AUTOMATIC TRANSMISSION

CONTENTS OF THIS SECTION

GENERAL DESCRIPTION

The Pontiac Tempest automatic transmission (Fig. 7B-1) is a combination torque converter, two-speed planetary geared transmission. Torque multiplication is obtained hydraulically through the converter, and mechanically through a compound planetary gear set. The gear set, in combination with the torque converter, provides a high starting ratio for acceleration from a stop, up steep grades, etc. The torque converter provides torque multiplication for performance and smooth operation. The converter functions as a fluid coupling at normal road load conditions and at higher speeds. The L-6 transmission is air-cooled and the V-8 transmission is water-cooled. Description of the transmission is divided into eight basic sections: (1) Torque Converter, (2) Oil Pump, (3) Planetary Gear Set and Controls, (4) Forward Clutch, (5) Low Band, (6) Reverse Clutch, (7) Governor, (8) Valve Body.

TRANSMISSION IDENTIFICATION

The transmission name plate is located on the right side of the transmission (Fig. 7B-2). The transmission model number and the assembly date code appear on the name plate, or on the low servo cover. Whenever the servo cover is replaced it will be necessary to stamp all of the above information on the new cover. Model numbers are as follows:

20 - L-6 Air-cooled

30 - V-8 water-cooled

31 - V-8 water-cooled - V326 H.O.

40 - V-8 water-cooled - G.T.O.

The first two digits of the assembly date code denote the model year and the digits following the dash represent the production build day.

It is very important that any communication concerning this transmission contain the model number and date code and that all transmission parts returned to Pontiac Motor Division be tagged with this information.

TORQUE CONVERTER OPERATION

The torque converter is a device that multiplies engine torque. The converter assembly has three members: a driving member called the converter pump, a driven member called the turbine, and a stator located between the pump and turbine. The three components are immersed in oil. The converter pump is mechanically connected to the engine. When the engine is running, oil within the converter cavity is maintained under pressure by the oil pump. Oil is then picked up at the inner section of the converter pump and directed to its outer edges where it is thrown against the curved blades in the turbine. This causes the turbine to rotate, driving the input shaft. As the oil leaves the turbine blades it is traveling in a direction relatively opposite to the pump rotation. The blades of the stator (curved in the opposite direction to those in the turbine) change the direction of oil flow so that the oil strikes the back side of the converter pump, blades helping to drive the pump. Therefore, the total torque transmitted to the drive line is the combination of engine torque plus the additional torque supplied by the redirected oil striking the back side of the converter pump blades.

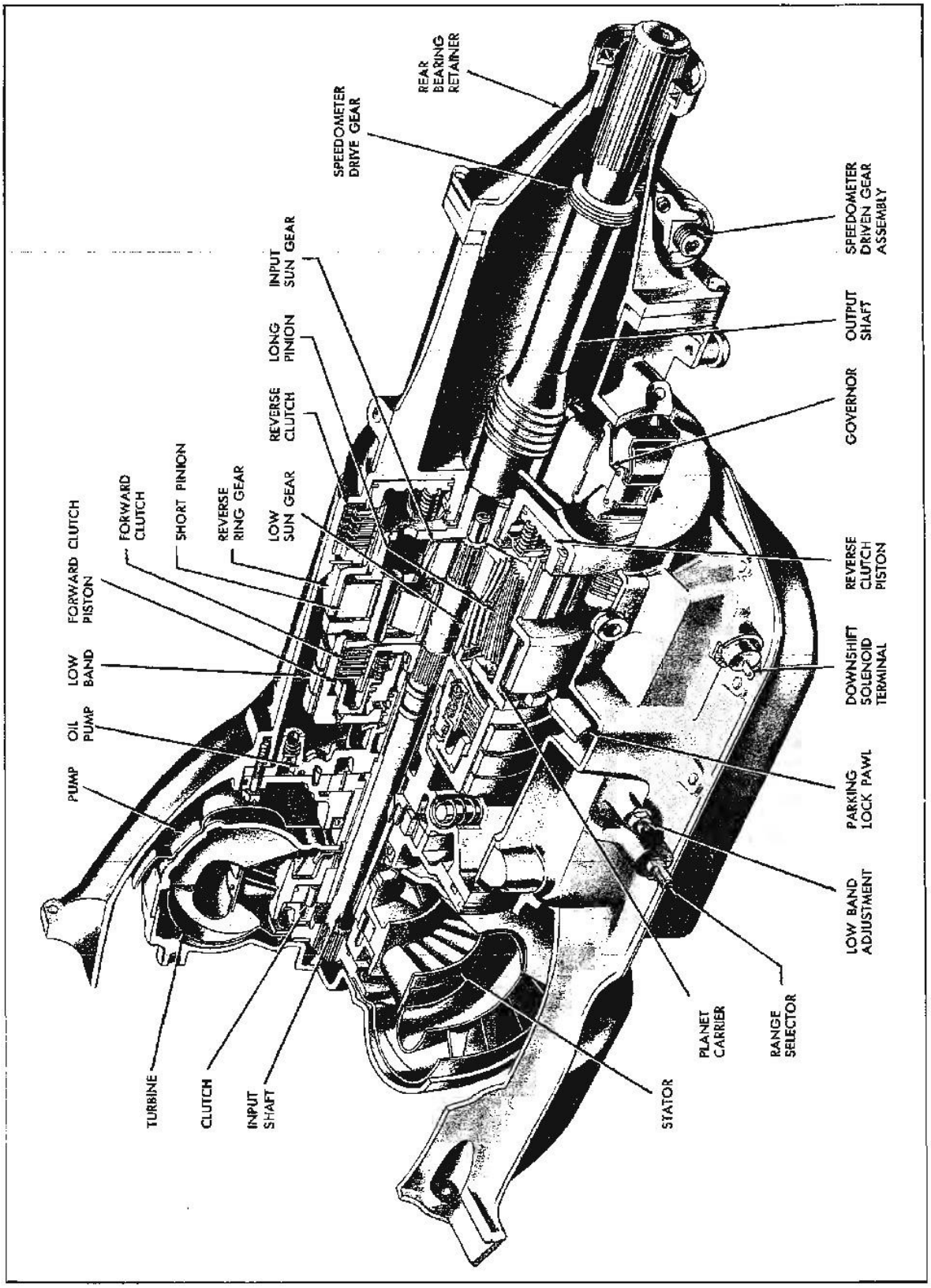


Fig. 7B-1 Cross Section of Automatic Transmission

The stator is mounted on a roller clutch, which holds the stator from moving in a reverse direction when the unit is acting to multiply torque. As the turbine speed approaches pump speed, there is progressively less torque multiplication. The stator, which in the beginning was standing still, is picked up by the rapidly rotating oil and accelerates until the pump, turbine and stator are turning at almost the same speed. When the stator rotates, interference in the oil flow between the turbine and pump is minimized. When all three members are turning there is no torque multiplication in the converter and it is acting as a fluid coupling.

OIL PUMP

A positive-displacement, internal-external gear-type oil pump is used to supply oil to fill the converter, for application of forward and reverse clutches, for application and release of the low band, and to circulate oil for lubrication and heat transfer.

PLANETARY GEAR SET AND CONTROLS

The planetary gear set consists of an input sun gear, low sun gear, short and long pinions, a reverse ring gear and a planet carrier. The input sun gear is splined to the input shaft. The low sun gear, which is part of the forward clutch assembly, rotates freely until the low band is applied. The input sun gear is meshed with three long pinions and the long pinions are meshed with three short pinions. The short pinions are meshed with the low sun gear and reverse ring gear. The input sun gear and short pinions always rotate in the same direction. Application of either the low band or the reverse clutch determines whether the output shaft rotates clockwise or counterclockwise.

FORWARD CLUTCH

The forward clutch assembly consists of a drum, piston, coil springs, piston seals, and a clutch pack. These parts are retained inside the drum by the low sun gear and flange assembly and a snap ring. When oil pressure is applied to the piston, the clutch plates are pressed together connecting the clutch drum to the input shaft through the clutch hub. This engagement of the clutch causes the low sun gear to rotate with the input shaft.

LOW BAND

The low band is a double-wrap steel band faced with a bonded lining which surrounds the forward clutch drum. The band is hydraulically applied by the low servo piston and released by spring pressure plus oil pressure.

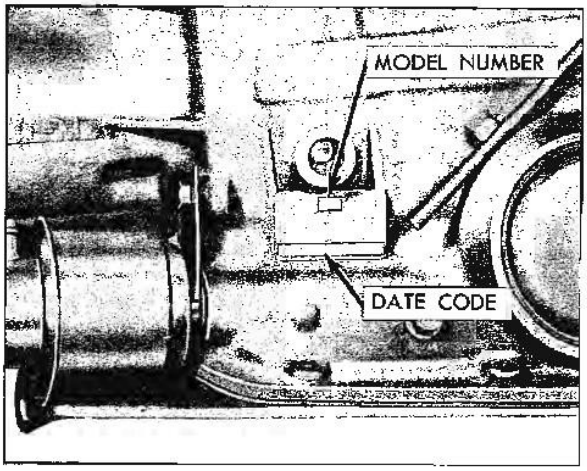


Fig. 7B-2 Transmission Name Plate

REVERSE CLUTCH

The reverse clutch assembly consists of a piston, inner and outer seal, cushion spring, coil springs, clutch pack, and reaction plate. These parts are retained inside the case by a snap ring. When oil pressure is applied to the piston, the clutch plates are pressed together holding the reverse ring gear stationary. This engagement of the clutch causes reverse rotation of the output shaft.

GOVERNOR

The governor is located to the rear of the transmission case on the left side and is driven off the output shaft. The purpose of the governor is to generate a speed-sensitive modulating oil pressure that increases with car speed.

VALVE BODY

The valve body assembly is bolted to the bottom of the transmission case and is accessible for service by removing the oil pan. The valve body assembly consists of a manual control valve, a shift valve, a modulator limit valve, a detent valve, and a high-speed downshift timing valve. The function of the valve body is to control application of the low band and clutches in response to governor and vacuum modulator pressure.

POWER FLOW

POWER FLOW—NEUTRAL (Fig. 7B-3)

With the shift control lever in Neutral (N) position, the output shaft remains stationary. The clutches and low band are released, so there is no reaction member to provide positive drive. All gears are free to spin around their axis and no motion is imparted to the plant carrier.

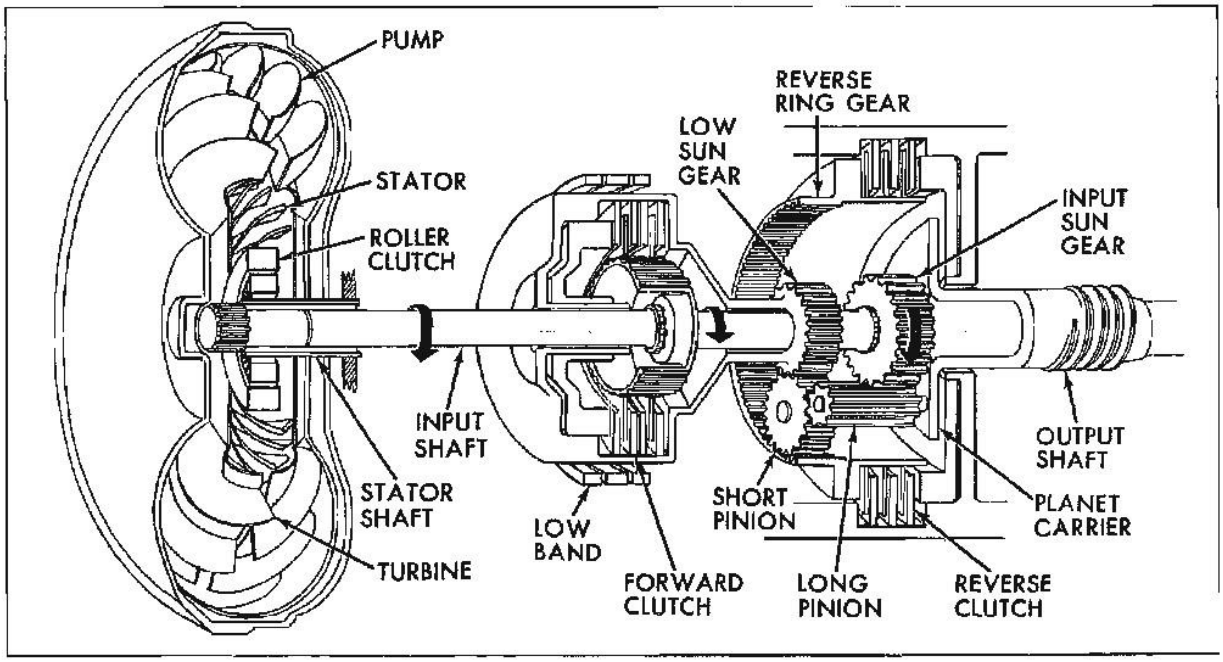


Fig. 7B-3 Power Flow - Neutral

POWER FLOW—LOW (Fig. 7-B-4)

In Low (L) range the forward clutch is released and the low band is applied to the outside diameter of the forward clutch drum. With the low band applied, the low sun gear and flange assembly are held stationary. Drive is from the converter through the input shaft to the input sun gear in the planetary gear set. The input sun gear drives the long planet pinions, which are meshed with the short planet pinions. The short planet pinions are, in turn, meshed with the low sun gear. Since the low sun gear is held stationary with the low band applied, the short pinions walk around the low sun gear and carry

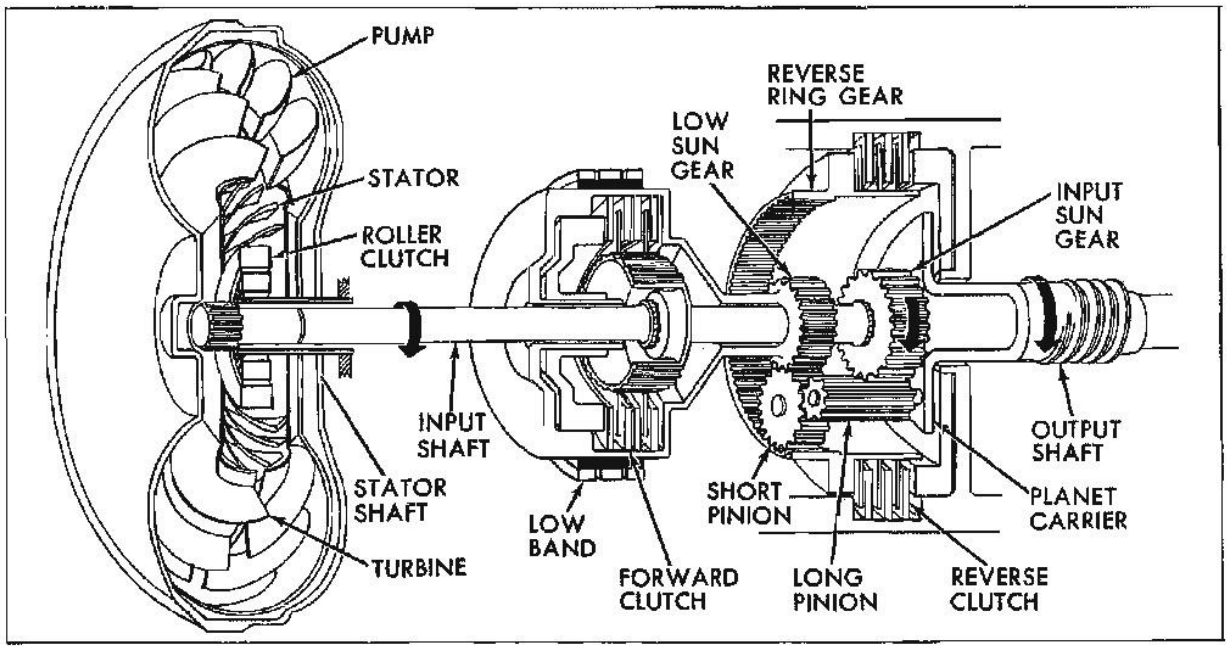


Fig. 7B-4 Power Flow - Low

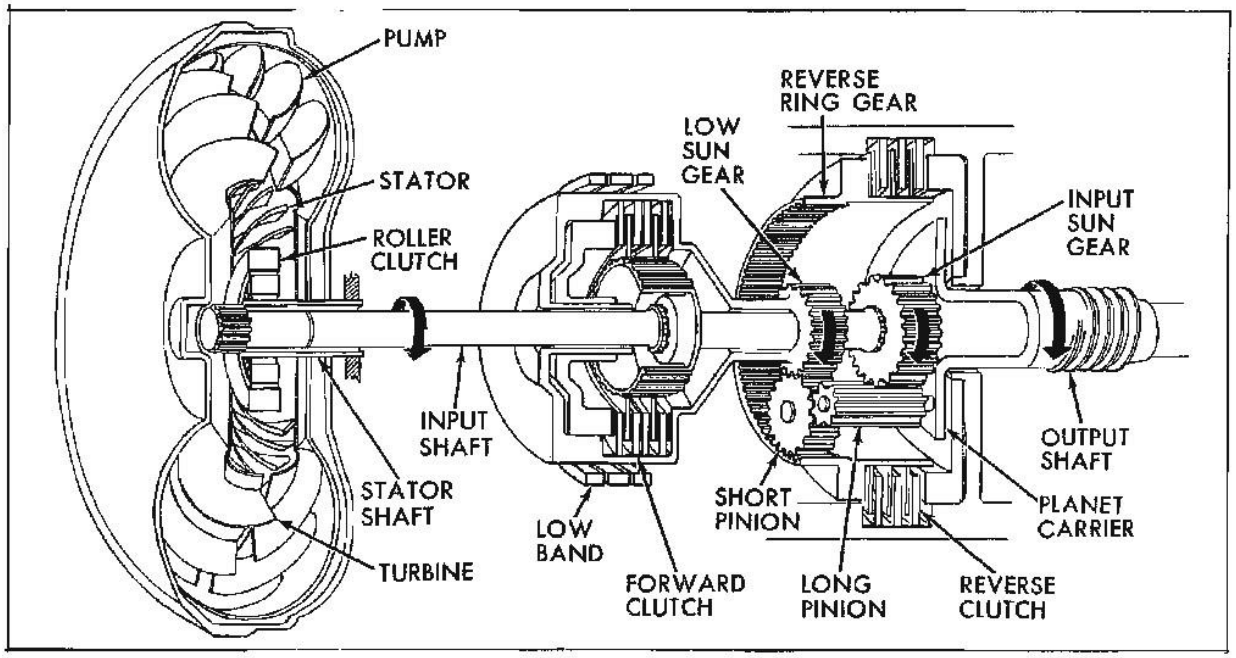


Fig. 7B-5 Power Flow - Direct Drive

with them the planet carrier and the output shaft at a reduction of 1.76 to 1.

POWER FLOW—DIRECT DRIVE (Fig. 7B-5)

With the manual control lever in Drive (D) position, the transmission is started automatically in low gear. When the upshift into direct drive occurs, the low band is released and the forward clutch is applied. With the forward clutch applied, the clutch hub, which is splined to the input shaft, is locked to the low sun gear and flange assembly through the clutch plates. The low sun gear is meshed with the short pinions, the short pinions are meshed with the

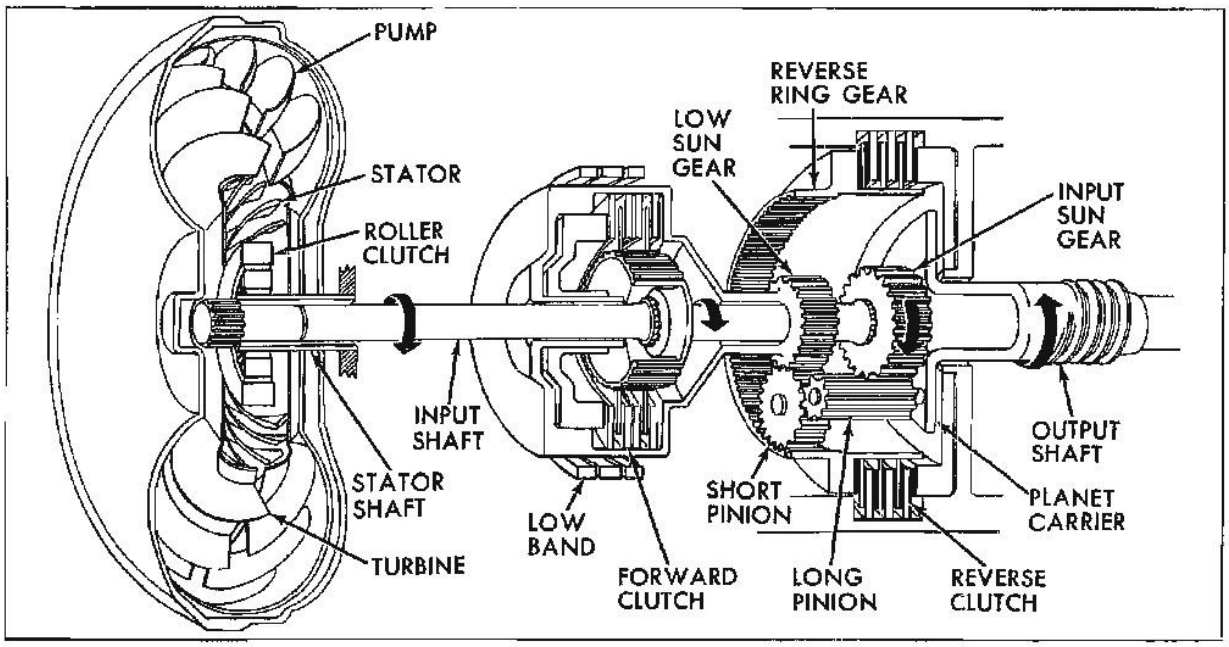


Fig. 7B-6 Power Flow - Reverse

long pinions, and the long pinions are meshed with the input sun gear which is also splined to the input shaft. Since both the low sun gear and input sun gear now rotate with the input shaft in the same direction, the entire planetary unit revolves at input shaft speed. Since the planet carrier is attached to the output shaft, the output shaft rotates at input shaft speed and in the same direction.

POWER FLOW—REVERSE (Fig. 7B-6)

When the manual control lever is in Reverse (R) position, the forward clutch and low band are released and the reverse clutch is applied, holding the reverse ring gear stationary. Drive is through the input shaft and input sun gear to the long pinions and then to the short pinions. The short pinions mesh with the reverse ring gear which is held stationary by the reverse clutch. The short pinions walk around the inside of the ring gear in a reverse direction, carrying with them the planet carrier and output shaft.

OPERATION OF COMPONENTS IN PARK

In Park (P) position, all reaction members are released as in Neutral. A positive plant carrier lock is provided when the parking pawl is engaged with the heavy teeth spaced around the front face of the planet carrier (Fig. 7B-1). The linkage is actuated by manual action, but the parking pawl is activated by spring action. If the pawl is in line with a tooth of the planet carrier, rather than a space between teeth, the linkage remains in the Park position with the spring holding pressure against the pawl. Slight rotation of the planet carrier will immediately seat the pawl and lock the output shaft to the case.

HYDRAULIC OPERATION

Hydraulic operation of the transmission is covered in three major sections: DEFINITIONS, CONTROL VALVES and CIRCUIT OPERATION. Circuit terminology is first defined and then the inputs and outputs of the control valves and the function of each valve are described. The last section describes circuit operation.

DEFINITIONS

Circuit terminology used in describing hydraulic operation is defined as follows:

Detent pressure	Wide open throttle (downshift solenoid energized) shift point control pressure derived from limited modulator pressure by the detent valve (see Detent Valve, page 7B-13).
Drive oil	Mainline pressure directed by the manual shift control valve to the control valves (see Manual Shift Control Valve, page 7B-9).
Governor pressure	Shift point control pressure derived from drive oil by the governor. Governor pressure is approximately proportional to car speed. Since it is derived from drive oil, it can never be higher than drive oil (mainline pressure (see Governor, page 7B-11).
Limited feed oil	A shift point control pressure that positions the modulator limit valve that, in turn, regulates the amount of pressure applied to the shift control valve. When the downshift solenoid is de-energized, limited feed oil is derived from vacuum modulator pressure. When the downshift solenoid is energized, limited feed oil is derived from drive oil. (See Modulator Limit Valve, page 7B-13 and Detent Valve, page 7B-13).
Limited modulator oil (pressure)	A shift point control pressure derived from limited feed (drive) oil by the modulator limit valve and applied to the shift control valve (see Modulator Limit Valve, page 7B-13).
Mainline oil (pressure)	Oil pump output pressure controlled by the main pressure regulator valve (see Main Pressure Regulator valve, page 7B-9).

Modulator oil (pressure)	A "feedback" pressure derived from mainline pressure by the vacuum modulator and applied to the main pressure regulator boost valve to modulate (control) mainline pressure (see Vacuum Modulator, page 7B-10, and Main Pressure Regulator Valve, page 7B-9).
Low boost (Modulator boost)	Drive oil directed by the manual shift control valve to the vacuum modulator to increase modulator pressure in Low range and directed to the shift valve to keep it in the downshift (low) position (see Manual Shift Control Valve, page 7B-9 and Shift and Shift Control Valve, page 7B-12).
Reverse boost	Drive oil directed by the manual shift control valve to the main pressure regulator boost valve to increase mainline pressure in Reverse range (see Manual Shift Control Valve, page 7B-9).

CONTROL VALVES

NOTE: With regard to control valve inputs and outputs, the terminology of an output oil pressure may differ from that of the input. Although the pressure is the same, functional terminology is used to facilitate description of hydraulic operation. For example, "detent pressure" and "limited modulator pressure" are the same but when the term "detent pressure" is used it is understood to be the pressure in the circuit between the detent valve and the shift control valve that causes a forced downshift.

Definitions for the hydraulic terminology used in the following paragraphs are found under DEFINITIONS above.

MANUAL SHIFT CONTROL VALVE (Fig. 7B-7)

Input: Mainline pressure

Outputs: Drive oil to governor, shift valve, detent valve, high speed downshift timing valve, and low servo
Reverse oil to reverse clutch and pressure regulator boost valve
Low boost oil to shift valve and vacuum modulator

The manual shift control valve in the valve body routes drive oil to the controlling devices that govern operation in Drive, Low and Reverse. In Neutral, Park and Reverse ranges, the manual control valve cuts off drive oil to the low servo and forward clutch. The manual shift control valve is connected by mechanical linkage to the manual control lever operated by the driver.

MAIN PRESSURE REGULATOR VALVE (Fig. 7B-8)

Inputs: Oil pump output
Reverse boost
Modulator oil

Outputs: Converter feed and lubrication oil and mainline pressure.

The main pressure regulator valve, which is located in the pump body, is used as the basic control of hydraulic pressure within the transmission.

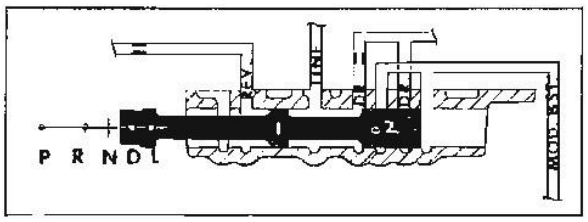


Fig. 7B-7 Manual Shift Control Valve

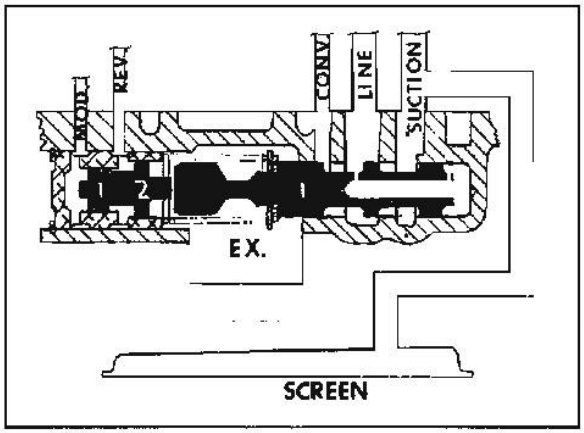


Fig. 7B-8 Main Pressure Regulator Valve - At Idle

MAIN PRESSURE REGULATOR VALVE (Fig. 7B-8) (Cont.)

When the engine is idling or has just been started, oil enters the main pressure regulator valve assembly between the first and second lands and flows through interconnecting drilled holes in the valve to occupy the space between the third land and the oil pump body (Fig. 7B-8). Oil under pressure between the third land and the pump body moves the valve against its spring to uncover the port which directs oil to the converter and thence to the oil cooler (V-8 only) and lubrication systems of the transmission.

As higher engine speeds are attained, the volume of oil leaving the pump increases until the valve moves to a position that opens a port to allow the proper amount of mainline oil to escape to suction to regulate pressure (Fig. 7B-9).

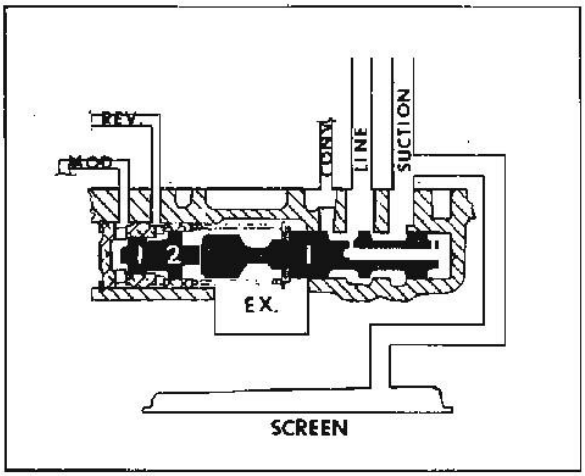


Fig. 7B-9 Main Pressure Regulator Valve - Typical Position

Boost Valve

A boost valve at the spring end of the pressure regulator valve functions to raise mainline pressure when necessary by adding hydraulic pressure to the spring pressure on the main pressure regulator valve.

Modulator Boost

With the manual shift control valve in Drive (D) position, modulator pressure varied by operating conditions is directed to the space between the first land of the boost valve and the boost valve sleeve. Oil pressure in this space has the same effect as increasing the spring pressure against the pressure regulator valve, thus it increases mainline oil pressure.

