

# MANUAL TRANSMISSIONS

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## GENERAL

Transmission Models T-14A and T-15A have three speeds forward and one in reverse. Model T-18 has four speeds forward and one in reverse.

Models T-14A and T-15A provide synchromesh engagement in all forward speeds. Model T-18 provides synchromesh engagement in second, third, and fourth speeds.

## IDENTIFICATION

An identification tag, which displays the vendor part number and Jeep part number, is attached to the upper left side of the transmission at the case cover or shift control. The information on the tag is necessary to obtain correct components for replacement purposes.

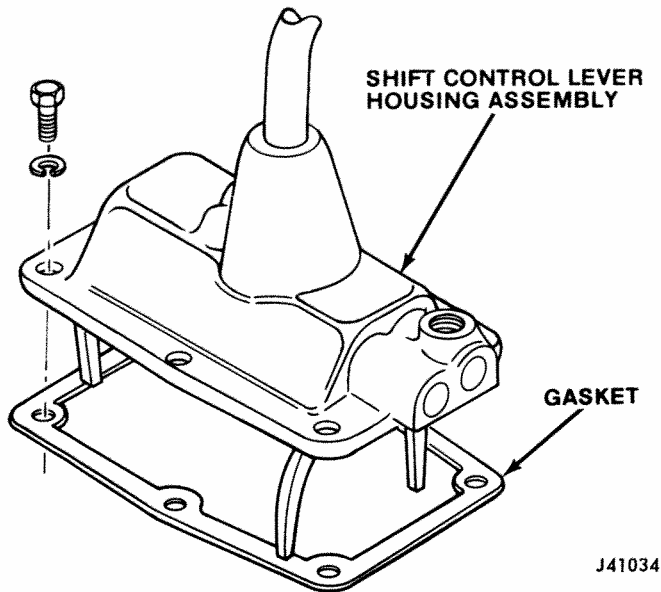
**NOTE:** During assembly, make certain that the identification tag is attached to the transmission in its original position.

## TRANSMISSION REMOVAL ( ALL MODELS)

- (1) Remove floor lever knob, trim ring, and boot.
- (2) Remove floor covering and floorpan section from above transmission.
- (3) On three-speed models, remove transmission shift control lever housing assembly from transmission (fig. 6-1).
- (4) On four-speed models, remove shift control housing cap, spring retainer, spring, shift lever, and pin (fig. 6-2).
- (5) Remove transfer case shift lever and bracket assembly.
- (6) Raise vehicle.

## SERVICE DIAGNOSIS

| Condition                          | Possible Cause   | Correction  |
|------------------------------------|--|---|
| LOCKS IN TWO GEARS                 | (1) Worn poppet components   | (1) Replace   |
| HARD SHIFTING                      | (1) Improper Clutch linkage adjustment<br>(2) Synchro-Clutch wear or failure<br>(3) Incorrect lubricant  | (1) Adjust<br>(2) Replace<br>(3) Replace  |
| SLIPS OUT OF GEAR                  | (1) Synchro-Clutch wear or failure<br>(2) Incorrect lubricant<br>(3) Gear teeth worn or tapered<br>(4) Insufficient inter-lock spring tension<br>(5) Misaligned or loose clutch housing or clutch housing to transmission adapter<br>(6) Excessive transmission end play<br>(7) Worn or loose engine mounts<br>(8) Damaged main drive gear needle bearings<br>(9) Damaged or worn crankshaft pilot bushing | (1) Replace<br>(2) Replace<br>(3) Replace<br>(4) Replace parts<br>(5) Align and tighten<br>(6) Adjust<br>(7) Tighten or replace<br>(8) Replace<br>(9) Replace |
| NOISE IN LOW GEAR                  | (1) Gear teeth worn or broken<br>(2) Shifting fork bent<br>(3) Lack of lubrication   | (1) Replace gears<br>(2) Replace shoe<br>(3) Drain and refill   |
| GREASE LEAKS INTO FLYWHEEL HOUSING | (1) Gasket leaking at front bearing cap or cap oil seal leaking. Oil slinger broken or missing.  | (1) Inspect cap oil seal gasket, and oil slinger. Replace as required.  |



**Fig. 6-1 Shift Control Lever Housing Assembly Removal - 3-Speed Transmission**

(7) Index propeller shafts prior to removal to ensure proper alignment at installation.

(8) Remove front propeller shaft and disconnect front end of rear propeller shaft from transfer case.

(9) Disconnect speedometer cable, backup light switch wires, transmission controlled spark (TCS) advance and parking brake cable (if connected to crossmember).

(10) On models equipped with V-8 engines, remove nuts securing exhaust pipes to manifolds and lower exhaust pipes.

(11) Support transmission and engine.

(12) Disconnect rear support crossmember from side sill.

(13) Remove bolts attaching transmission to clutch housing.

(14) Lower transmission slightly, and move transmission, transfer case, and crossmember rearward sufficiently for transmission clutch shaft to clear clutch housing.

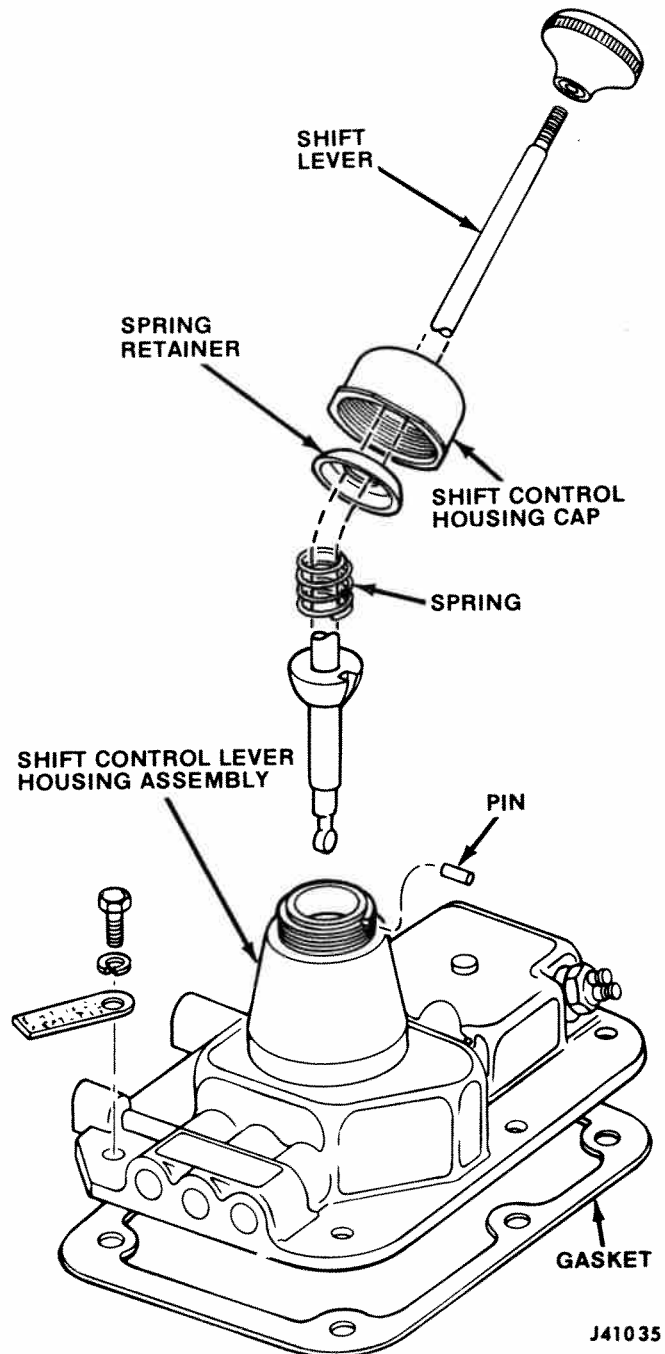
(15) Remove assembly from vehicle.

## TRANSMISSION INSTALLATION

(1) Position wave washer, throwout bearing, and sleeve assembly in throwout lever fork. Center throwout bearing over pressure plate release lever.

**CAUTION:** Exercise caution to protect splines and preserve throwout bearing alignment while installing transmission.

(2) Slide transmission slowly into position. Some maneuvering may be required in order to align transmission input shaft splines and clutch-driven plate splines.



**Fig. 6-2 Shift Control Lever Housing Assembly Removal - 4-Speed Transmission**

(3) Install bolts which attach transmission to clutch housing.

(4) Attach support crossmember to side sills.

(5) Remove transmission jack and engine support.

(6) On models equipped with V-8 engines, connect exhaust pipes to manifolds.

(7) Connect speedometer cable, backup light switch wires, and transmission controlled spark (TCS) advance.

(8) Install front propeller shaft, align index mark made at disassembly, and connect front end of rear propeller shaft. Check for proper alignment.



- (9) Lower vehicle.
- (10) Install transfer case shift lever and bracket assembly.
- (11) On four-speed models, install pin, shift lever, spring, spring retainer, and shift control housing cap.
- (12) On three-speed models, install shift control lever housing assembly (fig. 6-1). Position transmission gear train and shift lever in neutral and enter shifter forks into clutch sleeves.
- (13) Align cover, case, and gasket holes and install capscrews and lockwashers. Tighten capscrews to 8 to 15 ft-lb torque.
- (14) Install floorpan section and floor covering.
- (15) Install floor trim boot, trim ring, and shift lever knob.
- (16) Check transmission for proper shifting.

## TOWING INSTRUCTIONS

All Jeep vehicles can be towed at reasonable and safe speeds (such as specified by state law) for any distance by following the procedures given below. **Should it be necessary to lift the rear wheels and tow the vehicle in reverse, be sure to remove the front axle shaft driving flanges to prevent the front differential from rotating.** If the steering wheel on Cherokee, Wagoneer, and Truck Models cannot be unlocked, use a dolly under the front axle.

