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TRANSMISSION

STANDARD 3-SPEED

The new Chrysler three-speed synchomesh manual Transmission has been modified to include a simplified gear shift mechanism, low and reverse sliding gear and a new set of gear ratio to improve acceleration and increase the service life of the transmission. The Standard Transmission is of the synchromesh type and the gears are helically cut to provide silent operation. The counter-shaft gears are in constant mesh, assuring smooth, silent shifting in second and high gear.

SERVICE PROCEDURES

1. DISASSEMBLY

a. Removal From Vehicle

Drain lubricant from transmission. Disconnect the propeller shaft, speedometer cable and housing and gearshift control rods. Remove back-up light switch (if vehicle is so equipped) and speedometer drive pinion. If mainshaft is to be removed or rear oil seal is to be replaced, apply the hand brake to hold mainshaft while loosening the flange nut or use flange holding wrench, Tool C-3281. This method will also prevent possible brinelling of bearings, or other damage caused by pounding on the wrench. Remove flange nut and washer. Disconnect hand brake cable. Remove brake drum and flange assembly, using puller Tool C-452. Remove oil seal with puller, Tool C-748. Pull transmission straight back until pinion shaft clears clutch disc before lowering transmission. This precaution will avoid bending the clutch disc.

b. Gearshift Housing (Fig. 1)

Remove six bolts holding gearshift housing to transmission case, remove housing and discard gasket. Remove shift forks from transmission case (if not removed with housing). Remove operating levers from their respective shafts. Drive out retaining pin from either one of two lever shafts and withdraw lever from housing.

CAUTION

Interlock balls are spring loaded.

Remove interlock sleeve, spring, pin and re-

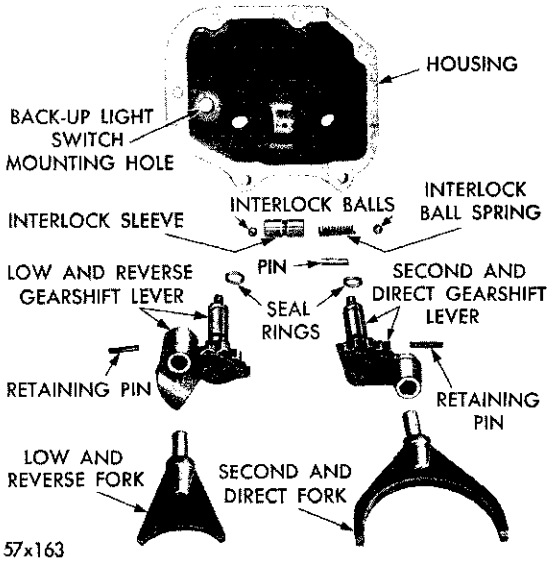


Fig. 1—Gear Shift Housing—Disassembled View

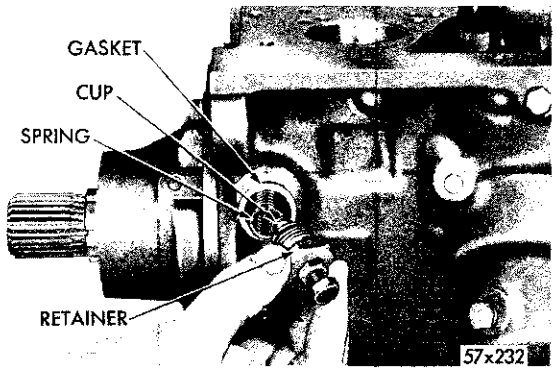


Fig. 2—Transmission Assembly Mounted on Holding Fixture

maining interlock ball. Remove remaining operating shaft, after driving out retaining pin. Remove "O" type seal ring from each operating shaft and discard. Do not remove steel expansion plug from side of gearshift housing unless there is evidence of leaking.

c. Drive Pinion

Remove main drive pinion bearing retainer and discard gasket. **Do not remove drive pinion shaft assembly at this time.** Loosen, but do not remove transmission case to extension bolts. Reinstall brake drum and flange assembly, place transmission assembly on mounting fixture, as shown in Figure 2.

NOTE: As the transmission will be partially disassembled and assembled, while mounted in a vertical position; it will be necessary to provide a suitable mounting fixture. A suggested mounting fixture consists of a wood or steel block (Fig. 2) approximately 8 inches square with holes drilled to receive the four studs of the brake drum and flange assembly. To provide additional stability additional holes may be drilled in the mounting fixture for attachment to repair stand, Tool DD-1014 (with adapter arms, C-3304).

Remove drive pinion shaft assembly by lifting upward on shaft (Fig. 2). It may be necessary to tap shaft lightly to aid in its removal.

NOTE: Complete the following only if condition of the large ball bearing or pilot bearing rollers warrant their removal.

Remove snap ring (small) which locks main drive pinion bearing in position on shaft. Remove pinion bearing in position on shaft. Remove pinion bearing washer, carefully press pinion shaft out of bearing. Remove oil slinger. Remove main drive pinion pilot bearing snap ring from cavity in end of pinion shaft, using a hook or flat blade. Remove washer and pick out rollers.

d. Mainshaft

Remove extension housing to transmission case bolts. Place a nut (½ to ⅝ inch in thickness) between synchronizer clutch gear sleeve and inner stop ring assembly, as shown in Figure 3. The nut will serve to minimize any interference from synchronizer clutch gear sleeve when transmission case is removed from extension housing assembly.

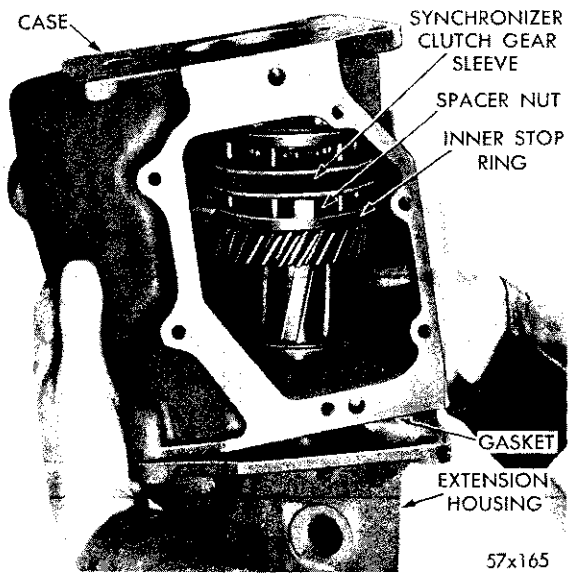


Fig. 3—Removing Transmission from Extension Housing

Remove transmission case by lifting upward while guiding cluster gear second speed gear past synchronizer sleeve (Fig. 3). Remove extension housing assembly from mounting fixture. There should be no end play of synchronizer clutch gear on mainshaft. If end play is present, select one of four snap rings to eliminate all end play. (Refer to Paragraph 3). Pointed ends of clutch teeth must retain their original contour to allow proper synchronization. Check end play of second speed gear. More than .008 inch end play may result in noise. Excessive end play may be caused by end play of clutch gear or wear on the thrust faces of second speed gear, clutch gear and ends of mainshaft helical splines. Worn parts should be replaced if noise is objectionable or gear disengagement is encountered. If there is no end play in the clutch gear and no evidence of wear on the gears or shaft, select the combination of parts (clutch gear assembly, second speed gear, or mainshaft) that will bring the second gear end play within limits. The first and reverse sliding gear should move smoothly and freely on mainshaft.

Remove synchronizer clutch gear snap ring, using pliers, Tool C-484 or Tool C-3301. Exercise care so as not to damage mainshaft or clutch gear. Using a soft hammer, drive mainshaft out of extension housing by tapping rear end of shaft. Remove mainshaft rear bearing retaining snap ring.

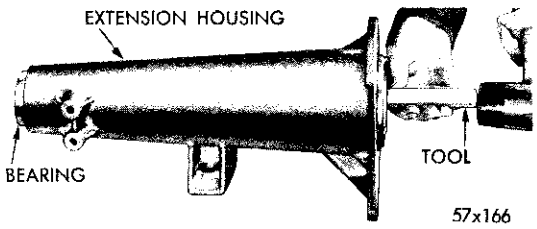


Fig. 4—Removing Extension Housing Rear Bearing

NOTE: If condition of needle and ball bearings warrant their removal proceed as follows:

Remove needle bearing using Tool C-3275 by driving bearing **into** extension housing. With needle bearing laying in extension housing, drive ball bearing out of its bore, using driver, Tool C-3275 as shown in Figure 4. Needle bearing can now be removed through rear of extension housing.

e. Reverse Idler

Using a suitable brass drift, drive reverse idler gear shaft towards rear of transmission case. Remove locking key from keyway. Finish driving out of shaft and lift out reverse idler gear and bearing assembly.

f. Countershaft

Check end play of the countershaft (.004-.012 inch permissible end play—refer to Paragraph 3), to determine need for new thrust washers at assembly. Using adapter arbor, Tool C-578, drive countershaft toward rear and out of transmission case. A key at end of shaft prevents the shaft from turning. Remove key. Remove adapter shaft (with adapter arbor installed) from transmission case. Disassemble countershaft assembly by removing thrust washers, rollers and spacer.

2. INSPECTION

Before inspecting, wash each part thoroughly in a suitable solvent, then dry. Clean mainshaft and drive pinion shaft bearings. Dry by applying compressed air directly through bearing. **Never spin bearing with compressed air. Apply a little oil and turn bearing several times by hand.** Check bearings for looseness or noise by comparing them with a new bearing. (Be sure to wash grease from new bearing. Apply a little oil before making comparison test).

Inspect fit of bearings on their respective shafts and in bores. Inspect bearings, shaft, and case for wear. If installation of a new bearing does not correct condition, install a new shaft or case.

Inspect mainshaft splines for galling or scoring. Inspect bearing mounting surfaces and snap ring grooves. Slight nicks or burrs can be stoned off. Replace damaged parts. Inspect the gear teeth and threads on inner and outer synchronizer stop rings. Check gear teeth on clutch gear sleeve.

If there is evidence of chipped or excessively worn gear teeth, replace the part. Make sure synchronizer clutch sleeve slides freely on clutch gear. Check pins of inner and outer synchronizer stop ring assembly for straightness and looseness. The pins should be 1.570 to 1.580 inches long. If pins do not comply with this specification, replace synchronizer stop ring assemblies.

Replace countershaft gear cluster, if any of its gear teeth are broken, chipped or excessively worn. Small nicks or burrs can be stoned off. Check rollers for chips and nicks. Replace all rollers if any one is damaged. Check condition of thrust washers, and replace if excessive wear is evident. Inspect the clutch teeth of the drive pinion. If they are excessively worn, broken, or chipped, install a new pinion shaft. Inspect mainshaft pilot rollers for pitting or scoring. If any of these conditions exist, replace all roller bearings.

If roller bearings fall out during disassembly, they are too loose and should be replaced. Inspect gearshift housing and operating levers. Replace rubber grommets in operating levers, if worn or torn. Check interlock sleeve for free movement in its bore. Examine interlock balls for corrosion. If operating lever shaft detents show signs of wear, replace shaft. Check shift forks for free movement in shaft lever. Check general condition of transmission case and extension housing. Check all threaded holes and plugs for stripped or pulled threads. Check all mating and gasket surfaces for roughness and scratches. Inspect castings for small cracks and sand holes.

3. ASSEMBLY OF TRANSMISSION

a. Mainshaft

Before assembling the transmission, lubricate each part with clean S.A.E. 80 lubricant. Drive mainshaft rear bearing (ball) into bore at rear of extension housing using driver, Tool

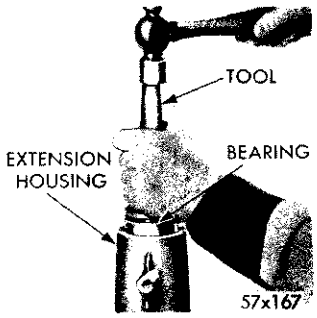


Fig. 5—Installing Extension Housing Rear Bearing

C-3204, as shown in Figure 5 until bearing is seated against shoulder in extension housing. Select and install snap ring to eliminate all end play at bearing. Snap rings are available in two sizes. **Make sure snap ring seats properly.** Place needle bearing on extension (Fig. 6) and carefully press (on lettered side of bearing) using a suitable arbor press. Press until bearing is flush with face of extension.

Using driver, Tool C-3105, install oil seal, driving until tool bottoms on extension housing. Position mainshaft into extension housing and tap forward end of mainshaft, using a soft hammer (Fig. 7), until shoulder at rear of mainshaft seats firmly against inner race of rear bearing (ball).

Install brake drum and flange assembly on mainshaft, place mainshaft and extension housing assembly on mounting fixture. Place first and reverse sliding gear on mainshaft with fork collar facing up. Install second speed gear, place spreader spring and then synchronizer inner stop ring on second speed gear.

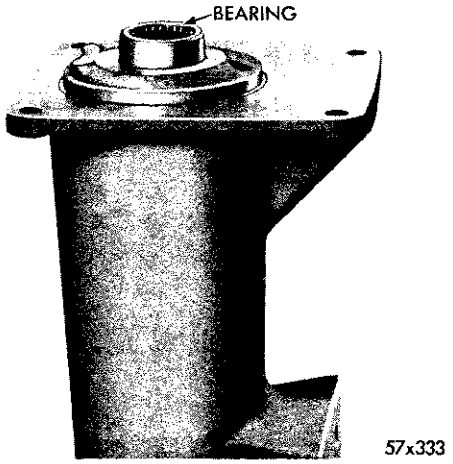


Fig. 6—Positioning Bearing for Installation

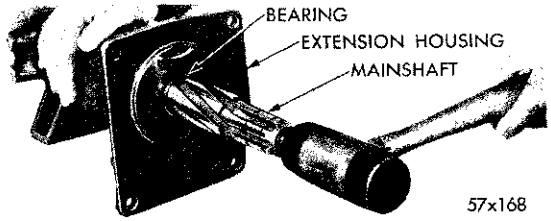


Fig. 7—Installing Mainshaft in Extension Housing

NOTE: Lightly grease threads on stop ring to provide lubrication during initial application of synchronizer assembly.

Install synchronizer clutch gear on mainshaft and secure in place with one of four available snap rings to eliminate all end play at clutch gear. Snap rings are available in the following sizes: (thin) .086-.088 inch, (med.) .089-.091 inch; (thick) .092-.094 inch; (x-thick) .095-.097 inch. Install snap ring. Make sure snap ring is properly seated. Place balance of synchronizer assembly on mainshaft. (Fig. 8). **Be sure to apply a light film of grease to outer stop ring.**

b. Reverse Idler Gear

Insert adapter arbor (Fig. 9) into reverse idler gear, then place the 22 rollers in position in gear.

NOTE: A suitable adapter arbor, for assembling the reverse idler gear assembly, can be made of either wood or metal by turning and cutting the stock to a length of 1.0625 inches and a diameter of .750 inch. (¾ inch dowel stock should prove satisfactory).

Install thrust washer at each end of adapter arbor. Place small amount of grease on thrust washers to hold in place during installation of

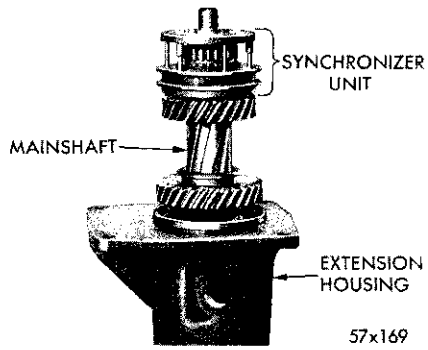


Fig. 8—Synchronizer Unit Assembled on Mainshaft

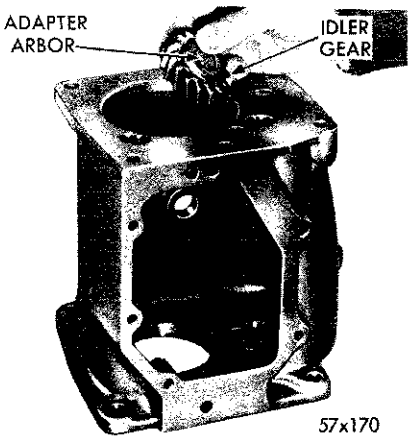


Fig. 9—Installing Reverse Idler Gear

gear in case. Place reverse idler assembly into transmission case (pointed end of teeth forward), as shown in Figure 9. Remove adapter arbor by driving reverse idler gear shaft through idler gear until key can be installed. Install key. Continue to drive shaft into case until shaft is approximately 1/64 inch below mating surface on transmission case.

c. Countershaft

Insert adapter arbor, Tool C-578 into countershaft gear. Place spacer over adapter arbor and insert into cluster gear. After installing the 22 bearing rollers (on one end), place small thrust washer against end of rollers. Install remaining rollers (22) at opposite end of countershaft. Place remaining small thrust washer next to rollers. Add small amount of grease to hold small thrust washers in place.

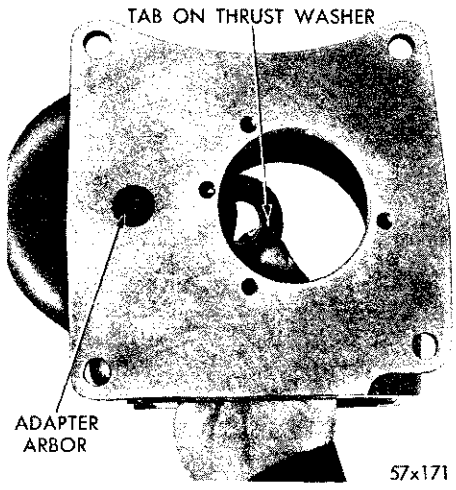


Fig. 10—Installing Counterweight Thrust Washer

Do not install large tabbed thrust washers at this time.

Be sure transmission case is resting on smooth surface, then position countershaft assembly into transmission case allowing adapter arbor to enter cluster gear shaft hole in rear of case. Install one of the large tabbed thrust washers (Fig. 10), making sure tab on washer engages groove in case. Washers are available in two sizes marked A and B. Select one to give .004 to .012 inch total end play of countershaft. Slide transmission case to edge of bench to permit adapter arbor to be pushed (with the finger) into countershaft hole in front of transmission case. Rotate case 180 degrees and install remaining large thrust washer in like manner. **Make sure tab engages groove in case.**

Using cluster gear shaft, push adapter arbor from cluster gear until shaft key can be inserted. Continue to drive shaft into case until it is approximately 1/64 inch below mating surface on rear of transmission case. Lightly grease gasket surface of extension housing and install gasket. Install transmission case to extension housing assembly, as shown in Figure 3.

NOTE: To minimize interference from synchronizer clutch gear sleeve, when transmission case is placed on extension housing, place a nut (1/2 to 5/8 inch thick) between clutch gear sleeve and inner stop ring, as shown in Figure 3.

Install extension housing to case studs and bolts and **tighten finger** tight only.

d. Drive Pinion

Place oil slinger, if removed, on pinion shaft. (Fig. 11). Press pinion shaft into ball bearing.

CAUTION

Make definitely sure slinger does not "hang-up" in bearing snap-ring groove during pressing operation.

Install keyed washer and secure with snap ring to eliminate all end play. Four snap rings are available (same sizes as synchronizer clutch gear snap ring). **Make sure snap ring is properly seated.** If the large snap ring on main drive pinion bearing was removed, replace at this time. Place shaft in vise equipped with soft jaws, and place 14 rollers in place in pilot pocket of drive pinion. Install washer against ends of rollers. Install snap ring.

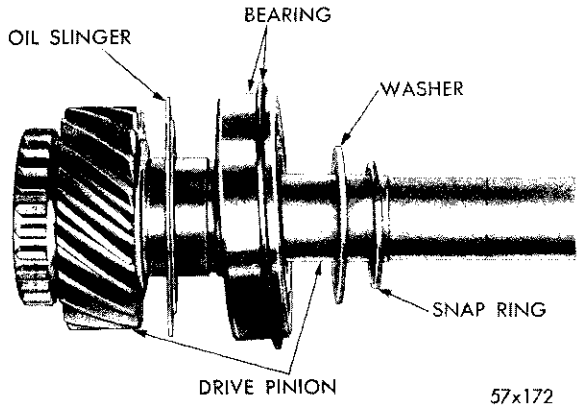


Fig. 11—Positioning Oil Slinger

CAUTION

Remove the ½ to ⅝ inch nut from synchronizer clutch gear sleeve and inner stop ring (if not done so previously). Guide drive pinion shaft through front of case, engaging synchronizer outer stop ring with clutch gear on drive pinion. Pinion shaft bearing is fully seated when snap ring makes full contact with face of transmission case.

Slide pinion bearing retainer over pinion shaft and against transmission case. While holding retainer with hand pressure against transmission case, measure the clearance between retainer and case, using a feeler gauge. Select a gasket about .005 inch thicker (consult parts catalog for sizes) than the clearance (to eliminate end play on front bearing) and install retainer and tighten bolts.

Remove transmission assembly from mounting fixture and tighten bearing retainer screws to 15 foot-pounds torque and extension to case bolts 30 foot-pounds torque. Install mainshaft washer (convex side towards nut) and draw nut up snug against washer. Install lubricant drain plug and tighten 20 foot-pounds torque.

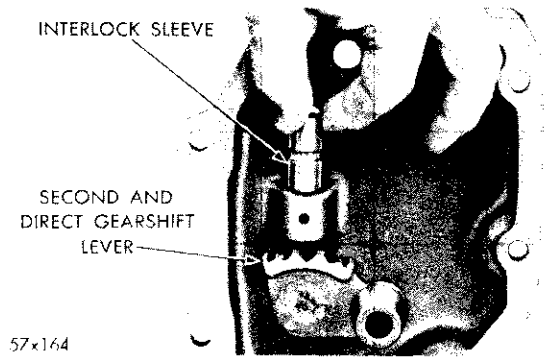
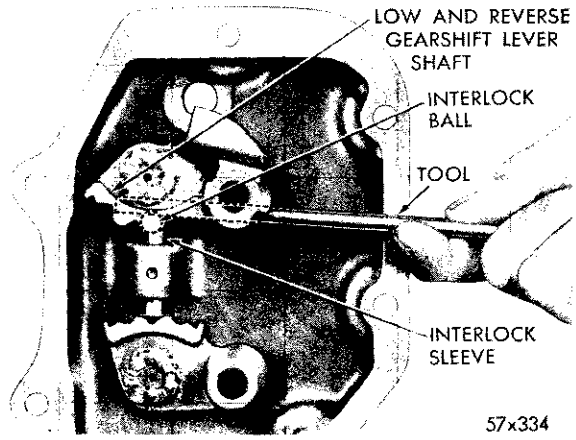


Fig. 12—Installing Interlock Sleeve



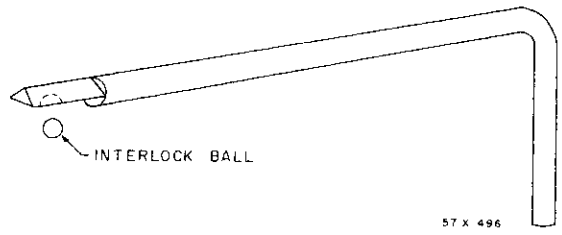


Fig. 13—Depressing Interlock Ball—Using Suggested Tool

e. Gearshift Housing (Refer to Fig. 1)

Place gearshift housing in vise (equipped with soft jaws) (Fig. 12). Place "O" ring seal on second and direct gearshift lever shaft and install lever shaft in housing. Secure shaft in place with retaining pin. Install interlock sleeve in its bore, as shown in Figure 12. Place one of the interlock balls in sleeve followed by interlock ball spring, and pin.

Place low and reverse gearshift lever shaft (part way) into its bore after installing "O" ring seal on shaft. Place second interlock ball on top of interlock ball spring. While depressing ball with the suggested tool, as shown in Figure 13, rotate tool 90° and engage with low and reverse gearshift lever cam by completely seating shaft in bore while allowing interlock ball to seat in detent of lever, as shown in Figure 14.

NOTE: A suggested tool for depressing and engaging the interlock ball consists of bending and finishing a piece of ¼ inch drill rod, as shown in the section accompaning Figure 13.

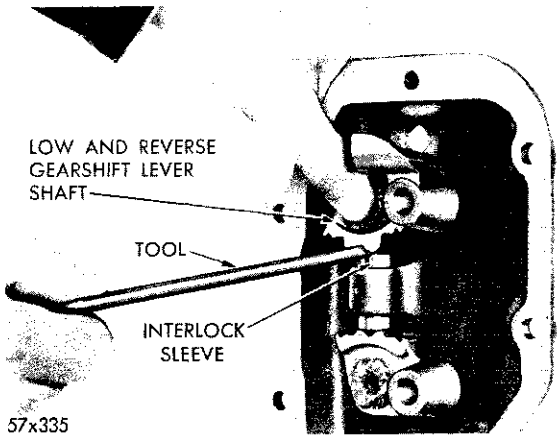


Fig. 14—Engaging Low and Reverse Gearshift Lever Shaft Ball with Interlock

Secure shaft with retaining pin, as shown in Figure 15.

NOTE: Lever shaft detents must be placed in neutral position to allow clearance for tool.

Install the gearshift operating levers and tighten retaining nuts to 20 foot-pounds torque. Shift transmission into neutral and place shift forks in position in transmission case, as shown in Figure 16. Place operating levers in gearshift housing in neutral position.

Place gasket on transmission case to gearshift housing mating surface and install gearshift housing by engaging shift fork ends with their respective operating lever shafts. Tighten gearshift housing bolts to 20 foot-pounds torque.

Install a new steel expansion plug (if removed) in side of gearshift housing. Install back-up light switch (if so equipped) and speedometer drive pinion. Check operation of gearshift housing.

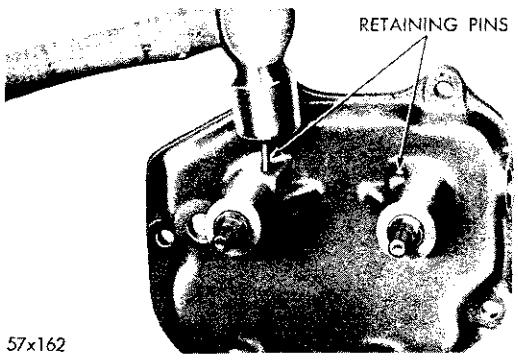


Fig. 15—Driving Retaining Pin into Position

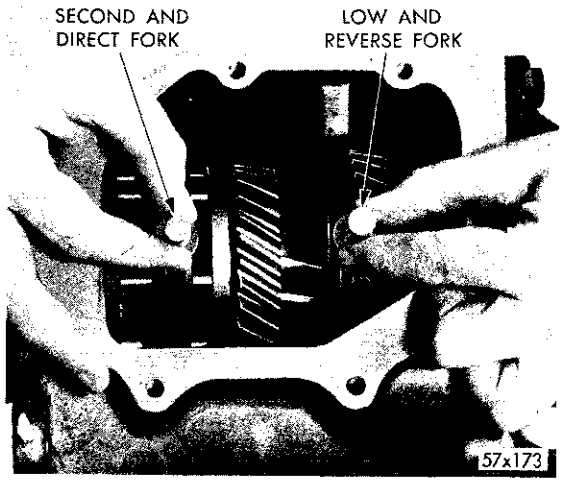


Fig. 16—Installing Shift Forks

NOTE: The transmission case is not equipped with back-up light switch, install plug and tighten to 15 foot-pounds torque.

4. INSTALLATION

If transmission has been jumping out of gear, check clutch housing bore and face alignment with housing aligning arbor, Tool C-870, before installing transmission in car. Refer to Clutch, Section IV of this manual for procedures outlining clutch housing alignment.

Installing Transmission

Insert about ½ teaspoonful of short-fibre wheel bearing grease behind radius in the drive pinion pilot bushing in end of crankshaft. Do not put grease on end of drive pinion. Be careful not to get any grease on clutch facing or flywheel, this will cause clutch disc slippage and chattering. Be sure clutch disc is properly aligned.

NOTE: An old transmission drive pinion shaft may be used to check clutch disc alignment.

Use extreme care when installing the transmission to avoid springing the clutch disc. Tighten transmission case to clutch housing bolts to 50 foot-pounds torque. Tighten the mainshaft flange nut to 150 foot-pounds torque using the hand brake to facilitate the operation, or wrench, Tool C-3281. Always check clutch pedal adjustment after installing transmission. Adjust the shifting linkage with the transmission in the neutral position.

5. SERVICING TRANSMISSION REAR OIL SEAL

The transmission rear oil seal can be removed as follows: Remove the propeller shaft. Remove nut and washer from the rear end of the main shaft and pull off the universal joint flange and brake drum assembly. Using puller Tool C-452, never drive the flange off with a hammer as mainshaft splines may be damaged and drum made out-of-round. Insert oil seal puller, Tool C-748 into the seal securely, tighten the puller bolt and draw the seal out of housing. When installing a new oil seal, be sure to use special driver, Tool C-3105, which automatically locates the seal in its proper position.

Reinstall brake drum and flange assembly. Install washer (convex side towards nut). Tighten nut to 150 foot-pounds torque. Reconnect propeller shaft and tighten nuts securely.

6. GEARSHIFT CONTROL ADJUSTMENTS (Fig. 17).

a. Crossover Adjustment

Before making the crossover adjustment the **gearshift lever shaft must be in its normal fully returned position in neutral.** After removing lubrication fitting (Fig. 17) from the tube lever pin retainer, rotate retainer until gearshift tube cross pin is exposed (Fig. 18). If a .040 inch feeler (round) gauge cannot be inserted between the gearshift tube cross pin and the bottom of the slot in second—direct shift lever hub, as shown in Figure 18, an adjustment at

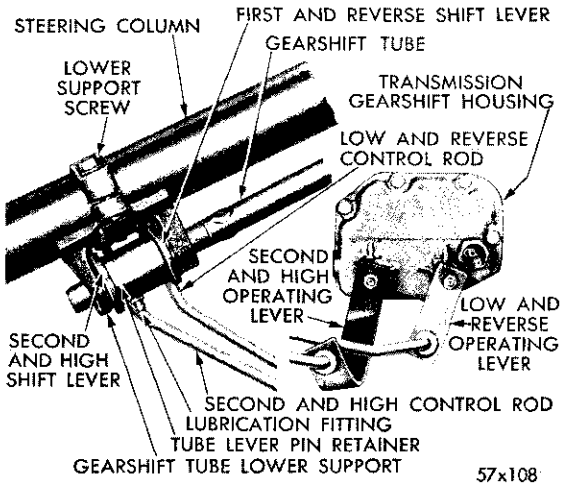


Fig. 17—Gearshift Control Adjustment 3-Speed Transmission

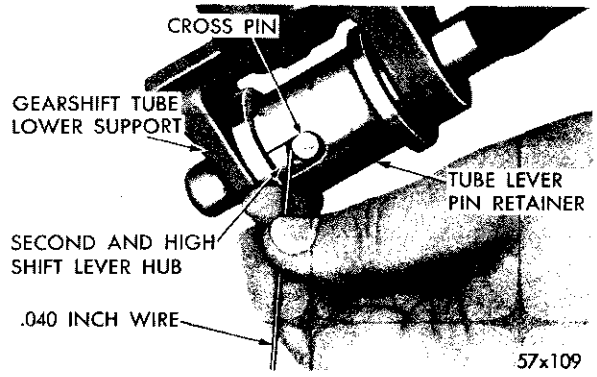


Fig. 18—Gearshift Crossover Adjustment (3-Speed Trans.)

gearshift tube lower support must be made as follows.

Loosen gearshift tube lower support screws sufficiently to permit movement of the support when support is tapped lightly with a plastic hammer. Adjust support up or down, as required, to secure the necessary .040 inch clearance. Tighten support clamping screws to 150 inch-pounds torque (90 inch-pounds for power steering equipped units). Rotate tube lever pin retainer to original position and install lube fitting.

CAUTION

Be sure lubricant fitting is securely tightened 70 inch-pounds torque. Failure to reinstall or loss of fitting will permit tube lever pin retainer to rotate resulting in loss of gearshift tube cross pin.

After completing adjustment, approximately equal up and down free travel of the gearshift

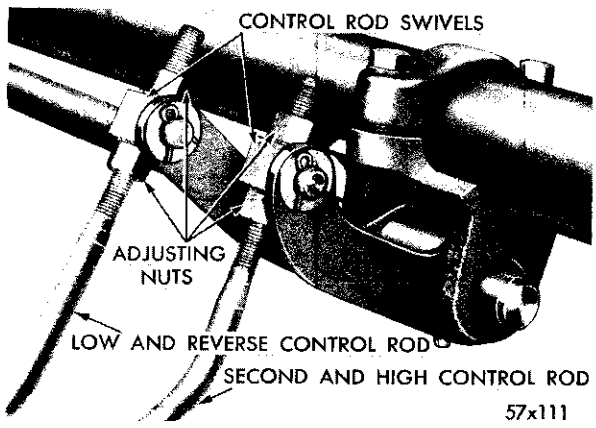


Fig. 19—Aligning the Gearshift Levers (3-Speed Trans.)

lever should be provided in either high or direct gear positions and low or reverse gear positions. Check crossover adjustment, at the manual lever, by making the crossover from second-direct to low-reverse. Crossover movement should be free of interference. Crossover movement from low-reverse to second-direct, likewise, should also be free of interference.

b. Control Rod Adjustment

Transmission must be in neutral before attempting to make this adjustment.

Loosen and back-off adjusting nuts at the second-direct gearshift control rod swivel (Fig. 19). Turn both adjusting nuts in direction required to locate knob end of lever (in vehicle) in a horizontal plane (sighting through rear window of vehicle will aid in determining horizontal plane of lever). Tighten adjusting nuts securely (70 foot-pounds torque) against the second-direct control rod swivel block. **Be sure transmission remains in neutral.**

Loosen and back-off adjusting nuts at low-reverse gearshift control rod swivel (Fig. 19). Position low-reverse gearshift lever in direct alignment (through center of swivel block pin) with second-direct gearshift lever. Tighten adjusting nuts securely (70 foot-pounds torque) against swivel block. **DO NOT LUBRICATE SWIVEL BLOCKS.**

CAUTION

Failure to make this adjustment correctly will result in insufficient manual lever to steering column clearance or manual lever to operator's leg clearance. Damage to transmission assembly is also a possibility because of incomplete engagement of gears.

TORQUEFLITE TRANSMISSION

The TorqueFlite Transmission (Fig. 20) combines a wide range 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 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 overrunning clutch can transmit torque only on 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. Shifts 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 transmission in the first two gears only. This range is suitable for heavy city traffic where the driver may desire part throttle second gear operation for more precise speed control. It may also be used on 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.

7. 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 L (low). (Fig. 21).

