SECTION A

TURBO HYDRA-MATIC "350" AUTOMATIC TRANSMISSION

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DIVISION I SPECIFICATIONS AND ADJUSTMENTS

75-1 GENERAL SPECIFICATIONS

A. MODEL DESIGNATIONS

Trans. Model	Converter Assembly Information	Engine Cu. In. Displacement	Intermediate Clutch		Direct Clutch		Forward Clutch		Low and Reverse Clutch		Modulator Assembly Note: Refer to PAR 75-35 for Diagnosis Procedure	Model Usage
			Driven Plate Req'd	Drive Plate Req'd	Driven Plate Req'd	Drive Plate Req'd	Driven Plate Req'd	Drive Plate Req'd	Driven Plate Req'd	Drive Plate Req'd		
JH	White Dot of Paint	350	3	3	4	4	5	5	5	5	Prod. No. 8623365 Serv. No. 8623947	Special—Skylark—Skylark Custom—G.S. 350
JJ	White Dot of Paint	350	3	3	4	4	5	5	5	5	Prod. No. 8623365 Serv. No. 8623947	Sportwagon

B. TIGHTENING SPECIFICATIONS

Location	Thread Size	Torque Lbs. Ft.
Oil Pan to Transmission Case	5/16-18	13
Pump Assembly to Transmission Case	5/16-18	20
Vacuum Modulator Retainer to Case	5/16-18	12
Valve Body Assembly to Case	5/16-18	13
Oil Channel Support Plate to Case	5/16-18	13
Pump Body to Pump Cover	5/16-18	15
Parking Lock Bracket to Case	5/16-18	29
Extension Housing to Case	3/8-16	35
Inside Shift Nut	3/8-16	30
External Test Plugs to Case	1/8-27	8
Cooler Fitting to Case	1/4-18	30
Oil Pickup Screw to Valve Body	1/4-20 (Slotted Machine Screw)	36 LB. IN.
Detent Valve Actuating Lever Bracket to Valve Body	1/4-20	48 LB. IN.

c. Transmission Identification Number and Car Serial Number

A production day and shift built number, transmission model and model year are stamped on the intermediate clutch accumulator cover located on the middle right side of the transmission case. See Figure 75-1. Since the production day built number and model number furnishes the key to construction and interchangeability of parts in each transmission, they should be used when selecting replacement parts as listed in the master parts list. The model number and day built number should always be furnished *on product reports, AFA forms, and all correspondence with factory concerning a particular transmission.*

On all 1969 Turbo Hydra-Matic 350 transmissions the car serial number is stamped on the lower left side of the transmission case, next to the manual shaft. See Figure 74-3.

d. Turbo Hydra-Matic 350 Fluid Recommendations

Use DEXRON Automatic Transmission Fluid only in the Turbo Hydra--Matic 350 automatic transmission (GM Part No. 1050568-69-70 or any other fluid having DEXRON identifications).

The oil pan should be drained and the strainer cleaned every 24,000 miles and fresh fluid added to obtain the proper level on the dipstick. See sub-paragraph 2 for proper refill procedures. For cars subjected to heavy city traffic during hot weather, or in commercial use, when the engine is regularly idled for prolonged periods, the oil pan should be drained and the strainer cleaned every 12,000 miles.

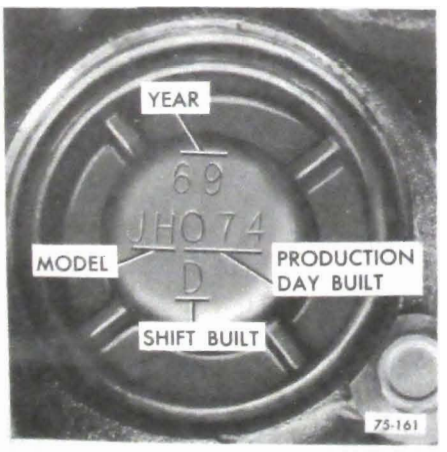


Figure 75-1 · Model Identification

1. Checking and Adding Fluid

Fluid level should be checked at every engine oil change. The "FULL" and "ADD" marks on the transmission dipstick indicate one (1) pint difference. To determine proper fluid level, proceed as follows:

NOTE: The Turbo Hydra-Matic 350 transmission is designed to operate at the full mark on the dipstick at normal operating temperature (180°F) and should be checked under these conditions. The normal operating temperature is obtained only after at least 15 miles of highway type driving or the equivalent of city driving.

To determine proper level, proceed as follows:

1. With manual control lever in Park position start engine. DO NOT RACE ENGINE. MOVE MANUAL CONTROL LEVER THROUGH EACH RANGE.

2. Immediately check fluid level with selector lever in Park, engine running and vehicle on LEVEL surface.

At this point, when a reading is made, fluid level on the dipstick should be 1/4" below the "ADD" mark.

3. If additional fluid is required add fluid to bring level to 1/4" below the "ADD" mark on the dipstick.

NOTE: If transmission fluid level is correctly established at 70°F it will appear at the "FULL" mark on the dipstick when the transmission reaches normal operating temperature (180°F). The fluid level is set 1/4" below the "ADD" mark on the dipstick to allow for expansion of the fluid which occurs as transmission temperatures rise to normal operating temperature of 180°F.

CAUTION: Do Not Overfill, as foaming and loss of fluid through the vent pipe might occur as fluid heats up. If fluid is too low especially when cold, complete loss of drive may result which can cause transmission failure.

2. Draining Oil Pan and Replacing Strainer Assembly

1. Raise car on hoist or place on jack stands, and provide container to collect draining fluid.

2. Remove oil pan and gasket. Discard gasket.

3. Drain fluid from oil pan. Clean pan with solvent and dry thoroughly with clean compressed air.

4. Remove strainer assembly and clean, and discard oil strainer to valve body gasket.

5. Install new oil strainer to valve body gasket on strainer. Install strainer assembly.

6. Install new gasket on oil pan and install pan. Tighten attaching bolts to 13 lb.ft.

7. Lower car and add 3 pints of transmission fluid through filler tube.

8. With manual control lever in Park position, start engine. DO NOT RACE ENGINE. Move manual control lever through each range.

9. Immediately check fluid level with selector lever in Park, engine running, and vehicle on LEVEL surface.

10. Add additional fluid to bring level to 1/4" below the "ADD" mark on the dipstick.

CAUTION: Do not overfill.

3. Adding Fluid to Fill Dry Transmission and Converter Assembly

The fluid capacity of the Turbo Hydra-Matic 350 transmission and converter assembly is approximately

20 pints, but correct level is determined by the mark on the dipstick rather than by amount added. In cases of transmission overhaul, when a complete fill is required, including a new converter proceed as follows:

1. Add 8 pints of transmission fluid through filler tube.

NOTE: The converter should be replaced only if the converter itself fails. On any major failure, such as a clutch or gearset, the strainer must be cleaned.

NOTE: If installation of a new converter is not required add only 5 pints of transmission fluid.

2. With manual control lever in Park position start engine and place on cold idle cam. DO NOT RACE ENGINE. Move manual control lever through each range.

3. Immediately check fluid level with selector lever in Park, engine running, and vehicle on LEVEL surface.

4. Add additional fluid to bring level to 1/4" below the "ADD" mark on the dipstick.

CAUTION: Do not overfill.

e. Turbo Hydra-Matic 350 Towing Instructions

If a Buick equipped with Turbo Hydra-Matic 350 transmission must be towed, the following precautions must be observed:

The car may be towed safely on its rear wheels with the shift lever in neutral position at speeds of 35 miles per hour or less under most conditions.

However, the drive shaft must be disconnected or the car towed on its front wheels if

Tow speeds in excess of 35 mph are necessary,

Car must be towed for extended distances (over 50 miles) or,

Transmission is not operating properly.

If car is towed on its front wheels, the steering wheel should be secured to keep the front wheels in a straight-ahead position.

f. Rocking Car

If it becomes necessary to rock the car to free it from sand, mud or snow, move the selector lever from "D" to "R" in a repeat pattern while simultaneously applying moderate pressure to the accelerator. Do not race engine. Avoid spinning wheels when trying to free the car.

75-2 DETENT CABLE ADJUSTMENT

1. Position retainer on upper end of cable. See Figure 75-2, view B.

2. Attach cable to throttle bracket "C", being sure guide is fully seated.

3. With throttle cable connected to carburetor and throttle lever, depress accelerator pedal full to adjust retainer.

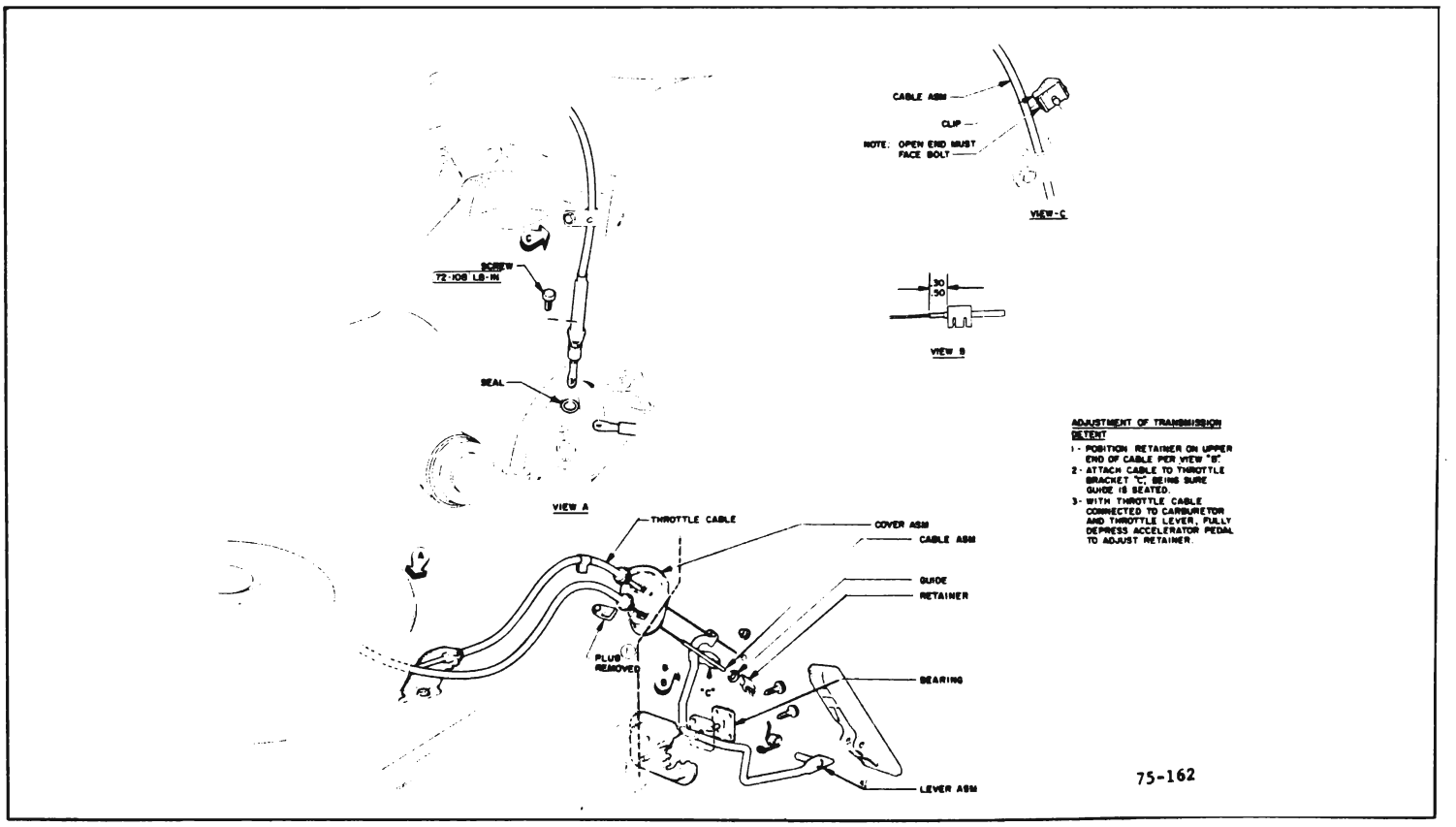


Figure 75-2 - Transmission Detent Cable Adjustment

DIVISION II

DESCRIPTION AND OPERATION

75-3 DESCRIPTION OF TURBO HYDRA-MATIC 350 AUTOMATIC TRANSMISSION

The Turbo Hydra-Matic 350 transmission, see Figure 75-3, is a fully automatic unit consisting primarily of 3-element hydraulic torque converter and two planetary gear sets. Four multiple-disc clutches, two roller clutches, and an intermediate overrun band provide the friction elements required to obtain the desired function of the two planetary gear sets.

The 3-element torque converter consists of a pump, turbine and a stator assembly. The stator is mounted on a one way roller clutch which will allow the stator to turn clockwise. but not counterclockwise.

NOTE: References to clockwise and counterclockwise are determined by looking toward rear of car.

The torque converter is of welded construction and is serviced as a complete assembly. The unit is filled with oil and is attached to the engine crankshaft by a flywheel. thus always rotates at engine speed. The converter pump is an integral part of the converter housing, therefore, the pump blades, rotating at engine speed, set the oil within the converter into motion and direct it to the turbine, causing the turbine to rotate.

As the oil passes throughout the turbine it is traveling in such a direction that if it were not redirected by the stator it would hit the rear of the converter pump blades and impede its pumping action. So at low turbine speeds, oil is redirected by the stator to the converter pump in such a manner that it actually assists the converter pump to deliver power, or multiply engine torque.

As turbine speed increases, the direction of oil leaving the turbine changes and flows against the rear side of the stator vanes in a clockwise direction. Since the stator is now impeding the smooth flow of oil, its roller clutch releases and it revolves freely on its shaft. Once the stator becomes inactive, there is no further multiplication of engine torque within the converter. At this point, the converter is merely acting as a fluid coupling as both the converter pump and turbine are being driven at approximately the same speed.

A hydraulic system pressurized by a gear type pump provides the working pressure required to operate the friction elements and automatic controls.

External control connections to the transmission are:

1. Manual Linkage - To select the desired operating range.

2. Engine Vacuum - To operate the vacuum modulator.

3. Cable Control - To operate the detent valve.

A vacuum modulator is used to automatically sense any change in the torque input to the transmission. The vacuum modulator transmits this signal to the pressure regulator, which controls line pressure, so that all torque requirements of the transmission are met and smooth shifts are obtained at all throttle openings.

The detent valve is activated by a cable that is connected to the accelerator lever assembly. When the throttle is half open, the valve is actuated causing throttle downshift at speeds below 50 mph. When the throttle is fully open the detent valve is actuated causing the transmission to downshift from 3-1 at speeds below 40 mph and 3-2 below 75 mph.

75-5 FUNCTIONS OF VALVES AND HYDRAULIC CONTROL UNITS

a. Pressure Control

The transmission is controlled automatically by a hydraulic system. Hydraulic pressure is supplied by the transmission oil pump, see Figure 75-13, which is engine driven. Main line pressure is controlled by a pressure regulator valve train and by the vacuum modulator which is connected to engine vacuum. The pressure regulator valve train controls line pressure automatically, in response to a pressure signal from a modulator valve, in such a way that the torque requirements of the transmission clutches are met and proper shift spacing is obtained at all throttle openings. To control line pressure properly, a modulator pressure is used which varied in the same manner as torque input to the transmission. Modulator pressure is regulated by engine vacuum which is an indicator of engine torque and carburetor opening.

b. Vacuum Modulator Assembly

The engine vacuum signal is provided by the vacuum modulator, which consists of an evacuated metal bellows, a diaphragm and two springs. See Figure 75-14. These are so arranged that when installed, the bellows and its external spring apply a force which acts on the modulator valve. This force acts on the modulator valve so that it increases modulator pressure. Engine vacuum and the other spring acts in the opposite direction to decrease modulator, or low engine vacuum, high modulator pressure; high engine vacuum, and low modulator pressure. To reduce the effect of engine power loss at high altitudes on shift points, the effective area of the diaphragm is made somewhat larger than that of the bellows. Atmospheric pressure then acts on the resulting differential area to reduce modulator pressure.

c. Governor Assembly (See Figure 75-15)

The vehicle speed signal to the

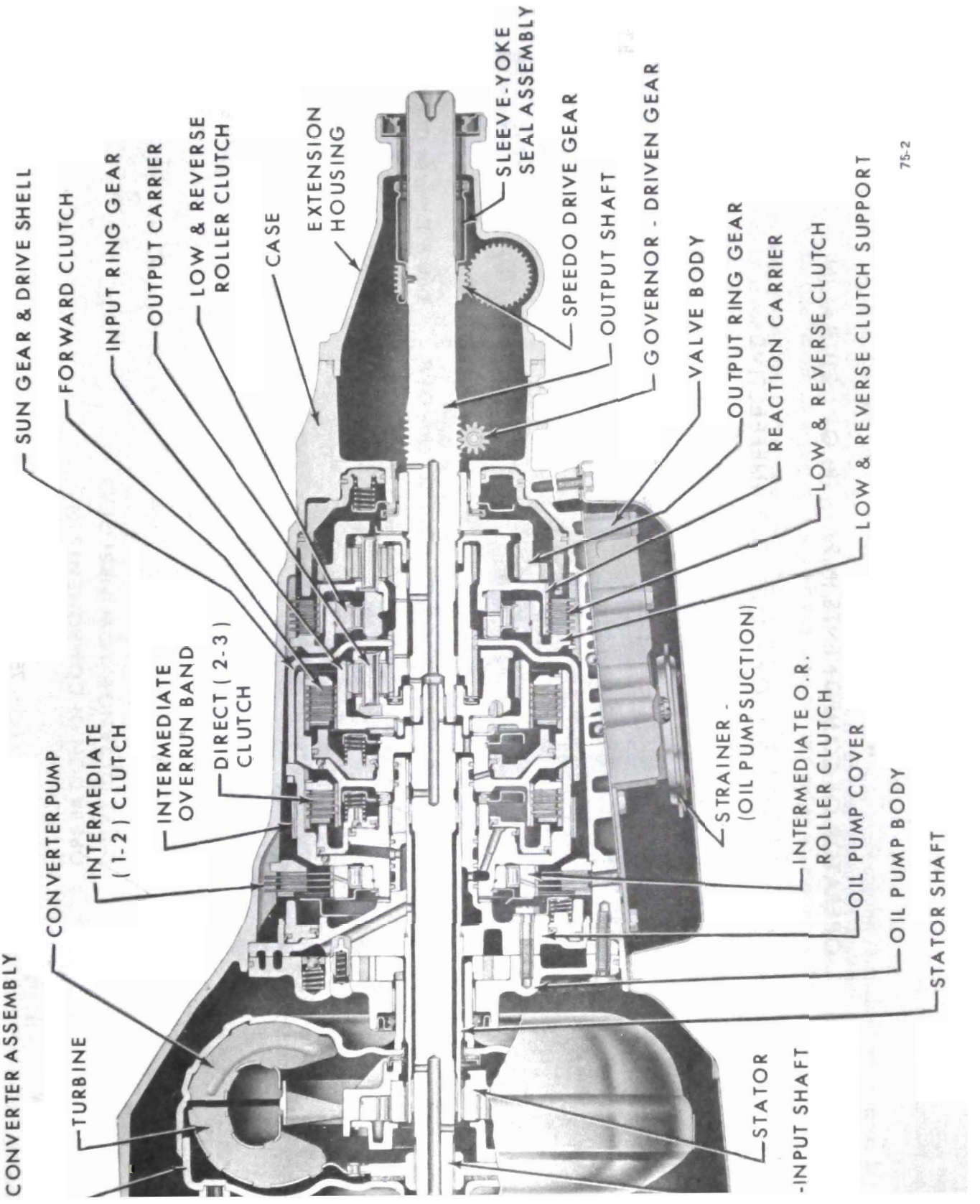
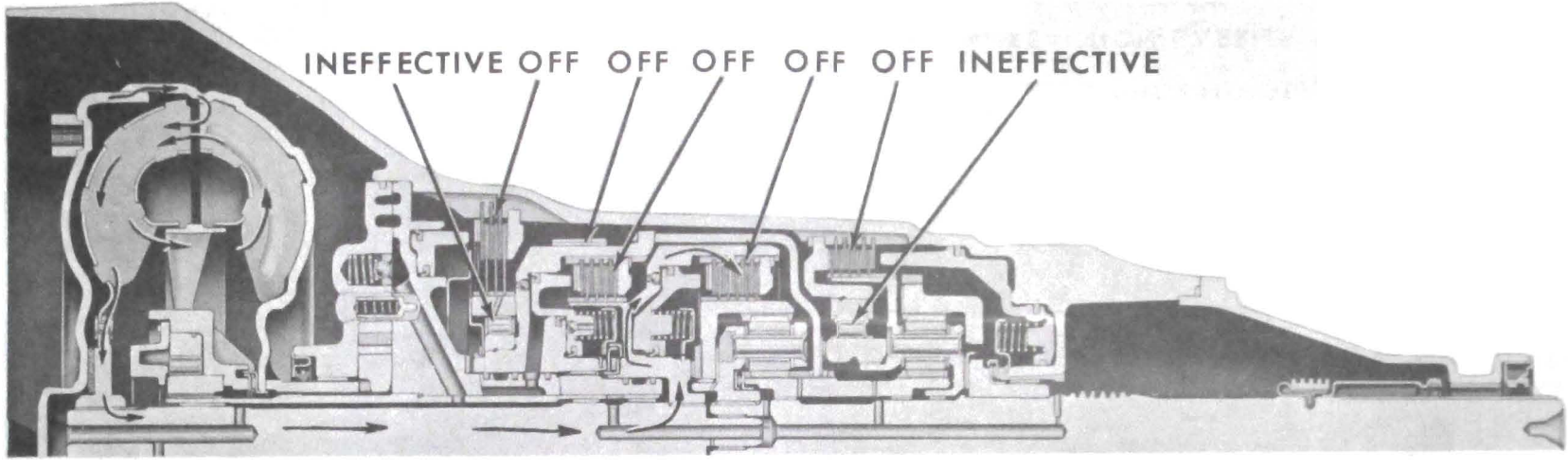


Figure 75-3 - Turbo Hydra-Matic 350 - Cross Section

1. OPERATOR OF COMPONENTS IN PARK (P) OR NEUTRAL (N)



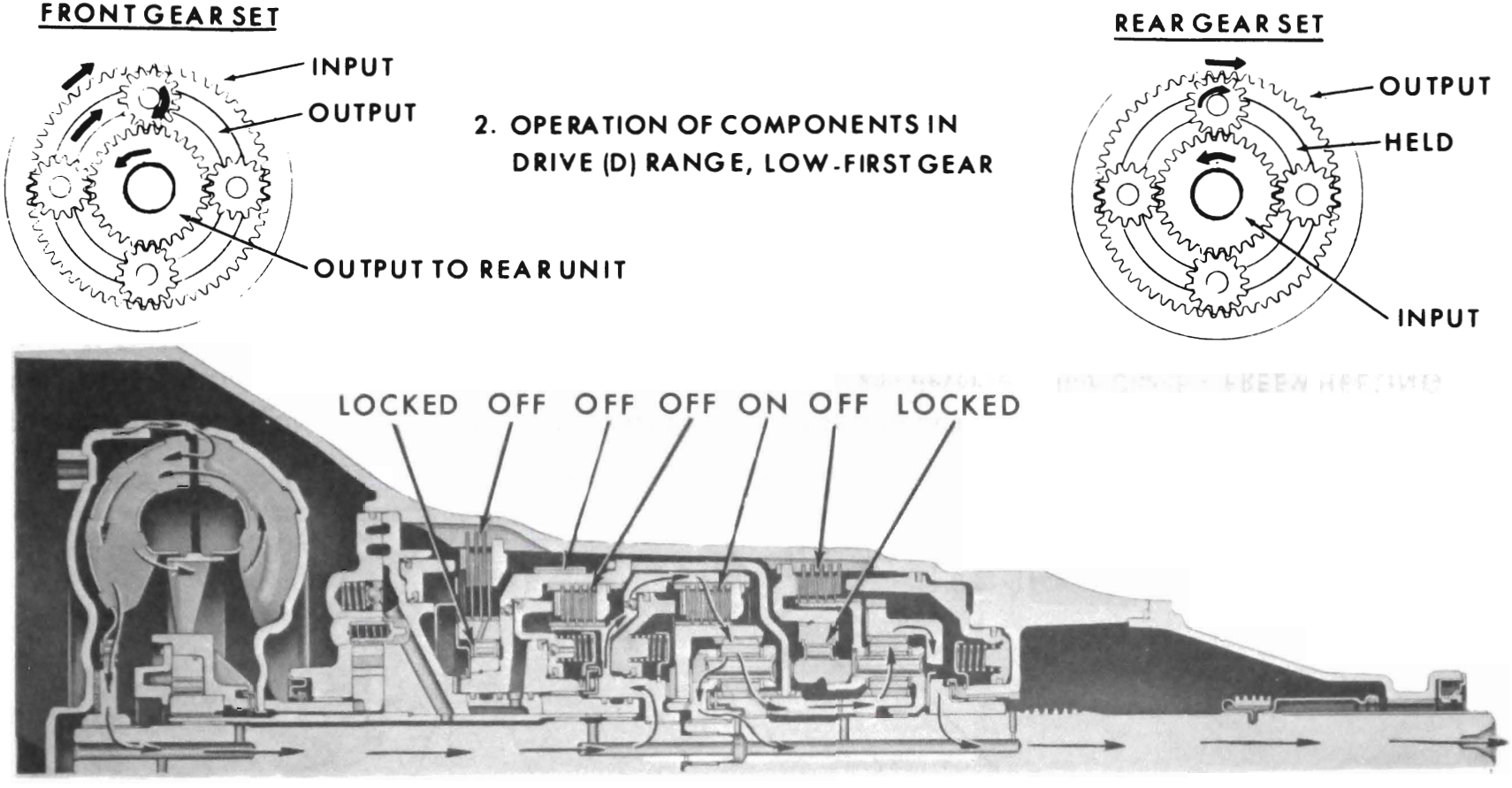
Intermediate Clutch - OFF Direct Clutch - OFF Forward Clutch - OFF Low & Reverse Clutch - OFF

Intermediate Overrun Roller Clutch - INEFFECTIVE Low and Reverse Roller Clutch - INEFFECTIVE

Intermediate Overrun Band - OFF

In park and neutral, all clutches and the intermediate overrun band are released: therefore no power is transmitted from the torque converter turbine to planetary gear sets or output shaft.

Figure 75-4 - Operation of Components in Park (P) or in Nuetral (N)



Intermediate Clutch - OFF Direct Clutch - OFF Forward Clutch - ON Low and Reverse Clutch - OFF

Intermediate Overrun Roller Clutch - LOCKED Low and Reverse Roller Clutch - LOCKED

Intermediate Overrun Band - OFF

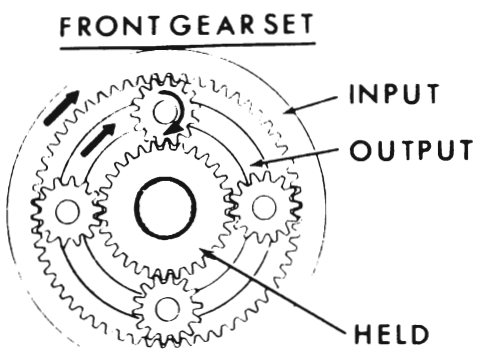
With the range selector lever in Drive "D" range, the forward clutch is applied. This delivers turbine torque from the input shaft through the forward clutch, to the input ring gear in a clockwise direction. (Convertor torque ratio equals approximately 2:25 at stall)

Clockwise rotation of the input ring gear causes the output planet pinions to rotate in a clockwise direction, driving the sun gear counterclockwise. In turn, the sun gear turns causing the reaction carrier planet pinions to turn clockwise. Clockwise rotation of the reaction carrier planet pinions causes the output ring gear and output shaft to turn in a clockwise direction in a reduction ratio of approximately 2.52 to 1. The reaction of the reaction carrier planet pinions against the output ring gear is taken by the low and reverse roller clutch which is grounded to the case.

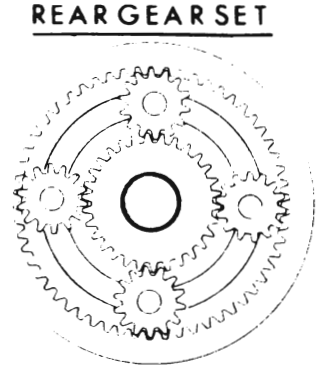
To prepare the transmission for the shift into intermediate (Second gear) the intermediate roller clutch is locked. Therefore, the sun gear, sun gear drive shell, direct clutch housing, intermediate roller clutch and the intermediate clutch faced plates are all turning in a counterclockwise direction.

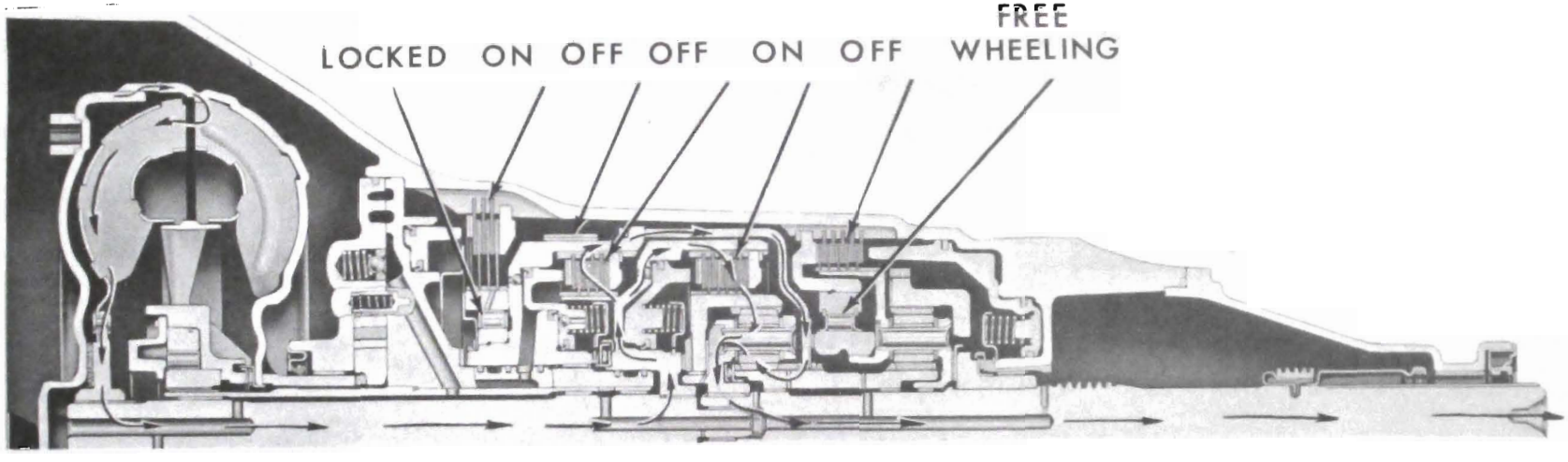
75-5

Figure 75-5 - Operation of Components in Drive (D) Range. Low - First Gear



3. OPERATION OF COMPONENTS IN DRIVE (D) RANGE, INTERMEADIATE - SECOND GEAR





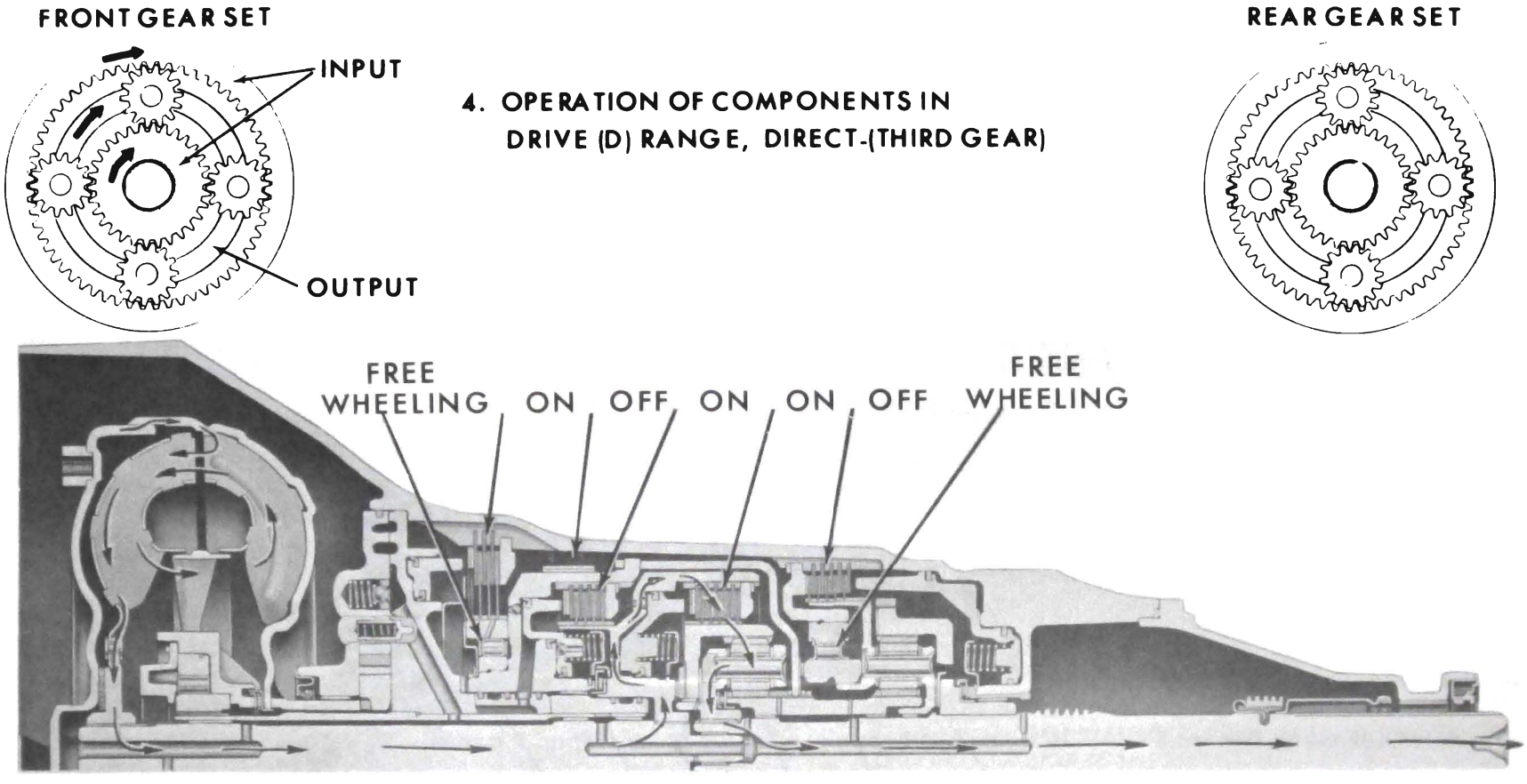
Intermediate Clutch - ON Direct Clutch - OFF Forward Clutch - ON Low and Reverse Clutch - OFF

Intermediate Overrun Roller Clutch - LOCKED Low and Reverse Roller Clutch - FREEWHEELING

Intermediate Overrun Band - OFF

In Drive "D" range intermediate, (second gear) the intermediate clutch is applied to allow the intermediate overrun roller clutch to hold the shell and sun gear stationary (against counterclockwise rotation.) Turbine torque, through the applied forward clutch is delivered to the input ring gear in a clockwise direction. Clockwise rotation of the input ring gear causes the output planet pinions to walk around the stationary sun gear in a clockwise direction. This causes the output shaft to turn in a clockwise direction in a reduction ratio of approximately 1.52 to 1.

Figure 75-6 - Operation of Components in Drive (D) Range, Intermediate - Second Gear



4. OPERATION OF COMPONENTS IN DRIVE (D) RANGE, DIRECT-(THIRD GEAR)

Intermediate Clutch - ON Direct Clutch - ON Forward Clutch - ON Low and Reverse Clutch - OFF

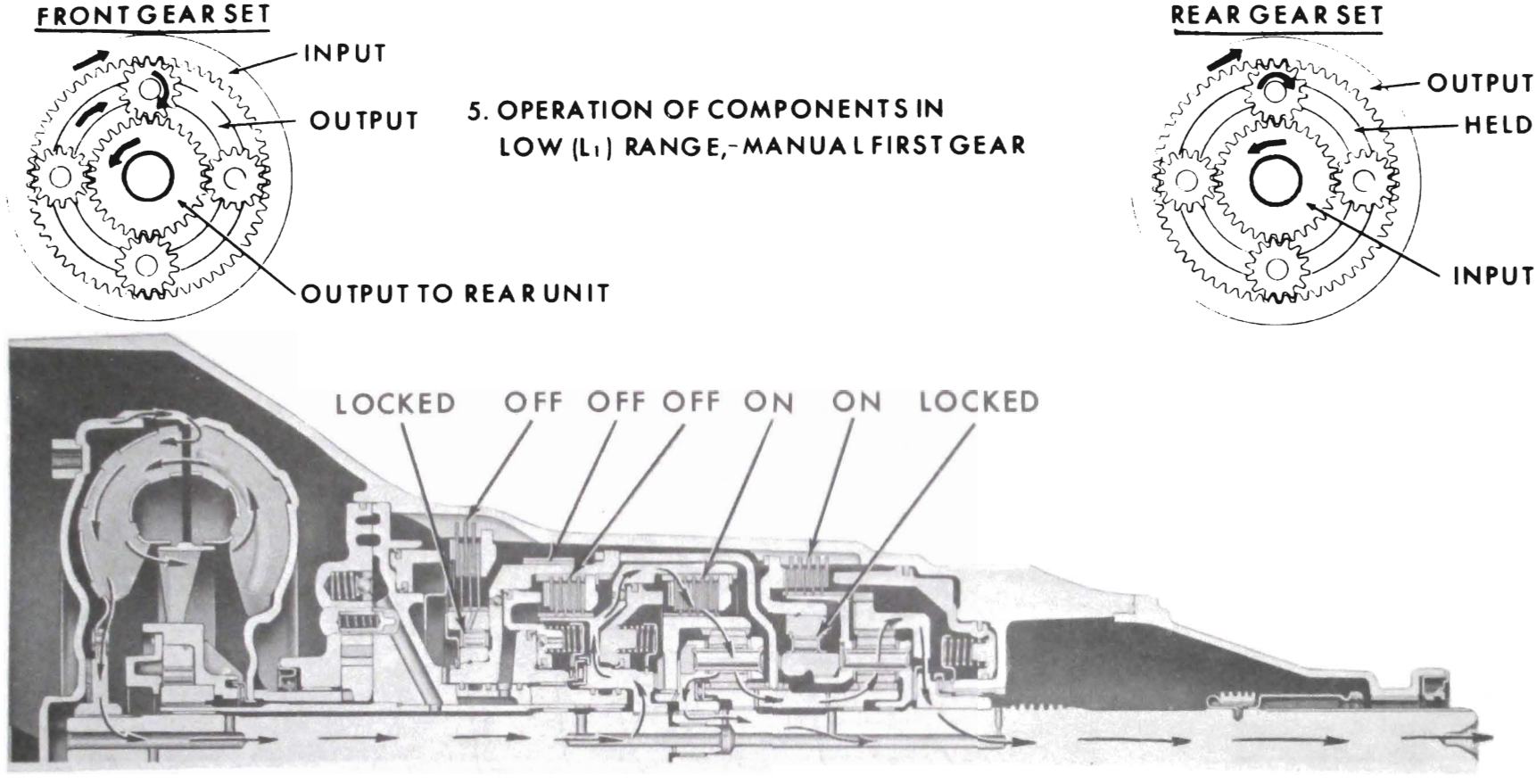
Intermediate Overrun Roller Clutch - FREE WHEELING Low and Reverse Roller Clutch - FREE WHEELING

Intermediate Overrun Band - OFF

In direct drive, engine torque it transmitted to the converter then through the forward clutch, to the input ring gear in clockwise direction the direct clutch is applied transmitting torque through the sun gear drive shell to the sun gear in a clockwise direction. Since both the sun gear and the planet pinion gears are both turning in a clockwise direction at the same speed, the planetary gear sets are locked and turn as one unit in direct drive or at a ratio of 1:1.

75-7

Figure 75-7 - Operation of Components in Drive (D) Range, Direct - Third Gear



5. OPERATION OF COMPONENTS IN LOW (L_1) RANGE,-MANUAL FIRST GEAR

Intermediate Clutch - OFF Direct Clutch - OFF Forward Clutch - ON **Low and Reverse Clutch - ON**

Intermediate Overrun Roller Clutch - Locked Low and Reverse Roller Clutch - LOCKED

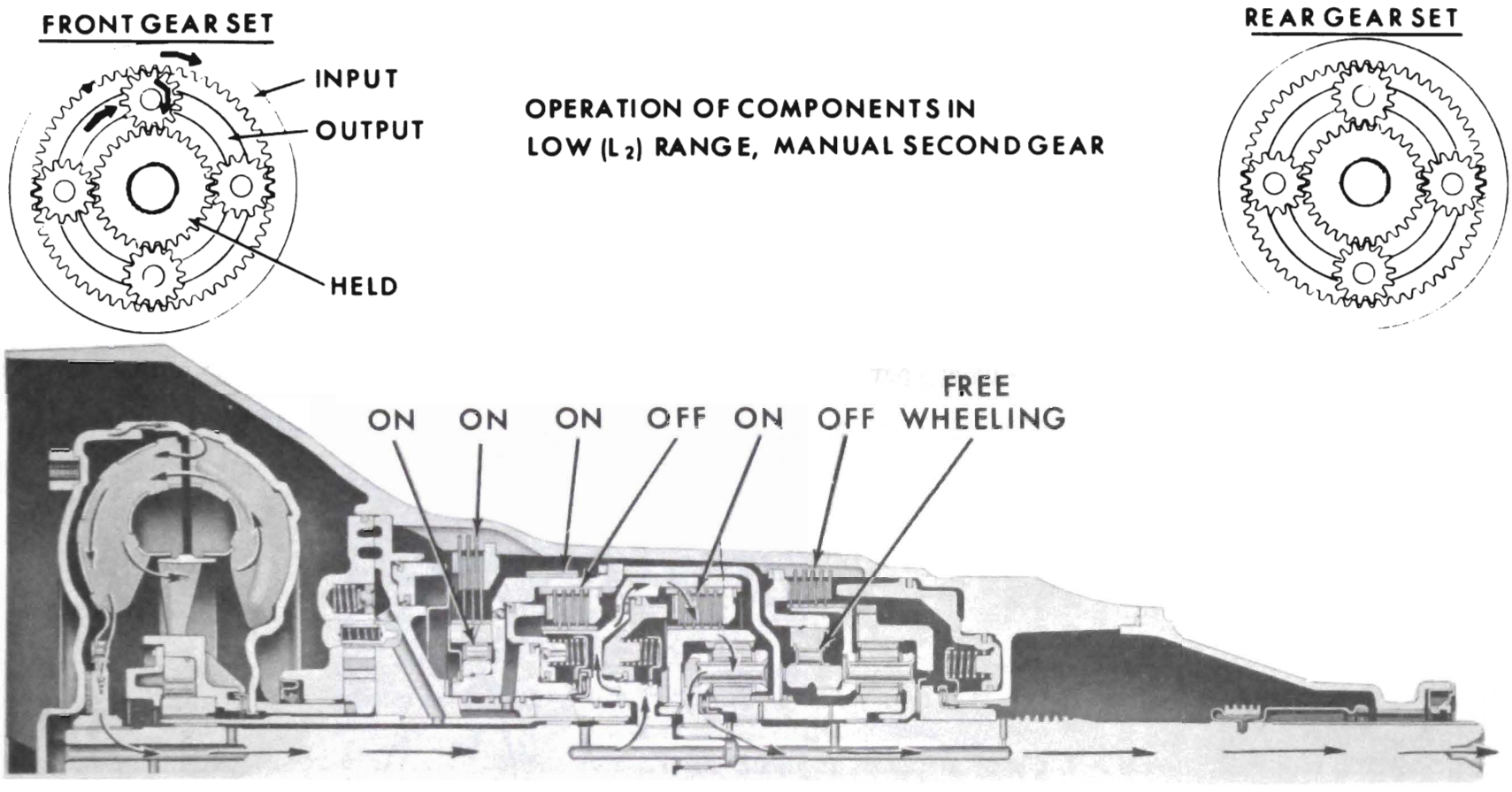
Intermediate Overrun Band - OFF

With the range selector lever in L_1 range, the forward clutch is applied. This delivers turbine torque from the input shaft through the forward clutch, to the input ring gear in clockwise direction. (Converter torque ratio equals approximately 2:25 at stall.)

Clockwise rotation of the input ring gear causes the output planet pinions to rotate in a clockwise direction, driving the sun gear counter-wise. In turn, the sun gear turns, causing the reaction carrier planet pinions to turn clockwise. Clockwise rotation of the reaction carrier planet pinions causes the output ring gear and output shaft to turn in a clockwise direction in a reduction ratio of approximately 2:52 to 1. The reaction of the reaction carrier planet pinions against the output ring gear is taken by either the low and reverse roller clutch or the low & reverse clutch which are grounded to the case.

When the transmission is shifted into L1 (first gear), the low and reverse clutch is applied below a preset controlled car speed in addition to the forward clutch which is on for all forward ranges. The low and reverse clutch provides overrun braking as it holds the reaction carrier fixed.

Figure 75-8 - Operation of Components in Low (LI) Range - Manual First Gear



OPERATION OF COMPONENTS IN LOW (L_2) RANGE, MANUAL SECOND GEAR

Intermediate Clutch - ON Direct Clutch - OFF Forward Clutch - ON Low and Reverse Clutch - OFF

Intermediate Overrun Roller Clutch - ON Low and Reverse Roller Clutch - FREE WHEELING

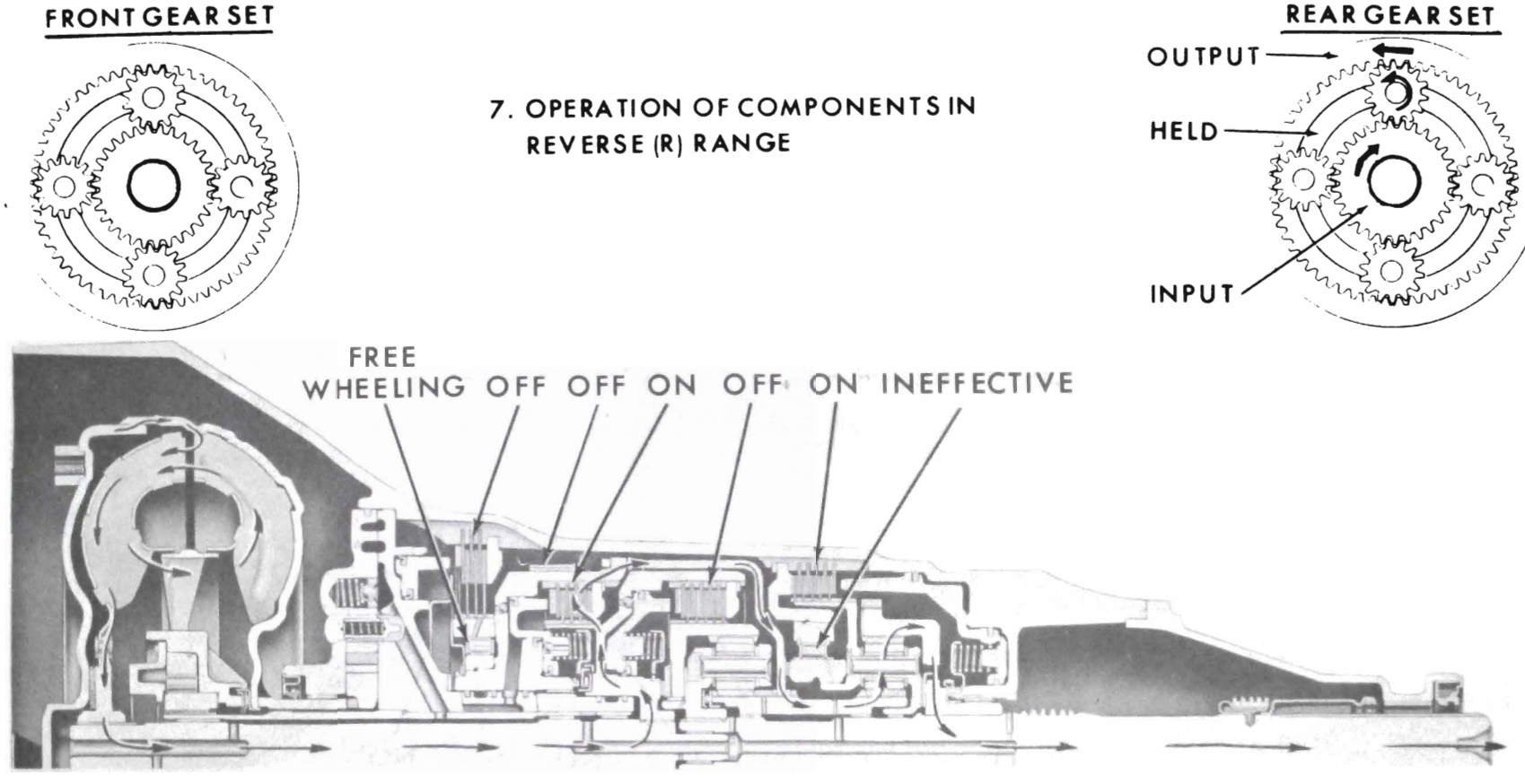
Intermediate Overrun Band - ON

In L_2 range intermediate, the intermediate clutch is applied to allow the intermediate overrun roller clutch to hold the shell and sun gear stationary (against counterclockwise rotation). Turbine torque, through the applied forward clutch is delivered to the input ring gear in a clockwise direction. Clockwise rotation of the input ring gear causes the output planet pinions to walk around the stationery sun gear in a clockwise direction. This causes the output ring gear and output shaft to turn in a clockwise direction in a reduction ratio of approximately 1:52 to 1. The reaction of the output planet pionions against the sun gear is taken by either the intermediate overrun roller clutch or the intermediate overrun band. When the transmission is shifted into L_2 (second gear), the intermediate overrun band is applied in addition to the forward and intermediate clutches. The intermediate overrun band provides overrun braking as it holds the sun gear fixed.

