SECTION B
SUPER TURBINE "400"
AUTOMATIC TRANSMISSION
CONTENTS

CONTENTS CONT'D.

DIVISION I

SPECIFICATIONS AND ADJUSTMENTS

74-1 GENERAL SPECIFICATIONS

a. Model Designations

Trans. Model	Engine Cu. In. Displacement	Forward Clutch		Direct Clutch		Intermediate Clutch		Forward Clutch Piston	Direct Clutch Piston	Intermediate Clutch Piston	Modulator Can Assembly	Model Use
		Driven Plate Req'd.	Drive Plate Req'd.	Driven Plate Req'd.	Drive Plate Req'd.	Driven Plate Req'd.	Drive Plate Req'd.					
BT	430	5	5	5	5	3	3	8624016	8625515	8624210	8623947	Wildcat - Electra - Riviera
BA	400	5	5	5	5	3	3	8624016	8625515	8624210	8623947	G.S. 400
BW	340	5	5	5	5	3	3	8624016	8625515	8624210	8623947	Sport-wagon 400
BU	340	5	5	5	5	3	3	8624016	8625515	8624210	8623947	Le Sabre 400

b. Transmission Identification Number

A production identification number is stamped on a metal tag, located in the lower right side of the transmission case.

The production code number is located along the top of the tag. See Figure 74-200. Since the production code number furnishes the key to construction and interchangeability of parts in each transmission, the number should be used when selecting replacement parts as listed in the master parts list. The number should always be furnished on product reports, AFA forms, and all correspondence with the factory concerning a particular transmission.

c. Super Turbine 400 Fluid Recommendations

Whenever fluid is added, use only Type "A" Automatic Transmission Fluid identified by the mark "AQ-ATF" followed by a number and the suffix letter "A". (AQ-ATF-XXXX-A).

The oil pan should be drained and the filter replaced 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 filter replaced every 12,000 miles.

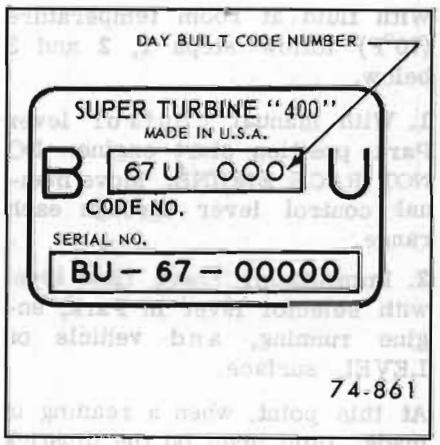


Figure 74-200—Transmission Code Identification

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 pint difference.

To determine proper fluid level, proceed as follows:

CAUTION: The full mark on the dipstick is an indication of transmission fluid at normal operating temperature of 180°F. This temperature is only obtained after at least 15 miles of expressway driving or equivalent of city driving.

1. With manual control lever 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 at the "FULL" mark.

3. If additional fluid is required, add fluid to the "FULL" mark on the dipstick.

If vehicle can not be driven 15 expressway miles or equivalent, and it becomes necessary to check fluid level, the transmission fluid must be at room temperature (70°F).

With fluid at room temperature (70°F) follow steps 1, 2 and 3 below.

1. With manual control lever 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.

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.

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.

2. Draining Oil Pan and Replacing Filter

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

(b) Remove oil pan and gasket. Discard gasket.

(c) Drain fluid from oil pan. Clean pan with solvent and dry thoroughly with clean compressed air.

(d) Remove Filter. Remove and discard oil filter to case O-ring.

(e) Install new oil filter to case O-ring. Install filter assembly.

(f) Install new gasket on oil pan and install pan. Tighten attaching bolts to 12 lb. ft.

(g) Lower car and add 5 pints of transmission fluid through filler tube.

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

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

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

NOTE: 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.

CAUTION: Do not overfill.

3. Adding Fluid to Fill Dry Transmission and Converter Assembly

The fluid capacity of the Super Turbine 400 transmission and converter assembly is approximately 23 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:

NOTE: The converter and filter should be replaced on any major failure, such as a clutch or gearset, and an excessive amount of foreign material is indicated in the pan.

(a) Add 10 pints of transmission fluid through filler tube.

NOTE: If installation of a new converter is not required add only 6 pints of transmission fluid.

(b) With manual control lever in Park position start engine and place fast idle screw on middle of fast idle cam. DO NOT RACE ENGINE. Move manual control lever through each range.

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

(d) Add additional fluid to bring lever to 1/4" below the "ADD" mark on the dipstick.

NOTE: Fluid level is set at 1/4" below the "ADD" mark on the dipstick to allow for expansion so fluid heats up.

CAUTION: Do not overfill.

d. Super Turbine 400 Towing Instructions

If a Buick equipped with Super Turbine 400 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.

e. 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 apply moderate pressure to the accelerator. Do not race engine. Avoid spinning wheels when trying to free the car.

74-2 BOLT TORQUE SPECIFICATIONS

Location	Thread Size	Torque Lbs. Ft.
Solenoid Assembly to Case	1/4-20	6-10
Valve Body to Case	1/4-20	6-10
Pump Body to Cover	5/16-18	15-20
Pump Assembly to Case	5/16-18	15-20
Rear Servo Cover to Case	5/16-18	15-20
Governor Cover to Case	5/16-18	15-20
Parking Brake Bracket to Case	5/16-18	15-20
Vacuum Modulator Retainer to Case	5/16-18	15-20
Valve Body to Case	5/16-18	6-10
Oil Pan to Case	5/16-18	10-13
Case Extension to Case	3/8-16	20-25

74-3 IDLE STATOR AND DETENT SWITCH ADJUSTMENTS

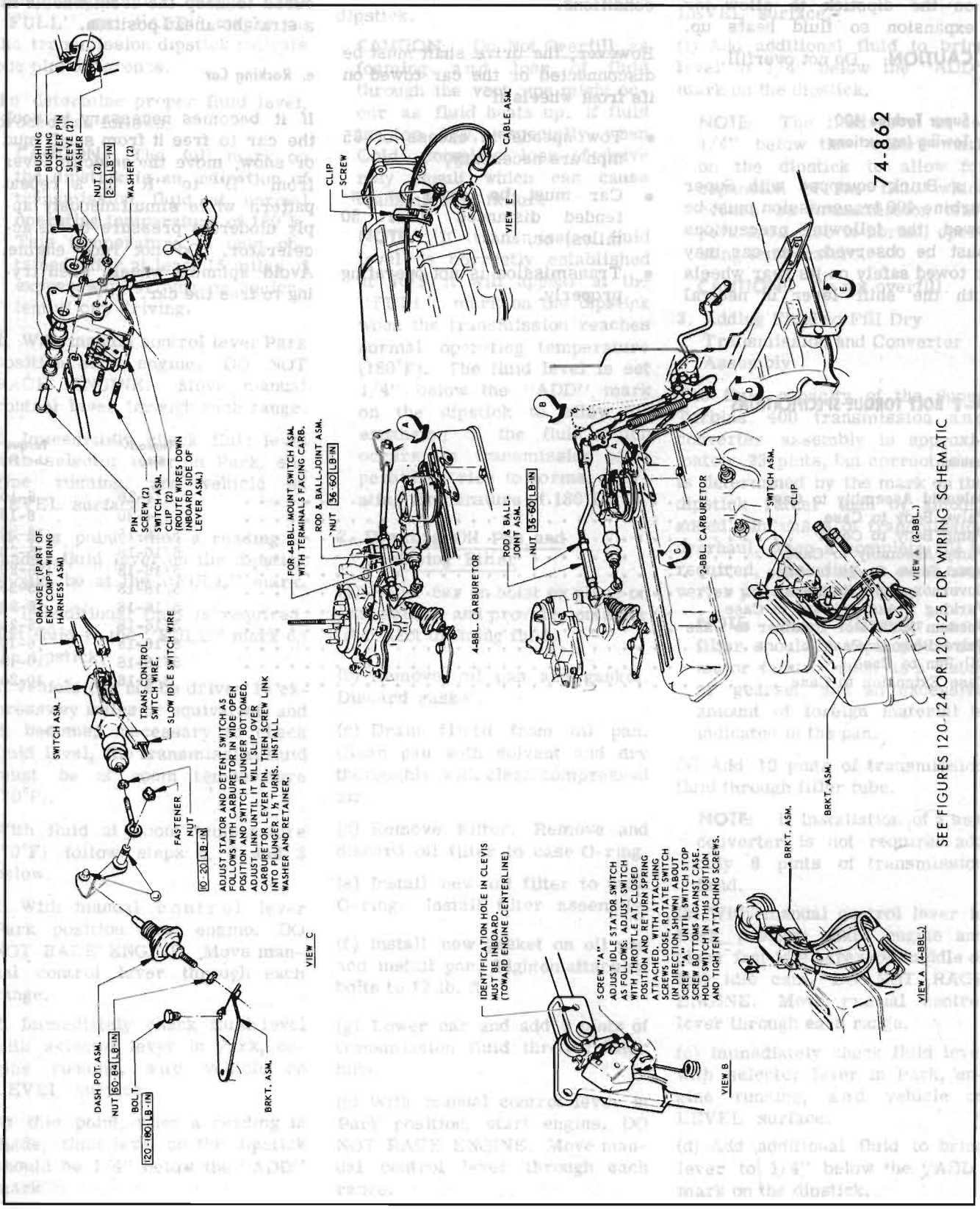


Figure 74-201—Idle Stator and Detent Switch Adjustments

DIVISION II

DESCRIPTION AND OPERATION

74-4 DESCRIPTION

The Super Turbine 400 Automatic Transmission, see Figure 74-202, is a fully automatic unit consisting primarily of a 3-element hydraulic torque converter and a compound planetary gear set. Three multiple-disc clutches, two (2) one way roller clutches and two bands provide the friction elements required to obtain the desired function of the compound planetary gear set.

The 3-element torque converter consists of a pump, turbine and a variable pitch stator assembly. The stator blades can be operated in two different positions, maximum or high angle and minimum or low angle. The stator is mounted on a one way roller clutch which will allow the stator to turn clockwise but not counterclockwise.

The torque converter housing 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 through 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, the 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.

High stator blade angle means greater redirection of the oil and increased engine speed and torque multiplication for maximum performance. At engine idle it reduces the efficiency of the converter which reduces "creep".

Low angle results in a more efficient converter for coupling operation.

As turbine speed increases, the direction of the 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 - or at a one-to-one ratio.

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 transmission are:

Manual Linkage - To select the desired operating range.

Engine Vacuum - To operate a vacuum modulator unit.

12 Volt Electrical Signal - To operate an electrical detent solenoid and stator solenoid.

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 solenoid is activated by a signal from the stator and detent switch that is connected to the throttle linkage. When the throttle is fully open, the switch on the linkage is closed, energizing the detent solenoid and causing the transmission to downshift at speeds below approximately 70 MPH.

At engine idle the stator control solenoid is activated by a signal from a switch on the throttle linkage which changes the stator blade angle from low to high. It is also energized at 3/4 throttle opening by a switch on the throttle linkage to change the stator blades from low angle to high angle.

The selector quadrant has six selector positions: P, R, N, D, L^2, L^1.

P. - Park position positively locks the output shaft to the transmission case by means of a locking pawl to prevent the vehicle from rolling either direction. This position should be selected whenever the driver leaves the vehicle. The engine may be started in park position.

R. - Reverse range enables the vehicle to be operated in a reverse direction.

N. - Neutral position enables the engine to be started and run without driving the vehicle.

D. - Drive range is used for all normal driving conditions and maximum economy.

Drive range has three gear ratios, from the starting ratio to direct drive. Detent down shift is available for safe passing by depressing the accelerator to the floor.

L^2 - L^2 range adds new performance for congested traffic or hilly terrain. L^2 range has the same starting ratio as drive range, but prevents the transmission from shifting above second gear to retain second gear acceleration when extra performance is desired. L^2 range can

also be used for engine braking. L^2 range can be selected at any vehicle speed, and the transmission will shift to second gear and remain in second until the vehicle speed or the throttle are changed to obtain first gear operation in the same manner as in drive range.

L^1 - L^1 range can be selected at any vehicle speed and the transmission will shift to second gear and remain in second until vehicle speed is reduced to approximately 40 MPH, depending on axle ratio. The transmission will then down shift into first gear. Under no circumstances will it again upshift while the selector lever is in L^1 range.

L^1 range prevents the transmission from shifting out of first gear. This is particularly beneficial for maintaining maximum engine braking when continuous first gear operation is desirable.

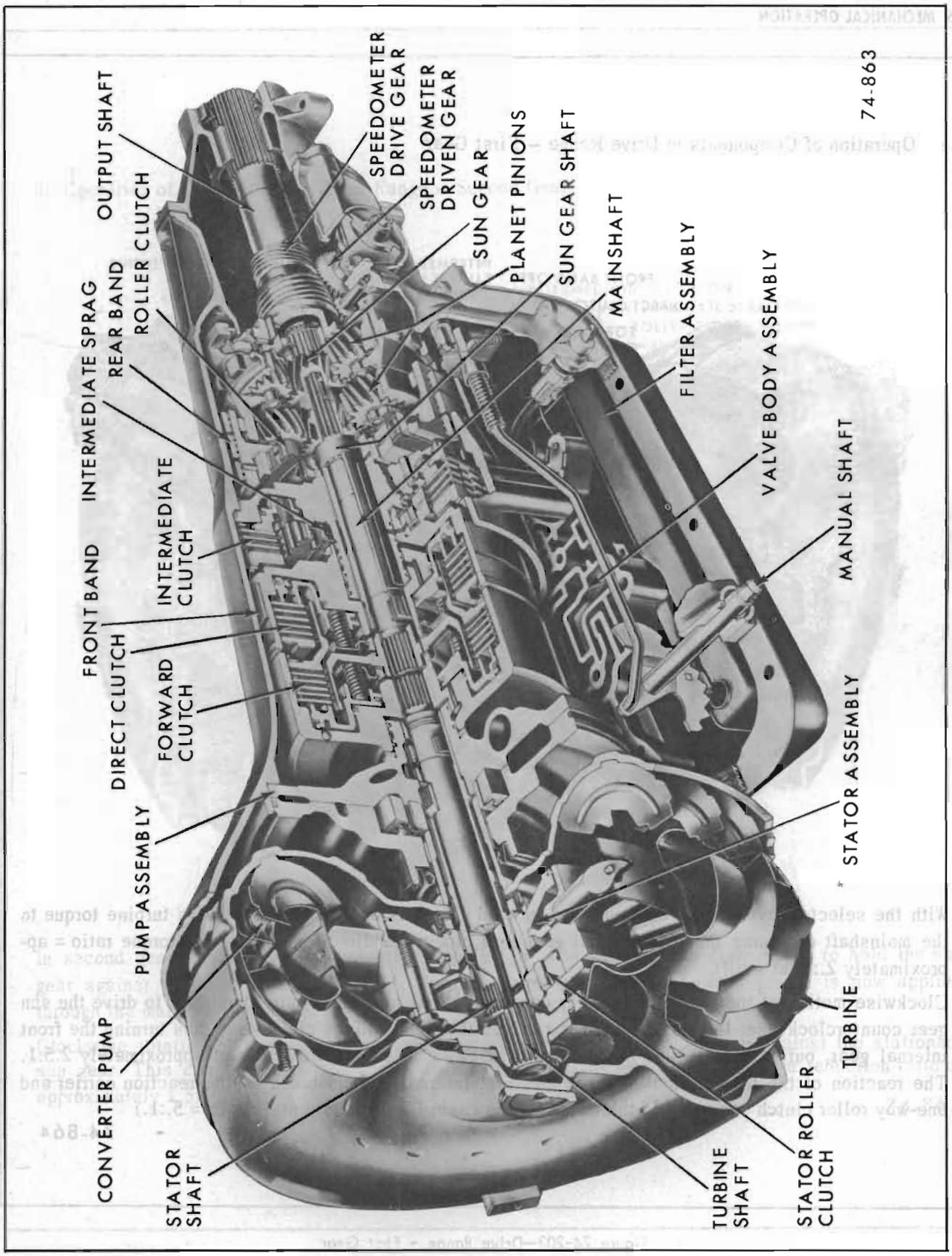
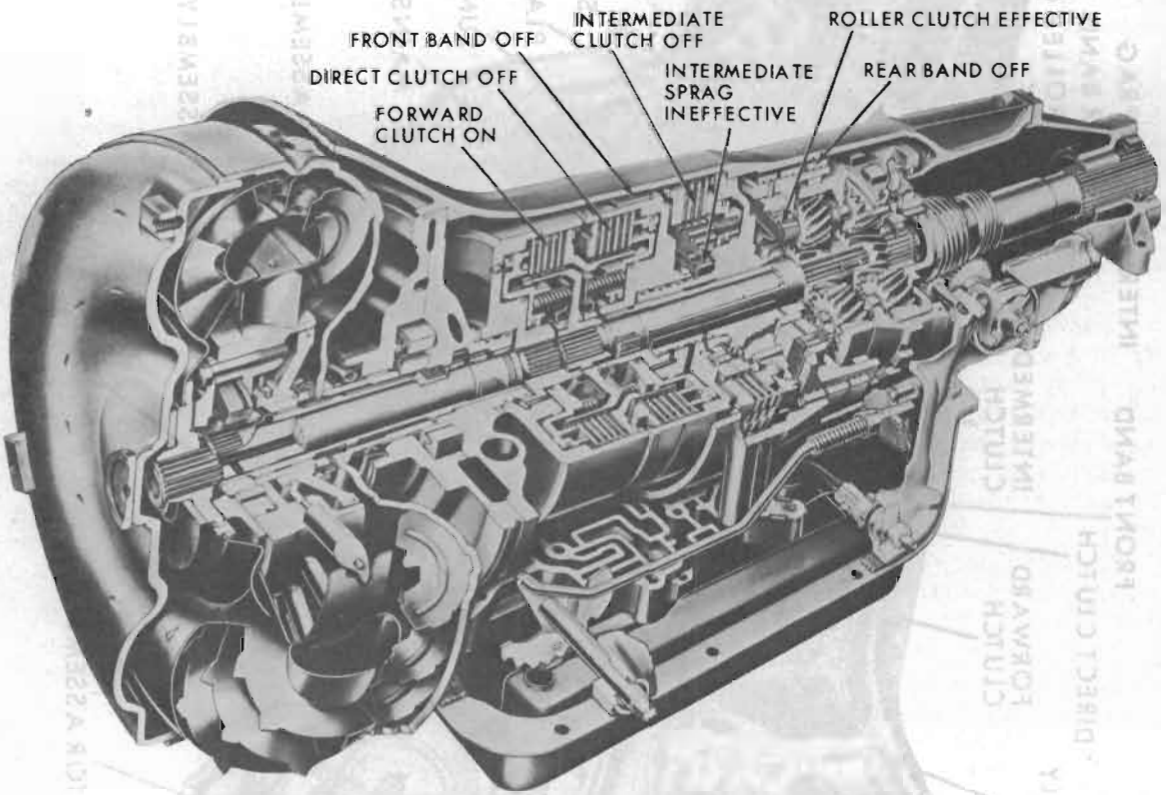


Figure 74-202—Cross Section of Transmission

74-5 MECHANICAL OPERATION

a. Operation of Components in Drive Range – First Gear



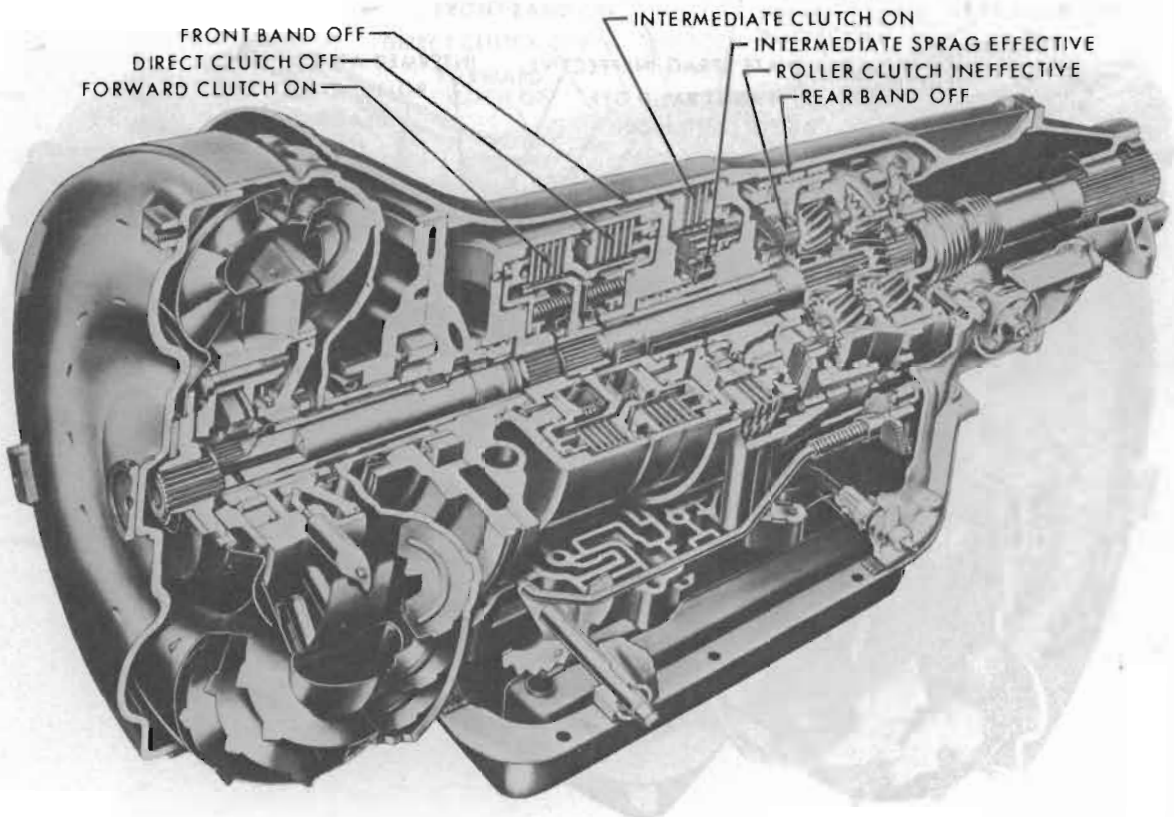
With the selector lever in Drive Range, the forward clutch is applied. This delivers turbine torque to the mainshaft and turns the rear internal gear in a clockwise direction. (Converter torque ratio = approximately 2.:1. at stall).

Clockwise motion of the rear internal gear causes the rear pinions to turn clockwise to drive the sun gear counterclockwise. In turn, the sun gear drives the front pinions clockwise, thus turning the front internal gear, output carrier, and output shaft clockwise in a reduction ratio of approximately 2.5:1. The reaction of the front pinions against the front internal gear is taken by the reaction carrier and one-way roller clutch assembly to the transmission case. (Approximate stall ratio = 5.:1.)

74-864

Figure 74-203—Drive Range - First Gear

b. Operation of Components in Drive Range – Second Gear



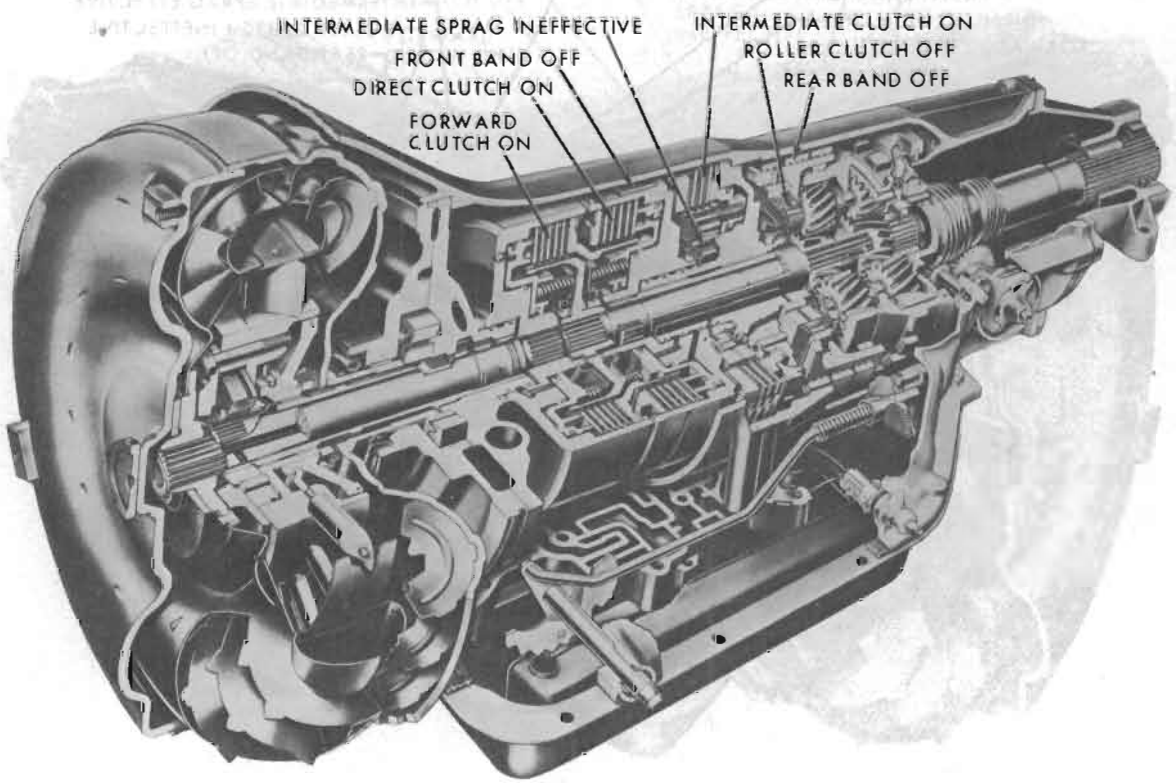
In second gear, the intermediate clutch is applied to allow the intermediate sprag to hold the sun gear against counterclockwise rotation. Turbine torque through the forward clutch is now applied through the mainshaft to the rear internal gear in a clockwise direction.

Clockwise rotation of the rear internal gear turns the rear pinions clockwise against the stationary sun gear. This causes the output carrier and output shaft to turn clockwise in a reduction ratio of approximately 1.5:1.

74-865

Figure 74-204—Drive Range - Second Gear

C. Operation of Components in Drive Range – Third Gear

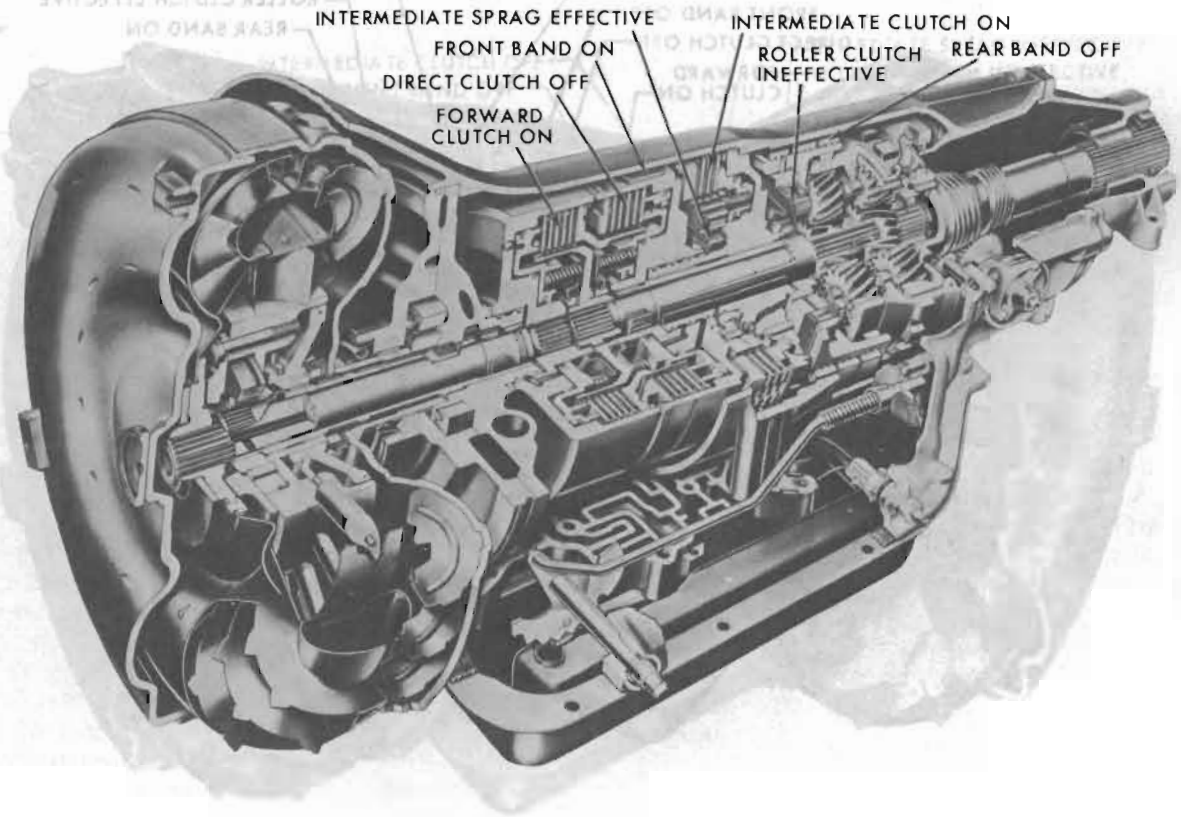


In direct drive, engine torque is transmitted to the converter through the forward clutch to the mainshaft and rear internal gear. Because the direct clutch is applied, equal power is also transmitted to the sun gear shaft and the sun gear. Since both the sun gear and internal gears are now turning at the same speed, the planetary gear set is essentially locked and turns as one unit in direct drive or a ratio of 1:1.

74-866

Figure 74-205—Drive Range - Third Gear

d. Operation of Components in Low – L^2 Range – Second Gear



In second gear, the intermediate clutch is applied to allow the intermediate sprag to hold the sun gear against counterclockwise rotation. Turbine torque through the forward clutch is now applied through the mainshaft to the rear internal gear in a clockwise direction.

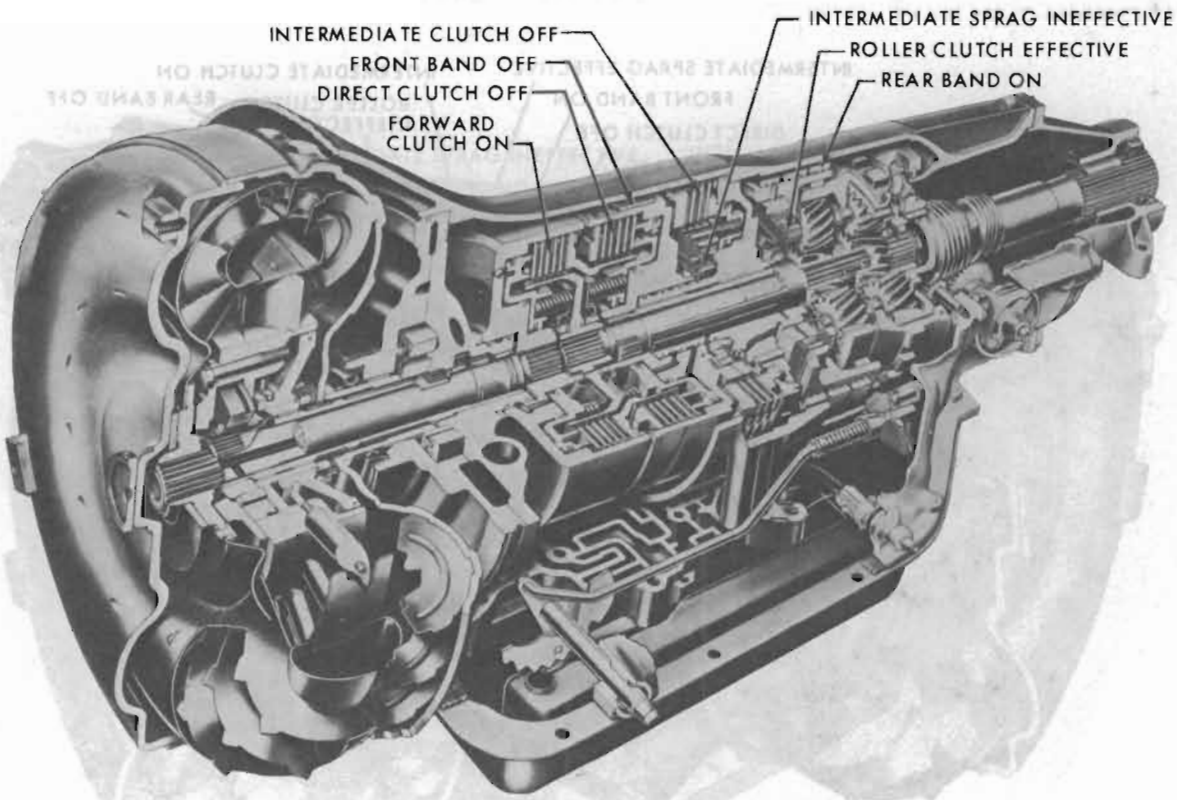
Clockwise rotation of the rear internal gear turns the rear pinions clockwise against the stationary sun gear. This causes the output carrier and output shaft to turn clockwise in a reduction ratio of approximately 1.5:1.

In L^2 Range second gear, overrun braking is provided by the front band as it holds the sun gear fixed. Without the band applied, the sun gear would overrun the intermediate sprag.

74-867

Figure 74-206—L^2 Range - Second Gear

e. Operation of Components in Low – L^1 Range – First Gear



With the selector lever in L^1 Range, the forward clutch is applied. This delivers turbine torque to the mainshaft and turns the rear internal gear in a clockwise direction. (Converter torque ratio = approximately 2.:1. at stall.)

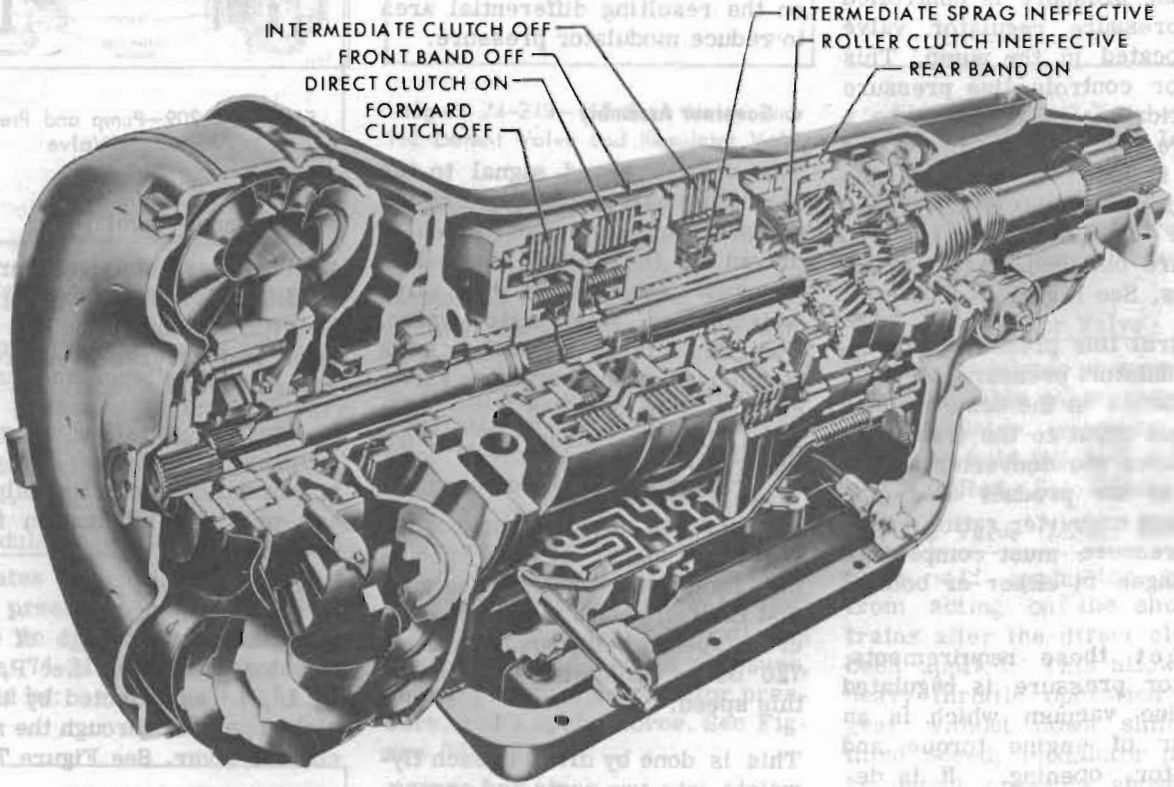
Clockwise motion of the rear internal gear causes the rear pinions to turn clockwise to drive the sun gear counterclockwise. In turn, the sun gear drives the front pinions clockwise, thus turning the front internal gear, output carrier, and output shaft clockwise in a reduction ratio of approximately 2.5:1. The reaction of the front pinions against the front internal gear is taken by the reaction carrier and the one way clutch. (Total stall ratio = approximately 5.:1.)

Downhill or overrun braking is provided in L^1 Range by applying the rear band as this prevents the reaction carrier from overrunning the one way clutch.

74-867

Figure 74-207—L^1 Range - First Gear

f. Operation of Components in Reverse



In Reverse, the direct clutch is applied to direct turbine torque to the sun gear shaft and sun gear. The rear band is also applied, holding the reaction carrier.

Clockwise torque to the sun gear causes the front pinions and front internal gear to turn counterclockwise in reduction. The front internal gear is connected directly to the output shaft, thus providing the reverse output gear ratio of approximately 2.:1. The approximate reverse torque multiplication at stall (converter and gear ratios) is approximately 4.:1.

74-868

Figure 74-208—Reverse

74-6 HYDRAULIC OPERATION FUNCTIONS OF VALVES AND HYDRAULIC CONTROL UNITS

a. Pressure Control

The transmission is automatically controlled by a hydraulic system. Hydraulic pressure is supplied by the transmission gear type oil pump, which is engine driven. Main line pressure is controlled by a pressure regulator valve train located in the pump. This regulator 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 are met and smooth shifts are obtained at all throttle openings. See Figure 74-209.

To control line pressure properly, modulator pressure is used which varies in the same manner as torque input to the transmission. Since the converter torque output is the product of engine torque and converter ratio, modulator pressure must compensate for changes in either or both of these.

To meet these requirements, modulator pressure is regulated by engine vacuum which is an indicator of engine torque and carburetor opening. It is decreased by governor pressure with an increase in vehicle speed because converter torque ratio also decreases.

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. These are so arranged that when installed, the bellows and one 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 act in the opposite direction to decrease modulator, or low engine vacuum, high modulator pressure; high engine vacuum, and low modulator pressure. See Figure 74-210.

To reduce the effect of altitude 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

The vehicle speed signal to the modulator valve is supplied by the transmission governor, which is driven by the output shaft. The governor consists of two flyweights and a regulator valve. Centrifugal force of the flyweights is imposed on the regulator valve, causing it to regulate a pressure signal that increases with speed. See Figure 74-211.

To increase the accuracy of the governor signal at low speeds, the flyweights are so designed that their effective mass is greater at speeds below approximately 720 output RPM than it is above this speed.

This is done by dividing each flyweight into two parts and arranging them so that the primary weights act through preloaded springs on the secondary weights, which in turn acts on the valve. At approximately 720 RPM the centrifugal force on each primary weight exceeds the spring force and the primary weights move to a grounded stop. With the primary weights grounded the force on the governor regulator valve is equal to the spring forces plus the centrifugal force on the secondary weights.

Governor pressure acts on the modulator valve to cause modulator pressure to decrease as vehicle speed increases.

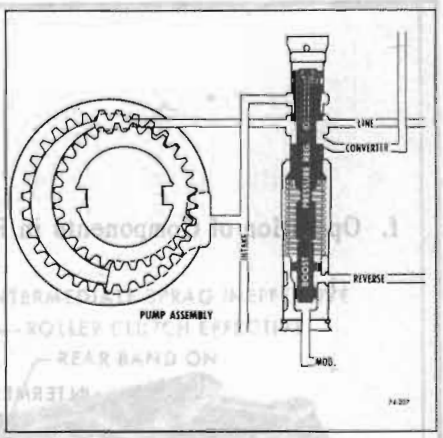


Figure 74-209—Pump and Pressure Regulator Valve

1. Pressure Regulator

a. Regulates line pressure according to a fixed spring force and forces controlled by modulator and reverse pressure. See Figure 74-209.

b. Controls the flow of oil that charges the torque converter, stator valve, feeds the oil cooler and provides lubrication for the transmission.