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,

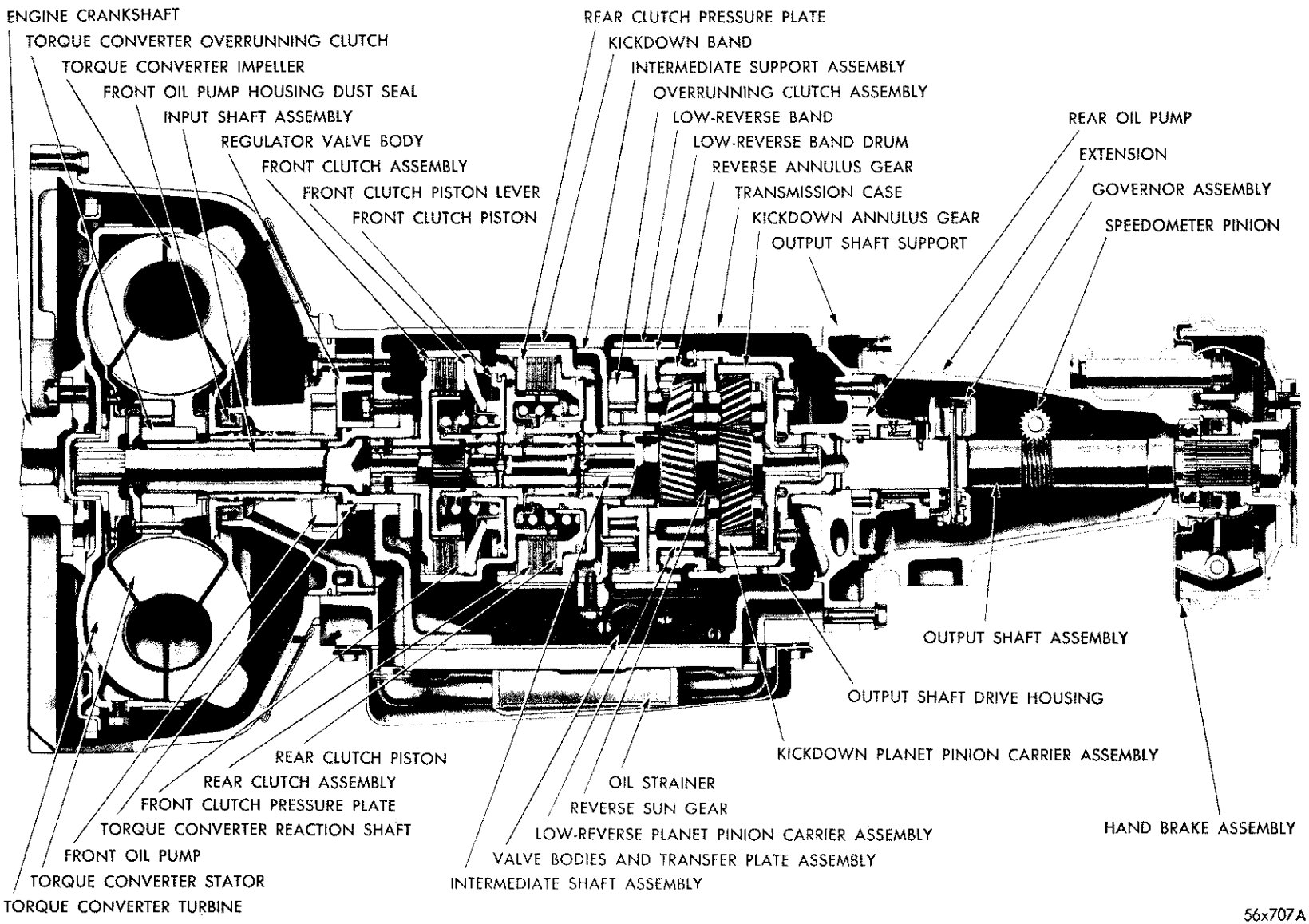
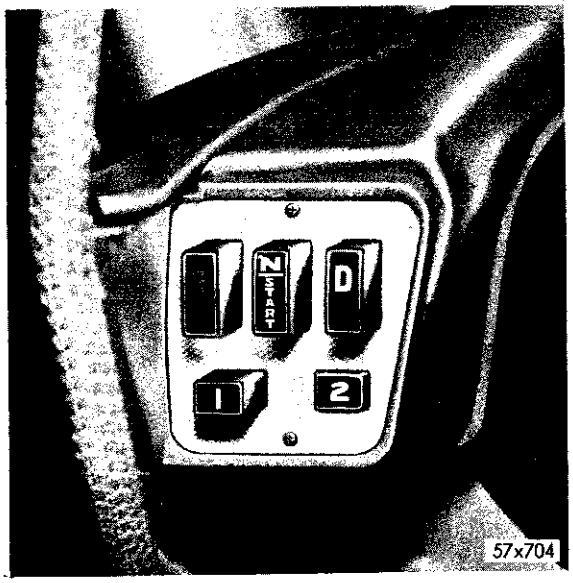


Fig. 20—TorqueFlite Transmission and Torque Converter (Sectional View)



Models C-75, C-76

Imperial

Fig. 21—Arrangement of Push Buttons

above approximately 15 m.p.h., it will move the manual control lever to the neutral position and when car speed drops below approximately 15 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 22. 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 transmission case to engage the manual control valve lever assembly.

When 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. (Fig. 22).

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.

A motor starting switch is also incorporated into the gearshift control housing (Fig. 22). The car is started by turning ignition switch to "ON" and pressing the N (neutral) push button beyond the neutral position to engage the motor starting switch. Should car stall, it is restarted by fully depressing the N (neutral) push button.

A vacuum switch, on the engine, prevents the starter from being energized should the N (neutral) push button be accidentally engaged while the engine is running. The starting motor is also wired so that the engine cannot be started unless the N (neutral) starting switch (at the transmission) is closed. Engaging the N (neutral) button closes starting motor circuit at neutral starting switch (Fig. 40). The purpose of the neutral starting switch (on the transmission) is to prevent starting the engine while the transmission is in gear, as a result of improper gearshift control cable adjustment.

8. STARTING THE ENGINE

As a safety precaution, apply hand or foot brakes. Turn ignition key to "ON" position. Depress accelerator slightly and push in the N (neutral) push button to limit of its travel. When engine starts, release pressure on N (neu-

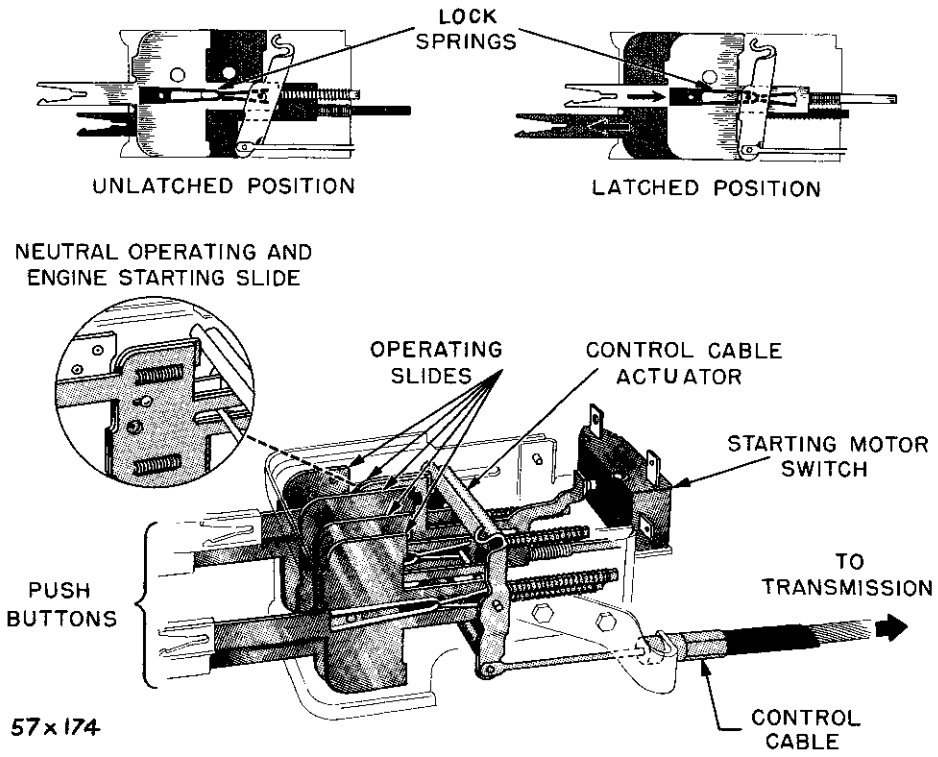


Fig. 22—Gearshift Control Unit (Operational Sketch)

tral) push button. If engine fails to start, release pressure on N (neutral) push button momentarily before attempting to start engine again.

9. PUSH STARTING

If engine fails to start in normal manner, it may be started by pushing. **Towing the car to start is not recommended due to the sudden surge of power when the engine starts.**

Turn ignition switch on, push L (low) button in and depress accelerator pedal slightly. After vehicle has been pushed to a speed of 15 m.p.h. (approximately), the transmission will drive engine.

10. HOW TO DRIVE THE CAR

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

a. 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 10 to 25 m.p.h., depending on the amount the accelerator is depressed, the transmission will automatically upshift to second. At a speed of approximately 15 to 55 m.p.h., depending upon the amount the accelerator is depressed and on car speed, 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 10 m.p.h.

b. 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 75 m.p.h. That is, as soon as accelerator is depressed, the vehicle will move forward in the drive (breakaway) range. At a speed of approximately 7 to 42 m.p.h., depending on the amount accelerator is depressed and on car speed the

transmission will automatically upshift into second. If vehicle is accelerated in second gear to wide open throttle upshift speed, an upshift to direct will occur, thus eliminating over speeding engine in second gear. If vehicle speed falls below approximately 10 m.p.h. or the accelerator is completely depressed, at speeds below approximately 30 m.p.h., transmission will automatically downshift to breakaway. It is possible to push buttons from 2 (second) to D (drive) or D (drive) to 2 (second) at any speed; however, transmission will not downshift to second gear if vehicle speed is above approximately 65 m.p.h.

c. 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. To prevent overspeeding 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 speed is above approximately 29 m.p.h.**

d. R (reverse)

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

e. Kickdown (forced downshift)

At speeds below approximately 30 m.p.h., in D (drive) or 2 (second), after 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 transmission will automatically upshift to second if the accelerator is released or a speed of approximately 45 m.p.h. is reached. In D (drive) range from second speed transmission will automatically upshift into direct if the accelerator is partially released or a speed of approximately 75 m.p.h. is reached. If vehicle is accelerated in 2 (second) position to wide open throttle upshift speed, an upshift to direct will occur thus eliminating overspeeding the engine in second gear.

f. Kickdown (forced downshift)

At speeds between 30 to 65 m.p.h. (approximately) in D (drive) position after transmissin has upshifted into direct, maximum acceleration can be obtained for passing by completely depressing accelerator. This will cause the transmission to downshift to second. The transmission will automatically upshift to direct if accelerator is released or a speed of approximately 75 m.p.h. is reached.

11. TOWING

Transmission Inoperative

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

12. 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.

THE PLANETARY GEAR SET

13. CONSTRUCTION

The planetary gear set, as shown in Figure 23 consists of: An annulus gear or internal gear, a planet pinion carrier with three planet pinion gears and a sun gear.

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

14. 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 24. 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

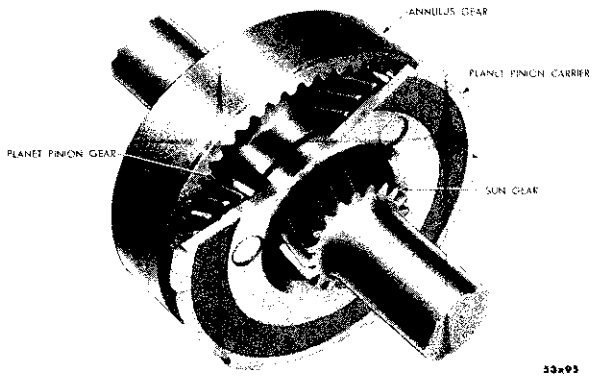


Fig. 23—Planetary Gear Set

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.

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 (Fig. 25). 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 26) 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.

Fig. 24—Planetary Gear Set (Sun Gear Held—Gear Reduction)

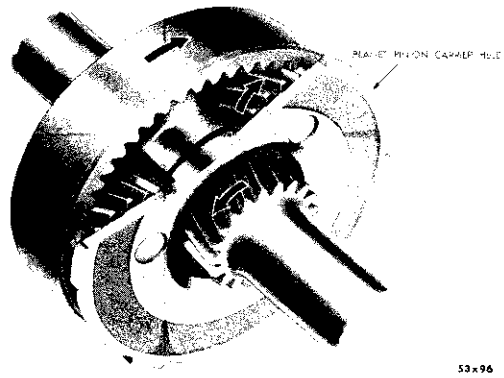


Fig. 25—Planetary Gear Set (Planet Pinion Carrier Held)—Reverse

15. 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 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 wedging 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 wedging 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 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.

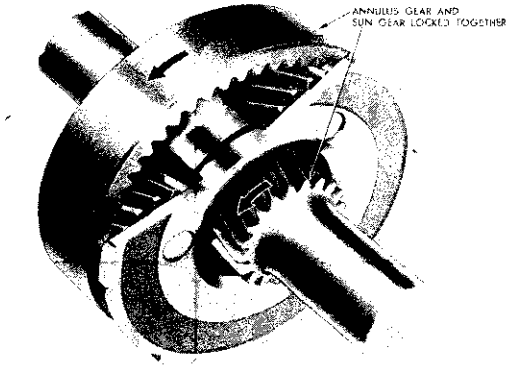


Fig. 26—Planetary Gear Set (Annulus and Sun Gear Locked)—Direct

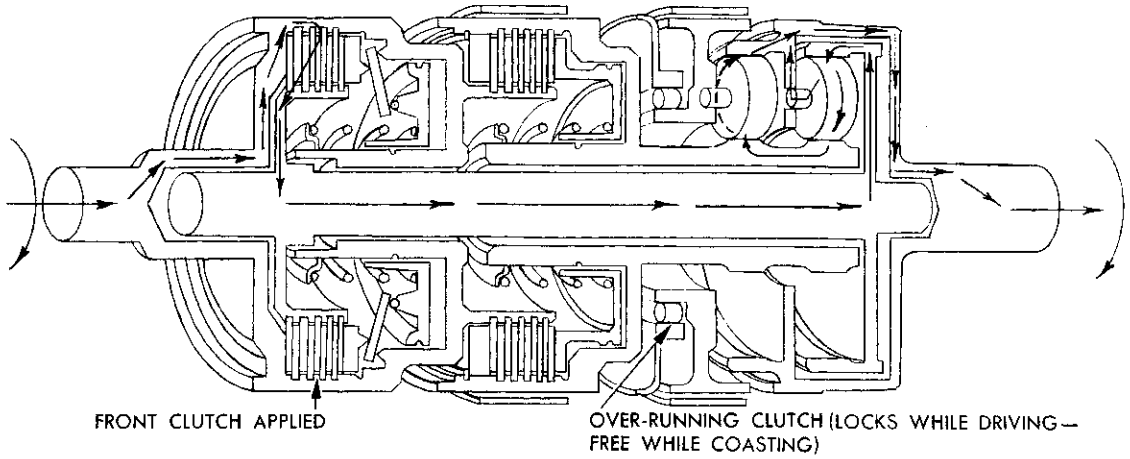


Fig. 27—Power Flow in D (Drive) Position—Breakaway

16. POWER FLOW IN THE TRANSMISSION

a. D (Drive) Position—Breakaway—(Fig. 27)

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.

b. D (Drive Position—2nd Speed and 2 (Second) Position—2nd Speed (Fig. 28)

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

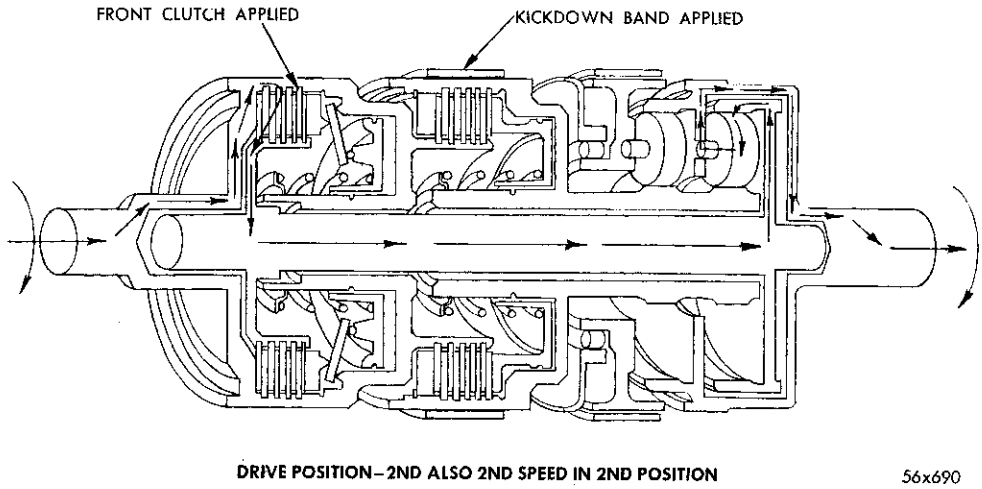
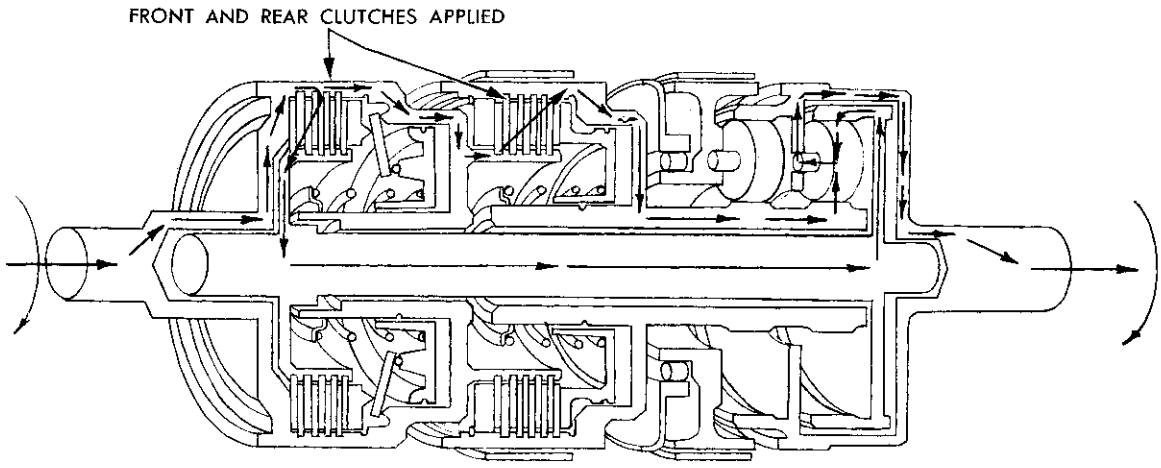


Fig. 28—Power Flow in D (Drive) Position—2nd Speed and 2 (second) Position—2nd speed



DRIVE POSITION—DIRECT DRIVE 56x688

Fig. 29—Power Flow in D (Drive) Position—Direct

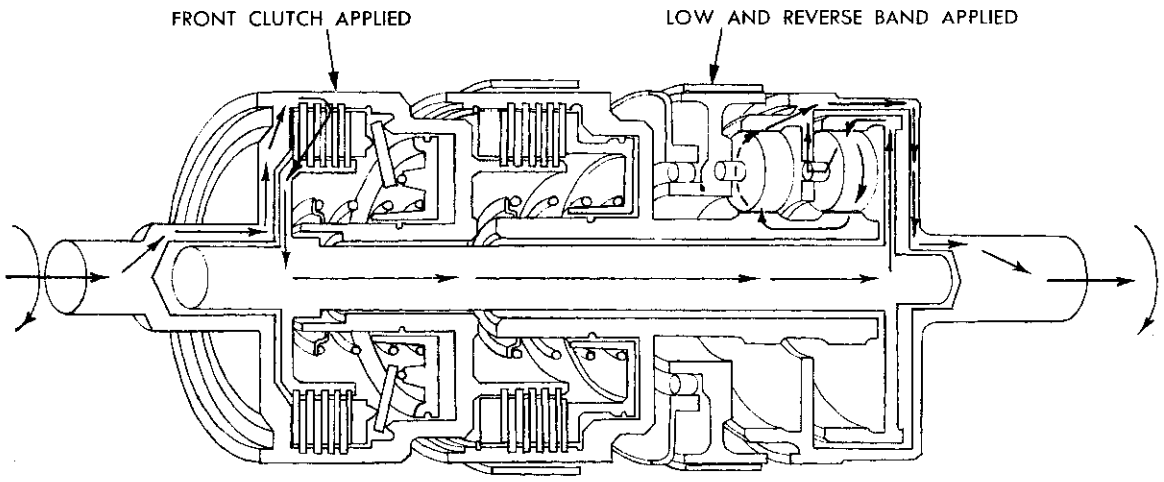
gear set. The kickdown band is applied which holds the sun gear stationary. The annulus gear drives the kickdown planet pinions which rotate in the same direction as the input and intermediate shafts. The kickdown planet pinions are meshed with the sun gear; therefore, they walk around this gear and 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.

c. D (Drive) Position—Direct (Fig. 29)

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.

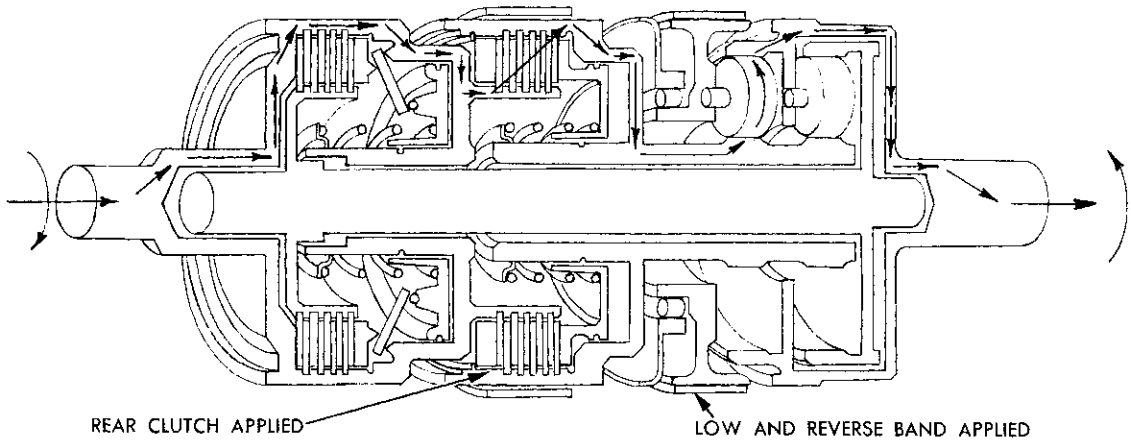
d. Kickdown (Forced Downshift) In D (Drive) Position Below 30 m.p.h.

This will force the transmission to downshift and the power flow will be the same as D (drive) position (breakaway).



LOW POSITION 1 LOW SPEED 56x691

Fig. 30—Power Flow in L (Low) Position—Low Speed



REVERSE POSITION 56x692

Fig. 31—Power Flow in R (Reverse) Position

e. Kickdown (Forced Downshift) In D (Drive) Position 30 to 65 m.p.h.

This will force the transmission to downshift and the power flow will be the same as D (drive) position 2nd speed.

f. 1 (Low) Position—Low Speed—(Fig. 30)

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.

g. R (Reverse) Position (Fig. 31)

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.

h. N (Neutral) Position

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

i. Power Flow Summary

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

17. HYDRAULIC CONTROL SYSTEM (Figs. 32 through 38)

The hydraulic control system must furnish oil under pressure and route it at the proper time and rate to the proper piston device for en-

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
L (low) position—Low Speed	2.45	Front Clutch and Low—Reverse (Rear) Band
N (neutral)	....	No Clutch or Band

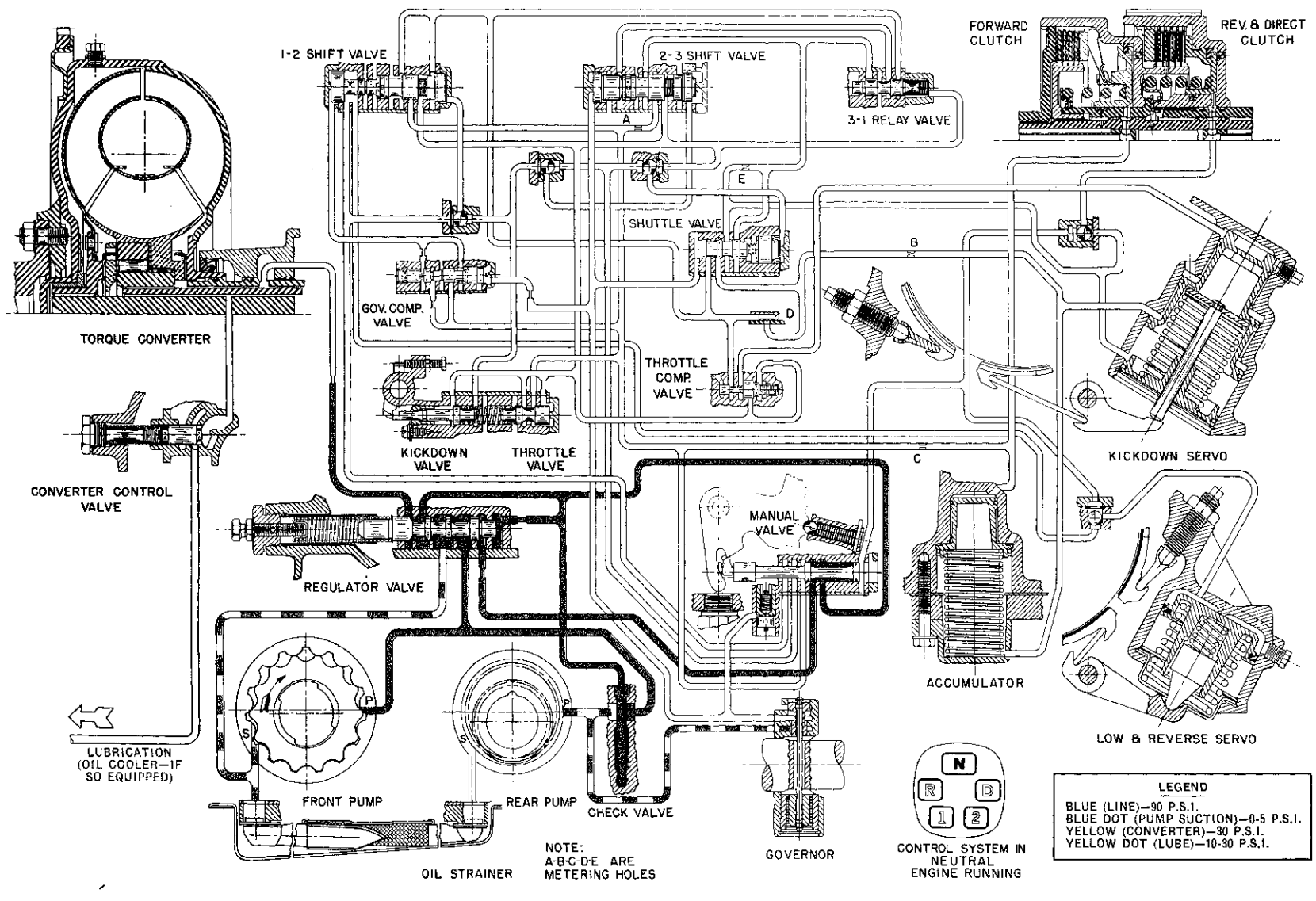


Fig. 32—Hydraulic Circuit—N (Neutral)