### CJ Models

Shift the transfer case and transmission into

**NEUTRAL.** The vehicle can then be towed forward or backward with all four wheels on the ground, or forward with the front end raised.

### Cherokee-Wagoneer-Truck

#### With Ignition Key

With the anti-theft ignition key in the off position (to unlock the steering wheel), shift the transfer case and transmission into neutral. The vehicle can now be towed forward or backward with all four wheels on the ground, or forward with the front end raised.

#### Without Ignition Key

If able to shift manual transmission and Model 20 transfer case into neutral, the vehicle can be towed **with the front end raised.** Steering is locked.

If vehicle is locked and manual transmission and Model 20 transfer case cannot be shifted, remove rear propeller shaft or use a dolly under the rear wheels and tow **with the front end raised.**

Should the driving flanges be removed, a cover should be improvised that will prevent dirt from entering the wheel bearings.

If the vehicle is equipped with free-wheeling selective drive hubs, there are no drive flanges to be removed, and it is only necessary to lock the hubs in the free-wheeling position.

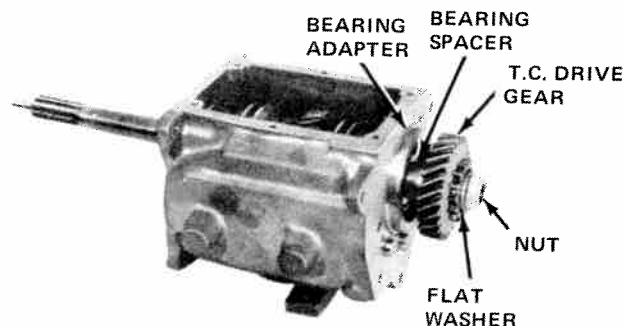
## MODELS T-14A AND T-15A 3-SPEED TRANSMISSIONS

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### DISASSEMBLY

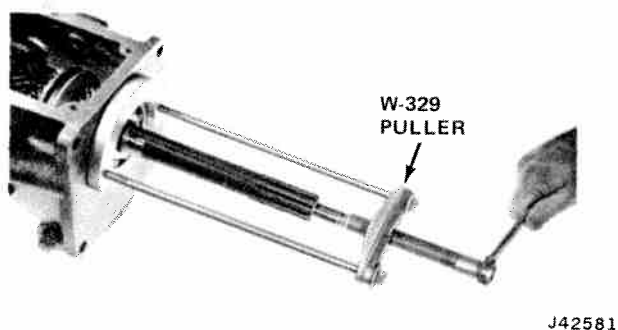
- (1) Remove screws which attach transfer case to transmission.
- (2) Separate transfer case and transmission.
- (3) Remove nut and flat washer which attach transfer case drive gear to main shaft.
- (4) Remove gear, adapter, and spacer (fig. 6-3).
- (5) Remove main drive gear bearing cap and gasket. gasket.
- (6) Remove main drive gear bearing snap ring and main shaft bearing snap ring.
- (7) Remove main drive gear bearing and main shaft bearing. Use Bearing Puller Set W-329 (fig. 6-4 and 6-5).
- (8) Remove main drive gear from case.



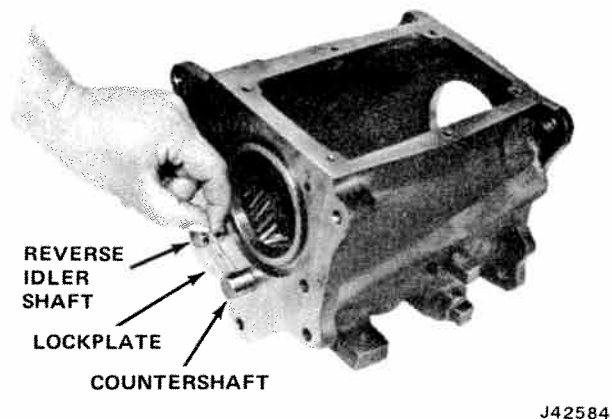
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Fig. 6-3 Transfer Case Drive Gear

**NOTE:** T-15A must be shifted into second gear position to permit removal of main shaft and gear assembly.



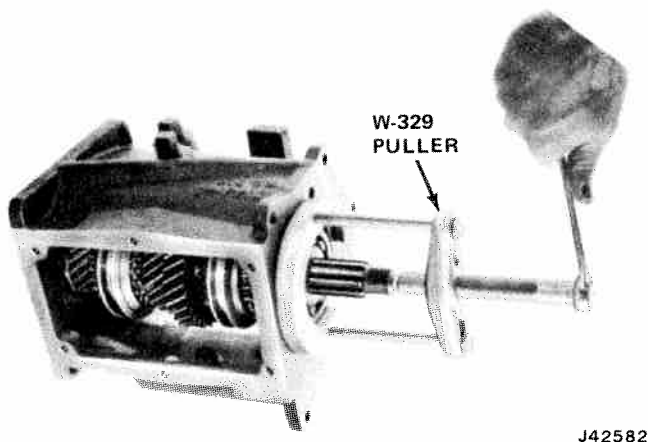
**Fig. 6-4 Main Drive Gear Bearing Removal**



**Fig. 6-7 Lock Plate Removal and Installation**

Tool W-332 with T-15A transmission, drive countershaft rearward, out of case, as shown in figure 6-8.

**NOTE:** Countershaft gear assembly drops to bottom of case. Using Special Arbor Tool ensures that roller bearings remain in countershaft gear hub and may be removed as an assembly.



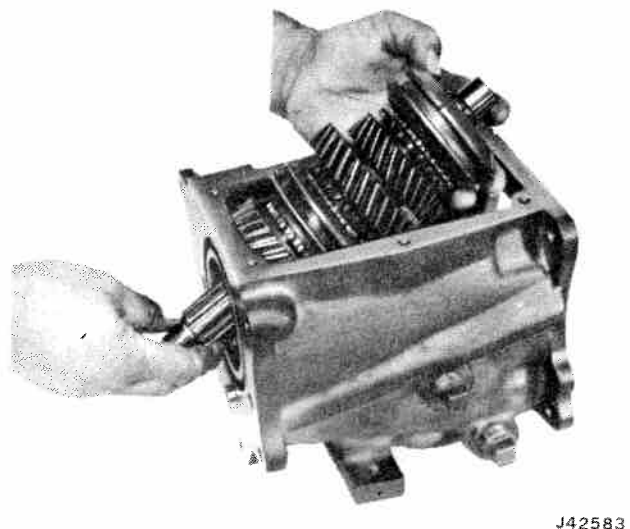
**Fig. 6-5 Main Shaft Bearing Removal**

(13) Remove countershaft gear assembly and two thrust washers.

(14) Remove spacer washers, bearing rollers, and spacer from counter gear hub assembly for inspection.

(15) Using Arbor Tool W-336 with T-14A or Arbor Tool W-337 with T-15A transmission, drive reverse idler shaft rearward, out of case (fig. 6-8).

(16) Remove reverse idler gear, washers, and roller bearings as an assembly (fig. 6-9).



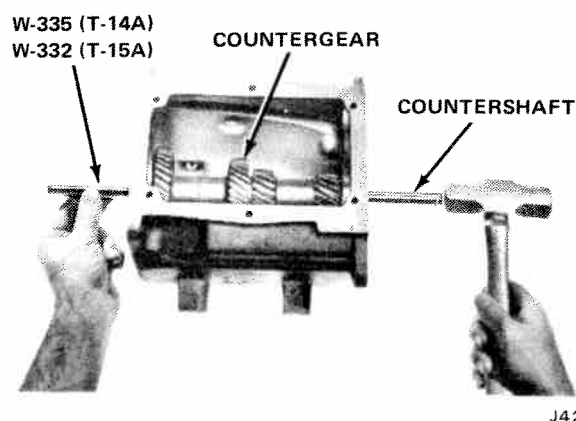
**Fig. 6-6 Mainshaft Gear Assembly - Removal and Installation**

(9) Remove main shaft and gears as an assembly through case cover opening as shown in figure 6-6.

(10) Remove lock plate by tapping lightly on front end of countershaft and reverse idler shaft.

(11) Remove lock plate from slots in shafts (fig. 6-7).

(12) Using Arbor Tool W-335 with T-14A or Arbor



**Fig. 6-8 Countershaft Removal and Installation**

(17) Remove clutch hub snap ring and second-third synchronizer assembly from main shaft (fig. 6-10).

(18) Remove second-speed gear from main shaft.

(19) Remove reverse gear from main shaft.

(20) Remove clutch hub snap ring and low synchronizer assembly from main shaft (fig. 6-11).

(21) Remove low speed gear from main shaft.