2. Manual Valve

Establishes the range of transmission operation, i.e. P, R, N, D, L^2, L^1 as selected by the vehicle operator through the manual control lever. See Figure 74-212.

3. Governor Assembly

Generates a speed sensitive oil

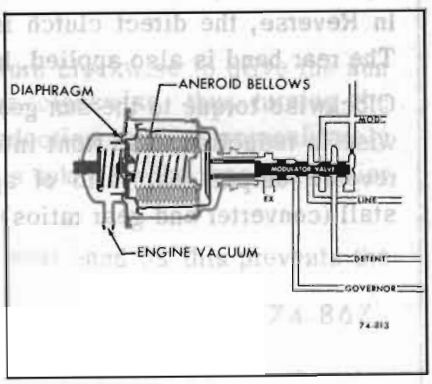


Figure 74-210—Vacuum Modulator Assembly

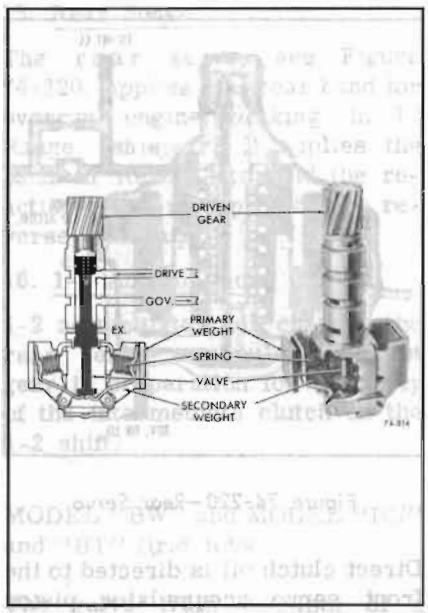


Figure 74-211—Governor Assembly

pressure that increases with output shaft or vehicle speed. Governor pressure is used to vary the shift points and modulator pressure regulation. See Figure 74-211.

4. Modulator Valve

Regulates line pressure to modulator pressure that varies with torque to the transmission. See Figure 74-210. It senses forces created by:

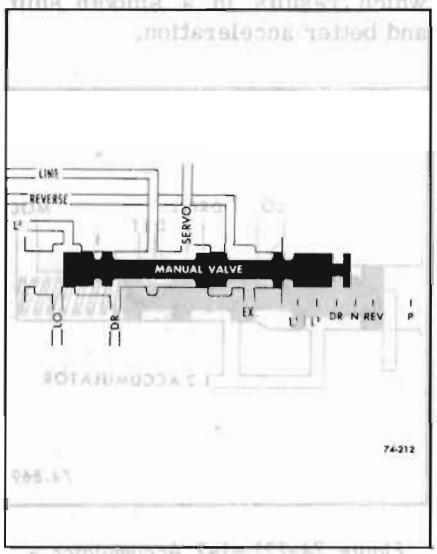


Figure 74-212—Manual Valve

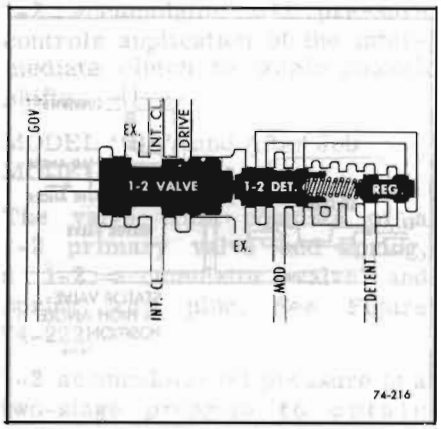


Figure 74-213—1-2 Shift Valve and 1-2 Detent Valve and Regulator Valve

a. The vacuum modulator bellows that increases modulator pressure.

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

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

5. 1-2 Shift Valve

Controls the 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 a spring force. See Figure 74-213.

6. 1-2 Regulator Valve

Regulates modulator pressure to a pressure proportional to modulator pressure, tending to keep the 1-2 shift valve in the down shift position. See Figure 74-213.

7. 1-2 Detent Valve

Senses regulated modulator pressure tending to hold the 1-2 shift valve in the down shift position and provides an area for detent pressure for detent 2-1 shifts. See Figure 74-213.

8. 2-3 Shift Valve

Controls the oil pressure that causes the transmission to shift from 2-3 or 3-2. Its operation is

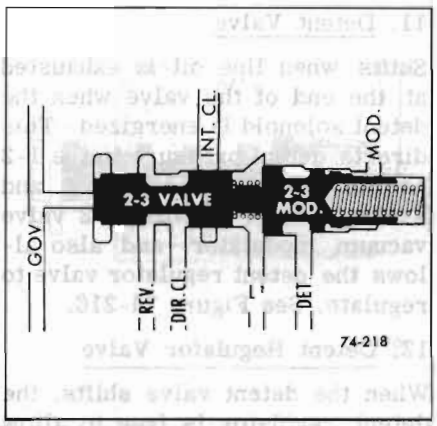


Figure 74-214—2-3 Valve and 2-3 Modulator Valve Train

controlled by modulator, L^2, governor and detent pressure as well as a spring force. See Figure 74-214.

9. 2-3 Modulator Valve

Senses modulator pressure to apply a variable force proportional to modulator pressure which tends to hold the 2-3 shift valve down shifted. See Figure 74-214.

10. 3-2 Valve (Model BW Only)

Shuts off modulator pressure from acting on the shift valve trains after the direct clutch has been applied. This allows fairly heavy throttle operation in third gear without down shifting. In third speed, modulator pressure or detent pressure above 87 psi will provide part throttle downshift forces. (Resulting in a 3-2 downshift at less than wide open throttle) See Figure 74-215.

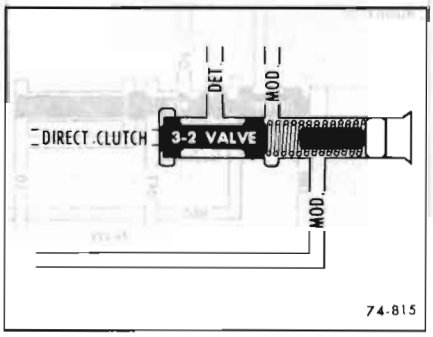


Figure 74-215—3-2 Valve — Model BW Only

11. Detent Valve

Shifts when line oil is exhausted at the end of the valve when the detent solenoid is energized. This directs detent pressure to the 1-2 accumulator, 1-2 regulator and 2-3 modulator valves, 3-2 valve vacuum modulator, and also allows the detent regulator valve to regulate. See Figure 74-216.

12. Detent Regulator Valve

When the detent valve shifts, the detent regulator is free to allow drive oil to enter the detent passage and thus becomes regulated to a valve of 70 psi. Detent pressure will also flow into the modulator passage which flows to the 2-3 modulator valve, 3-2 valve and the 1-2 detent valve. Lo oil moves the detent regulator open to drive oil allowing drive oil to enter the modulator and detent passages. See Figure 74-216.

13. Stator Valve

Shifts when line oil is exhausted at end of the valve when the stator control solenoid is energized.

This exhausts oil from the variable stator piston and the stator blades change from low angle to high angle. See Figure 74-217. When the solenoid is not energized, converter oil is directed to the stator piston and low angle is obtained.

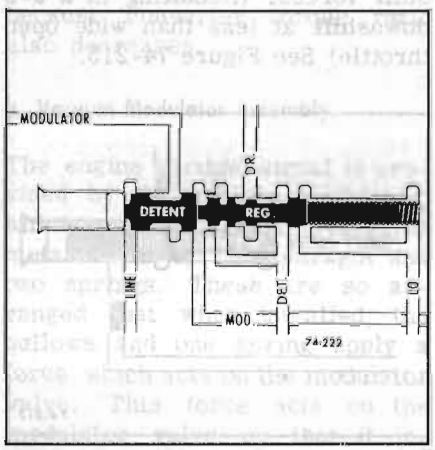


Figure 74-216—Detent Valve and Detent Regulator Valve

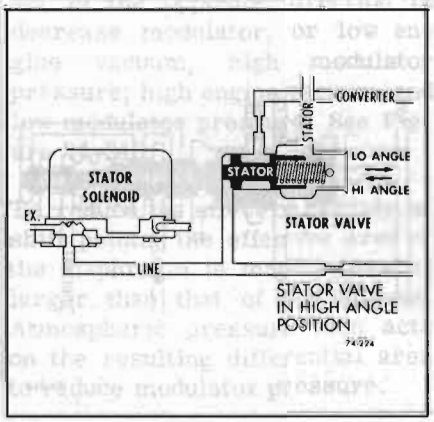


Figure 74-217—Stator Valve

14. Front Servo

The front servo, see Figure 74-218, applies the front overrun band to provide engine braking in 2nd gear in L² Range. It is also used as an accumulator for the apply of the direct clutch and in conjunction with a series of check balls and controlling orifices is a part of the timing for the release of the direct clutch.

To prevent the apply of the front overrun band in Neutral, Drive and Reverse ranges, oil is directed from the manual valve to the release side of the servo piston.

In Drive Range the servo release oil from the manual valve also acts to charge the servo in preparation for the apply of the direct clutch.

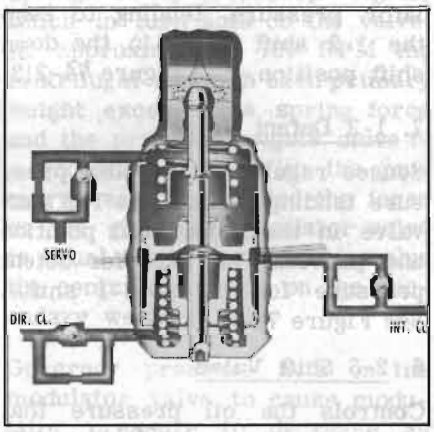


Figure 74-218—Front Servo

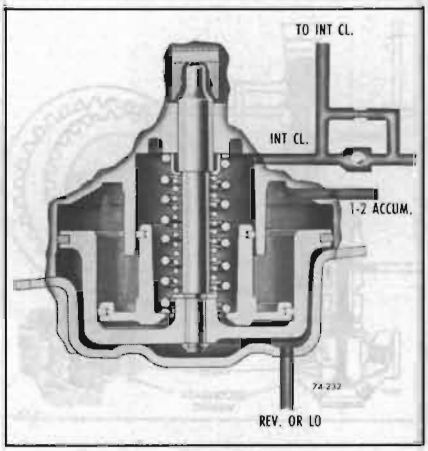


Figure 74-220—Rear Servo

Direct clutch oil is directed to the front servo accumulator piston where spring force plus direct clutch pressure stroke the piston up against the force of servo release oil. This lowers the clutch apply pressure during the shift for a smooth engagement.

The release of the direct clutch and the exhausting of the front servo accumulator is slowed down by three check balls and three orifices which permits a soft return of the drive load to the intermediate sprag and also allows engine RPM to increase during a detent 3-2 down shift in preparation for the lower gear ratio, which results in a smooth shift and better acceleration.

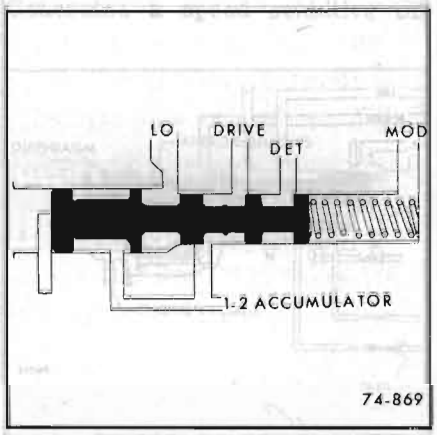


Figure 74-221—1-2 Accumulator - Model "BW" and First Job Model "BT" and "BU"

15. Rear Servo

The rear servo, see Figure 74-220, applies the rear band for overrun engine braking in L^1 Range 1st gear. It applies the band in Reverse to hold the reaction carrier to provide the reverse gear ratio.

16. 1-2 Accumulator

1-2 accumulator oil charges the rear servo accumulator in 1st gear in preparation for the apply of the intermediate clutch on the 1-2 shift.

MODEL "BW" and MODEL "BU" and "BT" first Jobs

The valve train consists of a 1-2 accumulator valve and one spring. See Figure 74-221.

1-2 accumulator oil pressure controls application of the intermediate clutch to obtain smooth shifts.

MODEL "BA" and After Job MODEL "BU"

The valve train consists of a 1-2 primary valve and spring, a 1-2 accumulator valve and spring and plug. See Figure 74-222.

1-2 accumulator oil pressure is a two-stage pressure to obtain greater flexibility in obtaining the desired curve for various engine requirements.

MODEL "BT" (After Jobs Only)

The valve train consists of a 1-2 accumulator secondary spring and valve. See Figure 74-614.

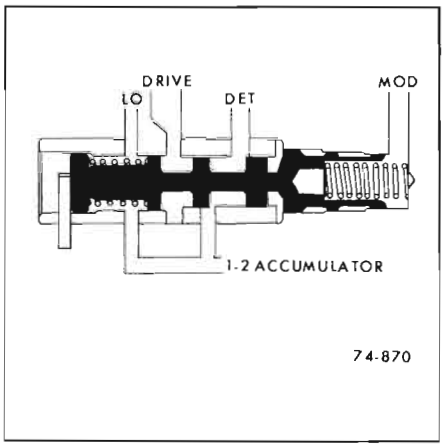


Figure 74-222—1-2 Accumulator - Model "BA" and after Job "BU"

1-2 accumulator oil pressure controls application of the intermediate clutch to obtain smooth shifts.

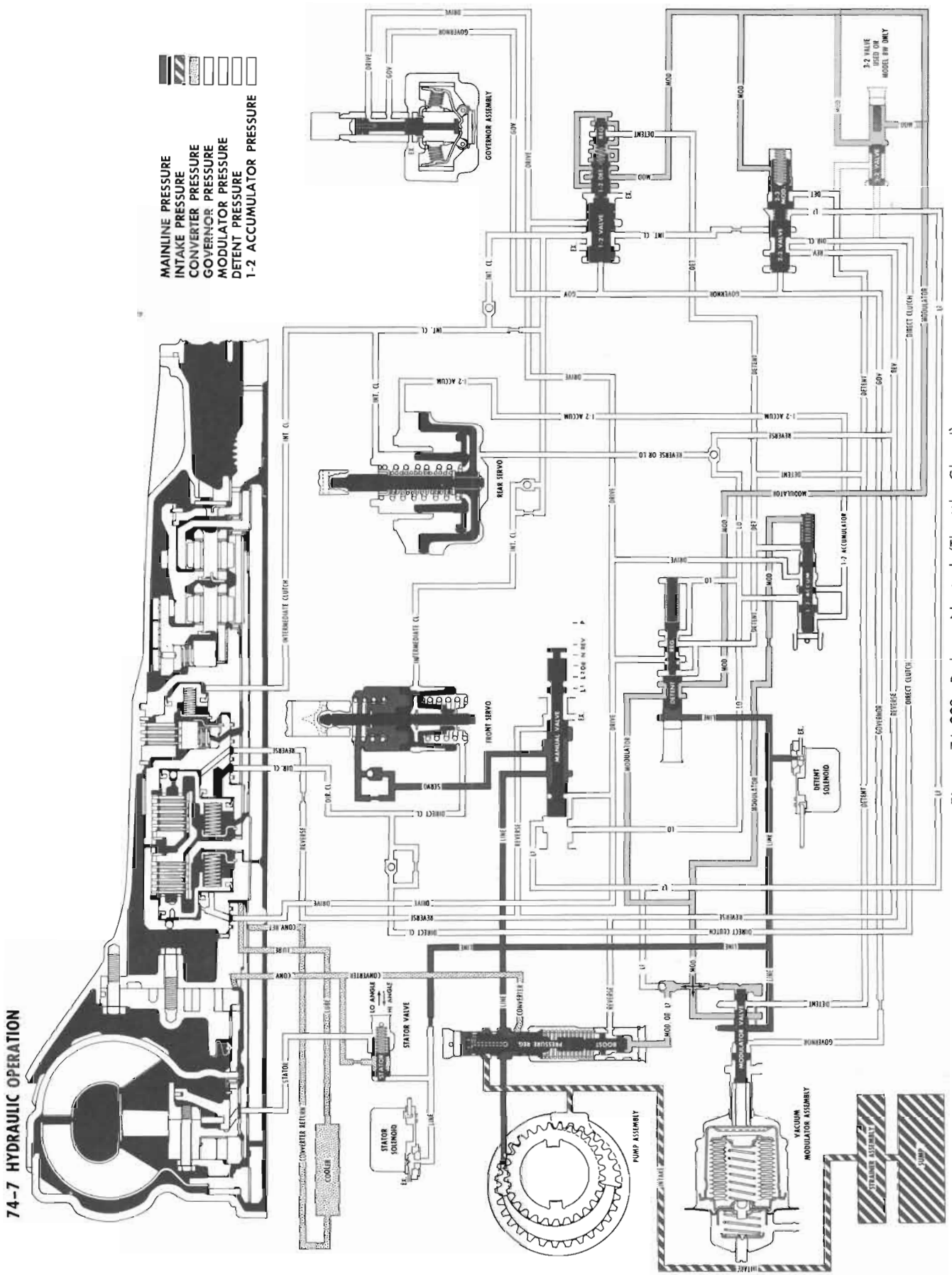


Figure 74-223—Park or Neutral (Throttle Closed)

a. Operation of Controls
Park or Neutral (throttle closed)

Forward Clutch	- Off	Front Band	- Off	Intermediate Sprag	- Ineffective
Direct Clutch	- Off	Rear Band	- Off	Detent Solenoid	- De-energized
Intermediate Clutch	- Off	Roller Clutch	- Ineffective	Stator Solenoid	- Energized

Whenever the engine is running at idle with the selector lever in "P" or "N", oil from the pump is directed to the: (See Figure 74-223)

1. Pressure Regulator Valve
2. Converter
   a. Oil Cooler
   b. Lubrication System
   c. Stator Valve and Solenoid
3. Manual Valve
4. Detent Valve
5. Detent Solenoid
6. Vacuum Modulator Valve
7. Front Servo (Neutral Only)

Cooling and Lubrication

Oil flows from the pump to the pressure regulator valve which regulates the pump pressure. When the pump output exceeds the demand of line pressure, oil from the pressure regulator is directed to the converter feed passage to fill the converter and is directed to the stator valve. Oil from the converter, termed converter return oil, is directed to the transmission cooler. Oil from the cooler is directed to the transmission lubrication system.

Line pressure acts on the:

1. Manual Valve
2. Detent Valve
3. Detent Solenoid
4. Modulator Valve
5. Stator Solenoid and Valve
6. Front Servo Piston (Neutral Only)

Line pressure at the modulator valve is regulated to a pressure called modulator oil, which acts on the pressure boost valve, 1-2 accumulator and 1-2 accumulator primary valve on Model BA only and passes through the detent valve and (3-2 valve Model BW only) to the 1-2 detent valve and 2-3 modulator valve.

Stator Blade Angle

Line oil at the stator valve and stator solenoid is exhausted through an orifice at the solenoid, when the solenoid switch is energized. (The switch is activated at idle) This allows the stator valve spring to move the stator valve, cutting off converter oil and allowing stator oil to exhaust. This places the stator blades at high angle.

SUMMARY

The converter is filled, stator blades are at high angle, and all clutches and bands are released. The transmission is in Neutral.

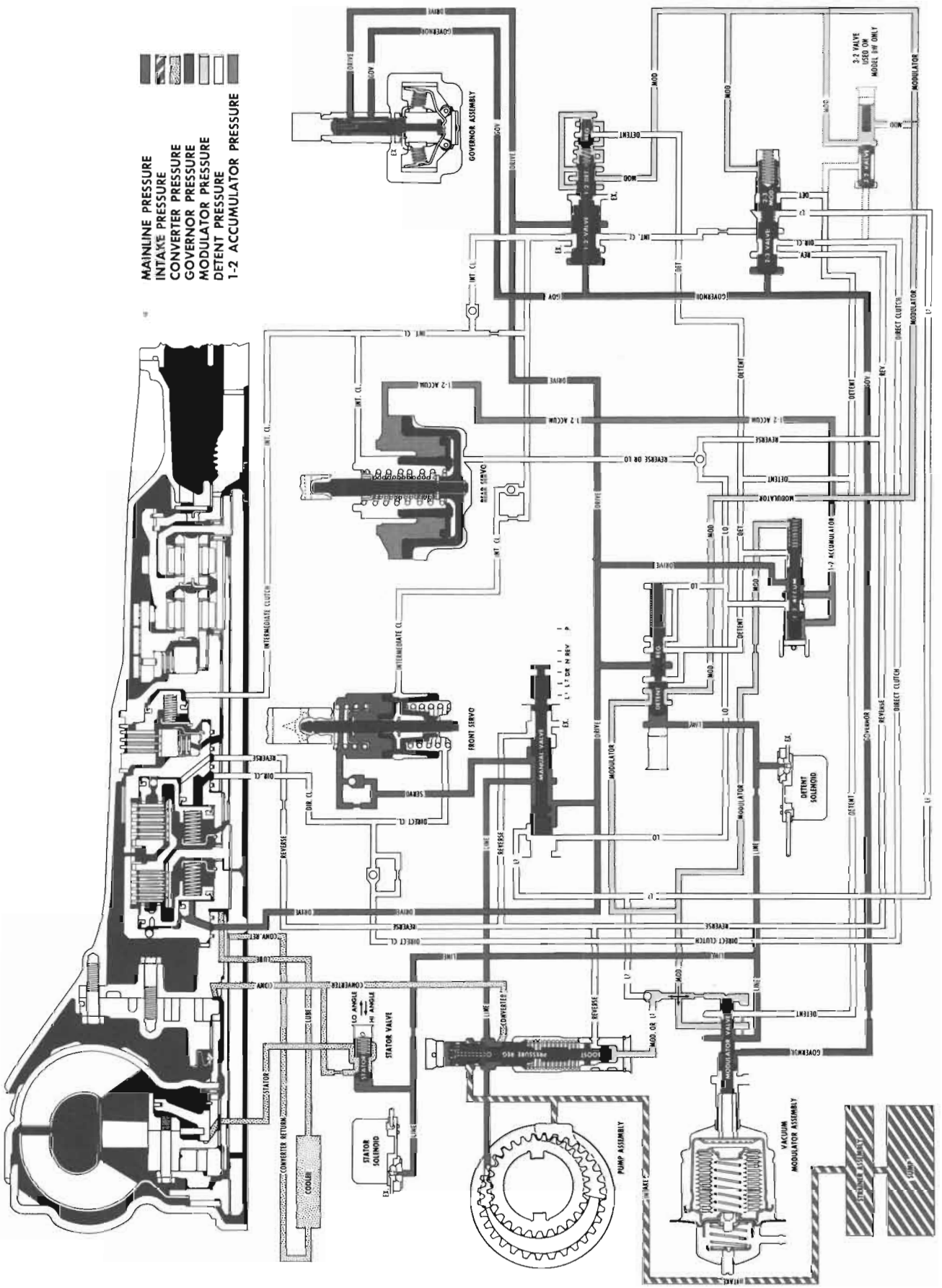


Figure 74-224—Drive Range - First Gear

b. Operation of Controls
Drive Range—First Gear

Forward Clutch	- On	Front Band	- Off	Intermediate Sprag	- Ineffective
Direct Clutch	- Off	Rear Band	- Off	Detent Solenoid	- De-energized
Intermediate Clutch	- Off	Roller Clutch	- Effective	Stator Solenoid	- De-energized

When the selector lever is moved into Drive position, the manual valve is repositioned to allow line pressure to enter the drive circuit. Drive oil then flows to the: (See Figure 74-224)

1. Forward Clutch
2. 1-2 Shift Valve
3. Governor Assembly
4. 1-2 Accumulator Valve
5. Detent Regulator Valve

Basic Control

Drive oil is directed to the forward clutch where it acts on two areas of the clutch piston to apply the forward clutch. The first, or inner area, is fed through an unrestricted passage. The outer area is fed through an orifice to insure a smooth shift from Park, Neutral and Reverse to Drive.

Drive oil at the governor assembly is regulated to a variable pressure. This pressure, called governor oil, increases with vehicle speed and acts against the ends of the 1-2 and 2-3 shift valves and an area on the modulator valve.

Drive oil is also regulated to another variable pressure at the 1-2 accumulator valve. This pressure, called 1-2 accumulator oil, is controlled by modulator oil and is directed to the rear servo. 1-2 Accumulator oil at the rear servo acts on the accumulator piston.

Stator Blade Angle

When at idle, the stator blades are at high angle. This is also true under heavy throttle operation due to the stator solenoid being energized.

At light or medium throttle (as shown), the solenoid is not activated. Line pressure then moves the stator valve against the spring, allowing converter oil to act on the stator piston, which puts the blades at low angle.

SUMMARY

The converter is filled and the stator blades are at high or low angle, depending upon throttle position. The forward clutch is applied. The transmission is in first gear.

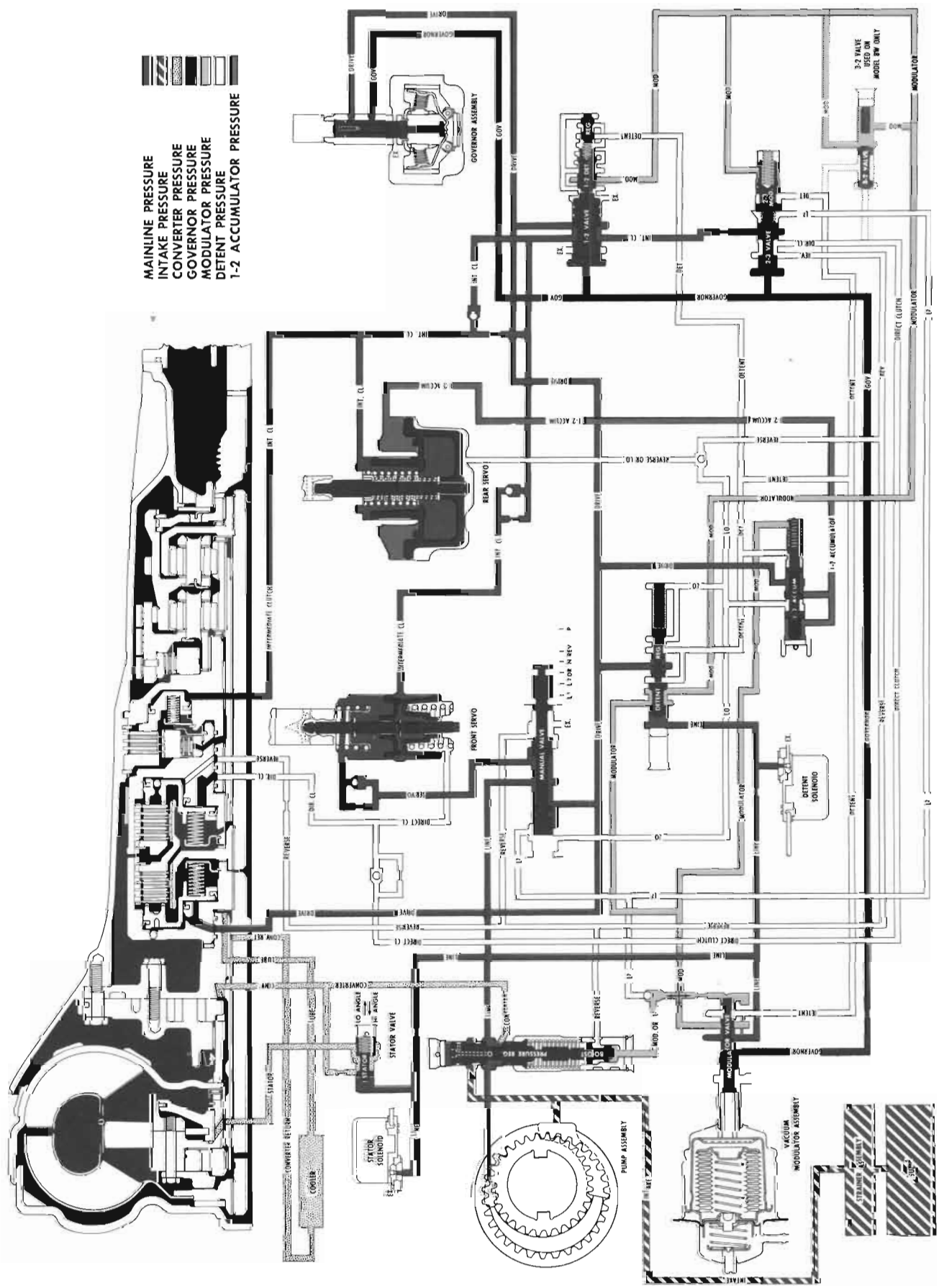


Figure 74-225—Drive Range - Second Gear

c. Operation of Controls
Drive Range—Second Gear

Forward Clutch	- On	Front Band	- Off	Intermediate Sprag	- Effective
Direct Clutch	- Off	Rear Band	- Off	Detent Solenoid	- De-energized
Intermediate Clutch	- On	Roller Clutch	- Ineffective	Stator Solenoid	- De-energized

As both vehicle speed and governor pressure increase, the force of governor oil acting on the 1-2 shift valve will overcome the force of re-regulated modulator oil pressure. This allows the 1-2 shift valve to open, permitting drive oil to enter the intermediate clutch passage. Oil in this passage is called intermediate clutch oil. (See Figure 74-225)

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

1. Intermediate Clutch
2. Rear Servo
3. Front Servo and Accumulator Pistons
4. 2-3 Shift Valve

Basic Control

Intermediate clutch oil from the 1-2 shift valve seats a one-way check ball and flows through an orifice to the intermediate clutch piston to apply the intermediate clutch. At the same time, intermediate clutch oil moves the accumulator piston against the 1-2 accumulator oil and accumulator spring to maintain lower pressure in the clutch during a 1-2 shift for a smooth clutch apply. Intermediate clutch oil seats a second one-way check ball and flows to the front servo and accumulator pistons. Intermediate clutch oil is also directed to a land of the 2-3 shift valve.

SUMMARY

The forward and intermediate clutches are applied. The transmission is in second gear.

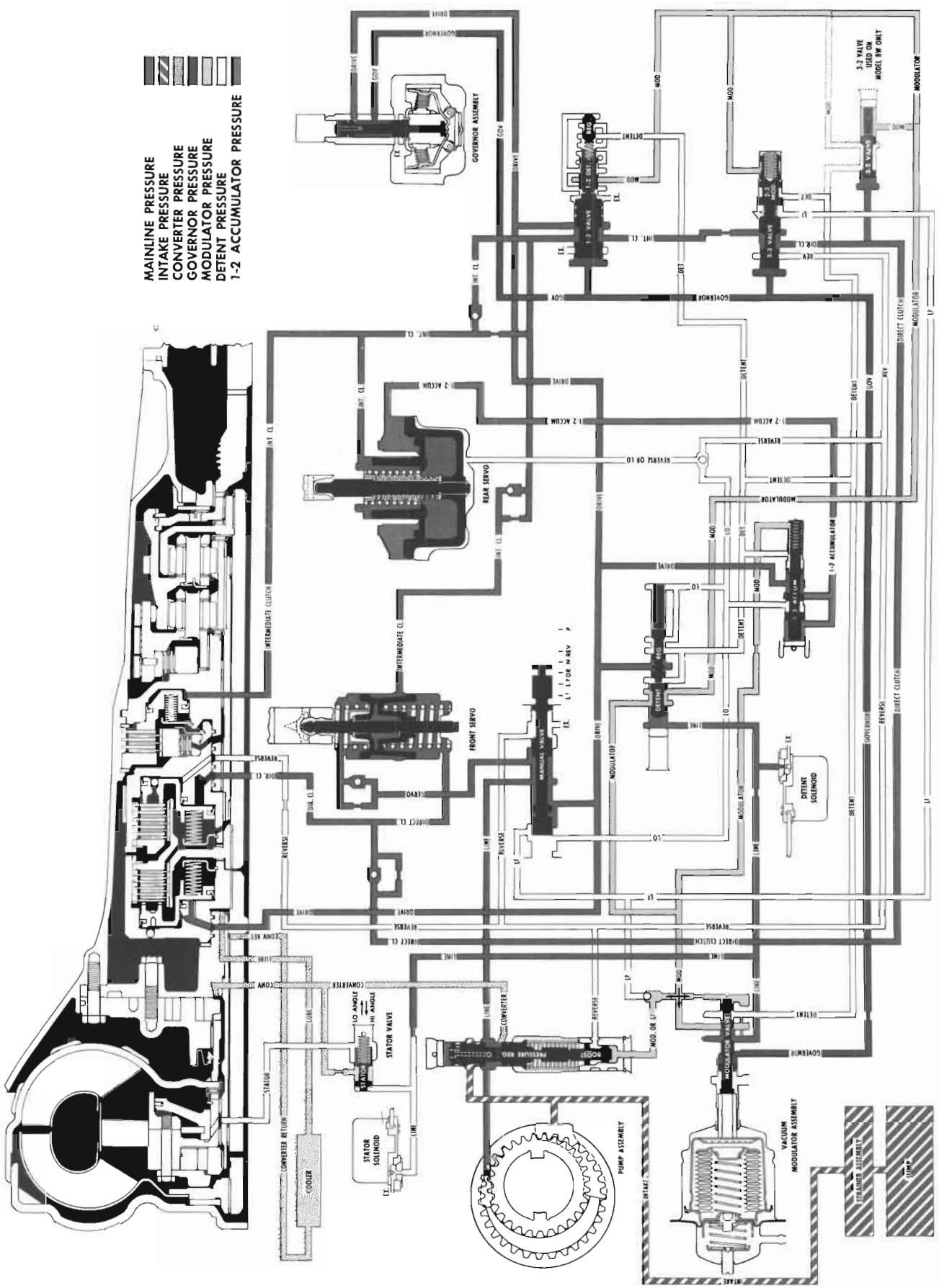


Figure 74-226—Drive Range - Third Gear

d. Operation of Controls
Drive Range—Third Gear

Forward Clutch	- On	Front Band	- Off	Intermediate Sprag	- Ineffective
Direct Clutch	- On	Rear Band	- Off	Detent Solenoid	- De-energized
Intermediate Clutch	- On	Roller Clutch	- Ineffective	Stator Solenoid	- *Energized

*The stator solenoid is energized at 3/4 throttle opening.

As vehicle speed and governor pressure increase, the force of governor oil 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, feeding intermediate clutch oil to the direct clutch passage. This oil is termed direct clutch oil. (See figure 74-226)

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

1. Direct Clutch
2. Front Accumulator Piston
3. 3-2 Valve (Model BW Only)

Basic Control

Direct clutch oil from the 2-3 shift valve flows past a one-way check valve to the inner area of the direct clutch piston to apply the direct clutch. Simultaneously, direct clutch oil is fed to the front accumulator piston. The pressure of the direct clutch oil, combined with the accumulator spring, moves the accumulator and servo pistons against servo oil. This acts as an accumulator for a smooth direct clutch assembly.

MODEL BW ONLY

Direct Clutch oil is also supplied to the 3-2 valve to move against modulator pressure. This cuts off modulator oil to the 1-2 detent and 2-3 modulator valves and allows the transmission to utilize the torque multiplying characteristics of the variable pitch stator.

Stator Blade Angle

The degree of converter torque multiplication is dependent upon the angle of the stator blades (high or low angle) which is controlled by the stator solenoid. When activated, the line oil acting on the solenoid and stator valve is exhausted at the solenoid. The stator valve spring will move the stator valve cutting off converter oil to the stator piston. The converter charge pressure will move the stator piston, putting the stator blades at high angle.

SUMMARY

The forward, intermediate and direct clutches are applied. The transmission is in third gear (direct drive).

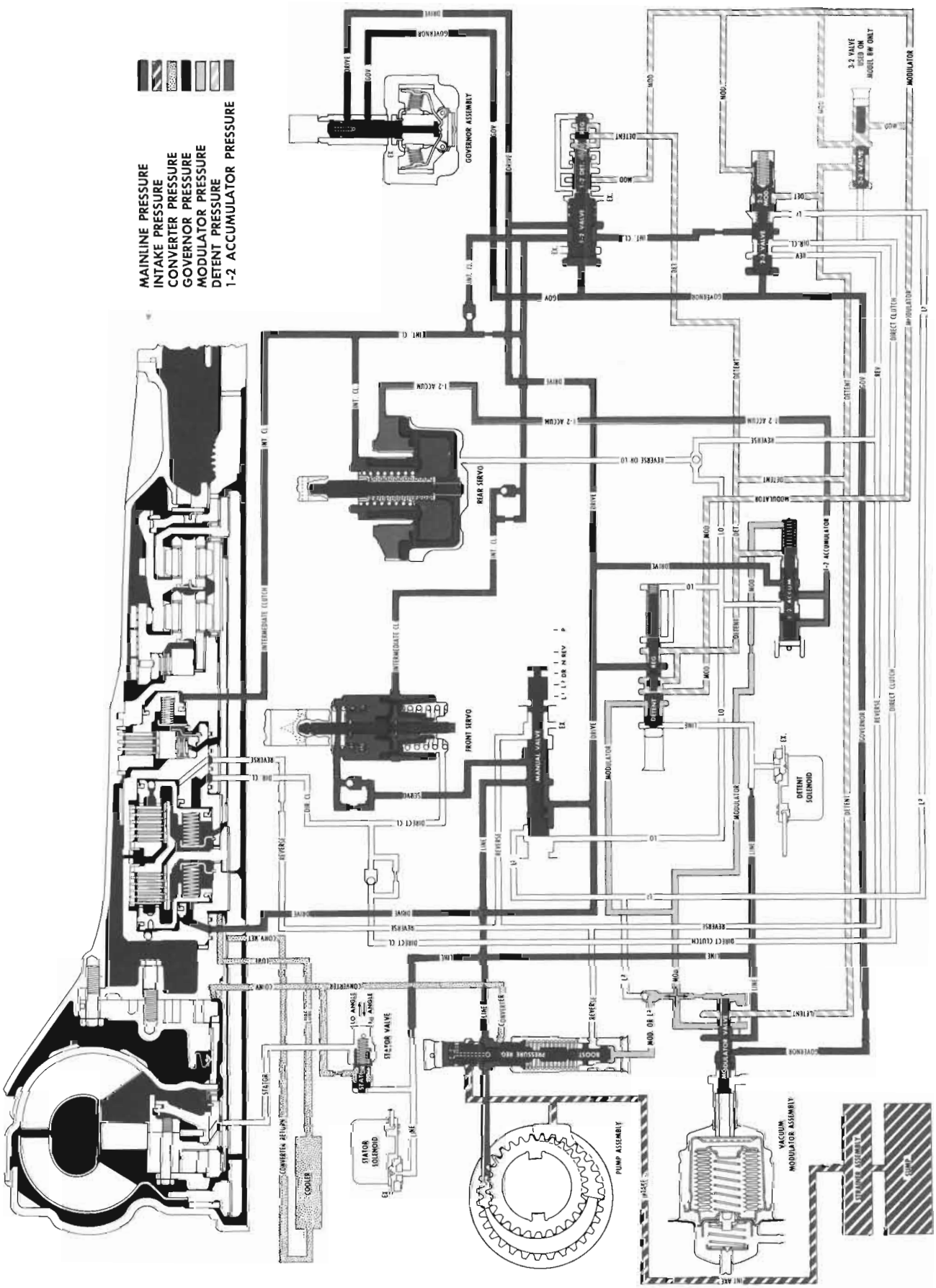


Figure 74-227—Detent Downshift - Valve in Second Gear Position

e. Operation of Controls
Detent Down Shift—Valves in Second Gear Position

Forward Clutch	- On	Front Band	- Off	Intermediate Sprag	- Effective
Direct Clutch	- Off	Rear Band	- Off	Detent Solenoid	- Energized
Intermediate Clutch	- On	Roller Clutch	- Ineffective	Stator Solenoid	- Energized

While operating at speeds below approximately 70 MPH a forced detent 3-2 down shift is possible by depressing the accelerator fully. This engages an electrically operated switch on the throttle linkage and actuates the detent solenoid. The detent solenoid opens an orifice that allows line oil at the detent valve to be exhausted, thus permitting the detent regulator valve to operate. Line oil acting on the detent valve and solenoid is supplied by a smaller orifice. (See Figure 74-227)

Drive oil on the detent regulator valve is then regulated to a pressure of approximately 70 psi and called detent oil. Detent oil is then routed to the:

1. Modulator Passage
2. 1-2 Regulator Valve
3. 2-3 Modulator Valve
4. 3-2 Valve (Model BW only)
5. 1-2 Primary Accumulator Valve
6. Primary Accumulator Valve (Used on Model BA only)

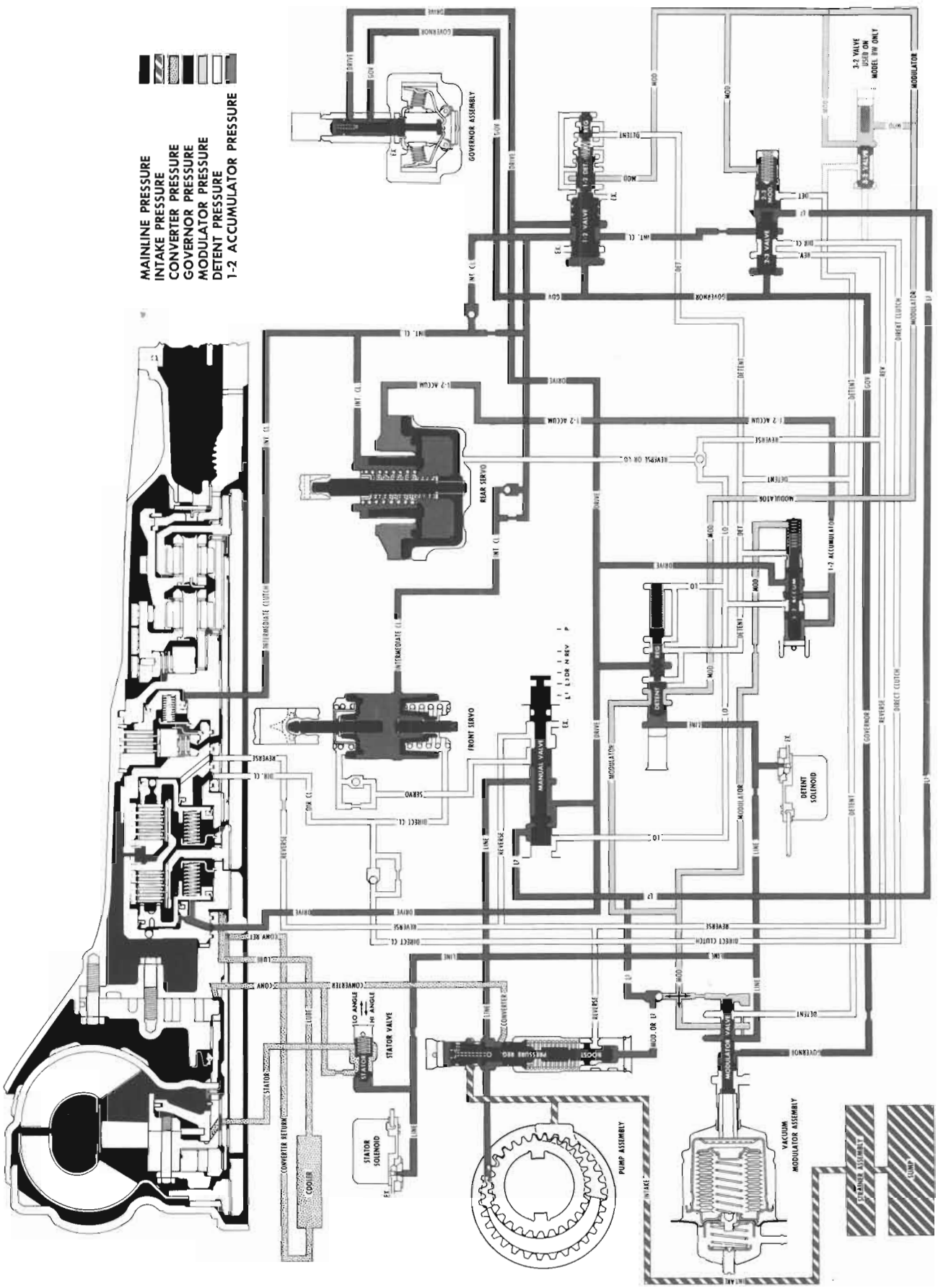
7. Vacuum Modulator Valve

Detent oil in the modulator passage and at the 2-3 modulator valve will close the 2-3 shift valve below approximately 70 MPH, shifting the transmission to second gear.