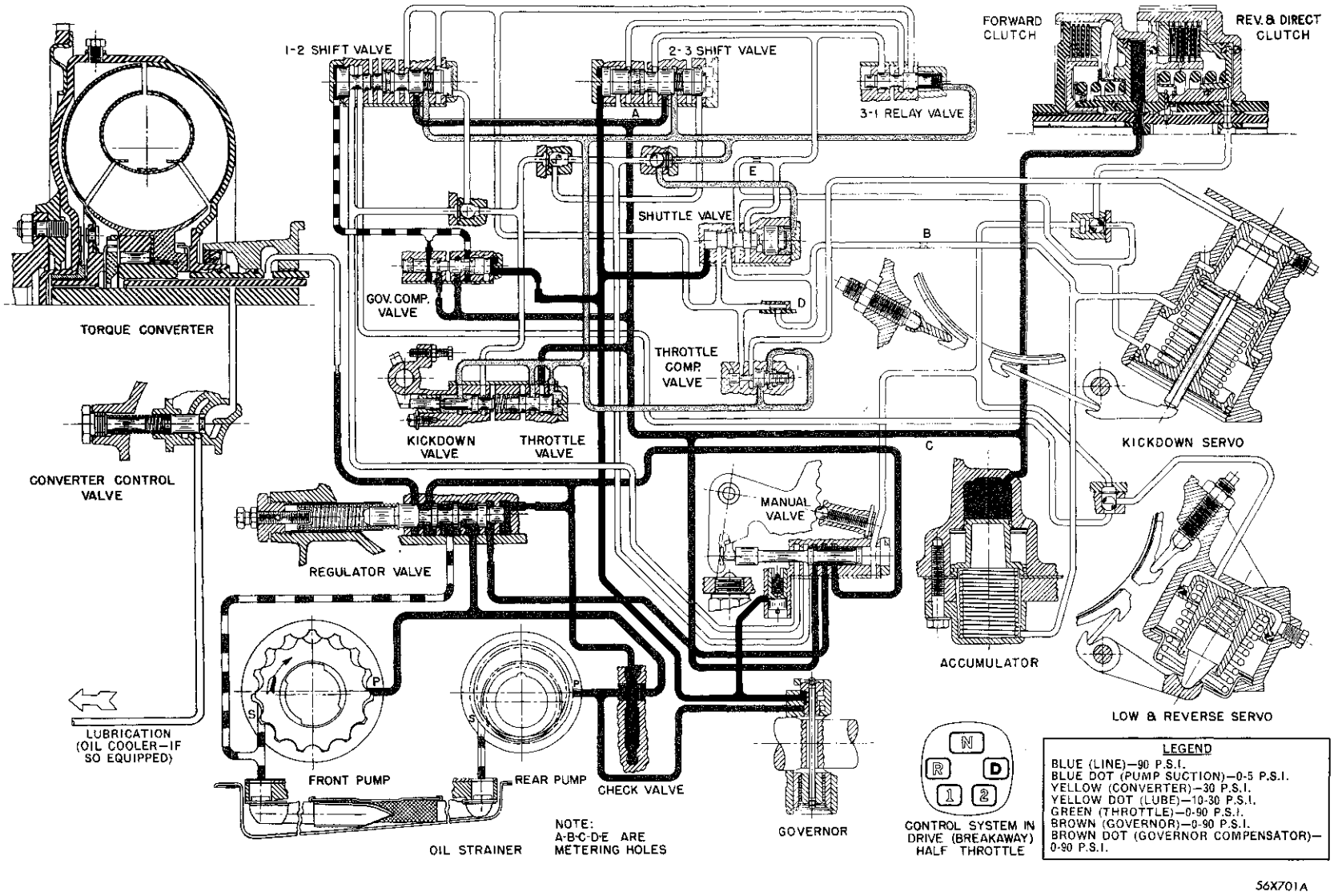


Fig. 33—Hydraulic Circuit—D (Drive)—Breakaway

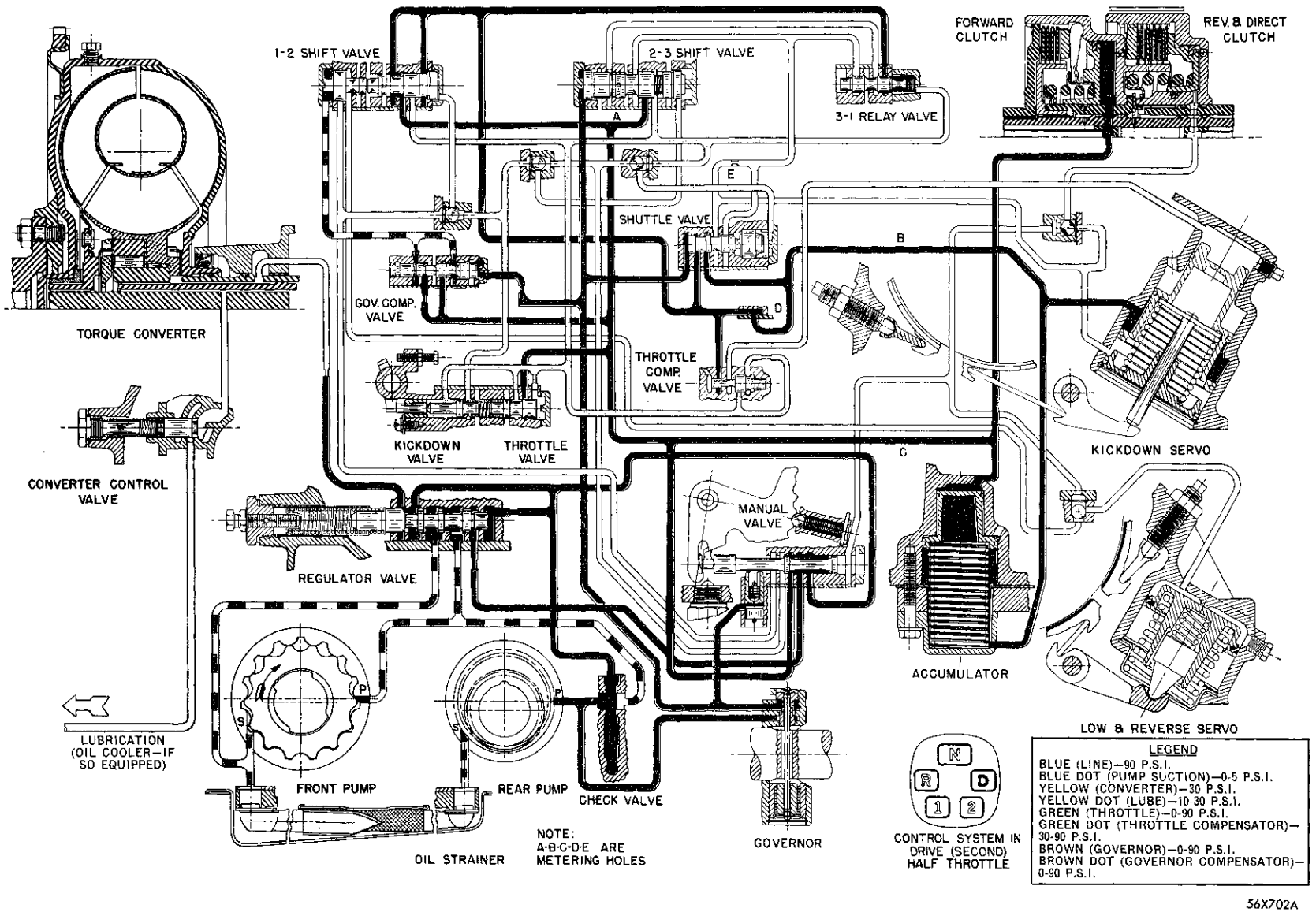


Fig. 34—Hydraulic Circuit—D (Drive)—Second

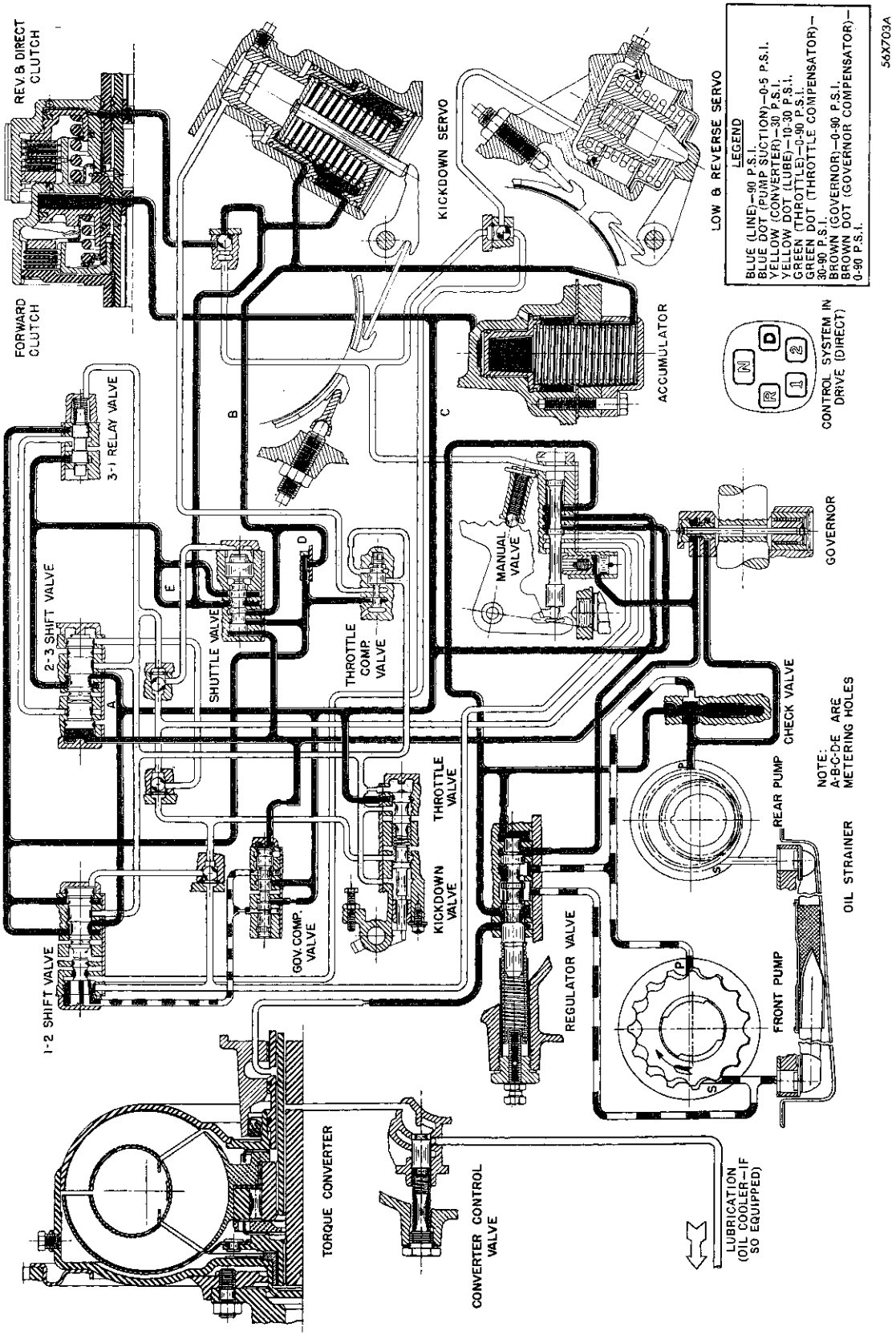


Fig. 35—Hydraulic Circuit—D (Drive)—Direct

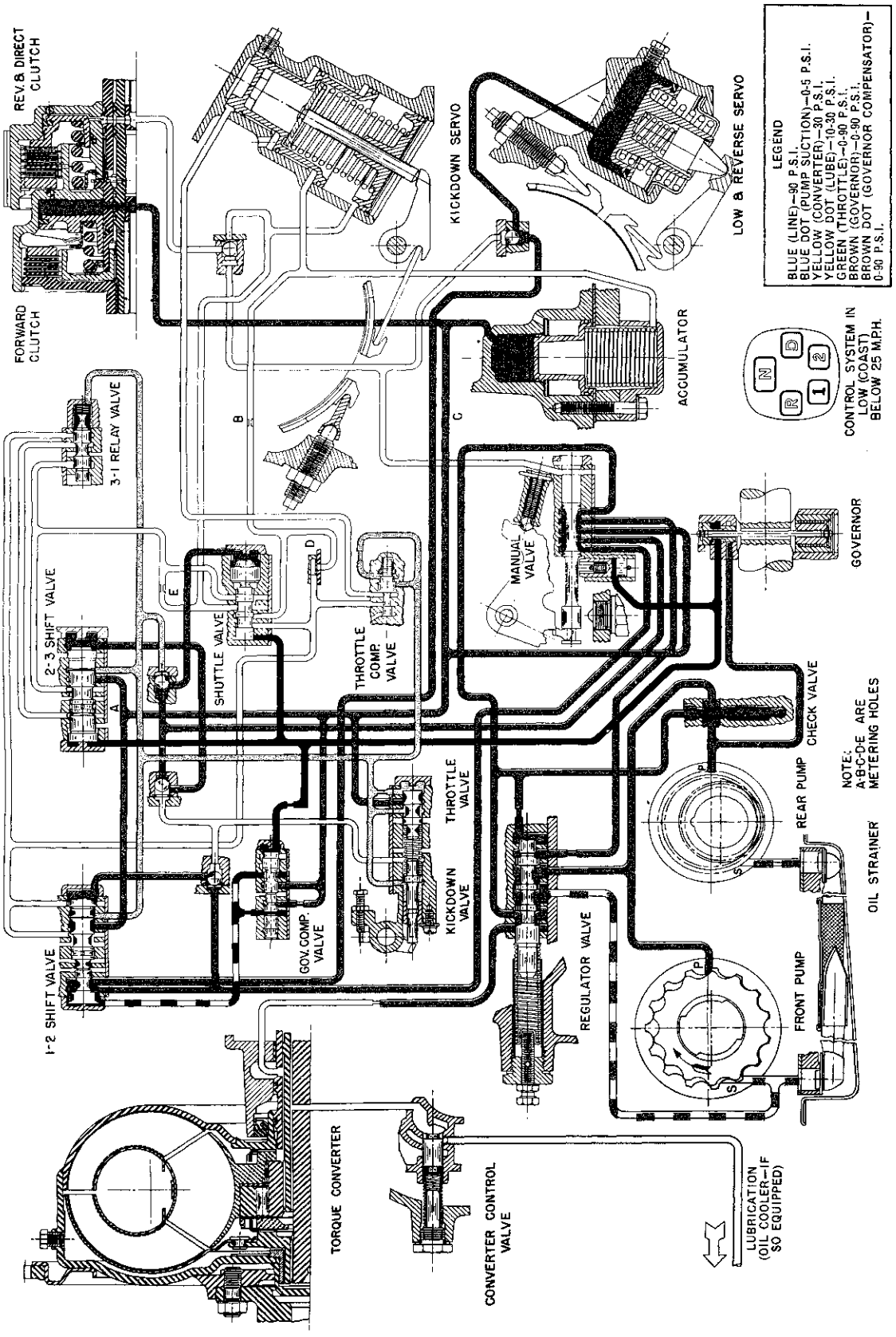


Fig. 36—Hydraulic Circuit—L (Low)—Low

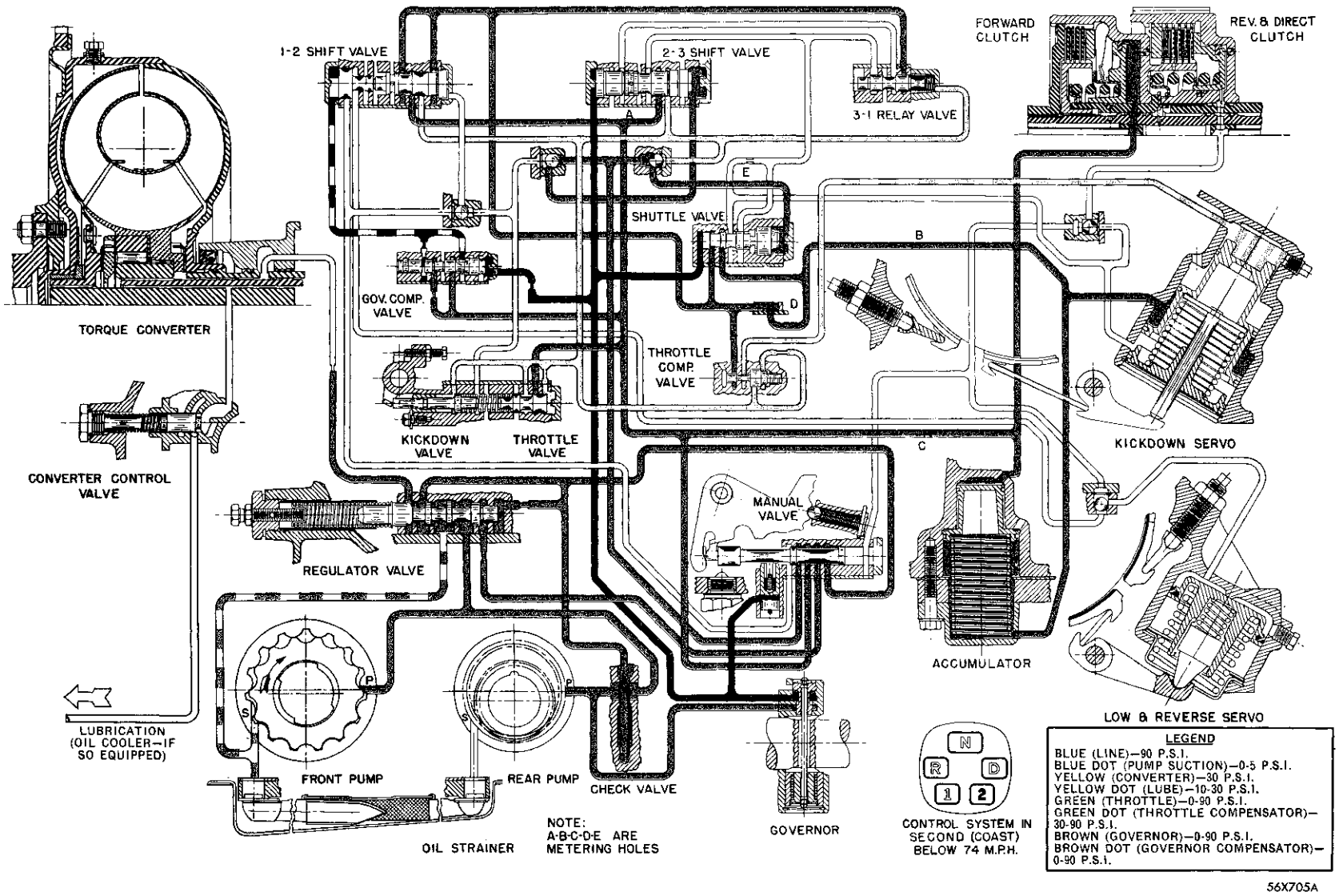


Fig. 37—Hydraulic Circuit—2 (Second)—Second

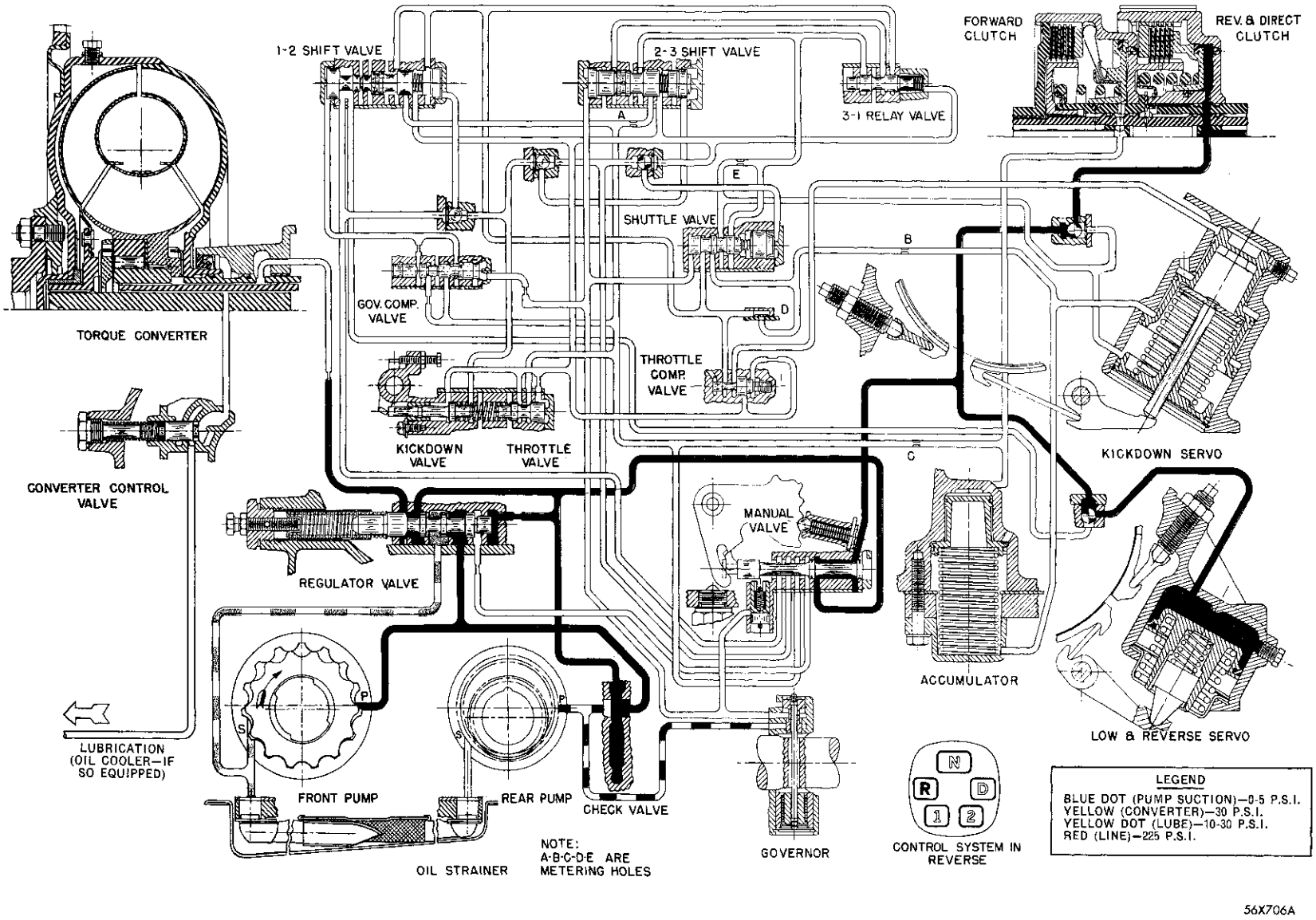


Fig. 38—Hydraulic Circuit—R (Reverse)

gaging 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:

a. The pressure supply system.

b. The clutches and band servos.

c. The pressure regulating valves.

d. The flow control valves.

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

18. THE PRESSURE SUPPLY SYSTEM

a. Front Pump

Under all normal operation 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, cooler flow (if so equipped) and lubrication.

The front pump delivers oil at 90 p.s.i. to fulfill these conditions 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.

b. Rear Pump

The rear pump (smaller than the front pump and driven by the output shaft) furnishes all of the oil required by the transmission in normal driving at all vehicles 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.

19. CLUTCHES AND BAND SERVOS

a. 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.

b. 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 identical 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.

c. 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 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 kick-

down 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.

d. 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, as shown in Figure 31.

(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 L (low) range operation at a ratio of 2.45 to 1 through both planetary gear sets (Fig. 30) which may be used for engine braking. On initial engagement, oil is admitted to the chamber behind the low-reverse servo piston. 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.

e. Accumulator

An accumulator cushions the application of the kickdown band in the upshift from breakaway to second. It is connected in parallel 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.

20. PRESSURE REGULATING VALVES

a. Regulator Valve

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 psi. When this condition is reached, the pressure increases slightly and the regulator valve moves over to a new position where the excess flow is dumped from the line pressure port 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 psi. 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 psi. applied to the primary reaction area is required to overcome the force of the regulator valve spring.

b. Torque Converter Control Valve

This valve maintains an oil pressure of 30 psi.

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 psi., 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 psi., 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 heat exchanger in the bottom of the radiator (water cooled transmission only) and through the transmission lubrication system to lubricate the gear train.

c. 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 port to the governor pressure port, building up pressure in the governor circuit and against the valve reaction area sufficient to balance the centrifugal force of the weight.

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.

d. 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 pressures) 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 psi. (approximately 20 m.p.h.) the plug becomes active. When this happens, the governor compensator pressure then becomes approximately 1⅓ times greater than governor pressure. Governor compensator pressure is routed to the 1-2 shift valve governor plug.

e. 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 with 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 and 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 psi. 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.

f. 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 psi. at closed throttle to a value of 90 psi. 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.

21. FLOW CONTROL VALVES

a. Front and Rear Pump Check Valves

The front pump check 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.

b. 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 psi. 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 psi.) 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 following places:

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

(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 accumulator and front clutch.

(6) Through an orifice in the upper valve body plate to the rear pump circuit (to prime pump after reverse operation).

When 2 (second) button is pushed in, the manual valve routes line pressure to same places as in D (drive) and to 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 1 (low) button is pushed in, the manual valve routes line pressure to the same places as in 2 (second) and following additional places:

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

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

c. 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 three parts and a spring) 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) and oil in the kickdown servo apply area is allowed to escape through vent port.

When the shift valve train is moved to 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 lead.

At light 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 psi. throttle pressure), the shift valve upshifts at approximately 45 m.p.h. and throttle compensator pressure is at a high value, applying the band at a load corresponding to the 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 downshift 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 10 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 different 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.

d. 2-3 Shift Valve

This shift valve automatically shifts the transmission from intermediate to direct gears. 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.

e. 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.

f. 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 65 m.p.h. from drive to second and approximately 30 m.p.h. from drive or 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.

22. 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 braking effect on vehicle of second gear and then by harsh engagement of 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 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 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 speeds 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 "backup" 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 shutle 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.

23. 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. One side of the accumulator is connected in parallel with the front clutch so that a cushioned engagement of the front clutch is obtained.

At a speed which is dependent on throttle position (approximately 10 m.p.h. at closed throttle, 25 m.p.h. at detent, 45 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 overunning clutch starts to free roll, so release of the previous reaction number 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 15 m.p.h. at closed throttle, 55 m.p.h. at detent, 75 m.p.h. at wide open throttle), 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 65 m.p.h., and forced 3-1 shift is obtainable below approximately 30 m.p.h. Normal downshifts are not throttle sensitive and above half-throttle, they occur in sequence (3-2 at approximately 15 m.p.h. and 2-1 at approximately 10 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 the 2 (second) in, this 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 overspeeding 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. This is accomplished by utilizing the 1-2 shift valve governor plug as a relay valve that is fed from the low port of the manual valve. A downshift force is established in connection with the relay action of the governor plug so the transmission will not upshift out of low gear while the 1 (low) button is engaged.

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** (reverse) 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 psi. by venting of the secondary reaction area of the regulator valve.

MAINTENANCE ADJUSTMENTS AND TESTS

Checking For Oil Leaks

For lubrication requirements of the TorqueFlite Transmission, refer to the Lubrication Section of this manual. If the transmission is leaking fluid, the following points should be checked.

24. LEAKS REPAIRED WITH TRANSMISSION IN VEHICLE

a. Transmission output shaft rear bearing oil seal.

b. Extension gasket.

c. Speedometer pinion assembly in extension.

d. Oil pan to filler tube connector.

e. Oil pan to transmission case.

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

g. Gearshift control cable seal and housing gasket.

h. Governor, line, lubrication and rear clutch apply pressure check plugs in transmission case or support (pressure test holes) (Fig. 40). Fittings on oil cooler lines at transmission and radiator (water cooled transmission only).

i. Neutral starting switch.

j. 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.

25. LEAKS REQUIRING REMOVAL OF TRANSMISSION FROM VEHICLE

a. Sand hole in transmission case.

b. Sand hole in front oil pump housing.

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

d. Front oil pump housing oil seal.

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

f. Torque converter.

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

26. MANUAL CONTROL CABLE—ADJUSTMENT

The following procedure should be used in adjusting the manual control cable for proper operation of manual lever.

a. Push in the N (neutral) push button.

b. Disconnect oil filler tube at connector on oil pan (filler tube support bracket screw may have to be loosened). Drain approximately two quarts of fluid from transmission. Reconnect filler tube. Loosen cable to transmission adjustable mounting bracket screw.

c. Remove the neutral starting switch. Place the point of a screw driver through neutral starting switch opening in transmission case and against neutral starting switch cam of manual control lever to maintain neutral position of manual lever.

d. While holding manual lever in reverse position, adjust control cable for free play by pushing in until cable stops. Mark position on cable in relation to adapter housing. Withdraw control cable to stop and measure travel. Push control cable in adapter housing one half of total travel (Fig. 39). With cable in this position, tighten cable to transmission adjustable mounting bracket screw securely. Do not move cable when tightening bracket.

e. Install neutral starting switch with cupped washer and "O" seal and attach lead wire. With transmission in neutral, adjust switch to show electrical contact, and tighten to ½ turn.

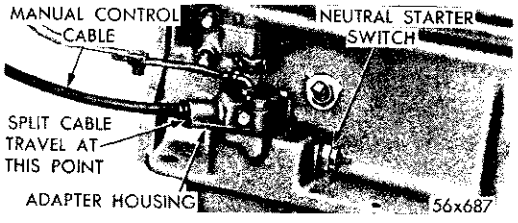


Fig. 39—Manual Control Cable Adjustment

f. To check for proper adjustment, push the various push buttons, return to neutral each time while checking the starter operation. Engine should start only when the N (neutral) push button is depressed to limit of travel. A test light attached to the neutral starter switch may be used instead of the starter for checking proper adjustment. Refill transmission with Automatic Transmission Fluid (Type A) to proper level. (Refer to Lubrication Section).

27. THROTTLE LINKAGE ADJUSTMENT (4-BARREL CARBURETOR)

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:

Check the accelerator pedal angle to make sure it is 118° (degrees) to the horizontal. Proper pedal angle is obtained by adjusting the accelerator pedal to accelerator shaft rod length at the ball joint located on the accelerator pedal end.

Check for any binding in throttle linkage. If there is, correct this condition before proceeding. Run engine until normal operating temperature is reached, then stop. Remove air cleaner and check for choke being in a fully opened position. Connect tachometer to coil and ground. With the engine idling in neutral, adjust engine idle screw to give 475 to 500 rpm. and stop engine. Loosen the throttle linkage adjusting nut located on the rod from the accelerator shaft assembly to the intermediate shaft assembly. Move the rod rearward against idle stop of the transmission throttle cam. With rod preloaded and in line, lock throttle linkage adjusting nut and tighten to 9 foot-pounds torque. Start engine and recheck idle setting (475 to 500 rpm's) with transmission in neutral and handbrake applied. Stop engine and remove tachometer.

28. THROTTLE LINKAGE ADJUSTMENT (2-BARREL CARBURETOR)

Four barrel carburetor adjustments apply also to the 2-barrel carburetor except operations which are performed in the following manner: Loosen the throttle linkage adjusting screw (located on accelerator shaft assembly to car-

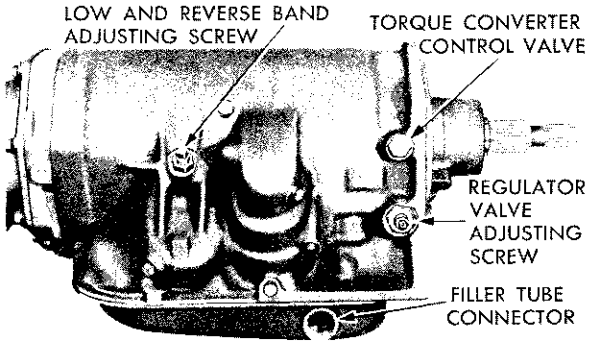


Fig. 40—Transmission Case (Right Side)

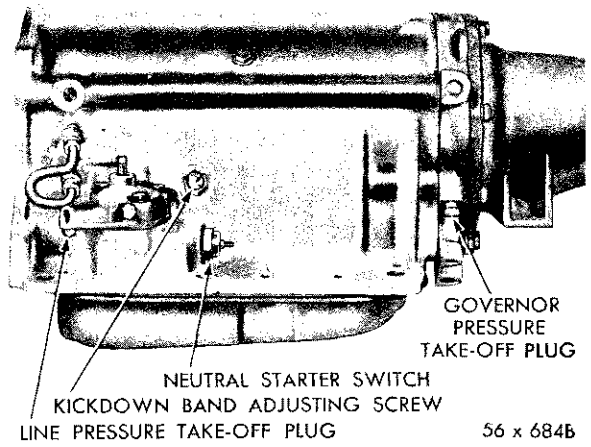


Fig. 40—Transmission Case (Left Side)

buretor rod). Move the rear portion of the accelerator to carburetor rod rearward until it is stopped by the idle stop on the transmission throttle cam. With rods in line and rear portion of rod preloaded, lock throttle linkage adjusting screw and torque to 9 foot-pounds torque.

Some vehicles may be equipped with a throttle linkage adjustment at the transmission throttle operating lever. The purpose of this adjustment is to allow for variations between chassis and engine assemblies in the manufacturing of different models and should not be used for making the throttle linkage adjustment.

29. TRANSMISSION BANDS

a. Kickdown Band (Front)

The kickdown band adjusting screw is located on the left side of the transmission case, as shown in Figure 40. 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-338 (with extension Tool C-3583). Because of the added leverage afforded by extension Tool 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 Tool 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. While holding the adjusting screw stationary, tighten the locknut and torque from 35 to 40 foot-pounds torque. **Care must be exercised in performing this operation.**

b. Low-Reverse (Rear) Band

The low-reverse band adjusting screw is located on the right side of the transmission, as shown in Figure 40. 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 Tool C-3583). Because of the added leverage afforded by the extension Tool C-3583, set the clock device on the indicator at 47-50 inch-pounds, then tighten adjusting screw to the torque. 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 to 40 foot-pounds torque. **Care must be exercised in performing this operation.**

c. 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 temperature of the engine and transmission.

CAUTION

Do not stall test the torque converter. For safe-

ty reasons and because damage to the transmission may result, wide open throttle stall operation is not recommended.

Engage the N (neutral) button and check for dragging up to an engine speed of 800 r.p.m. Push in the R (reverse) button and note the shift time and smoothness of the shift. Back the car up and check for dragging. Push the D (drive) button and note the shift time and smoothness of engagement. Accelerate the car at very light throttle. The transmission should upshift into second at approximately 7 to 11 mph. and into direct at approximately 11 to 15 mph. Check the quality of the shifts.

Slow the car to approximately 15 mph., 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. At a car speed of approximately 25 to 32 mph. depress the accelerator pedal fully. The transmission should downshift to breakaway gear. Check the quality of the shift.

Release the accelerator pedal and allow the transmission to upshift. Accelerate the car to 51-64 mph. Depress the accelerator pedal fully. The transmission should downshift to second gear. Check the quality of the shift. Release the accelerator pedal to closed throttle. Check the quality of the "lift-foot" upshift. Accelerate the car to 60 mph. and depress the accelerator pedal fully. The transmission should downshift to second gear. Check the quality of the shift.

Accelerate the car in kickdown (second gear) at wide open throttle until the transmission upshift. The shift should occur at approximately 70 mph. Check the quality of the shift. Slow the car down to 25 to 32 mph. and engage the 2 (second) button. The transmission should downshift to second gear. Check for gear noise. Slow the car to 15 mph. 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.

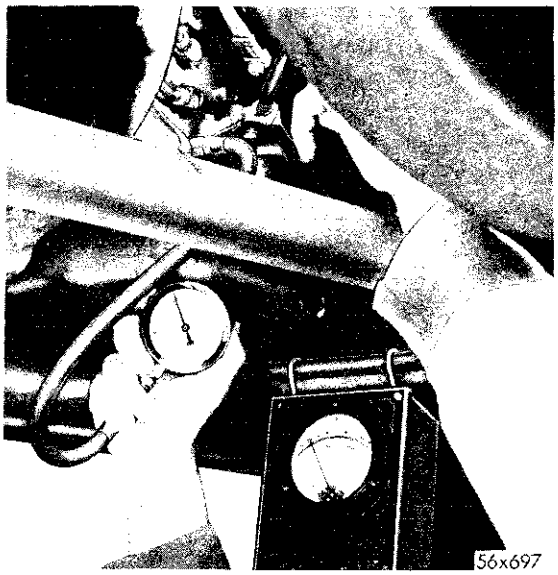


Fig. 41—Checking Line Pressure

Release the accelerator pedal and push in the L (low) button. The transmission should downshift at approximately 25 mph. With the accelerator pedal at light throttle, push the D (drive) button at approximately 15 mph. (the transmission will upshift.) Coast to a stop. The transmission should downshift at 6-10 mph. Check the quality of the downshift.

30. HYDRAULIC CONTROL PRESSURE CHECKS

a. Line Pressure

Remove the pipe plug from the line pressure takeoff hole located on the left side of the transmission case (Fig. 40). Install gauge, Tool C-3293 (300 psi.) at this point (Fig. 41). If line pressure is not correct, it may be adjusted by loosening the lock nut on the adjusting screw (Fig. 40) and turning the adjusting screw clockwise to increase or counter-clockwise to decrease line pressure. All line pressure adjustments should fall within the limits specified in

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

the table shown for all other push button positions. If the line pressure cannot be satisfactorily adjusted, check "Trouble Diagnosis Chart."

b. Governor Pressure (Fig. 42)

Remove the pipe plug from the governor pressure take-off hole located on the lower left side of the output shaft support (Fig. 40). Install gauge, Tool C-3292 (100 psi.) at this point. With car in D (direct drive) and rear wheels free to turn, refer to the following chart:

	C75-1, 2 C76	C75-1, 2 C76	C76	IM-1	IM-1	IM-1
Governor Pressure	3.18 R.A.	3.36 R.A.	2.92 R.A.	2.92 R.A.	3.18 R.A.	3.36 R.A.
15 psi.	17-19 mph.	16-18 mph.	19-21 mph.	19-21 mph.	18-20 mph.	17-19 mph.
45 psi.	32-39 mph.	29-36 mph.	35-42 mph.	36-43 mph.	33-40 mph.	31-37 mph.
75 psi.	66-71 mph.	63-67 mph.	73-79 mph.	74-80 mph.	68-74 mph.	64-70 mph.

If governor pressure does not correspond to car speeds, check line pressure and the "Trouble Diagnosis Chart".

c. Rear Clutch Apply (Fig. 43)

Remove pipe plug from the rear clutch, apply pressure take-off hole located on the output shaft support (Fig. 40). Install gauge Tool C-3293 (300 psi.), as shown in Figure 43. The rear clutch circuit is pressurized in D (drive) position, direct and in the R (reverse) position. 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 psi. lower than line pressure (90 psi. in direct and 200-250 psi. in reverse). If the rear clutch pressure is not correct investigate the "Trouble Diagnosis Chart".

d. Lubrication Pressure

Remove the pipe plug from the lubrication pressure take-off hole located on the left side of the transmission case (Fig. 40). Install gauge, Tool C-3293 (300 psi.) at this point. With engine running at 800 r.p.m. in neutral, lubrication pressure should be approximately 10 to 30 psi. If the pressure is incorrect, check line pressure and the "Trouble Diagnosis Chart".

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

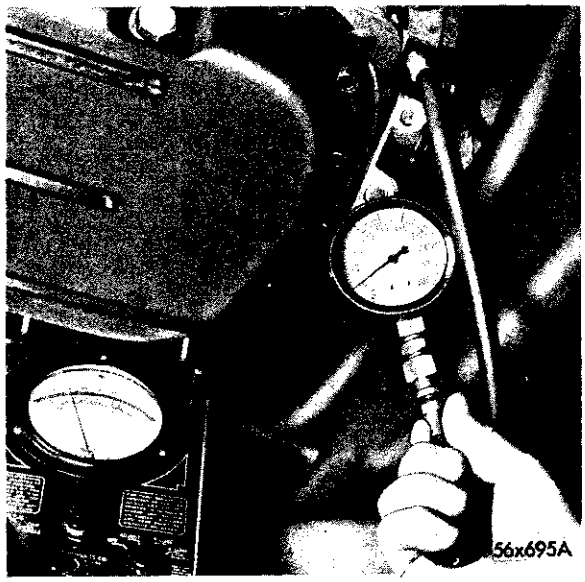


Fig. 42—Checking Governor Pressure

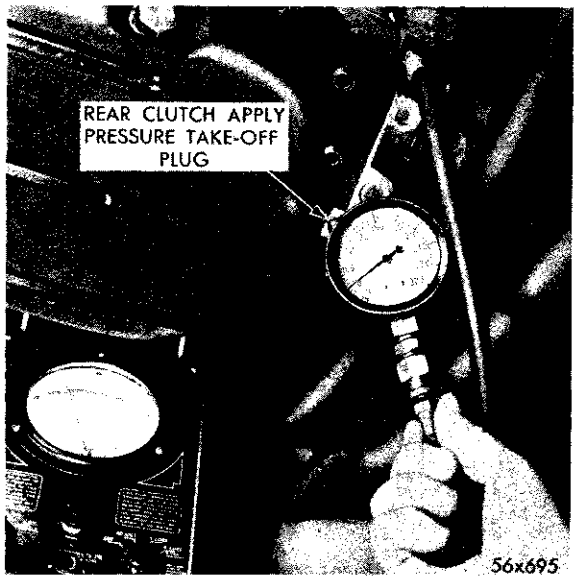


Fig. 43—Checking Rear Clutch Apply Pressure

TROUBLE DIAGNOSIS CHART

The Trouble 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.

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.

31. EXPLANATION OF INDEX ITEMS

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 (Fig. 39) Adjust to specifications.

F. **Low and reverse band adjustment**—The low and reverse band adjustment screw is found on the right side of the transmission case. (Fig. 40). Adjust to specifications.

