SECTION 7

TRANSMISSION/TRANSAXLE

CONTENTS

SECTION 7A

TRANSMISSION/TRANSAXLE GENERAL INFORMATION

CONTENTS

The information contained in this section is common to all automatic transmission/transaxles. For on-vehicle service procedures refer to Section 7A1. For complete Diagnosis and Unit Repair refer to the specific transmission/transaxle sections.

For vehicles sold in Canada also refer to the appropriate Canadian Service Manual Supplement for driveability diagnosis.

TRANSMISSION/TRANSAXLE IDENTIFICATION INFORMATION

See Figures 1 thru 3

All automatic transmission/transaxles have a metal identification nameplate attached to the case exterior. The location of this name plate is shown in Figure 1 and Figure 2. The information on the nameplate will assist in the servicing and determination of replacement parts when ordered through a GM Parts Catalog.

Additional transmission/transaxle identificaiton is provided on the Service Parts Identification Label. This label contains information on the regular production options (RPO) as well as standard and mandatory options. This label is affixed to the inside of each vehicle at the assembly plant. Refer to Section 0A of this Service Manual for label location and information.

TRANSMISSION/TRANSAXLE DEFINITIONS

The following definitions are being provided to establish a common language and assist the user in describing transmission/transaxle related conditions. Some of these terms or conditions are used in the Unit Repair sections of this Service Manual.

Throttle Positions

- **Minimum Throttle** - the least amount of throttle opening required for an upshift.
- **Light Throttle** - approximately 1/4 of accelerator pedal travel.
- **Medium Throttle** - approximately 1/2 of accelerator pedal travel.
- **Heavy Throttle** - approximately 3/4 of the accelerator pedal travel.
- **Wide Open Throttle (WOT)** - full travel of the accelerator pedal.

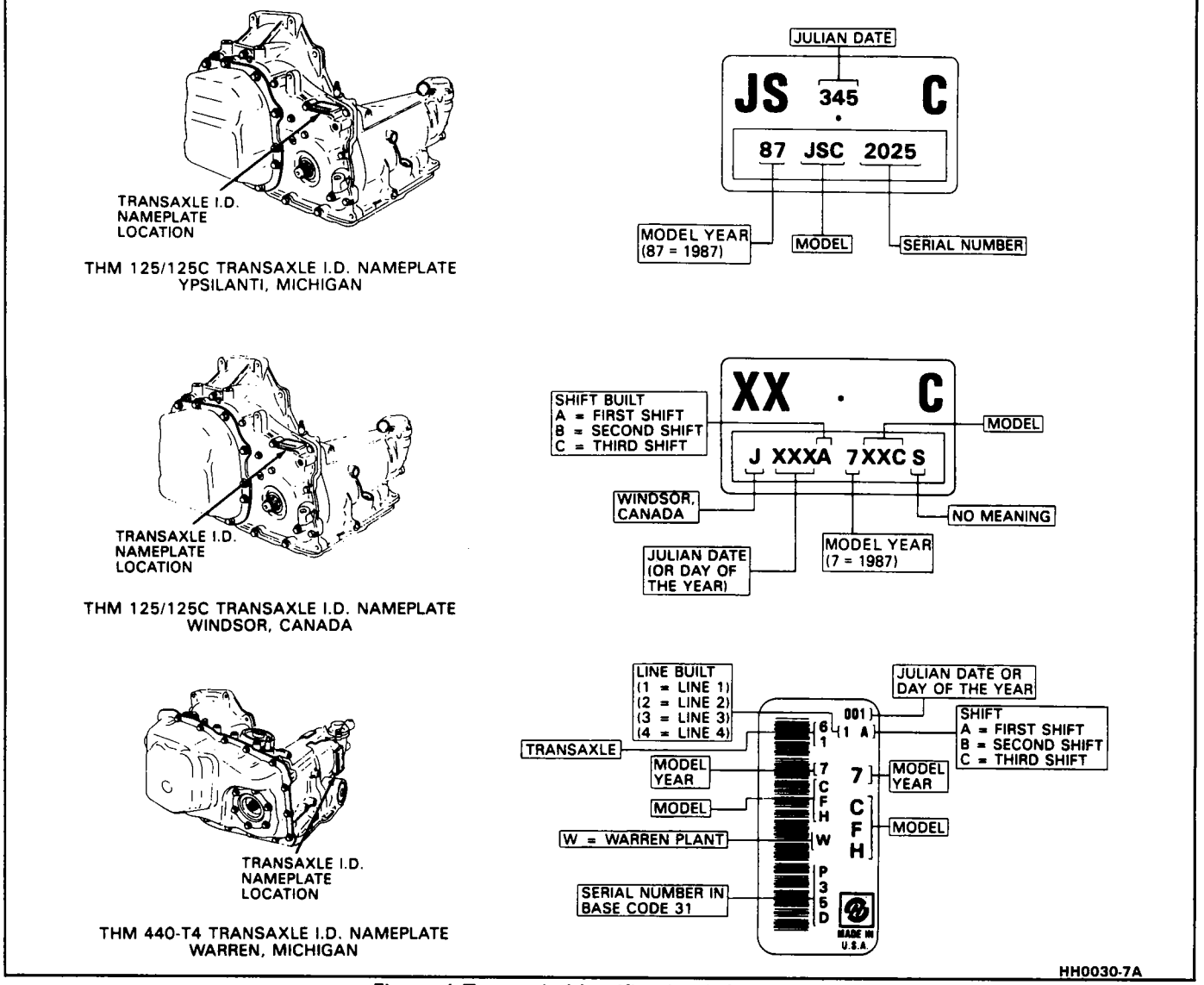


Figure 1 Transaxle Identification Information

- **Full Throttle Detent Downshift** - a quick apply of the accelerator pedal to its full travel, forcing a downshift.
- **Zero Throttle Coastdown** - a full release of the accelerator pedal while the vehicle is in motion and in drive range.
- **Engine Braking** - a condition where the engine is used to slow the vehicle by manually downshifting during a zero throttle coastdown.

Shift Conditions

- **Bump** - a sudden and forceful apply of a clutch or band.
- **Chuggle** - a bucking or jerking condition that may be engine related. May be most noticeable when the converter clutch is engaged. Similar to the feel of towing a trailer.
- **Delayed** - a condition where a shift is expected but does not occur for a period of time. Samples of this condition could be described as clutch or band engagement does not occur as quickly as expected during a part throttle or wide open throttle apply of the accelerator or, when manually downshifting to a lower range. Also defined as "LATE" or, "EXTENDED."
- **Double Bump ("Double Feel")** - two sudden and forceful applies of a clutch or band.
- **Early** - a condition where the shift occurs before the vehicle has reached a proper speed and tends to labor the engine after the upshift.
- **End Bump** - a firmer feel at the end of a shift as compared to the feel at the start of the shift. Also defined as "END FEEL" or, "SLIP BUMP."
- **Firm** - a noticeable quick apply of a clutch or band that is considered **normal** with a medium to heavy throttle shift. Should not be confused with "HARSH" or "ROUGH."
- **Flare** - a quick increase in engine rpm accompanied with a momentary loss of torque. This most generally occurs during a shift. Also defined as "SLIPPING."
- **Harsh ("Rough")** - a more noticeable apply of a clutch or band as compared to "FIRM." This condition is considered undesireable at any throttle position.

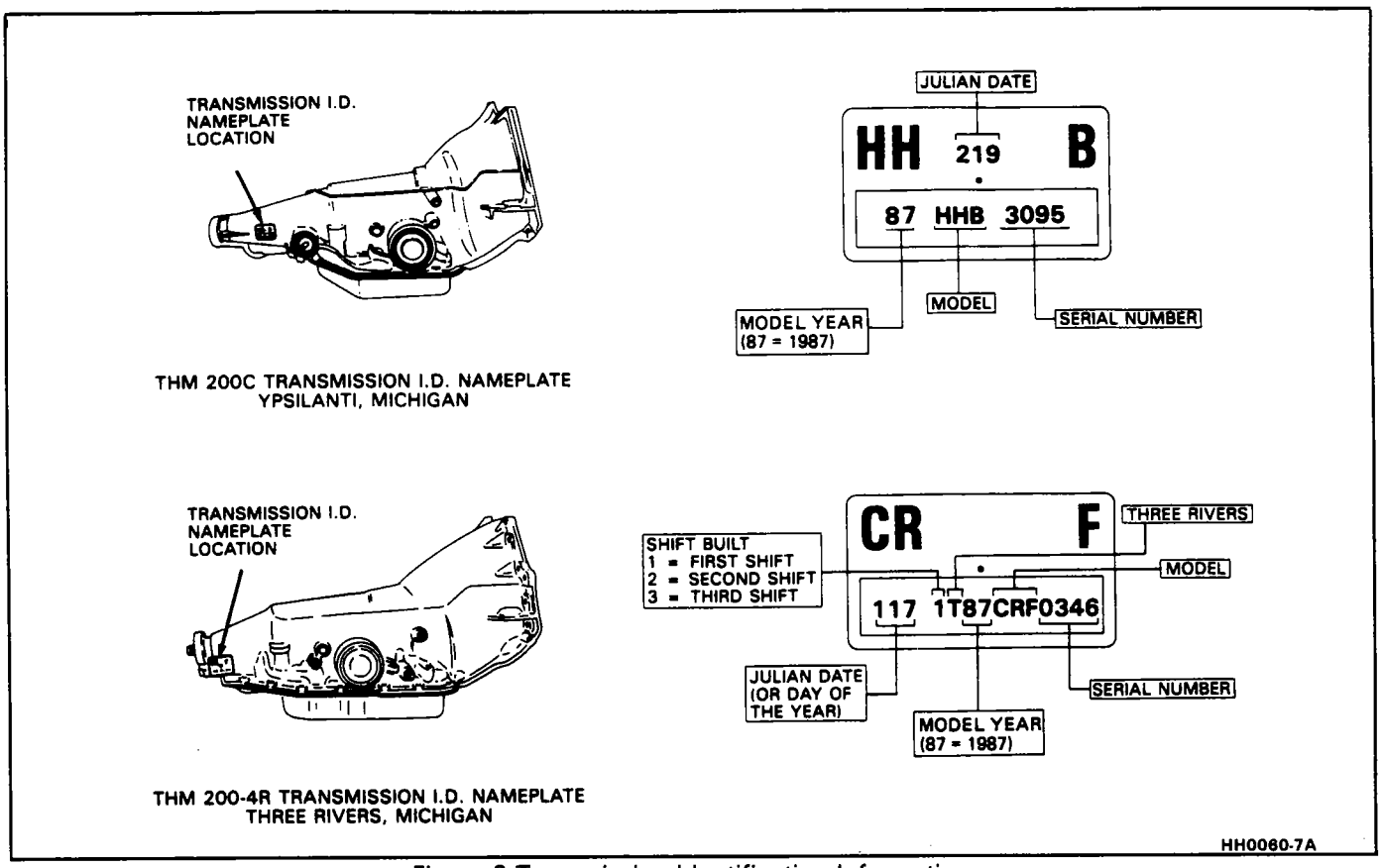


Figure 2 Transmission Identification Information

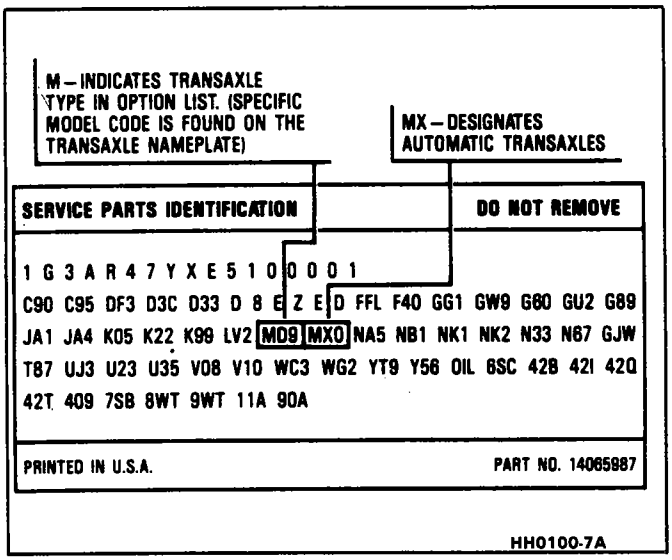


Figure 3 Service Parts Identification Label

- **Hunting** - a repeating quick series of upshifts and downshifts that causes a noticeable change in engine rpm. An example could be described as a 4-3-4 shift pattern. Also defined as "BUSYNESS."
- **Initial Feel** - a distinct firmer feel at that start of a shift as compared to the finish of the shift.
- **Late** - a shift that occurs when the engine is at a higher than normal rpm for a given amount of throttle.
- **Shudder** - a repeating jerking sensation similar to "CHUGGLE" but more severe and rapid in nature. This condition may be most noticeable during certain ranges of vehicle speed. May also be used to define the condition after converter clutch engagement.
- **Slipping** - a noticeable increase in engine rpm without a vehicle speed increase. A slip usually occurs during or after initial clutch or band engagement.
- **Soft** - a slow, almost unnoticeable clutch apply with very little shift feel.
- **Surge** - a repeating engine related feeling of acceleration and deceleration that is less intense than "CHUGGLE."
- **Tie-Up** - a condition where two opposing clutches are attempting to apply at the same time causing the engine to labor with a noticeable loss of engine rpm.

Noise Conditions

- **Chain Noise** - a whine or growl that increases and fades with vehicle speed and is most noticeable under light throttle acceleration. May also be noticeable in PARK or NEUTRAL operating ranges with the vehicle stationary.
- **Final Drive Noise** - a hum related to vehicle speed and is most noticeable under light throttle acceleration.
- **Gear Noise** - a whine, most noticeable in first gear and reverse that is related to vehicle speed. A gear noise condition may become less noticeable or go away after an upshift.
- **Pump Noise** - a high pitch whine that increases in intensity with engine rpm. This condition may

also be noticeable in PARK and NEUTRAL operating ranges with the vehicle stationary.

PRELIMARY CHECKING PROCEDURE

The condition of an automatic transmission/transaxle not operating properly may be influenced by one, or a combination of the following items:

- Fluid level high/low
  (Refer to Section 7A1 or 7A2)
- Engine performance
  (Refer to Sections 6 and 6E)
- T.V. cable adjustment
  (Refer to Section 7A1 or 7A2)
- Manual linkage adjustment
  (Refer to Section 7A1 or 7A2)
- Internal fluid leaks
  (Refer to specific Unit Repair section)
- Electrical system
  (Refer to Section 6E and 8A)
- Transmission/transaxle or other mechanical component
  (Refer to specific Unit Repair section)
- Vacuum modulator
  (Refer to appropriate Hydraulic Diagnosis Section)

NOISE AND VIBRATION ANALYSIS

A noise or vibration that is noticeable when the vehicle is in motion, MAY NOT be the result of the transmission/transaxle.

If noise or vibration is noticeable in "Park" (P) and "Neutral" (N) with engine at idle, but is less noticeable as RPM's increase, the cause may be from poor engine performance.

Inspect

- Tires for
  - Uneven wear
  - Imbalance
  - Mixed sizes
  - Mixed radial and bias ply
    (Refer to Section 3E)
- Suspension components for
  - Alignment and wear
  - Loose fasteners
    (Refer to Section 3C1 or 3C2)
- Engine or transmission/transaxle mounts for
  - Damage
  - Loose bolts
    (Refer to Sections 6A, 7A1 and 7A2)
- transmission/transaxle case mounting holes for:
  - Missing bolts, nuts, studs
  - Stripped threads
  - Cracks
- Flexplate for:
  - Missing or loose bolts
  - Cracks
  - Imbalance
    (Refer to Section 6A)
- Torque converter for:
  - Missing or loose bolts or lugs
  - Missing or loose balance weights
  - Imbalance

TRANSMISSION/TRANSAXLE FLUID LEVEL INFORMATION

Checking fluid level, color and condition at regular intervals will provide early diagnosis information about the transmission/transaxle. This information may then be used to correct a condition that, if not detected early, could result in major transmission/transaxle repairs.

When adding or changing fluid, use only DEXRON® II, or equivalent. Refer to Section 0B of this Service Manual for maintenance information and servicing intervals.

- Fluid level should be checked when it reaches normal operating temperatures of 190-200°F. (88-93°C). This temperature is reached after approximately 15 miles (24 km) of highway driving.
- Fluid color
  - Should be dark red (may be dark green)

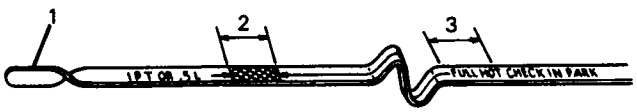
NOTICE: Do not overfill. Overfilling will cause foaming, loss of fluid and possible damage to the transmission/transaxle.

- Inaccurate fluid level readings will result if checked immediately after the vehicle has been operated:
  - In high abmient temperatures above 90°F (32°C)
  - At sustained high speeds
  - In heavy city traffic during hot weather
  - As a towing vehicle
  - In commercial service (taxi or police use)

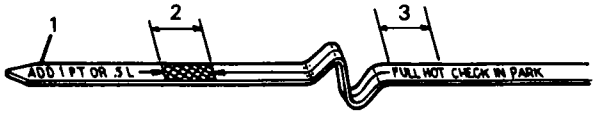
TRANSMISSION/TRANSAXLE FLUID CHECKING PROCEDURE

See Figure 4

1. Park vehicle on level ground.
2. Apply parking brake and block wheels.
3. Start engine and operate vehicle for 15 minutes or until a normal operating temperature is reached.
4. Move gear selector through all gear positions.
5. Move gear selector to "Park" (P).
6. Check fluid level, color and condition.



1 FLUID LEVEL INDICATOR (125C)
2 LEVEL TO BE IN CROSS-HATCHED AREA ON FLUID LEVEL INDICATOR BLADE. CHECK AT OPERATING TEMPERATURE.
3 COLD LEVEL ENGINE OFF



1 FLUID LEVEL INDICATOR (440-T4)
2 LEVEL TO BE IN CROSS-HATCHED AREA ON FLUID LEVEL INDICATOR BLADE. CHECK AT OPERATING TEMPERATURE.
3 COLD LEVEL ENGINE OFF

CHECKING FLUID COLOR, LEVEL AND CONDITION

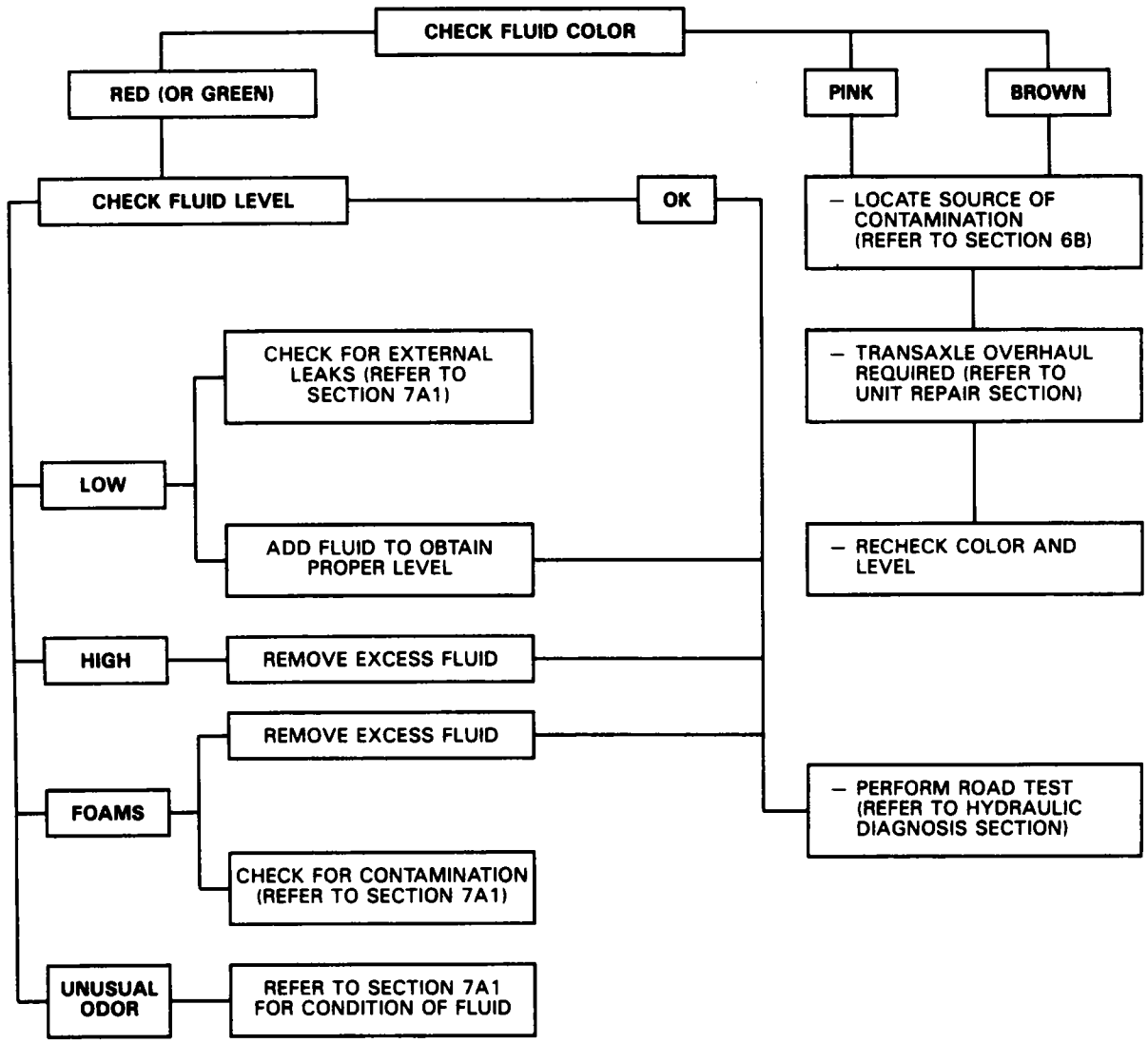


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Figure 4 Checking Fluid Color, Level and Condition

SECTION 7A2

AUTOMATIC TRANSMISSION

CONTENTS

"FOR VEHICLES SOLD IN CANADA AND EQUIPPED WITH NON-CLOSED LOOP ENGINES, ALSO REFER TO THE APPROPRIATE CANADIAN SERVICE MANUAL SUPPLEMENT."

The service procedures contained in this section are common to all automatic transmissions contained in this manual. Refer to the specific automatic transmission sections for service procedures and for a list of required special tools.

PARTS CLEANING, INSPECTION AND REPLACEMENT

- Use appropriate safety equipment such as:
  - Safety glasses
  - Safety shoes
  - Gloves
- Keep work area and tools clean
- Clean transmission exterior before removing parts
- Do not use wipe cloths or rags
- Do not use solvents on:
  - Rubber seals
  - Plastic/Teflon® thrust washers
- Blow out all passages with compressed air
- Clean out small passages with fine wire
- Handle parts carefully to prevent damage
- Lubricate all internal parts with transmission fluid during assembly
- When installing screws, bolts or studs into aluminum always dip the threads in transmission fluid
- Always use a torque wrench for proper torque
- Recondition damaged or stripped aluminum threads with thread inserts
- Replace all gaskets and o-ring seals
  - Do not use gasket cement or sealers
- Replace Teflon® and rubber lip seals only when necessary and install using the appropriate seal protector

Inspect

- Manual linkage for:
  - Wear at pivoting points
  - Bent or broken links and rods
- All seals, gaskets, o-rings and mating surfaces for:
  - Nicks
  - Cuts
  - Damage
- Snap rings for:
  - Expansion or compression
  - Distortion
  - Nicks
  - Proper ring to groove fit
- Bearings and thrust surfaces for:
  - Wear
  - Scoring
  - Pitting

FLYWHEEL/TORQUE CONVERTER VIBRATION TEST PROCEDURE

1. Start engine
2. With engine at idle speed and the transmission in "Park" (P) or "Neutral" (N), observe vibration.
3. Shut off engine.

Remove or Disconnect

- Converter shield attaching bolts
- Flywheel to torque converter attaching bolts
- Rotate torque converter 120° (1/3 turn)

Install or Connect

- Flywheel to torque converter attaching bolts

- Torque bolts to 63 N·m (46 lbs. ft.)
- Converter shield bolts
  - Torque bolts to 10 N·m (88 lbs. in.)

4. Start engine and check for vibration. Repeat this procedure until the best possible balance is obtained.

NOTICE: Some engine/transmission combinations cannot be balanced in this manner due to limited clearances between the torque converter bolts and engine. Be sure bolts do not bottom out in lug nuts or the torque converter cover could be dented and cause internal damage.

FLUID LEAK DIAGNOSIS

The cause of most external leaks can generally be located and repaired with the transmission in the vehicle.

METHODS FOR LOCATING LEAKS

General Method

1. Verify that the leak is transaxle fluid.
2. Thoroughly clean the suspected leak area.
3. Operate the vehicle for about 15 miles or until normal operating temperatures are reached.
4. Park the vehicle over clean paper or cardboard.
5. Shut off engine and look for fluid spots on paper.
6. Make necessary repairs.

Powder Method

1. Thoroughly clean the suspected leak area with solvent.
2. Apply an aerosol type powder (foot powder) to the suspected leak area.
3. Operate the vehicle for about 15 miles or until normal operating temperatues are reached.
4. Shut off engine.
5. Inspect suspected leak area and trace the leak path through the powder to find the source.
6. Make necessary repairs.

Dye And Black Light Method

A fluid dye and black light kit is available from various tool manufacturers.

1. Follow the manufacturer's recommendations for the amount of dye to be used.
2. Detect the leak with the black light.
3. Correct cause of leak.

REPAIRING THE LEAK

Once the leak has been pinpointed and traced back to its source, the cause of the leak must be determined in order for it to be repaired properly. If a gasket is replaced, but the sealing flange is bent, the new gasket will not repair the leak. The bent flange must be repaired also. Before attempting to repair a leak, check to be sure that the following conditions are correct as they may cause a leak.

Gaskets

1. Fluid level/pressure is too high.
2. Plugged vent or drain-back holes.
3. Improperly torqued fasteners or dirty/damaged threads.
4. Warped flanges or sealing surface.
5. Scratches, burrs or other damage to the sealing surface.
6. Damaged or worn gasket.
7. Cracking or porosity of the component.
8. Improper sealant used (where applicable).

Seals

1. Fluid level/pressure is too high.
2. Plugged vent or drain-back holes.
3. Damaged seal bore (scratched, burred or nicked).
4. Damaged or worn seal.
5. Improper installation.
6. Cracks in component.
7. Manual or output shaft surface scratched, nicked or damaged.
8. Loose or worn bearing causing excess seal wear.

Possible Points of Oil Leak

1. **Transmission oil pan:**
   - Attaching bolts not correctly torqued
   - Improperly installed or damaged gasket
   - Oil pan
2. **Case Leak:**
   - Filler pipe "multi-lip seal" damaged or missing
   - Filler pipe bracket mislocated
   - T.V. cable "multi-lip" seal missing, damaged or improperly installed
   - Governor cover and O-rings damaged or missing
   - Speedometer driven gear/speed sensor seal damaged
   - Manual shaft seal damaged
   - Oil cooler connector fittings loose or damaged
   - Propeller shaft oil seal worn or damaged
   - Parking pawl shaft cup plug loose (if equipped)
   - Governor pressure pipe plug loose
   - Line pressure pipe plug loose
   - Case to case cover gasket damaged (if equipped)
   - Porous casting
3. **Leak at converter end:**
   Converter seal damaged
   - Seal lip cut. (Check converter hub for damage.)
   - Bushing moved forward and damaged
   - Garter spring missing from seal
   - Converter leak in weld area. (Refer to Torque Converter.)
   - Porous casting (Case or pump)
4. **Fluid comes out vent pipe or fill tube:**
   - Over-filled
   - Water or coolant in fluid. Fluid will appear milky.

- Case porous
- Incorrect dipstick
- Plugged vent
- Drain back holes plugged
- Mispositioned oil pump to case gasket (if equipped)

Case Porosity Repair

1. Clean the leak area with solvent and air dry.
   CAUTION: Epoxy cement may cause skin irritations and eye damage. Read and follow all information on the container label as provided by the manufacturer.
2. Mix a sufficient amount of epoxy cement, GM 1052533 or equivalent, following the manufacturer's recommendations.
3. While the transmission case is hot, apply epoxy cement with a clean, dry soldering acid brush.
4. Allow the epoxy cement to cure for three hours before starting the engine.
5. Repeat fluid leak diagnosis procedures.

MANUAL LINKAGE

See Figures 1 thru 3

Manual linkage should be adjusted so that the engine will start in "PARK" and "NEUTRAL" only.

CAUTION: Personal injury may result if the engine can be started in a drive position.

NOTICE: Improper linkage adjustment can lead to clutch and/or band failure.

Adjust

1. Place shift lever in "N" (Neutral). Neutral can be obtained by rotating transmission lever clockwise from Park thru Reverse to Neutral.
2. Loosely attach cable to transmission shift lever with a nut. Assemble cable to cable bracket and to column shift lever. Tighten cable to transmission shift lever nut.
3. Tighten nut to specification. Lever must be held out of "PARK" when torquing nut.

T.V. CABLE SYSTEM

See Figures 4 thru 14

The T.V. cable used on the 200C and 200-4R transmission controls line pressure, shift points, shift feel, part throttle downshifts and detent downshifts. The T.V. cable operates the throttle valve lever and bracket assembly in the control valve.

The Throttle Valve Lever and Bracket Assembly serves two (2) basic functions:

1. To transfer the throttle lever movement to the T.V. plunger in the control valve assembly. This causes T.V. pressure and line pressure to increase according to engine throttle opening and controls part throttle and detent downshifts.
2. To prevent the transmission from operating at low (idle) pressures, if the T.V. cable should become broken or disconnected. If the cable is not connected or broken, the T.V. lifter rod will not move from its normal position which holds the T.V. exhaust check ball off its seat. The T.V. lifter rod will drop down to allow the T.V. exhaust ball to seat only if the cable is broken, disconnected or out of adjustment. With the transmission pan removed, pull down on the T.V. exhaust valve lifter rod and the spring should return the rod to its normal up position. If the throttle valve lever and bracket assembly or lifter rod binds or sticks so that the T.V. lifter rod cannot lift the exhaust ball off its seat, high line pressures and delayed upshifts will result. The T.V. lifter rod must not be bent or it will not function properly.

T.V. CABLE SYSTEM DIAGNOSIS

Inspect

CAUTION: To avoid possible personal injury and/or damage to the car, brakes must be applied at all times during the test.

1. Install oil pressure gage.
2. Install engine tachometer.
3. Warm up engine to proper operating temperature.
4. Run engine at 1000 RPM.
5. Apply parking brake
6. Place gear selector in "PARK" and note oil pressure.
7. Place gear selector into "DRIVE." Oil Pressure should be equal or not more than 10 psi (34 kPa) higher than in "PARK."
8. Increase engine speed to 1400 RPM. If oil pressure does not increase, adjust T.V. cable. Refer to "T.V. Cable Adjustment."

T.V. CABLE ASSEMBLY

Remove or Disconnect

1. Air cleaner
2. Cable terminal from throttle lever at carburetor or throttle body.
3. Compress locking tangs and disconnect cable assembly from bracket.
4. Routing clips or straps, (if used).
5. Raise vehicle and suitably support. See Section 0A.
6. Remove screw and washer securing cable to transmission and disconnect cable from link.

Install or Connect

1. New seal into transmission case hole
2. Transmission end of cable and secure to transmission case with bolt and washer. Torque to 10 N·m (84 in. lbs.).
3. Lower vehicle.
4. Cable routing clips or straps

ADJUSTMENT PROCEDURE

1. STEERING COLUMN ATTACHMENT TO BODY MUST BE COMPLETE AND ALL BODY BOLTS MUST BE SECURED BEFORE ADJUSTING TRANS CONTROL LINKAGE.

2. POSITION THE STEERING COLUMN SHIFT LEVER IN NEUTRAL GATE NOTCH.

3. SET TRANS LEVER IN NEUTRAL DETENT.

4. ASSEMBLE CLAMP SPRING WASHER & SCREW TO EQUALIZER LEVER & CONTROL ROD.

5. HOLD CLAMP FLUSH AGAINST EQUALIZER LEVER & FINGER TIGHTEN CLAMPING SCREW AGAINST ROD. NO FORCE SHOULD BE EXERTED IN EITHER DIRECTION ON ROD OR EQUALIZER LEVER WHILE TIGHTENING CLAMPING SCREW.

6. TIGHTEN SCREW TO SPECIFIED TORQUE.

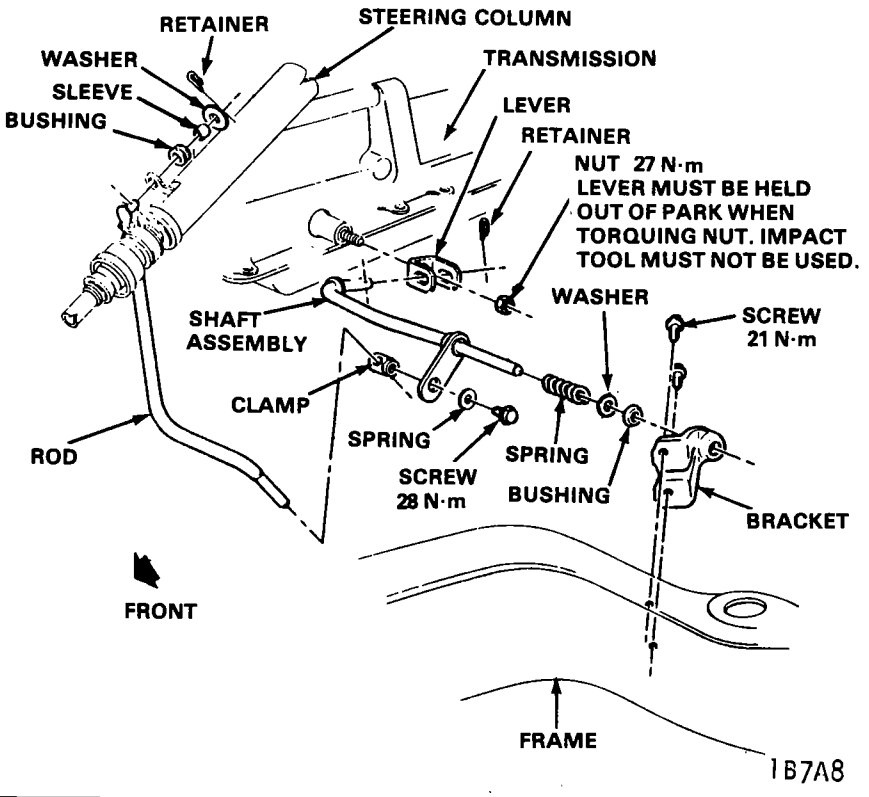


Figure 1 Column Shift Control Adjustment

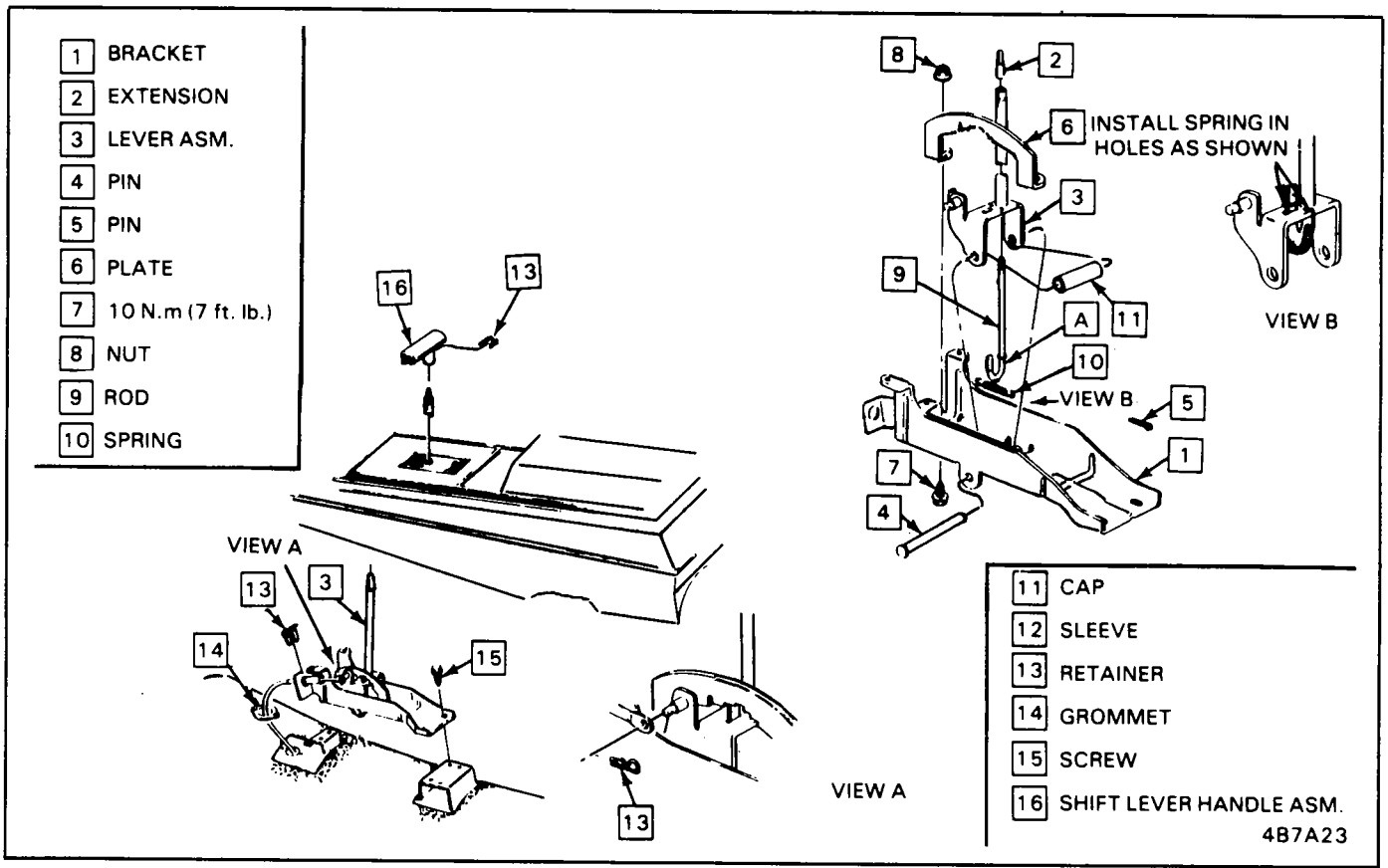


Figure 2 Floor Shift Control (G Series)

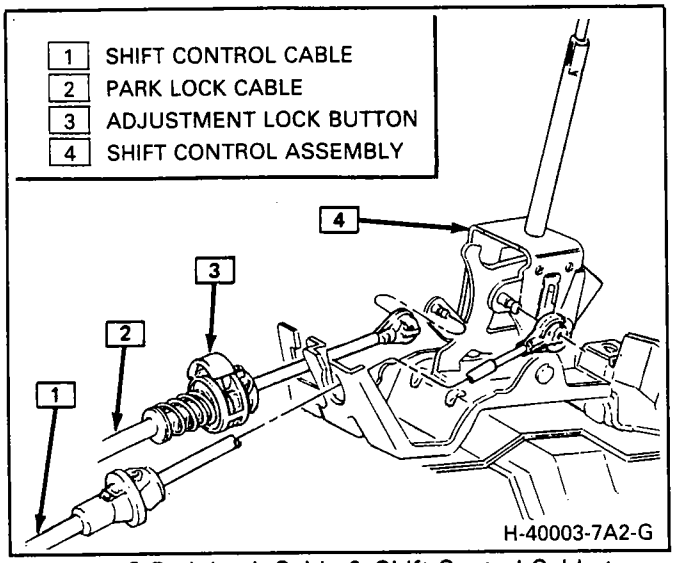


Figure 3 Park Lock Cable & Shift Control Cable to Control Assembly

5. Pass cable through bracket and engage locking tangs of cable on bracket.
6. Cable terminal to throttle lever at carburetor or throttle body.

Adjust

- T.V. cable.

T.V. CABLE

Adjustment Procedure

Important

- Adjustment of the T.V. cable must be made by rotating the throttle lever at the carburetor or throttle body. Do not use the accelerator pedal to rotate the throttle lever.

Adjustment Procedure

Adjust

1. Stop engine
2. Depress and hold down metal readjust tab at engine end of T.V. cable.
3. Move slider until it stops against the fitting.
4. Release readjustment tab.
5. Rotate the throttle lever to its "full travel position."
6. The slider must move (ratchet) toward the lever when the lever is rotated to its "full travel position."

Inspect

- Check that cable moves freely. The cable may appear to function properly with the engine stopped and cold. Recheck after the engine is hot.
- Road test car.

TRANSMISSION ASSEMBLY

See Figures 16 thru 21

A pressure test should be performed before transmission removal, to aid in diagnosis.

Remove or Disconnect

Tool Required:
J 21366 Torque Converter Holding Fixture

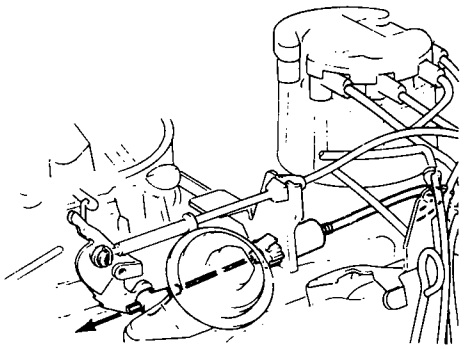
1. Negative battery cable
   - Air cleaner
   - T.V. cable at its upper end
   - Transmission fluid level indicator (and bolt holding fluid level indicator tube if accessible.)
2. Raise car and suitably support. See Section 0A.
3. Propeller shaft - Refer to Section 4A.
   - Floor pan reinforcement (if used) if it interferes with propeller shaft removal
4. Speedometer cable at transmission
   - Shift linkage at transmission
   - Electrical leads at the transmission and any clips that retain the leads to the transmission case
5. Flexplate cover.
   - Mark flexplate and torque converter to aid in re-assembly.
   - Torque converter to flexplate bolts and/or nuts
6. Catalytic converter support bracket
7. Transmission support to transmission mount bolt and transmission support to frame bolts (and insulators, if used)
   - Support and raise transmission slightly.
   - Slide transmission support rearward.
8. Lower transmission to gain access to the oil cooler lines and T.V. cable attachments.
   - Oil cooler lines. Cap all openings.
   - T.V. cable
9. Support engine with a suitable tool and remove transmission to engine bolts.
   - Transmission assembly. Be careful not to damage any cables, lines or linkage.
   - Install J 21366 and remove transmission assembly.

Install or Connect

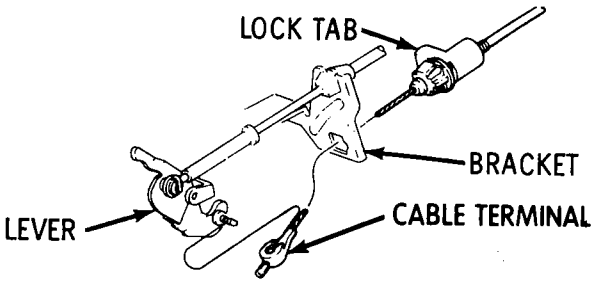
1. Remove J 21366
2. Raise transmission into place and tighten bolts to specification.
   - Oil cooler lines
   - T.V. cable
   - Transmission support and mount. Tighten bolts to specification.
   - Remove transmission jack.
3. Torque converter to flexplate, three bolts 62 N·m (46 ft. lbs.).

Important

- Observe marks made during disassembly and lineup in the original position.



PULL CABLE TERMINAL IN THIS DIRECTION
TO DISCONNECT CABLE FROM LEVER.
REVERSE DIRECTION FOR INSTALLATION.



NOTICE:

DO NOT PRY ON PLASTIC CABLE TERMINAL TO DISCONNECT CABLE FROM LEVER. PULL ON CABLE TERMINAL IN DIRECTION SHOWN ABOVE TO DISCONNECT. PRYING ON CABLE TERMINAL MAY CAUSE BREAKAGE OF CABLE TERMINAL OR KINKING OF T.V. CABLE.

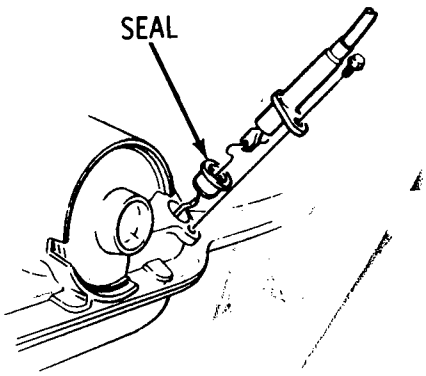


Figure 4 T.V. Cable LV2 VIN Y

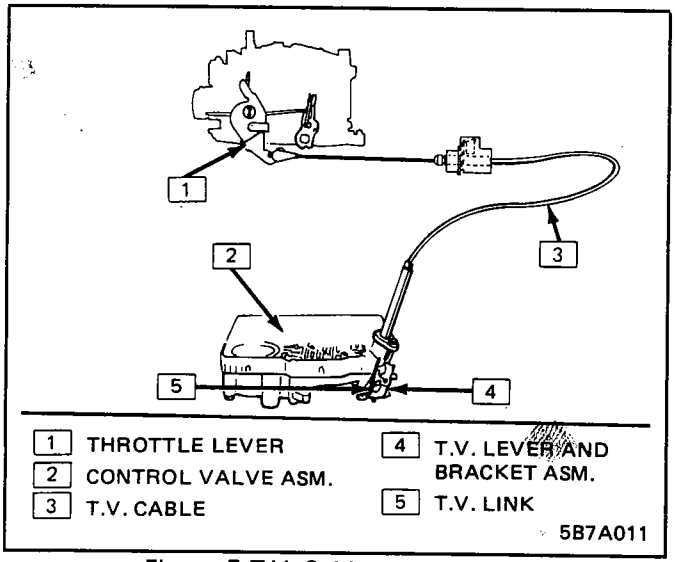


Figure 5 T.V. Cable and Linkage

- Make sure weld nuts on the torque converter are flush with the flexplate.
- Test torque converter for freedom of rotation.
- Tighten three bolts finger tight, then torque to specification. Re-torque the first bolt tightened.

4. Floor pan reinforcement (if removed)
5. Catalytic converter support bracket
6. Flexplate cover
   - Shift linkage
   - Speedometer cable
   - Electrical leads and brackets
7. Propeller shaft. Refer to Section 4A.
8. Lower car.
9. Fluid filler tube using a new oil seal
   - T.V. cable at engine
   - Air cleaner
   - Negative battery cable

Adjust

- Shift Linkage
- T.V. Cable.
- Fluid Level

INTERMEDIATE SERVO ASSEMBLY

200C Transmission

Remove or Disconnect

Tool Required:
J 28653 Servo Cover Depressor

1. (V8) Left exhaust pipe
2. Install tool J 28653 on case with two oil pan bolts. Depress servo cover.
3. Cover retaining ring, using suitable tool
4. Remove Tool J 28653.
5. Cover and seal ring, using pliers. (Cover seal ring may be located in case).
6. Piston and band apply pin assembly
7. Refer to specific section for inspection procedure.

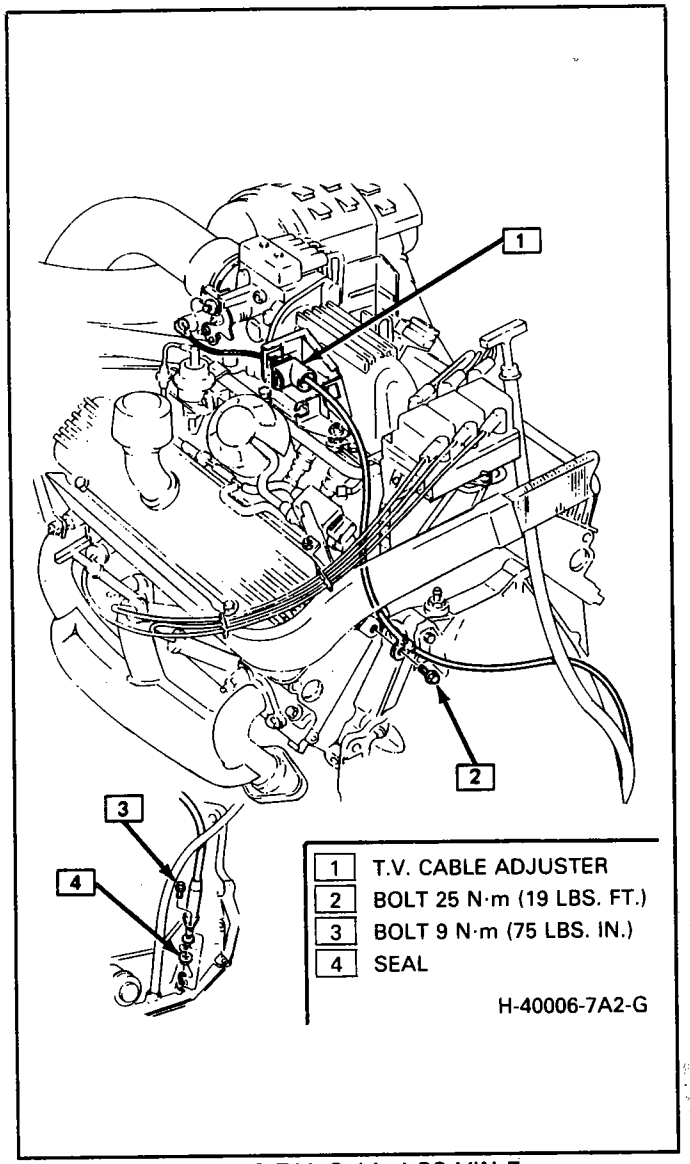


Figure 6 T.V. Cable LC2 VIN 7

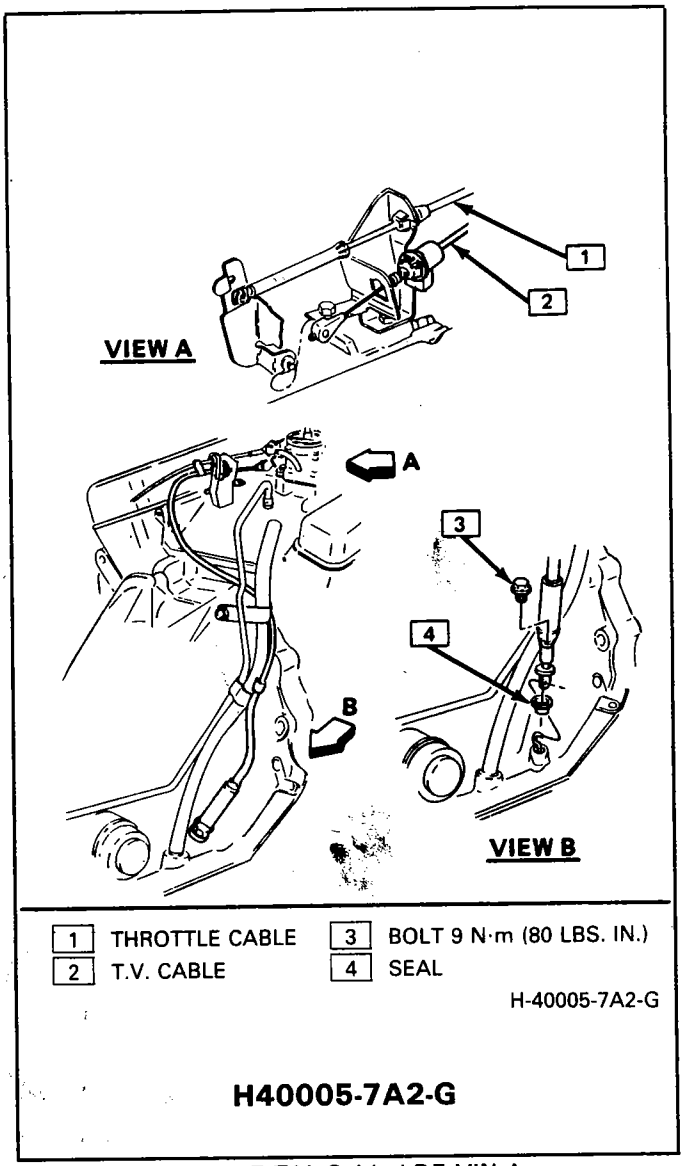


Figure 7 T.V. Cable LD5 VIN A

Install or Connect

1. Piston and band apply pin assembly
2. Install J 28653
   - Cover and a new seal ring
   - With tool J 28653 depress cover.
   - Retainer ring
   - Remove J 28653.
3. (V8) Left exhaust pipe

Adjust

- Transmission fluid level

200-4R Transmission

Remove or Disconnect

1. Four catalytic converter heat shield screws and slide heat shield outboard.
2. Depress servo cover and remove retaining ring, using suitable tool.
3. Cover and seal ring. (Seal ring may be in case).
4. Piston and band apply pin assembly

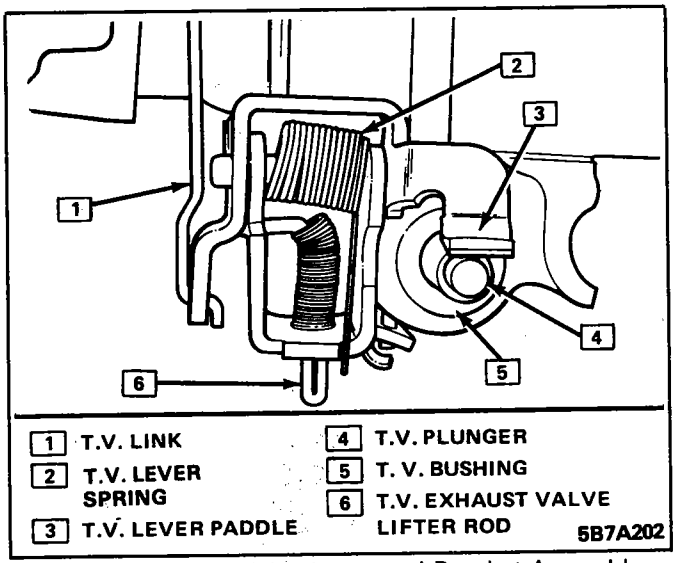


Figure 8 Throttle Valve Lever and Bracket Assembly

5. Refer to specific section for inspection procedure.

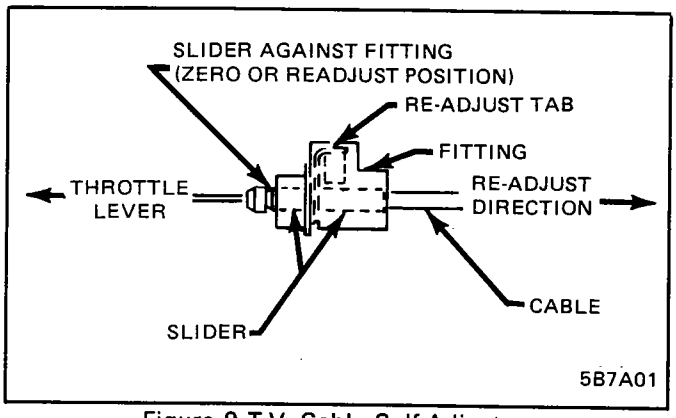


Figure 9 T.V. Cable Self-Adjuster

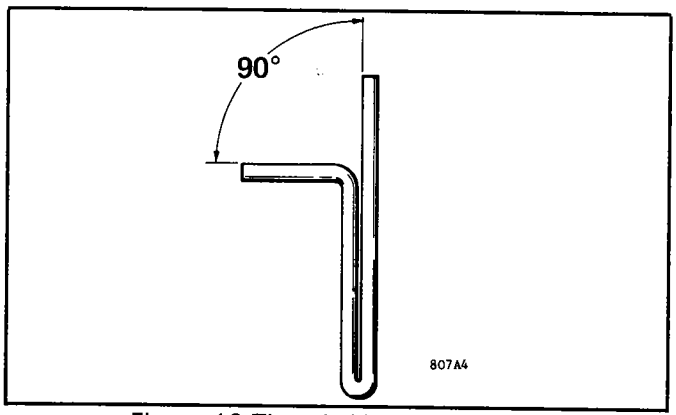


Figure 10 Throttle Valve Lifter Rod

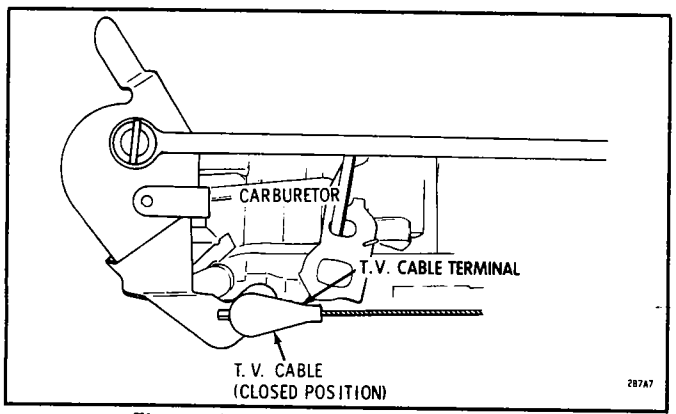


Figure 11 T.V. Cable at Carburetor

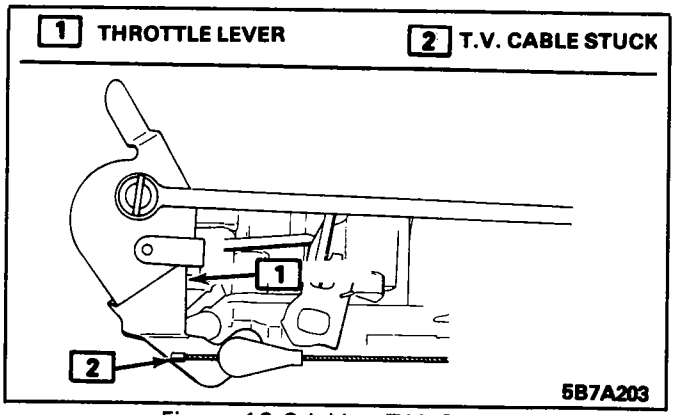


Figure 12 Sticking T.V. Cable

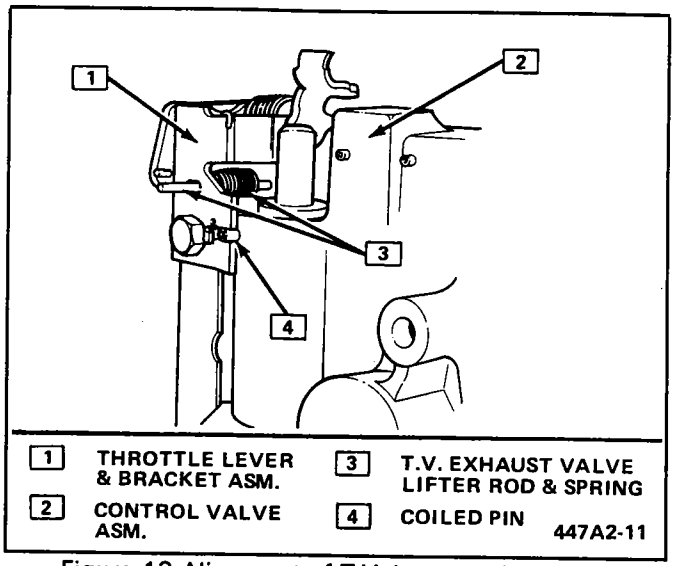


Figure 13 Alignment of T.V. Lever and Bracket Assembly

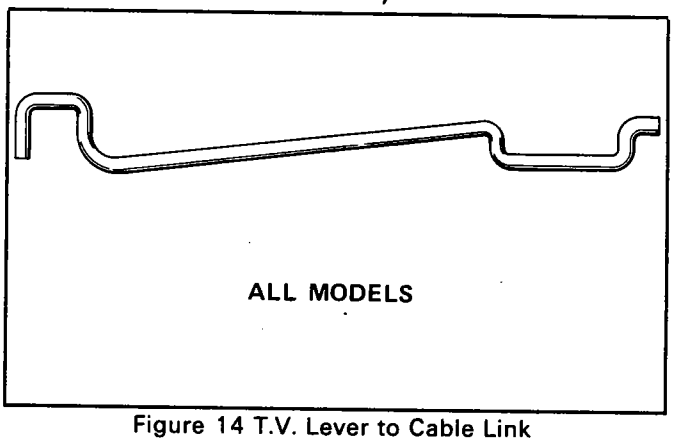


Figure 14 T.V. Lever to Cable Link

Install or Connect

1. Piston and band apply pin assembly
2. Cover and a new seal ring
3. Depress servo cover.
4. Retaining ring
5. Catalytic converter heat shield

Adjust

- Transmission fluid level

SPEEDOMETER DRIVEN GEAR

200C, 200-4R

Remove or Disconnect

1. Speedometer cable
2. Retainer bolt, retainer
3. Speedometer driven gear and "O" ring seal

Install or Connect

1. Speedometer driven gear with a new "O" ring seal
2. Retainer and bolt
3. Speedometer cable

THE FOLLOWING PARTS CAN BE SERVICED WITH THE TRANSMISSION IN THE CAR. FOR REMOVAL AND INSTALLATION PROCEDURES NOT LISTED IN THIS SECTION REFER TO THE APPROPRIATE UNIT REPAIR SECTION.