A detent 2-1 down shift can also be accomplished below approximately 20 MPH because detent oil is directed to the 1-2 regulator valve, regulating or exhaust port. This allows detent oil to act on the 1-2 regulator and 1-2 detent valve to close the 1-2 shift valve, shifting the transmission to first gear.

To insure intermediate clutch durability during 1-2 upshifts under detent conditions, detent oil is directed to the 1-2 accumulator (1-2 accumulator primary valve on Model BA only) to increase 1-2 accumulator oil pressure acting on the rear servo accumulator piston.

Detent oil is also directed to the modulator valve to prevent modulator pressure from regulating 70 psi at high speeds or at high altitudes.



74-247

Figure 74-228—L^2 Range - Valves in Second Gear Position

f. Operation of Controls
L^2 Range—Valves in Second Gear Position

Forward Clutch	- On	Front Band	- On	Intermediate Sprag	- Effective
Direct Clutch	- Off	Rear Band	- Off	Detent Solenoid	- De-energized
Intermediate Clutch	- On	Roller Clutch	- Ineffective	Stator Solenoid	- De-energized

A 3-2 downshift can be accomplished by moving the selector lever from Drive to L^2 Range. When the selector lever is in the L^2 Range, L^2 oil from the manual valve is directed to the: (See Figure 74-228).

1. Pressure Boost Valve

2. 2-3 Shift Valve

L^2 oil at the boost valve will increase line pressure to 150 psi. This increased L^2 oil pressure at the 2-3 shift valve will close the 2-3 shift valve, regardless of car speed.

For engine braking the front band is applied by exhausting servo oil at the manual valve in L^2 Range. This allows intermediate clutch oil, acting on the servo piston, to move the piston and apply the front band. Once the transmission is in second gear - L^2 Range, it cannot upshift to third gear regardless of vehicle speed.

SUMMARY

The forward and intermediate clutches and front band are applied. The transmission is in second gear - L^2 Range.

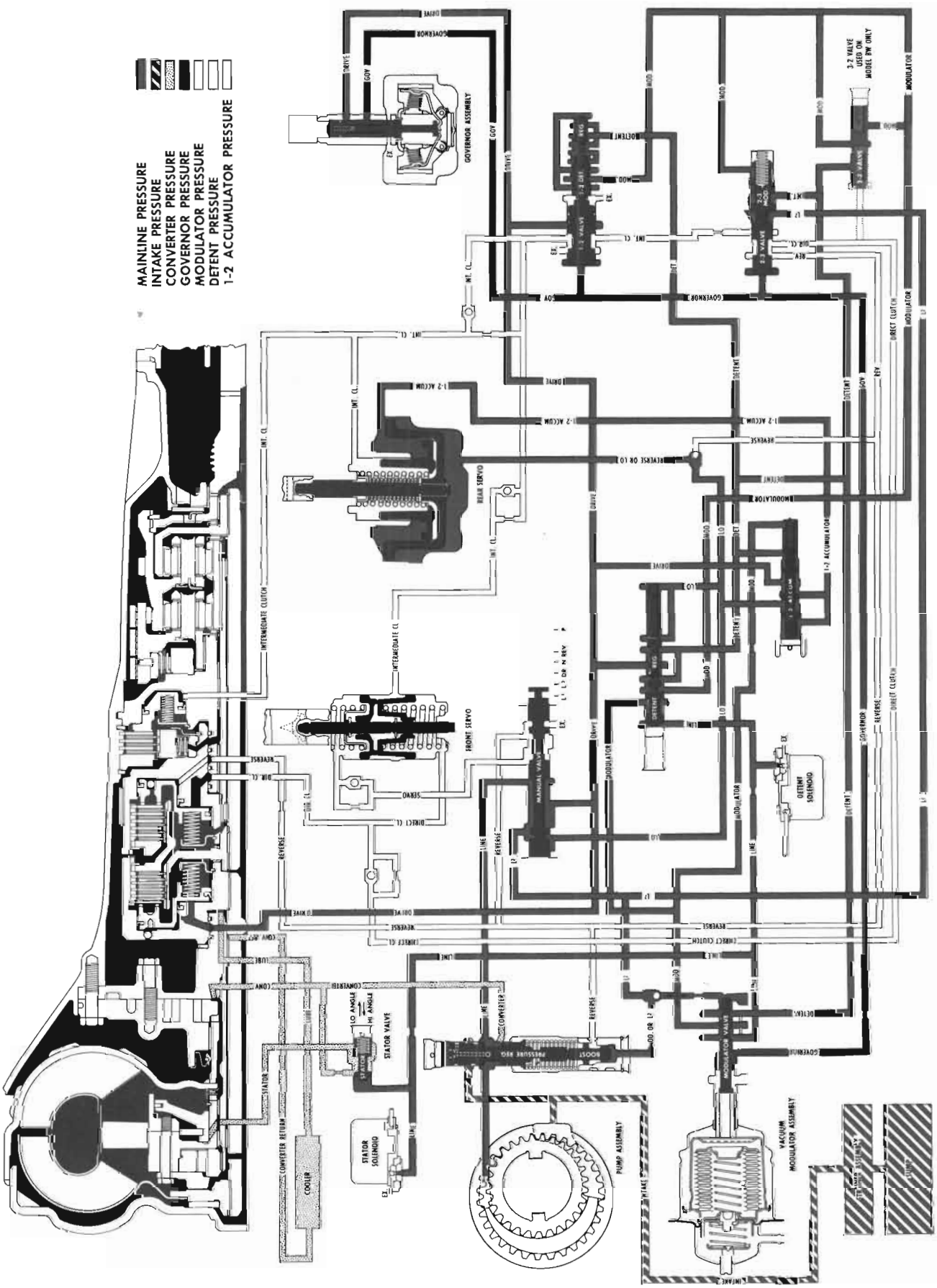


Figure 74-229—L[1] Range - First Speed - Valves in First Gear Position

g. Operation of Controls
L^1 Range—First Gear—
Valves in First Gear Position

Forward Clutch	- On	Front Band	- Off	Intermediate Sprag	- Ineffective
Direct Clutch	- Off	Rear Band	- On	Detent Solenoid	- De-energized
Intermediate Clutch	- Off	Roller Clutch	- Effective	Stator Solenoid	- De-energized

Maximum downhill braking can be attained at speeds below 40 mph with the selector lever in L^1 Range as this directs Lo oil from the manual valve to the: (See Figure 74-229).

1. Rear Servo
2. 1-2 Accumulator Valve
3. Detent Regulator Valve

Basic Control

Lo oil flows past a ball check to the apply side of the rear servo piston and to the 1-2 accumulator valve to raise the 1-2 accumulator oil to line pressure for a smooth band apply.

Lo oil acts on the detent regulator valve. Combined with the detent spring, Lo oil holds the detent valve against line oil acting on the detent valve, causing drive oil to flow through the detent regulator valve into the detent and modulator passages. Modulator and detent oil at line pressure acting on the 1-2 regulator and 1-2 detent valve overcomes governor oil on the 1-2 shift valve at any vehicle speed below approximately 40 MPH and the transmission will shift to first gear.

With the transmission in first speed - L^1 Range, the transmission cannot upshift to second gear regardless of vehicle or engine speed. The forward clutch and rear band are applied. The transmission is in first gear - L^1 Range.

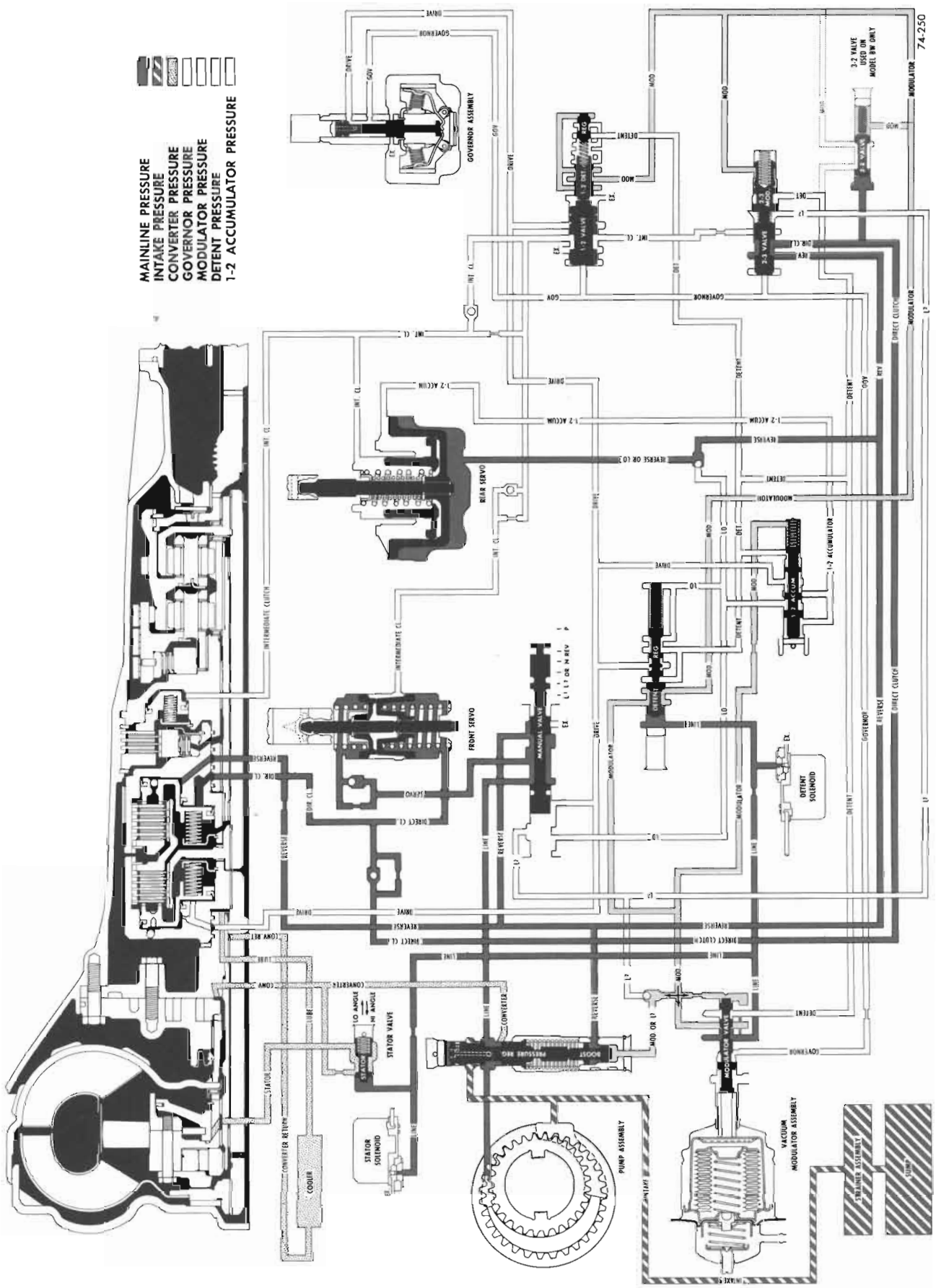


Figure 74-230—Reverse

h. Operation of Controls
Reverse

Forward Clutch	- Off	Front Band	- Off	Intermediate Sprag	- Ineffective
Direct Clutch	- On	Rear Band	- On	Detent Solenoid	- De-energized
Intermediate Clutch	- Off	Roller Clutch	- Ineffective	Stator Solenoid	- De-energized

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 to the: (See Figure 74-230).

1. Direct Clutch
2. 2-3 Shift Valve
3. Rear Servo Piston
4. Pressure Boost Valve

Basic Control

Reverse oil from the manual valve flows to the large area of the direct clutch piston and to the 2-3 shift valve. From the 2-3 shift valve, it enters the direct clutch passage and is directed to the small area of the direct clutch piston to apply direct clutch.

Reverse oil seats a check ball and flows to the rear servo and acts on the servo piston to apply the rear band. Reverse oil also acts on the pressure boost valve to boost line pressure.

SUMMARY

The direct clutch and rear band are applied. The transmission is in Reverse.

DIVISION III

SERVICE PROCEDURES

74-8 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. Disconnect propeller shaft.

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

5. Remove vacuum line from vacuum modulator. See Figure 74-500.

6. Loosen cooler line nuts and separate cooler lines from transmission. See Figures 74-501, 502, 503.

7. Remove transmission mounting pad to cross member bolts.

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

9. Disconnect stator and detent wires from transmission.

10. Disconnect speedometer cable.

11. Disconnect shift linkage from transmission.

12. Disconnect transmission filler pipe at engine. Remove filler pipe from transmission.

13. Support engine at oil pan.

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

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

16. Remove transmission case to engine block bolts.

17. 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. Rotate converter to permit coupling of flywheel and converter with original relationship. Remove J-21366.

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

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

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

5. Remove transmission jack and engine support.

6. Install transmission flywheel cover pan with tapping screws.

7. Install transmission oil filler pipe using a new "O" ring.

8. Reconnect speedometer cable.

9. Connect stator and detent wires.

10. Install propeller shaft.

11. Reinstall front exhaust crossover pipe if removed.

12. Install oil cooler lines to transmission. See Figures 74-501, 502 and 503.

13. Install vacuum line to vacuum modulator.

14. Fill transmission with fluid as described in Paragraph 74-1, subparagraph c.

74-9 REMOVAL OF CONVERTER AND VACUUM MODULATOR

1. With transmission in portable jack, remove J-21366. Remove converter assembly, by pulling straight out.

NOTE: The converter contains a large amount of oil.

2. Install Holding Fixture J-8763-01 on the transmission so that the modulator assembly will be located on the side of the holding fixture that is nearest the bench.

3. Install fixture and transmission into Holding Tool Base, J-3289-20, with bottom pan facing up. See Figure 74-504.

4. Remove modulator assembly attaching bolt and retainer. See Figure 74-505.

5. Remove modulator assembly and "O" ring seal from case. See Figure 74-506.

6. Remove modulator valve from transmission case.

74-10 REMOVAL OF GOVERNOR SPEEDOMETER DRIVEN GEAR, OIL PAN, STRAINER

NOTE: The following operations can be performed with transmission in car.

1. Remove attaching bolts, governor cover and gasket. See Figure 74-507.

2. Withdraw governor assembly from case. See Figure 74-508.

3. Remove speedometer driven gear attaching bolt and retainer. See Figure 74-509.

4. Withdraw speedometer driven gear assembly from case. See Figure 74-510.

5. Remove oil pan attaching bolts. See Figure 74-511.

6. Remove oil pan and gasket.

7. Remove filter assembly. See Figure 74-512.

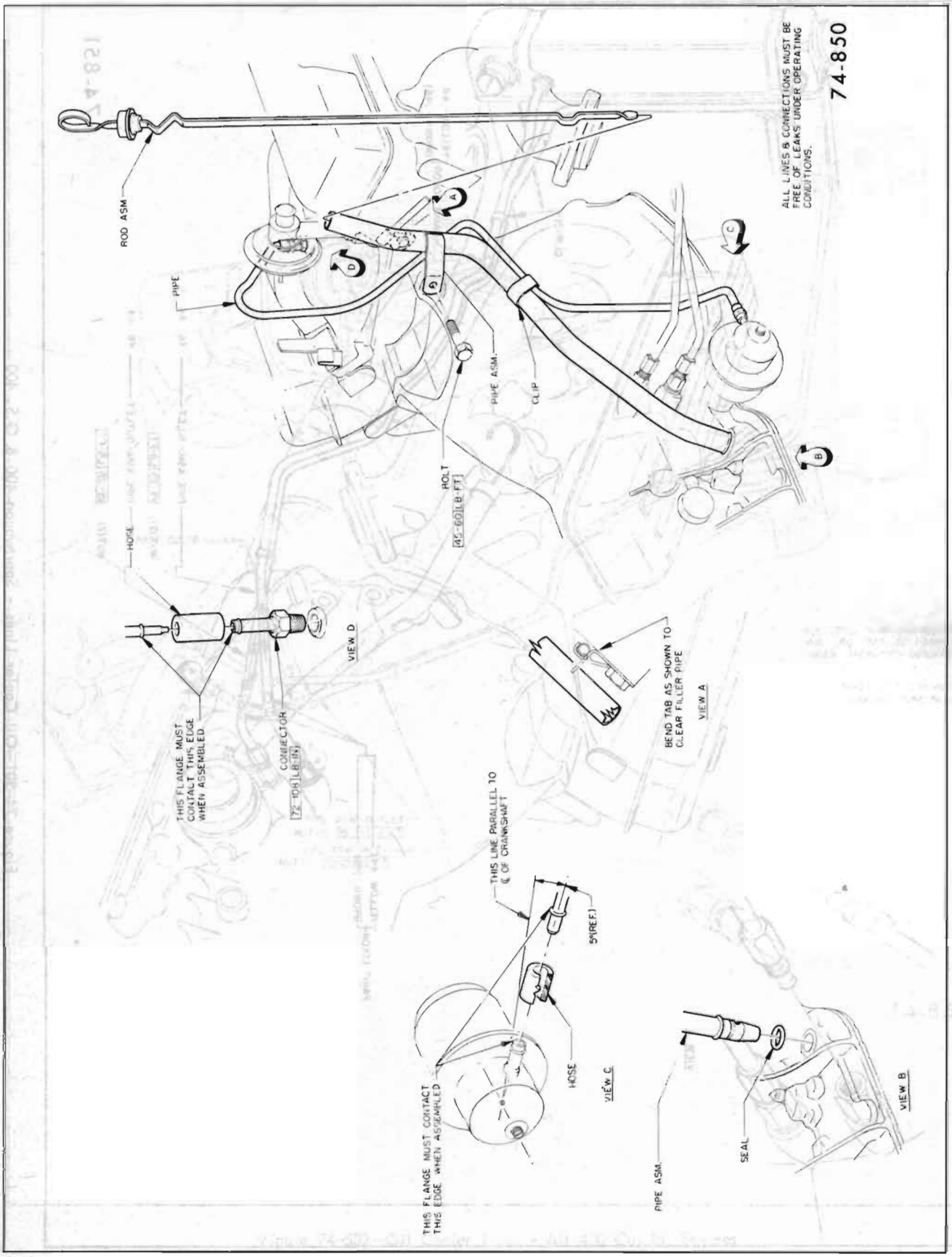


Figure 74-500—Vacuum Modulator Line and Dipstick - All Super Turbine 400 Transmissions

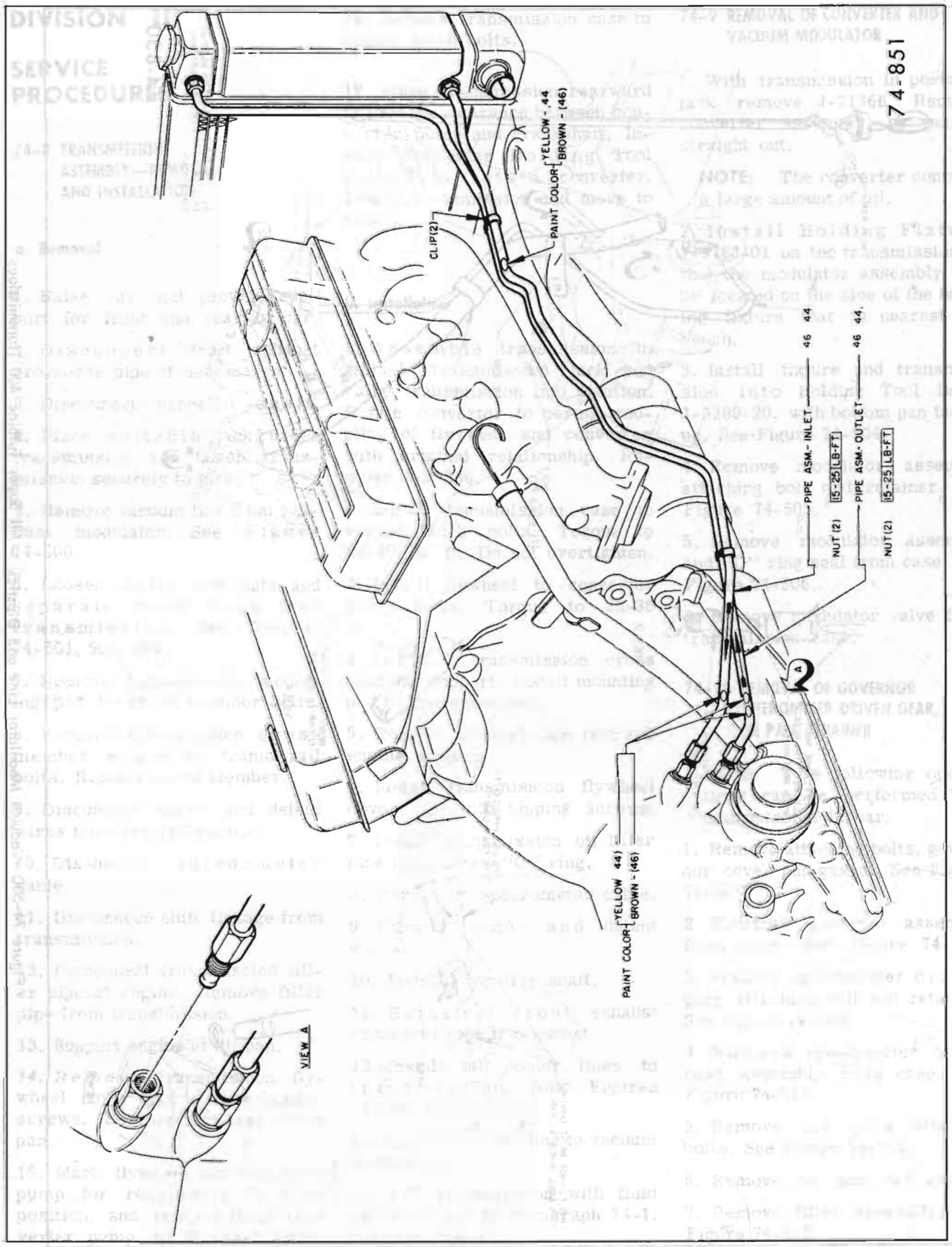


Figure 74-501—Oil Cooler Lines - Sportwagon 400 & G.S. 400

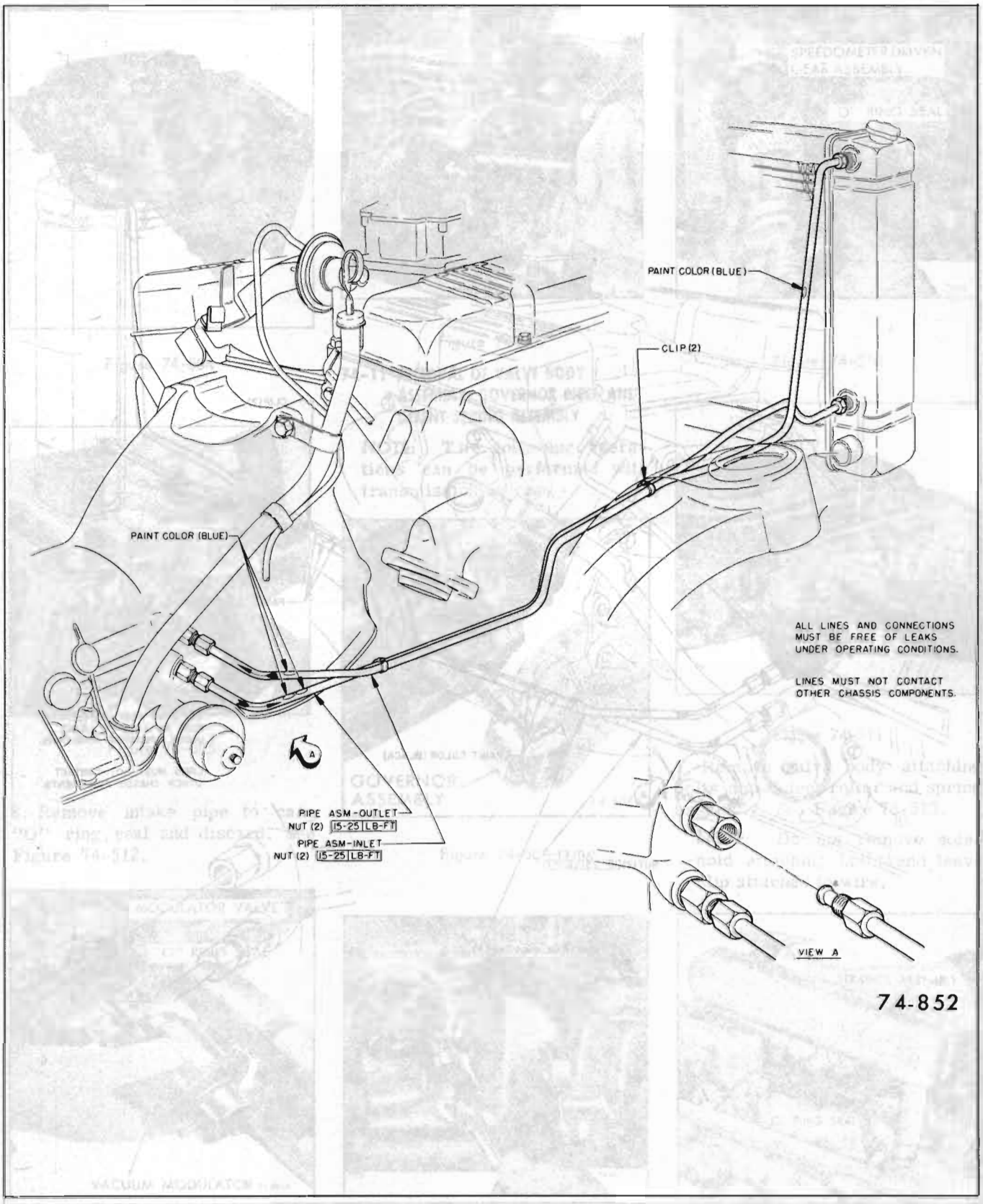


Figure 74-502—Oil Cooler Lines - All 430 Cu. In. Engines

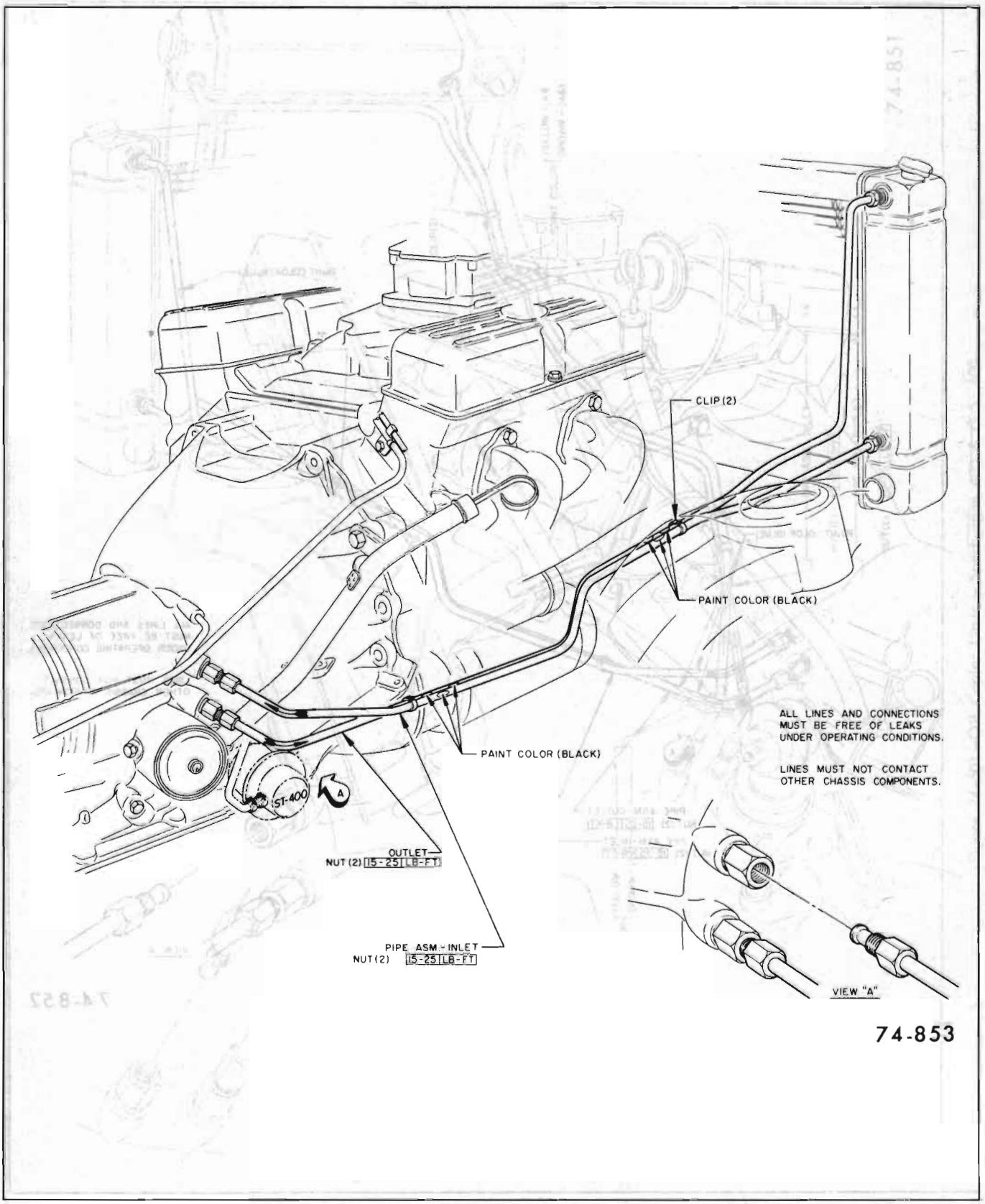


Figure 74-503—Oil Cooler Lines - LeSabre Only

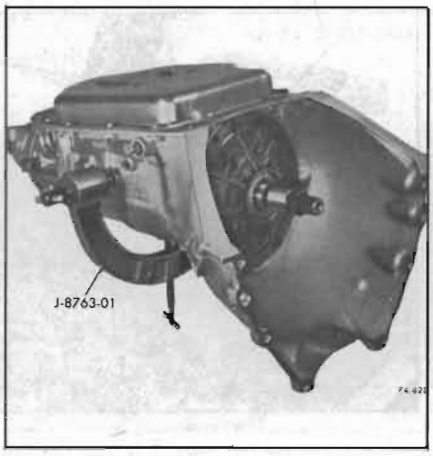


Figure 74-504

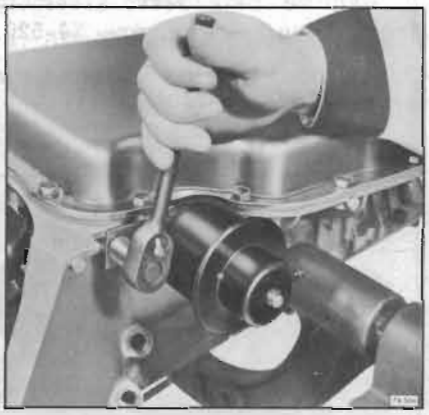


Figure 74-505

8. Remove intake pipe to case "O" ring seal and discard. See Figure 74-512.

Figure 74-506

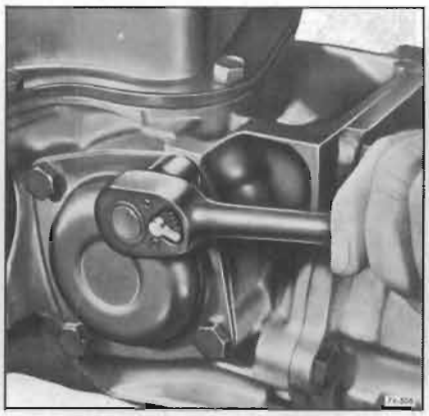


Figure 74-507

74-11 REMOVAL OF VALVE BODY ASSEMBLY, GOVERNOR PIPES AND DETENT SPRING ASSEMBLY

NOTE: The following operations can be performed with transmission in car.

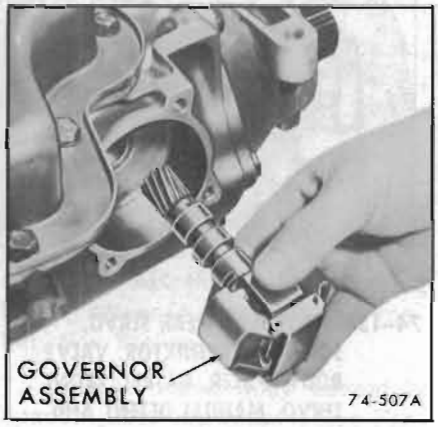


Figure 74-508

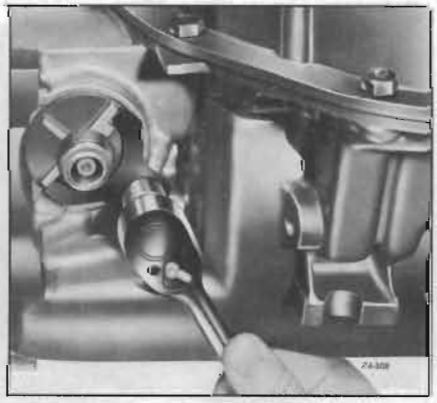


Figure 74-509

Figure 74-510

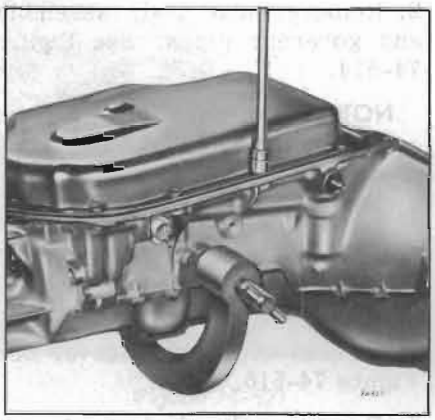


Figure 74-511

1. Remove valve body attaching bolts and detent roller and spring assembly. See Figure 74-513.

NOTE: Do not remove solenoid attaching bolts and leave clip attached to wire.

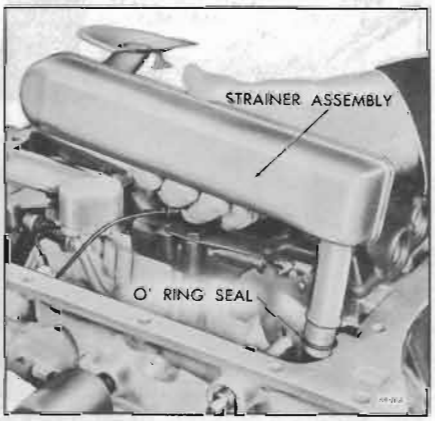


Figure 74-512

Figure 74-513

2. Remove valve body assembly and governor pipes. See Figure 74-514.

NOTE: Do not allow manual valve to fall out of valve body assembly.

3. Remove governor pipes from valve body assembly. See Figure 74-515.

4. Disconnect stator connector from case connector sleeve. See Figure 74-516.

5. Remove valve body to spacer plate gasket. See Figure 74-517.

6. Disconnect detent solenoid wire (short) from stator connector.

NOTE: Do not remove stator wire from connector.