G. **Engine Idle**—Adjust to 475 to 500 r.p.m.

H. **Starting switches**—Check wire, connections and switch. Check clearance of N (neutral) push button slide to motor starting switch, contact clearance. (Fig. 48)

I. **Handbrake**—Check for excessive drag. Refer to Brakes 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 (Fig. 40). 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 (Fig. 40). 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. **Torque converter housing cooling air passages**—Check for dirt, mud, or other foreign material on screens or on torque converter cooling fins.

O. **Kickdown servo, band and linkage**—Check for broken seal rings, stuck servo piston or broken linkage.

P. **Low and reverse servo, band and linkage**—Check for torn seal, broken band and/or linkage.

Q. **Oil strainer**—Check for possible air leakage.

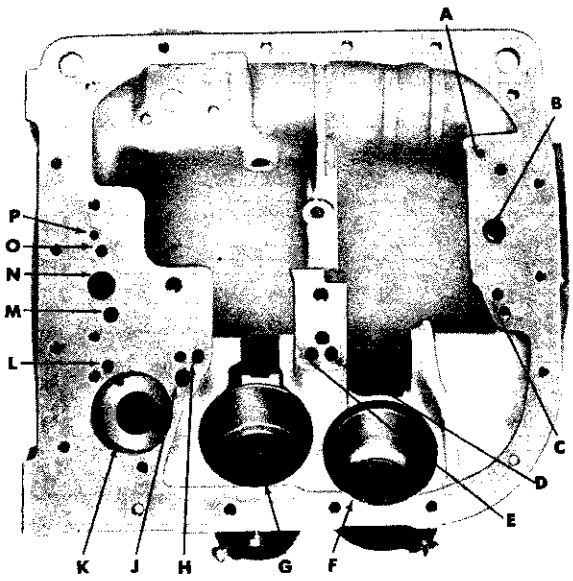
R. **Valve body attaching bolts and mating surface**—Check for loose bolts, burrs or scratches on mating surfaces. Clean valve body assembly. Check for stuck valves, dirt, scratched valves or body, and burrs on valves. Torque valve body bolts to specification.

S. **Accumulator**—Check accumulator cover screw tightness and piston for broken rings. Torque accumulator cover screws to specifications.

T **Air pressure checks**—The front clutch, rear clutch, kickdown servo, governor 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 com-

TROUBLE DIAGNOSIS CHART

ITEMS TO CHECK — See "Explanation of Index Items" — INDEX / ITEM	OPERATING DIFFICULTY: Shift Abnormalties: 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	Response: 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	Miscellaneous: Drags or Locks	Grating, Scraping, Etc. Noises	Buzzing Noises	Trans. Hard to Fill—Oil Blows Out Fill Tube	Trans. Overheats	Impossible to Push	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. T. C. Cooling																			●		
O. K. D. Servo Band-Linkage			●	●	●	●						●			●						
P. L.-R. Servo, Band-Linkage	●								●				●		●					●	
Q. Oil Strainer							●				●							●			
R. Valve Body—Bolts Mating Surfaces		●	●	●	●	●	●	●	●	●	●	●		●						●	
S. Accumulator	●	●	●	●	●	●		●				●									
T. Air Pressure Check		●	●		●	●	●	●	●	●	●	●	●								
U. Governor					●	●	●									●					
V. Rear Pump																●			●	●	
a. Front Pump—Drive Sleeve		●					●			●	●					●		●	●		
b. Reg. Valve Body, Gasket, Surfaces								●	●	●	●						●	●	●		
c. Converter																					
d. Front Clutch	●	●						●				●		●	●	●			●		
e. Rear Clutch	●		●	●	●			●				●	●		●	●			●		
f. Planetary Gear Set															●	●					
g. Overrunning Clutch						●		●				●			●						



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

Fig. 44—Oil Passages in Transmission Case

plete air pressure check proceed as follows: (Fig. 44.)

CAUTION

Compressed air supply must be free of all dirt and moisture.

Raise the vehicle on a hoist, drain the transmission fluid, and remove the transmission oil pan. 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 base to prevent piston from being blown out). Protect yourself 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 the 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 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.

Apply air pressure to the line pressure passage (M, Fig. 44). Rotate the propeller shaft slightly to bring the governor flyweight down while applying the air pressure. Operation of the governor will be indicated by a sharp "click" when air pressure is applied.

If the clutches, servos and governor 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 "Reconditiong of Valve Body and Transfer Plate Assemblies," Paragraph 38.

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 valve linkage.

U. **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.

V. **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. Converter—Flush out converter and check converter to housing runout. (Refer to Torque Converter of this Section).

d. 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 number 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.

e. 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.

f. Planetary gear set—Clean and inspect gear set for worn thrust washers nicked or rough gear teeth, and excessive pinion and clearance.

g. Low-Speed Over-running clutch—Clean and inspect the over-running clutch assembly for the brinnelled rollers and/or cam and improperly assembled rollers or springs.

32. SERVICING GEARSHIFT CONTROL HOUSING

a. Removing Gearshift Control Housing

Remove the four screws, holding gearshift housing and plate assembly to instrument panel. One screw at top front of plate, one screw at front left edge of plate and two screws at bottom (rear) of plate. Pull plate and gearshift control housing assembly straight out and down from instrument panel, as shown in Figure 45. If housing is equipped with a back-up light switch, exercise care when removing plate so as not to damage switch. Remove two retaining screws (Fig. 45) securing gearshift housing to plate and remove plate by carefully withdrawing from push buttons.

Remove hairpin clip securing cable end to actuator. Remove the two screws holding cable

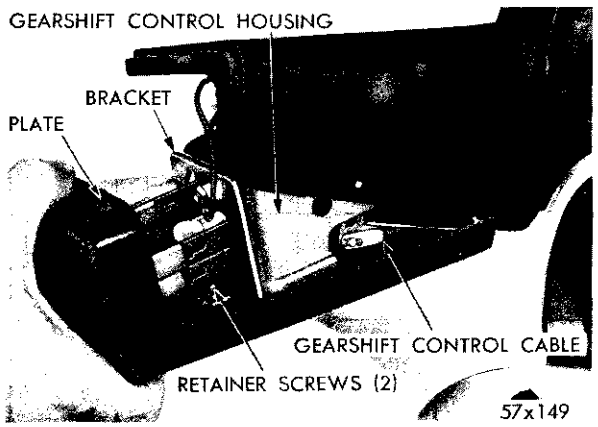


Fig. 45—Removing Gearshift Control Housing

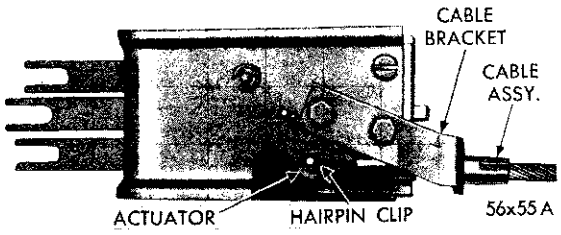


Fig. 46—Gearshift Control Housing (Exterior View)

assembly bracket to gearshift control housing (Fig. 46) and remove cable assembly. Remove wires from back-up light switch—if vehicle is so equipped. Remove illuminating lamp lead wire. Remove leads from starting motor switch. If necessary to remove push buttons from slides, withdraw by pulling on the buttons. Do not spread the slide tangs or fingers.

NOTE: The light socket bracket should be mounted between the push button box and the box mounting bracket. The wire should be located in the light socket bracket key slot and be routed directly up and over towards the center of the car. The box upper mounting bolt with the wire retained in the recess between the box and its mounting.

b. Installing the Gearshift Control Housing

Install end of control cable on actuator and install hairpin clip (Fig. 46). Place cable bracket in position on gearshift control housing, install two screws and tighten securely. Reconnect back-up light switch wires (if so equipped). Reconnect illuminating lamp lead. (Check wire routing as noted in disassembly). Reconnect starting motor switch leads. If push buttons were removed, slightly compress fingers on slides (if necessary) to aid in retention of push buttons. Place gearshift control housing assembly in position on plate, as shown in Figure 45, and secure with the two retainer screws.

Carefully guide plate and gearshift housing assembly back into position in instrument panel and secure with four screws. If housing is equipped with back-up light switch, exercise care during positioning of plate in instrument panel to avoid damaging switch. Adjust gearshift control cable as outlined in "Maintenance Adjustments and Tests", Paragraph 24.

c. Removing Gearshift Control Cable

Engage L (low) button to place spring lock

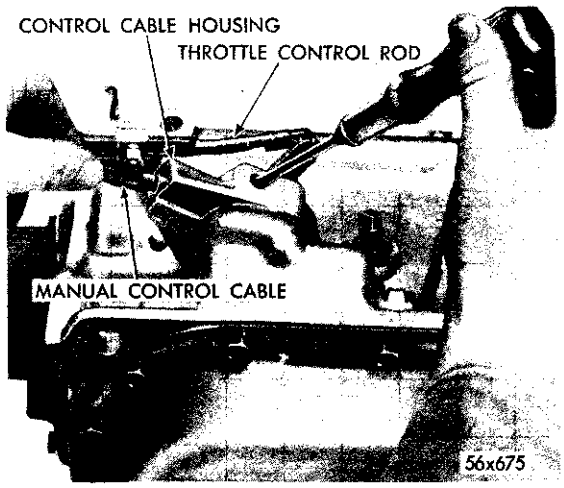


Fig. 47—Releasing Manual Control Cable Spring Lock

in line with control cable adapter plug hole in transmission case. Remove the gearshift control unit from the instrument panel as outlined under "Removing Gearshift Control Housing", Paragraph 32. Remove cable adjustable mounting bracket on transmission. Remove control cable adapter housing plug, insert screw driver through hole, and release the control cable spring lock, as shown in Figure 47. While releasing the spring lock, remove cable. Using the same screw driver, insert through cable hole in adapter housing and push lever rearward to last detent. Reinstall housing plug and tighten. From front of dash, pull cable assembly and rubber grommet from dash panel.

d. Installing and Adjusting Gearshift Control Cable

Place grommet on cable. From front of dash, install control housing end of cable through dash panel. Install gearshift control unit as outlined under "Installing Gearshift Control Housing," Paragraph 32. Install cable grommet into dash panel.

Remove oil pan. Remove neutral starting switch from transmission case (Fig. 40). Position manual valve lever in **low** range detent. Hold the R (reverse) push button in at full travel position. Insert cable into transmission manual lever adapter until spring lock engages control cable securely. Release the R (reverse) button and hold the N (neutral) push button in. Adjust cable as outlined under "Manual Control Cable—Adjustment", Paragraph 26.

e. Replacing the Back-Up Light Switch (when so equipped)

Remove gearshift control housing and plate as outlined under "Removing Gearshift Control Housing", Paragraph 32. Back-up light switch is fastened to the control unit by four tabs. Remove lead wires, then straighten tabs to remove switch. Install repaired or replacement switch and bend tabs to secure switch to gearshift control housing. Reconnect lead wires. Check reverse slide operation—slide should freely return full travel. Install gearshift control housing and plate assembly.

f. Replacing Push Button Unit Lamp Bulb

Remove the gearshift control housing and plate as outlined under "Removing Gearshift Control Housing", Paragraph 32. Remove one or more push buttons for clearance. Replace defective or burned out bulb. Replace gearshift control housing and plate assembly. Test operation of unit.

g. Replacing Starting Motor Switch

Remove gearshift housing and plate assembly as outlined under "Removing Gearshift Control Housing", Paragraph 32.

Remove starting motor switch by drilling out rivets. Mount replacement switch on gearshift control housing and secure by riveting or using suitable screws, lockwashers and nuts. **Be sure that sufficient clearance is maintained for free movement of operating slide ends, if screws are used.** Push button operating slide

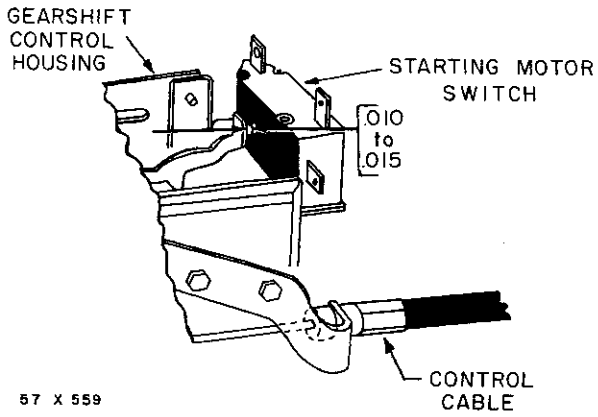


Fig. 48—Push Button Operating Slide to Starting Motor Switch Clearance

to starting motor switch clearance is obtained by depressing the N (neutral) push button to the **neutral** position **only** and depressing only far enough beyond **this** point to remove **all** free movement from the actuator. Clearance between slide and motor starting switch contact should then be between .010-.015 inch. (Fig. 48.)

If clearance is not within this specification, the tab on the neutral operating slide may be adjusted by carefully bending to bring within specifications. **Use care as the operating slide is of hardened material and may break if care is not exercised during the bending operation.** Test operation of unit, using a suitable test lamp. Reinstall gearshift control housing and plate assembly as outlined in "Installing Gearshift Control Housing", Paragraph 32.

SERVICING OF COMPONENT PARTS WITH TRANSMISSION IN VEHICLE

33. SPEEDOMETER PINION

a. Removal

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

b. Installation

Install speedometer pinion and sleeve assembly in transmission extension and tighten to 45 foot-pounds torque. Connect speedometer cable and housing to drive pinion and sleeve assembly in transmission and tighten.

34. NEUTRAL STARTING SWITCH

a. 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.

b. Installation

Place cupped spring washer and "O" ring over switch and install switch in transmission case. With transmission in neutral, adjust switch to electrical contact, and tighten 1/3 to 1/2 additional turns. Connect wire to switch. Refill transmission with Automatic Transmission Fluid (Type A) to proper level after reconnecting filler tube at oil pan.

35. TRANSMISSION REGULATOR VALVE ASSEMBLY

a. Removal

Remove transmission regulator valve spring retainer, gasket, cup spring and sleeve. Using a mechanical retriever or a piece of welding rod (5/32") inserted in end of valve, remove valve (Fig. 49).

b. Installation

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

36. TORQUE CONVERTER CONTROL VALVE ASSEMBLY

a. Removal

Remove the torque converter control valve spring retainer (Fig. 40) gasket and spring. Using a mechanical retriever or a piece of welding rod (1/8") inserted in end of valve, remove valve.

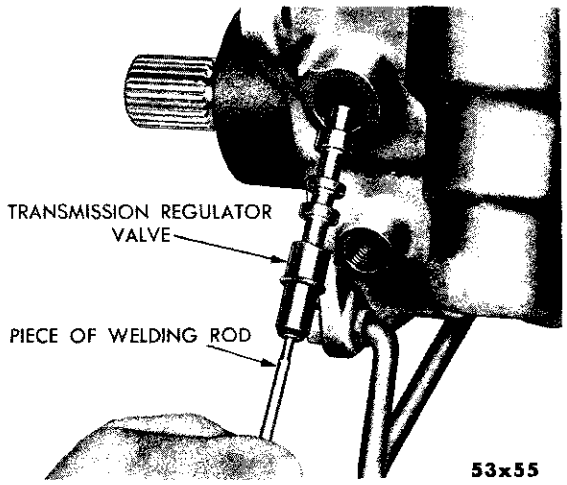


Fig. 49—Removing Regulator Valve

b. Installation

With the assistance of the retrieving tool, place valve in position and seat properly in regulator valve body. Install torque converter control valve spring, gasket, and retainer, and tighten to 40 foot-pounds torque.

37. OIL PAN

a. Removal

Drain transmission by disconnecting filler tube connector at oil pan. It 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.

b. Installation

Using a new oil pan gasket, place oil pan into position on transmission case. Install oil pan screws and washers drawing them down evenly and tighten to 17 foot-pounds torque. Install oil pan filler tube, and tighten nut connector to 40 foot-pounds torque. Tighten support bracket screw. Refill transmission with Automatic Transmission Fluid (Type A).

38. VALVE BODIES AND TRANSFER PLATE ASSEMBLY

a. Removal

Place push button control unit in 1 (low) position.

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

Remove oil pan. 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. Remove control cable adjustable mounting bracket. Remove control cable adapter housing plug, insert screw driver through hole, and release the control cable spring lock. While releasing control cable spring lock, remove cable. Using same screw driver, insert through cable opening in adapter housing and push lever rearward to last detent. Reinstall housing plug and tighten.

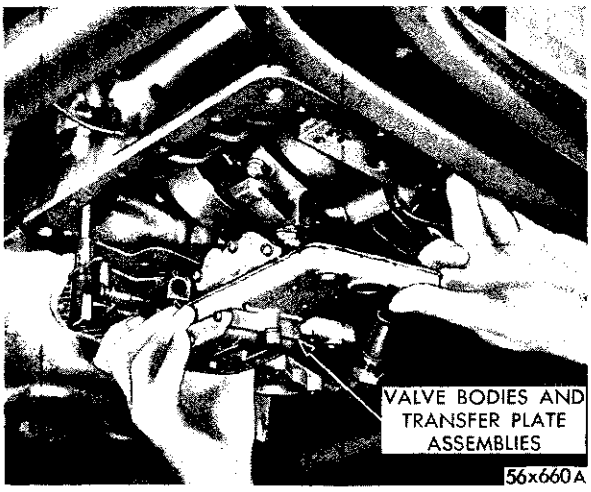


Fig. 50—Removal and Installation of Valve Bodies and Transfer Plate Assembly

Remove the three control cable housing screws and washers. 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 (Fig. 50).

b. Installation

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

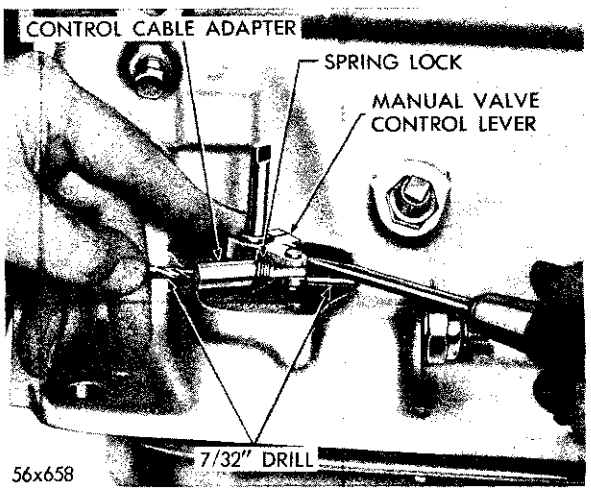


Fig. 51—Setting Manual Valve Control Lever Clearance

CAUTION

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. 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 tighten strainer and accumulator cover screw to 16 foot-pounds torque. 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.

NOTE: A 7/32" drill bit can be used for obtaining proper clearance (Fig. 51). 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 tighten to 16 foot-pounds torque. 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. Refer to "Maintenance, Adjustments and Tests", Paragraph 24. Refill transmission with Automatic Transmission Fluid (Type A). Adjust throttle linkage. Refer to "Throttle Linkage Adjustment", Paragraph 27.

39. KICKDOWN PISTON

a. Removal

Remove valve bodies and transfer plate assembly. Loosen kickdown band adjusting screw lock nut and back adjusting screw out suf-

ficiently to remove anchor. Remove kickdown band strut. Install Tool C-3529 or C-3289, (modified as shown in Figure 84), apply sufficient pressure on the kickdown piston rod guide, and remove the snap ring. Loosen compression portion of tool and remove piston rod guide, piston spring, and piston rod. Using C-484 pliers, remove the kickdown piston from transmission case (Fig. 52). Refer to "Kickdown Piston Inspection" under "Reconditioning Transmission", Paragraph 46.

b. Installation

Lubricate piston rings and place kickdown piston assembly into position, compress outer ring, and start assembly into case. With piston properly centered so 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 (Fig. 53). 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 as outlined under "Maintenance Adjustments and Tests", Paragraph 24. Install valve bodies and transfer plate assembly.

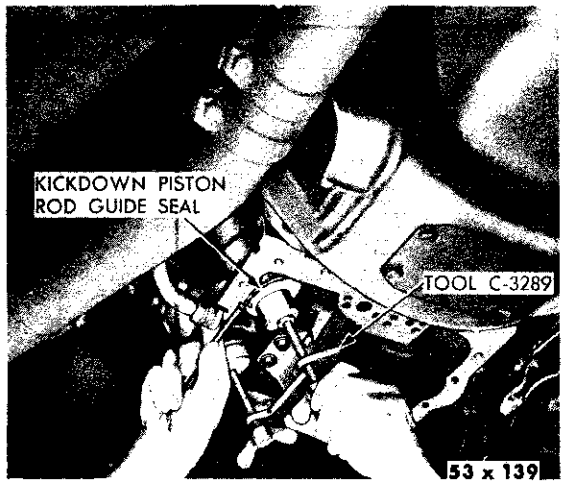


Fig. 53—Positioning Kickdown Piston Rod Guide Seal (Typical View)

40. ACCUMULATOR PISTON

a. Removal

Remove valve bodies and transfer plate assemblies. Using Tool C-484, remove accumulator piston from transmission case, as shown in Figure 54. Refer to Accumulator Piston—Inspection, as outlined in "Reconditioning Transmission", Paragraph 46.

b. 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.

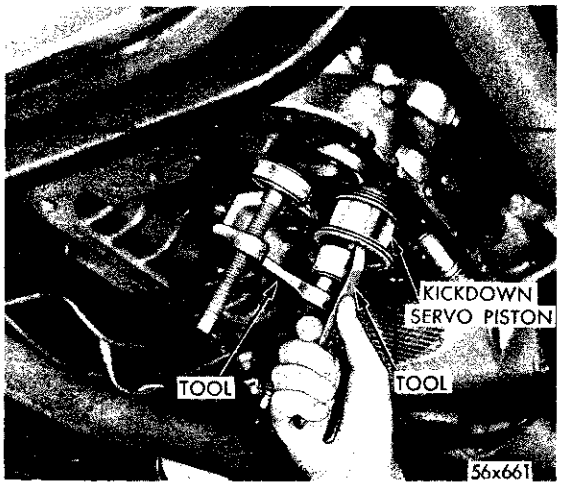


Fig. 52—Removal and Installation of Kickdown Piston (Typical View)

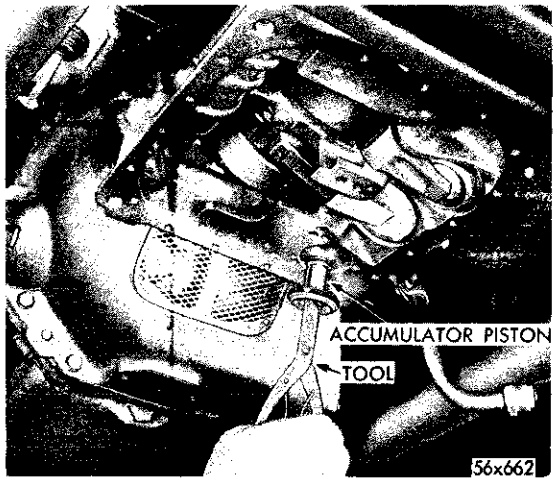


Fig. 54—Removal and Installation of Accumulator Piston (Typical View)

41. TRANSMISSION OUTPUT SHAFT REAR BEARING OIL SEAL

a. 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). Remove brake support grease shield from extension.

CAUTION

If screw driver 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.

b. Installation

Using driver, Tool C-3205, install output shaft rear bearing oil seal (metal portion of seal facing in) until driver bottoms on extension, (Fig. 97). 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 tighten propeller shaft flange nut to 175 foot-pounds torque. Connect front universal joint and tighten nuts to 37 foot-pounds torque.

Refill transmission (if necessary) with Automatic Transmission Fluid (Type A) to proper level.

42. EXTENSION

a. 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 the way. Apply hand brake and remove propeller shaft nut and washer.

Release hand brake and using puller, Tool C-452 (if necessary), remove the propeller shaft flange and drum 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 two nuts and lockwashers that hold engine rear support insulator to crossmember, leaving insulator attached to extension. Remove the two top transmission extension to case screws and lockwashers.

Using suitable jack (or engine support fixture Tool 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. That is, back screw out as far as possible and slide extension back and continue loosening of screw.

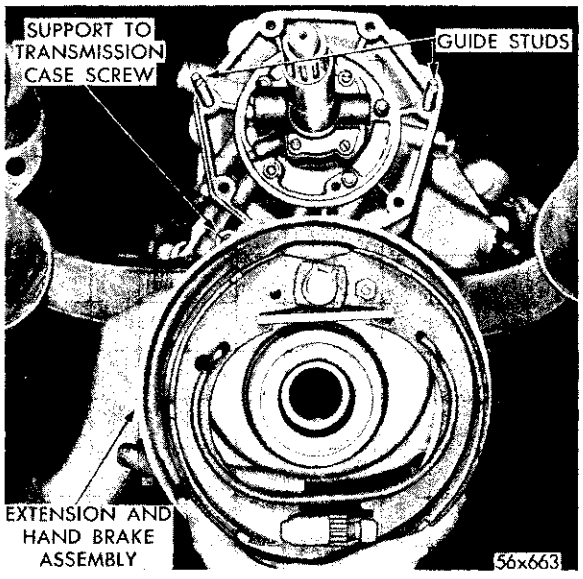


Fig. 55—Removal and Installation of Extension and Handbrake Assembly

CAUTION

Do not remove the one output shaft support to transmission case screw.

Remove extension and hand brake as one assembly, as shown in Figure 55. **If care is used, it is not necessary to remove hand brake support and shoe assemblies from extension to replace output shaft rear bearing.**

b. Installation

With guide studs, Tool C-3283 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 six remaining extension to case screws and lockwashers. Draw down evenly and tighten 30 foot-pounds torque. After screws have been properly tightened, 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 two nuts and lockwashers that hold the rear engine support insulator and tighten to 35 foot-pounds torque. Engage ball end of hand brake cable in operating lever and tighten cable clamp bolt.

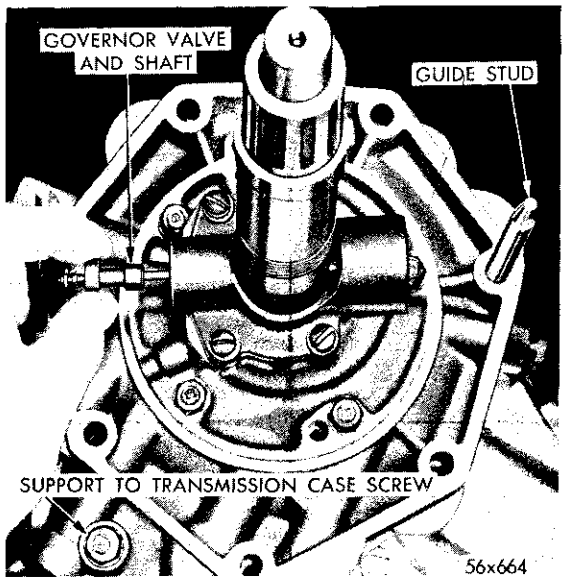


Fig. 56—Removal and Installation of Governor Valve Shaft and Valve

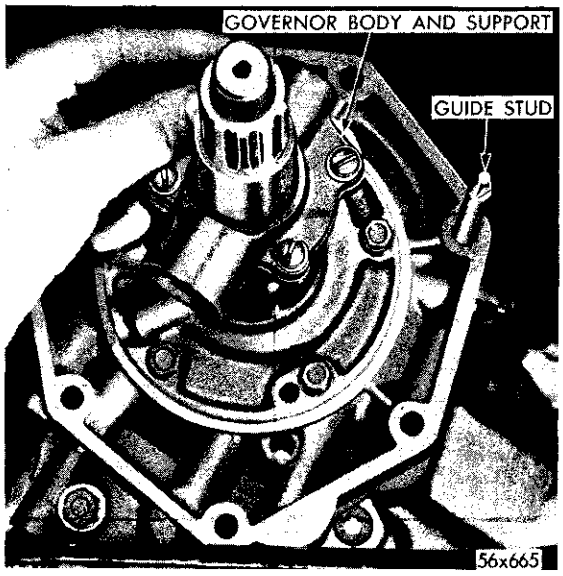


Fig. 57—Removal and Installation of Governor Body and Support Assembly

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). Appply hand brake and tighten nut to 175 foot-pounds torque. Install adjusting screw cover plate on hand brake support. Connect front universal joint and tighten to 37 foot-pounds torque. Install speedometer pinion and sleeve assembly. Tighten to 45 foot-pounds torque and connect speedometer cable housing. Lower vehicle and refill transmission to proper level with Automatic Transmission Fluid (Type A).

43. GOVERNOR

a. Removal

Remove extension. Using a screw driver, remove the governor valve shaft snap ring from the weight assembly end. Remove governor valve shaft and valve from governor body assembly (Fig. 56).

Using Tool 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 (Fig. 57). 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.

b. Installation

Slide governor body and support assembly into position in rear oil pump housing. Using extreme care, compress governor support seal ring as support enters oil pump housing. **Do not force.** Align locating hole in output shaft to locating hole in governor support, and install screw and tighten to 7 foot-pounds torque. Holes can be aligned by turning output shaft and holding governor body. If governor body has been removed and reinstalled, tighten four governor body screws to 8 foot-pounds torque. Place governor weight assembly (secondary weight snap ring facing out) into governor body; and using Tool C-3229, install snap ring. Make sure snap ring seats properly. With governor body through 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. (Fig. 129.) Check operation of governor weight assembly and valve by turning output shaft. Both should fall freely in body. Install transmission extension.

44. REAR OIL PUMP

a. Removal

Remove transmission extension. Refer to "Governor—Removal," Paragraph 43. **Using a screw driver, remove the governor valve shaft snap ring from weight assembly end.** Remove governor valve shaft and valve from governor valve body assembly. Using Tool C-3229, remove governor weight assembly snap ring (large one) and remove governor weight assembly from governor body. Remove governor locating 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 small ball. Use care when removing pinion so as not to lose ball.** Remove governor assembly from oil pump housing.

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.

b. 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. Place rear oil pump pinion (as marked when removed) over output shaft and into position aligning key way 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.

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.

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 tighten to 12 foot-pounds torque. 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 locat-

ing screw hole in governor support; install locating screw, and tighten to 7 foot-pounds torque. **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.

45. REMOVAL AND INSTALLATION OF TRANSMISSION

a. Removal

(1) Disconnect battery. 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 adapter housing on transmission.

Drain transmission and torque converter. When fluid has drained, replace torque converterter 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 clasp 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. Disconnect throttle control linkage from throttle lever in transmission. Loosen push button control cable adjustable mounting bracket.

Remove control cable adapter housing plug, insert screw driver through hole, and release the control cable spring lock. While releasing control cable spring lock, remove cable from adapter housing. Using the same screw driver, insert through cable opening in adapter housing and push lever rearward to last detent. Reinstall housing plug and tighten. Remove radiator oil cooling lines from transmission (if water cooled). Remove two nuts and lockwashers that hold the engine rear support insulator to the crossmember, leaving insulator attached to transmission.

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. Raise engine slightly, remove crossmember to torsion bar bracket bolts and remove crossmember.

CAUTION

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 front oil pump driving sleeve, then lower to floor.

b. 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 (Fig. 123).**

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 engage 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 tighten to 50 foot-pounds torque.

Place crossmember into position and install the crossmember to torsion bar bracket bolts. Tighten 55 foot-pounds torque. Lower engine and at the same time align mounting studs in insulator with holes in crossmember.

Install two nuts and lockwashers that hold engine rear support insulator to crossmember and tighten to 35 foot-pounds torque. Remove support fixture, Tool C-3487 from side of frame member. Install radiator oil cooling lines (if water cooled). Connect neutral starting switch wire to switch. Install oil pan filler tube and tighten filler tube nut to 40 foot-pounds torque. Tighten support bracket screw. Connect speedometer cable in housing extension. 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 tighten nuts to 37 foot-pounds torque.

Connect throttle control linkage to throttle lever on transmission. Install push button control cable in adapter making sure spring lock engages cable. Adjust manual control cable. Refer to "Maintenance Adjustments and Tests," Paragraph 24. Tighten cable adjustable mounting bracket nut securely. Install starter. Lower vehicle and connect battery. Refill transmission with Automatic Transmission Fluid (Type A). Adjust throttle linkage.

RECONDITIONING OF TRANSMISSION

46. REMOVAL OF COMPONENTS

The following precautions should be observed during disassembly of 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.** 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.

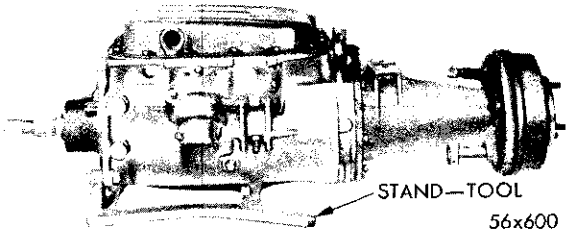


Fig. 58—Transmission Assembly Inverted in Stand

47. OIL PAN—REMOVAL

Place transmission assembly in stand, Tool C-3280, and invert, as shown in Figure 58. Remove the oil pan bolts and remove the oil pan

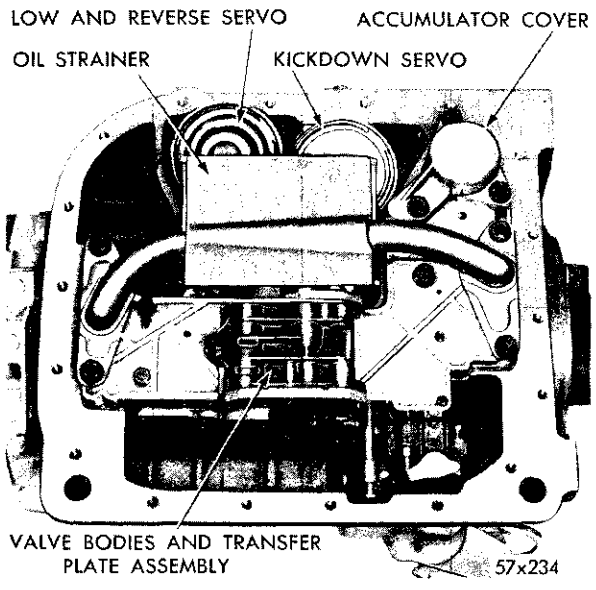


Fig. 59—Transmission Assembly—Oil Pan Removed

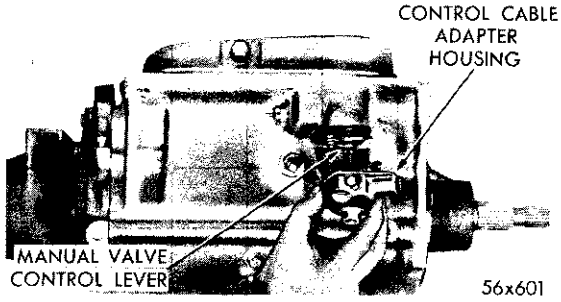


Fig. 60—Removal and Installation of Control Cable Adapter Housing

and gasket, as shown in Figure 59. Note the construction of oil pan bolts, washers used are part of the bolt.

