

Fig. 5—Removing Cover

dered shaft and a broken case would most certainly result (Fig. 8).

Countershaft

- (1) Remove countershaft rear bearing retainer.
- (2) Slide countershaft to rear, then up and out of case (Fig. 9).
- (3) Drive countershaft from bearing assembly forward out of transmission case.

DISASSEMBLY OF SUBASSEMBLIES

Mainshaft

- (1) Place mainshaft vertically in soft-jawed vise with front end up.
- (2) Lift 3rd-4th synchronizer and high speed clutch gear off of mainshaft.
- (3) Remove 3rd-speed gear.
- (4) Remove 2nd-speed gear snap ring with snap ring pliers. Lift off thrust washer. The thrust washer must be positioned with the ground surface toward the 2nd-speed gear when the mainshaft is reassembled (Fig. 10).

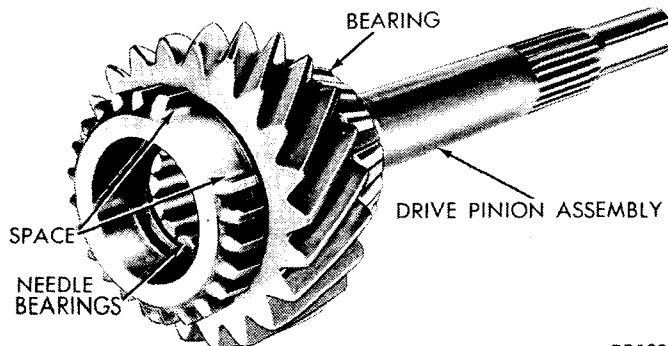


Fig. 6—Drive Gear

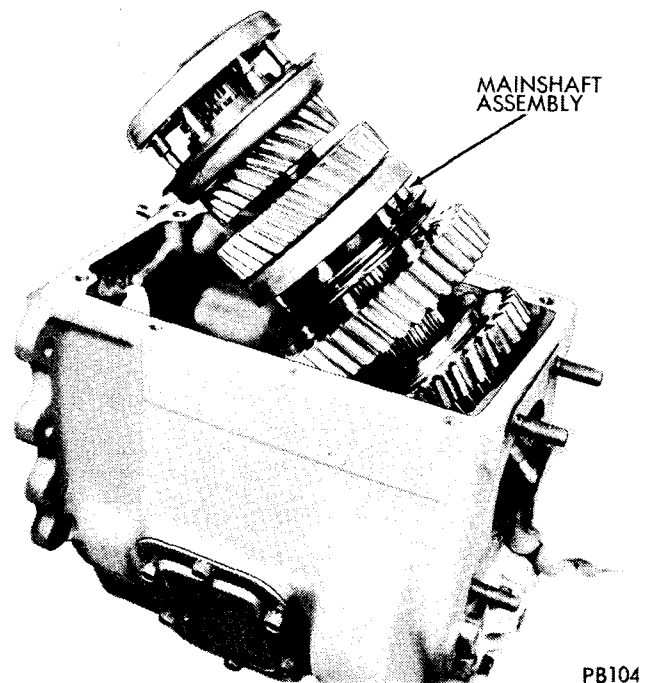


Fig. 7—Removing Mainshaft

- (5) Remove 2nd-speed gear.
- (6) Lift off low-speed synchronizer and clutch gear.
- (7) Reverse Mainshaft in Vise.
- (8) Install appropriate gear puller and remove tapered bearing from rear of mainshaft.
- (10) Remove 1st-speed gear snap ring and thrust washer.
- (11) Lift off 1st-speed gear.

Cover and Shift Fork Assembly (Fig. 11)

The shift cover should be disassembled only if it is necessary to replace a shift fork, a shaft or the cover itself.

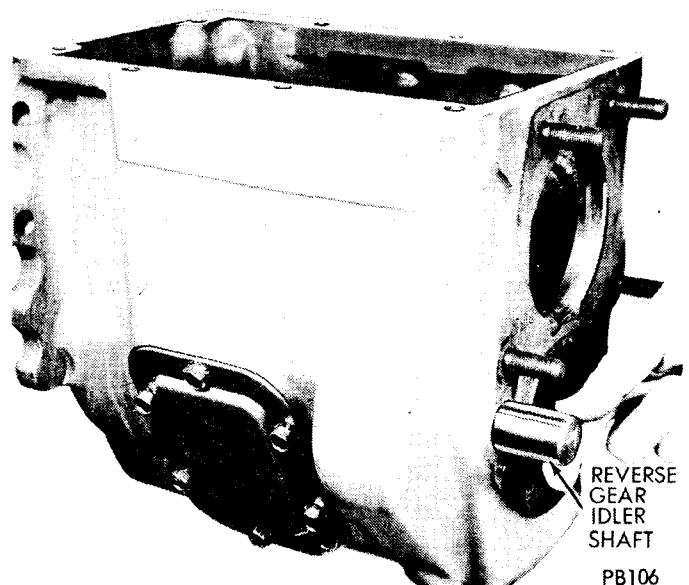


Fig. 8—Removing Reverse Idler Shaft

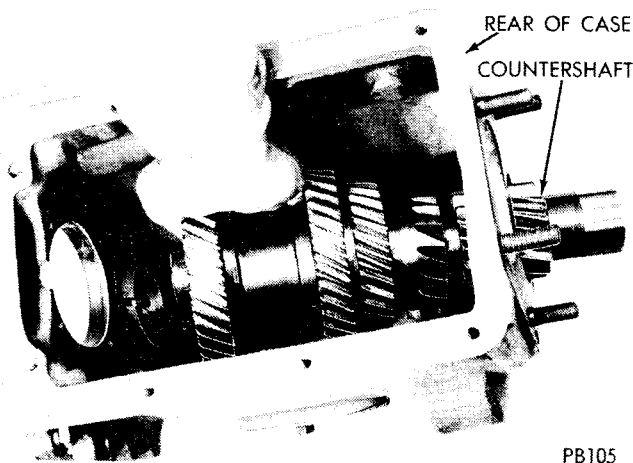


Fig. 9—Removing Countershaft

(1) Remove the roll pin from the 1st-2nd speed shift fork. Use a square-type or spiral wound "easy-out" mounted in a tap handle. Remove roll pin from shift gate in the same manner.

(2) Push 1st-2nd speed shift rail out of the rear of the cover, driving out the expansion plug. Remove shift fork and gate. Be sure to cover detent hole to prevent loss of detent ball and spring.

(3) Remove 3rd-4th speed shift rail in the same manner as in steps 1 and 2.

(4) Compress reverse gear plunger and remove retaining clip. Remove plunger and spring from gate.

TRANSMISSION INSPECTION AND REPAIR

All transmission parts should be carefully checked and inspected prior to re-assembly. All gaskets **must** be replaced. All worn or damaged parts should be replaced also. Maximum service life can be expected

from a reconditioned transmission only if inspection procedures are thorough. The cost of new parts is usually a fraction of the cost of down-time and the additional labor which would be required if questionable parts are used.

The check list below details recommended inspection procedures for transmission components and sub-assemblies.

Bearings: Wash all bearings in clean solvent. Check all rollers and races for wear, pitting and spalled areas. Replace bearings that are worn, pitted or spalled.

Gears: Check operating gear teeth for wear or pitting on tooth faces. All gears with worn or pitted teeth must be replaced.

Check all engaging gear teeth. Gears with teeth which have been shortened or tapered from clashing during gear shifts should be replaced. Check axial gear clearance. If excessive clearance is found, check snap rings, washers, spacers and gear hubs for excessive wear. Proper axial clearance must be maintained on all mainshafts gears.

Splines: Check splines on mainshaft for excessive wear. If sliding gears, clutch hubs or flanges have worn into the sides of the splines, the shafts should be replaced.

Reverse Idler Gear and Shaft: Check shaft, gear and rollers for wear.

Grey Iron Parts: Check all grey iron parts for cracks and fractures. Replace or repair all damaged parts. Castings may be welded or brazed as long as cracks do not extend into bearing bores or bolting surfaces.

Shift Bar Housing (Cover): Check forks and gates for wear at pads and lever slot. Replace worn parts. Check all forks for alignment. Check roll pin fit in forks and gates. Replace all worn roll pins. Check neutral notches of shift shafts for wear from interlock balls. Shafts which are indented at points adjacent to neutral notches should be replaced.

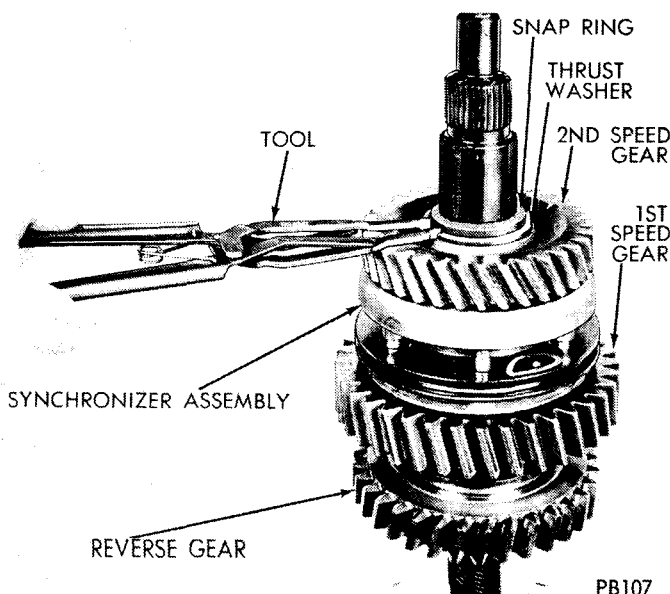


Fig. 10—Removing 2nd Speed Gear Snap Ring

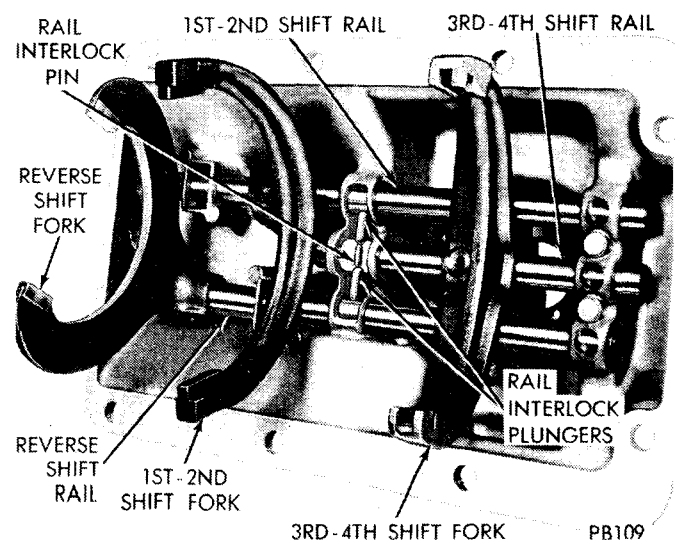


Fig. 11—Cover and Shift Fork Assembly

Synchronizers: Check synchronizers for burrs and for uneven or excessive wear at contact surfaces. Check blocker pins for excessive wear or looseness. Check synchronizer contact surfaces on all affected gears for excessive wear.

After parts have been thoroughly cleaned and carefully inspected, secure replacement parts for all defective components. Clean the transmission housing thoroughly and wipe out all bores and bearing surfaces.

TRANSMISSION REASSEMBLY

Prior to beginning reassembly, lubricate all parts with clean transmission lubricant. During reassembly, replace all expansion, plugs, gaskets and seals.

Mainshaft

(1) Place mainshaft in vertical position in soft-jawed vise, rear end up. Lubricate with transmission oil.

(2) Slide 1st-speed gear over mainshaft, clutch gear down. Install thrust washer and snap ring (Fig. 12).

(3) Slide reverse gear over end of mainshaft, fork groove down.

(4) Install mainshaft rear bearing on mainshaft with sleeve of suitable diameter, Tool C-4040, pressing on bearing inner race.

(5) Reverse mainshaft in vise.

(6) Install low-speed synchronizer.

(7) Slide 2nd-speed gear over mainshaft.

(8) Install keyed thrust washer over mainshaft, ground side toward 2nd gear. Secure with snap ring.

(9) Install 3rd-speed gear and one shim on mainshaft.

(10) Install 3rd-4th synchronizer over mainshaft.

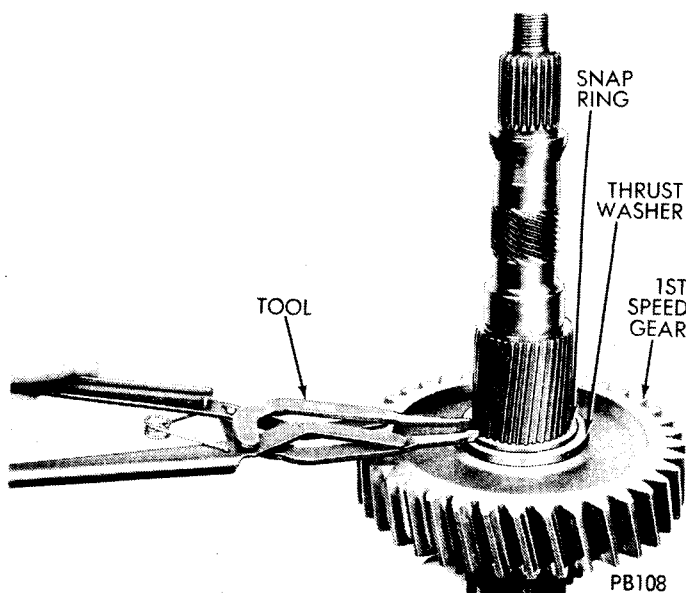


Fig. 12—Installing 1st-Speed Gear Snap Ring

Be sure slotted end of clutch gear is positioned toward 3rd-speed gear.

Transmission Cover (Fig. 11)

(1) Grease interlock slugs and slide into openings in shift rail supports.

(2) Insert reverse shift rail through reverse shift plate and shift fork.

(3) Slide reverse shift rail through reverse shift plate and shift fork.

(4) Secure reverse shift plate and shift fork with roll pin. Install interlock pin in 3rd-4th shift rail. Secure with grease.

(5) Slide 3rd-4th shift rail into rail support from rear of cover. Slide rail through 3rd-4th speed shift fork and over poppet ball and spring.

(6) Secure 3rd-4th speed shift fork to rail with roll pin.

(7) Be sure interlock slug is in place. Slide 1st-2nd speed shift rail into case, through shift fork and shift gate. Hold poppet ball and spring down until shift rail passes.

(8) Secure 1st-2nd speed shift fork and shift gate with roll pins.

SUBASSEMBLY INSTALLATION

(1) Install countershaft front bearing in case using 1-3/8 inch socket as driver. Grease needle bearings prior to installation. Hold bearings in place in bearing retainer with socket of appropriate diameter while seating retainer. Drive retainer in until flush with front of case.

(2) Install tanged thrust washer on countershaft with tangs facing out. Install countershaft in case.

(3) Install countershaft rear bearing retainer over countershaft rear bearing. Use new washer and position retainer with curved segment toward bottom of case.

(4) Install reverse idler gear with chamfer to rear of case. Hold thrust washers and needle bearing in position.

(5) Slide reverse idler shaft into case and through idler gear. Be sure shaft lock notch is down and at rear of shaft.

(6) Install shaft lock and bolt.

(7) Place the mainshaft vertical in a soft-jawed vise, front end up.

(8) Mount the drive gear on top of the mainshaft.

(9) Measure the clearance between the high-speed synchronizer and the drive gear with two feeler gauges.

If the clearance is greater than 0.043 inch to 0.053 inch, install synchronizer shims between the third-speed gear and the synchronizer brake drum of the thickness needed to bring clearance within specifications. After required shim thickness has been determined, remove the drive gear from the mainshaft.

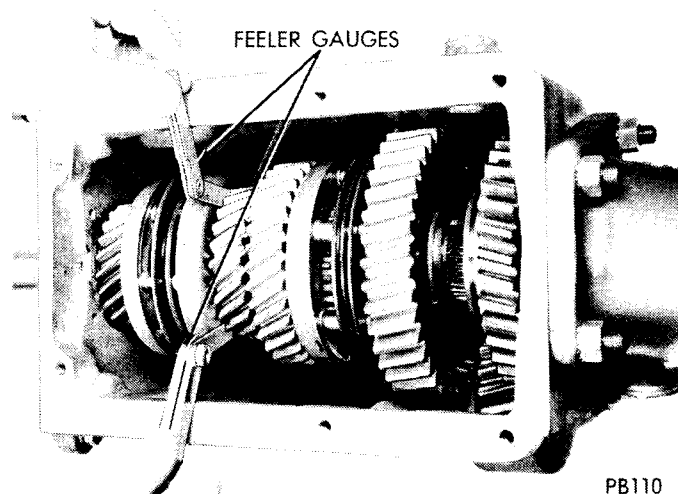


Fig. 13—Measuring End Play Float

(10) Insert assembled mainshaft into case. Place thrust washer over pilot end of mainshaft.

(11) Position the drive gear so that the cutaway portion of the gear is facing down. Slide the drive gear into the front of the case engaging the mainshaft pilot in the pocket of the drive gear.

(12) Slip the drive gear front bearing retainer over the shaft with no gasket or cap screws.

(13) Install mainshaft rear bearing retainer. Tighten bearing retainer bolts as specified.

(14) Hold retainer against front of transmission case and measure clearance between front bearing retainer and front of case with feeler gauge. Remove front bearing retainer.

(15) Install a gasket pack on front bearing retainer which is 0.010 inch to 0.015 inch thicker than the clearance measured in (14) above. Install front bearing retainer and torque bolts as specified. This will insure

the required 0.007 inch to 0.017 inch drive gear end play.

(16) The end play float on the front synchronizer must be checked before installation of the transmission cover assembly. Measure end-play "float" by inserting two feeler gauges diametrically opposite one another between the 3rd speed gear and the synchronizer stop ring. Accurate measurement can be made only after all mainshaft components are in place and tightened to specifications (Fig. 13).

(17) If front synchronizer end play "float" does not fall between 0.050 inch and 0.070 inch, shims should be added or removed as required between the 3rd speed gear and the synchronizer stop ring.

(18) Install yoke and retaining nut on rear of mainshaft. Shift transmission into two gears at once and torque yoke nut to 125 foot-pounds.

(19) Shift transmission into neutral.

(20) Install cover gasket.

(21) Shift transmission into 2nd gear. Shift cover into second gear also.

(22) Carefully lower cover into position. It may be necessary to position reverse gear to permit shift fork to engage groove.

(23) Install cover aligning screws and tighten finger tight.

(24) Install remaining cover screws. Tighten all cover screws to specifications, after cover is seated evenly on gasket.

TRANSMISSION INSTALLATION

(1) Place transmission on transmission jack.

(2) Install transmission.

(3) Install transmission-to-clutch housing bolts.

(4) Install speedometer and back-up light wire.

540-542 FIVE SPEED TRANSMISSION

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GENERAL INFORMATION (Fig. 1, 2)

The New Process Model 540 and 542 five speed transmissions have a direct mounted shift lever and cover. The shift lever retainer is removable by pressing down, rotating the retainer clockwise slightly then releasing. Second through fifth speeds are synchronized, with helical type, constant mesh gears. First and reverse are spur type gears.

Service procedures generally apply to 540 and 542

models except where noted otherwise. A ball bearing supports the main drive pinion. Pilot roller bearings recessed in the main drive pinion support the front end of the main shaft with the rear end supported by a ball bearing.

On the mainshaft use a single piece snap ring in front of the third speed gear. All 540 models use a spring loaded plunger lock pin and washer behind

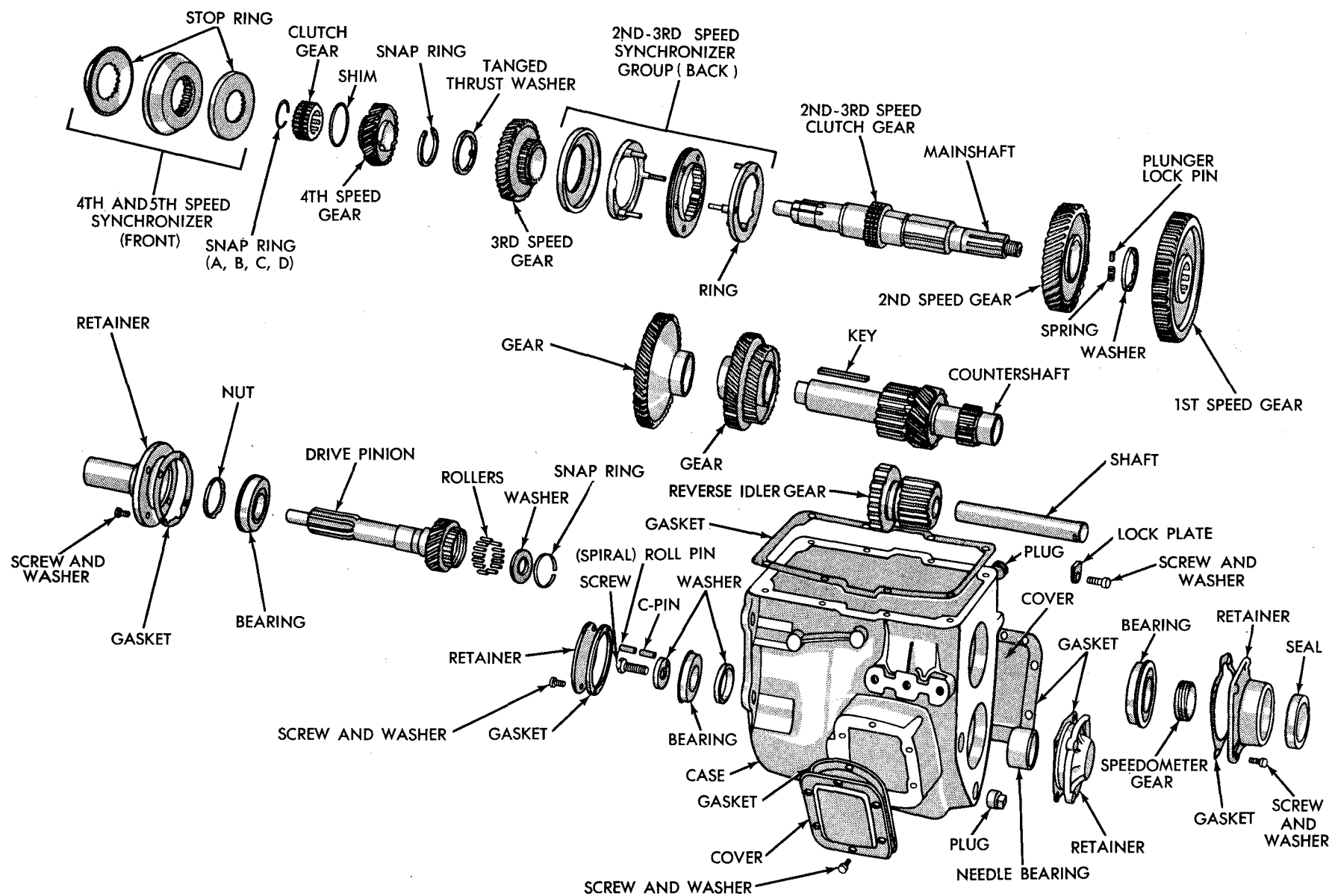


Fig. 1—540 Transmission (Exploded View)

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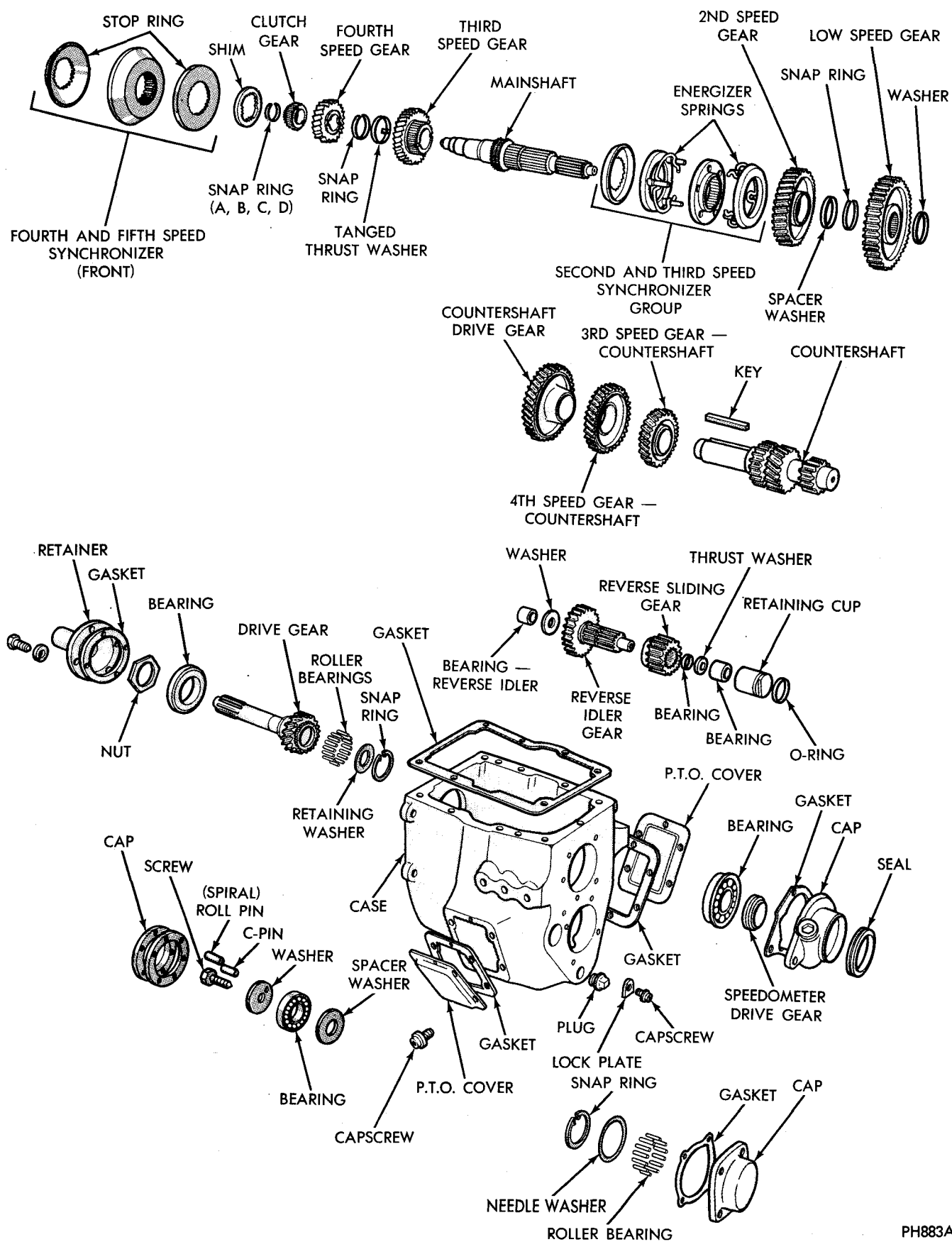


Fig. 2—542 Transmission (Exploded View)

the second speed mainshaft gear. In 542 models a thrust washer and snap ring are used.

Front (fourth and fifth speed) synchronizer is a unit consisting of a sliding clutch gear, energizer springs, floating solid pins with synchronizer cones, serviced as an assembly. Wide flange outer stop rings are separately replaceable. On the 542 model, energizer springs are used in the rear (two-three) synchronizer group.

Countershaft front ball bearing is held on shaft by

retaining washer, C-pin, single bolt and spiral type roll pin inserted in C-pin.

In the 540 model reverse idler turning on a fixed shaft is serviced as an assembly complete with bearings. In the 542 a separate reverse sliding gear is splined to rotating shaft with integral reverse idler gear. Shaft is supported at each end in caged needle bearing serviced separately.

Parking brake drum may or may not be used, depending on the overall braking system.

SERVICE PROCEDURES

REMOVAL OF TRANSMISSION

- (1) Remove gearshift lever, floor mat and floor cover over transmission.
- (2) Disconnect speedometer cable, parking brake cable and propeller shaft. Loosen flange nut.
- (3) Drain lubricant.
- (4) Drop center bearing, if truck is so equipped.
- (5) Place transmission jack under transmission and remove cap screws which hold transmission to clutch housing.
- (6) Pull transmission and transmission jack straight back about 6 inches.
- (7) Then, lower jack slightly.
- (8) Move transmission with jack to the left so the transmission main drive pinion will clear clutch housing.
- (9) Remove unit.

REMOVAL OF SUBASSEMBLIES (Figs. 1 and 2)

Transmission Cover Assembly

- (1) Place transmission in stand, or on bench.
- (2) Use a screw driver (or install gearshift lever) inserted in gearshift lever opening and shift transmission into 2nd speed for 540 and 3rd speed for 542.
- (3) Remove transmission cover screws. Note location of (2) alignment screws (Fig. 3). Alignment screws use split type lockwashers.
- (4) Remove transmission cover by lifting upward while carefully rotating housing counterclockwise, (Fig. 3).
- (5) On the 542 transmission, it may be necessary to move first speed gear back slightly allowing offset curve in shift fork to clear rim of gear.
- (6) Movement of transmission cover, during removal, will usually cause the second-third speed synchronizer assembly to be rotated into a position which will allow sufficient clearance for the reverse shift fork to be withdrawn. If gear train is so damaged that synchronizer unit is not free to turn, the drive shaft can be slowly rotated by an assistant to place pins in required position, while transmission cover is being removed.

- (7) Lock transmission in two gears and remove output flange nut, with yoke and parking brake drum as an assembly (if used). **The drum and yoke are balanced and unless replacement of parts is required it is recommended that drum and yoke be removed as a unit assembly.**

Mainshaft End-Play Check (Front Synchronizer—Fig. 4)

- (1) Before removal and disassembly of drive pinion and mainshaft **measure end-play** between synchronizer outer stop ring and fourth speed gear. **Record reading for reference during build-up.** Note deviation from ideal .050 to .070 inch allowable end play so that correction shims can be installed during assembly. Thick or thin shims are available as required.

Drive Pinion and Mainshaft Assembly

- (1) Shift transmission into any two gears to lock mainshaft while flange nut is being removed. **If flange nut was not loosened while transmission was in truck, use Wrench Tool 3281.**

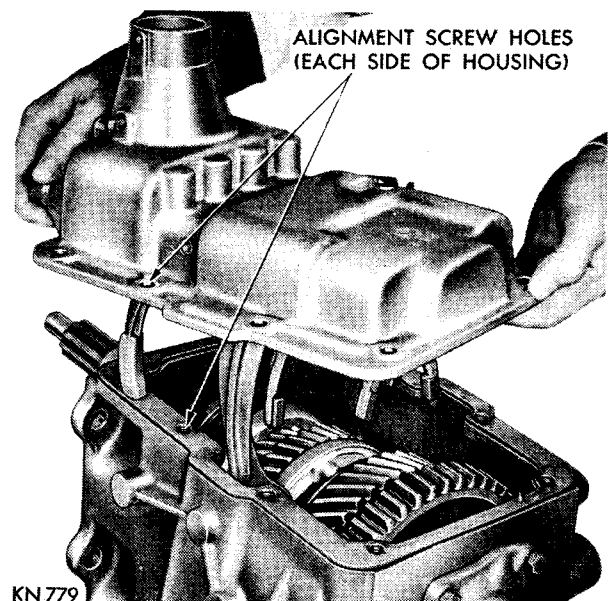


Fig. 3—Removing or Installing Cover

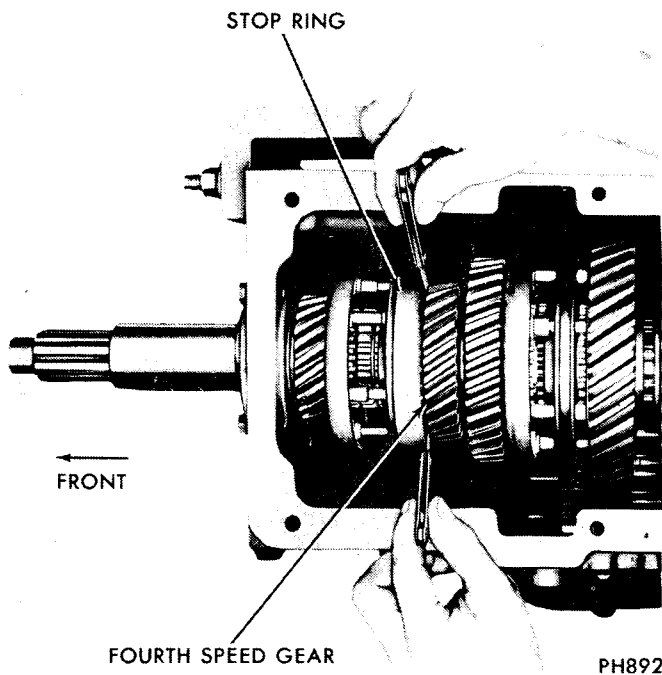


Fig. 4—Checking Synchronizer to Fourth Speed Gear Clearance

(2) Remove brake drum and flange assembly by lightly tapping with a soft hammer.

(3) Remove brake band assembly anchor and support bolts and lockwashers. Remove brake band assembly as a complete unit.

(4) Remove drive pinion bearing retainer.

(5) Withdraw drive pinion assembly from case by pulling on shaft while tapping with a soft hammer.

(6) Remove mainshaft rear bearing retainer.

(7) Remove speedometer drive gear.

(8) Using a brass hammer, carefully tap front end of mainshaft rearward to drive rear bearing from its bore. Pull bearing from mainshaft using a suitable puller.

(9) Remove mainshaft assembly from case by lifting front end upward and drawing entire assembly forward until 1st speed gear can pass through notched areas in transmission case (Fig. 5).

Reverse Idler

(1) Remove reverse idler lock screw and lock plate.

(2) With brass drift held at angle drive idler shaft to rear and pull shaft.

(3) Lift reverse idler gear from case.

(4) On the 542 transmission, push back bearing retainer with needle bearings and radial thrust bearing out back of case, using blunt tool.

On the 542 transmission, the countershaft must be laid in the bottom of the transmission case to facilitate removal of the reverse idler gear.

(5) Remove reverse gear shaft with integral gear, sliding gear and thrust washer.

(6) Push caged front needle bearing out of case.

Countershaft

If excessive side play and end play are not found and teeth are not badly worn or chipped countershaft gears may not require replacement. However, if continued use seems impaired, remove as follows:

(1) Remove countershaft front bearing cover and gasket.

(2) To prevent countershaft from turning, insert hammer handle between gear set and transmission case to form a locking wedge.

(3) Remove spiral roll pin, screw, retaining washer and C-pin.

(4) After first removing rear bearing retainer cap screws, drive against front end of countershaft with a brass drift driving through the front bearing toward the rear, until the countershaft rear bearing and retainer cap comes out of case.

On the 542, the idler gear must be removed before the countershaft can be removed from the transmission case.

(5) Remove bearing and cap from countershaft and lift countershaft from case.

(6) Remove countershaft front bearing from bore in case by tapping outer bearing race from inside of case.

DISASSEMBLY OF SUBASSEMBLIES

Mainshaft

(1) Remove first speed gear from mainshaft.

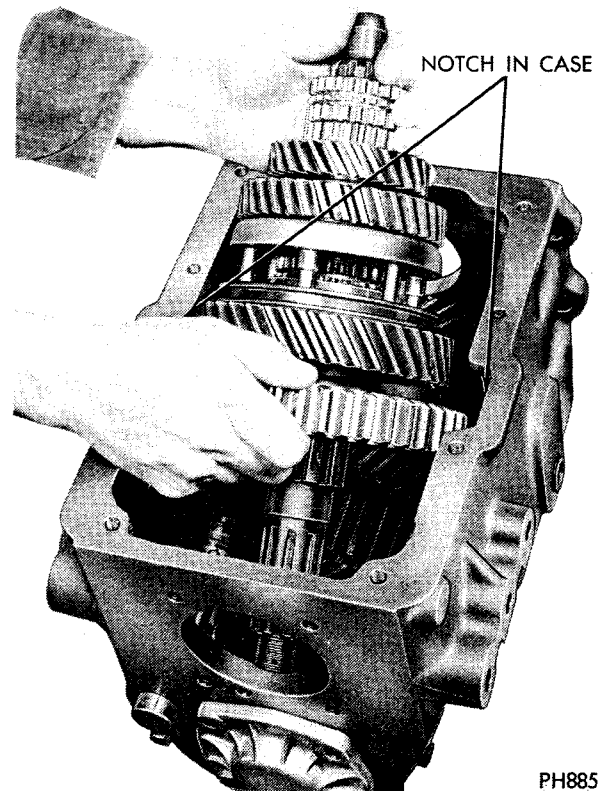


Fig. 5—Removing Mainshaft Assembly

(2) Remove second speed gear by depressing plunger lock, (Fig. 6) and rotating splined thrust washer. Plunger lock is spring loaded—do not lose plunger or spring. On the 542 remove snap ring and thrust washer.

(3) Remove second-third speed synchronizer unit.

(4) Clamp mainshaft in vise equipped with soft jaws and remove fourth and fifth speed synchronizer assembly, clutch gear snap ring (use snap ring pliers), and clutch gear.

(5) Remove fourth speed gear and shim (or shims).

(6) Remove third speed gear snap ring and tapered thrust washer. Remove third speed gear. The second-third speed synchronizer clutch gear is integral with mainshaft.

Drive Pinion

(1) Remove snap ring and washer holding pilot roller bearing in place and remove bearings.

(2) Remove drive gear ball bearing retainer nut and remove ball bearing. Ball bearing retainer nut has left hand threads.

(3) Remove snap ring from drive gear ball bearing.

(4) Remove seal from drive gear bearing retainer.

Countershaft

During disassembly operations, it is usually not

necessary to disassemble the countershaft assembly; however, if inspection, damage or malfunction warrants disassembly, proceed as follows:

(1) Place assembly in a suitable arbor press with blocks supporting the third speed gear and carefully press shaft out.

(2) Remove one key.

Cover and Shift Forks

Cover and shift forks should be disassembled only if rails, poppets or interlock plungers are worn or springs broken allowing end play or simultaneous movement of rails, and if shift forks or cover itself need replacing. Observe these parts for wear as disassembly takes place.

(1) Mount the cover in a bench fixture or soft-jawed vise. Mark each fork and rail for location at assembly (Fig. 7). Shift all the shifter rails into neutral position.

(2) Remove roll pins from shifter forks and rail ends. Roll pins may be removed by using a square type "easyout" installed in a tap handle or improvised holder.

(3) Drive fourth-fifth speed shift rails forward and out front of transmission cover, then, remaining center (second-third) rail. Place a cloth over shift rail while driving out, to prevent loss of interlock balls, pins and springs.

(4) Drive out reverse and first speed rails.

(5) Remove six interlock balls and two interlock pins from shift rail support. It may be necessary to shake or tap transmission cover to remove interlock balls and pins.

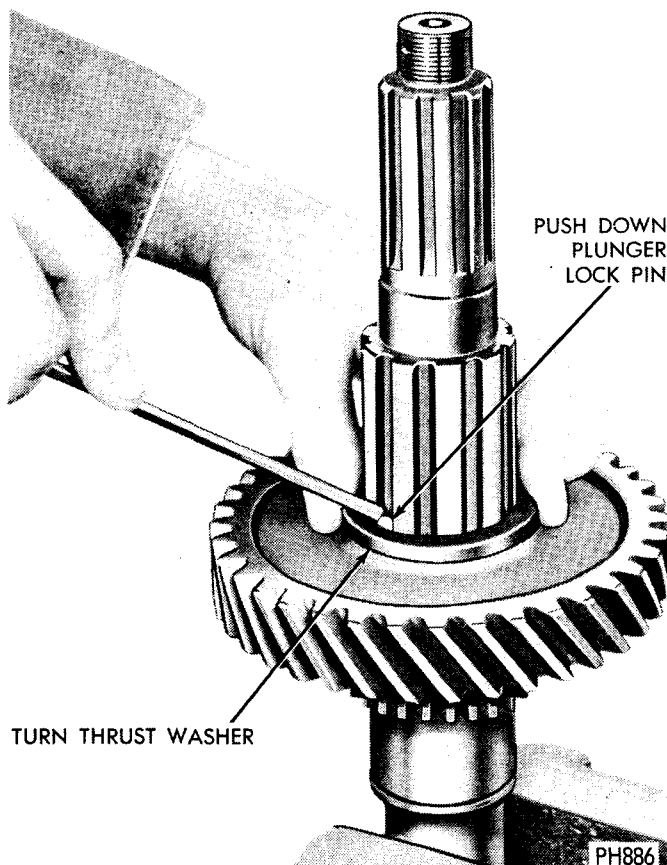


Fig. 6—Removing Second Speed Gear Thrust Washer (540 Mainshaft)

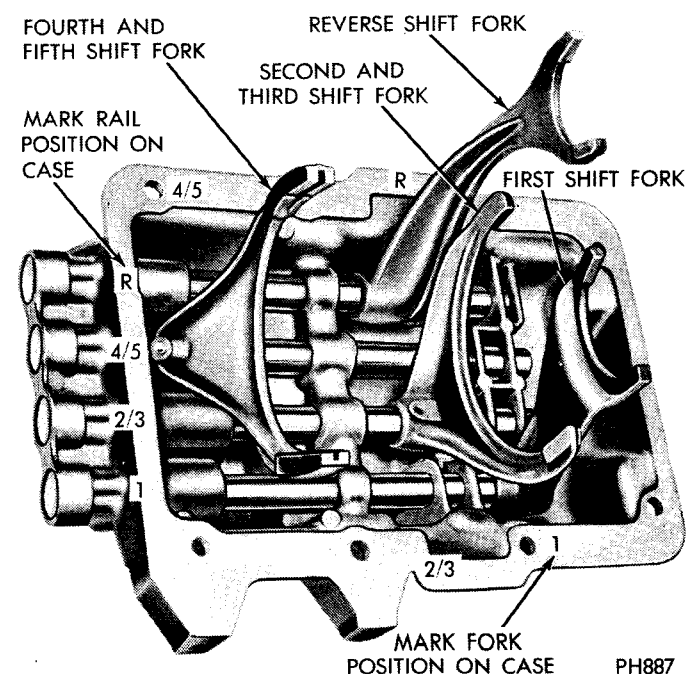


Fig. 7—Transmission Cover

ASSEMBLY OF SUBASSEMBLIES

In performing assembly operations, use new expansion plugs, gaskets and seals. Lubricate all parts with transmission lubricant before assembly. Where grease is specified as an assembly aid in holding parts together, use an oil soluble grease such as Multi-Purpose Grease NLGI Grade 2, or equivalent. Make certain that oil returns are not plugged with grease.

Mainshaft

(1) Place mainshaft (forward end up) in a vise equipped with soft jaws.

(2) Place third speed gear on shaft with clutching teeth facing down. Install 1-piece snap ring and tanged thrust washer (Figs. 1, 2 and 8).

(3) Place fourth speed gear on shaft with clutching teeth up.

(4) Refer to end-play dimension recorded before disassembly and select shims to provide .050 to .070 inch end play between gear and front synchronizer (Fig. 13). Thick and thin shims are available.

(5) Place fourth-fifth speed synchronizer clutch gear (with oil slots down) on mainshaft. Select a snap ring of greatest possible thickness (available in four sizes, marked A,B,C,D) to eliminate all end-play of the clutch gear.

(6) Remove mainshaft from vise and install second-third speed synchronizer group. Synchronizer sleeve is marked "FRONT" for proper installation.

(7) Place second speed gear on shaft. On 540 lock in place by installing plunger spring, plunger and splined thrust washer. Push in plunger, (Fig. 6) and lock the washer by rotating until splines are aligned. On the 542 install thrust washer and snap ring. Place first speed gear on shaft with fork groove facing front end of shaft.

(8) Checking the end play float (.070-.090) at the rear synchronizer (second-third speeds) is mandatory and should be performed during the assembly of the main shaft subassembly. This can be done by using two equal sized feeler gauges diametrically opposite each other between third speed outer stop ring and the third speed gear itself (Fig. 4). Extreme care should be used to make sure that all synchronizer parts are properly assembled and square and the

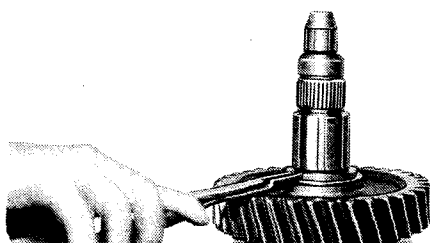


Fig. 8—Removing Third Speed Gear Snap Ring and Tanged Thrust Washer

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gauges are inserted close to the mainshaft and up on the shoulder of third speed gear, otherwise an erroneous reading will result.

(9) In the event the end play float is less than .070 or is more than .090, install new component parts for the assembly of the synchronizer group. **Shims cannot be used at this point.**

Countershaft

If countershaft assembly was disassembled for any reason, reassemble as follows:

(1) Place key in position on shaft.

(2) Press gears on countershaft until properly seated.

(3) Install spacer washer on countershaft drive gear.

Drive Pinion

(1) Grease pilot rollers to hold in place and insert into pocket of drive gear. Install washer and snap ring.

(2) Press large bearing onto shaft. Make sure bearing is properly seated.

(3) Install bearing retainer nut and tighten securely. Nut has a left hand thread. Stake in place.

(4) Install snap ring on large bearing, making sure it is properly seated.

Cover and Shift Forks (Fig. 9)

(1) Drive reverse rail into housing only far enough to install reverse gate, poppet ball and spring. Continue to drive rail through support until reverse fork can be installed, then finish driving in rail. Install welch plug.

(2) Install first speed rail in similar manner.

(3) Place a small quantity of grease on the six interlock balls.

(4) Shift reverse and first speed rails into neutral and install interlock balls in shift rail support.

(5) Install fourth-fifth speed shift rail and fork and second-third speed shift rail, fork and rail end in same manner described in step (1). **Interlock pins must be placed in these two center rails.**

INSTALLATION OF SUBASSEMBLIES

Countershaft

(1) Lay countershaft in bottom of transmission. Be sure spacer washer is still installed in position in front of drive gear.

At this point, the reverse idler gear should be installed on the 542 transmission. Installation of the reverse idler gear on the 540 transmission may be deferred until countershaft installation is complete.

(2) With countershaft front bearing journal protruding through front bearing bore, install front bearing on journal seat against spacer washer. Be sure to keep center line of countershaft aligned with rear

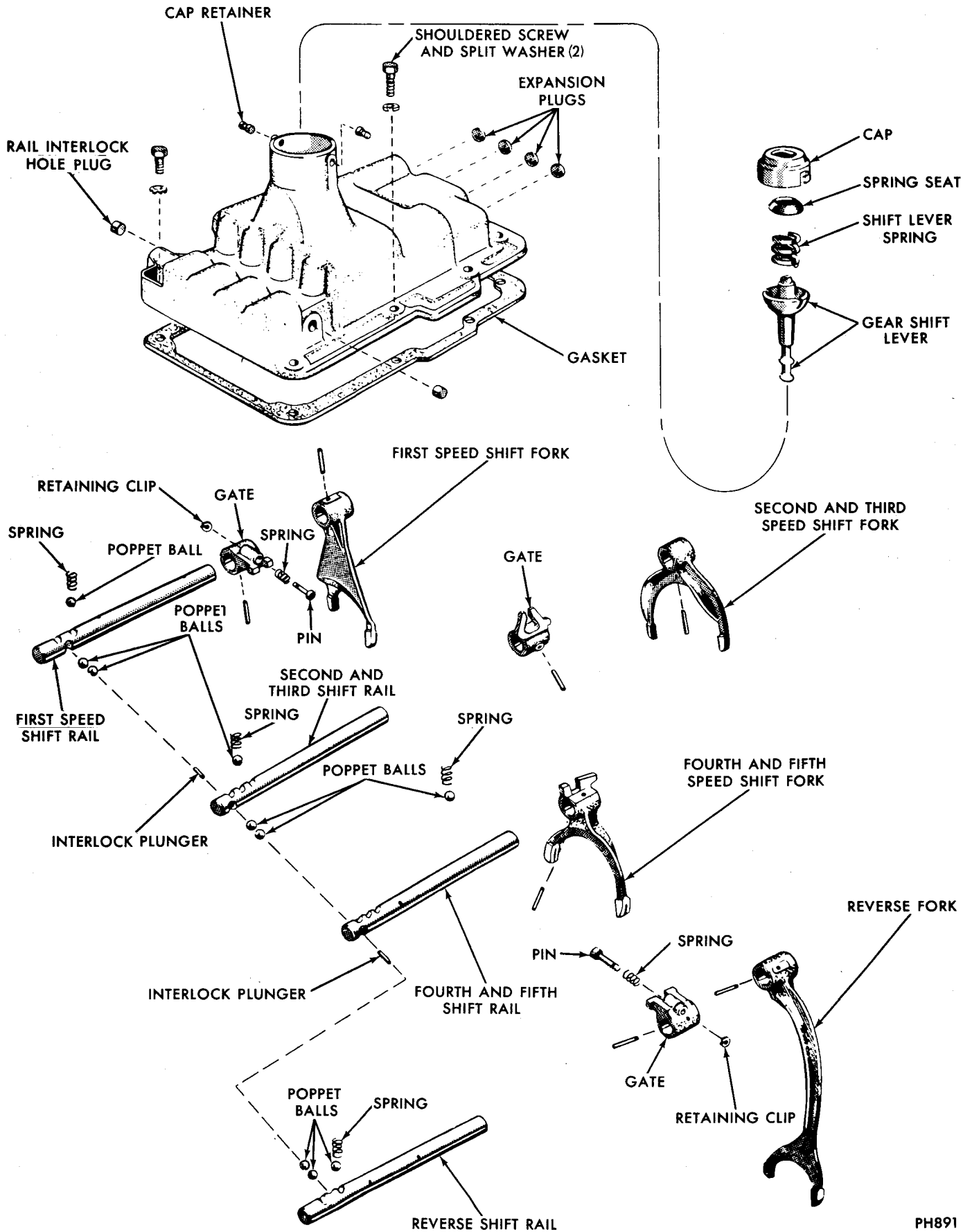


Fig. 9—Cover and Shift Forks (Exploded View)

bearing bore to prevent damage to countershaft front bearing. Install countershaft rear bearing (needle bearing on 540) (roller bearing on 542) gasket and retainer. Tighten retainer screws securely.