75-9

Figure 75-9 - Operation of Components in Low (L2) Range - Manual Second Gear

7. OPERATION OF COMPONENTS IN REVERSE (R) RANGE



Intermediate Clutch - OFF **Direct Clutch - ON** **Forward Clutch - OFF** **Low & Reverse Clutch - ON**

Intermediate Overrun Roller Clutch - FREE WHEELING **Low and Reverse Roller Clutch - INEFFECTIVE**

Intermediate Overrun Band - OFF

In Reverse "R", the direct clutch is applied to transmit torque from the forward clutch housing to the sun gear drive shell and the sun gear. The low and reverse clutch is applied preventing the output carrier from turning. Clockwise rotation of the sun gear causes the reaction carrier pinions to turn counterclockwise, thus turning the output ring gear and output shaft counterclockwise in a reduction ratio of approximately 1.93 to 1.

Figure 75-10 - Operation of Components in Reverse (R) Range

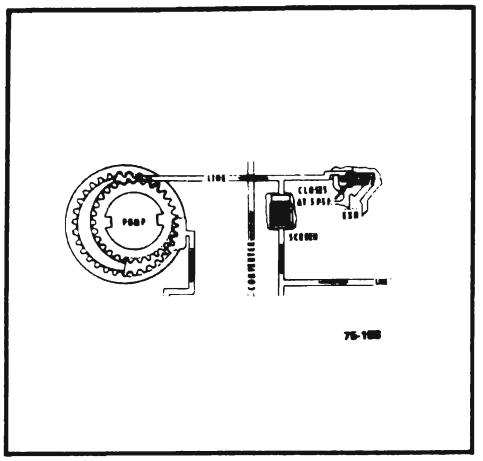


Figure 75-13 - Oil Pump and Priming Valve

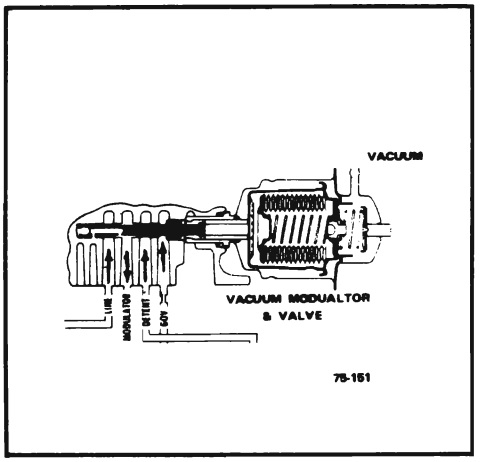


Figure 75-14 - Vacuum Modulator Assembly

modulator valve is supplied by the transmission governor, which is driven by the output shaft. The governor consists of a pair of dual weights and a regulator valve.

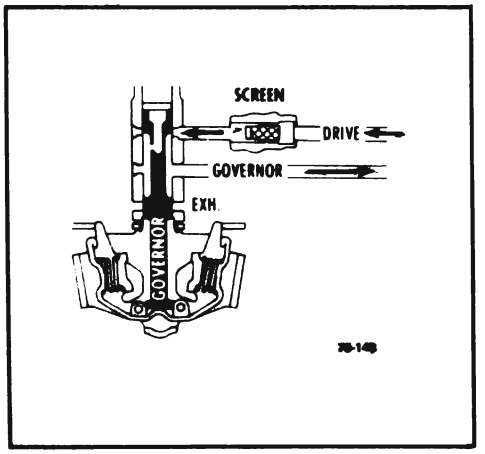


Figure 75-15 - Governor Assembly

As the car begins to move the weight assemblies move outward to provide a regulating force against the valve through the springs between the primary and secondary weights. As car speed is further increased, regulating force against the valve is provided by the secondary weights moving outward. At approximately 22 MPH the primary weights have reached the limit of their travel and the force against the valve is then entirely through the secondary weights

Thus, governor valve pressure is determined at very low speeds by the primary and secondary weights and at higher speeds by the secondary weights plus the force of the springs between the weights. In this manner governor pressure is increased rapidly but smoother from very low speeds to approximately 22 MPH, where it increases at a slower rate.

d. Pressure Regulator Valve (See Figure 75-16)

1. Regulates line pressure according to a fixed spring force and forces controlled by modulator intermediate and reverse pressure.

2. Controls flow of oil that charges the torque converter, feeds the oil cooler and provides lubrication and oil for clutch applications.

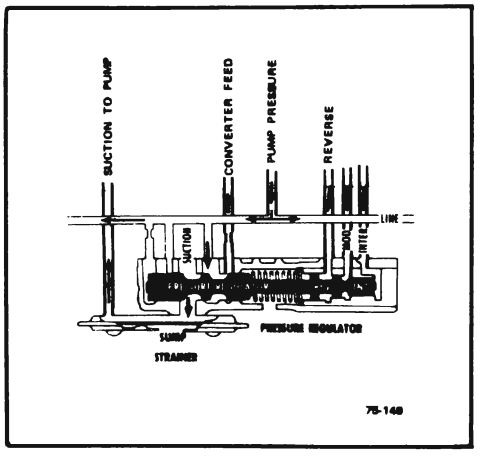


Figure 75-16 - Pressure Regulator Valve

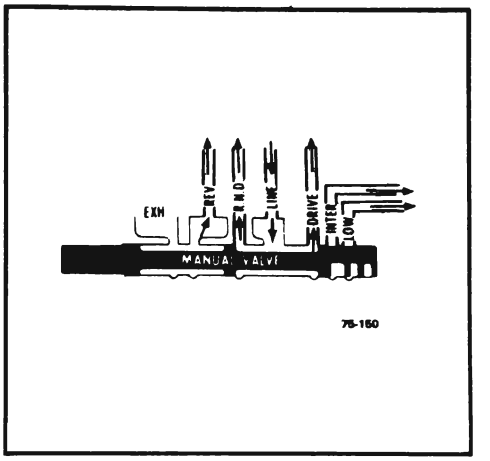


Figure 75-17 - Manual Valve

e. Manual Valve (See Figure 75-17)

Establishes the range of transmission operation, i.e., P, R, N, D, Ll, L2, as selected by the vehicle operator through the manual selector lever.

f. Modulator Valve (See Figure 75-18)

Regulates line pressure to modulator pressure that varies with torque to the transmission. It senses forces created by:

1. The vacuum modulator bellows that increases modulator pressure.

2. Engine vacuum acting on a diaphragm to decrease modulator pressure.

3. Governor pressure which is generated by the governor assembly. Governor pressure tends to decrease modulator pressure.

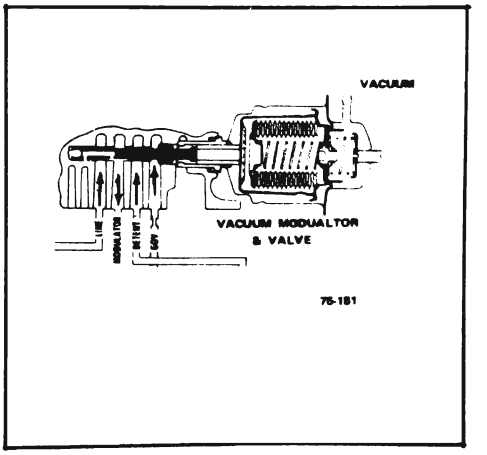


Figure 75-18 - Modulator Valve

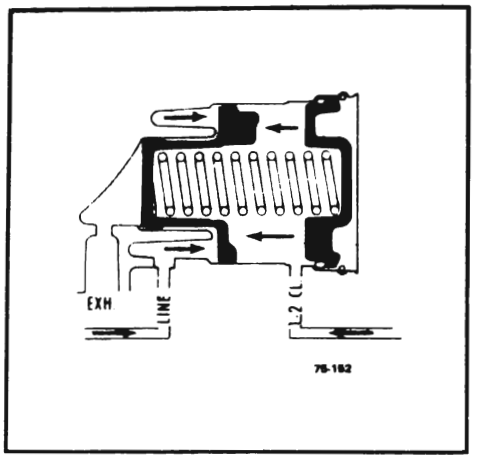


Figure 75-19 - 1-2 Accumulator

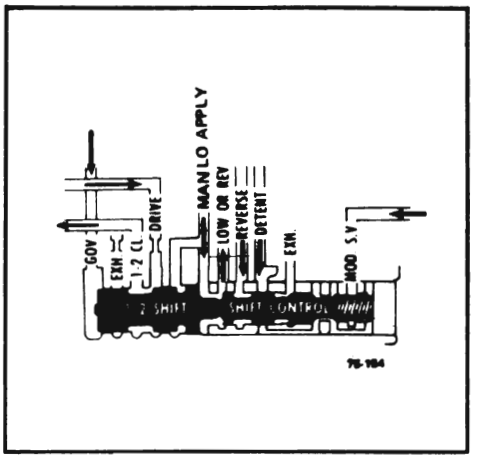


Figure 75-21 - 1-2 Shift Valve

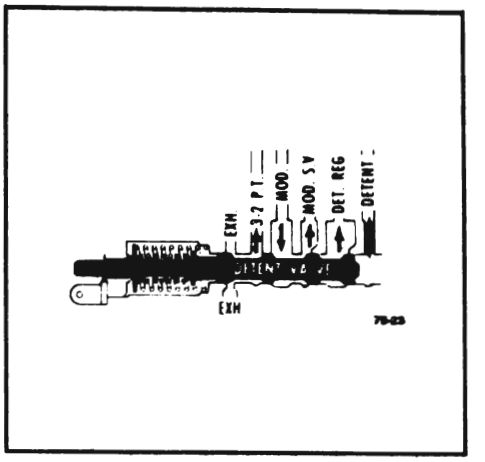


Figure 75-23 - Detent Valve

g. 1-2 Accumulator (See Figure 75-19)

Line pressure routed to the 1-2 accumulator causes the piston to cushion application of the intermediate clutch. The spring within the accumulator acts against the piston. The force of the spring and the pressure of the 1-2 clutch oil push the 1-2 accumulator piston back towards the line oil to allow a gradual build up of the 1-2 clutch pressure.

h. 2-3 Accumulator (See Figure 75-20)

Oil routed to the 2-3 accumulator cushions the application of the direct clutch. The spring within the accumulator acts against the piston. The force of the spring and the pressure of the 2-3 clutch oil push the 2-3 accumulator piston back towards the R, D, N oil to allow a gradual build up of the 2-3 clutch pressure.

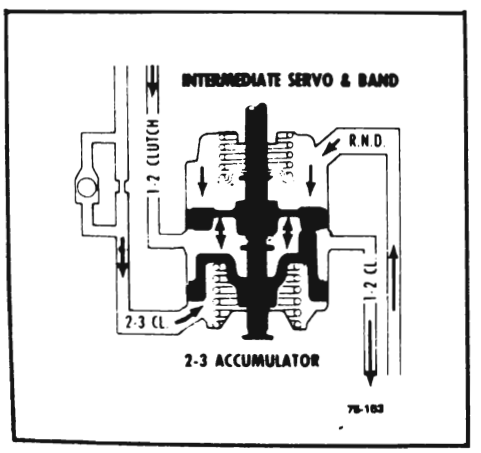


Figure 75-20 - 2-3 Accumulator

i. 1-2 Shift Valve (See Figure 75-21)

Routes oil pressure that causes the transmission to shift from 1-2 or 2-1. Its operation is controlled by governor pressure, detent pressure, modulator pressure, and spring force. See Figure 75-21.

j. 2-3 Shift Valve (See Figure 75-22)

Routes oil pressure that causes the transmission to shift from 2-3 or 3-2. Its operation is controlled by modulator, governor, detent and modulator, valves pressures as well as a spring force.

k. Detent Valve (Actuated by Cable Linkage From Throttle Linkage) (See Figure 75-23)

Directs regulated modulator pressure tending to hold the 1-2 shift and 2-3 shift valves in the downshift position and provides areas for modulator and detent regulated pressures for detent 2-1, 3-1, and 3-2 downshifts.

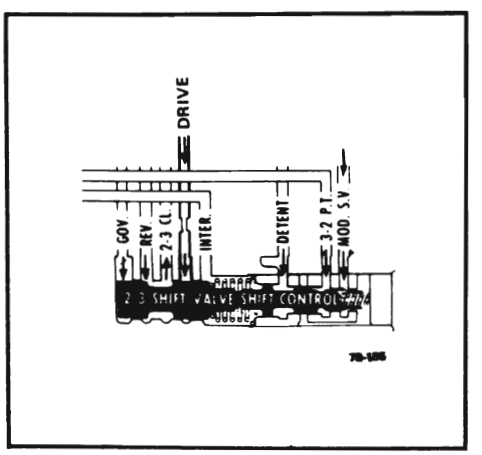


Figure 75-22 - 2-3 Shift Valve

l. Detent Regulator Valve (See Figure 75-24)

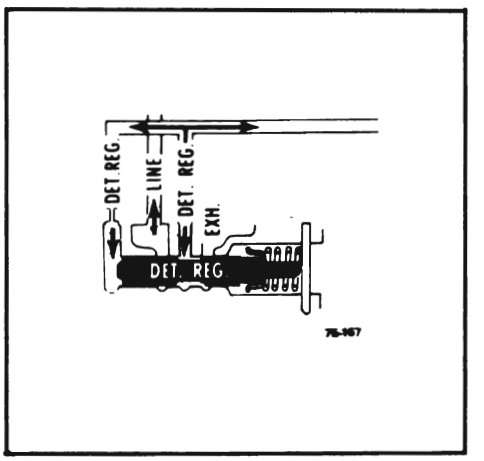


Figure 75-24 - Detent Regulator Valve

The detent regulator valve and spring regulate line pressure into detent regulator oil which is used to control the car speed at which the 1-2 and 2-3 upshifts occur.

m. Oil Pump Priming Valve (See Figure 75-25)

The priming valve provides an exhaust for any air that may be trapped in the pump and suction oil passages. The priming valve spring holds the valve in an open position until the pump primes allowing any trapped air to exhaust. As hydraulic pressure reaches approximately 5 psi., the valve is forced to the bottom

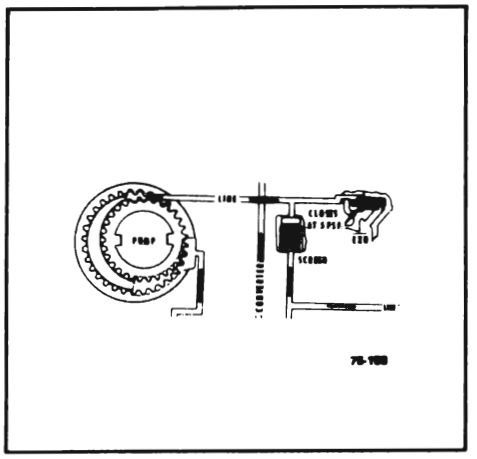


Figure 75-25 - Pump Priming Valve

of its bore, closing the exhaust bleed hole.

n. Cooler By-Pass Valve (See Figure 75-26)

The cooler by-pass valve permits oil to be fed directly from the converter to the lubrication circuit when the oil is very cold or if the cooler or lines should become restricted.

o. Manual Low Control Valve (See Figure 75-27)

The manual low control valve is positioned to exhaust the manual low apply line when the manual valve is placed in the manual low (L1) position above approximately 50 MPH. At speeds below 50 MPH low oil is fed into the manual low apply line which move the 1-2 shift valve to the downshifted position

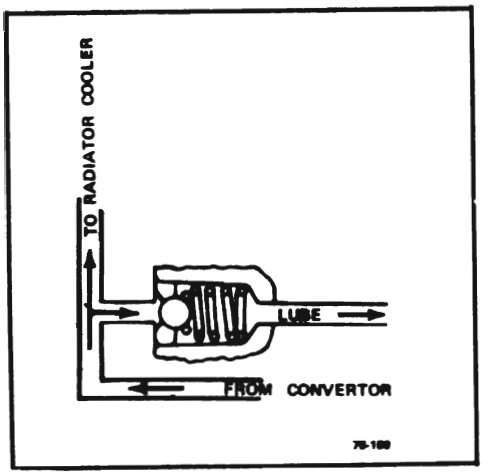


Figure 75-26 - Cooler By-Pass Valve

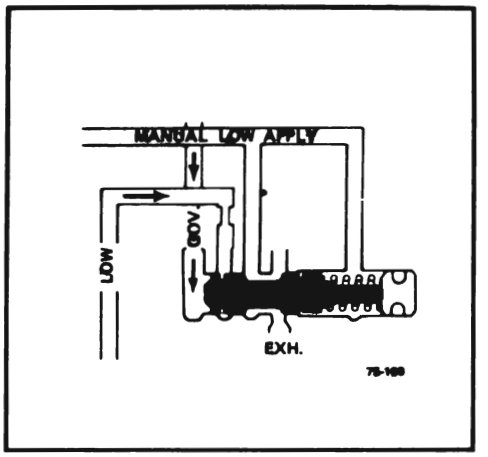


Figure 75-27 - Manual Low Control Valve

(exhausting the 1-2 clutch) and moves the 1-2 shift control valve to the upshifted position which sends low apply oil to the low and reverse clutch which engages this clutch. Once the manual low control valve is in the downshifted position, its spring plus low apply oil acting on it will keep it in this position; therefore, with the transmission in manual low (L1 range), the transmission cannot upshift to intermediate (second gear) regardless of vehicle or engine speed once low gear has been engaged.

The manual low control valve is used also to protect the engine by preventing low range engagement (indicated by high car speed which is sensed by high governor pressure) at car speeds over 50 MPH.

75-7 TRANSMISSION ASSEMBLY - REMOVAL AND INSTALLATION

a. Removal

1. Raise car and provide support for front and rear of car.

2. Disconnect front exhaust crossover pipe if necessary.

3. Remove propeller shaft.

4. Place suitable jack under transmission and fasten transmission securely to jack.

5. Remove vacuum line from vacuum modulator. See Figure 75-44.

6. Loosen cooler line nuts and separate cooler lines from transmission.

7. Remove detent cable from accelerator lever assembly. CAUTION: Do not bend cable. Remove plastic guide from bracket and slide cable out through slot. See Figure 75-2.

8. Remove detent cable from detent valve link. CAUTION: Do not bend cable.

9. Remove transmission mounting pad to cross member bolts.

10. Remove transmission cross member support to frame rail bolts. Remove cross member.

11. Disconnect speedometer cable.

12. Disconnect shift linkage from transmission.

13. Disconnect transmission filler pipe at engine. Remove filler pipe from transmission. See Figure 75-44.

14. Support engine at oil pan.

15. Remove transmission flywheel cover pan to case tapping screws. Remove flywheel cover pan.

16. Mark flywheel and converter for reassembly in same position, and remove three converter to flywheel bolts.

17. Assemble transmission to suitable transmission jack and remove transmission case to engine block bolts.

18. Move transmission rearward to provide clearance between converter pump and crankshaft. Install converter holding Tool J-21366 to retain converter. Lower transmission and move to bench.

b. Installation

1. Assemble transmission to suitable transmission jack and raise transmission into position. Remove converter

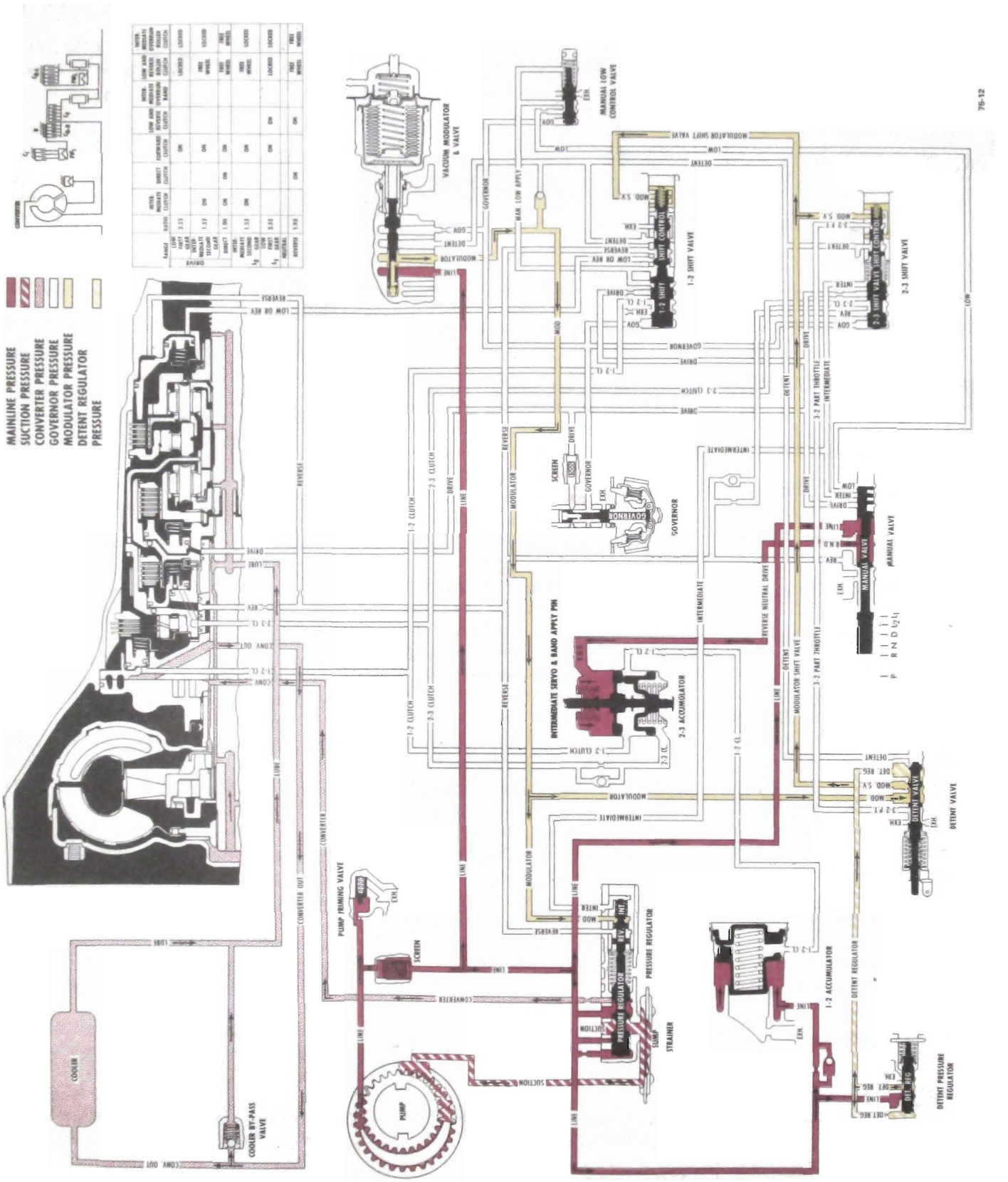


Figure 75-28 - Neutral - Engine Running

NEUTRAL — ENGINE RUNNING

Intermediate Clutch — Off
Direct Clutch — Off
Forward Clutch — Off
Low and Reverse Clutch — Off

Intermediate Overrun Roller Clutch — Free Wheeling
Low and Reverse Roller Clutch — Free Wheeling
Intermediate Overrun Band — Off

Whenever the engine is running at idle with the selector lever in neutral, oil from the pump is directed to —

1. Pump Priming Valve
2. Pressure Regulator Valve
3. Converter (With Pressure Regulator Valve regulating)
   a. Cooler By-pass Valve
   b. Oil Cooler
   c. Lubrication System.
4. Manual Valve
5. Modulator Valve
6. 2-3 Accumulator (Neutral — Not In Park)
7. Detent Pressure Regulator
8. 1-2 Accumulator

Cooling and Lubrication

Oil flows from the pump to the priming valve and then to the pressure regulator valve which regulates the pump pressure. When pump output exceeds the demand of line pressure, oil from the pressure regulator valve is directed to the converter feed passage to fill the converter. Converter return oil is directed to the cooler by-pass valve and transmission cooler. Oil from the cooler is directed to the transmission lubrication system. The cooler by-pass valve permits oil to be fed directly from the converter to the lubrication circuit if the cooler should become restricted.

The primary valve provides an exhaust for any air that may be trapped in the pump. The primary valve spring holds the valve in an open position until the pump primes allowing any trapped air to exxhaust. As hydraulic pressure reaches approximately 5 PSI, the valve is forced to the bottom of its bore, closing the exhaust bleed hole.

From the pressure regulator valve line oil is then routed as follows —

1. Manual Valve
2. 2-3 Accumulator
3. Detent Pressure Regulator
4. 1-2 Accumulator
5. Vacuum Modulator Valve

Line pressure at the modulator valve is regulated to modulator oil which acts on the modulator and reverse boost valve, detent valve, 2-3 shift control valve, and the 1-2 shift control valve.

Summary

The converter is filled, all clutches and bands are released. The transmission is in neutral.

Figure 75-29 - Neutral - Engine Running

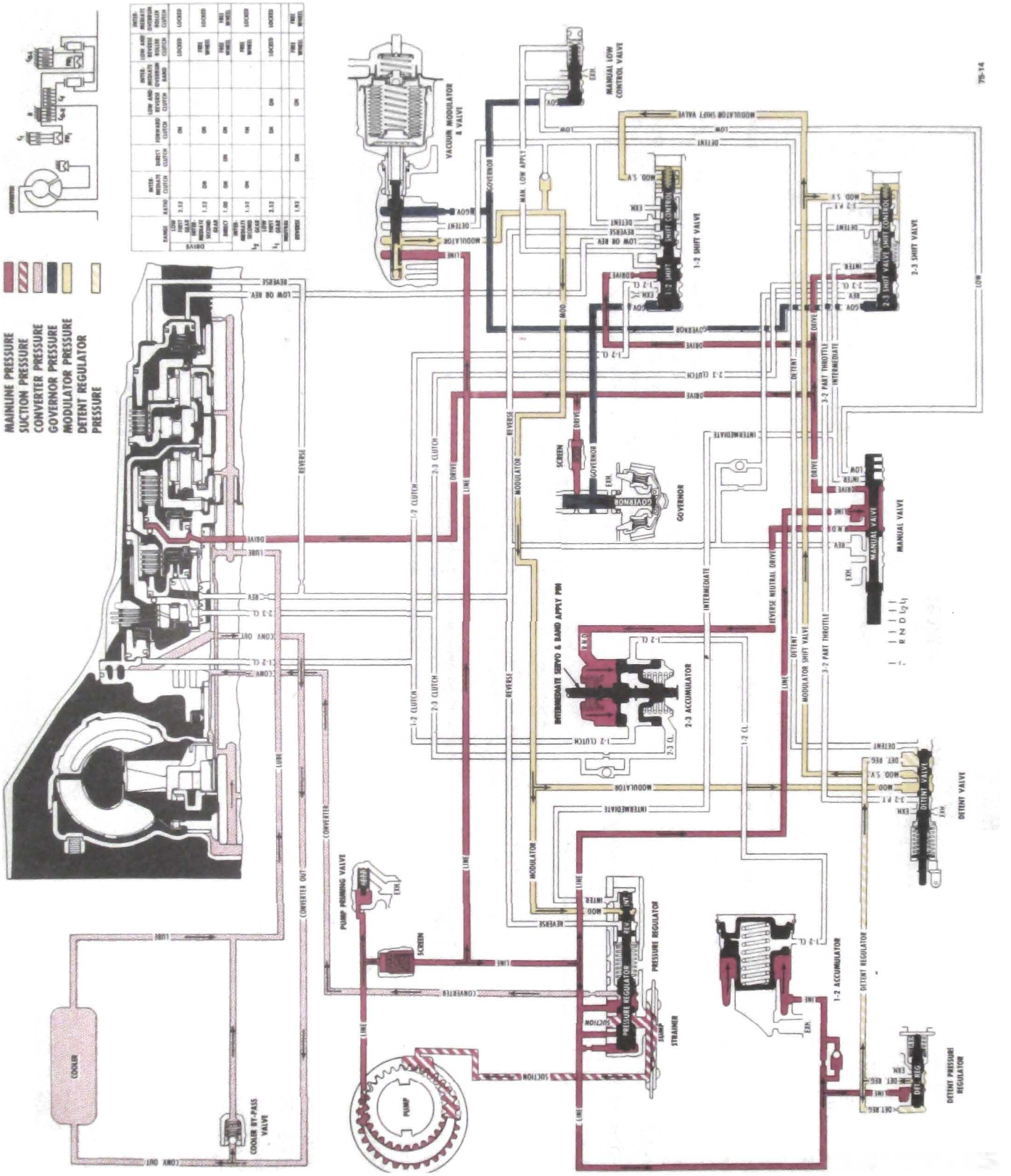


Figure 75-30 - Drive Range - Low (First Gear)

DRIVE RANGE — LOW — (FIRST GEAR)

Intermediate Clutch — Off
Direct Clutch — Off
Forward Clutch — On
Low and Reverse Clutch — Off
Intermediate Overrun Roller Clutch — Locked
Low and Reverse Roller Clutch — Free Wheeling
Intermediate Overrun Band — Off

Line pressure is fed to the:

1. Modulator Valve
2. 1-2 Accumulator Piston
3. Detent Pressure Regulator Valve
4. Manual Valve

From the manual control valve line pressure forms drive oil and is fed to the:

1. Forward Clutch
2. Governor
3. 1-2 Shift Valve
4. 2-3 Shift Valve
5. Intermediate Servo (as R.N.D. oil)

Basic Control

When the selector lever is moved to the drive position, the manual valve directs line pressure to the R.N.D. and drive ports. R.N.D. pressure strokes the 2-3 accumulator so that it is prepared to cushion the 2-3 clutch for an upshift. The 1-2 accumulator has already been stroked with line oil to prepare it to cushion the 1-2 clutch.

Drive oil applies the forward clutch, feeds the governor and also the 1-2 and 2-3 shift valves.

Summary

Drive oil is directed to the forward clutch and is regulated to a variable pressure called governor pressure at the governor assembly.

Governor pressure increases with car speed and acts against the ends of the 1-2 and 2-3 shift valves, and the modulator valve.

Figure 75-31 - Drive Range - Low
(First Gear)

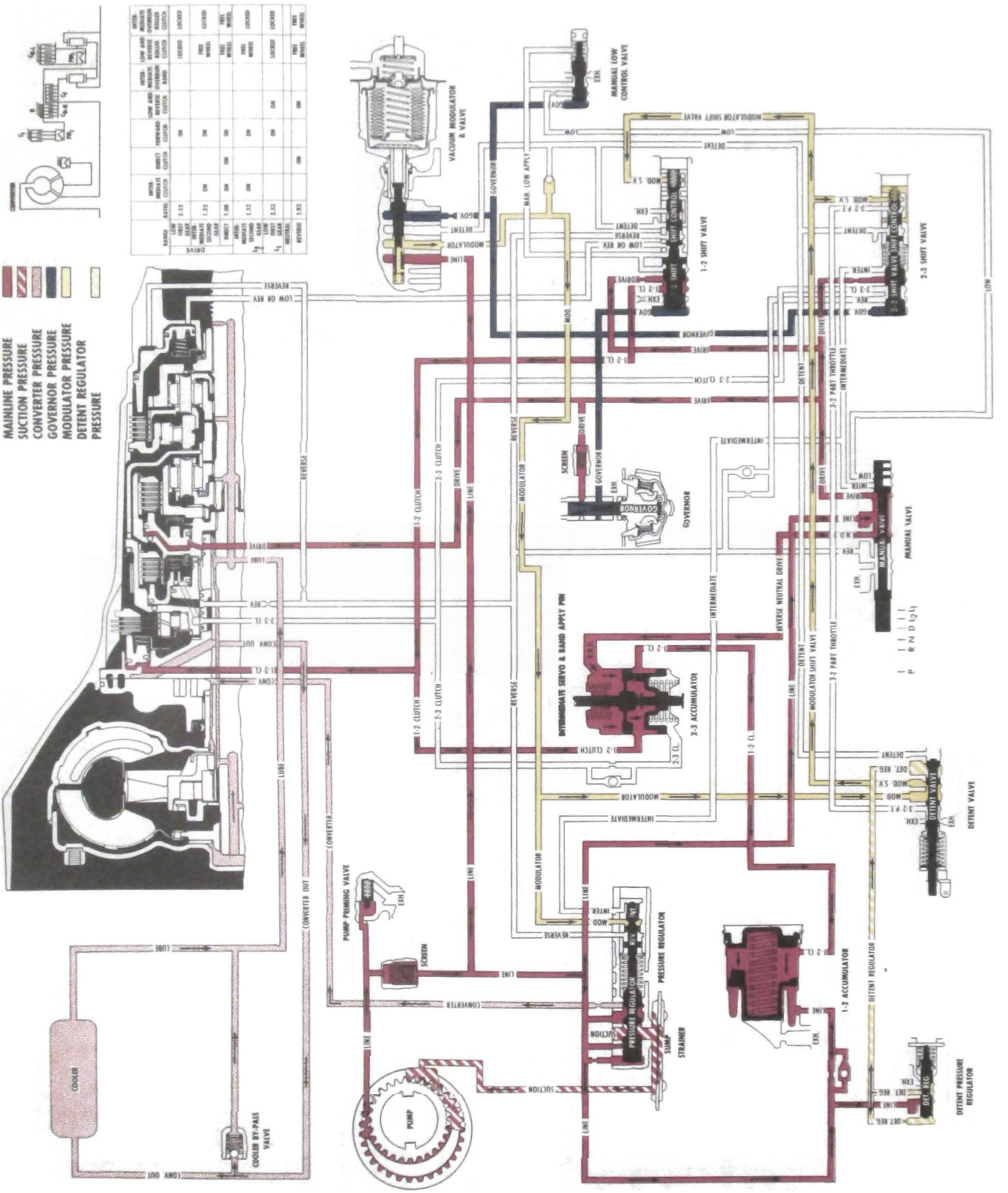


Figure 75-32 - Drive Range - Intermediate (Second Gear)

DRIVE RANGE — INTERMEDIATE (SECOND GEAR)

Intermediate Clutch — On
Direct Clutch — Off
Forward Clutch — On
Low and Reverse Clutch — Off
Intermediate Overrun Roller Clutch — Locked
Low and Reverse Roller Clutch — Free Wheeling
Intermediate Overrun Band — Off

As both vehicle speed and governor pressure increase, the force of governor pressure (46 PSI @ W.O.T.) acting on the 1-2 shift valve overcome the force of the 1-2 shift valve spring and modulator oil regulated by the modulator valve. This allows the 1-2 shift valve to move to the upshifted position which directs drive oil to apply the intermediate clutch. Oil in this passage is called (1-2) clutch oil.

Intermediate (1-2) clutch oil from the 1-2 shift valve is directed to:

1. Intermediate Clutch
2. 2-3 Accumulator
3. 1-2 Accumulator

Basic Control

Intermediate clutch oil flows from the 1-2 shift valve through the 2-3 accumulator. And then to the 1-2 accumulator which cushions intermediate clutch application. The 1-2 accumulator has clutch apply pressure and a calibration spring acting on one side with line pressure on the other side.

Summary

The forward and intermediate clutch are applied. The transmission is in drive range 2nd gear. When in drive range the full throttle 1-2 upshift will occur at approximately 50 MPH and minimum throttle 1-2 upshift will occur at approximately 12 MPH.

Figure 75-33 - Drive Range
Intermediate (Second Gear)

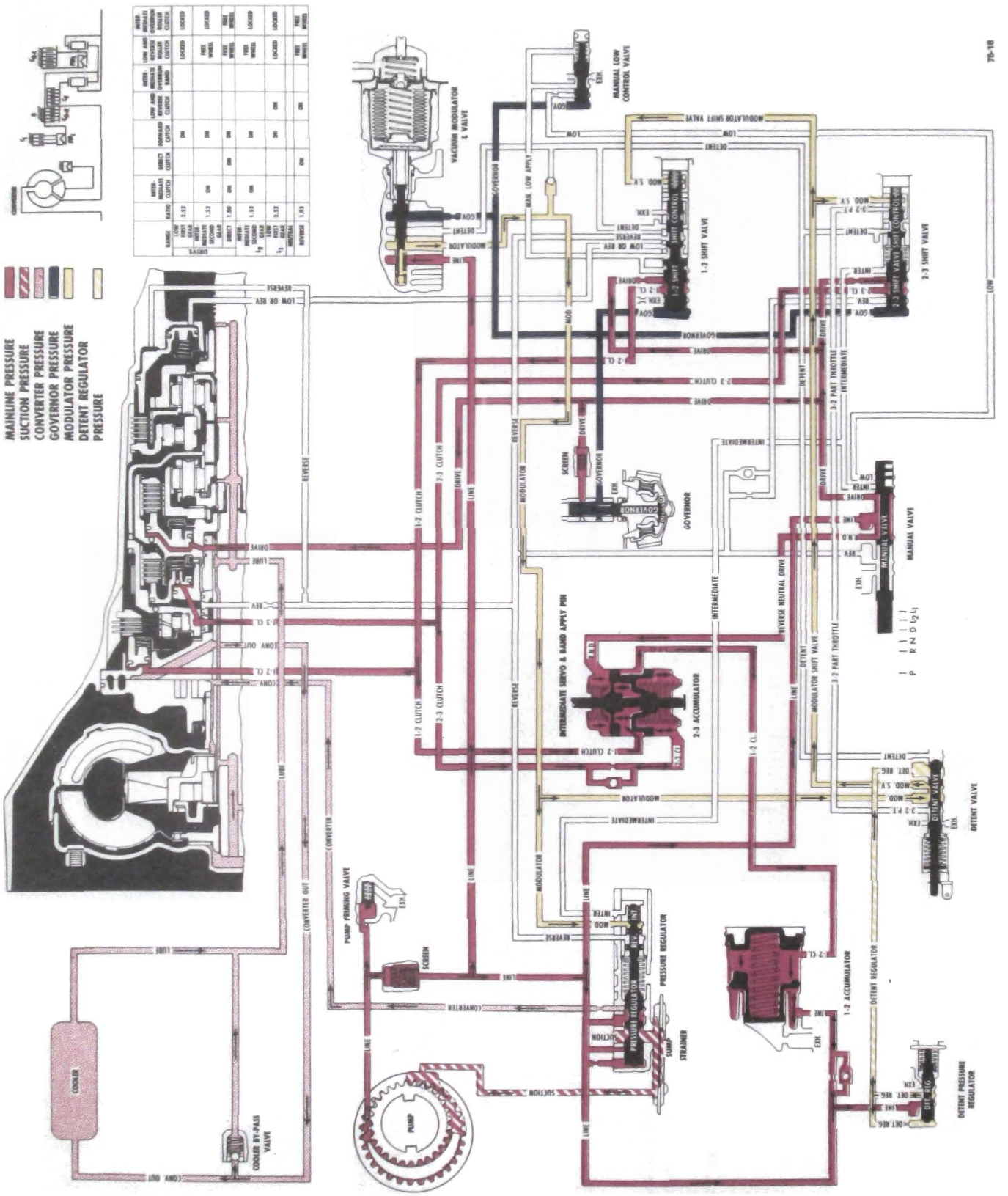


Figure 75-34 - Drive Range - Direct (Third Gear)

DRIVE RANGE — DIRECT (THIRD GEAR)

Intermediate Clutch — On
Direct Clutch — On
Forward Clutch — On
Low and Reverse Clutch — Off

As vehicle speed and governor pressure increase, the force of the governor pressure (83 PSI @ W.O.T.) acting on the 2-3 shift valve overcomes the force of the 2-3 shift valve spring and modulator oil. This allows the 2-3 shift valve to move to the upshifted position feeding drive oil to the direct clutch. This oil is called 2-3 (direct) clutch oil.

Direct (2-3) clutch oil is directed from the 2-3 shift valve to:

1. Direct Clutch
2. 2-3 Accumulator

Intermediate Overrun Roller Clutch — Free Wheeling
Low and Reverse Roller Clutch — Free Wheeling
Intermediate Overrun Band — Off

Basic Control

Direct (2-3) clutch oil from the 2-3 shift valve flows to the direct clutch and also to the 2-3 accumulator piston. The shift is cushioned by the R.N.D. oil force on the other side of the accumulator piston.

Summary

The forward, intermediate and direct clutches are applied. The transmission is in drive range — third gear (direct drive).
When in drive range the full throttle 2-3 upshift will occur at approximately 85 MPH and minimum throttle 2-3 upshifts will occur at approximately 22 MPH.

Figure 75-35 - Drive Range - Direct (Third Gear)

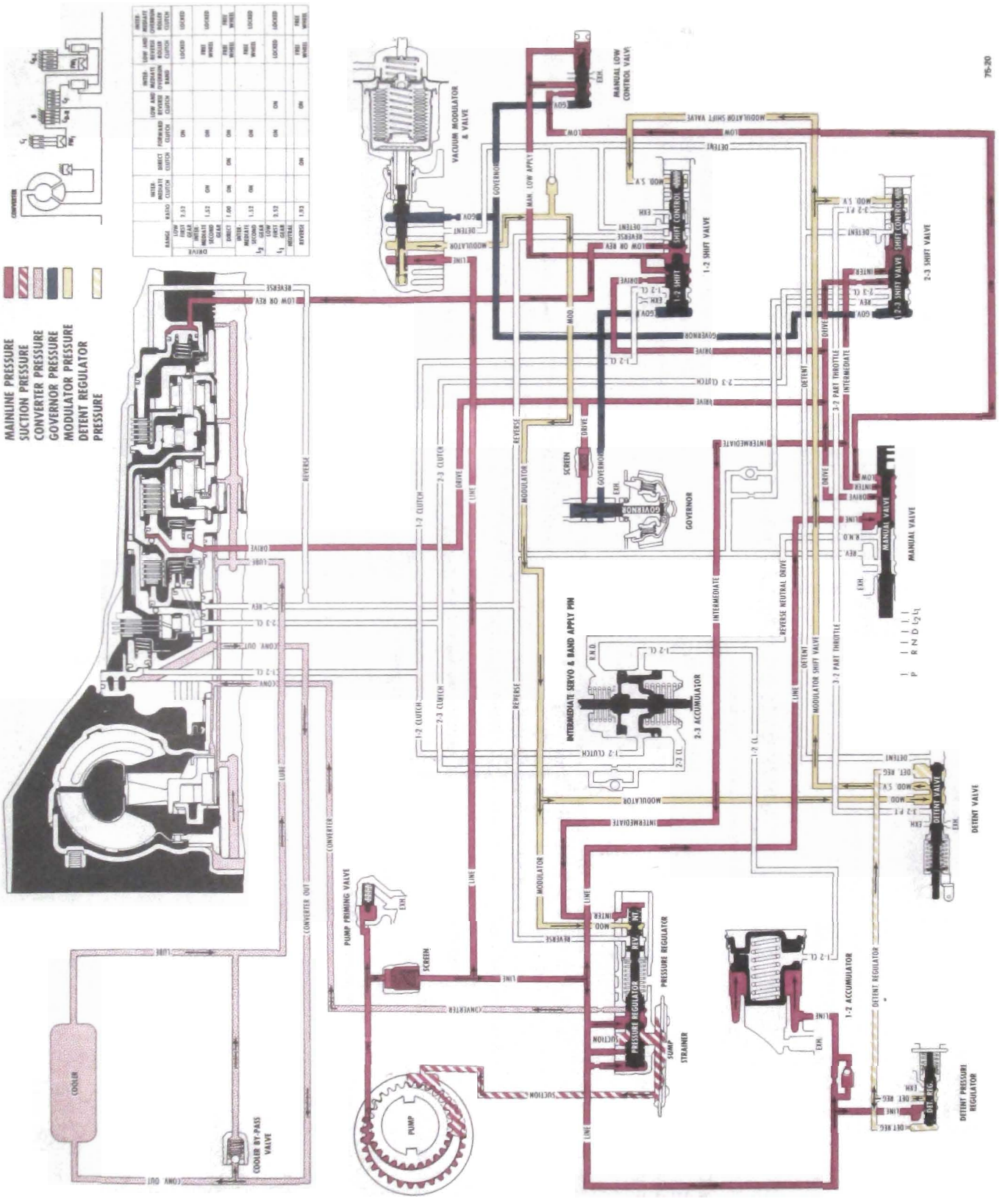


Figure 75-36 - LI Range (Manual Low - 1st Gear)

L_1 — RANGE (MANUAL LOW — FIRST GEAR)

Intermediate Clutch — Off
Direct Clutch — Off
Forward Clutch — On
Low and Reverse Clutch — On
Intermediate Overrun Roller Clutch — Locked
Low and Reverse Roller Clutch — Locked
Intermediate Overrun Band — Off

Maximum downhill braking can be attained at speeds below approximately 50 MPH with the selector lever in L_1 range position, low range oil from the manual valve is then directed to the manual low control valve which in turn directs it through the 1-2 shift valve train to the low and reverse clutch piston (inner area only).

Basic Control

The manual low control valve is positioned to exhaust the manual low apply line when the manual valve is placed in the manual low (L_1) position above approximately 50 MPH. At speeds below 50 MPH low oil is fed into the manual low apply line which moves the 1-2 shift valve to the downshift position (exhausting the 1-2 clutch) and moves the 1-2 shift control valve to the upshifted position which sends low apply oil to the low and reverse clutch which engages this clutch. Once the manual low control valve is in the downshifted position, its spring plus low apply oil acting on it will keep it in this position; therefore, with the transmission in manual low (L_1 range), the transmission cannot upshift to intermediate (second gear) regardless of vehicle or engine speed once low gear has been engaged.

Summary

The forward clutch and the low and reverse clutch are applied. The transmission is in low (first gear) L_1 range.
The manual low control valve is used also to protect the engine by preventing low range engagement (indicated by high car speed which is sensed by high governor pressure) at car speeds over 50 MPH, or approximately 3600 engine rpm.