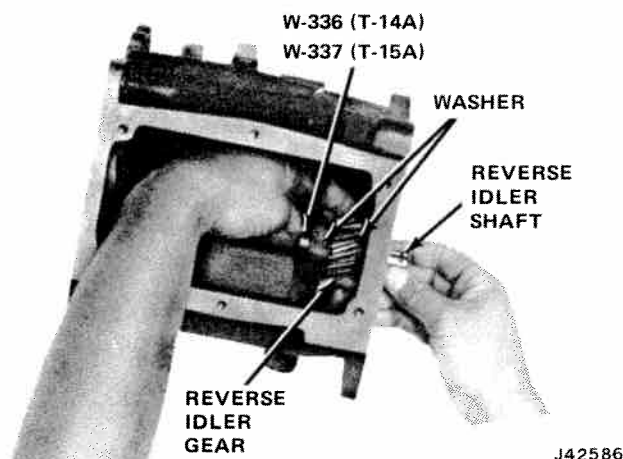


Fig. 6-9 Reverse Gear Idler Gear Removal and Installation

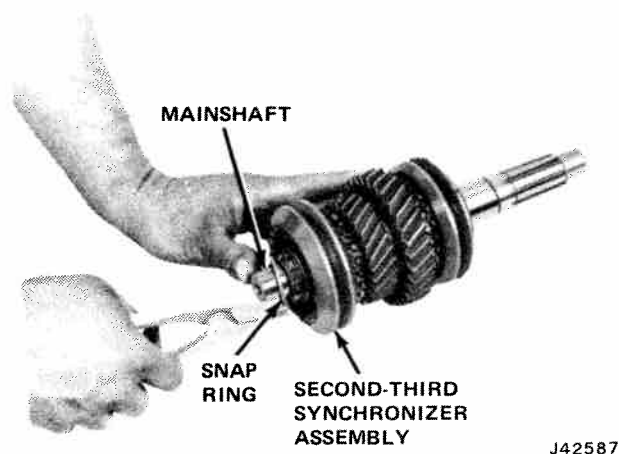


Fig. 6-10 Second-Third Clutch Hub Snap Ring Removal and Installation

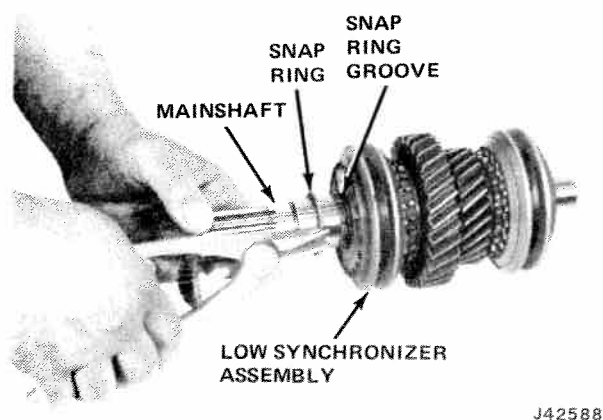


Fig. 6-11 Low Clutch Hub Snap Ring Removal and Installation

## Synchronizer Assemblies

### Second-Third Synchronizer Unit - Disassembly

- (1) Remove springs (one on each side of unit).
- (2) Mark sleeve and hub before separating to ensure proper installation at assembly.

- (3) Remove hub from sleeve.
- (4) Remove three synchronizer plates from third-speed side of hub.
- (5) Clean and inspect synchronizer assembly parts.
- (6) Assemble synchronizer in reverse order of disassembly, **making certain the two synchronizer spring openings are installed 120 degrees opposite each other, with spring tension opposed** (fig. 6-12).

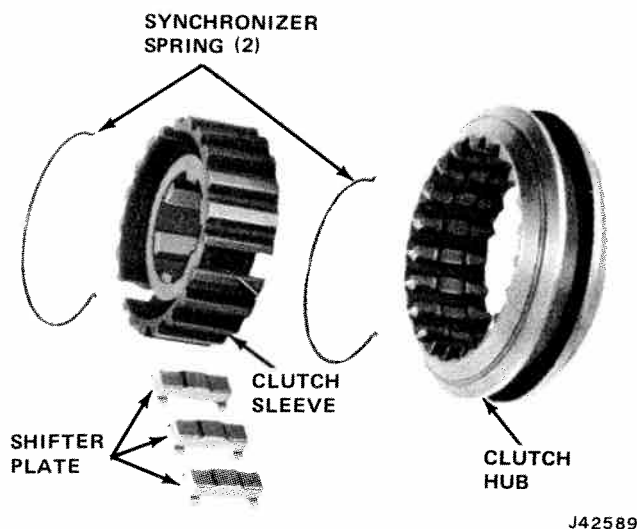


Fig. 6-12 Second-Third Synchronizer Assembly

### Low Synchronizer Unit - Disassembly

The low synchronizer assembly is serviced in the same manner as second-third with the exception of one synchronizer spring (fig. 6-13).

**NOTE:** Should a synchronizer assembly (either low-and-reverse or second-and-high) be replaced for any reason on a floor shift transmission, the shift fork that operates the synchronizer being replaced must have an identifying letter A appearing just under the shaft hole on the side opposite the pin. If the letter A does not appear on the existing fork, it must be replaced with a letter A fork.

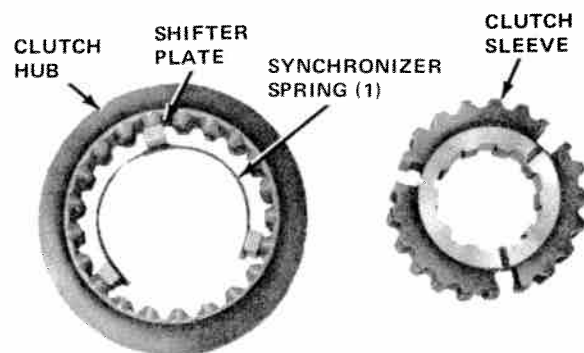


Fig. 6-13 Low Synchronizer Assembly

## CLEANING AND INSPECTION

Wash transmission case inside and outside with cleaning solvent.

Check bearing and shaft bores. Inspect the case for cracks. Check the front and rear faces and dress off any burrs with a fine mill file. If cracks are found and bores are not true, replace the case.

Clean and inspect all gears and bronze blocking rings for cracks, chipped or cracked teeth, or excessive tooth wear.

**NOTE:** Whenever any transmission gear requires replacement, the gear with which it meshes should also be replaced.

Inspect all bearings or bushings for wear or damage.

Make certain that the second-third and low synchronizer clutch sleeve slide freely on the clutch hub.

## ASSEMBLY

**NOTE:** Lubricate all internal transmission parts before assembly using SAE 80 Gear Lubricant of API, GL-4 quality.

(1) Position reverse idler gear with Arbor Tool W-336 with T-14A or T-337 with T-15A transmission, roller bearing, and thrust washers in case.

(2) Install reverse idler shaft forcing out Arbor Tool. Make certain slot end of idler shaft is correctly aligned to receive lock plate (fig. 6-9).

(3) Assemble countershaft center spacer, four bearing spacers, and countershaft bearing rollers in countershaft gear hub assembly.

(4) Using Arbor Tool W-335 with T-14A or Tool W-332 with T-15A transmission, place center spacer inside hub and insert Arbor Tool in spacer.

(5) Place a bearing at each end of center spacer and load bearing roller set.

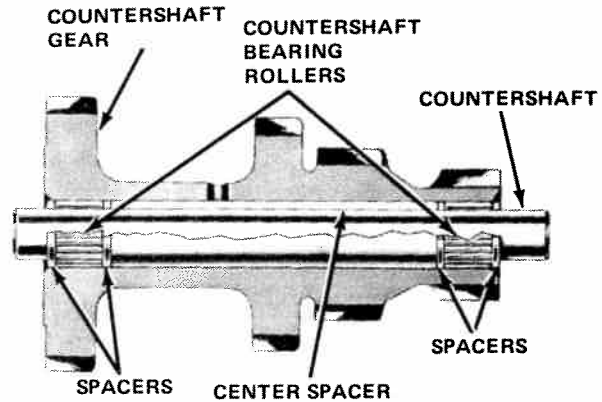
(6) Place a bearing spacer at each end to complete assembly (fig. 6-14 and 6-15).

(7) Install large countergear thrust washer in front of case.



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Fig. 6-14 Countershaft Gear Bearing Arbor



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Fig. 6-15 Countershaft Bearing and Spacers Installed

(8) Position small thrust washer on countershaft gear hub with lip facing groove in case.

(9) Holding countershaft gear assembly in position, begin installation of countershaft in rear of case with lock plate slot toward rear and slot aligned with slot in reverse idler gear shaft.

(10) Press shaft through gear hub assembly and into case front, forcing out Arbor Tool (fig. 6-15).

(11) Locate lock plate in slots of reverse idler shaft and countershaft.

(12) Tap two shafts alternately until lock plate is tight against case (fig. 6-16).

(13) When assembling main shaft, first install main shaft low gear and bronze blocking ring.

(14) Install low synchronizer assembly, then install select-fit snap ring (fig. 6-11).

**NOTE:** Main shaft snap rings are select-fit to eliminate clutch hub and main drive gear bearing end play. Make certain correct snap ring is installed at assembly.

(15) Install main shaft second gear and bronze blocking ring.

(16) Install second-third synchronizer assembly, then install select-fit snap ring (fig. 6-10).

(17) Install reverse gear on main shaft.

(18) Install main shaft and gear assembly as a unit, through top cover opening of transmission case (fig. 6-6).

(19) Install bronze blocking ring onto second-third synchronizer assembly.

(20) Install main drive gear roller bearings using petroleum jelly to hold bearings in place (fig. 6-17).

(21) Install main drive gear and oil retainer washer (slinger) into case with cutaway portion of gear positioned downward toward countergear assembly.

(22) Guide main drive gear onto main shaft using care not to drop roller bearings (fig. 6-18).