Reverse Boost

With the manual shift control valve in Reverse (R) position, oil pressure is directed to the space between the first and second lands of the boost valve. Since the second land is larger than the first, the boost valve bears on the spring end of the pressure regulator valve, adding to the spring pressure of the valve and increasing mainline oil pressure for operation in reverse range.

VACUUM MODULATOR (Fig. 7B-10)

Inputs:	Mainline pressure Low Boost Governor pressure
Output:	Modulator oil

The vacuum modulator and valve assembly translates load (engine manifold vacuum), barometric pressure (altitude) and speed (governor pressure) into modulated oil pressure to regulate mainline oil pressure at an efficient value.

Mainline oil enters between the first and second lands of the valve and flows through the drilled ports to the space between the first land and the valve body. When it reaches sufficient pressure, the oil moves the valve against the modulator assembly load to regulate the exit oil (modulator oil).

Manifold Vacuum Effect

The modulator assembly is housed in a sealed container so that engine manifold vacuum acts upon it to reduce the load against the valve and thus affect modulator pressure. Conditions of load or

grade that lower manifold vacuum increase modulator pressure, while high manifold vacuum decreases modulator pressure.

NOTE: Fig. 7B-10 shows the valve assembly all the way to the right. This is the position of the valve assembly when manifold vacuum is high and mainline pressure is low.

Altitude or Barometric Effect

If the car is operated at high altitudes where barometric pressure is reduced, the aneroid device in the vacuum modulator housing expands to reduce modulator load on the valve in proportion to the barometric pressure.

At high altitudes engine output is reduced and comparable reduction in transmission mainline oil pressure is necessary to accomplish smooth shifts.

Governor Effect

As car speed increases, governor pressure increases. Governor pressure bearing on the fourth land of the vacuum modulator valve has the effect of reducing the modulator assembly load against the valve assembly, thereby reducing modulator oil pressure as governor pressure (car speed) increases.

Low (Modulator) Boost Effect

With the manual shift control valve in Low (L) position, mainline pressure bears against the second land of the modulator valve, separating the two parts of the valve assembly and moving the left (front) valve to the bottom of its bore independent of the modulator load. Thus, modulator pressure is directed to the main pressure regulator boost valve to provide an increase in mainline pressure in low range regardless of engine vacuum. However, if driving conditions result in low engine vacuum, the modulator load will move the two sections of the valve back together. Under these conditions both the modulator assembly and the pressure of mainline oil against the second land of the valve will regulate modulator oil pressure.

GOVERNOR (Fig. 7B-11)

Input: Drive oil

Output: Governor pressure

The governor assembly contains a pressure regulator valve, the output of which is determined by car speed acting through the centrifugal force of a pair of dual weights, the inner pair of which is spring loaded.

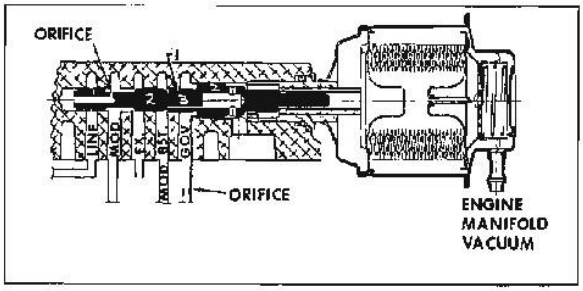


Fig. 7B-10 Vacuum Modulator and Valve Assembly

As the car begins to move, the weight assemblies move outward to provide a regulating force against the valve through the springs between the primary and secondary weights. As the car speed is further increased, regulating force against the valve is provided by the secondary weights moving outward. At approximately 35 mph the primary weights have reached the limit of their travel and the force against the valve is then entirely through the secondary weights and the spring. Governor pressure is determined at very low speeds by the primary weights, and at higher speeds by the secondary weights.

Regulated oil from the governor is directed to the shift valve, vacuum modulator valve, modulator limit valve and high-speed downshift timing valve.

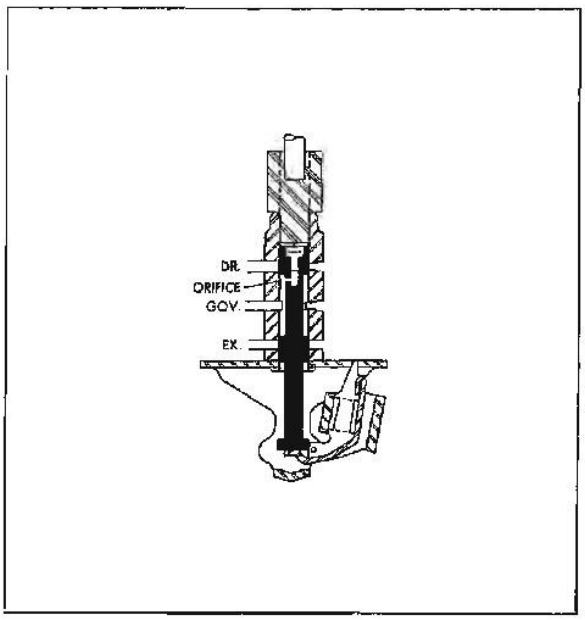


Fig. 7B-11 Governor

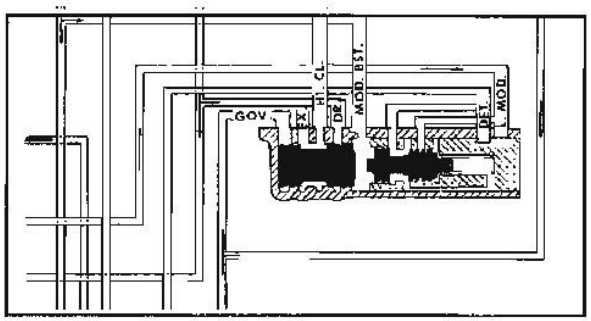


Fig. 7B-12 Shift Valve and Shift Control – Low

Governor pressure determines or affects shift points, mainline oil pressure and downshift timing.

SHIFT VALVE AND SHIFT CONTROL VALVE

Inputs:	Drive oil Governor pressure Limited modulator oil Detent pressure Low boost
Output:	Drive oil (clutch apply and low band release.)

The shift valve and shift control valve in the valve body react to oil pressure controlled by the governor and the vacuum modulator to shift the transmission from low to high gear or from high gear to low gear.

Upshift From Automatic Low to Direct Drive

As the car is accelerated from a stop, the shift valve and shift control valve are positioned as shown in Fig. 7B-12. The shift valve is held against the end of its bore by the force of a spring and the pressure exerted on the end of the shift control valve. With the shift valve thus positioned, no drive oil is directed to the high clutch piston or the spring side of the low servo piston, thus the low band is applied and the transmission is in low gear.

When the proper relationship between car speed and throttle opening exists, governor pressure against the first land of the shift valve will overcome the spring pressure and the force of limited modulator oil pressure against the shift regulator valve and move both valves to the right as shown in Fig. 7B-13. With the shift valve thus positioned drive oil is directed to the forward clutch piston and the spring side of the low servo piston.

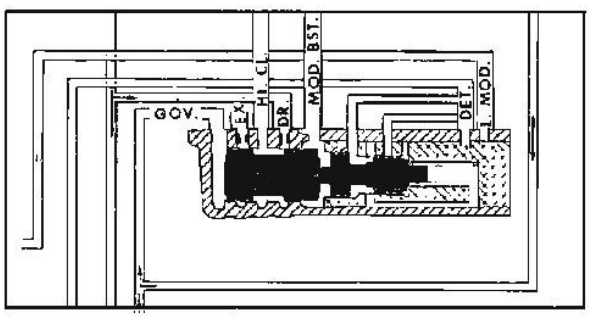


Fig. 7B-13 Shift Valve and Shift Control Valve-Low

Downshift From Direct Drive to Low Gear

When limited modulator pressure against the first and second lands of the shift regulator valve in combination with the spring reaches a value sufficient to overcome governor pressure against the first land of the shift valve, both valves move to the shift, shifted by cutting off drive oil to the high clutch and the spring side of the low servo piston.

Forced Downshift From Direct Drive to Low Gear

During a forced downshift, detent pressure is applied to the first and second lands of the shift control valve. The addition of detent pressure to limited modulator pressure on the third land plus the shift valve spring is enough to overcome governor pressure and cause a downshift.

Manual Low

With the manual control lever in Low (L) position, low boost pressure is directed to the space between the shift valve and the shift control valve (Fig. 7B-14). Low boost pressure in this space moves the shift valve to the end of its bore. With the shift valve thus positioned, no drive oil is directed to the high clutch piston or the spring side of the low servo piston, thus the low band is applied and the transmission is in low range.

NOTE: Governor pressure can never become high enough to cause an upshift in Low (L) range.

DETENT VALVE (Fig. 7B-15)

Inputs:	Modulator oil Limited modulator oil (downshift solenoid de-energized) Drive oil (downshift solenoid energized)
Outputs:	Limited feed oil (limited modulator oil with downshift solenoid de-energized; drive oil with solenoid energized) Detent pressure (with solenoid energized)

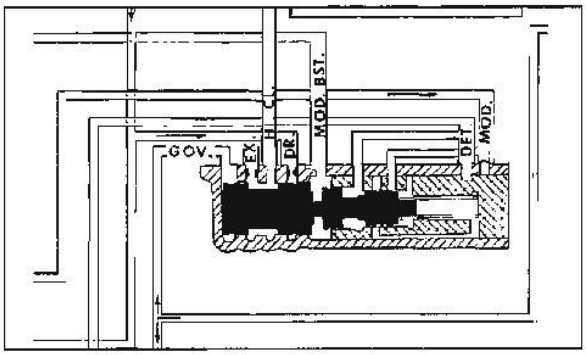


Fig. 7B-14 Shift Valve and Shift Control Valve-Manual Low

The detent valve is a solenoid-operated, two-position valve that provides a downshift at wide open throttle if car speed is low enough.

Electrical contacts on the carburetor linkage energize the detent solenoid as wide open throttle is reached. Energization of the solenoid retracts its plunger and allows oil from the center of the valve to flow to exhaust. Drive oil against the first land and end of the valve moves the valve against its spring (Fig. 7B-16).

With the valve in this position, ports are opened to allow drive oil (limited feed oil) to flow to the modulator limit valve and limited modulator oil (detent oil) to flow to the detent port of the shift control valve.

When the solenoid is de-energized, the spring-loaded plunger seals the exhaust port. Drive oil then occupies the center of the valve and bears against the fifth land of the valve as well as the first land. The detent valve spring then moves the valve to shut off the detent port.

MODULATOR LIMIT VALVE (Fig. 7B-17)

Inputs: Limited feed oil (see Detent Valve outputs above)
Governor pressure

Output: Limited modulator oil

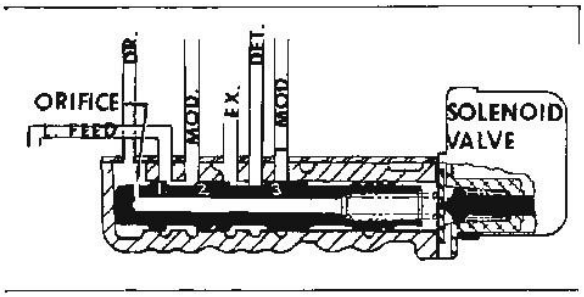


Fig. 7B-15 Detent Valve - Solenoid De-energized

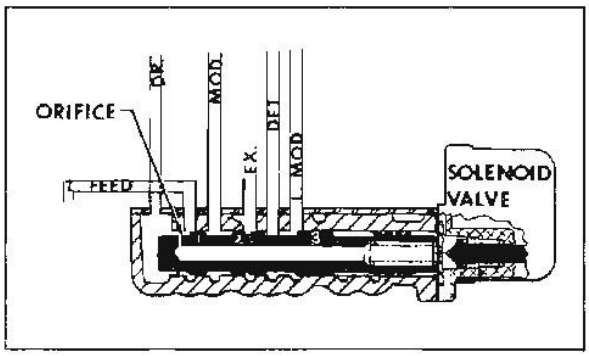


Fig. 7B-16 Detent Valve - Solenoid Energized

The function of the modulator limit valve is to provide limited modulator pressure for wide open throttle shift point control that is not affected by altitude.

The modulator limit valve regulates limited feed oil (mainline pressure) routed through the detent valve to provide decreasing oil pressure bearing against the second and third lands of the shift control valve as car speed increases. This decrease in oil pressure is accomplished in part by governor valve pressure on the third land of the valve acting to decrease spring pressure as car speed (governor pressure) increases (Fig. 7B-18). While governor pressure is exerted on the third land, limited modulator pressure is directed to the area between the first land and the valve body, compressing the valve spring. The combined force of governor pressure and limited modulator pressure moves the valve to the right, reducing the opening through which oil flows to the shift control valve. Thus limited modulator pressure substitutes for the modulator pressure controlled by the vacuum modulator and routed through the detent valve when the detent valve is to the left (solenoid de-energized).

The modulator limit valve is in operation only during wide open throttle operation with the manual shift control valve in Drive (D) position.

HIGH SPEED DOWNSHIFT TIMING VALVE (Fig. 7B-19)

Inputs: Governor pressure
Drive oil

Output: Drive oil (band apply)

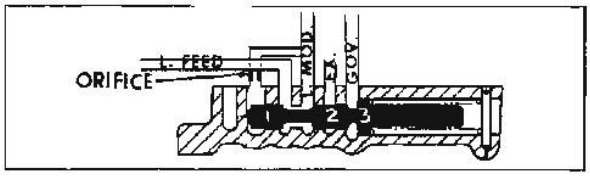


Fig. 7B-17 Modulator Limit Valve - Low Speed

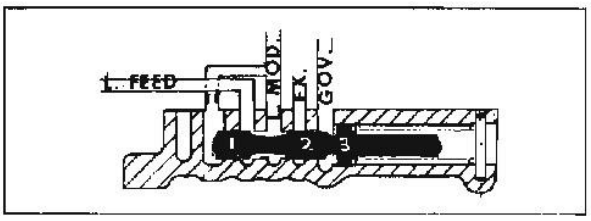


Fig. 7B-18 Modulator Limit Valve - Wide Open Throttle

The high-speed downshift timing valve is a spring-loaded valve located in the valve body. Its function is to control the rate of low servo application at high road speeds.

At sufficiently high road speeds, governor pressure against the first land of the valve overcomes spring pressure to move the valve to the position shown in Fig. 7B-19. With the valve in this position, oil for low servo application must pass through two orifices as shown. At lower car speeds, governor valve pressure is not sufficient to overcome the spring pressure and low servo application is made through passages containing only one orifice as shown in Fig. 7B-20. Because the orifices restrict the flow of oil, when the oil must pass through two orifices at higher car speeds, the low band is not applied as rapidly as at lower speeds when the oil must pass through only one orifice. This slight delay in band application gives the engine an instant to speed up after the clutch is released and before the low band is applied.

COOLER BY-PASS CHECK VALVE (Fig. 7B-21)

If the cooler system (radiator or lines) becomes restricted, the cooler by-pass check valve unseats to allow oil to flow directly to the lubrication system passages.

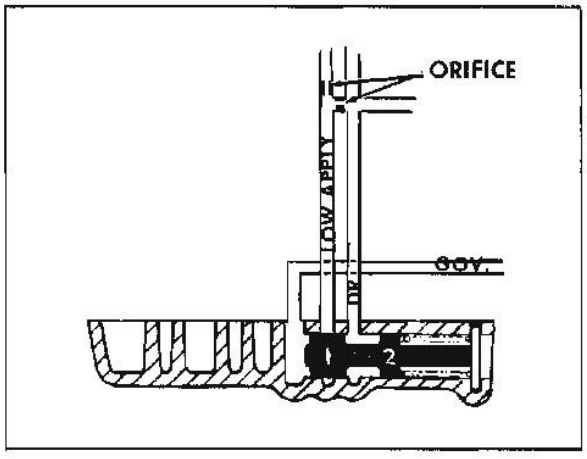


Fig. 7B-19 Highspeed Downshift Timing Valve-High Speed

CIRCUIT OPERATION

For terminology definitions and detailed description of the operation of individual valves, refer to DEFINITIONS and CONTROL VALVES above.

NEUTRAL (Fig. 7B-21)

In Neutral (N) the manual shift control valve is positioned as shown in Fig. 7B-21. When the engine is running, regulated mainline pressure is applied to the manual shift control valve and the vacuum modulator. Converter feed and lubrication oil are applied from the main pressure regulator valve to the converter feed and lubrication circuits.

DRIVE RANGE - UPSHIFTED (Fig. 7B-22)

In Drive (D) the manual shift control valve is positioned as shown in Fig. 7B-22. With the engine running and the car standing still, drive oil is directed from the manual shift control valve to the governor, shift valve, detent valve, and low servo. With drive oil applied to the low servo, the low band is applied and the transmission is in automatic low.

When the throttle is opened for a normal start, engine manifold vacuum drops and the vacuum modulator reacts to apply modulator oil to the detent valve and to the main pressure regulator boost valve to increase mainline pressure. Modulator oil entering the detent valve leaves as limited feed oil, which is applied to the modulator limit valve where it becomes limited modulator oil applied to the shift control valve.

When the car begins to move, governor pressure begins to build up and is applied to the shift valve, vacuum modulator, modulator limit valve, and the high-speed downshift timing valve. As car speed increases, governor pressure increases, and governor pressure applied to the vacuum modulator acts

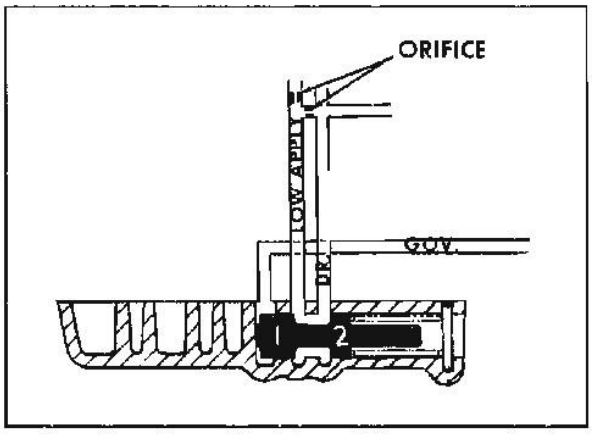


Fig. 7B-20 High Speed Downshift Timing Valve - Low Speed

to reduce modulator load, assisting engine manifold vacuum and reducing mainline pressure by reducing the modulator oil pressure applied to the main pressure regulator boost valve.

When the proper relationship exists between engine manifold vacuum and car speed, governor pressure overcomes the combined forces of the shift valve spring and limited modulator oil applied to the shift control valve and the shift valve moves to the right. When the shift valve moves to the right, drive oil from the shift valve applies the forward clutch and releases the low band, and the transmission is in direct drive.

During a wide open throttle start, limited feed oil is derived from drive oil because the downshift solenoid is energized, allowing the detent valve to move to the right and direct drive oil into the limited feed passage. Since limited feed oil pressure derived from drive oil is higher than when derived from modulator oil, the modulator limit valve will move to the right, regulating limited modulator oil against the modulator limit valve spring. Therefore, during a wide open throttle upshift or downshift, the effect of altitude on the shift point is eliminated since the limited modulator oil pressure applied to the shift control valve is regulated by the modulator limit valve spring, which is unaffected by altitude.

DRIVE RANGE - DOWNSHIFTED (Fig. 7B-23)

At speeds below approximately 60 MPH, a forced downshift in Drive range is possible by depressing the accelerator to wide open throttle to actuate the downshift switch and energize the downshift solenoid, allowing the detent valve to move to the right.

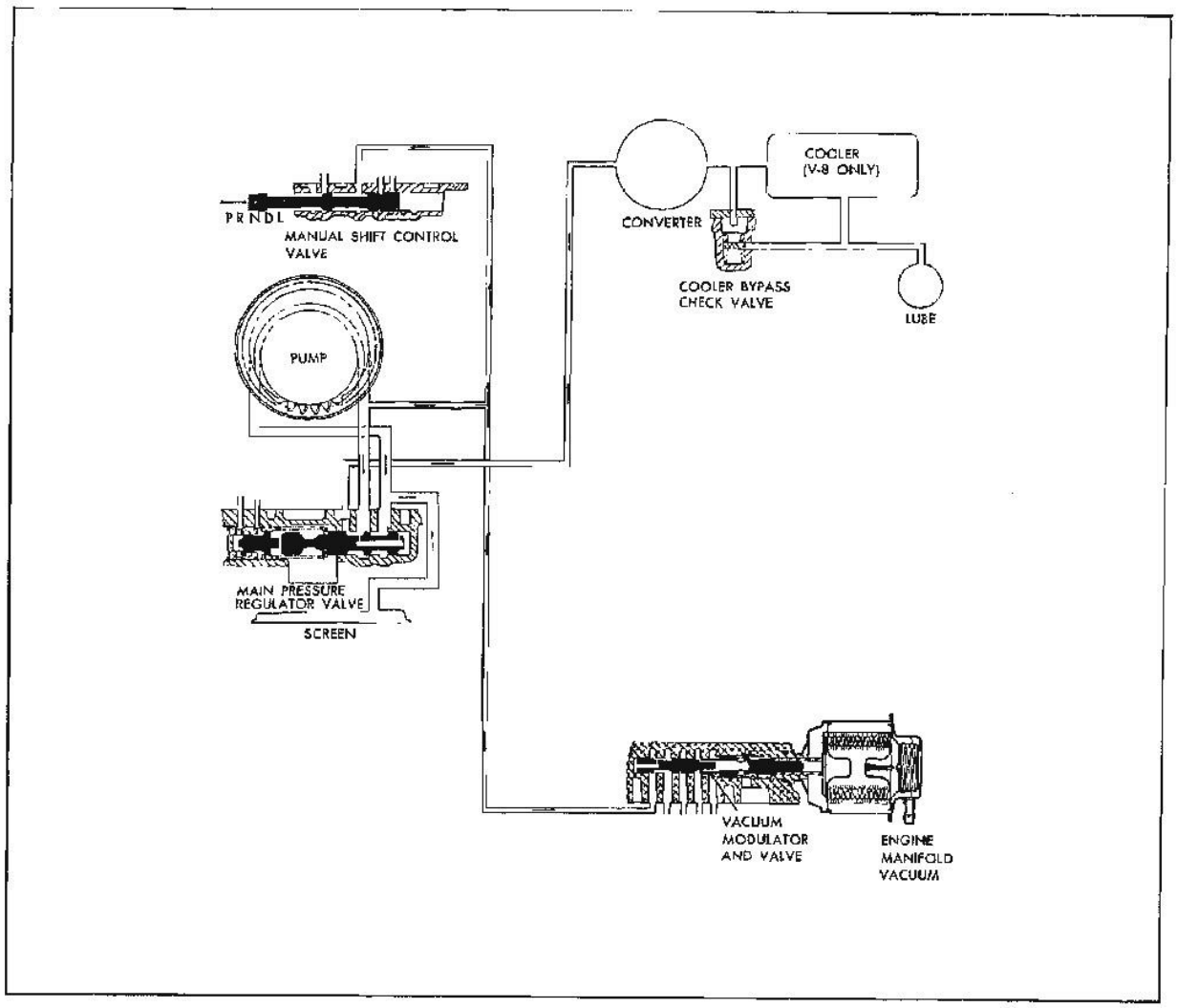


Fig. 7B-21 Oil Circuits - Neutral

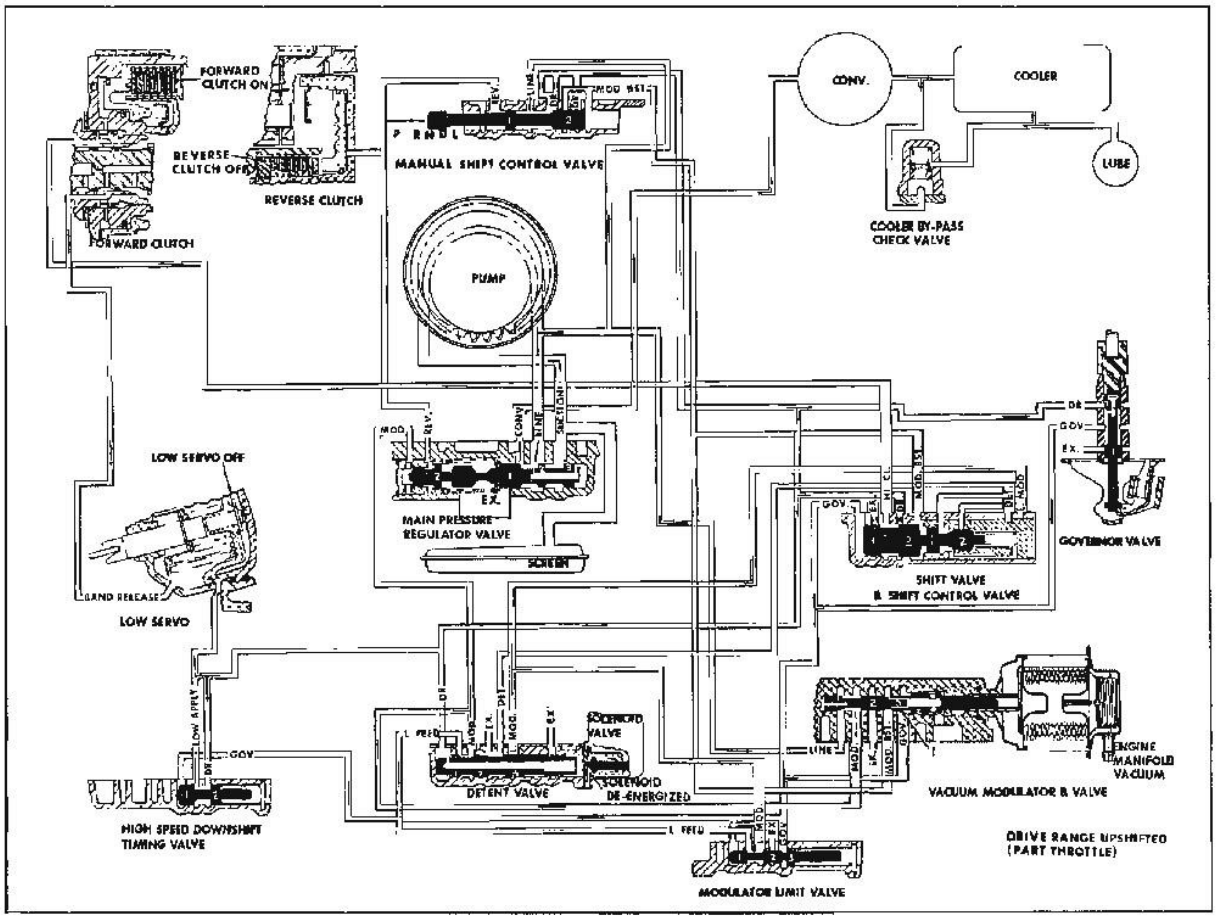


Fig. 7B-22 Oil Circuits - Drive Range (Upshifted)

When the detent valve moves to the right, drive oil enters the limited feed circuit to the modulator limit valve and leaves the modulator limit valve as limited modulator oil. This limited modulator oil is applied to the second and third lands of the shift control valve and to the detent valve. Limited modulator oil enters the detent valve and leaves as detent oil, which is applied to the first land of the shift control valve. The combined forces of limited modulator oil, detent pressure, and shift valve spring are sufficient to overcome governor pressure and move the shift valve to the left, downshifting the transmission by releasing the forward clutch and applying the low band.

If the forced downshift is accomplished at a high enough speed, governor pressure is high enough to move the high-speed downshift timing valve all the way to the right. When this valve is all the way to the right, drive oil to the low servo must pass through a restricted orifice because the unrestricted circuit through the high-speed downshift timing valve is blocked. Under these conditions application of the low band is delayed enough to assure full release of the forward clutch and a slight increase in engine speed before the downshift is completed.

MANUAL LOW (Fig. 7B-24)

In Low (L) range the manual shift control valve is positioned as shown in Fig. 7B-24. With the manual shift control valve in this position, mainline oil is directed as low boost oil to the vacuum modulator and the shift valve.

Low boost oil applied to the right end of the shift valve and the force of the shift valve spring keep the shift valve in the downshift position regardless of governor pressure. Low boost oil applied to the vacuum modulator increases modulator pressure, which is applied to the main pressure regulator boost valve to raise mainline pressure. Increased mainline pressure (drive oil) applied to the low servo assures that the low band will not slip under the load conditions encountered when Low range operation is required.

