X			H	OR	OR	OR
4TH	OD	A			X	A		X			OR	OR	OR	OR
M-3RD	D			A	A	A		X		H	H		OR	OR
M-2ND	1		A	X		A		A	OR	OR			H	
M-1ST	1		A	A	A			A	H			H	H	
PLANETARY COMPONENT		FS	RS	FS	FS	FC/RR	FC/RR	RS	FS		FS		RS	

FS = FRONT SUN GEAR

RS = REAR SUN GEAR

FC/RR = FRONT CARRIER/REAR RING GEAR

DIAGNOSIS AND TESTING

DIAGNOSTIC TROUBLE CODE DESCRIPTION CHART

THREE DIGIT DTC	COMPONENT	DESCRIPTION	CONDITION	SYMPTOM
111	SYSTEM	Pass	No malfunction detected.	Malfunction not detected by PCM.
112	IAT	IAT indicates 125°C (254°F)	Voltage drop across IAT exceeds scale set for temperature 125°C (254°F).	Incorrect EPC pressure. Either high or low which will result in harsh or soft shifts.
113	IAT	IAT indicates -40°C (-98.6°F)	Voltage drop across IAT exceeds scale set for temperature -40°C (-40°F).	Incorrect EPC pressure. Either high or low which will result in harsh or soft shifts.
114	IAT	IAT out of on-board diagnostic range	IAT temperature higher or lower than expected during KOEO and KOER.	Rerun on-board diagnostic at normal operating temperature.
116	IAT	ECT out of on-board diagnostic range	ECT temperature higher or lower than expected during KOEO and KOER.	Rerun on-board diagnostic at normal operating temperature.
117	ECT	ECT indicates 125°C (254°F)	ECT temperature higher or lower than expected during KOEO and KOER.	Torque converter clutch will always be off, resulting in low fuel economy.
118	ECT	ECT indicates -40°C (-98.6°F)	ECT temperature higher or lower than expected during KOEO and KOER.	Torque converter clutch will always be off, resulting in low fuel economy.
121	TP	TP voltage high/low for on-board diagnostic.	TP was not in the correct position for on-board diagnostic.	Rerun at appropriate throttle position per application.
122, 123, 124, 125 167	TP TP	TP DTCs	PCM has detected an error. This error may cause a transaxle concern. Refer to the PC/ED Manual for diagnosis.	Harsh engagements, firm shift feel, abnormal shift schedule, torque converter clutch does not engage. Torque converter clutch cycling.
157, 158, 159 184, 185	MAF MAF	MAF DTCs	MAF system has a malfunction which may cause a transaxle concern. Refer to PC/ED Manual for diagnosis.	Incorrect shift schedule, high/low EPC pressure. Incorrect converter engagement scheduling. Symptoms similar to a TP failure.
211	CKP	CKP circuit failure.	Ignition system has a malfunction which may cause a transaxle concern. Refer to the PC/ED Manual for diagnosis.	Engine malfunction, no converter engagement.
212	CKP	IDM signal loss.	Ignition system has a malfunction which may cause a transaxle concern. Refer to the PC/ED Manual for diagnosis.	Engine malfunction, no converter engagement.
213	CKP	SPOUT circuit open.	Ignition system has a malfunction which may cause s transaxle concern. Refer to the PC/ED Manual for diagnosis.	Engine malfunction, no converter engagement.
452	VSS	Insufficient input from VSS.	VSS detected a loss of vehicle speed signal during operation.	Harsh engagements, firm shift feel, abnormal shift schedule, unexpected downshift may occur at closed throttle. Torque converter clutch will not engage.
519	PSP	PSP circuit open during KOEO	PSP circuit open.	Failed ON—EPC slightly high, firm engagements, firm shifts, harsh coastdown shifts. Failed OFF—EPC pressure slightly low during increased loading of the vehicle power steering.

DIAGNOSIS AND TESTING

DIAGNOSTIC TROUBLE CODE DESCRIPTION CHART

THREE DIGIT DTC	COMPONENT	DESCRIPTION	CONDITION	SYMPTOM
521	PSP	PSP not changing state KOER.	Operator did not rotate steering wheel during KOER.	Malfunction detected. Rerun on-board diagnostic and rotate steering wheel.
536	BOO	Brake not actuated during on-board diagnostic.	Brake not cycled during KOER.	Failed ON or not connected—torque converter clutch will not engage at less than 1/3 throttle.
536	BOO	BOO switch circuit failed.	Brake ON/OFF circuit failure.	Failed OFF—torque converter clutch will not disengage when brake is applied.
539	A/C	A/C clutch cycling pressure switch error	A/C or Defrost ON condition may result from A/C clutch being ON during on-board diagnostic.	Failed ON—EPC pressure slightly low with A/C OFF. Failed OFF—EPC pressure slightly low with A/C ON.
621*	SS1	SS1 solenoid circuit failure	Solenoid 1 circuit failed to provide voltage drop across solenoid. Circuit open or shorted or PCM drive failure during on-board diagnostic.	Improper gear selection depending on condition mode and manual lever position. See solenoid ON/OFF chart.
622*	SS2	SS2 solenoid circuit failure	Solenoid 2 circuit fails to provide voltage drop across solenoid. Circuit open or shorted or PCM drive failure during on-board diagnostic.	Improper gear selection depending on condition mode and manual lever position. See solenoid ON/OFF chart.
624*	EPC	EPC solenoid circuit failure, shorted circuit or output driver.	Voltage through EPC solenoid is checked and compared to a voltage through solenoid after a time delay. An error will be noted if tolerance is exceeded. KOEO and continuous on-board diagnostic.	Short Circuit—Causes failsafe EPC pressure (maximum capacity). Harsh engagements and shifts.
625*	EPC	Open PCM output driver.	Voltage through EPC solenoid is checked and compared to a voltage through solenoid after a time delay. An error will be noted if tolerance is exceeded. KOEO and continuous on-board diagnostic.	Open Circuit—Causes maximum EPC pressure, harsh engagements and shifts.
628**	TCC	Torque converter clutch engagement error	The PCM picked up an excessive amount of torque converter clutch slippage when converter was scheduled to be engaged during normal vehicle operation.	Failed OFF—converter never engages. Failed ON—engine runs rough/vehicle shudder, engine stalls in DRIVE (2nd, 3rd or 4th) at low idle speeds.
632	TCS	TCS did not change states.	TCS not cycled during Self-Test. TCS circuit open or shorted.	TCS not cycled during KOER Self-Test. No overdrive cancel when switch is cycled.
634	TR	TR Sensor out of range.	Indicated voltage drop across TR Sensor exceeds limits established for each position.	Harsh engagements, firm shift feel. No 3/4 shift.
636	TFT	TFT out of on-board diagnostic range.	Transaxle not at operating temperature during on-board diagnostic.	Warm vehicle to normal operating temperature.
637	TFT	-40°C (-40°F) indicated TFT sensor circuit open.	Voltage drop across TFT sensor exceeds scale set for temperature -40°C (-40°F)	Torque converter clutch and stabilized shift schedule may be enabled sooner after cold start. Harsh or soft shifts.

DIAGNOSIS AND TESTING

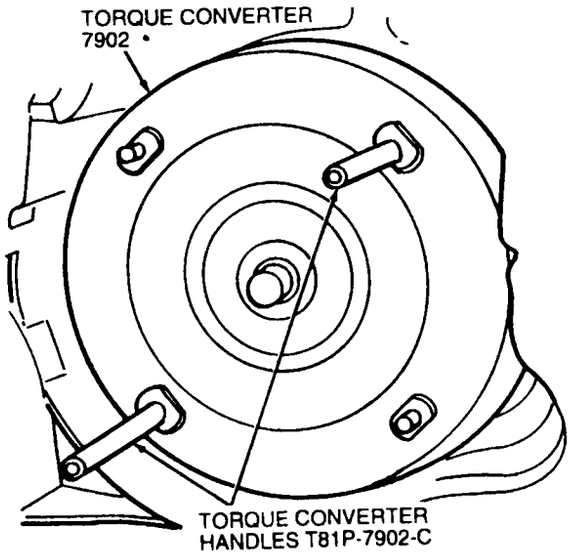
DIAGNOSTIC TROUBLE CODE DESCRIPTION CHART

THREE DIGIT DTC	COMPONENT	DESCRIPTION	CONDITION	SYMPTOM
638	TFT	157°C (315°F) indicated TFT sensor circuit grounded.	Voltage drop across TFT sensor exceeds scale set for temperature of 157°C (315°F)	Torque converter clutch and stabilized shift schedule may be enabled sooner after cold start. Harsh or soft shifts.
639	TSS	Insufficient input from Turbine Shaft Speed sensor.	PCM detected a loss of TSS signal during operation.	Increased engine rpm on engagements, harsh shifts.
641*	SS3	SS3 solenoid circuit failure	Solenoid 3 circuit fails to provide voltage drop across solenoid. Circuit open or shorted or PCM drive circuit failure during on-board diagnostic.	Improper gear selection depending on condition mode and manual lever position. See solenoid ON/OFF chart.
645**	SS1, SS2, or internal parts	1at gear failure	No 1st gear	Improper gear selection depending on condition mode and manual lever position: see solenoid ON/OFF chart. Shift errors may also be due to other internal transaxle concerns (e.g., stuck valves, damaged friction material).
646**	SS1, SS2, or internal parts	3rd gear failure	No 2nd gear	Improper gear selection depending on condition mode and manual lever poaition: see solenoid ON/OFF chart. Shift errors may also be due to other internal transaxle concerns (e.g., stuck valves, damaged friction material).
647**	SS1, SS3, or internal parts	2nd gear failure	No 3rd gear	Improper gear selection depending on condition mode and manual lever position: see solenoid ON/OFF chart. Shift errors may also be due to other internal transaxle concerns (e.g., stuck valves, damaged friction material).
648**	SS1, SS3, or internal parts	4th gear failure	No 4th gear	Improper gear selection depending on condition mode and manual lever position: see solenoid ON/OFF chart. Shift errors may also be due to other internal transaxle concerns (e.g., stuck valves, damaged friction material).
652*	TCC	TCC solenoid circuit failure during on-board diagnostic.	TCC solenoid circuit fails to provide voltage drop across solenoid. Circuit open or shorted or PCM drive failure during on-board diagnostic.	Failed ON—engine runs rough/vehicle shudder, engine stalls in DRIVE (2nd, 3rd or 4th) at low idle speeds. (Short circuit). Failed OFF—converter never engages. (Open circuit).
654	TR	TR Sensor not in PARK.	On-board diagnostic not run in PARK.	Rerun on-board diagnostic in PARK.
656**	TCC	Continuous slip ERROR	Excessive variations in slip (engine speed surge) across the torque converter clutch detected.	Engine runs rough/vehicle shudders. You may feel a slight sensation of the engine running rough at road loads (approximately 56-64 km/h (35-40 mph) in 3rd gear, 72-80 km/h (45-50 mph) in 4th gear).
657	TFT	Transmission overtemp condition indicated.	Transmission fluid temperature exceeded 270°F.	Increase in EPC pressure.

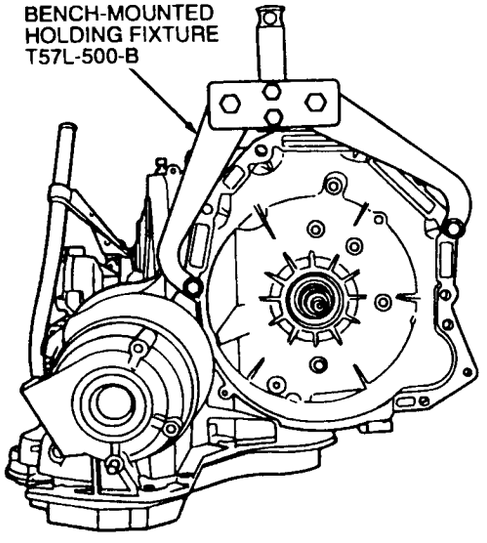
Disassembly

1. **CAUTION: The torque converter is heavy. Be careful not to drop it or damage will result.**

   Install Torque Converter Handles T81P-7902-C. Remove torque converter (7902) from transaxle. Drain fluid from torque converter.

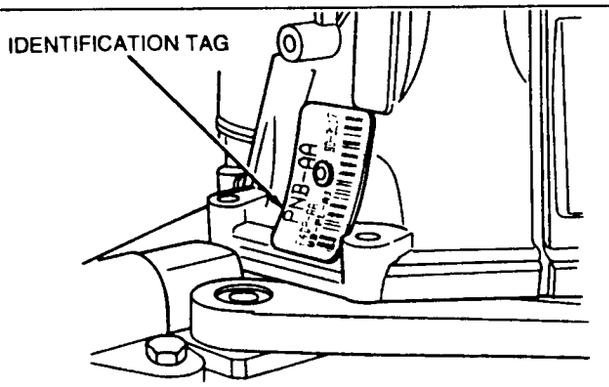


2. Mount transaxle in Bench Mounted Holding Fixture T57L-500-B.

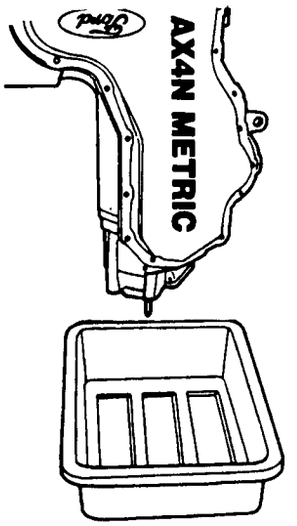


3. **CAUTION: Use care not to damage tag.**

   Remove identification tag using a screwdriver.



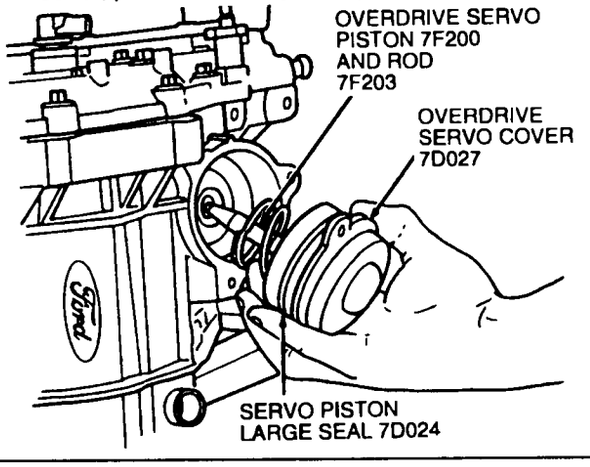
4. Place drain pan under transaxle. Turn transaxle in vertical position and drain fluid.



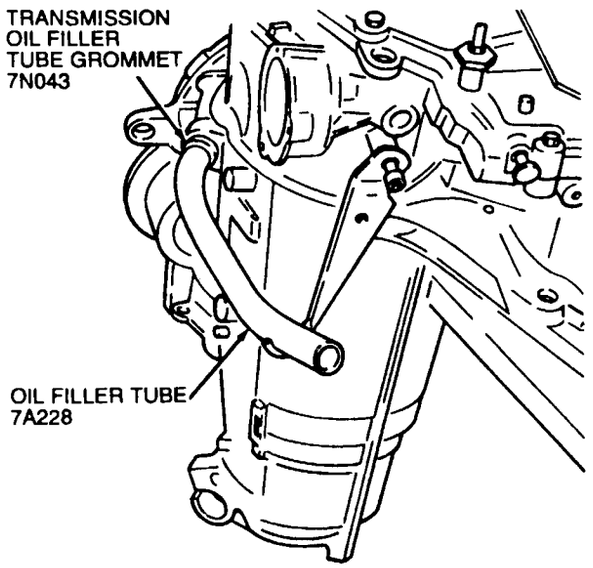
5. **CAUTION: The overdrive band servo spring cover is under spring tension. Care must be taken when removing as components may be ejected from the case.**

   NOTE: Piston assembly and spring may remain in cover.

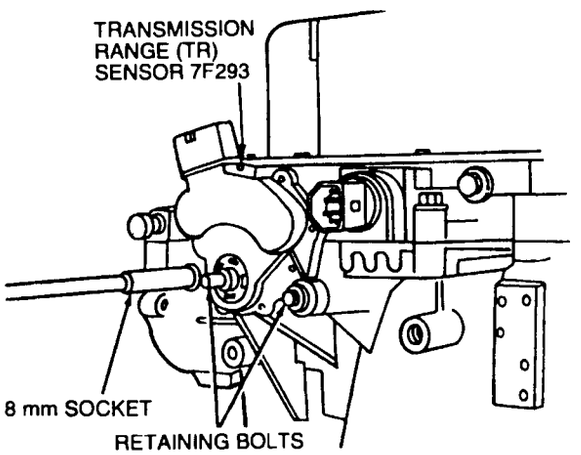
   Remove three 8 mm overdrive servo cover bolts, cover, piston assembly and spring.



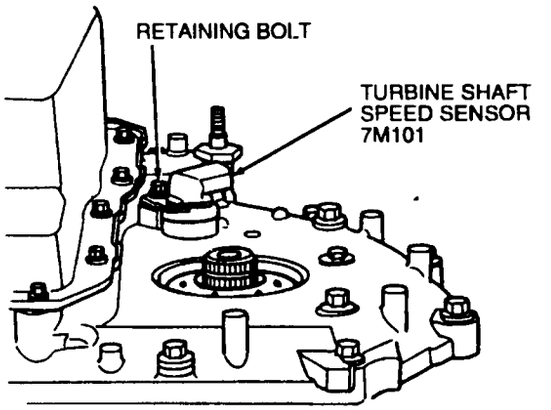
6. Remove one 8 mm transaxle filler tube retaining bolt and pull oil filler tube (7A228) from case. Remove and discard tube-to-case grommet.



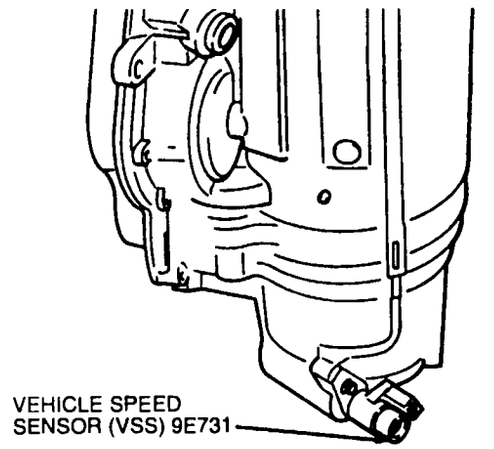
7. Remove two 8 mm transmission range sensor retaining bolts and remove transmission range sensor. Refer to Section 07-14A.



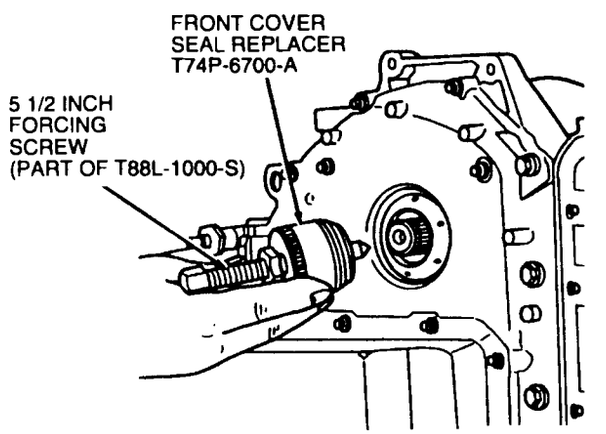
8. Remove turbine shaft speed sensor (TSS) retaining bolt using 8 mm socket. Remove sensor. Remove and discard O-rings from sensor.



9. Using 8 mm socket, remove vehicle speed sensor (VSS).

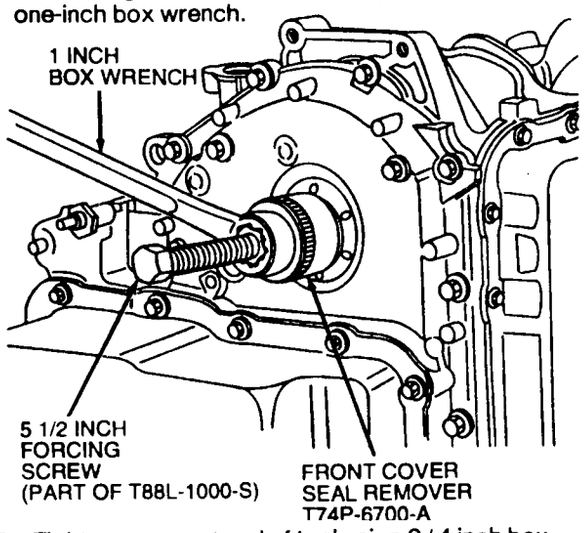


10. Install Front Cover Seal Remover T74P-6700-A and 5 1/2 inch forcing screw (from tool kit T88T-1000-A) into LH differential seal.

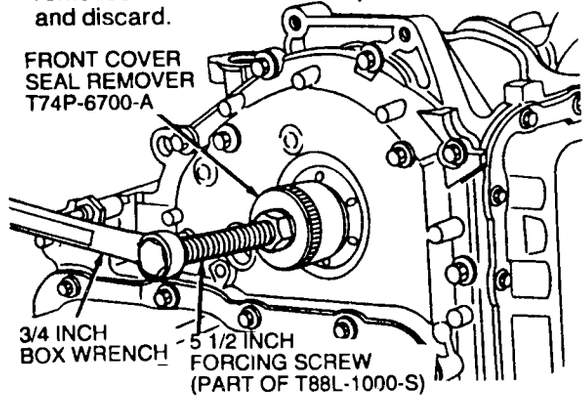


11. NOTE: Output shaft seal is a two-piece construction, outer metal protector and inner rubber seal.

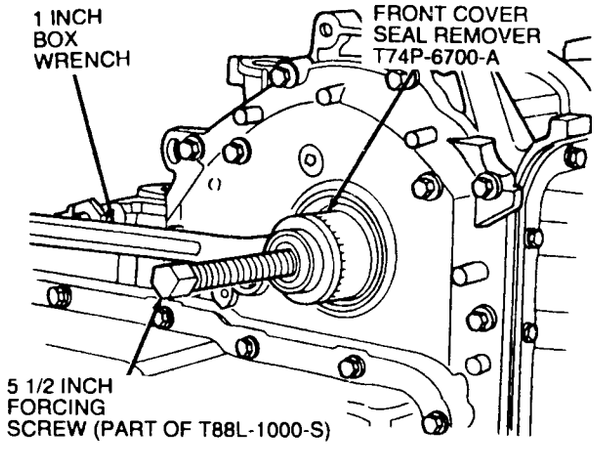
    Screw Front Cover Seal Remover T74P-6700-A and forcing screw into metal seal protector using one-inch box wrench.



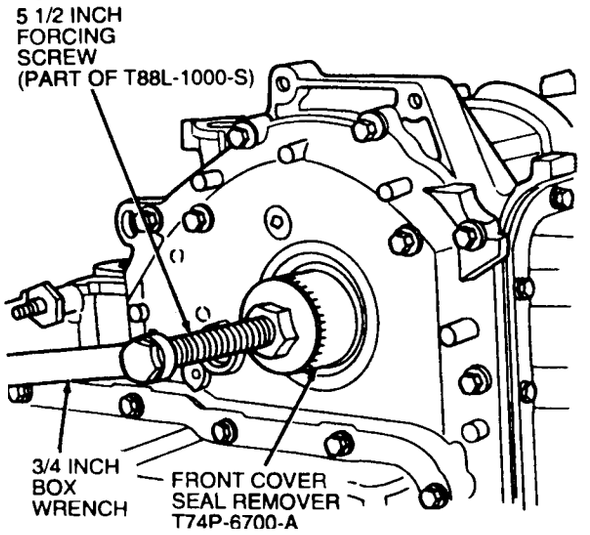
12. Tighten screw on end of tool using 3/4 inch box wrench until outer metal seal protector is removed. Remove metal seal protector from tool and discard.



13. Install Front Cover Seal Remover T74P-6700-A and forcing screw into seal using a one-inch box wrench.

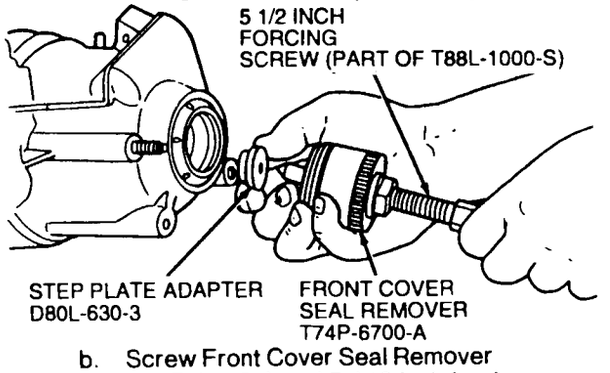


14. Tighten screw on the end of tool using a 3/4 inch box wrench until seal is removed. Discard seal.

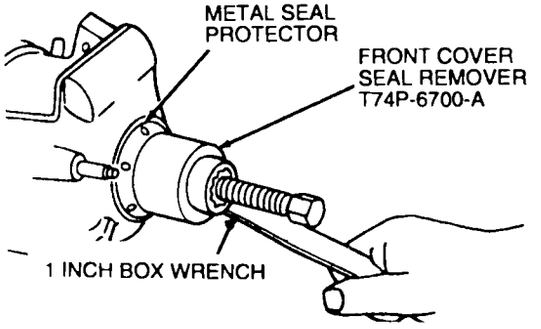


15. NOTE: Output shaft seal is a two-piece construction, outer metal protector and inner rubber seal.

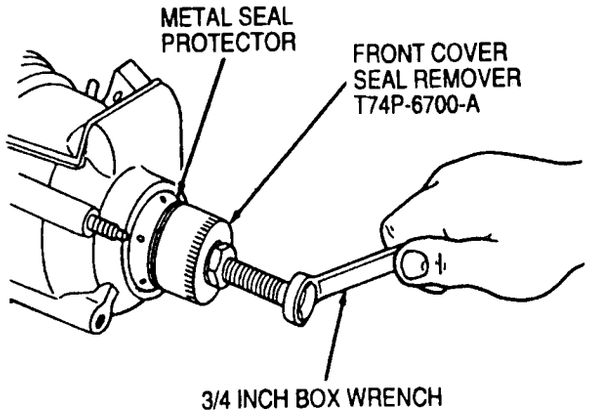
    a. Install Step Plate Adapter D80L-630-3 (from kit T88L-1000-A) or equivalent into output shaft (7060) opening. Install Front Cover Seal Remover T74P-6700-A and 5 1/2-inch Forcing Screw into output shaft opening.



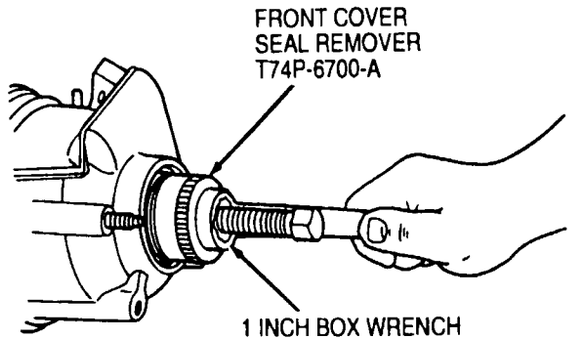
    b. Screw Front Cover Seal Remover T74P-6700-A and 5 1/2-inch forcing screw (from tool kit T88T-1000-A), into metal seal protector using a one-inch box wrench.



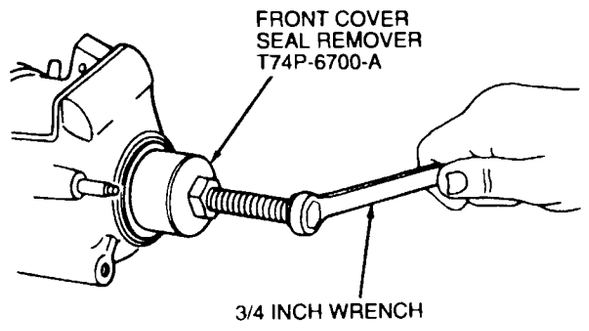
    c. Tighten screw on end of tool using a 3/4-inch box wrench, until metal seal protector is removed.



d. Remove metal seal protector from tool and discard. Install tool into seal using one-inch box wrench.

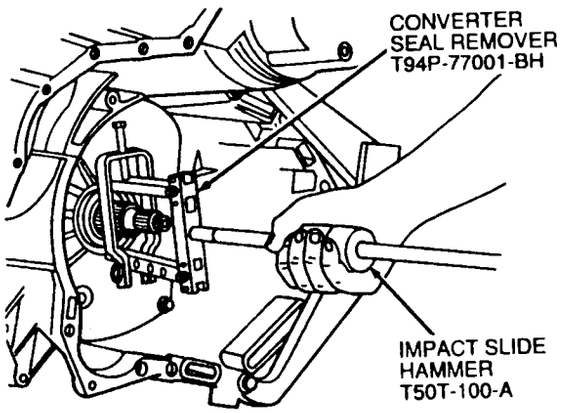


e. Tighten screw on the end of tool using 3/4-inch box wrench, until seal is removed. Remove seal from tool and discard.

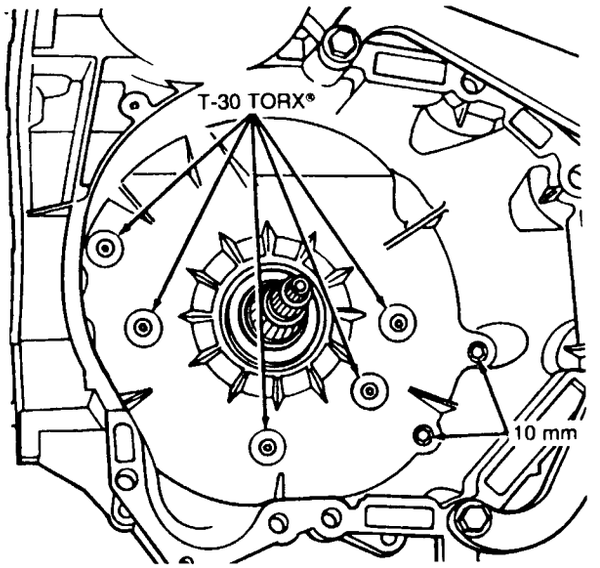


16. **CAUTION: Do not damage any machined surfaces.**

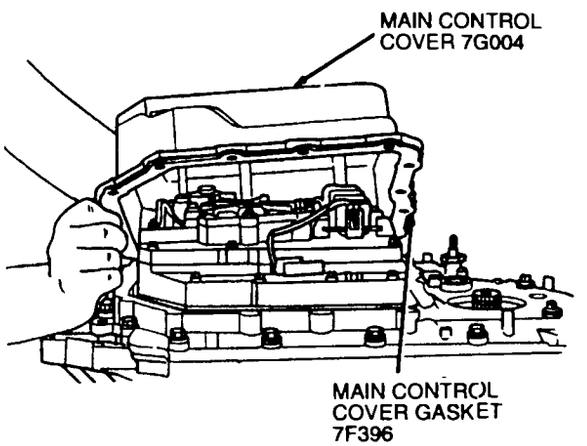
Remove and discard converter impeller hub seal (7F401) using Converter Seal Remover T94P-77001-BH and Impact Slide Hammer T50T-100-A.



17. Remove five T30 Torx® and two 10 mm chain cover bolts from inside transmission bell housing.



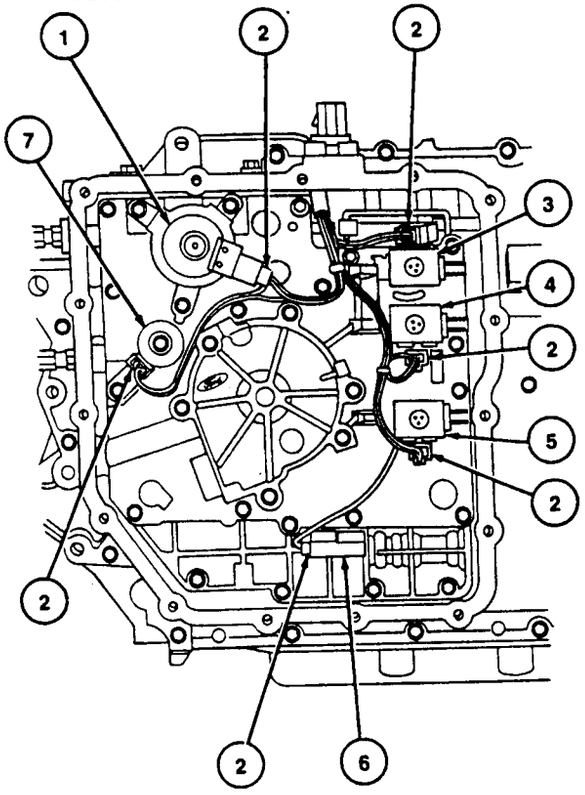
18. Rotate transaxle to vertical position.
19. Remove fifteen 8 mm main control cover bolts. Remove main control cover (7G004) and discard main control cover gasket (7F396).



20. **CAUTION: Use both hands to disconnect sensors. Do not pull on wires nor pry on connectors or damage to connector will result.**

    Disconnect electrical connectors from Transmission Fluid Temperature (TFT) sensor and five solenoids.

Transaxle Main Control Electrical Connector and Solenoid Locations

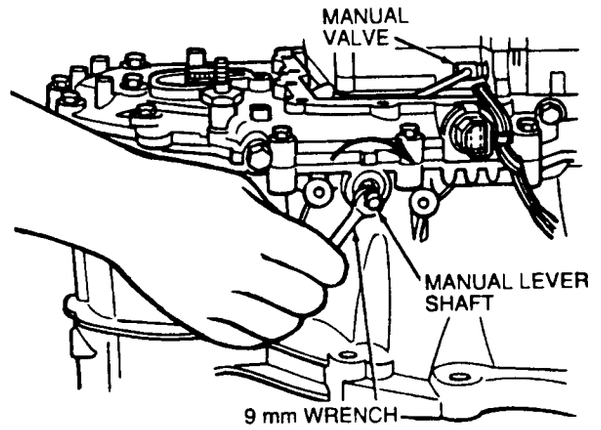


Item	Part Number	Description
1	—	Electronic Pressure Control (EPC) Solenoid
2	—	Electrical Connectors
3	—	Shift Solenoid #1 (SS-1)

Item	Part Number	Description
4	—	Shift Solenoid #2 (SS-2)
5	—	Shift Solenoid #3 (SS-3)
6	—	Transmission Fluid Temperature (TFT) Sensor
7	—	Torque Converter Clutch (TCC) Solenoid

21. NOTE: Manual valve positioned all the way in.

    Using a 9 mm wrench on flats of manual control lever shaft (7C493), rotate shaft clockwise to manual LOW detent.

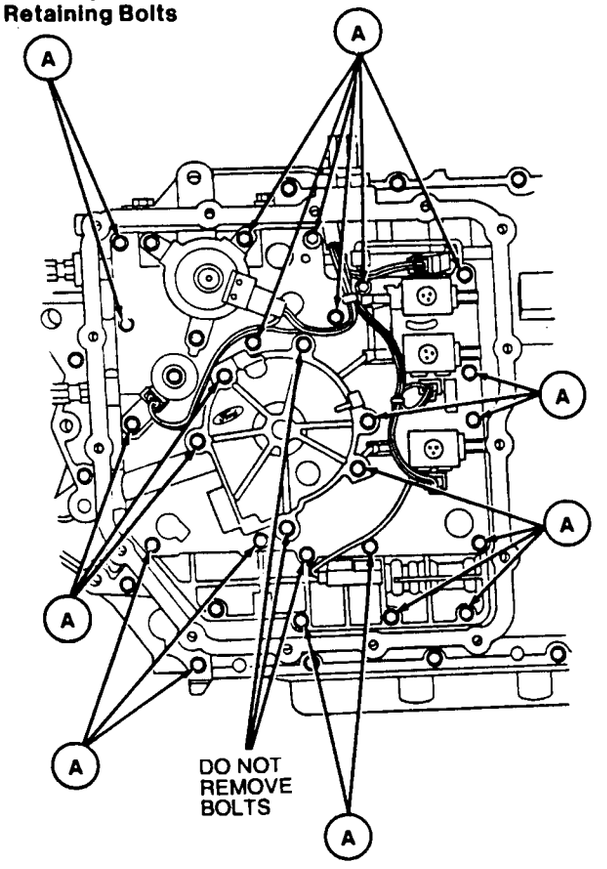


22. **CAUTION: Do not remove the two bolts that retain the oil pump and main control valve body assembly together as the oil pump components may fall from the main control valve body.**

    NOTE: Do not remove oil pump cover bolts indicated.

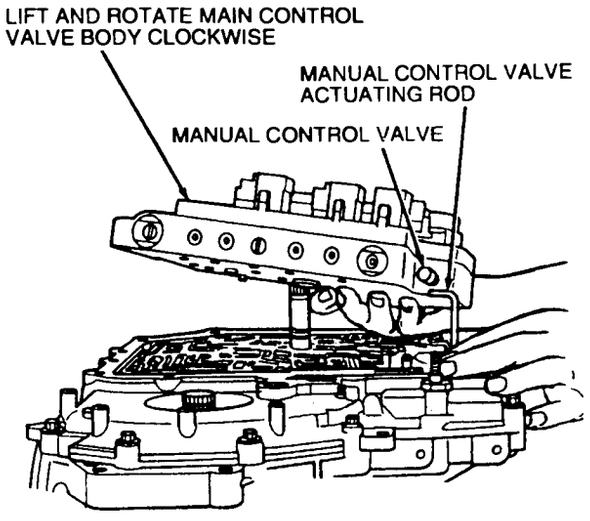
    Remove twenty four 8 mm oil pump and main control valve body assembly retaining bolts. Note length and location of bolts.

Oil Pump and Main Control Valve Body Assembly Retaining Bolts

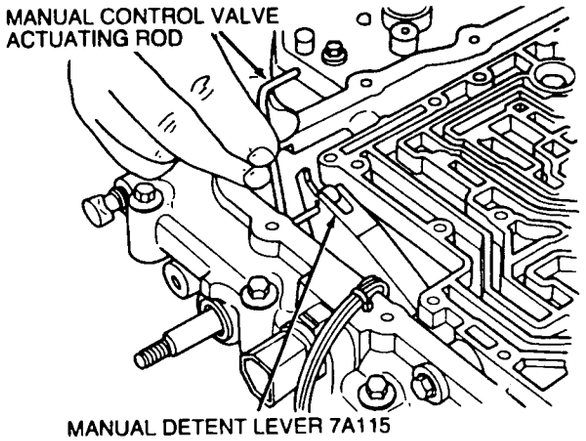


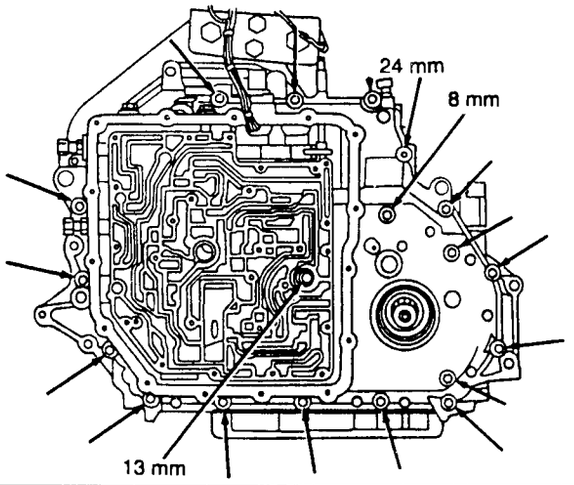
23. NOTE: Store main control valve body in a clean location.

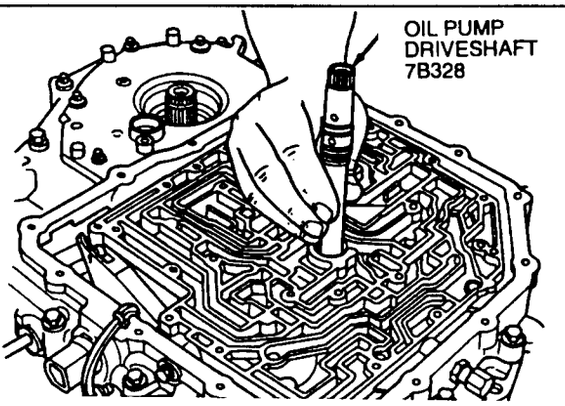
Rotate main control valve body (7A100) clockwise. Remove manual control valve actuating rod from manual control valve and remove main control valve body.



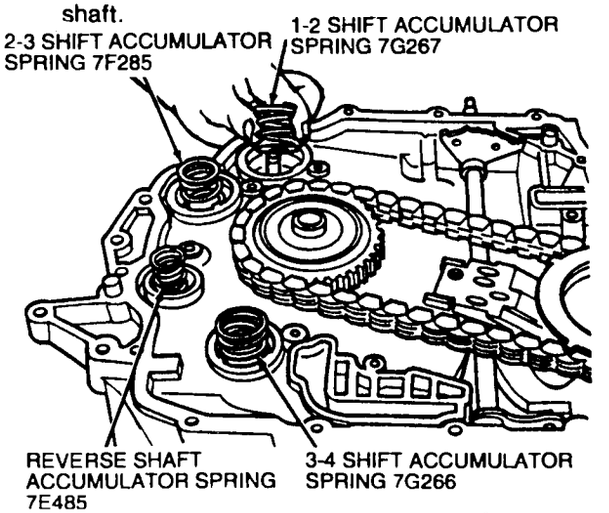
24. Disconnect manual control valve actuating rod from manual valve detent lever (7A115).







25. Pull oil pump shaft (7B328) out of case. Remove and discard four Teflon® seals from oil pump shaft.

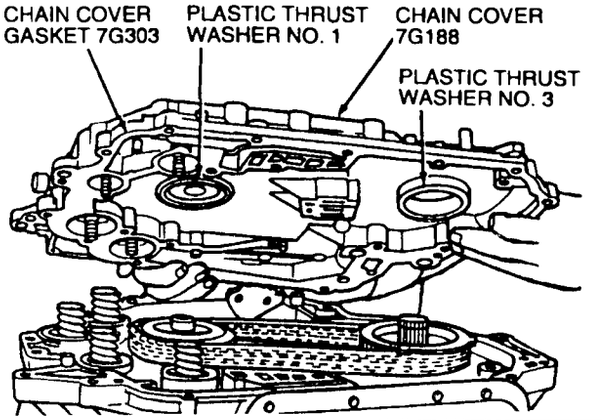


26. **CAUTION: Chain cover is under spring pressure. Use care when removing to prevent internal parts from being ejected from case.**

Remove eighteen chain cover bolts and one shift cable stud. Note length and location of bolts. Start at inside and work out.

27. NOTE: Plastic thrust washers # 1 and # 3 may come off with cover or may stay on sprockets.

Remove chain cover (7G188). Remove and discard chain cover gasket (7G303).



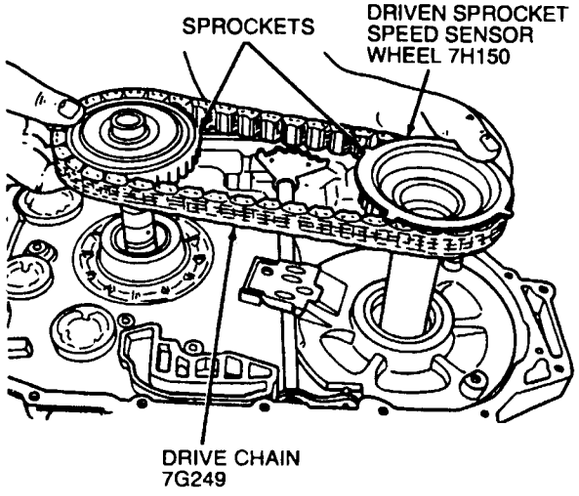
28. Tag and remove four accumulator springs to be sure they can be installed in their correct positions during reassembly.

29. **WARNING: CHAIN AND SPROCKET TEETH MAY BE SHARP.**

    CAUTION: Be careful not to damage or bend tabs on exciter ring. TSS will not operate correctly if exciter tabs are bent.

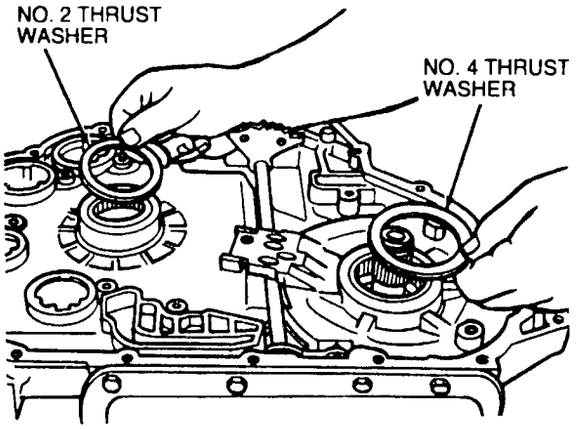
    Simultaneously, lift out both drive sprocket (7G129) and driven sprocket (7G132) with drive chain (7G249).

CAUTION: BE CAREFUL NOT TO BEND OR DAMAGE EXCITER TABS ON SPEED SENSOR WHEEL



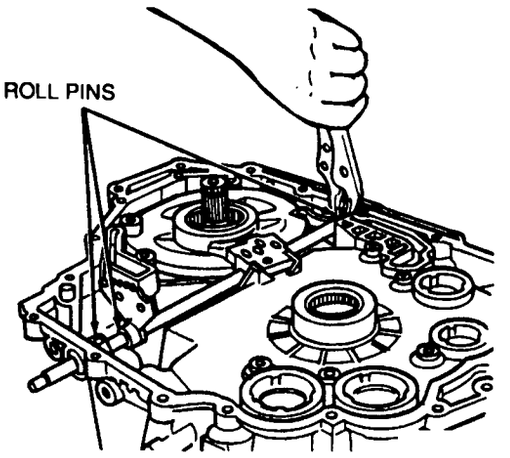
30. NOTE: Thrust washers may remain on underside of sprockets.

    Remove No. 2 thrust washer from drive sprocket support and No. 4 thrust washer from driven sprocket support.

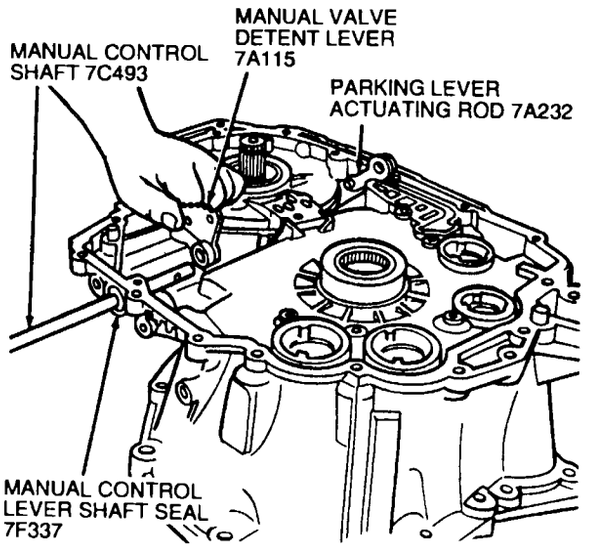


31. **CAUTION: Use care not to damage any machined surfaces.**

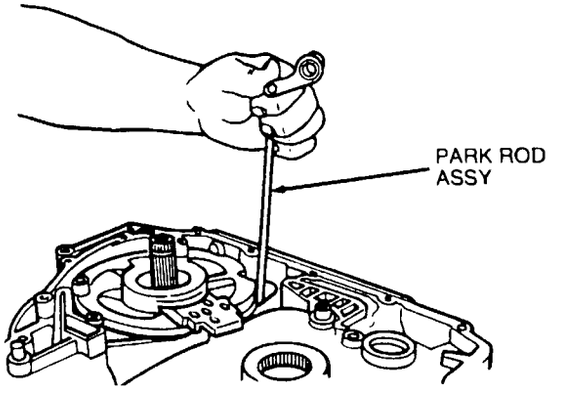
    Remove and discard three roll-pins from manual control lever shaft using locking pliers.



32. Slide manual control lever shaft out of case.

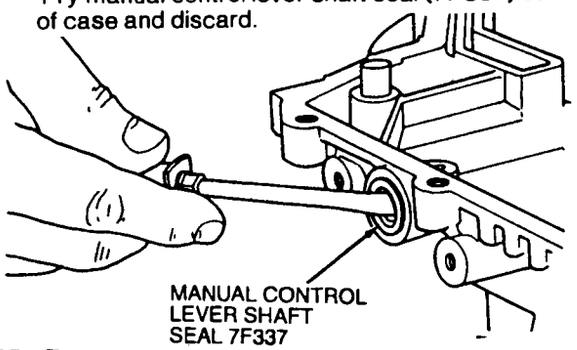


33. Remove park rod assembly.

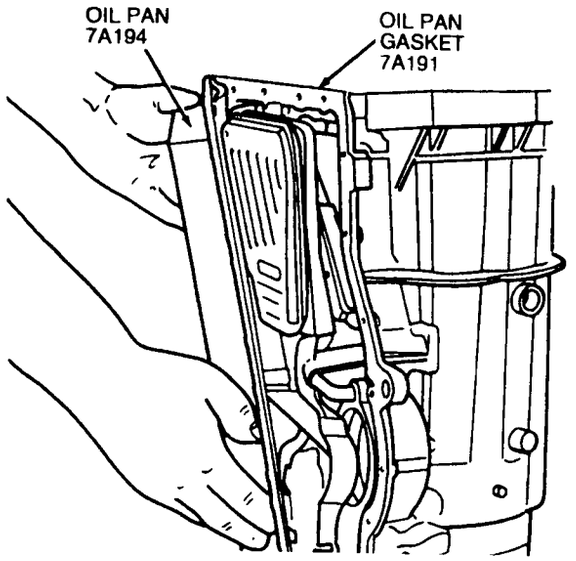


34. **CAUTION: Use care not to damage any machined surfaces.**

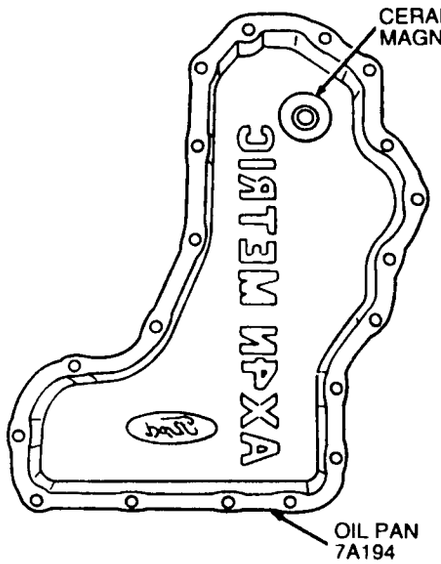
Pry manual control lever shaft seal (7F337) out of case and discard.



35. Remove nineteen 8 mm oil pan cover bolts. Remove transmission oil pan (7A194) and discard oil pan to case gasket (7A191).

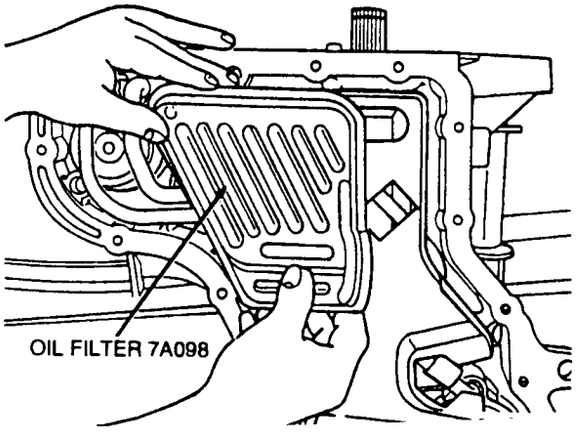


36. Remove magnet from transmission oil pan.

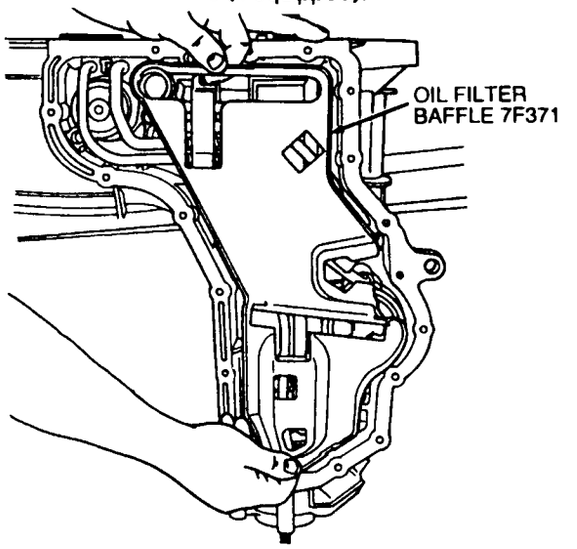


37. NOTE: Lip seal may stick inside case.

Remove and discard oil filter assembly.

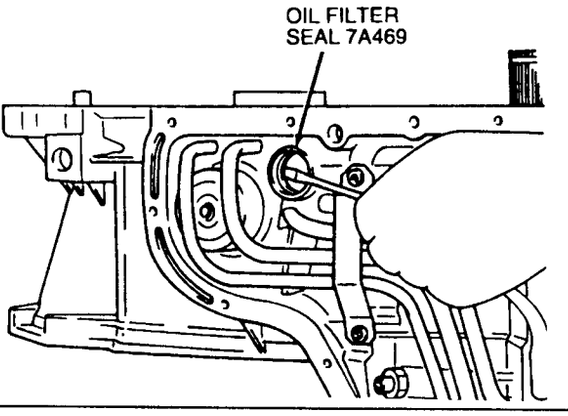


38. Remove oil baffle (if equipped).

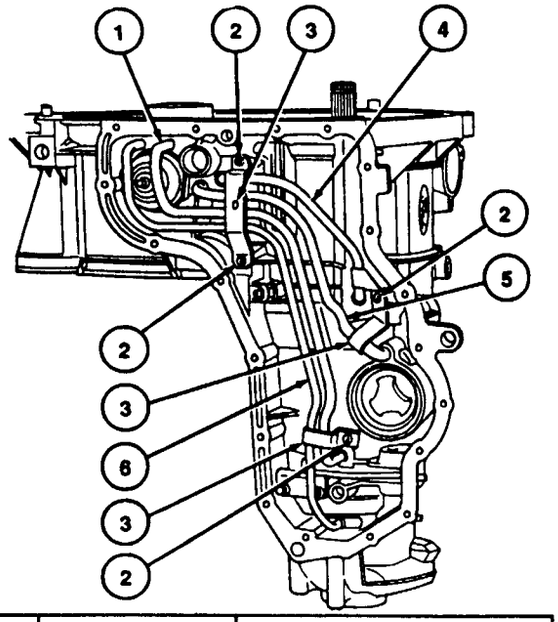


39. **CAUTION: Use care not to damage any machined surfaces.**

If oil filter seal did not come out of case with oil filter, remove and discard oil filter seal.