Figure 74-514

Figure 74-515

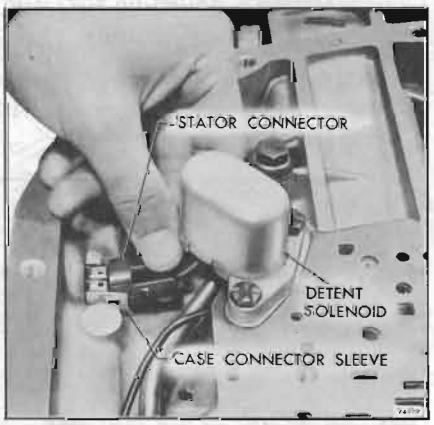


Figure 74-516

74-12 REMOVAL OF REAR SERVO, SOLENOID CONNECTOR, VALVE BODY SPACER, GASKET, FRONT SERVO, MANUAL DETENT AND PARK LINKAGE

1. Remove rear servo cover attaching bolts, servo cover and gasket. (Discard gasket). See Figure 74-518.

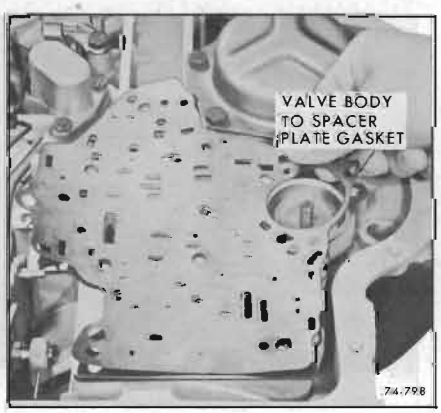


Figure 74-517

Figure 74-518

2. Remove rear servo assembly from case. See Figure 74-520.

3. Remove servo accumulator spring. See Figure 74-521.

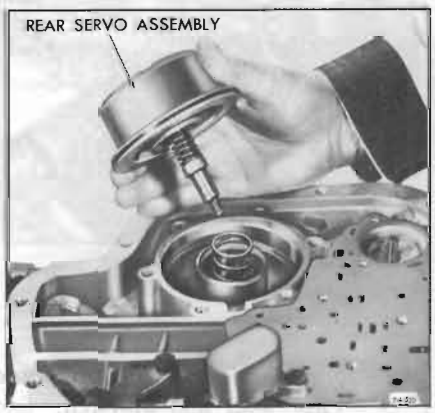


Figure 74-520

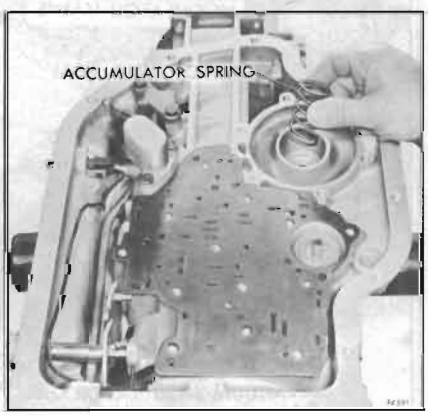


Figure 74-521

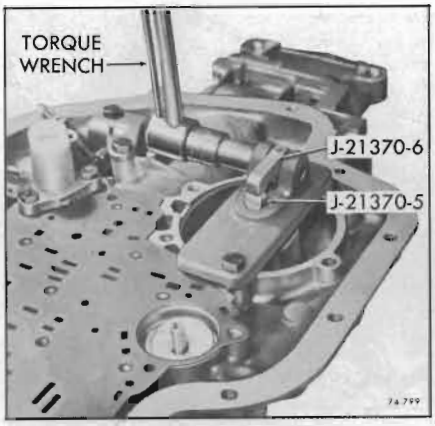


Figure 74-522

4. Check band apply Pin.

a. Attach band apply pin Selection Gauge J-21370-6 with J-21370-5, to transmission case with attaching bolts.

b. Apply 25 lb. ft. torque and select proper pin to be used during assembly of transmission. See Figure 74-522.

There are three selective pins identified as follows:

Pin Identification	Pin Size
3 Rings	Long
2 Rings	Medium
1 Ring	Short

If both steps of J-21370-5 are below the gauge surface, the long pin should be used. If the gauge surface is between the steps, the medium length pin should be used. The short pin should be used if both steps of the gauge pin are above the gauge surface.

The identification ring is located on the band lug end of the pin. Selecting the proper pin is the equivalent of adjusting the band.

NOTE: If new pin is required, make note of pin size required, and remove gauge from transmission case.

Figure 74-523

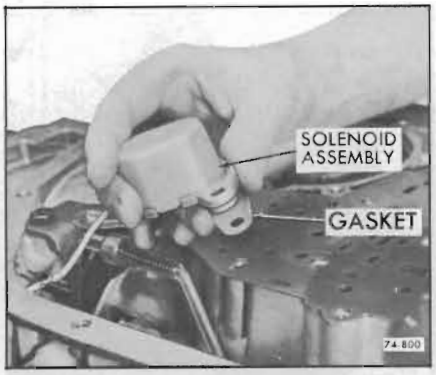


Figure 74-524

5. Compress fingers on case connector sleeve and withdraw. See Figure 74-523.

6. Remove solenoid attaching bolts, solenoid assembly and gasket. See Figure 74-524.

7. Remove valve body assembly spacer plate and gasket. See Figure 74-525.

8. Remove six (6) check balls from cored passages in transmission case. See Figure 74-526.

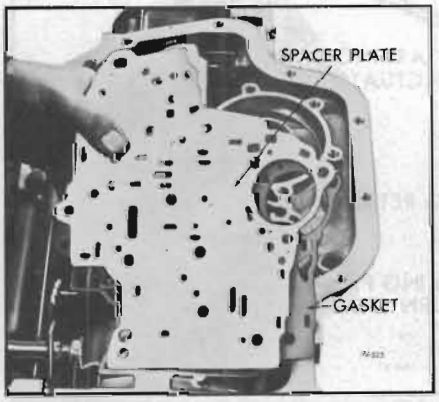


Figure 74-525

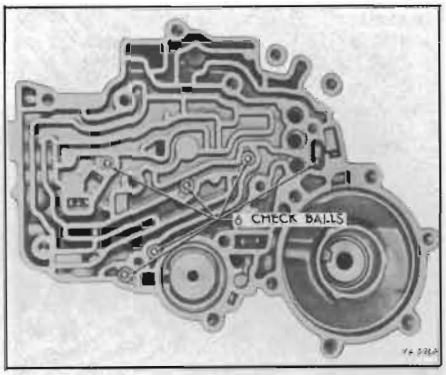


Figure 74-526

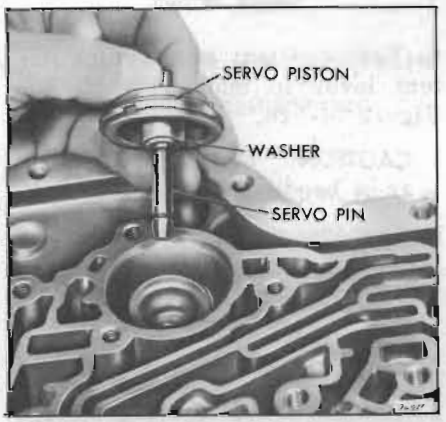


Figure 74-527

9. Remove front servo piston, washer, servo pin, retainer and spring from transmission. See Figure 74-527.

10. If it becomes necessary to remove the internal manual linkage proceed as follows:

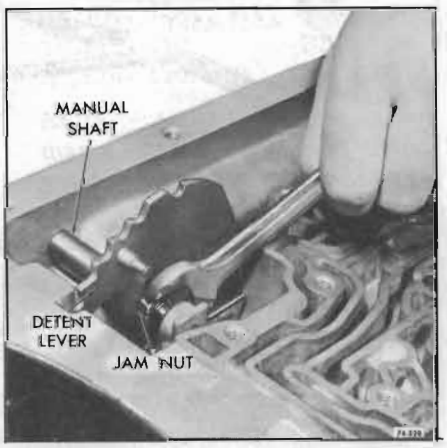


Figure 74-528

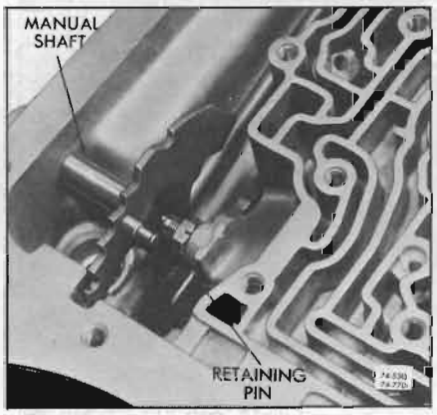


Figure 74-529

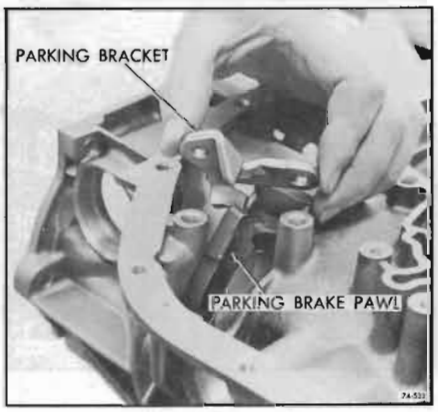


Figure 74-531

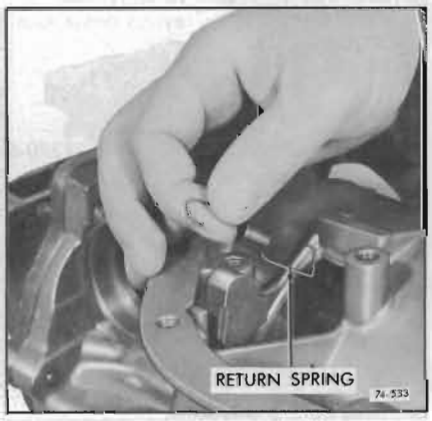


Figure 74-532

a. Unthread jam nut holding detent lever to manual shaft. See Figure 74-528.

CAUTION: Do not lose jam nut as it becomes free from shaft.

b. Remove manual shaft retaining pin from case. See Figure 74-529.

NOTE: It may be necessary to bend pin to remove.

c. Remove detent lever from the manual shaft.

d. Remove manual shaft and jam nut from case. See Figure 74-530.

NOTE: If necessary remove manual shaft to case lip seal.

e. Remove parking actuator rod and detent lever assembly.

f. Remove attaching bolts and parking bracket. See Figure 74-531.

g. Remove parking pawl return spring. See Figure 74-532.

NOTE: The following steps are to be completed only if one or more of the parts involved require replacement.

Figure 74-533

h. Remove parking pawl shaft retainer. See Figure 74-533.

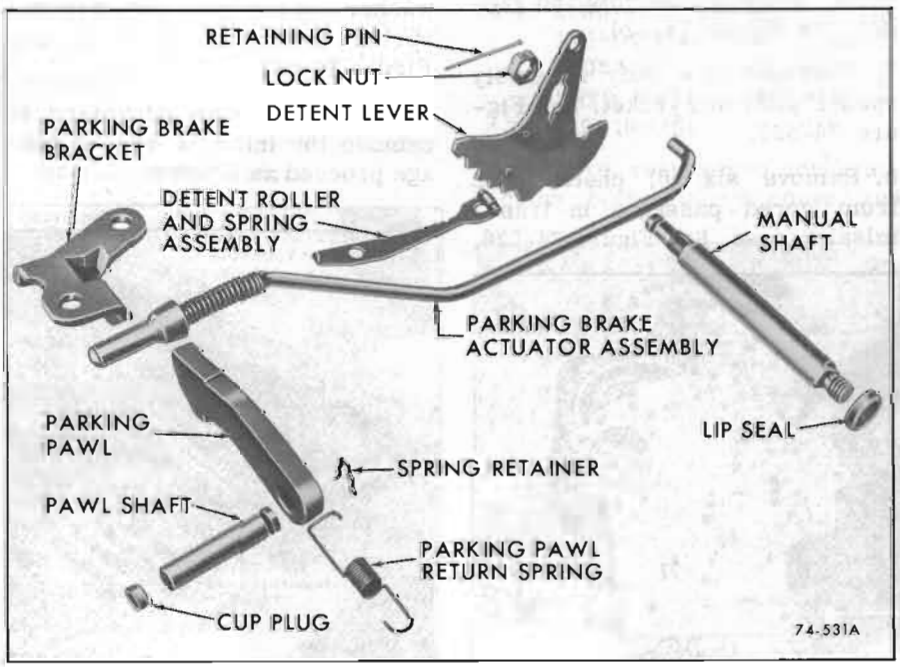


Figure 74-530

Figure 74-534

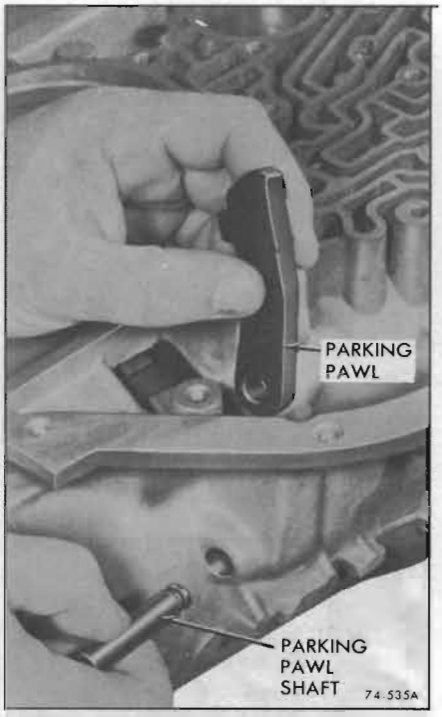


Figure 74-535

i. Remove parking pawl shaft cup plug by inserting a screwdriver between the parking pawl shaft and the case rib, and prying outward. See Figure 74-534.

j. Remove parking pawl shaft, and parking pawl. See Figure 74-535.

74-13 REMOVAL OF REAR OIL SEAL AND EXTENSION HOUSING

1. If necessary to replace, pry the rear oil seal from the extension housing. See Figure 74-536.

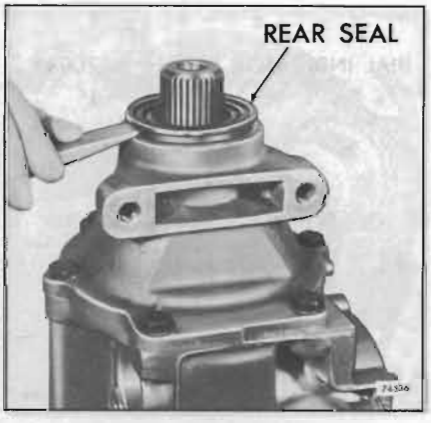


Figure 74-536

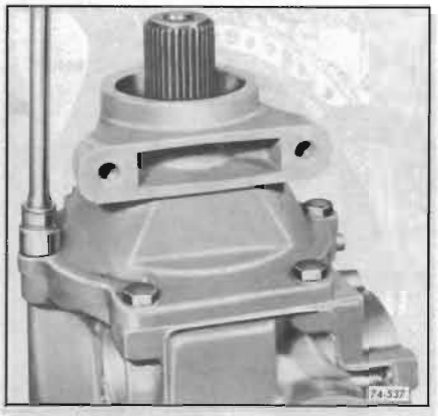


Figure 74-537

2. Remove extension housing to case attaching bolts. See Figure 74-537.

3. Remove extension housing and extension housing to case gasket. See Figure 74-538.

4. Check front unit end play as follows:

a. Remove one front pump attaching bolt.

b. Install a 5/16-18 threaded slide hammer bolt or J-7004, into bolt hole in pump. See Figure 74-540.

c. Mount dial indicator on the rod and index indicator to register with end of turbine shaft. See Figure 74-540.

Figure 74-538

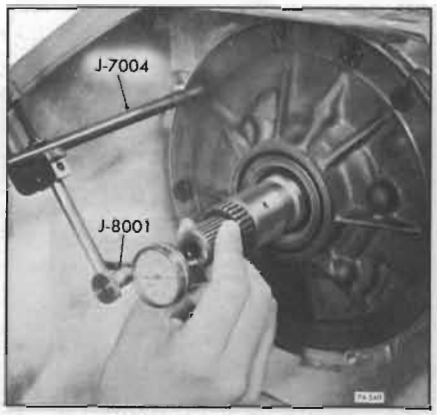


Figure 74-540

d. Push turbine shaft rearward.

e. Push output shaft forward.

f. Set dial indicator to Zero.

g. Pull turbine shaft forward.

Read the resulting travel or end play which should be .003"-.024".

The selective washer controlling this end play is the phenolic resin washer located between the pump cover and the forward clutch housing. If more or less washer thickness is required to bring end play within specifications, select the proper washer from the chart below.

Thickness	Color
.060-.064	Yellow
.071-.075	Blue
.082-.086	Red
.093-.097	Brown
.104-.108	Green
.115-.119	Black
.126-.130	Purple

NOTE: An oil soaked washer may tend to discolor so that it will be necessary to measure the washer for its actual thickness.

74-14 REMOVAL OF OIL PUMP, FORWARD CLUTCH, INTERMEDIATE CLUTCH AND GEAR UNIT ASSEMBLY

1. If seal replacement is necessary, pry seal from pump. See Figure 74-541.

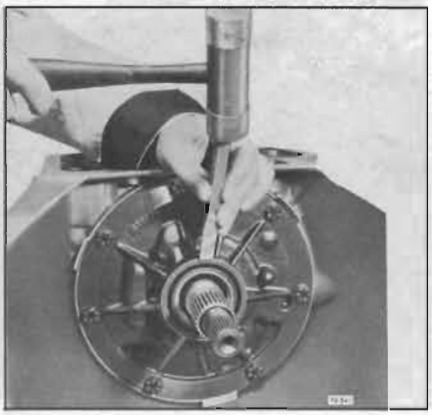


Figure 74-541

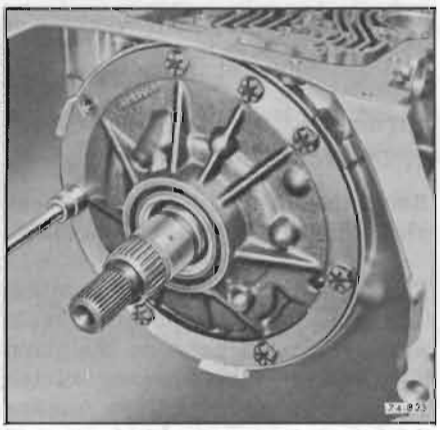


Figure 74-542

2. Remove pump attaching bolts. See Figure 74-542.

3. Install threaded slide Hammers, J-7004, into bolt holes in the pump body, tighten jam nuts and remove pump assembly from case. See Figure 74-543.

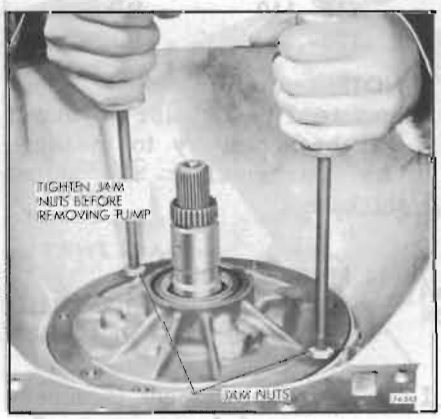


Figure 74-543

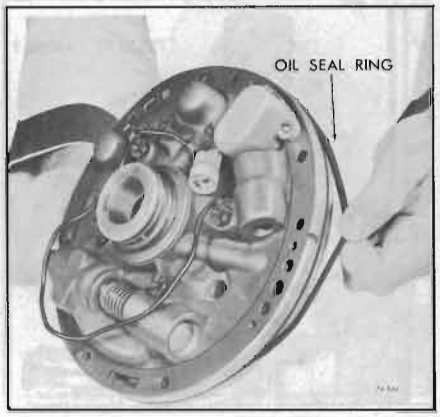


Figure 74-544

NOTE: As pump is removed guide stator solenoid wire and connector from transmission case.

4. Remove and discard pump to case oil seal ring. See Figure 74-544.

5. Remove forward clutch and turbine shaft assembly from transmission. See Figure 74-545.

6. Remove forward clutch hub to direct clutch housing thrust washer, if it did not come out with forward clutch housing assembly.

7. Remove direct clutch assembly. See Figure 74-546.

8. Remove front band assembly.

9. Remove sun gear shaft. See Figure 74-547.

10. Check rear end play as follows:

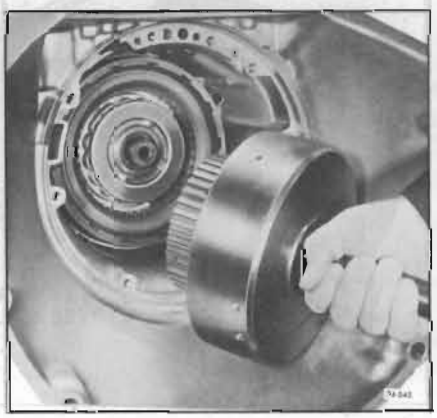


Figure 74-545

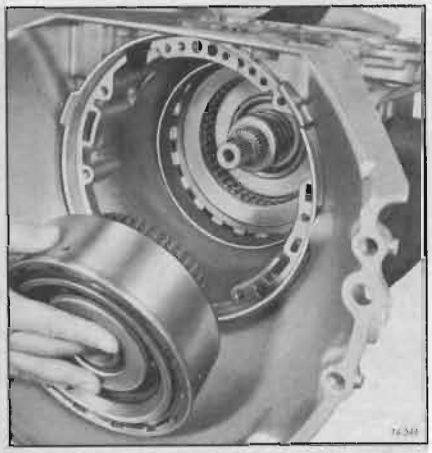


Figure 74-546

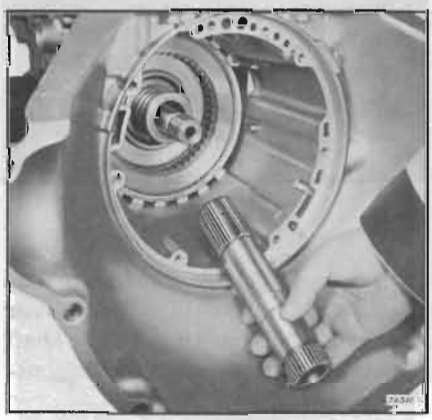


Figure 74-547

a. Install J-7004 into an extension housing attaching bolt hole.

b. Mount dial indicator, J-8001 on rod and index with end of the output shaft. See Figure 74-548.

Figure 74-548

Figure 74-549

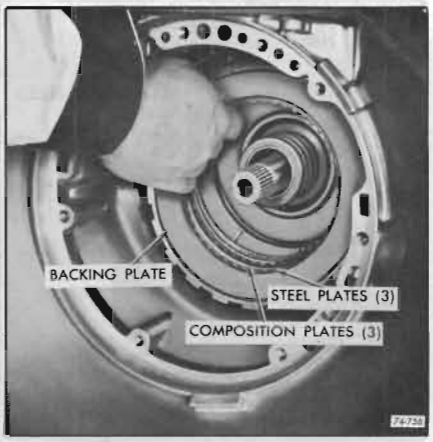


Figure 74-551

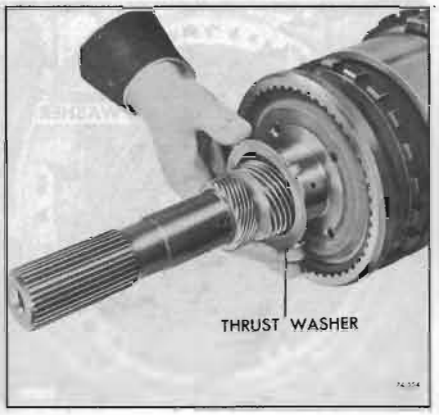


Figure 74-554

c. Move output shaft in an out to rear end play. End play should be from .003"-.019". The selective washer controlling this end play is the steel washer having 3 lugs that is located between the thrust washer and the rear face of the transmission case.

If a different washer thickness is required to bring the end play within specification, it can be selected from the following chart.

Thickness	Notches
.078-.082	None
.086-.090	1 Tab Side
.094-.098	2 Tab Side
.102-.106	1 Tab O.D.
.110-.114	2 Tabs O.D.
.118-.122	3 Tabs O.D.

11. Remove case center support to case bolt. See Figure 74-549.

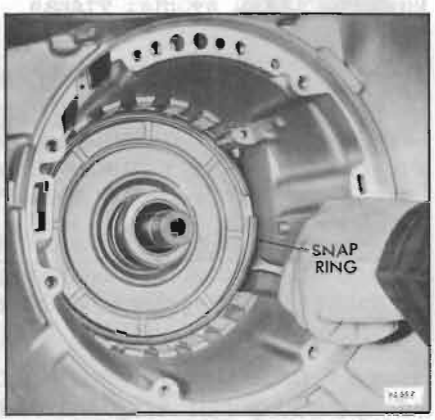


Figure 74-552

12. Remove intermediate clutch backing plate to case snap ring. See Figure 74-550.

13. Remove intermediate clutch backing plate, 3 composition, and 3 steel clutch plates. See Figure 74-551.

14. Remove center support to case retaining snap ring. See Figure 74-552.

15. Remove entire gear unit assembly by lifting with J-21795 and J-7004 Slide Hammer. See Figure 74-553.

16. Remove output shaft to case thrust washer from rear of the output shaft or inside case. See Figure 74-554.

17. Place gear unit assembly with output shaft facing down in hole in work bench. See Figure 74-555.

18. Remove rear unit selective

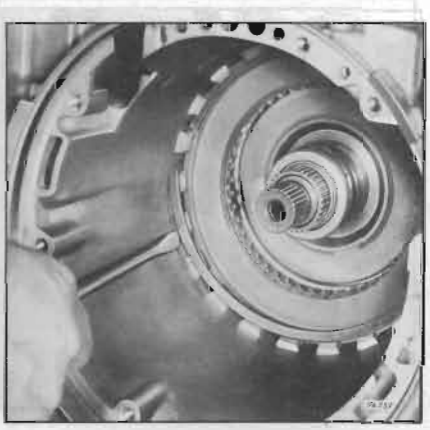


Figure 74-550

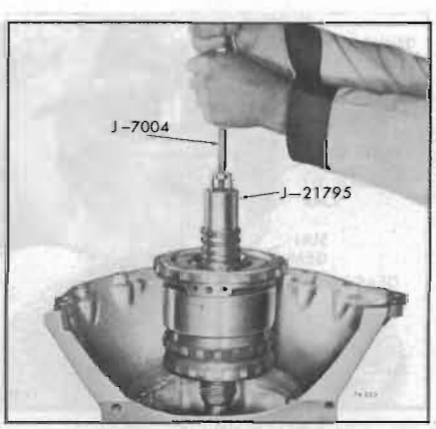


Figure 74-553

Figure 74-555

Figure 74-556

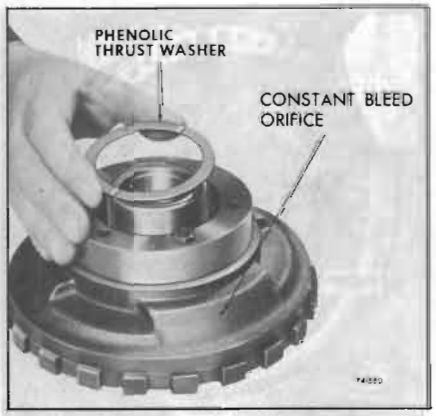


Figure 74-560

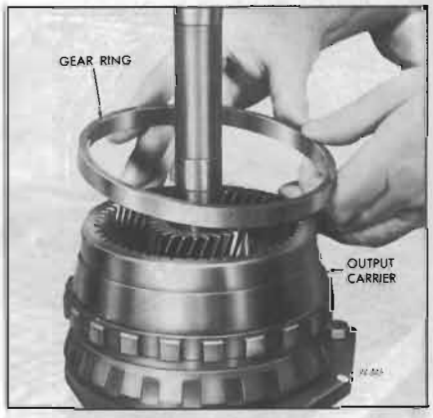


Figure 74-563

Figure 74-557

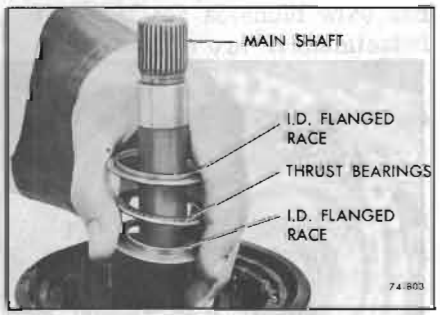


Figure 74-561

washer from the transmission case. See Figure 74-556.

19. Remove rear band assembly. See Figure 74-557.

74-15 GEAR UNIT ASSEMBLY

a. Disassembly

1. Remove case center support assembly. See Figure 74-558.

2. Remove center support to reaction carrier phenolic thrust washer. See Figure 74-560.

3. Remove center support to sun gear races and thrust bearing. See Figure 74-561.

NOTE: One of races may have been removed with the center support.

4. Remove reaction carrier and roller clutch assembly. See Figure 74-562.

5. Remove front internal gear ring from output carrier assembly. See Figure 74-563.

6. Remove sun gear. See Figure 74-564.

7. Remove reaction carrier to output carrier phenolic thrust washer. See Figure 74-565.

8. Turn assembly over and place mainshaft through hole in work bench.

Figure 74-558

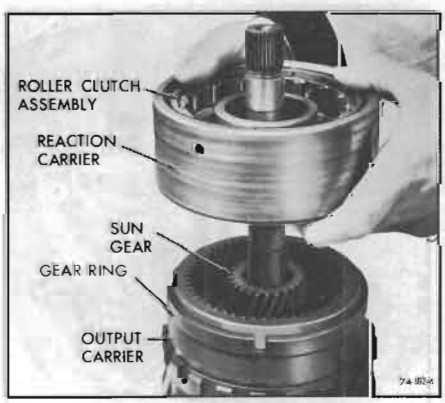


Figure 74-562

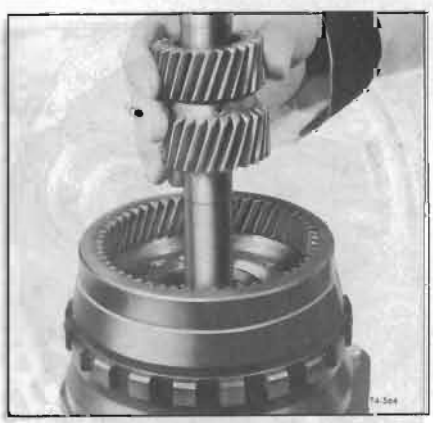


Figure 74-564

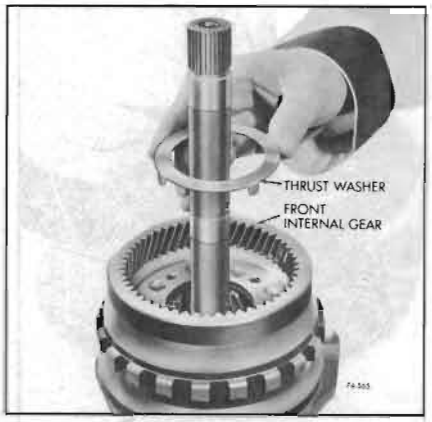


Figure 74-565

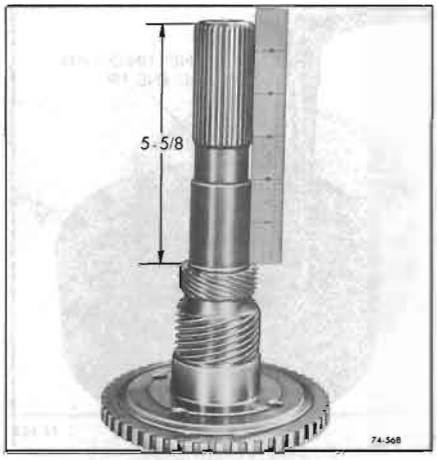


Figure 74-568

Figure 74-571

9. Remove output shaft to rear carrier snap ring. See Figure 74-566.

10. Remove output shaft.

NOTE: If replacement of the speedometer drive gear is necessary remove in the following manner.

a. Install Speedometer Gear Removing Tool, J-21427 and J-9578, on output shaft and remove speedometer drive gear. See Figure 74-567.

b. Install new speedometer drive gear and press to 5-5/8" for all models except "BW" which is 11-7/16". See Figure 74-568.

11. Remove output shaft to rear internal gear thrust bearing and two (2) races. See Figure 74-570.

12. Remove rear internal gear and mainshaft. See Figure 74-571.

NOTE: Do not drop bearings.

13. Remove rear internal gear to sun gear thrust bearing and two (2) races. See Figure 74-572.

14. To remove mainshaft, remove the rear internal gear to mainshaft snap ring. See Figure 74-573.

Figure 74-566

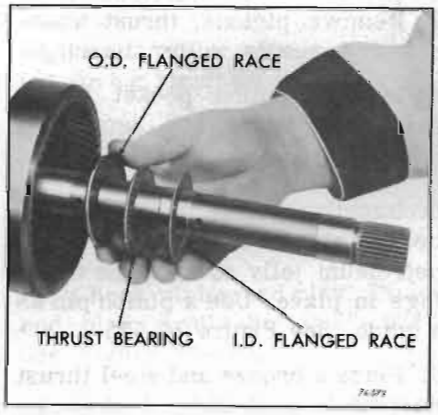


Figure 74-572

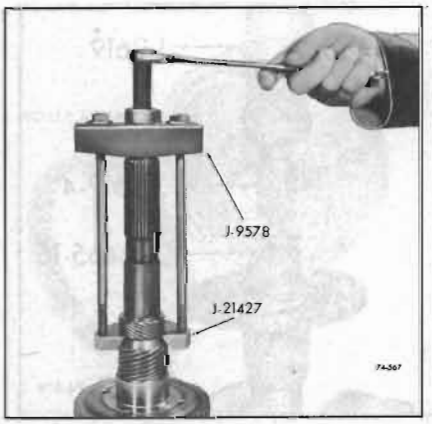


Figure 74-567

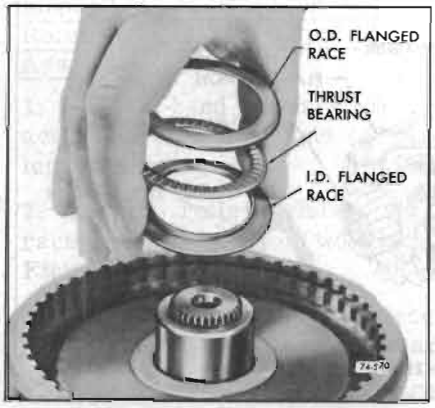


Figure 74-570

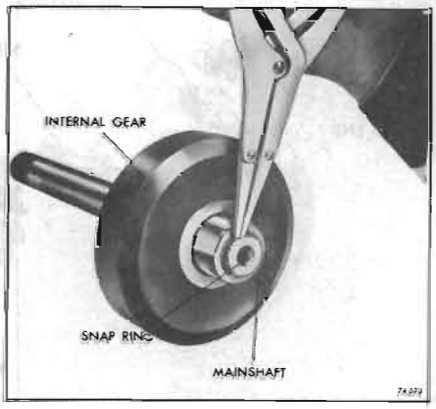


Figure 74-573

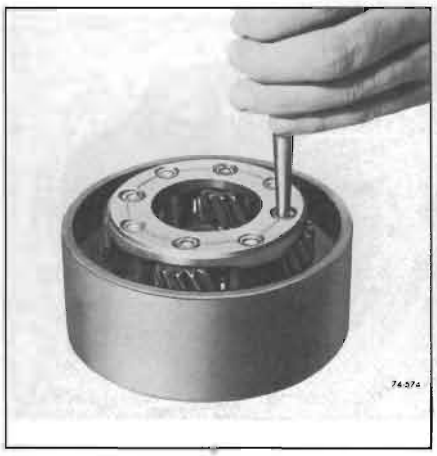


Figure 74-574

Figure 74-576

Figure 74-577

b. Pinion Replacement Procedure

1. Support carrier assembly on its front face.

2. Using a tapered punch, drive or press the pinions out of the carrier. See Figure 74-574.

3. Remove pinions, thrust washers and needle roller bearings.

4. Inspect pinion pocket thrust faces for burrs and remove if present.

5. Install nineteen (19) needle bearings into each pinion, using petroleum jelly to hold the bearings in place. Use a pinion pin as a guide. See Figure 74-575.

6. Place a bronze and steel thrust washer on each side of pinion so steel washer is against pinion, hold them in place with petroleum jelly.

7. Place pinion assembly in position in the carrier and install a pilot shaft through the rear face of the assembly to hold the parts in place.

8. Drive a new pinion pin into place while rotating pinion from the front, being sure that the headed end is flush or below the face of the carrier. See Figure 74-576.

9. Place a large punch in a bench vise to be used as an anvil while staking the opposite end of the pinion pin in three places. See Figure 74-577.

NOTE: Both ends of the pinion pins must lie below the face of the carrier or interference may occur.

c. Inspection

Output Shaft

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

a. Thread Tool J-21465-16 into bushing using Slide Hammer J-2619, remove. See Figure 74-578.

b. Using Tool J-21465-1 install bushing. See Figure 74-580.

2. Inspect bearing and thrust washer surfaces for damage.

3. Inspect governor drive gear for rough or damaged teeth.

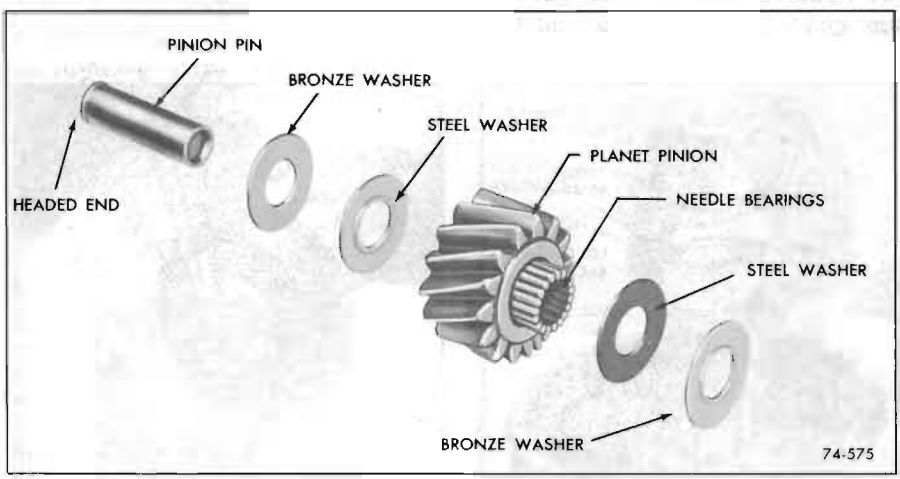


Figure 74-575

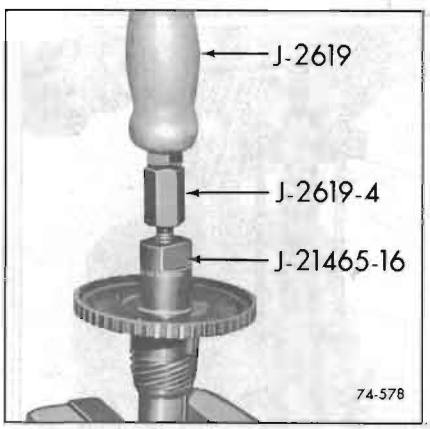


Figure 74-578

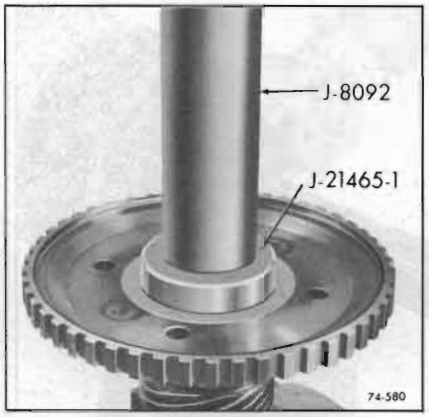


Figure 74-580

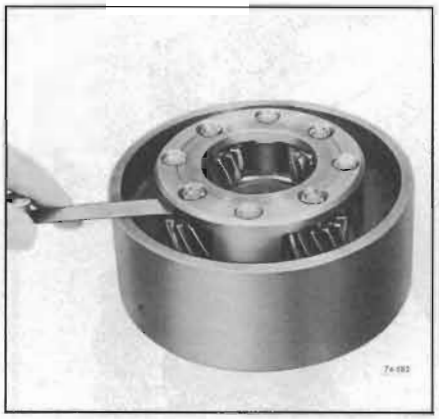


Figure 74-582

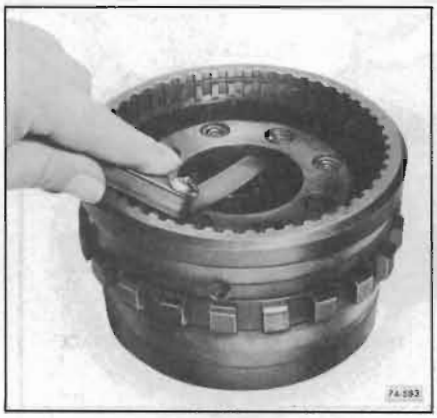


Figure 74-583

4. Inspect splines for damage.

5. Inspect orificed cup plug in the lubrication passage.

6. Inspect drive lugs for damage.

Inspection of Rear Internal Gear

1. Inspect gear teeth for damage or wear.

2. Inspect splines for damage.

3. Inspect gear for cracks.

Inspection of Sun Gear

1. Inspect gear teeth for damage or wear.

2. Inspect splines for damage.

3. Inspect the gear for cracks.

Inspection of Sun Gear Shaft

1. Inspect shaft for cracks or splits.

2. Inspect splines for damage.

3. Inspect bushings for scoring or galling. If replacement is necessary proceed as follows:

a. Thread J-21465-15 into Sun Gear Shaft. Thread Slide Hammer J-2619 into remover. Clamp slide hammer handle into vise. Grasp sun gear shaft and remove bushing.

b. Using Installer J-21465-5 install new bushing.

NOTE: This procedure applies to bushings in both ends of shaft.