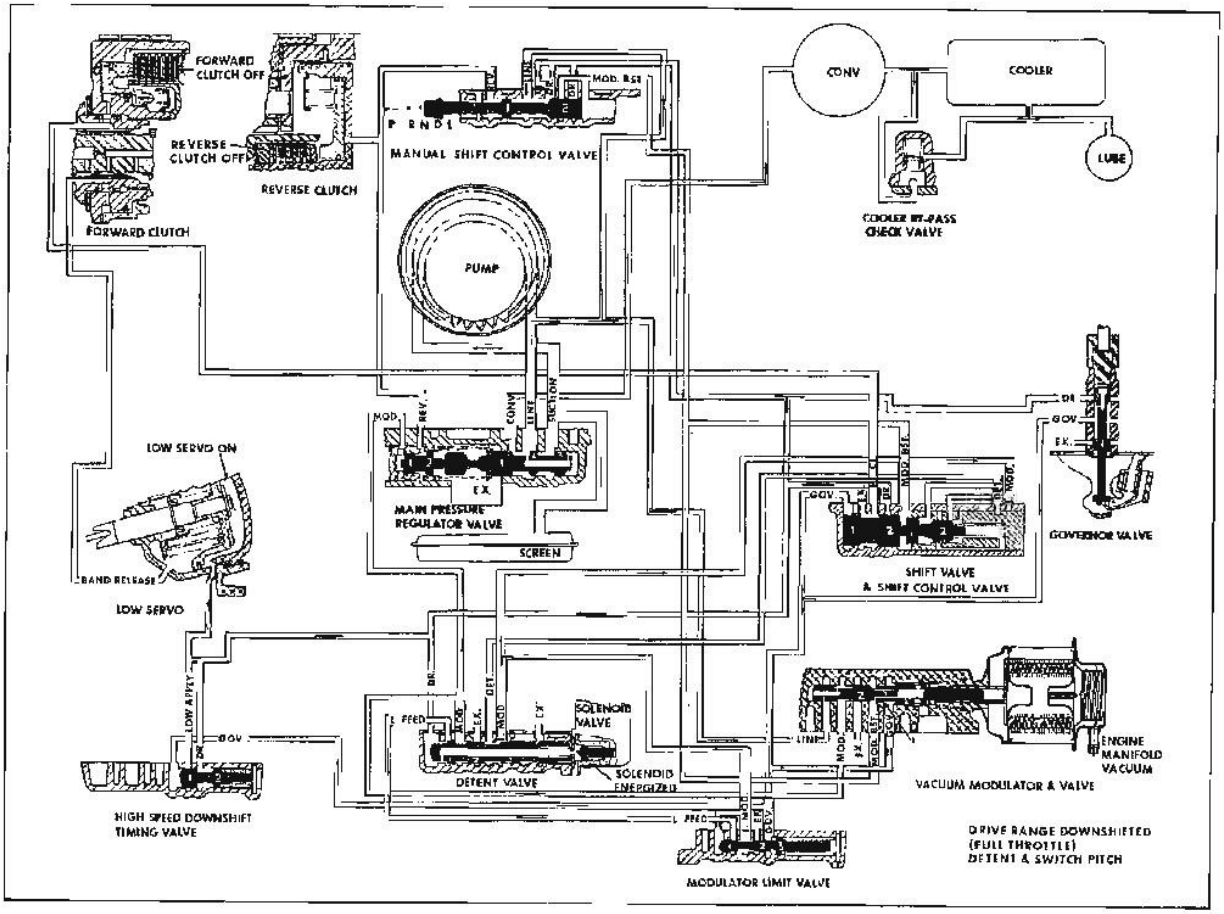


Fig. 7B-23 Oil Circuits - Drive Range (Downshifted)

REVERSE (Fig. 7B-25)

In Reverse (R) range the manual shift control valve is positioned as shown in Fig. 7B-25. With the manual shift control valve in this position, mainline pressure is directed to the reverse circuit to apply the reverse clutch and to boost mainline pressure by adding to the modulator oil applied to the main pressure regulator boost valve.

MAINTENANCE AND ADJUSTMENTS

OIL RECOMMENDATIONS

It is important to use only Automatic Transmission Fluid (Type A). This is an all-season fluid, ideal for year-round operation. No special additives to these fluids are required or recommended.

Instructions for checking fluid level and for draining and refilling the transmission follow:

OIL LEVEL

The transmission oil level should be checked every 6,000 miles. Oil should be added only when the level is near the ADD mark on the indicator (Fig. 7B-26) with oil at normal operating temperature. The oil level indicator is located in the engine compartment (Fig. 7B-27).

NOTE: The difference in oil level between Full and ADD is one (1) pint.

To check oil level accurately, the car should be level, the engine should be idled with the transmission oil at normal temperature, and the control lever in Park (P) position.

It is important that the oil level be maintained no higher than the FULL mark on the transmission oil level indicator. DO NOT OVERFILL, for when the

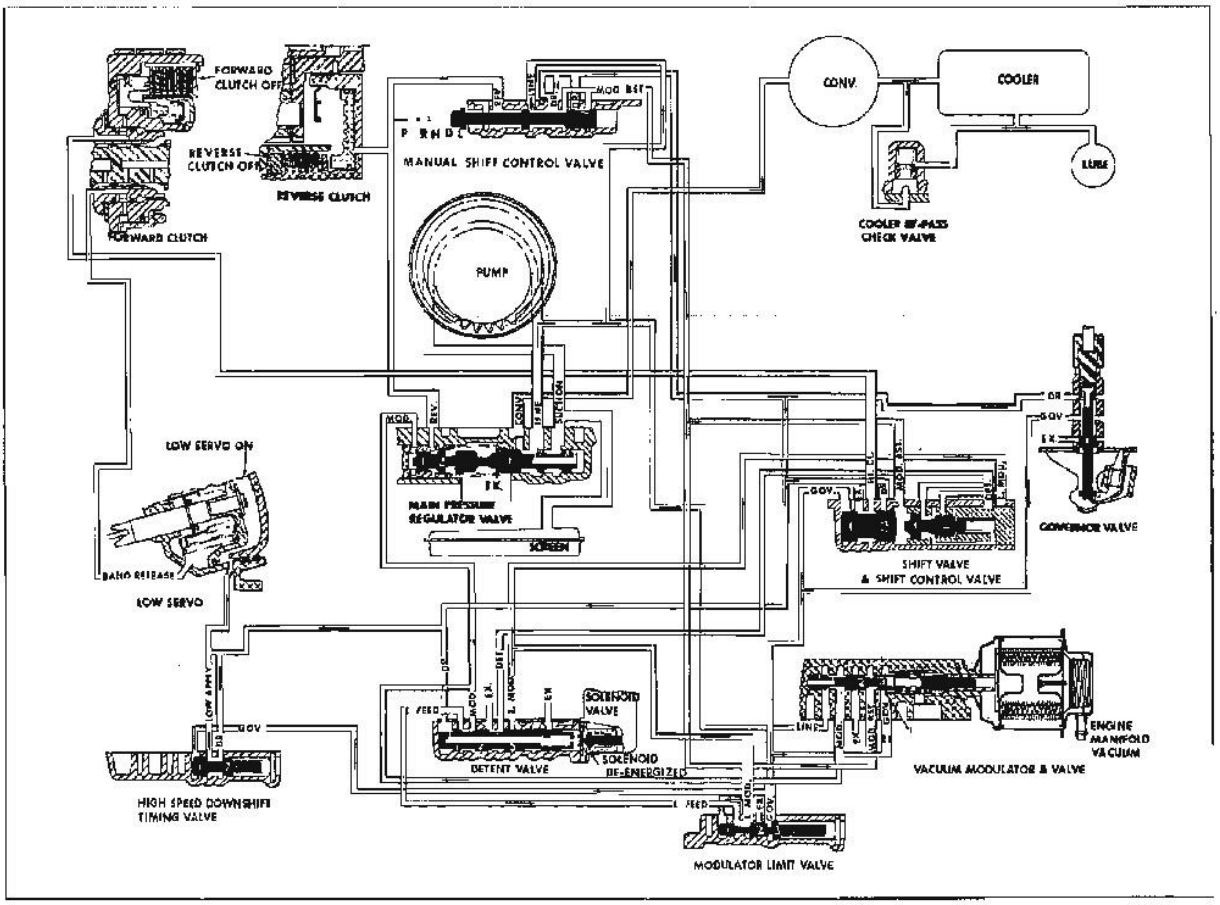


Fig. 7B-24 Oil Circuits - Manual Low

oil level is at the full mark on the oil level indicator, it is just slightly below the planetary gear unit. If oil is added which brings the oil level above the full mark, the planetary unit will run in the oil, foaming and aerating the oil. This will cause malfunctioning of the transmission assembly due to improper application of the band or clutches and excessive temperature.

If the transmission is found to be consistently low on oil, a thorough inspection should be made to find and correct all external oil leaks. All mating surfaces, such as the oil pan rail, filler tube, governor and modulator should be carefully examined for signs of leakage. The modulator must also be checked to insure that the diaphragm has not ruptured as this would allow transmission oil to be drawn into the intake manifold. Usually, the exhaust will be excessively smoky if the diaphragm ruptures, due to transmission oil drawn into the combustion chambers.

DRAINING AND REFILLING

Draining of the transmission oil at 24,000-mile intervals is recommended. Drain the oil by removing the oil pan; no drain plug is provided. Clean the oil strainer before refilling.

To refill the transmission, replace the oil pan, using a new gasket, and add 5 pints of transmission fluid, using filler tube and funnel. Start engine and allow engine to idle in Park (P) position 3-5 minutes to warm oil, then check oil and add as required to raise to the level of the FULL mark. Assuming that the converter was not drained (since it is welded) and allowing for a nominal spillage or draindown, approximately 6 pints of oil will be required for refill.

CAUTION: Do not overfill!

The dry capacity of the V-8 or L-6 transmission, including converter, is approximately 19-1/2 pints. Normal refills require 6 pints.

NEUTRALIZER AND BACK-UP LIGHT SWITCH

The starter neutralizer and back-up light switch is located on the gearshift control and indicator assembly.

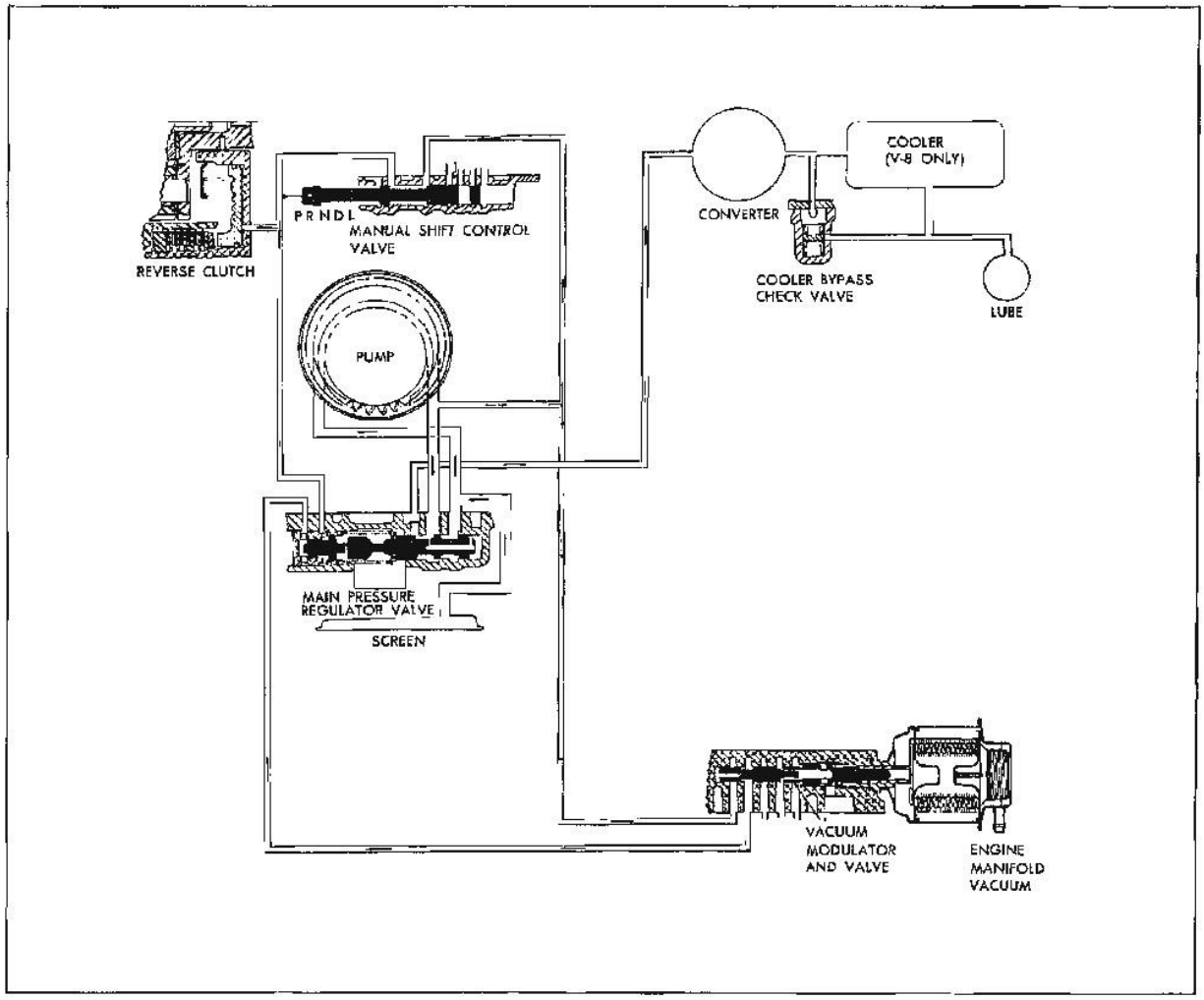


Fig. 7B-25 Oil Circuits - Reverse

Properly adjusted, the switch should turn on the back-up lights in reverse and prevent engine cranking with the selector lever in any position other than "N" (neutral) or "P" (park). If the engine cranks in any other position, adjust the switch by loosening the two switch-mounting screws and repositioning as required.

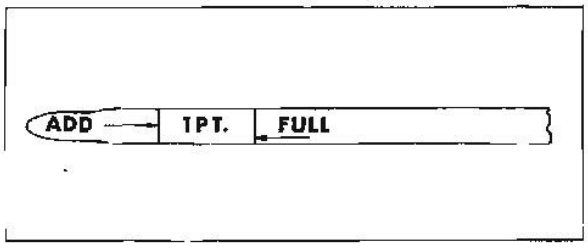


Fig. 7B-26 Oil Level Indicator

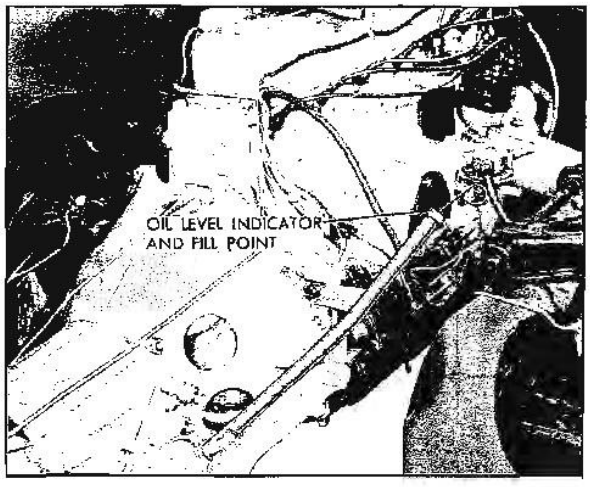


Fig. 7B-27 Location of Oil Level Indicator

SHIFT LINKAGE

If improper shaft linkage adjustment is suspected, adjustment can be made quickly as described below:

STANDARD

1. Loosen nut on swivel (Fig. 7B-28).

2. Set transmission selector lever in park position detent (clockwise to last detent).

3. Set shift lever in park position.

4. Tighten nut on swivel.

CONSOLE

1. Back off trunnion nuts on rod and trunnion assembly (Fig. 7B-29).

2. Set transmission selector lever in park position detent (clockwise to last detent).

3. Set shift lever in park position.

4. Tighten trunnion nuts.

LOW BAND

Adjustment of the low band at 24,000-mile intervals is recommended. Adjustment is performed as follows:

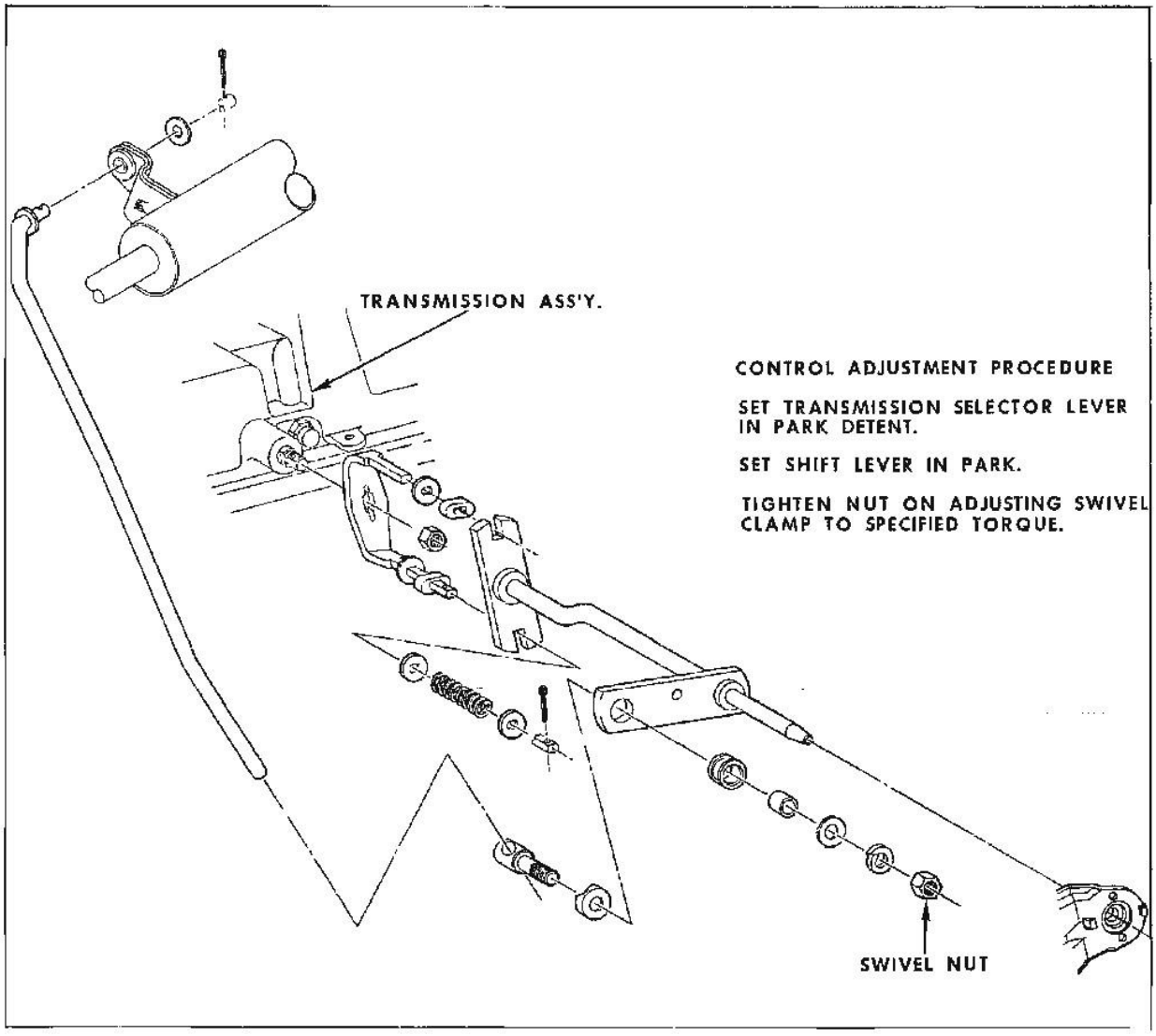


Fig. 7B-28 Shift Control Linkage

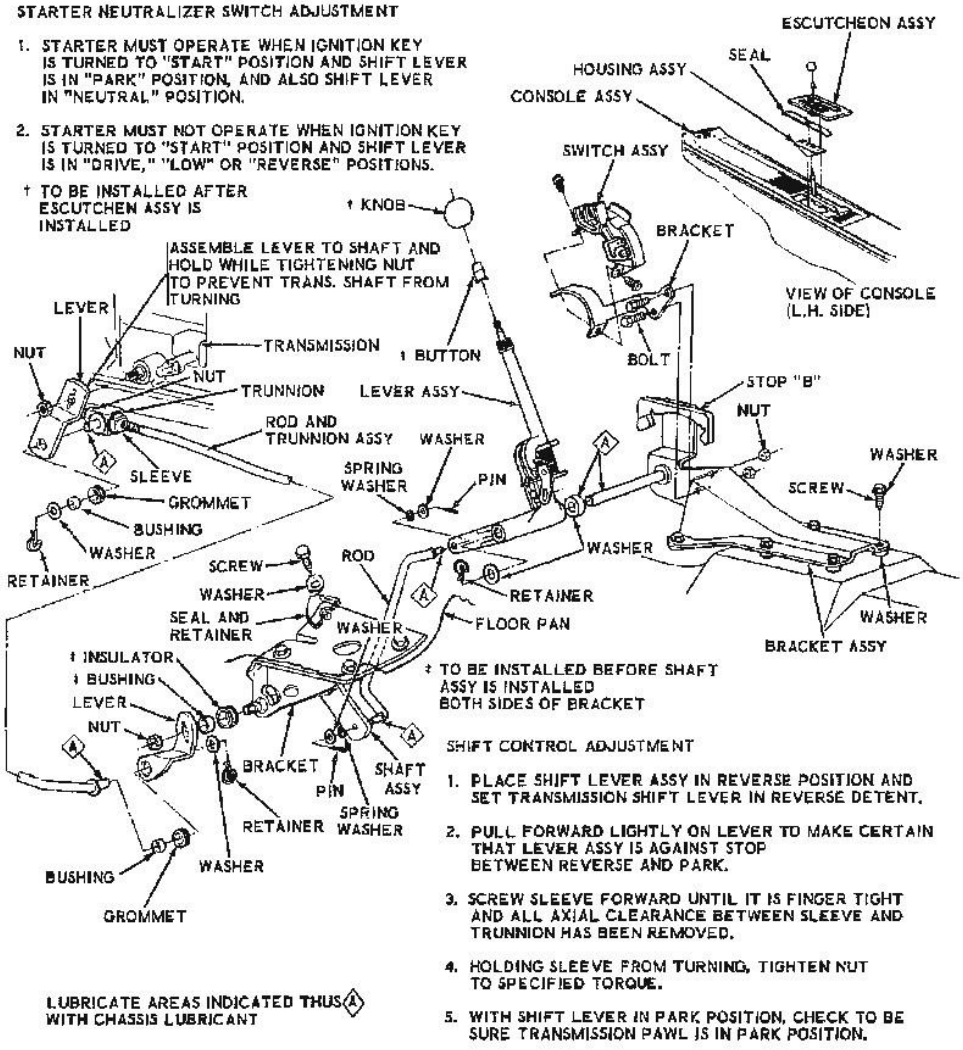


Fig. 7B-29 Console Shift Control Linkage

Remove protective cap, loosen lock nut, and tighten adjusting screw to 40 ± 5 lb. in. torque; then back off four (4) full turns exactly. While holding adjusting screw stationary, tighten adjusting screw lock nut securely. Replace cap.

SERVICE OPERATIONS— TRANSMISSION IN CAR

The Tempest automatic transmission service operations that can be performed while the transmission is in the car are covered below.

SHIFT LINKAGE (Fig. 7B-28 and 7B-29)

If any components are worn or damaged so that replacement is necessary, refer to the Master Parts Catalog to determine which items are serviced separately and which are serviced in assembly.

PARK LOCK ACTUATOR ASSEMBLY, INNER PARK LOCK AND RANGE SELECTOR LEVER

REMOVAL

1. Drain oil and remove pan.

2. Remove strainer and pipe.

3. Remove park lock bracket, and range selector shaft retainer.

4. Fully loosen nut that retains outer range selector lever to inner park lock and range selector lever.

5. Slide outer range selector lever out of case.

NOTE: Exercise care, when removing lever from case, so that nut doesn't drop down into gear train.

6. Remove inner park lock and range selector lever.

INSTALLATION

1. Installation is the reverse of removal.

REAR BEARING RETAINER OIL SEAL OR BUSHING REPLACEMENT

OIL SEAL

1. Remove propeller shaft (see Section 4).

2. Pry out old seal (Fig. 7B-30).

3. Coat outer casing of new oil seal with gasket sealing compound and drive it into place with installer J-5154 (Fig. 7B-31).

4. Install propeller shaft (see Section 4).

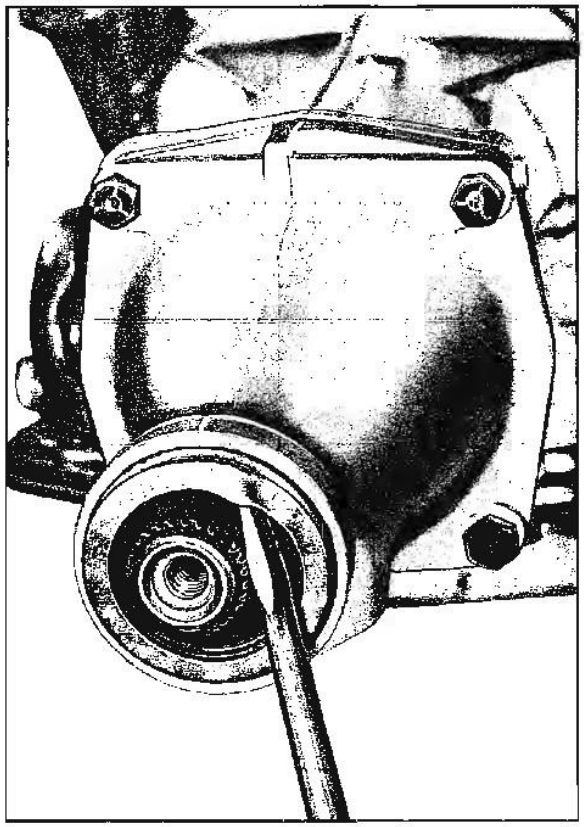


Fig. 7B-30 Removing Rear Bearing Retainer Oil Seal

BUSHING

1. Remove propeller shaft (see Section 4).

2. Support transmission and remove frame cross member and rear engine mount.

3. Remove speedometer cable and speedometer driven gear assembly.

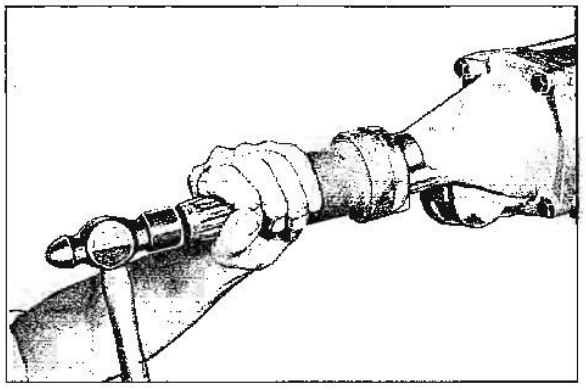


Fig. 7B-31 Installing Rear Bearing Retainer Oil Seal

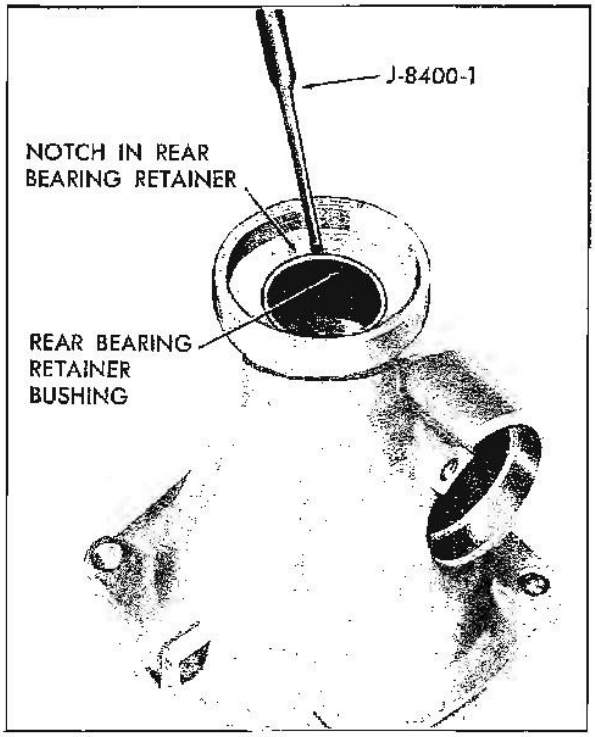


Fig. 7B-32 Removing Rear Bearing Retainer Bushing

4. Remove rear bearing retainer.

5. Pry out old oil seal.

6. Remove old case to rear bearing retainer oil seal.

7. Remove old rear bearing retainer bushing, using bushing chisel J-8400-1 (Fig. 7B-32).

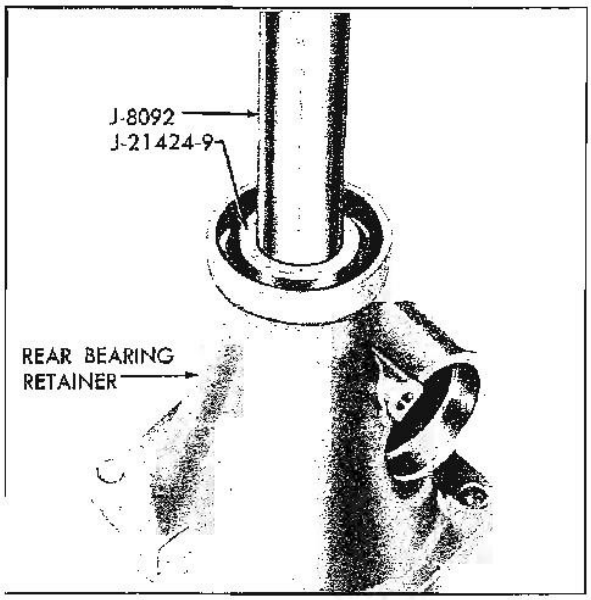


Fig. 7B-33 Installing Rear Bearing Retainer Bushing

8. Install new bushing from rear, using installer J-21424-1 and handle J-8092 (Fig. 7B-33).

9. Coat outer casing of new oil seal with gasket sealing compound and drive it into place with installer J-5154 (Fig. 7B-31).

