MANUAL TRANSMISSION

GENERAL

Three manual transmission models are used in Jeep vehicles. They are, Models T-150, T-15A, and T-18A. Models T-150 and T-15A are 3-speed, constant mesh units which provide synchromesh engagement in all three forward gears. Model T-18A is a 4-speed, constant mesh unit which provides synchromesh engagement in

Service Diagnosis

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

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second, third, and fourth speeds only. First gear is not synchronized.

Model T-150 is used in CJ models with six and eight-cylinder engines. Model T-15A is used in Cherokee, and Truck models with six or eight-cylinder engines. Model T-18A is used in all models and with six or eight-cylinder engines.

IDENTIFICATION

An identification tag which displays the vendor and Jeep part number is attached to the transmission shift control housing. The information on this tag is necessary to obtain the correct components should replacement be necessary. Be sure the tag is securely attached to the transmission in the original location after completing all service operations.

TRANSMISSION REMOVAL—ALL MODELS

(1) Remove shift lever knob, trim ring, and boot.

(2) Remove floor covering and transmission access cover from floorpan.

(3) On Cherokee and Truck models with T-15A transmission, remove shift control lever housing assembly (fig. 6-1).

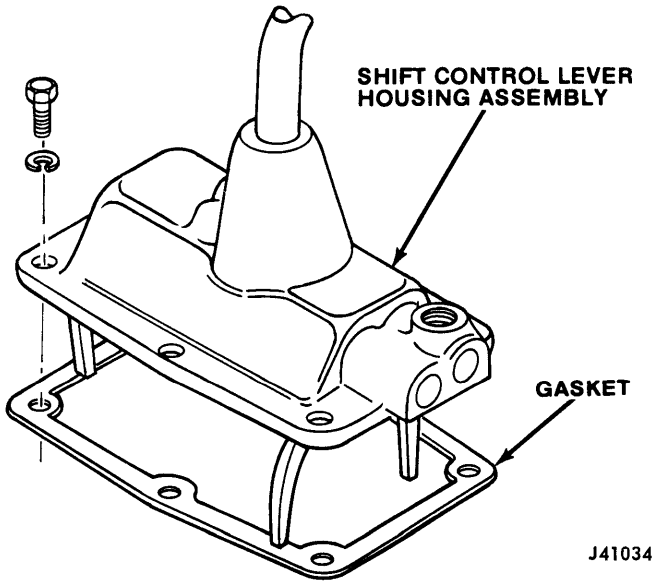


Fig. 6-1 Shift Control Lever Housing Assembly —3-Speed Transmission

(4) On all models with T-18A transmission or CJ models with T-150 transmission, remove shift control housing cap, spring retainer, spring, shift lever, and pin (fig. 6-2).

(5) On models with T-18A transmission, remove transfer case shift lever.

(6) Raise vehicle.

(7) Mark propeller shafts before removal for assembly alignment reference.

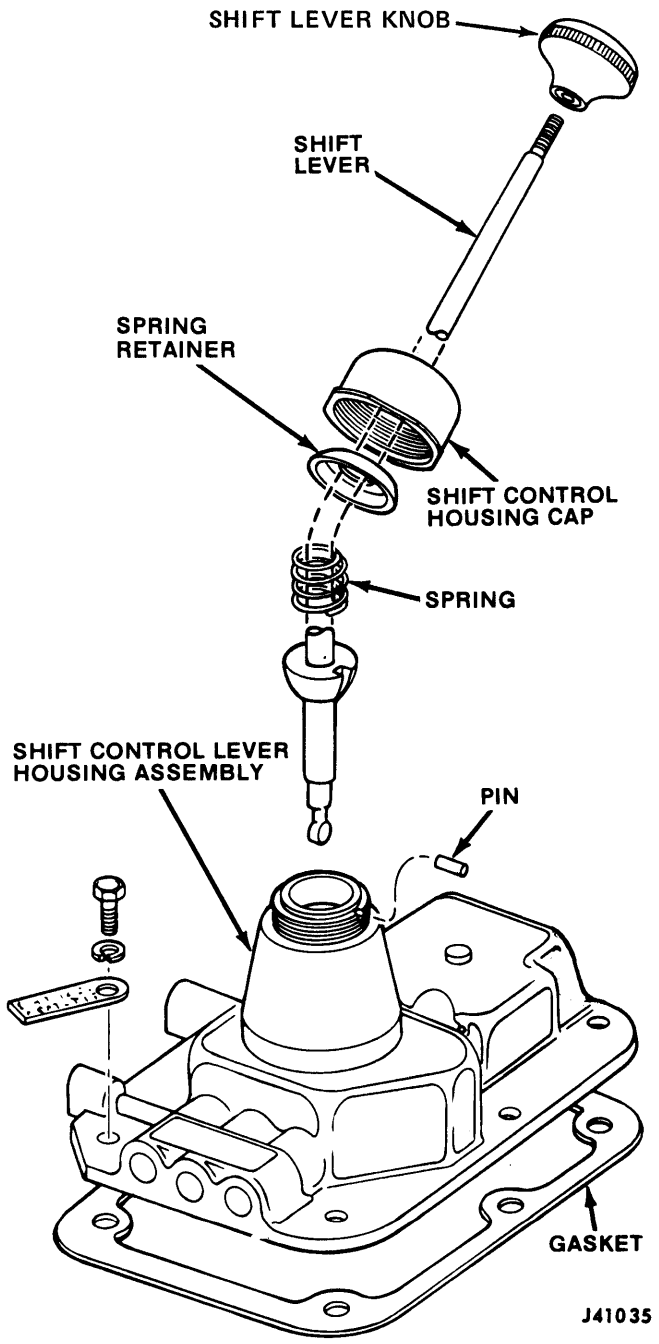


Fig. 6-2 Shift Control Lever Housing Assembly —4-Speed Transmission

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

(9) Disconnect speedometer cable, backup lamp switch wires, TCS switch (if equipped) and parking brake cable, if connected to crossmember.

(10) On models equipped with eight-cylinder engines, remove nuts securing exhaust pipes to manifolds and lower catalytic converter (if equipped) and exhaust pipes.

(11) Place support stand under clutch housing to support engine.

(12) Disconnect rear crossmember from frame side sills.

(13) Remove bolts attaching transmission to clutch housing or transmission adapter.

(14) Lower transmission slightly, and move transmission, transfer case, and crossmember rearward until transmission clutch shaft clears clutch housing or transmission adapter.

(15) Remove assembly from vehicle. Remove lubricating wick from pilot bushing and soak wick in engine oil.

TRANSMISSION INSTALLATION

CAUTION: *If a replacement transmission is being installed, remove the protective fiber washer covering the rear bearing and install a replacement mainshaft seal in the rear bearing adaptor. Install the replacement seal using Tool J-26852.*

(1) Install oil wick in pilot bushing. If removed, position wave washer, throwout bearing, and sleeve assembly in throwout lever fork. Center throwout bearing over pressure plate release lever.

CAUTION: *Protect the splines and preserve throwout bearing alignment when installing transmission.*

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

(3) Install bolts attaching transmission to clutch housing or transmission adapter.

(4) Attach rear crossmember to frame side sills.

(5) On models equipped with eight-cylinder engines, connect exhaust pipes to manifolds.

(6) Connect speedometer cable, backup lamp switch wires, and TCS switch if equipped.

(7) Install front propeller shaft, align index marks made during removal, and connect rear propeller shaft to transfer case.

(8) Lower vehicle.

(9) On models with T-18A transmission, install transfer case shift lever.

(10) On all models with T-18A or CJ models with T-150 transmission, install pin, shift lever, spring, spring retainer, and shift control housing cap.

(11) On Cherokee and Truck models with T-15A transmission install shift control lever housing assembly. Place transmission gears and shift lever and forks in Neutral before installing assembly. Be sure shifter forks are seated in synchronizer sleeves.

(12) Align cover, case, and gasket holes and install bolts and lockwashers. Tighten bolts to 12 foot-pounds torque.

(13) Install transmission access cover and floor covering on floorpan.

(14) Install boots, trim rings, and shift knobs on shift levers.

(15) Check transmission for proper shifting.

(16) Check and correct lubricant level if necessary.

MODEL T-150 3-SPEED TRANSMISSION

DISASSEMBLY

(1) Remove bolts attaching transfer case to transmission.

(2) Separate transfer case and transmission.

(3) Remove transfer case drive gear locknut, flat washer, and drive gear (fig. 6-3). Move second-third clutch sleeve forward and first-reverse sleeve rearward before removing locknut.

(4) Remove fill plug.

(5) Remove countershaft roll pin using 3/16 diameter pin punch. Roll pin is accessible through fill plug hole (fig. 6-4).

(6) Remove countershaft and access plug using Arbor Tool J-25232 (fig. 6-5). Remove countershaft from rear of case. Allow countershaft gear to remain at bottom of case after countershaft removal.

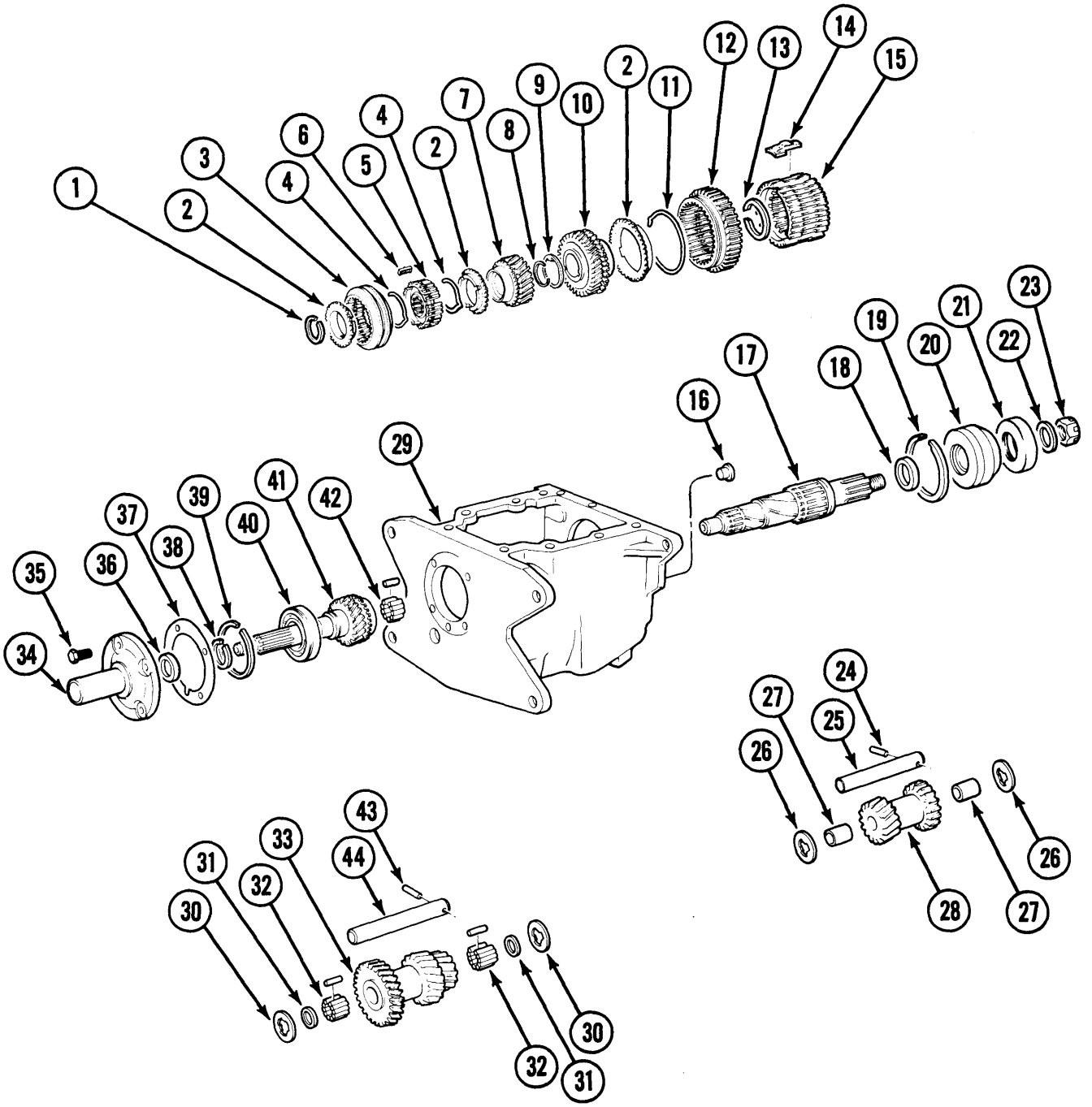
(7) Punch alignment marks in front bearing cap and transmission case for assembly reference.

(8) Remove front bearing cap and gasket.

(9) Remove large lockring from front bearing.

(10) Remove clutch shaft, front bearing and second-third synchronizer blocking ring as an assembly using Tool J-6654-01 (fig. 6-6).