48. VALVE BODIES AND TRANSFER PLATE—REMOVAL

Remove throttle control lever, flat washer, and felt washer from transmission. Remove the three gearshift control cable adapter housing bolts and washers. Remove housing and gasket from transmission, as shown in Figure 60. **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 adapter pin, slide lever and cable adapter off shaft.

Remove four oil strainer assembly bolts and lock washers. Remove oil strainer assembly, as shown in Figure 61. One strainer is used for both front and rear oil pumps. Loosen (to relieve spring load) the three accumulator cover bolts with washers, and remove cover and spring from transfer plate, as shown in Figure 62. Remove three transfer plate bolts and

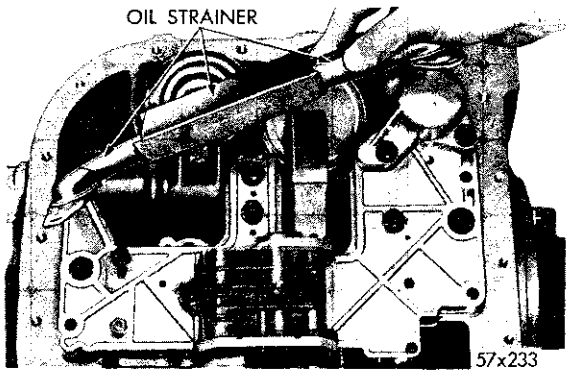


Fig. 61—Removing Oil Strainer Assembly

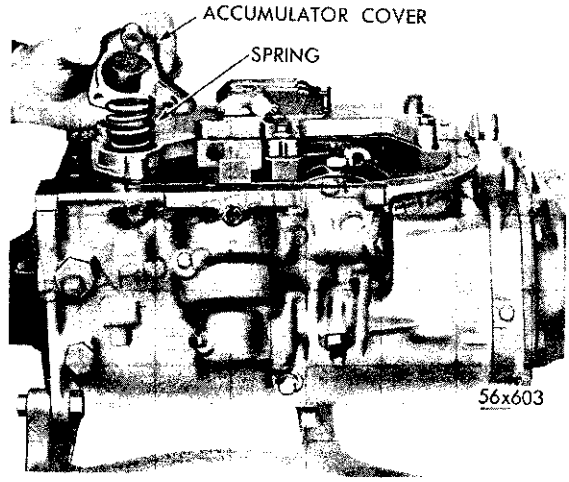


Fig. 62—Removal and Installation of Accumulator Cover

washers. Remove valve bodies and transfer plate assembly from transmission case, as shown in Figure 63. **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 as shown in Figure 40.

49. 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 64.

To make this check, pry front clutch forward by carefully inserting screw driver be-

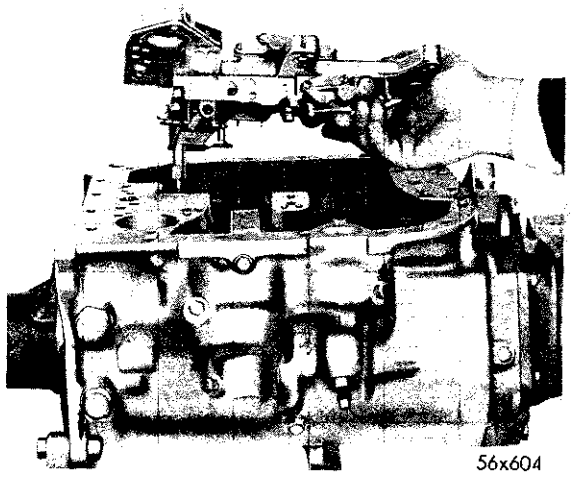


Fig. 63—Removal and Installation of Valve Bodies and Transfer Plate Assembly (Typical View)

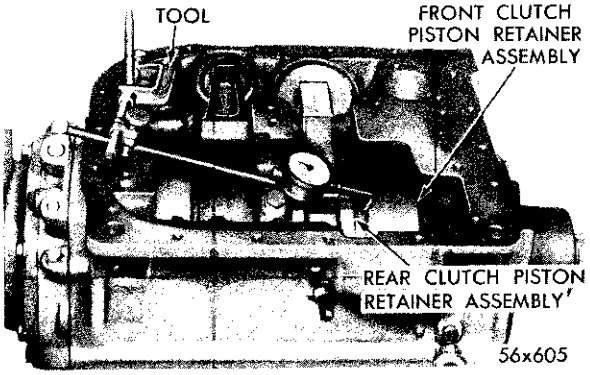


Fig. 64—Checking Front Clutch Piston Retainer Assembly End Clearance

tween the front and rear clutch. Remove screw driver, and with dial indicator point contacting edge of front clutch retainer, set dial indicator to zero. Pry front clutch assembly rearward against rear clutch, remove screw driver, and take indicator reading. This clearance should be from .020 to .050 inch. If this clearance exceeds the specified limits, particular attention should be paid to the condition of the input shaft thrust washer when disassembling transmission.

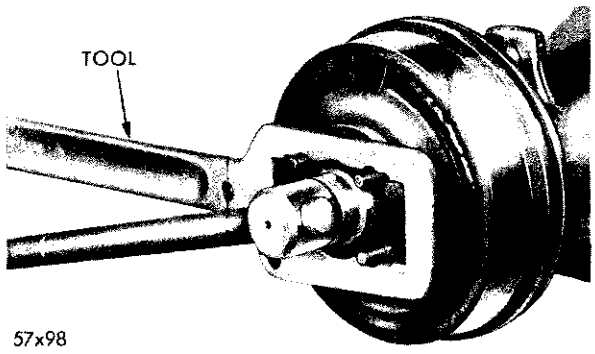


Fig. 65—Removing Handbrake Drum and Flange (Assembly Nut)

50. HAND BRAKE ASSEMBLY—REMOVAL

Remove the transmission flange nut and washer. Use wrench, Tool C-3281, to hold brake drum and flange assembly. (Fig. 65). 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 transmission brake support grease shield spring. This spring has two purposes,

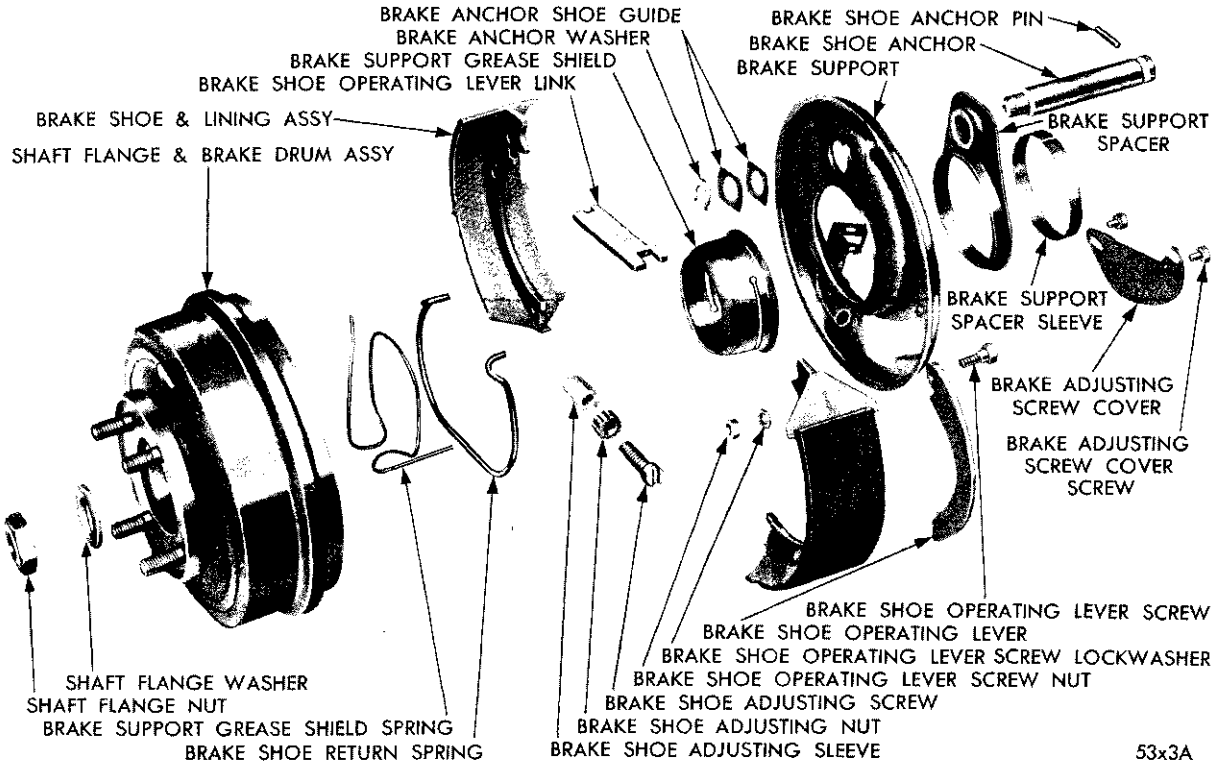


Fig. 66—Internal Expanding Hand Brake (Disassembled View)

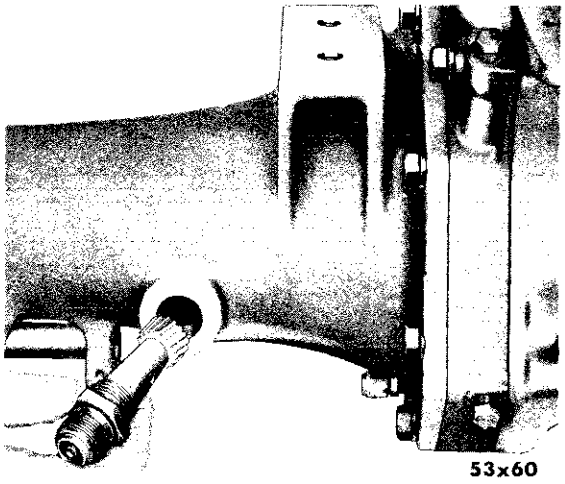


Fig. 67—Removal and Installation of Speedometer Drive Pinion Assembly

it acts as a guide for the brake shoes and retains the brake support grease shield for the brake support grease shield to the transmission extension. (Fig. 66). Remove the brake support grease shield from extension. **If a screw driver 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.

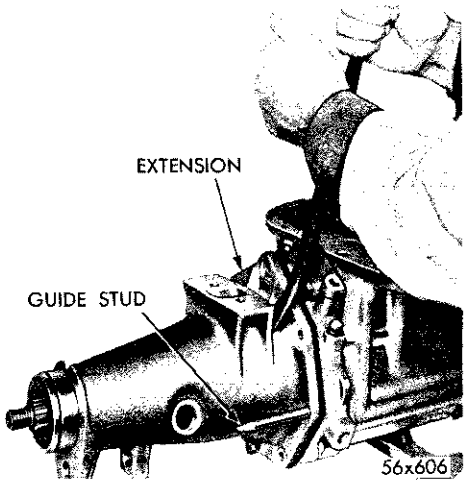


Fig. 68—Removal of Extension

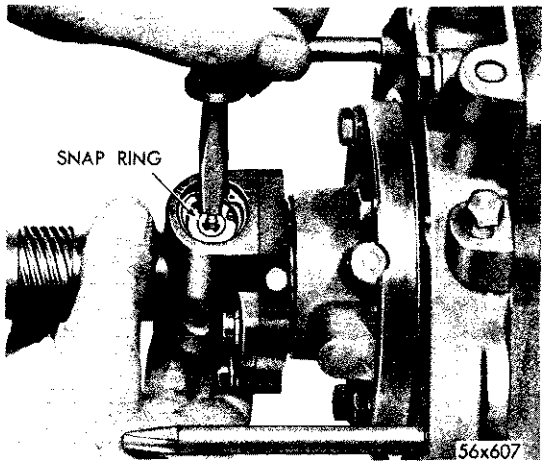


Fig. 69—Removal and Installation of Governor Valve Shaft Snap Ring

51. TRANSMISSION EXTENSION—REMOVAL

Remove speedometer drive pinion and sleeve assembly, as shown in Figure 67. **Nylon gear can be easily damaged if extension is removed without first removing the speedometer drive pinion and sleeve assembly.** 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 68.** Remove extension gasket.

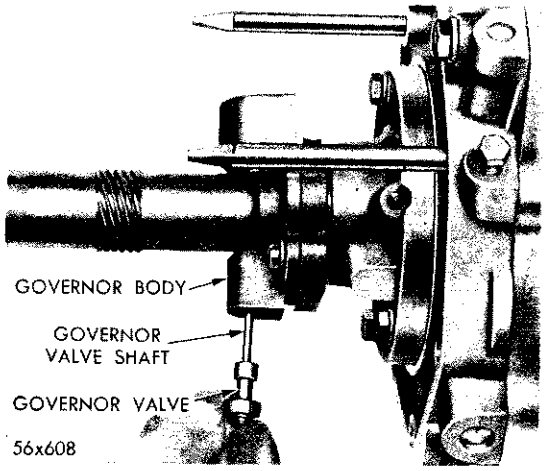


Fig. 70—Removal and Installation of Governor Valve and Shaft

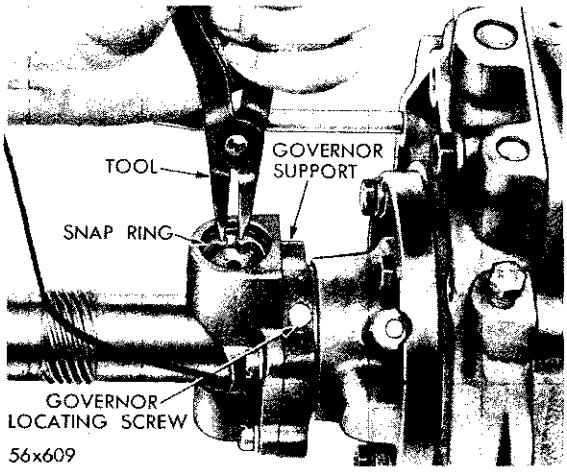


Fig. 71—Removal and Installation of Governor Weight Assembly

52. GOVERNOR AND REAR OIL PUMP HOUSING—REMOVAL

Using a small screw driver, remove the governor valve shaft snap ring from the weight assembly end as shown in Figure 69.

Remove governor valve shaft and valve from governor valve body assembly, as shown in Figure 70. Using pliers, Tool C-3229, remove governor weight assembly snap ring (large), as shown in Figure 71, and remove governor weight assembly from governor body (Fig. 72).

Using a 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 73. Use dye and mark face of pump gear in relation to pump housing.

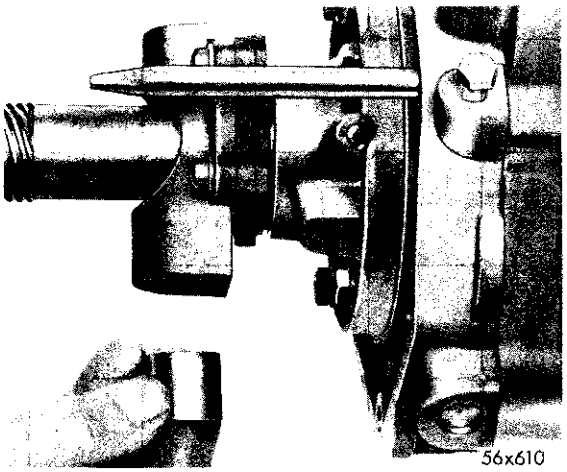


Fig. 72—Removal and Installation of Governor Weight Assembly

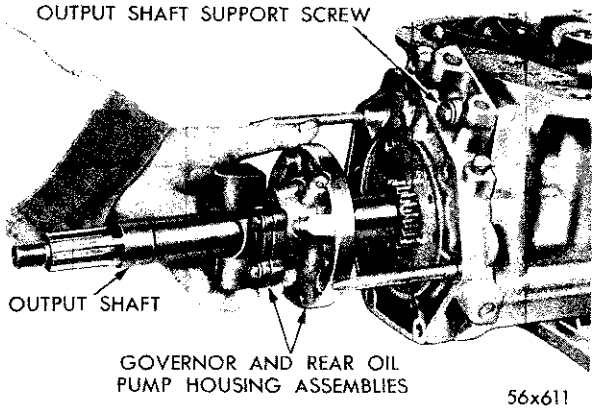


Fig. 73—Removal and Installation of Governor and Rear Oil Pump Housing Assemblies

Do not use scribe. Oil pump pinion is keyed to output shaft by a small ball. Use care when removing pinion so as not to lose ball. Remove rear oil pump pinion from output shaft, as shown in Figure 74. Mark in the same manner as previously described.

53. 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 75. 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.

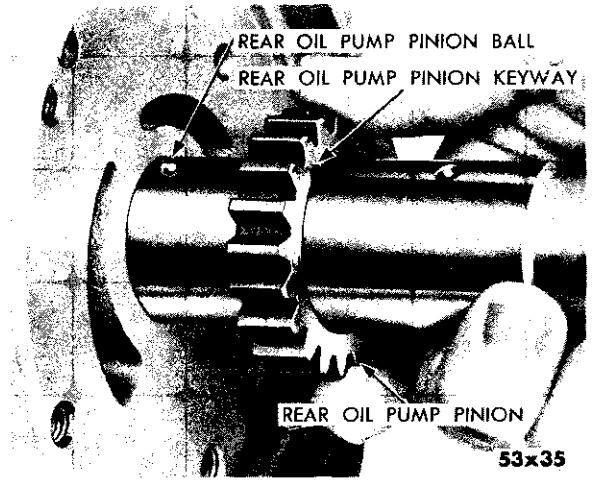


Fig. 74—Removal and Installation of Rear Oil Pump Pinion

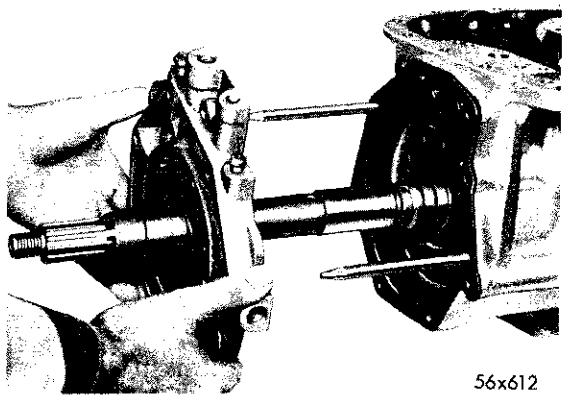


Fig. 75—Removal and Installation of Output Shaft Support

54. 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. (Fig. 76). **Support unit as much as possible, when removing, to prevent damage to seal rings on intermediate shaft.**

55. REMOVING POWER TRAIN 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). (Fig. 77). **When removing unit, identify locating hole in the intermediate support to correspond with the threaded locating hole inside of case—for installation purposes. (Fig. 127).**

Keep unit centered as much as possible to prevent binding of intermediate support, and remove assembly from transmission case, as shown in Figure 78. **Make sure front clutch and sun gear thrust washer remains in position in front of unit.**

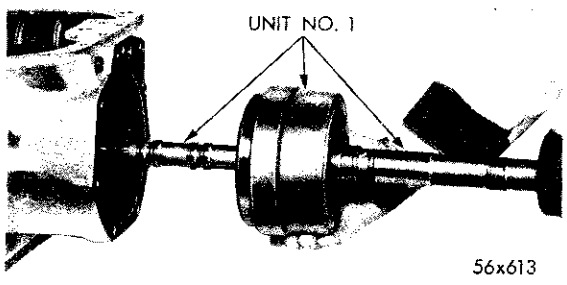


Fig. 76—Removal and Installation of Unit No. 1

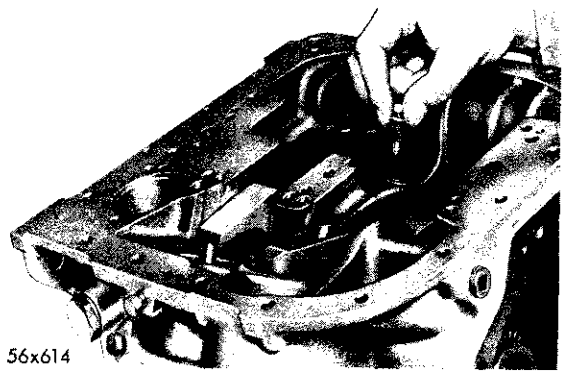


Fig. 77—Removal and Installation of Intermediate Support Locating Screw

56. 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 79. **Use extreme care when removing to prevent damage to seal rings on input shaft and sealing surfaces in reaction shaft (aluminum).**

57. 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

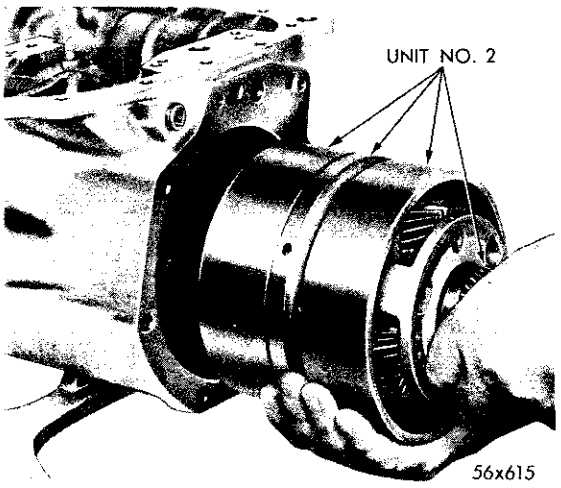


Fig. 78—Removal of Unit No. 2

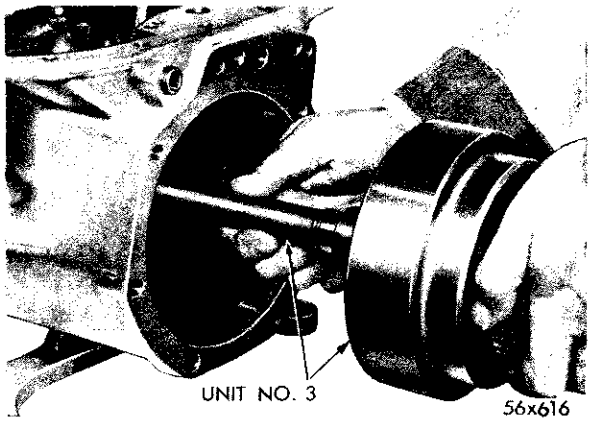


Fig. 79—Removal and Installation of Unit No. 3

strut. Remove low-reverse band assembly by rotating band ends through rear opening in transmission case, as shown in Figure 80. Remove low-reverse band anchor from adjusting screw.

58. KICKDOWN BAND—REMOVAL

Compress kickdown band ends sufficiently to remove the kickdown band strut. (Fig. 81.) (Note that strut is grooved to act as a guide). Remove the kickdown band anchor from adjusting screw. Remove kickdown band assembly by rotating band ends over center support in transmission case, as shown in Figure 82. **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 **different** lining material.

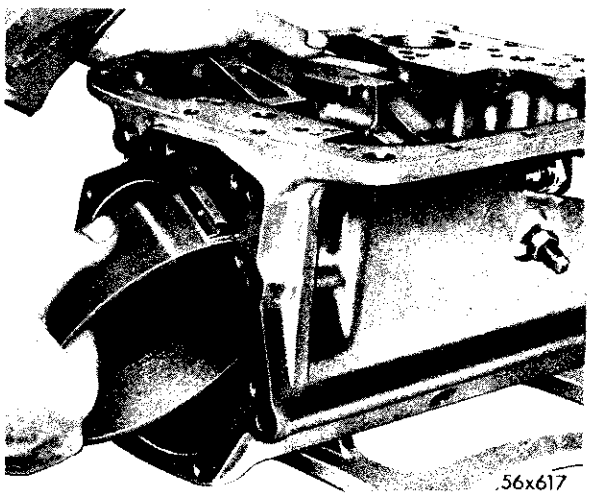


Fig. 80—Removal and Installation of Low-Reverse Band

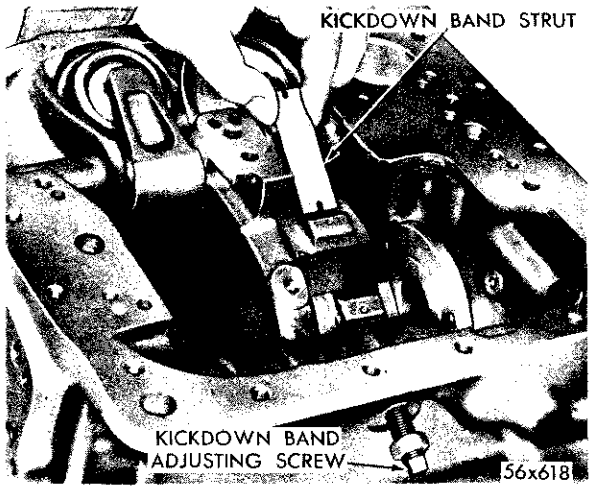


Fig. 81—Removal and Installation of Kickdown Band Strut

59. LOW-REVERSE AND KICKDOWN BAND LEVER ASSEMBLIES—REMOVAL

Remove kickdown and reverse lever shaft stop plug at rear of transmission case. Using pliers, remove kickdown and low-reverse shaft lever spacer (flat). Thread a guide stud, Tool C-3288, into shaft, and remove shaft from case, as shown in Figure 83. Remove kickdown and low-reverse servo levers.

60. LOW-REVERSE SERVO—REMOVAL

Install Tool C-3529 or C-3289 (modified, as shown in Figure 84) on transmission case and compress piston spring retainer. **Due to modification of tool, only one attaching bolt can be used.** Using a screw driver, remove the low-reverse servo piston spring retainer, snap ring, as shown in Figure 85. Loosen compression por-

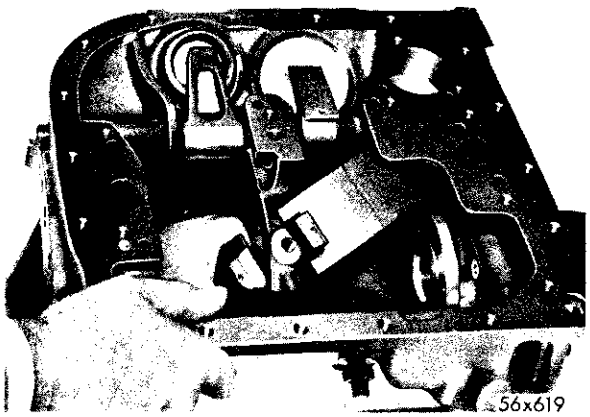


Fig. 82—Removal and Installation of Kickdown Band

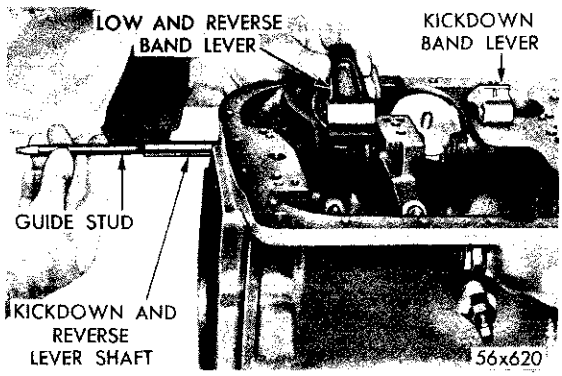


Fig. 83—Removal and Installation of Kickdown and Reverse

tion of tool, and remove. **Spring retainer may require guiding out of transmission case.** Remove the spring retainer, spring and servo piston assembly.

61. KICKDOWN SERVO—REMOVAL

Reinstall Tool C-3529 or C-3289 (modified, as shown in Figure 84), apply sufficient pressure on the kickdown piston rod guide, and remove the snap ring, as shown in Figure 86. Loosen compressing portion of tool, and remove from transmission case. Remove piston rod guide, piston 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 87.

62. FRONT OIL PUMP—REMOVAL

Remove front oil pump drive sleeve (if installed). Remove the transmission regulator valve spring retainer, gasket, cup, spring,

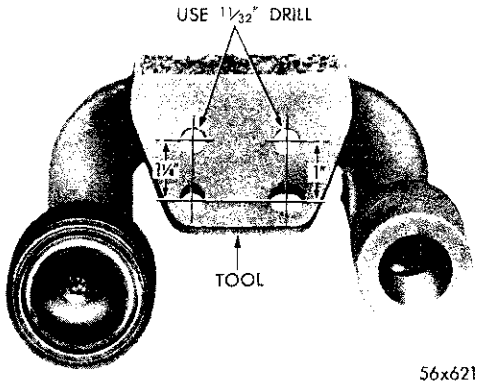


Fig. 84—Modification of Tool C-3289

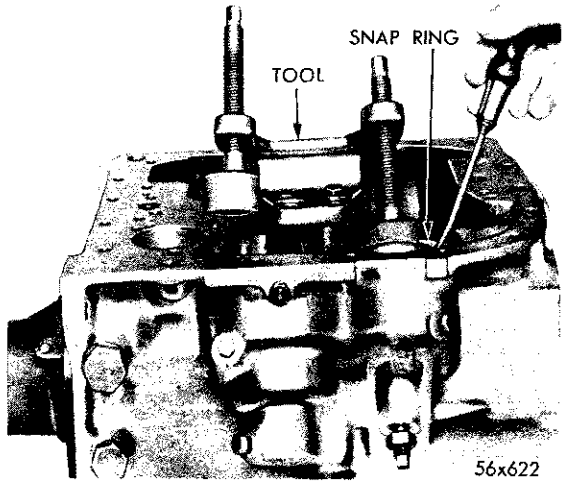


Fig. 85—Removal and Installation of Low-Reverse Servo

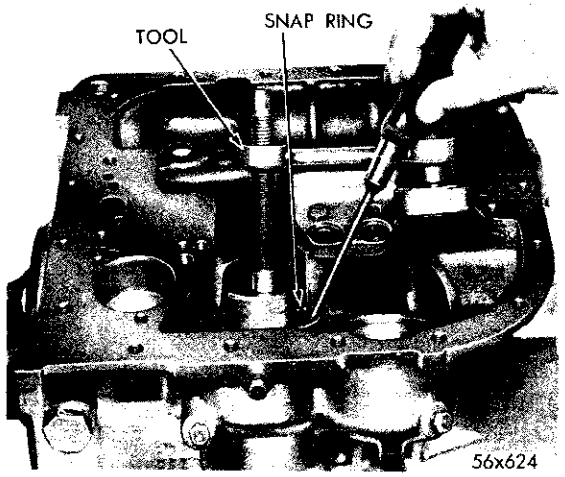


Fig. 86—Removal and Installation of Kickdown Piston Rod

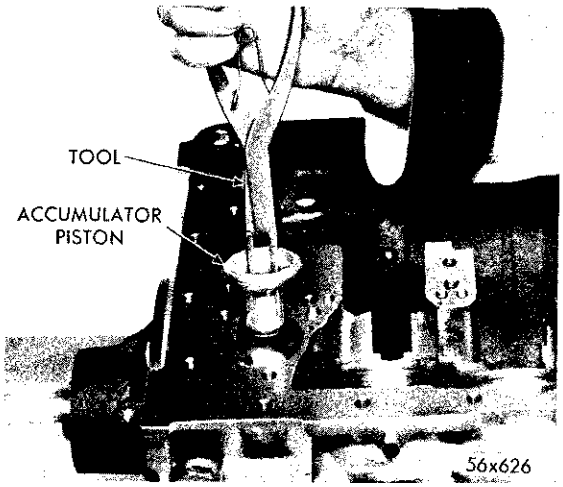


Fig. 87—Removal and Installation of Accumulator Piston

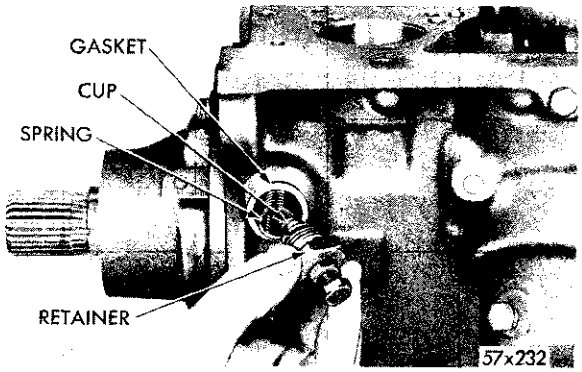


Fig. 88—Removal and Installation of Regulator Valve Retainer

sleeve and valve, as shown in Figures 88, 89 and 90. Remove the torque converter valve 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 49. The converter valve is so

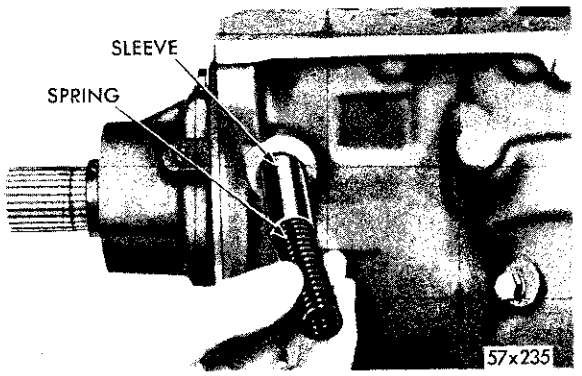


Fig. 89—Removal and Installation of Regulator Valve Spring

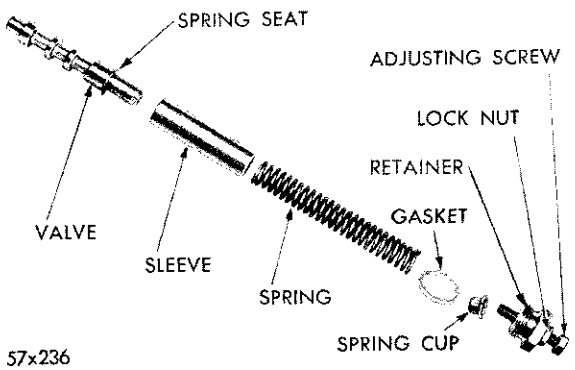


Fig. 90—Regulator Valve Assembly (Disassembled View)

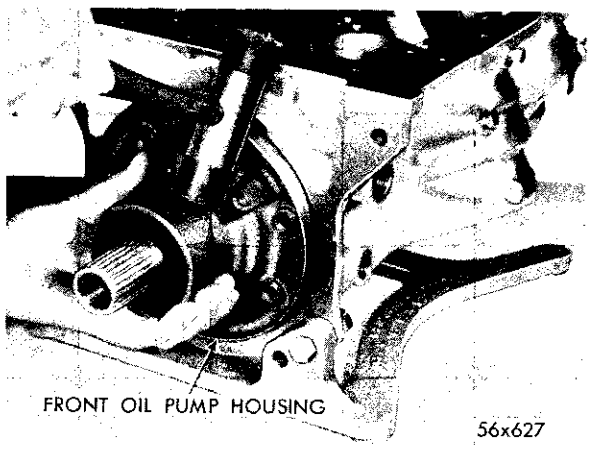


Fig. 91—Removal of Front Oil Pump Housing Assembly

constructed that it will not drop into front housing during removal.