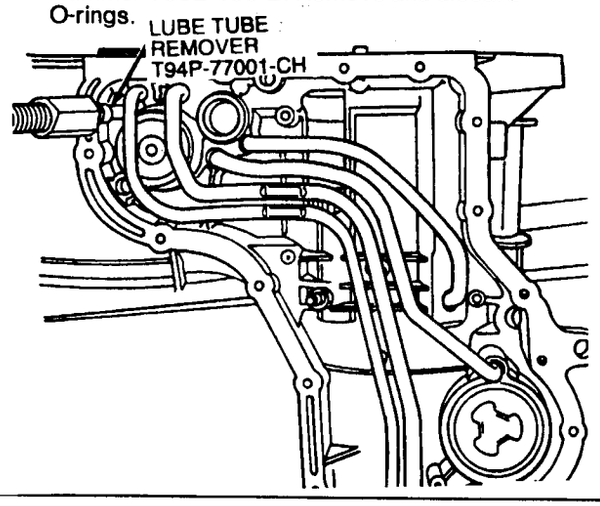
40. Remove four T-30 Torx® tube bracket bolts and three tube support brackets (7G353).



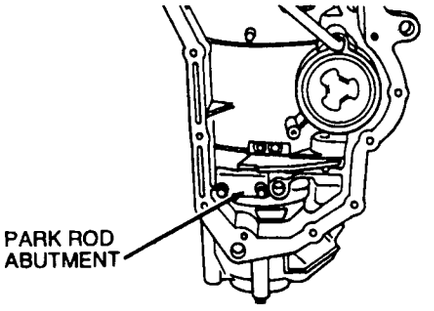
Item	Part Number	Description
1	7G463	Low / Intermediate Clutch Apply Oil Transfer Tube
2	—	Bracket Retaining Screw
3	7G353	Tube Support Bracket
4	7G199	Reverse Clutch Oil Supply Transfer Tube
5	7G087	Servo Apply Oil Transfer Tube
6	7G084	Rear Lubrication Supply Oil Transfer Tube

41. NOTE: For complete transaxle disassembly, the low / intermediate clutch apply oil transfer tube, rear lube oil transfer tube (7G084) and reverse clutch lube tubes must be removed.

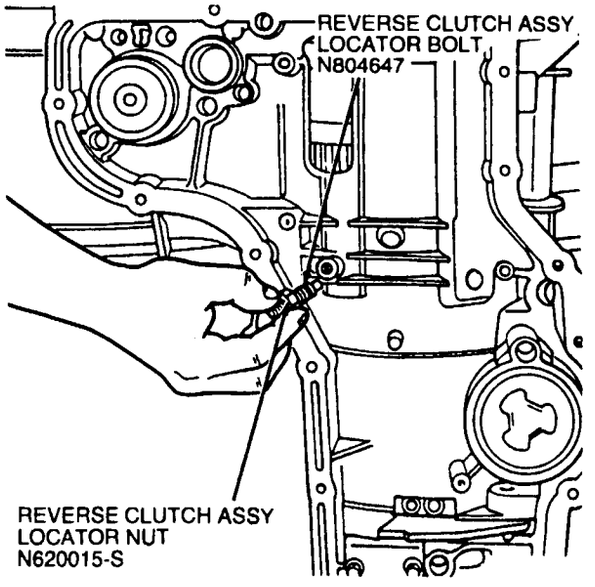
Remove all four lube tubes using Lube Tube Remover T94P-77001-CH and Impact Slide Hammer T59L-100-B. Remove and discard O-rings.



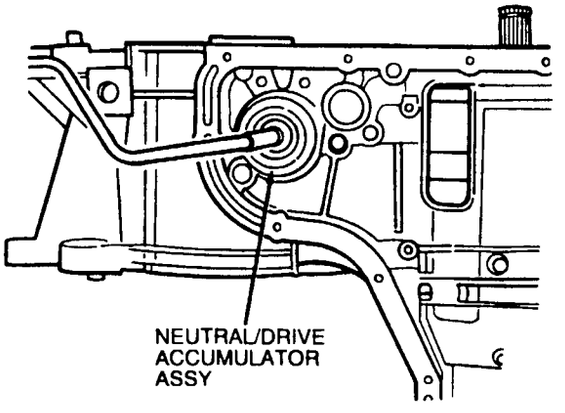
42. Using a 10 mm socket, remove two park pawl actuating rod abutment bolts. Remove park pawl actuating rod abutment.



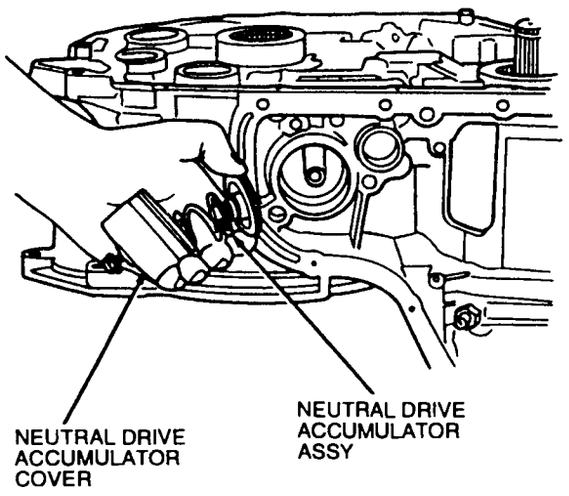
43. Loosen 19 mm reverse clutch anchor pin nut and remove 6 mm Allen head bolt.



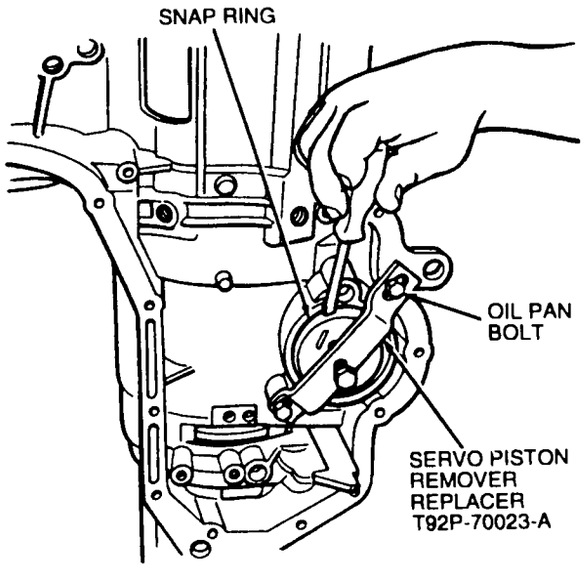
44. Use an 8 mm socket to remove the neutral / drive accumulator cover.



45. Remove neutral / drive accumulator piston, shaft assembly and spring.

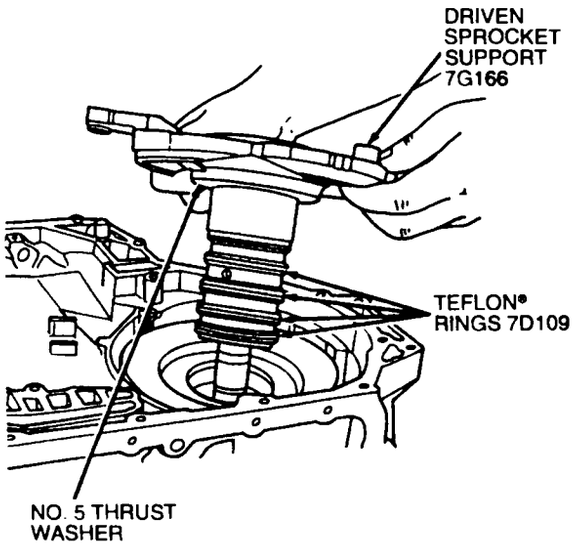


46. Using Servo Piston Remover / Replacer T92P-70023-A, a 9 / 16 inch wrench and two oil pan bolts, remove coast band servo assembly cover snap ring with a screwdriver. Remove cover, piston and rod assembly and spring.



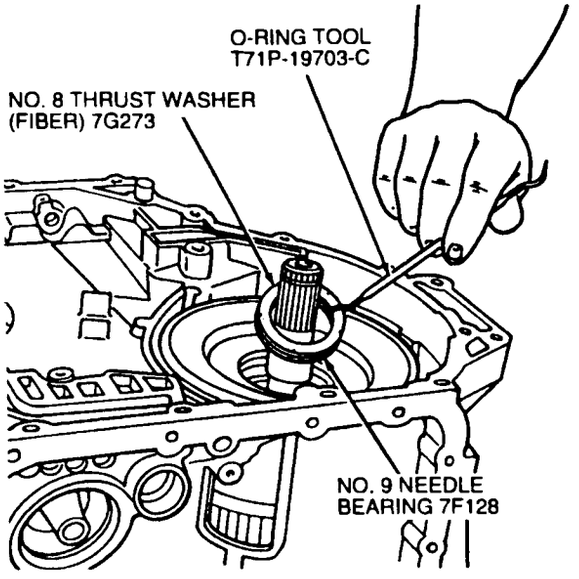
47. Remove driven sprocket support.
48. NOTE: Thrust washer may remain on driven sprocket support.

    Remove No. 5 selective thrust washer.

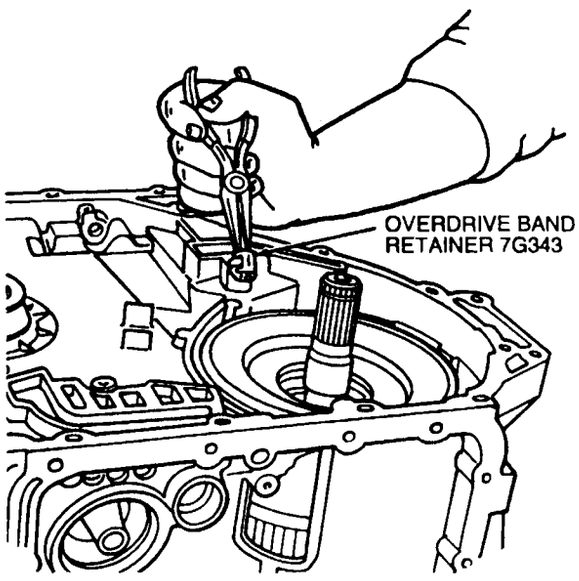


49. NOTE: Thrust washer and driven sprocket bearing (7G247) may remain on driven sprocket support when it is removed.

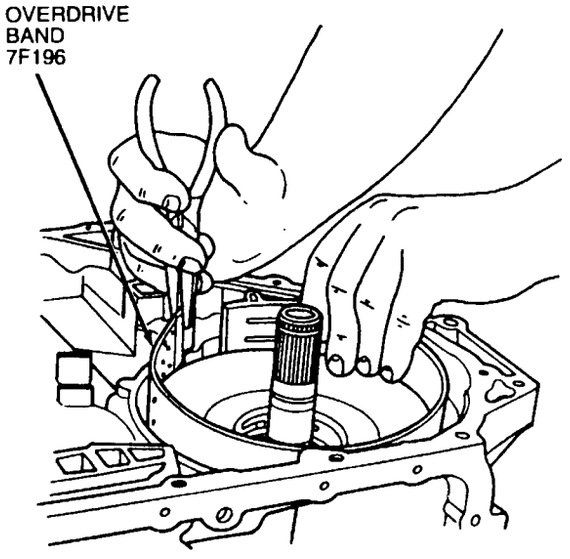
    Using O-Ring Tool T71P-19703-C, remove No. 8 selective thrust washer and No. 9 needle bearing.



50. Remove plastic overdrive band retainer.

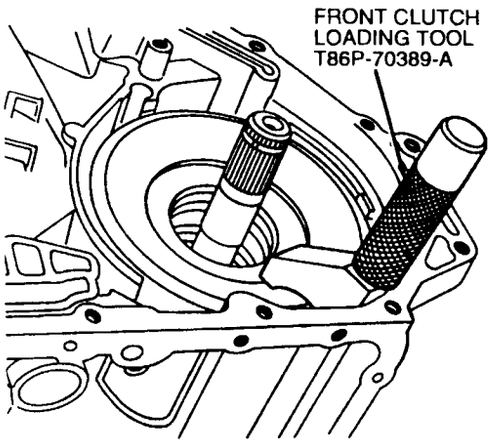


51. Remove overdrive band (7F196).

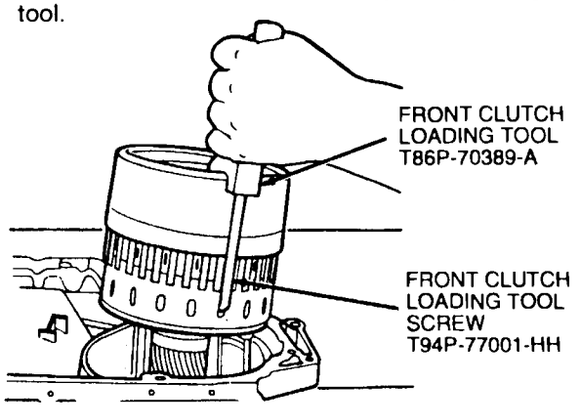


52. NOTE: Do not overtighten handle of tool. Install Extended Front Clutch Loading Tool Screw T94P-77001-HH into Front Clutch Loading Tool T86P-70389-A.

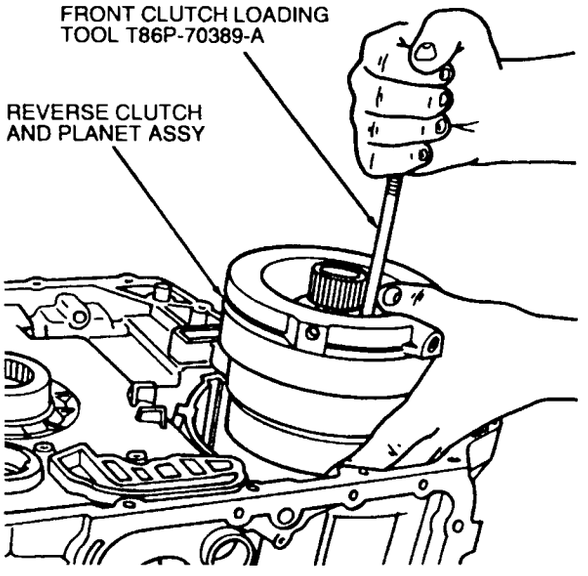
Rotate transaxle to vertical position. Using Front Clutch Loading Tool T86P-70389-A, install hook end of tool into one of the six lube holes in front sun shell (7D064). Position notched block over edge of assembly and tighten handle. Do not over-tighten handle.



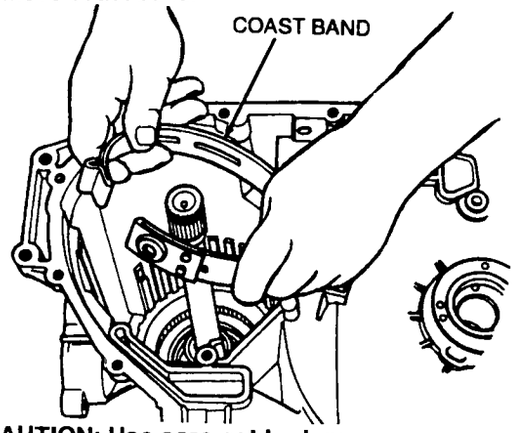
53. Lift clutch assembly out of case by lifting loading tool.



54. Install extended Front Clutch Loading Tool Screw T94P-77001-HH into handle of Front Clutch Loading Tool T86P-70389-A. Install tools to reverse clutch and planet assembly and lift from case.

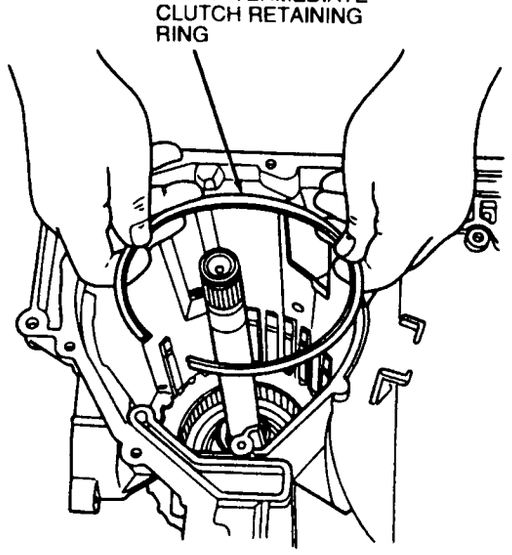


56. Remove coast band.

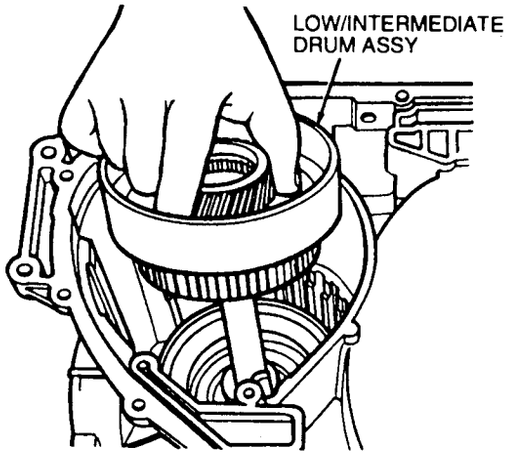


57. **CAUTION: Use care not to damage any machined surfaces.**

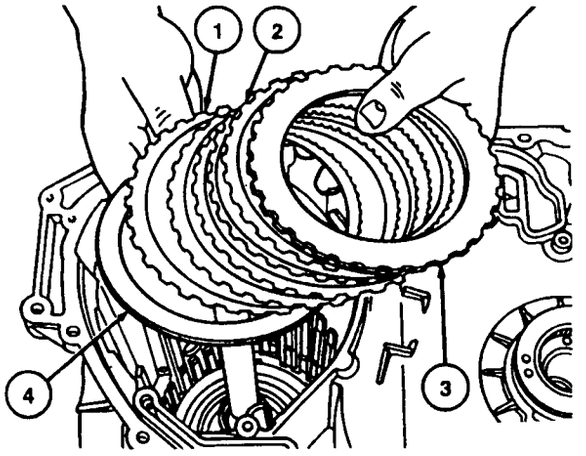
Remove low / intermediate clutch retaining ring from case using a screwdriver inserted through side of case.



55. Lift out low / intermediate drum, sun gear and one-way clutch assembly.



58. Remove low / intermediate clutch pack pressure plate, friction plates, steels and wave spring.

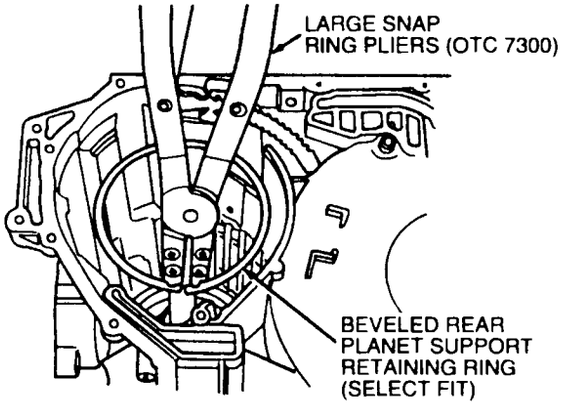


Item	Part Number	Description
1	7H278	Low / Intermediate Clutch Plate—Steel (5 Req'd)
2	7H279	Low / Intermediate Clutch Plate—Friction (5 Req'd)
3	7H280	Low / Intermediate Clutch Pressure Plate
4	7H269	Low / Intermediate Clutch Cushion Spring

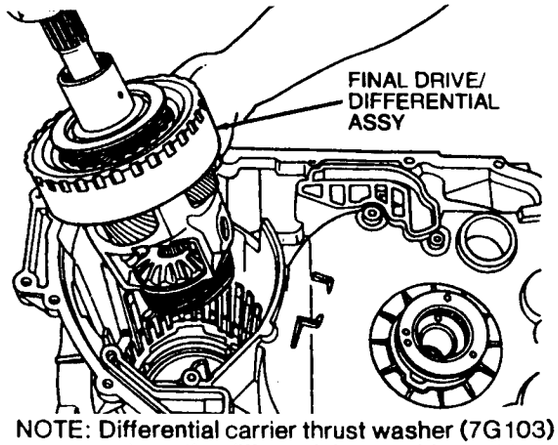
59. **WARNING: USE CAUTION WHEN UNLOADING BEVELED RETAINING RING.**

CAUTION: Use care not to damage final drive support assembly, transaxle case or retaining ring during removal.

Remove rear planet support beveled retaining ring (select fit) using large snap ring pliers positioned in the slots at the ring ends. Note that the ring bevel faces down (toward the differential).

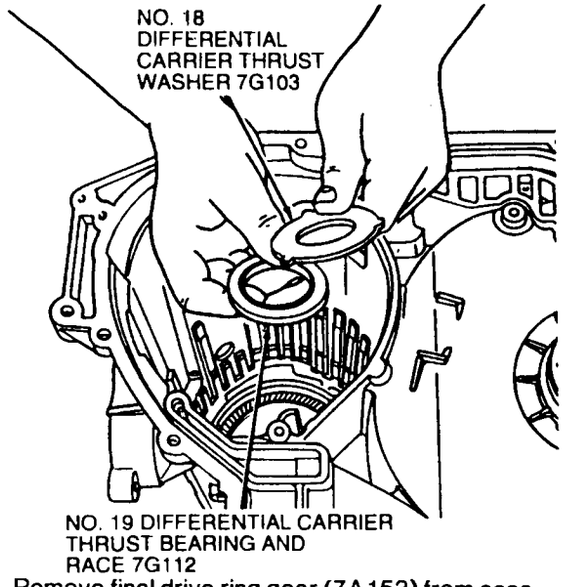


60. Lift final drive / differential and rear planet support assembly from transaxle using output shaft.

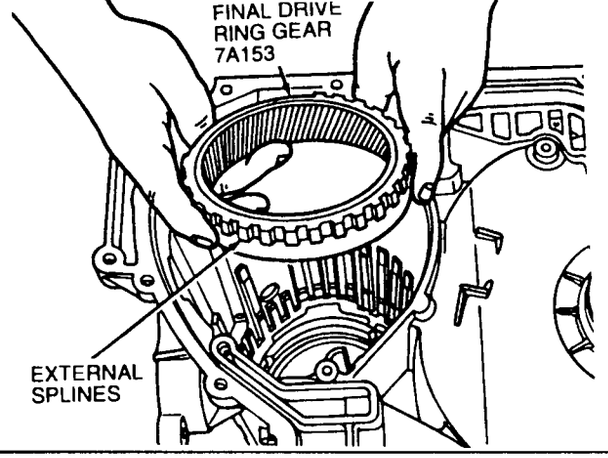


61. NOTE: Differential carrier thrust washer (7G103) may remain on the differential assembly next to speedometer drive gear.

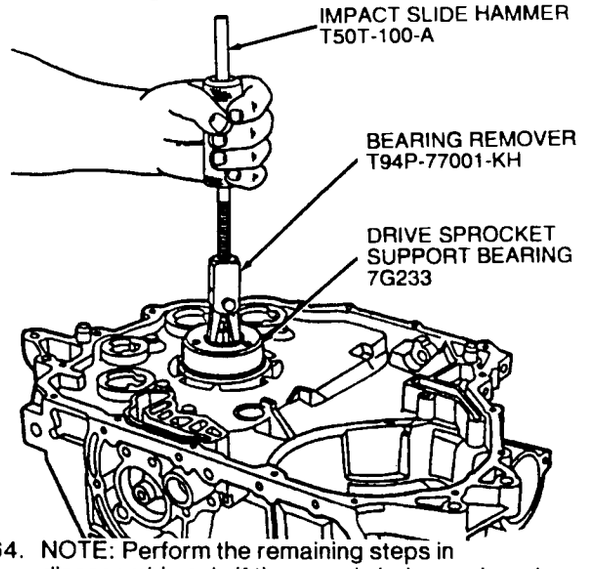
Remove No. 18 differential carrier thrust washer and No. 19 differential carrier thrust bearing and race (7G112).



62. Remove final drive ring gear (7A153) from case.

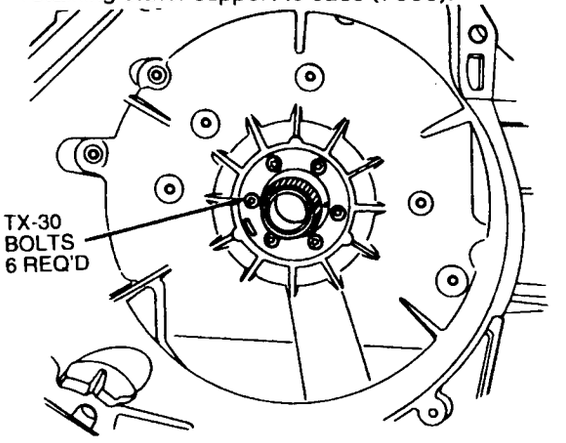


63. IF NECESSARY, remove drive sprocket bearing (7G233) using Impact Slide Hammer T50T-100-A and Bearing Remover T94P-77001-KH.

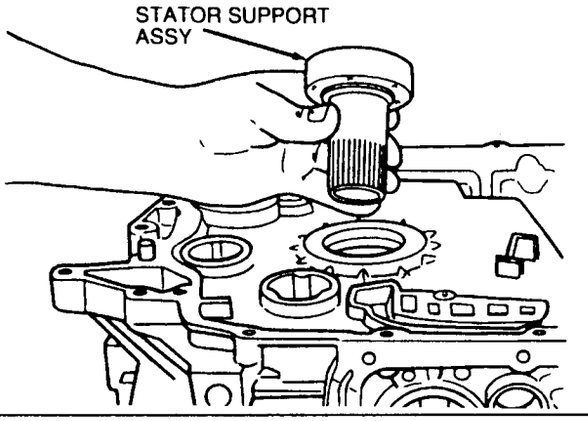


64. NOTE: Perform the remaining steps in disassembly only if the case is being replaced or park pawl / shaft / spring are damaged.

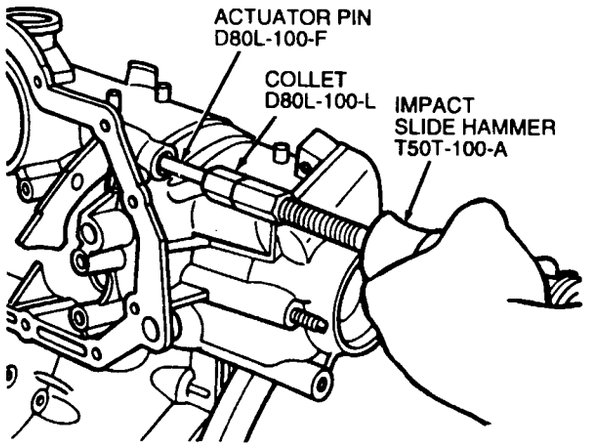
If case replacement is necessary, rotate case 180 degrees and remove six T-30 Torx® bolts retaining stator support to case (7005).



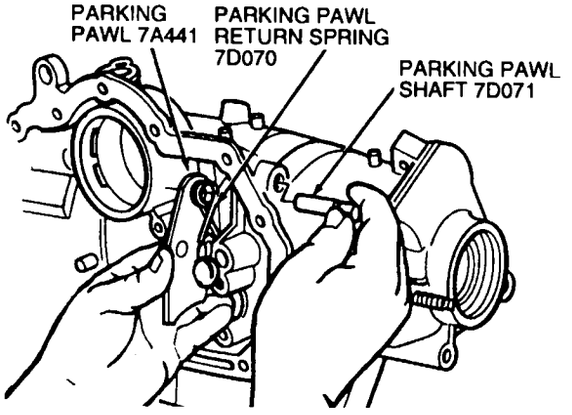
65. Remove stator support assembly.



68. Using Blind Hole Puller Set D80L-100-M, Collet D80L-100-L and Impact Slide Hammer T50T-100-A or equivalent, remove the cup plug from the case.



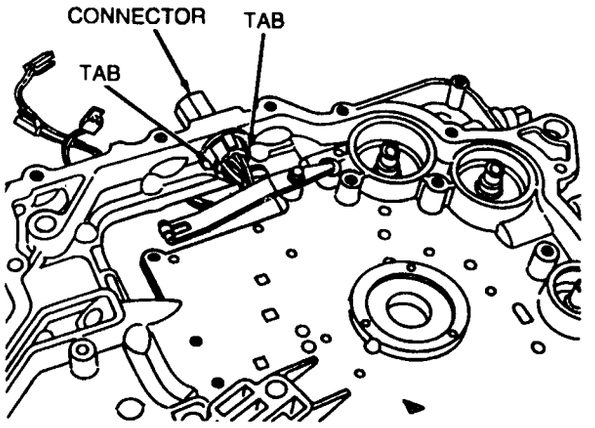
69. Use magnet to remove parking pawl shaft (7D071), and remove parking pawl (7A441) and parking pawl return spring (7D070).



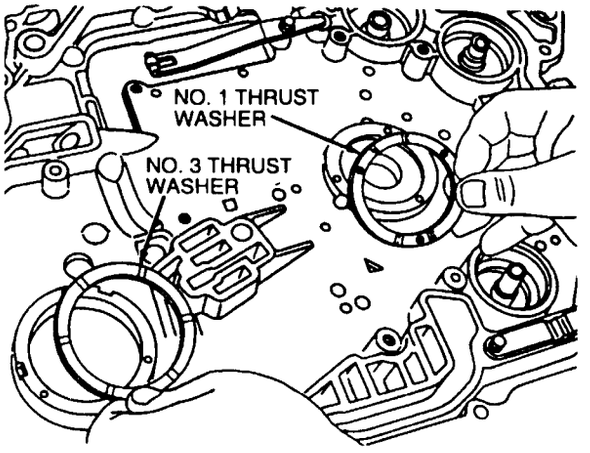
Disassembly

1. **CAUTION: Do not pull on wiring. Pull on connector or wires may be pulled from connector. Be careful not to cut or damage wire insulation or connector.**

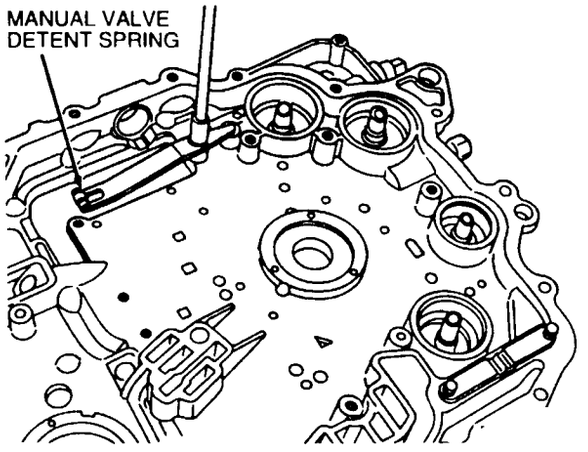
   If wiring or chain cover (7G188) replacement is necessary, compress tabs on both sides of connector from inside of chain cover. Pull connector and harness out of chain cover.



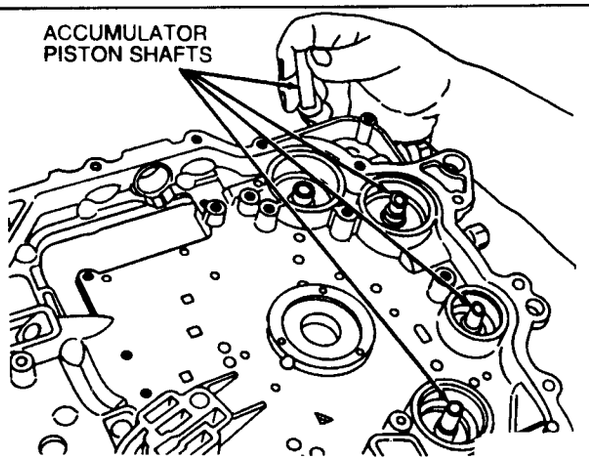
2. Remove No. 1 drive sprocket thrust washer (7G099) and No. 3 chain cover thrust washer (7G096) from chain cover.



3. Use an 8 mm socket to remove bolt and manual valve detent spring.



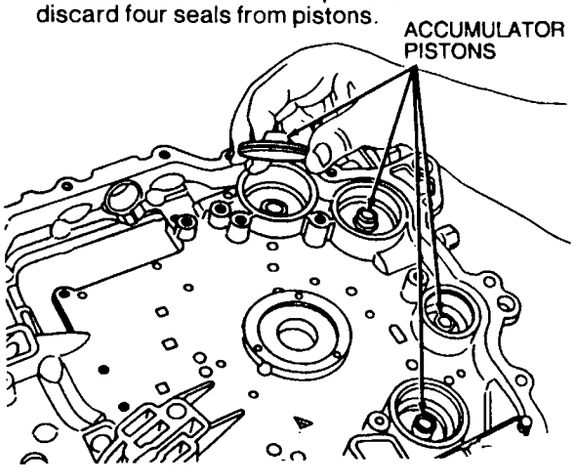
4. Remove four accumulator piston shafts.



5. **CAUTION: Do not use any objects in piston shaft bore for removal or damage to bore may result.**

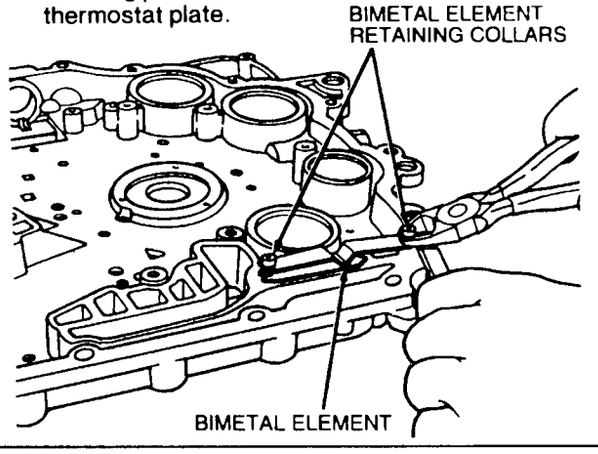
   NOTE: Identify pistons with respect to the proper bore to aid in reassembly.

   Remove four accumulator pistons. Remove and discard four seals from pistons.



6. **CAUTION: Use care not to damage machined surfaces or bimetal element.**

   IF NECESSARY, use side cutters supported by a small piece of wood to carefully remove bimetal retaining pin collars. Remove bimetal element and thermostat plate.

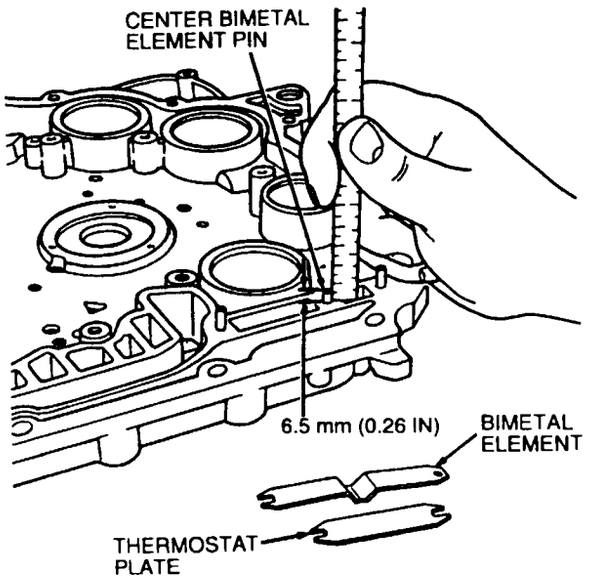


Assembly

1. NOTE: Use a thread sealer or Teflon ® tape.

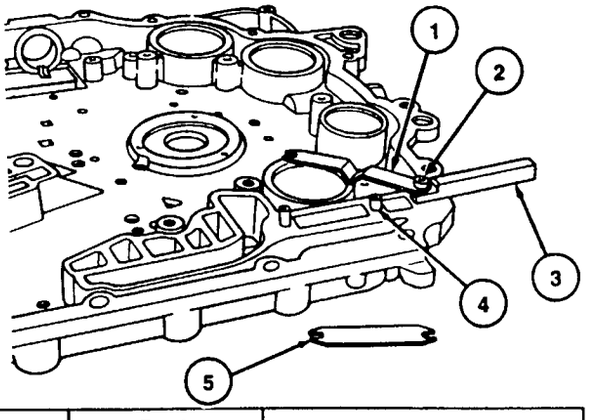
   Install quick-connect oil cooler fittings.

2. Measure the distance that the center bimetal element pin protrudes from the chain cover. Maximum allowable height is 6.5 mm (0.26 inch).



3. Engage hole in bimetal strip onto end retaining pin.

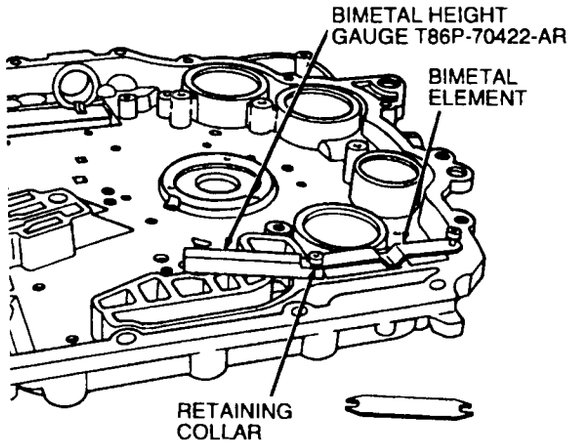
4. Position Bimetal Height Gauge T86P-70422-AR against retaining pin and under bimetal element. Gently tap retaining collar onto pin until it seats against tool edge.



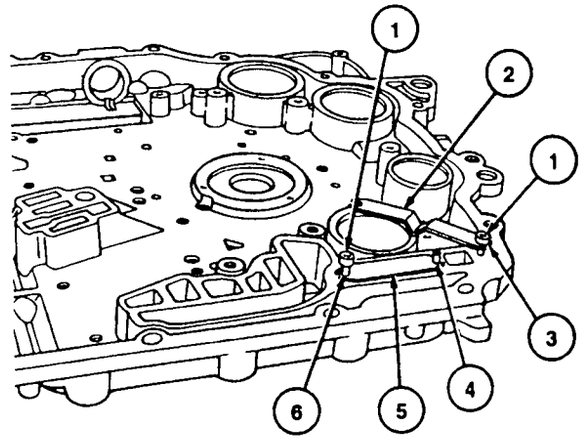
Item	Part Number	Description
1	7G191	Oil Level Thermostatic Element
2	7G089	Oil Level Thermostat Retaining Collar
3	T86P-70422-AR	Bimetal Height Gauge
4	N804184-S	Bimetal Element Retaining Pin (3 Req'd)

Item	Part Number	Description
5	7G190	Oil Level Thermostat Plate

5. Engage slotted end of bimetal element under rear retaining pin. Place Bimetal Height Gauge T86P-70422-AR against retaining pin and under bimetal element. Gently tap retaining collar onto pin until it seats against tool.

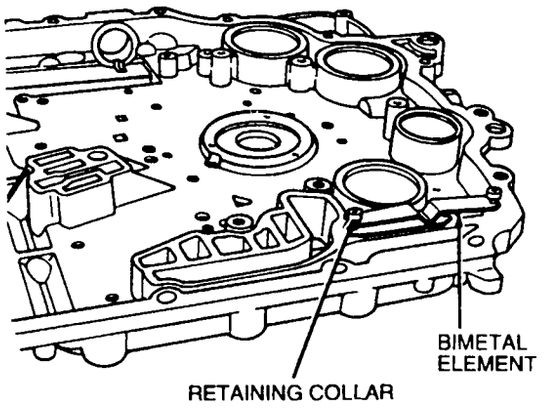


6. Remove slotted end of bimetal element from pin. Position oil level thermostat plate over end and middle retaining pins.

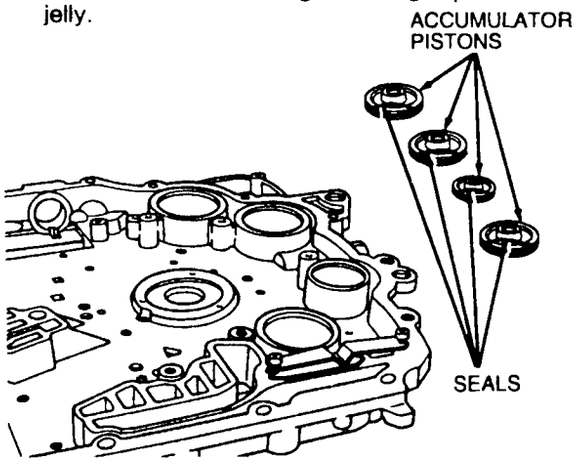


Item	Part Number	Description
1	7G089	Oil Level Thermostat Retaining Collar
2	7G191	Bimetal Element
3	N804184-S	Right End-Bimetal Element Retaining Pin (3 Req'd)
4	N804184-S	Middle-Bimetal Element Retaining Pin (3 Req'd)
5	7G190	Oil Level Thermostat Plate
6	N804184-S	Left End-Bimetal Element Retaining Pin (3 Req'd)

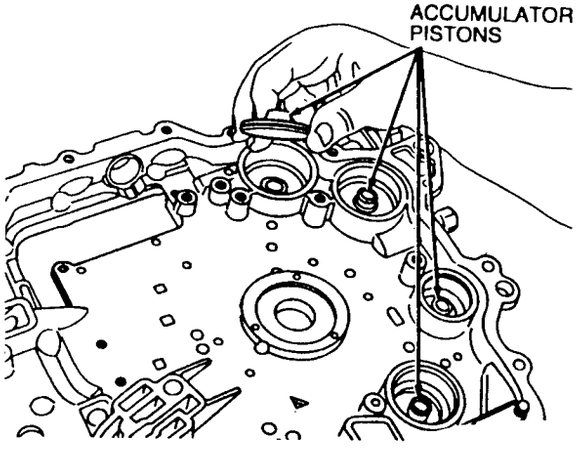
7. Install slotted end of bimetal element under retaining collar.



8. Install four new seals on accumulator pistons. Lubricate seals with a light coating of petroleum jelly.

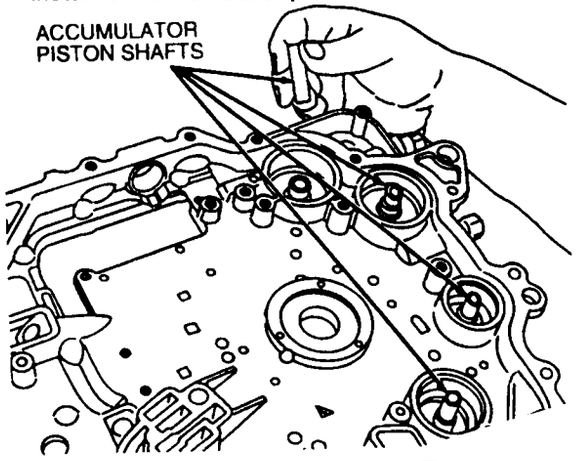


9. **CAUTION: Do not allow pistons to cock in their bores; seal or bore damage may result.**
Install four accumulator pistons into their bores.

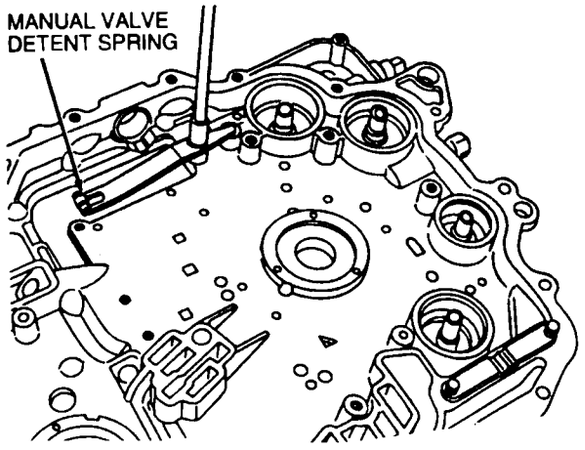


10. NOTE: Use petroleum jelly to keep shafts in place during chain cover installation; shafts can be installed after chain cover is installed.

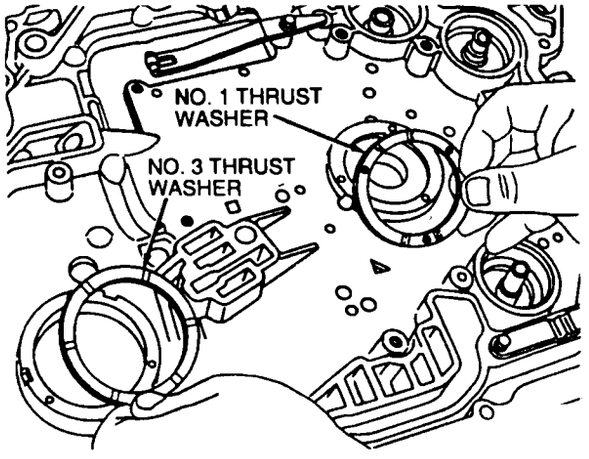
    Install four accumulator piston shafts (7G094).



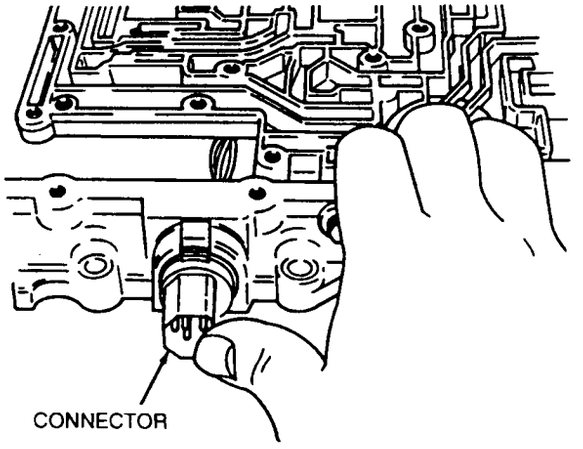
11. Install manual valve detent spring. Tighten retaining bolt to 9-12 N·m (84-144 lb-in).



12. Install No. 1 drive sprocket thrust washer and No. 3 chain cover thrust washer. Use petroleum jelly to hold them in place.

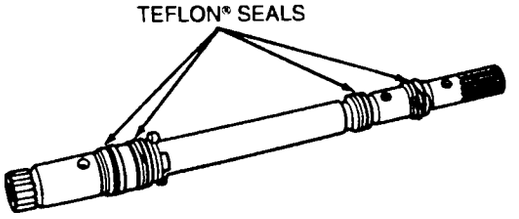


13. If removed, install new connector and harness assembly by pushing into bore from the outside until a click is heard.



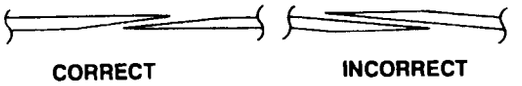
Pump Shaft

1. Remove Teflon® seals from oil pump driveshaft.
2. Inspect oil pump driveshaft in area that bearing rides. If worn, shaft and main control must be replaced.



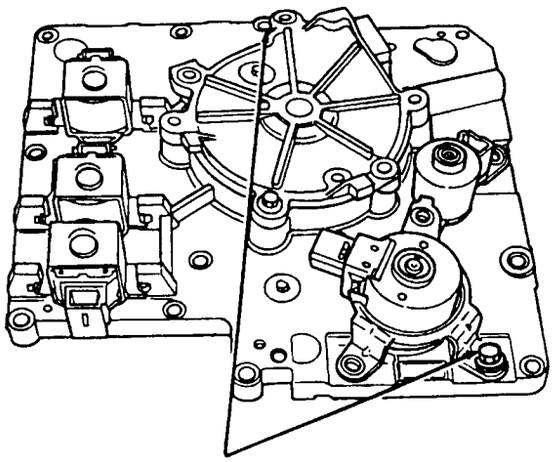
3. Install four new Teflon® seals on the oil pump drive shaft.

CAUTION: SEAL RINGS MUST BE INSTALLED CORRECTLY



Pump and Main Control Valve Body Assembly

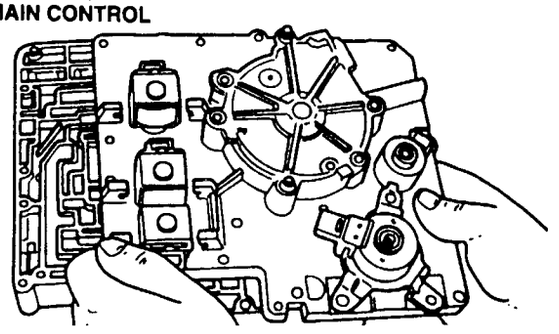
1. Remove two 8 mm bolts retaining pump to main control valve body (7A100).



PUMP-TO-MAIN CONTROL VALVE BODY RETAINING BOLTS

2. Remove pump from main control valve body.

OIL PUMP/ MAIN CONTROL

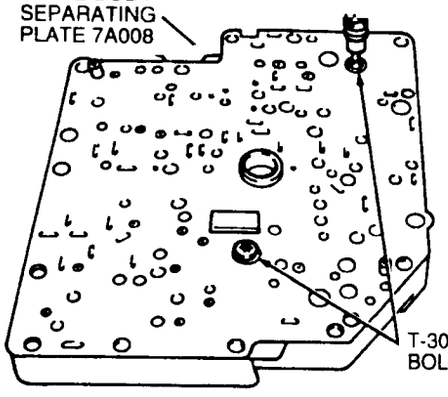


3. **CAUTION: Do not damage gaskets.**

NOTE: Main control valve body separator plate and main control valve body separator plate gasket are bonded together. This separator plate and its gaskets are serviced as an assembly.

Place main control valve body on bench with valve body separating plate (7A008) up, and remove two T-30 Torx® bolts retaining valve body separating plate to main control valve body.

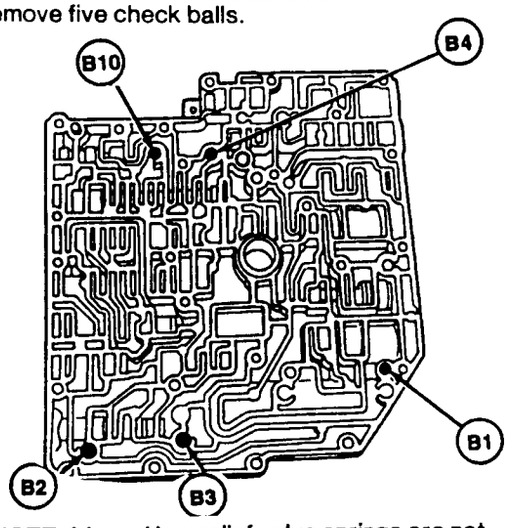
VALVE BODY SEPARATING PLATE 7A008



T-30 TORX® BOLTS

4. Remove valve body separating plate and main control to case gasket (7C155).

5. NOTE: Be sure to note location of check balls. Remove five check balls.

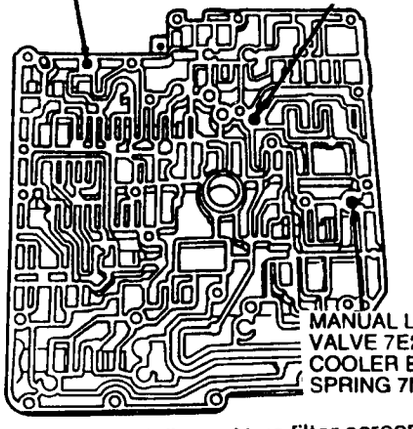


6. NOTE: Manual low relief valve springs are not interchangeable.

Remove and identify two manual low relief valves and springs. Remove modulator check valve and springs.