4. Inspect ground bushing journals for damage.

5. Be sure the oil lubrication hole is open.

Inspection of Reaction Carrier, Roller Clutch and Output Carrier Assembly

1. Inspect band surface on reaction carrier for signs of burning or scoring.

2. Inspect roller clutch outer race for scoring or wear. See Figure 74-581.

3. Inspect thrust washer surfaces for signs of scoring or wear.

4. Inspect bushing for damage. If bushing is damaged the reaction carrier must be replaced.

5. Inspect pinions for damage, rough bearings or excessive tilt.

6. Check pinion end play. Pinion end play should be .009"-.024". See Figure 74-582.

7. Inspect roller clutch for damaged members.

8. Inspect roller cage and retaining spring for damage.

9. Inspect front internal gear for damaged teeth.

10. Inspect pinions for damage, rough bearings or excessive tilt.

11. Check pinion end play. Pinion end play should be .009"-.024". See Figure 74-583.

12. Inspect parking pawl lugs for cracks or damage.

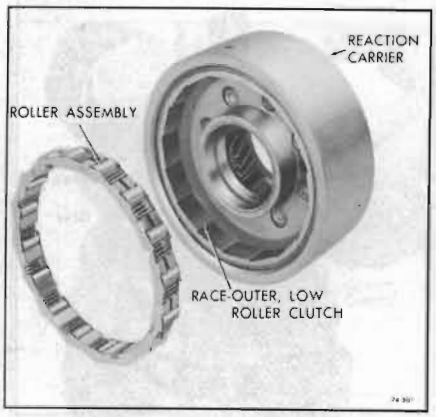


Figure 74-581

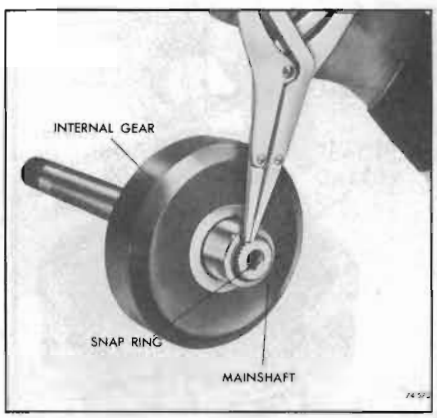


Figure 74-584

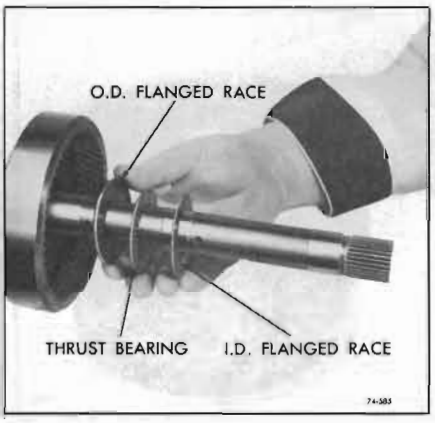


Figure 74-585

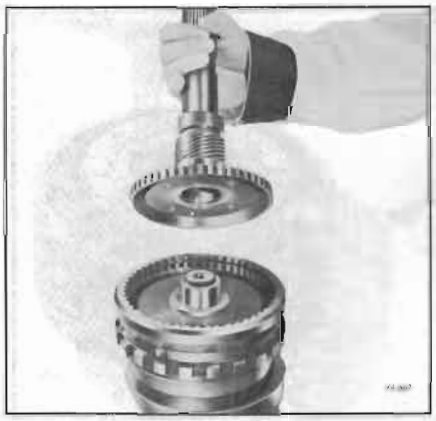


Figure 74-587

Figure 74-589

13. Inspect output locating splines for damage.

14. Inspect front internal gear ring for flaking or cracks.

d. Installation

1. Install rear internal gear on end of mainshaft having snap ring groove.

2. Install internal gear retaining snap ring. See Figure 74-584.

3. Install sun gear to internal gear thrust races and bearings against the inner face of the rear internal gear as follows, and retain with petroleum jelly. See Figure 74-585.

a. Place large race against the internal gear with flange facing forward or up.

b. Place thrust bearing against race.

c. Place small race against bearing with inner flange facing into the bearing or down.

4. Install output carrier over the mainshaft so that the pinions mesh with rear internal gear.

5. Place above portion of "build-up" through hole in bench so that mainshaft hangs downward.

6. Install rear internal gear to output shaft thrust races and bearings as follows; and retain with petroleum jelly. See Figure 74-586.

a. Place small diameter race against internal gear with center flange facing up.

b. Place bearing on race.

c. Place second race on bearing with outer flange cupped over bearing.

7. Install output shaft into output carrier assembly. See Figure 74-587.

8. Install output shaft to output carrier snap ring with bevel side facing up. See Figure 74-588.

9. Lubricate with petroleum jelly and install output shaft to case thrust washer and turn unit over. See Figure 74-589.

10. Lubricate with petroleum jelly and install reaction carrier to output carrier phenolic thrust washer with tabs facing down in pockets. See Figure 74-590.

11. Install sun gear splines with

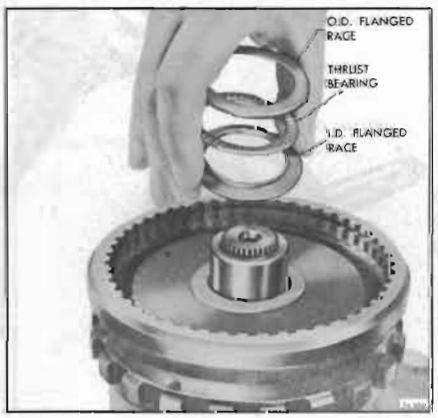


Figure 74-586

Figure 74-588

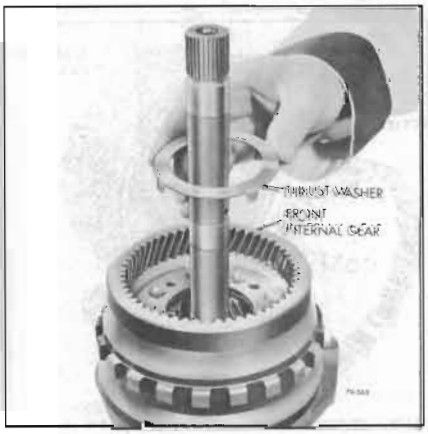


Figure 74-590

Figure 74-591

Figure 74-593

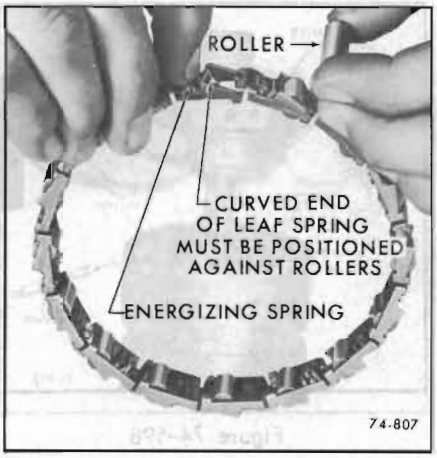


Figure 74-596

inner chamfer down. See Figure 74-591.

12. Install gear ring over output carrier. See Figure 74-592.

13. Install sun gear shaft.

14. Install reaction carrier. See Figure 74-593.

15. Install center support to sun gear thrust races and bearing as follows:

a. Install large race, center flange up over the sun gear shaft.

b. Install thrust bearing against race.

c. Install second race, center flange up. See Figure 74-594.

16. Lubricate with petroleum jelly and install phenolic center

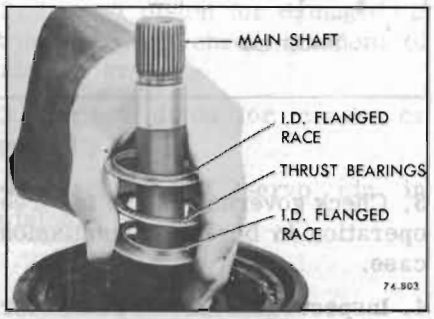


Figure 74-594

support to reaction carrier thrust washer into recess in center support. See Figure 74-595.

17. Install rollers in roller clutch cage, by compressing energizing spring with forefinger and inserting roller from outer side. See Figure 74-596.

NOTE: Make certain that energizing springs are not distorted, and that curved end of leaf of springs are positioned against rollers.

18. Install roller clutch assembly in reaction carrier on case center. See Figure 74-597.

19. Install case center support into roller clutch in reaction carrier. See Figure 74-598.

NOTE: With reaction carrier held, center support should turn counterclockwise only.

Figure 74-592

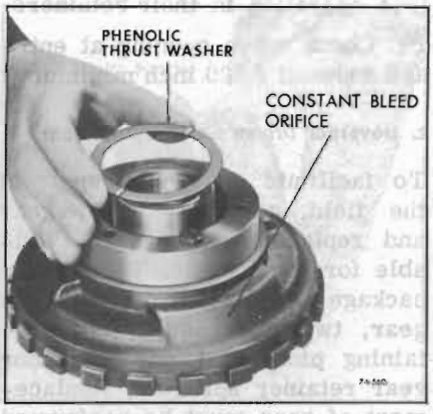


Figure 74-595

74-16 GOVERNOR ASSEMBLY

All components of the governor

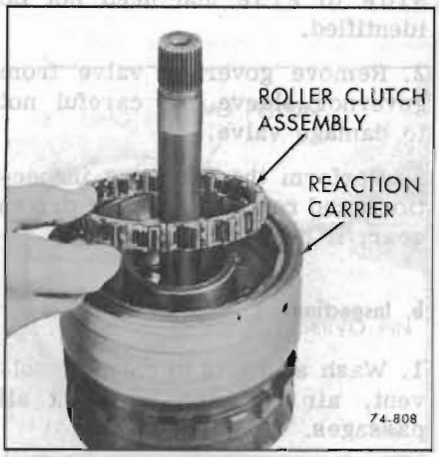


Figure 74-597

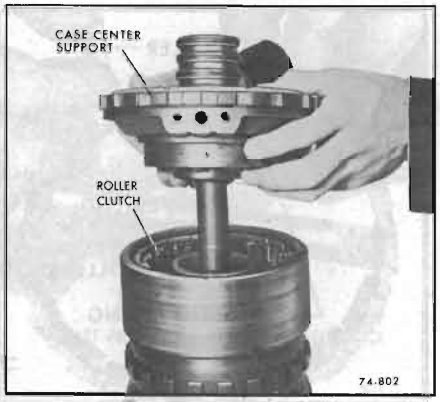


Figure 74-598

assembly, with the exception of the driven gear, are a select fit and each assembly is calibrated. The governor, including the driven gear, is serviced as a complete assembly. However, the driven gear can also be serviced separately.

It is necessary to disassemble the governor assembly in order to replace the driven gear. Disassembly may also be necessary due to foreign material causing improper operation. In such cases, proceed as follows:

a. Disassembly (See Figure 74-600)

1. Cut off one end of each governor weight pin and remove pins, governor thrust cap, governor weights, and springs. Governor weights are interchangeable from side to side and need not be identified.

2. Remove governor valve from governor sleeve. Be careful not to damage valve.

3. Perform the following inspections and replace governor driven gear, if necessary.

b. Inspection

1. Wash all parts in cleaning solvent, air dry and blow out all passages.

2. Inspect governor sleeve for nicks, burrs, scoring or galling.

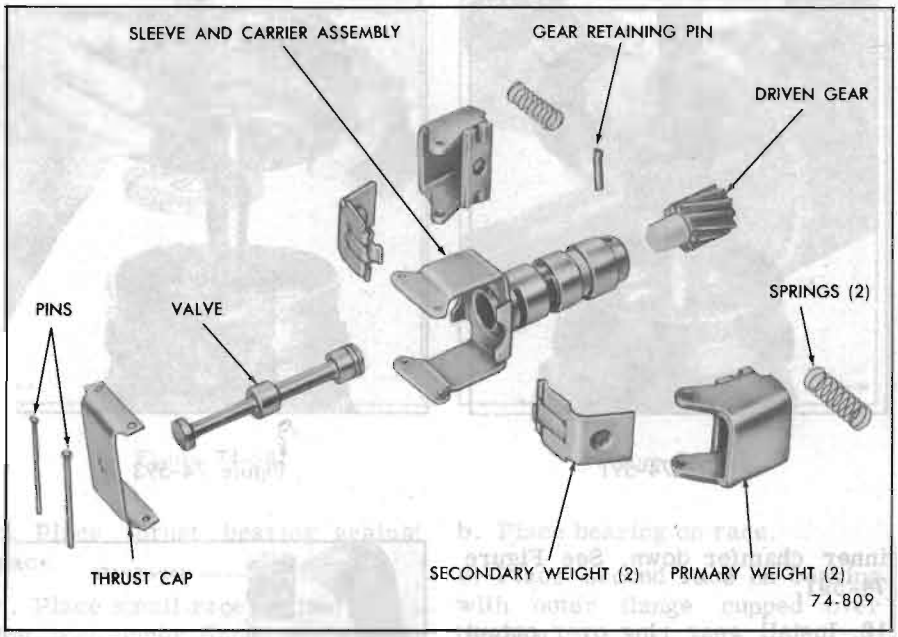


Figure 74-600

3. Check governor sleeve for free operation in bore of transmission case.

4. Inspect governor valve for nicks, burrs, scoring or galling.

5. Check governor valve for free operation in bore of governor sleeve.

6. Inspect governor driven gear for nicks, burrs, or damage.

7. Check governor driven gear for looseness on governor sleeve.

8. Inspect governor weight springs for distortion or damage.

9. Check governor weights for free operation in their retainers.

10. Check valve opening at entry and exhaust (.020 inch minimum.)

c. Governor Driven Gear Replacement

To facilitate governor repair in the field, governor driven gear and replacement pins are available for service use. The service package contains a nylon driven gear, two governor weight retaining pins and one governor gear retainer split pin. Replacement of gear must be performed with care in the following manner:

1. Drive out governor gear retaining split pin using small punch or 1/8" drill rod. See Figure 74-601.

2. Support governor on 3/16 inch plates installed in exhaust slots of governor sleeve, place in press, and with a long punch, press gear out of sleeve.

3. Carefully clean governor sleeve of chips that remain from original gear installation.

4. Support governor on 3/16 inch plates, install in exhaust slots of sleeve, position new gear in sleeve and, with a suitable socket, press gear into sleeve until nearly seated. Carefully remove any chips that may have shaved off gear hub and press gear in until it bottoms on shoulder.

5. A new pin hole must be drilled through sleeve and gear. Locate hole position 90° from existing hole, center punch, and then while supporting governor in press, drill new hole through sleeve and gear using a standard (1/8 inch) drill.

6. Install retaining pin.

7. Wash governor assembly

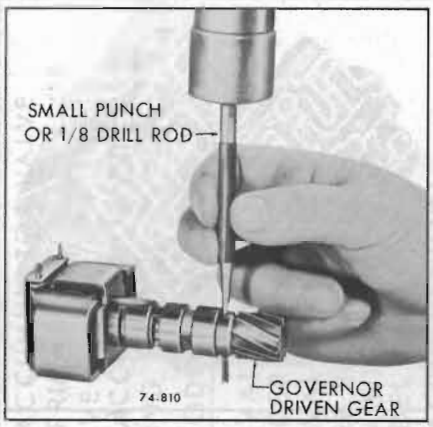


Figure 74-601

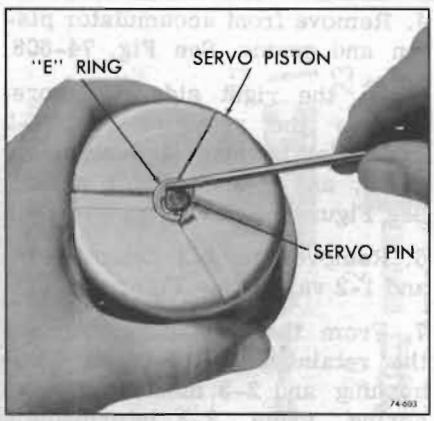


Figure 74-603

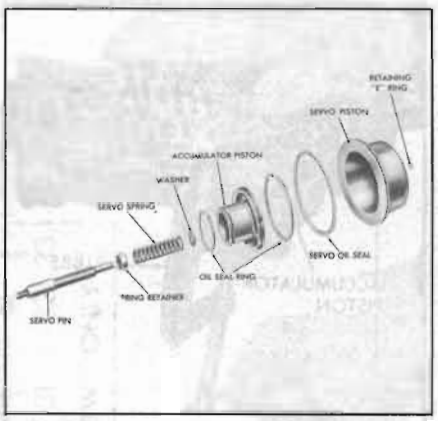


Figure 74-605

thoroughly to remove any chips that may have collected.

d. Assembly
(See Figure 74-600)

1. Install governor valve in bore of governor sleeve.

2. Install governor weights and springs, and thrust cap on governor sleeve.

3. Align pin holes in thrust cap, governor weight assemblies and governor sleeve, and install new pins. Crimp both ends of pin to prevent them from falling out.

4. Check governor weight assemblies for free operation on pins and governor valve for free operation in governor sleeve.

74-17 FRONT SERVO INSPECTION

1. Inspect servo pin for scores and cracks. See Figure 74-602.

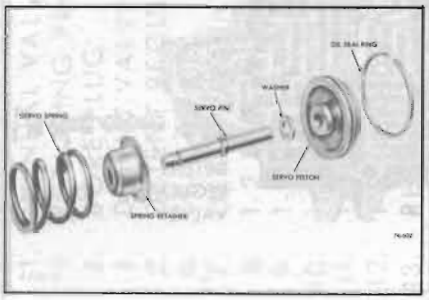


Figure 74-602

2. Inspect piston for damaged oil ring groove, check freedom of ring in groove.

3. Inspect piston for cracks or porosity.

4. Check fit of servo pin in piston.

74-18 REAR SERVO ASSEMBLY

a. Disassembly

1. Remove rear accumulator piston from rear servo piston.

2. Remove "E" ring retaining rear servo piston to band apply pin. See Figure 74-603.

3. Remove rear servo piston and seal from band apply pin.

Figure 74-604

b. Inspection

1. Inspect freedom of accumulator ring in piston.

2. Inspect fit of band apply pin in servo piston.

3. Inspect band apply pin for scores and cracks.

c. Reassembly

1. Install spring retainer, spring and washer on band apply pin. See Figure 74-605.

NOTE: If new pin is required, install here.

2. Install band apply pin retainer, spring and washer, into bore of servo piston and secure with "E" ring. See Figure 74-606.

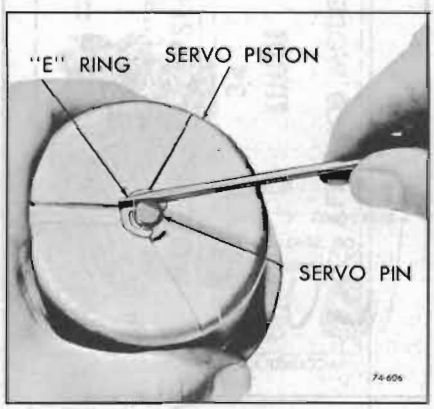


Figure 74-606

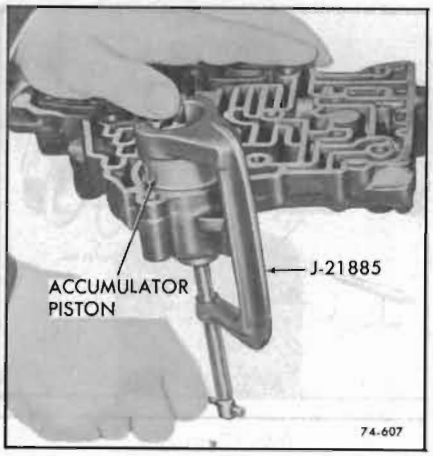


Figure 74-607

3. Install oil seal ring on servo piston, if removed.

4. Install outer and inner oil rings on accumulator piston, if removed, and assemble into bore of servo piston.

74-19 VALVE BODY ASSEMBLY

a. Disassembly

1. Position valve body assembly with cored face up and servo pocket nearest operator.

2. Remove manual valve from upper bore.

3. Install special Tool J-21885, on accumulator piston and remove retaining "E" ring. See Figure 74-607.

4. Remove front accumulator piston and spring. See Fig. 74-608.

5. On the right side, top bore, remove the retaining pin, 1-2 modulator bushing, 1-2 regulator valve, and 1-2 regulator spring. See Figure 74-614.

6. Remove the 1-2 detent valve and 1-2 valve. See Figure 74-614.

7. From the next bore, remove the retaining pin; 2-3 modulator bushing and 2-3 modulator valve spring, valve, 2-3 intermediate spring and the 2-3 valve. See Figure 74-614.

8. From the next bore remove the retaining roll pin, bore plug, spacer, spring and 3-2 valve. See Figure 74-614.

NOTE: This step is for model "BW" only.

9. At the other end of the assembly, top bore, remove the retaining pin and bore plug. See Figure 74-614.

10. Remove the detent valve, detent regulator valve, spring and spacer. See Figure 74-614.

Steps 11 and 12 are for Model "BW" and first Job "BU" and "BT" models.

11. From next bore remove the 1-2 accumulator retaining pin and bore plug.

12. Remove the 1-2 accumulator valve and the 1-2 accumulator spring. See Figure 74-614.

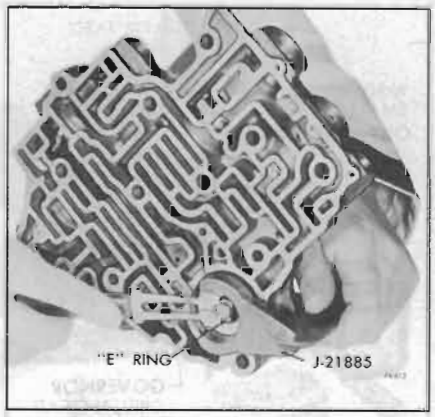


Figure 74-612

NOTE: On "After" Job "BT" models remove spring then valve.

Steps 13, 14 and 15 are for model "BA" and after Job Model "BU".

13. Remove the 1-2 accumulator retainer pin, and the 1-2 accumulator valve plug. See Fig. 74-614.

14. Remove 1-2 accumulator bushing, 1-2 accumulator valve secondary spring, and 1-2 accumulator secondary valve.

15. From the same bore, remove the primary 1-2 accumulator valve and spring.

16. All Models - from the Governor feed hole remove the screen assembly. See Fig. 74-611.

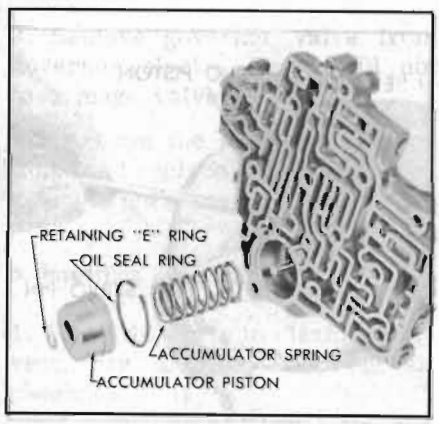


Figure 74-608

Figure 74-611

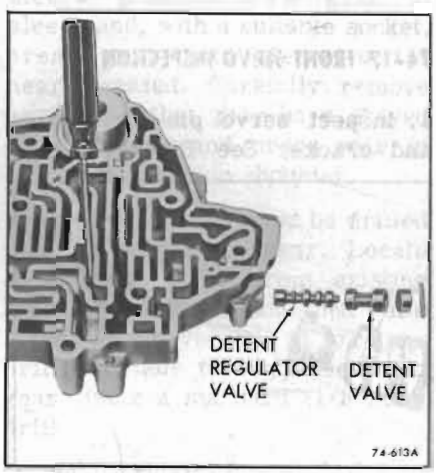


Figure 74-613

1. MANUAL VALVE
2. RETAINING PIN
3. BORE PLUG
4. DETENT VALVE
5. DETENT REGULATOR VALVE
6. SPACER PIN
7. DETENT REGULATOR SPRING
8. 1-2 SHIFT VALVE
9. 1-2 DETENT VALVE
10. 1-2 REGULATOR SPRING
11. 1-2 REGULATOR VALVE
12. 1-2 MODULATOR BUSHING
13. RETAINING PIN
14. GROOVED RETAINING PIN
15. BORE PLUG
16. 1-2 ACCUMULATOR VALVE
17. 1-2 ACCUMULATOR SPRING
18. 2-3 SHIFT VALVE
19. 2-3 INTERMEDIATE SPRING
20. 2-3 MODULATOR VALVE
21. 2-3 VALVE SPRING
22. 2-3 MODULATOR BUSHING
23. RETAINING PIN

MODEL "BA" & "BU"

24. 1-2 ACCUMULATOR BUSHING
25. 1-2 ACCUMULATOR SECONDARY SPRING
26. 1.2 ACCUMULATOR VALVE
27. 1-2 PRIMARY ACCUMULATOR VALVE
28. 1-2 ACCUMULATOR PRIMARY SPRING

MODEL "BW" ONLY

29. 3-2 VALVE
30. SPACER PIN
31. 3-2 VALVE SPRING
32. BORE PLUG
33. RETAINING PIN MODEL "BT" ONLY
34. 1-2 ACCUMULATOR SECONDARY SPRING
35. 1-2 ACCUMULATOR VALVE

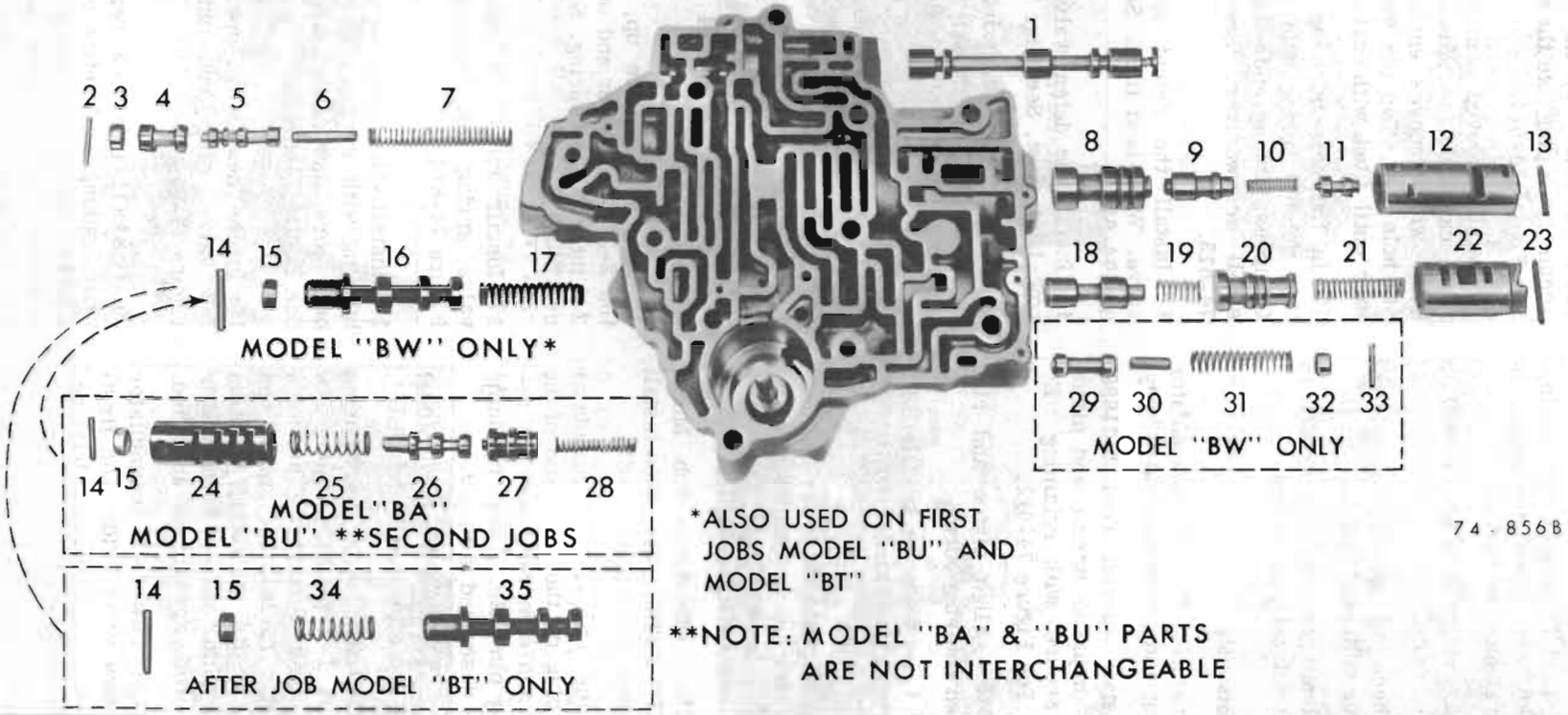


Figure 74-614—Exploded View of Valve Body

b. Inspection

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

2. Inspect the body for cracks, or scored bores.

3. Check all springs for distortion or collapsed coils.

4. Clean governor oil screen in clean solvent and air dry.

c. Reassembly

1. Install front accumulator spring and piston into valve body.

2. Install special Tool J-21885, and compress spring and piston and secure with retaining "E" ring. See Figure 74-612.

NOTE: Align piston and ring when entering bore.

Steps 3 and 4 are for Model "BW" and first Job Model "BU" and "BT".

3. Install, into the lower left hand bore, the 1-2 accumulator spring and 1-2 accumulator valve with stem end out. See Figure 74-614.

NOTE: On After Job Model "BT" install valve then install spring. See Figure 74-614.

4. Place the 1-2 accumulator bore plug on the stem end of the valve and compress past the retaining pin hole. Install retaining pin as described in Step 9.

Steps 5, 6, 7, and 8 are for Model "BA" and after Job Model "BU".

5. Install the 1-2 primary spring and the 1-2 primary valve into bore using a retaining pin as a retractor to hold the spring and valve in its operating position until bushing and 1-2 accumulator valve and spring are installed.

6. Install the 1-2 accumulator secondary valve (wide land first) into the 1-2 accumulator bushing. See Figure 74-614.

7. Install the 1-2 accumulator valve bushing into the bore.

8. Install the 1-2 accumulator valve secondary spring and 1-2 accumulator plug into the bushing. See Figure 74-614.

9. Install grooved retaining pin from cast surface side of valve body with grooves entering the pin hole last. Tap pin with hammer until flush with cast surface.

10. In the next bore up, install the detent spring and spacer. Compress spring and secure with small screwdriver. See Figure 74-613.

11. Install the detent regulator valve. Wide land first. See Figure 74-613.

12. Install the detent valve, narrow land first. See Fig. 74-613.

13. Remove the screwdriver as the bore plug (hole out) and retaining pin are installed. See Figure 74-613.

14. In the lower right hand bore, install the 3-2 valve. See Figure 74-614. (Model BW only)

15. Install the spacer, spring, bore plug (hole out) and retaining pin. See Figure 74-614 (Model BW only)

16. In the next bore up, install the 2-3 valve, stem end out, and 2-3 intermediate spring. See Figure 74-614.

17. Install the 2-3 modulator valve spring into bushing. See Figure 74-614.

18. Install the 2-3 valve and bushing with spring, into valve body bore. Install retaining pin. See Figure 74-614.

19. In the next bore, install the 1-2 valve, stem end out. See Figure 74-614.

20. Install the 1-2 regulator valve, spring and detent valve, into the bushing, aligning spring in bore of detent valve, and install parts into the valve bore. See Figure 74-614.

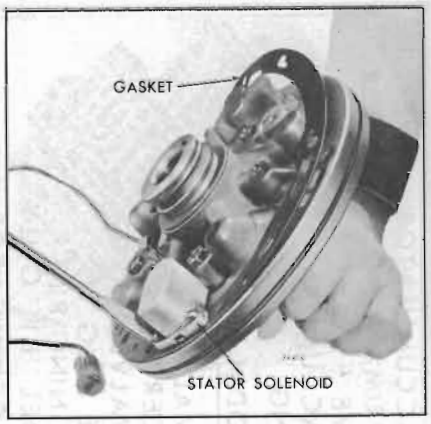


Figure 74-615

21. Compress the bushing against the spring and install the retaining pin. See Figure 74-614.

22. Install governor oil screen assembly into governor oil feed hole, pinched end first. See Figure 74-611.

NOTE: Screen is held in place by the governor feed pipe when installed on transmission case.

23. Install the manual valve with detent pin groove to the right. See Figure 74-614.

74-20 OIL PUMP ASSEMBLY

a. Disassembly

1. Remove stator solenoid attaching screws and solenoid and pump to case gasket. See Fig. 74-615.

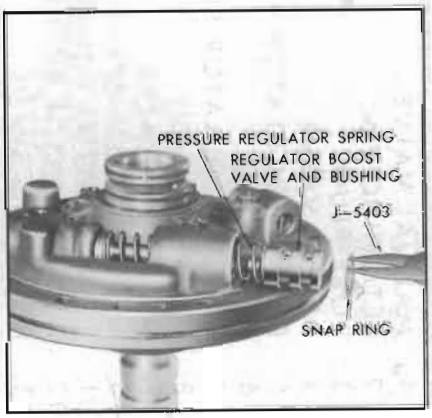


Figure 74-616

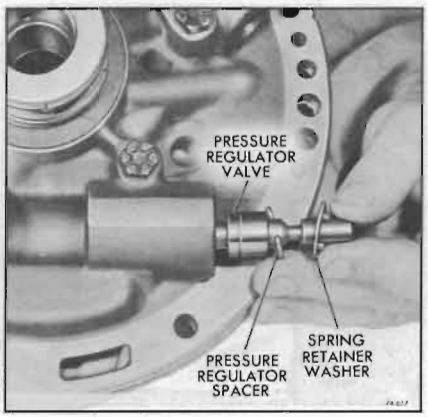


Figure 74-617

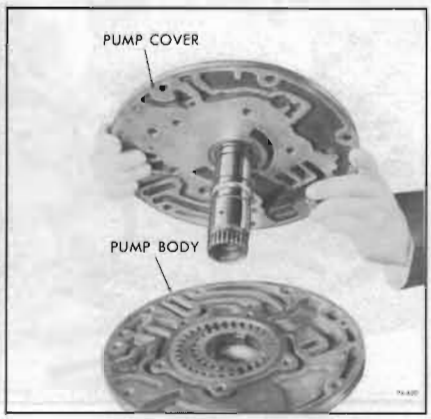


Figure 74-620

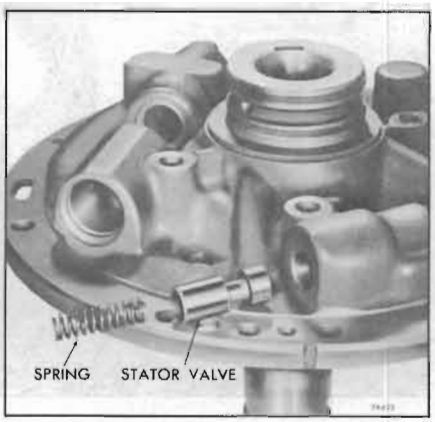


Figure 74-623

2. Place pump assembly through hole in bench.

3. Compress the regulator boost valve bushing against the pressure regulator spring and remove the snap ring, using J-5403 pliers. See Figure 74-616.

4. Remove the regulator boost valve bushing and valve.

5. Remove the pressure regulator spring.

6. Remove the regulator valve, spring retainer and spacer(s), if present. See Figure 74-617.

7. Remove the pump cover to body attaching bolts. See Figure 74-618.

8. Remove pump cover from body. See Figure 74-620.

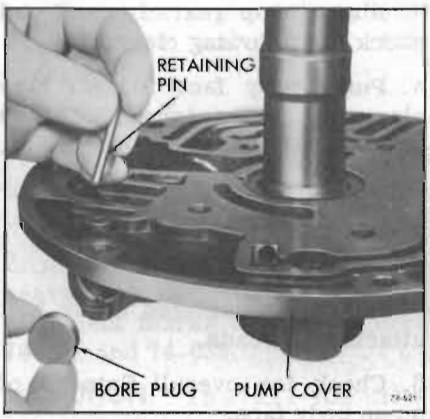


Figure 74-621

9. Remove the retaining pin and bore plug from the pressure regulator bore. See Figure 74-621.

Figure 74-624

10. Remove the stator valve retaining pin. See Figure 74-622.

11. Remove stator valve spring and valve. See Figure 74-623.

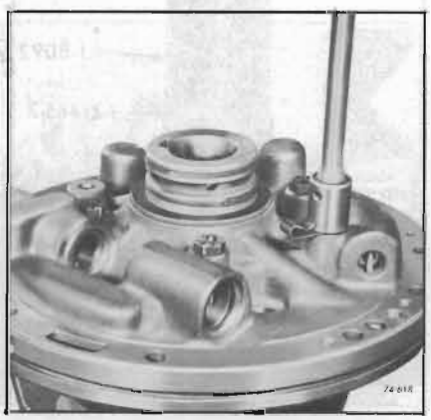


Figure 74-618

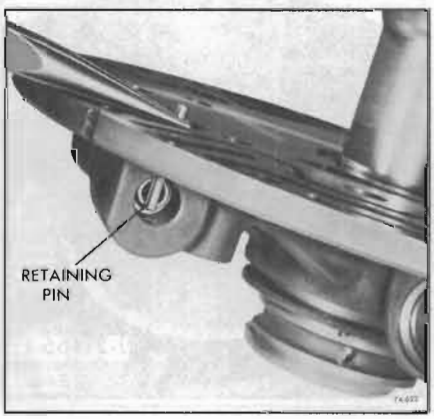


Figure 74-622

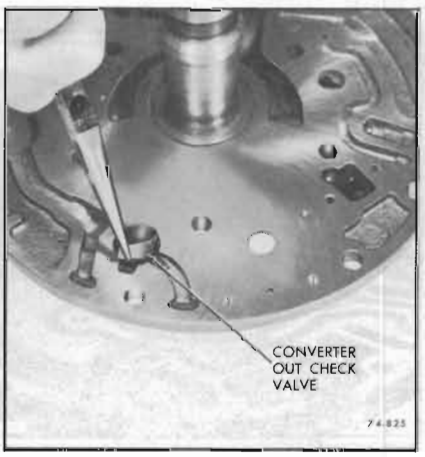


Figure 74-625

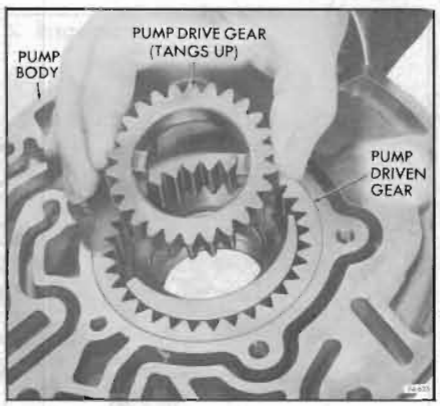


Figure 74-626

12. Remove the hook type oil rings from the pump cover. See Figure 74-624.

13. Remove converter out-check valve. See Figure 74-625.

14. Remove the pump to forward clutch housing selective washer (fiber).

15. Mark drive and driven gears for reassembly and remove drive gear. See Figure 74-626.

16. Remove driven gear from pump body. See Figure 74-627.

b. Inspection

1. Inspect the gear pocket and crescent for scoring, galling or other damage.

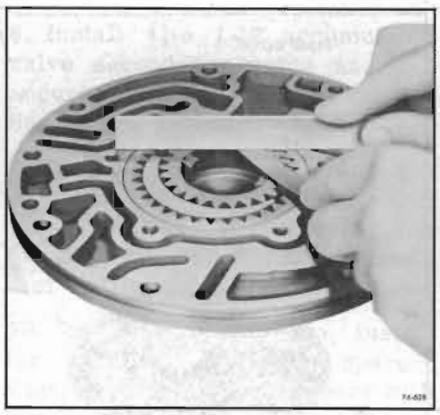


Figure 74-628

2. Place pump gears in pump and check the following clearance.

a. Pump body face to gear face clearance. Clearance should be .0008"-.0015". See Figure 74-628.

3. Check face of pump body for scores or nicks.

4. Check oil passages.

5. Check for damaged cover bolt attaching threads.

6. Check for overall flatness of pump body face.

7. Check bushing for scores or nicks. If damaged replace as follows:

a. Support oil pump on wood blocks. Using Tool J-21465-17 and Drive Handle J-8092 press bushing out of oil pump body. See Figure 74-632.

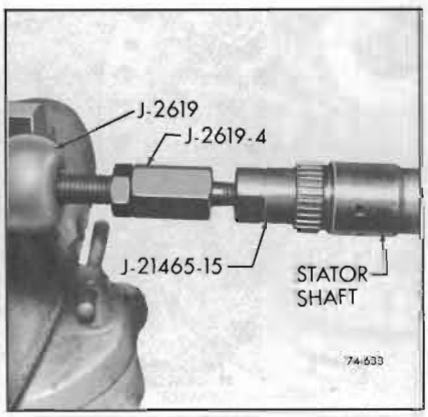


Figure 74-633

b. Using Tool J-21465-17 drive bushing into pump body until it is flush with top of front pump hub. See Figure 74-632.