(3) Place front bearing retainer washer into position, with large roll pin through it and in corresponding hole in countershaft. Install a 5/8 inch cap screw, tighten to 100-135 foot pounds (Fig. 10). Install smaller spiral lock pin into roll pin leaving lock pin protruding approximately one-half screw head thickness to prevent screw from backing out.

Reverse Idler—540 Transmission

- (1) Place reverse idler gear in position in case.
- (2) Drive shaft through case and gear, using a brass hammer. Make sure lock plate slot in shaft will line up so that lock plate and cap screw can be installed.
- (3) Install lock plate and tighten cap screw securely.

Reverse Idler—542 Transmission

- (1) Drive the reverse idler front bearing into the bore in the transmission case. The end of the front bearing with the thicker wall should be toward the rear of the case. Drive the bearing into the front bore until it is flush with the rear of the bore.
- (2) Place thrust washer, tangs forward, on front of idler shaft.
- (3) Place reverse sliding gear on shaft, shift fork channel forward, followed by radial thrust bearing and thrust washer on small end of shaft. Hold in place with small amount of grease.
- (4) Insert reverse idler gear shaft assembly in front needle bearing. Be sure tangs on thrust washer are seated in slots in case and radial thrust washer and small thrust washer do not drop off.
- (5) Push rear bearing with retainer cup encircled by oiled O-ring into case far enough to install lock plate, washer and cap screw.

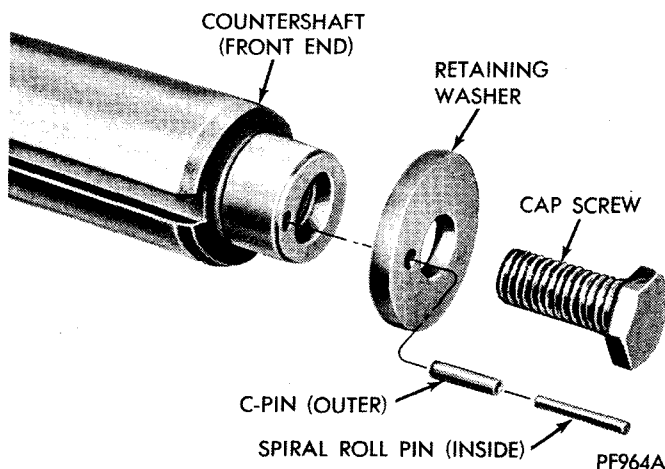


Fig. 10—Countershaft Front Bearing Retainer

(6) Make sure oil hole is fully in view as seen looking down into case, and lock plate is flat against case.

Mainshaft

- (1) Carefully guide first speed gear through relieved areas in case, as rear end of mainshaft is lowered into case (Fig. 5).
- (2) Place a hardwood block at the front of the mainshaft and drive the mainshaft bearing onto the shaft (Fig. 11) and into case.

Drive Pinion

- (1) Install drive pinion by carefully driving on bearing outer race forcing it into case while guiding front end of mainshaft into pilot bearing pocket. Make sure bearing is fully seated.
- (2) Replace retainer oil seal. Press seal into retainer until seal makes contact with its seat. Do not press beyond this point.
- (3) Install bearing retainer and gasket.

Mainshaft Flange

- (1) Install spacer and speedometer gear on output shaft.
- (2) Replace retainer oil seal. Press seal into retainer until seal makes contact with its seat. Do not press beyond this point.
- (3) Place gasket on output shaft bearing retainer, and install retainer on case. Torque bolts to specifications.
- (4) Position universal joint flange and brake drum (if used) on output shaft.
- (5) After shifting transmission into 2 gears at one time, install output shaft nut and torque to specifications.

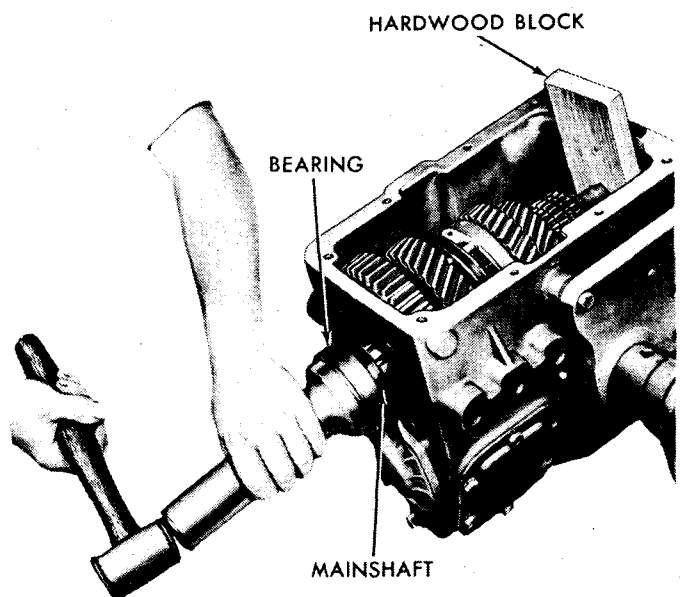


Fig. 11—Installing Mainshaft Rear Bearing

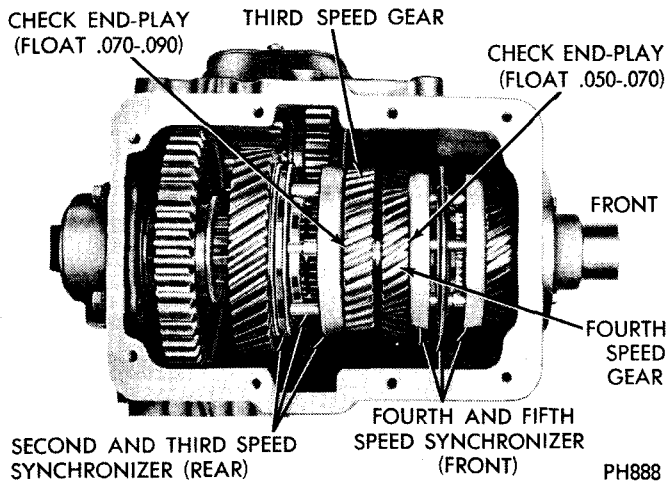


Fig. 12—Typical End Play (Float) Check Points

Front Synchronizer Float (Final Check Fig. 12)

(1) When checking the end play float of (.050-.070) at front synchronizer (fourth-fifth speed), which should be performed just before transmission cover assembly is installed, follow essentially the same procedure as for initial front synchronizer end-play check except that the feeler gauges are placed between the main drive pinion and the outer stop ring. **Correct readings can only be obtained after all main shaft components are properly assembled and tightened to specifications.**

(2) If end-play float does not check within limits (.050 to .070), shims should be removed or added between fourth speed gear and outer stop ring of synchronizer assembly (Fig. 13).

(3) Reassemble with corrective shims and recheck.

Rear Synchronizer Float (Final Check Fig. 12)

(1) After assembly of main case and just before cover assembly is installed verify correctness (.070-.090) of rear synchronizer float.

(2) If not within limits, install corrective new parts as necessary. **Shims cannot be used at this point.**

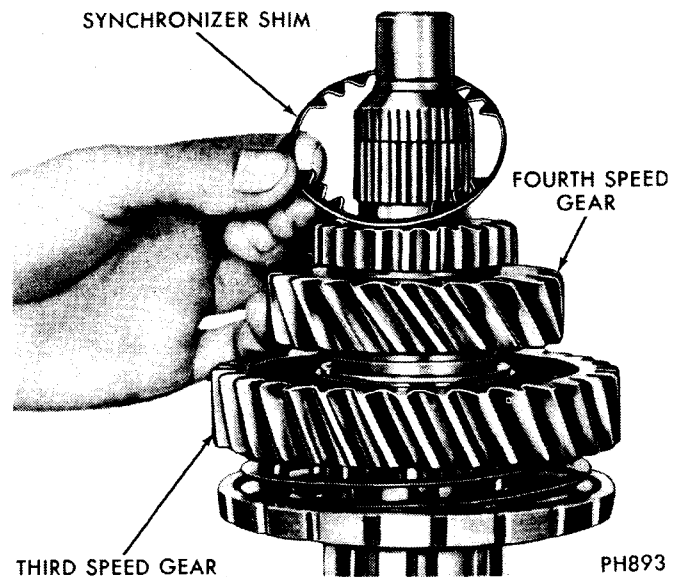


Fig. 13—Typical Shim Placement for End Play Adjustment at Front Synchronizer

Transmission Cover

(1) Place transmission in third gear, rotate second-third speed synchronizer unit until pins are aligned.

(2) Move reverse idler gear forward, then, position housing above case.

(3) Carefully lower cover into position on case while guiding reverse fork through relieved area in case and past synchronizer pins. At this point it may be necessary to move the first speed gear slightly forward (using screw driver) to enable fork to properly engage fork groove on gear.

(4) Install shouldered aligning screws and split lockwashers in second hole from front and tighten thumb tight.

(5) Install remaining screws and tighten all screws securely after cover is properly seated.

(6) Install shift lever temporarily or use bar and verify shifting and function through all gears.

7550-7590 FIVE SPEED TRANSMISSION

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GENERAL INFORMATION (Figs. 1 and 2)

The New Process Model 7500 series five speed transmissions have a direct mounted shift lever and cover. Low, two-piece cover provides short shift lever movement. The shift lever retainer is removable by

pressing down, rotating the retainer counterclockwise slightly then releasing. Second through fifth speeds are synchronized, first and reverse are engaged with a sliding gear clutch. All gears, including first, re-

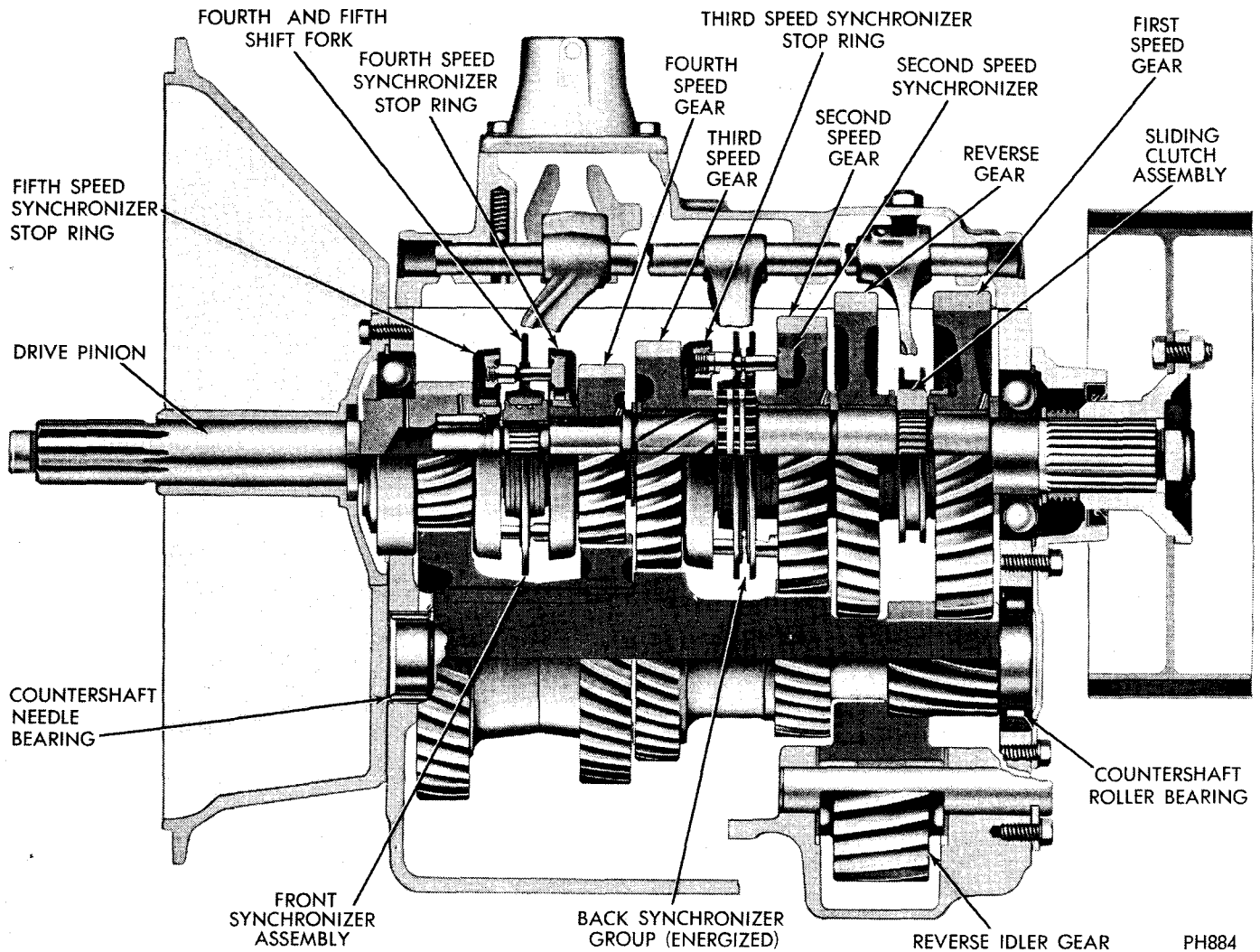


Fig. 1—7500 Five Speed Transmission

verse and reverse idler are helical type constant mesh. Steel backed bronze bushings are used under second, first, and reverse mainshaft gears.

A ball bearing supports the main drive pinion. A pilot needle bearing recessed in the main drive pinion supports the front end of the main shaft with the rear end supported by a ball bearing.

A single piece snap ring with tanged thrust washer is used in front of the third speed gear. Two piece split thrust washer, with pin to prevent rotation on the shaft, is held in place behind the second speed gear by a retaining ring.

Front (fourth-fifth) synchronizer is a unit consisting of a sliding clutch gear, energizer springs, floating solid pins with synchronizer cones, serviced as an assembly. Wide flange outer stop rings are separately replaceable. Back (two-three) synchronizer group uses energizer springs, and can be disassembled. Two-

three clutch gear is integral with mainshaft, while fourth-fifth and first-reverse clutch gears are removable, held in place by a snap ring.

Caged needle bearing pressed into case, with separate thrust washer, supports front of countershaft. Rear end of countershaft is supported by roller bearing held in place in case by retainer and cap screws. Reverse idler, supported on a fixed shaft turns on loose needle bearings in two rows separated by a spacer. A thrust washer on each side controls end-play.

These transmissions will accommodate heavy duty 8-bolt power take-off units on the right side and 6-bolt power take-off units on the left side as may be required for special equipment drive. Drum type parking brake may or may not be used, depending on overall braking system.

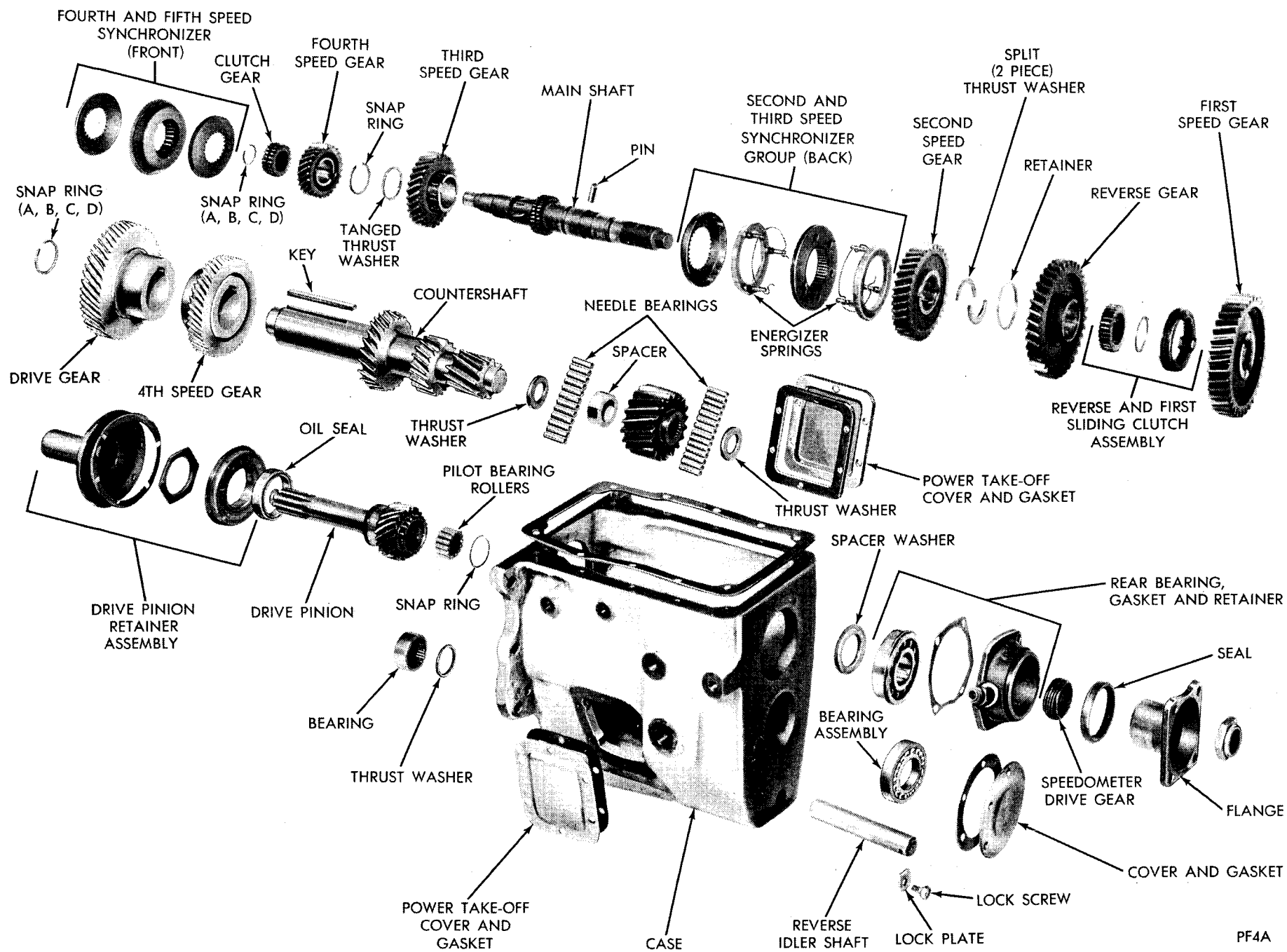


Fig. 2-7500 Five Speed Transmission (Exploded View)

SERVICE PROCEDURES

REMOVAL OF SUBASSEMBLIES

Shift Cover and Parking Brake (Figs. 3 and 4)

(1) Mount transmission in holding fixture. Remove parking brake assembly (if used).

(2) Shift gears into neutral gear by reinstalling gear shift lever temporarily, or using bar or screw

(3) Remove cover screws. (Second screw from front on each side is shouldered with split washer for installation alignment).

(4) Lift cover, turn slightly either way to clear shift forks and remove cover.

(5) Lock transmission in two gears and remove out-put flange nut.

(6) Remove brake drum (if used) and yoke assembly by lightly tapping with a soft hammer. **The drum and yoke are balanced and unless replacement of parts is required it is recommended that drum and yoke be removed as a unit assembly.**

(7) Remove brake band assembly bracket (if used) and support bolts and lock-washers. Remove brake band assembly as a complete unit.

DISASSEMBLY OF SUBASSEMBLIES

End-Play Float Check-Front Synchronizer (Fig. 12)

(1) Before removal and disassembly of drive pinion and mainshaft **measure end-play** between synchronizer outer stop ring and fourth speed gear. **Record reading for reference during build-up.** Note deviation from ideal .050 to .070 inch allowable end play so that correction shims can be installed during assembly. Thick or thin shims are available as required.

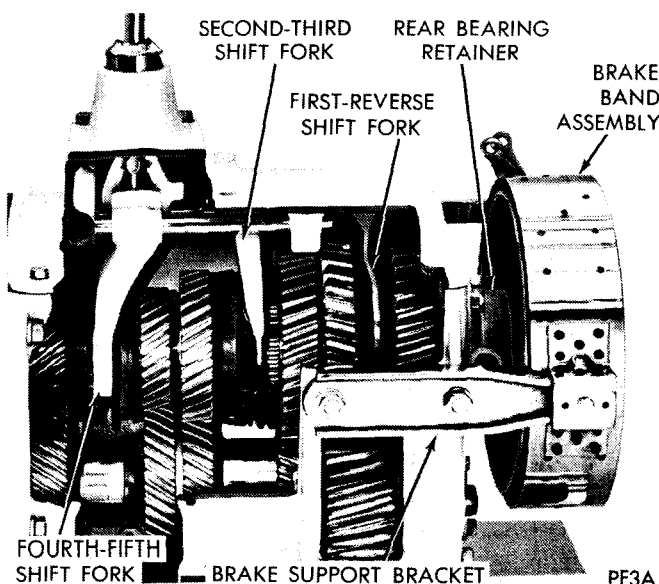


Fig. 3—7500 Five Speed Transmission (Cutaway)

Drive Pinion and Bearing Retainer (Figs. 1 and 2)

(1) Remove drive pinion bearing retainer.

(2) Remove drive pinion gear and ball bearing from transmission. (Pull on pinion shaft, rap face of case with brass hammer).

Mainshaft

(1) Remove speedometer drive pinion, and mainshaft rear bearing retainer.

(2) Place a brass drift in front center of mainshaft and drive mainshaft to rear.

(3) Pull bearing from mainshaft using a suitable puller, or pry out, using two large screwdrivers (Fig. 5).

(4) When mainshaft rear bearing has cleared case, remove rear bearing and speedometer gear with a suitable puller.

(5) Move mainshaft assembly to rear and tilt front of mainshaft up.

(6) Hold first and reverse gear and fourth and fifth speed synchronizer to keep them from sliding off mainshaft while lifting assembly out top of case (Fig. 6).

Reverse Idler (Figs. 1 and 2)

(1) Remove reverse idler lock screw and lock plate.

(2) With brass drift held at angle drive idler shaft to rear and pull shaft.

(3) Lift reverse idler gear and thrust washers from case.

(4) Loose needle bearings are usually replaced with all new needles. **Never mix old with new.**

Countershaft (Figs. 1 and 2)

If excessive side play and end play are not found and teeth are not badly worn or chipped countershaft gears may not require replacement. However, if con-

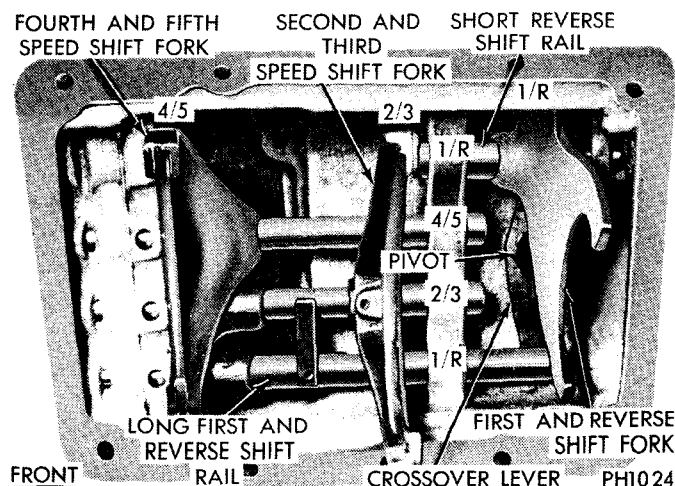


Fig. 4—7500 Cover (Mark Rail and Fork Position)

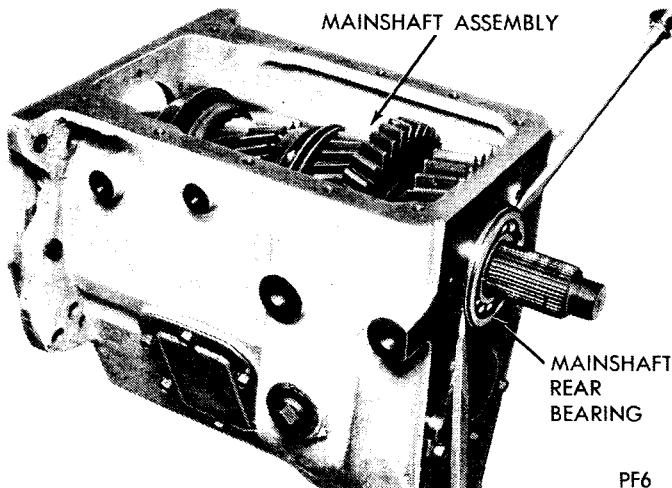


Fig. 5—Removing Rear Bearing from Mainshaft

tinued use seems impaired, remove as follows:

- (1) Remove countershaft rear bearing retainer, gasket and bearing.
- (2) Tip countershaft upward and remove from transmission case. Remove thrust washer from front end of countershaft.
- (3) Remove countershaft front needle bearing from bore in case by tapping on bearing cage from inside of case with suitable driver.

Drive Pinion (Fig. 7)

- (1) Remove snap ring and washer holding pilot needle bearings in place and remove bearings.
- (2) Relieve staked area, remove drive pinion ball bearing retainer nut and remove ball bearing. Ball bearing retainer nut has left hand threads.
- (3) Remove snap ring from drive pinion ball bearing.
- (4) Remove seal from drive pinion bearing retainer.

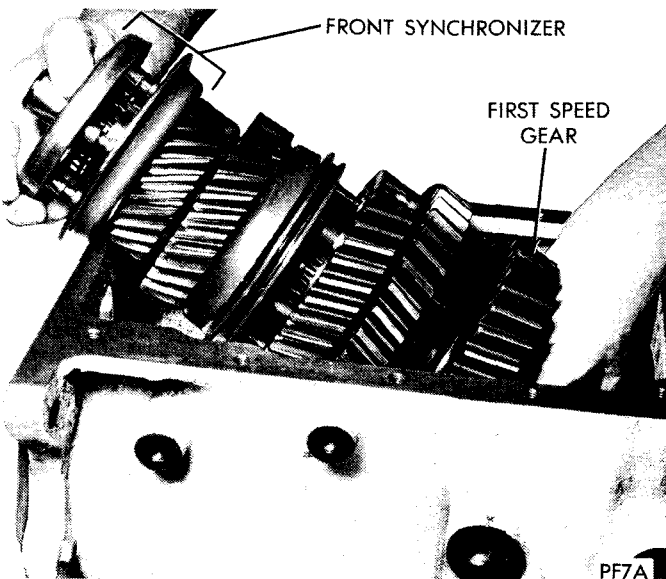


Fig. 6—Installation or Removal—Mainshaft Assembly

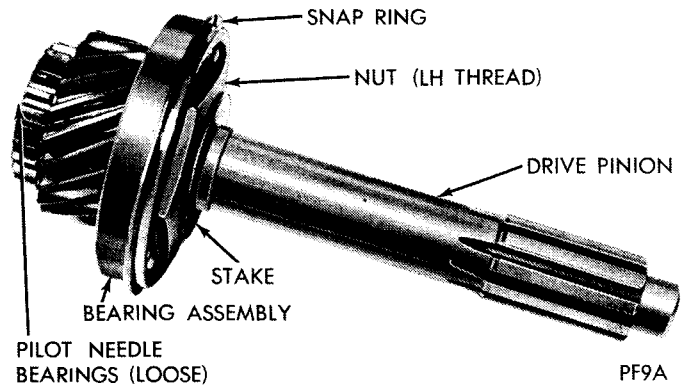


Fig. 7—Drive Pinion Shaft Assembly

Mainshaft (Fig. 8)

- (1) Remove spacer washer and first speed gear from mainshaft.
- (2) Remove retaining ring and first-reverse clutch and clutch gear assembly.
- (3) Remove reverse gear.
- (4) Remove second speed gear (retaining) thrust washer assembly. This two-piece split thrust washer consists of two halves held in position on the mainshaft and prevented from turning by a pin in a hole in the mainshaft, together with a retaining ring.
- (5) Remove second speed gear.
- (6) Remove back (second-third speed) synchronizer assembly. The second-third speed clutch gear is integral with mainshaft.
- (7) Remove snap ring, then remove front (fourth-fifth speed) synchronizer assembly and clutch gear.
- (8) Remove fourth speed gear. Lay aside and hold shim(s), if any.
- (9) Remove retaining snap ring, tanged thrust washer and third speed gear.

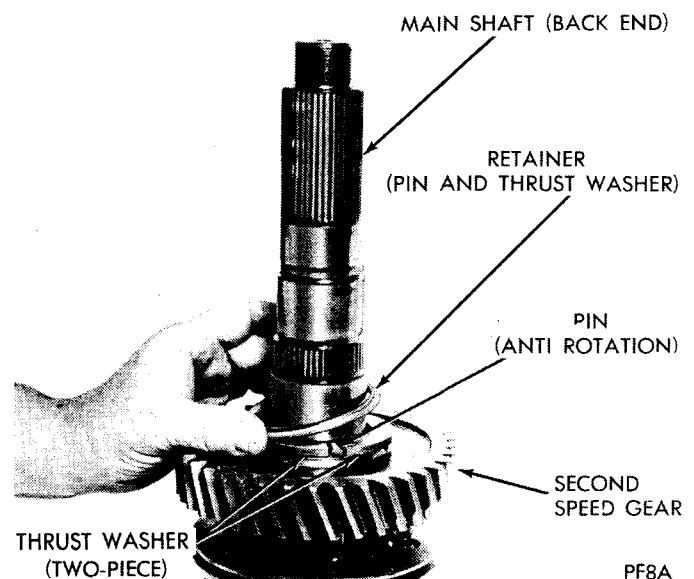


Fig. 8—Installation or Removal Second Speed Gear

Countershaft (Figs. 1 and 2)

During disassembly operations, it is usually unnecessary to disassemble the countershaft assembly; however, if after inspection, damage or malfunctioning warrants disassembly, proceed as follows:

- (1) Remove snap ring.
- (2) Place assembly in a suitable arbor press with blocks supporting the drive gear and carefully press shaft out.
- (3) Repeat the above procedure supporting fourth speed gear.
- (4) Remove key.

Cover and Shift Forks (Fig. 9)

Cover and shift forks should be disassembled only if rails, poppets or interlock plungers are worn or springs broken allowing end play or simultaneous movement of rails, and if shift forks or cover itself needs replacing. Observe these parts for wear as disassembly takes place.

(1) Mount the cover in a bench fixture or soft-jawed vise. Mark each fork and rail for location at assembly (Fig. 4).

(2) Place shift forks and rails in neutral. Remove spiral pins from shift forks and shift lugs. Spiral pins may be removed by using an "easyout" installed in a tap handle or improvised holder.

(3) Drive the short, first-reverse shift rail toward the rear and out of the transmission cover. Remove fork.

(4) Remove first-reverse shift rail pivot bolt and nut; remove crossover lever.

(5) Drive fourth-fifth and second-third speed shift rails forward and out of transmission cover, then remove the first reverse shift rail in the same manner. **Place a shop towel over shift rails while driving the shift rails out, to prevent loss of poppet balls and springs.**

(6) Remove the four interlock balls and pin from the bore through the width of the cover. To make sure the pin and balls are out, shake the cover or jar the cover sharply on a block of wood.

ASSEMBLY OF SUBASSEMBLIES

In performing assembly operations, use new expansion plugs, gaskets and seals. Lubricate all parts with transmission lubricant before assembly. Where grease is specified as an assembly aid in holding parts together, use an oil soluble grease such as Multi-Purpose Grease NLGI Grade 2, or equivalent. Make certain that oil returns are not plugged with grease. After all parts have been cleaned and inspected and all necessary replacement parts have been secured, clean transmission case thoroughly. Wipe out all

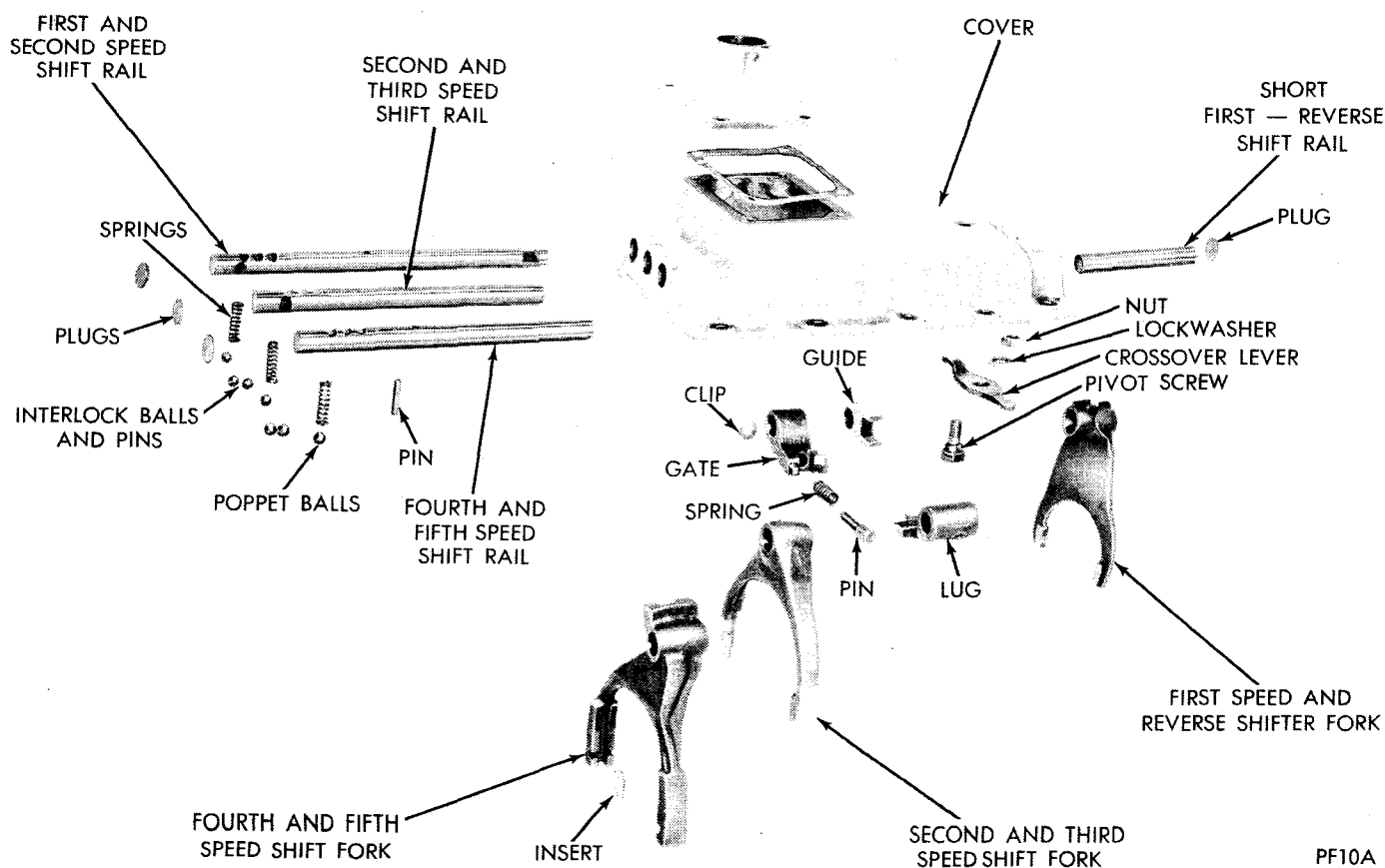


Fig. 9—Cover and Shift Forks

bore and bearing surfaces before beginning reassembly.

Synchronizers Pre-Installation—Check synchronizers for burrs or uneven or excessive wear at threads. Check blocker pins for excessive wear or looseness. Check synchronizer contact surfaces on gears for excessive wear. If no longer considered serviceable replace front (fourth-fifth speed) synchronizer (available only as an assembly) along with outer stop rings. Replace back (second-third speed) synchronizer details as needed for continuing service.

Mainshaft (Figs. 2, 6 and 8)

(1) Place mainshaft (forward end up) in a vise equipped with soft jaws.

(2) Place third speed gear on shaft with clutching teeth facing down. Install tanged thrust washer and one-piece snap ring.

(3) Place fourth speed gear on shaft with clutching teeth up.

(4) Refer to end-play dimension recorded before disassembly and select shims to provide .050 to .070 inch end-play between fourth speed gear and front synchronizer (Fig. 12). Thick and thin shims are available.

(5) Place fourth-fifth speed synchronizer clutch gear (with oil slots down) on mainshaft. Select a snap ring of greatest possible thickness (available in four sizes, marked A,B,C,D) to eliminate all end-play of the clutch gear.

(6) Remove mainshaft from vise and install second-third speed synchronizer group. Synchronizer sleeve is marked "FRONT" for proper installation.

(7) Place second speed gear on shaft.

(8) Place thrust washer retaining pin in hole in mainshaft; position the two thrust washer halves on the mainshaft and install the thrust washer retaining ring, with large diameter contacting second speed gear (Fig. 8).

(9) Install reverse gear.

(10) Position reverse and first speed clutch gear on mainshaft; install retaining snap ring. Select a snap ring of greatest possible thickness (available in four sizes marked A,B,C,D) to eliminate all end-play of the clutch gear.

(11) Position sliding clutch on clutch gear; install first speed gear.

(12) Place spacer washer on mainshaft.

Back Synchronizer Float—During Assembly (Fig. 12)

Checking end-play float (.070-.090) at back synchronizer (second-third speeds) is mandatory and should be performed during assembly of the mainshaft subassembly. This can be done by using two equal sized feeler gauges diametrically opposite to each other between third speed outer stop ring and

the third speed gear itself. Extreme care should be used to make sure that all synchronizer parts are assembled and square and the gauges are inserted close to the mainshaft and up on the shoulder of third speed gear, otherwise an erroneous reading will result.

In the event the end-play float is less than .070 or more than .090 inch, install new component parts for the assembly of the synchronizer. This may also require new gears if thrust faces are too worn. **Shims cannot be used at this point.**

Countershaft (Fig. 2)

If countershaft assembly was disassembled for any reason, reassemble as follows:

(1) Place key in position on shaft.

(2) Press gears on countershaft until properly seated. **Make sure key does not climb out of position as gear is being pressed on.**

(3) Install snap ring on countershaft. Select a snap ring of greatest possible thickness (available in four sizes, marked A,B,C,D) to eliminate possible end-play.

(4) Install washer on countershaft drive gear.

Drive Pinion (Fig. 7)

(1) Grease loose pilot needle bearings to hold in place and insert into pocket of drive gear. Install washer and snap ring.

(2) Press large bearing onto pinion shaft. Make sure bearing is properly seated.

(3) Install bearing retainer nut and tighten securely. Stake in place. **Nut has a left hand thread.**

(4) Install snap ring on large bearing, making sure it is properly seated.

Cover and Shift Forks (Figs. 4 and 9)

(1) Push first-reverse shift rail into cover bore far enough to permit installation of gates, poppet ball springs and roll pins; move shift rail into neutral position.

(2) Place a small quantity of grease on four interlock balls and pin.

(3) Place two balls in interlock bore; move both balls toward shift rail to seat ball in neutral notch.

(4) Grease interlock pin and place it in the hole located in second-third speed shift rail. Install second-third speed shift rail, gate and fork as in step one. Move rail into neutral position.

(5) Install remaining two balls into interlock bore.

(6) Push fourth-fifth speed shift rail into cover bore and install shift fork, as in steps one and four. Move shift rail into neutral position.

(7) Place crossover lever in position in cover in such a manner that short first-reverse shift rail, fork and roll pin can be installed.

(8) Reposition crossover lever to mate in notches in both long and short first-reverse shift rails.

(9) Install pivot bolt through crossover lever and

transmission cover. Install nut and washer and tighten nut.

(10) Install new welch plugs.

INSTALLATION OF SUBASSEMBLIES

Countershaft (Figs. 1 and 2)

Coat all parts with transmission lubricant to prevent scoring when transmission is first operated.

(1) Install front bearing assembly into countershaft bearing bore of case if it was removed.

(2) Grease thrust washer and place it in position in the transmission case.

(3) Install countershaft front bearing journal into front bearing and seat against thrust washer. Be sure to keep centerline of countershaft aligned with rear bearing bore during installation to prevent damage to countershaft front bearing.

(4) Install countershaft rear bearing assembly (roller bearing assembly), gasket, and cover. Tighten screws securely.

(5) Check countershaft for end clearance (.008 to .020 inch specified). Clearance can be adjusted by changing countershaft rear bearing cover gasket.

Reverse Idler (Fig. 10)

(1) With new needle bearings held in place each side of spacer with grease, place reverse idler gear and thrust washers in position in case.

(2) Drive shaft through case and gear using a hammer and a brass drift. Be sure needles stay in place and lock strap slot in shaft will line up so that lock strap, cap and cap screw can be installed.

(3) Install lock strap on shaft and tighten cap screw securely.

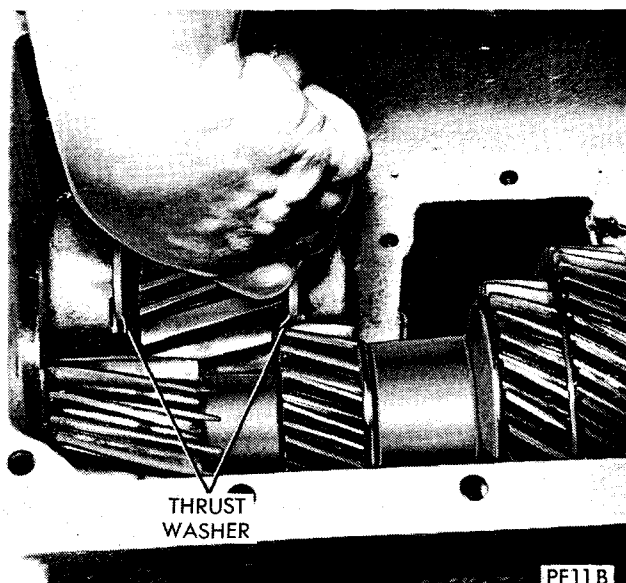


Fig. 10—Reverse Idler Installation

Mainshaft (Figs. 1 and 6)

(1) Carefully lower rear end of mainshaft into case while holding first speed gear and spacer washer from slipping off shaft.

(2) Place a hardwood block at the front of the mainshaft and drive the mainshaft bearing onto the shaft (Fig. 11) and into case.

Drive Pinion (Figs. 1 and 7)

(1) Install drive pinion by carefully driving on bearing outer race forcing it into case while guiding front end of mainshaft into pilot bearing pocket. Make sure bearing is fully seated.

(2) Replace retainer oil seal, pressing seal into retainer until seal makes contact with its seat. Do not press beyond this point.

(3) Install bearing retainer and gasket. Torque retainer screws to specifications.

Mainshaft Flange (Fig. 1)

(1) Install speedometer gear on output shaft.

(2) Replace retainer oil seal, pressing seal into retainer until seal makes contact with its seat. Do not press beyond this point.

(3) Place gasket on output shaft bearing retainer, and install retainer on case. Torque retainer screws to specifications.

(4) Position universal joint flange and brake drum (if used) on output shaft.

(5) After shifting transmission into two gears at one time, install output shaft nut and torque to specifications.

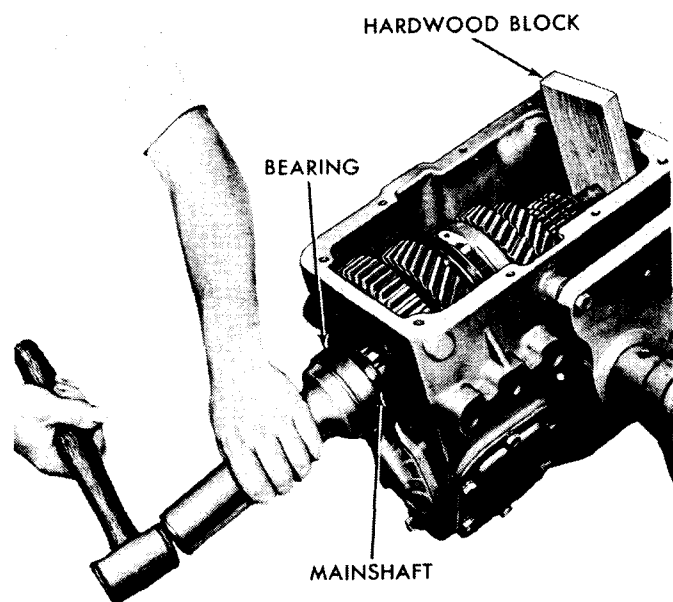


Fig. 11—Installing Mainshaft Rear Bearing

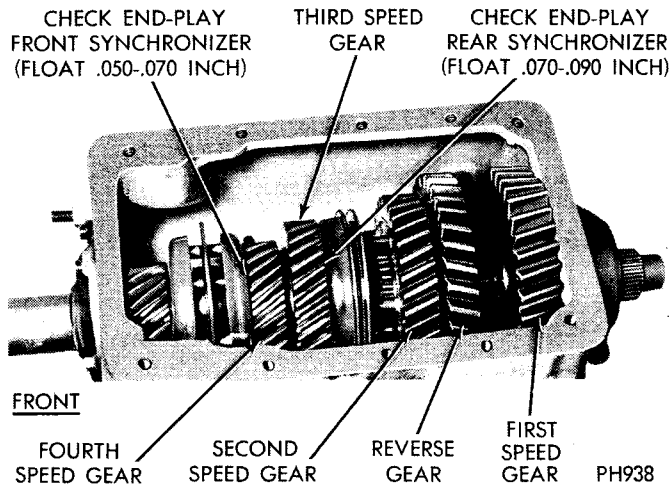


Fig. 12—End Play (Float) Check Points

Front Synchronizer Float—Final Check (Fig. 12)

(1) When checking the end-play float of (.050-.070) at front synchronizer (fourth-fifth speed), which should be performed just before transmission cover assembly is installed, follow essentially the same procedure as for initial back synchronizer end-play check except that the feeler gauges are placed between the fourth speed gear and the outer stop ring. **Correct readings can only be obtained after all main shaft components are properly assembled and tightened to specifications.**

(2) If end-play float does not check within limits (.050 to .070), shims should be removed or added between fourth speed gear and outer stop ring of synchronizer assembly.

(3) Reassemble with corrective shims and recheck.

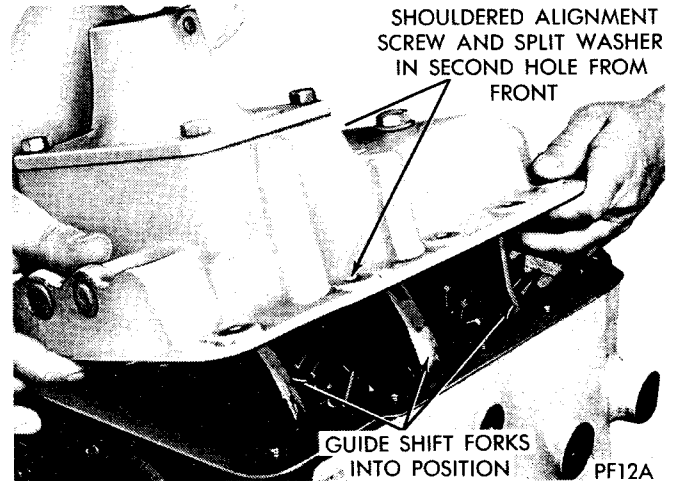


Fig. 13—Cover and Shift Forks Installation

Back Synchronizer Float—Final Check (Fig. 12)

(1) After completing assembly of main case and just before cover assembly is installed verify correctness (.070-.090) of rear synchronizer float.

(2) If not within limits, install corrective new parts as necessary. **Shims cannot be used at this point.**

Transmission Cover (Fig. 13)

(1) Place transmission gears and cover in neutral.

(2) Carefully lower cover into position on case while guiding shift forks into position.

(3) Install shouldered aligning screws and split lockwashers in second hole from front and tighten thumb tight.

(4) Install remaining screws and tighten all screws securely after cover is properly seated.

(5) Install shift lever temporarily or use bar and verify shifting and function through all gears.