	200-4R	200C
1. Governor Cover and Seals	X	X
2. Governor Assembly	X	X
4. Governor Pipes		
5. Intermediate Servo Cover and Seal	X	X
6. Intermediate Servo Piston Assembly	X	X
7. Rear Servo Assembly		
8. Front Servo Assembly		
9. 3rd Accumulator Check Valve Assembly		X
10. Oil Pan and Oil Screen (Intake Pipe) Assembly	X	X
11. Control Valve Assembly (Valve Body)	X	X
12. Auxillary Valve Body Assembly		
13. Check Balls and Valve Body Space Plates and Gaskets	X	X
14. Pressure Regulator Parts	X	X
15. Inside Detent/Range Lever	X	X
16. Manual Detent Roller and Spring Assembly	X	X
17. Throttle Lever and Bracket Assembly	X	X
18. TV/Detent Cable and 'O' Ring	X	X
19. TV Boost Valve and Bushing	X	
20. Parking Pawl Actuator Rod	X	X
21. Parking Pawl Bracket	X	X
22. Parking Pawl	X	X
23. Manual Shaft and Seal	X	X
24. Manual Valve	X	X
25. Manual Valve Link	X	
26. Extension Housing and Gasket		
27. Rear Seal	X	X
28. 1-2 Accumulator Assembly	X	X
29. 3-4 Accumulator Assembly	X	
30. Low and Reverse Clutch Cup Plug	X	X
31. Reverse Boost Valve and Bushing	X	
32. Stop Valve	X	
33. Intermediate Band Anchor Pin	X	
34. 4-3 Pressure Switch	X	
35. 4th Clutch Pressure Switch	X	
36. Vacuum Modulator		
37. Cooler Fittings	X	X
38. Oil Filter Pipe and 'O' Ring	X	X
39. Speedometer Driven Gear Assembly	X	X
40. Speedometer Drive Gear	X	
41. Down Shift Solenoid		
42. Converter Clutch Valve and Springs	X	
43. Converter Clutch Solenoid	X	
44. Solenoid Wire Clips	X	X
45. Electical Connectors	X	X
46. Governor Feed Screen		
47. Pump Pressure Screen		
48. Modulator Valve		
49. Intermediate Band Adjustment		

G40001-7A2-B6

Figure 15 On-Car Service Items

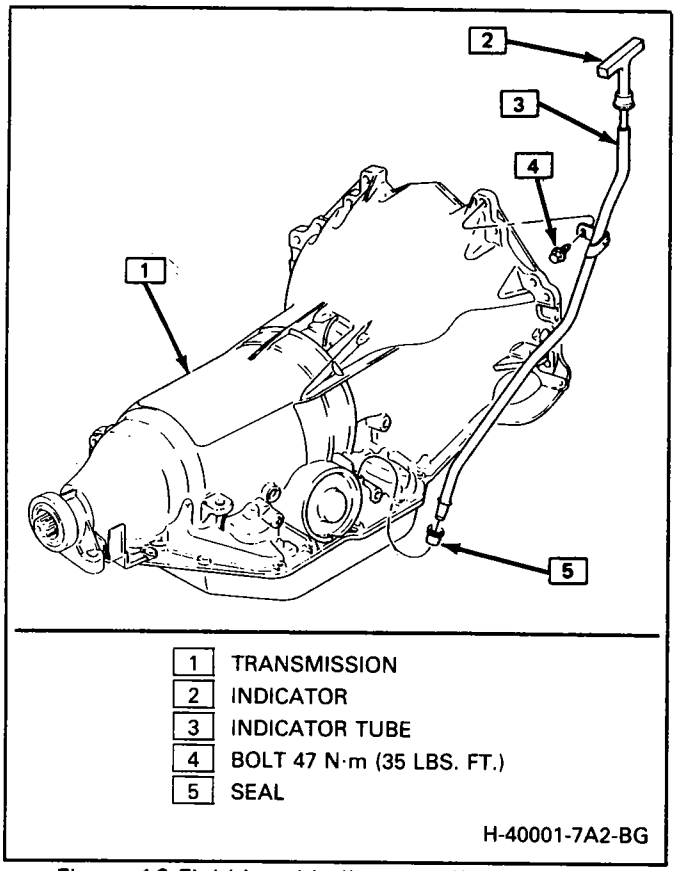


Figure 16 Fluid Level Indicator to Transmission

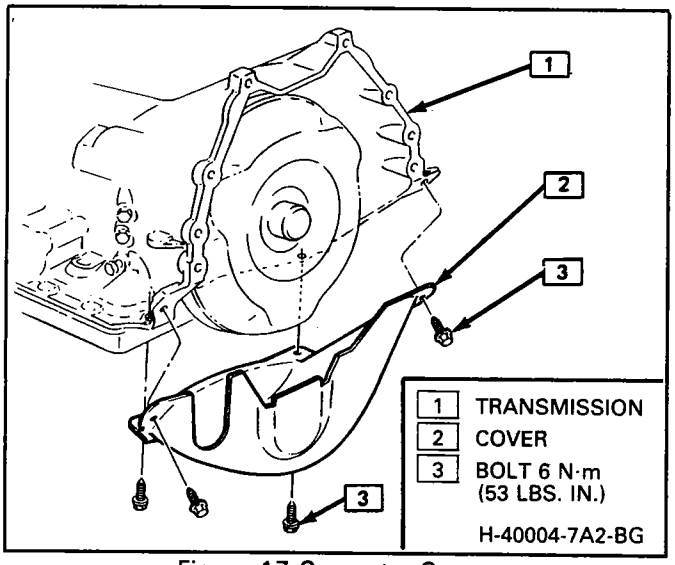


Figure 17 Converter Cover

REAR OIL SEAL

200C

Remove or Disconnect

1. Propeller shaft. Refer to Section 4A.
2. Pry out lip oil seal with a suitable tool.

Install or Connect

Tool Required:

J 21426 Seal Installer

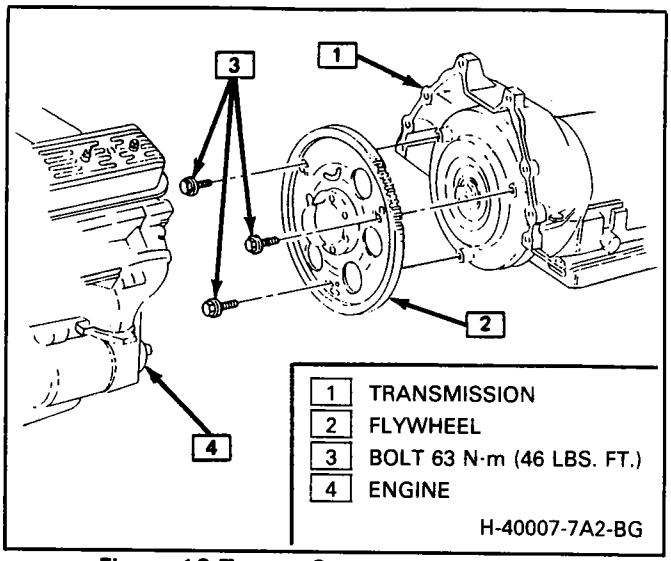


Figure 18 Torque Converter to Flywheel

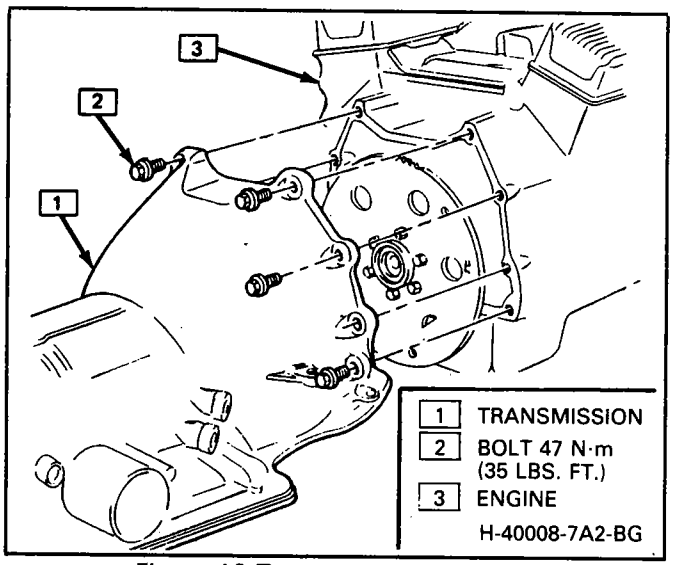


Figure 19 Transmission to Engine

1. Coat outer casing of new lip oil seal with a non-hardening sealer and tap it into place with J 21426.
2. Propeller shaft. Refer to Section 4A.

Adjust

- Transmission fluid level

200-4R

Remove or Disconnect

1. Propeller shaft. Refer to Section 4A.
2. Tunnel strap
3. Pry out lip oil seal with a suitable tool.

Install or Connect

Tool Required:

J 21426 Seal Installer

1. Coat outer casing of new lip oil seal with a non-hardening sealer and tap it into place with J 21426.

2. Tunnel strap
3. Propeller shaft. Refer to Section 4A.

Inspect

- Transmission fluid level

GOVERNOR

Refer to Specific Unit Repair Section for Governor Overhaul Procedure.

200C

Remove or Disconnect

1. Negative battery cable
2. Raise and and suitably support car. See Section 0A.
3. Exhaust to converter bolts. Let catalytic converter and exhaust pipe hang down.
4. Support transmission.
5. Transmission to frame support and slide it rearward.
6. Propeller shaft. Refer to Section 4A.
7. Lower transmission to provide clearance to remove the governor.
8. Governor retainer ring and cover
9. Two seal rings
10. Governor assembly

Install or Connect

NOTICE: Do not use force to install governor assembly and cover into case. Damage to case, governor or cover could result.

1. Governor assembly
2. Seal rings (New)
3. Retainer ring and cover
4. Raise transmission into position.
5. Propeller shaft. Refer to Section 4A.
6. Transmission to frame support
7. Remove transmission support
8. Exhaust to catalytic converter bolts
9. Lower car.
10. Negative battery cable

Adjust

- Shift linkage
- Transmission fluid level

200-4R

Remove or Disconnect

1. Raise and suitably support car. See Section 0A.
2. Drain transmission oil pan.
3. Oil pan, filter and pan gasket
4. Governor and gasket.
5. It may be necessary to rotate the output shaft counterclockwise while removing the governor. Do not use pliers to remove governor assembly.

Install or Connect

1. Governor assembly
2. Cover with a new gasket
3. Oil pan and filter with a new gasket. Torque bolts to specification.
4. Lower car.

Adjust

- Transmission fluid level

PRESSURE REGULATOR VALVE

Tool Required:
J 24684 Spring Compressor

200C

Remove or Disconnect

1. Raise vehicle and suitably support. See Section 0A.
1. Drain transmission oil pan.
3. Oil pan and screen
4. Pushing on pressure regulator valve bore plug, compress pressure regulator spring with small screwdriver or J 24684.
5. Retaining ring, withdraw screwdriver or J 24684 slowly to release spring tension.
6. Pressure regulator bore plug, valve, spring and guide. Refer to Unit Repair section for inspection procedure.

Install or Connect

1. Valve spring
2. Spring guide
3. Valve, stem end and bore plug hole side out
4. With J 24684 compress valve spring until retainer groove is exposed and insert retainer ring.
5. Oil pan and screen, using a new gasket
6. Lower car.

Adjust

- Transmission fluid level

CONTROL VALVE ASSEMBLY

200C

Remove or Disconnect

1. T.V. cable from throttle lever at carburetor or throttle body.
2. Raise vehicle and suitably support. See Section 0A.
3. Drain transmission oil pan.
4. Oil pan, gasket and filter screen
5. T.V. lever and bracket assembly. Do not bend T.V. lever link.
6. Manual detent roller and spring assembly
7. Support valve assembly and remove retaining bolts.

8. Holding manual valve with fingers, remove valve assembly spacer plate and gaskets together to prevent dropping of four (4) check balls located in control valve body and fifth (5th) check ball located on spacer plate. When removing control valve assembly, the intermediate band anchor pin may come out.
9. Lay control valve assembly down with spacer plate side up and remove fifth check ball from spacer plate.
10. Refer to specific section for inspection and overhaul.

Install or Connect

1. Control valve assembly. Torque bolts to 17 N·m (12 Lbs. Ft.)

NOTICE: Intermediate band anchor pin must locate on intermediate band or damage to transmission will result.

2. Manual detent roller and spring assembly
3. T.V. lever and bracket assembly. Be sure not to bend the T.V. lever link.
4. Oil pan and screen with a new gasket
5. Lower vehicle.
6. T.V. cable to throttle lever at carburetor or throttle body.

Adjust

- Transmission fluid level
- T.V. cable.
- Shift linkage

CONTROL VALVE ASSEMBLY

200-4R

Remove or Disconnect

1. Raise vehicle and suitably support. See Section 0A.
2. Drain transmission oil pan.
3. Oil pan, gasket and filter
4. Screw and washer securing T.V. cable to transmission, and T.V. cable.
5. T.V. lever and bracket assembly. Do not bend throttle lever link.
6. Wire leads on electrical connector at case.
7. TCC solenoid assembly
8. Manual detent roller and spring assembly
9. Support control valve assembly and remove retaining bolts
10. Holding manual valve with fingers, remove control valve assembly.

Care must be taken to prevent loss of three (3) check balls located in control valve assembly.

- Do not carry assembly by attached pipe.

11. Lay control valve assembly down with spacer plate side up.
    - Do not damage pressure switches.
12. Refer to Unit Repair section for inspection and overhaul.

Install or Connect

1. Control valve assembly. Torque bolts to 17 N·m (12 lbs. ft.).
2. Manual detent roller and spring assembly
3. TCC solenoid assembly
4. Electrical leads
5. T.V. lever and bracket assembly. Be sure not to bend the throttle lever link.
6. T.V. cable to transmission with screw and washer assembly
7. Oil pan and filter with a new gasket
8. Lower vehicle.

Adjust

- Transmission fluid level
- T.V. cable
- Shift linkage

OIL COOLER LINES

See Figures 20 & 21

If replacement of transmission cooler lines is required, use only double wrapped and brazed steel tubing meeting GM specification 123M or equivalent. Tubing should be double flared.

NOTICE: Allow sufficient clearance to cooler lines to prevent damage or wear which may cause fluid loss.

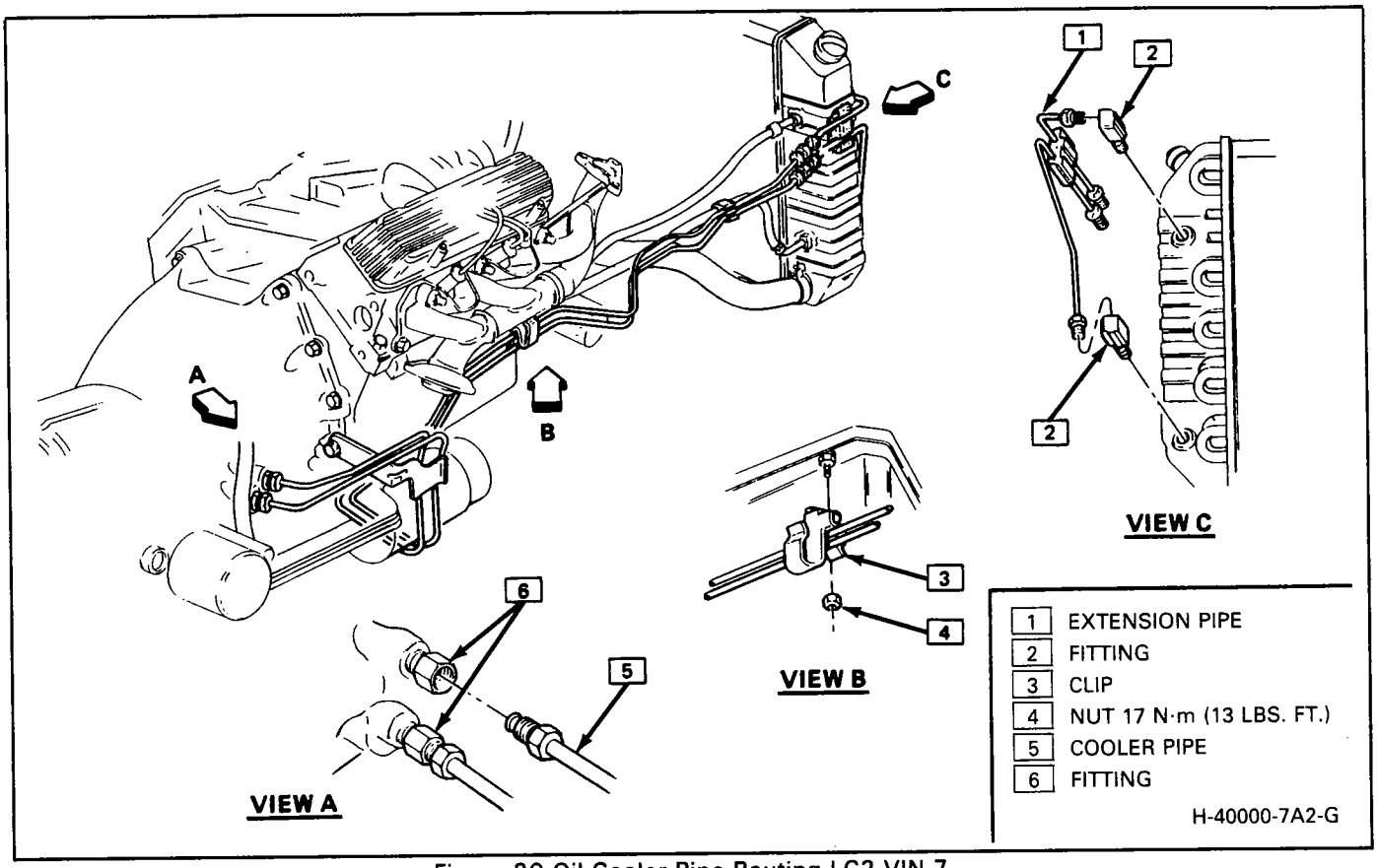


Figure 20 Oil Cooler Pipe Routing LC2 VIN 7

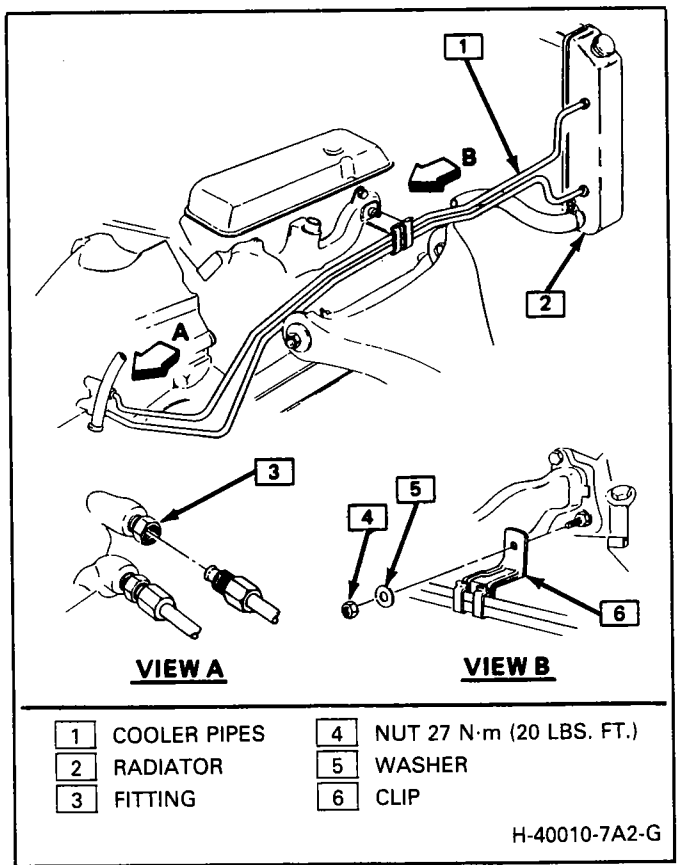


Figure 21 Oil Cooler Pipe Routing LD5 VIN A (LV2 VIN Y Similar)

TORQUE SPECIFICATIONS

	N·m (ft. lbs.)
Starter mounting bolts	41 (30)
Transmission to engine bolts	47 (35)
Flexplate to converter bolts	62 (46)
Converter housing cover screws	10 (7)
Fluid Level Indicator tube brace to transmission	10 (7)
Oil cooler lines to transmission	22 (16)
Transmission support to frame	55 (40)
Mount to transmission support	34 (25)
Catalytic converter bracket	21 (15)
Floor pan reinforcement	25 (19)
Propeller shaft (straps) bolts	22 (16)
T.V. cable to case	10 (7)

SECTION 200-4R

MD9

AUTOMATIC TRANSMISSION HYDRAULIC DIAGNOSIS

CONTENTS

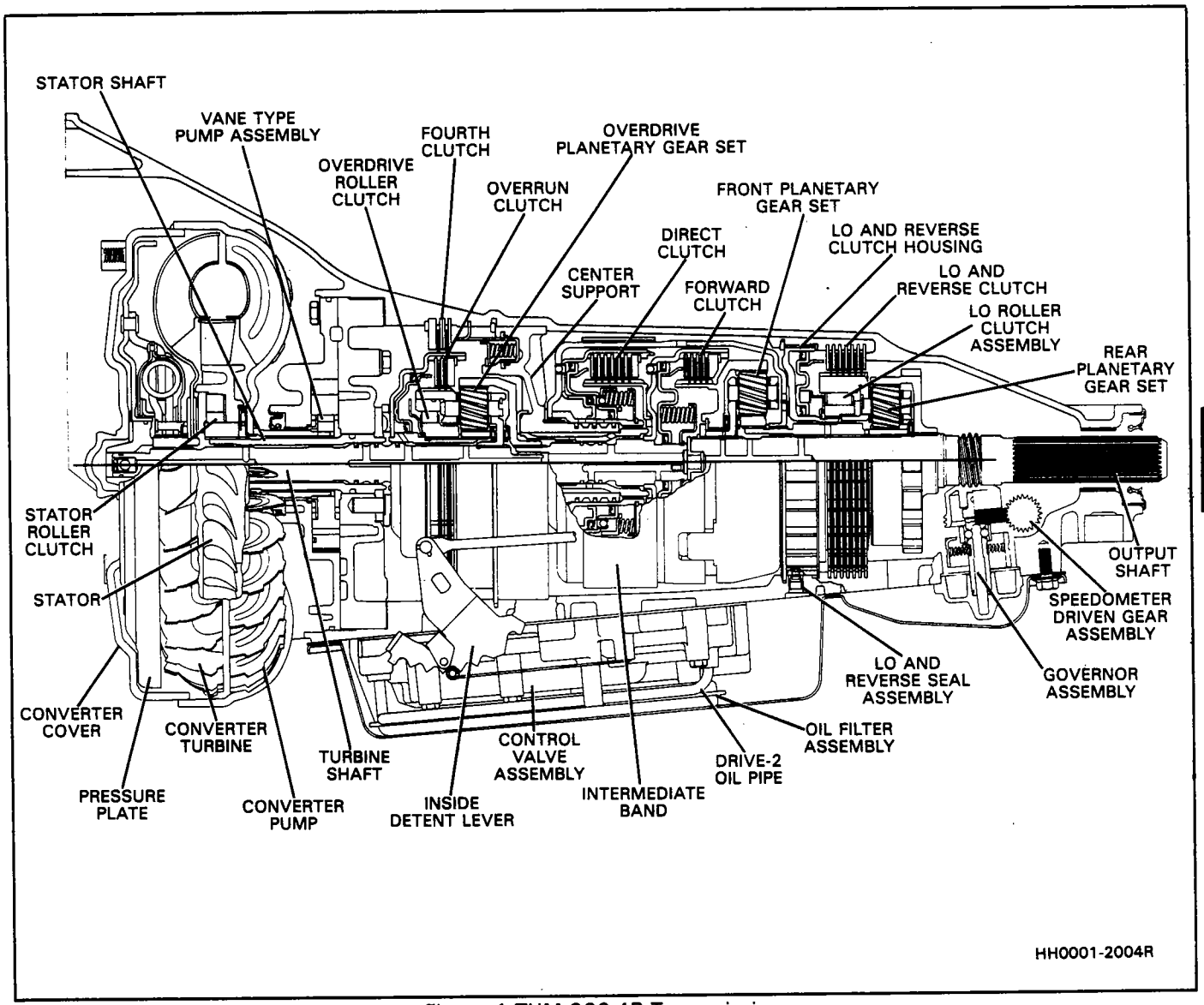


Figure 1 THM 200-4R Transmission

GENERAL DESCRIPTION

The THM 200-4R is a fully automatic transmission for rear wheel drive vehicles which provides four forward gear ranges and a reverse.

The major components of this transmission are:

- Torque Converter Clutch Asm.
- Vane Type Oil Pump
- Intermediate Band Asm.
- Five Multiple Disc Clutches
- Two Planetary Gear Sets
- Two Roller Clutches
- Valve Body Asm.

The oil pressure and shift points are controlled by throttle opening via a throttle valve cable. (See Section 7A for T.V. cable information).

P - Park position prevents the vehicle from rolling either forward or backward. (For safety reasons the parking brake should be used in addition to the park position).

R - Reverse allows the vehicle to be operated in a rearward direction.

N - Neutral allows the engine to be started and operated without driving the vehicle. If necessary this position may be selected if the engine must be restarted with the vehicle moving.

D - Overdrive is used for all normal driving conditions. It provides four gear ratios plus converter clutch operation. Downshifts are available for safe passing by depressing the accelerator.

3 - Drive position is used for city traffic, hilly terrain, and trailer towing. It provides three gear ranges. Again, downshifts are available by depressing the accelerator.

2 - Manual second is used to provide acceleration and engine braking. This range may be selected at any vehicle speed.

1 - Manual Lo is used to provide maximum engine braking. This range may also be selected at any vehicle speed.

DIAGNOSIS INFORMATION

ROAD TEST PROCEDURE

- Perform the road test following the sequence given
- MPH (KPH) shift points will vary with actual throttle position and driver habits
- Compare the results of the test with speed shift chart information. Use these results with the diagnosis information in the specific Automatic Transmission Unit Repair Section the evaluate the transmission.
- This test should only be performed when traffic and road conditions permit
- Observe all traffic safety regulations

Garage Shift Check

1. Start engine
2. Depress brake pedal
3. Move gear selector:
   - "Park" (P) to "Reverse" (R)
   - "Reverse" (R) to "Neutral"
   (N) to "Drive" (D)
   Gear selections should be immediate and not harsh.

Upshifts and Torque Converter Clutch (TCC) Apply (Figure 2)

With gear selector in "Overdrive" (D)

1. Accelerate using a steady increasing throttle pressure
2. Note the shift speed point gear engagements for:
   - 2nd gear
   - 3rd gear
   - Overdrive
3. Note the speed shift point for TCC apply. This should occur while in Third Gear or Overdrive. If the apply is not noticed, refer to the Preliminary Torque Converter Clutch Diagnosis information contained in this section of the Service Manual.

Important

The torque converter clutch will not engage if engine coolant has not reached a minimum operating temperature of approximately 54°C (130°F).

Part Throttle Detent Downshift

At vehicle speeds of 40-55 MPH (64-88 KPH) quickly depressed the accelerator to a half open position and observe:

- TCC releases
- Transmission downshift to 3rd gear immediately

Full Throttle Detent Downshift

At vehicle speeds of 40-55 MPH (64-88 KPH) quickly depress the accelerator to a wide open position and observe:

- TCC releases
- Transmission downshifts to 3rd gear immediately

Manual Downshift

1. At vehicle speeds of 40-55 MPH (64 to 88 KPH) release the accelerator pedal while moving the gear selector to "Third" gear (D) and observe:
   - TCC release
   - Transmission downshift to 3rd gear should be immediate
   - Engine should slow vehicle down
2. Move gear selector to "Overdrive" and accelerate to 40-45 MPH (64-72 KPH). Release the accelerator pedal while moving the gear selector to "Second" gear (2) and observe:
   - TCC Release
   - Downshift to second gear should be immediate
   - Engine should slow vehicle down

3. Move gear selector to "Overdrive" (D) and accelerate to 25 MPH (40 KPH). Release the accelerator pedal while moving the gear selector to "First" gear (1) and observe:
   - TCC release
   - Transmission downshift to 1st gear should be immediate
   - Engine should slow vehicle down

Coastdown Downshift

1. With the gear selector in "Overdrive" (D) accelerate to 4th gear with TCC applied.
2. Release the accelerator pedal and lightly apply the brakes to observe:
   - TCC release
   - Shift points for downshifts.

Manual Gear Range Selection

MANUAL THIRD (D)

1. With vehicle stopped, place gear selector in "Third" (D) and accelerate to observe:
   - The first to second gear shift point
   - The second to third gear shift point

MANUAL SECOND (2)

2. With vehicle stopped, place gear selector in "Second" (2) and accelerate to observe:
   - The first to second gear shift point
3. Accelerate to 25 MPH (40 KPH) and observe:
   - That a second to third gear shift does not occur
   - That TCC does not engage

MANUAL FIRST (1)

1. With vehicle stopped, place gear selector in "First" (1) and accelerate to 15 MPH (24 KPH) and observe:
   - That no upshift occurs
   - That TCC does not engage

REVERSE

1. With vehicle stopped, place gear selector in "Reverse" (R) and slowly accelerate to observe reverse gear operation.

All possible throttle positions and corresponding MPH shift point information has not been provided.

TRANSMISSION PRESSURE CHECK PROCEDURE

Inspect

- Fluid level
- TV cable adjustment
- Manual linkage
- Engine mechanical, emissions, electrical and fuel delivery systems

Install or Connect (Figure 3)

- Oil pressure gage
- Tachometer

1987 "THM 200-4R" SPEED SHIFT CHART

Model	1-2 Min Throt	2-3 Min Throt	3-4 Min Throt	4-3 Part Throt	3-2 Part Throt	4-3 Coast Down	3-2 Coast Down	2-1 Coast Down
BR	14	22	43	53	46	37	21	11
CC	11	22	33	37	46	31	20	8
CH	11	22	26	31	49	24	20	7
CR	12	24	29	32	49	28	22	9
CY	11	23	29	33	41	28	21	8
CZ	9	20	30	35	44	23	19	6
HD	12	20	43	55+	39	42	18	9
HF	12	22	43	55+	39	42	18	9
HT	13	22	45	55+	41	43	20	9
KC	12	20	28	46	32	26	19	9
KJ	10	20	26	42	29	25	19	7
KT	12	21	29	48	33	28	19	9
KZ	12	18	24	52	45	20	17	10

NOTES:
1. ALL SPEEDS INDICATED ARE IN MILES PER HOUR. CONVERSION TO KPH = MPH × 1.609.
2. SHIFT POINTS WILL VARY SLIGHTLY DUE TO ENGINE LOAD AND VEHICLE OPTIONS.
3. ALL SPEEDS LISTED WITH + EXCEED 55 MPH.

HH 0008-HD

Figure 2 Speed Shift Chart

PRELIMINARY CHECK PROCEDURE

CHECK TRANSMISSION OIL LEVEL
CHECK AND ADJUST T.V. CABLE
CHECK OUTSIDE MANUAL LINKAGE AND CORRECT
CHECK ENGINE TUNE
INSTALL OIL PRESSURE GAGE
(SEE FIGURES 24 AND 74 FOR OIL PRESSURE TAP LOCATION)
CONNECT TACHOMETER TO ENGINE
CHECK OIL PRESSURES IN THE FOLLOWING MANNER:

Minimum T.V. Line Pressure Check
Set the T.V. cable to specification; and with the brakes applied, take the line pressure readings in the ranges and at the engine r.p.m.'s indicated in the chart below.

Full T.V. Line Pressure Check
Full T.V. line pressure readings are obtained by tying or holding the T.V. cable to the full extent of its travel; and with the brakes applied, take the line pressure readings in the ranges and at the engines r.p.m.'s indicated in the chart below.

***NOTICE** Total running time for this combination not to exceed 2 minutes.

CAUTION Brakes must be applied at all times.

1987 200-4R AUTOMATIC TRANSMISSION OIL PRESSURE

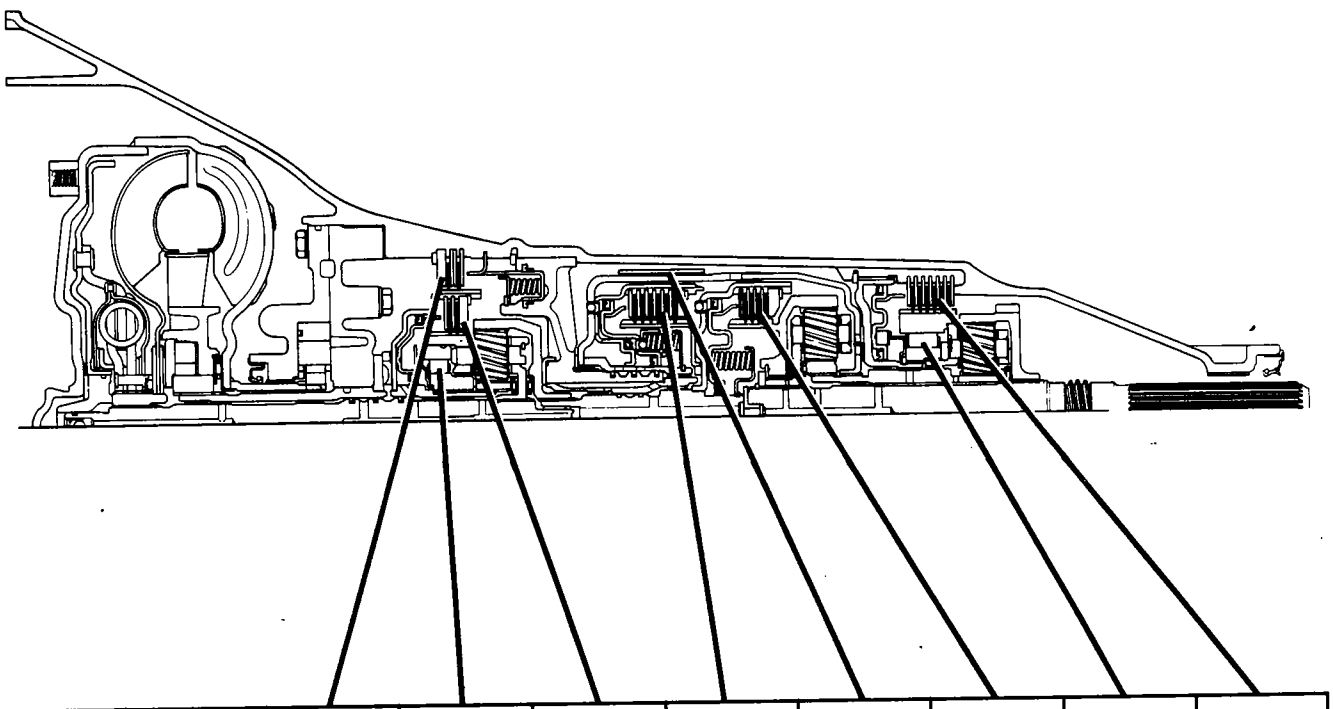
MODEL	RANGE	NORMAL OIL PRESSURE AT MINIMUM T.V.		NORMAL OIL PRESSURE AT FULL T.V.	
		kPa	P.S.I.	kPa	P.S.I.
CRF	PARK & NEUTRAL @ 1000 RPM	389 - 439	56 - 64	772 - 869	112 - 126
CHF, CYF		389 - 439	56 - 64	788 - 888	114 - 129
KCF, KJF, KTF		389 - 439	56 - 64	797 - 896	116 - 130
CCF, HFF, HTF, HDF		389 - 439	56 - 64	823 - 927	119 - 134
CZF		389 - 439	56 - 64	991 - 1117	144 - 162
KZF		389 - 439	56 - 64	1104 - 1259	160 - 183
BRF		389 - 439	56 - 64	1194 - 1368	173 - 198
KZF	*REVERSE @ 1000 RPM	549 - 619	80 - 90	1557 - 1774	226 - 257
CRF		725 - 817	105 - 118	1437 - 1617	208 - 235
CHF, CYF		725 - 817	105 - 118	1467 - 1653	213 - 240
KCF, KJF, KTF		725 - 817	105 - 118	1485 - 1667	215 - 242
CCF, HHF, HTF, HDF		725 - 817	105 - 118	1533 - 1725	222 - 250
CZF		725 - 817	105 - 118	1845 - 2078	268 - 301
BRF		725 - 817	105 - 118	2223 - 2547	322 - 369
CRF	*DRIVE (D4) & MANUAL THIRD (D3) @ 1000 RPM	389 - 439	56 - 64	772 - 869	112 - 126
CHF, CYF		389 - 439	56 - 64	778 - 888	113 - 129
KCF, KJF, KTF		389 - 439	56 - 64	797 - 896	116 - 130
CCF, HFF, HTF, HDF		389 - 439	56 - 64	823 - 927	119 - 134
CZF		389 - 439	56 - 64	991 - 1117	144 - 162
KZF		389 - 439	56 - 64	1104 - 1259	160 - 183
BRF		389 - 439	56 - 64	1194 - 1368	173 - 198
KZF	*MANUAL SECOND (D2) & LO (D1) @ 1000 RPM	789 - 889	114 - 129	789 - 889	114 - 129
BRF, CCF, CHF, CRF		846 - 953	123 - 138	846 - 953	123 - 138
CYF, CZF, HHF, HTF		846 - 953	123 - 138	846 - 953	123 - 138
KCF, KJF, KTF, HDF		846 - 953	123 - 138	846 - 953	123 - 138

Line pressure is basically controlled by pump output and the pressure regulator valve. In addition, line pressure is boosted in Reverse, Second and Lo by the reverse boost valve.

Also, in the Neutral, Drive, Intermediate and Reverse positions of the selector lever, the line pressure should increase with throttle opening because of the T.V. system. The T.V. system is controlled by the T.V. cable, the throttle lever and bracket assembly and the T.V. link, as well as the control valve assembly.

H 200-4R-165-8

Figure 3 Preliminary Check Procedure



RANGE	GEAR	FOURTH CLUTCH	OVERDRIVE ROLLER CLUTCH	OVERRUN CLUTCH	DIRECT CLUTCH	INTERMEDIATE BAND	FORWARD CLUTCH	LO-ROLLER CLUTCH	LO-REVERSE CLUTCH
P-N			HOLDING						
D	FIRST		HOLDING				APPLIED	HOLDING	
	SECOND		HOLDING			APPLIED	APPLIED		
	THIRD		HOLDING		APPLIED		APPLIED		
	FOURTH	APPLIED			APPLIED		APPLIED		
D	FIRST			APPLIED			APPLIED	HOLDING	
	SECOND			APPLIED		APPLIED	APPLIED		
	THIRD			APPLIED	APPLIED		APPLIED		
2	FIRST			APPLIED			APPLIED	HOLDING	
	SECOND			APPLIED		APPLIED	APPLIED		
1	FIRST			APPLIED			APPLIED		APPLIED
R	REVERSE		HOLDING		APPLIED				APPLIED

HH0154-2004R

Figure 4 Clutch Application Chart

CONDITION	INSPECT COMPONENT	FOR CAUSE
OIL LEAK	• Oil Pan	— Bolts not correctly torqued. — Improperly installed or damaged pan gasket. — Oil pan gasket mounting face not flat.
	• Filler Pipe	— Multi lip seal damaged or missing.
	• Filler Pipe Bracket	— Mispositioned.
	• Throttle Valve Cable	— Multi lip seal missing, damaged or improperly installed.
	• Rear Seal Assembly	— Damaged or improperly installed.
	• Speedometer Driven Gear	— "O" ring damaged.
	• Manual Shaft	— Lip seal damaged or improperly installed.
	• Case	— Line pressure tap plug. — Fourth clutch pressure tap plug. — Porous.
	• Intermediate Servo	— "O" rings damaged.
	• Oil Pump Assembly	— Front pump seal leaks: Seal lip cut—check converter hub for nicks, etc.; bushing moved forward and damaged; garter spring missing from seal. — Front pump attaching bolts loose or bolt seal damaged or missing. — Front pump housing "O" ring damaged or cut. — Porous casting. — Inspect converter weld area.
	• Vent Pipe	— Transmission over filled. — Water in oil. — Foreign matter between pump and case or between pump cover and body. — Case porous; front pump cover mounting face shy of stock near breather. — Pump to case gasket mispositioned. — Incorrect dipstick. — Pump shy of stock on mounting faces, porous casting, breather hole plugged in pump cover.
NO DRIVE IN DRIVE RANGE (Install Pressure Gage)	• Oil Level	— Incorrect level. — External leaks.
	• Manual Linkage	— Misadjusted.

HH0002-2004R

Figure 5 Diagnosis Chart

CONDITION	INSPECT COMPONENT	FOR CAUSE
NO DRIVE IN DRIVE RANGE (Install Pressure Gage) (Continued)	• Oil Pressure	— Plugged or restricted oil filter. — Cut or missing oil filter "O" ring seals. — Pump assembly - pressure regulator stuck. — Pump rotor - tangs damaged by converter. — Porosity in oil filter to pump intake bore.
	• Overdrive Unit	— Springs missing in the roller clutch. — Rollers galled or missing.
	• Forward Clutch	— Piston cracked, seals missing, damaged; clutch plates burned; snap ring out of groove. — Oil seal rings missing or damaged on turbine shaft; leak in feed circuits; pump to case gasket mispositioned or damaged. — Clutch housing ball check stuck or missing. — Cup plug leaking or missing in the rear of the forward clutch shaft in the clutch apply passage.
	• Lo & Reverse Roller Clutch	— Springs missing. — Rollers galled or missing.
HIGH OR LOW OIL PRESSURE (Refer To Oil Pressure Checks)	• Throttle Valve Cable	— Misadjusted, binding, unhooked, broken or wrong link.
	• Throttle Valve Assembly	— Damaged or leaking. — Throttle lever and bracket assembly binding, unhooked or mispositioned. — Throttle valve or plunger valve binding.
	• Pressure Regulator Valve	— Binding.
	• T.V. Boost Valve	— Binding. — Wrong valve - causing low oil pressure only.
	• Reverse Boost Valve	— Binding.
	• Manual Valve	— Unhooked. — Mispositioned.
	• Pressure Relief Valve	— Ball missing. — Spring damaged.
	• Pump	— Slide stuck. — Slide seal damaged or missing. — Decrease air bleed orifice missing or damaged - causing high oil pressure. — Decrease air bleed orifice plugged - causing low oil pressure.
	• T.V. Limit Valve	— Binding.

HH0003-2004R

Figure 6 Diagnosis Chart

CONDITION	INSPECT COMPONENT	FOR CAUSE
HIGH OR LOW OIL PRESSURE (Refer To Oil Pressure Checks) (Continued)	• Line Bias Valve	— Binding in open position - causing high oil pressure. — Binding in closed position - causing low oil pressure.
	• Control Valve Assembly Spacer Plate & Case	— Correct orifices and passages.
1-2 SHIFT - FULL THROTTLE ONLY	• Throttle Valve Cable	— Binding, unhooked or broken. — Misadjusted.
	• Throttle Lever & Bracket Assembly	— Binding or unhooked.
	• T.V. Exhaust Ball Lifter Or No. 5 Ball	— Binding, mispositioned or unhooked. (Allowing No. 5 ball to seal causes full T.V. pressure regardless of throttle valve position.
	• Throttle Valve & Plunger	— Binding.
	• Control Valve Assembly	— Valve body gaskets leaking, damaged, incorrectly installed.
	• Case Assembly	— Porosity.
NO 1-2 SHIFT	• Governor & Governor Feed Passages	— Plugged governor oil feed orifice in spacer plate. — Ball or balls missing in governor assembly. — Inner governor cover rubber "O" ring seal missing or leaking. — Governor shaft seal missing or damaged. — Driven gear stripped. — Weights binding on pin. — Driven gear not engaged with governor shaft.
	• Control Valve Assembly	— 1-2 shift, Lo 1st/Detent, or 1-2 throttle valve stuck in downshift position. — Spacer plate gaskets in wrong position.
	• Case	— Porosity in case channels or undrilled 2nd oil feed hole. — Excessive leakage between case bore and intermediate band apply rings. — Intermediate band anchor pin missing or unhooked from band. — Broken or missing band.

HH0004-2004R

Figure 7 Diagnosis Chart

CONDITION	INSPECT COMPONENT	FOR CAUSE
NO 1-2 SHIFT (Continued)	• Intermediate Servo Assy.	— Servo cover oil seal ring missing. — Porosity in servo; cover, inner piston or outer piston. — Wrong intermediate band apply pin. — Incorrect usage of cover and piston.
	• 1-2 Accumulator	— Housing bolts loose. — Housing face damaged. — Missing or damaged accumulator plate.
NO 2-3 SHIFT	• Control Valve Assembly & Spacer Plate	— 2-3 shift valve or 2-3 throttle valve stuck in the downshift position. — Valve body gaskets leaking, damaged or incorrectly installed. — Reverse/3rd check ball not seating, damaged or missing.
	• Case	— Porosity in case channels.
	• Center Support	— Direct clutch feed passage in the center support plugged or not drilled through. — Steel oil seal rings on center support damaged.
	• Direct Clutch	— Inner oil seal ring missing or damaged on piston. — Center oil seal ring missing or damaged on direct clutch hub. — Check ball and/or retainer damaged or missing from direct clutch piston. — Direct clutch piston or housing damaged or missing. — Direct clutch plates damaged or missing. — Direct clutch backing plate snap ring out of groove. — Release spring guide mislocated, preventing piston check ball from seating in retainer.
	• Intermediate Servo Assy. (Third Clutch Accumulator Oil Passages)	— Servo to case oil seal ring broken or missing on intermediate servo piston. — Intermediate servo and/or capsule missing or damaged. — Exhaust hole in case between servo piston seal rings plugged or undrilled. — Bleed orifice cup plug missing from intermediate servo pocket in case.
NO REVERSE OR SLIPS IN REVERSE (Install Pressure Gage)	• Throttle Valve Cable	— Binding or misadjusted.
	• Manual Linkage	— Misadjusted.
	• Throttle Valve	— Binding.

HH0005-2004R

Figure 8 Diagnosis Chart

CONDITION	INSPECT COMPONENT	FOR CAUSE
NO REVERSE OR SLIPS IN REVERSE (Install Pressure Gage) (Continued)	• T.V. Limit Valve	— Binding.
	• Line Bias Valve	— Binding.
	• Reverse Boost Valve	— Binding in pressure regulator bore.
	• Reverse/3rd Or Lo/Reverse Check Ball	— Missing or seat in spacer plate damaged.
	• Reverse Clutch	— Piston cracked, or missing inner or outer seals. Clutch plates burned. — Reverse oil seal in case missing or damaged. — Missing clutch plate or wave plate.
	• Center Support	— Attaching bolts loose or missing. — Passages blocked or not drilled. — Porosity.
	• Direct Clutch Housing	— Piston or housing cracked. — Inner or outer piston seal missing or damaged. — Check ball in either the direct clutch housing or the piston missing or damaged. — Plates burned.
	• Spacer Plate	— Lo/Reverse overrun clutch orifice plugged.
DRIVE IN NEUTRAL	• Manual Linkage	— Misadjusted or disconnected.
	• Forward Clutch	— Clutch does not release. — Exhaust check ball sticking. — Plates burned together.
	• Case	— Cross leakage to forward clutch passage (D4).
SLIP IN 1-2 SHIFT	• Oil Level	— Low oil level.
	• Spacer Plate & Gaskets	— Gaskets damaged or incorrectly installed.
	• Accumulator Valve	— Valve sticking in valve body causing low 1-2 accumulator pressure. — Weak or missing spring.
	• 1-2 Accumulator Piston	— Seal leaking, spring broken or missing. — Leak between piston and pin. — Piston binding. — Piston bore damaged.
	• Intermediate Band Apply Pin	— Wrong selection of apply pin. — Excessive leakage between apply pin and case. — Apply pin feed hole not completely drilled.

HH0006-2004R

Figure 9 Diagnosis Chart

CONDITION	INSPECT COMPONENT	FOR CAUSE
SLIP IN 1-2 SHIFT (Continued)	• Intermediate Servo Assy.	— Porosity in piston. — Cover to servo oil seal ring damaged or missing. — Leak between servo apply pin and case.
	• Throttle Valve Cable	— Not properly adjusted.
	• Throttle Valve	— Binding, causing low T.V. pressure.
	• T.V. Limit Valve	— Binding.
	• Line Bias Valve	— Sticking, causing low line pressure.
	• Intermediate Band	— Worn or burned.
	• Case	— Porosity in 2nd clutch passage.
ROUGH 1-2 SHIFT	• Throttle Valve Cable	— Not adjusted properly. — Binding.
	• Throttle Valve Or T.V. Plunger	— Binding.
	• T.V. Limit Valve	— Binding.
	• Accumulator Valve	— Binding.
	• Line Bias Valve	— Binding.
	• Intermediate Servo Assy.	— Wrong selection apply pin. — Servo piston to case oil seal ring damaged or missing. — Bleed cup plug missing in case.
	• 1-2 Accumulator	— Oil ring damaged. — Piston stuck. — Broken or missing spring. — Bore damaged.
	• 1-2 Shift Check Ball No. 8	— Missing or sticking.
SLIP IN 2-3 SHIFT	• Oil Level	— Low oil level.
	• Throttle Valve Cable	— Not adjusted properly.
	• Throttle Valve	— Binding.
	• Spacer Plate & Gaskets	— Direct Clutch orifice partially blocked in spacer plate. — Gaskets mispositioned or damaged.

HH0007-2004R

Figure 10 Diagnosis Chart

CONDITION	INSPECT COMPONENT	FOR CAUSE
SLIP IN 2-3 SHIFT (Continued)	• Intermediate Servo Assy.	— Servo to case oil seal ring damaged or missing. — Piston or servo bore damaged. — Intermediate servo orifice bleed cup plug in case missing. — Porosity in the case in the servo bore area.
	• Direct Clutch Feed	— Porosity in direct clutch feed channels in case. — Case to support bolts not tight causing leakage. — Direct clutch piston or housing cracked. — Piston seals cut or missing. — Direct clutch plates burned. — Check ball in piston and/or housing missing, damaged or leaking. — Check ball capsule damaged. — Release spring guide mislocated preventing check ball from seating in piston.
	• Center Support	— Channels cross feeding, leaking or restricted. — Oil seal rings damaged or missing.
ROUGH 2-3 SHIFT	• Throttle Valve Cable	— Mispositioned or missing.
	• Throttle Valve & Plunger	— T.V. plunger binding. — Throttle valve binding.
	• T.V. Limit Valve	— Binding.
	• Intermediate Servo Assy.	— Exhaust hole undrilled or plugged between intermediate servo piston seals, not allowing intermediate servo piston to complete its stroke.
	• 3-2 Exhaust Check Ball No. 4	— Missing or mispositioned.
	• 3rd Accumulator Check Ball No. 2	— Missing or mispositioned.
SLIP IN 3-4 SHIFT	• Oil Level	— Low oil level.
	• Control Valve Assembly & Spacer Plate	— Gaskets or spacer plate damaged or incorrectly installed. — Accumulator valve sticking causing low 3-4 accumulator pressure. — Weak or missing accumulator valve spring.
	• 3-4 Accumulator	— Piston stuck. — Bore damaged. — Oil ring damaged.

HH0008-2004R

Figure 11 Diagnosis Chart

CONDITION	INSPECT COMPONENT	FOR CAUSE
SLIP IN 3-4 SHIFT (Continued)	• Center Support	— Porosity. — Center support attaching bolts loose. — Fourth clutch piston surface damaged. — Fourth clutch piston seals damaged. — Proper plate usage (see Clutch Plate Usage Chart). — Fourth clutch plates burned.
	• Case	— Porosity. — 1-2 accumulator housing bolts loose. — 3-4 accumulator piston seal damaged. — 3-4 accumulator leaking between the piston and pin. — 3-4 accumulator bore damaged.
ROUGH 3-4 SHIFT	• Throttle Valve Cable	— Mispositioned or missing.
	• Throttle Valve & Plunger	— Binding.
	• T.V. Limit Valve	— Binding.
	• 3-4 Accumulator	— Piston stuck. — Bore damaged.
	• Fourth Clutch	— Piston binding.
NO CONVERTER CLUTCH APPLY	• Electrical System (12 volts must be supplied to the solenoid for it to engage)	— Defective solenoid. — Damaged electrical connector. — Defective pressure switch. — Wire grounded.
	• Control Valve Assembly & Spacer Plate	— Converter clutch shift valve or throttle valve stuck.
	• Pump Assembly	— Orifice plugged for converter signal oil in pump. — "O" ring damaged or missing on solenoid. — Orificed cup plug missing in oil cooler passage in pump. — Pump to case gasket damaged or mispositioned. — Converter clutch apply valve stuck. — Cup plug missing from apply passage.
ROUGH CONVERTER CLUTCH APPLY	• Converter Clutch Pressure Plate	— Damaged.
	• Check Ball In End Of Turbine Shaft	— Damaged or missing.

HH0009-2004R

Figure 12 Diagnosis Chart

CONDITION	INSPECT COMPONENT	FOR CAUSE
NO CONVERTER CLUTCH RELEASE	• Converter Clutch Apply Valve	— Stuck.
	• Converter	— Damaged.
	• Pump	— Cup plug in release passage missing.
	• Turbine Shaft	— Seal missing or damaged. — Hole not drilled through.
NO 3-4 SHIFT (Install Pressure Gage To Fourth Clutch Pressure Tap)	• Control Valve Assembly & Spacer Plate	— 3-4 shift valve or 3-4 throttle valve stuck. — Orifice in spacer plate plugged.
	• Center Support	— Oil passages plugged or not drilled. — Center support attaching bolts loose or missing. — Fourth clutch piston cracked or damaged. — Fourth clutch piston seals damaged, missing or improperly assembled. — Improper plate usage (see Clutch Plate Usage Chart). — Fourth clutch plates burned. — Overrun clutch plates binding.
	• Case	— Porosity. — Orificed cup plug missing in 3-4 accumulator passage in case. — Leakage between accumulator piston and pin. — 3-4 accumulator bore damaged.
NO MANUAL 3RD OR 2ND	• Turbine Shaft & Overrun Clutch	— D-3 oil passage not drilled or plugged in turbine shaft. — D-3 oil passage not drilled through in overrun clutch hub. — Oil seals missing or damaged in the overrun clutch piston. — Overrun clutches burned. — Overrun clutch backing plate snap ring out of groove.

HH0010-2004R

Figure 13 Diagnosis Chart

CONDITION	INSPECT COMPONENT	FOR CAUSE
NO ENGINE BRAKING IN MANUAL LO-1ST GEAR	• Control Valve Assembly & Spacer Plate	— Manual linkage misadjusted. — D-3 orifice in spacer plate plugged. — Valve body gaskets leaking, damaged or incorrectly installed. — D-2 oil pipe leaking or out of position. — Lo overrun clutch valve binding in valve body. — Lo/Reverse check ball (#10) mispositioned or missing. — Lo/Detent check ball (#9) mispositioned or missing. — Lo/Reverse overrun clutch orifice in spacer plate plugged. — PT/D-3 check ball (#3) mispositioned or missing.
	• Turbine Shaft & Overrun Clutch	— D-3 oil passage not drilled or plugged in turbine shaft. — D-3 oil passage not drilled through in overrun clutch hub. — Oil seals missing or damaged in the overrun clutch piston. — Overrun clutches burned. — Overrun clutch backing plate snap ring out of groove.
	• Case	— Porosity.
	• Lo/Reverse Clutch Assy.	— Piston seals broken or missing. — Clutch housing snap ring out of case. — Piston or housing cracked or porous. — Cup plug or rubber seal missing or damaged between case and lo/reverse clutch housing.
NO ENGINE BRAKING IN MANUAL 2ND-2ND GEAR	• Control Valve Assembly & Spacer Plate	— Manual linkage misadjusted. — Valve body gaskets leaking, damaged, or incorrectly installed. — D-2 oil pipe leaking or out of position. — D-3 orifice in spacer plate plugged. — PT/D-3 check ball (#3) mispositioned or missing.
	• Case	— Porosity.
	• Intermediate Servo Assy.	— Servo cover to case oil seal ring missing or damaged.
	• Intermediate Band	— Off anchor pin. — Broken or burned.

HH0011-2004R

Figure 14 Diagnosis Chart

CONDITION	INSPECT COMPONENT	FOR CAUSE
NO ENGINE BRAKING IN MANUAL 2ND-2ND GEAR (Continued)	• Turbine Shaft & Overrun Clutch	— D-3 oil passage not drilled through in overrun clutch hub. — Oil seals missing or damaged in the overrun clutch piston. — D-3 oil hole not drilled or plugged in turbine shaft. — Overrun clutches burned. — Overrun clutch backing plate snap ring out of groove.
NO ENGINE BRAKING IN MANUAL 3RD-3RD GEAR	• Control Valve Assembly & Spacer Plate	— Manual linkage misadjusted. — D-3 orifice in spacer plate plugged. — Valve body gaskets leaking, damaged, or incorrectly installed. — PT/D-3 check ball (#3) mispositioned or missing.
	• Turbine Shaft & Overrun Clutch	— D-3 oil passage not drilled or plugged in turbine shaft. — D-3 oil hole not drilled through in overrun clutch hub. — Oil seals missing or damaged in the overrun clutch piston. — Overrun clutches burned. — Overrun clutch backing plate snap ring out of groove.
WILL NOT HOLD IN PARK	• Manual Linkage	— Misadjusted.
	• Internal Linkage	— Parking pawl binding in case. — Actuator rod, spring or plunger damaged. — Parking pawl broken. — Parking bracket loose or damaged. — Manual shaft to case pin missing or mispositioned.
	• Inside Detent Lever & Pin Assembly	— Nut loose. — Hole in lever worn or damaged.
	• Manual Detent Roller & Spring Assembly	— Bolt loose that holds roller assembly to valve body. — Pin or roller damaged, mispositioned or missing.
NO PART THROTTLE DOWNSHIFTS (Install Pressure Gage)	• Throttle Valve	— Binding.
	• T.V. Limit Valve	— Binding.
	• Spacer Plate	— Hole plugged or undrilled.

HH0012-2004R

Figure 15 Diagnosis Chart

CONDITION	INSPECT COMPONENT	FOR CAUSE
NO PART THROTTLE DOWNSHIFTS (Install Pressure Gage) (Continued)	• Valve Body Gaskets	— Mispositioned or damaged.
	• T.V. Modulator Downshift Valve	— Stuck.
	• Throttle Valve Cable	— Improperly set.
NO PART THROTTLE 4-3 DOWNSHIFT (On Selected Models With A P.T. Passage In The Throttle Plunger Bushing)	• Throttle Plunger Bushing	— Passages not open.
	• 3-4 Throttle Valve Bushing	— Passages not open.
	• PT/D-3 Check Ball (#3)	— Mispositioned or missing.
	• Valve Body Gaskets	— Mispositioned or damaged.
	• Throttle Valve Cable	— Improperly set.
	• T.V. Limit Valve	— Binding.
LOW OR HIGH SHIFT POINTS (Install Pressure Gage To Line Pressure Tap)	• Throttle Valve Cable	— Binding or misadjusted.
	• T.V. Limit Valve	— Binding.
	• Throttle Valve	— Binding.
	• T.V. Modulator Upshift Valve	— Binding.
	• T.V. Modulator Downshift Valve	— Binding.
	• Valve Body Gaskets	— Mispositioned, leaking or damaged.
	• Throttle Valve Plunger	— Binding.
	• 1-2, 2-3 or 3-4 Throttle Valves	— Binding in bushings.
	• Pressure Regulator Valve	— Binding.
	• T.V. Exhaust Ball (#5) & Lifter	— Mispositioned, unhooked or missing.
	• Throttle Lever & Bracket Assembly	— Binding, unhooked or loose at mounting valve body bolt. — Not positioned at the throttle valve plunger bushing pin locator.
	• Governor Shaft To Cover Seal Ring	— Broken or missing.
	• Governor Cover Gasket	— Broken or missing.
	• Case	— Porosity.