Figure 75-37 - LI Range (Manual Low - Ist Gear)

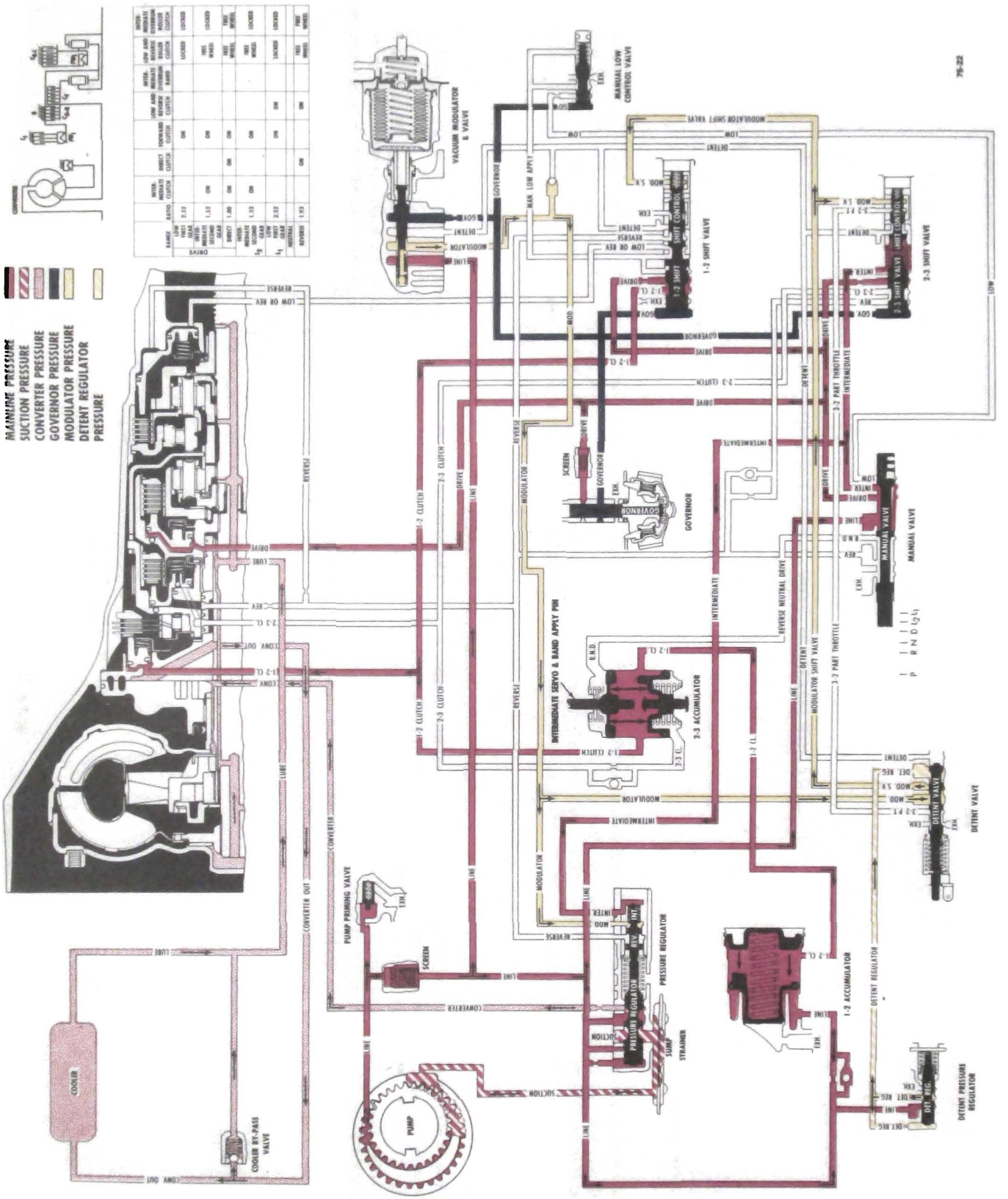


Figure 75-38 - L2 Intermediate Range (Manual Second Gear)

L_2 — INTERMEDIATE RANGE (MANUAL SECOND GEAR)

Intermediate Clutch — On
Direct Clutch — Off
Forward Clutch — On
Low and Reverse Clutch — Off
Intermediate Overrun Roller Clutch — Locked
Low and Reverse Roller Clutch — Free Wheeling
Intermediate Overrun Band — On

A manual 3-2 downshift can be accomplished by moving the selector lever from drive to intermediate range (L_2). Intermediate oil from the manual valve is then directed to:

1. Intermediate Boost Valve
2. 2-3 Shift Valve

Intermediate oil at the pressure regulator intermediate boost valve will increase minimum line pressure to 80 PSI. Intermediate oil will move the 2-3 shift valve to the downshifted position regardless of car speed. This in turn releases the direct clutch.

When the manual valve is moved to the intermediate position R.N.D. oil is exhausted. 1-2 clutch oil acting on the intermediate servo piston then applies the intermediate overrun band which places the transmission in second gear. This provides engine braking in the intermediate range by preventing counterclockwise rotation of the direct clutch drum, sun gear drive shell, and sun gear once the transmission is in second gear, it cannot upshift to third gear regardless of car speed.

Summary

When the forward, intermediate clutches and intermediate overrun band are applied, the transmission is in intermediate range — second gear and allows engine braking. When the car slows down to approximately 9 MPH a 2-1 shift will occur when decreased governor pressure allows the 1-2 shift valve to move and exhaust the 1-2 clutch.

Figure 75-39 - L2 Intermediate Range (Manual Second Gear)

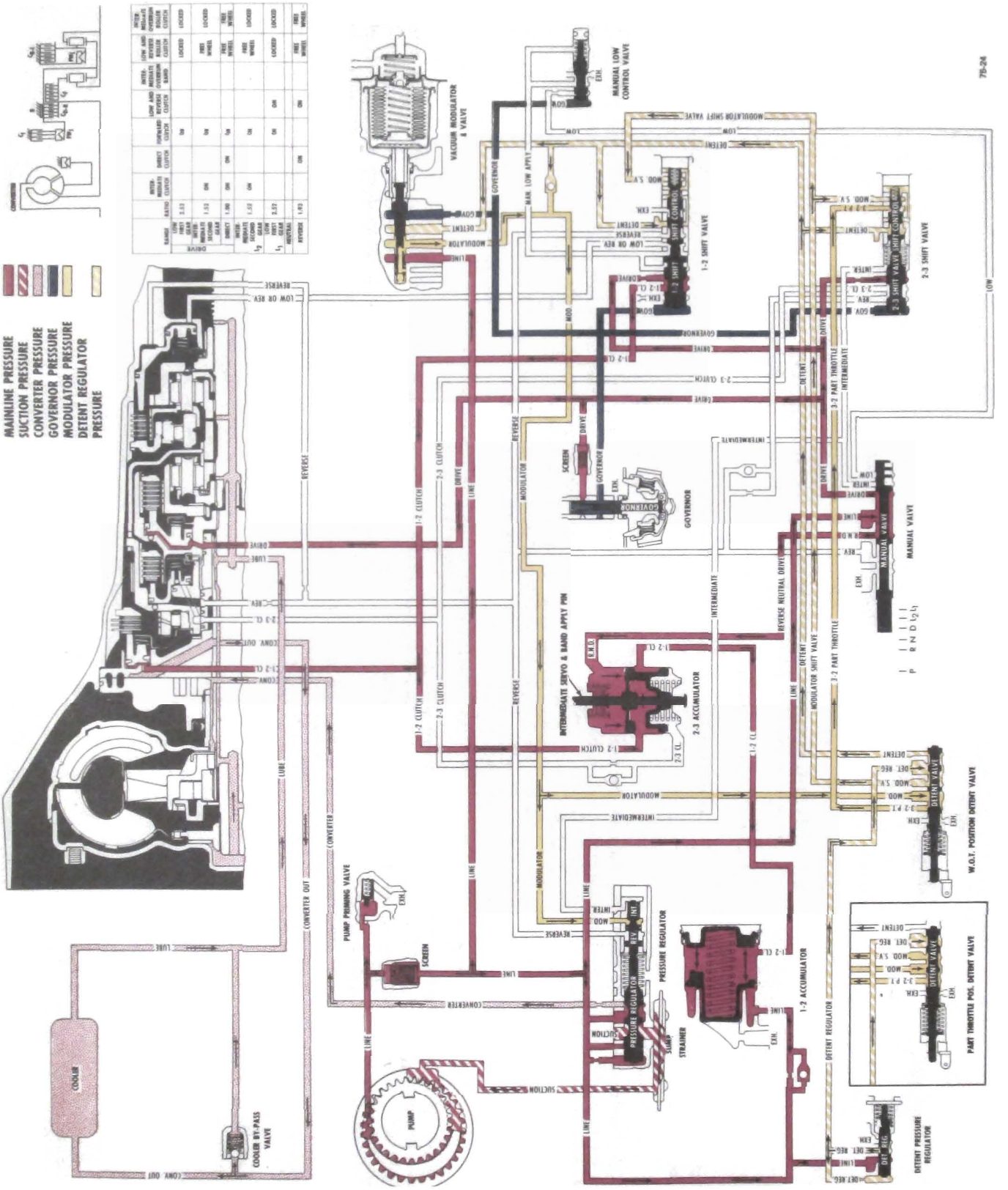


Figure 75-40 - Drive Range Detent Downshift (1-2 and 2-3 Shift Valves in Second Gear Position)

DRIVE RANGE DETENT DOWNSHIFT (1-2 AND 2-3 SHIFT VALVES IN SECOND GEAR POSITION)

Intermediate Clutch — On
Direct Clutch — Off
Forward Clutch — On
Low and Reverse Clutch — Off
Intermediate Overrun Roller Clutch — Locked
Low and Reverse Roller Clutch — Free Wheeling
Intermediate Overrun Band — Off

While operating at speeds below approximately 75 MPH, a forced or detent 3-2 downshift is possible by depressing the accelerator fully. This moves the detent valve by cable linkage, to its extreme inner position allowing modulator oil to be routed into the 3-2 part throttle passage and detent regulator oil to be routed into the modulator shift valve and detent passages. Detent regulated oil therefore acts on both the 1-2 & 2-3 shift control valves and modulator pressure also acts on the 2-3 shift control valve through the 3-2 part throttle passage. Detent regulator oil is also routed to the modulator valve via the detent passage.

Modulator oil, detent regulator oil plus the force of the 2-3 shift control valve spring will move the 2-3 shift valve to the downshift position below approximately 75 MPH shifting the transmission to second gear.

A detent 2-1 or 3-1 downshift can also be accomplished below approximately 40 MPH because detent regulator oil is directed to 1-2 shift control valve. This allows detent regulator oil plus the force of the 1-2 shift control valve spring to move the 1-2 shift valve to the downshifted position placing the transmission in first gear.

Detent regulator oil is directed to the modulator valve to prevent modulator pressure from falling below that of detent regulator at high speeds or at high altitudes.

NOTE: The 3-2 part throttle downshift can be made below 50 MPH (see insert of detent valve in part throttle position). At light throttle opening the 3-2 part throttle passage is exhausted; however, at moderate throttle opening the detent valve connects modulator pressure to the 3-2 part throttle passage. If modulator pressure acting on the 3-2 part throttle area of the 2-3 shift control valve plus the 2-3 shift valve spring is sufficient to move the valve to the downshifted position, the transmission will be in second gear.

Figure 74-41 - Drive Range Detent Downshift (1-2 and 2-3 Shift Valves in Second Gear Position)

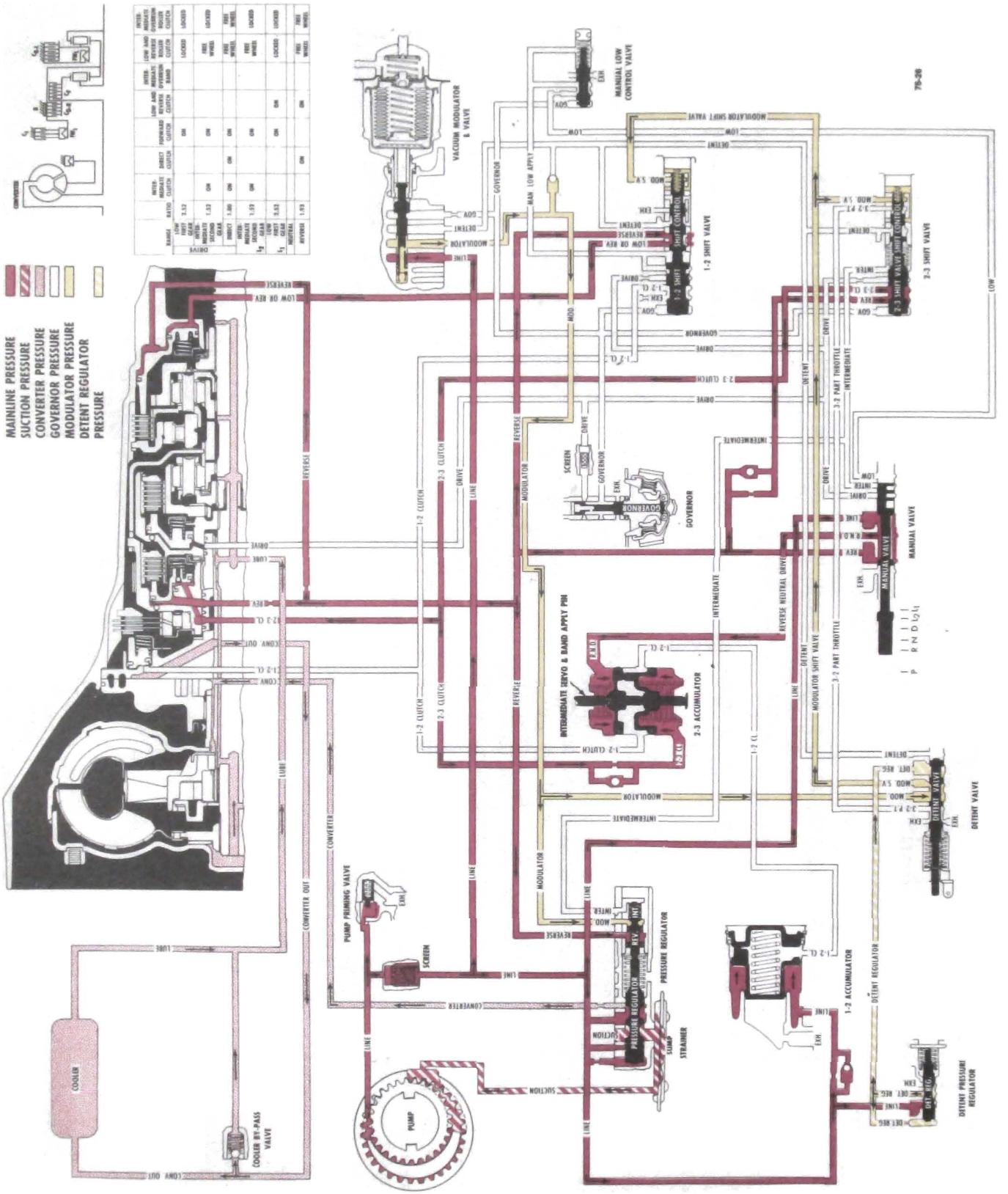


Figure 75-42 - Reverse

REVERSE

Intermediate Clutch — Off
Direct Clutch — On
Forward Clutch — Off
Low and Reverse Clutch — On

When the selector lever is moved to the reverse position, the manual valve is repositioned to allow line pressure to enter the reverse circuit. Reverse oil then flows as shown below.

1. Direct (2-3) Clutch.
2. Low and Reverse Clutch
3. 1-2 Shift Valve
4. 2-3 Shift Valve
5. Reverse Boost Valve

Intermediate Roller Clutch — Free Wheeling
Low and Reverse Roller Clutch — Free Wheeling
Intermediate Overrun Band — Off

Basic Control

Reverse oil from the manual valve flows to the outer area of the direct clutch piston, to the outer area of the low and reverse clutch piston, to the 1-2 shift valve and to the 2-3 shift valve. From the 1-2 shift valve, it is directed to the inner area of the low and reverse clutch piston. From the 2-3 shift valve it is directed to the inner area of the direct clutch piston.

Reverse oil also acts on the reverse boost valve to increase line pressure to a maximum of **250** PSI at stall.

Summary

The direct clutch and the low and reverse clutch are applied. Line pressure is boosted and the transmission is in reverse.

Figure 75-43 - Reverse

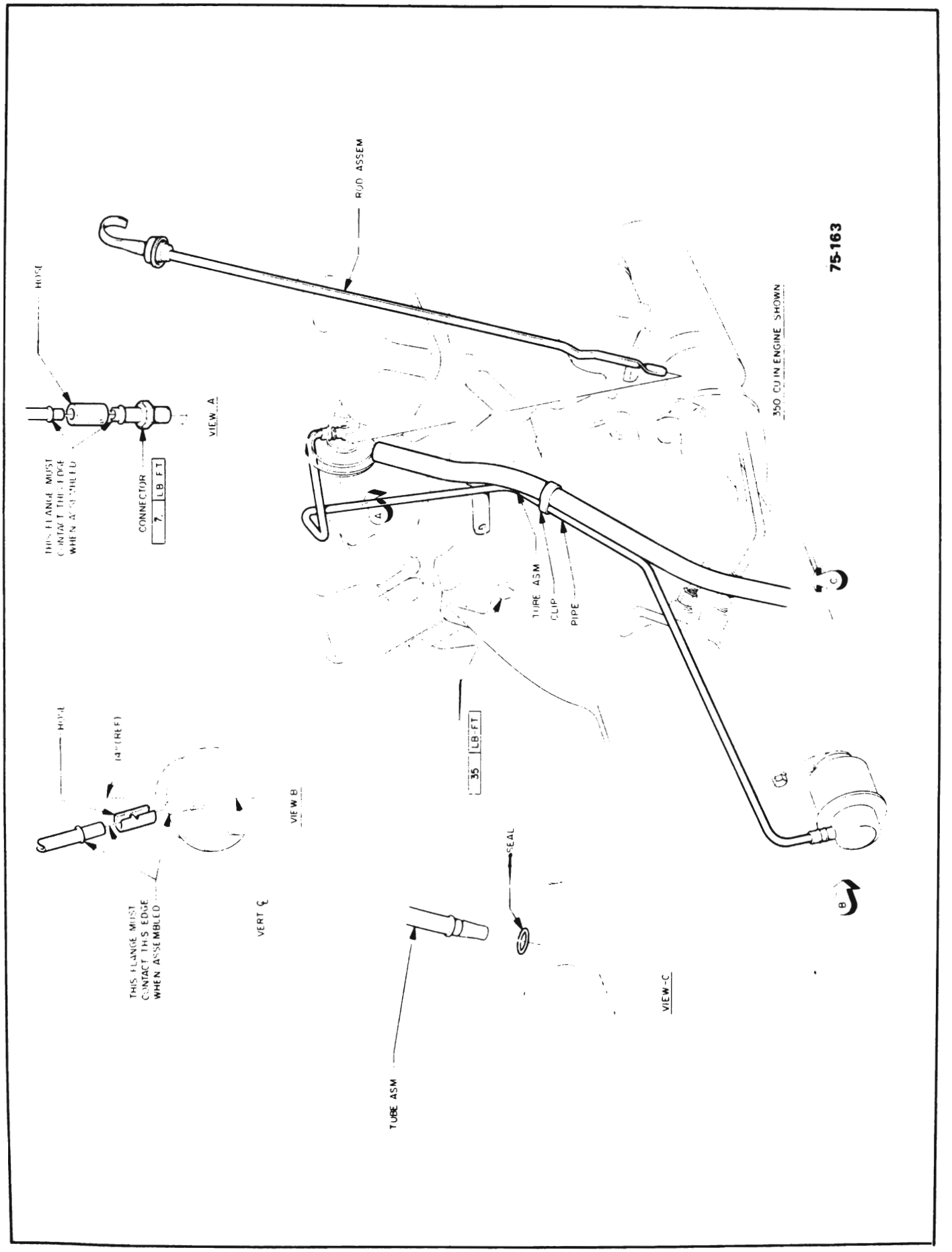


Figure 75-44 - Vacuum Line and Oil Filler Pipe

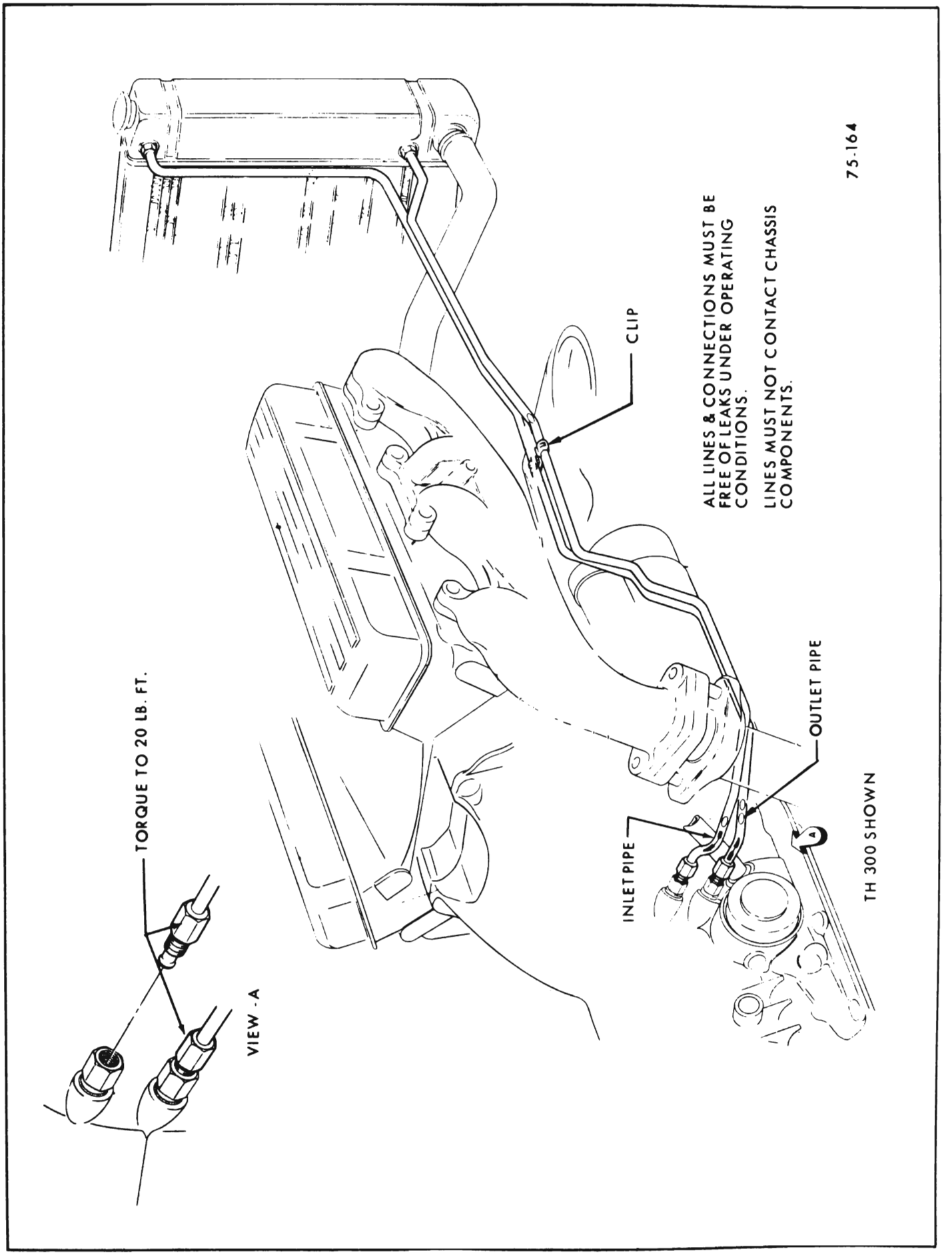


Figure 75-45 - Oil Cooler Lines

holding Tool J-21366. Rotate converter to permit coupling of flywheel and converter with original relationship.

2. Install transmission case to engine block bolts. Torque to 30-40 lb.ft. Do not overtighten.

3. Install flywheel to converter bolts. Torque to 25-35 lb.ft.

4. Install transmission cross member support. Install mounting pad.

5. Remove transmission jack and engine support.

6. Install transmission flywheel cover pan with tapping screws.

7. Install transmission filler pipe using a new "O" ring. See Figure 75-44.

8. Reconnect speedometer cable.

9. Install propeller shaft.

10. Reinstall front exhaust crossover pipe, if removed.

11. Install detent cable on detent valve link.

CAUTION: Do Not Bend Cable.

12. Install detent cable on accelerator lever assembly.

CAUTION: Do Not Bend Cable.

Install cable by sliding through slot on bracket and snapping plastic guide back on the bracket. For adjustment refer to paragraph 75-2.

13. Install oil cooler lines to transmission. See Figure 75-45.

14. Install vacuum line to vacuum modulator. See Figure 75-44.

15. Fill transmission with fluid as described in Paragraph 75-1, Subparagraph d.

75-8 PRELIMINARY INSTRUCTIONS

1. Before starting disassembly of the transmission it should be thoroughly cleaned externally to avoid getting dirt inside.

2. Place transmission on a CLEAN work bench and use CLEAN tools during disassembly. PRovide CLEAN STORAGE SPACE FOR PARTS AND UNITS REMOVED FROM TRANSMISSION. An excellent working arrangement is provided by assembling the transmission to Holding Fixture J-8763. See Figure 75-46.

3. The transmission contains parts which are ground and highly polished, therefore, parts should be kept separated to avoid nicking and burring surfaces.

4. When disassembling transmission carefully inspect all gaskets at times of removal. The imprint of parts on both sides of an old gasket will show whether a good seal was obtained. A poor imprint indicates a possible source of oil leakage due to gasket condition, looseness of bolts, or uneven surfaces of parts.

5. None of the parts require forcing when disassembling or assembling transmission. Use a rawhide or plastic mallet to separate tight fitting cases - do not use a hard hammer.

75-9 REMOVAL OF CONVERTER HOLDING TOOL J-21366, CONVERTER, VACUUM MODULATOR

a. Removal of Converter

1. Assemble transmission in Fixture J-8763. See Figure 75-46.

NOTE: Before assembling transmission in Holding Fixture J-8763 it must be modified so 1-2 accumulator will clear fixture. Remove 3/8" from Fixture as shown in Figure 75-46.

2. Remove converter Holding Tool J-21366. See Figure 75-47.

3. With transmission in Holding Fixture J-8763, remove torque converter assembly. See Figure 75-48.

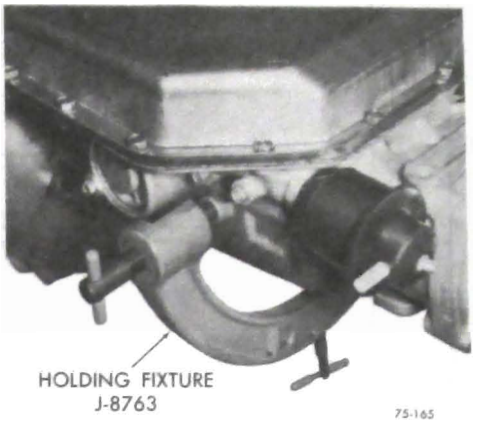


Figure 75-46

Figure 75-47

b. Removal of Vacuum Modulator

1. Remove modulator assembly attaching bolt and retainer. See Figure 75-49.

2. Remove vacuum modulator assembly "O" ring seal and modulator valve from case. See Figure 75-56.

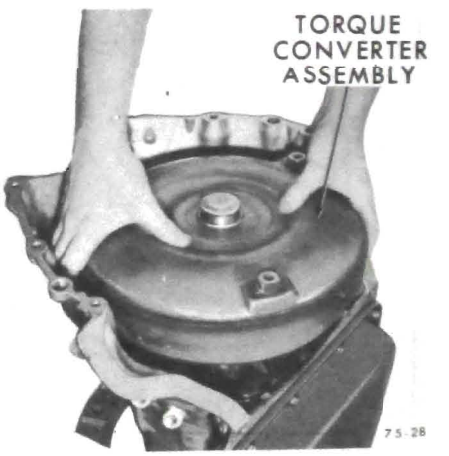


Figure 75-48

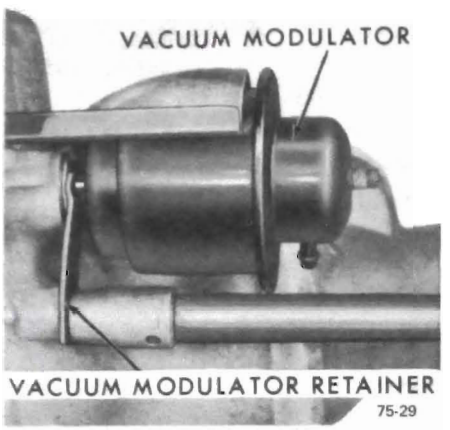


Figure 75-49

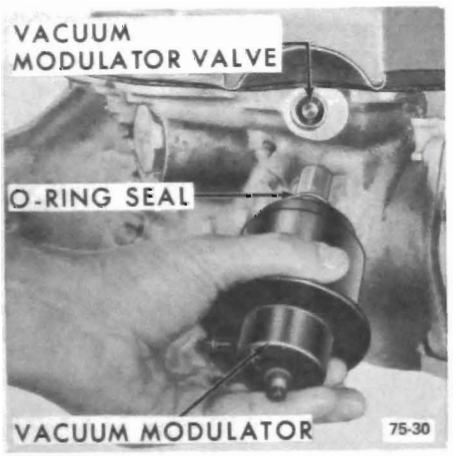


Figure 75-56

75-10 REMOVAL OF EXTENSION HOUSING, LIP SEAL AND BUSHING

a. Removal of Extension Housing

1. Remove bolt retainer and speedometer driven gear from side of extension housing and remove four (4) extension housing to case attaching bolts. See Figure 75-57.

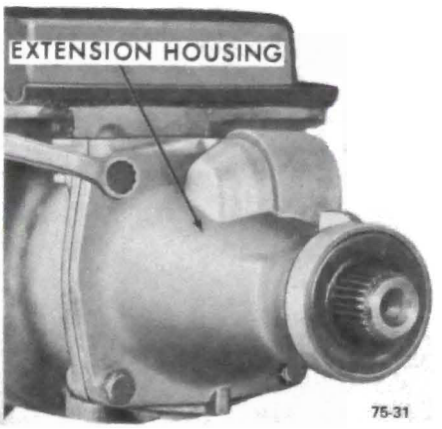


Figure 75-57

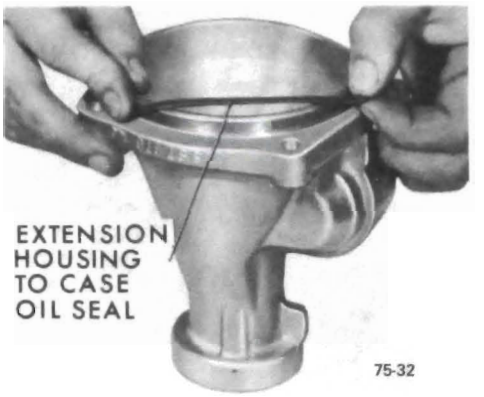


Figure 75-58

b. Removal of Extension Housing Seal

1. Remove extension housing to case oil seal. See Figure 75-58.

c. Removal of Extension Housing Lip Seal

1. Remove extension housing lip seal using screwdriver. See Figure 75-59.

d. Removal of Extension Housing Bushing

1. Remove extension housing bushing using screwdriver to collapse bushing. See Figure 75-60.

75-11 INSTALL EXTENSION HOUSING BUSHING AND LIP SEAL

a. Installation of Extension Housing Bushing

1. Install extension housing bushing using Drive Handle J-8092 and Bushing Tool J-21424-1. See Figure 75-61.

Figure 75-59

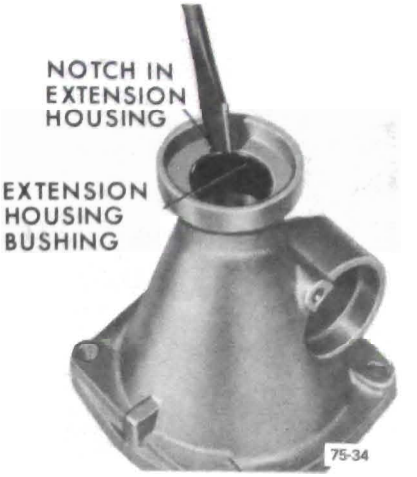


Figure 75-60

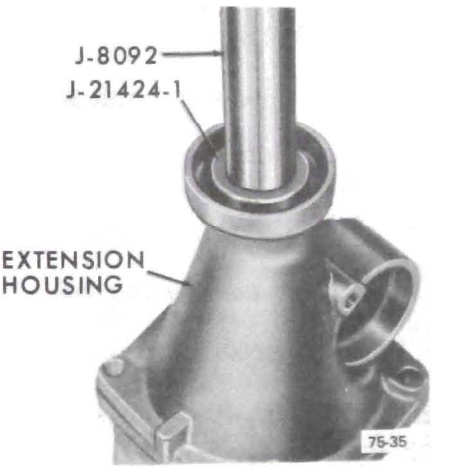


Figure 75-61

b. Installation of Extension Housing Lip Seal

1. Install extension housing lip seal using Installer J-21426. See Figure 75-62.

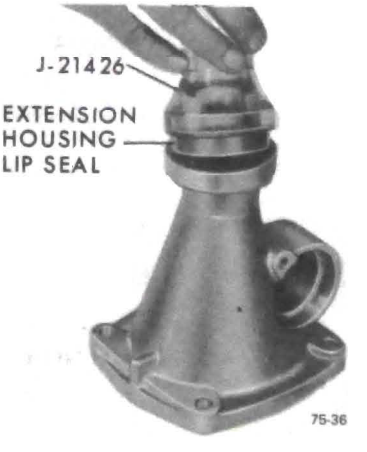


Figure 75-62

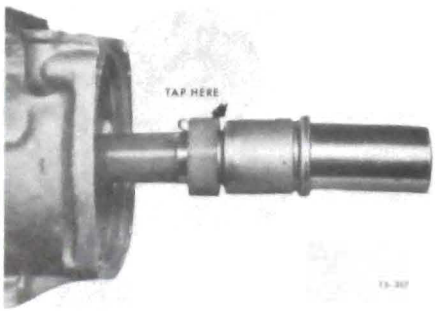


Figure 75-62A

75-12 REMOVAL OF PROPELLER SHAFT YOKE SEAL, SPEEDOMETER DRIVE GEAR, AND GOVERNOR

a. Removal of Propeller Shaft Yoke Seal

1. Remove propeller shaft yoke seal using Tool J-23103 and screwdriver. See Figure 75-62A.

b. Removal of Speedometer Drive Gear

1. Depress speedometer drive gear retaining clip, then slide speedometer drive gear off output shaft. See Figure 75-63.

c. Removal of Governor

1. Remove governor cover retainer wire with a screwdriver. See Figure 75-64.

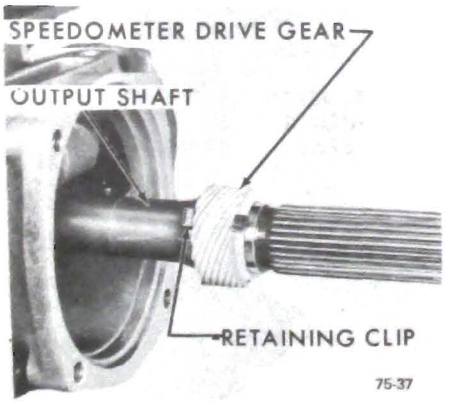


Figure 75-63

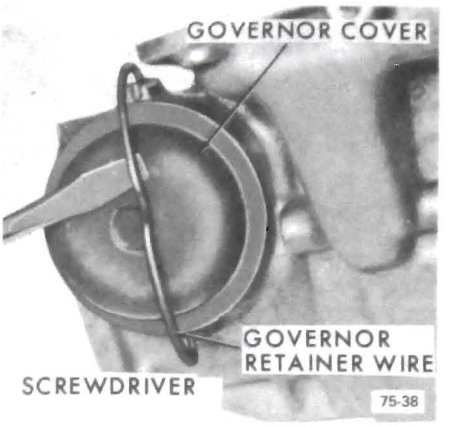


Figure 75-64

2. Remove governor cover and "O" ring seal from case. Aid removal of cover with screwdriver. NOTE: Use extreme care not to damage cover. If cover is damaged it must be replaced.

Remove "O" ring seal from governor cover, and replace. See Figure 75-65.

3. Withdraw governor assembly from case. See Figure 75-66.

NOTE: Check governor bore and governor sleeve for scoring.

75-13 REMOVAL OF OIL PAN, OIL STRAINER, AND VALVE BODY

NOTE: Removal of oil pan, oil strainer, and valve body can be done without removal of transmission from car.

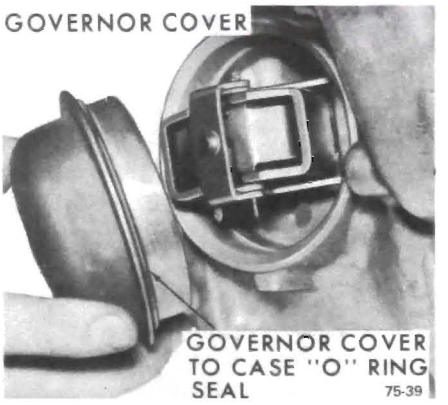


Figure 75-65

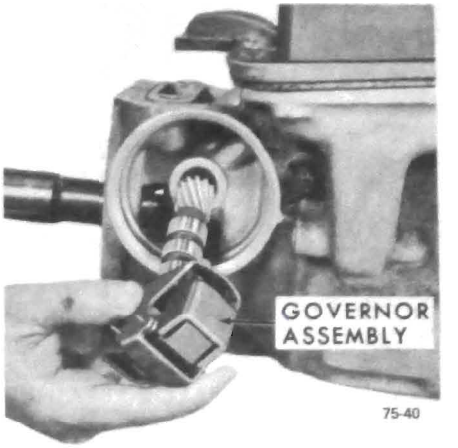


Figure 75-66

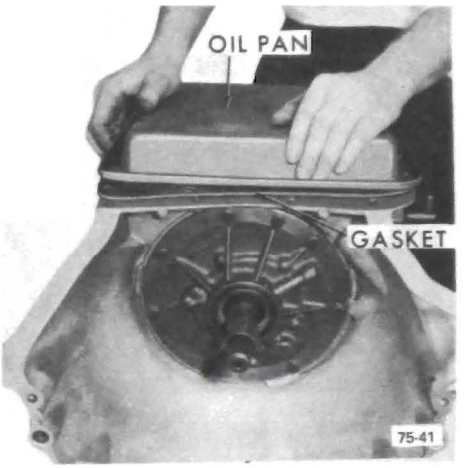


Figure 75-67

a. Removal of Oil Pan

1. Remove (13) oil pan attaching screw and washer assemblies, oil pan, and gasket. See Figure 75-67.

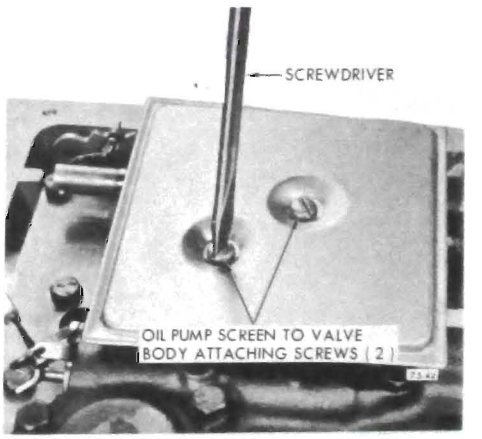


Figure 75-68

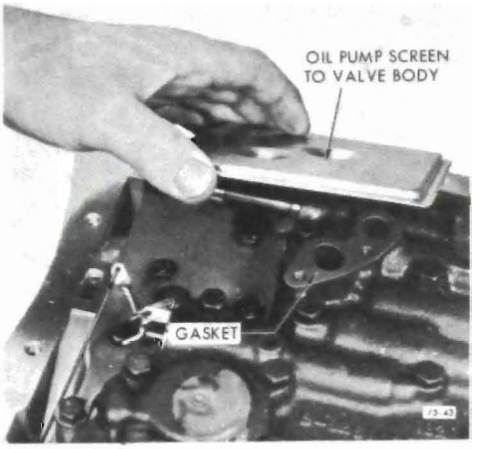


Figure 75-70

b. Removal of Oil Screen

1. Remove two (2) strainer assembly to valve body attaching screws. See Figure 75-68.

2. Remove strainer assembly and gasket from valve body. See Figure 75-70.

c. Removal of Valve Body

1. Remove detent roller and spring assembly from valve body. Remove valve body to case attaching bolts. See Figure 75-71.

2. Lift valve body from case while carefully guiding manual valve link from range selector inner lever. Remove detent control valve link from detent actuating lever.

3. Remove valve body to spacer plate gasket. See Figure 75-72.

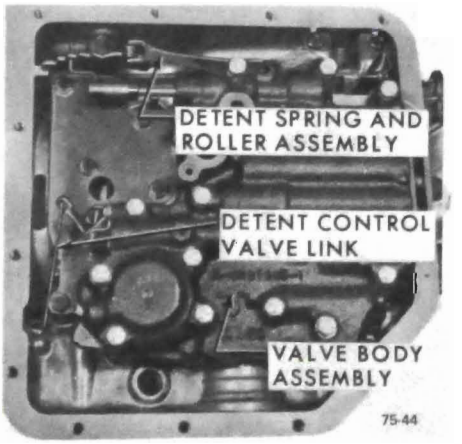


Figure 75-71

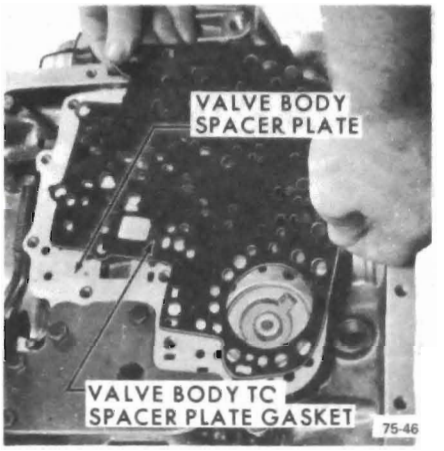


Figure 75-72

4. Remove spacer support plate bolts. Remove spacer support plate. See Figure 75-73.

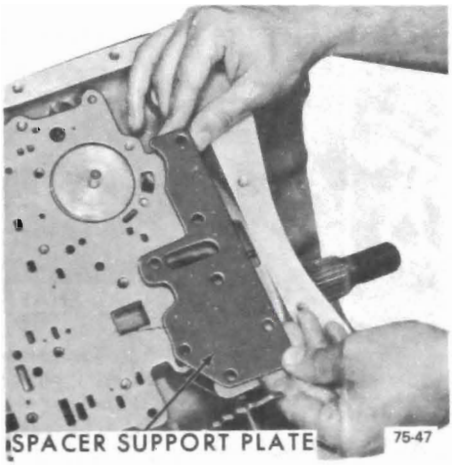


Figure 75-73

5. Remove valve body spacer plate and valve body spacer plate to case gasket. See Figure 75-74.

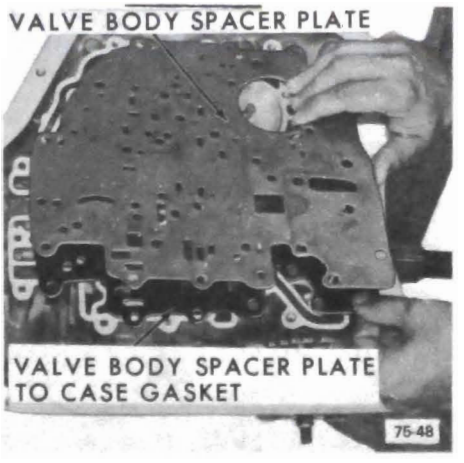


Figure 75-74

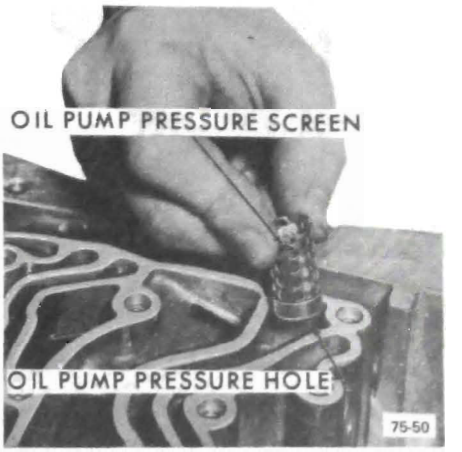


Figure 75-75

75-14 REMOVAL OF OIL PUMP SCREEN, GOVERNOR SCREEN, AND CHECK BALLS

a. Removal of Pressure Screens

1. Remove oil pump pressure screen from oil pump pressure hole in case, and clean. See Figure 75-75.

2. Remove governor feed screen from governor feed hole (drive oil) in case, and clean. See Figure 75-76.

b. Removal of Check Balls

1. Remove four check balls from correct passages in case face. See Figure 75-77.

75-15 REMOVAL OF MANUAL SHAFT, INNER, LEVER, PARKING PAWL, AND INTERMEDIATE SERVO PISTON

a. Removal of Range Selector Inner Lever

1. Remove manual control valve link retainer from range selector inner lever.

2. Remove manual shaft to case retainer with screwdriver. See Figure 75-78.

3. Remove jam nut holding range selector inner lever to manual shaft. See Figure 75-79.

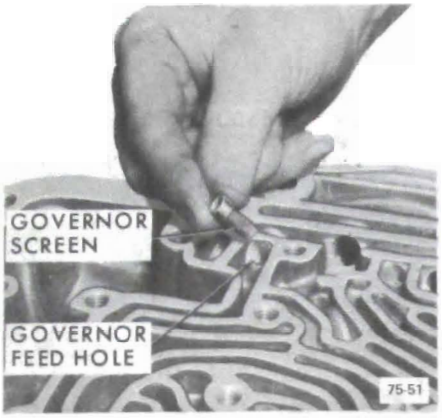


Figure 75-76

4. Remove manual shaft from case. Remove range selector inner lever and parking pawl actuating rod. See Figure 75-80.

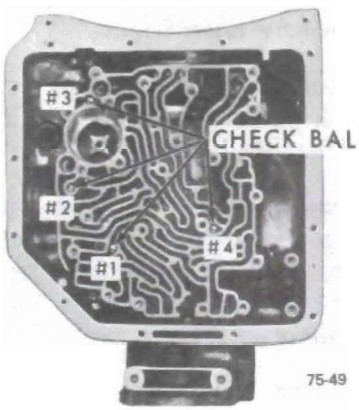


Figure 75-77

5. Remove manual shaft to case lip seal, if necessary. See Figure 75-81.

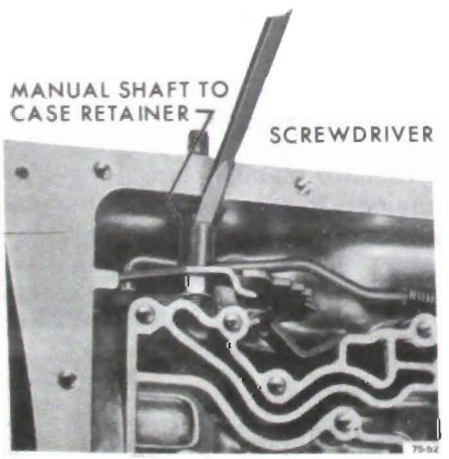


Figure 75-78

Figure 75-79

6. Removing parking lock bracket. See Figure 75-82.

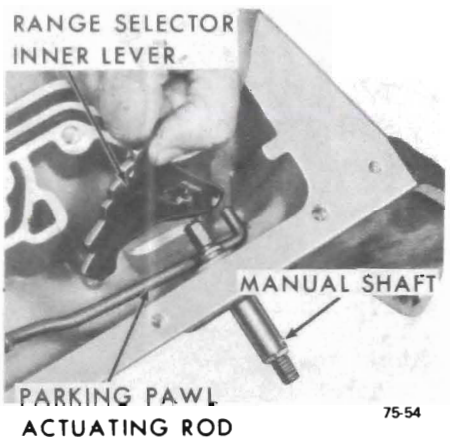


Figure 75-80

7. Remove parking pawl disengaging spring. See Figure 75-83.

Figure 75-81

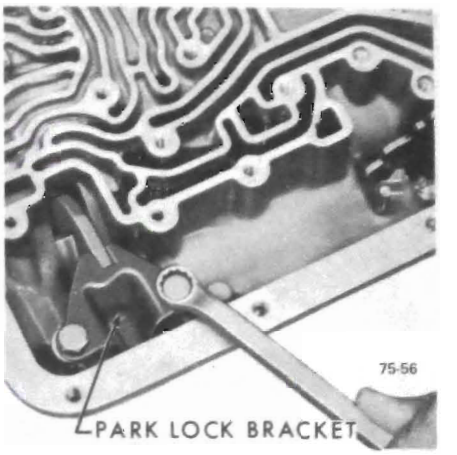


Figure 75-82

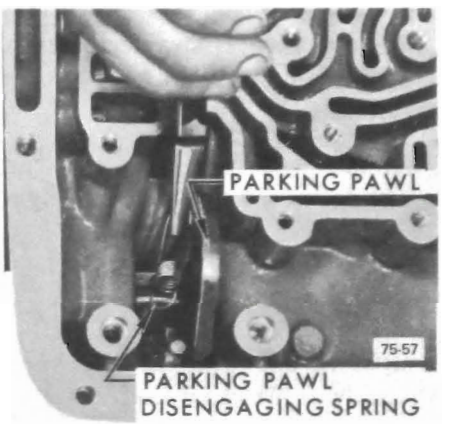


Figure 75-83

8. Remove parking pawl shaft retaining plug stake marks. Remove retaining plug, parking pawl shaft and parking pawl. See Figure 75-84.

b. Removal of Intermediate Servo Piston

1. Remove intermediate servo piston

Figure 75-84

Figure 75-85

and metal oil seal ring. Remove washer, spring seat and apply pin. See Figure 75-85.