MODULATOR CHECK VALVE 7D453 AND SPRING 7G310

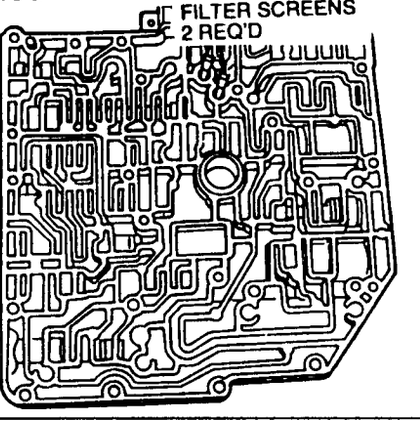
MANUAL LOW RELIEF VALVE 7E217 AND DRAIN BACK SPRING 7G315



MANUAL LOW RELIEF VALVE 7E217 AND COOLER BY-PASS SPRING 7N155

7. Remove and discard two filter screens.

FILTER SCREENS 2 REQ'D



AX4N MAIN CONTROL ASSEMBLY EXPLODED VIEW

BORE 500

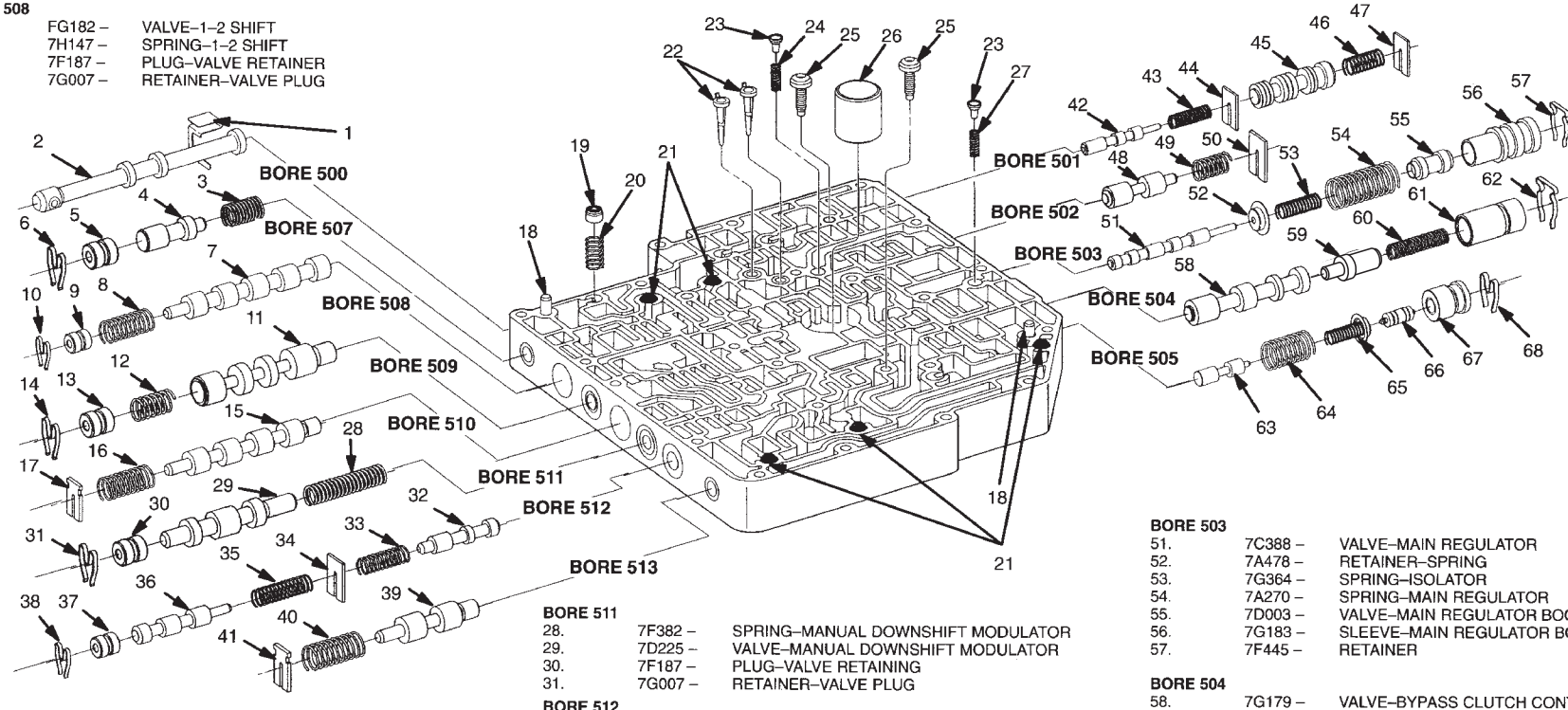
1.	7G295 –	RETAINER–MANUAL VALVE
2.	7C389 –	VALVE– MANUAL CONTROL

BORE 507

3.	7F423 –	SPRING–CAPACITY MODULATOR
4.	7E477 –	VALVE–2–3 CAPACITY MODULATOR
5.	7F187 –	PLUG–VALVE RETAINER
6.	7G007–	RETAINER–VALVE PLUG

BORE 508

7.	FG182 –	VALVE–1–2 SHIFT
8.	7H147 –	SPRING–1–2 SHIFT
9.	7F187 –	PLUG–VALVE RETAINER
10.	7G007 –	RETAINER–VALVE PLUG



BORE 509

11.	7D053 –	VALVE–2–3 SHIFT
12.	7A320 –	SPRING–2–3 SHIFT
13.	7F187 –	PLUG–VALVE RETAINING
14.	7G007 –	RETAINER–VALVE PLUG

BORE 510

15.	7F259 –	VALVE–3–4 SHIFT
16.	7H147 –	SPRING–3–4 SHIFT
17.	7F194 –	PLATE–RETAINER

18.	N807739–S	– COIL PIN (2 REQ'D)
19.	7D453 –	MODULATOR CHECK VALVE
20.	7G310 –	SPRING–MODULATOR CHECK
21.	7E195 –	CHECK BALL (5 REQ'D)
22.	7G308 –	FILTER (2 REQ'D)
23.	7E217 –	VALVE–TRANS MANUAL LOW RELIEF (2 REQ'D)
24.	7G315 –	SPRING–DRAINBACK VALVE
25.	N807737 –	SCREW USED TO HOLD BONDED GASKET
26.	7G318 –	SLEEVE–VALVE BODY
27.	7N155 –	SPRING–COOLER BY–PASS

BORE 511

28.	7F382 –	SPRING–MANUAL DOWNSHIFT MODULATOR
29.	7D225 –	VALVE–MANUAL DOWNSHIFT MODULATOR
30.	7F187 –	PLUG–VALVE RETAINING
31.	7G007 –	RETAINER–VALVE PLUG

BORE 512

32.	7D059 –	VALVE–3–2 SHIFT TIMING
33.	7F414 –	SPRING–3–2 SHIFT TIMING
34.	7F194 –	PLATE–RETAINER
35.	7G312 –	ENGAGEMENT SPRING
36.	7G317 –	VALVE–ENGAGEMENT
37.	7F187 –	PLUG–VALVE RETAINING
38.	7G007 –	PLUG–RETAINER

BORE 513

39.	7H146 –	VALVE–FORWARD CLUTCH CONTROL
40.	7H147 –	SPRING–FORWARD CLUTCH CONTROL
41.	7F194 –	PLATE–RETAINER

BORE 501

42.	7G473 –	VALVE–SOLENOID REGULATOR
43.	7G411 –	SPRING–SOLENOID REGULATOR
44.	7F194 –	PLATE–SPRING RETAINER
45.	7G316 –	SPRING–CONVERTER REGULATOR
46.	7G307 –	VALVE–CONVERTER REGULATOR
47.	7F194 –	PLATE–SPRING RETAINER

BORE 502

48.	7H166 –	VALVE–PRESSURE FAILSAFE
49.	7H167 –	SPRING–FAILSAFE
50.	7F194 –	PLATE –PLATE–SPRING RETAINER

BORE 503

51.	7C388 –	VALVE–MAIN REGULATOR
52.	7A478 –	RETAINER–SPRING
53.	7G364 –	SPRING–ISOLATOR
54.	7A270 –	SPRING–MAIN REGULATOR
55.	7D003 –	VALVE–MAIN REGULATOR BOOST
56.	7G183 –	SLEEVE–MAIN REGULATOR BOOST
57.	7F445 –	RETAINER

BORE 504

58.	7G179 –	VALVE–BYPASS CLUTCH CONTROL
59.	7G320 –	PLUNGER–BYPASS CLUTCH CONTROL
60.	7H140 –	SPRING–BYPASS CLUTCH CONTROL
61.	7G319 –	SLEEVE–BYPASS CLUTCH CONTROL
62.	7F445 –	RETAINER

BORE 505

63.	7G408 –	VALVE–LINE PRESS MODULATOR
64.	7G314 –	SPRING–LINE MODULATOR
65.	7H149 –	RETAINER ASSEMBLY–SPRING
66.	7G415 –	PLUNGER–LINE MODULATOR VALVE
67.	7G407 –	SLEEVE–LINE MODULATOR VALVE
68.	7E335 –	RETAINER –LINE MODULATOR SLEEVE

Item	Part Number	Description
1	7G295	Manual Valve Retainer
2	7C389	Manual Control Valve
3	7F423	Capacity Modulator Spring
4	7E477	2-3 Capacity Modulator Valve
5	7F187	Valve Retainer Plug
6	7G007	Valve Plug Retainer
7	7G182	1-2 Shift Valve
8	7H147	1-2 Shift Spring
9	7F187	Valve Retainer Plug
10	7G007	Valve Plug Retainer
11	7D053	2-3 Shift Valve
12	7A320	2-3 Shift Spring
13	7F187	Valve Retaining Plug
14	7G007	Valve Plug Retainer
15	7F259	3-4 Shift Valve
16	7H147	3-4 Shift Spring
17	7F194	Retainer Plate
18	7F382	Manual Downshift Modulator Spring
19	7D225	Manual Downshift Modulator Valve
20	7F187	Valve Retaining Plug
21	7G007	Valve Plug Retainer
22	7D059	3-2 Shift Timing Valve
23	7F414	3-2 Shift Timing Spring
24	7F194	Retainer Plate
25	7G312	Engagement Spring
26	7G317	Engagement Valve
27	7F187	Valve Retaining Plug
28	7G007	Retainer Plug
29	7H146	Forward Clutch Control Valve
30	7H147	Forward Clutch Control Spring
31	7F194	Retainer Plate
32	N807739-S	Coil Pin (2 Req'd)
33	7D453	Cap Modulator Check Valve
34	7G310	Modulator Check Spring
35	7E195	Check Ball (5 Req'd)
36	7G308	Filter (2 Req'd)
37	7E217	Trans Manual Low Relief Valve (2 Req'd)
38	7G315	Drainback Valve Spring
39	N807737	Screw (Used To Hold Bonded Gasket)
40	7G318	Valve Body Sleeve

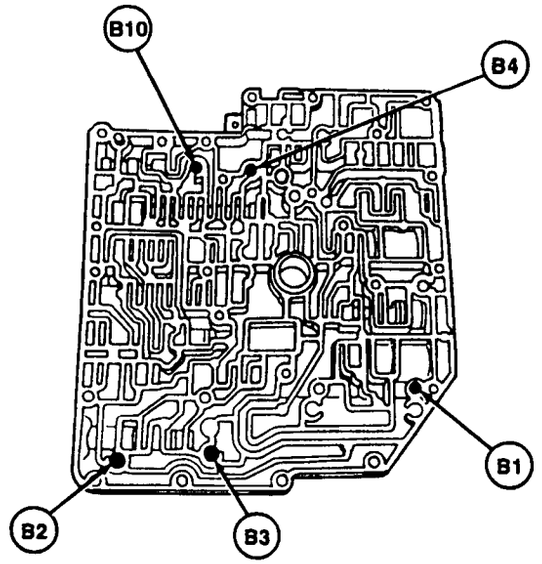
Item	Part Number	Description
41	7N155	Cooler By-Pass Spring
42	7G473	Solenoid Regulator Valve
43	7G411	Solenoid Regulator Spring
44	7F194	Spring Retainer Plate
45	7G316	Converter Regulator Spring
46	7G307	Converter Regulator Valve
47	7F194	Spring Retainer Plate
48	7H166	Pressure Failsafe Valve
49	7H167	Failsafe Spring
50	7F194	Spring Retainer Plate
51	7C388	Main Regulator Valve
52	7A478	Spring Retainer
53	7G364	Isolator Spring
54	7A270	Main Regulator Spring
55	7D003	Main Regulator Boost Valve
56	7G183	Main Regulator Boost Sleeve
57	7F445	Retainer
58	7G179	Bypass Clutch Control Valve
59	7G320	Bypass Clutch Control Plunger
60	7H140	Bypass Clutch Control Spring
61	7G319	Bypass Clutch Control Sleeve
62	7F445	Retainer
63	7G408	Line Press Modulator Valve
64	7G314	Line Modulator Spring
65	7H149	Spring Retainer Assy
66	7G415	Line Modulator Valve Plunger
67	7G407	Line Modulator Valve Sleeve
68	7E335	Line Modulator Sleeve Retainer
A	—	Bore 501
B	—	Bore 502
C	—	Bore 503
D	—	Bore 504
E	—	Bore 505
F	—	Bore 513
G	—	Bore 512
H	—	Bore 511
I	—	Bore 510
J	—	Bore 509
K	—	Bore 508
L	—	Bore 507
M	—	Bore 500

Assembly

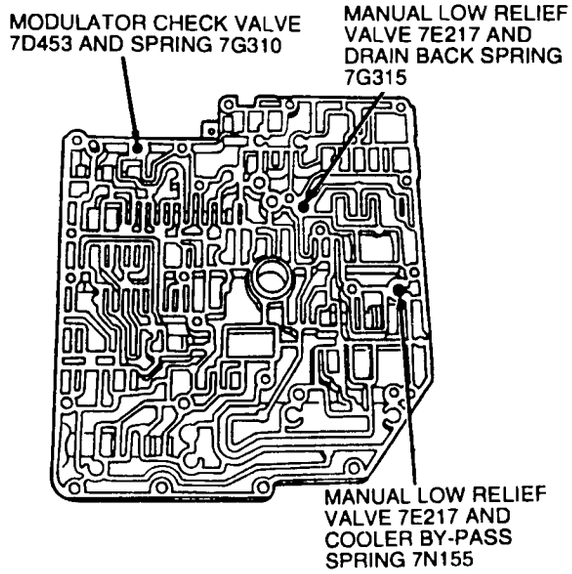
1. **CAUTION: Do not stone or polish any valves. If valves do not move freely, replace assembly.**

   Assemble valves and springs into main control valve body.

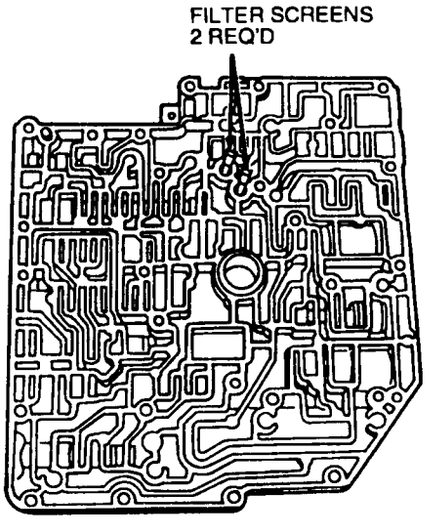
2. Install five check balls.



3. Install two manual low relief valve springs and one modulator check valve and spring previously identified.



4. Install two new filter screens into main control valve body assembly.

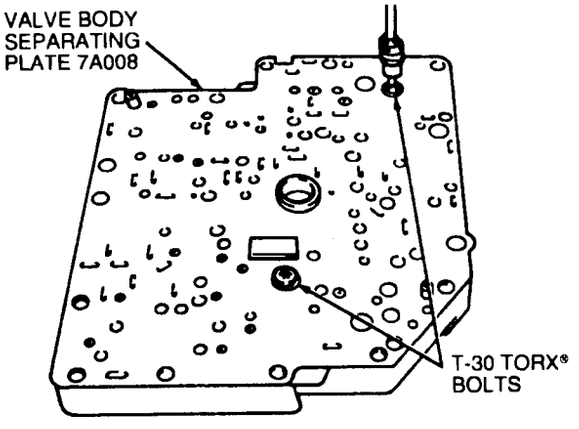


5. **CAUTION: Verify relief and check valves for proper alignment to separator plate before tightening bolts. If relief and check valves are improperly installed, the transaxle will not operate properly.**

   NOTE: Gaskets are bonded to the separator plate.

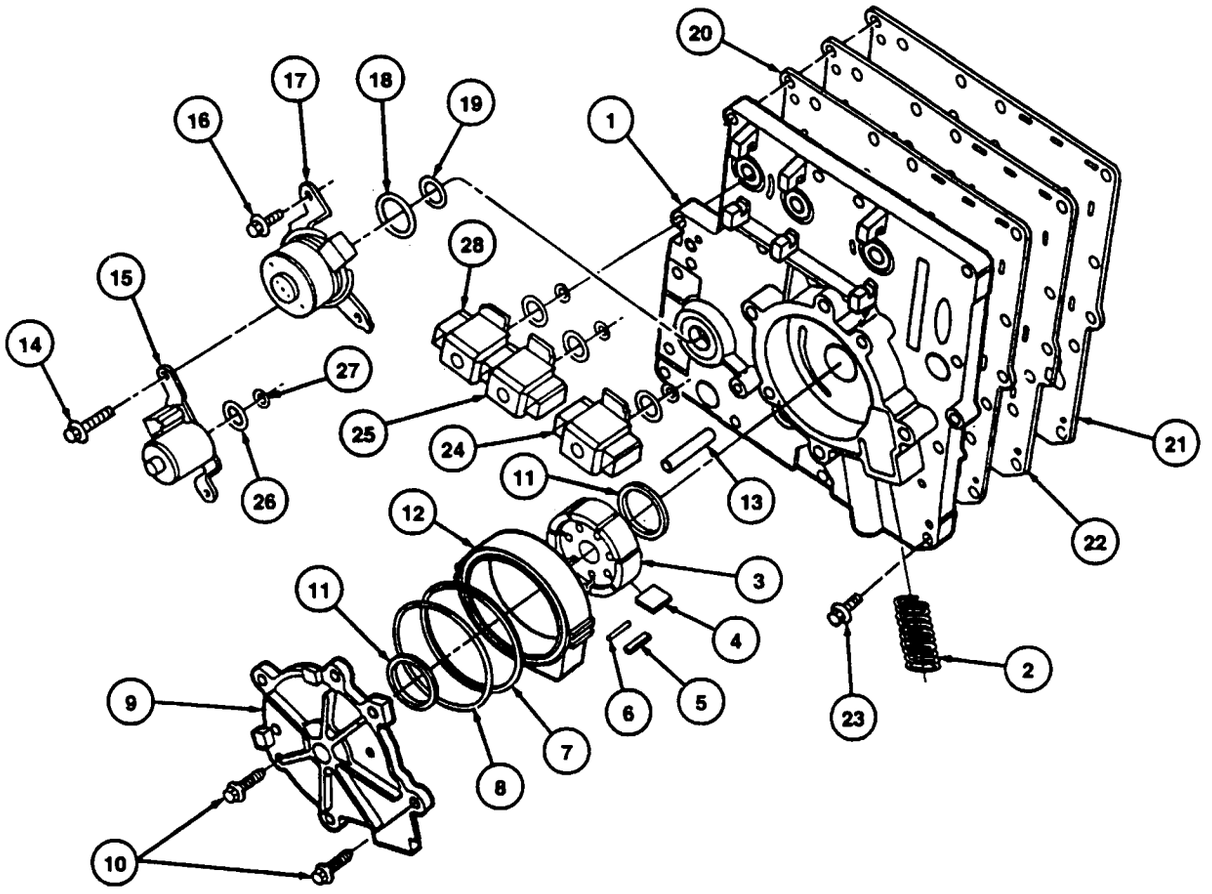
   Install valve body separating plate with new main control to case gasket on main control valve body.

6. Install two T-30 Torx® bolts and tighten to 9-12 N·m (7-9 lb-ft).



Pump Assembly

Pump Assembly—Exploded View



Item	Part Number	Description
1	7A104	Pump Body
2	7G285	Pump Bore Ring Spring
3	7A146	Pump Rotor
4	7G286	Pump Vane (7 Req'd)
5	7G283	Pump Bore Ring Radial Seal
6	7G284	Pump Bore Ring Radial Seal Support
7	7G281	Pump Bore Ring Side Seal
8	7G282	Pump Bore Ring Side Support
9	7G187	Pump Cover and Sleeve Assy
10	N605892-S	Bolt (6 Req'd)
11	7G287	Pump Vane Support Ring
12	7R194	Pump Body Ring
13	N803499	Bore Ring Pin

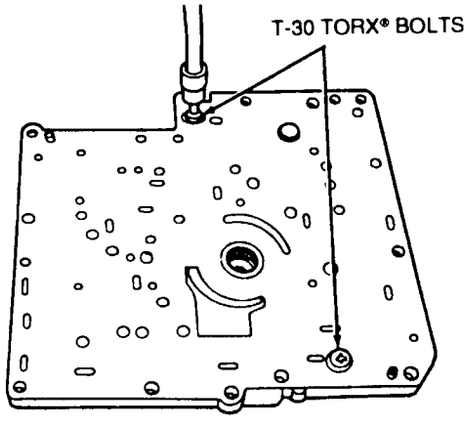
Item	Part Number	Description
14	N803727-S	Bolt
15	7G136	TCC Solenoid
16	N605772-8	Bolt
17	7H144	EPC Solenoid Valve
18	7Z144	O-Ring Seal (Inner)
19	7Z144	O-Ring Seal (Outer)
20	7A331	Separator Plate to Oil Pump Body Gasket
21	7A136	Separator Plate to Main Control Valve Body Gasket
22	7A142	Separator Plate
23	N606026-S1000	Bolt
24	7G484	#3 Shift Solenoid
25	7G484	#2 Shift Solenoid
26	7Z484	O-Ring Seal (Inner)
27	7Z484	O-Ring Seal (Outer)
28	7G484	#1 Shift Solenoid

SPECIAL SERVICE TOOL(S) REQUIRED

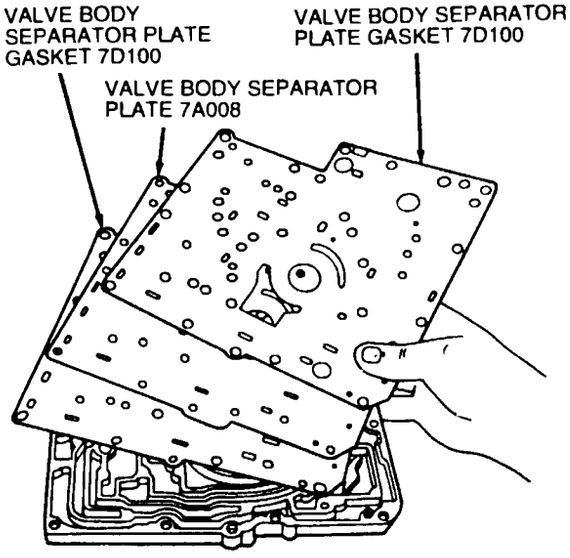
Description	Tool Number
Pump Body Guide Pin	T86P-70370-A

Disassembly

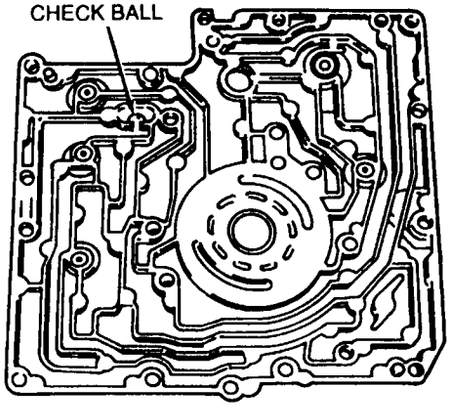
1. Remove two T-30 Torx® bolts retaining valve body separating plate (7A008) to pump housing.



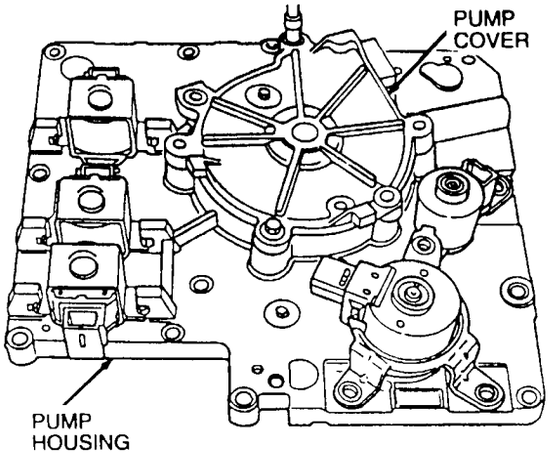
2. Remove pump housing to valve body separating plate and discard gaskets.



3. NOTE: Be sure to note location of check ball. Remove check ball.



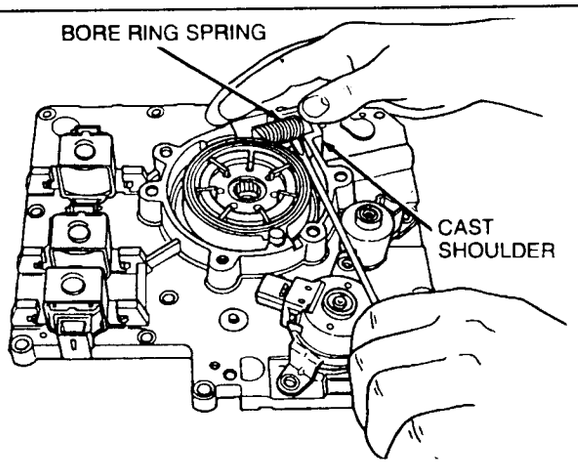
4. Remove two bolts retaining pump cover to pump housing and remove cover.



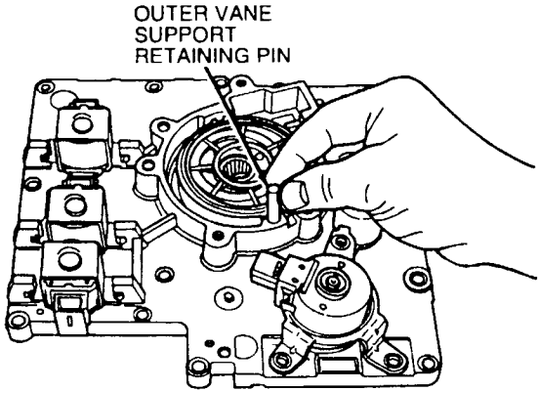
5. **WARNING: USE EXTREME CAUTION WHEN REMOVING SPRING TO PREVENT PERSONAL INJURY.**

   CAUTION: Place a piece of cardboard or suitable material under screwdriver to prevent damage to housing gasket surface. Do not scratch or damage any machined surface.

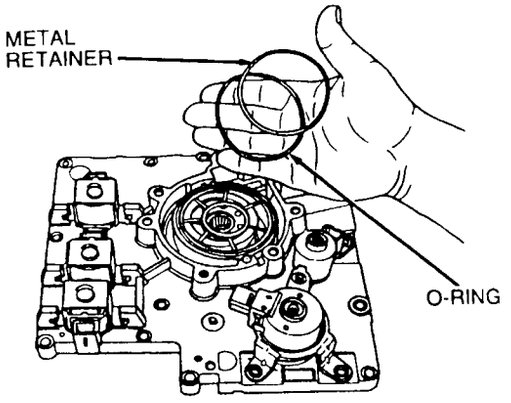
   Remove bore-ring spring by prying spring out of housing, using the cast shoulder as a leverage point.



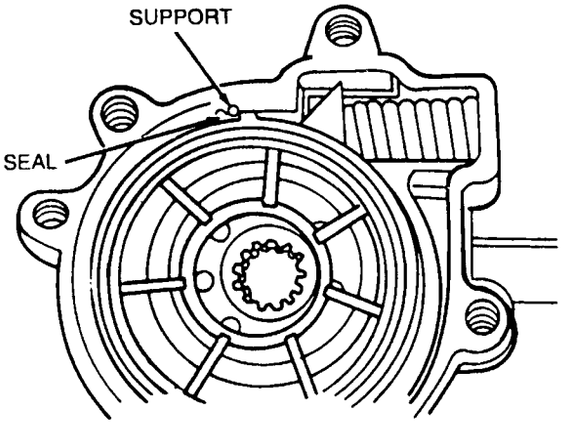
6. Remove outer vane support retaining pin.



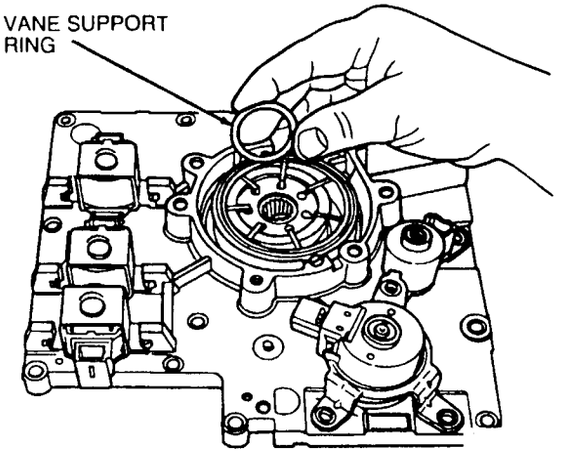
7. Remove metal O-ring retainer and pump bore ring side seal from outer vane support. Discard O-ring.



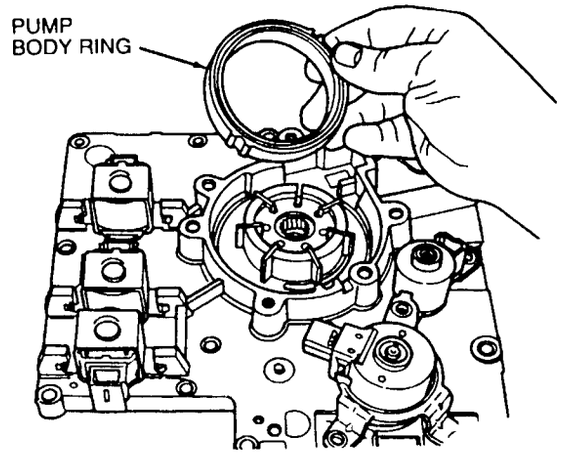
8. Remove and discard pump bore ring side seal. Remove side seal support.



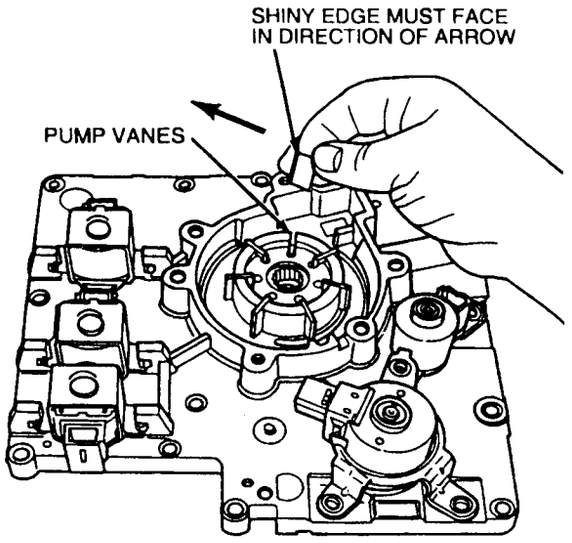
9. Remove top pump vane support ring.



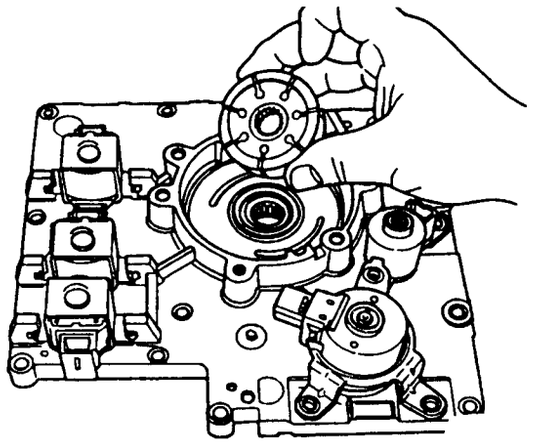
10. Remove outer pump body ring.



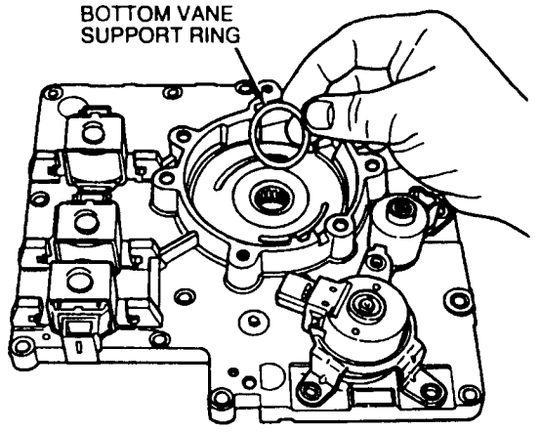
11. Remove seven vanes from rotor.



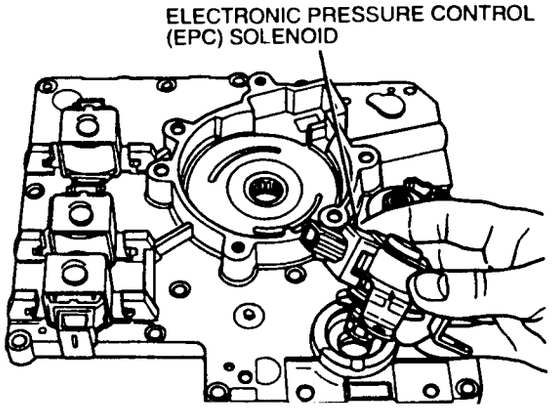
12. Remove rotor.



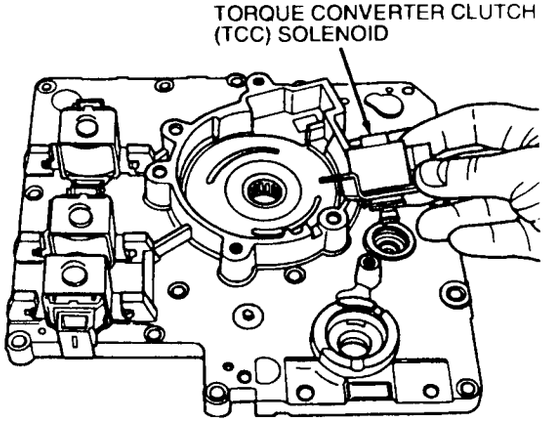
13. Remove bottom pump vane support ring.



14. Remove EPC solenoid retaining ring and solenoid. Remove and discard O-rings.

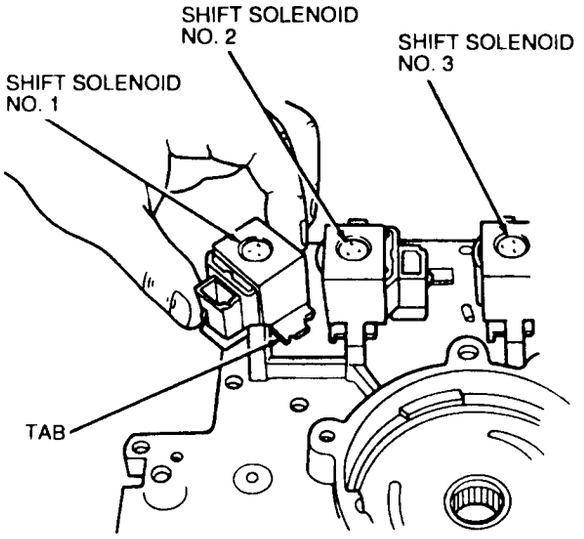


15. Remove torque converter clutch (TCC) solenoid. Remove and discard O-rings.



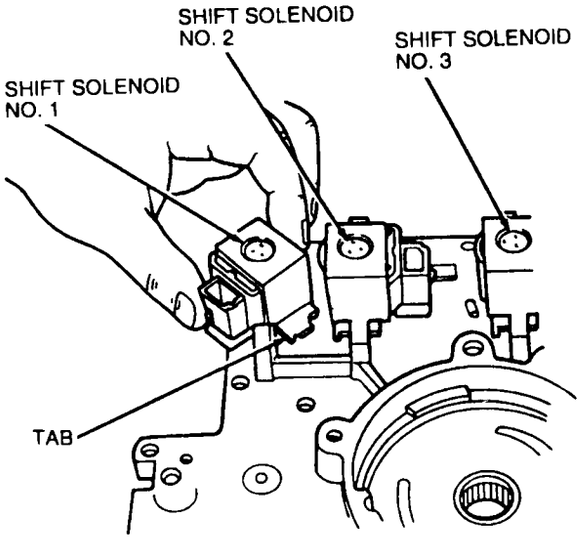
16. NOTE: Shift solenoids are interchangeable. Take note of connector orientation.

Remove three shift solenoids by pressing tab with small screwdriver. Twist solenoids and lift. Remove and discard O-rings.

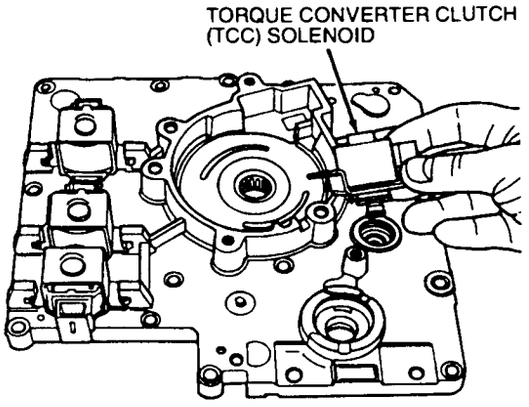


Assembly

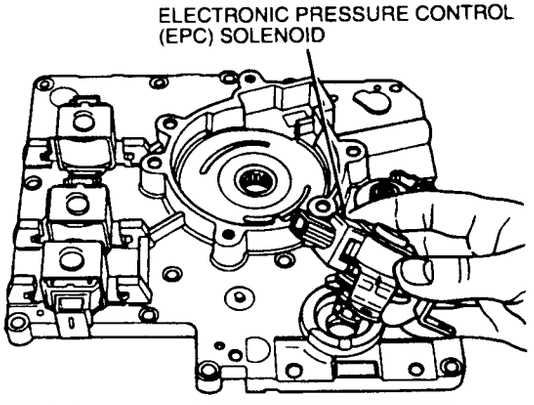
1. Install new O-rings on shift solenoids. Install solenoids by pressing down and twisting until a click is heard. Refer to illustration for proper orientation of shift solenoid (7G484).



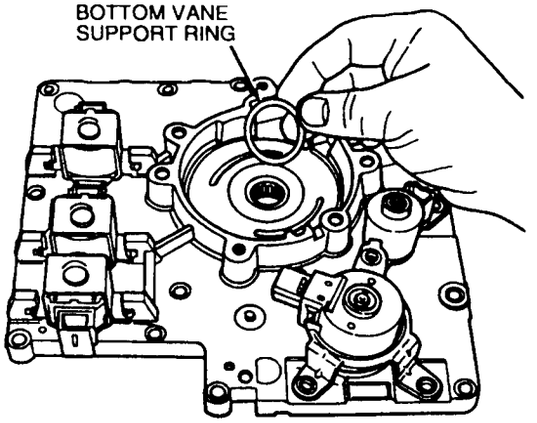
2. Install new O-rings on TCC solenoid. Install TCC solenoid.



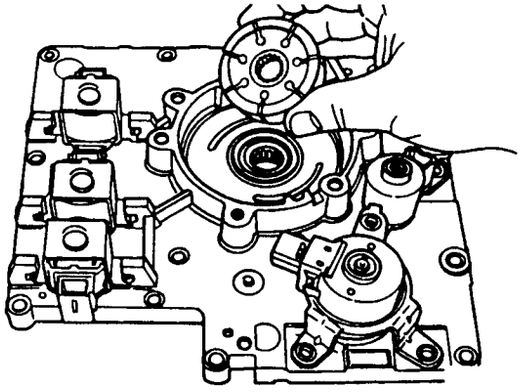
3. Install new O-rings on EPC solenoid. Install EPC solenoid.



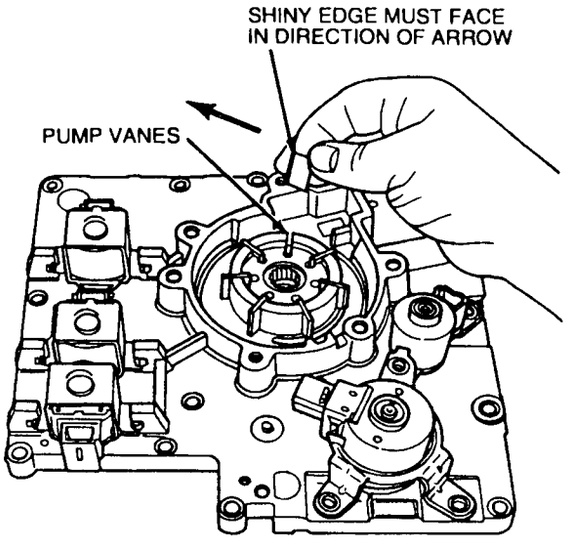
4. Install bottom pump vane support ring.



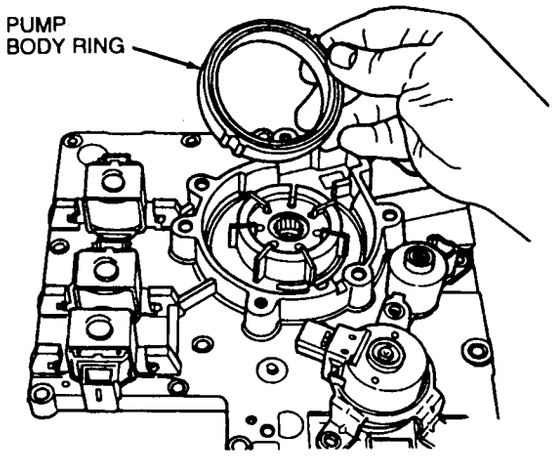
5. NOTE: Counter bore area is where the pump shaft and mating splines pass through the rotor.
   Install rotor with counter bore facing up.



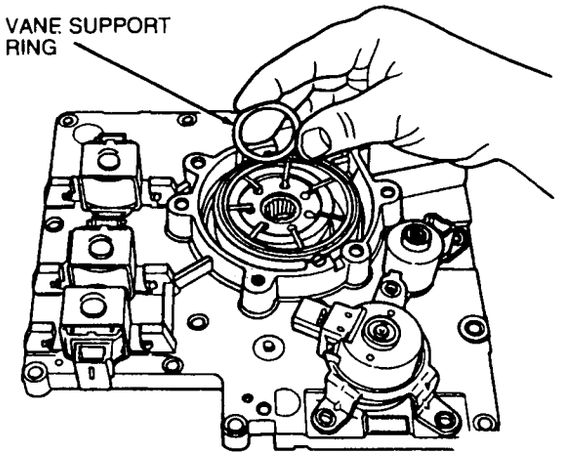
6. NOTE: Shiny portion of vane blade is installed outward toward pump body ring.
   Install seven pump vanes in inner vane support.



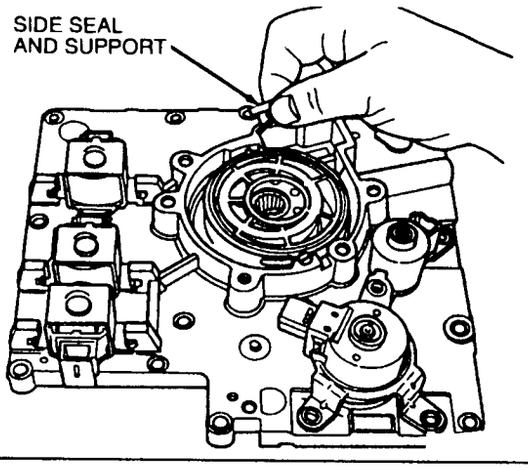
7. Install pump body ring with O-ring groove facing up.

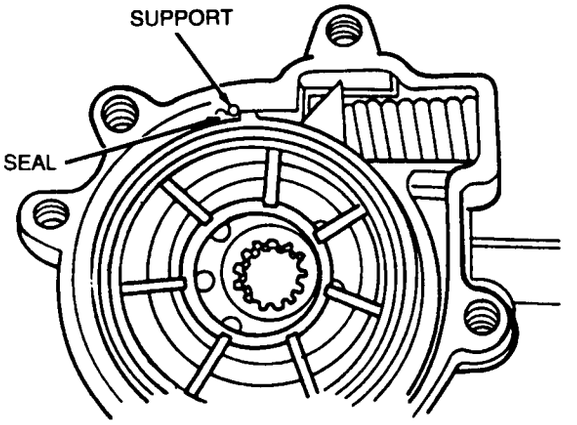


8. Install top pump vane support ring.

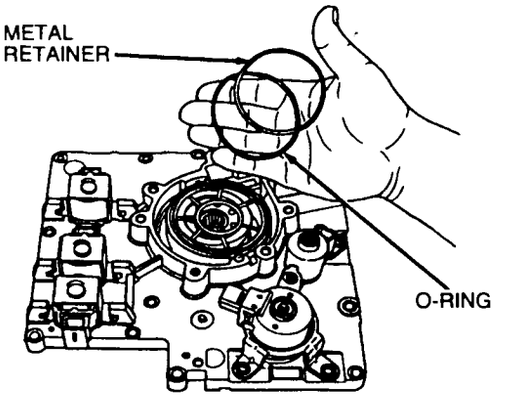


9. Install new side seal support. Install new pump bore ring side seal.



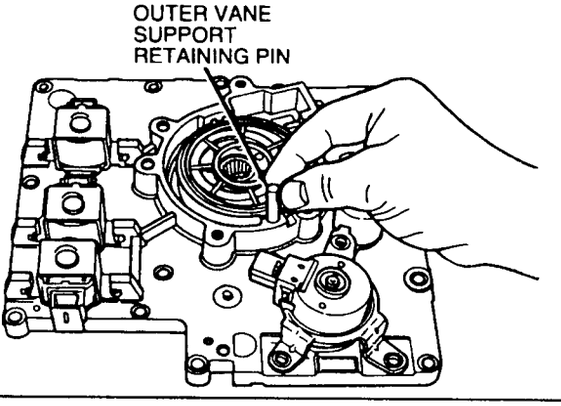


10. Install new O-ring in groove in outer vane support. Then, install metal O-ring retainer.

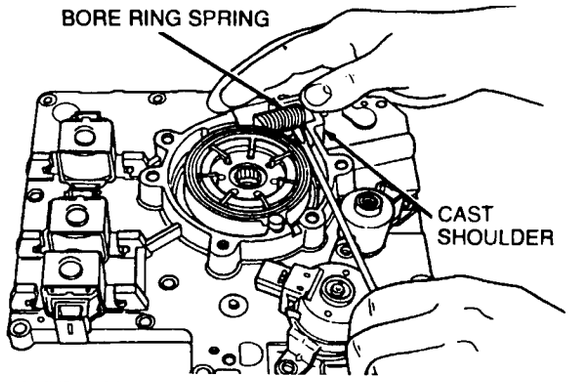


11. **CAUTION: Pin must not be pushed through the pump body; it should be flush with valve body side of pump to prevent component interference.**

Install outer vane support retaining pin.



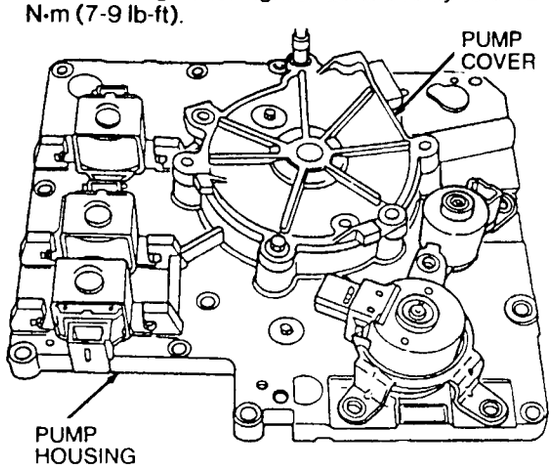
12. **CAUTION: Be sure this area is well cleaned—it is a hidden debris tap; flow from pump goes into manual valve circuit, then into EPC circuit. Pump pressure at this point is high, and any contamination not cleaned will be pumped throughout the transaxle on first operation.**



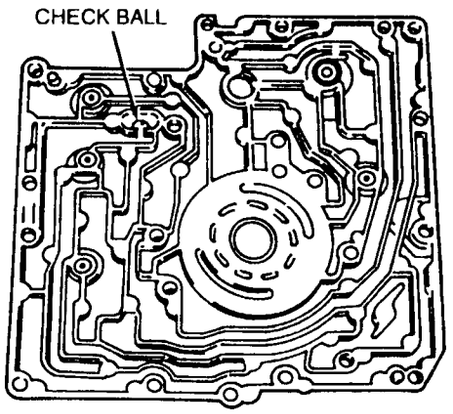
13. NOTE: Use the oil pump shaft (7B328) to align the pump while installing the pump cover.

    NOTE: Ensure that outer vane ring retaining pin is flush with or below the surface of the main control valve body side of the oil pump.

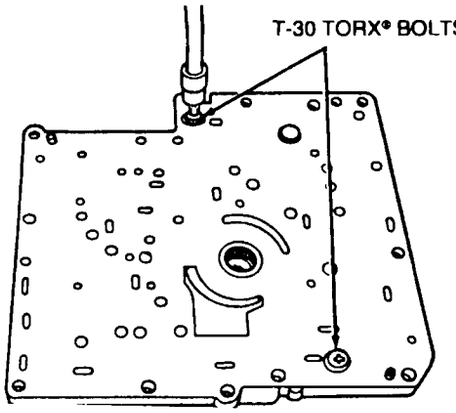
    Install oil pump cover on pump housing and install two retaining bolts. Tighten bolts evenly to 9-12 N·m (7-9 lb-ft).



14. Install check ball as shown.

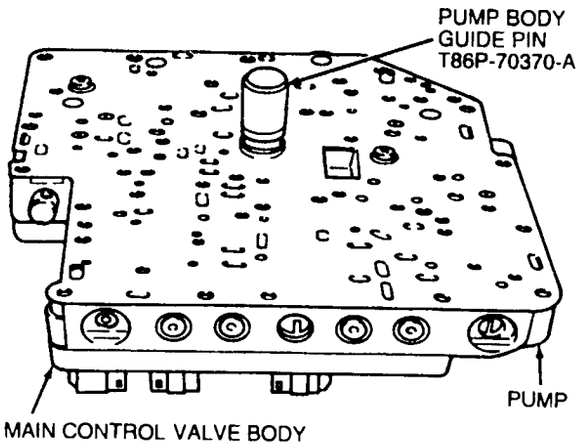


15. Position control valve body separator plate and two new gaskets on pump housing. Install two Torx® bolts. Tighten bolts to 9-12 N·m (7-9 lb-ft).

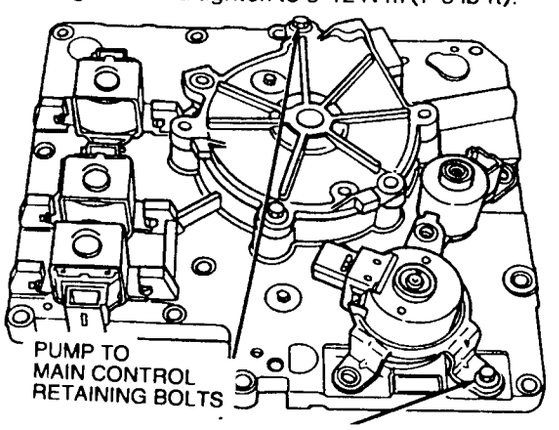


16. **CAUTION: Do not use the oil pump driveshaft for this alignment or a misalignment between the two components may occur.**

    Position main control valve body (7A100) on pump using a new pump gasket. Use Pump Body Guide Pin T86P-70370-A to align the main control valve body to the pump.

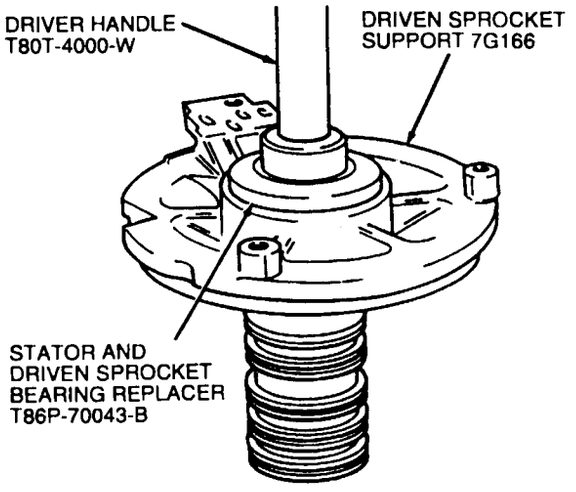


17. Install two main control valve body-to-pump retaining bolts and tighten to 9-12 N·m (7-9 lb-ft).



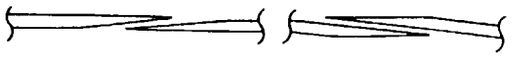
Assembly

1. If removed, press driven sprocket bearing using an Arbor Press, Stator and Driven Sprocket Bearing Replacer T86P-70043-B, and Driver Handle T80T-4000-W.

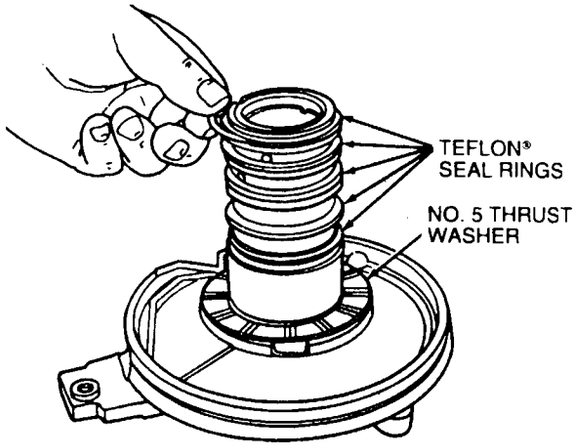


2. **CAUTION: Seal rings must be installed correctly.**

CAUTION: SEAL RINGS MUST BE INSTALLED CORRECTLY

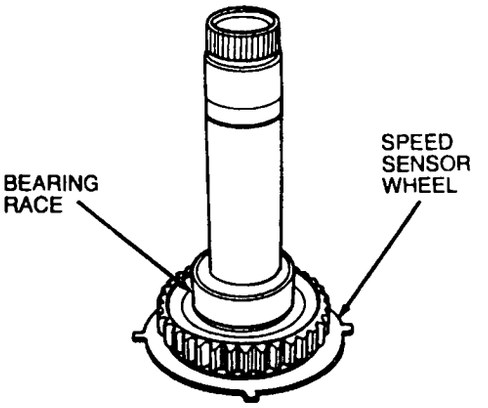


Install No. 5 thrust washer to driven sprocket support. Use petroleum jelly to hold washer in place. Install five new Teflon® seal rings.



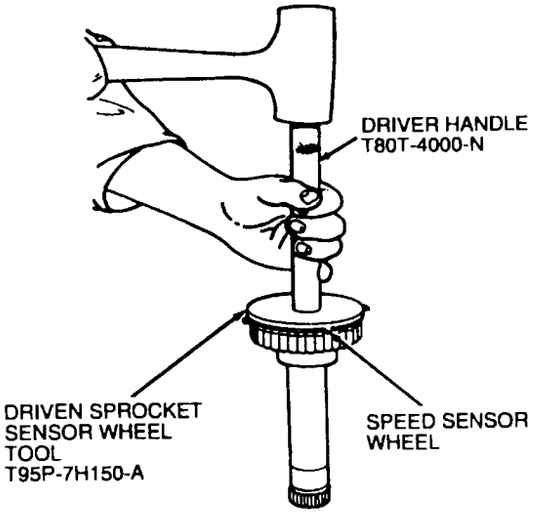
Driven Sprocket

1. Inspect bearing race to verify it has not moved out of position or become scored.



2. Inspect driven sprocket speed sensor wheel for damage. Service as required.

3. If speed sensor wheel is damaged, replace it using Driven Sprocket Sensor Wheel T95P-7H150-A with Driver Handle T80T-4000-N.

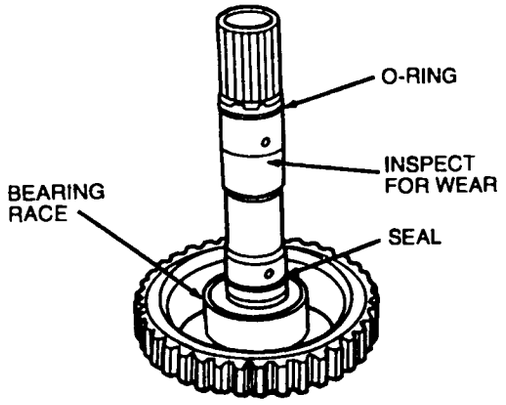


4. Inspect bearing on inside diameter of driven sprocket shaft bottom. Service as required.

Drive Sprocket / Turbine Shaft

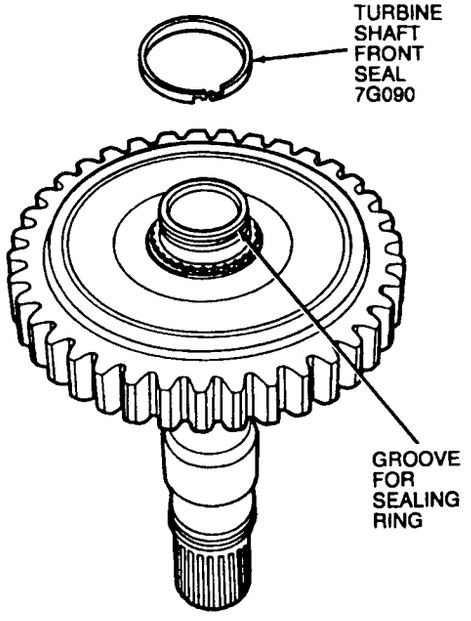
Disassembly

1. Remove and discard drive sprocket / turbine shaft seal and O-ring.



2. Inspect bearing race for wear.

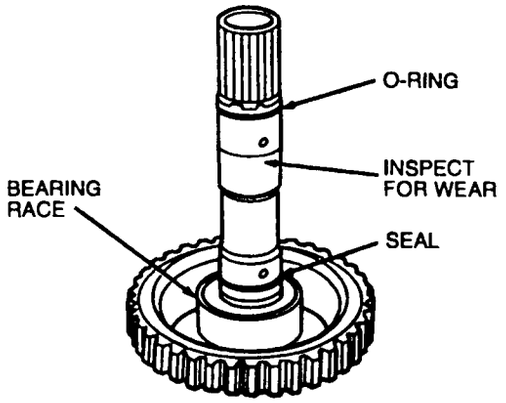
3. Remove and discard cast-iron sealing ring.