(23) Install main drive gear and main shaft bearings using Bearing Installer Set W-331 together with Thrust Yoke Tool W-334 with T-14A or W-333 with

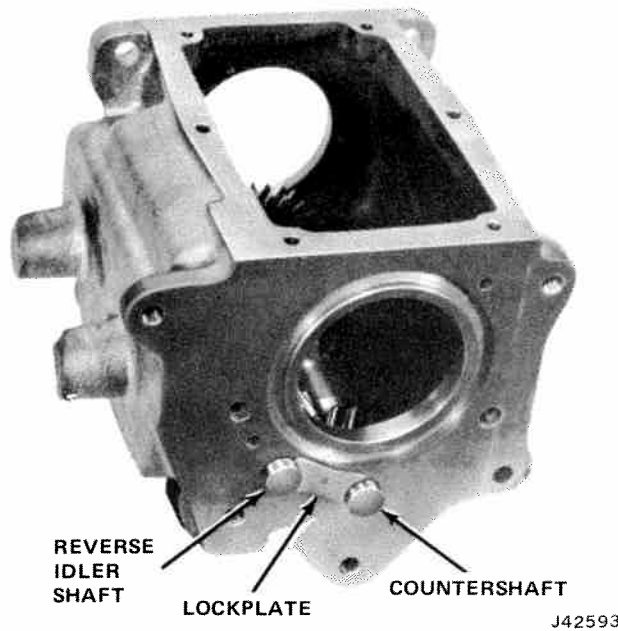


Fig. 6-16 Lock Plate Installation

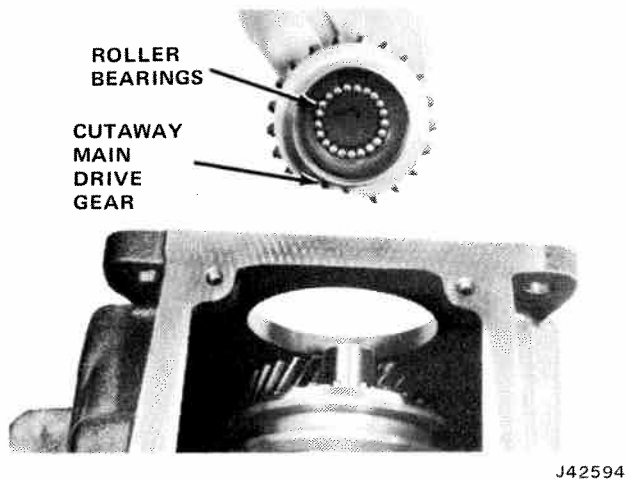


Fig. 6-17 Main Drive Gear Roller Bearing Installed

T-15A to prevent damage to synchronizer clutch.

(24) Install thrust yoke tool into second speed gear groove and between main drive gear (steel) clutch teeth and bronze synchronizer ring. Use both bearing drivers and a backup block when driving bearings into position (fig. 6-19 and 6-20).

(25) Install main drive gear and main shaft bearing snap rings.

**NOTE:** The main shaft bearing snap ring is 0.010 inch thicker than the main drive gear bearing snap ring. Take care to install proper snap ring at these locations.

(26) Install main shaft rear bearing adapter, spacer, transfer case drive gear, flat washer, and nut. Tighten nut to 130 to 170 ft-lb (fig. 6-3).

(27) Check the main drive bearing retainer oil seal.

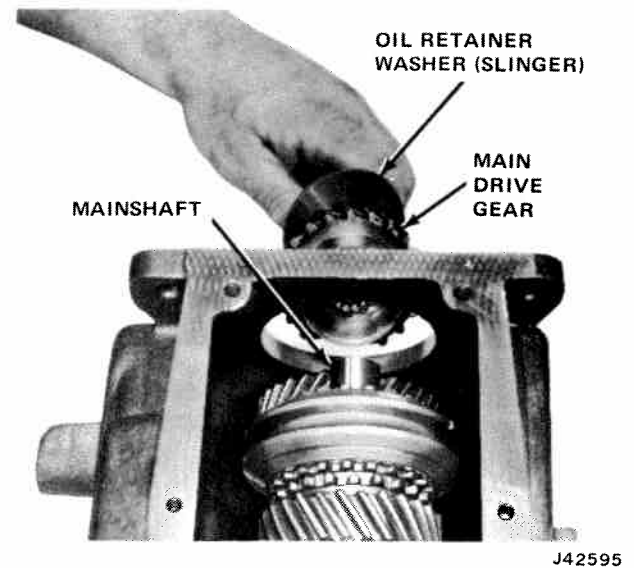


Fig. 6-18 Main Drive Gear Assembly Installation

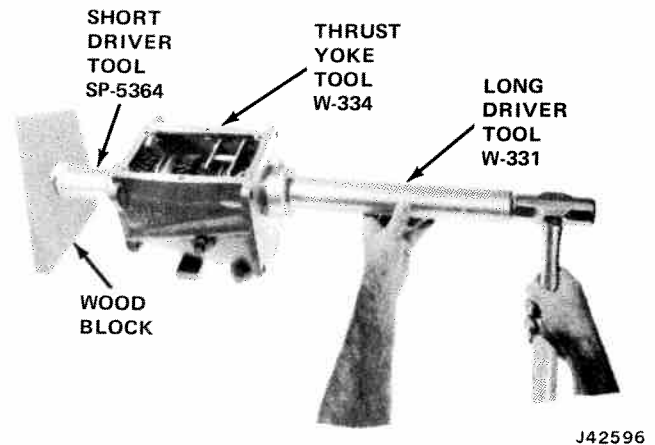


Fig. 6-19 Main Drive Gear Bearing Installation

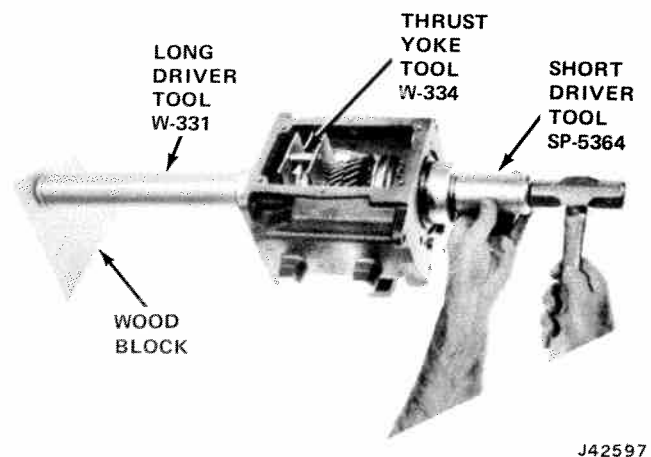
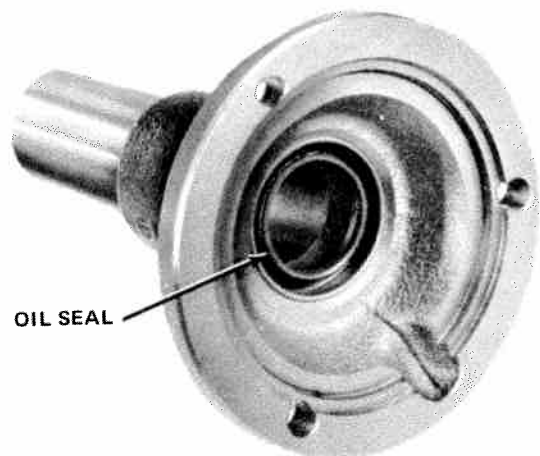


Fig. 6-20 Main Shaft Bearing Installation

If seal is worn or damaged, it must be replaced (fig. 6-21).

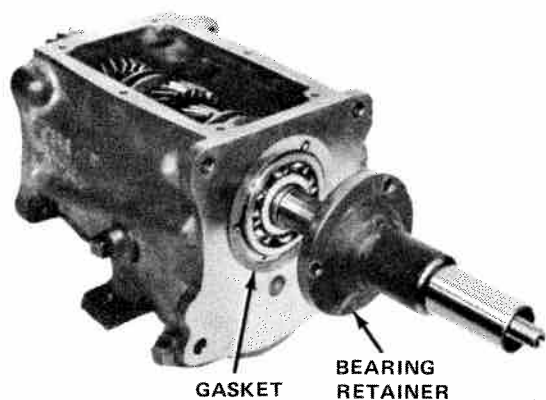
(28) Install main drive gear bearing retainer gasket and retainer assembly. Make certain oil drain hole slot





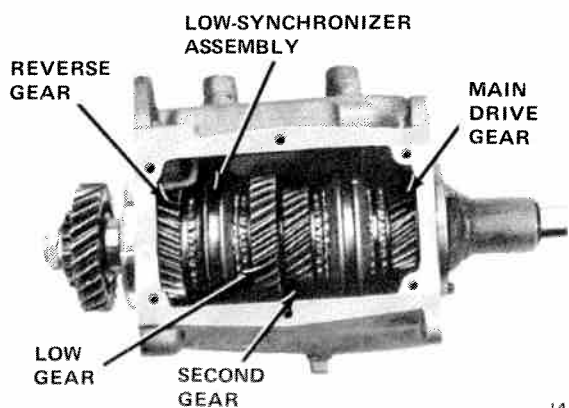
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Fig. 6-21 Main Drive Gear Bearing Retainer Oil Seal



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Fig. 6-22 Main Drive Gear Bearing Retainer Installation



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Fig. 6-23 Main Shaft Gear Train Neutral Position

in the retainer housing and gasket are aligned.

(29) Install ferry-type screws and washers (fig. 6-22).

(30) Install transmission case cover gasket and gasket.

(31) Install transfer case drive gear spacer, drive gear, washer, and retaining nut.

(32) Assemble transfer case to transmission using new gasket.

## SHIFT CONTROL HOUSING

### Disassembly

(1) Remove TCS switch and backup light switch.

(2) Remove shift rail sealing plugs from rear of control housing. Plugs may be easily removed by driving them sideways in bore then prying them out.

(3) Place first and reverse shift rail in first gear position.

