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PowerFlite & TorqueFlite A466 Automatic Transmission Factory Service Manual

1955 - 1958

Chrysler, DeSoto, Dodge, Imperial, Plymouth

Contents

(PDF Page Numbers)

PowerFlite 2-speed Automatic

9. POWERFLITE—OPERATING PRINCIPLES

Plymouth PowerFlite combines a highly efficient torque converter and a simple automatic two speed transmission which provides exceptionally smooth performance throughout the entire speed range. The transmission is equipped with a neutral starter safety switch which prevents starting the car in gear. All normal driving can be done in the Drive range, which accelerates the car in low range and then automatically shifts the transmission into direct drive at the proper time, depending upon the degree of acceleration desired by the driver. The shift is fully automatic, allowing the driver to keep constant pressure with his foot on the accelerator pedal at all times. Instant acceleration with the selector in Drive range is accomplished by pressing the accelerator pedal to the floor. This action downshifts the transmission to low gear.

A low range is provided to keep the transmission in low gear at all speeds for unusual driving conditions such as climbing or descending mountains or driving through sand.

"Rocking" the car, when mired in mud or snow, is easily accomplished by alternately shifting the selector between Low and Reverse.

TORQUE CONVERTER

The torque converter is capable of producing an engine torque multiplication of 2.6 to 1. on 6 Cylinder and 2.7 to 1. on 8 Cylinder models. The torque converter receives its oil supply at a constant pressure from the front pump in the transmission.

The torque converter unit is bolted to and supported by the crankshaft flange. It consists of three basic parts: an impeller, a turbine, and a stator. The impeller which forms the outer shell of the converter unit is driven by the engine. The turbine is driven by the force of oil from the impeller vanes. The turbine is splined to the input shaft of the transmission. The stator located between the impeller and turbine serves to redirect the flow of oil in the unit, thus multiplying engine torque. The stator is mounted on overrunning clutches which permits it to rotate only in the direction of the impeller and turbine.

Since the torque converter is a welded unit, it can be serviced only as a complete assembly.

POWERFLITE TRANSMISSION DATA AND SPECIFICATIONS

PowerFlite	Type	Automatic Two-Speed with Torque Converter
	Oil Capacity of Transmission and Torque Converter	10 Quarts
	Torque Converter Multiplication	P-30, LP-1—2.6 to 1. / P-31, LP-2—2.7 to 1.
	Oil Cooling	Fins welded to Torque Converter
	Lubrication	Provided by Transmission Front and Rear Pump
Transmission Gear Ratios	Low	1.72 to 1
	Drive Breakaway	1.72 to 1
	Drive—Direct	1 to 1
	Reverse	2.39 to 1
Front-Rear Pumps	Type	Gear
	End Clearance	.0012 to .0022 inches
Governor Type		Centrifugal
Clearance between Governor Valve and Body		.005 to .003 inches
Thrust Washers	Direct Clutch Piston Retainer Thrust Washers (3 sizes)	.043 to .045 in. (thin) .060 to .062 in. (medium) .078 to .080 in. (thick)
	Kickdown Planet Pinion Carrier Thrust Washer	.060 to .062 inches
	Planet Pinion Carrier Housing Thrust Washers	.078 to .080 inches
Kickdown Sun Gear Snap Ring (3 sizes)		.059 to .061 in. (thin) .062 to .064 in. (medium) .065 to .067 in. (thick)
Hydraulic Pressures	Line Pressure	Takeoff Plug, Left Front Side of Transmission
	Governor Pressure	Takeoff Plug, Left Side of Transmission in Output Shaft Support
	Throttle Pressure	Takeoff Plug, Right Side of Transmission, Next to Kick-down Servo
	Direct Clutch Pressure	Takeoff Plug, Right Side of Transmission at Bottom of Kick-down Servo

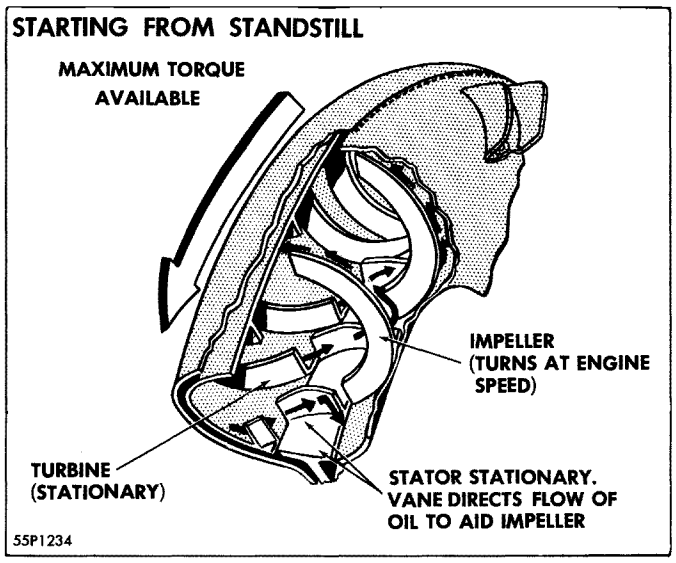


Figure 37—Torque Converter Operation (Starting from Standstill)

The adapter plate is located between the converter housing and rear face of the engine block. The torque converter housing is bolted to the adapter plate.

TORQUE CONVERTER OPERATION

STARTING FROM STANDSTILL — When a TorqueFlite equipped Plymouth is started from a standstill, the engine driven impeller rotates rapidly and the turbine begins to rotate, absorbing energy from the high velocity oil flow. See Figure 37. This high velocity oil is then discharged against the stator vanes which in turn redirects the oil to the impeller. It is this force of redirected oil flow which povides the multiplication of engine torque.

AS CAR SPEED INCREASES—As the speed of the turbine approaches the speed of the impeller, torque multiplication gradually diminishes. See Figure 38. As this occurs, the angle of oil leaving the turbine gradually changes in relation to the stator and the oil flow begins to strike the back of the stator vanes. When this action takes place, the stator is carried along by the force of oil on the backs of the stator vanes because the stator is mounted on an overrunning clutch, permitting it to rotate in the direction of the impeller. During this time, the oil continues to strike the front face of the stator vanes and is redireced to the impeller.

CRUISING SPEED—Under wide open throttle operation, the speed of the turbine approaches very near the speed of the impeler at approximately 35 miles per hour. At this point the angle of the oil flow from the turbine changes still more and its force is directed to the back of the stator vanes. See Figure 39. The stator then begins to rotate in the same direction as the impeller, the stator, and the turbine. When this occurs no further torque multiplication exists and the unit operates at a ratio of approximately 1 to 1.

MECHANICAL OPERATION OF TRANSMISSION

The transmission unit consists essentially of two planetary gear sets, one multiple disc clutch, a reverse band, and a series of operating valves. Each planetary gear set consists of an annulus gear, a planet pinion carrier with three planet pinion gears, and a sun gear.

DRIVE RANGE—BREAKAWAY — When the car is starting or is being driven slowly with the gearshift panel control in Drive (D), the transmision is downshifted into low. The kickdown band is applied at this time and holds the sun gear of the kickdown planetary gearset

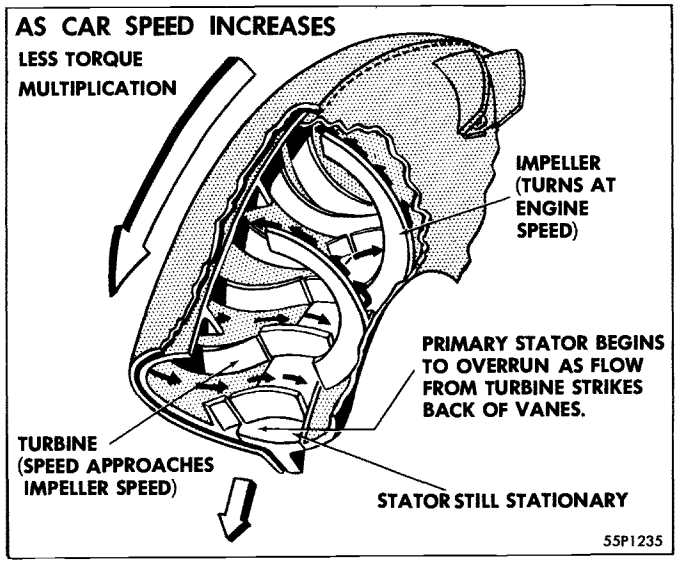


Figure 38—Torque Converter Operation (As Car Speed Increases)

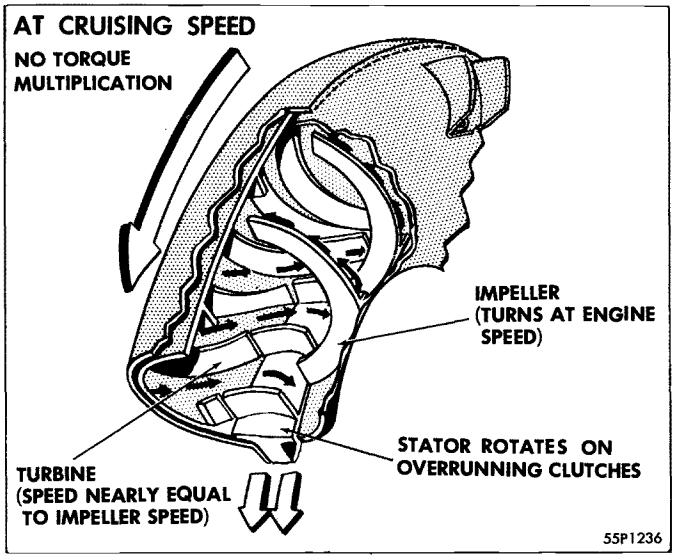


Figure 39—Torque Converter Operation (At Cruising Speed)

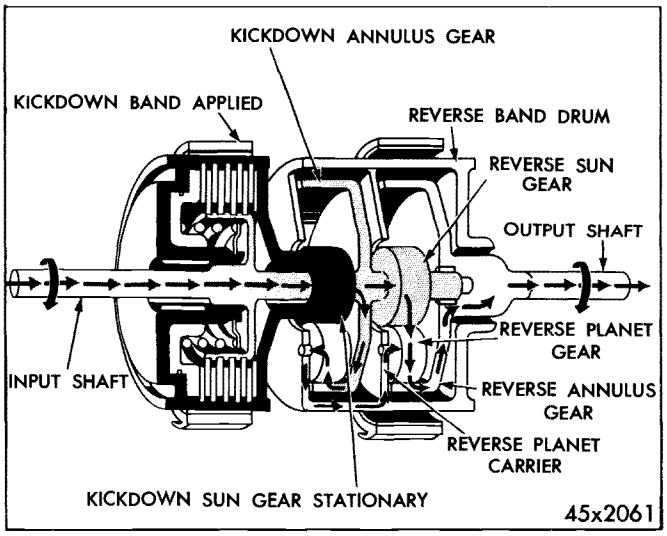


Figure 40—PowerFlow in Transmission (Breakaway, Kickdown or Low)

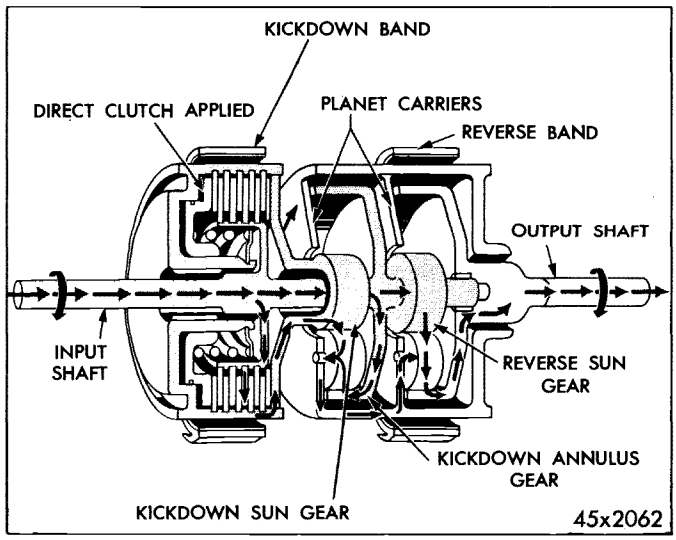


Figure 41—PowerFlow in Transmission (Direct Drive)

stationary. See Figure 40. The power flow is from the torque converter turbine, through the transmission input shaft, to the annulus gear of the kickdown (front) planetary set and to the sun gear of the reverse (rear) planetary gearset. When the kickdown sun gear is held stationary and the annulus gear is the driving member, the kickdown planet carrier rotates at a slower speed than the annulus gear. The speed of the reverse sun gear is further reduced by the reverse planetary gearset before power is transmitted to the output shaft. Since both the kickdown planet carrier and the reverse planet carrier are splined to the reverse band drum, the reverse planet carrier is revolving slower than the reverse sun gear, which is turning at input shaft speed. Therefore, the reverse planet gears rotate backward on their shafts and the reverse annulus gear which is the driven member and is splined to the output shaft, rotates forward more slowly than the planet carriers.

The kickdown planetary gearset coupled with the reverse planetary gearset provides a starting gear ratio of 1.72 to 1 at the output shaft of the transmission. The 1.72 to 1 gearset ratio in the transmisison multiplied by the 2.6 to 1 torque multiplication of the torque converter provides an overall starting ratio of 4.47 to 1 at the transmission output shaft.

DRIVE RANGE—KICKDOWN—Pressing the accelerator pedal to the floor when in direct drive downshifts the transmission from direct drive to low gear. When this occurs the direct clutch is released and the kickdown band is applied. The power flow through the transmission is the same as it is for breakaway. See Figure 40.

LOW RANGE—When the panel control is placed in Low (L) the transmisison stays in low at all times and cannot upshift into direct drive. When driving in low, only the kickdown band is applied and the power flow is the same as for breakaway, shown in Figure 40.

DRIVE RANGE—DIRECT—When the transmission upshifts from low gear, the unit is in direct drive. At the point of upshift, the direct clutch is applied and both the kickdown band and reverse band are off the apply position. When the direct clutch is applied the kickdown sun gear is locked to the input shaft and both rotate at the same speed. Figure 41.

The kickdown annulus gear is splined to the input shaft. Since the annulus and sun gear are locked together the entire kickdown planet gear set rotates as a solid unit.

The kickdown planet carrier and reverse planet carrier also rotate at the same speed, since both are locked together by splines in the reverse band drum.

The reverse sun gear is splined to the input shaft. Since the reverse sun gear is locked to the reverse planet

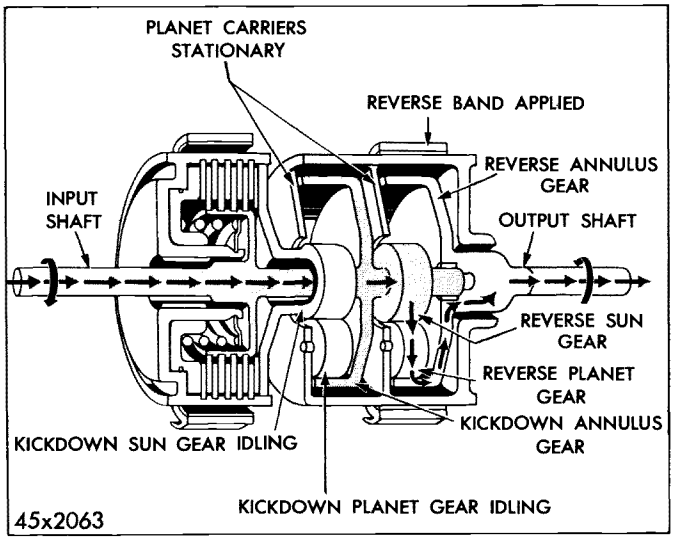


Figure 42—PowerFlow in Transmission (Reverse)

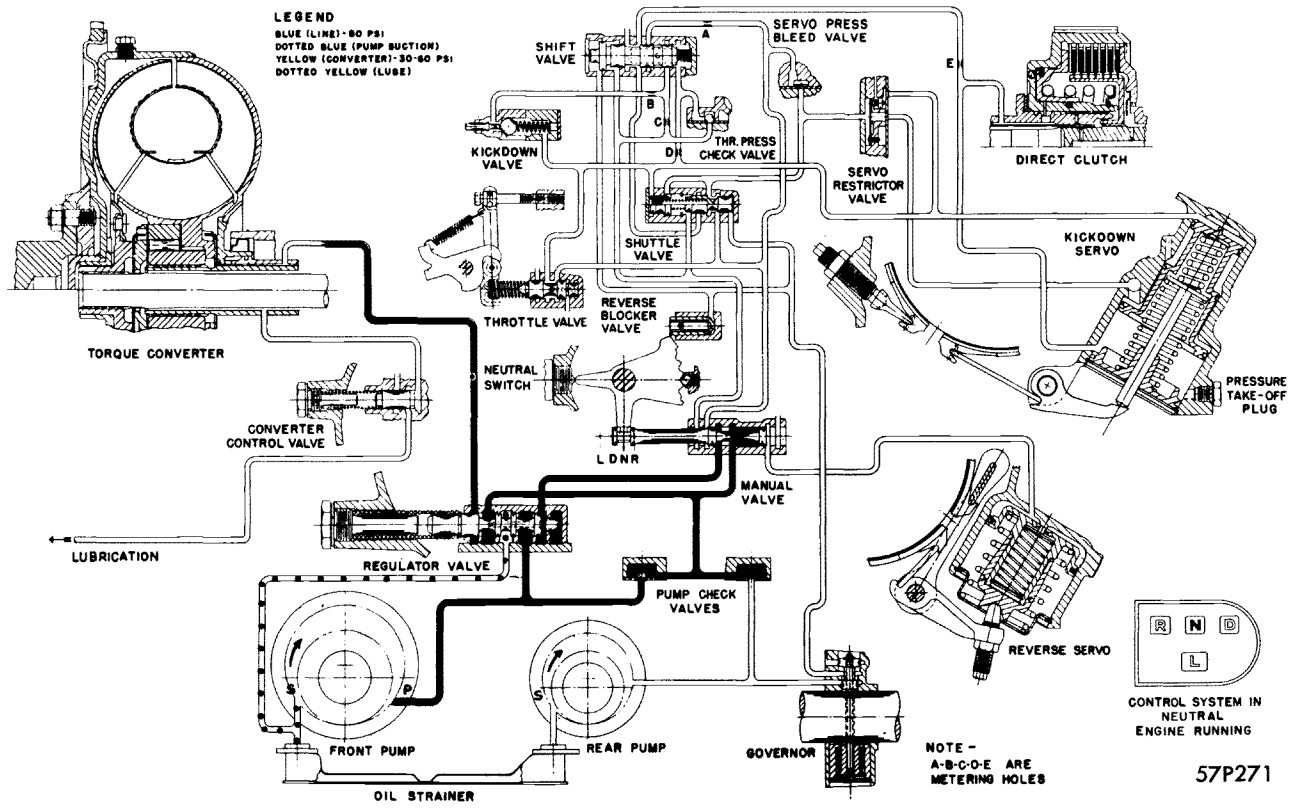


Figure 43—PowerFlite Oil Flow Diagram (Neutral)

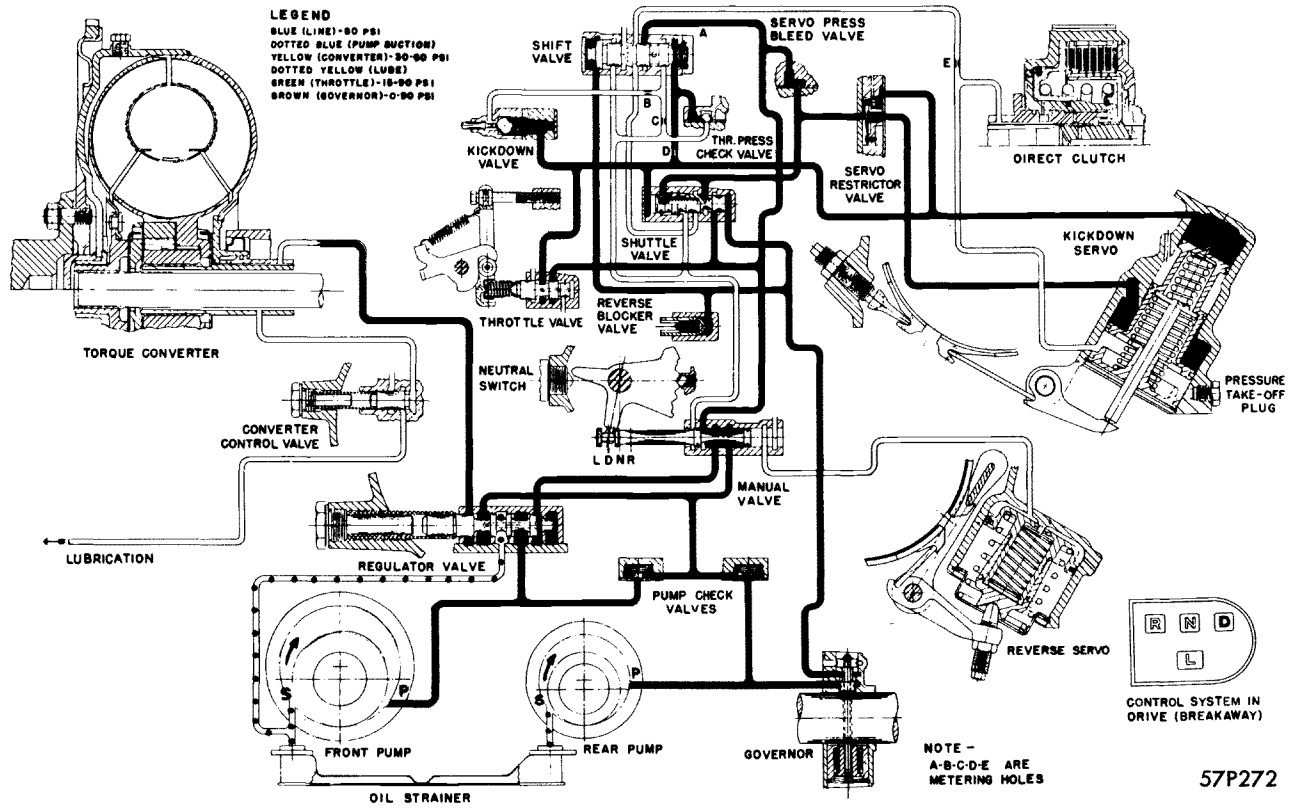


Figure 44—PowerFlite Oil Flow Diagram (Drive—Breakaway)

carrier, the reverse planetary gearset rotates as a solid unit. With both the kickdown and reverse planetary gearsets locked together, the power flow is straight through the transmission, resulting in a 1 to 1 gear ratio.

REVERSE—When the panel control is placed in Reverse (R) position, the reverse band is applied, locking the kickdown and reverse planet carriers stationary. See Figure 42. The direct clutch and kickdown band are disengaged. The power flow is through the input shaft to the reverse sun gear. Since the reverse planet carrier is held stationary, the reverse annulus gear and output shaft are driven by the reverse planet gears in a reverse direction at a reduced speed. The transmission gear ratio in reverse is 2.39 to 1.

NEUTRAL—When the panel control is placed in Neutral (N) position, the direct clutch, kickdown band and reverse band are released. Since the gears of the planetary gearset are not locked together and the other units are in the released position, power cannot be transmitted to the output shaft. All gears are, however, free to rotate and sounds caused by the units revolving may be audible.

HYDRAULIC OPERATION

NEUTRAL—When the engine is started (panel control placed in Neutral), the manual valve which is connected to the panel control by mechanical linkage is positioned so that oil cannot pass to the hydraulic control system of the transmission. Therefore, the direct clutch and both the front and rear bands are in the released position. Oil under pressure flows from the front pump to the torque converter, then to the transmission lubricating system and back into the transmission oil pan. See Figure 43. The front pump is connected directly to the impeller of the torque converter by a driving sleeve. The rear pump is connected to the output shaft of the transmission, but does not operate unless the output shaft is turning.

Oil leaves the front pump and is directed through the regulator valve. This valve controls oil pressure to 90 p.s.i., which is the required oil pressure to operate the direct clutch and front and rear bands when the transmission is in drive or low. The oil, under 90 p.s.i. flows from the regulator valve to the torque converter control valve which reduces the oil pressure to 60 p.s.i. before it enters the torque converter. The converter pressure is maintained at 60 p.s.i. by a torque converter outlet valve assembly in the converter oil return passage in the transmission. This valve prevents cavitation.

Cooling of the oil in the torque converter is accomplished by fins welded to the impeller housing which dissipate heat to the outside air. The oil is directed under pressure from the torque converter to various parts of the transmission where lubrication is essential. It then drops down into the transmission oil pan.

Circulation through the torque converter and transmission is maintained at all times regardless of the position of the selector lever. The front pump provides all lubrication in the transmission until car speed reaches approximately 40 miles per hour. At speeds above approximately 40 miles per hour the rear pump provides the necessary lubrication.

DRIVE—BREAKAWAY—Placing the panel control in Drive (D), positions the manual valve so that oil flows to the apply side of the kickdown piston. When this occurs, the kickdown band is applied and the transmission is in Low. The direct clutch and reverse band are disengaged at this time. See Figure 44.

Oil, under pressure (90 p.s.i.) from the manual valve is also directed to the throttle pressure valve, thence to the throttle pressure area of the kickdown piston. This valve is a regulating type of valve which provides variable oil pressure over a range of approximately 15 p.s.i., to 90 p.s.i.

As the car engine accelerates, the engine torque increases and a greater force is required to hold the kickdown band. The function of the throttle valve is to provide the required additional oil pressure to the kickdown piston to prevent kickdown band slippage.

The amount of oil pressure applied to the throttle pressure area of the kickdown piston is proportional to the carburetor throttle opening as determined by the position of the accelerator pedal. This is accomplished by mechanical linkage between the carburetor and transmission.

DRIVE—DIRECT—Upshifting the transmission is accomplished by the shift valve which directs oil under pressure to the direct clutch and also to the off area of the kickdown piston, as shown in Figure 45. When the upshift occurs the direct clutch is applied at the same time the kickdown band is released.

As the car speed increases in Drive (D), the position of the accelerator pedal results in a build up of throttle pressure against one end of the shift valve which holds the shift valve in the downshifted position. In order for the transmission to upshift into direct drive, governor pressure must increase enough to overcome throttle pressure and the shift valve spring and move the shift valve to the upshifted position. As the valve moves, oil passages in the valve body are opened to provide oil pressure to apply the direct clutch and to flow to the off side of the kickdown piston and release the kickdown band. When pressure from the throttle valve and governor valve acts on the shift valve to initiate an upshift, the

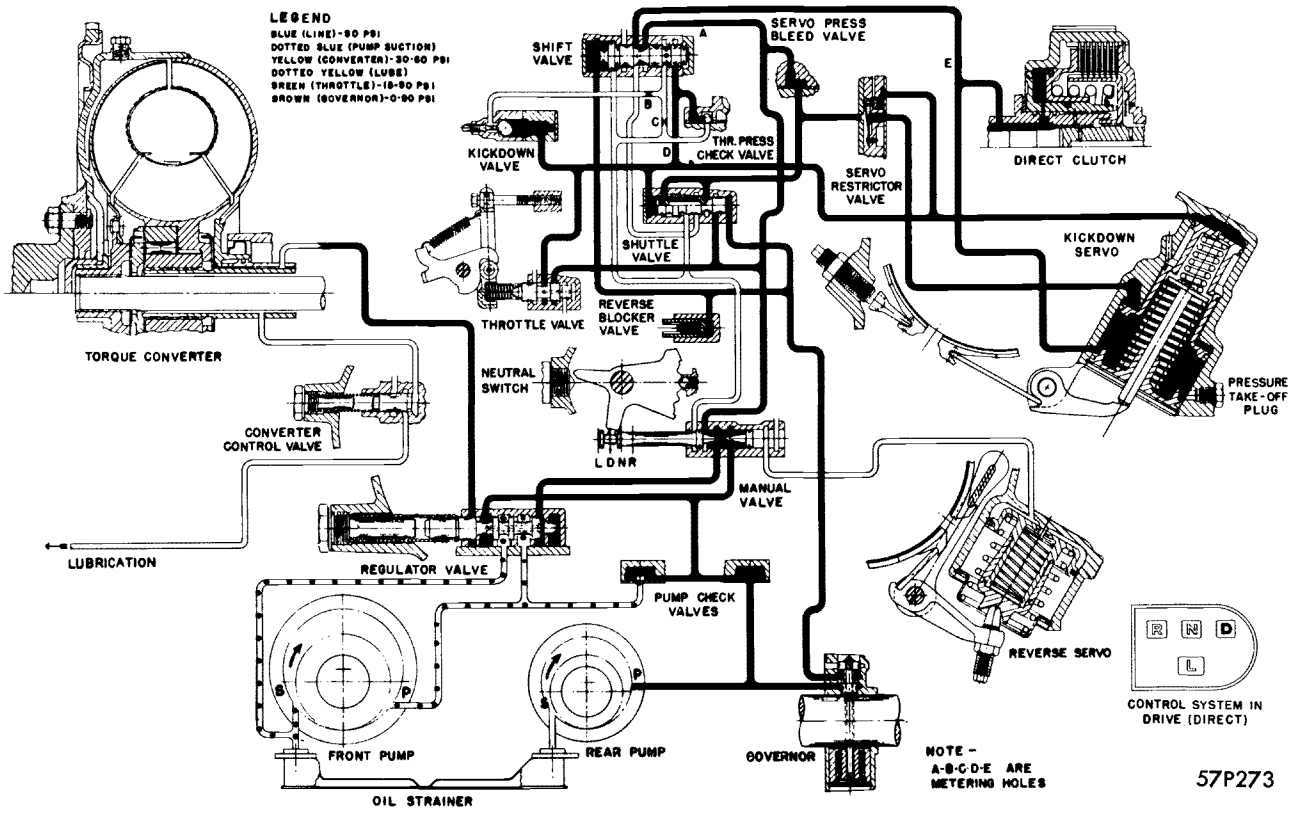


Figure 45—PowerFlite Oil Flow Diagram (Drive—Direct)

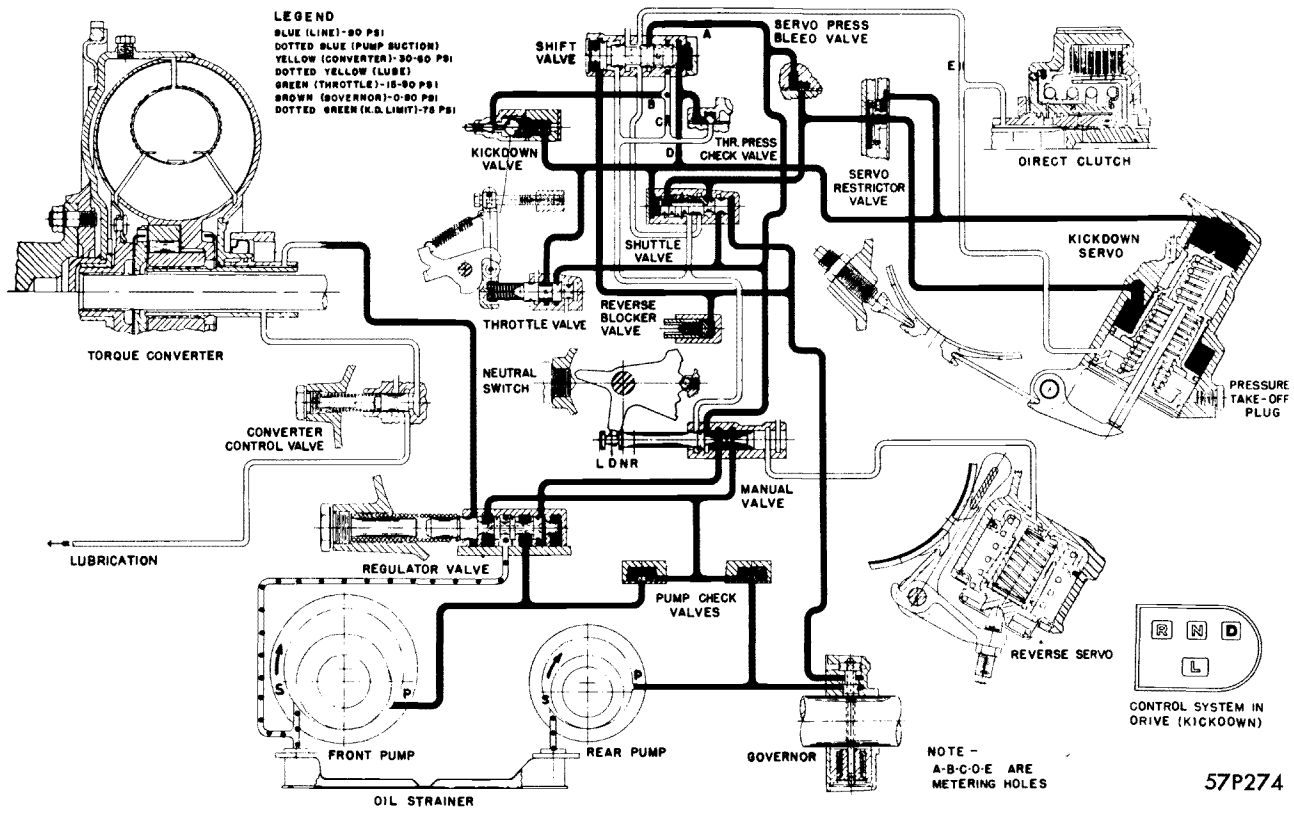


Figure 46—PowerFlite Oil Flow Diagram (Drive—Kickdown)

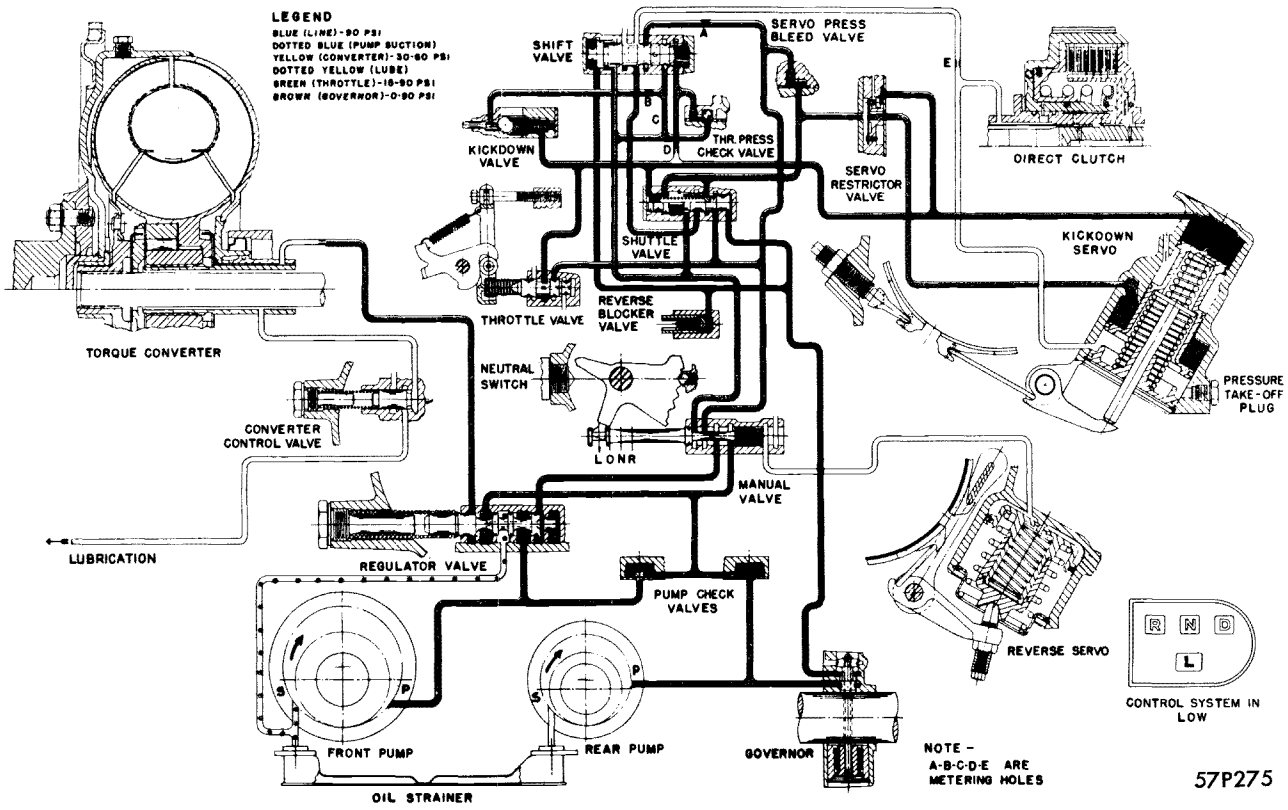


Figure 47—PowerFlite Oil Flow Diagram—(Low)

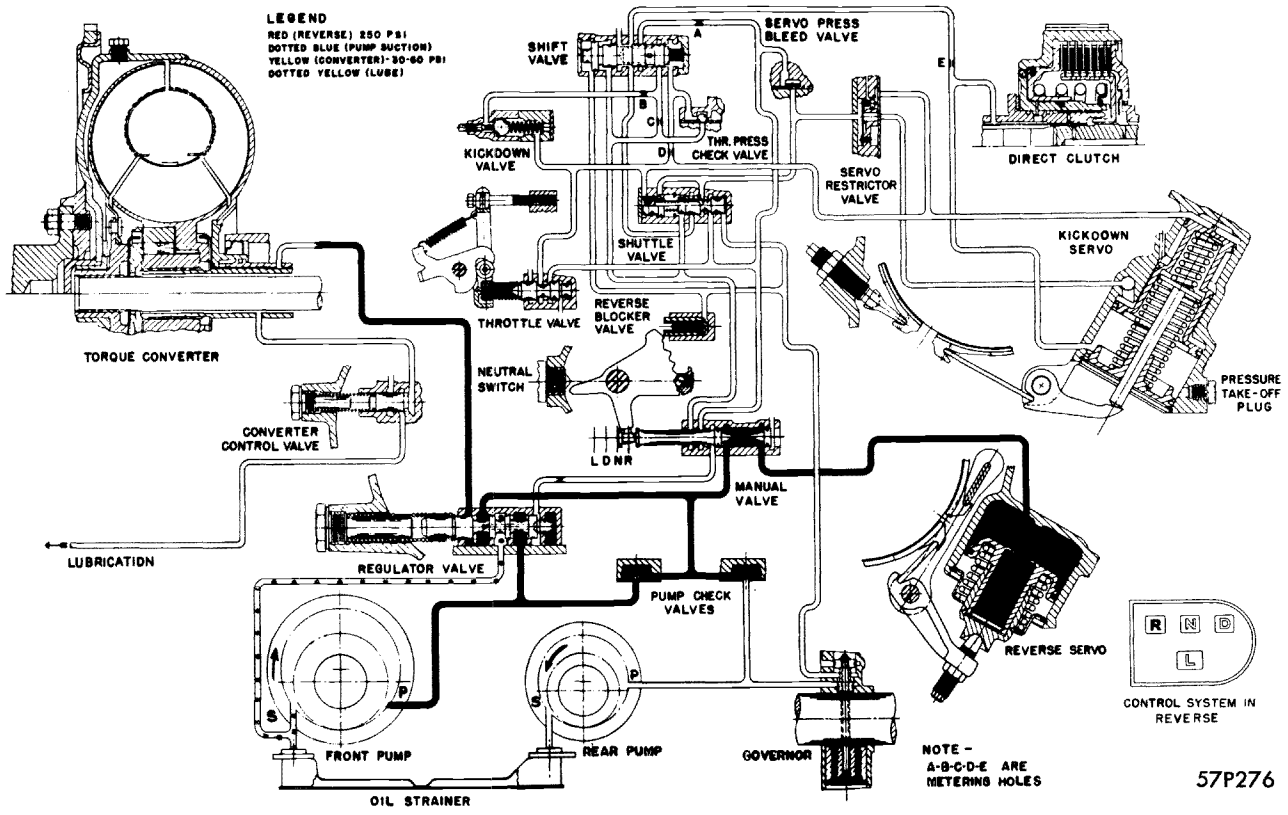


Figure 48—PowerFlite Oil Flow Diagram (Reverse)

valve snaps to the upshifted position without hesitation. The valve will remain in upshifted position unless the transmission is intentionally downshifted or the car speed is reduced below approximately 10 miles per hour. When the car speed falls below 10 miles per hour the shift valve spring is strong enough to downshift the valve against governor pressure which drops off as the car slows down.

The governor is mounted on the transmission output shaft and incorporates a valve in the governor body. As output shaft speed (car speed) increases, a greater oil pressure is applied to the governor pressure area of the shift valve.

If accelerator pedal pressure is relatively light, throttle pressure will be low and a low governor pressure will offset throttle pressure and shift valve spring to cause an upshift at low speeds. However, if accelerator pedal pressure is heavy, a high road speed is necessary to provide a correspondingly greater governor pressure to cause an upshift.

DRIVE—DOWNSHIFT—Downshifting (kickdown) the transmission to low, selector lever in Drive (D), is accomplished by the addition of a kickdown valve in the system, as shown in Figure 46. The valve includes a valve ball. valve spring and kickdown valve rod. The Kickdown valve spring and throttle pressure hold the ball seated in its closed position at all times except during kickdown.

When the accelerator pedal is pressed to the floor the throttle valve cam contacts the kickdown valve rod which in turn pushes the kickdown valve ball off its seat. This action allows oil under pressure to bypass the valve ball and apply pressure to the throttle pressure area of the shift valve.

This additional pressure coupled with the pressure of the shift valve spring moves the shift valve against governor pressure. The shift valve instantly moves into the downshifted position without hesitation. As the shift valve snaps into the downshifted position, the oil passage leading to the direct clutch piston and to the off area of the kickdown piston is blocked off. A port in the valve body is opened, allowing oil to drain from the direct clutch and the off area of the kickdown piston. In addition, pressure to the on area of the kickdown piston applies the front band. When this occurs, the transmission is downshifted into low and will remain downshifted until car speed exceeds 40 to 60 miles per hour. Above this speed the transmission will upshift into direct drive.

The line restrictor and pressure bleed orifice serve to reduce throttle pressure to 75 p.s.i. in order to prevent downshifting the transmission at too high a speed. The excess oil is channeled through a vent into the transmission oil pan. The 75 p.s.i. limit to the throttle pressure area of the shift valve is sufficient to overcome governor pressure at a car speed below 40 miles per hour. At higher speeds governor pressure exceeds 75 p.s.i. and holds the shift valve in its upshifted position.

LOW—When the panel control is placed in the low (L) position, the manual valve is located so that line pressure (90 p.s.i.) is directed to the low range side of the shift valve, and to the on area of the kickdown piston, thus applying the kickdown band. The combined oil pressures in their respective shift valve chambers result in a greater combined force than the maximum force of governor pressure. This prevents the governor pressure from moving the shift valve, thus the transmission remains in the downshifted position at all times when the panel control is in low (L), as shown in Figure 47.

REVERSE—When the panel control is placed in Reverse (R), the manual valve is positioned so that oil pressure normally directed to the secondary reaction area of the regulator is blocked off. Thus oil pressure normally directed to the secondary reaction area of the regulator is blocked off. Thus oil pressure from the front pump is directed through the manual valve to the primary reaction area of the regulator valve. Line pressure builds up to 250 p.s.i. and when this pressure is reached, excess oil bypasses the regulator valve to the suction side of the front pump, as shown in Figure 48.

In addition, movement of the manual valve to Reverse (R) also opens a port in the manual valve allowing oil at 250 p.s.i. to the reverse servo. The rear band is immediately applied and the tranmission is in Reverse (R). The reverse servo piston spring releases the reverse band when the selector lever is moved out of the Reverse (R) position.

LINE RESTRICTIONS AND RESTRICTOR VALVES

In addition to the main valves mentioned in the hydraulic operation of the PowerFlite Transmission, line restrictions and line restrictor valves are incorporated in the transmission hydraulic system to smooth out the operation of the unit. See Figure 47, for location of the restrictors.

RESTRICTIONS "A"—This restriction cushions the actions of direct clutch application and the release of the front band during upshift.

RESTRICTIONS "B" AND "C"—Pressure to the shift valve is reduced to 75 p.s.i. by the use of these two restrictions, thus preventing kickdown at too great a car speed.

RESTRICTION "D"—This restriction prevents line pressure (90 p.s.i.) from entering the throttle pressure lines when the transmission is in Low (L). Any line pressure that does bleed through the restriction is vented out through the throttle valve. In this way throttle pressure is maintained, depending upon the position of the accelerator pedal which is connected to the throttle valve by mechanical linkage.

RESTRICTION "E"—This restriction prevents oil pressure in the direct clutch and the off area of the kickdown piston from flowing out all at once during kickdown. This slowing down action of the restrictor enables the direct clutch to remain engaged until the kickdown band is partially applied.

SERVO RESTRICTOR VALVE—The servo restrictor valve slows down the application of the kickdown band during a downshift with the accelerator pedal released. This occurs at approximately 10 miles per hour. The slowing down action prevents harsh application of the kickdown band which would disrupt the smooth change of gears during downshift.

SERVO PRESSURE BLEED VALVE—The servo pressure bleed valve slows down the application of the front band during a kickdown at higher car speeds providing a smooth change of gears.

SHUTTLE VALVE—The shuttle valve has two separate functions, and performs them independently of each other. The first is that of providing fast and smooth direct clutch engagement when the driver makes an upshift after accelerating rapidly and then allowing the throttle to close completely. Without the shuttle valve, the resulting upshift would consist of a series of lurches, caused first by the braking effect on the car of the kickdown gear and then by the too-hard engagement of the direct clutch.

Under conditions of closed throttle (low throttle pressure) and high car speed (high governor pressure) the shuttle valve is forced to its extreme limit of travel. In this position, oil is allowed to flow from the kickdown band piston to the direct clutch. Because the kickdown piston is being fed oil only through the hole in the servo pressure bleed valve, pressure on this piston drops to a low valve while oil from the shuttle valve and from the shift valve build up pressure on the direct clutch and the "off" area of the kickdown piston. The kickdown band load is then reduced sufficiently to allow the band to slip. In the meantime, the direct clutch has built up enough pressure load to complete a smooth engagement.

The second function of the shuttle valve is to regulate the application of the kickdown piston when making kickdowns. Kickdowns made at low car speeds require very little time in which to complete the shift due to the comparatively small change in engine speed between direct drive and kickdown gear. The higher the car speed at which the kickdown shift is made, the longer is the time required to make a smooth shift. The shuttle valve controls the engagement according to car speed.

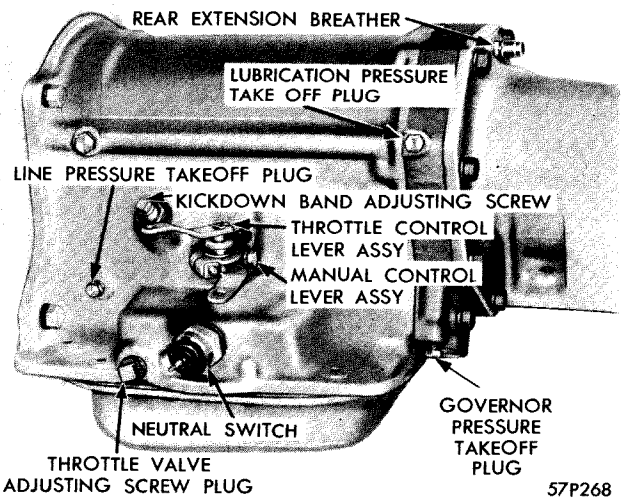


Figure 49—View Showing Left Side of Transmission

10. POWERFLITE HYDRAULIC PRESSURE TESTS

LINE PRESSURE

The engine must be at operating temperature when checking pressures. Remove the ⅛ inch pipe plug from the line pressure take-off hole located on the front left side of the transmission, as shown in Figure 49, for location of plug. Install a 300 p.s.i. pressure gauge C-3293 at this point. Refer to chart for correct line pressures.

THROTTLE PRESSURE

Remove the ⅛ inch pipe plug from the throttle pressure take-off hole located on the right hand side of the transmission, as shown in Figure 50, for correct location of plug. Install 100 p.s.i. pressure gauge C-3292 at this point. Operate engine at speeds shown on throttle pressure chart. If pressures do not correspond, refer to Diagnosis Procedures.

CAUTION

To prevent overheating of transmission and torque converter, do not hold throttle wide open for more than a few seconds when making throttle pressure check.

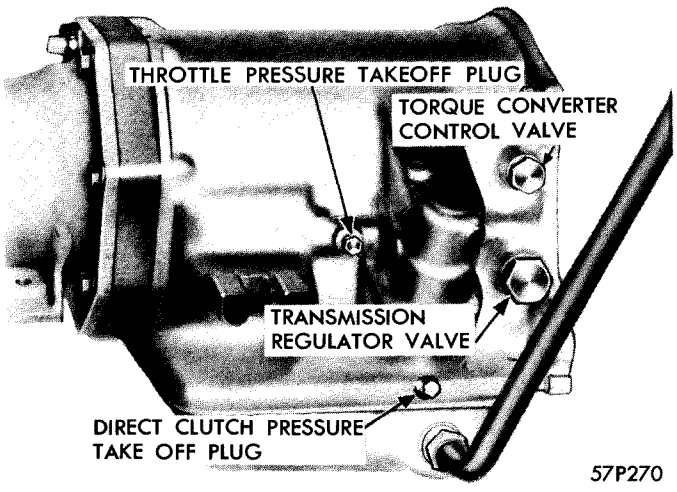


Figure 50—View Showing Right Side of Transmission

GOVERNOR PRESSURE

Remove the ⅛ inch pipe plug from the governor pressure take-off hole located on the lower left side of the output shaft support. See Figure 49, for correct location of this plug. Install 100 p.s.i. pressure gauge C-3292 at this point. Refer to governor pressure chart for correct pressures. If pressure checks do not correspond to chart, refer to Diagnosis Procedures.

LINE PRESSURE CHART

Selector Position	Rear Wheels	Engine R.P.M.	Line Pressure
R	Free to Turn	1600	250 p.s.i.
N	.....	800	90 p.s.i.
D	Brakes Applied	800	90 p.s.i.
L	Brakes Applied	800	90 p.s.i.

THROTTLE PRESSURE CHART

Selector Position	Brakes	Throttle	Engine R.P.M.	Throttle Pressure
D	Applied	Closed	450	14 p.s.i.
D	Applied	Wide-open	1500	90 p.s.i.

DIRECT CLUTCH PRESSURE

Before checking direct clutch pressure, check line pressure since any deviation in line pressure directly affects clutch pressure. Then, remove the ⅛ inch pipe plug from direct clutch pressure take-off hole located at the bottom of the kickdown servo boss on the right side of the transmission. See Figure 50, for correct location of

GOVERNOR PRESSURE CHART

Selector Lever Position	Wheels	Car Speed 6 Cyl.	Car Speed 8 Cyl.	Governor Pressure
D	Free to Turn	12-14	13-16	15 p.s.i.
D	Free to Turn	19-23	23-26	45 p.s.i.
D	Free to Turn	41-48	55-62	60 p.s.i.

plug. Connect a 300 p.s.i. pressure gauge C-3293 at this point. With rear wheels free to turn, accelerate engine slowly until an upshift occurs. During the upshift, the pressure should rise rapidly from 0 to 90 p.s.i. in 1½ to 2 seconds.

With an engine speed of not less than 650 R.P.M. and transmission upshifted, the direct clutch pressure should read within 10 p.s.i. of line pressure. If difference is greater than 10 p.s.i. refer to Diagnosis Procedures.

11. POWERFLITE LINKAGE AND BAND ADJUSTMENTS

PUSH BUTTON CONTROLS AND LINKAGE

Mechanical connection between the push button unit, as shown in Figure 51, and the manual control valve is obtained through the use of a single push pull cable. One end of the wire cable is secured to the cable actuator in the speed range selector unit on the instrument panel. The other end enters the transmission case to engage the manual control valve assembly.

The push button control is as simple to service as it is to operate. The push button control unit requires no lubrication. The adjustment is easily made at the transmission end of the cable. The transmission end of the

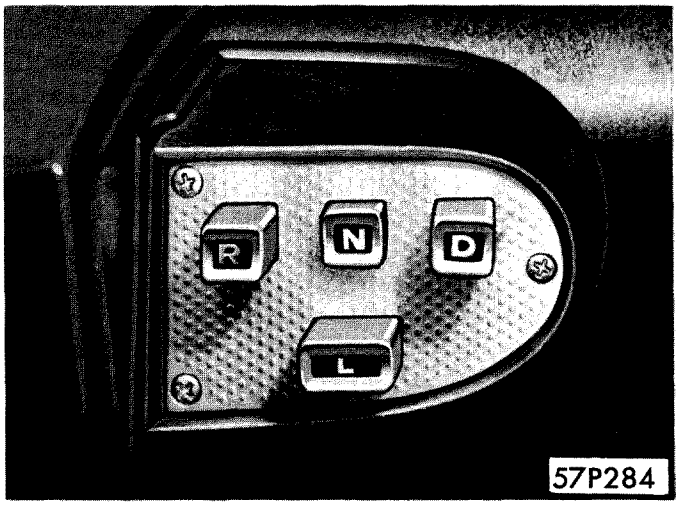


Figure 51—Push Button Control Unit

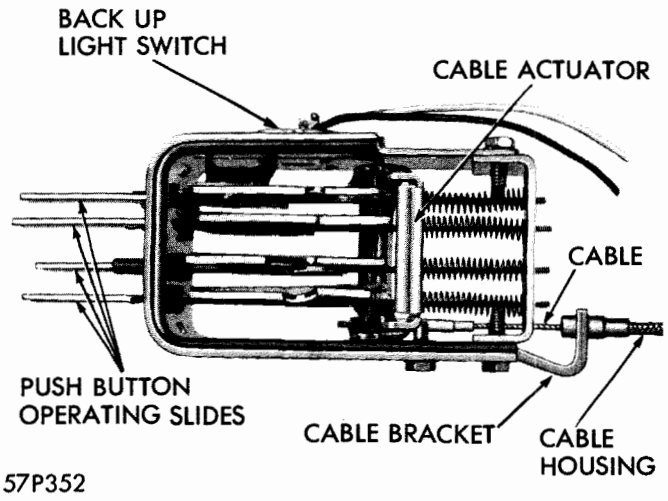


Figure 52—Speed Range Selector (Top View)

cable housing enters the transmission case and is sealed at this point with a rubber "O" ring. The cable housing is protected with a rubber cover.

CABLE REMOVAL—PUSH BUTTON END—To remove the cable at the push button unit end, remove the three bezel attaching screws, then remove the bezel and push buttons. Remove the two hex nuts holding the push button unit to the instrument panel and remove push button unit from rear of the instrument panel. The cable bracket is held by two screws to the push button unit. A hairpin clip secures the cable to the actuator bar.

CABLE REMOVAL—TRANSMISSION END—Remove throttle adjustment hole plug and allow transmission fluid to drain off to level of hole. Remove neutral starter switch to provide access to the cable lock spring. Remove cable bracket screw and bracket. Insert screwdriver (or similar tool) through neutral switch hole. Push gently on projecting portion of cable lock spring and pull outward on cable. See Figure 53.

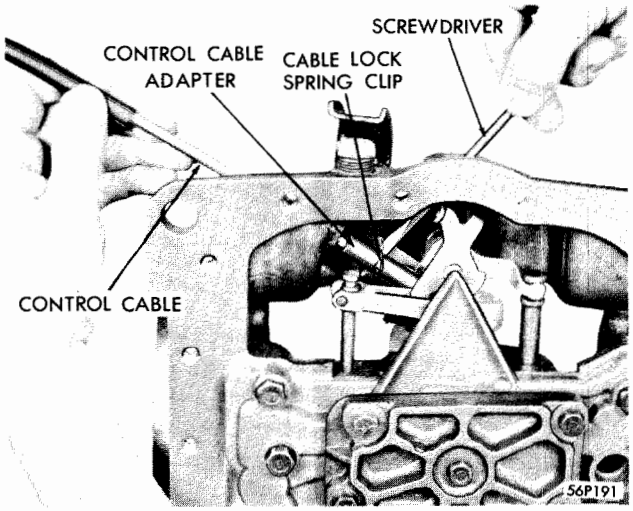


Figure 53—Removal of Control Cable

INSTALLATION—TRANSMISSION END — When installing the cable in the transmission, be sure the cable is fully extended by pushing the low (L) button. With the cable extended, the housing will enter the transmission case the proper distance preventing damage or possible displacement of the "O" ring if the housing was inserted too far. Push the cable into the cable adaptor as far as it will go; pull outward on the cable to make sure it is securely locked in the adaptor. Push the low (L) button in the full length of its travel and hold in this position. With the low (L) button held in push the control cable into the adaptor in the transmission as far as it will go. Withdraw the cable slightly to make sure the low range detent is fully seated. The panel control and the transmission are not both in low range. Lock the cable in place by tightening the cable bracket screw being careful not to move the cable. See Figure 54.

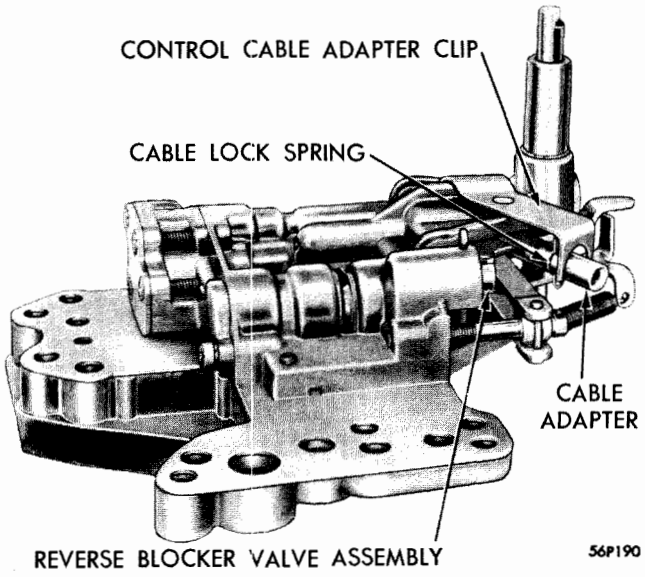


Figure 54—Control Cable Adaptor and Reverse Blocker Valve

CABLE ADJUSTMENT—WITHOUT REMOVAL—Loosen the cable bracket screw (the cable bracket screw hole is elongated for adjustment) have someone hold the low (L) speed push button in its full length of travel to remove backlash from the cable actuator. Carefully position the cable bracket in the cable bracket recess on the cable and tighten screw. Check operation of push buttons to insure correct adjustment. See Figure 55.

CAUTION

Make sure the control cable housing is not moved in or out during the tightening of the bracket as the backlash setting will be disturbed.

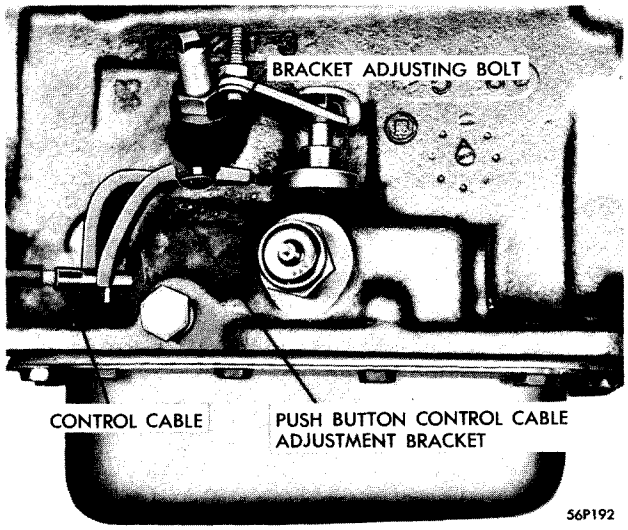


Figure 55—Control Cable Bracket

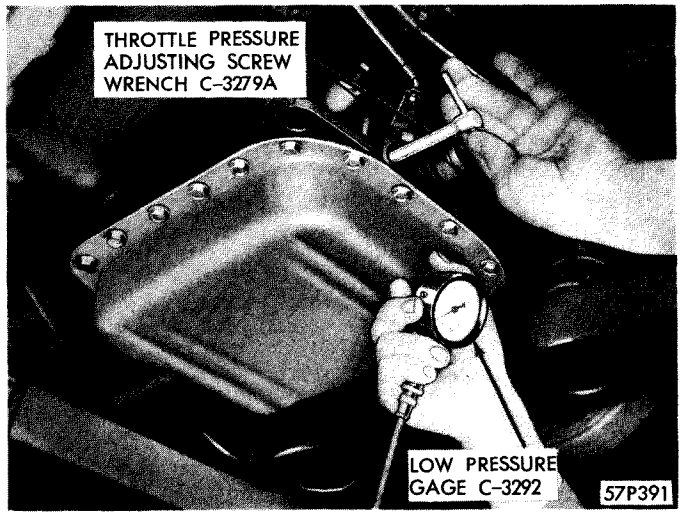


Figure 56—Adjusting Throttle Pressure with Wrench C-3279A

REVERSE BLOCKER VALVE—A hydraulic valve located in the valve body prevents the transmission from being shifted into Reverse (R) range when the car is traveling forward at speeds about 10 miles per hour.

The blocker valve is connected to the governor pressure line and is held in by a spring. As the car's speed reaches 10 miles per hour governor pressure builds up enough to overcome the spring and moves the valve pin outward. This extension of the blocker valve serves as a stop and prevents the detent plate from moving into the Reverse (R) range position by engaging a projection on the detent plate.

THROTTLE LINKAGE AND PRESSURE ADJUSTMENTS

Adjustments are made in the engine compartment, however, the linkage should always be checked for possible binding by checking at the throttle lever on the transmission to make sure the lever returns freely to its stop. When throttle linkage is properly adjusted, pressing the accelerator pedal causes a simultaneous increase of engine speed and throttle pressure. To obtain this relationship, throttle pressure as well as throttle linkage should be checked.

Move the selector lever in Neutral. Apply parking brake firmly. Start the engine and bring to normal operating temperature. Make sure that the carburetor is not on fast-idle cam. Adjust engine idle to 475-500 rpm. Stop engine.

Arrange tachometer leads for use under the car. Start engine, then raise car on hoist. Remove the throttle oil presure take-off plug (⅛ inch pipe) located between the reverse and kickdown servos on the right side of the transmission. Connect 100 p.s.i. throttle pressure gauge C-3292. There will be no oil pressure at this plug when transmission is in neutral.

Move the gearshift control lever on transmission one detent toward the front of the car to put the transmission in Drive range. Disconnect the throttle linkage at the transmission throttle control lever and operate the throttle control lever several times by hand. Pressure should return to 13-15 p.s.i. with throttle lever returned to its stop. If it does not, adjust as follows:

Remove the (⅜ inch pipe) throttle valve adjusting screw plug on the left side of the transmission. About one quart of fluid may drain out. Using throttle adjusting screw wrench C-3279A adjust the throttle pressure to 14 p.s.i. See Figure 56. Turn the screw counter-clockwise to increase pressure; clockwise to decrease. Shift the transmission several times between Neutral and Drive. Pressure should return to 14 p.s.i. when the lever is returned to Drive. If it does not, repeat the adjustment. Reinstall the plug and tighten to 20 to 25 ft. lbs.

After throttle pressure is adjusted, adjust the throttle control linkage as follows:

V-8—THROTTLE LINKAGE ADJUSTMENT—The throttle linkage adjustment is made on the throttle control rod. Loosen the clamp nut on the throttle control rod and slide the rear part of the rod toward the rear of the car to take up all slack. Then tighten the clamp nut. Be sure carburetor is "off" the fast idle cam.

IMPORTANT

One of the most important adjustments is the connection between the two parts of the throttle control rod. They should be so connected that movement of the accelerator pedal will cause a simultaneous increase of engine speed and throttle pressure.

6 CYLINDER—THOTTLE LINKAGE ADJUSTMENT—Loosen the vertical clamp rod and adjust the carburetor lever rod to provide $5\frac{7}{16}$ inches distance between the anchor points of the throttle return spring. Then with engine idling, (off fast idle), take up slack at the vertical rod and tighten the clamp nut.

After adjustments are made, move the gearshift control lever on transmission one detent toward rear of the car to put the transmission into neutral. Remove the pressure gauge and reinstall the plug. Tighten 10 to 12 foot-pounds.

With engine idling and transmission in neutral check transmission lubricant level. Add sufficient automatic transmission fluid type A to bring the level up to the "low" mark. As operating temperature increases, normal expansion of fluid will raise the level from the "low" mark to the "full" mark.

KICKDOWN BAND ADJUSTMENT

Working from beneath the car, use a box wrench to loosen locknut, and back off at least four turns. Adjust screw and tighten to 60-72 inch-pounds, using special torque wrench C-3380. With chalk, mark a reference point on the adjusting screw and transmission case, then back off adjusting screw exactly three turns. Hold screw stationary and tighten locknut. See Figure 57.

REVERSE BAND ADJUSTMENT

Drain transmission and remove oil pan. Remove reverse band adjusting screw locknut and tighten adjusting screw to 20-25 inch-pounds using special tool C-3380. Mark a reference point and back off adjusting screw 10 turns. Hold adjusting screw, replace locknut and tighten to 30-35 foot-pounds. See Figure 58. Replace oil pan and refill transmission with type "A" automatic transmission fluid.

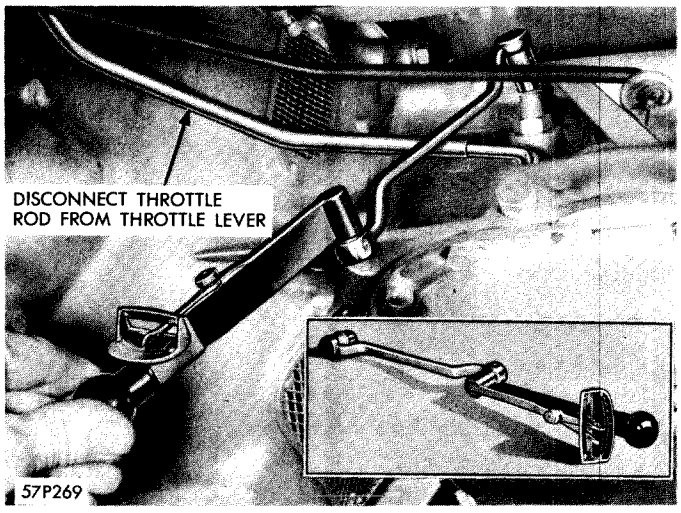


Figure 57—Adjusting Kickdown Band Using Wrench C-3380

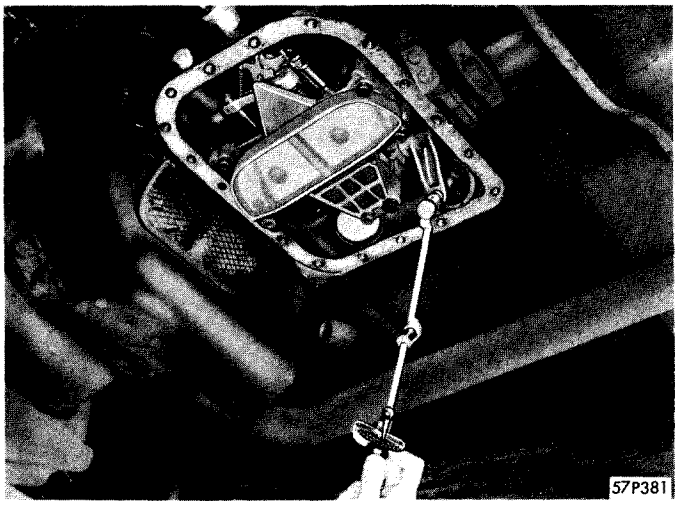


Figure 58—Adjusting Reverse Band Using Wrench C-3380

ROAD TESTING

The following procedures will provide a step-by-step method of checking the transmission for proper operation such as panel control positions, smoothness of upshift and downshift, throttle linkage adjustment, kickdown shifting and reverse operation.

1. Move panel control through all positions.
2. With panel control in (N), start the engine.
3. Move the panel control to (R), noting the speed and smoothness of the shift. Back car up.
4. Attach an electric tachometer to the engine. Move panel control to drive (D), checking speed and smoothness of engagement. Apply both handbrake and footbrake and check for band slippage at wide open throttle. Do not hold at wide open throttle for longer than a few seconds.
5. Accelerate the car at very light throttle. The transmision should upshift at 13 to 18 M.P.H.
6. Slow the car to approximately 15 M.P.H. then go quickly to wide open throttle (without going into kickdown). Check for possible clutch slippage. The transmission should not downshift at this time.
7. Make a kickdown at 15 to 20 M.P.H.
8. Release the accelerator to approximately half throttle so that the transmission upshifts at 25 to 30 M.P.H.
9. Make a kickdown at 30 to 40 M.P.H. Release the accelerator to closed throttle (6 cylinder).
10. Make a kickdown at 45 M.P.H. Release the accelerator to closed throttle. (V-8 cylinder).
11. At 40 to 50 M.P.H. move the panel control to (L). The transmission should downshift.

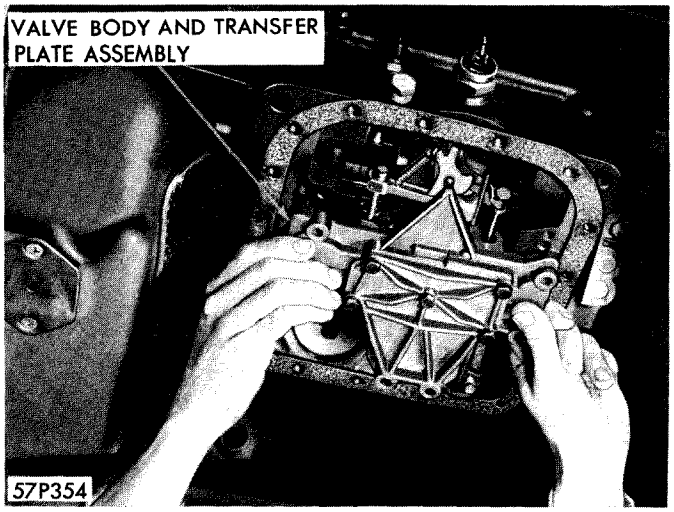


Figure 59—Removing or Installing Transfer Plate Assembly

12. Move panel control back to (D) at approximately 20 M.P.H. (The transmission will upshift.) Coast to a stop. The transmission should downshift at 10 to 12 M.P.H.

12. POWERFLITE—SERVICING IN VEHICLE

VALVE BODY AND TRANSFER PLATE

Drain transmission by removing the oil pan filler tube from the oil pan. Remove the eighteen pan screws and washers, then remove pan and gasket.

Disconnect the throttle and manual control lever linkage from levers. Loosen the throttle and manual control lever assembly locking screws. Slide the throttle valve operating lever assembly off shaft and remove the throttle valve camshaft felt retainer and felt. Slide the manual valve lever assembly off shaft and remove manual valve lever shaft seal and cover.

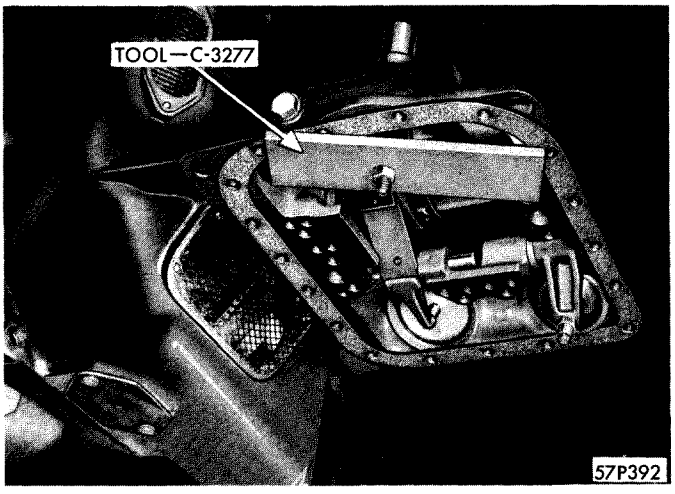


Figure 60—Install Tool C-3277 to Install Oil Seal

Remove the two oil strainer support screws and washers. Remove the strainer assembly from the valve body and transfer plate assembly. Five screws attach the transfer plate to transmission case. Remove plate assembly. See Figure 59. Refer to page 190 for complete service information of the valve body and transfer plate assembly.

If it is necessary to replace the manual control valve lever shaft oil seal, drive the seal out of transmission from below, using a suitable size brass drift. Inspect the bore for burrs or nicks and remove with crocus cloth if necessary. Using tool C-3277 start new seal, straighten and tighten until seal is flush with transmission case. See Figure 60.