Remove the seven front oil pump housing to transmission case bolts and washers. 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 91. **Using dye, mark pump gears in relation to face of oil pump housing for reassembly purposes. Do not scribe.**

63. 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 92. Pull regulator valve body off of torque converter reaction shaft and remove gasket. **Regulator valve body (Fig. 93)**

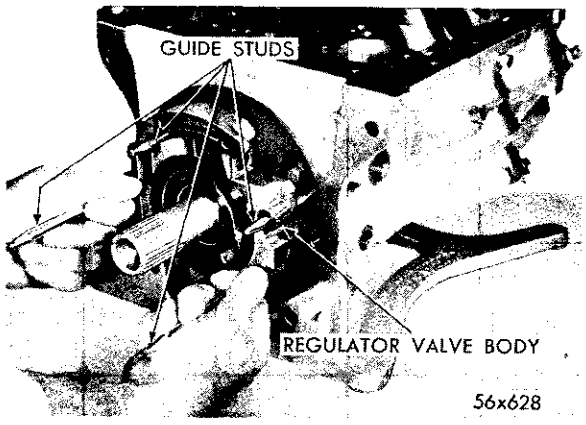


Fig. 92—Removing Regulator Valve Body

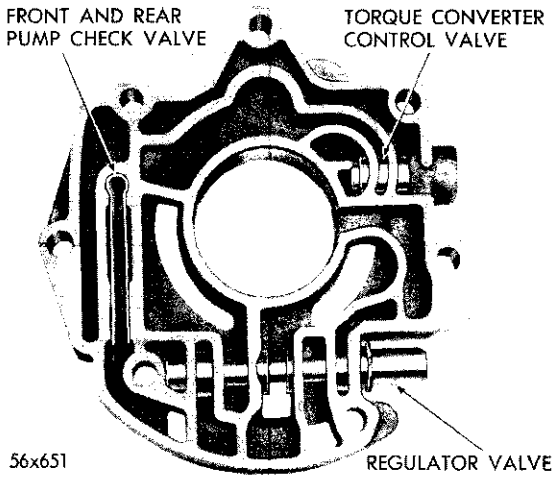


Fig. 93—Regulator Valve Body and Valves

is made of aluminum and requires care in handling to avoid damage.

64. TORQUE CONVERTER REACTION SHAFT —REMOVAL

Refer to "Inspection of Torque Converter Reaction Shaft," Paragraph 66. If inspection reveals it is necessary to remove torque converter reaction shaft, proceed as follows. Remove torque converter reaction shaft seal ring (neoprene). Remove three transmission case to reaction shaft bolts and washers. Using Tool C-3531, press reaction shaft out of transmission case, as shown in Figure 94.

65. 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.**

66. TORQUE CONVERTER REACTION SHAFT —INSPECTION

Inspect inside of torque converter reaction shaft for burrs. Inspect splines on shaft for burrs and

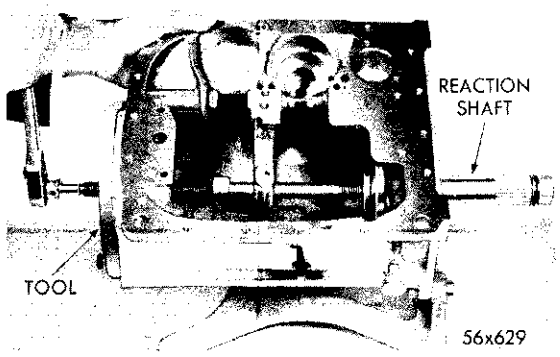


Fig. 94—Removal and Installation of Torque Converter Reaction Shaft

wear. Inspect the reaction shaft seal ring (neoprene) 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.**

67. 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.**

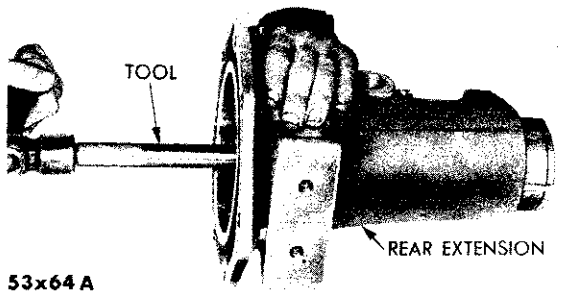


Fig. 95—Removing Output Shaft Rear Bearing

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, the adjusting screws must be finger free. If not, inspect screws and nuts for pulled threads or foreign material in threads. This is very important in obtaining proper band adjustments.**

68. 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 releases 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.

69. OUTPUT SHAFT REAR BEARING—REMOVAL

If necessary to remove rear bearing, proceed as follows: Remove output shaft rear bearing oil seal—if installed. 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 95.

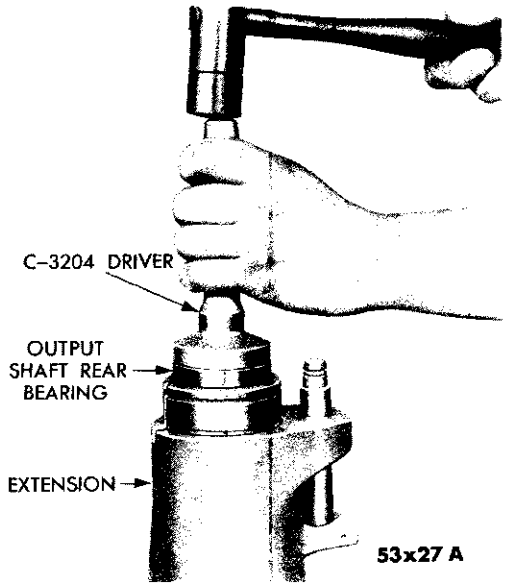


Fig. 96—Installing Output Shaft Rear Bearing

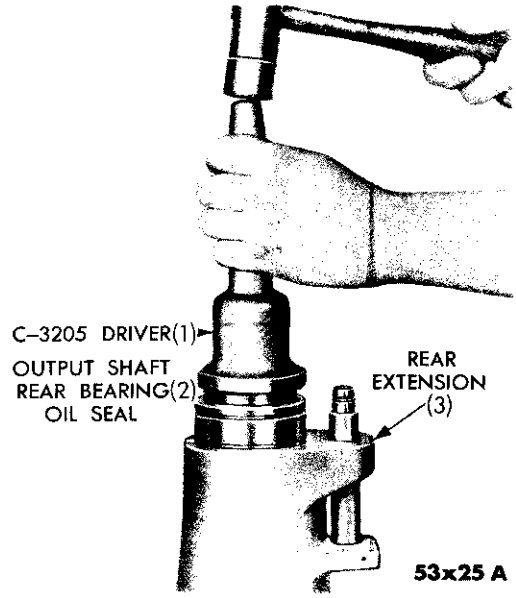


Fig. 97—Installing Output Shaft Rear Bearing Oil Seal

70. 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 96. Make sure bearing is properly seated, lubricate with Automatic Transmission Fluid (Type A). Install output shaft rear bearing snap ring. **Snap rings 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 extensions, as shown in Figure 97.

71. GOVERNOR DISASSEMBLY AND INSPECTION (Fig. 98)

Using pliers, Tool C-339, remove snap ring from governor weight assembly. **Keep thumb pressure against secondary weight when removing snap ring (spring loaded).** 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.

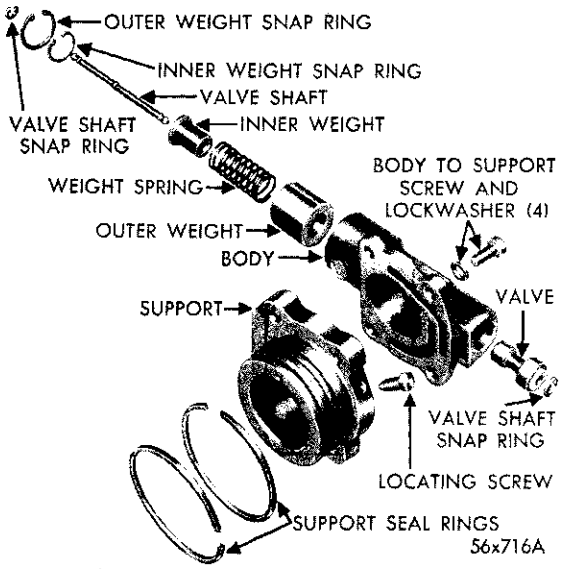


Fig. 98—Governor Assembly (Disassembled View)

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

72. 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 99. Clearance limits are from .001" to .0025".

73. GOVERNOR ASSEMBLY—REASSEMBLY

Lubricate the two governor support seal rings with Automatic Transmission Fluid (Type A) and install on the governor support. Make sure

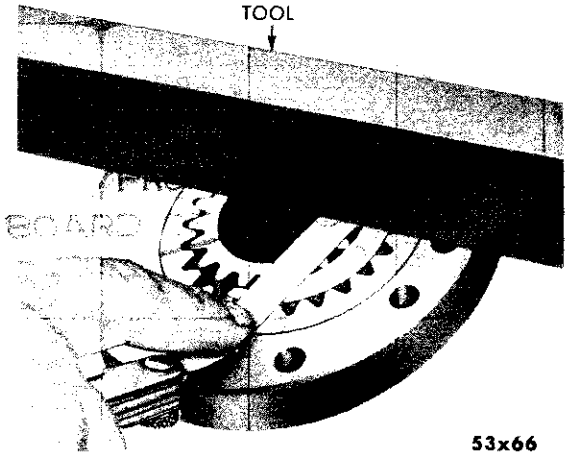


Fig. 99—Checking Clearance between Rear Pump Body and Gears

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.**

74. 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 Fig. 40) and clean passage with compressed air. Check

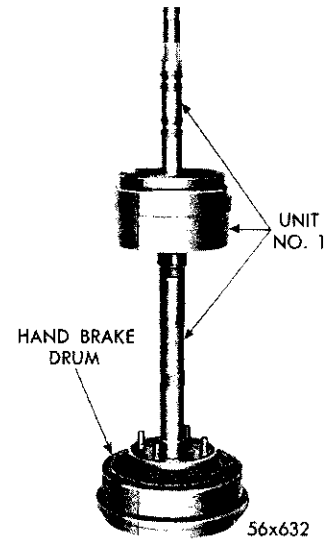


Fig. 100—Using Propeller Shaft Flange and Brake Drum Assembly (As a Holding Fixture for Unit No. 1)

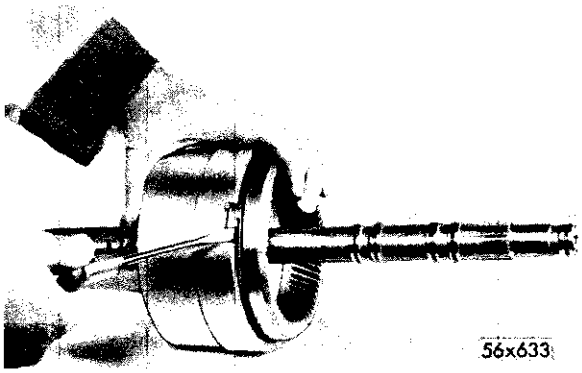


Fig. 101—Removal and Installation of Output Shaft Drive Housing Snap Ring

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.

75. 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 100. Using a screw driver, remove output shaft drive housing snap ring, as shown in Figure 101. Refer to Fig. 102 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. 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 washer (G) from intermediate shaft assembly. With a screw driver, remove kickdown annulus gear snap ring (H) and separate gear (I) from intermediate shaft assembly (C).

76. OUTPUT SHAFT—INSPECTION

Inspect speedometer drive gear for any nicks or burrs. Any nick 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**

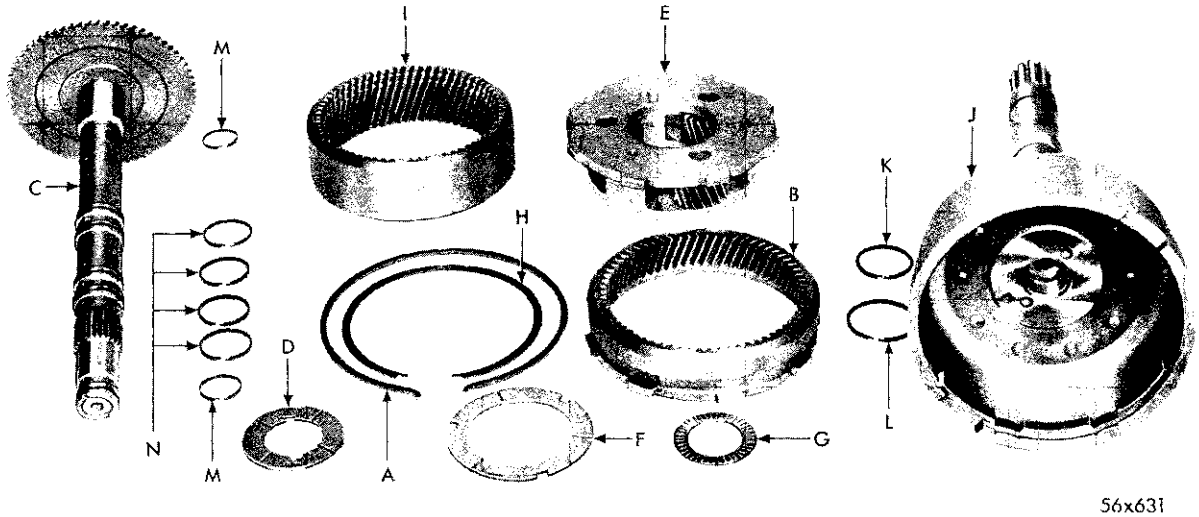


Fig. 102—Unit No. 1 (Disassembled View)

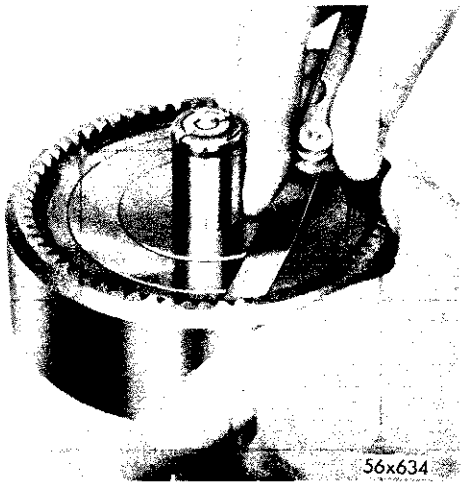


Fig. 103—Checking Clearance between Kickdown Annulus Gear Snap Ring and Intermediate Shaft Assembly

not remove rings unless condition warrants. When replacing rings, use extreme care so as not to damage interlocking portion of ring. Make sure all oil passages are open by blowing out with compressed air. Inspect output shaft (D) and kickdown carrier (F) thrust washers for scratches or excessive wear. Inspect sun gear (roller type) thrust washer (G) for pitted or cracked rollers.

77. 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.

78. KICKDOWN PLANET PINION CARRIER ASSEMBLY—INSPECTION

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

79. REVERSE AND KICKDOWN ANNULUS GEARS—INSPECTION

Inspect for worn, cracked, or broken gear teeth.

80. 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. With output shaft assembly (J) in the 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 (Fig. 103). Clearance limits are as close to zero as possible. Snap rings are available in the following two thickness:

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

81. UNIT NO. 2—(SUN GEAR, REVERSE PLANET PINION CARRIER, OVERRUNNING CLUTCH, AND REAR CLUTCH PISTON RETAINER ASSEMBLIES)—DISASSEMBLY

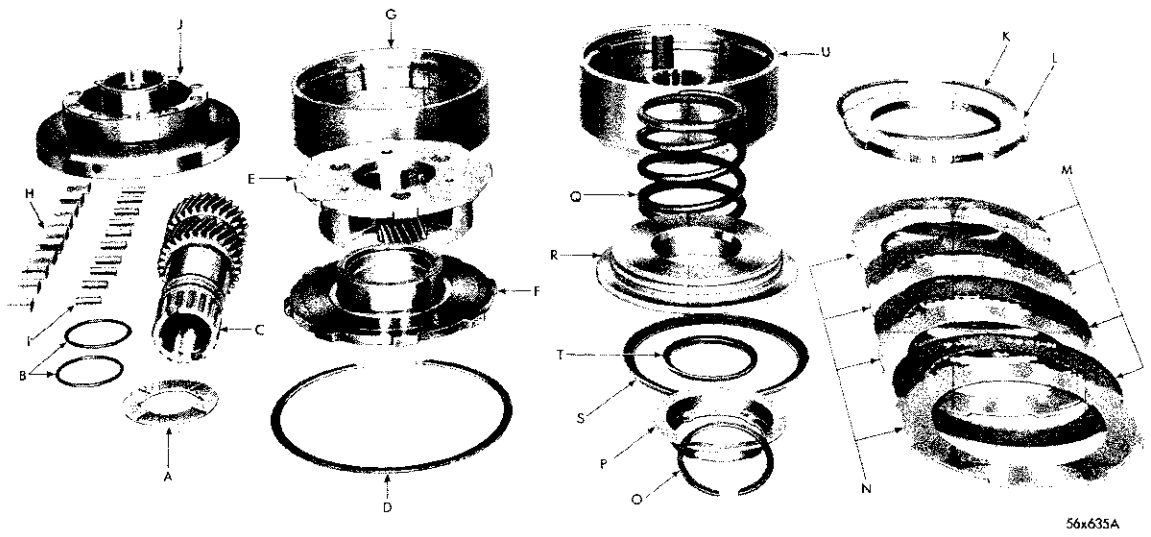


Fig. 104—Unit No. 2 (Disassembled View)

The letters referred to in the Disassembly, Inspection, and Assembly of this unit pertain to Figure 104.

With unit setting in upright position, remove sun gear and front clutch thrust washer (A). Using two screw drivers, inserted between clutch and intermediate support, remove rear clutch retainer assembly from sun gear, as shown in Figure 105. Remove the two rear clutch seal rings (neoprene) from sun gear. Remove reverse sun gear from overrunning clutch and reverse planet pinion carrier asemblies, as shown in Figure 106.

Install fixture, Tool C-3527, in intermediate support and cam assembly, as shown in Figure 107. Remove intermediate support and cam assembly from overrunning clutch hub (Fig. 108). Using a screw driver, 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 109.

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.**

82. REAR CLUTCH PISTON RETAINER ASSEMBLY—DISASSEMBLY

Using screw driver, remove snap ring (large)

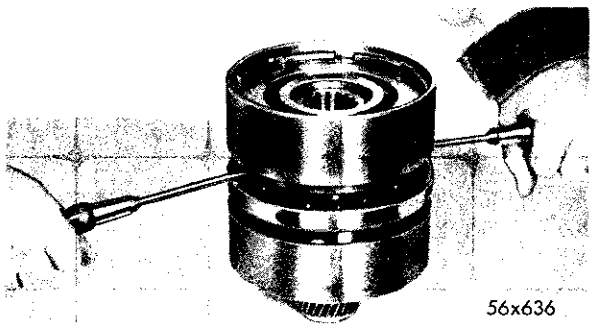


Fig. 105—Removing Rear Clutch Piston Retainer Assembly from Sun Gear

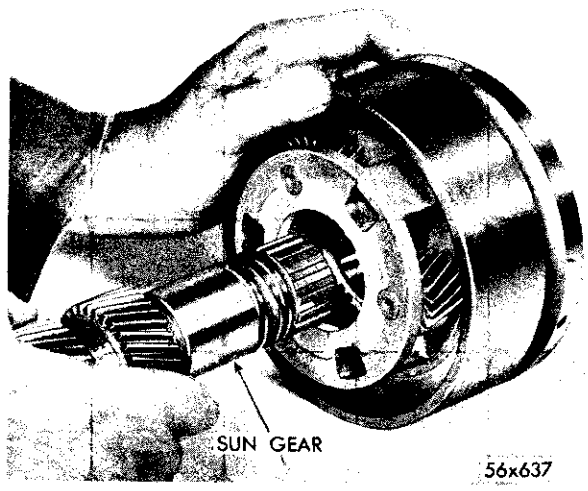


Fig. 106—Removal and Installation of Sun Gear (Reverse Planet Pinion Carrier and Overrunning Clutch Assembly)

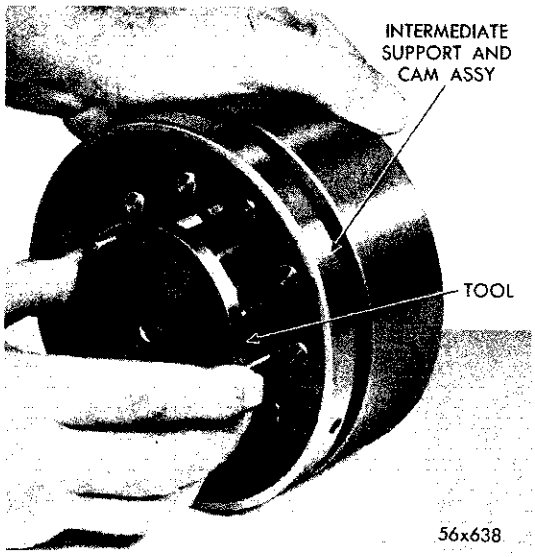


Fig. 107—Installation of Tool X-3427 in Intermediate Support and Cam Assembly

from rear clutch piston retainer assembly, as shown in Figure 110. 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 111. **Use extreme care not to damage piston return spring retainer by compressing spring too far.**

Release compressor, Tool C-3575, and remove

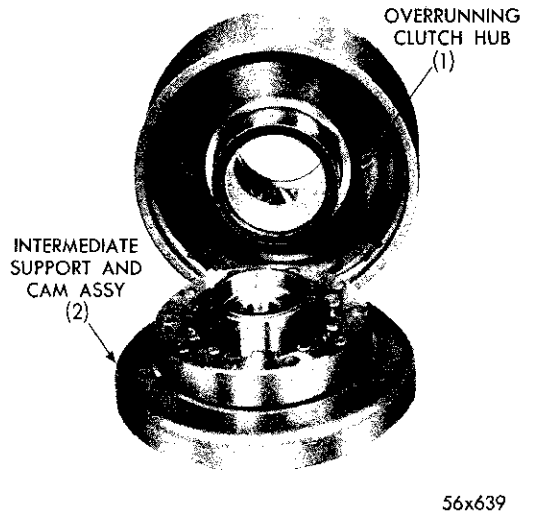


Fig. 108—Removal and Installation of Intermediate Support and Cam Assembly from Overrunning Clutch Hub

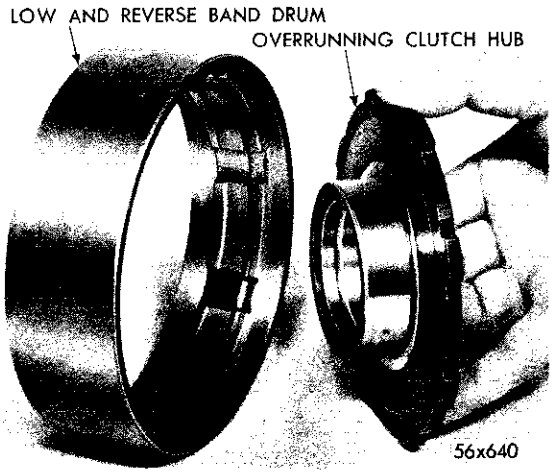


Fig. 109—Removal and Installation of Overrunning Clutch Hub in Low and Reverse Band Drum

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).

83. 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

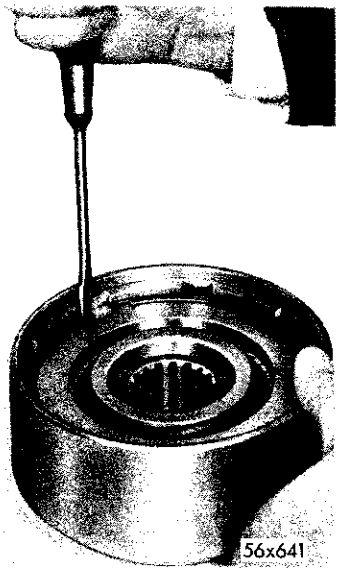


Fig. 110—Removal and Installation of Rear Clutch Piston Retainer Snap Ring

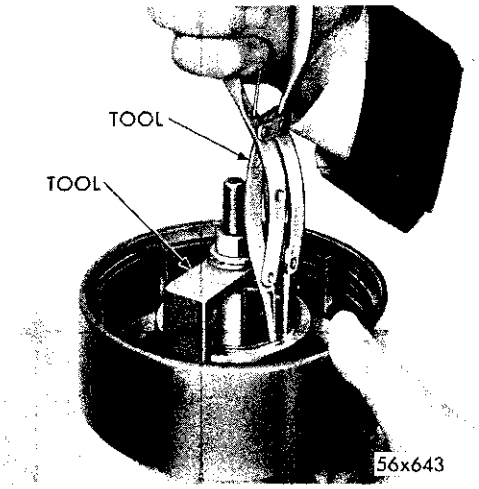


Fig. 111—Removal and Installation of Rear Clutch Spring Retainer Snap Ring

nail; if material collects under nail, replace all of driving discs. Replace driving discs if splines have become damaged. Inspect the steel clutch plates and pressure plate surfaces for evidence of burning, scoring, and damaged driving lugs; replace if necessary.

84. 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 deterioration, 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.

85. 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 burns, 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.

86. 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 is facing down and seal is properly seated in groove.** Lubricate and install outer seal ring (S) on clutch piston (lip of seal facing away 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 111. **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.**

87. REVERSE SUN GEAR ASSEMBLY—INSPECTION

Inspect gears for cracked or broken teeth. Inspect steel back bronze type bushing for scoring or excessive wear. Bushing and reverse sun gear serviced as an assembly. Inspect intermediate support bearing surface of gear for wear and slight score. Inspect rear clutch seal ring grooves on gear for nicks or burrs. Inspect inner ring sealing area in bore of sun gear for grooves or scratches.

Inspect thrust area of sun gear for nicks, scratches, or burrs. Inspect seal rings (neoprene) for deterioration, wear nicks, or hardness. Inspect front clutch and sun gear thrust washer for scratches or excessive wear.

88. INTERMEDIATE SUPPORT AND CAM ASSEMBLY—INSPECTION

Inspect riveting of cam to intermediate support. Inspect cam roller surface for brinelling. Inspect roller spring retaining tabs for being bent or distorted. Inspect bearing surface on hub for scoring.

Inspect steel back bronze type bushing in hub for scratches or scoring and excessive wear. Bushing and intermediate support are serviced as an assembly. Inspect overrunning clutch cam rollers for being pitted or scored. Inspect overrunning cam roller springs for distortion. Replace if necessary.

89. 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″.

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.**

90. LOW AND REVERSE BAND DRUM—INSPECTION

Inspect the band contacting surface for deep scratches and burns, 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.

91. 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.

92. UNIT NO. 2—ASSEMBLY

Install overrunning clutch hub assembly (hub first) into snap ring side of the low and reverse band drum, (Fig. 109). 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 #1636315	.060″ to .062″
1636316	.064″ to .066″
1636317	.068″ to .070″

Place fixture, Tool C-3527, in position in intermediate support and cam assembly, and install cam springs and rollers, as shown in Figure 112. **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 on 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

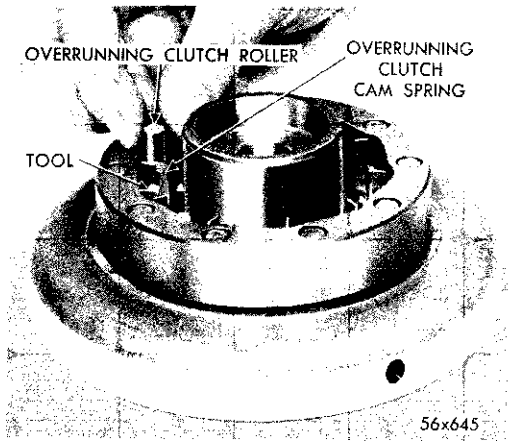


Fig. 112—Installation of Overrunning Clutch Rollers and Springs in Intermediate Support and Cam Assembly

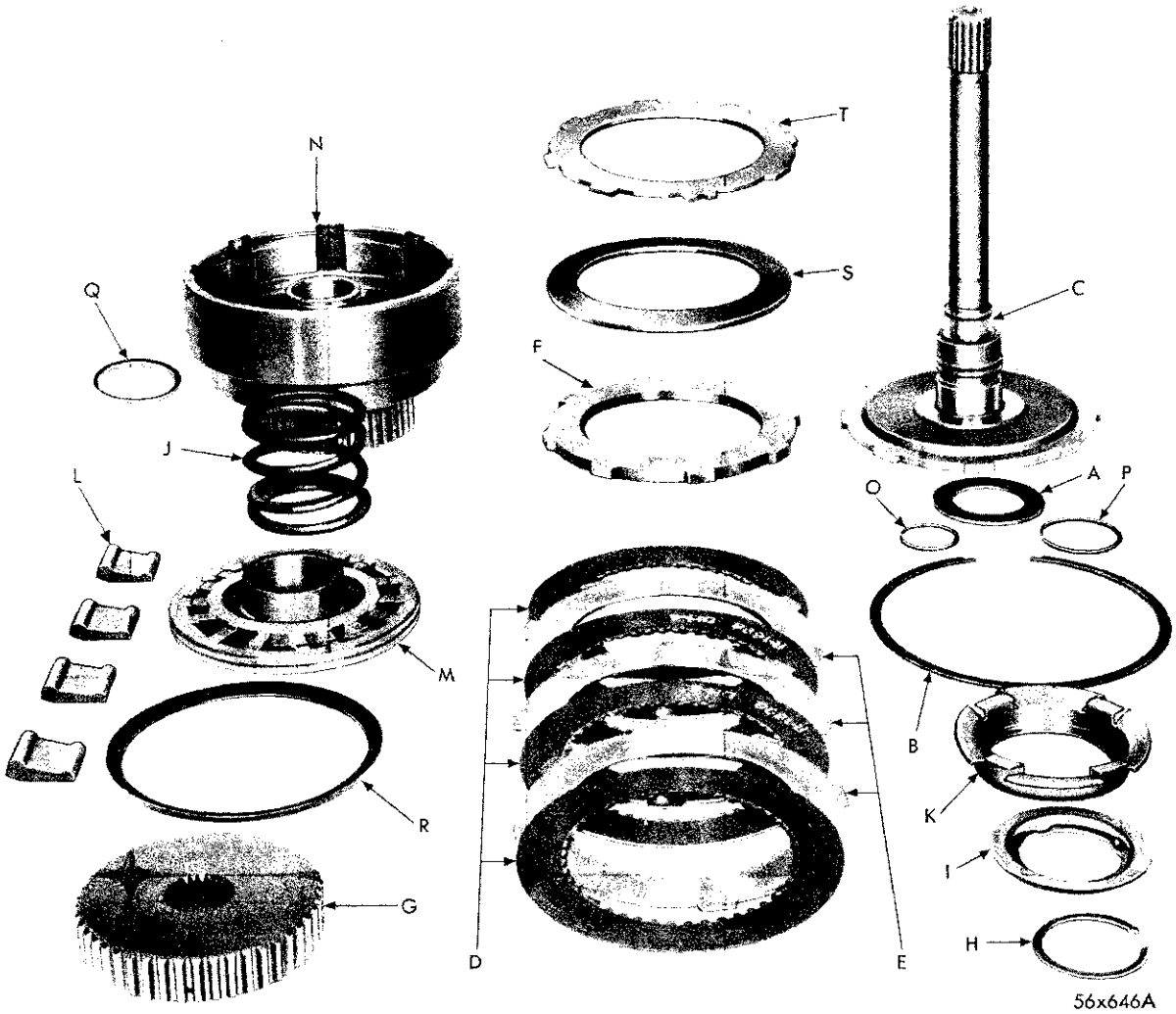


Fig. 113—Unit No. 3 (Disassembled View)

front clutch and sun gear thrust washer (A). **Lubriplate may be used to hold the thrust washer in position.**

93. UNIT NO. 3—(INPUT SHAFT AND FRONT CLUTCH PISTON RETAINER ASSEMBLIES) —DISASSEMBLY

The letters referred to in disassembly, inspection and reassembly of this unit, pertain to Figure 113.

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 screw driver.**

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 re-

move 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 clutch piston return spring retainer (I) and spring (J). Remove lever retainer (K) and levers (4) (L) from front clutch piston retainer (N). Using a twisting motion, remove the piston assembly from the retainer, as shown in Figure 114.

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

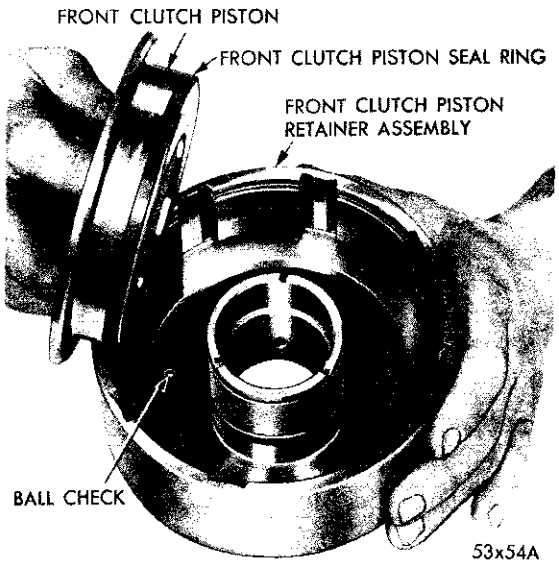


Fig. 114—Removal and Installation of Front Clutch Piston Assembly

95. 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 nail; 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.

96. FRONT CLUTCH PISTON, SEAL, AND LEVERS—INSPECTION

Inspect levers (L) for wear or distortion. Remove and inspect inner and outer piston seal rings (Q and 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.

97. 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.

98. 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, as shown in Figure 114. 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 (N) 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.

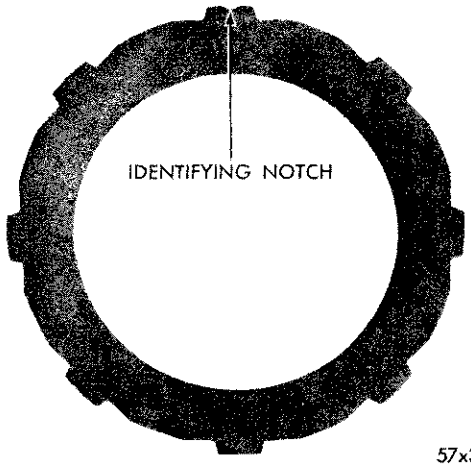


Fig. 115—Identification of Front Clutch Piston Spring Retaining Plate

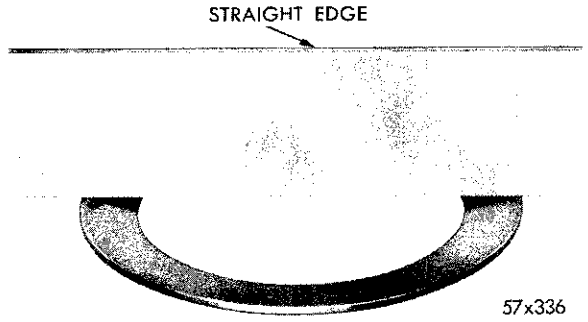


Fig. 116—Identification of Front Clutch Cushion Spring

99. 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. Excessive 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 #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, 1636372 or 1636373) to provide for proper clearance (10). 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) (Fig. 115), and cushion spring (S) (concave side, as shown in Figure 116, 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

100. BAND—INSPECTION

All letters referred to in inspection of these parts pertain to Figure 117. 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.