203 TRANSFER CASE (W100, W200, and W300)

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GENERAL INFORMATION

The 203 transfer case (Figs. 1, 2, and 3) provides full time four wheel drive. It is a two speed unit which provides speed reduction and transmits power from the transmission to the front drive axle as well as the

rear axle by means of two conventional propeller shafts. This model incorporates a differential unit within the transfer case which allows front and rear axles to remain in continuous drive in normal Hi and

21-72 TRANSMISSION—TRANSFER CASE

Lo positions. When positive front and rear wheel drive is desired the differential action in the transfer case is locked out by moving the control lever to either Hi-

Loc or Lo-Loc position. This causes both propeller shafts to transmit power simultaneously and at the same R.P.M.

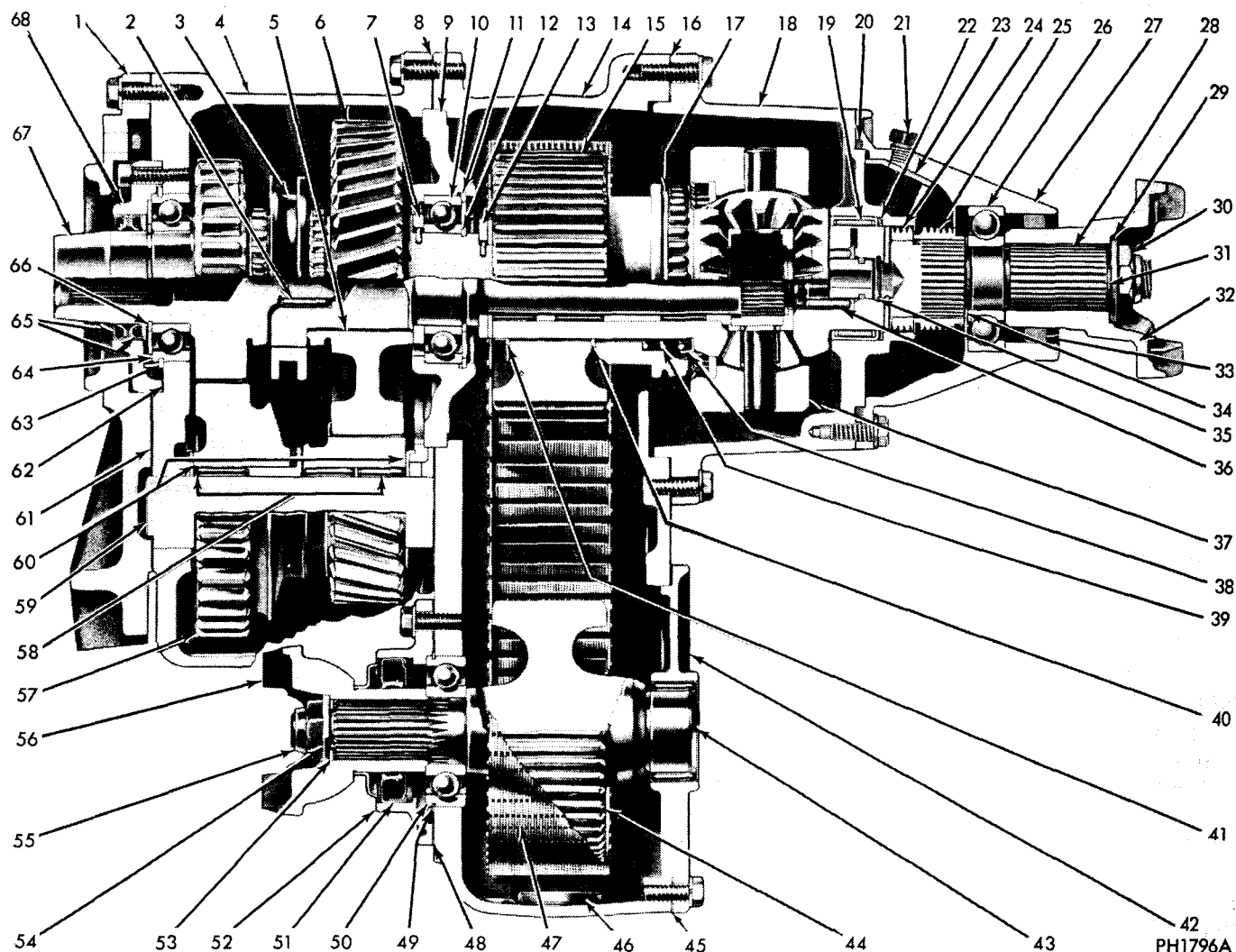
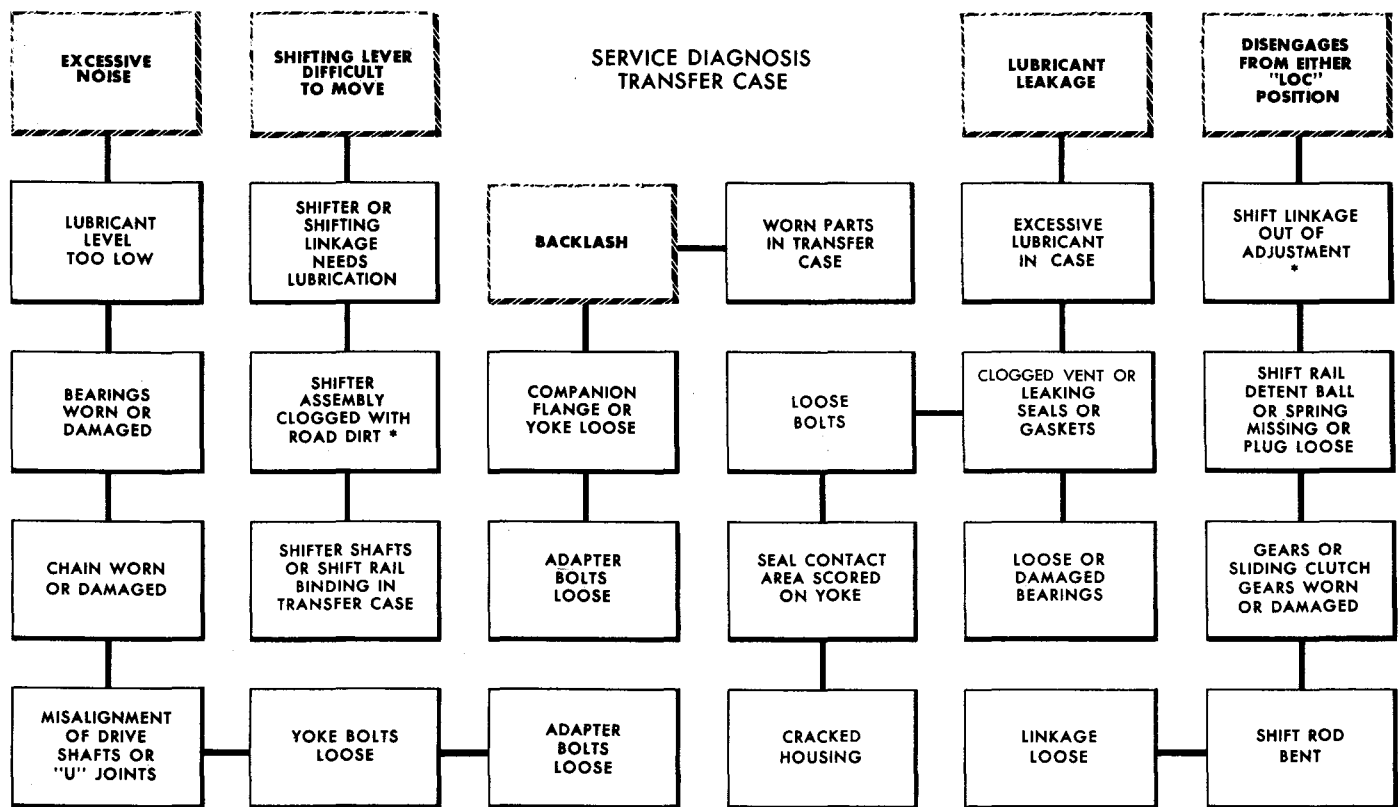


Fig. 1—203 Transfer Case—Cross Section View

LEGEND FOR FIG. 1

- | | | |
|--|--|---|
| 1. Adapter | 22. Oil Seal, Rear Output Front Bearing | 45. Gasket, Front Output Rear Bearing Cover |
| 2. Input Drive Gear Pilot Bearings | 23. Oil Seal, Vent | 46. Magnet |
| 3. Range Selector Sliding Clutch | 24. Oil Pump | 47. Drive Chain |
| 4. Range Selector Housing | 25. Speedometer Drive Gear | 48. Gasket, Front Output Bearing Retainer |
| 5. Low Speed Gear Bushing | 26. Rear Output Rear Bearing | 49. Front Output Bearing Outer Retaining Ring |
| 6. Low Speed Gear | 27. Rear Output Shaft Housing | 50. Front Output Bearing |
| 7. Thrust Washer and Locating Pin | 28. Rear Output Shaft | 51. Front Output Shaft Seal |
| 8. Gasket, Range Selector Housing to Intermediate Housing | 29. Washer, Rear Output | 52. Front Output Bearing Retainer |
| 9. Input Bearing Retainer | 30. Nut, Rear Output | 53. Rubber Spline Seal |
| 10. Input Bearing | 31. Rubber Washer, Rear Output | 54. Washer, Front Output |
| 11. Input Bearing Retaining Ring (Large) | 32. Rear Output Yoke | 55. Nut, Front Output |
| 12. Input Bearing Retaining Ring (Small) | 33. Oil Seal, Rear Output Bearing | 56. Front Output Yoke |
| 13. Thrust Washer, Locating Pin, Lubricating Washer and Retaining Ring | 34. Shim Pack | 57. Countergear |
| 14. Intermediate (Chain) Housing | 35. Input Shaft "O" Ring Seal | 58. Countergear Spacers and Bearings |
| 15. Drive Shaft Sprocket | 36. Input Shaft Roller Bearings | 59. Countergear Shaft |
| 16. Gasket, Intermediate Housing to Differential Housing | 37. Differential Carrier Assembly | 60. Countergear Thrust Washer |
| 17. Sliding Lock Clutch | 38. Spring Cup Washer | 61. Gasket, Adapter to Selector Housing |
| 18. Differential Housing | 39. Lockout Clutch Spring | 62. Gasket, Input Bearing Retainer |
| 19. Rear Output Front Bearing | 40. Rear Retaining Ring, Drive Shaft Sprocket | 63. Input Bearing Outer Ring |
| 20. "O" Ring, Differential Housing to Rear Output Shaft Housing | 41. Front Retaining Ring, Drive Shaft Sprocket | 64. Input Gear Bearing |
| 21. Vent | 42. Front Output Rear Bearing Cover | 65. Input Gear Seals |
| | 43. Front Output Rear Bearing | 66. Input Bearing Retaining Ring |
| | 44. Front Output Drive Sprocket | 67. Input Gear |
| | | 68. Input Gear Bearing Retainer |



*INDICATES A PROCEDURE DESCRIBED IN APPROPRIATE SECTION OF THIS MANUAL

PH1923A

The two speed feature of the 203 transfer case consists of a 1:1 ratio (direct drive) high range and a 2.01:1 ratio speed reduction in low range.

The speed range and lock positions are controlled by a single shifting lever having five positions, Hi-Loc, Hi, Neutral, Lo, and Lo-Loc. Refer to "Operators Manual 81-370-5407 for operating instructions.

Special towing instructions for disabled vehicles equipped with 203 transfer case can be found in both, "Group 0" of this manual and "Operators Manual."

The transfer case mounts to the rear of the transmission by means of an adapter assembly.

To use transfer case Service Diagnosis chart, look for the squares with broken lines which describe the condition requiring correction, then follow connecting lines into squares indicating possible causes. In most cases corrective procedures are self evident, however, an asterisk (*) indicates a procedure described in appropriate section of this manual.

SERVICE PROCEDURES

SHIFTER CONTROL ASSEMBLY (Fig. 4)

The shift lever attaches to the shifter control assembly. The shifter control assembly is bolted to the adapter, between the transmission and the transfer case. All shifter assemblies are greased at time of manufacture but due to exposure under vehicle, periodic lubrication is necessary. It should be included with regular oil changes and/or suspension lubrication. If clogged with road dirt, the shifter mechanism must be thoroughly cleaned (on or off vehicle). After any cleaning, the mechanism must be completely relubricated. MOPAR Multi-purpose Lubricant Part Number 2932524 or equivalent is recommended. Use a needle fitting grease gun adapter on grease gun nozzle to direct grease into vital areas.

LINKAGE ADJUSTMENT (Fig. 4)

- (1) Loosen lock screws in both swivel rod clamps at shifter assembly (Fig. 5). Rods must be free to slide in swivels.
- (2) Place selector lever in cab into neutral position and insert 11/64 inch diameter rod through alignment holes in shifting housing (Fig. 6).
- (3) Place range shift lever on transfer case (out-board lever) into neutral position.
- (4) Place lockout shift lever on transfer case (in-board lever) in "unlock" position (Figs. 7 and 8).
- (5) Retighten rod swivel screws to 100-150 inch-pounds.
- (6) Remove 11/64 inch alignment rod from shifter housing.

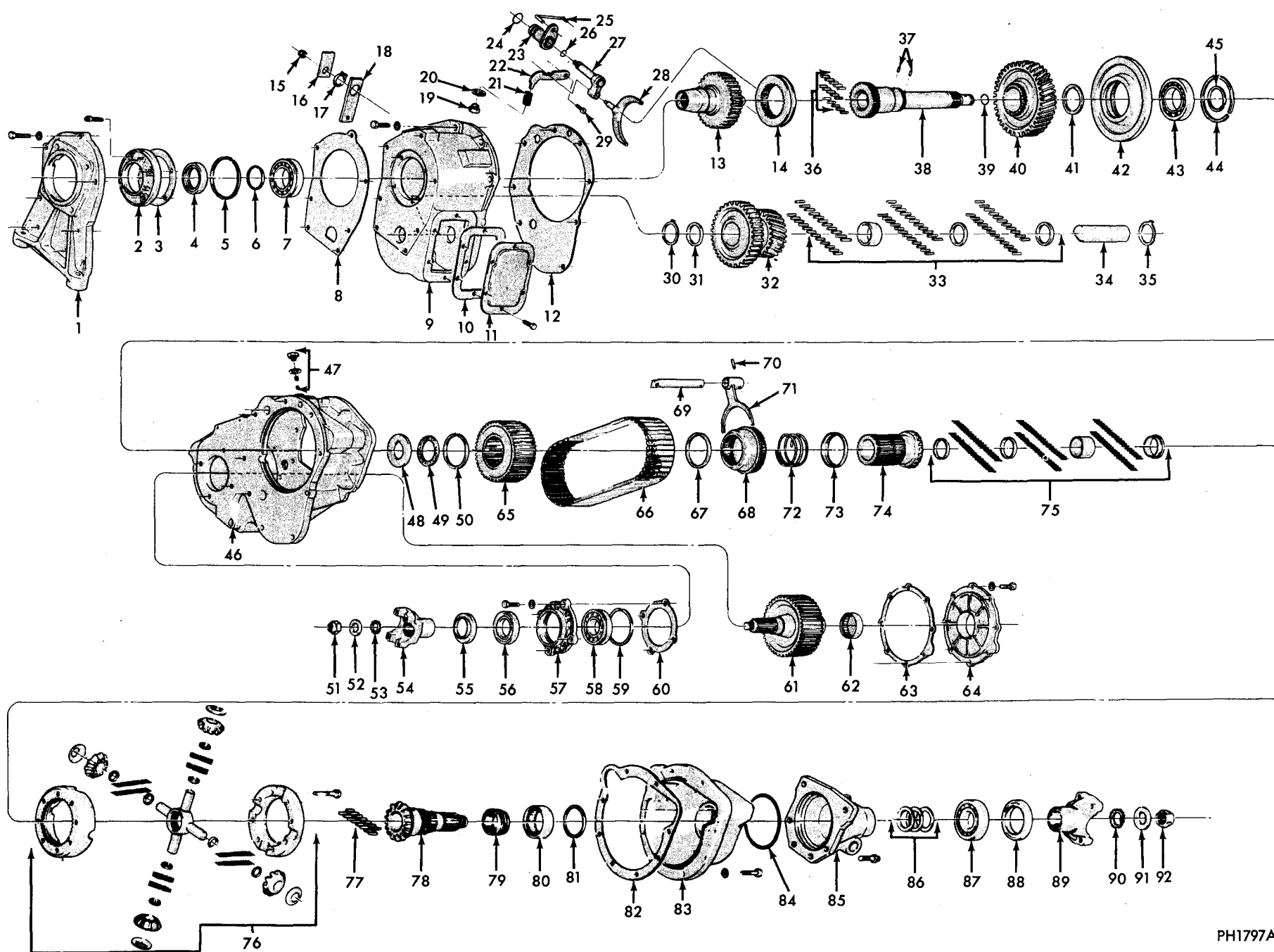


Fig. 2-203 Transfer Case—Disassembled View

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(7) Cycle selector lever to check for proper function.

REMOVAL FROM VEHICLE

(1) Remove 4 bolts attaching skid plate rear cross member to underside of frame.

(2) Remove 5 bolts attaching front end of skid plate to transmission cross member. Remove skid plate. **Disregard steps 1 and 2 if vehicle is not equipped with skid plate assembly.**

(3) Remove bottom bolt from front output rear cover and allow case to drain completely. Replace bolt.

(4) Disconnect speedometer cable.

(5) Disconnect front and rear output shafts. **Secure each shaft. Do not allow to hang.**

(6) Disconnect shift rods at transfer case.

(7) With suitable jack, support transfer case. **Be sure transfer case is safely secured in removing device.**

(8) Remove adapter to transfer case mounting bolts.

(9) Move transfer case rearward to disengage front input spline.

(10) Lower transfer case assembly and remove from under vehicle.

DISASSEMBLY OF TRANSFER CASE

(1) Position drained transfer case on suitable work table (Fig. 9).

(2) Using holding tool C-3281 and a 1-5/16 inch

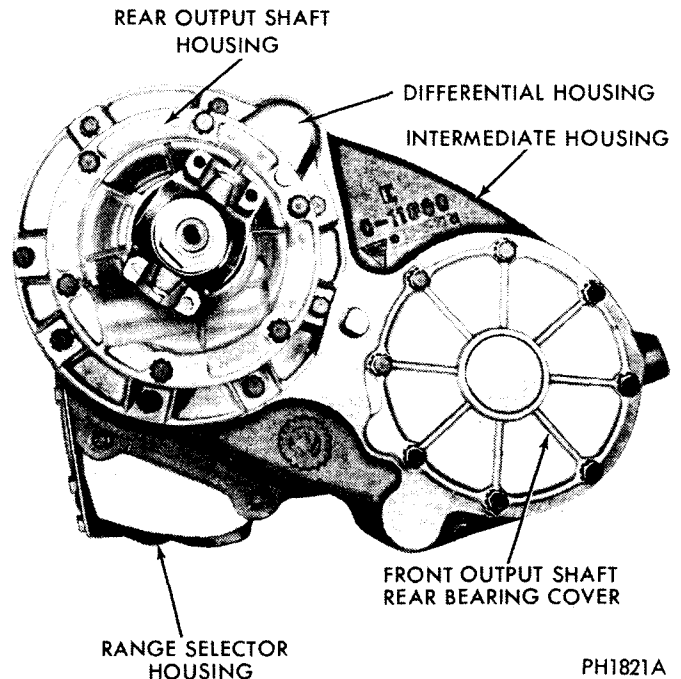


Fig. 3-203 Transfer Case—Rear View

socket with suitable handle, loosen rear output shaft yoke nut.

(3) Using holding tool C-3281 and a 1-1/4 inch socket with suitable handle remove front output shaft yoke nut. Remove washer and yoke (Fig. 10).

(4) Remove front output shaft bearing retainer bolts (Fig. 11). Remove retainer. Discard gasket.

(5) Using hoist or other suitable lifting device, posi-

Legend for Fig. 2

- | | | |
|--|--|---|
| 1. Adapter | 34. Countergear Shaft | 64. Front Output Rear Bearing Retainer |
| 2. Input Gear Bearing Retainer | 35. Thrust Washer | 65. Drive Shaft Sprocket |
| 3. Input Gear Bearing Retainer Gasket | 36. Input Shaft Roller Bearings (15 Req'd.) | 66. Drive Chain |
| 4. Input Gear Bearing Retainer Seals | 37. Thrust Washer Pins (2 Req'd.) | 67. Retaining Ring |
| 5. Bearing Outer Ring | 38. Input Shaft | 68. Sliding Lock Clutch |
| 6. Bearing to Shaft Retaining Ring | 39. "O" Ring Seal | 69. Lockout Shift Rail |
| 7. Input Gear Bearing | 40. Low Speed Gear and Bushing | 70. Shift Fork Retaining Pin |
| 8. Adapter to Selector Housing Gasket | 41. Thrust Washer | 71. Lockout Shift Fork |
| 9. Range Selector Housing (Range Box) | 42. Input Shaft Bearing Retainer | 72. Lockout Clutch Spring |
| 10. P.T.O. Cover Gasket | 43. Input Shaft Bearing | 73. Spring Washer Cup |
| 11. P.T.O. Cover | 44. Input Shaft Bearing Retaining Ring (Large) | 74. Front Side Gear |
| 12. Selector Housing to Intermediate Housing Gasket | 45. Input Shaft Bearing Retaining Ring | 75. Front Side Gear Bearing and Spacers (123 Bearings Req'd.) |
| 13. Main Drive Input Gear | 46. Chain Drive Housing (Intermediate Housing) | 76. Differential Carriage Assembly (132 Bearings Req'd.) |
| 14. Range Selector Sliding Clutch | 47. Lockout Shift Rail (Poppet) Plug, Gasket, Spring and Ball. | 77. Rear Output Shaft Roller Bearings (15 Req'd.) |
| 15. Shift Lever Lock Nut | 48. Thrust Washer | 78. Rear Output Shaft |
| 16. Range Selector Shift Lever | 49. Lubricating Thrust Washer | 79. Speedometer Drive Gear |
| 17. Shift Lever Retaining Ring | 50. Retaining Ring | 80. Rear Output Shaft Front Roller Bearing |
| 18. Lockout Shift Lever | 51. Flange Lock Nut | 81. Oil Pump "O" Ring Seal |
| 19. Detent Plate Spring Plug | 52. Washer | 82. Differential Housing Gasket |
| 20. Detent Plate Spring Plug Gasket | 53. Seal | 83. Differential Housing |
| 21. Detent Plate Spring | 54. Front Output Yoke | 84. "O" Ring, Differential Housing to Rear Output Shaft Housing |
| 22. Detent Plate | 55. Dust Shield | 85. Rear Output Shaft Housing |
| 23. Lockout Shifter Shaft | 56. Front Output Shaft Bearing Retainer Seal | 86. Shim Pack |
| 24. "O" Ring Seal | 57. Front Output Shaft Bearing Retainer | 87. Rear Output Rear Bearing |
| 25. Lockout Shaft Connector Link | 58. Front Output Shaft Bearing | 88. Rear Output Shaft Seal |
| 26. "O" Ring Seal | 59. Bearing Outer Ring | 89. Rear Output Yoke |
| 27. Range Selector Shifter Shaft | 60. Bearing Retainer Gasket | 90. Rear Output Shaft Rubber Seal |
| 28. Range Selector Shift Fork | 61. Front Output Shaft | 91. Washer |
| 29. Detent Plate Pivot Pin | 62. Front Output Shaft Rear Bearing | 92. Flange Nut |
| 30. Thrust Washer | 63. Front Output Rear Bearing Retainer Cover Gasket | |
| 31. Spacer (short) | | |
| 32. Range Selector Counter Gear | | |
| 33. Countergear Roller Bearings and Spacers (72 Bearings Req'd.) | | |

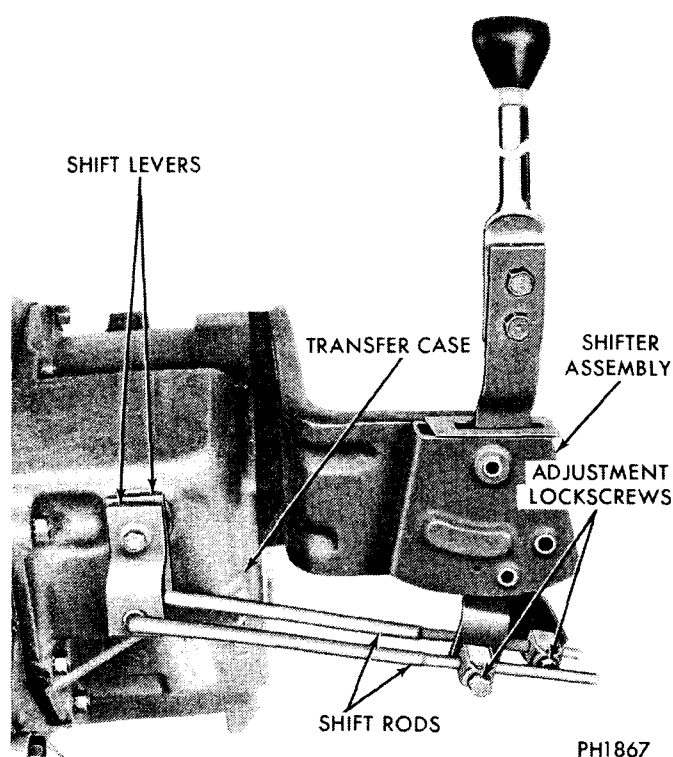


Fig. 4—Shifter Assembly and Linkage

tion transfer case on blocks (Fig. 12).

(6) Remove differential housing retainer bolts and disengage assembly from transfer case. Remove and discard gaskets.

(7) Slide carrier unit from shaft. 1-1/2 to 2 inch band type hose clamp may be installed on the input shaft to prevent losing bearings when removing input shaft assembly from the range box.

(8) Raise shift rail and drive retaining pin out of shift fork (Fig. 13).

(9) Remove shift rail detent ball plug, gasket, spring and ball from case (Fig. 14). A small magnet may be used to remove ball.

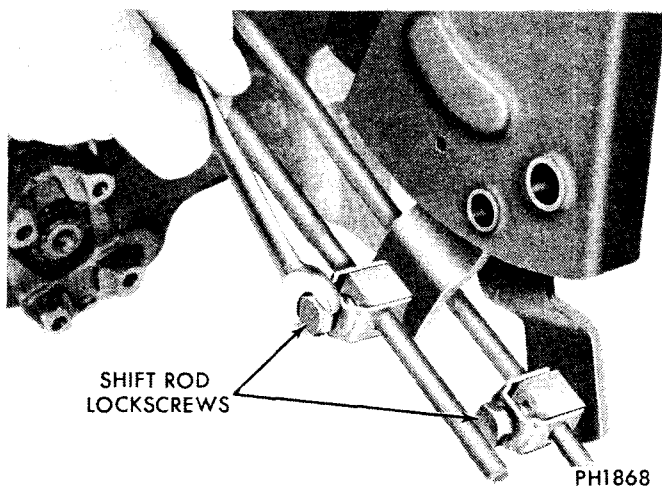


Fig. 5—Loosening Lock Screws

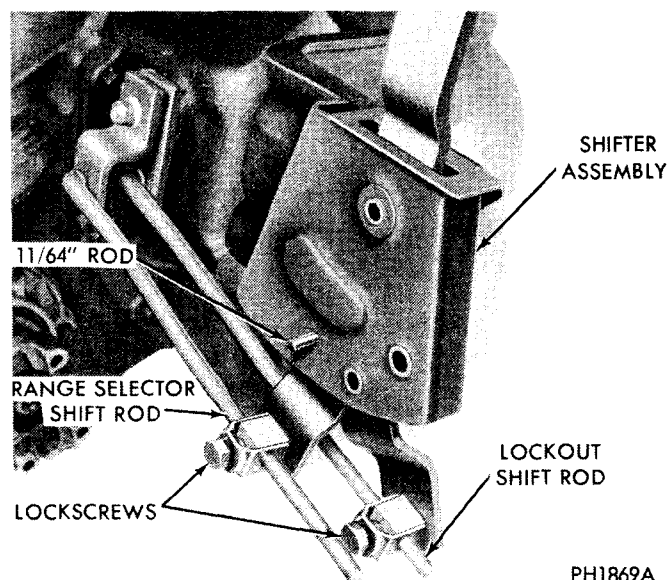


Fig. 6—Alignment Rod in Position

(10) Push shift rail down, lift up on lockout clutch and remove shift fork from clutch assembly.

(11) Remove front output shaft rear bearing retainer bolts. Tap on front of shaft or carefully pry retainer away from case. Remove retainer from shaft and discard gasket. Recover roller bearings which may fall from cover. **If necessary to replace rear bearing, support cover and press out bearing. Position new bearing on outside face of cover and press in until bearing is flush with opening.**

(12) Pry output shaft front bearing out of lower side of case.

(13) Disengage front output shaft from chain and

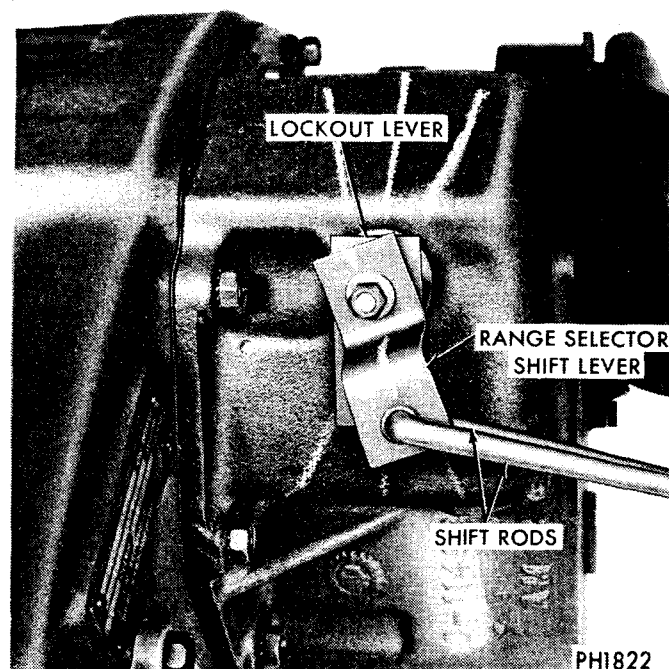


Fig. 7—Lockout Lever in "Unlock" and Range Lever in "Hi" Position

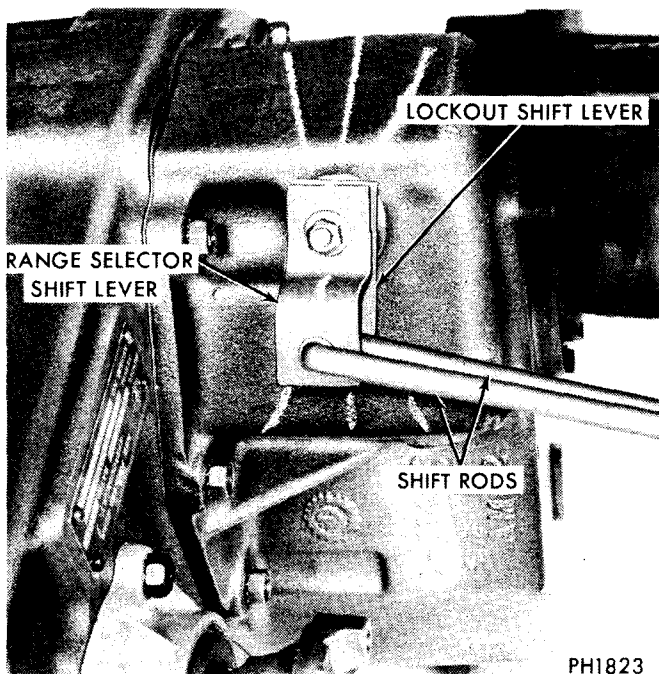


Fig. 8—Both Levers Positioned for Adjustment

remove shaft from case (Fig. 15).

(14) Remove bolts attaching intermediate chain housing to range box. Lift or with chain hoist, remove intermediate housing from range box (Fig. 16).

(15) Remove chain from intermediate housing.

(16) Remove lockout clutch, drive gear and input shaft assembly from range box. A 1-1/2 to 2 inch band type hose clamp may be used to retain the 123 roller bearings on the input shaft.

(17) Pull up shift rail and disconnect from link.

(18) Lift input shaft assembly from range box. See "Disassembly of Subassemblies" for further disassembly procedures.

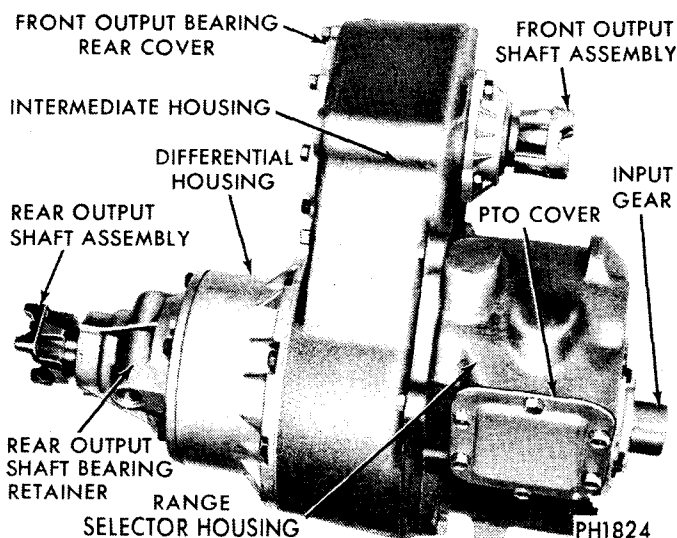


Fig. 9—Transfer Case in Position for Removing Output Yokes

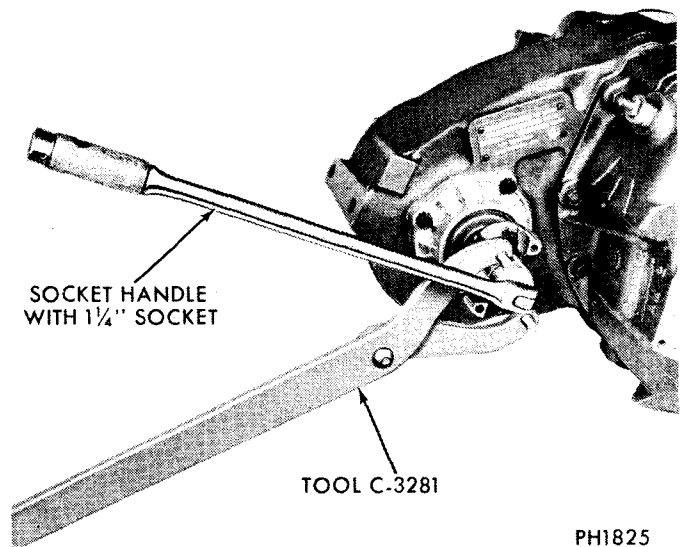


Fig. 10—Loosening Front Output Shaft Yoke Nut

CLEANING AND INSPECTION

Bearings

Clean all bearings in suitable solvent and blow dry with compressed air. **Do not spin bearings.** Immediately after air drying, coat machined surfaces of all components with oil to prevent corrosion.

Shafts and Gears

With suitable solvent, clean all shafts and gears of all deposits. Dry with compressed air.

Case, Cover and Housings

Clean transfer case, cover and housings thoroughly, removing all dirt and lubricant. Remove residual deposit from magnets in range box and chain housing. Remove all gasket material from gasket surface areas.

Inspection

Carefully inspect all bearings and rollers for wear or damage. Use new parts if replacement is necessary.

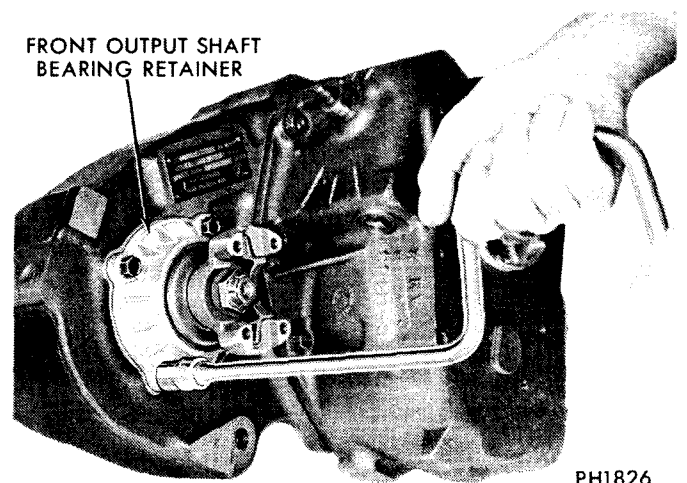


Fig. 11—Removing Bearing Retainer Screws

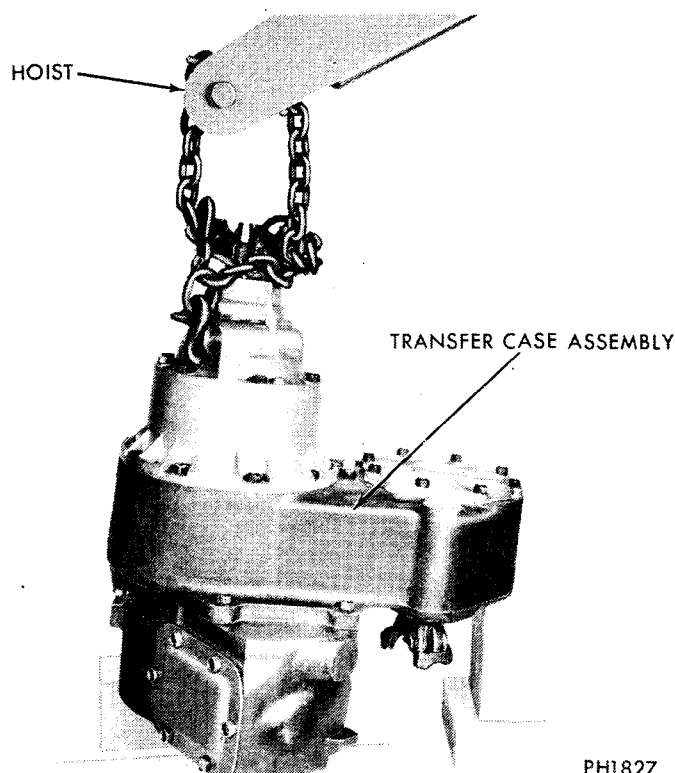


Fig. 12—Positioning Transfer Case on Blocks

Inspect shaft splines, drive chain and gears. Replace any parts showing wear or damage with new parts.

DISASSEMBLY OF SUBASSEMBLIES (Fig. 2)

Differential Carrier Assembly (Disassembly)

(1) Remove bolts from carrier assembly and separate carrier sections.

(2) Lift pinion gear and spider assembly from carrier. **Observe that undercut side of pinion gear spider faces toward front side gear.**

(3) Remove pinion thrust washers, pinion roller washers, pinion gears and roller bearing from spider unit.

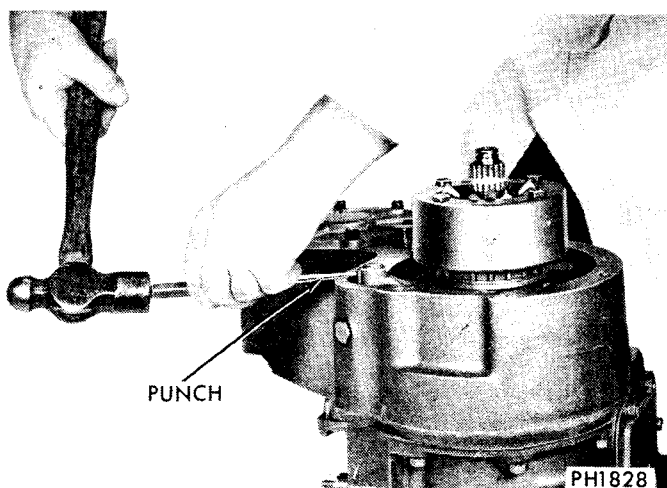


Fig. 13—Removing Retaining Pin

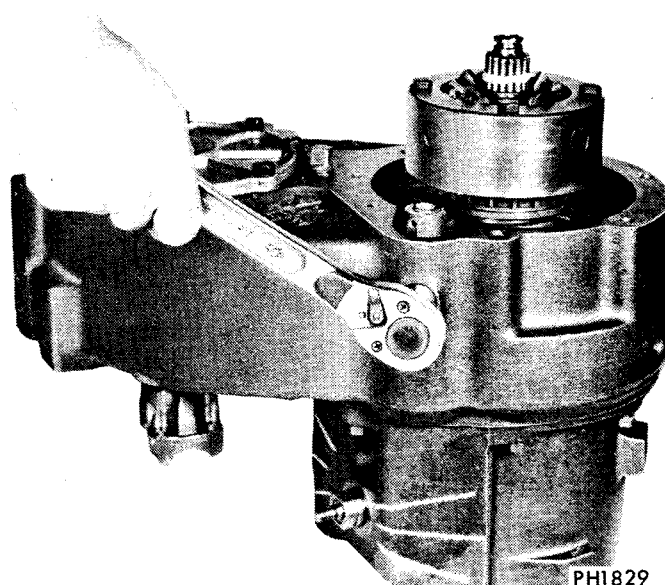


Fig. 14—Removing Detent Ball Plug

(4) Clean and inspect all components. Replace all worn or damaged parts.

Lockout Clutch Assembly (Disassembly)

(1) Remove front side gear from input shaft assembly and remove thrust washer, roller bearings (123) and spacers from front side gear bore. Note position of spacers to facilitate reassembly.

(2) Using snap ring pliers, remove drive sprocket to clutch assembly retaining ring. Slide drive sprocket from front side gear.

(3) Remove lower snap ring.

(4) Remove sliding gear, spring and spring cup washer from front side gear.

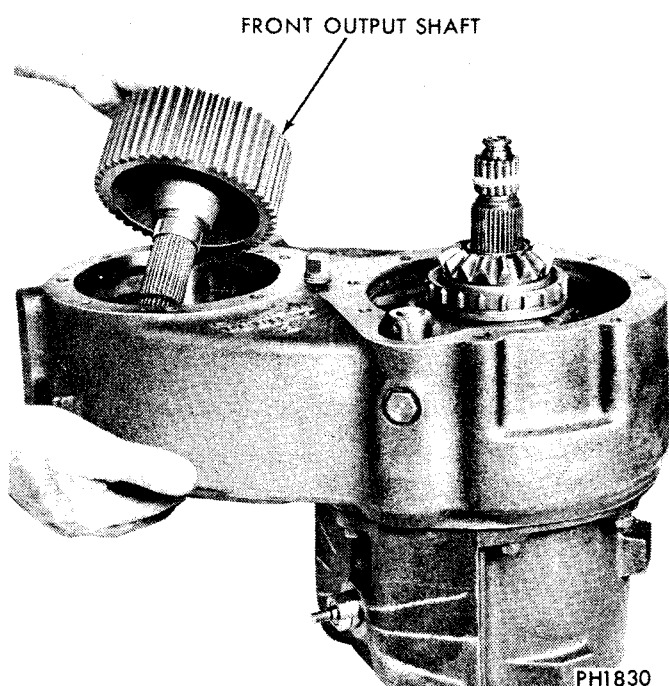


Fig. 15—Removing Front Output Shaft

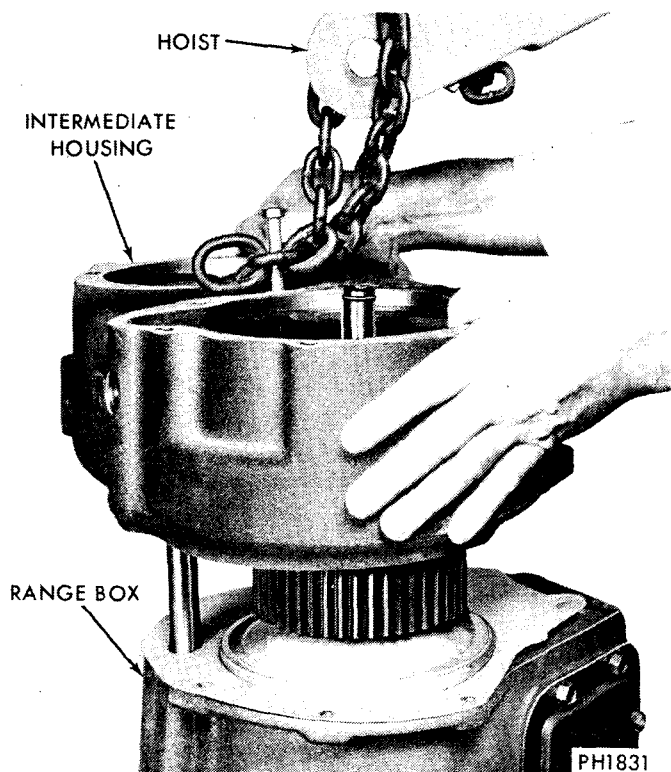


Fig. 16—Removing Intermediate Housing

(5) Clean and inspect all components. Replace all worn or defective parts.

Input Shaft Assembly (Disassembly)

- (1) Slide thrust washer and spacer from shaft.
- (2) Using snap ring pliers, remove retainer from input shaft (Fig. 17).
- (3) Tap shaft out of low speed gear. **Observe two thrust washer pins in shaft.**
- (4) With screwdriver remove lock ring out of bearing retainer (Fig. 18). Tap bearing out of retainer bore.
- (5) Remove roller bearings (15) from end of input shaft.
- (6) Remove and discard "O" ring from end of shaft.
- (7) Clean and inspect all components. Replace if worn or damaged.

Range Selector Housing (Range Box)—Disassembly

Removing Shifter Shaft Assembly

- (1) Remove detent plate spring, plug and gasket. Discard gasket.
- (2) Disengage sliding clutch gear from input gear and remove clutch fork and sliding gear from case.
- (3) Remove shift lever assembly retaining nut and range shift lever from shifter shaft.
- (4) Remove shift lever snap ring and lock nut shift lever.
- (5) Push shifter shaft assembly downward and remove lockout clutch connector link. Long end of connector link engages detent plate.

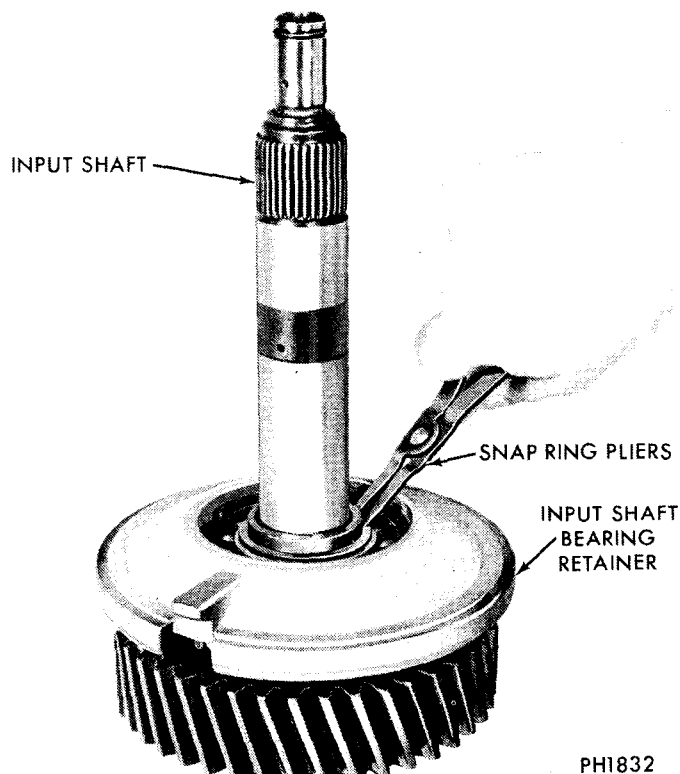


Fig. 17—Removing Input Shaft Bearing Retainer

(6) Remove shifter shaft assembly from case and separate inner and outer shifter shafts. Remove and discard "O" rings.

(7) Inspect detent plate for damage. If necessary to

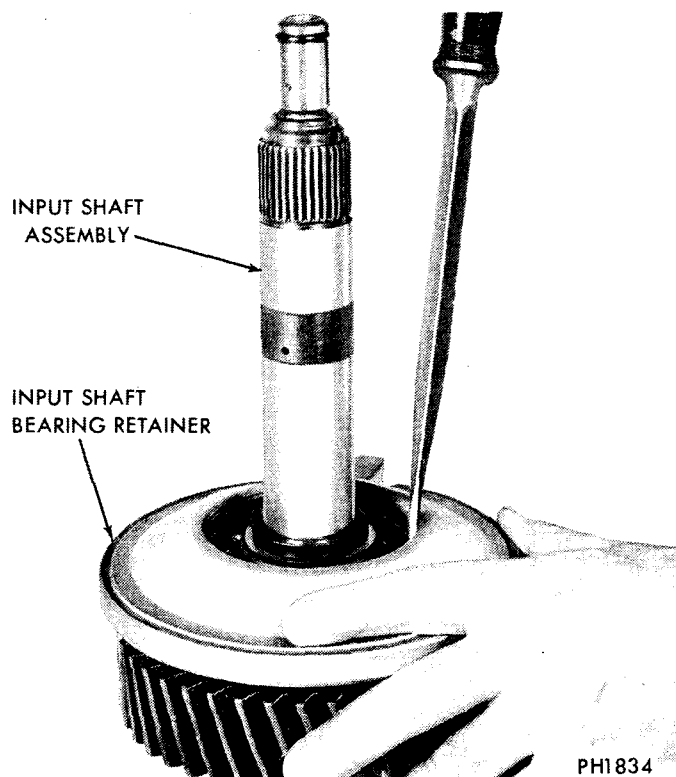


Fig. 18—Removing Lock Ring

remove, drive pivot shaft from case. Remove detent plate and spring from bottom of case.