Assembly

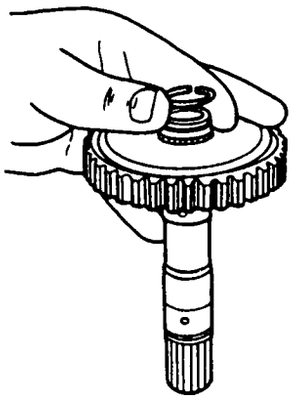
1. **CAUTION: Seal rings must be installed correctly.**

   Install new drive sprocket / turbine shaft seal and O-ring.

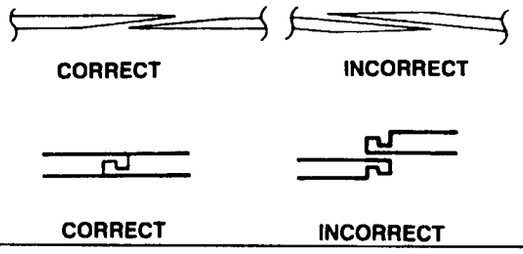


2. **CAUTION: Seal rings must be installed correctly.**

   Install new cast-iron sealing ring.

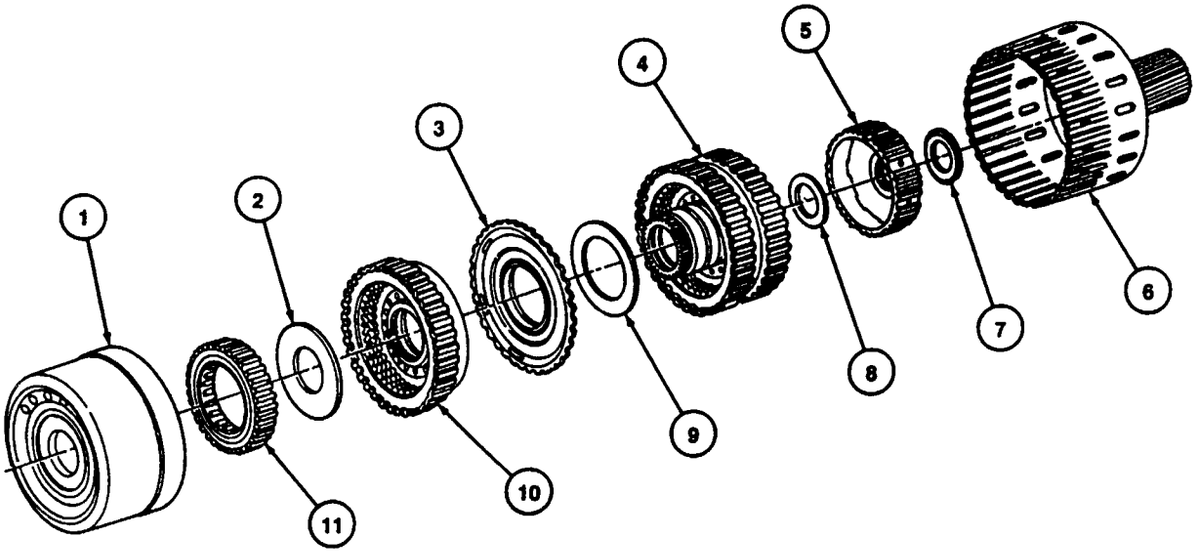


CAUTION: SEAL RINGS MUST BE INSTALLED CORRECTLY



Sun Shell Assembly—Disassembly

Disassembled View

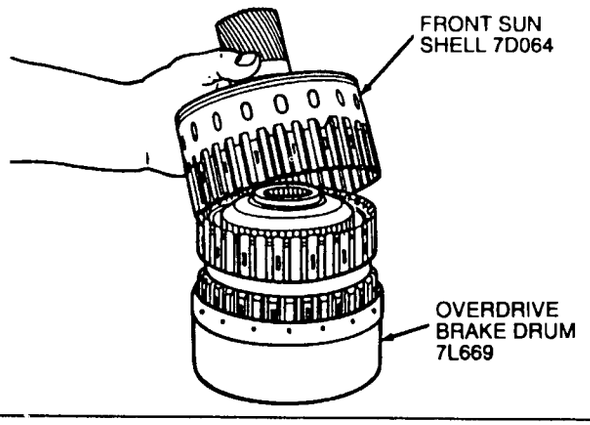


Item	Part Number	Description
1	7L669	Overdrive Brake Drum
2	7A166	No. 6 Forward Clutch Thrust Washers
3	7G156	Direct One-Way Clutch
4	7G120	Direct / Intermediate Clutch Assembly
5	7F221	Intermediate Clutch Hub

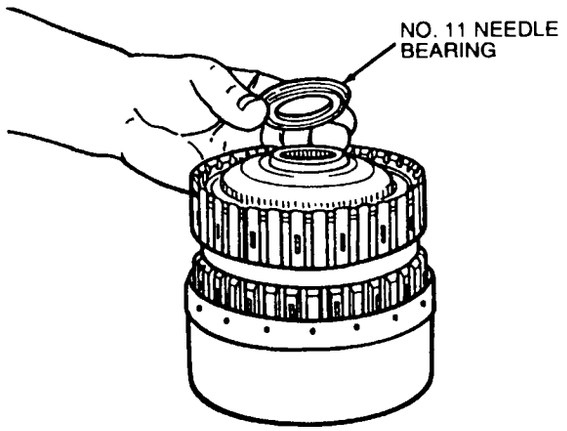
Item	Part Number	Description
6	7D064	Front Sun Shell
7	7C096	No. 11 Front Sun Shell Thrust Bearing
8	7C096	No. 10 Thrust Bearing
9	7F369	No. 7 Direct / Intermediate Clutch Thrust Washer
10	7A360	Forward Clutch Cylinder
11	7A089	One-Way Clutch Assy

Disassembly

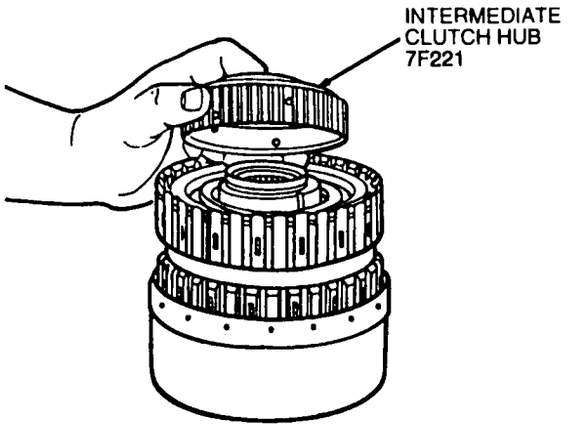
1. Set assembly on overdrive brake drum (7L669).
2. Remove front sun shell (7D064).



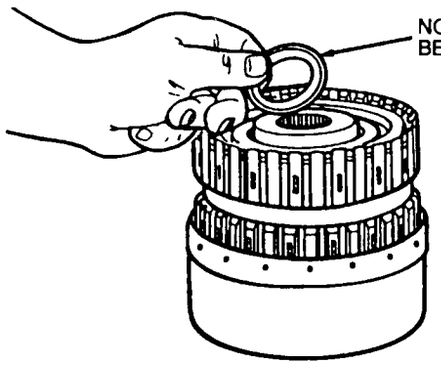
3. Remove No. 11 needle bearing.



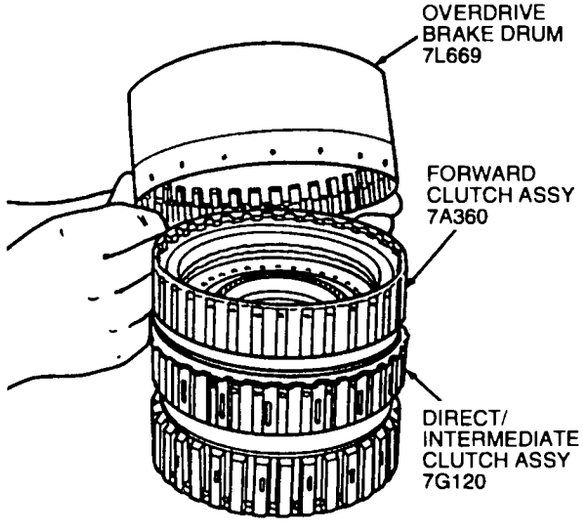
4. Remove intermediate clutch hub.



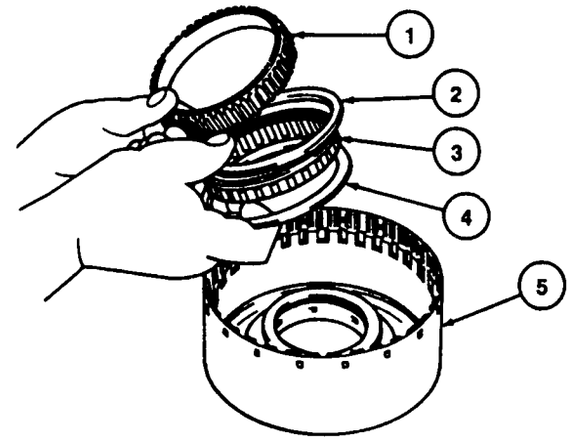
5. Remove No. 10 needle bearing.



6. Turn assembly over.
7. Remove overdrive brake drum.

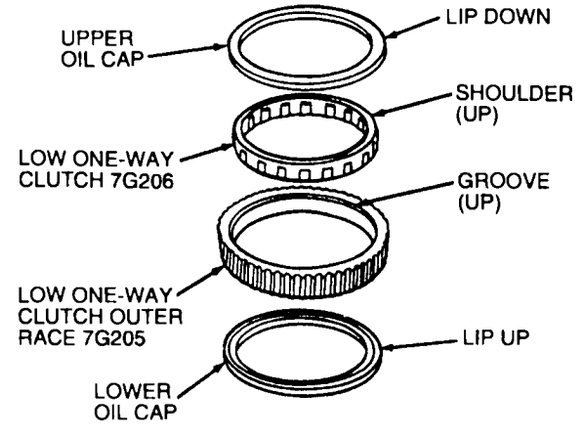


8. Remove one-way clutch assembly from inner race of overdrive brake drum.



Item	Part Number	Description
1	7D171	One-Way Clutch Race
2	—	Top Cap
3	7A089	One-Way Clutch
4	—	Bottom Cap (Part of 7L669)
5	7L669	Overdrive Brake Drum

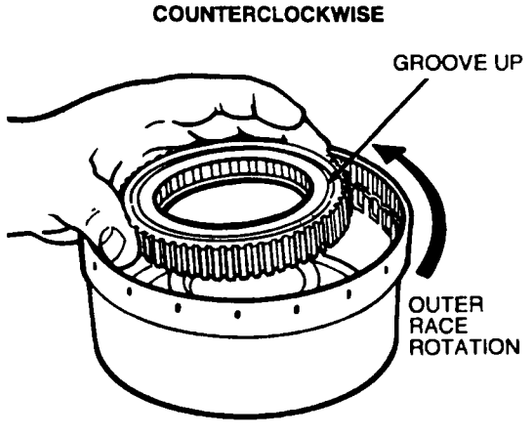
9. Disassemble one-way clutch for cleaning and inspection.



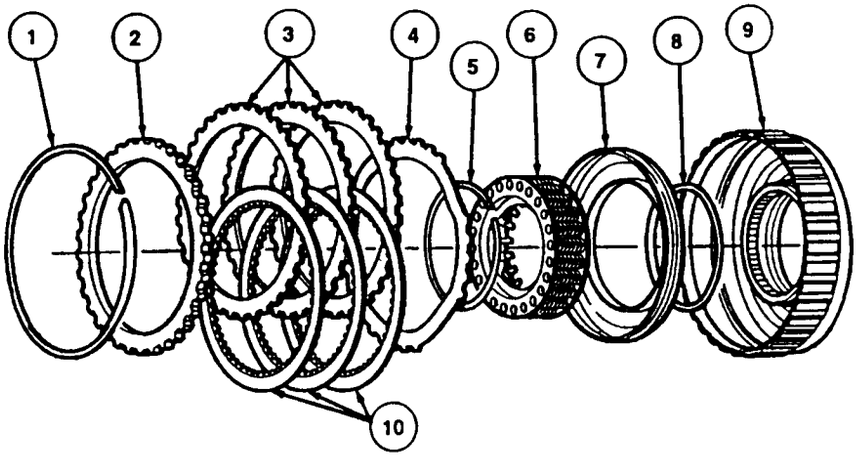
10. Assembly one-way clutch with shoulder up, outer race with groove up and upper and lower oil caps.

11. **CAUTION: Outer race must rotate counterclockwise. Make sure end caps are fully seated.**

Install low one-way clutches as an assembly with groove on outer race up.



Forward Clutch Cylinder

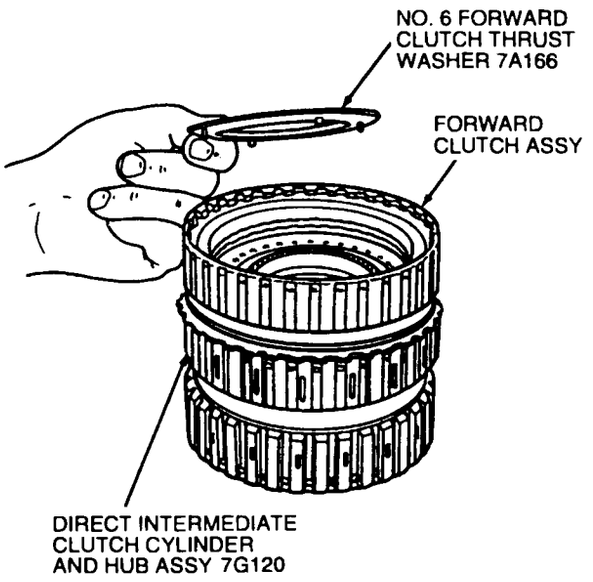


Item	Part Number	Description
1	7G367	Retainer Ring
2	7B066	Forward Clutch Pressure Plate
3	7E314	Forward Clutch Plate (Steel)
4	7G159	Forward Clutch Wave Spring
5	N-803053-S	Retaining Ring
6	7G299	Direct Clutch Support and Spring Assy

Item	Part Number	Description
7	7L140	Forward Clutch Piston and Seal Assembly
8	7G242	Forward Clutch Inner Seal
9	7H011	Forward Clutch Cylinder and Valve Assy
10	7E311	Forward Clutch Plate (Friction)

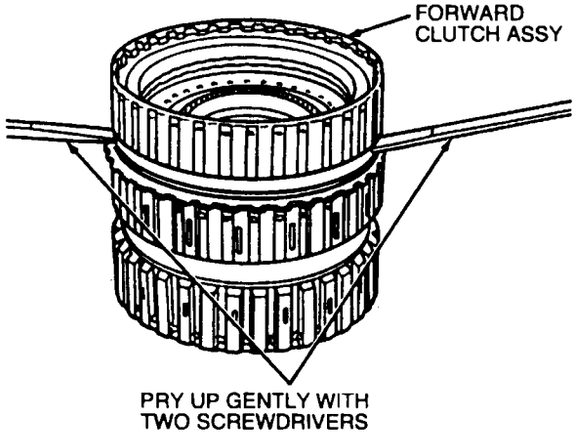
(Continued)

1. Remove No. 6 thrust washer.



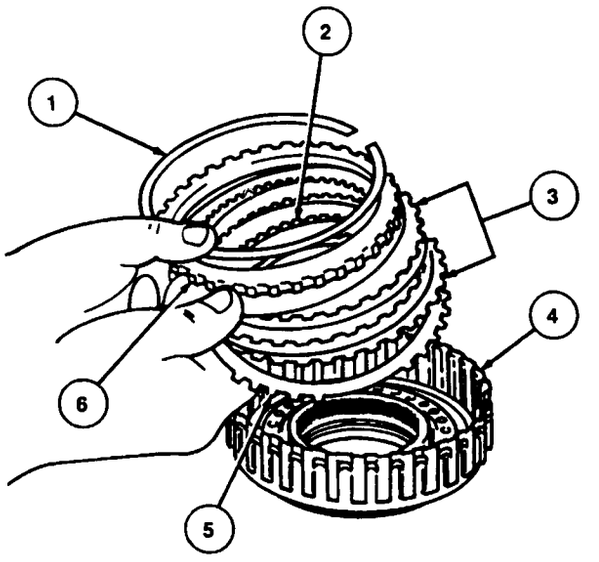
2. **CAUTION: Pry evenly and do not locate screwdriver ends on or near forward clutch check ball to prevent component damage.**

   Remove forward clutch assembly by prying up on each side with two screwdrivers.



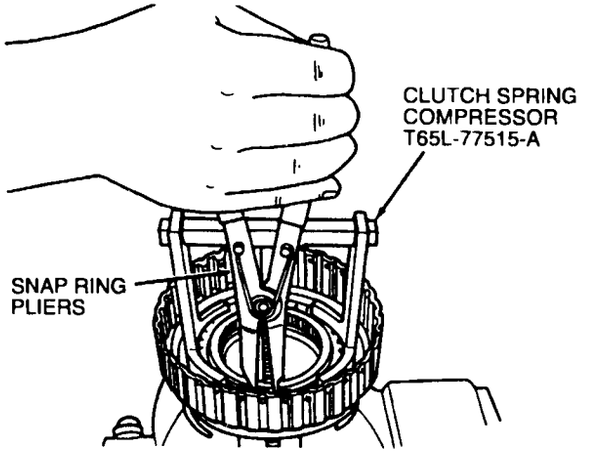
3. **CAUTION: Check intersplines on clutch plates for wear. If found worn, they must be replaced.**

   Remove retaining ring, pressure plate, clutch plates and wave spring.

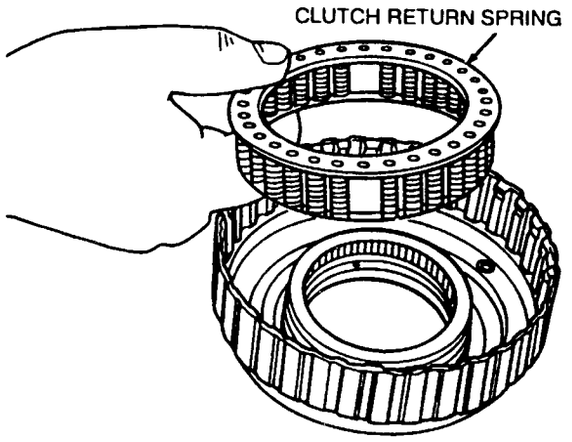


Item	Part Number	Description
1	—	Retaining Ring
2	—	Intersplines
3	—	Clutch Pack
4	—	Forward Clutch Hub
5	—	Wave Spring
6	—	Pressure Plate

4. Compress return spring assembly with Clutch Spring Compressor T65L-77515-A. Remove retaining ring with snap ring pliers.

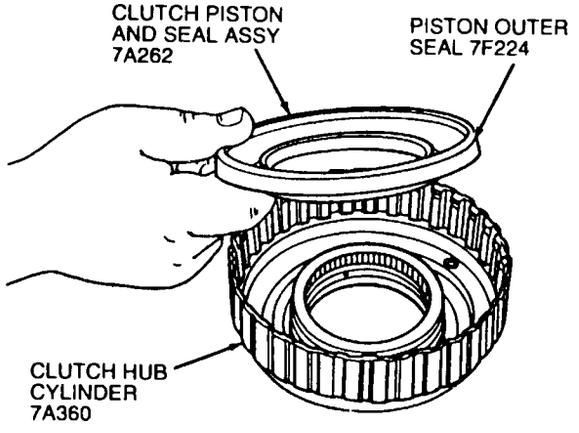


5. Remove clutch return spring.



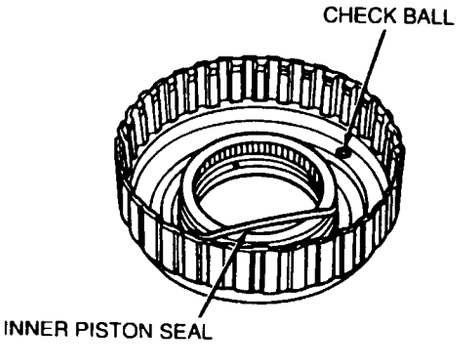
6. NOTE: Piston and seal are one part and serviced only as an assembly.

   Remove clutch piston and seal assembly. Clean and inspect piston and seal assembly. Service as required.



7. NOTE: Lip on seal faces toward bottom of cylinder.

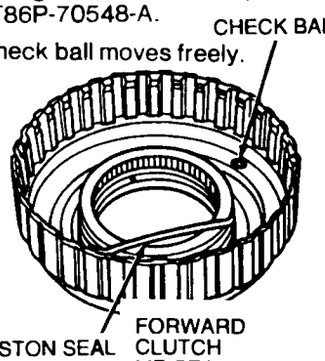
   Replace inner clutch piston seal. Make sure check ball moves freely.

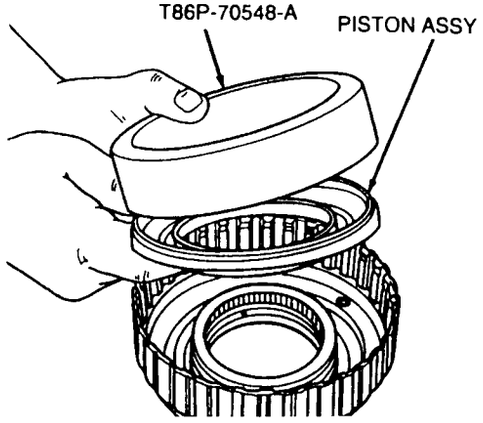


Assembly

1. Lightly coat all seals and surfaces with petroleum jelly before piston installation. Install piston assembly using Forward Clutch Lip Seal Protector T86P-70548-A.

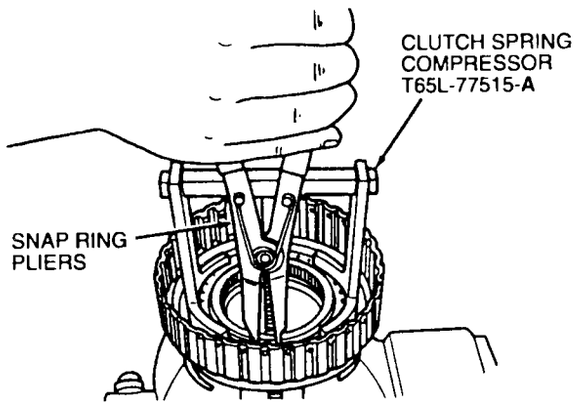
Make sure check ball moves freely.





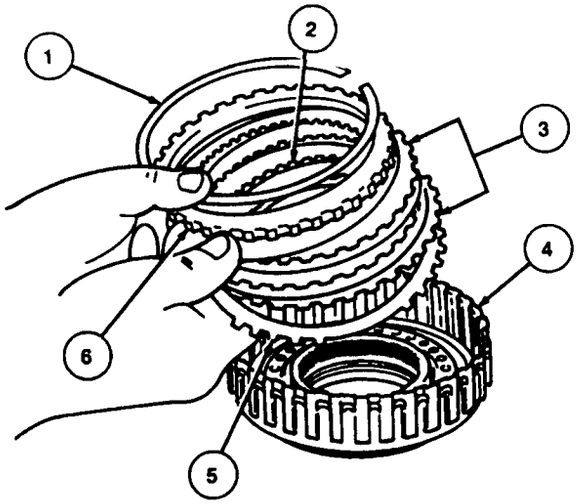
2. **CAUTION: Do not fully compress return spring retainer.**

   Install clutch return spring using Clutch Spring Compressor T65L-77515-A. Use snap ring pliers to install the retaining ring.



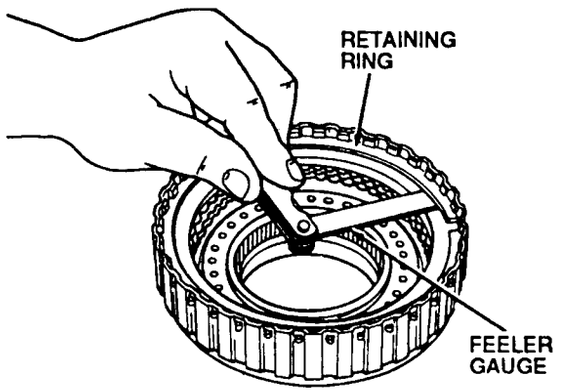
3. NOTE: Number of plates may vary with application.

   Install wave spring, clutch pack, pressure plate and retaining ring.



Item	Part Number	Description
1	—	Retaining Ring
2	—	Intersplines
3	—	Clutch Pack
4	—	Forward Clutch Hub
5	—	Wave Spring
6	—	Pressure Plate

4. Check the clearance between the retaining ring and the clutch cylinder lip. Clearance should be 1.02 mm - 1.54 mm (0.040 - 0.060 inch).



5. If clearance is not within specifications, selective retaining rings are available in the following thicknesses:

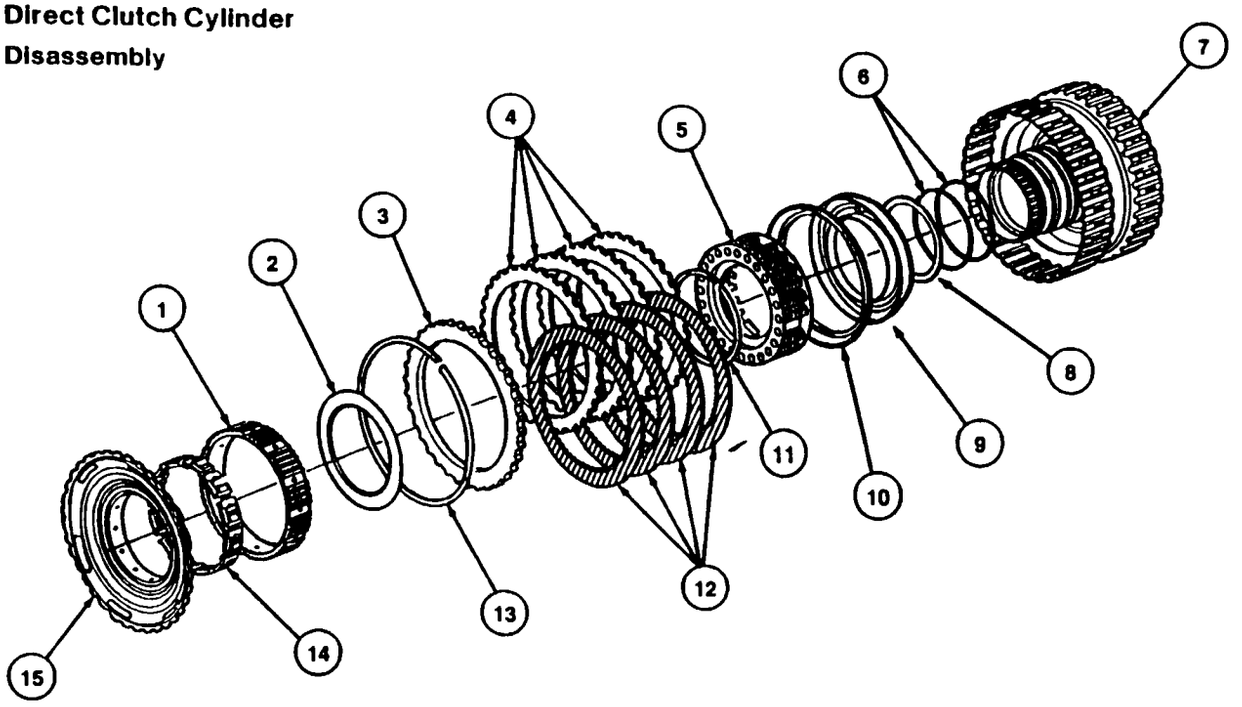
SELECTIVE RETAINING RING

mm	Inch
1.24-1.34	0.049-0.053
1.60-1.70	0.063-0.067
1.95-2.05	0.077-0.081
2.30-2.40	0.091-0.094
2.65-2.75	0.104-0.108

6. After installing correct retaining ring, recheck clearance.

Direct Clutch Cylinder

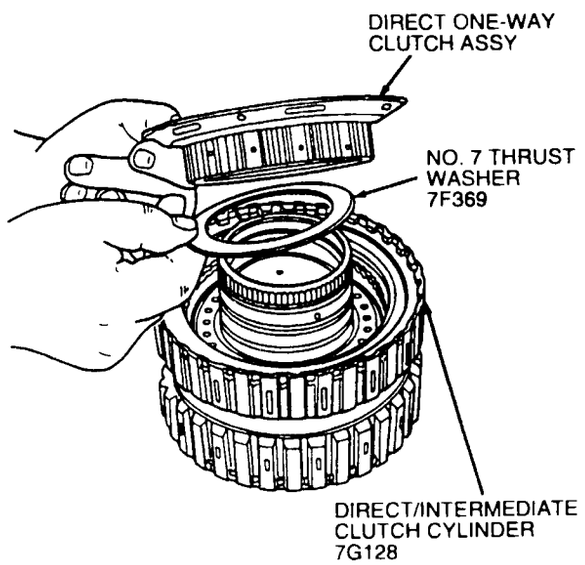
Disassembly



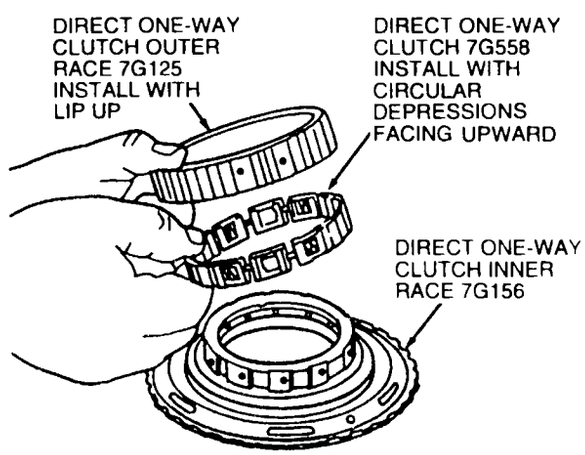
Item	Part Number	Description
1	7D171	Direct One-Way Clutch Outer Race Assy
2	7F369	No. 7 Thrust Washer
3	7B066	Pressure Plate
4	7B442	Steel Plates
5	7F235	Return Spring Assy
6	7G102	O-Rings (2 Req'd)
7	7G120	Clutch Cylinder

Item	Part Number	Description
8	7F225	Inner Piston Seal
9	7A262	Piston and Seal Assy
10	7G448	Apply Ring
11	N803176-S	Return Spring Retaining Ring
12	7B164	Friction Plates
13	7D483	Direct Clutch Retaining Ring
14	7A089	Direct One-Way Clutch Assy
15	7G156	Direct One-Way Clutch Inner Race and Bushing Assy

1. Remove direct one-way clutch and No. 7 thrust washer.



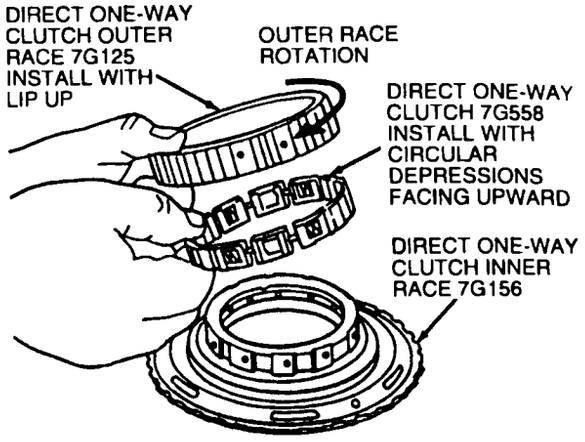
2. Disassemble, clean and inspect direct one-way clutch and inner and outer races. Service as required.



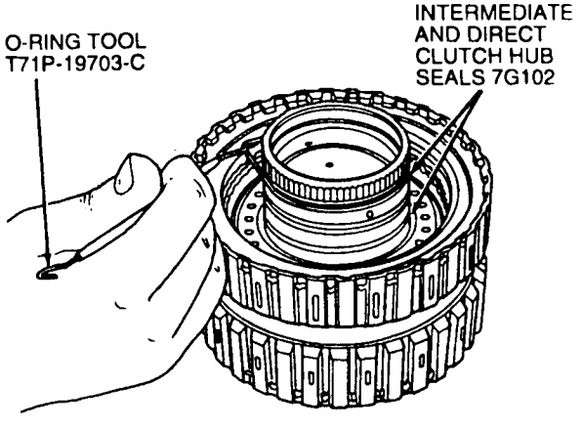
3. **CAUTION: Circular depressions on top of nylon cage must be visible when installed on inner race or transaxle may be improperly assembled.**

   NOTE: Outer race must rotate clockwise.

   Assemble one-way clutch. Use petroleum jelly to hold parts together.



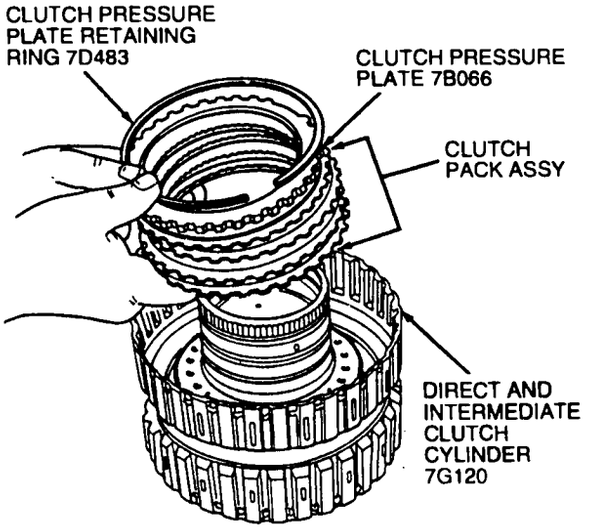
4. Remove two intermediate and direct clutch hub seals (7G102) using O-Ring Tool T71P-19703-C. Discard O-ring seals.



5. **CAUTION: Check for wear on intersplines of friction plates. If found worn, they must be replaced.**

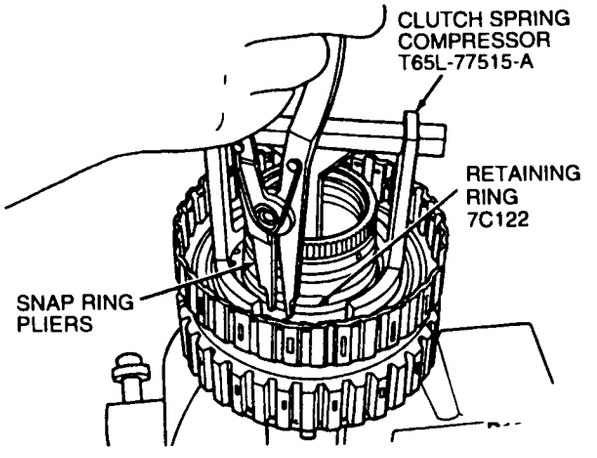
   NOTE: Number of plates in clutch pack may vary with application.

   Remove clutch pressure plate retaining ring, clutch pressure plate (7B066) and clutch pack assembly.

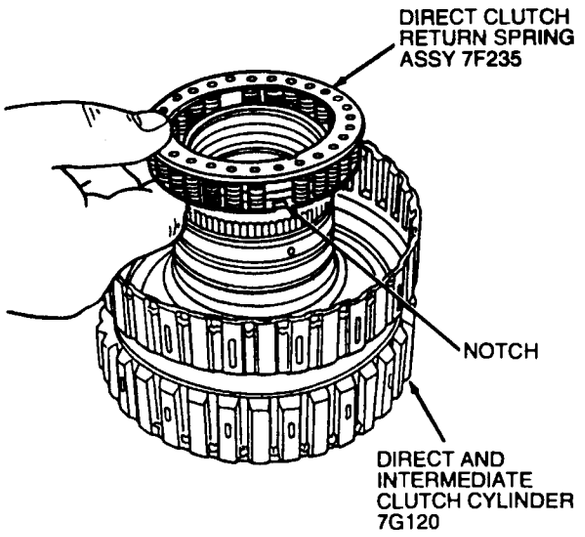


6. **CAUTION: Do not allow clutch spring compressor to bottom out on piston.**

   Compress direct clutch return spring assembly using Clutch Spring Compressor T65L-77515-A. Remove retaining ring with snap ring pliers.



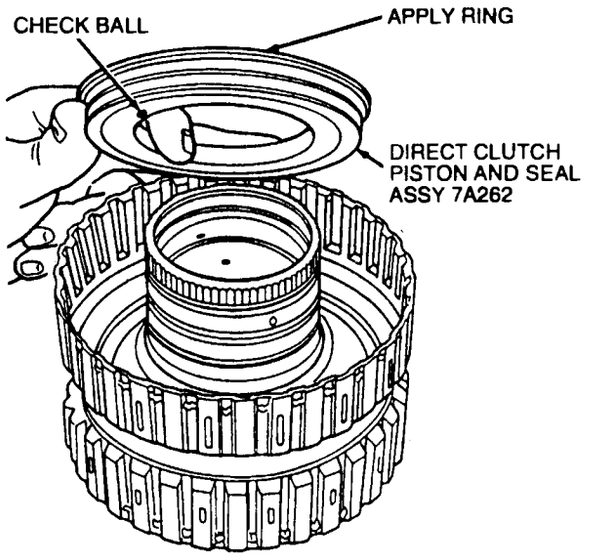
7. Remove tool. Remove direct clutch return spring.



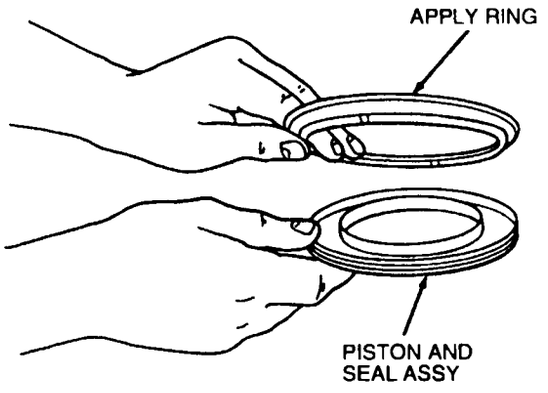
8. NOTE: Seal is part of piston and is serviced only as an assembly.

   NOTE: Make sure check ball in piston moves freely. Remove piston and seal assembly.

   Remove piston and seal assembly.



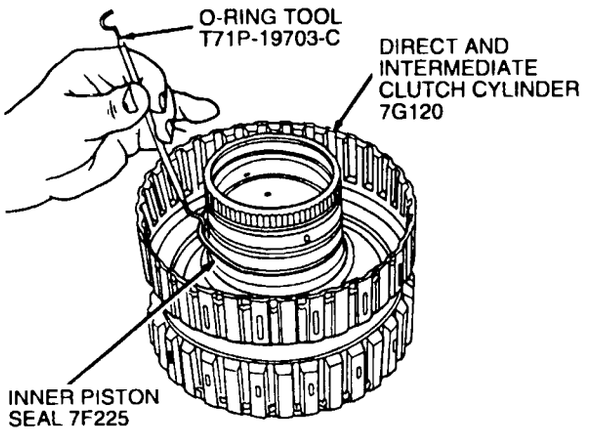
9. Separate piston and seal assembly from apply ring. Service as required.



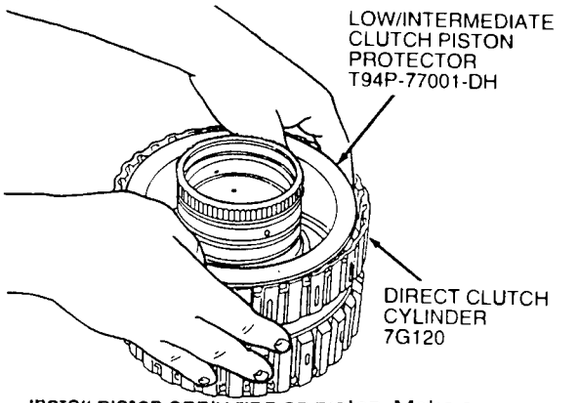
Assembly

1. NOTE: Lip on seal faces bottom of clutch cylinder.

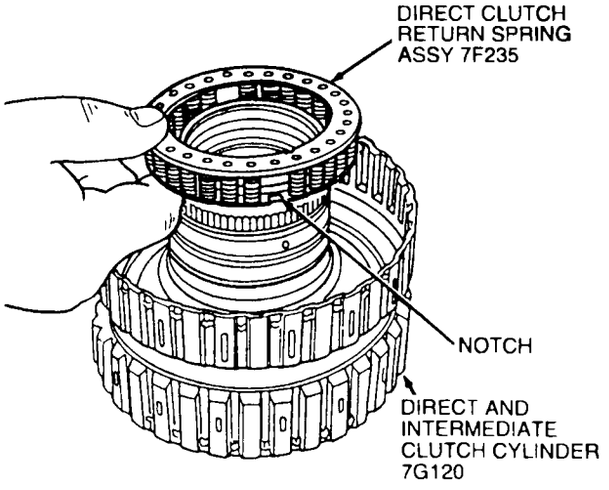
   Replace inner piston seal using O-Ring Tool T71P-19703-C.



2. Ensure that check ball is in place on clutch piston. Lightly coat all seals and surfaces with petroleum jelly before piston installation. Install a new outer piston seal onto clutch piston using Direct Clutch Lip Seal Protector T86P-70234-A. Install clutch piston (7A262) into direct and intermediate clutch cylinder (7G120). Be sure that clutch piston is fully seated.

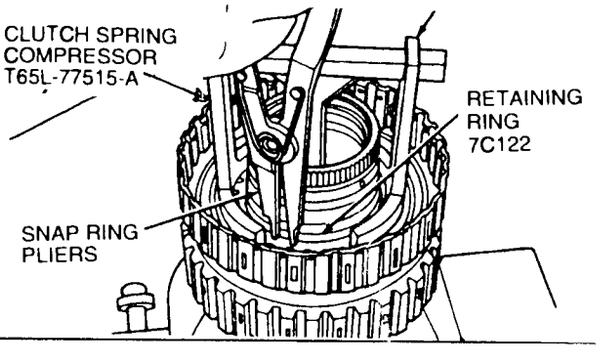


3. Install piston apply ring on piston. Make sure piston apply ring is fully seated.
4. Install direct clutch return spring assembly, aligning spring notch with check ball.



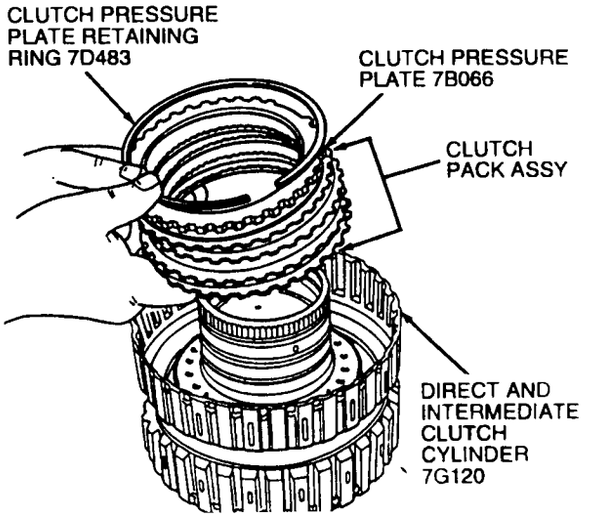
5. **CAUTION: Do not allow tool to bottom out on piston to prevent component damage.**

   Use Clutch Spring Compressor T65L-77515-A to compress direct clutch return spring assembly. Use snap ring pliers to install snap ring (7064).

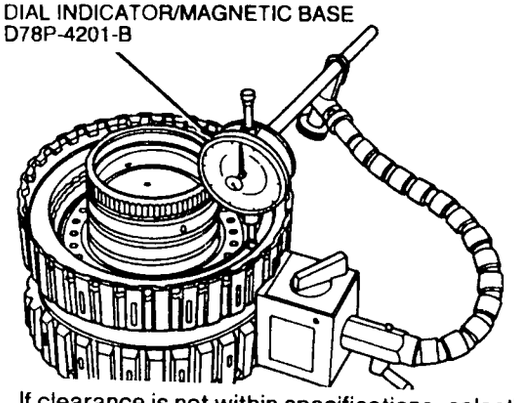


6. NOTE: Number of clutch plates may vary with application.

   Install clutch pack, forward clutch pressure plate and clutch pressure plate retaining ring.



7. Install clutch pressure plate retaining ring. Check clutch pack clearance using Dial Indicator with Magnetic Base D78P-4201-B or equivalent. Push firmly downward on the clutch pack. Release pressure and zero the dial indicator. Lift pressure plate to the bottom of the snap ring. Note dial indicator reading. Take two readings, 180 degrees apart, and determine the average of the two readings. The clearance should be 1.28-1.76 mm (0.050-0.069 inch).



8. If clearance is not within specifications, selective retaining rings are available in the following thicknesses:

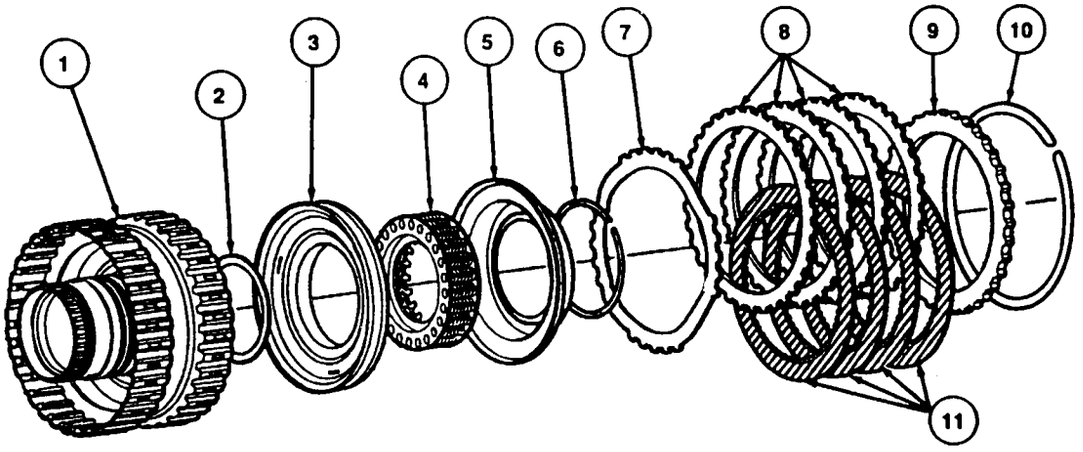
SELECTIVE RETAINING RING

mm	Inch
1.24-1.34	0.049-0.053
1.60-1.70	0.062-0.067
1.95-2.05	0.077-0.081
2.30-2.40	0.091-0.094
2.65-2.75	0.104-0.108

9. After installing correct retaining ring, recheck clearance.

Intermediate Clutch Cylinder

Disassembled View



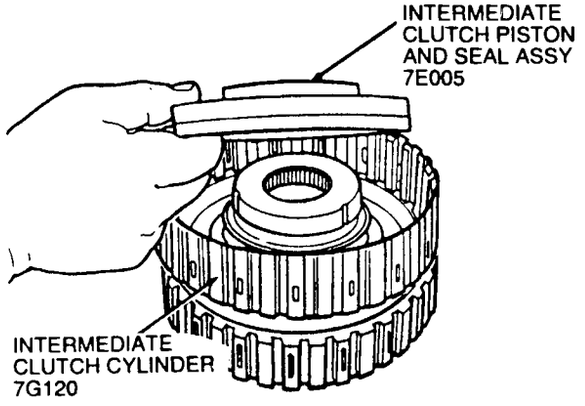
Item	Part Number	Description
1	7G121	Direct and Intermediate Clutch Cylinder
2	7G240	Intermediate Clutch Piston Inner Seal
3	7E005	Intermediate Clutch Piston and Seal Assy
4	7G297	Intermediate Clutch Support and Spring
5	7H185	Intermediate Clutch Return Piston and Seal Assy
6	N803175-S	Retaining Ring

Item	Part Number	Description
7	7G159	Wave Spring
8	7B164	Intermediate Clutch Plate-Internally Splined (Steel)
9	7B455	Intermediate Clutch Pressure Plate
10	7G367	Intermediate Clutch Pressure Plate Retainer Snap Ring
11	7E314	Intermediate Clutch Plate-Externally Splined (Friction)

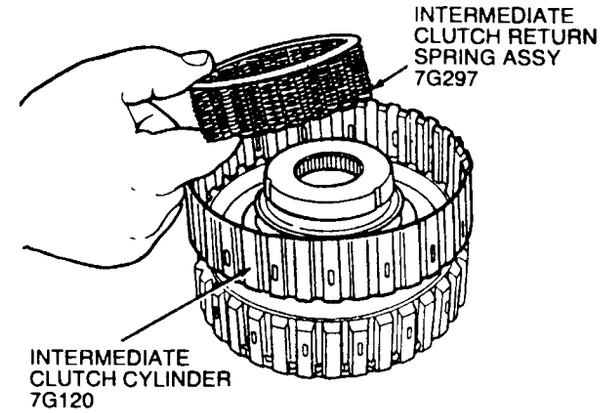
Assembly

1. NOTE: Lightly coat all seals and surfaces with petroleum jelly before piston installation.

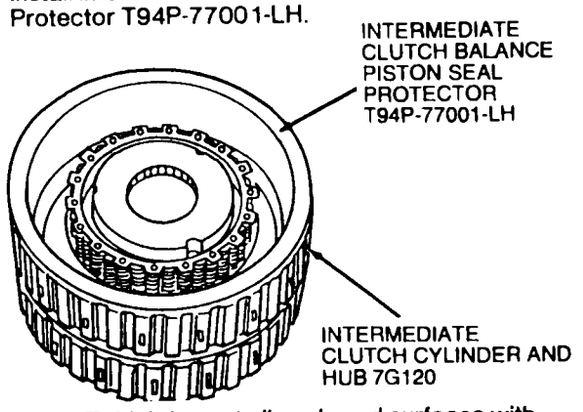
   Install intermediate clutch piston and seal assembly to intermediate clutch cylinder.



2. Install intermediate clutch return spring assembly to intermediate clutch cylinder.

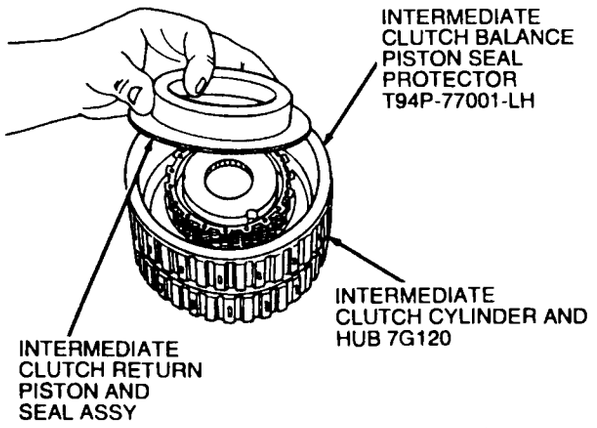


3. Install Intermediate Clutch Balance Piston Seal Protector T94P-77001-LH.



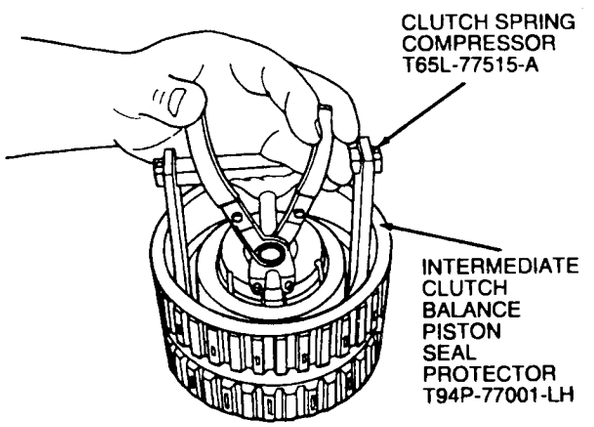
4. NOTE: Lightly coat all seals and surfaces with petroleum jelly before piston installation.

Install intermediate clutch balance piston and seal assembly to direct and intermediate clutch cylinder (7G120) using Intermediate Clutch Balance Piston Seal Protector T94P-77001-LH.



5. **CAUTION: Do not fully compress spring retainer.**

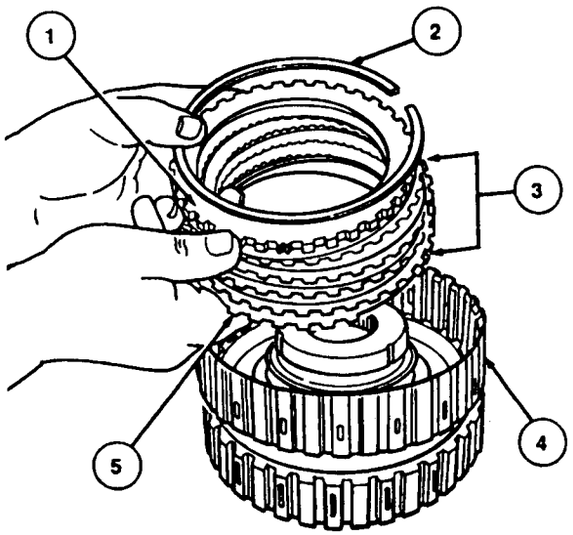
With piston seal protector in place, compress intermediate clutch support and spring (7F222) using Clutch Spring Compressor T65L-77515-A. Install retaining ring.



6. Remove clutch spring compressor and piston seal protector.

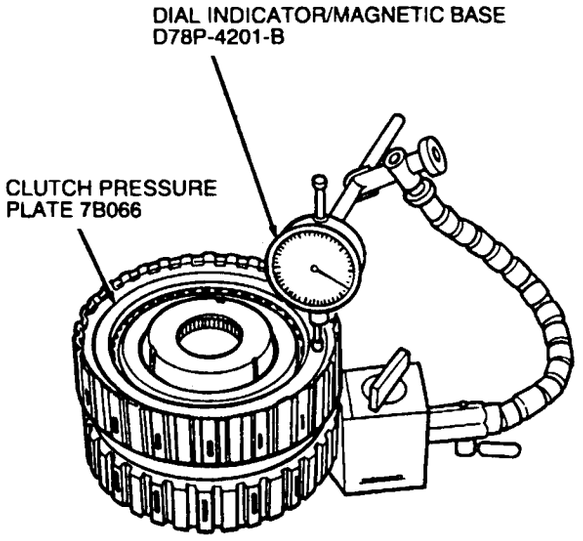
NOTE: Number of clutch plates may vary with application.

Install wave spring, clutch pack assembly, clutch pressure plate and clutch pressure plate retaining snap ring.



Item	Part Number	Description
1	7B066	Clutch Pressure Plate
2	7D483	Clutch Pressure Plate Retaining Ring
3	—	Clutch Pack Assembly
4	7G120	Direct and Intermediate Clutch Cylinder
5	7E085	Wave Spring

7. Use Dial Indicator / Magnetic Base D78P-4201-B or equivalent to check clutch pack clearance. Push downward on clutch pack. Release pressure and zero the dial indicator. Lift pressure plate to bottom of retaining ring. Note dial indicator reading. Take two readings, 180 degrees apart, and determine the average of the two readings.



8. The clearance should be 1.28-1.76 mm (0.050-0.069 inch); if the clearance is not within specifications, selective retaining rings are available in the thicknesses shown.