101. LEVER ASSEMBLIES—INSPECTION

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.

102. REVERSE SERVO PISTON ASSEMBLY —INSPECTION

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.

103. KICKDOWN PISTON ASSEMBLY— INSPECTION

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

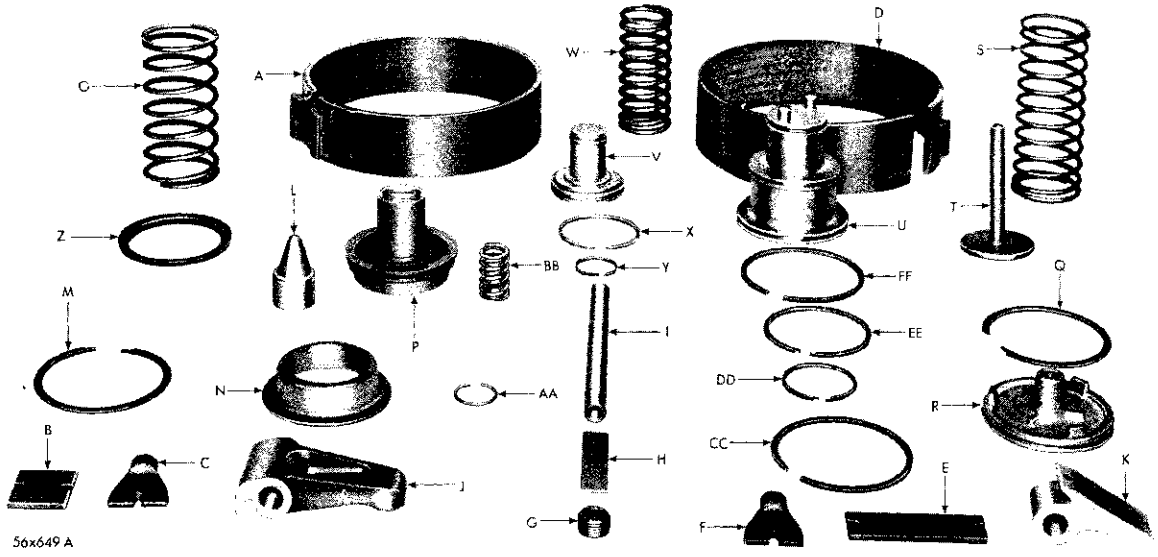


Fig. 117—Servos and Bands (Disassembled View)

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.

104. 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 not to damage interlocking portion of ring. Inspect accumulator piston (V) for nicks, burrs, and excessive wear. Inspect the accumulator spring (W) for being distorted.

105. 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.

106. FRONT OIL PUMP

Inspect front oil pump housing outer seal (on circumference of housing) and oil seal for deterioration and 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 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 118. 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 indentified when removed, with counterbore in pinion gear facing down.** Using straightedge, Tool C-3335 and feeler gauge, check clearance between pump housing face and face of gears, as shown in Figure 119. Clearance limits are from .001″ to .0025″. After checking pump gear clearance, lubricate pump gears with Automatic Transmission Fluid (Type A).

107. 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 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

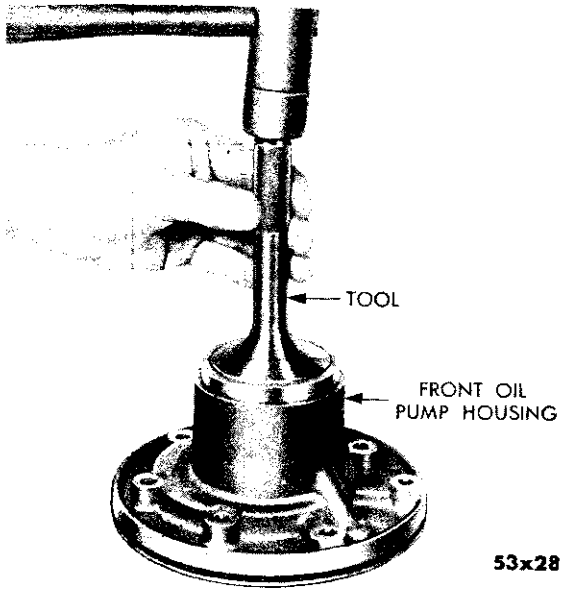


Fig. 118—Installing Front Pump Housing Oil Seal

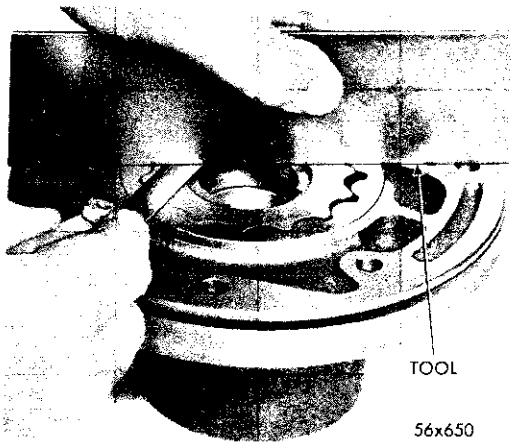


Fig. 119—Checking Clearance between Front Pump Body and Gears

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, (Fig. 93). **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 and pulled threads.

ASSEMBLY OF UNITS IN TRANSMISSION CASE

108. TORQUE CONVERTER REACTION SHAFT —INSTALLATION

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-3431, press reaction shaft into place, as shown in Figure 94. Remove the guide studs and start the three transmission case to reaction shaft bolts and washers, draw down evenly, and tighten 15 foot-pounds torque. Coat torque converter reaction shaft seal (neoprene) with Automatic Transmission Fluid (Type A) and install on shaft.

109. REGULATOR VALVE BODY

Install guide studs, Tool C-3288, as shown in Figure 92. 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.**

110. FRONT OIL PUMP ASSEMBLY— INSTALLATION

With inner and outer seals lubricated and pump gears in position in housing (counterbore in pinion gear facing down as identified when re-

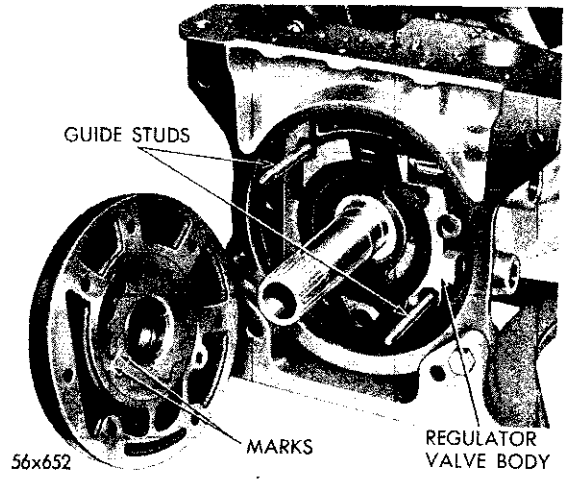


Fig. 120—Installing Front Oil Pump Assembly

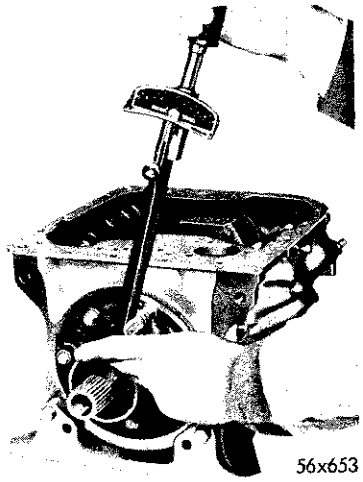


Fig. 121—Tightening Front Oil Pump Housing Screws

moved), place oil pump housing over studs and slide into position, as shown in Figure 120. Start five of the bolts (with aluminum washers) and **draw housing down evenly** until it is seated into transmission case. Remove guide studs and install the two remaining bolts and washers, then tighten to 16 foot-pounds, as shown in Figure 121. **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 122, 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), (Fig. 123). 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 to 40 foot-pounds torque. Reinstall the transmission regulator valve spring, sleeve, cup, gasket and retainer (with adjusting screw and lock nut installed). Tighten 50 foot-pounds torque.

111. ACCUMULATOR PISTON—INSTALLATION

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

112. KICKDOWN PISTON—INSTALLATION

Lubricate piston seal rings and place kickdown piston assembly into position, compress outer ring, and start assembly into case. With piston properly centered so 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.

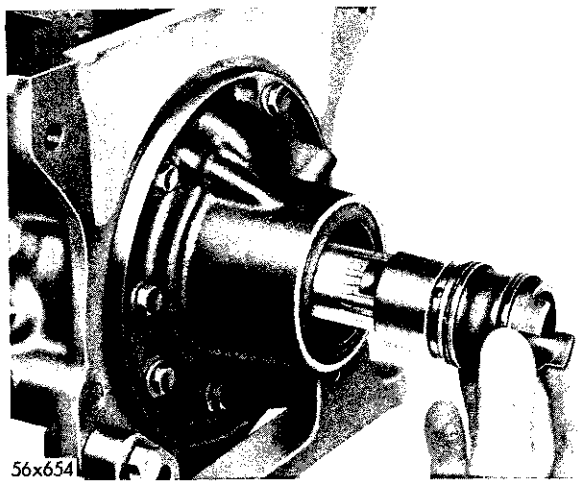


Fig. 122—Installing Front Oil Pump Drive Sleeve

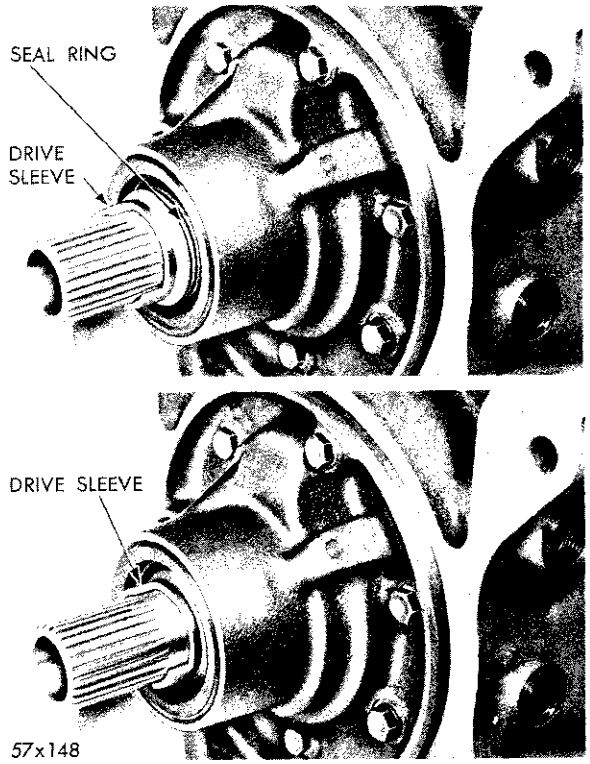


Fig. 123—Front Pump Drive Sleeve—Installation—
Incorrect Installation (Top View)
Correct Installation (Bottom View)

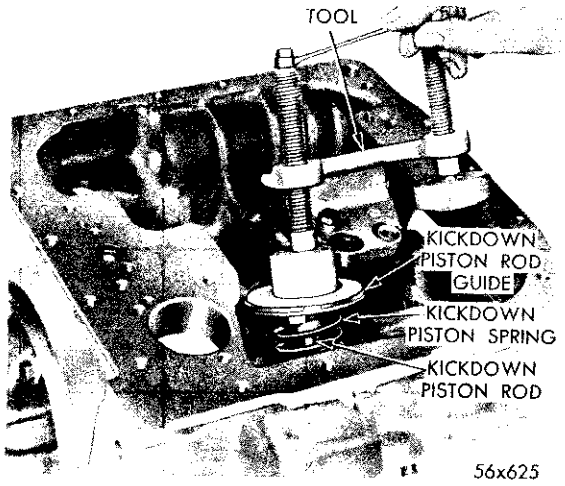


Fig. 124—Removal and Installation of Kickdown Piston Rod Guide and Spring

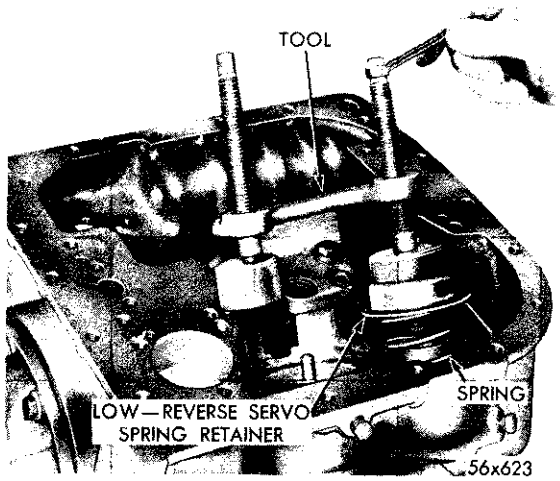


Fig. 125—Compressing Low and Reverse Servo Spring and Retainer

Place the kickdown piston rod guide over spring and compress spring until piston rod enters piston rod guide, as shown in Figure 124. 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 86. Loosen compressing portion of tool and remove.

113. REVERSE SERVO PISTON—INSTALLATION

Lubricate the low reverse servo piston seal ring 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 reverse servo piston spring over piston and position spring retainer over spring. Install Tool C-3429 or C-3489 (modified) for reverse servo piston installation. Compress spring (Fig. 125) 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.

114. KICKDOWN BAND—INSTALLATION

Install the kickdown band assembly by rotating band ends over center support in transmission case, as shown in Figure 82. **Use extreme care when installing bands so not to damage lining on edges of transmission case.** Install anchor on kickdown band adjusting screw.

115. LOW-REVERSE BAND—INSTALLATION

Install anchor on reverse band adjusting screw. Install band by rotating band ends through rear opening in transmission case, as shown in Figure 80.

116. LOW-REVERSE AND KICKDOWN BAND LEVER ASSEMBLIES AND STRUTS—INSTALLATION

Place levers in position in case and slide shaft through levers from rear of transmission case, as shown in Figure 83. Remove guide stud, Tool C-3288 from threading 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 81. Then place low-reverse band into position on anchor and compress band end; and with the aid of a screw driver, install strut.

POWER TRAIN UNITS (Fig. 126) – INSTALLATION

117. 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. To accomplish this, use a micrometer and measure 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:

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, as shown in Figure 79. By supporting and keeping unit centered as much as possible, guide through bands and reaction shaft into position.

118. UNIT NO. 2—(SUN GEAR, REVERSE PLANET PINION CARRIER, OVERRUNNING CLUTCH, AND REAR CLUTCH ASSEMBLIES—INSTALLATION

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 127. By supporting and keeping unit centered as much as possible, guide it 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.

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 locating holes.

Install the three intermediate support locating bolts, lockwashers, and tighten to 30 foot-pounds. Use extreme care when installing the locating bolt inside of case to prevent loss of lock washer, as shown in Figure 77. Check input shaft and sun gear for free rotation.

119. UNIT NO. 1—(OUTPUT SHAFT, KICK-DOWN PLANET PINION CARRIER, AND INTERMEDIATE SHAFT ASSEMBLIES)—INSTALLATION

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

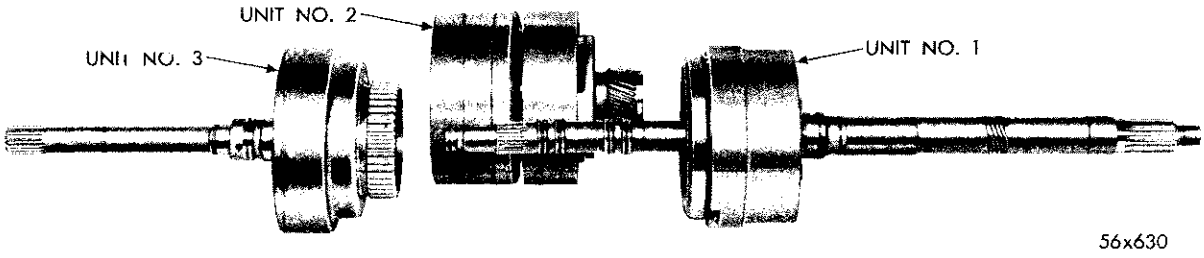


Fig. 126—Power Train Units

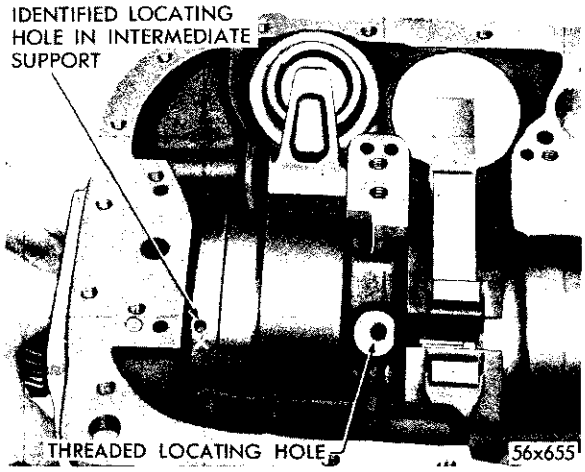


Fig. 127—Installing Unit No. 2

Transmission Fluid (Type A). Install unit by placing intermediate shaft in sun gear, as shown in Figure 76. 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.**

120. OUTPUT SHAFT SUPPORT—INSTALLATION

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 transmission case, as shown in Figure 75. **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.

121. REAR OIL PUMP AND GOVERNOR ASSEMBLIES—INSTALLATION

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 74. **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 position against support, as shown in Figure 73. **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, tighten to 12 foot-pounds torque. **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.**

122. GOVERNOR WEIGHTS AND VALVE ASSEMBLY—INSTALLATION

Align locating hole in output shaft to locating bolt hole in governor support and install locating bolt, tighten 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 to 8 foot-pounds.

Dry governor weight assembly and valve with compressed air, but do not lubricate when assembling. Place governor weight assembly (Fig. 128) (secondary weight snap ring facing out) into governor body (Fig. 72) and using pliers, Tool C-3229, install snap ring. Make sure snap ring seats properly, as shown in Figure 71. With the governor valve (small end up) on governor valve shaft, slide shaft into governor body, as shown in Figure 70 through the output shaft and governor weight assembly; at the same time position valve body.

Install the governor valve shaft snap ring (from weight assembly end). Make sure it is properly locked to shaft, as shown in Figure

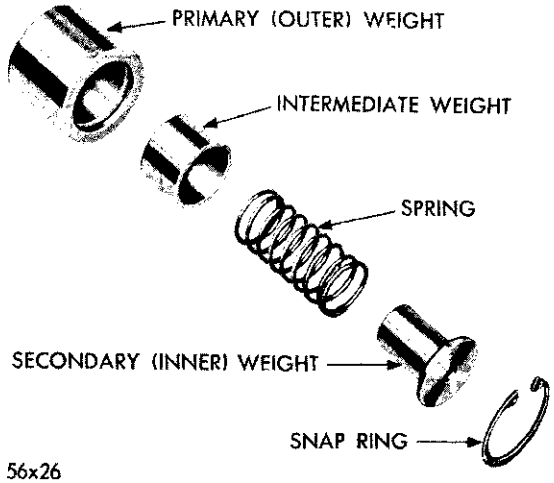


Fig. 128—Governor Weight Assembly (Disassembled View) (Typical)

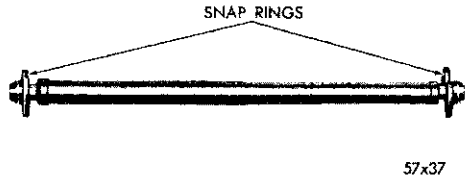


Fig. 129—Positioning Governor Valve Shaft Snap Rings in Grooves

69. **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 Fig. 129).** Check operation of governor weight assembly and valve by turning output shaft. Both should fall freely in governor body.

123. TRANSMISSION EXTENSION—INSTALLATION

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 to 30 foot-pounds torque. **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 67 and tighten to 45 foot-pounds torque.

124. HAND BRAKE—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 hand brake assembly (intact) over rear of extension. Make sure spacer sleeve remains in center of support.

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

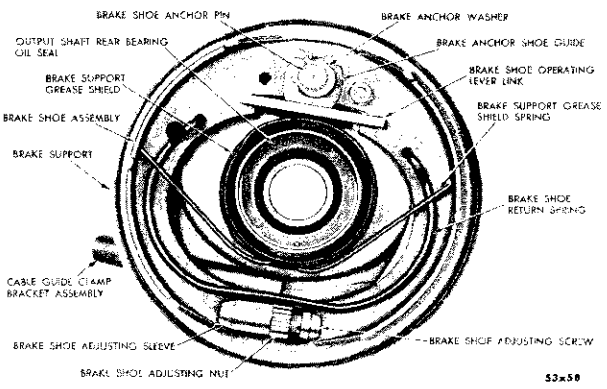


Fig. 130—Internal Expanding Handbrake (Drum Removed)

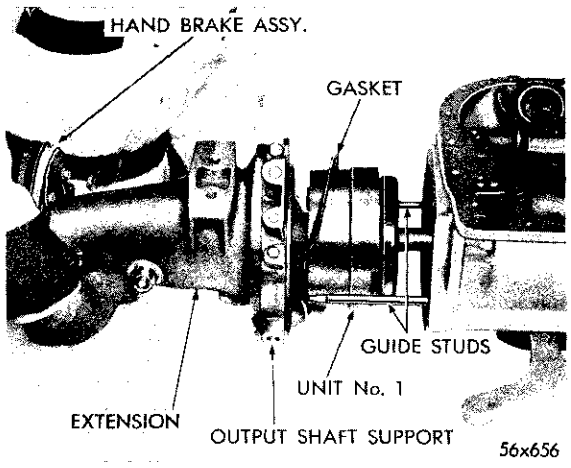


Fig. 131—Removal of Output Shaft Support, Extension, Handbrake Assembly and Unit No. 1 as an Assembly

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 130. 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 torque. Use wrench, Tool C-3281 to hold brake drum and flange assembly while tightening nut.

125. 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 64. To make this check, pry front clutch forward by carefully inserting screw driver between the front and rear clutch. Remove screw driver 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 screw driver, 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 131. **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 Unit No. 3.**

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 refer to "Power Train Units—Installation"; Unit No. 3, and Unit No. 2.

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 to 30 foot-pounds torque. Tighten after bolts have been properly torqued, turn output shaft to make sure it turns freely. Recheck front clutch end clearance.

126. BAND ADJUSTMENT

Since both band assemblies have been removed, it is very important that the hand brake drum is turned in a clockwise and counter-clockwise direction to center bands on retainers prior to making band adjustments.

127. LOW-REVERSE (REAR) BAND

Using wrench, Tool C-3380 and with lock nut loose, tighten low-reverse band adjusting screw to 75 inch-pounds torque, as shown in Figure 132. Refer to "Maintenance Adjustments and Test," Paragraph 24.

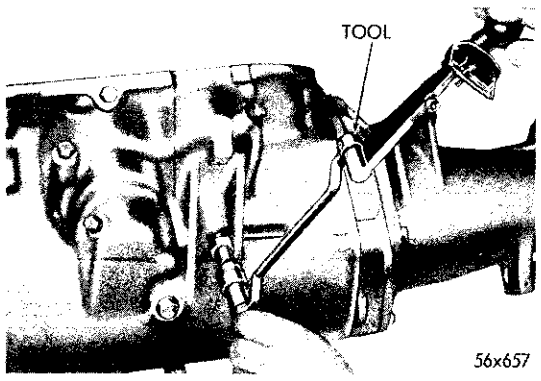


Fig. 132—Adjusting Low-Reverse Band

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 to 40 foot-pounds torque.

128. KICKDOWN (FRONT) BAND

Using wrench, Tool C-3380 (and with lock nut loose), tighten kickdown band adjusting screw to 75 inch-pounds torque. Refer to "Maintenance, Adjustments and Tests," Paragraph 24. 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 to 40 foot-pounds torque.

129. VALVE BODIES AND TRANSFER PLATE ASSEMBLY—INSTALLATION

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 63. Install the three transfer plate bolts (short) and washers, two in center, and one in front. Draw down evenly and tighten to 16 foot-pounds torque. **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 62, (three bolts, with washers) and draw down evenly. Place oil strainer assembly in position on transfer plate assembly. Install the four bolts and washers, draw down evenly, and tighten strainer assem-

bly and accumulator cover bolts to 16 foot-pounds torque. Install neutral starting switch and visually check the manual valve lever contact with switch.

130. OIL PAN—INSTALLATION

Using a new oil pan gasket, place oil pan in position on transmission case. Install the oil pan bolts and washer asemblies; draw down evenly, and tighten to 12 foot-pounds torque. Position lever so there is $\frac{7}{32}$ inch clearance (without gasket) between bottom of lever and transmission case. Tighten locking screw securely. **A 7/32 inch drill can be used for obtaining proper clearance, (Fig. 51).** Place control cable adapter (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. Draw down evenly and tighten to 16 foot-pounds torque. Install felt washer, flat washer, and throttle valve lever assembly over shaft and tighten clamping bolt.

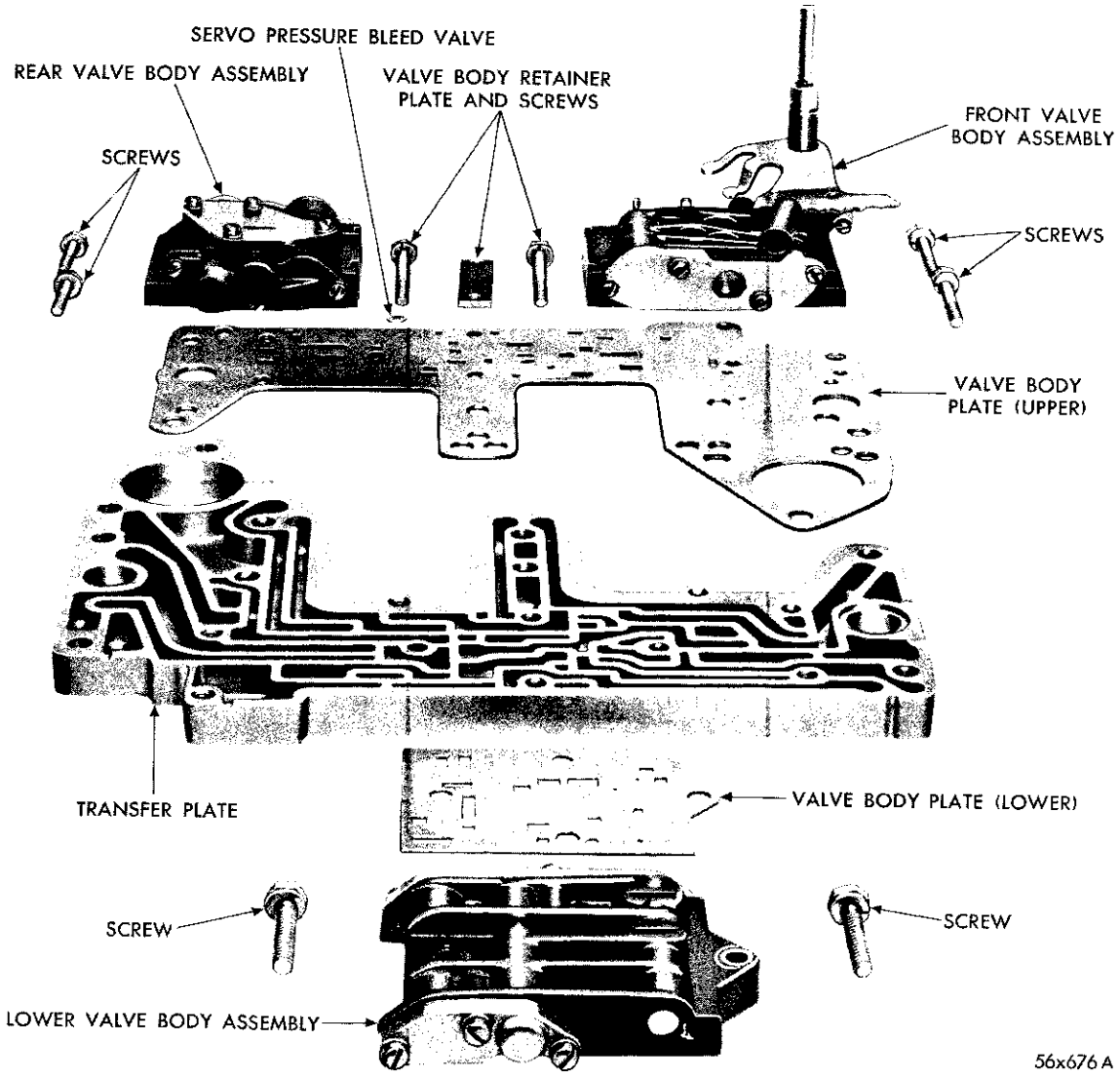


Fig. 133—Valve Bodies and Transfer Plate (Separated)

RECONDITIONING OF VALVE BODY AND TRANSFER PLATE ASSEMBLIES

131. LOWER VALVE BODY—REMOVAL

Place the valve bodies and transfer plate assembly in stand, Tool C-3528. **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 133, and remove plate. Invert valve bodies and transfer plate and remove the two lower valve body bolts and lockwashers. Remove lower valve body and plate from transfer plate, as shown in Figure 134. **Use extreme care to prevent loss of governor compensator valve plug retaining pin.**

132. REAR VALVE BODY—REMOVAL

Remove the two transfer plate to rear valve body bolts and lockwashers, and remove rear valve body from transfer plate assembly, as shown in Figure 135. **Remove the servo pressure bleed valve to prevent loss.** Invert valve bodies and transfer plate assembly and replace on stand Tool C-3428.

133. FRONT VALVE BODY—REMOVAL

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 136. **Do not disturb throttle valve stop screw setting. Remove upper valve body plate from transfer plate.**

134. CLEANING AND INSPECTION

Place all parts in clean solvent, wash thoroughly, and dry with compressed air. Make definitely sure all passages are free from obstruction. 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. Using straight edge, Tool C-3335, check all mating surface for distortion.

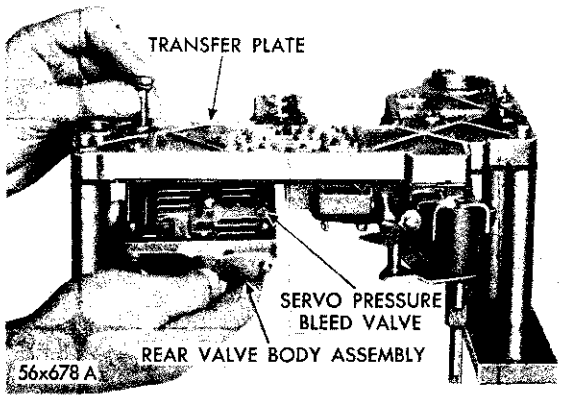


Fig. 135—Removal and Installation of Rear Valve Body Assembly

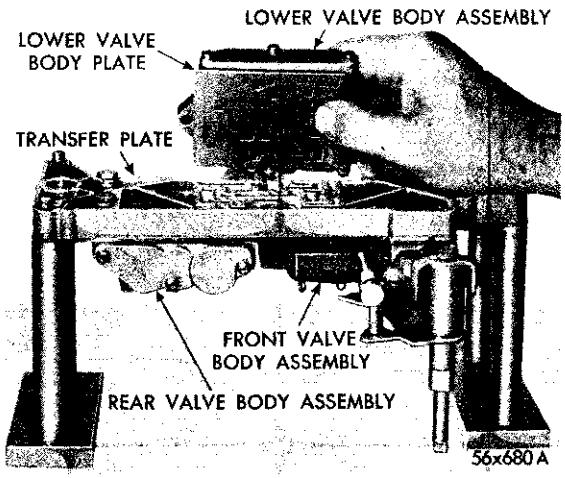


Fig. 134—Removal and Installation of Lower Valve Body Assembly and Plate

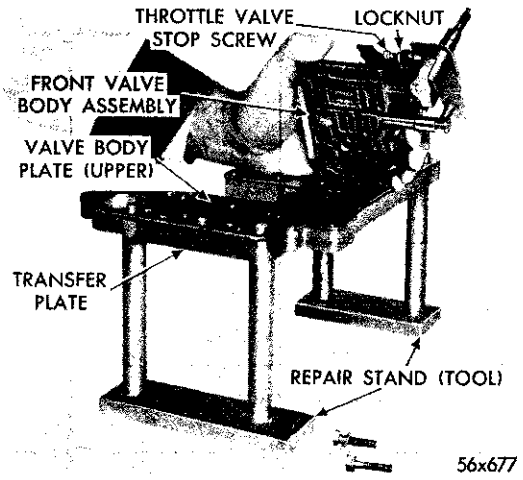


Fig. 136—Removal and Installation of Front Valve Body Assembly

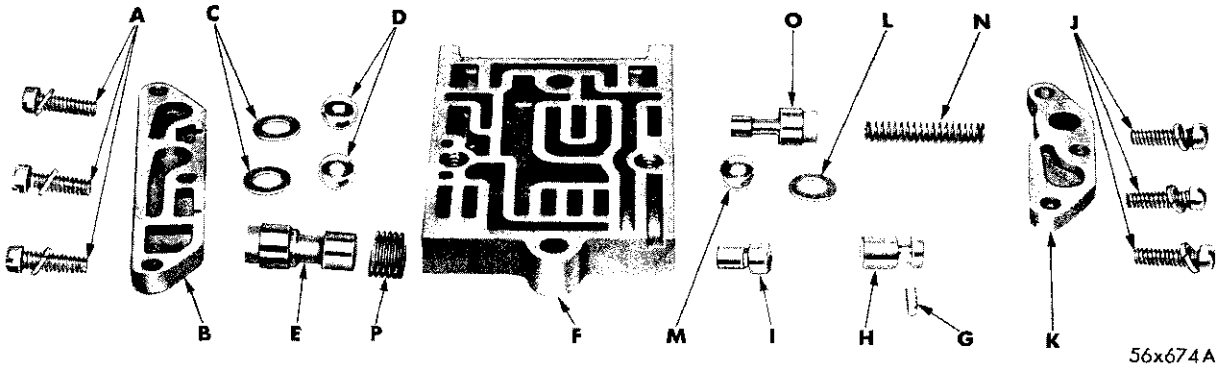


Fig. 137—Lower Valve Body (Disassembled View)

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 plug 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 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 valves and body, thus reducing possibilities of sticking. Check valves and plugs for free operation in bores; they must fall freely in bores when valves, plugs and bores are clean and dry.

135. VALVE BODY AND PLATES (UPPER AND LOWER) AND TRANSFER PLATE—INSPECTION

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 threaded machined surface for nicks or burrs. Inspect threaded holes for pulled threads.