Removing Input Gear Assembly

- (1) Remove input gear bearing retainer and seal assembly. Discard gasket.
- (2) Remove snap ring from outer diameter of input gear bearing.
- (3) Tap input gear and bearing from case.
- (4) Remove bearing retaining snap ring from input shaft. This is a select fit snap ring. Sizes A, B, C, and D are released for service. (Select tightest fit when reassembling).

Removing Countershaft Gear Assembly

- (1) From intermediate case side, remove countershaft from countershaft gear and case. Remove countershaft gear assembly from case. **Recover 72 roller bearings from gear case and shaft.**
- (2) Remove countershaft gear thrust washers from case.
- (3) Clean and inspect components. Replace worn or defective parts.

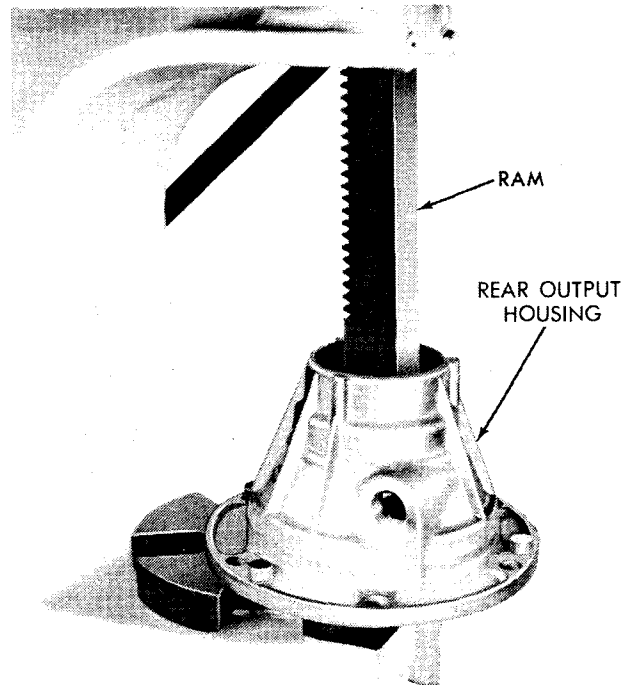
Differential Housing Assembly—Disassembly (Fig. 2)

- (1) Remove speedometer driven gear from housing.
- (2) Remove yoke nut and washer (if not removed during disassembly). Remove yoke.
- (3) Tap yoke end of shaft with soft hammer and remove shaft from housing. Remove speedometer drive gear from shaft. If it is not on shaft, refer to step (5).
- (4) Remove 6 capscrews and separate rear output housing from differential housing.
- (5) Remove shim pack from rear face of rear bearing. Also remove speedometer drive gear from housing if it did not already remove with rear output shaft. (Sometimes shim pack and speedometer drive gear will stay on output shaft when it is removed.)
- (6) With screwdriver or other suitable tool, pry seal out of output housing.
- (7) Tap or press bearing from output housing (Fig. 19).
- (8) Using tool W356 (or by other suitable means) remove bearing from differential housing (Fig. 20).

BEARING AND SEAL REPLACEMENT PROCEDURES (WITHOUT DISASSEMBLING TRANSFER CASE)

Input Gear Bearing

- (1) Remove bearing retainer screws, retainer and gasket from housing. Discard gasket.
- (2) Remove bearing retaining snap ring from shaft. **Discard snap ring.**
- (3) With screwdriver or other suitable tool, pry bearing from case and remove from shaft.
- (4) Remove 6 capscrews from PTO cover and re-

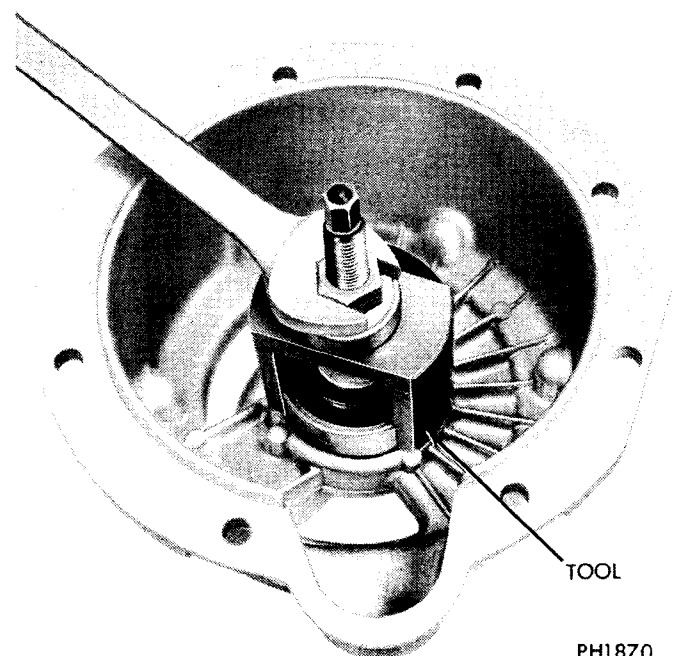


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Fig. 19—Pressing Rear Output Shaft Rear Bearing out of Retainer

move cover. This provides an opening to inspect input and countergear assemblies. Check for burrs, scoring, heat discoloration or other irregularities.

- (5) Install outer ring into groove of new input gear bearing and with soft hammer tap into place in housing.



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Fig. 20—Removing Rear Output Shaft Front Bearing

(6) Select service ring size A, B, C or D that will provide tightest fit and install ring in bearing retaining groove of input gear shaft.

(7) Position new gasket and the bearing retainer on housing. Install retaining screws. Tighten as specified.

(8) Replace PTO cover gasket and reinstall PTO cover.

Input Gear Bearing Retainer Seal

(1) Remove bearing retainer attaching screws, retainer and gasket from housing. Discard gasket.

(2) Pry seal out of retainer and discard seal.

(3) Apply sealer to outer diameter of new seal and with suitable tool install flush with housing.

(4) Install bearing retainer and gasket on housing and tighten capscrews as specified.

Front Output Shaft Bearing Retainer Seal

(1) Remove front output shaft yoke lock nut, washer and rubber seal. Tap or pry yoke off shaft.

(2) Pry seal out of retainer bore.

(3) Clean and inspect retainer.

(4) Apply sealer to outer diameter of new seal.

(5) Position seal on retainer bore. Using tools C-4299 and C-4300 install seal in retainer (Fig. 21).

Front Output Shaft Rear Bearing

(1) Remove rear cover from transfer case. Remove gasket and discard.

(2) Support rear cover and press bearing from cover.

(3) Position new bearing to outside face of cover

and using a piece of wood to cover bearing, press bearing into cover until flush with bore opening.

(4) Position gasket and cover on transfer case and tap into place.

(5) Install retaining bolts and tighten as specified.

REASSEMBLY AND INSTALLATION OF SUBASSEMBLIES (Fig. 2)

CAUTION: All transfer case housing, bearing retainer cover and PTO cover bolts are factory coated with a sealant material. These bolts are generally reusable without additional sealant. However, when replacement bolts are used, they must have sealant coating. Loctite 242, or equivalent, is recommended.

Rear Output Shaft and Differential Housing Assembly (Reassembly)

(1) Position flat rubber seal ring in bearing bore. Use grease to hold in place. Position roller bearing in differential housing bore and press in until bearing bottoms in housing.

(2) Position rear bearing in output shaft housing and tap or press into place.

(3) With tools C-4298 and C-4300 install rear output shaft seal into output shaft housing (Fig. 22).

(4) Install two new seal(s) on inside surface of output housing, centering the holes at vent opening (Fig. 23) (Stack the two seals).

(5) Position sealing "O" Ring on differential housing as shown (Fig. 23).

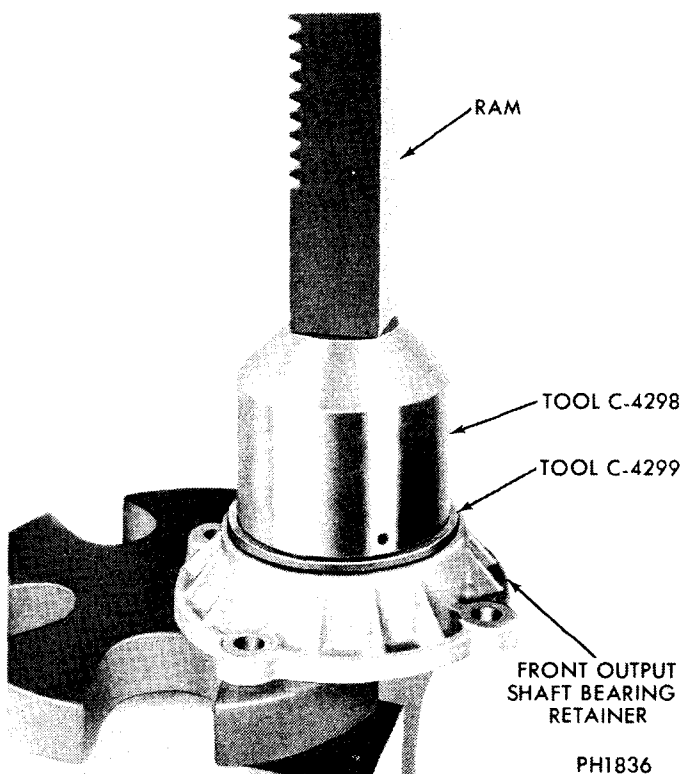


Fig. 21—Pressing in Front Output Shaft Seal

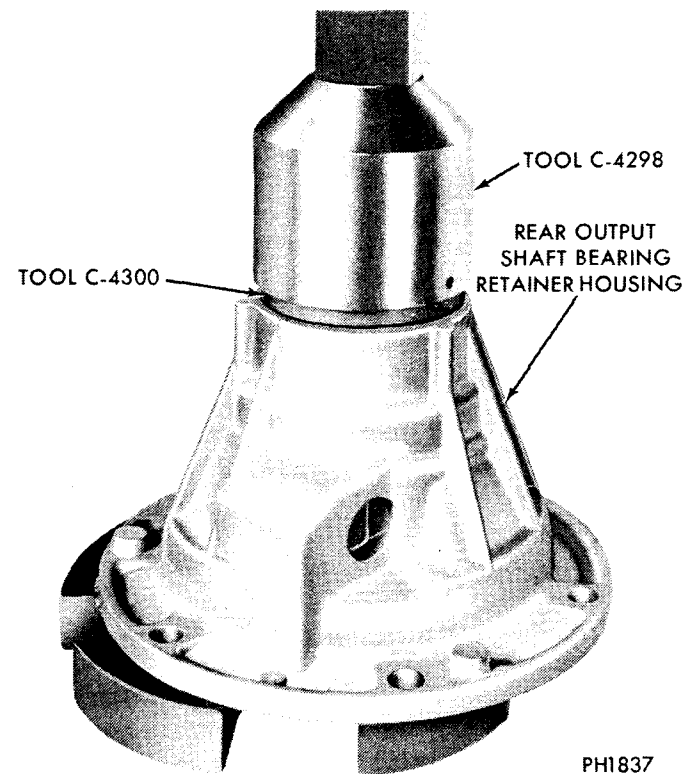


Fig. 22—Installing Rear Output Shaft Seal

(6) Install retainer housing assembly on differential housing. Tighten 6 capscrews as specified.

(7) Install speedometer drive gear and shims (approximately .050 inch thickness) on output shaft. Install shaft into carrier through front opening. (Be careful not to damage oil seal).

(8) Install yoke, rubber seal, washer and retaining nut. Leave nut approximately .060 inch loose until necessary shim thickness is determined.

(9) Install speedometer driven gear in case.

Range Selector Housing (Range Box)—Reassembly

Installing Countershaft Gear Assembly

(1) Using heavy grease for retention, install roller bearings (72 required) and spacers in countergear bore.

(2) Using heavy grease, position countershaft thrust washers in case. Engage tab on washers with a slot in case thrust surface.

(3) Position countergear assembly in case and install countershaft into gear assembly through front face of range box. Countershaft face with flat should face forward and must be aligned with case gasket. (A 1.490" diameter dummy shaft will aid in reinstallation of countershaft).

Installing Input Gear Assembly

(1) Install bearing (without large snap ring) on input gear shaft, positioning snap ring groove outward. Install new retaining ring on shaft. Position input gear

and bearing in housing. **The retaining ring is a select fit. Use service ring size A, B, C, or D to provide tightest fit.**

(2) Install snap ring into groove in outer diameter of bearing.

(3) Align oil slot in retainer with drain hole in case and install input gear bearing retainer, gasket and retaining bolts. Tighten as specified.

Installing Shifter Shaft Assembly

(1) If removed, install detent plate and pivot pin assembly in housing. Use sealant on pin.

(2) Install new "O" rings on the inner and outer shafts. Lubricate "O" rings and assemble inner shaft in outer shaft.

(3) Push shifter shafts into housing, engaging long end of lockout clutch connector link to outer shifter shaft before shaft assembly bottoms out.

(4) Install lockout shift lever and retaining ring.

(5) Install range selector shift lever and shift shaft retaining nut.

(6) Install shift fork and sliding clutch gear. Push fork up into shifter shaft assembly to engage detent plate, sliding clutch gear forward onto the input shaft gear.

(7) Install detent plate spring, gasket and plug in top of housing. Check spring engagement with detent plate.

Input Shaft Assembly (Reassembly)

(1) Position bearing on retainer bore and press or tap into place.

(2) Install large snap ring retaining bearing in retainer. Snap ring is a select fit. Use size A, B, C, or D to provide tightest fit.

(3) Install low speed gear on shaft with clutch end toward gear end of shaft.

(4) Position thrust washers on shaft, aligning slot in washer with pin in shaft. Slide or tap washer into place.

(5) Position input bearing retainer on shaft and install snap ring on shaft. **Snap ring is a select fit. Use size A, B, C, or D to provide tightest fit.**

(6) Slide spacer and thrust washer onto shaft. Align spacer with locator pin.

(7) Using heavy grease, install roller bearings (15 required) in end of shaft.

(8) Install new "O" ring on end of shaft.

Lockout Clutch Assembly (Reassembly)

(1) Install spring cup washer, spring and sliding clutch gear on front side gear.

(2) Install snap ring retaining sliding clutch to front side gear.

(3) Using petrolatum for retention, insert roller bearings (123 required) and spacers in the front side gear.

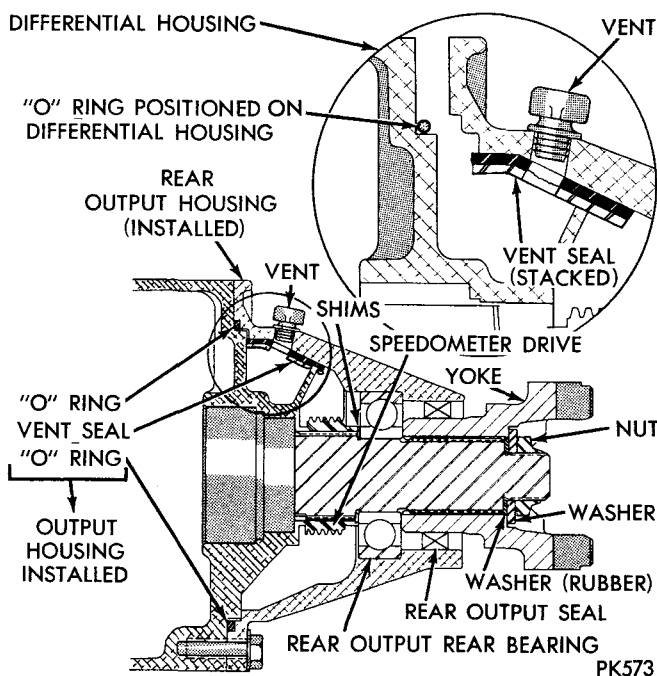


Fig. 23—Rear Output Housing Assembly

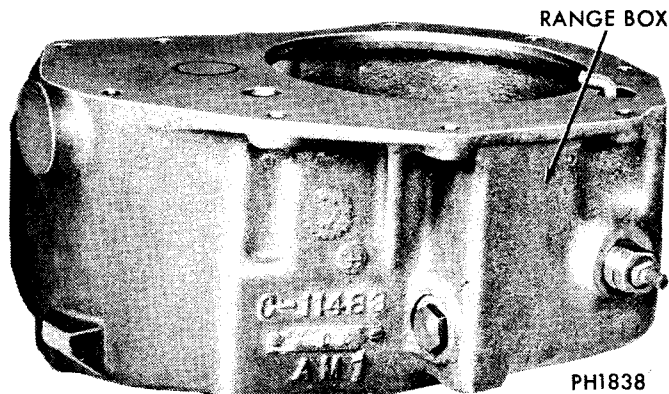


Fig. 24—Range Box Positioned for Assembly

(4) Install thrust washer in gear end of front side gear.

(5) Slide drive sprocket onto clutch splines and install retaining ring.

Differential Carrier Assembly (Reassembly)

(1) Using petrolatum for retention, install roller bearings (132 required, 33 each pinion) into pinion gears.

(2) Install pinion roller washer, pinion gear, roller washer and thrust washer on each leg of spider.

(3) Place spider assembly into carrier (front half) with undercut surface of spider thrust surface facing downward or toward gear teeth.

(4) Align marks on carrier sections and position carrier halves together. Install retaining bolts and tighten as specified.

REASSEMBLY OF TRANSFER CASE (Figs. 1 and 2)

(1) Place range box on blocks with front (input) side down (Fig. 23).

(2) Position gasket on range box (Range Selector Housing).

(3) Install lockout clutch and drive sprocket assembly on input shaft assembly. **A 2 inch band type clamp or other similar device may be used to retain loose bearings.**

(4) Install input shaft, lockout clutch and drive sprocket assembly into range box, aligning tab on bearing retainer with notch in gasket.

(5) Connect lockout clutch shift rail to the connector link and position rail in housing bore (Fig. 24). Rotate shifter shaft while lowering shift rail into housing, to prevent the link and rail from being disconnected.

(6) Install drive chain in chain housing, positioning the chain around outer wall of housing.

(7) Install chain housing on range box (Fig. 25), engaging shift rail channel of housing to shift rail. Position chain on input drive sprocket.

(8) Install front output sprocket in case, engaging drive chain to sprocket. Rotate clutch drive gear to aid in positioning chain on drive sprocket.

(9) Install shift fork on clutch assembly and shift rail, then push clutch assembly fully into drive sprocket. Install roll pin retaining shift fork to shift rail.

(10) Install outer retainer ring on front output shaft bearing and install bearing into housing bore.

(11) Install front output shaft bearing retainer, gasket and retaining bolts.

(12) Install front output shaft seal, yoke, dust shield, rubber seal, washer and retaining nut. Tap dust shield back into place after installing bolts in flange.

(13) Install front output shaft rear bearing retainer, gasket and retaining bolts. **If rear bearing was removed, position new bearing to outside face of cover and press into cover until flush with opening.**

(14) Install differential carrier assembly on input shaft. (Carrier bolt head toward rear of shaft.)

(15) Install rear output housing assembly, gasket and retaining bolts (Load bearings in pinion shaft).

(16) With yoke nut at least .06 loose, push or tap end of rear output shaft into unit. This will put differential into close mesh for next check. Check rear output shaft end play as follows:

(a) Install dial indicator on rear housing (Fig. 26).

(b) Holding rear yoke, rotate front output shaft to determine the highest point of axial movement in the output shaft.

(c) Zero dial indicator with output shaft set at this high point.

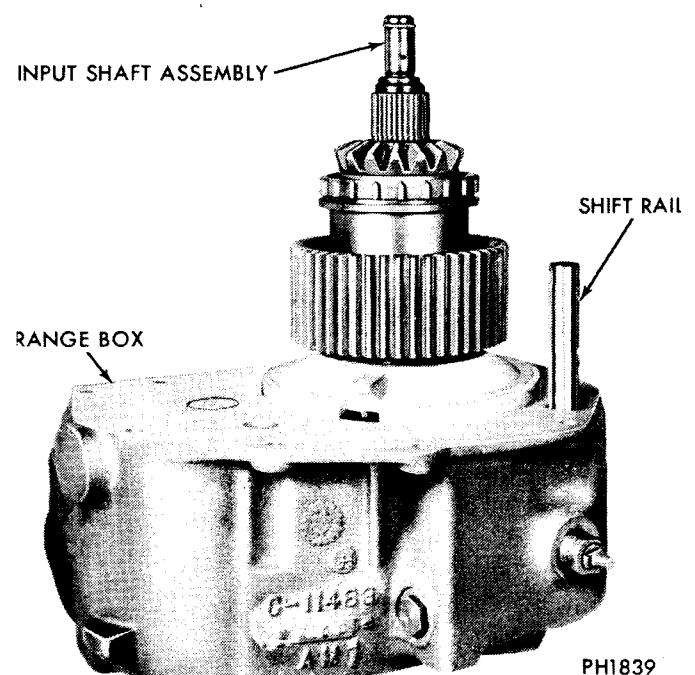


Fig. 25—Shift Rail in Installed Position

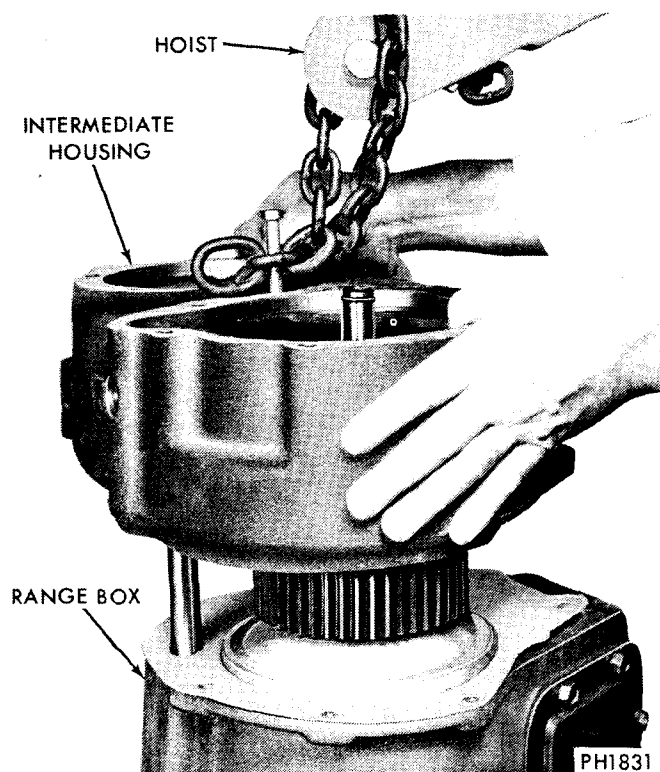


Fig. 26—Installing Intermediate Housing on Range Box

(d) Pull up on yoke to determine end play of shaft. (Gap between bearing shoulders of shaft and housing.)

(17) Remove dial indicator and install shim pack onto shaft in front of bearing to obtain .001 to .010 inch end play. Hold rear yoke and rotate front output shaft to check for binding of rear output shaft.

(18) Install lockout clutch shift rail detent ball, spring and screw plug into case.

(19) Install detent plate spring, gasket and plug, if not installed during reassembly of range box.

(20) Install shift levers on range box shifter shaft.

(21) Torque all bolts, nuts, and plugs (except filler plug) as specified.

(22) Fill transfer case to proper level with specified

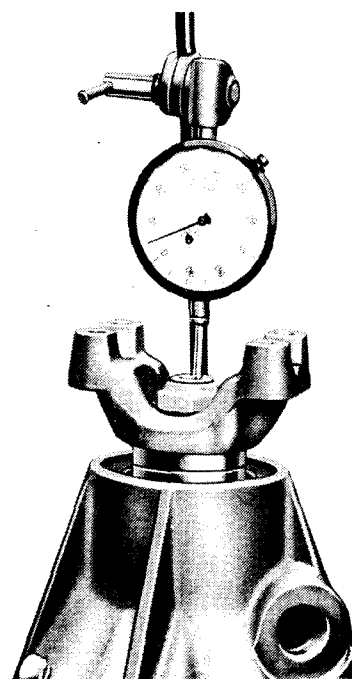


Fig. 27—Checking Rear Output Shaft End Play

lubricant and install filler plug. Tighten as specified.

(23) Carefully check transfer case for leaks. If leakage is visible at any bolt head, remove the bolt, clean and recoat with Loctite 242, or equivalent, and reinstall.

INSTALLATION INTO VEHICLE

(1) Place transfer case on suitable jack or other installing device. **Be sure transfer case is safely secured.**

(2) Position transfer case under vehicle then move it upward and forward into alignment with transmission output shaft. Engage input spline with transmission output shaft and install adapter to transfer case mounting bolts.

(3) Remove jack or installing device.

(4) Connect shift rods and speedometer cable.

(5) Connect front and rear propeller shafts to yokes.

(6) Reinstall skid plate assembly (if so equipped).

T-223 TRANSFER CASE

(W600 MODEL)

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GENERAL INFORMATION

The "Clover Leaf" design transfer case is a gear box mounted behind the transmission. An input shaft

is driven by the engine and transmission. It drives an idler shaft and gear assembly, which in turn drives

drive be engaged only when poor traction, or other severe operating conditions make it necessary and beneficial to drive through all 4 wheels.

REMOVAL AND INSTALLATION

Removal

(1) Remove drain plug and allow case to completely drain, then replace drain plug.

(2) Disconnect speedometer drive cable and parking brake cable.

(3) Disconnect the one input and two output shafts. Secure each shaft out of the way. **Do not allow shafts to hang.**

(4) Remove clevis pins and disengage de-clutch and shift control rods from transfer case shift rails. Secure rods out of way.

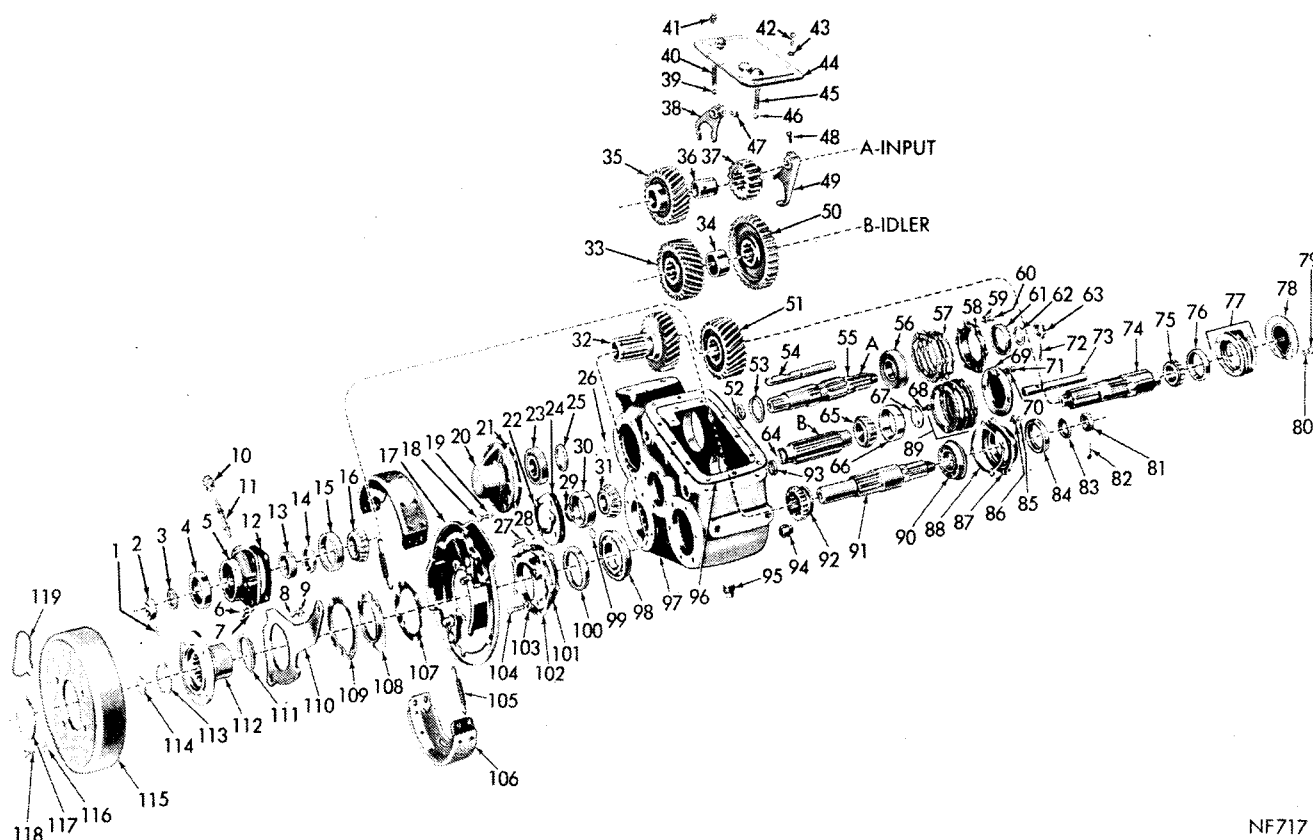
(5) Using blocks or a suitable jack, support transfer case adequately, while removing transfer case to support bracket bolts.

(6) Carefully lower case to floor and remove from under truck.

(1) Using a suitable jack or blocks, raise transfer case and align threaded mounting bolt holes in transfer case with holes in support brackets.



Fig. 1—Shift Linkage



NF717

Fig. 2—T-223 Transfer Case (Disassembled View)

- (2) Install bolts and tighten securely.
- (3) Reconnect speedometer cable and brake controls (Adjust parking brake—if necessary. Refer to "Parking Brake" section of this manual).
- (4) Install and adjust transfer case shift and de-clutch rods as outlined in Paragraph "Linkage Adjustment."
- (5) Reconnect propeller shafts.
- (6) Refill transmission with proper lubricant. Refer to "Lubrication" section of this manual.

REMOVAL AND DISASSEMBLY OF SUBASSEMBLIES (Fig. 2)

Shift Cover

- (1) Remove 12 bolts and lift off transfer case cover (Fig. 3). This releases the shift rail detent springs and balls, which should be removed at this time. The detent balls can be lifted out of case with a magnet.
- (2) Remove 4 bolts and remove parking brake drum.
- (3) Using yoke holding tool C-3281 and 1-1/2 inch socket, remove yoke nuts after cotter keys have been removed. Remove yokes.

Shift Shafts

- (1) Cut lockwire and remove lockscrews from gear shift shaft and de-clutch shift shaft.
- (2) Clean off any burrs, corrosion, or dirt from pro-

truding portions of these shift shafts. Then, using a brass rod or drift about 3/8 inch in diameter, drive both shift shafts out through rear of case, at the same time forcing out the expansion plugs.

(3) Lift out both shift forks and de-clutch fork spacer.

(4) Remove the two shift shaft seals from front of case.

Front Output Shaft

- (1) Remove 4 bolts and remove front output shaft front bearing cap.
- (2) Slide front output shaft out of case, at the same time sliding front drive-de-clutch gear from shaft.
- (3) Position a round bar, approximately 7/8 inch diameter x 12 inches long through front output shaft bore in case, through front output shaft drive gear, and against the expansion plug in output shaft gear.
- (4) Strike the bar with a hammer to remove both the small plug in the output shaft gear and the large expansion plug in the parking brake hub.

Parking Brake Assembly

- (1) Remove parking brake hub snap ring and remove parking brake hub, using puller C-3688 if necessary.
- (2) Unhook brake shoe return springs. Remove brake shoes and lever.

LEGEND FIG. 2

- | | | |
|--|---|---|
| 1. Cotter Key | 42. Cap Screw | 83. Washer |
| 2. Nut | 43. Washer | 84. Oil Seal |
| 3. Washer | 44. Housing Cover | 85. Cap Screw |
| 4. Oil Seal | 45. Detent Spring | 86. Lock Washer |
| 5. Rear Output Shaft Rear Bearing Cap | 46. Detent Ball | 87. Front Output Shaft Front Bearing Cap |
| 6. Cap Screw | 47. Shift Fork Set Screw | 88. Gasket |
| 7. Lock Washer | 48. Shift Fork Set | 89. Shims |
| 8. Cap Screw | 49. Front Axle Declutch Shift Fork | 90. Front Output Shaft Front Bearing (With Snap Ring) |
| 9. Lock Washer | 50. Idler Shaft Lo Gear | 91. Front Output Shaft |
| 10. Speedometer Driven Gear Bushing | 51. Rear Output Shaft Gear | 92. Declutch Collar |
| 11. Speedometer Driven Gear and Shaft | 52. Shift Shaft Oil Seal | 93. Shift Shaft Oil Seal |
| 12. Gasket | 53. Direct Drive Gear Spacing Washer | 94. Oil Filler Plug (Some Units Employ Elbow Arrangement) |
| 13. Speedometer Drive Gear | 54. Range Shift Shaft | 95. Drain Plug |
| 14. Spacer | 55. Input Shaft | 96. Cover to Housing Gasket |
| 15. Rear Output Shaft Rear Bearing Cup | 56. Input Shaft Front Bearing | 97. Transfer Case Housing |
| 16. Rear Output Shaft Rear Bearing | 57. Shims | 98. Front Output Shaft Rear Bearing (With Snap Ring) |
| 17. Brake Backing Plate | 58. Input Shaft Front Bearing Cap | 99. Shift Shaft Hole Plug |
| 18. Cap Screw | 59. Lock Washer | 100. Oil Seal |
| 19. Lock Washer | 60. Cap Screw | 101. Gasket |
| 20. Input Shaft Rear Bearing Cage | 61. Oil Seal | 102. Front Output Shaft Rear Bearing Cap |
| 21. Gasket | 62. Washer | 103. Washer |
| 22. Idler Shaft Rear Bearing | 63. Nut | 104. Cap Screw |
| 23. Input Shaft Rear Bearing | 64. Idler Shaft | 105. Brake Shoe Return Spring |
| 24. Gasket | 65. Idler Shaft Front Bearing | 106. Brake Shoe |
| 25. Spacer | 66. Idler Shaft Front Bearing Cup | 107. Gasket |
| 26. Shift Shaft Hole Plug | 67. Bearing Retainer Plate | 108. Oil Deflector |
| 27. Cap Screw | 68. Cap Screw | 109. Washer |
| 28. Lock Washer | 69. Idler Shaft Front Bearing Cap | 110. Brake Lever |
| 29. Snap Ring | 70. Lock Washer | 111. Oil Baffle |
| 30. Idler Shaft Rear Bearing Cup | 71. Cap Screw | 112. Brake Hub |
| 31. Idler Shaft Rear Bearing | 72. Cotter Key | 113. Snap Ring |
| 32. Front Output Shaft | 73. Declutch Shift Shaft | 114. Small Expansion Plug |
| 33. Idler Shaft Hi Gear | 74. Rear Output Shaft | 115. Brake Drum |
| 34. Gear Spacer | 75. Rear Output Shaft Front Bearing | 116. Lock Washer |
| 35. Direct Drive Gear | 76. Rear Output Shaft Front Bearing Cup | 117. Large Expansion Plug |
| 36. Direct Drive Gear Bushing | 77. Shims | 118. Cap Screw |
| 37. Low Speed Sliding Gear | 78. Rear Output Shaft Front Bearing Cap | 119. Lock Wire |
| 38. Range Shift Fork | 79. Cap Screw | |
| 39. Detent Ball | 80. Locker Washer | |
| 40. Detent Spring | 81. Nut | |
| 41. Breather | 82. Cotter Key | |

(3) Take out mounting bolts and remove parking brake support assembly.

Idler Shaft and Gear Assembly

The front output gear cannot be removed with the idler assembly in position because the gears interfere with each other.

(1) Remove eight attaching bolts and lift off the idler shaft front and rear bearing caps. Bearing adjusting shims will be found under front cap. Tie these shims together and set aside for reassembling.

(2) The idler shaft bearings are a press fit on the shaft and shaft can either be pressed out of assembly or driven out.

(3) If idler shaft is removed with a press, place transfer case assembly in the press and support rear of case as close as possible to bearing bore in case.

(4) Press shaft out of front bearing, gears and spacer out through rear of case.

(5) If the idler shaft is to be driven out, use a brass drift approximately 7/8 inch diameter and drive shaft out through rear of case, while the helical gear is positioned squarely against inside diameter of transfer case rear wall.

(6) After idler shaft has been removed, lift idler shaft low speed gear, spacer and front bearing out of case (Fig. 4).

(7) Remove the helical gear. Tap front bearing cup from case.

(8) Remove snap ring and press rear bearing from idler shaft.

Front Output Gear

(1) With idler assembly removed, front output gear and bearing can be removed.

(2) Remove rear bearing cap and gasket.

(3) Take off bearing snap ring and tap gear into case; reach through cover opening and lift out gear and bearing.

(4) Press off radial bearing.

Rear Output Shaft

(1) Remove attaching bolts and remove front and rear output shaft bearing caps. The bearing adjustment shims found under front cap should be tied together and set aside for reassembly.

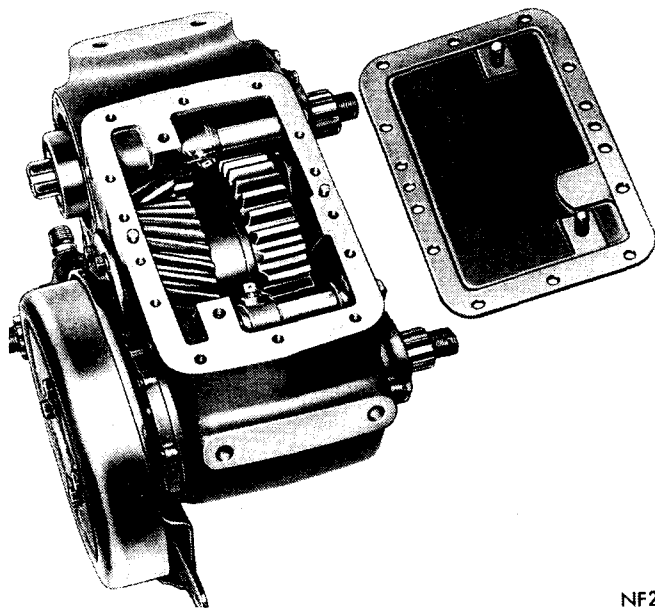
(2) Remove speedometer drive gear and spacer.

(3) Block gear with a piece of wood and press rear output shaft and front bearing out of case (Fig. 5). The gear and rear bearing can be lifted out through cover hole.

(4) Remove front bearing with DD-914 puller and NO 13 adapters.

Input Shaft

(1) Remove six bolts and lift off input shaft front



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Fig. 3—Cover Removed

bearing cover and oil seal assembly. Preserve shim pack found under cover for reassembling.

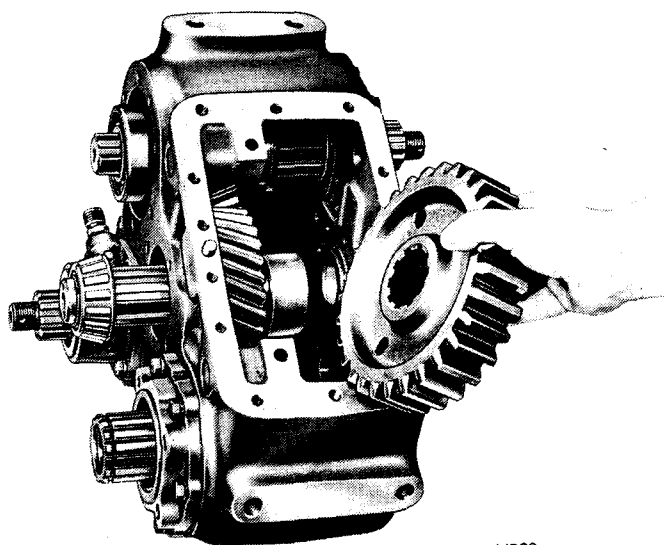
(2) Using a block of wood between sliding gear and case (Fig. 6) press out input shaft and front bearing. **Do not pound on shaft if gear becomes bound.**

(3) Lift out sliding gear, drive gear and spacer (Fig. 7).

(4) Remove front bearing from shaft.

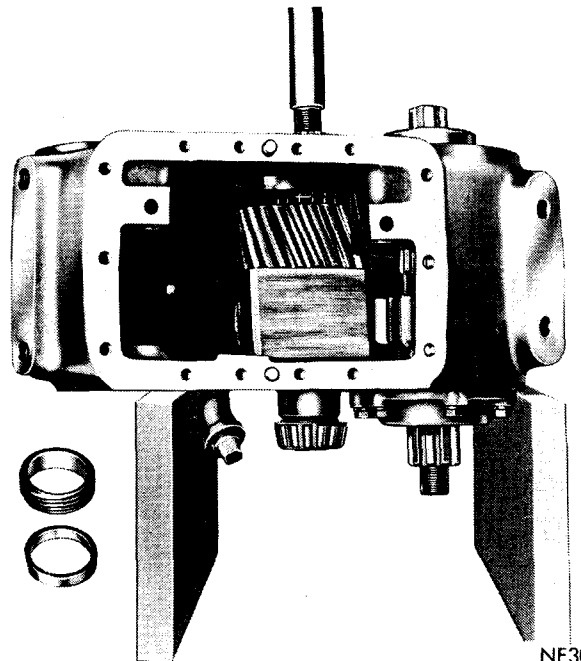
Cleaning and Inspection

(1) All parts should be thoroughly inspected after washing with a clean solvent. After washing, parts should be dried with compressed air and all ma-



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Fig. 4—Removing or Installing Idler Gear Assembly



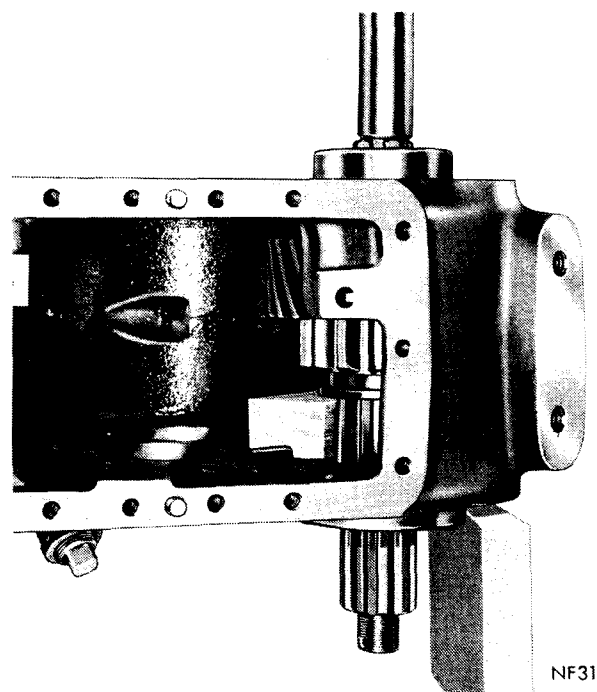
NF30

Fig. 5—Pressing Out Rear Output Shaft

chined surfaces should be coated immediately with oil to prevent corrosion.

(2) Do not spin bearings with compressed air. Running dry bearings at high speed results in scored races, balls or rollers, even with no load. Hold bearing so it does not turn and gently blow it dry. Then oil the cone and rollers.

(3) Inspect all bearings and cups for wear, corro-



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Fig. 6—Pressing Out Input Shaft

sion, scores, chips, brinnelling or cracks. With ball bearing assemblies lubricated with light oil, hold inner race of bearing and rotate bearing outer race. Bearing action should feel smooth and free, if it is not, the bearing either contains dirt or has been damaged. If a bearing has any defect, it should be replaced.

Tapered roller bearing wear, if it has occurred, will be evident at the large end of the bearing rolls. New bearing rolls have a radius at the edge of the roll end a recessed area in the center of the roll end. If the ground end surface of the rolls has been worn down, as evidenced by comparing the old bearing with a new one, the bearing should be replaced. Any attempts to use a worn bearing by readjusting bearing clearances will not be economical since the bearing will continue to wear and early failure along with necessity for another overhaul of the assembly will result.

(4) Inspect all bearing retainers for damaged machined surfaces, cracks, scores, or loose cups in counterbores.

(5) Inspect all shafts for worn, scored or damaged teeth.

(6) Inspect all gears for worn, scored chipped or damaged teeth.

(7) Inspect shift forks for misalignment, scored machined surfaces or cracks.

(8) Inspect shift shafts for wear or scoring in areas which slide back and forth in case bores. Surfaces which contact seals should also be clean and free from scoring or corrosion.

(9) Be sure poppet balls and springs are in good condition, with no collapsed spring coils. Check all oil sealing surfaces for wear and imperfections, since these can result in early seal failure and lubricant

leakage. Make sure all oil duct channels and openings are clean and smooth.

Replace all damaged parts to assure good long lived economical operation.

ASSEMBLY AND INSTALLATION OF SUBASSEMBLIES

Input Shaft Assembly

(1) Using a suitable sleeve, install input shaft front bearing against shoulder at front end of input shaft, with shielded side of bearing toward inside of transfer case.

(2) Install front bearing on input shaft with shielded side against shoulder.

(3) Start input shaft into case. Mount sliding gear, spacer and drive gear (with bushing on shaft).

(4) Tap input shaft into position using a suitable sleeve against inner race of front bearing.

(5) Position original shim pack plug .010 inch or more to make sure there is endplay in the assembly. Install front cover and tighten cap screws.

(6) Place thrust washer on shaft and install rear bearing with shielded side toward inside.

(7) Position a new gasket and attach the power take off (or cover, if used) to rear of case. Tighten cap screws.

(8) Mount a dial indicator on the unit (Fig. 8). Set the stem against front end of input shaft and check amount of endplay in the assembly. **Remove enough shims from under bearing cap to arrive at an adjustment of .003-.005 inch endplay.**

(9) Reposition bearing cap, insert cap screws and tighten as specified. Remove power take off for convenience in handling the transfer case.

Rear Output Shaft

(1) Press front bearing onto shaft with suitable sleeve.

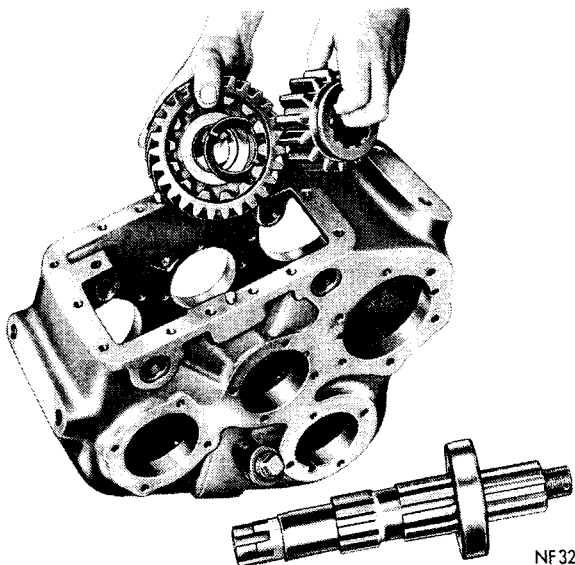


Fig. 7—Removing or Installing Sliding Gear, Drive Gear and Spacer

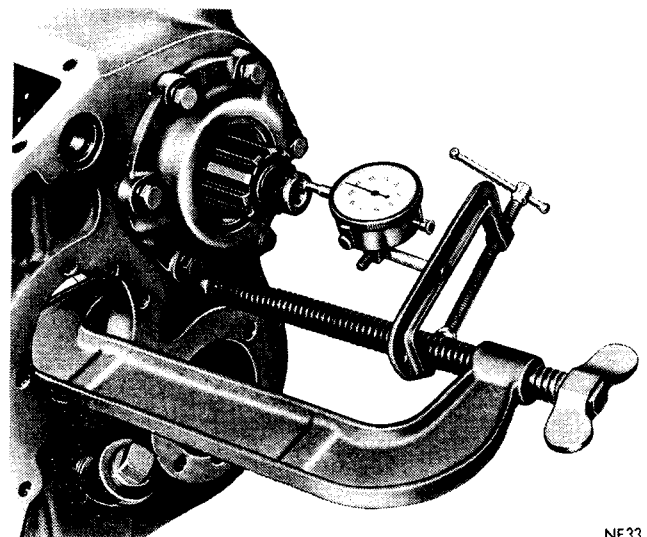


Fig. 8—Checking End Play (Input Shaft)

(2) Hold the rear output gear in position inside case and slide shaft through it (Fig. 9).

(3) Install front bearing cup and original shim pack plus .010 inch. Install bearing cover, lock washers and tighten cap screws.

(4) Press rear bearing on shaft with a suitable sleeve. Then tap bearing cup into position.

(5) Install spacer and speedometer drive gear over shaft.