CAUTION: *Do not damage the threaded holes in the case when using Tool J-6654-01.*



1. MAINSHAFT RETAINING SNAP RING
2. SYNCHRONIZER BLOCKING RINGS (3)
3. SECOND-THIRD SYNCHRONIZER SLEEVE
4. SECOND-THIRD SYNCHRONIZER INSERT SPRING (2)
5. SECOND-THIRD HUB
6. SECOND-THIRD SYNCHRONIZER INSERT (3)
7. SECOND GEAR
8. FIRST GEAR RETAINING SNAP RING
9. FIRST GEAR TABBED THRUST WASHER
10. FIRST GEAR
11. FIRST-REVERSE SYNCHRONIZER INSERT SPRING
12. FIRST-REVERSE SLEEVE AND GEAR
13. FIRST-REVERSE HUB RETAINING SNAP RING
14. FIRST-REVERSE SYNCHRONIZER INSERT (3)
15. FIRST-REVERSE HUB
16. COUNTERSHAFT ACCESS PLUG
17. MAINSHAFT
18. MAINSHAFT SPACER
19. REAR BEARING ADAPTER LOCK RING
20. REAR BEARING AND ADAPTER ASSEMBLY
21. MAINSHAFT REAR OIL SEAL
22. FLAT WASHER
23. LOCKNUT
24. ROLL PIN
25. REVERSE IDLER GEAR SHAFT
26. THRUST WASHER
27. BUSHING (PART OF IDLER GEAR)
28. REVERSE IDLER GEAR
29. TRANSMISSIONCASE
30. THRUST WASHER (2)
31. BEARING RETAINER (2)
32. COUNTERSHAFT NEEDLE BEARINGS (50)
33. COUNTERSHAFT GEAR
34. FRONT BEARING CAP
35. BOLT (4)
36. FRONT BEARING CAP OIL SEAL
37. GASKET
38. FRONT BEARING RETAINER SNAP RING
39. FRONT BEARING LOCKRING
40. FRONT BEARING
41. CLUTCH SHAFT
42. MAINSHAFT PILOT ROLLER BEARINGS
43. ROLL PIN
44. COUNTERSHAFT

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Fig. 6-3 Model T-150—Exploded View

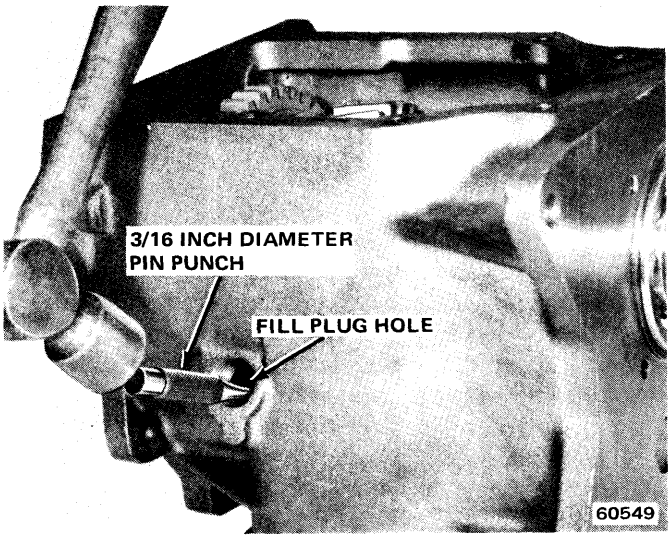

Fig. 6-4 Removing—Installing Countershaft Roll Pin

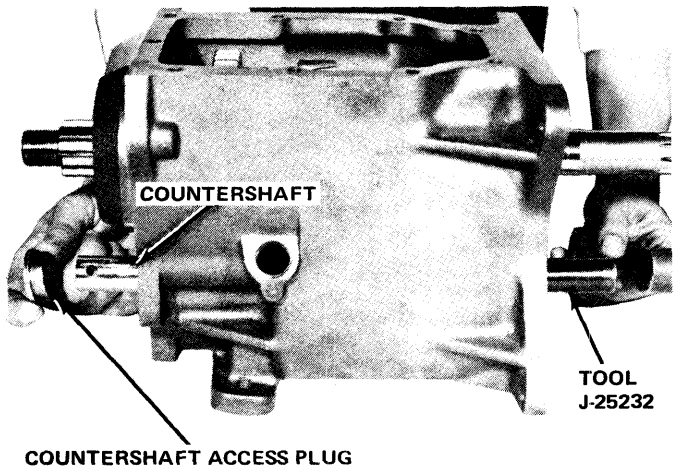

Fig. 6-5 Removing—Installing Countershaft

(11) Remove rear bearing and adapter assembly using brass drift and hammer (fig. 6-7).

(12) Remove main shaft assembly. Tilt spline end of main shaft downward and lift forward end of shaft upward and out of case.

(13) Remove countershaft gear and arbor tool as assembly. Remove countershaft gear thrust washers, countershaft roll pin, and any main shaft pilot roller bearings which may have fallen into case during clutch shaft removal.

(14) Remove reverse idle gear shaft. Insert brass drift through clutch shaft bore in front of case and tap shaft until end of shaft with roll pin clears counterbore in rear of case (fig. 6-8) and remove shaft.

(15) Remove reverse idler gear and thrust washers.

Main Shaft Gear Train—Disassembly

(1) Remove retaining snap ring from front of main

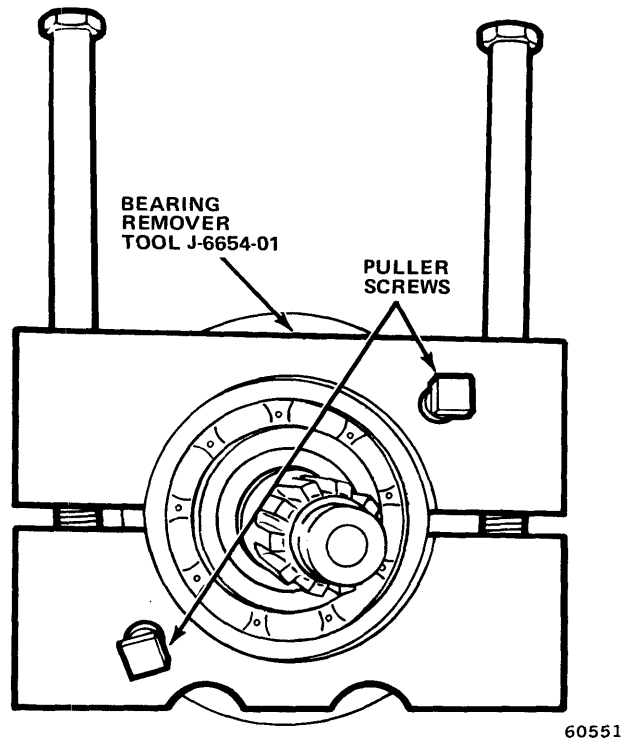

Fig. 6-6 Removing Clutch Shaft

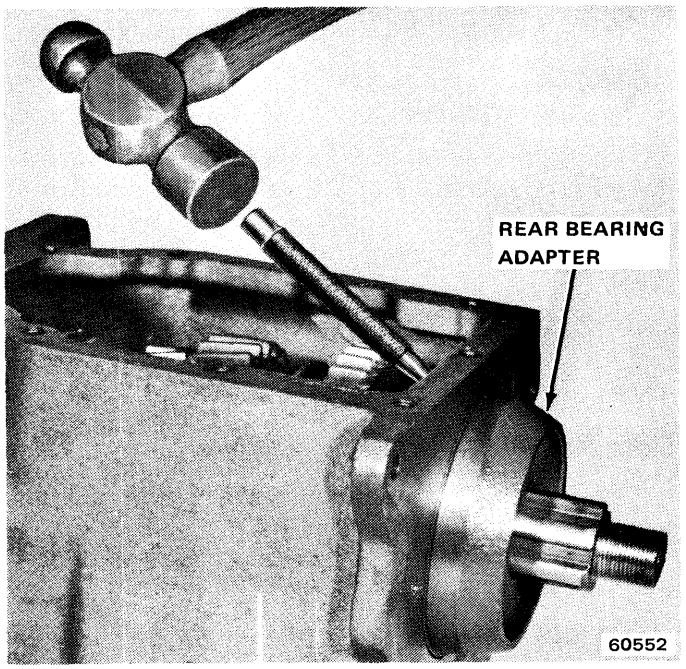

Fig. 6-7 Removing Rear Bearing and Adapter Assembly

shaft and remove second-third synchronizer assembly and second gear. Mark hub and sleeve for assembly reference.

NOTE: *Observe the position of the insert springs and inserts for assembly reference.*

(2) Remove insert springs from second-third synchronizer, remove three inserts, and separate sleeve

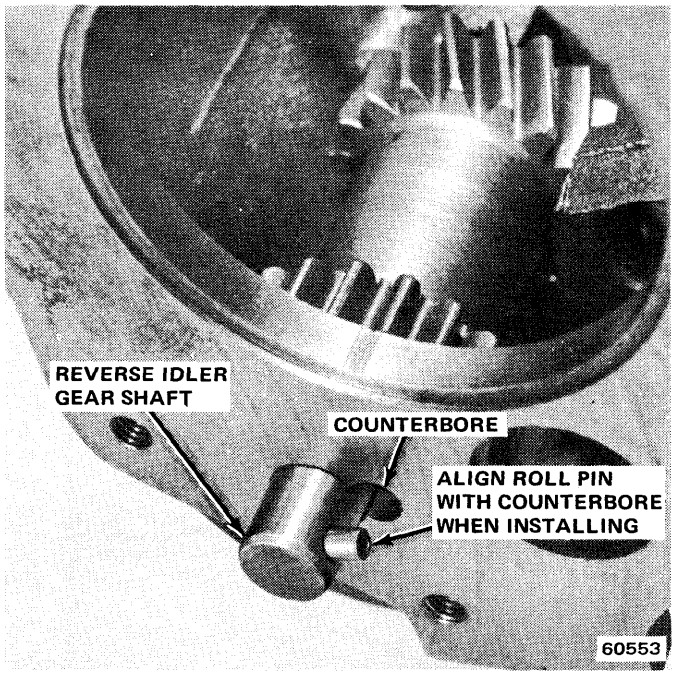

Fig. 6-8 Removing-Installing Reverse Idler Gear Shaft

from synchronizer hub (fig. 6-3).

(3) Remove snap ring and tabbed thrust washer from shaft and remove first gear and blocking ring.

(4) Remove first-reverse hub retaining snap ring.

NOTE: *Observe the position of the inserts and spring for assembly reference.*

(5) Remove sleeve and gear, insert spring, and three inserts from hub (fig. 6-3). Remove spacer from rear of main shaft.

(6) Remove hub from output shaft using an arbor press.

CAUTION: *Do not attempt to hammer the press-fit hub from the shaft. Hammer blows will damage the hub and shaft.*

Clutch Shaft—Disassembly

(1) Remove front bearing retaining snap ring and any remaining roller bearings.

(2) Press front bearing from shaft using arbor press and Tool J-6654-01.

CAUTION: *Do not attempt to drive the bearing from the shaft with a hammer. Hammer blows will damage the bearing and shaft.*

Rear Bearing and Adapter—Disassembly

(1) Clamp rear bearing adapter in vise. Do not overtighten.

(2) Remove seal from rear bearing adaptor.

(3) Using pointed-type tool, remove rear bearing retaining snap ring and remove bearing adapter from vise.

(4) Press rear bearing out of adapter using arbor press.

(5) Remove bearing adapter lockring.

CLEANING AND INSPECTION

Cleaning

Thoroughly wash all parts in solvent and dry with compressed air. Do not dry bearings with compressed air. Air dry the bearings or use a clean cloth only.

Clean the needle and clutch shaft roller bearing by wrapping the bearings in a clean cloth and submerging them in solvent. Or, place the bearings in a shallow parts cleaning tray and cover them with solvent. Allow the bearings to air dry on a clean cloth.

Inspection

Inspect the transmission components. Replace any components that exhibit the following:

Case

- Cracks in bores, sides, bosses, or at bolt holes.
- Stripped threads in bolt holes.
- Nicks, burrs, rough surfaces in shaft bores or on gasket surfaces.

Gear and Synchronizer Assemblies

- Broken, chipped, or worn gear teeth.
- Damaged splines on synchro hubs or sleeves.
- Broken or worn teeth or excessive wear of blocking rings.
- Bent or broken inserts.
- Damaged needle bearings or bearing bores in countershaft gear.
- Wear or galling of countershaft, clutch shaft, or idler gear shafts.
- Worn thrust washers.
- Nicked, broken, or worn main shaft or clutch shaft splines.
- Bent, distorted, weak snap rings.
- Worn bushings in reverse idler gear. Replace gear if bushings are worn.
- Rough, galled, or broken front or rear bearing.

ASSEMBLY

(1) Lubricate reverse idler gear shaft bore and bushings with transmission lubricant.

(2) Coat transmission case reverse idler gear thrust washer surfaces with petroleum jelly and install thrust washers in case.

NOTE: *Be sure to engage the locating tabs on the thrust washers in the locating slots in the case.*

(3) Install reverse idler gear. Align gear bore, thrust washers, case bores, and install reverse idler gear shaft from rear of case. Be sure to align and seat roll pin in shaft into counterbore in rear of case (fig. 6-8).

(4) Measure reverse idler gear end play by inserting feeler gauge between thrust washer and gear. End play should be 0.004 to 0.018 inch. If end play exceeds 0.018 inch, remove idler gear and replace thrust washers.

(5) Coat needle bearings and bearing bores in countershaft gear with petroleum jelly. Insert Arbor Tool J-25232 in bore of gear and install 25 needle bearings and one retainer in each end of gear (fig. 6-3).

(6) Coat countershaft gear thrust washer surfaces with petroleum jelly and position thrust washers in case.

NOTE: *Be sure to engage the locating tabs on the thrust washers in the locating slots in the case.*

(7) Insert countershaft into rear case bore just far enough to hold rear thrust washer in position. This will prevent thrust washer from being displaced when countershaft gear is installed.

(8) Install countershaft gear but do not install roll pin at this time. Align gear bore, thrust washers, bores in case, and install countershaft.

NOTE: *Do not remove Arbor Tool J-25232 completely.*

(9) Measure countershaft gear end play by inserting feeler gauge between washer and countershaft gear. End play should be 0.004 to 0.018 inch. If end play exceeds 0.018 inch, remove gear and replace thrust washers. After correct end play has been obtained, install arbor tool fully in countershaft gear. Allow gear to remain at bottom of case. Leave countershaft in rear case bore to hold rear thrust washer in place.

NOTE: *The countershaft gear must remain at the bottom of the case to provide sufficient clearance for installation of the main shaft and clutch shaft assemblies.*

(10) Coat all splines and machined surfaces on main shaft with transmission lubricant and start first-reverse synchronizer hub on output shaft splines by hand. End of hub with slots should face front of shaft. Use arbor press to complete hub installation on shaft and install retaining snap ring in most rearward groove (fig. 6-9).

CAUTION: *Do not attempt to drive the hub onto the shaft with a hammer. Hammer blows will damage the hub and splines.*

(11) Coat splines on first-reverse hub with transmission lubricant and install first-reverse sleeve and gear halfway onto hub. Gear end of sleeve must face rear of shaft. Align sleeve and hub using alignment marks made during disassembly.