10. Install new case to rear bearing retainer oil seal.

11. Install rear bearing retainer. Tighten bolts to 25-35 lb. ft. torque.

12. Install frame cross member and rear mount.

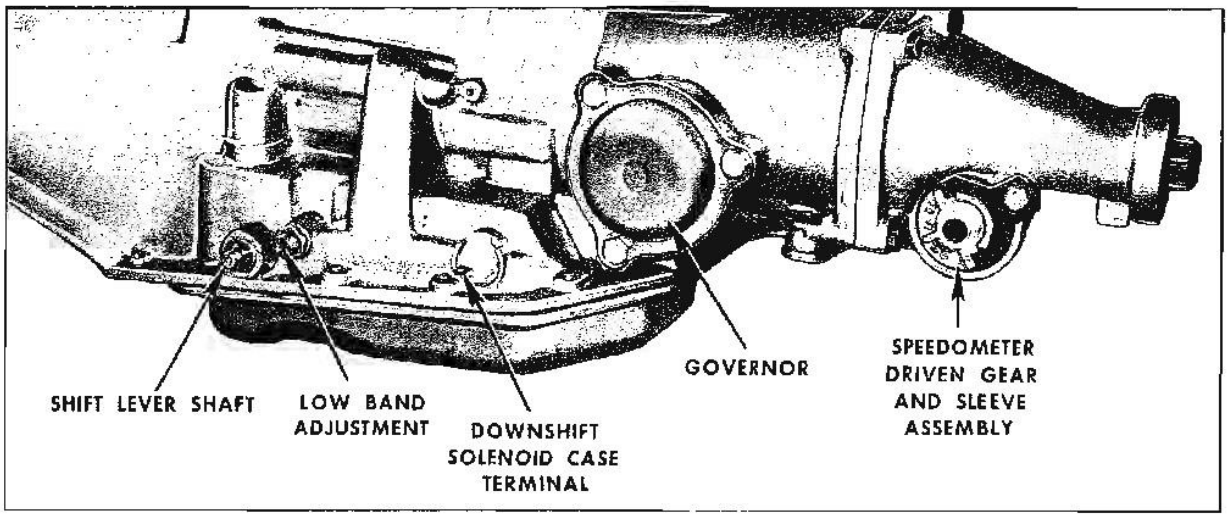


Fig. 7B-34 Transmission Assembly - Left Side View

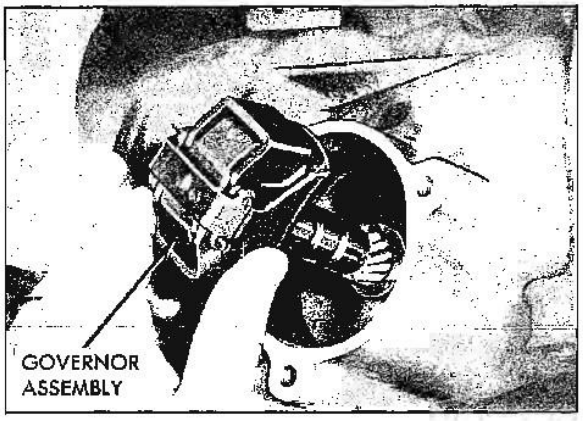


Fig. 7B-35 Removing Governor Assembly

13. Install propeller shaft (see Section 4).

14. Install speedometer driven gear assembly and connect cable.

GOVERNOR (Fig. 7B-34)

REMOVAL

1. Remove three bolts retaining governor cover to case. Remove cover and gasket.

2. Pull governor assembly out of case bore, allowing assembly to twist as driven gear disengages from drive gear teeth machined into output shaft (Fig. 7B-35).

INSPECTION

Check for sticking governor valve, broken or missing governor weight springs, damaged driven gear or worn weight pins.

REMOVAL AND REPLACEMENT OF GOVERNOR DRIVEN GEAR

1. Support governor sleeve on wood block. Remove roll pin with a 1/8" drill rod (Fig. 7B-36).

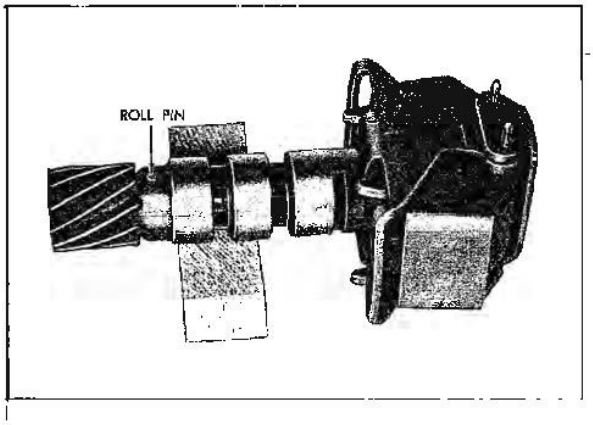


Fig. 7B-36 Supporting Governor

CAUTION: If wood block is placed under nylon gear, breakage of gear inside governor sleeve will result. Exercise extreme care not to damage machine surfaces of governor sleeve.

2. Remove driven gear. Remove any chips or burrs from inside governor sleeve.

3. Install replacement gear by carefully pressing new gear into sleeve as follows:

a. Use press plate J-8904, with adapters J-6407-1 and J-6407-2 (Fig. 7B-37).

b. Place shim supplied in replacement gear kit between the second and third lands of governor sleeve.

c. Make certain new gear is positioned squarely on sleeve and press gear onto sleeve. Gear must be seated against sleeve.

CAUTION: Do not support or hammer on rear of governor.

4. Through existing hole in governor sleeve, drill a 1/8" hole half-way through from each end.

NOTE: It is important that the hole for roll pin be drilled straight as possible to insure proper retention and installation of roll pin and gear. This can be best accomplished by above method.

5. Support end of governor sleeve (not gear) on a wooden block. Install new roll pin; then using a small chisel, stake pin in place at both ends of pin to prevent pin from becoming loose (Fig. 7B-36).

6. Check for burrs on sleeve and if valve is free in its bore. Any burrs that are left on governor sleeve will damage the case.

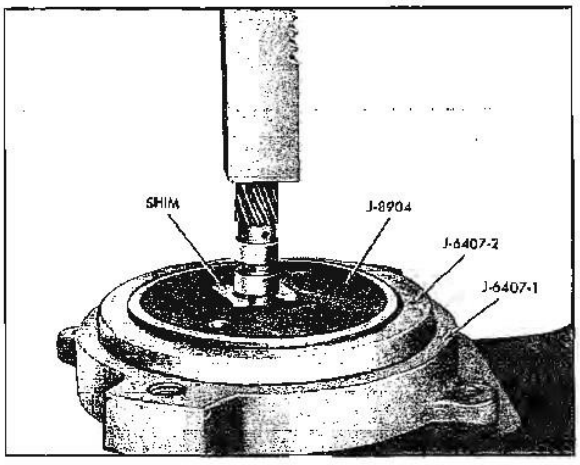


Fig. 7B-37 Installing Governor Driven Gear

INSTALLATION

1. Insert governor into case bore with a slight counterclockwise twist to engage gear teeth.

2. Using new gasket, install cover and retain with three bolts. Tighten bolts to 8-12 lb. ft. torque.

VACUUM MODULATOR (Fig. 7B-38)

Do not replace vacuum modulator before making the pressure check described in TROUBLE DIAGNOSIS at the end of Section 7B.

NOTE: Vacuum modulator is not adjustable.

REMOVAL

1. Remove vacuum hose at vacuum modulator.

2. Remove vacuum modulator retainer bolt and retainer.

3. Pull vacuum modulator (Fig. 7A-39) and valve assembly (Fig. 7A-40) out of case bore.

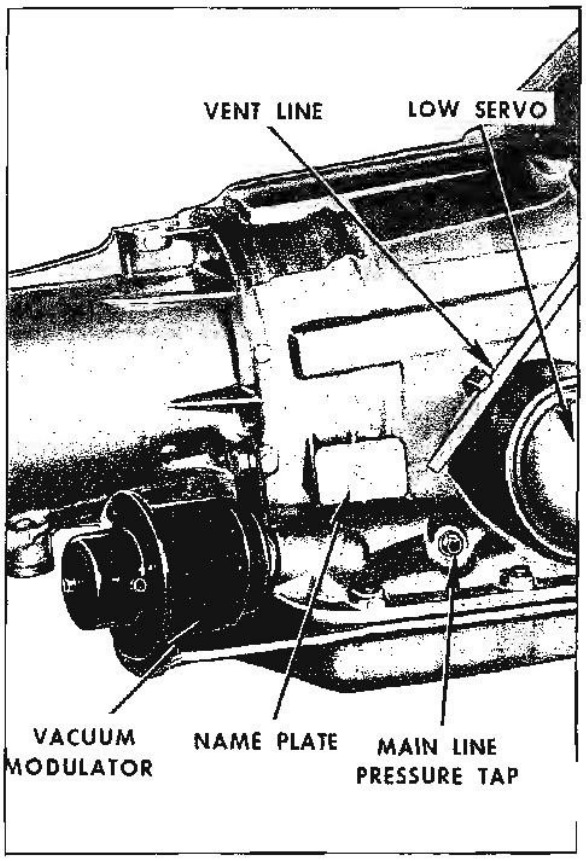


Fig. 7B-38 Transmission Assembly - Right Side View

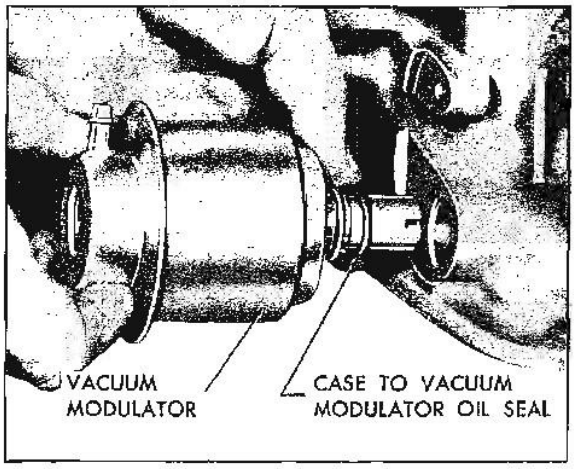


Fig. 7B-39 Removing Vacuum Modulator

NOTE: To remove the front modulator valve it may be necessary to use a magnet or "retriever".

INSPECTION AND REPAIRS

Check the modulator valve assembly for burrs. If such minor imperfections cannot be removed with a slip stone, replace the valves.

The modulator diaphragm can be checked with vacuum source for leakage. However, diaphragm leakage normally permits transmission oil pull-over, which is evident as smoky exhaust and continually low transmission oil level. No modulator repairs are possible; replace as an assembly.

Inspect case to vacuum modulator oil seal. Discard seal if it is nicked, cut or deteriorated.

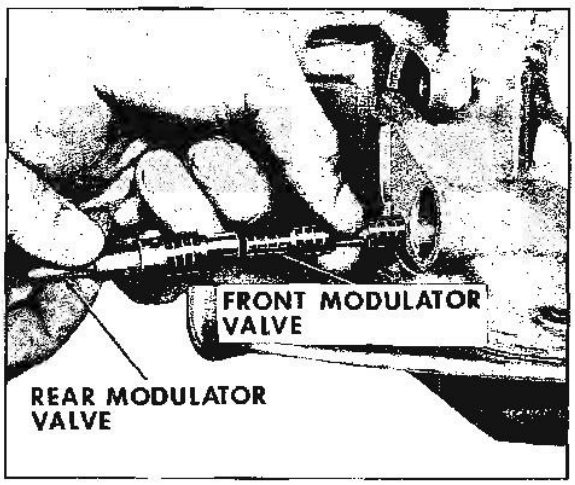


Fig. 7B-40 Removing Vacuum Modulator Valve Assembly

INSTALLATION

1. Install modulator valve assembly into case bore. (Refer to Fig. 7B-40 for correct assembly sequence.)

2. Assemble oil seal on vacuum modulator and install assembly into case bore.

3. Secure modulator assembly with retainer and bolt and tighten bolt 8-12 lb. ft. torque. Connect vacuum hose.

SPEEDOMETER DRIVEN GEAR AND SLEEVE

REMOVAL

1. Disconnect speedometer cable.

2. Remove speedometer driven gear sleeve retainer bolt.

3. Remove retainer and speedometer driven gear assembly.

NOTE: Transmission in cars with trailer provisions use a different retainer and an adapter (Fig. 7B-41).

INSPECTION AND REPAIRS (Fig. 7B-42)

Inspect both oil seals for nicks, cuts, or deterioration. Discard damaged seals. Check the driven gear for wear or damage; replace if necessary.

INSTALLATION

1. Assemble speedometer gear and sleeve assembly (Fig. 7B-42). Driven gear shaft oil seal lip must face driven gear.

2. Install assembly into case bore secure with retainer and bolt.

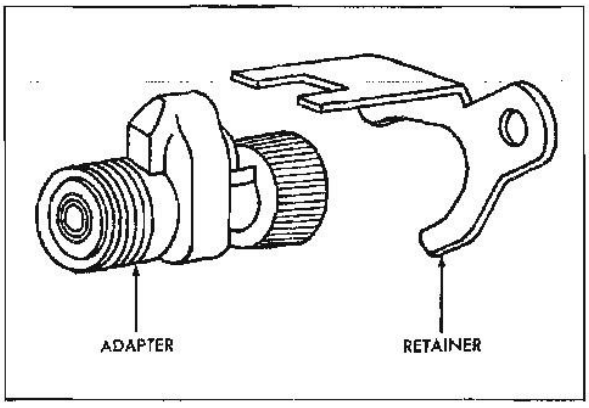


Fig. 7B-41 Speedometer Driven Gear Adapter and Retainer - Trailer Provision

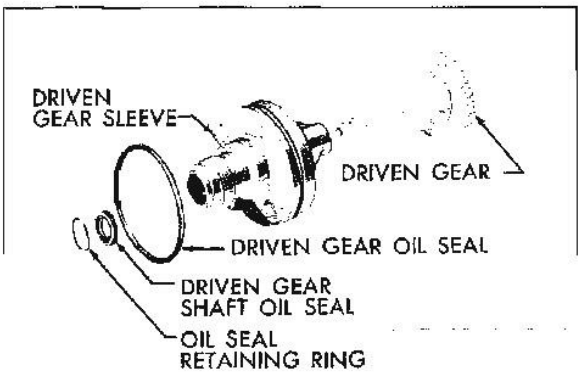


Fig. 7B-42 Speedometer Driven Gear and Sleeve Assembly - Exploded View

NOTE: Assembly must be rotated to align with retainer.

3. Connect speedometer cable.

DOWNSHIFT SOLENOID REPLACEMENT

1. Remove oil pan, gasket and oil strainer.

2. Disconnect solenoid connector from terminal (Fig. 7B-43).

NOTE: Raise retaining finger on top of case terminal to permit disengaging connector and disengage wire from retaining clip.

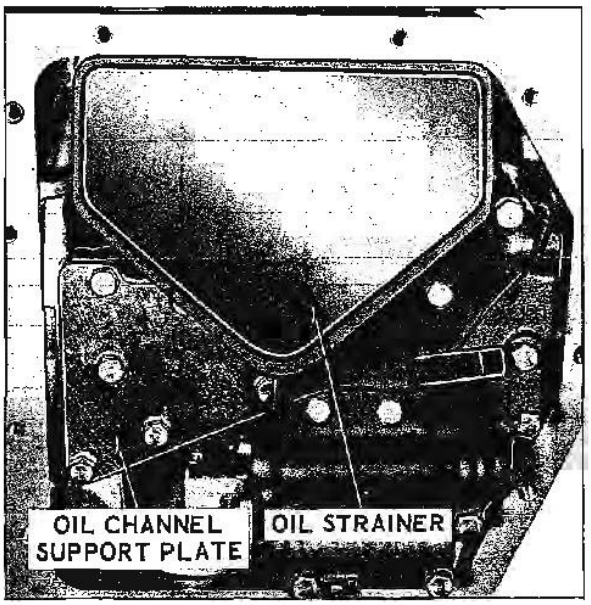


Fig. 7B-43 Transmission - Oil Pan Removed

3. Remove solenoid attaching bolts. Remove solenoid and gasket.

4. Install new gasket on solenoid so that gasket notch will face bottom of valve body.

5. Install solenoid on valve body and secure connector to case terminal. Make certain that case terminal retaining finger engages connector and wire is retained by clip.

6. Install oil screen (make certain grommet is in good condition) and tighten retaining bolt to 8-11 lb. ft. torque. Install oil pan using a new gasket. Tighten oil pan bolts to 10-12 lb. ft. torque.

VALVE BODY

REMOVAL

1. Remove oil pan and gasket.

2. Remove oil strainer retaining bolt and remove strainer (Fig. 7B-43) using a twisting motion. Remove oil strainer pipe from case, but only if necessary because seal failure is suspected.

3. Disconnect solenoid connector from terminal (Fig. 7B-43).

NOTE: Raise retaining finger on top of case terminal to permit disengaging connectors.

4. Remove detent spring assembly from valve body (Fig. 7B-43).

5. Remove remaining valve body bolts and hold valve body in position.

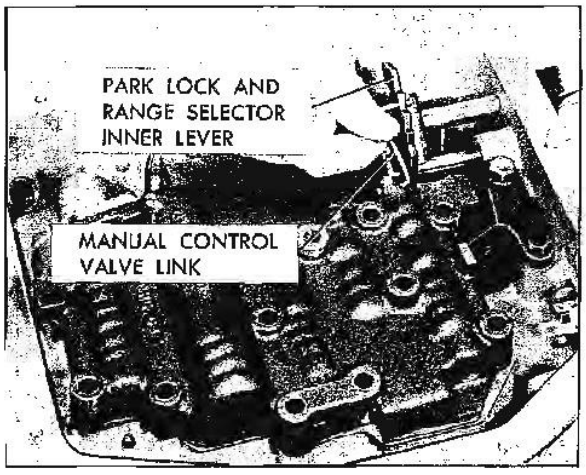


Fig. 7B-44 Disengaging Manual Control Valve Link

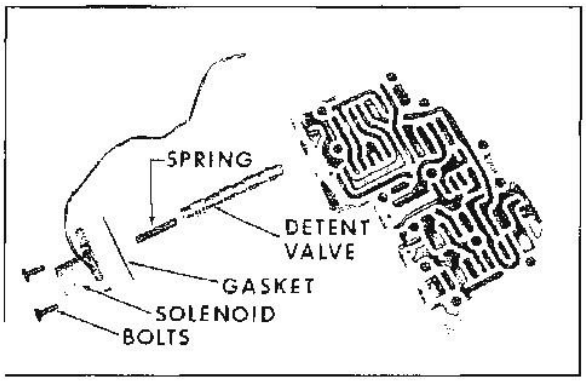


Fig. 7B-45 Downshift Solenoid and Detent Valve - Exploded View

6. Disengage manual control valve link from park lock and range selector inner lever by rotating valve body (Fig. 7B-44).

7. Remove valve body. Remove manual control valve and link from valve body.

8. If necessary, remove oil channel support plate (Fig. 7B-43), valve body plate, and plate to case gasket.

DISASSEMBLY

1. Remove downshift solenoid, gasket, spring, and detent valve (Fig. 7B-45).

2. Depress shift control valve sleeve and remove retaining pin by turning valve body over so pin can fall free (Fig. 7B-46). Remove shift control valve sleeve, shift control valve, spring, washer, and shift valve.

NOTE: Modulator limit valve spring is under moderate pressure. Care should be exercised during removal during Step 3 below.

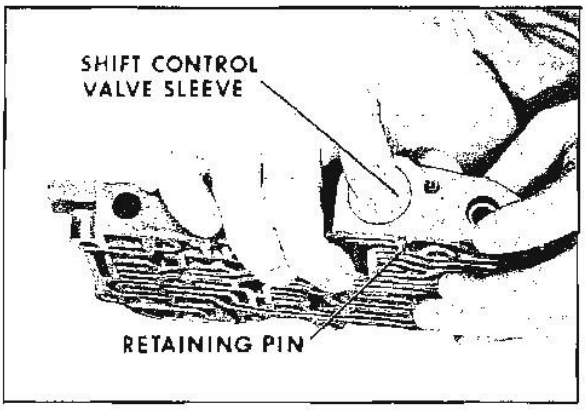


Fig. 7B-46 Removing Shift Control Valve Sleeve

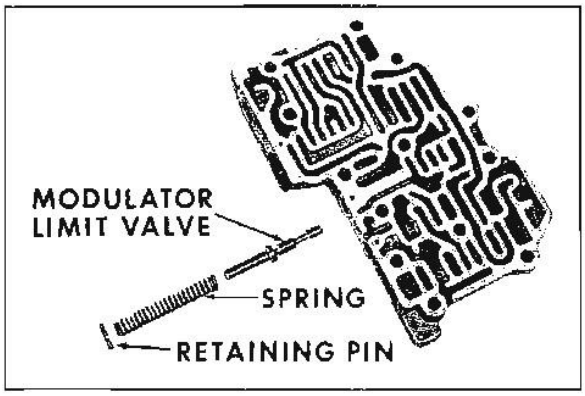


Fig. 7B-47 Modulator Limit Valve - Exploded View

3. Depress modulator limit valve spring (using J-21361) and. turn valve body over so that retaining pin falls free. Remove spring and valve (Fig. 7B-47). (Needle nose pliers can be used to depress spring and work out pin.)

4. Depress high-speed downshift timing valve spring (using J-21361) and remove retaining pin by turning valve body over so that pin can fall free. Remove spring and valve (Fig. 7B-48). (Needle-nose pliers can be used to depress spring and work out pin.)

INSPECTION

As most valve body failures are initially caused by dirt or other foreign material preventing a valve from functioning properly, a thorough cleaning of all parts in clean solvent is mandatory. Check all valves and their operating bores for burrs or other deformities that could cause valve "hang-up". Discard oil strainer grommet.

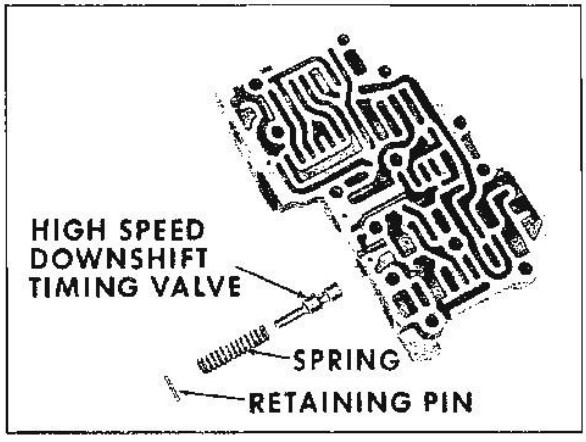


Fig. 7B-48 High Speed Downshift Timing Valve - Exploded View

ASSEMBLY

1. Install high-speed downshift timing valve and spring (Fig. 7B-48). Depress spring with needle-nose pliers and install retaining pin.

2. Install modulator limit valve and spring (Fig. 7B-47). Depress spring with needle-nose pliers and install retaining pin.

3. Install shift valve, washer, spring, shift control valve, and shift control valve sleeve (Fig. 7B-49). Depress shift control valve sleeve and install retaining pin.

4. Install detent valve and spring. Install gasket on downshift solenoid with notch facing bottom of valve body and install downshift solenoid. Tighten bolts to 8-12 lb. ft. torque.

INSTALLATION

1. If previously removed, install new valve body plate to case gasket, using petrolatum to hold it in position. Install valve body plate and oil channel support plate. Install bolts finger tight.

2. Install manual control valve and link into valve body.

3. Engage manual control valve link in park lock and range selector inner lever (Fig. 7B-44).

4. Install spring detent assembly on valve body (Fig. 7B-50). (Note routing of solenoid wire and wire retaining clip position.)

5. Install remaining valve body to case bolts (except oil strainer retaining bolt) and tighten all bolts to 8-11 lb. ft. torque.

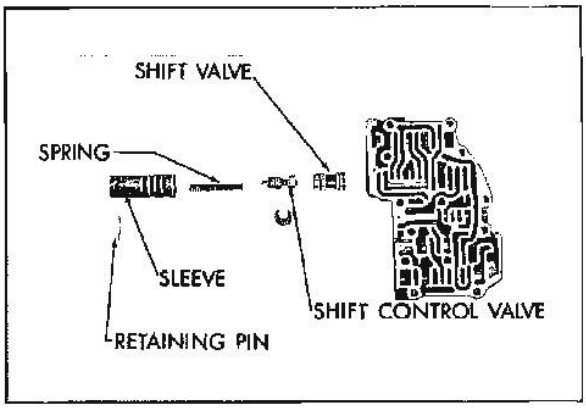


Fig. 7B-49 Shift Valve and Shift Control Valve

6. Connect solenoid connector to case terminal (Fig. 7B-50). Make certain that case terminal retaining finger engages connector and wire is retained by clip.

7. If previously removed, install oil strainer pipe to case seal on oil strainer pipe. Lubricate seal and install pipe into case.

8. Install oil strainer to oil strainer pipe grommet. Lubricate grommet and install strainer on pipe with a twisting motion. Install and tighten oil strainer bolt to 8-11 lb. ft. torque.

9. Install oil pan, using a new gasket. Tighten oil pan bolts to 10-12 lb. ft. torque.

PRESSURE REGULATOR

REMOVAL

1. Remove oil pan and gasket.

CAUTION: Valve spring is under high pressure. Use extreme care after snap ring has been removed in Step 2 below.

2. Compress main pressure regulator valve spring by pressing on boost valve sleeve and remove snap ring (Fig. 7B-51).

3. Remove boost valve sleeve, valve, spring, washer and pressure regulator valve.

INSPECTION

Inspect pressure regulator valve, boost valve, and boost valve sleeve for nicks or burrs that could interfere with proper operations. If minor imperfections cannot be removed with a slip stone, replace parts as required.

ASSEMBLY

1. Refer to Fig. 7B-108 for correct assembly sequence.

2. Install pressure regulator valve, washer, spring and boost valve and sleeve into pump body.

NOTE: Later production transmissions incorporate a C type spring washer and may have one or two C type spacers behind the washer. Install the same number of spacers originally removed.

3. Compress valve spring by depressing boost valve sleeve and install snap ring.

4. Install new gasket and install oil pan.

TRANSMISSION REMOVAL AND INSTALLATION

1. Disconnect speedometer cable and remove speedometer driven gear assembly to allow oil to drain during removal procedure.

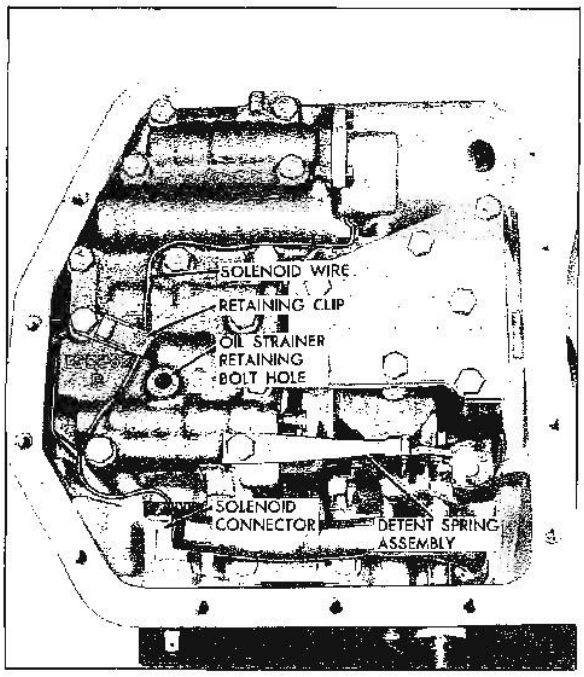


Fig. 7B-50 Transmission - Oil Pan and Strainer Removed

2. Remove propeller shaft (see Section 4).

3. Disconnect vacuum line and downshift switch lead.

4. Disconnect shift control linkage from outer shift lever.

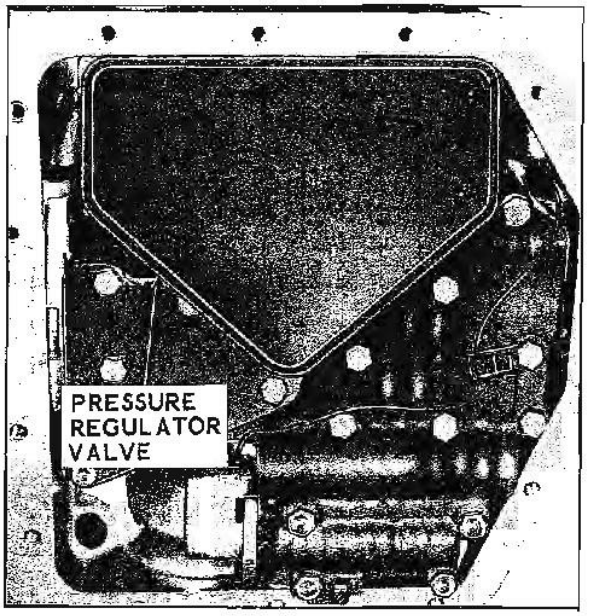


Fig. 7B-51 Pressure Regulator Location

5. Remove flywheel housing bottom cover.

6. Remove flywheel to converter mounting bolts. After bolts are removed, make certain converter hub is free of crankshaft.

7. Support transmission and remove frame cross member.

8. Lower transmission and engine assembly to gain access to cooler line fittings (V-8 only). Disconnect cooler lines, using a crow foot adapter and a suitable extension or using oil cooler pipe wrench J-21477.

NOTE: On some cars it may be necessary to loosen exhaust system.

9. With transmission in lowered position, remove case to engine bolts.

10. Move transmission down and to the rear and install converter holding strap J-21366 to hold converter in position until transmission is to be disassembled.

To install transmission, reverse the above procedure.

TRANSMISSION DISASSEMBLY

Service procedures for the rear bearing retainer, governor, vacuum modulator, speedometer driven gear assembly, downshift solenoid, pressure regulator, and valve body are covered under SERVICE OPERATIONS - TRANSMISSION IN CAR, page 7B-21.

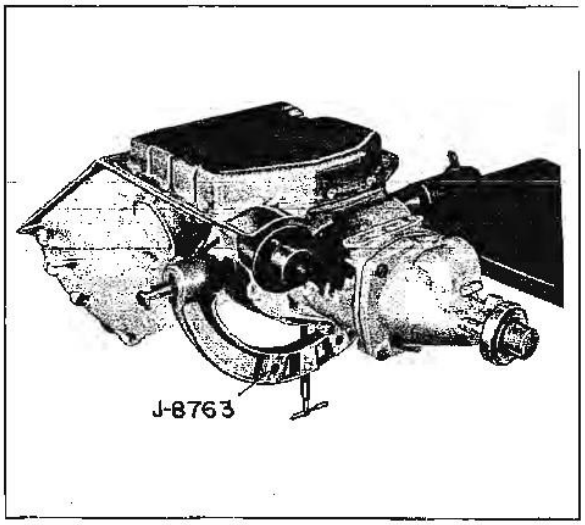


Fig. 7B-52 Transmission Mounted in Holding Fixture

REMOVAL OF VALVE BODY, REAR BEARING RETAINER, SPEEDOMETER DRIVE GEAR, AND LOW SERVO

1. Mount transmission in holding fixture J-8763 (Fig. 7B-52).

2. With transmission in horizontal position, pull out converter.

3. Remove valve body (see page 7B-26).

4. Remove speedometer driven gear assembly (see page 7B-25).

5. Remove governor assembly (see page 7B-24).

6. Remove vacuum modulator (see page 7B-24).

7. Remove rear bearing retainer.

8. Place transmission in Park, then remove speedometer drive gear, using J-21427 and J-8433 (Fig. 7B-53).

NOTE: J-5814 may also be used with J-21427.