Before installing assembly on transmission, inspect mating surfaces for dirt or burrs. The two 1⅝ inch screws are installed through the transfer plate cover on the valve body. The three 1⅛ inch screws are installed through the transfer plate cover. Tighten screws finger tight and then tighten to 12 to 17 foot-pounds.

Install oil strainer tubes in position and install both 1¼ inch screws and lockwashers. Tighten 12 to 17 foot pounds. Place seal cover over the manual valve lever shaft and slide into position. Install manual control lever on shaft with arm side of lever against cover. Tighten lock screw. Install throttle valve armshaft felt and retainer. Then install throttle valve lever assembly and tighten lock screw. Check operation of lever for drag by shifting in all positions. Check position and operation of throttle valve lever. Check lever contact on neutral starter and back up light switches. Reinstall oil pan.

KICKDOWN PISTON

To remove the kickdown piston, first drain fluid from transmission oil pan. Remove pan and valve body and transfer plate assembly. Loosen band adjusting screw. Compress the band ends and remove kickdown band strut. Install tool C-3289 on transmission case. See Figure 61. Tighten compressing screw on special tool enough so that the kickdown piston rod guide snap ring can be removed. Use screwdriver for this purpose. Loosen compressing tool and remove kickdown piston assembly. Refer to page 183 for complete servicing procedures of kickdown piston.

REVERSE SERVO

To remove the reverse servo, first drain fluid from transmission oil pan. Then remove pan and valve body and transfer plate assembly. Loosen the reverse band adjusting screws. Compress the band ends and remove the reverse band strut. It may be necessary to tap the strut lightly to free it. Remove the reverse servo piston sleeve. Install tool C-3289 and compress piston spring.

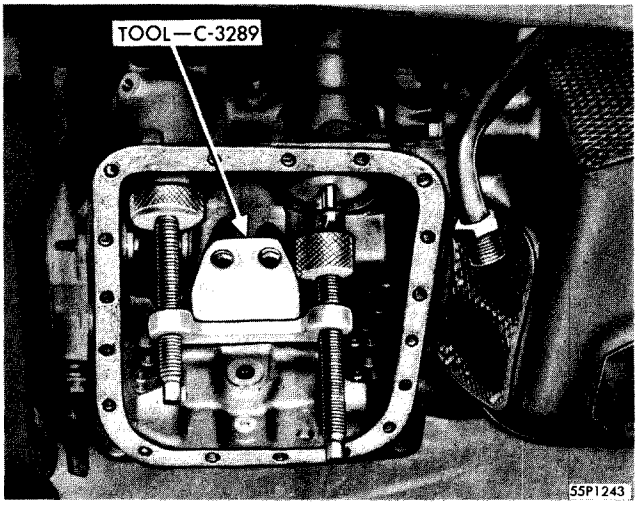


Figure 61—Install Tool C-3289 as Shown to Remove Reverse Servo

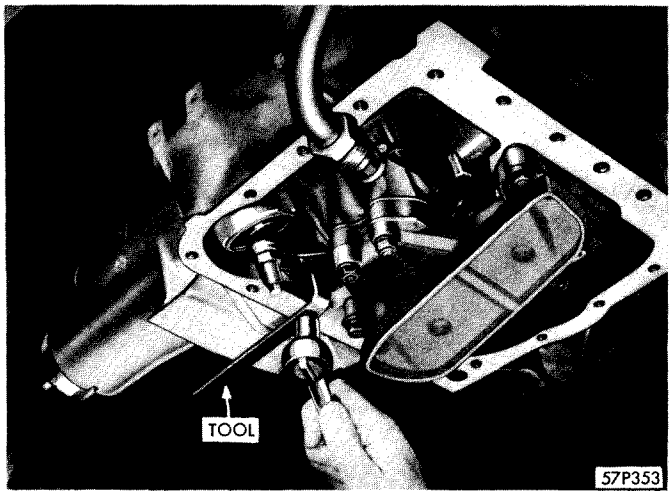


Figure 63—Gearset Holding Tool Installed in Position

See Figure 61. Remove snap ring with screwdriver. Piston assembly can be removed after loosening compressing tool. Refer to page 183 for complete servicing procedure of reverse servo.

GOVERNOR

To remove the governor for servicing it is necessary to remove the extension housing.

Disconnect battery and raise vehicle off floor. Drain transmission fluid and remove pan. Disconnect the front propeller shaft universal joint and wire shaft out of the way. Remove brake drum assembly. Remove speedometer pinion from transmission extension. Remove the nuts that hold the engine rear support insulator to the crossmember. Install engine support fixture, tool C-3245.

Raise the engine slightly, remove crossmember to frame bolts and remove crossmember. Remove transmission oil pan. Move the entire gearset forward by hand. It is important that the gearset be held in its extreme forward position so that the kickdown planet pinion carrier thrust washer (No. 2 thrust washer) does not fall off its pilot on the kickdown sun gear, when the extension housing is removed. Figure 62 is a plan for a tool which can be made to hold the gearset in position. The holding tool is installed behind the rear edge of planet pinion carrier and is attached to the transmission case with a pan screw. See Figure 63. Remove the seven transmission extension to case screws and lockwashers. Install guide studs C-3283 and remove housing using puller C-3282. Refer to page 176 for complete servicing of governor.

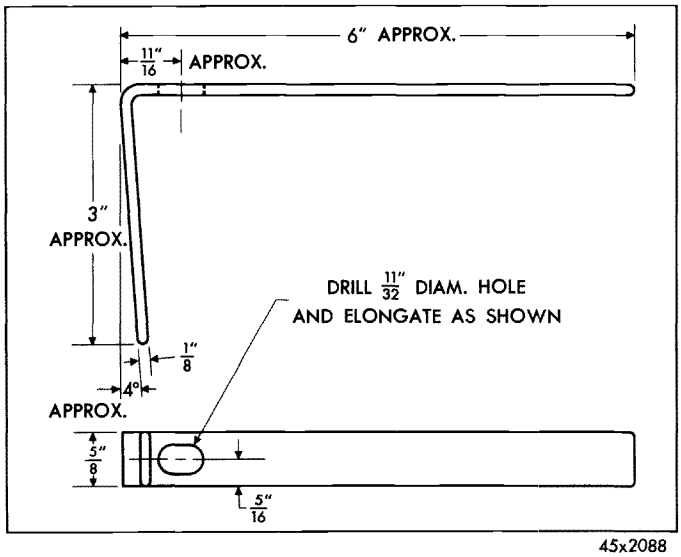


Figure 62—Plan for Making Gearset Holding Tool

TRANSMISSION REGULATOR VALVE

Remove the spring retainer, gasket and spring. See Figure 93. Use a suitable length of welding rod to retrieve the valve by placing the rod in the small hole in the valve. Cock the rod so as to apply a slight pressure to prevent the rod from slipping out of the hole as the valve is withdrawn. Refer to page 182 for servicing valve assembly. When installing spring retainer, tighten to 45 to 50 foot-pounds.

OUTPUT SHAFT REAR BEARING OIL SEAL

Use puller C-452 to remove the propeller shaft flange and drum assembly. Remove the transmission support grease shield spring. Remove the brake support grease shield from extension housing. Use care when removing shield. Use puller C-748 to remove rear bearing oil seal. Inspect inner seal surface of extension housing for burrs.

Use driver C-3205 to install new seal. Install grease shield. Note indent on shield to match groove in housing. Install grease shield making sure spring is seated in

groove. Install drum washers and nut. Apply parking brake and tighten flange nut to 140 to 160 foot-pounds. Connect front propeller shaft universal joint.

NEUTRAL STARTER SWITCH

When replacing switch a suitable container should be used to catch the transmission oil which will come out when the switch is removed.

> **CAUTION**
>
> ***Oil may be extremely hot if car has been in operation.***

When installing switch tighten to 15 to 20 foot-pounds. Replace oil which may have been drained.

SPEEDOMETER PINION

Disconnect speedometer cable and housing from sleeve assembly on transmission. Remove the speedometer pinion and sleeve assembly. Inspect nylon gear for wear. When installing pinion and sleeve assembly, tighten to 40 to 45 foot-pounds.

13. POWERFLITE—DISASSEMBLY AND INSPECTION

TRANSMISSION REMOVAL

Disconnect the battery and raise the car off the floor. Drain the transmission and torque converter. Then replace drain plugs and tighten to specified torque. Disconnect the oil pan filler tube from the oil pan. Disconnect front universal joint and hang shaft out of the way. Remove the adjusting screw cover plate and cable clamp bolt from the handbrake support. Disengage the ball end of the cable from the operating lever and remove the cable from the brake support. Disconnect the speedometer cable from the transmission extension housing. Disconnect neutral starter and back-up light wires from the switches and unclip the wires from the crossmember.

Disconnect the throttle and manual control linkage from the levers. Remove screws attaching exhaust pipe bracket to transmission. Remove the two nuts and lockwashers that hold the engine rear support insulator to the crossmember, leaving the insulator attached to the transmission. Install engine support fixture, tool C-3245. Inspect the hooks of the fixture into the holes in the frame sub side rail with the support ends up against the underside of the oil pan flange. Adjust fixture to support the weight of the engine and raise engine slightly. Remove the crossmember to frame bolts and remove the crossmember.

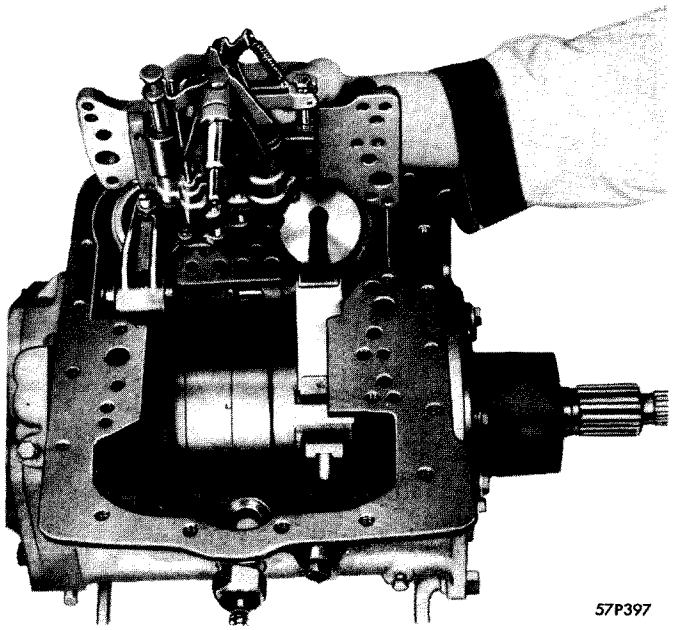


Figure 64—Removal or Installation of Valve Body and Transfer Plate

Lower the engine two or three inches. Place transmission jack in position and adjust jack to just support the weight of the transmission. Remove the two upper transmission to torque converter housing screws and lockwashers and install guide studs C-3276. Remove the two lower transmission to torque converter housing screws and lockwashers. Then, using care, slide the transmission straight back to prevent damage to drive sleeve. Lower transmission. Remove the sleeve and inspect the driving lugs and machined surfaces for wear or burrs. Inspect the interlocking type oil ring and replace if worn or broken. The oil ring should be free in the groove.

TORQUE CONVERTER HOUSING REMOVAL

Remove the torque converter housing-to-adapter plate-bolts and lockwashers. Three bolts are located on the engine side of the adapter plate. The housing is doweled to the adapter plate and care should be exercised when removing the housing.

Do not hammer or pry between the flanges to loosen it since this will distort the metal and result in misalignment. Carefully move the housing straight back to avoid damage to the torque converter.

Inspect the mating surfaces of the adapter plate and torque converter housing and remove any burrs or rough spots with emery cloth.

TRANSMISSION DISASSEMBLY AND INSPECTION

Cleanliness is essential during disassembly of transmission. Clean all external surfaces of transmission with steam if possible. During disassembly all parts should be cleaned in a suitable solvent and dried with compressed air only. Use care when handling parts as they are removed to prevent damage to them.

Remove the oil pan and oil pan gasket. Loosen the throttle and manual control lever assembly lock screw. Slide the lever assembly off the shaft and remove the shaft seal cover.

Remove the two oil strainer to transmission case screws and washers. Lift off strainer and inspect both neoprene oil seal rings. Remove the five transfer plate to transmission case screws and lift off the valve body and transfer plate assembly. See Figure 64. Place the valve body assembly in stand C-3294.

Before further disassembling the transmission, check the end clearance in the following manner. Insert a screwdriver between the planet pinion carrier housing and direct clutch assembly and move the clutch assembly to its forward position. Measure the distance between the planet pinion carrier housing and clutch assembly. Then insert screwdriver between transmission case and direct clutch assembly and move direct clutch assembly back. Measure distance between the direct clutch assembly and planet pinion carrier. Subtract the second measurement from the first to obtain the end clearance. Allowable clearance is .026 to .052 inch. Use either a feeler gauge or a dial indicator to measure the end clearance. See Figure 65. If clearance exceeds .052 inches install a thicker direct clutch piston retainer thrust washer. If clearance is less than .026 inches install a thinner washer. The thrust washer is selectively fit and is available in three sizes.

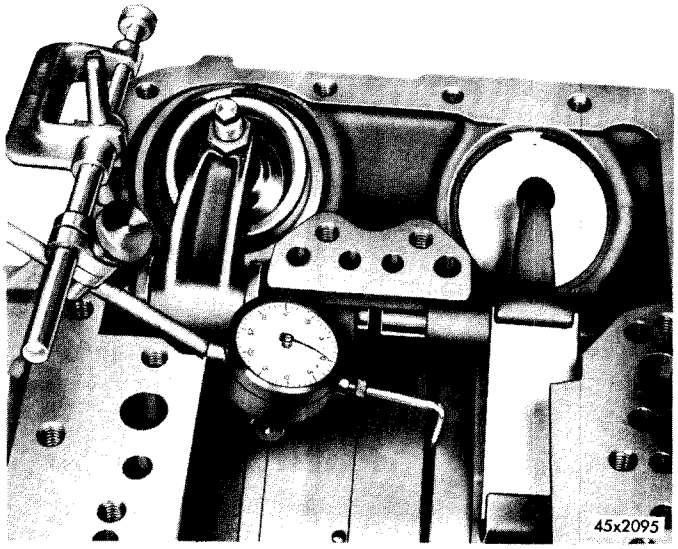


Figure 65—Checking End Clearance With Gauge C-430

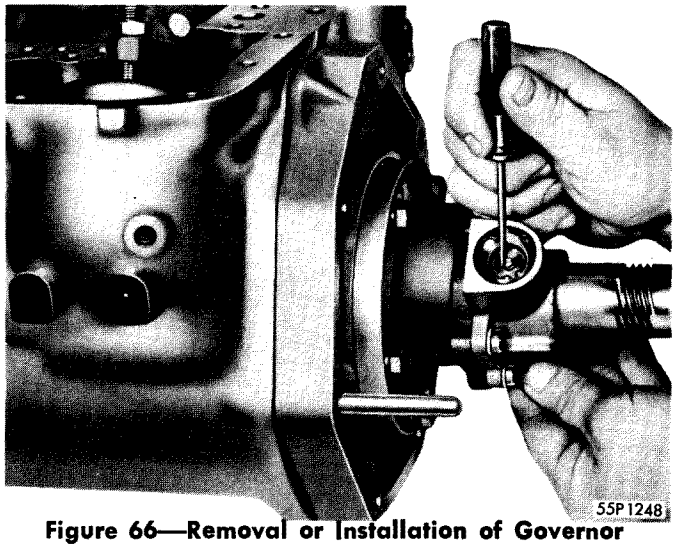


Figure 66—Removal or Installation of Governor Valve Shaft Snap Ring

REAR EXTENSION HOUSING—REMOVAL

Remove the hand brake assembly from the rear extension housing. Remove the speedometer drive pinion and inspect nylon gear. Remove rear bearing oil seal using Puller C-748. Remove any burrs or nicks from the counterbore with crocus cloth. Remove the seven extension housing to transmission housing screws and lockwashers. Install guide studs C-3283 and remove extension housing with puller C-3282. Use care when removing housing to prevent damage to the governor. Inspect the housing for cracks and remove any burrs from the gasket surface.

Clean the output shaft rear bearing and dry with compressed air. Do not spin bearing. Inspect bearing for rough spots. To remove bearing, first remove rear bearing snap ring, using long nose pliers. Note bevel edge of snap ring and inspect for distortion. Use driver C-3275 and drive bearing from housing. Remove vent in top of extension housing and make certain it is open and free of dirt.

GOVERNOR REMOVAL, DISASSEMBLY AND INSPECTION

Remove one of the snap rings from the governor valve shaft, as shown in Figure 66.

Use pliers C-760 and remove the large governor weight snap ring. Then remove the governor weight from governor body, as shown in Figure 68.

Keep thumb pressure on the spring loaded secondary governor weight and remove the secondary weight snap ring with pliers C-3229. Inspect all parts for wear or burrs after cleaning and drying.

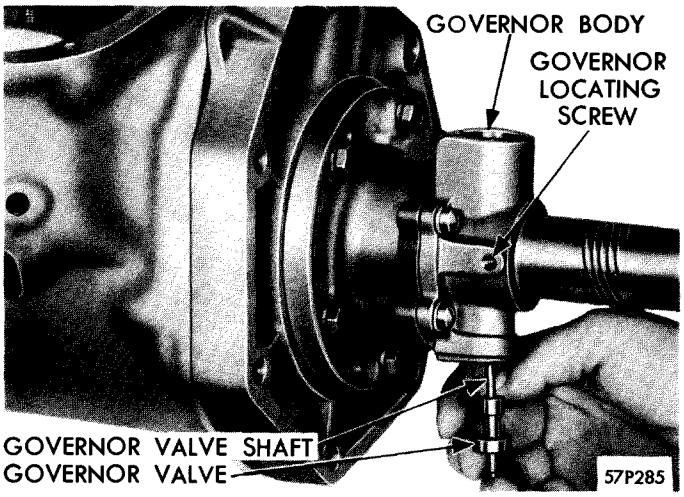


Figure 67—Removal or Installation of Governor Valve and Shaft

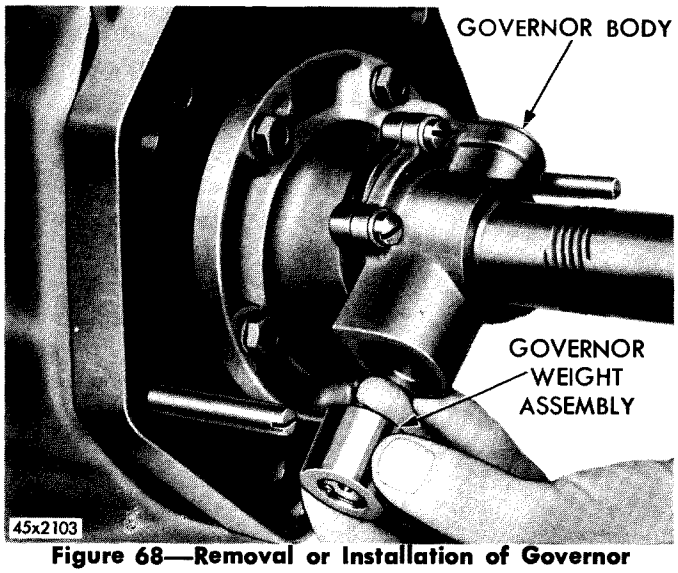


Figure 68—Removal or Installation of Governor Weight Assembly

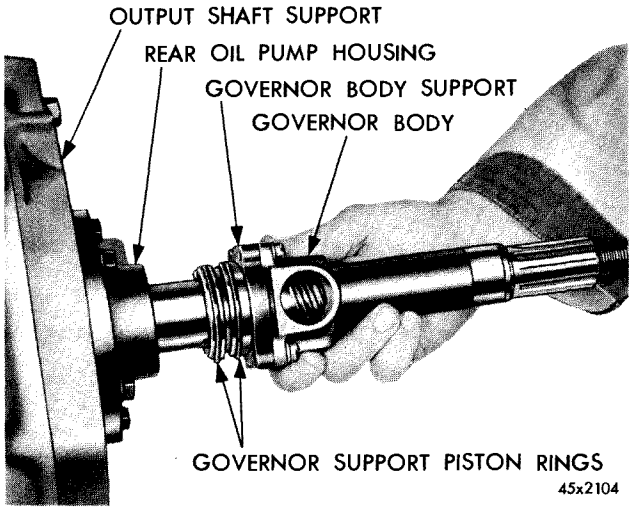


Figure 69—Removal or Installation of Governor Body and Support

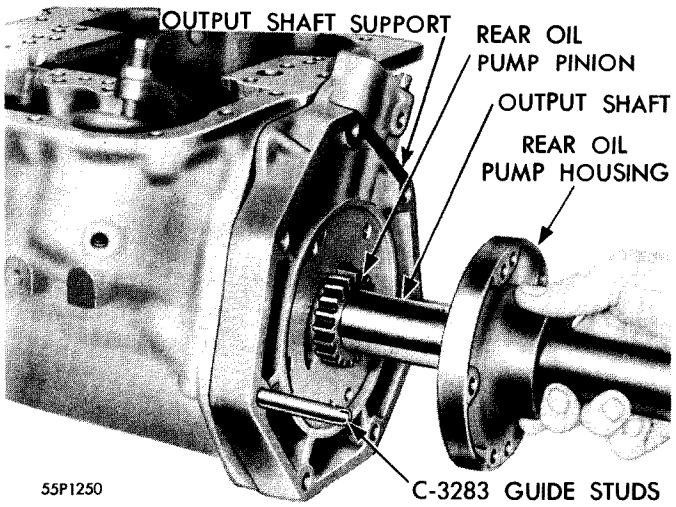


Figure 70—Removal or Installation of Rear Oil Pump Housing

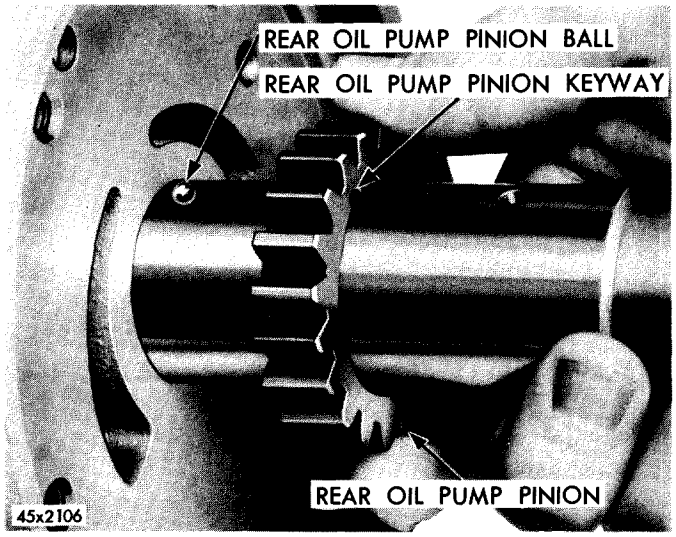


Figure 71—Removal or Installation of Rear Oil Pump Piston

Secondary weight should work freely in primary weight when parts are clean and dry. Inspect spring for distortion. Compare with a new one. Remove the governor locating screw from the governor body and output shaft. Slide the governor body and support from the output shaft, as shown in Figure 69. Remove the governor support piston rings and inspect for wear. Inspect the oil passages and make certain they are free of dirt and foreign matter. The governor support has a pressed in steel sleeve which routes oil through the support. If sleeve is damaged replace complete support. Inspect the valve and governor body for score marks.

REAR OIL PUMP REMOVAL AND DISASSEMBLY

Remove the five rear oil pump housing to output shaft support screws and lockwashers. Remove housing and oil pump gear. See Figure 70.

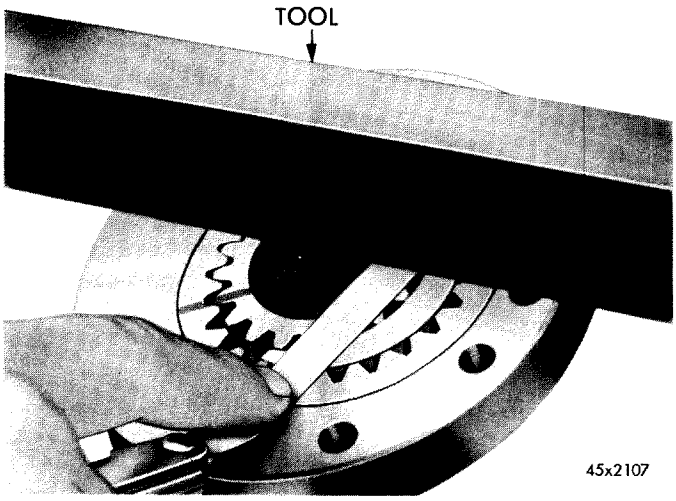


Figure 72—Checking Clearance Between Pump Body and Gears

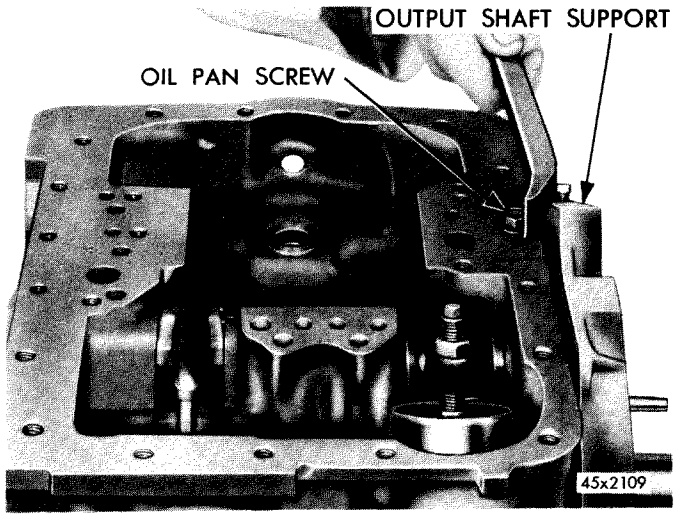


Figure 74—Separating Rear Support From Transmission Case

Use prussian blue to mark front side of gear. Do not use a scribe. Inspect machined surfaces and housing for being scored or pitted, and pump housing plug for leaks. Remove the rear oil pump pinion from the output shaft and mark the front side prussian blue. See Figure 71.

The pinion is keyed to the shaft by a small ball. Use care when removing. Inspect keyway in pinion and ball pocket in shaft for wear. Check clearance between pump housing face and face of gear with tool C-3335 and feeler gauge. Clearance limits are .0012 to .0022 inches. See Figure 72.

OUTPUT SHAFT SUPPORT, PLANET PINION CARRIERS, AND DIRECT CLUTCH ASSEMBLIES—REMOVAL

Remove the output shaft support to transmission case screw and lockwasher. Work output shaft up and down and at the same time apply pressure to the input shaft.

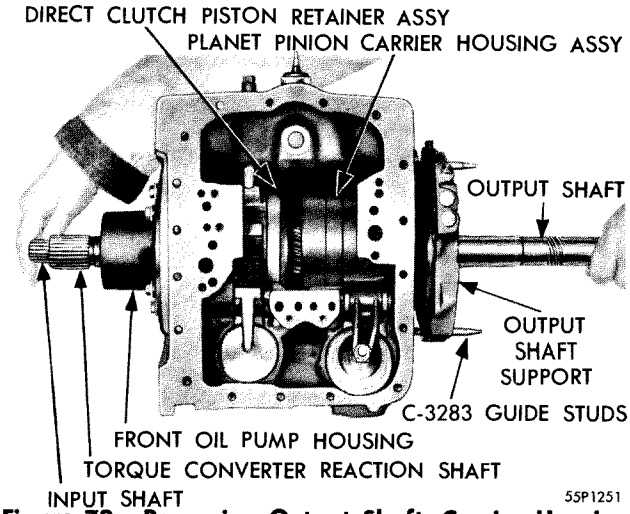


Figure 73—Removing Output Shaft, Carrier Housing and Input Shaft Assemblies

See Figure 73. Slide the complete assembly from the housing. If rear support cannot be freed, install oil pan screw in transmission and carefully pry support free, as shown in Figure 74. Remove the direct clutch assembly from the reaction shaft. Remove the thrust washer from reaction shaft. This washer is selectively fit and controls end play between the clutch assembly and carrier housing. Inspect washer for nicks, burrs and wear.

DISASSEMBLY OF PLANET PINION CARRIER HOUSING

Place assembly in support fixture C-3285 in upright position. Using a feeler gauge check clearance between kickdown planet pinion carrier housing snap ring and kickdown planet pinion carrier assembly. This clearance should be from .012 to .038 inches. If within limits identify each thrust washer as it is removed during disassembly. Remove snap ring with screwdriver and identify it to aid during assembly. See Figure 75.

Remove the input shaft, kickdown planet pinion carrier assembly and kickdown annulus gear from carrier housing. See Figure 76. Remove the reverse planet pinion carrier thrust washer and inspect for cracks, burrs, or wear. Remove the snap ring from input shaft. See Figure 77. Remove annulus gear and inspect for wear, cracked or broken teeth. Remove pinion carrier assembly from input shaft. See Figure 78. Inspect stop ring on shaft which controls position of annulus gear. Check oil passages in gear and shaft for obstructions. Inspect splines and bearing surfaces for burrs or wear. Inspect the pinion carrier for scoring on thrust surfaces and broken or worn teeth. Check end clearance of pinions. Limits are from .006 to .017 inches. Inspect pinion shafts for tightness and make sure pinion rotates freely. Check oil holes in gears and shafts for obstruc-

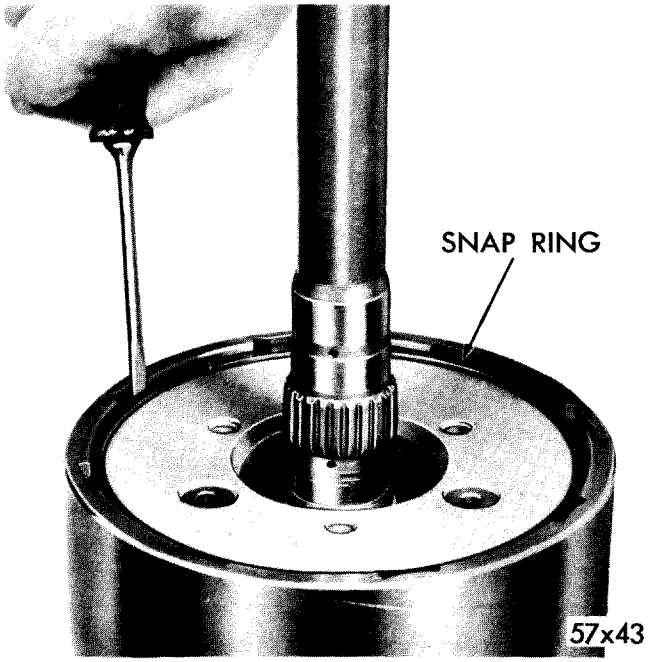


Figure 75—Removal or Installation of Snap Ring

tions. The planet pinion carrier is serviced as an assembly. Inspect oil holes in the thrust washer of kickdown carrier.

Remove the reverse planet pinion carrier assembly from the carrier housing. See Figure 79. Make the same inspections for the reverse planet pinion carrier assembly as were made for the kickdown planet pinion carrier assembly. Remove the output shaft and reverse annulus gear from the carrier housing and output snap ring and separate the output shaft and annulus gear. Inspect shaft for scores and the annulus for damaged teeth. Inspect splines, ring grooves and worn gear on shaft. Remove the thrust washer and inspect for wear.

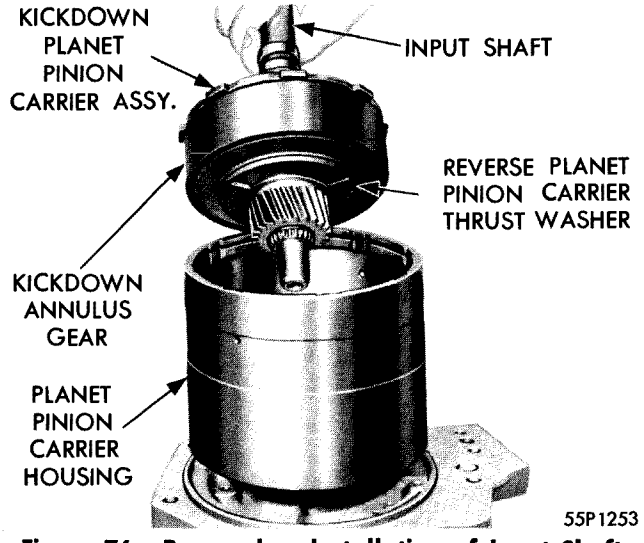


Figure 76—Removal or Installation of Input Shaft and Carrier Assembly

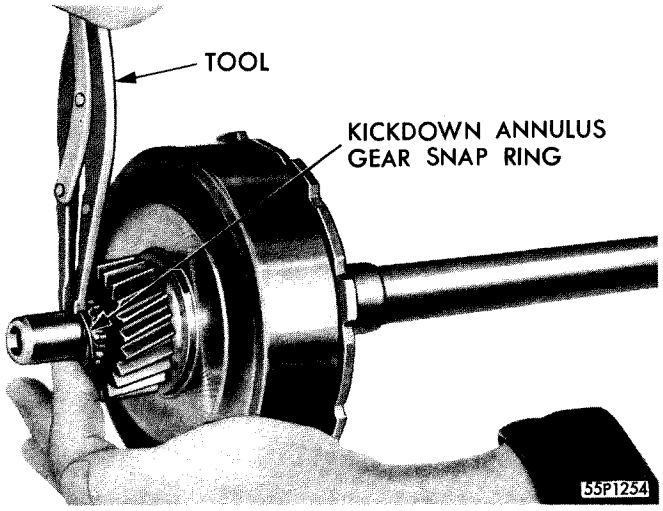


Figure 77—Removal or Installation of Kickdown Annulus Gear Snap Ring

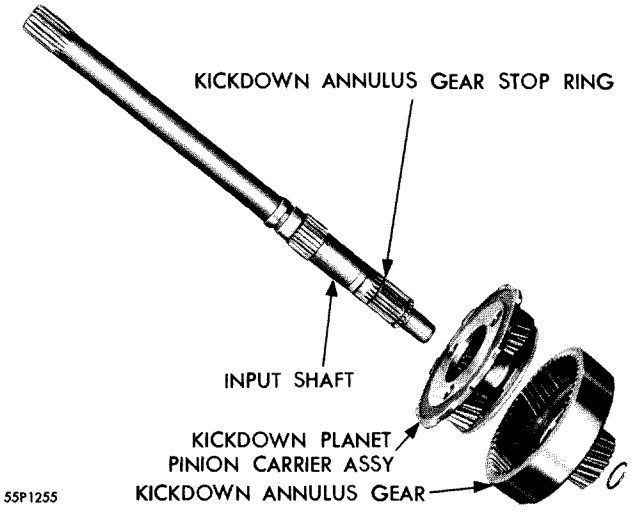


Figure 78—Input Shaft and Kickdown Planetary Gearshift—Disassembled

Figure 79—Removal or Installation of Reverse Planet Pinion Carrier

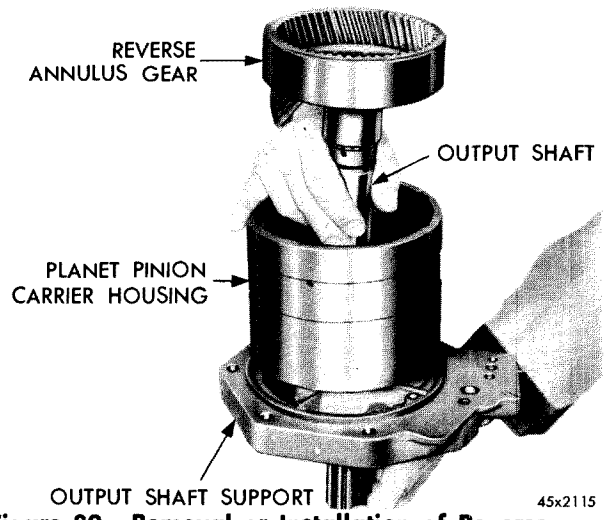


Figure 80—Removal or Installation of Reverse Annulus Gear

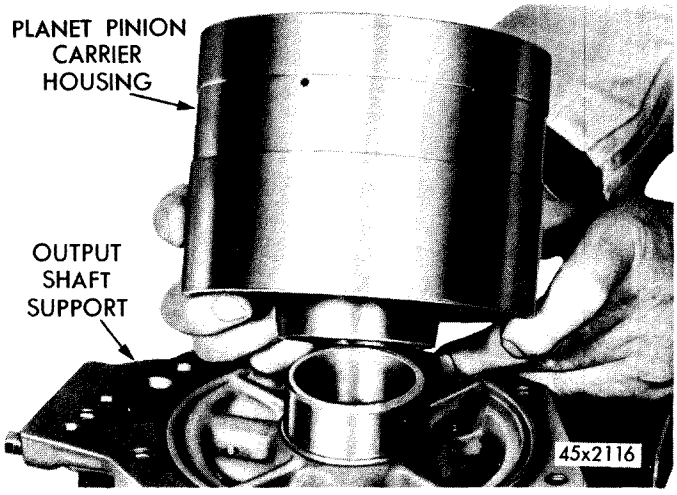


Figure 81—Removal or Installation of Carrier Housing

Remove the carrier housing from the output shaft support and inspect driving lug slots, thrust surfaces, and band contact surface. See Figure 81. Inspect the output shaft support oil passages, rear oil pump surface, and bearing surfaces. Remove burrs or score marks with crocus cloth.

DIRECT CLUTCH PISTON RETAINER—DISASSEMBLY

Remove the kickdown sun gear snap ring (selective fit), as shown in Figure 82. Lift out sun gear assembly. See Figure 83. Inspect sun gear for worn or broken teeth. Lift direct clutch hub from retainer. See Figure 84. Inspect hub driving lugs and spline. Invert the piston retainer and remove the five steel clutch plates and the five clutch discs. See Figure 85. Discs are constructed of cork and krafelt. Inspect for evidence of burning, glazing or flaking of the facing material. Replace if necessary. Inspect the steel clutch plates for evidence of burning, scoring or damaged splines.

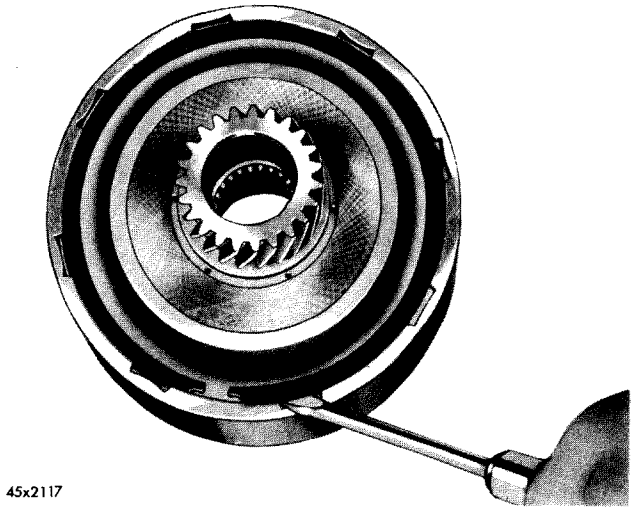


Figure 82—Removal or Installation of Kickdown Sun Gear Snap Ring

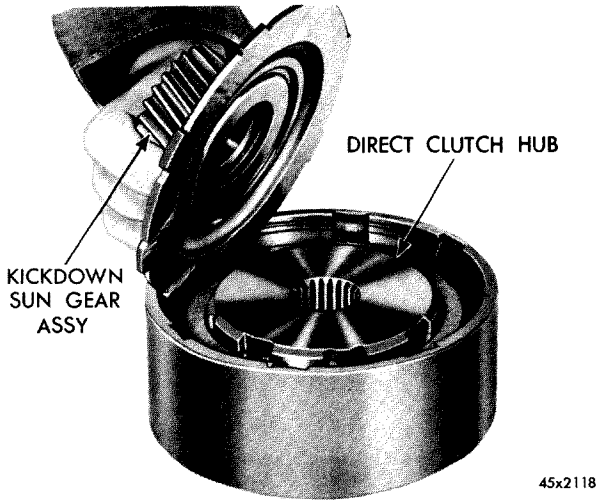


Figure 83—Removal or Installation of Kickdown Sun Gear

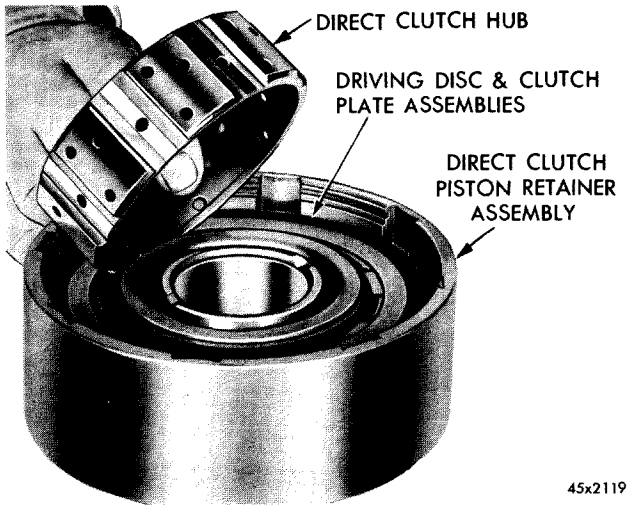


Figure 84—Removal of Direct Clutch Hub from Piston Retainer

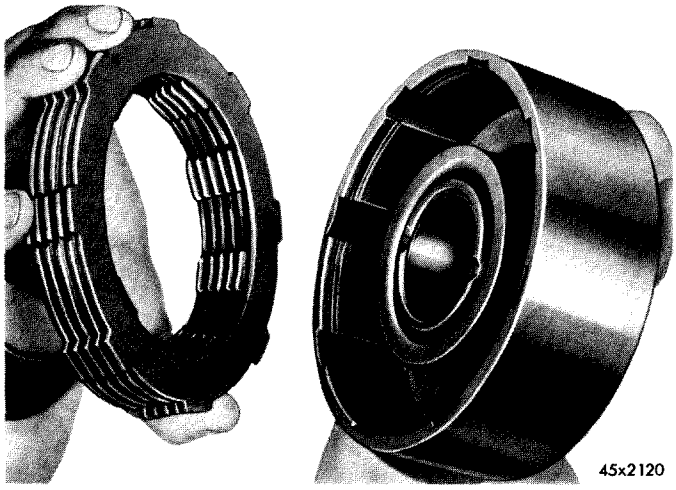


Figure 85—Removal of Clutch Discs and Clutch Plates

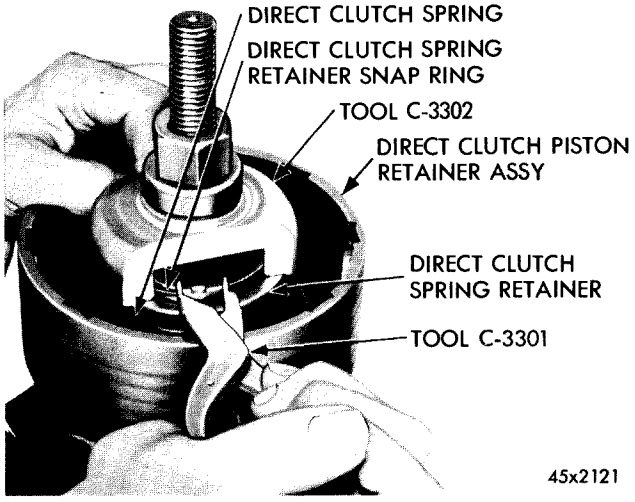


Figure 86—Removal or Installation of Spring Retainer Snap Ring

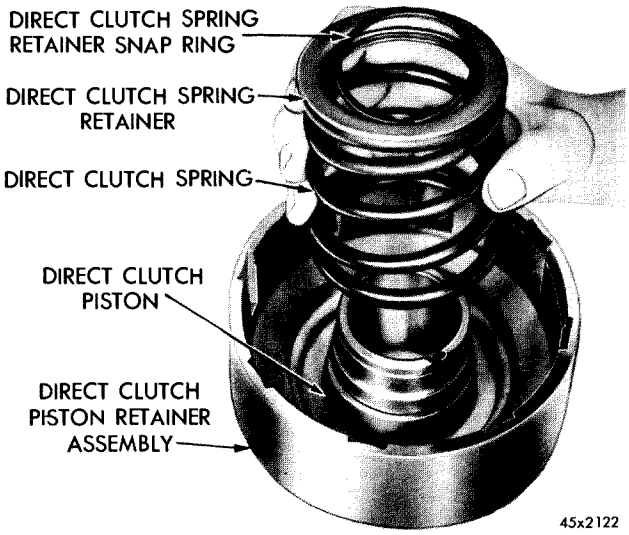


Figure 87—Removal or Installation of Direct Clutch Piston Spring

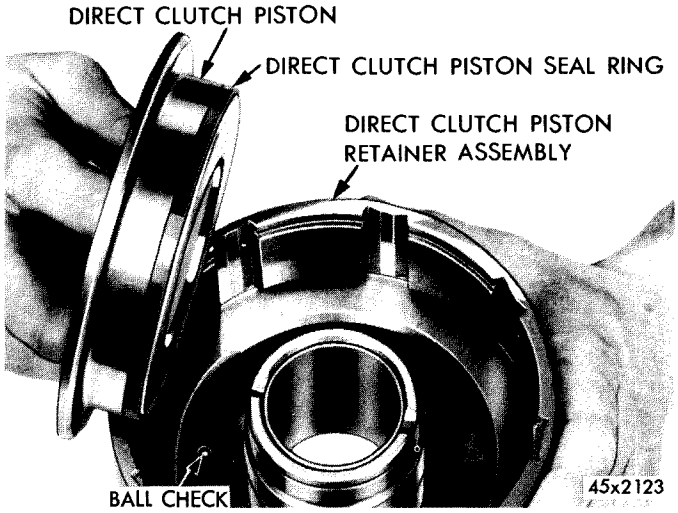


Figure 88—Removal or Installation of Direct Clutch Piston

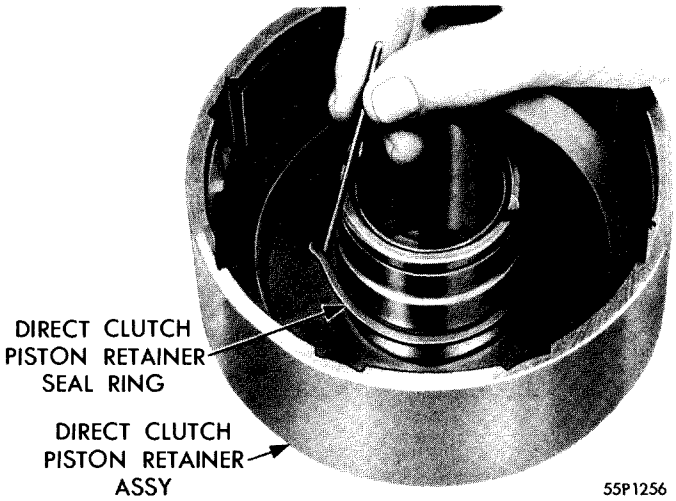


Figure 89—Removal or Installation of Piston Retainer Seal Ring

CAUTION

Use care when releasing the tool. The piston spring may require guiding past the snap ring grooves in the clutch retainer.

Using tool C-3302, compress the direct clutch spring sufficiently to unseat the direct clutch spring retainer snap ring. See Figure 86. Release the tool, and remove the snap ring, spring retainer and spring. See Figure 87.

Using a twisting motion, remove the direct clutch piston from the clutch retainer. See Figure 88. Observe the ball check in the clutch retainer. Make sure ball operates freely. The bearing in the clutch retainer is steel backed bronze and is not replaceable. If the torque converter reaction shaft seal rings have grooved the bearing through the bronze, replace the direct clutch retainer assembly.

Inspect the band contacting surface for score marks or burning. Light score marks can be removed with crocus cloth. Remove the neoprene seal ring from the piston and replace it, if there is evidence of deterioration, wear or hardness. See Figure 89.

DIRECT CLUTCH PISTON RETAINER—ASSEMBLY

Coat the neoprene piston seal ring with lubriplate and install on piston, with lip facing away from flange. Coat the piston retainer ring with lubriplate and install on retainer hub.

Make sure ring rotates freely in groove. Place piston in retainer and with a twisting motion, seat piston in bottom of retainer. Exercise care to prevent damage to the neoprene seal. Install the direct clutch spring in the retainer and position the spring retainer and snap ring on spring. Using tool C-3302 and compress the direct clutch spring sufficiently to seat the snap ring. See Figure 86. Use care when compressing the spring, since the retainer may require guiding past the snap ring groves. Make certain that ring is securely seated in groove before removing tool. Install the direct clutch hub in retainer. Lubricate all clutch plates and driving discs with automatic transmission fluid type A and assemble by placing a clutch plate in the clutch piston retainer followed by a clutch disc.

CAUTION

If the first disc was installed with cork portion at outer edge, then all succeeding discs must be installed in this manner. If first disc was krafelt at outer edge succeeding discs must also be installed. See Figure 90 for proper sequence.

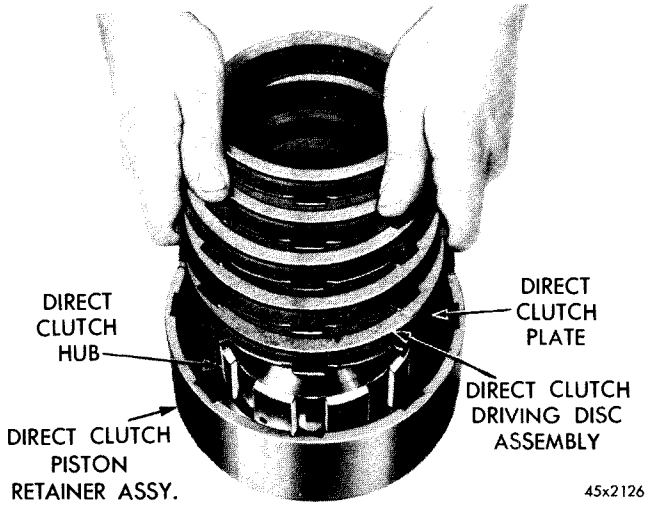


Figure 90—Installation of Clutch Plates and Clutch Driving Discs

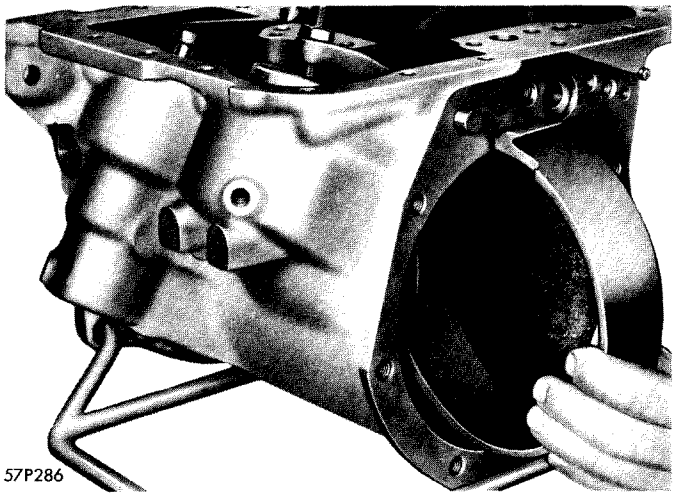


Figure 91—Removal or Installation of Reverse or Kickdown Band

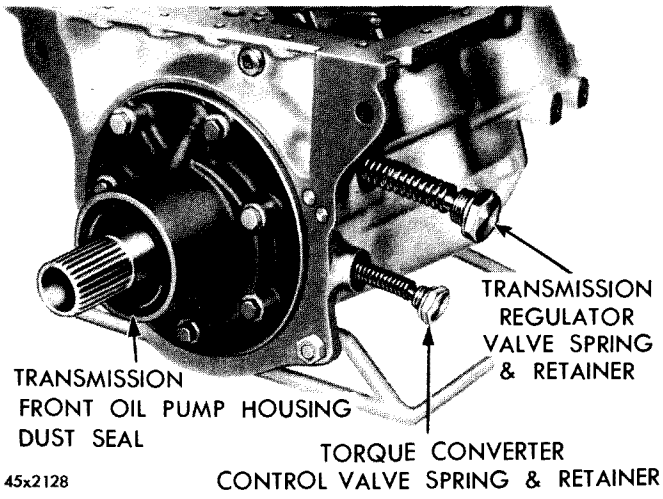


Figure 92—Transmission Regulator and Torque Converter Control Valves

Place the kickdown sun gear assembly in retainer and install snap ring. Check distance between snap ring and sun gear assembly. Clearance limit is as close to zero as possible. Snap ring is available in the following sizes: .059 to .061 inches (thin), .062 to .064 (medium), and .065 to .067 (thick).

REVERSE AND KICKDOWN BAND—REMOVAL AND INSPECTION

Mark the reverse band for installation purposes. Compress band ends sufficiently to remove the reverse band strut. Unhook the band from the link assembly and remove band by rotating it out of transmission, as shown in Figure 91.

To remove the kickdown band, compress the ends and remove the strut. Note notch in strut which acts as a guide to the pin in the band end. Remove band, as shown in Figure 91. Both the kickdown band and reverse band

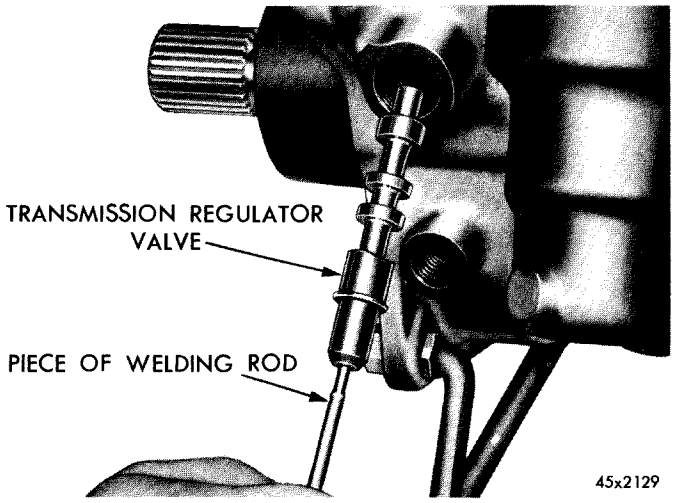


Figure 93—Removing Transmission Regulator Valve

have bonded lining and no attempt should be made to reline them. If grooves in lining are no longer visible, replace the band. Inspect bands for distortion or cracked ends.

Inspect the reverse band link and lever assemblies. Levers should be free to rotate and have sufficient end play. Do not remove these assemblies unless necessary. To remove the reverse band lever; push the shaft out of rear opening in case. To remove the kickdown band lever, first remove the shaft plug at front of transmission. Shaft can then be pushed out.

FRONT OIL PUMP—REMOVAL

Remove the transmission regulator valve retainer spring, gasket and valve. See Figure 93. Remove the seven front oil pump housing to transmission case screws and washers. Discard the aluminum or copper sealing washers under bolts and use new ones during assembly. Tap pump housing lightly with a soft hammer to loosen, then pull the oil pump housing assembly from the transmission case. See Figure 94.

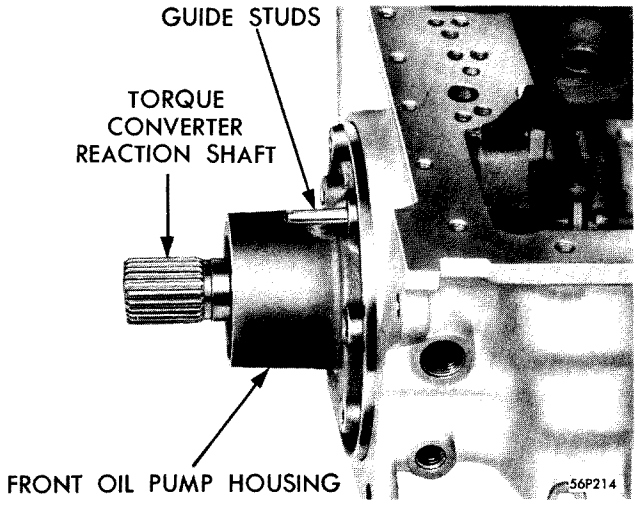


Figure 94—Front Oil Pump Housing Assembly

IMPORTANT

Use prussian blue to mark the front face of the pump gears to aid during assembly. Do not use a scribe to mark gears.

Remove the oil pump gear from the front pump housing. Remove the large neoprene oil pump housing seal from the housing and inspect for deterioration, cracking, or hardness. Use a brass drift and drive the dust seal from the housing. Inspect bushing in housing since bushing is not replaceable. Small scores can be removed with crocus cloth. Inspect the gears for worn or chipped gear teeth.

Use tool C-3335 and feeler gauge and check clearance between pump housing face and face of gears. Clearance limits are .001 to .003 inches. Clear out all oil passages with compressed air.

REGULATOR VALVE BODY—REMOVAL

Using the two threaded holes provided in the regulator valve body, attach puller C-3287, and install guide studs C-3299. Pull regulator valve body off of torque converter reaction shaft. See Figure 95.

Regulator valve body is made of aluminum and requires care in handling to avoid damage. Place body and both valves in pan containing a clean solvent, wash thoroughly, and dry with compressed air. Inspect both valves for free movement in valve body, they should fall in and out of bores when both the valves and body are dry.

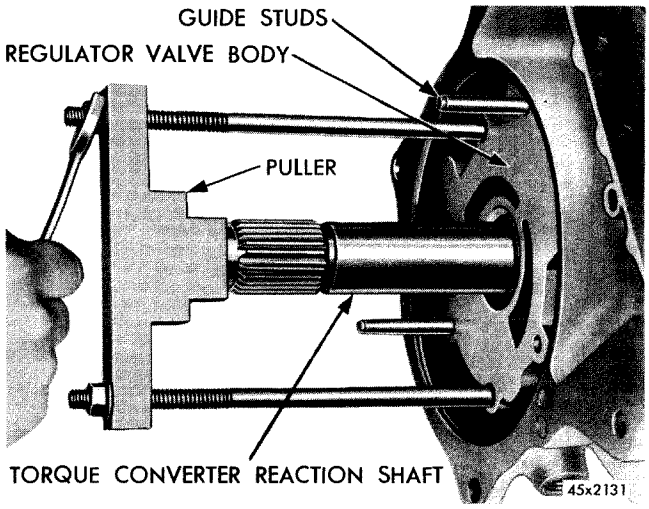


Figure 95—Removing Transmission Regulator Valve Body

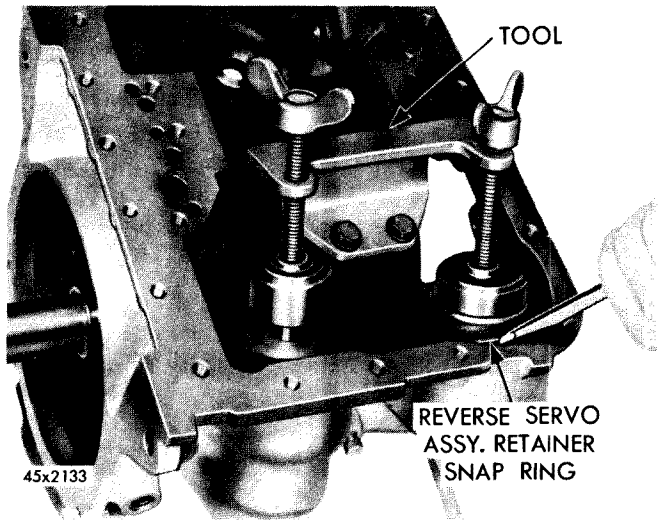


Figure 96—Removal or Installation of Reverse Servo Snap Ring

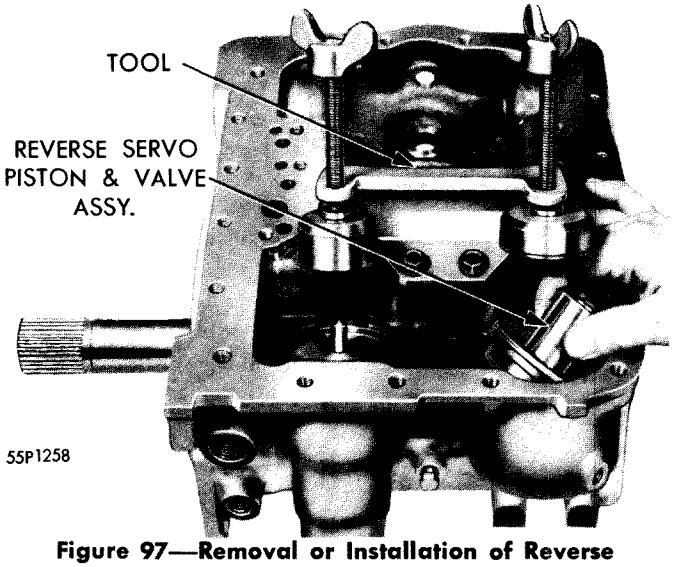


Figure 97—Removal or Installation of Reverse Servo Piston

Crocus cloth may be used to polish valves providing care is exercised not to round the sharp edge portion of the valves. The sharp edge portion is vitally important to this type of valve, it helps to prevent dirt and foreign matter from getting between the valve and body, thus reducing the possibilities of sticking. Check all fluid passages for obstructions and inspect all mating surfaces for burrs and distortion. If regulator valve body should have a slight nick or raised portion on mating surfaces, it may be removed by using a surface plate and crocus cloth.

Check regulator valve spring seat (snap ring). After both valves and regulator valve body have been thoroughly cleaned and inspected, they should be placed on and covered with clean shop towels until ready for installation. Leave valves in regulator body bores until ready for reassembly. This will help to prevent them from being damaged.

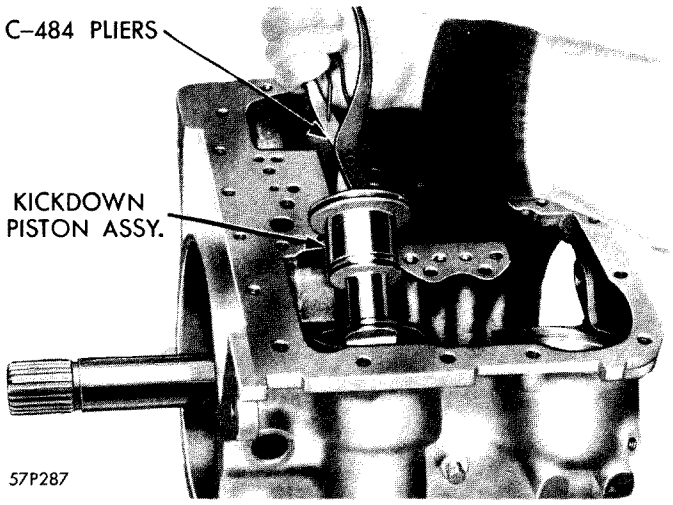


Figure 98—Removal of Kickdown Piston Assembly

REVERSE SERVO PISTON—REMOVAL

Lift out the reverse servo piston sleeve. Inspect the inside bore, lever and contacting surface on the piston sleeve for scores and wear. Make sure the two bleeder holes are open. Install tool C-3289 or C-3529 on transmission case and compress the reverse piston spring retainer. Use a screwdriver to remove the snap ring, as shown in Figure 96. Loosen the compressing tool and remove the spring retainer, spring, servo piston and valve assembly. See Figure 97. Use care when loosening tool since the spring retainer may require guiding out of transmission bore.

Remove the lip type neoprene piston ring from piston and inspect for deterioration and hardness. Use pliers C-3229 to remove the servo valve spring snap ring. Remove the spring and valve from piston. Inspect servo bore for score marks. Light scores can be removed with crocus cloth.

KICKDOWN PISTON—REMOVAL

Using tool C-3289, or C-3529, apply sufficient pressure on the kickdown piston rod guide and remove the snap ring. Loosen compressing portion of tool and remove tool from transmission case. Remove piston rod guide, piston spring, kickdown piston rod assembly, and kickdown piston cushion spring. Inspect riveting of the kickdown piston rod to kickdown piston spring retainer. Remove seal ring from guide. Inspect for light scores and wear on piston rod and guide. Using C-484 pliers, remove the transmission kickdown piston from the transmission case. See Figure 98. Remove the three seal rings (two locking and one open type) from the kickdown piston. Inspect piston for light scores and wear. Inspect rings for broken ends.

TORQUE CONVERTER REACTION SHAFT—INSPECTION

Inspect torque converter reaction shaft seal rings (interlocking type) for broken ends and make sure they are free to rotate in the lands. Inspect inside of torque converter reaction shaft for burrs and wear. Remove the neoprene reaction shaft seal and check for deterioration and hardness. Inspect thrust surface for wear and slight scores. Do not remove the torque converter reaction shaft unless inspection reveals it is necessary to do so.

TORQUE CONVERTER REACTION SHAFT—REMOVAL

Remove torque converter reaction shaft neoprene seal. Using a suitable brass drift, remove the reaction shaft dowel pin from reaction shaft flange and transmission case. Remove the three transmission case to reaction shaft screws and washers. Using tool C-3297, press reaction shaft out of transmission case. See Figure 99. Remove the two interlocking type torque converter reaction shaft seal rings.

MANUAL CONTROL VALVE LEVER SHAFT OIL SEAL—REMOVAL AND INSTALLATION

Using a suitable drift, drive seal out of transmission case. Using tool C-3277, start seal squarely and tighten until the seal is flush with case. Seal will then be correctly positioned.

KICKDOWN BAND ADJUSTING SCREW REMOVAL AND INSTALLATION

Loosen locking nut and remove kickdown band adjusting screw and locknut.

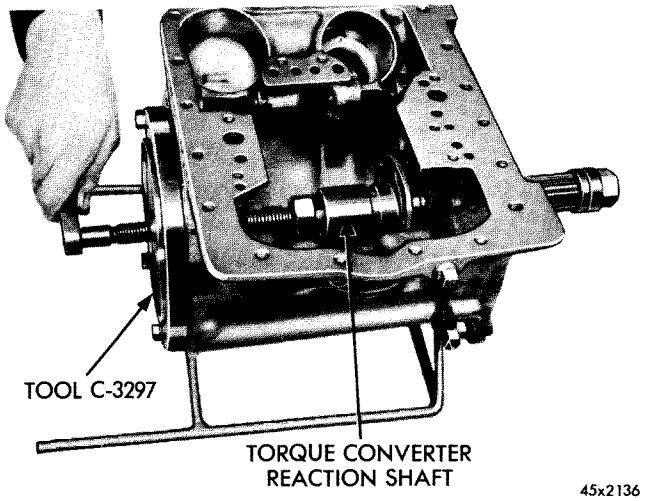


Figure 99—Removal of Torque Converter Reaction Shaft

IMPORTANT

When lock nut is loosened, the adjusting screw must be finger free. If not, inspect screw and nut for pulled threads or foreign material in threads. This is very important to adjustment.

Screw adjusting screw, with locking nut attached into transmission case until there is approximately one inch of screw left on outside of case. Do not lock screw into position at this time.

TRANSMISSION CASE—INSPECTION

Inspect transmission case for cracks, and holes, and stripped threads. Check for burrs on mating surfaces. Blow compressed air through all passages to make sure they are open. Check oil hole plugs for tightness.

TORQUE CONVERTER REACTION SHAFT—INSTALLATION

Using sun lamps, heat front of transmission case to approximately 170 to 190 degrees F. Coat with Lubriplate and install the two torque converter reaction shaft seal rings on shaft and lock in place. Make sure they are free to rotate in lands. Coat portion of reaction shaft that presses into case with Lubriplate. Position torque converter reaction shaft into front of transmission case so that holes in shaft align with screw holes in case.

Place a $\frac{5}{16}$ inch (.308 to .311 inch outside diameter in unthreaded section) 2½ inch bolt through dowel guide pin holes in case and reaction shaft to act as guides. Install nut. Using tool C-3297 press reaction shaft into place. See Figure 100. Do not remove $\frac{5}{16}$ inch bolt from dowel pin holes at this point. Start the three transmission case to reaction shaft screws and washers and tighten slightly, but do not torque. Remove $\frac{5}{16}$ inch bolt from dowel pin hole and install the reaction shaft dowel from inside of transmission case. Torque transmission to reaction shaft screws from 10 to 15 foot pounds. Coat torque converter reaction shaft seal (neoprene) with Lubriplate and install on shaft.

KICKDOWN PISTON—REASSEMBLY AND INSTALLATION

Coat the three kickdown piston rings with Lubriplate (two locking and one open type) and install on piston. Lock into position and make sure they are free to rotate in lands. Place kickdown piston assembly into transmission case, compress bottom ring with a piece of brass rod, with end flattened, and push piston into case. See Figure 101.

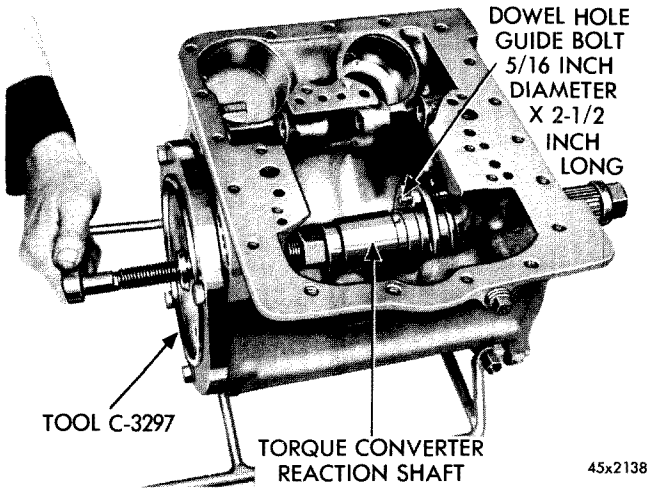


Figure 100—Installing Torque Converter Reaction Shaft

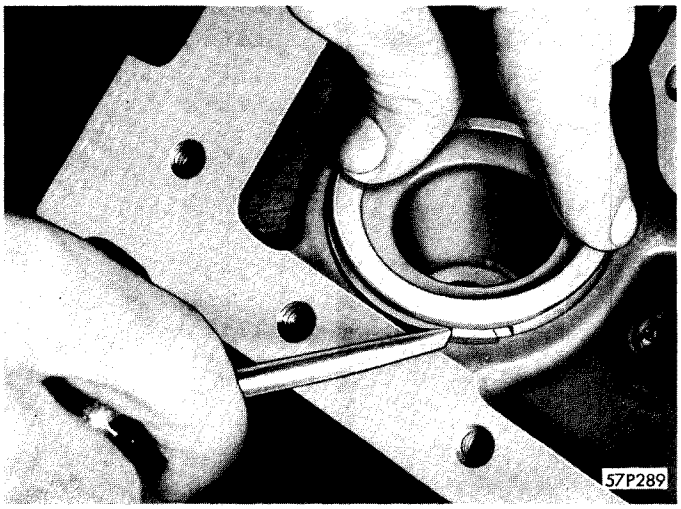


Figure 101—Installing Kickdown Piston Assembly

CAUTION

After bottom ring has entered, piston will seem to hang at two different locations while being pushed into case. This is due to rings entering cylinders. If any of the rings should be broken when piston assembly is being installed, transmission will not operate properly.

Place kickdown piston cushion spring in piston. Install tool C-3289 on transmission case. Place kickdown piston rod assembly in piston and slide piston spring over kickdown piston rod assembly. Coat the kickdown piston rod guide seal ring with Lubriplate and install on kickdown piston rod guide. Make sure ring rotates freely in lands. Place the kickdown piston rod guide assembly on kickdown piston rod assembly. Using extreme care, compress the kickdown piston spring to the point that piston guide seal ring slightly binds on case. Then using a piece of brass rod flattened on one end, work seal ring into position, gradually compressing spring until seal ring enters case and snap ring can be installed. Install the kickdown piston rod guide snap ring. Make sure snap ring is properly seated.

REVERSE SERVO PISTON—REASSEMBLY AND INSTALLATION

Place the reverse servo piston valve and spring in reverse servo piston. Shaft on valve protrudes through hole in bottom of piston. Using C-3229 pliers, install the reverse servo piston valve spring snap ring. Make sure snap ring is properly seated. Coat the reverse servo piston ring (neoprene) with Lubriplate and install on piston. Insert reverse servo piston and valve assembly into transmission case in a cocked position, then by rotating piston, the piston will enter case without being damaged. See Figure 97. Place reverse servo piston spring over piston and position spring retainer over spring. Compress spring with Tool C-3289 sufficiently to install snap ring. See Figure 96. Spring retainer may require guiding into case. Make sure snap ring seats properly.

Inspect interior of reverse servo piston sleeve for burrs, then place sleeve over the piston. Make sure sleeve slides freely on piston by working it up and down. Remove installing tool from transmission case.