2. Check Band Apply Pin.

a. Using band apply selection pin tool J-23071, and straight edge, apply firm downward pressure on selection pin. See Figure 75-86.

There are two selective pins available and are identified as follows:

Pin Identification Pin Size

With Groove Long

Without Groove Short

If Tool J-23071 is below the straight edge surface, the long pin should be used. If the tool is above the straight edge surface, the short pin sould be used. The identification groove on the selective pins is located on the band lug end of the pin. Selecting the proper pin is the equivalent of adjusting the band.

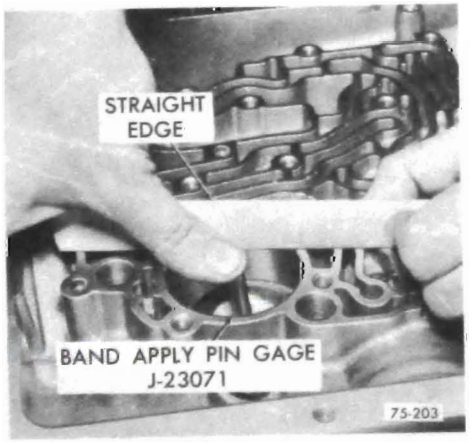


Figure 75-86

NOTE: If a new pin is required, make note of pin size required, and remove Tool J-23071 from transmission case.

75-16 REMOVAL OF PUMP ASSEMBLY, CUSHION SPRING AND INTERMEDIATE CLUTCH PLATES, AND OVERRUN BRAKE BAND

a. Removal of Oil Pump Assembly

1. Remove eight (8) pump attaching bolts with washer type seals. Discard washer type seals. See Figure 75-88.

2. Install two (2) threaded slide hammers J-7004 into threaded holes in pump body. Tighten jam nuts and remove pump assembly from case. See Figure 75-89.

3. Remove pump assembly to case gasket and discard. See Figure 75-90.

b. Removal of Intermediate Clutch Cushion Spring, Intermediate Clutch Plates and Intermediate Overrun Brake Band

1. Remove intermediate clutch cushion spring. See Figure 75-100.

2. Remove three (3) intermediate clutch faced plates and three (3) steel separator plates. See Figure 75 101.

3. Remove intermediate clutch pressure plate. See Figure 75-102.

4. Remove intermediate overrun brake band. See Figure 75-103.

75-17 REMOVAL OF DIRECT AND FORWARD CLUTCH ASSEMBLIES, INPUT RING GEAR, AND OUTPUT CARRIER

a. Removal of Direct and Forward Clutch Assemblies

1. Remove direct and forward clutch assemblies from case. See Figure 75-104.

b. Removal of Input Ring Gear

1. Remove forward clutch housing to input ring gear - front thrust washer. See Figure 75-105.

2. Remove input ring gear. See Figure 75-106.

3. Inspect bushing for wear or galling. If replacement is necessary proceed as follows:

a. Thread Tool J-23062-5 on Drive Handle J-8092, and remove bushing from ring gear. See Figure 75-107

b. Using Tool J-23062-5, press in new bushing .050" to .060" from inner surface of hub. See Figure 75 107.

c. Removal of Output Carrier Assembly

1. Remove input ring gear to output carrier thrust washer. See Figure 75-108.

2. Remove output carrier to output shaft snap ring and discard. See Figure 108A.

3. Remove output carrier assembly. See Figure 75-109.

75-18 REMOVAL OF SUN GEAR DRIVE SHELL, LOW AND REVERSE CLUTCH SUPPORT ASSEMBLY, LOW AND REVERSE CLUTCH PLATES, AND REACTION CARRIER

a. Removal of Sun Gear Drive Shell Assembly

1. Remove sun gear drive shell assembly. See Figure 75-110.

b. Removal of Low and Reverse Clutch Support Assembly

1. Remove low and reverse roller clutch support to case retaining ring. See Figure 75-111.

2. Grasp output shaft and pull up until low and reverse roller clutch

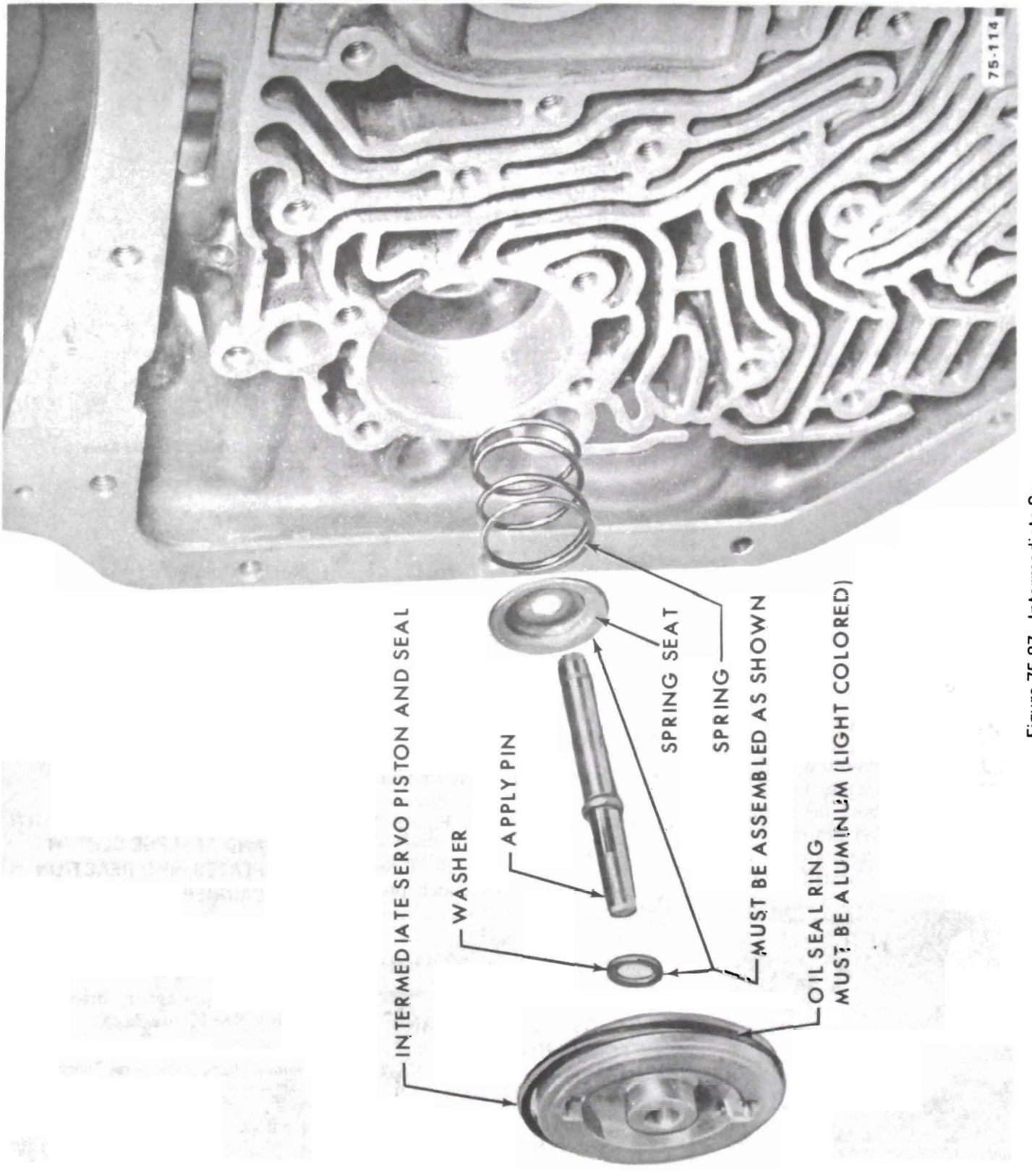


Figure 75-87 - Intermediate Servo Assembly - Exploded View

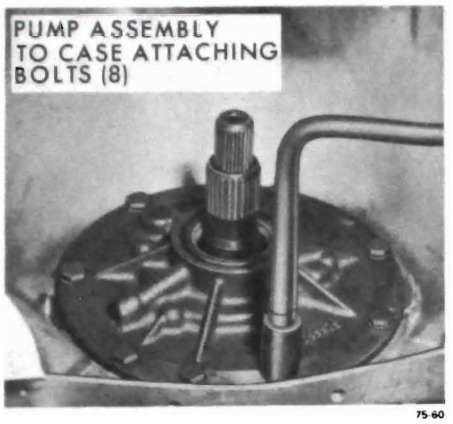


Figure 75-88

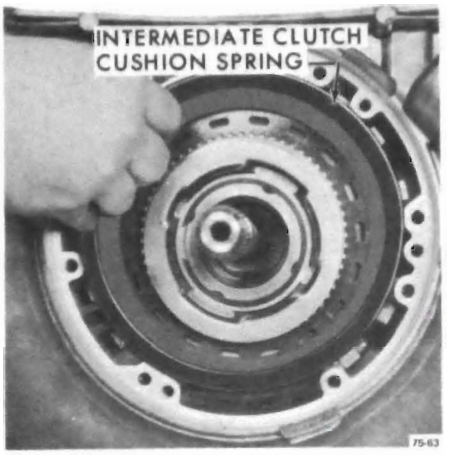


Figure 75-100

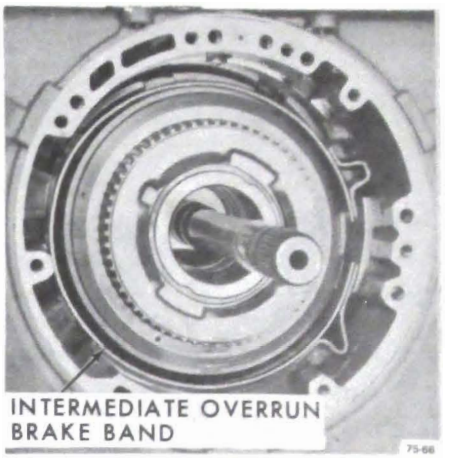


Figure 75-103

Figure 75-89

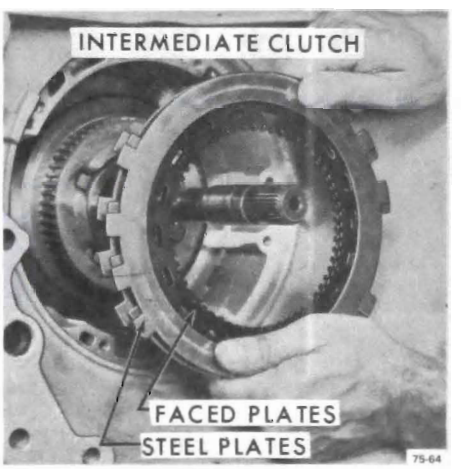


Figure 75-101

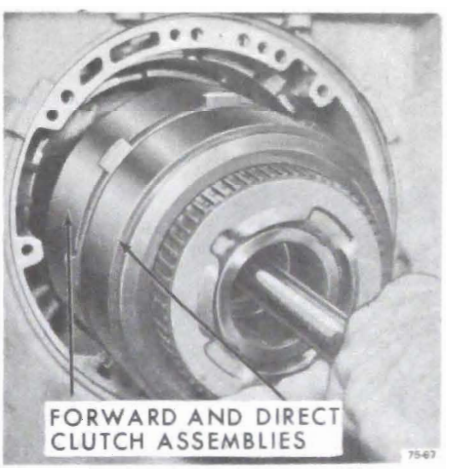


Figure 75-104

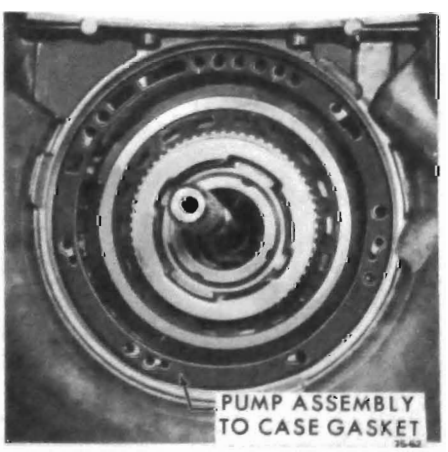


Figure 75-90

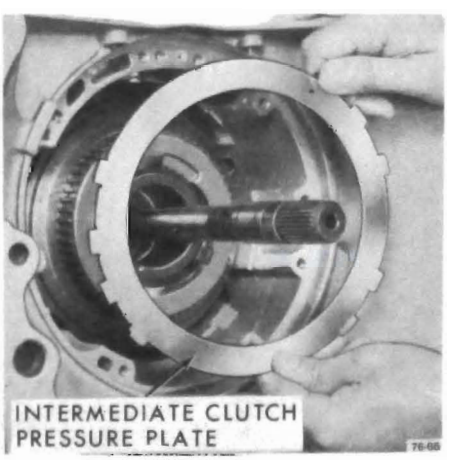


Figure 75-102

Figure 75-105

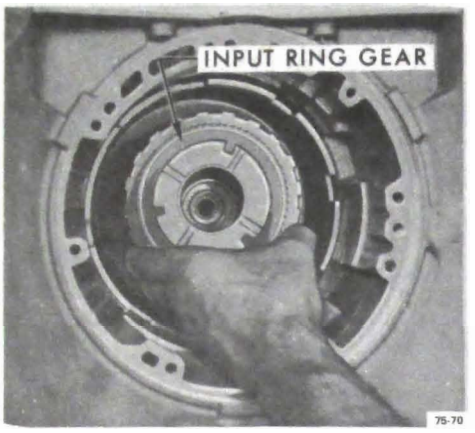


Figure 75-106

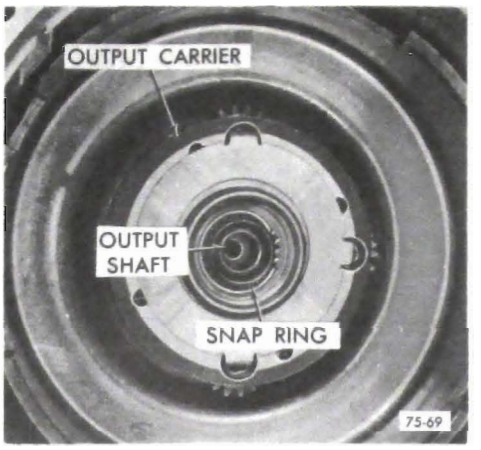


Figure 75-108A

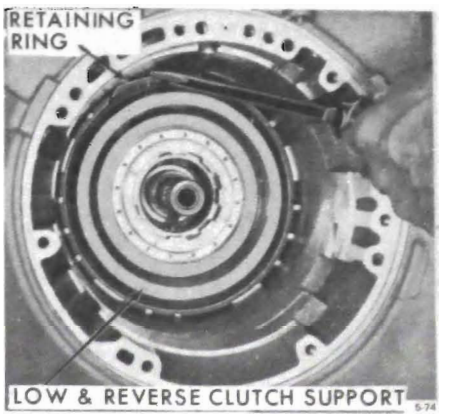


Figure 75-111

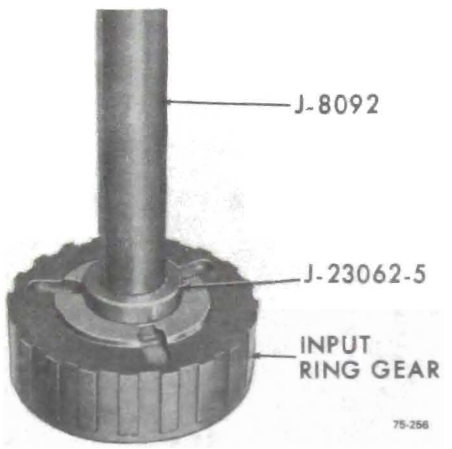


Figure 75-107

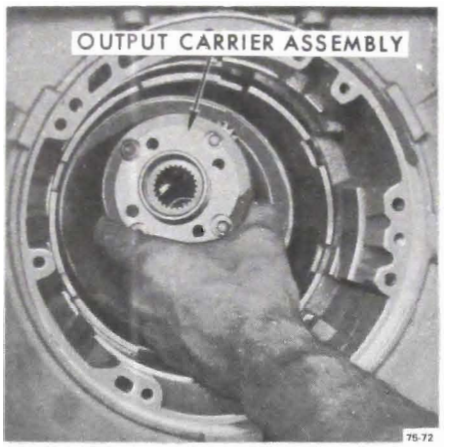


Figure 75-109

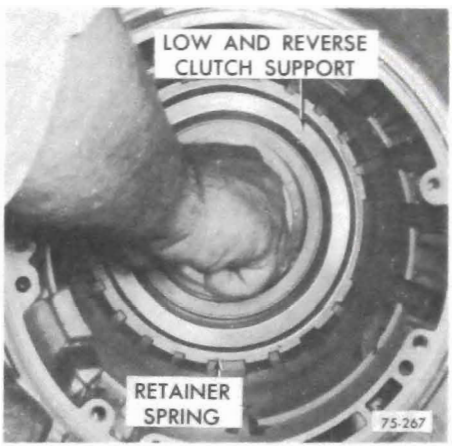


Figure 75-112

and support assembly clear low and and reverse clutch support retainer spring and remove support assembly. See Figure 75-112.

3. Remove low and reverse clutch support retainer spring. See Figure 75-112A.

c. Removal of Low and Reverse Clutch Plates

1. Remove five (5) low and reverse clutch faced plates and five (5) steel separator plates. See Figure 75-113.

d. Removal of Reaction Carrier Assembly

1. Remove reaction carrier assembly

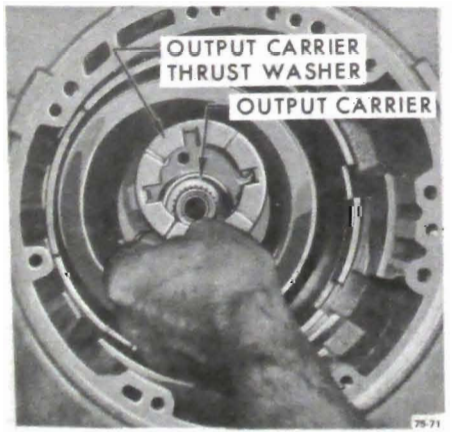


Figure 75-108

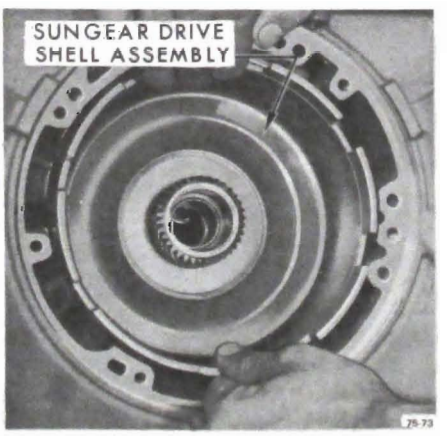


Figure 75-110

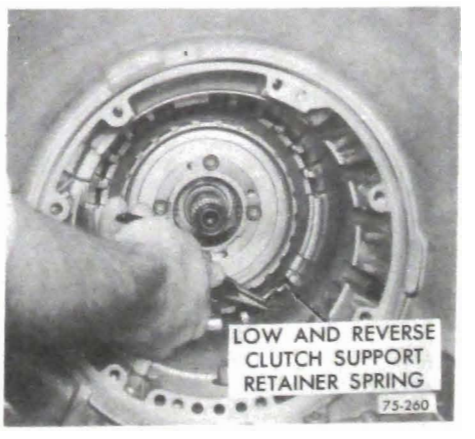


Figure 75-112A

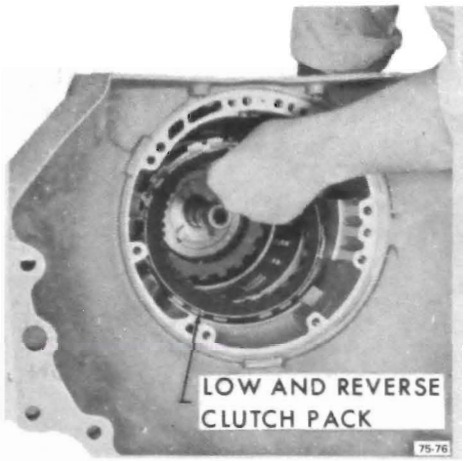


Figure 75-113

from output ring gear and shaft assembly. See Figure 75-114.

2. Inspect reaction carrier bushing for wear or galling. If replacement is necessary proceed as follows:

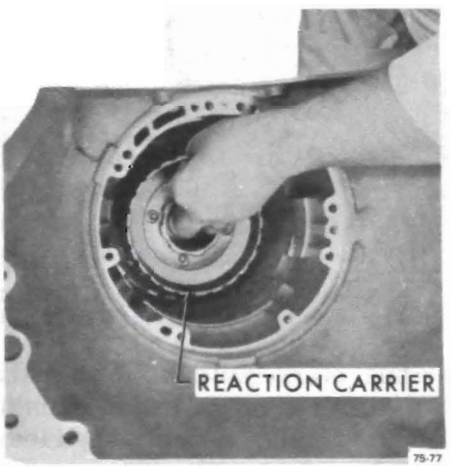


Figure 75-114

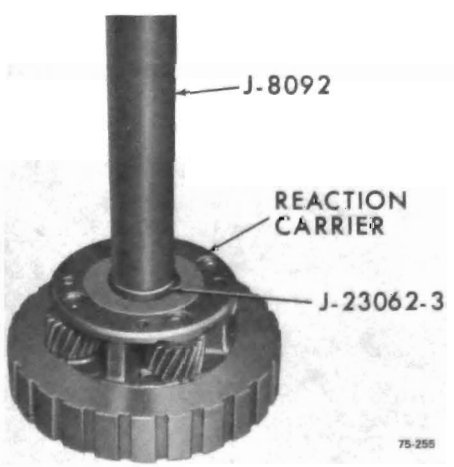


Figure 75-114A

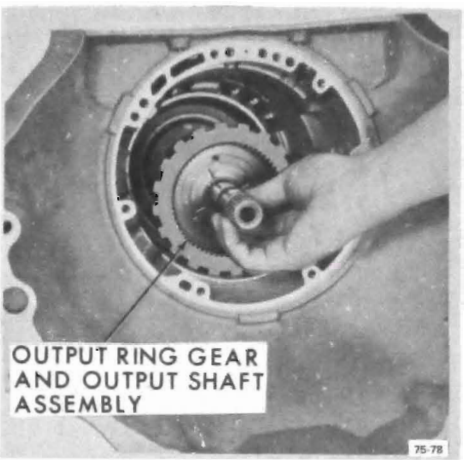


Figure 75-115

a. Thread tool J-23062-3 on Drive Handle J-8092 and remove bushing. See Figure 75-114A.

b. Using Tool J-23062-3 press in new busing flush to .010" from inner surface of hub. See Figure 75-114A.

75-19 REMOVAL OF OUTPUT RING GEAR AND SHAFT ASSEMBLY, AND OUTPUT RING GEAR TO CASE NEEDLE BEARING ASSEMBLY

a. Removal of Output Ring Gear and Shaft Assembly

1. Remove output ring gear and shaft assembly from case. See Figure 75-115.

2. Remove reaction carrier to output ring gear tanged thrust washer. See Figure 75-116.

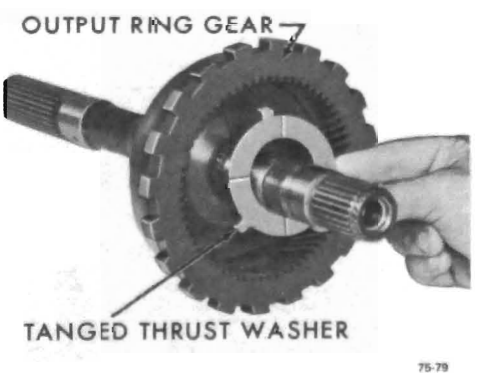


Figure 75-116

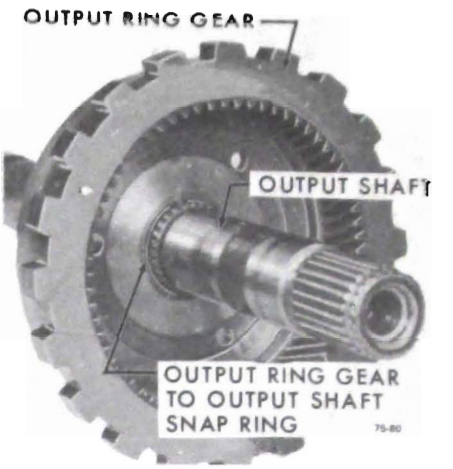


Figure 75-117

3. Remove output ring gear to output shaft snap ring. Remove output ring gear from output shaft and discard. See Figure 75-117.

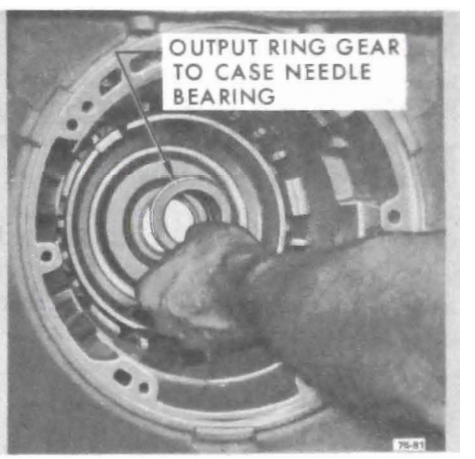


Figure 75-118

4. Remove output ring gear to case needle bearing assembly. See Figure 75-118.

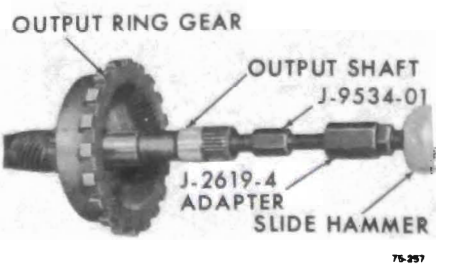


Figure 75-118A

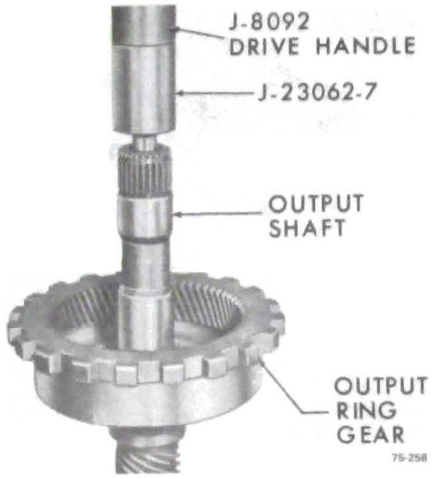


Figure 75-118B

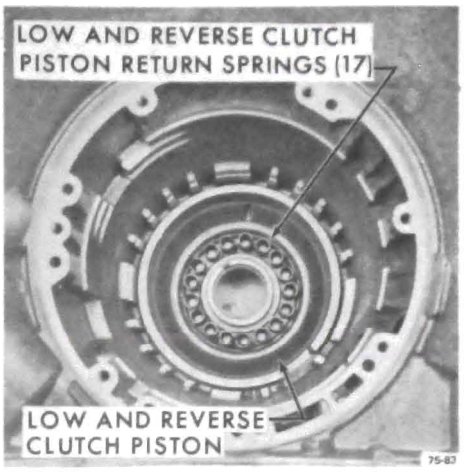


Figure 75-120

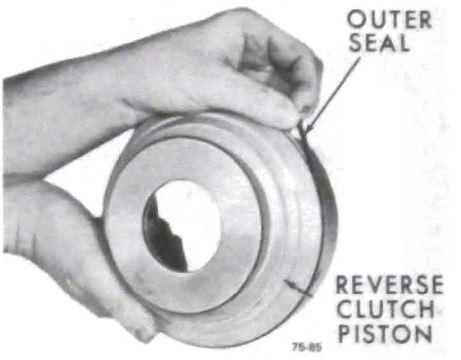


Figure 75-122

5. Inspect output shaft bushing for wear or galling. If replacement is necessary proceed as follows:

a. Assemble J-9534-01 into Adapter J-2619-4 and assemble to Slide Hammer J-2619. Thread assembly into bushing. Clamp slide hammer into vise, grasp output shaft and remove bushing. See Figure 75-118A.

b. Using Tool J-23062-7, assembled into Drive Handle J-8092, press in new bushing .140" below end surface of shaft. See Figure 75-118B.

75-20 REMOVAL OF LOW AND REVERSE CLUTCH PISTON, AND CASE BUSHING

a. Removal of Low and Reverse Clutch Piston

1. Using Tool J-21420-1 compress low and reverse clutch piston spring retainer and remove piston retaining ring and spring retainer. See Figure 75-119.

2. Remove seventeen (17) piston return coil springs from piston. See Figure 75-120.

3. Remove low and reverse clutch piston assembly. Aid removal with the use of compressed air in passage shown. See Figure 75-121.

b. Removal of Low and Reverse Clutch Piston Seals

1. Remove low and reverse clutch piston outer seal. See Figure 75-122.

2. Remove low and reverse clutch piston center and inner seal. See Figure 75-123.

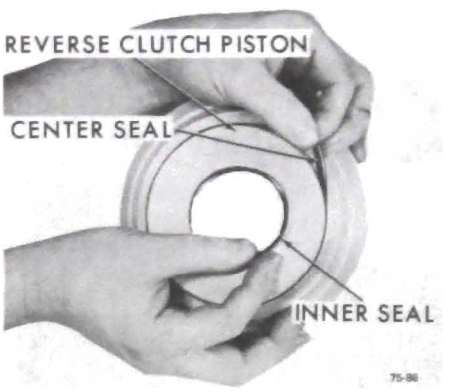


Figure 75-123

c. Removal and Installation of Case Bushing

1. Inspect case bushing for nicks, scoring or excessive wear. If damaged, remove as follows: Assemble Tool J-23062-1 on Drive Handle J-8092 and remove bushing. See Figure 75-124.

2. Using Tool J-23062-1 and Drive

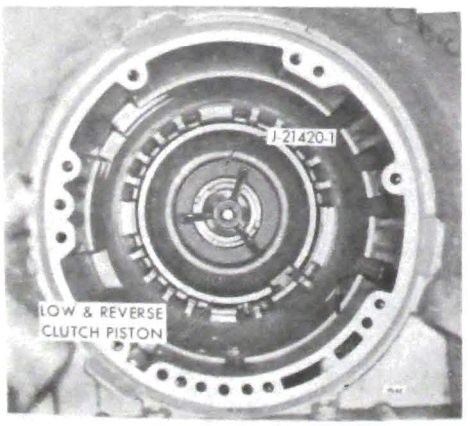


Figure 75-119

Figure 75-121

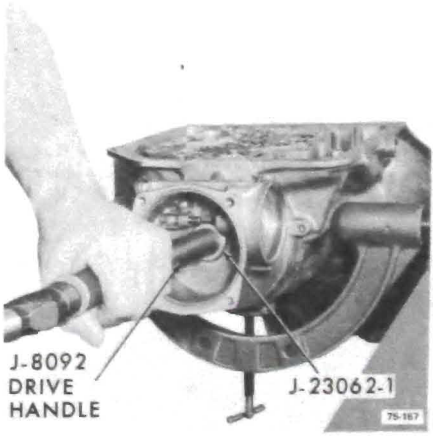


Figure 75-124

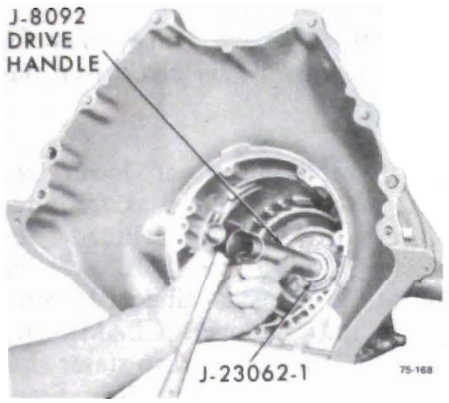


Figure 75-125

Handle J-8092, press bushing to .195" below chamfered edge of case. Make certain split on bushing is opposite notch in case. See Figure 75-125.

75-21 REMOVAL AND INSTALLATION OF INTERMEDIATE CLUTCH ACCUMULATOR

NOTE: Removal and installation of intermediate clutch accumulator can be done without removal of transmission from car.

a. Removal of Intermediate Clutch Accumulator Piston

1. Install Tool J-23069 to compress intermediate clutch accumulator cover and remove retaining ring. See Figure 75-126.

2. Remove intermediate clutch accumulator piston cover. Remove cover

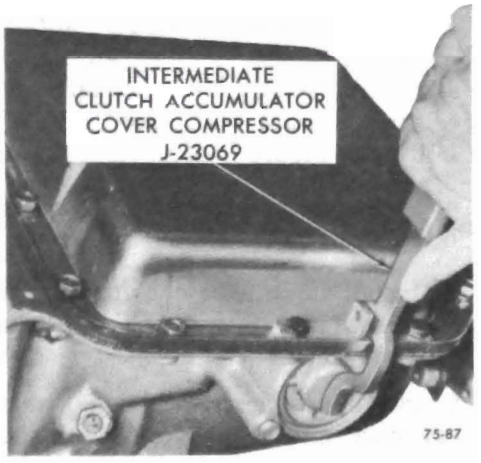


Figure 75-126

Figure 75-127

"O" ring seal from case. See Figure 75-127.

NOTE: A production day and shift built number, transmission model and model year are stamped on the intermediate clutch accumulator piston cover. If cover is replaced, this information must be stamped on new cover.

3. Remove intermediate clutch accumulator piston spring. See Figure 75-128.

4. Remove intermediate clutch accumulator piston assembly. Remove inner and outer hook type oil seal rings, if required and check if nicked or worn. See Figure 75-130.

b. Installation of Intermediate Clutch Accumulator Piston

1. Install inner and outer hook type oil seal rings, if required. Install

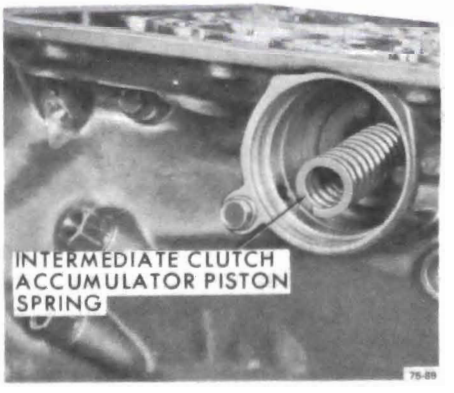


Figure 75-128

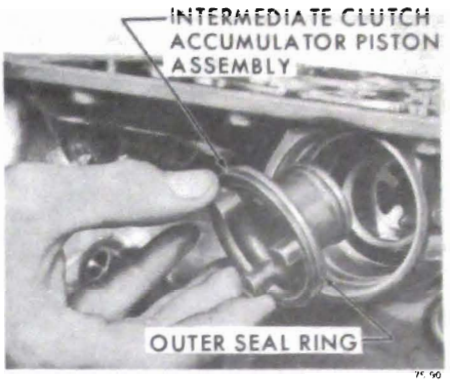


Figure 75-130

intermediate clutch accumulator piston assembly. See Figure 75-130.

2. Install intermediate clutch accumulator piston spring. See Figure 75-131.

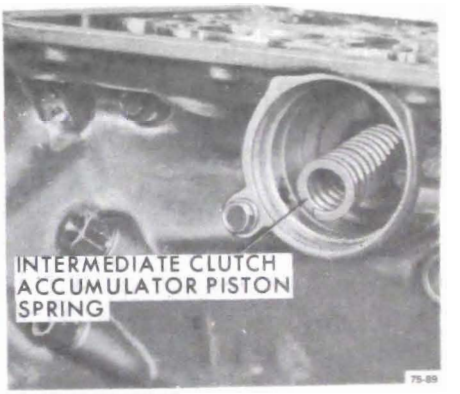


Figure 75-131

3. Install intermediate clutch accumulator piston cover. See Figure 75-132.

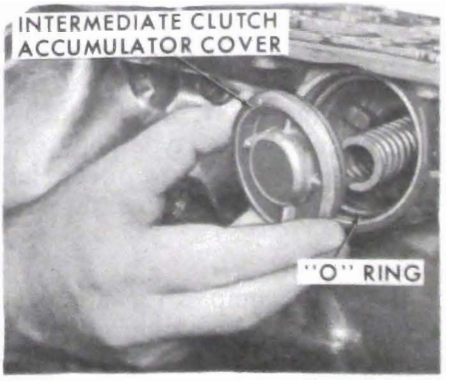


Figure 75-132

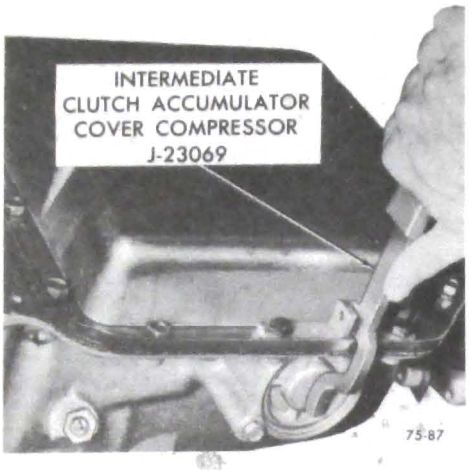


Figure 75-133

4. Install J-23069 tool and compress intermediate clutch accumulator cover and install retaining ring. See Figure 75-133.

75-22 DISASSEMBLY AND REASSEMBLY OF OIL PUMP ASSEMBLY

a. Disassembly of Oil Pump Assembly

1. Place assembly through hole in bench. Remove five (5) pump cover to body attaching bolts. Remove spring seat retainer. See Figure 75-135.

2. Remove thirty (30) intermediate clutch return springs and the intermediate clutch piston assembly. See Figure 75-136.

3. Remove intermediate clutch piston inner and outer seals. See Figure 75-137.

4. Remove two (2) forward clutch to pump hub hook type oil seal rings. Remove three (3) direct clutch to pump hub hook type oil rings. Remove pump cover to direct clutch drum selective thrust washer. See Figure 75-138.

5. Remove pump cover and stator shaft assembly from pump body. See Figure 75-139.

6. Remove pump drive gear and driven gear from pump body. See Figure 75-140.

7. Remove oil pump priming valve and spring. See Figure 75-141.

8. Fill cooler by-pass passage with grease and insert Tool J-23071-2 and force by-pass valve seat, check ball, and spring from pump body. See Figure 75-142.

9. Remove pump outside diameter to case square cut "O" ring seal and discard. See Figure 75-143.

10. Remove pump body to converter hub lip seal, if necessary and discard. See Figure 75-144.

11. Place pump on wood blocks so surface finish is not damaged and install pump to converter hub lip seal using Seal Driver J-21359. See Figure 75-145.

NOTE: Make certain lip seal is not torn or nicked.

12. Check oil pump bushing for nicks severe scoring or wear. If bushing replacement is necessary remove as follows: support pump on wood blocks. Use Tool J-21465-17 and Drive Handle J-8092 press bushing out of pump body. To install new oil pump bushing use Tool J-21465-17 and Drive Handle J-8092 and press bushing into pump body from gear pocket face until it is flush to .010" below opposite face. (Front Pump Seal Side). See Figure 75-146.

13. Check front stator shaft bushing for nicks, severe scoring or wear. If bushing replacement is necessary remove as follows: Assemble bushing remover J-21465-15 to adapter J-2619-4. Assemble this assembly to Slide Hammer J-2619. Clamp Slide Hammer into vise. Grasp stator shaft and remove bushing. See Figure 75-147.

14. Install front stator shaft bushing as follows: Support pump assembly on J-21424-7 before installing bushing. Install bushing into the front end of stator shaft. Install bushing into the front end of stator shaft. Using Installer J-21424-7 and Drive Handle J-8092 tap bushing into shaft to 1/4 inch below top of stator shaft. See Figure 75-148.

CAUTION: Extreme care must be taken so bushing is not driven past shoulder.

15. If replacement of lower rear stator shaft bushing is required, proceed as follows: Thread Tool J-21465-15 into stator shaft lower rear bushing. Thread Slide Hammer J-2619 into remover. CLAMp slide hammer into vise. Grasp stator shaft and remove bushing. See Figure 75-149. If upper rear stator shaft bushing is required, repeat above procedure.

b. Reassembly of Oil Pump Assembly

1. Install pump drive gear and driven gear.

NOTE: Drive gear has off-set tangs, assemble with tang face up to prevent damage to converter. See Figure 75-153.

Using Tool J-23062-2 press upper rear stator shaft bushing 1-1/32 inch below top surface of oil pump delivery sleeve. See Figure 75-150.

Using Tool J-23062-2 press lower rear stator shaft bushing flush to .010" below chamfer on oil pump delivery sleeve.

2. Install oil pump priming valve spring and priming valve. See Figure 75-154.

3. Install cooler by-pass spring, check ball and seat. Using Tool J-23112, press seat into bore until top of seat is flush with face of pump body. See Figure 75-155.

4. Assemble pump cover to pump body. See Figure 75-156.

5. Install intermediate clutch piston inner seal and outer seal. See Figure 75-157.

6. Install intermediate clutch piston assembly into pump cover with the aid of a piece of .020" music wire crimped into copper tubing.