HH0013-2004R

Figure 16 Diagnosis Chart

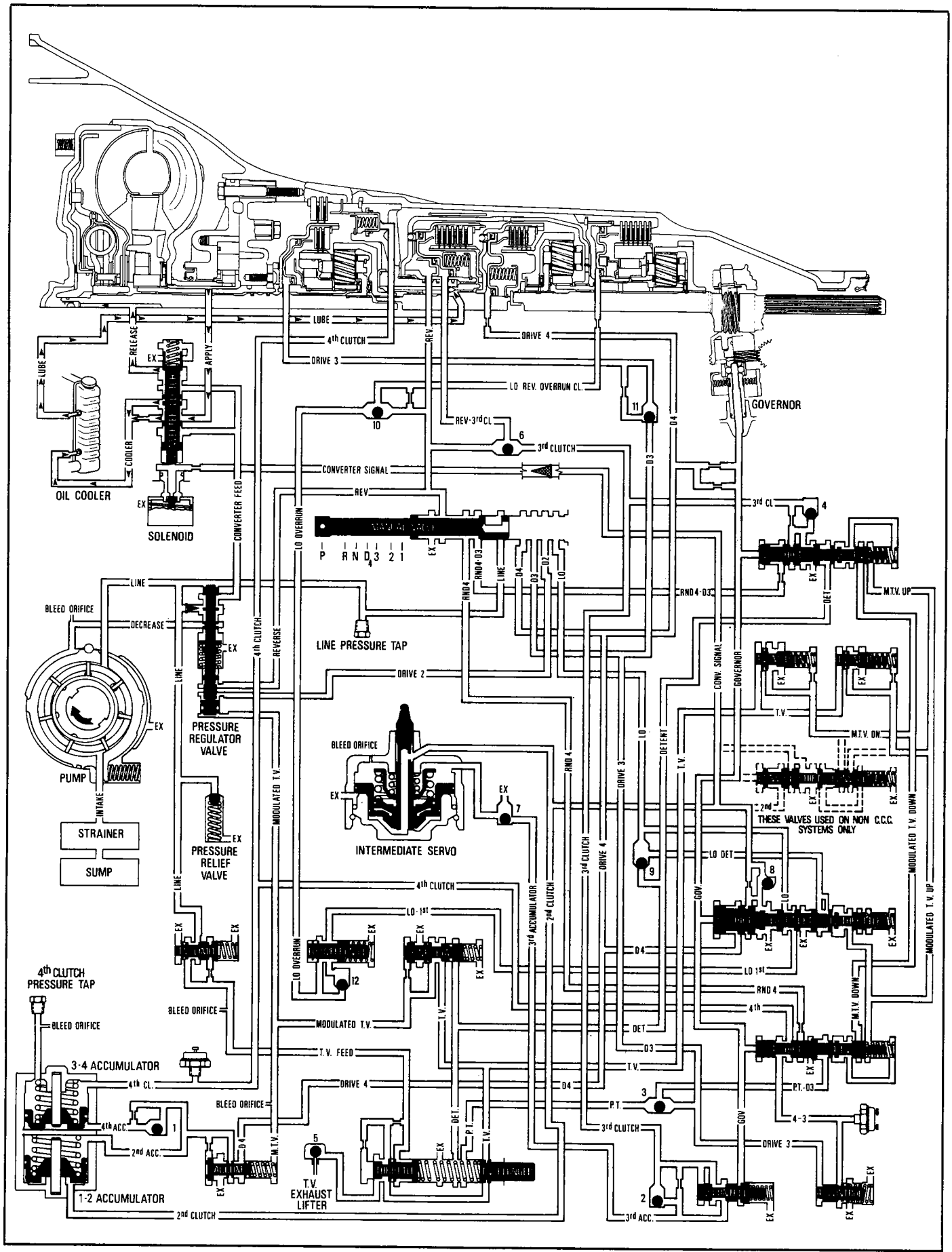


Figure 17 Park - Engine Running

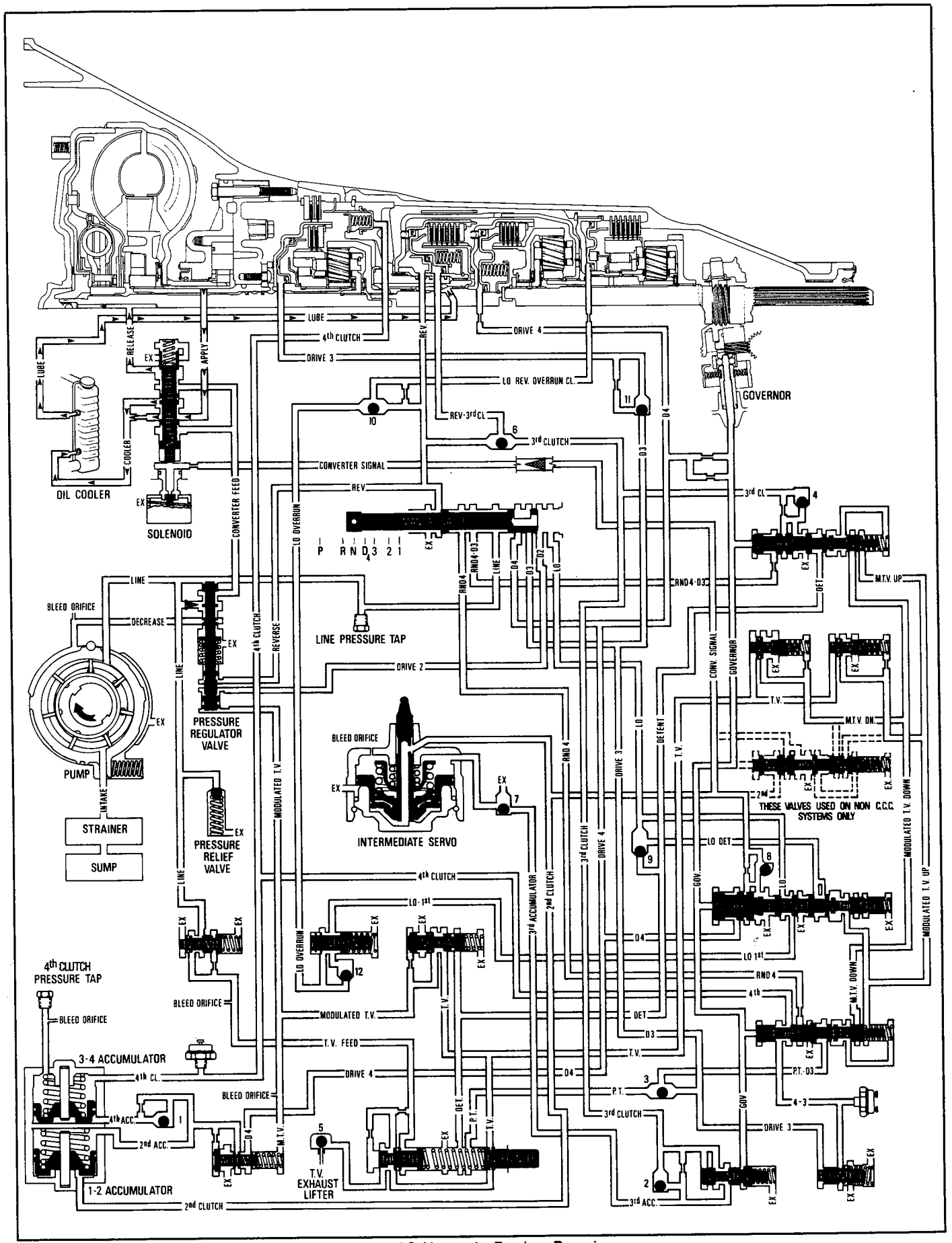


Figure 18 Neutral - Engine Running

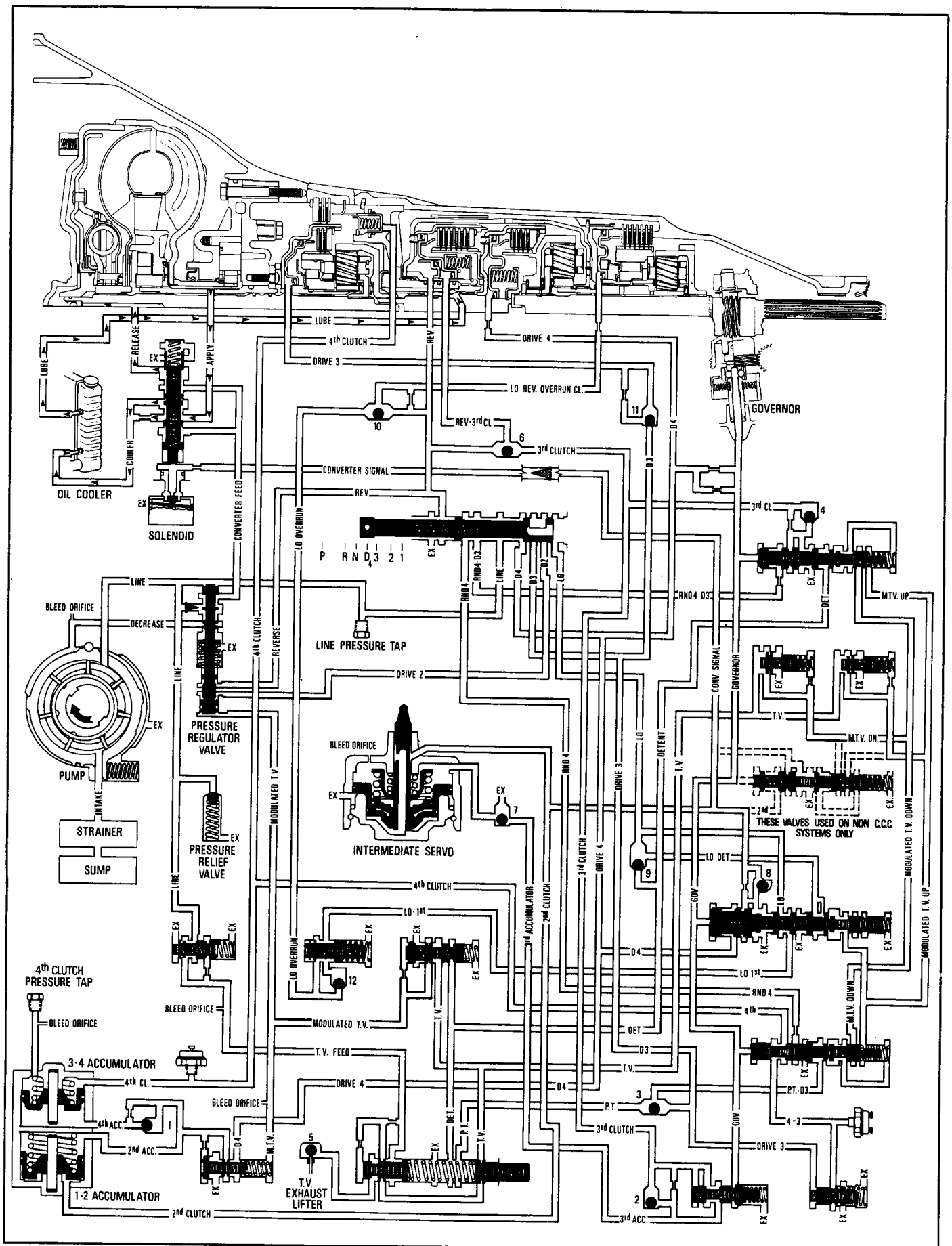


Figure 19 Drive Range - First Gear

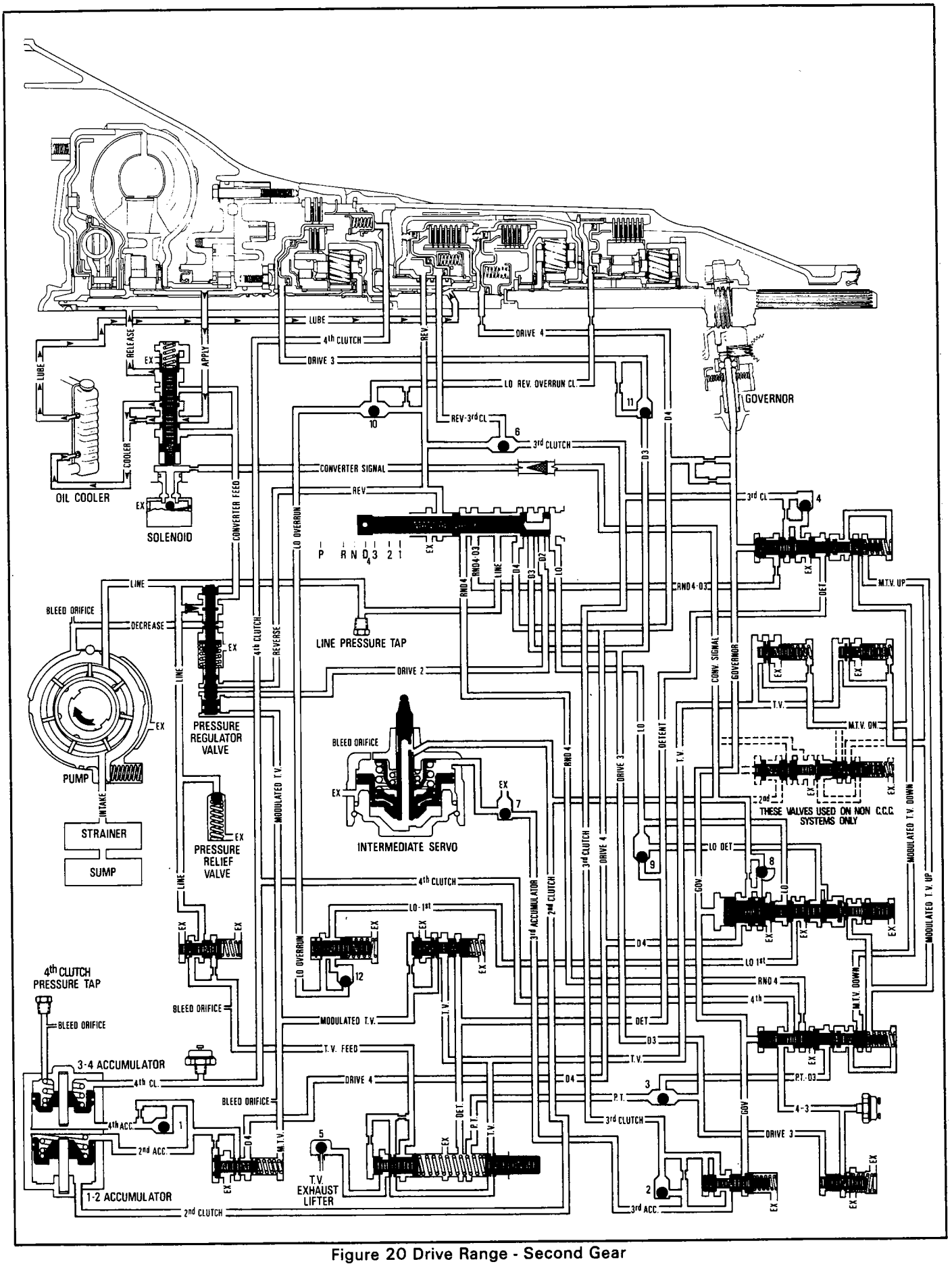


Figure 20 Drive Range - Second Gear

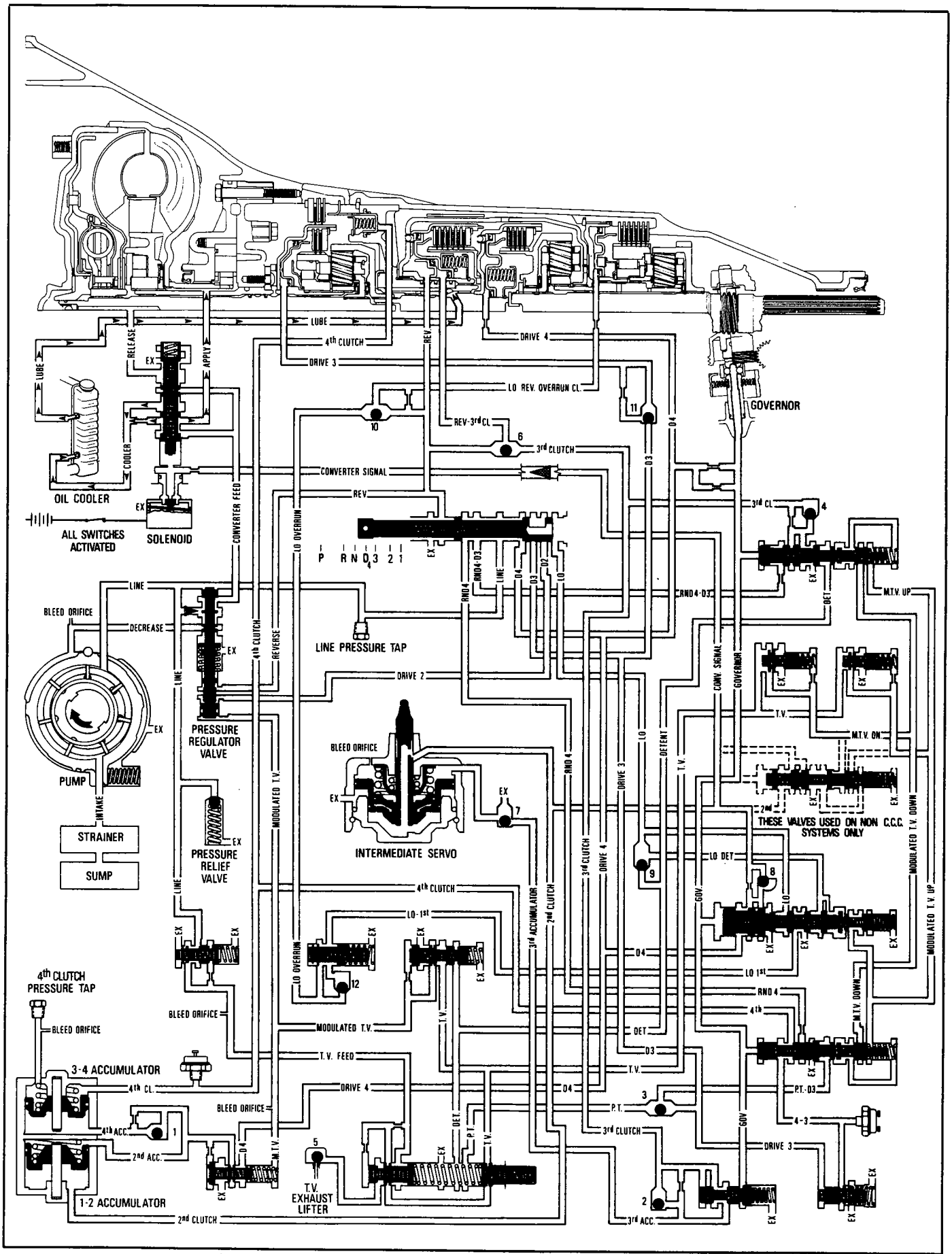


Figure 21 Drive Range - Second Gear, Converter Clutch Applied

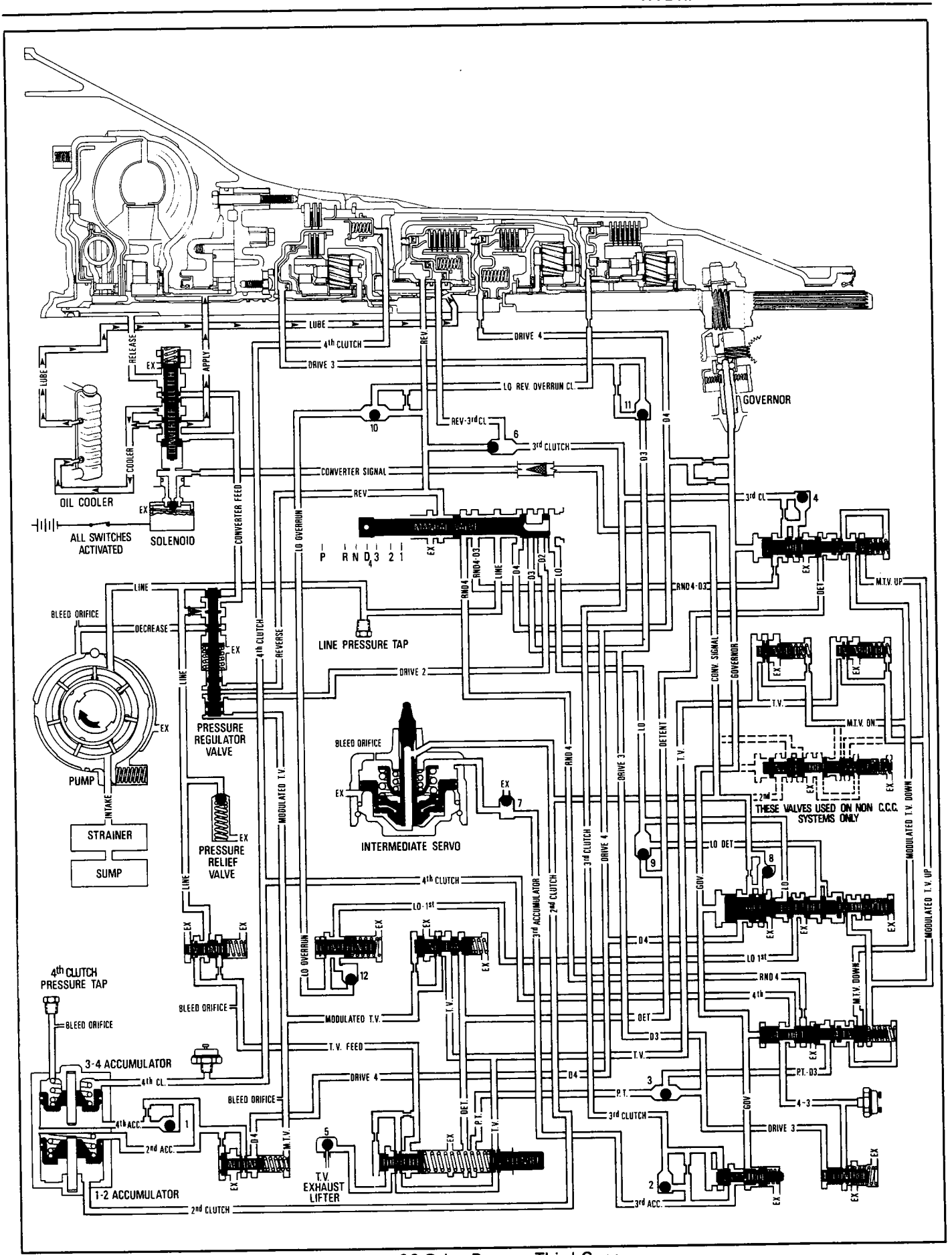


Figure 22 Drive Range - Third Gear

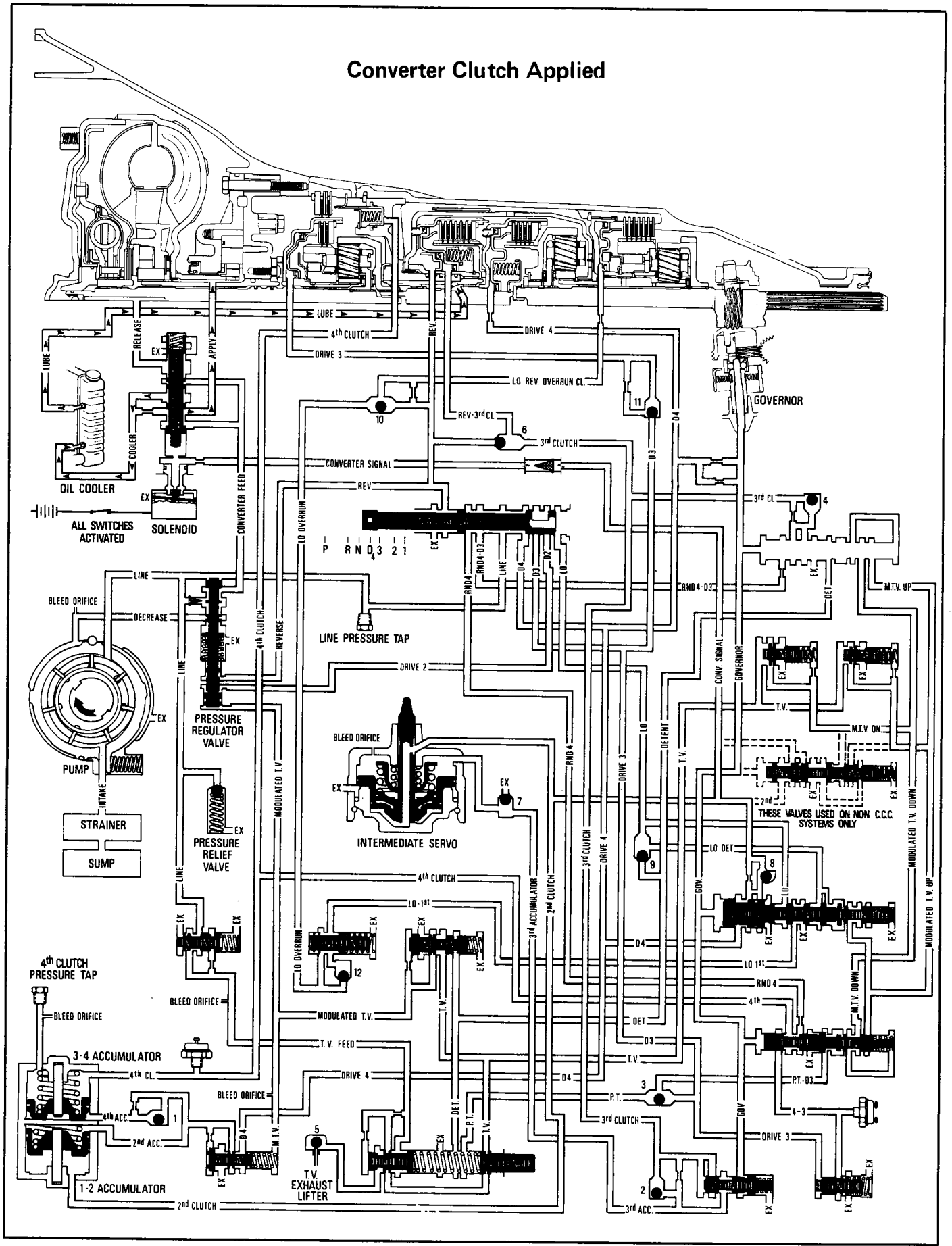


Figure 23 Drive Range - Overdrive

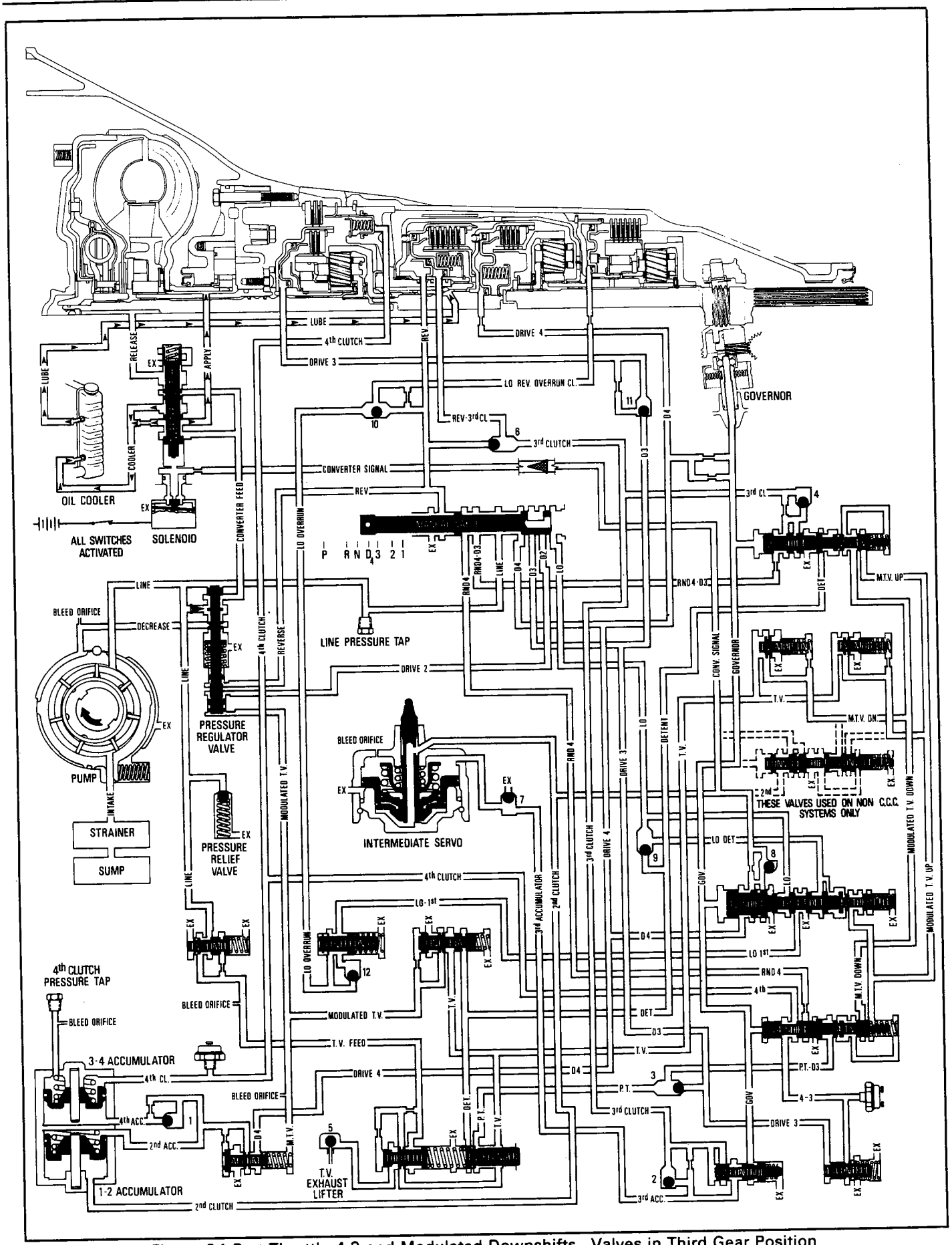


Figure 24 Part Throttle 4-3 and Modulated Downshifts - Valves in Third Gear Position

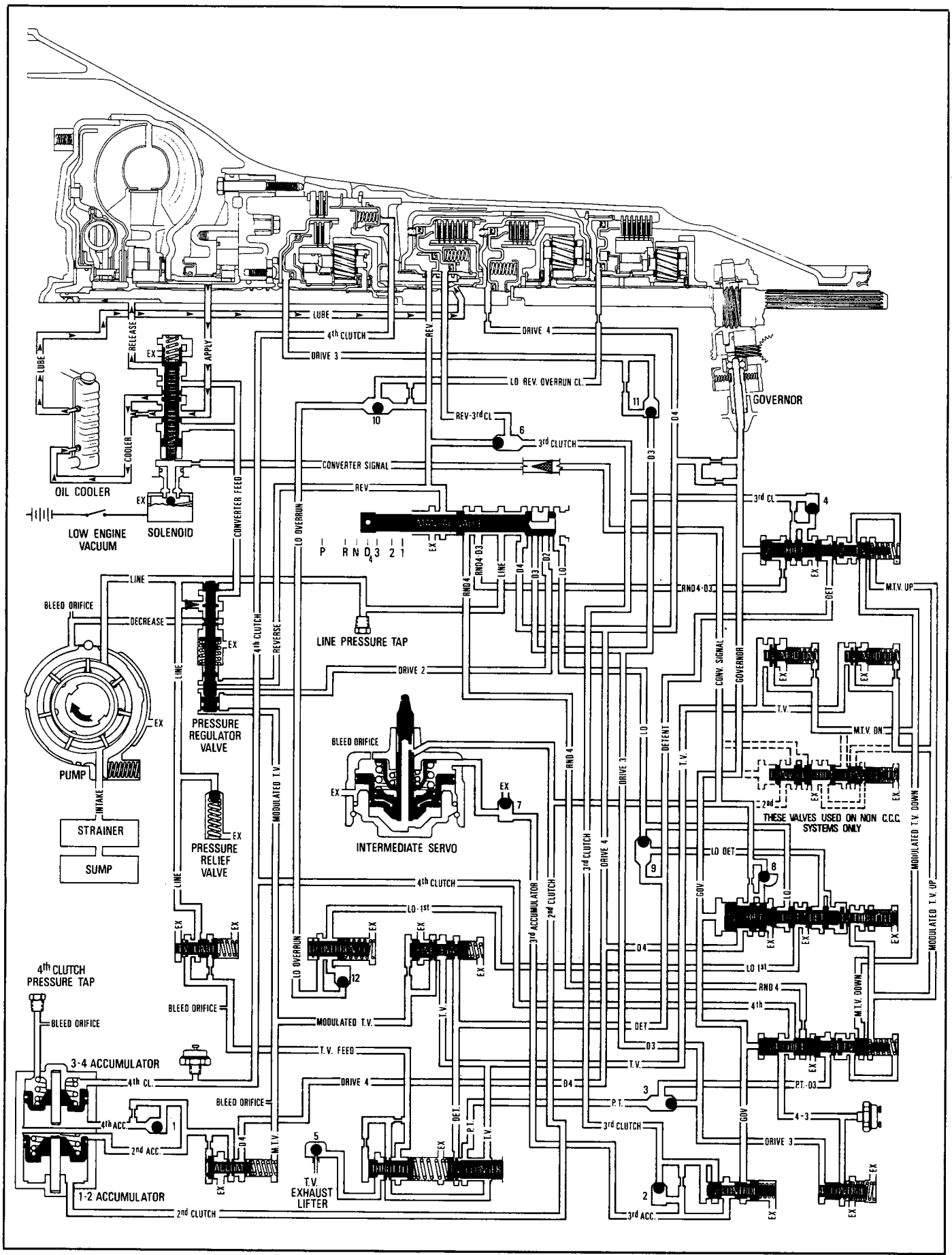


Figure 25 Detent Downshifts - Valves in Second Gear Position

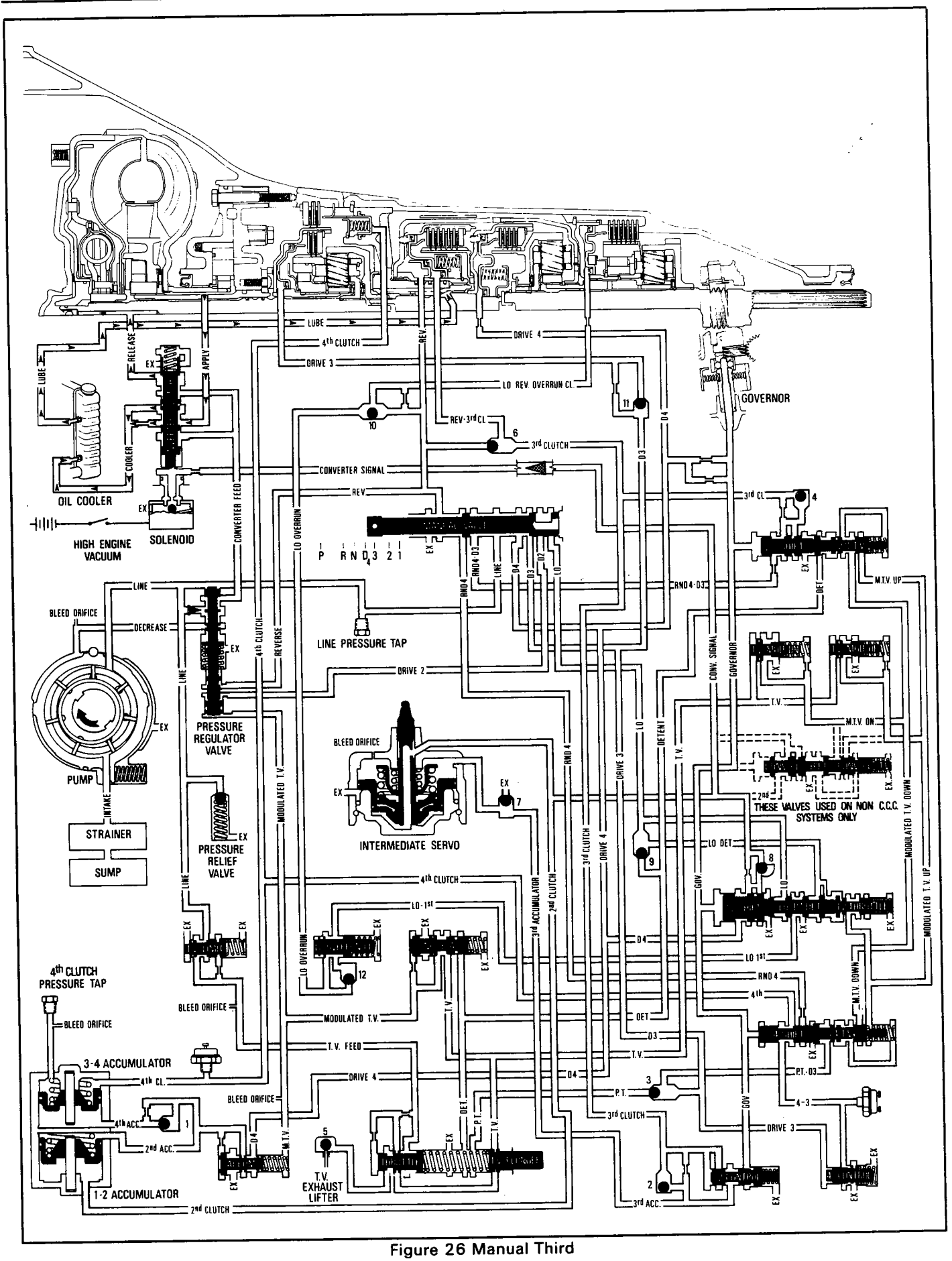


Figure 26 Manual Third

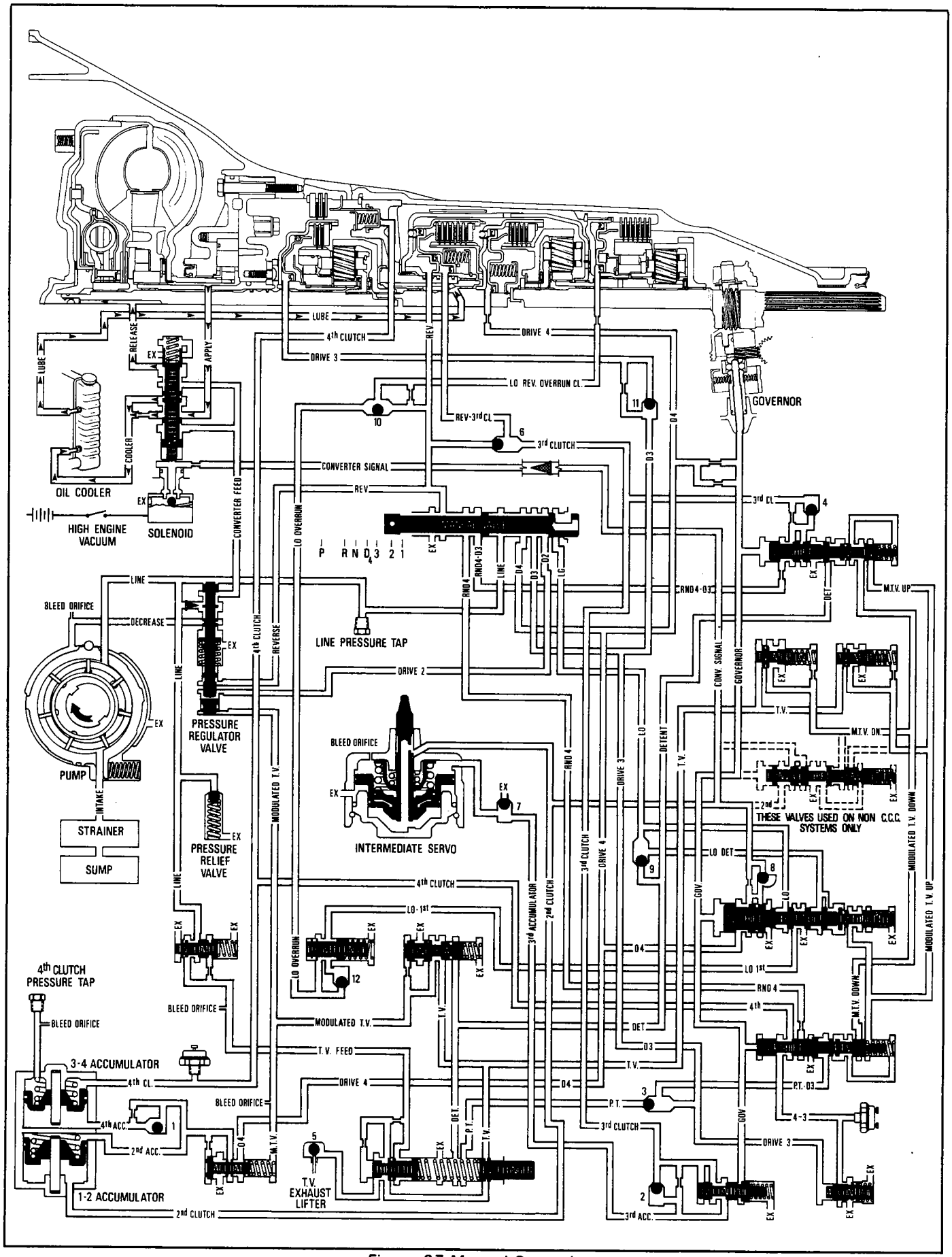


Figure 27 Manual Second

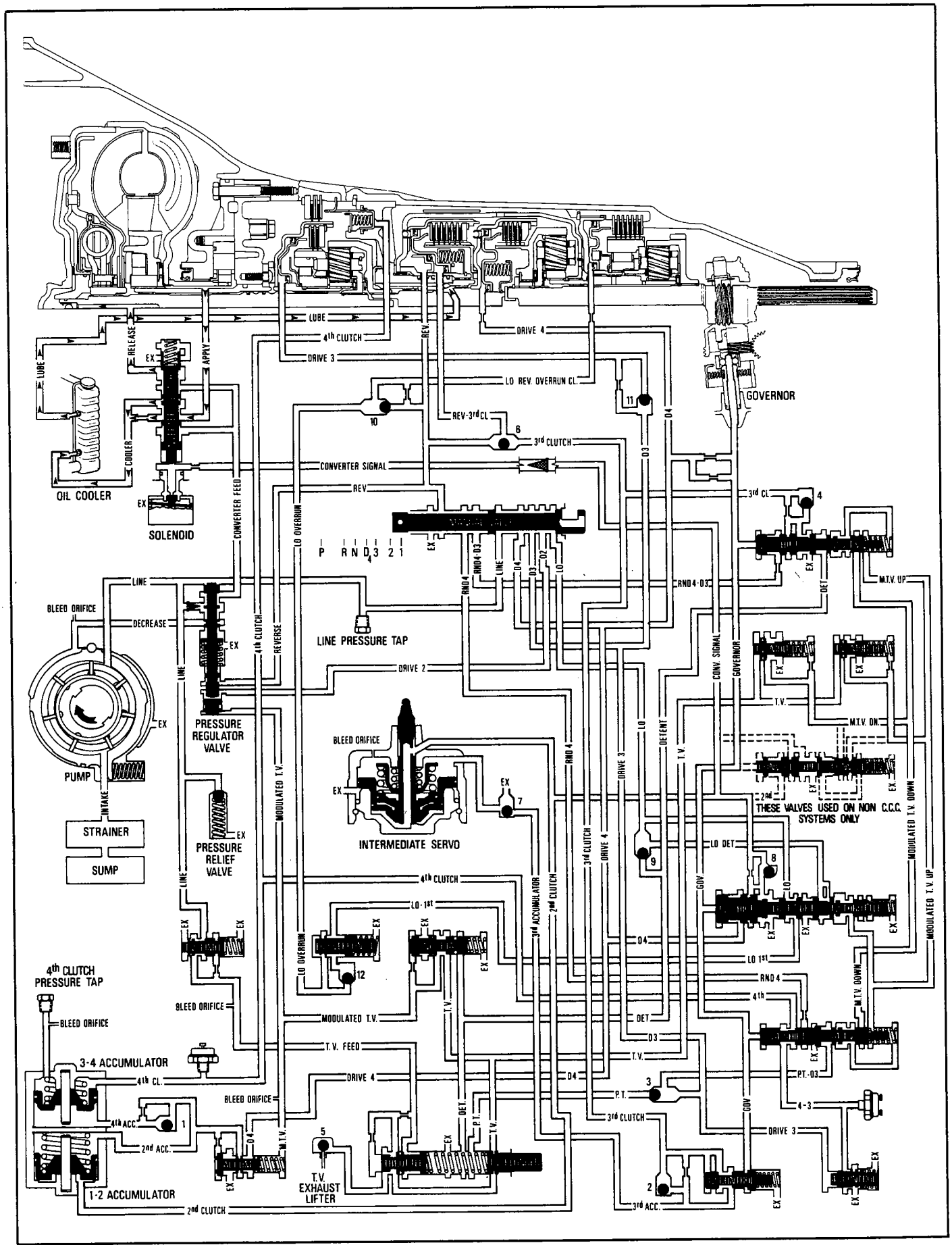


Figure 28 Manual Lo

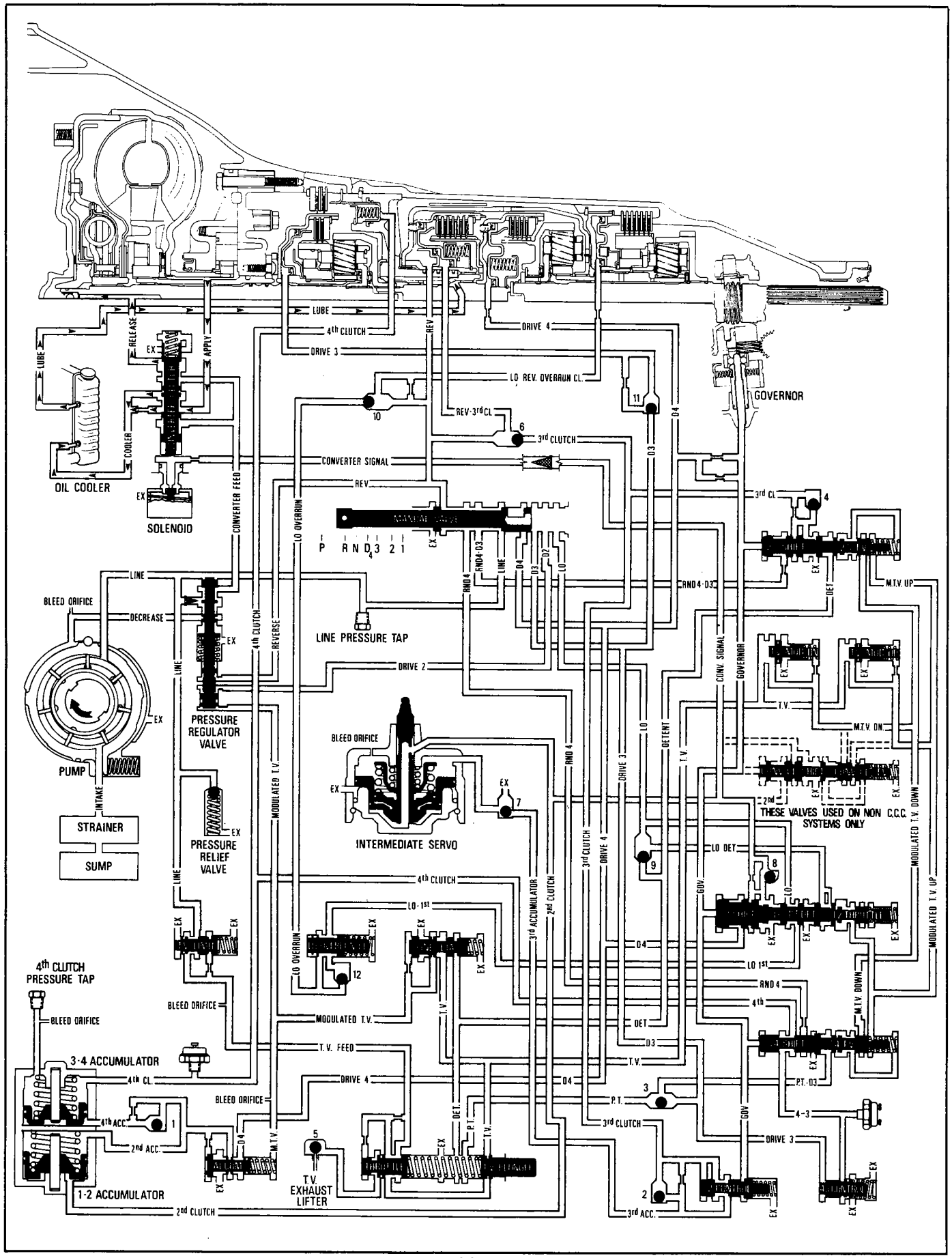
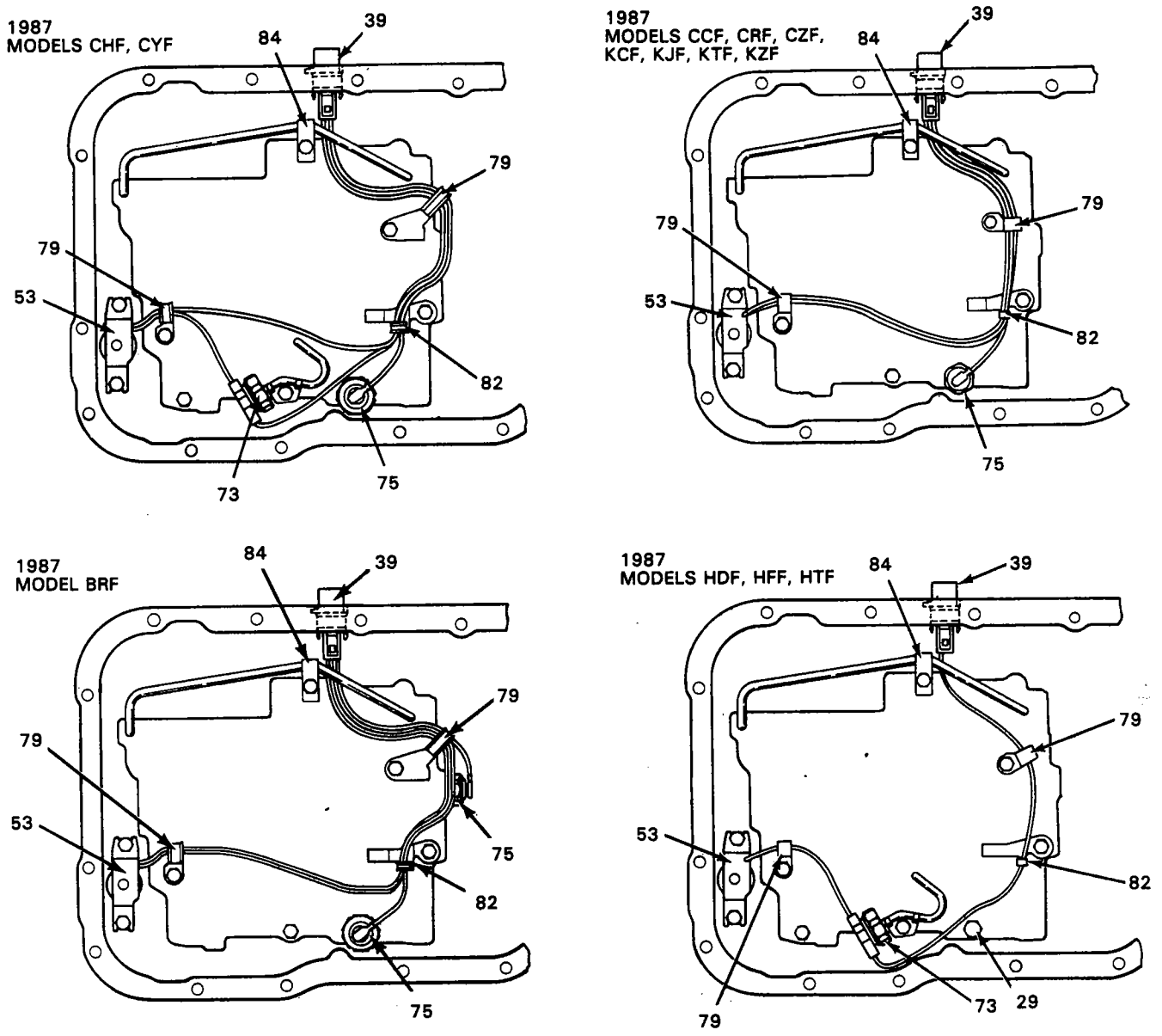


Figure 29 Reverse

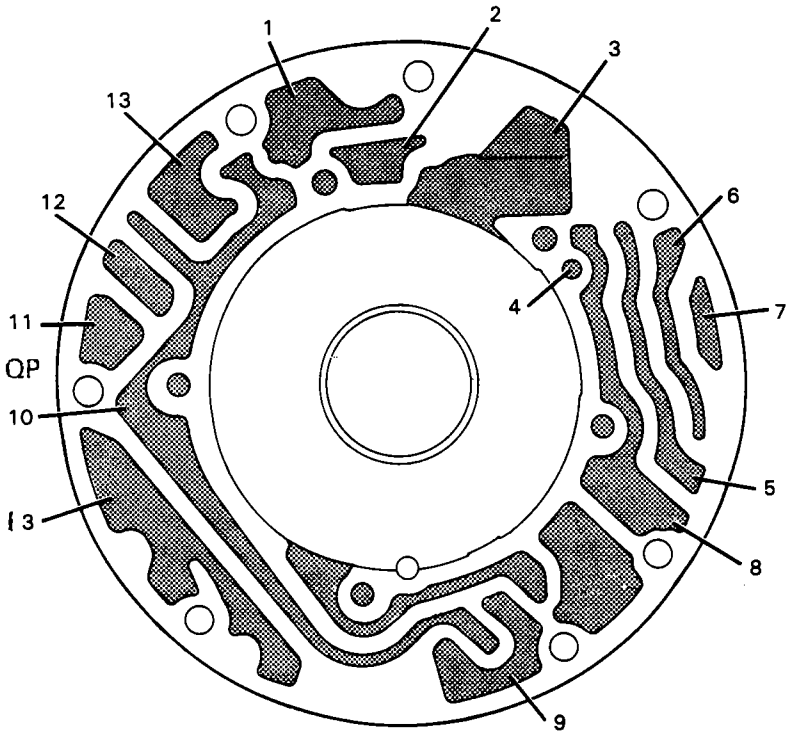


ILL. NO.	DESCRIPTION
29	PLUG, HEX HEAD 1/8" PIPE (2)
39	CONNECTOR, ELECTRICAL
53	SOLENOID ASSEMBLY
73	SWITCH, PRESSURE 4-3
75	SWITCH ASSEMBLY, PRESSURE (3RD OR 4TH)
79	CLIP, SOLENOID WIRE (2)
82	CLIP, FILTER RETAINER
84	RETAINER, SIGNAL OIL PIPE

HH0017-2004R

Figure 30 Wiring Diagrams

ILL. NO.	DESCRIPTION
1	CONVERTER CL. SIGNAL
2	OVERRUN CLUTCH
3	VENT
4	DRAIN
5	LO
6	MTV
7	VOID
8	REVERSE
9	LINE
10	CONVERTER FEED
11	EXHAUST
12	RELEASE
13	TO COOLER



HH0018-2004R

Figure 31 Pump Body

ILL. NO.	DESCRIPTION
1	CONVERTER CL. SIGNAL
2	OVERRUN CLUTCH
3	VENT
4	DECREASE
5	LO
6	MTV
7	REVERSE
8	LINE
9	CONVERTER FEED
10	EXHAUST
11	RELEASE
12	TO COOLER

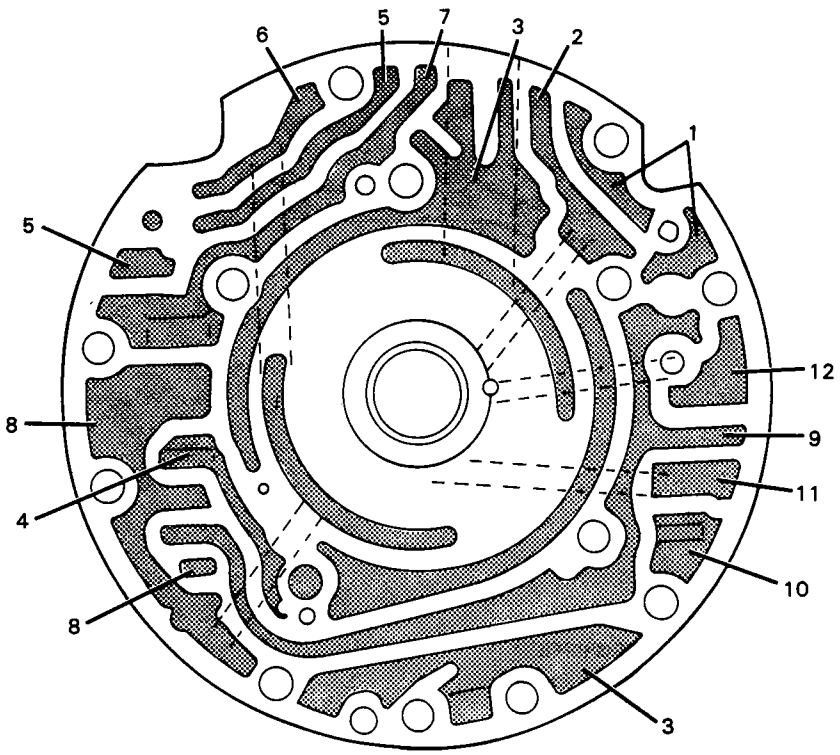


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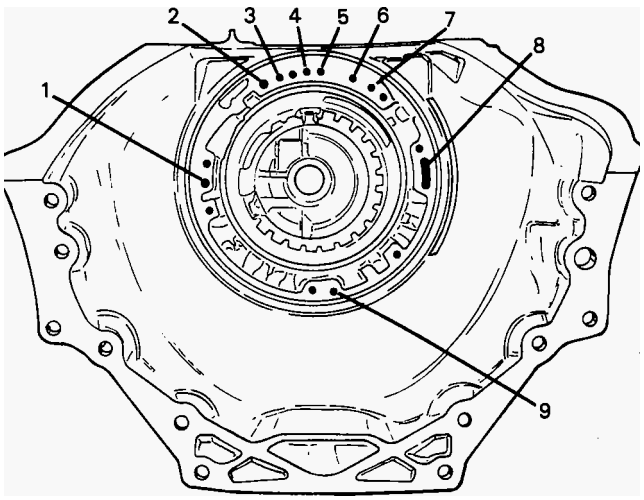
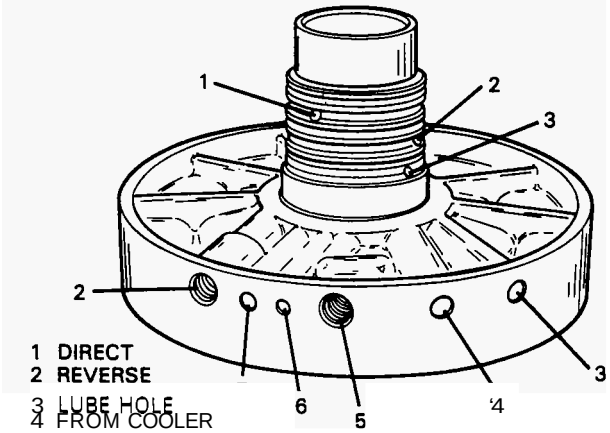
Figure 32 Pump Cover



ILL. NO.	DESCRIPTION
1	LINE PRESSURE TAP
2	LINE
3	MODULATOR THROTTLE VALVE
4	DRIVE 2
5	REVERSE
6	DRIVE 3
7	CONVERTER CL. SIGNAL
8	TO COOLER
9	CASE VENT

HH0024-2004R

Figure 33 Pump Assembly to Case Passages

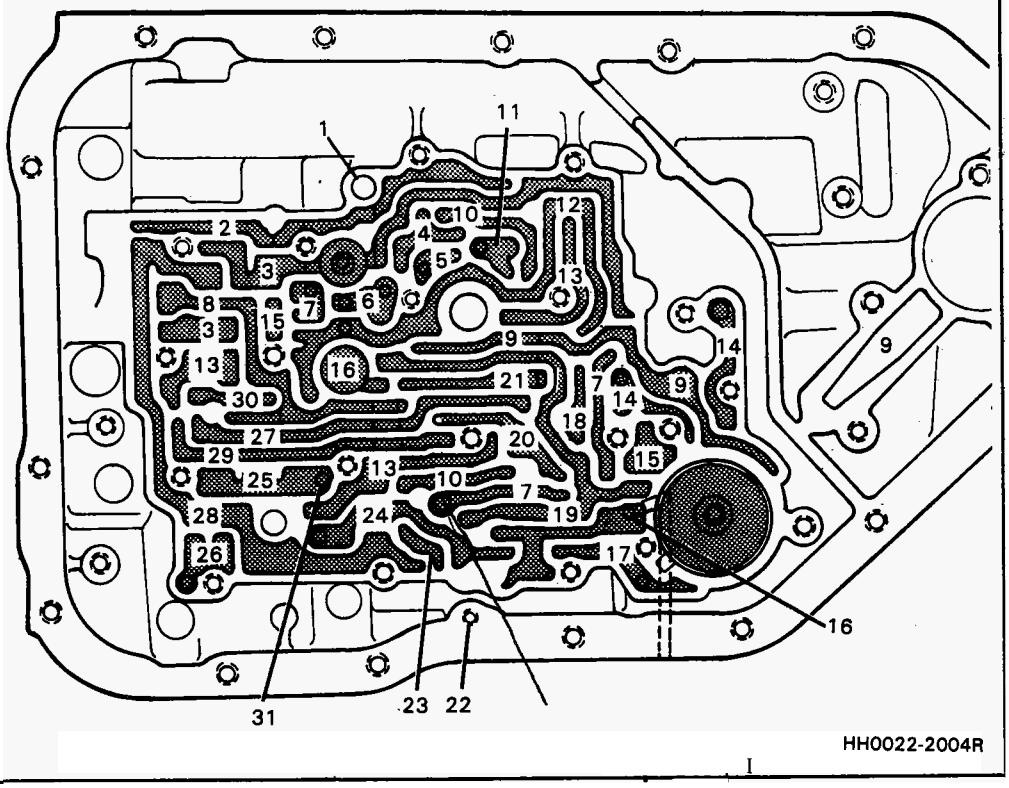


1 DIRECT
2 REVERSE
3 LUBE HOLE
4 FROM COOLER
5 FOURTH
6 FORWARD
7 DRIVE

HH0020-2004R

Figure 34 Center Support Passages

1 EXHAUST
2 LINE
3 REVERSE
4 RND4D3
5 3RD CLUTCH
6 REVERSE/3RD
7 3RD ACCUMULATOR
8 DRIVE 2
9 GOVERNOR
10 RND4
11 LO/DETENT
12 DRIVE 4
13 DRIVE 3
14 REVERSE OR LO OVERRUN
15 VOID
16 4TH CLUTCH
17 4TH ACCUMULATOR
18 LO OVERRUN
19 2ND CLUTCH
20 LO-1ST
21 LO
22 SERVO EXHAUST
23 THROTTLE VALVE
24 PART THROTTLE/D3
25 TV FEED
26 TVEXHAUST
27 MTVDOWN
28 MOD. THROTTLE VALVE
29 CONVERTER CL. SIGNAL
30 MTV UP
31 CUP PLUG



HH0022-2004R

Figure 35 Case Passages - Valve Body Side

1 LO
2 DRIVE 2
3 DRIVE 3
4 DRIVE 4
5 LINE
6 RND4D3
7 RND4
8 3RD CLUTCH
9 REVERSE
10 EXHAUST
11 GOVERNOR
12 3RD ACCUMULATOR
13 ORIFICED MODULATED TV
14 THROTTLE VALVE
15 DETENT
16 MTV UP
17 MTV DOWN
18 ORIFICED MTV UP
19 ORIFICED MTV DOWN
20 2ND CLUTCH
21 4-3
22 PART THROTTLE
23 TV FEED
24 MODULATED TV
25 LO-1ST
26 ORIFICED TV
27 4TH CLUTCH
28 LO OR DETENT
29 PART THROTTLE/D3
30 VOID
31 ACCUMULATOR
32 4TH ACCUMULATOR
33 LO OVERRUN
34 CONVERTER CL. SIGNAL

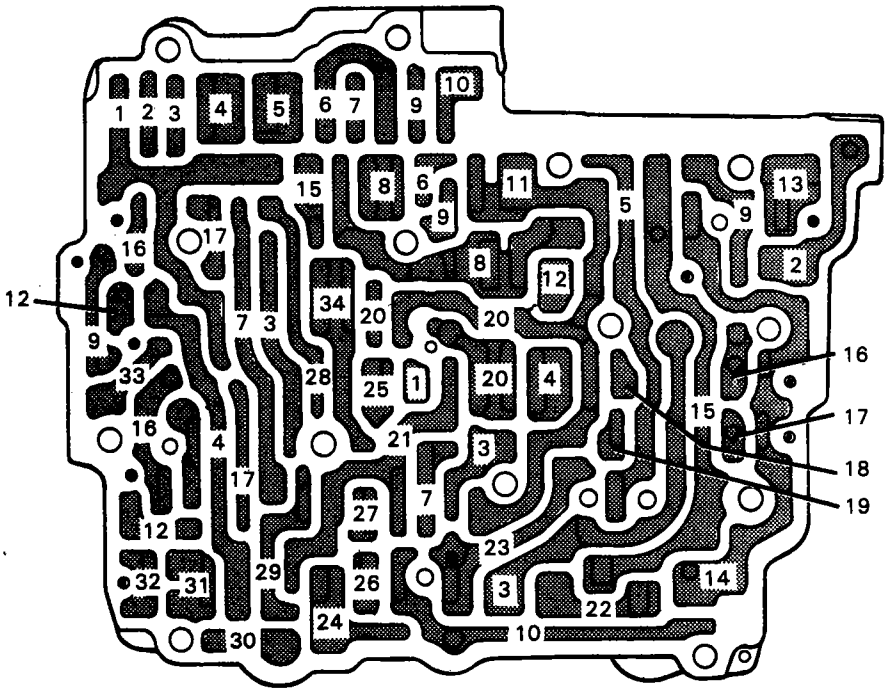


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Figure 36 Valve Body Passages - Case Side

ILL. NO.	DESCRIPTION
1	ORI MTV
2	REVERSE
3	MTV
4	DRIVE 2
5	3RD ACC.
6	LINE
7	EXHAUST
8	RND4D3
9	RND4
10	DETENT
11	DRIVE 4
12	DRIVE 3
13	LO/DETENT
14	3RD CLUTCH
15	MTV UP
16	MTV DOWN
17	ORI MTV DOWN
18	ORIFICE
19	GOVERNOR
20	2ND CLUTCH
21	4TH CLUTCH
22	LO
23	LO-1ST
24	GOV. ORIFICE
25	LO OV
26	REV/LO OV
27	CONV. CL. SIGNAL
28	RND4 ORI
29	TV FEED
30	PART THROTTLE
31	PT/D3
32	ACCUMULATOR
33	TV

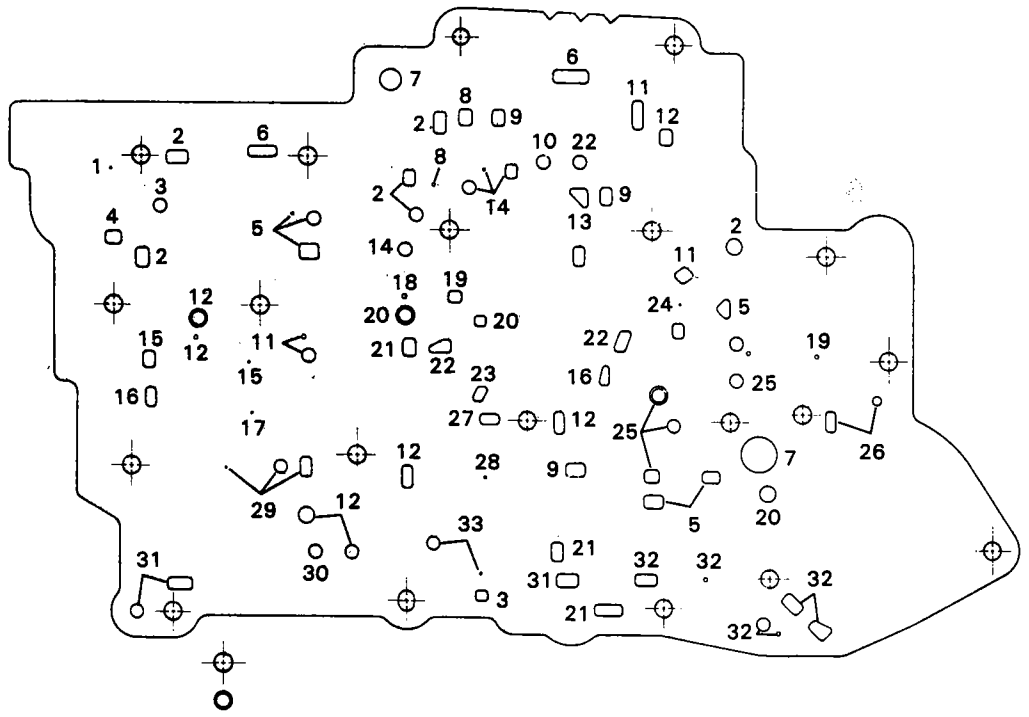

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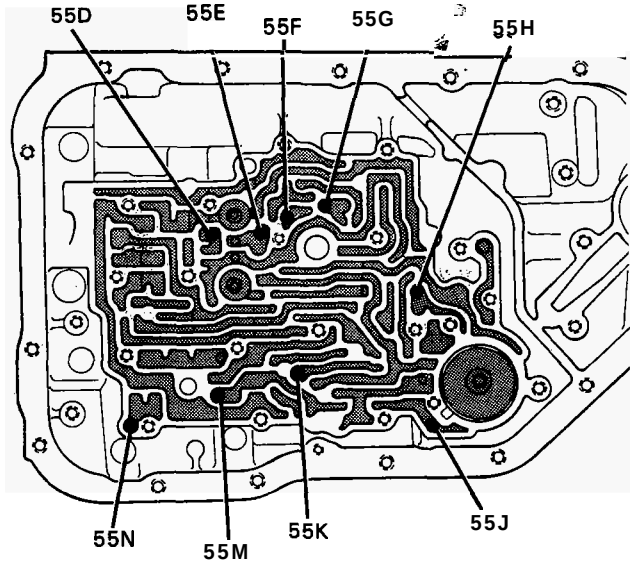
Figure 37 Typical Spacer Plate



ILL. NO.	DESCRIPTION
55D	CHECK BALL #2 3RD ACCUMULATOR
55E	CHECK BALL #6 REVERSE/3RD
55F	CHECK BALL #4 3RD CLUTCH
55G	CHECK BALL #9 LO/DETENT
55H	CHECK BALL #10 LO/REVERSE
55J	CHECK BALL #1 4TH ACCUMULATOR
55K	CHECK BALL #7 INTERMEDIATE SERVO CHECK BALL IS LOCATED IN CAPSULE
55M	CHECK BALL #3 PT/D3
55N	CHECK BALL #5 T.V. EXHAUST

HH0015-2004R

Figure 38 Check Ball Location - Case

Same as Fig. 119

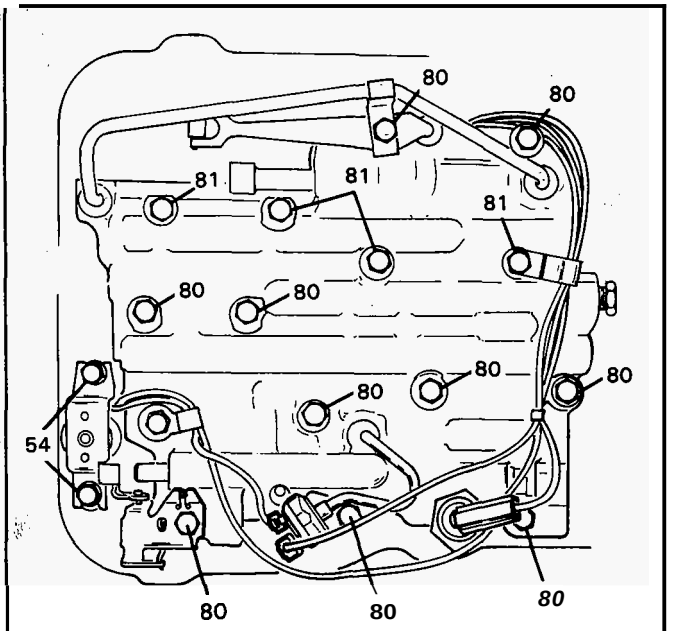
TORQUE CONVERTER CLUTCH (TCC) DIAGNOSIS

To properly diagnose the Torque Converter Clutch (TCC) system, perform all electrical testing first and then the hydraulic testing. Refer to Torque Converter Section 6E2-C8 for additional information.