REGULATOR VALVE BODY—INSTALLATION

Inspect regulator valve body and valves to make sure that no damage has occurred since first inspection and cleaning. Blow out passages with compressed air. Make sure torque converter reaction shaft neoprene seal is coated with Lubriplate. Place the transmission regulator valve and torque converter control valve in the regulator valve body. Install guide studs C-3288 in front of transmission case.

CAUTION

Use extreme care, when reaction shaft seal enters regulator body to prevent reaction shaft screws from damaging passages on regulator body.

Place transmission regulator valve body assembly, with oil passages to rear, over torque converter reaction shaft and on to guide studs, seat firmly to front of transmission case.

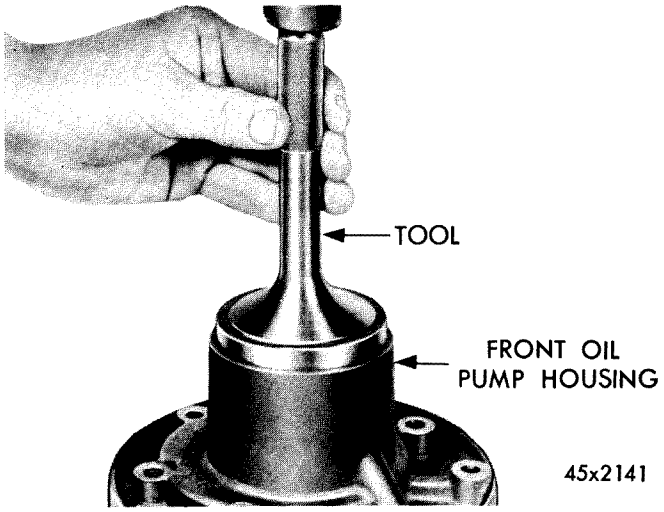


Figure 102—Installing Front Oil Pump Housing Dust Seal

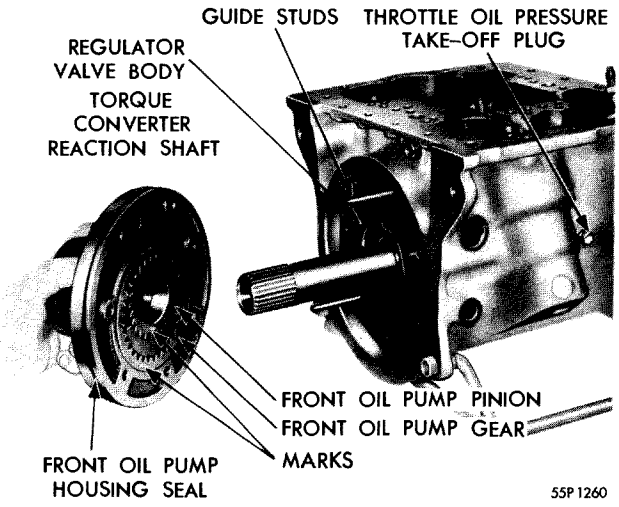


Figure 103—Installation of Front Oil Pump Assembly

FRONT OIL PUMP—REASSEMBLY AND INSTALLATION

Position front oil pump housing dust seal in front of oil pump housing (metal portion of seal down). Using driver C-3278 bottom seal into housing. See Figure 102. Coat transmission oil pump housing seal with Lubriplate and install on housing. Place transmission front oil pump gear and pinion (driving lugs of pinion facing up) in oil pump housing. See Figure 103.

CAUTION

Unless oil pump pinion is installed correctly, considerable damage will result when transmission is installed in vehicle. Lubricate oil pump gears with automatic transmission fluid (type A).

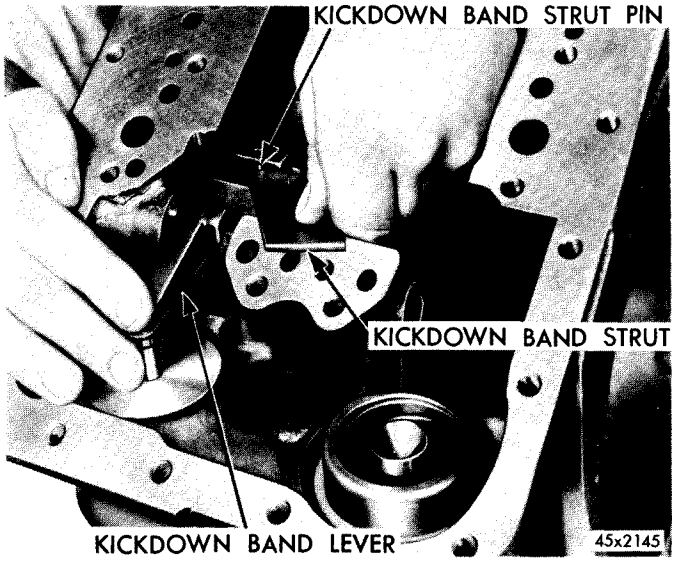


Figure 104—Installation of Kickdown Band Strut

Place front oil pump housing assembly over torque converter reaction shaft and slide into position over guide studs until oil pump housing seal is flush with transmission case. Using new aluminum or copper washers on screws, start five of the screws and draw housing down evenly until it is seated into transmission case. Remove guide studs and install the two remaining screws and washers then torque to 17 foot pounds.

Using a new gasket, reinstall the torque converter control valve spring and retainer. Torque from 35 to 40 foot pounds. Using a new gasket, reinstall the transmission regulator valve spring and retainer. Torque from 45 to 50 foot pounds. See Figure 92.

IMPORTANT

After all screws have been installed and properly torqued, engage the driving lugs of the oil pump pinion to determine if oil pump pinion turns freely. Use the oil pump drive sleeve for this check. If not free, remove pump and check for foreign matter between pump gears and housing.

REVERSE BAND, KICKDOWN BAND—INSTALLATION

Place kickdown band assembly into transmission case by rotating ends of band through rear opening in case. See Figure 91. Fit the proper end of the kickdown band over adjusting screw and compress the band sufficiently to install the kickdown band strut between other end and kickdown band lever. See Figure 104.

CAUTION

Make sure kickdown band strut slot engages with kickdown band strut pin in the band end.

Place reverse band assembly into transmission case by rotating ends of band through rear opening in case. See Figure 91. Hook the proper end of the reverse band (previously identified when band was removed) in link assembly. Compress the band sufficiently to install the reverse band strut in the slots of reverse band and reverse band lever assembly.

PLANET PINION CARRIERS IN HOUSING—INSTALLATION

Place output shaft support in tool C-3285 with bearing surface up. Lubricate bearing surface of planet pinion housing, then place bearing surface of housing over output shaft support bearing surface. See Figure 81. Place the reverse annulus gear on the output shaft and install the reverse annulus gear snap ring. Selectively fit the snap ring with one of the following three sizes: .078 to .080 inches (thin), .082 to .084 inches (medium), and .086 to .088 inches (thick).

CAUTION

Reverse annulus gear must fit tightly on output shaft. End clearance is controlled by various snap rings which are available in the three thicknesses.

Make sure snap ring seats properly. The output shaft may be placed in a vise, providing it is clean and equipped with brass jaws.

Coat transmission output shaft seal ring with Lubriplate and install on shaft. Lock into position and make sure ring rotates freely in lands. Coat the planet pinion carrier housing thrust washer with Lubriplate, slide over output shaft and into position on reverse annulus gear. Place output shaft and reverse annulus gear into position in the planet pinion carrier housing thrust washer with Lubriplate, slide over output shaft and into position on reverse annulus gear. Place output shaft and reverse annulus gear into position in the planet pinion carrier housing and through the output shaft support, being careful not to damage the output shaft seal rings as it enters the output shaft support. See Figure 80.

Lubricate thrust surfaces and gear teeth on the reverse planet pinion gear and carrier assembly. Place carrier assembly in the reverse annulus gear.

CAUTION

Make sure the planet pinion carrier thrust washer seats properly between the reverse annulus gear and the planet pinion carrier housing. Coat output shaft splines with Lubriplate.

The driving lugs on carrier assembly must engage the slots in the planet pinion carrier housing. See Figure 79.

Inspect stop ring for proper position in input shaft groove. Lubricate thrust surfaces and gear teeth on the kickdown planet pinion gear and carrier assembly. Slide assembly (oil collector ring up) carefully down on rear end of input shaft and over stop ring. Lubricate teeth and thrust surfaces of the kickdown annulus gear. Slide on to input shaft down to stop ring. See Figure 78. Install kickdown annulus gear snap ring. Make sure it is seated properly. See Figure 77. Input shaft may be placed in a vise, providing it is clean and equipped with brass jaws. Engage the gear teeth of the kickdown planet pinion gears with teeth on the kickdown annulus gear. Slide the pinion gear and carrier assembly into position in the kickdown annulus gear. Coat the reverse planet pinion carrier thrust washer with Lubriplate and install on kickdown annulus.

Place the kickdown planet pinion carrier assembly, annulus gear and input shaft into position in planet pinion carrier housing. See Figure 76. Make sure planet pinion carrier thrust washer remains on annulus, and driving lugs on carrier assembly properly engage the slots in the planet pinion housing. Install planet pinion carrier housing snap ring (not a selective fit). Make sure it is positioned and seated properly. See Figure 75. Lubricate gear and splines. Using a feeler gauge, check the clearance between the kickdown planet pinion carrier housing snap ring and the kickdown planet pinion carrier assembly. Limits are .012 to .038 inches. If not within these limits, disassemble and recheck the reverse planet pinion carrier and the planet pinion carrier housing thrust washers.

OUTPUT SHAFT SUPPORT, PLANET PINION CARRIER AND DIRECT CLUTCH ASSEMBLIES—INSTALLATION

Coat the kickdown planet pinion carrier thrust washer with Lubriplate, place over kickdown sun gear and on to thrust surface of direct clutch piston retainer assembly. Place the direct clutch piston retainer assembly over the input shaft, engaging sun gear with the kickdown planet pinion gears and engaging splines of the input shaft with the direct clutch hub. See Figure 105.

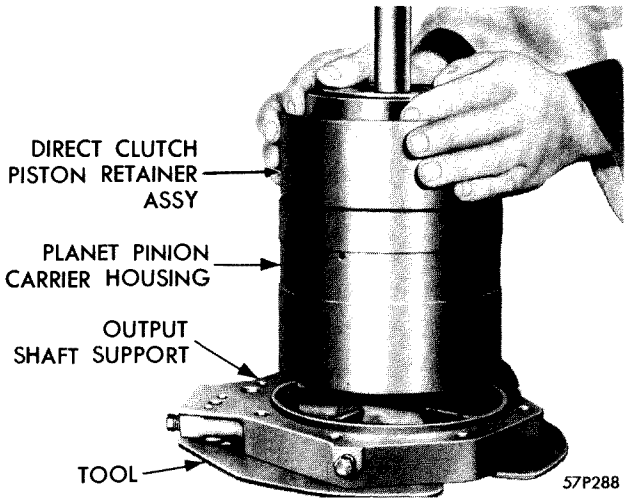


Figure 105—Installation of Direct Clutch Piston Retainer Assembly

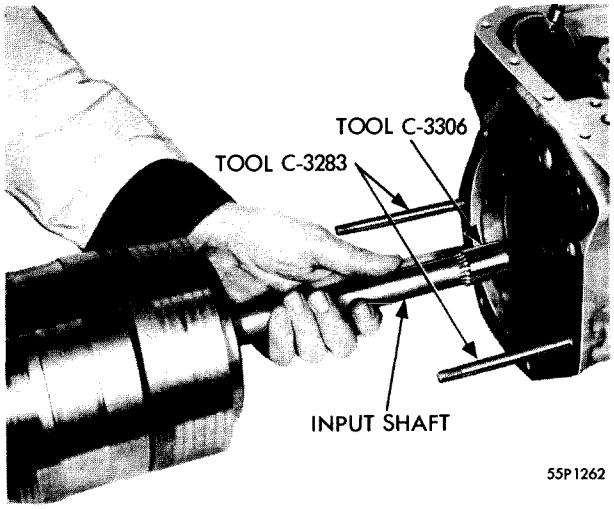


Figure 106—Preparing to Install Power Train Assembly

Make sure kickdown planet pinion carrier thrust washer remained in position. Coat the direct clutch piston retainer thrust washer (select fit) with Lubriplate and install on torque converter reaction shaft inside of transmission case. Use care when sliding washer over rings to prevent damage.

Install guide studs C-3283 in rear of transmission case, position new output shaft support gasket over guide studs and on to case. Place tool C-3306 over the splines on the front of input shaft. See Figure 106.

Insert input shaft, with direct clutch assembly, planet pinion carrier housing, output shaft support and output shaft attached, through the rear of transmission case and through torque converter reaction shaft. Then guide assembly through bands and over guide studs and into position in transmission case. See Figure 107. Remove tool C-3306 from the front of the input shaft.

Install the one output shaft support to transmission case screw and lockwasher finger tight.

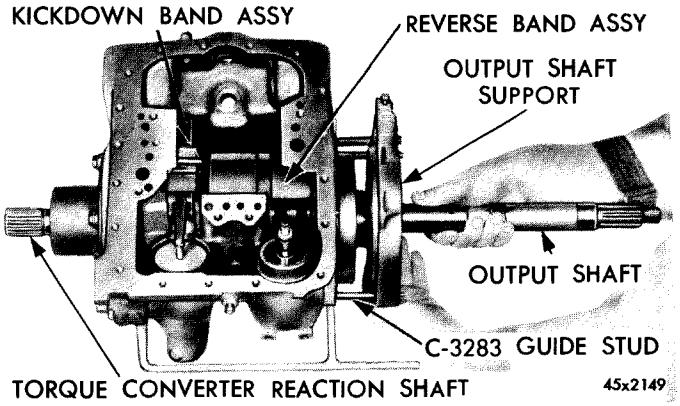


Figure 107—Installation of Power Train in Transmission

REAR OIL PUMP—REASSEMBLY AND INSTALLATION

Coat transmission rear oil pump pinion ball with Lubriplate and insert in ball pocket in output shaft. See Figure 71.

Coat rear oil pump drive pinion with lubriplate, place over output shaft and slide into position, aligning keyway in pinion with ball in shaft. Pinion was marked when removed in disassembly, make sure it is installed correctly. Lubricate rear oil pump gear and position into rear oil pump housing.

CAUTION

Make sure gear is installed correctly, check markings.

Slide rear oil pump housing assembly over output shaft and into position against output shaft support. See Figure 70.

CAUTION

There are two extra holes in housing which are used for vents. Make definitely sure you do not attempt to install screws in these holes. Check each screw hole before installing screws.

Install the five rear oil pump housing to output shaft support screws and lockwashers. Draw down evenly, then torque from 15 to 20 foot pounds. After screws have been properly tightened turn output shaft to make sure pump gears are free to rotate. If not, disassemble pump to determine cause.

REASSEMBLY OF GOVERNOR ON OUTPUT SHAFT

Coat the two governor support piston rings with lubriplate and install on the governor support. Stagger rings and make sure they are free to rotate in lands. Position governor body on support and install the four screws and lockwashers. Do not tighten screws at this point. Slide governor support and body assembly over output shaft and into position in rear oil pump housing. See Figure 69. Compress governor support piston rings with fingers as support enters oil pump housing. Align locating hole in output shaft to locating screw hole in governor body and install governor locating screw, torque from 3½ to 4 foot pounds.

NOTE

Holes can be easily aligned by turning output shaft and holding governor body. Make sure screwdriver attachment fits the screw slot when tightening locating screw.

Torque the four governor body screws from 5 to 10 foot pounds. Dry governor parts with compressed air but do not lubricate when assembling. Place governor weight spring over secondary weight and position both in primary weight. Make sure governor weight spring seats properly. Guide secondary weight, and compress governor weight spring sufficiently to install snap ring. Make sure snap ring is seated properly. Place governor weight assembly (secondary weight snap ring up) into governor body and install snap ring. See Figure 68. Make sure snap ring seats properly.

Slide the governor valve (small end up) over governor valve shaft. Slide the governor shaft into governor body through the output shaft and governor weight assembly, at same time position valve into body. See Figure 67. Install the governor valve shaft snap ring. Make sure it is properly locked to shaft. See Figure 66. Check operation of governor weight assembly and valve by turning output shaft. Both should fall freely in body.

CHECKING TRANSMISSION END PLAY

Using dial indicator C-430 or feeler gauge, measure the distance between the direct clutch assembly and carrier housing when clutch is in rearward position. Then using a screwdriver inserted between the direct clutch assembly and carrier housing, carefully pry the direct clutch forward. Remove screwdriver and measure again. The end clearance must be .026 to .052 inches. See Figure 65.

If it does not fall within this specification, then transmission will have to be partially disassembled in the following manner to allow a direct clutch piston retainer thrust washer of proper thickness to be installed. Remove the seven screws and lockwashers from the transmission extension and install guide studs C-3283. Then remove the one output shaft support to case screw and washer, and remove the extension housing, output shaft, support and planet pinion carrier housing assembly as one assembly. Slide the direct clutch piston retainer from torque converter reaction shaft and remove the direct clutch piston retainer thrust washer. Using a micrometer, measure the thickness of the washer then select washer to give correct clearance. These washers are available in three thicknesses. See Page 175. Reassemble as previously instructed and recheck end play.

KICKDOWN BAND AND REVERSE BAND ADJUSTMENT

Adjustment of the kickdown and reverse bands can be made at this time. Refer to Page 171 for correct procedure when performing this operation.

HAND BRAKE—REASSEMBLY AND INSTALLATION

Make sure the brake support spacer (neoprene) is in position on back of brake support and spacer sleeve is in center of support. Slide brake support assembly over rear of extension housing and anchor pin. Make sure spacer sleeve remained in center of support. Install brake support grease shield on extension housing.

CAUTION

Indent in shield for correct positioning on extension housing. Also shield must be located on housing far enough to permit installation of spring later.

Place both brake anchor washers on brake shoe anchor and install locking anchor washer. Place both shoe assemblies with adjusting sleeve nut and screw into position on anchor. Make sure brake shoes are between the anchor washers. Use rubber band around shoes to help hold them into position. Install operating link. Note link marked for correct installation. Install the brake support grease shield spring (opening in spring toward adjusting sleeve). Make sure spring is properly seated in groove. Slide the brake shoe return spring behind the grease shield spring and hook into position. Make sure brake adjustment is loose enough, then install brake drum assembly.

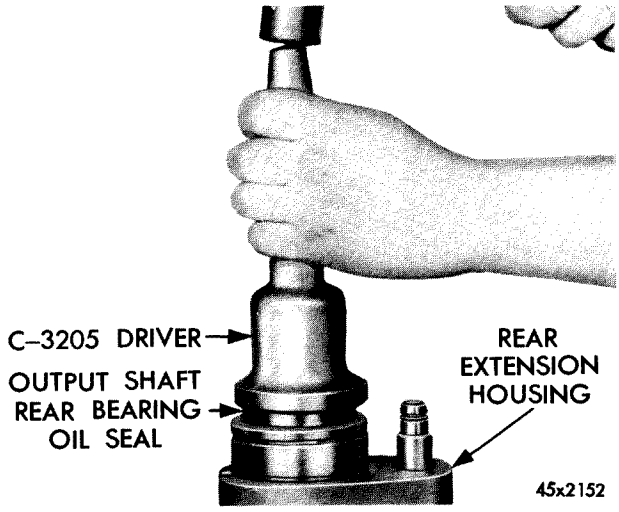


Figure 108—Installing Output Shaft Rear Bearing Oil Seal

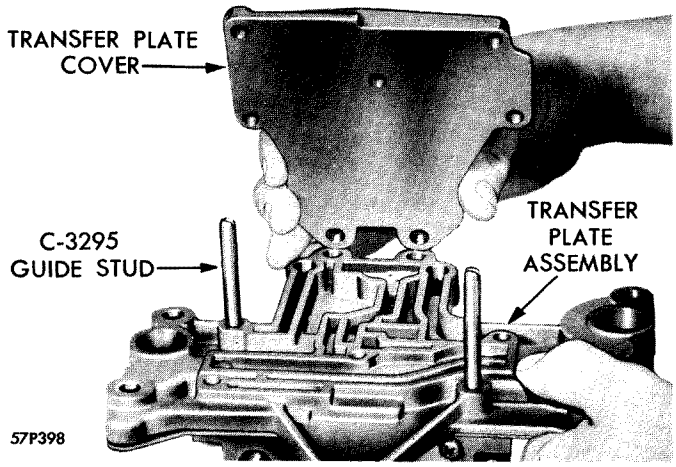


Figure 109—Removal of Transfer Plate Cover

NOTE

In some instances it may be necessary to use tool C-496 to press brake drum on to output shaft.

Install the transmission flange washer, shakeproof washer and nut. Using C-3281, tighten from 140 to 160 foot-pounds.

TRANSMISSION EXTENSION, OIL SEAL AND BEARING—REASSEMBLY AND INSTALLATION

Using driver C-3204, install the output shaft rear bearing in extension housing. Make sure bearing is properly seated then lubricate with automatic transmission fluid type "A." Install output shaft rear bearing snap ring. Install bevel side up, and make sure snap ring seats properly. Install oil seal and lubricate contacting lip to provide initial lubrication. See Figure 108. Replace extension breather (vent) and torque from 10 to 12 foot pounds. Install new transmission extension gasket over guide studs and into position against output shaft support.

Do not use sealing material on gasket. Using care to avoid damaging the governor housing, place rear extension housing over output shaft and on to guide studs. Using Tool C-496 with adapter C-3284, press extension housing into position against output shaft support.

Start the seven transmission extension to case screws and lockwashers then drawn down evenly and torque from 25 to 30 foot pounds. Tighten the output shaft support to case screw from 25 to 30 foot pounds.

After these screws have been properly torqued, turn output shaft to make sure it turns freely.

Coat nylon gear and threads on speedometer drive pinion with Lubriplate and install in transmission extension. Torque from 40 to 45 foot pounds.

DISASSEMBLY AND INSPECTION OF VALVE BODY AND TRANSFER PLATE ASSEMBLY

Place the assembly in stand C-3294. Do not use vise to hold assembly. Remove two of the long transfer plate cover screws and lockwashers and install guide studs C-3295. Keep finger pressure against the transfer plate and remove the three remaining cover screws. Then remove cover. See Figure 109. Remove the transfer plate from the valve body plate using care so as not to lose the servo restrictor valve operating plug. See Figure 110.

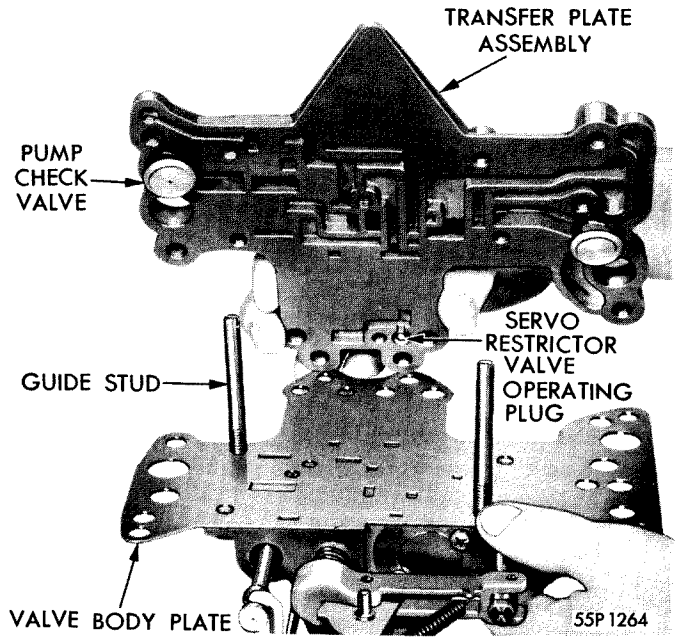


Figure 110—Removal of Valve Body Plate

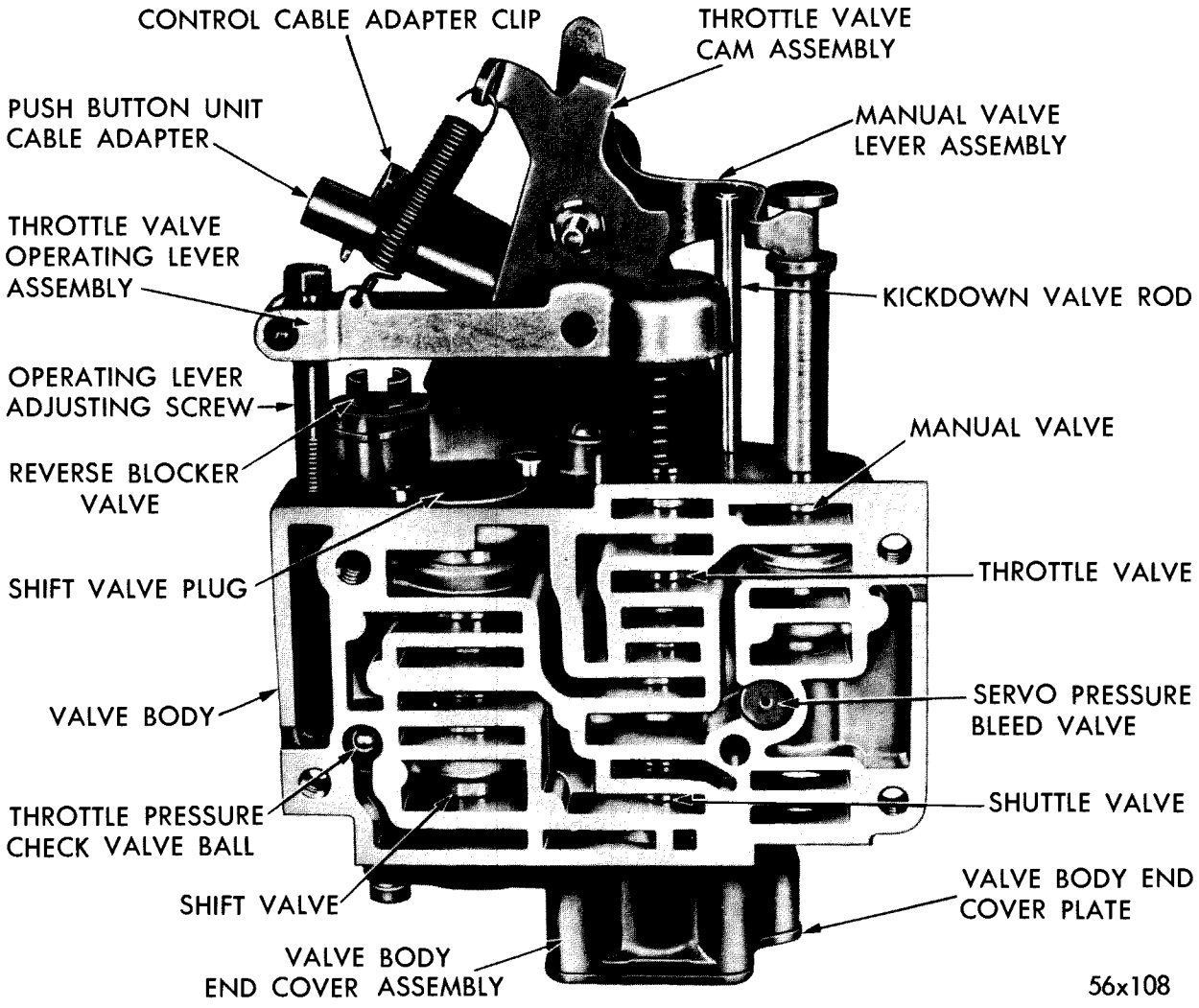


Figure 111—Valve Body Assembly

Note position of the front and rear pump check valves in the transfer plate. The rear pump check valve has a metering hole.

Remove the valve body plate from the valve body. See Figure 112. The servo bleed valve may stick to the valve body plate. Note the position of the servo bleed valve and throttle pressure check valve ball in the valve body. See Figure 111. Remove both valves and place in a clean container.

Compress the throttle valve operating lever assembly against the throttle valve operating lever assembly against the throttle valve spring and slide the throttle valve cam assembly from the manual valve lever assembly. See Figure 114.

IMPORTANT

Remove any burrs from the throttle valve camshaft and manual valve lever shaft before removing them from the valve body.

Rotate the throttle valve operating lever out of the way and remove the throttle valve spring and retainer from throttle valve. Then remove throttle valve from valve body. Measure distance from the valve body to the end of the throttle valve operating lever adjusting screw. This distance should be approximately $1\frac{11}{16}$ inches. See Figure 115. It is not necessary to remove the lever or adjusting screw unless replacement parts are required.

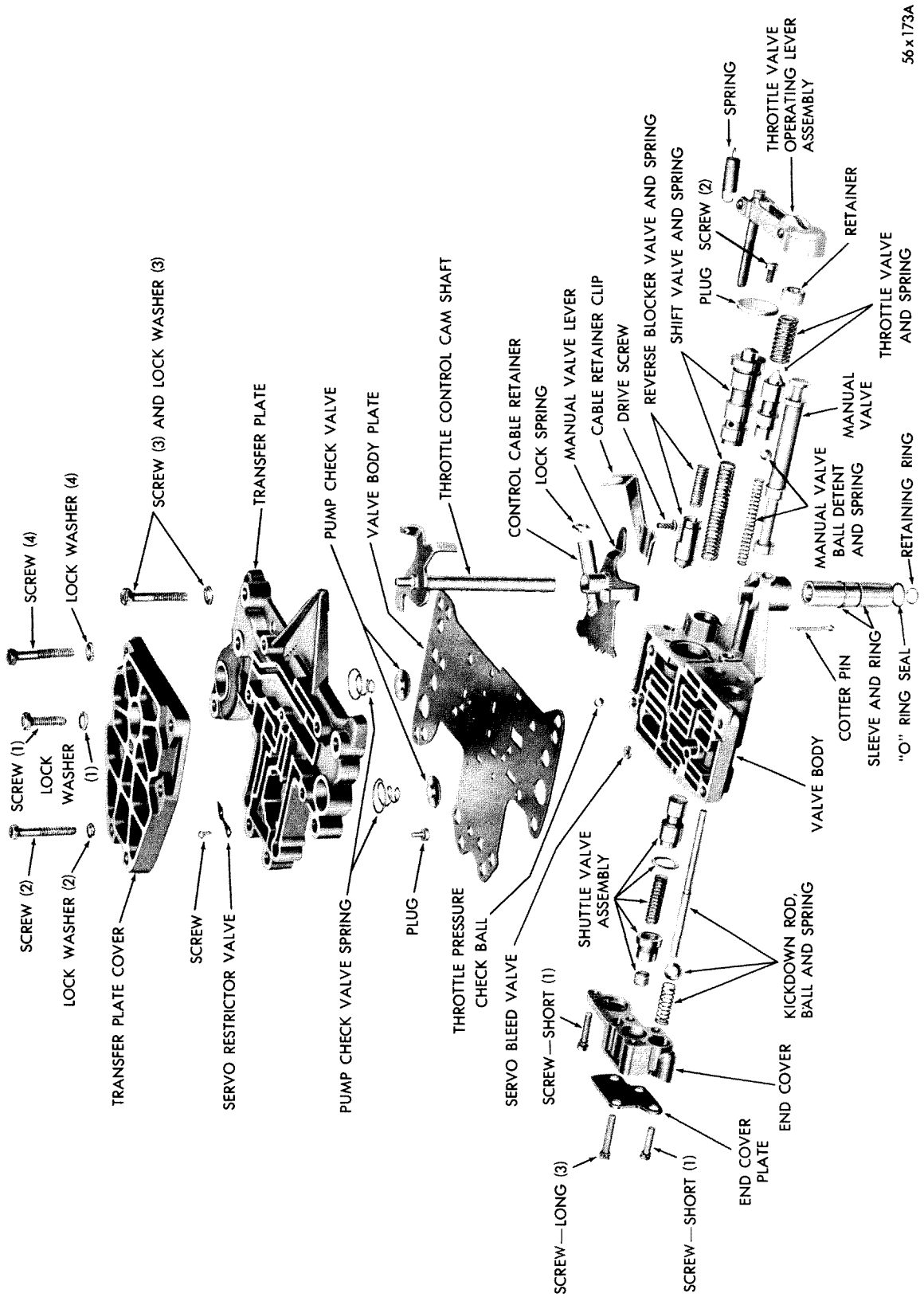


Figure 112—Valve Body and Transfer Plate Disassembled

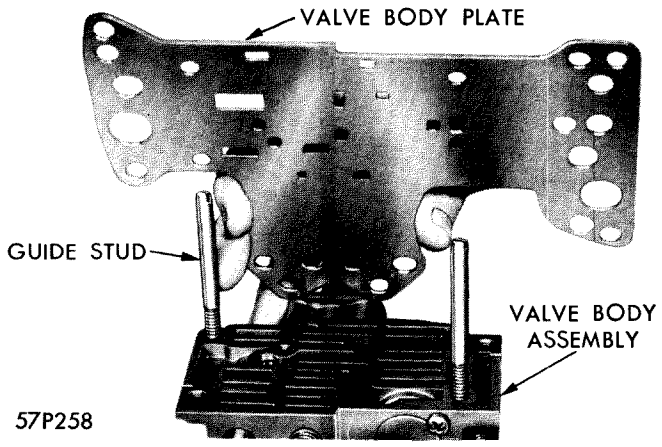


Figure 113—Removal of Valve Body Plate

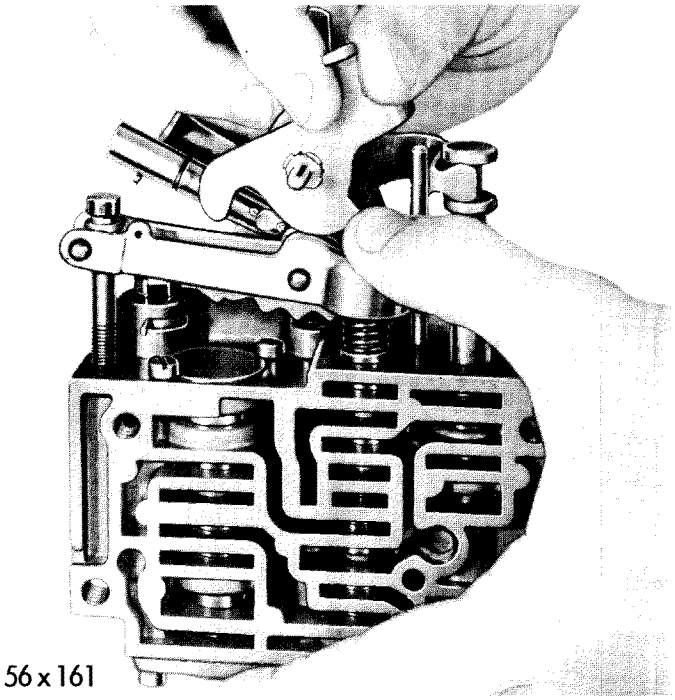


Figure 114—Removal or Installation of Throttle Valve Cam Assembly

Remove the four (three long and one short) valve body end cover plate screws and lockwashers. Then remove plate. See Figure 116.

Keep finger pressure on valve body end cover and remove the end screw. Carefully remove the end cover to prevent losing any of the four springs or the kickdown valve ball. Remove the shuttle valve spring, and shuttle valve. See Figure 117. Remove the direct clutch shaft valve spring.

Remove the direct clutch shaft valve and spring. Then remove snap ring from kickdown rod and pull rod from valve body.

Using a screwdriver compress the detent ball and slide out manual valve lever until it is disengaged from detent ball.

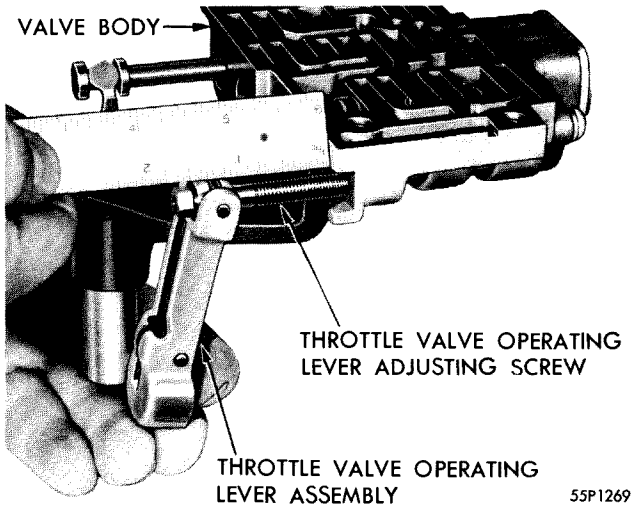


Figure 115—Adjusting Throttle Valve Operating Lever

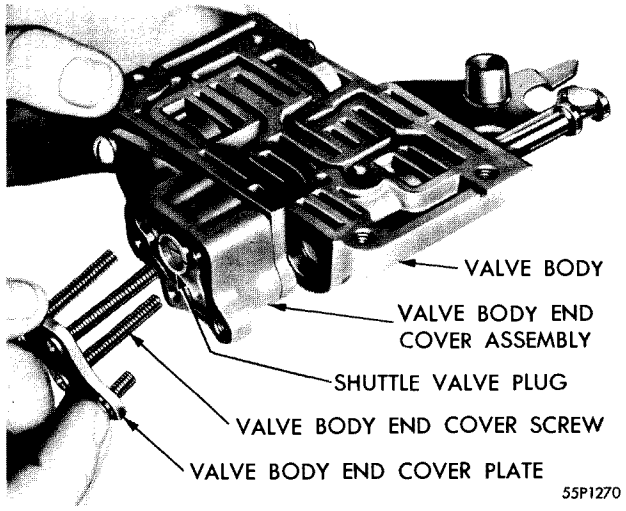


Figure 116—Removal or Installation of Valve Body End Cover Plate

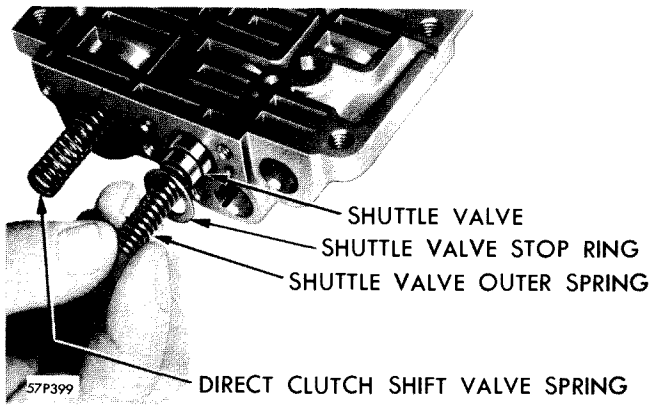


Figure 117—Removal or Installation of Shuttle Valve Assembly

CLEANING AND INSPECTION OF VALVE BODY AND TRANSFER PLATE ASSEMBLY

Place all parts in clean solvent. Wash thoroughly and dry with compressed air. Inspect all passages to be sure

they are free of obstructions. Also inspect castings for evidence of porosity. Remove small nicks or burrs from mating surfaces with crocus cloth. Check parallelism of mating surfaces with straight edge Tool C-3335. Using a light, inspect bores in valve body for score marks or pitting.

Inspect the valves and plugs for burrs or nicks. Crocus cloth can be used provided that the sharp edges or plugs are not rounded off. The sharp edge prevents dirt from wedging between the bore and valve, thus reducing the possibility of sticking. Check the operation of the valves and plugs in their respective bores. They should work freely when clean and dry.

Inspect detents on manual valve lever, lever pin, and detent plunger for wear.

Inspect the throttle valve operating lever roller for binding. Inspect the adjusting screw and pin for wear. Make sure screw rotates freely in lever.

Inspect the kickdown valve rod for wear and scoring and also the bore in the valve body. Inspect the kickdown valve ball seat in valve body.

Check the servo restrictor valve in the transfer plate to make sure valve is seating properly. See Figure 118. If it is necessary to replace the valve, extreme caution must be exercised when removing the drive screw so that the transfer plate is not distorted.

Inspect valve body plate and make sure all ports are open. Inspect the pump check valve and springs in the transfer plate. See Figure 118.

ASSEMBLY OF VALVE BODY

Place manual valve lever detent ball spring and detent ball in valve body. Slide the manual valve lever assembly into the valve body. With a rotating motion slide the manual valve into the valve body just enough

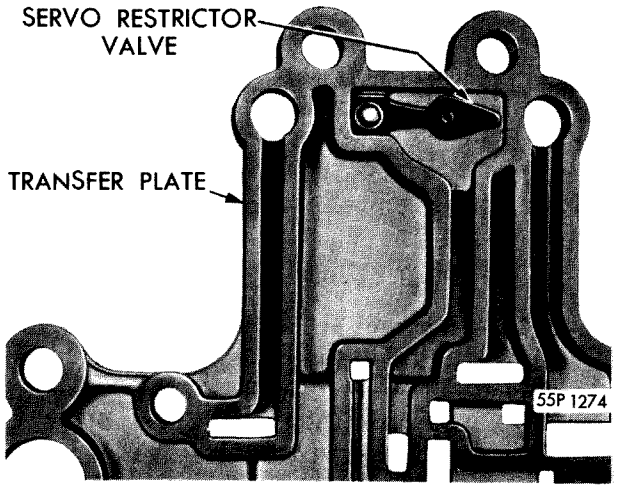


Figure 118—Location of Servo Restrictor Valve

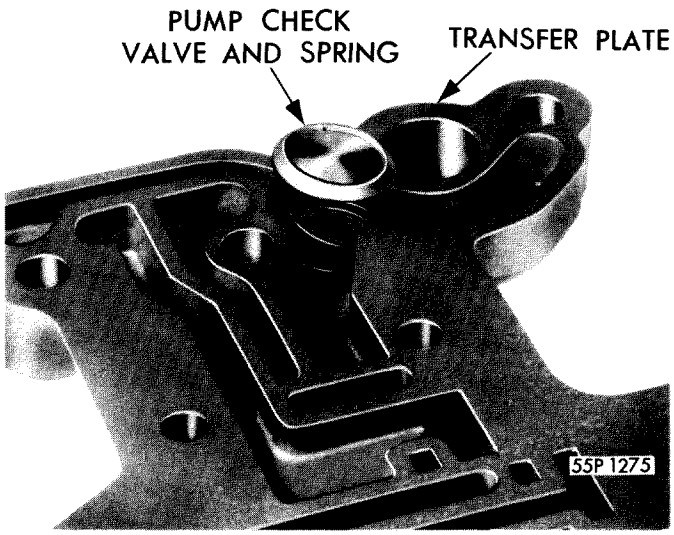


Figure 119—Pump Check Valve and Spring

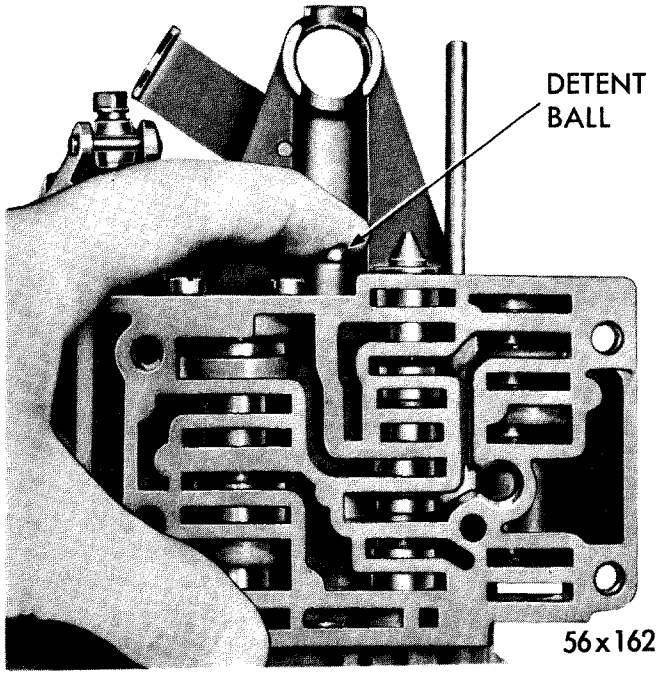


Figure 120—Compressing Manual Valve Detent Spring and Ball

to engage the manual valve, (compress the manual valve detent ball into the valve body). See Figure 119. Press the valve lever until it snaps over the detent ball. See Figure 120.

Place the kickdown rod with the large end toward the end cover into the valve body and install the snap ring.

Install the direct clutch shift valve plug into the valve body. Place the direct shift valve plug into position in the valve body aligning the marks previously made during disassembly. Tighten the two screws 24 to 30 inch pounds being sure that the plug is properly seated. Install the direct clutch shift valve spring in the valve.

Install the shuttle valve in the valve body. Coat the stop ring lightly with grease and place it into the recess in the valve body. Place the shuttle valve spring in the shuttle valve. See Figure 117.

Place the kickdown valve ball into the valve body. Place the valve body and cover plate on end cover. Then install the one short screw and lockwasher and tighten snugly. Place the shuttle valve plug in end cover. Then install the end cover on the valve body, but do not tighten the end screw. Make sure shuttle valve, direct clutch shift valve and kickdown valve springs are properly seated when installing the end cover. Install the cover plate screws and tighten to 24 to 30 inch pounds.

Install the throttle valve adjusting screw and throttle valve operating lever assembly. Distance between valve body and end of throttle valve operating adjusting screw should be $1\frac{11}{16}$ inch, as shown in Figure 115.

Install the throttle valve in the valve body with the point outward. Place the throttle valve spring and retainer over throttle valve.

Swing the throttle valve operating lever over the spring and retainer. Compress the throttle valve operating lever assembly against the throttle valve spring. Slide the throttle valve cam assembly into manual valve lever assembly, indexing cam in slot of operating lever. See Figure 113. Install the servo bleed valve and throttle pressure check valve ball in valve body and install guide studs C-3295. See Figure 111.

Position the transfer plate cover on transfer plate and install the center screw (short) and lockwasher finger tight. Install the servo restrictor valve operating plug (long end first) into the transfer plate. See Figure 121. Place pump check valves in transfer plate. See Figure 119. The check valve with the metering hole should be toward rear of transmission. Place the valve body plate flush into position on the transfer plate by compressing the pump check valve springs.

IMPORTANT

Make sure that the pump check valves enter the transfer plate as the valve body plate is compressed, otherwise damage will result to the valves, valve body plate, or transfer plate when the screws are tightened.

Keep sufficient pressure on the transfer plate and valve body plate to hold them together. Place the assembly over the guide studs and into position on the valve body. Install two of the screws and lockwashers being sure that check valves are still in position. Remove guide studs and install remaining two screws and lockwashers. Tighten evenly to 45 to 50 inch pounds. Check operation of check valves.

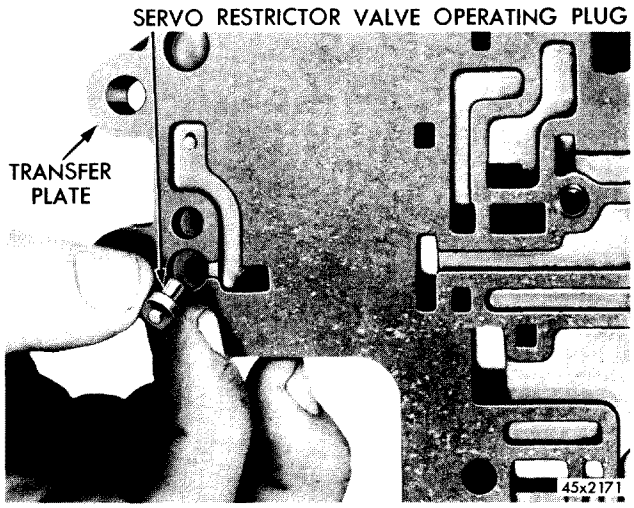


Figure 121—Installing Servo Restrictor Valve Operating Plug

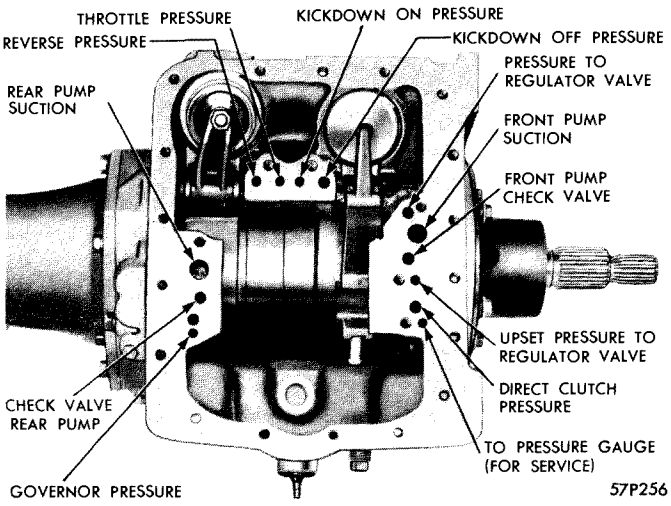


Figure 122—Oil Passages in Bottom of Transmission Case

INSTALLATION OF VALVE BODY AND TRANSFER PLATE ASSEMBLY

Clean mating surfaces and check for burrs on both the transmission case and valve body. For the purpose of identifying the oil passages only refer to Figure 122. Place valve and transfer plate into position on transmission case. Install the five transfer plate screws and lockwashers.

Make sure the two oil strainer tube seals are in position on oil strainer and place oil strainer assembly into position on valve body. Install the two oil strainer support screws ($1\frac{1}{4}$ inches long) and lockwashers. Torque from 12 to 17 foot pounds.

CAUTION

Two screws are 1⅝ inches long. These go through the transfer plate cover on valve body. The other three are 1⅛ inches long. Draw screws down evenly and torque from 12 to 17 foot pounds.

Place the manual valve lever shaft seal cover over the manual valve lever shaft. Install the manual control lever (arm side of lever against cover) on manual valve lever shaft, and tighten locking screw. Place the throttle valve camshaft felt and retainer over the throttle valve shaft. Install throttle valve lever assembly on the throttle camshaft, and tighten locking screw. Check operation of controls by shifting the manual control into the four operating positions.

CAUTION

Make sure oil tubes on strainer properly enter the valve body.

Check the throttle cam position in throttle operating lever assembly and throttle assembly and throttle camshaft assembly for kickdown operation. Visually check the manual valve lever contact on neutral starter and back-up light switches. Using a new oil pan gasket, place oil pan into position on transmission case. Install the eighteen oil pan screws and washer assemblies, drawing them down evenly, and torque from 12 to 17 foot-pounds. Tighten oil pan drain plug from 20 to 35 foot-pounds.

14. POWERFLITE—ASSEMBLY AND INSTALLATION

INSTALLATION OF TORQUE CONVERTER AND HOUSING

Inspect mating surfaces on torque converter and crankshaft flange for burrs and dirt. Install torque converter on crankshaft. Install the eight torque converter stud nuts and lockwashers. Draw down evenly and tighten 55 to 60 foot-pounds. Install torque converter housing and tighten screws 25 to 30 foot-pounds. Install starting motor.

NOTE

When torque assembly is removed from the crankshaft drive flange for any reason, the converter assembly runout should be checked when reinstalled. Runout should not exceed .004 total indicator reading.

INSTALLATION OF TRANSMISSION

Install guide studs C-3276 in the two upper transmission case to adapter screw holes. Lubricate front oil pump drive sleeve ring and bearing surface with lubriplate and install in torque converter hub, making sure driving lugs are properly engaged.

Note position of driving lugs on front oil pump drive sleeve, then position front oil pump pinion accordingly to aid in proper engagement when transmission is installed. Slide transmission over guide studs and into position. Make sure driving lugs on front oil pump drive sleeve properly engage the front oil pump pinion.

Install the two lower transmission case to adapter screws and lockwashers. Do not tighten. Remove guide studs and install the two upper transmission case to adapter screws and lockwashers, then draw the four down evenly and torque from 45 to 50 foot pounds. Place crossmember into position and install the crossmember to frame bolts. Torque from 50 to 55 foot pounds. Lower engine and at the same time align mounting holes in crossmember. Install the two nuts and lockwashers that hold the engine rear support insulator to the crossmember and torque from 30 to 35 foot pounds.

CAUTION

To avoid damage to front oil pump, do not attempt to use transmission to torque converter housing screws to bring transmission and torque converter housing together. If oil pump drive sleeve and input shaft have been properly aligned, the transmission should slide into position relatively easy. Do not use force.

Remove support fixture Tool C-3245 from side of frame member. Install oil pan filler tube and torque filler tube nut 35 to 40 foot pounds. Connect throttle and manual control linkage to levers. Connect neutral starter and back-up wires to switches. Connect speedometer cable. Engage ball end of hand brake cable in operating lever and install cable clamp bolt. Install adjusting screw cover plate on hand brake support. Install propeller shaft and torque nuts from 33 to 37 foot pounds. Refill transmission. Connect battery. Adjust manual and throttle control linkage.

TORQUEFLITE TRANSMISSION DATA AND SPECIFICATIONS

TorqueFlite	Type	Automatic three speed with Torque Converter
	Oil Capacity of Transmission and Torque Converter	11 Quarts
	Torque Converter Multiplication	2.7 to 1
	Oil Cooling	Fins welded to Torque Converter
	Lubrication	Provided by Transmission Front and Rear Pump
Transmission Gear Ratios	1 (Low)	2.45 to 1
	2 (Second)	1.45 to 1
	Drive—Breakaway	2.45 to 1
	Drive—Direct	1 to 1
	Reverse	2.20 to 1
Front Pump—	Type	Gear
	End Clearance	.0012 — .0025
Rear Pump—	Type	Gear
	End Clearance	.0012 — .0027
Governor Type		Centrifugal
Clearance between Governor Valve and Body		.0005 to .002
Thrust Washers	Input Shaft Thrust Washer (3 sizes)	.078 to .080 (thin) .097 to .099 (medium) .115 to .117 (thick)
	Front Clutch Snap Ring Rear Clutch Snap Ring Reverse Band Drum Snap Ring	.060 to .062 (thin) .064 to .066 (medium) .068 to .072 (thick)
Kickdown Annulus Gear Snap Ring (2 sizes)		.060 to .062 (thin) .064 to .066 (thick)
Extension Shaft Bearing Snap Ring (2 sizes)		.086 to .088 (thin) .091 to .093 (thick)
Hydraulic Pressures	Line Pressure	Takeoff Plug, Left Front Side of Transmission
	Governor Pressure	Takeoff Plug, Left Side of Transmission in Output Shaft Support
	Lubrication Pressure	Takeoff Plug, Left Front side of Transmission

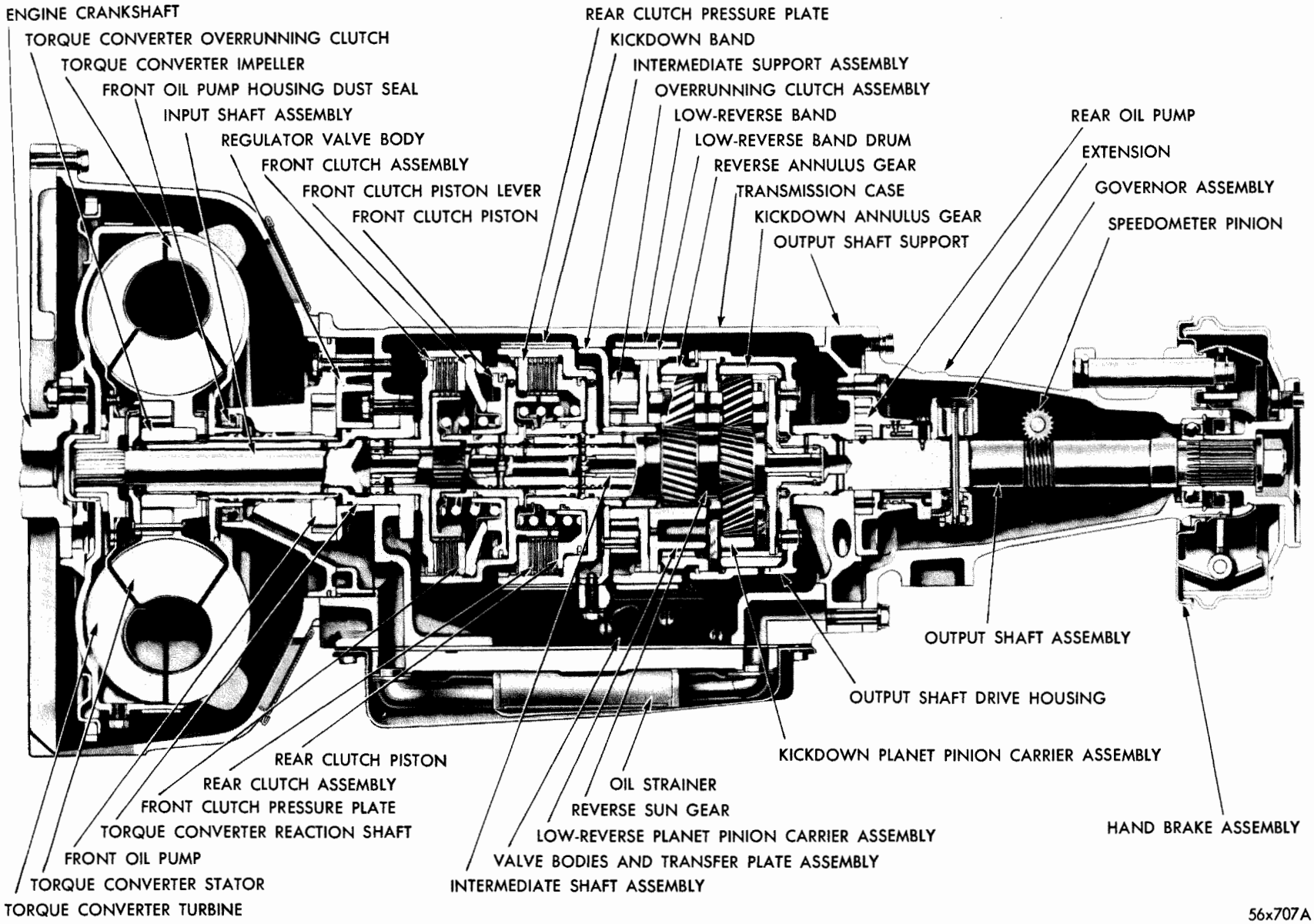


Figure 123—TorqueFlite Transmission and Torque Converter

15. TORQUEFLITE OPERATING PRINCIPLES

The transmission, as shown in Figure 123, combines a torque converter and an automatic planetary gear box. The torque converter extends torque multiplication (2.7 at stall) over a wide range of engine speeds. The transmission consists of two multiple disc clutches, an overrunning clutch, two bands, and two planetary gear sets to provide three forward ratios and a reverse ratio. With the front or forward clutch engaged and low gear reaction, transferred through the transmission overrunning clutch assembly, a low ratio of 2.45 to 1 is obtained. Engagement of the kickdown or second speed band will shift the transmission to second speed ratio of 1.45 to 1. Disengagement of the kickdown band and engagement of the rear or direct clutch locks the gear set so that a direct drive ratio of 1 to 1 is obtained. Since the overrunning clutch can transmit torque only on the drive side, it is necessary to apply the low and reverse band when using low for engine braking. Reverse ratio of 2.20 to 1 is obtained by application of the rear clutch and rear band. In the drive range, the transmission shifts through all three gear ratios automatically. Shift points are determined by throttle opening and car speed. If additional acceleration is desired while in drive range, the transmission will downshift (depending on vehicle speed) to second gear or breakaway automatically when the accelerator pedal is completely depressed.

The intermediate or second position range is used to operate the transmission in the first two gears only. This range is suitable for long down grades where additional engine braking is needed. A low or first position range is also available to keep the transmission in first gear only. This position provides added handling ease in mountain driving and exceptional pulling qualities in sand and snow.

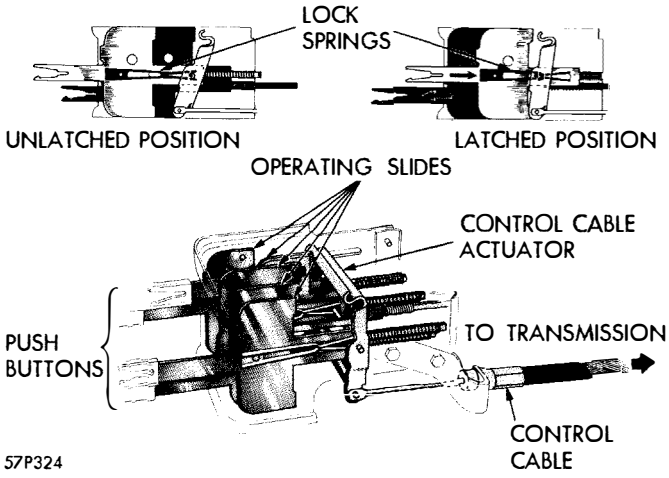


Figure 125—Gearshift Control Unit (Operational Sketch)

GEARSHIFT CONTROL UNIT

The transmission is operated by a gearshift control unit consisting of five push buttons, identified by R (reverse), N (neutral), D (drive), 2 (second) and 1 (low). See Figure 124.

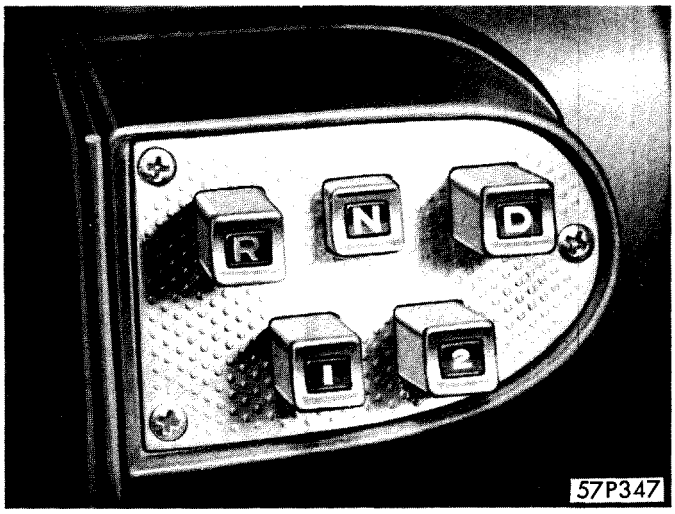


Figure 124—Arrangement of TorqueFlite Push Button

The control unit is located on the instrument panel to the left of the steering column. Range selection is made by pushing the proper button.

Should the R (reverse) button be pushed in, above approximately 10 M.P.H., it will move the manual control lever to the neutral position and when car speed drops below 10 M.P.H. it will again be necessary to reposition the R (reverse) push button.

Mechanical connection between the gearshift control housing and the transmission manual control valve is obtained through the use of a single push-pull cable, as shown in Figure 125. One end of the wire cable is secured to the cable actuator in the gearshift control housing, while the other end enters the adapter housing on the transmission case to engage the manual control valve lever assembly.

When a button is pushed in, the slide contacts the cable actuator, causing it to pivot. Movement of the cable actuator about its axis moves the attached wire cable. When the button nears its limit of travel, a lock on the button slide engages the actuator shaft. This action allows the slide lock to hold the button in the engaged position.

When the operator pushes another button, to select a different range, the top or bottom portion (depending on which button was pushed) of the slide contacts the actuator, thereby releasing the first button from the restraint of the spring lock. The first button is then free to return (under spring force) to its original position.

A back-up light switch (when so equipped) is incorporated in the gearshift control housing and is operated by the R (reverse) push button slide.

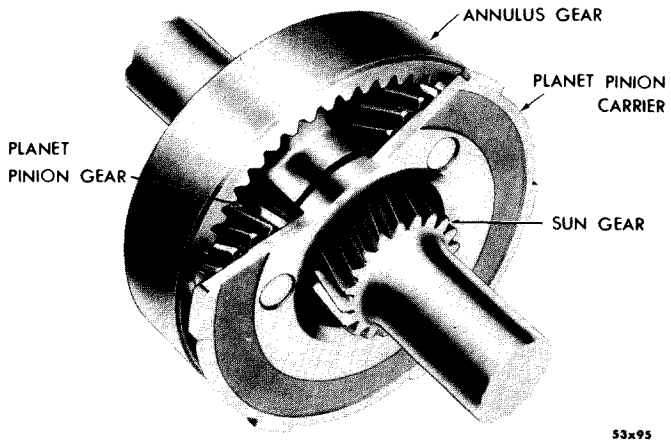


Figure 126—Planetary Gear Set

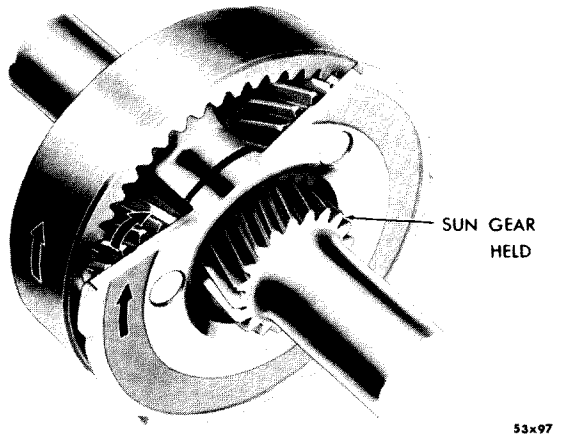


Figure 127—Planetary Gear Set (Sun Gear Held Gear Reduction)

The transmission will automatically upshift to second if the accelerator is released or a speed of approximately 42 M.P.H. is reached. In D (drive) range from second speed, the transmission will automatically upshift into direct if the accelerator is partially released or a speed of approximately 71 M.P.H. is reached. If vehicle is accelerated in 2 (second) position to the wide open throttle upshift speed, an upshift to direct will occur thus eliminating over-speeding the engine in second gear.

Kickdown (forced downshift). At speeds between 27 to 60 M.P.H. (approximately) in D (drive) position after the transmission has upshifted into direct, maximum acceleration can be obtained for passing by completely depressing the accelerator. This will cause the transmission to downshift to second. The transmission will automatically upshift to direct if the accelerator is released or a speed of approximately 71 M.P.H. is reached.

Transmission Inoperative—Tow the vehicle with a rear end pickup or remove the propeller shaft.

Transmission operating Properly—The vehicle may be towed safely in N (neutral) at moderate speeds. For long distance towing (over 100 miles), the propeller shaft should be removed.

PLANETARY GEAR SET—CONSTRUCTION

The planetary gear set, as shown in Figure 126, consists of:

1. An annulus or internal gear.
2. A planet pinion carrier with three planet pinion gears.
3. A sun gear.

The annulus gear surrounds and meshes with the planet pinion gears. The planet pinion gears are free to rotate on the planet pinion shafts in the planet pinion carrier. The sun gear rotates inside and is also meshed with the planet pinions.

PLANETARY GEAR SET—OPERATION

A planetary gear set may be used to increase torque and reduce speed. This is done by holding the sun gear and driving the annulus gear, as shown in Figure 127. The annulus gear will turn the planet pinion gears on their shafts and at the same time cause the planet pinion gears to move around the sun gear.

The planet pinion carrier will, therefore, be forced to rotate in the same direction as the annulus but at a slower speed. The gear set in this case operates as a speed-reducing, torque-increasing device. Further reduction may be obtained by adding planetary gear sets and providing a means of holding various members to obtain proper ratios.

DRIVING THE CAR

When starting in extremely cold weather, allow the engine and transmission to warm up while in N (neutral) position. If the engine is cold (engine on fast idle) apply the foot brake lightly to prevent a tendency of vehicle to creep when making a push button selection.

D (drive). All normal forward driving will be done in this range. The vehicle will have a slight tendency to creep after pushing the button from N (neutral) to D (drive) at idle. This can be prevented by applying the foot brake lightly. As soon as the accelerator is depressed, the vehicle will move forward in the drive (breakaway) range. At a speed of approximately 9 to 35 M.P.H., depending on the amount the accelerator is depressed, the transmission will automatically upshift to second. At speeds of approximately 13 to 65 M.P.H., depending upon the amount the accelerator is de-

pressed, the transmission will automatically upshift from second to direct. When slowing the vehicle down (at throttle openings short of wide open) the transmission will automatically downshift from direct to breakaway at approximately 8 M.P.H.

2 (second) position provides driving characteristics similar to D (drive)—second speed except that the transmission will not upshift into direct at vehicle speeds below approximately 65 M.P.H. That is, as soon as the accelerator is depressed, the vehicle will move forward in the drive (breakaway) range. At a speed of approximately 9 to 35 M.P.H., depending on the amount the accelerator is depressed (and car speed) the transmission will automatically upshift into second. If the vehicle is accelerated in second gear to the wide open throttle upshift speed, an upshift to direct will occur, thus eliminating over speeding the engine in second gear. If vehicle speed falls below 8 M.P.H. or the accelerator is completely depressed, at speeds below approximately 29 M.P.H., a transmission will automatically downshift to breakaway. It is possible to push the buttons from 2 (second) to D (drive) or D (drive) to 2 (second) at any speed; however, the transmission will not downshift to second gear if vehicle is above approximately 65 M.P.H.

1 (low) provides driving characteristics similar to D (drive—breakaway) except that the transmission will not upshift into any other range regardless of vehicle speed.

NOTE

To prevent over-speeding of engine, do not operate vehicle above 40 M.P.H. in 1 (low) position.

It is possible to push the buttons from 1 (low) to D (drive) and D (drive) to 1 (low) at any speed; however, the transmission will not downshift to low if vehicle is above approximately 29 M.P.H. The free wheeling which occurs in 1 (low) gear operation with the D (drive) button depressed in locked up to provide engine braking when the 1 (low) button is depressed.

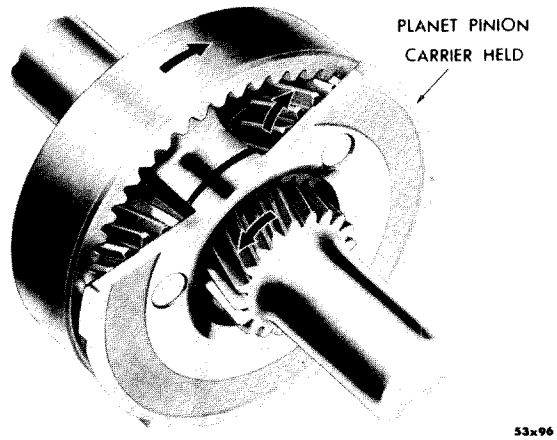


Figure 128—Planetary Gear Set—Reverse (Planet Pinion Carrier Held)

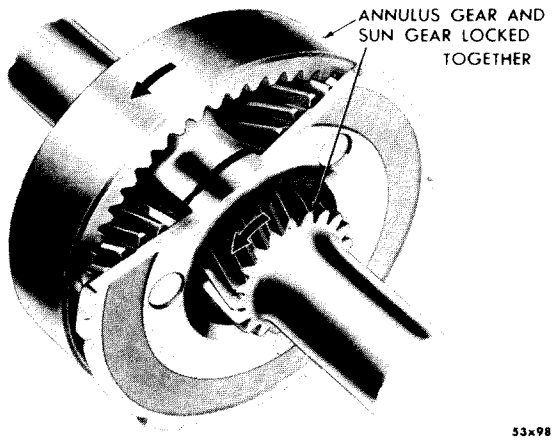


Figure 129—Planetary Gear Set—Direct (Annulus and Sun Gear Locked)

R (reverse). Stop the vehicle and with foot brake lightly applied, push the R (reverse) button in.

Kickdown (forced downshift). At speeds below approximately 29 M.P.H., in D (drive) or 2 (second), after the transmission has upshifted, maximum acceleration can be obtained for passing or climbing a steep grade by completely depressing the accelerator. This will cause the transmission to downshift to breakaway.

The direction of rotation may be reversed by use of a planetary gear set. By holding the planet pinion carrier stationary and driving the sun gear, the planet pinion gears will rotate on their shafts, as shown in Figure 128. Because the planet pinion carrier cannot move, the planet pinion gears operate as idlers and transmit the torque to the annulus gear. This drives the annulus gear in the reverse direction at reduced speed but with increased torque.

If any two members of a planetary gear set are locked together (as the annulus gear and sun gear in the case illustrated in Figure 129), a direct or 1 to 1 drive is obtained. There is no movement between the gears.

If no two members are locked together and no member is held from rotating, no torque will be transmitted. This provides neutral operation.