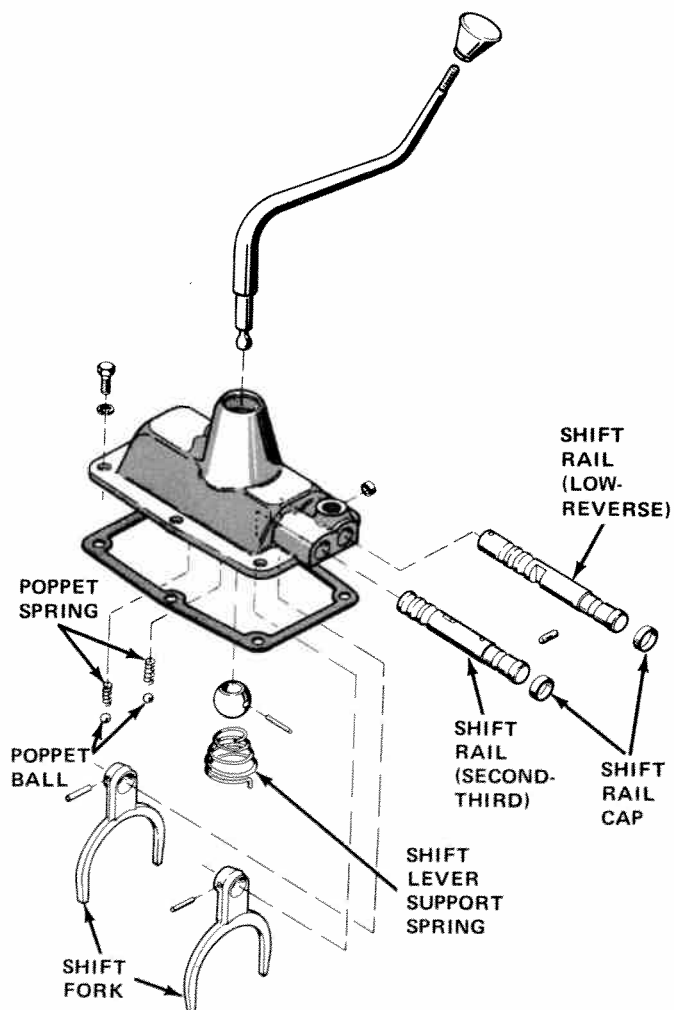
(4) Remove roll pin from first and reverse shift fork and rail.

(5) Slide first and reverse fork rearward sufficiently to expose roll pin hole in rail.

(6) Insert a tapered punch in roll pin hole in shaft.

(7) Rotate first and reverse rail toward second and third rail to align groove at rear of first and reverse rail with interlock plunger. Slide first and reverse rail forward as far as possible.

(8) Remove interlock plunger.



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Fig. 6-24 Three-Speed Transmission Shift Control Housing Assembly Sequence



**NOTE:** Before removing the rail, cover the poppet ball holes with a cloth to prevent loss of ball and spring.

(9) Rotate first and reverse rail away from second and third rail and, at the same time, push rail rearward out of control housing.

(10) Remove roll pin from second and high shift fork and rail.

**NOTE:** Before removing the rail, cover the poppet ball holes with cloth to prevent loss of ball and spring.

(11) Remove second and third shift rail.

(12) Remove shift lever retainer spring and shift lever.

### Assembly

(1) Install shift lever and retainer spring.

**NOTE:** Small end of spring cone should be against lever ball. Be sure spring is snapped in behind shoulders in cover.

(2) Slide second and third shift rail into housing to poppet boss.

(3) Insert poppet spring and ball.

(4) Compress ball and spring and slide rail just through boss.

(5) Rotate rail to position shift lever slot toward center of housing.

(6) Install second and high fork with flanged side of fork toward front of housing.

(7) Install roll pin.

(8) Hold first and second shift fork in position, with flange side of fork toward rear of housing.

(9) Slide first and second shift rail into housing, through fork, to poppet boss.

(10) Insert and compress poppet spring and ball.

(11) Push shift rail as far forward as possible.

(12) Install interlock plunger. Be sure second and high shift rail is in neutral position and that interlock plunger contacts rail.

(13) Rotate first and reverse shift rail until notch in interlock end of rod faces away from housing.

(14) Move rail backward until end of rail contacts interlock plunger.

(15) Rotate rail to align notch with interlock plunger, then move rail as far backward as possible.

(16) Rotate rail to align roll pin holes in rail and fork.

(17) Install roll pin.

(18) Install shift rail sealing plugs, backup light switch, and TCS switch.

## MODEL T-18 4-SPEED TRANSMISSION

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### DISASSEMBLY

**NOTE:** Refer to figure 6-25 for Model T-18 4-Speed Transmission parts relationship.

(1) If transfer case is attached, separate it from transmission by removing attaching screws and lock-washers.

(2) Remove shift control housing from top of transmission.

(3) Control housing can be disassembled at this point. Refer to Shift Control Housing Disassembly at the end of this subsection.

(4) Remove nut, washer, transfer case drive gear, and spacer from output shaft.

(5) Remove transmission-to-transfer case adapter and gasket.

(6) Remove oil seal from adapter and, if damaged, discard seal.

(7) Mark direct- and third-clutch hub and direct-

and-third clutch sleeve to make certain these two blocking rings will be assembled in their original relationship. Also mark blocking ring, low-and-second clutch hub and low- and second-speed gear (fig. 6-26).

(8) Slide low- and second-speed gear toward rear of transmission case.

(9) Disengage reverse shifting arm and reverse shifting shoe from reverse idler gear.

(10) Remove arm from reverse shifting arm pivot.

(11) Move low- and second-speed gear into neutral position.

(12) Remove front bearing retainer and gasket.

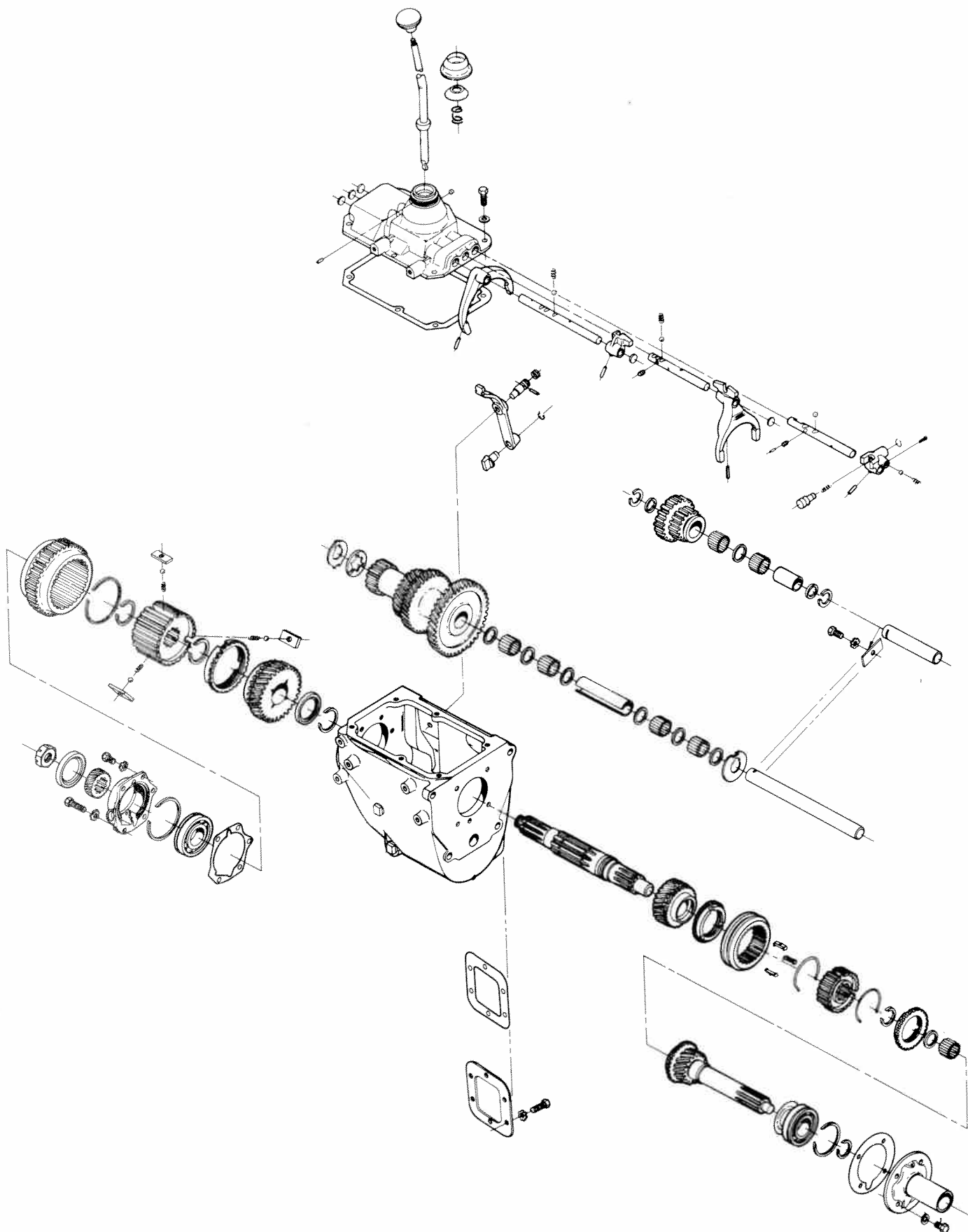
(13) Remove snap rings from main drive gear and outer race of ball bearing.

(14) Remove main drive gear ball bearing using Bearing Puller Set W-329 (fig. 6-27).

(15) Remove oil slinger.