The TCC is applied by fluid pressure which is controlled by a solenoid located inside the Automatic Transmission assembly. The solenoid is energized or released by making or breaking an' electrical circuit through a combination of switches and sensors.

TCC Electrical Diagnosis

- For electrical diagnosis of TCC, refer to the specific carline section in Section 8A, Electrical Diagnosis.
- For diagnosis of emission control related components of TCC, Refer to the specific section of 6E, Driveability and Emissions.
- For the diagnosis of TCC Hydraulic Controls, refer to the specific procedure and wiring diagrams provided in this section.



ILL. NO.	DESCRIPTION
54	BOLTS, HEX WASHER HEAD M6 X 1 X 12.0
80	BOLT, M6 X 1 X 45
81	BOLT, M6 X 1 X 60

HH0021-2004R

Figure 39 Valve Body Bolt Location

Functional Check Procedure

inspect

1. Install a tachometer
2. Operate the vehicle until proper operating temperature is reached
3. Drive vehicle at 50-55 mph (80-88 Km/h) with light throttle (road load)
4. Maintaining throttle lightly touch the brake pedal and check for a slight bump when the TCC releases and a slight increase in engine RPM.
5. Release the brake, slowly accelerate and check for a re-apply of the converter clutch and a slight decrease in engine RPM.

Preliminary Checking Procedure

The purpose of the preliminary checking procedure is to isolate external (electrical) problems from internal (electrical or mechanical) ones.

Important

- Use only a scale type ohmmeter. High impedance type ohmmeters and those with a digital readout will not work.
- An ALCL scanner may be used to verify the electrical circuit. Remember, a completed ground does not indicate that the solenoid will apply.
- Do not bench test using an automotive type battery. Accidentally crossed wires will damage the internal diodes of the TCC solenoid.

External Controls

Inspect

- Connect voltmeter between transmission connector and ground.
- Turn key "ON"
- If 0 or low voltage is found, refer to Sections 6E and 8A for electrical diagnosis.
- If 12 volts are present at the connector, refer to the TCC hydraulic diagnosis.

TORQUE CONVERTER STATOR

The Torque Converter Stator roller clutch can have one of two different type malfunctions:

A. Stator Assembly freewheels in both directions.

B. Stator Assembly remains locked up at all times.

Condition A-Poor Acceleration Low Speed

The car tends to have poor acceleration from a standstill. At speeds above 30-35 mph (50-55 km/h), the car may act normal. If poor acceleration is noted, it should first be determined that the exhaust system is not blocked, the engine timing is correct and the transmission is in first (1st) gear when starting out.

If the engine freely accelerates to high r.p.m. in "NEUTRAL" (N), it can be assumed that the engine and exhaust system are normal. Checking for poor performance in "Drive" and Reverse will help determine if the stator is freewheeling at all times.

Condition B-Poor Acceleration High Speed

Engine r.p.m. and car speed limited or restricted at high speeds. Performance when accelerating from a standstill is normal. Engine may over-heat. Visual examination of the converter may reveal a blue color from over-heating.

If the converter has been removed, the stator roller clutch can be checked by inserting a finger into the splined inner race of the roller clutch and trying to turn the race in both directions. The inner race should turn freely clockwise, but not turn or be very difficult to turn counterclockwise.

TORQUE CONVERTER EVALUATION

The converter should be replaced if:

- Converter has an imbalance which cannot be corrected. (Refer to Converter Vibration Test Procedure)
- Converter is contaminated with engine coolant containing antifreeze.

The Converter Should Not be Replaced If:

- The oil has an odor, is discolored, and there is no evidence of metal or clutch facing particles.
- The threads in one or more of the three converter bolt holes are damaged.
  - Correct with thread insert. (Refer to Section 6A)

SECTION 200-4R

MW9

AUTOMATIC TRANSMISSION UNIT REPAIR

CONTENTS

TRANSMISSION DISASSEMBLY

GENERAL SERVICE INFORMATION

- OIL SEAL RINGS
  - If any seal rings are damaged, cut, or do not rotate in their groove, be certain to check the ring groove for debris or damage.
- THRUST WASHERS
  - Thrust washers and bearing surfaces may appear to be polished. This is a normal condition and should not be considered damage.
- SNAP RINGS
  - Do not over extend snap rings when removing or installing.

DISASSEMBLY

Clean

- Thoroughly clean the exterior of the transmission.

Remove or Disconnect

- Torque converter.

Install or Connect

Tools Required
J-8763-02 Holding Fixture
J-3289-20 Base

1. J-8763-02 onto the transmission.
2. Holding fixture into J-3289-20.

Remove or Disconnect

- Drain the transmission through the rear of the transmission.

Valve Body and Wiring Harness

Remove or Disconnect (Figures 3 and 4)

1. Bolts (64), oil pan (65), and gasket (66).
2. Oil filter (68) and "O" ring seal (67).
3. Electrical connections.
4. Bolts (80) and clips (82 and 79).
5. Bolts (54), solenoid (53), and "O" ring seal (52).

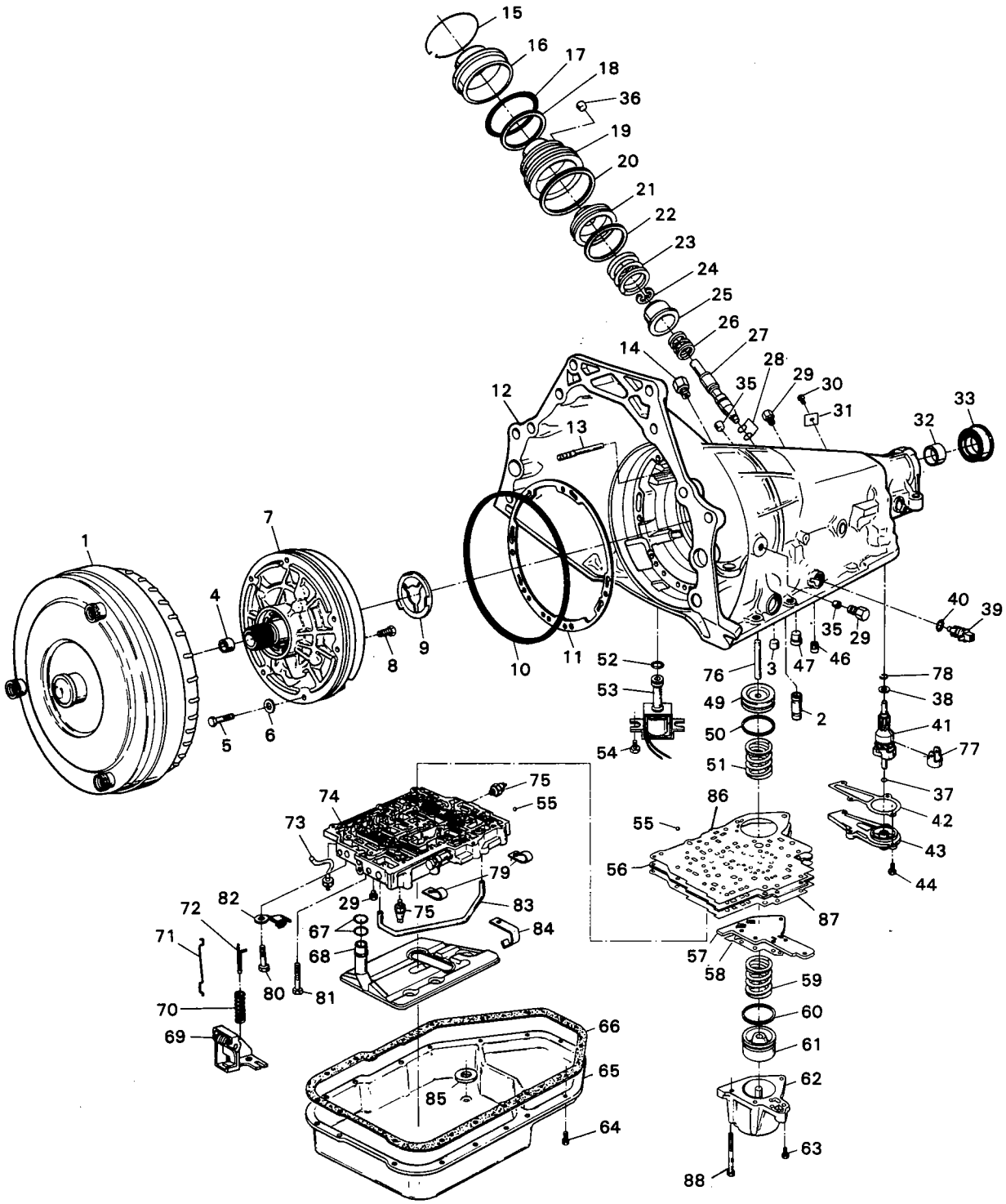


Figure 1 Case and External Parts

ILL. NO.	DESCRIPTION
1	CONVERTER ASSEMBLY, COMPLETE
2	RETAINER & BALL ASSEMBLY, 3RD ACCUMULATOR
3	PLUG, CUP (LUBE HOLE) (8.05 DIA.)
4	BUSHING, STATOR SHAFT
5	BOLTS, M8 X 1.25 X 62
6	WASHER, PUMP TO CASE BOLTS
7	PUMP ASSEMBLY, COMPLETE
8	BOLT, PUMP COVER TO BODY
9	WASHER, THRUST (HOUSING TO PUMP)
10	SEAL, RING (PUMP TO CASE)
11	GASKET, PUMP COVER TO CASE
12	CASE & BUSHING ASSEMBLY
13	PIPE, VENT
14	CONNECTOR, INVERTED FLARE (BRASS)
15	RING, SERVO COVER RETAINING
16	COVER, INTERMEDIATE SERVO
17	SEAL, "O" RING (INTERMEDIATE SERVO COVER)
18	RING, OIL SEAL (INNER)
19	PISTON, INTERMEDIATE SERVO (OUTER)
20	RING, OIL SEAL (OUTER)
21	PISTON, INTERMEDIATE SERVO (INNER)
22	RING, OIL SEAL PISTON (INNER)
23	SPRING, INTERMEDIATE SERVO CUSHION
24	RING, SNAP (APPLY PIN/RETAINER)
25	RETAINER, SERVO SPRING
26	SPRING, INTERMEDIATE SERVO (INNER)
27	PIN, INTERMEDIATE BAND APPLY (SELECTIVE)
28	RING, OIL SEAL (INTERMEDIATE BAND APPLY PIN)
29	PLUG, HEX HEAD 1/8" PIPE (2)
30	SCREW, TRUSS HEAD DRIVE (NAMEPLATE)
31	NAMEPLATE
32	BUSHING, CASE REAR
33	SEAL ASSEMBLY, REAR OIL
34	GEAR, SPEEDO DRIVEN (GOVERNOR)
35	PLUG, CUP (4TH ACCUMULATOR OR SERVO) (2)
36	PLUG, CUP (ORIFICE)
37	RING, OIL SEAL
38	WASHER, THRUST (GOVERNOR DRIVEN GEAR/CASE)
39	CONNECTOR, ELECTRICAL
40	SEAL, "O" RING (ELECTRICAL CONNECTOR)
41	GOVERNOR ASSEMBLY, COMPLETE
42	GASKET, GOVERNOR COVER
43	COVER ASSEMBLY, GOVERNOR
44	SCREW, GOVERNOR COVER
46	SEAL, REVERSE OIL (CASE TO HOUSING)
47	PIN, BAND ANCHOR
49	PISTON, 3-4 ACCUMULATOR
50	RING, OIL SEAL (3-4 ACCUMULATOR PISTON)
51	SPRING, 3-4 ACCUMULATOR
52	SEAL, "O" RING (SOLENOID)
53	SOLENOID ASSEMBLY
54	BOLTS, HEX WASHER HEAD M6 X 1 X 12.0
55	BALL, .25 DIAMETER
56	PLATE, VALVE BODY SPACER
57	PLATE, ACCUMULATOR
58	GASKET, ACCUMULATOR HSG. TO ACCUM. PLATE
59	SPRING, 1-2 ACCUMULATOR PISTON
60	RING, OIL SEAL (1-2 ACCUMULATOR PISTON)
61	PISTON, 1-2 ACCUMULATOR
62	HOUSING & PIN ASSEMBLY, 1-2 ACCUMULATOR
63	BOLT, ACCUMULATOR HOUSING
64	SCREW, CONICAL WASHER ASSEMBLY
65	PAN, TRANSMISSION OIL
66	GASKET, PAN
67	SEAL, "O" RING (FILTER)
68	FILTER ASSEMBLY, TRANSMISSION OIL
69	LEVER & BRACKET ASSEMBLY, THROTTLE
70	SPRING, LIFTER (T.V. EXHAUST VALVE)
71	LINK, THROTTLE LEVER TO CABLE
72	LIFTER, T.V. EXHAUST
73	SWITCH, PRESSURE 4-3
74	VALVE ASSEMBLY, CONTROL
75	SWITCH ASSEMBLY, PRESSURE (3RD OR 4TH)
76	PIN, ACCUMULATOR PISTON
77	CLIP, SPEEDO DRIVE GEAR
78	RING, GOVERNOR GEAR RETAINER
79	CLIP, SOLENOID WIRE (2)
80	BOLT, M6 X 1 X 45
81	BOLT, M6 X 1 X 60
82	CLIP, FILTER RETAINER
83	PIPE, SIGNAL OIL
84	RETAINER, SIGNAL OIL PIPE
85	MAGNET, CHIP COLLECTOR
86	GASKET, SPACER PLATE TO CASE
87	GASKET, VALVE BODY TO SPACER PLATE
88	BOLT, ACCUMULATOR HOUSING

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Figure 1L Legend

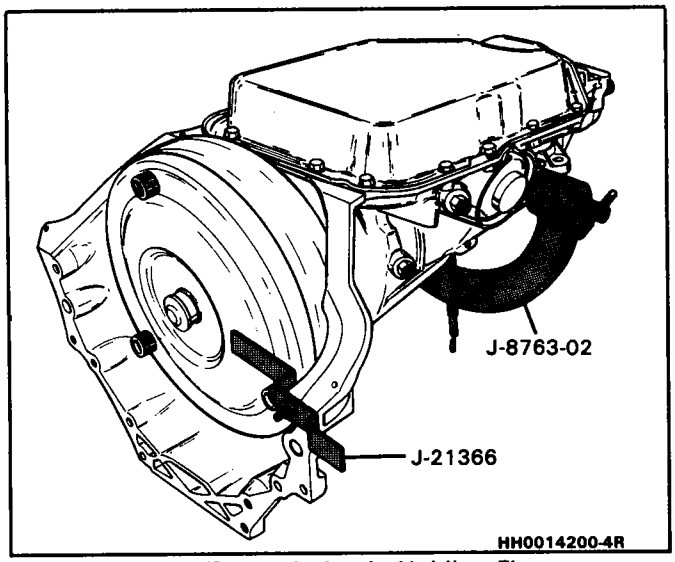


Figure 2 Transmission in Holding Fixture

6. Case electrical connector (39) and "O" ring seal (40).

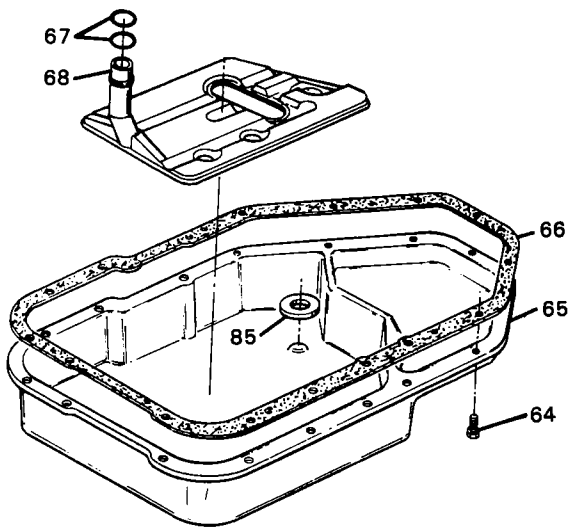
Remove or Disconnect

1. Throttle lever and bracket assembly (69) and throttle lever to cable link (71).
2. T.V. exhaust valve lifter (72) and spring (70).
3. Manual detent roller and spring assembly (708), signal oil pipe retainer (84), and signal pipe (83).
4. NON-C-3 MODELS ONLY.Pressure switch (73).
5. Remaining valve body bolts (80).
6. Control valve (74) and manual valve (345).
7. (3) Check balls (55).

1-2 Accumulator, 3-4 Accumulator Piston Assembly

Remove or Disconnect (Figure 6)

1. Bolts (63), 1-2 accumulator housing (62), spring (59), plate (57), and gasket (58).
2. 1-2 Accumulator piston (61).
   - apply low air pressure (3 psi) to orifice in housing (62).



ILL. NO.	DESCRIPTION
64	SCREW, CONICAL WASHER ASSEMBLY
65	PAN, TRANSMISSION OIL
66	GASKET, PAN
67	SEAL, "O" RING (FILTER)
68	FILTER ASSEMBLY, TRANSMISSION OIL
85	MAGNET, CHIP COLLECTOR

HH0027200-4R

Figure 3 Oil Pan and Filter

3. 1-2 Accumulator piston seal ring (60).
4. Spacer plate and gaskets (56).
5. 3-4 Accumulator piston (49), spring (51), and pin (76).

Important

Note position of spring (51) and piston (49). Parts must be installed in the same position as removed.

6. Piston seal ring (50).
7. (8) Check balls (55).

Governor Assembly

Remove or Disconnect (Figure 7)

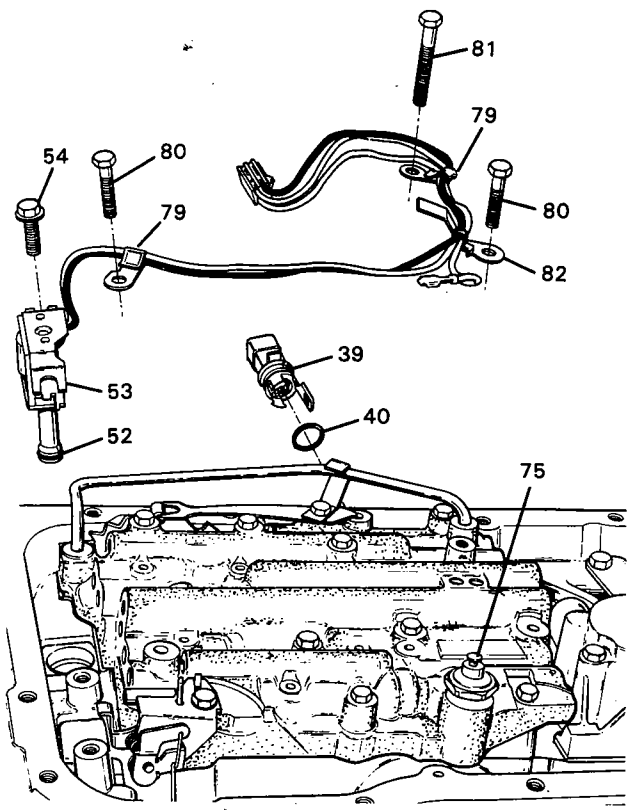
1. Bolts (44), governor cover (43), and gasket (42).
2. Governor assembly (41).
3. Speedometer assembly.

Intermediate Servo Assembly

Remove or Disconnect (Figures 8 and 9)

Tools Required
J-29714 Servo Cover Depressor

1. Install oil pan, retain with two bolts.
2. Install J-29714.
3. Retaining ring (15).
4. Servo cover (16) and "O" ring seal (17).
5. Servo piston (19) and band apply pin (27).
6. Remove J-29714.



39	CONNECTOR, ELECTRICAL
40	SEAL, "O" RING (ELECTRICAL CONNECTOR)
52	SEAL, "O" RING (SOLENOID)
53	SOLENOID ASSEMBLY
54	BOLTS, HEX WASHER HEAD M6 X 1 X 12.0
75	SWITCH ASSEMBLY, PRESSURE (3RD OR 4TH)
79	CLIP, SOLENOID WIRE (2)
80	BOLT, M6 X 1 X 45
81	BOLT, M6 X 1 X 60
82	CLIP, FILTER RETAINER

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Figure 4 Solenoid and Electrical Connector

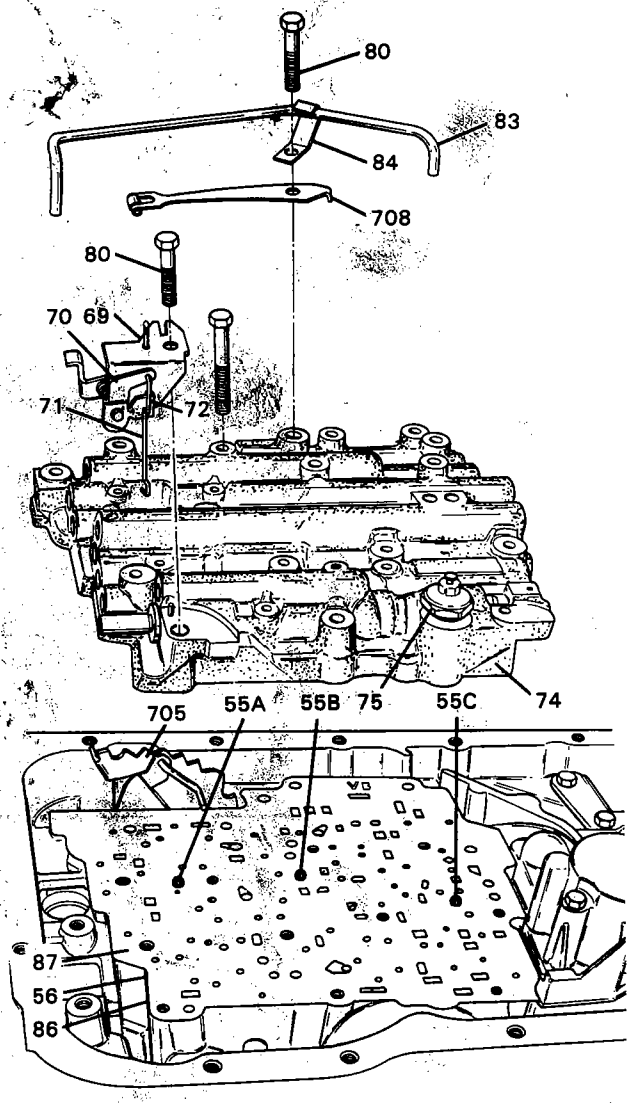
Servo Pin Length

As a diagnostic aid, the servo pin length should now be checked. If the pin length is too short or too long, be certain to inspect the intermediate band and drum for damage or wear when disassembled.

Measure (Figures 10 and 11)

Tools Required
J-25014-1 Intermediate Band Apply Pin Gage
J-25014-2 Intermediate Band Apply Pin Gage
J-8001 Dial Indicator

1. Install J-25014-2 in the intermediate servo bore. Align retaining ring with case slot.
2. Insert J-25014-1 into J-25014-2.
   - Make sure tapered end of J-25014-1 is properly located against the band apply pin.
   - Make sure the band apply pin is located in the case.
3. Install J-8001. Position dial indicator stem against the zero post. Zero indicator.



ILL. NO.	DESCRIPTION
55A	CHECK BALL #11
55B	CHECK BALL #8
55C	CHECK BALL #12
56	PLATE, VALVE BODY SPACER
69	LEVER & BRACKET ASSEMBLY, THROTTLE
70	SPRING, LIFTER (T.V. EXHAUST VALVE)
71	LINK, THROTTLE LEVER TO CABLE
72	LIFTER, T.V. EXHAUST
75	SWITCH ASSEMBLY, PRESSURE (3RD OR 4TH)
74	VALVE ASSEMBLY, CONTROL
80	BOLT, M6 X 1 X 45
83	PIPE, SIGNAL OIL
84	RETAINER, SIGNAL OIL PIPE
86	GASKET, SPACER PLATE TO CASE
87	GASKET, VALVE BODY TO SPACER PLATE
705	LINK, INSIDE DETENT (LEVER TO VALVE)
708	MANUAL DETENT ROLLER & SPRING ASSEMBLY

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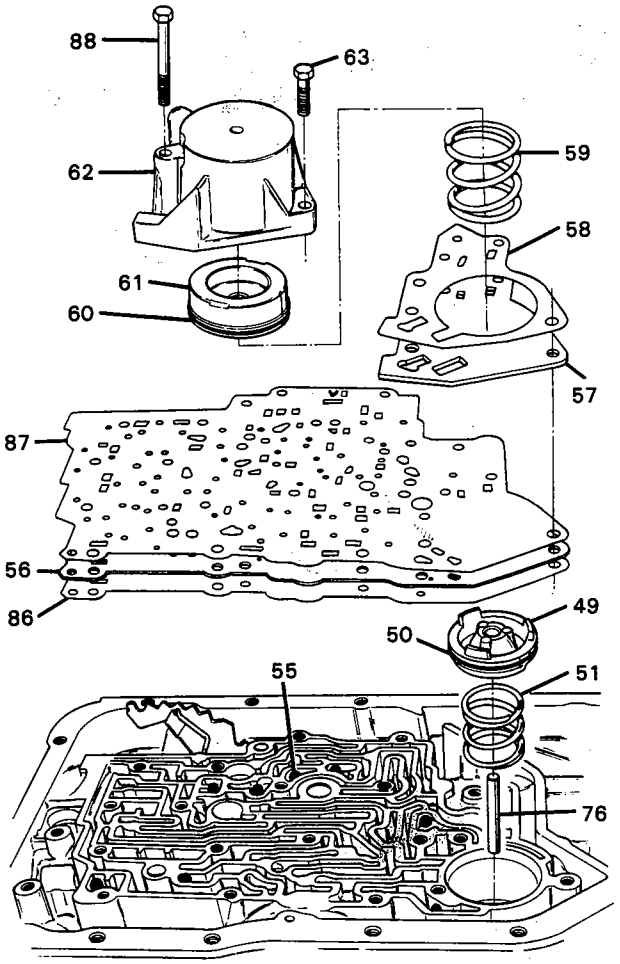
Figure 5 Removing Control Valve Assembly

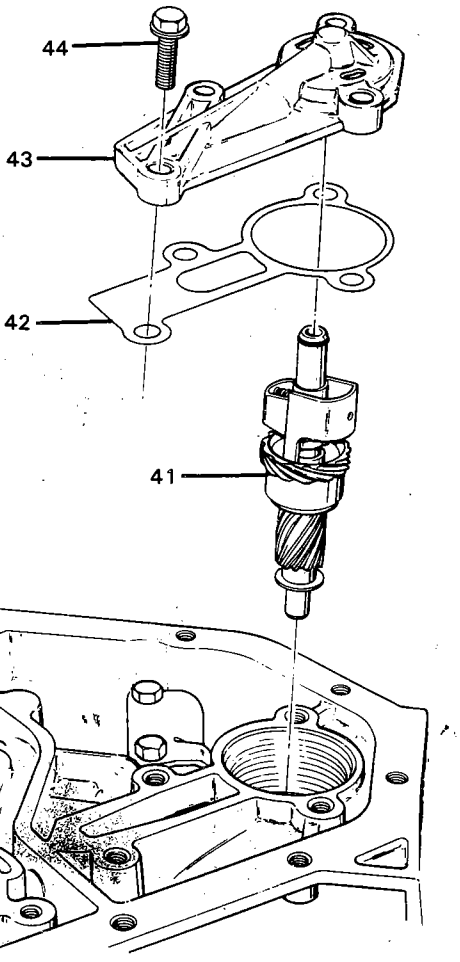


ILL. NO.	DESCRIPTION
49	PISTON, 3-4 ACCUMULATOR
50	RING, OIL SEAL (3-4 ACCUMULATOR PISTON)
51	SPRING, 3-4 ACCUMULATOR
55	BALL, .25 DIAMETER
56	PLATE, VALVE BODY SPACER
57	PLATE, ACCUMULATOR
58	GASKET, ACCUMULATOR HSG. TO ACCUM. PLATE
59	SPRING, 1-2 ACCUMULATOR PISTON
60	RING, OIL SEAL (1-2 ACCUMULATOR PISTON)
61	PISTON, 1-2 ACCUMULATOR
62	HOUSING & PIN ASSEMBLY, 1-2 ACCUMULATOR
63	BOLT, ACCUMULATOR HOUSING
86	GASKET, SPACER PLATE TO CASE
87	GASKET, VALVE BODY TO SPACER PLATE
88	BOLT, ACCUMULATOR HOUSING

HH0030200-4R

Figure 6 1-2 and 3-4 Accumulator Assembly

Same as Fig. 121



ILL. NO.	DESCRIPTION
41	GOVERNOR ASSEMBLY, COMPLETE
42	GASKET, GOVERNOR COVER
43	COVER ASSEMBLY, GOVERNOR
44	SCREW, GOVERNOR COVER

HH0031200-4R

Figure 7 Removing Governor Assembly

J-25014-2 MUST SEAT SQUARELY AGAINST THE RETAINING RING.

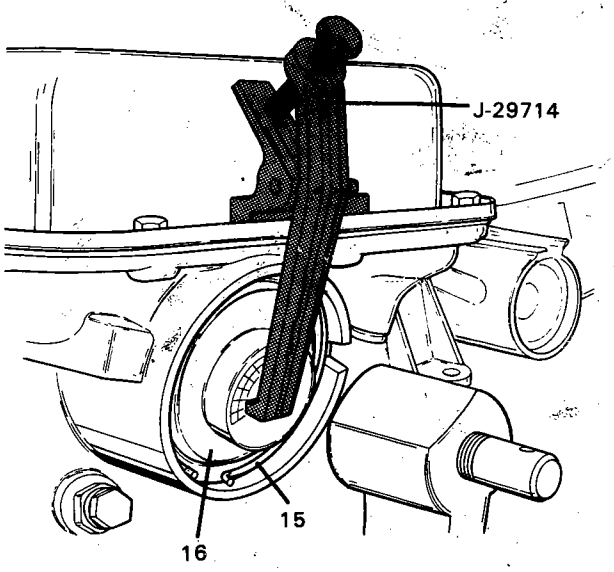
4. Align the stepped side of pin J-25014-1 with torquing arm of J-25014-2.
5. Apply 12 N·m (100 LBS.-IN.) of torque.
6. Position dial indicator stem over J-25014-1. Read dial indicator. See chart for proper servo pin.

Important

Dial indicator travel is reversed, making the indicator read backwards. On an indicator that ranges from 0-100, a .5 mm (0.020) travel will read .2mm (0.080"). A 1.5mm (0.060") travel will read 1mm (0.040").

Inspect (Figure 12)

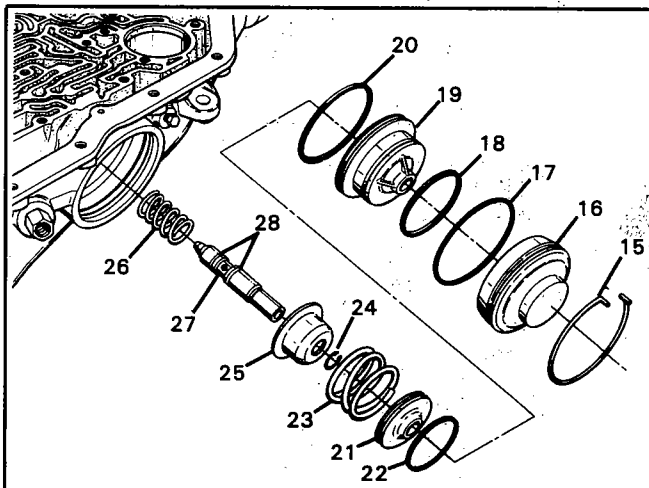
- Third accumulator check valve assembly for:
  - missing check ball
  - binding or stuck check ball
  - oil feed slot missing or restricted
  - not seated in case



ILL. NO.	DESCRIPTION
15	RING, SERVO COVER RETAINING
16	COVER, INTERMEDIATE SERVO

HH0034200-4R

Figure 8 Removing Servo Cover



15	RING, SERVO COVER RETAINING
16	COVER, INTERMEDIATE SERVO
17	SEAL, "O" RING (INTERMEDIATE SERVO COVER)
18	RING, OIL SEAL (INNER)
19	PISTON, INTERMEDIATE SERVO (OUTER)
20	RING, OIL SEAL (OUTER)
21	PISTON, INTERMEDIATE SERVO (INNER)
22	RING, OIL SEAL PISTON (INNER)
23	SPRING, INTERMEDIATE SERVO CUSHION
24	RING, SNAP (APPLY PIN/RETAINER)
25	RETAINER, SERVO SPRING
26	SPRING, INTERMEDIATE SERVO (INNER)
27	PIN, INTERMEDIATE BAND APPLY (SELECTIVE)
28	RING, OIL SEAL (INTERMEDIATE BAND APPLY PIN)

HH0032200-4R

Figure 9 Intermediate Servo Assembly

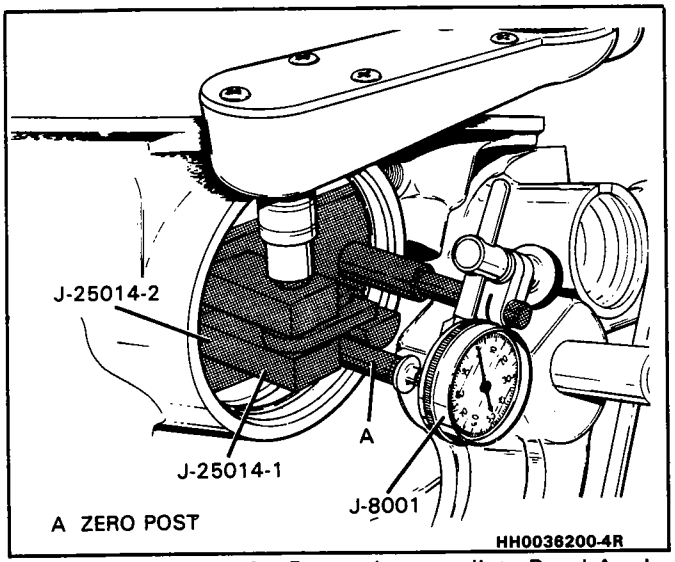


Figure 10 Checking for Proper Intermediate Band Apply Pin

INTERMEDIATE BAND APPLY PIN SELECTION CHART

DIAL INDICATOR TRAVEL		APPLY PIN IDENTIFICATION
.0 - .72mm	(.0" - .029")	1 GROOVE
.72 - 1.44mm	(.029" - .057")	2 GROOVES
1.44 - 2.16mm	(.057" - .086")	3 GROOVES
2.16 - 2.88mm	(.086" - .114")	NONE

HH0035200-4R

Figure 11 Intermediate Band Apply Pin Selection Chart

Third Accumulator Check Valve Removal

REMOVE THE THIRD ACCUMULATOR CHECK VALVE ONLY IF DAMAGED

Remove or Disconnect (Figure 13)

Tools Required

6.3 mm (#4) Easy Out Tap Handle

1. Insert easy out into third accumulator check valve assembly.
2. Pull straight out while turning tap handle.

Install or Connect (Figure 14)

Tools Required

9.5 mm (3/8") Metal Rod

1. Insert check valve (2) small end first, oil feed slot facing servo cover (16).
2. Seat check valve (2). Use a 9.5 mm (3/8") rod metal rod.

Overdrive Unit End Play Check

As a diagnostic aid, overdrive unit end play should be checked prior to removing the internal parts. If the end play is not within specifications you should watch for possible worn or misassembled parts during disassembly.

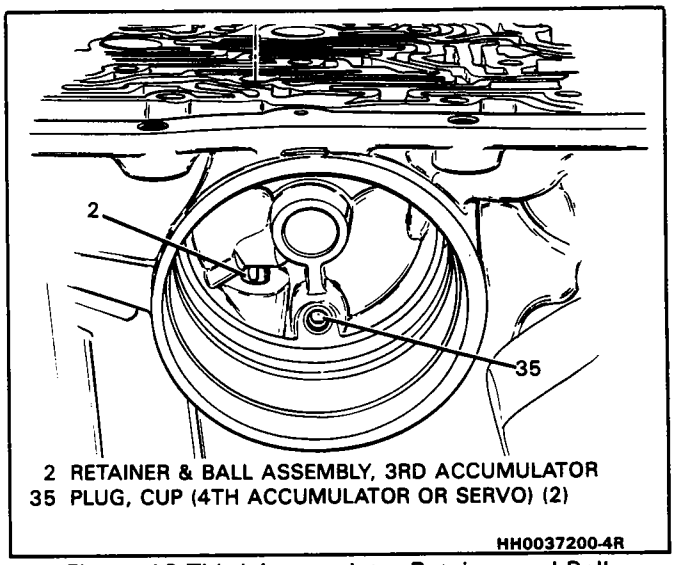


Figure 12 Third Accumulator Retainer and Ball Assembly

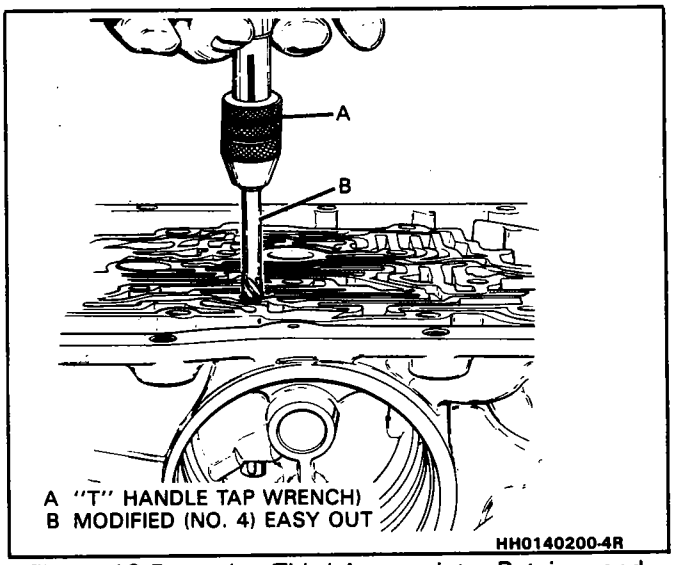


Figure 13 Removing Third Accumulator Retainer and Ball Assembly

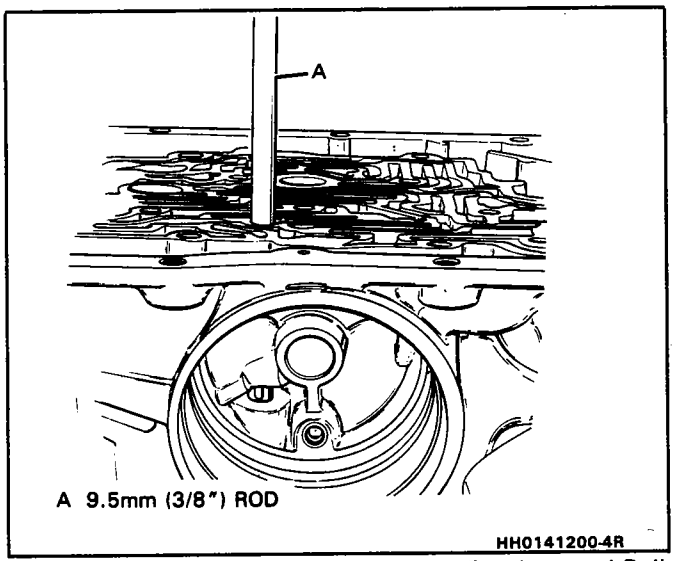


Figure 14 Installing Third Accumulator Retainer and Ball Assembly

Measure (Figures 15 and 16)

Tools required
J-8001 Dial Indicator
J-24773-A Oil Pump Remover and End Play Checking Fixture
J-25013-1 Output Shaft and Rear Unit Support Fixture
J-25022 End Play Fixture Adapter
J-25025-7A Post
J-29332 Output Shaft Support Fixture

1. Remove an oil pump bolt (5) and install 25025-7A.
2. Install J-25013-1 and J-29332-1 as shown.
3. Install J-25022 and J-24773-A as shown.
4. Install dial indicator
   - maintain approximately 3 lbs. of lifting force.
   - set indicator to zero.
   - increase lifting force to approximately 20 lbs.
   - end play should be 0.010-0.81 mm (.004"-.027")

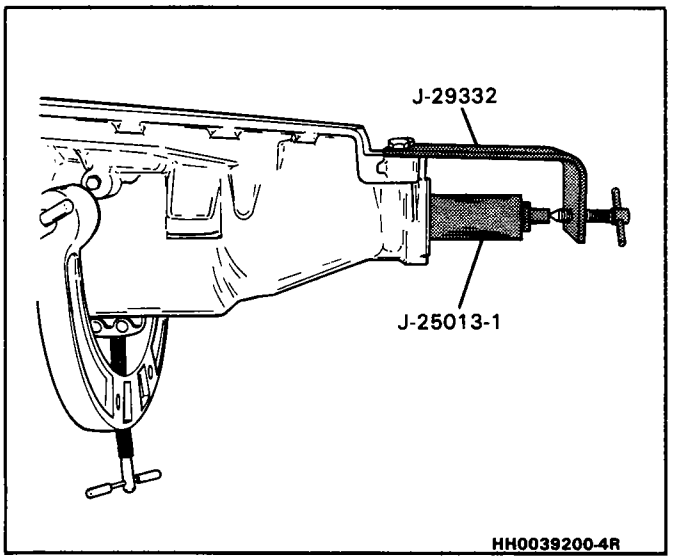


Figure 15 Installing Output Shaft and Rear Unit Support Fixture

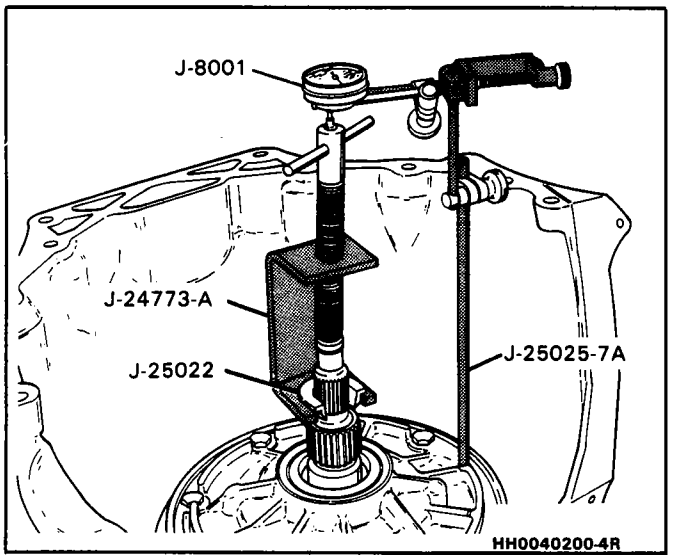


Figure 16 Checking Overdrive Unit End Play

OVERDRIVE UNIT END PLAY WASHER THICKNESS CHART

THICKNESS		IDENTIFICATION NUMBER AND/OR COLOR
4.25-4.36mm	(0.167"-0.171")	0 - SCARLET
4.36-4.48mm	(0.172"-0.176")	1 - WHITE
4.49-4.60mm	(0.177"-0.180")	2 - COCOA BROWN
4.61-4.72mm	(0.181"-0.185")	3 - GRAY
4.73-4.84mm	(0.186"-0.190")	4 - YELLOW
4.85-4.96mm	(0.191"-0.195")	5 - LIGHT BLUE
4.97-5.08mm	(0.196"-0.200")	6 - PURPLE
5.09-5.20mm	(0.201"-0.204")	7 - ORANGE
5.21-5.32mm	(0.205"-0.209")	8 - GREEN

HH0038200-4R

Figure 17 Overdrive Unit Washer Thickness Chart

Remove or Disconnect (Figures 18 and 19)

Tools Required
J-24773-A Oil Pump Remover and End Play Checking Fixture

1. Oil Pump seal (201).
2. Bolts (5) and washers (6).
3. Install J-24773-A.
4. Oil Pump (7), seal ring (10), and gasket (11).
5. Oil deflector plate (542).

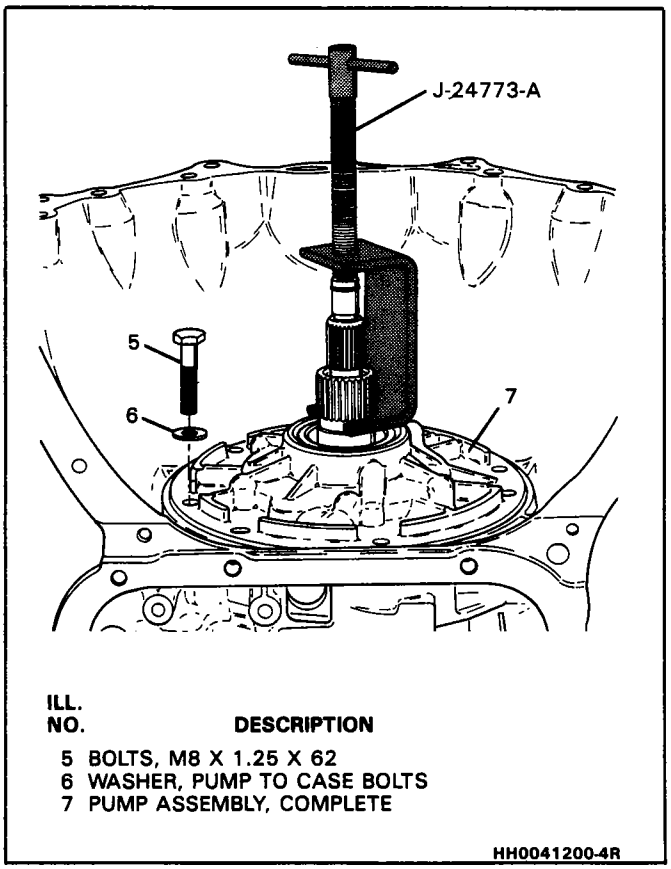
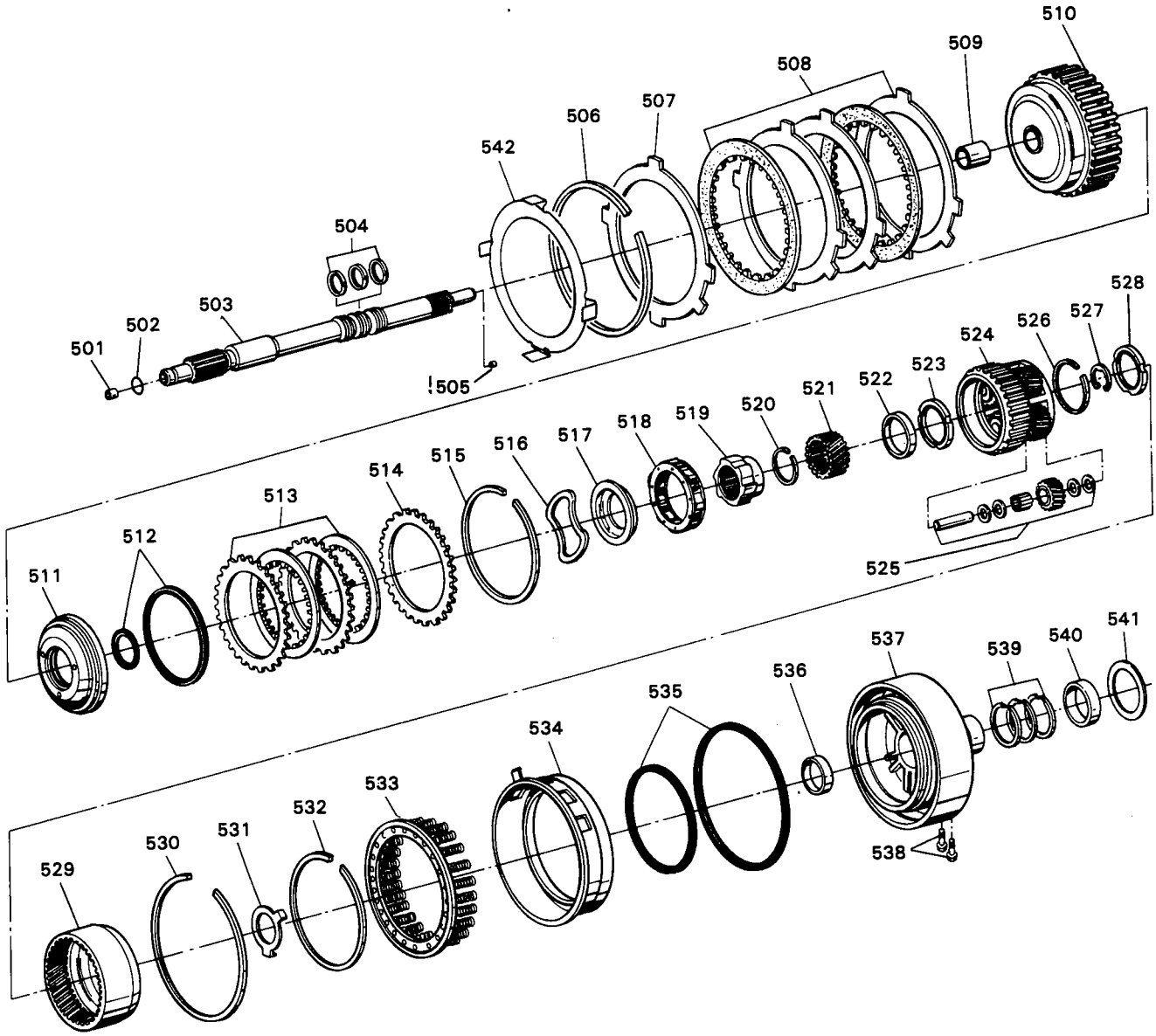


Figure 18 Removing Pump Assembly



ILL. NO.	DESCRIPTION
501	RETAINER & BALL ASSEMBLY, CHECK VALVE
502	SEAL, "O" RING (TURBINE SHAFT/SELECTIVE WASHER)
503	SHAFT, TURBINE
504	RING, OIL SEAL (TURBINE SHAFT)
505	PLUG, TURBINE SHAFT (4.80 DIA.)
506	RING, SNAP (4TH CLUTCH RETAINER IN CASE)
507	PLATE, 4TH CLUTCH BACKING
508	PLATE ASSEMBLY, 4TH CLUTCH
509	BUSHING, OVERRUN CLUTCH
510	HOUSING, OVERRUN CLUTCH ASSEMBLY
511	PISTON ASSEMBLY, OVERRUN CLUTCH
512	SEALS, OVERRUN CLUTCH (INNER/OUTER)
513	PLATE ASSEMBLY, OVERRUN CLUTCH
514	PLATE, OVERRUN CLUTCH BACKING
515	RING, SNAP (OVERRUN CLUTCH HOUSING)
516	SPRING, WAVE (OVERRUN CLUTCH RELEASE)
517	RETAINER, OVERRUN CLUTCH RELEASE SPRING
518	ROLLER ASSEMBLY, OVERDRIVE CLUTCH
519	CAM, OVERDRIVE ROLLER CLUTCH
520	RING, SNAP (OVERRUN CLUTCH HUB)
521	GEAR, OVERDRIVE SUN
522	BUSHING, OVERDRIVE CARRIER
523	BEARING ASSEMBLY, THRUST (CARRIER/SUN)
524	CARRIER ASSEMBLY, OVERDRIVE (COMPLETE)
525	PINION ASSEMBLY, OVERDRIVE CARRIER
526	RING, SNAP (OVERDRIVE CARRIER)
527	RING, SNAP (TURBINE SHAFT/CARRIER)
528	BEARING ASM., THRUST (CARRIER/INTERNAL GEAR)
529	GEAR, OVERDRIVE INTERNAL
530	RING, SNAP (CENTER SUPPORT TO CASE)
531	WASHER, THRUST (INTERNAL GEAR/SUPPORT)
532	RING, SNAP (SUPPORT/4TH CLUTCH SPRING)
533	RETAINER & SPRING ASSEMBLY, 4TH CLUTCH
534	PISTON, 4TH CLUTCH
535	SEALS, 4TH CLUTCH (INNER & OUTER)
536	BUSHING, CENTER SUPPORT (29.8 O.D. X 11.0)
537	SUPPORT, CENTER
538	SCREW, FLANGED (MOD) M10 X 1.5 X 23.0
539	RING, OIL SEAL (CENTER SUPPORT)
540	BUSHING, CENTER SUPPORT (33.8 O.D. X 11)
541	WASHER, THRUST (SUPPORT/DIRECT CLUTCH)
542	PLATE, OIL DEFLECTOR

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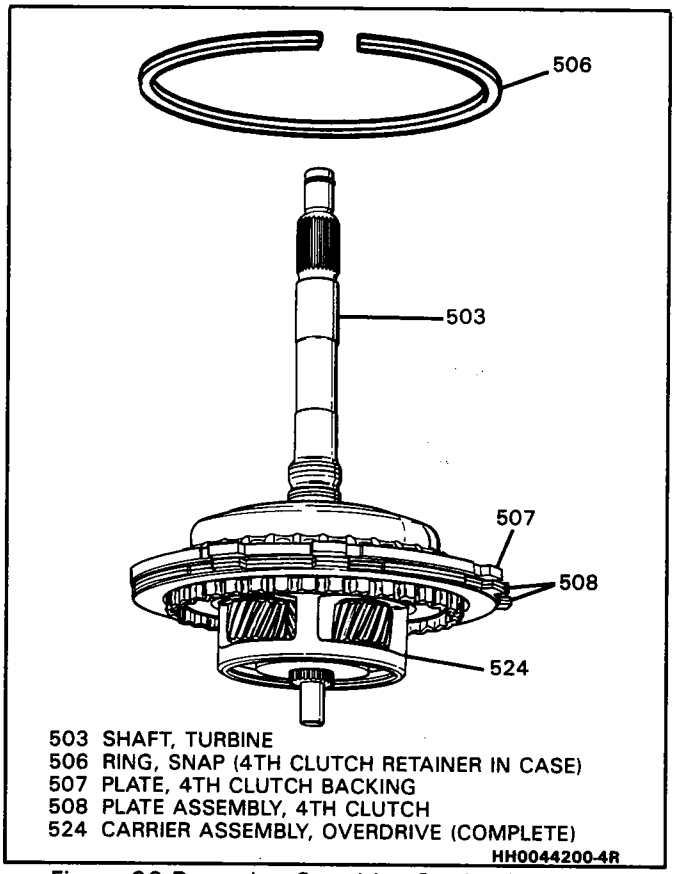
Figure 19 Internal Components

Fourth Clutch Assembly

Remove or Disconnect (Figures 19 and 20)

1. Snap ring (506).
2. Overdrive (524) and fourth clutch plates (508) grasp turbine shaft (503) and lift.
3. Thrust bearing (528).
4. Overdrive internal gear (529).
5. Thrust washer (531).



503 SHAFT, TURBINE
506 RING, SNAP (4TH CLUTCH RETAINER IN CASE)
507 PLATE, 4TH CLUTCH BACKING
508 PLATE ASSEMBLY, 4TH CLUTCH
524 CARRIER ASSEMBLY, OVERDRIVE (COMPLETE)
HH0044200-4R

Figure 20 Removing Overdrive Carrier Assembly

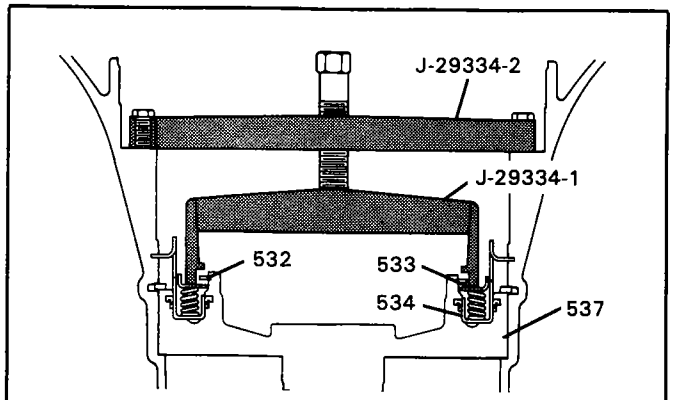
Remove or Disconnect (Figure 21)

Tools Required
J-29334 Fourth Clutch Compressor

1. Install J-29334-1 on the fourth clutch spring and retainer(533).
2. Install J-29334-2 on the case.
3. Compress the fourth clutch spring and retainer(533).
4. Snap ring (532).
5. Remove J-29334.
6. Fourth clutch piston (534).

Forward Clutch Shaft End Play Check

As a diagnostic aid a forward clutch shaft end play should be made prior to removing. If the end play is not within specifications, inspect for possible worn or missassembled parts during disassembly.