OVERRUNNING CLUTCH

The overrunning clutch consists of a cam, cam rollers, cam springs, and a clutch hub. The cam, which provides the ramps, is riveted to the intermediate support so that

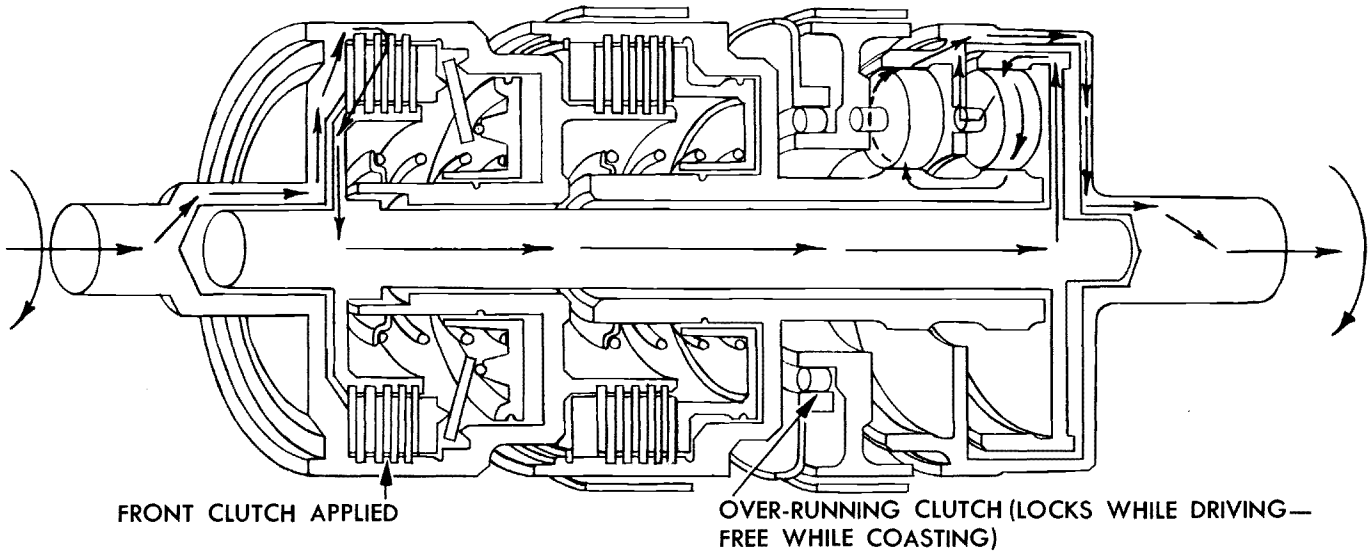


Figure 130—Power Flow in D (Drive) Position—Breakaway

it is prevented from turning. The overrunning clutch hub is splined in the low-reverse band drum with the reverse planet pinion carrier assembly. Connection between the cam and hub is obtained through the rollers.

When torque is applied to the reverse planet pinion carrier and overrunning clutch hub by the sun gear, the clutch rollers are forced outward into a wedged contact by the ramps in the cam, thus holding the planet pinion carrier.

If the driving force is removed, the rollers are released from their wedged contact and the overrunning clutch will coast. The overrunning clutch is used in the 1-2 upshift, normal 2-1 downshift, and forced 2-1 and 3-1 downshifts. For 1 (low) range operation, the low-reverse band is applied, holding the reverse planet pinion carrier stationary, thus preventing the overrunning clutch from coasting.

POWER FLOW IN THE TRANSMISSION

D (DRIVE) POSITION—BREAKAWAY — The power flow is from the converter turbine through the input shaft and front clutch retainer (one unit). The front clutch is applied and the drive continues through the clutch hub to the intermediate shaft and kickdown annulus gear (one unit). The kickdown annulus gear drives the kickdown planet pinion gears, rotating them in the same direction. The kickdown planet gears are meshed with the kickdown sun gear which in turn is integral with the reverse sun gear. Both sun gears are forced to rotate in a reverse direction by the reaction of the kickdown planet pinion carrier together with the reverse annulus gear, both of which are splined to the output shaft drive housing. The reverse planet pinion carrier is attached to and prevented from turning backward by an overrunning clutch and becomes stationary in forward drive (overruns on coast). Therefore, the reverse carrier pinions are forced to rotate in a forward direction and force the reverse annulus to rotate in the same direction transmitting the power flow to the output shaft with the combined ratio of the kickdown and reverse planetary gear sets of 2.45 to 1. See Figure 130.

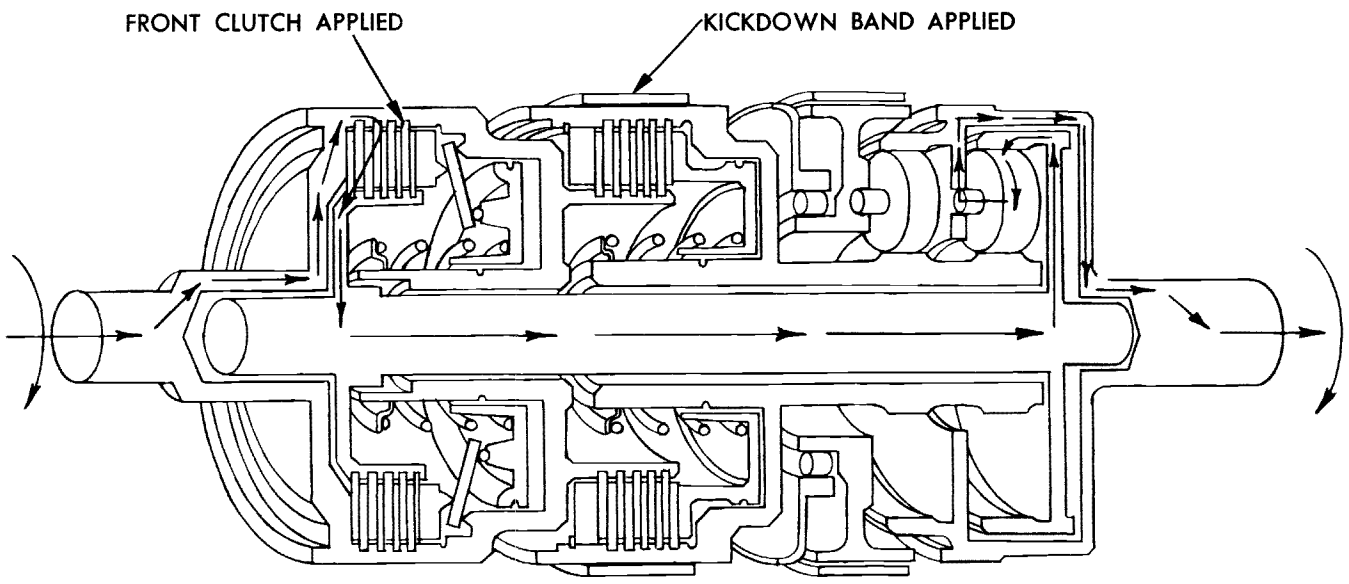
D (DRIVE) POSITION—2ND SPEED AND 2 (SECOND) POSITION—2ND SPEED

The power flow is from the torque converter turbine through the input shaft to the front clutch (which is applied).

From the front clutch through the intermediate shaft to the annulus gear of the kickdown (rear) planetary gear set. The kickdown band is applied which holds the sun gear stationary. The annulus gear drives the kickdown planet pinions which rotate in the same direction as the input and intermediate shafts. The kickdown planet pinions are meshed with the sun gear; therefore, they walk around this gear and exert force through the kickdown planet pinion shafts to rotate the kickdown planet pinion carrier. The carrier, which is splined to the output shaft drive housing, moves at a slower speed than the annulus gear, thus providing a gear ratio of 1.45 to 1. See Figure 131.

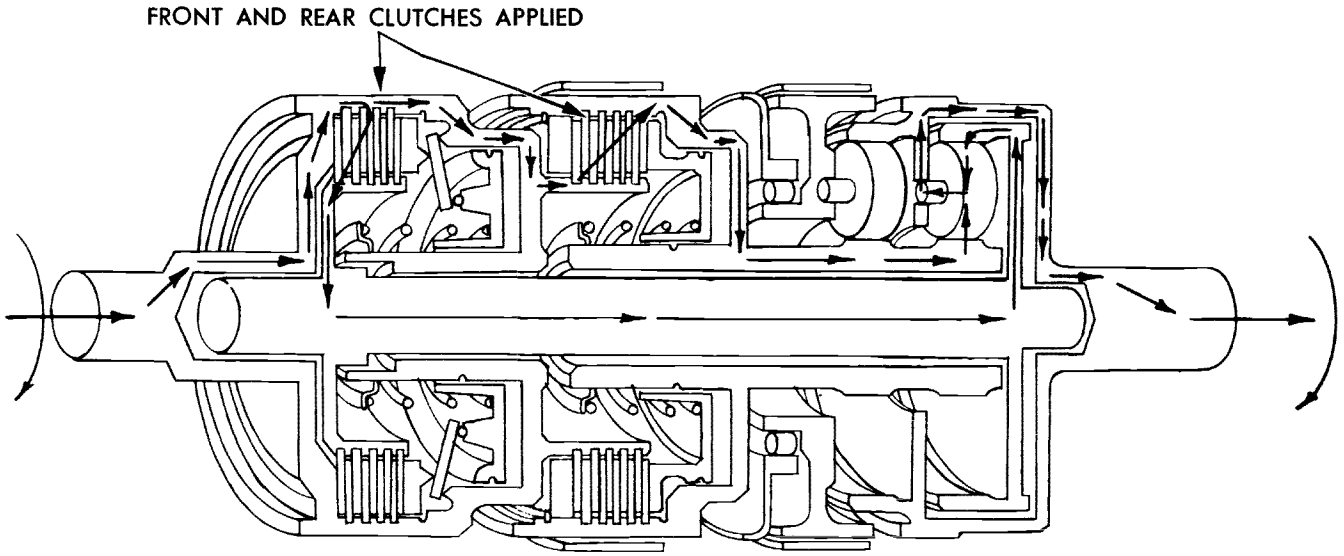
D (DRIVE) POSITION—DIRECT

The power flow from the torque converter goes directly through the transmission because the planetary elements of the gear train are locked up by two multiple disc clutches and both bands are released. The torque converter provides all of the torque multiplication. See Figure 132.



DRIVE POSITION–2ND ALSO 2ND SPEED IN 2ND POSITION 56x690

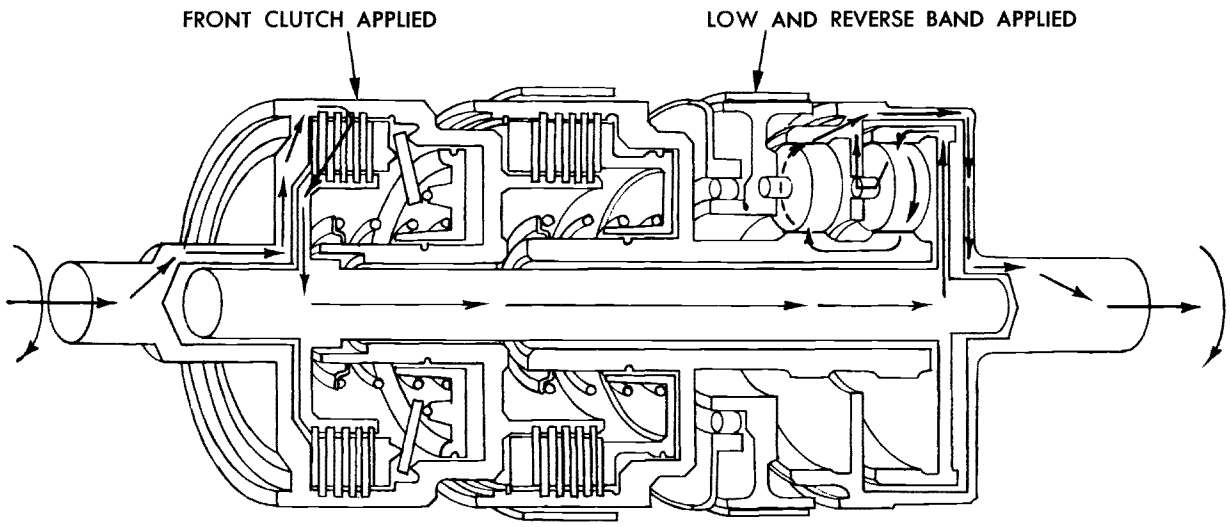
Figure 131—Power Flow in D (Drive) Position—2nd Speed and 2 (Second) Position—2nd Speed



DRIVE POSITION–DIRECT DRIVE 56x688

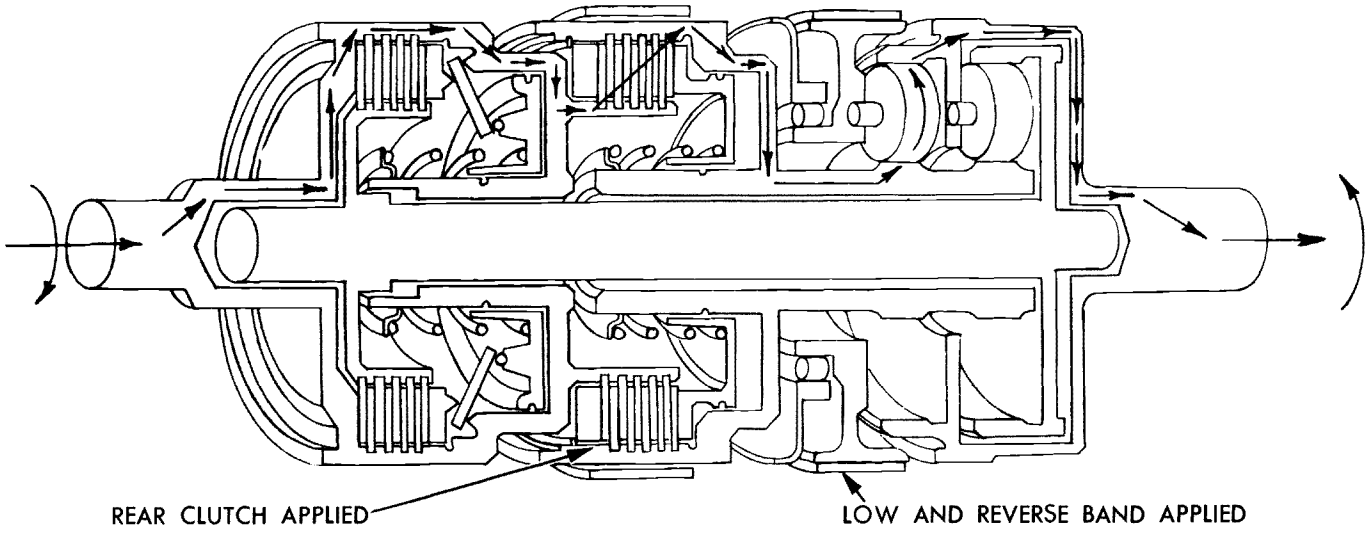
Figure 132—Power Flow in D (Drive) Position—Direct

Range	Ratio	Element Applied
D (Drive) position—(breakaway)	2.45	Front Clutch and Overrunning Clutch
D (Drive) position—second speed, 2 (Second) position—second speed	1.45	Front Clutch and Kickdown (Front) Band
D (Drive) position—direct	1.00	Front and Rear Clutches
R (Reverse) position	2.20	Rear Clutch and Low-Reverse (Rear) Band
1 (Low) position—low speed	2.45	Front Clutch and Low-Reverse (Rear) Band
N (Neutral)	——	No Elements Applied



LOW POSITION 1 LOW SPEED 56x691

Figure 133—Power Flow in 1 (Low) Position— Low Speed



REVERSE POSITION 56x692

Figure 134—Power Flow in R (Reverse) Position

KICKDOWN (FORCED DOWNSHIFT) IN D (DRIVE) POSITION BELOW 25 M.P.H.—This will force the transmission to downshift and the power flow will be the same as D (drive) position (breakaway).

KICKDOWN (FORCED DOWNSHIFT) IN D (DRIVE) POSITION 25 TO 70 M.P.H.—This will force the transmission to downshift and the power flow will be the same as D (drive) position 2nd speed.

1 (LOW) POSITION—LOW SPEED—In 1 (low) position the power flow is the same as D (drive) position (breakaway) or 2 (second) position (breakaway) with one exception, the low-reverse band is applied, locking the overrunning clutch to provide engine braking. See Figure 133.

R (REVERSE) POSITION—The rear clutch and the low-reverse band are applied. All other friction elements are released. The power flow is from the torque converter turbine through the input shaft to the rear clutch hub (part of the front clutch retainer). The rear clutch is splined to the reverse sun gear. The carrier of the reverse (front) planetary gear set is held stationary by the low-reverse band; therefore, the set acts as a simple reverse train through the reverse planet pinions to the reverse annulus (which is splined to the output shaft drive housing) and provides a reverse ratio of 2.20 to 1. See Figure 134.

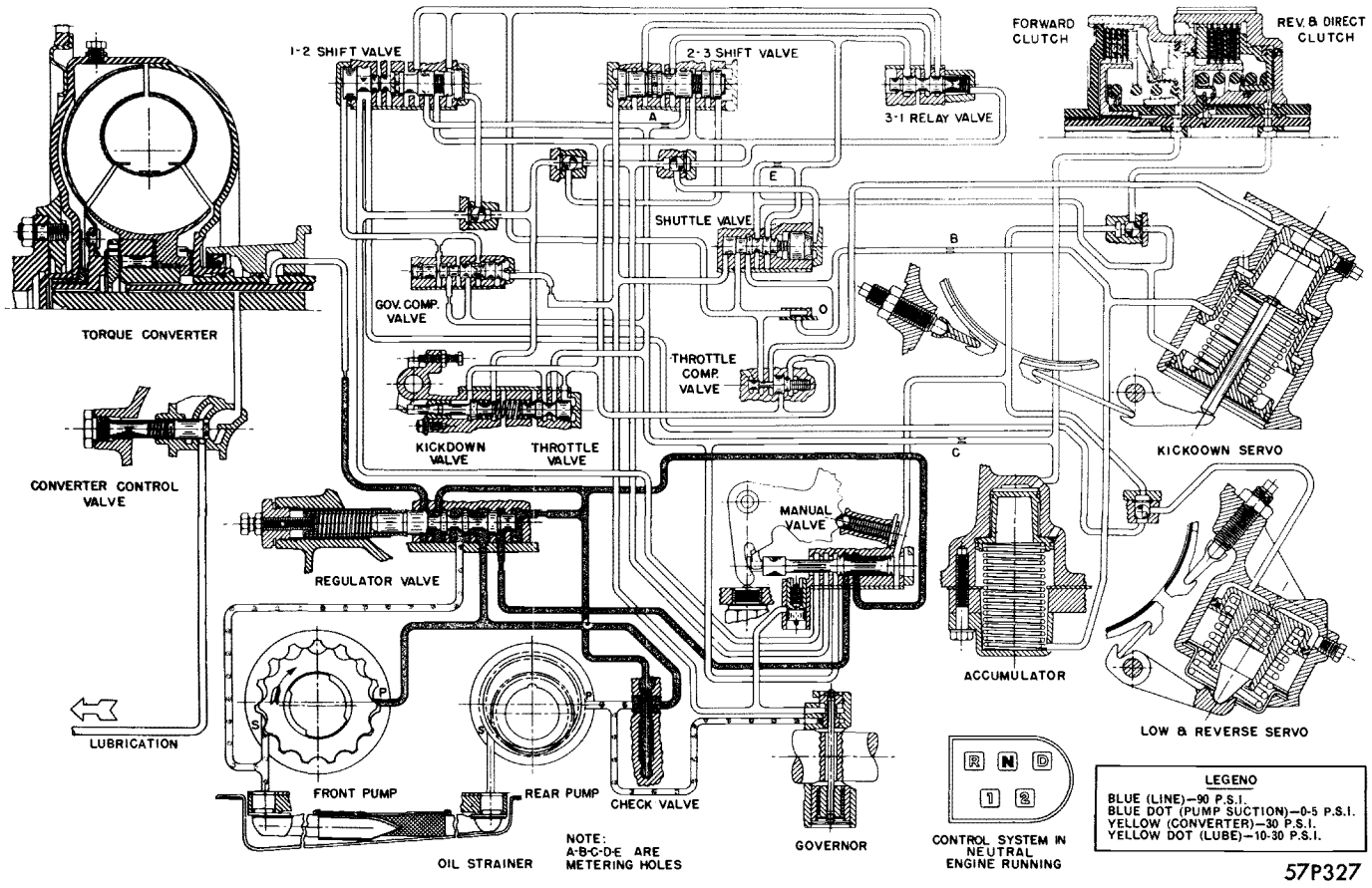


Figure 135—Hydraulic Circuit—N (Neutral)

N (NEUTRAL) POSITION

All friction elements are released. Hence, there is no drive connection between the engine and the rear wheels.

POWER FLOW SUMMARY

The chart summarizes power flow conditions in the various ranges as regards to gear train elements involved and the ratios obtained.

HYDRAULIC CONTROL SYSTEM

The hydraulic control system must furnish oil under pressure and route it at the proper time and rate to the proper piston device for engaging the transmission in the desired gear. This system is composed of different parts whose functions are interrelated.

In a general way, the components of any automatic control system may be grouped into the following basic components or units: Refer to Figures 135 through 141.

1. The pressure supply system.
2. The clutches and band servos.
3. The pressure regulating valves.
4. The flow control valves.

Taking each of these basic components or units in turn, the control system may be described as follows:

THE PRESSURE SUPPLY SYSTEM

FRONT PUMP—Under all normal operating conditions (up to a forward speed of approximately 35 M.P.H.) the front pump, driven at engine speed, provides oil needed for torque converter pressure, control pressures, and lubrication.

The front pump delivers oil at 90 P.S.I. to fulfill these condtions and also satisfy the normal amount of internal leakage in the transmission at all engine speeds above approximately 700 R. P. M. In reverse, the front pump pressure is increased to 225 P.S.I. in order to handle the high torque loads imposed during reverse operation.

REAR PUMP—The rear pump (smaller than the front pump and driven by the output shaft) furnishes all of

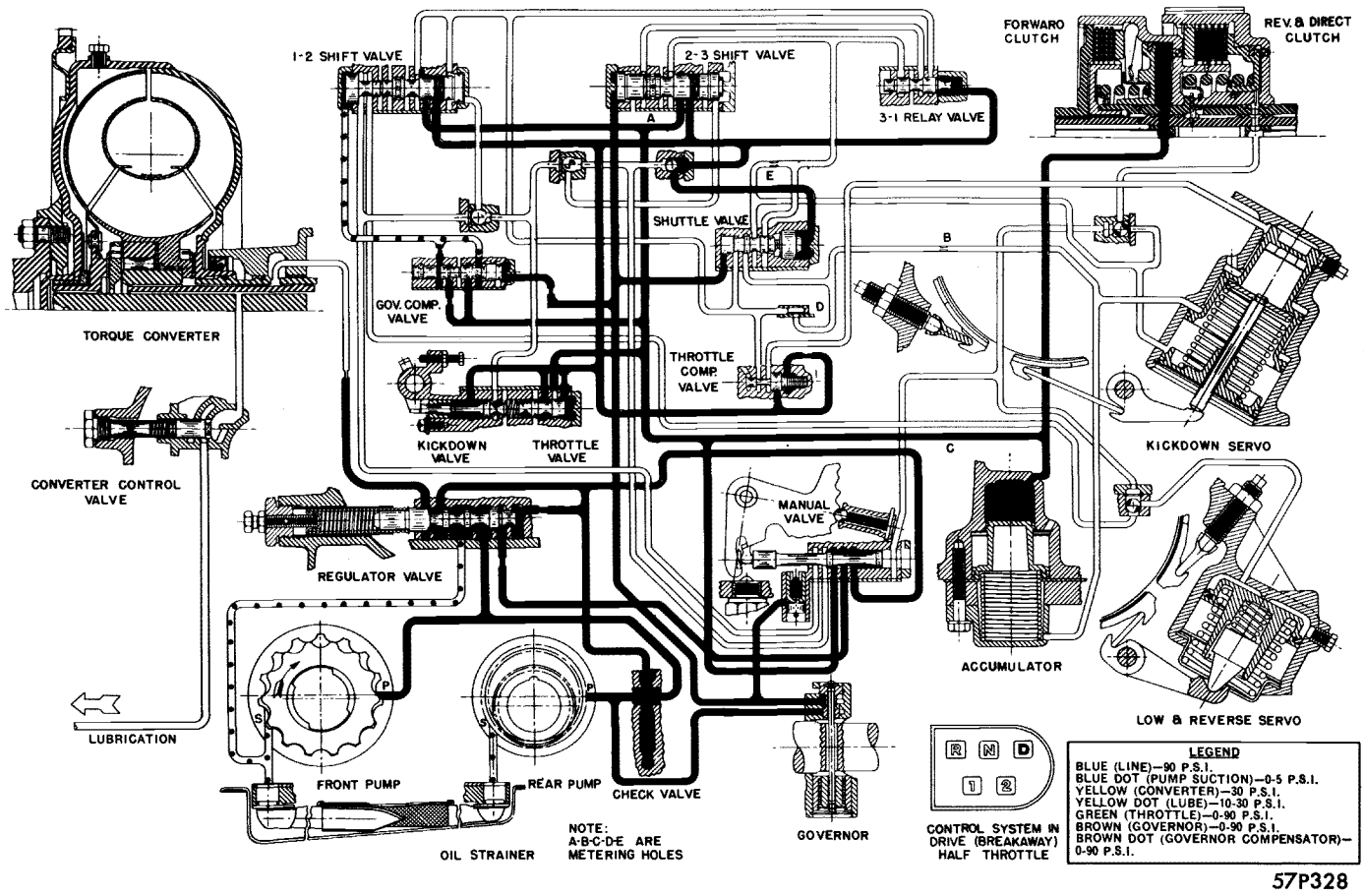


Figure 136—Hydraulic Circuit—D (Drive)—Breakaway

the oil required by the transmission in normal driving at all vehicle speeds above approximately 35 M.P.H. Rear pump oil pressure is routed to the regulator valve body through a drilled passage in the transmission case. The front clutch and low-reverse band are applied by the oil pressure developed by the rear pump when the engine is started by pushing.

CLUTCHES AND BAND SERVOS

FRONT CLUTCH—The front clutch transmits full engine and converter torque in all forward drive positions. The front clutch piston is moved hydraulically to engage the multiple disc clutch in all forward speeds. The clutch piston is released by means of the clutch return spring when feed of the control pressure is discontinued.

In order to develop the required capacity, a system of levers (4) is used to actuate the clutch apply plate.

Although no pressure is applied to the front clutch piston in reverse or neutral, oil is present in the clutch piston chamber. With high rotative speeds of the clutch retainer in reverse or neutral, it is possible to build up sufficient centrifugal oil pressure to move the clutch piston. To eliminate the possibility of clutch drag caused by such movement, the clutch check valve ball is unseated by centrifugal force and the oil in the chamber is allowed to escape. For normal application of the clutch, the flow of oil under controlled pressure into the clutch piston chamber is sufficient to seat the clutch check valve ball.

REAR CLUTCH

The rear clutch locks the gear train for direct drive operation in the forward range and transmits full input torque to the gear train in reverse operation. Rear clutch operation is similar to that of the front clutch. When making the power upshift from second to direct, the engagement of the clutch and disengagement of the kickdown band is accomplished by application of controlled pressure.

KICKDOWN SERVO

The kickdown piston actuates the kickdown band through the kickdown lever, strut, and anchor, holding the sun gear of the rear planetary set stationary and resulting in a forward ratio of 1.45 to 1 through the rear

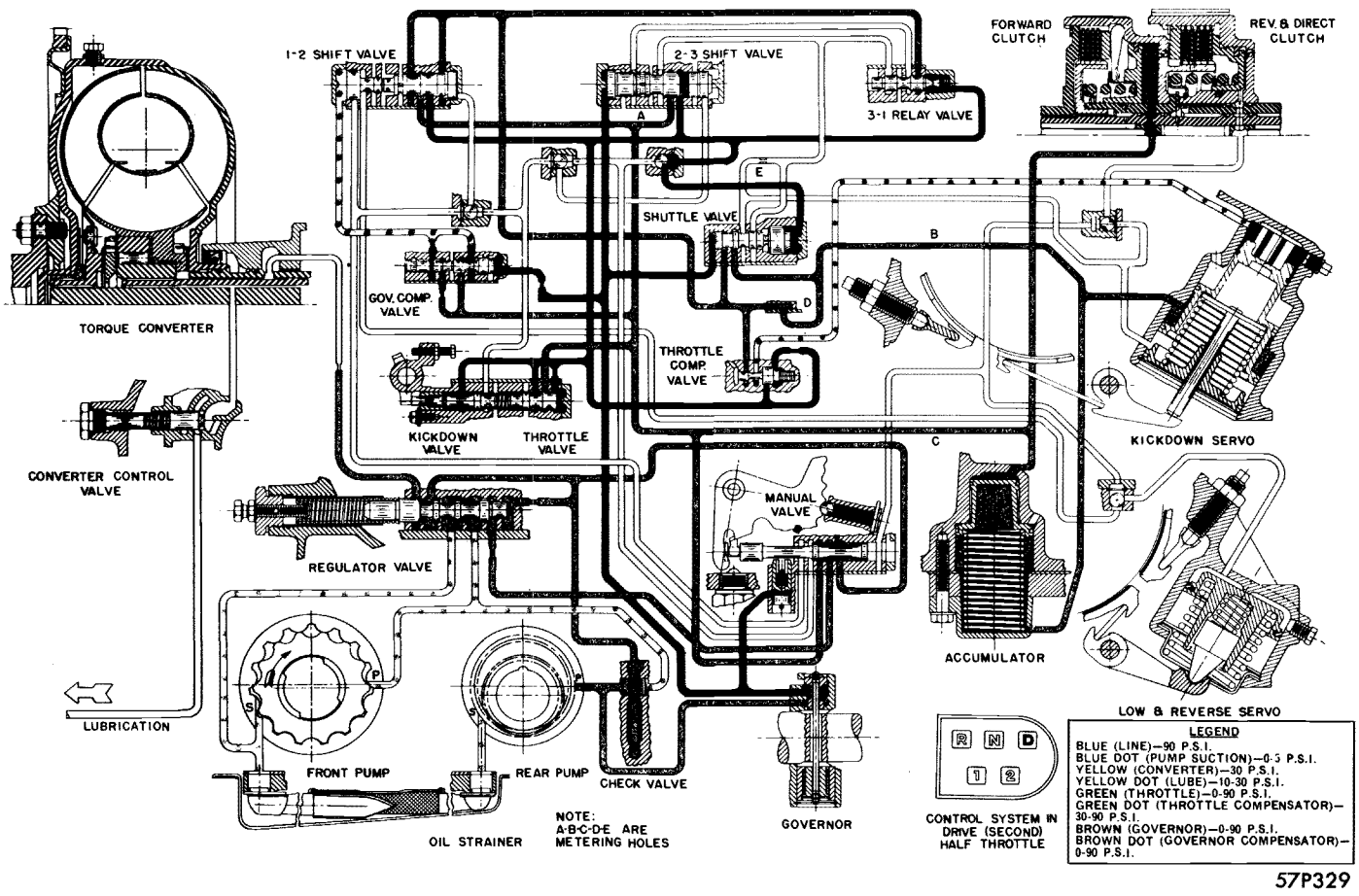


Figure 137—Hydraulic Circuit—D (Drive)—Second

planetary gear set. The kickdown piston is hydraulically applied in 2 (second) and D (drive) second (kickdown) by two controlled pressures—line pressure and throttle compensator pressure-acting on separate areas.

In N (neutral), 1 (low), D (drive) breakaway, and R (reverse) the kickdown piston is held released by the kickdown piston spring, there being no pressures applied to the kickdown piston at these times. In the D (drive) range, for the automatic upshift from second to direct drive, the kickdown piston is released by controlled pressure acting on the "off" area of the kickdown piston. The force of the pressure on the "off" area, assisted by the kickdown piston spring, is sufficient to overcome the forces of line pressure and throttle compensator pressure acting on the apply side of the kickdown piston.

Application of the kickdown piston when shifting from breakaway to second is softened by the accumulator.

LOW-REVERSE SERVO

The low-reverse servo has two functions which are performed independently. The low-reverse servo piston is moved hydraulically to apply the low-reverse band through the low-reverse band lever, strut, and anchor. The results are:

1—To hold the carrier of the front planetary gear set stationary while the rear clutch (applied) drives the sun gear. This provides a reverse ratio of 2.20 to 1 through the front planetary gear set. See Figure 134.

2—To hold the carrier of the front planetary gear set stationary while the front clutch (applied) drives the intermediate shaft and kickdown annulus. This provides the 1 (low) range operation at a ratio of 2.45 to 1 through both planetary gear sets, see Figure 133, which may be used for engine braking. Initial engagement of the low-reverse servo (when shifting from neutral to low or reverse) is softened by compression of the low-reverse servo cushion spring. The servo piston is released by a return spring when the source of apply pressure is discontinued.

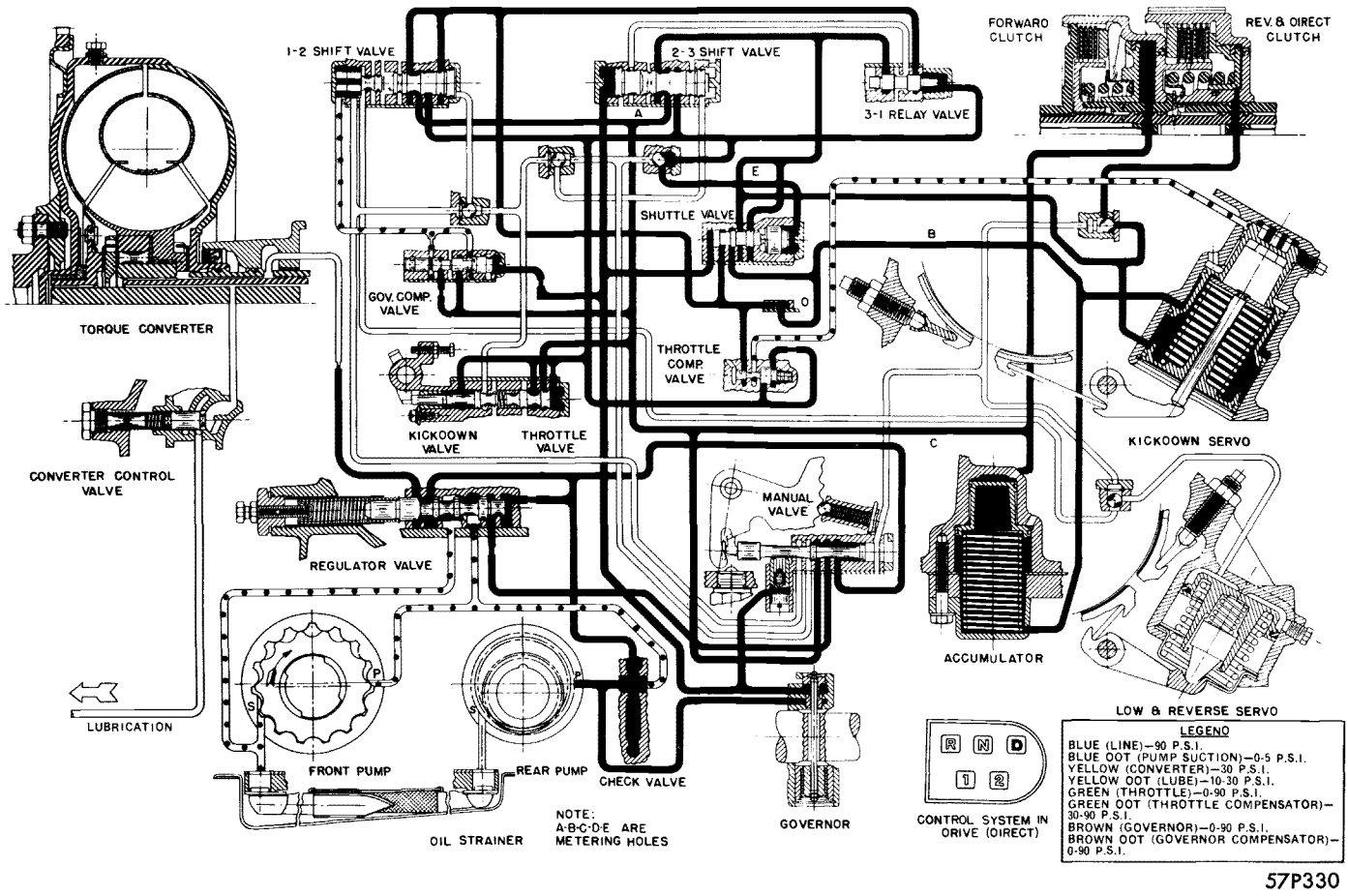


Figure 138—Hydraulic Circuit—D (Drive)—Direct

ACCUMULATOR

An accumulator cushions the application of the kickdown band in the upshift from breakaway to second. It is connected in parallel and to the passage which supplies line pressure to the apply side of the kickdown servo.

In neutral and reverse the accumulator piston is held released by the accumulator spring, there being no pressure applied to the piston at these times.

In the D (drive) range, for the automatic upshift from breakaway to second, the accumulator piston is again moved by line pressure (kickdown servo apply) acting on the large end of the piston. The force of line pressure assisted by the accumulator spring is sufficient to overcome the force of line pressure (front clutch) which is acting on the small area of the accumulator piston. This action cushions the application of the kickdown band.

PRESSURE REGULATING VALVES

The regulator valve controls line pressure at a value of approximately 90 P.S.I. for all operating conditions except reverse. Line pressure, which is supplied by the front pump (at car speeds under 35 M.P.H.) is routed directly to a primary reaction area in the regulator valve body. For all conditions except reverse, line pressure is also routed through the front valve body to the secondary reaction area. A line pressure of 90 P.S.I. (acting on the two reaction areas) is sufficient to overcome the force of the regulator valve spring and move the valve to the position that will allow oil to flow through a restricting hole in the regulator valve body to the torque converter.

If the oil flow from the front pump exceeds the amount necessary to feed the torque converter and transmission, line pressure will rise slightly, causing the regulator valve to move to a new position where excess oil from the front pump pressure port is allowed to dump into the front pump suction port.

Above a car speed of approximately 35 M.P.H., the rear pump furnishes the oil needed by the torque converter and transmission at a line pressure of 90 P.S.I. When this condition is reached, the pressure increases slightly and the regulator valve moves over to a new

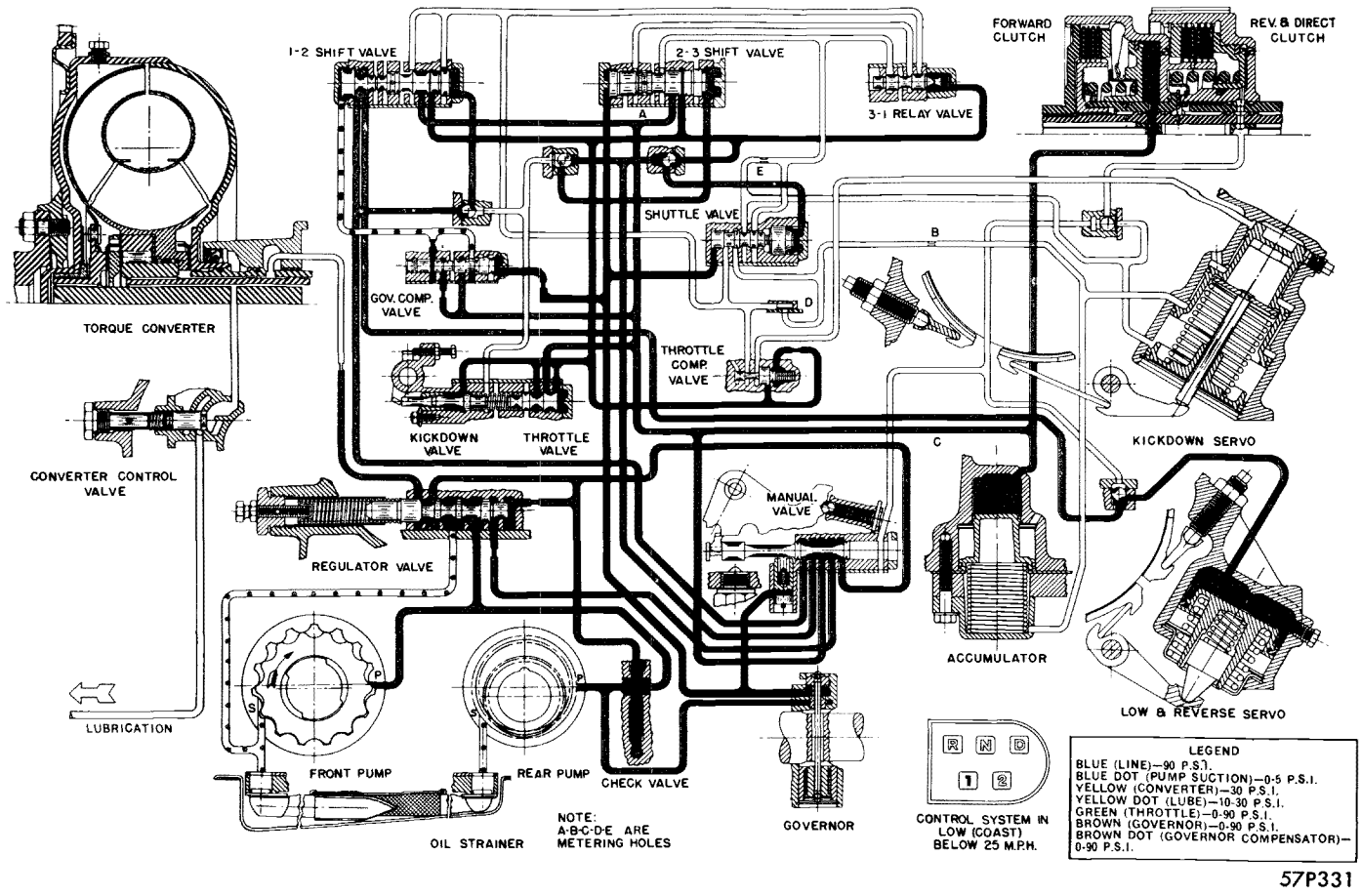


Figure 139—Hydraulic Circuit—1 (Low)—Low

position where the excess flow is dumped from the line pressure post into the front pump suction port. Under this condition the front pump check valve closes and all of the oil pumped from the front pump is dumped back through the large valve opening into the front pump suction port. Thus the front pump turns with reduced effort since it is operating at a low pressure.

For reverse operation, oil must be at a pressure of 225 P.S.I. This is accomplished by shutting off the source of line pressure to the secondary reaction area, with the result that a line pressure of 225 P.S.I. applied to the primary reaction area is required to overcome the force of the regulator valve spring.

TORQUE CONVERTER CONTROL VALVE

This valve maintains an oil pressure of 30 P.S.I. within the torque converter. Oil is fed from the regulator valve through a restricting hole in the regulator valve body to the torque converter. The oil flows through the torque converter and returns to the regulator valve body where the converter pressure is regulated by the torque converter control valve. When the torque converter pressure rises to 30 P.S.I., the control valve will move against the spring load and allow oil to flow to the lubrication circuit. Torque converter pressure acts on the valve's reaction area such that if it exceeds 60 P.S.I., the valve is moved further against the spring load, permitting excess oil from the converter to by-pass into the oil pan. From the torque converter control valve, oil is routed through the transmission lubrication system to lubricate the gear train.

GOVERNOR VALVE

The governor valve assembly transmits a hydraulic pressure to the transmission which is proportional to car speed. This governed pressure, in conjunction with throttle pressure, controls upshift and downshift speeds. The governor is so mounted on the output shaft that when the output shaft rotates, the governor weight assembly exerts a centrifugal force on the governor shaft. The governor shaft transmits this force to the governor valve. Oil is allowed to flow from the line pressure in the governor circuit and against the valve reaction area sufficient to balance the centrifugal force of the weight.

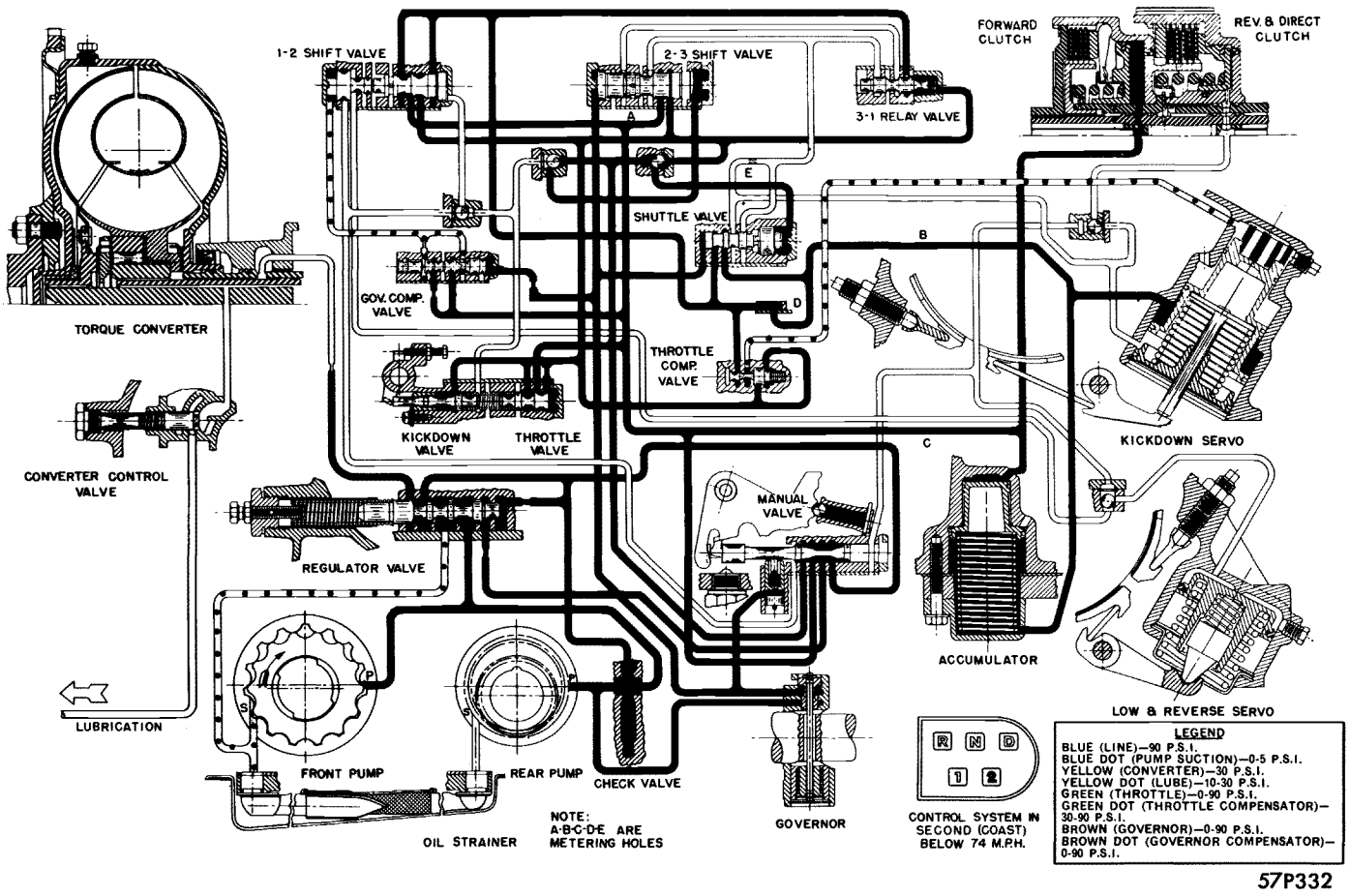


Figure 140—Hydraulic Circuit—2 (Second)—Second

The greater the vehicle speed, the greater is the centrifugal force of the weights, and hence the greater the governor pressure necessary to balance the centrifugal force. If the vehicle speed decreases, the decrease in centrifugal force allows the valve to move out slightly, venting excess oil and bringing the governor once more in balance at a lower pressure.

The governor weight assembly is constructed so that for vehicle speeds under approximately 25 M.P.H., both weights act as a unit, with the result that small changes in vehicle speed result in comparatively large changes in centrifugal force and governor pressure. Above approximately 25 M.P.H., the primary weight moves outward against the preload of the spring and bottoms against the snap ring leaving only the secondary weight active. Small variations in vehicle speed above approximately 25 M.P.H., therefore, result in only small variations in governor pressure.

Governor pressure is routed to the governor pressure ports of the governor compensator valve, shuttle valve, and the 2-3 shift valve governor plug.

GOVERNOR COMPENSATOR VALVE

This valve is designed to produce a pressure relative to governor pressure to fulfill the requirements of the 1-2 shift pattern. The governor compensator valve train consists of valve, spring and plug.

The governor compensator valve allows oil to flow from the line pressure port to the governor compensator valve pressure port. Governor pressure acts on one end of the compensator valve while the plug (with governor compensator and line pressure) acts on the other. At low vehicle speeds (low governor pressure) the plug is inactive, and the governor compensator pressure is approximately 2½ times greater than governor pressure.

As vehicle speed increases, governor compensator pressure will move the plug against the valve. When governor compensator pressure reaches 40 P.S.I., approximately 20 M.P.H., the plug becomes active. When this happens the governor compensator pressure then becomes approximately 1½ times greater than governor pressure. Governor compensator pressure is routed to the 1-2 shift valve governor plug.

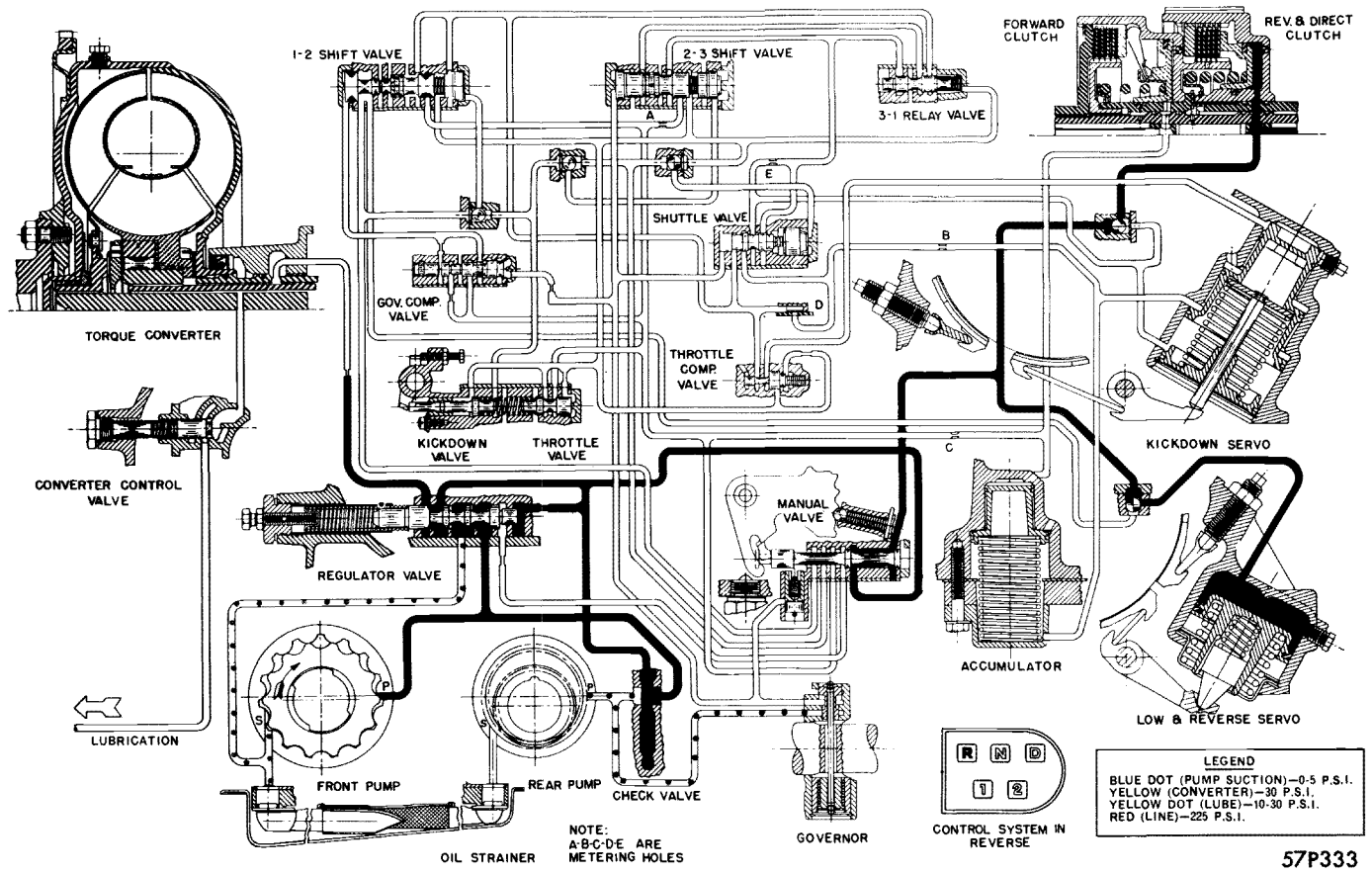


Figure 141—Hydraulic Circuit—R (Reverse)

THROTTLE VALVE

The throttle valve assembly transmits a hydraulic pressure to the transmission which is proportional to the amount of throttle opening. The throttle valve lever shaft is rotated in proportion to the amount of throttle opening of the carburetor by a linkage connecting the throttle valve lever shaft to the car's throttle linkage. The throttle valve lever shaft positions the kickdown valve and throttle valve spring in accordance with the amount of carburetor throttle opening, the spring being free (no load) at closed throttle and compressed at wide open throttle. Therefore, the throttle valve spring exerts a force on the throttle valve that increases wih carburetor throttle opening.

The throttle valve allows oil to flow from the line pressure port to the throttle pressure port which is connected by a passage to the reaction area of the throttle valve. Throttle pressure will build up in the throttle pressure circuit against the reaction area until it reaches a value great enough to balance the force of the throttle valve spring. If throttle pressure builds up too high, the throttle valve will move slightly to a position such that excess oil is allowed to escape through the vent port.

Throttle pressure will vary with the amount of carburetor throttle opening from a value of 0 (zero) pressure at closed throttle to a value of approximately 90 P.S.I. at wide open throttle. Throttle pressure is routed to the following places:

1. Throttle pressure port of the kickdown valve.
2. Throttle pressure port of the throttle compensator valve.
3. Through check valve to throttle pressure port of the shuttle valve plug.
4. To the throttle pressure port of the 3-1 relay valve.
5. To the throttle pressure port of the 2-3 shift valve kickdown plug.
6. To the throttle pressure port of the 1-2 shift valve kickdown plug.

THROTTLE COMPENSATOR VALVE

The throttle compensator valve amplifies the variations in throttle pressure. It allows oil to flow from the

line pressure port of the 1-2 shift valve (in the upshifted position) to the throttle compensator valve pressure port. Throttle compensator pressure is controlled by throttle pressure and spring force acting on one end of the valve against a reaction area fed by compensator pressure. Throttle compensator pressure will vary with the amount of carburetor throttle opening from a value of approximately 30 P.S.I. at closed throttle to a value of 90 P.S.I. at approximately ¾ throttle. This arrangement makes it possible to more closely obtain the variations required for the 1-2 and 2-3 shifts. Throttle compensator pressure is routed to the throttle compensator pressure area of the kickdown servo.

FLOW CONTROL VALVES

FRONT AND REAR PUMP CHECK VALVES — The front pump valve prevents back flow from line pressure into the pressure side of the pump when the pump is either stationary or merely circulating oil at a very low pressure.

The rear pump check valve allows oil to flow from the rear pump into the control system of the transmission. However, due to the metering hole in the valve, it restricts back flow from line pressure into the pressure side of the pump when the pump is stationary or rotating backwards. The front and rear pump check valves are combined as a leaf spring unit and mounted in the regulator valve body behind the front pump.

MANUAL VALVE

The manual valve selects the different transmission drive ranges as dictated by the vehicle operator. The manual valve is moved by a cable which is connected to the push button control unit on the instrument panel. It is held in these positions by the force of a spring-loaded detent ball.

When the N (neutral) button is pushed in, the manual valve is positioned so that line pressure from the regulator valve is routed to the secondary and primary reaction areas of the regulator valve. Line pressure is, therefore, 90 P.S.I. but neither the bands nor the clutches are applied.

When the R (reverse) button is pushed in, the manual valve shuts off line pressure to the secondary reaction area of the regulator valve and routes line pressure (at 225 P.S.I.) to the rear clutch and low-reverse servo.

When the D (drive) button is pushed in, the manual valve is positioned to route line pressure to the following places:

1. The secondary reaction area of the regulator valve (making line pressure 90 P.S.I.).

2. The line pressure port of the throttle valve.

3. The line pressure ports of the governor compensator valve and plug.

4. The line pressure port of the 1-2 shift valve and through metering hole "A" to the line pressure port of the 2-3 shift valve.

5. Through metering hole "C" to the line pressure area of the accumulator and front clutch.

When the 2 (second) button is pushed in, the manual valve routes line pressure to the same places as in D (drive) and to the following additional places:

1. Through ball check valve to the kickdown pressure port of the 2-3 shift valve kickdown plug.

2. Through ball check valve to the throttle pressure port of the shuttle valve plug.

When the L (low) button is pushed in, the manual valve routes line pressure to the same places as in 2 (second) and the following additional places:

1. The low pressure port of the 1-2 shift valve governor plug and through the ball check valve to the low-reverse servo.

2. Through ball check valve to the kickdown pressure port of the 1-2 shift valve kickdown plug.

1-2 SHIFT VALVE

This valve determines whether the transmission is either in low gear ratio or second gear ratio, depending upon whether the valve is in the upshifted or downshifted position. The 1-2 shift valve train (consisting of shift valve kickdown plug, valve spring, shift valve and governor plug) is normally at either extreme of its travel. With the valve train downshifted (at the extreme of travel toward the governor compensator pressure end of the rear valve body) any oil in the kickdown servo apply area is allowed to escape through the vent port.

When the shift valve train is moved to the opposite extreme of its travel, the vent port is closed off and oil is fed by line pressure to the following places:

1. 3-1 relay valve.

2. Line pressure port of the shuttle valve.

3. Line pressure port of the throttle compensator valve.

4. Through servo pressure bleed valve "D" to the kickdown servo apply pressure port of the shuttle valve.

5. The apply area of the kickdown servo.

6. The accumulator.

7. Line pressure port of the 1-2 shift valve kickdown plug.

The kickdown piston and accumulator are so designed that the value of the "balance pressure" is sufficient to complete a smooth band application during the time required to stop the rear clutch retainer. After completion of the 1-2 shift, the servo apply pressure rises further to the value of line pressure, providing a "safety margin" of band load.

At line throttle (low throttle pressure), the shift valve is made to upshift at approximately 10 M.P.H. and "balance pressure" is at a low value corresponding to the small force of throttle compensator pressure on the kickdown piston. The resulting band application load is, therefore, in proportion to the light throttle engine output. At wide open throttle (90 P.S.I. throttle pressure), the shift valve upshifts at approximately 40 M.P.H. and throttle compensator pressure is at a high value, applying the band at a load corresponding to a high engine output.

With the 1-2 shift valve train in the upshifted position, throttle pressure is not allowed to act on the end of the shift valve. Instead, any oil trapped in that area is allowed to vent through the drilled hole in the shift valve. The shift valve spring then exerts the only force on the "throttle pressure end" of the shift valve. At throttle openings less than wide open, the shift valve will downshif to breakaway when vehicle speed drops to a point where the governor compensator pressure can no longer overcome the force of the shift valve spring. This downshift occurs at a vehicle speed of approximately 7-11 M.P.H.

All that is required of the 1-2 shift valve for low range operation is that it must downshift below kickdown limit in response to the movement of the push button to low position and remain downshifted regardless of vehicle speed. The shift valve is forced to downshift by the application of line pressure from the low port of the manual valve around the ball check valve to the kickdown pressure port of the 1-2 shift valve kickdown plug. To insure that the shift valve remains downshifted regardless of car speed, line pressure is also allowed to flow to the low port of the 1-2 shift valve governor plug.

It is necessary that whenever the forces of governor pressure and throttle pressure act on the shift valve to cause an upshift, the valve must "snap" from one position to the other without hesitating or "hunting." This is accomplished by a differential area which is subjected to supply pressure when the valve is upshifted. When the valve is upshifted, throttle pressure is cut off so that normal downshifts are not throttle sensitive.

2-3 SHIFT VALVE

This shift valve automatically shifts the transmission from intermediate to direct gear. The 2-3 shift valve train is similar in construction and operation to the 1-2 shift valve train, in that it is controlled by governor and throttle pressures and spring force. When the valve train is in the upshifted position, oil is fed by line pressure through metering hole "A" to the following places:

1. 3-1 relay valve.

2. Through or around metering hole "E" (depending on shuttle valve position) to the "off" area of the kickdown servo and through the ball check valve to the rear clutch piston.

With the shift valve downshifted (at the extreme of travel toward the governor pressure end of the rear valve body) any oil in the rear clutch chamber and the kickdown servo "off" area is allowed to escape through the vent port.

3-1 RELAY VALVE

This valve assures a 3-1 downshift. The 3-1 relay valve is a valve arranged so that the 2-3 shift valve is coupled to the 1-2 shift valve during downshift at light throttle. Under these conditions line pressure from the 2-3 shift valve acting on the 3-1 relay valve overcomes the forces of throttle and spring pressure moving the valve to the throttle pressure end. In this position, line pressure from the 1-2 shift valve is permitted to act on the 2-3 shift valve governor plug forcing it against governor pressure to the downshift position and on the governor plug end of the 2-3 shift valve holding the 2-3 shift valve in the upshift position regardless of governor pressure.

As car speed decreases and governor compensator pressure can no longer overcome the force of the 1-2 shift valve spring, the two shift valves will downshift at the same time resulting in a smooth 3-1 downshift.

KICKDOWN VALVE

The kickdown valve makes possible a forced downshift from direct to second—second to breakaway and direct to breakaway by depressing the accelerator pedal past the detent "feel" near wide open throttle.

It is desirable to limit the maximum vehicle speed at which kickdowns may be made (approximately 70 M.P.H. from drive to second and approximately 25 M.P.H. from drive to second to breakaway). The kickdown detent plug on the stem of the kickdown valve supplies the resistance necessary for a detent "feel" at kickdown. With the kickdown valve in the kickdown position, throttle pressure is routed to the following places:

1. Through ball check valve to the 1-2 shift valve kickdown plug.

2. Through ball check valve to the 2-3 shift valve kickdown plug.

This pressure, when applied to the end of the kickdown plugs, is great enough to make the shift valves downshift against the force of any governor, or governor compensator pressure up to the kickdown limit speeds.

SHUTTLE VALVE, SHUTTLE VALVE PLUG, AND SERVO PRESSURE BLEED VALVE

The shuttle valve has two separate functions and perform each independently of the other. The first is that of providing fast and smooth rear clutch engagement when the driver makes a "lift-foot" upshift from second to direct.

The "lift-foot" upshift is made by accelerating the vehicle in breakaway or second gear and then returning the accelerator pedal to closed throttle. Without the shuttle valve, the resulting upshift to direct would consist of a series of lurches, caused first by the braking effect on the vehicle of the second gear and then by the harsh engagement of the rear clutch.

Under conditions of closed throttle (no throttle pressure) and moderate vehicle speed (moderate governor pressure) the shuttle valve and shuttle valve plug are forced to their extreme of travel (toward the throttle end of the front valve body). In this position, oil is allowed to flow from the kickdown servo apply pressure port to the rear clutch pressure port and kickdown servo "off" area. Because the line pressure apply area of the kickdown servo is being fed oil only through the hole in the servo pressure bleed valve, pressure on this area drops to a low value while oil from the 2-3 shift valve builds up pressure on the rear clutch and the "off" area of the kickdown servo. The kickdown band load is then reduced sufficiently to allow a smooth band release. In the meantime, pressure in the rear clutch has built up sufficiently to complete a smooth engagement.

The second function of the shuttle valve is to regulate the application of the kickdown piston when making high speed (above approximately 30 M.P.H.) kickdowns. Kickdowns made at low vehicle speds require very little time in which to complete the shift due to the comparatively small change in engine speed between direct and kickdown gear. The higher the vehicle speed at which the kickdown is made, the longer is the time required to make a smooth shift.

The force of the shuttle valve spring is great enough so that the combined force of line pressure on the shuttle valve reaction area and governor pressure (at vehicle speeds under approximately 30 M.P.H.) on the governor pressure area cannot move the shuttle valve toward the shuttle valve plug. Thus, for kickdowns below 30 M.P.H., oil is fed to the line pressure area of the kickdown servo through both the hole in the servo pressure bleed valve and the line pressure and servo pressure ports of the shuttle valve. Speed of kickdown piston application is then at its maximum.

As further insurance against the engine "running away" during low speed kickdowns, rear clutch disengagement is delayed while the kickdown piston is applying the band. This is accomplished by the introduction of a restriction (metering hole "E") placed such that oil is "backed up" into the clutch chamber as the kickdown piston moves on. This "back up" pressure is greatest on low speed kickdowns when the kickdown piston applies rapidly and is sufficient to hold the clutch applied until the kickdown band is applied. At this time, the kickdown piston can no longer force oil into the clutch and the pressure is allowed to fall to zero.

For kickdowns at higher vehicle speeds, governor pressure attains a sufficient value to move the shuttle valve toward the shuttle valve plug, cutting off the feed of line pressure to the shuttle valve. Oil must then flow to the apply pressure area of the kickdown servo only through the hole in the servo pressure bleed valve. Kickdown piston application is, therefore, retarded.

If on high speed kickdown, the servo pressure drops below the proper value (due to restricted flow through the servo pressure bleed valve hole) the drop in force of servo pressure on the shuttle valve reaction area causes the shuttle valve to move back toward the governor pressure end of the valve body, allowing enough oil to flow from the line pressure area of the shuttle valve to maintain servo pressure at the desired value during servo piston application.

OPERATIONAL SUMMARY

With the D (drive) button pushed in, the manual valve is positioned to give the full range of operation of the transmission. With the manual valve in the drive position, the front clutch is pressurized and the transmission will transmit drive torque in breakaway.

At a speed which is dependent on throttle position (approximately 7-11 M.P.H. at closed throttle, 19-24 M.P.H. at detent, 27-42 M.P.H. at wide open throttle), the transmission automatically upshifts to second gear. The change is initiated by movement of the 1-2 shift valve to the upshifted position so that pressure is directed to the apply side of the kickdown servo. When the kickdown band develops sufficient capacity to slow the rear clutch retainer, the overrunning clutch starts to free roll, so release of the previous reaction member is automatic. The band application during the shift is controlled by action of the accumulator.

At a speed which is again dependent on throttle position (approximately 11-15 M.P.H. at closed throttle, 40-55 M.P.H. at detent, 59-71 M.P.H. at wide open throtle), the transmission makes an upshift to direct. This action is initiated by movement of the 2-3 shift valve. The upshift is accomplished by simultaneous disengagement of the kickdown band and engagement of the rear clutch.

Forced 3-2 shift is obtainable below approximately 27 M.P.H. Normal downshifts are not throttle sensitive and above half-throttle, they occur in sequence (3-2 at approximately 11-15 M.P.H. and 2-1 at approximately 7-11 M.P.H.). At throttle openings less than half-throttle the two shift valves are interlocked by means of the 3-1 relay valve and the shift occurs as a 3-1 relay sequence at the normal 2-1 downshift speed. This action provides a smooth downshift since the overrunning clutch is free rolling in breakaway.

Pushing in the 2 (second) button of the control unit moves the manual valve so that line pressure is directed to the kickdown circuit of the 2-3 shift valve. When in direct, this results in a downshift to second speed only if the vehicle speed is below 3-2 kickdown limit. If the vehicle is accelerated in second gear to the wide open throttle upshift speed, an upshift to direct will occur, thus eliminating over-speeding the engine in second gear. Operation of the 1-2 and 2-1 shift occur in the same manner as in the D (drive) position.

Pushing in the 1 (low) button of the control unit positions the manual valve so that line pressure is directed to the kickdown circuit of the 1-2 shift valve. This results in a downshift to low only if the vehicle speed is below the 3-1 kickdown limit. Use of 1 (low) is intended primarily for engine braking so it is also necessary that the low-reverse band be engaged to lock the overrunning clutch. Line pressure from low port of the manual valve is fed to the low port of the 1-2 shift valve governor plug where it is blocked until compensated governor pressure drops sufficiently so that line pressure at the kickdown plug overcomes it and the complete valve train shifts down. After the downshift, pressure at the low port of the governor plug is permitted to react on an area of the governor plug and also directed to the low-reverse servo. Then the line pressure, acting on the combined areas of the governor plug and the kickdown plug, prevent an upshift—regardless of vehicle speed.

Pushing in the N (neutral) button moves the manual valve to a position which shuts off oil flow to the valve bodies. The torque converter and lubrication system remain pressurized.

Pushing in the R (reserve) button of the control unit positions the manual valve so that oil pressure is directed to apply the rear clutch and the low-reverse band. In order to transmit the high torque loads involved in reverse operation, the system pressure is raised to 225 P.S.I. by venting of the secondary reaction area of the regulator valve.

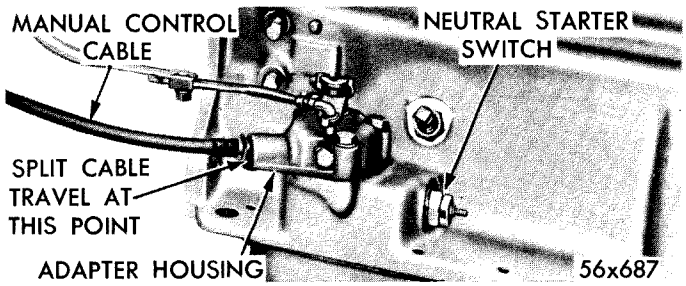


Figure 142—Manual Control Cable Adjustment

16. TORQUEFLITE ADJUSTMENTS AND TESTS

For lubrication reuirements of the TorqueFlite Transmission, refer to the Lubrication Section of this manual.

CHECKING FOR OIL LEAKS

If the transmission is leaking fluid, the following points should be checked.

LEAKS REPAIRED WITH TRANSMISSION IN VEHICLE

1. Transmission output shaft rear bearing oil seal.
2. Extension gasket.
3. Speedometer pinion assembly in extension.
4. Oil pan to filler tube connector.
5. Oil pan to transmission case.

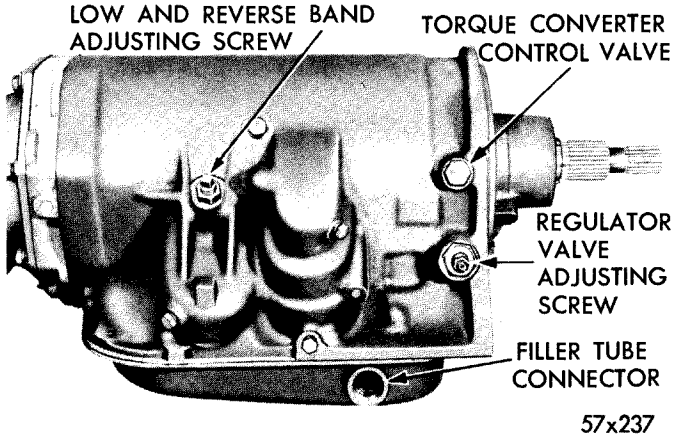


Figure 143—Transmission Case (Right Side)

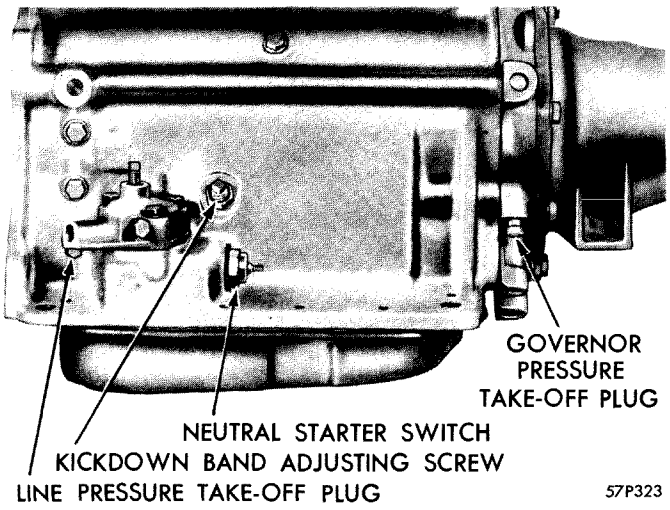


Figure 143A—Transmission Case (Left Side)

6. Regulator valve and torque converter control valve spring retainers. Also regulator valve adjusting screw.

7. Gearshift control cable seal and housing gasket.

8. Governor, line, lubrication and real clutch apply pressure check plugs in transmission case or support (pressure test holes). Refer to Figure 143.

9. Neutral starting switch.

10. If oil is found inside torque converter housing, determine whether it is Automatic Transmission Fluid or engine oil. Check torque converter drain plug for tightness.