136. LOWER VALVE BODY—DISASSEMBLY (Fig. 137)

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).

136. LOWER VALVE BODY—ADDITIONAL INSPECTION

Inspect check ball contacting surface in valve seats and valve body for nicks or burrs. Inspect covers for flatness and porosity.

137. LOWER VALVE BODY—ASSEMBLY (Fig. 137)

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), 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.**

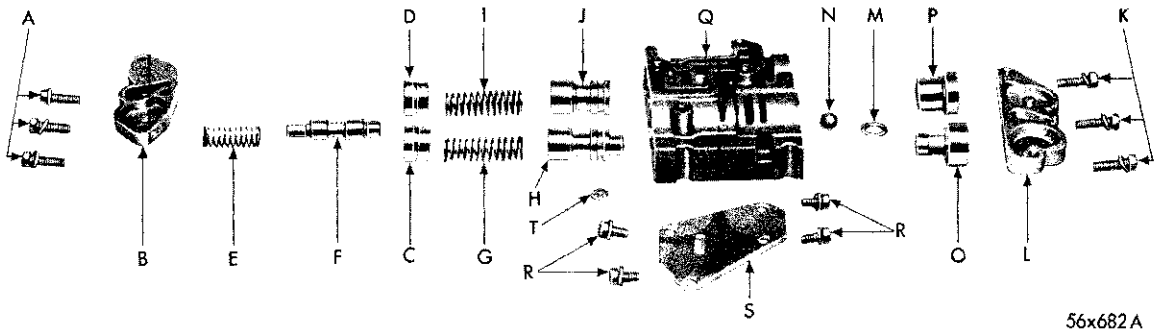


Fig. 138—Rear Valve Body (Disassembled View)

138. REAR VALVE BODY—DISASSEMBLY (Fig. 138)

Keeping thumb pressure against the kickdown plug cover (spring loaded) remove the three bolts and lockwashers.

CAUTION

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 the 2-3 shift valve governor plug (P) from valve body. Rear valve body plate (S) can be removed for cleaning purposes by removing the four bolts and lockwashers.

139. REAR VALVE BODY—ASSEMBLY

With valve body (Q) 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 shift valve springs (G and 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 139. Install the 3-1 relay valve (F) (large end first) into valve body and place spring (E) on pilot. Place the 1-2 shift valve kickdown plug (C) over the 1-2 shift 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 (Q) (small end first) in position in valve body. Place the 2-3 shift valve governor plug (P) (small end first) in position in valve body. Install check valve ball (N) and seat (M). Place governor plug cover (L) in position on

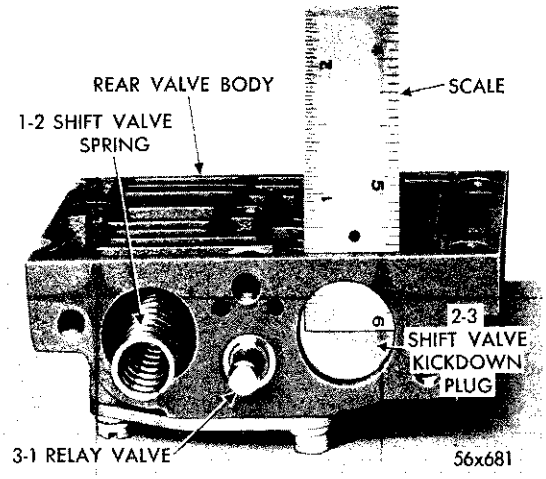


Fig. 139—Using Scale to Hold 2-3 Shift Valve Kickdown Plug in Body During Assembly

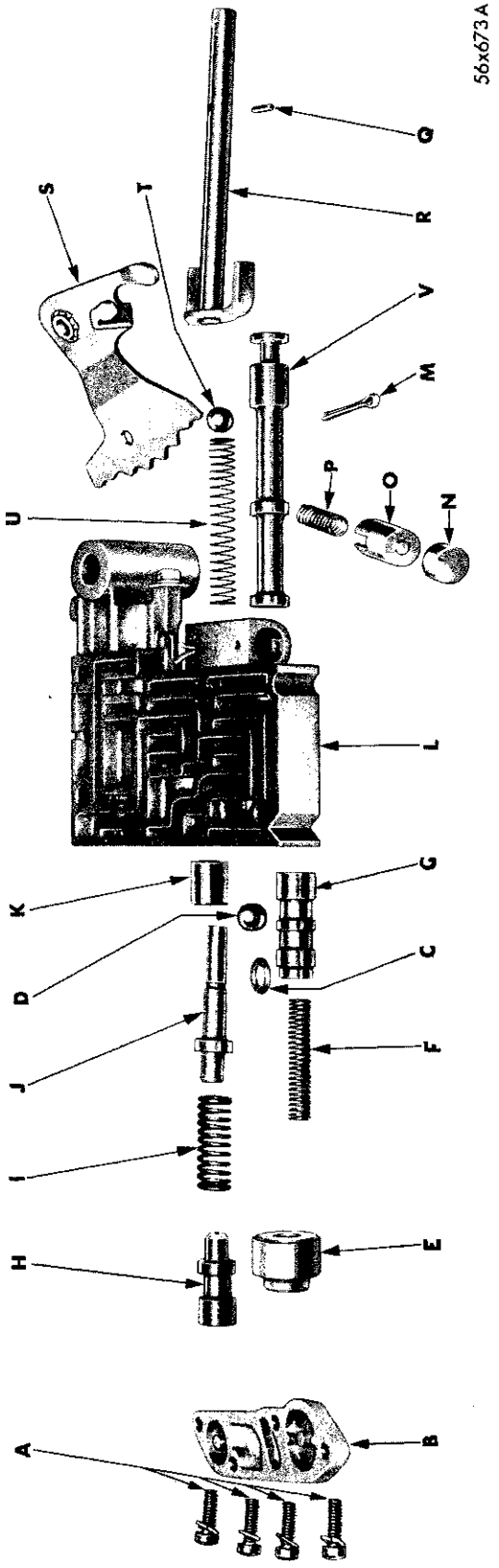


Fig. 140—Front Valve Body (Disassembled View)

valve body and install the three bolts and lockwashers. Draw down evenly and tighten.

140. FRONT VALVE BODY—DISASSEMBLY

All letters referred to in disassembly of front valve body pertain to Figure 140. **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 141.

Remove throttle valve, spring kickdown valve, and detent plug, as shown in Figure 142. 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). If condition warrants, however, (such as damage), proceed as follows:

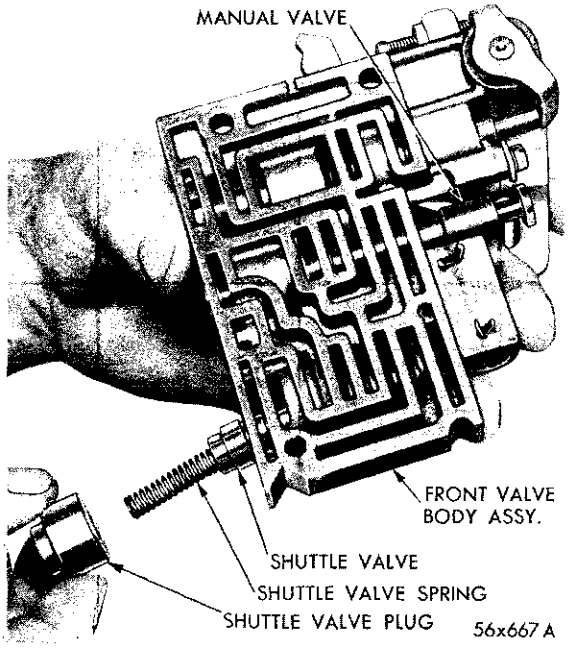


Fig. 141—Removal and Installation of Shuttle Valve, Plug, Spring and Valve

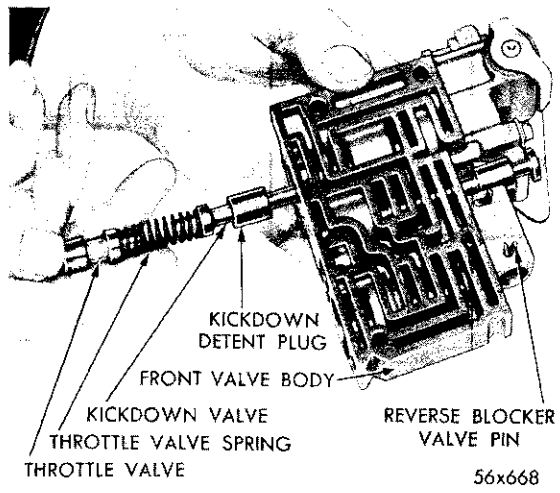


Fig. 142—Removal and Installation of Throttle Valve, Spring, Kickdown Valve and Detent Plug

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 143. **A rubber band may be used to hold manual lever in place while removing pin.**

Remove any burrs from throttle valve and manual valve lever shafts and slide them from 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).

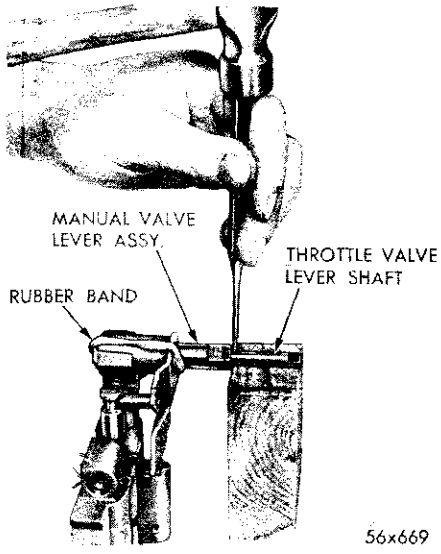


Fig. 143—Removal and Installation of Throttle Valve Lever Shaft Pin (Typical View)

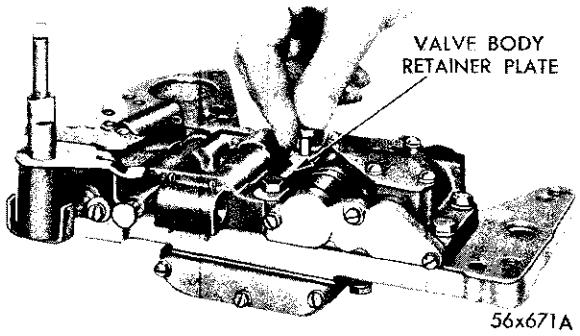


Fig. 144—Installation of Valve Body Retainer Plate

141. FRONT VALVE BODY—ADDITIONAL INSPECTION

Inspect the manual valve detent ball (T) and make sure it slides freely into valve body. Inspect staking of manual lever and throttle cam to their respective shafts. Inspect kickdown valve detent plug to make sure it slides freely on valve. Inspect check valve ball seat in valve body (faulty casting).

142. 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.**

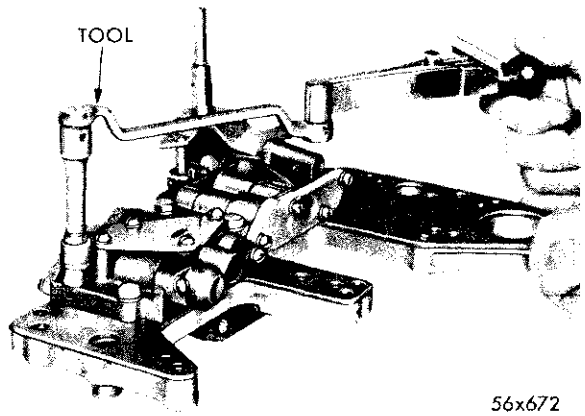


Fig. 145—Tightening Valve Body Screws

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 143. 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 four bolts and lockwashers. Draw down evenly.

143. VALVE BODY PLATE (UPPER)—INSTALLATION

Place valve body transfer plate in an upright position on fixture Tool C-3528. Place steel plate (upper) over pilots on Tool C-3528, and into position on transfer plate.

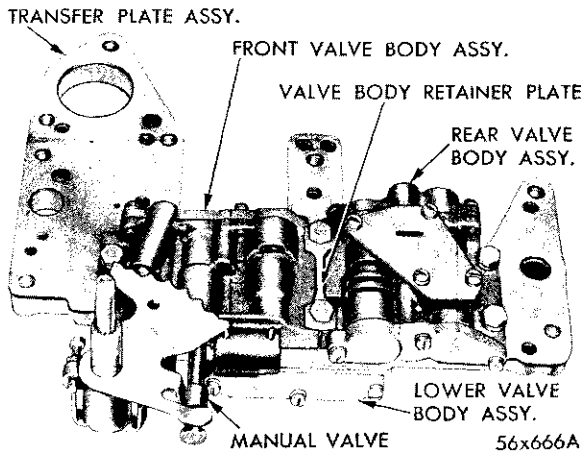


Fig. 146—Valve Bodies and Transfer Plate Assembly (Bottom View)

144. FRONT VALVE BODY—INSTALLATION

Position front valve body on steel plate (upper), as shown in Figure 136, and install two bolts and lockwashers in outer end of valve and draw down finger tight.

145. REAR VALVE BODY—INSTALLATION

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 135, and install the two outer bolts (short) with lockwashers through the transfer plate and into lower valve body. Draw up finger tight.

146. LOWER VALVE BODY—INSTALLATION

To prevent loss of governor compensator valve retainer pin, position steel plate (lower) on lower valve 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 133, tighten the two lower valve body and two rear valve body bolts to 60 inch-pounds torque.

Invert valve bodies and transfer plate and replace on fixture Tool C-3528. Install valve bodies retainer plate and two bolts (long) with lockwashers, (Fig. 144), and tighten the two retainer plate bolts and two front valve body bolts to 60 inch-pounds torque, as shown in Figure 145. **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 146. Place transfer plate and valve bodies assembly in transmission case. Remove stand, Tool C-3280. Install transmission as outlined under "Removal and Installation of Transmission," Paragraph 45.

TORQUE CONVERTER SERVICE PROCEDURES

147. REMOVAL AND INSTALLATION OF TORQUE CONVERTER

a. Removal

Remove transmission. Remove the torque converter housing to adapter screws and lockwashers. Remove torque converter housing. If torque converter is being removed because of excessive runout damage, check runout by using a dial indicator on hub and mark the highest point of runout on both converter and crankshaft flange. The reason for this is so it may be determined later if runout was caused by the converter or crankshaft, after crankshaft has been checked in same manner.

Using wrench, Tool C-589 or C-811, remove eight torque converter stud nuts and lockwashers from crankshaft flange, as shown in Figure 147. Remove torque converter from crankshaft. Check crankshaft flange runout (maximum .002 inch).

b. Correcting Hub Runout

Permissible torque converter hub runout, when mounted on crankshaft, is .004 inch total indicator reading. The following method is provided for bringing the converter hub within this tolerance: If new torque converter is being installed, make sure all visible foreign matter such as raised metal around studs, burrs, chips, etc., have been removed from converter and crankshaft drive flanges.

Check crankshaft flange runout (maximum .002 inch T.I.R.). Check torque converter runout by mounting a dial indicator to adapter plate or some other unit which is mounted rigidly to cylinder block, as shown in Figure 148. Rotate the converter 360 degrees and deter-

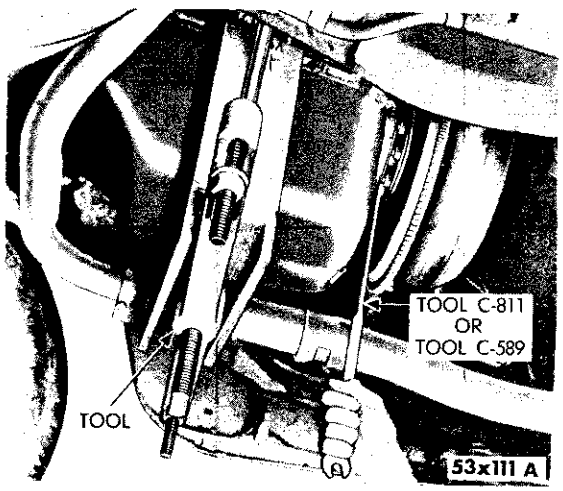


Fig. 147—Removing or Installing Torque Converter Mounting Stud Nuts

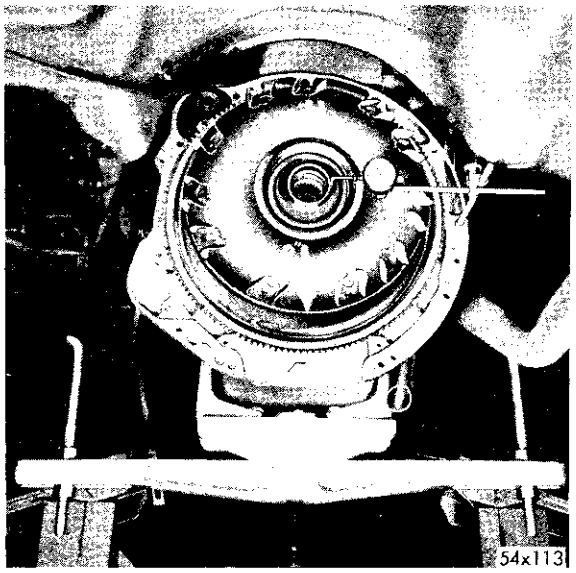


Fig. 148—Checking Torque Converter Runout

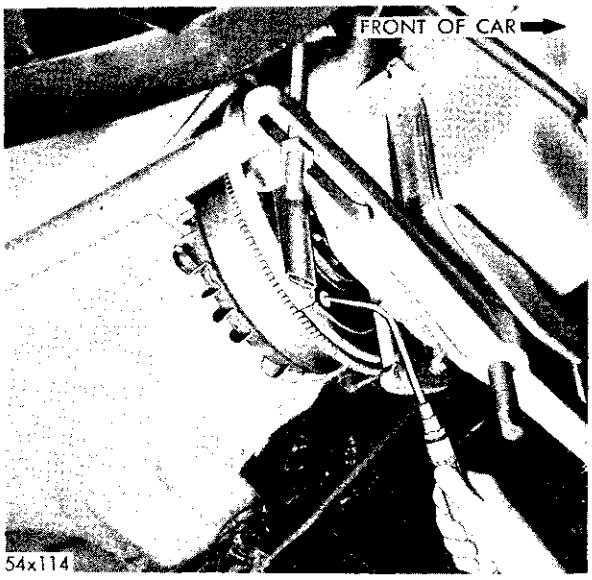


Fig. 149—Correcting Torque Converter with Heat

mine the converter hub O.D. runout. If this exceeds .004 inch total indicator reading, correct by using heat in following manner: Before using heat, make definitely sure the torque converter has been drained.

Mark position of hub low spot as accurately as possible on impeller shell. Rotate the converter so this mark is directly down. Remove dust shield from front of adapter plate. Using chalk, mark front cover radius directly opposite hub low spot previously marked on impeller shell. The subsequent heating operation can now be done through opening in adapter plate, as shown in Figure 149.

The size of spot to be heated is governed by magnitude of hub runout and is usually about ½ inch diameter for .008 inch total indicator reading. Using an acetylene torch containing a No. 3 tip, and set to maximum heat, apply it to the selected spot until it becomes a dull red. Rapid heating of a local area is essential and if torch is adjusted properly, the spot will become red within a few seconds. If sparks are noted, it is an indication that torch is too close and metal is starting to burn; move back slightly. **Care should be taken to remove the torch the instant selected spot becomes a dull red to avoid over correction or damage to unit.**

The area is then quenched (as rapidly as possible) with cold water (hose or wet rags). It is suggested this be done by starting around the heated area and working in toward the spot. This prevents the heat from spreading. The hub runout should not be rechecked until converter has returned to a uniform room temperature. If converter hub runout exceeds .016 inch total indicator reading, remove converter and recheck drive flanges for raised metal chips, etc. Check crankshaft flange runout (maximum .002 inch). If hub runout remains in excess of .016 inch total indicator reading, install a new converter.

148. REPLACING STARTER RING GEAR ON TORQUE CONVERTER

a. Removal

Support the torque converter assembly in a vise and with a file carefully remove the staking lugs which retain the ring gear to torque

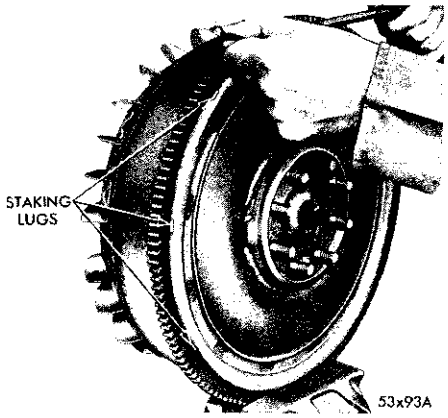


Fig. 150—Removal of Staking Lugs from Torque Converter

converter, as shown in Figure 150. Be careful to avoid distortion when supporting torque converter in vise.

Place torque converter on blocks of wood (for support) while removing gear. Using a blunt chisel, or drift, tap around ring gear until it comes off torque converter, (Fig. 151).

b. Installation

Remove burrs or raised spots (left on the gear contact surface of torque converter) with a file. Do not remove more metal from converter than is required to remove burrs and rough surfaces. Any of the following methods may be used to heat the starter ring gear for installation on converter:

Oven—Use Oven C-794 and set temperature at 150 degrees F. Allow ring gear to remain in oven for approximately 15 to 20 minutes.

Boiling Water—Place ring gear in a shallow container, add water, and heat for approximately eight minutes after water has come to a boil.

Steam—Place ring gear on a flat surface and direct the steam flow around the gear for approximately two minutes.

Flame—Place ring gear squarely on a flat surface. Using a medium-size tip, direct a slow flame around the inner rim of the gear, being careful not to direct the flame onto teeth of ring gear. Place a few drops of water on face of gear at intervals during heating process. When gear is hot enough to boil drop of water, installation of gear to torque converter can be made.

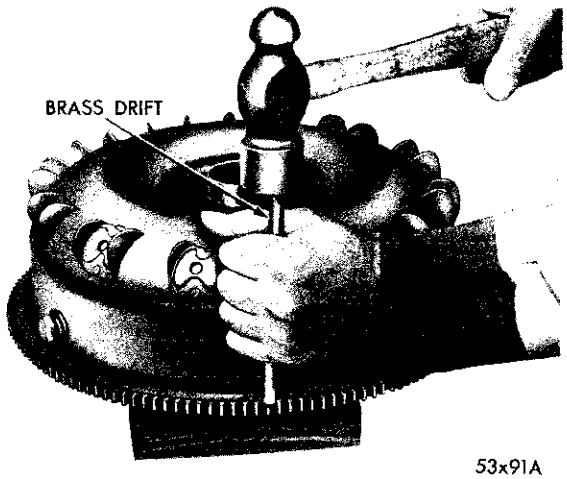


Fig. 151—Removing Starter Ring Gear

Place starter gear over flange surface of torque converter, making sure that the rear face of gear contacts flange on torque converter evenly around the entire diameter. Reweld ring gear to torque converter, using extreme care to place as nearly as possible, the same amount of metal in exactly the same location as original assembly. This is necessary in order to maintain proper balance of unit. Place welds alternately on opposite sides of the converter to minimize distortion.

The following suggestions are offered as an aid in making the weld:

a. Use a welding current of 200 amps.

b. Use a D.C. welder that is set straight polarity or an A.C. welder.

c. Use a $\frac{5}{32}$ inch diameter, No. 47 or a $\frac{5}{32}$ inch diameter No. W2B (or their equivalent). To prevent burning through the torque converter, the arc should be directed at the intersection of gear and housing from an angle of approximately 45 degrees from face of gear. **DO NOT GAS WELD.**

Before installing the torque converter, inspect all gear teeth and remove all nicks where metal is raised, welding splatter, etc., as these will cause noisy starter operation.

149. INSTALLATION OF TORQUE CONVERTER

Inspect mating surfaces on torque converter and crankshaft flange for burrs and dirt. Install torque converter on crankshaft. Install eight torque converter stud nuts and lockwashers. Draw down evenly and tighten, as shown in Figure 147.

When torque converter assembly is removed from crankshaft drive flange for any reason, the converter assembly runout should be checked when reinstalled. Runout should not exceed .004 inch total indicator reading. Refer to "Correcting Hub Runout," Paragraph 147.

Place torque converter housing over dowels and into position against adapter. Install torque converter housing to adapter screws and lockwashers, draw down evenly and tighten to 30 foot-pounds torque. Install transmission if converter housing bore and face runout are within limits.

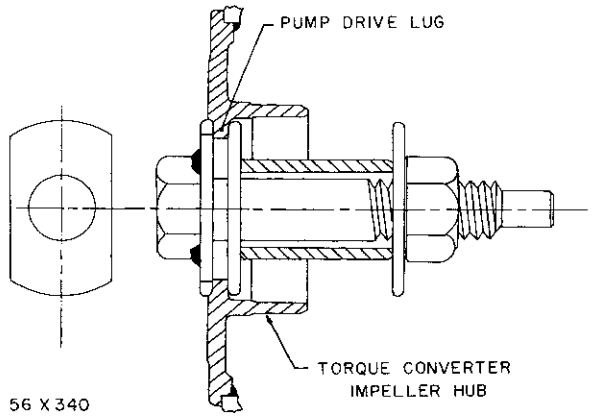


Fig. 152—Tool C-3461 Installed in Torque Converter Hub

150. CORRECTING TORQUE CONVERTER HOUSING BORE AND FACE RUNOUT

a. Torque Converter Housing Bore Runout

Mount Tool C-3461, as shown in Figure 152, inside converter with ears of washer behind converter pump drive lugs. The square end of bolt can be held with a wrench as nut is tightened. Dial indicator set, Tool C-3339 can now be attached to square end of bolt, as shown in Figure 153.

Locate indicator so that it is bearing on transmission pilot bore of converter housing and rotate the converter as outlined previously.

If bore runout exceeds .010 total indicator reading, the following procedures illustrate a correction made possible by selecting a pair (same part number) of following three dowels.

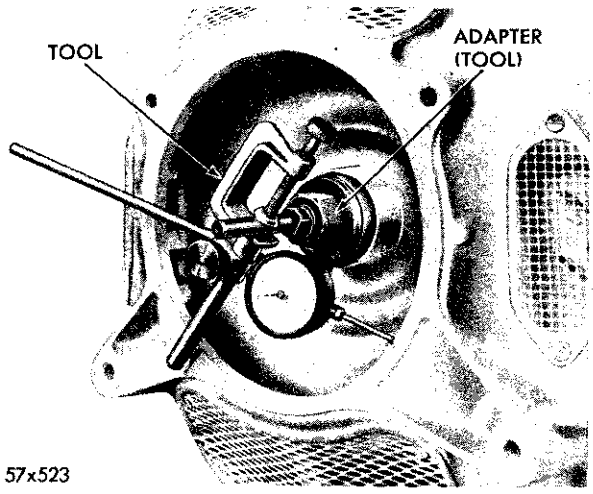


Fig. 153—Gauge Installed for Indicating Bore Runout

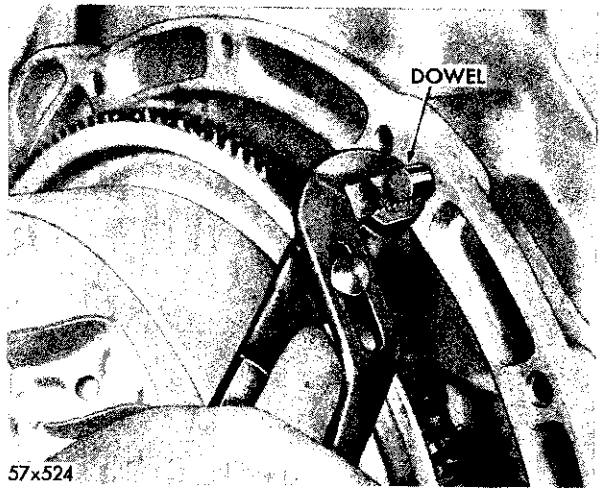


Fig. 154—Removing Dowel

Part No.	Eccentricity
1736347	.007″
1736348	.014″
1736353	.021″

Determine amount and direction of bore runout. Loosen intake manifold bolt which holds throttle linkage bracket in position. Before proceeding further, it is essential that the torque converter impeller hub runout be within .004 inch total indicator reading. Correct if necessary.

Remove two dowel pins from adapter plate that align housing. Removal can be made with "vise-grips" and prying with screw driver or using "special" pliers, as shown in Figure 154.

Select eccentric dowels (pair) .007 inch (No. 1736347), .014 inch (No. 1736348), or .021 inch (No. 1736353) (consult chart for dowel to use in relation to total indicator reading) and install both dowels with slots parallel and aligned in direction to correct bore runout.

(Refer to Figure 155 for examples). (Slot indicates the direction of maximum dowel eccentricity). Majority of corrections will be for one direction only; but it is possible that housing bore may be out in two directions. In latter case, it may be necessary to use the next higher step dowel, adjusting these dowels with housing installed to bring within tolerance.

NOTE: Care should be taken to back-up adapter plate when inserting lower dowel to avoid distortion or breakage or adapter plate. Both

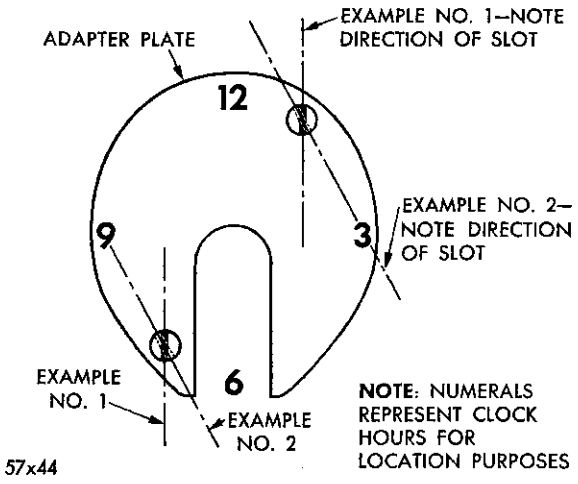


Fig. 155—Orientation Diagram—Positioning Eccentric Dowels

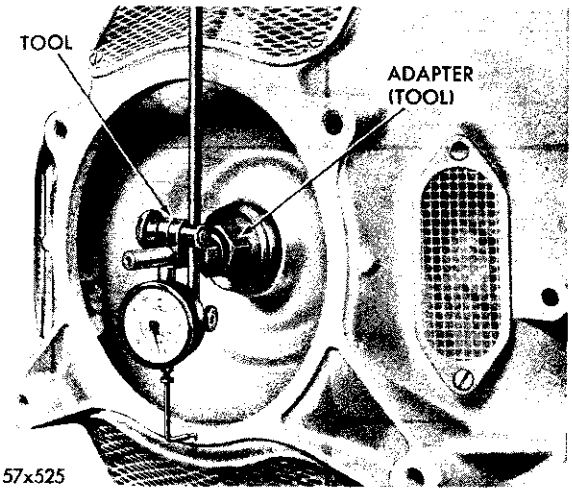


Fig. 156—Gauge Installed for Indicating Face Runout

dowels should be inserted into adapter plate up to off-set shoulder.

b. Example No. 1

Housing Bore in relation to crankshaft centerline is high .010 inch for total indicator reading of .020 inch. Readings are as follows: 12 o'clock—0 inch, 3 o' clock—.005 inch, 6 o'clock —.030 inch, 9 o'clock—.020 inch. Vertical and horizontal adjustment is necessary. Dowels should be inserted into adapter plate on an angle corresponding to direction of housing bore centerline and crankshaft centerline. Use extreme care in selecting the dowel to be used to correct runout in two directions.

Install housing making sure mating faces are clean and free from dirt and nicks. Tighten bolts. Check bore concentricity; if necessary, loosen bolts and adjust alignment of dowels to give a reading within .010 inch total indicator

ECCENTRIC DOWEL CHART

Total Indicator Reading	Amount Off Center	Dowel To Be Used	Part No.
.012	.006	.007	1736347
.014	.007	.007	"
.016	.008	.007	"
.018	.009	.007	"
.020	.010	.007	1736348
.022	.011	.014	"
.024	.012	.014	"
.026	.013	.014	"
.028	.014	.014	"
.030	.015	.014	"
.032	.016	.014	"
.034	.017	.014	"
.036	.018	.021	1736353
.038	.019	.021	"
.040	.020	.021	"
.042	.021	.021	"
.044	.022	.021	"
.046	.023	.021	"
.048	.024	.021	"
.050	.025	.021	"
.052	.026	.021	"

reading. If the housing bore runout is found to be over .052 inch total indicator reading, install a new housing and recheck. If runout still remains over .052 inch total indicator reading, remove housing and install a new adapter plate (with the old housing) repeating the bore check. In these procedures always check for any imbedded particles or dirt on mating faces. If excessive force is needed to install housing on dowels, recheck to be sure dowel "off-set" is in same direction and that slots in dowel ends are running parallel.

151. TORQUE CONVERTER HOUSING FACING RUNOUT

Locate the indicator so that it is bearing on rear face of converter housing, as shown in Figure 156, and rotate converter as outlined previously. If total indicator reading is greater than .008 inch note the amount of total indicator reading and location of lowest indicator reading (i.e., the point where the indicator arm or follower is extended the furthest). Place shim on one or more of transmission to housing bolts in position between transmission and housing. For correct location and thickness of shim, consult the following table:

SHIM THICKNESS TABLE

Location of Housing Face Low Point	Location of Shim	Total Indicator Reading Observed on Housing Face	Total Shim Thickness
Near one of the lower trans. to housing bolt holes.	Place shim on bolt which will enter this hole.	1) .005 to .010″ 2) .010 to .015″ 3) .015 to .020″	1) .013″ 2) .020″ 3) .026″
Near one of the upper trans. to housing bolt holes.	Place shim on bolt which will enter this hole.	1) .005 to .010″ 2) .010 to .015″ 3) .015 to .020″	1) .014″ 2) .021″ 3) .029″
Between the two lower trans. to housing bolt holes.	Place shims on both bolts which will enter these holes.	1) .005 to .010″ 2) .010 to .015″ 3) .015 to .020″	1) .010″ 2) .015″ 3) .020″
Between the two upper trans. to housing bolt holes.	Place shims on both bolts which will enter these holes.	1) .005 to .010″ 2) .010 to .015″ 3) .015 to .020″	1) .003″ 2) .012″ 3) .016″
Between the upper and lower trans. to housing bolt holes.	Place shims on both bolts which will enter these holes.	1) .005 to .010″ 2) .010 to .015″ 3) .015 to .020″	1) upper .010″ lower .014″ 2) upper .015″ lower .020″ 3) upper .020″ lower .027″

Part Number	Thickness
1610442	.002″
1610443	.003″
1610444	.005″

The above shims, when used in combination, will satisfy any of the required shim thickness listed in the table. **Before reinstalling transmission, check for any transmission leakage or damaged parts (seals and bushings). In most cases, the torque converter hub oil seal should be replaced. Install transmission and throttle bracket.**