532 RING, SNAP (SUPPORT/4TH CLUTCH SPRING)
533 RETAINER & SPRING ASSEMBLY, 4TH CLUTCH
534 PISTON, 4TH CLUTCH
537 SUPPORT, CENTER
HH0045200-4R

Figure 21 Fourth Clutch Piston Removal

Measure (Figure 22)

Tools Required
J-8001 Dial Indicator
J-25013 Output Shaft and Rear Unit Support Fixture
J-29332 Output Shaft Support Fixture
J-25025-7A Post
J-29337 Forward and Direct End Play Checking Devise

1. Push forward clutch shaft (618) down.
2. Install J-25013 and J-29332 as shown.
3. Install J-29337, J-25025-7A, and J-8001 as shown.
4. Turn adjusting screw on J-29332 until white/scribe line on J-25013-1 begins to disappear.
5. Zero dial indicator
   - lift on J-29337
   - end play should be 0.56mm-1.30mm(.022"-.051")
6. Remove J-8001, J-29337 and J-25025-7A.
   - Do not remove J-25013/J-29332

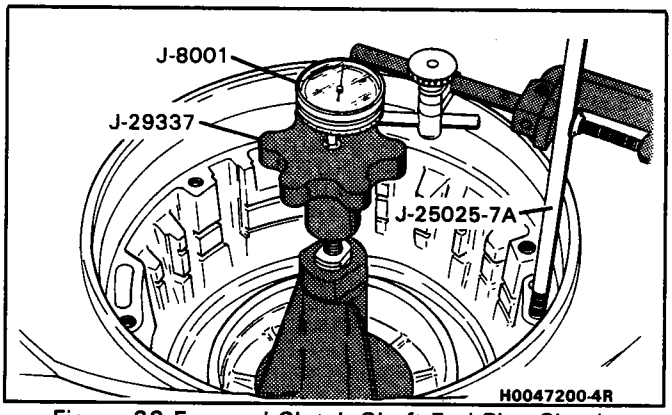


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Figure 22 Forward Clutch Shaft End Play Check

Remove or Disconnect (Figures 24, 25, 26)

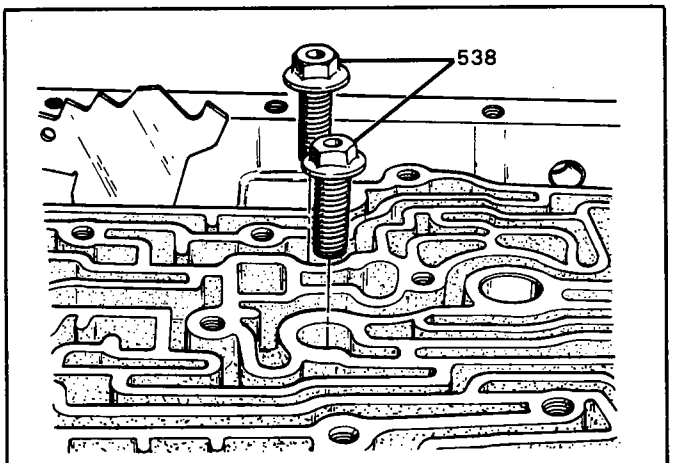
Tools Required
J-7004 Slide Hammer
J-29334 Center Support Remover

THICKNESS		IDENTIFICATION NUMBER AND/OR COLOR
1.66-1.77mm	(0.065"-0.070")	1 - —
1.79-1.90mm	(0.070"-0.075")	2 - —
1.92-2.03mm	(0.076"-0.080")	3 - BLACK
2.05-2.16mm	(0.081"-0.085")	4 - LIGHT GREEN
2.18-2.29mm	(0.086"-0.090")	5 - SCARLET
2.31-2.42mm	(0.091"-0.095")	6 - PURPLE
2.44-2.55mm	(0.096"-0.100")	7 - COCOA BROWN
2.57-2.68mm	(0.101"-0.106")	8 - ORANGE
2.70-2.81mm	(0.106"-0.111")	9 - YELLOW
2.83-2.94mm	(0.111"-0.116")	10 - LIGHT BLUE
2.96-3.07mm	(0.117"-0.121")	11 - —
3.09-3.20mm	(0.122"-0.126")	12 - —
3.22-3.33mm	(0.127"-0.131")	13 - PINK
3.35-3.46mm	(0.132"-0.136")	14 - GREEN
3.48-3.59mm	(0.137"-0.141")	15 - GRAY

HH0046200-4R

Figure 23 Front Unit End Play Washer Thickness Chart

1. (2) Bolts (538).
2. Snap ring (530).
3. Install J-29334/J-7004. Use snap ring (532).
4. Center support (537).
5. Thrust washer (541).



538 SCREW, FLANGED (MOD) M10 X 1.5 X 23.0

HH0049200-4R

Figure 24 Removing Center Support Bolts

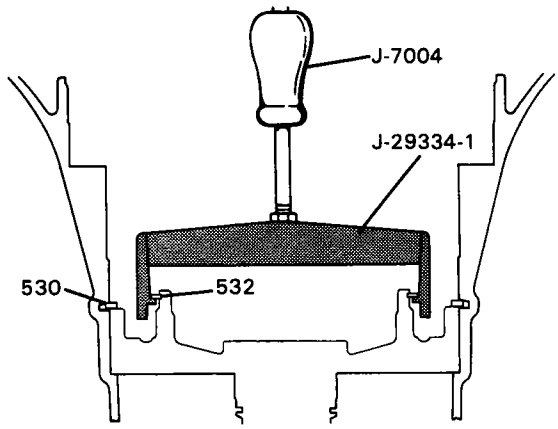
Forward and Direct Clutch Disassembly

Remove or Disconnect (Figures 27, 28, 29)

Tools Required

J-29337 Forward and Direct Clutch End Play Checking Device

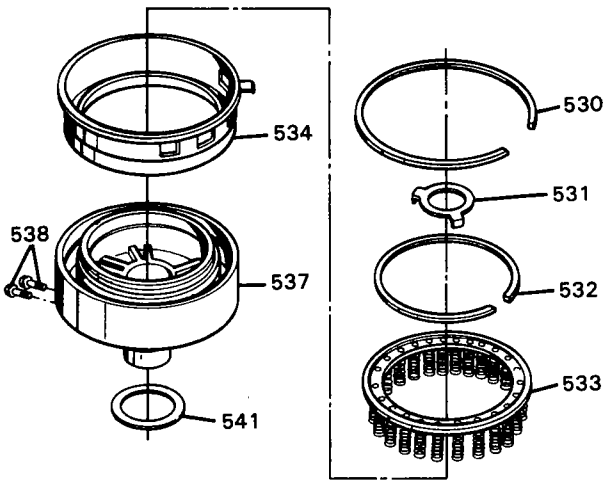
1. Install J-29337 as shown.
2. Direct and Forward clutch assembly (604 and 618).
3. Direct clutch (604) from forward clutch (618).
4. Thrust washer (617).
5. Intermediate band assembly (602).
6. Band anchor pin (47).
7. Thrust washer (629).



530 RING, SNAP (CENTER SUPPORT TO CASE)
532 RING, SNAP (SUPPORT/4TH CLUTCH SPRING)

HH0048200-4R

Figure 25 Removing Center Support



ILL. NO.	DESCRIPTION
530	RING, SNAP (CENTER SUPPORT TO CASE)
531	WASHER, THRUST (INTERNAL GEAR/SUPPORT)
532	RING, SNAP (SUPPORT/4TH CLUTCH SPRING)
533	RETAINER & SPRING ASSEMBLY, 4TH CLUTCH
534	PISTON, 4TH CLUTCH
537	SUPPORT, CENTER
538	SCREW, FLANGED (MOD) M10 X 1.5 X 23.0
541	WASHER, THRUST (SUPPORT/DIRECT CLUTCH)

HH0050200-4R

Figure 26 Center Support Assembly

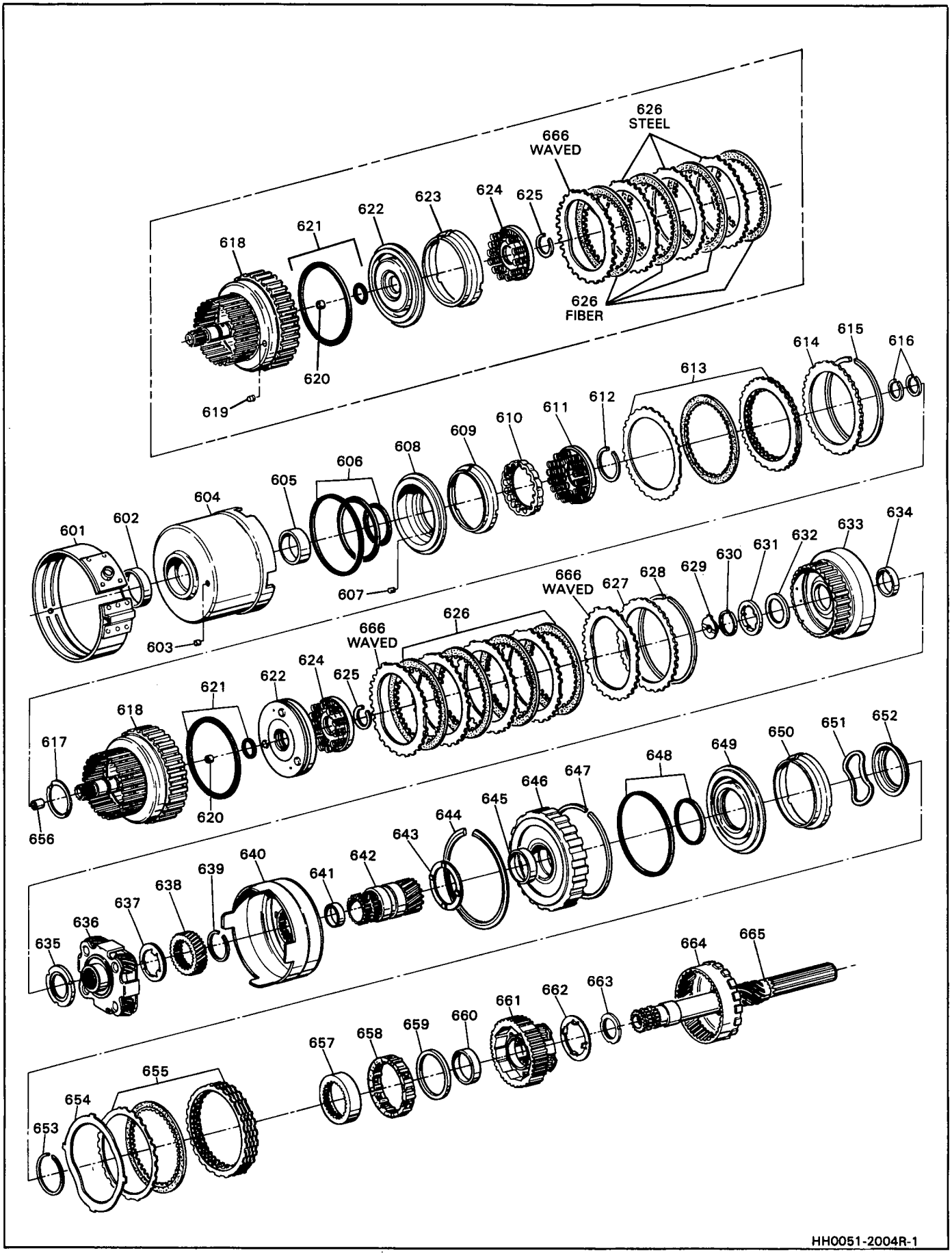
Front Internal Gear to Output Shaft End Play

As a diagnostic aid, front gear end play should be checked prior to removing internal parts. If the end play is not within specifications,you should watch for worn or misassembled parts during disassembly.

Measure (Figures 30 and 31)

Tools Required

J-8001 Dial Indicator
J-7057 Plunger Extension
J-25013 Output Shaft and Rear Unit Support Fixture
J-29332 Output Shaft Support Fixture Clamp

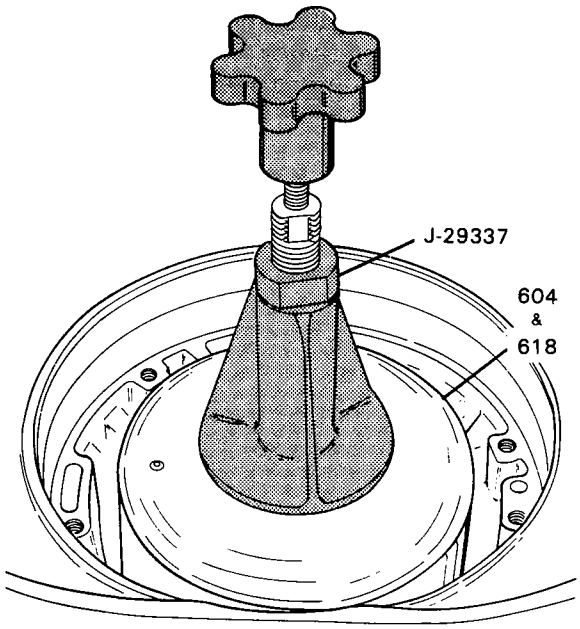


★ Figure 27 Internal Components

ILL. NO.	DESCRIPTION
601	BAND ASSEMBLY, INTERMEDIATE
602	BUSHING, DIRECT CLUTCH (FRONT)
603	RETAINER & BALL ASSEMBLY, CHECK VALVE
604	HOUSING & DRUM ASSEMBLY, DIRECT CLUTCH
605	BUSHING, DIRECT CLUTCH (REAR)
606	SEALS, DIRECT CLUTCH PISTON
607	RETAINER & BALL ASSEMBLY, CHECK VALVE
608	PISTON ASSEMBLY, DIRECT CLUTCH
609	RING, CLUTCH APPLY (DIRECT)
610	GUIDE, RELEASE SPRING
611	RETAINER & SPRING ASSEMBLY, DIRECT CLUTCH
612	RING, SNAP (SPRING RETAINER)
613	PLATE ASSEMBLY, DIRECT CLUTCH
614	PLATE, CLUTCH BACKING
615	RING, SNAP (DIRECT CLUTCH HOUSING)
616	SEALS, RING (FORWARD CLUTCH SHAFT) TEF
617	WASHER, THRUST (DIRECT/FORWARD CLUTCH)
618	HOUSING ASSEMBLY, FORWARD CLUTCH
619	RETAINER & BALL ASM., CHECK VALVE (7 BRF ONLY
620	PLUG, CUP (4.8 DIAMETER)
621	SEALS, FORWARD CLUTCH PISTON (PACKAGE)
622	PISTON ASSEMBLY, FORWARD CLUTCH
623	RING, CLUTCH APPLY (FORWARD) (7 BRF ONLY)
624	RETAINER & SPRING ASSEMBLY, FORWARD
625	RING, SNAP (FORWARD SPRING RETAINER)
626	PLATE, FORWARD CLUTCH (FLAT)
627	PLATE, CLUTCH BACKING
628	RING, SNAP (FORWARD CLUTCH HOUSING)
629	WASHER, THRUST (FORWARD CL./OUTPUT) (SEL.)
630	RING, SNAP (OUTPUT SHAFT)
631	WASHER, THRUST (SELECTIVE REAR)
632	WASHER, THRUST (INTERNAL GEAR/REAR SEL.)
633	GEAR, FRONT INTERNAL
634	BUSHING, FRONT INTERNAL GEAR
635	BEARING ASM., ROLLER (INTERNAL GEAR/CARRIER)
636	CARRIER ASSEMBLY, FRONT (COMPLETE)
637	BEARING ASSEMBLY, THRUST (FRT. CARRIER/SUN)
638	GEAR, FRONT SUN
639	RING, SNAP (INPUT DRUM/REAR SUN)
640	DRUM, INPUT
641	BUSHING, REAR SUN GEAR
642	GEAR, REAR SUN
643	WASHER, THRUST (INPUT DRUM/HOUSING)
644	RING, SNAP (HOUSING/CASE)
645	BUSHING, LO & REVERSE HOUSING
646	HOUSING ASSEMBLY, LO & REVERSE CLUTCH
647	SPACER, HOUSING TO CASE
648	SEALS, LO & REVERSE PISTON (INNER/OUTER)
649	PISTON ASSEMBLY, LO & REVERSE CLUTCH
650	RING, CLUTCH APPLY (13.13mm)
651	SPRING, WAVE (REVERSE CLUTCH RELEASE)
652	RETAINER, LO & REVERSE CLUTCH SPRING
653	RING, SNAP (RETAINER/HOUSING)
654	PLATE, LO & REVERSE CLUTCH (WAVE)
655	PLATE, LO & REVERSE CLUTCH (1.969 MST)
656	BUSHING, FORWARD CLUTCH HOUSING
657	RACE, LO ROLLER CLUTCH
658	ROLLER ASSEMBLY, LO CLUTCH
659	BEARING, THRUST (REAR CAM/LO RACE)
660	BUSHING, REAR CARRIER (53.13 X 9.53)
661.	CARRIER ASSEMBLY, REAR (COMPLETE)
662	WASHER, THRUST (REAR CARRIER/INTERNAL GEAR)
663	BEARING ASSEMBLY, ROLLER THRUST (SUN/INT.)
664	GEAR, REAR INTERNAL
665	SHAFT, OUTPUT
666	PLATE, CLUTCH 1.585 (WAVED)

HH0052-2004R-1

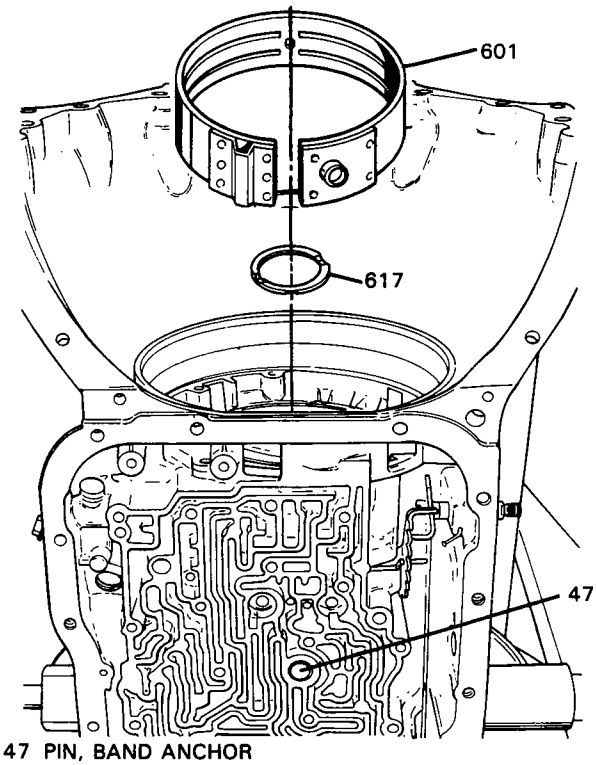
★ Figure 27L Legend



ILL. NO.	DESCRIPTION
604	HOUSING & DRUM ASSEMBLY, DIRECT CLUTCH
618	HOUSING ASSEMBLY, FORWARD CLUTCH

HH0053200-4R

Figure 28 Removing Forward and Direct Clutch Housing



47 PIN, BAND ANCHOR
601 BAND ASSEMBLY, INTERMEDIATE
617 WASHER, THRUST

HH0054200-4R

Figure 29 Removing Intermediate Band

1. Install clamp, J-7057, and J-8001 as shown.
2. Position J-7057 against the output shaft (665).
   - Zero dial indicator.
3. Turn the adjusting screw on J-29332 until white/scrib line begins to disappear.
4. Read dial indicator.
   End play should be 0.10mm-0.51mm(.004"-.025").

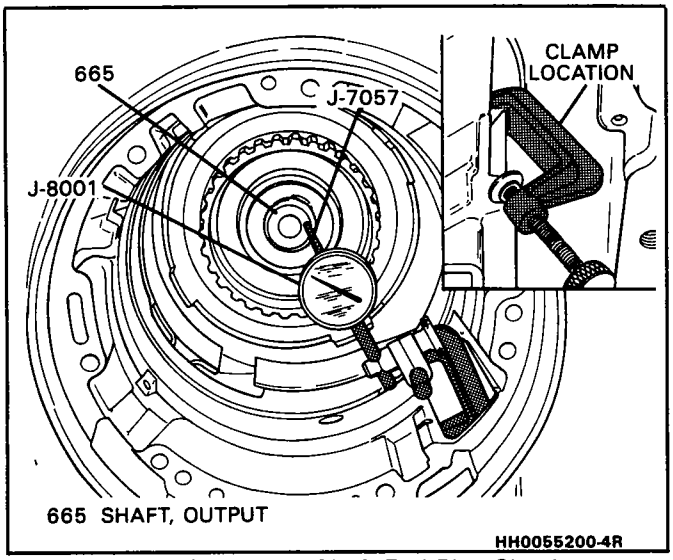


Figure 30 Output Shaft End Play Check

THICKNESS		IDENTIFICATION NUMBER AND/OR COLOR
2.90-3.01mm	(0.114"-0.119")	1 - ORANGE
3.08-3.19mm	(0.121"-0.126")	2 - WHITE
3.26-3.37mm	(0.128"-0.133")	3 - YELLOW
3.44-3.55mm	(0.135"-0.140")	4 - BLUE
3.62-3.73mm	(0.143"-0.147")	5 - RED
3.80-3.91mm	(0.150"-0.154")	6 - BROWN
3.98-4.09mm	(0.157"-0.161")	7 - GREEN
4.16-4.27mm	(0.164"-0.168")	8 - BLACK
4.34-4.45mm	(0.171"-0.175")	9 - PURPLE

HH0056200-4R

Figure 31 Rear Unit End Play Washer Thickness Chart

Remove or Disconnect (Figure 32)

1. Snap ring (630), selective washer (631), and thrust washer (632).
2. Front internal gear (633).
3. Front carrier (636) and roller bearing (635).
4. Front sun gear (638) and thrust bearing (637).
   - Thrust bearing (637) has only one thrust race.
5. Input drum (640) and rear sun gear (642).
6. Tanged thrust washer (643).

Remove or Disconnect (Figures 33 and 34)

Tools Required

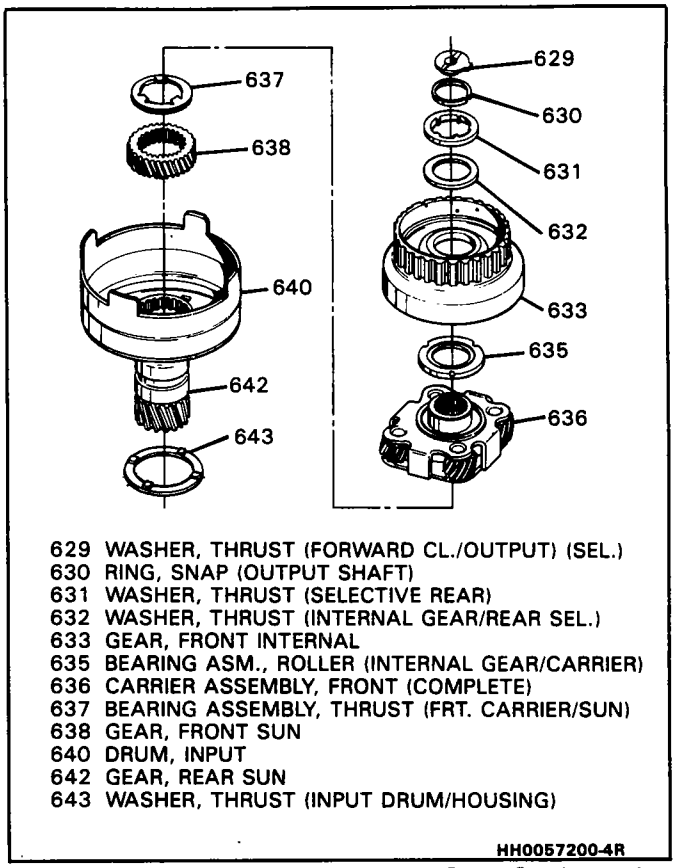


Figure 32 Removing Front Internal Gear, Carrier and Input Drum

#4 Easy out
"T" Handle Tap Wrench
J-28542 Reverse Clutch Housing Remover and Installer

1. Modify 6.3mm (#4) easy out as follows:
   - Grind approximately 20mm (3/4") from the end.
2. Insert the easy out into the case cup plug (46).
3. Case cup plug (46).
   DO NOT REUSE CASE CUP PLUG
4. Snap ring (644).
   - Beveled side should be facing up.
5. Install J-28542 as shown.
6. Lo and reverse clutch housing (646).
7. Spacer (647).

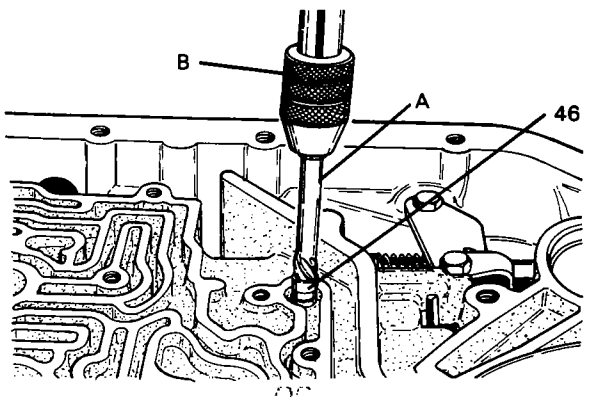
Rear Carrier Removal

Remove or Disconnect (Figures 35 and 36)

1. Output shaft assembly (665).
2. Roller clutch (657/658) and rear carrier (661).
3. Thrust washer (662).
4. Wave plate (654) and Lo-reverse clutch plates (655).
5. Thrust washer (663).

NOTICE: The internal gear is pressed onto the output shaft. DO NOT REMOVE.

6. Rear internal gear (664).
7. Output shaft seal (33), if necessary.



A MODIFIED (NO. 4) EASY-OUT
B "T" HANDLE TAP WRENCH
46 SEAL, REVERSE OIL (CASE TO HOUSING)

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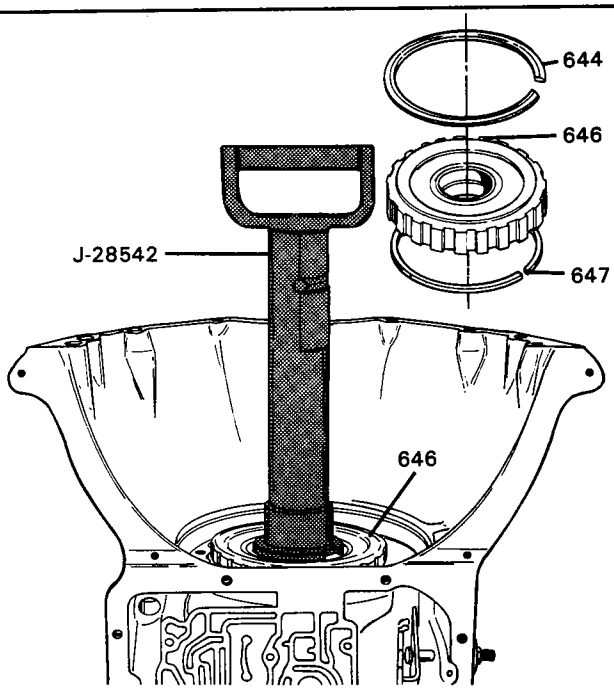
Figure 33 Removing Reverse Oil Seal



ILL. NO. DESCRIPTION

644 RING, SNAP (HOUSING/CASE)
646 HOUSING ASSEMBLY, LO & REVERSE CLUTCH
647 SPACER, HOUSING TO CASE

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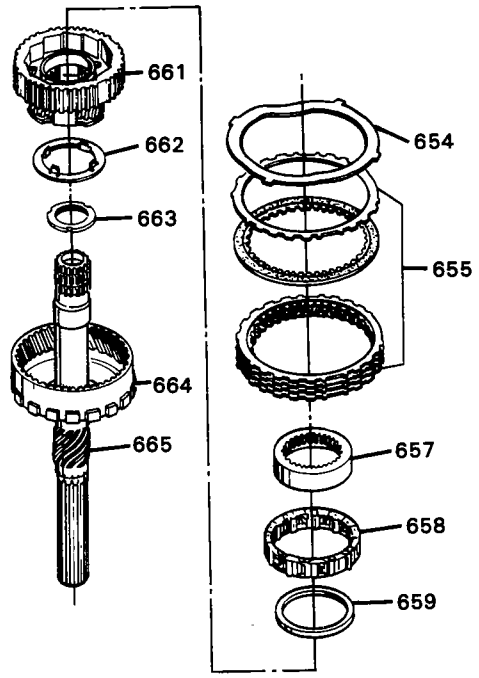
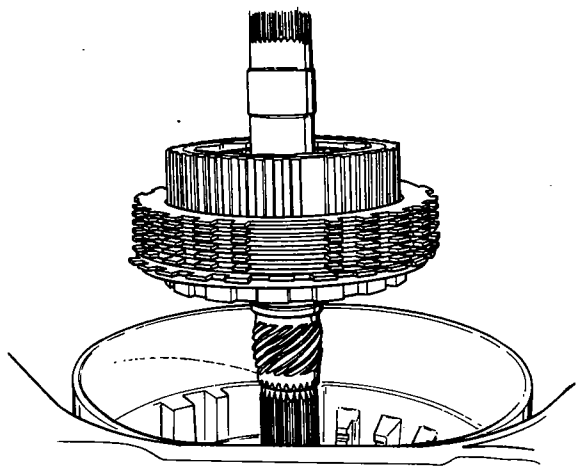
Figure 34 Removing Lo and Reverse Clutch Housing

Manual Shaft and Parking Pawl

Remove or Disconnect (Figures 37 and 38)

1. Hex nut (707) and inside detent lever (704).
2. Parking Brake actuator rod assembly (709) and inside detent lever (704).
3. Retaining pin (703).
4. Manual shaft (702).
5. Manual valve link (705) and clip (706), if necessary.
6. Manual shaft seal (701).





ILL. NO. DESCRIPTION

654 PLATE, LO & REVERSE CLUTCH (WAVE)
655 PLATE, LO & REVERSE CLUTCH (1.969 MST)
657 RACE, LO ROLLER CLUTCH
658 ROLLER ASSEMBLY, LO CLUTCH
659 BEARING, THRUST (REAR CAM/LO RACE)
661 CARRIER ASSEMBLY, REAR (COMPLETE)
662 WASHER, THRUST (REAR CARRIER/INTERNAL GEAR)
663 BEARING ASSEMBLY, ROLLER THRUST (SUN/INT.)
664 GEAR, REAR INTERNAL
665 SHAFT, OUTPUT

HH0060200-4R

Figure 35 Removing Output Shaft, Rear Internal Gear and Carrier Assemblies

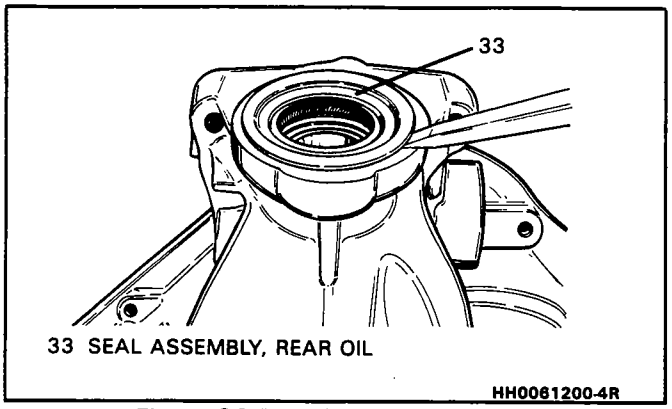
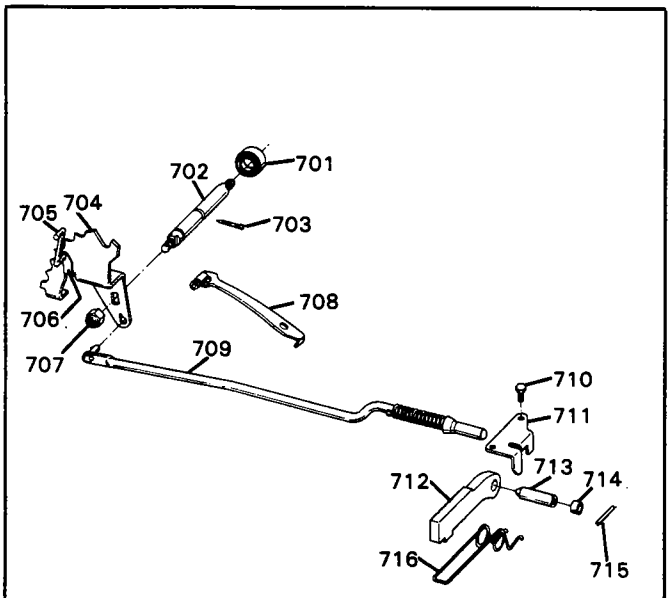


Figure 36 Rear Oil Seal Assembly



ILL. NO.	DESCRIPTION
701	SEAL, MANUAL SHAFT
702	SHAFT, MANUAL
703	PIN, RETAINING (MANUAL SHAFT TO CASE)
704	LEVER, INSIDE DETENT
705	LINK, INSIDE DETENT (LEVER TO VALVE)
706	CLIP, LINK TO DETENT LEVER
707	NUT, HEX
708	MANUAL DETENT ROLLER & SPRING ASSEMBLY
709	ROD ASSEMBLY, PARKING LOCK
710	BOLT, PARK BRAKE BRACKET TO CASE (M8 X 1.25 X 20)
711	BRACKET, PARKING BRAKE
712	PAWL, PARKING BRAKE
713	SHAFT, PARKING BRAKE PAWL
714	PLUG, STEEL CUP (.38 DIAMETER)
715	PIN, SLOTTED SPRING
716	SPRING, PARKING PAWL RETURN

HH0062200-4R

Figure 37 Manual Shaft and Detent Lever Assemblies

Remove or Disconnect (Figures 37 and 39)

Tools Required

Modified #4 Easy Out

1. Modify #4 easy out as follows:
   - grind off appromxiately 20mm (3/4") from the end.

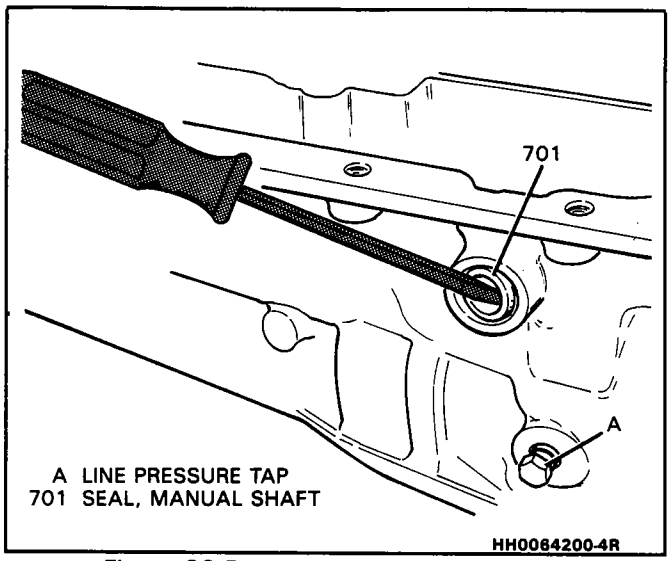
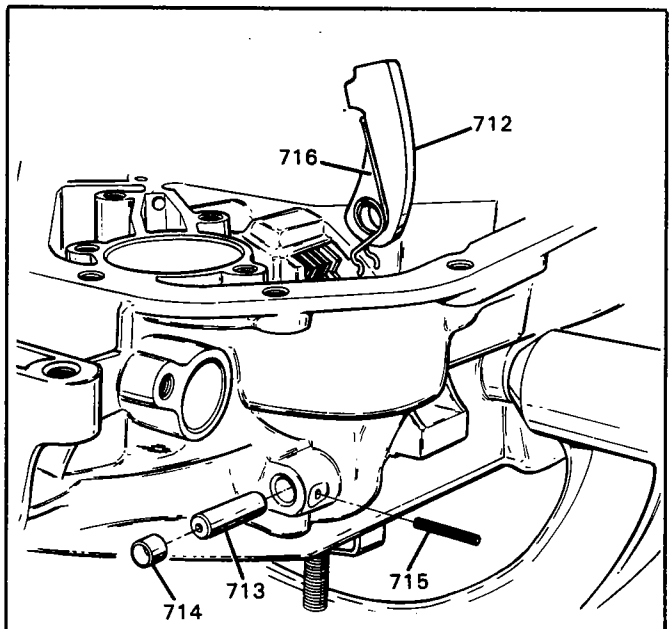


Figure 38 Removing Manual Shaft Seal

2. Bolts (710) and parking brake bracket (711).
3. Retaining pin (715) and cup plug (714). Use modified #4 easy out.
4. Parking pawl shaft (713).Use modified #4 easy out.
5. Parking pawl (712) and spring (716).



ILL. NO.	DESCRIPTION
712	PAWL, PARKING BRAKE
713	SHAFT, PARKING BRAKE PAWL
714	PLUG, STEEL CUP (.38 DIAMETER)
715	PIN, SLOTTED SPRING
716	SPRING, PARKING PAWL RETURN

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Figure 39 Removing Parking Pawl

Component Repair and Transmission Assembly

Inspect

- Case (12) exterior for cracks or porosity

- Case to valve body face for interconnected oil passages or damage
- Air check all oil passages
- 3-4 accumulator bore for:
  - sharp edges
  - porosity
  - damage
- Intermediate servo bore for:
  - sharp edges
  - damage
  - porosity
  - orifice for debris
- Governor bore for:
  - sharp edges
  - porosity
  - damage
- Speedometer bore for:
  - sharp edges
  - damage
- All bolt hole threads for damage
  - heli-coil to repair
- Case interior for:
  - damaged ring grooves or casting flash
  - clutch plate lugs worn or damaged
  - Bushing scored, worn, or damaged (see Bushing Replacement)

Manual Shaft and Parking Pawl

Inspect

- Actuator rod (709) for damage
- Inside detent lever (704) for damage or cracks
- Manual shaft (702) for damage or burrs

Install or Connect (Figures 40 and 41)

1. Parking pawl (712) and spring (716).
2. Parking pawl shaft (713) into case (12) and parking pawl (712).
3. Retaining pin (715) and cap plug (714).
   - CHECK FOR PROPER OPERATION
4. Bolts (710) and parking brake bracket (711).
   - Torque to 24 N·m (18 lbs.-ft.)
5. Actuator rod (709) and inside detent lever (704).

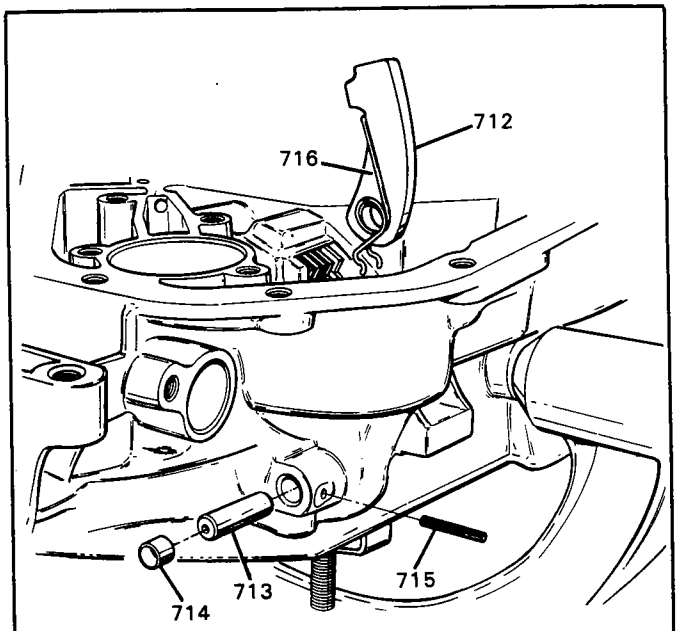
Install or Connect (Figures 40 and 41)

1. Manual shaft seal (701). Lubricate seal lip.
2. Manual shaft (702), identification ring groove first.
3. Retaining pin (703) and hex nut (707).
   - Torque to 31 N·m (23 lbs.-ft.)

Rear Carrier

Inspect

- Journals and snap ring grooves for wear or damage
- Lubrication passages for restrictions
- Splines for damage



ILL. NO.	DESCRIPTION
712	PAWL, PARKING BRAKE
713	SHAFT, PARKING BRAKE PAWL
714	PLUG, STEEL CUP (.38 DIAMETER)
715	PIN, SLOTTED SPRING
716	SPRING, PARKING PAWL RETURN

HH0063200-4R

Figure 40 Installing Parking Pawl

- Governor drive gear for chipped or cracked teeth

Install or Connect (Figure 42)

Tools Required
J-21426 Seal Installer

Rear Internal Gear

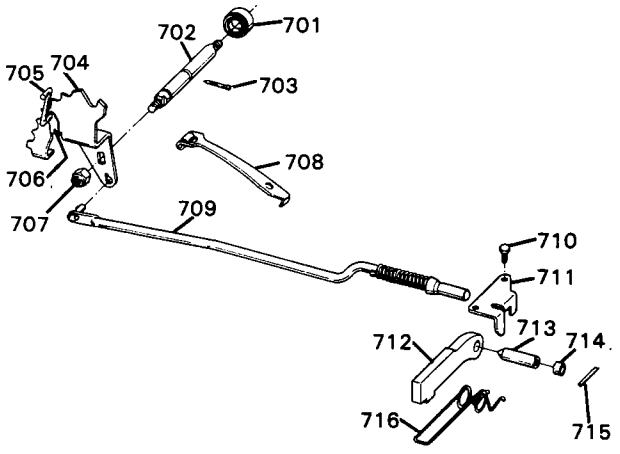
The rear internal gear is pressed onto the output shaft and is not removed. These units are serviced as an assembly.

Inspect

- Rear internal gear for:
  - worn or damaged splines
  - worn or scored bearing surfaces
  - worn or damaged parking pawl lugs
- Rear internal gear for:
  - worn or damaged splines
  - worn or scored bearing surfaces
  - worn or damaged parking pawl lugs
- Rear internal gear to rear sun gear thrust washer for:
  - pitting
  - scoring
  - damage

Assemble (Figure 43)

1. Rear internal gear (664) pressed onto the output shaft (665).



ILL. NO.	DESCRIPTION
701	SEAL, MANUAL SHAFT
702	SHAFT, MANUAL
703	PIN, RETAINING (MANUAL SHAFT TO CASE)
704	LEVER, INSIDE DETENT
705	LINK, INSIDE DETENT (LEVER TO VALVE)
706	CLIP, LINK TO DETENT LEVER
707	NUT, HEX
708	MANUAL DETENT ROLLER & SPRING ASSEMBLY
709	ROD ASSEMBLY, PARKING LOCK
710	BOLT, PARK BRAKE BRACKET TO CASE (M8 X 1.25 X 20'
711	BRACKET, PARKING BRAKE
712	PAWL, PARKING BRAKE
713	SHAFT, PARKING BRAKE PAWL
714	PLUG, STEEL CUP (.38 DIAMETER)
715	PIN, SLOTTED SPRING
716	SPRING, PARKING PAWL RETURN

HH0062200-4R

Figure 41 Manual Shaft and Detent Lever Assemblies

2. Thrust bearing (663). Inside diameter of race against gear.

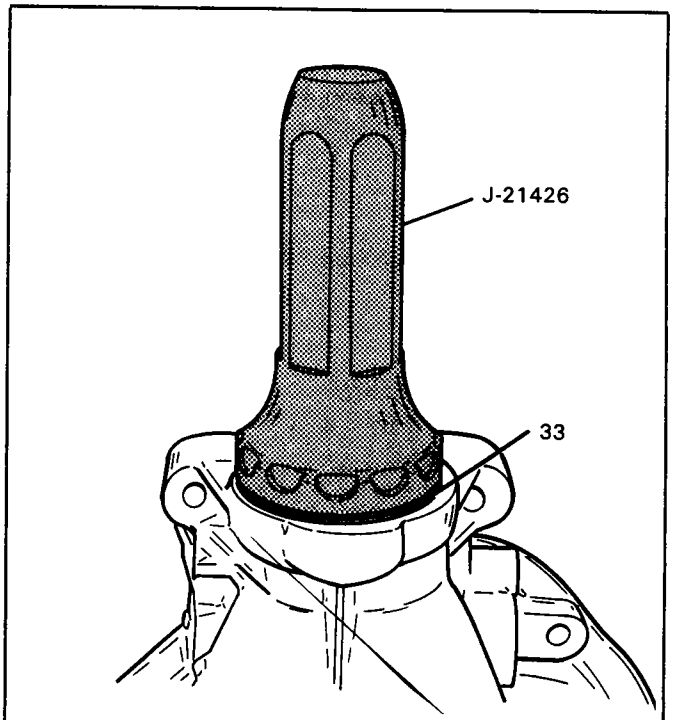
Roller Clutch and Rear Carrier

Disassemble

1. Roller clutch race (657).
2. Roller clutch (658).
3. Thrust washer (659).

Inspect

- Roller clutch for:
  - pitting
  - scoring
  - heat damage
- Roller clutch for:
  - missing rollers or springs
  - wear or damage
- Thrust washer for:
  - scoring
  - pitting
  - damage



ILL. NO.	DESCRIPTION
33	SEAL ASSEMBLY, REAR OIL

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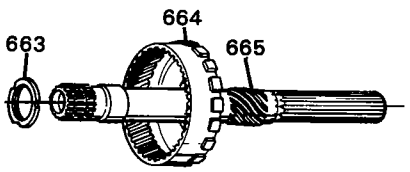
Figure 42 Installing Rear Output Seal



ILL. NO.	DESCRIPTION
663	BEARING ASSEMBLY, ROLLER THRUST (SUN/INT.)
664	GEAR, REAR INTERNAL
665	SHAFT, OUTPUT

HH0066200-4R

Figure 43 Rear Internal Gear and Output Shaft Assembly

- Tanged thrust washer for:
  - pitting
  - scoring
  - damage
- Bushing for scoring or damage (See Bushing Replacement)

Measure

- Check pinion clearance as shown. End play should be .024mm-0.060mm (.009"-.024").

Inspect

- Pinions for:
  - rough bearings
  - cracked or chipped teeth

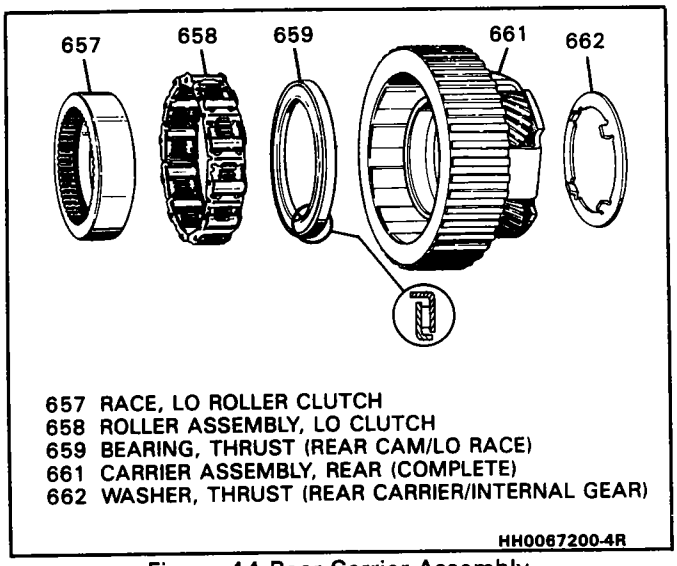


Figure 44 Rear Carrier Assembly

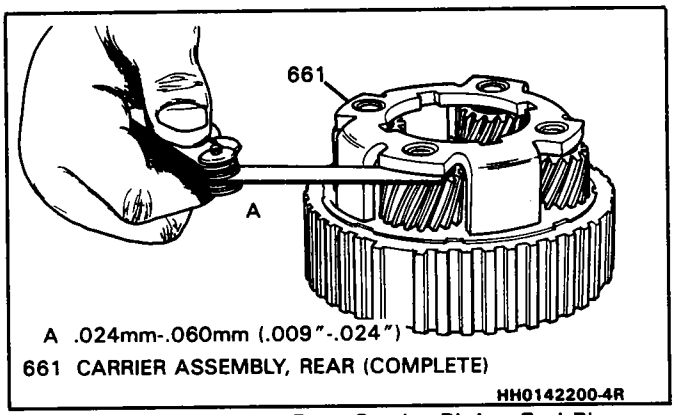


Figure 45 Checking Rear Carrier Pinion End Play

Assemble (Figure 46)

1. Thrust bearing (663).
2. Compress spring with forefinger and install roller.
3. Roller clutch (658) into rear carrier (661).
4. Roller clutch race (657) with splines facing up.
5. Tanged thrust washer (662). Use petrolatum to retain in position.
6. Rear carrier assembly (661) into the rear internal gear (664).

Assemble (Figures 47 and 48)

Tools Required

J-25013 Output Shaft and Rear Unit Support Fixture

J-29332 Output Support Fixture

1. Install J-25013 and J-29332 as shown.
2. Output shaft assembly (665) into case(12).
3. Align parking pawl (712) and parking pawl lugs.
4. Use J-29332 to align internal gear parking lugs flush with the parking pawl (712).

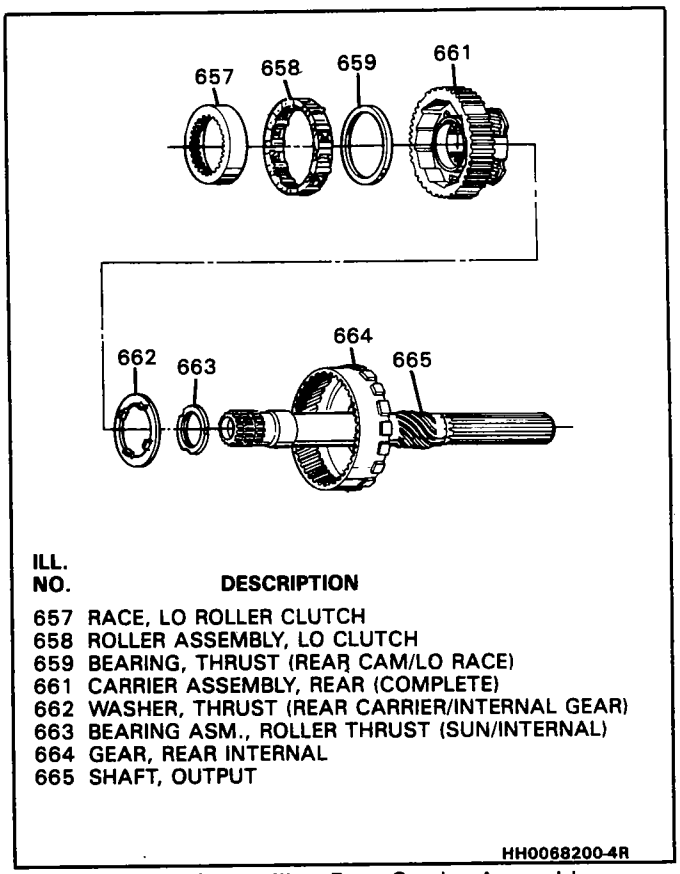


Figure 46 Installing Rear Carrier Assembly

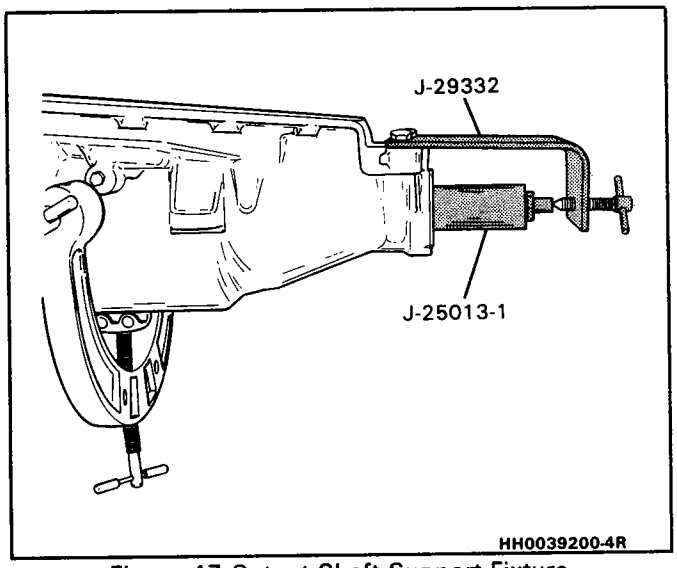


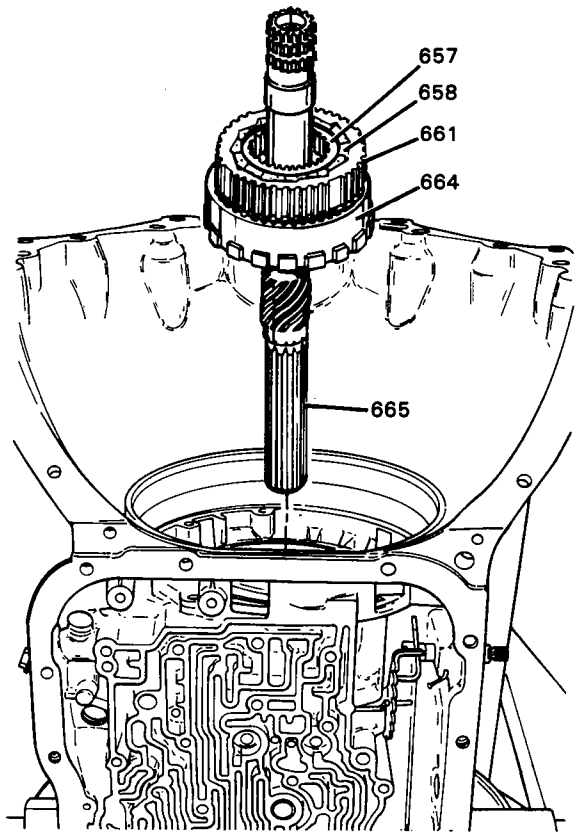
Figure 47 Output Shaft Support Fixture

Lo and Reverse Clutch Housing

Disassemble (Figure 49)

1. Compress Lo and reverse clutch spring retainer (652).

   Remove snap ring (653) and retainer (652).
2. Waved spring (651).
3. Lo and reverse clutch piston (649).
4. Inner and outer piston seals (648).
5. Clutch apply ring (650).



ILL. NO.	DESCRIPTION
657	RACE, LO ROLLER CLUTCH
658	ROLLER ASSEMBLY, LO CLUTCH
661	CARRIER ASSEMBLY, REAR (COMPLETE)
664	GEAR, REAR INTERNAL
665	SHAFT, OUTPUT
712	PAWL, PARKING BRAKE

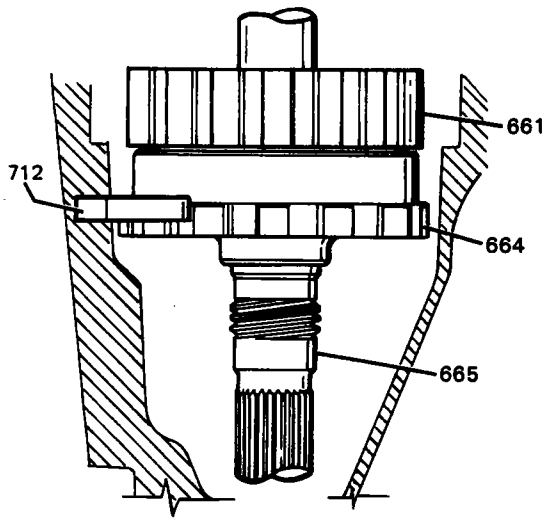


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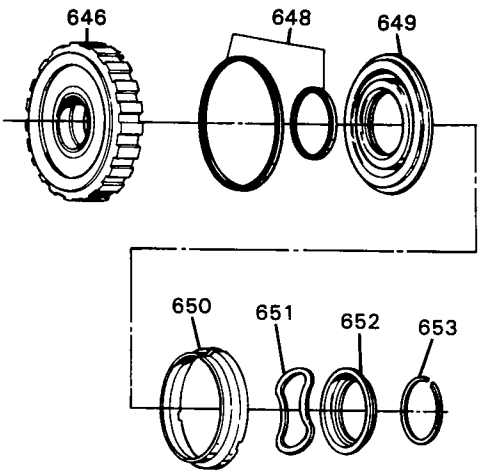
Figure 48 Installing Output Shaft



ILL. NO.	DESCRIPTION
646	HOUSING ASSEMBLY, LO & REVERSE CLUTCH
648	SEALS, LO & REVERSE PISTON (INNER/OUTER)
649	PISTON ASSEMBLY, LO & REVERSE CLUTCH
650	RING, CLUTCH APPLY (13.13mm)
651	SPRING, WAVE (REVERSE CLUTCH RELEASE)
652	RETAINER, LO & REVERSE CLUTCH SPRING
653	RING, SNAP (RETAINER/HOUSING)

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Figure 49 Lo and Reverse Clutch Housing Assembly

Inspect

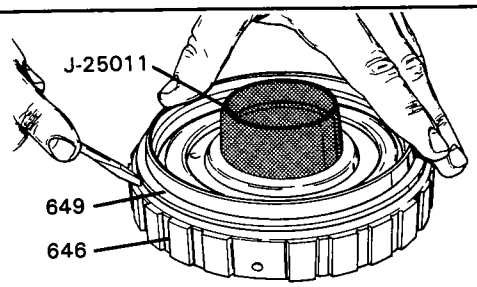
- Lo and Reverse clutch housing for:
  - plugged or damaged feed hole
  - bushing for scoring or damage
  - worn or chipped clutch splines
- Clutch apply ring (650) for cracks or distortion
- Piston (649) for wear, cracks, or damage
- Spring retainer (652) for damage
- Clutch plates (626):
  - composition plates for tang damage, delamination, or wear
  - steel plates for tang damage, wear, or heat damage

Assemble (Figures 50 and 51)

Tools Required

J-25011 Lo-Reverse Clutch Seal Protector
J-26744 Universal Seal Installer

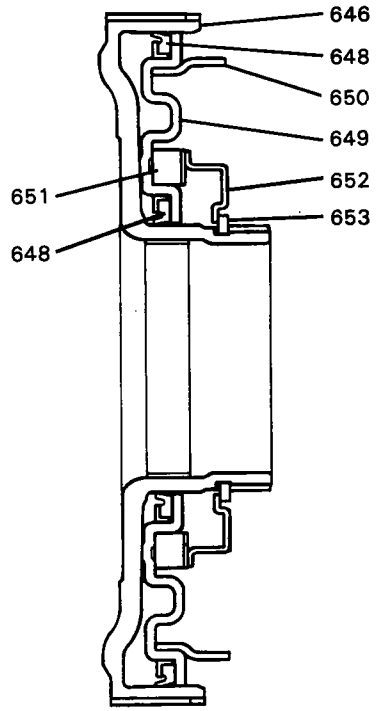
1. Clutch apply ring (650).
2. Inner and outer piston seals (648).
   - seal lips face up. Lubricate seals with transmission fluid.
3. Install J-25011.
4. Lo and reverse piston (649). Use J-26744.
5. Remove J-25011.
6. Waved release spring (651).
7. Retainer (652), cup facing down.
8. Compress retainer (652) and install snap ring (653).



646 HOUSING ASSEMBLY, LO & REVERSE CLUTCH
649 PISTON ASSEMBLY, LO & REVERSE CLUTCH

HH0071200-4R

Figure 50 Installing - Lo and Reverse Clutch Piston



ILL. NO.	DESCRIPTION
646	HOUSING ASSEMBLY, LO & REVERSE CLUTCH
648	SEALS, LO & REVERSE PISTON (INNER/OUTER)
649	PISTON ASSEMBLY, LO & REVERSE CLUTCH
650	RING, CLUTCH APPLY (13.13mm)
651	SPRING, WAVE (REVERSE CLUTCH RELEASE)
652	RETAINER, LO & REVERSE CLUTCH SPRING
653	RING, SNAP (RETAINER/HOUSING)

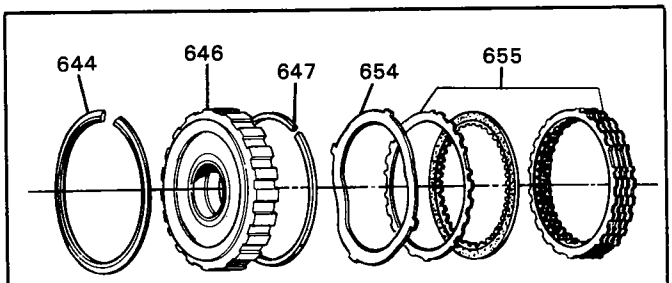
HH0070200-4R

Figure 51 Cross Section - Lo and Reverse Clutch Housing

Assemble (Figure 52, 53 and 54)

Tools Required
J-28542 Reverse Clutch Housing Installer/Remover

1. Clutch plates (655).
   - start with steel, alternate with composition plates.
2. Waved steel plate (654).
3. Snap ring (647).
4. Lo and reverse clutch housing (646).
   - align clutch housing feed hole with case feed passage
5. If clutch housing does not seat past case snap ring:
   - remove J-28542.
   - install rear sun gear (642) and input drum (640)
   - rotate input drum (640) to align roller clutch and clutch hub splines
6. Snap ring (644). Bevel side up,ring opening opposite parking brake actuator rod (709).
   - It may be necessary to loosen J-29332.
7. Oil seal (46). Seat seal against clutch housing (646).



ILL. NO.	DESCRIPTION
644	RING, SNAP (HOUSING/CASE)
646	HOUSING ASSEMBLY, LO & REVERSE CLUTCH
647	SPACER, HOUSING TO CASE
654	PLATE, LO & REVERSE CLUTCH (WAVE)
655	PLATE, LO & REVERSE CLUTCH (1.969 MST)

HH0072200-4R

Figure 52 Lo and Reverse Clutch Assembly

Front Gear Components

Disassemble (Figure 54)

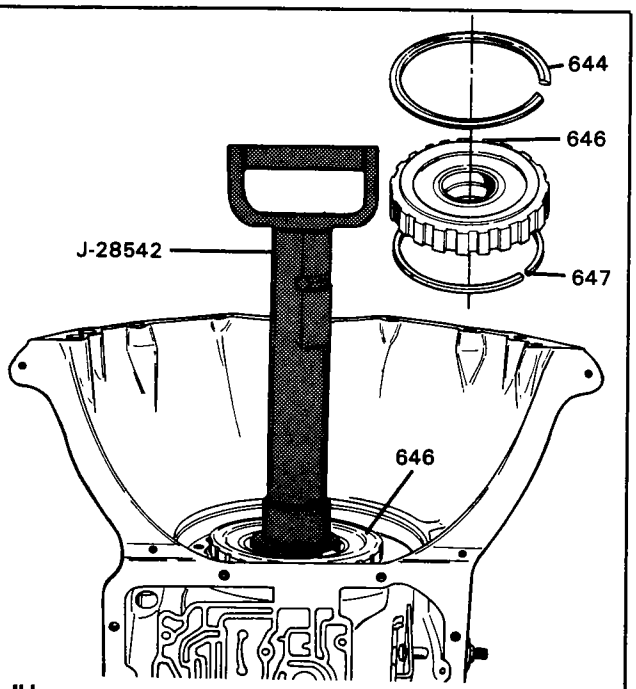
1. Snap ring (639).
2. Rear sun gear (642) from input drum (640).