Leaks at these locations should be corrected, regardless of how slight. Correct by tightening loose screws or plugs. Where this does not remedy the situation, replace faulty gaskets, seals or plugs.

LEAKS REQUIRING REMOVAL OF TRANSMISSION FROM VEHICLE

1. Sand hole in transmission case.

2. Sand hole in front oil pump housing.

3. Front oil pump housing screws or damaged sealing washers.

4. Front oil pump housing oil seal.

5. Front oil pump housing seal (located on outside diameter of front oil pump housing).

6. Torque converter.

Leaks at these locations may be corrected by tightening loose bolts or replaceing damaged or faulty parts.

PUSH BUTTON CONTROL CABLE—ADJUSTMENT

The procedure for adjusting the manual control cable for proper operation of manual lever is as follows:

(R) Reverse button must be depressed and held all the way in during the adjustment. Loosen cable lock clip screw at the transmission, push the cable in until it stops then release the cable. Tighten the cable clip screw, making sure cable housing is not forced in or out during adjustment. See Figure 142.

To check for proper adjustment, push the various push buttons, return to (N) neutral each time while checking the starter operation. Engine should start only when (N) neutral button is depressed.

THROTTLE LINKAGE ADJUSTMENT

Proper adjustment of the transmission throttle linkage is very important for proper operation of the transmission. Therefore, the following procedure should be very carefully performed:

FOUR BARREL

1. With engine at operating temperature and adjusted to 475-500 R.P.M., loosen throttle linkage adjusting nut on rod from bellcrank to intermediate throttle control. 2. Hold light preload rearward on rod so that throttle valve lever is against the stop in the transmission.

3. Tighten throttle adjusting nut.

4. Adjust accelerator pedal rod by removing pedal to accelerator shaft rod at the pedal arm. Loosen lock nut and turn ball and socket end of rod in the direction required to adjust the pedal so that wide open throttle is obtained when the pedal is depressed just down to the floor mat but not compressing it.

TWO BARREL

All operations are the same as the four barrel, except that, since there is no intermediate throttle control assembly, adjustment is made on the bellcrank to carburetor rod.

TRANSMISSION BAND ADJUSTMENTS

KICKDOWN BAND (FRONT) — The kickdown band adjusting screw is located on the left side of the transmission case, as shown in Figure 143. Using a ¾ inch wrench, loosen the locknut. Check the freeness of the adjusting screw in the transmission case. If free, use inch-pound torque-wrench, Tool C-3380 (with extension C-3583). Because of the added leverage afforded by extension C-3583, set the click device on the indicator at 47-50 inch-pounds, then tighten adjusting screw to this torque (disregard multiplication factor notation on extension C-3583). Using a reference mark of chalk or

colored pencil on the corner of the adjusting screw square and the transmission case, back the adjusting screw out exactly 3½ turns. (Cars equipped with 350 cu. in. engines 2¼ turns). While holding the adjusting screw stationary, tighten the locknut from 35 to 40 foot-pounds torque. If band adjustment is made with transmission removed from vehicle (using wrench, Tool C-3380—without special extension C-3583) the adjusting screw should be torqued from 70-75 inch-pounds torque.

LOW-REVERSE BAND—The low-reverse band adjusting screw is located on the right side of the transmission case, as shown in Figure 143. Using a ¾ inch wrench, loosen the locknut. Check the freeness of the adjusting screw in the transmission case. If free, use inch-pound torque wrench, Tool C-3380 (with extension C-3583). Because of the added leverage afforded by the extension C-3583, set the click device on the indicator at 47-50 inch-pounds, then tighten adjusting screw to this torque (disregard multiplication factor notation on extension C-3583). Using a reference mark of chalk or colored pencil on the corner of the adjusting screw square and the transmission case, back the adjusting screw out exactly 2⅝ turns. While holding the adjusting screw stationary, tighten the locknut from 35 to 40 foot-pounds torque. If band adjustment is made with transmission removed from vehicle (using wrench, Tool C-3380—without special extension C-3583) the adjusting screw should be torqued from 70-75 inch-pounds torque.

ROAD TESTING

First check the transmission fluid level and engine idle. Good transmission operation depends on good engine operation. Make sure the engine is operating at full efficiency. If, when tuning the engine, the throttle linkage between the carburetor and the transmission is disturbed, it will be necessary to readjust the linkage.

Before attempting to diagnose or correct the transmission operation, the engine and transmission should be warmed up to operating temperature. A short drive, approximately five to ten miles, with frequent starts and stops will create normal operating temperatures of the engine and transmission.

Do not stall test the torque converter. For safety reasons and because damage to the transmission may result, wide open throttle stall operation is not recommended.

1. Engage the N (neutral) button and check for dragging up to an engine speed of 800 R.P.M.

2. Push in the R (reverse) button and note the shift time and smoothness of the shift. Back the car up and check for dragging.

3. Push in the D (drive) button and note the shift time and smoothness of engagement.

4. Accelerate the car at very light throttle. The transmission should upshift into second at approximately 10 M.P.H. and into direct at approximately 15 M.P.H. Check the quality of the shifts.

5. Slow the car to approximately 15 M.P.H., then depress the accelerator pedal quickly to wide open throttle (without going into kickdown). Check for slippage of the front and rear clutches. The transmission should not downshift at this time.

6. At a car speed of approximately 25 M.P.H. depress the accelerator pedal fully. The transmission should downshift to breakaway gear. Check the quality of the shift.

7. Release the accelerator pedal and allow the transmission to upshift. Accelerate the car to 50 M.P.H. Depress the accelerator pedal fully. The transmission should downshift to second gear. Car should not downshift above approximately 55 M.P.H.

8. Release the accelerator pedal to closed throttle. Check the quality of the "lift-foot" upshift.

9. Accelerate the car in kickdown (second gear) at wide open throttle until the transmission upshifts. The shift should occur at approximately 65 M.P.H. Check the quality of the shift.

10. Slow the car down to 10-55 M.P.H. and engage the 2 (second) button. The transmission should downshift to second gear. Check for gear noise.

11. Slow the car to 15 M.P.H. and depress the accelerator pedal quickly to wide open throttle without going into kickdown. Check for kickdown band or front clutch slippage. The transmission should not downshift at this time.

12. Release the accelerator pedal and push in the 1 (low) button. Transmission should downshift to second below approximately 55 M.P.H. The transmission should downshift to breakaway at approximately below 25 M.P.H.

13. With the accelerator pedal at light throttle, push in the D (drive) button at approximately 15 M.P.H. (the transmission will upshift to direct). Coast to a stop. The transmission should downshift at approximately 10 M.P.H. Check the quality of the downshift.

HYDRAULIC CONTROL PRESSURE CHECKS

LINE PRESSURE

Remove the pipe plug from the line pressure take-off hole located on the left side of the transmission case.

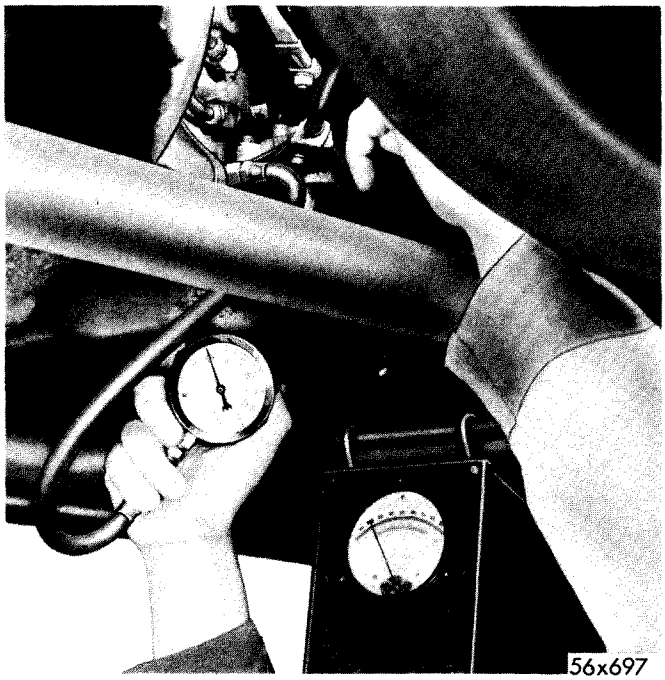


Figure 144—Checking Line Pressure

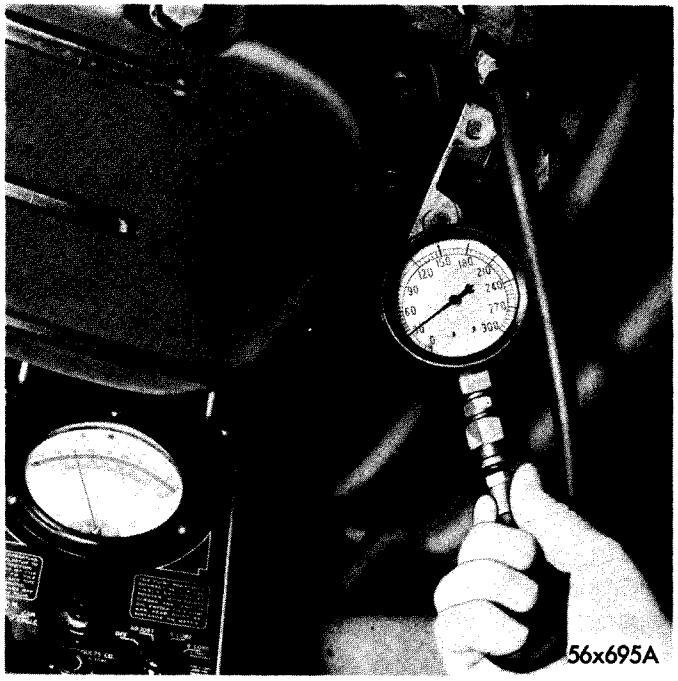


Figure 145—Checking Governor Pressure

See Figure 143. Install gauge, Tool C-2393 (300 P.S.I.) at this point. See Figure 144.

If line pressure is not correct, it may be adjusted by loosening the lock nut on the adjusting screw. See Figure 142, and turning the adjusting screw clockwise to increase or counterclockwise to decrease line pressure. All line pressure adjustments should fall within the limits specified in the table shown for all push-button positions.

If the line pressure cannot be satisfactorily adjusted check "Service Diagnosis Chart." Line pressure adjustment must be made in D (drive) position with engine at 800 R.P.M. and wheels free to turn.

GOVERNOR PRESSURE

Remove the pipe plug from the governor pressure takeoff hole located on the lower left side of the output shaft support. See Figure 142. Install gauge, Tool C-3292 (100 P.S.I.). If the rear clutch pressure is not correct, investigate the "Service Diagnosis Chart." See Figure 145.

LINE PRESSURE CHART

Push Button Position	Rear Wheels	Engine Speed (RPM)	Line Pressure (PSI)
R	Free to Turn	1600	200-250
N		800	85-95
D	Free to Turn	800	90
2	Free to Turn	800	85-95
1	Free to Turn	800	85-95

GOVERNOR PRESSURE CHART

Push Button Position	Rear Wheels	Car Speed	Governor Pressure
D	Free to Turn	16-18 M.P.H.	14 P.S.I.
D	Free to Turn	29-35 M.P.H.	45 P.S.I.
D	Free to Turn	61-66 M.P.H.	75 P.S.I.

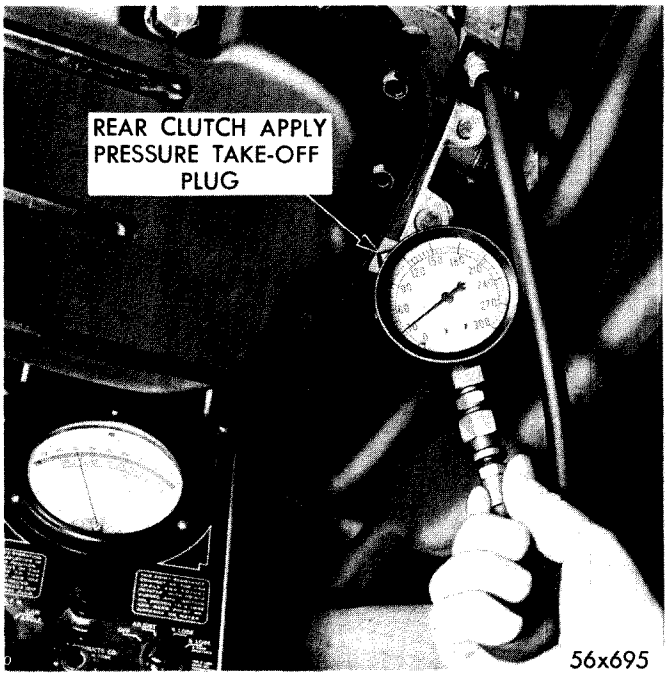


Figure 146—Rear Clutch Apply Pressure Tap Location

If governor pressure doesn't correspond to car speeds, check line pressure and the "Service Diagnosis Chart."

REAR CLUTCH APPLY

Remove the pipe plug from the rear clutch apply pressure take-off hole located on the output shaft support. Install gauge Tool C-3293 (300 P.S.I.). The rear clutch circuit pressure should be checked simultaneously with line pressure. The rear clutch apply pressure should not be less than a value of 15 P.S.I. lower than line pressure (90 P.S.I. in direct and 200-250 P.S.I. in reverse). If the rear clutch pressure is not correct, investigate the "Service Diagnosis Chart." See Figure 146.

LUBRICATION PRESSURE

Remove the pipe plug from the lubrication pressure take-off hole located on the left side of the transmission case. See Figure 143. Install gauge, Tool C-3293 (300 P.S.I.) at this point. With engine running at 800 R.P.M. in neutral, lubrication pressure should be approximately 10 to 30 P.S.I. If the pressure is incorrect, check line pressure and the "Service Diagnosis Chart."

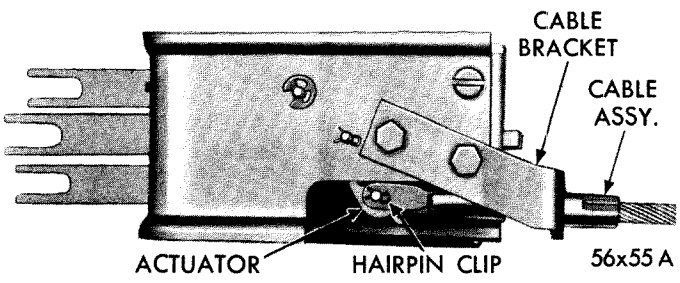


Figure 147—Gearshift Control Unit

If the pressure is extremely high (above 50 P.S.I.), it is a good indication that there is a restriction due to dirt or foreign matter in the lubrication passages.

PUSH BUTTON CONTROL UNIT REMOVAL

Remove the three screws holding push button control plate. Remove plate, push buttons and light bulb. Then remove the two nuts holding the light bulb strap. The control unit can then be removed from behind the instrument panel being careful not to kink the push button control cable. If control unit is equipped with a backup light switch, use care when removing unit so as not to damage switch.

To remove the control cable, remove hairpin clip securing cable end to actuator. Remove the two screws holding cable assembly bracket to push button control unit then, remove cable assembly. See Figure 147.

PUSH BUTTON CONTROL UNIT INSTALLATION

Install end of control cable on actuator and assemble hairpin clip. Place cable bracket on push button control unit, install the two screws and tighten securely. Carefully guide the unit into position from behind the instrument panel and install the light bulb strap and the two nuts on the push button unit studs and tighten. Install the light bulb, push buttons and face plate. Readjust control cable at transmission if necessary.

GEARSHIFT CONTROL CABLE REMOVAL

Engage 1 (low) button to place cable adapter spring lock in line with control cable adapter plug hole in transmission case. Remove the push button control unit from the instrument panel as outlined under "Push Button Control Removal." Remove cable adjustable mounting bracket on transmission. Remove control cable adapter housing plug, insert screwdriver through hole, and release the control cable spring lock, as shown in Figure 148. While releasing the spring lock, remove cable. From front of dash, pull cable assembly and rubber grommet from dash panel.

GEARSHIFT CONTROL CABLE INSTALLATION

Place grommet on cable. From front of dash, install control unit end of cable through dash panel. Install push button control unit as outlined under "Push Button Control Installation." Install cable grommet into dash panel. Hold the R (reverse) push button in at full travel position. Insert cable into transmision manual lever adapter until spring lock engages control cable securely. Adjust cable as outlined under "Push Button Control Cable Adjustment."

BACK-UP LIGHT SWITCH REPLACEMENT (WHEN SO EQUIPPED)

Remove gearshift control housing and plate. Back-up light switch is fastened to the control unit by four tabs. Straighten tabs to remove switch. Install repaired or

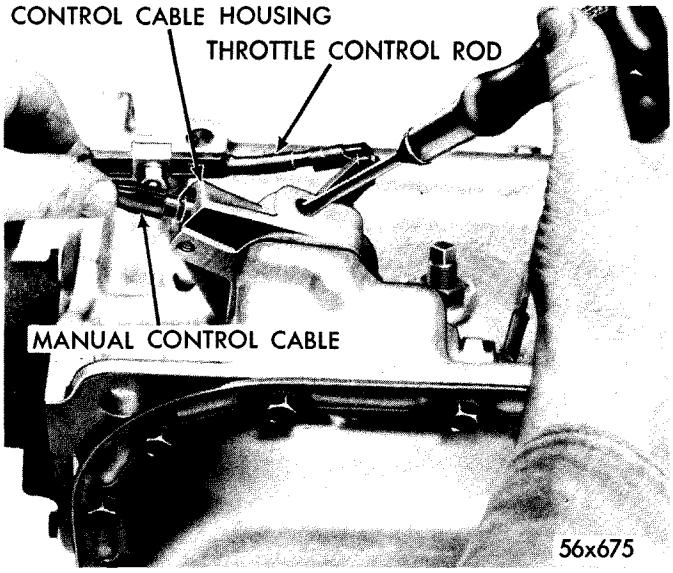


Figure 148—Releasing Manual Control Cable Spring Lock

replacement switch and bend tabs to secure switch to gearshift control housing. Install gearshift control housing and plate assembly. Reconnect all lead wires, then check reverse slide for travel and free return.

PUSH BUTTON UNIT LAMP BULB REPLACEMENT

Remove the gearshift control housing face plate. Remove one or more push buttons for clearance. Replace defective or burned out bulb then, replace gearshift control housing face plate.

17. TORQUEFLITE SERVICING IN VEHICLE

SPEEDOMETER PINION

REMOVAL—Disconnect speedometer cable and housing from drive pinion and sleeve assembly in transmission extension. Remove speedometer pinion and sleeve assembly from transmission extension.

INSTALLATION — Install speedometer pinion and sleeve assembly in transmission extension and torque from 40 to 45 foot-pounds. Connect speedometer cable and housing to drive pinion and sleeve assembly in transmission. Tighten securely.

NEUTRAL STARTING SWITCH—

REMOVAL—Drain approximately two quarts of fluid from transmission by disconnecting filler tube at oil pan connector (may be necessary to loosen filler tube support bracket screw). Remove wire at switch. Remove switch and gasket.

INSTALLATION—Place spring washer and "O" ring over switch and install switch in transmission case. With transmission in neutral, adjust switch to electrical contact, then tighten ⅓ to ½ turn. Connect wire to switch and refill transmission with Automatic Transmission Fluid (Type A) to proper level after reconnecting filler tube at oil pan.

TRANSMISSION REGULATOR VALVE ASSEMBLY

REMOVAL—Remove transmission regulator valve spring retainer, gasket, cup spring and sleeve. Using a mechanical retriever or a piece of welding rod ($\frac{5}{32}$") inserted in the end of valve, remove valve. See Figure 149.

INSTALLATION—With the assistance of the retrieving tool, place valve in position and seat properly in regulator valve body. Then, install regulator valve spring, sleeve, cup, gasket and retainer and tighten to a torque of 45 to 50 foot-pounds. Check and adjust line pressure—if necessary.

TORQUE CONVERTER CONTROL VALVE ASSEMBLY

REMOVAL—Remove the torque converter control valve spring retainer, see Figure 143, gasket and spring. Using a mechanical retriever or a piece of welding rod (⅛") inserted in end of valve, remove valve.

INSTALLATION—With the assistance of the retrieving tool, place valve in position and seat properly in regulator valve body then, install torque converter control valve spring, gasket and retainer then torque from 35 to 40 foot-pounds.

OIL PAN

REMOVAL—Drain transmission by disconnecting filler tube connector at oil pan, (may be necessary to loosen filler tube support bracket screw). Remove the oil pan screws and washers, and remove the oil pan and gasket from transmission case.

INSTALLATION—Using a new oil pan gasket, place oil pan into position on transmission case. Install the oil pan screws and washers drawing them down evenly, and torque from 12 to 17 foot-pounds. Install oil pan filler tube, and tighten nut connector from 35 to 40 foot-pounds. Tighten support bracket screw and refill transmission with Automatic Transmission Fluid (Type A). Refer to "Lubrication Section" of this manual.

VALVE BODIES AND TRANSFER PLATE ASSEMBLY

REMOVAL—Place push button control unit in 1 (low) position. Remove oil pan then, disconnect throttle linkage from throttle lever on transmission. Remove all dirt and foreign material from around control cable housing. Loosen throttle control lever screw and remove lever assembly. Remove flat washer and felt seal from throttle lever shaft then, remove control cable adjustable mounting bracket.

> **NOTE**
>
> ***It will be necessary for control cable adapter to be in this position when removing cable from adapter housing on transmission.***

Remove control cable adapter housing plug, insert screwdriver through hole, and release the control cable spring lock. While releasing control cable spring lock,

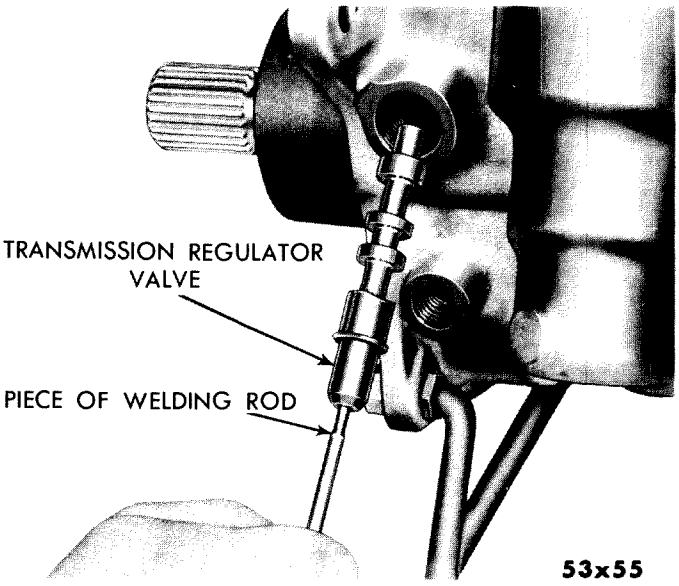


Figure 149—Removing Regulator Valve

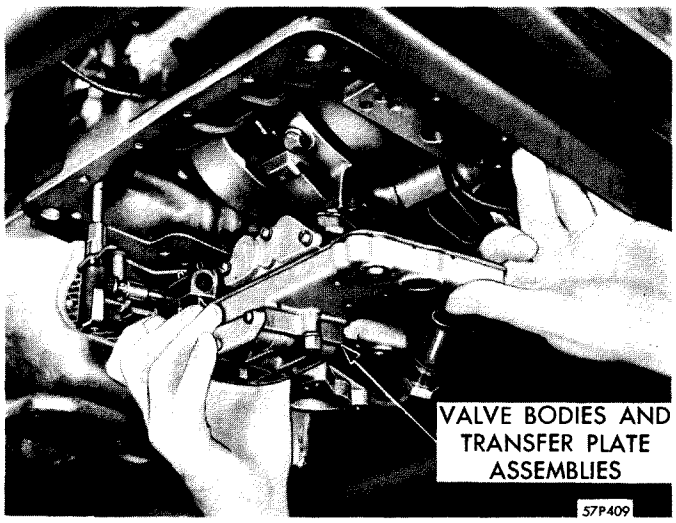


Figure 150—Removal and Installation of Valve Bodies and Transfer Plate Assembly

remove cable. Using same screwdriver, insert through cable opening in adapter housing and push lever rearward to last detent. Reinstall housing plug and tighten.

Remove the three control cable housing screws and washers then, remove control cable housing and gasket. Loosen manual valve control lever screw and slide lever off shaft. Remove the four oil strainer assembly screws and washers and remove oil strainer assembly. Loosen (to relieve spring load) and remove the three accumulator cover screws with washers. Remove cover and spring from transfer plate.

Remove the three transfer plate screws and washers and remove valve bodies and transfer plate assembly from transmission case, as shown in Figure 150.

INSTALLATION—Clean mating surfaces and check for burrs on both the transmission case and valve body transfer plate then, install valve bodies and transfer plate assembly on transmission. Install the three transfer plate screws and washers two in center and one in front. Draw down evenly and torque from 14 to 16 foot-pounds.

NOTE

Dished type washers are used to prevent cutting or chipping of soft metals and should be installed on screws with dished portion facing away from head.

Install accumulator spring through transfer plate and position in piston then, install accumulator cover, three screws, and washers; draw down evenly. Place oil strainer in position on transfer plate assembly. Install the four screws and washers. Draw down evenly and torque strainer and accumulator cover screws from 14 to 16 foot-pounds. Install oil pan.

Install manual valve control lever (locking screw to rear) on manual valve lever shaft. Position lever on shaft so there is $\frac{7}{32}$" clearance (without gasket) between lever and transmission case. A $\frac{7}{32}$" drill bit can be used for obtaining proper clearance, as shown in Figure 151. Tighten locking screw securely.

If control cable adapter has been removed from manual valve control lever, reinstall by positioning in lever (end of spring lock up), and installing pin. Place manual valve control lever in reverse position (last detent to rear) and install gasket, control cable housing, and screws and washers. Draw down evenly and torque from 14 to 16 foot-pounds.

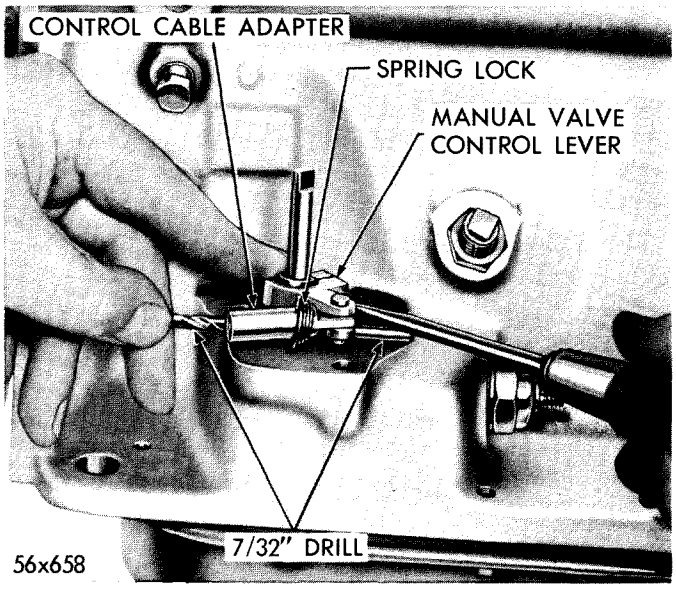


Figure 151—Setting Manual Valve Control Lever Clearance

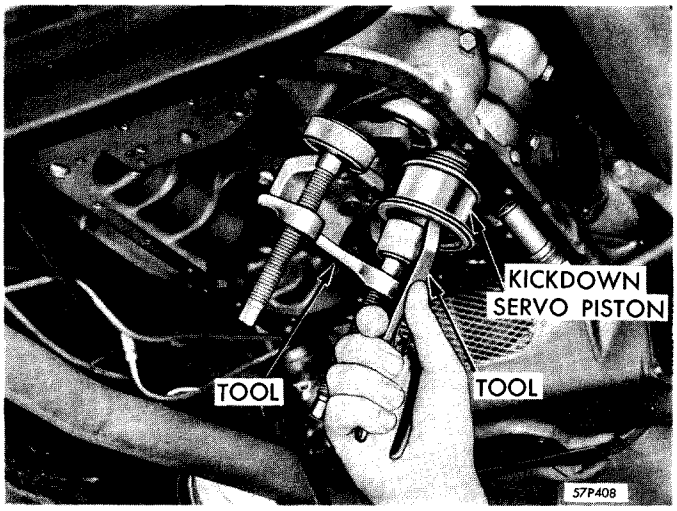


Figure 152—Removal and Installation of Kickdown Piston (Typical View)

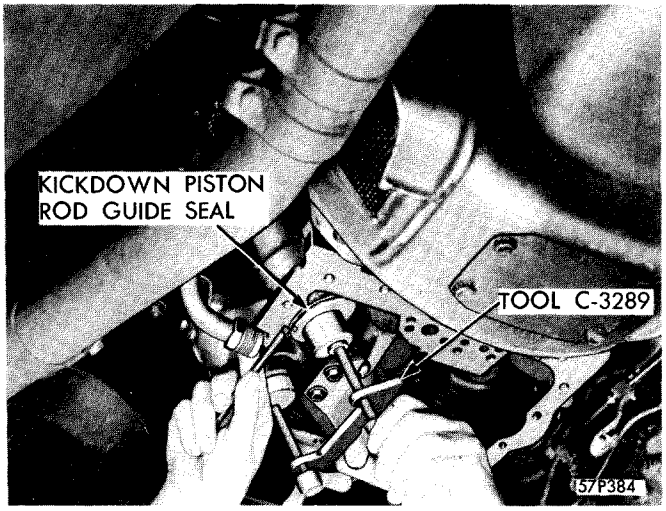


Figure 153—Positioning Kickdown Piston Rod Guide Seal (Typical View)

Install felt washer, flat washer, and throttle lever control assembly. Tighten clamping bolt. Connect throttle linkage to throttle lever on transmission. Install control cable in housing and adapter making sure spring lock engages cable. Replace cable adjustable mounting bracket.

Adjust manual control cable. Refill transmission with Automatic Transmission Fluid (Type A). Refer to "Lubrication" section of this manual.

Adjust throttle linkage. Refer to "Throttle Linkage Adjustment."

KICKDOWN PISTON

REMOVAL—Remove valve bodies and transfer plate assembly. Loosen kickdown band adjusting screw lock nut and back adjusting screw out sufficiently to remove anchor. Remove kickdown band strut. Install Tool C-3529 or C-3289 (modified, as shown in Figure 184), apply sufficient pressure on the kickdown piston rod guide, and remove the snap ring. Loosen compressing portion of tool and remove piston rod guide, piston spring, and piston rod.

Using C-484 pliers, remove the kickdown piston from transmission case, as shown in Figure 152.

INSTALLATION — Lubricate piston rings and place kickdown piston assembly into position, compress outer ring, and start assembly into case. With piston properly centered so as not to damage rings, tap lightly and bottom piston into transmission case. Slide piston spring over kickdown piston rod assembly and install in piston.

While holding in position, install the kickdown piston rod guide assembly on kickdown piston rod. Using Tool C-3529 or C-3289 (modified) and extreme care, compress the kickdown piston spring to the point that piston guide seal ring slightly binds on transmission case. Work seal ring into position and gradually compress spring until seal ring enters case and snap ring can be installed. See Figure 153.

Install kickdown piston rod guide snap ring, making sure it is properly seated. Loosen compressing portion of tool and remove tool from transmission case.

Place kickdown band strut in position in band and lever, and compress band end sufficiently to install anchor over adjusting screw. Adjust kickdown band. Install valve bodies and transfer plate assembly.

ACCUMULATOR PISTON

REMOVAL—Remove valve bodies and transfer plate assemblies. Using C-484 pliers, remove accumulator piston from transmission case, as shown in Figure 154.

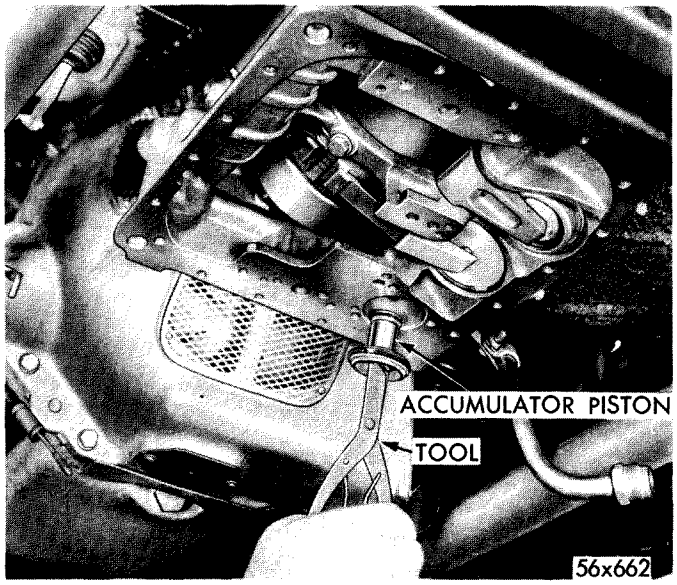


Figure 154—Removal and Installation of Accumulator Piston (Typical View)

INSTALLATION—Lubricate seal rings and place accumulator piston into position. Compress outer seal ring and tap lightly into transmission case. Install valve bodies and transfer plate assemblies.

TRANSMISSION OUTPUT SHAFT REAR BEARING OIL SEAL

REMOVAL—Disconnect the front universal joint and secure propeller shaft out of the way. Apply the hand brake and remove the propeller shaft flange nut and washer.

Release hand brake and install puller, Tool C-452 (if necessary). Remove the propeller shaft flange and brake drum assembly. Remove the transmission brake support grease shield spring (small one). Then, remove brake support grease shield from extension. If screwdriver or sharp instrument is used in performing this operation, care must be exercised not to damage the neoprene sealing surface at bottom of shield.

Install puller, Tool C-748 and remove the transmission output shaft rear bearing oil seal.

INSTALLATION—Using driver, C-3205, install output shaft rear bearing oil seal (metal portion of seal facing in) until driver bottoms on extension. See Figure 197. Install brake support grease shield on extension housing.

CAUTION

Indent on grease shield must match groove in extension for correct positioning. Also, shield must be located on extension far enough to permit installation of spring.

Install brake support grease shield spring (opening in spring toward adjusting sleeve). Make sure spring is properly seated in groove. Install propeller shaft flange and drum assembly. Install propeller shaft flange washer (convex side towards nut) and nut. Apply hand brake and torque the propeller shaft flange nut to 175 foot-pounds torque.

Connect front universal joint and torque nuts from 33 to 37 foot-pounds torque. Refill transmission (if necessary) with Automatic Transmission Fluid (Type A) to proper level. Refer to "Lubrication" section.

EXTENSION

REMOVAL — Raise vehicle off floor. Drain approximately two quarts of fluid from transmission, then reconnect filler tube at connector.

Disconnect front universal joint and secure propeller shaft out of way. Apply hand brake and remove propeller shaft flange nut and washer. Release hand brake and using puller, Tool C-452 (if necessary), remove the propeller shaft flange and drum assembly.

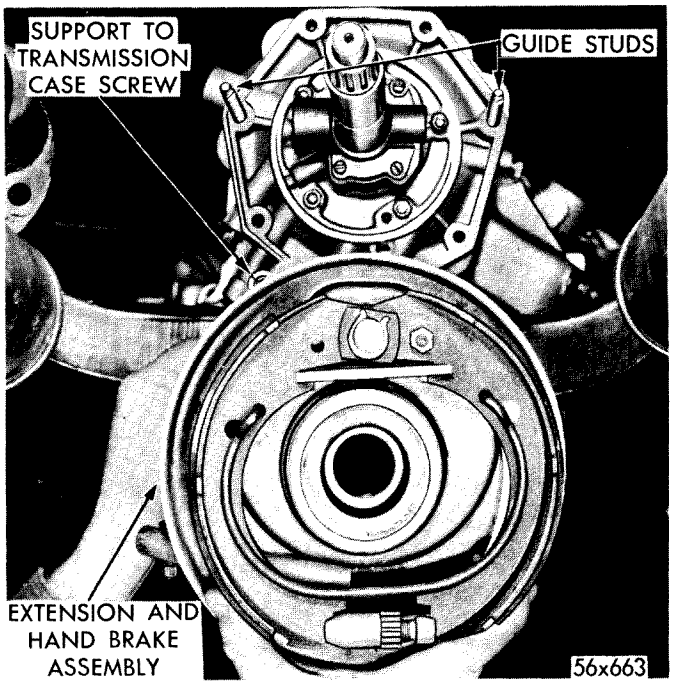


Figure 155—Removal and Installation of Extension and Handbrake Assembly

Remove brake adjusting screw cover plate and loosen cable clamp bolt on hand brake support. Disengage the ball end of the cable from operating lever and remove cable from brake support. Disconnect speedometer cable and housing at transmission extension and remove speedometer drive pinion and sleeve assembly.

Remove the two nuts and lockwashers that hold engine rear support insulator to the crossmember, leaving insulator attached to extension. Remove the two top transmission extension to case screws and lockwashers.

Using suitable jack (or engine support fixture, C-3487) and extreme care (to prevent damage to oil pan), raise transmission sufficiently for insulator on extension to clear crossmember. Remove four of the remaining extension to case screws and lockwashers and install guide studs, Tool C-3283.

Due to interference of the insulator, it will be necessary to remove the bottom extension to case screw with the extension. This is, back screw out as far as possible and slide extension back and continue loosening of screw. Do not remove the one output shaft support to transmission case screw.

Remove extension and hand brake as one assembly, as shown in Figure 155. If care is used, it is not necessary to remove hand brake support and shoe assemblies from extension to replace output shaft rear bearing.

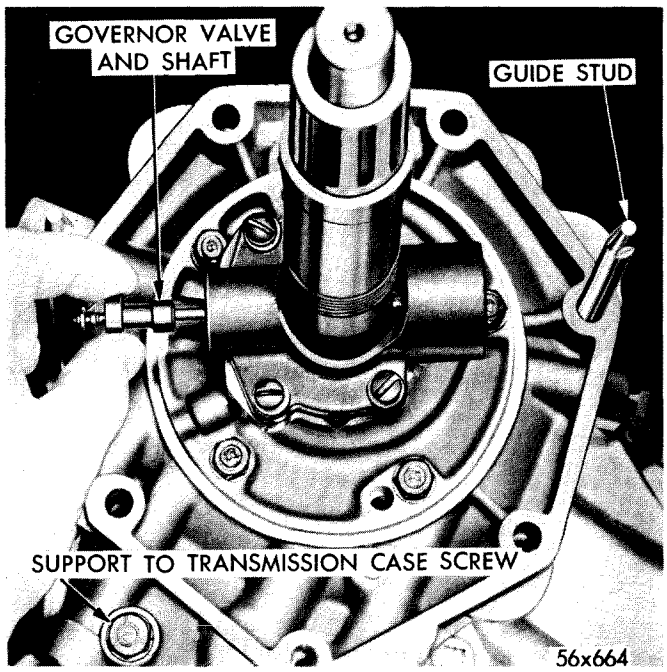


Figure 156—Removal and Installation of Governor Valve Shaft and Valve

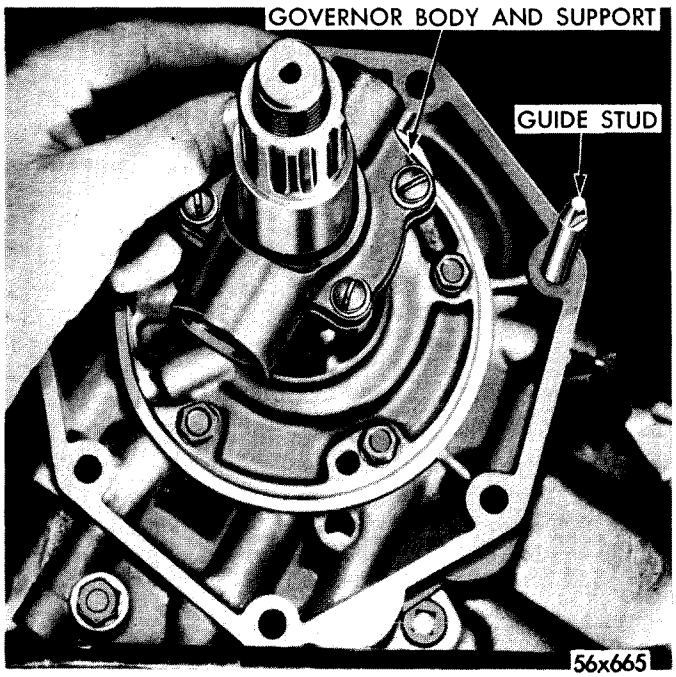


Figure 157—Removal and Installation of Governor Body and Support Assembly

INSTALLATION—With guide studs, Tool C-13283 installed in transmission case, install a new extension gasket over guide studs and into position against output shaft support. Do not use sealing material on gasket.

Using extreme care, place extension and hand brake assembly over output shaft and on guide studs. Due to interference of the insulator, it will be necessary to start the bottom extension to case screw as the extension is pushed into position against support. Do not use hammer or attempt to pull extension in with the aid of screws; otherwise, damage to extension may result. The propeller shaft flange and drum assembly may be used to force bearing in extension on output shaft.

Remove guide studs, Tool C-3283, and install the six remaining extension to case screws and lockwashers. Draw down evenly and tighten from 25 to 30 foot-pounds. After screws have been properly torqued, turn output shaft to make sure it turns freely.

Lower transmission and at the same time align mounting studs in insulator with holes in crossmember. Install the two nuts and lockwashers that hold the rear engine support insulator and torque from 30 to 35 foot-pounds. Engage ball end of hand brake cable in operating lever and tighten cable clamp bolt.

Install propeller shaft flange and drum assembly, washer, and nut. (If assembly was used to force bearing in extension on output shaft, then omit this operation.) Apply hand brake and tighten nut to 175 foot-pounds. Install adjusting screw cover plate on hand brake support. Connect front universal joint and torque nuts from 33 to 37 foot-pounds.

Install speedometer pinion and sleeve assembly. Torque from 40 to 45 foot-pounds and connect speedometer cable housing. Lower vehicle and refill transmission to proper level with Automatic Transmission Fluid (Type A). Refer to "Lubrication" section of this manual.

GOVERNOR

REMOVAL—Remove extension. Using a screwdriver, remove the governor valve shaft snap ring from the weight assembly end. Remove governor valve shaft and valve from governor body assembly, as shown in Figure 156. Using pliers, C-3229, remove governor weight assembly snap ring (large one) and remove governor weight assembly from governor body.

The primary cause of governor operating failures is due to improper operation of governor valve which may be sticking in housing or travel restricted by chips or other foreign matter. If inspection reveals that it is necessary for further governor servicing, then remove governor support locating screws, and remove governor and support assembly from rear oil pump housing, as shown in Figure 157. Normal servicing does not require removal of the governor body from the governor support. If condition warrants removal of governor body from governor support, when reassembling do not tighten governor body screws until governor body support is located on output shaft.

INSTALLATION — Slide governor body and support assembly into position in rear oil pump housing. Using extreme care, compress governor support seal rings as support enters oil pump housing. Do not force. Align locating hole in output shaft to locating hole in governor

support, and install screw. Torque from 5 to 7 foot-pounds. Holes can be aligned by turning output shaft and holding governor body.

If governor body has been removed and reinstalled, torque the four governor body screws from 6 to 8 foot-pounds torque. Place governor weight assembly (secondary weight snap ring facing out) into governor body; and using pliers, C-3229, install snap ring. Make sure snap ring seats properly.

With the governor body through the output shaft and governor weight assembly, at the same time, position valve into body. Install the governor valve shaft snap ring. Make sure it is locked securely to shaft. Replace snap ring if distorted. After snap ring installation apply sufficient pressure to both ends of the valve shaft to force snap rings to outer portion of snap ring grooves. Refer to Figure 229.

Check operation of governor weight assembly and valve by turning output shaft. Both should fall freely in body. Install transmission extension.

REAR OIL PUMP

REMOVAL — Remove transmission extension, then using a screwdriver, remove the governor valve shaft snap ring from weight assembly end. Remove governor valve shaft and valve from governor valve body assembly. Using pliers, C-3229, remove governor weight assembly snap ring (large one) and remove governor weight screw from governor support. Remove the five rear oil pump housing to output shaft support screws and washers, and install guide studs, Tool C-3288.

Remove pump housing, gear, and governor assembly from output shaft. Use dye and mark pump gears in relation to pump housing face. Do not use scribe. Oil pump pinion is keyed to output shaft pinion by a small ball. Use care when removing pinion so not to lose ball.

NOTE

If output shaft is turned to a position where governor locating screw hole is up, when removing rear pump pinion, pump drive ball will also be up, preventing ball from falling out.

Remove rear oil pump pinion from output shaft and mark in the same manner. Remove governor assembly from oil pump housing.

INSTALLATION — Slide governor support and body assembly into position in rear oil pump housing. Compress governor support seal rings as support enters oil pump housing. Do not force.

Place rear oil pump pinion ball in ball pocket in output shaft then, place rear oil pump pinion (as marked when removed) over output shaft and into position aligning key in pinion with ball in shaft.

With rear oil pump gear properly positioned in pump housing (check marking) slide rear oil pump and governor assemblies over output shaft and guide studs into position against support. There are two extra holes in housing which are used for vents. Make definitely sure you do not attempt to install screws in these holes.

Remove guide studs and install the five rear oil pump housing to output shaft support screws and washers.

CAUTION

Dished washers are used to prevent cutting of soft metals and should be installed on screws with dished portion facing away from head. Draw down evenly and torque from 10 to 12 foot-pounds. After screws have been properly tightened, turn output shaft to make sure pump gears are free to rotate. If not, remove pump to determine cause.

Align locating hole in output shaft to locating screw hole in governor support; install locating screw, and torque from 5 to 7 foot-pounds. Holes can be easily aligned by turning output shaft and holding governor body. Check operation of governor weight assembly and valve by turning output shaft. Both should fall freely in body. Install transmission extension.

18. TORQUEFLITE DISASSEMBLY AND INSPECTION

REMOVAL

Disconnect battery then, place push button control in 1 (low) position and raise vehicle off floor.

NOTE

It is necessary for control to be in this position to remove cable from adaptor housing on transmission.

Drain transmission and torque converter. When fluid has drained, replace torque converter drain plug and tighten. Loosen filler tube support bracket screw if necessary.

Disconnect the front universal joint and secure propeller shaft out of the way. Remove brake adjusting screw cover plate and loosen cable clamp bolt on hand

brake support. Disengage the ball end of the cable from the operating lever and remove cable from brake support.

Disconnect speedometer cable and housing at transmission extension. Disconnect neutral starting switch wire and disconnect throttle control linkage from throttle lever in transmission.

Loosen push button control cable adjustable mounting bracket. Remove control cable adapter housing plug, insert screwdriver through hole, and release the control cable spring lock. While releasing control cable lock, remove cable from adaptor housing. Using the same screwdriver, insert through cable opening in adaptor housing and push lever rearward to last detent. Reinstall housing plug and tighten.

Remove the two nuts and lockwashers that hold the engine rear support insulator to the crossmember, leaving insulator attached to transmission then, remove starter.

Install engine support fixture, Tool C-3487; insert hooks of fixture firmly into holes in side of frame member with support ends up against the underside of oil pan flange. Adjust fixture to support the weight of the engine. Remove engine slightly, remove crossmember to torsion bar bracket bolts and remove crossmember.

NOTE

When using fixture, Tool C-3487, do not lower engine more than three inches from floor pan to avoid disrupting the set position of water hose and other engine attachments.

Remove the two transmission case to torque converter housing screws and lockwashers from right side and install guide studs, Tool C-3276. With transmission supported, remove the two transmission case to torque converter housing screws and lockwashers from left side. Slide transmission straight back to avoid damage to the front oil pump driving sleeve, then lower to the floor.

INSTALLATION

Install guide studs, Tool C-3276, in the two transmission mounting holes in right side of torque converter housing. With front oil pump drive sleeve lubricated, install, making sure driving lugs are properly engaged with oil pump pinion. Main portion of drive sleeve will be flush with front of pump housing when properly installed. See Figure 223.

Note position of driving lugs inside torque converter hub, then position front oil pump drive sleeve on transmission accordingly, to aid in proper engagement when transmission is installed. Slide transmission over guide studs and into position against converter housing. Make sure driving lugs on front oil pump drive sleeve properly engages the torque converter. To avoid damage to front oil pump, do not attempt to use transmission to torque converter housing screws to bring transmission and housing together. If oil pump drive sleeve and input shaft have been properly aligned, the transmission should slide into position relatively easy. Do not force.

Install the two transmission case to torque converter housing screws and lockwashers in left side, do not tighten. Remove guide studs and install the two transmission case to housing screws and lockwashers in right side, then draw the four down evenly and torque from 45 to 50 foot-pounds.

Place crossmember into position and install the crossmember to torsion bar bracket bolts. Torque from 50 to 55 foot-pounds. Lower engine and at the same time align mounting studs in insulator with holes in crossmember. Install the two nuts and lockwashers that hold the engine rear support insulator to the crossmember and torque from 30 to 35 foot-pounds then, remove support fixture, Tool C-3487 from side of frame member.

Connect neutral starting switch wire to switch and install oil pan filler tube and torque filler tube nut from 35 to 40 foot-pounds. Tighten support bracket screw.

Connect speedometer cable in housing. Engage ball end of hand brake cable in operating lever and tighten cable clamp bolt. Install adjusting brake screw cover plate on hand brake support.

Connect front universal joint and torque nuts from 33 to 37 foot-pounds. Connect throttle control linkage to throttle lever on transmission.

Install push button control cable in adaptor making sure spring lock engages cable. Adjust manual control cable as outlined in "Cable Adjustments."

Install starter then, lower vehicle and connect battery. Refill transmission with Automatic Transmission Fluid (Type A). Refer to "Lubrication" section of this manual then adjust throttle linkage.

RECONDITIONING OF TRANSMISSION

REMOVAL OF COMPONENTS — The following precautions should be observed during disassembly of the transmission. Cleanliness through the entire disassembly and assembly cannot be over-emphasized. Unit should be thoroughly cleaned when removed from vehicle, preferably by steam. When disassembling, each part should be placed in a suitable solvent, washed, then dried by compressed air. Do not wipe parts with shop towels.

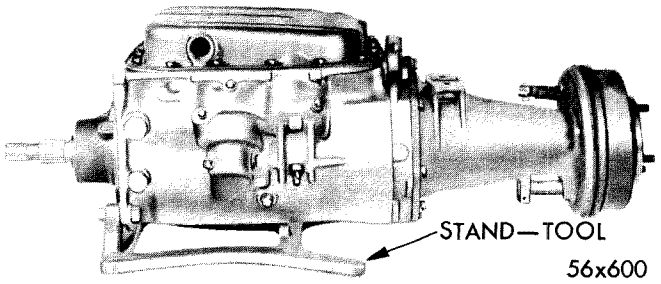


Figure 158—Transmission Assembly Inverted in Stand

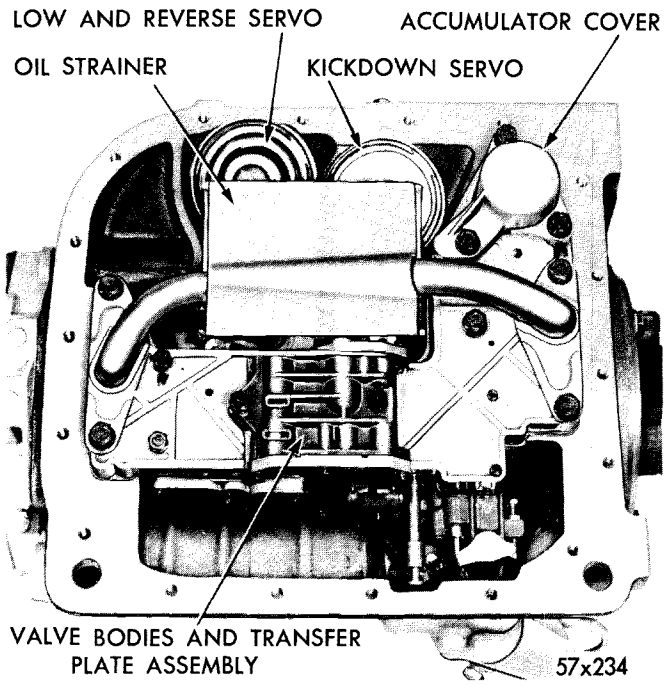


Figure 159—Transmission Assembly—Oil Pan Removed

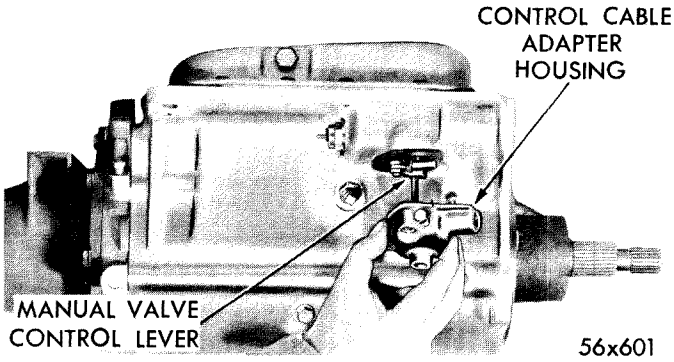


Figure 160—Removal and Installation of Control Cable Adaptor Housing

All of the mating surfaces in the transmission are accurately machined; therefore, careful handling of parts must be exercised to avoid nicks or burrs. The use of crocus cloth is permissible where necessary, providing it is used carefully. When used on valves, use extreme care so not to round off the sharp edges. The sharp edge portion is vitally important to this type valve. Sharp edges prevent dirt and foreign matter from getting between the valve and body, thus reducing the possibilities of sticking. When it becomes necessary to recondition the transmission, and vehicle has accumulated considerable mileage, install new seal rings on parts requiring their usage.

OIL PAN REMOVAL

Place transmission assembly in stand, Tool C-3280 and invert, as shown in Figure 158. Remove the oil pan bolts and remove the oil pan and gasket, as shown in Figure 159. Note the construction of oil pan bolts, washers used are part of the bolt.

VALVE BODIES AND TRANSFER PLATE—REMOVAL

Remove throttle control lever, flat washer, and felt washer from transmission. Remove the three gearshift control cable adaptor housing bolts and washers. Remove housing gasket from transmission, as shown in Figure 160.

NOTE

Manual valve control lever must be moved to the reverse position before housing can be removed.

Loosen manual valve control lever bolt. Using caution to prevent loss of cable adaptor pin, slide lever and cable adaptor off shaft. Remove the four oil strainer assembly bolts and lockwashers. Remove oil strainer assembly, as shown in Figure 161. One strainer is used for both the front and rear oil pump.

Loosen (to relieve spring load) the three accumulator cover bolts with washers, and remove cover and spring from transfer plate, as shown in Figure 162.

Remove the three transfer plate bolts and washers. Remove the valve bodies and transfer plate assembly

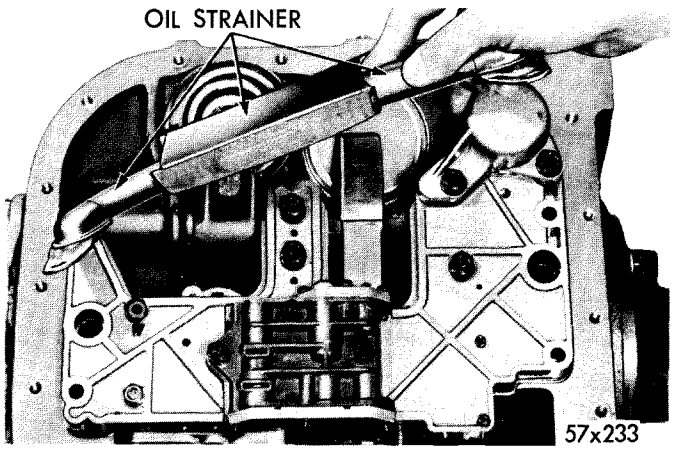


Figure 161—Removing Oil Strainer Assembly

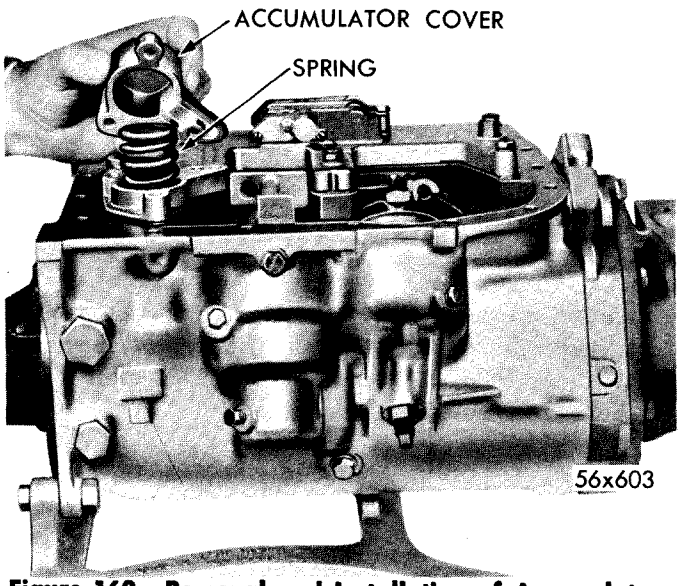


Figure 162—Removal and Installation of Accumulator Cover

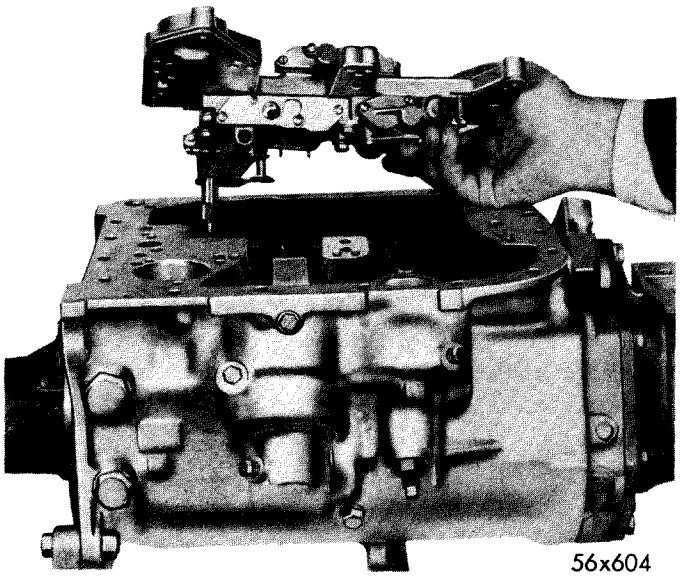


Figure 163—Removal and Installation of Valve Bodies and Transfer Plate Assembly

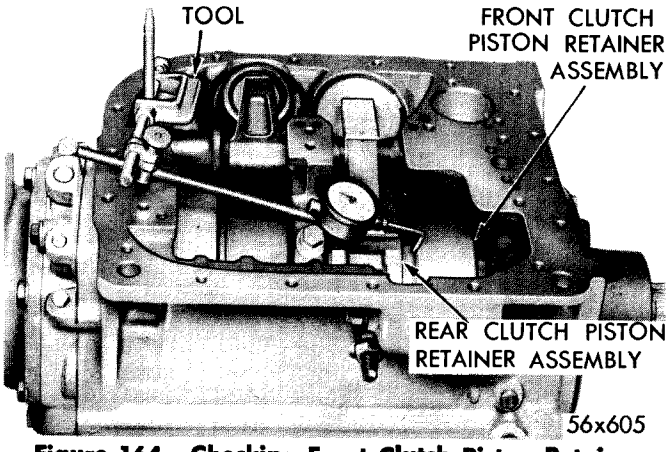


Figure 164—Checking Front Clutch Piston Retainer Assembly End Clearance

from transmission case, as shown in Figure 163. Mating surfaces are machined; use extreme care so as not to damage these surfaces. Place valve body in stand, Tool C-3528.

Remove the neutral starting switch with cupped washer and "O" ring located in left side of transmission case. See Figure 143.

CHECKING FRONT CLUTCH END CLEARANCE

Prior to removal of propeller shaft flange and drum assembly, check end clearance of front clutch piston retainer assembly using dial indicator, Tool C-3339, as shown in Figure 164.

To make this check, pry front clutch forward by carefully inserting screwdriver between the front and rear clutch. Remove screwdriver, and with dial indicator point contacting edge of front clutch retainer, set dial indicator to zero. Now, pry front clutch assembly rearward against rear clutch, remove screwdriver, and take indicator reading. This clearance should be from .020" to .050". If this clearance exceeds the specified limit, particular attention should be paid to the condition of the input shaft thrust washer when disassembling transmission.

HAND BRAKE ASSEMBLY REMOVAL

Remove the transmission flange nut and washer. Use wrench Tool C-3281, to hold brake drum and flange assembly. See Figure 165.

Attach puller, Tool C-452, if necessary, and remove propeller shaft flange and drum assembly. Inspect oil seal surfaces. Inspect lining contact surfaces on brake drum assembly for scoring and inspect brake lining for wear.

Remove the transmission brake support grease shield spring. This spring has two purposes, it acts a a guide for the brake shoes and retains the brake support grease shield to the transmission extension. See Figure 166.

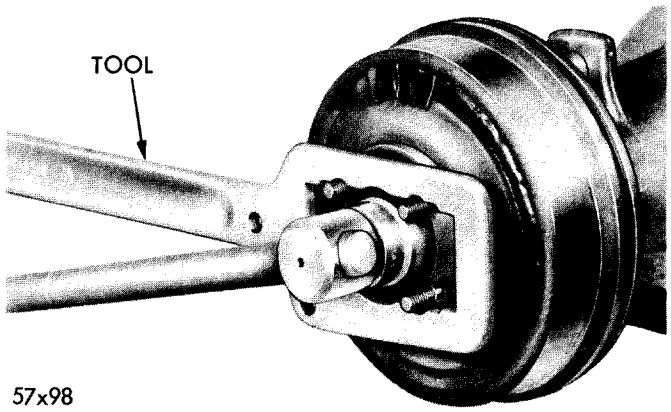


Figure 165—Removing Handbrake Drum and Flange Assembly

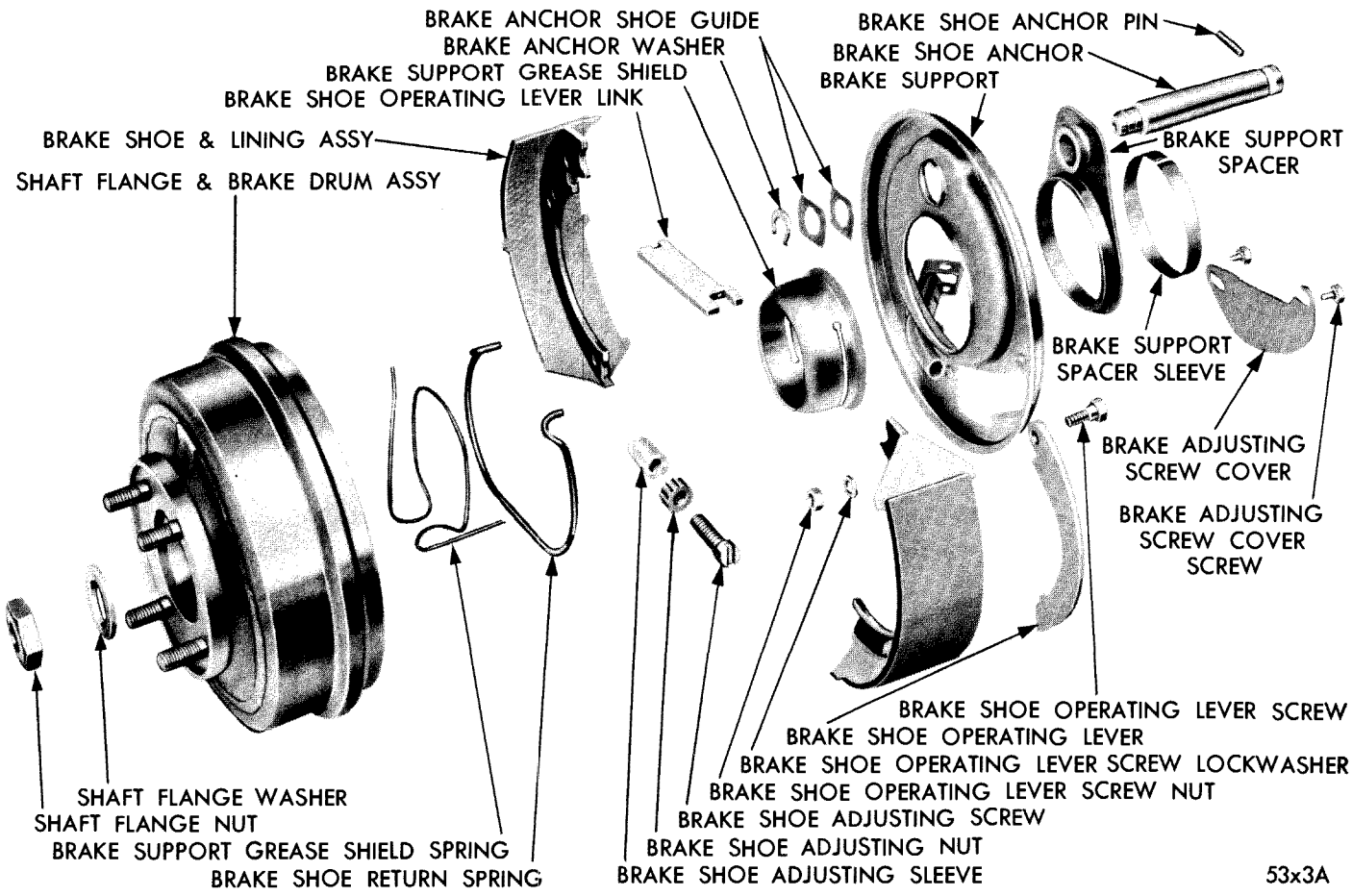


Figure 166—Internal Expanding Hand Brake

Remove the brake support grease shield from extension. If a screwdriver or sharp instrument is used in removing this shield, care must be exercised not to damage the neoprene sealing surface at bottom of shield. Note the indent on grease shield for correct positioning on extension.

Using a suitable drift, remove pin which secures brake shoe anchor in extension housing. Slide balance of handbrake assembly intact from extension housing. Inspect spacer (neoprene) on back of support plate for deterioration and note the steel sleeve used between neoprene spacer and extension.

TRANSMISSION EXTENSION REMOVAL

Remove the speedometer drive pinion and sleeve assembly, as shown in Figure 167. Inspect the output shaft rear bearing oil seal and remove (if necessary) using puller, Tool C-748.

Remove the seven transmission extension to case bolts and lockwashers. Install guide studs, Tool C-3283 and remove extension from output shaft support assembly by tapping housing lightly with a soft hammer. Housing may be separated from support by using a pry bar against support screw, as shown in Figure 168.

GOVERNOR AND REAR OIL PUMP REMOVAL

Using a small screwdriver, remove the governor valve shaft snap ring from the weight assembly end, as shown in Figure 169.

Remove governor valve shaft and valve from governor valve body assembly, as shown in Figure 170. Using pliers, Tool C-3229, remove governor weight assembly snap ring (large), as shown in Figure 171, and remove governor weight assembly from governor body, as shown in Figure 172.

Using a $\frac{5}{16}$ inch socket (Tool C-3279) remove governor locating screw from the governor support. Remove the five rear oil pump housing to output shaft support bolts and washers. Remove pump housing, gear, and governor assembly from output shaft, as shown in Figure 173. Use dye and mark face of pump gear in relation to pump housing. Do not use scribe.

Remove rear oil pump pinion from output shaft, as shown in Figure 174. Mark in the same manner as previously described.

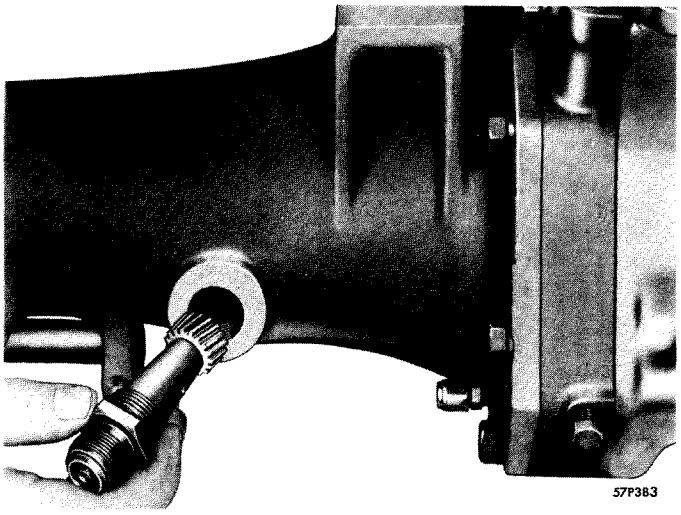


Figure 167—Removal and Installation of Speedometer Drive Pinion Assembly

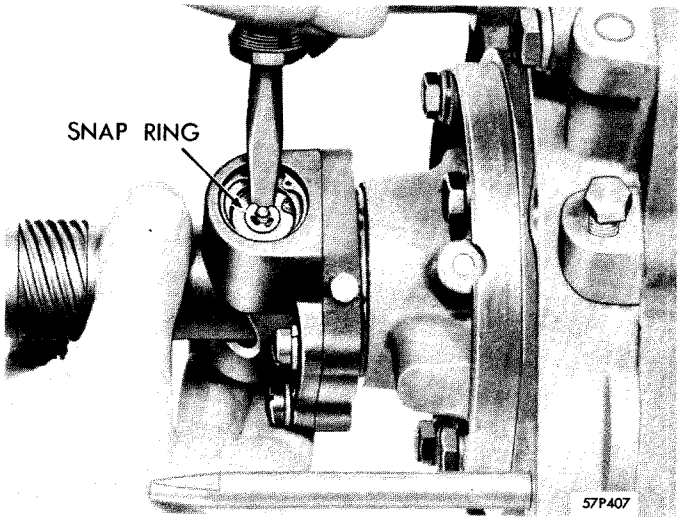


Figure 169—Removal and Installation of Governor Valve Shaft Snap Ring

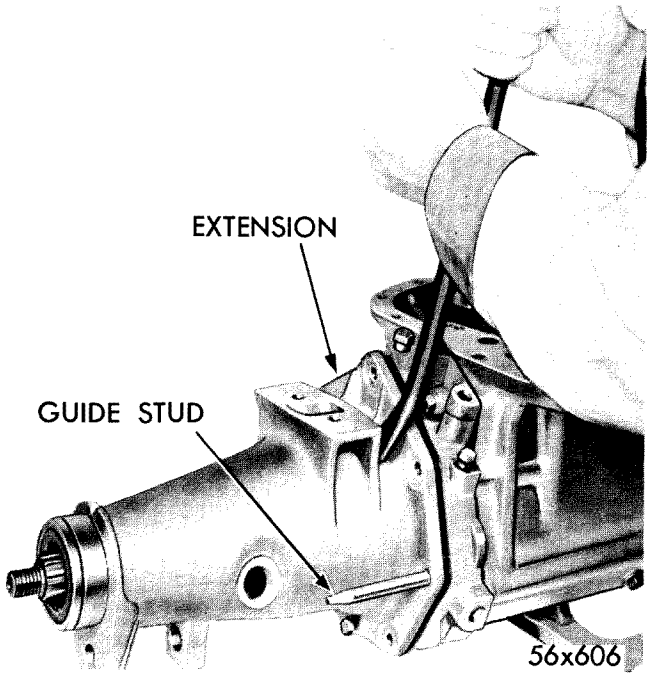


Figure 168—Removal of Extension

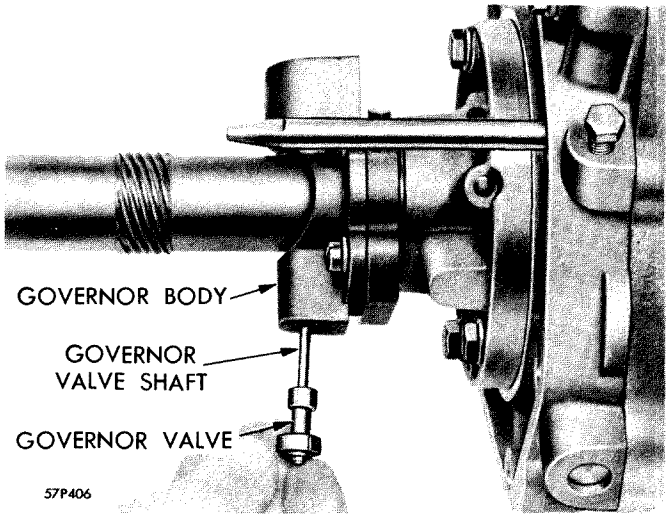


Figure 170—Removal and Installation of Governor Valve and Shaft

NOTE

Oil pump pinion is keyed to output shaft by a small ball. Use care when removing pinion so as not to loose ball.