(6) Position new gasket, bearing cap (and oil seal) over shaft. Install lock washers and cap screws and tighten as specified.

(7) Rotate shaft to seat bearings. Mount a dial indicator tool C-3339 against rear end of shaft to check the amount of endplay in the assembly (Fig. 10). Remove sufficient shims from under the front bearing cap to arrive at an adjustment of zero endplay and zero preload.

Front Output Shaft Gear and Bearing

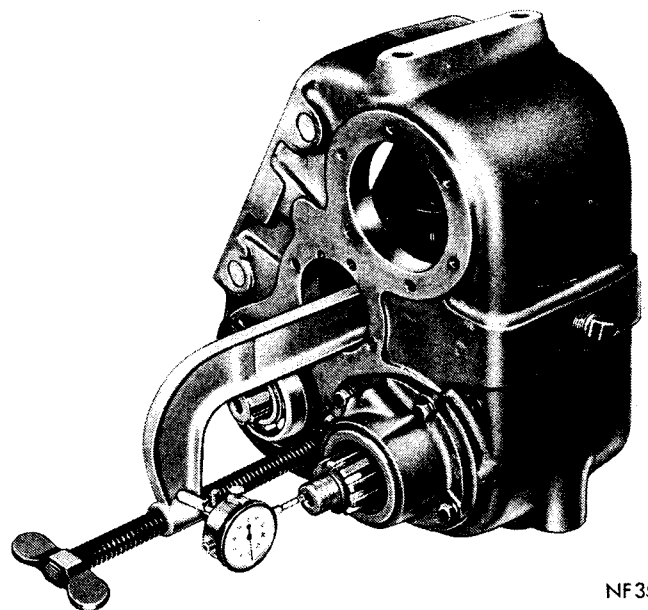
(1) Install front output shaft gear and rear bearing assembly in bore at rear of case and install snap ring in the groove on bearing outer race. **Front output shaft rear bearing can be removed by careful use of C-549 puller. Care must be exercised to apply force only against inner race of the bearing. The front output shaft gear and bearing assembly must be installed before idler shaft and gear assembly.**

Idler Gear Assembly

(1) Press rear bearing on idler shaft. Install snap ring.

(2) Hold the helical gear in position inside case and tap idler shaft through it with soft hammer (Fig. 11). The short hub side of gear goes to outside (rear).

(3) Install gear spacer on shaft and then install the



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Fig. 10—Checking End Play (Output Shaft)

Lo gear with long hub toward outside (front) of case.

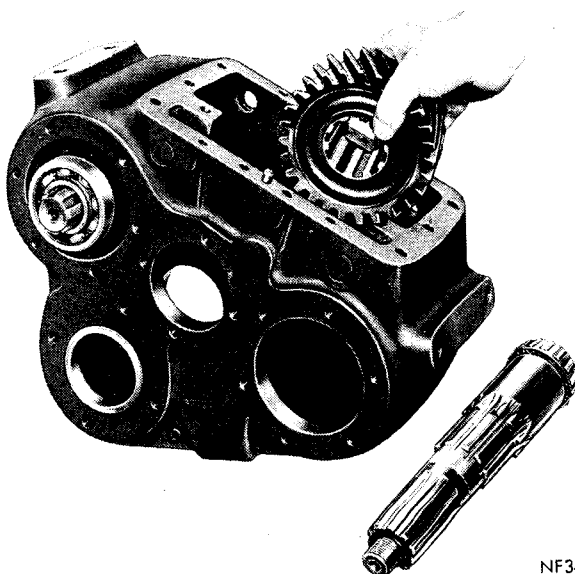
(4) With shaft in position, install rear bearing cup in case. Use a new gasket and install rear bearing cap, lock washers and cap screws. Tighten cap screws as specified.

(5) Drive front bearing onto idler shaft. Hold shaft rigid to avoid damaging rear bearing and cup. Install bearing retainer plate and cap screws. Lock wire.

(6) Tap front bearing cup into place.

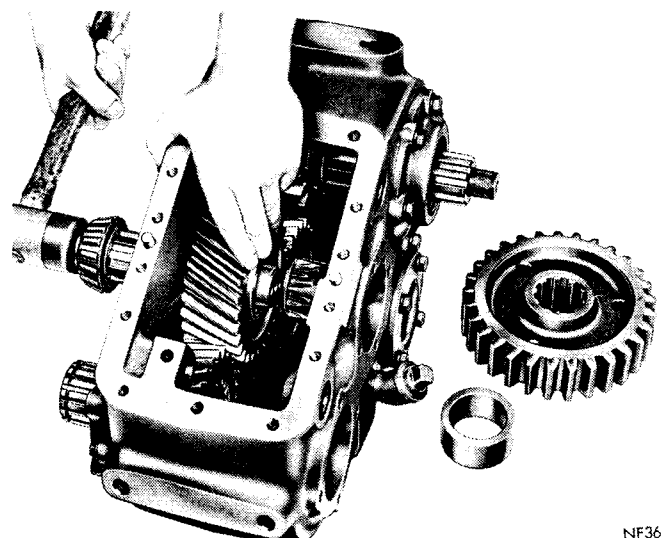
(7) Install sufficient shims to set up endplay in idler assembly. Install front bearing cap and secure with cap screws and lock washers.

(8) Mount a dial indicator Tool C-3339 on case with the stem set against inside face of Lo-gear. Check amount of endplay by working assembly back and forth with two prybars.



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Fig. 9—Installing Output Gear



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Fig. 11—Installing Helical Gear

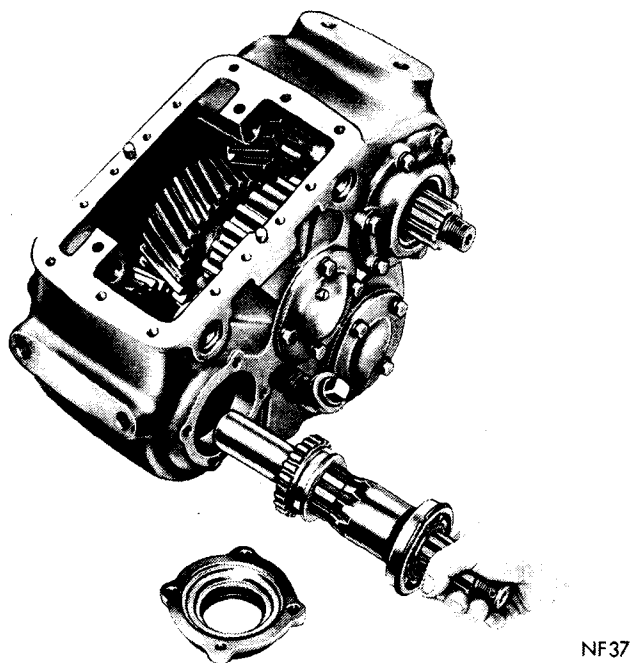


Fig. 12—Installing Front Output Shaft

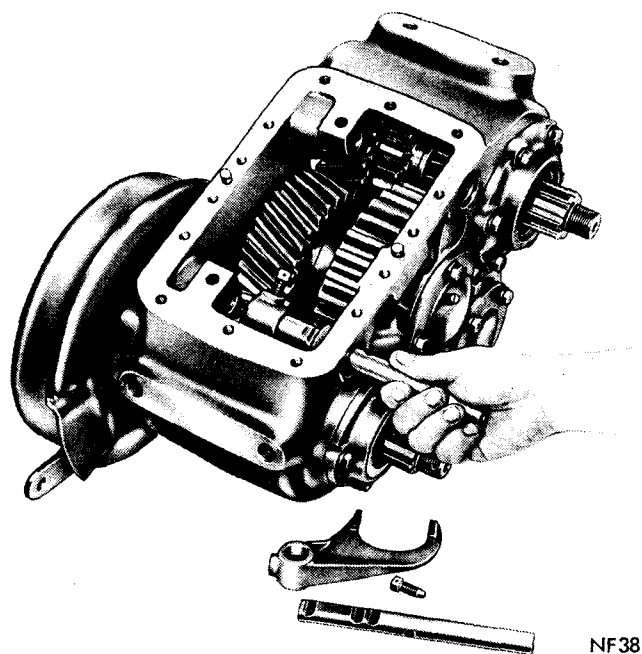
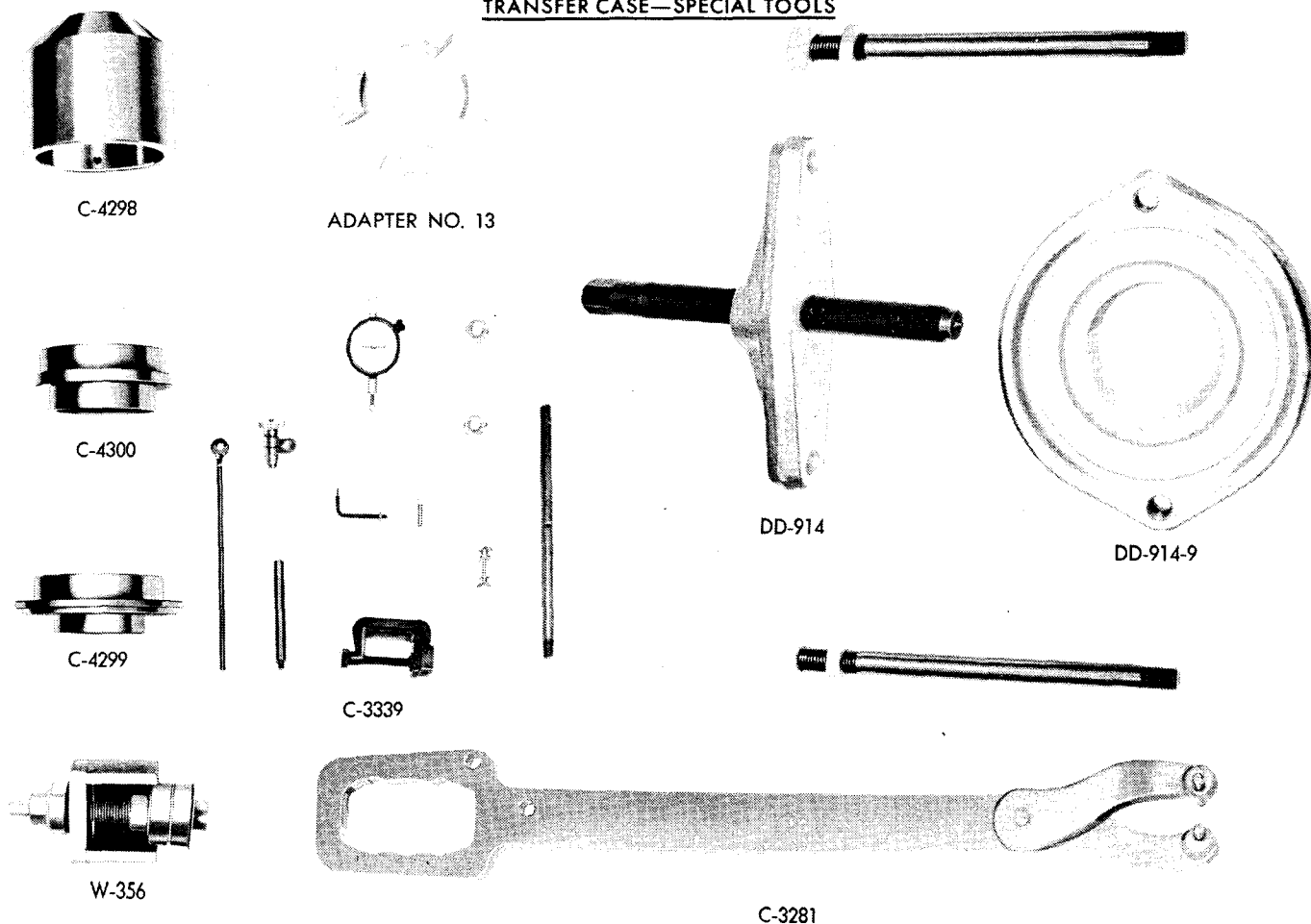


Fig. 13—Installing Shift Shafts

TRANSFER CASE—SPECIAL TOOLS



Remove sufficient shims to arrive at a bearing adjustment of .003-.005 inch endplay.

Front Output Shaft (Fig. 12)

- (1) Install ball bearing on shaft with bearing snap ring toward outside.
- (2) Install sliding collar on shaft. Slide shaft into case.
- (3) With shaft in position, install a new gasket, bearing cap and oil seal, lock washers and cap screws. Tighten cap screws as specified.

Shift Shafts (Fig. 13)

- (1) Install new shift shaft oil seals in case (if old seals are not in good condition).
- (2) Position the declutch fork in collar.
- (3) Grease the declutch shift shaft and slide it into case and through fork.
- (4) With shift shaft in position, insert set screw. Tighten screw and lock wire to fork.
- (5) Position range shift fork in sliding gear.
- (6) Slide range shift shaft through fork. Install set screw, tighten and lock wire to shift fork.
- (7) Install expansion plugs at rear of case and flatten to expand.
- (8) Place detent balls and springs in position in case.
- (9) Install cover with a new gasket and tighten cap screws as specified.
- (10) Install power take off assembly over a new gasket. Secure with cap screws and lock washers.

- (11) Install yokes or flanges and nuts and tighten as specified.

Parking Brake Assembly

- (1) Mount parking brake support and reinforcing ring on case and tighten the four 7/16 inch bolts to 35 foot-pounds.
- (2) Position parking brake lever on assembly with lower swinging pin entered in hole in lever and with lever offset, fitting offset area of parking brake support.
- (3) Position brake shoes with webs in abutment slots and with a swinging pin entered in slotted hole of each shoe web.
- (4) Center lever exactly over hub of front output shaft gear, so it will not interfere with brake hub lubricant slinger ring.
- (5) Press or tap lubricant slinger ring onto grooved surface of parking brake hub (if previously removed).
- (6) Drive brake hub onto splined extension of front output shaft gear, being sure that no interference occurs between lubricant slinger ring and edge of large hole in parking brake lever.
- (7) Install parking brake hub snap ring in groove in splined gear hub extension.
- (8) Mount parking brake drum on hub and tighten the four 7/16 inch bolts with lock washers to 38 to 49 foot-pounds. Install lock wire in bolt heads.
- (9) Install large expansion plug in rear of parking brake hub. Expand plug in counterbore.

LOADFLITE TRANSMISSION (A-727)

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GENERAL INFORMATION

The Loadflite transmissions for truck are heavy duty versions of the A-727 Torqueflite transmission.

Three cases are used: one for the 225 cu. in. engine, one for the 318/360 cu. in. engines and one for the 400/440 cu. in. engines.

One short and one long extension housing is used. The short extension is used when a two piece drive shaft is required due to truck length. A long extension is used on conventional models with a one piece drive shaft (Figs. 1 and 2).

Transmission operation requirements are different for each vehicle and engine combination and some in-

ternal parts will be different to provide for this. Therefore, when replacing parts, refer to the seven digit part number stamped on left side of the transmission oil pan flange.

The transmission combines a torque converter and a fully-automatic 3-speed gear system. The converter housing and transmission case are an integral aluminum casting. The transmission consists of two multiple disc clutches, an over-running clutch, two servos and bands, and two planetary gear sets to provide three forward ratios and a reverse ratio. The common sun gear of the planetary gear sets is connected to

the front clutch by a driving shell which is splined to the sun gear and to the front clutch retainer. The hydraulic system consists of an oil pump, and a single valve body which contains all of the valves except the governor valve.

Venting of the transmission is accomplished by a drilled passage through the upper part of the oil pump housing. The torque converter is attached to the crankshaft through a flexible driving plate. Cooling of the converter is accomplished by circulating the transmission fluid through an oil-to-water type cooler, located in the radiator lower tank. The torque converter assembly is a sealed unit which cannot be disassembled.

The transmission fluid is filtered by an internal "Dacron Type" filter attached to the lower side of the valve body assembly.

Engine torque is transmitted to the torque converter then, through the input shaft to the multiple disc clutches in the transmission. The power flow depends on the application of the clutches and bands. Refer to "Clutch Engagement and Band Application Chart" in "Diagnosis and Tests".

HYDRAULIC CONTROL SYSTEM

The hydraulic control circuits (Figs. 3 through 10) show the position of the various valves with color coded passages to indicate those under hydraulic pressure for all operations of the transmission.

The hydraulic control system makes the transmission fully automatic, and has four important functions to perform. In a general way, the components of any automatic control system may be grouped into the following basic groups:

The pressure supply system, the pressure regulating valves, the flow control valves, and the clutches and band servos.

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

Pressure Supply System

The pressure supply system consists of an oil pump driven by the engine through the torque converter. The single front pump furnishes pressure for all the hydraulic and lubrication requirements.

Pressure Regulating Valves

The pressure regulating valves consist of a regulator valve which controls line pressure at a value dependent on throttle opening.

The torque converter control valve maintains torque converter operating pressure and transmission lubricating pressure.

The governor valve transmits regulated pressure to the transmission (in conjunction with vehicle speed) to control upshift and downshift speeds.

The throttle valve transmits regulated pressure to

the transmission (in conjunction with throttle position) to control upshift and downshift speeds.

Flow Control Valves

The manual valve provides the different transmission drive ranges as selected by the vehicle operator.

The 1-2 shift valve automatically shifts the transmission from low to second or from second to low depending on the vehicle operation.

The 2-3 shift valve automatically shifts the transmission from second to direct or from direct to second depending on the vehicle operation.

The kickdown valve makes possible a forced downshift from direct to second-second to breakaway or direct to breakaway (depending on vehicle speed) by depressing the accelerator pedal past the detent "feel" near wide open throttle.

The throttle pressure plug at the end of the 2-3 shift valve, provides a 3-2 downshift with varying throttle openings depending upon vehicle speed.

The 1-2 shift control valve transmits 1-2 shift control pressure to the transmission accumulator piston to control the kickdown band capacity on 1-2 upshifts and 3-2 downshifts. The limit valve determines the maximum speed at which a 3-2 part throttle downshift can be made.

The shuttle valve has two separate functions and performs each independently of the other. The first is that of providing fast release of the kickdown band, and smooth front clutch engagement when the driver makes a "lift-foot" upshift from second to direct. The second function of the shuttle valve is to regulate the application of the kickdown servo and band when making direct to second kickdowns.

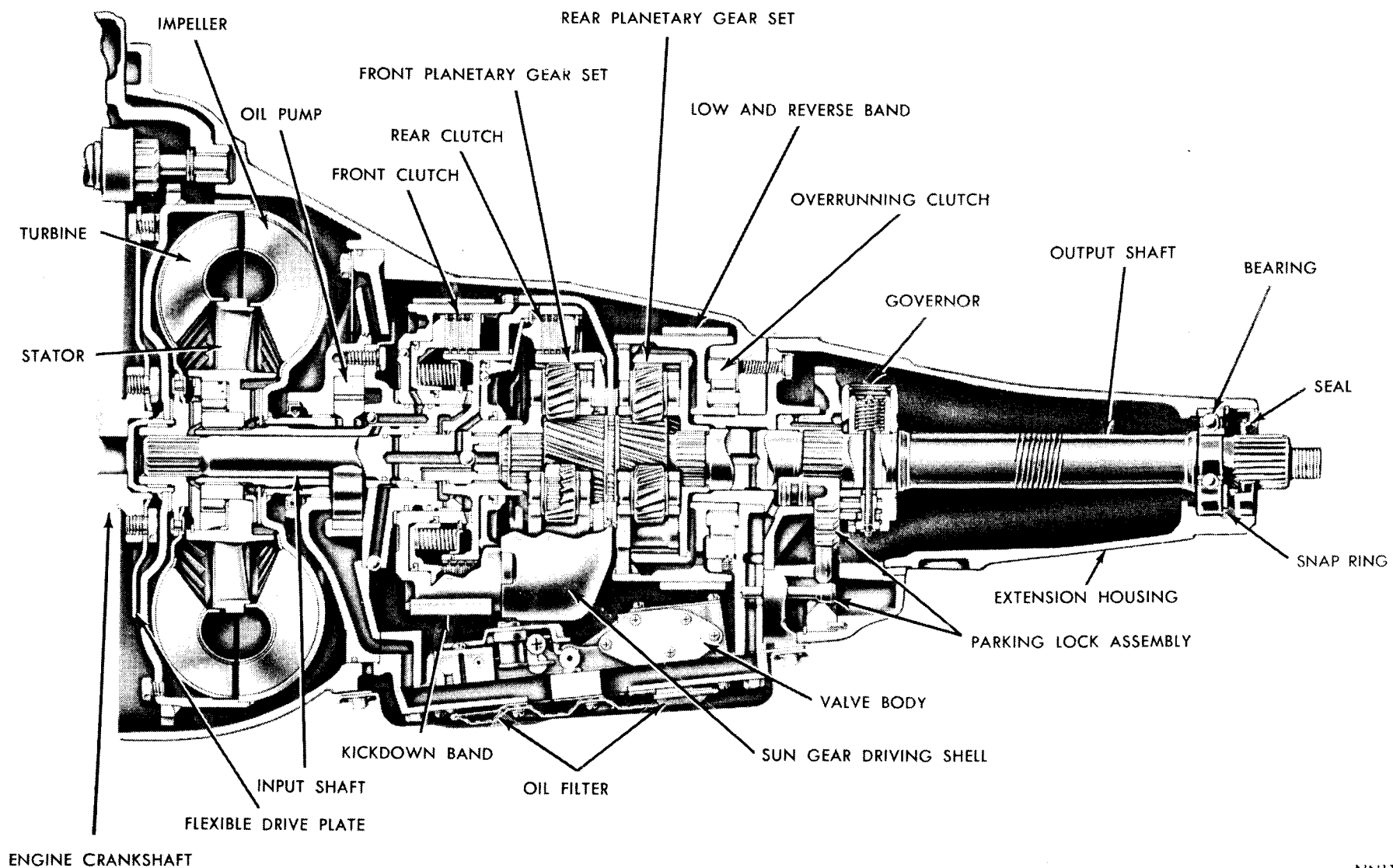
Clutches, Band Servos and Accumulator

The front and rear clutch pistons, and both servo pistons are moved hydraulically to engage the clutches and apply the bands. The pistons are released by spring tension when hydraulic pressure is released. On the 2-3 upshift, the kickdown servo piston is released by spring tension and hydraulic pressure.

The accumulator controls the hydraulic pressure on the apply side of the kickdown servo during the 1-2 shift; thereby, cushioning the kickdown band application at any throttle position.

OPERATING INSTRUCTIONS

The transmission will automatically upshift and downshift at approximately the speeds shown in the "Automatic Shift Speed Chart." All shift speeds given in the "Chart" may vary somewhat due to production tolerances and rear axle ratios. The quality of the shifts is very important. All shifts should be smooth and positive with no noticeable engine runaway. See "Diagnosis" for chart.



NN118B

Fig. 1—Loadflite Transmission and Torque Converter (Short Extension)

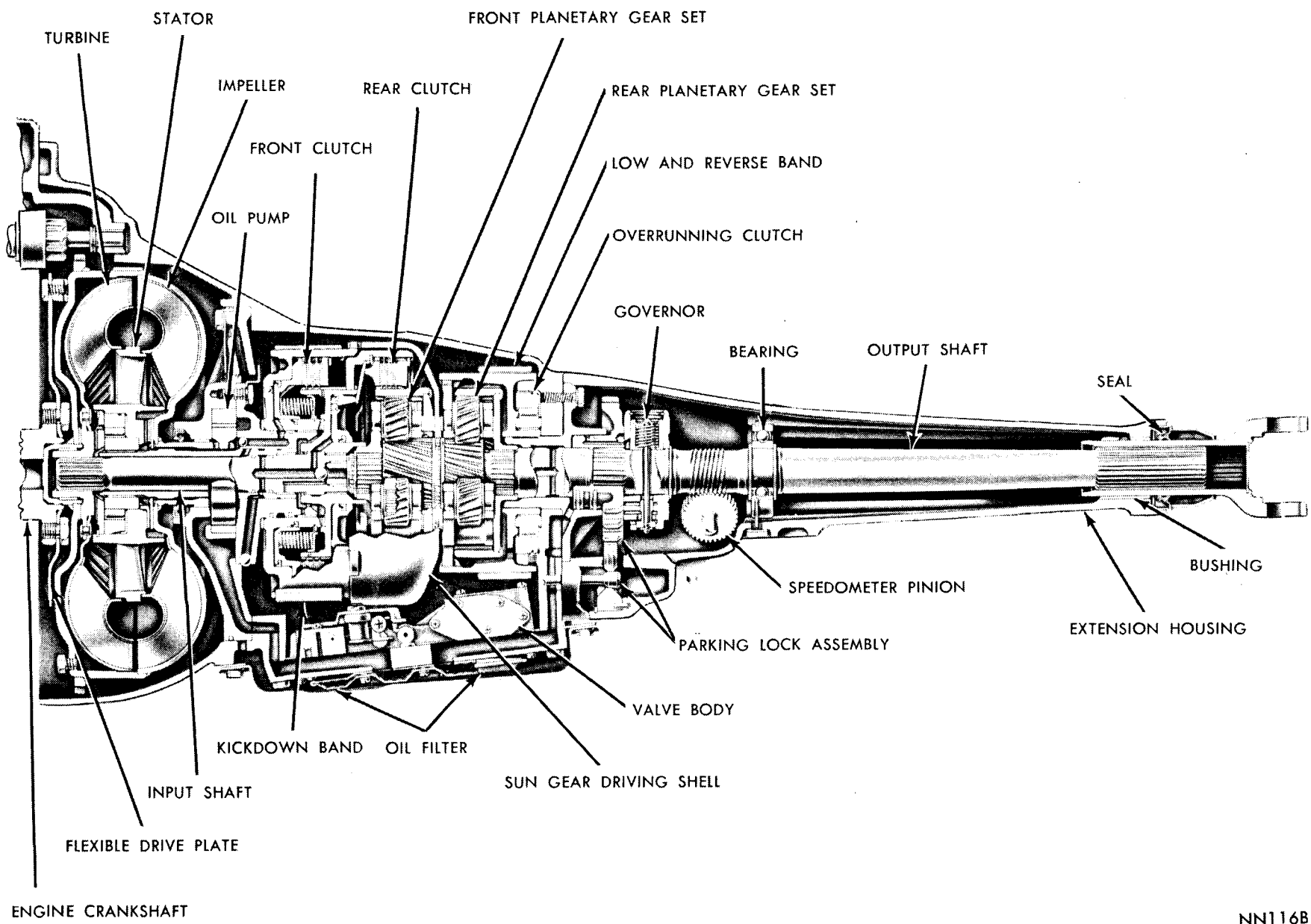
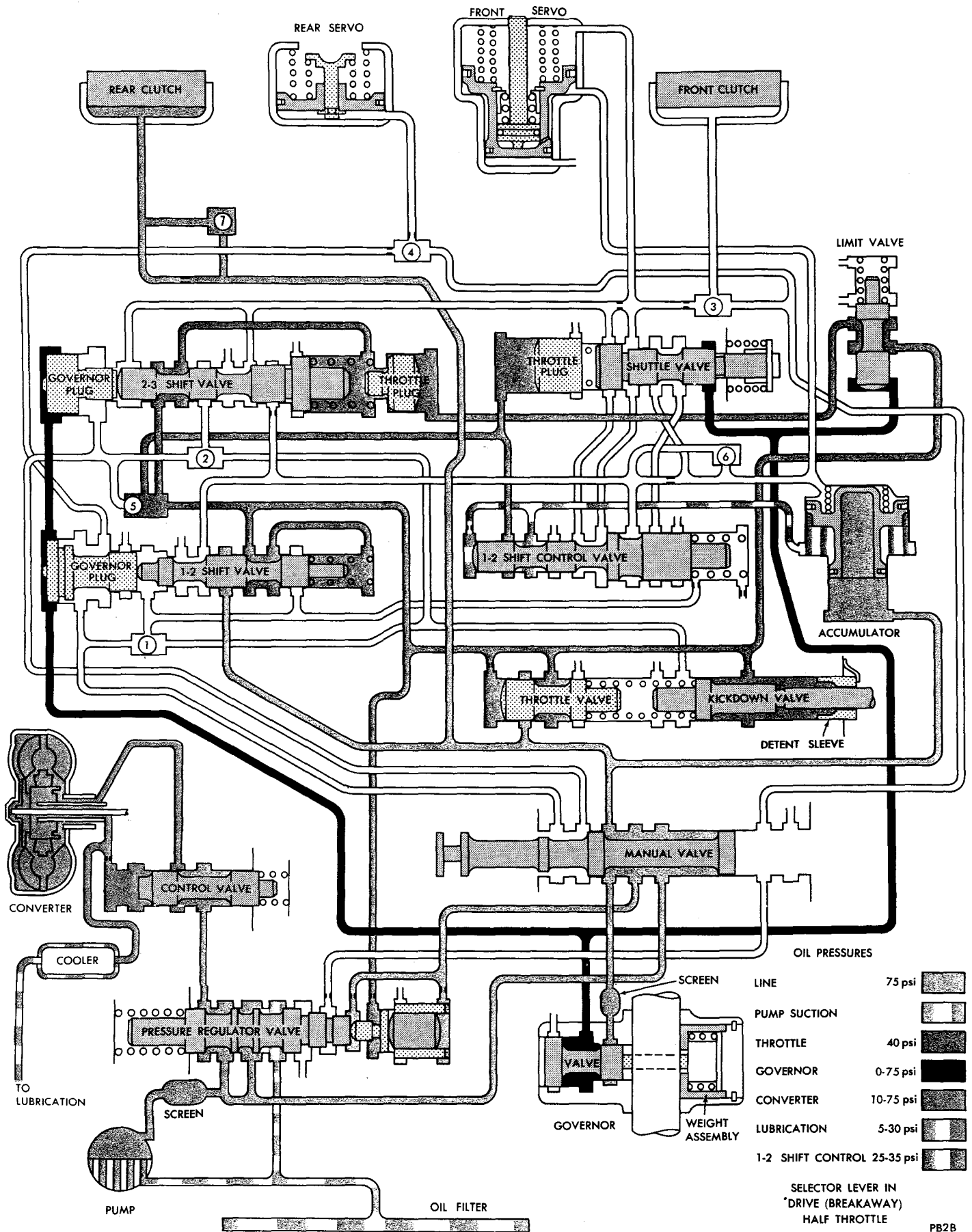


Fig. 2—Loadflite Transmission and Torque Converter (Long Extension)

NN116B



PB2B

Fig. 3—Drive—Breakaway

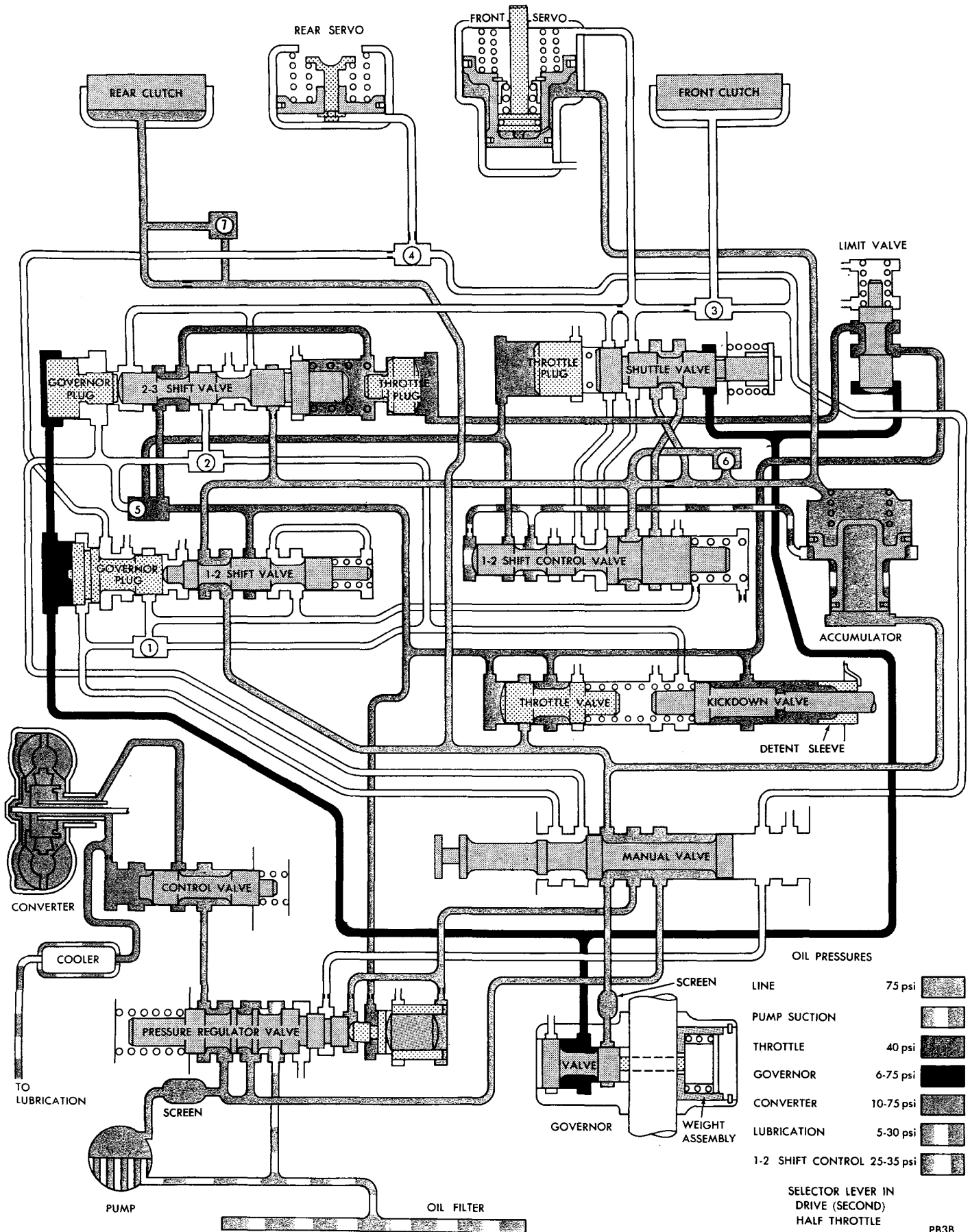


Fig. 4—Drive—Second

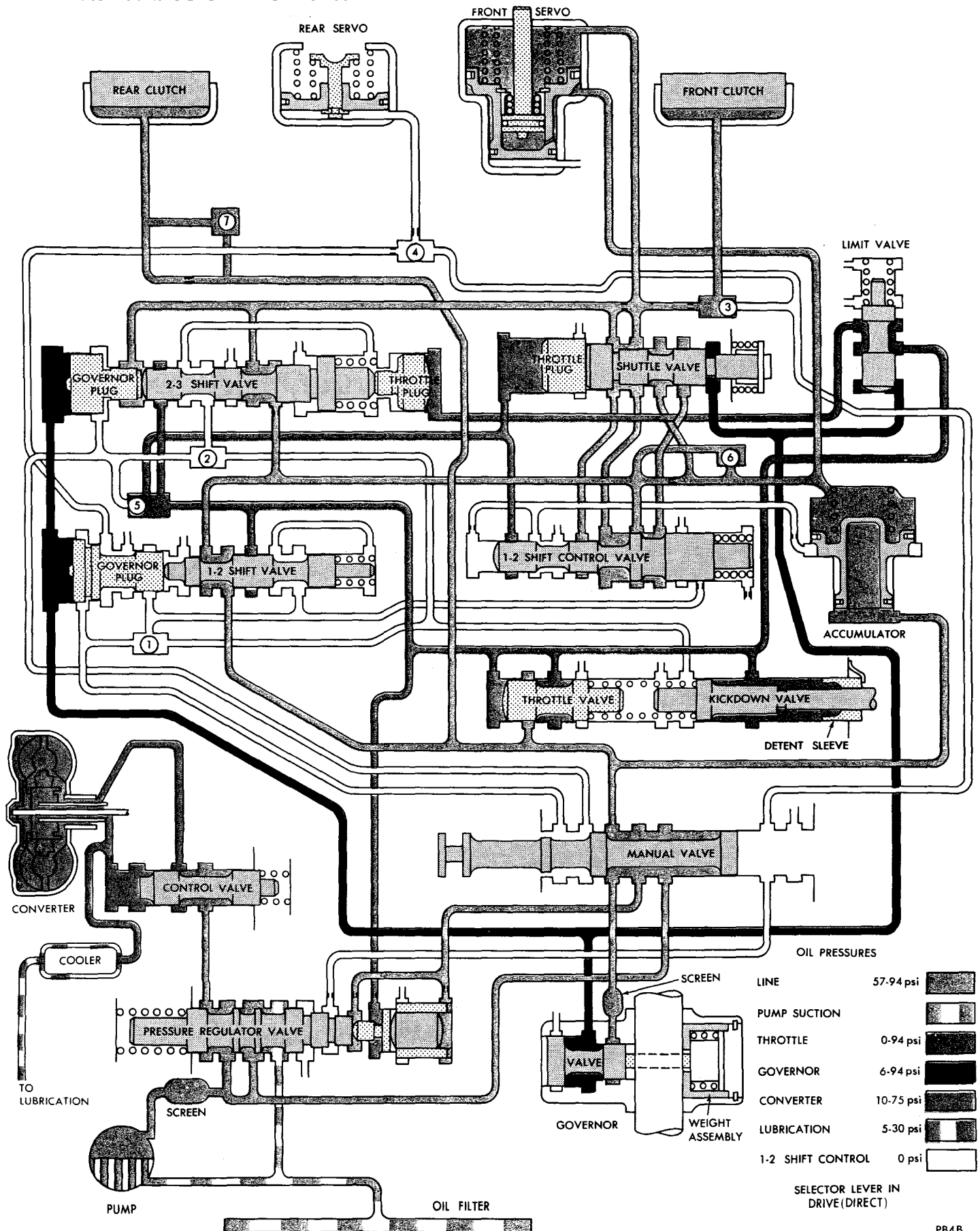


Fig. 5—Drive—Direct

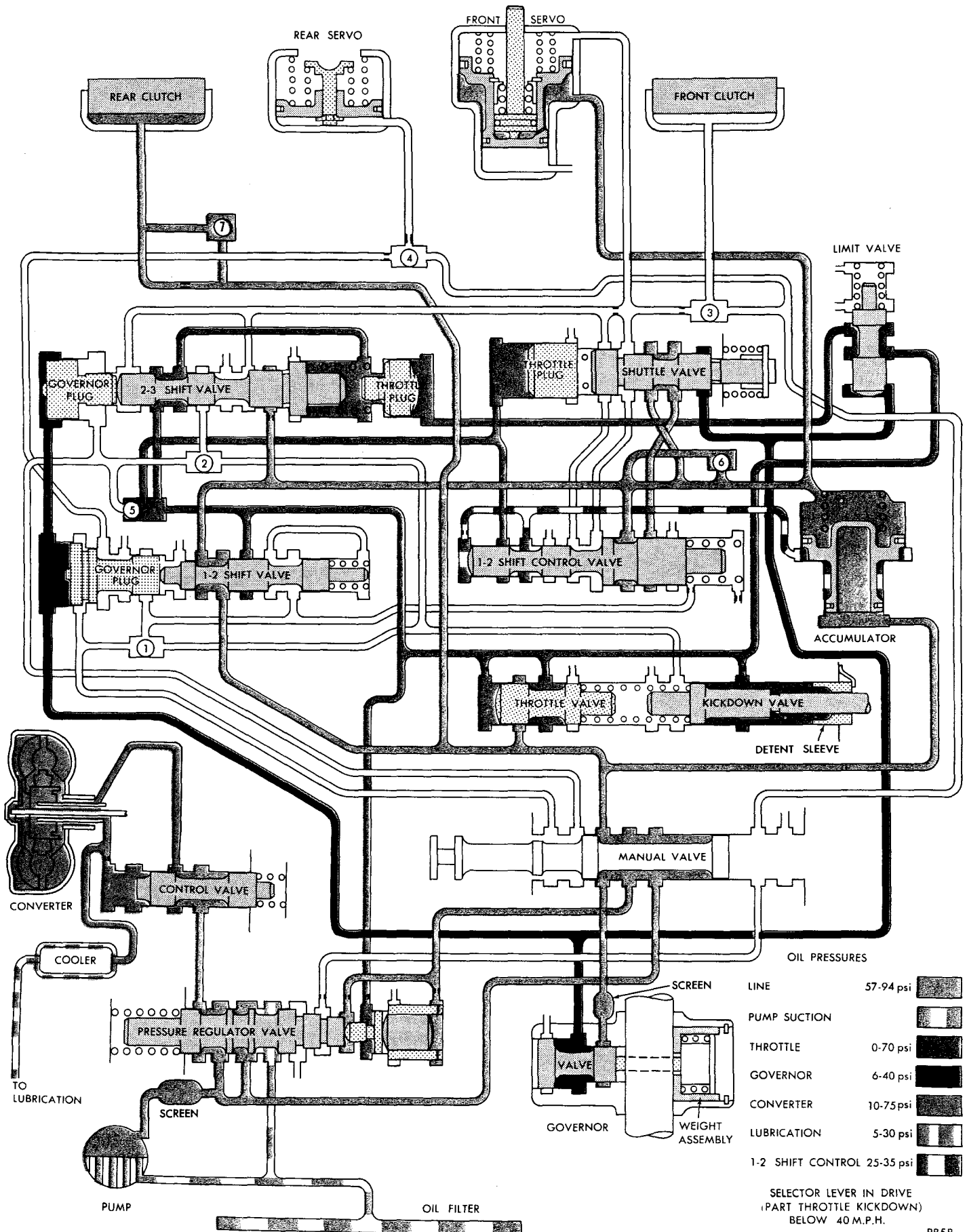
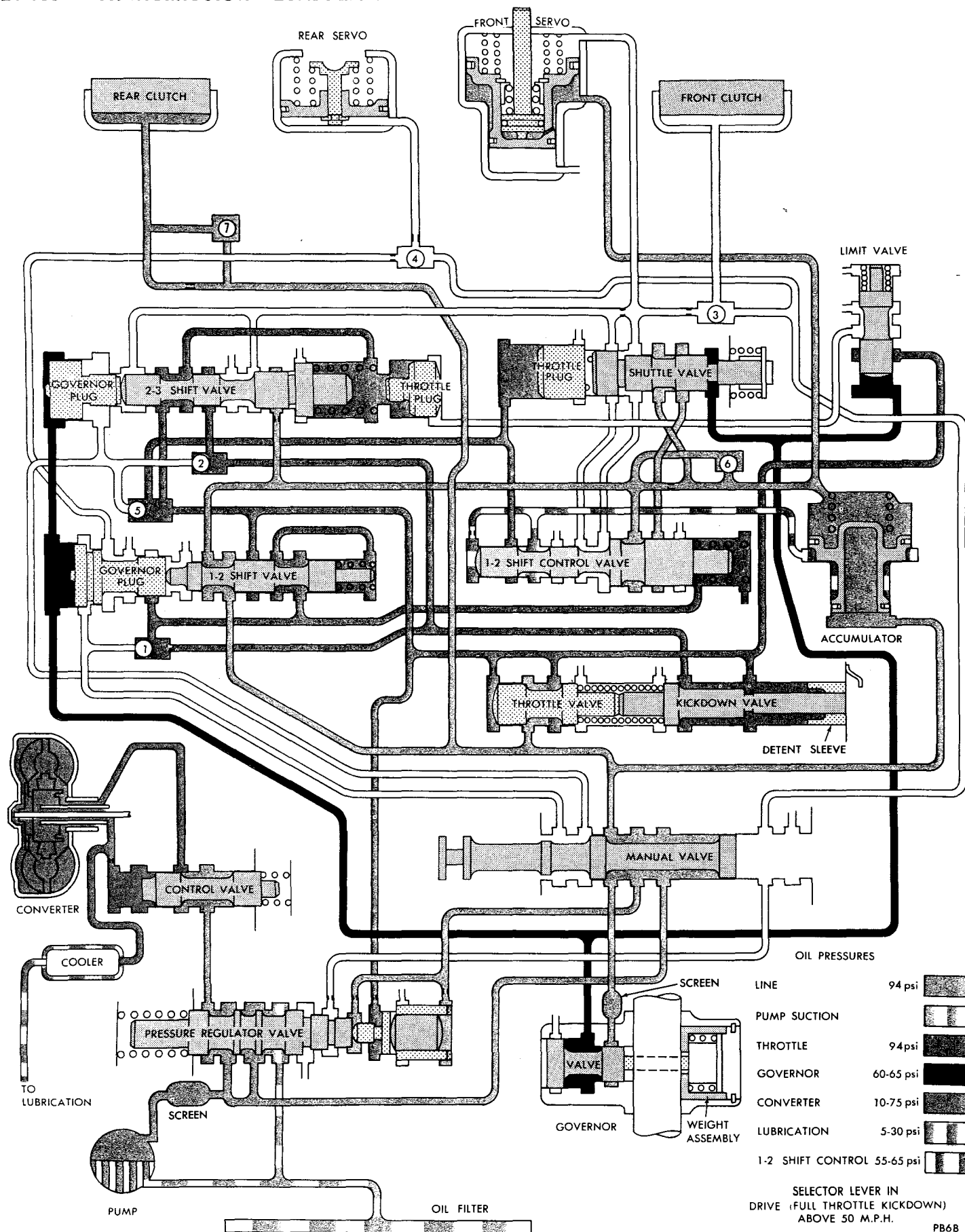


Fig. 6—Drive—Part Throttle Kickdown


Fig. 7—Drive—Full Throttle Kickdown

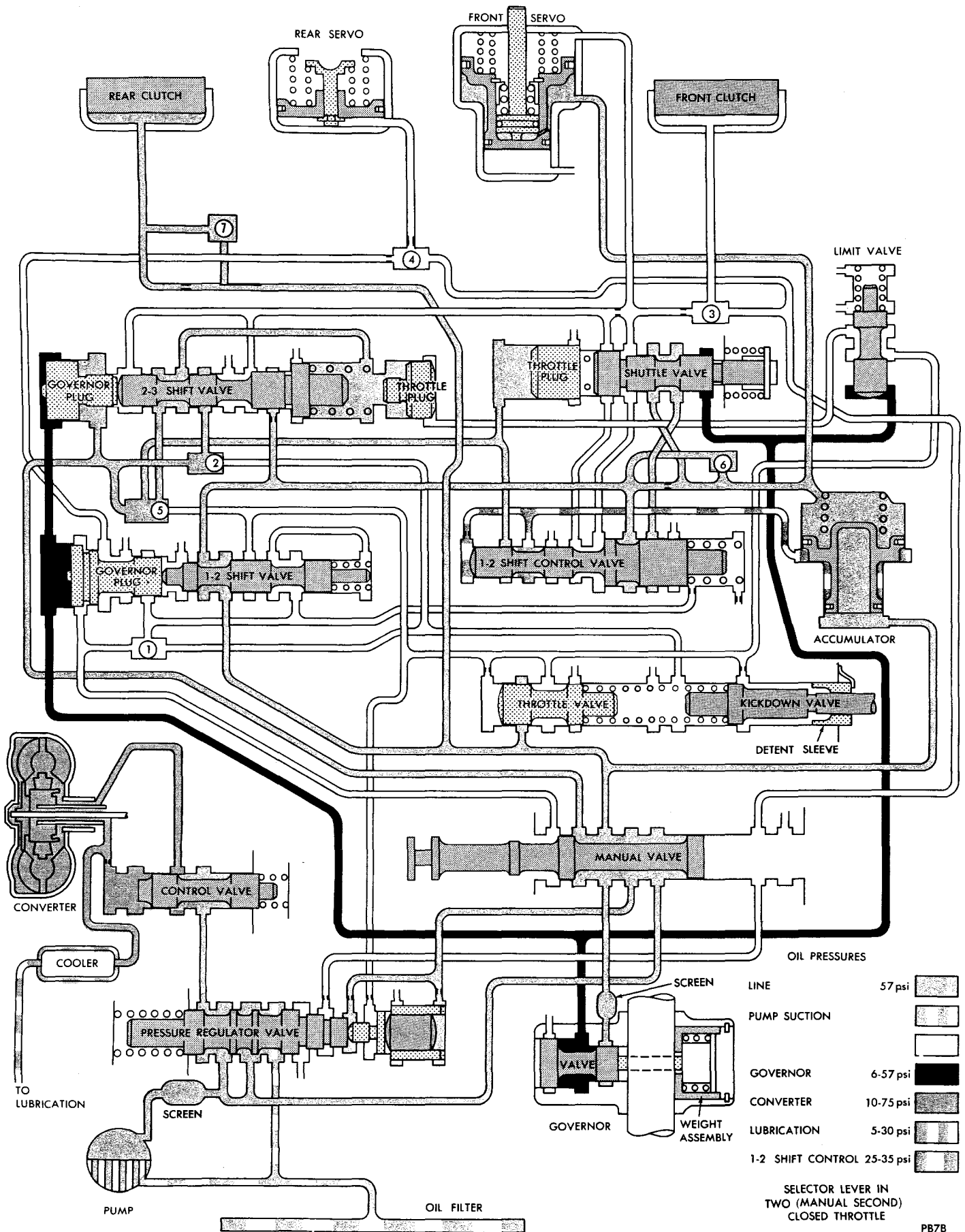
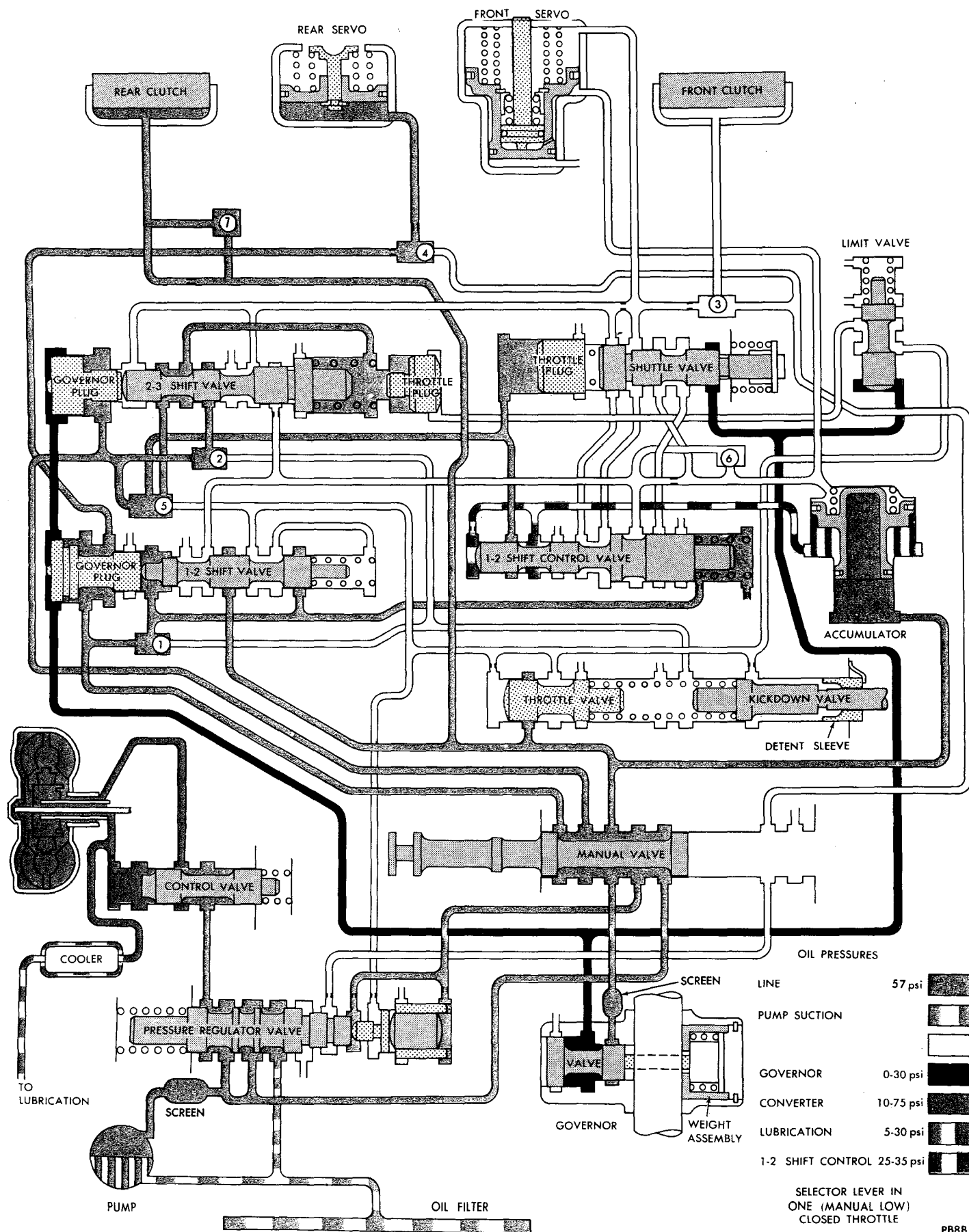