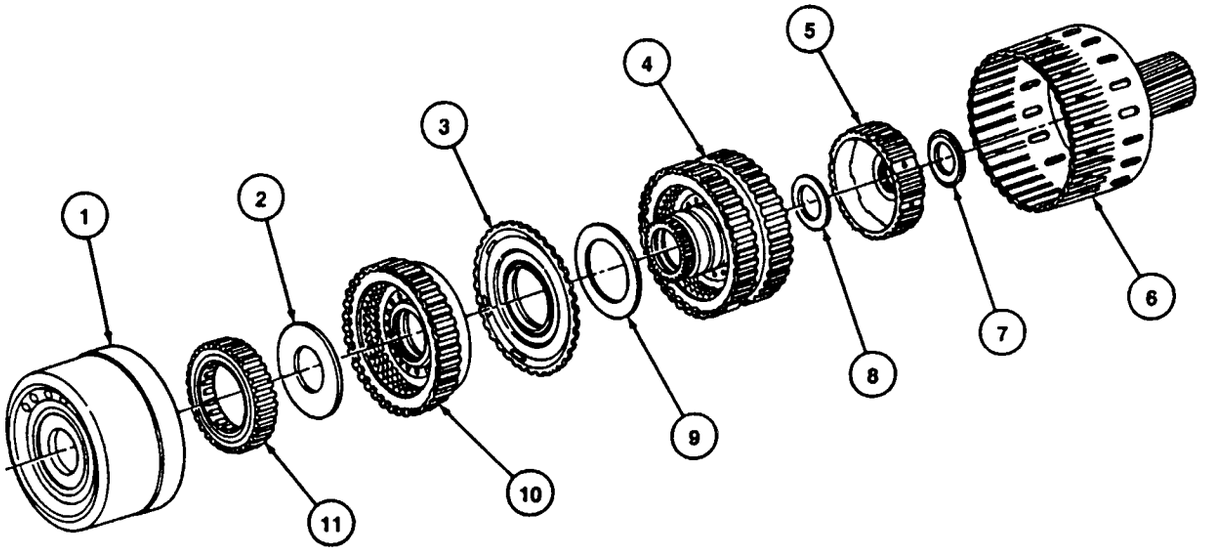
SELECTIVE RETAINING RING

mm	Inch
1.24-1.34	0.049-0.053
1.60-1.70	0.063-0.067
1.95-2.05	0.077-0.081
2.30-2.40	0.091-0.094
2.65-2.75	0.104-0.108

9. After installing correct retaining ring, recheck clearance.

Sun Shell Assembly—Assembly

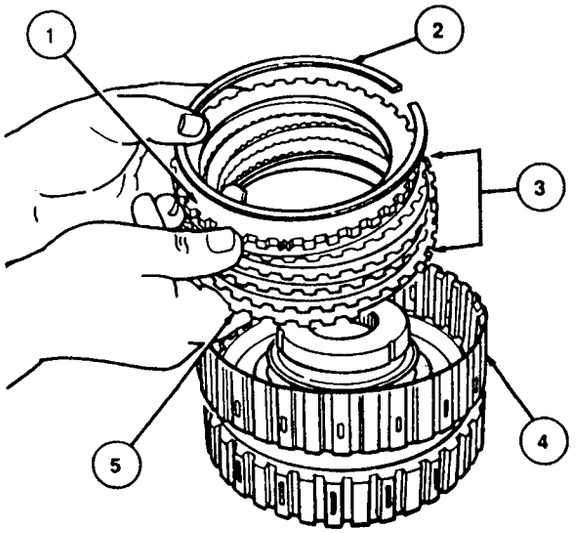
Disassembled View



Disassembly

1. NOTE: Number of clutch plates may vary with application.

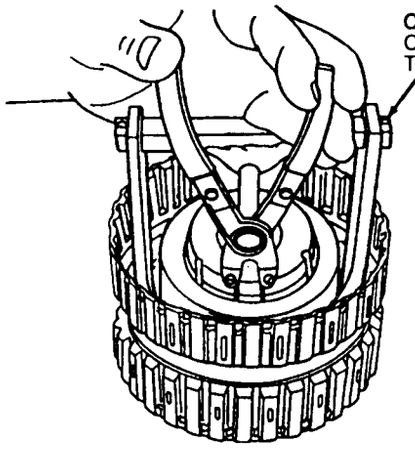
   Remove clutch pressure plate retaining ring, clutch pressure plate (7B066), clutch pack assembly and rear clutch pressure spring (7E085).



Item	Part Number	Description
1	7B066	Clutch Pressure Plate
2	7D483	Clutch Pressure Plate Retaining Ring
3	—	Clutch Pack Assembly
4	7G121	Direct and Intermediate Clutch Cylinder
5	7E085	Wave Spring

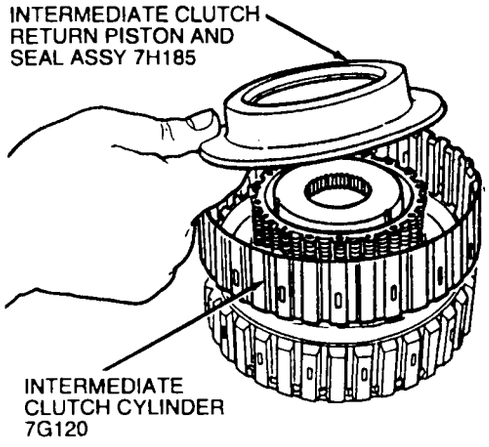
2. **CAUTION: Do not fully compress spring retainer.**

   Compress intermediate clutch return spring assembly using Clutch Spring Compressor T65L-77515-A. Remove retaining ring.

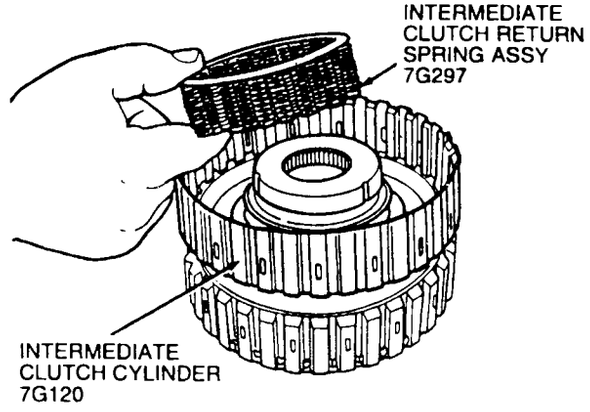


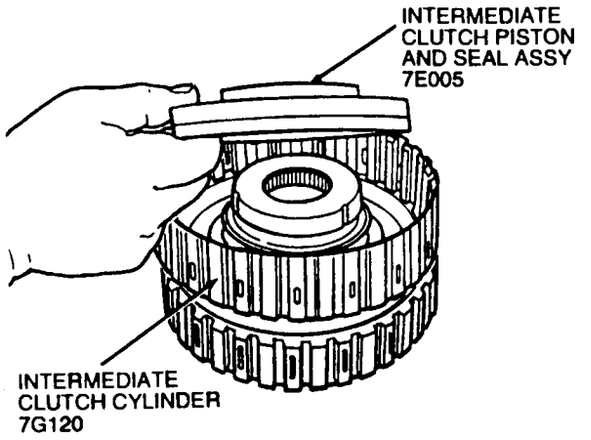
3. NOTE: Seal is part of piston and is serviced only as an assembly.

   Remove intermediate clutch balance piston assembly from intermediate clutch cylinder.

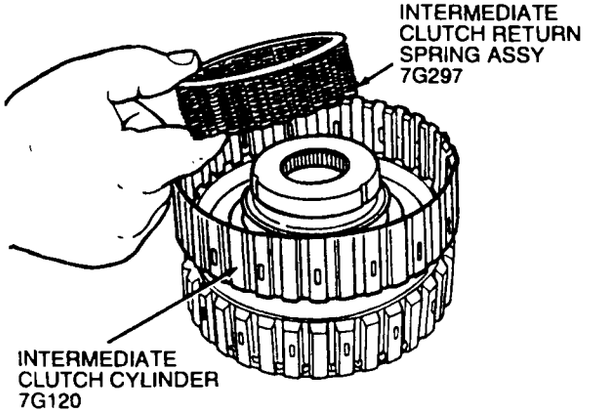


4. Remove intermediate clutch return spring assembly.

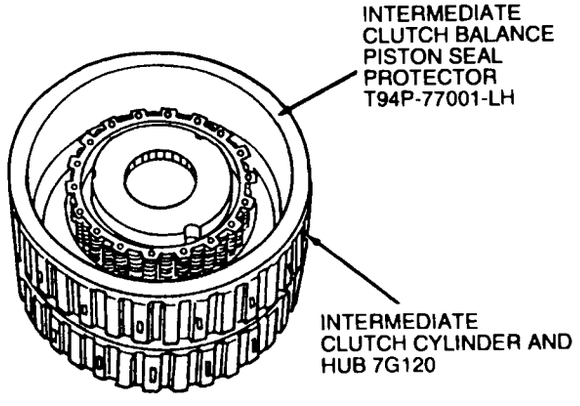




2. Install intermediate clutch return spring assembly to intermediate clutch cylinder.

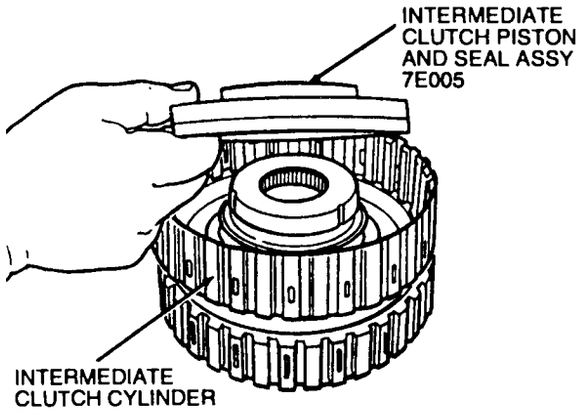


3. Install Intermediate Clutch Balance Piston Seal Protector T94P-77001-LH.

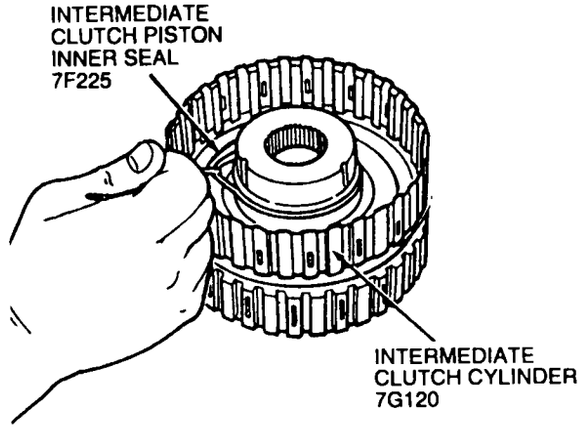


5. NOTE: Seal is part of piston and is serviced only as an assembly.

   Remove intermediate clutch piston and seal assembly from intermediate clutch cylinder.



6. Clean and inspect intermediate clutch cylinder. Replace intermediate clutch piston inner seal (7F225).



Item	Part Number	Description
1	7L669	Overdrive Brake Drum
2	7A166	No. 6 Forward Clutch Thrust Washers
3	7G156	Direct One-Way Clutch
4	7G120	Direct / Intermediate Clutch Assembly
5	7B067	Intermediate Clutch Hub

(Continued)

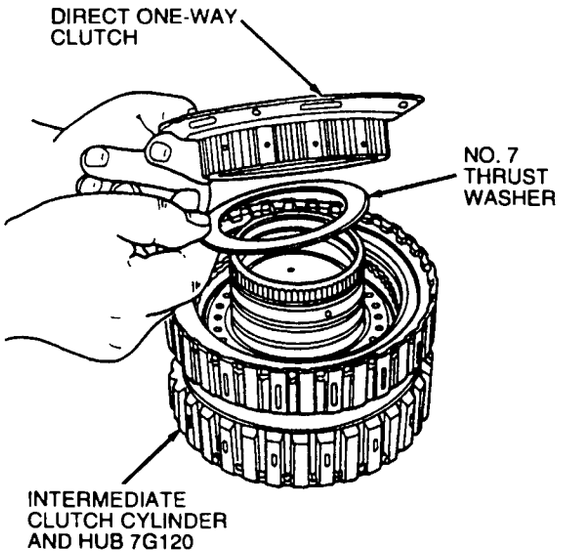
Item	Part Number	Description
6	7D064	Front Sun Shell
7	7C096	No. 11 Front Sun Shell Thrust Bearing
8	7C096	No. 10 Thrust Bearing
9	7F369	No. 7 Direct / Intermediate Clutch Thrust Washer
10	7A360	Forward Clutch Cylinder
11	7D171	One-Way Clutch Race

Assembly

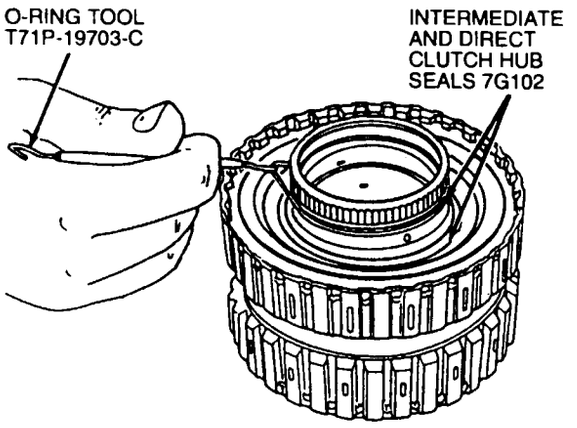
1. NOTE: Make sure direct one-way clutch is fully seated.

   NOTE: No. 7 thrust washer tabs snap into direct clutch spring retainer.

   Install No. 7 thrust washer and direct one-way clutch assembly to direct and intermediate clutch cylinder (7G120).



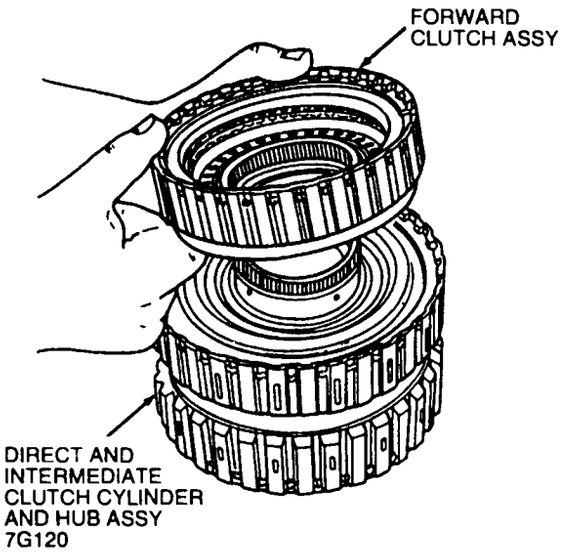
2. Install two new O-rings onto direct and intermediate clutch cylinder.



3. **CAUTION: Do not damage O-rings on direct clutch hub.**

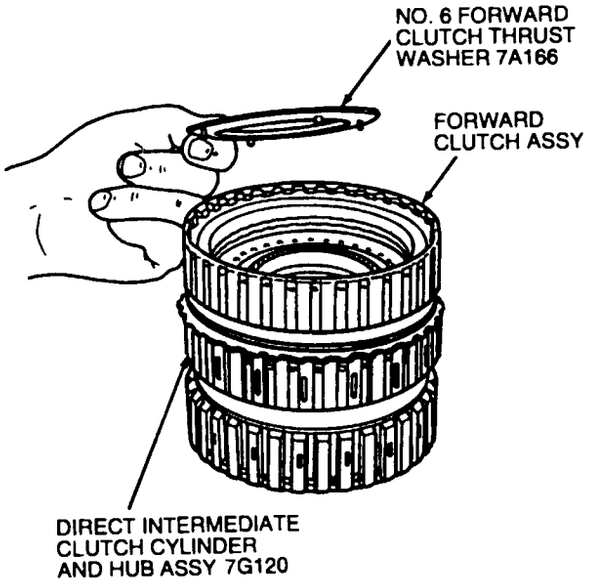
   NOTE: Lightly coat O-rings with petroleum jelly before installation.

   Install forward clutch assembly into direct and intermediate clutch cylinder.



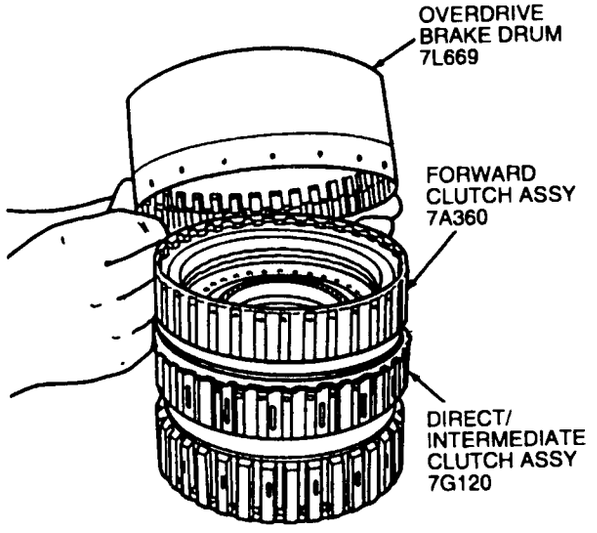
4. NOTE: Spring retainer assembly contains both oval and circular holes.

   Install No. 6 forward clutch thrust washer. Make sure washer tabs lock into oval holes on spring retainer assembly.



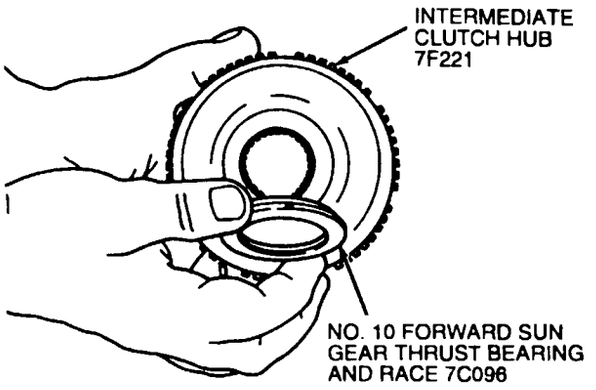
5. NOTE: Make sure overdrive drum and low one-way clutch assembly are fully seated.

   Install overdrive drum and low one-way clutch assembly. Ensure that overdrive drum and one-way clutch are fully seated.

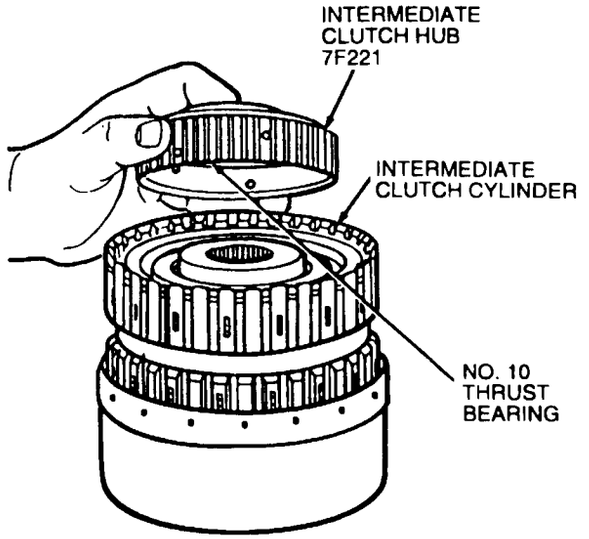


6. NOTE: Lip on bearing goes over hub.

   Install No. 10 forward sun gear thrust bearing to the intermediate clutch hub using petroleum jelly to hold the bearing in place.



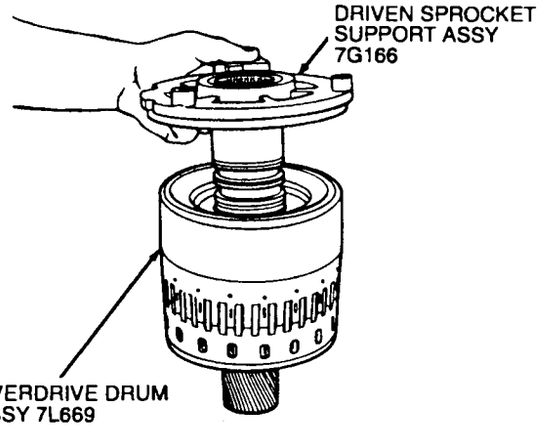
7. Turn assembly over. Install intermediate clutch hub with No. 10 thrust bearing to the intermediate clutch cylinder.



10. **CAUTION: Be sure not to damage driven sprocket seals.**

NOTE: Do not install No. 8 thrust washer or No. 9 bearing at this time.

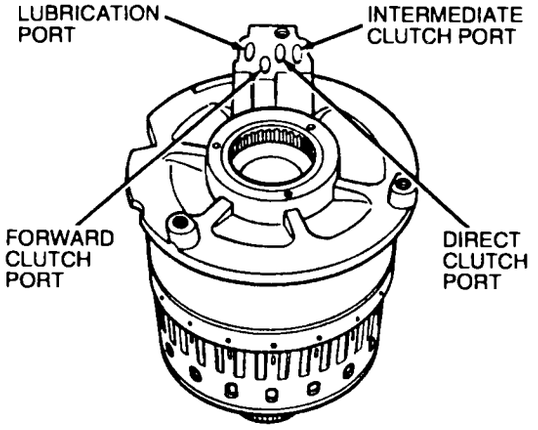
Turn complete assembly (with overdrive drum) face-up. Install driven sprocket support into overdrive drum.



11. **CAUTION: Safety glasses should be worn when working with pressurized air.**

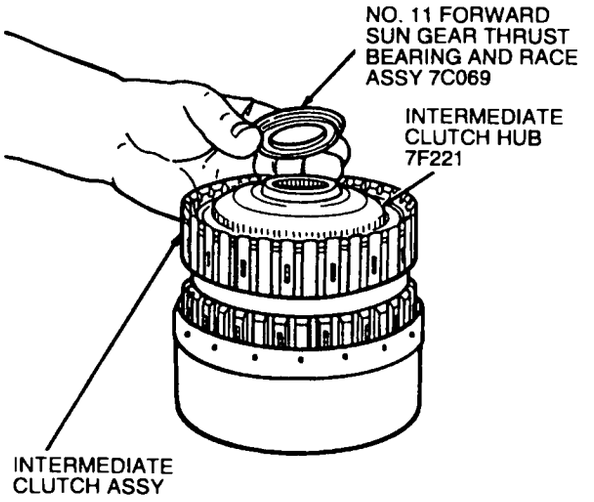
NOTE: Be sure shop air is dry and regulated at 276 kPa (40 psi).

Apply pressurized air to the driven sprocket support ports as shown to check for seals damaged during assembly. If air can be heard leaking past seals, the seals must be replaced.

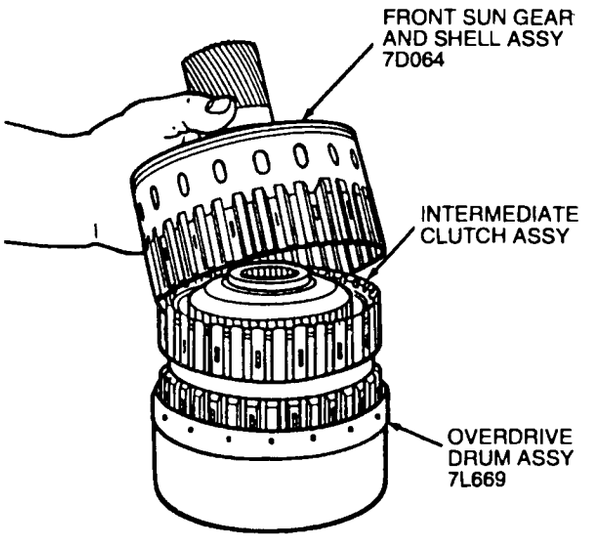


8. NOTE: Lip on bearing goes down over hub.

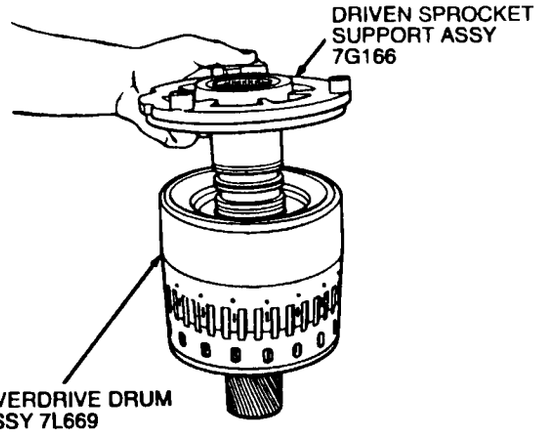
Install No. 11 forward sun gear thrust bearing to the intermediate clutch assembly using petroleum jelly to hold in place.



9. Install front sun gear and shell assembly over the direct / intermediate clutch assembly, and into the overdrive drum assembly.



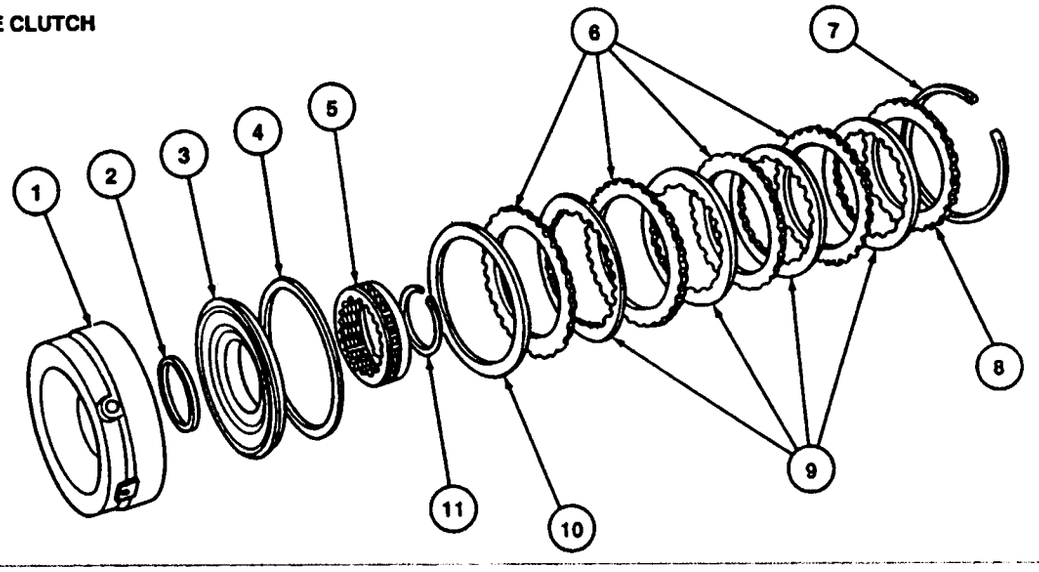
12. Remove driven sprocket support from overdrive drum.



Reverse Clutch

Disassembled View

REVERSE CLUTCH



Item	Part Number	Description
1	7F341	Reverse Clutch Cylinder
2	7D404	Reverse Clutch Piston Inner Seal
3	7D402	Reverse Clutch Piston
4	7D403	Reverse Clutch Piston Outer Seal
5	7G335	Reverse Clutch Support and Spring
6	7E315	Reverse Clutch Plates-Externally Splined (Steel)
7	7D483	Reverse Clutch Plate Retaining Ring

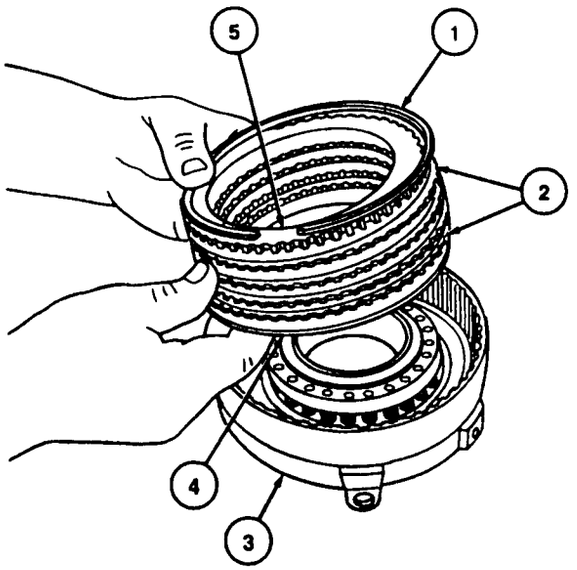
Item	Part Number	Description
8	7D408	Reverse Clutch Pressure Plate
9	7E312	Reverse Clutch Plates-Internally Splined (Friction)
10	7F154	Reverse Clutch Piston Spring
11	N803048-S	Retaining Ring

Disassembly

SPECIAL SERVICE TOOL(S) REQUIRED

Description	Tool Number
Clutch Spring Compressor	T65L-77515-A
O-Ring Tool	T71P-19703-C
Reverse Clutch Piston Seal Protector	T94P-77001-PH

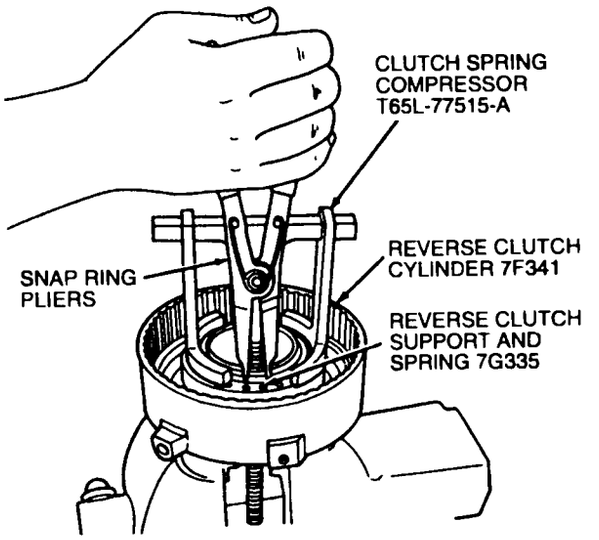
1. Remove reverse clutch pressure plate retaining ring, clutch pressure plate (7B066), clutch pack and reverse clutch wave spring.



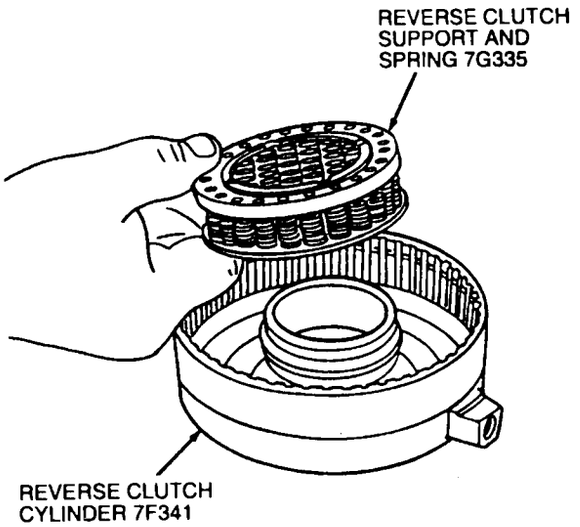
Item	Part Number	Description
1	7D483	Reverse Clutch Retaining Ring
2	—	Clutch Pack Assembly
3	7F341	Reverse Clutch Cylinder
4	7E085	Reverse Clutch Wave Spring
5	7B066	Reverse Clutch Pressure Plate

2. **CAUTION: Do not fully compress return spring.**

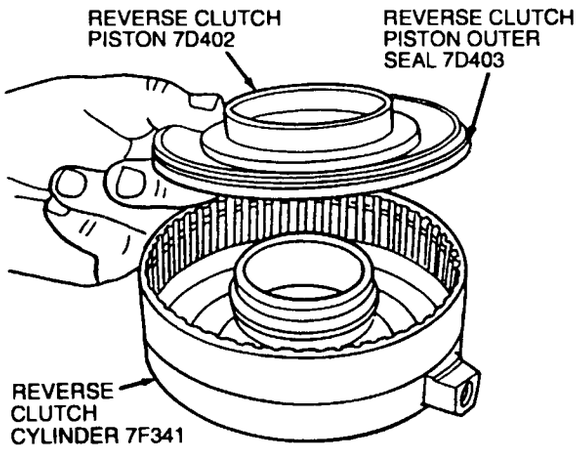
   Using Clutch Spring Compressor T65L-77515-A, compress reverse clutch support and spring (7G335). Use snap ring pliers to remove the retaining ring.

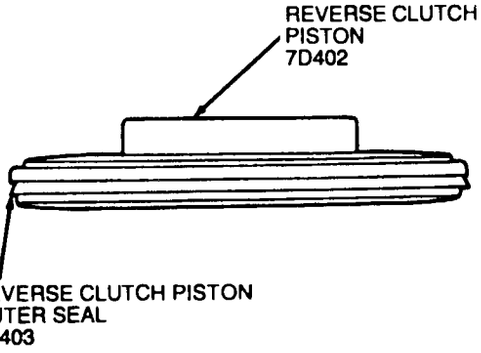


3. Remove clutch spring compressor and retaining ring. Remove reverse clutch support and spring from reverse clutch hub.

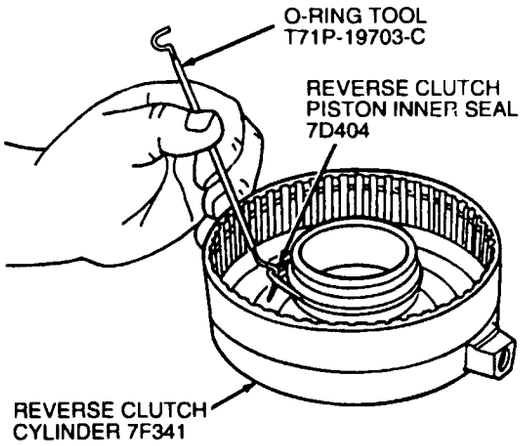


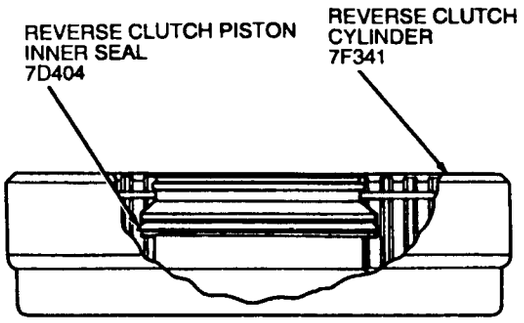
4. Lift out clutch piston. Remove and discard reverse clutch piston outer seal (7D403). Clean piston.



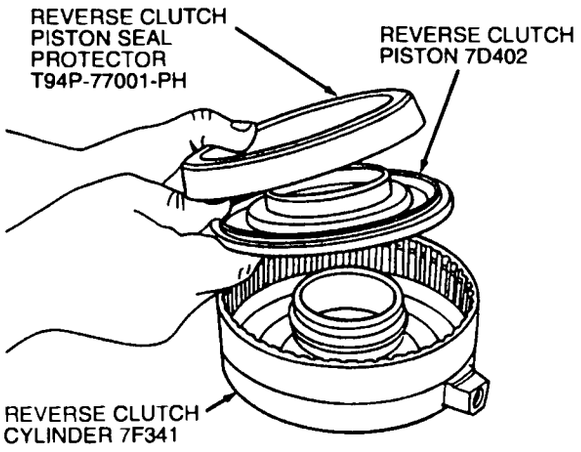


5. NOTE: Lip on seal faces toward bottom cylinder.
   Remove reverse clutch piston inner seal. Clean reverse clutch cylinder.

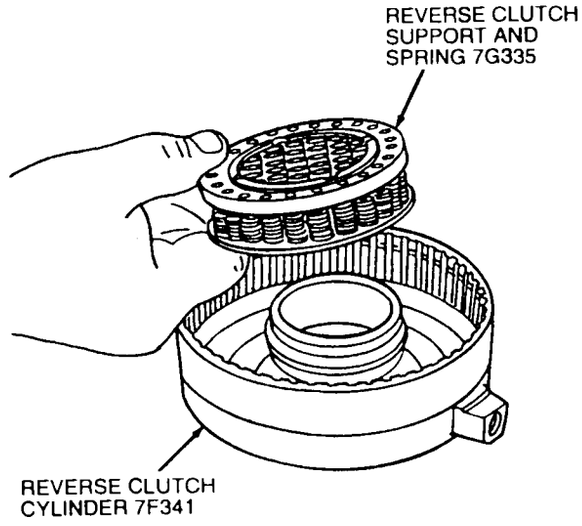




1. Install reverse clutch piston inner seal (lip facing toward bottom of cylinder).
2. Install reverse clutch piston outer seal (lips facing toward bottom of cylinder) and install reverse clutch piston (7D402) using Reverse Clutch Piston Seal Protector T94P-77001-PH.

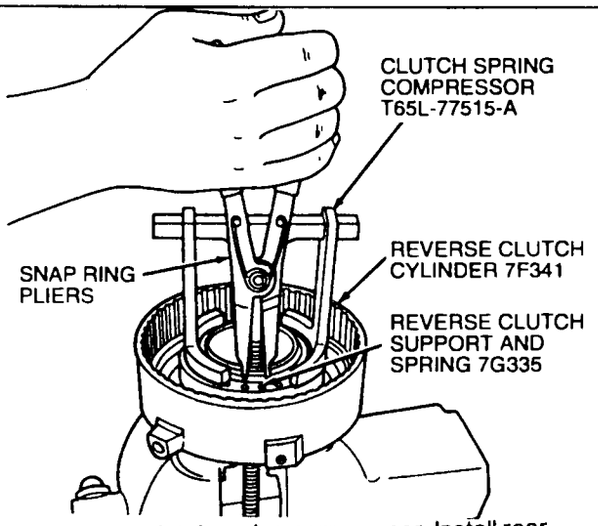


3. Install reverse clutch support and spring to reverse clutch cylinder. Position retaining ring.

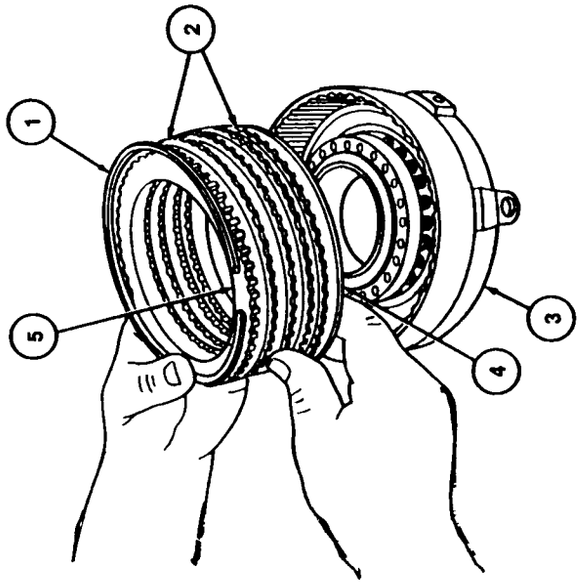


4. **CAUTION: Do not fully compress spring retainer.**

   Compress reverse clutch support and spring using Clutch Spring Compressor T65L-77515-A. Install retaining ring.



5. Remove clutch spring compressor. Install rear clutch pressure spring (7E085), clutch pack, clutch pressure plate and clutch pressure plate retaining ring.

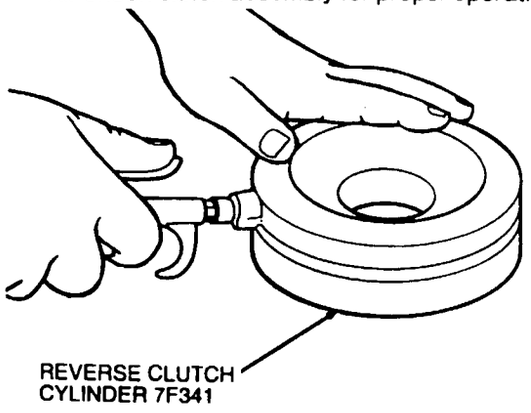


Item	Part Number	Description
1	N808185-S	Retaining Ring-Select Fit
2	—	Clutch Pack Assy
3	7F341	Reverse Clutch Cylinder
4	7E085	Reverse Clutch Wave Spring
5	7B066	Reverse Clutch Pressure Plate

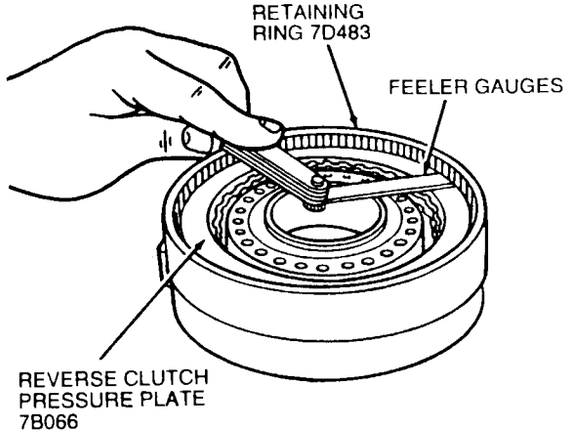
6. **WARNING: TO PREVENT INJURY, WEAR EYE PROTECTION WHEN USING PRESSURIZED AIR.**

   NOTE: Be certain that shop air is dry and regulated at 276 kPa (40 psi).

   Air check clutch assembly for proper operation.



7. Check clutch pack clearance using feeler gauge. Take two readings, 180 degrees apart, and determine the average of the two readings. The clearance should be: 0.97-1.63 mm (0.038-0.064 inch). If the clearance is not within specification, selective snap rings are available in the following thicknesses:



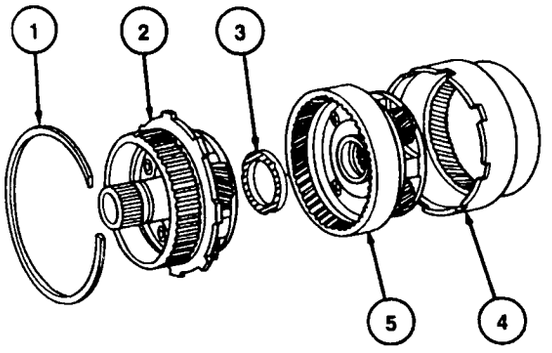
SELECTIVE SNAP RING

mm	Inch
1.52-1.62	0.059-0.064
1.98-2.08	0.078-0.081
2.45-2.55	0.096-0.100
2.92-3.02	0.115-0.118

After installing the correct snap ring, recheck the clearance.

Planet Assembly

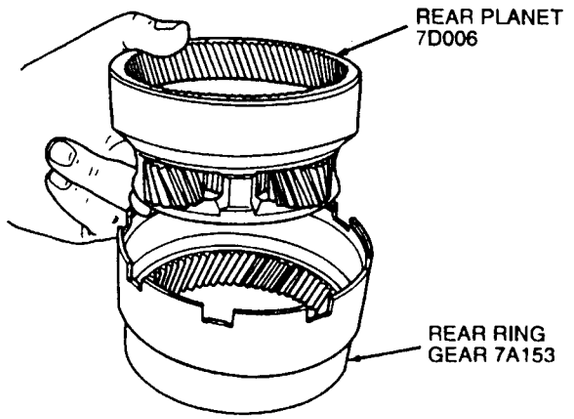
Disassembled View



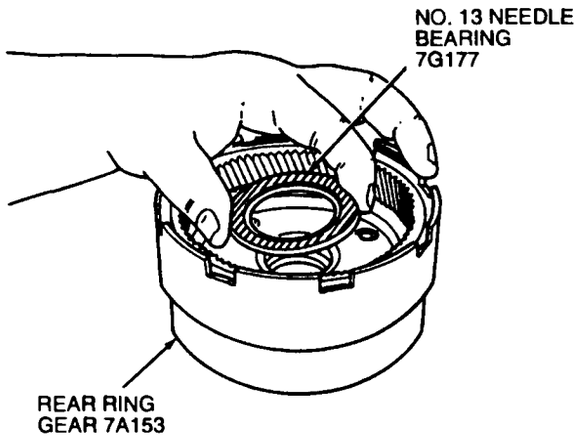
Item	Part Number	Description
1	7D483	Retaining Ring
2	7A398	Front Planetary Gear Assembly
3	7G177	No. 13 Planet Thrust Center Bearing and Race Assembly
4	7A153	Rear Ring Gear
5	7D006	Rear Planetary Gear Assembly

Assembly

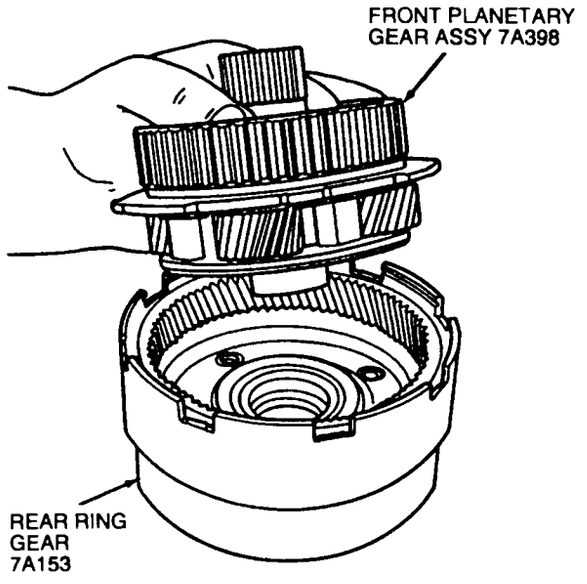
1. Install reverse planet into ring gear.



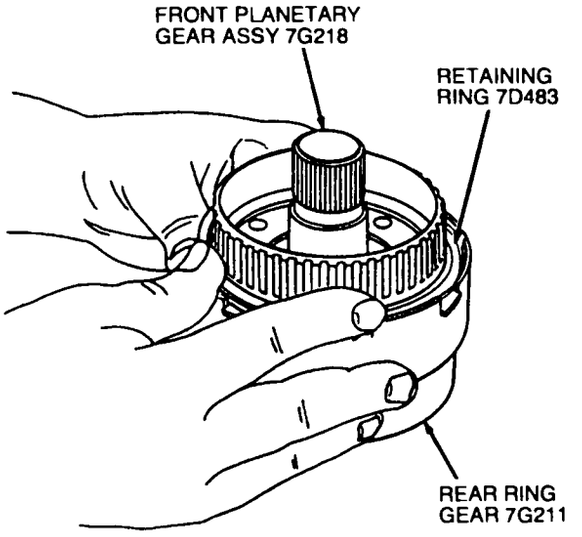
2. Install No. 13 needle bearing to ring gear with black side of bearing facing up.



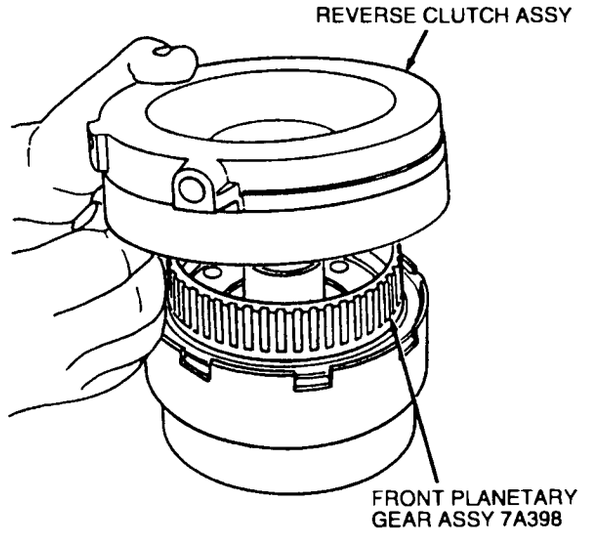
3. Install front planet into ring gear.



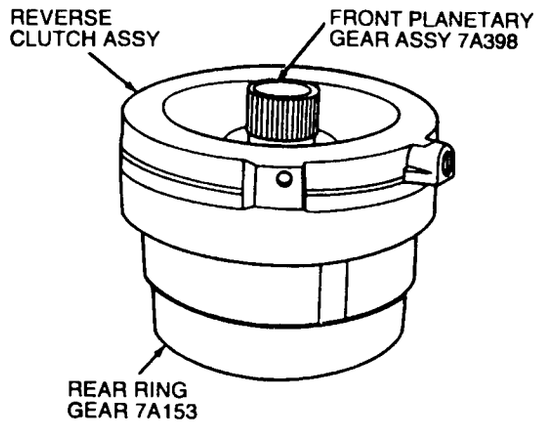
4. Install retaining ring to ring gear.



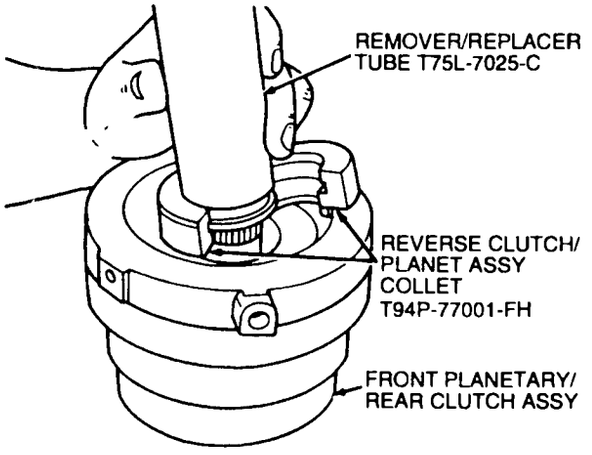
5. Install the reverse clutch assembly over the front planetary assembly.



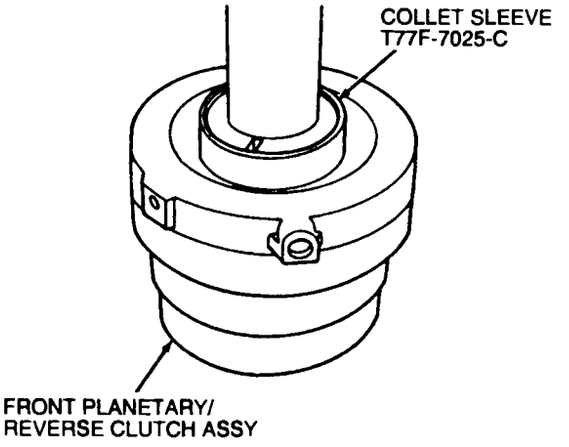
6. Ensure the reverse clutch assembly is fully seated.



7. Install Remover / Replacer Tube T75L-7025-C and Reverse Clutch / Planet Assembly Collet T94P-77001-FH over front planet and into rear clutch assembly.

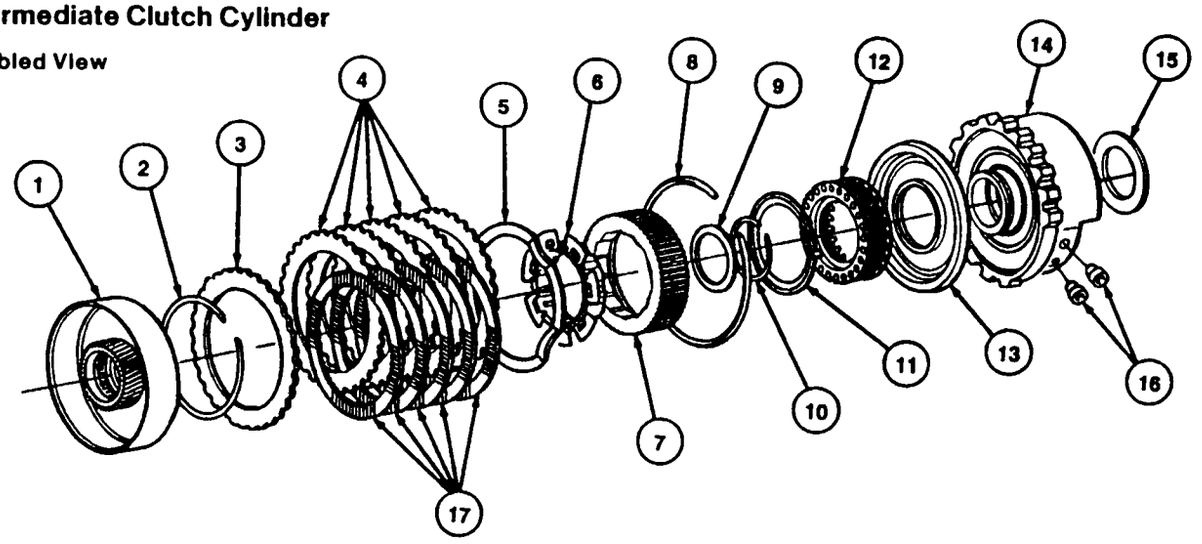


8. Install Collet Sleeve T77F-7025-C. This assembly is now ready for re-assembly in case later.



Low-Intermediate Clutch Cylinder

Disassembled View

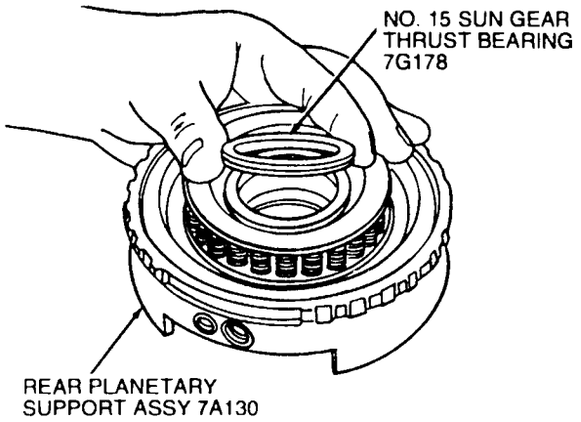


Item	Part Number	Description
1	7N461	Rear Sun Gear Assembly
2	7H272	Low Intermediate Clutch Retainer-Select Fit
3	7H280	Low Intermediate Clutch Pressure Plate
4	7H279	Low Intermediate Clutch Plate-Steel
5	7H269	Low Intermediate Clutch Wave Spring
6	7C190	Low Intermediate One-Way Clutch Roller Assy
7	7F448	Low Intermediate One-Way Clutch Outer Race
8	N808413-S	Rear Planet Support Beveled Retaining Ring (Select Fit)

Item	Part Number	Description
9	7G178	No. 15 Sun Gear Thrust Bearing
10	N807670-S	Retaining Ring
11	7H270	No. 15 Low Intermediate Clutch Retaining Washer
12	7H266	Low Intermediate Clutch Support and Spring
13	7H290	Low Intermediate Clutch Piston and Seal Assy
14	7G033	Rear Planetary Support Assy
15	—	No. 16 Thrust Washer
16	—	Lube Oil Transfer Tube Seal Assy (2 Req'd)
17	7H278	Low Intermediate Clutch Plate-Friction

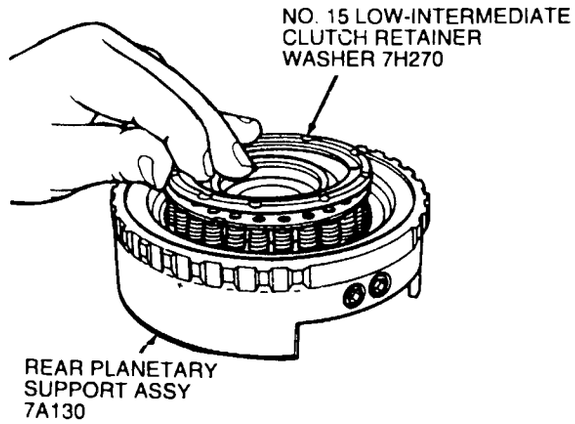
Disassembly

1. Remove No. 15 rear sun gear thrust bearing and race (7G178) from rear planet support (7A130).



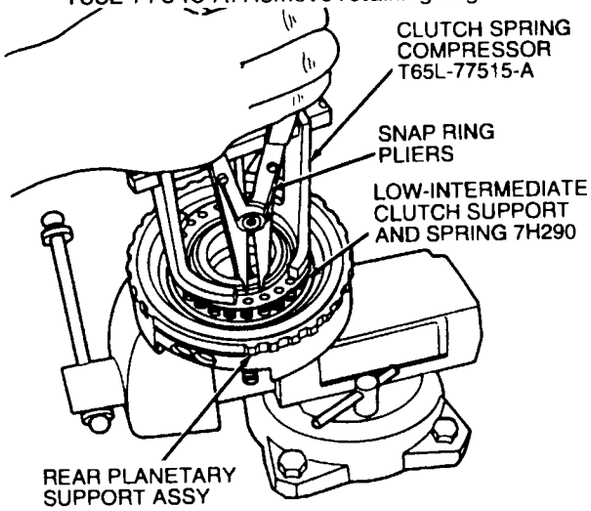
2. **CAUTION: Do not damage locking tabs on washer.**

   Remove low-intermediate clutch retainer washer from rear planet support.