Inspect

- Rear sun gear for:
  - cracks
  - worn, cracked, or damaged splines
  - chipped, cracked, or damaged gear teeth
  - plugged lubrication passages
  - bushing for scoring, wear, or damage
- Input drum for:
  - cracks or damage
  - worn splines
- Thrust washer for scoring or damaged tangs

Assemble (Figure 54)

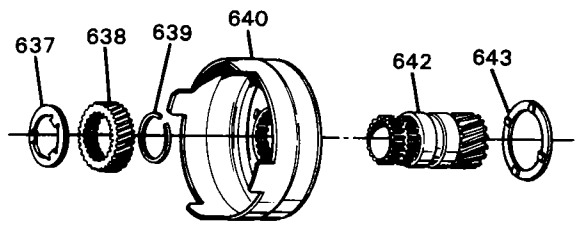
1. Rear sun gear (642) into input drum (640).
2. Snap ring (639).



ILL. NO.	DESCRIPTION
644	RING, SNAP (HOUSING/CASE)
646	HOUSING ASSEMBLY, LO & REVERSE CLUTCH
647	SPACER, HOUSING TO CASE

HH0059200-4R

Figure 53 Installing Lo and Reverse Clutch



ILL. NO.	DESCRIPTION
637	BEARING ASSEMBLY, THRUST (FRT. CARRIER/SUN)
638	GEAR, FRONT SUN
639	RING, SNAP (INPUT DRUM/REAR SUN)
640	DRUM, INPUT
642	GEAR, REAR SUN
643	WASHER, THRUST (INPUT DRUM/HOUSING)

HH0073200-4R

Figure 54 Installing Front Sun Gear and Input Drum

3. Tanged thrust washer (643). Retain with petrolatum.
4. Input drum (640) and rear sun gear (642).

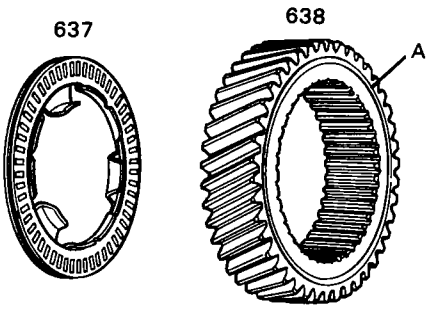
Front Sun Gear

Inspect (Figure 55)

- Front sun gear (638) for:
  - wear or damaged splines
  - chipped or cracked gear teeth
  - scored, pitted, or damaged bearing surface
- Thrust bearing for pitting or roughness

Assemble

1. Front sun gear (638).
   - identification groove against snap ring (639)
2. Thrust bearing (637). This thrust bearing requires only one race.
   - needle bearings against gear (638)



ILL. NO.	DESCRIPTION
A	IDENTIFICATION GROOVE
637	BEARING ASSEMBLY, THRUST (FRT. CARRIER/SUN)
638	GEAR, FRONT SUN

HH0074200-4R

Figure 55 Front Sun Gear

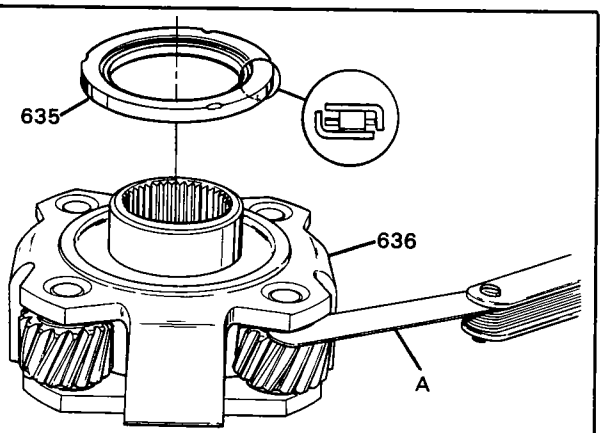
Front Carrier Assembly

Inspect (Figure 56)

- Pinions for chipped or cracked gears
- Bearings for roughness
- Thrust washer (635) for scoring, pitting, or damage

Measure

- Check pinion end play as shown. Clearance should be 0.24mm-.060mm (.009"-.024").



A	.024mm-.060mm (.009"-.024")
635	BEARING ASM., ROLLER (INTERNAL GEAR/CARRIER)
636	CARRIER ASSEMBLY, FRONT (COMPLETE)

HH0075200-4R

Figure 56 Front Carrier Assembly

Assemble (Figure 56)

1. Thrust bearing (635). Retain with petrolatum.
   - inside diameter against carrier
2. Front carrier (636).

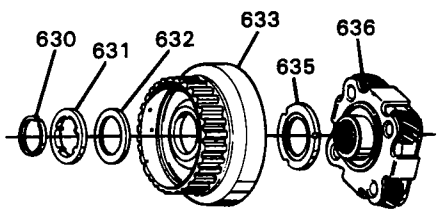
Front Internal Gear

Inspect (Figure 57)

- Front internal gear (633) hub for:
  - worn or damaged splines
  - restricted lubrication passages
- Internal gear for cracks or chips
- Gear teeth for cracks or chips
- Bushing for scoring or damage
- Thrust washer (632) for scoring or damage
- Selective washer (631) for scoring, pitting, or damage

Assemble (Figure 57)

1. Internal gear (633).
2. Thrust washer (632).
3. Selective washer (631).
   - identification number faces up
4. Snap ring (630).
   - make sure snap ring is seated



ILL. NO.	DESCRIPTION
630	RING, SNAP (OUTPUT SHAFT)
631	WASHER, THRUST (SELECTIVE REAR)
632	WASHER, THRUST (INTERNAL GEAR/REAR)
633	GEAR, FRONT INTERNAL
635	BEARING ASM., ROLLER (INTERNAL GEAR/CARRIER)
636	CARRIER ASSEMBLY, FRONT (COMPLETE)

HH0076200-4R

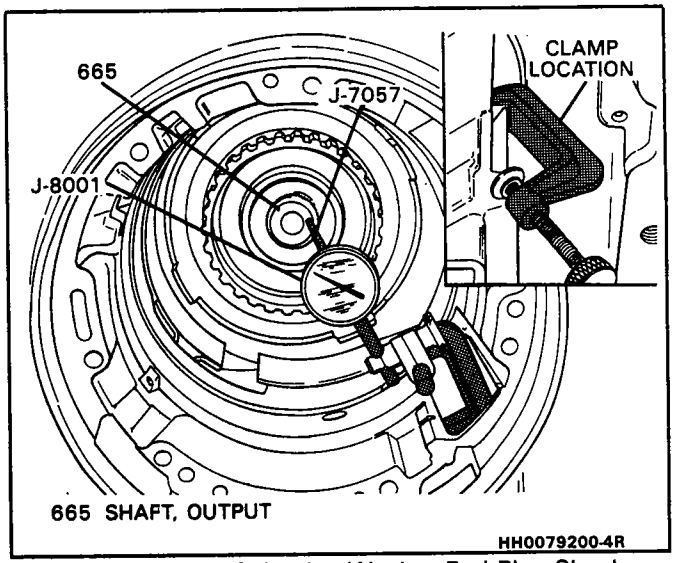
Figure 57 Front Internal Gear Assembly

Front Internal Gear to Outpur Shaft End Play Check

Measure (Figures 57, 58 and 59)

Tools Required
J-8001 Dial Indicator
J-7057 Plunger Extension

1. Loosen J-29332. Push output shaft (665) down.
2. Install clamp, J-7057, and J-8001 as shown.
3. Position J-7057 against output shaft (665).
   - Zero dial indicator
4. Turn adjusting screw until scribe/white line on J-25013 begins to disappear.
   - Read dial indicator
   - End play should be 0.10mm-0.64mm (.004"-.025")
5. If end play is not within specifications, refer to chart to select proper selective washer (631).
6. Remove J-8001, J-7057, and clamp.
7. Loosen J-25013.



HH0079200-4R

Figure 58 Rear Selective Washer End Play Check

THICKNESS		IDENTIFICATION NUMBER AND/OR COLOR
2.90-3.01mm	(0.114"-0.119")	1 - ORANGE
3.08-3.19mm	(0.121"-0.126")	2 - WHITE
3.26-3.37mm	(0.128"-0.133")	3 - YELLOW
3.44-3.55mm	(0.135"-0.140")	4 - BLUE
3.62-3.73mm	(0.143"-0.147")	5 - RED
3.80-3.91mm	(0.150"-0.154")	6 - BROWN
3.98-4.09mm	(0.157"-0.161")	7 - GREEN
4.16-4.27mm	(0.164"-0.168")	8 - BLACK
4.34-4.45mm	(0.171"-0.175")	9 - PURPLE

HH0056200-4R

Figure 59 Rear Unit End Play Washer Thickness Chart

Direct Clutch Assembly

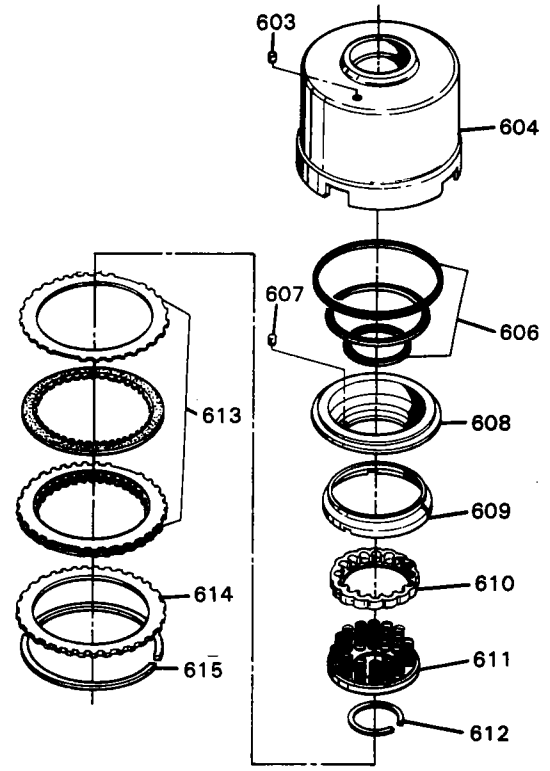
Disassemble (Figure 60 and 61)

Tools Required
J-23327 Clutch Spring Compressor

1. Snap ring (615).
2. Clutch backing plate (614).
3. Direct clutch plates (613).
   - Keep separate from forward clutch plates.
4. Compress retainer and spring assembly (611). Remove snap ring (612).
5. Remove J-23327.

Disassemble (Figure 60)

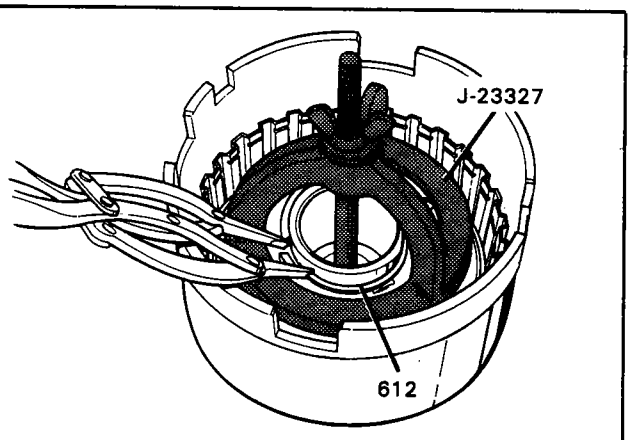
1. Retainer and spring assembly (611).
2. Spring guide (610).
3. Direct piston (608).



603 RETAINER & BALL ASSEMBLY, CHECK VALVE
604 HOUSING & DRUM ASSEMBLY, DIRECT CLUTCH
606 SEALS, DIRECT CLUTCH PISTON
607 RETAINER & BALL ASSEMBLY, CHECK VALVE
608 PISTON ASSEMBLY, DIRECT CLUTCH
609 RING, CLUTCH APPLY (DIRECT)
610 GUIDE, RELEASE SPRING
611 RETAINER & SPRING ASSEMBLY, DIRECT CLUTCH
612 RING, SNAP (SPRING RETAINER)
613 PLATE ASSEMBLY, DIRECT CLUTCH
614 PLATE, CLUTCH BACKING
615 RING, SNAP (DIRECT CLUTCH HOUSING)

HH0080200-4R

Figure 60 Direct Clutch Housing and Drum Assembly



612 RING, SNAP (SPRING RETAINER)

HH0081200-4R

Figure 61 Installing J-23327

4. Inner and outer piston seal rings (606).

Important

Do not remove clutch apply ring (609) unless damaged or clutch piston is being replaced.

Inspect

- Direct clutch housing (604) for:
  - cracks
  - worn or damaged clutch lugs
  - snap ring grooves for damage
  - bushing for scoring or damage
- Clutch backing plate (614)
  - scoring or heat damage
- Clutch plates (613)
  - composition plates for tang damage, delamination, or wear
  - steel plates for tang damage, wear, or heat damage
- Retainer and spring assembly (611)
  - collapsed springs
  - distorted or collapsed retainer
- Spring guide for damage
- Piston (608)
  - cracks or damage
- Piston and housing check valves (603 and 607)
  - the ball must move freely
  - leak test check ball with solvent

Remove or Disconnect

Tools Required
10mm (3/8") Diameter Rod or Drift

1. Tap out check valve assembly (603 and 607).

Install or Connect (Figure 62)

1. Using same tools, tap in check valve (603 and 607) until seated.

Assemble (Figures 60 and 63)

Tools Required
J-25010 Seal Protector

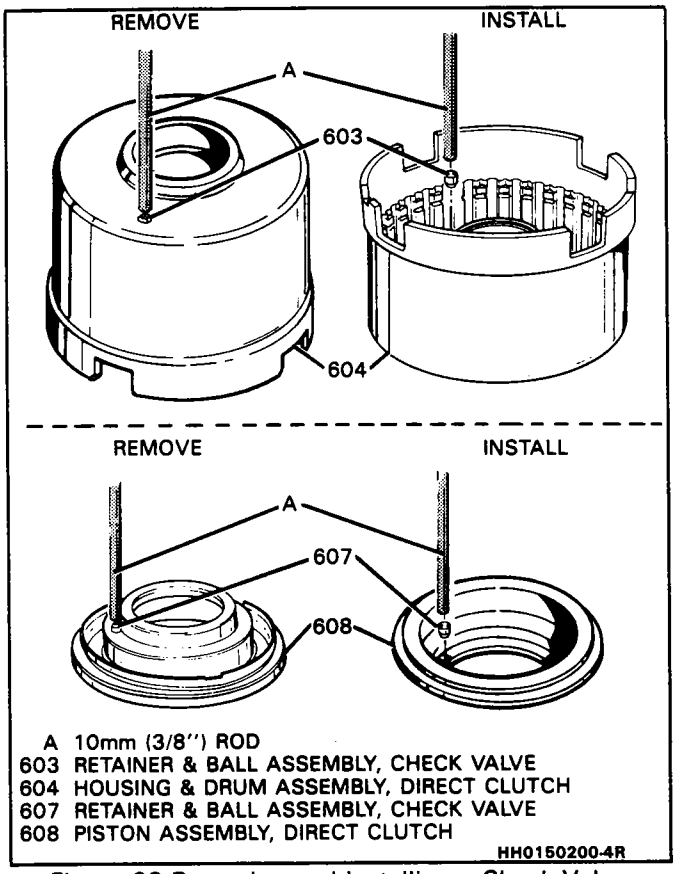
1. Clutch apply ring (609), if necessary.
2. Inner and outer piston seals (606).
   - lips face away from apply ring side.
3. Center seal (606).
4. Lubricate piston seals with transmission fluid.
5. Install J-25010.

NOTICE: Use care when installing piston seals. Snap ring groove could cut outer piston seal.

Assemble (Figures 60, 61, 64, 65)

Tools Required
J-26744-A Universal Seal Installer
J-23327 Clutch Spring Compressor

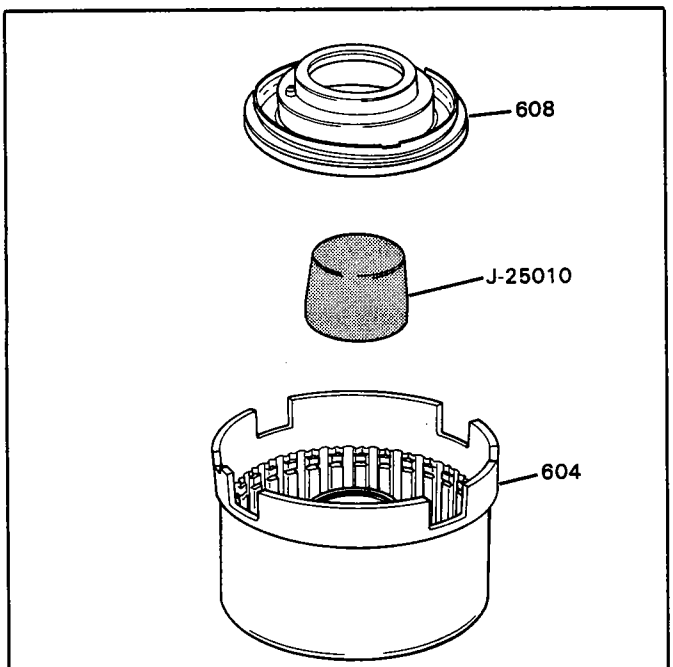
1. Piston (608). Use J-26744-A to compress lip of seal while pushing down on piston.
2. Remove J-25010.
3. Spring guide (610).



A 10mm (3/8") ROD
603 RETAINER & BALL ASSEMBLY, CHECK VALVE
604 HOUSING & DRUM ASSEMBLY, DIRECT CLUTCH
607 RETAINER & BALL ASSEMBLY, CHECK VALVE
608 PISTON ASSEMBLY, DIRECT CLUTCH

HH0150200-4R

Figure 62 Removing and Installing a Check Valve Retainer and Ball Assembly



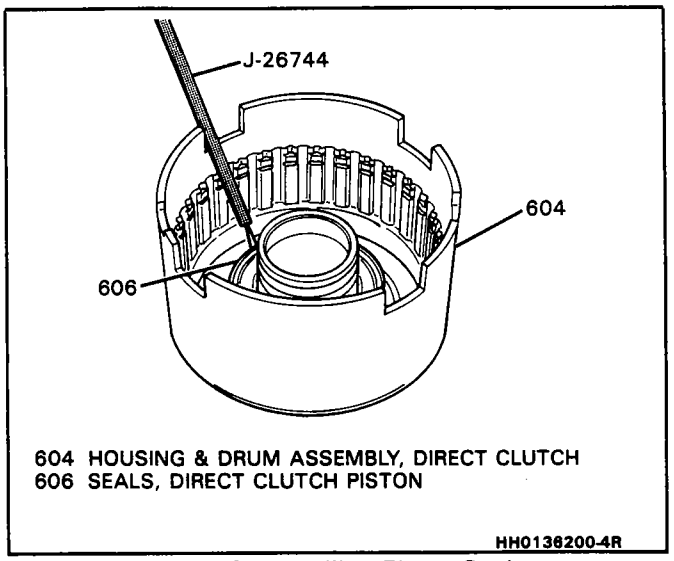
604 HOUSING & DRUM ASSEMBLY, DIRECT CLUTCH
608 PISTON ASSEMBLY, DIRECT CLUTCH

HH0135200-4R

Figure 63 Installing Direct Clutch Piston Seals

- Align omitted rib with check valve(607).

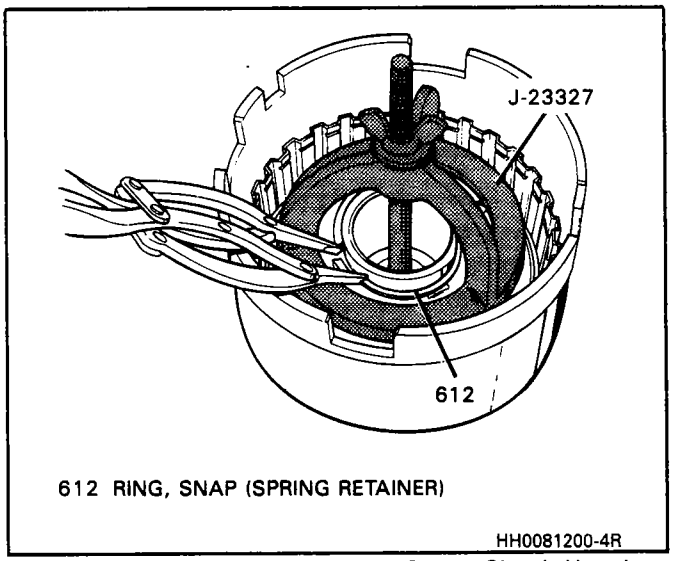
4. Retainer and spring assembly (611).
   - Do not let retainer catch on snap ring groove.
5. Compress retainer (611). Use J-23327.
6. Snap ring (612).
7. Remove J-23327.



604 HOUSING & DRUM ASSEMBLY, DIRECT CLUTCH
606 SEALS, DIRECT CLUTCH PISTON

HH0136200-4R

Figure 64 Installing Piston Seals



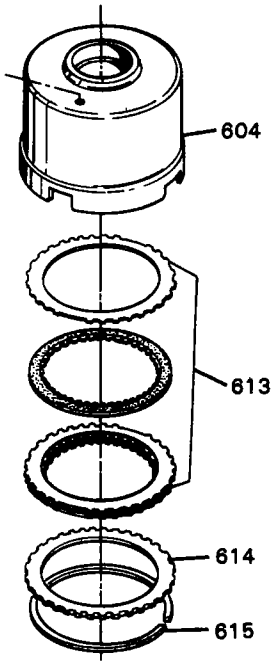
612 RING, SNAP (SPRING RETAINER)

HH0081200-4R

Figure 65 Installing Snap Ring in Direct Clutch Housing

Assemble (Figures 66 and 67)

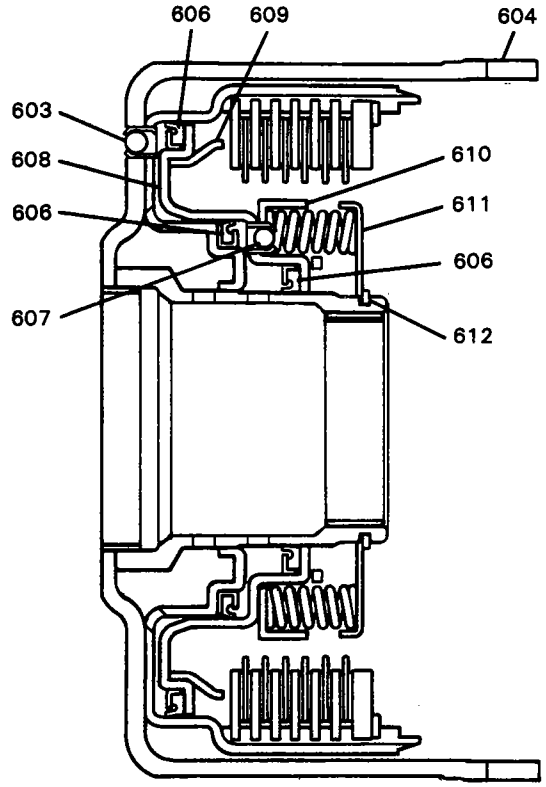
1. Clutch plates (613).
   - Soak in transmission fluid
   - start with steel and alternate with composition
2. Backing plate (614).
   - micro finish down
3. Snap ring (615).
   - composition plates must rotate freely.



604 HOUSING & DRUM ASSEMBLY, DIRECT CLUTCH
613 PLATE ASSEMBLY, DIRECT CLUTCH
614 PLATE, CLUTCH BACKING
615 RING, SNAP (DIRECT CLUTCH HOUSING)

HH0084200-4R

Figure 66 Direct Clutch Housing and Drum Assembly



603 RETAINER & BALL ASSEMBLY, CHECK VALVE
604 HOUSING & DRUM ASSEMBLY, DIRECT CLUTCH
606 SEALS, DIRECT CLUTCH PISTON
607 RETAINER & BALL ASSEMBLY, CHECK VALVE
608 PISTON ASSEMBLY, DIRECT CLUTCH
609 RING, CLUTCH APPLY (DIRECT)
610 GUIDE, RELEASE SPRING
611 RETAINER & SPRING ASSEMBLY, DIRECT CLUTCH
612 RING, SNAP (SPRING RETAINER)

HH0083200-4R

Figure 67 Cross-Section, Direct Clutch Assembly

Forward Clutch Assembly

Disassemble (Figure 68)

1. Position forward clutch (618) as shown.
2. Snap ring (628).
3. Backing plate (627).
4. Clutch plates (626).
5. Waved plate (666).

Disassemble (Figures 68 and 69)

Tools Required
J-23327 Clutch Spring Compressor
J-25018 Forward Clutch Adapter
J-25024 Forward Clutch Spring Compressor

1. Install J-23327, J-25018, and J-25024.
2. Compress retainer (624).
3. Snap ring (625).
4. Retainer and spring assembly (624).
5. Forward clutch piston (622).
6. Inner and outer piston seals (621).

Important

Do not remove clutch apply ring (623) unless damaged or piston (622) is being replaced.

Inspect

- Forward clutch shaft teflon seals (616)
  - Do not remove unless replacing
- Retainer and spring assembly (611)
  - collapsed springs
  - distorted retainer
- Piston (622) and clutch apply ring (623)
  - cracks or damage
- Forward clutch housing (618)
  - worn or damaged clutch lugs
  - snap ring grooves for damage
- Forward clutch shaft
  - restricted oil passages
  - journals at both ends for damage
- Cup plug (620) for damage

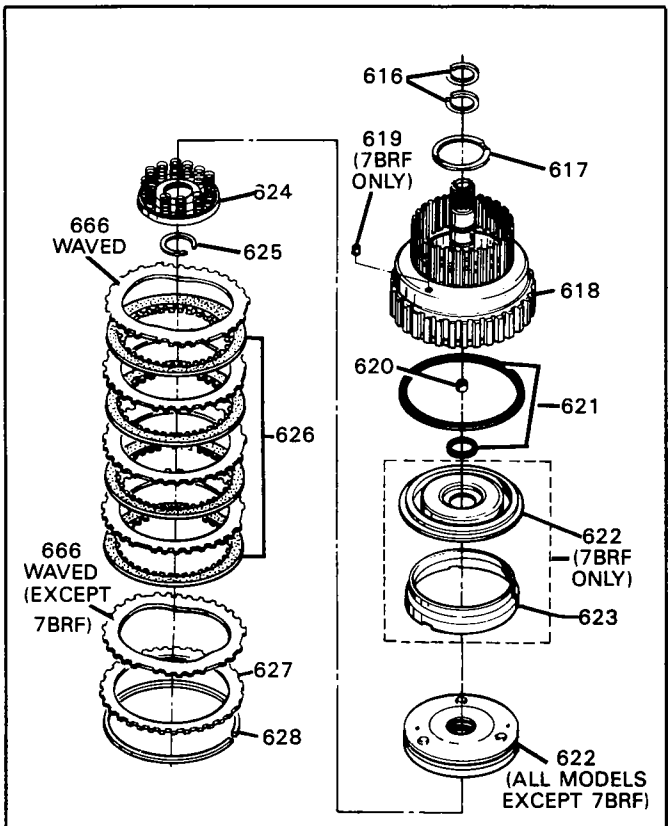
Remove or Disconnect (Figure 70)

Tools Required
#3 Screw Extractor (grind to fit)

1. Cup plug (620). Use #3 screw extractor.

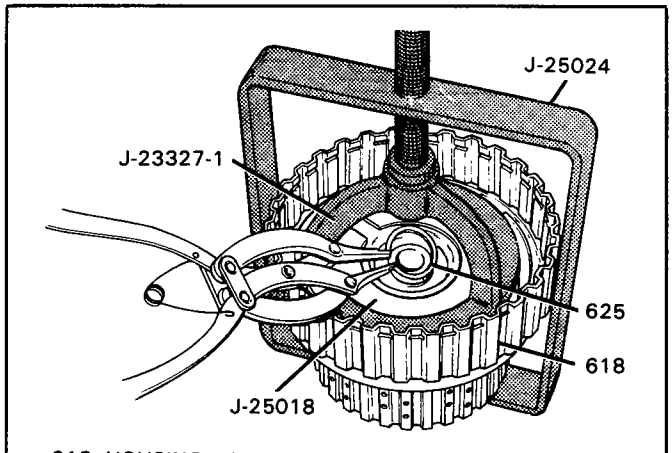
Install or Connect (Figure 70)

1. Seat cup plug (620) to 1.0mm (.039") below shaft.



616 SEALS, RING (FORWARD CLUTCH SHAFT) TEF
617 WASHER, THRUST (DIRECT/FORWARD CLUTCH)
618 HOUSING ASSEMBLY, FORWARD CLUTCH
619 RETAINER & BALL ASSEMBLY, CHECK VALVE
620 PLUG, CUP (4.8 DIAMETER)
621 SEALS, FORWARD CLUTCH PISTON (PACKAGE)
622 PISTON ASSEMBLY, FORWARD CLUTCH
623 RING, CLUTCH APPLY (FORWARD)
624 RETAINER & SPRING ASSEMBLY, FORWARD
625 RING, SNAP (FORWARD SPRING RETAINER)
626 PLATE, FORWARD CLUTCH (FLAT)
627 PLATE, CLUTCH BACKING
628 RING, SNAP (FORWARD CLUTCH HOUSING)
666 PLATE, CLUTCH 1.585 (WAVED) HH0086-2004R-2

★ Figure 68 Forward Clutch Housing Assembly



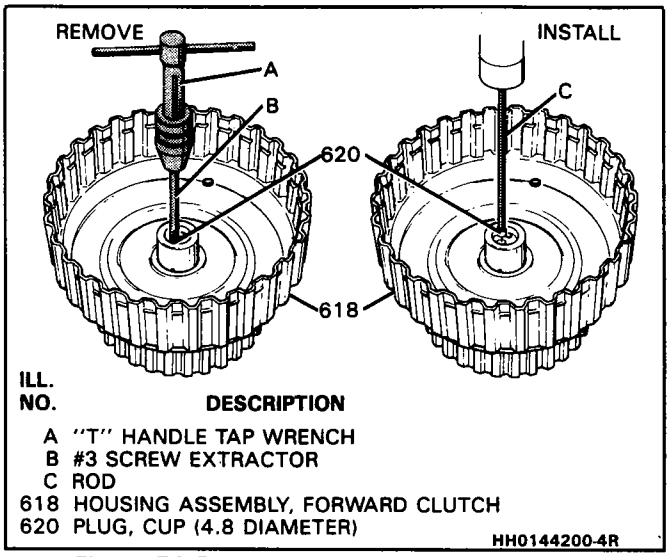
618 HOUSING ASSEMBLY, FORWARD CLUTCH
625 RING, SNAP (FORWARD SPRING RETAINER)

HH0085200-4R

Figure 69 Removing Forward Clutch Snap Ring

Inspect (Figure 71)

- Check valve (619)
  - ball must move freely
  - leak test with solvent



ILL. NO. DESCRIPTION
A "T" HANDLE TAP WRENCH
B #3 SCREW EXTRACTOR
C ROD
618 HOUSING ASSEMBLY, FORWARD CLUTCH
620 PLUG, CUP (4.8 DIAMETER)

HH0144200-4R

Figure 70 Removing and Installing Cup Plug

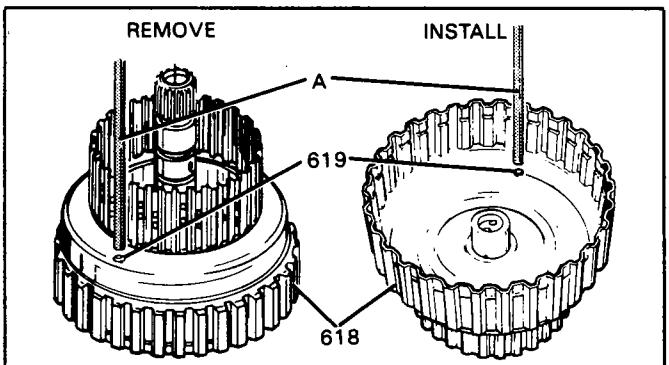
Remove or Disconnect (Figure 71)

Tools Required
10mm (3/8") Rod

1. Tap out check valve (619). Use 10mm (3/8") rod.

Install or Connect (Figure 71)

1. Using same tools, tap in check valve (619) until seated.



ILL. NO. DESCRIPTION
A 10mm (3/8") ROD
618 HOUSING ASSEMBLY, FORWARD CLUTCH
619 RETAINER & BALL ASSEMBLY, CHECK VALVE

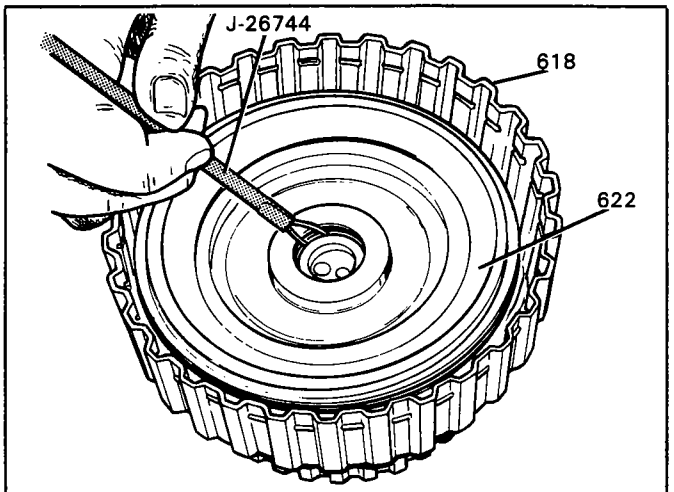
HH0145200-4R

Figure 71 Removing and Installing Check Valve

Assemble (Figure 72)

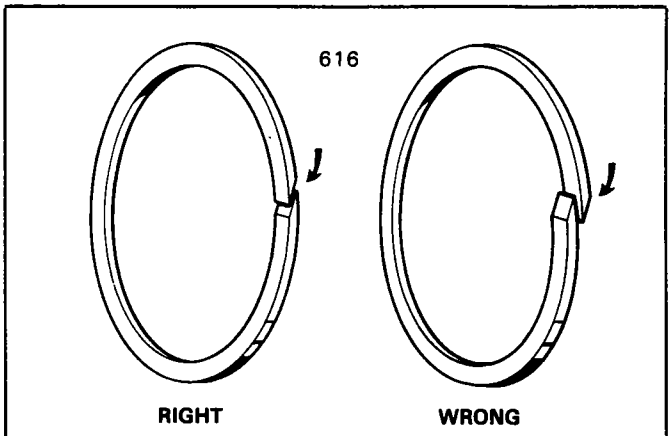
Tools Required
J-26744 Universal Seal Installer

1. Inner and outer piston seals (621).
   - lips face away from clutch apply ring
2. Lubricate seal with transmission fluid.
3. Piston (622). Use J-26744 while pushing down on piston.
4. Retainer and spring assembly (624).



618 HOUSING ASSEMBLY, FORWARD CLUTCH
622 PISTON ASSEMBLY, FORWARD CLUTCH
HH0149200-4R

Figure 72 Installing Seals Onto Forward Clutch Piston



616 SEALS, RING (FORWARD CLUTCH SHAFT) TEF
HH0089200-4R

Figure 73 Installing Scarf Cut Seals

Assemble (Figures 68, 69 and 73)

Tools Required
- J-23327 Clutch Spring Compressor
- J-25018 Forward Clutch Adapter
- J-25024 Forward Clutch Spring Compressor

1. Install J-23327, J-25018,and J-25024.
2. Compress retainer (624).
   - do not let retainer catch on snap ring groove
3. Remove J-23327, J-25018, and J-25024.
4. Waved steel plate (666).
5. Clutch plates (626)
   - soak in transmission fluid
   - start with composition plate and alternate with steel plates
6. Backing plate (627).
   - micro finish down
7. Snap ring (628)
   - composition plates must rotate freely.

Assemble (Figure 73)

1. Forward clutch shaft seal rings (616), if necessary.
   - make sure cut ends are assembled as shown
   - retain with petrolatum

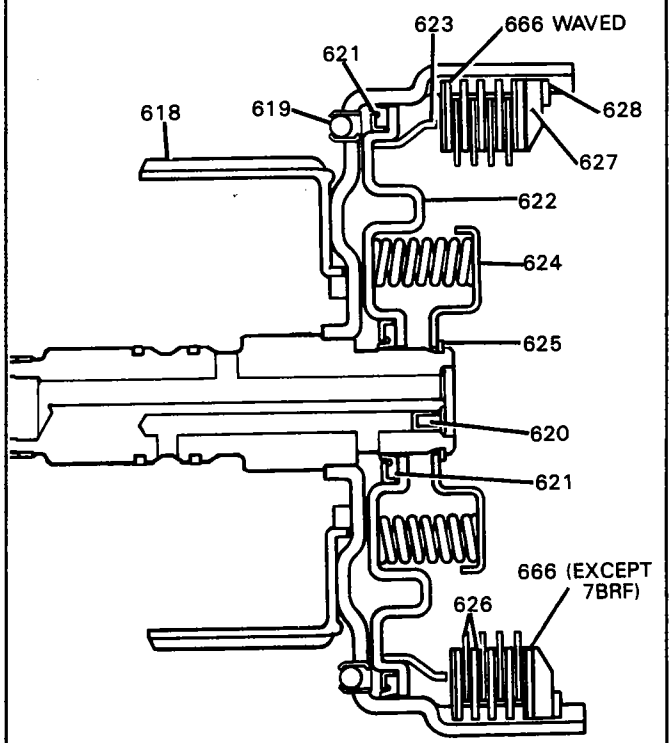
Intermediate Band

Inspect (Figure 75)

- Intermediate band (601) for:
  - burning
  - flaking
  - cracks

Install or Connect (Figure 75)

1. Intermediate band (601).
2. Band anchor pin (47).



618 HOUSING ASSEMBLY, FORWARD CLUTCH
619 RETAINER & BALL ASM., CHECK VALVE (7BRF ONLY)
620 PLUG, CUP (4.8 DIAMETER)
621 SEALS, FORWARD CLUTCH PISTON (PACKAGE)
622 PISTON ASSEMBLY, FORWARD CLUTCH
623 RING, CLUTCH APPLY (FORWARD)
624 RETAINER & SPRING ASSEMBLY, FORWARD
625 RING, SNAP (FORWARD SPRING RETAINER)
626 PLATE, FORWARD CLUTCH (FLAT)
627 PLATE, CLUTCH BACKING
628 RING, SNAP (FORWARD CLUTCH HOUSING)
666 PLATE, CLUTCH 1.585 (WAVED)
HH0087-2004R-2

★ Figure 74 Cross-Section Forward Clutch Housing

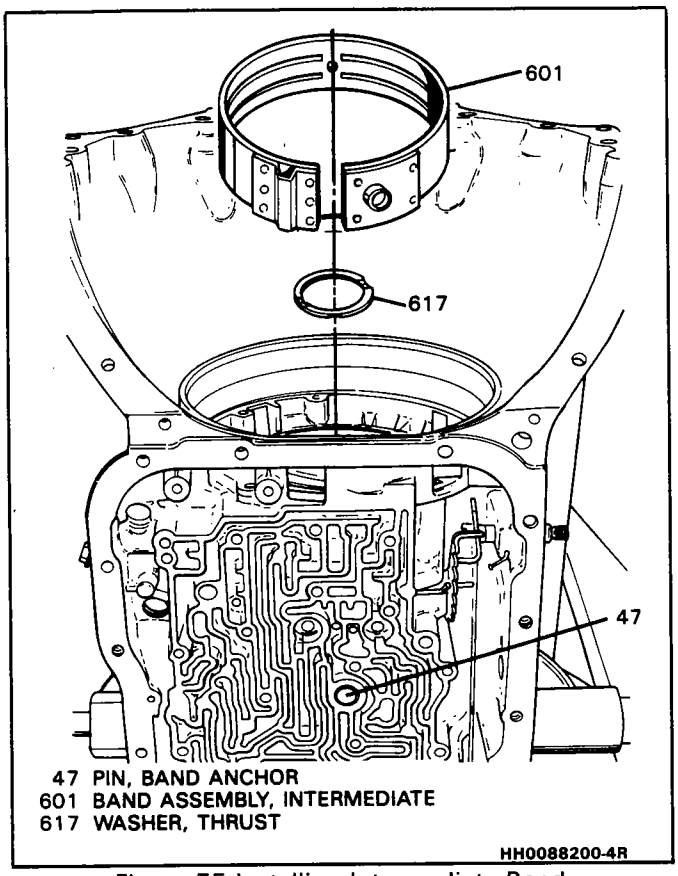


Figure 75 Installing Intermediate Band

Forward and Direct Clutch

Install or Connect (Figures 76, 77, 78)

Tools Required

J-29337 Forward and Direct Clutch and End Play Checking Fixture

1. Align clutch plates.
2. Position direct clutch housing (604) as shown.
3. Forward clutch (618).
   - when seated, the forward clutch housing (618) protrude approximately 15.8mm (5/8") from direct clutch housing (604).
4. Preventing separation, position direct and forward clutch assembly (604/618) with forward clutch shaft facing up.
5. Install J-29337.
6. Direct and forward clutch assembly (604/618).
   - direct clutch housing will be approximately 105mm (4-1/8") from pump face surface of case when seated properly
7. Remove J-29337.

Center Support

Disassemble (Figure 79)

1. Fourth clutch inner and outer seal rings (535).
2. (3) Oil seal rings (539).

Inspect

- Center support (537) for:

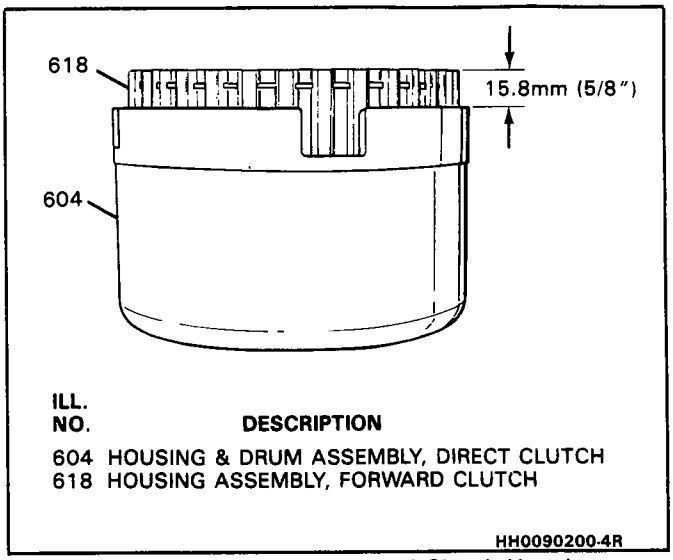


Figure 76 Measuring Forward Clutch Housing

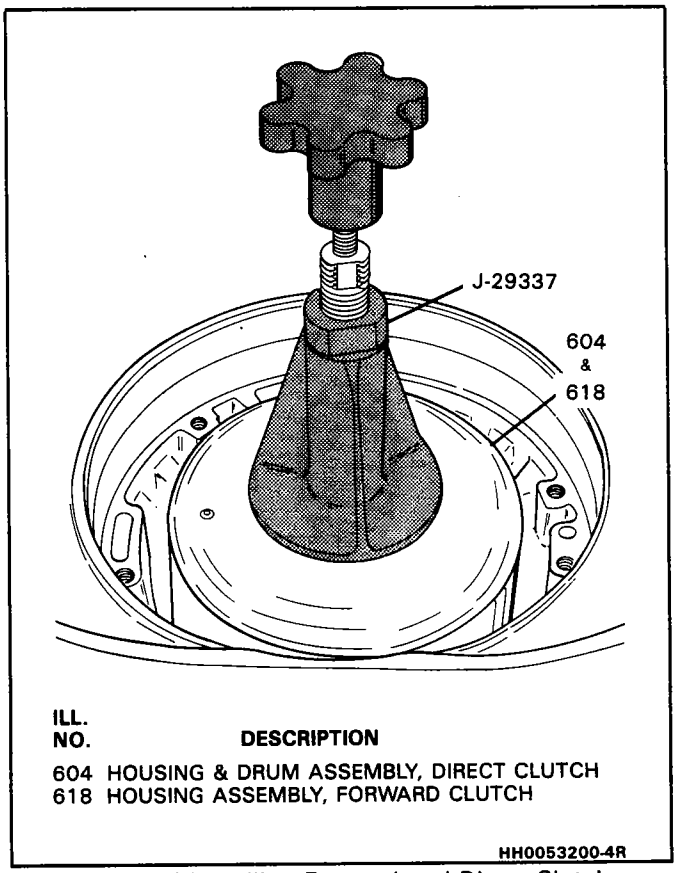
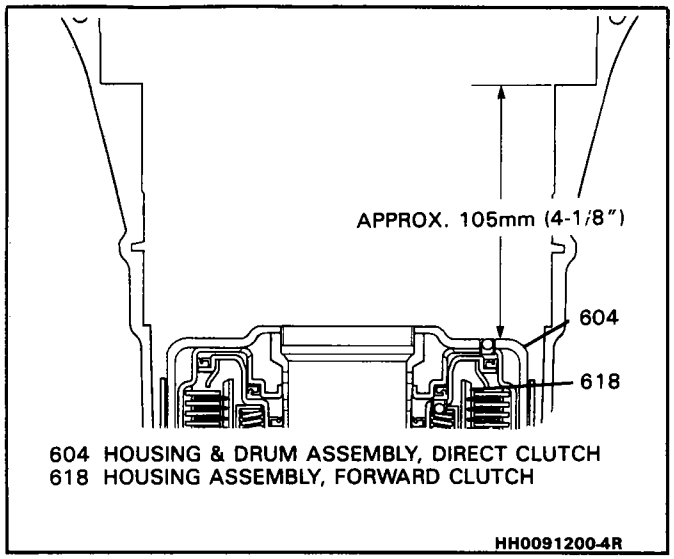


Figure 77 Installing Forward and Direct Clutch Assemblies

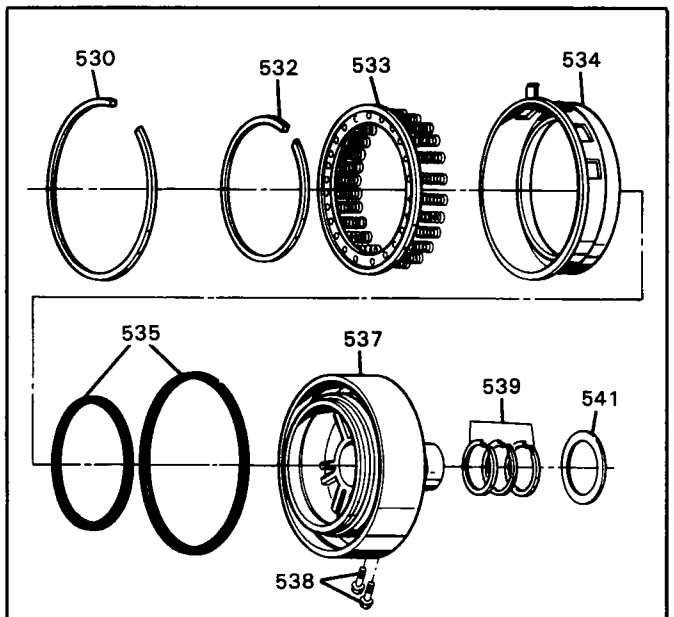
  - sharp edges
  - burrs
  - cracks
  - porosity
- Oil ring grooves for:
  - nicks or damage
- Piston seal surfaces for:
  - scratches
  - nicks
- Air check all oil passages
- Bushing (540) for:



604 HOUSING & DRUM ASSEMBLY, DIRECT CLUTCH
618 HOUSING ASSEMBLY, FORWARD CLUTCH

HH0091200-4R

Figure 78 Installed Forward and Direct Clutch Assemblies



530 RING, SNAP (CENTER SUPPORT TO CASE)
532 RING, SNAP (SUPPORT/4TH CLUTCH SPRING)
533 RETAINER & SPRING ASSEMBLY, 4TH CLUTCH
534 PISTON, 4TH CLUTCH
535 SEALS, 4TH CLUTCH (INNER & OUTER)
537 SUPPORT, CENTER
538 SCREW, FLANGED (MOD) M10 X 1.5 X 23.0
539 RING, OIL SEAL (CENTER SUPPORT)
541 WASHER, THRUST (SUPPORT/DIRECT CLUTCH)

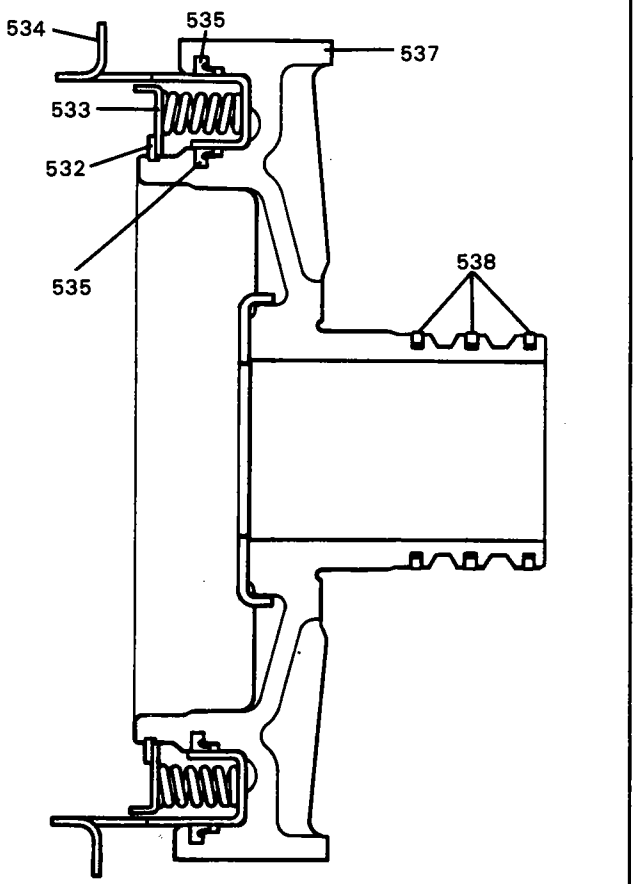
HH0093200-4R

Figure 79 Center Support and Fourth Clutch Piston Assembly

- scoring
- galling
- wear

Assemble (Figures 79, 80, and 81)

1. (3) Oil seal rings (539).
   - apply petrolatum to rings
2. Fourth clutch inner and outer seal rings (535).
   - lips face down
3. Thrust washer (541).
   - retain with petrolatum
4. Center support (537).
   - align bolt holes
5. (2) Bolts (538).
   - do not tighten
6. Snap ring (530).
   - beveled side up
7. Torque bolts to 24 N·m (18 lbs.-ft.).



ILL. NO. DESCRIPTION
532 RING, SNAP (SUPPORT/4TH CLUTCH SPRING)
533 RETAINER & SPRING ASSEMBLY, 4TH CLUTCH
534 PISTON, 4TH CLUTCH
535 SEALS, 4TH CLUTCH (INNER & OUTER)
537 SUPPORT, CENTER
538 SCREW, FLANGED (MOD) M10 X 1.5 X 23.0

HH0092200-4R

Figure 80 Cross Section Center Support Assembly

Forward Clutch Shaft End Play Check

Measure (Figures 82, 83 and 84)

Tools Required
J-8001 Dial Indicator
J-29337 Forward and Direct Clutch End Play Checking Device
J-25013 Rear Unit Support
J-29332 Output Shaft Loading Fixture Adapter

1. Push forward clutch shaft (518) downward.
2. Install J-29337.
3. Install clamp and J-8001 as shown.

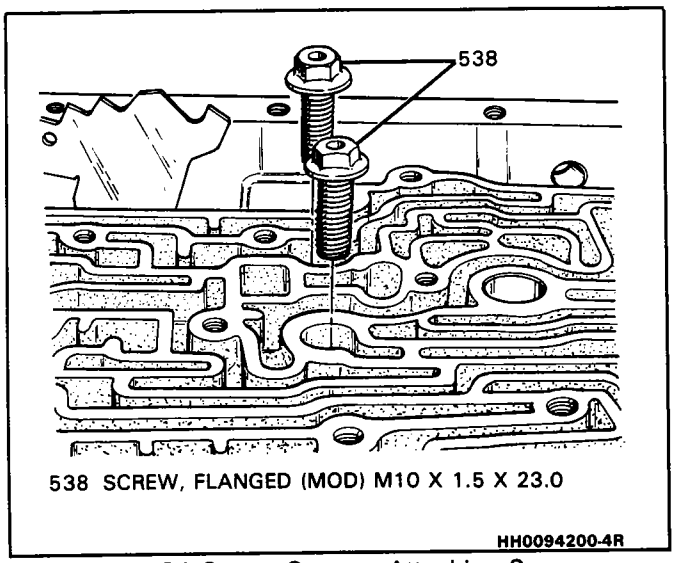


Figure 81 Center Support Attaching Screws

4. Turn J-29332 until white/scribed line on J-25013-1 begins to disappear.
5. Zero dial indicator.
6. Pull upward on J-29337.
   - Read dial indicator
   - End play should be 0.56mm-1.30mm (.022"-.051")
   - Selective washer controling end play is located between the output shaft (665) and the forward clutch shaft.
   - If clearance is not within specifications, use chart to select proper selective washer (617).

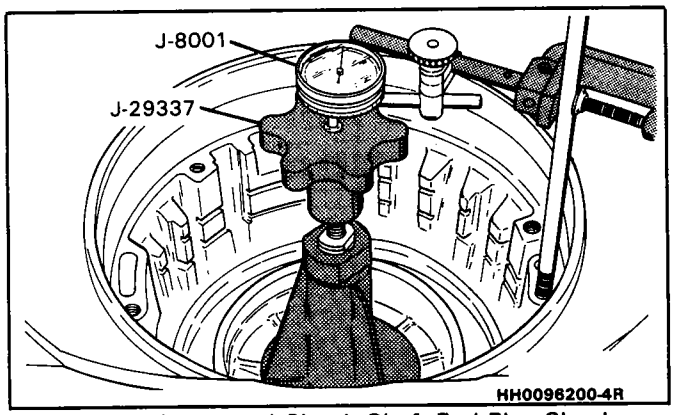


Figure 82 Forward Clutch Shaft End Play Check

Inspect (Figure 79)

- Snap ring (532) for damage.
- Fourth clutch piston (534) for:
  - cracks
  - damage
- Release springs and retainer (533) for:
  - distortion
  - collapsed springs

Assemble (Figure 85)

Tools Required

J-29334-2 Fourth Clutch Compressor and Center Support Remover

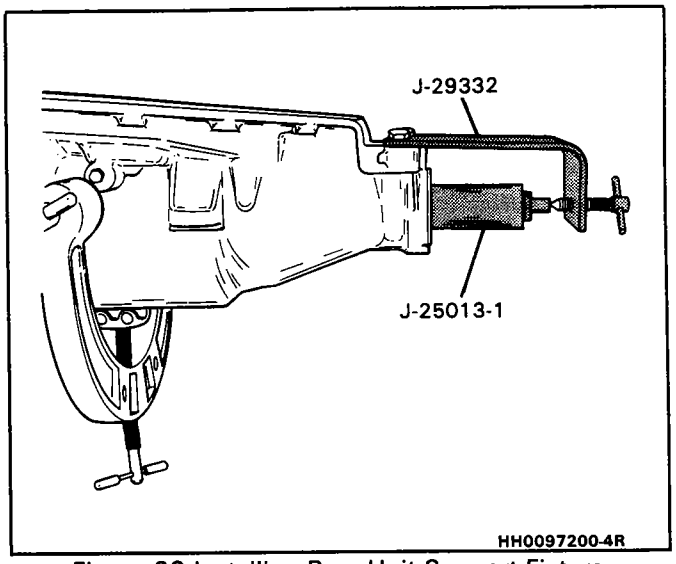


Figure 83 Installing Rear Unit Support Fixture

THICKNESS		IDENTIFICATION NUMBER AND/OR COLOR
1.66-1.77mm	(0.065"-0.070")	1 - –
1.79-1.90mm	(0.070"-0.075")	2 - –
1.92-2.03mm	(0.076"-0.080")	3 - BLACK
2.05-2.16mm	(0.081"-0.085")	4 - LIGHT GREEN
2.18-2.29mm	(0.086"-0.090")	5 - SCARLET
2.31-2.42mm	(0.091"-0.095")	6 - PURPLE
2.44-2.55mm	(0.096"-0.100")	7 - COCOA BROWN
2.57-2.68mm	(0.101"-0.106")	8 - ORANGE
2.70-2.81mm	(0.106"-0.111")	9 - YELLOW
2.83-2.94mm	(0.111"-0.116")	10 - LIGHT BLUE
2.96-3.07mm	(0.117"-0.121")	11 - –
3.09-3.20mm	(0.122"-0.126")	12 - –
3.22-3.33mm	(0.127"-0.131")	13 - PINK
3.35-3.46mm	(0.132"-0.136")	14 - GREEN
3.48-3.59mm	(0.137"-0.141")	15 - GRAY

HH0095200-4R

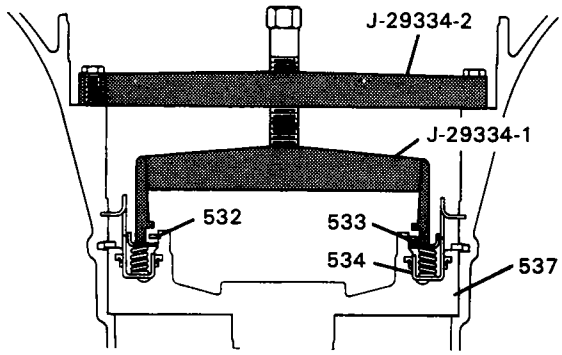
Figure 84 Front Unit End Play Washer Thickness Chart

1. Fourth clutch piston (534).
   - align tang with case spline
2. Spring and retainer (533).
3. Install J-29334-2.
4. Snap ring (532).
5. Remove J-29334-2.

Overdrive Internal Gear

Inspect (Figure 86)

- Thrust washer (531) for:
  - tang damage
  - scoring
- Internal gear (529) for:
  - chipped or cracked teeth
  - worn splines
  - worn or damaged bearing surface
- Thrust bearing (528) for:
  - pitting or roughness



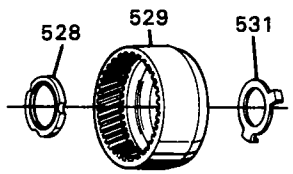
532 RING, SNAP (SUPPORT/4TH CLUTCH SPRING)
533 RETAINER & SPRING ASSEMBLY, 4TH CLUTCH
534 PISTON, 4TH CLUTCH
537 SUPPORT, CENTER

HH0098200-4R

Figure 85 Installing Fourth Clutch Snap Ring

Assemble

1. Thrust washer (531).
   - tangs face down
2. Internal gear (529).
3. Thrust bearing (528).
   - large diameter against internal gear



ILL. NO.	DESCRIPTION
528	BEARING ASM., THRUST (CARRIER/INTERNAL GEAR)
529	GEAR, OVERDRIVE INTERNAL
531	WASHER, THRUST (INTERNAL GEAR/SUPPORT)

HH0099200-4R

Figure 86 Overdrive Internal Gear

Overrun Clutch and Overdrive Carrier Assembly

Disassemble (Figure 87)

1. Snap ring (527).
2. Turbine shaft (503).
3. Overdrive assembly (524).
4. Overdrive sun gear (521).
5. Snap ring (515).
6. Overrun clutch backing plate (514).
7. Clutch plates (513).

Disassemble (Figure 87)

1. Snap ring (520).
2. Overdrive roller clutch cam assembly (518/519).
3. Roller assembly (518).
4. Retainer (517) and waved spring (516).
5. Overrun piston (511).
6. Inner and outer piston seals (512).

Inspect

- Clutch plates (513) :
  - composition plates for damaged tangs, delamination, or wear.
  - steel plates for damaged tangs, wear, or heat damage.
- Roller clutch cam (519) for:
  - damaged or missing rollers
  - damaged or missing energizing springs
- Retainer (517) for distortion or damage.
- Overrun clutch piston (511) for:
  - cracks
  - damage
- Overrun clutch housing (510) for:
  - cracks
  - open oil passages
  - damaged or worn snap ring grooves

Assemble (Figures 87, 88 and 89)

Tools Required
J-29335 Seal Protector
J-26744-A Univerasl Seal Installer

1. Inner and outer piston seals (512).
   - lips face away from clutch apply ring
   - lubricate with transmission fluid
2. Install J-29335.
3. Overrun clutch piston (511). Use J-26744-A while pushing down on piston.
4. Remove J-29335.
5. Waved spring (516).
6. Spring retainer (517)
   - cupped face down

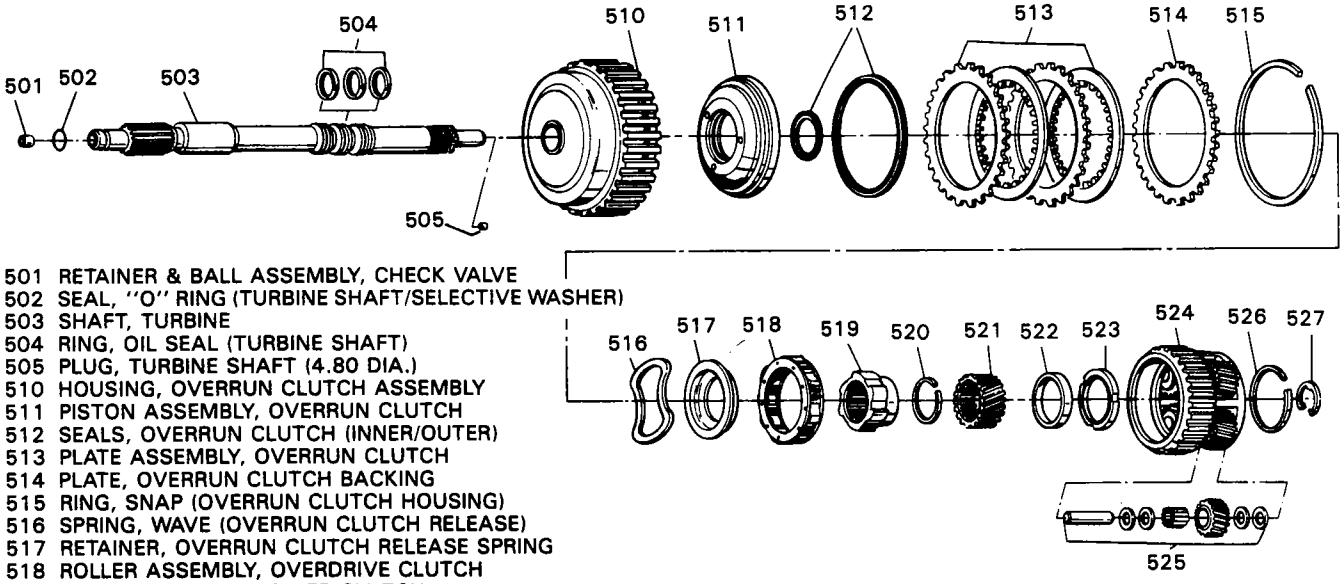
Assemble (Figure 87 and 89)

1. Roller assembly (518) onto roller clutch cam (519).
   - roller assembly locator tangs must set on clutch cam (519)
2. Roller clutch assembly (518/519).
3. Compress retainer (517).
   - install snap ring (520)
4. Clutch plates (513).
   - soak in transmission fluid
   - start with steel plates and alternate with composition plate
5. Backing plate (514).
   - chamfered side up
6. Snap ring (515).
   - composition plates must rotate freely

Overdrive Carrier

Disassemble (Figure 90)

1. Snap ring (526).
2. (4) Overdrive pinion pins.
3. (4) pinions, (16) thrust washers, and needle bearings.
4. Thrust bearing (523).