OUTPUT SHAFT SUPPORT REMOVAL

Remove output shaft support to transmission case screw and washer. Slide the output shaft rear support assembly and gasket from transmission case, as shown in Figure 175. If rear support is stuck to transmission case, it can be loosened by tapping lightly with a soft hammer. Remove guide studs, Tool C-3283 from transmission case.

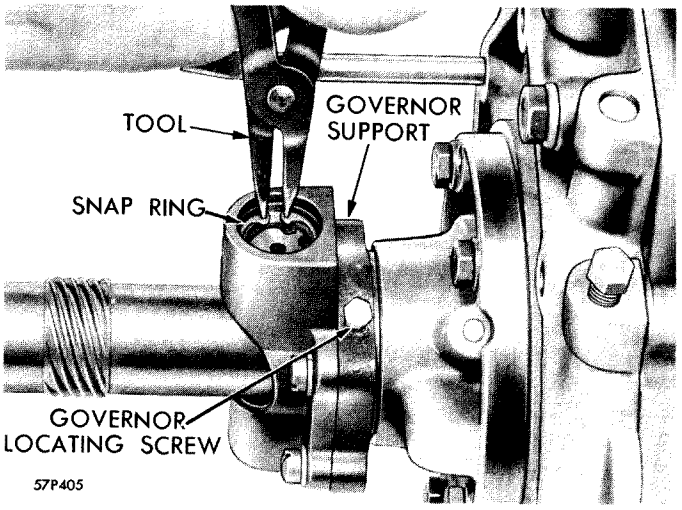


Figure 171—Removal and Installation of Governor Weight Assembly Snap Ring

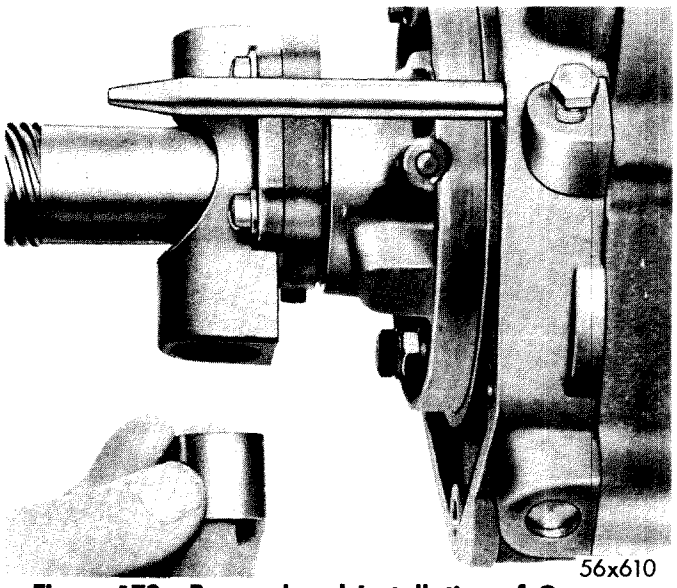


Figure 172—Removal and Installation of Governor Weight Assembly

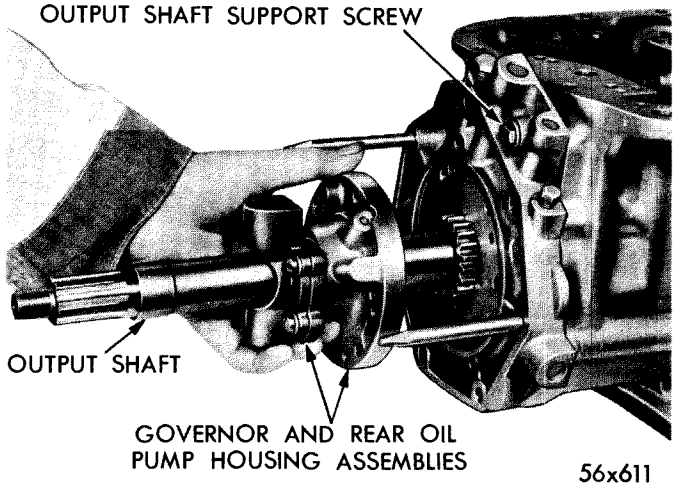


Figure 173—Removal and Installation of Governor and Rear Oil Pump Housing Assemblies

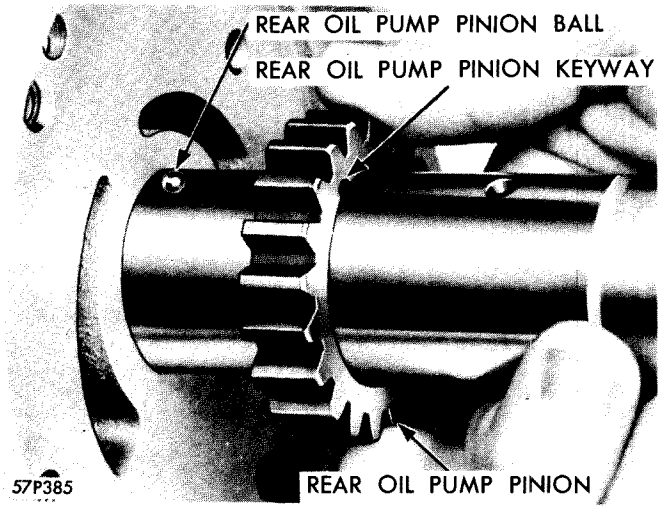


Figure 174—Removal and Installation of Rear Oil Pump Pinion

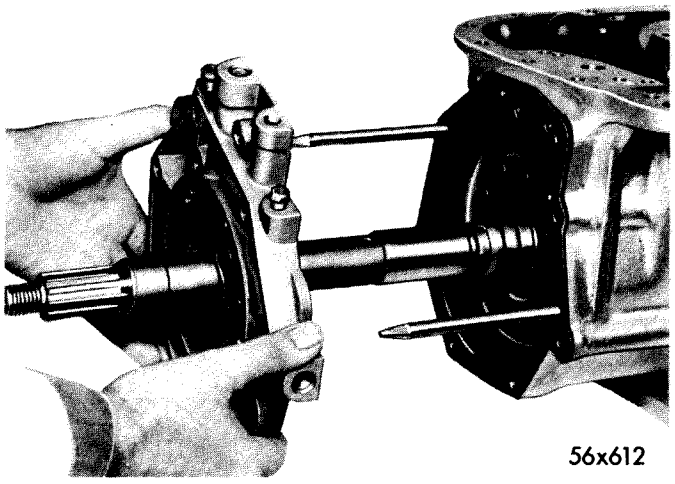


Figure 175—Removal and Installation of Output Shaft Support

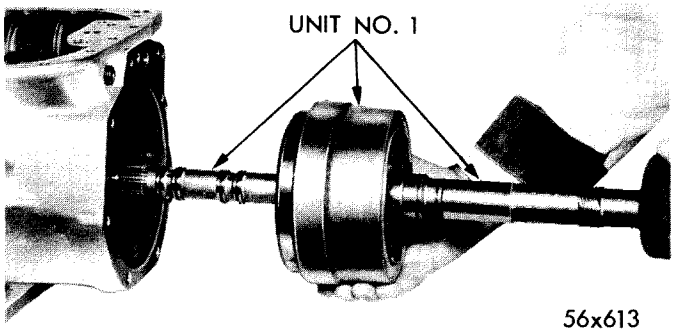


Figure 176—Removal and Installation of Unit No. 1

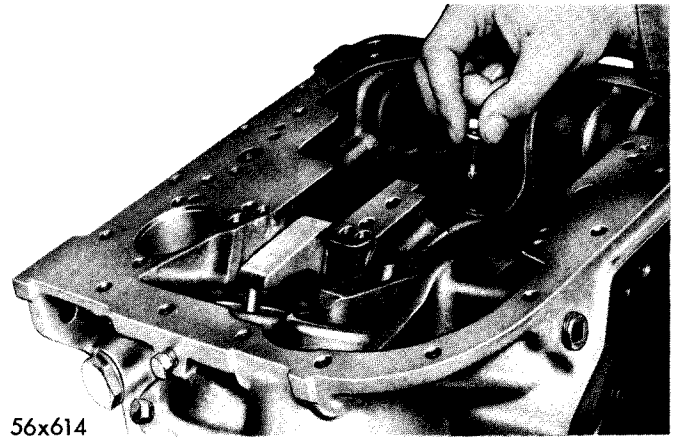


Figure 177—Removal and Installation of Intermediate Support Locating Screw

REMOVING POWER TRAIN UNIT NO. 1 (OUTPUT SHAFT, KICKDOWN PLANET PINION CARRIER, AND INTERMEDIATE SHAFT ASSEMBLIES)

Remove by sliding unit out rear of transmission case. See Figure 176. Support unit as much as possible, when removing, to prevent damage to seal rings on intermediate shaft.

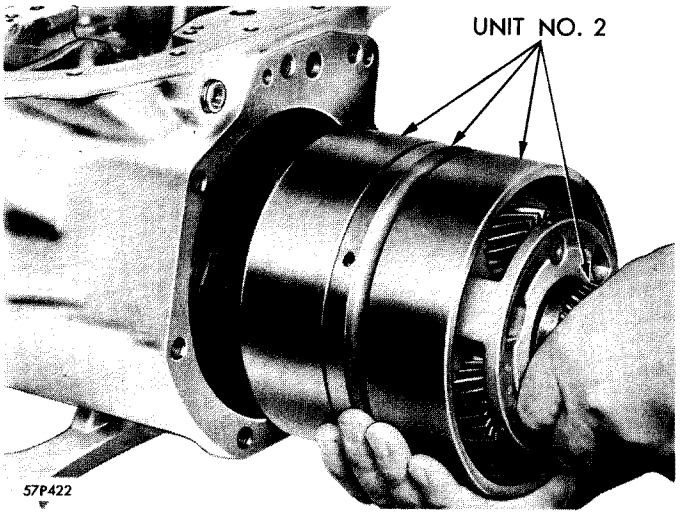


Figure 178—Removal of Unit No. 2

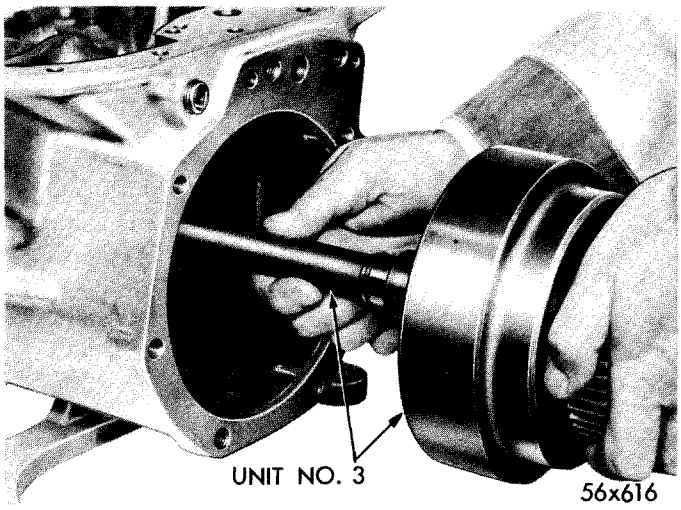


Figure 179—Removal and Installation of Unit No. 3

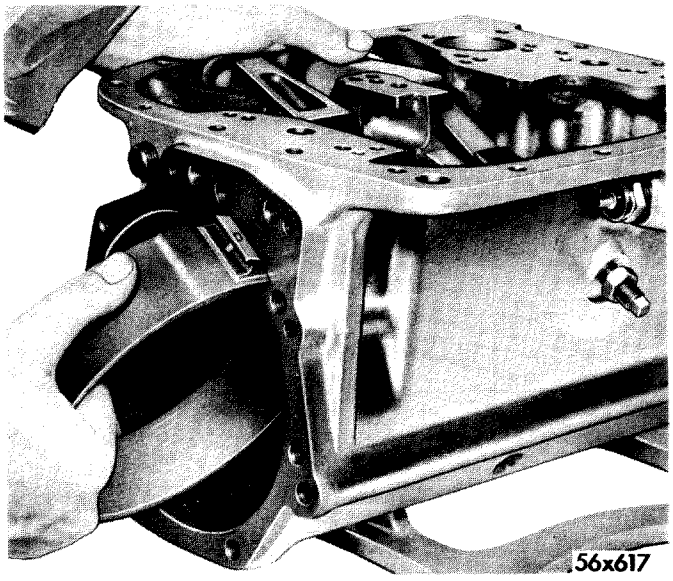


Figure 180—Removal and Installation of Low-Reverse Band

REMOVING POWER UNIT NO. 2 (SUN GEAR, REVERSE PLANET PINION CARRIER, OVERRUNNING CLUTCH, AND REAR CLUTCH ASSEMBLIES)

Loosen lock nuts on low-reverse and kickdown band adjusting screws, and back adjusting screws out 2 to 3 turns. Remove the three intermediate support locating bolts and lockwashers (two outside of case and one inside). See Figure 177. When removing unit, identify locating hole in the intermediate support to correspond with the threaded locating hole inside of case for installation purposes. Refer to Figure 227.

Keep unit centered as much as possible to prevent binding of intermediate support, and remove assembly from transmission case, as shown in Figure 178. Make sure front clutch and sun gear thrust washer remains in position in front of unit.

REMOVING UNIT NO. 3 (FRONT CLUTCH PISTON RETAINER AND INPUT SHAFT ASSEMBLIES)

Keep unit centered as much as possible, and remove from transmission case, as shown in Figure 179. Use extreme care when removing to prevent damage to seal rings on input shaft and sealing surfaces in reaction shaft (aluminum).

LOW-REVERSE BAND ASSEMBLY REMOVAL

Mark the low-reverse band assembly for installation purposes; then compress ends of band sufficiently to remove the low-reverse band strut. Remove low-reverse band assembly by rotating band ends through rear opening in transmission case, as shown in Figure 180. Remove low-reverse band anchor from adjusting screw.

KICKDOWN BAND REMOVAL

Compress kickdown band ends sufficiently to remove the kickdown band strut, see Figure 181. (Note that strut is grooved to act as a guide.) Remove the kickdown band anchor from adjusting screw.

Remove the kickdown band assembly by rotating band ends over center support in transmission case, as shown in Figure 182. Use extreme care when removing band so not to damage lining against edges of transmission case.

Both bands have bonded lining and no attempt should be made to reline them. The kickdown band is wider and has a different lining material.

LOW-REVERSE AND KICKDOWN BAND LEVER ASSEMBLIES REMOVAL

Remove kickdown and reverse lever shaft stop plug at rear of transmission case. Using a pair of long-nosed pliers, remove kickdown and low-reverse shaft lever spacer (flat).

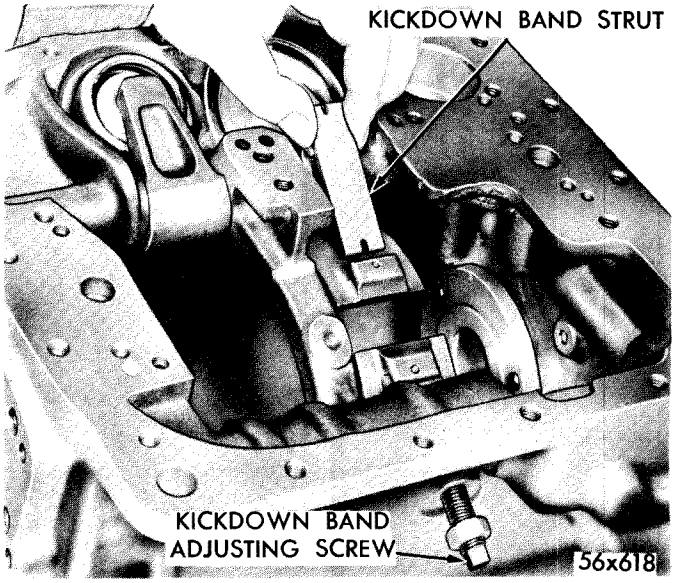


Figure 181—Removal and Installation of Kickdown Band Strut

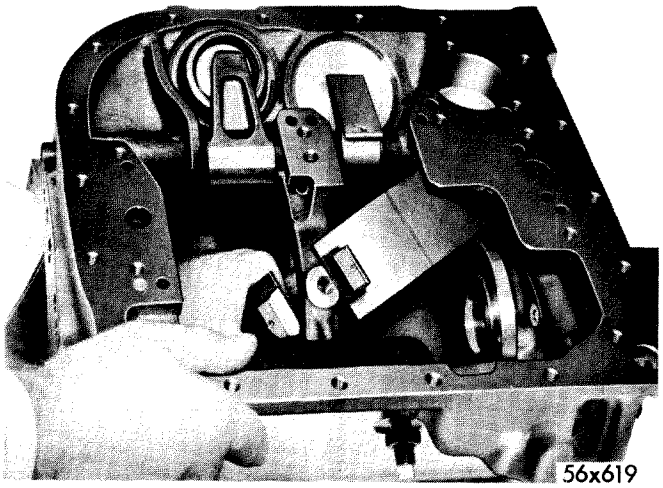


Figure 182—Removal and Installation of Kickdown Band

Thread a guide stud, Tool C-3288, into shaft, and remove shaft from case, as shown in Figure 183. Remove kickdown and low-reverse servo levers.

LOW-REVERSE SERVO REMOVAL

Install Tool C-3529 or C-3289 (modified as shown in Figure 184) on transmission case and compress piston spring retainer. Due to modification of tool, only one attaching bolt can be used. Using a screwdriver, remove the low-reverse servo piston spring retainer snap ring, as shown in Figure 185. Loosen compression portion of tool, and remove. Spring retainer may require guiding out of transmission case. Remove the spring retainer, spring and servo piston assembly.

KICKDOWN SERVO REMOVAL

Reinstall Tool C-3529 or C-3289 (modified as shown in Figure 184), apply sufficient pressure on the kickdown

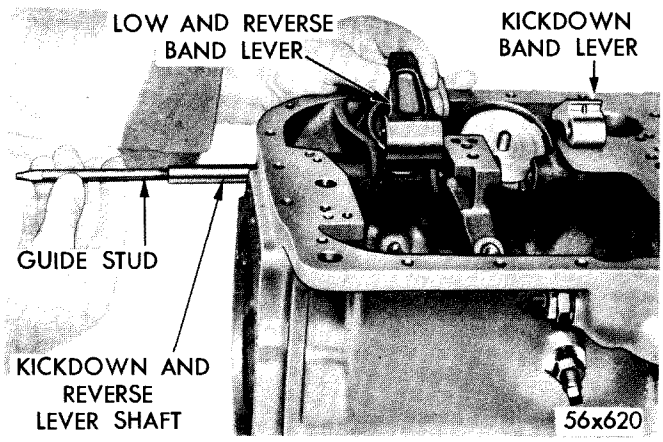


Figure 183—Removal and Installation of Kickdown and Reverse Lever Shaft

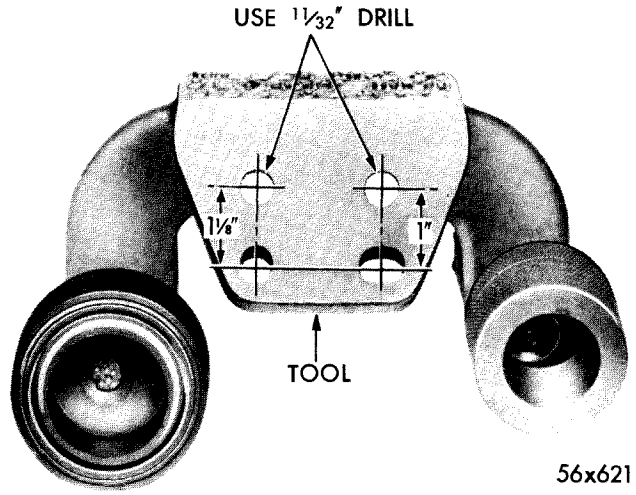


Figure 184—Modification of Tool C-3289

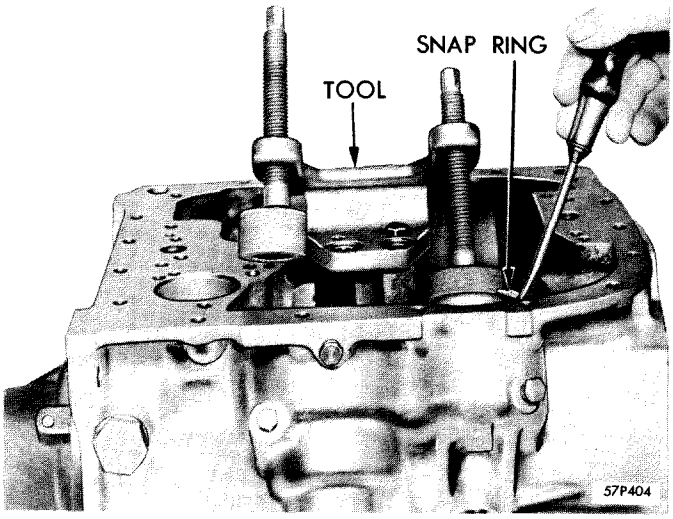


Figure 185—Removal and Installation of Low-Reverse Servo Piston Spring Retainer Snap-Ring

piston rod guide, and remove the snap ring, as shown in Figure 186.

Loosen compressing portion of tool, and remove from transmission case. Remove piston rod guide, piston

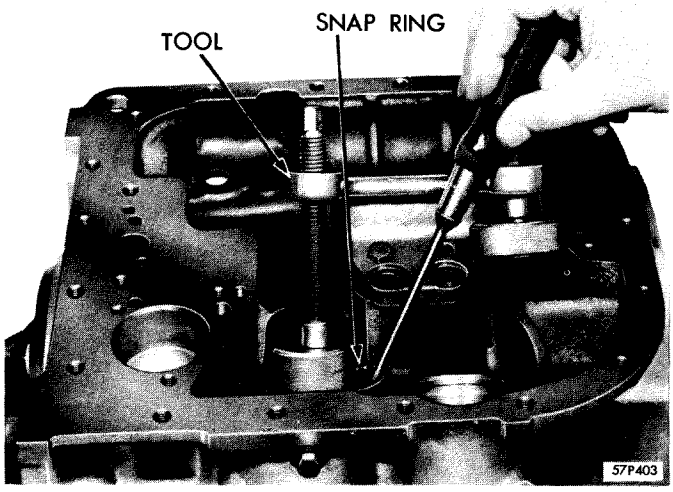


Figure 186—Removal and Installation of Kickdown Piston Rod Guide Snap Ring

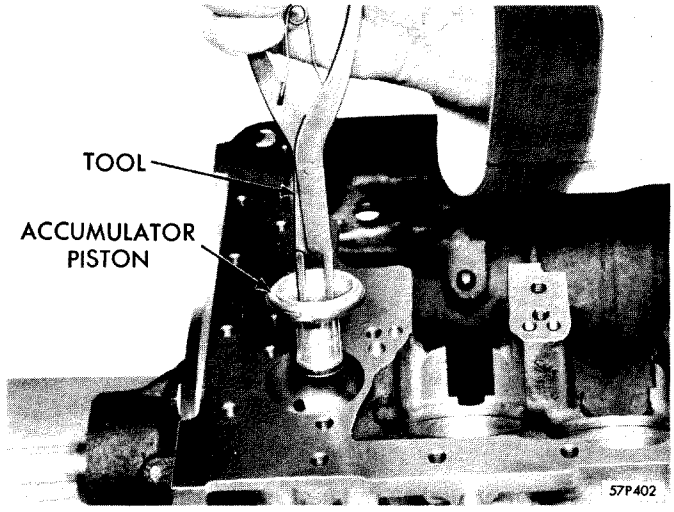


Figure 187—Removal and Installation of Accumulator Piston

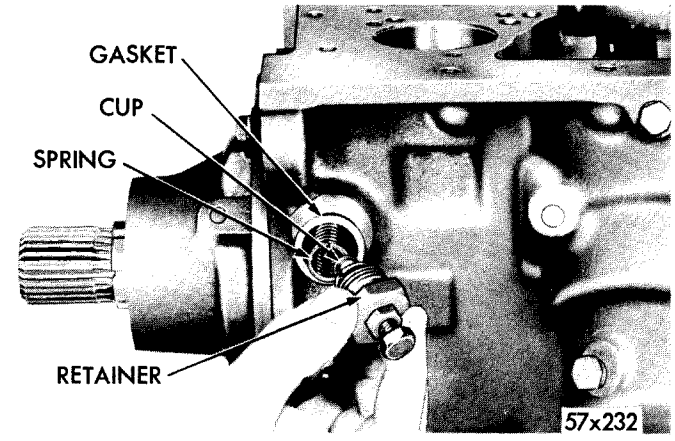


Figure 188—Removal and Installation of Regulator Valve Retainer and Gasket

spring, and piston rod. Using pliers, Tool C-484, remove the kickdown piston from the transmission case. Using pliers, Tool C-484, remove the accumulator piston from transmission case, as shown in Figure 187.

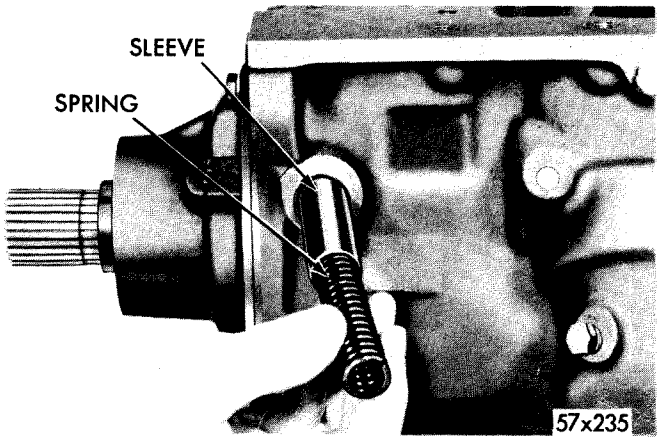


Figure 189—Removal and Installation of Regulator Valve Spring and Sleeve

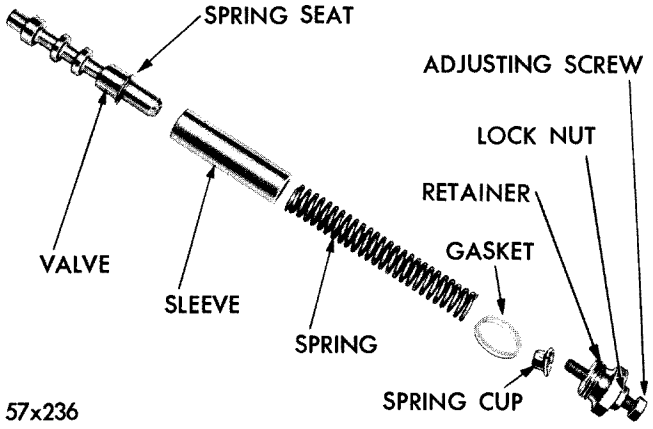


Figure 190—Regulator Valve Assembly (Disassembled View)

FRONT OIL PUMP REMOVAL

Remove front oil pump drive sleeve (if installed) then, remove the transmission regulator valve spring retainer, gasket, cup, spring, sleeve and valve, as shown in Figures 188, 189 and 190.

Remove the torque converter control valve spring retainer, gasket, spring and valve. These valves can be removed with the aid of a mechanical retriever or a piece of welding rod ($\frac{5}{32}$ inch for regulator valve and $\frac{1}{8}$ inch for torque converter valve) inserted in end of valve, as shown in Figure 149. The converter valve is so constructed that it will not drop into front housing during removal.

Remove the seven front oil pump housing to transmission case bolts. Sealing washers used under bolts are made from aluminum; discard if damaged.

Remove oil pump housing assembly from transmission case by tapping housing lightly with a soft hammer, as shown in Figure 191. Using dye, mark pump gears in relation to face of oil pump housing for reassembly purposes. Do not scribe.

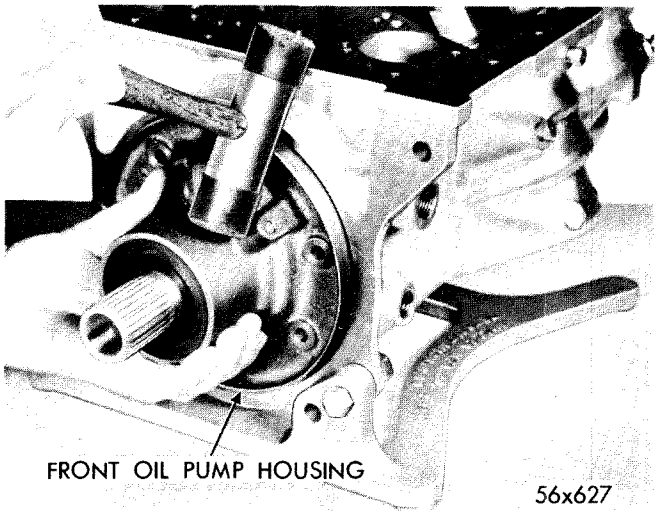


Figure 191—Removal of Front Oil Pump Housing Assembly

REGULATOR VALVE BODY REMOVAL

Install guide studs, Tool C-3288; and using the two threaded holes provided in the regulator valve body, install guide studs, Tool C-3283, as shown in Figure 192. Pull regulator valve body off of torque converter reaction shaft and remove gasket. Regulator valve body, as shown in Figure 193, is made of aluminum and requires care in handling to avoid damage.

TORQUE CONVERTER REACTION SHAFT REMOVAL

Refer to "Inspection of Torque Converter Reaction Shaft." If inspection reveals it is necessary to remove torque converter reaction shaft, proceed as follows:

Remove torque converter reaction shaft seal ring (neoprene). Remove the three transmission case to reaction shaft bolts and washers then, using Tool C-3531, press reaction shaft out of transmission case, as shown in Figure 194.

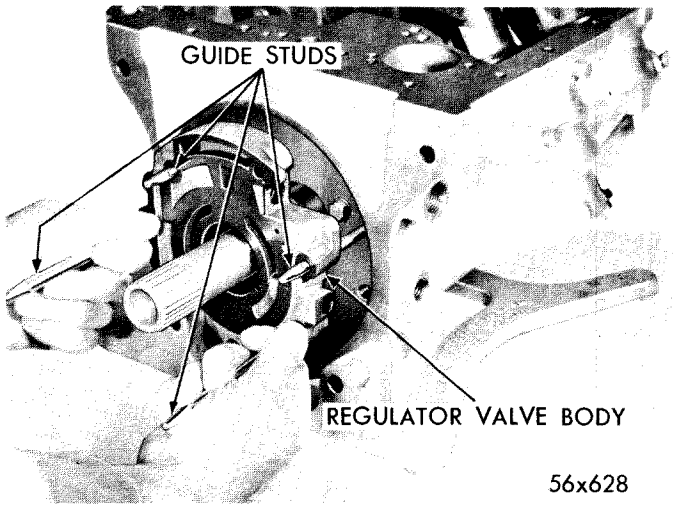


Figure 192—Removing Regulator Valve Body

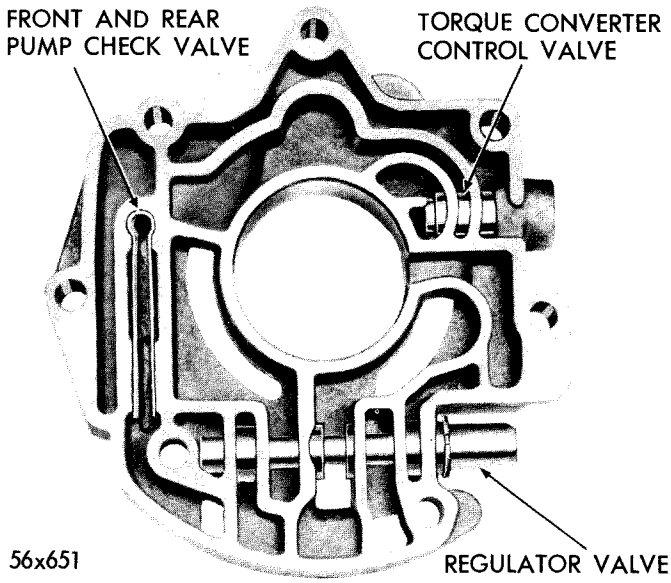


Figure 193—Regulator Valve Body and Valves

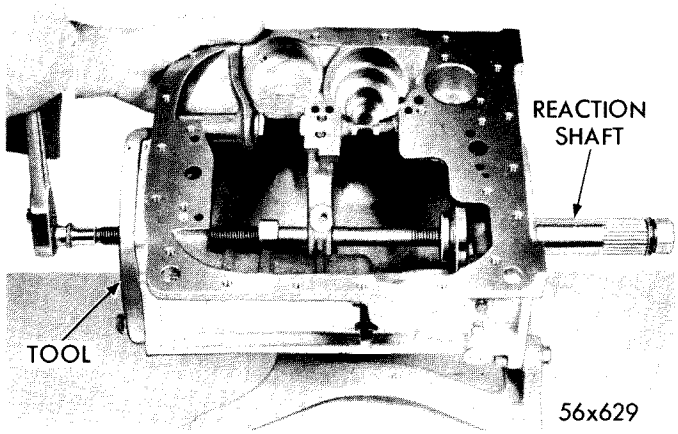


Figure 194—Removal and Installation of Torque Converter Reaction Shaft

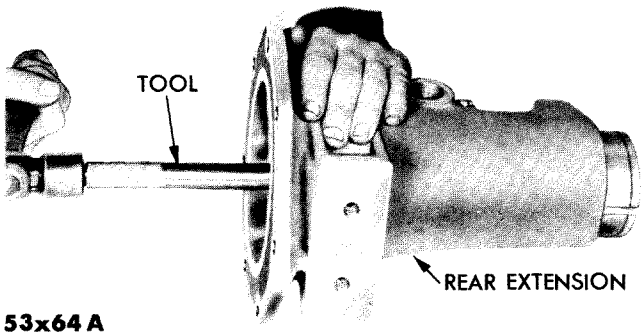
DISASSEMBLY, INSPECTION AND ASSEMBLY OF COMPONENT PARTS

The following precautions should be observed during assembly of component parts. Where lubrication is required, use Automatic Transmission Fluid (Type A). Do not use a sealing material on any gasket or mating surface, always use new gaskets. Torque all bolts and nuts to correct specifications.

Where snap rings are used, always make sure they are seated properly. If mating parts do not go together properly, always check reason. Do not force parts unnecessarily.

TORQUE CONVERTER REACTION SHAFT INSPECTION

Inspect inside of torque converter reaction shaft for burrs. Inspect splines on shaft for burrs and wear. Inspect the reaction shaft seal ring (neoprene) for deterior-



53x64 A

Figure 195—Removing Output Shaft Rear Bearing

ation and hardness. Inspect thrust surface for wear and slight scores. Do not remove the torque converter reaction shaft unless inspection reveals it is necessary to do so.

TRANSMISSION CASE INSPECTION

Inspect transmission case for cracks, sand holes, and stripped threads. Check for burrs on mating surfaces. Blow compressed air through all passages to make sure they are open. Check pressure take-off plugs for tightness.

Using straight edge, Tool C-3335, inspect valve body mating surface on transmission case for any burrs or irregularity in surface. Surfaces should be smooth and flat.

Inspect servo and accumulator bores for any scores or scratches. Light scratches may be removed with crocus cloth. Check regulator valve body mating surface in front of case for any irregularities. Disregard any scratches which may have been caused by torque converter reaction shaft bolt lock washers.

LOW-REVERSE AND KICKDOWN BANDS ADJUSTING SCREWS INSPECTION

It is vitally important that adjusting screws fit freely into transmission case. When lock nuts are loose, inspect screws and nuts for pulled threads or foreign material in threads. This is very important in obtaining proper band adjustments.

TRANSMISSION EXTENSION INSPECTION

Inspect extension for cracks in casting and remove burrs from gasket surface. Inspect vent (drive type) in top of extension and make sure it is open and free from dirt, undercoating, etc. The purpose of this vent is to prevent vacuum from forming in transmission case when it is drained. Vent also released fumes and expansion of oil caused by heat.

Clean output shaft rear bearing and dry with compressed air. Do not spin bearing with air pressure. Inspect bearing for rough spots. Do not remove bearing from extension unless inspection reveals it is necessary to do so.

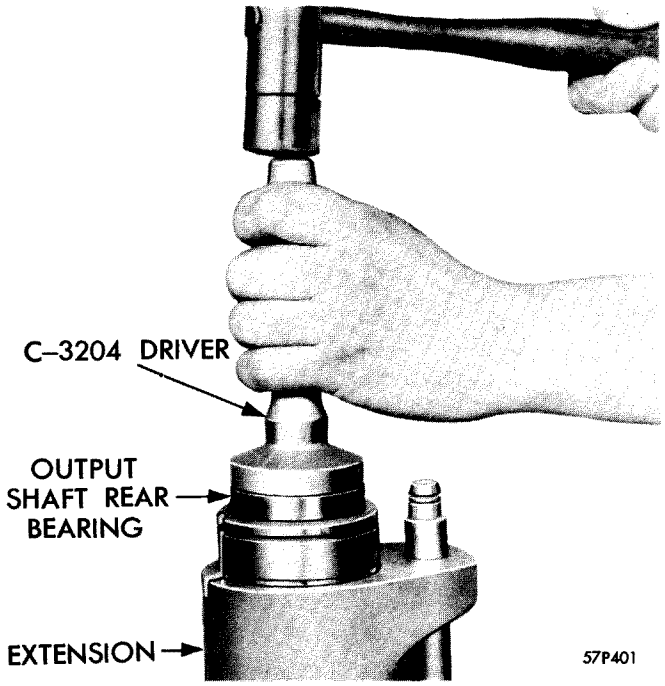


Figure 196—Installing Output Shaft Rear Bearing

OUTPUT SHAFT REAR BEARING REMOVAL

If necessary to remove rear bearing, remove output shaft rear bearing oil seal. Then, using pliers, Tool C-760 and remove the output shaft rear bearing snap ring. Inspect ring for distortion. Using driver, Tool C-3275, drive output shaft rear bearing out of rear extension, as shown in Figure 195.

OUTPUT SHAFT REAR BEARING AND OIL SEAL INSTALLATION

Using driver, Tool C-3204, install the output shaft rear bearing in extension as shown in Figure 196. Make sure bearing is properly seated, then lubricate Automatic Transmission Fluid (Type A).

Install output shaft rear bearing snap ring. Snap ring available in two sizes, select one to give minimum clearance. Using driver, Tool C-3205, install output shaft rear bearing oil seal (with metal portion of seal facing in) until tool bottoms on extension, as shown in Figure 197.

GOVERNOR DISASSEMBLY AND INSPECTION

Remove governor secondary weight and spring. Inspect all parts for burrs and wear. Check secondary weight for free movement in primary weight by placing secondary weight in primary weight without the spring. Primary weight should fall freely when both parts are clean and dry. Inspect governor weight spring for distortion. See Figure 198.

Place secondary weight and spring in primary weight, compress spring and install snap ring. Make sure snap

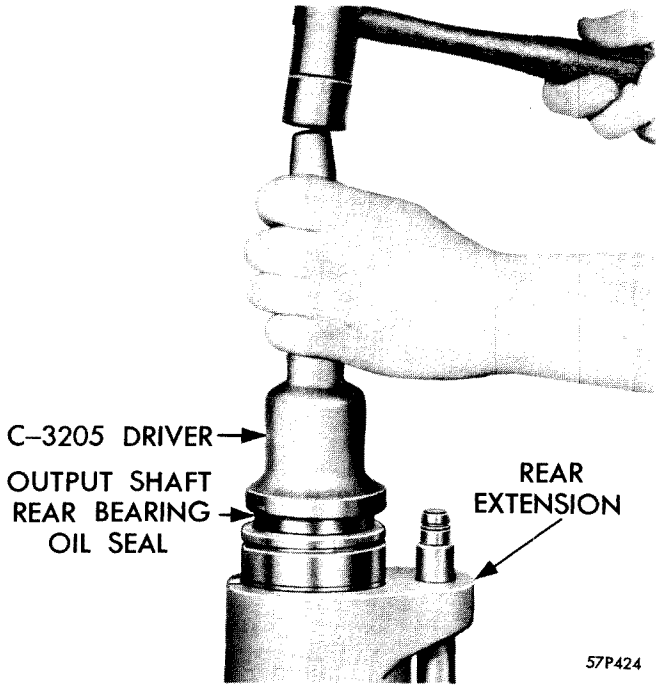


Figure 197—Installing Output Shaft Rear Bearing Oil Seal

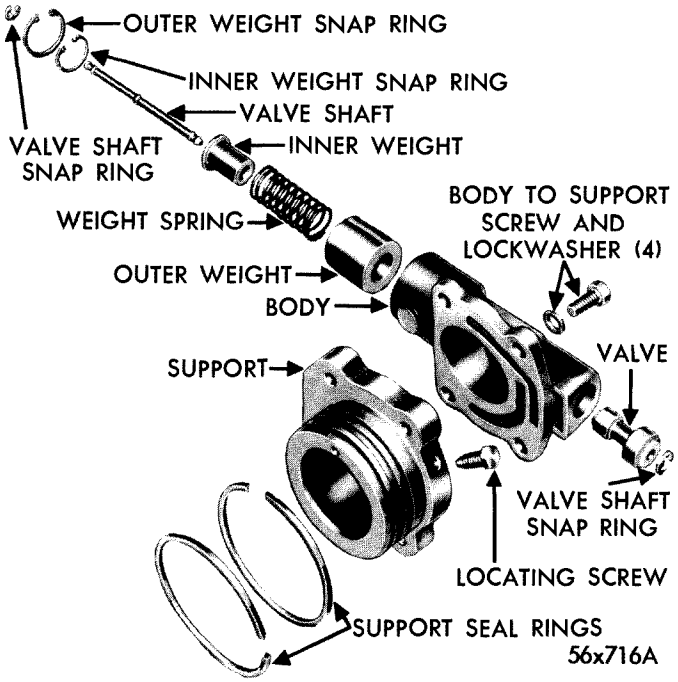


Figure 198—Governor Assembly (Disassembled View)

ring is seated properly. Slide governor body and support from rear oil pump housing. Remove the two governor support seal rings and inspect.

Remove the four governor body to support bolts and lockwashers. Separte body from support. Washers are part of bolt and serviced as an assembly. Mating surfaces are machined and can be easily damaged. Inspect oil passages and make sure they are free from dirt or foreign matter. Clean passages with compressed air. Inspect governor valve and body for slight scores. Valve should travel freely in governor body.

REAR OIL PUMP INSPECTION

Inspect oil pump housing machined surfaces for nicks and burrs and housing plug for leaks. Inspect oil pump gears for scoring or pitting. With gears cleaned and installed in pump housing (as marked) and using straight edge, Tool C-3335 (and feeler gauge), check clearance between pump housing face and face of gears, as shown in Figure 199. Clearance limits are from .001 to .0025 inch.

GOVERNOR ASSEMBLY REASSEMBLY

Lubricate the two governor support seal rings with Automatic Transmission Fluid (Type A) and install on the governor support. Make sure they are free to rotate in grooves.

Position governor body on support and install the four bolts with attached lockwashers. Do not tighten bolts at this time. Slide governor support and body assembly into position in rear oil pump housing. Compress governor support seal rings with fingers as support enters oil pump housing. Do not force.

OUTPUT SHAFT SUPPORT INSPECTION

Inspect all oil passages in output shaft support for any obstructions. Remove pressure take-off plugs (governor and rear clutch apply—Figure 143) and clean passages with compressed air.

Check rear oil pump mating surface for burrs and score marks. Check for stripped threads in support. Inspect gasket surfaces for burrs and dirt. Inspect inside bearing surface for wear and scoring.

DISASSEMBLY, INSPECTION AND ASSEMBLY OF POWER TRAIN UNITS

UNIT NO. 1 (OUTPUT SHAFT, KICKDOWN PLANET PINION CARRIER, AND INTERMEDIATE SHAFT ASSEMBLIES)—DISASSEMBLY—Unit can be placed in the propeller flange and brake drum assembly to aid in disassembly, as shown in Figure 200.

Using a screwdriver, remove output shaft drive housing snap ring, as shown in Figure 201. Refer to Figure 202 and complete disassembly of unit as follows:

Remove reverse annulus gear (B) from output shaft assembly (J). Remove intermediate shaft (C) and kickdown carrier assemblies (E) from output shaft assembly then, remove output shaft thrust washer (D) located inside of housing.

Remove kickdown planet pinion carrier assembly (E) from intermediate shaft assembly (C). The kickdown planet pinion carrier assembly used in this unit is identical to the low-reverse planet pinion carrier assembly used in Unit No. 2 but should not be interchanged.

Remove kickdown carrier thrust washer (F) from carrier assembly (E). Remove sun gear roller thrust

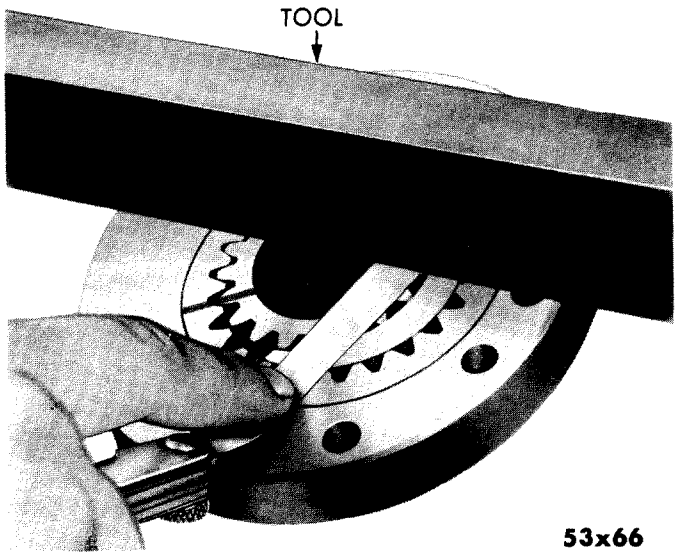


Figure 199—Checking Clearance Between Rear Pump Body and Gears

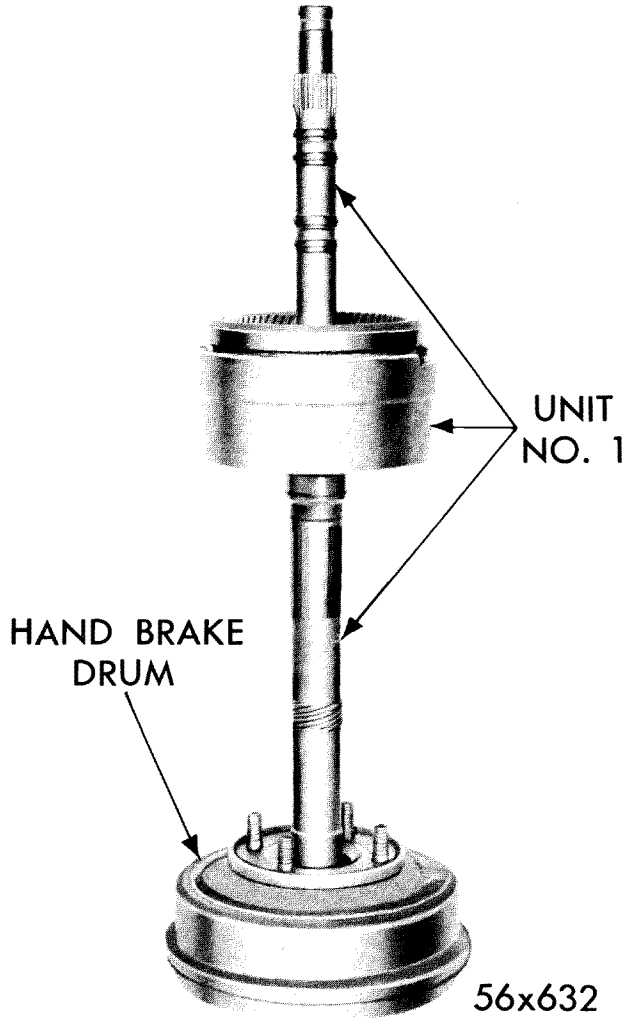


Figure 200—Using Propeller Shaft Flange and Brake Drum Assembly As a Holding Fixture for Unit No. 1

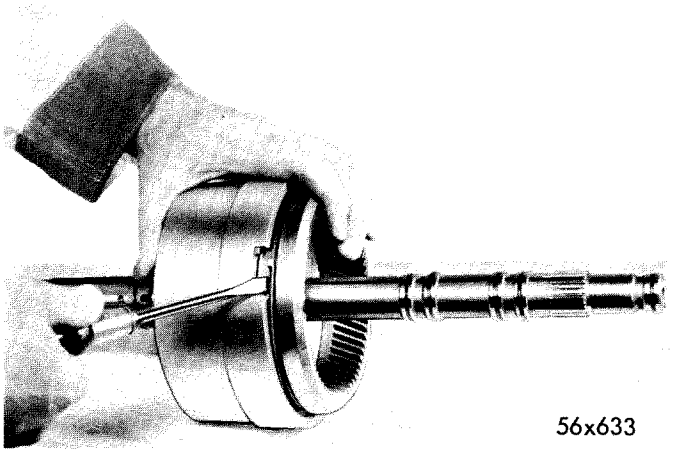


Figure 201—Removal and Installation of Output Shaft Drive Housing Snap Ring

washer (G) from intermediate shaft assembly. With a screwdriver, remove kickdown annulus gear snap ring (H) and separate gear (I) from intermediate shaft assembly (C).

OUTPUT SHAFT INSPECTION

Inspect speedometer drive gear for any nicks or burrs. Any nicks or burr on gear surface can be removed with the use of a sharp edged stone.

Inspect thrust surfaces, journals, and inner bushing for scores or excessive wear. Inspect riveting and housing for any cracks and internal driving lugs for excessive wear. Housing and output shaft is serviced as an assembly.

Inspect interlocking seal rings (K-L) on output shaft (J) for wear or broken locks, and make sure they turn freely in the grooves. Do not remove rings unless condition warrants. When replacing rings, use extreme care so not to damage interlocking portion of ring. Make sure all oil passages are open by blowing out with compressed air.

Inspect output shaft and kickdown carrier thrust washers (D) and (F) for scratches or excessive wear. Inspect sun gear (roller type) thrust washer (G) for pitted or cracked rollers.

INTERMEDIATE SHAFT ASSEMBLY INSPECTION

Inspect all bearing and thrust surfaces for scoring or scratches. Blow compressed air through all oil passages; make sure they are open and free of foreign matter.

Inspect the four large (N) and two small (M) interlocking seal rings for excessive wear, broken ends, and make sure they rotate freely in the grooves. Intermediate shaft and clutch feed tubes are serviced as an assembly.

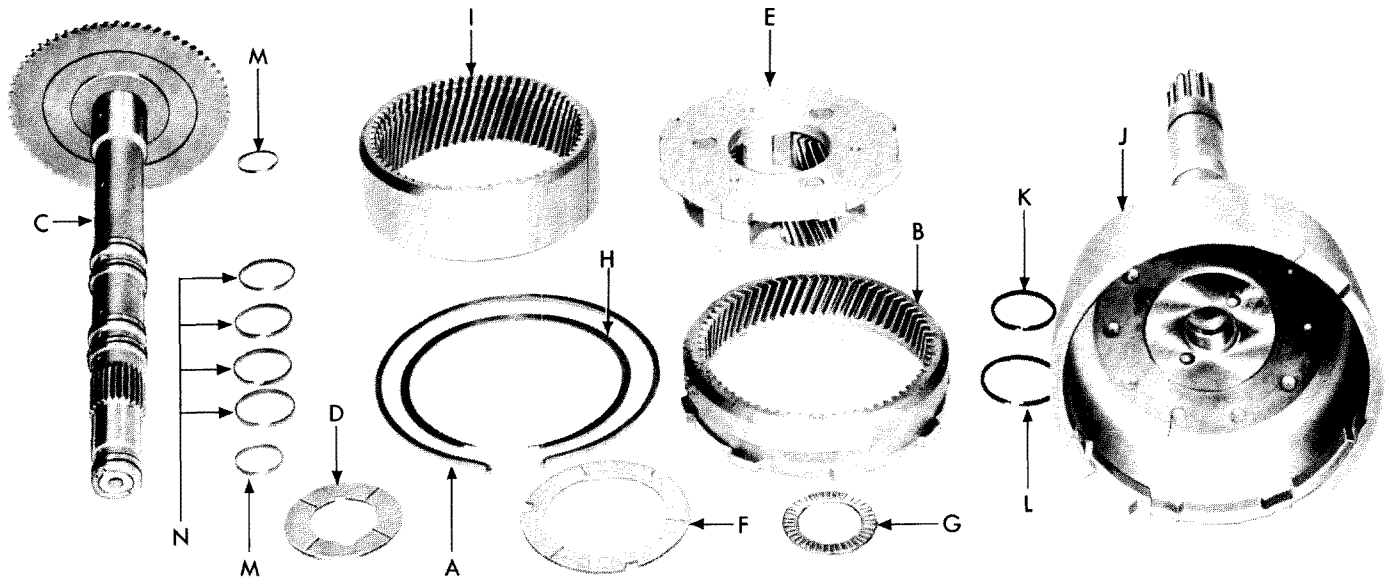


Figure 202—Unit No. 1 (Disassembled View)

A—Output Shaft Drive Housing Snap Ring
B—Reverse Annulus Gear
C—Intermediate Shaft Assembly
D—Output Shaft Thrust Washer
E—Kickdown Planet Pinion Carrier Assembly
F—Kickdown Carrier Thrust Washer
G—Sun Gear Thrust Washer (Roller)
H—Kickdown Annulus Gear Snap Gear
I—Kickdown Annulus Gear
J—Output Shaft Assembly
K—Output Shaft Seal Ring (Small)
L—Output Shaft Seal Ring (Large)
M—Intermediate Shaft Seal Rings (Small)
N—Intermediate Shaft Seal Rings (Large)

KICKDOWN PLANET PINION CARRIER ASSEMBLY INSPECTION

Inspect planet pinion carrier for cracks and pinions for broken or worn gear teeth. Using a feeler gauge, check end clearance on individual planet pinion gears, clearance should be .006 to .017 inch. Inspect pinion shafts for fit in the carrier and make sure pinions are free to rotate on shafts. Make sure shaft lock pins are installed.

Do not replace carrier assembly unless inspection reveals it is necessary. The planet pinion carrier and pinions are serviced only as a complete assembly. Inspect kickdown carrier thrust washer (F) for scratches or excessive wear.

REVERSE AND KICKDOWN ANNULUS GEARS INSPECTION

Inspect for worn, cracked, or broken gear teeth.

UNIT NO. 1 (OUTPUT SHAFT, KICKDOWN PLANET PINION CARRIER AND INTERMEDIATE SHAFT ASSEMBLIES)—ASSEMBLY—To aid in the assembly of unit No. 1, use the propeller shaft flange and brake drum assembly which was removed from the transmission.

Place reverse annulus gear (B) in position in housing (J) and install output shaft drive housing snap ring. Make sure snap ring seats properly in housing.

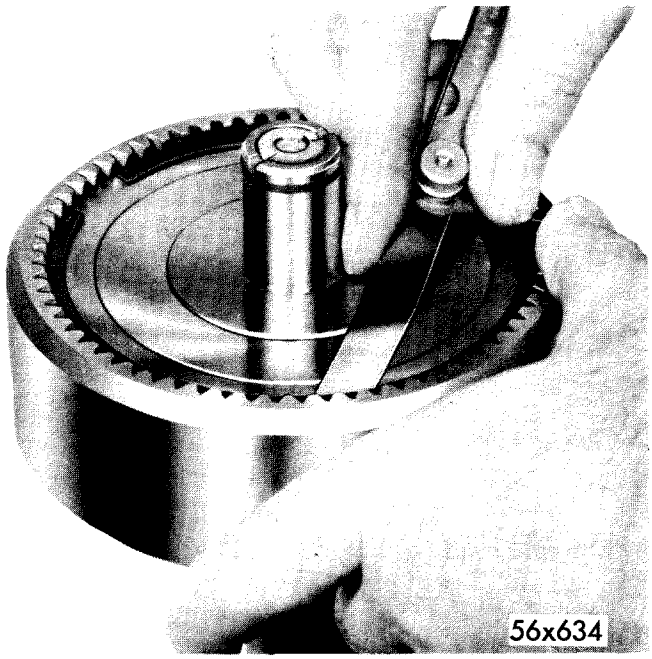


Figure 203—Checking Clearance Between Kickdown Annulus Gear Snap Ring and Intermediate Shaft Assembly

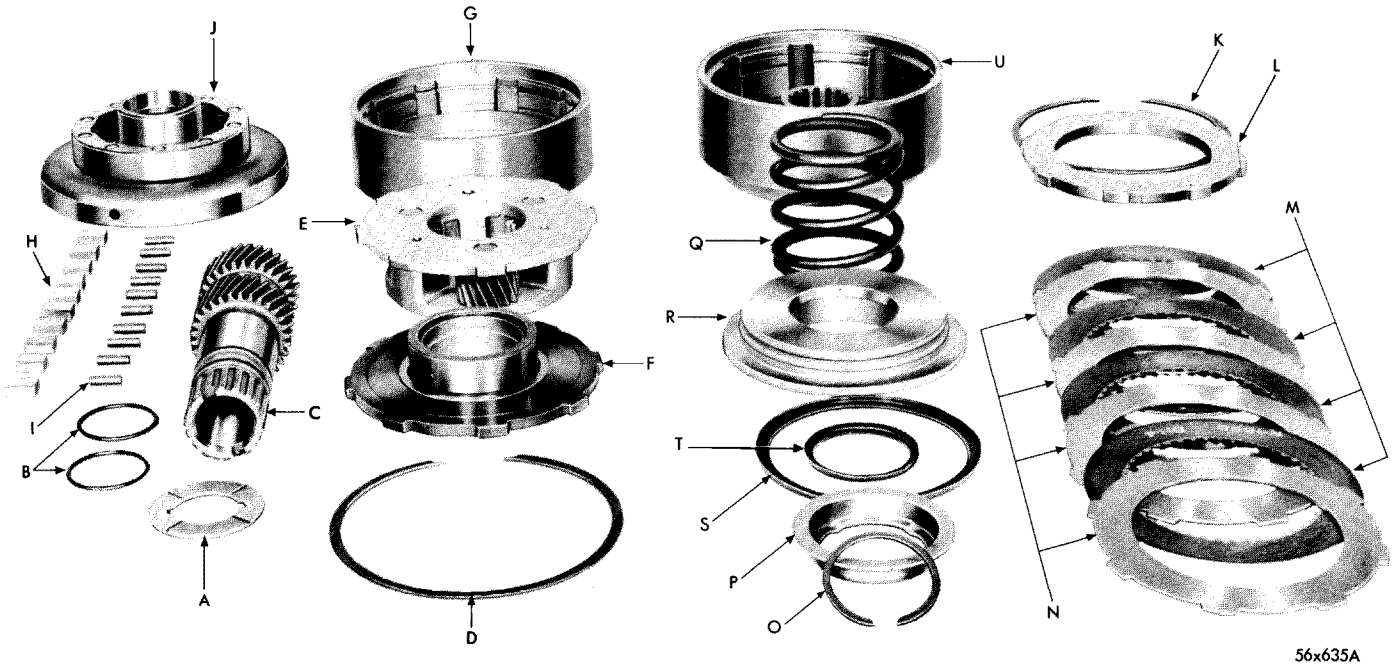


Figure 204—Unit No. 2 (Disassembled View)

A—Front Clutch and Sun Gear Thrust Washer
B—Sun Gear Rear Clutch Seal Rings
C—Reverse Sun Gear
D—Low and Reverse Band Drum Snap Ring
E—Low and Reverse Planet Pinion Carrier Assembly
F—Overrunning Clutch Hub Assembly
G—Low and Reverse Band Drum
H—Overrunning Clutch Cam Roller Springs
I—Overrunning Clutch Cam Rollers
J—Intermediate Support and Cam Assembly
K—Rear Clutch Snap Ring
L—Rear Clutch Pressure Plate
M—Rear Clutch Driving Disc
N—Rear Clutch Plates
O—Rear Clutch Piston Return Spring Snap Ring
P—Rear Clutch Return Spring Retainer
Q—Rear Clutch Piston Return Spring
R—Rear Clutch Piston
S—Rear Clutch Piston Seal Ring (Outer)
T—Rear Clutch Piston Seal Ring (Inner)
U—Rear Clutch Piston Retainer Assembly

With output shaft assembly (J) in an upright position, lubricate output shaft thrust washer (D) with Automatic Transmission Fluid (Type A) and place into position in housing.

Place kickdown annulus gear (I) in position on intermediate shaft assembly (C) and install snap ring (H) (select fit). Using a feeler gauge, check the clearance under the kickdown annulus gear snap ring, as shown in Figure 203. Clearance limits are as close to zero as possible. Snap rings are available in the following two thicknesses:

PT No. 1636357	.060" to .062"
1636358	.064" to .066"

When checking clearance, support annulus gear on edge of bench so intermediate shaft will seat properly in gear. Make sure snap seats properly.

Place intermediate shaft assembly (C) in output shaft housing (J). Lubricate kickdown carrier thrust washer (F) with Automatic Transmission Fluid (Type A) and place in position on kickdown planet pinion carrier assembly (E). Place carrier assembly (E) in position in kickdown annulus gear (I). Make sure thrust washer (F) remains in position.

Lubricate and install sun gear (roller type) thrust washer (G) over intermediate shaft and into position in carrier assembly.

UNIT NO. 2 (SUN GEAR, REVERSE PLANET PINION CARRIER, OVERRUNNING CLUTCH, AND REAR CLUTCH PISTON RETAINER ASSEMBLIES)—DISASSEMBLY—The letters referred to in the Disassembly, Inspection and Assembly of this unit pertain to Figure 204.

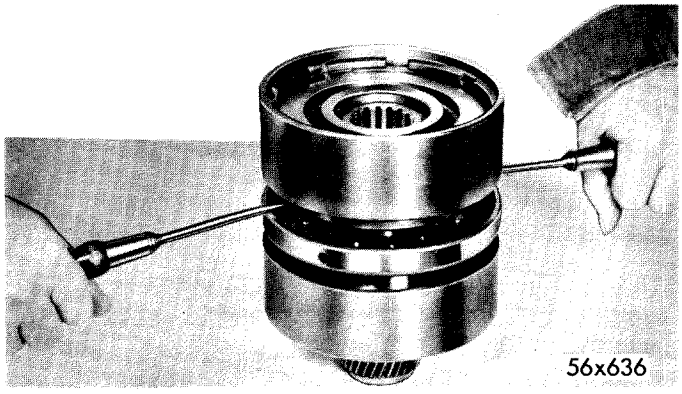


Figure 205—Removing Rear Clutch Piston Retainer Assembly From Sun Gear

With unit setting in upright position, remove sun gear and front clutch thrust washer (A). Using two screwdrivers, inserted between clutch and intermediate support, remove rear clutch retainer assembly from sun gear, as shown in Figure 205.

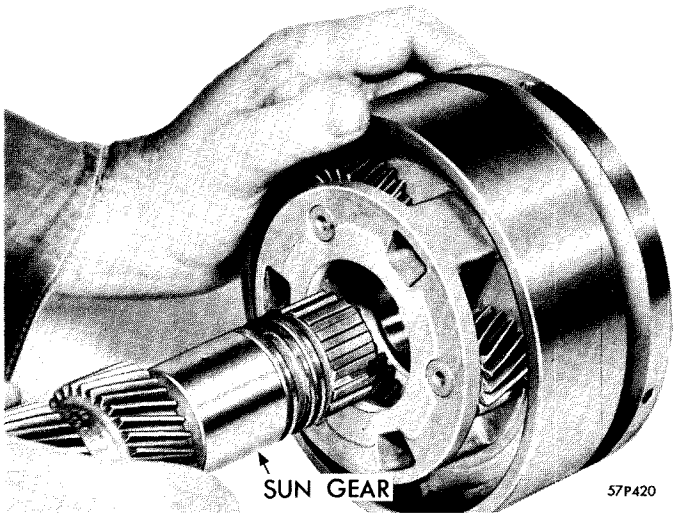


Figure 206—Removal and Installation of Sun Gear (Reverse Planet Pinion Carrier and Overrunning Clutch Assembly)

Remove the two rear clutch seal rings (neoprene) from sun gear. Remove reverse sun gear from overrunning clutch and reverse planet pinion carrier assemblies, as shown in Figure 206.

Install fixture, Tool C-3527, in intermediate support and cam assembly, as shown in Figure 207. Remove

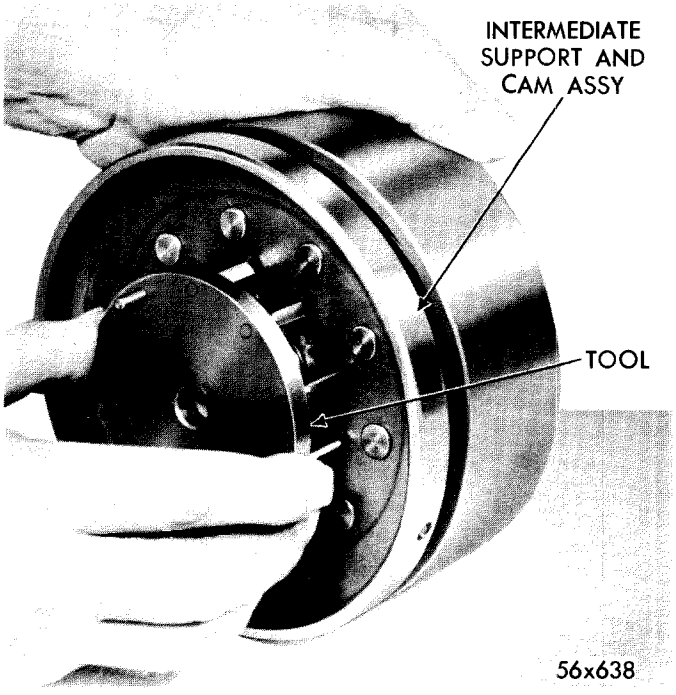


Figure 207—Installation of Tool C-3527 in Intermediate Support and Cam Assembly

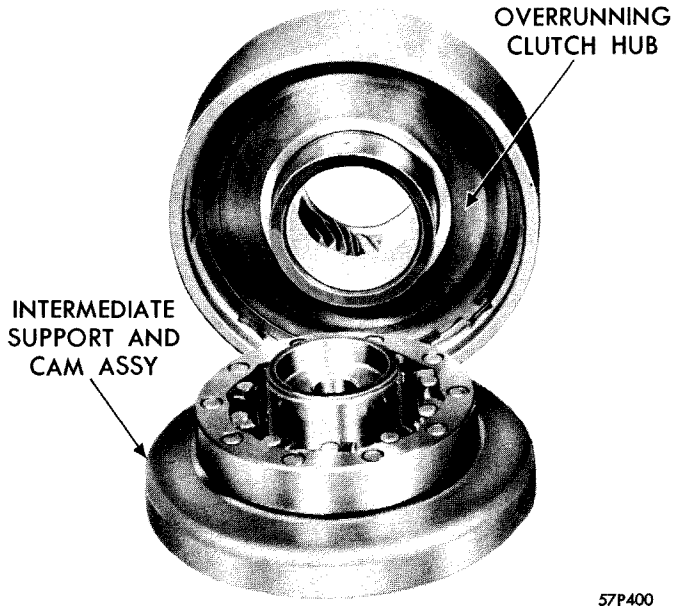


Figure 208—Removal and Installation of Intermediate Support and Cam Assembly from Overrunning Clutch Hub

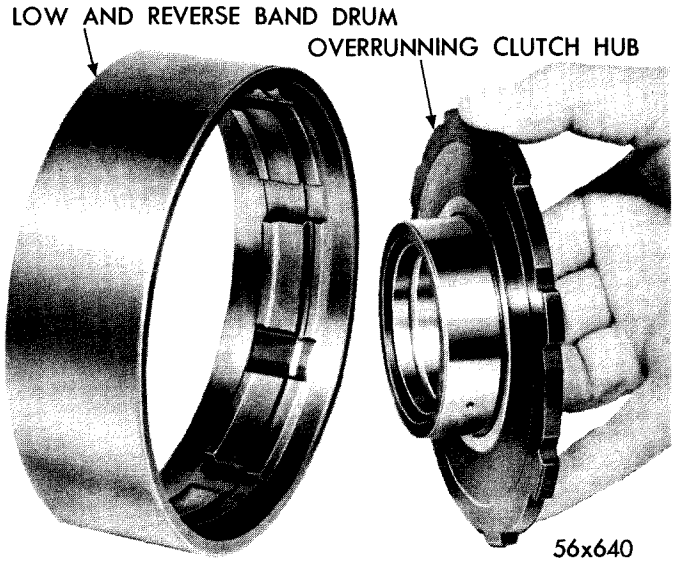


Figure 209—Removal and Installation of Overrunning Clutch Hub in Low and Reverse Band Drum

intermediate support and cam assembly from overrunning clutch hub, as shown in Figure 208.

Using a screwdriver, remove snap ring (D) from low and reverse band drum assembly (G). Remove the low and reverse planet pinion carrier assembly (E) from reverse band drum.

Remove overrunning clutch hub assembly from reverse band drum, as shown in Figure 209. Remove overrunning clutch cam roller springs (H) and rollers (I) (ten each) by removing fixture, Tool C-3527, from intermediate support and cam assembly. Have assembly over bench when removing tool.

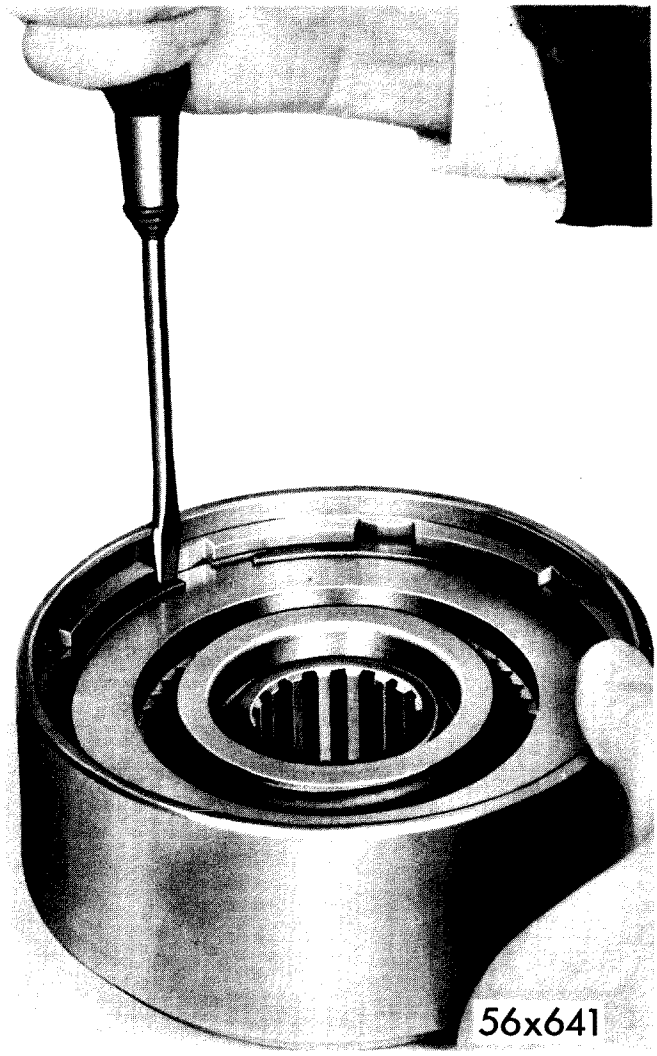


Figure 210—Removal and Installation of Rear Clutch Piston Retainer Snap Ring

REAR CLUTCH PISTON RETAINER ASSEMBLY DISASSEMBLY

Using screwdriver, remove snap ring (large) from rear clutch piston retainer assembly, as shown in Figure 210.

Remove rear clutch pressure plate (L) from retainer assembly. Invert clutch piston retainer assembly and remove the clutch plates (N) and driving disc (M) assemblies (four each). Using compressor, Tool C-3575, slightly compress the rear clutch piston return spring retainer, as shown in Figure 211. Use extreme care not to damage piston return spring retainer by compressing spring too far.

Release compressor, Tool C-3575, and remove the clutch return spring retainer (P) and spring (Q) from clutch piston retainer assembly. Spring retainer may require guiding past snap ring groove as tool is released. Using a twisting motion, remove the clutch piston assembly (R) from retainer. Remove rear clutch piston inner and outer seal rings (S & T).