Fig. 8—Selector Lever—Two



PB88

Fig. 9—Selector Lever—One

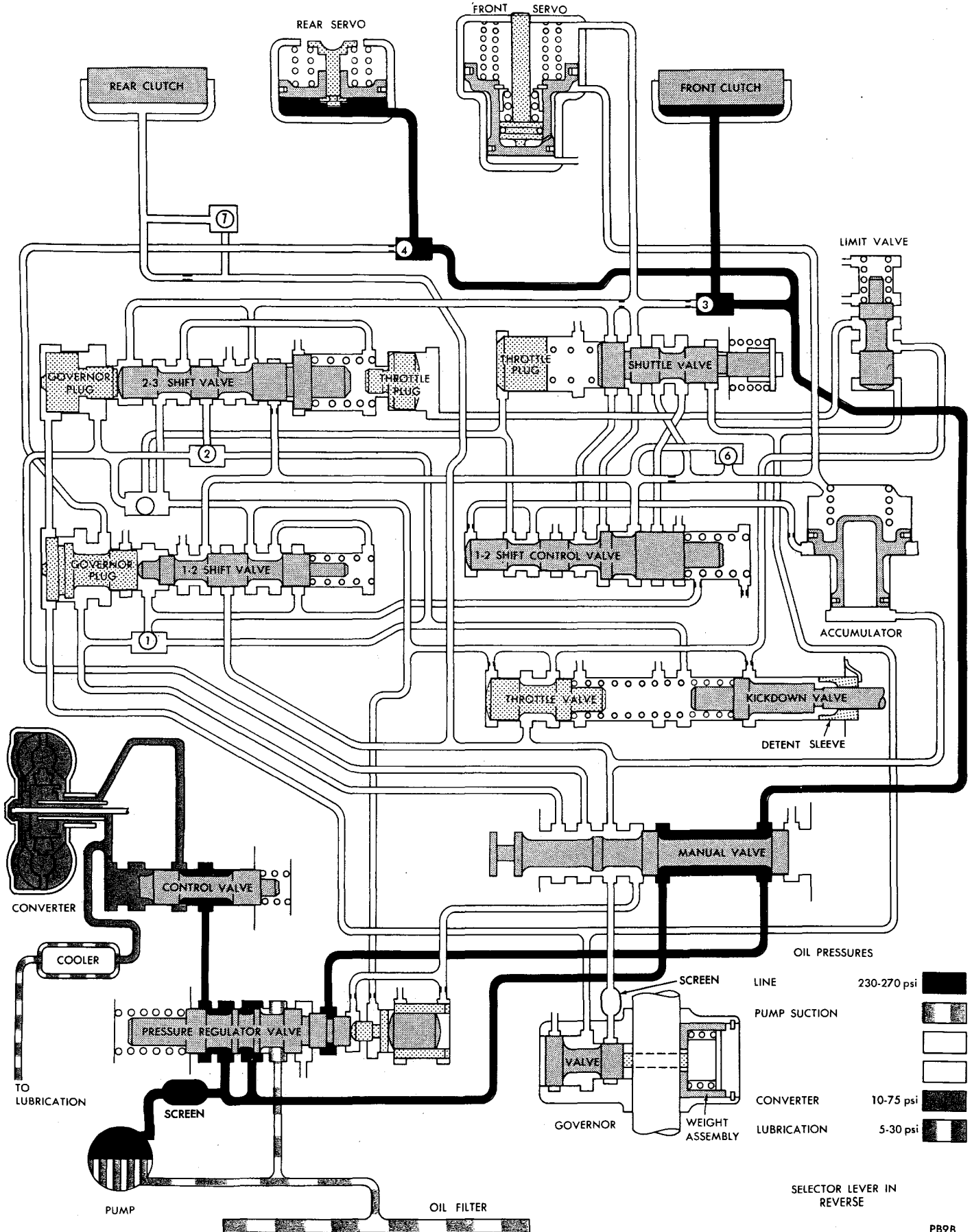


Fig. 10—Reverse

Gearshift and Parking Lock Controls

The transmission is controlled by a "lever type" gearshift incorporated within the steering column. The control has six selector lever positions: P (park), R (reverse), N (neutral), D (drive), 2 (second) and 1 (low). The parking lock is applied by moving the selector lever past a gate to the P position.

CAUTION: Never apply the parking lock until the vehicle has stopped.

Starting the Engine

The engine will start with the selector lever in either the P (park) or N (neutral) positions.

(1) As a safety precaution when starting in the N (neutral) position, apply the parking or foot brake.

(2) Depress the accelerator pedal fully, then release, to insure proper choke operation.

(3) Turn the ignition key all the way to the right to START position. When the engine starts, release the key and it will return to the ON position. The Loadflite transmission will not permit starting the engine by pushing or towing.

Mountain Driving

When driving in the mountains with either heavy loads or when pulling trailers, the 2 (second) or 1 (low) position should be selected on upgrades which require heavy throttle of 1/2 mile or more. This reduces possibility of overheating the transmission and torque converter under these conditions.

Towing Vehicle

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

Transmission Operating Properly: The vehicle may be towed safely in N (neutral) with rear wheels on the ground at a speed not to exceed 30 mph. **If the vehicle is to be towed for extended distances, it should be done with a rear end pickup or the propeller shaft removed.** Because the transmission receives lubrication only when the engine is running, **it is good practice to always tow a disabled vehicle with a rear end pickup or remove the propeller shaft.**

SERVICE DIAGNOSIS AND TESTS

DIAGNOSIS—GENERAL

Automatic transmission malfunctions may be caused by four general conditions: poor engine performance, improper adjustments, hydraulic malfunctions, and mechanical malfunctions. Diagnosis of these problems should always begin by checking the easily accessible variables: fluid level and condition, manual linkage adjustment, and throttle linkage adjustment. Then perform a road test to determine whether the problem has been corrected or that more diagnosis is necessary. If the problem exists after the preliminary tests and corrections are completed, hydraulic pressure tests should be performed.

Fluid Level and Condition

Before removing the dipstick, wipe all dirt off of the protective cap and top of the filler tube.

Since the torque converter fills more slowly in the "P" Park position, place the selector lever in "N" Neutral to be sure that the fluid level check is accurate. The engine should be running at idle speed. The fluid should be at normal operating temperature (approximately 175° F). The fluid level is correct if it is between the "Full" and "Add One Pint" marks on the dipstick.

Low fluid level can cause a variety of conditions because it allows the pump to take in air along with the fluid. As in any hydraulic system, air bubbles make the fluid spongy, therefore, pressures will be low and build up slowly.

Improper filling can also raise the fluid level too high. When the transmission has too much fluid, the

gears churn up foam and cause the same conditions which occur with a low fluid level.

In either case, the air bubbles can cause overheating, fluid oxidation and varnish which can interfere with normal valve, clutch, and servo operation. Foaming can also result in fluid escaping from the transmission vent where it may be mistaken for a leak.

Along with fluid level, it is important to check the condition of the fluid. When the fluid smells burned, and is contaminated with metal or friction material particles, a complete transmission overhaul is needed. Be sure to examine the fluid on the dipstick closely. If there is any doubt about its condition, drain out a sample for a double check.

After the fluid has been checked, seat the dipstick fully to seal out water and dirt.

Manual Linkage

Normal operation of the neutral safety switch provides a quick check to confirm proper manual linkage adjustment.

Move the selector lever slowly upward until it clicks into the "P" Park notch in the selector gate. If the starter will operate, the "P" position is correct.

After checking "P" position, move the selector slowly toward "N" Neutral position until the lever drops at the end of the "N" stop in the selector gate. If the starter will also operate at this point the manual linkage is properly adjusted. If adjustment is required, refer to "Gearshift Linkage Adjustment" in "Service Procedures".

Throttle Linkage

The throttle rod adjustment is very important to proper transmission operation. This adjustment positions a valve which controls shift speed, shift quality, and part throttle down shift sensitivity. If the setting is too short, early shifts and slippage between shifts may occur. If the setting is too long, shifts may be delayed and part throttle down shifts may be very sensitive.

In fact, this adjustment is so critical that the use of a throttle lever holding spring is necessary to remove slack in the linkage during adjustment. Refer to "Throttle Rod Adjustment" in "Service Procedures".

Road Test

Prior to performing a road test, be certain that the fluid level and condition, and control linkage adjustments have been checked and approved.

During the road test the transmission should be operated in each position to check for slipping and any variation in shifting. Note whether the shifts are harsh or spongy and check the speeds where the upshifts and downshifts occur. Approximate shift speeds for the various modes of operation are shown in the "Automatic Shift Speeds and Governor Pressure" chart.

Observe closely for slipping or engine speed flare-up. Slipping or flare-up in any gear usually indicates clutch, band, or overrunning clutch problems. If the condition is far advanced, an overhaul will probably be necessary to restore normal operation.

In most cases, the clutch or band that is slipping can be determined by noting the transmission operation in all selector positions and by comparing which internal units are applied in those positions. The chart "Elements In Use At Each Position Of The Selector Lever" provides a basis for road test analysis.

By observing that the rear clutch is applied in both the "D" first gear and "1" first gear positions, but that the overrunning clutch is applied in "D" first and the low and reverse band is applied in "1" first, if the transmission slips in "D" range first gear but does not slip in "1" first gear, the overrunning clutch must be the unit that is slipping. Similarly, if the transmission slips in any two forward gears, the rear clutch is the slipping unit.

Using the same procedure, the rear clutch and front clutch are applied in "D" third gear. If the transmission slips in third gear, either the front clutch or the rear clutch is slipping. By selecting another gear which does not use one of those units, the unit which is slipping can be determined. If the transmission also slips in reverse, the front clutch is slipping. If the transmission does not slip in reverse, the rear clutch is slipping.

This process of elimination can be used to detect any unit which slips and to confirm proper operation

of good units. However, although road test analysis can usually diagnose slipping units, the actual cause of the malfunction usually cannot be decided. Practically any condition can be caused by leaking hydraulic circuits or sticking valves.

Therefore, unless the condition is obvious, like no drive in "D" range first gear only, the transmission should never be disassembled until hydraulic pressure tests have been performed.

HYDRAULIC PRESSURE TESTS

Pressure testing is a very important step in the diagnostic procedure. These tests usually reveal the cause of most transmission problems.

Before performing pressure tests, be certain that fluid level and condition, and control linkage adjustments have been checked and approved. Fluid must be at operating temperature (150 to 200 degrees F.).

Install an engine tachometer, raise vehicle on hoist which allows rear wheels to turn, and position tachometer so it can be read under the vehicle.

Disconnect throttle rod and shift rod from transmission levers so they can be controlled under the vehicle.

Attach 100 psi gauges (C-3292) to ports required for test being conducted. A 300 psi gauge (C-3293) is required for "reverse" pressure test at rear servo.

Test port locations are shown in (Figs. 1 and 2).

Test One (Selector in "1")

- (1) Attach gauges to "line" and "rear servo" ports.
- (2) Operate engine at 1000 rpm for test.
- (3) Move selector lever on transmission all the way forward ("1" position).
- (4) Read pressures on both gauges as throttle lever on transmission is moved from full forward position to full rearward position.
- (5) Line pressure should read 54 to 60 psi with

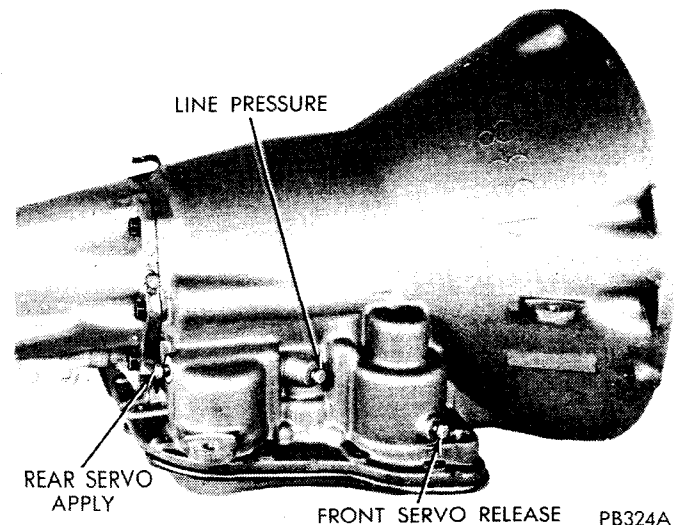


Fig. 1—Pressure Test Locations (Right Side of Case)

throttle lever forward and gradually increase, as lever is moved rearward, to 90 to 96 psi.

(6) Rear servo pressure should read the same as line pressure within 3 psi.

(7) This tests pump output, pressure regulation, and condition of rear clutch and rear servo hydraulic circuits.

Test Two (Selector in "2")

(1) Attach gauge to "line pressure" port and "tee" into rear cooler line fitting to read "lubrication" pressure.

(2) Operate engine at 1000 rpm for test.

(3) Move selector lever on transmission one "detent" rearward from full forward position. This is selector "2" position.

(4) Read pressures on both gauges as throttle lever on transmission is moved from full forward position to full rearward position.

(5) Line pressure should read 54 to 60 psi with throttle lever forward and gradually increase, as lever is moved rearward, to 90 to 96 psi.

(6) Lubrication pressure should be 5 to 15 psi with lever forward and 10 to 30 psi with lever rearward.

(7) This tests pump output, pressure regulation, and condition of rear clutch and lubrication hydraulic circuits.

Test Three (Selector in "D")

(1) Attach gauges to "line" and "front servo release" ports.

(2) Operate engine at 1000 rpm for test.

(3) Move selector lever on transmission two "detents" rearward from full forward position. This is selector "D" position.

(4) Read pressures on both gauges as throttle lever on transmission is moved from full forward position to full rearward position.

(5) Line pressure should read 54 to 60 psi with throttle lever forward and gradually increase, as lever is moved rearward, to 90 to 96 psi.

(6) Front servo release is pressurized only in direct drive and should be same as line pressure within 3 psi, up to downshift point.

(7) This tests pump output, pressure regulation, and condition of rear clutch and front clutch hydraulic circuits.

Test Four (Selector in Reverse)

(1) Attach 300 psi gauge to "rear servo apply" port.

(2) Operate engine at 1600 rpm for test.

(3) Move selector lever on transmission four "detents" rearward from full forward position. This is selector "R" position.

(4) Rear servo pressure should read 230 to 260 psi.

(5) This tests pump output, pressure regulation,

and condition of front clutch and rear servo hydraulic circuits.

(6) Move selector lever on transmission to "D" position to check that rear servo pressure drops to zero.

(7) This tests for leakage into rear servo, due to case porosity, which can cause reverse band burn out.

Test Result Indications

(1) If proper line pressure, minimum to maximum, is found in any one test, the pump and pressure regulator are working properly.

(2) Low pressure in "D, 1 and 2" but correct pressure in "R" indicates rear clutch circuit leakage.

(3) Low pressure in "D and R" but correct pressure in "1" indicates front clutch circuit leakage.

(4) Low pressure in "R and 1" but correct pressure in "2" indicates rear servo circuit leakage.

(5) Low line pressure in all positions indicates a defective pump, a clogged filter or a stuck pressure regulator valve.

Governor Pressure

Test only if transmission shifts at wrong vehicle speeds when throttle rod is correctly adjusted.

(1) Connect a 0-100 psi pressure gauge, to governor pressure take-off point, located at lower left side of extension near the mounting flange (Fig. 2).

(2) Operate transmission in third gear to read pressures and compare speeds shown in chart.

If governor pressures are incorrect at the given vehicle speeds, the governor valve and/or weights are probably sticking. The governor pressure should respond smoothly to changes in mph and should return to 0 to 1-1/2 psi when vehicle is stopped. High pressure at stand still (above 2 psi) will prevent the transmission from downshifting.

Throttle Pressure

No gauge port is provided for the throttle pressure. Incorrect throttle pressure should only be suspected

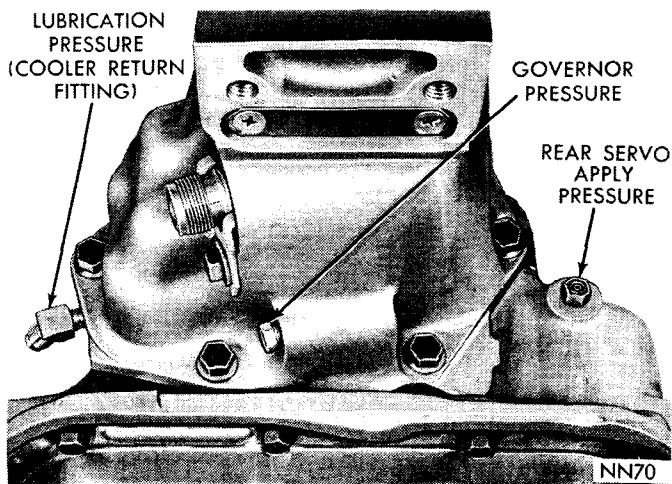


Fig. 2—Pressure Test Locations (Rear End of Case)

AUTOMATIC SHIFT SPEEDS, AND GOVERNOR PRESSURE CHART (APPROXIMATE MILES PER HOUR)

| Models | Typical—See Note Below | | | | | |
|--------------------|------------------------|-----------|-----------|-----------|-----------|-----------|
| Engine cu. in. | 225 | | 318/360 | | 400-440 | |
| Axle Ratio | 4.01:1 | 4.56:1 | 4.10:1 | 4.56:1 | 3.54:1 | 4.10:1 |
| Tire Size | 8.75x16.5 | 8.75x16.5 | 8.00x16.5 | 8.00x16.5 | 8.00x16.5 | 8.00x16.5 |
| Throttle Closed | 8-10 | 7-9 | 8-10 | 7-9 | 9-12 | 8-10 |
| 1-2 Upshift | 11-13 | 10-13 | 11-13 | 10-13 | 13-16 | 11-13 |
| 2-3 Upshift | 7-9 | 6-8 | 7-9 | 6-8 | 8-11 | 7-9 |
| 3-1 Downshift* | | | | | | |
| Throttle Wide Open | 23-31 | 20-28 | 23-31 | 20-28 | 26-36 | 23-31 |
| 1-2 Upshift | 49-56 | 44-50 | 49-56 | 44-50 | 56-64 | 49-56 |
| 2-3 Upshift | | | | | | |
| Kickdown Range | 42-51 | 38-45 | 42-51 | 38-45 | 48-58 | 42-51 |
| 3-2 Downshift | 20-23 | 18-20 | 20-23 | 18-20 | 23-26 | 20-23 |
| 3-1 Downshift | | | | | | |
| Governor Pressure | 15-18 | 13-15 | 15-18 | 13-15 | 17-19 | 15-18 |
| 15 psi | 36-39 | 32-35 | 36-39 | 32-35 | 41-45 | 36-39 |
| 50 psi | 50-54 | 45-49 | 50-54 | 45-49 | 57-62 | 50-54 |
| 75 psi | | | | | | |

NOTE: Figures given are for D200 and D300 models and are typical for other models. Changes in tire size or axle ratio will cause shift points to occur at corresponding higher or lower vehicle speeds.

*Governor pressure should be from zero to 1.5 psi at stand-still or downshift may not occur.

ELEMENTS IN USE AT EACH POSITION OF THE SELECTOR LEVER

| Lever Position | Gear Ratio | Start Safety | Parking Sprag | Clutches | | Over Running | Bands (Kickdown) (Low-Rev.) | |
|----------------|------------|--------------|---------------|----------|------|--------------|-----------------------------|------|
| | | | | Front | Rear | | Front | Rear |
| P—PARK | | X | X | | | | | |
| R—REVERSE | 2.21 | | | X | | | | X |
| N—NEUTRAL | | X | | | | | | |
| D—DRIVE | | | | | | | | |
| First | 2.45 | | | | X | X | | |
| Second | 1.45 | | | | X | | X | |
| Direct | 1.00 | | | X | X | | | |
| 2—SECOND | | | | | | | | |
| First | 2.45 | | | | X | X | | |
| Second | 1.45 | | | | X | | X | |
| 1—LOW (First) | 2.45 | | | | X | | | X |

LOADFLITE TRANSMISSION STALL SPEED CHART

| Engine | Cycle | Converter Diameter | Stall R.P.M. | Application |
|--------|-------|--------------------|--------------|----------------|
| 225 | LDC | 10-3/4 | 1750-2050 | D1-2-3, W1-2-3 |
| 318 | LDC | 10-3/4 | 1775-2075 | D1-2-3, W1-2-3 |
| 318 | HDC | 10-3/4 | 1675-1975 | D1-2-3 |
| 360 | LDC | 10-3/4 | 1825-2125 | D1-2-3, W1-2-3 |
| 360 | HDC | 10-3/4 | 1925-2225 | D1-2-3 |
| 400 | HDC | 10-3/4 | 1975-2275 | D1-2-3 |
| 440 | HDC | 10-3/4 | 2175-2375 | D1-2-3 |

if part throttle up-shift speeds are either delayed or occur too early in relation to vehicle speeds. Engine runaway on either up shifts or down shifts can also be an indicator of incorrect (low) throttle pressure setting.

In no case should throttle pressure be adjusted until transmission throttle linkage adjustment has been verified to be correct.

CONVERTER STALL TEST

WARNING: During test let no one stand in front of vehicle.

The stall test consists of determining the engine speed obtained at full throttle in D position. This test checks the torque converter stator clutch operation, and the holding ability of the transmission clutches. The transmission oil level should be checked and the fore stall operation. **Both the parking and service brakes must be fully applied and front wheels blocked while making this test.**

Do not hold the throttle open any longer than is necessary to obtain a maximum engine speed reading, **and never longer than five seconds at a time.** If more than one stall check is required, operate the engine brought to normal operating temperature before at approximately 1,000 rpm in neutral for 20 seconds to cool the transmission fluid between runs. If engine speed exceeds the maximum limits shown, release the accelerator immediately since transmission clutch slippage is indicated.

Stall Speed Above Specification

If stall speed exceeds the maximum specified in chart by more than 200 rpm, transmission clutch slippage is indicated. Follow the transmission oil pressure and air pressure checks outlined in this section to determine the cause of slippage.

Stall Speed Below Specification

Low stall speeds with a properly tuned engine indicate torque converter stator clutch problems. A road test will be necessary to identify the exact problem.

If stall speeds are 250-350 rpm below specification, and the vehicle operates properly at highway speeds, but has poor through-gear acceleration, the stator overrunning clutch is slipping.

If stall speed and acceleration are normal, but abnormally high throttle opening is required to maintain highway speeds, the stator clutch has seized.

Both of these stator defects require replacement of the torque converter.

Noise

A whining or siren-like noise due to fluid flow is normal during stall operation with some converters; however, loud metallic noises from loose parts or interference within the assembly indicate a defective torque converter. To confirm that the noise originates

within the converter, operate the vehicle at light throttle in D and N on a hoist and listen under the transmission bell housing.

CLUTCH AND SERVO AIR PRESSURE TESTS

A "NO DRIVE" condition might exist even with correct fluid pressure, because of inoperative clutches or bands. The inoperative units, clutches, bands and servos can be located through a series of tests by substituting air pressure for fluid pressure (Fig. 3).

The front and rear clutches, kickdown servo, and low-reverse servo may be tested by applying air pressure to their respective passages after the valve body assembly has been removed. To make air pressure tests, proceed as follows:

CAUTION: Compressed air supply must be free of all dirt and moisture. Use a pressure of 30 psi.

Front Clutch

Apply air pressure to front clutch "apply" passage and listen for a dull "thud" which indicates that front clutch is operating. Hold air pressure on for a few seconds and inspect system for excessive oil leaks.

Rear Clutch

Apply air pressure to rear clutch "apply" passage and listen for a dull "thud" which indicates that rear clutch is operating. Also inspect for excessive oil leaks. If a dull "thud" cannot be heard in the clutches, place finger tips on clutch housing and again apply air pressure. Movement of piston can be felt as the clutch is applied.

Kickdown Servo (Front)

Direct air pressure into front servo "apply" pas-

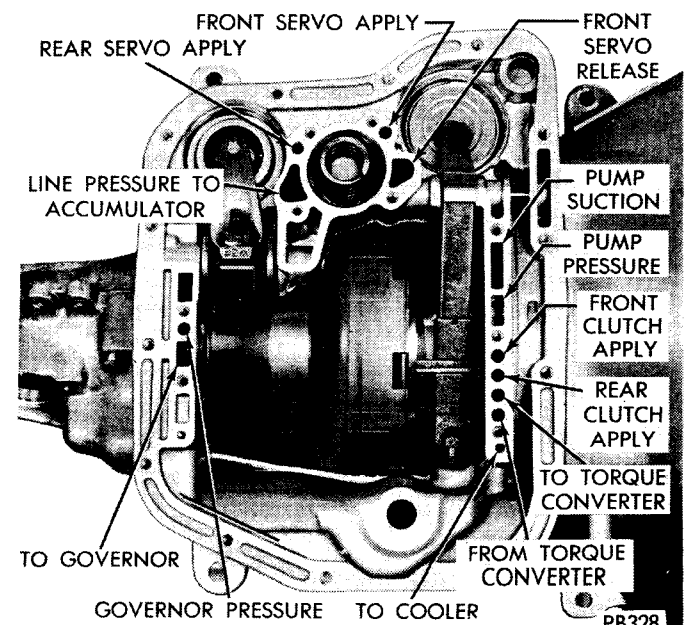


Fig. 3—Air Pressure Test

sage. Operation of servo is indicated by a tightening of front band. Spring tension on servo piston should release the band.

Low and Reverse Servo (Rear)

Direct air pressure into rear servo "apply" passage. Operation of servo is indicated by a tightening of rear band. Spring tension on servo piston should release the band.

If clutches and servos operate properly, no up-shift or erratic shift conditions indicate that malfunctions exist in the valve body.

FLUID LEAKAGE—TRANSMISSION CONVERTER HOUSING AREA

(1) Check for Source of Leakage.

Since fluid leakage at or around the converter area may originate from an engine oil leak, the area should be examined closely. Factory fill fluid is dyed red and, therefore, can be distinguished from engine oil.

(2) Prior to removing the transmission, perform the following checks:

When leakage is determined to originate from the transmission, check fluid level and torque converter drain plug torque prior to removal of the transmission and torque converter.

High oil level can result in oil leakage out the vent located at the top of the front pump housing. If the fluid level is high, adjust to proper level.

Oil leakage can also occur at the torque converter drain plug. Torque the drain plug to 90 inch-pounds.

After performing these two operations, re-check for leakage. If a leak persists, perform the following operation on the vehicle to determine whether it is the **converter or transmission** that is leaking.

Leakage Test Probe

(1) Remove converter housing dust shield.

(2) Position vehicle with front lower than back so that accumulated fluid in converter housing will drain out. Wipe bottom inside of converter housing as dry as possible. A solvent spray followed by compressed air drying is preferable.

(3) Fabricate and fasten test probe (Fig. 4) securely to convenient dust shield bolt hole. Make certain converter is cleared by test probe. Tool must be clean and dry.

(4) Run engine at approximately 2,500 rpm with transmission in neutral, for about 2 minutes. Transmission must be at operating temperature.

(5) Stop engine and carefully remove tool.

(6) If upper surface of test probe is dry, there is no converter leak. A path of fluid across probe indicates a converter leak. Oil leaking under the probe is coming from the transmission converter area (Fig. 5).

(7) Remove transmission and torque converter as-

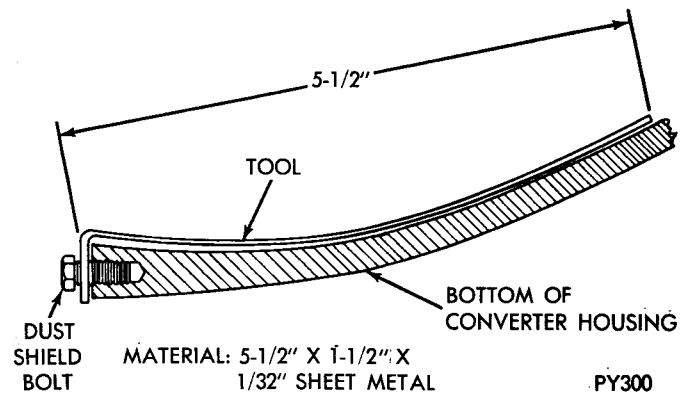


Fig. 4—Leak Locating Test Probe Tool

sembly from vehicle for further investigation. The fluid should be drained from the transmission and converter. Re-install converter drain plug and oil pan (with new gasket) at specified torque.

Possible sources of transmission converter area fluid leakage shown in (Fig. 5) are:

- (1) Converter Hub Seal.
 - (a) Seal lip cut, check converter hub finish.
 - (b) Bushing moved and/or worn.
 - (c) Oil return hole in front pump housing plugged or omitted.
 - (d) Seal worn out (high mileage cars).
- (2) Fluid leakage at the outside diameter from pump housing "O" ring seal.
- (3) Fluid leakage at the front pump to case bolts.
- (4) Fluid leakage due to case or front pump housing porosity.
- (5) Oil leakage out the vent.
- (6) Kickdown lever shaft access plug.

Converter Leakage (Fig. 6)

Possible sources of converter leakage are:

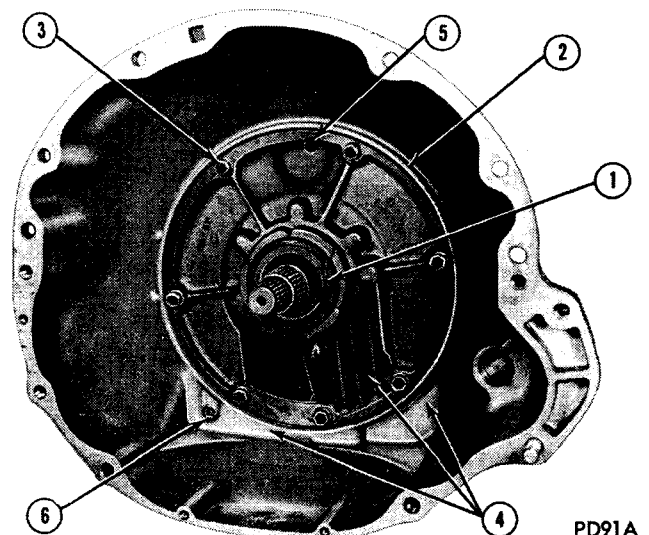


Fig. 5—Transmission Converter Area

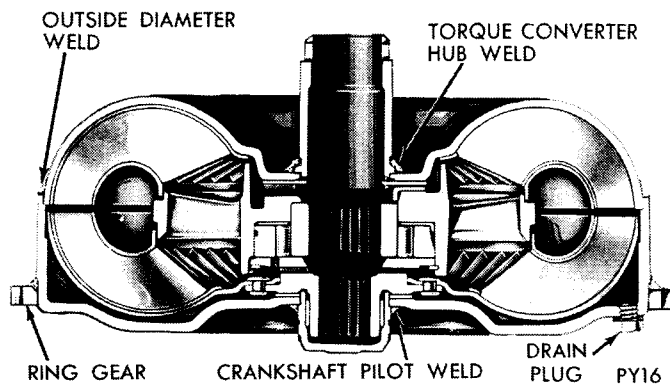


Fig. 6—Torque Converter Cross Section

- (a) Torque converter weld leaks at the outside diameter (peripheral) weld.
 - (b) Front pump hub weld.
 - (c) Crankshaft pilot weld.
 - (d) Fluid leakage from the converter drain plug.
- These leaks appear at the outside diameter of the converter on the engine side.

Air Pressure Test of Transmission

Fabricate equipment needed for test as shown in (Figs. 7, 8 and 9).

The transmission should be prepared for pressure test as follows after removal of the torque converter:

- (1) Install filler tube bore plug, propeller shaft yoke (tie in with cord or wire), flared tube fitting cap (on front cooler line fitting), and pipe nipple (in case at rear cooler line fitting) (Fig. 10 and 11).
- (2) Remove necessary front pump housing bolts, and vent shield. Install vent plug (rubber stopper), and vent plug retainer preferably using longer bolts than those removed.
- (3) With rotary motion, install converter hub seal cup over input shaft, and through the converter hub seal until the cup bottoms against the pump rotor lugs. Secure with cup retainer strap (Fig. 8), using converter housing to engine block retaining bolts.
- (4) Attach and clamp hose from nozzle of Tool C-

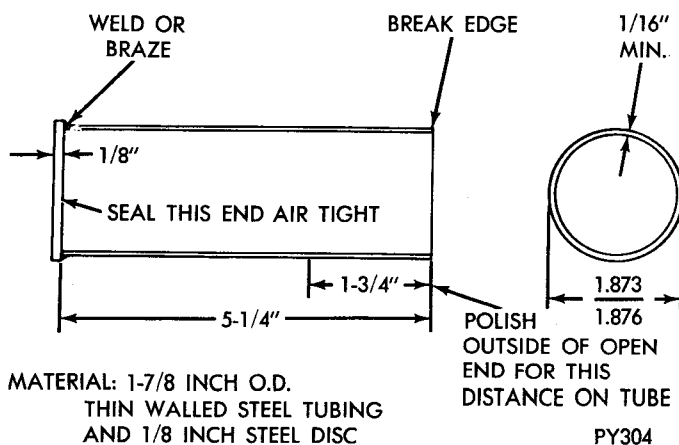


Fig. 7—A-727 Converter Hub Seal Cup

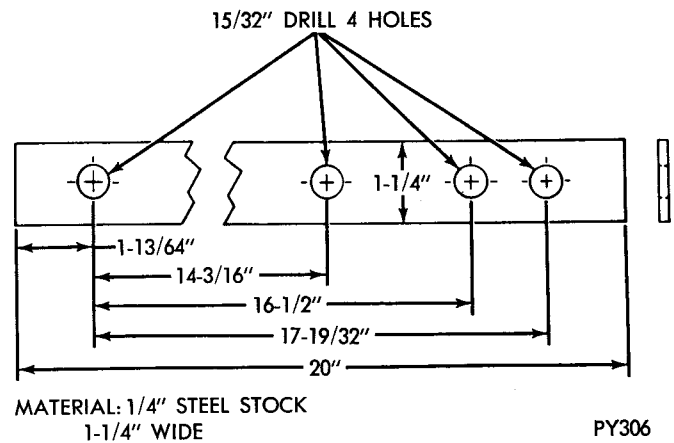


Fig. 8—Hub Seal Cup Retaining Strap

4080 to pipe nipple, which is in the rear cooler line fitting position in case (Fig. 11).

(5) Pressurize the transmission using Tool C-4080 until the pressure gauge reads 8 psi. Position transmission so that pump housing and case front may be covered with soapy solution or water. Leaks are sometimes caused by porosity in the case or pump housing.

CAUTION: Do not, under any circumstances, pressurize a transmission to more than 10 psi.

If a leak source is located, that part and all associated seals and gaskets should be replaced with new parts.

Torque Converter Pressure Test

If fluid leakage has occurred in the bell housing area, the torque converter can be leak checked as follows after removal from the transmission:

- (1) Drain all oil from the converter. If flushing is required, flush before checking for leakage.
- (2) Install Tool C-4102 and tighten.

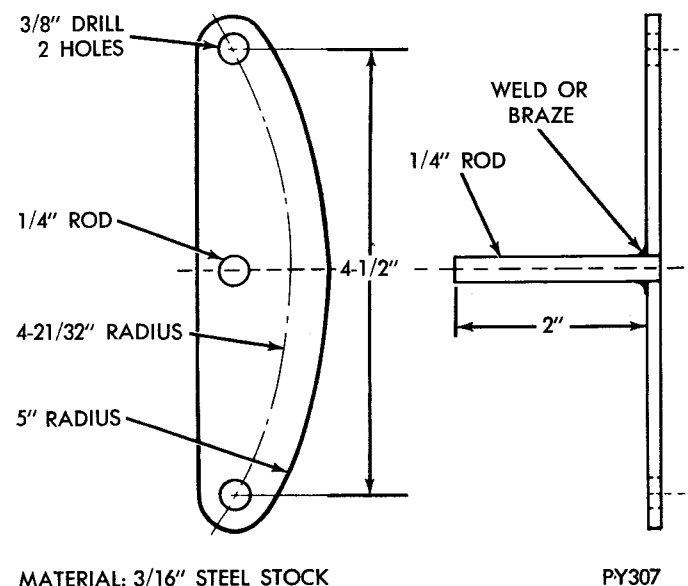


Fig. 9—A-727 Vent Plug Retainer

TORQUEFLITE DIAGNOSIS CHART-GENERAL

POSSIBLE CAUSE

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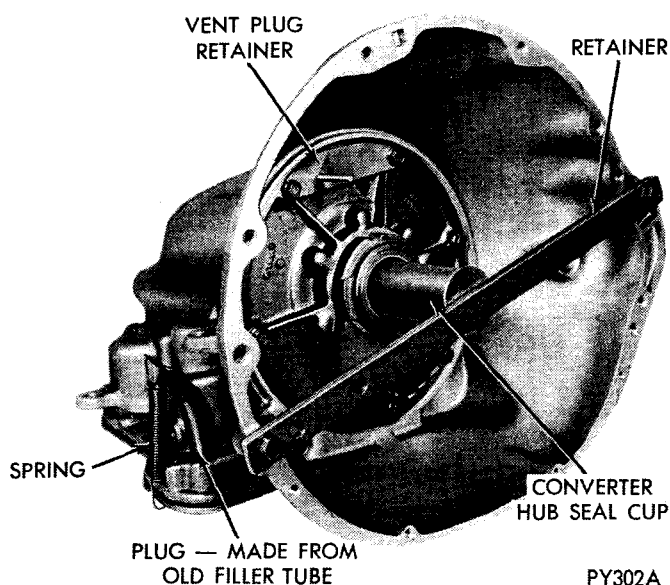


Fig. 10—Transmission Prepared for Test

- (3) Apply a maximum of 100 psi air pressure to the converter.
- (4) Submerge the converter in a tank of water and

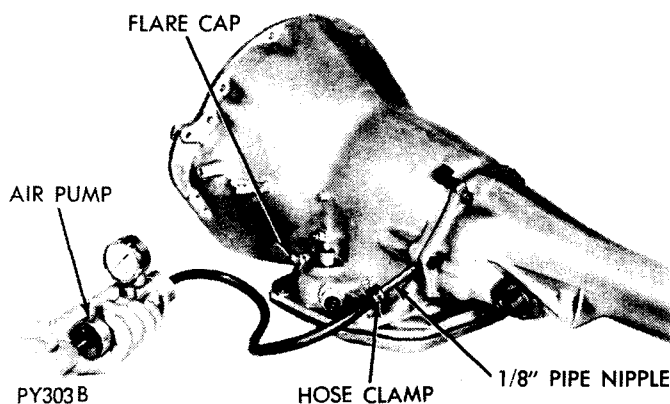


Fig. 11—Pressurizing Transmission

observe the hub, ring gear, and seam welds for bubbles. Five to ten minutes may be required for bubbles to develop from small leaks.

If no bubbles are observed, it can be assumed that the welds are not leaking. If leakage occurs, the converter should be replaced.

DIAGNOSIS GUIDE—VEHICLE WILL NOT MOVE

CHECK THE TRANSMISSION FLUID LEVEL BEFORE STARTING THE ENGINE. IF NO FLUID IS VISIBLE ON THE DIP STICK ADD FLUID TO THE 'L' MARK BEFORE STARTING THE ENGINE. THEN START THE ENGINE WITH THE TRANSMISSION IN NEUTRAL AND LISTEN FOR NOISE.

NO ABNORMAL NOISE,
MOVE THE SELECTOR TO A FORWARD DRIVE RANGE AND OBSERVE THE PROPELLER SHAFT FOR TURNING.

ABNORMAL NOISE,
STOP ENGINE IMMEDIATELY. REMOVE THE TRANSMISSION AND CONVERTER AS AN ASSEMBLY. DISASSEMBLE, CLEAN AND INSPECT ALL PARTS. CLEAN VALVE BODY. INSTALL ALL NEW SEALS, RINGS, AND GASKETS. REPLACE WORN OR DEFECTIVE PARTS.

PROPELLER SHAFT TURNS
BUT REAR WHEELS DO NOT TURN, INSPECT FOR BROKEN REAR AXLE PARTS.

PROPELLER SHAFT DOES NOT TURN,
REMOVE THE TRANSMISSION OIL PAN. INSPECT FOR DEBRIS.

NO DEBRIS.
REMOVE VALVE BODY. DISASSEMBLE CLEAN AND INSPECT ALL PARTS. REASSEMBLE. INSTALL AND CHECK PRESSURES AND OPERATION.

DEBRIS IS PRESENT.
REMOVE TRANSMISSION AND CONVERTER AS AN ASSEMBLY. DISASSEMBLE, CLEAN AND INSPECT ALL PARTS. CLEAN THE VALVE BODY. INSTALL ALL NEW SEALS, RINGS, AND GASKETS. REPLACE WORN OR DEFECTIVE PARTS.

DIAGNOSIS GUIDE-FLUID LEAKS

VISUALLY INSPECT FOR SOURCE OF LEAK. IF THE SOURCE OF LEAK CANNOT BE READILY DETERMINED, CLEAN THE EXTERIOR OF THE TRANSMISSION. CHECK TRANSMISSION FLUID LEVEL. CORRECT IF NECESSARY.

THE FOLLOWING LEAKS MAY BE CORRECTED WITHOUT REMOVING THE TRANSMISSION:

MANUAL LEVER SHAFT OIL SEAL
FILLER TUBE 'O' RING
PRESSURE GAUGE PLUG
NEUTRAL START SWITCH
PAN GASKET
OIL COOLER FITTINGS
EXTENSION HOUSING TO CASE GASKET
EXTENSION HOUSING TO CASE BOLTS
EXTENSION HOUSING YOKE SEAL
SPEEDOMETER ADAPTER 'O' RING
FRONT BAND ADJUSTING SCREW

THE FOLLOWING LEAKS REQUIRE REMOVAL OF THE TRANSMISSION AND TORQUE CONVERTER FOR CORRECTION.

TRANSMISSION FLUID LEAKING FROM THE LOWER EDGE OF THE CONVERTER HOUSING; CAUSED BY FRONT PUMP SEAL, PUMP TO CASE SEAL, OR TORQUE CONVERTER WELD.
CRACKED OR POROUS TRANSMISSION CASE.

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DIAGNOSIS GUIDE-ABNORMAL NOISE

INSPECT AND CORRECT THE TRANSMISSION FLUID LEVEL, ROAD TEST TO VERIFY THAT AN ABNORMAL NOISE EXISTS, IDENTIFY THE TYPE OF NOISE, DRIVING RANGES, AND CONDITIONS WHEN THE NOISE OCCURS.

GEAR NOISE OR GRINDING

REMOVE THE TRANSMISSION AND CONVERTER ASSEMBLY; DISASSEMBLE, CLEAN AND INSPECT ALL PARTS; CLEAN THE VALVE BODY INSTALL ALL NEW SEALS, RINGS, AND GASKETS; REPLACE WORN OR DEFECTIVE PARTS.

WHINE OR BUZZ NOISE

LISTEN TO TRANSMISSION AND CONVERTER FOR SOURCE OF NOISE.

KNOCK, CLICK, OR SCRAPE NOISE

REMOVE TORQUE AND INSPECT FOR LOOSE OR CRACKED CONVERTER DRIVE PLATE; INSPECT FOR CONTACT OF THE STARTER DRIVE WITH THE STARTER RING GEAR.

TRANSMISSION HAS BUZZ OR WHINE

REMOVE THE TRANSMISSION PAN; INSPECT FOR DEBRIS INDICATING WORN OR FAILED PARTS.

REPLACE TORQUE CONVERTER

CONVERTER HAS LOUD BUZZ OR WHINE

NO DEBRIS PRESENT
REMOVE VALVE BODY, DISASSEMBLE, CLEAN AND INSPECT PARTS. REASSEMBLE, INSTALL, CHECK OPERATION AND PRESSURES.

DEBRIS PRESENT
REMOVE TRANSMISSION AND CONVERTER AS AN ASSEMBLY; DISASSEMBLE, CLEAN AND INSPECT ALL PARTS; CLEAN THE VALVE BODY INSTALL ALL NEW SEALS, RINGS AND GASKETS; REPLACE WORN OR DEFECTIVE PARTS.

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SERVICE PROCEDURES

SERVICE IN VEHICLE

Various transmission components can be removed for repairs without removing the transmission from the vehicle. The removal, reconditioning and installation procedures for these components are covered here.

ALUMINUM THREAD REPAIR

Damaged or worn threads in the aluminum transmission case and valve body can be repaired by the use of Heli-Coils or equivalent. Essentially, this repair consists of drilling out the worn or damaged threads, tapping the hole with a special Heli-Coil or equivalent Tap, and installing a Heli-Coil or equivalent insert into the tapped hole. This brings the hole back to its original thread size (Fig. 1). Refer to chart in specifications for details.

The chart lists the threaded hole sizes which are used in the aluminum case and valve body, and the necessary tools and inserts for the repair of damaged or worn threads. Heli-Coil or equivalent tools and inserts are readily available from most automotive parts jobbers. Some thread drag may occur in screwing a bolt into the installed Heli-Coil or equivalent insert. Therefore, a torque reading should be taken of the thread drag with an inch-pound torque wrench and added to the specified bolt torque, so that all bolts securing a particular part will be tightened to the same torque.

LUBRICATION

Fluid Level

The fluid level should be checked every 4,000 miles or 90 days, whichever occurs first. When checking, the engine and transmission should be at normal operating temperature.