REMOVAL OF OIL PUMP, FORWARD CLUTCH, AND LOW BAND

NOTE: Oil pump seal can be replaced without removing pump from case:

a. Pry out old seal.

b. Coat outer casing of new oil seal with gasket sealing compound and drive it into place with installer J-21359.

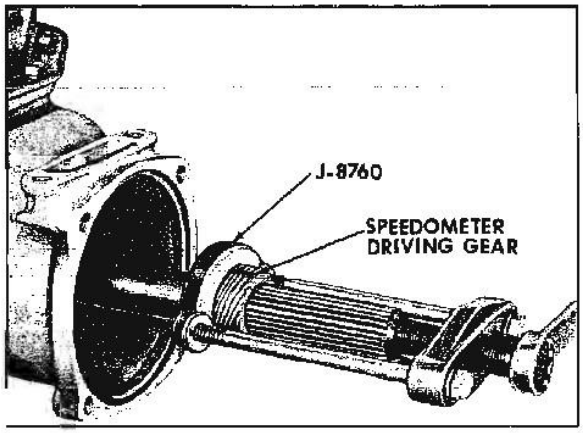


Fig. 7B-53 Removing Speedometer Drive Gear

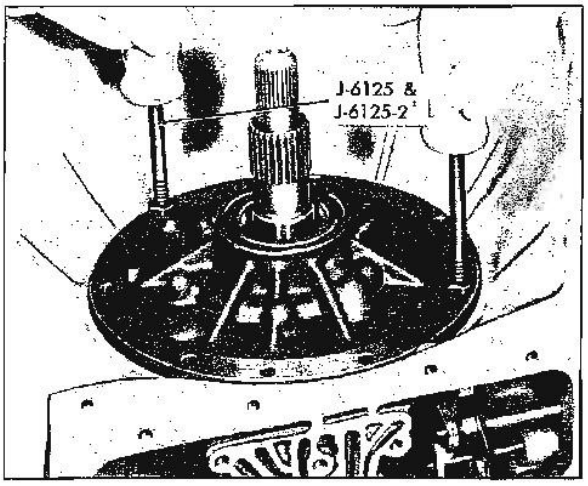


Fig. 7B-54 Removing Oil Pump

1. With transmission in vertical position, remove eight oil pump attaching bolts. Install slide hammers J-2619 into threaded holes in pump, loosen pump and remove pump and gasket (Fig. 7B-54).

2. Remove input shaft from forward clutch drum (Fig. 7B-55).

3. Remove forward clutch assembly by pulling straight out of case (Fig. 7B-56).

4. Remove low band and struts from case.

5. Remove low servo cover snap ring, using tool J-21495-1 to compress low servo cover so that snap ring can be removed (Fig. 7B-57).

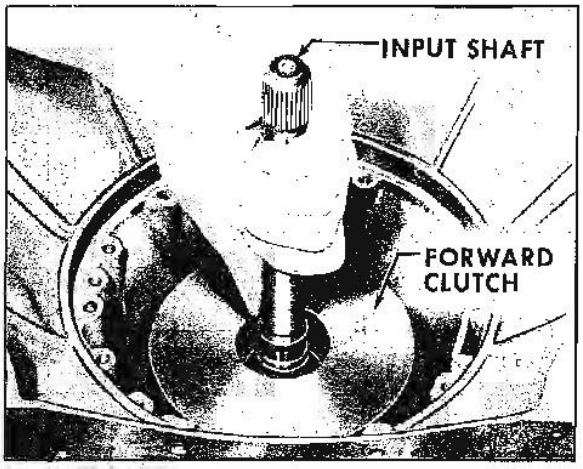


Fig. 7B-55 Removing Input Shaft

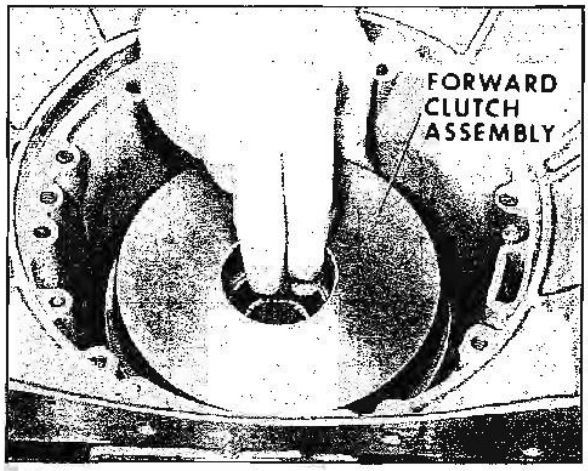


Fig. 7B-56 Removing Forward Clutch Assembly

6. Remove tool J-21495-1 from case and remove low servo cover. If necessary, tap lightly on low servo assembly piston rod to assist in removal of cover.

7. Remove low servo assembly from case.

REMOVAL OF PLANETARY GEAR SET, REVERSE CLUTCH AND PISTON, AND PARK LOCK MECHANISM

1. Pull planet carrier assembly from case, using care to avoid damaging case bushing (Fig. 7B-58) and remove reverse ring gear (Fig. 7B-59) thrust bearing and races (Fig. 7B-60).

2. With transmission in vertical position, remove reverse clutch pack snap ring with a screwdriver (Fig. 7B-61).

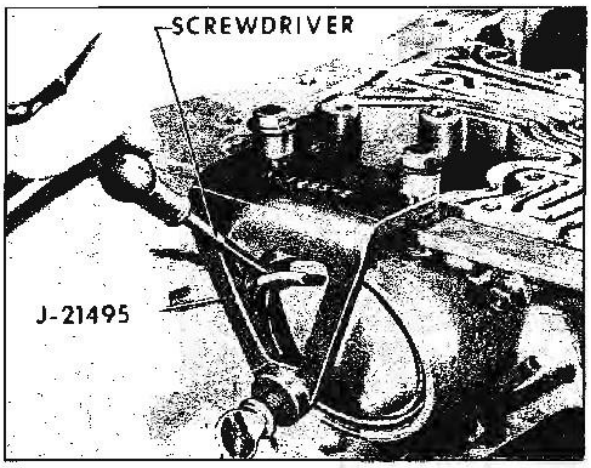


Fig. 7B-57 Removing Low Servo Cover Snap Ring

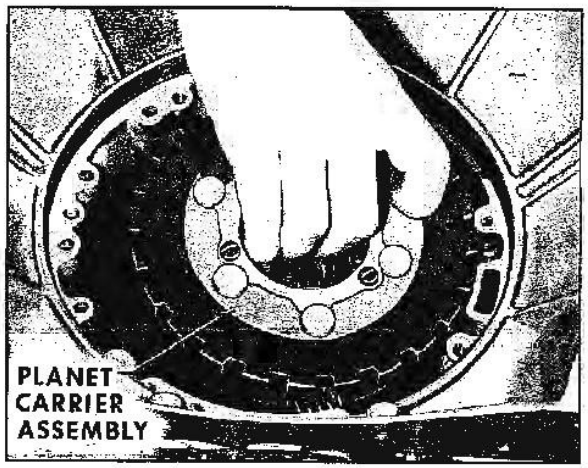


Fig. 7B-58 Removing Planet Carrier Assembly

3. Lift reverse clutch pressure plate, clutch pack, and cushion spring from case.

NOTE: Position spring compressor so that reverse piston return seat snap ring gap is accessible in Step 4 below.

4. Compress reverse piston return springs, using spring compressor J-9542 and adapters (Fig. 7B-62).

5. With return springs fully compressed, remove snap ring.

6. Release pressure on the return springs, being careful that piston return seat does not catch in snap ring groove. Remove return seat and springs.

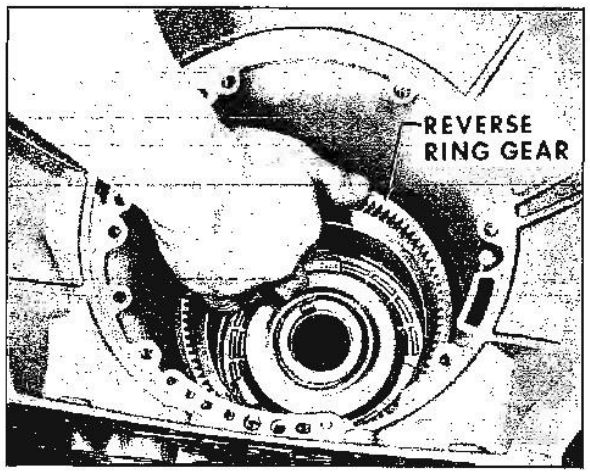


Fig. 7B-59 Removing Reverse Ring Gear

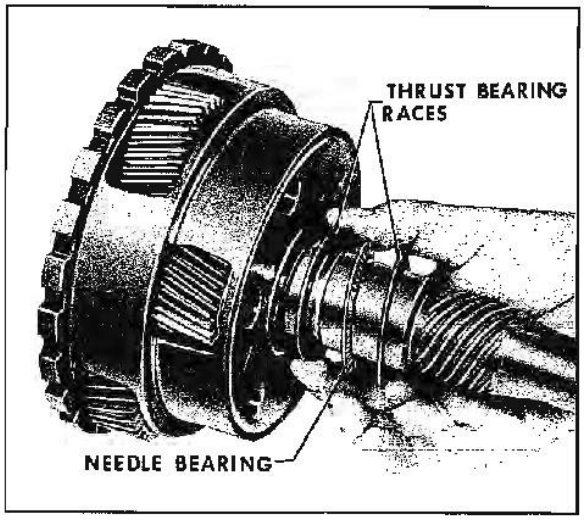


Fig. 7B-60 Removing Planet Carrier Thrust Bearing and Races

7. With transmission in horizontal position, apply compressed air to reverse piston apply port to force out reverse piston (Fig. 7B-63).

8. Remove parking lock bracket (Fig. 7B-64).

9. Remove range selector shaft retainer (Fig. 7B-65).

10. Fully loosen nut that retains outer range selector lever shaft to inner park lock and range selector lever (Fig. 7B-66).

NOTE: Before sliding range selector lever shaft out of case, remove any burrs on inner end of shaft that could score case bore or make removal difficult.

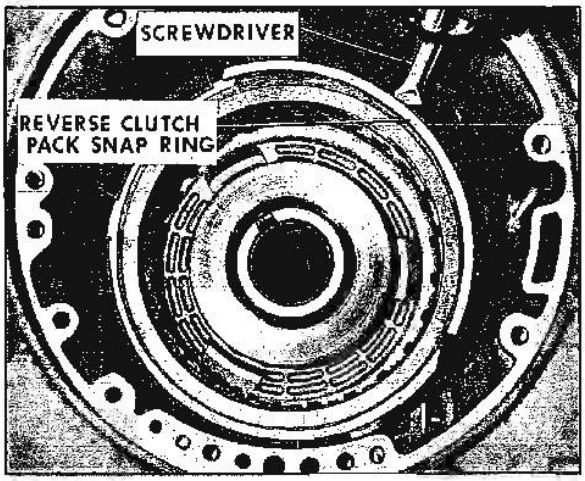


Fig. 7B-61 Removing Reverse Clutch Pack Snap Ring

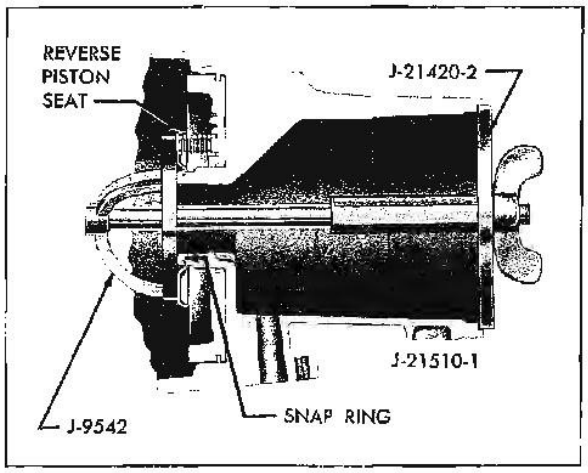


Fig. 7B-62 Compressing Reverse Piston Return Springs

11. Slide range selector lever shaft out of case (see NOTE above). Remove nut and inner park lock and range selector lever.

12. Slide parking lock pawl shaft out of parking lock pawl (Fig. 7B-67). Remove parking lock pawl and spring.

INSPECTION AND OVERHAUL OF INDIVIDUAL COMPONENTS

Service procedures for the rear bearing retainer, governor, vacuum modulator, speedometer driven gear assembly, downshift solenoid, valve body and pressure regulator are covered under SERVICE OPERATIONS - TRANSMISSION IN CAR, page 7B-21.

TRANSMISSION CASE

INSPECTION

1. Inspect for hairline cracks or oil leaks.

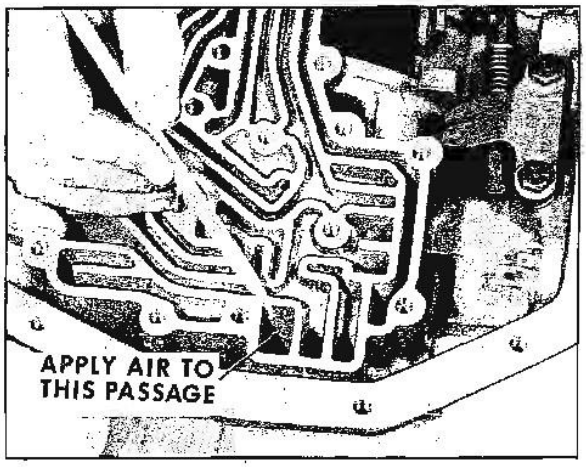


Fig. 7B-63 Reverse Piston Apply Passage

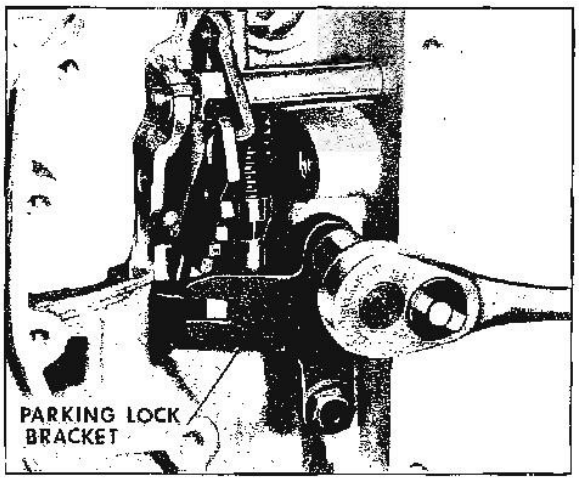


Fig. 7B-64 Removing Parking Lock Bracket

2. Check for interconnected oil passages, using air gun or smoke.

3. Check bolt hole threads for cross threading or stripped condition.

4. Check case bushing for nicks, excessive scoring, or wear. If replacement is required, proceed as follows:

CASE BUSHING REPLACEMENT

1. Remove bushing, using bushing chisel J-8400-1. Avoid damaging bushing bore.

2. Install new bushing, using installer J-21424-2 and handle J-8092.

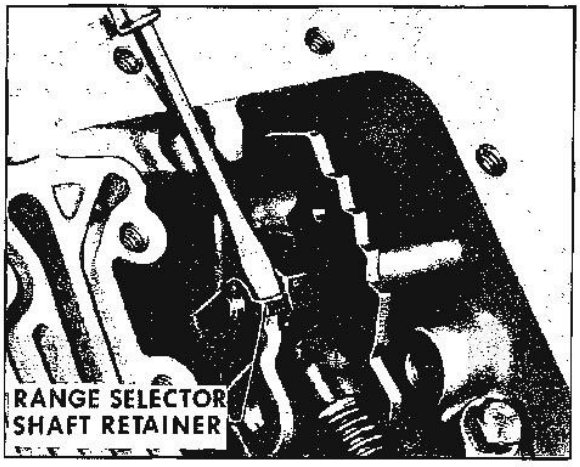


Fig. 7B-65 Removing Range Selector Shaft Retainer

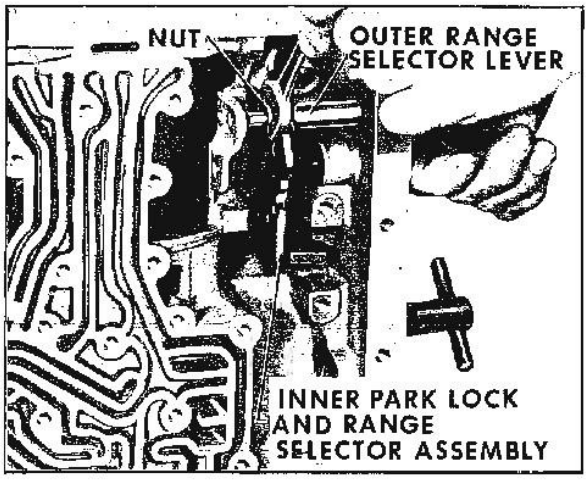


Fig. 66 Removing Range Selector Shaft Nut

RANGE SELECTOR SHAFT OIL SEAL REPLACEMENT

1. Pry out old seal.

2. Tap new seal gently until it bottoms in case bore. Use a piece of flat metal or wood to avoid damaging seal.

PARK LOCK ACTUATOR ASSEMBLY AND INNER PARK LOCK AND RANGE SELECTOR LEVER

DISASSEMBLY

Remove retainer ring that holds inner park lock and range selector to park lock actuator assembly (Fig. 7B-68).

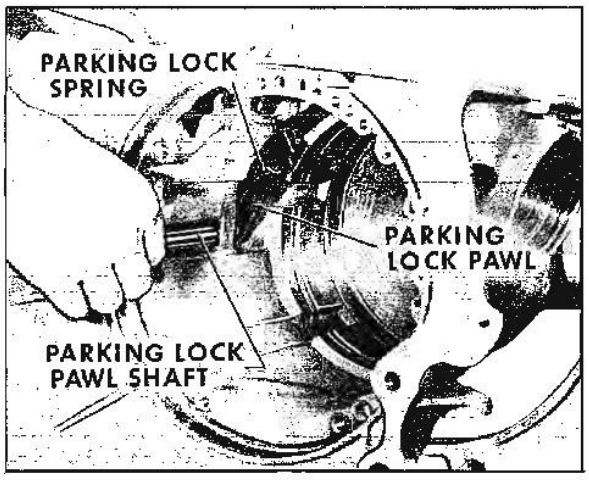


Fig. 7B-67 Removing Parking Lock Pawl Shaft

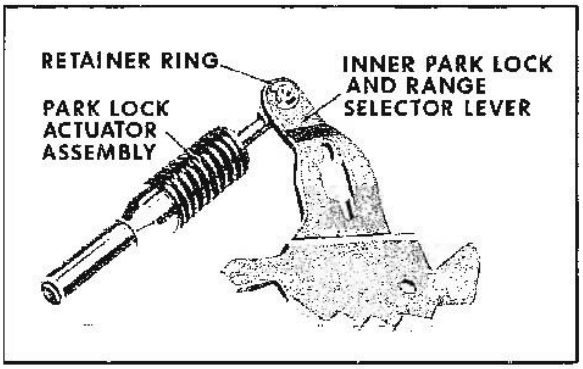


Fig. 7B-68 Park Lock Actuator and Range Selector Lever

INSPECTION

Check for worn or damaged parts and replace as required.

ASSEMBLY

Engage park lock actuator assembly in inner park lock and range selector lever and secure with retainer ring (Fig. 7B-68).

REVERSE CLUTCH AND PISTON

DISASSEMBLY AND INSPECTION

1. Remove and discard reverse piston inner and outer seals.

2. Check for broken piston return springs and make a comparative check of spring heights by standing all springs in a row. If there is appreciable difference in spring height, replace springs.

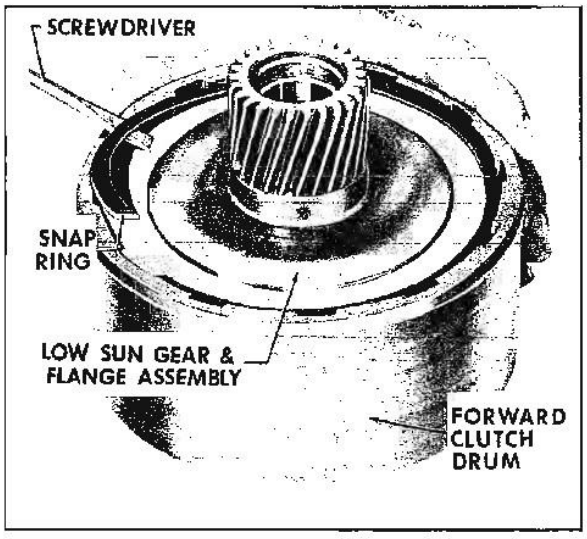


Fig. 7B-69 Removing Low Sun Gear and Flange Assy Snap Ring

3. Examine clutch plates for evidence of wear or burning. Discard damaged plates. (L-6 clutch pack contains 4 steel and 4 faced plates, V-8-5 steel and 5 faced plates, and the G.T.O. 6 steel and 6 faced plates.)

4. Check piston for cracks or distortion.

ASSEMBLY

1. Check reverse piston thickness. L-6 piston is 1" thick; V-8 piston is 13/16" thick, G.T.O. piston is 5/8" thick.

2. Lubricate with transmission oil and install inner and outer seals in reverse piston grooves.

FORWARD CLUTCH

DISASSEMBLY

1. Remove low sun gear and flange assembly snap ring (Fig. 7B-69).

2. Remove low sun gear and flange assembly (Fig. 7B-70).

3. Remove clutch hub rear thrust washer (Fig. 7B-71).

4. Remove clutch hub (Fig. 7B-72).

5. Remove clutch hub front thrust washer (Fig. 7B-73).

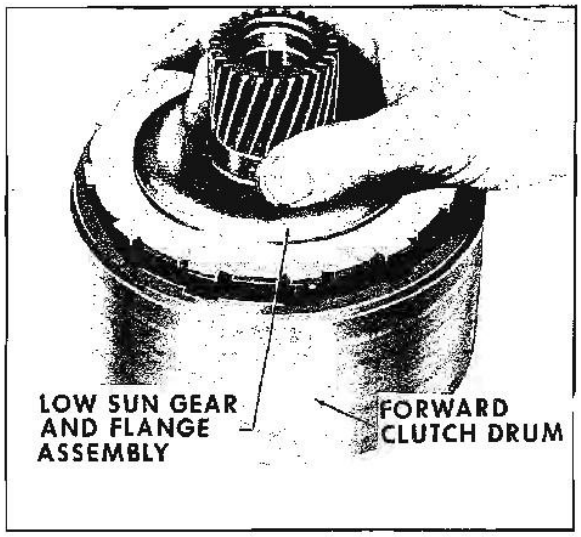


Fig. 7B-70 Removing Low Sun Gear and Flange Assy

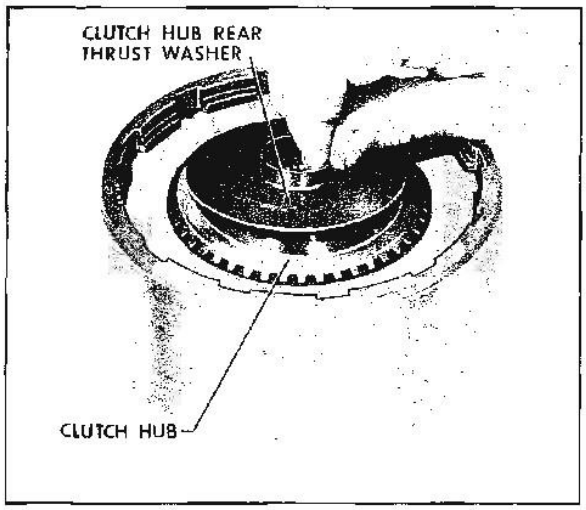


Fig. 7B-71 Removing Clutch Hub Rear Thrust Washer

6. Remove clutch pack.

7. Using spring compressor J-9542, compress piston return springs (Fig. 7B-74). Remove snap ring.

8. Carefully release pressure, then remove spring retainer and return springs.

9. Remove clutch piston with a twisting motion. Remove and discard outer seal on piston and inner seal on clutch drum hub.

INSPECTION

1. Wash all parts in cleaning solvent and air dry.

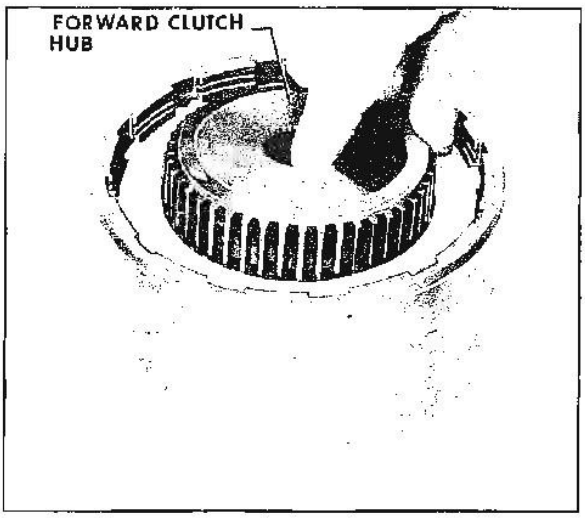


Fig. 7B-72 Removing Clutch Hub

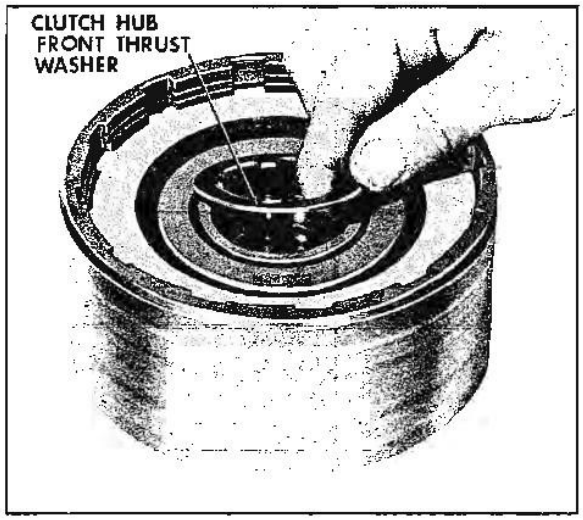


Fig. 7B-73 Removing Clutch Hub Front Thrust Washer

2. Inspect low band surface of clutch drum for excessive scoring or burning. Check clutch drum bushing for scoring or excessive wear. If bushing replacement is necessary, see Clutch Drum Bushing Replacement below.

3. Check steel ball in clutch drum that acts as a relief valve. Be sure that it is free to move and that the orifice in the front face of the drum is open. If the check ball is loose enough to come out or not loose enough to rattle, replace the clutch drum as an assembly. Replacement or restaking of the ball should not be attempted.

NOTE: When the drum is rotating at high speed with enough fluid trapped in the piston apply area, centrifugal force acting on the fluid could partially apply the piston and burn the clutch pack unless the relief orifice is open. During normal piston application, oil pressure seats the ball and prevents loss of pressure.

4. Check fit of low sun gear and flange assembly in drum slots. There should be no appreciable radial play. Inspect low sun gear for damage and bushing for wear.

5. Check clutch plates for burning, pitting, or metal pick-up. Also check to see that faced plates are a free fit over clutch hub and that steel plates are a free fit in clutch drum slots. Check for excessive wear on friction facing of drive plates. Examine condition of clutch hub splines and mating splines on faced plates.

6. Check piston for cracks or distortion.

CLUTCH DRUM BUSHING REPLACEMENT

1. Remove old bushing using chisel J-8400-1 or tool J-21424-5 (Fig. 7B-75). Avoid damaging bushing bore.

2. Install new bushing, using tool J-21424-5 (Fig. 7B-76). Press bushing in until tool touches front face of drum.

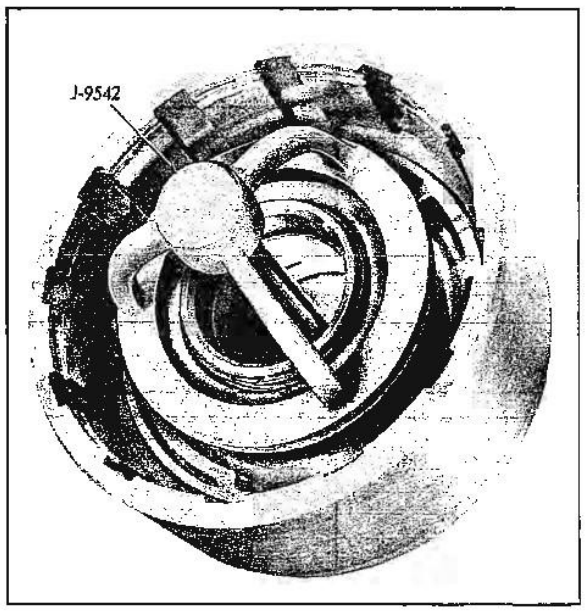


Fig. 7B-74 Compressing Forward Piston Return Springs

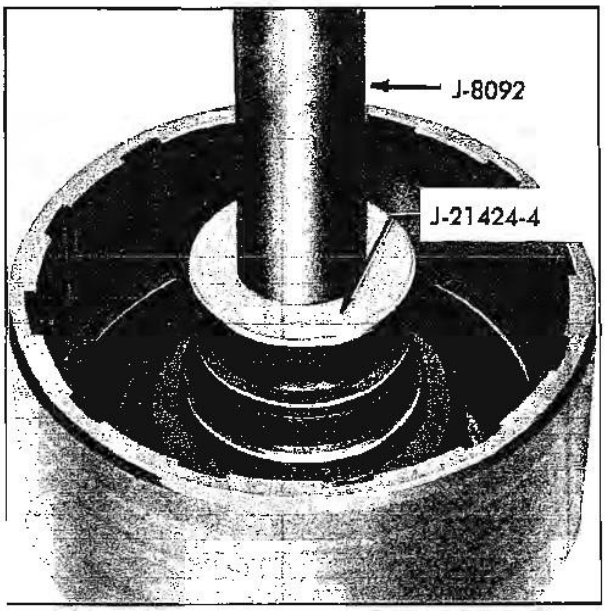


Fig. 7B-75 Removing Clutch Drum Bushing

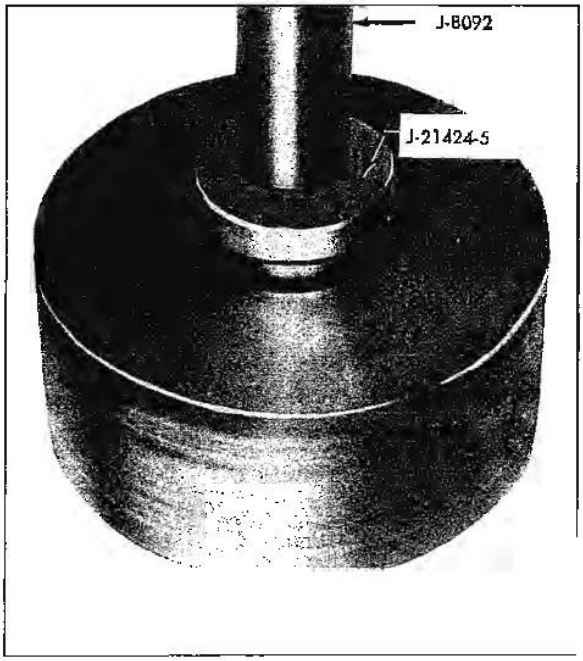


Fig. 7B-76 Installing Clutch Drum Bushing

LOW SUN GEAR BUSHING REPLACEMENT

1. Remove old bushing, using bushing chisel J-8400-1 or tool J-21424-4 (Fig. 7B-77). Avoid damaging bushing bore.

2. Install new bushing, using tool J-21424-4 (Fig. 7B-78. Press in bushing until J-21424-4 is flush with face of sun gear.