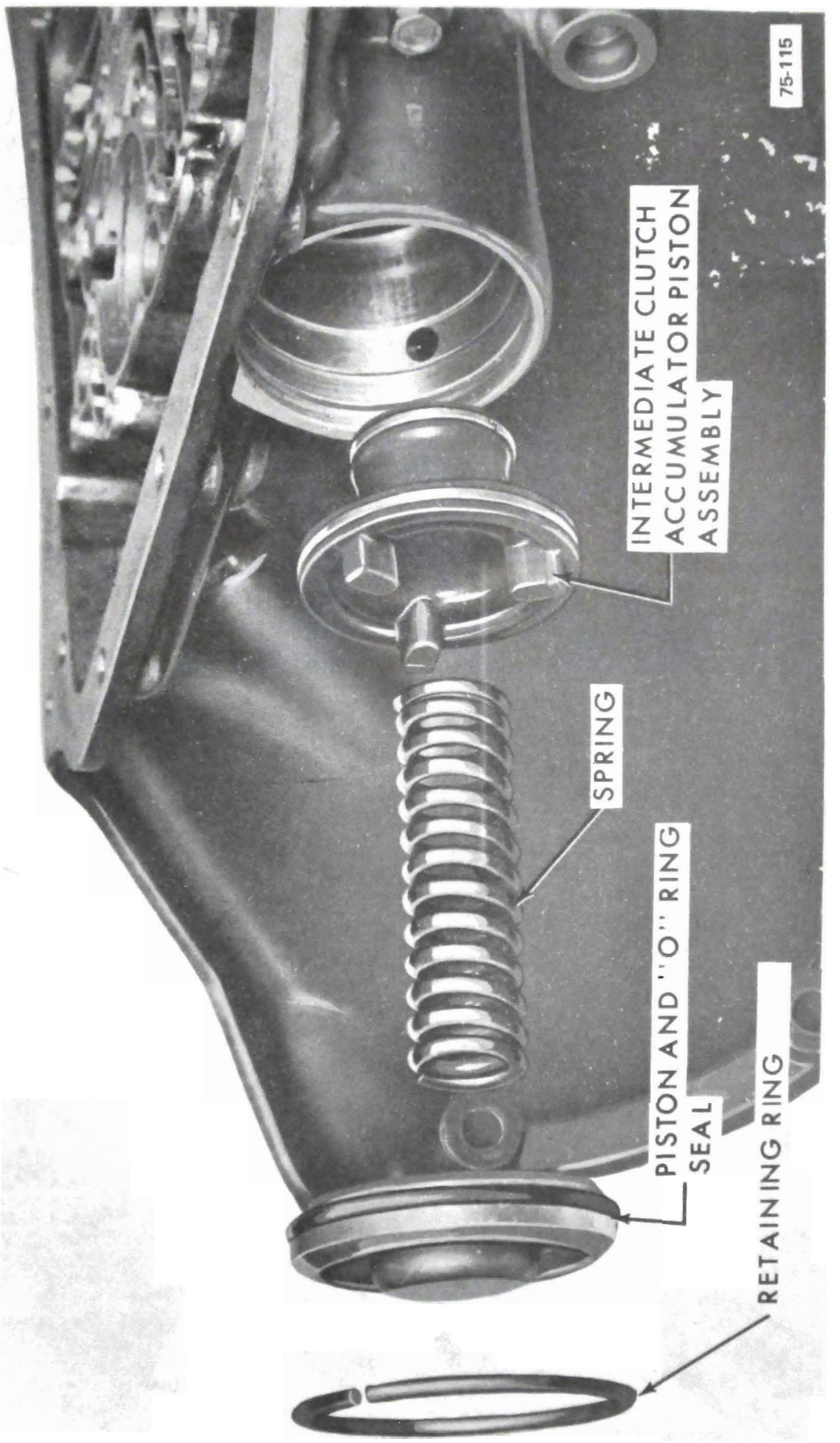


Figure 75-134 - Intermediate Clutch Accumulator - Exploded View

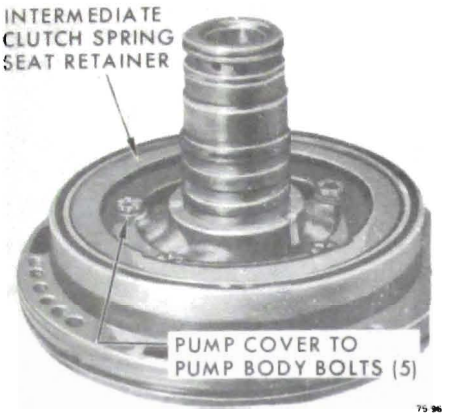


Figure 75-135

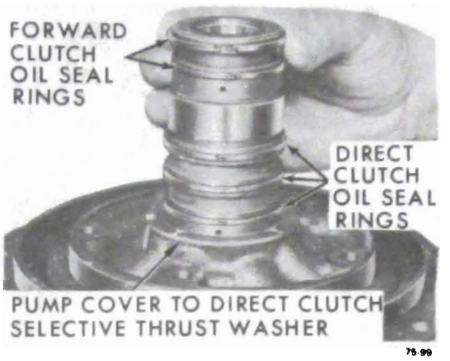


Figure 75-138

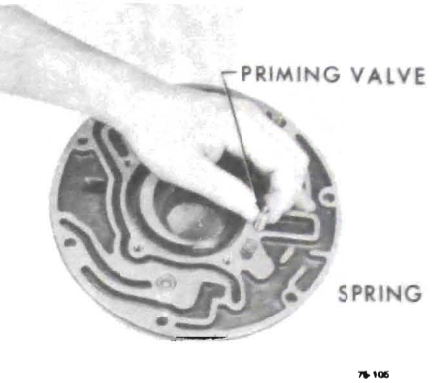


Figure 75-141

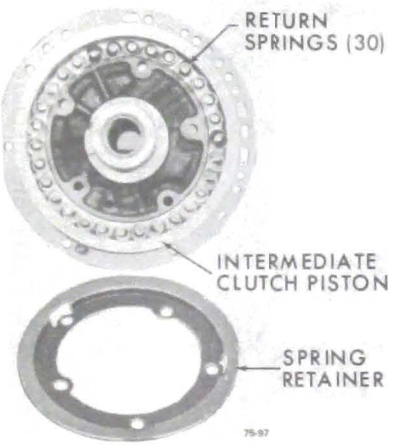


Figure 75-136

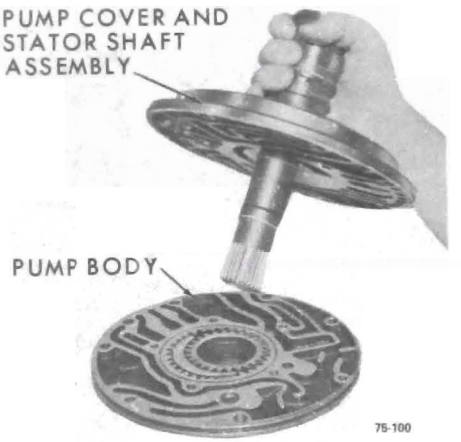


Figure 75-139

Figure 75-142

Figure 75-137

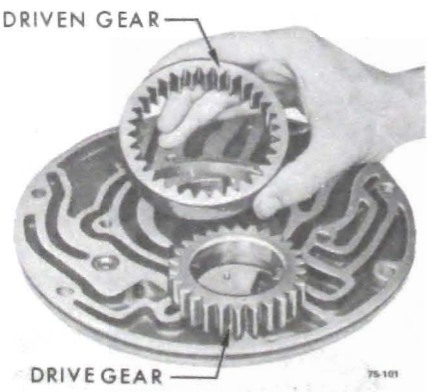


Figure 75-140

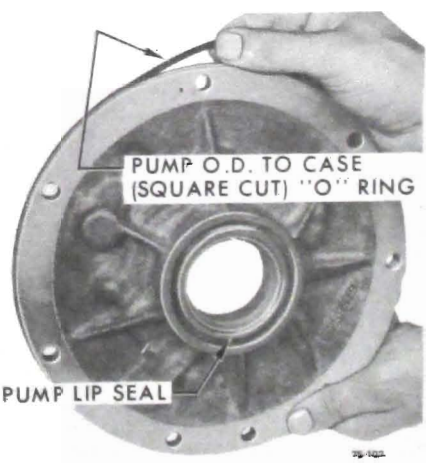


Figure 75-143

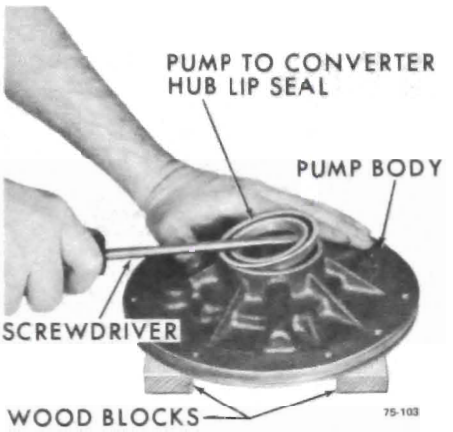


Figure 75-144

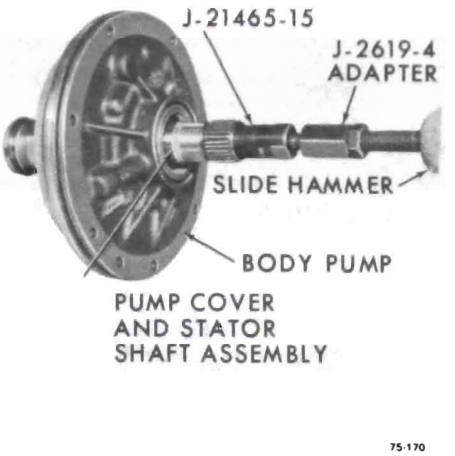


Figure 75-147

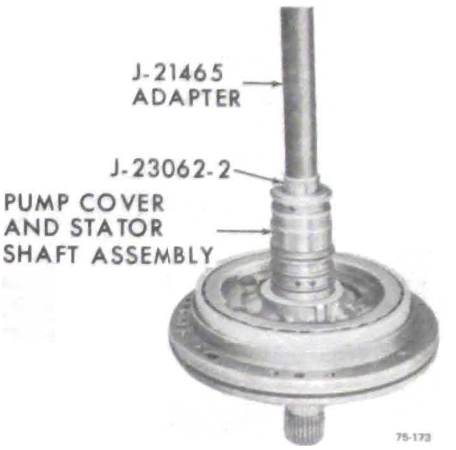


Figure 75-150

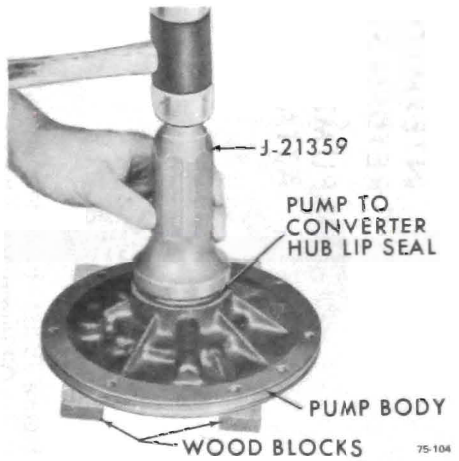


Figure 75-145

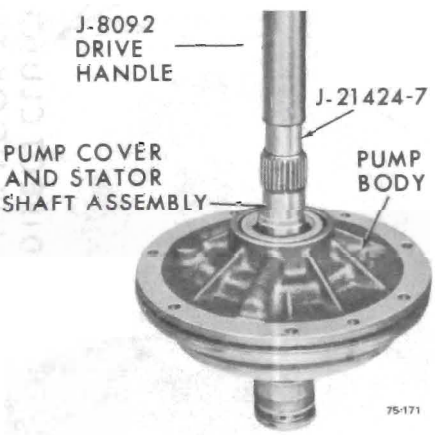


Figure 75-148

Figure 75-146

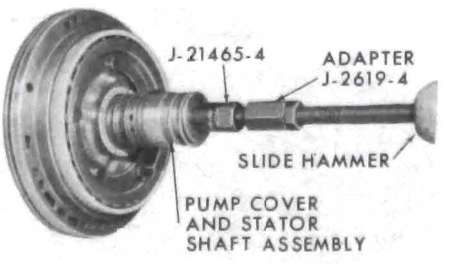


Figure 75-149

7. Install thirty (30) release springs. See Figure 75-158.

8. Install spring retainer and install five (5) attaching bolts, finger tight. See Figure 75-160.

9. Place pump aligning strap, J-21369 over pump body and cover and tighten.

10. Tighten attaching bolts. Torque to 18 lb.ft.

11. Install pump outside diameter to case (square cut) "O" ring seal. See Figure 75-163.

IMPORTANT: Use new square cut "O" ring seal.

12. Install three (3) direct clutch to pump hub hook type oil seal rings. Install two (2) forward clutch to pump hub hook type oil seal rings. See Figure 75-164.

13. Install direct clutch drum housing to pump cover selective thrust washer over pump cover delivery sleeve. See Figure 75-165.

CAUTION: Check three (3) pump cover hub lube holes. Make certain they are not restricted. See Figure 75-166.

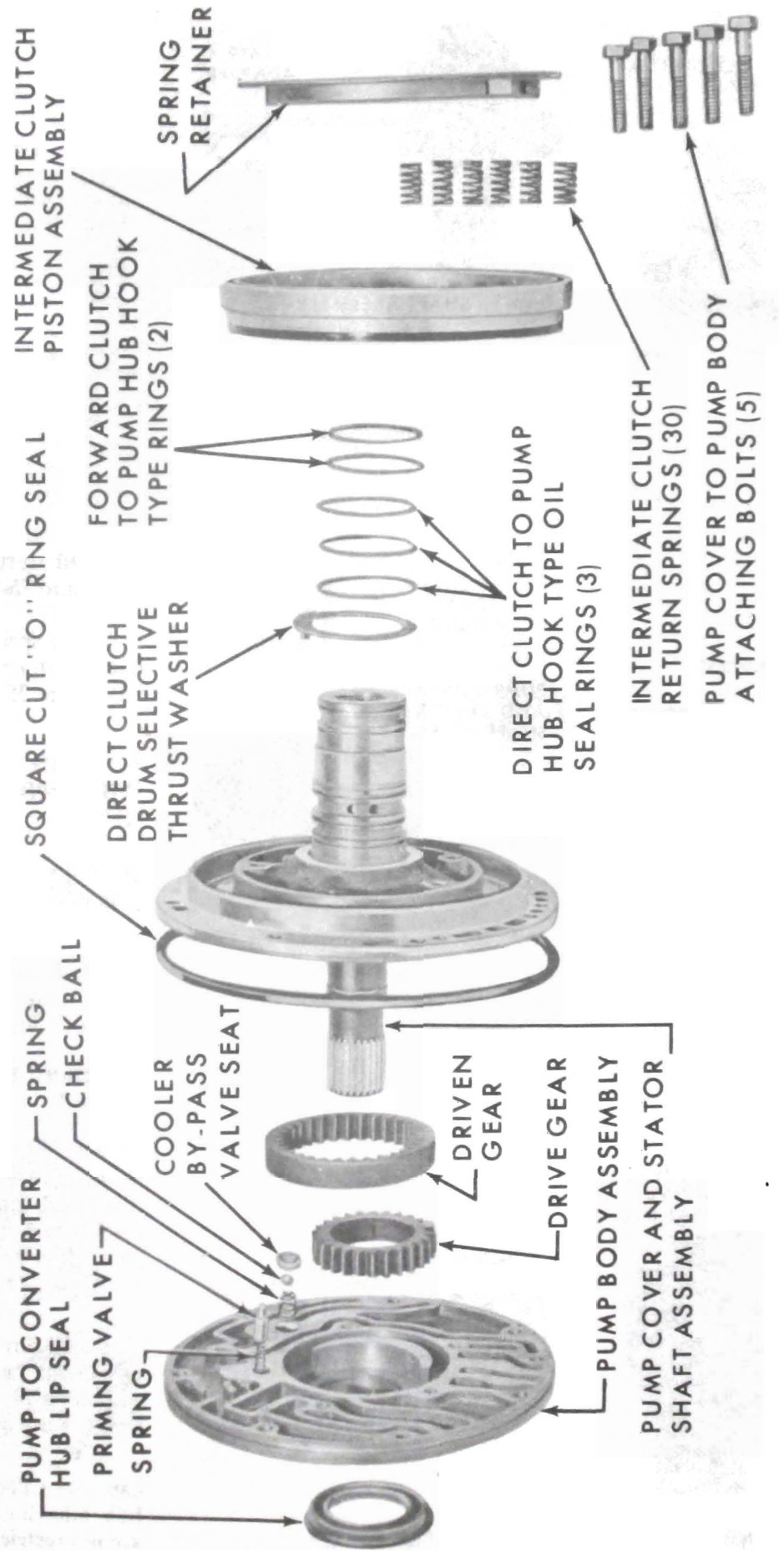


Figure 75-152 - Exploded View of Oil Pump Assembly

Figure 75-153

Figure 75-156

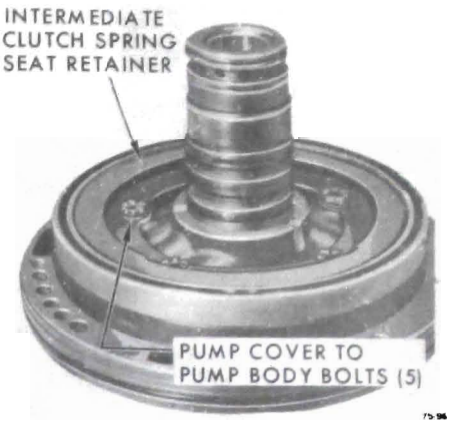


Figure 75-160

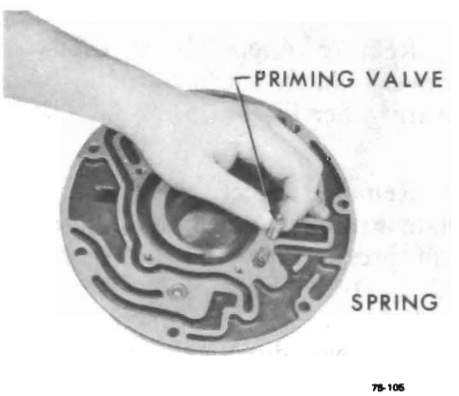


Figure 75-154

Figure 75-157

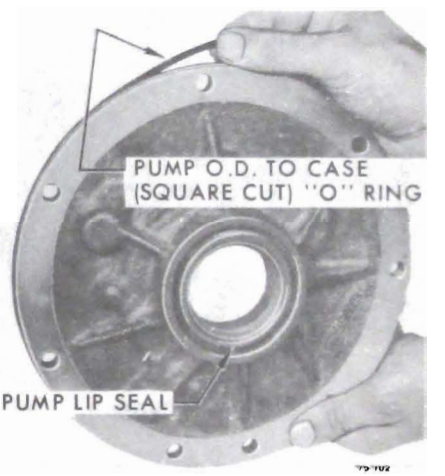


Figure 75-163

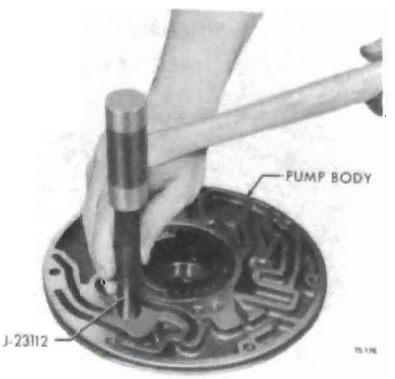


Figure 75-155

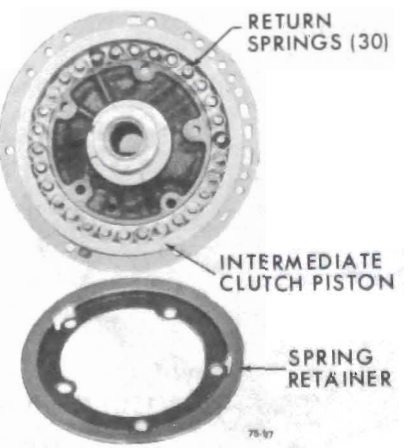


Figure 75-158

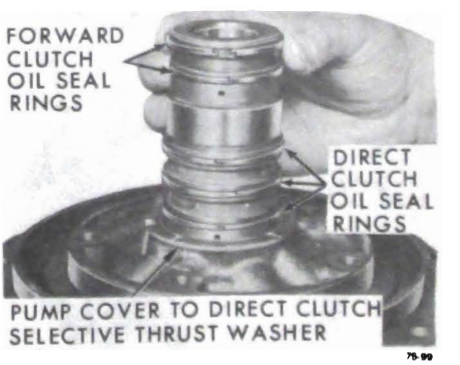


Figure 75-164

Figure 75-165

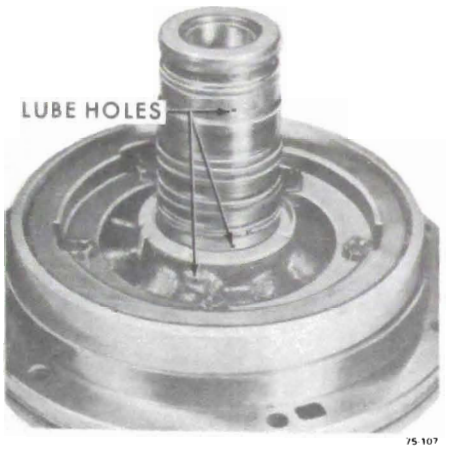


Figure 75-166

75-23 DISASSEMBLY AND REASSEMBLY OF DIRECT CLUTCH

a. Disassembly of Direct Clutch

1. Remove intermediate overrun clutch front retainer ring and retainer. See Figure 75-167.

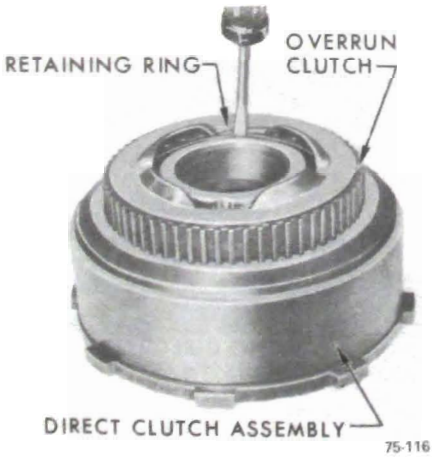


Figure 75-167

Figure 75-168

Figure 75-169

2. Remove intermediate clutch overrun outer race. See Figure 75-168.

3. Remove intermediate overrun roller clutch assembly. See Figure 75-169.

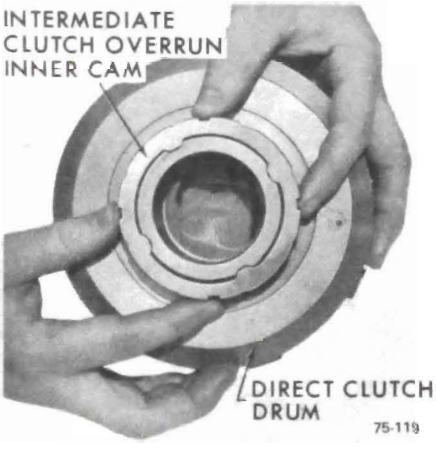


Figure 75-170

Figure 75-171

4. Remove intermediate overrun roller clutch cam. See Figure 75-170.

5. Remove direct clutch drum to forward clutch housing needle roller bearing. See Figure 75-171.

6. Remove direct clutch pressure plate to clutch drum retaining ring and pressure plate. See Figure 75 172.

7. Remove direct clutch housing cushion spring, four (4) lined and four (4) steel plates. See Figure 75 173.

8. Remove direct clutch piston return spring seat retaining ring and spring seat by using Tools J-2590-3, J-2590-5, and snap ring pliers. See Figure 75-174.

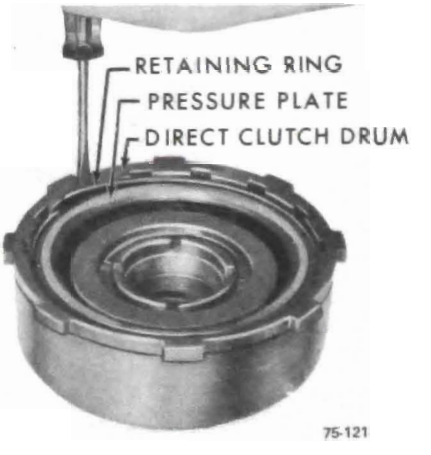


Figure 75-172

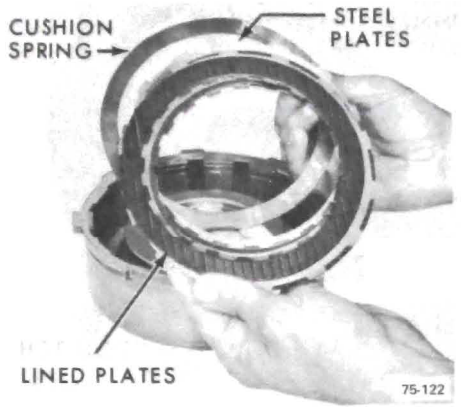


Figure 75-173

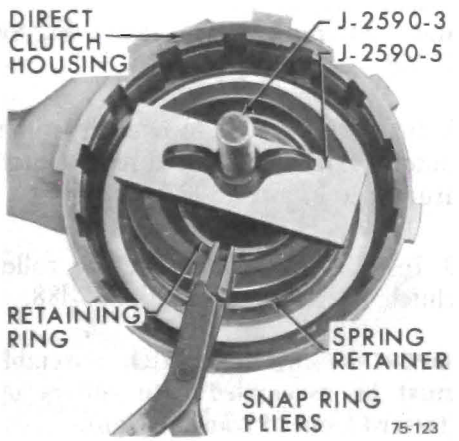


Figure 75-174

9. Remove seventeen (17) clutch return coil springs and piston. See Figure 75-175.

10. Remove direct clutch piston inner and outer seals. See Figure 75-176.

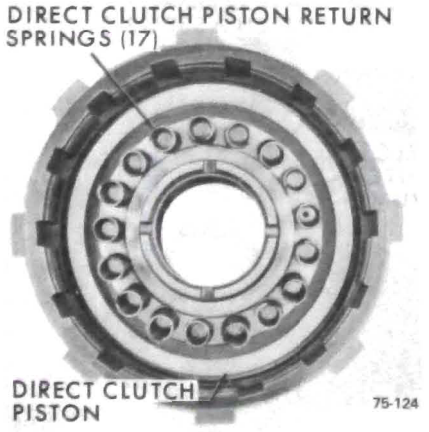


Figure 75-175

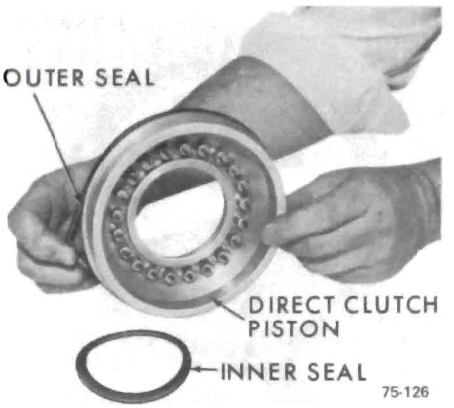


Figure 75-176

11. Remove direct clutch piston center seal. See Figure 75-177.

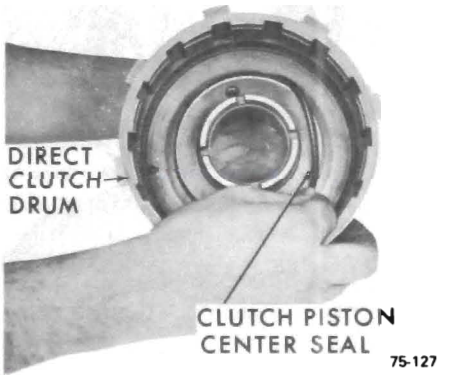


Figure 75-177

12. If bushing replacement is necessary, use a Cape Chisel and remove bushing using care not to score inner

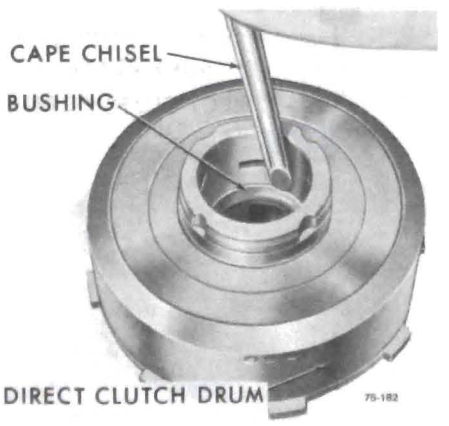


Figure 75-178

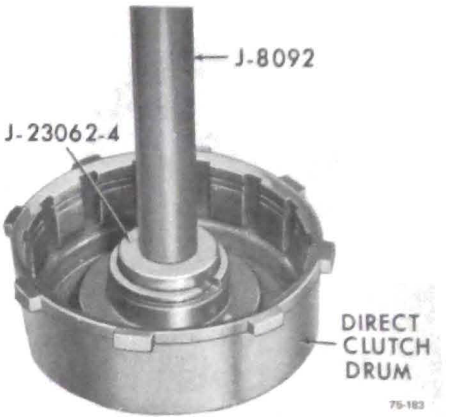


Figure 75-179

surface of direct clutch drum. See Figure 75-178.

13. Install direct clutch bushing using Tool J-23062-4, Drive Handle J-8092, and install .010" below slot in retainer hub. See Figure 75-179.

b. Reassembly of Direct Clutch

1. Install the direct clutch piston outer seal and inner seal. See Figure 75-180.

2. Install direct clutch piston center seal. See Figure 75-181.

3. Install the direct clutch piston into housing with the aid of a piece of .020" music wire crimped into copper tubing. See Figure 75-182.

4. Install seventeen (17) clutch return coil springs. See Figure 75-183.

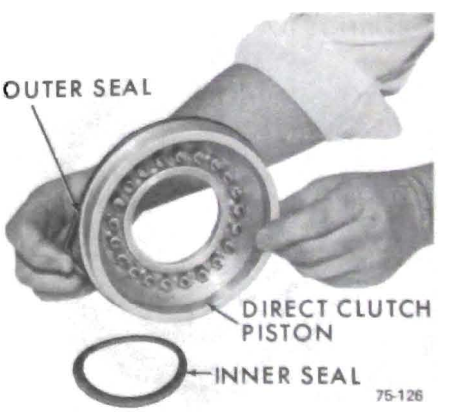


Figure 75-180

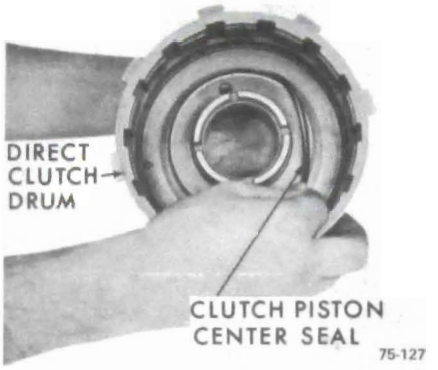


Figure 75-181

Figure 75-182

NOTE: Return springs are violet in color.

5. Install spring retainer. Compress spring retainer and install retaining ring, using Tools J-2590-3 and J-2590-5. See Figure 75-184.

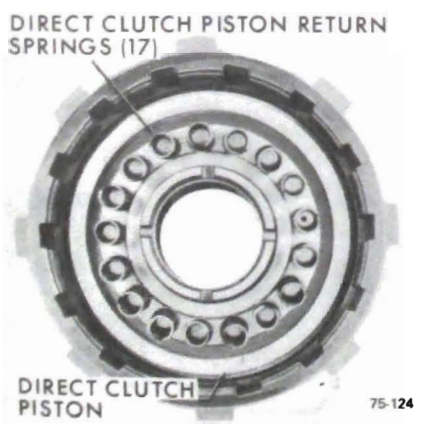


Figure 75-183

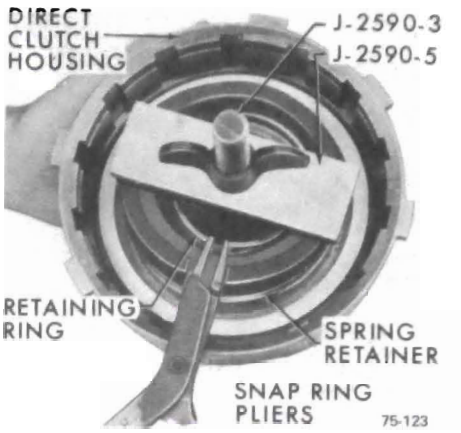


Figure 75-184

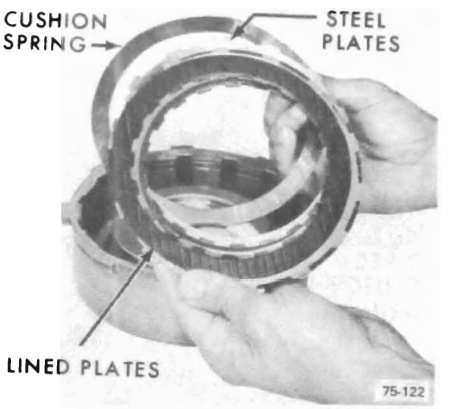


Figure 75-185

6. Lubricate with transmission fluid and install cushion spring, four (4) faced plates and four (4) steel separator plates starting with the cushion spring and alternating steel and faced. See Figure 75-185.

Figure 75-186

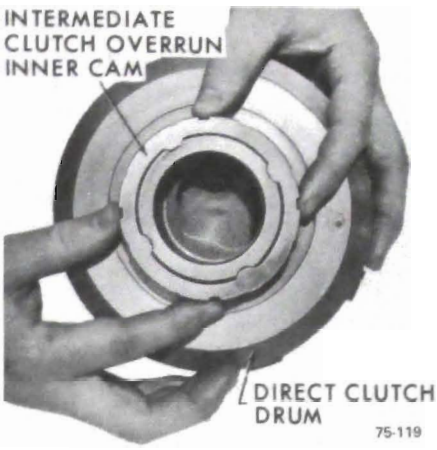


Figure 75-187

7. Install direct clutch pressure plate and retaining ring. See Figure 75-186.

8. Install intermediate overrun roller clutch cam on the direct clutch drum. See Figure 75-187.

9. Install intermediate overrun roller clutch assembly. See Figure 75-188.

IMPORTANT: Roller clutch assembly must be assembled with rollers up (toward front of transmission).

10. Install intermediate clutch overrun outer race. See Figure 75-189.

NOTE: When the intermediate overrun clutch outer race is installed it should free wheel in the counterclockwise direction only.

11. Install intermediate overrun clutch

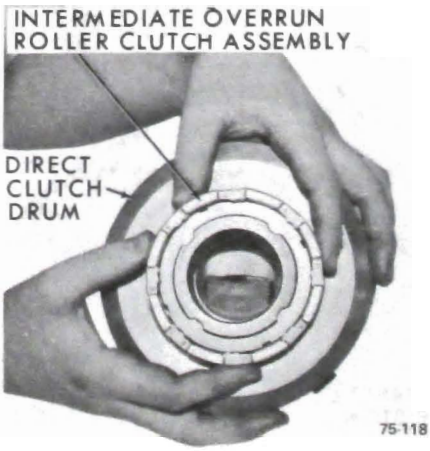


Figure 75-188

Figure 75-189

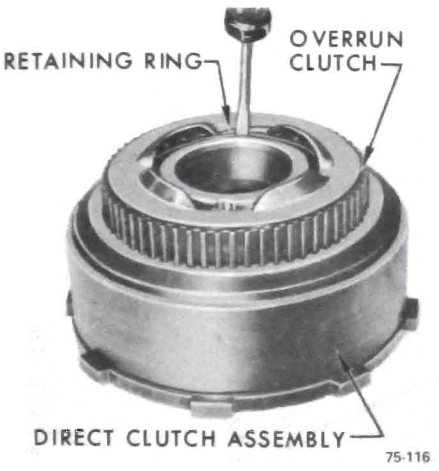


Figure 75-190

retainer, and retaining ring. See Figure 75-190.

75-24 DISASSEMBLY AND REASSEMBLY OF FORWARD CLUTCH ASSEMBLY

a. Disassembly of Forward Clutch

1. Remove forward clutch drum to pressure plate retaining ring.

Remove forward clutch pressure plate. See Figure 75-193.

2. Remove five (5) forward clutch housing faced plates, five (5) steel plates and cushion spring. See Figure 75-194.

3. Remove spring retainer by compressing with a ram press. See Figure 75-197.

4. Remove twenty-one (21) clutch return coil springs. See Figure 75-198.

5. Remove forward clutch piston assembly. See Figure 75-199.

6. Remove forward clutch piston inner and outer seals. See Figure 75-200.

7. Make certain forward clutch ball check exhaust is free of dirt, etc. See Figure 75-201.

b. Reassembly of Forward Clutch Assembly

1. Install the forward clutch inner piston seal and outer piston seal. See Figure 75-203.

2. Install the forward clutch piston assembly with aid of a piece of .020" music wire crimped into copper tubing. See Figure 75-204.

3. Install twenty-one (21) clutch return coil springs. See Figure 75-205.

NOTE: Return springs are violet in color.

4. Install spring retainer. Compress spring retainer with an arbor press or ram press. See Figure 75-206.

5. Lubricate with transmission fluid and install cushion spring, five (5) faced plates and five (5) steel separator plates, starting with the cushion spring and alternating steel and faced. See Figure 75-207.

NOTE: Forward clutch cushion spring is plain (not color coded).

6. Install forward clutch pressure plate and retaining ring. See Figure 75-208.

Using a feeler gage check free back height between the forward clutch pressure plate and faced plate. See Figure 75-208A. There are (3) three pressure plates available which are identified by tangs adjacent to the source identification mark. See Figure 75-208B. If checking height is .0205"-.0560" use pressure plate with no tang, .0560"-.0870" (1) one tang, .0870"-.1430" (2) two tangs.

75-25 DISASSEMBLY AND REASSEMBLY OF SUN GEAR TO DRIVE SHELL

a. Disassembly of Sun Gear to Drive Shell

1. Remove sun gear to sun gear drive shell rear retaining ring. See Figure 75-210.

2. Remove sun gear to drive shell flat rear thrust washer. See Figure 75-211.

3. Remove front retaining ring from sun gear. See Figure 75-212.

If sun gear bushings replacement are necessary, remove with a cape chisel. See Figure 75-213.

Install sun gear bushings using Tool J-23062-3, J-8092 and install flush to .010" below counterbores. See Figure 75-214.

b. Reassembly of Sun Gear to Drive Shell

1. Install sun gear to drive shell front retaining ring, and install into drive shell. See Figure 75-215.

CAUTION: Use a new ring and do not overstress when installing.

2. Install sun gear to drive shell flat thrust washer. See Figure 75-216.

3. Install sun gear to sun gear drive shell rear retaining ring. See Figure 75-217.

CAUTION: Use a new ring and do not overstress when installing.

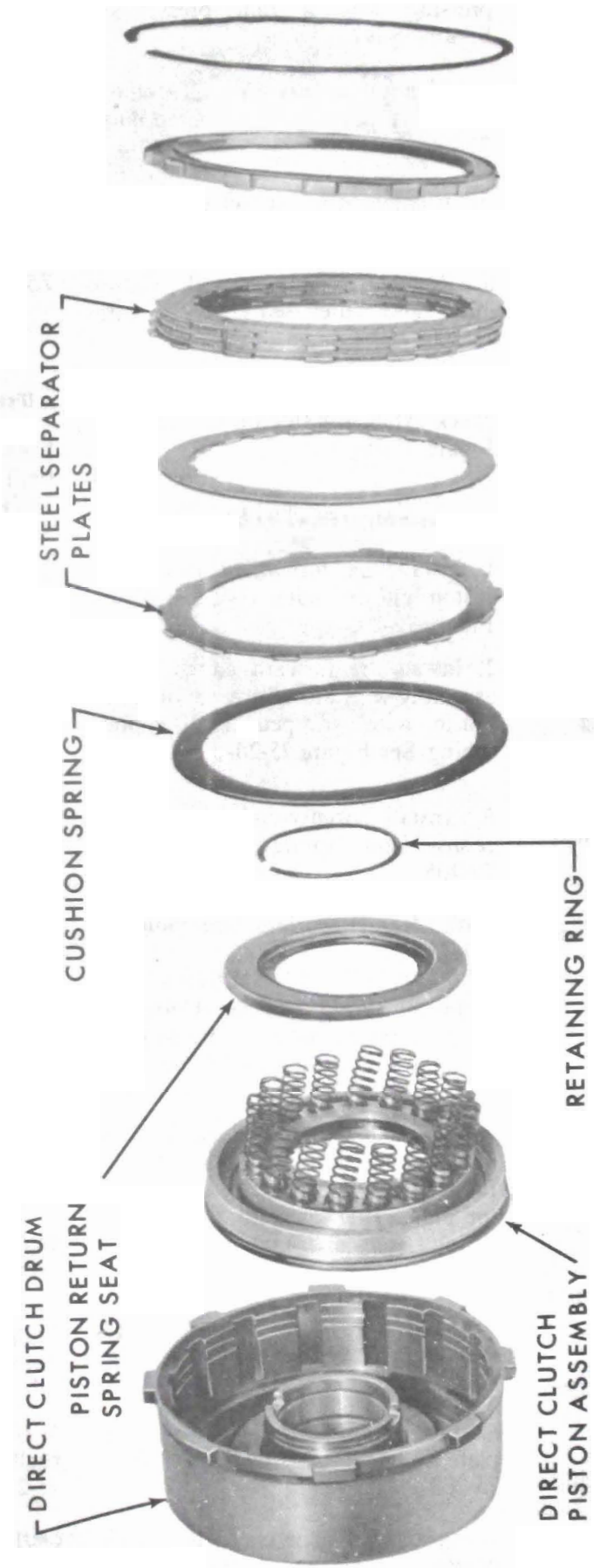


Figure 75-191 - Direct Clutch Assembly - Exploded View

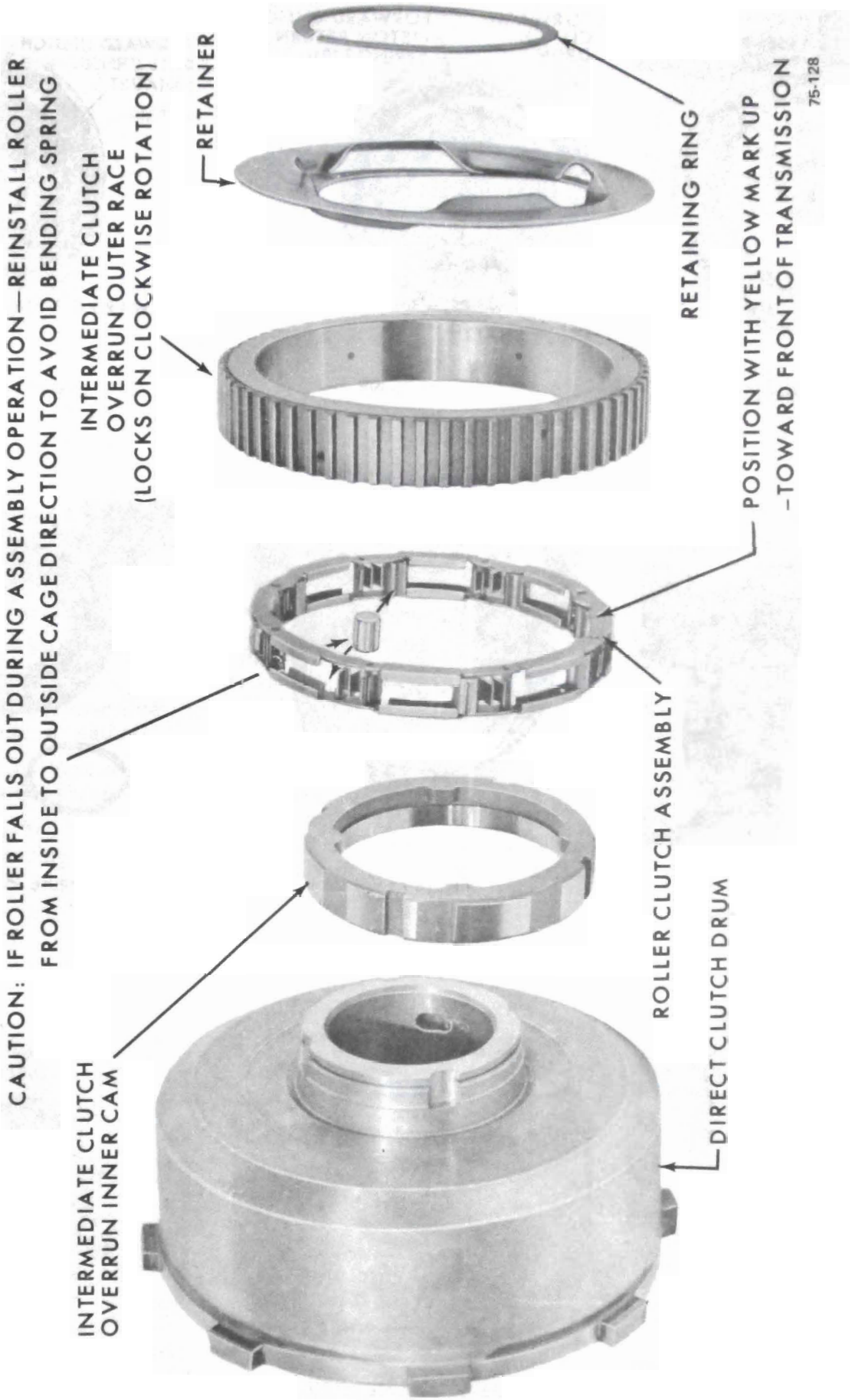


Figure 7B-192 - Intermediate Overrun Roller Clutch Assembly

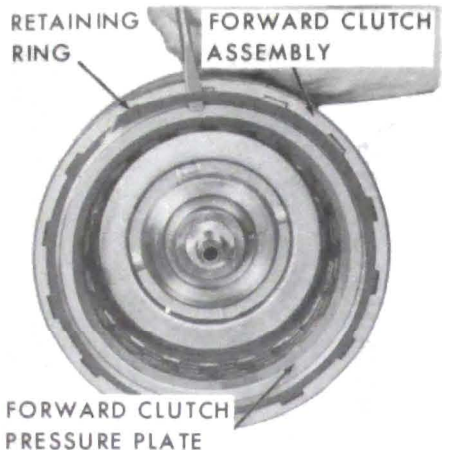


Figure 75-193

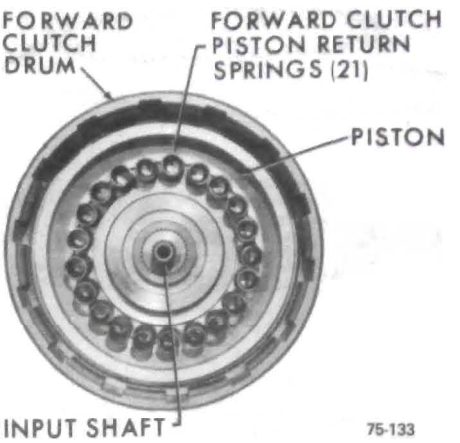


Figure 75-198

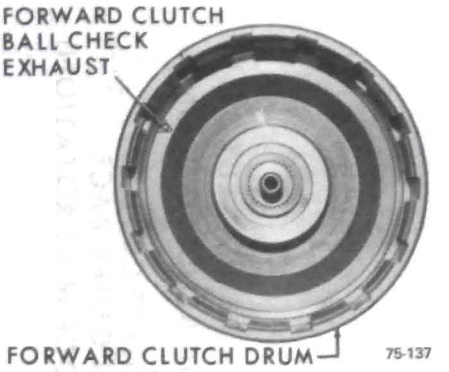


Figure 75-201

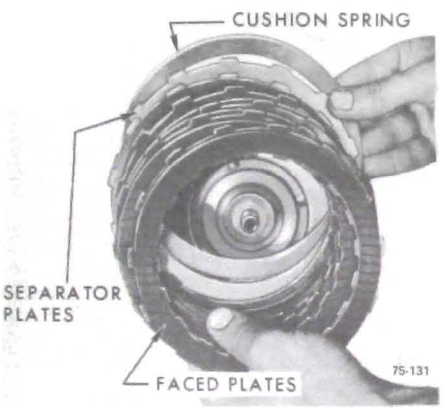


Figure 75-194

Figure 75-199

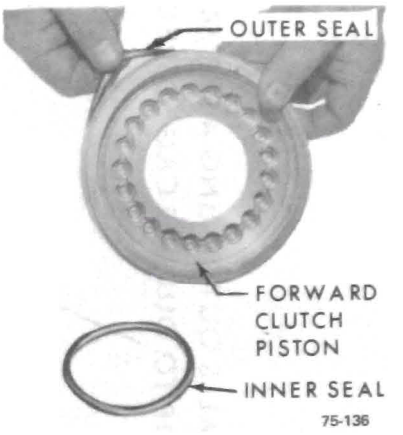


Figure 75-203

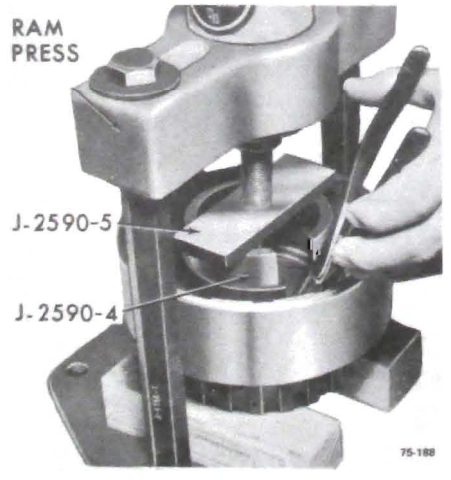


Figure 75-197

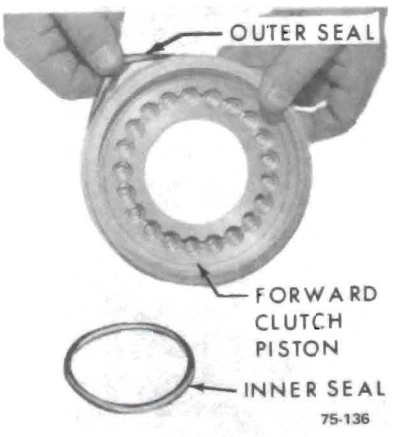


Figure 75-200

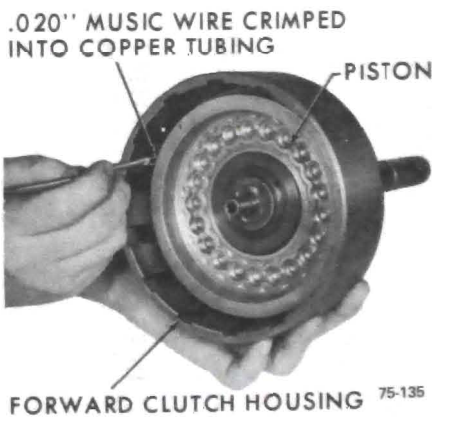


Figure 75-204

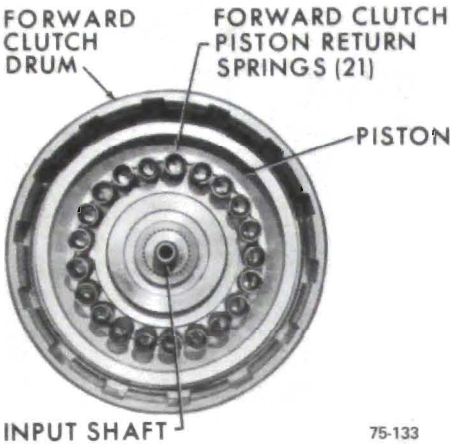


Figure 75-205

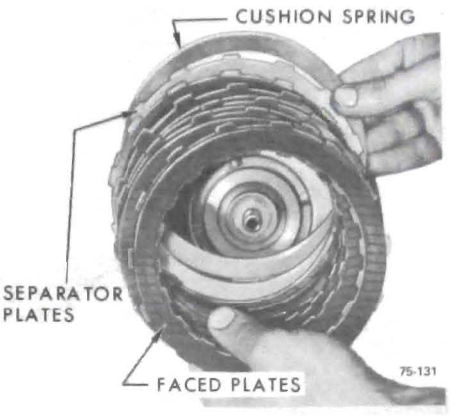


Figure 75-207

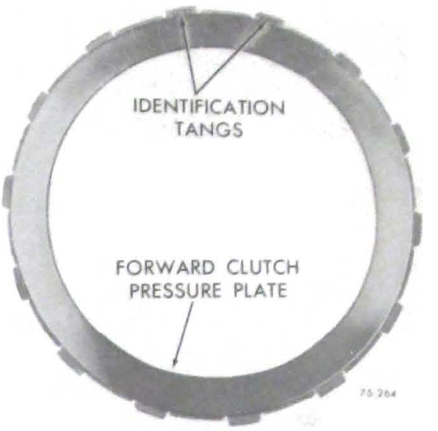


Figure 75-208B

75-26 DISASSEMBLY AND REASSEMBLY OF LOW AND REVERSE ROLLER CLUTCH ASSEMBLY

a. Disassembly of Low and Reverse Roller Clutch Assembly

1. Remove low and reverse clutch to sun gear shell thrust washer.

2. Remove low and reverse overrun clutch inner race. See Figure 75-219.

3. Remove low and reverse roller clutch retaining ring. See Figure 75-220.

4. Remove low and reverse roller clutch assembly.

5. Remove springs and rollers from low and reverse clutch assembly. See Figure 75-222.

6. Install springs and rollers using caution on installation of rollers. Install rollers from outside in to avoid bending springs. See Figure 75-223.

b. Reassembly of Low and Reverse Roller Clutch Assembly

1. Install low and reverse roller clutch assembly to inner race. See Figure 75-225.

NOTE: The inner race should free wheel in the clockwise direction only.