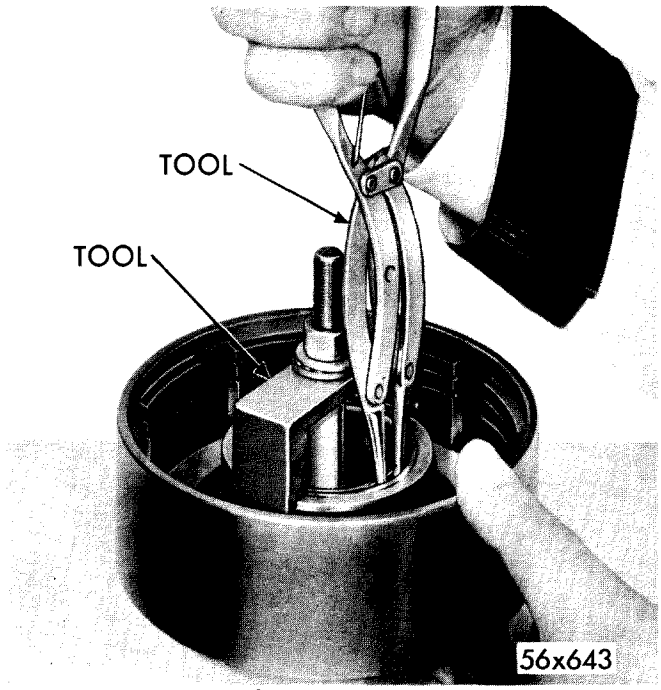


Figure 211—Removal and Installation of Rear Clutch Return Spring Retainer Snap Ring

CLUTCH DRIVING DISC AND PLATE INSPECTION

Inspect driving discs for evidence of burning, glazing and flaking off of facing material. Check discs by scratching facings with finger nail; if material collects under nail, replace all of driving discs. Replace driving discs if splines become damaged. Inspect the steel clutch plates and pressure plate surfaces for evidence of burning, scoring, and damaged driving lugs; replace if necessary.

PISTON AND SEAL RINGS INSPECTION

Inspect seal ring surfaces in piston retainer for nicks or deep scratches. Light scratches will not interfere with sealing of neoprene rings.

Inspect inner and outer piston seal rings (neoprene) for deterioriation, wear and hardness. Inspect seal ring groove in piston for nicks or burrs.

Inspect inside bore of the piston for score marks; if light, remove with crocus cloth; if heavy, replace the piston. Inspect piston spring, retainer, and snap ring for distortion.

REAR CLUTCH PISTON RETAINER ASSEMBLY INSPECTION

Note the ball check in clutch retainer. The purpose of ball check is to relieve centrifugal oil pressure when transmission is in neutral or operating in drive (breakaway) and engine speeds are increased, otherwise clutch may engage. Make sure ball operates freely.

Inspect the band contacting surface for deep scores and burrs, especially if the band lining is worn to the point where the steel band has been contacting the rear clutch piston retainer. Do not machine the piston retainer in a lathe to remove score marks.

Inspect steel clutch plate contacting surfaces for burrs or brinelling. Make sure clutch driving lugs on steel clutch plates travel freely into retainer. Remove any metal pickup on hub of retainer.

REAR CLUTCH PISTON RETAINER ASSEMBLY

Lubricate and install inner piston seal ring (T) on hub of clutch retainer. Make definitely sure that lip of seal if facing down and seal is properly seated in groove. Lubricate and install outer seal ring (S) on clutch piston (lip of seal facing from flange). Place piston assembly (R) in clutch retainer (U) and with a twisting motion, seat piston in bottom of retainer.

Install piston return spring on hub and position spring retainer and snap ring on spring. Using compressor, Tool C-3575, compress the clutch spring sufficiently to seat the snap ring, as shown in Figure 211. Piston spring retainer may require guiding past the clutch hub. Make sure snap ring is properly seated.

Remove compressor, Tool C-3575. Lubricate all clutch plates and drive discs with Automatic Transmission Fluid (Type A). Assemble by placing one of the rear clutch steel plates, in the clutch retainer followed by a driving disc. Repeat this procedure until all four discs and four plates have been installed. Do not install rear clutch pressure plate and snap ring at this time as the rear clutch pressure plate will be used as an assembly tool in selecting the proper front clutch clearance. The pressure plate should be thoroughly cleaned.

REVERSE SUN GEAR ASSEMBLY INSPECTION

1. Inspect gears for cracked or broken teeth.
2. Inspect steel back bronze type bushing for scoring or excessive wear. Bushing and reverse sun gear serviced as an assembly.
3. Inspect intermediate support bearing surface of gear for wear and slight scores.
4. Inspect rear clutch seal ring grooves on gear for nicks or burrs.
5. Inspect inner ring sealing area in bore of sun gear for grooves or scratches.
6. Inspect thrust area of sun gear for nicks, scratches, or burrs.
7. Inspect seal rings (neoprene) for deterioration, wear, nicks or hardness.
8. Inspect front clutch and sun gear thrust washer for scratches or excessive wear.

INTERMEDIATE SUPPORT AND CAM ASSEMBLY INSPECTION

1. Inspect riveting of cam to intermediate support.
2. Inspect cam roller surface for brinelling.
3. Inspect roller spring retaining tabs for being bent or distorted.
4. Inspect bearing surface on hub for scoring.
5. Inspect steel back bronze type bushing in hub for scratches or scoring and excessive wear. Bushing and intermediate support are serviced as an assembly.
6. Inspect overrunning clutch cam rollers for being pitted or scored.
7. Inspect overrunning cam roller springs for distortion. Replace if necessary.

LOW AND REVERSE PLANET PINION CARRIER ASSEMBLY INSPECTION

Inspect planet pinion carrier for cracks and pinions for broken or worn gear teeth. Using a feeler gauge, check end clearance on individual planet pinion gears, clearance should be .006 to .017 inch.

Inspect pinion shafts for fit in the carrier and make sure pinions are free to rotate on shafts. Make sure shaft lock pins are installed. Do not replace carrier assembly unless inspection reveals it is necessary. The planet pinion carrier and pinions are serviced only as a complete assembly.

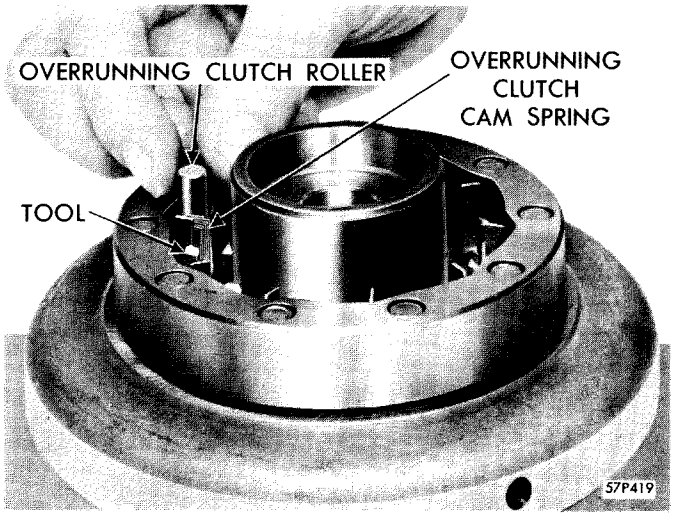


Figure 212—Installation of Overrunning Clutch Rollers and Springs in Intermediate Support and Cam Assembly

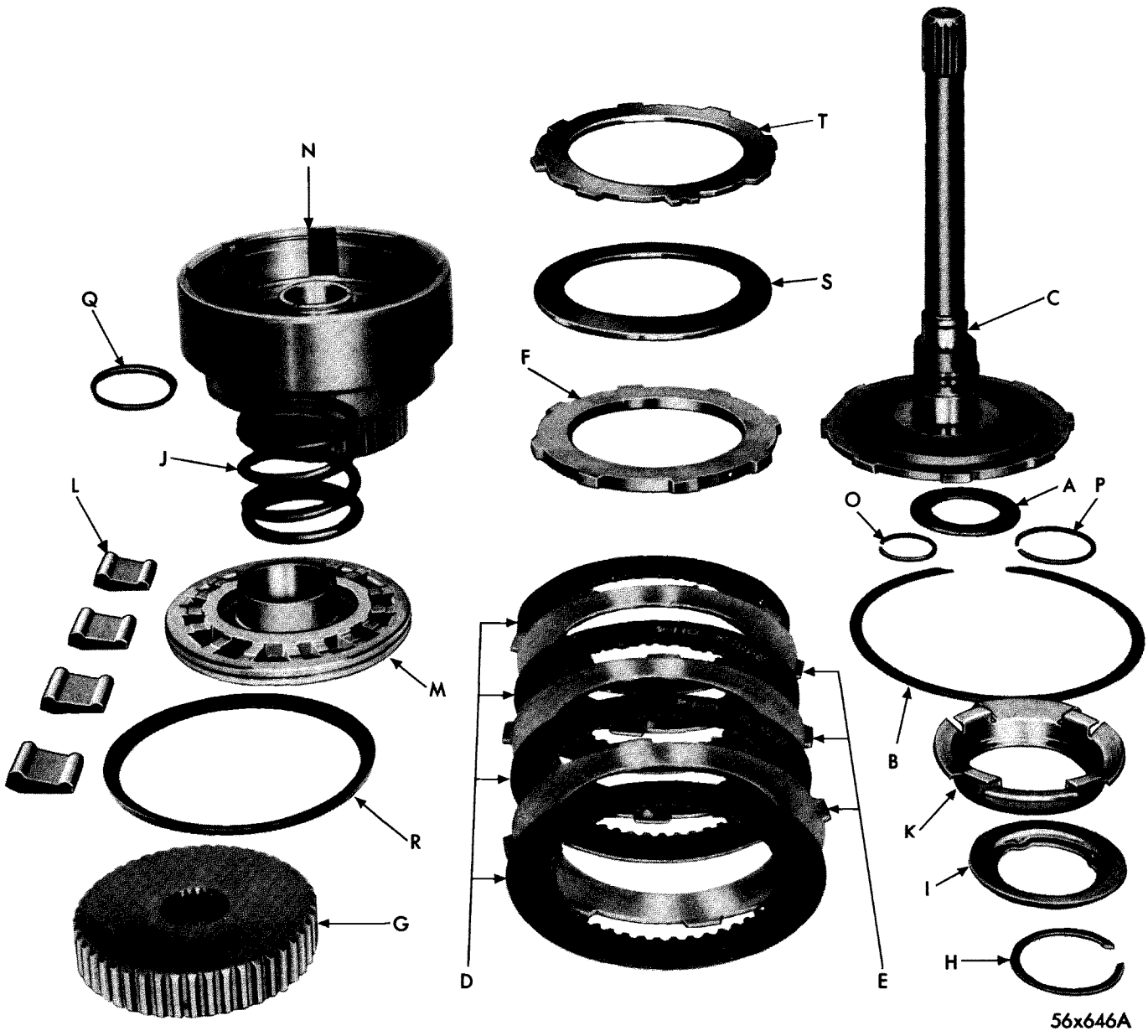


Figure 213—Unit No. 3 (Disassembled View)

A—Input Shaft Thrust Washer
B—Front Clutch Snap Ring
C—Input Shaft Assembly
D—Front Clutch Driving Discs
E—Front Clutch Plates
F—Front Pressure Plates
G—Front Clutch Driving Disc Hub
H—Front Clutch Piston Return Spring Snap Ring
I—Front Clutch Piston Return Spring Retainer
J—Front Clutch Return Spring
K—Front Clutch Piston Lever Retainer
L—Front Clutch Piston Levers
M—Front Clutch Piston
N—Front Clutch Piston Retainer
O—Input Shaft Oil Seal Ring (Small)
P—Input Shaft Oil Seal Ring (Large)
Q—Front Clutch Piston Seal Ring (Inner)
R—Front Clutch Piston Seal Ring (Outer)
S—Front Clutch Piston Cushion Spring
T—Front Clutch Piston Cushion Spring Retaining Plate

LOW AND REVERSE BAND DRUM INSPECTION

Inspect the band contacting surface for deep scratches and burrs, especially if band lining is worn to the point where steel band has been contacting the drum. Do not attempt to machine the drum in lathe to remove score marks. Inspect driving lugs inside of drum for excessive wear.

OVERRUNNING CLUTCH HUB ASSEMBLY INSPECTION

Inspect cam roller contacting surface for brinelling. Inspect steel back bronze type bushing in hub for scratching or scoring and excessive wear. Bushing and hub serviced as an assembly.

Inspect lubricating hole and make sure it is free from

foreign matter by cleaning with compressed air. Inspect reverse band drum snap ring (select fit) for being distorted.

UNIT NO. 2 ASSEMBLY

Install overrunning clutch hub assembly (hub first) into snap ring side of the low and reverse band drum, see Figure 209.

Place low and reverse planet pinion carrier assembly (E) in position in low and reverse band drum (G). With drum supported, select snap ring to give minimum clearance and install. Snap rings are available in the following three thicknesses:

PT No. 1636315	.060" to .062"
1636316	.064" to .066"
1636317	.068" to .070"

Place figure, Tool C-3527, in position in intermediate support and cam assembly, and install cam springs and rollers, as shown in Figure 212. Make definitely sure that cam springs and rollers are properly seated against cam; otherwise, damage to springs will result when overrunning clutch hub is installed.

With intermediate support and cam assembly resting on bench, lubricate bushing and install low and reverse band drum assembly over hub. While holding the two assemblies together, remove fixture, Tool C-3527.

Lubricate bearing surface and reverse sun gear and install intermediate support and planet pinion carrier assembly. Lubricate the two sun gear rear clutch seal rings (neoprene) with Automatic Transmission Fluid (Type A) and install on reverse sun gear.

Install rear clutch piston retainer assembly on reverse sun gear. To prevent personal injury, do not place the fingers under the clutch retainer assembly when installing. Install the front clutch and gun gear thrust washer (A). Lubriplate may be used to hold the thrust washer in position.

UNIT NO. 3—(INPUT SHAFT AND FRONT CLUTCH PISTON RETAINER ASSEMBLIES)—DISASSEMBLY—The letters referred to in the disassembly, inspection and reassembly of this unit, pertain to Figure 213.

Remove the input shaft fibre thrust washer (select fit) (A). During assembly, the front clutch cushion spring (S) was preloaded to 500 pounds. To remove snap ring (B) and input shaft, the front clutch assembly must be placed in an arbor press. With the rear of retainer resting on a suitable support, press the input shaft only far enough into retainer to permit removal of the snap ring with a screwdriver.

If an arbor press is not available, two large "C" clamps may be used by placing them 180° apart and applying equal pressure. If "C" clamps are used, make sure they are positioned so as not to damage the ball check located in back side of retainer.

Slowly release pressure on arbor press, then remove the retainer and input shaft from the arbor press. Remove the input shaft assembly (C) from the clutch piston retainer (N). Invert the front clutch piston retainer, and remove the cushion spring retaining plate (T), cushion spring (S), driving disc (4) (D), clutch plates, (3), (E), pressure plate (F) and clutch hub (G).

Install compressor Tool C-3575, then compress the front clutch piston return spring retainer (I). Using pliers, Tool C-3301, remove the piston return spring snap ring (H). Release and remove fixture, Tool C-3575. Remove the piston return spring retainer (I) and spring (J).

Remove lever retainer (K) and levers (L) from front clutch piston retainer (N). Using a twisting motion, remove the piston assembly from the retainer, as shown in Figure 214.

INPUT SHAFT INSPECTION

Inspect the input shaft thrust washer (A) for cracks or excessive wear. Inspect front clutch snap ring (B) for distortion. Inspect interlocking seal rings (O & P) for wear or broken locks. Make sure they turn freely in the grooves. Do not remove rings unless condition warrants. When replacing rings, use extreme care not to damage interlock portion of ring. Make sure all oil passages are open by blowing out with compressed air.

Check splines and lugs for nicks or burrs. Inspect bearing and thrust surfaces for nicks or scratches. Inspect steel back bronze type bushing for scratches or

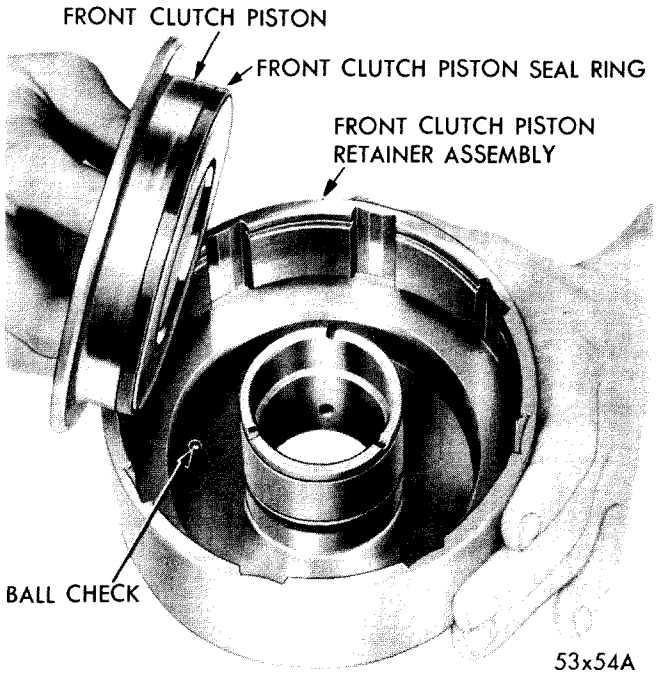


Figure 214—Removal and Installation of Front Clutch Piston Assembly

scoring or excessive wear. Bushing and input shaft are serviced as an assembly.

CLUTCH DRIVING DISCS, PLATES, AND HUB INSPECTION

Inspect driving discs (D) for evidence of burning, glazing, and flaking off of facing material. Check discs by scratching facings with finger nails; if material collects under nail, replace all of driving discs. Replace driving discs if splines have become damaged. Inspect the steel clutch plates (E) cushion spring retaining plate (T), and pressure plate (F) surface for evidence of burning, scoring, and damaged lugs; replace if necessary. Inspect cushion spring (S) for distortion and evidence of scoring.

Inspect lever contacting surface on pressure plate for evidence of wear. Inspect clutch hub (G) driving lugs for wear and remove any metal pickup which may have accumulated on either side of the hub. Inspect splines in center of hub for burrs and wear. (Oil passages in hub are to lubricate clutch plates.) Make sure they are free of foreign matter.

FRONT CLUTCH PISTON, SEAL AND LEVERS INSPECTION

Inspect levers (L) for wear or distortion. Remove and inspect inner and outer piston seal rings (Q & R) (neoprene) for deterioration, wear, and hardness. Inspect seal ring groove in piston for nicks or burrs. Inspect inside portion of piston hub for score marks. If light remove with crocus cloth, if heavy replace the piston (M). Inspect lever retainer (K), return spring (J), spring retainer (I), and snap ring (H) for distortion.

FRONT CLUTCH RETAINER INSPECTION

Note ball check in clutch retainer. The purpose of ball check is to relieve centrifugal oil pressure when clutch is in released position (neutral and reverse) and engine speeds are increased; otherwise, clutch may engage. Make sure ball operates freely.

Inspect seal ring surface in hub; if intermediate shaft seal rings have excessively worn or grooved this surface, replace the clutch piston retainer (N) assembly.

Remove any metal pickup on hub of retainer, and inspect seal ring groove for nicks or burrs. Inspect steel clutch plate contacting surfaces for scores or brinelling. Make sure clutch driving lugs on steel plates travel free in retainer.

Inspect splines on rear of retainer for nicks, burrs, or brinelling. Inspect thrust surface on rear of retainer for scratches or scoring. Make sure all clutch feed and lubricating passages are free from foreign matter.

UNIT NO. 3 ASSEMBLY

Lubricate and install inner (neoprene) seal ring (Q) on hub of clutch retainer. Make definitely sure that lip of seal is facing down and seal is properly seated in groove.

Lubricate and install outer seal ring (R) on clutch piston with lip of seal facing away from flange. Place piston assembly (M) in clutch retainer and with a twisting motion, seat piston in bottom of retainer, see Figure 214.

Place lever retainer (K) in piston and install the four levers (L). Make sure levers are free and properly seated in piston slots. Install clutch return spring (J) over hub of clutch retainer (N), and position spring retainer (I) and snap ring (H) on spring.

Using compressor, Tool C-3575, compress the clutch return spring sufficiently to seat snap ring with pliers, Tool C-3301. Spring retainer may require guiding past the piston retainer hub. Make sure snap ring is properly seated. Remove spring compressing portion of Tool C-3575.

Install pressure plate (F) (smooth side up) in retainer. Install discs and plates by placing one of the driving discs (D) in the clutch retainer followed by a steel plate (E). Repeat this procedure until all driving discs and steel plates have been installed.

CHECKING FOR PROPER TRAVEL OF CLUTCH PRESSURE PLATE

It is very important that the front clutch pressure plate has the proper amount of travel where levers are used for applying additional pressure to clutch plates. Insufficient travel may cause the clutch plates to drag. Exces-

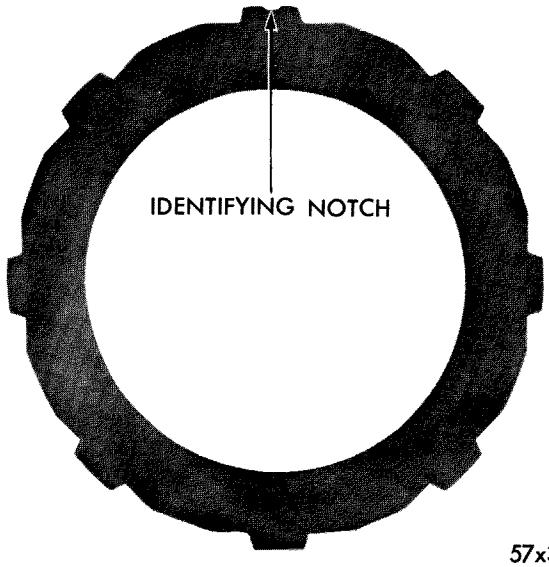


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Figure 215—Identification of Front Clutch Cushion Spring Retaining Plate

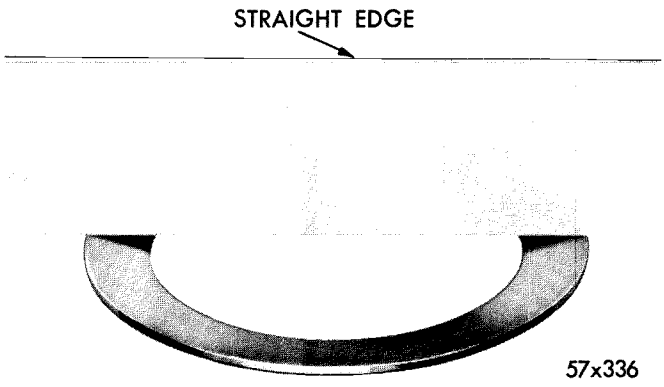


Figure 216—Identification of Front Clutch Cushion Spring

sive travel may allow slippage of the clutch. To check for proper travel of the clutch pressure plate, proceed as follows:

Install the rear clutch pressure plate (which was withheld during the assembly of unit No. 2) on top of the front clutch pack. Holding this plate firmly in position, insert a feeler gauge between the plate and top disc in the assembly. The total clearance should be from .020 to .040 inches. If the measured clearance is not within these limits, the clutch discs should be replaced with any combination of new discs, (part numbers 1636260, 1363372 or 1636373) to provide for proper clearance.

Remove the rear clutch pressure plate and install in its proper location in the rear clutch assembly. Install rear clutch snap ring. Install the front clutch hub, cushion spring retaining plate (T). See Figure 215, and cushion spring (S) (concave side, as shown in Figure 216, toward retaining plate) (K).

The front clutch cushion spring (S) must be preloaded to 500 pounds for assembly. Place front clutch and the input shaft assembly in an arbor press with the rear of the piston retainer resting on a suitable support. Press the input shaft into the clutch retainer until snap ring (B) can be installed. If arbor press is not available use two "C" clamps placed 180° apart as described previously.

Remove the input shaft and front clutch assemblies from the arbor press (or remove "C" clamps) and install the input shaft thrust washer.

SERVOS, BANDS AND MISCELLANEOUS INSPECTION

BANDS

All letters referred to in the inspection of these parts pertain to Figure 217.

Make visual inspection of bands and lining for wear and bond to metal. If lining is worn to the point that grooves are no longer visible, band assemblies must be replaced. The lining is bonded to the band and no attempt should be made to reline them. Inspect bands for distortion or cracked ends. The reverse band is narrower than the kickdown band. Therefore, it should be identified to prevent improper installation.

LEVER ASSEMBLIES

Inspect levers (J and K) for being cracked or worn and make sure they are free to turn on shaft and have side clearance when installed. Inspect lever shaft (I) for excessive wear.

REVERSE SERVO PISTON ASSEMBLY

Inspect lever contacting surface on plug (L) for excessive wear. Remove and inspect reverse servo piston seal ring (Z) (neoprene) for deterioration and hardness. Inspect seal ring groove for nicks or burrs. Inspect servo piston return spring (O), retainer (N), and snap ring (M) for being distorted.

KICKDOWN PISTON ASSEMBLY

Inspect riveting of kickdown piston rod (T). Also inspect guide (R) contacting surface for nicks or burrs. Inspect seal ring (CC) on guide for wear and make sure it turns freely in the groove. Check fit of guide (R) on piston rod. Inspect the three rings (two interlocking) on piston for wear or broken locks. Make sure they turn freely in the groove. It is not necessary to remove ring unless condition warrants. When replacing new rings, use extreme care so as not to damage the interlocking portion of the ring. Inspect kickdown piston (U) for light scores and wear. Inspect kickdown piston spring (S) and rod guide snap ring (Q) for being distorted.

ACCUMULATOR PISTON AND SPRING

Inspect the two seal rings (X and Y) (one interlocking) for wear or broken locks and make sure they turn freely in the grooves. It is not necessary to remove rings unless condition warrants. When replacing new interlocking seal rings, use extreme care so as not to damage interlocking portion of ring. Inspect accumulator piston (V) for nicks, burrs, and excessive wear. Inspect the accumulater spring (W) for being distorted.

DRIVE SLEEVE

Inspect the front seal ring (neoprene) for nicks, deterioration and hardness. Inspect the interlocking seal ring for wear or broken locks, and make sure it turns freely in the groove. It is not necessary to remove rings unless condition warrants. Inspect driving lugs for excessive wear and bearing surface on outer diameter for nicks, burrs, or scratches.

FRONT OIL PUMP

Inspect front oil pump housing outer seal (on circumference of housing) and oil seal for deterioration and

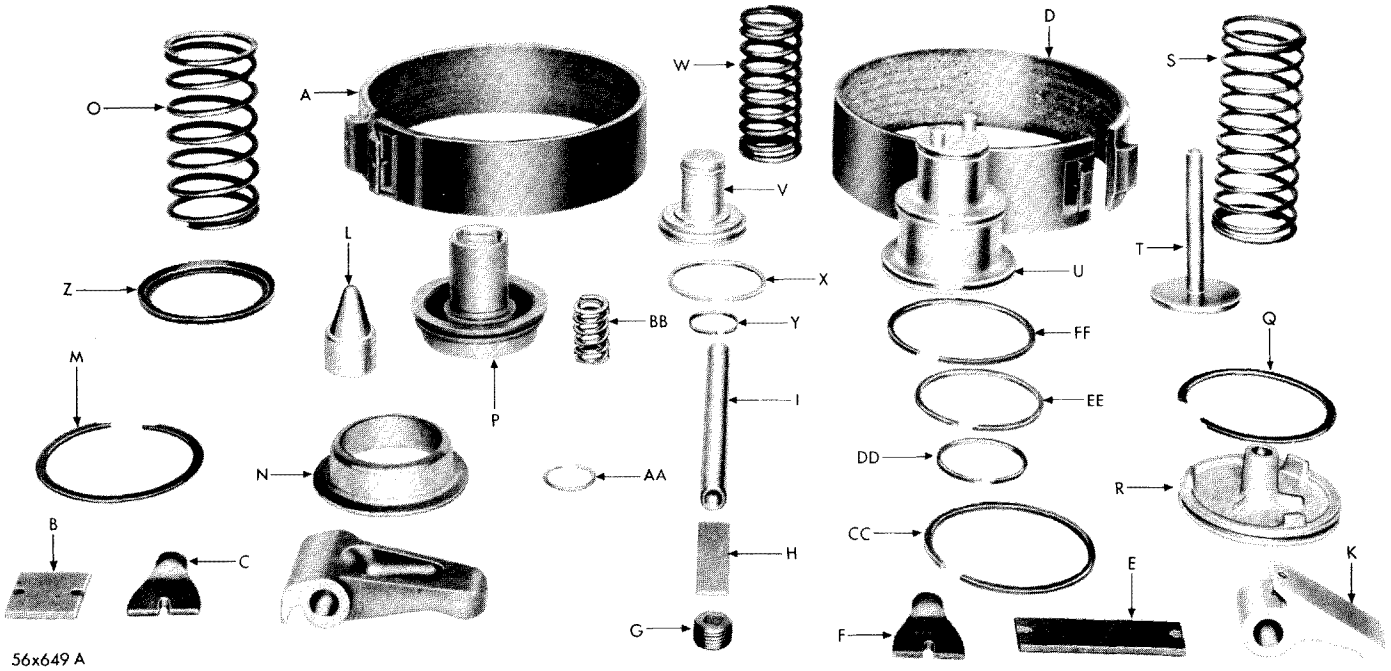


Figure 217—Servos and Bands (Disassembled View)

A—Low and Reverse Band Assembly
B—Reverse Band Strut
C—Reverse Band Anchor
D—Kickdown Band
E—Kickdown Band Strut
F—Kickdown Band Anchor
G—Kickdown and Reverse Lever Shaft Stop Plug
H—Servo Lever Shaft Spacer
I—Kickdown and Reverse Lever Shaft
J—Low and Reverse Band Lever
K—Kickdown Band Lever
L—Reverse Servo Piston Plug
M—Reverse Servo Spring Retainer Snap Ring
N—Reverse Servo Piston Spring Retainer
O—Reverse Servo Piston Spring
P—Reverse Servo Piston
Q—Kickdown Piston Rod Guide Snap Ring
R—Kickdown Piston Rod Guide
S—Kickdown Piston Spring
T—Kickdown Piston Rod
U—Kickdown Servo Piston
V—Accumulator Piston
W—Accumulator Spring
X—Accumulator Piston Ring (Large)
Y—Accumulator Piston Ring (Small)
Z—Reverse Servo Piston Seal Ring
AA—Reverse Servo Piston Plug Snap Ring
BB—Reverse Servo Piston Cushion Spring
CC—Kickdown Piston Rod Guide Seal Ring
DD—Kickdown Piston Seal Ring (Small)
EE—Kickdown Piston Seal Ring (Intermediate)
FF—Kickdown Piston Seal Ring (Large)

hardness. Do not remove oil seal from housing unless inspection reveals that it is necessary.

To remove oil seal, use a brass drift and drive seal out front of housing. To replace front oil pump housing oil seal, position seal in housing, (metal portion of seal down) and use driver, Tool C-3278 to drive seal until tool bottoms on face of housing, as shown in Figure 218.

Inspect drive sleeve seal ring contacting surface in housing for wear and scratches. Inspect steel back bronze type bushing in hub for scratches or scoring and excessive wear. (Bushing and housing are serviced as an assembly.)

Remove oil pump gears and inspect gear contacting surfaces for scratches, burrs, or grooving. Inspect regulator body contacting surface on pump housing face for nicks or burrs.

Inspect housing passages and make definitely sure they are free from dirt and foreign matter. Clean and install oil pump gears in housing. Replace gears, as identified when removed, with counterbore in pinion gear facing down.

Using straightedge, Tool T-3335 and feeler gauge, check clearance between pump housing face and face of gears, as shown in Figure 219. Clearance limits are from .001 to .0025 inch. After checking pump gear clearance, lubricate pump gears with Automatic Transmission Fluid (Type A).

REGULATOR VALVE BODY AND VALVES

Place body and valves in pan containing a clean solvent, wash thoroughly, and dry with compressed air. Inspect the reaction seal ring surface in bore for scratches, nicks, or burrs.

Inspect both valves for free movement in valve body; they should fall in and out of bores when both the valves and body are dry. Crocus cloth may be used to polish valves providing care is exercised not to round the

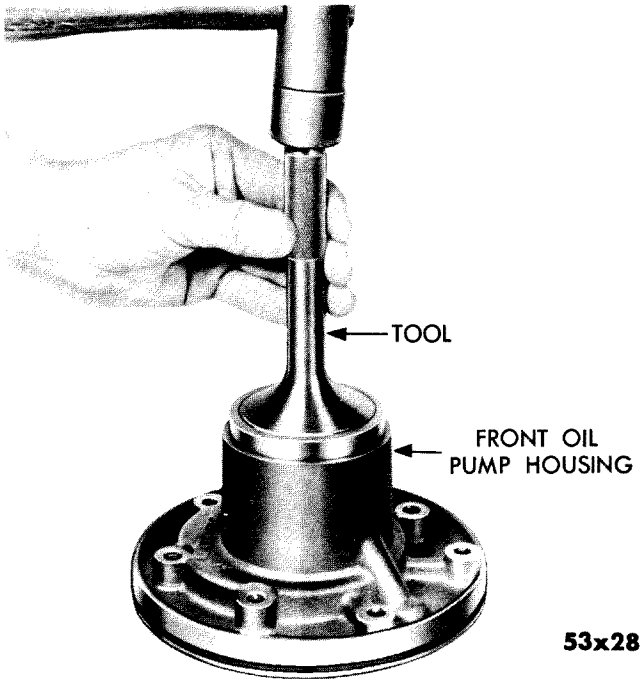


Figure 218—Installing Front Pump Housing Oil Seal

sharp edge portion of the valves. The sharp edge portion is vitally important to this type of valve, it helps to prevent dirt and foreign matter from getting between the valve and body, thus reducing the possibilities of sticking.

Check all fluid passages for obstructions and inspect all mating surfaces for burrs and distortion. If regulator valve body should have a slight nick or raised portion on mating surfaces, it may be removed by using a surface plate and crocus cloth.

Inspect front and rear pump check valve for proper seating on both surfaces. Check metering hole for a plugged condition and be sure hole is free of foreign matter. If necessary to remove valve, use a pair of long nose pliers.

When installing check valve make definitely sure rear pump check valve (with metering hole) is positioned toward outside of regulator valve body.

Check regulator valve spring seat (snap ring). After the valves and regulator valve body have been thoroughly cleaned and inspected, the valves should be reinstalled in body, refer to Figure 193. Torque converter control valve has end drilled for removal and installation purposes. Place assembly on a clean surface and cover until ready for installation.

Inspect regulator valve and torque converter control valve springs for distortion. Check regulator valve spring sleeve and cup for burrs. Check adjusting screw and locknut in retainer for freeness.

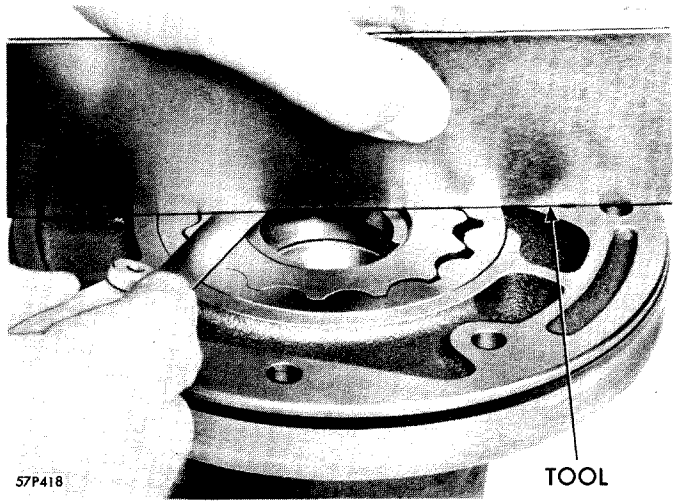


Figure 219—Checking Clearance Between Front Pump Body and Gears

ASSEMBLY OF UNITS IN TRANSMISSION CASE

TORQUE CONVERTER REACTION SHAFT

Using heat lamps, heat front of transmission case to approximately 170 to 190 degrees F. Install guide studs, Tool C-3283, in front face of reaction shaft flange. Lubricate portion of reaction shaft that presses into case with Automatic Transmission Fluid (Type A).

Position torque converter reaction shaft into front of transmission case so that guide studs in shaft align with threaded holes in case. Using Tool C-3531, press reaction shaft into place, as shown in Figure 194.

Remove the guide studs and start the three transmission case to reaction shaft bolts and washers, draw down evenly and tighten from 10 to 15 foot-pounds. Coat torque converter reaction shaft seal (neoprene) with Automatic Transmission Fluid (Type A) and install on shaft.

REGULATOR VALVE BODY

Install guide studs, Tool C-3288, see Figure 192. Install regulator valve body gasket over guide studs and into position on the transmission case. With seal ring (neoprene) in position on reaction shaft, install regulator valve body and valves over guide studs and into position. Hold valves in place to prevent damage while installing valve body.

FRONT OIL PUMP ASSEMBLY

With inner and outer seals lubricated and pump gears in position in housing (counterbore in pinion gear facing down as identified when removed), place oil pump housing over studs and slide into position, as shown in Figure 220.

Start five of the bolts (with Aluminum washers) and draw housing down evenly until it is seated into trans-

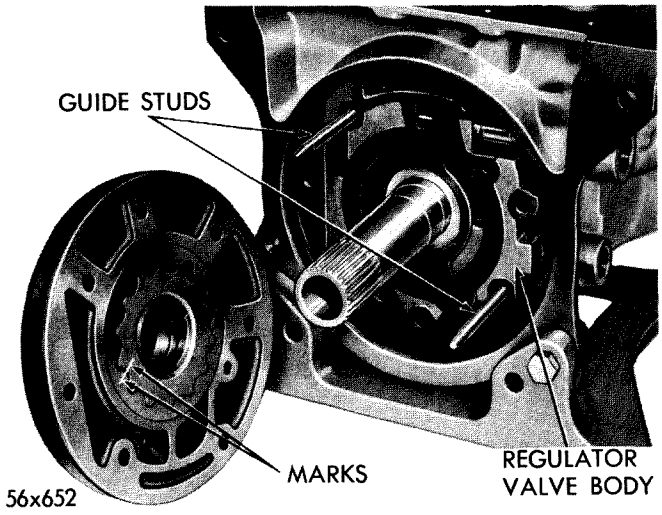


Figure 220—Installing Front Oil Pump Assembly

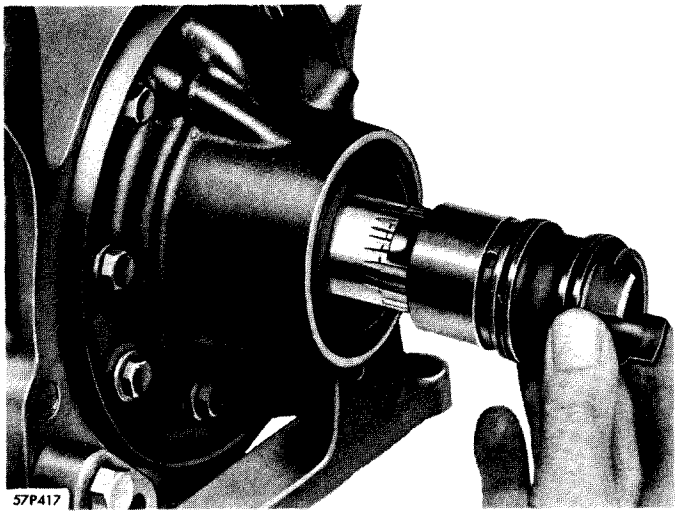


Figure 222—Installing Front Oil Pump Drive Sleeve

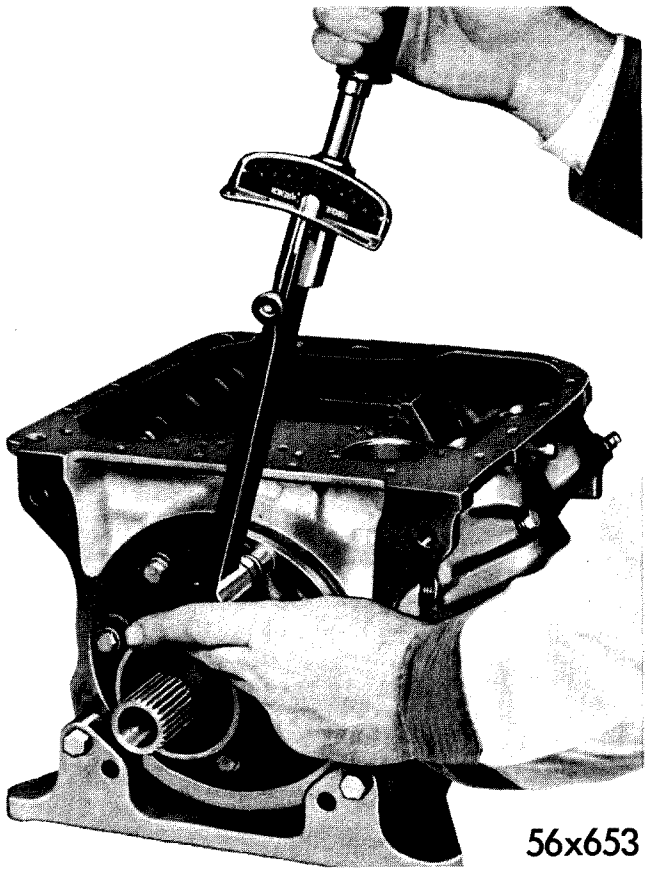


Figure 221—Tightening Front Oil Pump Housing Screws

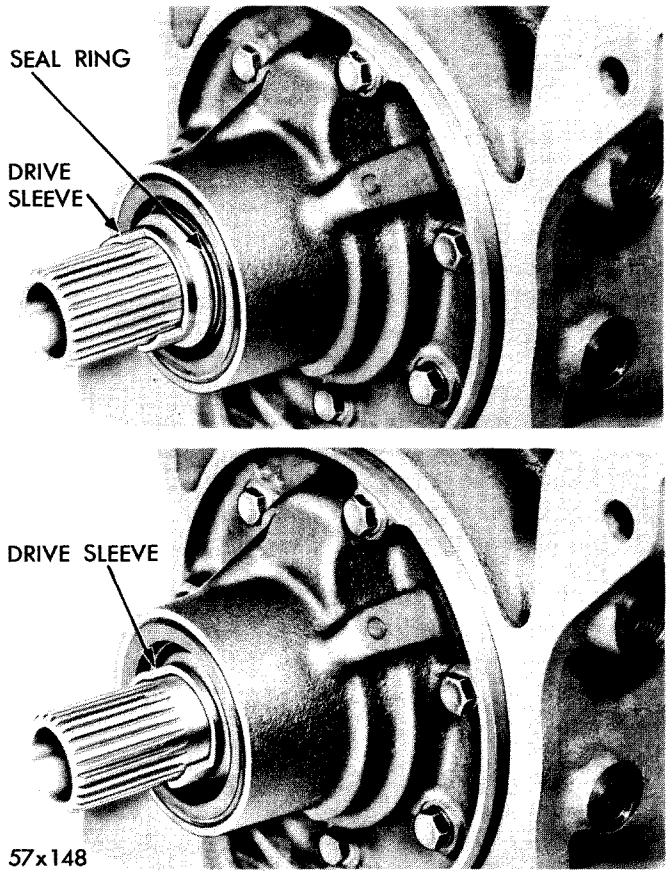


Figure 223—Front Pump Drive Sleeve Installation. Incorrect Installation (Top View); Correct Installation (Bottom View)

mission case. Remove guide studs and install the two remaining bolts and washers, then tighten from 14 to 16 foot-pounds, as shown in Figure 221. Improper tightening of these bolts may cause pump gears to bind.

Lubricate and install front pump drive sleeve (bearing surface first), as shown in Figure 222, then engage the driving lugs of the oil pump pinion to determine if oil pump gears turn freely (main body of driving sleeve should be flush with oil pump housing when properly installed). Refer to Figure 223. If gears do not turn freely, remove pump and check for foreign matter between pump gears and housing.

Install the torque converter control valve spring, retainer, and gasket. Tighten from 35 to 40 foot-pounds. Reinstall the transmission regulator valve spring, sleeve,

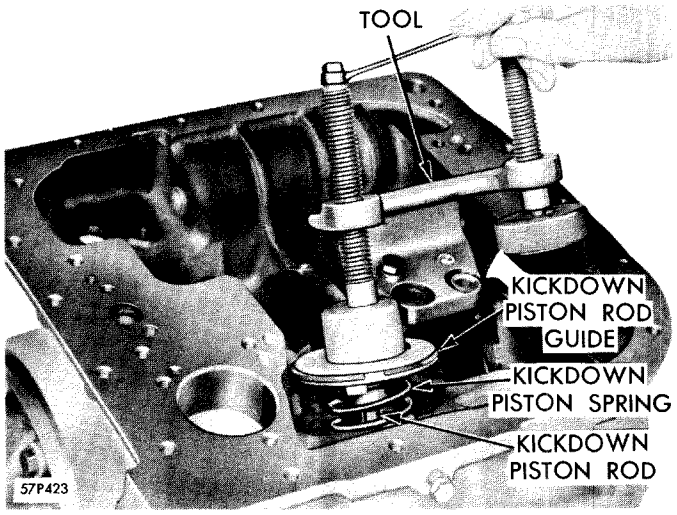


Figure 224—Removal and Installation of Kickdown Piston Rod Guide and Spring

cup and gasket and retainer (with adjusting screw and lock nut installed). Tighten from 45 to 50 foot-pounds.

ACCUMULATOR PISTON

Lubricate seal rings and place accumulator piston into position. Compress outer seal ring and tap lightly into transmission case.

KICKDOWN PISTON

Lubricate piston seal rings and place kickdown piston assembly into position, compress outer ring, and start assembly into case. With piston properly centered so as not to damage rings, tap lightly and bottom piston into case.

Place kickdown piston rod assembly in piston and slide piston spring over kickdown piston rod. Install Tool C-3529 or C-3289 (modified) for kickdown piston installation. Place the kickdown piston rod guide over spring and compress spring until piston rod enters piston rod guide as shown in Figure 224.

Using extreme care, compress the kickdown piston spring to the point that piston rod guide seal ring slightly binds on case. Then work seal ring into position by gradually compressing spring. Install snap ring and make sure it is properly seated, as shown in Figure 186.

LOW-REVERSE SERVO PISTON

Lubricate the low-reverse servo piston seal and install on piston (lip of seal facing end of piston). Install cushion spring and plug into servo piston and secure with snap ring. (Make sure snap ring seats properly.) Install piston assembly into transmission case.

Place low-reverse servo piston spring over piston and position spring retainer over spring. Install Tool C-3529 or C-3489 (modified) for low-reverse servo piston installation.

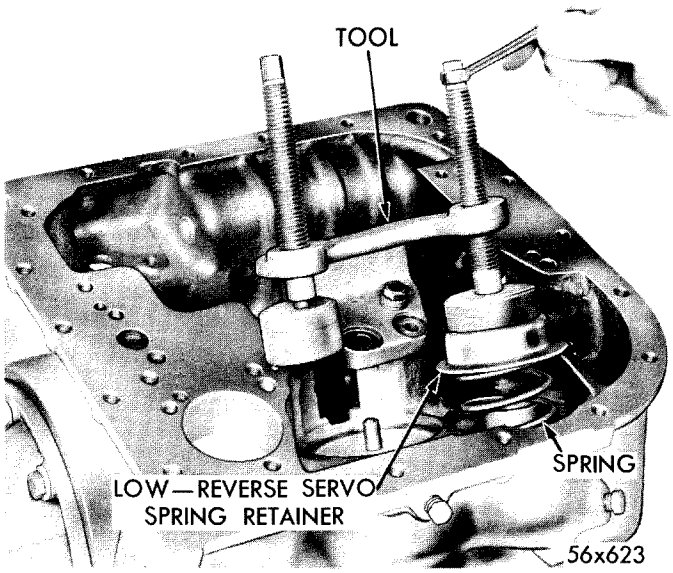


Figure 225—Compressing Low and Reverse Servo Piston Spring and Retainer

Compress spring (Figure 225) sufficiently to install snap ring. Spring retainer may require guiding into case. Make sure snap ring seats properly. Loosen compressing portion of tool and remove from transmission case.

LOW-REVERSE BAND

Install anchor on reverse band adjusting screw. Install band by rotating band ends through rear opening in transmission case, as shown in Figure 180.

LOW-REVERSE AND KICKDOWN BAND LEVER ASSEMBLIES AND STRUTS

Place levers in position in case and slide shaft through levers from rear of transmission case, as shown in Figure 183. Remove guide stud, Tool C-3288 from threaded end of shaft and install shaft lever spacer (flat) and plug. Tighten plug from 30 to 35 foot-pounds.

Position kickdown band over anchor and compress band in sufficiently to install kickdown band strut, as shown in Figure 181. Then place low-reverse band into position on anchor and compress band end; and with the aid of a screwdriver, install strut.

POWER TRANS UNITS INSTALLATION

UNIT NO. 3—Front Clutch and Input Shaft Assemblies —Installation—If when transmission was disassembled, the end clearance was found to be incorrect, correction can be made at this time by selection of proper input shaft thrust washer. See Figure 226. To accomplish this, use a micrometer and measures the thickness of the thrust washer which was removed. Then, select a thicker or thinner washer to give proper clearance. Thrust washers are available in the following three thicknesses:

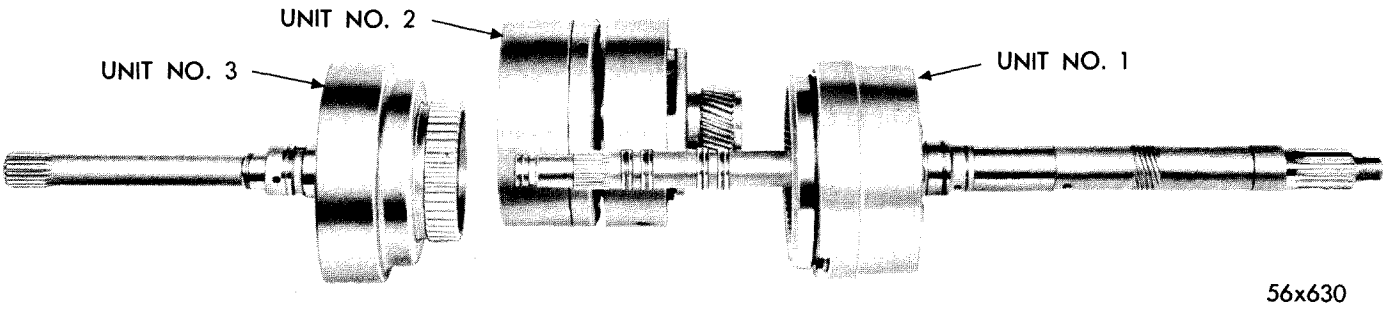


Figure 226—Power Train Units

Part No.	Thickness	Color
1638669	.115″ to .117″	Natural
1638670	.097″ to .099″	Black
1638671	.078″ to .080″	Red

With input shaft thrust washer in position and input shaft seal rings lubricated, start unit through rear of transmission case. See Figure 179.

By supporting and keeping unit centered as much as possible, guide through bands and reaction shaft into position.

UNIT NO. 2—(Sun Gear, Reverse Planet Pinion Carrier, Overrunning Clutch, and Rear Clutch Assemblies)—Start unit through rear of transmission case. Align identified locating hole in intermediate support with threaded locating hole inside of transmission case, as shown in Figure 227. By supporting and keeping unit centered as much as possible, guide through bands until it contacts the hub on the front clutch.

While pushing in on assembly, rock sun gear to engage clutch plates of rear clutch on hub of front clutch.

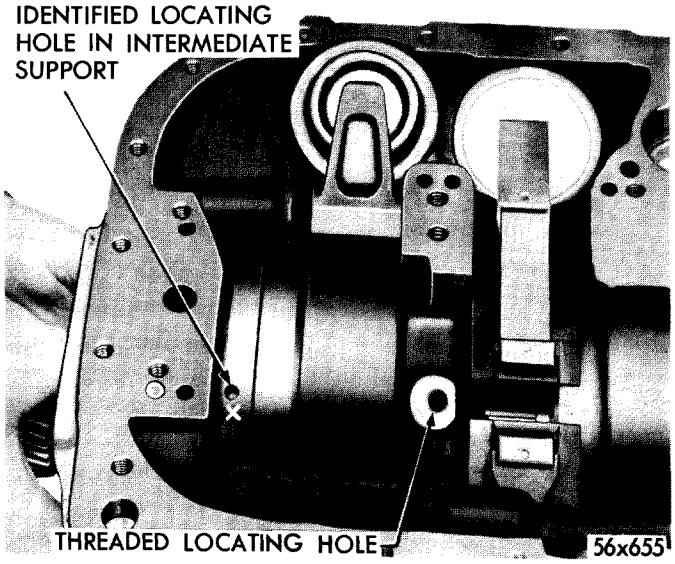


Figure 227—Installing Unit No. 2

While rocking sun gear, make sure unit does not bind on bands or in intermediate support. Do not use excessive force when installing this unit so as to prevent damage to clutch discs in rear clutch. A drift may be used to assist in alignment of intermediate support locating holes.

Install the three intermediate support locating bolts, lockwashers, and tighten from 25 to 30 foot-pounds. Use extreme care when installing the locating bolt inside of case to prevent loss of lockwasher, as shown in Figure 177. Check input shaft and sun gear for free rotation.

UNIT NO. 1—(Output Shaft, Kickdown Planet Pinion Carrier, and Intermediate Shaft Assemblies)—Be sure reverse sun gear thrust washer (roller type) is in position in planet pinion carrier assembly. Lubricate seal rings and bearing surface on intermediate shaft with Automatic Transmission Fluid (Type A).

Install unit by placing intermediate shaft in sun gear, as shown in Figure 176. Keeping unit centered as much as possible and slowly turning output shaft, slide into position (large seal ring on output shaft flush with rear of transmission case). Use extreme care when installing to prevent damage to seal rings on intermediate shaft.

OUTPUT SHAFT PINION

With guide studs Tool C-3283 installed in rear of transmission case, place output shaft support gasket over guide studs and into position on rear of case.

Lubricate output shaft seal rings. Install support over shaft and guide studs, and position against the transmission case, as shown in Figure 175. Use care when installing support so not to damage ring sealing surfaces. Install the one (short) output shaft support to transmission case bolt and lockwashers, and tighten finger tight.

REAR OIL PUMP AND GOVERNOR ASSEMBLIES

Place rear oil pump pinion ball in ball pocket in output shaft. Lubricate rear oil pump drive pinion. Place

over output shaft and slide into position aligning key way in pinion with ball in shaft as shown in Figure 174. Pinion was marked when removed in disassembly. Make sure it is installed correctly.

Lubricate rear oil pump gear and position in pump housing. Make sure gear is installed correctly; check marking. Slide rear oil pump and governor assemblies over output shaft and into position against support, as shown in Figure 173. There are two extra holes in housing which are used for vents. Make definitely sure that no attempt is made to install bolts in these holes. Check each threaded hole before installing bolts.

Install the five rear oil pump housing to output shaft support bolts and washers. Dished type washers are used to prevent cutting or chipping of soft metals and should be installed on bolts with dished portion facing away from bolt head. Draw down evenly, then tighten from 10 to 12 foot-pounds. After bolts have been properly tightened, turn output shaft to make sure pump gears are free to rotate. If not, disassemble pump to determine cause.

GOVERNOR WEIGHTS AND VALVE ASSEMBLY

Align locating hole in output shaft to locating bolt hole in governor support and install locating bolt, tighten from 5 to 7 foot-pounds. Holes can be easily aligned by turning output shaft and holding governor body.

If governor body has been removed and reinstalled, tighten the four governor body bolts from 6 to 8 foot-pounds. Dry governor weight assembly and valve with compressed air, but do not lubricate when assembling.

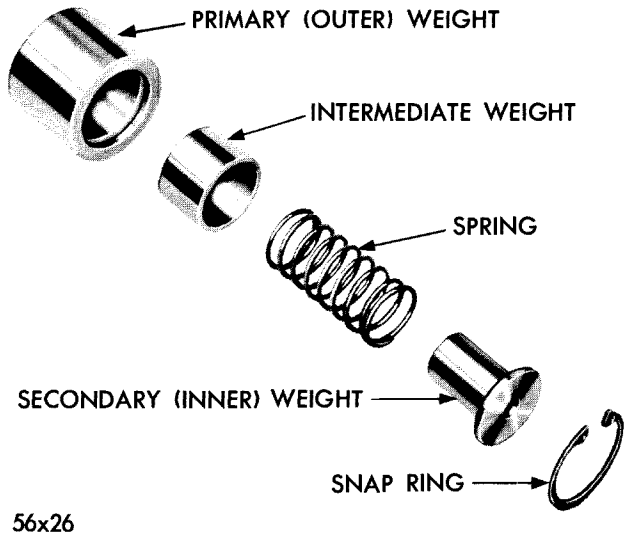


Figure 228—Governor Weight Assembly (Disassembled View) (Typical)

Place governor weight assembly (Figure 228) with secondary weight snap ring facing out, into governor body (Figure 172). Using pliers, Tool C-3229, install snap ring. Make sure snap ring seats properly, as shown in Figure 171.

With the governor valve (small end up) on governor valve shaft, slide shaft into governor body, as shown in Figure 170 through the output shaft and governor weight assembly; at the same time position valve into body.

Install the governor valve shaft snap ring (from weight assembly end). Make sure it is properly locked to shaft, as shown in Figure 169. After snap ring installation, apply sufficient pressure to both ends of the valve shaft to force snap rings to outer portion of snap ring grooves. See Figure 229.

Check operation of governor weight assembly and valve by turning output shaft. Both should fall freely in governor body.

TRANSMISSION EXTENSION

Install new transmission extension gasket over guide studs and into position against output shaft support. Do not use sealing material on gasket. Place extension over output shaft and guide studs and into position against support. Propeller shaft flange and drum assembly can be used if necessary to draw extension bearing on output shaft. Do not use hammer.

Start the seven transmission extension to case bolts and lockwashers, then draw down evenly and tighten from 25 to 30 foot-pounds. After these bolts have been properly torqued, turn output shaft to make sure it turns freely.

Install speedometer drive pinion and sleeve assembly in transmission extension, as shown in Figure 167 and tighten from 40 to 45 foot-pounds.

HAND BRAKE

Make sure the brake support spacer neoprene, is in position on back of brake support and spacer sleeve is in center of support. Slide hand brake assembly (intact) over rear of extension. Make sure spacer sleeve remains in center of support.

Install brake support grease shield on extension housing. Indent in shield is for correct positioning on extension. Also shield must be located on extension far enough to permit installation of spring.

Install the brake support grease shield spring (opening in spring toward adjusting sleeve). Make sure spring is properly seated in groove. Slide the brake shoe return spring behind the grease shield spring and hook into position, as shown in Figure 230.

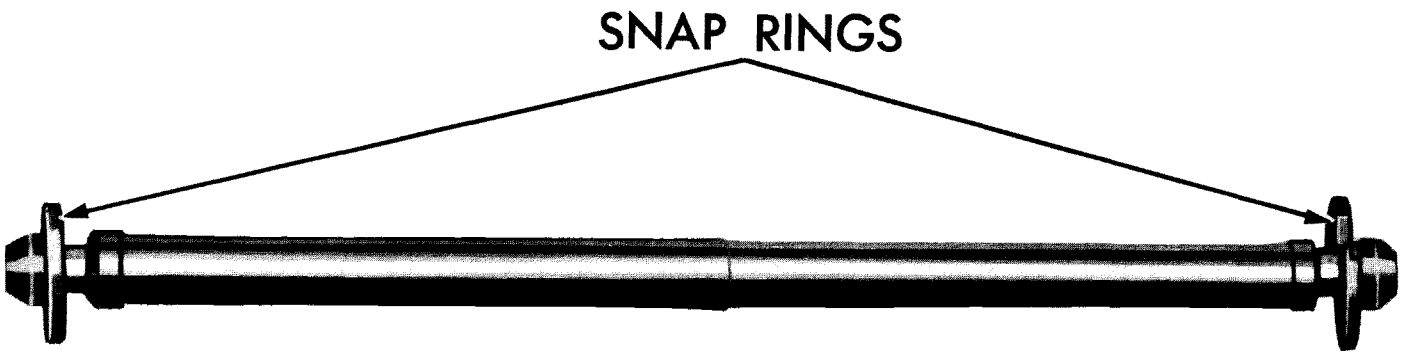


Figure 229—Positioning Governor Valve Shaft Snap Rings in Grooves

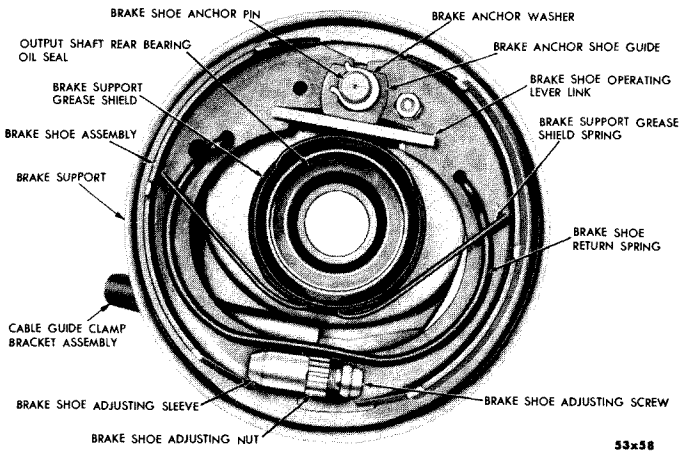


Figure 230—Internal Expanding Handbrake (Drum Removed)

Reinstall pin through brake-anchor and extension. Install propeller shaft flange and drum assembly. Omit this operation if flange and drum assembly were used to force bearing on output shaft.

Install the propeller shaft flange washer and nut. Tighten to 175 foot-pounds. Use wrench, Tool C-3281, to hold brake drum and flange assembly while tightening nut.

RECHECKING FRONT CLUTCH END CLEARANCE

Prior to installing the valve bodies and transfer plate assembly, recheck front clutch end clearance using dial indicator, Tool C-3339, as shown in Figure 164. To make this check, pry front clutch forward by carefully inserting screwdriver between the front and rear clutch. Remove screwdriver and with dial indicator, point contacting edge of front clutch retainer, set dial indicator to zero. Then pry front clutch assembly rearward against rear clutch, remove screwdriver, and take indicator reading. This clearance should be from .020" to .050". If the clearance is not within these limits, then transmission will have to be partially disassembled in the following manner to allow an input shaft thrust washer of proper thickness to be installed.

Remove the seven bolts and lockwashers from the transmission extension and install guide studs, Tool C-3283. Then, remove the one output shaft support to transmission case bolt and washer, and remove the hand brake assembly, extension, output shaft support, and Unit No. 1 as one assembly, as shown in Figure 231. Support assemblies as much as possible when removing to prevent damaging seal rings on intermediate shaft. Refer to "Power Train Units—Removal" Unit No. 2, and perform operations 2 and 3; Unit No. 3, and perform operation 1.

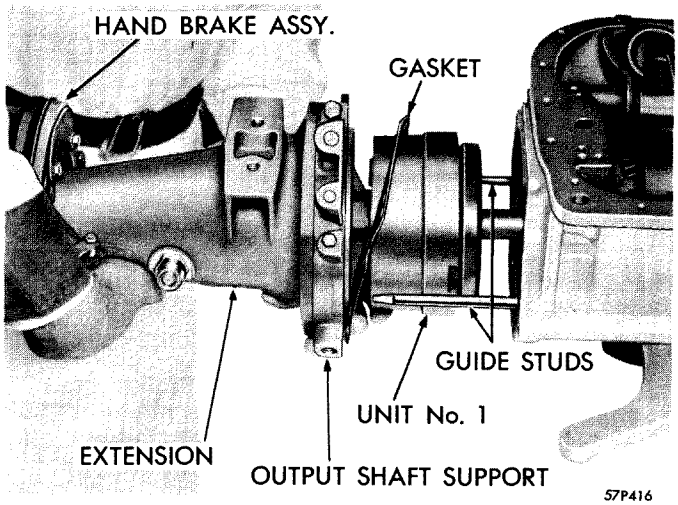


Figure 231—Removal of Output Shaft Support, Extension, Handbrake Assembly and Unit No. 1 as an Assembly

Using a micrometer, measure the thickness of the input shaft thrust washer and select a washer to give correct clearance. Thrust washers are available in the following three thicknesses:

Part No.	Thickness	Color
1638669	.115" to .117"	Natural
1638670	.097" to .099"	Red
1638671	.078" to .080"	Black

Install power train units. Install hand brake assembly, extension, output shaft support, and Unit No. 1 in one assembly as removed, following the procedure as described in the installation of Unit No. 1. With assembly in position in transmission case, install the one support to case bolt and lockwasher finger tight. Remove the guide studs and install the seven extension to case bolts and lockwashers, draw down evenly and tighten from 25 to 30 foot-pounds. Tighten the one support to case bolt from 25 to 30 foot-pounds. After bolts have been properly torqued, turn output shaft to make sure it turns freely. Recheck front clutch end clearance.

BAND ADJUSTMENT

Since both band assemblies have been removed, it is very important that the hand brake drum is turned in a clockwise and counterclockwise direction to center bands on retainers prior to making band adjustments.

LOW-REVERSE (REAR) BAND

Using wrench, Tool C-3380 and with lock nut loose, tighten low-reverse band adjusting screw from 70 to 75 inch-pounds, as shown in Figure 232. Refer to "Maintenance, Adjustments and Tests."

Using a colored pencil, identify adjusting screw, location in relation to transmission case. Back adjusting screw out 2⅝ turns. Holding adjusting screw stationary, tighten lock nut from 35 to 40 foot-pounds.

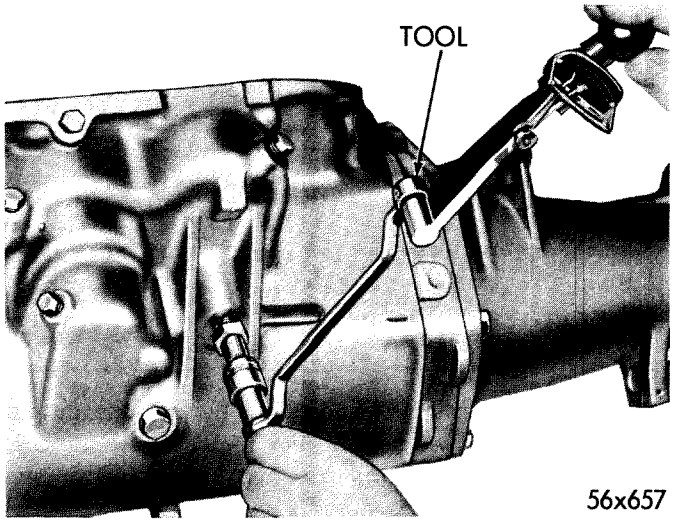


Figure 232—Adjusting Low-Reverse Band

KICKDOWN (FRONT) BAND

Using wrench, Tool C-3380 (and with lock nut loose), tighten kickdown band adjusting screw from 70 to 75 inch-pounds. Refer to "Maintenance, Adjustments and Tests."

Using a colored pencil, identify location of adjusting screw in relation to transmission case, then back adjusting screw out 3½ turns. While holding adjusting screw stationary, tighten lock nut from 35 to 40 foot-pounds.

VALVE BODIES AND TRANSFER PLATE ASSEMBLY INSTALLATION

If valve bodies and transfer plate assemblies are not being reconditioned at this time proceed as follows:

Check mating surfaces of valve body assembly for cleanliness. Then place the valve bodies and transfer plate assembly into position on transmission case, as shown in Figure 163. Install the three transfer plate bolts and washers, (two in center, and one in front). Draw down evenly and tighten from 14 to 16 foot-pounds.

Dished type washers are used to prevent cutting or chipping of soft metals and should be installed on bolts with dished portion facing away from head.

Install accumulator spring through transfer plate and position in piston. Install accumulator cover, as shown in Figure 162, (three bolts, with washers) and draw down evenly. Place oil strainer assembly in position on transfer plate assembly.

Install the four bolts and washers, drawn down evenly, and tighten strainer assembly and accumulator cover bolts from 14 to 16 foot-pounds. Install neutral starting switch and visually check the manual valve lever contact with switch.

OIL PAN INSTALLATION

Using a new oil pan gasket, place oil pan in position on transmission case. Install the oil pan bolts and washer assemblies; draw down evenly, and tighten from 10 to 12 foot-pounds.

Position lever so there is $\frac{7}{32}$ inch clearance (without gasket) between bottom of lever and transmission case. Tighten locking screw securely. A $\frac{7}{32}$ inch drill can be used for obtaining proper clearance. See Figure 151.

Place control cable adaptor (with spring lock in position in lever and install pin. Place manual valve control lever in reverse position and install gasket, control cable housing, and three bolts and washers.

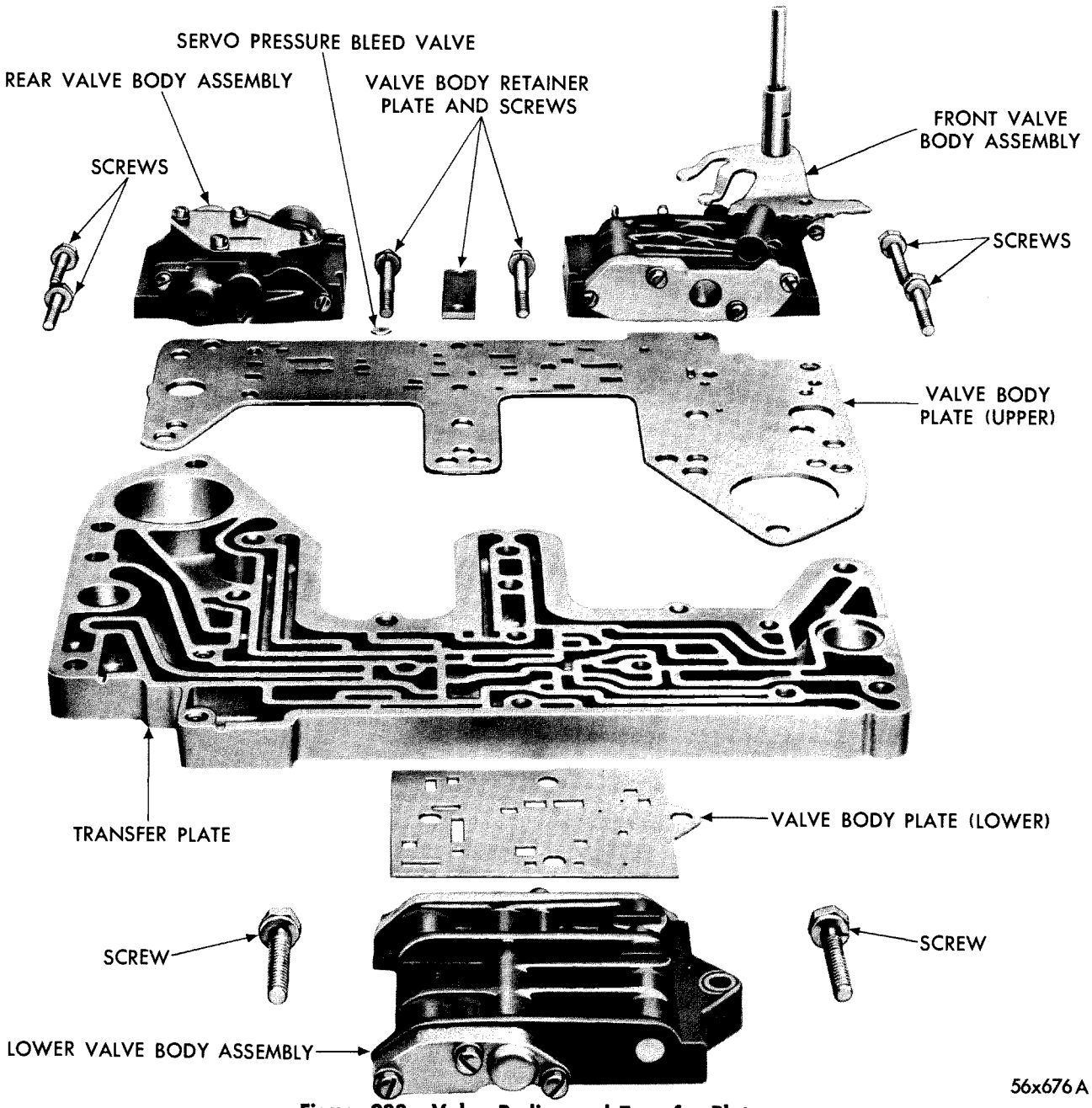


Figure 233—Valve Bodies and Transfer Plate (Separated)

Draw down evenly and tighten from 14 to 16 foot-pounds. Install felt washer, and throttle valve lever assembly over shaft and tighten clamping bolt. Remove transmission from stand, Tool C-3280, and install in vehicle as outlined under "Removal and Installation of Transmission."