ASSEMBLY

1. Lubricate a new piston inner seal with transmission oil and install in clutch hub groove with

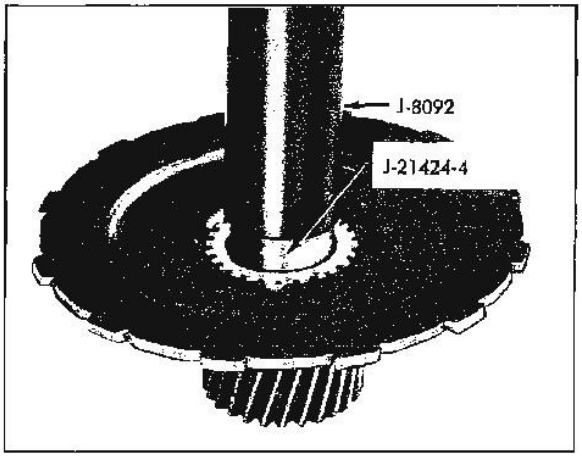


Fig. 7B-77 Remove Low Sun Gear Bushing

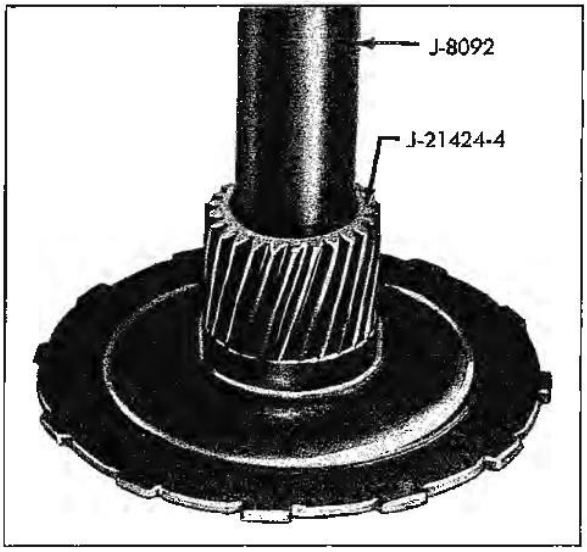


Fig. 7B-78 Installing Low Sun Gear Bushing

seal lip down (Fig. 7B-79). (A satisfactory tool for this operation can be made by crimping a loop of .020" music wire in a short length of copper tubing.)

NOTE: Run fingers around seal after it is installed to verify that seal is fully in groove.

2. Check forward clutch piston thickness. L-6 piston is 1-5/64" thick; V-8 piston is 29/32" thick.

3. Lubricate a new piston outer seal with transmission oil and install in piston groove. Seal lip must face down.

4. Install forward clutch piston into clutch drum, using a loop of smooth wire to start lip of seal into bore.

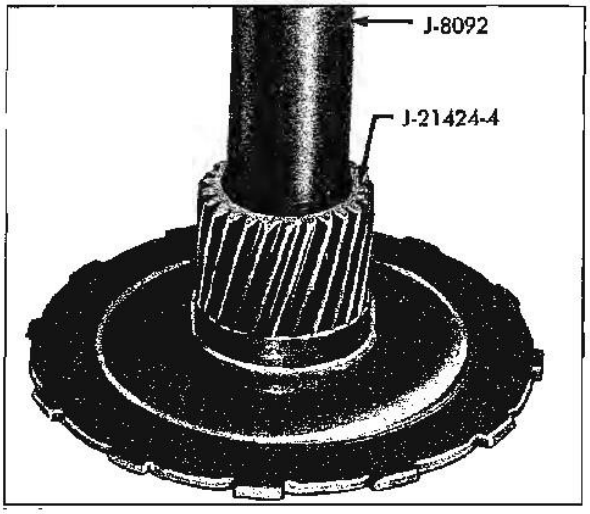


Fig. 7B-79 Installing Clutch Piston Inner Oil Seal

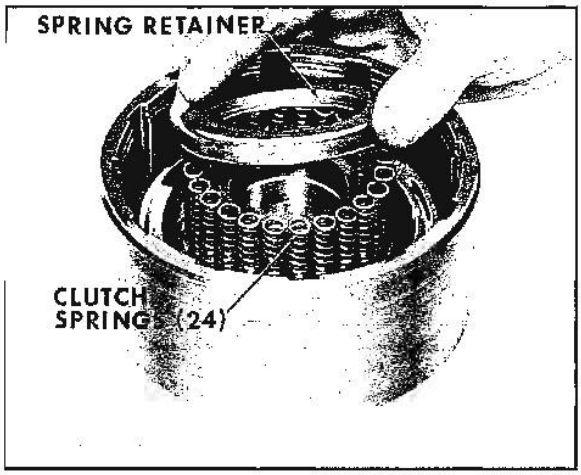


Fig. 7B-80 Installing Spring Retainer

5. Install piston return springs and spring retainer (Fig. 7B-80). Place snap ring in position on top of retainer.

6. Compress return springs as shown in Fig. 7B-74 to expose snap ring groove. Install snap ring in clutch drum hub and remove compressor.

7. Install clutch hub front thrust washer on clutch hub (retain with petrolatum), aligning tangs in clutch hub with grooves in thrust washer (Fig. 7B-81). Install clutch hub.

NOTE: Notches on steel driven plates must be aligned in Step 8 below.

8. Install steel driven plates and faced drive plates alternately, beginning with a steel driven plate (Fig. 7B-82). (L-6 clutch pack contains 5 steel plates and 4 faced plates; V-8 clutch pack contains 6 steel plates and 5 faced plates.) G.T.O. contains 7 steel plates and 6 faced plates.

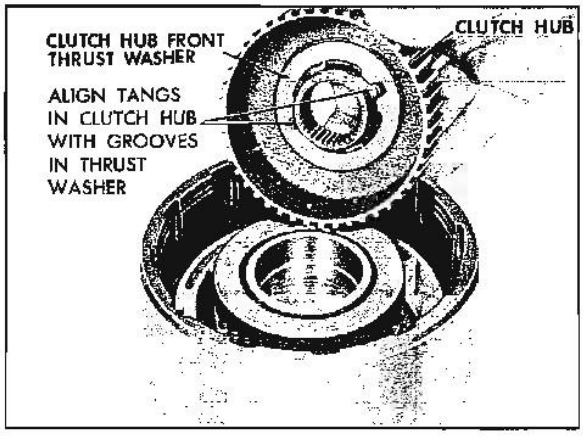


Fig. 7B-81 Installing Clutch Hub Front Thrust Washer

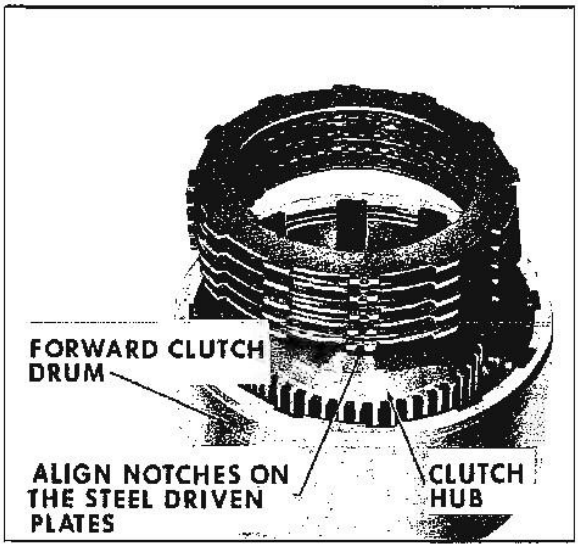


Fig. 7B-82 Installing Clutch Pack

9. Install clutch hub rear thrust washer with flange in bore of low sun gear (Fig. 7B-83).

10. Install low sun gear and flange assembly and secure with snap ring. Position snap ring so that gap is centered between slots in drum.

PLANET CARRIER

PRELIMINARY INSPECTION

1. Wash planet carrier assembly in cleaning solvent and air dry.

2. Inspect planet pinions for nicks or other tooth damage.

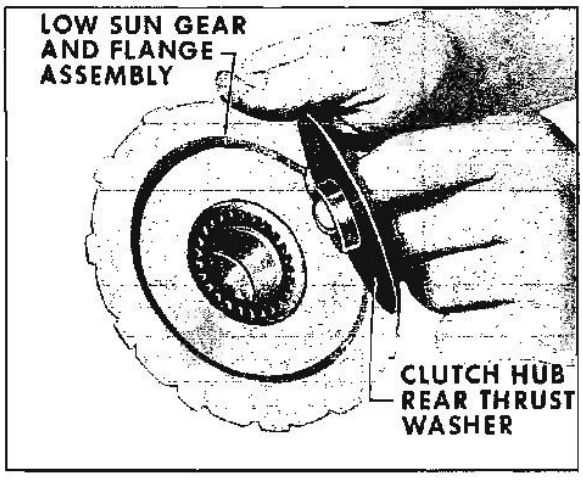


Fig. 7B-83 Installing Clutch Hub Rear Thrust Washer

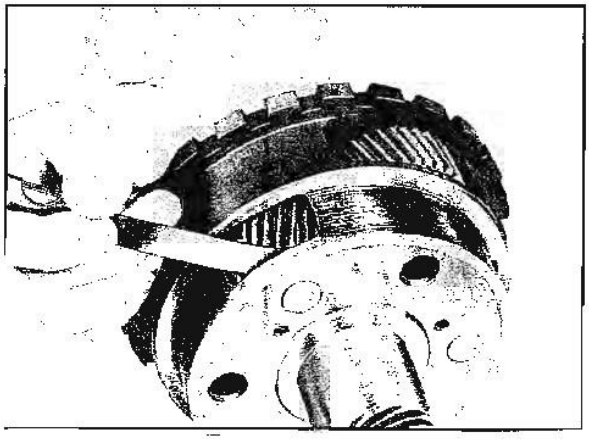


Fig. 7B-84 Checking Planet Pinion End Clearance

3. Check end clearance of planet pinions. This clearance should be .006 - .030" (Fig. 7B-84).

4. Check input sun gear for tooth damage.

5. Inspect output shaft bearing surface for nicks or scoring.

6. Inspect output shaft splines for nicks or damage. To disassemble the planet carrier to replace worn or damaged parts, proceed as follows:

DISASSEMBLY

1. Remove plant pinion shaft lock plate screws and lockwashers (Fig. 7B-85).

2. Rotate lock plate clockwise and remove.

NOTE: If gears are to be reused, mark them in some convenient way so that they can be re-installed in the original position, facing the original direction. If this is not done, the gear set may be noisy.

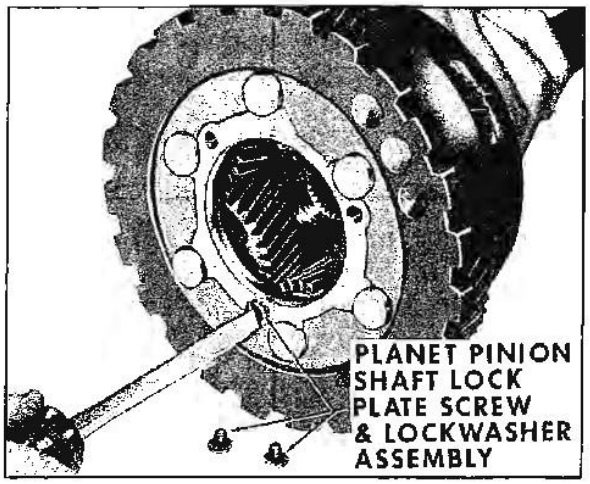


Fig. 7B-85 Removing Lock Plate Screws

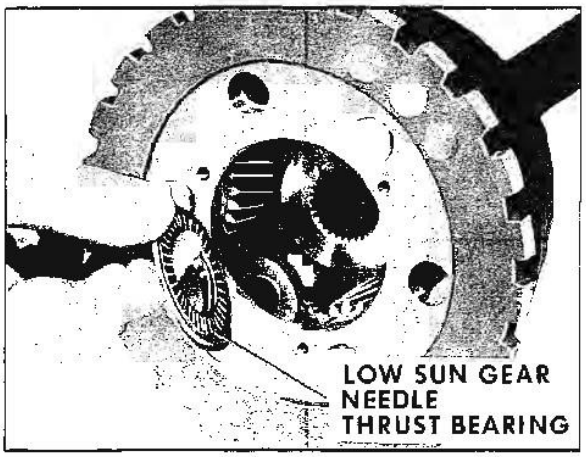


Fig. 7B-86 Removing Low Sun Gear Needle Thrust Bearing

3. Starting with a short planet pinion, push out the pinion shaft. Remove pinion, needle bearings, and thrust washers.

4. Repeat Step 3 to remove remaining two short pinions.

5. Remove low sun gear needle thrust bearing (Fig. 7B-86).

6. Remove input sun gear (Fig. 7B-87).

7. Remove input sun gear thrust washer (Fig. 7B-88).

8. Remove three long pinion shafts, pinions, bearings, and thrust washers.

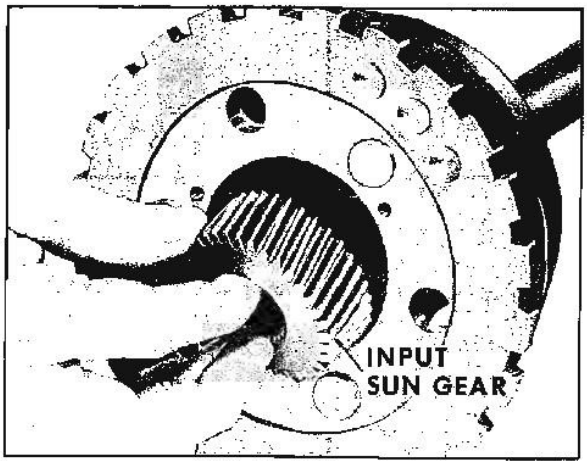


Fig. 7B-87 Removing Input Sun Gear

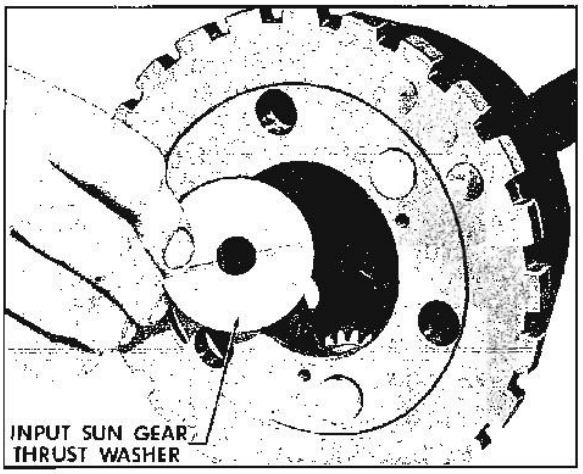


Fig. 7B-88 Removing Input Sun Gear Thrust Washer

INSPECTION

1. Wash all parts in cleaning solvent and air dry.

2. Recheck pinions and input sun gear for nicks or other tooth damage. Check needle thrust bearing and all thrust washers for wear. Replace worn or damaged parts.

3. Inspect pinion needle bearings carefully. If worn, all needle bearings must be replaced. Replace worn pinion shafts.

4. Check output shaft bushing for nicks, severe scoring, or wear. If replacement is required, proceed as follows:

OUTPUT SHAFT BUSHING REPLACEMENT

1. Install bushing remover J-9534 into bushing. Install slide hammer into J-9534 and remove bushing (Fig. 7B-89).

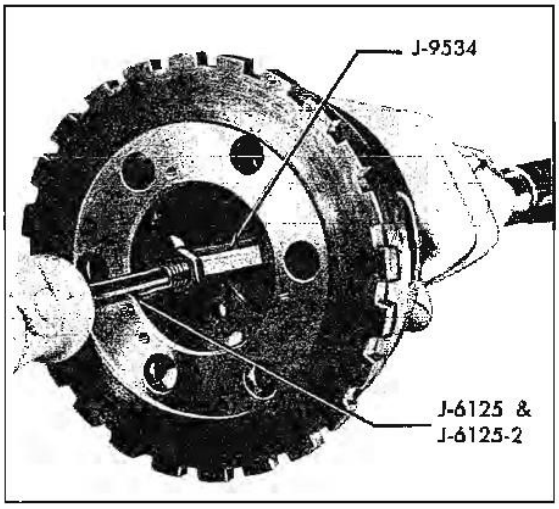


Fig. 7B-89 Removing Output Shaft Bushing

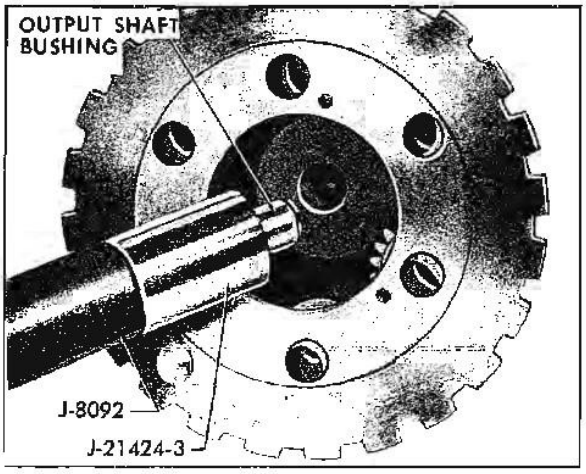


Fig. 7B-90 Installing Output Shaft Bushing

2. Using installer J-21424-3 and handle J-8092, press new bushing into output shaft until J-21424-3 touches machined surface of carrier assembly (Fig. 7B-90).

ASSEMBLY

1. Install long pinions first. Install pinion rear thrust washer, retaining it with petrolatum. Oil groove must face pinion; engage washer tang in hole (Fig. 7B-91).

2. Install pinion front thrust washer ("paired" washer), retaining it with petrolatum. Oil grooves must face pinion (Fig. 7B-92).

3. Install 20 needle bearings, spacer, 20 more needle bearings, and two thrust washers into long pinion (Fig. 7B-93). A small amount of petrolatum will aid in holding needle bearings and washers in place.

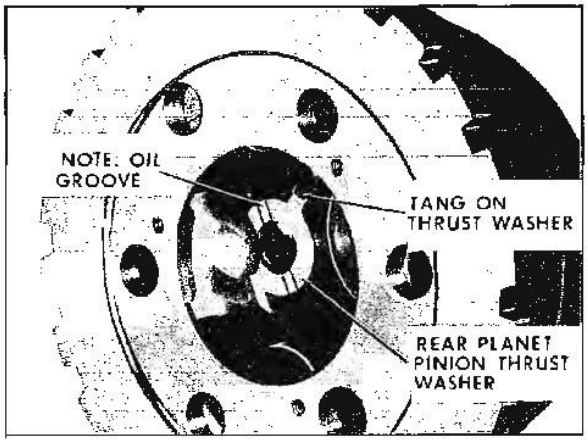


Fig. 7B-91 Installing Lone Pinion Rear Thrust Washer

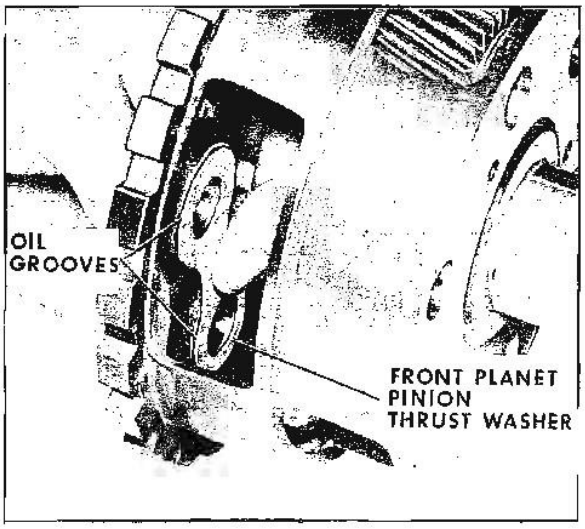


Fig. 7B-92 Installing Long Pinion Front Thrust Washer

4. Hold long pinion and needle bearing assembly in position and install long pinion shaft from front of planet carrier. As shaft is pushed in, make certain that it picks up thrust washers. Turn pinion shaft so that lock plate slot faces center of planet carrier.

NOTE: Repeat Steps 1 through 4 above to install remaining two long pinions.

5. Install input sun gear thrust washer with oil groove facing input gear (Fig. 7B-94).

6. Install input sun gear.

7. Install low sun gear needle thrust bearing with bearings facing input sun gear (Fig. 7B-95).

8. Install short pinion thrust washer with oil grooves facing pinion and retain with petrolatum. Position short pinion half of adjacent "paired" thrust washer and retain with petrolatum.

9. Install 20 needle bearings and 2 thrust washers in short planet pinion (Fig. 7B-96). Retain with petrolatum.

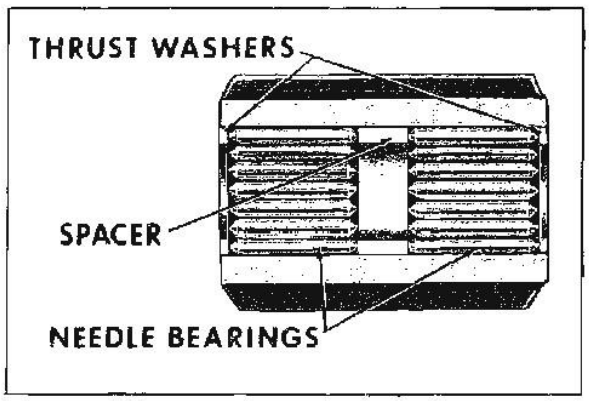


Fig. 7B-93 Long Pinion and Bearing Assembly

10. Hold short pinion and needle bearing assembly in position and install short pinion shaft from front of planet carrier. As shaft is pushed in, make certain that it picks up thrust washers. Turn pinion shaft so that lock plate slot faces center of planet carrier.

NOTE: Repeat Steps 8 through 10 above to install remaining two short pinions.

11. Install planet pinion lock plate. Rotate plate so that tabs align with slots in planet pinion shafts and the three attaching screw holes. Install screw and lockwasher assemblies and tighten securely.

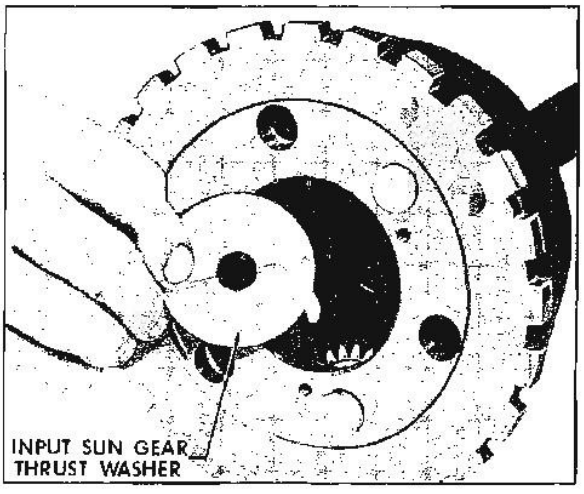


Fig. 7B-94 Installing Input Sun Gear Thrust Washer

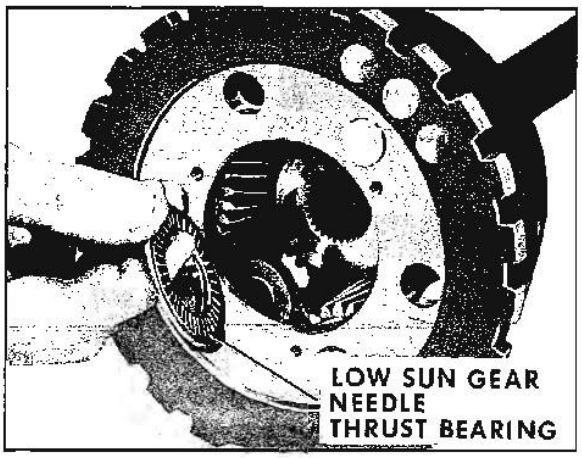


Fig. 7B-95 Installing Low Sun Gear Needle Thrust Bearing

LOW SERVO ASSEMBLY

DISASSEMBLY

CAUTION: The low servo assembly spring pressure is very high. Use extreme care when disassembling or assembling.

1. Support piston in vise or on arbor press base so that piston and rod retainer is accessible for removal. Exert pressure on piston rod until retainer can be removed.

2. Remove retainer and release pressure slowly. Separate parts of assembly (Fig. 7B-97).

INSPECTION AND REPAIR

Visually examine parts for damage or wear. Discard worn or damaged parts. Remove and discard piston oil seal ring.

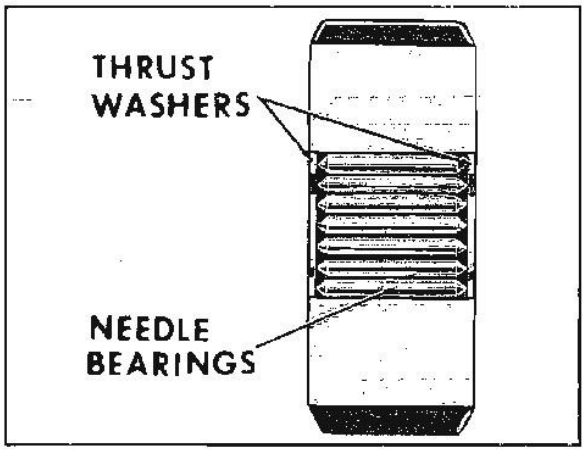


Fig. 7B-96 Short Pinion and Bearing Assembly

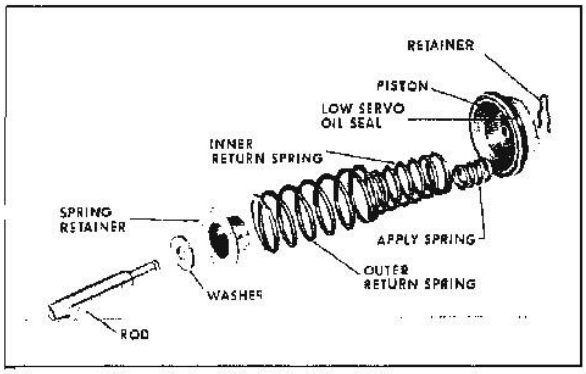


Fig. 7B-97 Low Servo Assembly - Exploded

ASSEMBLY

1. Assemble low servo parts, using Fig. 7B-97 as a guide.

2. Compress assembly in a vise or arbor press and install retainer.

3. Remove assembly from vise or arbor press and install new oil seal ring.

OIL PUMP

DISASSEMBLY

1. Remove the two hook-type oil seal rings from pump hub (Fig. 7B-98).

2. Remove pump cover to forward clutch drum thrust washer (Fig. 7B-99).

3. Remove and discard oil pump to case seal.

4. Support oil pump on wood blocks. Remove five pump cover bolts and remove pump cover.

Fig. 7B-98 Removing Oil Seal Rings

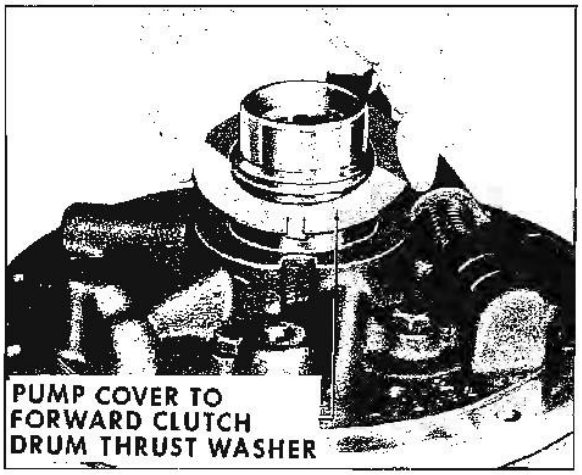


Fig. 7B-99 Removing Thrust Washer

5. Identify gear faces so that gears can be reassembled with faces in original position and remove drive and driven gears.

6. If necessary, remove cooler by-pass (V-8 only) valve seat, using tool J-21361 (Fig. 7B-100). Remove valves and springs.