2. Install low and reverse overrun roller clutch assembly and inner race into the low and reverse clutch support. See Figure 75-226.

NOTE: Assemble with four (4) holes down or to rear of transmission.

3. Install low and reverse clutch to cam retaining ring. See Figure 75-227.

4. Install low and reverse clutch to sun gear drive shell thrust washer. See Figure 75-228.

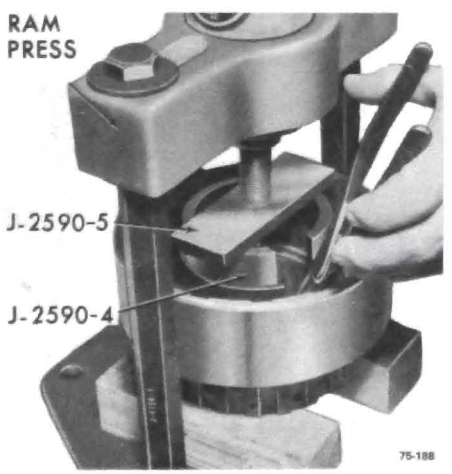


Figure 75-206

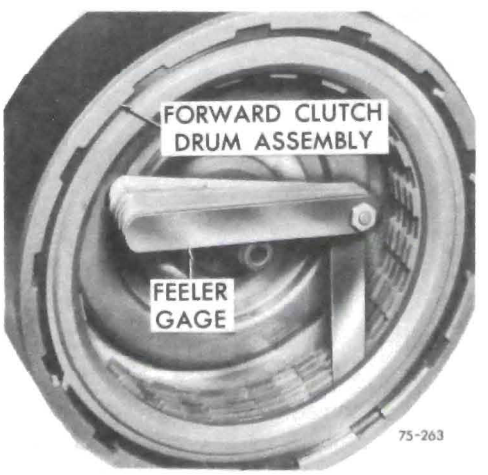


Figure 75-208A

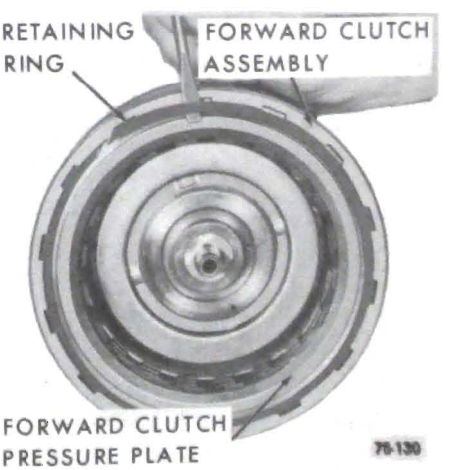


Figure 75-208

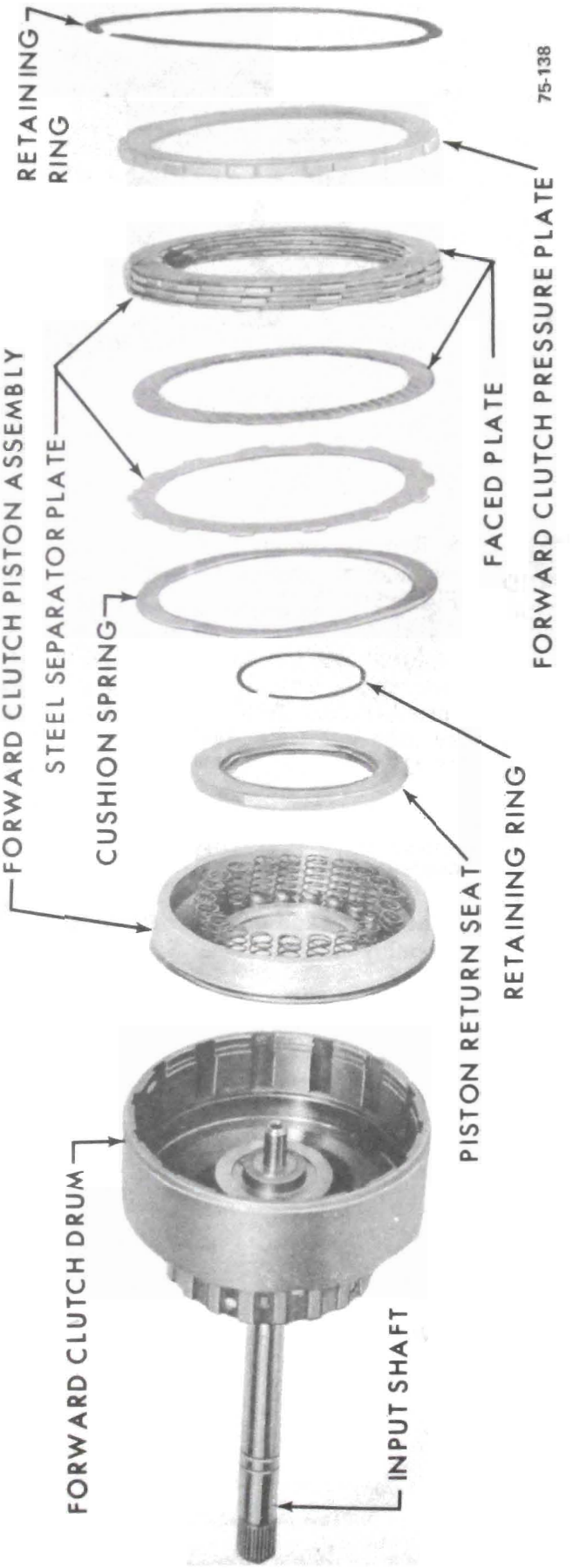


Figure 75-209 - Forward Clutch Assembly Exploded View

Figure 75-210

Figure 75-213

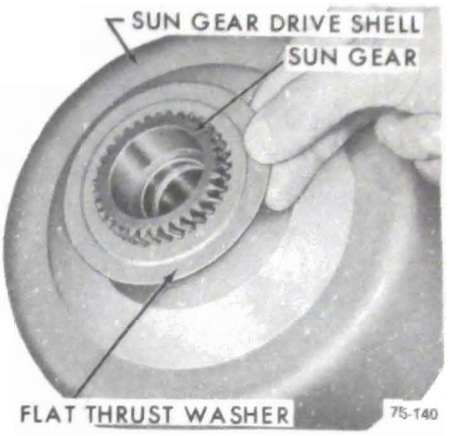


Figure 75-216

Figure 75-211

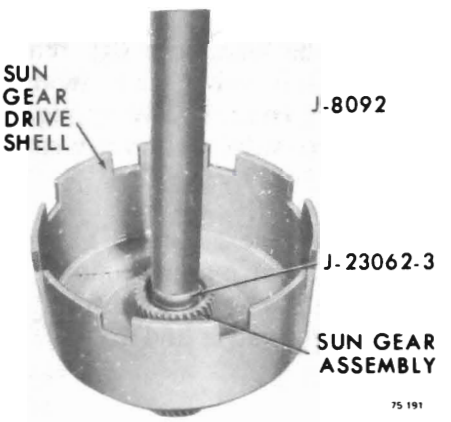


Figure 75-214 - Bushing Installation

Figure 75-217

Figure 75-212

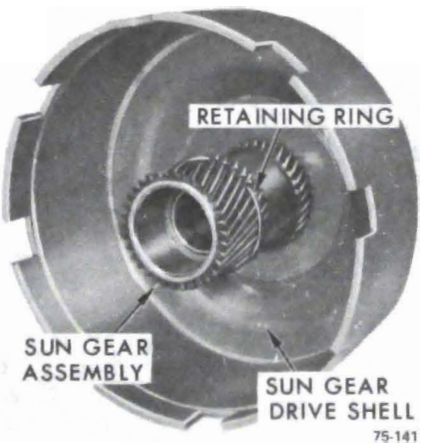


Figure 75-215

Figure 75-218

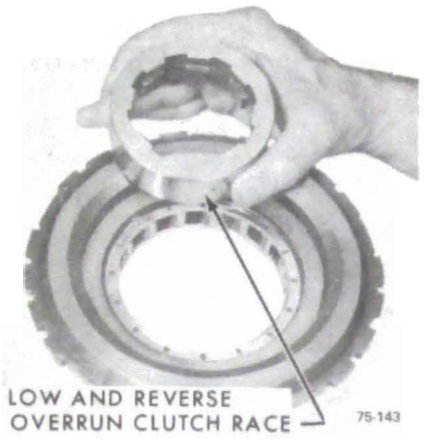


Figure 75-219

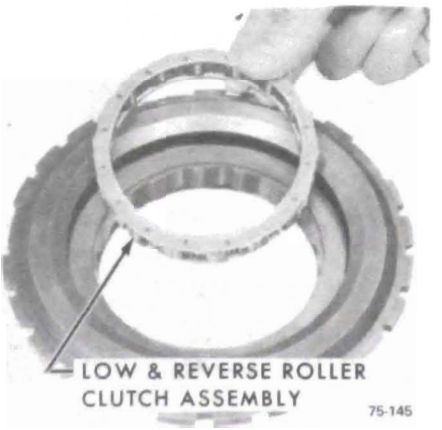


Figure 75-221

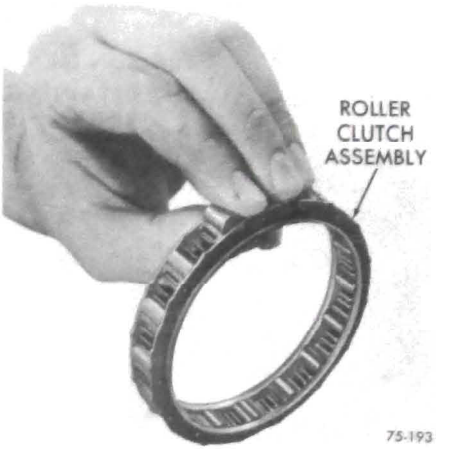


Figure 75-223

75-27 VALVE BODY DISASSEMBLY, INSPECTION AND REASSEMBLY

a. Disassembly of Valve Body (Refer to Figure 75-230)

NOTE: Transmission need not be removed from car to perform the following operations.

1. Position valve body assembly with cored face up and direct clutch accumulator piston pocket positioned as shown in Figure 75-231.

2. Remove manual valve from lower left hand bore (J).

3. From lower right hand bore (A) remove the pressure regulator valve train retaining pin, boost valve sleeve, intermediate boost valve, reverse and modulator boost valve, pressure regulator valve spring, and the pressure regulator valve.

4. From the next bore (B), remove the 2-3 shift valve train retaining pin, sleeve, control valve spring, 2-3 shift control valve, shift valve spring, and the 2-3 shift valve.

5. From the next bore (C), remove the 1-2 shift valve train retaining pin, sleeve, shift control valve spring, 1-2 shift control valve, and the 1-2 shift valve.

6. From the next bore (E), remove retaining pin, plug, manual low control valve spring, and the manual low control valve.

7. From the next bore (F), remove the retaining pin, spring, seat, and the detent regulator valve. 8. Install Tool J-22269, on direct clutch accumulator piston and remove retaining "E" ring. (G) See Figure 75-230.

9. Remove direct clutch accumulator piston, and metal oil seal ring, and spring. (G)

10. From the next bore down (D) from the direct clutch accumulator, remove the detent actuating lever bracket bolt, bracket, actuating lever and retaining pin, stop, spring retainer, seat, outer spring, inner spring, washer and the detent valve.

NOTE: Do not touch sleeves when handling valve body assembly as valve body sleeve retaining pins will fall out.

b. Valve Body Inspection

1. Inspect all valves for scoring, cracks and free movement in their respective bores.

2. Inspect valve body for cracks, scored bores, interconnected oil passages and flatness of mounting face.

3. Check all springs for distortion or collapsed coils.

c. Reassembly of Valve Body

1. Install direct clutch accumulator piston spring and piston into valve body.

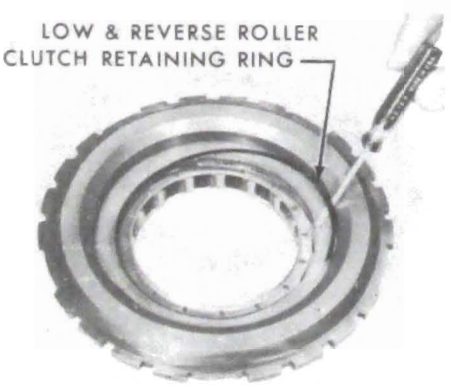


Figure 75-220

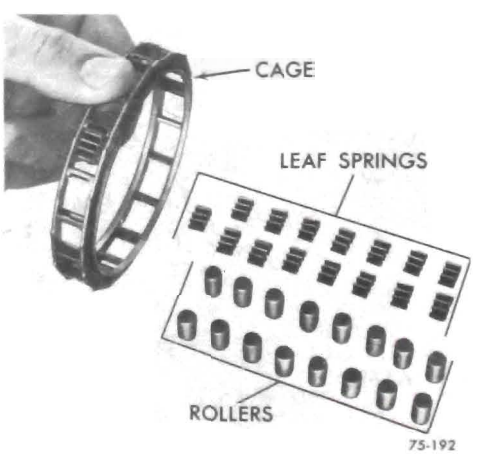


Figure 75-222

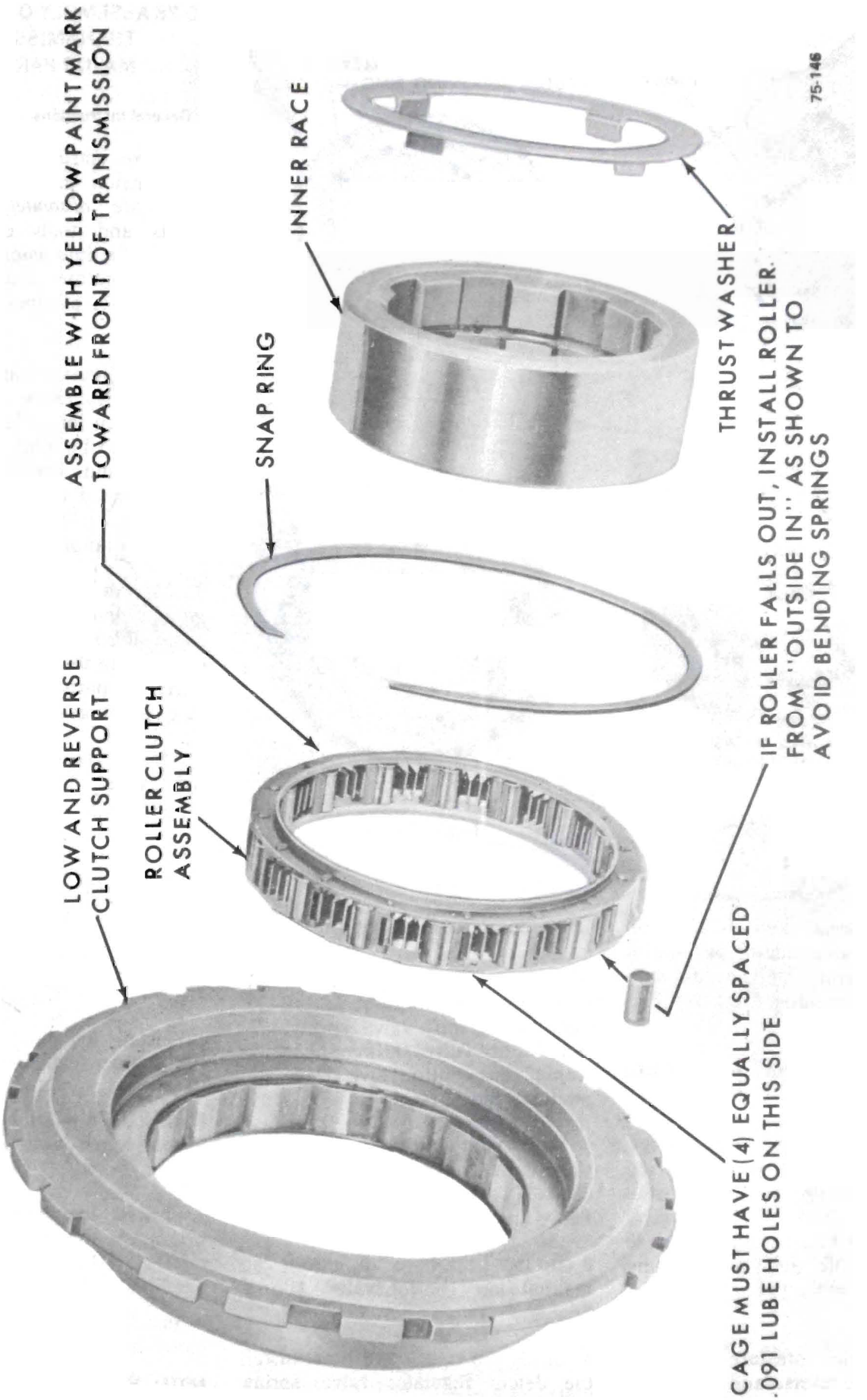


Figure 75-224 - Low and Reverse Clutch Support and Overrun Roller Clutch Assembly - Exploded View

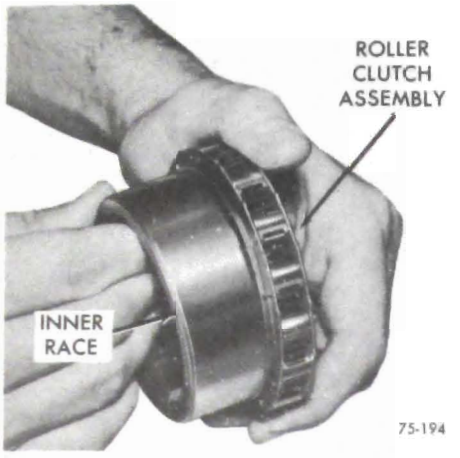


Figure 75-225

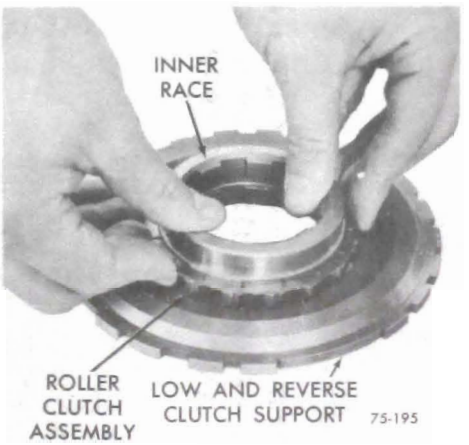


Figure 75-226

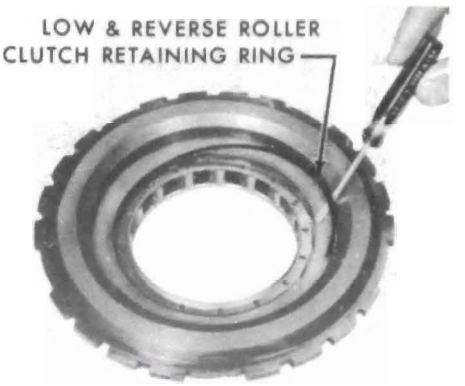


Figure 75-227

Figure 75-228

2. Install special tool J-22269 on direct clutch accumulator piston and compress spring and piston and secure with retaining ring. See Figure 75-230.

NOTE: Align piston and oil seal ring when entering bore.

3. Install the detent valve, washer, outer spring, inner spring, spring seat, and spring retainer. Install detent valve stop and detent valve actuating bracket. Torque bolt to 16 lb.ft. Assemble detent actuating lever with retaining pin.

4. Install the pressure regulator valve, spring, reverse and modulator boost valve, intermediate boost valve, boost valve sleeve and retaining pin.

5. In the next bore up, install 2-3 shift valve, shift valve spring, 2-3 shift control valve, shift control valve spring, shift control valve sleeve and retaining pin.

6. In the next bore up, install the 1-2 shift valve, 1-2 shift control valve, control valve spring, control valve sleeve and retaining pin.

7. In the next bore up, install the manual low control valve, spring, plug and retaining pin.

8. In the top right hand bore, install the detent regulator valve, spring seat, spring and retaining pin.

75-28 ASSEMBLY OF TRANSMISSION FROM MAJOR PARTS AND UNITS

a. General Instructions

1. Before starting to assemble the transmission make certain that all parts are *absolutely clean.* Keep hands and tools clean to avoid getting dirt into assembly. If work is stopped before assembly is completed cover all openings with clean cloths.

2. When reassembling it is important that all thrust washer surfaces be given an initial lubrication. Bushings should be lubricated with transmission fluid. Thrust washers should be lubricated on both surfaces with petroleum jelly, (unmedicated) before installation.

3. *Do not take a chance on used gaskets and seals - use new ones to avoid oil leaks.*

4. Use care to avoid making nicks or burrs on parts, particularly on surfaces where gaskets are used.

5. It is extremely important to tighten all parts evenly and in proper sequence, to avoid distortion of parts and leakage at gaskets and other joints. *Use a reliable torque wrench to tighten all bolts and nuts to specified torque and in the specified sequence.*

b. Installation of Low and Reverse Clutch Piston

1. Install low and reverse clutch piston outer seal. See Figure 75-240.

2. Install low and reverse clutch piston center and inner seal. See Figure 75-241.

3. Install low and reverse clutch piston assembly with notch in piston installed adjacent to parking pawl. See Figure 75-242.

4. Install seventeen (17) piston return (coil) springs. See Figure 75-243.

NOTE: Return springs are orange in color.

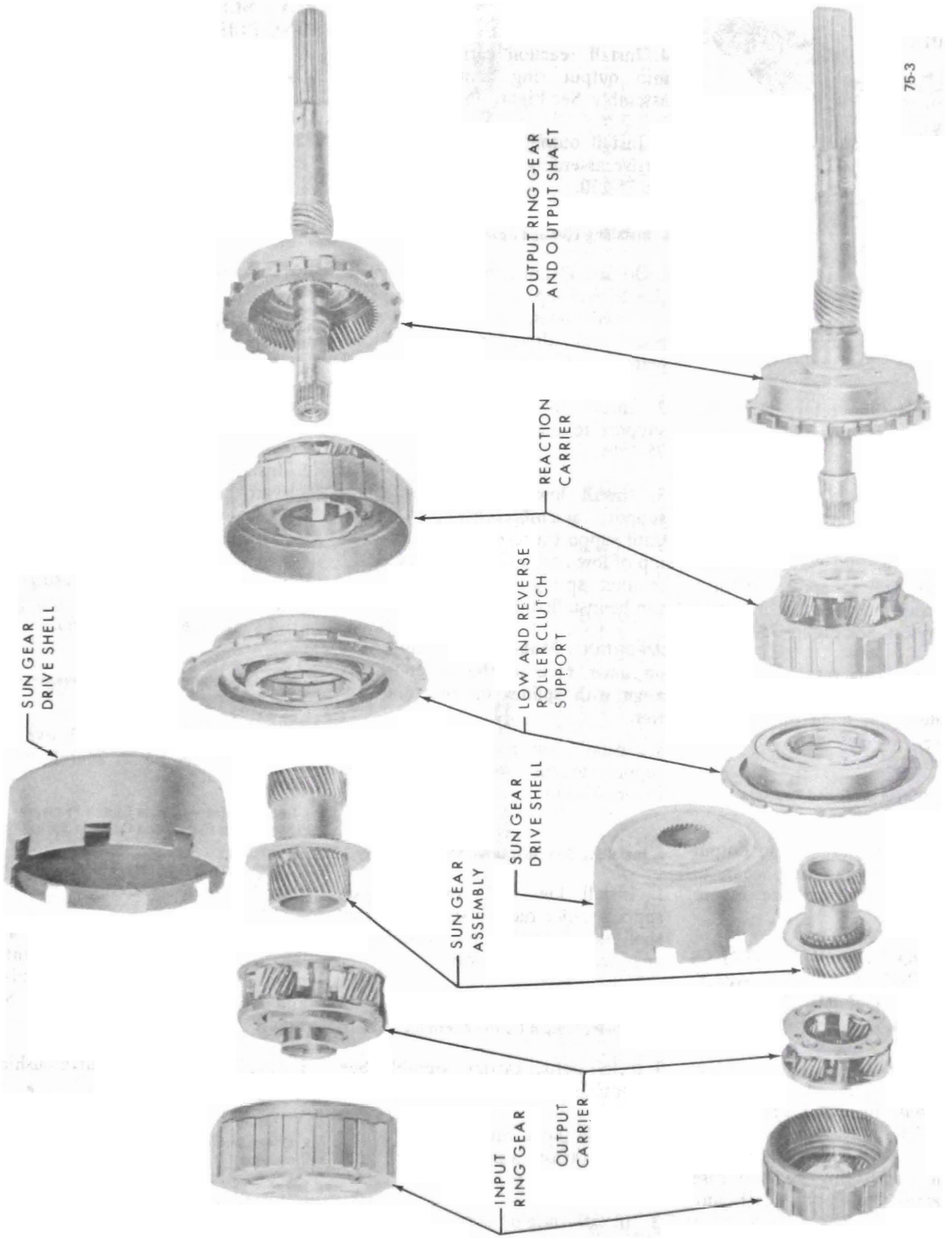


Figure 75-229 - Planetary Gear Train - Exploded View

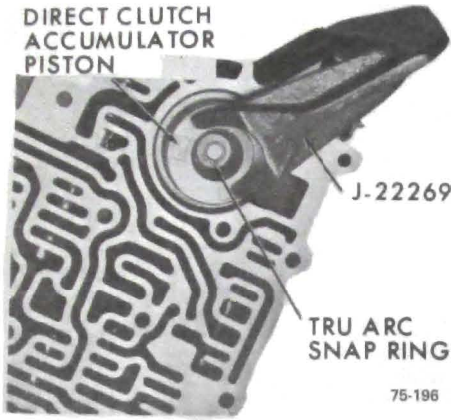


Figure 75-230

5. Position piston return seat on piston return springs. Place snap ring on return seat so that ring may be easily installed when seat is compressed with Tool J-21420.

6. Install spring retainer and retaining ring. Using Tool J-21420-1 compress return seat so spring retainer retaining ring may be installed with snap ring pliers. See Figure 75-245.

CAUTION: As spring retainer is compressed make certain inner edge of retainer does not hang up on snap ring groove.

c. Installing Output Shaft and Reaction Carrier

1. Install output ring gear to output shaft. Install output ring gear to output shaft snap ring. See Figure 75-246.

CAUTION: DO NOT OVER STRESS SNAP RING ON ASSEMBLY. ALWAYS USE NEW RING ON REASSEMBLY.

2. Install reaction carrier to output ring gear tanged thrust washer. Washer has three (3) tangs see Figure 75-247.

3. Install output ring gear to case needle bearing assembly. See Figure 75-248.

NOTE: Lip on inner race of bearing MUST point toward rear of transmission.

4. Install reaction carrier assembly into output ring gear and shaft assembly. See Figure 75-249.

5. Install output shaft and reaction carrier assembly into case. See Figure 75-250.

d. Installing Low and Reverse Clutch Plates

1. Oil and install five (5) low reverse clutch steel separator plates and five (5) faced plates, starting with a steel plate and alternating with faced plates. See Figure 75-251.

2. Install low and reverse clutch support retainer spring. See Figure 75-251A.

3. Install low and reverse clutch support assembly pushing firmly until support assembly is seated past top of low and reverse clutch support retainer spring and retaining ring can be installed. See Figure 75-252.

IMPORTANT: Make certain the splines on inner race of the roller clutch align with splines on reaction carrier.

4. Install low and reverse clutch support to case retaining ring. See Figure 75-253.

e. Installing Sun Gear Drive Shell Assembly

1. Install low and reverse clutch support inner race to sun gear drive shell thrust washer and install sun gear drive shell assembly.

f. Installing Output Carrier Assembly

1. Install output carrier assembly. See Figure 75-255.

2. Install input ring gear to output carrier thrust washer. See Figure 75-256.

3. Install output carrier to output **shaft snap ring. CAUTION: Use new snap ring and do not over stress on installing. USE PROPER ASSEMBLY SLEEVE AND/OR SNAP RING PLIERS.**

g. Installing Input Ring Gear

1. Install input ring gear. See Figure 75-258.

2. Install forward clutch housing to input ring gear front thrust washer. See Figure 75-259.

NOTE: Washer has three (3) tangs.

h. Installing Direct and Forward Clutch Assemblies

1. Install direct clutch drum to forward clutch housing needle roller bearing. See Figure 75-260A.

2. Install direct clutch assembly to forward clutch assembly. Install assemblies into case making certain forward clutch faced plates are positioned over input ring gear and the tangs on direct clutch housing are installed into slots on the sun gear drive shell. See Figure 75-260.

i. Installing Intermediate Clutch Overrun Brake Band

1. Install intermediate clutch overrun brake band. See Figure 75-261.

j. Installing Intermediate Clutch Pressure Plate, Clutch Plates, and Cushion Spring

1. Install intermediate clutch pressure plate. See Figure 75-262.

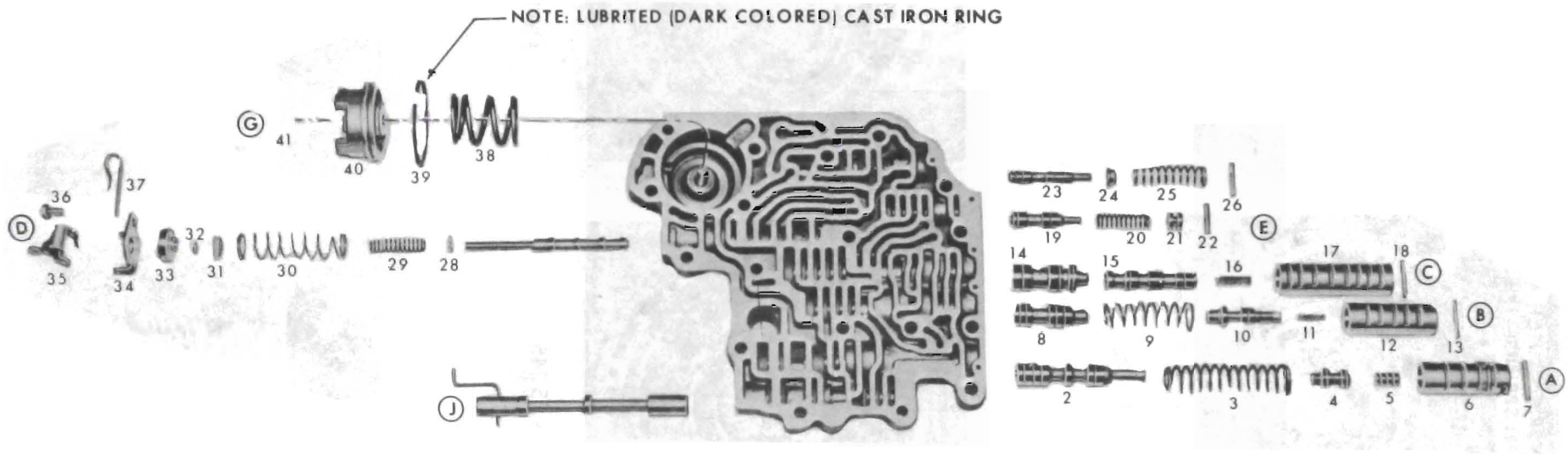
2. Oil and install three (3) faced and three (3) steel intermediate clutch plates, starting wtih a faced plate and alternating steel and faced. See Figure 75-263.

3. Install intermediate clutch cushion spring. See Figure 75-264.

k. Check Direct Clutch to Oil Pump Clearance

1. Install guide pins into case. See Figure 75-267.

2. Install pump into case. Remove



J – 1 MANUAL VALVE AND LINK ASSEMBLY

A
- 2 PRESSURE REGULATOR VALVE
- 3 PRESSURE REGULATOR VALVE SPRING
- 4 REVERSE AND MODULATOR BOOST VALVE
- 5 INTERMEDIATE BOOST VALVE
- 6 BOOST VALVE SLEEVE
- 7 RETAINING PIN

B
- 8 2-3 SHIFT VALVE
- 9 2-3 SHIFT VALVE SPRING
- 10 2-3 SHIFT CONTROL VALVE
- 11 2-3 SHIFT CONTROL VALVE SPRING
- 12 2-3 SHIFT CONTROL VALVE SLEEVE
- 13 RETAINING PIN

C
- 14 1-2 SHIFT VALVE
- 15 1-2 SHIFT CONTROL VALVE
- 16 1-2 SHIFT CONTROL VALVE SPRING
- 17 1-2 SHIFT CONTROL VALVE SLEEVE
- 18 RETAINING PIN

E
- 19 MANUAL LOW CONTROL VALVE
- 20 MANUAL LOW CONTROL VALVE SPRING
- 21 PLUG
- 22 RETAINING PIN

F
- 23 DETENT REGULATOR VALVE
- 24 DETENT REGULATOR VALVE SPRING SEAT
- 25 DETENT REGULATOR VALVE SPRING
- 26 RETAINING PIN

D
- 27 DETENT VALVE
- 28 WASHER
- 29 DETENT VALVE INNER SPRING
- 30 DETENT VALVE OUTER SPRING
- 31 DETENT VALVE OUTER SPRING SEAT
- 32 DETENT VALVE SPRING RETAINER
- 33 DETENT VALVE STOP
- 34 DETENT VALVE ACTUATING LEVER BRACKET
- 35 DETENT VALVE ACTUATING LEVER
- 36 RETAINING BOLT
- 37 RETAINING PIN

G
- 38 DIRECT CLUTCH ACCUMULATOR SPRING
- 39 OIL SEAL RING
- 40 DIRECT CLUTCH ACCUMULATOR PISTON
- 41 RETAINER RING

75-93

VALVE BODY ASSEMBLY

Figure 75-231 - Valve Body Assembly

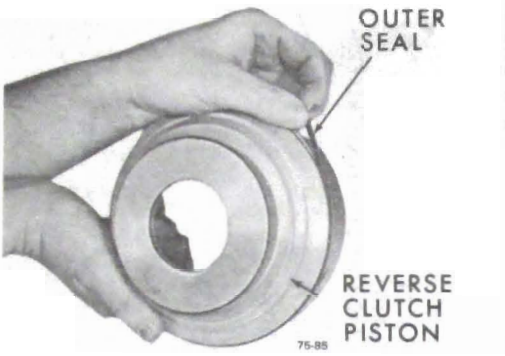


Figure 75-240

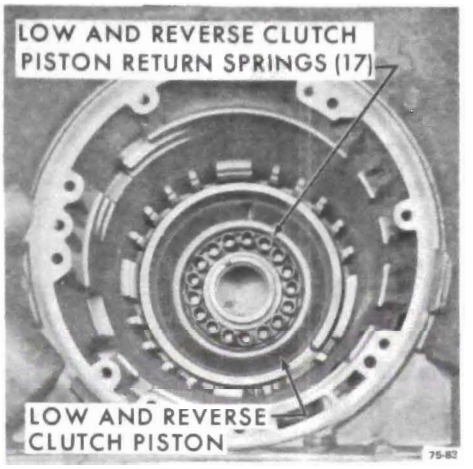


Figure 75-243

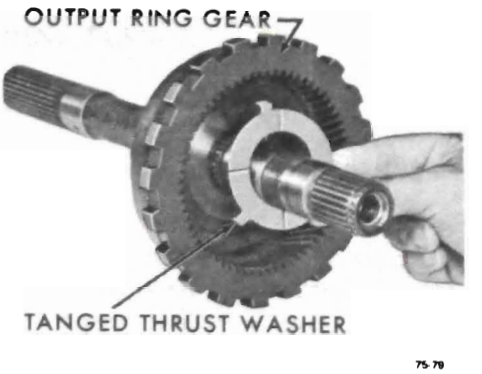


Figure 75-247

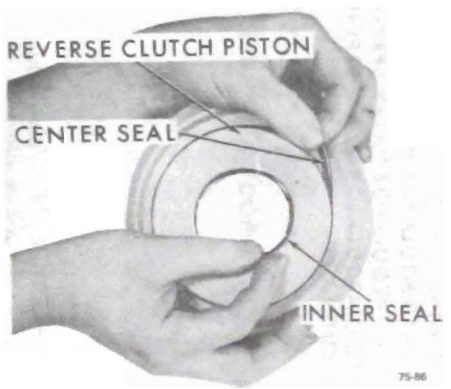


Figure 75-241

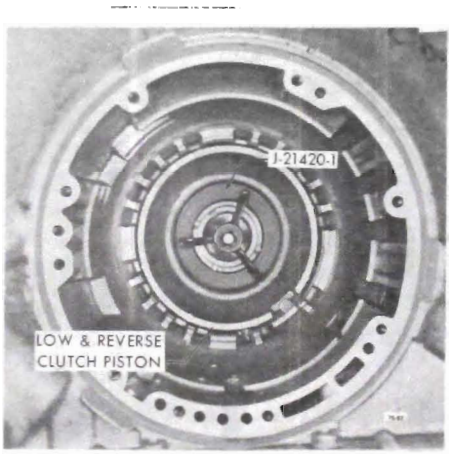


Figure 75-245

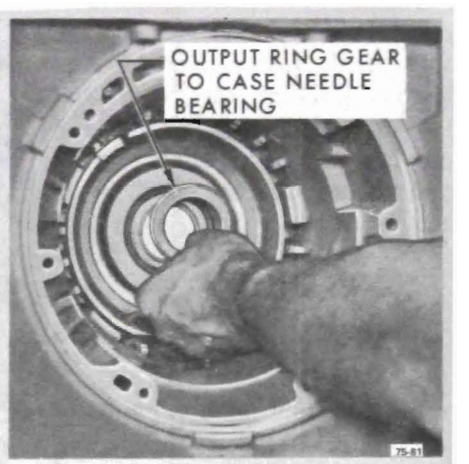


Figure 75-248

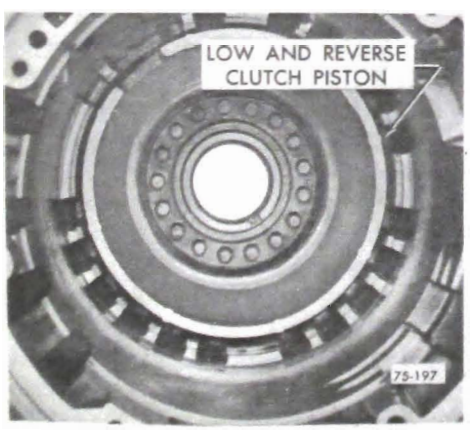


Figure 75-242

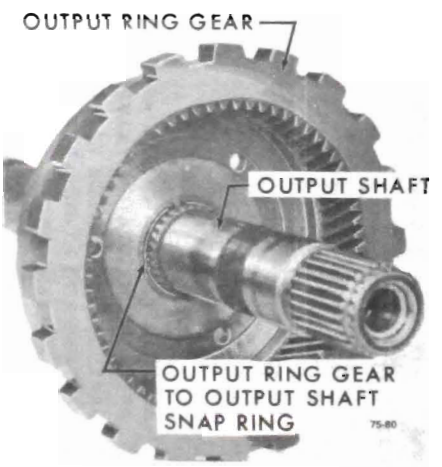


Figure 75-246

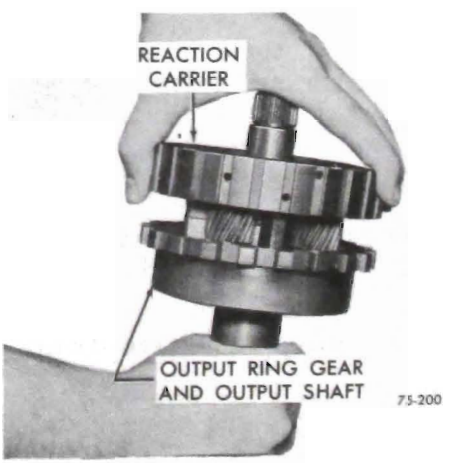


Figure 75-249

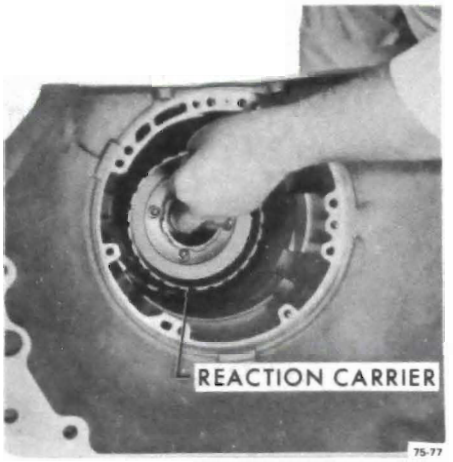


Figure 75-250

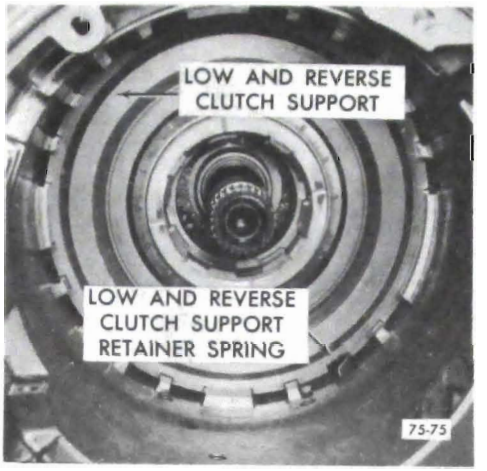


Figure 75-252

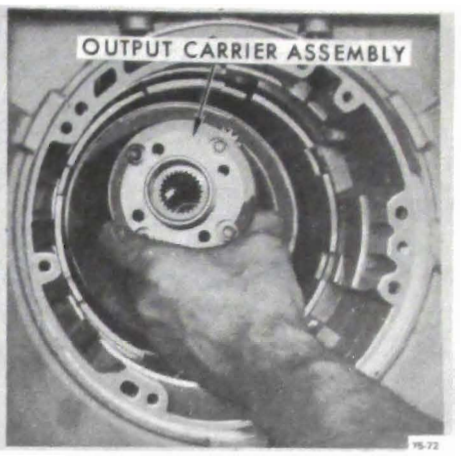


Figure 75-255

Figure 75-251

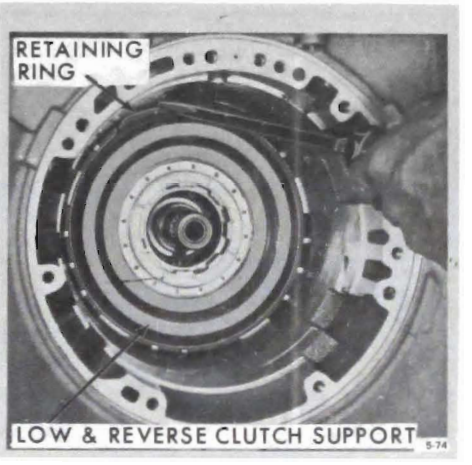


Figure 75-253

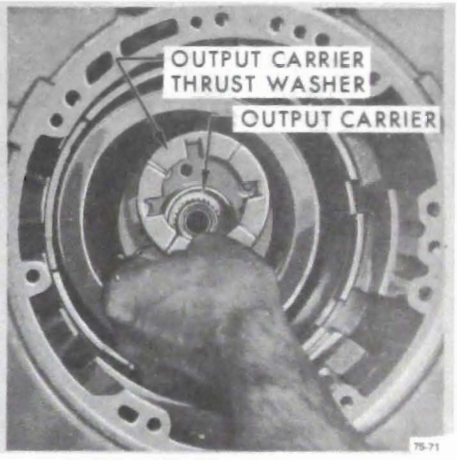


Figure 75-256

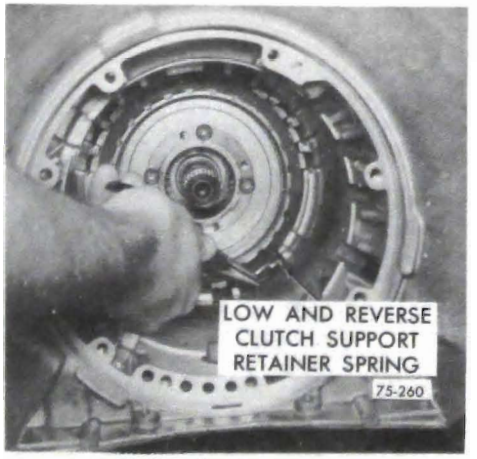


Figure 75-251A

Figure 75-254

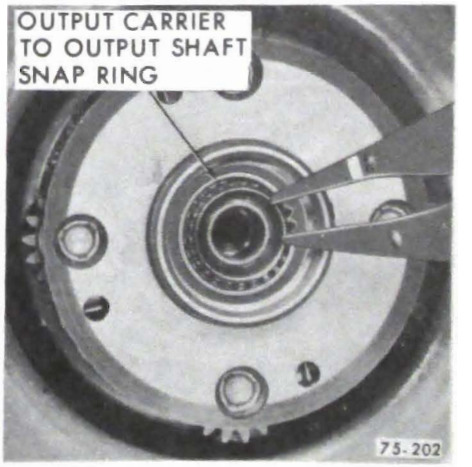


Figure 75-257

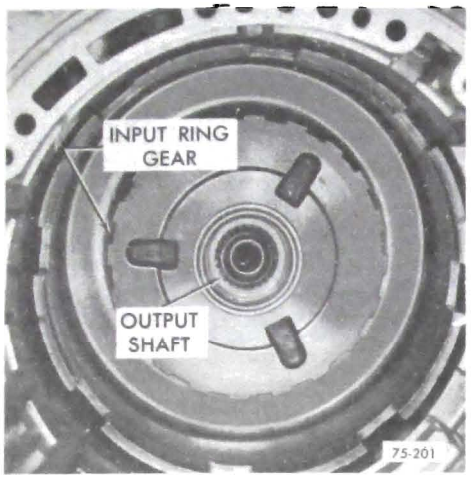


Figure 75-258

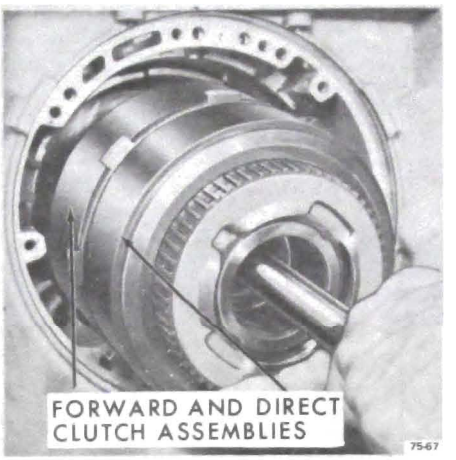


Figure 75-260A

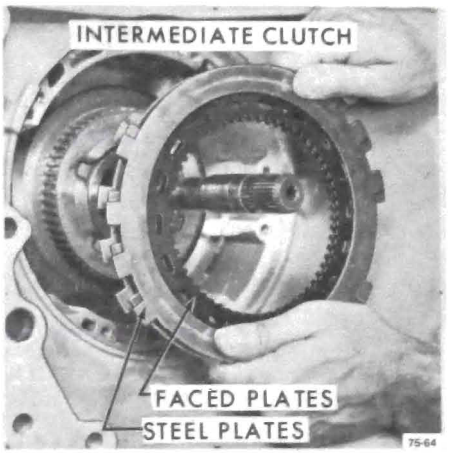


Figure 75-263

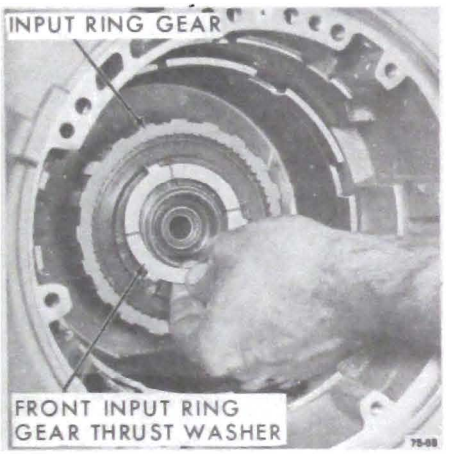


Figure 75-259

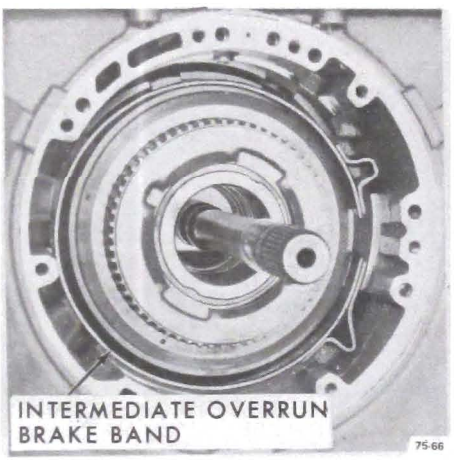


Figure 75-261

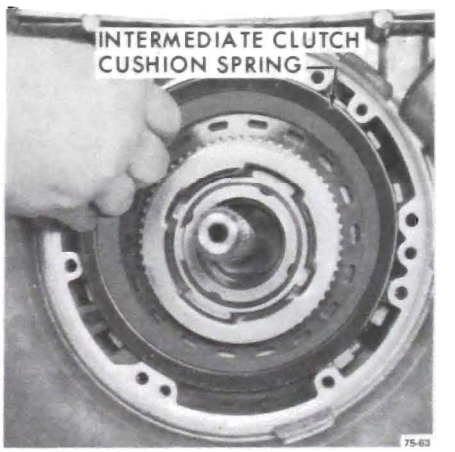


Figure 75-264

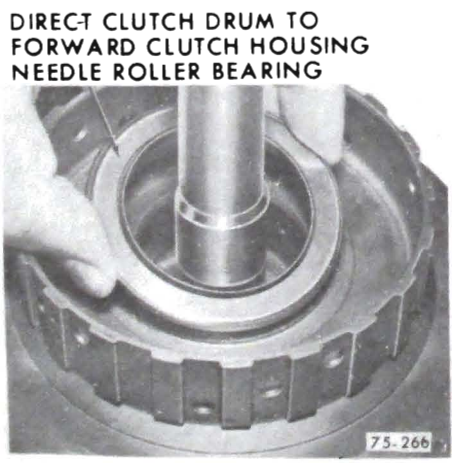


Figure 75-260A

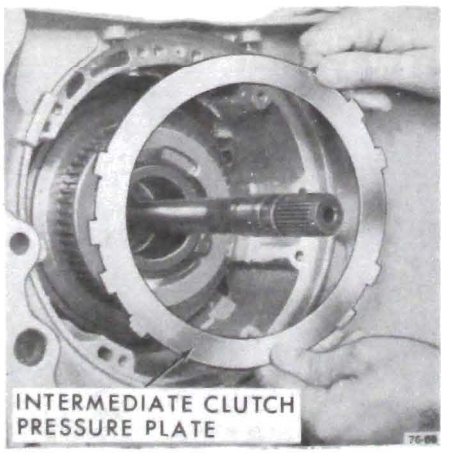


Figure 75-262

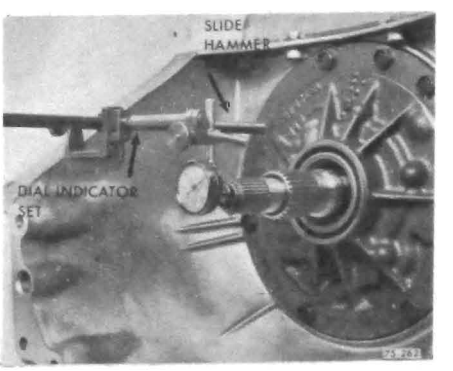


Figure 75-264A

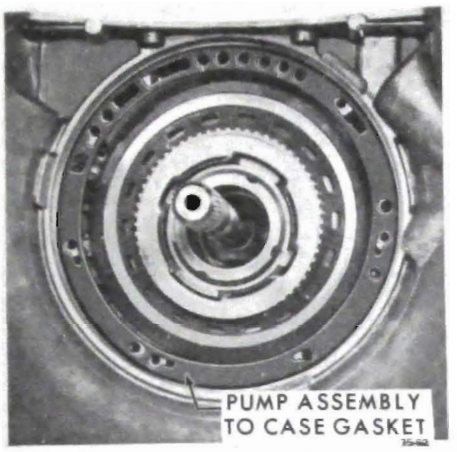


Figure 75-265

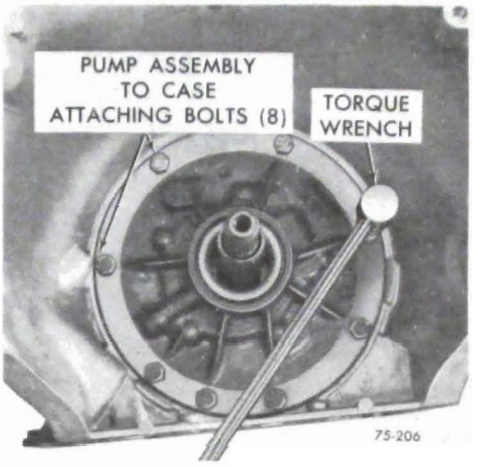


Figure 75-267

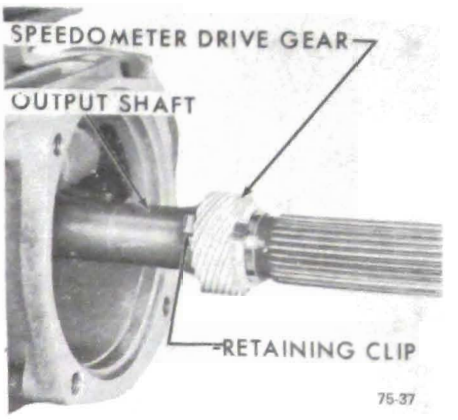


Figure 75-271

guide pins and install pump to case bolts.