8. Inspect the pump attaching bolt seals for damage, replace if necessary.

9. Inspect pump cover face for overall flatness.

10. Check for scores or chips in pressure regulator bore.

11. Check that all passages are open and not interconnected.

12. Check for scoring or damage at pump gear face.

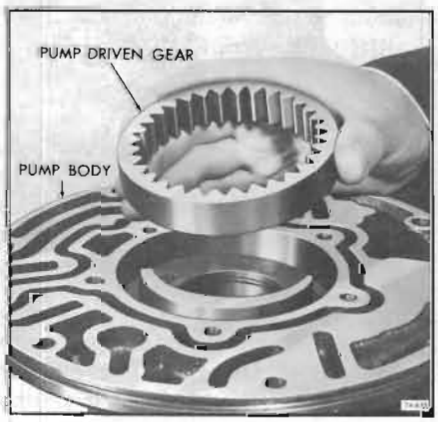


Figure 74-627

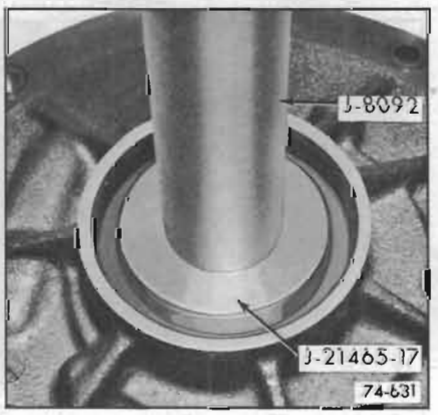


Figure 74-632

Figure 74-634

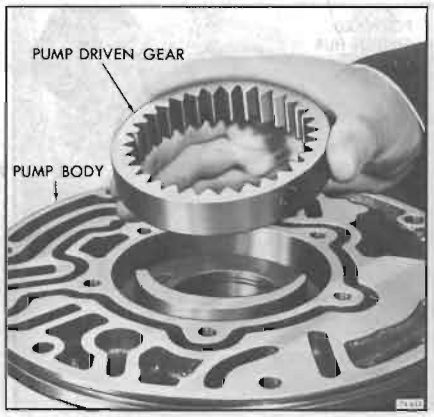


Figure 74-635

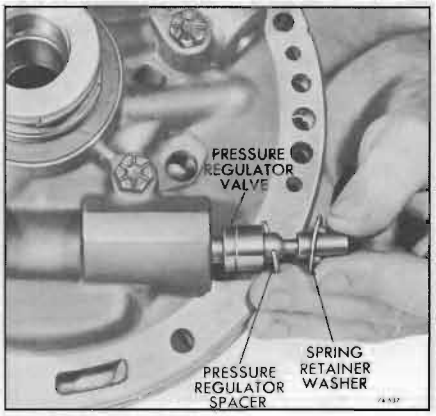


Figure 74-637

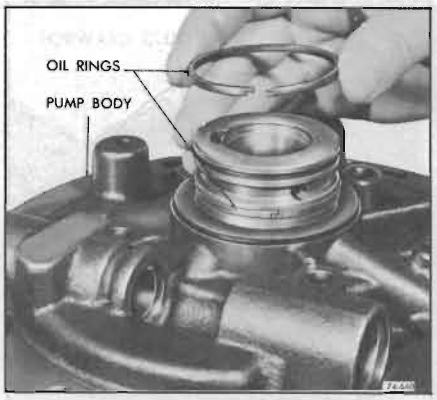


Figure 74-639

13. Inspect stator shaft for damaged splines, or scored bushings.

If replacement of bushings is necessary proceed as follows:

a. Thread J-21465-15 into stator shaft bushing. Thread Slide Hammer J-2619 into remover. Clamp slide hammer handle into vise. Grasp stator shaft and remove bushing. See Figure 74-633.

b. Using Installer J-21465-3 install bushing in front of shaft. See Figure 74-634.

c. See Figure 74-634 for installation of bushing in rear of shaft.

14. Inspect oil ring grooves for damage or wear.

15. Inspect selective washer thrust face for wear or damage.

16. Inspect pressure regulator and boost valve for free operation.

c. Reassembly

1. Install stator valve and spring. Compress spring and install retaining pin. See Figure 74-623.

2. Install drive and driven pump gears into the pump body with alignment marks up. See Figures 74-635 and 74-636.

CAUTION: Install the drive gear with drive tangs up.

3. Install pressure regulator spring retainer, spacer(s) if used, and spring into the pressure regulator bore. See Figure 74-637.

4. Install the pressure regulator valve from opposite end of bore, stem end first.

5. Install the boost valve into the bushing, stem end out, and install both parts into the pump cover by compressing the bushing against the spring.

6. Install the retaining snap ring.

7. Install the pressure regulator valve bore plug and retaining pin into opposite end of bore. See Figure 74-638.

8. Install the previously selected front unit selective thrust washer (fiber) over the pump cover delivery sleeve.

9. Install two (2) hook type oil seal rings. See Figure 74-639.

10. Install converter out check valve. See Figure 74-625.

11. Assemble pump cover to pump body. See Figure 74-640.

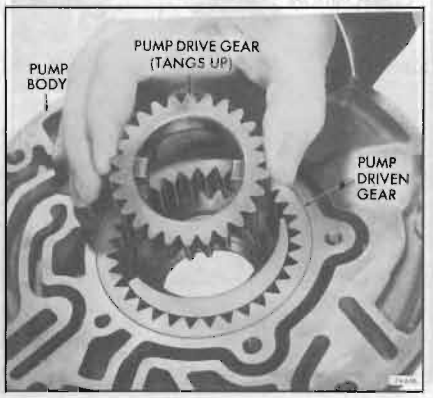


Figure 74-636

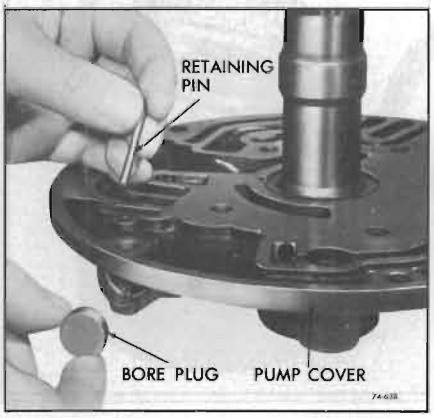


Figure 74-638

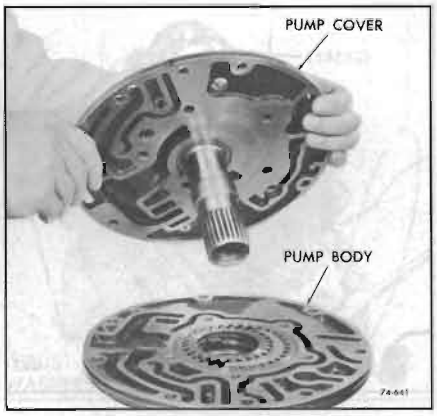


Figure 74-640

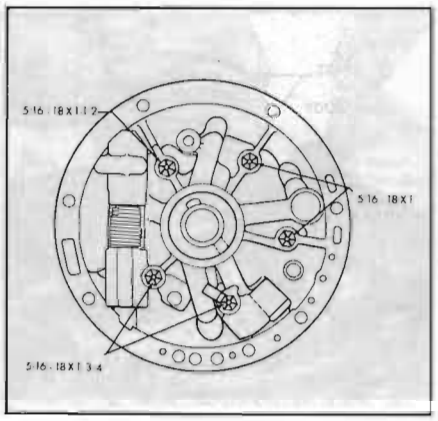


Figure 74-641

Figure 74-644

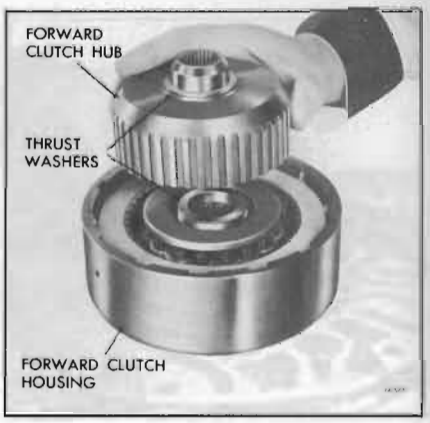


Figure 74-646

Install bolts as shown in Figure 74-641. Install clip adjacent to stator valve.

NOTE: Leave the bolts one turn loose at this time.

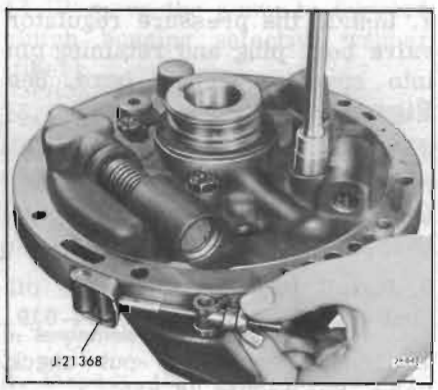


Figure 74-642

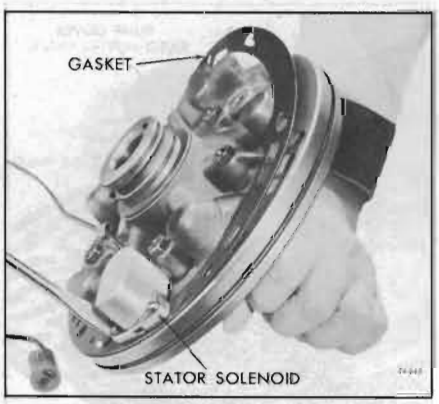


Figure 74-643

12. Place Pump Aligning Strap, J-21368, over pump body and cover, and tighten tool. See Figure 74-642.

13. Tighten pump cover bolts. Torque to 15-20 lb. ft. and align pump to case gasket.

14. Attach stator solenoid with screws. See Figure 74-643.

15. Attach stator wire to clip.

16. Install pump to case "O" ring seal.

74-21 FORWARD CLUTCH ASSEMBLY

a. Disassembly

1. Place forward clutch and turbine shaft in hole in bench and remove the forward clutch housing to direct clutch hub snap ring. See Figure 74-644.

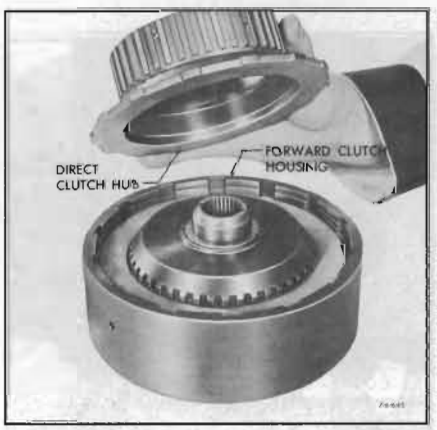


Figure 74-645

2. Remove the direct clutch hub. See Figure 74-645.

3. Remove the forward clutch hub and thrust washers. See Figure 74-646.

4. Remove five (5) radial groove composition and five (5) steel clutch plates. See Figure 74-647.

5. If necessary remove turbine shaft. See Figure 74-648.

6. Using J-2590 clutch spring compressor, compress the spring retainer and remove the snap ring. See Figure 74-650.

NOTE: If turbine shaft is not removed, compress spring retainer as shown in Figure 74-651.

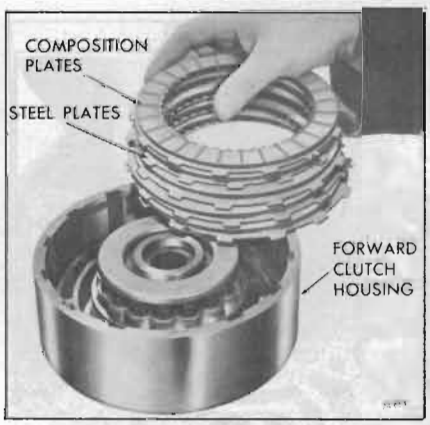


Figure 74-647

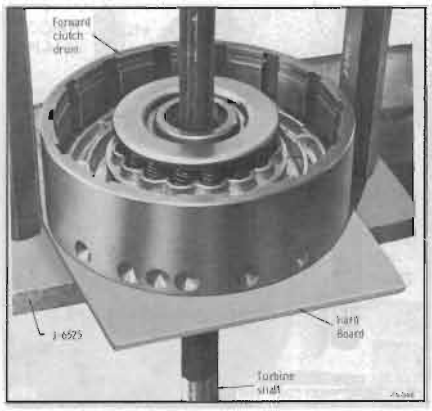


Figure 74-648

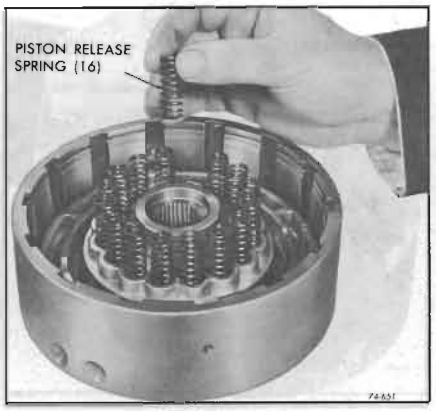


Figure 74-652

Figure 74-654

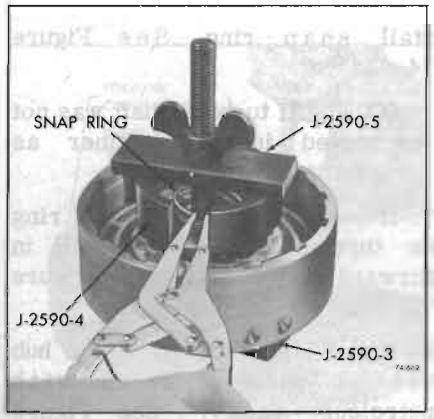


Figure 74-650

7. Remove tools, snap ring, spring retainer and sixteen clutch release springs. See Figure 74-652.

8. Remove clutch piston.

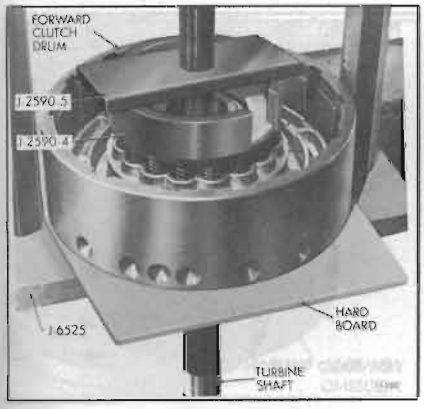


Figure 74-651

Figure 74-653

9. Remove inner and outer clutch piston seals. See Figure 74-653.

10. Remove center piston seal from the forward clutch housing. See Figure 74-654.

b. Inspection

1. Inspect drive and driven clutch plates for signs of burning, scoring, or wear. See Figure 74-655.

2. Inspect sixteen springs for collapsed coils or signs of distortion.

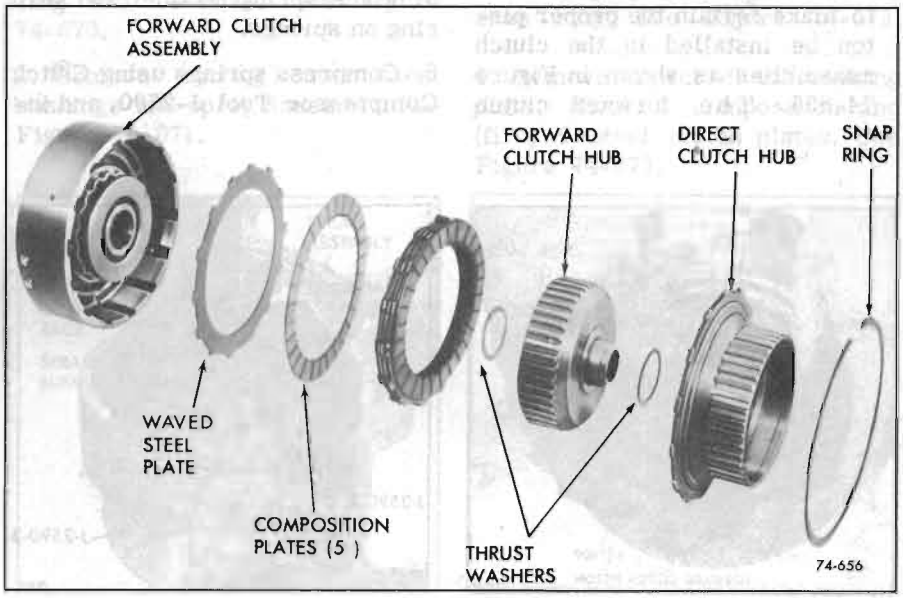


Figure 74-655

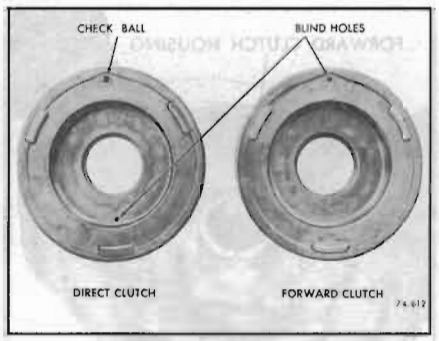


Figure 74-656

3. Inspect clutch hubs for worn splines, proper lubrication holes, thrust faces.

4. Inspect the piston for cracks.

5. Inspect clutch housing for wear, scoring, open oil passages and free operation of the ball check.

c. Reassembly

1. Place new inner, and outer oil seals on clutch piston, lips face away from spring pockets. See Figure 74-653.

NOTE: The forward and direct clutch pistons have identical inside and outside diameters. It is possible to reverse the pistons during reassembly, therefore care should be exercised to make certain the proper piston be installed in the clutch assemblies as shown in Figure 74-656. The forward clutch piston can be identified by the blind hole in the clutch apply face of the piston.

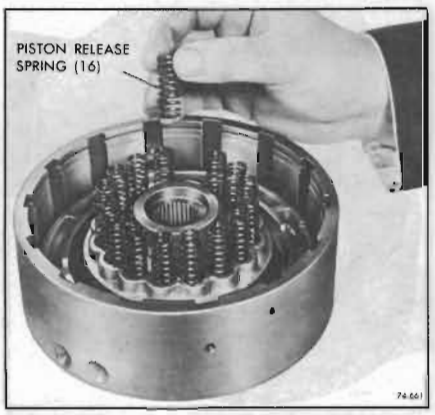


Figure 74-661

2. Place a new center seal on the clutch housing, lip faces up. See Figure 74-654.

3. Place Seal Protector Tool J-21362, over clutch hub and install outer clutch piston Seal Protector J-21409, into clutch drum and install piston. See Figure 74-660.

4. Install clutch release springs into pockets in piston. See Figure 74-661.

5. Place spring retainer and snap ring on springs.

6. Compress springs using Clutch Compressor Tool J-2590, and install snap ring. See Figure 74-662.

NOTE: If turbine shaft was not removed install retainer as shown in Figure 74-648.

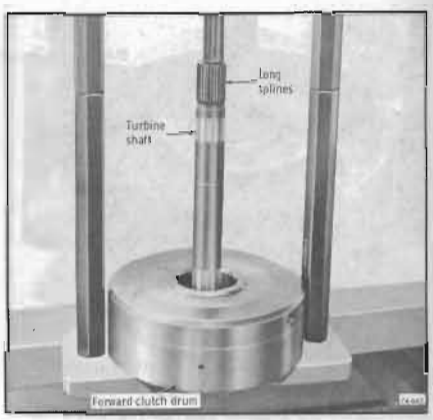


Figure 74-663

7. If removed install oil seal ring on turbine shaft and install in forward clutch drum. See Figure 74-663.

8. Install the forward clutch hub thrust washers. Retain with petroleum jelly. See Figure 74-664.

NOTE: Radially grooved plates are used only in the forward clutch.

9. Place forward clutch hub into forward clutch housing. See Figure 74-664.

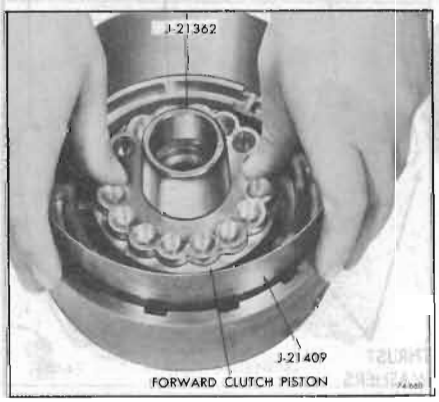


Figure 74-660

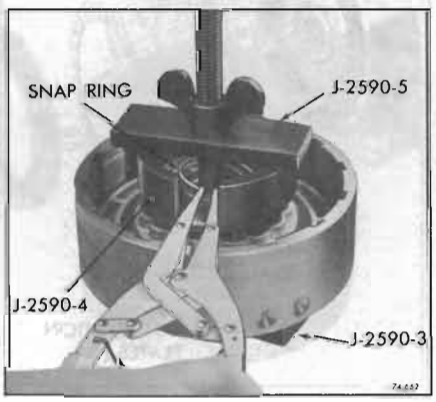


Figure 74-662

Figure 74-664

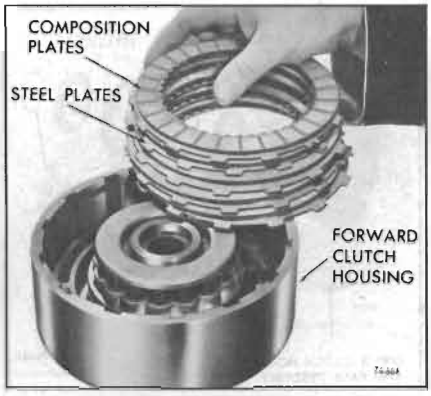


Figure 74-665

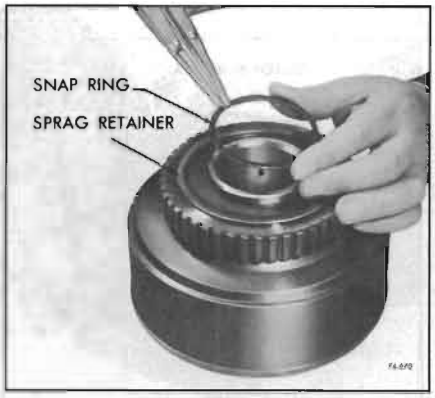


Figure 74-670

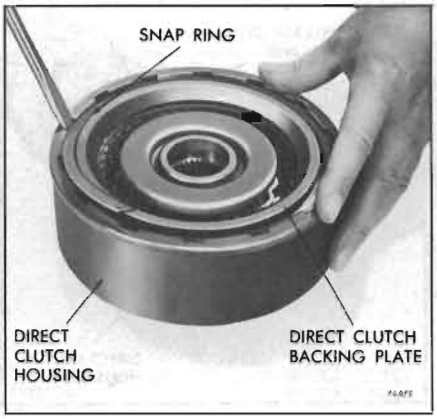


Figure 74-672

Figure 74-667

10. Oil and install five (5) radial groove composition and four (4) flat steel clutch plates and one (1) waved steel plate (plate with notches), starting with waved steel and alternating steel and composition. See Figure 74-665.

11. Install the direct clutch hub and retaining snap ring. See Figure 74-667.

12. Place forward clutch housing on pump delivery sleeve and air check clutch operation. See Figure 74-668.

74-22 DIRECT CLUTCH AND INTERMEDIATE SPRAG

a. Disassembly

1. Remove sprag retainer snap ring and retainer. See Figure 74-670.

2. Remove sprag outer race, bushings and sprag assembly. See Figure 74-671.

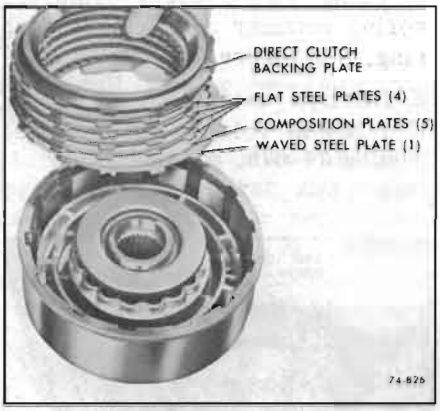


Figure 74-673

3. Turn unit over and remove backing plate to clutch housing snap ring. See Figure 74-672.

4. Remove direct clutch backing plate, (five) 5 composition and (five) 5 steel clutch plates. See Figure 74-673.

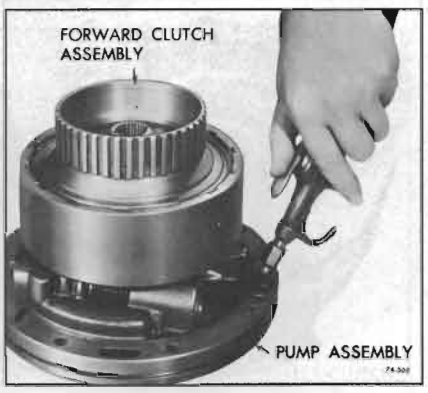


Figure 74-668

Figure 74-671

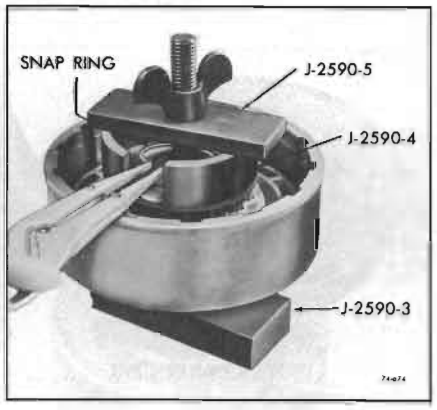


Figure 74-674

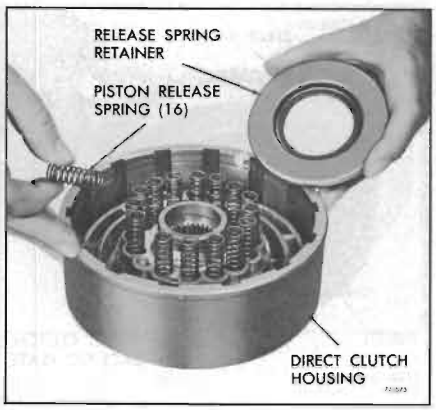


Figure 74-675

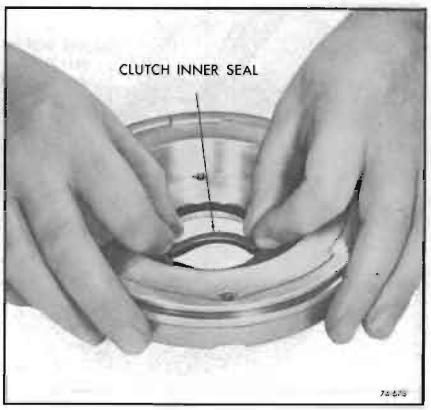


Figure 74-678

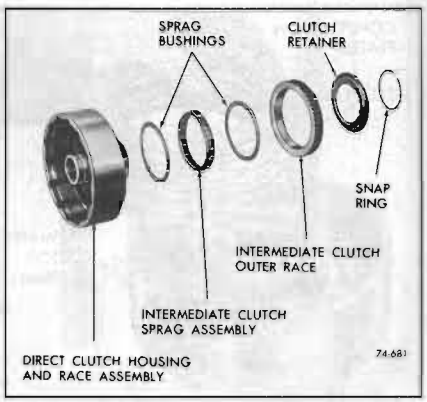


Figure 74-683

5. Using Tool J-2590, compress spring retainer and remove snap ring. See Figure 74-674.

6. Remove retainer and sixteen (16) piston release springs. See Figure 74-675.

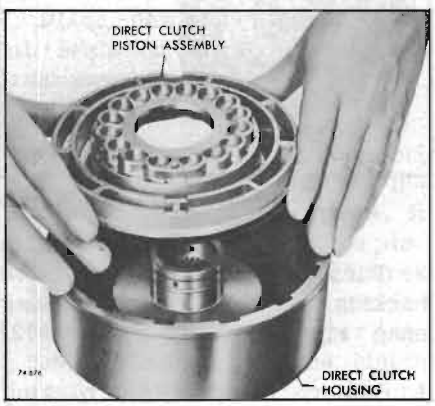


Figure 74-676

7. Remove the direct clutch piston. See Figure 74-676.

8. Remove the outer seal from the piston. See Figure 74-677.

9. Remove the inner seal from the piston. See Figure 74-678.

10. Remove the center piston seal from the direct clutch housing. See Figure 74-682.

b. Inspection

1. Inspect sprag assembly for popped or loose sprags. See Figure 74-683.

2. Inspect sprag bushings for wear or distortion.

3. Inspect the inner and outer races for scratches or wear.

4. Inspect the clutch housing for cracks, wear, proper opening of oil passages or wear on clutch plate drive lugs.

5. Inspect the drive and driven clutch plates for sign of wear or burning.

6. Inspect the backing plate for scratches or other damage.

7. Inspect the clutch piston for cracks and free operation of the ball check.

c. Reassembly

1. Install a new inner clutch piston seal on piston with lips facing away from spring pockets. Make certain correct piston is used. See Figure 74-678.

2. Install a new outer clutch piston seal with lip away from spring pockets. See Figure 74-677.

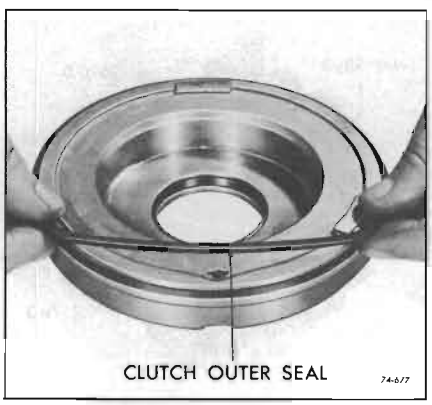


Figure 74-677

Figure 74-682

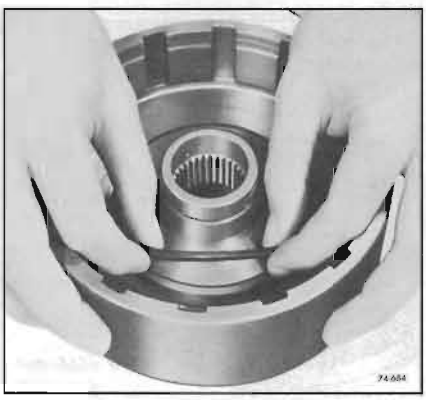


Figure 74-684

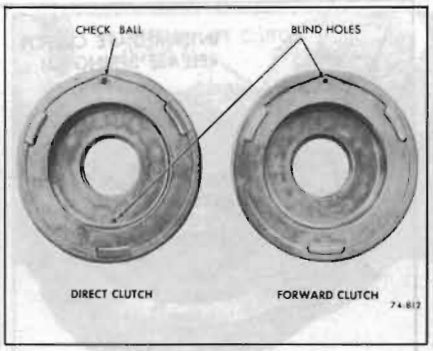


Figure 74-685

NOTE: Make certain the piston has a ball check. The piston with the blind hole is for the forward clutch assembly. See Figure 74-685.

3. Install a new center seal on clutch housing with lip of seal facing up. See Figure 74-684.

4. Place Seal Protectors, Tools J-21362 - Inner, J-21409 - Outer, over hub and clutch housing and install clutch piston. See Figure 74-686.

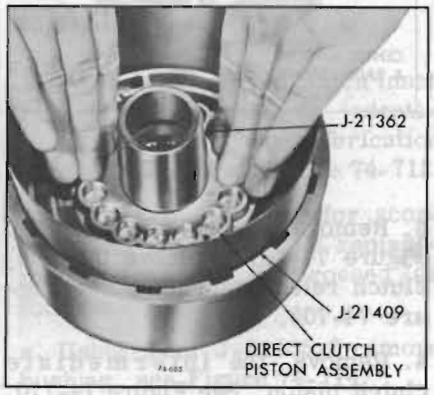


Figure 74-686

Figure 74-687

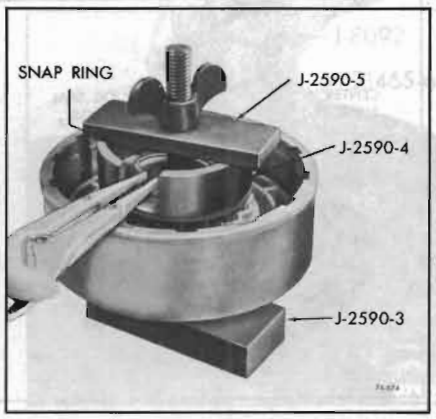


Figure 74-688

5. Install sixteen (16) springs into the piston. See Figure 74-687.

6. Place spring retainer and snap ring on springs.

7. Using Tool J-2590, install snap ring. See Figure 74-688.

8. Install five (5) composition and five (5) steel clutch plates, starting with the waved steel and alternating steel and composition. See Figure 74-689.

NOTE: Do not use radial groove plates here.

9. Install the clutch backing plate.

10. Install the backing plate retaining snap ring. See Figure 74-690.

11. Turn unit over and install one sprag bushing, cup side up, over inner race.

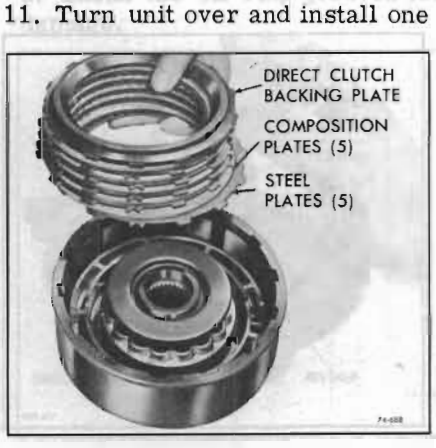


Figure 74-689

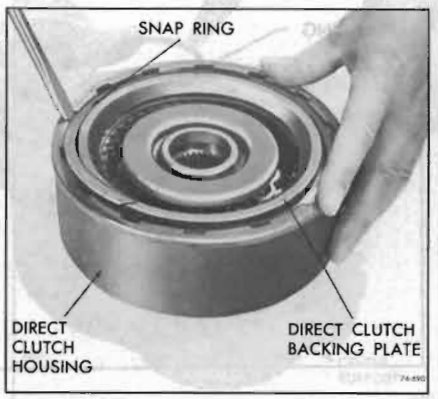


Figure 74-690

12. Install sprag assembly into outer race.

13. With ridge on inner cage facing down start sprag and outer race over inner race with clockwise turning motion. See Figure 74-691.

Figure 74-691

Figure 74-692

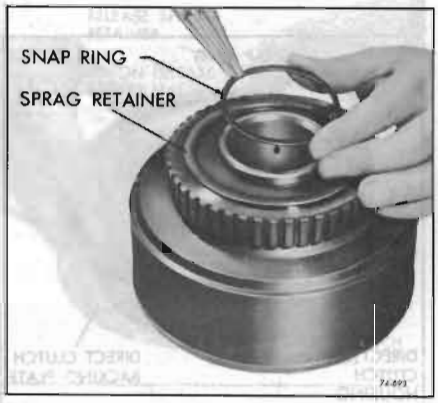


Figure 74-693

NOTE: Outer race should not turn counterclockwise after installation.

14. Install sprag retainer over sprag, cup side down. See Figure 74-692.

15. Install sprag retainer snap ring. See Figure 74-693.

16. Place direct clutch assembly over center support and air check operation of direct clutch. See Figure 74-694.

NOTE: If air is applied through reverse passage it will escape from the direct clutch passage. This is normal.

74-23 CENTER SUPPORT AND INTERMEDIATE CLUTCH

a. Disassembly

1. Remove four (4) hook type oil

Figure 74-694

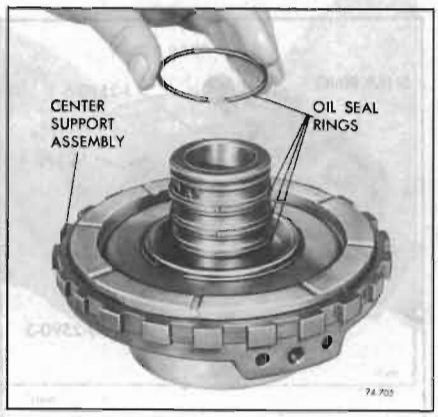


Figure 74-705

seal rings from center support. See Figure 74-705.

2. Using Clutch Compressor J-2590, compress the spring retainer and remove the snap ring. See Figure 74-706.

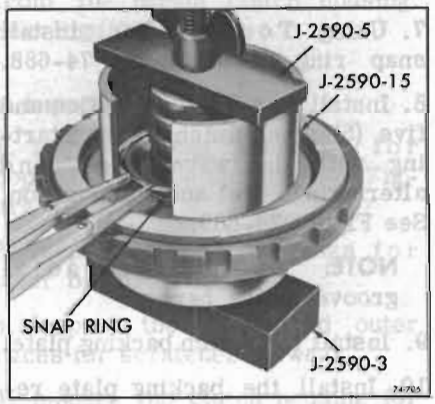


Figure 74-706

Figure 74-707

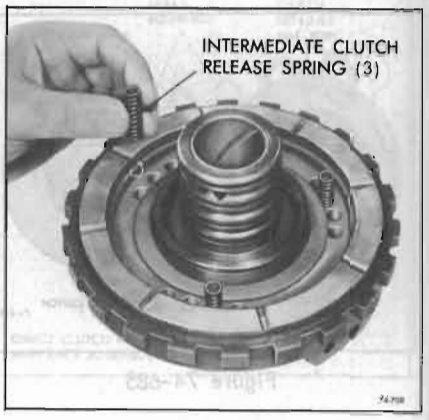


Figure 74-708

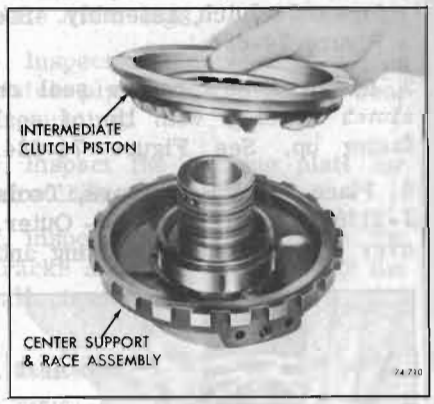


Figure 74-710

3. Remove spring retainer. See Figure 74-707. Remove three (3) clutch release springs. See Figure 74-708.

4. Remove the intermediate clutch piston. See Figure 74-710.

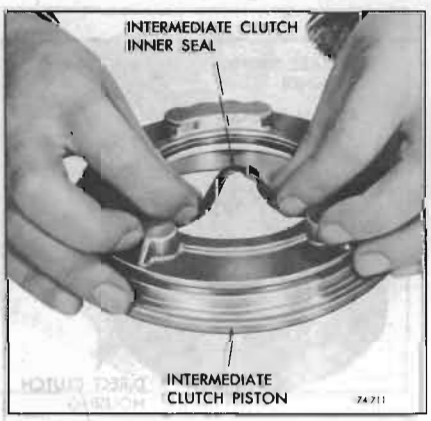


Figure 74-711

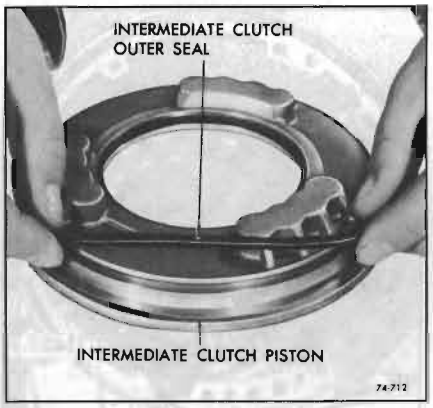


Figure 74-712

NOTE: Do not remove the three (3) bolts retaining the roller clutch inner race to the center support.

5. Remove the inner piston seal. See Figure 74-711.

6. Remove the outer piston seal. See Figure 74-712.

b. Inspection

1. Inspect the roller clutch inner race for scratches or indentations. Be sure the lubrication hole is open. See Figure 74-713.

2. Inspect the bushing for scoring, wear or galling. If replacement is necessary proceed as follows:

a. Using Tool J-21465-6 remove bushing. see Figure 74-714.