(12) Install insert spring in first-reverse hub. Make sure spring is bottomed in hub and covers all three insert slots. Position three T-shaped inserts in hub with

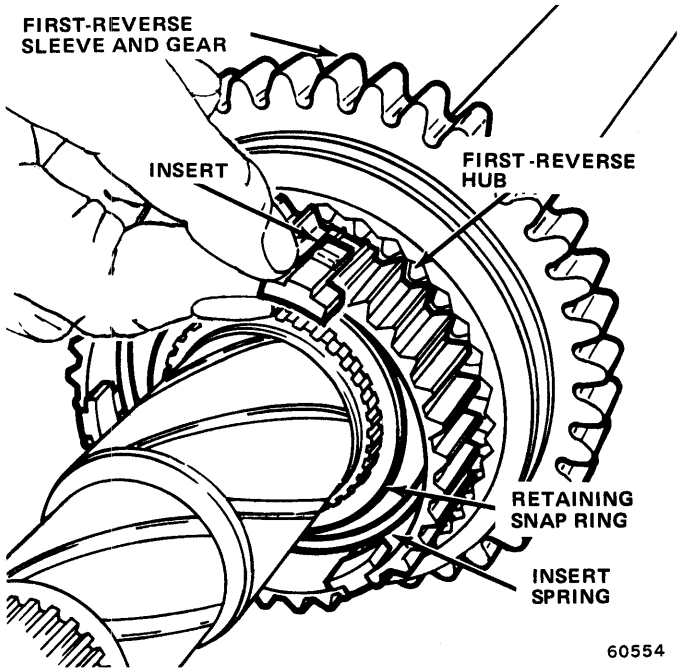

Fig. 6-9 Installing Inserts in First-Reverse Hub

small ends in hub slots and large ends inside hub (fig. 6-9). Push inserts fully into hub so they seat on insert spring, then slide first-reverse sleeve and gear over inserts until inserts engage in sleeve (fig. 6-10).

(13) Coat bore and blocking ring surface of first gear with transmission lubricant and place first gear blocking ring on tapered surface of gear.

(14) Install first gear on output shaft. Rotate gear until notches in blocking ring engage inserts in first-reverse hub, then install tabbed thrust washer (sharp

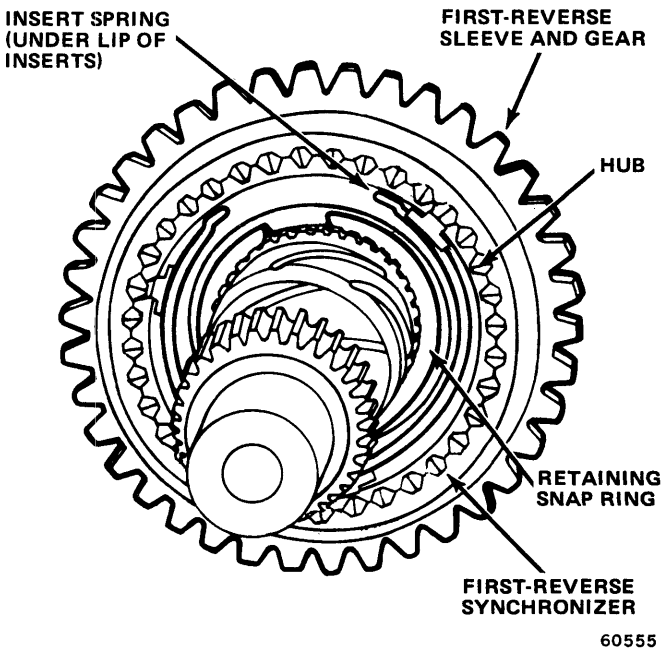

Fig. 6-10 Snap Ring and Insert Spring Position in First-Reverse Hub

edge facing out) and retaining snap ring on main shaft (fig. 6-11).

(15) Coat bore and blocking ring surface of second gear with transmission lubricant and place second gear blocking ring on tapered surface of gear.

(16) Install second gear on output shaft with tapered surface of gear facing front of main shaft (fig. 6-12).

(17) Install one insert spring into second-third hub. Be sure spring covers all three insert slots in hub. Align second-third sleeve to hub using marks made during disassembly, and start sleeve onto hub.

(18) Place three inserts into hub slots and on top of insert spring, then push sleeve fully onto hub to engage inserts in sleeve (fig. 6-13). Install remaining insert spring in exact same position as first spring. Ends of both springs must cover same slots in hub and not be staggered.

NOTE: *The inserts have a small lip on each end. When correctly installed, this lip will fit over the insert spring (fig. 6-13).*

(19) Install second-third synchronizer assembly on main shaft. Rotate second gear until notches in blocking ring engage inserts in second-third synchronizer assembly.

(20) Install retaining snap ring on main shaft and measure end play between snap ring and second-third synchronizer hub with feeler gauge (fig. 6-14). End play should be 0.004 to 0.014 inch. If end play exceeds 0.014 inch, replace thrust washer and all snap rings on output shaft assembly. Install spacer on rear of main shaft.

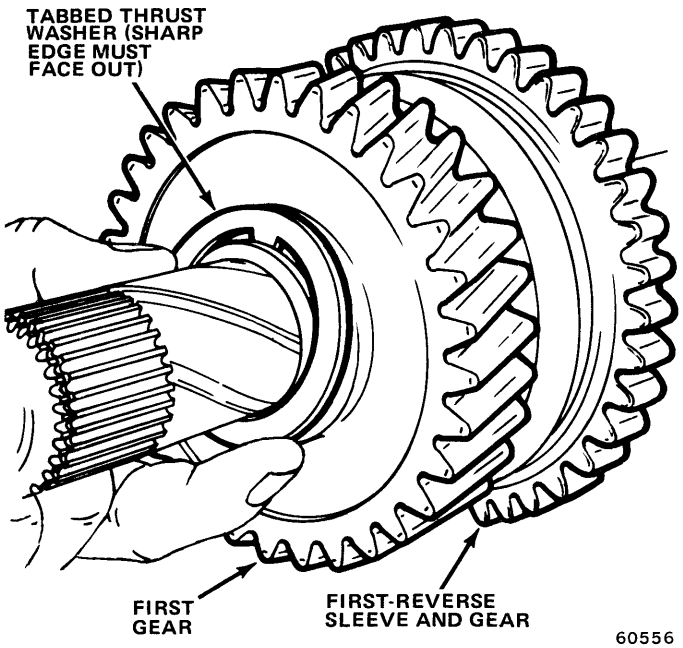

Fig. 6-11 Installing First Gear Thrust Washer on Main Shaft

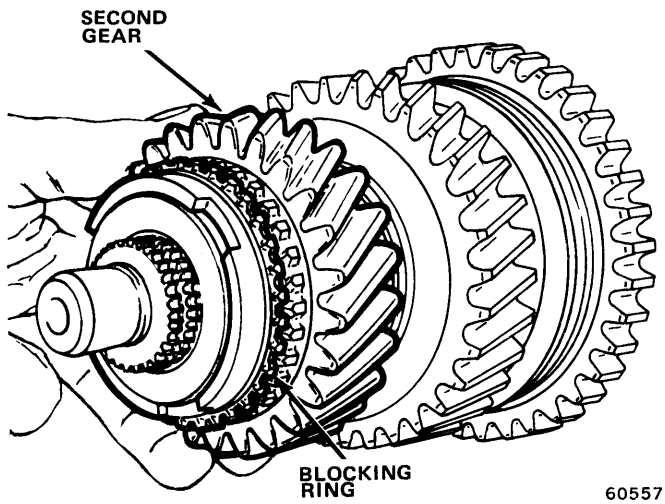

Fig. 6-12 Installing Second Gear on Main Shaft

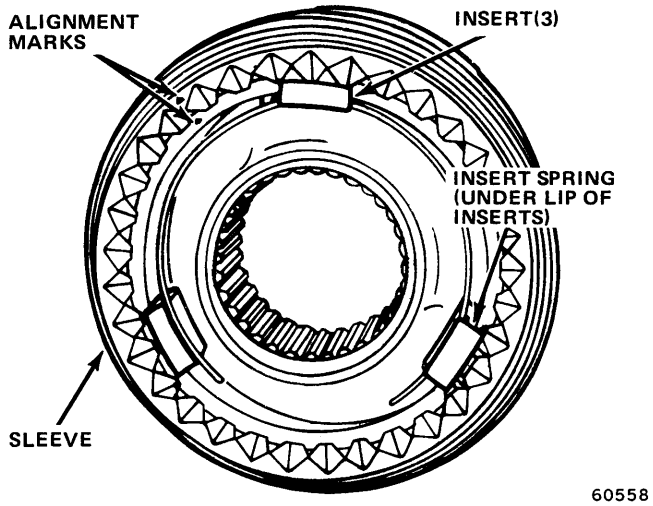

Fig. 6-13 Second-Third Synchronizer Assembly

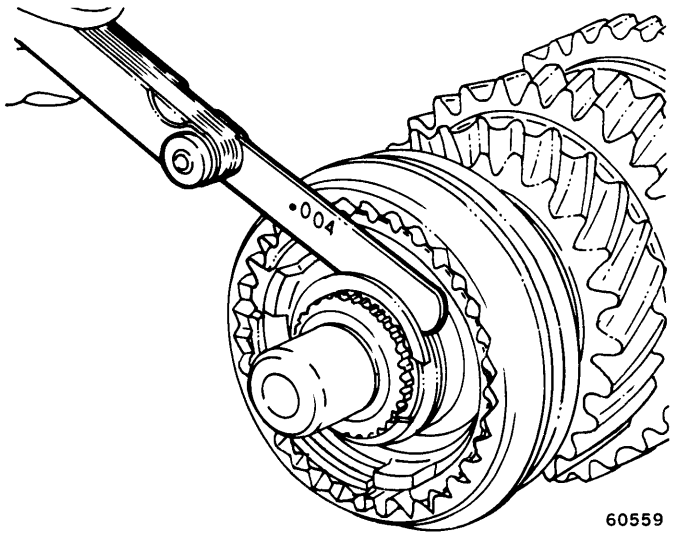

Fig. 6-14 Measuring Main Shaft End Play

(21) Install main shaft assembly in case. Be sure first-reverse sleeve and gear is in Neutral (centered) position on hub so gear end of sleeve will clear top of case when output shaft assembly is installed.

(22) Press rear bearing into rear bearing adapter using arbor press. Install rear bearing retaining ring and bearing adapter lockring.

(23) Support main shaft assembly and install rear bearing and adapter assembly in case. Use plastic hammer to seat adapter in case.

(24) Press front bearing onto clutch shaft. Install bearing retaining snap ring on clutch shaft and lockring in front bearing groove.

NOTE: *When correctly installed, the snap ring groove in the front bearing will be nearest to the front of the clutch shaft.*

(25) Coat bearing bore of clutch shaft with petroleum jelly and install 15 roller bearings in clutch shaft bore.

CAUTION: *Do not use chassis grease or a similar "heavy" type grease in the clutch shaft bore. Use petroleum jelly only. Heavy grease will plug the lubricant holes in the shaft and prevent proper lubrication of the roller bearings.*

(26) Coat blocking ring surface of clutch shaft with transmission lubricant and position blocking ring on shaft.

(27) Support main shaft assembly and insert clutch shaft through front bearing bore in case. Seat main shaft pilot in clutch shaft roller bearings and tap bearing into position in case using rawhide mallet.

(28) Apply thin film of sealer to front bearing cap gasket and position gasket on case. Be sure gasket notch is aligned with oil return hole in case.

(29) Remove front bearing cap oil seal using screwdriver and install replacement oil seal using Tool J-25233 (fig. 6-15).

(30) Install front bearing cap and tighten attaching bolts to 33 foot-pounds torque. Align cap and case alignment marks and be sure oil return slot in cap is aligned with oil return hole in case.

(31) Make wire loop about 18 to 20 inches long and pass wire under countershaft gear assembly. Wire loop will raise and support gear assembly when loop is pulled upward.

(32) Raise countershaft gear with wire loop (fig. 6-16), align bore in countershaft gear with front thrust washer and countershaft, and start countershaft into gear using plastic hammer (fig. 6-16).

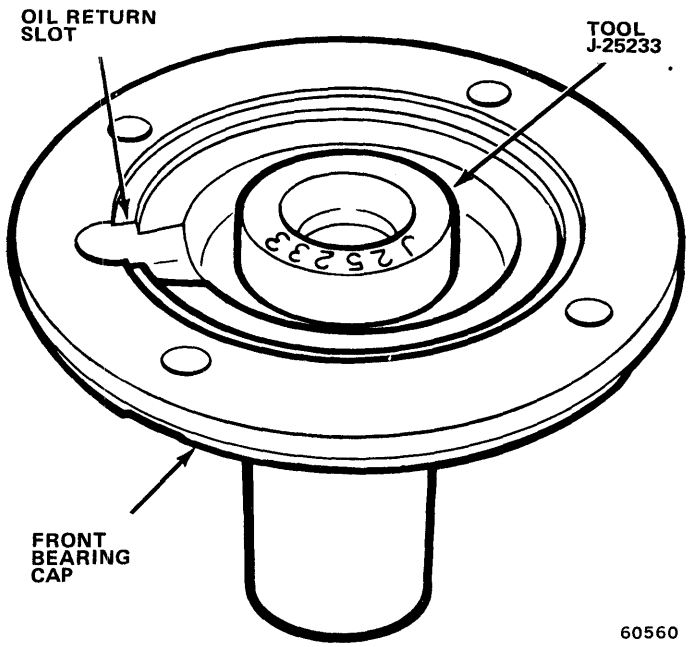

Fig. 6-15 Front Bearing Cap Oil Seal Installation

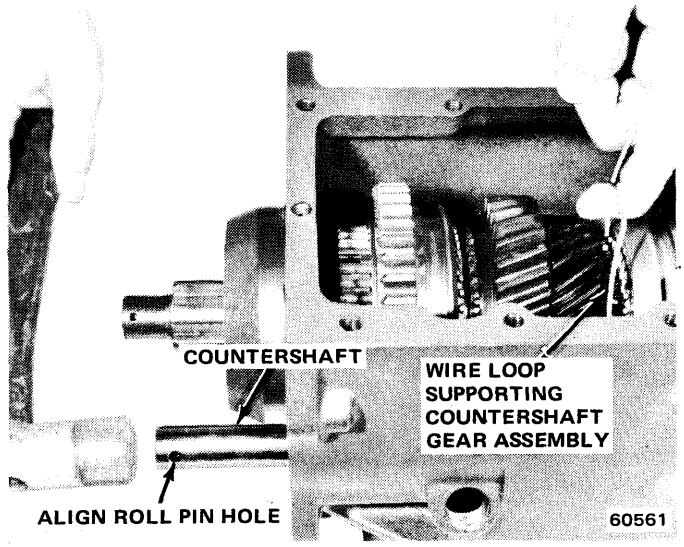

Fig. 6-16 Installing Countershaft

(33) Align roll pin hole in countershaft and roll pin holes in case (fig. 6-16) and complete installation of countershaft.