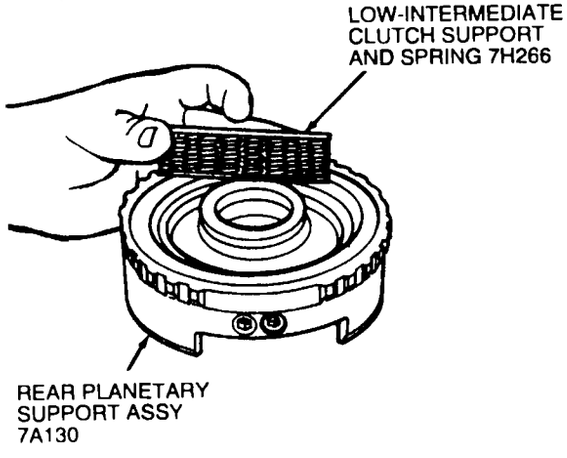


3. **CAUTION: Do not fully compress spring retainer.**

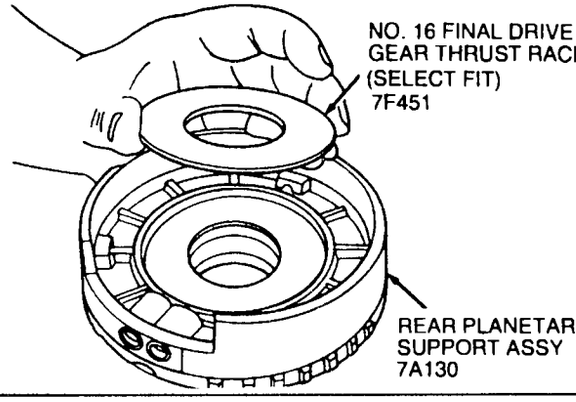
   Compress low-intermediate clutch support and spring assembly using Clutch Spring Compressor T65L-77515-A. Remove retaining ring.



4. Remove low-intermediate clutch support and spring assembly from rear planet support.



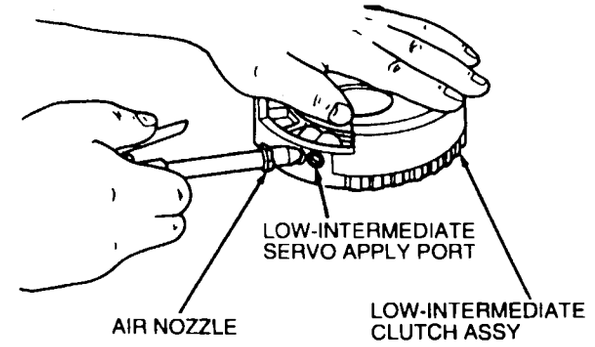
5. Turn rear planet support over. Remove No. 16 final drive gear thrust washer (select fit) from rear planet support.



6. **WARNING: ALWAYS WEAR SAFETY GLASSES WHEN USING COMPRESSED AIR TO AVOID PERSONAL INJURY.**

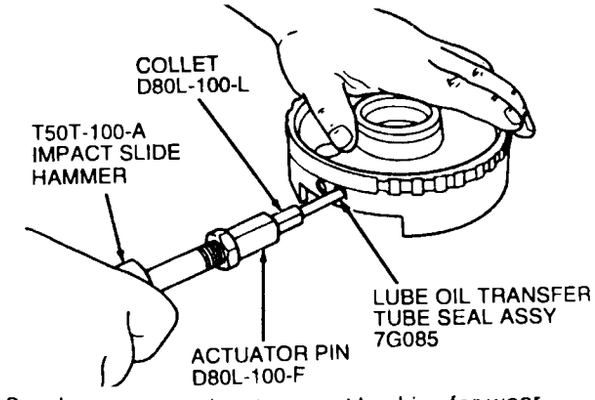
   NOTE: Seal is part of piston and is serviced as an assembly.

   Using air nozzle, apply 40 psi of regulated air to low intermediate apply port to remove piston and seal assembly. Service as required.

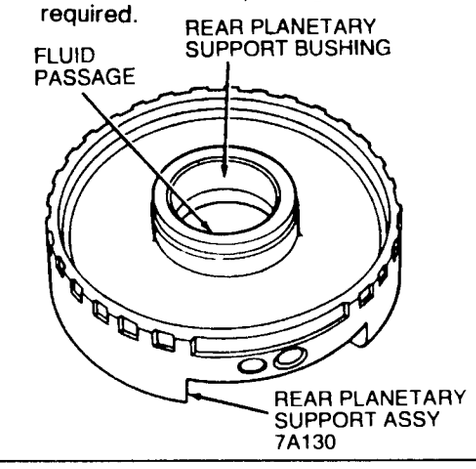


7. **CAUTION: Use care not to damage any machined surfaces.**

   Use Collet D80L-100-L and Actuator Pin D80L-100-F (from Blind Hole Puller Set D80L-100-A or equivalent) and Impact Slide Hammer T50T-100-A to remove two rear lube oil transfer tube seals (7G085).

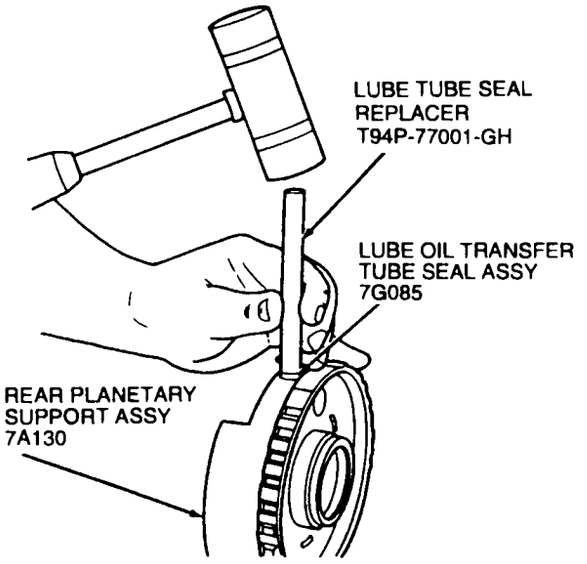


8. Inspect rear planet support bushing for wear. Make sure all fluid passages are clear. Service as required.



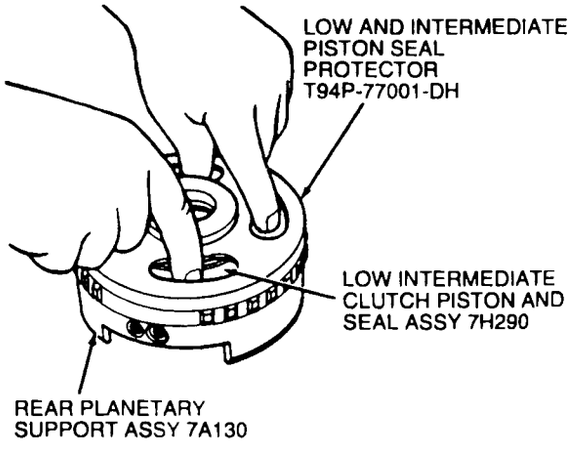
Assembly

1. Install two new rear lube oil transfer tube seals using Lube Tube Seal Replacer T94P-77001-GH.

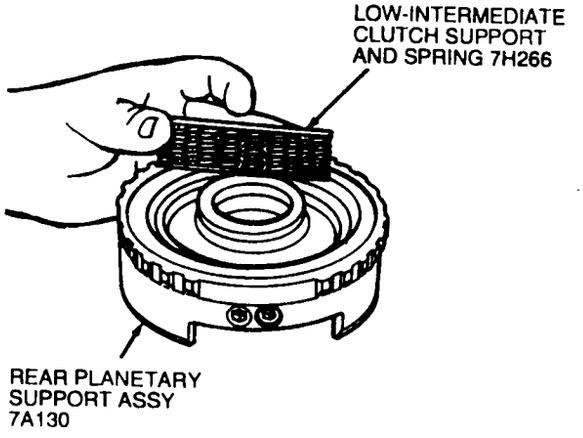


2. NOTE: Lightly coat all seals and surfaces with petroleum jelly before piston installation.

   Install low-intermediate clutch piston and seal assembly to rear planet support using Low and Intermediate Piston Seal Protector T94P-77001-DH.

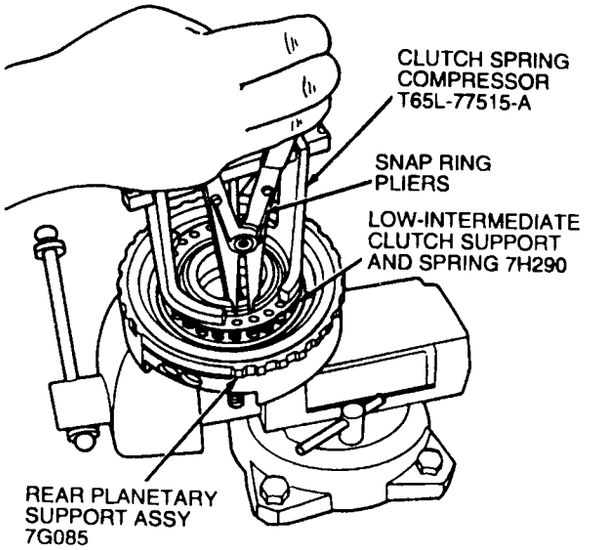


3. Install low-intermediate clutch support and spring assembly into intermediate clutch assembly, located in the rear planetary support assembly.



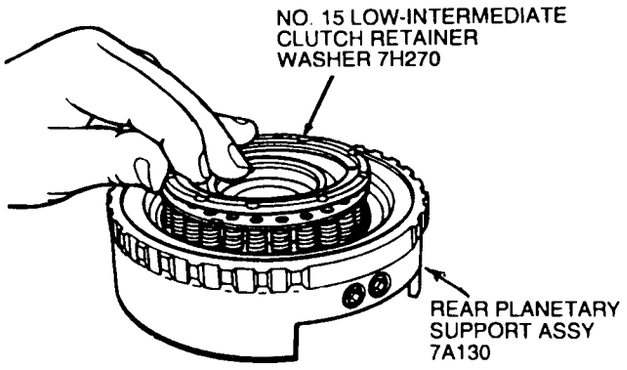
4. **CAUTION: Do not fully compress spring retainer.**

   Compress low-intermediate clutch piston and seal assembly using Clutch Spring Compressor T65L-77515-A. Install retaining ring.



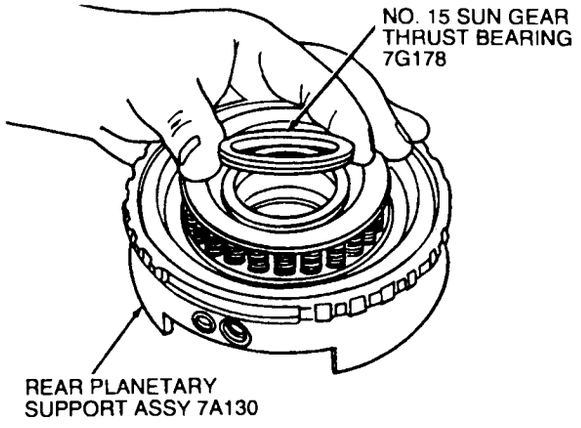
5. **CAUTION: Make sure locking tabs are snapped over retainer.**

   Install No. 15 plastic spring retainer washer to low / intermediate clutch support and spring assembly.

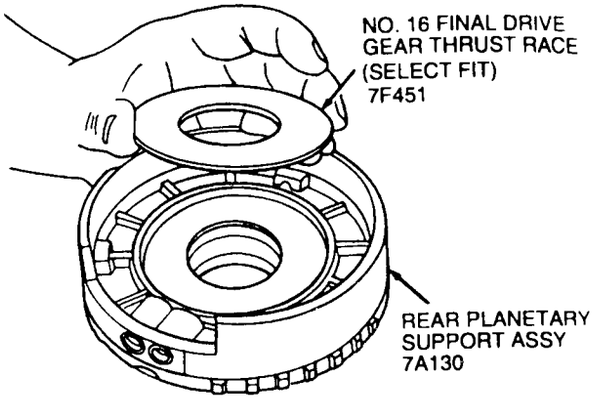


6. NOTE: Lip on bearing goes over hub.

   Install No. 15 rear sun gear thrust bearing and race to rear planet support using petroleum jelly to hold in place.



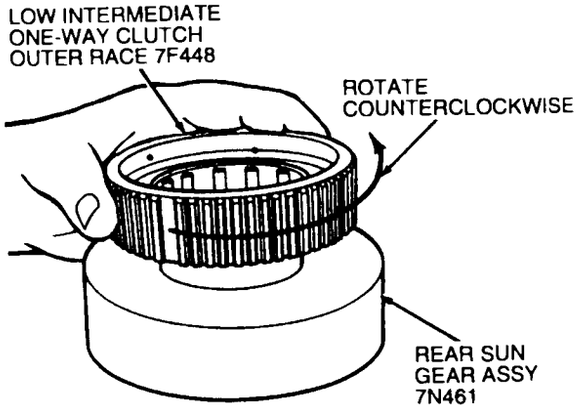
7. Turn rear planet support over. Install select fit No. 16 final drive gear thrust race to rear planet support using petroleum jelly to hold in place.



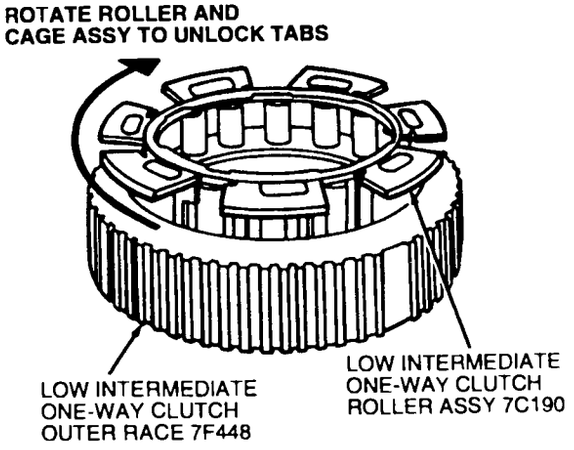
Low Intermediate One-Way Clutch

Disassembly

1. Rotate low-intermediate one-way clutch (outer) counterclockwise to remove from rear sun gear assembly.

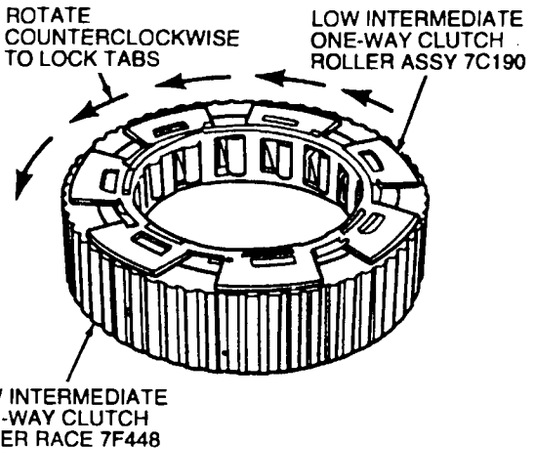


2. Rotate roller and cage assembly clockwise to unlock tabs. Remove low-intermediate one-way clutch roller and cage assembly from low-intermediate one-way clutch race (outer). Clean and inspect rollers and cage for cracks, brinelling or scoring. Service as required.

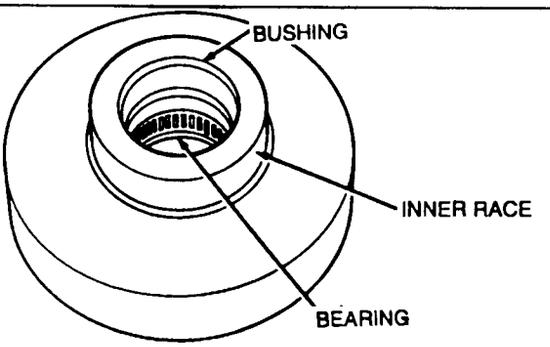


Assembly

1. Install low-intermediate one-way clutch roller assembly to low-intermediate one-way clutch race (outer). Then, rotate counterclockwise to lock tabs.

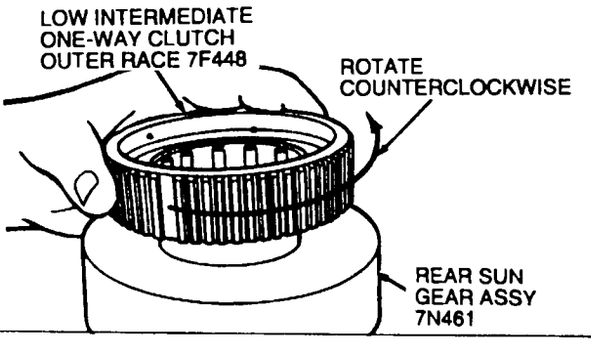


2. Clean and inspect rear sun gear assembly bushing, bearing and outer race. Service as required.



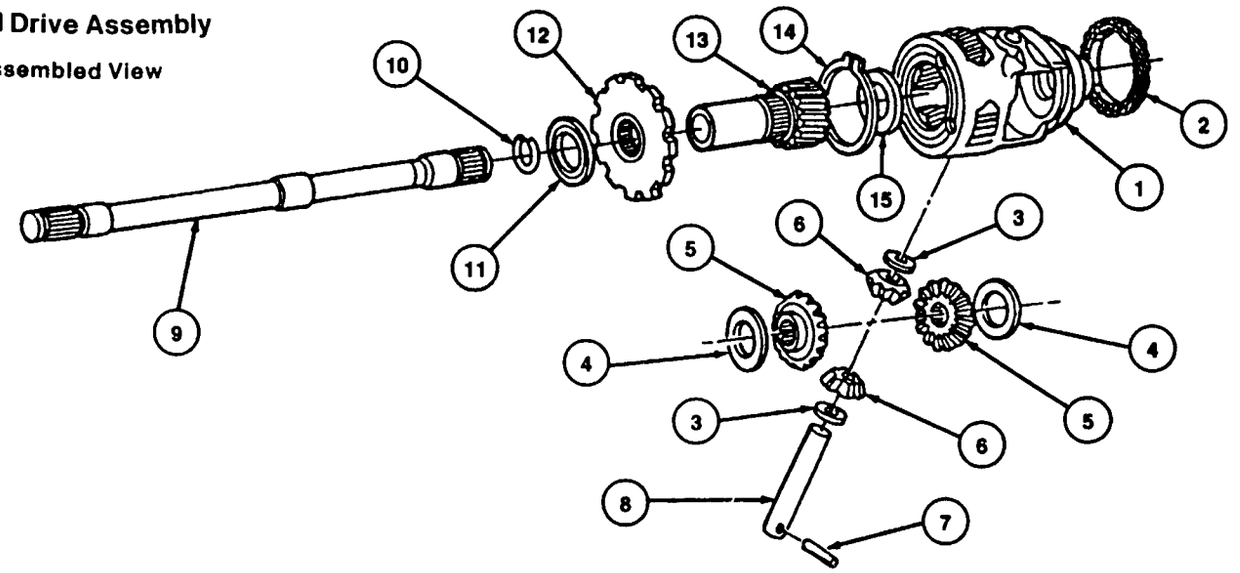
3. NOTE: Outer splined race should rotate counterclockwise and hold clockwise.

   Install one-way clutch assembly to rear sun gear assembly by rotating counterclockwise.



Final Drive Assembly

Disassembled View

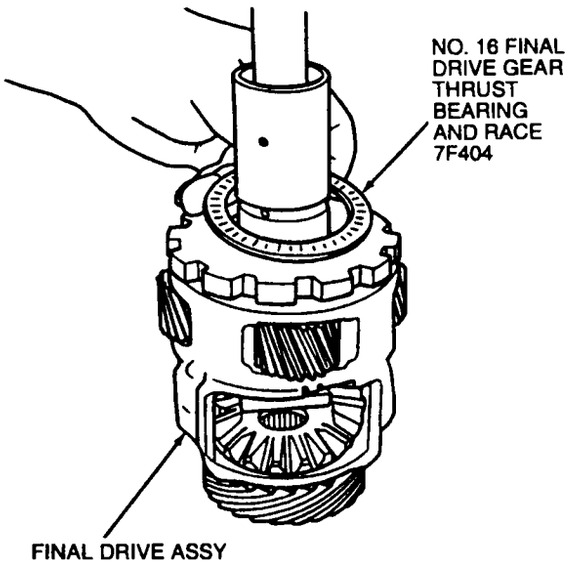


Item	Part Number	Description
1	7F465	Differential Case
2	7G237	Speedometer Drive Gear
3	4230	Differential Pinion Thrust Washer
4	4228	Differential Side Gear Thrust Washer
5	4236	Differential Side Gear
6	4211	Differential Pinion Gear
7	67847-S	Roll Pin

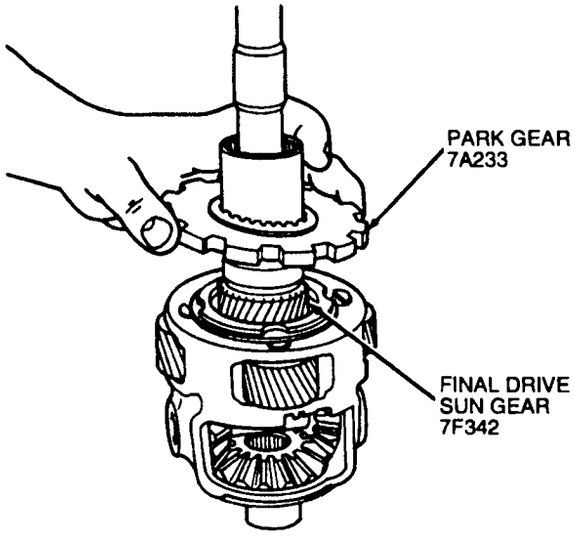
Item	Part Number	Description
8	4211	Differential Pinion Shaft
9	7060	Output Shaft Assy
10	N803200-S	Ring
11	7FA05	Output Shaft No. 16 Bearing
12	7A233	Park Gear
13	7F342	Final Drive Sun Gear
14	N803202-S2	Ring
15	7F404	No. 17 Final Drive Gear Thrust Bearing

Disassembly

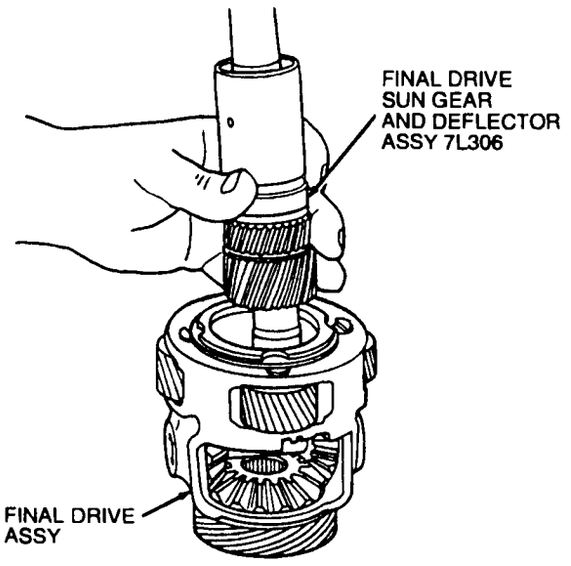
1. Remove No. 16 final drive gear thrust bearing from final drive assembly.



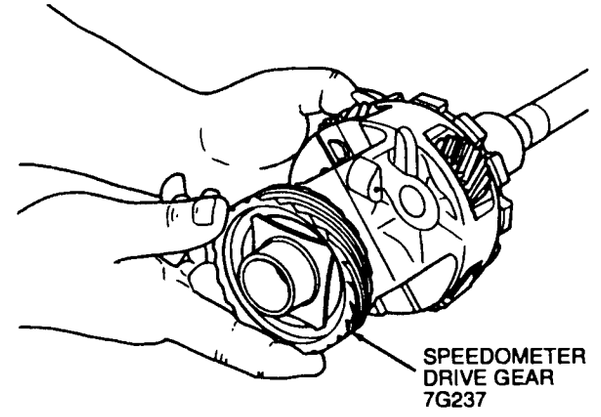
2. Remove park gear (7A233) from final drive assembly.



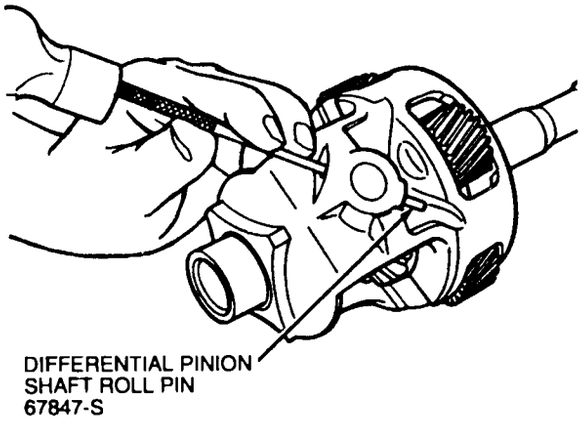
3. Remove final drive sun gear and deflector assembly from final drive assembly.



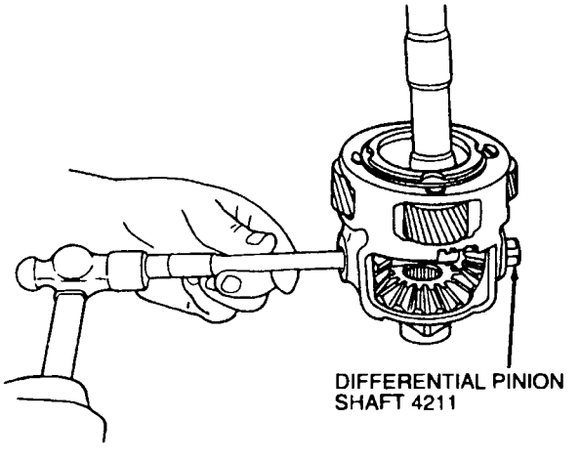
4. IF NECESSARY, remove speedometer drive gear.



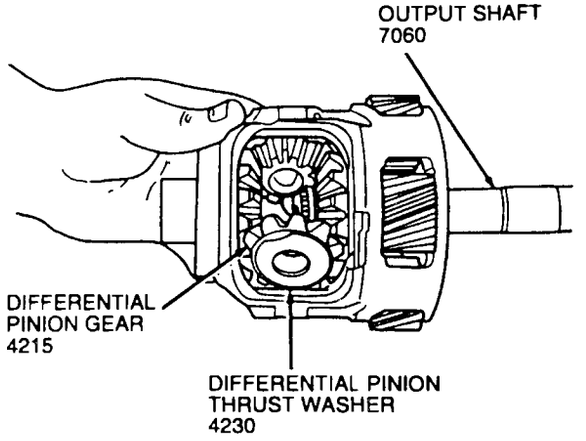
5. IF NECESSARY, use a drift to drive out differential pinion shaft roll pin.



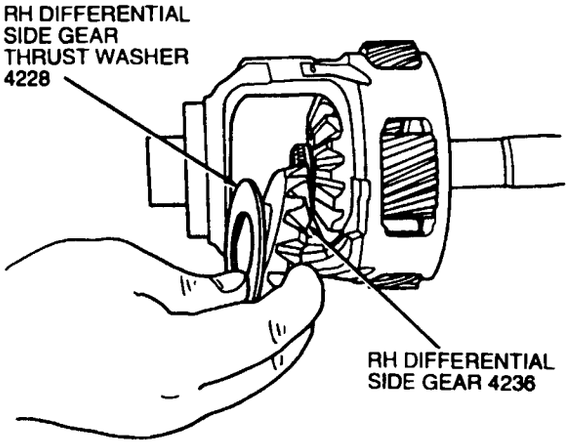
6. Use a drift to tap out the differential pinion shaft (4211).



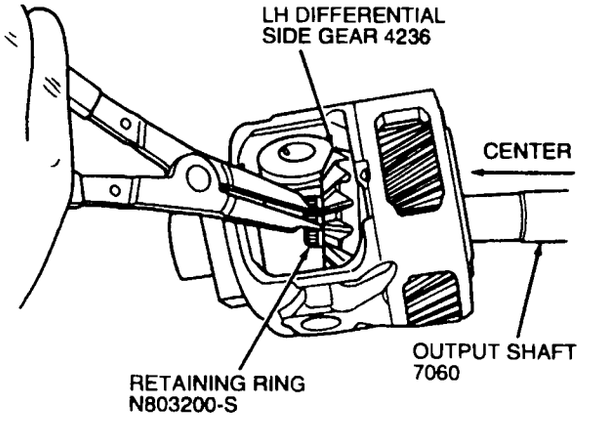
7. Rotate the output shaft (7060) to remove two differential pinion gears (4215) and two differential pinion thrust washers (4230).



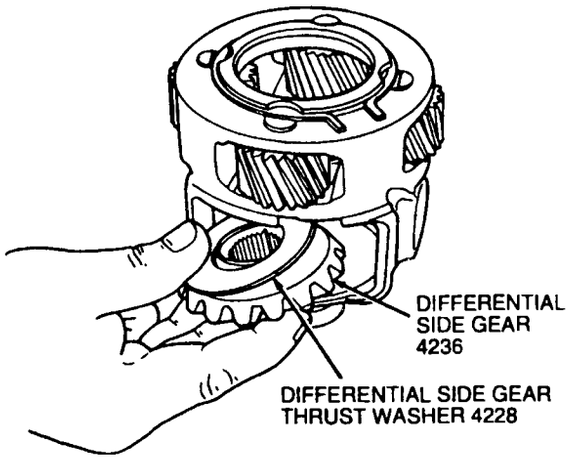
8. Remove RH differential side gear (4236) and differential side gear thrust washer (4228) from differential case.



9. Push output shaft towards center of differential housing. Slide LH differential side gear upward to gain access to retaining ring. Use snap ring pliers to remove retaining ring. Remove output shaft.

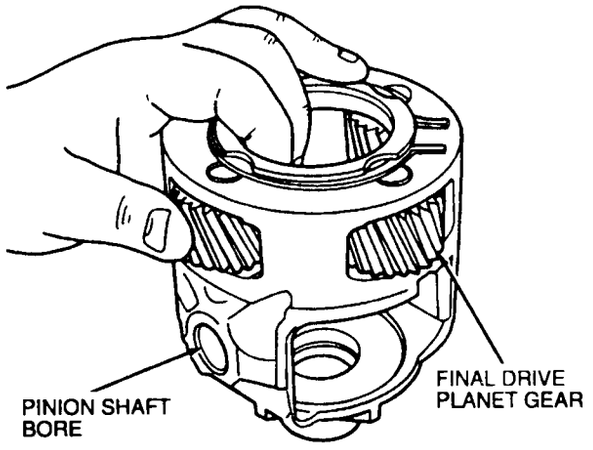


10. Remove differential side gear and differential side gear thrust washer.

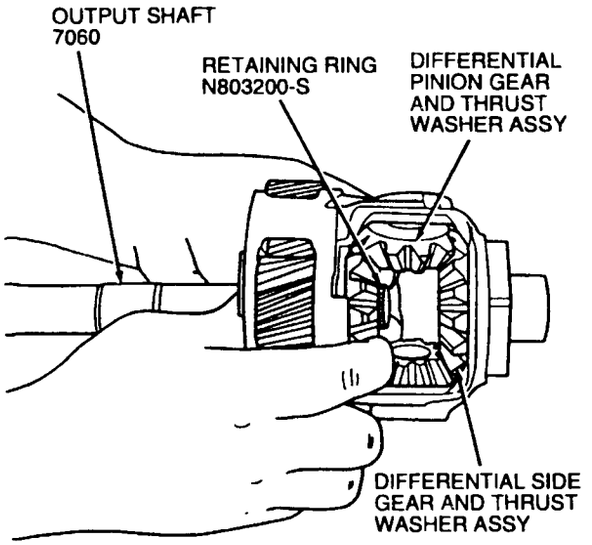


Assembly

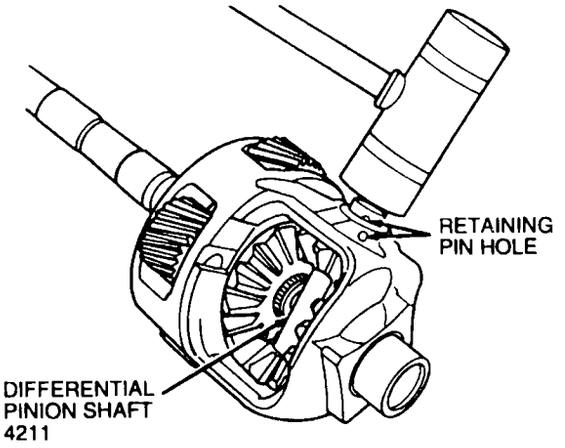
1. Inspect differential pinion and side gears for looseness, discoloration, cracks or excessive gear tooth wear. Inspect four final drive planet gears, two pinion shaft bores and pinion shaft for looseness, discoloration, cracks, excessive gear tooth wear or galling. Service as required.



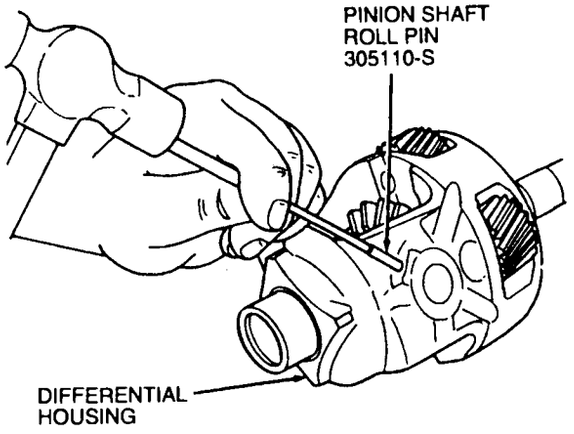
2. If removed, install two differential side gear thrust washers, differential side gears, output shaft and retaining ring. Walk differential pinion gears and differential side gear thrust washers into position by rotating output shaft.



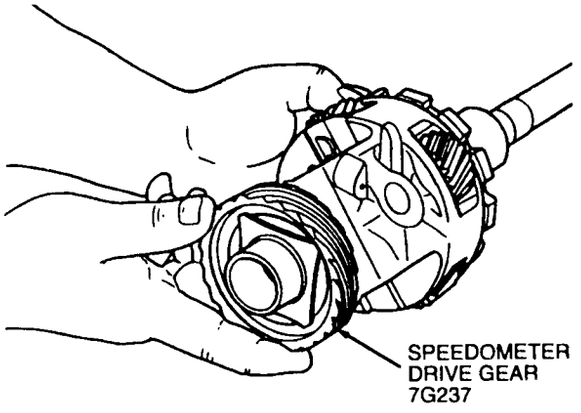
3. Tap differential pinion shaft through differential case, differential side gear thrust washers and differential side gears using a soft mallet. Make sure to align retaining pin hole in differential pinion shaft with hole in differential case.



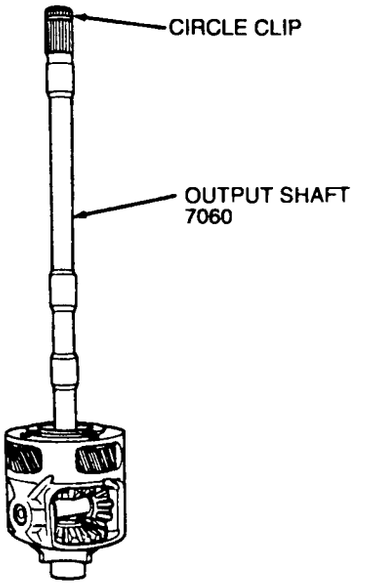
4. Install new pinion shaft roll pin using a drift. Install pin so it is flush with differential housing.



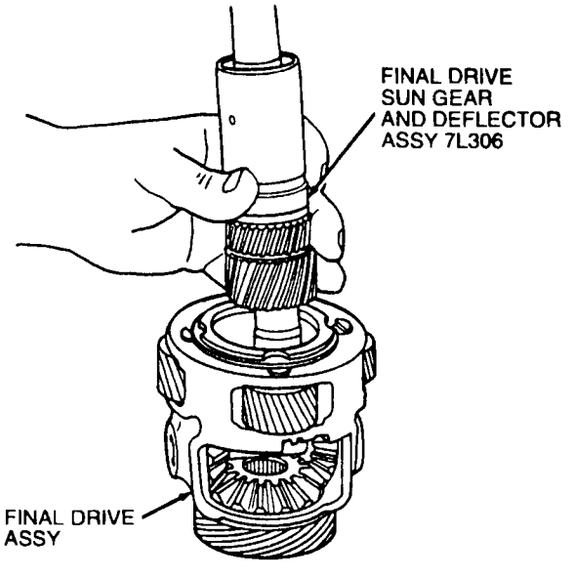
5. If removed, install speedometer drive gear.



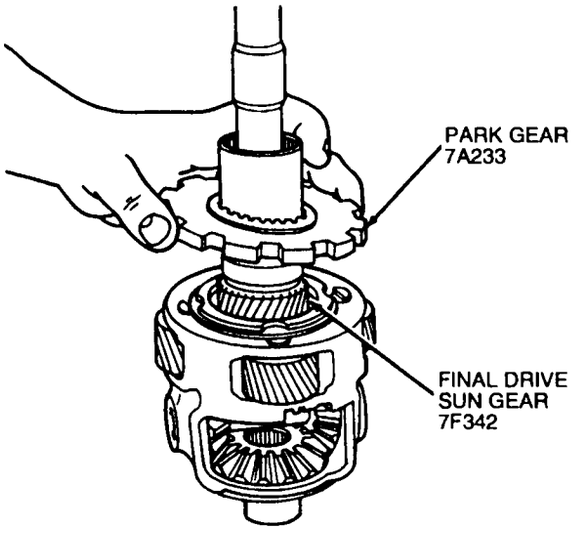
6. Install new retaining clip on output shaft.



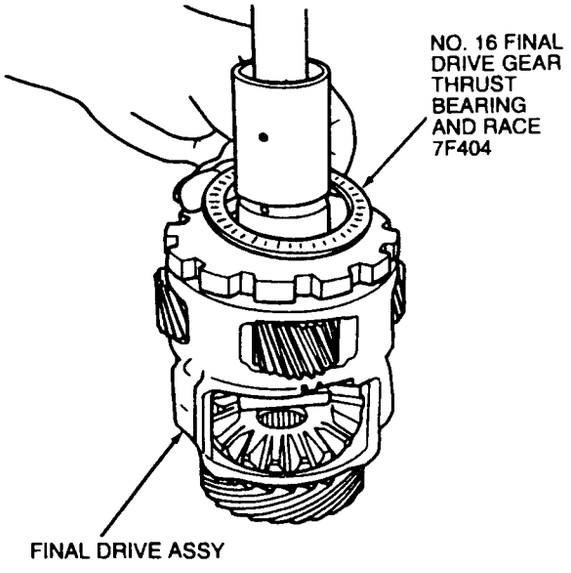
7. Install final drive sun gear (7F342).



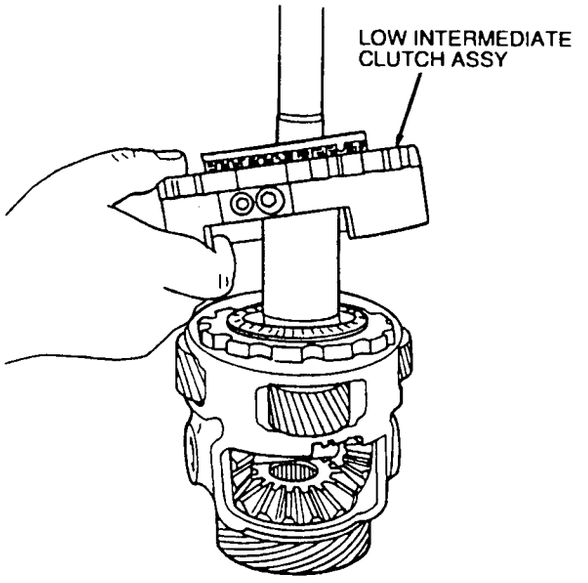
8. Install park gear.



9. NOTE: Needle bearing must face up.
Install No. 16 thrust bearing.

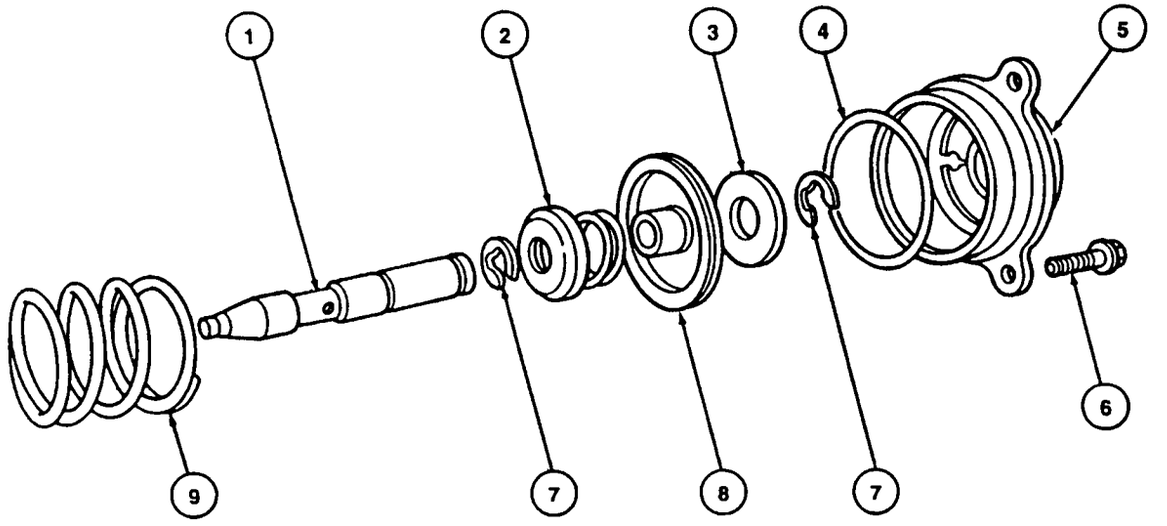


10. Install low intermediate clutch piston and rear planet support onto final drive assembly for reassembly into transaxle.



Overdrive Servo

Disassembled View

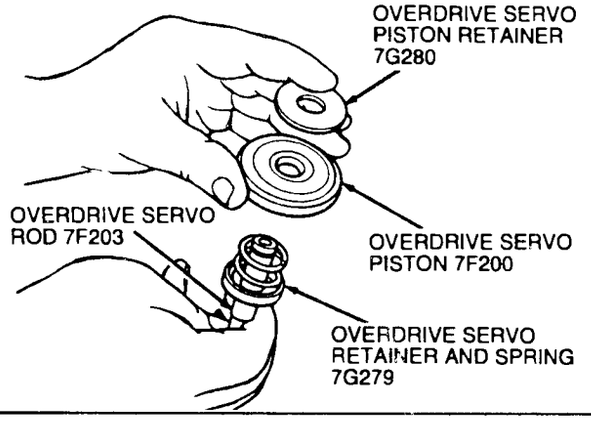


Item	Part Number	Description
1	7F203	Overdrive Servo Rod
2	7G279	Overdrive Servo Retainer and Spring
3	7G280	Overdrive Servo Piston Retainer
4	7D024	Overdrive Servo Piston Cover Seal

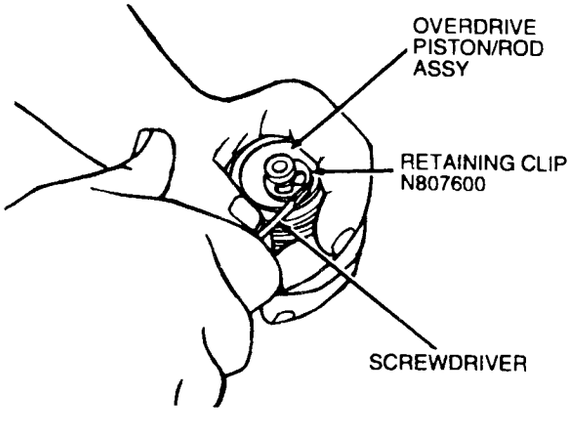
Item	Part Number	Description
5	7D027	Overdrive Servo Piston Cover
6	N605892-S36	Cover Bolt
7	N807600	Piston Retaining Clip (2 Req'd)
8	7F200	Overdrive Servo Piston
9	7F201	Overdrive Servo Piston Return Spring

Assembly

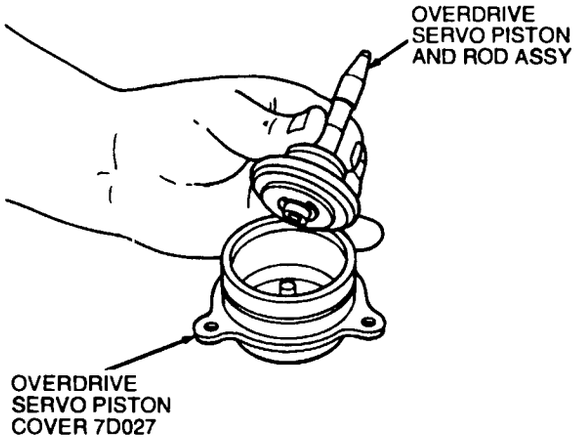
1. If removed, install overdrive servo retainer and spring, overdrive servo piston and overdrive servo piston retainer.



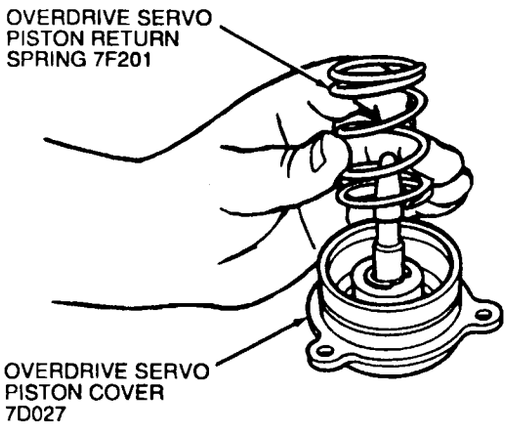
2. Compress assembly and install rear piston rod retaining clip.



3. Lubricate piston seal with petroleum jelly. Install assembled servo piston and rod assembly into servo cover.

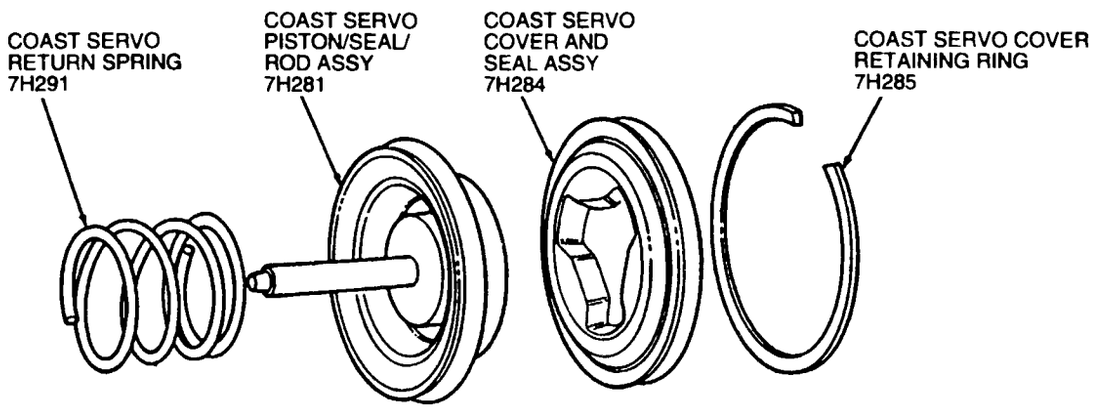


4. Install overdrive servo piston return spring.



Coast Band Servo

Disassembled View



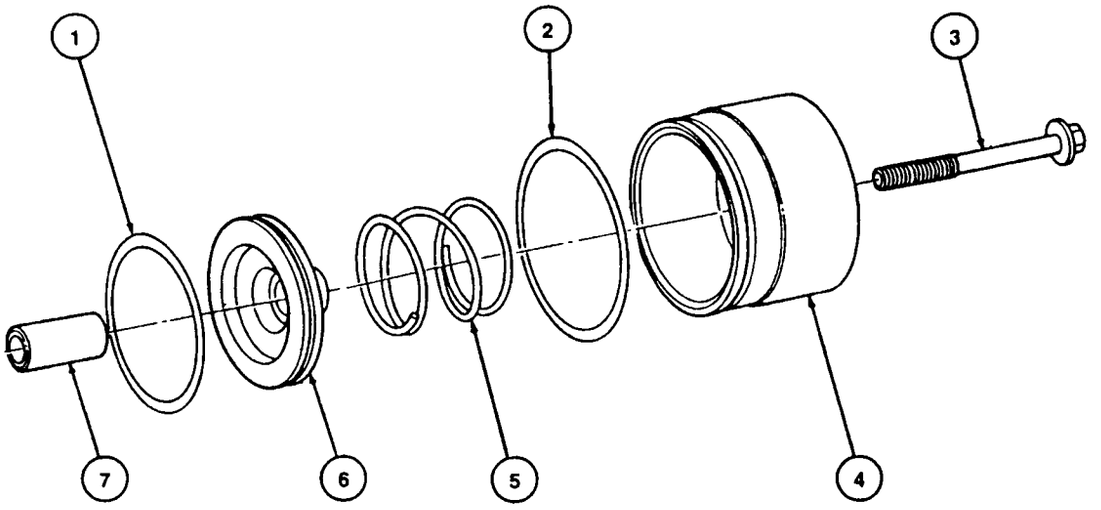
Disassembly and Assembly

1. NOTE: Servo piston cover and seal, and servo piston / seal / rod are serviced as assemblies. If either seal needs to be replaced, the whole assembly is needed.

   Inspect coast band servo piston components for damage. Service as required.

Neutral Drive Accumulator

Disassembled View



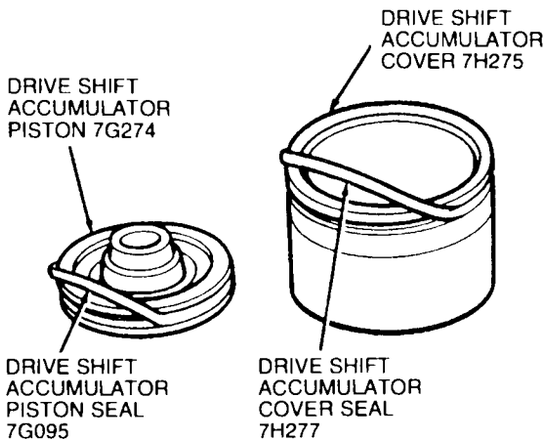
Item	Part Number	Description
1	7G095	Accumulator Piston Seal
2	7H277	Accumulator Cover Seal
3	N-807757-S	Bolt
4	7H275	Neutral Drive Shift Accumulator Cover

Item	Part Number	Description
5	7G300	Drive Shift Accumulator Spring
6	7G274	Drive Shift Accumulator Piston
7	7H276	Drive Shift Accumulator Shaft

(Continued)

Disassembly

1. Disassemble neutral drive accumulator cover spring, piston and rod. Inspect parts for damage. Service as required.



2. Remove and discard O-ring seals from drive shift accumulator piston and cover.

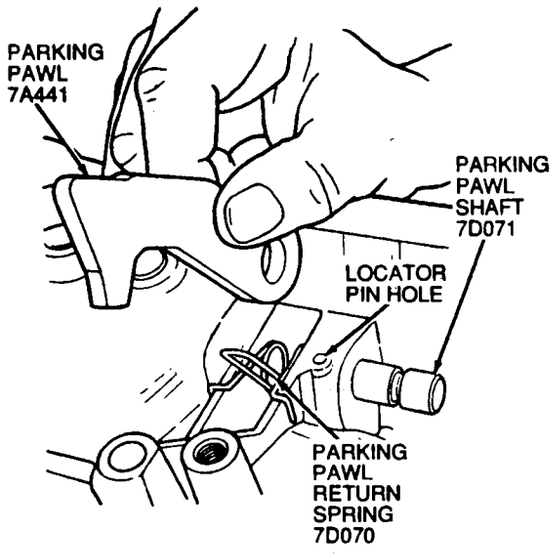
Assembly

1. Install new O-ring seals on drive shift accumulator piston and cover. Lubricate seals with petroleum jelly.
2. Assemble components in reverse order of Disassembly.

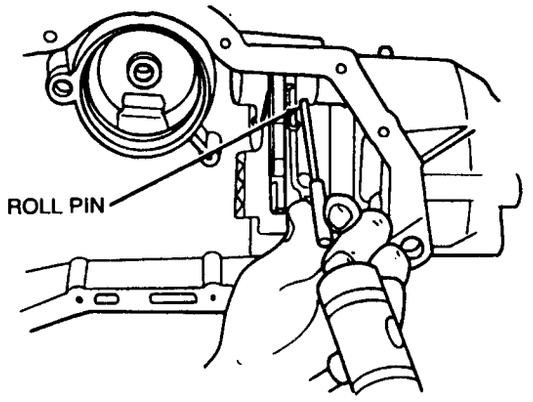
Assembly

1. NOTE: Ensure that the parking pawl (7A441) engages the park gear and returns freely.

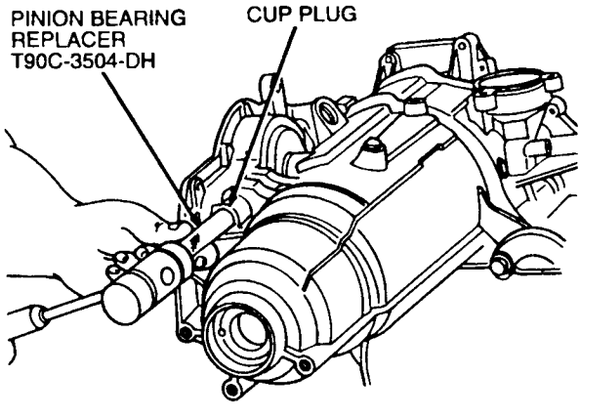
   If removed, install parking pawl, parking pawl return spring (7D070) and parking pawl shaft (7D071).