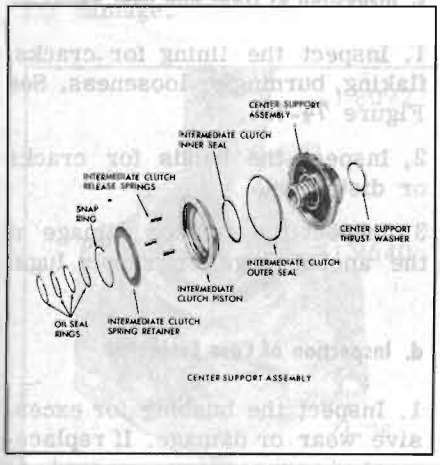


Figure 74-713

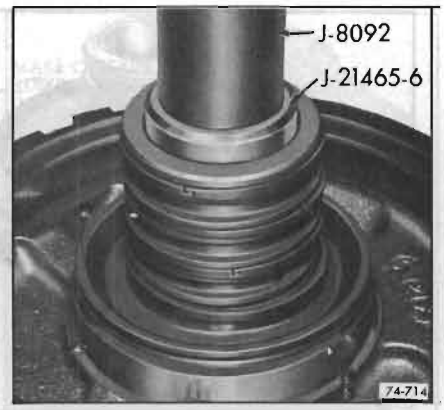


Figure 74-714

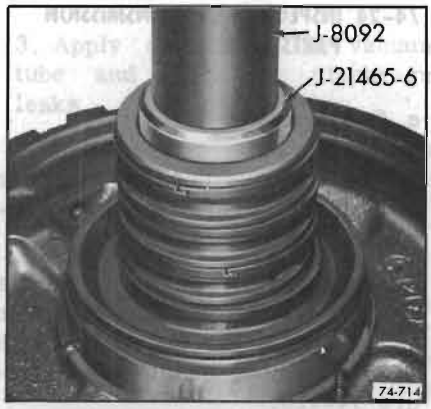


Figure 74-715

b. From front side of center support install bushing using Tool J-21465-6. See Figure 74-715. Install bushing flush to .010 below top surface of center support oil delivery sleeve.

2. Check the oil ring grooves for damage.

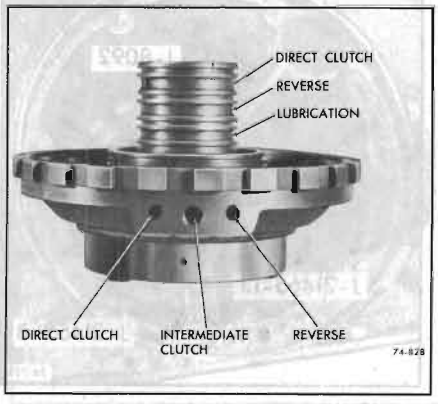


Figure 74-716

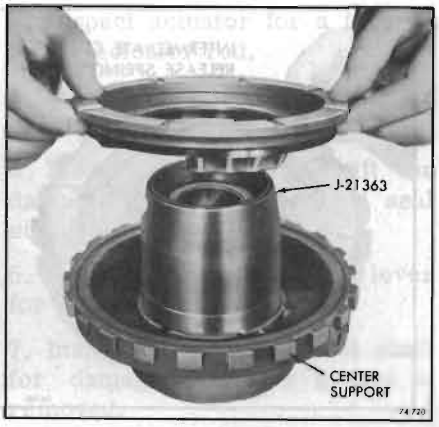


Figure 74-720

3. Air check the oil passages to be sure they are open and not interconnected. See Figure 74-716. Be sure constant bleed plug orifice is open.

4. Inspect piston sealing surfaces for scratches.

5. Inspect the piston seal grooves for nicks or other damage.

6. Inspect the piston for cracks or porosity.

7. Inspect the release springs for distortion.

c. Reassembly

1. Install new inner seal on the piston with lip of the seal facing away from the spring pocket. See Figure 74-711.

2. Install new outer seal with the lip away from the spring pockets. See Figure 74-712.

3. Install inner seal protector, Tool J-21363, on the center support hub, install the piston. See Figure 74-720.

4. Install three (3) release springs into the piston, space equally during assembly. See Figure 74-721.

5. Place the spring retainer and snap ring over the springs.

6. Using the Clutch Spring Compressor, J-2590, compress the

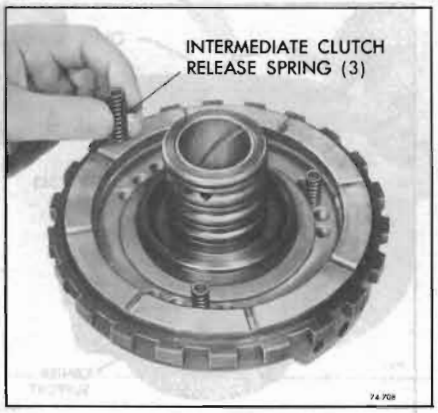


Figure 74-721

springs and install the snap ring. See Figure 74-722.

7. Install four (4) hook type oil rings. See Figure 74-723.

8. Air check operation of intermediate clutch piston. See Figure 74-724.

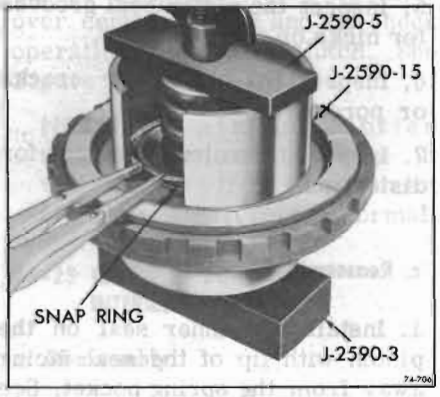


Figure 74-722

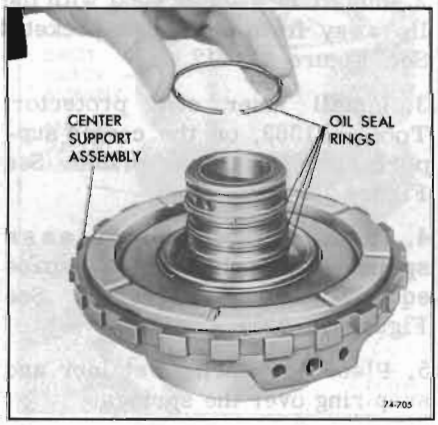


Figure 74-723

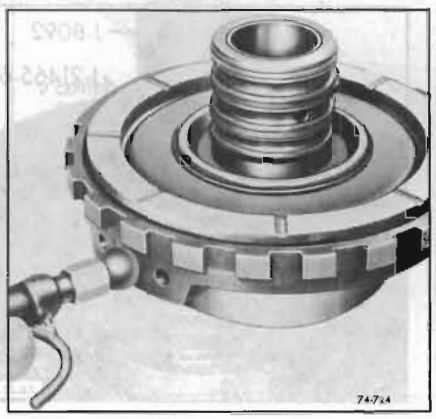


Figure 74-724

74-24 INSPECTION OF TRANSMISSION PARTS

a. Case Bushing

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

a. Thread Extension Handle J-21465-13 into Bushing Remover J-21465-8 using Drive Handle J-8092 remove bushing. see Figure 74-725.

b. Using Adapter J-21465-9 on J-21465-8 install new bushing. See Figure 74-726.

c. Using J-21465-10 stake bushing in oil groove.

2. Inspect the bearing and thrust washer surfaces for damage.

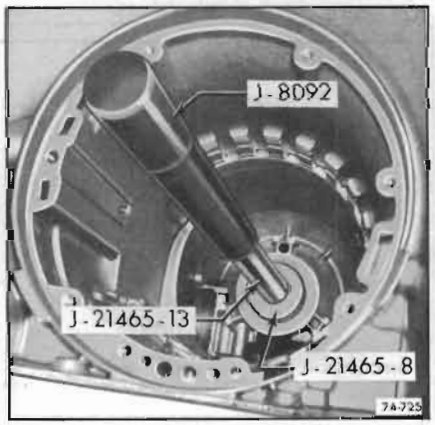


Figure 74-725

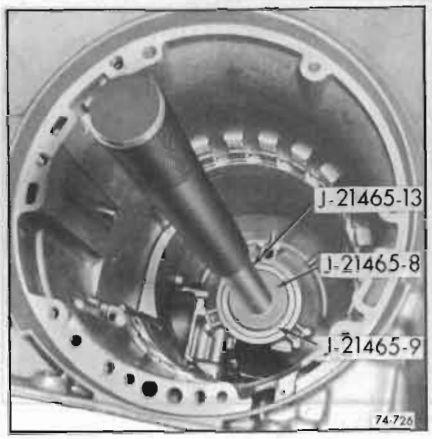


Figure 74-726

3. Inspect the governor drive gear for rough or damaged teeth.

4. Inspect the splines for damage.

5. Inspect the orificed cup plug in the lubrication passage.

6. Inspect the drive lugs for damage.

b. Inspection of Turbine Shaft

1. Inspect for open lubrication passages at each end.

2. Inspect the splines for damage.

3. Inspect the ground bushing journals for damage.

4. Inspect the shaft for cracks or distortion.

c. Inspection of Front and Rear Bands

1. Inspect the lining for cracks, flaking, burning or looseness. See Figure 74-727.

2. Inspect the bands for cracks or distortion.

3. Inspect the end for damage at the anchor lugs or supply lugs.

d. Inspection of Case Extension

1. Inspect the bushing for excessive wear or damage. If replacement is necessary proceed as follows:

Figure 74-727

a. Use J-8092 Drive Handle and Tool J-9640 remove. See Figure 74-728.

b. Using Tool J-9640 install bushing. See Figure 74-728.

c. Using J-21465-10 stake bushing in oil ring groove. See Figure 74-730.

2. Inspect the housing for cracks or porosity.

3. Be sure rear seal drain back port is not obstructed.

e. Inspection of Modulator and Valve

1. Inspect the modulator assembly for any signs of bending or distortion. See Figure 74-731.

2. Inspect the "O" ring seal seat for damage.

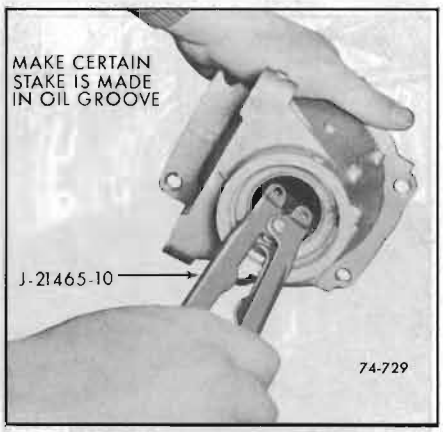


Figure 74-730

3. Apply suction to the vacuum tube and check for diaphragm leaks.

4. Inspect the modulator valve for nicks or damage.

5. Check freeness of valve operation in case bore.

6. Check modulator bellows, modulator plunger is under pressure. If bellows is damaged the plunger will have very little pressure.

f. Inspection of Manual and Parking Linkage

1. Inspect the parking actuator rod for cracks, broken spring retainer lugs. See Figure 74-530.

2. Inspect the actuator spring for damage.

3. Inspect actuator for a free fit on the actuator rod.

4. Inspect the parking pawl for cracks or wear, if removed.

5. Inspect the manual shaft for damaged threads, rough oil seal surface or loose lever.

6. Inspect the inside detent lever for cracks or a loose pin.

7. Inspect the parking pawl shaft for damaged retainer groove if removed.

8. Inspect the parking pawl return spring for deformed coils or ends.

9. Inspect the parking bracket for cracks or wear.

10. Inspect detent roller and spring assembly.

g. Inspection of Case Assembly

1. Inspect case assembly for cracks, porosity or interconnected passages.

NOTE: If case porosity exists repair following procedures outlined in Paragraph 74-37, subparagraph c.

2. Check for good retention of band anchor pins.

3. Inspect all threaded holes for thread damage.

4. Inspect the intermediate clutch

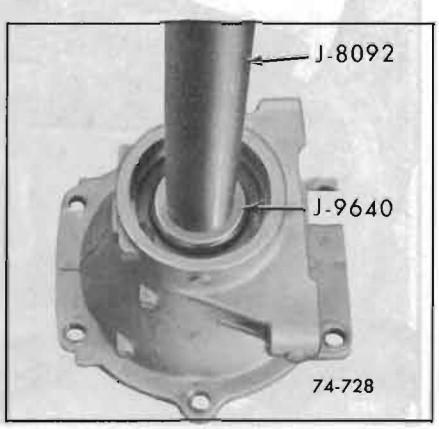


Figure 74-728

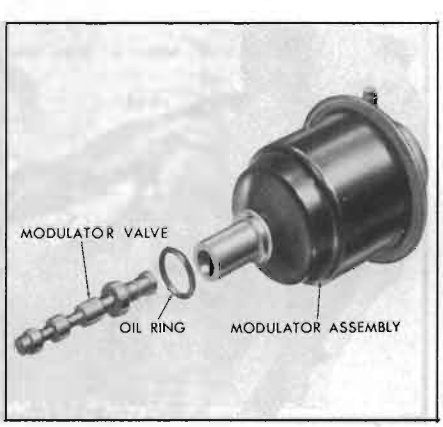


Figure 74-731

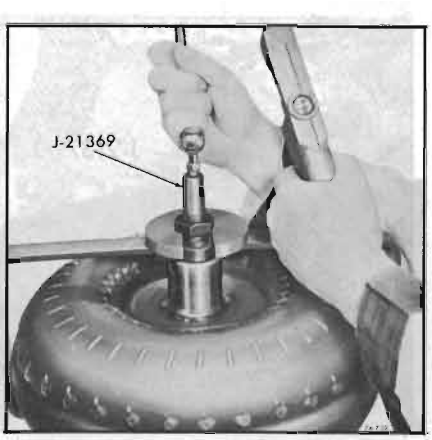


Figure 74-732

driven plate lugs for damage or brinelling.

5. Inspect the snap ring grooves for damage.

6. Inspect the bore for the governor assembly for scratches or scoring.

7. Inspect the modulator valve bore for scoring or damage.

8. Inspect the cup plug inside the case for good staking and sealing.

h. Inspection of Torque Converter

1. Check converter for leaks as follows: (See Figure 74-732.)

a. Install Tool J-21369, and tighten.

b. Fill converter with air; 80 psi.

c. Submerge in water and check for leaks.

2. Check converter hub surfaces for signs of scoring or wear.

3. Check converter end clearance as follows:

a. Install Tool J-21371-2 and tighten brass nut. See Figure 74-743.

b. Install Tool J-21371-3 and tighten hex nut. See Figure 74-744.

c. Install dial indicator set at 0 as shown in Figure 74-745.

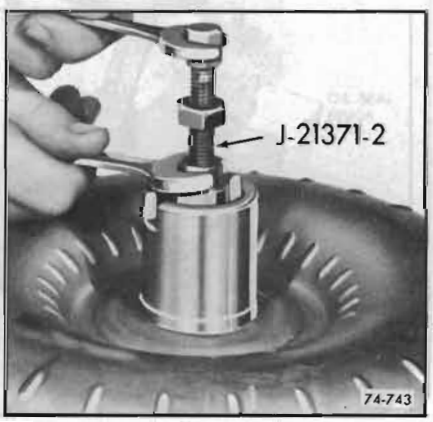


Figure 74-743

Figure 74-744

Figure 74-745

d. Loosen hex nut. 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. See Figure 74-745.

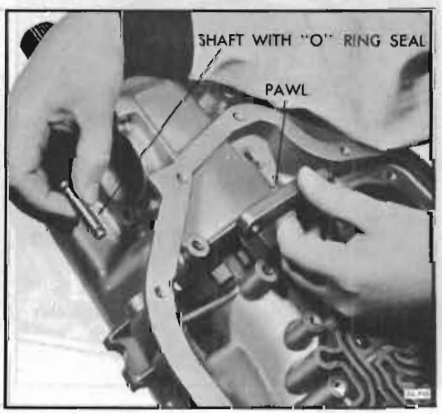


Figure 74-746

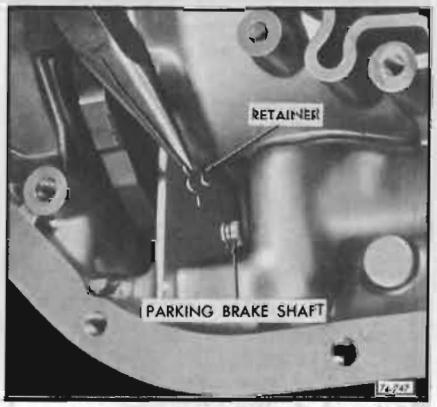


Figure 74-747

74-25 ASSEMBLY OF MAJOR UNITS

NOTE: The first three steps can be omitted if the parts involved were not removed on disassembly.

1. Install the parking pawl, tooth toward the inside case and parking pawl shaft. See Figure 74-746.

2. Install the parking pawl shaft retainer clip. See Figure 74-747.

3. Install cup plug and drive into case, using a 3/8" dia. rod, until parking pawl shaft bottoms on case rib. See Figure 74-748.

Figure 74-748

Figure 74-749

Figure 74-752

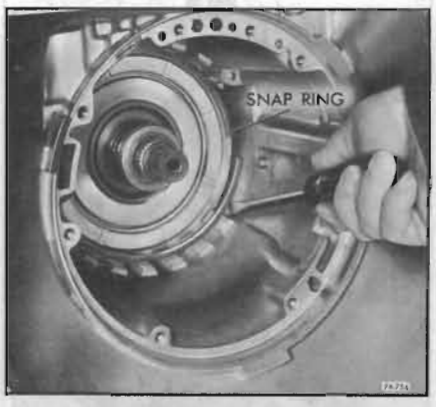


Figure 74-754

Figure 74-750

4. Install the parking pawl return spring, square end hooked on pawl. See Figure 74-749.

5. Install the parking brake bracket, guides over parking pawl, using two attaching bolts torque to 15-20 lb. ft. See Figure 74-750.

6. Install the rear band assembly so that the two lugs index with the two anchor pins. See Figure 74-751. Check band to be sure band ends are seated on lugs.

7. Lubricate and install rear selective washer into slots provided inside rear of transmission case. See Figure 74-752.

8. Install complete gear unit assembly into case making certain center support bolt hole is properly aligned with hole in case. See Figure 74-753.

NOTE: Make certain tangs on output shaft to case thrust washer are positioned in pockets. See Figure 74-589.

9. Oil and install center support to case retaining snap ring with bevel side up and locating gap adjacent to band anchor pin. Make certain ring is properly seated in case. See Figure 74-754.

Figure 74-755

10. Install center support locating screw (tool) for locating center support. Torque to 4-6 lb. ft. See Figure 74-755.

Figure 74-751

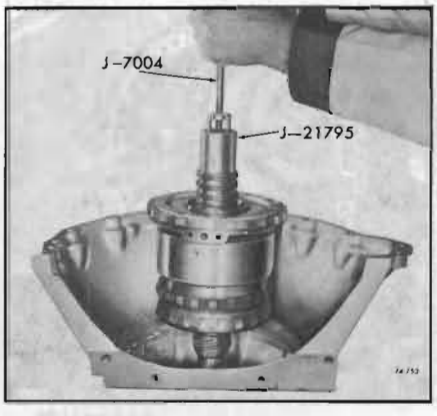


Figure 74-753

Figure 74-756

Figure 74-757

11. Install case to center support bolt. Torque 20-25 lb. ft. See Figure 74-755.

12. Remove center support locating screw.

13. Install three (3) steel and three (3) composition intermediate clutch plates. Start with waved steel, alternate the plates. See Figure 74-756.

14. Install the intermediate clutch backing plate ridge up.

15. Install the backing plate to case snap ring. Gap in snap ring should be opposite band anchor pin. See Figure 74-757.

16. Check rear end play as follows: See Figure 74-758.

a. Install J-7004 into an extension housing attaching bolt hole. See Figure 74-758.

b. Mount the Dial Indicator, J-8001, on the rod and index with the end of the output shaft.

c. Apply air pressure to apply the intermediate clutch (center oil passage) while moving the output shaft in and out to read the end play. End play should be from .003"-.019". The selective washer controlling this end play is the steel washer having 3 lugs that is located between the thrust washer and the rear face of the transmission case.

If a different washer thickness is required to bring the end play within specification, it can be selected from the following chart.

Thickness	Notches
.078-.082	None
.086-.090	1 Tab Side
.094-.098	2 Tabs Side
.102-.106	1 Tab O.D.
.110-.114	2 Tabs O.D.
.118-.122	3 Tabs O.D.

17. Install front band with band anchor hole placed over the band anchor pin and apply lug facing servo hole. See Figure 74-760.

18. Install the direct clutch and intermediate sprag assembly. It will be necessary to twist the housing to allow the sprag outer race to index with the clutch drive plates. The housing hub will bottom on the sun gear shaft. See Figure 74-761.

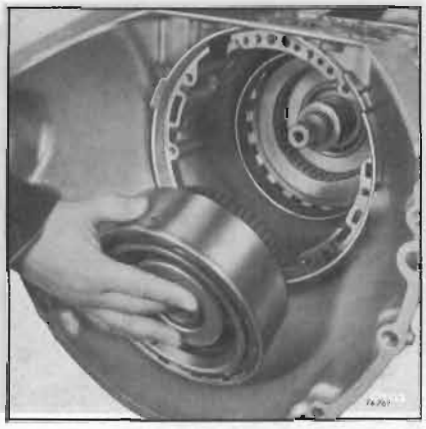


Figure 74-761

NOTE: Removal of direct clutch, drive and driven plates, may be helpful.

19. Install the forward clutch hub to direct clutch housing thrust washer on the forward clutch hub. Retain with petroleum.

20. Install the forward clutch and turbine shaft assembly, indexing the direct clutch hub so end of the mainshaft will bottom on end of the forward clutch hub. When forward clutch is seated it will be approximately 1-1/4" from pump face in case. See Figure 74-762.

21. Install the front pump assembly guiding stator wire through

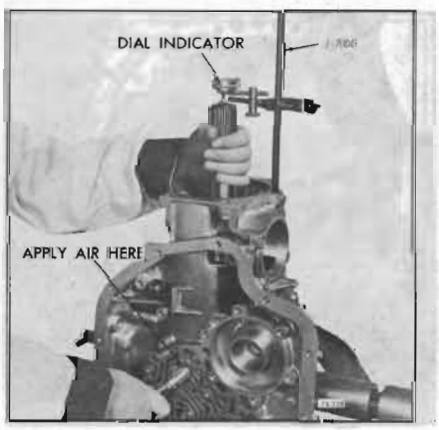


Figure 74-758

Figure 74-760

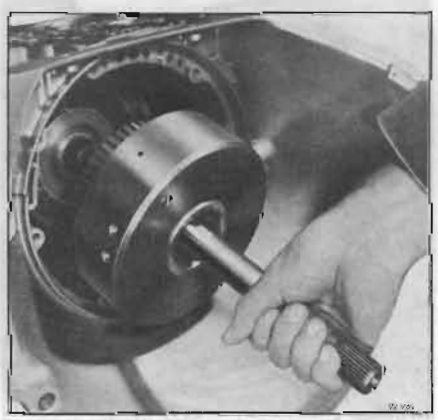


Figure 74-762

Figure 74-763

case hole at pressure regulator. See Figure 74-763.

22. Install the front pump assembly and all but one attaching bolt and seal. Always use new seal on bolt. Torque 15-20 lb. ft.

NOTE: If the turbine shaft can not be rotated as the pump is being pulled into place, the forward or direct clutch housings have not been properly installed to index with all the clutch plates. This condition must be corrected before the pump is pulled fully into place.

23. If necessary, install a new front seal, using Tool J-21359, to drive the seal in place. See Figure 74-764.

24. Check front unit end play as follows: See Figure 74-765.

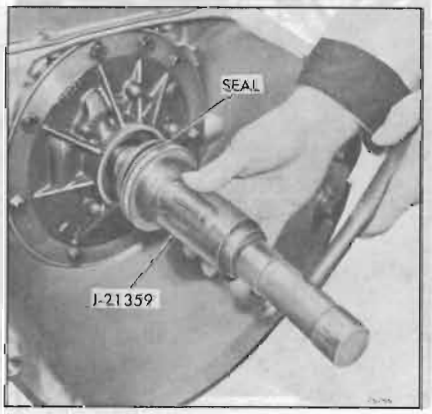


Figure 74-764

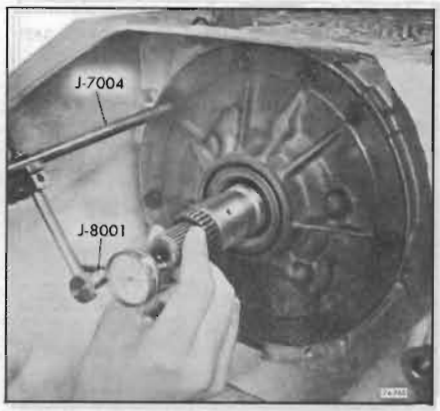


Figure 74-765

a. Remove one front pump attaching bolt, and bolt seal.

b. Install J-7004 Slide Hammer into bolt hole.

c. Mount the dial indicator on the rod and index indicator to register with end of turbine shaft.

d. Push turbine shaft rearward.

e. Push output shaft forward.

f. Set dial indicator to zero.

g. Pull turbine shaft forward.

Read the resulting travel or end play which should be .003"-.024".

The selective washer controlling this end play is the phenolic resin washer located between the pump cover and the forward clutch housing. If more or less washer thickness is required to bring end play within specifications, select the proper washer from the chart below.

Thickness	Color
.060-.064	Yellow
.071-.075	Blue
.082-.086	Red
.093-.097	Brown
.104-.108	Green
.115-.119	Black
.126-.130	Purple

NOTE: An oil soaked washer may tend to discolor so that it will be necessary to measure the washer for its actual thickness.

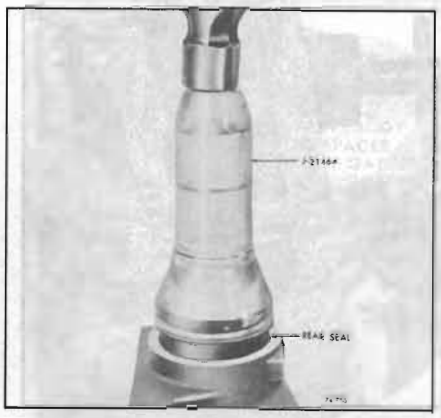


Figure 74-766

25. Install the remaining front pump attaching bolt and new seals. Torque bolts to 15-20 lb. ft.

74-26 REAR EXTENSION HOUSING

1. Install the extension housing to case gasket on the extension housing.

2. Attach the extension housing to the case using attaching bolts. Torque bolts to 20-25 lb. ft.

3. If necessary, install a new rear seal, using Seal Installer Tool J-21464. See Figure 74-766.

74-27 INSTALLATION MANUAL LINKAGE

1. If necessary, install a new manual shaft to case lip seal using a

Figure 74-767

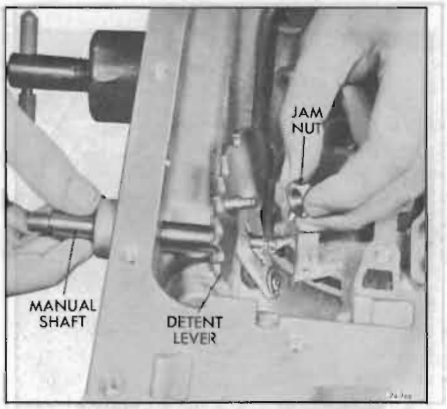


Figure 74-768

3/4" dia. rod seat seal in case.

2. If removed, insert the actuator rod into manual detent lever from side opposite pin.

3. Install the actuator rod plunger under the parking bracket and over the parking pawl.

4. Install the manual shaft through the case and detent lever. See Figure 74-767.

5. Install retaining hex-lock nut on manual shaft. See Figure 74-768.

6. Install manual shaft retaining pin indexing with groove in manual shaft. See Figure 74-770.

NOTE: It may be necessary to bend pin to install. Straighten pin as it is installed.

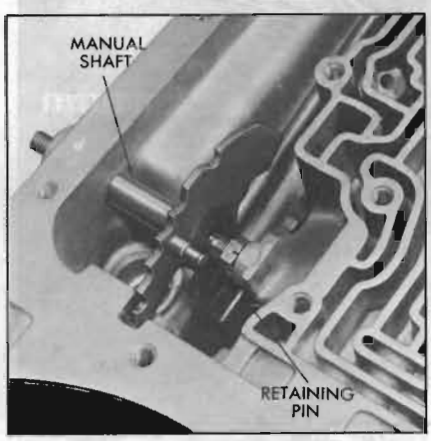


Figure 74-770

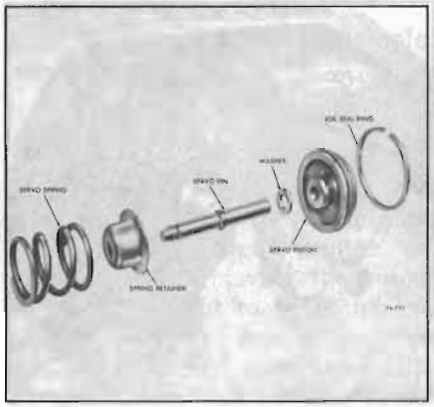


Figure 74-771

7. Tighten lock nut on manual shaft.

74-28 INSTALLATION OF CHECK BALLS, FRONT SERVO, GASKETS, SPACER AND SOLENOID

1. Install front servo spring and retainer into the transmission case. See Figure 74-771.

2. Install flat washer on front servo pin on end opposite taper.

3. Install pin and washer into case so that tapered end is contacting band.

4. Install oil seal ring on front servo piston if removed, and install on apply pin so that identification numbers on shoulders are positioned toward bottom of pan. See Figure 74-771.

5. Check freeness of piston by stroking piston in bore.

6. Install six (6) check balls into transmission case pockets. See Figure 74-772.

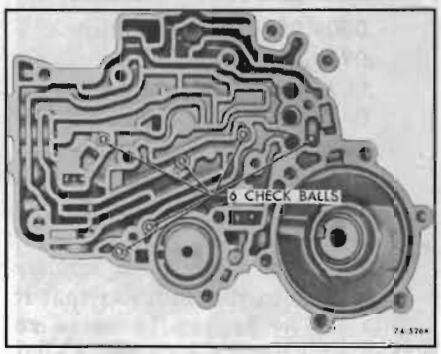


Figure 74-772

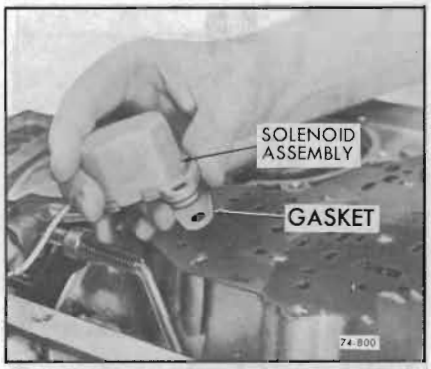


Figure 74-773

7. Install valve body spacer to case gasket. (Gasket with extension for solenoid).

8. Install valve body to case spacer plate.

9. Install solenoid gasket. See Figure 74-773.

10. Install solenoid assembly with connector facing outer edge of case, using attaching bolts.

NOTE: Do not tighten bolts at this time.

11. Install "O" seal ring on the solenoid connector.

12. Install connector with lock tabs facing into case, positioning locator tab in notch on side of case. See Figure 74-774.

Figure 74-774

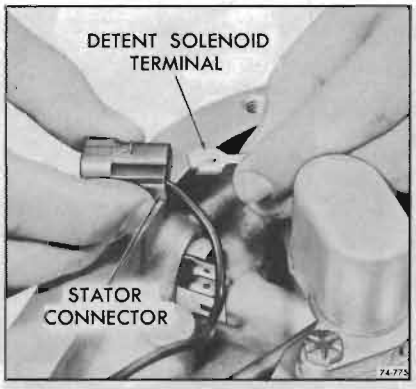


Figure 74-775

13. Install detent connector terminal into stator connector, pushing inward so that terminal connections are locked.

NOTE: Check by pulling on detent connector wire. If detent connector wire can be removed, turn wire connector over and reinstall into stator connector. If both wires were removed, reinstall as shown in Figure 74-775.

74-29 INSTALLATION OF REAR SERVO ASSEMBLY

1. Install rear servo accumulator spring into case.

2. Install rear servo assembly into case. See Figure 74-776.

3. Install rear servo gasket and cover. See Figure 74-777.

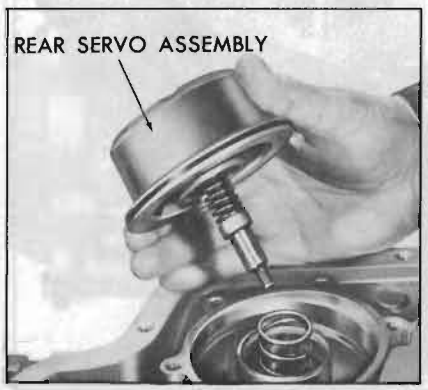


Figure 74-776

Figure 74-777

4. Install attaching bolts. Torque bolts to 15-20 lb. ft. See Figure 74-780.

74-30 INSTALLATION OF VALVE BODY ASSEMBLY AND GOVERNOR PIPES

1. Install valve body to spacer plate gasket. See Figure 74-781.

2. Install governor pipes into valve body assembly. See Figure 74-782.

3. Install two guide pins (control valve assembly attaching bolts with heads removed). See Figure 74-783.

4. Install control valve assembly and governor pipes. See Figure 74-783.

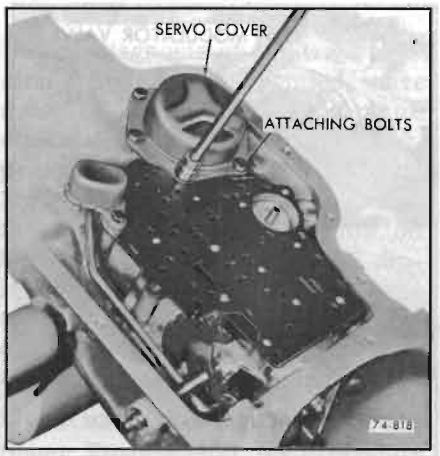


Figure 74-780

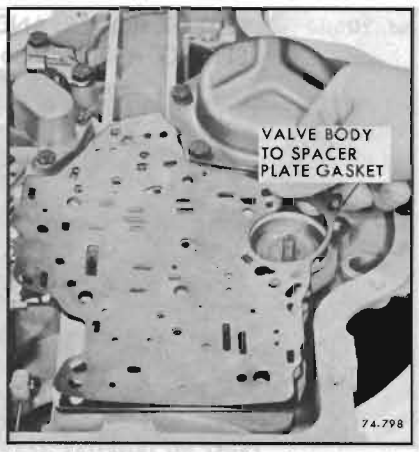


Figure 74-781

Figure 74-782

NOTE: Make certain manual valve is properly indexed with pin on detent lever and governor pipes are properly installed in case.

Figure 74-783

Figure 74-784

5. Remove guide pins.

6. Install control valve assembly attaching bolts, solenoid wire clip and detent roller and spring assembly. Center roller on detent lever. See Figure 74-784. Route stator solenoid wire as shown in Figure 74-785.

7. Tighten solenoid and valve body attaching bolts. Torque bolts to 6-10 lb. ft.

74-31 INSTALLATION OF OIL STRAINER

1. Install case to intake pipe "O" ring seal on filler assembly. See Figure 74-786.

2. Install filter assembly.

3. Install a new pan gasket and oil pan. Install attaching bolts and torque 10-13 lb. ft.

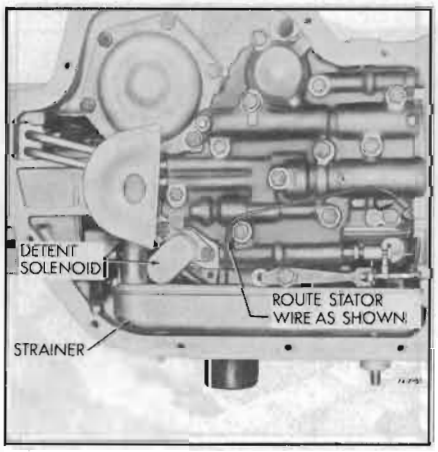


Figure 74-785

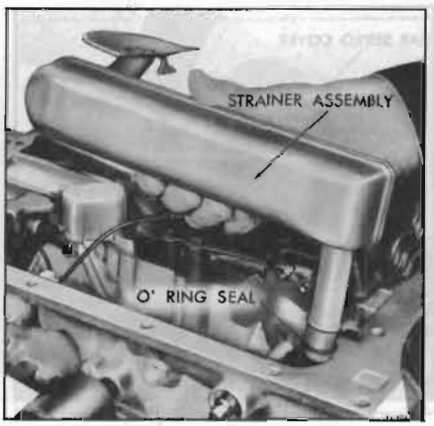


Figure 74-786

74-32 INSTALLATION OF MODULATOR VALVE AND VACUUM MODULATOR

1. Install modulator valve into the case, stem end out. See Figure 74-787.

2. Install the "O" ring seal on the vacuum modulator.

3. Install the vacuum modulator into the case.

4. Install the modulator retainer and attaching bolt. Torque bolt to 15-20 lb. ft. See Figure 74-788.

74-33 INSTALLATION OF GOVERNOR ASSEMBLY

1. Install the governor assembly into the case. See Figure 74-790.

Figure 74-787

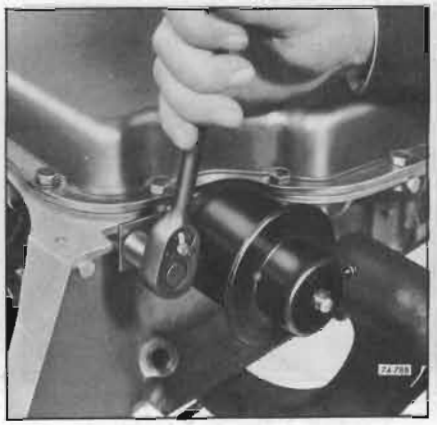


Figure 74-788

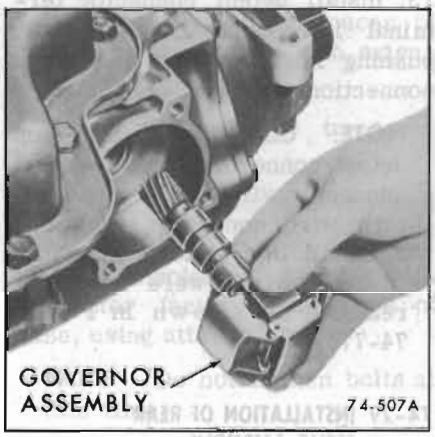


Figure 74-790

2. Attach the governor cover and gasket with four (4) attaching bolts. Torque bolts to 15-20 lb. ft. See Figure 74-791.

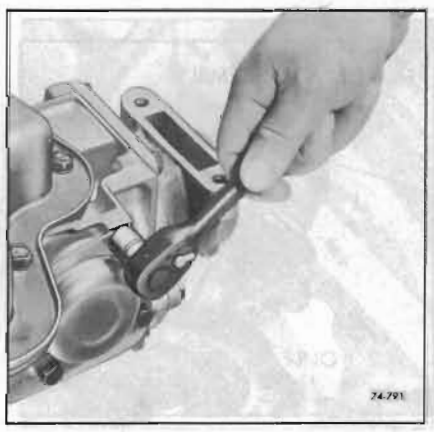


Figure 74-791

Figure 74-792

74-34 INSTALLATION OF SPEEDOMETER DRIVEN GEAR ASSEMBLY AND CONVERTER ASSEMBLY

1. Install the speedometer driven gear assembly. See Figure 74-792.

2. Install the speedometer driven gear retainer and attaching bolt. See Figure 74-793.

3. Install converter assembly into front oil pump. Extreme care must be taken not to damage seal.

NOTE: Make certain converter hub drive bolts are fully engaged with pump drive gear tangs.

4. Install Converter Holding Tool J-21366 to retain converter until ready to install in car.

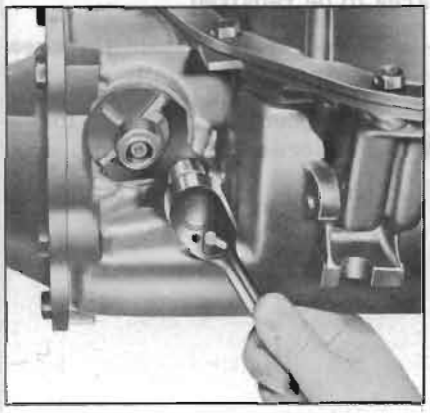


Figure 74-793

DIVISION IV TROUBLE DIAGNOSIS

74-35 SEQUENCE FOR SUPER TURBINE 400 TRANSMISSION DIAGNOSIS

1. Check and correct oil level.

2. Check and correct detent and idle stator switches. See Figure 74-201. See Figures 120-123 and 120-124 for wiring diagrams.

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 gauge.