501 RETAINER & BALL ASSEMBLY, CHECK VALVE
502 SEAL, "O" RING (TURBINE SHAFT/SELECTIVE WASHER)
503 SHAFT, TURBINE
504 RING, OIL SEAL (TURBINE SHAFT)
505 PLUG, TURBINE SHAFT (4.80 DIA.)
510 HOUSING, OVERRUN CLUTCH ASSEMBLY
511 PISTON ASSEMBLY, OVERRUN CLUTCH
512 SEALS, OVERRUN CLUTCH (INNER/OUTER)
513 PLATE ASSEMBLY, OVERRUN CLUTCH
514 PLATE, OVERRUN CLUTCH BACKING
515 RING, SNAP (OVERRUN CLUTCH HOUSING)
516 SPRING, WAVE (OVERRUN CLUTCH RELEASE)
517 RETAINER, OVERRUN CLUTCH RELEASE SPRING
518 ROLLER ASSEMBLY, OVERDRIVE CLUTCH
519 CAM, OVERDRIVE ROLLER CLUTCH
520 RING, SNAP (OVERRUN CLUTCH HUB)
521 GEAR, OVERDRIVE SUN
522 BUSHING, OVERDRIVE CARRIER
523 BEARING ASSEMBLY, THRUST (CARRIER/SUN)
524 CARRIER ASSEMBLY, OVERDRIVE (COMPLETE)
525 PINION ASSEMBLY, OVERDRIVE CARRIER
526 RING, SNAP (OVERDRIVE CARRIER)
527 RING, SNAP (TURBINE SHAFT/CARRIER)

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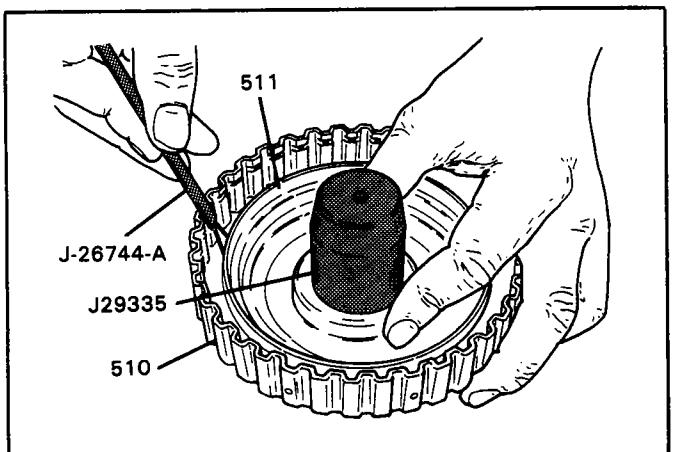
Figure 87 Overrun Clutch and Overdrive Carrier Components



510 HOUSING, OVERRUN CLUTCH ASSEMBLY
511 PISTON ASSEMBLY, OVERRUN CLUTCH

HH0102200-4R

Figure 88 Installing Overrun Clutch Piston

Inspect

- Overdrive carrier (524) for:
  - damaged or worn splines
  - roller clutch race for damage or wear
  - housing for cracks
- Pinions for:
  - cracked or chipped teeth
  - bearing surface damage
- Pinion thrust washers for scoring or damage.
- Thrust bearing (523) for pitting or roughness.

Assemble (Figure 90)

1. Thrust bearing (523).
   - small diameter faces down
   - retain with petrolatum
2. (19) Needle bearings into each pinion.
   - retain with petrolatum
3. Position steel and bronze thrust washers on each end of pinion.
   - retain with petrolatum
4. Position pinion and thrust washers into carrier (524).
5. Insert pinion pins through carrier, thrust washers,and pinions.
6. Snap ring (526).

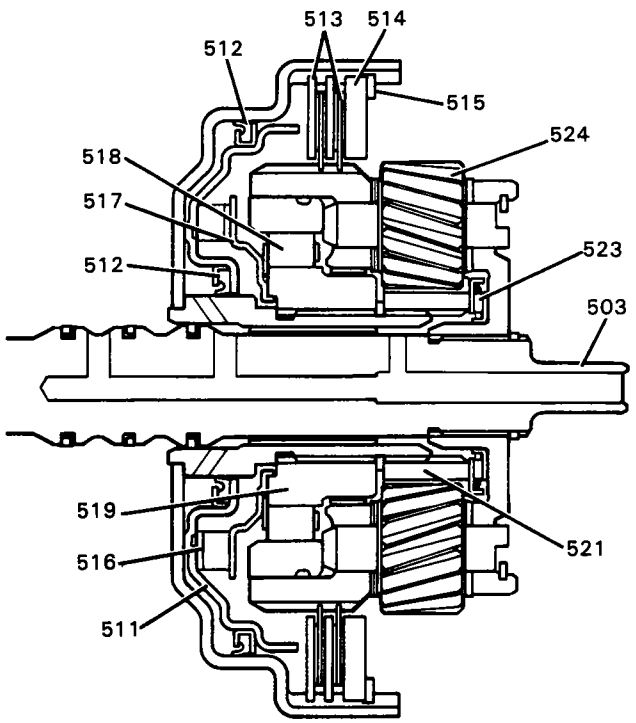
Measure (Figure 91)

- Check pinion end play.
- Clearance is 0.24mm-0.060mm (.009"-.024").

Turbine Shaft

Inspect (Figure 92)

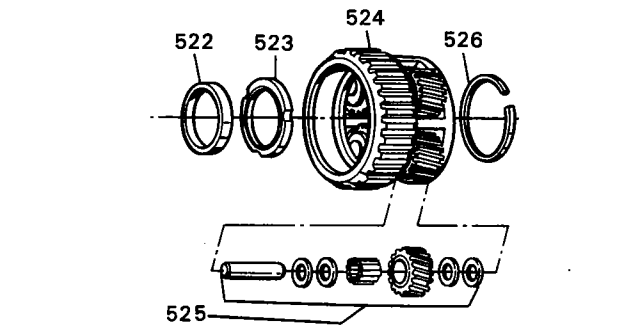
- Turbine shaft seal rings (504) for nicks, cuts, or damage.
- Presence of cup plug (505).
- Snap ring grooves for nicks, wear, or damage.
- Check valve retainer and ball assembly (501)
  - ball must move freely
  - retainer must be tight in turbine shaft



503 SHAFT, TURBINE
511 PISTON ASSEMBLY, OVERRUN CLUTCH
512 SEALS, OVERRUN CLUTCH (INNER/OUTER)
513 PLATE ASSEMBLY, OVERRUN CLUTCH
514 PLATE, OVERRUN CLUTCH BACKING
515 RING, SNAP (OVERRUN CLUTCH HOUSING)
516 SPRING, WAVE (OVERRUN CLUTCH RELEASE)
517 RETAINER, OVERRUN CLUTCH RELEASE SPRING
518 ROLLER ASSEMBLY, OVERDRIVE CLUTCH
519 CAM, OVERDRIVE ROLLER CLUTCH
521 GEAR, OVERDRIVE SUN
523 BEARING ASSEMBLY, THRUST (CARRIER/SUN)
524 CARRIER ASSEMBLY, OVERDRIVE (COMPLETE)

HH0101200-4R

Figure 89 Overrun Clutch and Overdrive Carrier Assemblies

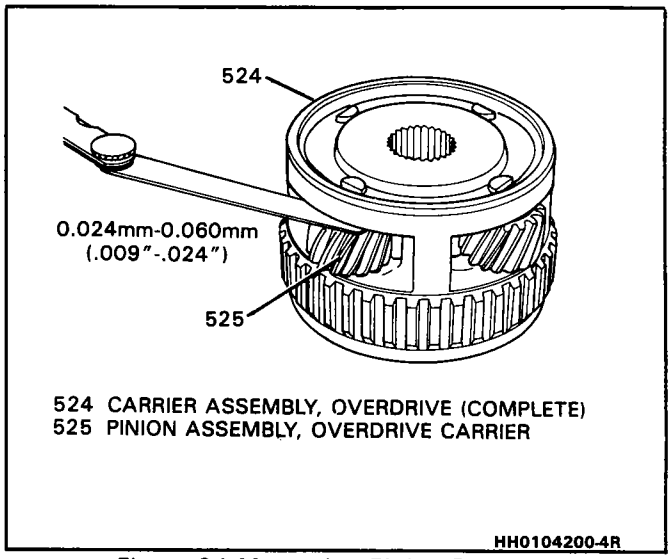


522 BUSHING, OVERDRIVE CARRIER
523 BEARING ASSEMBLY, THRUST (CARRIER/SUN)
524 CARRIER ASSEMBLY, OVERDRIVE (COMPLETE)
525 PINION ASSEMBLY, OVERDRIVE CARRIER
526 RING, SNAP (OVERDRIVE CARRIER)

HH0103200-4R

Figure 90 Overdrive Carrier Assembly

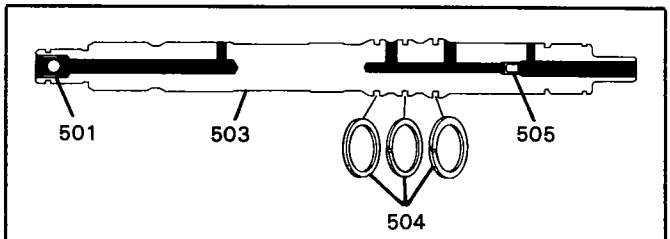
Check Valve Assembly and Seal Ring Replacement Procedure



524 CARRIER ASSEMBLY, OVERDRIVE (COMPLETE)
525 PINION ASSEMBLY, OVERDRIVE CARRIER

HH0104200-4R

Figure 91 Measuring Pinion End Play



501 RETAINER & BALL ASSEMBLY, CHECK VALVE
503 SHAFT, TURBINE
504 RING, OIL SEAL (TURBINE SHAFT)
505 PLUG, TURBINE SHAFT (4.80 DIA.)

HH0107200-4R

Figure 92 Turbine Shaft Seals

Remove or Disconnect (Figure 93)

Tools Required
#4 Screw Extractor

1. Straighten the tangs of retainer and remove the ball.
2. Check ball retainer. Use #4 screw extractor.

Install or Connect (Figure 93)

Tools Required
9.5mm (3/8") diameter

- Install check valve (501):
  - Use 9.5mm (3/8") metal rod
  - seat check valve 3.0mm (1/8") below top of turbine shaft
  - be certain ball moves freely

Assemble (Figure 94)

Tools Required
J-29696-1 Turbine Shaft Seal Installer

1. Lubricate seals (504) with transmission fluid.
   - Install solid seal.Use J-29696-1.
   - scarf cut seals.
   - Lubricate seals (504). Size seals using J-29696-2.

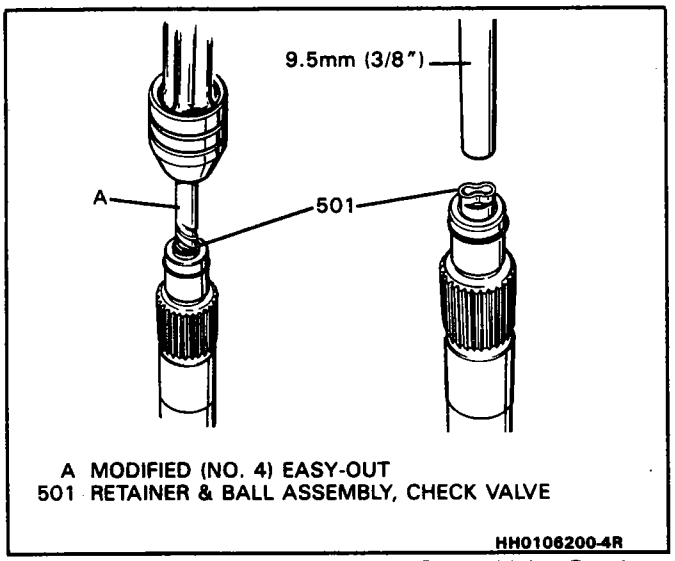


Figure 93 Removing and Installing Check Valve Retainer and Ball Assembly

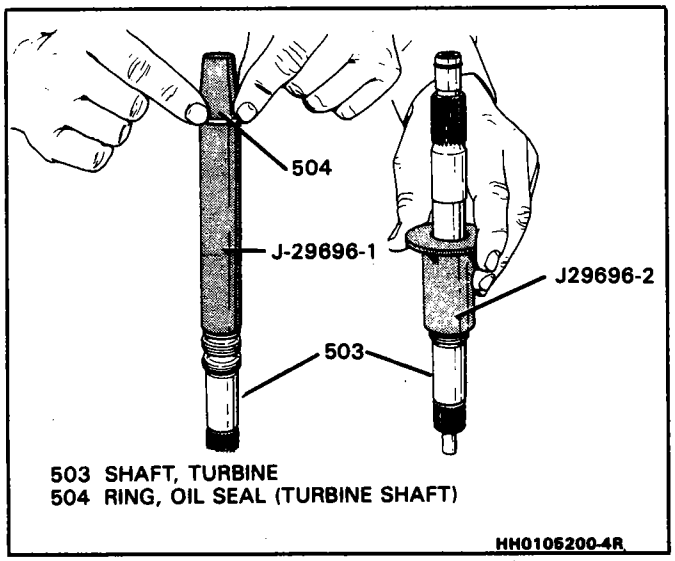


Figure 94 Installing Turbine Shaft Seals

Assemble (Figure 95)

1. Overdrive sun gear (521).
   - chamfered side up
2. Align clutch plates (513).
3. Overdrive carrier assembly (524) into overrun clutch assembly (510).
4. Position overrun clutch assembly (510) and overdrive carrier (524) as shown.
5. Turbine shaft (503).
6. Snap ring (527).
7. Overrun clutch and overdrive carrier assembly (510/524).

Inspect

- Clutch Plates (508)
  - composition plates for damaged tangs, delamination or wear
  - steel plates for damaged tangs, wear or heat damage
- Backing Plate (507) For:
  - scratches
  - damage

Assemble (Figure 95 and 96)

1. Fourth clutch plates (508):
   - soak in transmission fluid
   - install in the following order:
     - steel plate
     - composition plate
     - (2) steel plates
     - composition plate
2. Backing plate (507).
3. Snap ring (506).
   - composition plates must rotate freely
4. Oil deflector (542).
   - tangs face up
5. Overdrive unit.

Oil Pump Assembly

Remove or Disconnect (Figure 97)

1. Selective thrust washer (9).
2. Pump cover bolts (8).
3. Pump cover (217) from pump body (203).

Pump Body

Disassemble (Figure 98)

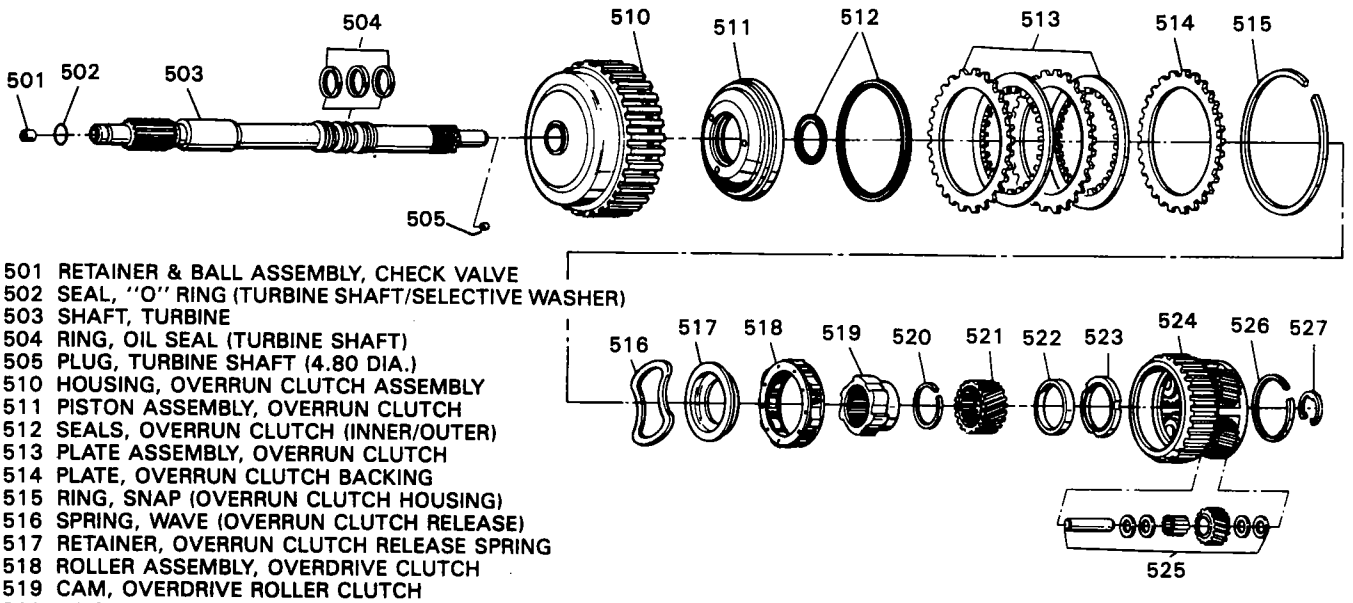
1. Pump slide spring (209).
   - compress with needle nose pliers
   - pull straight out

   CAUTION: Spring is under very high pressure. Place covering over spring to prevent injury.
2. From the pump pocket:
   - pump guide rings (212)
   - pump vanes (215)
   - pump rotor (214)
   - pump guide (213)
   - slide (206)
   - slide seal (211)
   - seal support (210)
   - pivot slide pin (208) and spring (207)
   - slide seal ring (204) and slide back up seal (205)

Oil Pump Cover

Disassemble (Figures 99 and 100)

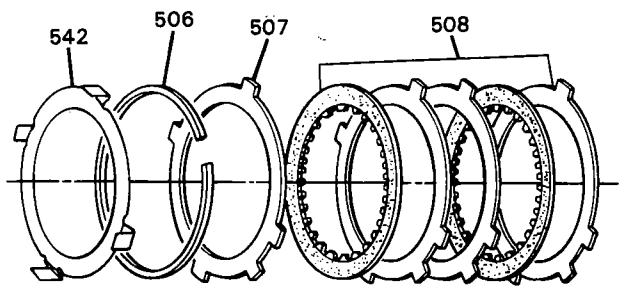
1. Converter clutch apply valve train
   - compress converter clutch apply valve spring (228/229)
   - remove retaining ring (225)
   - slowly release spring tension
   - stop valve (226), converter clutch valve (227), and (2) converter clutch valve springs (228/229)
2. Pressure relief ball (231)
   - ball is under strong spring pressure



501 RETAINER & BALL ASSEMBLY, CHECK VALVE
502 SEAL, "O" RING (TURBINE SHAFT/SELECTIVE WASHER)
503 SHAFT, TURBINE
504 RING, OIL SEAL (TURBINE SHAFT)
505 PLUG, TURBINE SHAFT (4.80 DIA.)
510 HOUSING, OVERRUN CLUTCH ASSEMBLY
511 PISTON ASSEMBLY, OVERRUN CLUTCH
512 SEALS, OVERRUN CLUTCH (INNER/OUTER)
513 PLATE ASSEMBLY, OVERRUN CLUTCH
514 PLATE, OVERRUN CLUTCH BACKING
515 RING, SNAP (OVERRUN CLUTCH HOUSING)
516 SPRING, WAVE (OVERRUN CLUTCH RELEASE)
517 RETAINER, OVERRUN CLUTCH RELEASE SPRING
518 ROLLER ASSEMBLY, OVERDRIVE CLUTCH
519 CAM, OVERDRIVE ROLLER CLUTCH
520 RING, SNAP (OVERRUN CLUTCH HUB)
521 GEAR, OVERDRIVE SUN
522 BUSHING, OVERDRIVE CARRIER
523 BEARING ASSEMBLY, THRUST (CARRIER/SUN)
524 CARRIER ASSEMBLY, OVERDRIVE (COMPLETE)
525 PINION ASSEMBLY, OVERDRIVE CARRIER
526 RING, SNAP (OVERDRIVE CARRIER)
527 RING, SNAP (TURBINE SHAFT/CARRIER)

HH0108200-4R

Figure 95 Turbine Shaft, Overrun Clutch and Overdrive Carrier Assemblies



ILL. NO. DESCRIPTION

506 RING, SNAP (4TH CLUTCH RETAINER IN CASE)
507 PLATE, 4TH CLUTCH BACKING
508 PLATE ASSEMBLY, 4TH CLUTCH
542 PLATE, OIL DEFLECTOR

HH0109200-4R

Figure 96 Installing Fourth Clutch Plates

- cover with a cloth when removing

3. Pressure regulator assembly (218-224)
   - follow the same procedure used to remove the converter clutch valve.

Inspect

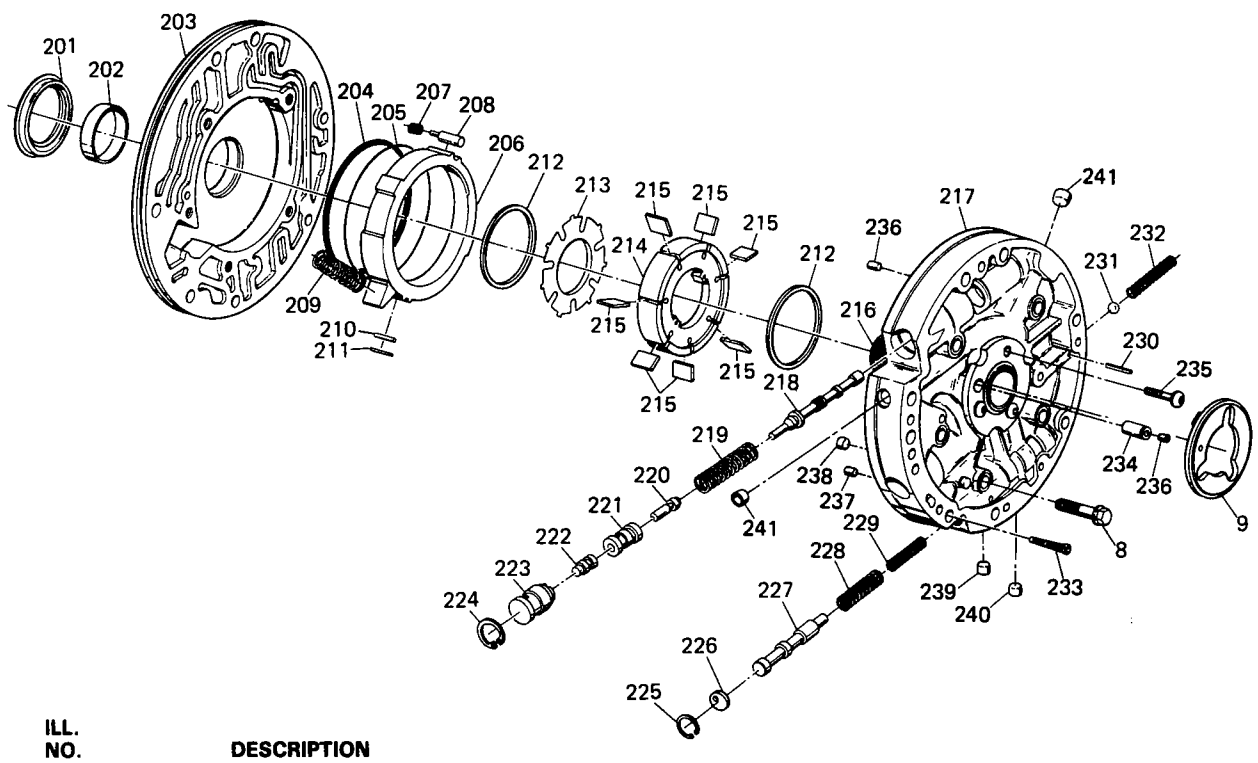
- Pressure regulator assembly (218-224) and converter clutch apply valve assembly (225-229) for:
  - chips, burrs, distortion, plugged oil passages, and free movement in bore
  - remove burrs with crocus cloth
- Pressure relief assembly (231-232) for damage or distortion
- Pump cover (217) and pump body (203) for:
  - worn or damaged bushing (see Bushing Replacement Procedures)
  - foreign material or debris
  - scored or irregular mating surface
  - cross channel leaks
  - ring groove damage
- Rotor (214) and slide (206) for cracks
- Oil seal assembly for damage or wear

Clean

- Wash and air dry all parts
  - do not wipe dry with a cloth

Inspect

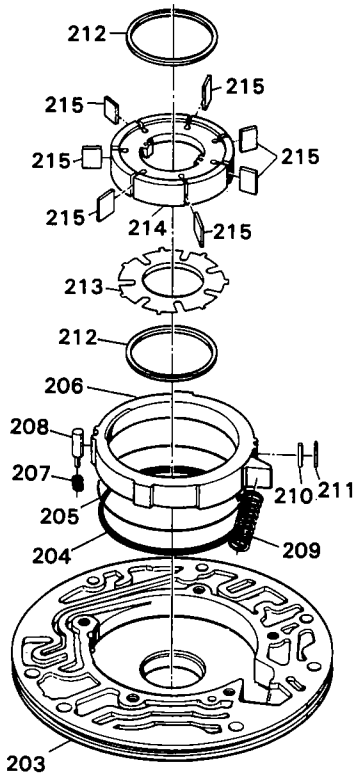
- Stator shaft and Flange assembly (216) for:



ILL. NO.	DESCRIPTION
8	BOLT, PUMP COVER TO BODY
9	WASHER, THRUST (HOUSING TO PUMP)
201	SEAL, HELIX (PUMP BODY) (FRONT)
202	BUSHING, PUMP BODY
203	BODY, PUMP
204	RING, OIL SEAL (SLIDE TO WEAR PLATE)
205	SEAL, "O" RING (SLIDE SEAL BACK-UP)
206	SLIDE, PUMP
207	SPRING, PIVOT PIN
208	PIN, PIVOT SLIDE
209	SPRING, PUMP SLIDE (INNER/OUTER)
210	SUPPORT, PUMP SLIDE SEAL
211	SEAL, PUMP SLIDE
212	RING, PUMP VANE
213	GUIDE, ROTOR
214	ROTOR, OIL PUMP
215	VANE, PUMP
216	SHAFT & FLANGE ASSEMBLY, STATOR
217	COVER, PUMP
218	VALVE, PRESSURE REGULATOR
219	SPRING, PRESSURE REGULATOR VALVE
220	VALVE, REVERSE BOOST
221	BUSHING, REVERSE BOOST VALVE
222	VALVE, T.V. BOOST
223	BUSHING, T.V. BOOST VALVE
224	RING, SNAP PRESSURE REGULATOR CASE
225	RING, SNAP (CONVERTER CL. PUMP VALVE RET.)
226	STOP, VALVE (CONVERTER CLUTCH)
227	VALVE, CONVERTER CLUTCH
228	SPRING, CONVERTER CLUTCH VALVE (OUTER)
229	SPRING, CONVERTER CLUTCH VALVE (INNER)
230	RIVET, FLAT HEAD (.156 X 1.0)
231	BALL, PRESSURE RELIEF
232	SPRING, PRESSURE RELIEF
233	SCREEN ASSEMBLY, GOVERNOR
234	PIN, DOWEL (PUMP COVER)
235	SCREW, SOCKET BUTTON HEAD (M6 X 1 X 16)
236	PLUG, CUP (SELECTIVE WASHER LUBE) (2)
237	PLUG, ORIFICE (CONV. CLUTCH SIGNAL) 4.84 DIA.
238	PLUG, ORIFICE (COOLER FEED) 6.84 DIA.
239	PLUG, CUP (COOLER FEED) 6.8 DIA.
240	PLUG, CUP (CLUTCH RELEASE) 6.8 DIA.
241	PLUG, CUP (LINE/CASE) .511 DIA. (2)

HH0110200-4R

Figure 97 Oil Pump Assembly



ILL. NO.	DESCRIPTION
203	BODY, PUMP
204	RING, OIL SEAL (SLIDE TO WEAR PLATE)
205	SEAL, "O" RING (SLIDE SEAL BACK-UP)
206	SLIDE, PUMP
207	SPRING, PIVOT PIN
208	PIN, PIVOT SLIDE
209	SPRING, PUMP SLIDE (INNER/OUTER)
210	SUPPORT, PUMP SLIDE SEAL
211	SEAL, PUMP SLIDE
212	RING, PUMP VANE
213	GUIDE, ROTOR
214	ROTOR, OIL PUMP
215	VANE, PUMP

HH0146200-4R

Figure 98 Pump Body Assembly

- damaged splines
- damaged or missing orifice cup plug (236)

Do Not Remove Unless Damaged

STATOR SHAFT AND FLANGE ASSEMBLY IS PRESSED INTO THE PUMP BODY. DO NOT REMOVE UNLESS DAMAGED.

Disassemble (Figures 100 and 101)

Tools Required

#27 TORX Drive Bit

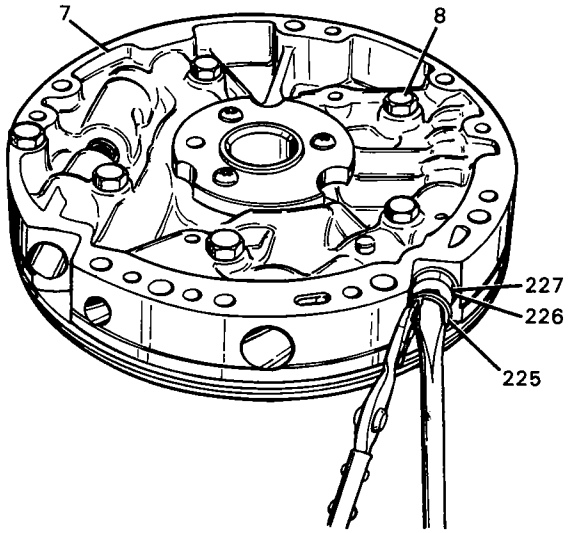
1. Screws (235).
2. Press the stator shaft (216) from pump cover.

Assemble (Figures 100 and 101)

Tools Required

J-25359-3 #27 TORX Drive Bit

1. Align stator shaft (216) with dowel pin (234).
2. Press stator shaft until seated on pump cover (217).
3. Screws (235).



ILL. NO.	DESCRIPTION
7	PUMP ASSEMBLY, COMPLETE
8	BOLT, PUMP COVER TO BODY
225	RING, SNAP (CONVERTER CL. PUMP VALVE RET.) (FLAT SIDE OUT)
226	STOP, VALVE (CONVERTER CLUTCH)
227	VALVE, CONVERTER CLUTCH

HH0111200-4R

Figure 99 Removing Converter Clutch Valve Train

- torque screws (235) to 12 N·m (9 lbs.-ft.)

Measure (Figure 102)

Tools Required

One-inch Micrometer

- Oil pump rotor (214) thickness.
- Oil pump slide (206) thickness.

Important

Measurement of rotor/slide must be made on undamaged surfaces. Select similar size replacements. Lightly hone both sides of replacement rotor or slide to remove any burrs or nicks.

Pump Body

Assemble (Figures 103 and 104)

Tools Required

J-25016 Seal Installer

1. Oil seal (201). Use J-25016.
2. "O" ring back-up seal (205) and oil seal ring (204) into the groove on the back side of slide.
3. Slide (206).
   - seal side down.
   - index the notch in the slide with the pivot pin
4. Slide seal (211) and support (210).
5. Pivot pin spring (207) and pin (208).
6. Vane guide ring (212) into the pump pocket.

ILL. NO.	DESCRIPTION
8	BOLT, PUMP COVER TO BODY
9	WASHER, THRUST (HOUSING TO PUMP)
216	SHAFT & FLANGE ASSEMBLY, STATOR
217	COVER, PUMP
218	VALVE, PRESSURE REGULATOR
219	SPRING, PRESSURE REGULATOR VALVE
220	VALVE, REVERSE BOOST
221	BUSHING, REVERSE BOOST VALVE
222	VALVE, T.V. BOOST
223	BUSHING, T.V. BOOST VALVE
224	RING, SNAP PRESSURE REGULATOR CASE
225	RING, SNAP (CONVERTER CL. PUMP VALVE RET.)
226	STOP, VALVE (CONVERTER CLUTCH)
227	VALVE, CONVERTER CLUTCH
228	SPRING, CONVERTER CLUTCH VALVE (OUTER)
229	SPRING, CONVERTER CLUTCH VALVE (INNER)
230	RIVET, FLAT HEAD (.156 X 1.0)
231	BALL, PRESSURE RELIEF
232	SPRING, PRESSURE RELIEF
233	SCREEN ASSEMBLY, GOVERNOR
234	PIN, DOWEL (PUMP COVER)
235	SCREW, SOCKET BUTTON HEAD (M6 X 1 X 16)
236	PLUG, CUP (SELECTIVE WASHER LUBE) (2)
237	PLUG, ORIFICE (CONV. CLUTCH SIGNAL) 4.84 DIA.
238	PLUG, ORIFICE (COOLER FEED) 6.84 DIA.
239	PLUG, CUP (COOLER FEED) 6.8 DIA.
240	PLUG, CUP (CLUTCH RELEASE) 6.8 DIA.
241	PLUG, CUP (LINE/CASE) .511 DIA. (2)

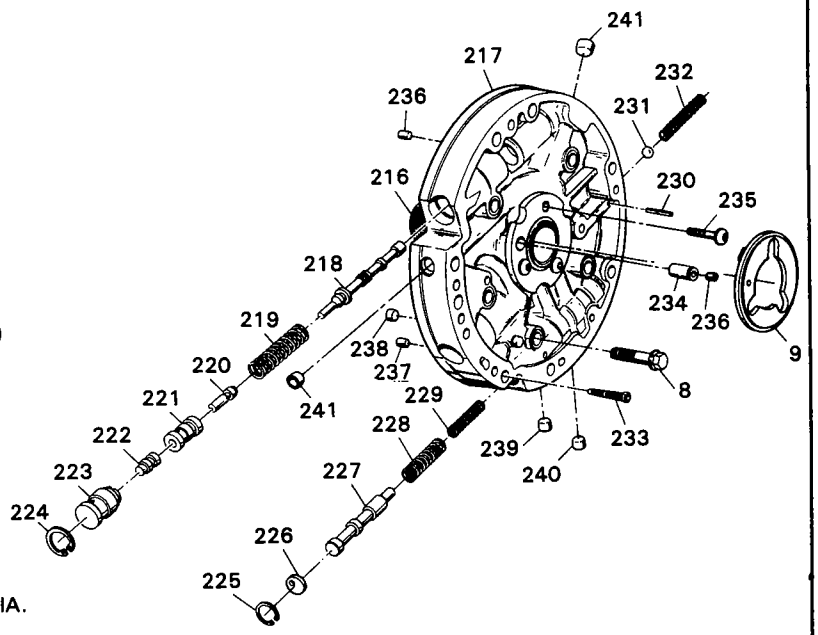
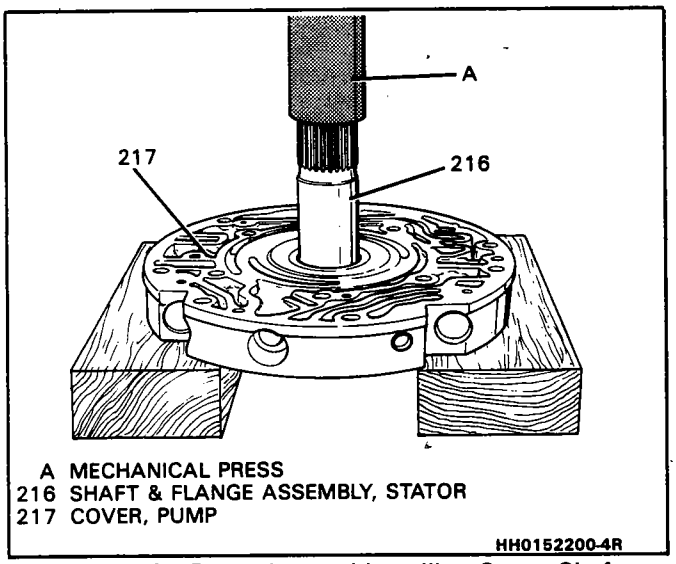


Figure 100 Pump Cover Assembly



A MECHANICAL PRESS
216 SHAFT & FLANGE ASSEMBLY, STATOR
217 COVER, PUMP

Figure 101 Removing and Installing Stator Shaft

Assemble

1. Rotor guide (213) onto rotor (214)
   - retain with petrolatum
2. Rotor (214).
3. Vanes (215).
4. Vane guide ring (212).
5. Pump slide spring (209).
6. Vane guide ring (212).

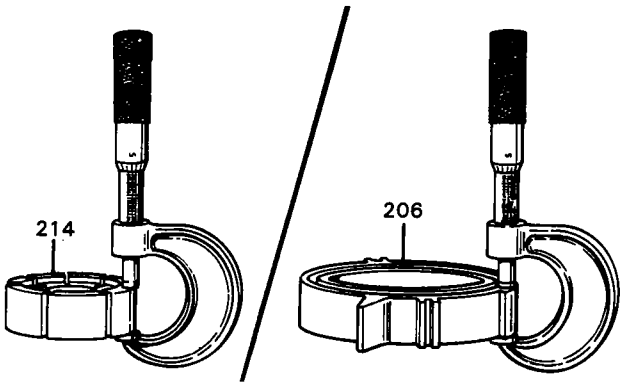
Pump Cover

Assemble (Figure 105)

1. Pressure relief ball (231), spring (232), and rivet (230).
2. Inner (229) and outer (228) converter clutch valve springs.
3. Conveter clutch valve (227).
4. Stop valve (226).
5. Retaining ring (225).

Assemble

1. Pressure regulator valve (218) into the pressure regulator bore.
2. Pressure regulator spring (219).
3. T.V. boost valve (222) into the T.V. bushing
   - long land of the valve into the large hole of the bushing
   - retain with petrolatum.
4. Reverse boost valve (220) into the reverse boost bushing (221).
   - small end first
   - retain with petrolatum
5. Reverse boost valve sleeve (221) into the pressure regulator bore.
6. T.V. boost valve sleeve (223) into the pressure regulator bore.
7. Retaining ring (224).



206 SLIDE, PUMP
214 ROTOR, OIL PUMP

OIL PUMP ROTOR SELECTION CHART

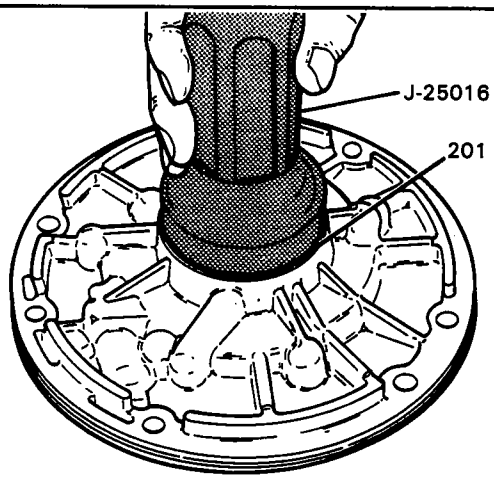
THICKNESS (mm)	THICKNESS (In.)
17.948 - 17.961	0.7066 - 0.7071
17.961 - 17.974	0.7071 - 0.7076
17.974 - 17.987	0.7076 - 0.7081
17.987 - 18.000	0.7081 - 0.7086
18.000 - 18.013	0.7086 - 0.7091

OIL PUMP SLIDE SELECTION CHART

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

HH0112200-4R

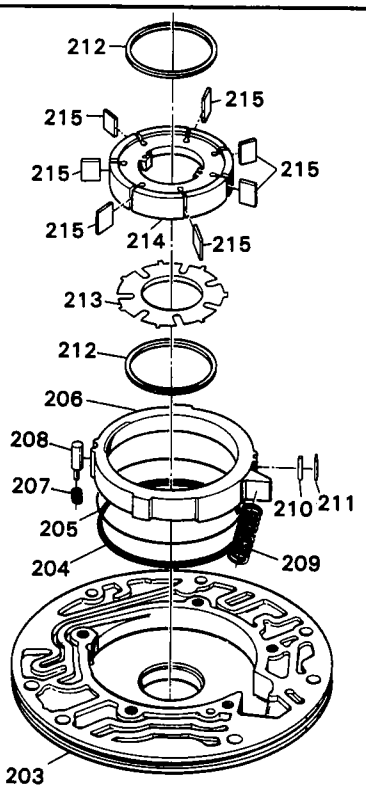
Figure 102 Measuring Oil Pump Rotor



201 SEAL, HELIX (PUMP BODY) FRONT

HH0113200-4R

Figure 103 Installing Front Helix Seal



ILL. NO. DESCRIPTION

203 BODY, PUMP
204 RING, OIL SEAL (SLIDE TO WEAR PLATE)
205 SEAL, "O" RING (SLIDE SEAL BACK-UP)
206 SLIDE, PUMP
207 SPRING, PIVOT PIN
208 PIN, PIVOT SLIDE
209 SPRING, PUMP SLIDE (INNER/OUTER)
210 SUPPORT, PUMP SLIDE SEAL
211 SEAL, PUMP SLIDE
212 RING, PUMP VANE
213 GUIDE, ROTOR
214 ROTOR, OIL PUMP
215 VANE, PUMP

HH0146200-4R

Figure 104 Pump Body Assembly

Oil Pump Cover and Body

Assemble (Figures 106 and 107)

Tools Required

J-25015 Oil Pump Body and Cover Alignment Band

1. Oil pump cover (217) onto oil pump body (203)
   - stator shaft through a bench hole.
2. Pump cover bolts (8)
   - leave finger tight.
3. Align pump cover and pump body with J-25015.
4. Torque bolts (8) to 24N·m (18 lbs.-ft.).
5. Remove J-25025.
6. "O" ring seal (10)
   - chamfered side out
   - do not twist seal
   - lubricate with transmission fluid
7. Thrust washer (9)
   - retain with petrolatum

ILL. NO.	DESCRIPTION
8	BOLT, PUMP COVER TO BODY
9	WASHER, THRUST (HOUSING TO PUMP)
216	SHAFT & FLANGE ASSEMBLY, STATOR
217	COVER, PUMP
218	VALVE, PRESSURE REGULATOR
219	SPRING, PRESSURE REGULATOR VALVE
220	VALVE, REVERSE BOOST
221	BUSHING, REVERSE BOOST VALVE
222	VALVE, T.V. BOOST
223	BUSHING, T.V. BOOST VALVE
224	RING, SNAP PRESSURE REGULATOR CASE
225	RING, SNAP (CONVERTER CL. PUMP VALVE RET.)
226	STOP, VALVE (CONVERTER CLUTCH)
227	VALVE, CONVERTER CLUTCH
228	SPRING, CONVERTER CLUTCH VALVE (OUTER)
229	SPRING, CONVERTER CLUTCH VALVE (INNER)
230	RIVET, FLAT HEAD (.156 X 1.0)
231	BALL, PRESSURE RELIEF
232	SPRING, PRESSURE RELIEF
233	SCREEN ASSEMBLY, GOVERNOR
234	PIN, DOWEL (PUMP COVER)
235	SCREW, SOCKET BUTTON HEAD (M6 X 1 X 16)
236	PLUG, CUP (SELECTIVE WASHER LUBE) (2)
237	PLUG, ORIFICE (CONV. CLUTCH SIGNAL) 4.84 DIA.
238	PLUG, ORIFICE (COOLER FEED) 6.84 DIA.
239	PLUG, CUP (COOLER FEED) 6.8 DIA.
240	PLUG, CUP (CLUTCH RELEASE) 6.8 DIA.
241	PLUG, CUP (LINE/CASE) .511 DIA. (2)

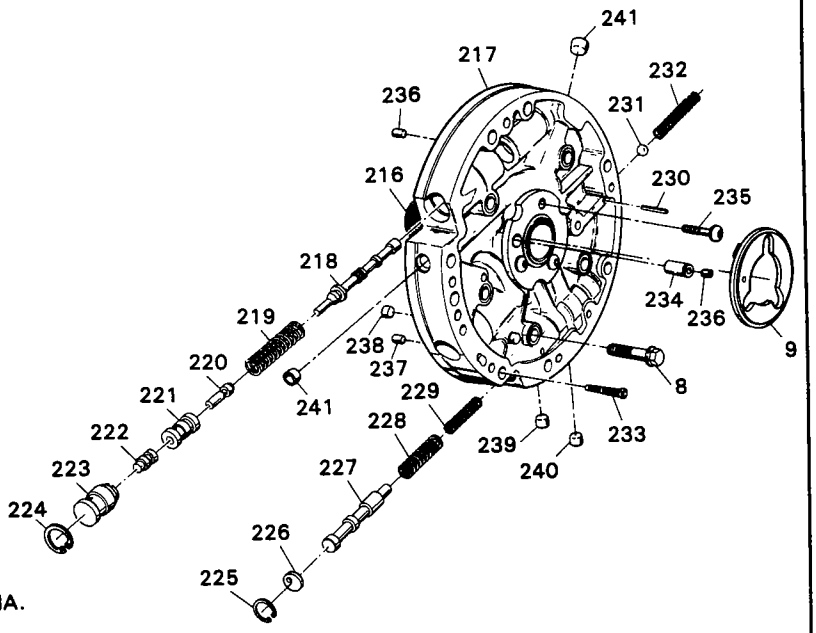
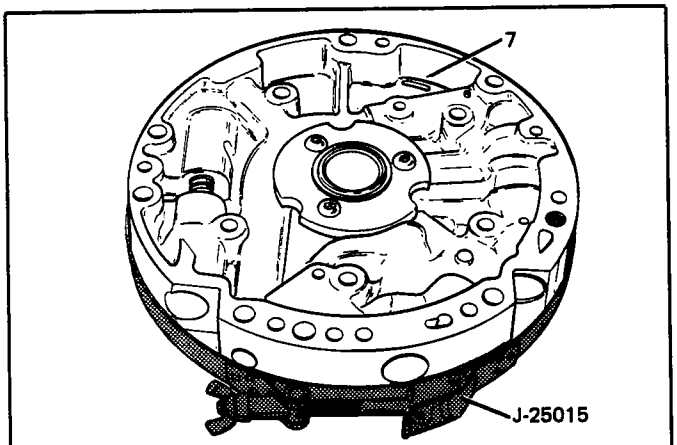


Figure 105 Pump Cover Assembly



ILL. NO.	DESCRIPTION
7	PUMP ASSEMBLY, COMPLETE

HH0153200-4R

Figure 106 Aligning Pump Body and Pump Cover

Install or Connect (Figure 108)

Tools Required

J-25025-1 Alignment Pins

1. J-25025-1 into case as shown.
2. Gasket (11).
3. Oil pump assembly into the case
   - align all holes properly.
4. Bolts (5) and washers (6)
   - torque to 24 N·m (18 lbs.-ft.)

Important

Rotate the transmission to a horizontal position. If the transmission is assembled properly the turbine shaft should turn by hand. If not, identify and correct misassembly now.

Overdrive Unit End Play Check

Measure (Figures 109 and 110)

Tools Required

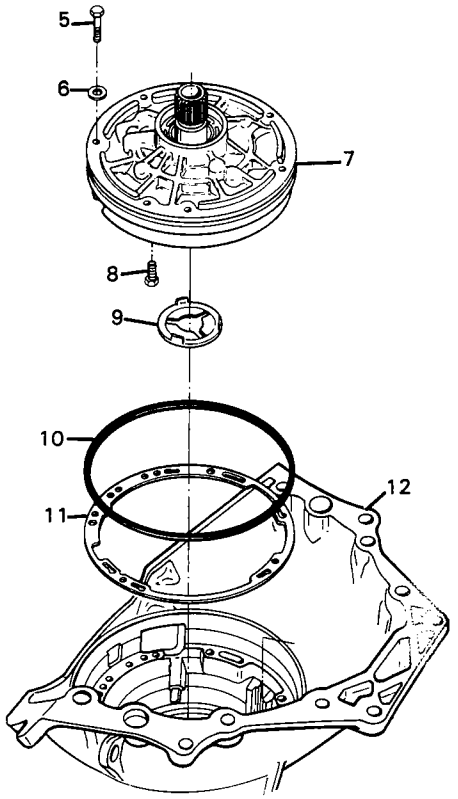
J-8001 Dial Indicator

J-24773-A Oil Pump Remover and End Play Checking Fixture

J-25022 End Play Fixture Adapter

J-25025-7A Post

1. Remove an oil pump to case bolt and install J-25025-7A and locknut.
2. Install J-24773,J-25022,and J-8001 as shown.
   - position dial indicator as shown.
3. Lift up on J-24773-5 with approximately 3 lbs. of force.
   - zero dial indicator
4. Increase lifting force to 20 lbs.
   - overdrive end play is 0.10mm-0.81mm (.004"-.027")
   - the selective washer that controls end play is located between the pump and the overrun clutch housing. If more or less end play is required, select the proper washer from the chart and install.



ILL. NO.	DESCRIPTION
5	BOLTS, M8 X 1.25 X 62
6	WASHER, PUMP TO CASE BOLTS
7	PUMP ASSEMBLY, COMPLETE
8	BOLT, PUMP COVER TO BODY
9	WASHER, THRUST (HOUSING TO PUMP)
10	SEAL, RING (PUMP TO CASE)
11	GASKET, PUMP COVER TO CASE
12	CASE & BUSHING ASSEMBLY

HH0148200-4R

Figure 107 Installing Pump Seal and Thrust Washer

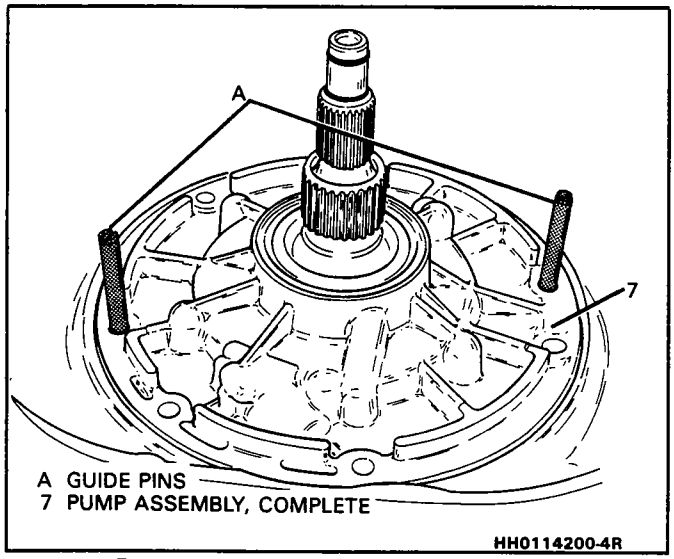


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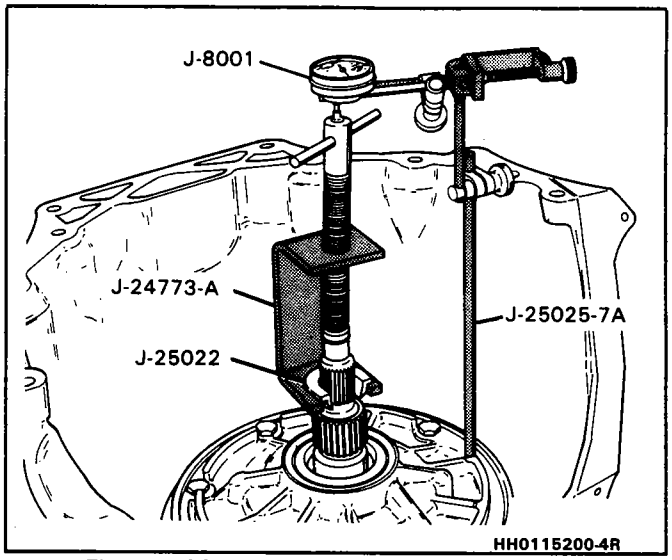
Figure 108 Installing Pump Assembly



HH0115200-4R

Figure 109 Overdrive Unit End Play Check

OVERDRIVE UNIT END PLAY WASHER THICKNESS CHART

THICKNESS		IDENTIFICATION NUMBER AND/OR COLOR
4.25-4.36mm	(0.167"-0.171")	0 - SCARLET
4.36-4.48mm	(0.172"-0.176")	1 - WHITE
4.49-4.60mm	(0.177"-0.180")	2 - COCOA BROWN
4.61-4.72mm	(0.181"-0.185")	3 - GRAY
4.73-4.84mm	(0.186"-0.190")	4 - YELLOW
4.85-4.96mm	(0.191"-0.195")	5 - LIGHT BLUE
4.97-5.08mm	(0.196"-0.200")	6 - PURPLE
5.09-5.20mm	(0.201"-0.204")	7 - ORANGE
5.21-5.32mm	(0.205"-0.209")	8 - GREEN

HH0116200-4R

Figure 110 Overdrive Unit End Play Washer Thickness Chart

EXTERNAL PARTS

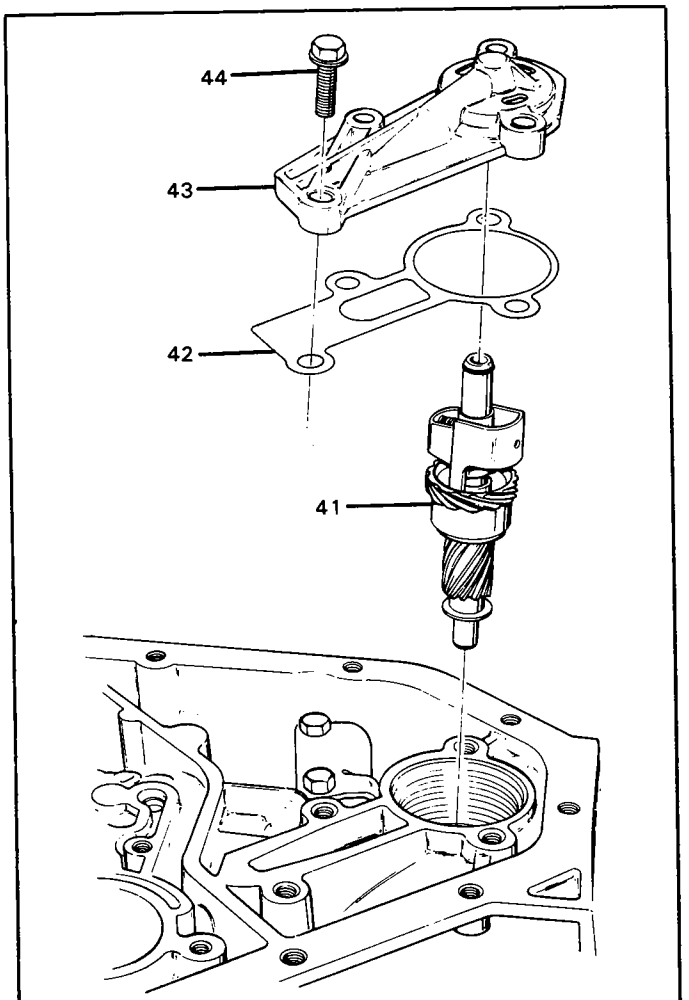
Governor Assembly

Inspect

- Governor cover (34) for:
  - worn bore
  - scoring
  - plugged oil passage
- Governor driven gear for:
  - chipped teeth
  - damage
- Free movement of governor weights

Install or Connect (Figure 111)

1. Governor assembly (41).
2. Gasket (42), governor cover (43), and bolts (44)
   - make sure governor pilot into cover.
   - torque bolts to 24 N·m (18 lbs.-ft.)



ILL. NO.	DESCRIPTION
41	GOVERNOR ASSEMBLY, COMPLETE
42	GASKET, GOVERNOR COVER
43	COVER ASSEMBLY, GOVERNOR
44	SCREW, GOVERNOR COVER

HH0117200-4R

Figure 111 Installing Governor Assembly

Intermediate Servo Piston

Measure (Figures 112 and 113)

Tools Required

J-8001 Dial Indicator

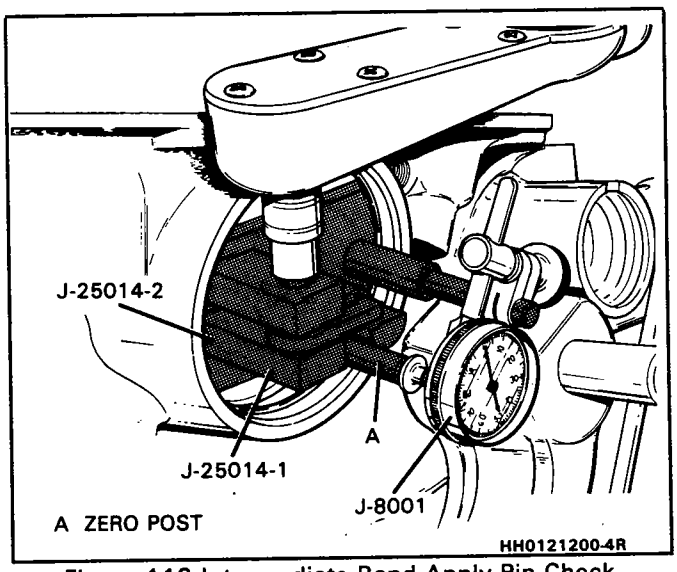
J-25014-1 Intermediate Band Apply Pin Gage

J-25014-2 Intermediate Band Apply Pin Gage

1. Insatll J-25014-2 in the intermediate servo bore.
   - align retaining ring with case slot.
2. Insert J-25014-1 into J-25014-2.
   - make sure tapered end of J-25014-1 is properly located against band apply pin.
   - make sure band apply pin is located in case.
3. Install J-8001. Position dial indicator stem against the zero post.
   - zero indicator.
   - J-25014-2 MUST BE SEATED SQUARELY AGAINST RETAINING RING.
4. Align the stepped side of pin J-25024-1 with torquing arm of J-25024-2.
5. Apply 12 N·m (100 lbs.-in.).
6. Position dial indicator stem over J-25014-1.
   - read dial indicator
   - see chart.

Important

Dial indicator travel is reversed, making indicator read backwards. On an indicator that ranges from 0-100, a .5mm (.020") travel will read .2mm (.080"). A 1.5mm (.060") travel will read 1mm (.040").



HH0121200-4R

Figure 112 Intermediate Band Apply Pin Check

INTERMEDIATE BAND APPLY PIN SELECTION CHART

DIAL INDICATOR TRAVEL		APPLY PIN IDENTIFICATION
.0 - .72mm	(.0" - .029")	1 GROOVE
.72 - 1.44mm	(.029" - .057")	2 GROOVES
1.44 - 2.16mm	(.057" - .086")	3 GROOVES
2.16 - 2.88mm	(.086" - .114")	NONE

HH0120200-4R

Figure 113 Intermediate Band Apply Pin Selection Chart

Disassemble (Figure 114)

1. Outer (19) and inner (21) servo pistons and cushion spring (23).
2. Snap ring (24).
3. Spring retainer (25) and spring (26).
4. Inner (22) and outer (18 and 20) piston seals.
5. Band apply pin oil seals (28).

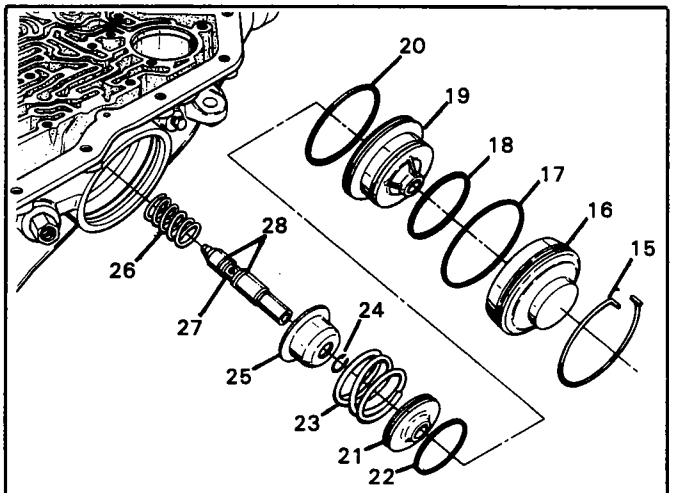
Inspect

- Band apply pins oil seals (28) for nicks or cuts

- Band apply pin (27) for:
  - proper fit in case
  - damage
  - debris in oil passages
- Piston seals (18, 20 and 22) for nicks cuts or damage

Assemble (Figure 114)

1. Spring (26) and retainer (25).
2. Snap ring (24).
3. Cushion spring (23).
4. Spring retainer (25) and outer (18 and 20) piston seals as shown.
5. Inner (21) and outer (19) servo pistons onto the band apply pin (27).
6. Compress spring (23).