(34) Install countershaft access plug in rear of case and seat plug with plastic hammer.

(35) Install countershaft roll pin in case. Use magnet or needlenose pliers to insert and start pin in case. Use 1/2-inch diameter punch to seat pin and install fill plug.

(36) Shift synchronizer sleeves into all gear positions and check operation. If clutch shaft and main shaft appear to bind in Neutral position, check for blocking rings sticking on first or second speed gear tapers.

(37) Install mainshaft rear seal in rear bearing adapter using Tool J-26852.

(38) Shift both synchronizers into gear to prevent gears from turning.

(39) Install transfer case drive gear and gear retaining nut on mainshaft. Tighten nut to 150 foot-pounds torque.

(40) Shift synchronizers to neutral position.

(41) Attach transmission to transfer case. Tighten attaching bolts to 30 foot-pounds torque.

SHIFT CONTROL HOUSING

Disassembly

(1) Remove backup lamp switch and TCS switch if equipped.

(2) Unthread shift control housing cap and remove cap, gasket, spring retainer, and shift lever spring as an assembly (fig. 6-17).

(3) Invert housing and mount in vise. Clamp housing at shift lever tower. Do not overtighten.

(4) Move second-third shift rail to rear of housing, rotate shift fork toward first-reverse rail until roll pin is accessible. Drive roll pin out of fork and rail with pin punch and remove shift fork and roll pin.

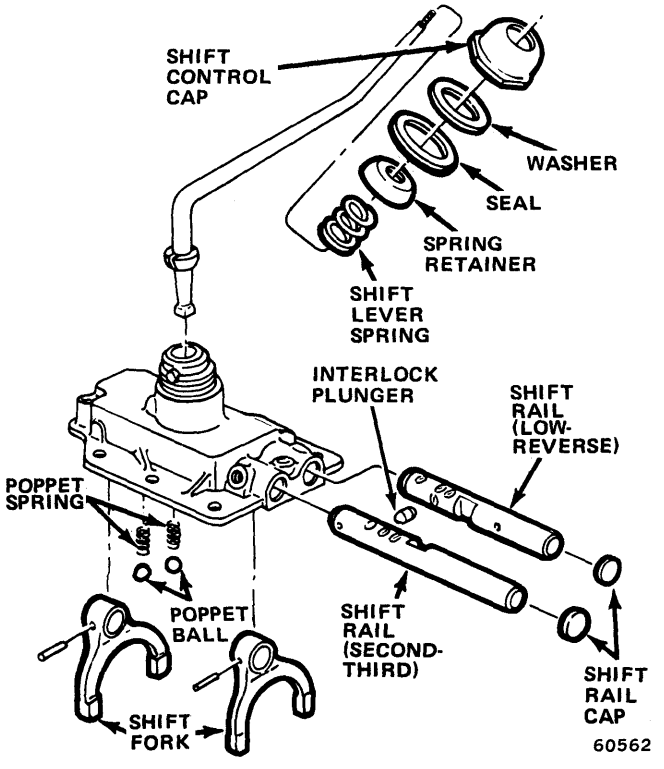

Fig. 6-17 Shift Control Housing—CJ Models

NOTE: *The roll pin hole in the shift fork is offset. Mark position of the shift fork for assembly reference.*

(5) Remove second-third shift rail using brass drift or hammer. Catch shift rail plug as rail drives it out of housing. Do not lose poppet ball during removal of shift rail. Cover shift and poppet ball holes in housing with cloth or tape before removing shift rail. Mark location of shift rail for assembly reference.

(6) Rotate first-reverse shift fork away from notch in housing until roll pin is accessible. Drive roll pin out of fork and rail using pin punch, and remove shift fork and roll pin.

NOTE: *Roll pin hole shift fork is offset. Mark position of shift fork for assembly reference.*

(7) Remove first-reverse shift rail using brass drift or hammer. Catch shift rail plug as rail drives it out of housing. Do not lose poppet ball during removal of shift rail. Cover shift tower and poppet ball holes in housing with cloth or tape before removing shift rail. Mark location of shift rail for assembly reference.

(8) Remove poppet balls, springs, and interlock plunger from housing.

Assembly

(1) Install poppet springs and detent plug in housing.

(2) Insert first-reverse shift rail into housing, and install shift fork on shift rail.

(3) Install poppet ball on top of spring in first-reverse shift rail bore.

(4) Using punch or wooden dowel, push poppet ball and spring downward into housing bore and install first-reverse shift rail.

(5) Align roll pin holes in first-reverse shift rail and shift fork and install roll pin. Move shift rail to Neutral (center) detent.

(6) Insert second-third shift rail into housing and install poppet ball on top of spring in second-third shift rail bore.

(7) Using punch or wooden dowel, push poppet ball and spring downward into housing bore and install second-third shift rail.

(8) Align roll pin holes in second-third shift rail and shift fork and install roll pin. Move shift rail to Neutral (center) detent.

(9) Install shift rail plugs in housing, and remove shift control housing from vise.

(10) Install shift lever, shift lever spring, spring retainer, gasket and shift control housing cap as assembly. Tighten cap securely.

(11) Install backup lamp switch and TCS switch if equipped.

MODEL T-15A 3-SPEED TRANSMISSION

DISASSEMBLY

(1) Remove bolts attaching transfer case to transmission.

(2) Separate transfer case and transmission.

(3) Remove nut and flat washer attaching transfer case drive gear to main shaft (fig. 6-18). Move second-third sleeve forward and first-reverse sleeve rearward before removing nut.

(4) Remove drive gear, adapter, and spacer.

(5) Punch alignment marks on front bearing cap and transmission case for assembly reference.

(6) Remove front bearing cap and gasket.

(7) Remove front and rear bearing retaining snap rings.

(8) Remove front and rear bearings using Puller Set J-25152 (fig. 6-19 and 6-20).

(9) Remove clutch shaft from case.

(10) Shift transmission into second gear and remove main shaft and gear assembly.

(11) Remove reverse idler and countershaft lock plate. Tap lightly on shafts to ease removal.

(12) Remove countershaft from rear of case using Arbor Tool J-25199 (fig. 6-21).

(13) Remove countershaft gear assembly, arbor tool, and thrust washer.

(14) Remove arbor tool, spacer washers, bearing rollers and center spacer from countershaft gear.

(15) Remove reverse idler gear shaft using Tool J-25203 (fig. 6-22).

(16) Remove reverse idler gear, thrust washers, and roller bearings as assembly.

Main Shaft Gear Train—Disassembly

(1) Remove second-third synchronizer retaining snap ring and remove synchronizer assembly (fig. 6-23).

(2) Remove second gear and blocking ring.

(3) Remove reverse gear.

(4) Remove first gear clutch hub retaining snap ring and remove first gear synchronizer assembly (fig. 6-24).

(5) Remove first gear and blocking ring.

(6) Remove synchronizer springs from second-third synchronizer assembly (fig. 6-25). Mark synchronizer sleeve and hub for assembly reference and remove sleeve and shifting plates from hub.

(7) Remove synchronizer spring from first gear synchronizer assembly (fig. 6-26). Mark synchronizer sleeve and hub for assembly reference and remove sleeve and shifting plates from hub.

NOTE: *The first gear synchronizer assembly uses only one synchronizer spring (fig. 6-26).*

CLEANING AND INSPECTION

Cleaning

Thoroughly wash all parts in solvent and dry with compressed air. Do not dry bearings with compressed air. Air dry the bearings or use a clean cloth only.

Clean needle and clutch shaft roller bearings by wrapping the bearings in a clean cloth and submerging them in solvent. Or, place the bearings in a shallow parts cleaning tray and cover them with solvent. Allow the bearings to air dry on a clean cloth.

Inspection

Inspect transmission components. Replace any components that exhibit the following:

Case

- Cracks in bores, sides, bosses, or at bolt holes.
- Stripped threads in bolt holes.
- Nicks, burrs, rough surfaces in shaft bores or on gasket surfaces.

Gear and Synchronizer Assemblies

- Broken, chipped, or worn gear teeth.
- Damaged splines on synchro hubs or sleeves.
- Broken or worn teeth or excessive wear of blocking rings.
- Bent or broken inserts.
- Weak insert springs.
- Damaged needle bearings or bearing bores in countershaft gear.
- Wear or galling of countershaft, clutch shaft, or idler gear shafts.
- Worn thrust washers.
- Nicked, broken, or worn main shaft or clutch shaft splines.

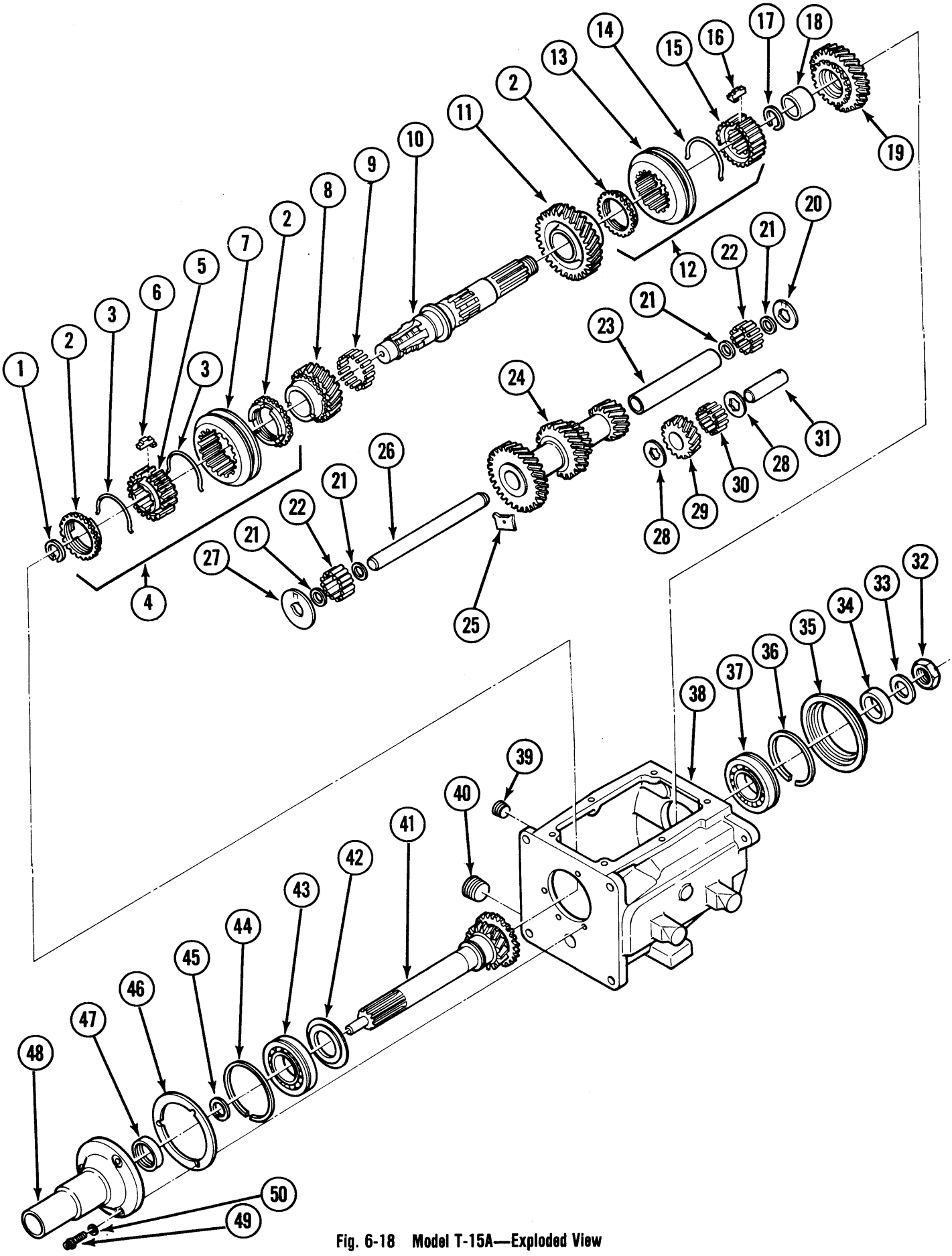

Fig. 6-18 Model T-15A—Exploded View

1. SECOND-THIRD SYNCHRONIZER SNAP RING
2. BLOCKING RINGS (3)
3. SYNCHRONIZER SPRINGS (2)
4. SECOND-THIRD SYNCHRONIZER ASSEMBLY
5. SECOND-THIRD CLUTCH HUB
6. SECOND-THIRD SHIFTING PLATE (3)
7. SECOND-THIRD CLUTCH SLEEVE
8. SECOND GEAR
9. MAINSHAFT PILOT BEARING ROLLERS (21)
10. MAINSHAFT
11. FIRST GEAR
12. FIRST GEAR SYNCHRONIZER ASSEMBLY
13. FIRST-REVERSE CLUTCH SLEEVE
14. SYNCHRONIZER SPRING (1)
15. FIRST GEAR CLUTCH HUB
16. FIRST GEAR SHIFTING PLATE (3)
17. FIRST GEAR SNAP RING
18. REVERSE GEAR BUSHING (INCLUDED WITH REVERSE GEAR)
19. REVERSE GEAR
20. COUNTERSHAFT GEAR THRUST WASHER (REAR)
21. COUNTERSHAFT GEAR BEARING WASHER (4)
22. COUNTERSHAFT GEAR BEARING ROLLERS (44)
23. COUNTERSHAFT GEAR BEARING SPACER
24. COUNTERSHAFT GEAR
25. COUNTERSHAFT-REVERSE IDLER SHAFT LOCKPLATE
26. COUNTERSHAFT
27. COUNTERSHAFT GEAR THRUST WASHER (FRONT)
28. REVERSE IDLER GEAR THRUST WASHER (2)
29. REVERSE IDLER GEAR
30. REVERSE IDLER GEAR BEARING ROLLERS
31. REVERSE IDLER GEAR SHAFT
32. MAINSHAFT LOCKNUT
33. MAINSHAFT WASHER
34. MAINSHAFT BEARING SPACER
35. REAR BEARING ADAPTER
36. REAR BEARING LOCK RING
37. REAR BEARING
38. TRANSMISSION CASE
39. FILL PLUG
40. DRAIN PLUG
41. CLUTCH SHAFT
42. FRONT BEARING RETAINER
43. FRONT BEARING
44. FRONT BEARING LOCK RING
45. FRONT BEARING SNAP RING
46. FRONT BEARING CAP GASKET
47. FRONT BEARING CAP OIL SEAL
48. FRONT BEARING CAP
49. FRONT BEARING CAP BOLT
50. LOCKWASHER