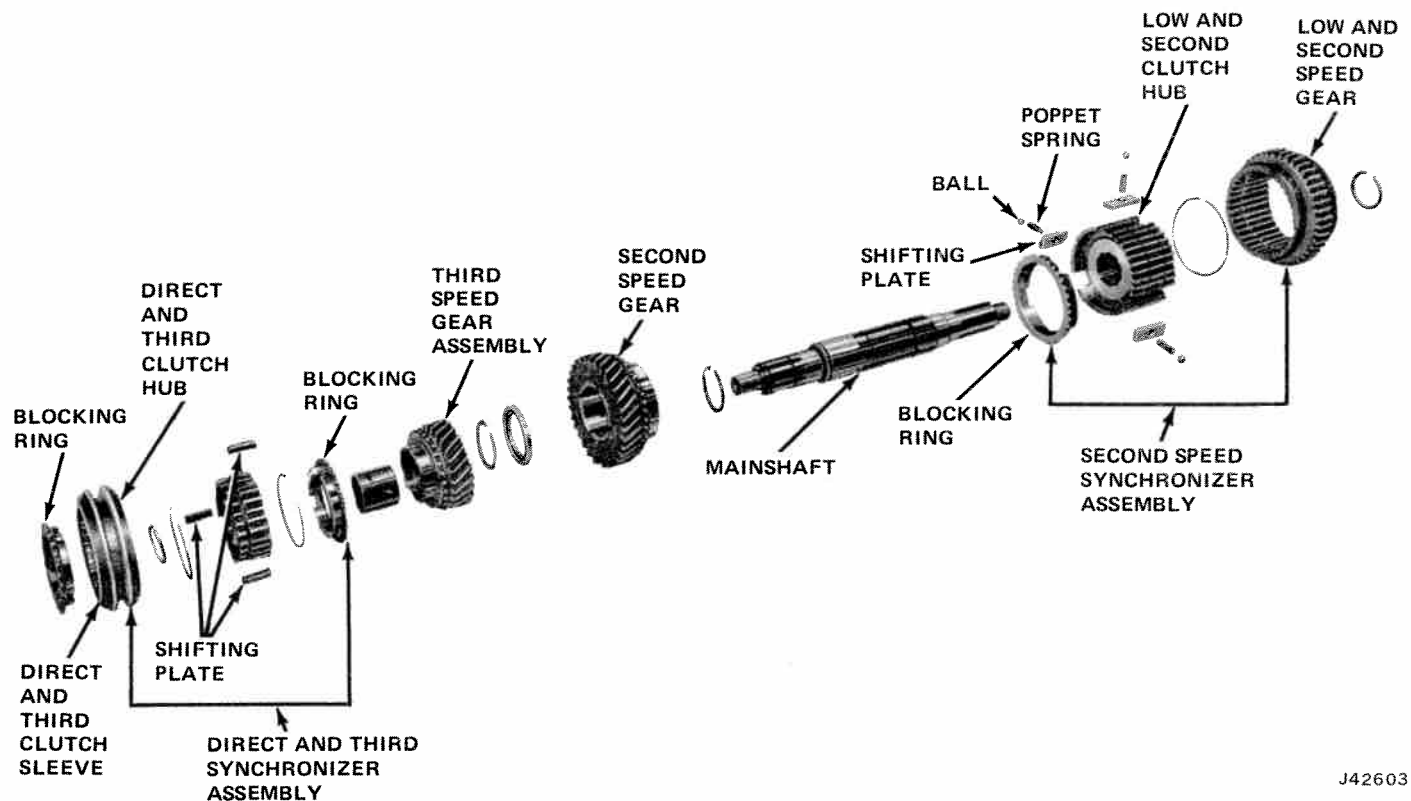
(16) Remove snap ring from outer bearing race of transmission main shaft ball bearing.

(17) Remove main shaft ball bearing using a bearing puller.



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Fig. 6-25 Model T-18 4-Speed Transmission Exploded View



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Fig. 6-26 Main Shaft Assembly

**NOTE:** It may be necessary to drive the main shaft rearward by striking the end of the main drive gear with a lead hammer to get sufficient clearance to install the bearing puller plates.

(18) Slide direct- and third-clutch sleeve to rear (third-speed) position.

(19) Separate main shaft assembly from main drive gear. Be careful not to loosen any main shaft pilot bearing rollers.

(20) Lift main shaft assembly out of transmission case.

(21) Remove main drive gear from transmission case.

(22) Remove main shaft bearing rollers from gear.

(23) Mark relationship between synchronizer hubs and splines on main shaft.

(24) Begin disassembly of main shaft assembly by removing snap ring which holds direct- and third-synchronizer assembly on main shaft.

(25) Remove front block ring from front of shaft.

(26) Slide direct- and third-synchronizer assembly and third-speed gear assembly off main shaft.

(27) Remove snap ring at rear of main shaft.

(28) Slide second synchronizer assembly and blocking ring off main shaft.

(29) If synchronizer assemblies are to be disassembled and serviced, proceed as follows:

(a) Wrap second-speed synchronizer assembly in a cloth to prevent losing lock balls and springs.

(b) Push clutch hub out of low- and second-speed

gear in opposite direction of shift fork groove.

(30) Remove cloth and lift balls, springs, and plates out of hub.

(31) Remove lock plate for countershaft and reverse idler gear shaft.

(32) Use pry bar in slot of reverse idler gear shaft to loosen shaft. Slip reverse idler gear shaft out of housing and gear.

(33) Lift reverse idler gear assembly from transmission case.

(34) Drive countershaft toward rear of transmission case using a heavy brass drift.

(35) When countershaft end is approximately even with inside of transmission case, use a dummy shaft to force it completely out. Since a dummy shaft is required for assembly, make one at this time.

(a) Cut steel rod to 9.85 inches long.

(b) Break sharp edges with a mill file.

(c) Keep dummy shaft in contact with countershaft at all times to prevent dropping bearing rollers or thrust washers.

(36) Place dummy shaft in position and place transmission case on its side. Carefully roll countershaft gear cluster out of case.

(37) Complete disassembly by removing dummy shaft, thrust washers, four sets of bearing rollers, and spacers.

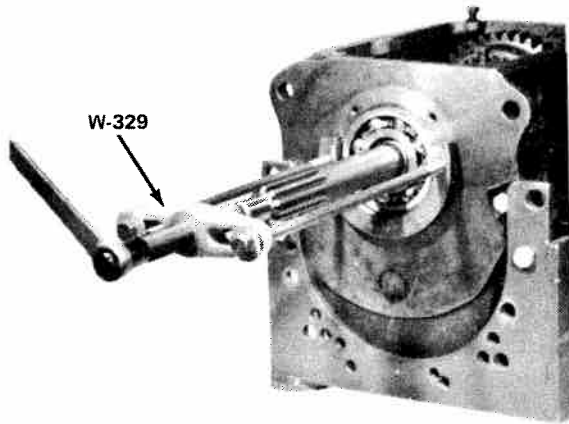
(38) Remove one of snap rings and tap out washers, both sets of bearing rollers, center spacer, and sleeve to disassemble reverse idler gear assembly.

(39) Remove remaining snap ring.

## CLEANING AND DISASSEMBLY

Transmission case and all component parts should be carefully cleaned so they can be thoroughly examined. Whenever any transmission gear requires replacement, the gear with which it meshes should also be replaced. Always use new gaskets, oil seals, and snap rings when assembling the transmission.

Inspect transmission case for cracks, bearing bosses for wear or scoring which would indicate that the bearing has been revolving in its housing. Examine ball bearings for cracked races and worn balls, for press fit on the shafts and for tight fit in the case bores. Inspect teeth of all gears for cracks, chips, or spots where case hardening is worn through. Main shaft gears should slide on and off smoothly without excessive play. Inspect synchro-blocking rings for excessive wear or a pitted condition on the tapered area of the ring. If the condition of the thrust washers is doubtful, replace washers.



J42604

Fig. 6-27 Front Bearing Removal

## ASSEMBLY

### Reverse Idler Gear

**NOTE:** A small amount of petroleum jelly will aid assembly and provide initial lubrication.

- (1) Install snap ring in one end of reverse idler gear.
- (2) With installed snap ring end down, place thrust washer into gear bore and against snap ring.
- (3) Install sleeve into gear bore and insert one set (37) of roller bearings, then install spacer, 37 more roller bearings, second thrust washer, and snap ring into gear.

### Countershaft Gear

- (1) Assembly of countershaft components and installation of countershaft into transmission case is

accomplished with a dummy shaft of 1-1/8 inch diameter by 9-1/2 inch length.

- (2) Lubricate bearing spacer sleeve, and install sleeve and dummy shaft into countershaft gear.

- (3) Insert one spacer over dummy shaft against spacer.

- (4) Insert 22 roller bearings.

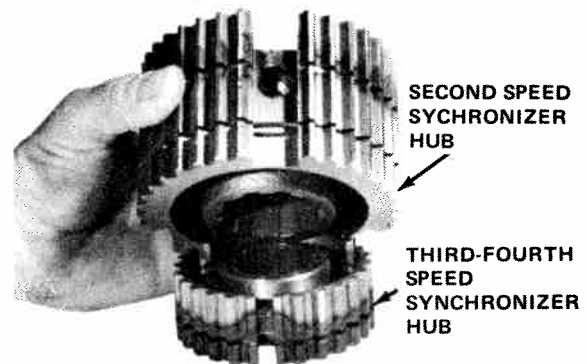
- (5) Insert second bearing spacer and 22 more roller bearings, followed with a third spacer.

- (6) Repeat this operation at the opposite end of the countershaft gear.