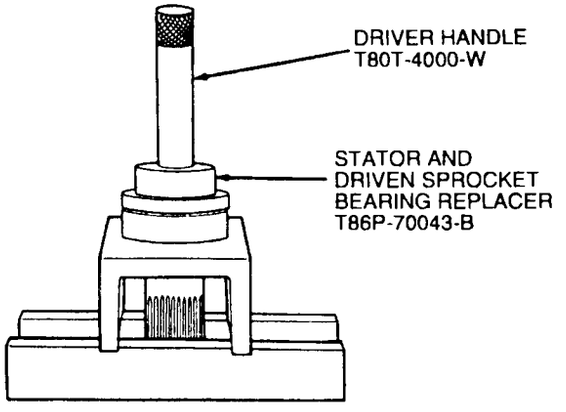
2. Install a new roll pin using a drift.



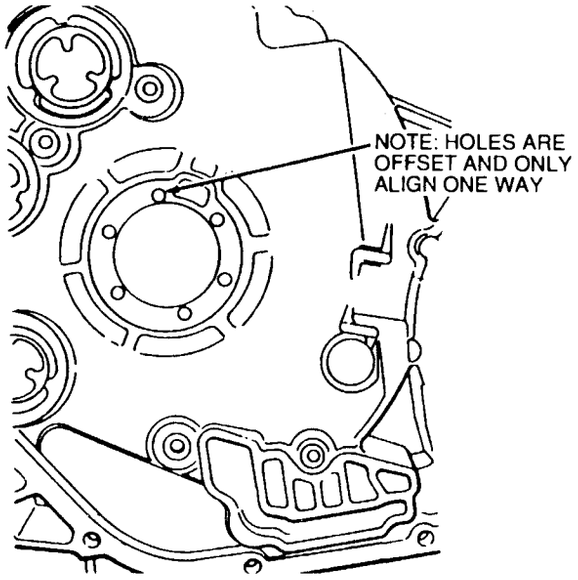
3. Install cup plug to case using Pinion Bearing Replacer T90C-3504-DH.



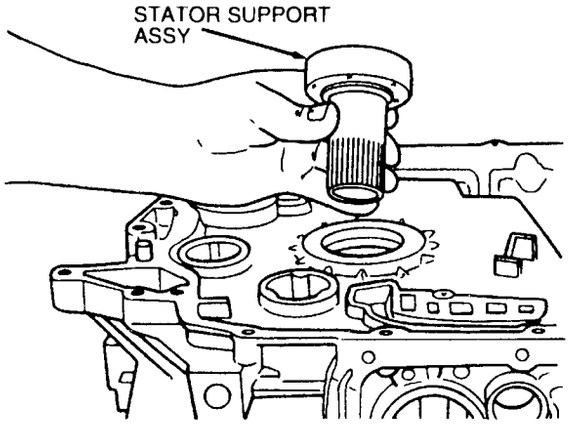
4. If bearing was removed, install new drive sprocket bearing (7G233) using Stator & Driven Sprocket Bearing Replacer T86P-70043-B and Driver Handle T80T-4000-W.

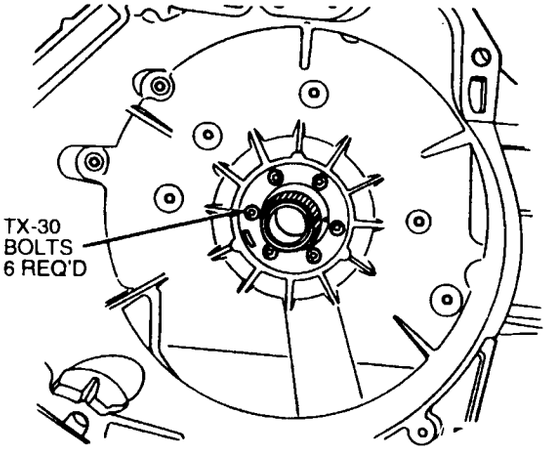


5. NOTE: Bolt holes are offset. Driven sprocket can only be aligned one way. Drain hole points downward.

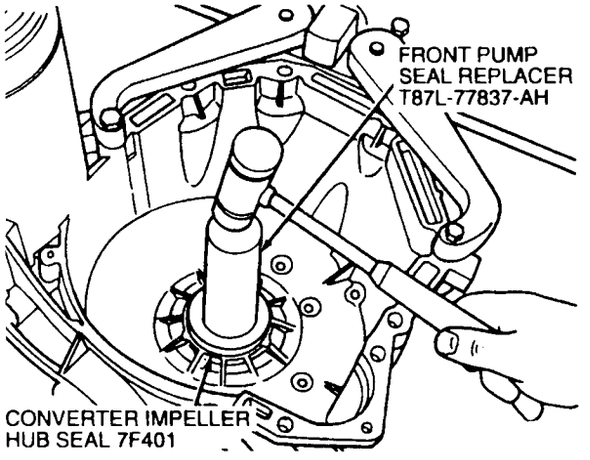


If removed, install driven sprocket support. Install six (T-30) Torx® bolts and tighten to 8.5-11.5 N·m (6.5-8.5 lb-ft).

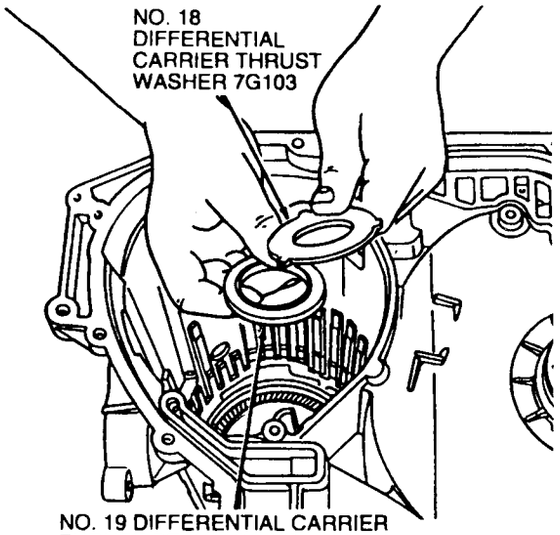




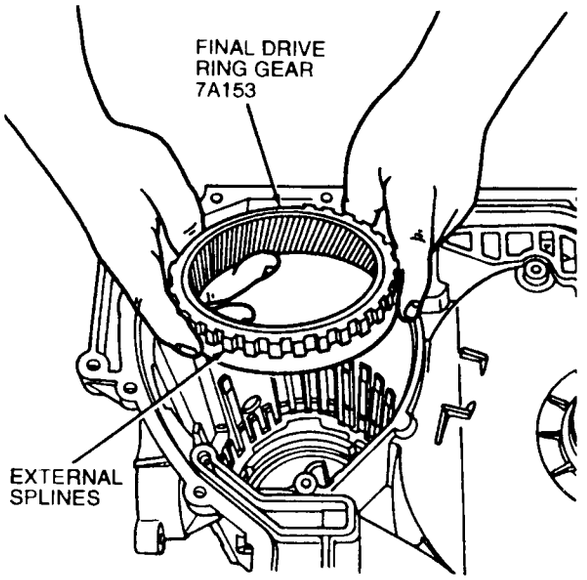
6. Install converter impeller hub seal (7F401) using Front Pump Seal Replacer T87L-77837-AH and a "Dead Blow" (lead filled) hammer.



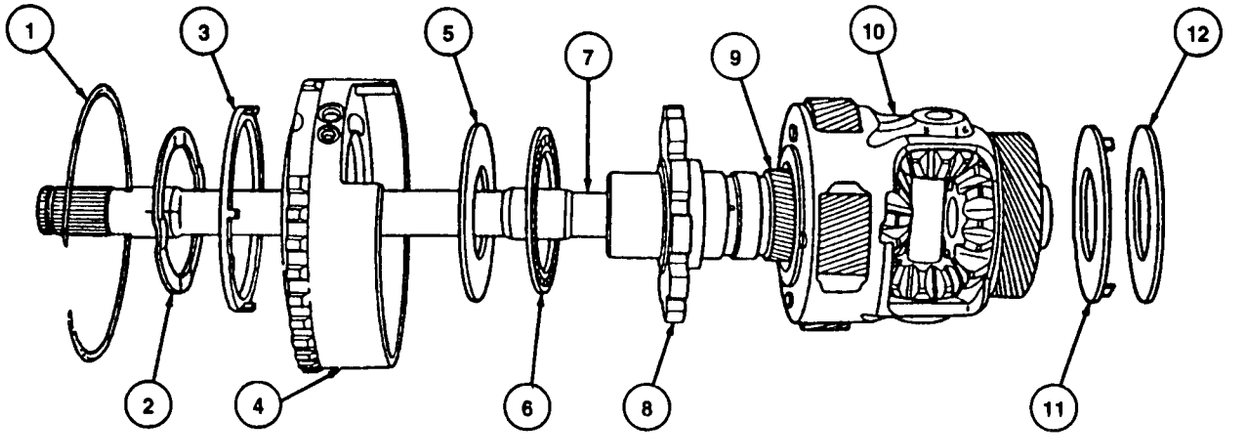
7. Install No. 19 differential carrier needle bearing assembly over case boss with flat side facing up, outer lip facing down. Install No. 18 differential carrier thrust washer (tabs down) over No. 19 needle bearing.



8. Install final drive ring gear (7F343) with external splines up.



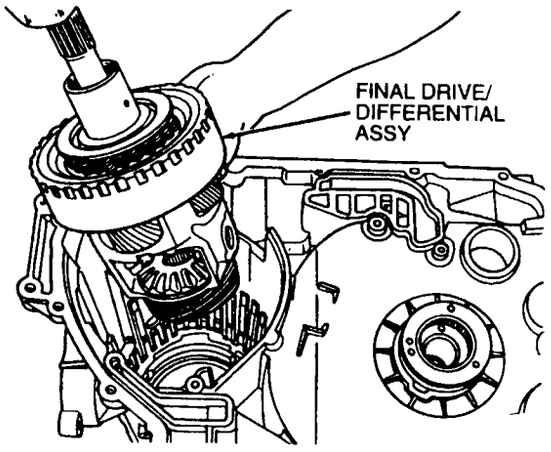
Final Drive Assy—Exploded View



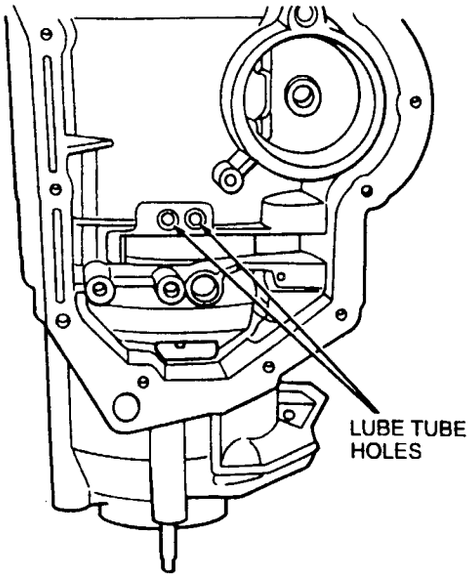
Item	Part Number	Description
1	7D483	Selective Beveled Retaining Ring
2	7G178	No. 15 Sun Gear Thrust Bearing and Race Assy
3	7H270	No. 15 Low/Intermediate Clutch Retainer Washer (Plastic)
4	7G033	Rear Planet Support Assy
5	7F451	No. 16 Final Drive Gear Thrust Washer (Select Fit)

Item	Part Number	Description
6	7F405	No. 16 Final Drive Bearing and Race Assy
7	7060	Differential Output Shaft
8	7A233	Parking Gear
9	7F342	Final Drive Sun Gear Assy
10	7F465	Final Drive Differential Assy
11	7G103	No. 18 Differential Carrier Thrust Washer
12	7G112	No. 19 Differential Carrier Thrust Bearing and Race Assy

9. Lower final drive assembly and rear planet support assembly into case as one unit.



10. Make sure both lube tube holes in rear planet support align in case window as shown.



11. **WARNING: USE CAUTION WHEN UNLOADING BEVELED RETAINING RING.**

NOTE: The beveled retaining ring clearance check for rear planet support only needs to be performed if one of the following components has been replaced:

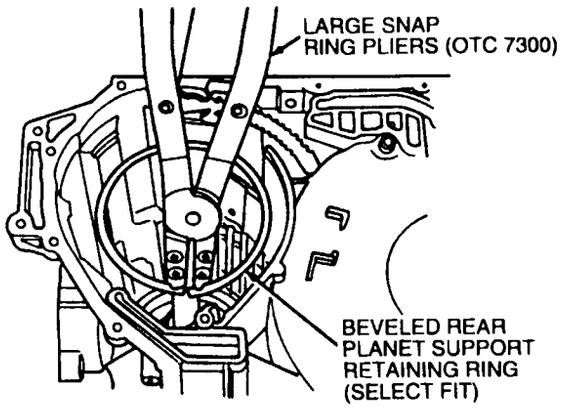
- Transaxle case (7005).
- Rear planet support (7A130).
- Final drive ring gear (7F343).

If none of these components has been replaced, re-use the original beveled retaining ring.

NOTE: Some early built transaxles may not have notches in the ends of the beveled retaining ring.

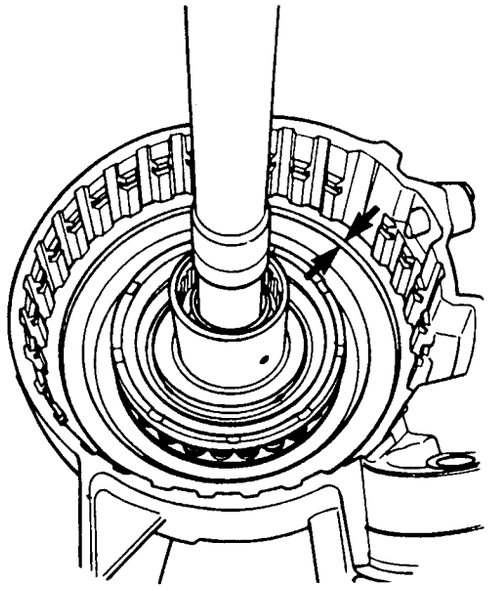
NOTE: Ensure proper seating of retaining ring in case groove with bevel down.

Install original beveled retaining ring removed during disassembly with bevel down using Large Snap Ring Pliers (OTC-7300) in the notches at the ends of the beveled retaining ring. Carefully tap beveled retaining ring into place. Use care not to damage retaining ring, support or case.

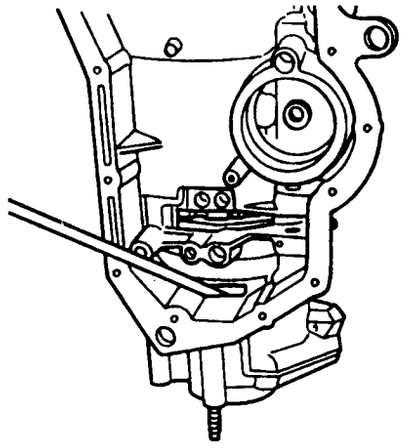


12. **CAUTION: If support is not visible on inside diameter of retaining ring, the low/intermediate piston could be damaged.**

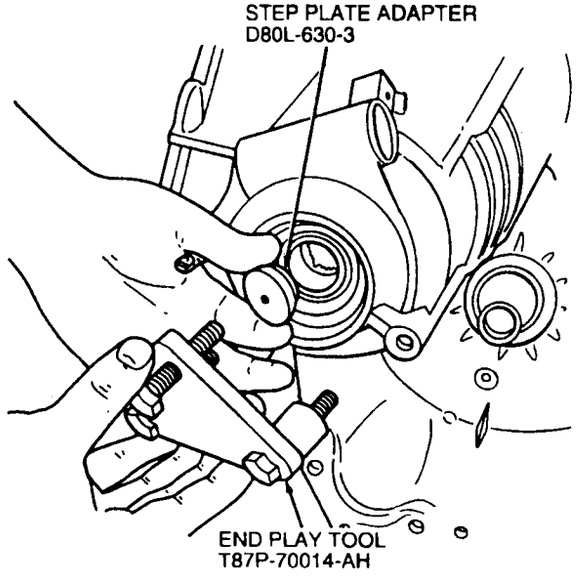
Make sure beveled retaining ring is properly seated and final drive support must be visible on the inside diameter of the retaining ring but must not seat against case wall.



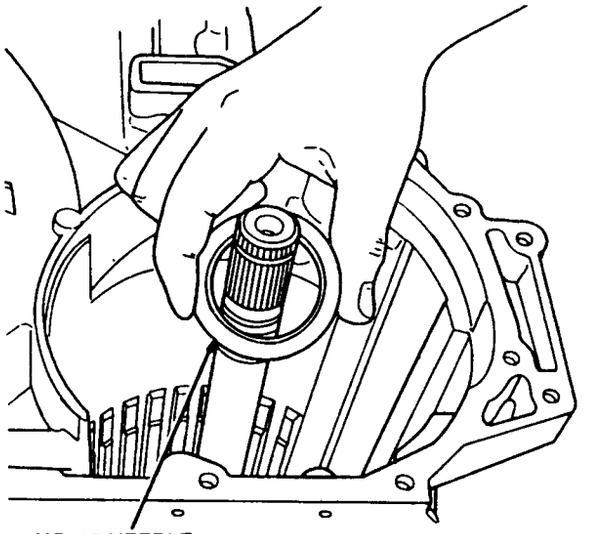
13. Place screwdriver into differential case and pry up to make sure that retaining ring is fully seated in top of case groove.



14. Install Step Plate Adapter D80L-630-3 or equivalent and End Play Tool T87P-70014-AH and two bolts over RH output shaft opening.

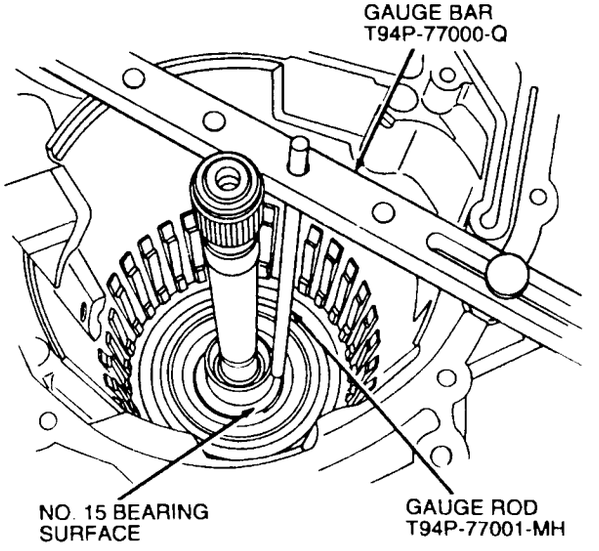


15. Remove No. 15 needle bearing from the rear planet support hub for this procedure.

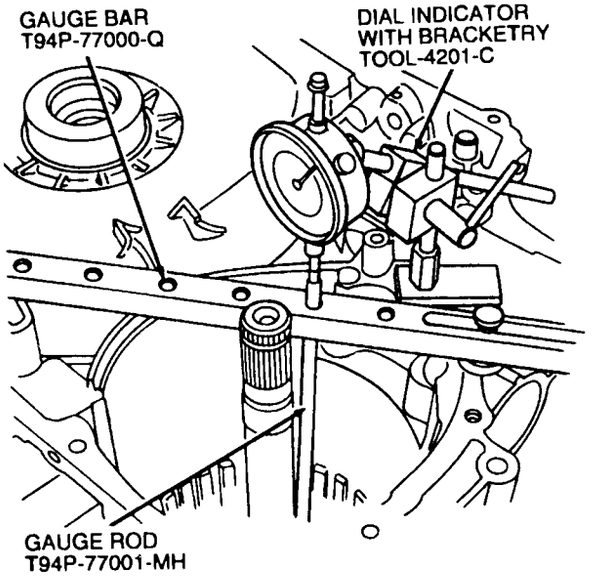


16. NOTE: Gauge rod must set on rear planet support No. 15 bearing surface.

    Check for correct selective fit beveled retaining ring. Place Gauge Bar T94P-77000-Q across case with round legs of gauge bar resting on chain cover gasket surface. Place Gauge Rod T94P-77001-MH through hose in gauge bar.



17. Mount Dial Indicator with Bracketry TOOL-4201-C or equivalent as shown. Zero indicator. Tighten end play tool to 1.13-1.70 N·m (10-15 lb-in). Read and record dial indicator reading.

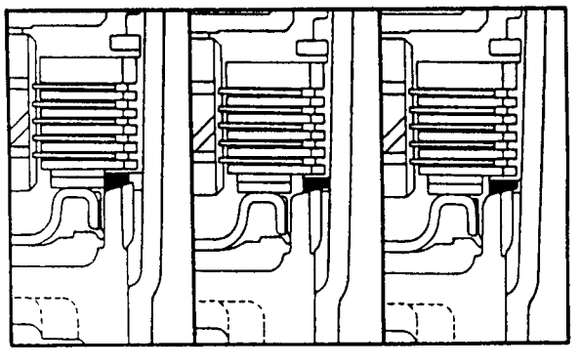


18. If dial indicator reading indicates movement more than 0.127 mm (0.005 inch), select the next largest beveled retaining ring from the chart below and repeat the check procedure to verify specification.

SELECTIVE FIT BEVELED RETAINING RING

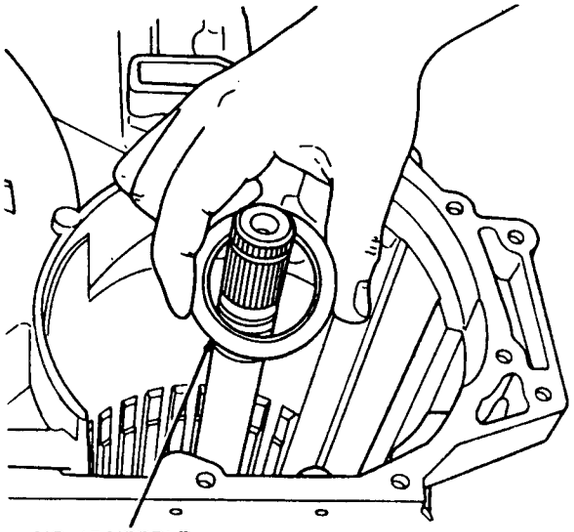
Part No.	Thickness
N808417	1.48-1.63 mm (0.058-0.084 inch)
N808416	1.54-1.69 mm (0.061-0.067 inch)
N808415	1.60-1.75 mm (0.063-0.069 inch)
N808414	1.68-1.81 mm (0.065-0.071 inch)
N808413	1.72-1.87 mm (0.065-0.071 inch)

BEVELED RETAINING RING INSTALLATION

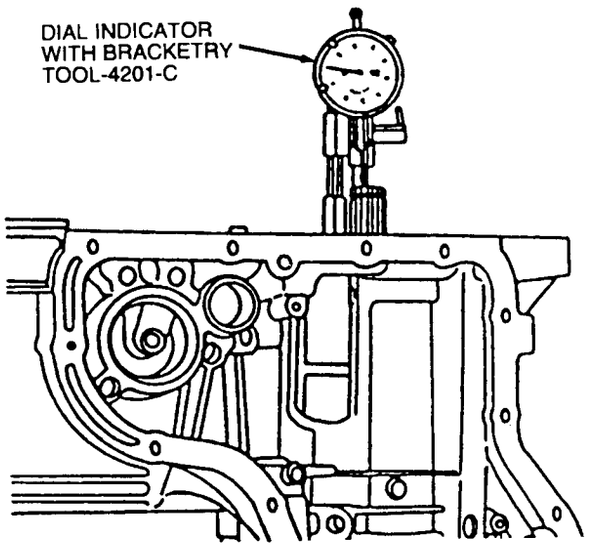


INCORRECT **INCORRECT** **CORRECT**

19. Remove dial indicator, gauge rod and gauge bar. Install No. 15 thrust bearing.



20. Check end clearance for selective fit of No. 16 thrust race. Mount Dial Indicator with Bracketry TOOL-4201-C or equivalent with stylus on end of output shaft as shown. Zero dial indicator. Tighten end play tool screw to 4-5 N·m (35-44 lb-in). Read dial indicator.



21. NOTE: The beveled retaining ring and rear planet support must be removed to change No. 16 thrust race.

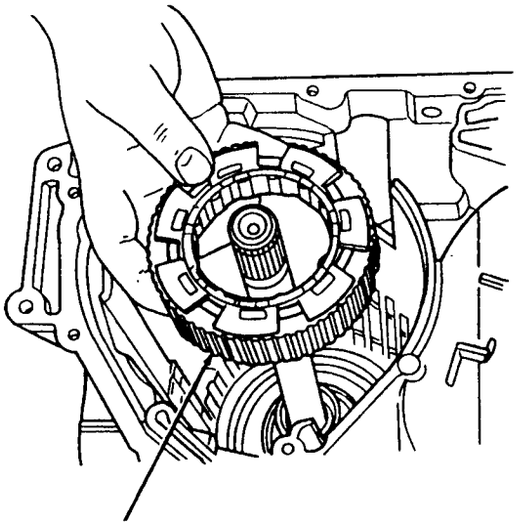
    Dial indicator reading should be 0.05-0.42 mm (0.002-0.017 inch). If clearance is not within specification, select a thicker or thinner washer from chart below and repeat the clearance check.

NO. 16 THRUST RACE (WASHER)

Thickness	ID
2.25-2.15 mm	Green (No. 1)
2.37-2.27 mm	Blue (No. 2)
2.49-2.39 mm	Black (No. 3)
2.61-2.51 mm	White (No. 4)
2.73-2.63 mm	Brown (No. 5)
2.85-2.75 mm	Gold (No.6)

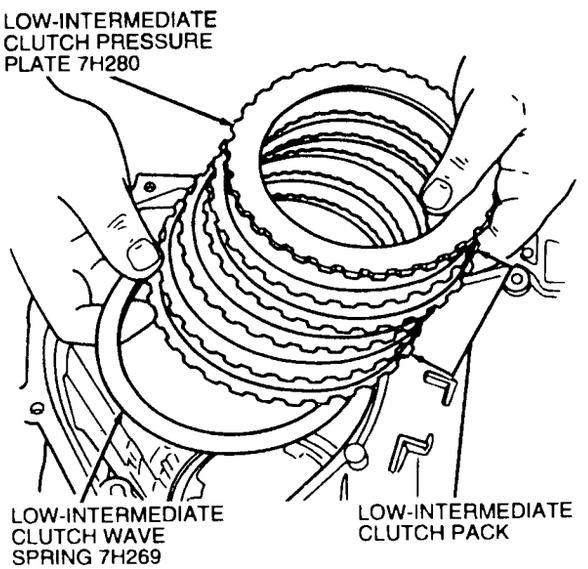
22. After completing clearance check for No. 16 thrust washer and clearance is within specification, remove end play tool and adapter.
23. NOTE: Make sure No. 15 needle bearing is on rear planet support hub and the black plastic No. 15 thrust washer is in place on top of low / intermediate clutch spring retainer.

    Install low / intermediate one-way clutch assembly.

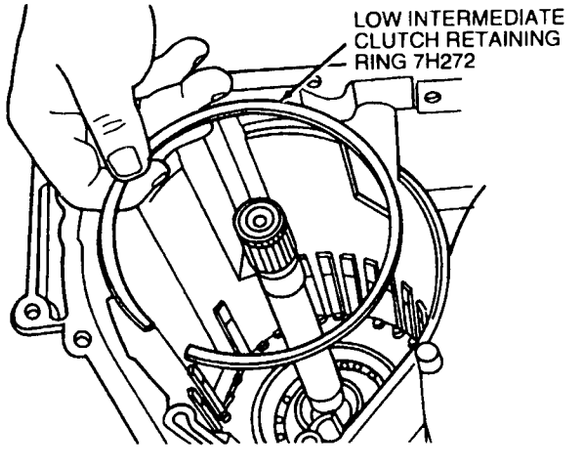


24. NOTE: The friction plate internal splines will center the one-way clutch.

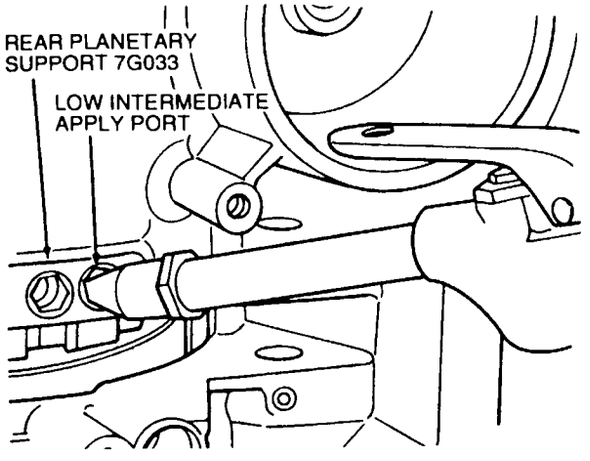
    Install low / intermediate clutch wave spring, low / intermediate clutch pack and low / intermediate clutch pressure plate over the one-way clutch.



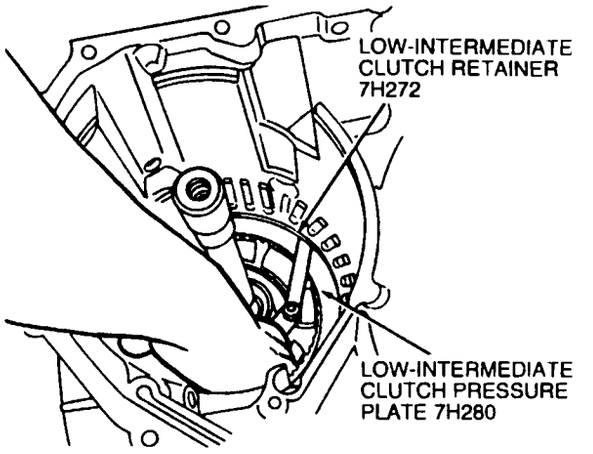
25. **CAUTION: Make sure retaining ring is seated in cage groove.**
Install low / intermediate clutch retaining ring.



26. Apply dry compressed air, regulated to 40 psi, to low / intermediate apply port (located in rear planet support). Make sure the piston strokes. Check for air leaking past the piston seal.



27. Use a feeler gauge to measure the clearance between the clutch pressure plate and the clutch retainer. The clearance should be 1.27-1.90 mm (0.050-0.075 inch).

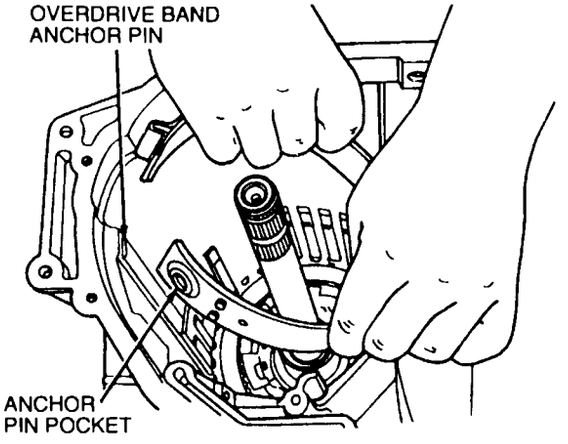


28. If the clearance is not within specification, select a retaining ring from the chart below. After installing the selected retaining ring, verify the clearance is correct.

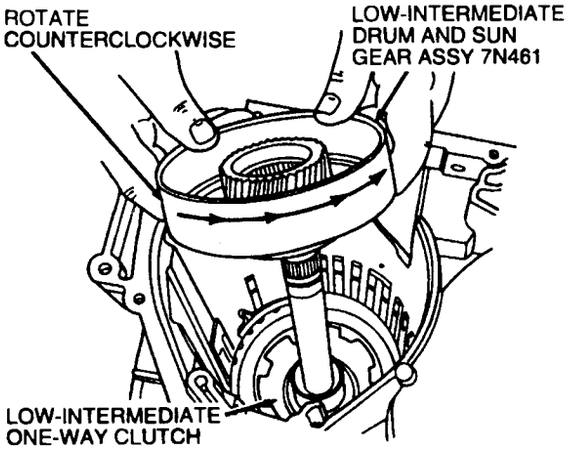
SELECTIVE RETAINING RINGS

Thickness
1.54-1.64 mm (0.061-0.065 inch)
2.08-2.18 mm (0.082-0.086 inch)
2.62-2.72 mm (0.103-0.107 inch)
3.16-3.26 mm (0.125-0.128 inch)
3.68-3.78 mm (0.145-0.149 inch)

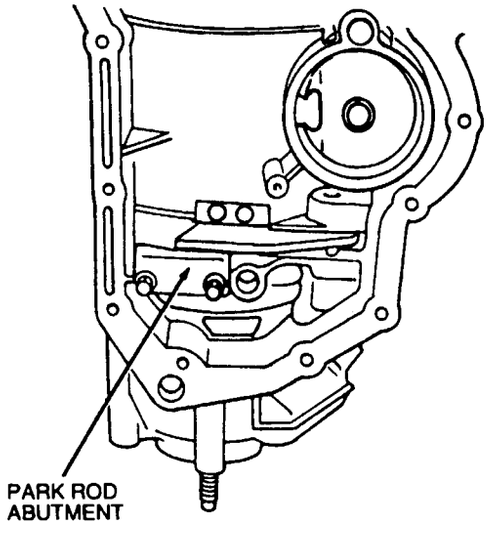
29. Install coast band into case and align anchor pin pocket on band with anchor pin in case.



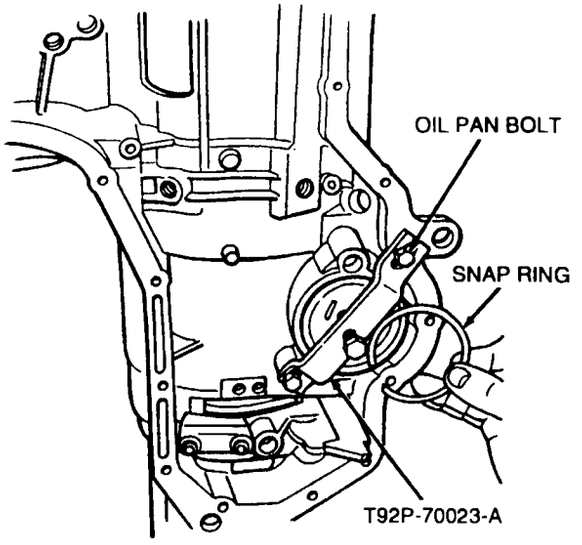
30. Install low-intermediate drum. Rotate counterclockwise to seat the race of low-intermediate drum and sun gear into the low-intermediate one-way clutch.



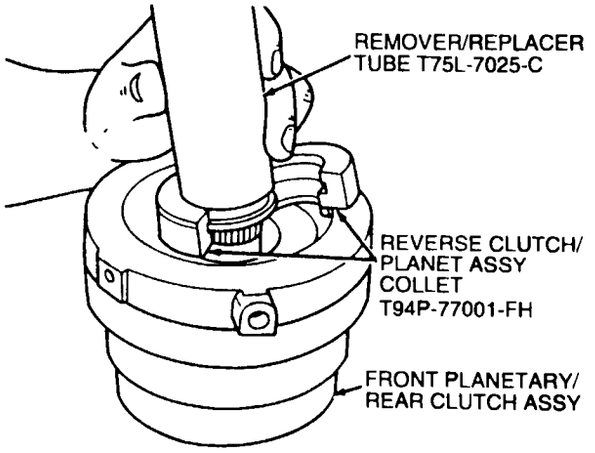
31. Install park rod abutment and tighten bolts to 27-30 N·m (20-22 lb-ft). Make sure park pawl moves freely.

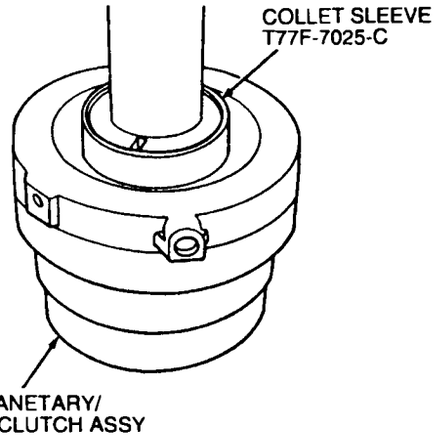


32. Install coast band apply piston spring, piston and rod assembly, cover and retaining ring using Servo Piston Remover / Replacer T92P-70023-A.



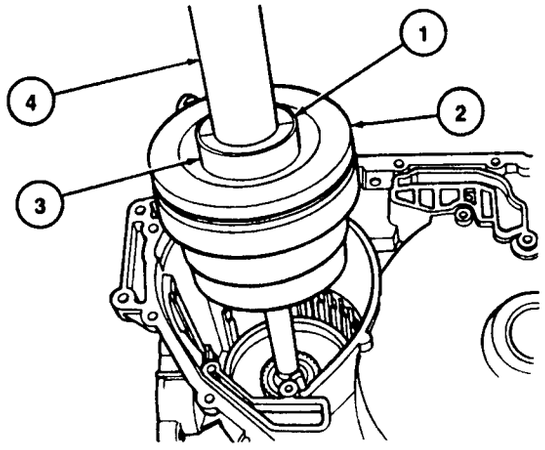
33. If not already completed, install Remover / Replacer Collets T94P-77001-FH and Tube T75L-7025-C over the front carrier hub. Slide Collet Sleeve T77F-7025-C over tube onto collet to hold in place.





34. NOTE: Align reverse clutch cylinder anchor bolt pocket with anchor bolt case hole.

    Use the reverse clutch and planetary removal and installation tool to install the reverse clutch assembly and planetary assembly as one unit.

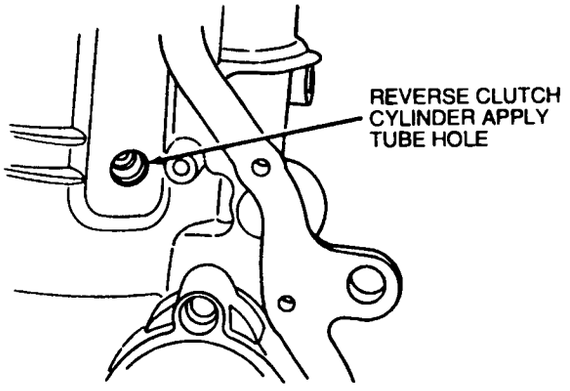


Item	Part Number	Description
1	T94P-77001-FH	Reverse Clutch/Planet Assembly Collet
2	—	Front and Rear Planetary Assembly

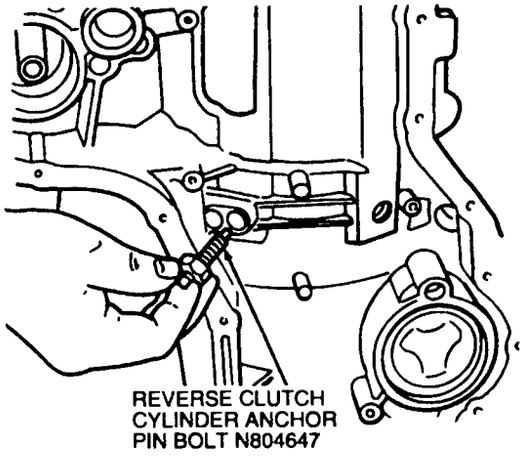
(Continued)

Item	Part Number	Description
3	T77F-7025-C	Bearing Collet Sleeve
4	T75L-7025-C	Remover/Installer Tube

35. Make sure reverse clutch cylinder apply tube hole is aligned with case holes as shown. Remove installation tool.

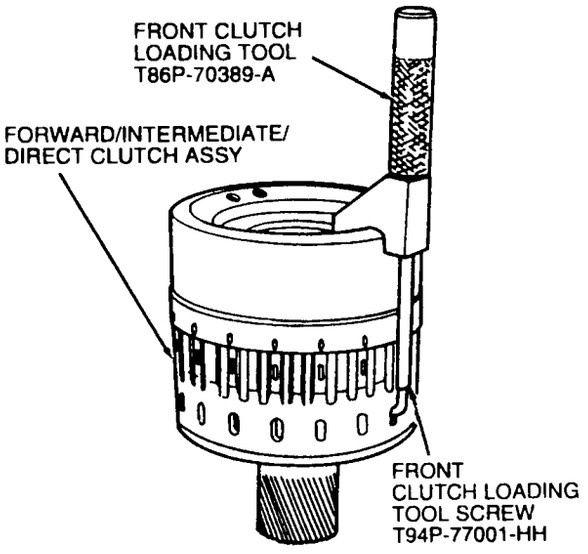


36. Install reverse clutch cylinder anchor pin bolt and locknut finger-tight. Do not tighten to specified torque at this time.



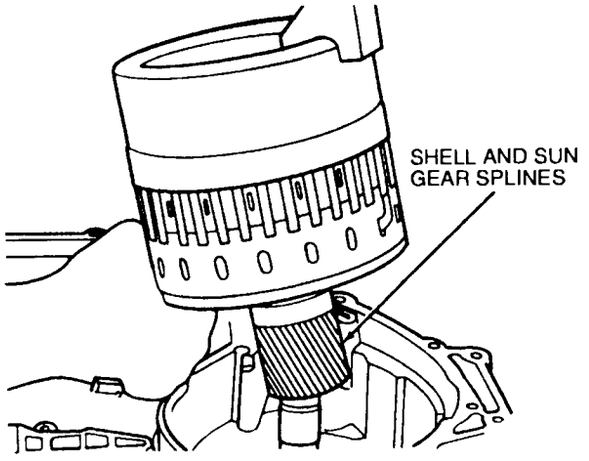
37. **CAUTION: Do not overtighten.**

Install Front Clutch Loading Tool Screw T94P-77001-HH into Front Clutch Loading Tool T86P-70389-A. Install tool to forward / intermediate / direct clutch assembly.

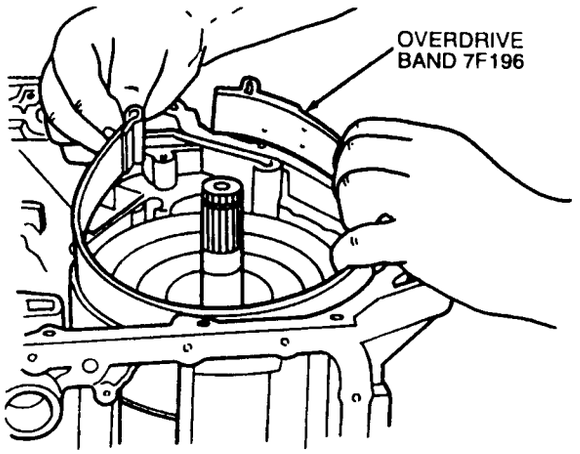


38. **CAUTION: Ensure the assembly is fully seated before removing the tool or transaxle may not be assembled correctly resulting in improper operation.**

Lower assembly into case (7005), aligning shell and sun gear splines into front planet (7A398).

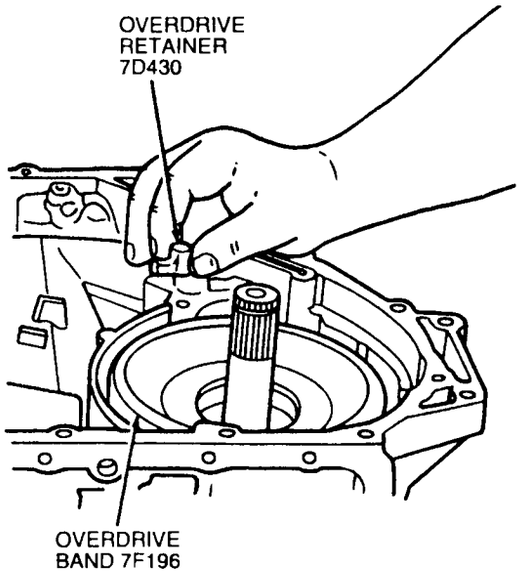


39. Install overdrive band (7F196) into case.

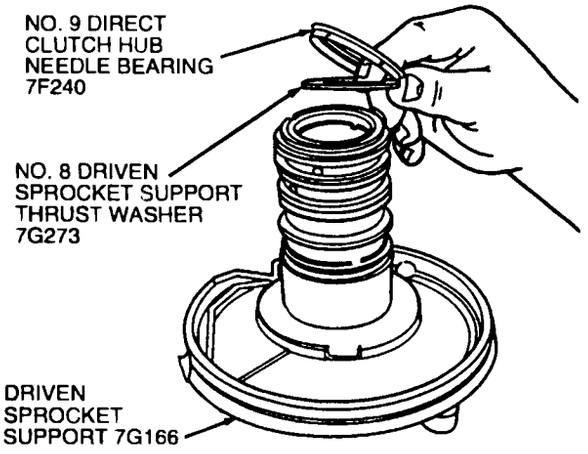


40. NOTE: Foot goes down against band.

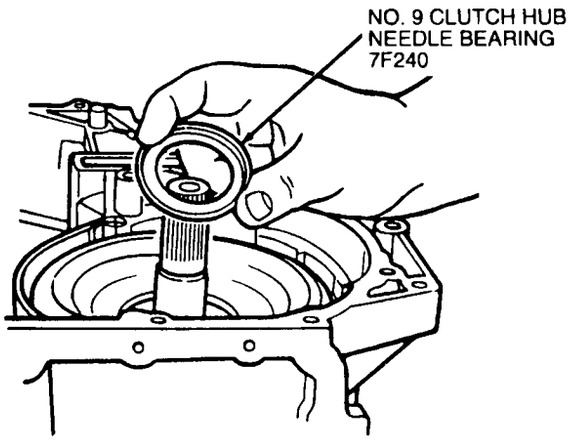
Install overdrive retainer with crosshairs facing up.



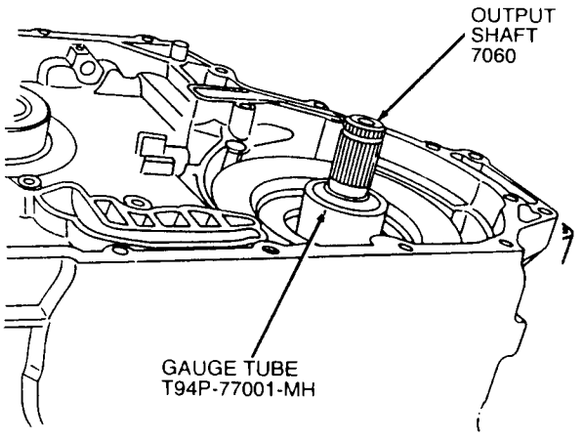
41. Remove No. 8 driven sprocket support thrust washer and No. 9 direct clutch hub needle bearing from the driven sprocket support.



42. Separate No. 8 thrust washer and No. 9 needle bearing. Install No. 9 needle bearing (only) into transaxle over the output shaft as shown with outer lip up.

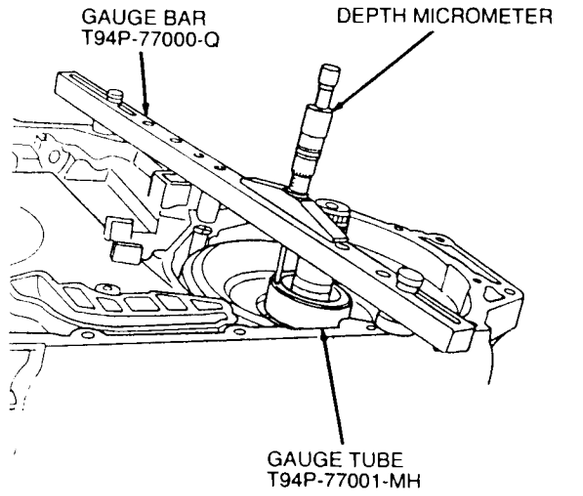


43. Install Gauge Tube T94P-77001-MH over output shaft until fully seated into No. 9 needle bearing. (This is where the No. 8 thrust washer normally sits.)



44. Place Gauge Bar T94P-77000-Q across transaxle case with round legs of gauge bar resting on chain cover gasket surface. Place Depth Micrometer D92P-4201-A or equivalent on gauge bar and measure down to gauge tube. Do this on both sides of output shaft (180 degrees apart). Add both readings, divide by two to obtain reading A.

Reading A



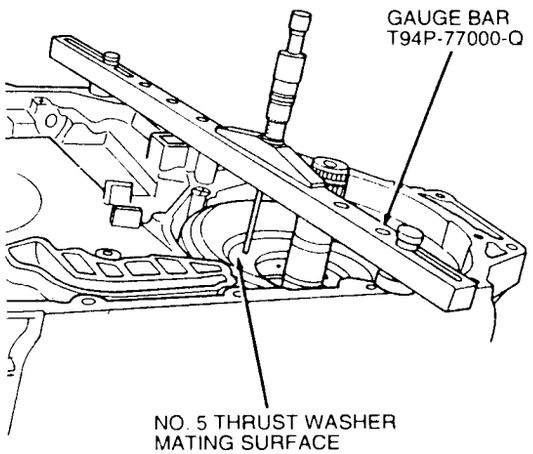
45. Use reading A to select the correct No. 8 thrust washer from the chart below.

NOTE: Reading A and Dimension C from this chart will be used in selection of No. 5 thrust washer.

Reading A	Washer Thickness	Dimension C	Color/ID
42.88-43.10 mm (1.688-1.698 inch)	1.43-1.53 mm (0.056-0.060 inch)	1.48 mm (0.058 inch)	Natural (No. 1)
43.11-43.34 mm (1.697-1.706 inch)	1.68-1.78 mm (0.066-0.070 inch)	1.73 mm (0.068 inch)	Dark Green (No. 2)
43.35-43.59 mm (1.707-1.716 inch)	1.92-2.02 mm (0.075-0.080 inch)	1.97 mm (0.087 inch)	Light Blue (No. 3)
43.60-43.77 mm (1.717-1.723 inch)	2.17-2.27 mm (0.085-0.089 inch)	2.22 mm (0.087 inch)	Red (No. 4)
43.78-43.98 mm (1.724-1.731 inch)	2.35-2.45 mm (0.093-0.096 inch)	2.40 mm (0.094 inch)	Black (No. 5)

46. Remove depth micrometer, gauge bar and gauge tube. Install gauge bar and depth micrometer as shown. Measure down to the No. 5 thrust washer mating surface of overdrive drum. Take another reading on the other side of the shaft (180 degrees apart). Add both readings, divide by two to obtain reading B. Remove gauge bar, depth micrometer and gauge tube from transaxle case.

Reading B



47. NOTE: Reading A was obtained during No. 8 thrust washer selection. Dimension C is found on No. 8 thrust washer selection chart following the selected No. 8 thrust washer.

    Subtract Reading A from Reading B, add difference between A and B to Dimension C. Record this as Reading D.

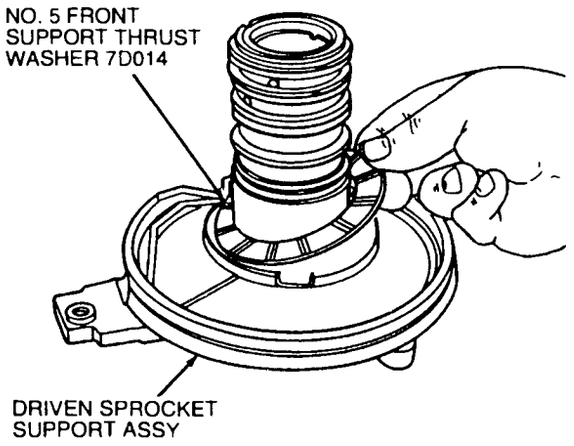
Reading B: _____
- Reading A: _____
Difference: _____
+ Dimension C: _____
Reading D: _____

48. Use Reading D to select the correct No. 5 thrust washer from the chart below.

Reading D	Washer Thickness	Color/ID
26.08-26.37 mm (1.027-1.038 inch)	2.18-2.28 mm (0.086-0.090 inch)	Green (No. 1)
26.38-26.61 mm (1.039-1.047 inch)	2.43-2.53 mm (0.096-0.100 inch)	Black (No. 2)
26.62-26.86 mm (1.048-1.057 inch)	2.67-2.77 mm (0.105-0.109 inch)	Natural (No. 3)
26.87-27.15 mm (1.058-1.068 inch)	2.92-3.02 mm (0.115-0.119 inch)	Red (No. 4)
27.16-27.50 mm (1.069-1.083 inch)	3.26-3.36 mm (0.128-0.132 inch)	Blue (No. 5)

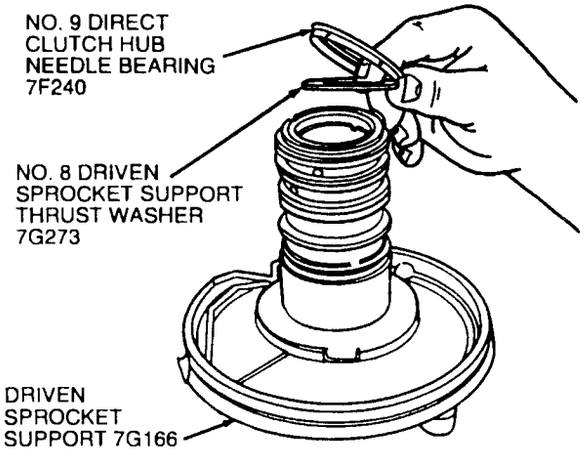
49. NOTE: Use petroleum jelly to hold washer in place for this step.

    Install correct No. 5 thrust washer on driven sprocket support.

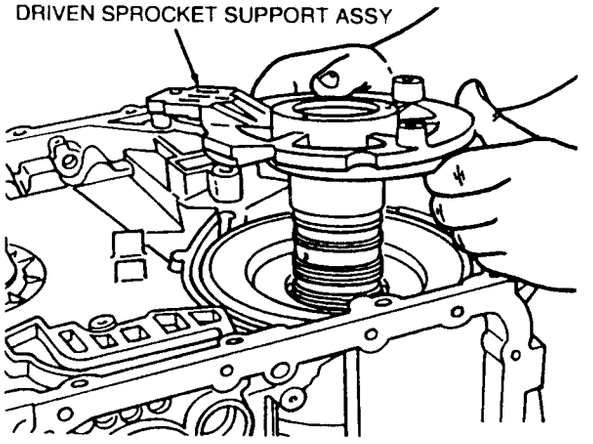


50. Install the correct No. 8 thrust washer and No. 9 needle bearing on driven sprocket support. Use petroleum jelly to hold washer and bearing in place.

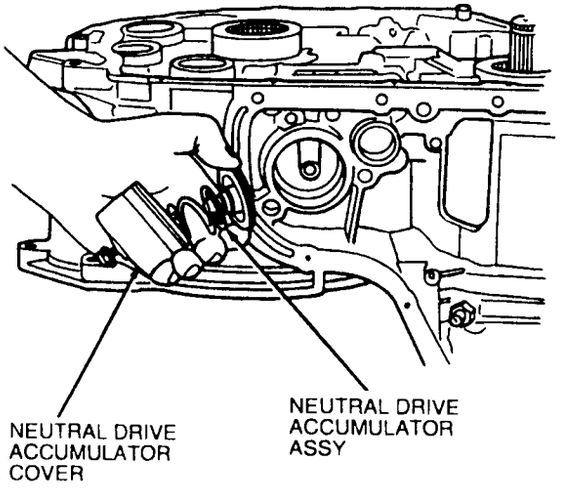
NOTE: No. 9 thrust bearing may still be inside transaxle from No. 8 thrust washer selection procedure.