REMOVING THE VALVE BODIES

LOWER VALVE BODY

If valve bodies and transfer plate are being serviced with transmission in vehicle refer to "Valve Bodies and Transfer Plate Removal." Place the valve bodies and transfer plate assembly in stand, Tool C-3528.

CAUTION

Never clamp any portion of any valve body assembly in a vise or use force when removing or installing valves and plugs.

Remove the two valve body bolts (long) from retainer plate located between front and rear valve bodies, as shown in Figure 233, and remove plate. Invert valve bodies and transfer plate and remove the two valve body bolts and lockwashers.

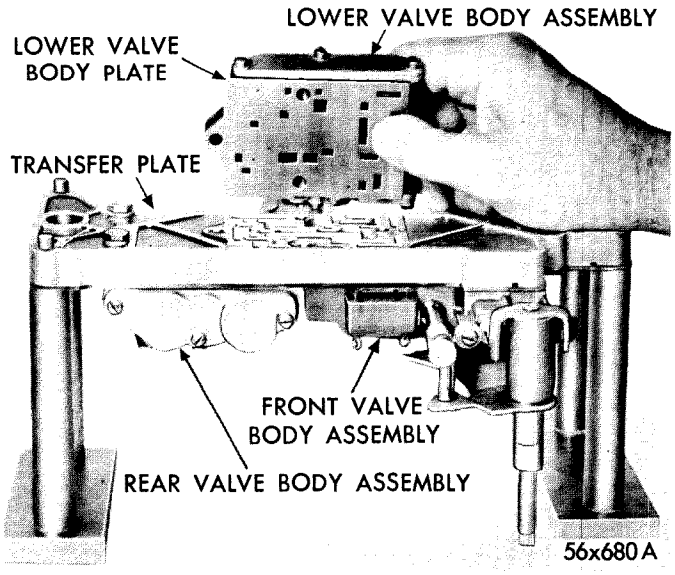


Figure 234—Removal and Installation of Lower Valve Body Assembly and Plate

Remove lower valve body and plate from transfer plate, as shown in Figure 234. Use extreme care to prevent loss of governor compensator valve plug retaining pin.

REAR VALVE BODY

Remove the two transfer plate to rear valve body bolts and lockwashers, and remove valve body from transfer plate assembly, as shown in Figure 235. Remove the servo pressure bleed valve to prevent loss. Invert valve bodies and transfer plate assembly and replace on stand Tool C-3528.

FRONT VALVE BODY

Remove the two front valve body to transfer plate bolts and lockwashers and separate front valve body from transfer plate assembly, as shown in Figure 236.

Do not disturb throttle valve stop screw setting. Remove upper valve body plate from transfer plate.

CLEANING AND INSPECTION
GENERAL

After disassembly (and each part has been thoroughly cleaned and inspected) place each part on clean paper until ready for reassembly.

Place all parts in a clean solvent, wash thoroughly, and dry with compressed air. Make definitely sure all passages are free from obstructions. When inspecting, also check for porous castings. Inspect all mating surfaces for burrs, nicks and grooves. Small ones may be removed with crocus cloth; otherwise, damaged parts must be replaced.

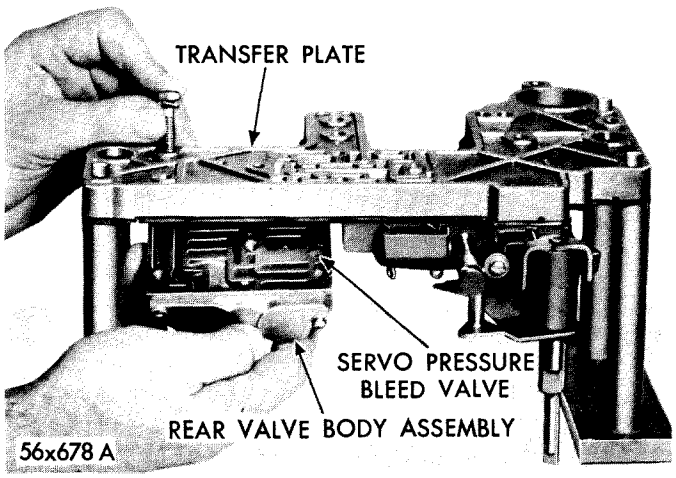


Figure 235—Removal and Installation of Rear Valve Body Assembly

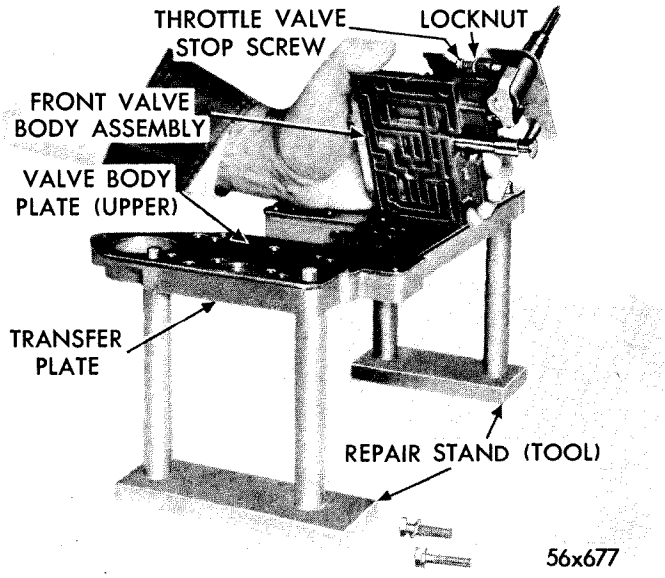


Figure 236—Removal and Installation of Front Valve Body Assembly

Using straight edge, Tool C-3335, check all mating surfaces for distortion. Using a pen light, inspect bores in valve body for score marks, pits, and irregularities. Inspect all springs for distortion and collapsed coils.

Inspect all valves and plugs for burrs, nicks, and scores. Small ones may be removed with crocus cloth providing extreme care is used not to round off the sharp edge portion of the valve. The sharp edge portion is vitally important to this type valve. The sharp edge helps to prevent dirt and foreign matter from getting between the valves and body, thus reducing the possibilities of sticking.

Check valves and plugs for free operation in bores; they must fall freely in bores when the valves, plugs and bores are clean and dry.

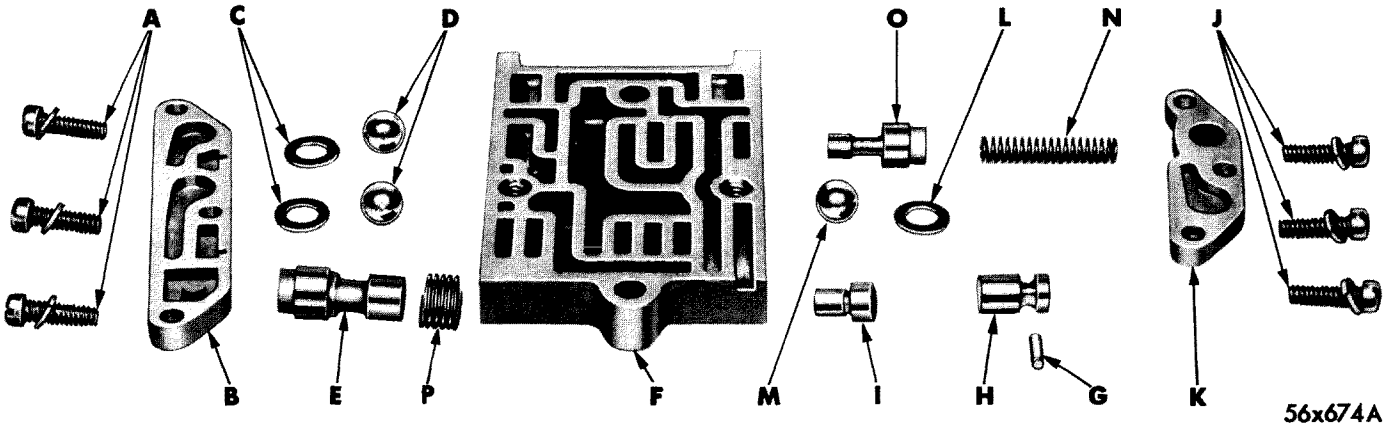


Figure 237—Lower Valve Body (Disassembled View)

*A—Governor Compensator Valve Cover Screws and Lockwashers
*B—Governor Compensator Valve Cover
C—Lower Valve Body Check Valve Ball Seats
D—Lower Valve Body Check Valve Balls
*E—Governor Compensator Valve
F—Lower Valve Body
*G—Governor Compensator Valve Plug Retainer Pin
*H—Governor Compensator Valve Plug Retainer
*I—Governor Compensator Valve Plug
J—Throttle Compensator Valve Cover Screws and Lockwasher
K—Throttle Compensator Valve Cover
L—Lower Valve Body Check Valve Ball Seat
M—Lower Valve Body Check Valve Ball
N—Throttle Compensator Valve Spring
O—Throttle Compensator Valve
*P—Governor Compensator Valve Spring

*Governor Compensator Valve Assembly Discontinued After Transmission Serial No. 633519

VALVE BODY PLATES (UPPER AND LOWER) AND TRANSFER PLATE

Inspect valve body plates (upper and lower) for nicks, scratches, or burrs; and make sure metering holes are open. Visually inspect transfer plate for porosity. Inspect machined surface for nicks or burrs. Inspect threaded holes for pulled threads.

DISASSEMBLY LOWER VALVE BODY

Refer to Figure 237 and disassemble as follows:

Remove governor compensator valve plug retaining pin (G), retainer (H) and compensator plug (I). Remove the three bolts from governor compensator cover (B) (large). Using care to prevent loss of the two check valve balls (D) and seats (C), remove cover. Invert valve body and remove governor compensator valve (E) and valve spring (P).

While holding throttle compensator valve cover (K) in place (spring loaded) remove the three bolts and lockwashers (J). Use care when removing cover to prevent loss of check valve ball (M) and seat (L). Remove throttle compensator valve spring (N) and valve (O).

Refer to Figure 237 and assemble as follows:

Place valve body in an upright position and install throttle compensator valve (O) and spring (N). Make sure spring is properly seated in valve. Place check ball (M) and ball seat (L) in position in valve body (F). Place throttle compensator valve cover (K) in position over spring and body, and install the three bolts and lockwashers. Draw down evenly and tighten. Place governor compensator valve spring (P) on valve (E) then install governor compensator valve into valve body (small end first). Place the two check valve balls (D) and seats (C) in position in valve body; and install governor compensator valve cover (B), then bolts, and lockwashers (A). Draw down evenly and tighten.

Install governor compensator valve plug (I) (small end first) in valve body. Install governor compensator valve plug retainer (H) and pin (G). Use care when handling valve body to prevent loss of retainer pin.

DISASSEMBLY REAR VALVE BODY

Refer to Figure 238 and disassemble rear valve body as follows:

Keeping thumb pressure against the kickdown plug cover (B) (spring loaded) remove the three bolts and lockwashers. Use caution when removing cover to prevent loss of the 3-1 relay valve spring (E) 1-2 shift valve kickdown plug (C) and 2-3 shift valve kickdown plug (D).

Remove the 1-2 shift valve spring (G) and valve (H). Remove the 3-1 relay valve (F). Remove the 2-3 shift valve spring (I) and valve (J).

Remove the three governor plug cover bolts and lockwashers (K). Use caution when removing cover (L) to prevent loss of check valve ball seat (M) and ball (N).

Remove the 1-2 shift valve governor plug (O) from valve body. Remove 2-3 shift valve governor plug (P)

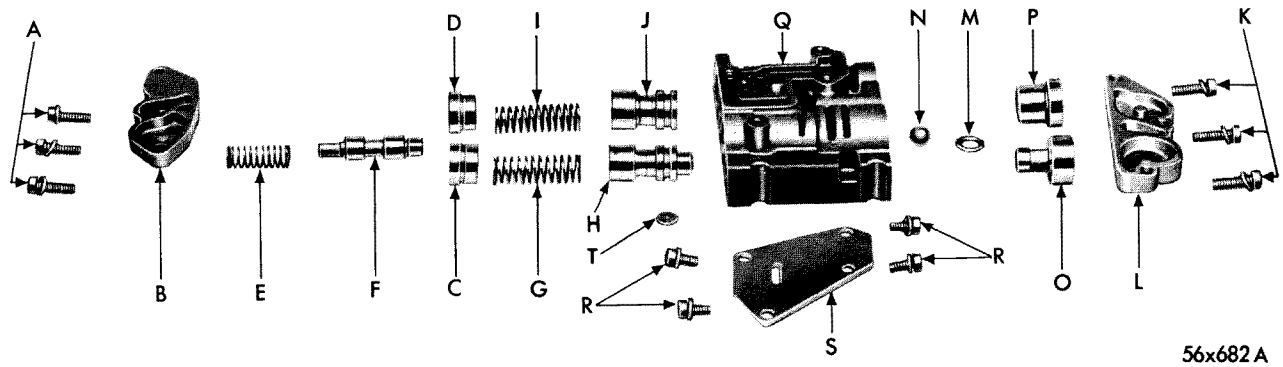


Figure 238—Rear Valve Body (Disassembled View)

A—Rear Valve Body Kickdown Plug Cover Screws and Lockwashers
B—Rear Valve Body Kickdown Plug Cover
C—1-2 Shift Valve Kickdown Plug
D—2-3 Shift Valve Kickdown Plug
E—3-1 Relay Valve Spring
F—3-1 Relay Valve
G—1-2 Shift Valve Spring
H—1-2 Shift Valve
I—2-3 Shift Valve Spring
J—2-3 Shift Valve
K—Rear Valve Body Governor Plug Cover Screws and Lockwashers
L—Rear Valve Body Governor Plug Cover
M—Check Valve Ball Seat
N—Check Valve Ball
O—1-2 Shift Valve Governor Plug
P—2-3 Shift Valve Governor Plug
Q—Rear Valve Body
R—Rear Valve Body Plate Screws and Lockwashers
S—Rear Valve Body Plate
T—Servo Pressure Bleed Valve

from valve body. Rear valve body plate (S) can be removed for cleaning purposes by removing the four bolts and lockwashers.

ASSEMBLY REAR VALVE BODY

With valve body (P) setting in an upright position, install the 1-2 shift valve (H) (small end first) into valve body. Place the 2-3 shift valve (J) (spring pilot facing out) into position in valve body. Position the 1-2 and 2-3 shaft valve springs (G & I) in valves.

Place the 2-3 shift valve kickdown plug (D) (identified by larger pilot) over 2-3 shift valve spring, (I). Compress spring sufficiently to seat plug in valve body and secure by placing a thin piece of metal (6″ scale) behind plug, as shown in Figure 239.

Install the 3-1 relay valve (F) (larger end first) into valve body and place spring (E) on pilot. Place the 1-2 shift valve kickdown plug (C) over the 1-2 valve spring (G). Place kickdown plug cover over 3-1 relay valve spring and 1-2 kickdown plug. Compress springs and guide the 1-2 kickdown plug into valve body. Install the three cover bolts and lockwashers and draw down evenly and tighten. Remove piece of metal or 6″ scale.

Install rear valve body plate (S) (if removed). Place the 1-2 shift valve governor plug (O) (small end first) in position in valve body. Place the 2-3 shift valve governor plug (P) (smal lend first) in position in valve body.

Install check valve ball (N) and seat (M). Place governor plug cover (L) in position on valve body and install the three bolts and lockwashers. Draw down evenly and tighten.

DISASSEMBLY FRONT VALVE BODY

All letters referred to in the disassembly of the front valve body pertain to Figure 240. Do not disturb throttle valve stop screw setting when disassembling valve body. This is a factory setting; it cannot be reset with field equipment.

Keeping thumb pressure against shuttle valve cover (B) (spring loaded) remove the four bolts and lockwashers. Use caution when removing cover to prevent loss of front check valve ball seat (C) and ball (D).

While holding thumb over throttle valve, invert valve body and remove shuttle valve plug, spring and valve, as shown in Figure 241.

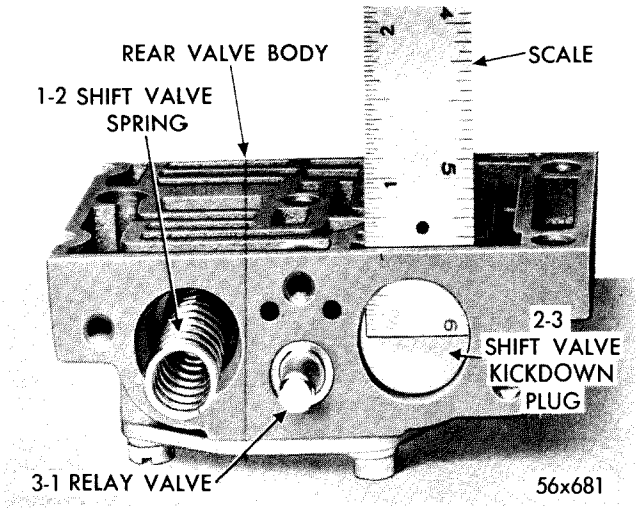


Figure 239—Using Scale to Hold 2-3 Shift Valve Kickdown Plug in Body During Assembly

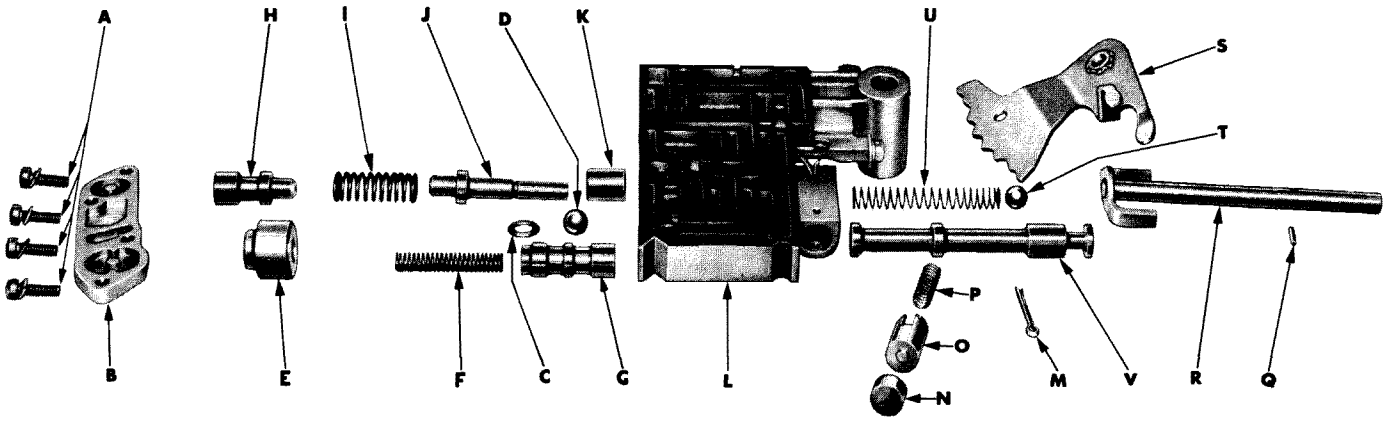


Figure 240—Front Valve Body (Disassembled View)

A—Shuttle Valve Cover Screws and Lockwashers
B—Shuttle Valve Cover
C—Front Check Valve Ball Seat
D—Front Check Valve Ball
E—Shuttle Valve Plug
F—Shuttle Valve Spring
G—Shuttle Valve
H—Throttle Valve
I—Throttle Valve Spring
J—Kickdown Valve
K—Kickdown Detent Plug
L—Front Valve Body
M—Reverse Blocker Valve Pin
N—Reverse Blocker Valve Pin
O—Reverse Blocker Valve
P—Reverse Blocker Valve Spring
Q—Throttle Valve Lever Shaft Pin
R—Throttle Valve Lever Shaft
S—Manual Valve Lever Assembly
T—Manual Valve Lever Detent Ball
U—Manual Valve Detent Ball Spring
V—Manual Valve

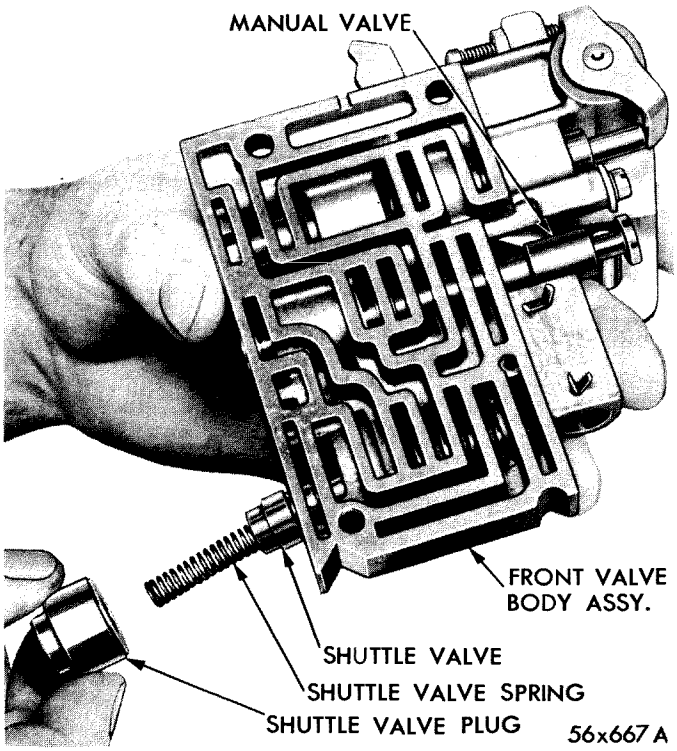


Figure 241—Removal and Installation of Shuttle Valve, Plug, Spring and Valve

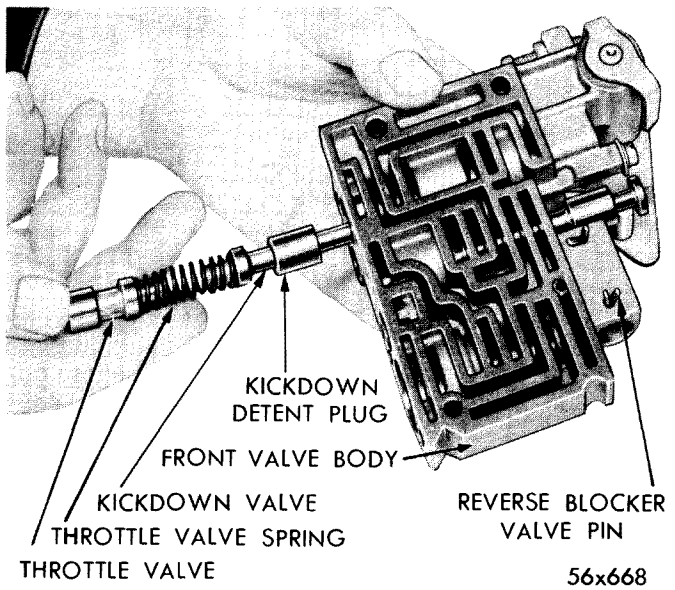


Figure 242—Removal and Installation of Throttle Valve, Spring, Kickdown Valve and Detent Plug

Remove throttle valve, spring kickdown valve, and detent plug, as shown in Figure 242. It is unnecessary to remove detent plug retaining bolt and lockwasher.

Remove cotter pin from valve body in outer end of reverse blocker valve. Remove reverse blocker valve plug (N), blocker valve (O), and spring (P).

Normally it isn't necessary to remove the throttle valve lever shaft (R) manual valve lever assembly (S) or manual valve (V). However, if condition warrants (such as damage) proceed as follows:

Support throttle lever shaft on block of wood. Using a small punch and hammer remove the throttle valve lever shaft pin, as shown in Figure 243. A rubber band

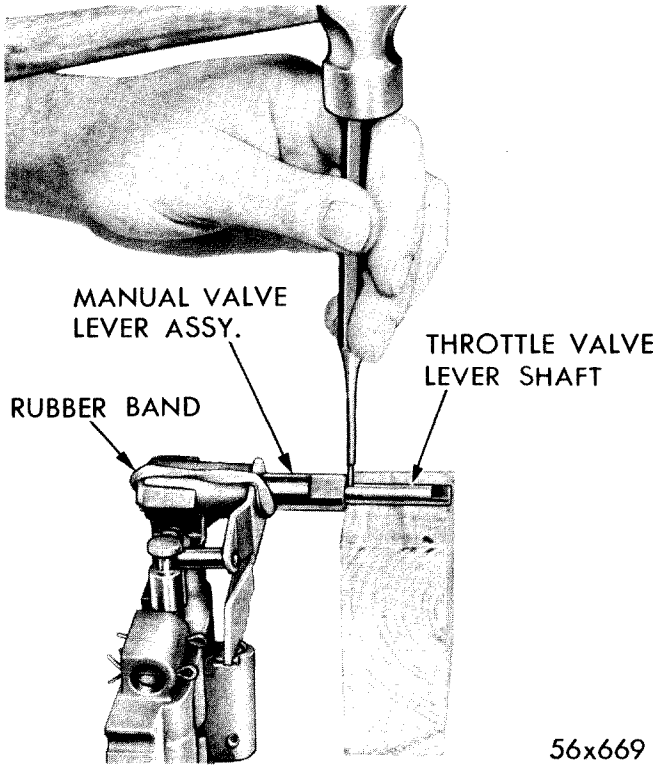


Figure 243—Removal and Installation of Throttle Valve Lever Shaft Pin

may be used to hold manual lever in place while removing pin.

Remove any burrs from the throttle valve and manual valve lever shafts and slide them from the valve body. Slide throttle valve lever shaft (R) out of manual lever assembly (S).

Using caution to prevent loss of detent ball (T) and spring (U), remove manual valve lever assembly (S) from valve body. Using a twisting motion, remove manual valve (Y).

FRONT VALVE BODY ADDITIONAL INSPECTION

Inspect the manual valve detent ball (T) and make sure it slides freely into valve body. Inspect the staking of manual lever and throttle cam to their respective shafts. Inspect the kickdown valve detent plug to make sure it slides freely on valve. Inspect check valve ball seat in valve body.

FRONT VALVE BODY ASSEMBLY

Place valve body on a piece of clean paper in an upright position. Using a twisting motion, install manual valve (V) until it bottoms on paper. Place manual valve lever detent ball spring (U) and ball (T) in position in valve body. While compressing detent ball in position with right index finger, install manual valve control lever by sliding over detent ball placing shaft of manual valve control lever in bore of valve body. This assembly may be held in position by the use of a rubber band.

While holding manual lever assembly in position against valve body, install throttle valve lever assembly through manual valve lever assembly, with flat portion on end of shaft. facing away from valve body (to allow maximum travel of lever).

While holding levers in position in valve body with rubber band, support throttle lever shaft on wooden block. Install shaft pin using a small punch and hammer, as shown in Figure 243. Remove rubber band.

With reverse blocker valve spring in position in valve (O) and with slots in valve aligned with pin, install reverse blocker valve in valve body. Install reverse blocker valve plug (N) and compress spring sufficiently to install pin (M). Lock pin in position.

Check kickdown detent plug stop screw for being tight. Install detent plug (larger inner diameter first) on kickdown valve (J) and position kickdown valve (detent plug first) into valve body.

Install throttle valve spring (I) and throttle valve (H) into valve body. Install shuttle valve (G) and spring (F) in the valve body. Install plug (E) into position in valve body.

Place front check valve ball (D) and seat (C) in position in valve body. Place shuttle valve cover (B) in position on valve body and install the four bolts and lockwashers. Draw down evenly.

INSTALLING THE VALVE BODIES
VALVE BODY PLATE (UPPER)

Place valve body transfer plate in an upright position on fixture, Tool C-3528. Place steel plate (upper) over pilots on Tool C-3538, and into position on transfer plate.

FRONT VALVE BODY

Position front valve body on steel plate (upper) as shown in Figure 236 and install two bolts and lockwashers in outer end of valve and draw down finger tight.

REAR VALVE BODY

Invert transfer plate assembly and replace on fixture, Tool C-3528. With servo pressure bleed valve in place, hold rear valve body up into position against steel plate as shown in Figure 235; and install the two outer bolts (short) with lockwashers through the transfer plate and into lower valve body. Draw up finger tight.

LOWER VALVE BODY

To prevent loss of governor compensator valve retainer pin, position steel plate (lower) on lower valve

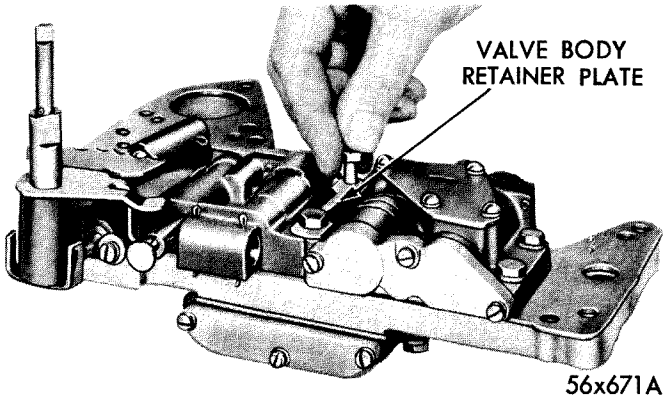


Figure 244—Installation of Valve Body Retainer Plate

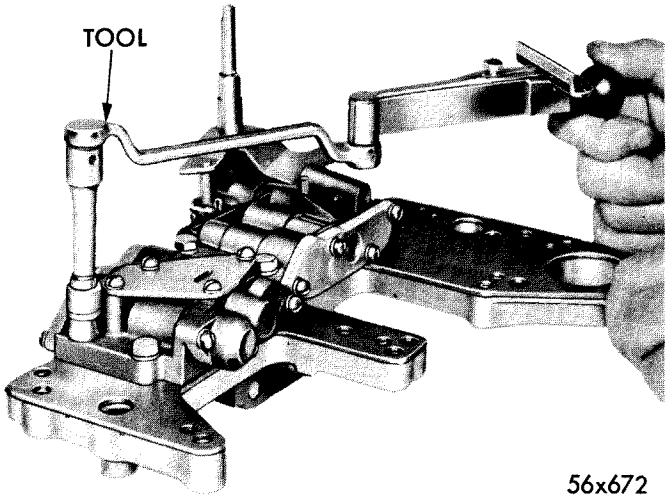


Figure 245—Tightening Valve Body Screws

body. Place valve body and steel plate into position on transfer plate. Install the two bolts (intermediate length) and lockwashers, and as shown in Figure 233. Tighten the two lower valve body and two rear valve body bolts from 50 to 60 inch-pounds.

Invert valve bodies and transfer plate and replace on fixture Tool C-3528.

Install valve bodies retainer plate and two bolts (long) with lockwashers, refer to Figure 244, and tighten the two retainer plate bolts and two front valve body bolts from 50 to 60 inch-pounds, as shown in Figure 245. Overtightening will cause distortion to valve body and result in sticky valves.

Check manual valve operation to make sure it operates freely, as shown in Figure 246.

Place transfer plate and valve bodies assembly in transmission case. Refer to Valve Bodies and Transfer Plate Installation.

Install transmission as outlined under "Removal and Installation of Transmission," if transmission is being serviced at the bench.

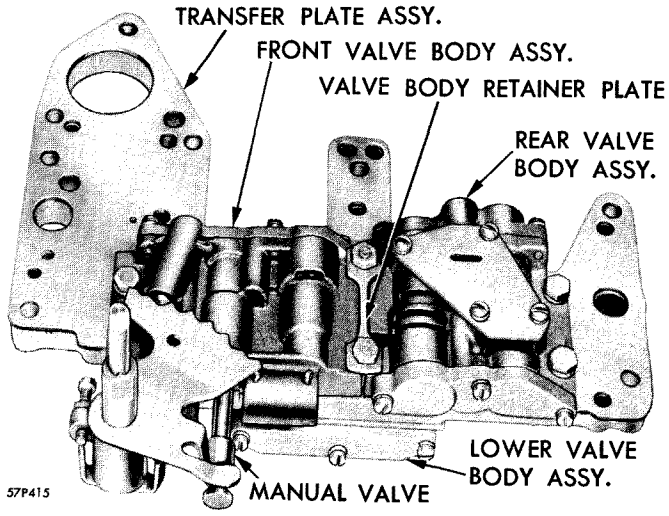
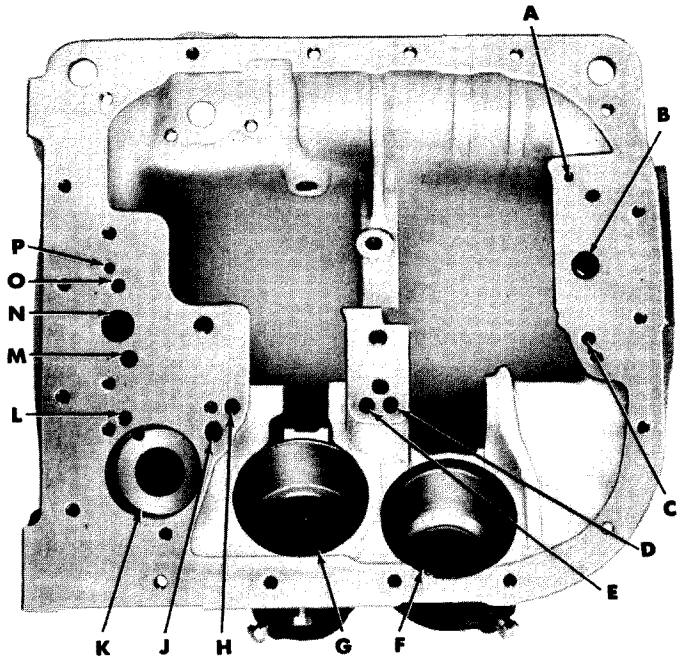


Figure 246—Valve Bodies and Transfer Plate Assembly (Bottom View)



A—GOVERNOR PRESSURE
B—REAR PUMP INLET
C—REAR CLUTCH 'APPLY' (Line pressure)
D—LOW AND REVERSE SERVO 'APPLY' (Line pressure)
E—KICKDOWN SERVO 'APPLY' (Throttle compensated pressure)
F—LOW AND REVERSE SERVO (Location)
G—KICKDOWN SERVO (Location)
H—KICKDOWN SERVO 'APPLY' (Line pressure)
J—KICKDOWN SERVO 'RELEASE' (Line pressure)
K—ACCUMULATOR (Location)
L—FRONT CLUTCH AND ACCUMULATOR 'APPLY' (Line pressure)
M—LINE PRESSURE
N—FRONT PUMP INLET
O—REVERSE UPSET (Reverse blocker 'Apply') (Line pressure)
P—LINE PRESSURE GAUGE 56x712A

Figure 247—Oil Passages in Transmission Case

20. DIAGNOSIS PROCEDURES

MANUAL TRANSMISSION

NOISES

It is always wise, when diagnosing transmission noise, to note the gear position in which the noise occurs. Noise present in all gear positions may be due to worn or damaged constant mesh gear or bearings. Noise present in only one gear position can usually be traced to the particular gear involved.

1. PINION GEAR AND MATING CLUSTER GEAR—The sound made by a worn or damaged pinion gear, or a mating cluster gear, will have about the same tone when the transmission is in low, second or reverse gears. But, it will be hardly noticeable when the transmission is in high gear.

2. SECOND SPEED GEAR OR MATING CLUSTER GEAR—The noise caused by a worn or damaged second speed gear, or a mating cluster gear, will be more pronounced while the car is driven in second gear. When the transmission is in high, low or reverse gear, the noise caused will be indistinct.

3. LOW AND REVERSE SLIDING GEAR—A worn or damaged low and reverse sliding gear will be noisy only while the transmission is in either of these two gears. If the sliding gear is in good condition, and a noise is heard when low gear is used, it indicates that the cluster gear is at fault. If noise is heard when the reverse gear is used, the reverse idler, or mating cluster gear, may be worn or damaged.

4. ROLLER BEARINGS OR CLUSTER GEAR SHAFT—Damaged roller bearings, or a worn cluster gear shaft, will create more noise when the transmission is in low, second and reverse gear, rather than when the transmission is in high gear.

5. PINION SHAFT BEARING—A pinion shaft bearing noise can often be determined by disengaging and engaging the clutch with the engine running and the transmission in neutral. The noise should disappear when the clutch is disengaged and the pinion stops. But, with this test, other similar noises may be heard, if the following constant mesh gears are worn or damaged: pinion gear, front cluster gear, second speed cluster gear, second speed mainshaft gear, reverse cluster gear, and reverse idler gear.

6. CLUSTER GEAR OR REVERSE IDLER GEAR—Noise caused by damaged roller bearings or shaft, in either the cluster gear or reverse idler gear, will also be apparent when test is made.

7. MAINSHAFT BEARING — A mainshaft bearing noise can usually be determined by driving the car in high gear at a speed where the noise is more apparent, and then shifting into neutral, shutting off the engine and coasting. This action stops the operation of the pinion bearing and then any noise (in either the center or rear bearing) may be heard.

8. DRIVE PINION PILOT BUSHING—The noise made by a worn drive pinion pilot bushing (in the rear end of the crankshaft) is usually apparent while coasting in low or second gear at moderate speeds, with the transmission in gear and the clutch disengaged, or during a cold start, with the transmission in gear and the clutch disengaged.

9. EXCESSIVE BACKLASH AND END PLAY—Noises caused by excessive backlash, or end play, are similar. To determine which condition exists, it will be necessary to check backlash or end play.

(a) Backlash—If backlash appears to be excessive, check the mating gears for wear or improper fitting. If excessive backlash is present, it will be more apparent in second gear. If in high gear, the noise would be due to excessive end play, rather than excessive backlash.

(b) End Play—To determine if end play is excessive, check the thrust washers or snap rings for wear, improper fitting or any condition which will allow too much endwise movement of parts. End play may be checked without removing the transmission from the car by removing the gear shift housing only. See page 146.

HARD SHIFTING

1. HIGH OR SECOND GEARS

(a) Shifter Linkage—If the selector rod is adjusted too short, the up-and-down movement of the gearshift lever in the neutral position will be limited and hard shifting into second and high gears may result.

(b) Shifter Fork and Stop Ring—Hard shifting into second or high gears, or failure to complete a shift into these gears, may be caused by a binding action due to a loose shifter fork, or the locking of the stop rings to the second speed gear or drive pinion. If the latter condition occurs, the shifter collar is prevented from aligning the teeth of the stop ring with the clutch teeth on the second speed gear or drive pinion, making a complete shift impossible. If this occurs frequently, the stop ring should be replaced.

(c) Synchronizer Assembly—Hard shifting into high or second gear may also result if the following parts are damaged or worn: Clutch gear sleeve, clutch gear, stop rings, shifting plates, plate springs, clutch gear snap ring. A broken or damaged selector and cam assembly will also cause hard shifting.

2. LOW OR REVERSE GEARS

(a) Shifter Linkage—Hard shifting into low or reverse gear may result if the selector rod is adjusted too long.

(b) Shifter Fork or Shifter Rail—A loose fork or shifter rail may cause binding action and result in hard shifting.

(c) Low and Reverse Gears—Failure to shift into low or reverse, without re-engaging the clutch, is generally due to "gear butting" which is caused by the leading edges, or bevels of the gears, being flattened by continual unnecessary gear clashing on the part of the driver.

(d) Idler Gear—A tight idler gear due to damaged roller bearings will cause hard shifting into and out of low and reverse gears.

3. ONE OR MORE GEARS

(a) Shifter Mechanism—If it is difficult to shift into one or more gears, the following parts may be broken, damaged, or loose: gearshift housing shift lever, shift lever shaft, shifter forks or shifter fork guide rail.

(b) Control Rods—Inspect for bent control rods.

4. ALL GEARS—If the clutch is dragging, it may be difficult to shift into or out of all gear positions, particularly low and reverse.

SLIPPING OUT OF GEAR

Slipping out of gear is usually the result of a condition which prevents complete gear engagement, such as, misalignment or excessive clearances. Restricted travel of the shifter linkage is the most common cause of slipping out of gear.

1. HIGH GEAR

(a) Misalignment—Inspect for misalignment between the clutch bell housing and engine; between the transmission case and clutch housing, and between the mainshaft and drive pinion.

(b) Excessive Wear—Inspect the following parts for wear or damage: pinion bearing, mainshaft bearings, drive pinion clutch teeth, synchronizer clutch teeth, shifter rail detents, shifter forks or shifter fork set screws.

2. SECOND GEAR

(a) Misalignment—Inspect alignment between clutch housing and engine, and between transmission and clutch housing.

(b) Excessive Wear — Inspect pinion bearing and mainshaft bearing, synchronizer clutch teeth, second speed gear clutch teeth, shifter rail detents, shifter forks or shifter fork set screws, for wear.

(c) End Play—Inspect the pinion shaft, countershaft gear and second speed mainshaft gear, for excessive end play.

3. LOW AND REVERSE GEARS

(a) Excessive Wear—Inspect the following parts for wear or damage: mainshaft sliding gear spline, sliding gear, countershaft gear, countershaft, reverse idler gear shaft, shifter rail detents, reverse idler gear, shifter forks or shifter fork set screws.

(b) End Play—Inspect for excessive end play in countershaft gear.

LEAKAGE

1. GASKETS—Inspect gaskets for damage or wrinkles at following points: transmission to clutch housing, gearshift housing to transmission case; extension to transmission case, and pinion bearing retainer.

2. GROMMETS—Inspect grommets for deterioration at extension screws and pinion bearing retainer screws.

3. WASHERS — Inspect washers on selector ball spring screw for damage.

4. MAINSHAFT REAR BEARING OIL SEAL—Inspect for wear or damage.

5. SPEEDOMETER PINION — Inspect speedometer pinion seal for wear.

6. IMPROPER FITS—Inspect for proper fit at following points: pinion bearing retainer and transmission case, and countershaft at front of transmission case.

Inspect the drive pinion bearing retainer for proper location of the end of the oil return thread in relation to the slot in this retainer.

NOTE

Leakage at pinion bearing retainer gaskets, or grommets, will be indicated by traces of oil in clutch housing pan. This should not be confused with leakage of the crankshaft rear main bearing oil seal.

OVERDRIVE

OVERDRIVE WILL NOT ENGAGE

It will be necessary to check the solenoid and control circuits. See Figures 23 and 24. Turn the ignition key to the "ON" position and push the overdrive handle in.

1. SOLENOID—Ground one of the "A" terminals of the kickdown switch. A click from the relay indicates that points have closed. A second click indicates the solenoid is being energized.

2. *FUSE*—If no click is heard from the solenoid hold the ground at the "A" terminal of the kickdown switch and remove the fuse. A click should be heard in the solenoid as the fuse is withdrawn and another click heard as the fuse is replaced. If none is heard check to see if fuse is burned out. Also check fuse contact in holder for corrosion.

3. *CONTROL CIRCUIT*—If steps (1 and 2) are satisfactory connect a jumper wire between the wire terminal on top of the governor, and ground. If relay clicks, the control circuit is good from the horn relay to the governor.

4. *ROAD TEST*—Check the governor operation by road test. Leave the jumper wire connected to the terminal on top of the governor and run the other end of the wire inside the car. Drive the car and bring it up to the overdrive cut-in speed and attempt to make the shift. If it will not shift, ground the wire. If the overdrive cuts-in, it will be necessary to clean the governor contacts. If the over-drive still fails to cut-in replace the governor cover and contact point assembly.

5. *SOLENOID CIRCUIT*—Assuming that the control circuit is operating properly to complete the circuit through the relay, but the solenoid doesn't click, check out the solenoid circuit from the "BAT" terminal of the horn relay to the solenoid. Do this with a test light. With the ignition key "ON" and one of the "A" terminals of the kickdown switch grounded, the test lamp should light at each of the connection points. If the test lamp does not light, look for a broken wire or a loose connection.

6. *SOLENOID POINTS*—If the solenoid circuit checks out up to the number four terminal of the solenoid, remove the solenoid cover and clean and inspect the closing coil points. If the points are making good contact, but still the solenoid does not operate, replace the solenoid.

OVERDRIVE WILL NOT DISENGAGE

This condition is produced by causes just the reverse of those which prevent the unit from shifting into overdrive. In other words, instead of the control or solenoid circuits not being completed, they are not being broken when they should. Therefore, the solenoid remains energized and holds the pawl in the control plate.

1. *DETERMINE WHETHER ELECTRICAL OR MECHANICAL*—A simple test to determine whether this is caused by an electrical or a mechanical condition is to push the control handle "IN" and turn the ignition key "ON." If a click is heard, the control circuit is grounded.

2. *ELECTRICAL CIRCUITS*—Pull the control handle out and turn the key "ON" again. If a click is still heard in the relay, the ground is between the horn relay and the rail lockout switch. If no click is heard in the relay with the control handle out, but a click is heard with the control handle in, the ground is between the rail lockout switch and the governor, or in either of those two units.

3. *MECHANICAL*—If no click is heard in the overdrive relay with the control handle in and the ignition key turned "ON" the electrical circuit is probably all right, and there is some mechanical difficulty preventing the pawl from being pulled out of the control plate. This could be a broken return spring in the solenoid, or the solenoid pawl rod may not be connected to the pawl.

4. *RELAY POINTS*—With the ignition key "OFF," connect a test lamp between the solenoid terminal ("SOL") of the overdrive relay, and the ground. If the test lamp lights, it indicates that the relay points are stuck closed and the relay must be replaced.

5. *GOVERNOR*—With the ignition key "ON," check out the control circuit to find the ground. Disconnect the wire on the governor. If a click is heard in the relay, the ground is either in the governor itself.

6. *CIRCUIT WIRES*—Continue the same test at the kickdown switch if the ground has not been located up to this point. When a wire is disconnected and a click is heard in the relay, the ground is between that point and the last point checked.

OVERDRIVE WILL NOT KICK DOWN

This indicates an open circuit in the ignition interruption circuit, and could be caused by lack of contact at the "B" terminals of the kickdown switch. If this switch is slightly out of position, the plunger will not be moved into the switch far enough to bridge the "B" contacts. The position of the kickdown switch may be checked with the aid of a test lamp.

1. *CHECKING KICKDOWN SWITCH* — Connect the test lamp between one of the "B" terminals of the kickdown switch and the battery. Ground the other "B" terminal. The test lamp may come on before the accelerator pedal is depressed (if the distributor points are closed), depending upon which "B" terminal is connected. If test lamp lights, move the connection to the other "B" terminal.

2. *ADJUSTING KICKDOWN SWITCH* — If the test lamp does not light when the pedal is depressed, adjust the lock nuts on the switch to position the switch correctly. Further adjustment may be made by loosening the mounting bracket nut and rotating the bracket until

it is flat against the cylinder head. Then make a final adjustment of the locking nuts.

ENGINE STALLS DURING KICKDOWN

If the engine stalls during the kickdown operation, it means that the ignition current is not being restored to the engine following ignition interruption. This could be due to the ignition ground points sticking and not opening when the solenoid is de-energized. Another possibility, although remote, is that the fiber block on the underside of the contact pilot spring is missing so the ignition circuit remains grounded even though the ground points are open.

Another condition which would prevent re-establishing the ignition circuit, would be a ground at the "B" terminal of the kickdown switch that leads to the solenoid. If the terminal is grounded, the ignition circuit would be grounded as long as the "B" contacts are bridged, but would be restored as soon as the kickdown switch plunger moves away from the "B" contacts. If the ignition ground points are sticking, and cleaning them does not correct the condition, replace the solenoid. If the fiber block on the underside of the contact point spring is missing, replace the solenoid. If there is a ground at one of the "B" terminals of the kickdown switch the switch will have to be replaced.

POWERFLITE TRANSMISSION
EXCESSIVE SLIPPAGE

1. ALL RANGES—Inspect oil level. Adjust gearshift linkage. Check oil pressure; if low, inspect regulator valve and torque converter control valve for sticking. Inspect valve body to transmission case mating surfaces for evidence of oil leakage.

2. KICKDOWN—Readjust throttle linkage and kickdown band. Inspect valve body to transmission case mating surfaces for oil leakage. Check operation of throttle valve and note wear of valve bore and cam. Check spring. Check valve body end cover for oil leakage. Check shutle valve for free movement. Inspect kickdown piston and guide for binding. Inspect spring. Inspect band lining for wear and band lever for free movement.

3. KICKDOWN (Over 25 M.P.H.)—Inspect valve body end cover for oil leakage. Inspect shuttle valve and plug for free movement. Inspect spring.

4. DIRECT—Inspect valve body to transmission case mating surfaces for evidence of oil pressure leakage. Check kickdown piston for binding. Check shaft seal rings and clutch retainer bushing for wear. Check clutch discs, piston, and clutch check valve ball.

5. REVERSE—Check reverse band adjustment. Inspect transmission case to valve body mating surfaces for evidence of oil leakage. Inspect reverse servo assembly for wear or binding. Inspect reverse lever and linkage for free movement.

6. HILL CLIMBING—Insufficient oil will result in low pressures to kickdown servo or direct clutch if oil level is low.

SHIFT PATTERN

1. NO UPSHIFT—Check oil level and gearshift linkage adjustment. Check governor and throttle pressure. If there is no pressure rise when accelerating engine in direct drive, governor valve may be stuck closed. Check valve body to transfer case for parallelism. Check manual valve and lever for correct detent engagement. Check shift valve for free operation and shift valve spring for breakage. Check kickdown piston assembly. Check rear pump drive pinion. Drive pinion ball may be cracked or broken, permitting pinion gear to slip. Inspect clutch ball check for proper operation. Ball check valve must operate freely and seat properly.

2. NO SHIFT IN DRIVE RANGE AND AN UP-SHIFT IN LOW RANGE—The cause is the governor valve sticking open. This can be verified by checking governor pressure. The pressure must not exceed approximately 15 lbs. at engine speed of 12 to 14 MPH, 45 lbs. at 19 to 23 MPH and 60 lbs. at 41 to 48 MPH. The governor pressure can be easily checked. Jack up the rear wheels of the car and attach a hydraulic gauge at the governor pressure take-off. This is a small brass plug behind the neutral switch on the same side of the transmission as the speedometer pinion. Start the engine. Put transmission in drive range.

If the pressure exceeds the above amount, a governor valve stuck open is indicated and most cases can be corrected in the following manner:

Clean off the area around the governor pressure take-off plug and remove the plug. Cover the oil filler tube with a cloth or plug and hold firmly in place to prevent the air from forcing the transmission oil out through the filler tube. Screw a piece of ⅛" pipe into the hole to help direct the air into the unit. Then put the compressed air nozzle at the other end of the pipe. As you apply short blasts of clean filtered air to the tube, tap the parking brake drum simultaneously with a rubber hammer just enough to jar the governor.

After applying the air pressure, check the governor pressure again and see if the governor valve has been freed up.

In cases where the governor pressure is still too high, it will then be necessary to remove the transmission extension case for further inspection.

3. LOW UPSHIFT PATTERN—Readjust throttle linkage. Check governor pressure. Governor valve may be binding or sticking. Inspect the rear pump assembly. Check valve body to transmission case mating surfaces for parallelism. Check operation of throttle valve and inspect the cam and spring. Check shift valve for free operation and spring for breakage.

4. LOW UPSHIFT PATTERN AT HEAVY THROTTLE—Inspect the regulator valve, throttle valve, and governor for burrs or dirt which would cause binding or sticking. Inspect the regulator spring.

5. HIGH UPSHIFT PATTERN—Readjust throttle linkage and check both throttle and governor pressure. Adjust throttle pressure if necessary. If throttle pressure does not rise according to speeds on chart in Pressure Checks section, throttle valve may be sticking. Inspect for dirt or burrs. Inspect throttle cam for wear. Check valve body to transmission case mating surfaces for parallelism. Check shift valve spring. If governor pressure does not correspond to governor pressure chart in Pressure Checks section, remove governor and inspect valve for sticking. Check rear pump gears for wear, broken teeth or excessive clearance. Inspect pump drive pinion ball.

6. ALL UPSHIFTS BELOW 14 MPH—Inspect throttle valve, cam and spring. Check throttle pressure check ball. Check governor valve for sticking.

7. ERRATIC SHIFTING — Check oil level. Inspect transmission case to valve body mating surfaces for parallelism. Check action of shift valve. Inspect governor support gaskets for oil leakage.

8. NO DOWNSHIFT—Check governor pressure. High initial pressure indicates valve is stuck open. Remove governor and inspect. Inspect shift valve action. Check spring.

9. LOW DOWNSHIFT SPEED — Governor valve is partially stuck open. Remove and clean. Check for burrs and dirt.

10. HIGH DOWNSHIFT SPEED — Readjust gearshift linkage. Inspect valve body to transmission case mating surfaces for parallelism. Inspect manual valve and lever. Inspect the kickdown valve ball and rod.

11. KICKDOWN AT PART THROTTLE — Readjust gearshift linkage. Inspect valve body to transmission case mating surfaces for parallelism. Inspect manual valve and lever. Inspect the kickdown valve ball and rod.

12. NO KICKDOWN—Adjust throttle linkage. Inspect valve body to transmission case mating surfaces for parallelism. Inspect throttle valve, cam and spring. Also inspect kickdown valve and shift valve components.

13. LOW KICKDOWN LIMIT—Check governor pressure. Governor valve may be sticking due to dirt. Inspect regulator valve and spring for proper operation. Inspect rear pump gears and drive pinion ball. Check valve body cover plate for parallelism.

SHIFT QUALITY

1. HARSH SHIFT FROM NEUTRAL TO REVERSE—Adjust engine idle speed. Readjust rear band. Inspect condition of the reverse band, strut and linkage. Inspect the reverse servo piston, spring, valve and rings.

2. HARSH SHIFT FROM NEUTRAL TO DRIVE—Adjust engine idle speed. Adjust throttle linkage. Inspect kickdown servo pistons, springs, guide rod and piston rings.

3. DELAYED SHIFT FROM NEUTRAL TO DRIVE—Adjust kickdown band. Inspect condition of band, strut, lever and lever shaft.

4. EXCESSIVE ENGINE SPEED INCREASE ON UPSHIFTS—Check oil level and adjust throttle linkage. Inspect regulator valve and spring and check operation of valve in regulator valve body. Check valve body, mating surface for parallelism. Inspect throttle valve, cam and spring. Check operation of valve in valve body. Inspect kickdown piston components. Check mating surfaces of regulator valve body and transmission for parallelism. Inspect reaction shaft seal ring for deterioration. Inspect input shaft oil seal rings for wear or breakage and condition of reaction shaft bore. Inspect the clutch retainer bronze bushing. If worn below bronze surface, replace retainer. Inspect condition of reaction shaft oil seal rings for wear or broken ends. Inspect condition of clutch plates and condition of friction material on seal ring. Check clutch check valve ball.

5. EXCESSIVE ENGINE SPEED INCREASE ON UPSHIFTS AT HIGH THROTTLE—Check line pressure. Inspect front oil pump gears for wear and excessive clearance.

6. HARSH UPSHIFT—Adjust throttle linkage. Inspect regulator valve and spring. Check for sticking shuttle valve. Check valve body mating surface for parallelism. Inspect throttle valve, cam and spring. Inspect kickdown piston components. Check regulator valve body mating surface for parallelism. Inspect direct clutch spring, spring retainer and snap ring for breakage.

7. *HARSH LIFT FOOT SHIFT*—Adjust throttle linkage. Check valve body mating surface for parallelism. Check operation of throttle valve. Inspect valve, valve bore, cam and spring. Inspect servo pressure bleed valve for dirt. Check operation of shuttle valve. Inspect shuttle valve, plug, inner and outer springs and guide pin.

8. *EXCESSIVE ENGINE SPEED INCREASE ON DOWNSHIFT AT PART THROTTLE* — Check oil level and adjust throttle and gearshift linkage. Check valve body mating surface for parallelism. Check operation of manual valve and valve lever. Inspect servo restrictor valve and operating plug. Check plug for free operation. Check valve spring for distortion or looseness.

9. *HARSH DOWNSHIFT*—Adjust engine idle speed. Adjust throttle linkage. Inspect valve body mating surface for parallelism. Inspect the throttle valve, cam and spring for proper operation. Inspect for dirt, burrs, wear or breakage. Inspect servo restrictor valve for proper operation. Inspect clutch plates and disc friction material. Inspect the piston for wear or scoring. Check seal for wear or deterioration which would result in leakage. Inspect thrust washers for excessive wear.

10. *EXCESSIVE INCREASE IN ENGINE SPEED ON KICKDOWN* — Readjust kickdown band. Check regulator valve and spring for proper operation. Inspect for dirt, burrs, or breakage. Check valve body mating surface for parallelism, nicks, burrs which would cause leakage. Check operation of servo restrictor valve. Check operations of shuttle valve. Inspect valve and plug for dirt, burrs or wear. Inspect all parts of kickdown piston assembly. Inspect piston rings for excessive wear or broken ends. Check governor valve for wear, dirt or sticking. Inspect the rear pump gears for excessive wear or broken teeth. Check clearance. Inspect drive pinion gear and pinion ball.

11. *HARSH KICKDOWN*—Adjust kickdown band. Inspect regulator valve and spring. Inspect for dirt, burrs, or breakage. Inspect servo pressure bleed valve for dirt. Check operation of shuttle valve. Check valve and plug for burrs, dirt, or excessive wear. Inspect all parts of kickdown piston assembly. Inspect piston rings for scoring, wear, or broken ends. Inspect regulator valve body mating surface for parallelism, nicks, burrs which would cause leakage. Inspect the reaction shaft neoprene seal for deterioration. Inspect governor valve for free operation. Check for dirt which would cause sticking. Inspect rear pump gears for excessive clearance, worn or chipped teeth. Inspect drive pinion gear and drive pinion ball. Inspect the input shaft seal rings for excessive wear or broken ends and reaction shaft bore for scoring. Inspect all parts of the direct clutch assembly.

OIL PRESSURE

1. *NO GOVERNOR PRESSURE*—Governor valve may be stuck in closed position, due to dirt. To free valve, apply a short spurt of high air pressure (90 lbs.) to governor pressure takeoff hole and at the same time tap transmission extension housing with rubber mallet. Before applying air pressure cover filler tube with a rag. In addition, drain two or three quarts of oil from transmission oil pan. After air is applied, reinstall governor pressure take off plug and run transmission in Reverse a few seconds. Recheck governor pressure. This corrective procedure may not be permanent. If valve become stuck again, remove governor for servicing.

If pressures do not correspond to the chart on page 168 the governor may need service. However, other parts of the transmission can cause low pressure readings. Check the valve body mating surface for parallelism, burrs, or nicks. These would result in oil pressure leakage. Check both output shaft support gaskets for evidence of internal leakage. Check operation of governor valve and inspect for foreign matter. Check the rear pump gears for broken teeth, wear, and excessive clearance. Check the mating surfaces of the output shaft for parallelism burrs, or nicks.

2. *HIGH INITIAL GOVERNOR PRESSURE*—High governor pressure at low engine speeds is due to the governor valve stuck in the open position usually caused by a particle of dirt. Use air pressure as outlined in 1. No Governor Pressure to dislodge particle. This method may not be a permanent correction. If the valve again becomes stuck in the open position, remove governor for servicing.

3. *LINE PRESSURE*—If line pressure does not correspond to the line pressure chart on page 168 it will be necessary to investigate and make the following adjustments or corrections.

Check the transmission oil level. Inspect the regulator valve for free operation, dirt or burrs, and condition of valve spring. Check the valve body mating surfaces for parallelism, nicks or burrs. Check operation of manual valve and lever.

Inspect the front pump gears for worn or chipped gears. Check clearance between face of gears and housing.

4. *THROTTLE PRESSURE*—If throttle pressures do not correspond to throttle pressure chart on page 148, check line pressure and make the following adjustments and inspections:

Adjust throttle linkage. Inspect operation and condition of regulator valve and spring. Check the valve body mating surface for parallelism, burrs or nicks. Check

operation and condition of the throttle valve, cam and spring. Check throttle pressure check valve ball for nicks or dirt. Inspect condition of kickdown rod and ball.

5. DIRECT CLUTCH PRESSURE—Direct clutch pressure should be approximately 10 P.S.I. lower than line pressure with transmission upshifted and engine speed not lower than 650 r.p.m. If not, refer to page 267. Shift Quality 4. Excessive Engine Speed Increase on Upshifts.

A pressure drop between line pressure and direct clutch pressure as high as 25 p.s.i., may be due to broken or damaged seal rings in the direct clutch circuit. These are: the interlocking type input shaft seal rings, the direct clutch piston retainer seal ring, the neoprene direct clutch piston seal ring, the neoprene reaction shaft seal ring, and two interlocking type reaction shaft seal rings.

6. LUBRICATION PRESSURE — Lubrication pressure is checked at the upper left side of the output shaft support. Remove ⅛ inch pipe plug and use 100 p.s.i. oil pressure gauge C3292 to check pressure. Lubrication pressure should be 35 to 50 p.s.i. with transmission in Neutral and engine speed at fast idle.

If pressure readings are incorrect, check line pressure and inspect torque converter control valve. Low pressures may be due to internal oil leakage at the following points: drive sleeve seal ring, regulator valve body mating surface, reaction shaft seal ring, output shaft support gaskets, input shaft seal rings, and reaction shaft bore. Low oil pressure may also be caused by plugged lubrication holes.

IMPROPER RESPONSE TO GEARSHIFT SELECTOR LEVER POSITIONS

1. MOVES FORWARD IN NEUTRAL—Adjust gearshift linkage. Adjust kickdown band. Inspect manual valve lever assembly. Check valve body mating surface for parallelism, nicks, dirt, burrs which would cause oil leakage. Check operation of manual valve. Inspect all parts of kickdown piston. Check regulator body mating surface for parallelism, nicks, or burrs which would result in oil leakage. Check clutch discs and plates for warpage which would cause dragging. Inspect clutch ball check.

2. CAR MOVES FORWARD IN NEUTRAL AT HIGH ENGINE SPEED—Clutch check valve ball bleed hole may be plugged causing centrifugal oil pressure to partially engage the direct clutch. A slight surge which is not continuous is normal.

3. CAR MOVES BACKWARD IN NEUTRAL—Readjust gearshift linkage and inspect manual valve and valve lever for proper engagement. Adjust reverse band. Inspect the reverse piston assembly and reverse band, levers, strut, and shaft. Check for binding, dirt, excessive wear.

MISCELLANEOUS DIAGNOSIS PROCEDURES

1. STARTER WILL NOT ENERGIZE—Adjust gearshift linkage. Test neutral starter switch. Inspect manual valve lever for proper engagement.

2. HARD SHIFTING INTO NEUTRAL—Check operation of neutral starter switch and inspect manual valve lever.

3. HARD SHIFTING INTO REVERSE—Check operation of backup light switch and manual valve lever.

4. OIL FORMS FROM FILLER TUBE — Check fluid level in transmission. Inspect transmission breather vent.

TORQUEFLITE TRANSMISSION

The Service Diagnosis Chart has the operating difficulties listed in three groups. After road testing, match the trouble found to its particular group and to the specific difficulty under that group. The Index and Item in the "Items to Check" column are next checked against the "Explanation of Index Items." Capital Letter items refer to those operations which may be performed without removing the transmission. The small letter items refer to those operations done after removal of transmission from car.

EXPLANATION OF INDEX ITEMS

Never remove a transmission from a car until all the possible "in car" causes have been checked for the operating difficulty and the oil pan has been removed to check for dirt, metal chips, band material, broken band ends, and burned or scored band contacting surfaces. Also, check the manual control cable and throttle linkage for adjustment and wear.

A. OIL LEVEL—Refer to Lubrication Section of this manual.

B. THROTTLE LINKAGE—Adjust to Specifications.

C. GEARSHIFT CONTROL CABLE—Adjust to Specifications.

D. PRESSURE TAP CHECK—Hydraulic pressure taps have been provided to check the following pressures: line, lubrication, governor and rear clutch apply. These pressures should fall within the specified limits stated in the Hydraulic Control Pressure Check Charts.

E. KICKDOWN BAND ADJUSTMENT—The kickdown band adjustment screw is found on the left side of the transmission case (Figure 143). Adjust to specifications.

SERVICE DIAGNOSIS CHART

OPERATING DIFFICULTY

ITEMS TO CHECK — See "Explanation of Index Items" — INDEX ITEM	Shift Abnormalities							Response								Miscellaneous					
	Harsh N to D or N to R	Delayed N to D	Runaway on Upshift and 3-2 K.D.	Harsh Upshift and 3-2 K.D.	No Upshift	No K.D. or Normal Downshift	Shifts Erratically	Slips in Forward Drive Position	Slips in L-R Only	Slips in All Positions	No Drive in Any Position	No Drive in Forward Ranges	No Drive in R	Drives in N	Drags or Locks	Grating, Scraping Etc. Noises	Buzzing Noises	Trans. Hard to Fill—Oil Blows Out Fil. Tb.	Trans. Overheats	Impossible to Push Start	Starter Won't Energize
A. *Oil Level		●	●		●	●	●	●		●	●						●	●	●	●	
B. *Throttle Link Adj.			●	●	●	●	●														
C. *Gearshift Control Cable Adj.						●	●							●							●
D. Pressure Checks—Line Lube, etc.	●	●	●	●	●	●	●	●	●	●	●	●	●							●	
E. K. D. Band Adj.			●	●	●	●						●			●				●		
F. Low-Reverse Band Adj.	●								●				●		●				●	●	
G. *Engine Idle	●						●														
H. Starting Switches																					●
I. Handbrake Adj.															●	●			●		
J. Regulator—Valve Spring							●			●	●						●	●	●		
K. Converter Control Valve																	●	●	●		
L. Breather																		●			
M. Output Shaft Rear Bearing S. R.							●									●					
N. K. D. Servo Band-Linkage			●	●	●	●						●			●						
O. L-R Servo, Band-Linkage	●								●				●		●					●	
P. Oil Strainer							●				●							●			
Q. Valve Body—Bolts—Mating Surfaces		●	●	●	●	●	●	●	●	●	●	●		●						●	
R. Accumulator	●	●	●	●	●	●		●				●									
S. Air Pressure Check		●	●		●	●	●	●	●	●	●	●	●								
T. Governor					●	●	●									●					
U. Rear Pump																●			●	●	
a. Front Pump—Drive Sleeve		●					●			●	●					●		●	●		
b. Regulator Valve Body, Gasket, Surfaces								●	●	●	●						●	●	●		
c. Front Clutch	●	●						●				●		●	●	●			●		
d. Rear Clutch	●		●	●	●			●				●	●		●	●			●		
e. Planetary Gear Set															●	●					
f. Overrunning Clutch						●		●				●			●						

*Always Check Items A, B, C & G before performing any other operation.

F. LOW AND REVERSE BAND ADJUSTMENT—The low and reverse band adjustment screw is found on the right side of the transmission case (Figure 143). Adjust to specifications.

G. ENGINE IDLE—Adjust to 475 to 500 r.p.m.

H. STARTING SWITCHES—Check wires, connections and switch.

I. HANDBRAKE—Check for excessive drag. Refer to Brake Section for method of adjusting hand brake.

J. REGULATOR VALVE, SPRING — The regulator valve may be removed by removing the regulator valve spring retainer which is on the right side of the transmission case (Figure 143). Check for a stuck or scratched valve and/or buckled spring.

K. CONVERTER CONTROL VALVE, SPRING—The converter control valve may be removed by removing the converter control valve spring retainer which is on the right side of the transmission case (Figure 143). Check for a stuck or scratched valve and/or buckled spring.

L. BREATHER—Check to determine whether breather is free of dirt and undercoating.

M. OUTPUT SHAFT REAR BEARING, SNAP RING—Check for rough bearing and/or unseated snap ring and correct thickness snap ring.

N. KICKDOWN SERVO, BAND AND LINKAGE—Check for broken seal rings, stuck servo piston or broken linkage.

O. LOW AND REVERSE SERVO, BAND AND LINKAGE—Check for torn seal, broken band and/or linkage.

P. OIL STRAINER—Check for possible air leakage.

Q. VALVE BODY ATTACHING BOLTS AND MATING SURFACE—Check for loose bolts, burrs or scratches on mating surfaces. Clean valve body assembly. Check for stuck valves, dirt, scratched valves or body and burrs on valves. Torque valve body bolts to specification.

R. ACCUMULATOR—Check accumulator cover screw tightness and piston for broken rings. Torque accumulator cover screws to specifications.

S. AIR PRESSURE CHECKS—The front clutch, rear clutch, kickdown servo, and low and reverse servo may be checked by applying air pressure to their respective passage when the valve body is removed. To make the complete air pressure check proceed as follows. Refer to Figure 247.

Raise the vehicle on a hoist, drain the transmission fluid and remove the accumulator cover and valve bodies assembly. Apply air pressure to the front clutch passage, located slightly toward the center of the transmission from the accumulator (be sure to cover accumulator piston bore to prevent piston from being blown out). Protect from oil spray by holding a clean lintless cloth, cardboard, or some other shield against the bottom of the transmission case when applying the air pressure. Listen for a dull "thud" which indicates that the front clutch is operating. Hold the air pressure on for a few seconds and observe for excessive oil leaks in the system.

Apply air pressure to the rear clutch passage (near the center rear end of the lower surface of the transmission case). Listen for a dull "thud" which indicates that the rear clutch is operating. Also check for excessive oil leaks.

Apply air pressure to the kickdown "apply" (line) pressure passage (toward the center of the transmission case and to the front of the kickdown servo). Observe the operation of the kickdown servo, lever and band when air pressure is applied.

Apply air pressure to the kickdown "apply" (compensated throttle) pressure passage (toward the center of the transmission case and to the rear of the kickdown servo). Observe the operation of the kickdown servo.

Apply air pressure to the low and reverse servo passage (toward the center of the transmission case and to the front of the low and reverse servo). Observe the operation of the low and reverse servo, lever, and band when air pressure is applied.

If the clutches and servos operate properly, "no drive" conditions as well as erratic or no upshift conditions, indicate that the malfunctioning exists in the control valve body assembly. Disassemble, clean, inspect and service the valve body assembly as described in the "Reconditioning of Valve Body and Transfer Plate Assemblies," section of this Service Manual.

Upon completion of the air pressure check, and servicing the valve body assembly, install the valve body assembly, accumulator cover, and transmission oil pan. Fill the transmission to proper level with fluid, and adjust the control cable and throttle linkage.

T. GOVERNOR—Clean assembly, and check weight assembly and valve for burrs, scratches or sticky operation. Examine the governor valve shaft, shaft snap rings and seal rings.

U. REAR PUMP—Clean and inspect assembly for side and diametral clearance. Note whether rear oil pump pinion ball is in place. Examine output shaft support face for scoring.

a. *FRONT PUMP—DRIVE SLEEVE*—Clean and inspect assembly for side and diametral clearance. Examine oil pump inner and outer rotor for scoring. Check front pump drive sleeve seal rings.

b. *REGULATOR VALVE BODY, MATING SURFACES, GASKET*—Clean and inspect valve body for scratches and scoring on valve bores and face which bears against the front pump housing. Examine the valve body to determine if the secondary reaction orifice is free of dirt. Check gasket for uniformness of compression by valve body.

c. *FRONT CLUTCH* — Clean and inspect discs, plates, drive hub, return spring, piston levers, cushion spring and retainer. Check the following front clutch circuit leakage possibilities:

(1) Valve body and valve body to case mating surface.

(2) Accumulator small and large piston rings.

(3) Regulator valve body to case mating surface.

(4) Torque converter reaction shaft seal ring.

(5) Input shaft small and large seal rings.

(6) Intermediate shaft No. 1, 2, and 3 seal rings.

(7) Front clutch oil feed tube.

(8) Front clutch piston inner and outer seal ring.

(9) Front clutch check valve ball.

d. *REAR CLUTCH*—Clean and inspect discs, plates, return spring and piston. Check the following rear clutch circuit leakage possibilities.

(1) Valve body and valve body to case mating surface.

(2) Output shaft support to case mating surface.

(3) Output shaft small and large seal rings.

(4) Intermediate shaft No. 4, 5, and 6 seal rings.

(5) Rear clutch oil feed tube.

(6) Sun gear rear clutch seal rings.

(7) Rear clutch piston inner and outer seal rings.

(8) Rear clutch check valve ball.

(9) Kickdown piston rod guide seal ring and rod guide to kickdown rod fit.

(10) Large kickdown piston seal ring.

e. *PLANETARY GEAR SET*—Clean and inspect gear set for worn thrust washers, nicked or rough gear teeth, and excessive pinion end clearance.

f. *LOW SPEED OVER-RUNNING CLUTCH*—Clean and inspect the overrunning clutch assembly for brinnelled rollers and/or cam and improperly assembled rollers or springs.