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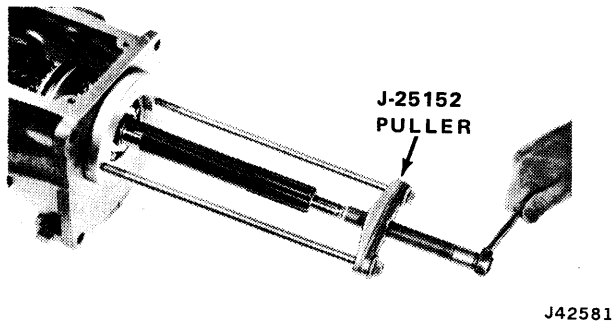

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Fig. 6-19 Front Bearing Removal

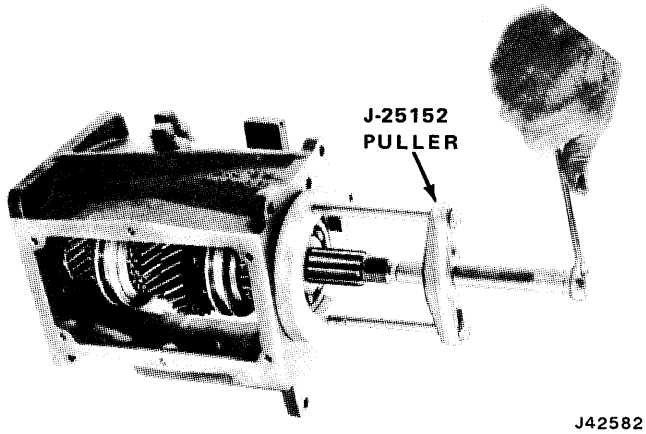

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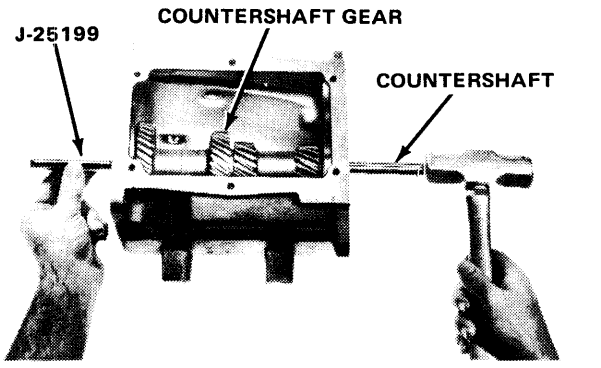
Fig. 6-20 Rear Bearing Removal



J42585

Fig. 6-21 Countershaft Removal-Installation

- Bent, distorted, weak snap rings.
- Worn bushings in reverse idler gear.
- Rough, galled, or broken front or rear bearing.

NOTE: *If any transmission gear requires replacement, also replace the gear with which it meshes. In addition, if either synchronizer assembly must be replaced the shift fork that operates that synchronizer must have the identifying letter A stamped on it. The letter appears just under the shaft hole on the side opposite the pin. If the letter A is not on the existing fork, it must be replaced.*

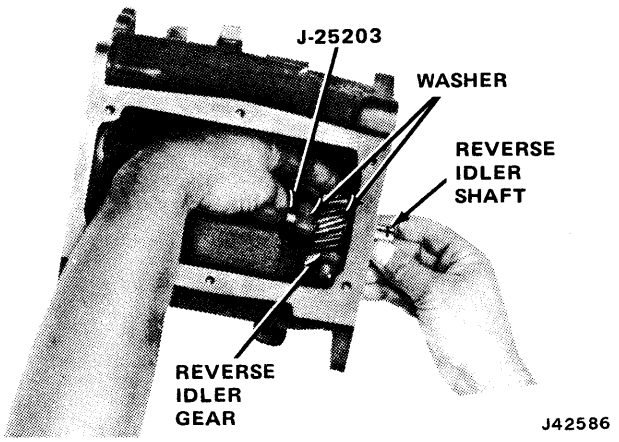


Fig. 6-22 Reverse Idler Gear Removal—Installation

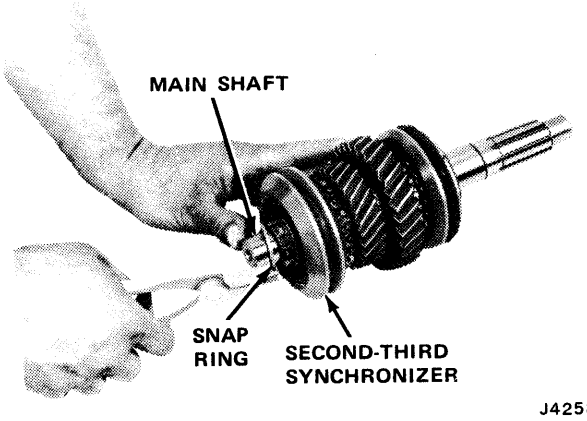


Fig. 6-23 Second-Third Clutch Hub Snap Ring Removal—Installation

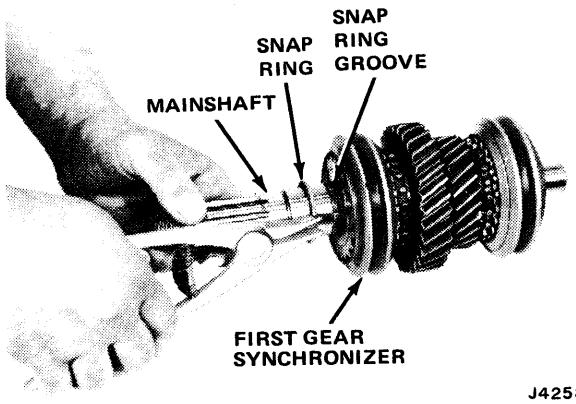


Fig. 6-24 First Gear Synchronizer Hub Snap Ring Removal—Installation

ASSEMBLY

(1) Lubricate all parts with transmission lubricant unless noted otherwise.

(2) Install reverse idler gear, roller bearings, and thrust washer using Tool J-25203.

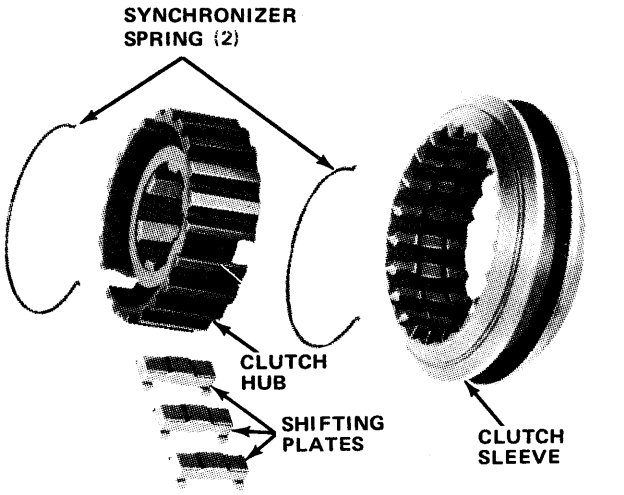


Fig. 6-25 Second-Third Synchronizer Assembly

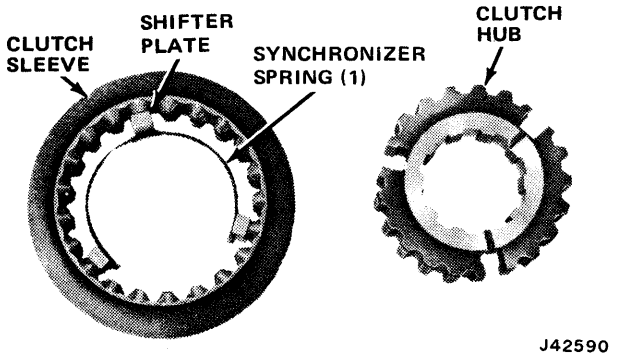


Fig. 6-26 First Gear Synchronizer Assembly

(3) Install reverse idler gear shaft (forcing out Tool J-25203). Be sure slotted end of shaft is correctly aligned with lock plate.

(4) Install center spacer and Arbor Tool J-25199 in countershaft gear bore.

(5) Install bearing washer at each end of center spacer. Slide washers over arbor tool until seated against spacer.

(6) Install 22 roller bearings at each end of countershaft gear and install bearing washer over roller bearings at each end of gear (fig. 6-27 and 6-28).

(7) Coat large countershaft gear thrust washer with petroleum jelly and install at front of case.

(8) Coat small countershaft gear thrust washer with petroleum jelly and install on countershaft gear hub with lip facing groove in case.

(9) Position countershaft gear assembly in case. Align gear bores with case bores and install countershaft from rear of case. Be sure lock plate slot in shaft is correctly aligned with slot in reverse idler gear shaft. Arbor tool will be forced out as countershaft is installed.

(10) Install lock plate in slots of reverse idler shaft and countershaft. Tap end of shafts until lock plate is seated against case.

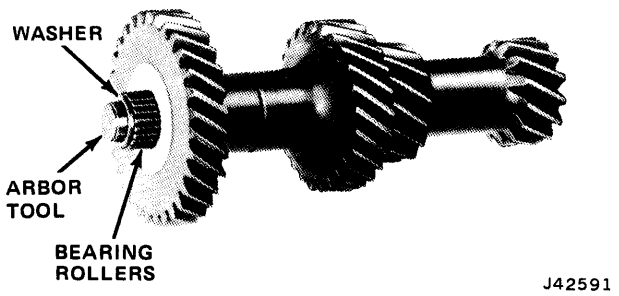


Fig. 6-27 Countershaft Gear Arbor Tool Installed

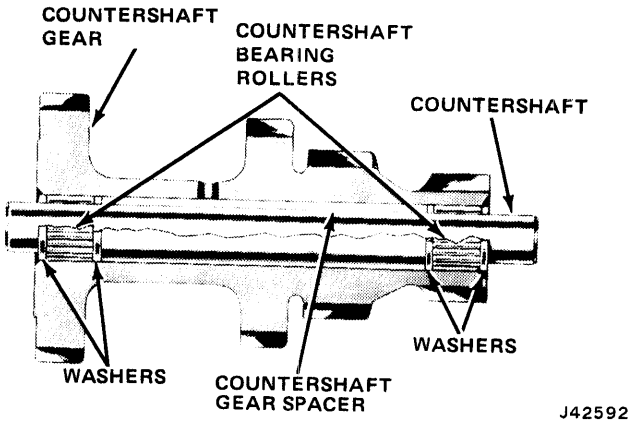


Fig. 6-28 Bearing—Spacer—Washer Location

(11) Install first gear and blocking ring on main shaft.

(12) Assemble first gear synchronizer assembly (fig. 6-26). Align sleeve and hub using alignment marks made at disassembly. Install sleeve shifting plates and insert spring and install assembly on main shaft.

(13) Install first gear clutch hub snap ring (fig. 6-24).

NOTE: *The main shaft snap rings are select-fit to eliminate clutch hub and main shaft bearing end play. Be sure the correct snap ring is installed.*

(14) Install second gear and blocking ring on main shaft.

(15) Assemble second-third synchronizer assembly (fig. 6-25). Align sleeve and hub using alignment marks made at disassembly. Install shifting plates and insert springs. Be sure insert springs are installed with open ends opposite one another or approximately 120° apart.

(16) Install second-third synchronizer assembly on main shaft and install synchronizer snap ring and blocking ring.

NOTE: *The main shaft snap rings are select-fit to eliminate clutch hub and main shaft bearing end play. Be sure the correct snap ring is installed.*

(17) Install reverse gear on main shaft.

(18) Install main shaft and gear assembly in case.

(19) Install main shaft pilot bearing rollers in clutch shaft bore. Use petroleum jelly to hold rollers in place.

CAUTION: *Do not use chassis grease or similar heavy grease in the clutch shaft bore. Use petroleum jelly only. This type of grease may plug the clutch shaft lubricant holes preventing proper lubrication of the roller bearings.*

(20) Install clutch shaft in case with cutaway portion of shaft facing downward (fig. 6-30). Guide clutch shaft onto main shaft. Do not displace pilot bearing rollers during installation.

(21) Install front bearing retainer on clutch shaft.

(22) Install lockrings on front and rear bearings and install bearings using Installer Set J-25153. Use Thrust Yoke Tool J-25200 to prevent damaging synchronizer parts during bearing installation.

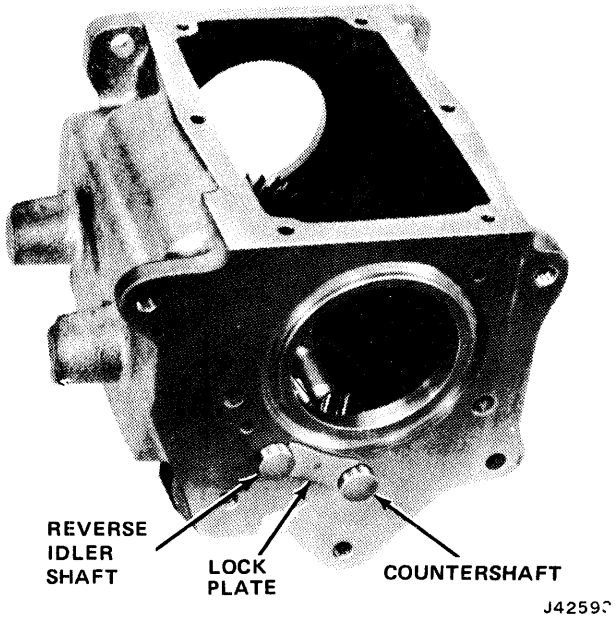


Fig. 6-29 Lock Plate Installation

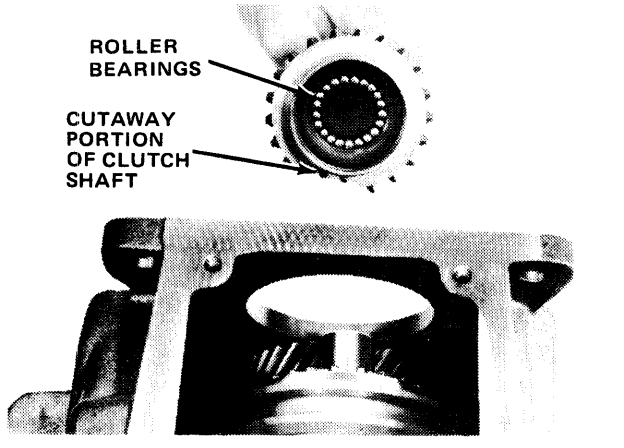


Fig. 6-30 Clutch Shaft Installation

(23) Install thrust yoke tool in second gear groove and between clutch shaft teeth and blocking ring. Use both bearing driver tools from set J-25153 and wooden backup block when installing bearings (fig. 6-31 and 6-32).