3. Attach slide hammer bolt to threaded hole in oil pump. See Figure 75-264A. With flat of hand on end of input shaft move shaft rearward. Install Dial Indicator Set J-8001 on rod and "O" dial indicator on end of input shaft. Push on end of output shaft to move shaft forward, the reading obtained will be the clearance. There are three selective thrust washers available. .074"-.099",.099"-.116",and .116"-.142".

Select washer so the clearance will be between .033" and .064".

4. Remove pump assembly. Install selective fit washer to pump cover hub. Before installation apply petroleum jelly to both sides of wahser.

l. Installing Oil Pump Assembly

1. Install new pump assembly to case gasket. See Figure 75-265.

2. Install guide pins into case. See Figure 75-266.

NOTE: Before installing pump lubricate case bore.

3. Install pump assembly into case. Install attaching bolts with new washer type seals. Torque to 20 lb.ft. See Figure 75-267.

IMPORTANT If input shaft cannot be rotated as the pump is being pulled into place, the direct and forward clutch housings have not been properly installed to index the faced plates with their respective parts. This condition must be corrected before the pump is pulled into place.

m. Installing Speedometer Drive Gear, and Propeller Shaft Yoke Seal

1. Place speedometer drive gear retaining clip into hole in output shaft. See Figure 75-270.

2. Align slot in speedometer drive gear with retaining clip and install. See Figure 75-271.

3. Install propeller shaft yoke seal using tool J-23103. See Figure 75-272.

n. Installing Extension Housing

1. Install extension housing to case square cut "O" - ring seal. See Figure 75-273.

2. Attach extension housing to case using attaching bolts. Torque to 35 lb.ft. See Figure 75-274.

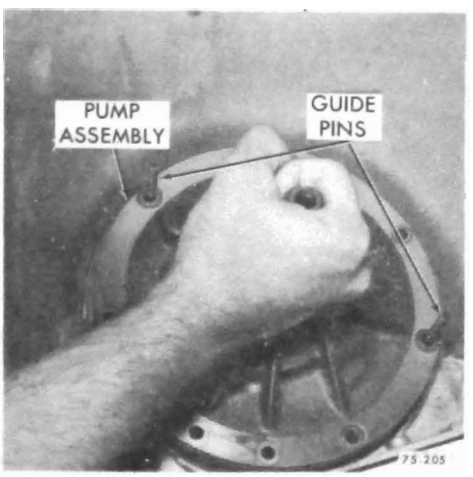


Figure 75-266

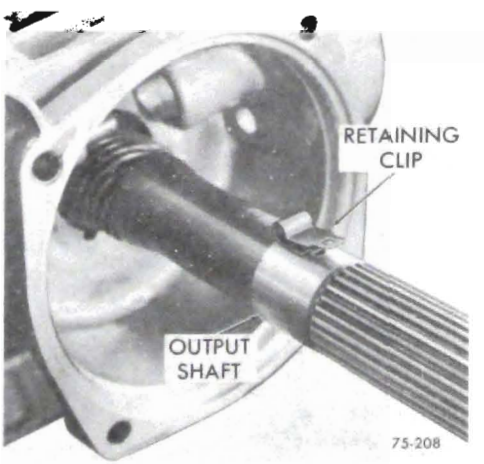


Figure 75-270

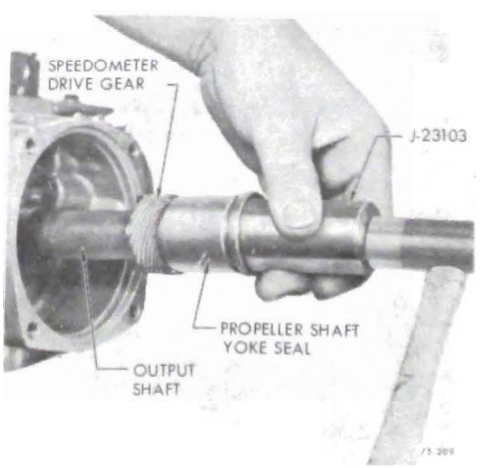


Figure 75-272

Figure 75-273

3. Install speedometer driven gear, retainer and bolt. Torque bolt to 12 lb.ft.

o. Installing Parking Pawl and Actuating Rod

1. Install parking pawl, tooth toward the inside of case, into case. See Figure 75-275.

2. Install parking pawl shaft into case and through parking pawl. See Figure 75-276.

3. Install parking pawl shaft retainer plug. Drive into case using a 3/8" dia. rod, until retainer plug is flush to .010" below face of case. Stake plug in three (3) places to retain plug in case. See Figure 75-277.

4. Install parking pawl disengaging spring, square end hooked on pawl. See Figure 75-278.

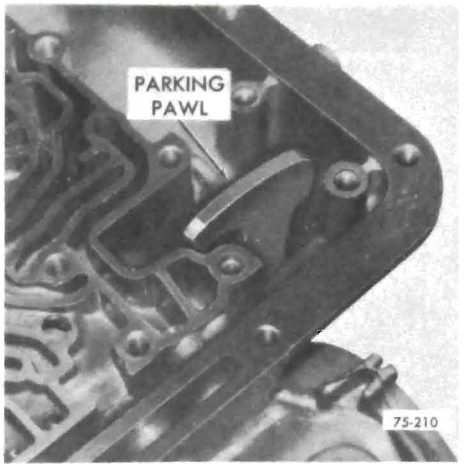


Figure 75-275

5. Install park lock bracket, torque bolts to 29 lb.ft. See Figure 75-280.

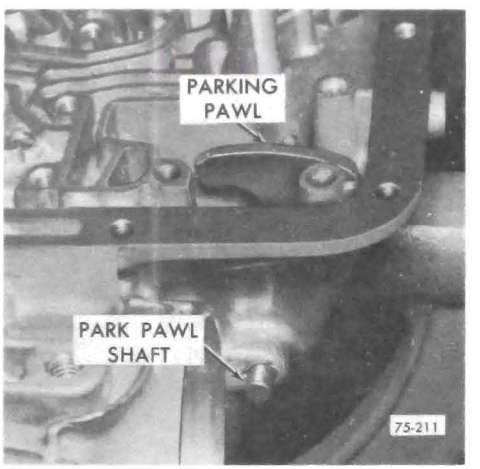


Figure 75-276

6. Install range selector inner lever to parking pawl actuating rod. See Figure 75-281.

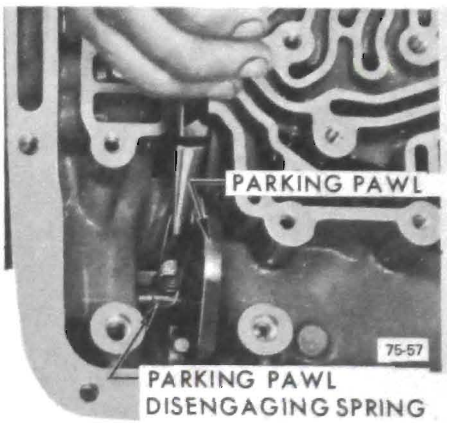


Figure 75-278

NOTE: Make certain manual control valve link hole is toward front of transmission.

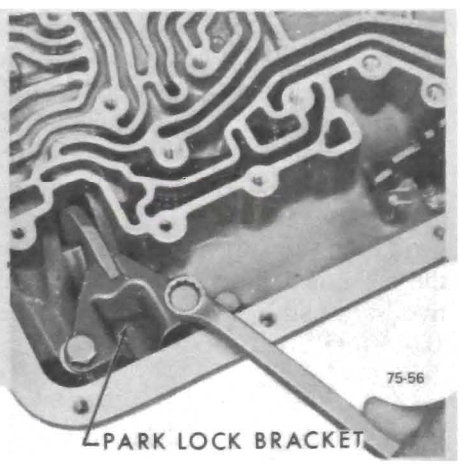


Figure 75-280

7. Install actuating rod under the park lock bracket and parking pawl. See Figure 75-282.

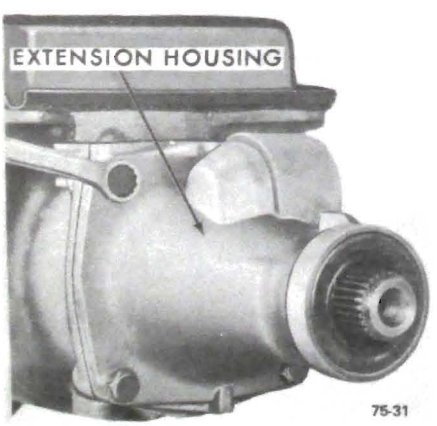


Figure 75-274

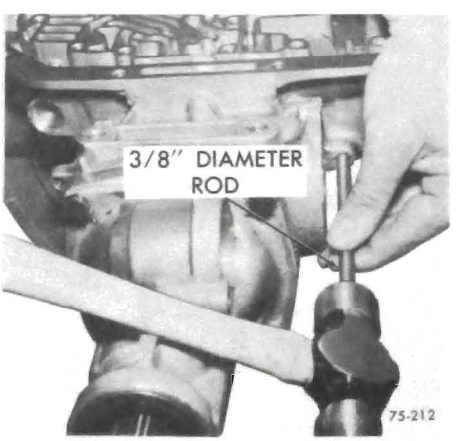


Figure 75-277

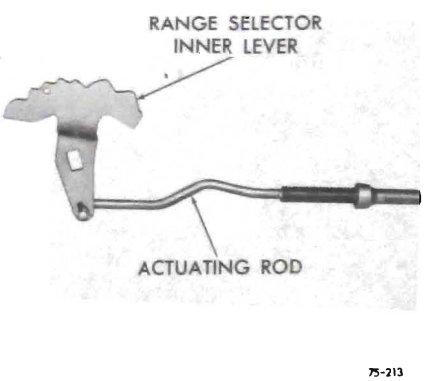


Figure 75-281

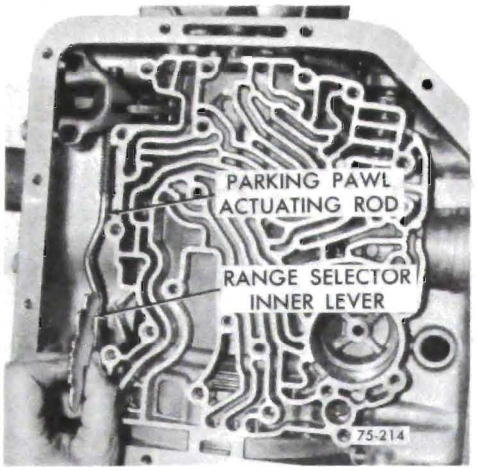


Figure 75-282

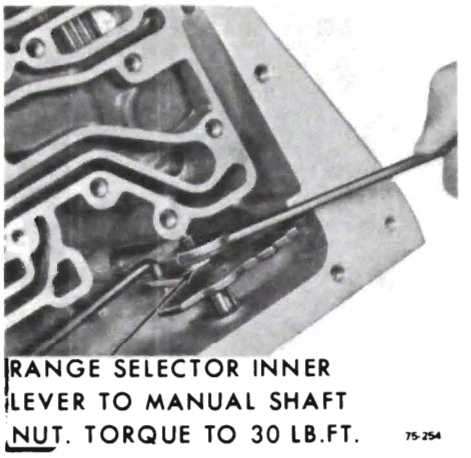


Figure 75-285

Figure 75-287

p. Installing Manual Shaft and Range Selector Inner Lever

1. If a new manual shaft to case lip seal is necessary, use a 7/8" diameter rod and seat flush with case. See Figure 75-283.

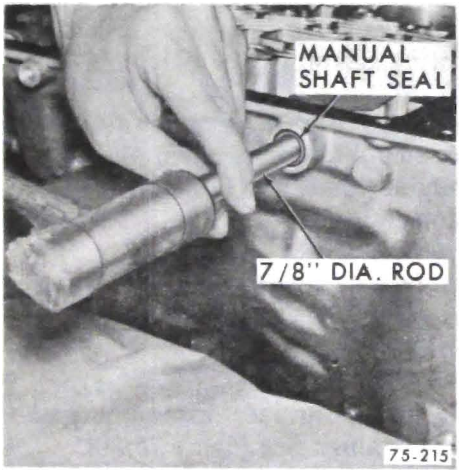


Figure 75-283

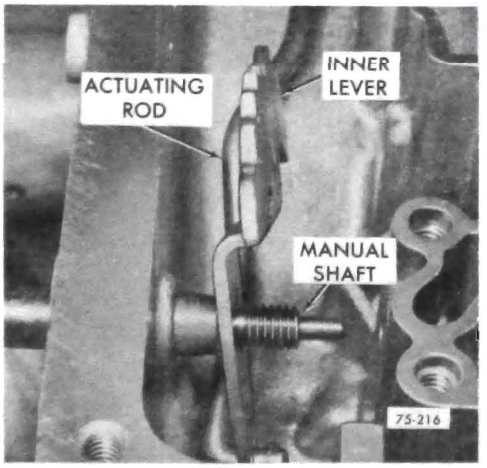


Figure 75-284

2. Install manual shaft through case and range selector inner lever. See Figure 75-284.

3. Install retaining jam nut on manual shaft. Torque jam nut to 30 lb.ft. See Figure 75-285.

4. Install manual shaft to case retainer ring. See Figure 75-286.

5. Install manual control valve link retainer. See Figure 75-287.

q. Installing Intermediate Servo Piston, Check Balls, Oil Pump Pressure Screen and Governor Feed Screen

1. Install metal oil seal ring on the intermediate servo piston. See Figure 75-288.

NOTE: Oil seal ring must be aluminum (light colored).

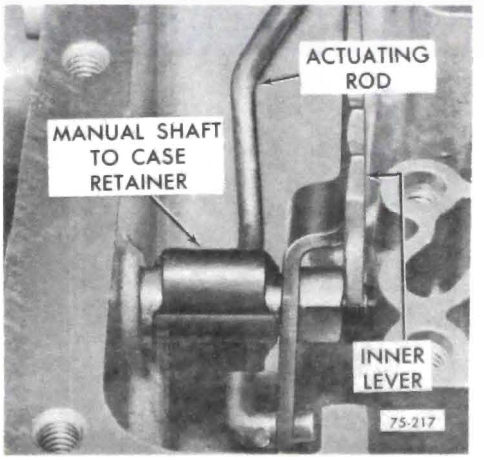


Figure 75-286

Figure 75-288

2. Install intermediate servo piston, apply pin, spring seat. See Figure 75-290.

3. Install four (4) check balls into correct transmission case pockets. See Figure 75-291.

Figure 75-290

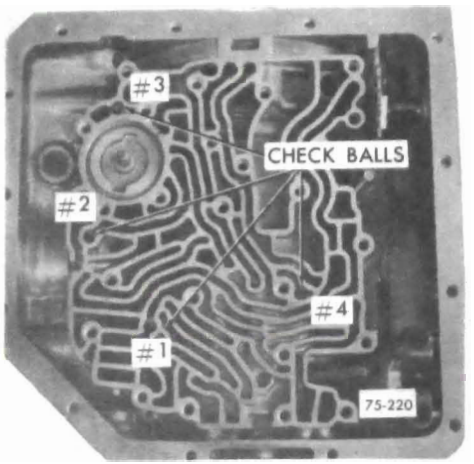


Figure 75-291

CAUTION: If number one (1) check ball is omitted or incorrectly placed, transmission failure will result due to minimum line pressure.

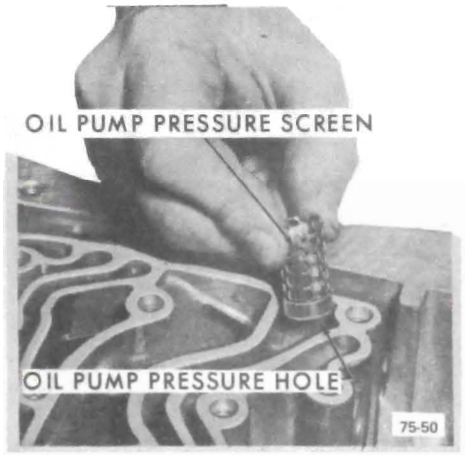


Figure 75-292

4. Install oil pump pressure screen in the oil pump pressure hole in case. Ring end of screen must be installed toward case face. See Figure 75-292.

NOTE: Clear before installing.

5. Install governor feed screen in the governor feed hole in case. See Figure 75-293.

NOTE: Clean before installing.

r. Installing Valve Body, Detent Roller and Spring Assembly, and Strainer

1. Install valve body spacer plate to case gasket and valve body spacer plate. See Figure 75-294.

2. Install valve body to spacer plate gasket. See Figure 75-295.

3. Install spacer support plate. Torque bolts to 13 lb.ft. See Figure 75-296.

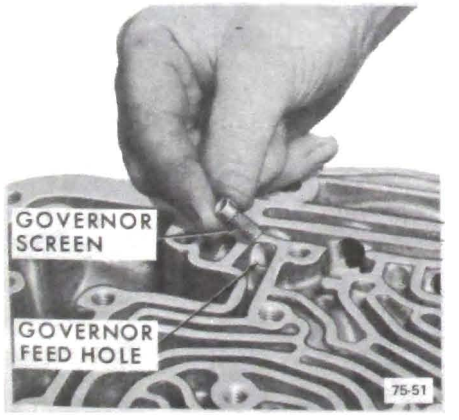


Figure 75-293

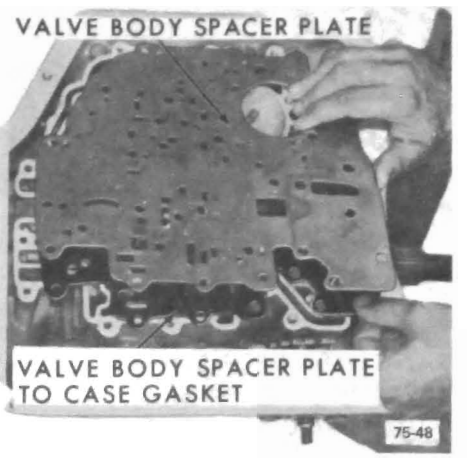


Figure 75-294

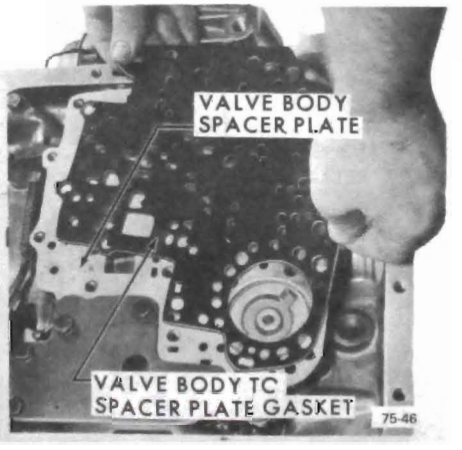


Figure 75-295

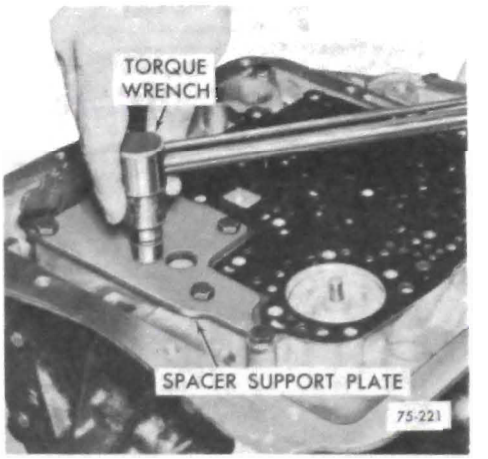


Figure 75-296

4. Connect detent control valve wire to detent valve actuating lever. See Figure 75-297.

5. Install valve body. Connect manual control valve link to range selector inner level. Torque bolts in random sequence to 13 lb.ft. leaving bolt loose for detent roller and spring assembly. See Figure 75-298.

NOTE: When handling valve body assembly do not touch sleeves as retainer pins will fall into transmission.

6. Install detent roller and spring assembly to valve body. See Figure 75-300.

7. Install strainer assembly gasket and strainer. See Figure 75-301.

NOTE: Install strainer and gasket

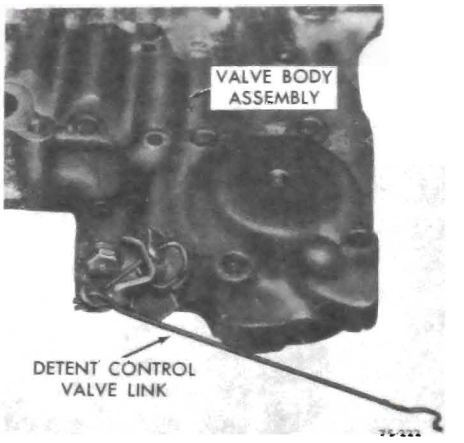


Figure 75-297

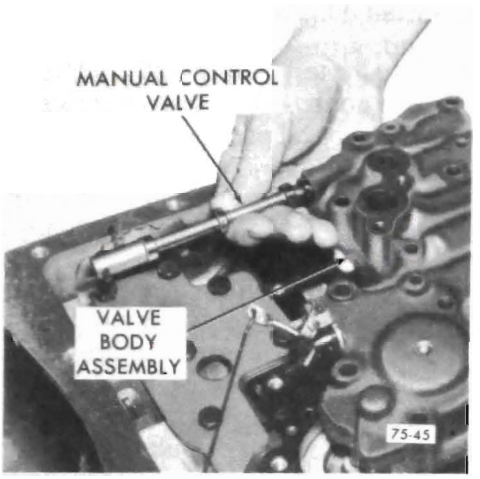


Figure 75-298

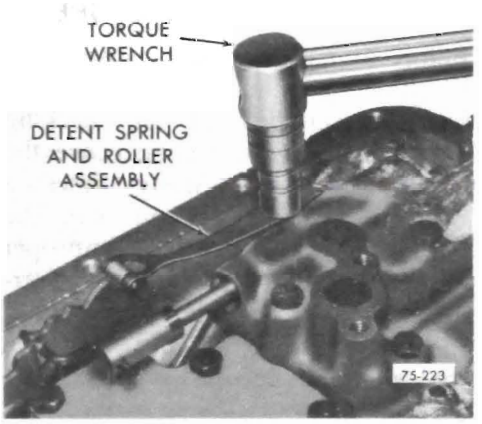


Figure 75-300

exactly as shown. Always flush out screens and check for foreign material.

s. Installing Oil Pan, Governor, and Modulator Valve

1. Install new bottom pan gasket and bottom pan. See Figure 75-302.

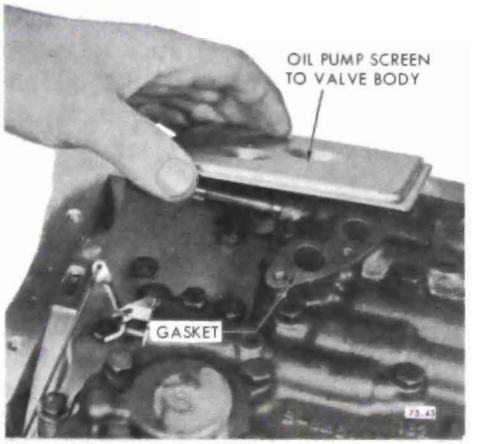


Figure 75-301

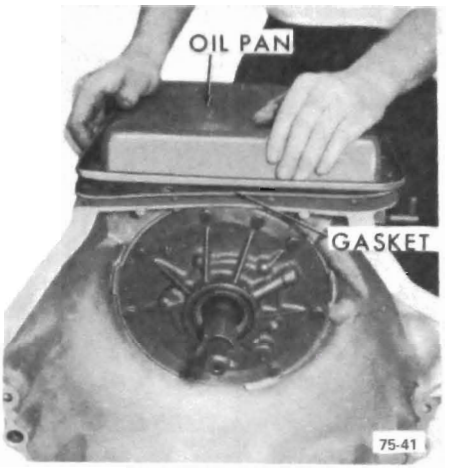


Figure 75-302

NOTE: Intermediate clutch accumulator assembly should be installed before oil pan is installed. Refer to paragraph 75-21 for disassembly and reassembly.

Figure 75-303

2. Install governor assembly, cover and seal and retainer wire. See Figure 75-303.

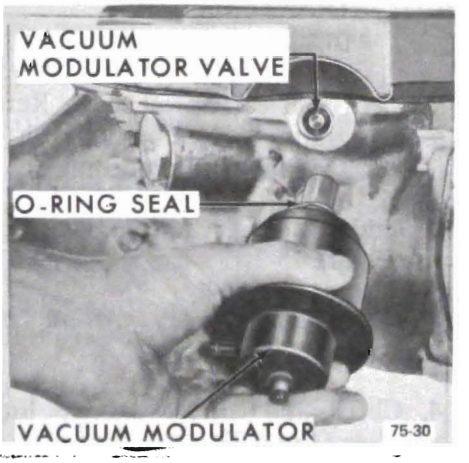


Figure 75-304

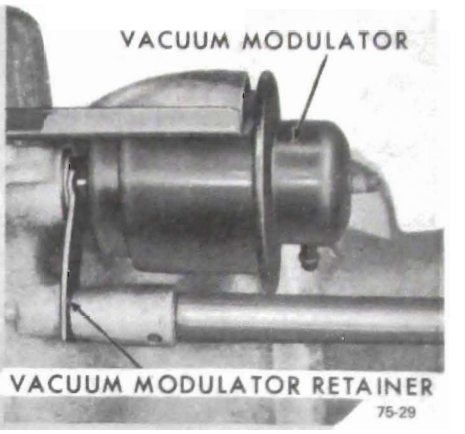


Figure 75-305

3. Install vacuum modulator valve. See Figure 75-304.

NOTE: Lubricate "O" ring seal to prevent damage.

4. Install vacuum modulator and retainer clip. Torque bolt to 12 lb.ft. See Figure 75-305.

75-29 CONVERTER CHECKING PROCEDURE

a. Check Converter For Leaks as Follows:

1. Install tool J-21369 and tighten. See Figure 75-306.

2. Fill converter with air: 80 psi.

3. Submerge in water and check for leaks.

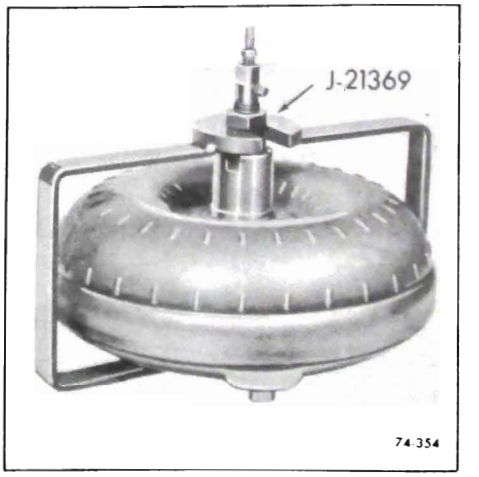


Figure 75-306

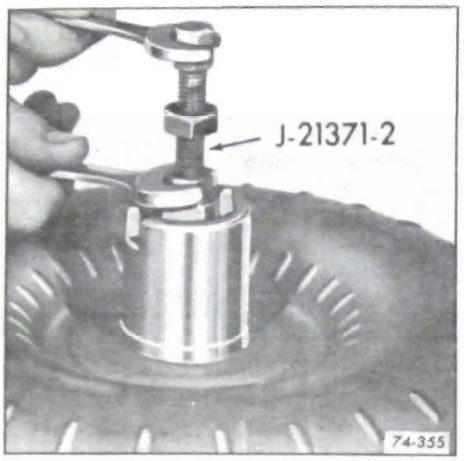


Figure 75-307

b. Check Converter End Clearance as Follows:

1. Install tool J-21371-2 and tighten brass nut. See Figure 75-307.

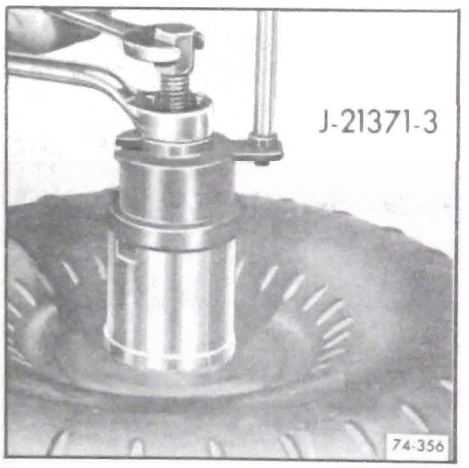


Figure 75-308

2. Install Tool J-21371-3 and tighten hex nut. See Figure 75-308.

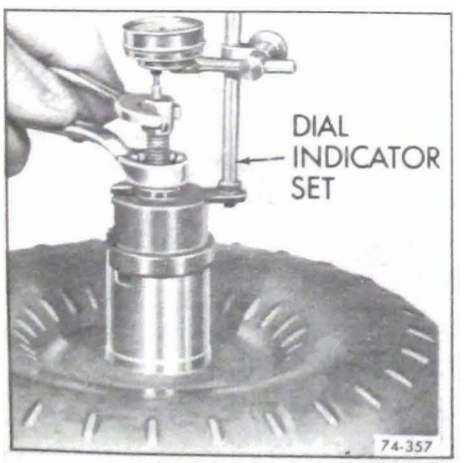


Figure 75-310

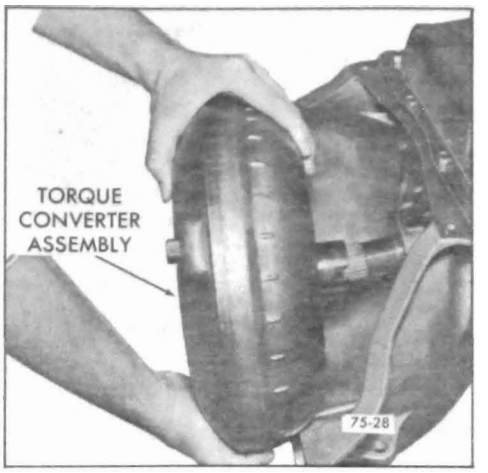


Figure 75-311

3. Install dial indicator set at "O".

4. Loosen hex nut. See Figure 75-310. When nut is fully loosened the reading obtained on the dial indicator will be converter end clearance. If clearance is .050" or over and the oil has the appearance of having been mixed with aluminum paint, replace the converter.

c. Install Converter. See Figure 75-311.

d. Install Converter Holding Tool J-21366

e. Refer to Paragraph 75-1, Subparagraph d, for Refill Procedures

DIVISION IV

TROUBLE DIAGNOSIS

75-30 SEQUENCE FOR TURBO HYDRA-MATIC 350 TRANSMISSION DIAGNOSIS

1. Check and correct oil level. Refer to Paragraph 75-1, Subparagraph 8. for checking for refill procedures.

2. Check detent cable adjustment. See Figure 75-2.

3. Check and correct vacuum line and fittings.

4. Check and correct manual linkage. See Group 73.

5. Road test car.

a. Install oil pressure gage.

b. Road test using all selective ranges, noting when discrepancies in operation or oil pressure occur.

c. Attempt to isolate the unit or circuit involved in the malfunction.

d. If engine performances indicates an engine tune-up is required, this should be performed before road testing is completed or transmission correction attempted. Poor engine performance can result in rough shifting or other malfunctions.

75-31 TURBO HYDRA-MATIC 350 TRANSMISSION CHECKING PROCEDURES

Before diagnosis of any transmission complain is attempted, there must be understanding of oil checking procedure and what appearance the oil should have. Many times a transmission malfunction can be traced to low oil level, improper reading of dipstick, or oil appearance; therefore, a careful analysis of the condition of oil and the level may eliminate needless repairs.

When checking oil level in the Turbo Hydra-Matic 350 Transmission, the procedure outlined in Paragraph 75-1, Subparagraph d should be followed to obtain the most accurate reading.

Also when the dipstick is removed, it should be noted whether the oil is devoid of air bubbles or not. Oil with air bubbles gives an indication of an air leak in the suction lines, which can cause erratic operation and slippage. Water in the oil imparts a milky, pink cast to the oil and can cause spewing.

75-32 EXTERNAL OIL LEAKS

a. Determining Source of Oil Leak

Before attempting to correct an oil leak, the actual source of the leak must be determined. In many cases, the source of the leak can be deceiving due to "wind flow" around the engine and transmission.

The suspected area should be wiped clean of all oil before inspecting for the source of the leak. Red dye is used in the transmission oil at the assembly plant and will indicate if the oil leak is from the transmission.

The use of a "Black Light" to locate the point at which the oil is leaking is helpful. Comparing the oil from the leak to that on the engine or transmission dipstick, when viewed by black light, will determine the source of the leak - engine or transmission.

Oil leaks around the engine and transmission are generally carried toward the rear of the car by air stream. For example, a transmission oil filler tube to case leak will sometimes appear as a leak at the rear of the transmission. In determining the source of a leak, proceed as follows:

1. Degrease underside of transmission.

2. Road test to get unit at operating temperature.

3. Inspect for leak with engine running.

4. With engine off, check for oil leaks due to the raised oil level caused by drain back.

b. Possible Points of Oil Leaks

1. Transmission Oil Pan Leak.

a. Attaching bolts not correctly torqued.

b. Improperly installed or damaged pan gasket.

c. Oil pan gasket mounting face not flat.

2. Extension Housing.

a. Attaching bolts not correctly torqued.

b. Rear seal assembly damaged or improperly installed.

c. Square seal, extension to case, damaged or improperly installed.

d. Porous casting. See subparagraph c.

3. Case Leak.

a. Filler pipe "O" ring seal damaged or missing; misposition of filler pipe bracket to engine.

b. Modulator assembly "O" ring seal damaged or improperly installed.

c. Detent cable connector "O" ring seal damaged or improperly installed.

d. Governor cover not tight, gasket damaged or leak between case face and gasket.

e. Speedometer gear "O" ring damaged.

f. Manual shaft seal damaged or improperly installed.

g. Line pressure tap plug loose.

h. Vent pipe (refer to item 5).

i. Porous casting. See Subparagraph c.

4. Leak at Front of Transmission.

a. Front pump seal leaks.

(1) Seal lip cut. Check converter hub, etc.

(2) Bushing moved and damaged. Oil return hole plugged.

(3) No oil return hole.

b. Front pump attaching bolts loose or bolt washer type seals damaged or missing.

c. Front pump housing "O" ring damaged or cut.

d. Converter leak in weld area.

e. Porous casting (pump).

5. Oil Comes Out Vent Pipe.

a. Transmission over-filled.

b. Water in oil.

c. Foreign material between pump and case or between pump cover and body.

d. Case - porous near converter bosses. Front pump cover or housing oil channels shy or stock near breather. See Subparagraph c.

e. Pump to case gasket mis-positioned.

Case Porosity Repair

Turbo Hydra-Matic 350 transmission external oil leaks caused by case porosity can be successfully repaired with the transmission in the car by using the following recommended procedures:

1. Road test and bring the transmission to operating temperature, approximately 180° F.

2. Raise car on a hoist or jack stand, engine running, and locate source of oil leak. Check for oil leaks in Low, Drive, and Reverse.

NOTE: A Clean, dry soldering acid brush can be used to clean the area and also to apply the epoxy cement.

3. Shut engine off and thoroughly clean area to be repaired with a suitable cleaning solvent and a brush - air dry.

4. Using instructions of the manufacturer, mix a sufficient amount of epoxy, Group 0.423, Part No. 1360016, to make the repair.

NOTE: Observe cautions of manufacturer in handling.

5. While the transmission case is still **HOT,** apply the epoxy to the area to be repaired.

NOTE: Make certain the area to be repaired is fully covered.

6. Allow cement to cure for *3 hours* before starting engine.

7. Road test and check for leaks.

75-33 TURBO HYDRA-MATIC 350 TROUBLE DIAGNOSIS CHART

Problem	Possible Cause	Possible Condition
I. NO DRIVE IN DRIVE RANGE—(Install Pressure Gage)	A. Low Oil Level	1. Correct level—check for external leaks or defective vacuum modulator (leaking diaphragm will evacuate oil from unit).
	B. Manual Linkage Adjustment	1. See Section 73.
	C. Low Oil Pressure	1. Filter Assembly—"O" ring missing or damaged, strainer blocked. 2. Pump Assembly—Pressure Regulator, pump drive gear—tangs damaged by converter. 3. Case—porosity in intake bore.
	D. Control Valve Assembly	1. Manual valve disconnected from inner lever.
	E. Forward Clutch	1. Forward clutch does not apply—piston cracked; seals missing, damaged; clutch plates burned. 2. Pump feed circuit to forward clutch oil seal rings missing or broken on pump cover; leak in feed circuits; pump to case gasket mispositioned or damaged. Clutch drum ball check stuck or missing.
	F. Roller Clutch Assembly	1. Broken spring or damaged cage.
II. OIL PRESSURE HIGH or LOW (See Oil Pressure Check) Paragraph 75-35	A. High Oil Pressure	1. Vaccum line or fittings leaking. 2. Vacuum modulator. 3. Modulator valve. 4. Pressure regulator. 5. Oil Pump.
	B. Low Oil Pressure	1. Vacuum line or fittings obstructed. 2. Vacuum modulator.

Problem	Possible Cause	Possible Condition
II. OIL PRESSURE HIGH or LOW (See Oil Pressure Check) Paragraph 75-35 (Cont'd)	B. Low Oil Pressure (Cont'd)	3. Modulator valve. 4. Pressure regulator. 5. Governor. 6. Oil pump.
III. 1-2 SHIFT—FULL THROTTLE ONLY	A. Detent Valve	1. Sticking or linkage misadjusted (See Figure 75-2)
	B. Vacuum Leak	1. Vacuum line or fittings leaking.
	C. Control Valve Assembly	1. Valve body gaskets — leaking, damaged, incorrectly installed. 2. Detent valve train stuck. 3. 1-2 valve stuck.
	D. Case Assembly	1. Porosity.
IV. FIRST SPEED ONLY, NO 1-2 SHIFT	A. Governor Assembly	1. Governor valve sticking. 2. Driven gear loose, damaged or worn, (check for pin in case and length of pin showing); also check output shaft drive gear for nicks or rough finish, if driven gear shows damage.
	B. Control Valve Assembly	1. 1-2 shift valve train stuck closed. 2. Governor feed channels blocked. 3. Valve body gaskets — leaking, damaged, incorrectly installed.
	C. Case	1. Porosity between channels. 2. Governor feed channel blocked, governor bore scored or worn allowing cross pressure leak.

Problem	Possible Cause	Possible Condition
IV. FIRST SPEED ONLY, NO 1-2 SHIFT (Cont'd)	D. Intermediate Clutch	1. Clutch piston seals — missing, improperly assembled, cut. 2. Intermediate roller clutch. Broken spring or damaged cage.
V. FIRST AND SECOND SPEEDS ONLY, NO 2-3 SHIFT	A. Control Valve Assembly	1. 2-3 shift train stuck. 2. Valve body gaskets — leaking, damaged, incorrectly installed.
	B. Direct Clutch	1. Pump hub—direct clutch oil seal rings—broken, missing. 2. Clutch piston seals — missing, improperly assembled, cut, piston ball check stuck or missing.
VI. DRIVE IN NEUTRAL	A. Manual Linkage	1. Misadjusted.
	B. Forward Clutch	1. Clutch does not release — (this condition will also cause "No Reverse").
VII. NO MOTION IN REVERSE, or SLIPS IN REVERSE— (Install Pressure Gage)	A. Low Oil Level	1. Add oil — See Paragraph 75-1 Subparagraph c.
	B. Manual Linkage	1. Misadjusted. Refer to Group 73.
	C. Oil Pressure—(Refer to par. 75-35)	1. Modulator valve stuck. 2. Modulator and reverse boost valve stuck. 3. Pump hub—direct clutch oil seal rings broken, missing. 4. Direct clutch piston seal cut or missing. 5. Low and reverse clutch piston seal cut or missing. 6. #1 check ball missing.

Problem	Possible Cause	Possible Condition
VII. NO MOTION IN REVERSE, or SLIPS IN REVERSE— (Install Pressure Gage) (Cont'd)	D. Control Valve Assembly	1. Valve body gaskets — leaking, damaged, incorrectly installed (Other malfunctions may also be indicated). 2. 2-3 Valve train stuck in upshifted position. (This will also cause 1-3 upshift in Drive Range). 3. 1-2 Valve train stuck in upshifted position.
	E. Intermediate Servo	1. Piston or pin stuck so intermediate overrun band is applied.
	F. Low and Reverse Clutch	1. Piston out or seal damaged or missing.
	G. Direct Clutch	1. Outer seal damaged or missing. 2. Clutch plates burned — may be caused by stuck ball check in piston.
	H. Forward Clutch	1. Clutch does not release (will also cause Drive in Neutral).
VIII. SLIPS IN ALL RANGES, SLIPS ON START— (Install Pressure Gage)	A. Oil Level Low	1. Add oil—See Paragraph 75-1, subparagraph c.
	B. Oil Pressure (Refer to par. 75-35)	1. Vacuum modulator defective. 2. Vacuum modulator valve sticking. 3. Filter assembly — plugged or leaks; grommet "O" ring missing or damaged.

Problem	Possible Cause	Possible Condition
VIII. SLIPS IN ALL RANGES, SLIPS ON START— (Install Pressure Gage) (Cont'd)	B. Oil Pressure (Refer to par. 75-35) (Cont'd)	4. Pressure regulator valve stuck. 5. Pump to case gasket damaged or incorrectly installed.
	C. Case	1. Cross leaks, porosity.
	D. Forward Clutch Slipping	1. If burned, look for cause. 2. Oil seal rings on pump cover broken or worn.
IX. SLIPS 1-2 SHIFT— (Install Pressure Gage)	A. Oil Level Low	1. Add oil—See Paragraph 75-1, Subparagraph c.
	B. Oil Pressure (Refer to par. 75-35)	1. Vacuum modulator assembly defective. 2. Modulator valve sticking. 3. Pump pressure regulator valve.
	C. 2-3 Accumulator	1. Oil ring damaged or missing.
	D. 1-2 Accumulator	1. Oil ring missing or damaged, case bore damaged.
	E. Pump to Case Gasket	1. Mispositioned.
	F. Case	1. Porosity between channels.
	G. Intermediate Clutch	1. Piston seals missing or damaged; clutch plates burned.