15 RING, SERVO COVER RETAINING
16 COVER, INTERMEDIATE SERVO
17 SEAL, "O" RING (INTERMEDIATE SERVO COVER)
18 RING, OIL SEAL (INNER)
19 PISTON, INTERMEDIATE SERVO (OUTER)
20 RING, OIL SEAL (OUTER)
21 PISTON, INTERMEDIATE SERVO (INNER)
22 RING, OIL SEAL PISTON (INNER)
23 SPRING, INTERMEDIATE SERVO CUSHION
24 RING, SNAP (APPLY PIN/RETAINER)
25 RETAINER, SERVO SPRING
26 SPRING, INTERMEDIATE SERVO (INNER)
27 PIN, INTERMEDIATE BAND APPLY (SELECTIVE)
28 RING, OIL SEAL (INTERMEDIATE BAND APPLY PIN)

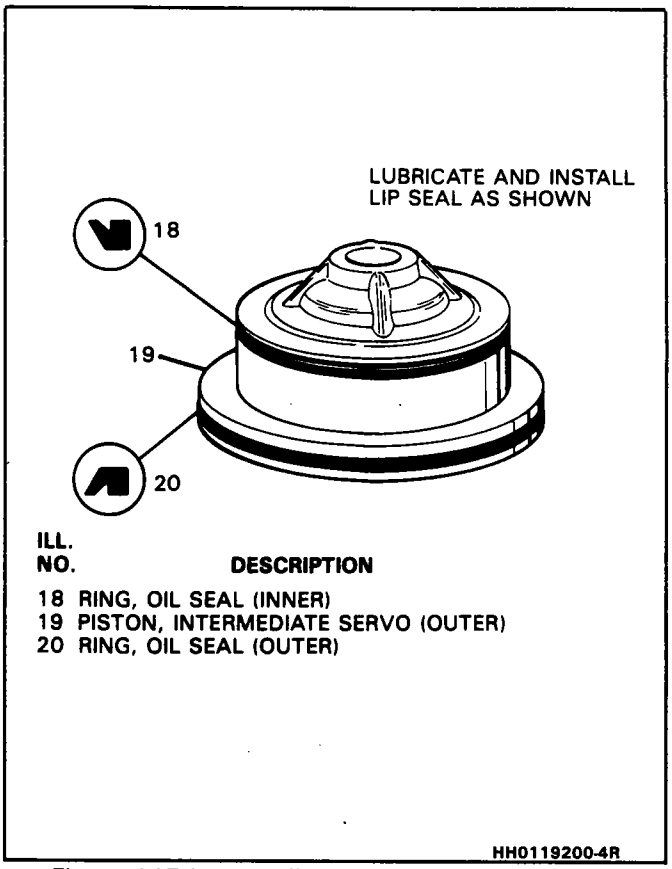
HH0118200-4R

Figure 114 Intermediate Servo Assembly

Install or Connect (Figures 115 and 116)

Tool Required
J-29714

1. Lubricate piston oil seals (18, 20, and 22) with petrolatum.
2. Intermediate servo assembly.
3. Cover "O" ring (17).
   - lubricate with petrolatum
4. Cover (16).
5. Oil pan.
   - retain with two bolts
6. J-29714.
7. Retaining ring (15).
   - align ring gap with case slot
8. Remove J-29714, bolts and oil pan.



ILL. NO. DESCRIPTION
18 RING, OIL SEAL (INNER)
19 PISTON, INTERMEDIATE SERVO (OUTER)
20 RING, OIL SEAL (OUTER)

HH0119200-4R

Figure 115 Intermediate Servo Piston Assembly

Control Valve Assembly

Clean

- Control valve assembly (74) throughly in solvent-move the valves with a pick or small screwdriver to dislodge any dirt or debris that may have accumulated
- Air Dry

Disassemble (Figure 117)

- Control Valve Assembly
  - Position as shown on a clean surface
  - Remove valve trains beginning with the upper left hand corner. **NOTE:** Some valves are under pressure-cover the bores while removing the roll pins
  - Remove blind hole roll pins with a modified drill bit
  - Valves, springs, and bushings must be laid out on a clean surface in the exact sequence they are removed
  - Remove pressure switches

Clean

- All valves, springs, bushings and control valve body in clean solvent
- Dry using compressed air.

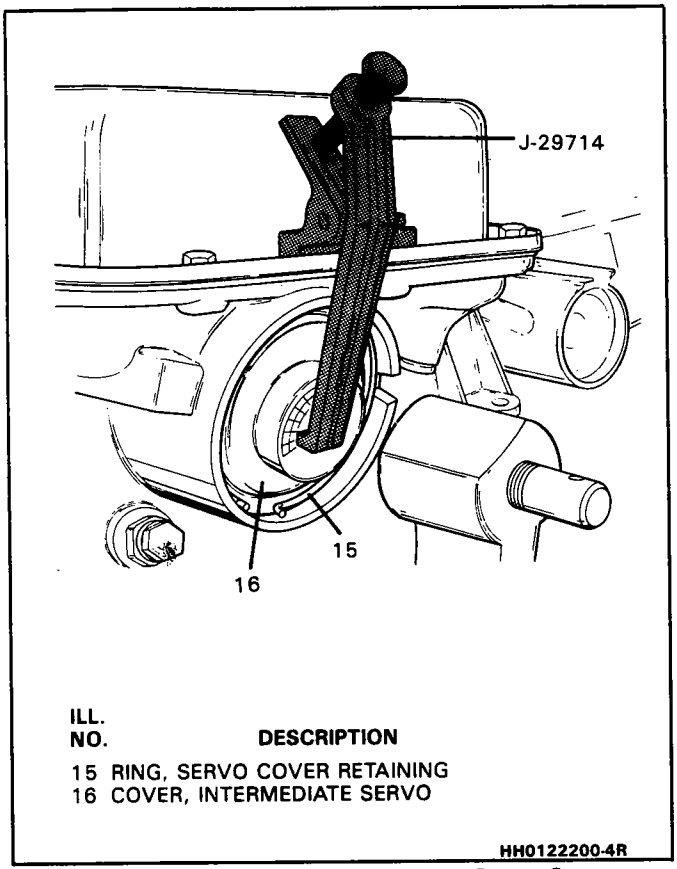


Figure 116 Installing Intermediate Servo Cover

Inspect

- All valves and bushings for:
  - porosity
  - scoring
  - nicks
  - scratches
- Springs for damaged or distorted coils
- Valve body casting for:
  - porosity
  - cracks
  - interconnected oil passages
  - damaged machined surfaces

Assemble (Figure 117)

- Control valve assembly (74) exactly as shown.

NOTICE: The position of the valve lands and bushing passages.

3-4 Accumulator

Install or Connect (Figures 118 and 119)

1. 3-4 Accumulator piston pin (76) into case.
2. Spring (51).
3. Piston oil seal ring (50)
   - retain with petrolatum.
4. Piston (49).
5. (8) Check balls (55) into case.

Install or Connect (Figures 120, 121, 122)

Tools Required
Guide Pins (2)

1. Install (2) guide pins as shown.
2. Spacer plate-to-case gasket (86) marked "C".
3. Spacer plate (56).
4. Spacer plate-to-valve body gasket (87) marked "VB".
5. (3) Check balls (55)
   - retain with petrolatum.
6. Control valve (74)
   - position manual valve (345) and link (705) as shown.
7. Bolts (80 and 81)
   - torque to 12 N·m (9 lbs.-ft.)

Assemble (Figures 121 and 122)

1. Oil seal (60) onto 1-2 accumulator piston (61).
2. Piston (61) into housing (62).
3. Plate (57), gasket (58), spring (59), and housing (62) onto case.
4. Bolts (63)
   - torque to 12 N·m (8 lbs.-ft.)
5. Pressure switch (75) and bolt (80).

Install or Connect (Figure 123)

1. "O" ring (52) onto solenoid.
   - lubricate with petrolatum.
2. Solenoid (53) and bolts (54)
   - torque to 12 N·m (8 lbs.-ft.)
3. Signal oil pipe (83).
4. Pressure switch (73).
5. Manual detent roller and spring (708).
6. Install wire clips (79) and signal oil pipe retainer (84).
   - remove valve body bolts as necessary.
7. Case electrical connector (39) with seal (40).

Install or Connect (Figures 122, 123 and 124)

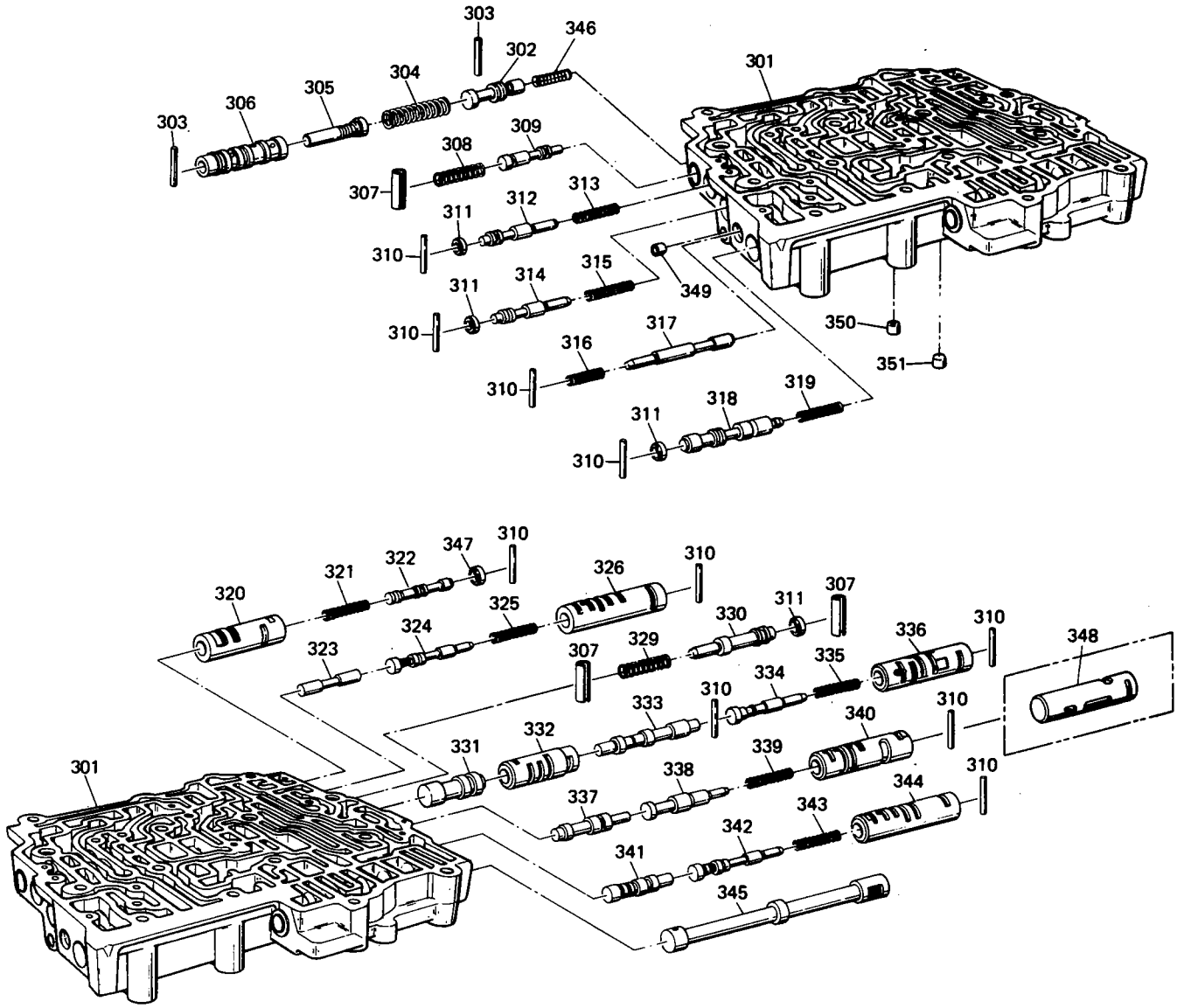
1. Throttle lever and bracket assembly:
   - install spring (70) on lifter (72)
   - lifter (72) into bracket, spring first
   - T.V. link (71) as shown
   - bracket (69) and bolt (81)
2. "O"ring (67) onto filter (68)
   - lubricate with petrolatum.
3. Position oil filter as shown.
4. Oil pan gasket (66), oil pan (65), and bolts (64).
   - torque bolts to 16 N·m (12 lbs.-ft.)

TORQUE CONVERTER ASSEMBLY

Inspect

The torque converter assembly (1) must be replaced for any of the following conditions:

- Evidence of damage to the pump assembly
- Metal particles are found after flushing the cooler and cooler lines



301 BODY, CONTROL VALVE
302 VALVE, THROTTLE
303 PIN, COILED SPRING 2.72 X 25 (2)
304 SPRING, THROTTLE VALVE
305 PLUNGER, THROTTLE VALVE
306 BUSHING, THROTTLE VALVE PLUNGER
307 SLEEVE, SPRING RETAINING (3)
308 SPRING, T.V. LIMIT VALVE
309 VALVE, T.V. LIMIT
310 PIN, COILED SPRING 2.72 X 20 (10)
311 PLUG, VALVE BORE 12.5mm (4)
312 VALVE, T.V. MODULATOR UPSHIFT
313 SPRING, T.V. MODULATOR UPSHIFT VALVE
314 VALVE, T.V. MODULATOR DOWNSHIFT
315 SPRING, T.V. MODULATOR DOWNSHIFT VALVE
316 SPRING, 3-2 CONTROL VALVE
317 VALVE, 3-2 CONTROL
318 VALVE, LINE BIAS
319 SPRING, LINE BIAS VALVE
320 BUSHING, ACCUMULATOR VALVE
321 SPRING, ACCUMULATOR VALVE
322 VALVE, ACCUMULATOR
323 VALVE, 3-4 SHIFT
324 VALVE, 3-4 THROTTLE
325 SPRING, 3-4 THROTTLE VALVE
326 BUSHING, 3-4 THROTTLE VALVE
329 SPRING, LO OVERRUN CLUTCH VALVE
330 VALVE, LO OVERRUN CLUTCH
331 VALVE, 1-2 SHIFT
332 BUSHING, LO-1ST/DETENT VALVE
333 VALVE, LO-1ST/DETENT
334 VALVE, 1-2 THROTTLE
335 SPRING, 1-2 THROTTLE VALVE
336 BUSHING, 1-2 THROTTLE VALVE
337 VALVE, CONVERTER CLUTCH SHIFT (NON ECM)
338 VALVE, CONVERTER CLUTCH THROTTLE (NON ECM)
339 SPRING, CONV. CLUTCH THROTTLE VALVE (NON ECM)
340 BUSHING, CONV. CLUTCH THROTTLE (NON ECM)
341 VALVE, 2-3 SHIFT
342 VALVE, 2-3 THROTTLE
343 SPRING, 2-3 THROTTLE VALVE
344 BUSHING, 2-3 THROTTLE VALVE
345 VALVE, MANUAL
346 SPRING, THROTTLE VALVE BOOST
347 PLUG, VALVE BORE (.56 DIA.)
348 BUSHING, CONVERTER CLUTCH THROTTLE (DUMMY ECM CARS ONLY)
349 PLUG, CUP (7)
350 PLUG, CUP 4TH EXHAUST
351 PLUG, CUP 2-1 COASTDOWN

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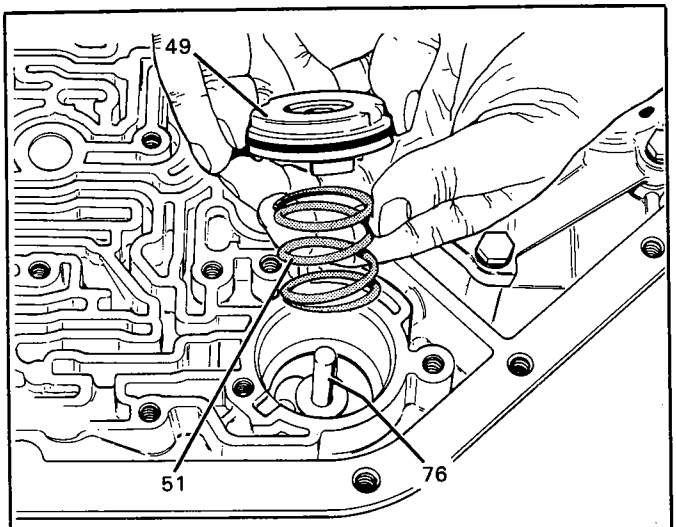
Figure 117 Control Valve Assembly



ILL. NO.	DESCRIPTION
49	PISTON, 3-4 ACCUMULATOR
51	SPRING, 3-4 ACCUMULATOR
76	PIN, ACCUMULATOR PISTON

HH0124200-4R

Figure 118 Installing 3-4 Accumulator Piston

- External leaks in hub weld area
- Converter pilot is broken, damaged or poor fit into crankshaft
- Converter hub is scored or damaged
- Internal failure to stator
- Contamination from engine coolant
- Excess end play

Measure (Figure 125)

Tool Required:

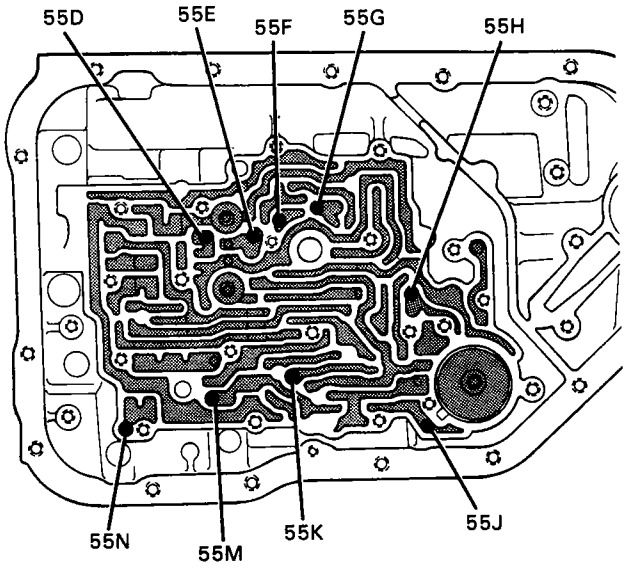
J-35138 Torque Converter End Play Checking Tool

- Install J-35138 and measure end play
  - 0mm - .5mm (.020") for 245mm Torque Converters
  - 0mm - .6mm (.024") for 298mm Torque Converters

The Torque Converter Should Not Be Replaced If:

- The fluid has an odor, discolored or no evidence of metal or clutch plate material
  - Drain out as much fluid as possible
  - Replace the oil filter and pan gasket
  - Fill to proper level (Refer to Section 7A)
- The converter bolt hole threads are damaged
  - Correct with thread insert (Refer to Section 6A)

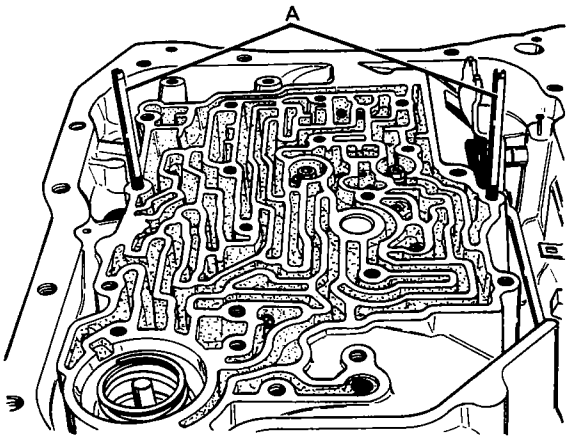
Flushing the torque converter is not recommended.



ILL. NO.	DESCRIPTION
55D	CHECK BALL #2 3RD ACCUMULATOR
55E	CHECK BALL #6 REVERSE/3RD
55F	CHECK BALL #4 3RD CLUTCH
55G	CHECK BALL #9 LO/DETENT
55H	CHECK BALL #10 LO/REVERSE
55J	CHECK BALL #1 4TH ACCUMULATOR
55K	CHECK BALL #7 INTERMEDIATE SERVO CHECK BALL IS LOCATED IN CAPSULE
55M	CHECK BALL #3 PT/D3
55N	CHECK BALL #5 T.V. EXHAUST

HH0015200-4R

Figure 119 Check Ball Location in Case



A GUIDE PINS

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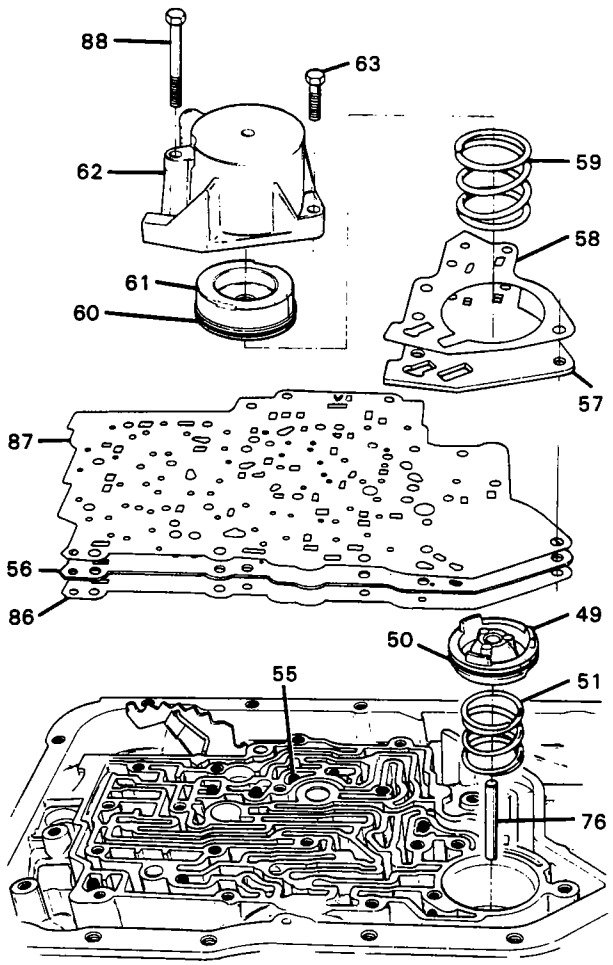
Figure 120 Spacer Plate and Valve Body Alignment

Install or Connect

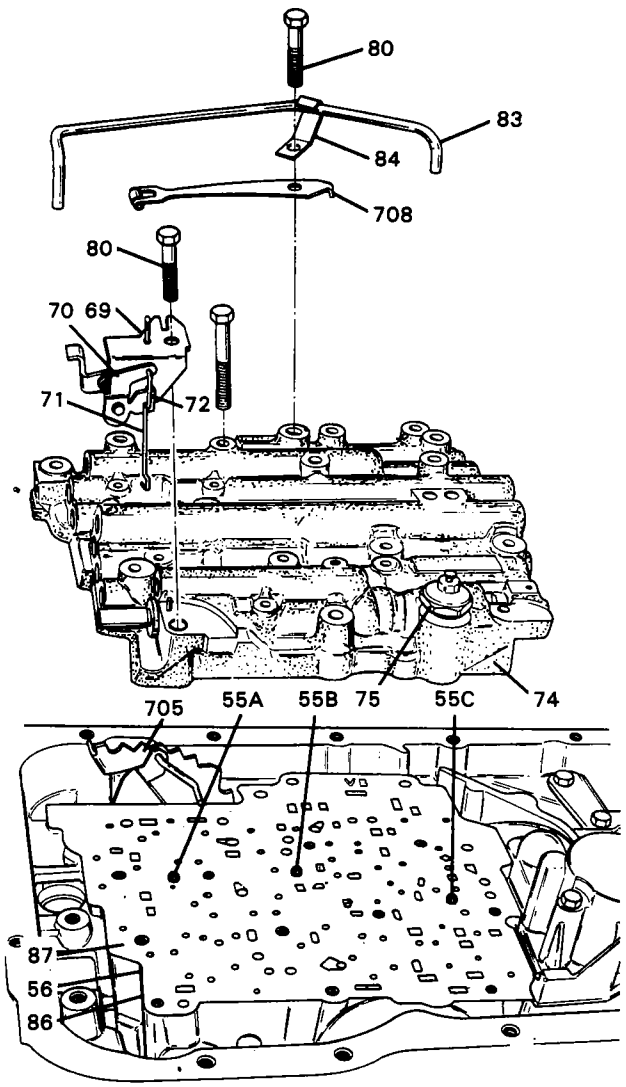
1. Torque converter (1).



ILL. NO.	DESCRIPTION
49	PISTON, 3-4 ACCUMULATOR
50	RING, OIL SEAL (3-4 ACCUMULATOR PISTON)
51	SPRING, 3-4 ACCUMULATOR
55	BALL, .25 DIAMETER
56	PLATE, VALVE BODY SPACER
57	PLATE, ACCUMULATOR
58	GASKET, ACCUMULATOR HSG. TO ACCUM. PLATE
59	SPRING, 1-2 ACCUMULATOR PISTON
60	RING, OIL SEAL (1-2 ACCUMULATOR PISTON)
61	PISTON, 1-2 ACCUMULATOR
62	HOUSING & PIN ASSEMBLY, 1-2 ACCUMULATOR
63	BOLT, ACCUMULATOR HOUSING
86	GASKET, SPACER PLATE TO CASE
87	GASKET, VALVE BODY TO SPACER PLATE
88	BOLT, ACCUMULATOR HOUSING

HH0126200-4R

Figure 121 Installing Spacer Plate and 1-2 Accumulator Assembly



ILL. NO.	DESCRIPTION
55A	CHECK BALL #11
55B	CHECK BALL #8
55C	CHECK BALL #12
56	PLATE, VALVE BODY SPACER
69	LEVER & BRACKET ASSEMBLY, THROTTLE
70	SPRING, LIFTER (T.V. EXHAUST VALVE)
71	LINK, THROTTLE LEVER TO CABLE
72	LIFTER, T.V. EXHAUST
75	SWITCH ASSEMBLY, PRESSURE (3RD OR 4TH)
74	VALVE ASSEMBLY, CONTROL
80	BOLT, M6 X 1 X 45
83	PIPE, SIGNAL OIL
84	RETAINER, SIGNAL OIL PIPE
86	GASKET, SPACER PLATE TO CASE
87	GASKET, VALVE BODY TO SPACER PLATE
705	LINK, INSIDE DETENT (LEVER TO VALVE)
708	MANUAL DETENT ROLLER & SPRING ASSEMBLY

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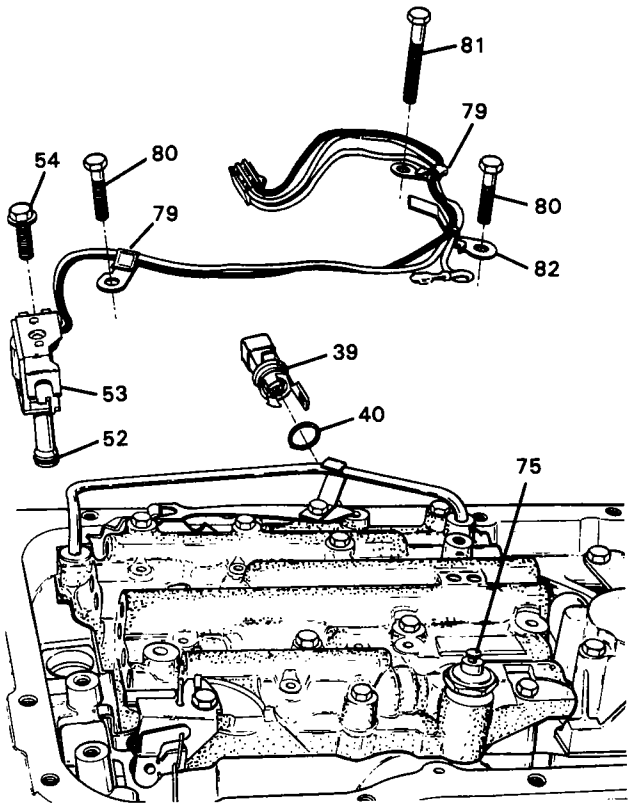
Figure 122 Installing Control Valve and T.V. Lever and Bracket Assemblies



39 CONNECTOR, ELECTRICAL
40 SEAL, "O" RING (ELECTRICAL CONNECTOR)
52 SEAL, "O" RING (SOLENOID)
53 SOLENOID ASSEMBLY
54 BOLTS, HEX WASHER HEAD M6 X 1 X 12.0
75 SWITCH ASSEMBLY, PRESSURE (3RD OR 4TH)
79 CLIP, SOLENOID WIRE (2)
80 BOLT, M6 X 1 X 45
81 BOLT, M6 X 1 X 60
82 CLIP, FILTER RETAINER

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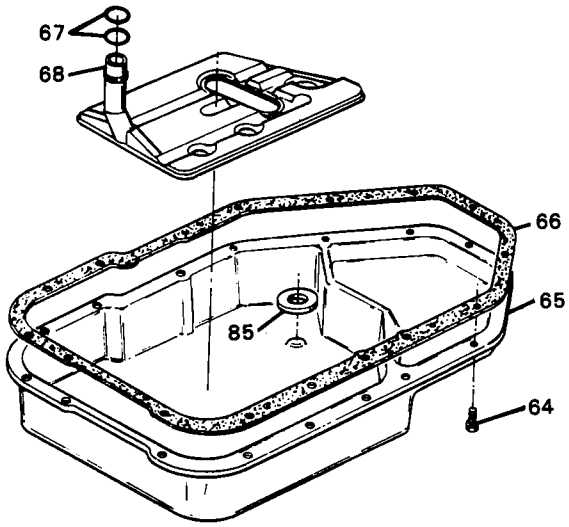
Figure 123 Installing Electrical Connector and Solenoid Assembly

2. J-21366 converter holding strap
3. Transmission assembly into vehicle
   - Refer to Section 7A2



ILL. NO.	DESCRIPTION
64	SCREW, CONICAL WASHER ASSEMBLY
65	PAN, TRANSMISSION OIL
66	GASKET, PAN
67	SEAL, "O" RING (FILTER)
68	FILTER ASSEMBLY, TRANSMISSION OIL
85	MAGNET, CHIP COLLECTOR

HH0129200-4R

Figure 124 Installing Oil Pan and Filter

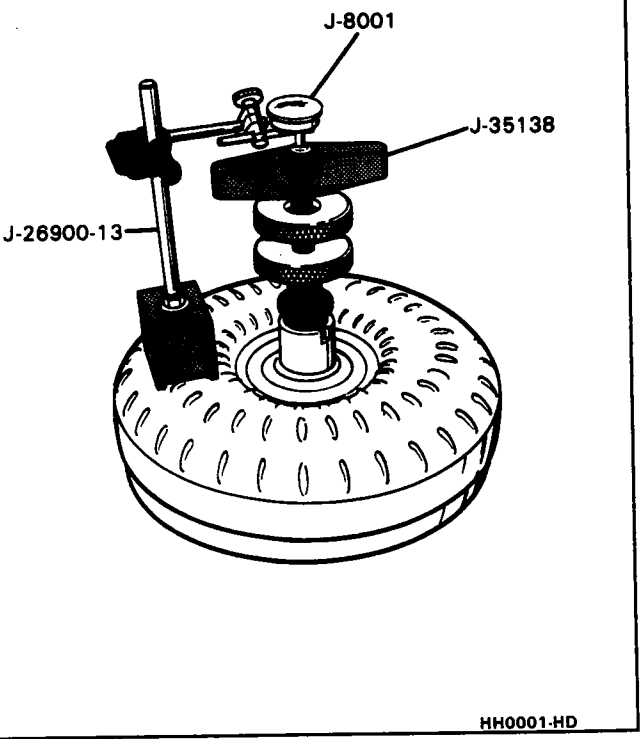


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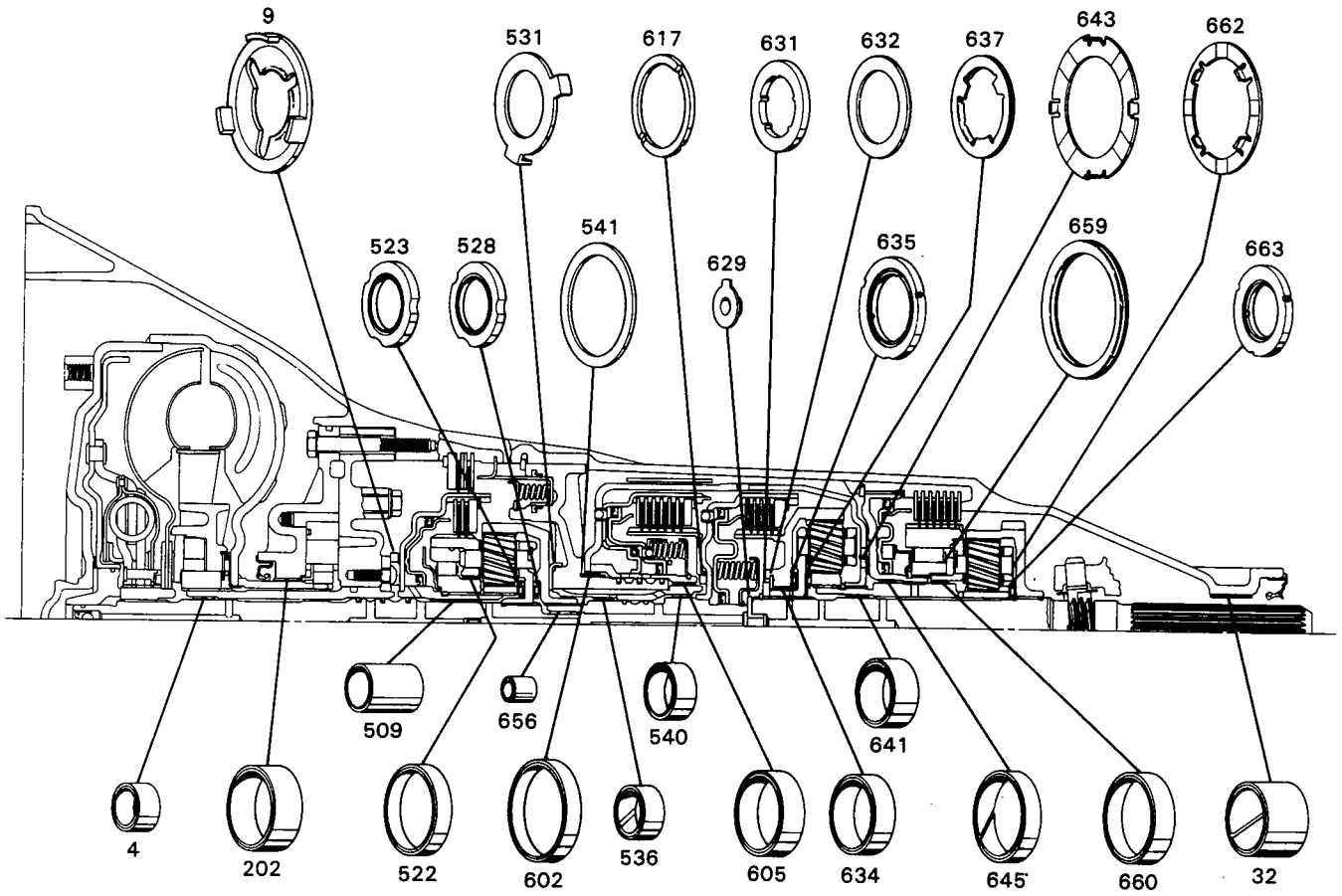
Figure 125 Checking Torque Converter End Play

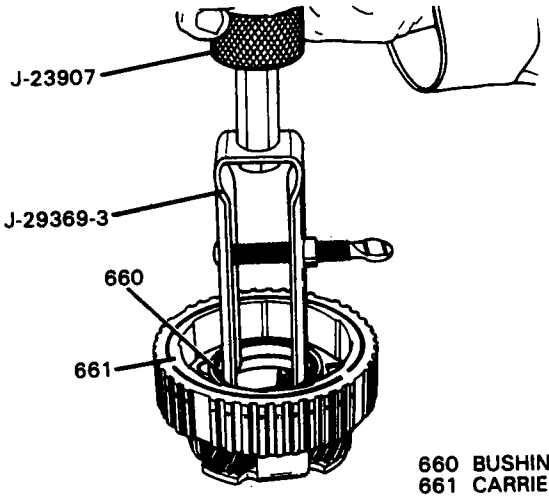
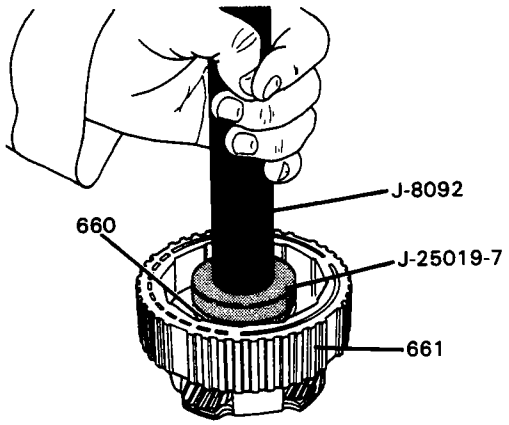


ILL. NO.	DESCRIPTION
4	BUSHING, STATOR SHAFT
9	WASHER, THRUST (HOUSING TO PUMP)
32	BUSHING, CASE REAR
202	BUSHING, PUMP BODY
509	BUSHING, OVERRUN CLUTCH
522	BUSHING, OVERDRIVE CARRIER
523	BEARING ASSEMBLY, THRUST (CARRIER/SUN)
528	BEARING ASM., THRUST (CARRIER/INTERNAL GEAR)
531	WASHER, THRUST (INTERNAL GEAR/SUPPORT)
536	BUSHING, CENTER SUPPORT (29.8 O.D. X 11.0)
540	BUSHING, CENTER SUPPORT (33.8 O.D. X 11.0)
541	WASHER, THRUST (SUPPORT/DIRECT CLUTCH)
602	BUSHING, DIRECT CLUTCH (FRONT)
605	BUSHING, DIRECT CLUTCH (REAR)
617	WASHER, THRUST (DIRECT/FORWARD CLUTCH)
629	WASHER, THRUST (FORWARD CL./OUTPUT) (SEL.)
631	WASHER, THRUST (SELECTIVE REAR)
632	WASHER, THRUST (INTERNAL GEAR/REAR SEL.)
634	BUSHING, FRONT INTERNAL GEAR
635	BEARING ASM., ROLLER (INTERNAL GEAR/CARRIER)
637	BEARING ASSEMBLY, THRUST (FRT. CARRIER/SUN)
641	BUSHING, REAR SUN GEAR
643	WASHER, THRUST (INPUT DRUM/HOUSING)
645	BUSHING, LO & REVERSE HOUSING
656	BUSHING, FORWARD CLUTCH HOUSING
659	BEARING, THRUST (REAR CAM/LO RACE)
660	BUSHING, REAR CARRIER (53.13 X 9.53)
662	WASHER, THRUST (REAR CARRIER/INTERNAL GEAR)
663	BEARING ASSEMBLY, ROLLER THRUST (SUN/INT.)

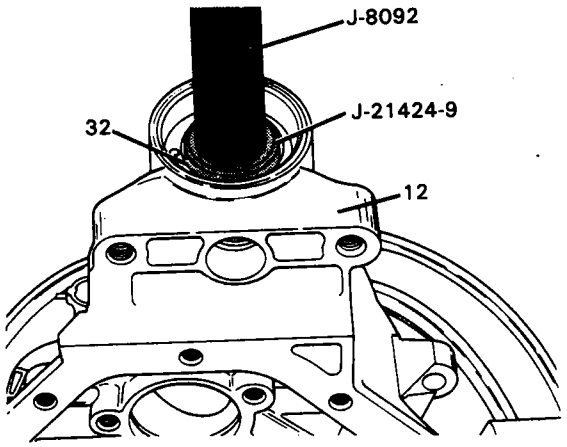
HH0130200-4R

Figure 126 Thrust Washer and Bushing Location

BUSHING REPLACEMENT PROCEDURE
PROTECT PARTS WITH WOOD BLOCKS OR CLOTH AS NECESSARY

REMOVE AS SHOWN	INSTALL AS SHOWN
	

660 BUSHING, REAR CARRIER (53.13 X 9.53)
661 CARRIER ASSEMBLY, REAR (COMPLETE)



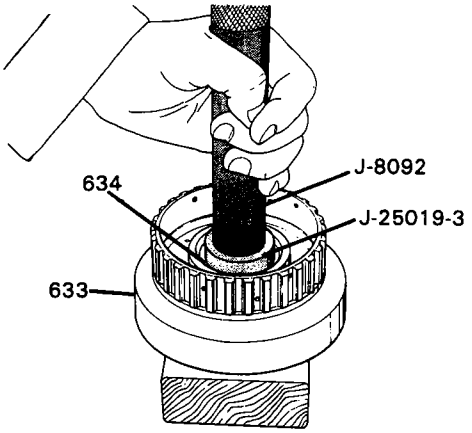
12 CASE & BUSHING ASSEMBLY
32 BUSHING, CASE REAR

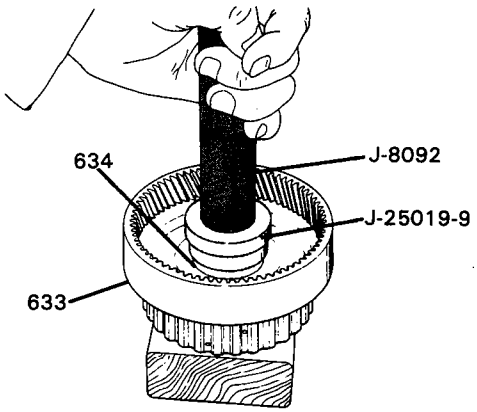
HH0131200-4R

Figure 127 Bushing Replacement Procedure

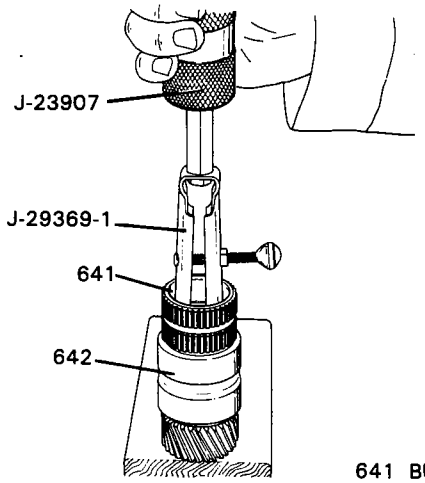
BUSHING REPLACEMENT PROCEDURE
PROTECT PARTS WITH WOOD BLOCKS
OR CLOTH AS NECESSARY

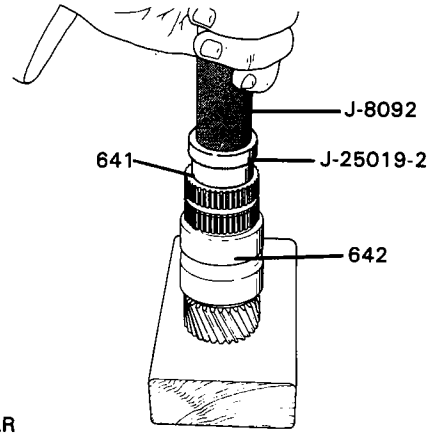
REMOVE AS SHOWN	INSTALL AS SHOWN



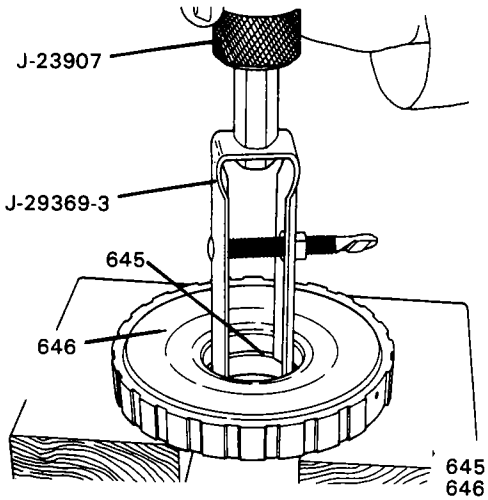


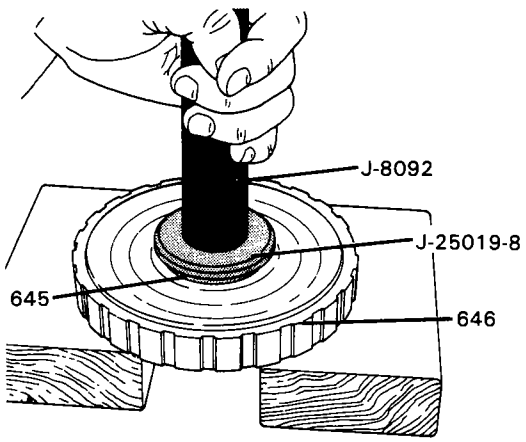
633 GEAR, FRONT INTERNAL
634 BUSHING, FRONT INTERNAL GEAR





641 BUSHING, REAR SUN GEAR
642 GEAR, REAR SUN





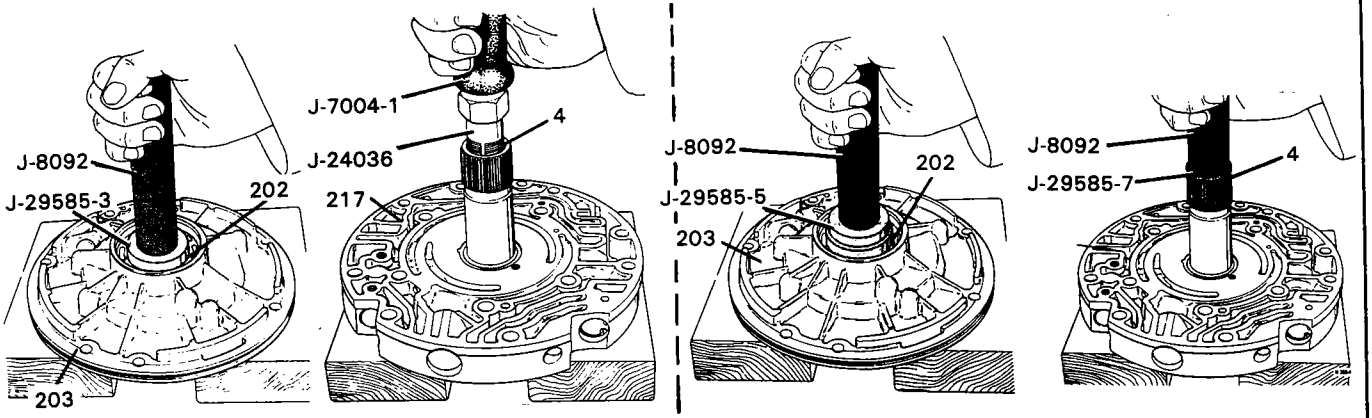
645 BUSHING, LO & REVERSE HOUSING
646 HOUSING ASSEMBLY, LO & REVERSE CLUTCH

HH0132200-4R

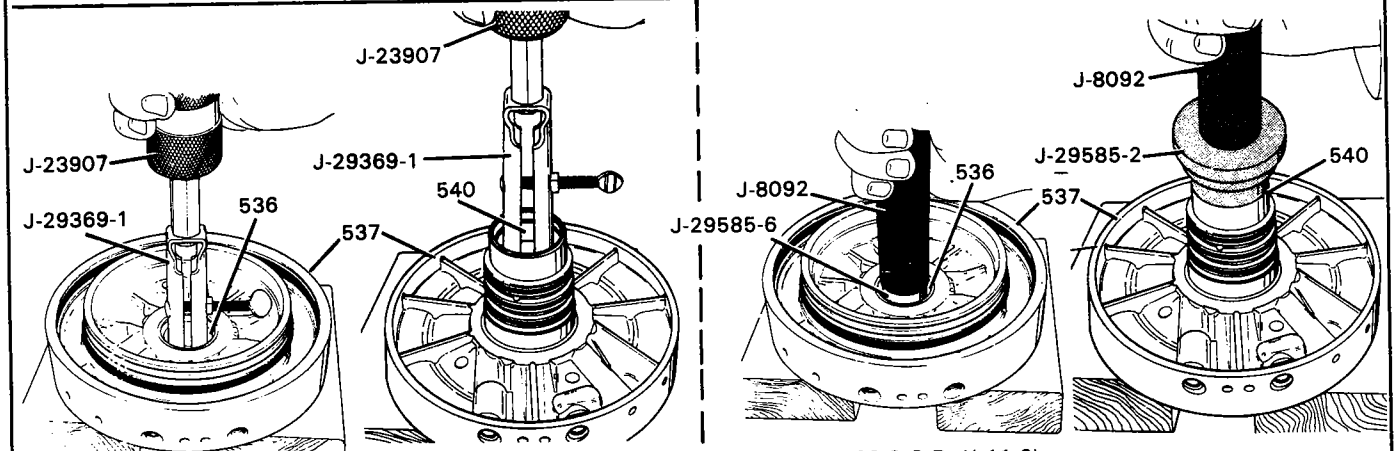
Figure 128 Bushing Replacement Procedure

BUSHING REPLACEMENT PROCEDURE
PROTECT PARTS WITH WOOD BLOCKS
OR CLOTH AS NECESSARY

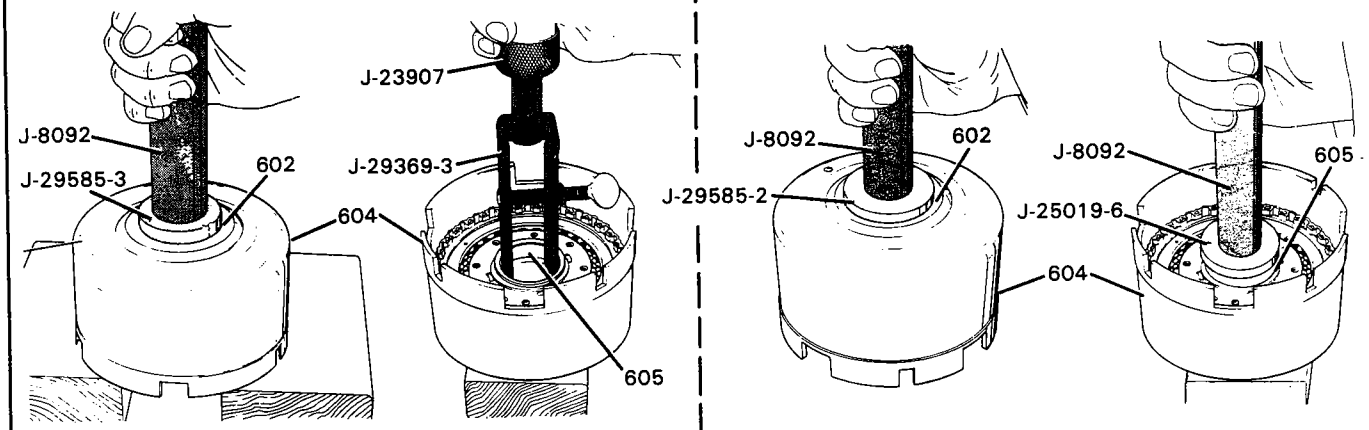
REMOVE AS SHOWN | **INSTALL AS SHOWN**



4 BUSHING, STATOR SHAFT
202 BUSHING, PUMP BODY
203 BODY, PUMP
217 COVER, PUMP



536 BUSHING, CENTER SUPPORT (29.8 O.D. X 11.0)
537 SUPPORT, CENTER
540 BUSHING, CENTER SUPPORT (33.8 O.D. X 11.0)

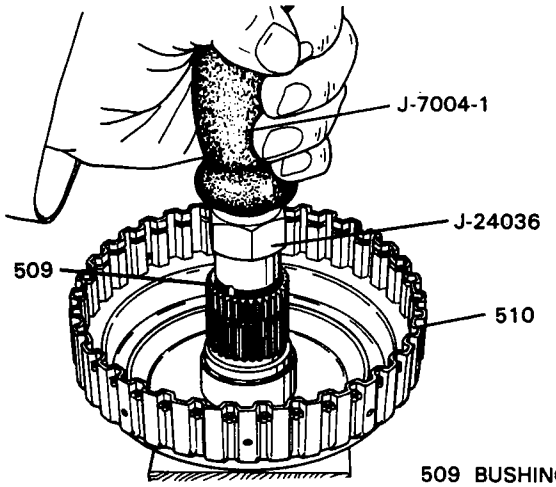
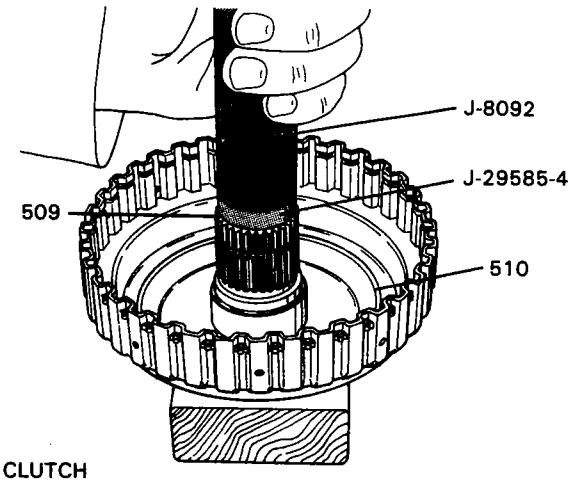


602 BUSHING, DIRECT CLUTCH (FRONT)
604 HOUSING & DRUM ASSEMBLY, DIRECT CLUTCH
605 BUSHING, DIRECT CLUTCH (REAR)

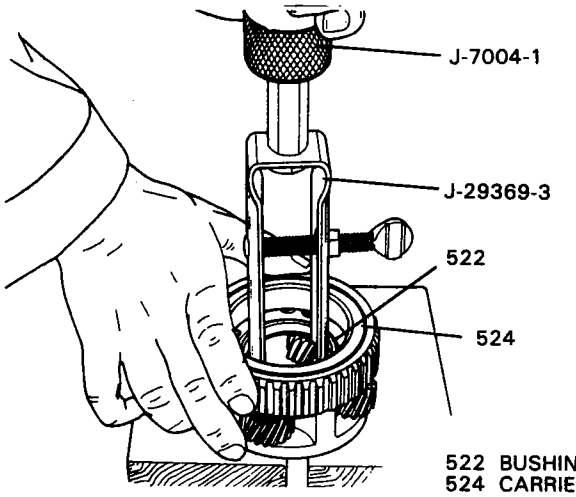
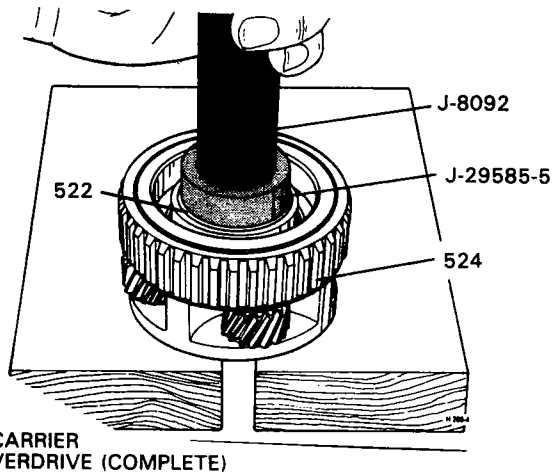
HH0133200-4R

Figure 129 Bushing Replacement Procedure

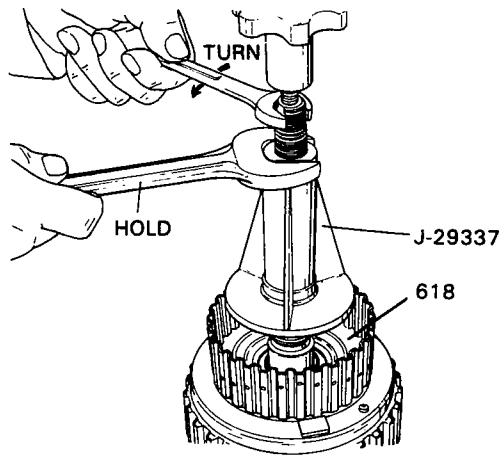
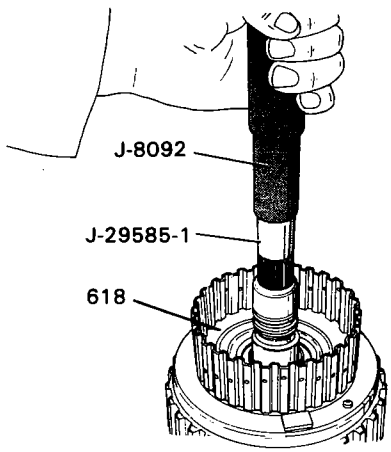
BUSHING REPLACEMENT PROCEDURE
PROTECT PARTS WITH WOOD BLOCKS
OR CLOTH AS NECESSARY

REMOVE AS SHOWN	INSTALL AS SHOWN
	

509 BUSHING, OVERRUN CLUTCH
510 HOUSING, OVERRUN CLUTCH ASSEMBLY

522 BUSHING, OVERDRIVE CARRIER
524 CARRIER ASSEMBLY, OVERDRIVE (COMPLETE)

618 HOUSING ASSEMBLY, FORWARD CLUTCH

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HH0134200-4R

Figure 130 Bushing Replacement Procedure

ALL 1987 MODELS	OVERRUN CLUTCH			FOURTH CLUTCH			DIRECT CLUTCH				
	FLAT STEEL PLATE		COMP. FACED PLATE	FLAT STEEL PLATE		COMP. FACED PLATE	FLAT STEEL PLATE		COMP. FACED PLATE	APPLY RING	
	No.	Thickness	No.	No.	Thickness	No.	No.	Thickness	No.	I.D.	Width
	2	1.969mm (.077")	2	3	1.969mm (.077")	2	6	2.324mm (.091")	6	19	12.5mm (.492")

FORWARD CLUTCH							LO & REVERSE CLUTCH						
WAVE PLATE		FLAT STEEL PLATE		COMP. FACED PLATE	APPLY RING		WAVE PLATE		FLAT STEEL PLATE		COMP. FACED PLATE	APPLY RING	
No.	Thickness	No.	Thickness	No.	I.D.	Width	No.	Thickness	No.	Thickness	No.	I.D.	Width
1	1.585mm (.062")	3	1.969mm (.077")	4	18	13.5mm (.531")	1	1.969mm (.077")	7	1.969mm (.077")	6	0	13.13mm (.516")

HH0139200-4R

Figure 131 Clutch Plate Chart

TORQUE SPECIFICATIONS

DESCRIPTION OF USAGE	QUANTITY	SIZE	TORQUE ASSEMBLY
LINE PRESSURE TAKE-OFF AND DIRECT CLUTCH PRESSURE TAKE-OFF	2	1/8-27 NPTF	7.0-14.0 N·m (5-10 ft.-lbs.)
COOLER CONNECTOR	2	1/4-18 NPSF	35.0-40.0 N·m (26-30 ft.-lbs.)
VALVE BODY ASSEMBLY TO CASE	15	M6 x 1.0	13.0-17.0 N·m (9-12 ft.-lbs.)
SPEEDO RETAINER TO CASE	1	M6 x 1.0	8.0-14.0 N·m (6-10 ft.-lbs.)
PUMP BODY TO PUMP COVER	5	M8 x 1.25	20.0-27.0 N·m (15-20 ft.-lbs.)
PUMP ASSEMBLY TO CASE	7	M8 x 1.25	20.0-27.0 N·m (15-20 ft.-lbs.)
PARKING LOCK BRACKET TO CASE	2	M8 x 1.25	20.0-27.0 N·m (15-20 ft.-lbs.)
TRANSMISSION OIL PAN TO CASE	16	M8 x 1.25	8.0-14.0 N·m (6-10 ft.-lbs.)
MANUAL SHAFT TO INSIDE DETENT LEVER (NUT)	1	M10 x 1.5	27.0-34.0 N·m (20-25 ft.-lbs.)
STATOR SHAFT TO PUMP COVER	3	M6 x 1.0	10.0-14.0 N·m (7-10 ft.-lbs.)
CASE TO CENTER SUPPORT	2	M10 x 1.5	20.0-27.0 N·m (15-20 ft.-lbs.)
SOLENOID TO CASE	2	M6 x 1.0	10.0-14.0 N·m (7-10 ft.-lbs.)
PRESSURE SWITCH	1	1/8-27 NPTF	7.0-14.0 N·m (5-10 ft.-lbs.)
ACCUMULATOR HOUSING TO CASE	5	M6 x 1.0	10.0-14.0 N·m (7-10 ft.-lbs.)
GOVERNOR COVER TO CASE	4	M8 x 1.25	20.0-27.0 N·m (15-20 ft.-lbs.)

HH0137200-4R

Figure 132 Torque Specifications

REQUIRED SPECIAL TOOLS

TOOL NO.	NAME
J-29332	OUTPUT SHAFT LOADING FIXTURE ADAPTER
J-25013-1	REAR UNIT SUPPORT
J-24773-5	OIL PUMP REMOVER SCREW
J-24773-A	OIL PUMP REMOVER & END PLAY CHECKING FIXTURE
J-29334	FOURTH CLUTCH COMPRESSOR & CENTER SUPPORT REMOVER
J-29335	INNER OVERRUN CLUTCH PISTON SEAL PROTECTOR
J-29337	FORWARD & DIRECT CLUTCH UNIT FIXTURE
J-8763-02	HOLDING FIXTURE
J-3289-20	HOLDING FIXTURE BASE
J-25359-3	#27 TORX BIT
J-26744-A	SEAL INSTALLER
J-21426	REAR OIL SEAL INSTALLER
J-23327	CLUTCH SPRING COMPRESSOR
J-25010	DIRECT CLUTCH SEAL PROTECTOR
J-25011	REVERSE CLUTCH SEAL PROTECTOR
J-25014	INTERMEDIATE BAND APPLY PIN GAGE
J-25015	OIL PUMP BODY AND COVER ALIGNMENT BAND
J-25016	FRONT OIL PUMP SEAL INSTALLER
J-25018-A	FORWARD CLUTCH SPRING COMPRESSOR ADAPTER
J-25022	OIL PUMP END-PLAY CHECKING FIXTURE ADAPTER
J-25024	FORWARD CLUTCH SPRING COMPRESSOR
J-25025-A	ALIGNMENT PIN & STUD SET
J-28542	REVERSE CLUTCH HOUSING INSTALLER & REMOVER
J-29060	TORQUE CONVERTER CLUTCH END-PLAY FIXTURE
J-7004	SLIDE HAMMER
J-8001	DIAL INDICATOR SET
or	
J-26900-12	DIAL INDICATOR SET
J-8092	DRIVER HANDLE
J-29696	TURBINE SHAFT SEAL INSTALLER

STANDARD TOOLS

- SPEED HANDLE WRENCH, 3/8" DRIVE
- 10mm, 13mm & 24mm SOCKETS, 3/8" DRIVE
- SMALL FLAT EDGE SCREWDRIVER & LONG FLAT EDGE SCREWDRIVER
- PLASTIC OR RUBBER HAMMER
- NO. 4 EASY OUT OR EQUIVALENT
- "T" HANDLE TAP WRENCH
- 3mm (1/8"), 5mm (3/16") & 6.4mm (1/4") PUNCH
- FEELER GAGE FROM 0.04mm - 2.40mm
- EXPANDING TYPE SNAP RING PLIERS
- CONTRACTING TYPE SNAP RING PLIERS
- NEEDLE NOSE PLIERS
- NEWTON METER (INCH POUND & FOOT POUND) TORQUE WRENCH
- #49 DRILL
- 300mm (12") SCALE
- PLIERS

HH0138-2004R

HH0138200-4R

Figure 133 Special Tools