(24) Install front and rear bearing retaining snap rings.

NOTE: *The rear bearing snap ring is 0.010-inch thicker than front bearing snap ring. Be sure correct snap ring is installed.*

(25) Inspect front bearing cap oil seal. Replace seal if cut, worn, loose, or distorted (fig. 6-33).

(26) Install front bearing cap and gasket. Be sure oil drain slot in cap and gasket are aligned with hole in case. Tighten bearing cap bolts to 15 foot-pounds torque.

(27) Shift both synchronizers into gear to prevent main shaft from turning.

(28) Install rear bearing adaptor, spacer, transfer case drive gear, flat washer, and drive gear retaining nut. tighten drive gear nut to 150 foot-pounds torque.

(29) Shift synchronizers into Neutral.

(30) Check operation of gears in all positions. Be sure gears are in Neutral position before installing case cover and gasket.

(31) Install transmission on transfer case. Tighten attaching bolts to 30 foot-pounds torque. Install replacement transfer case-to-transmission gasket.

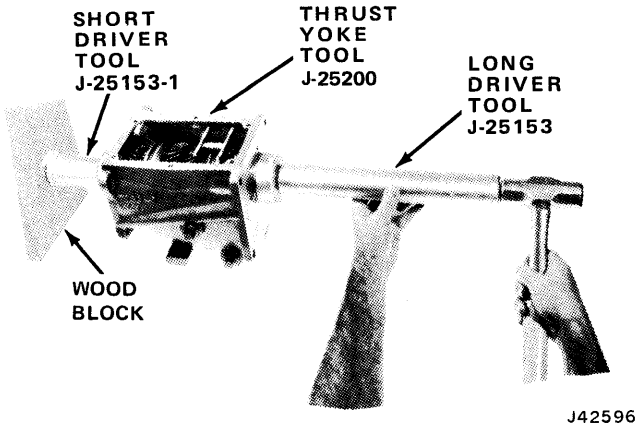


Fig. 6-31 Front Bearing Installation

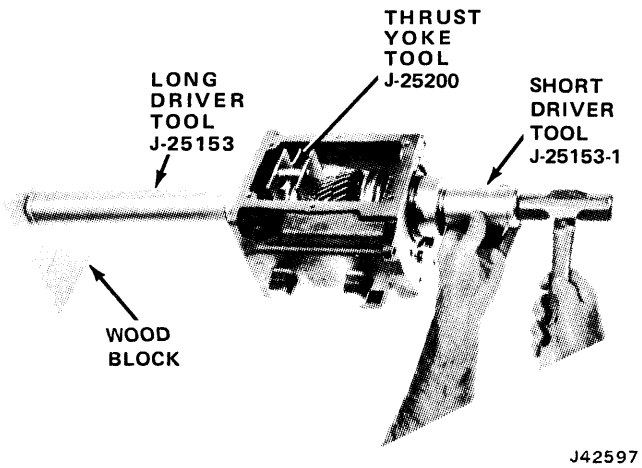


Fig. 6-32 Rear Bearing Installation

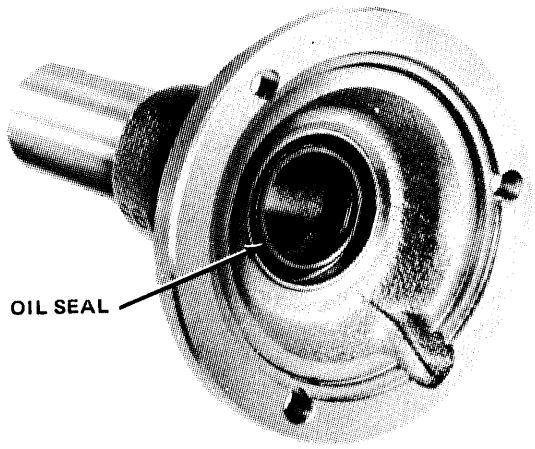


Fig. 6-33 Front Bearing Cap Oil Seal

SHIFT CONTROL HOUSING

Disassembly

(1) Remove TCS switch and backup lamp switch.

(2) Remove shift rail sealing plugs from rear of control housing (fig. 6-34). Remove plugs by driving them sideways in bore then prying them out.

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

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

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

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

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

(8) Remove interlock plunger.

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

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

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

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

(11) Remove second-third shift rail.

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

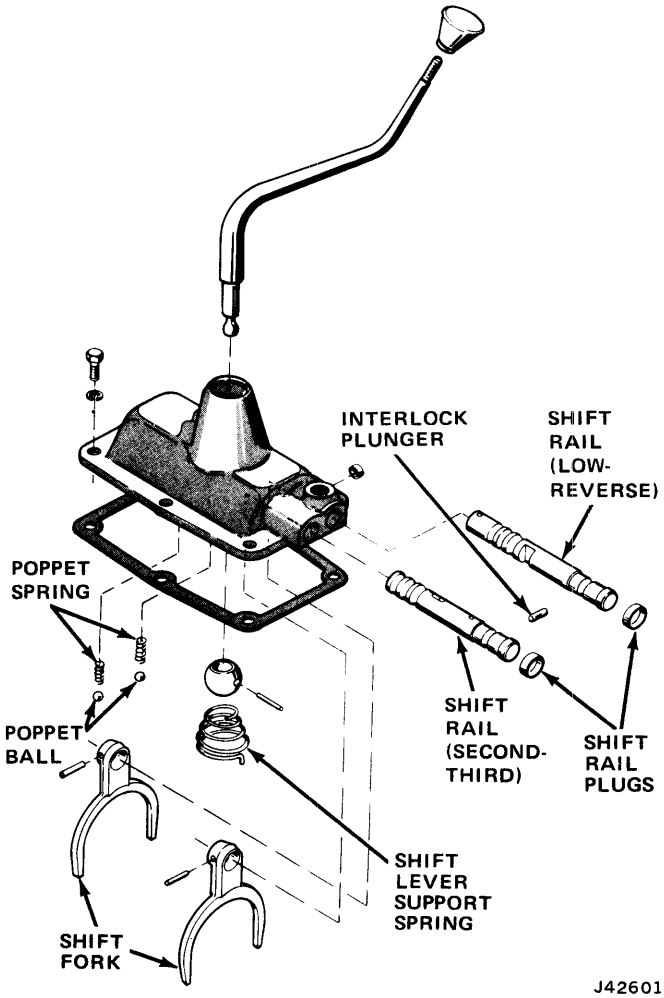


Fig. 6-34 Shift Control Housing—3-Speed Transmission

Assembly

(1) Install shift lever and retainer spring.

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

(2) Slide second-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-third fork with flanged side of fork toward front of housing.

(7) Install roll pin.

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

(9) Slide first-reverse 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-third shift rail is in Neutral position and that interlock end of rod faces away from housing.

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

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

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

(16) Install roll pin.

(17) Install shift rail sealing plugs, backup lamp switch, and TCS switch.

MODEL T-18 4-SPEED TRANSMISSION

DISASSEMBLY

(1) Separate transmission and transfer case.

(2) Remove shift control housing.

(3) Move third-fourth gear hub forward and first-second gear hub rearward and remove locknut, flat washer, transfer case drive gear and spacer.

(4) Move third-fourth gear hub to Neutral position.

(5) Remove transmission-to-transfer case adapter (if equipped). Remove oil seal from adapter. Replace seal if damaged.

CAUTION: *The pin is tapered and must be driven out toward the rear of the case only.*

(6) Remove reverse shifting arm, shifting arm shoe, and pivot. Remove O-ring from pivot and discard O-ring.

(7) Move first-second gear hub to Neutral position.

(8) Punch alignment marks in front bearing cap and case for assembly reference and remove cap and gasket.

(9) Remove lockring from clutch shaft and snap ring from front bearing (fig. 6-35).

(10) Remove front bearing from clutch shaft using Puller Set J-25152 (fig. 6-36).

(11) Remove front bearing retaining washer from clutch shaft.

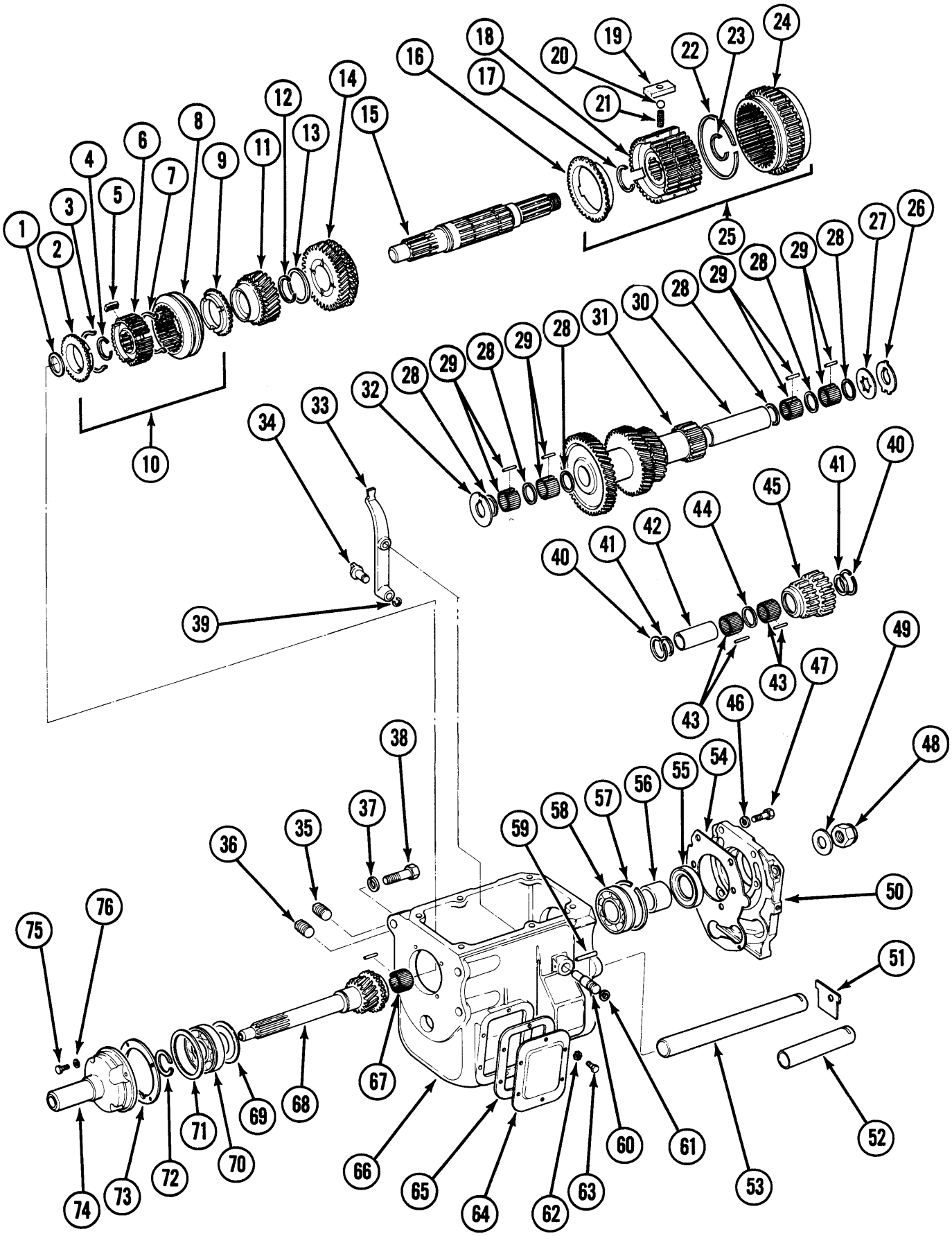


Fig. 6-35 Model T-18A Transmission

Legend

1. MAINSHAFT PILOT BEARING SPACER
2. THIRD-FOURTH BLOCKING RING
3. THIRD-FOURTH RETAINING RING
4. THIRD-FOURTH SYNCHRONIZER SNAP RING
5. THIRD-FOURTH SHIFTING PLATE (3)
6. THIRD-FOURTH CLUTCH HUB
7. THIRD-FOURTH RETAINING RING
8. THIRD-FOURTH CLUTCH SLEEVE
9. THIRD-FOURTH BLOCKING RING
10. THIRD-FOURTH GEAR SYNCHRONIZER ASSEMBLY
11. THIRD GEAR
12. MAINSHAFT SNAP RING
13. SECOND GEAR THRUST WASHER
14. SECOND GEAR
15. MAINSHAFT
16. SECOND GEAR BLOCKING RING
17. MAINSHAFT SNAP RING
18. FIRST-SECOND CLUTCH HUB
19. FIRST-SECOND SHIFTING PLATE (3)
20. POPPET BALL (3)
21. POPPET SPRING (3)
22. FIRST-SECOND RETAINING RING
23. MAINSHAFT SNAP RING
24. FIRST-SECOND CLUTCH SLEEVE
25. SECOND GEAR SYNCHRONIZER ASSEMBLY
26. COUNTERSHAFT GEAR THRUST WASHER (STEEL) (REAR)
27. COUNTERSHAFT GEAR THRUST WASHER (STEEL BACKED BRONZE) (REAR)
28. COUNTERSHAFT GEAR BEARING WASHER
29. COUNTERSHAFT GEAR BEARING ROLLERS (88)
30. COUNTERSHAFT GEAR BEARING SPACER
31. COUNTERSHAFT GEAR
32. COUNTERSHAFT GEAR THRUST WASHER (FRONT)
33. REVERSE SHIFTING ARM
34. REVERSE SHIFTING ARM SHOE
35. FILLER PLUG
36. DRAIN PLUG
37. LOCKWASHER
38. BOLT (TRANSMISSION-TO-CLUTCH HOUSING)
39. C-WASHER
40. REVERSE IDLER GEAR SNAP RING
41. REVERSE IDLER GEAR THRUST WASHER
42. REVERSE IDLER SHAFT SLEEVE
43. REVERSE IDLER GEAR BEARING ROLLERS (74)
44. REVERSE IDLER GEAR BEARING WASHER
45. REVERSE IDLER GEAR
46. LOCKWASHER (6)
47. ADAPTER PLATE BOLTS (6)
48. MAINSHAFT NUT
49. WASHER
50. ADAPTER PLATE
51. COUNTERSHAFT-REVERSE IDLER SHAFT LOCKPLATE
52. REVERSE IDLER GEAR SHAFT
53. COUNTERSHAFT
54. ADAPTER PLATE GASKET
55. ADAPTER PLATE SEAL
56. SPEEDOMETER GEAR SPACER
57. REAR BEARING RETAINER
58. REAR BEARING
59. REVERSE SHIFTING ARM PIVOT PIN
60. REVERSE SHIFTING ARM PIVOT
61. REVERSE SHIFTING ARM PIVOT O-RING
62. WASHER (6)
63. SIDE COVER BOLT (6)
64. SIDE COVER
65. SIDE COVER GASKET
66. TRANSMISSION CASE
67. MAINSHAFT PILOT BEARING ROLLERS (22)
68. CLUTCH SHAFT
69. FRONT BEARING RETAINER WASHER
70. FRONT BEARING
71. FRONT BEARING SNAP RING
72. FRONT BEARING LOCK RING
73. FRONT BEARING CAP GASKET
74. FRONT BEARING CAP
75. FRONT BEARING CAP BOLTS (4)
76. LOCKWASHER (4)