Problem	Possible Cause	Possible Condition
X. ROUGH 1-2 SHIFT— (Install Pressure Gage)	A. Oil Pressure—(Refer to par. 75-35)	1. Vacuum modulator—check for loose fittings, restrictions in line, modulator assembly defective. 2. Modulator valve stuck. 3. Valve body—regulator or boost valve stuck. 4. Pump to case gasket—off location or damaged.
	B. Case	1. Porosity between channels.
	C. 1-2 Accumulator Assembly	1. Oil rings damaged. 2. Piston stuck. 3. Broken or missing spring. 4. Bore damaged.
XI. SLIPS 2-3 SHIFT— (Install Pressure Gage)	A. Oil Level Low	1. Add oil—See Paragraph 75-1. Subparagraph c.
	B. Oil Pressure Low—(Refer to par. 75-35)	1. Modulator assembly. 2. Modulator valve. 3. Pump pressure regulator valve or boost valve; pump to case gasket off location.
	C. Case	1. Porosity.
	D. Direct Clutch	1. Piston seals leaking, or ball check leak.

Problem	Possible Cause	Possible Condition
XII. ROUGH 2-3 SHIFT—(Install Pressure Gage)	A. Oil Pressure—High (Refer to par. 75-35)	1. Vacuum leak. 2. Modulator valve sticking. 3. Valve body—pressure regulator or boost valve inoperative.
	B. 2-3 Accumulator Assembly	1. 2-3 accumulator spring missing, broken. 2. Accumulator piston stuck.
XIII. NO ENGINE BRAKING—L^2—2nd GEAR	A. Intermediate Servo and 2-3 Accumulator	1. Servo or accumulator oil rings or bores leaking. 2. Servo piston stuck.
	B. Intermediate Overrun Band	1. Intermediate overrun band broken, burned (check for cause).
	C. Oil Pressure—Low	1. Pressure regulator and/or boost valve stuck.
XIV. NO ENGINE BRAKING—L^1—1st GEAR	A. Manual Low Control Valve Assembly	1. Stuck.
	B. Oil Pressure—Low	1. Pressure regulator and/or boost valve stuck.
	C. Low and Reverse Clutch	1. Piston inner seal damaged or missing.
XV. NO PART THROTTLE DOWNSHIFT—(Install Pressure Gage)	A. Oil Pressure—(Refer to par. 75-35)	1. Vacuum modulator assembly, modulator valve, pressure regulator valve train. (Other malfunctions may also be noticed).
	B. Detent Value and Linkage	1. Sticks or disconnected or broken.
	C. 2-3 Shift Valve	1. Stuck.
XVI. NO DETENT DOWNSHIFTS	A. Control Valve Assembly	1. 2-3 valve stuck.
	B. Detent Valve and Linkage	1. Sticks or disconnected or broken.

Problem	Possible Cause	Possible Condition
XVII. LOW or HIGH SHIFT POINTS—(Install Pressure Gage)	A. Oil Pressure—(Refer to par. 75-35)	1. Engine vacuum—check at transmission end of the modulator pipe. 2. Vacuum modulator assembly vacuum line connections at engine and transmission, modulator valve, pressure regulator valve train.
	B. Governor	1. Valve sticking. 2. Feed holes restricted or leaking. pipes damaged or mispositioned 3. Feed line plugged.
	C. Detent Valve and Linkage	1. Stuck open. (Will cause late shifts).
	D. Control Valve Assembly	1. 2-3 valve train sticking. 2. 1-2 shift valve train sticking.
	E. Case	1. Porosity.
XVIII. WON'T HOLD IN PARK	A. Manual Linkage	1. Misadjusted.
	B. Internal Linkage	1. Parking brake lever and actuator assembly—defective (Check for chamfer on actuator rod sleeve). 2. Parking pawl broken or inoperative.

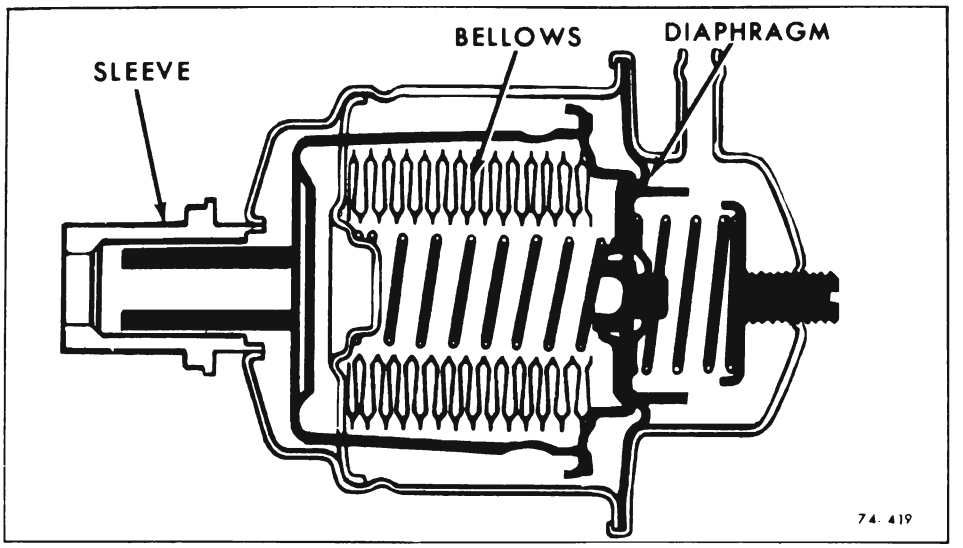


Figure 75-312 - Vacuum Modulator Assembly

75-34 VACUUM MODULATOR DIAGNOSIS PROCEDURE

NOTE: A defective vacuum modulator can cause one or more of the following complaints.

1. Harsh upshifts and downshifts.

2. Delayed upshifts.

3. Soft upshifts and downshifts.

4. Slips in low, drive and reverse.

5. Transmission overheating.

6. Engine burning transmission oil.

If any one of the above complaints are encountered, the modulator must be checked.

The vacuum modulator, See Figure 75-312, has three areas to be checked. If any one of the three (3) areas fail to pass the prescribed checks, the modulator must be replaced.

1. Bellows Comparison Check.

Using a comparison gage,, furnished with Dealer Service Information Bulletin 67-I-37, compare the load of a known good modulator *of the same part number* with the modulator in question.

NOTE: Refer to modulator usage chart in Paragraph 74-1, Subparagraph b.

To check bellows load proceed as follows:

a. Insert one end of the comparison gage into the suspected defective modulator sleeve. Insert the opposite end of the gage into a known, good modulator *of the same part number* as the suspected defective modulator.

NOTE: Refer to modulator usage chart in Paragraph 75-1, Subparagraph b.

NOTE: The part number of the modulator assembly is located on the back side of the modulator.

b. Holding the modulators in a horizontal position, see Figure 75-313, bring them slowly together under pressure. The modulator bellows in question, if defective, will reach the center line of the comparison gage before the known good modulator lines up with the outer gage line. See Figure 75-314.

If the modulator bellows in question is good, both modulator assemblies will be within the outer gage lines as the assemblies are slowly brought together. See Figure 75-315.

2. Vacuum Diaphragm Leak Check.

Turn modulator so vacuum line stem points downward. If transmission oil comes out the vacuum diaphragm is defective.

IMPORTANT: Gasoline and/or water vapor may settle in the vacuum side of the modulator. If this is found WITHOUT the presence of oil, the

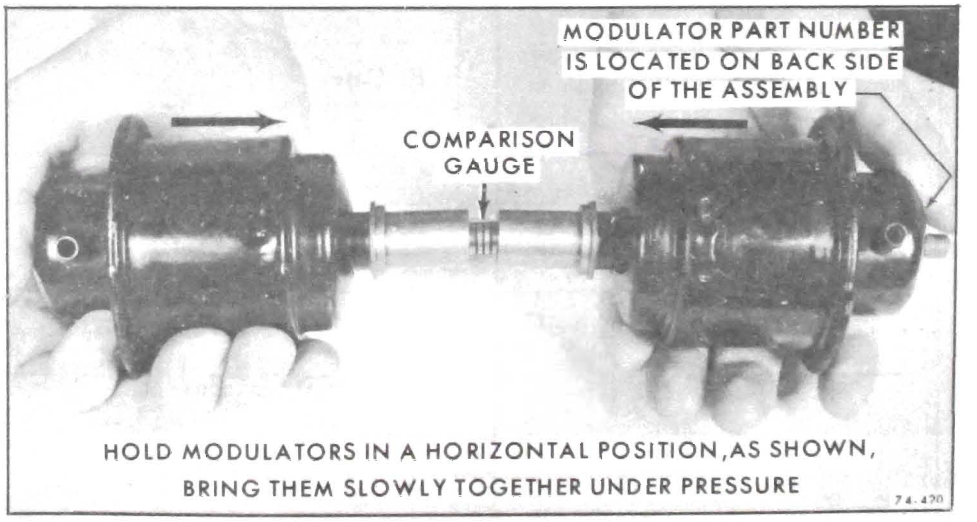


Figure 75-313 - Holding Modulator in Horizontal Position

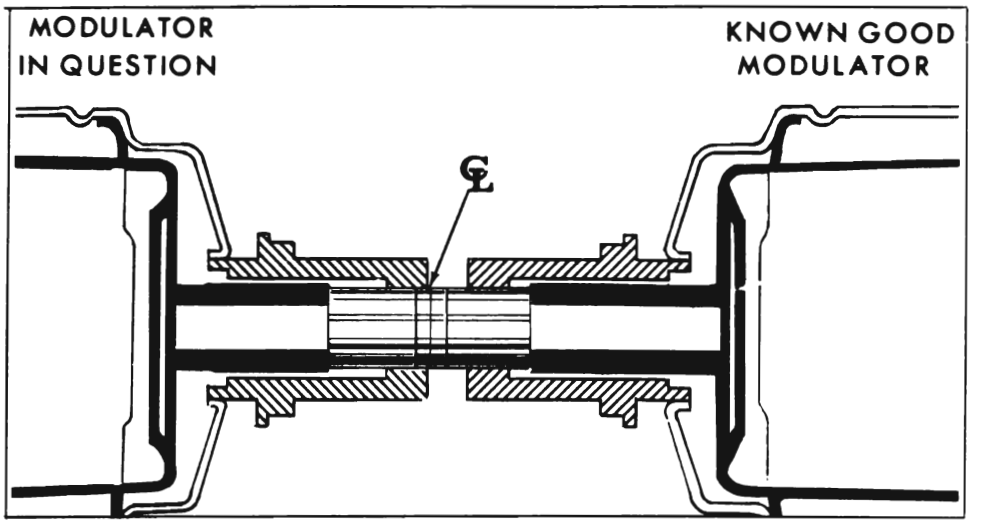


Figure 75-314 - Modulator Bellows Bad

modulator MUST NOT BE CHANGED.

Check solution that comes out of the modulator for evidence of lubricity. If the solution does not have the feel of oiliness it can be assumed the solution is a mixture of gas and/or water. The only way transmission oil can be on the vacuum side of the modulator is by a leak in the vacuum diaphragm.

If oil is found, the modulator must be replaced. If oil is not found in the vacuum side of the modulator but the transmission oil level is continually low, and *no external leaks are found,* there is a possibility that a pin hole leak exists in the diaphragm and the modulator should be replaced.

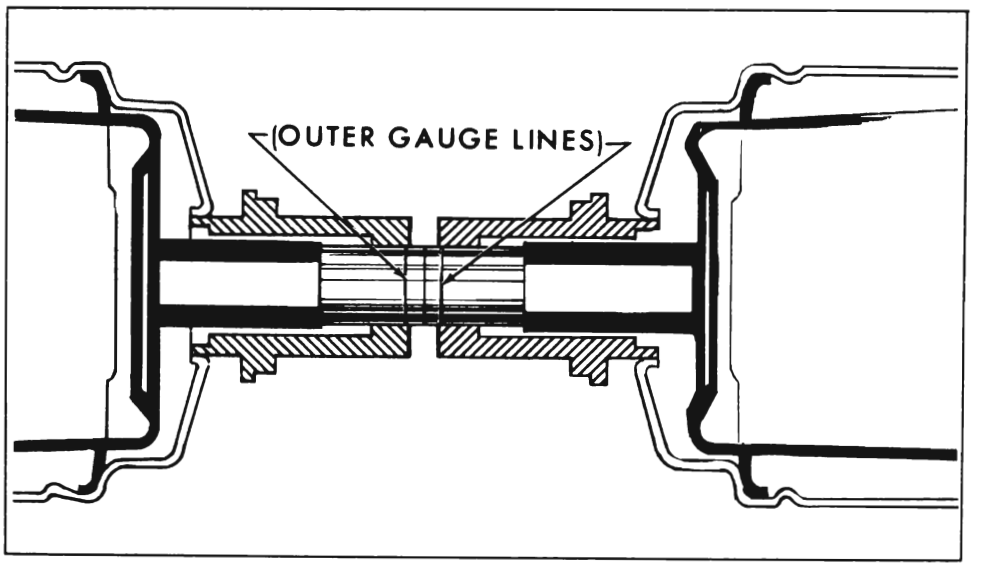


Figure 75-315 - Modulator Bellows Good

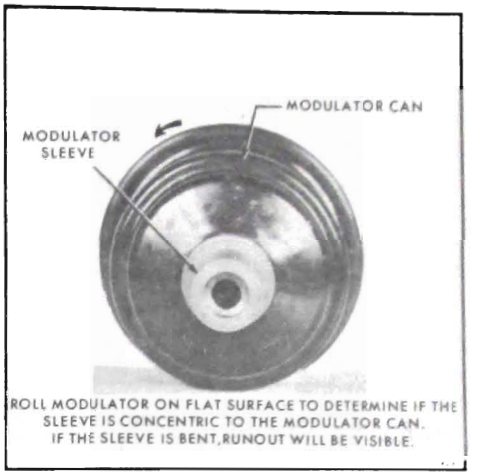


Figure 75-316 - Checking Modulator Sleeve Alignment

3. Inspection for External Damage.

1. Check for dents or cracks in modulator.

2. Check modulator valve sleeve alignment. Roll modulator on a flat surface to determine if the sleeve is concentric to the modulator can. See Figure 75-316. If the sleeve is bent, runout will be visible, and modulator must be replaced.

If the modulator passes the above checks, the following items should also be checked as a possible cause of the problem.

1. Check freeness of modulator valve in modulator.

2. Check freeness of modulator valve in transmission case.

3. Check the vacuum line from the manifold to modulator for holes, cracks or dents. Check the rubber hose connections at the modulator and at the intake manifold for leaks.

75-35 HYDRAULIC PRESSURE CHECKS

75-35 HYDRAULIC PRESSURE CHECKS TURBO HYDRA-MATIC 350

Selector Lever In:	Upshifts (MPH)		Downshifts (MPH)	
	1-2	2-3	3-2	3 or 2-1
Drive Range				
Full Throttle	50	85	(75)	(40)
Minimum Throttle	12	22	—	—
Part Throttle			(50)	—
Coast	—	—	22	9

(N) Lockout Speed

L_1 (MAN. LOW) — (ENGINE BRAKING @ 46 MPH OR BELOW)
L_2 (MAN. 2ND) — (ENGINE BRAKING @ ANY SPEED)

CAR TEST — LINE PRESSURE CHECKS

(A) Car coasting @ 25 MPH—Vacuum line connected—foot OFF throttle.

Range	Minimum PSI
Park/Neutral	67
Reverse	96
Drive	67
L_2	95
L_1	95

CAR STATIONARY — (SERVICE BRAKE ON)

(B) Oil pressures indicated are at zero output speed with the vacuum line disconnected from the modulator assembly and with the engine at 1200 rpm.

Alt. of Check Ft. Above Sea Level	Drive Neutral Park	L_2 or L_1	Rev.
0	176	175	251
2,000	164	166	234
4,000	159	162	227
6,000	151	157	215
8,000	144	151	205
10,000	137	146	195
12,000	130	141	188
14,000	124	137	177

NOTE: Altitude and pressures are approximate.

ROAD TEST — (With Vacuum Line and Gage Installed)

	Minimum PSI	Maximum PSI
Drive — 1st (0 to WOT)	67	175
— 2nd (0 to WOT)	67	175
— 3rd (Coast @ 30 MPH)	67	—
Reverse (0 to WOT)	96	251
L_1 (Coast @ 30 MPH)	95	—
L_2 (Coast @ 30 MPH)	95	—

TURBO HYDRA-MATIC 350 DIAGNOSIS CHART

LEGEND
X—PROBLEM AREA V.S. CAUSE
*—@ "O" VACUUM ONLY
O—BALLS #2/3/4 ONLY
L—LOCKED
S—STUCK

PROBLEM / CAR ROAD TEST → / POSSIBLE CAUSE	ALL RANGES—SLIPS	DRIVE—SLIPS—NO 1ST GEAR	LINE PRESSURE—ALL LOW	LINE PRESSURE—ALL HIGH	1-2 INTERM. CL. PRES. HIGH	1-2 INTERM. CL. PRES. LOW	2-3 DIRECT CL. PRES. HIGH	2-3 DIRECT CL. PRES. LOW	NO 1-2 UPSHIFT	1-2 U.S. EARLY/LATE	1-2 UPSHIFT @ W.O.T. ONLY	SLIPS—1-2 UPSHIFT	ROUGH—1-2 UPSHIFT	NO 2-3 UPSHIFT	2-3 U.S.—EARLY/LATE	SLIPS—2-3 UPSHIFT	ROUGH—2-3 UPSHIFT	NO WOT. 1-2 UPSHIFT	NO—PART TH. DOWN SHIFT	NO—FULL TH. DOWN SHIFT	2-3 UPSHIFT—W.O.T. ONLY	HARSH—DOWN SHIFT	L1 RANGE—NO ENG. BRAKING	L2 RANGE—NO ENG. BRAKING	NEUTRAL—DRIVES IN NEUTRAL	REVERSE—NO REVERSE	SLIPS IN REVERSE	PARK—NO PARK—RATCHETS	NOISY—ALL RANGES	1-2 2-3 SHIFT NOISY	REV. & D, L1 & L2 NOISY	LOW COOLER—FLOW	SPEWS OIL OUT BREATHER
LOW OIL LEVEL/WATER IN OIL	X	X	X			X		X			X				X											X		X	X		X	X
VACUUM LEAK				X	X		X		X	X	X		X		X		X			X												
MODULATOR & / OR VALVE	X	X	*	X	X						X	X		X	X	X										X						
STRAINER & / OR GASKET	X	X	X			X		X																			X		X			X	X
GOVERNOR—VALVE/SCREEN			X	X					X	X				X																		
VALVE BODY—GASKET/PLATE	X	X	X			X		X	X	X		X			X	X	X									X		X				
PRES. REG. & / OR BOOST VALVE	X	X	X	X	X	X	X	X	X			X	X			X	X						X	X		X	X					
BALL (#1) SHY	X	X	*			X			X			X			X	X					O					X	X					
1-2 SHIFT VALVE						X			X	X	X	X											X				X					
2-3 SHIFT VALVE								X						X	X	X	X		X													
MANUAL LOW CONT'L VALVE																							X									
DETENT VALVE & LINKAGE				X							X				X					X	X	X										
DETENT REG. VALVE																		X														
2-3 ACCUMULATOR						X						X				X																
MANUAL VALVE/LINKAGE	X	X	X																				X	X		X	X					
POROSITY/CROSS LEAK	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					X	X		X	X					
PUMP—GEARS	X	X	X			X		X				X				X												X				
PRIMING VALVE SHY	X	X	X																													S
COOLER VALVE LEAK																															X	X
CLUTCH SEAL RINGS	X	X	X			X		X	X			X		X		X							X	X		X	X					
POROUS/CROSS LEAK	X	X	X			X		X	X			X	X	X		X		X								X	X			X	X	
GASKET SCREEN—PRESSURE	X	X	X																							X	X		X		X	
BAND—INTERM. O.R.																								X								
CASE—POROUS/X LEAK	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X						X			X	X				X	
1-2 ACCUMULATOR	X	X	X			X			X			X	X																			
INTERMED. SERVO		X	X			X						X												X								
FORWARD CLUTCH ASS'Y		X																					X	X	X	L						
DIRECT CLUTCH ASS'Y								X						X		X										X	X			X		
INTERMED. CL. ASS'Y						X			X			X																		X		
L & REV. CL. ASS'Y																							X			X	X					
INT. ROLLER CL. ASS'Y									X			X												X								
L. & R. ROLLER CL. ASS'Y		X																														
PARK PAWL/LINKAGE																												X				
CONVERTER ASS'Y																												X		X		
GEAR SET & BEARINGS																												X	X			

75-265

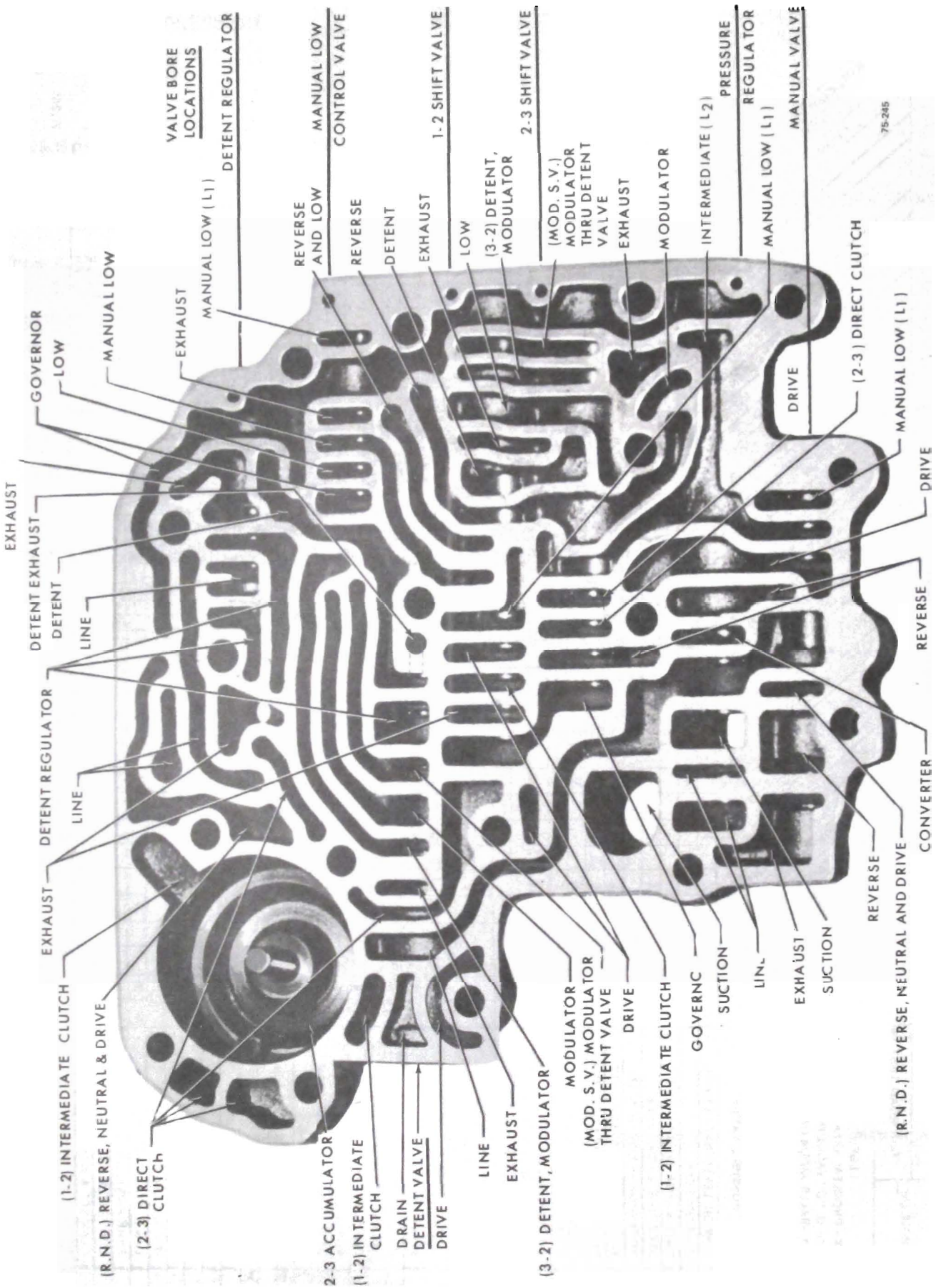


Figure 75-316A - Identification of Oil Channels in Valve Body

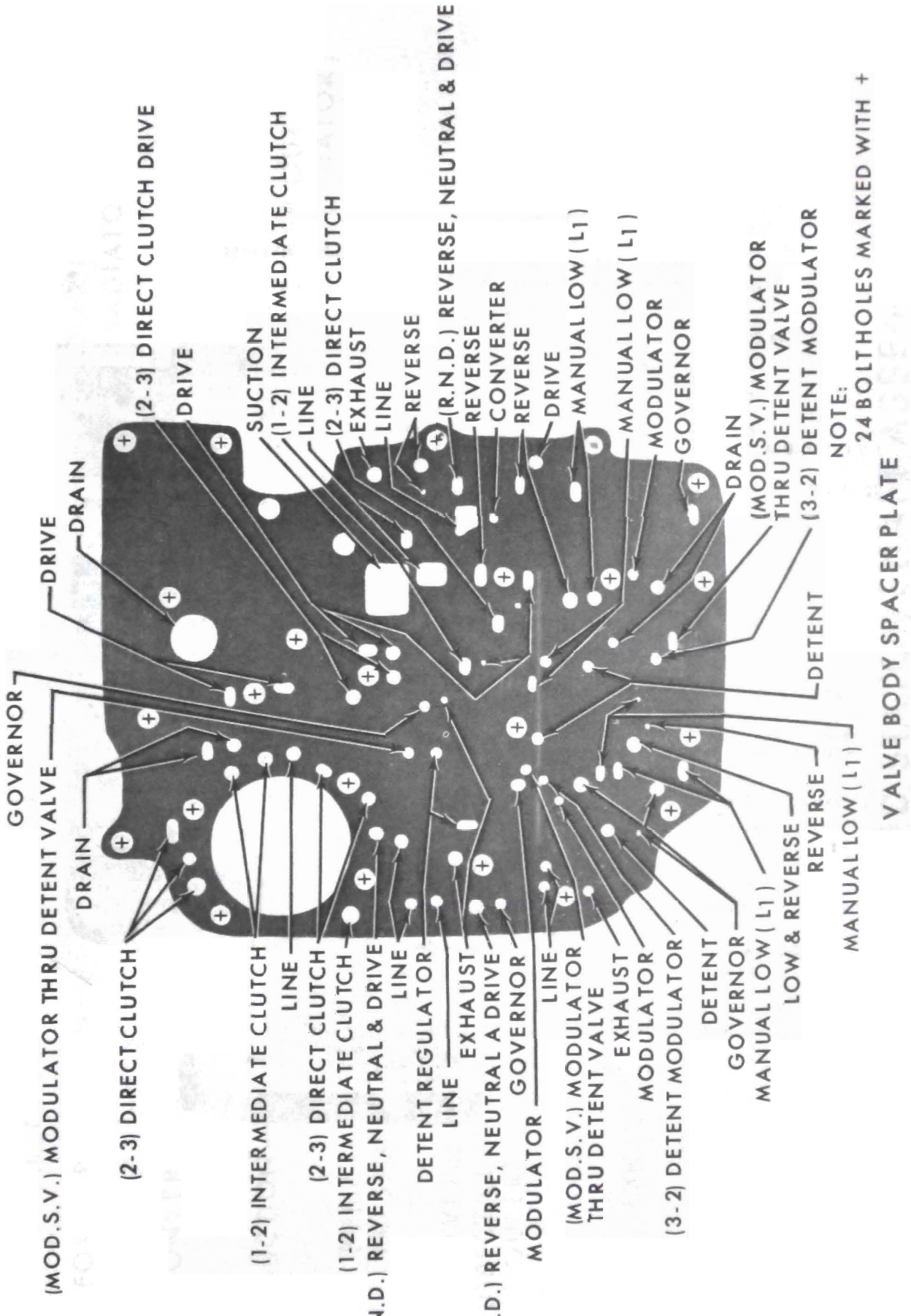


Figure 75-317 - Valve Body Spacer Plate

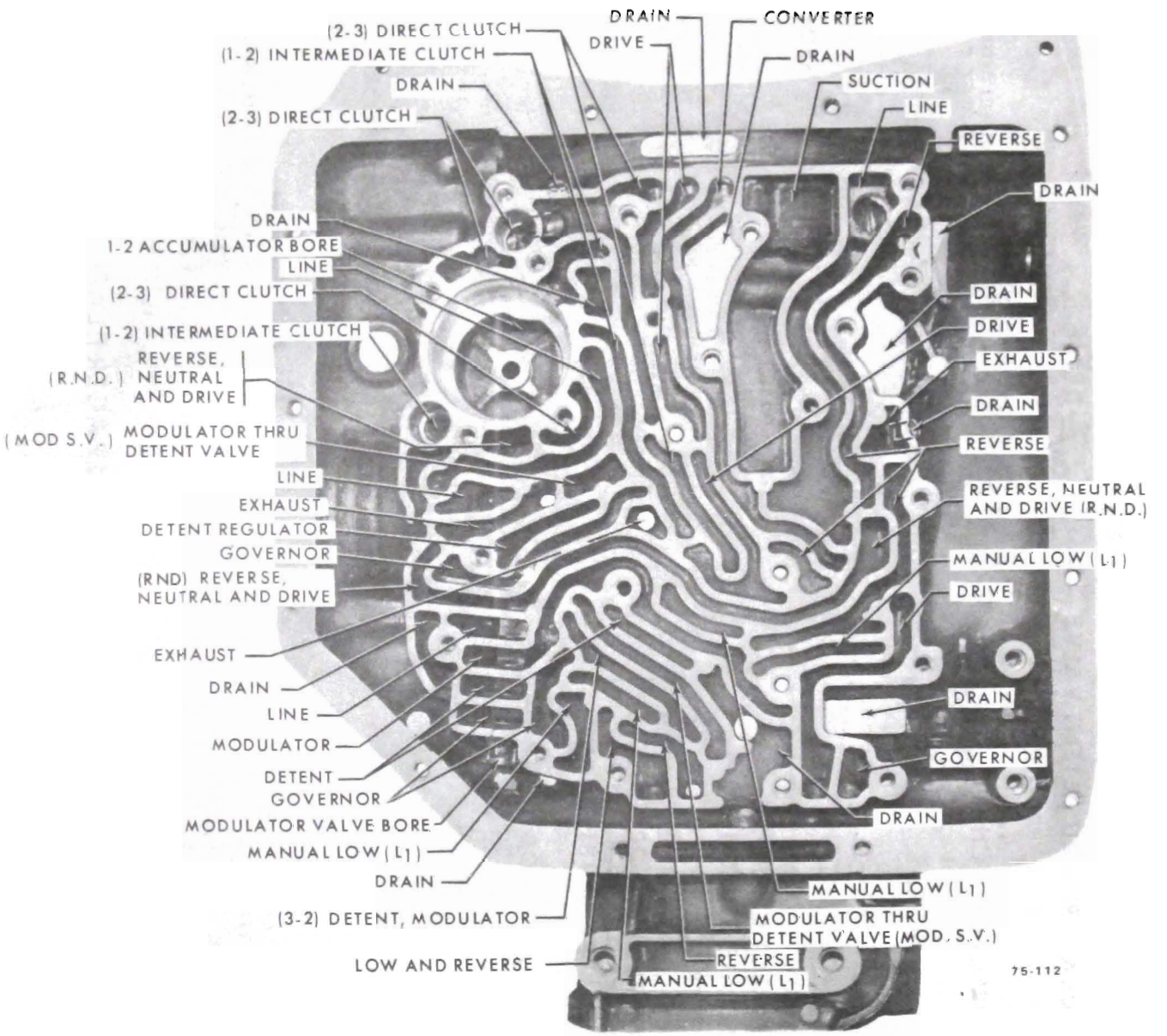
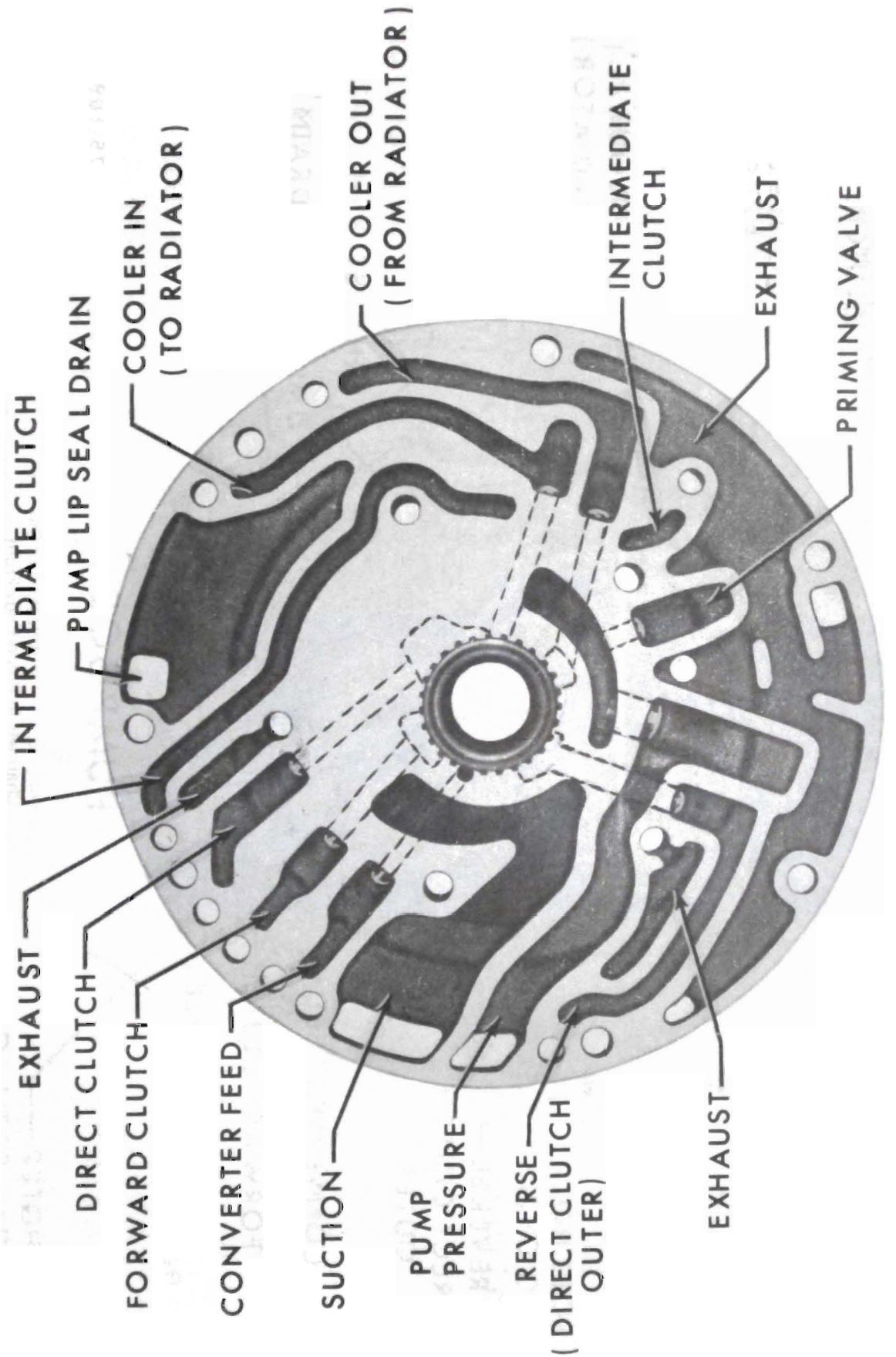


Figure 75-318 - Identification of Oil Channels in Case Face



PUMP COVER AND STATOR SHAFT ASSEMBLY

Figure 75-320 - Identification of Oil Channels in Pump Cover and Stator Shaft Face

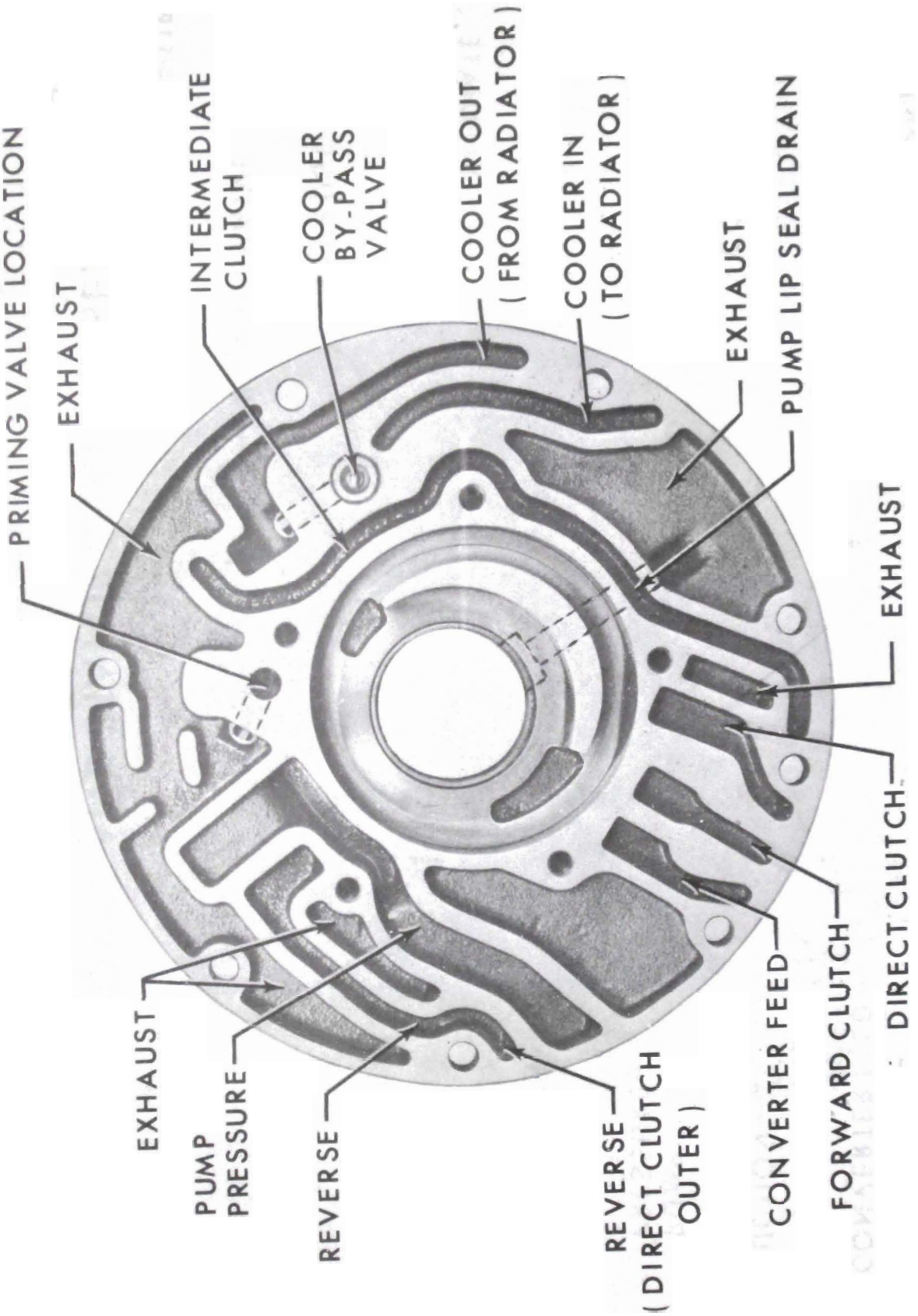


Figure 75-32I - Identification of Oil Channels in Pump Body Front Face

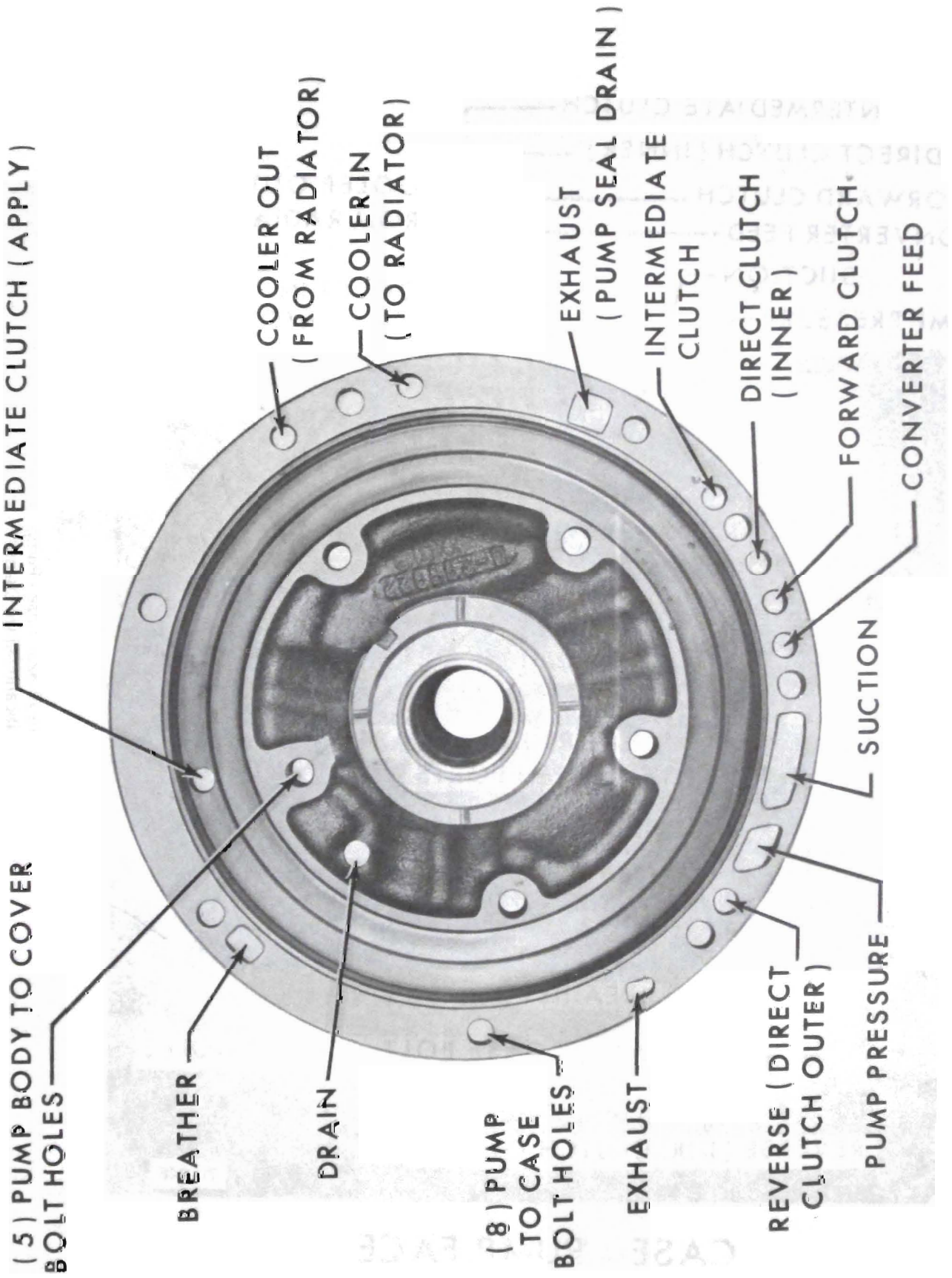


Figure 75-322 - Identification of Oil Channels in Pump Cover Rear Face

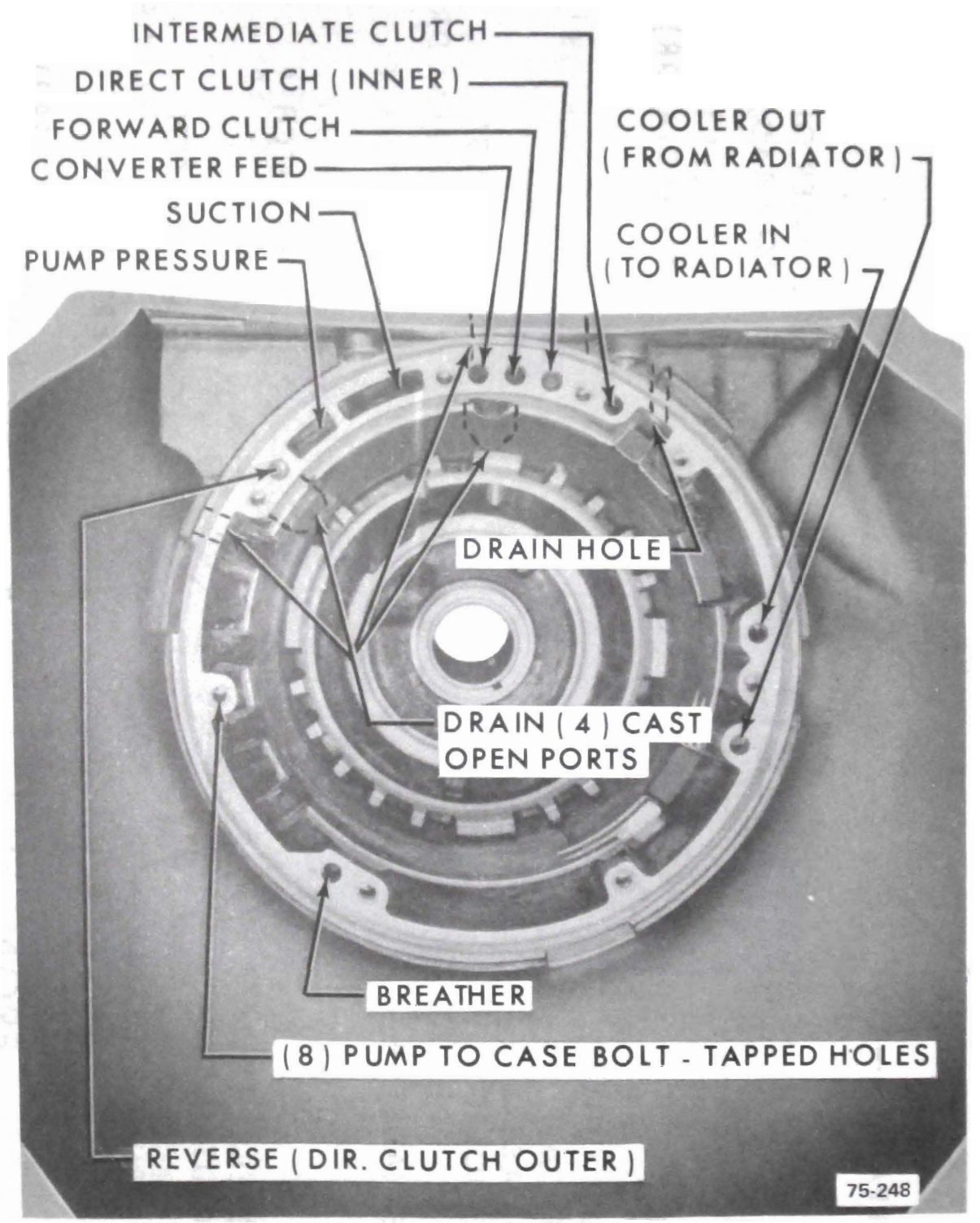


Figure 75-323 - Case - Pump Identification of Oil Channels

CASE - PUMP FACE