## Second-Speed Synchronizer

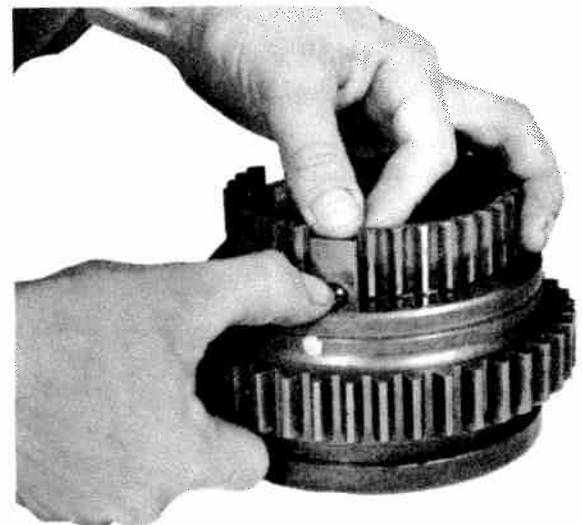
**NOTE:** Use third- and fourth-speed synchronizer hub to aid in assembly of second-speed synchronizer.

- (1) Place hub flat on work bench.
- (2) Place second-speed synchronizer sleeve over third-and-fourth speed hub with shift fork groove down.
- (3) Insert second-speed synchronizer hub into sleeve with poppet ball holes up (fig. 6-28).



J42605

Fig. 6-28 Supporting Second-Speed Synchronizer Hub



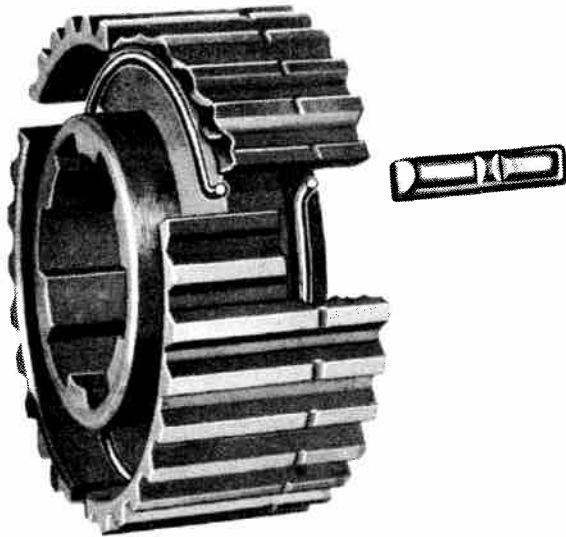
J42606

Fig. 6-29 Assembling Second-Speed Synchronizer

- (4) Insert shifting plates in slots of hub.
- (5) Install poppet spring through shifting plate.
- (6) Compress spring with poppet ball while pressing on shifting plate until poppet ball is held in position by synchronizer sleeve. Repeat this operation until three shifting plates, poppet springs, and balls are started into sleeve.
- (7) Complete assembly by pressing down on hub and pulling up on sleeve (fig. 6-29).

### Third- and Fourth-Speed Synchronizer

- (1) Assemble third- and fourth-speed synchronizer hub and sleeve.
- (2) Align marks previously painted or etched before disassembly.
- (3) Insert three shifting plates in slots of hub. Install retaining rings so that one end of each ring is hooked into the same shifting plate (fig. 6-30).



J42607

Fig. 6-30 Synchro-Plate and Retainer Installation

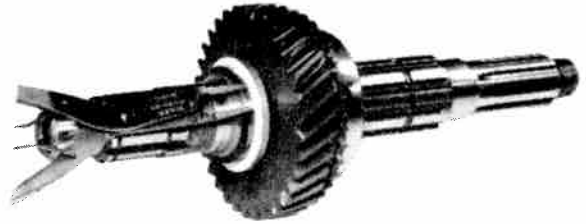
### Main Drive Gear

- (1) Install 22 roller bearings with petroleum jelly into bore of main drive gear.
- (2) Coat blocking ring with petroleum jelly and install on main drive gear.

### Main Shaft Assembly

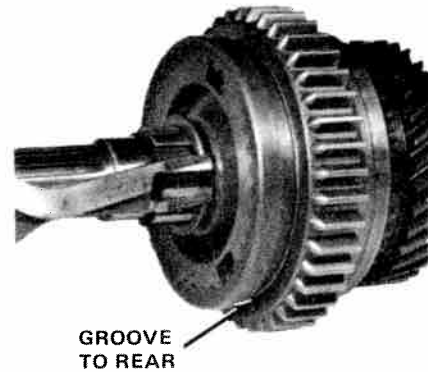
- (1) Install second-speed gear from front of main shaft.
- (2) Install thrust washer with step bore toward the front of main shaft.
- (3) Install snap ring. Be certain step bore of thrust washer fits over snap ring (fig. 6-31).
- (4) From rear of main shaft, install second-speed gear rear snap ring, blocking ring, second-speed synchronizer unit and snap ring.

**NOTE:** Second-speed synchronizer sleeve shift fork groove must be toward rear of main shaft (fig. 6-32).



J42608

Fig. 6-31 Second-Speed Gear and Washer Installation

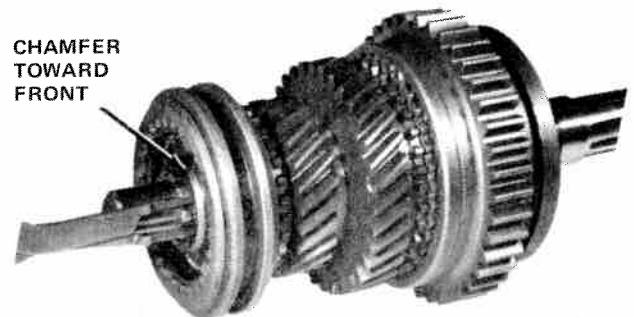


J42609

Fig. 6-32 Second-Speed Synchronizer Installation

- (5) From front of main shaft, install third-speed gear, blocking ring, third- and fourth-speed synchronizer assembly, snap ring and main drive gear roller bearing thrust washer.

**NOTE:** Third- and fourth-speed synchronizer unit must be installed with chamfered side of hub toward front of main shaft (fig. 6-33).

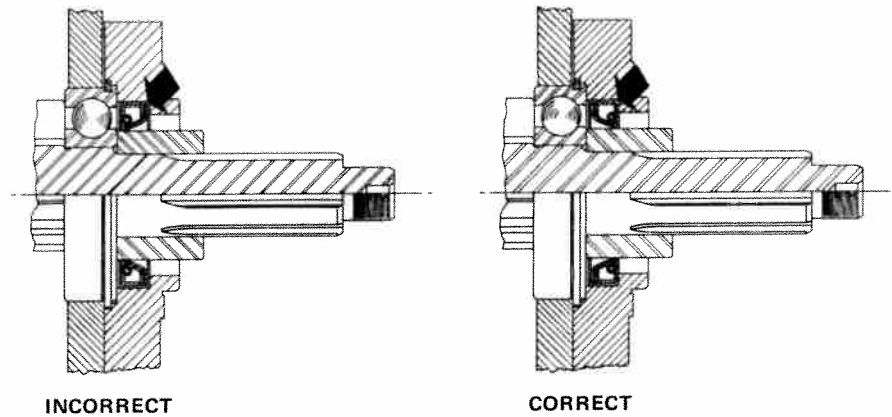


J42610

Fig. 6-33 Third- and Fourth-Speed Synchronizer Installation

### Transmission Case

- (1) Install countershaft thrust washers. Coat two thrust washers with petroleum jelly. Index tab of large bronze faced washer in recessed area of front of case. Index notch of smaller steel washer with lug at rear of case.
- (2) Lower countershaft gear assembly into transmission case.
- (3) Insert remaining countershaft thrust washer between end of countershaft gear and rear thrust washer.



J42611

Fig. 6-34 Oil Seal Position

(4) Insert countershaft from rear of case, keeping countershaft and dummy shaft into contact to prevent dropping bearing rollers or washers.

(5) Tap countershaft lightly into position in front of case, but do not seat it until reverse idler gear and shaft have been installed into case.

(6) Position reverse idler gear into transmission case with **larger gear** toward rear of case.

(7) Insert reverse gear idler shaft from rear of case, and tap forward until lock plate slot is adjacent to slot of countershaft.

(8) Insert lock plate in slots of shafts making sure plate ends are square with slots.

(9) Install lock plate to act as a guide while tapping shafts alternately into position. Install and tighten lock plate screw securely.

(10) Insert main drive gear, with roller bearings and fourth gear blocking ring through transmission case into front bearing bore.

(11) Install main shaft assembly into transmission case by placing rear end down and through case rear bearing bore.

(12) Be sure main drive gear roller bearing spacer is on main shaft pilot. Install main shaft pilot into bore of main drive gear, making sure roller bearings are not knocked out of place and fourth gear blocking ring notches are aligned with synchronized plates.

(13) Temporarily install main drive gear bearing retainer to support drive gear.

(14) Install snap ring on main shaft bearing. Drive bearing onto main shaft and into the rear case bore. Seat snap ring against case.

(15) Install rear oil seal in transfer case adapter plate.

(16) Position new gasket on rear of transmission and apply thin coat of lubricant to lip of oil seal.

(17) Install adapter plate on rear of transmission.

(18) Apply nonhardening sealer to capscrews and install. Tighten to specified torque.

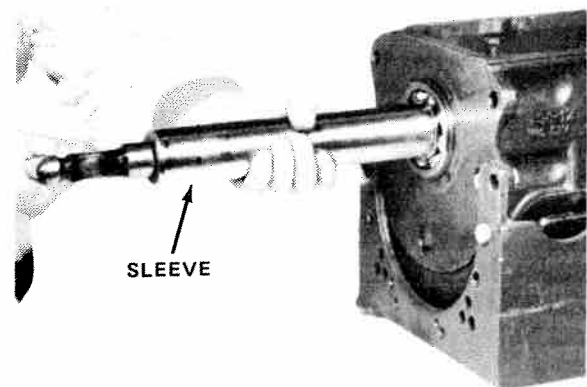
(19) Remove main drive gear bearing retainer.