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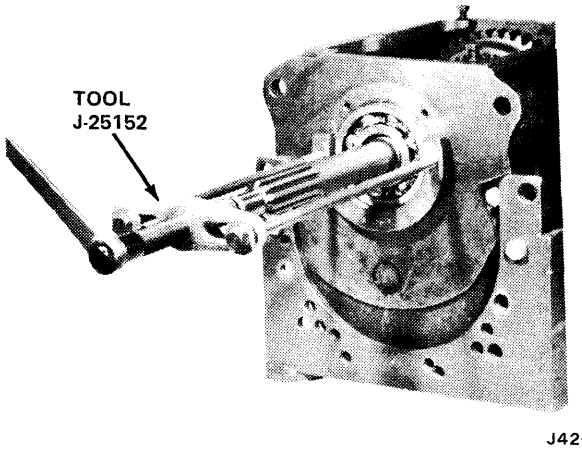

Fig. 6-36 Front Bearing Removal

(12) Remove speedometer drive gear spacer.

(13) Remove snap ring from rear bearing and remove rear bearing using Puller Set J-25152.

NOTE: *If the bearing puller plates will not seat in the groove of the rear bearing, strike the end of the clutch shaft with a lead hammer to drive the main shaft rearward and expose the bearing groove.*

(14) Move third-fourth clutch sleeve rearward and disengage main shaft from clutch shaft.

(15) Remove main shaft and gear assembly.

(16) Remove clutch shaft.

(17) Remove main shaft pilot bearing rollers from clutch shaft.

(18) Remove lock plate from countershaft and reverse idler gear shaft.

(19) Remove reverse idler gear shaft. Use pry bar installed in lock plate slot of shaft to pry shaft out of gear and case.

(20) Remove reverse idler gear assembly.

(21) Drive countershaft toward rear of case using brass drift and hammer. Stop when shaft is approximately even with front inside edge of case bore.

(22) To complete removal of countershaft, make arbor tool from steel rod 1.115-inches in diameter by 9.85-inches long. Use file to break all sharp edges on tool. When removing countershaft, keep tool in constant contact with countershaft to avoid displacing roller bearings or washers.

(23) Remove countershaft gear and thrust washers. Tip case on side and remove gear. Remove any main shaft pilot bearing rollers that may have fallen into case during main shaft removal.

(24) Remove arbor tool from countershaft gear and remove bearing rollers, washers, and spacer.

(25) Remove snap rings, bearing rollers, washers, and sleeve from reverse idler gear.

(26) Remove power takeoff cover and remove fill and drain plugs from case.

Main Shaft Gear Train—Disassembly

(1) Scribe alignment marks on main shaft splines and clutch hubs for assembly reference.

(2) Remove pilot bearing spacer from front of main shaft (fig. 6-35).

(3) Remove third-fourth synchronizer snap ring and remove third-fourth synchronizer assembly and Third gear (fig. 6-35).

(4) Remove first-second synchronizer snap ring and remove first-second synchronizer assembly (fig. 6-35).

(5) Move second gear rearward. Remove second gear snap ring and remove second gear.

(6) Punch alignment marks on clutch hubs and sleeves for assembly reference.

(7) Remove insert springs and shifting plates from third-fourth synchronizer assembly and separate sleeve and hub.

NOTE: *Observe the position of the insert springs and shift plates for assembly reference.*

(8) Position first-second synchronizer assembly on bench with shift fork groove facing upward. Wrap cloth around sleeve (to avoid losing shift plate lock balls) and separate sleeve and hub.

(9) Remove cloth from first-second synchronizer assembly and remove lock balls, springs, and shift plates.

Cleaning and Inspection

Clean and inspect the transmission case and all components thoroughly. If any transmission gear requires replacement, also replace the gear with which it meshes. Use new gaskets, oil seals, and snap rings during assembly.

Inspect the transmission case for cracks and the case bearing bosses for wear or scoring. Examine the ball bearings for cracked races, excessive wear, for proper fit and for tight fit in the case bores. Inspect the teeth of all gears for cracks, chips, or spots where case hardening is worn through. Main shaft gears should slide on and off the shaft smoothly without bind or excessive play. Inspect the synchro-blocking rings for excessive wear or pitting in the tapered area of the ring. If the condition of the thrust washers is doubtful, replace them.

Check all bearing rollers for flat spots, pitting, cracks, or other damage. Replace rollers as required. Inspect the countershaft and reverse idler shafts for pitting, wear, scores, nicks, cracks, and flat spots. Small nicks or scores can be reduced using crocus cloth or a fine-tooth file. Replace shafts if severely worn or damaged. Inspect the main shaft and synchronizer hubs and sleeves for damaged or worn splines, cracks, worn mainshaft pilot hub, and damaged mainshaft threads. Replace parts as required. Check reverse shifting arm and pivot pin for wear or other damage, and replace if necessary.

ASSEMBLY

Reverse Idler Gear

NOTE: *Use petroleum jelly for assembly and initial lubrication of all components.*

(1) Install snap ring in one end of reverse idler gear.
(2) Install thrust washer in gear bore against snap ring.
(3) Insert sleeve in gear bore and install one set of 37 roller bearings. Install spacer, 37 more roller bearings, and second thrust washer and snap ring in gear.

Countershaft Gear

(1) Use arbor tool to assemble countershaft gear.
(2) Lubricate bearing spacer sleeve, and install sleeve and arbor tool in countershaft gear.
(3) Insert one bearing spacer over arbor tool against spacer sleeve.
(4) Insert 22 roller bearings.
(5) Insert second bearing spacer and 22 more roller bearings, followed by third spacer.
(6) Repeat assembly operation at opposite end of countershaft gear.

First-Second Synchronizer

NOTE: *Use the third-fourth clutch hub to aid in assembly of the second gear synchronizer hub.*

(1) Place third-fourth clutch hub on work bench.
(2) Place first-second clutch sleeve over third-fourth hub with shift fork groove facing downward.
(3) Align punch marks and insert first-second clutch hub in sleeve with lock ball holes facing upward (fig. 6-37).
(4) Insert shifting plates in hub slots.
(5) Install poppet spring through shifting plate.
(6) Compress spring and lock ball while pressing on shifting plate until poppet ball is held in position by synchronizer sleeve. Repeat operation until three shifting plates, poppet springs, and lock balls are installed in sleeve.
(7) Complete assembly by pressing down on hub and pulling up on sleeve (fig. 6-38).

Third-Fourth Synchronizer

(1) Align punch marks made at disassembly.
(2) Insert three shifting plates in hub slots. Install retaining rings so one end of each ring is hooked into same shifting plate (fig. 6-39).

Clutch Shaft

(1) Install 22 roller bearings in clutch shaft bore. Use petroleum jelly to retain bearings.

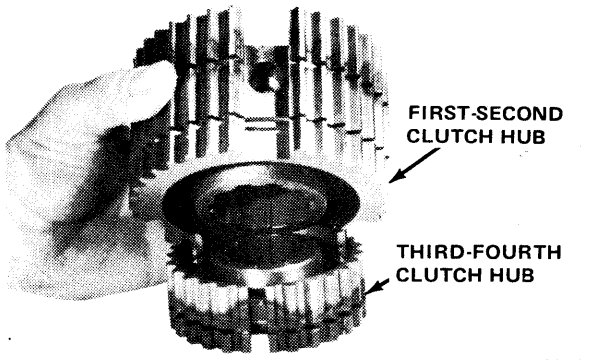

Fig. 6-37 Supporting First-Second Clutch Hub

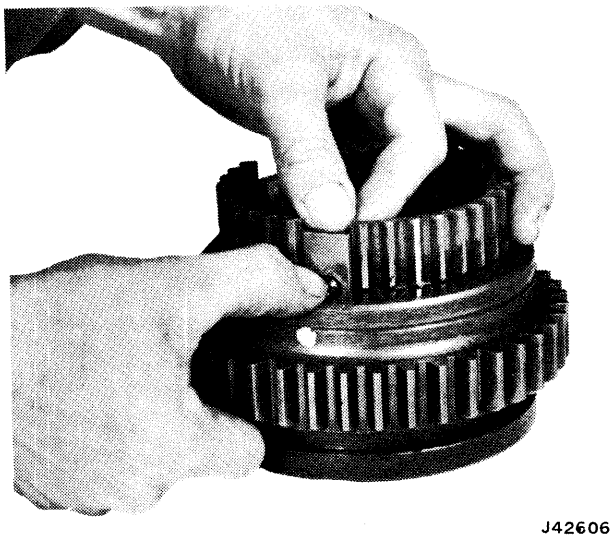

Fig. 6-38 Assembling Second Synchronizer

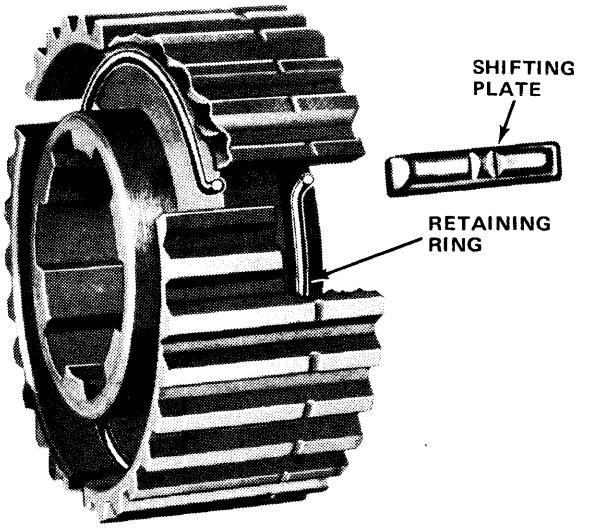

Fig. 6-39 Shifting Plate and Retaining Ring Installation

(2) Coat blocking ring with petroleum jelly and install on clutch shaft.

Main Shaft and Gear Assembly

(1) Install second gear from front of main shaft (fig. 6-40).

(2) Install thrust washer with step bore toward front of main shaft.

(3) Install snap ring. Be certain step bore of thrust washer fits over snap ring (fig. 6-40).

(4) From rear of main shaft, install second gear rear snap ring, blocking ring, first-second synchronizer assembly and snap ring.

NOTE: *First-second synchronizer sleeve shift fork groove must face rear of main shaft (fig. 6-41).*

(5) Install third gear, blocking ring, third-fourth synchronizer assembly, snap ring, and main drive gear roller bearing thrust washer.

NOTE: *Third-fourth synchronizer unit must be installed with chamfered side of hub facing front of main shaft (fig. 6-42).*

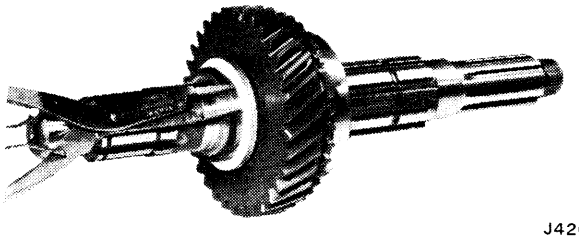

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Fig. 6-40 Second Gear and Thrust Washer Installation

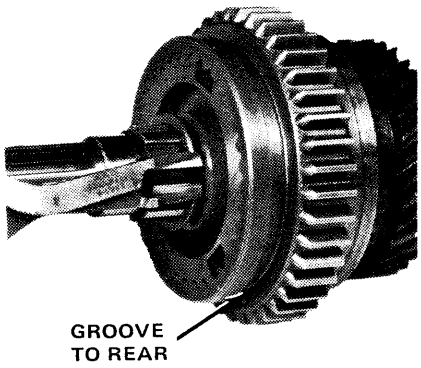

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Fig. 6-41 First-Second Synchronizer Installation

Transmission Case

(1) Install countershaft thrust washers. Coat washers with petroleum jelly. Index tab of large, bronze faced washer in recessed area at front of case. Index notch of smaller, steel washer with lug at rear of case.

(2) Install countershaft gear assembly.

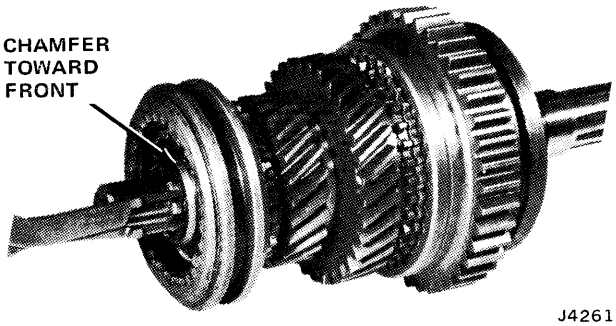

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Fig. 6-42 Third-Fourth Synchronizer Installation

(3) Insert remaining countershaft thrust washer between end of countershaft gear and rear thrust washer.

(4) Insert countershaft from rear of case, keeping countershaft and arbor tool in contact to prevent displacing bearing rollers or washers.

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

(6) Install reverse idler gear with large gear facing rear of case.

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

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

(9) Install lock plate to act as a guide and tap shafts alternately into position.

(10) Insert clutch shaft assembly and fourth gear blocking ring through transmission case into front bearing bore.

(11) Install main shaft and gear assembly.