(1) With parking brake on and engine idling, move selector lever into each position ending in the neutral position.

(2) The fluid level should check between the "FULL" mark and "ADD ONE PINT" mark, but never above the "FULL" mark when engine is at its normal warmed condition. Add or delete fluid as necessary to bring to this prescribed level (Fig. 2).

To prevent dirt from entering the transmission after

checking or replenishing fluid, make certain that dip stick cap is resealed properly onto the filler tube.

PERIODIC MAINTENANCE

NORMAL SERVICE—Transmission fluid and filter to be changed each 32,000 miles. At same time adjust bands and check throttle linkage.

SEVERE SERVICE—Prolonged operation with heavy loads, especially in hot weather, trailer towing, or off highway operations require more frequent fluid and filter changes and adjustments. 20,000 mile intervals are recommended.

(1) When the factory fill fluid is changed as recommended above, only fluids of the type labeled "DEXRON" Automatic Transmission Fluid should be used. A band adjustment and filter change should be made at the time of the oil change.

(2) If the transmission is disassembled for any reason, the fluid and filter should be changed, and the bands adjusted.

Drain and Refill

(1) Raise vehicle on a hoist. Place a drain container with a large opening, under transmission oil pan.

(2) Loosen pan bolts and tap the pan at one corner to break it loose allowing fluid to drain, then remove the oil pan.

(3) Remove access plate in front of converter and remove drain plug using 5/16 inch six point socket (Fig. 4). Allow fluid to drain (Fig. 3). Install and tighten converter drain plug to 90 inch-pounds and install the access plate.

(4) If necessary, adjust the reverse band.

(5) Install a new filter on bottom of the valve body, and tighten retaining screws to 35 inch-pounds.

(6) Clean the oil pan, and reinstall using a new gasket. Tighten oil pan bolts to 150 inch-pounds.

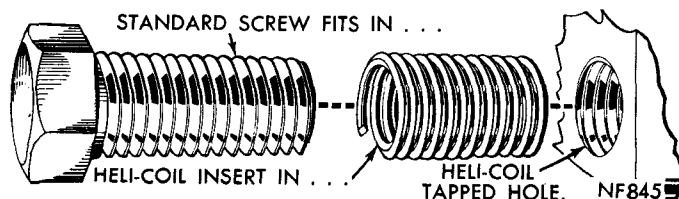


Fig. 1—Heli-Coil, or Equivalent, Installation

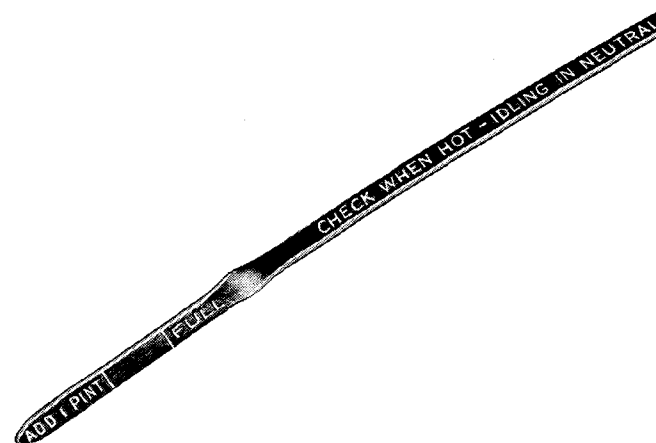


Fig. 2—Dip Stick Markings

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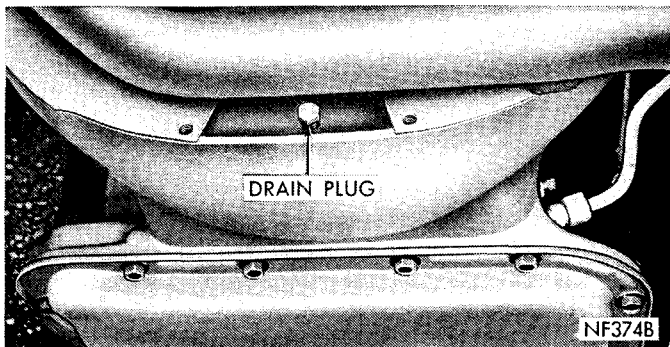


Fig. 3—Converter Drain Plug

(7) Pour six quarts of "DEXRON" type Automatic Transmission Fluid through the filler tube.

(8) Start engine and allow to idle for at least two minutes. Then, with parking brake on, move selector lever momentarily to each position, ending in the **neutral** position.

(9) Add sufficient fluid to bring level to the "ADD ONE PINT" mark.

Recheck fluid level after transmission is at normal operating temperature. The level should be between THE "FULL" mark and "ADD ONE PINT" mark (Fig. 2).

To prevent dirt from entering transmission, make certain that dip stick cap is fully seated onto the filler tube.

GEARSHIFT LINKAGE ADJUSTMENT (Column Shift) (Fig. 4)

(1) Assemble all linkage parts leaving adjustable rod end free.

(2) Place gearshift selector lever in **PARK** position.

(3) Move shift control lever on transmission all the way to rear (in **PARK** detent) (Fig. 5).

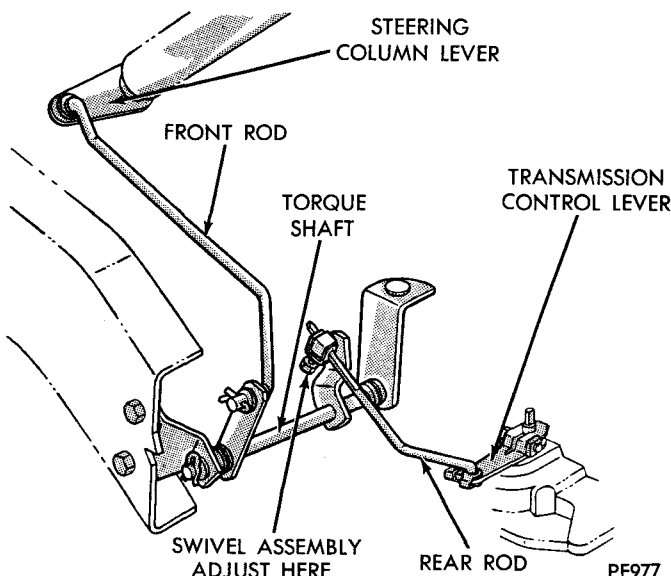


Fig. 4—Column Gearshift Adjustment

(4) Set adjustable rod to proper length and install with no load in either direction on linkage.

(5) Check Adjustment as follows:

(a) Shift effort must be free and detents feel crisp. All gate stops must be positive.

(b) Detent position must be close enough to gate stops in neutral and drive to assure that hand lever will not remain out of detent position when placed against gate and then released.

(c) Key start must occur with shift lever only in **Park** or **Neutral** positions.

Tighten adjustment swivel lock bolt to 125 inch-pounds.

BACK-UP LIGHT AND NEUTRAL STARTING SWITCH (Fig. 6 and 7)

Replacement and Test

The **Neutral Starting Switch** is the center terminal of the 3 terminal switches. It provides ground for the starter solenoid circuit through the selector lever in only **Park** and **Neutral** positions.

(1) To test switch, remove wiring connector from switch and test for continuity between center pin of switch and transmission case. Continuity should exist only when transmission is in **park** or **neutral**.

(2) Check gearshift linkage adjustment before replacing a switch which tests bad.

(3) Unscrew switch from transmission case allowing fluid to drain into a container. Move selector lever to **Park** and then to **Neutral** positions, and inspect to see that the switch operating lever fingers are centered in switch opening in the case.

(4) Screw switch and new seal into transmission case and tighten to 24 foot-pounds. Retest switch with the test lamp.

(5) Add fluid to transmission to bring up to proper level.

(6) The **Back-up Light Switch Circuit** is through the two outside terminals of the 3 terminal switch.

(7) To test switch, remove wiring connector from

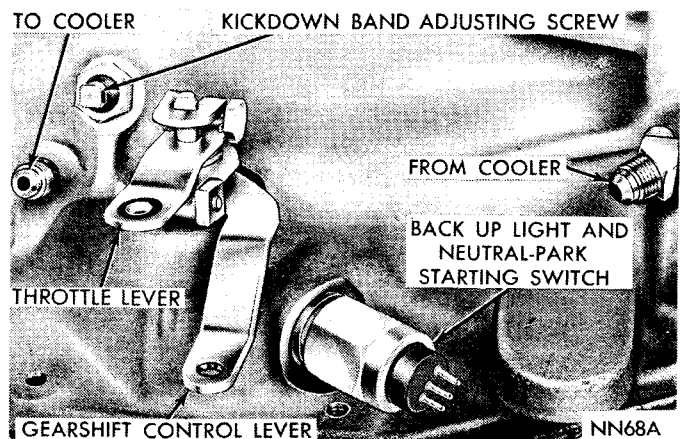


Fig. 5—External Controls and Adjustment

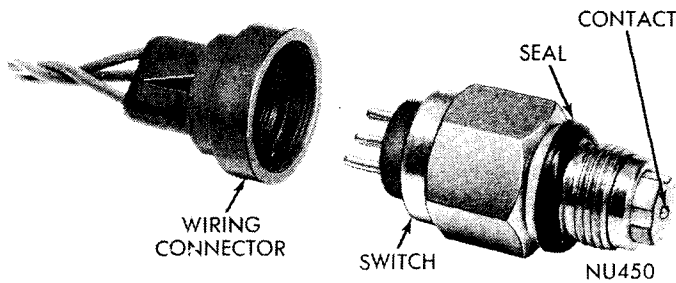


Fig. 6—Neutral-Park Starting Switch and Back-Up Light Switch

switch and test for continuity between the two outside pins.

(8) Continuity should exist only with transmission in **Reverse** position.

(9) No continuity should exist from either pin to the case.

BAND ADJUSTMENTS

Kickdown Band

The kickdown band adjusting screw is located on left side of transmission case near the throttle lever shaft (Fig. 5).

(1) Loosen lock nut and back off approximately five turns. Inspect adjusting screw for free turning in the transmission case.

(2) Using wrench, Tool C-3380-A with adapter C-3705, tighten band adjusting screw 47 to 50 inch-pounds. If adapter C-3705 is not used, tighten adjusting screw to 72 inch-pounds which is the true torque.

(3) Back off adjusting screw as listed in specifications. Hold adjusting screw in this position and tighten lock nut to 35 foot-pounds.

Low and Reverse Band

(1) Raise vehicle, drain transmission fluid and remove oil pan.

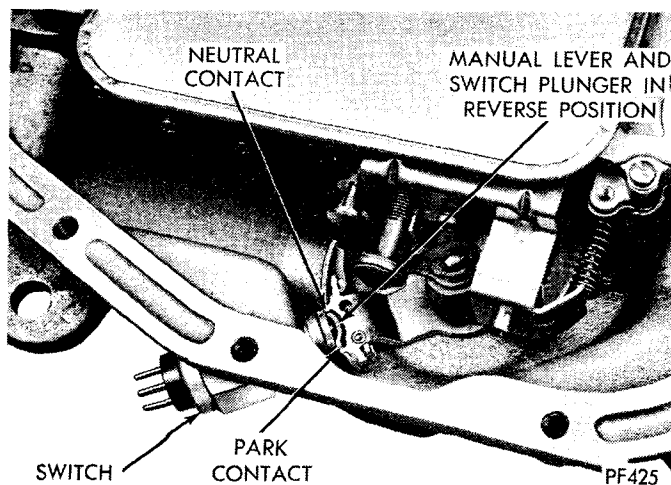


Fig. 7—Start and Back-Up Switch-Installed

(2) Loosen adjusting screw lock nut and back off nut approximately five turns (Fig. 8). Inspect adjusting screw for free turning in the lever.

(3) Using wrench, Tool C-3880-A with adapter C-3705, tighten band adjusting screw 47 to 50 inch-pounds. If adapter C-3705 is not used, tighten adjusting screw to 72 inch-pounds which is the true torque.

(4) Back off adjusting screw the number of turns listed in "Specifications". Hold adjusting screw in this position and tighten lock nut to 30 foot-pounds.

(5) Reinstall oil pan using a new gasket. Tighten oil pan bolts to 150 inch-pounds.

(6) Fill transmission with "DEXRON" type Automatic Transmission Fluid.

Transmission Throttle Linkage Adjustment—6 Cylinder Models (Fig. 9)

(1) Follow detailed instructions in Lubrication Section for linkage lubrication of all models.

(2) Disconnect choke (4) at carburetor or block choke valve in full open position. Open throttle slightly to release fast idle cam, then return carburetor to curb idle.

(3) Use Special Tool Assembly (with spring) C-4160 to hold the transmission lever forward against its stop while adjusting linkage, making sure that no other force is exerted against the lower end of the rod. It may be necessary to loosen the throttle lever, move it downward, (Fig. 10) and retighten to allow installation of the tool on the throttle shaft. Attach spring to hole in tool and hook spring to front end of the transmission case. (Figure 11).

It is important that the transmission lever remain firmly against the stop during the next step to insure a correct adjustment.

If a tool is not available, an assistant can hold the transmission throttle lever forward against its stop while the adjustment is made.

(4) To make transmission rod length adjustment, loosen the slotted link lock bolt (12). Pull forward on the slotted adjuster link (7) so that it contacts car-

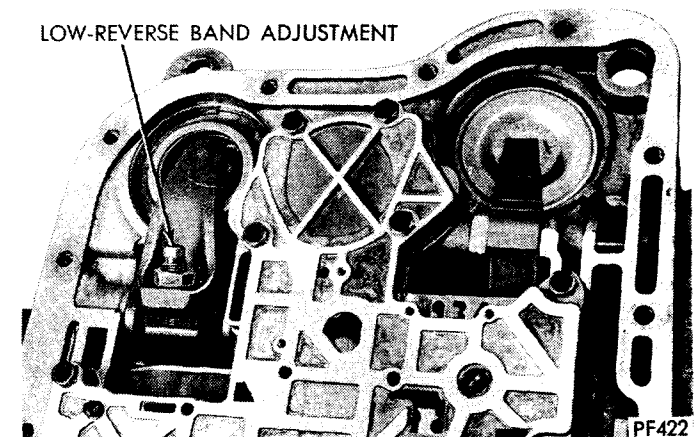
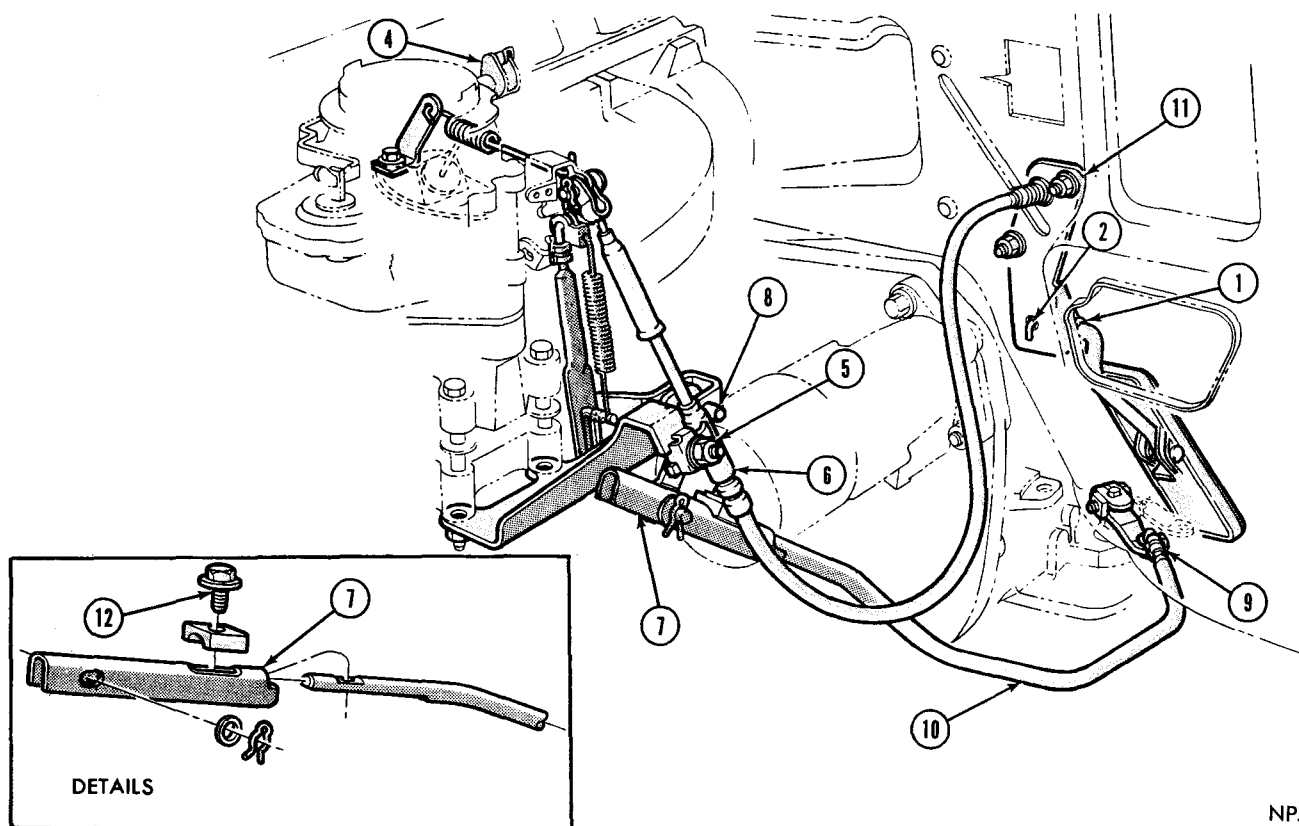


Fig. 8—Low-Reverse Band Adjustment



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Fig. 9—Throttle Rod Adjustment (6 Cylinder, Single Barrel Carb. Models)

buretor lever pin and all backlash is removed.

(5) Tighten transmission rod adjustment lock bolt (12) to 100 in. lbs.

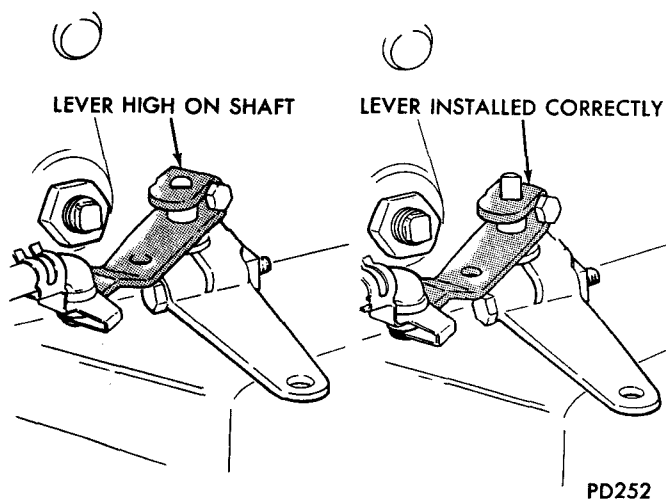
(6) Remove Tool Assembly (with spring) at transmission throttle lever. To check transmission linkage freedom of operation, move slotted adjuster link (7) to the full rearward position, then allow it to return slowly, making sure it returns to the full forward position.

(7) Connect choke rod (4) or remove blocking fixture.

Transmission Throttle Linkage Adjustment—8 Cylinder Model with Three Section Throttle Rod (Fig. 12)

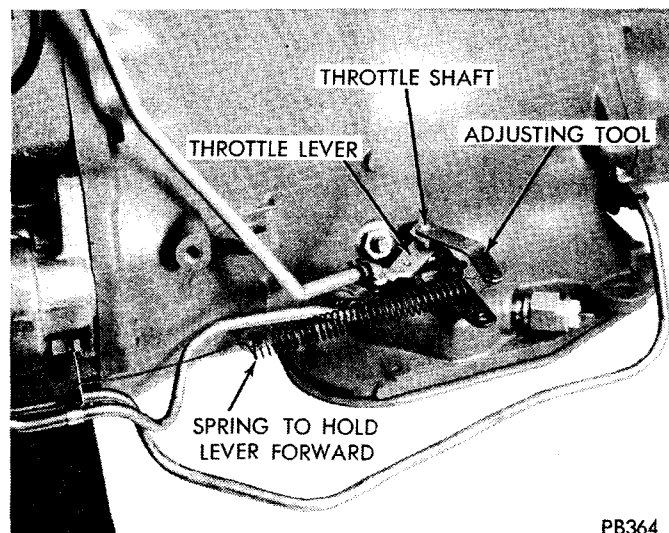
(1) Follow detailed instructions in Lubrication Section for linkage lubrication of all models.

(2) Disconnect choke (8) at carburetor or block choke valve in full open position. Open throttle slightly to release fast idle cam, then return carburetor to curb idle.



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Fig. 10—Reposition Throttle Lever on Shaft



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Fig. 11—Transmission Throttle Lever Holding Tool

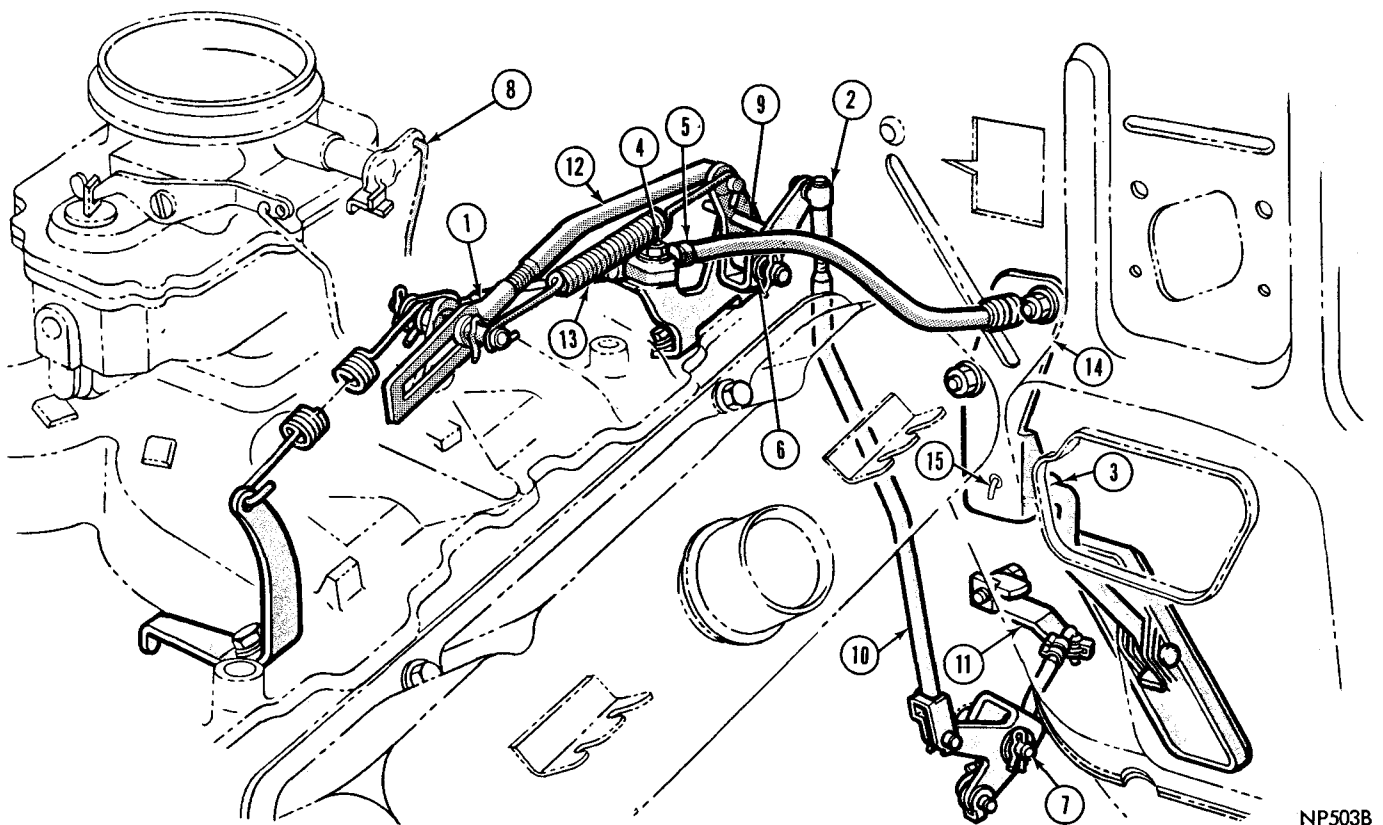


Fig. 12—Throttle Rod Adjustment (with 3 Section Throttle Rod)

(3) Use Special Tool Assembly (with spring) C-4160 to hold the transmission throttle lever forward against its stop while adjusting linkage, making sure that no other force is exerted against the lower end of the rod. It may be necessary to loosen the throttle lever, move it downward, (Fig. 10) and retighten to allow installation of the tool on the throttle shaft. Attach spring to hole in tool and hook spring to front end of the transmission case. See Figure 11.

On engines with solenoid idle stops (Fig. 13) the solenoid plunger must also be in its fully extended position. To extend plunger with engine not running,

disconnect solenoid wire and apply current to solenoid end of connector. Solenoid will not advance throttle, it will be necessary to manually advance throttle to obtain extended position of plunger.

It is important that the transmission lever remain firmly against the stop during the next steps to insure a correct adjustment.

If a tool is not available, an assistant can hold the transmission throttle lever forward against its stop while the adjustment is made.

(4) With a 3/16 inch diameter rod (9) placed in the holes provided in the upper bellcrank (6) and lever, adjust length of intermediate transmission rod (10) by means of threaded adjustment (2) at upper end. The ball socket (2) must line up with the ball end with a slight downward effort on rod.

(5) Assemble ball socket (2) to ball end and remove 3/16 inch rod (9) from upper bellcrank and lever.

(6) Disconnect return spring (13), clip and washer, then adjust length of carburetor rod (12) by pushing rearward on rod with a slight effort (to remove all backlash) and turning the threaded adjustment (1). The rear end of slot should contact carburetor lever pin (no backlash) without exerting any forward force on pin when slotted adjuster link (1) is in its normal operating position.

(7) Assemble slotted adjustment (1) to carburetor

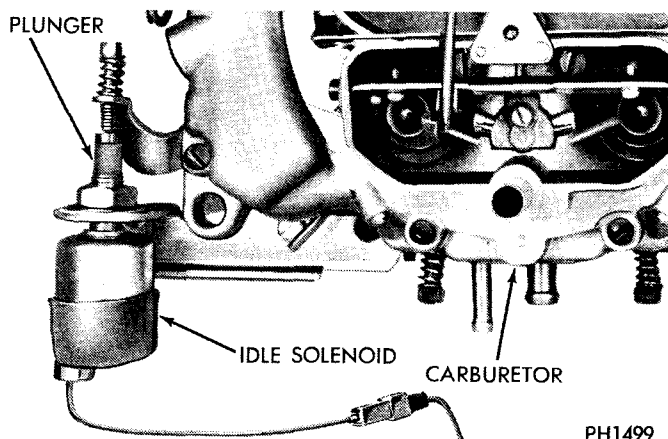


Fig. 13—Curb Idle Speed Solenoid

lever pin and install washer and retainer clip. Assemble transmission linkage return spring (13) in place.

(8) Remove Tool Assembly (with spring) at transmission throttle lever. Check freedom of operation by moving the slotted link at the carburetor to full rearward position, then allow it to return slowly, making sure it returns to the full forward position.

(9) Connect choke rod (8) or remove blocking fixture. Disconnect jumper wire and reconnect idle solenoid connection.

HYDRAULIC CONTROL PRESSURE TESTS

Line Pressure and Front Servo Release Pressure

Line Pressure and front servo release pressure tests must be made in D (drive) position with rear wheels free to turn. The transmission fluid must be at operating temperature (150 to 200 degrees F.).

(1) Install an engine tachometer, raise vehicle on a hoist and position tachometer so it can be read under the vehicle.

(2) Connect two 0-100 psi pressure gauges, Tool C-3292 to pressure take-off-points at side of accumulator and at front servo release (Fig. 14).

(3) With control in D (drive) position, speed up engine slightly until transmission shifts into direct. (Front servo release will be pressurized in direct.) Reduce engine speed slowly to 1,000 rpm. Line pressure at this time (1,000 rpm) must be 54-60 psi, and front servo release pressure must not be more than 3 psi below the line pressure.

(4) Disconnect throttle linkage from transmission throttle lever and move throttle lever gradually to the full throttle position. Line pressure must rise to a maximum of 90-96 psi just before or at kickdown into low gear. Front servo release pressure must follow line pressure up to kickdown point and should not be

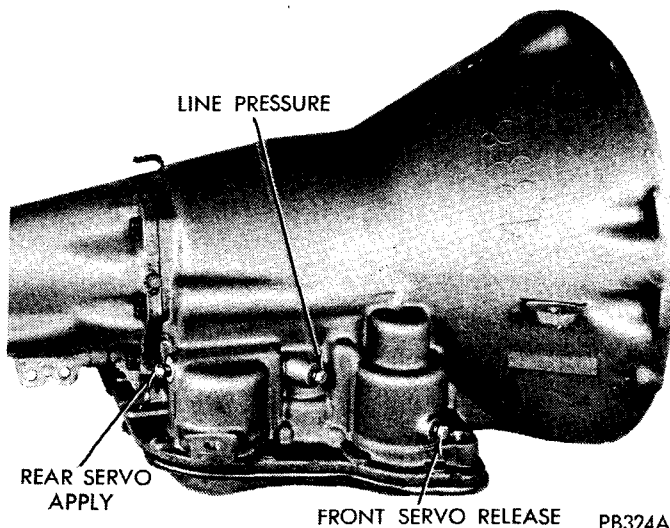


Fig. 14—Pressure Test Locations (Right Side of Case)

more than 3 psi below line pressure.

If pressure is not 54-60 psi at 1,000 rpm, see "Hydraulic Control Pressure Adjustments."

If front servo release pressures are less than pressures specified and line pressures are within limits, there is excessive leakage in the front clutch and/or front servo circuits. **Always inspect external transmission throttle lever for looseness on the valve body shaft when making the pressure tests.**

Lubrication Pressure

The lubrication pressure test should be made at same time that line pressure and front servo release pressure are tested.

(1) Install a "tee" fitting between cooler return line fitting and fitting hole in transmission case at rear left side of the transmission (Fig. 15). Connect a 0-100 psi pressure gauge, Tool C-3292 to the "tee" fitting.

(2) At 1,000 engine rpm, with throttle closed and transmission in direct, lubrication pressure should be 5-15 psi. Lubrication pressure will be approximately doubled as the throttle is opened to maximum line pressure.

Rear Servo Apply Pressure

(1) Connect a 0-300 psi pressure gauge, Tool C-3293 to apply pressure take-off point at rear servo (Fig. 13).

(2) With transmission control in R (reverse) position and engine speed set at 1600 rpm, reverse servo apply pressure should be 230 to 260 psi.

Governor Pressure

(1) Connect a 0-100 psi pressure gauge, Tool C-3292 to governor pressure take-off point, located at lower left side of extension near the mounting flange (Fig. 15).

(2) Governor pressures should fall within the limits given in the "Governor Pressure Chart" in specifications.

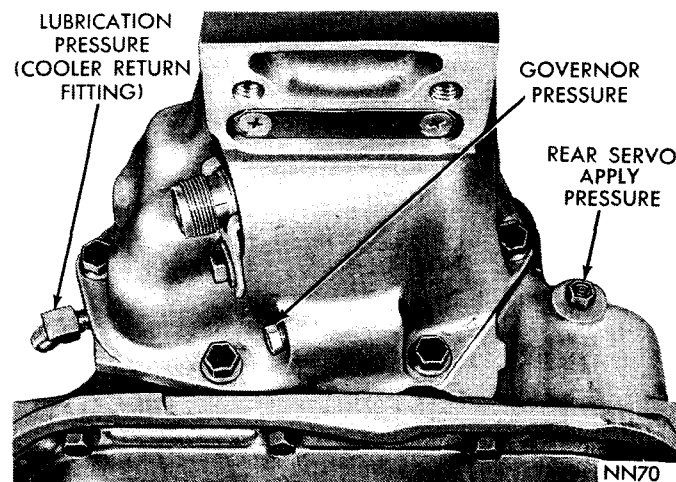


Fig. 15—Pressure Test Locations (Rear End of Case)

If governor pressures are incorrect at the given vehicle speeds, the governor valve and/or weights are probably sticking. **The governor pressure should respond smoothly to changes in mph and should return to 0 to 1-1/2 psi when vehicle is stopped. High pressure at stand still (above 2 psi) will prevent the transmission from downshifting.**

Throttle Pressure

No provisions are made to test the throttle pressure. Incorrect throttle pressure should only be suspected if part throttle up-shift speeds are either delayed or occur too early in relation to vehicle speeds. Engine runaway on either up shifts or down shifts can also be an indicator of incorrect (low) throttle pressure setting.

In no case should throttle pressure be adjusted until the transmission throttle linkage adjustment has been verified to be correct.

HYDRAULIC CONTROL PRESSURE ADJUSTMENTS

Line Pressure

An incorrect throttle pressure setting will cause incorrect line pressure readings even though line pressure adjustment is correct. Always inspect and correct throttle pressure adjustment before adjusting the line pressure.

The approximate adjustment is 1-5/16 inches, measured from valve body to inner edge of adjusting nut (Fig. 16). However, due to manufacturing tolerances, the adjustment can be varied to obtain specified line pressure.

The adjusting screw may be turned with an Allen wrench. One complete turn of adjusting screw changes closed throttle line pressure approximately 1-2/3 psi. Turning adjusting screw counter-clockwise increases pressure, and clockwise decreases pressure.

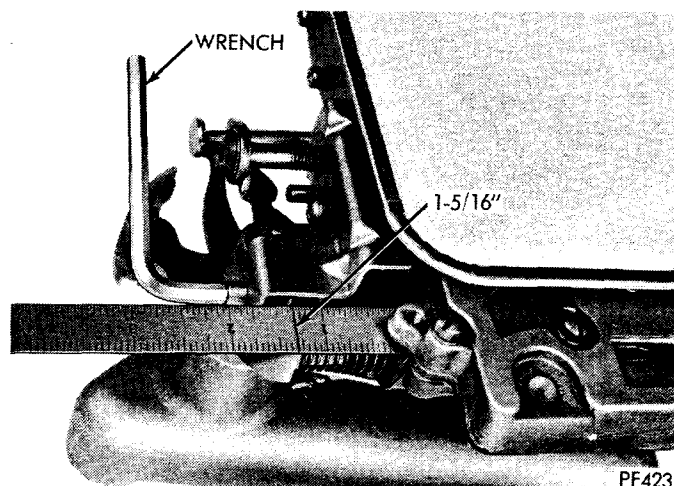


Fig. 16—Line Pressure Adjustment

Throttle Pressure

Throttle pressures cannot be tested accurately; therefore, the adjustment should be measured if a malfunction is evident.

(1) Insert gauge pin of Tool C-3763 between the throttle lever cam and kickdown valve (Fig. 17).

(2) By pushing in on tool, compress kickdown valve against its spring so throttle valve is completely bottomed inside the valve body.

(3) As force is being exerted to compress spring, turn throttle lever stop screw with allen wrench until head of screw touches the throttle lever tang with throttle lever cam touching tool and the throttle valve bottomed. **Be sure adjustment is made with spring fully compressed and valve bottomed in the valve body.**

SPEEDOMETER PINION GEAR

Removal and Installation

Rear axle gear ratio and tire size determines pinion gear size requirements. Refer to "Speedometer Pinion Chart" in Specifications for pinion usage.

(1) Remove bolt and retainer securing speedometer pinion adapter in the extension housing (Fig. 18).

(2) With cable housing connected, carefully work adapter and pinion out of the extension housing.

(3) If transmission fluid is found in cable housing, replace seal in the adapter (Fig. 19). Start seal and retainer ring in the adapter, then push them into adapter with Tool C-4004 until tool bottoms (Fig. 20).

Before installing pinion and adapter assembly make sure adapter flange and its mating area on extension housing are perfectly clean. Dirt or sand will cause mis-alignment resulting in speedometer pinion gear noise.

(4) Note number of gear teeth and install speedometer pinion gear into adapter (Fig. 19).

(5) Rotate the speedometer pinion gear and adapter assembly so that the number on the adapter, cor-

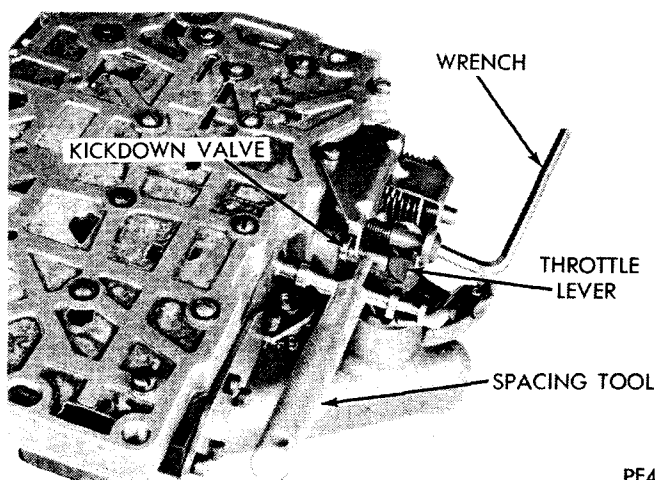


Fig. 17—Throttle Pressure Adjustment

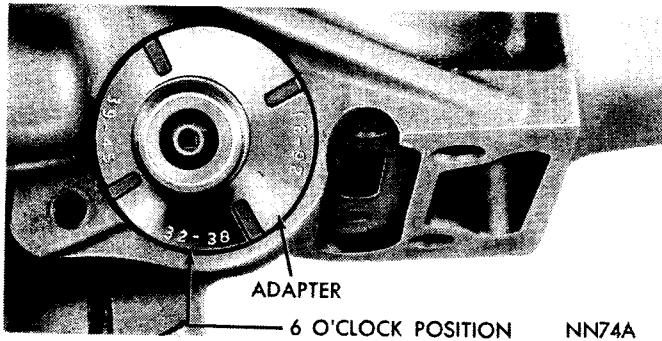


Fig. 18—Speedometer Pinion and Adapter-Installed (Retainer Removed for View)

responding to the number of teeth on the gear, is in the 6 o'clock position as the assembly is installed (Fig. 18).

(6) Install retainer and bolt, with retainer tangs in adapter positioning slots. Tap adapter firmly into the extension housing and tighten retainer bolt to 100 inch-pounds.

OUTPUT SHAFT OIL SEAL (Long Extension Housing)

Replacement

(1) Mark parts for reassembly then disconnect propeller shaft at rear universal joint. Carefully pull

shaft yoke out of the transmission extension housing. **Be careful not to scratch or nick ground surface on sliding spline yoke during removal and installation of the shaft assembly.**

(2) Remove the extension housing yoke seal (Fig. 21) with Tool C-748.

(3) To install a new seal, position seal in opening of extension housing and drive it into the housing with Tool C-3972 (Fig. 22).

(4) Carefully guide front universal joint yoke into extension housing and on the mainshaft splines. Align marks made at removal and connect propeller shaft to rear axle pinion shaft yoke.

LONG EXTENSION HOUSING BUSHING AND OUTPUT SHAFT BEARING

Removal

(1) Mark parts for reassembly then disconnect propeller shaft at rear universal joint. Carefully pull shaft assembly out of the extension housing.

(2) Remove speedometer pinion and adapter assembly (Fig. 18). Drain approximately two quarts of fluid from the transmission.

(3) Remove bolts securing extension housing to the crossmember. Raise transmission slightly with service jack, then remove center crossmember and support assembly.

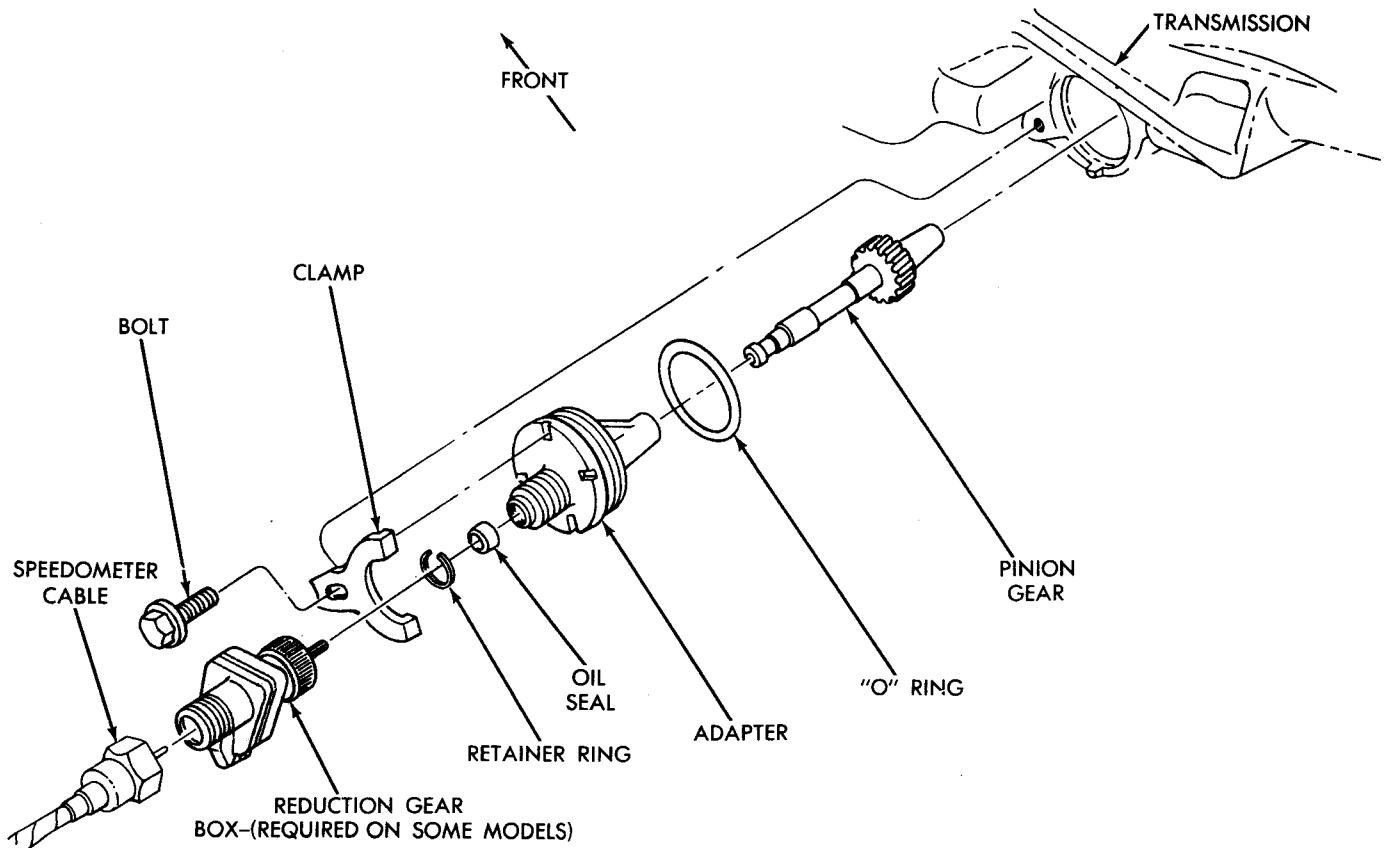


Fig. 19—Speedometer Drive Disassembled

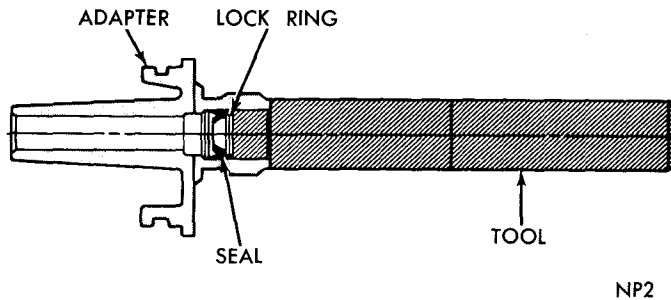


Fig. 20—Installing Speedometer Pinion Seal

(4) Remove extension housing to transmission bolts.

In removing or installing extension housing (step 5), the gearshift lever must be in "1" (low) position. This positions parking lock control rod rearward so it can be disengaged or engaged with the parking lock sprag.

(5) Remove access plate and gasket from extension housing. Spread large snap ring from output shaft bearing (Fig. 23).

With snap ring spread as far as possible, carefully tap extension ring housing off the output shaft bearing. Carefully pull extension housing rearward, to remove parking lock control rod knob past the parking sprag, then remove the housing.

Bushing Replacement

(1) Remove oil seal with Tool C-3985 (Fig. 21).

(2) Press or drive out bushing with Tool C-3974 (Fig. 24).

(3) Slide a new bushing on installing end of Tool C-3974. Align oil hole in bushing with oil slot in the housing, then press or drive bushing into place.

(4) Position a new seal in opening of the extension housing and drive it into housing with Tool C-3972 (Fig. 22).

Bearing Replacement

(1) Using heavy duty snap ring pliers remove output shaft bearing rear snap ring and remove bearing from the shaft (Fig. 25).

(2) Install a new bearing on shaft with outer race

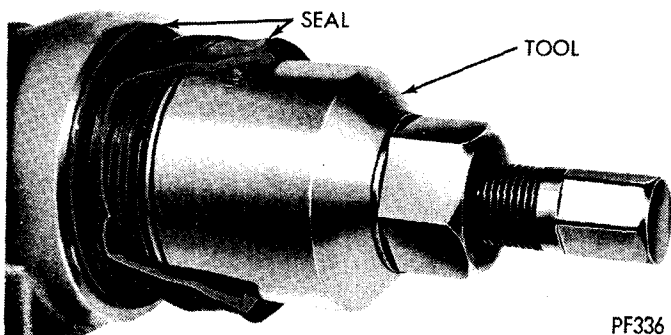


Fig. 21—Removing Extension Housing Yoke Seal

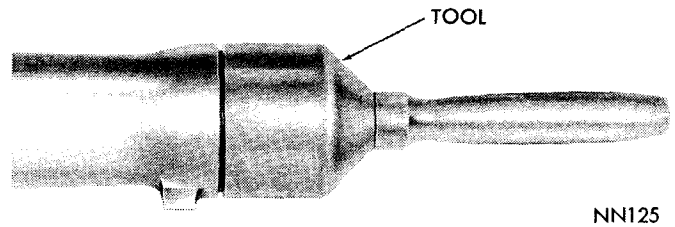


Fig. 22—Installing Extension Housing Yoke Seal

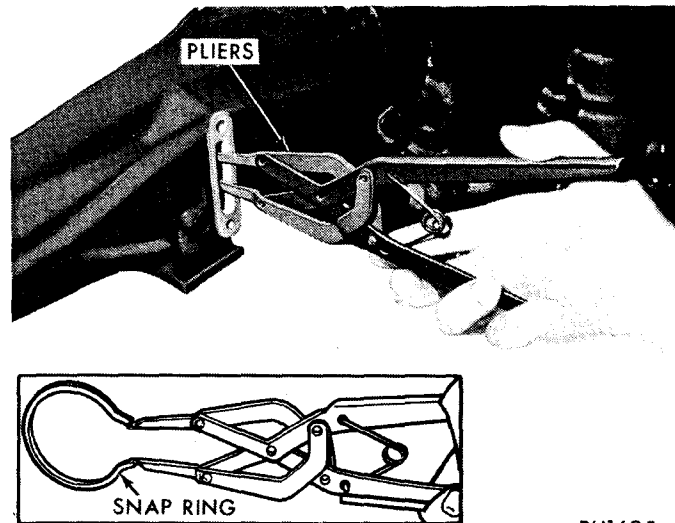


Fig. 23—Removing or Installing Extension Housing

ring groove toward front (Fig. 25), then install rear snap ring. A727 has a snap ring in front of bearing.

Installation

(1) Place a new extension housing gasket on the transmission case. Position output shaft bearing retaining snap ring in extension housing. Slide extension housing on output shaft guiding the parking lock control rod knob past the parking sprag. While spreading large snap ring in housing (Fig. 23), carefully tap housing into place, then release the snap ring. Make sure snap ring is fully seated in bearing outer race ring groove.

(2) Install and tighten extension housing bolts to 24 foot-pounds.

(3) Install gasket and access plate on the extension housing.

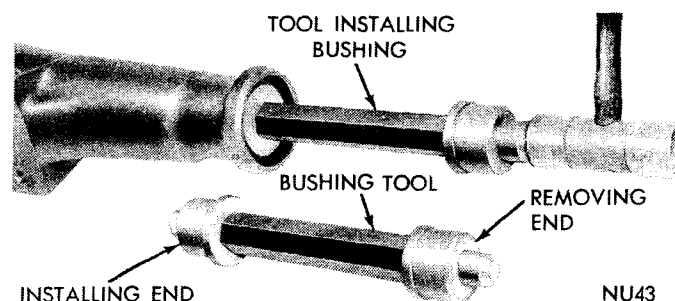


Fig. 24—Replacing Extension Housing Bushing

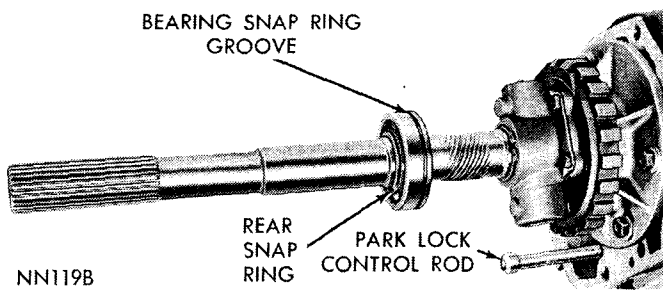


Fig. 25—Output Shaft Bearing

(4) Install center crossmember and rear mount assembly. Tighten retaining bolts.