(20) Install oil slinger on main drive gear with **dished side** toward rear of transmission.

(21) Install snap ring on main drive gear bearing and position bearing on drive gear.

(22) Using a piece of pipe or driver sleeve, drive bearing over main drive gear and into case bore until snap ring is flush against case (fig. 6-35).

(23) Install the thickest of the four available snap rings that will fit into the groove on main drive gear shaft.



J42612

Fig. 6-35 Front Bearing Installation

**NOTE:** It is important that the 4-speed transmission adapter plate oil seal be correctly installed to prevent flow of lubricant from the transfer case to the transmission. Correctly positioned, the lip of the oil seal is toward the transfer case (fig. 6-34).

(24) Slide main drive gear bearing retainer onto shaft and hold tightly against transmission. With a feeler gauge, measure distance between retainer and case. Select gaskets that will be 0.003 inch to 0.005 inch thicker than space between retainer and case.

(25) Position new gasket on main drive gear bearing retainer. Coat threads of capscrews with a non-hardening sealing compound. Align oil return hole of

retainer with oil return hole located in front face of transmission case. Install capscrews and tighten to 8 to 15 ft-lb torque.

(26) Install reverse shifting arm. Move first- and second-speed synchronizer sleeve toward rear of transmission case to provide clearance.

(27) For installation of reverse shifting arm, install O-ring seal on reverse shifting arm pivot pin.

(28) Place reverse shifting arm into transmission case, indexing shoe of arm with groove in reverse idler gear.

(29) Hold reverse shifting arm in position and install pivot pin into case and through arm. Install tapered pin from rear of pivot pin boss and tap in with hammer until snug.

(30) Position new gasket on power takeoff cover and with nonhardening sealer applied to capscrews, install to transmission case. Tighten capscrews to 8 to 15 ft-lb torque.

(31) Install transmission and drain and fill plugs. Pour a pint of recommended gear lubricant over all

gears in case while rotating main drive gear. Position synchronizer units in neutral position.

(32) Place new gasket on top of transmission case. Lower shift control housing down on top of case making sure shift forks are started into synchronizer sleeves and reverse shifting arm upper end engages flat portion of reverse shift rail. Install capscrews and tighten alternately and evenly to 8 to 15 ft-lb torque.

(33) Check operation of transmission by shifting gears in all ranges.

(34) Install transfer case drive gear spacer, drive gear, washer and retaining nut.

(35) Using a new gasket, assemble transfer case to transmission.

## SHIFT CONTROL HOUSING

### Disassembly

The rear shift lever, spring, seat and pivot are removed during transmission removal.

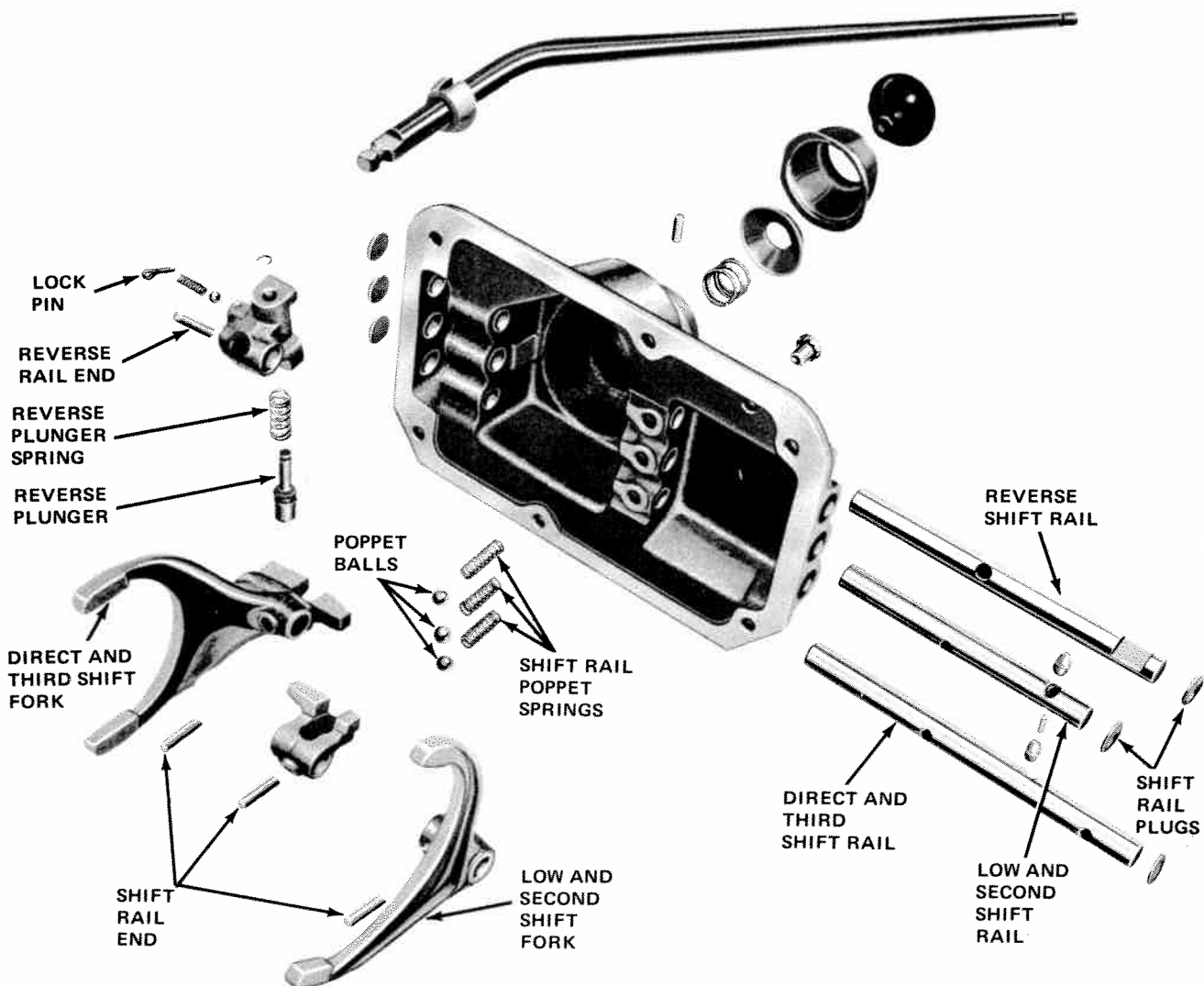


Fig. 6-36 4-Speed Transmission Shift Control Housing



(1) Remove lockpins from gear shift forks and gear shift rod ends.

(2) Remove expansion plugs from front and rear of control housing.

(3) Remove backup light switch and TCS switch.

(4) Remove center (third and high) shift rail first.

(5) Drive rail rearward out of housing. As rail is withdrawn from housing, remove interlock pin from crossover hole in rail. Before rail is removed from center section of housing, place a finger over hole to prevent loss of ball and spring.

(6) Remove first-second shift rail in same manner.

(7) Remove shift rail detent balls and springs and, with a piece of wire, push two interlock plungers out of pockets in center section of housing.

(8) In reverse shift, rail end is a spring-loaded plunger which prevents accidental engagement of reverse gear. Should this part require servicing, proceed as follows:

(a) Remove cotter pin from rail end assembly and, at the same time, hold a finger over hole to prevent loss of spring.

(b) Shake spring and ball.

(c) Compress plunger and spring until C-washer just clears end of casting. Remove C-washer.

breather assembly for damage, and replace if necessary.

(2) Place reverse plunger spring on plunger. Insert plunger through casting and install C-washer.

(3) Insert ball and spring into rail end. Compress spring and install a new cotter pin.

(4) Position interlock plungers in pockets in center of housing.

(5) Place reverse shift rail detent spring and ball in housing. Compress ball and spring into rail end. Compress spring and install new cotter pin.

(6) Position interlock plungers in pockets in center section of housing.

(7) Place reverse shift rail detent spring and ball in housing. Compress ball and spring into bore and slide shift rail into housing just through center section.

(8) Slide rail into reverse rail end and install lockpin.

(9) Install first-second shift rail detent spring, ball, shift fork, rail end, shift rail, and lockpin in same manner.

(10) Insert interlock pin into center (third and high) shift rail.

(11) Install shift rail detent spring, ball, shift fork, shift rail, and lockpin.

(12) The rear shift lever pivot pin, lever, spring, seat and cap should be installed after transmission assembly is installed.

## Assembly

(1) Prior to assembly, inspect transmission

## SPECIFICATIONS

|         | THREE-SPEED                                   |   | FOUR-SPEED                                   |
|---------|---|---|--|
|         | T-14A<br>Synchromesh<br>3 Forward - 1 Reverse | T-15A<br>Synchromesh<br>3 Forward - 1 Reverse | T-18<br>Synchromesh<br>4 Forward - 1 Reverse |
| Model   |   |   |  |
| Type    |   |   |  |
| Speeds  |   |   |  |
| Ratios: |   |   |  |
| First   | 3.100 to 1                                    | 2.997 to 1                                    | 4.02 to 1                                    |
| Second  | 1.612 to 1                                    | 1.832 to 1                                    | 2.41 to 1                                    |
| Third   | 1.000 to 1                                    | 1.000 to 1                                    | 1.41 to 1                                    |
| Fourth  | -----   | -----   | 1.00 to 1                                    |
| Reverse | 3.100 to 1                                    | 2.997 to 1                                    | 4.73 to 1                                    |



J42615

Fig. 6-37 Manual Transmission Tools

### TECHNICAL SERVICE LETTER REFERENCE

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