CAUTION: Valve spring is under high pressure. Use extreme care after snap ring has been removed in Step 7 below.

7. Compress main pressure regulator valve spring by pressing on boost valve sleeve with thumb and remove retaining snap ring (Fig. 7B-101).

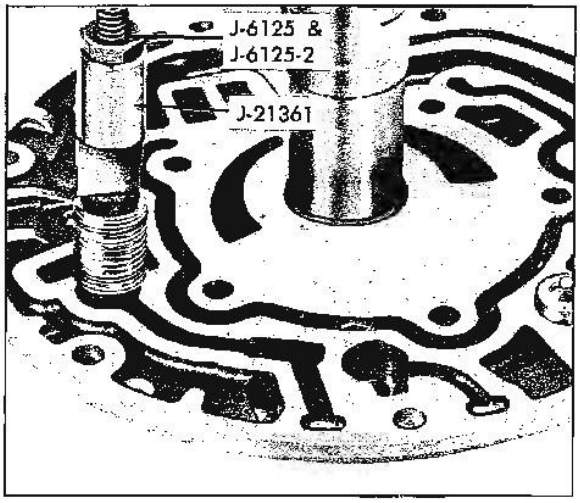


Fig. 7B-100 Removing Check Valve Seat

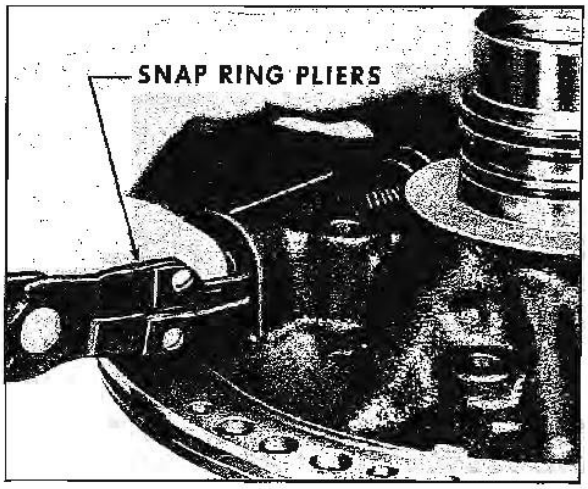


Fig. 7B-101 Removing Boost Valve Sleeve Snap Ring

8. Remove boost valve sleeve, valve, spring, washer and pressure regulator valve (Fig. 7B-102).

9. Remove oil pump seal with a small pry bar and discard seal (Fig. 7B-103).

INSPECTION

1. Check oil pump bushing for nicks, severe scoring or wear. If replacement is necessary, replace pump body assembly; bushing is not replaceable.

2. Check stator shaft bushing for nicks, severe scoring or wear. If replacement is necessary, see STATOR SHAFT BUSHING REPLACEMENT below.

3. Inspect pump gears for nicks or damage.

4. Inspect pump body for nicks or scoring.

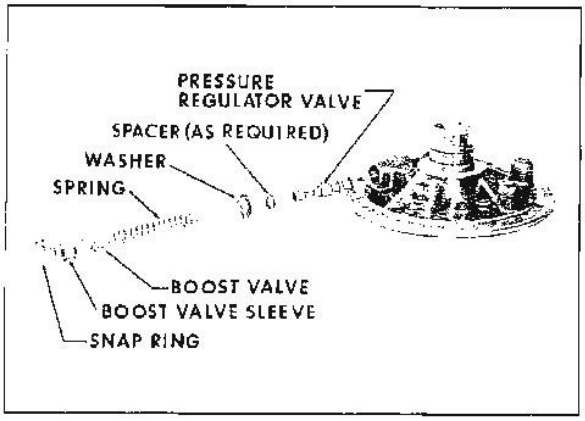


Fig. 7B-102 Main Pressure Regulator - Exploded

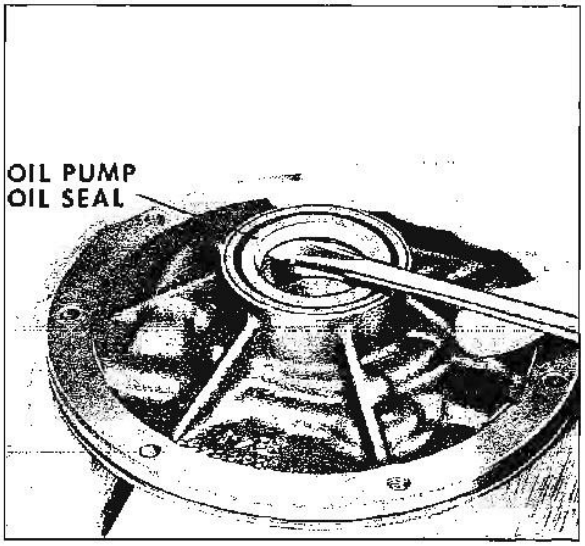


Fig. 7B-103 Removing Oil Pump Seal

5. With dial indicator set, check for clearance (Fig. 7B-104). Correct end clearance is .0005" to .0015".

6. Inspect pressure regulator valve and boost valve and sleeve for nicks or burrs.

STATOR SHAFT BUSHING REPLACEMENT

1. While holding front end of stator shaft in one hand, use tool J-21424-7, a suitable brass drift, and a hammer to drive bushing out of front end of stator shaft (Fig. 7B-105).

2. Using tool J-21424-7, drive new bushing into stator shaft until it just bottoms (Fig. 7B-106). Do not overdrive.

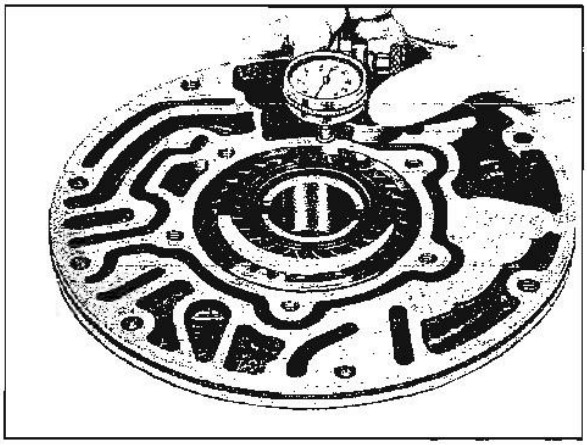


Fig. 7B-104 Checking Gear End Clearance

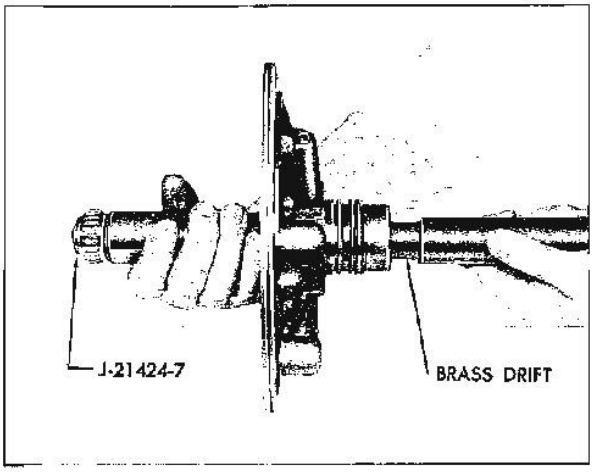


Fig. 7B-105 Removing Stator Shaft Bushing

ASSEMBLY

1. Using tool J-21359, install new oil seal (Fig. 7B-107).

2. Install new oil pump to case seal.

3. Assemble pressure regulator valve, washer, spring boost valve and sleeve (Fig. 7B-108).

NOTE: Later production transmissions incorporate a C type spring washer and may have one or two C type spacers behind the washer. Install the same number of spacers originally removed.

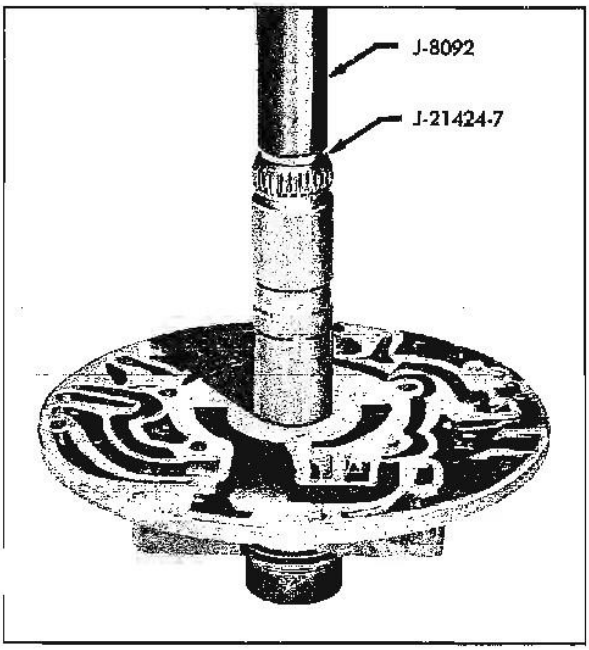


Fig. 7B-106 Installing Stator Shaft Bushing

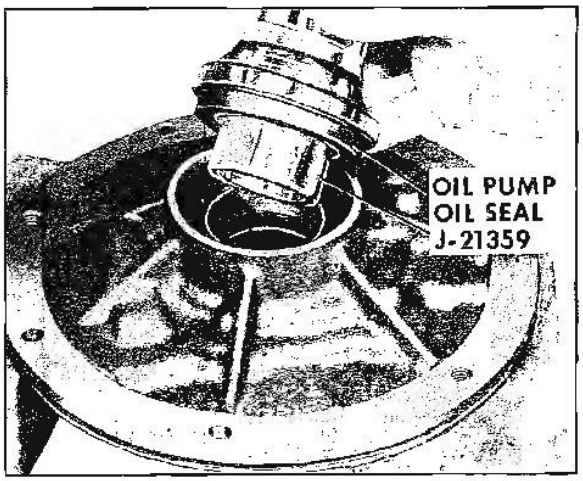


Fig. 7B-107 Installing Oil Pump Oil Seal

4. Compress pressure regulator valve spring by pressing on boost valve sleeve. Install snap ring.

5. If previously removed, install cooler by-pass (V-8 only) valves and valve seat. Using tool J-21558, press valve seat into pump body bore until tool bottoms on face of pump (Fig. 7B-109).

NOTE: Thrust washer and oil pump oil sealing rings will be installed during a later operation.

6. Assemble pump body and cover. Install five retaining bolts, but do not tighten. Align pump body and cover with tool J-21368 (Fig. 7B-110. Tighten bolts to 16-24 lb. ft. torque. Remove tool J-21368.

CONVERTER LEAK TEST

1. Install tool J-21369 and tighten.

2. Fill converter with air at a pressure of 80 psi.

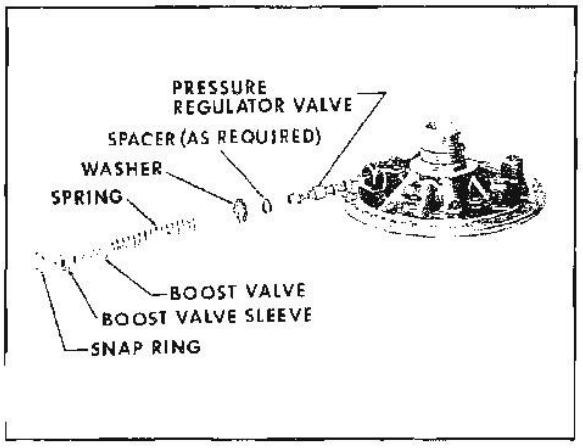


Fig. 7B-108 Main Pressure Regulator – Exploded

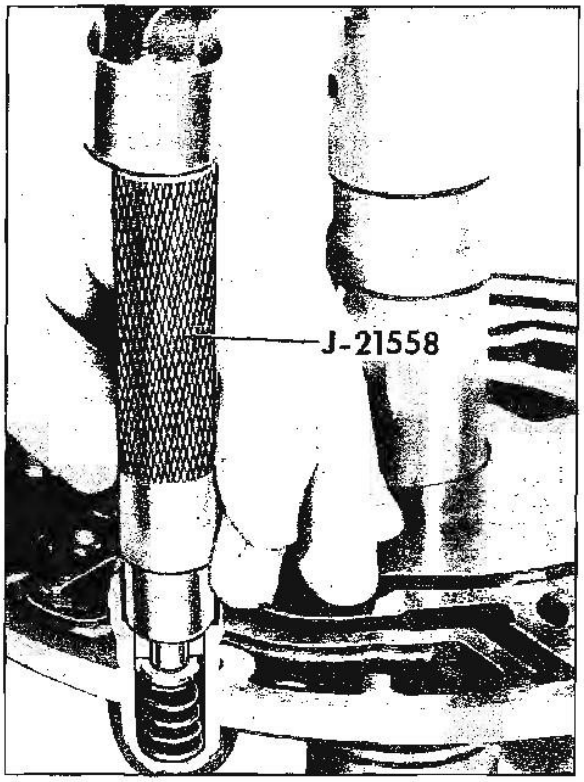


Fig. 7B-109 Installing Check Valve Seat

3. Submerge in water and check for leaks.

CONVERTER END PLAY CHECK

1. Fully release collet of tool J-21371 by turning screw clockwise.

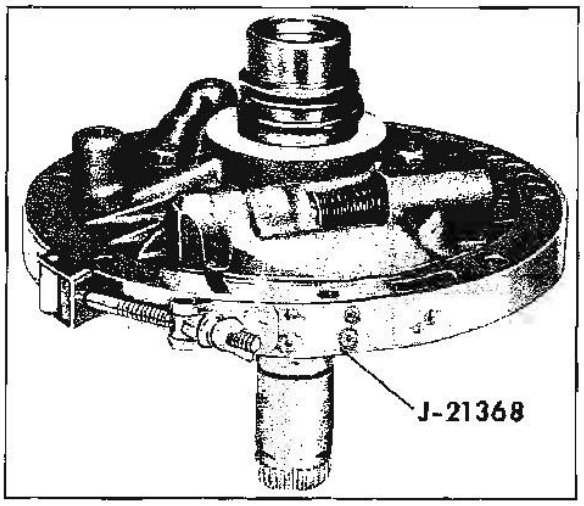


Fig. 7B-110 Aligning Oil Pump and Cover

2. Install collet end of J-21371 into converter until it bottoms.

3. Tighten brass cap nut to 5 lb. ft., then tighten large hex nut to 3 lb. in.

4. When hex nut of J-21371 has been tightened firmly, install dial indicator and adjust for zero reading while plunger rests on end of screw (Fig. 7B-111).

5. Loosen hex nut, allowing converter internal assembly to lower until dial indicator shows internal assembly has bottomed. Acceptable end clearance is .050" or less.

TRANSMISSION REASSEMBLY

GENERAL

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

Lightly coat all moving parts with transmission oil before installation. Thrust washers may be held in place with petrolatum sparingly applied.

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

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

It is extremely important to tighten all parts evenly to avoid distortion of parts and leakage at gaskets and other joints. Use a reliable torque wrench to tighten all bolts and nuts to specified torque.

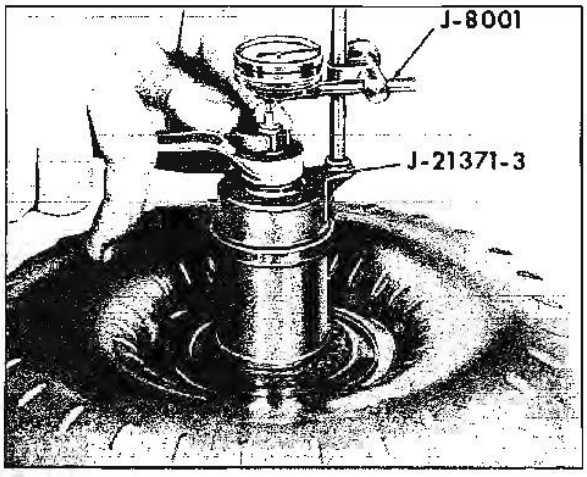


Fig. 7B-111 Checking Converter End Clearance

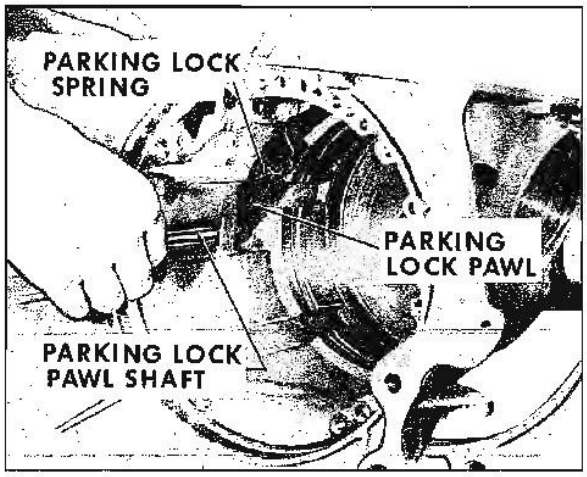


Fig. 7B-112 Installing Parking Lock Pawl Shaft

INSTALLATION OF RANGE SELECTOR LEVER, SHAFT, AND PARKING LOCK ACTUATOR

1. Hold parking lock pawl and spring in position and retain with parking lock pawl shaft (Fig. 7B-112).

2. Install range selector shaft into case with a twisting motion.

3. Install inner park lock and range selector assembly on range selector shaft and secure with nut (Fig. 7B-113).

NOTE: Make certain that shorter end of outer lever is to bottom of transmission.

4. Install range selector shaft retainer (Fig. 7B-114).

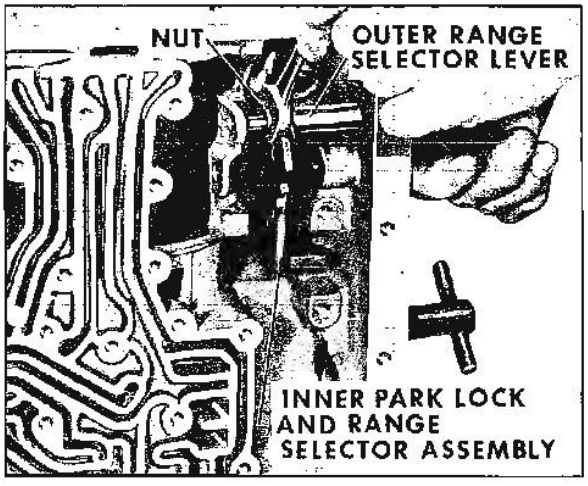


Fig. 7B-113 Installing Inner Park Lock and Range Selector

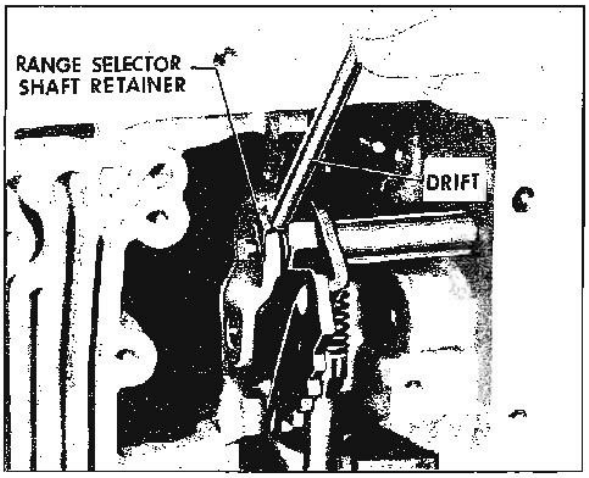


Fig. 7B-114 Installing Range Selector Shaft Retainer

5. Install parking lock bracket in case and tighten bolts to 8-12 lb. ft. torque (Fig. 7B-115).

INSTALLATION OF REVERSE PISTON AND CLUTCH

1. With transmission in vertical position, install reverse clutch piston into case, making certain it bottoms in case.

2. Install clutch piston return springs.

3. Position piston return seat on piston return springs. Place snap ring in position on return seat so that ring can be easily installed when seat is compressed with tool.

4. Compress reverse piston return springs, using spring compressor J-9542 and adapters until snap ring groove is exposed (Fig. 7B-116). Install snap ring and remove tool.

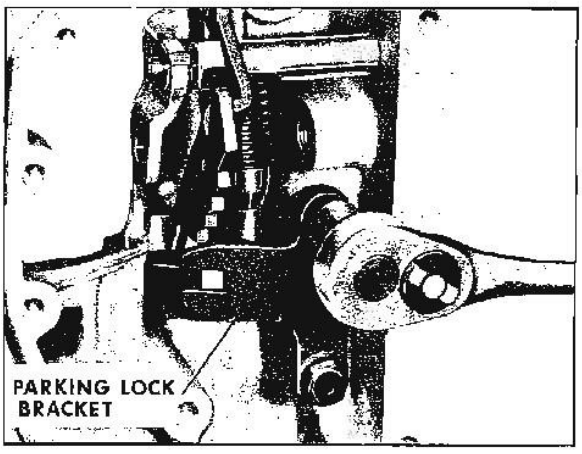


Fig. 7B-115 Installing Parking Lock Bracket

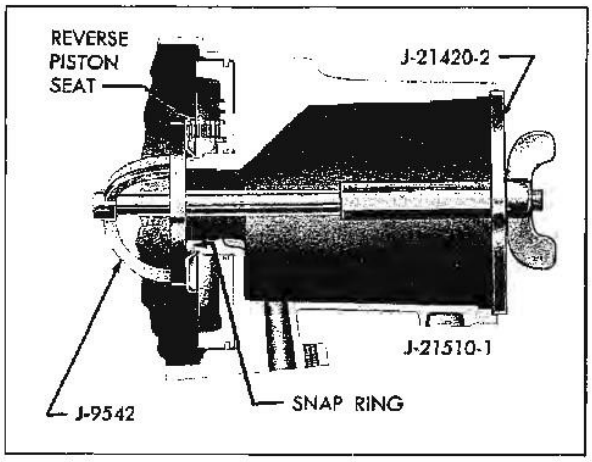


Fig. 7B-116 Compressing Reverse Piston Return Springs

NOTE: Make certain inner edge of seat does not hang up on snap ring groove while springs are being compressed.

5. Install reverse clutch cushion spring, reaction plates, and drive plates as shown in Fig. 7B-117. Notched lug in each steel reaction plate is installed so that it is at top of groove at 5 o'clock position in case (Fig. 7B-118).

6. Install pressure plate (Fig. 7B-119). The pressure plate has one, two or three rectangular "dimples" in lug that engages 5 o'clock case groove. Number of "dimples" (marks) is code for plate thickness.

7. Install reverse clutch pack snap ring.

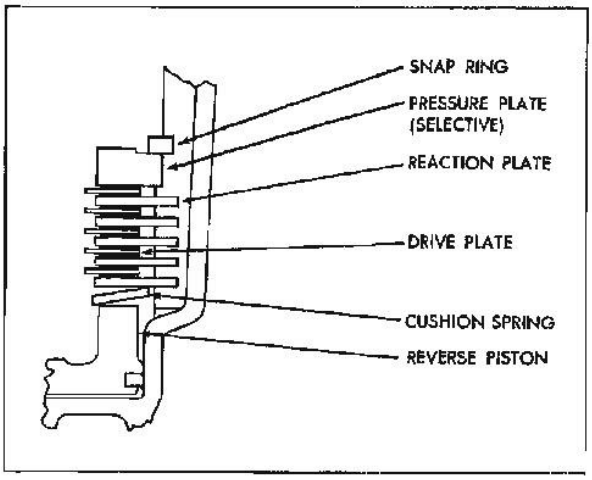


Fig. 7B-117 Reverse Clutch Rack Assembly Sequence

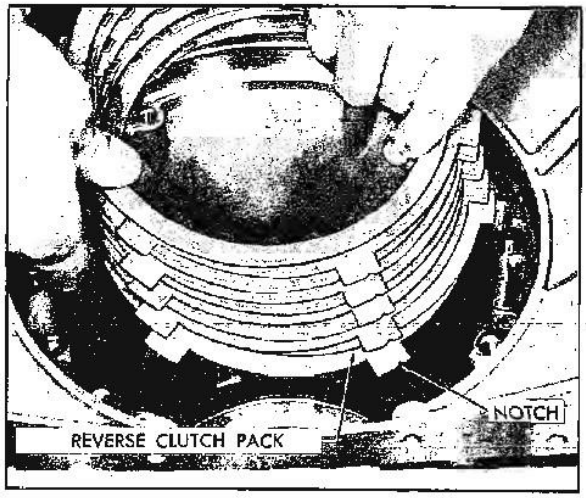


Fig. 7B-118 Installing Reverse Clutch Rack

8. Insert feeler gauge between any reaction plate and adjacent drive (faced) plate. If clearance is .025" to .060", running clearance is correct. If clearance is not within these limits, refer to chart in Fig. 7B-120 to select correct thickness of pressure plate to adjust running clearance.

INSTALLATION OF PLANETARY GEAR SET

1. Install thrust bearing race with lip, needle bearing, and plain race on output shaft (Fig. 7B-127). Retain on rear face of planet carrier with petrolatum. (Bearing and races can be installed on case reverse clutch piston hub, if desired.)

2. Install reverse ring gear (Fig. 7B-122).

3. Install planetary gear seat.

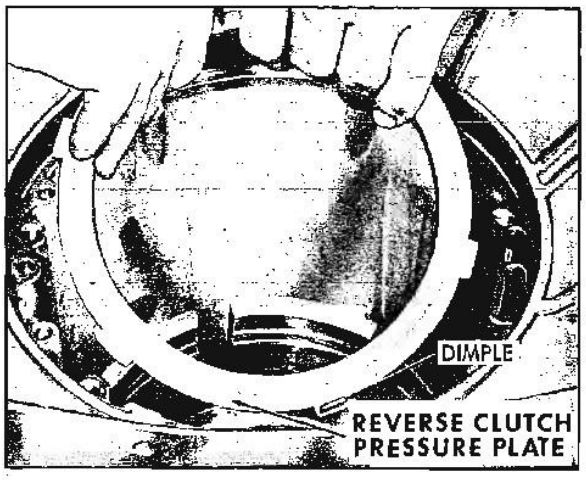


Fig. 7B-119 Installing Reverse Clutch Pressure Plate

Part No.	Total Thickness	No. of Ident. Marks on Lug
6257025	.316-.326	1
1362967	.348-.358	2
1362968	.380-.390	3

Fig. 7B-120 Reverse Clutch Pressure Plate Chart

INSTALLATION OF LOW SERVO ASSEMBLY, LOW BAND, AND FORWARD CLUTCH

LOW SERVO ASSEMBLY

1. Install low servo assembly into case. Position notch to receive low band strut.

2. Install new low servo cover oil seal and install cover. Whenever a new servo cover is installed it will be necessary to stamp the transmission code and model on the new cover.

3. Compress low servo cover with J-21495-1 and install snap ring (Fig. 7B-123).

4. Remove tool J-21495-1.

LOW BAND

1. With transmission in vertical position, install band-adjusting screw.

2. Install low band (Fig. 7B-124).

3. Install low band apply strut and band adjusting screw strut (Fig. 7B-125). After both struts have

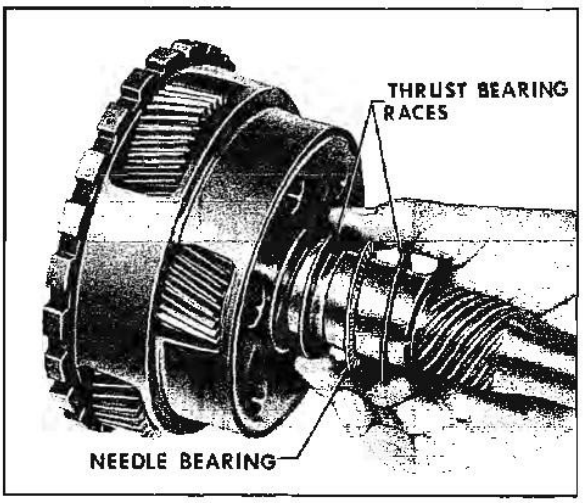


Fig. 7B-121 Installing Planet Carrier Thrust Bearing and Races

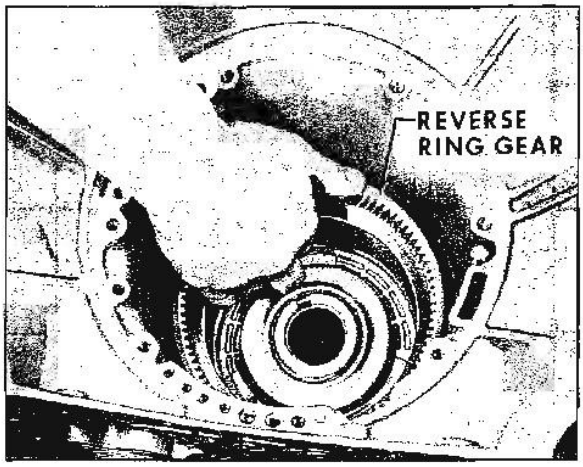


Fig. 7B-122 Installing Reverse Ring Gear

been installed, tighten low band adjusting screw enough to prevent struts from falling out.

FORWARD CLUTCH

Install forward clutch assembly (Fig. 7B-126). Turn slightly to engage low sun gear with planet pinions.

CAUTION: Make certain that the low sun gear needle thrust bearing assembly and the input sun gear rear thrust washer in the planet carrier are centered before installing the forward clutch assembly.