Lower transmission, install extension housing to support bolts and tighten to 40 foot-pounds.

(5) Install the speedometer pinion and adapter.

(6) Carefully guide front universal joint yoke into extension housing and on the output shaft splines. Align marks made at removal and connect propeller shaft to rear axle pinion shaft yoke.

(7) Add fluid to transmission to bring up to proper level.

OUTPUT SHAFT OIL SEAL

Short Extension Housing (Fig. 26)

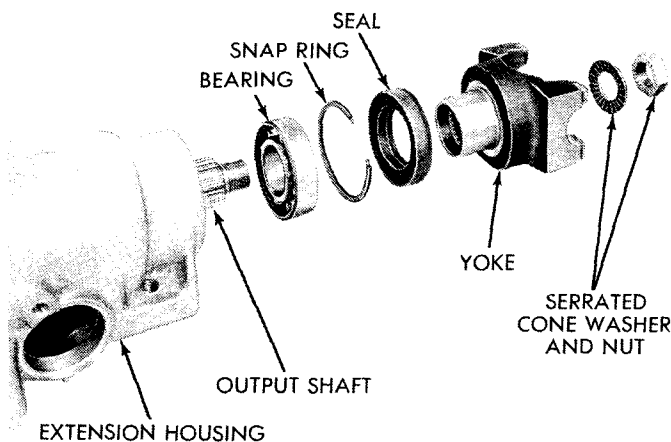
Replacement

(1) Disconnect propeller shaft at center bearing and at the transmission yoke (refer to Group 16).

(2) Using Tool C-3281, hold transmission yoke and remove retaining nut and washer (Fig. 27). Remove yoke from shaft.

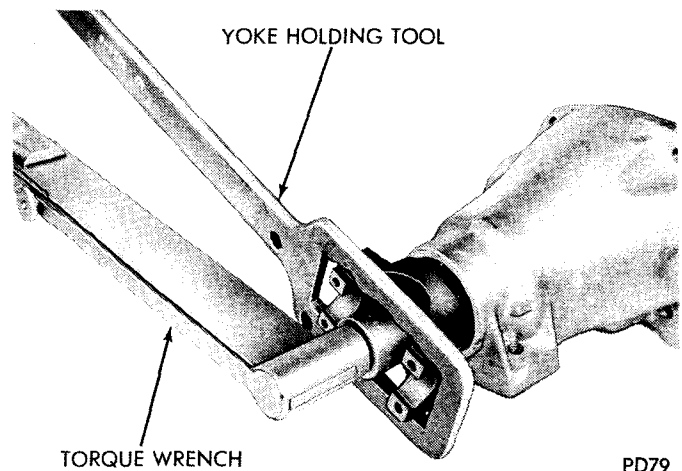
(3) Screw taper threaded end of Tool C-748 into seal then tighten screw of tool to remove the seal (Fig. 28).

(4) To install new seal, position seal in opening of extension housing with lip of seal facing inward. Drive seal into housing with Tool C-3837 (Fig. 29).



PD78

Fig. 26—Short Extension Housing—Disassembled



PD79

Fig. 27—Removing or Installing Output Shaft Yoke Nut (Short Extension)

(5) Install yoke on output shaft and position washer with its three projections toward the yoke. Install the nut with its convoluted surface contacting the washer. Hold the yoke with Tool C-3281, and tighten nut to 175 foot-pounds then connect the propeller shaft.

SHORT EXTENSION HOUSING AND OUTPUT SHAFT BEARING

Removal

(1) Remove speedometer pinion and adapter assembly from the extension housing.

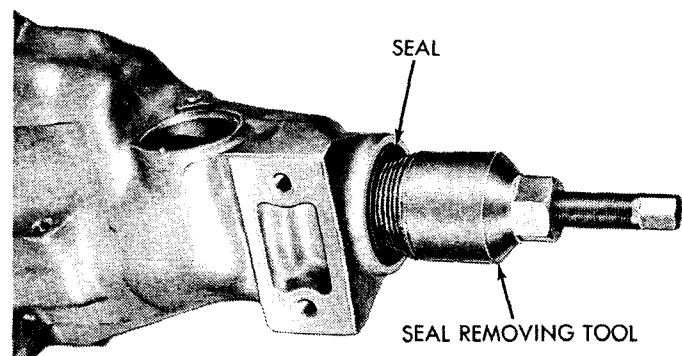
(2) Drain approximately two quarts of fluid from transmission.

(3) Disconnect propeller shaft and remove the transmission yoke as described under "output shaft oil seal."

(4) Raise transmission slightly with service jack, to relieve load on the mount.

(5) Remove extension mount and crossmember bolts, then remove the crossmember.

IMPORTANT: In removing or installing extension housing (Step 6), the gearshift lever must be in "1"



PD80

Fig. 28—Removing Seal (Short Extension)

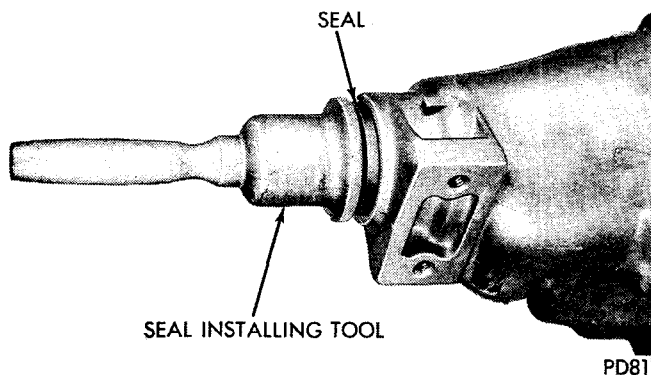


Fig. 29—Installing Seal (Short Extension)

(Low) position. This positions parking lock control rod rearward so it can be disengaged or engaged with the parking lock sprag.

(6) Remove extension housing to transmission bolts and tap the housing lightly to break it loose. Carefully pull housing rearward to remove parking lock control knob past the parking sprag, then remove the housing.

Bearing Replacement

(1) Screw taper threaded end of Tool C-748 into seal (Fig. 28) then tighten screw of tool to remove the seal.

(2) Remove bearing snap ring from the extension housing. Drive the bearing rearward out of housing with Tool C-4105 and C-637 (Fig. 30).

(3) Place new bearing in opening of extension housing. Using Tool C-3204, drive bearing into housing (Fig. 31). Install bearing retaining snap ring.

(4) Place new seal in opening of extension housing (lip of seal facing inward). Using Tool C-3837, drive seal into housing until tool bottoms (Fig. 29).

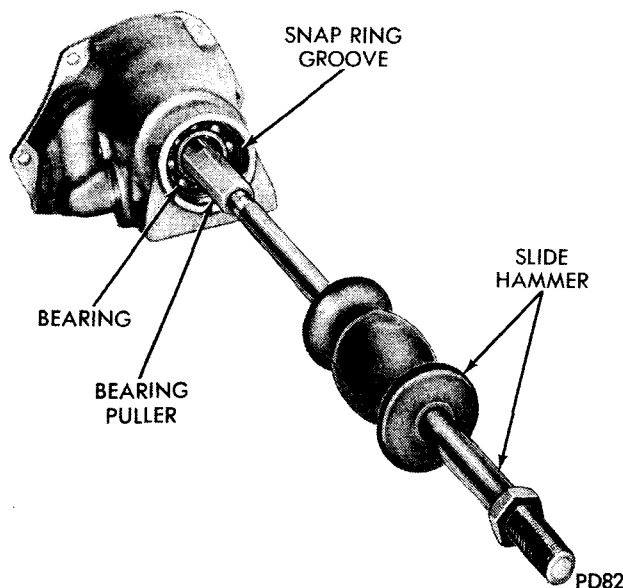


Fig. 30—Removing Bearing (Short Extension)

Installation

(1) Place a new extension housing gasket on the transmission case. Slide the extension housing on output shaft guiding parking lock control rod knob past the parking sprag. Install and tighten extension housing bolts to 24 foot-pounds.

(2) Install crossmember and tighten attaching bolts. Lower transmission so extension housing mount aligns with crossmember. Install bolts and tighten to 50 foot-pounds.

(3) Install transmission yoke and tighten yoke retaining washer and nut to 175 foot-pounds (Fig. 27).

(4) Replace propeller shaft and center bearing (Group 16).

GOVERNOR AND PARKING GEAR

Removal

(1) Remove extension housing and output shaft bearing.

(2) Carefully pry snap ring from weight end of governor valve shaft (Fig. 32). Slide valve and shaft assembly out of governor body.

(3) Remove large snap ring from weight end of governor body, lift out governor weight assembly.

(4) Remove snap ring from inside governor weight, remove inner weight and spring from the outer weight. Figure 33 shows a disassembled view of the governor assembly.

(5) Remove snap ring from behind governor body, then slide governor and support assembly off the output shaft. If necessary remove the four bolts and separate governor body and screen from the support.

Cleaning and Inspection

Figure 33 shows a disassembled view of the governor assembly.

Inspect all parts for burrs and wear. Inspect inner weight for free movement in outer weight, and outer weight for free movement in governor body. Inspect valve for free movement in governor body. The weights and valve should fall freely in the bores

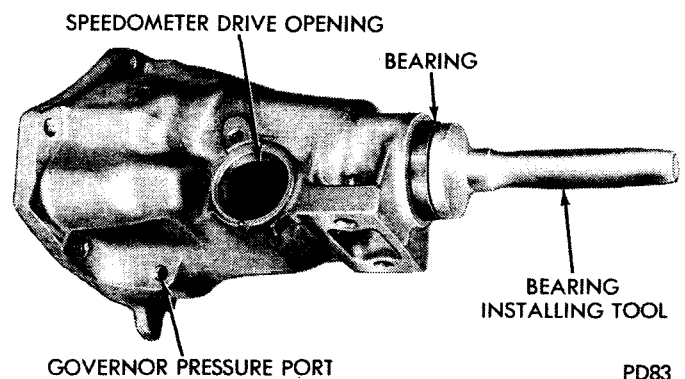


Fig. 31—Installing Bearing (Short Extension)

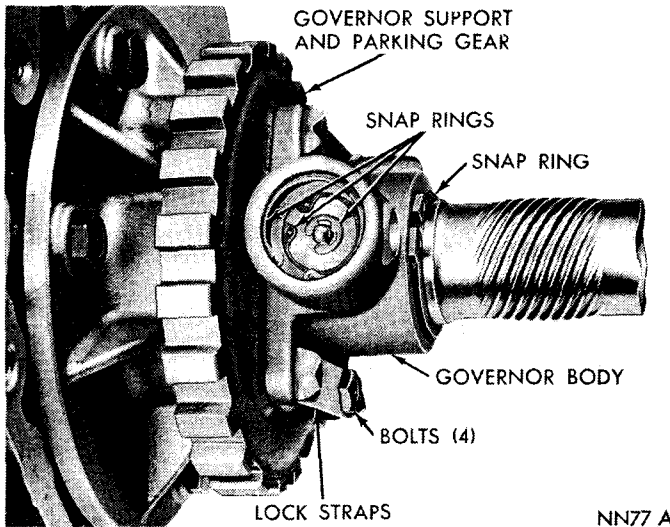


Fig. 32—Governor Shaft and Weight Snap Rings

when clean and dry. Rough surfaces may be removed with crocus cloth.

Inspect governor weight spring for distortion. Inspect lugs on support gear for broken edges or other damage. Thoroughly clean all governor parts in clean solvent and test for free movement before assembly.

Assembly

Assemble governor weights and spring, and secure with snap ring inside of large governor weight. Place weight assembly in governor body and install snap ring.

Installation

(1) Assemble governor body and screen to the support (if disassembled) and tighten bolts finger tight. Make sure oil passage of governor body aligns with passage in the support.

(2) Position support and governor assembly on the output shaft. Align assembly so valve shaft hole in governor body aligns with hole in the output shaft, then slide assembly into place. Install snap ring behind governor body (Fig. 31). Tighten the body to support bolts to 100 inch-pounds. Bend ends of lock straps over bolt heads.

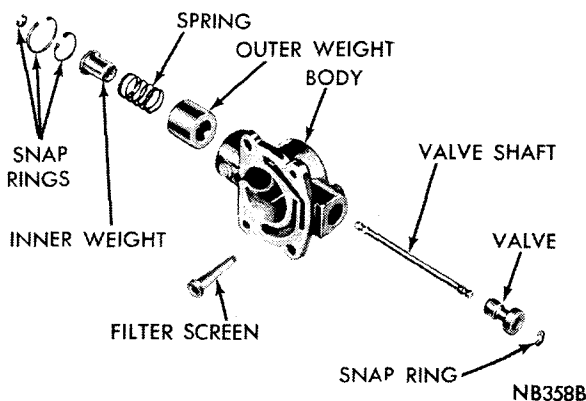


Fig. 33—Governor Assembly

(3) Assemble governor weights and spring, and secure with snap ring inside of large governor weight. Place weight assembly in governor body and install snap ring.

(4) Place governor valve on the valve shaft, insert assembly into the body and through governor weights. Install valve shaft retaining snap ring. Inspect valve and weight assembly for free-movement after installation.

(5) Install output shaft bearing and extension housing.

PARKING LOCK COMPONENTS

Removal

(1) Remove extension housing.

(2) Slide shaft out of extension housing to remove the parking sprag and spring (Fig. 34). Remove snap ring and slide the reaction plug and pin assembly out of the housing.

(3) To replace the parking lock control rod, refer to "Valve Body—Removal and Installation."

Inspection

Inspect sprag shaft for scores and free movement in the housing and sprag. Inspect sprag and control rod springs for distortion and tension. Inspect square lug on sprag for broken edges, also lugs on parking gear for damage. Inspect knob on end of control rod for nicks, burrs and free turning.

Assembly

(1) Install reaction plug and pin assembly in the housing and secure with snap ring (Fig. 34).

(2) Position sprag and spring in housing and insert the shaft. Make sure square lug on sprag is toward parking gear, and spring is positioned so it moves sprag away from the gear.

(3) Install extension housing.

VALVE BODY ASSEMBLY AND ACCUMULATOR PISTON

Removal

(1) Raise vehicle on a hoist.

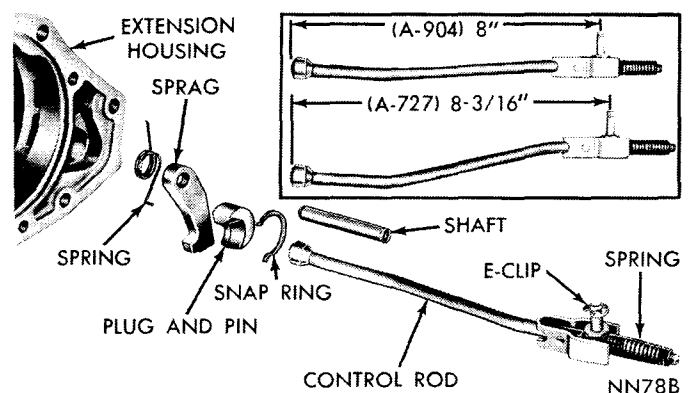


Fig. 34—Parking Lock Components

(2) Loosen oil pan bolts, tap the pan to break it loose allowing fluid to drain, then remove oil pan.

(3) Loosen clamp bolts and remove throttle and shift levers from transmission.

(4) Pull wire connector from combination Back-Up Light/Neutral Start Switch (Fig. 6).

(5) Unscrew and remove switch from transmission case (Fig. 7).

(6) Place a drain pan under transmission, then remove the ten hex-head valve body to transmission case bolts. Hold valve body in position while removing the bolts.

(7) While lowering valve body down out of transmission case, pull it forward out of the case. If necessary, rotate propeller shaft to align parking gear and sprag to permit knob on end of parking control rod to pass the sprag.

(8) Remove accumulator piston and spring from transmission case. Inspect piston for nicks, scores and wear. Inspect spring for distortion. Inspect rings for freedom in piston grooves and wear or breakage. Replace parts as required.

Manual Lever Shaft Seal

(1) If valve body manual lever shaft seal requires replacement, drive it out of the case with a punch.

(2) Drive a new seal into the case with a 15/16 inch socket and hammer (Fig. 44).

This seal can be replaced without removing the valve body from transmission by using a small screwdriver to pry seal out of its bore. Be careful not to scratch manual lever shaft or the seal bore in transmission.

VALVE BODY DISASSEMBLY

Do not clamp any portion of valve body or transfer plate in a vise. Any slight distortion of the aluminum body or transfer plate will result in sticking valves, excessive leakage or both. When removing or installing valves or plugs, slide them in or out carefully. Do not use force.

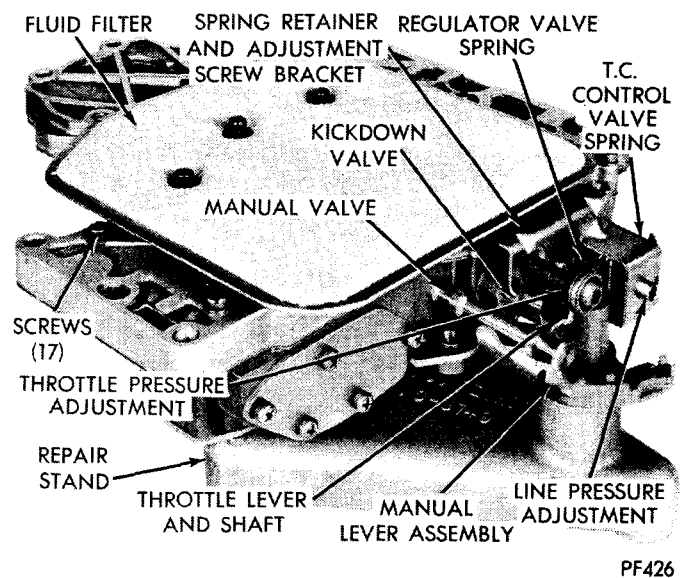
Filter, Transfer Plate, and Pressure Regulators

(1) Place valve body assembly on repair stand, Tool C-3749, (Fig. 35). Remove three screws from fluid filter and lift off the filter.

(2) Remove top and bottom screws from spring retainer and adjustment screw bracket.

(3) Hold spring retainer firmly against spring force while removing last retaining screw from side of valve body.

(4) Remove spring retainer, with line and throttle pressure adjusting screws (**do not disturb setting**) and the line pressure and torque converter regulator springs.



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Fig. 35—Valve Body Assembly

(5) Slide torque converter and line pressure valves out of their bores.

(6) Remove transfer plate retaining screws and lift off transfer plate and separator plate assembly.

(7) Remove screws from stiffener and separator plate and separate parts for cleaning (Fig. 36).

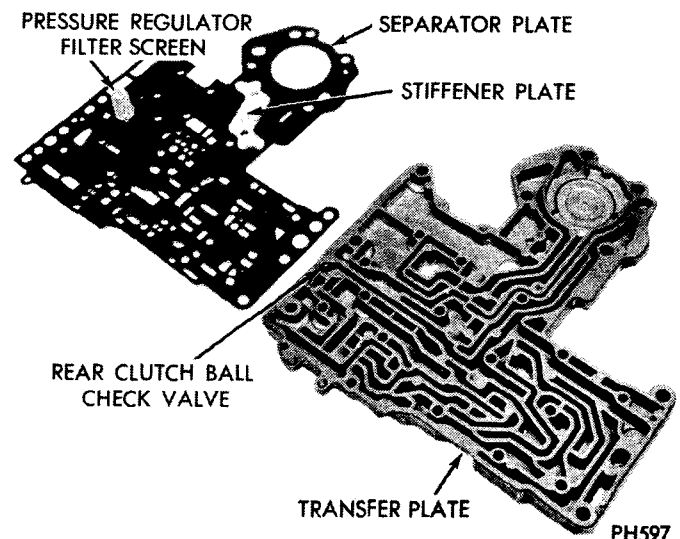
(8) Remove rear clutch ball check valve from transfer plate and regulator valve screen from separator plate for cleaning.

(9) Remove the six balls from valve body shown in (Fig. 37).

Tag all springs as they are removed for reassembly identification.

Shuttle Valve and Governor Plugs

(1) Turn valve body over (Fig. 38) and remove shuttle valve cover plate.



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Fig. 36—Transfer and Separator Plate

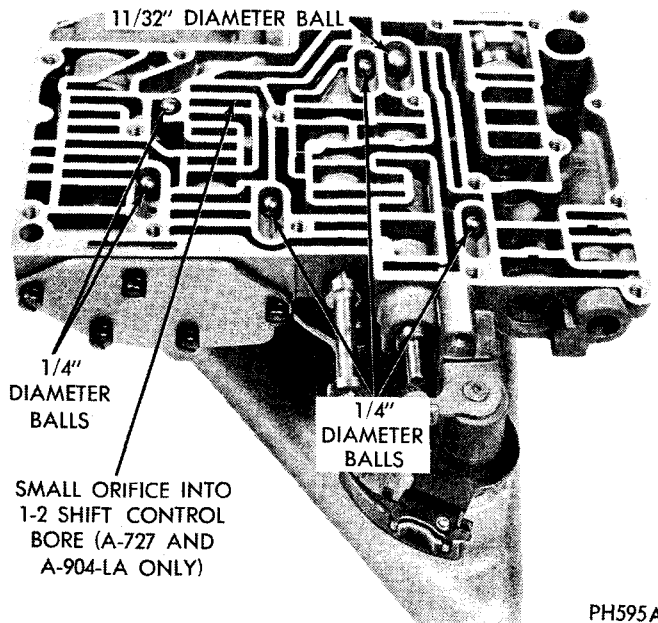


Fig. 37—Steel Ball Locations

(2) Remove governor plug end plate (Fig. 39) and slide out the shuttle valve throttle plug and spring, the 1-2 shift valve governor plug and the 2-3 shift valve governor plug.

(3) Remove shuttle valve "E" clip and slide shuttle valve out of its bore. Also remove the secondary

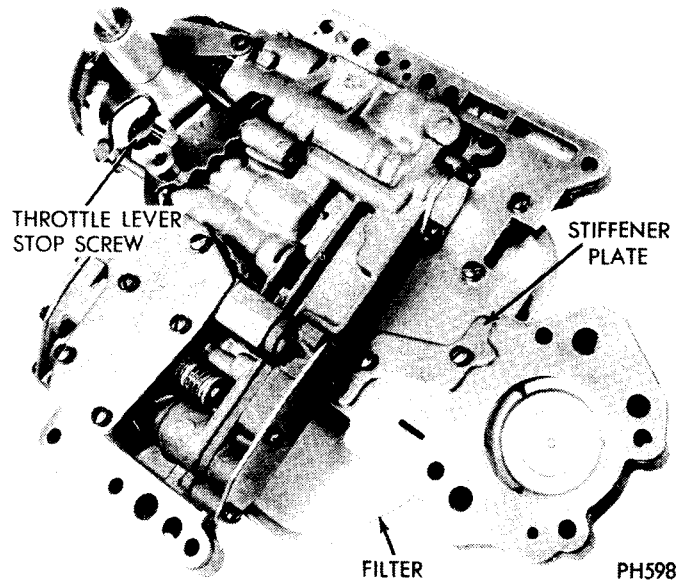


Fig. 38—Valve Body Controls

spring and guides which were retained by "E" clip.

(4) Remove "E" clip and park control rod from manual lever.

Manual Lever and Throttle Lever

(1) Remove E-clip and washer from throttle lever shaft (Fig. 40). Remove any burrs from shaft, then

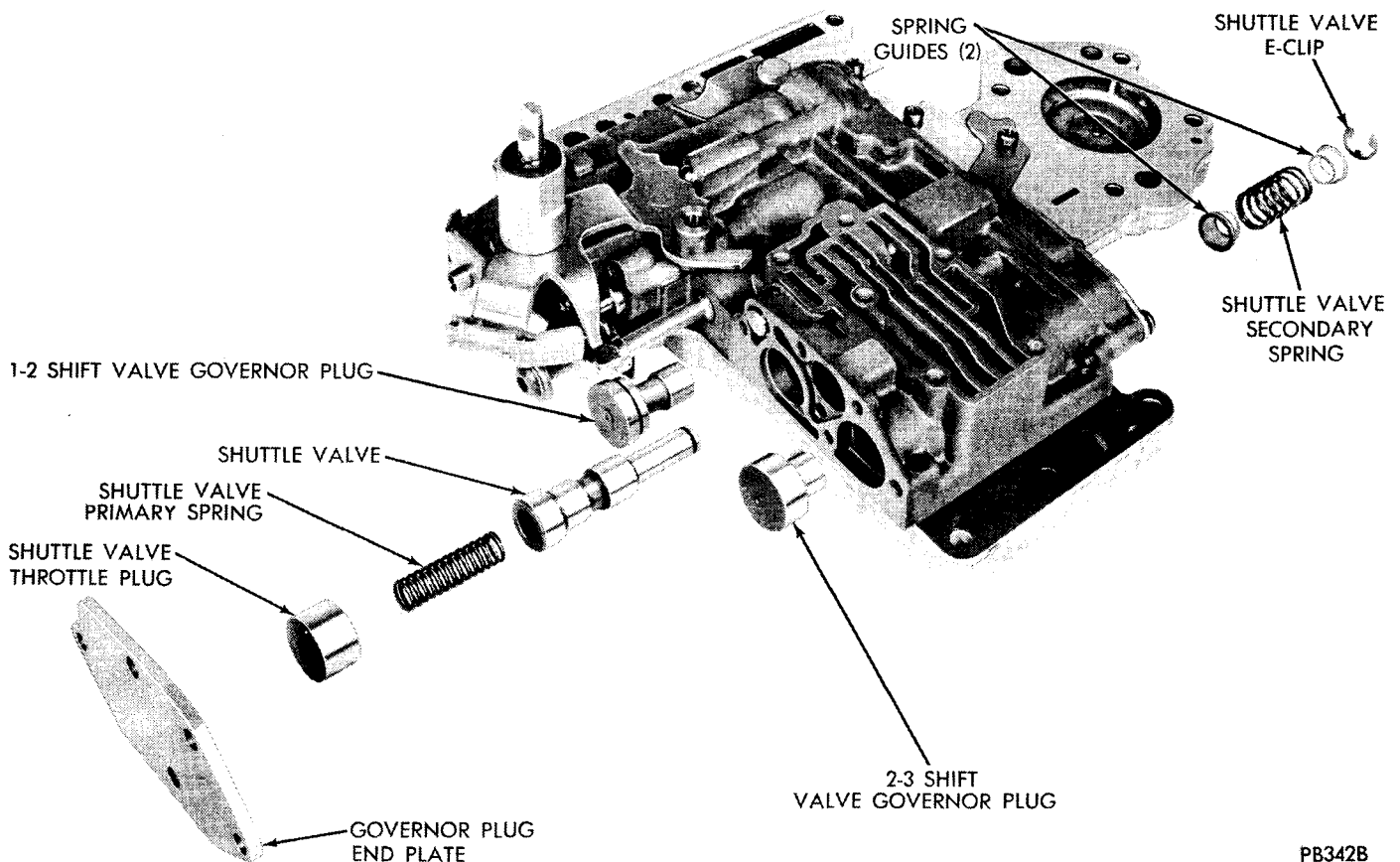
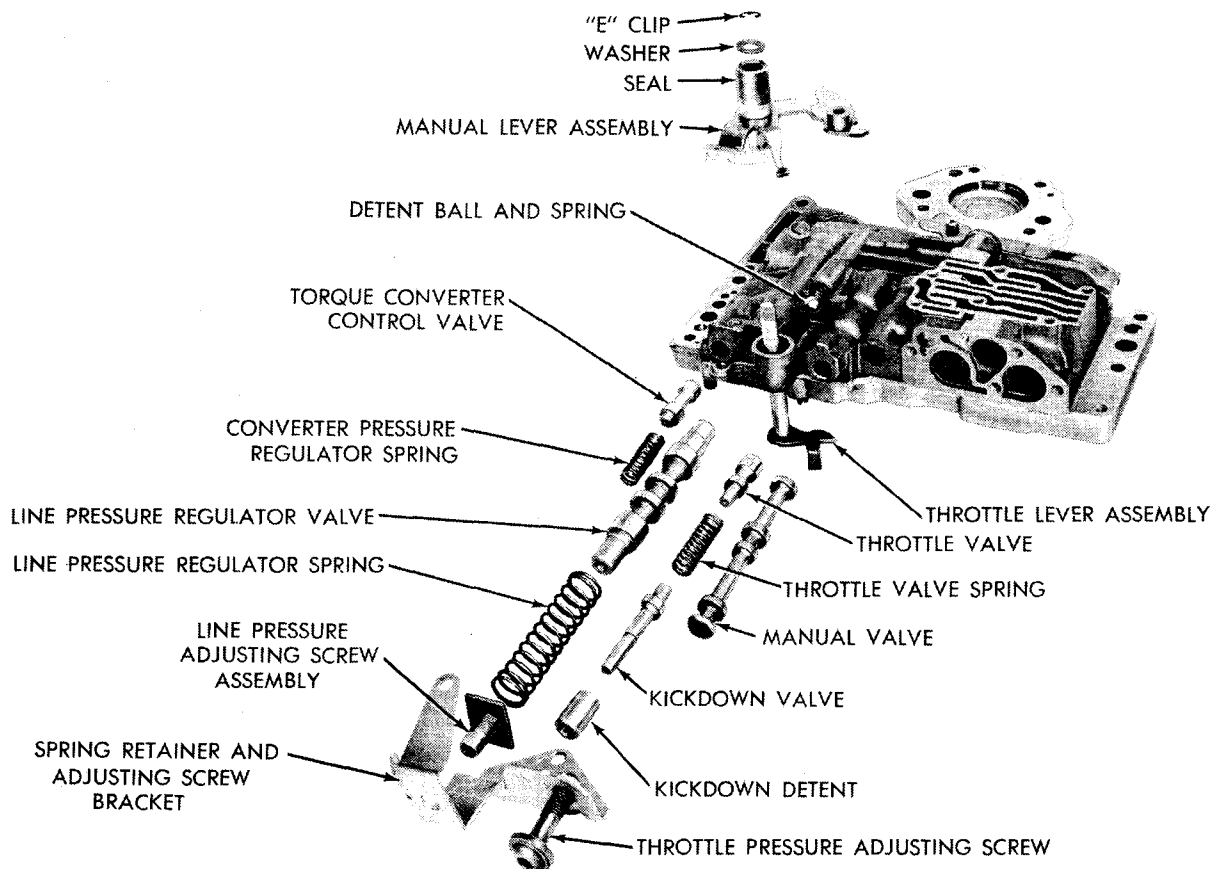


Fig. 39—Shuttle Valve and Governor Plugs



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Fig. 40—Pressure Regulators and Manual Control

while holding manual lever detent ball and spring in their bore with Tool C-3765 or similar tool, slide manual lever off the throttle shaft. Remove the detent ball and spring.

(2) Slide manual valve out of its bore.

(3) Slide out the kickdown detent, kickdown valve, throttle valve spring and throttle valve.

Shift Valves and Regulator Valve Pressure Sensing Plugs

(1) Remove the line pressure regulator valve end plate (Fig. 41) and slide out the regulator valve sleeve, line pressure plug, and throttle pressure plug.

(2) Remove end plate and downshift housing assembly.

(3) Remove throttle plug from housing.

(4) Slide retainer from housing and remove limit valve and spring.

(5) Remove the three springs and shift valves from the valve body.

Cleaning and Inspection

Allow all parts to soak a few minutes in a suitable clean solvent. Wash thoroughly and blow dry with compressed air. Make sure all passages are clean and free from obstructions.

Inspect manual and throttle valve operating levers

and shafts for being bent, worn or loose. If a lever is loose on its shaft, it may be **silver soldered** only, or lever and shaft assembly should be replaced. **Do not attempt to straighten bent levers.**

Inspect all mating surfaces for burrs, nicks and scratches. Minor blemishes may be removed with crocus cloth, using only a very light pressure. Using a straight edge, inspect all mating surfaces for warpage or distortion. Slight distortion may be corrected, using a surface plate. Make sure all metering holes in steel plate and valve body are open. Using a pen light, inspect bores in valve body for scores, scratches, pits and irregularities.

Make sure orifice referred to in (Fig. 37) is open by inserting a 1/32 in. dia. drill through it into the 1-2 shift control valve bore.

Inspect all valve springs for distortion and collapsed coils. Inspect all valves and plugs for burrs, nicks and scores. Small nicks and scores may be removed with crocus cloth, providing extreme care is taken not to round off sharp edges. The sharpness of these edges is vitally important because it prevents foreign matter from lodging between valve and valve body, thus reducing possibility of sticking. Inspect all valves and plugs for freedom of operation in valve body bores.

When bores, valves and plugs are clean and dry,

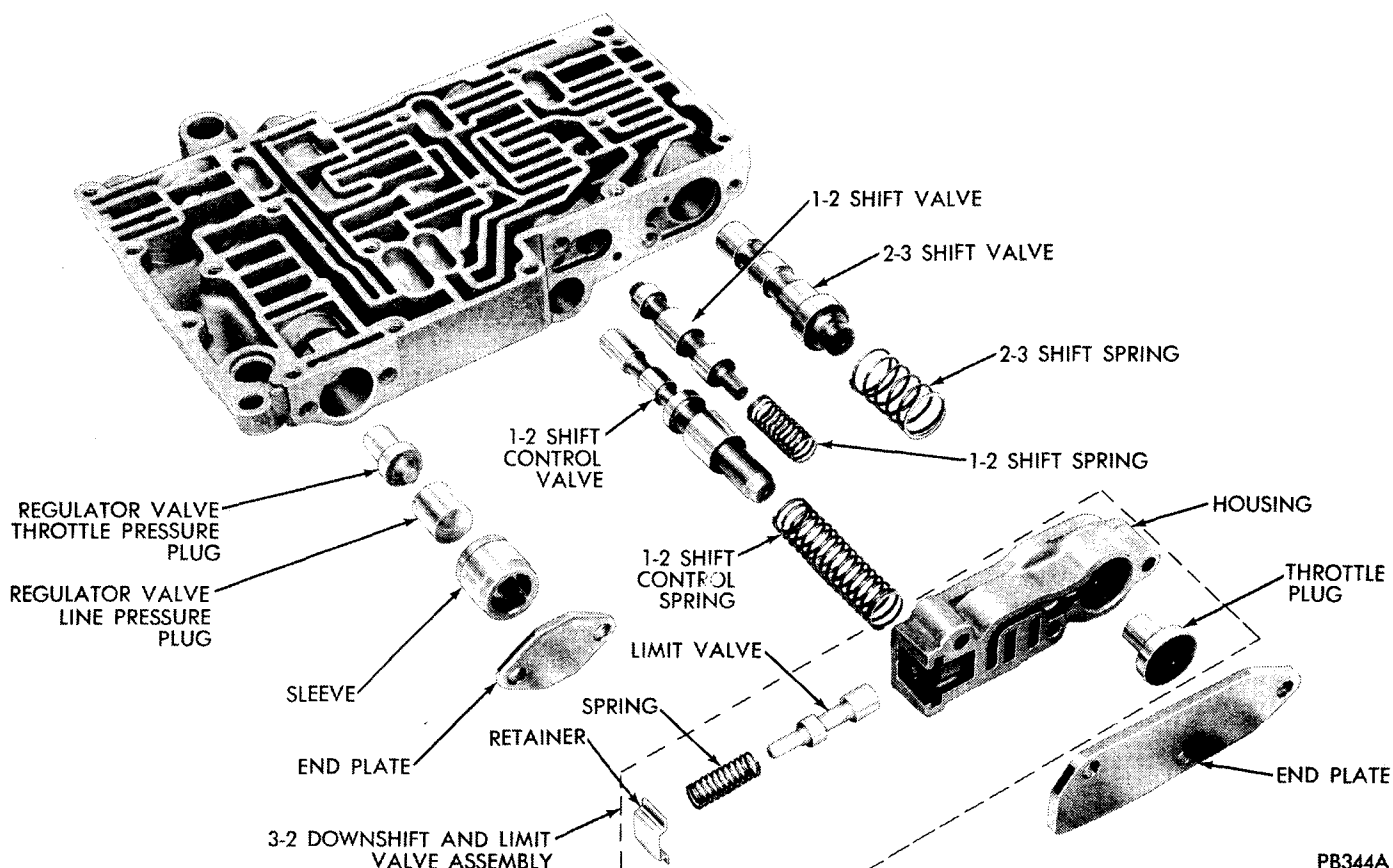


Fig. 41—Shift Valves and Pressure Regulator Valve Plugs

the valves and plugs should fall freely in the bores. The valve body bores do not change dimensionally with use. Therefore, a valve body that was functioning properly when vehicle was new, will operate correctly if it is properly and thoroughly cleaned. There is no need to replace valve body unless it is damaged in handling.

VALVE BODY REASSEMBLY (A-727)

Shift Valves and Regulator Valve Pressure Sensing Plugs (Fig. 41)

(1) Slide shift valves and springs into proper valve body bores.

(2) Sub-assemble the downshift housing as follows:

(a) Insert limit valve and spring into housing.

(b) Slide spring retainer into groove in housing.

(c) Insert throttle plug in housing bore. Position assembly against the shift valve springs.

(3) Install end plate and tighten screws to 28 inch-pounds.

(4) Install throttle pressure plug, line pressure plug and sleeve, then fasten end plate to valve body. Torque to 28 inch-pounds.

Manual Lever and Throttle Lever

(1) Install throttle valve, throttle valve spring, kickdown valve, kickdown detent.

(2) Slide manual valve into its bore.

(3) Install throttle lever and shaft on valve body (Fig. 40). Insert detent spring and ball in its bore in valve body. Depress ball and spring with Tool C-3765 (Fig. 42) or similar tool and slide manual lever over throttle shaft so that it engages manual valve and detent ball. Install seal, retaining washer and E-clip on throttle shaft.

(4) Insert torque converter control valve and spring into valve body.

(5) Insert line pressure regulator valve and spring into valve body.

(6) Install pressure adjusting screw and bracket assembly on the springs and fasten with screw which goes into side of valve body. This screw is to be tightened first, after starting the top and bottom screws.

Shuttle Valve and Governor Plugs

(1) Place 1-2 and 2-3 shift valve governor plugs in their respective bores (Fig. 39).

(2) Install shuttle valve and hold it in bore with index finger while installing on the other end of it the secondary spring with guides and retaining "E" clip.

(3) Install primary shuttle valve spring and throttle plug.

(4) Install governor plug end plate and tighten the five retaining screws to 28 inch-pounds.

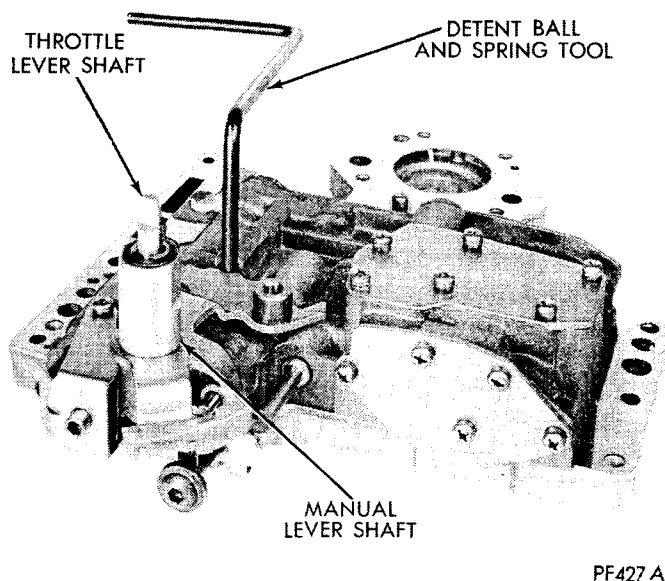


Fig. 42—Installing Detent Balls, Spring, and Control Levers

(5) Install shuttle valve cover plate and tighten the six retaining screws to 28 inch-pounds.

Filter, Transfer Plate, and Pressure Regulators

(1) Install the six balls in the valve body as shown in (Fig. 37).

(2) Place separator plate on the transfer plate (Fig. 36). **Install stiffener plate and retaining screws exactly as shown.** Make sure all bolt holes are aligned, then tighten two transfer plate screws and two stiffener plate screws to 28 inch-pounds.

(3) Place transfer plate assembly on valve body. Be careful to align the spring loaded ball as the 17 shorter screws are installed (3 longer screws are for oil filter).

(4) Starting at the center and working outward, tighten screws to 35 inch-pounds.

(5) Check spring engagement with tang and adjusting nut and install remaining top and bottom screws in adjusting screw bracket, tightening side screw first, to 28 inch-pounds, then tighten top and bottom screws.

(6) Install oil filter and tighten to 35 inch-pounds.

(7) After valve body has been serviced and completely assembled, adjust throttle and line pressures. However, if pressures were satisfactory prior to disassembly, use original settings.

Installation

(1) Make sure Back-Up Light and Neutral Start Switch has been removed. If parking lock rod was removed, insert it through opening in rear of case with knob positioned against the plug and sprag. Move front end of rod toward center of transmission while

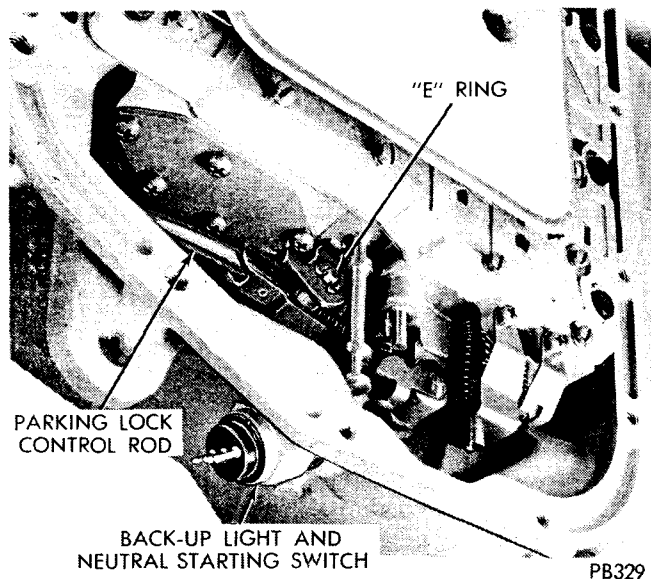


Fig. 43—Parking Lock Control Rod Retaining E-Ring

exerting rearward pressure on the rod to force it past the sprag. (Rotate propeller shaft if necessary).

(2) Install accumulator piston in the transmission case.

(3) Position accumulator spring on the valve body.

(4) Place valve body manual lever in **LOW** position. Lift valve body into its approximate position, connect parking lock rod to manual lever and secure with E-clip. Position valve body in the case, install retaining bolts finger tight (Fig. 43).

(5) With neutral starting switch installed, place manual lever in the neutral position. Shift valve body, if necessary, to center neutral finger over the neutral switch plunger. Snug bolts down evenly, then tighten to 100 inch-pounds.

(6) Install gearshift lever and tighten clamp bolt. Check lever shaft for binding in the case by moving lever through all detent positions. If binding exists, loosen valve body bolts and re-align.

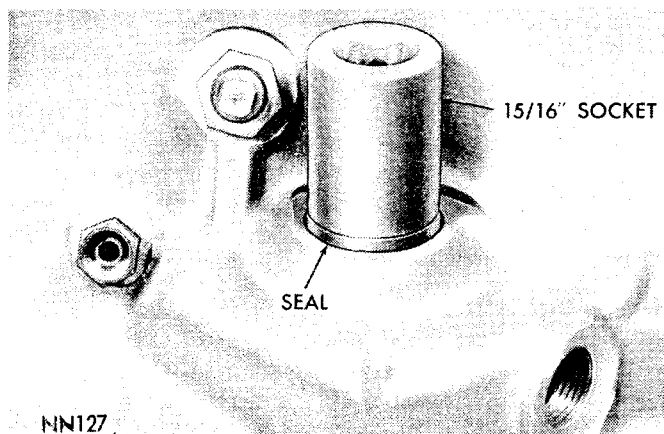


Fig. 44—Installing Valve Body Manual Lever Shaft Oil Seal

(7) Make sure throttle shaft seal is in place, then install flat washer, lever and tighten the clamp bolt. Connect throttle and gearshift linkage and adjust as required.

(8) Install oil pan, using a new gasket. Add transmission fluid to bring it up to proper level.

SERVICE OUT OF VEHICLE

TRANSMISSION AND CONVERTER REMOVAL

(1) The transmission and converter must be removed as an assembly; otherwise, the converter drive plate, pump bushing, or oil seal may be damaged. The drive plate will not support a load; therefore, none of the weight of the transmission should be allowed to rest on the plate during removal.

(2) Disconnect negative (ground) cable from the battery for safety.

(3) Some models require that the exhaust system be dropped for clearance, (see Group 11).

(4) Remove engine to transmission struts, if so equipped.

(5) Remove cooler lines at transmission.

(6) Remove starter motor and cooler line bracket.

(7) Remove converter access cover.

(8) Rotate engine clockwise, using socket wrench on vibration dampener bolt at front of crankshaft to bring converter drain plug to bottom.

(9) Drain converter (using a 5/16 inch six point socket) and loosen pan to drain transmission.

(10) Mark converter and drive plate to aid in reassembly. The crankshaft flange bolt circle, inner and outer circle of holes in the drive plate, and the four tapped holes in front face of the converter all have one hole offset so these parts will be installed in the original position. This maintains balance of the engine and converter.

(11) Rotate engine clockwise with socket wrench on vibration dampener bolt to position the bolts attaching torque converter to drive plate, and remove them.

(12) Mark parts for reassembly. Remove propeller shaft, and center mount if so equipped, (see Group 16).

(13) Disconnect wire connector from the back up light and neutral starting switch.

(14) Disconnect gearshift rod and torque shaft assembly from transmission.

(15) Disconnect throttle rod from lever at the left side of transmission.

(16) Remove oil filler tube and speedometer cable.

(17) Install engine support fixture, Tool C-3487-A with truck frame hooks or a suitable substitute, that will support rear of the engine (Fig. 1).

(18) Raise transmission slightly with service jack to relieve load on the supports.

(19) Remove bolts securing transmission mount to crossmember and crossmember to frame, then remove crossmember.

(20) Remove all bell housing bolts.

(21) Carefully work transmission and converter assembly rearward off engine block dowels and disengage converter hub from end of crankshaft. **Attach a small "C" clamp to edge of bell housing to hold converter in place during transmission removal.**

(22) Lower transmission and remove assembly from under the vehicle.

(23) To remove converter assembly, remove "C" clamp from edge of bell housing, then carefully slide assembly out of the transmission.

STARTER RING GEAR REPLACEMENT

The starter ring gear is mounted directly on outer diameter of the torque converter front cover.

With torque converter removed from vehicle, replacement of the gear is as follows:

Removal

(1) Cut through weld material at rear side of ring gear with a hack saw or grinding wheel (Fig. 2). Be careful not to cut or grind into front cover stamping.

(2) Scribe a heavy line on front cover next to front face of ring gear to aid in locating the new gear.

(3) Support converter with the front lug faces resting on blocks of wood. **The converter must not rest on the front cover hub during this operation.** Using a blunt chisel or drift and hammer, tap downward on ring gear near welded areas to break any remaining weld material (Fig. 2). Tap around ring gear until it comes off the converter.

(4) Smooth off weld areas on the cover with a file.

Installation

Any of the following methods may be used to heat

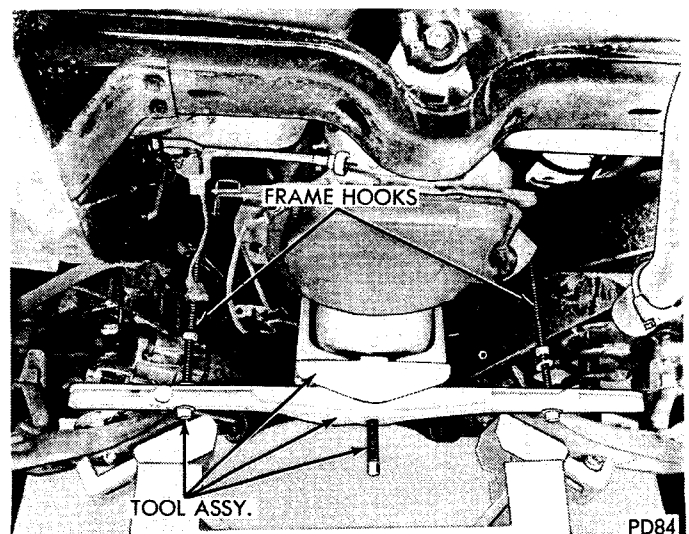


Fig. 1—Engine Support Tool