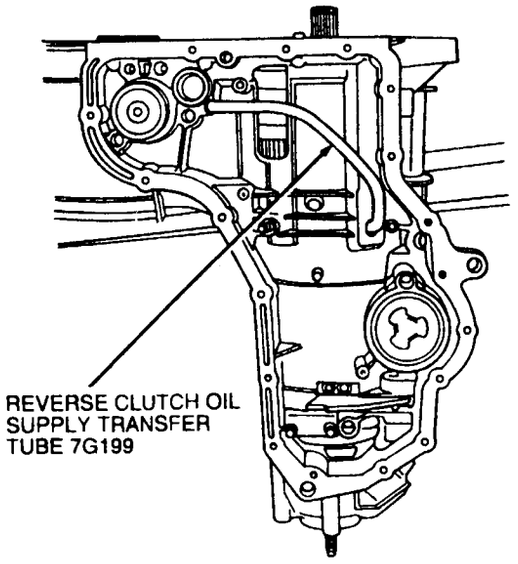
51. Lightly coat all seals with petroleum jelly before support installation. Install driven sprocket support assembly into case, making sure it is fully seated.



52. Install neutral/drive accumulator piston, pin, spring, cover and retaining bolt using an 8 mm socket. Tighten retaining bolt to 11-15 N·m (8-11 lb-ft).

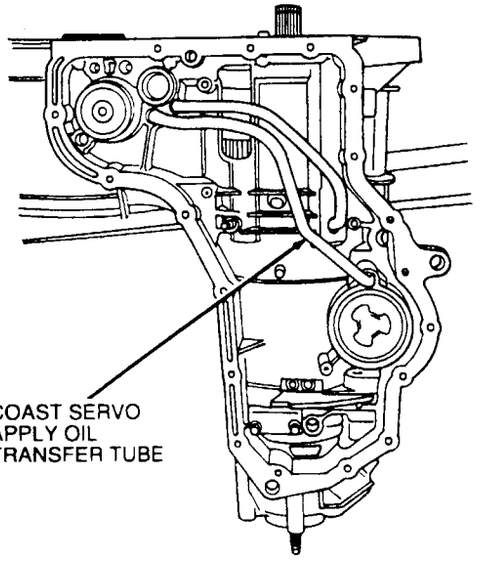


53. Install new O-rings on the lube supply tube if removed. Install reverse clutch oil supply tube in position and tap lightly until fully seated.

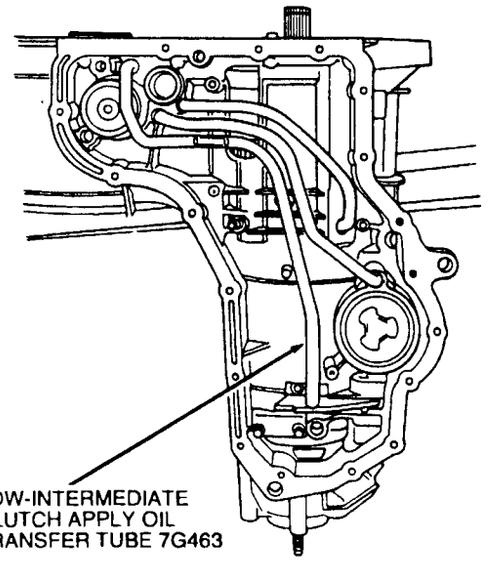


54. **CAUTION: Make sure tubes are firmly seated or they may leak, resulting in improper transaxle operation.**

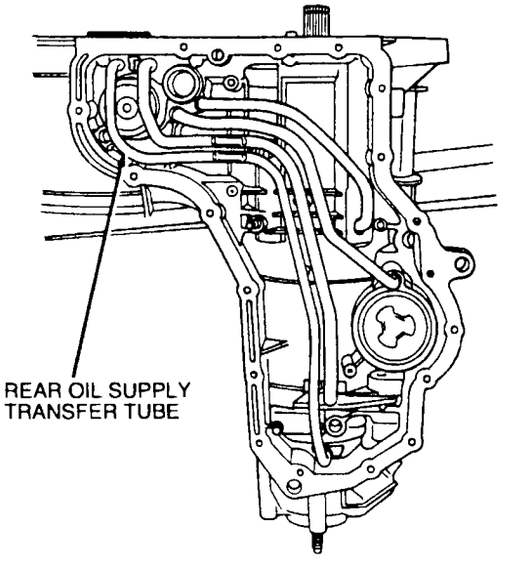
Install new O-rings as necessary and install coast servo apply oil transfer tube.



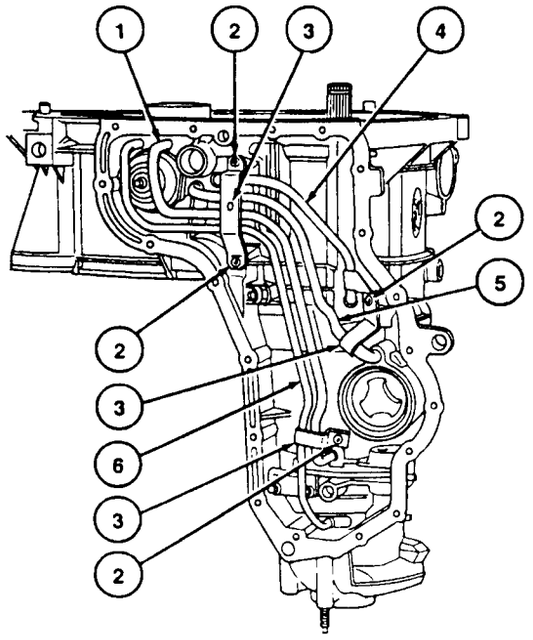
55. Install new O-rings as necessary and install low / intermediate clutch apply oil transfer tube.



56. Install new O-rings as necessary and install rear oil supply transfer tube.

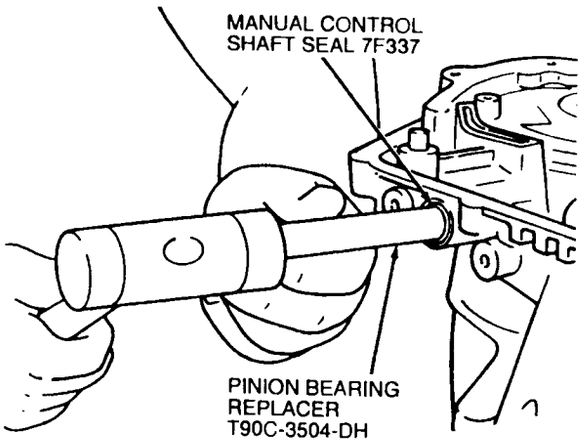


57. Install three lubrication tube support brackets. Tighten bracket bolts to 12 N·m (9 lb-ft).

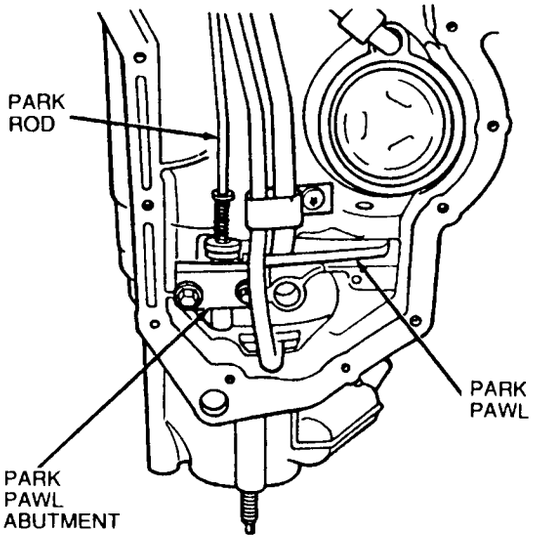


Item	Part Number	Description
1	7G463	Low/Intermediate Clutch Apply Oil Transfer Tube
2	—	Bracket Retaining Screw
3	7G353	Tube Support Bracket
4	7G199	Reverse Clutch Oil Supply Transfer Tube
5	7G087	Servo Apply Oil Transfer Tube
6	7G084	Rear Lubrication Supply Oil Transfer Tube

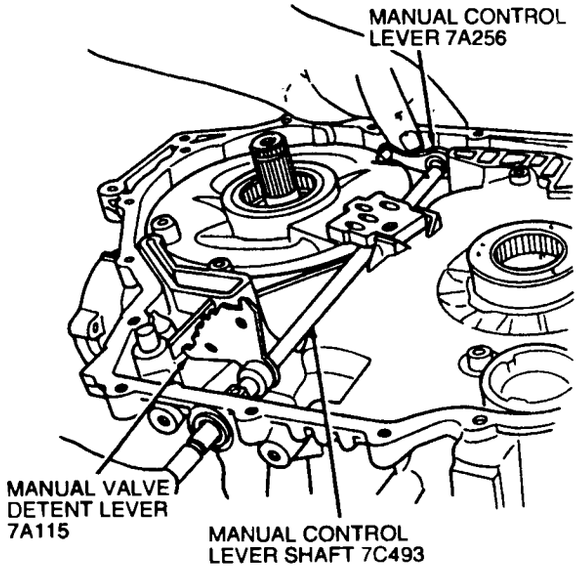
58. Install new manual shaft seal using Pinion Bearing Replacer T90C-3504-DH.



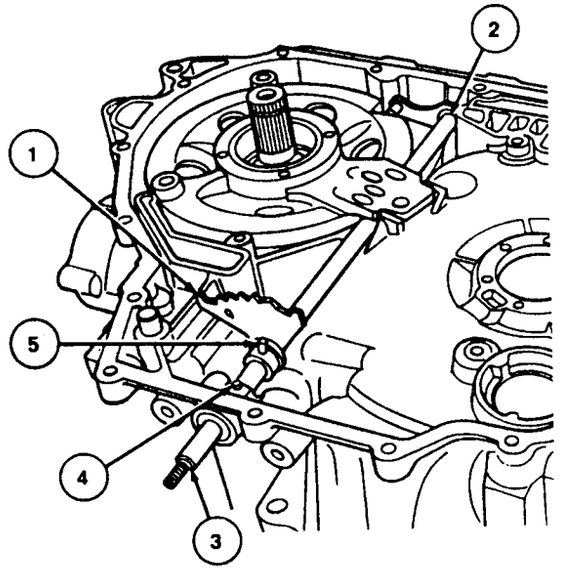
59. Install parking lever actuating rod (7A232) in case. Install park rod abutment and start abutment bolts. Push in parking pawl and locate rod between parking pawl and abutment.



60. Slide manual control lever shaft (7C493), manual control lever on, through parking lever actuating rod and tap into case hole.

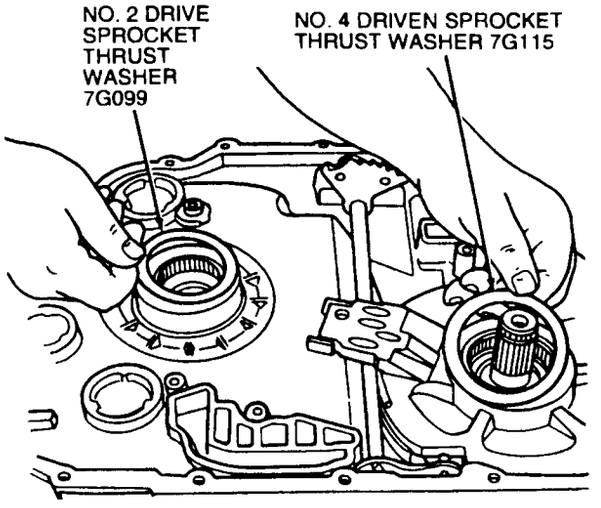


61. Install three new roll pins in manual valve detent lever (7A115) and parking lever actuating rod.



Item	Part Number	Description
1	7A115	Manual Valve Detent Lever
2	7G100	Manual Shaft Roll Pin
3	7C493	Manual Control Lever Shaft
4	7G100	Manual Control Lever Shaft Roll Pin
5	7G100	Manual Valve Detent Lever Roll Pin

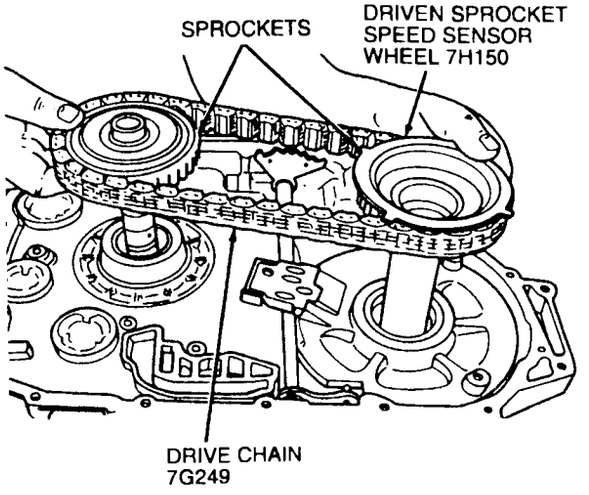
62. Install No. 2 drive support and No. 4 drive support tabbed thrust washers onto drive and drive sprocket supports (7G166). Align tabs on thrust washers with holes in sprocket supports. Apply petroleum jelly to washers to help hold in position.



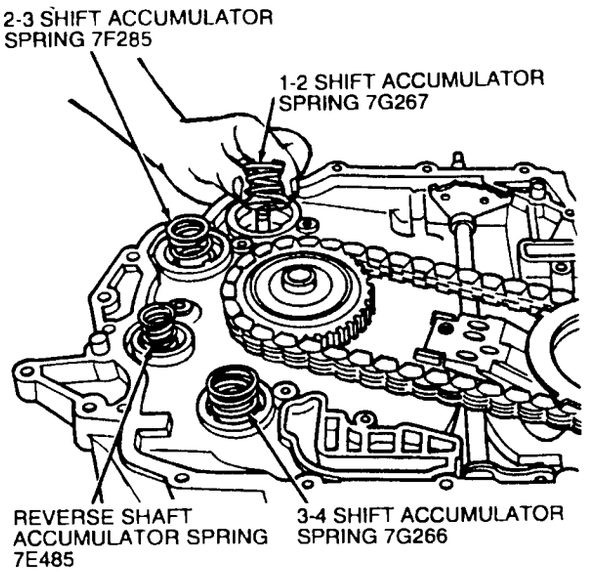
63. **CAUTION: Be careful not to damage or bend exciter tabs on driven sprocket speed sensor wheel. TSS will not operate properly if exciter tabs are bent.**

Install drive chain (7G249) on drive sprocket (7G129) and driven sprockets (7G132). Lower assembly into sprocket supports simultaneously with drive chain parallel to case surface, rotating sprockets to ensure that they are fully seated.

CAUTION: BE CAREFUL NOT TO BEND OR DAMAGE EXCITER TABS ON SPEED SENSOR WHEEL

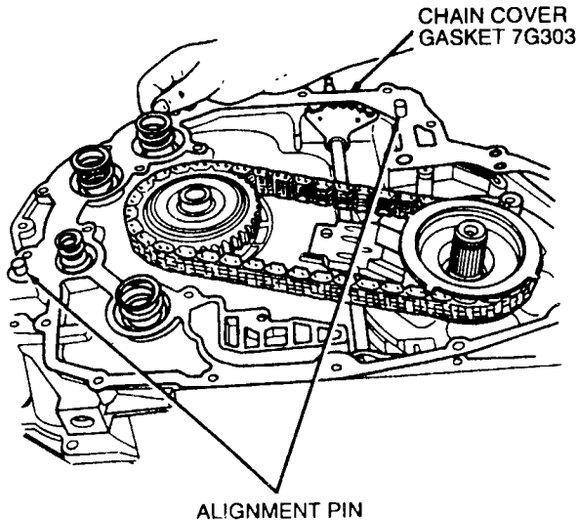


64. Install accumulator springs previously identified in correct position in case.

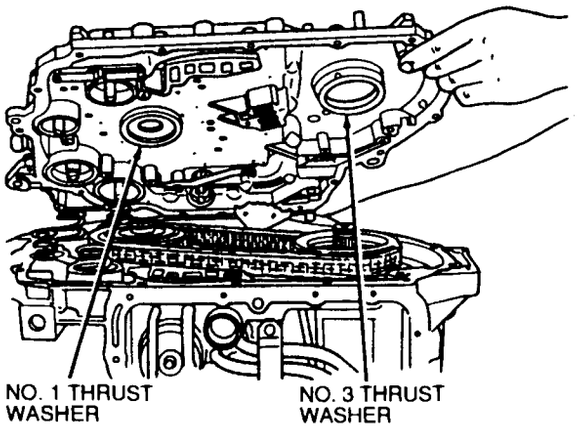


65. NOTE: Make sure alignment pins are installed in case.

Install new chain cover gasket on case.



66. Install No. 1 and No. 3 thrust washers on chain cover (7G188). Use petroleum jelly to hold in place. Make sure tabs align with slots in chain cover.

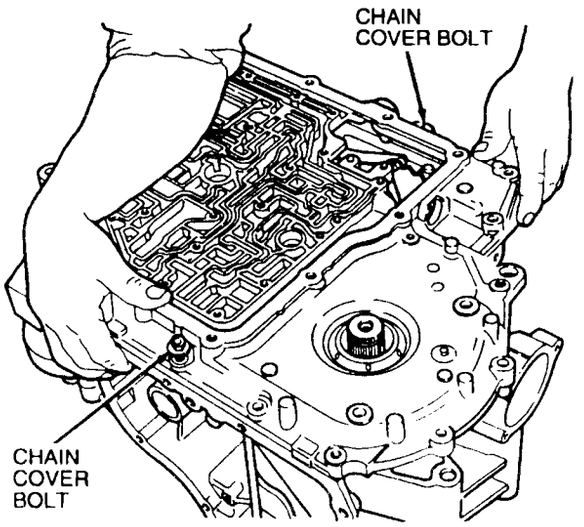


67. **CAUTION: Be extremely careful to prevent damage to the input shaft cast iron sealing ring.**

NOTE: No. 1 and No. 3 thrust washers installed in previous step must stay installed to case. If accumulator piston shafts fall out of chain cover, reinstall to their bores.

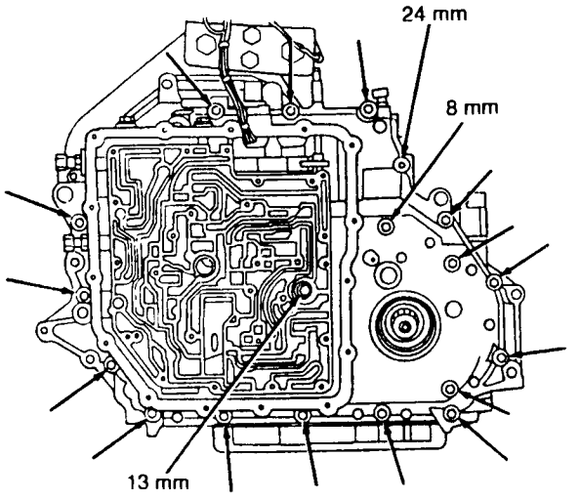
Carefully align chain cover input shaft bore with input shaft. Apply gentle downward pressure on chain cover to overcome accumulator spring pressure and start two chain cover bolts.

NOTE: After installing chain cover, input shaft should have some end play and should rotate freely. If it will not rotate freely, remove chain cover and inspect cast iron seal for damage.



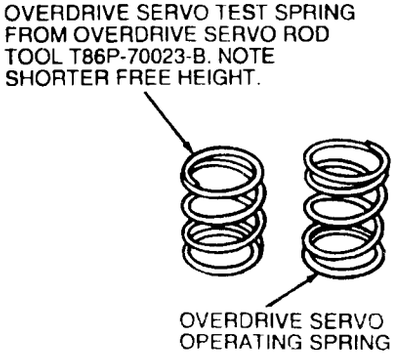
68. Start remaining chain cover bolts and tighten 10 mm bolts to 23-28 N·m (17-21 lb-ft). Tighten 8 mm bolt to 9-12 N·m (7-9 lb-ft). Tighten 13 mm bolt to 40-45 N·m (30-33 lb-ft). Install shaft cable stub (24 mm wrench) at location 9 and tighten to 27-35 N·m (20-26 lb-ft). Tighten bolts in sequence shown.

Chain Cover Bolts Torque Sequence

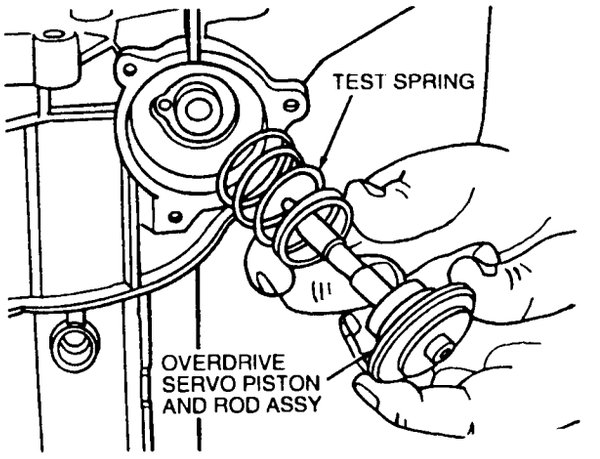


69. **CAUTION: The test spring from the Overdrive Servo Tool is plain in color and has a shorter free height than the operational spring. Extreme care must be used not to assemble the transaxle using the test spring.**

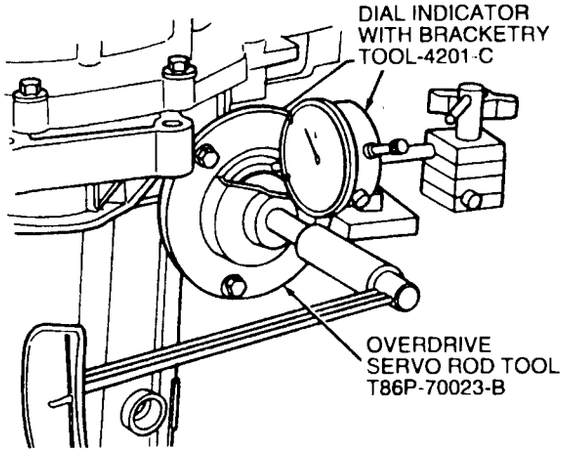
Check overdrive servo travel. Install test spring, from Overdrive Servo Rod Tool T86P-70023-B in case.



70. Install overdrive servo piston (7F200) and overdrive servo rod (7F203) into case.



71. Install Overdrive Servo Rod Tool T86P-70023-B and secure using servo cover bolts. Tighten bolts to 9-12 N·m (7-9 lb-ft). Install Dial Indicator With Bracketry TOOL-4201-C or equivalent as shown.



72. Tighten center screw on tool to 1.13 N·m (10 lb-in). Zero dial indicator.

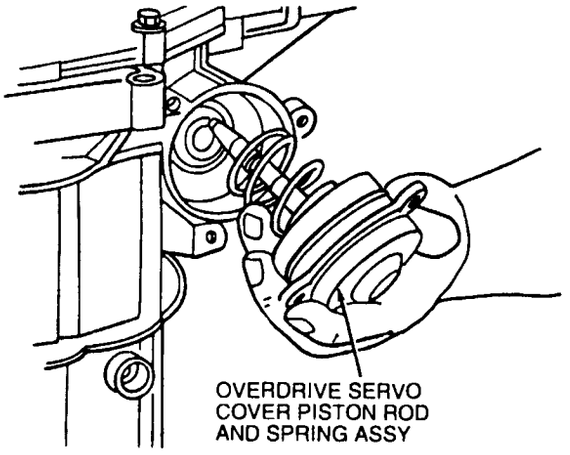
73. Back off center screw until piston movement stops and read dial indicator. The reading should be 1.8-3.8 mm (0.070-0.149 inch). If measurement does not meet specifications, refer to overdrive piston rod selection chart to determine which overdrive servo rod to install.

Overdrive Servo Rod Length		Number of Grooves (grooves are at the tip)
mm	Inch	
99.33	3.91	0
98.05	3.86	1
96.78	3.81	2

74. **CAUTION: Test spring for overdrive servo tool is plain colored. DO NOT assemble the transaxle using the test spring or transaxle may not operate properly.**

    If overdrive servo travel was incorrect, install new overdrive servo rod and repeat this procedure to verify amount of piston travel. If within specifications, remove tool and test spring.

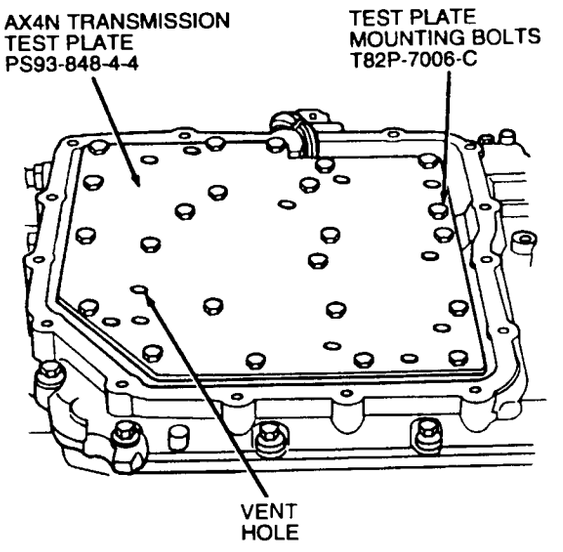
75. Install overdrive servo cover, piston, rod and spring assembly. Tighten retaining bolts to 10-12 N·m (84-108 lb-in).

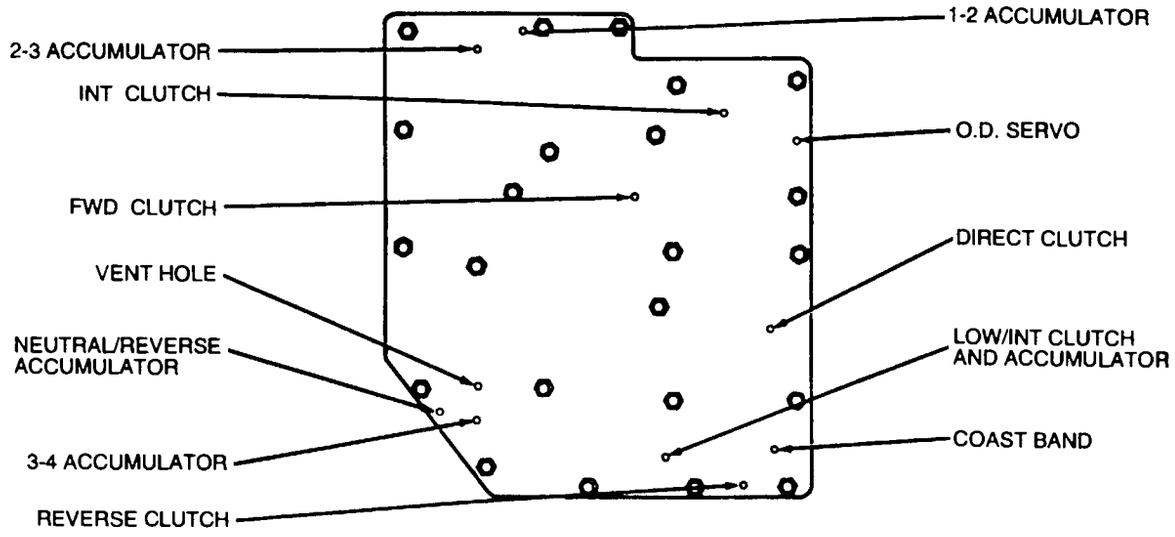


76. **WARNING: WEAR SAFETY GLASSES WHILE PERFORMING THIS PROCEDURE TO PREVENT PERSONAL INJURY.**

    NOTE: When applying regulated 276 kPa (40 psi) air pressure to the appropriate passage, a dull thud should be heard when the clutch or band applies. There should be no hissing sound when clutch or band is applied. Cover the vent hole in the test plate with a clean, lint-free shop towel to prevent spray when air is applied. Plugging vent hole during testing will result in inaccurate results.

    Perform air pressure checks using AX4N Transmission Test Plate T94P-77001-EH and Test Plate Mounting Bolts T82P-7006-C as outlined under Diagnosis and Testing. After pressure checks have been performed, remove tool.



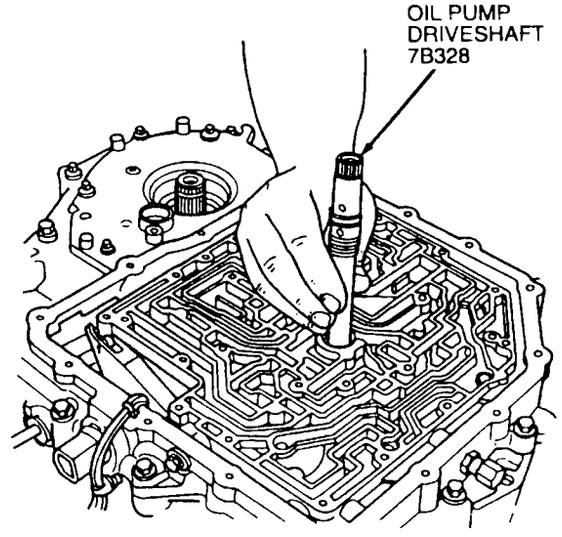


77. **CAUTION: Seals must be lapped correctly or internal leakage will occur.**

CAUTION: SEAL RINGS MUST BE INSTALLED CORRECTLY

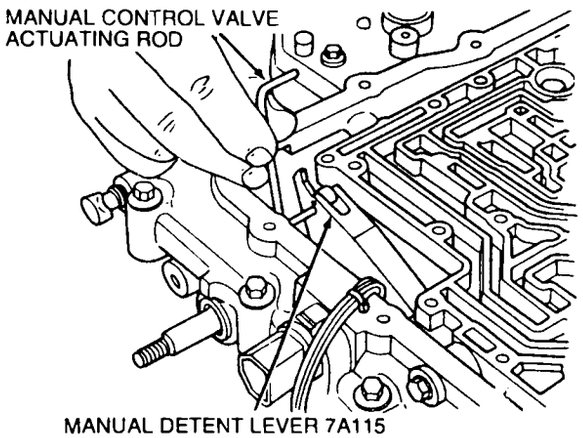
CORRECT **INCORRECT**

Install four new Teflon® oil pump shaft rear seals (7G093) and front pump shaft front seals (7G092) on oil pump shaft (7B328) and install oil pump shaft.



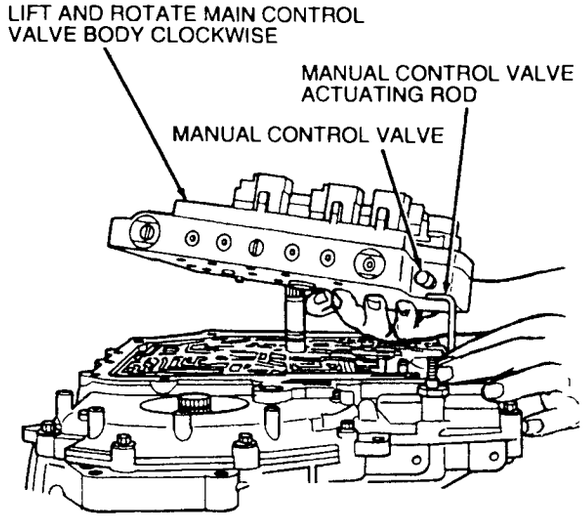
78. NOTE: Crimped end of link goes through detent lever.

Connect manual control valve actuating rod link to manual valve detent lever.



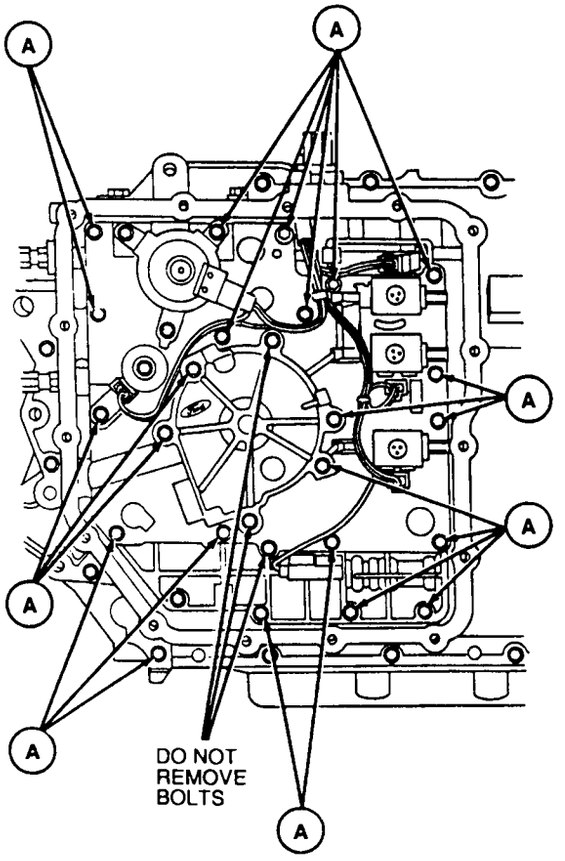
MANUAL DETENT LEVER 7A115

79. Start oil pump and main control valve body (7A100) over oil pump shaft and connect manual control valve actuating rod to manual shift valve (7C389). Push main control valve body down until seated.



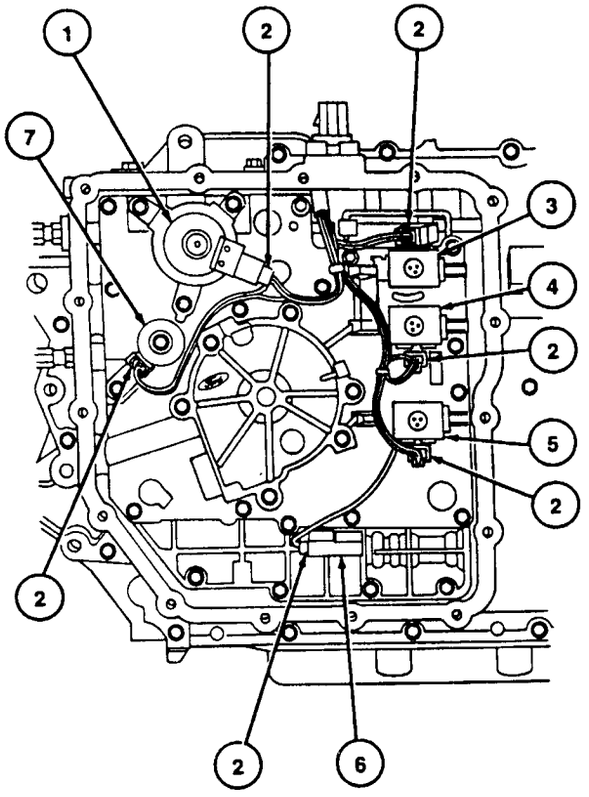
80. Install 23 main control valve body bolts and tighten in sequence (tighten from center outward) to 9-12 N·m (7-9 lb-ft).

Main Control Valve Body Bolts



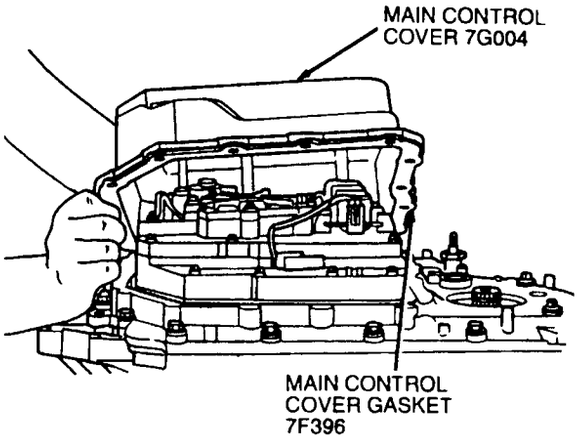
81. Install electrical connectors on proper solenoids and sensor until a slight click is felt.

Transaxle Electrical Connections



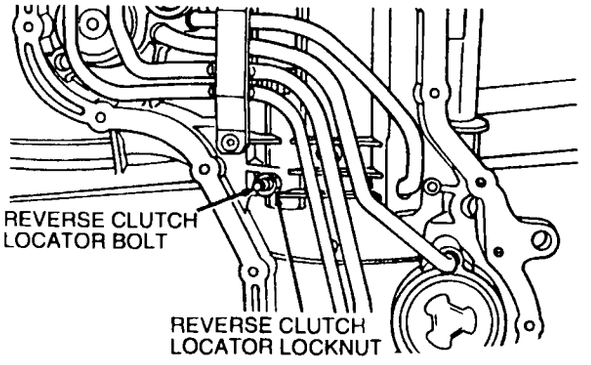
Item	Part Number	Description
1	—	Electronic Pressure Control (EPC) Solenoid
2	—	Electrical Connector
3	—	Shift Solenoid #1 (SS-2)
4	—	Shift Solenoid #2 (SS-1)
5	—	Shift Solenoid #3 (SS-3)
6	—	Transmission Fluid Temperature (TFT) Sensor
7	—	Torque Converter Clutch (TCC) Solenoid

82. Install main control cover gasket (7F396) and main control cover (7G004).

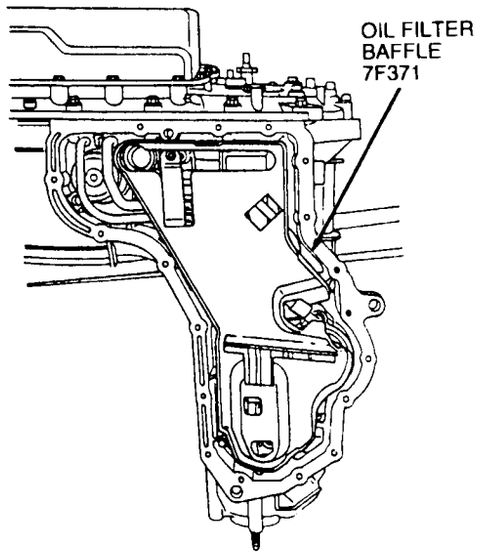


83. Tighten main control cover bolts to 9-11 N·m (6.5-8 lb-ft).

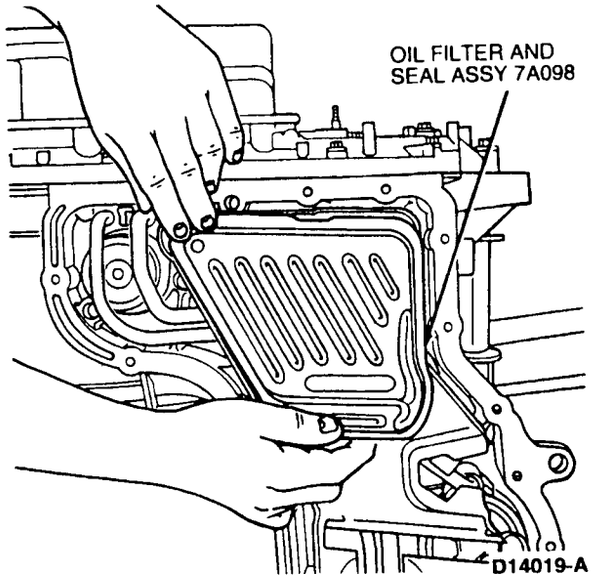
84. Use 6 mm Allen wrench to tighten reverse clutch locator to 10-12 N·m (90-170 lb-in). Use 19 mm socket to tighten locknut to 39-47 N·m (29-35 lb-ft).



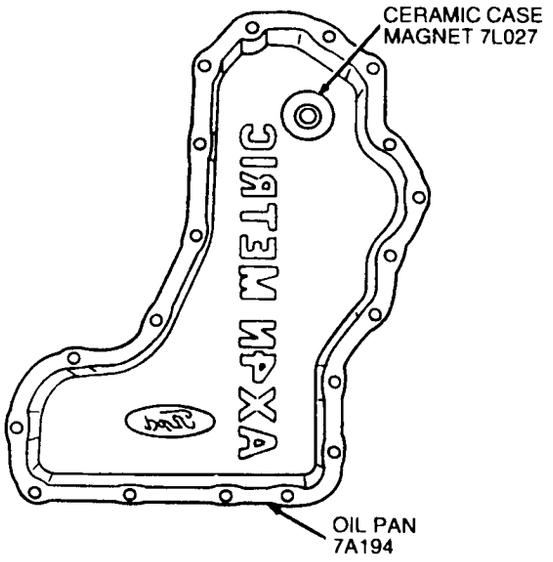
85. NOTE: Baffle clips over rear lube tube.
Install oil pan baffle (if equipped).



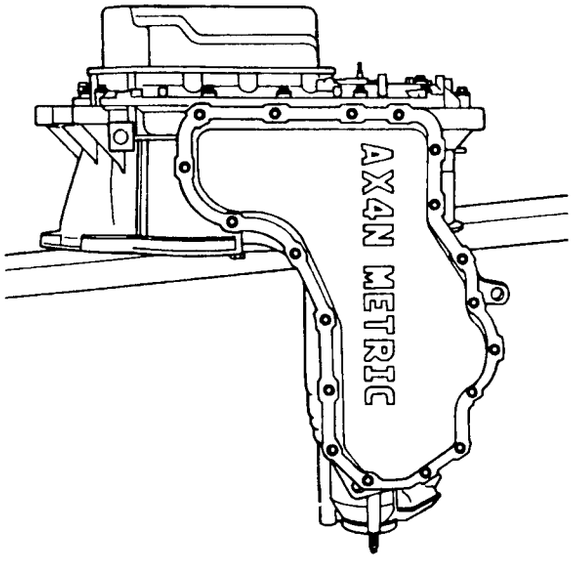
86. Install new oil filter and seal assembly.



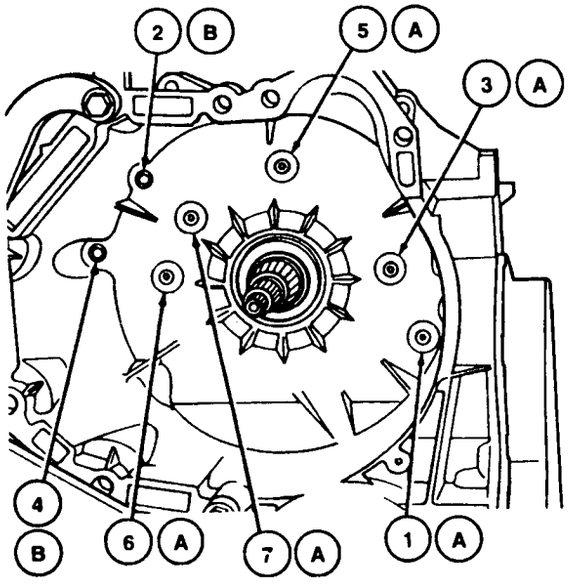
87. Install clean magnet in oil pan in correct location.



88. Install oil pan with new pan gasket. Tighten oil pan retaining bolts to 9-11 N·m (7-9 lb-ft).

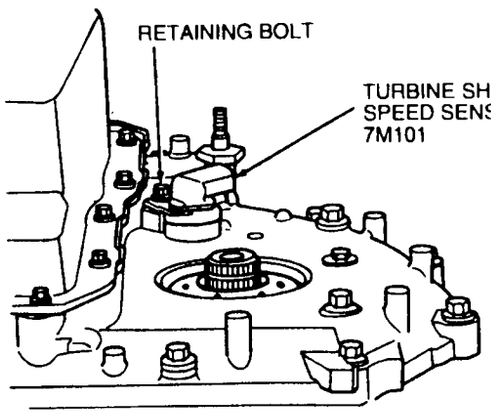


89. Install remaining chain cover bolts in converter housing. Tighten in sequence using torque shown.

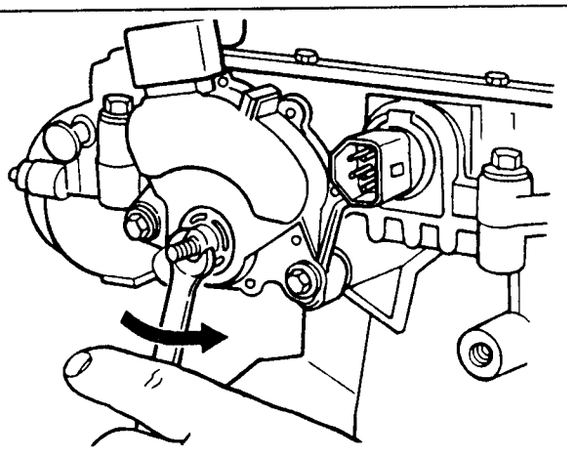


Item	Part Number	Description
A	—	Using an 8 mm wrench, tighten to 10-14 N·m (7.5-10 Lb-Ft)
B	—	Using a 10 mm wrench, tighten to 25-28 N·m (18-21 Lb-Ft)

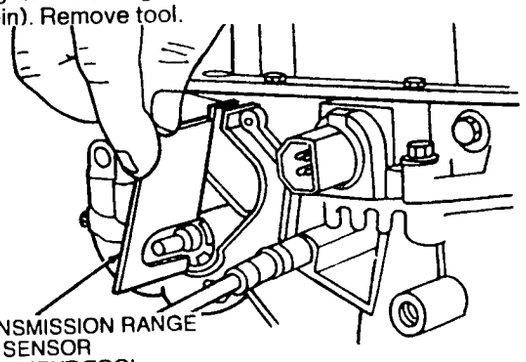
90. Install turbine shaft speed sensor to case. Tighten retaining bolt to 10-14 N·m (7.5-10 lb-ft).



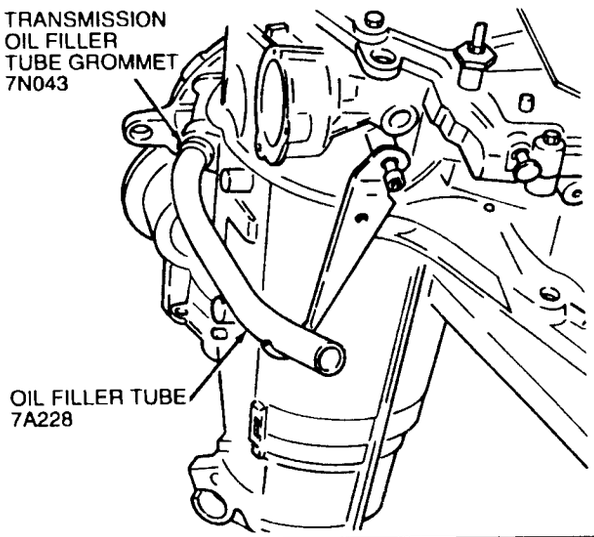
91. Install transmission range sensor and loosely install two retaining bolts.
92. Use a 9 mm wrench on the manual shaft flats to rotate the shaft counterclockwise to the PARK detent.



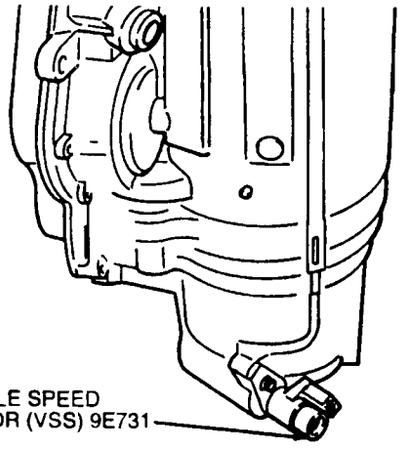
93. Rotate two detent positions clockwise to the NEUTRAL detent position.
94. Align TR sensor slots using Transmission Range (TR) Sensor Alignment Tool (MLPS Alignment Tool) T92P-70010-AH. Refer to Section 07-14A.
95. Tighten retaining bolts to 10.5-12 N·m (96-108 lb-in). Remove tool.



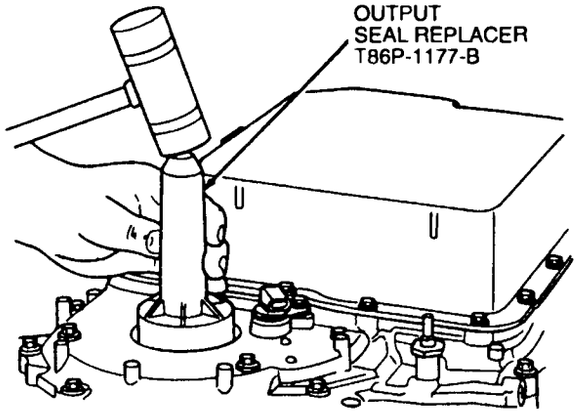
96. Install oil filler tube grommet into case, then install oil filler tube (7A228). Tighten bolt to 10.5-12 N·m (84-108 lb-in).



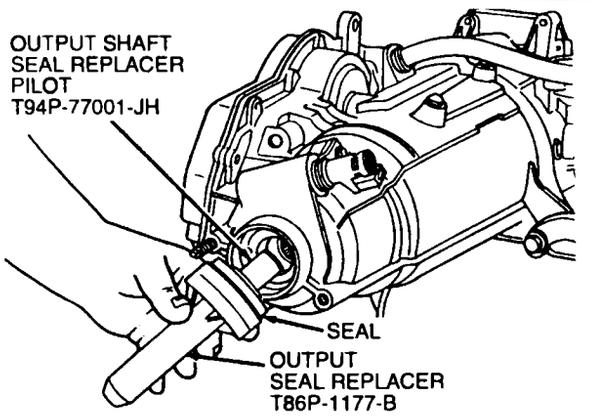
97. Install vehicle speed sensor (VSS). Tighten retaining bolt to 10.5-12 N·m (8-9 lb-ft).



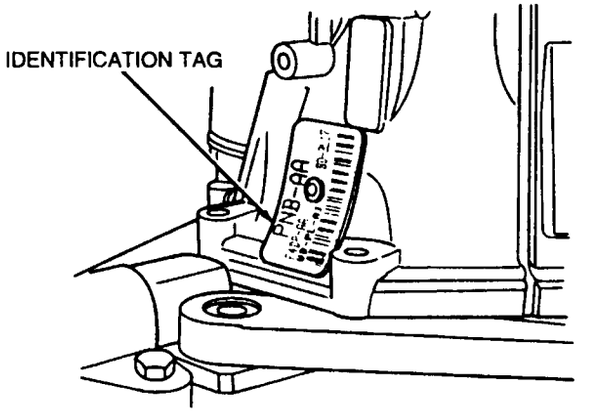
98. Install LH output shaft seal using Output Seal Replacer T86P-1177-B.



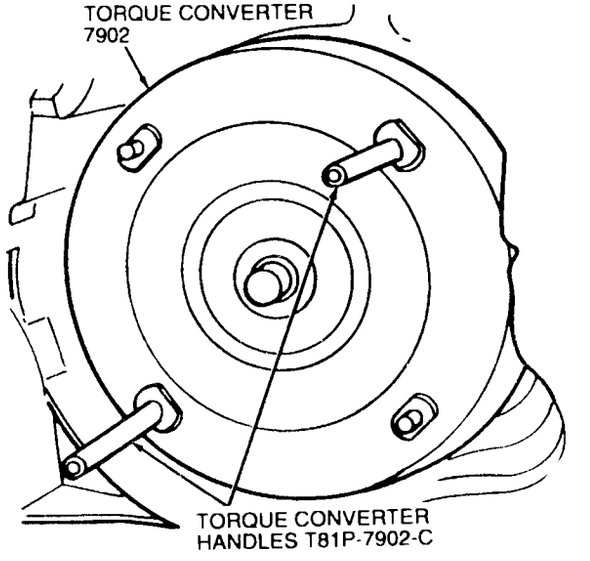
99. Install RH output shaft seal using Output Seal Replacer T86P-1177-B and Output Shaft Seal Replacer Pilot T94P-77001-JH.



100. Install identification tag on transaxle case.



101. Install torque converter (7902) using Torque Converter Handles T81P-7902-C.



102. Remove torque converter handles T81P-7902-C.

SPECIFICATIONS

FLUID CAPACITY

Type	Liters	Quarts
Motorcraft MERCON® Multi-Purpose ATF XT-2-QDX or MERCON® equivalent	13.2	14

TORQUE SPECIFICATIONS

Description	N·m	Lb-Ft
Drive Sprocket Support Bolts	7-9	5-7
Separator Plate to Pump Body	9-12	7-9
Detent Spring to Chain Cover	9-12	7-9
Low-Intermediate Servo Cover to Case	11-15	8-11
Overdrive Servo Cover to Case	9-12	7-9
Pump Cover to Pump Body	12-16	9-12
Filler Tube to Case	10-14	7.5-10
Case to Stator Support	7-9	7-9
Pump Assy to Main Control	9-12	7-9
Transmission Range Sensor to Case	9-12	7-9
Valve Body / Solenoid to Chain Cover	9-12	7-9
Valve Body to Pump	9-12	7-9
Dust Cover to Case	9-12	7-9
Chain Cover to Case (10 mm) Socket Size	23-28	17-21
Pump Body to Chain Cover	9-12	7-9
Main Control Cover to Chain Cover (Upper Reservoir)	9-11	6.5-8
Manual Lever to Manual Shaft	16-22	12-16
Case to Reverse Drum Bolt	10-12	7-9
Case to Reverse Drum Nut	34-47	26-35
Pressure Tap Plug for Chain Cover and Pump Body	6-8	4.5-6
Pressure Switch to Pump Body	8-12	6-9
Hose Screws	2.2-3.4	20-30 (Lb-In)
Oil Pan to Case (Lower Reservoir)	9-11	6.5-8
Chain Cover to Case (13mm) Socket Size	27-35	20-26
Case to Chain Cover (10mm) Socket Size	23-28	17-21
Case to Chain Cover (8mm) Socket Size	10-14	7.5-10
Transaxle to Engine Bolt	55-68	41-50
Stabilizer U-Clamp to Bracket Bolt	30-40	23-29
Brake Hose Routing Clip Bolt	11	8
Tie Rod to Knuckle Bolt [a]	31-47	23-35
Manual Cable Bracket Bolt	14-27	10-20
Starter Bolt	41-54	30-40
Dust Cover Bolt	9-12	7-9
Torque Converter to Flywheel Bolt	31-53	23-39

(Continued)

TORQUE SPECIFICATIONS (Cont'd)

Description	N·m	Lb-Ft
Vehicle Speed Sensor Bolt	3.4-4.5	31-39 (Lb-In)
Sub-frame Bolt	75-102	55-75
Lower Arm Pinch Bolt	53-72	40-53
Wheel Hub Bolt Nuts	115-142	85-105
Power Steering Line Bracket Bolts	4.5-5.7	40-50 (Lb-In)
Steering Gear Bolts	115-135	85-100
Engine Mount Bolts	81-116	60-85
LH Engine Support Bolts	54-75	40-55
Engine Mount to Support	74-102	55-75
Cooler Line Fitting at Radiator Transaxle Cooler Line Nut	11-18 [b] 24-31 [b] 18-24	8-12 18-23 13-18
Tube Nut to Connector	16-24	12-18
Threaded Connector to Cooler	11-16	8-12
Cooler Tube Bracket Bolts	11	8

a Tighten to minimum specified torque, continue tightening to nearest cotter pin slot.
b 1/4 inch x 18 Straight Pipe Fitting