DETERMINATION OF SELECTIVE THRUST WASHER THICKNESS

The thickness of the oil pump to forward clutch assembly thrust washer is determined as follows:

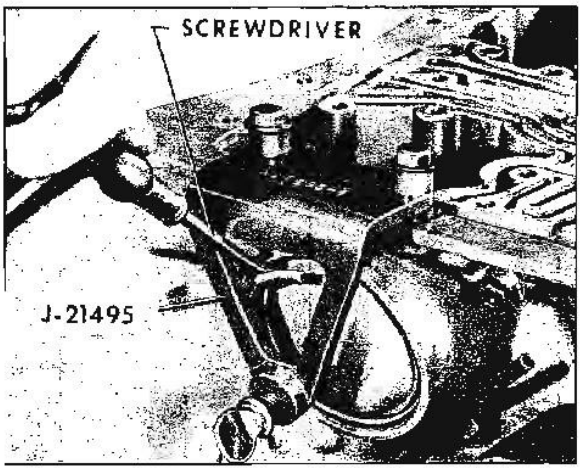


Fig. 7B-123 Installing Low Servo Cover Snap Ring

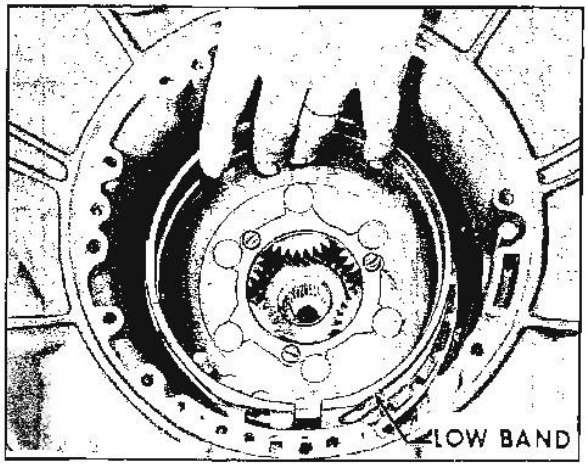


Fig. 7B-124 Installing Low Band

1. Install guide pins and new pump gasket (Fig. 7B-127).

2. Install input shaft into oil pump (Fig. 7B-128) and install oil pump (less oil seal rings, but with old or .061" thrust washer) into case.

3. Remove guide pins and install at least three oil pump retaining bolts. Tighten bolts to 16-24 lb. ft. torque.

4. With transmission in a vertical position, install a dial indicator so that its plunger bears on end of input shaft and zero the indicator.

5. Push up on output shaft and record amount of end play registered on dial indicator.

NOTE: If end play is less than .008", check for improper assembly of parts.

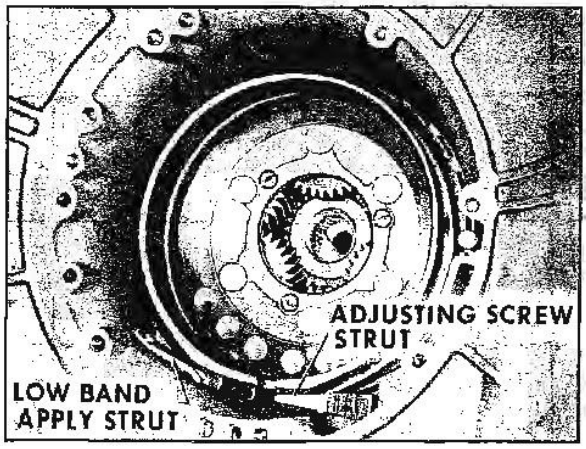


Fig. 7B-125 Low Band Struts Installed

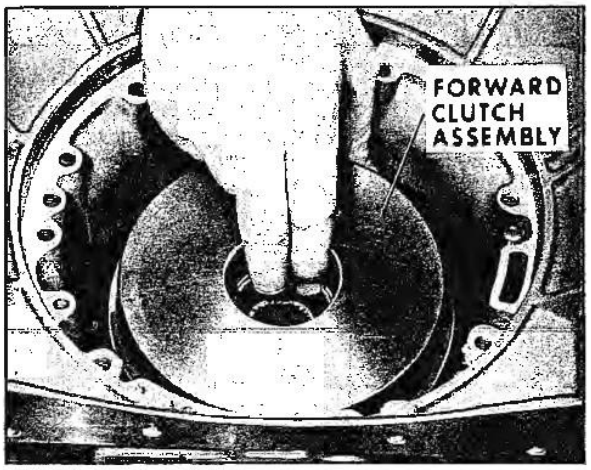


Fig. 7B-126 Installing Forward Clutch Assembly

6. Refer to chart (Fig. 7B-129) and select correct thickness of thrust washer to establish a running clearance of .008"-.051". (If end play is more than .051" with .097" thrust washer installed, check for excessive wear of assembled parts or omitted thrust washers, races or bearings in or behind planet carrier.)

NOTE: Selective thrust washers are available in three thicknesses: .061", .079", and .096" (±.002"). Since there are no identifying marks on these thrust washers, it will be necessary to measure thickness with a micrometer if thickness is in doubt.

7. Remove oil pump and input shaft and proceed in accordance with instructions in INSTALLATION OF OIL PUMP below.

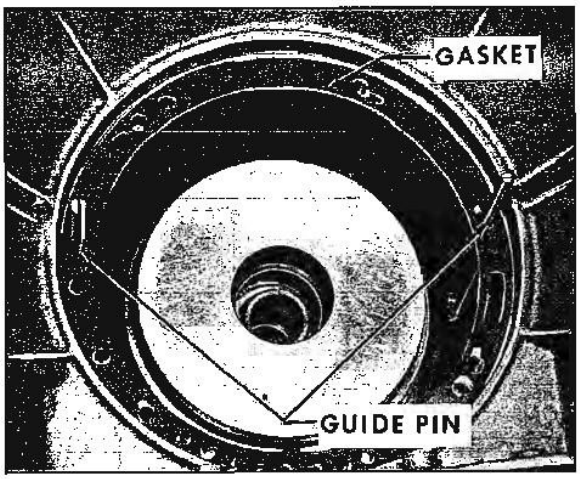


Fig. 7B-127 Guide Pins and Gaskets Installed

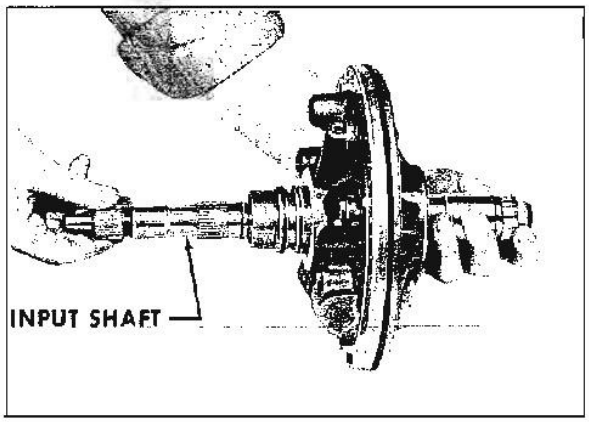


Fig. 7B-128 Installing Input Shaft Into Pump

INSTALLATION OF OIL PUMP

1. Install selective thrust washer on pump hub (Fig. 7B-130). See DETERMINATION OF SELECTIVE THRUST WASHER THICKNESS above.

2. Install two hook type oil seal rings on pump hub (Fig. 7B-131). Make certain rings are free to move in grooves.

3. Install guide pins and new pump gasket (Fig. 7B-127).

4. Install two input shaft hook type oil seal rings. Make certain rings are free to move in grooves.

5. Install input shaft into oil pump (Fig. 7B-128) and install oil pump into case. (Make certain input shaft turns freely in pump before installing pump into case.)

6. Remove guide pins and install oil pump retaining bolts with new O-rings under head (Fig. 7B-132). Tighten bolts to 16-24 lb. ft. torque.

LOW BAND ADJUSTMENT

1. Tighten low band adjusting screw to 40 ± 5 lb. in. torque.

2. Back off adjusting screw exactly four turns.

If end Play is:	Correct Thrust Washer Thickness is:
.071" to .110"	.061"
.089" to .128"	.079"
.107" to .146"	.097"

Fig. 7B-129 Selective Thrust Washer Chart

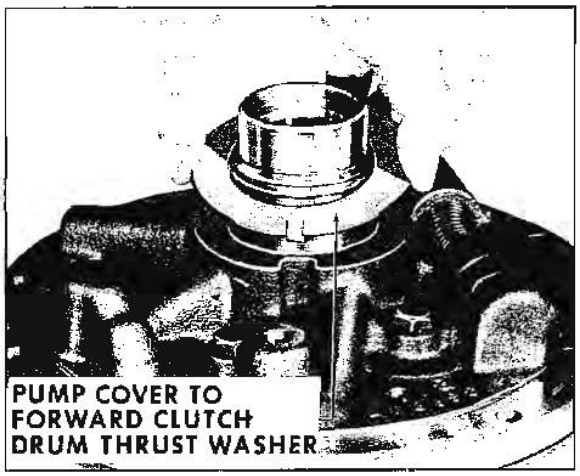


Fig. 7B-130 Installing Thrust Washer

3. Hold adjusting screw and tighten lock nut.

4. Install adjusting screw cap.

INSTALLATION OF SPEEDOMETER DRIVE GEAR

1. Place transmission in horizontal position and engage park lock.

2. Slide speedometer drive gear onto output shaft.

3. Using tools J-21421-1 and J-21421-2, drive speedometer drive gear into position (Fig. 7B-133). When J-21421-2 bottoms on end of output shaft, drive gear location is correct.

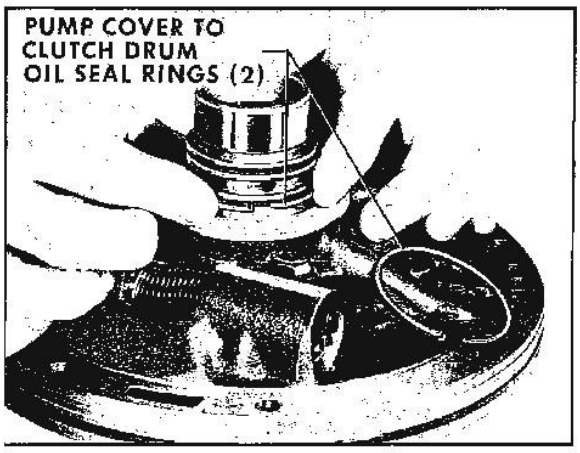


Fig. 7B-131 Installing Oil Seal Rings

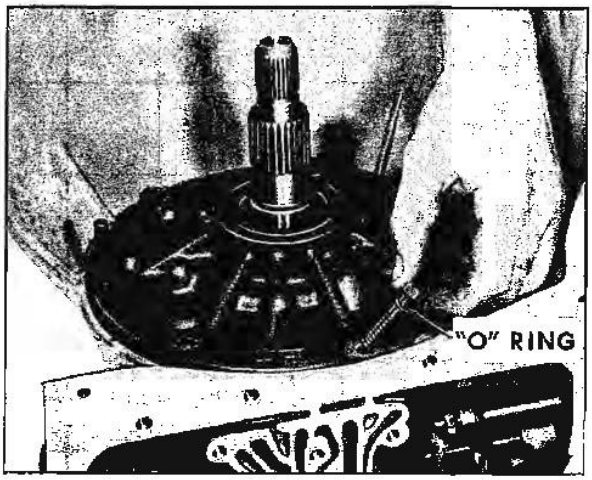


Fig. 7B-132 Installing Oil Pump Retaining Bolts

INSTALLATION OF REAR BEARING RETAINER, GOVERNOR, VACUUM MODULATOR, SPEEDOMETER DRIVEN GEAR, AND VALVE BODY

See SERVICE OPERATIONS -- TRANSMISSION IN CAR (page 7B-21).

INSTALLATION OF CONVERTER

1. Install converter into transmission, engaging drive lugs of oil pump drive gear.

2. Install converter holding clamp J-21366.

TROUBLE DIAGNOSIS

OIL CHECK

Before diagnosis of any transmission complaint is attempted, the oil level should be checked. At the

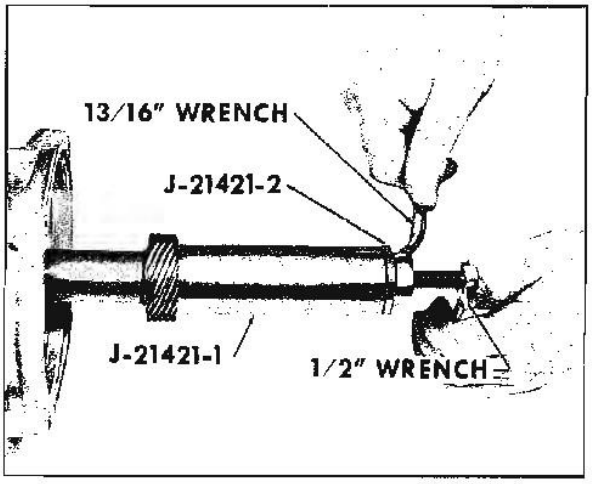


Fig. 7B-133 Installing Speedometer Drive Gear

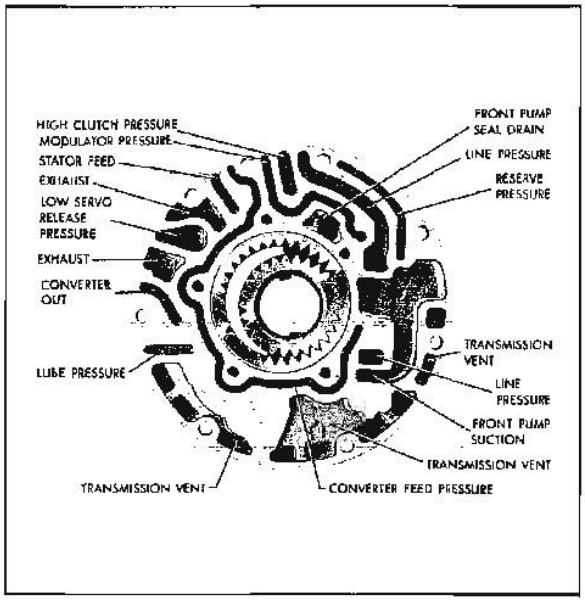


Fig. 7B-134 Pump Passages

same time, it should be observed on the dipstick whether the oil is solid in texture or aerated. Aerated oil gives an indication of an oil leak in the suction line, which can cause erratic operation and slippage. Water in the oil imparts a milky, pinkish cast to the oil and can cause spewing.

NO DRIVE IN ANY SELECTOR POSITION

1. Check oil level.
2. Check oil pressure.
3. Check manual shift linkage adjustment.
4. Check internal linkage.
5. Check for defective pressure regulator valve.
6. Check for pressure regulator valve retaining ring out of groove.
7. Check for defective front pump.

ERRATIC OPERATION AND SLIPPAGE (light to medium acceleration)

1. Check filter or screen and suction pipe assembly for leaks.
2. Check suction pipe "O" ring.
3. Low oil level.
4. Check for defective modulator.

EXCESSIVE SLIP OR ENGINE FLARE ON COASTING TO A STOP WHEN CORNERING

1. Check engine idle.
2. Check for suction leak.
3. Check low band adjustment.
4. Check for proper modulator can assembly.

NO REVERSE

1. Check reverse clutch piston seals.
2. Check freedom of reverse clutch piston.
3. Check for open feed lines to reverse clutch.
4. Loose stator valve body attaching bolts. (Specification is 8-12 ft. lbs.)

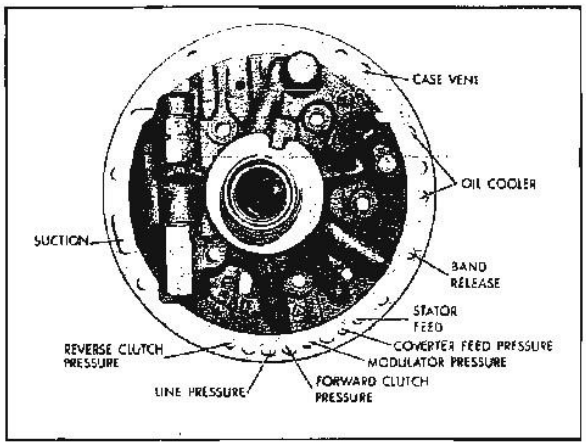


Fig. 7B-135 Pump To Case Passages

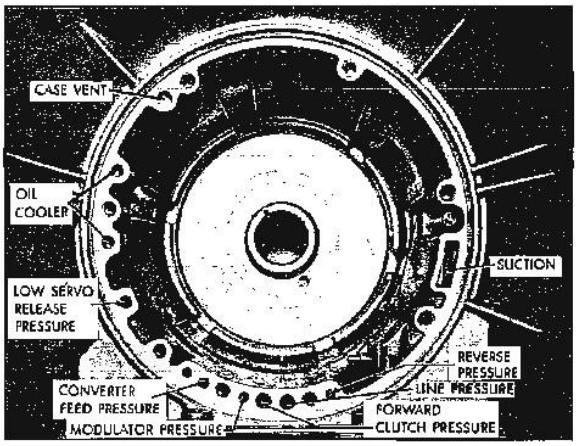


Fig. 7B-136 Case To Pump Passages

HARSH NEUTRAL TO DRIVE SHIFT AT IDLE

1. Check engine idle speed.

2. Check for three (3) springs in the low servo assembly or improper assembly of washers.

3. Check to see if center spring has end of coils ground.

4. Check for broken engine mounts.

NO UPSHIFT

1. Check freedom of shift valve and detent valve.

2. Check for plugged orifice in detent valve.

3. Check for open detent solenoid and loose attaching bolts.

4. Check for plug in front pump cover assembly.

5. Check clutch piston seals.

6. Check for broken clutch piston oil seal rings.

7. Check clutch lines in front pump cover and stator shaft assembly.

8. Check governor for failed pinion or stuck valve.

LONG SHIFT TIME—SHIFT DOES NOT HAVE POSITIVE ENGAGEMENT

1. Check for proper modulator can assembly.

2. Check for leak in clutch circuit.

3. Check valve body port between modulator boost and clutch feed in shift valve bore.

4. If foreign material in oil pan indicates a clutch failure, replace clutch plates and necessary parts.

ENGINE FLARES ON UPSHIFT

Refer to drive clutch plates burned (Page 7B-52).

LATE UPSHIFT

1. Check vacuum line connections.

2. Stuck detent valve.*

3. Open detent solenoid or loose solenoid attaching bolts*.

4. Sticky shift valve.

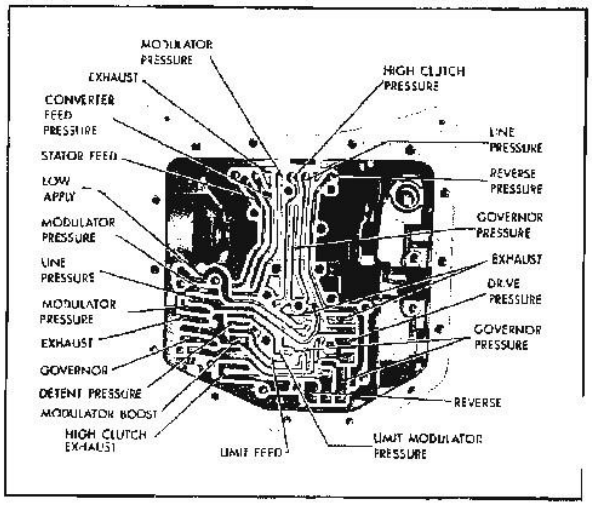


Fig. 7B-137 Case Valve Body Passages

5. Check governor assembly.

* will cause transmission to make wide-open throttle upshift.

UPSHIFTS—DOWNSHIFTS ERRATIC

1. Check for crossed solenoid wires.

NO WIDE OPEN THROTTLE DOWNSHIFT

1. Check detent control switch adjustment and continuity in wiring.

2. Check for stuck detent valve and shift valves.

3. Check orifice hole in detent valve.

4. Check solenoid on valve body.

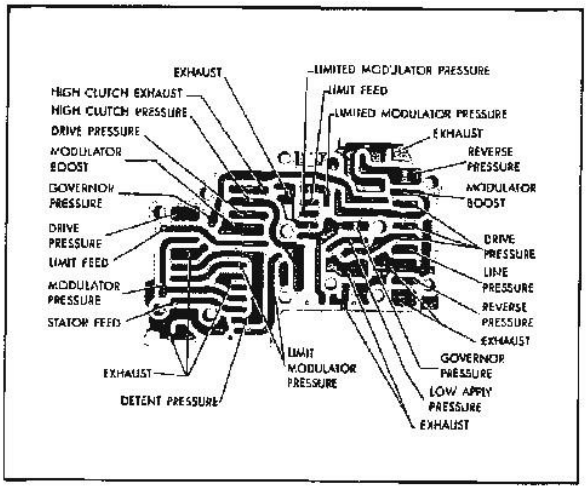


Fig. 7B-138 Valve Body Passages

ENGINE FLARES ON WIDE OPEN THROTTLE DOWNSHIFT

1. Check low band adjustment.

2. Check for restriction in vacuum line or fitting to transmission.

3. Check for correct valve body plate.

DISPLAYED ENGAGEMENT OF MANUAL LOW

1. Check freedom of 2-piece modulator valve.

OIL SPEWS OUT BREATHER

1. High oil level.

2. Water in oil.

3. Chip or burr between pump cover and housing or between complete pump assembly and case.

4. Direct leak from front pump pressure line into vent chamber.

DRIVE CLUTCH PLATES BURNED
(Usually low band and reverse clutch good)

1. Check for leakage in clutch circuit.

   a. Check ball in forward clutch drum.

   b. Clutch lines in front pump cover and stator shaft assembly.

   c. Plug in pump cover assembly missing.

   d. Clutch piston seals.

   e. Clutch feed oil rings.

   f. Check for proper number of clutch plates and correct piston.

DRIVE CLUTCH PLATES, LOW BAND AND REVERSE CLUTCH PLATES—ALL BURNED

1. Check for following causes of low maximum line pressure.

   a. Modulator can load check.

   b. Check for proper modulator can.

   c. Check modulator valve and bore in case for freedom of movement.

   d. Check freedom of boost valve in front pump regulator.

2. Valve body bolts loose. Torque specification is 8-12 ft. lbs.

3. Low oil level.

PRESSURE CHECKS

Pressure checks are a useful part of trouble diagnosis. The pressure tap for checking mainline pressure is located above the oil pan rail on the right side of the transmission and to the rear of the low servo (Fig. 7B-139).

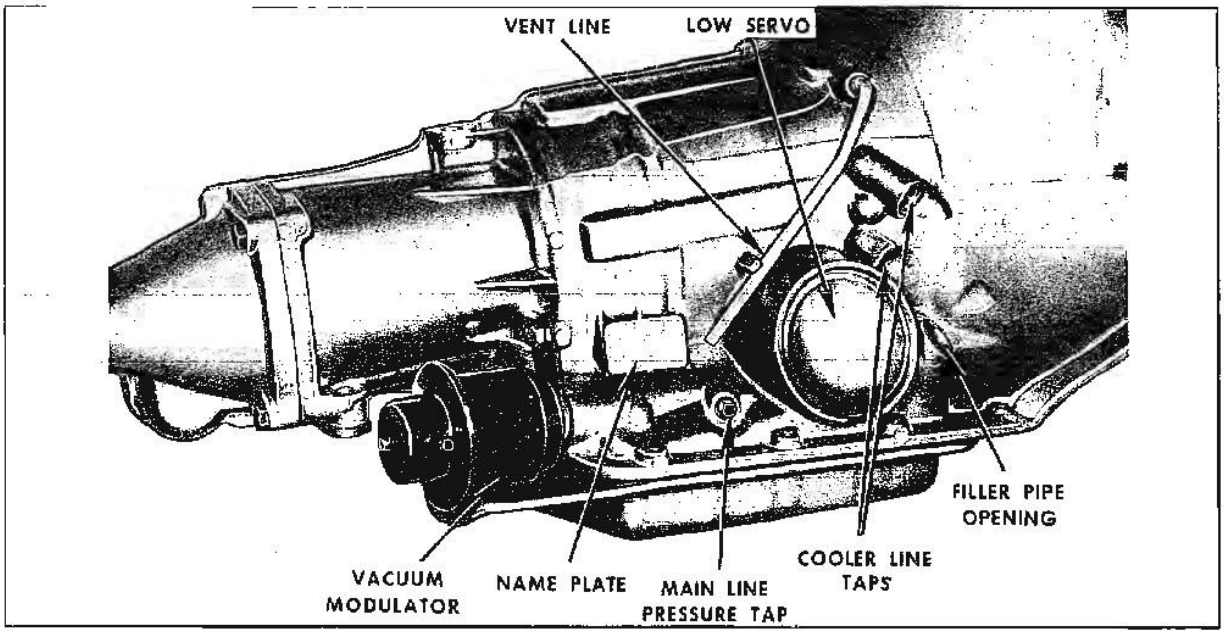


Fig. 7B-139 Mainline Prossure Top

All tests can be made without driving the vehicle by simply raising the rear wheels 3-5 inches from the floor on jack stands. With pressure gauge installed, perform the following preliminary steps:

- Establish pressure gauge indicator needle rest position at zero pressure.
- Thoroughly warm up transmission.
- Check transmission oil level.
- Make sure vacuum line connections are tight.
- Check linkage adjustment.

Mainline pressure will vary from one transmission to another but the following statements apply in general.

- Line pressure should increase as engine manifold vacuum decreases, at a constant speed.
- Line pressure should decrease as car speed increases, at a constant engine manifold vacuum (for example, about 13 psi between 40-60 mph).
- Reverse pressure should be about 90 psi at idle to over 200 psi at stall (wide open throttle with brakes on).

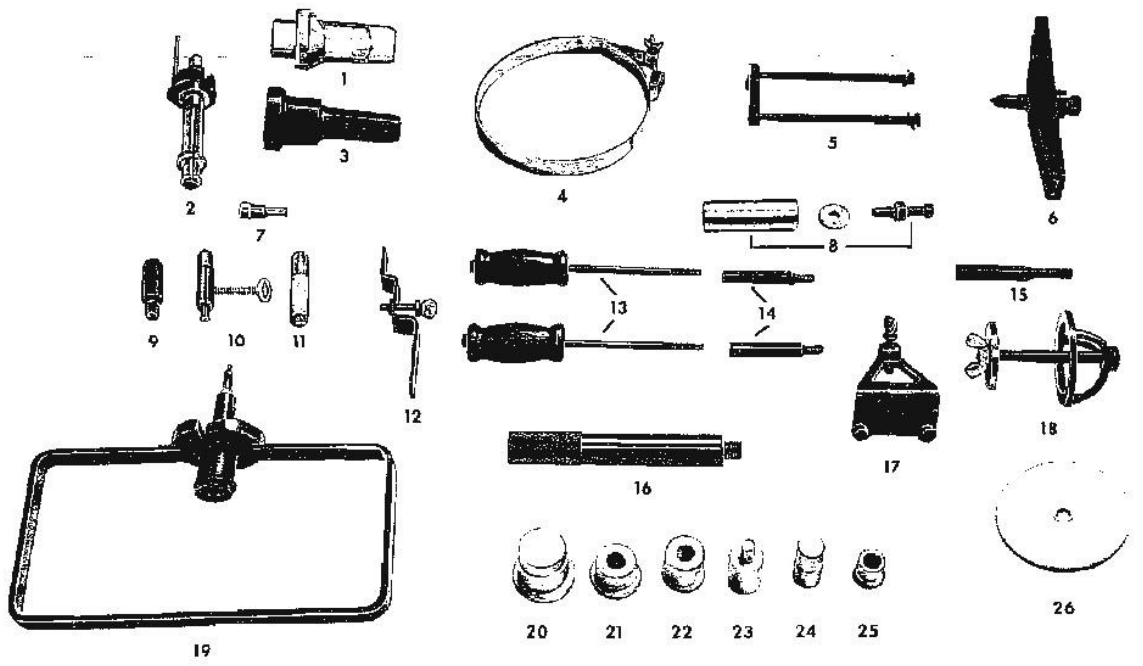
  NOTE: Do not operate at wide open throttle with brakes on longer than it is necessary to obtain a gauge reading.

- Line pressure at wide open throttle upshift should be about 85-90 psi for Model 20, and approximately 100 psi for Model 30.
- Model 20 mainline pressure in Drive range should be 140-160 psi, depending on operating conditions; in Low range 90 psi is the minimum.
- Model 30 mainline pressure in Drive range should be 150-160 psi, depending on operating conditions, in Low range 90 psi is the minimum.

TORQUE SPECIFICATIONS

Location	Torque Lb. Ft.
Case to Cylinder Block Bolts	40 ± 5
Flywheel to Converter Bolts	35 ± 5
Converter Cover Pan to Case Screws	8-12
Case Cooler Line Fittings	30 ± 5
Low Band Adjusting Screw Lock Nut	25 ± 5
Pump Body to Pump Cover Bolts	16-24
Valve Body to Case Bolts	8-11
Solenoid to Valve Body Bolts	8-12
Vacuum Modulator Clamp Bolt	8-12
Pump Assembly to Case Bolts	16-24
Rear Bearing Retainer to Case Bolts	30 ± 5
Oil Pan to Case Bolts	8-12
Speedometer Sleeve Clamp Bolt	5-10
Governor Cover Bolts	8-12
Park Lock Bracket Bolts	8-12

SPECIAL TOOLS



1. J-21359 Pump Oil Seal Installer
2. J-21371 Converter End Play Fixture
3. J-5154 Rear Oil Seal Installer
4. J-21368 Pump Body and Cover Alignment Band
5. J-21427 Speedometer Drive Gear Remover
6. J-8433 Puller (Use with J-21427)
7. J-8591 7/32" Allen Wrench (3/8" Square Drive)
8. J-21421 Speedometer Drive Gear Installer
9. J-9534 Planet Carrier Bushing Remover
10. J-21361 Pump Check Valve Seat Remover
11. J-21558 Check Valve Seat Installer
12. J-21366 Converter Holding Clamp
13. J-6125 Slide Hammer
14. J-6125-2 Slide Hammer Adapter
15. J-21510-1 Reverse Clutch Spring Compressor Screw Assembly
16. J-8092 Handle
17. J-21495 Low Servo Cover Remover and Installer
18. J-9542 Clutch Spring Compressor
19. J-21369 Converter Leak Test Fixture
20. J-21424-5 Forward Clutch Drum Bushing Remover and Installer
21. J-21424-2 Case Bushing Installer
22. J-21424-9 Rear Bearing Retainer Bushing Remover and Installer
23. J-21424-3 Planet Carrier Bushing Installer
24. J-21424-7 Stator Shaft Bushing Remover and Installer
25. J-21424-4 Low Sun Gear and Flange Assembly Bushing Remover and Installer
26. J-21420-2 Reverse Clutch Spring Compressor Pilot

Fig. 7B-140 Special Tools