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

74-36 SUPER TURBINE 400 TRANSMISSION OIL CHECKING PROCEDURES

Before diagnosis of any transmission complaint is attempted, there must be an understanding of oil checking procedures 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 Super Turbine 400, the procedure outlined in Paragraph 74-1, subparagraph c should be observed 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.

74-37 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 cource 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 the air stream. For example, a transmission oil filler pipe 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:

*A "Black Light" testing unit can be obtained from your local service tool supplier.

1. Degrease underside of transmission.

2. Road test to get unit at operating temperature. (180°F)

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. Rear Bearing Retainer

a. Attaching bolts not correctly torqued.

b. Rear seal assembly damaged or improperly installed.

c. Extension to case, gasket damaged or improperly installed.

d. Porous casting. See paragraph 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. Solenoid connector "O" ring seal damaged or improperly installed.

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

e. Speedometer gear "O" ring damaged.

f. Manual shaft lip seal damaged or improperly installed.

g. Parking pawl shaft cup plug - damaged, improperly installed.

h. Line pressure band release tap plug loose.

i. Vent pipe (refer to item 5).

j. 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 "O" rings 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 matter between pump and case or between pump cover and body.

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

e. Pump to case gasket mispositioned.

c. Case Porosity Repair

Super Turbine 400 transmission leaks caused by case porosity have successfully been 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°.

2. Raise car on a hoist or jack stand, engine running and locate source of oil leak. See subparagraph b.

NOTE: Use of a mirror is helpful in finding leaks.

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

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

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 mfg. 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.

74-38 SUPER TURBINE 400 TROUBLE DIAGNOSIS CHART

PROBLEM	POSSIBLE CAUSE	POSSIBLE CONDITION
I. NO DRIVE IN DRIVE RANGE - (INSTALL PRESSURE GAUGE)	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 - (Refer to par. 74-39)	1. Filter Assembly - "O" ring missing or damaged, neck weld leaking, 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 manual 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 74-39	A. High Oil Pressure	1. Vacuum 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 74-39 (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 *See paragraph 74-37 subparagraph c.	A. Detent Switch. See Figures 120, 123 and 124 for wiring diagrams.	1. Sticking or defective (See Figure 74-201).
	B. Detent Solenoid	1. Loose. 2. Gasket leaking. 3. Sticks open.
	C. Control Valve Assembly	1. Valve body gaskets - leaking, damaged, incorrectly installed. 2. Detent valve train. 3. 3-2 valve stuck - Model BW only.
	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, leaking, pipes out of position. 3. Valve body gaskets - leaking, damaged, incorrectly installed.
	C. Case	1. Intermediate clutch plug leaking or blown out. 2. Porosity between channels. 3. Governor feed channel blocked.

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. Case center support - oil rings missing, broken, defective - orifice plug missing.
V. FIRST AND SECOND SPEEDS ONLY, NO. 2-3 SHIFT	A. Detent Solenoid	1. Stuck open (Detent shifts only - the 2-3 shift would occur at very high speeds, being interpreted as no 2-3 shifts).
	B. Detent Switch. See Figures 120-123 and 120-124 for wiring diagrams.	1. Refer to Figure 74-201.
	C. Control Valve Assembly	1. 2-3 shift train stuck. 2. Valve body gaskets - leaking, damaged, incorrectly installed.
	D. Direct Clutch	1. Case center support - oil rings missing, broken, defective. 2. Clutch piston seals - missing, improperly assembled, cut, piston ball check stuck or missing.
VI. DRIVE IN NEUTRAL	A. Manual Linkage	1. Maladjusted.
	B. Forward Clutch	1. Clutch does not release - (this condition will also cause "No Reverse").
VII. NO DRIVE IN REVERSE, or SLIPS IN REVERSE - (Install Pressure Gauge)	A. Low Oil Level	1. Add oil - See Paragraph 74-1 Subparagraph c.
	B. Manual Linkage	1. Misadjusted. Refer to Group 73.
	C. Oil Pressure - (Refer to par. 74-39)	1. Vacuum modulator assembly - defective. 2. Vacuum modulator valve - sticking. 3. Restricted strainer or filter leak at intake pipe, or intake "O" ring.

PROBLEM	POSSIBLE CAUSE	POSSIBLE CONDITION
VII. NO DRIVE IN REVERSE, or SLIPS IN REVERSE - (Install Pressure Gauge) (Cont'd)	C. Oil Pressure - (Refer to par. 74-39) (Cont'd)	4. Pump assembly - regulator or boost valve sticking.
	D. Control Valve Assembly	1. Valve body gaskets - leaking, damaged, incorrectly installed (Other malfunctions may also be indicated). 2. Low Reverse ball check - missing from case (This will also cause no overrun braking in L[1] Range). 3. 2-3 Valve train stuck open (This will also cause 1-3 upshift in Drive Range). 4. Reverse feed passage - missing check case passages.
	E. Rear Servo and Accumulator	1. Servo piston seal ring, damaged or missing. 2. Short band apply pin (This may also cause no overrun braking or slips in overrun braking - L[1] Range).
	F. Reverse or Low Band	1. Burned, loose lining, apply pin or anchor pins not engaged, band broken.
	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 Gauge)	A. Oil Level Low	1. Add oil - See Paragraph 74-1, subparagraph c.
	B. Oil Pressure (Refer to par. 74-39)	1. Vacuum modulator defective 2. Vacuum modulator valve sticking. 3. Strainer or filter assembly - plugged or leaks at neck; "O" ring missing or damaged.

PROBLEM	POSSIBLE CAUSE	POSSIBLE CONDITION
VIII. SLIPS IN ALL RANGES, SLIPS ON START - (Install Pressure Gauge) (Cont'd)	B. Oil Pressure (Refer to par. 74-39) (Cont'd)	4. Pump assembly - regulator or boost valve sticking, cross leak. 5. Pump to case gasket damaged or incorrectly installed.
	C. Case	1. Cross leaks, porosity.
	D. Forward and Direct Clutches Slipping	1. If burned, look for cause.
IX. SLIPS 1-2 SHIFT - (Install Pressure Gauge)	A. Oil Level Low	1. Add oil - See Paragraph 74-1, Subparagraph c.
	B. Oil Pressure (Refer to par. 74-39)	1. Vacuum modulator assembly defective. 2. Modulator valve sticking. 3. Pump pressure regulator valve.
	C. Front Accumulator	1. Oil ring damaged or missing.
	D. Control Valve Assembly	1. 1-2 accumulator valve train. 2. Porosity in valve body or case.
	E. Rear Accumulator	1. Oil ring missing or damaged, case bore damaged.
	F. Pump to Case Gasket	1. Mispositioned.
	G. Case	1. Intermediate clutch plug-leaking excessively. 2. Porosity between channels.
	H. Intermediate Clutch	1. Piston seals missing or damaged; clutch plates burned. 2. Case center support leak in feed circuit (oil rings damaged or grooves defective), excessive leak between tower and bushing, orifice bleed plug hole (.020 dia.) blocked.

PROBLEM	POSSIBLE CAUSE	POSSIBLE CONDITION
X. ROUGH 1-2 SHIFT - (Install Pressure Gauge)	A. Oil Pressure - (Refer to par. 74-39)	1. Vacuum modulator - check for loose fittings, restrictions in line, modulator assembly defective. 2. Modulator valve stuck. 3. Pump - regulator or boost valve stuck. 4. Pump to case gasket - off location or damaged.
	B. Control Valve Assembly	1. 1-2 accumulator valve train. 2. Valve body to case bolts loose. 3. Wrong gaskets or off location - damaged.
	C. Case	1. Intermediate clutch ball missing or not sealing. 2. Porosity between channels.
	D. Rear Servo Accumulator Assembly	1. Oil rings damaged. 2. Piston stuck. 3. Broken or missing spring. 4. Bore damaged.
XI. SLIPS 2-3 SHIFT - (Install Pressure Gauge)	A. Oil Level Low	1. Add oil - See Paragraph 74-1, Subparagraph c.
	B. Oil Pressure Low - (Refer to par. 74-39)	1. Modulator assembly. 2. Modulator valve. 3. Pump pressure regulator valve or boost valve; pump to case gasket off location.
	C. Control Valve Assembly	1. Accumulator piston pin - leak at swedge end.
	D. Case	1. Porosity.
	E. Direct Clutch	1. Piston seals leaking. 2. Case center support - oil seal rings damaged; excessive leak between tower and bushing.
XII. ROUGH 2-3 SHIFT - (Install Pressure Gauge)	A. Oil Pressure - High (Refer to par. 74-39)	1. Modulator assembly defective.

PROBLEM	POSSIBLE CAUSE	POSSIBLE CONDITION
XII. ROUGH 2-3 SHIFT - (Install Pressure Gauge) (Cont'd)	A. Oil Pressure - High (Refer to par. 74-39) (Cont'd)	2. Modulator valve sticking. 3. Pump - pressure regulator or boost valve inoperative.
	B. Front Servo Accumulator Assembly	1. Front accumulator spring missing, broken. 2. Accumulator piston stuck.
XIII. NO ENGINE BRAKING - L^2 - 2nd GEAR	A. Front Servo and Accumulator	1. Servo or accumulator oil rings or bores leaking.
	B. Front Band	1. Front band broken, burned (check for cause); not engaged on anchor pin and/or servo pin.
XIV. NO ENGINE BRAKING - L^1 - 1st GEAR	A. Control Valve Assembly	1. Lo-Reverse check ball missing from case.
	B. Rear Servo	1. Oil seal ring, bore or piston damaged; leaking apply pressure. 2. Rear band apply pin short, improperly assembled.
	C. Rear Band **NOTE:** Item A, B, C, will also cause slips in Reverse or no Reverse.	1. Rear band - broken, burned (check for cause), not engaged on anchor pins or servo pin.
XV. NO DETENT DOWNSHIFTS	A. Control Valve Assembly	1. 3-2 valve stuck, spring missing or broken. BW only.
	B. Detent Switch	1. Adjustment, connections fuse.
	C. Solenoid	1. Inoperative, connections.
	D. Control Valve Assembly	1. Detent valve train.
XVI. LOW or HIGH SHIFT POINTS - (Install Pressure Gauge)	A. Oil Pressure - (Refer to par. 74-39)	1. 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.

PROBLEM	POSSIBLE CAUSE	POSSIBLE CONDITION
XVI. LOW or HIGH SHIFT POINTS - (Install Pressure Gauge) (Cont'd)	C. Detent Solenoid	1. Stuck open, loose, etc. (Will cause late shifts).
	D. Control Valve Assembly	1. Detent valve train. 2. 3-2 valve train. (BW only). 3. 1-2 shift valve train. a. 1-2 regulator valve stuck-(This would cause a constant 1-2 shift point regardless of throttle opening). 4. Spacer plate gaskets - mispositioned, spacer plate orifice holes missing or blocked.
	E. Case	1. Porosity; intermediate plug leaking, missing.
XVII. WON'T HOLD IN PARK	A. Manual Linkage	1. Maladjusted.
	B. Internal Linkage	1. Parking brake lever and actuator assembly - defective (Check for chamfer on actuator rod sleeve). 2. Parking pawl broken or inoperative.
XVIII. NO CONVERTER STATOR ANGLE CHANGE	A. Stator Switch	1. Inoperative or maladjusted - fuse - See Figure 74-201.
	B. Pump	1. Stator valve train stuck. 2. Lead wires not connected at outside or inside terminal or grounded out, may be pinched. 3. Feed circuit to stator restricted or blocked (Check feed hole in stator shaft). 4. Converter out check valve broken or missing.
	C. Turbine Shaft	1. Oil seal ring defective, damaged, missing; shaft ring lands defective.
	D. Case	1. Stator orifice plug blocked.
	E. Converter Assembly	1. Defective.

PROBLEM	POSSIBLE CAUSE	POSSIBLE CONDITION
XIX. TRANSMISSION NOISY	A. Pump Noise	1. Oil low or high. 2. Cavitation due to plugged strainer, "O" ring damaged, porosity in intake circuit; water in oil. 3. Pump gears - driving gear assembled backwards, gears damaged or defective, crescent interference.
	B. Gear Noise - First Gear (Drive Range)	1. Transmission grounded to body. 2. Planetary gear set.
	C. Clutch Noise - During Application	1. Forward clutch - (Neutral to Drive, Park to Drive); Check clutch plates. 2. Intermediate clutch - (1-2 shift in L^2 and Drive Range); Check clutch plates. 3. Direct clutch - (2-3 shift in Drive Range and in Neutral to Reverse, Park to Reverse); Check clutch plates.
	D. Converter Noise	1. This Condition will occur in R-D-L^2-L^1 Due to damaged Needle Bearings in Converter. Noise Level is generally lower in Park and Neutral.

74-39 TRANSMISSION OIL PRESSURE CHECK SUPER TURBINE 400

1. Oil Pressure Check - Road or Normal Operating Conditions

While road testing (with the transmission oil pressure gauge attached and the vacuum modulator tube connected) the transmission pressures should check approximately as follows:

L^2 Range	Min.	Max.
2nd gear - Steady road load at approximately 25 mph.	150 (±5) psi	150 (±5) psi

Gear	Selector Lever Position	Min.	Max.
1st	Drive	70	150
2nd	(Zero throttle to full throttle)	70	150
3rd	Drive Range, (Zero throttle 30 mph)	70	
Rev.	Reverse (full throttle)	220	260

2. Oil Pressure Check - Vacuum Modulator Check

The vacuum modulator assembly can be checked by making an oil pressure check as described in parts "A" and "B" of this section. The pressures given are approximate and can vary with changes in atmosphere pressure, but if this method is used as an indication of a source of malfunction, it can be a valuable service tool.

Using procedure "A" the oil pressures should be approximately as shown. Oil pressures taken in this manner, that vary appreciably from the chart, indicate further inspection of the following:

1. Vacuum lines and fittings.

2. Vacuum modulator.
3. Modulator valve.
4. Governor.
5. Pressure regulator.
6. Oil pump.

If the results of procedure "A" indicate further inspection is required, procedure "B" should be followed. If the pressures are appreciably different from those given in "B", a second check should be made with a new modulator assembly or one from a vehicle that is known to be operating standard. On the second check, if the pressures changed and were as shown on the chart, or closer to them, it would indicate a faulty modulator assembly and it should be suspected as a cause or part of the cause of the malfunction.

A. Car Stationary

Transmission oil pressure gauge and engine tachometer should be connected. Pressures indicated are with the vacuum line connected for normal modulator operation and service brakes holding vehicle with engine at 1200 rpm.

Drive Neutral Park	L^2 or L^1	Reverse
70	150	107

NOTE: Pressures are approximate.

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	150	150	244
2,000	150	150	233
4,000	145	150	222
6,000	138	150	212
8,000	132	150	203
10,000	126	150	194
12,000	121	150	186
14,000	116	150	179

NOTE: Altitude and pressures are approximate.

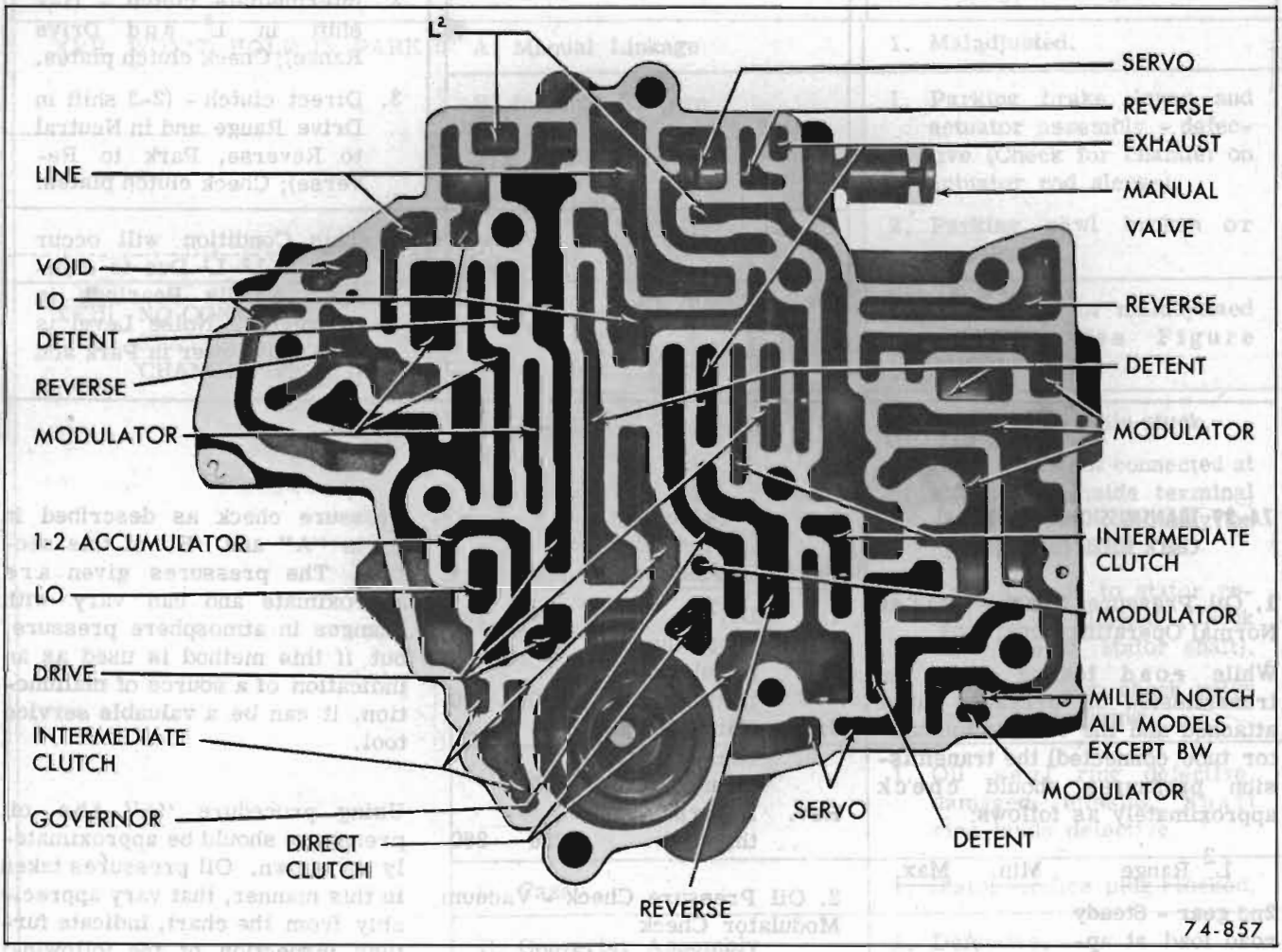


Figure 74-794—Valve Body

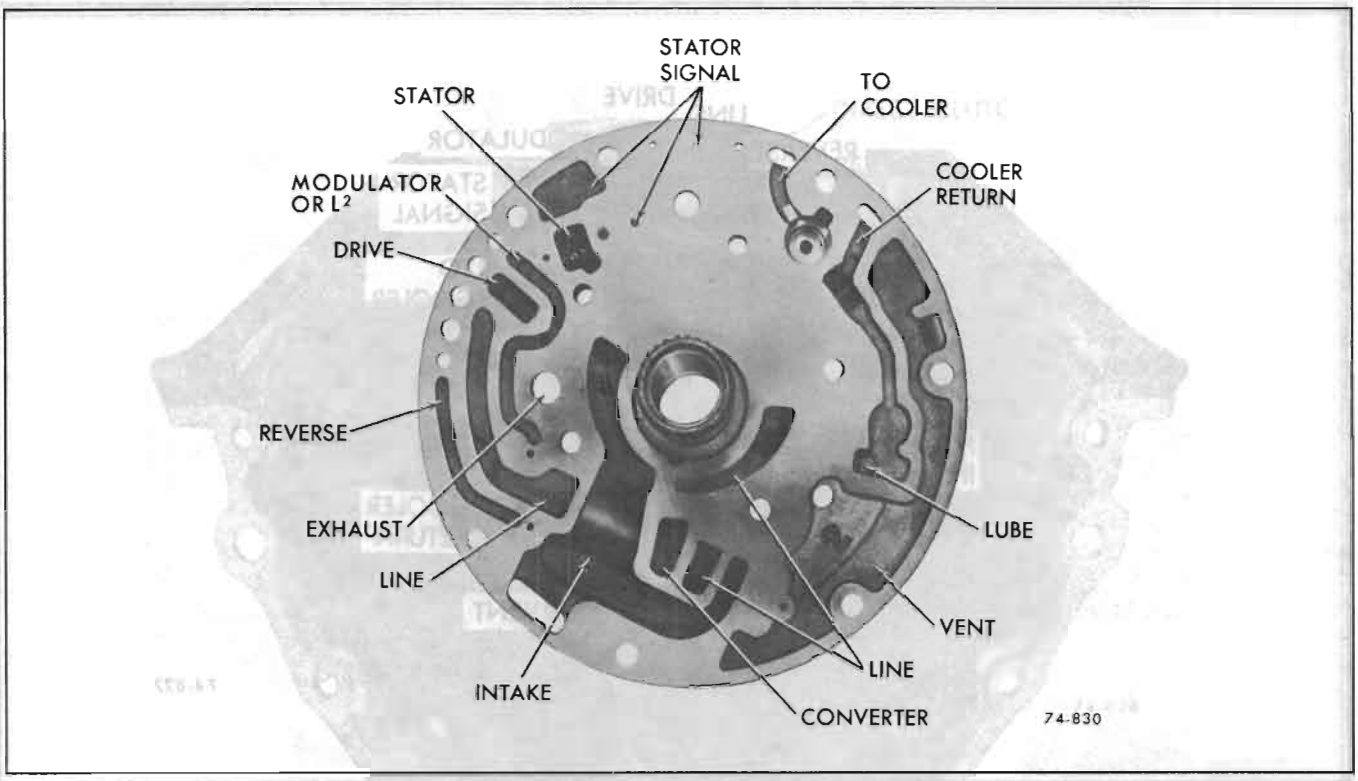


Figure 74-795—Oil Pump Cover

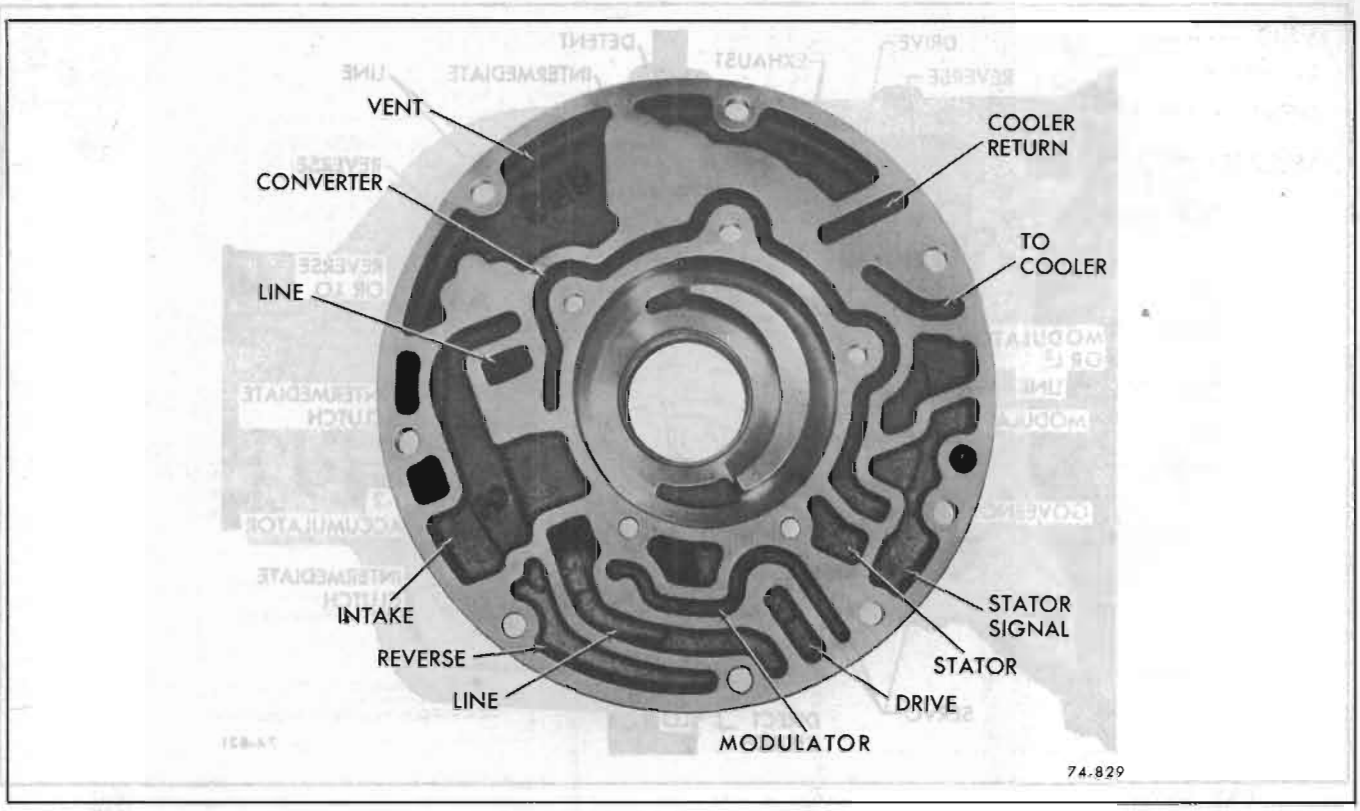


Figure 74-796—Oil Pump Body

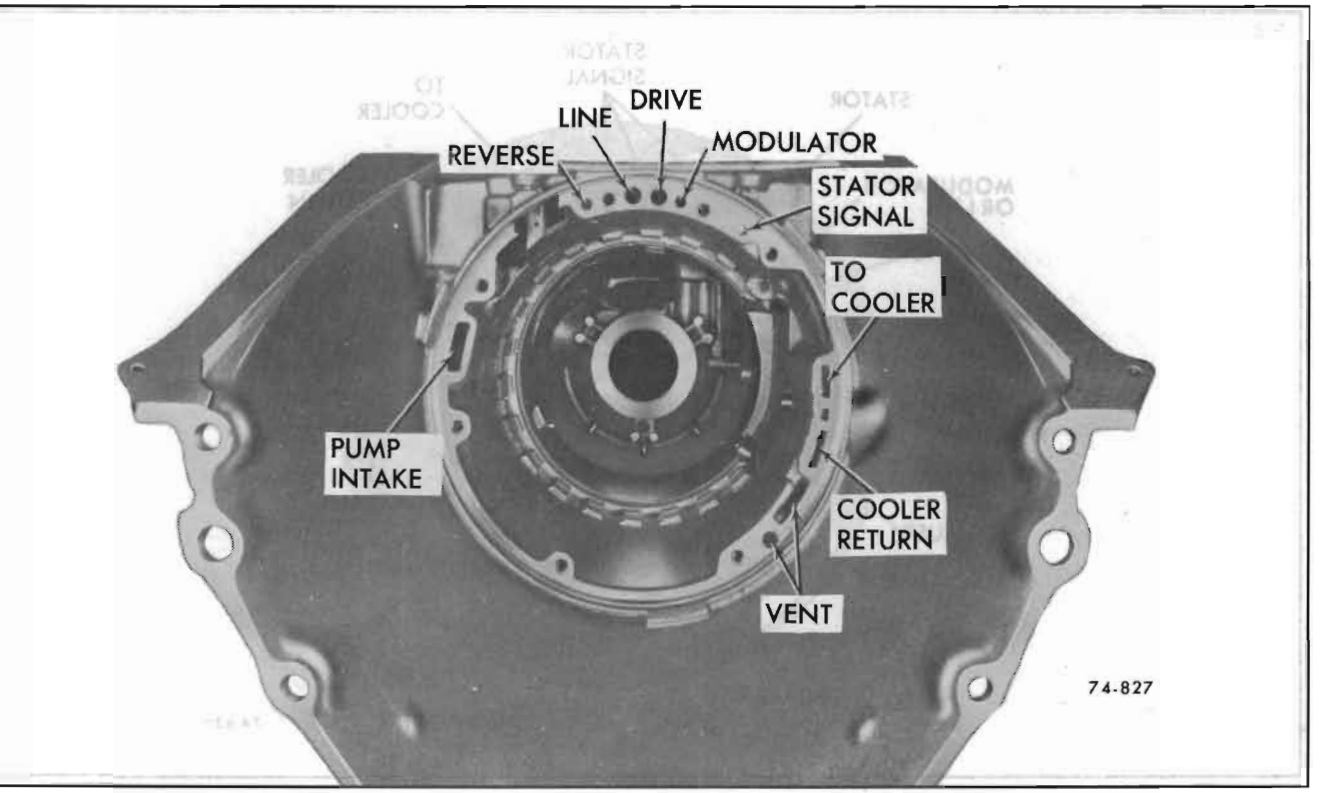


Figure 74-797—Front of Case

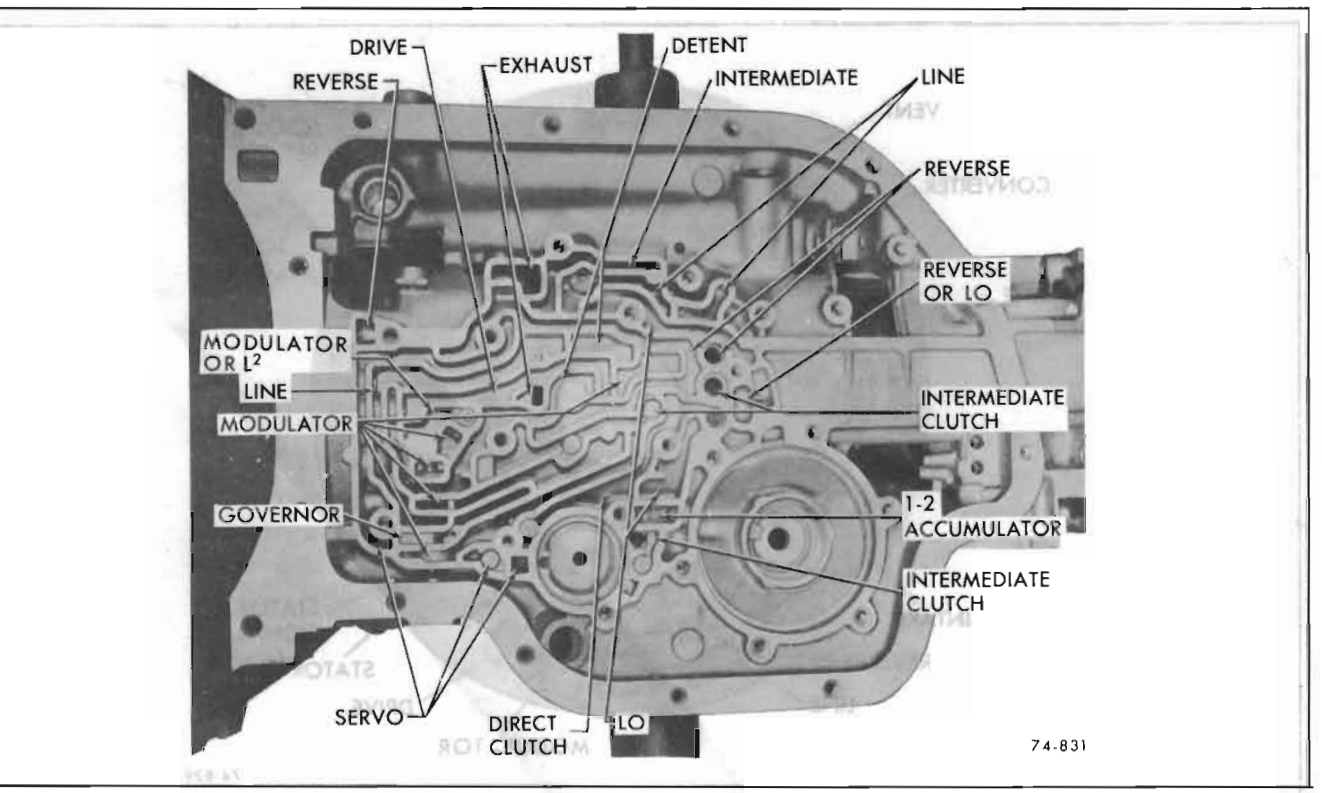


Figure 74-798—Bottom of Case

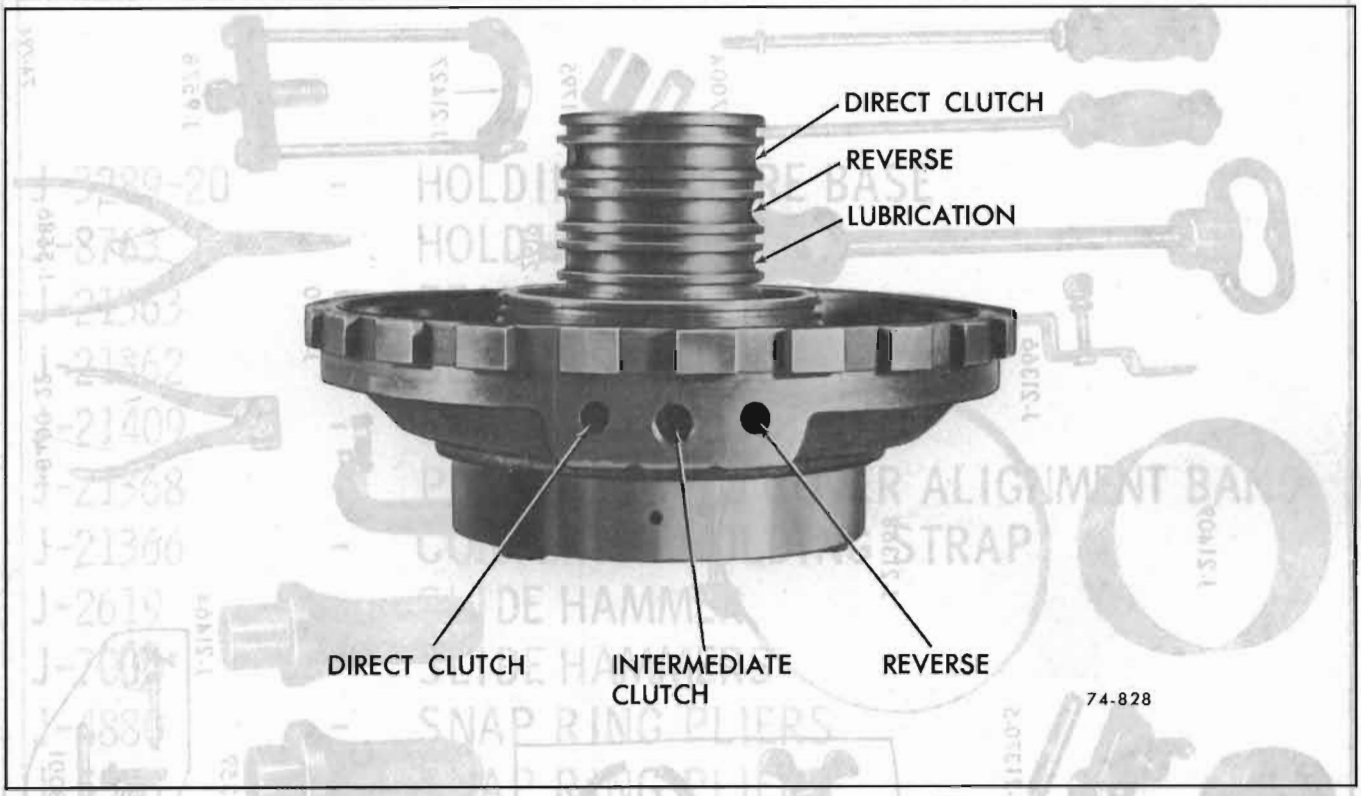
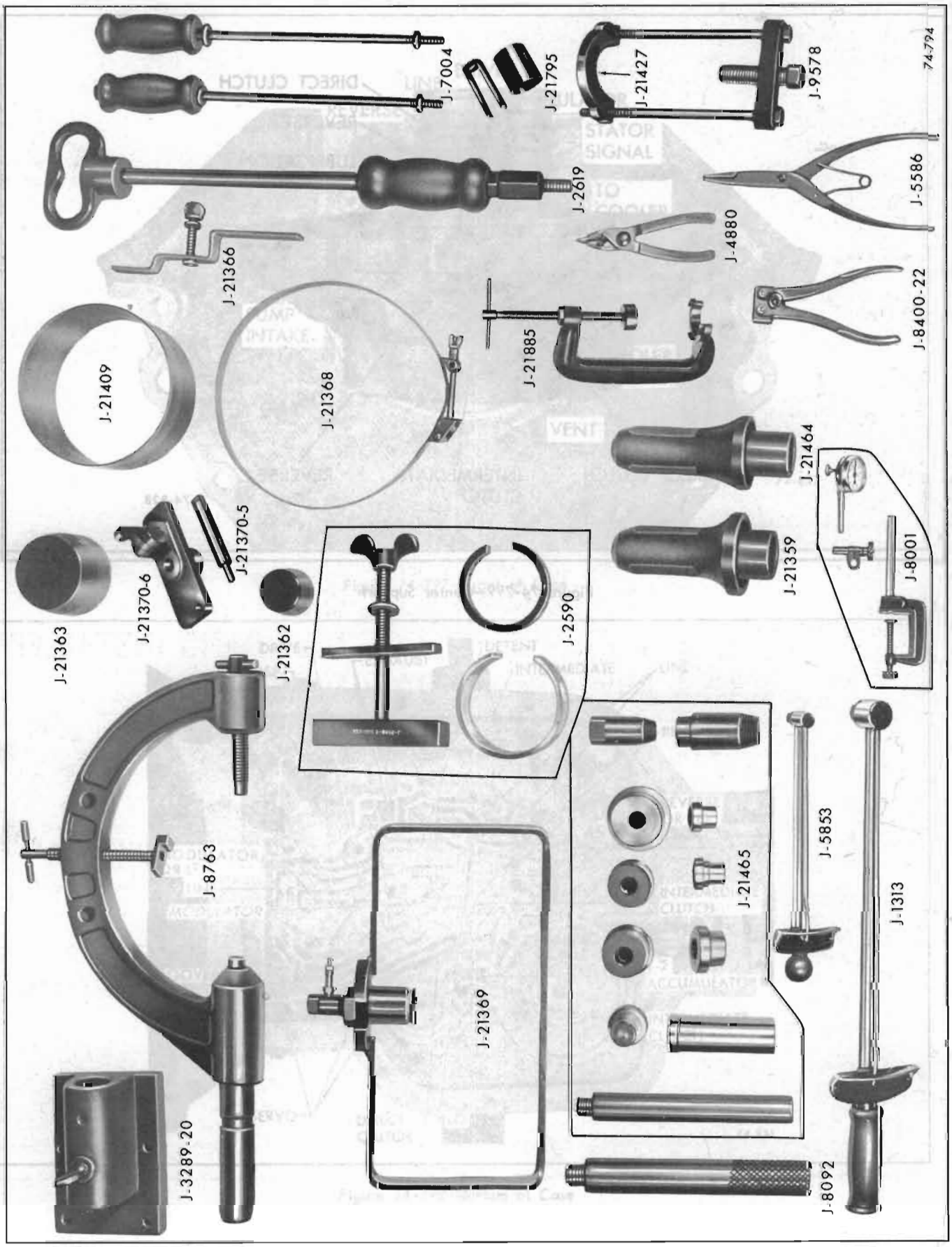


Figure 74-799—Center Support



J-3289-20	-	HOLDING FIXTURE BASE
J-8763	-	HOLDING FIXTURE
J-21363	-	SEAL INSTALLER
J-21362	-	SEAL INSTALLER
J-21409	-	SEAL INSTALLER
J-21368	-	PUMP BODY TO COVER ALIGNMENT BAND
J-21366	-	CONVERTER HOLDING STRAP
J-2619	-	SLIDE HAMMER
J-7004	-	SLIDE HAMMERS
J-4880	-	SNAP RING PLIERS
J-5586	-	SNAP RING PLIERS
J-9578	-	SPEEDO GEAR REMOVER
J-21795	-	GEAR ASSEMBLY REMOVER AND INSTALLER
J-21370	-	APPLY PIN SELECTION GAUGE
J-8001	-	DIAL INDICATOR SET
J-21464	-	REAR SEAL INSTALLER
J-21359	-	OIL PUMP SEAL INSTALLER
J-21369	-	CONVERTER PRESSURE CHECK FIXTURE
J-21465	-	BUSHING SET
J-8092	-	DRIVE HANDLE
J-5853	-	IN. LB. TORQUE WRENCH
J-1313	-	FT. LB. TORQUE WRENCH
J-21885	-	1 - 2 ACCUMULATOR "C" CLAMP

74-795

Figure 74-801—Tool Picture Legend