(12) Be sure clutch shaft roller bearing spacer is on main shaft pilot and install main shaft pilot in clutch shaft bore. Be sure roller bearings are not displaced and fourth gear blocking ring notches are aligned with shifting plates.

(13) Temporarily install clutch shaft front bearing cap to support clutch shaft.

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

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

NOTE: *It is important that the 4-speed transmission adapter plate oil seal be installed correctly to prevent flow of lubricant from the transfer case to the transmission. When correctly positioned, the lip of the oil seal faces toward the transfer case (fig. 6-43).*

(16) Coat lip of rear oil seal with petroleum jelly. Position transmission-to-adapter gasket on transmission and install adapter plate. Apply nonhardening sealer to attaching bolts.

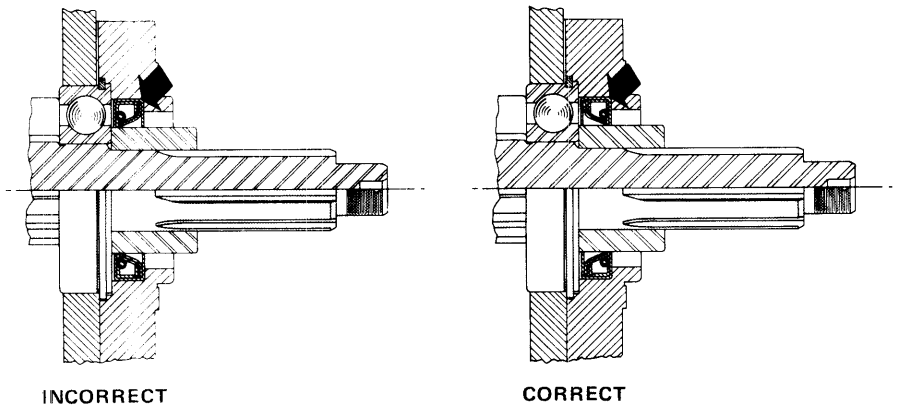

Fig. 6-43 Oil Seal Position

(17) Remove front bearing cap and install front bearing retaining washer on clutch shaft with dished side of washer facing main shaft.

(18) Install front bearing on clutch shaft and into case bore using section of pipe or driver sleeve (fig. 6-44). Seat bearing against clutch shaft gear and bearing retaining washer.

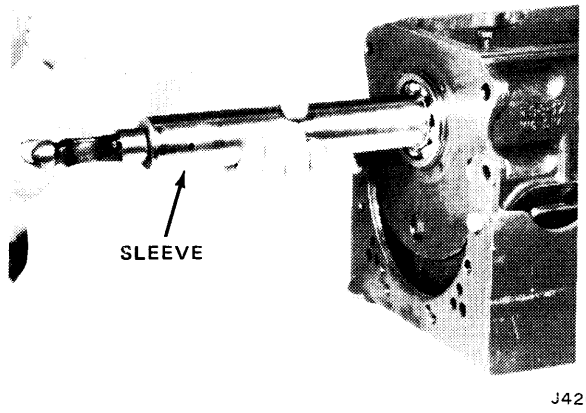

Fig. 6-44 Front Bearing Installation

(19) Install thickest of four available front bearing lockrings in groove of clutch shaft.

(20) Pull clutch shaft and front bearing out of case just far enough to permit installation of front bearing snap ring. Install snap ring and push clutch shaft into case until snap ring seats against case.

(21) Position front bearing cap gasket on front bearing cap. Coat threads of bearing cap attaching bolts with nonhardening sealer. Align oil return holes in cap, gasket, and case, and install attaching bolts. Tighten bolts to 15 foot-pounds torque.

(22) Check all synchronizer blocking rings for free movement. If blocking rings were wedged onto the tapered hubs of the clutch shaft, third, and second speed gears during front bearing installation, pry them free using screwdriver.

(23) Install reverse shifting arm. Move first-second synchronizer to rear to provide clearance.

(24) Install O-ring on reverse shifting arm pivot.

(25) Engage reverse shifting arm shoe in groove of reverse idler gear, align pivot holes in arm and case, and install pivot. Install tapered pivot pin from rear of pivot boss in case. Tap pivot pin with hammer until seated.

(26) Position power takeoff cover gasket on cover and install gasket ond cover. Use nonhardening sealer on cover attaching bolts. Tighten bolts to 12 foot-pounds torque.

(27) Install transfer case drive gear spacer, drive gear, flat washer and locknut. Move third-fourth synchronizer sleeve forward and first-second synchronizer sleeve rearward to prevent main shaft from turning. Tighten locknut to 150 foot-pounds torque.

(28) Move synchronizer sleeves to Neutral position.

(29) Install fill and drain plugs and pour pint of gear lubricant over all gears while rotating main shaft.

(30) Install top cover gasket on transmission case and install shift control housing. Be sure shift forks engage synchronizer sleeves and that Reverse shift arm engages flat on reverse shift rail. Install shift control housing attaching bolts and tighten to 12 foot-pounds torque.

(31) Shift gears through all positions to check operation.

(32) Assemble transfer case and transmission. Tighten attaching bolts to 30 foot-pounds torque.

SHIFT CONTROL HOUSING

Disassembly (fig. 6-45)

(1) Remove shift lever.

(2) Mount housing in vise with shift forks facing upward.

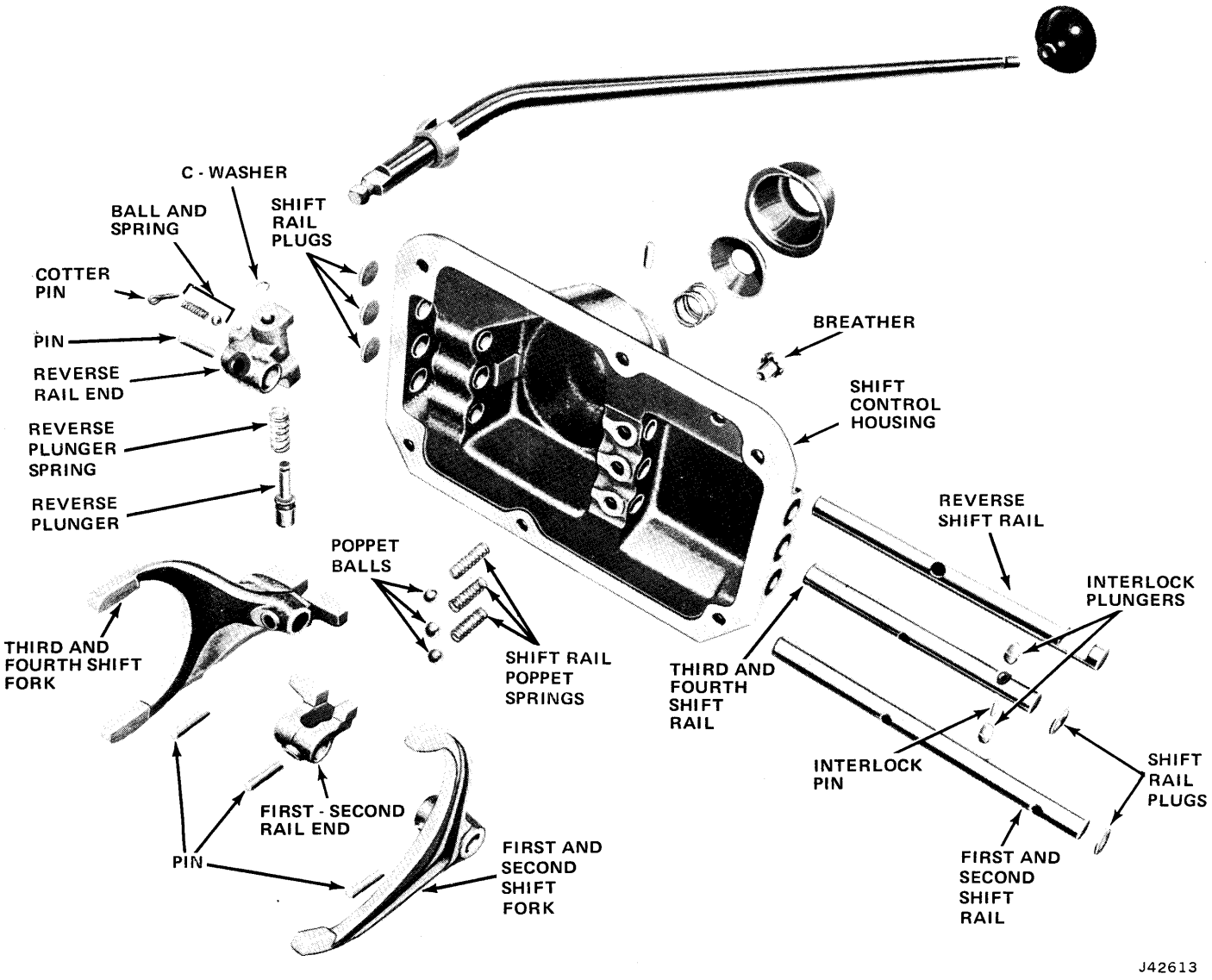

Fig. 6-45 Four-Speed Transmission Shift Control Housing

(3) Remove backup lamp switch, spring, and plunger.

(4) Remove transmission controlled spark (TCS) switch if equipped.

(5) Remove shift rail plugs using small punch.

(6) Move shift rails to Neutral position.

(7) Remove third-fourth shift fork roll pin.

(8) Cover poppet ball holes in housing with tape to prevent losing springs and balls during removal.

(9) Remove third-fourth shift. Drive rail out rear of housing using brass drift and hammer. Remove shift fork, poppet ball and spring. Do not lose shift rail plug when rail is removed.

(10) Remove roll pins from reverse rail end, first-second shift fork, and first-second rail end.

(11) Move first-second rail forward and remove shift fork.

(12) Remove first-second and reverse shift rails. Drive rails out rear of case using brass drift and hammer. Reverse rail will drive backup lamp switch and adapter out of case as it is removed. do not lose shift rail plugs when rails are removed.

(13) Remove interlock plungers from housing bores using bent wire.

(14) Remove cotter pin from reverse rail end and remove poppet ball and spring. Compress reverse plunger and spring, remove C-clip from plunger, and remove plunger and spring.

(15) Inspect breather vent in housing. If damaged, remove vent.

Assembly

(1) Install breather vent if removed.

(2) Install reverse plunger and spring in reverse rail end. Compress plunger and spring and install C-clip. Install poppet ball, spring, and cotter pin in reverse rail end.

(3) Install reverse rail poppet ball and spring in

housing bore. Compress ball and spring using punch and install reverse shift rail.

(4) Install reverse rail end on reverse rail. Be sure rail end is seated on machined edge of housing and C-clip faces outer edge of housing. Install lockpin in reverse rail end.

(5) Install first-second shift rail poppet ball and spring in housing bore. Compress ball and spring using punch and install first-second shift rail.

(6) Move first-second shift rail forward and install shift fork with roll pin hole in fork toward front of housing. Install roll pin in fork and move shift rail to neutral position.

(7) Install interlock plungers in housing bores.

NOTE: *Shift rails must be in neutral position in order to seat plungers completely in housing bores.*

(8) Install third-fourth shift rail poppet ball and spring in housing bore. Compress ball and spring using punch and install third-fourth shift rail.

(9) Install third-fourth shift fork on rail with roll pin hole in fork toward rear of housing. Install roll pin in fork and rail.

(10) Install shift lever and check operation of shift rails and forks.

(11) Install shift rail plugs, TCS switch (if equipped), backup lamp switch adapter, and backup lamp switch.

SPECIFICATIONS

End Play Tolerances

T150

Countershaft Gear to Case	0.004 to 0.018 Inch
Reverse Idler Gear to Case	0.004 to 0.018 Inch
Mainshaft Gear Train	0.004 to 0.014 Inch

T15A – T18A

All end play controlled by selective thickness snap rings. Use thickest snap ring available.

Frequency

Inspect/Correct Fill Level ..... Every 5000 Miles

Lubricants

SAE 80 or SAE 90 Gear Lubricant

Capacity

T150	3.0 Pints
T15A	2.7 Pints
T18A	6.5 Pints

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	Three-Speed		Four-Speed
Model	T-150	T-15A	T-18
Type	Synchromesh	Synchromesh	Synchromesh
Speeds	3 Forward-1 Reverse	3 Forward-1 Reverse	4 Forward-1 Reverse
Ratios:			
First	2.99:1	2.997 to 1	6.32 to 1
Second	1.75:1	1.832 to 1	3.09 to 1
Third	1.00:1	1.000 to 1	1.69 to 1
Fourth	–	–	1.00 to 1
Reverse	3.17:1	2.997 to 1	7.44 to 1

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Torque Specifications

Service Set-To Torques should be used when assembling components.

Service In-Use Recheck Torques should be used for checking a pre-torqued item.

	Service Set-To Torques	Service In-Use Recheck Torques
Backup Lamp Switch – T150	18	15-20
Fill and Drain Plugs (All)	15	10-20
Front Bearing Cap Bolt		
T150	33	30-36
T15A	15	12-18
T18A	15	12-18
Shift Control Housing Bolts		
T15A–T18A	12	10-15
T150	22	20-25
Transfer Case Drive Gear Locknut (All)	150	145-155
Transfer Case-To-Transmission Case Bolts (All)	30	25-35
TCS Switch – T150	18	15-20

All torque values given in foot-pounds with dry fits unless otherwise specified.

Refer to the Standard Torque Specifications and Capscrew Markings Chart in Section A of this manual for any torque specifications not listed above.

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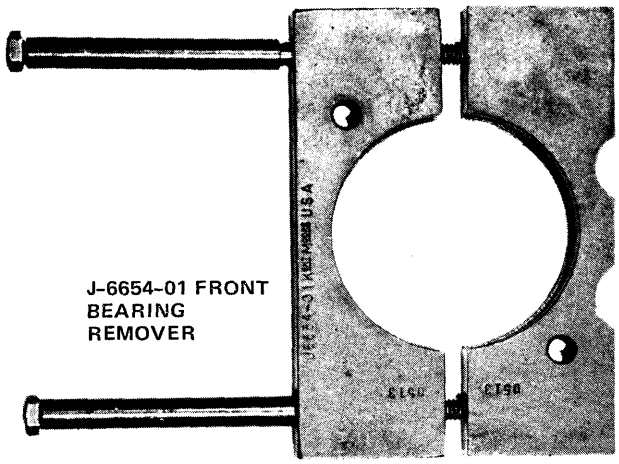
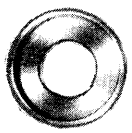
Special Tools

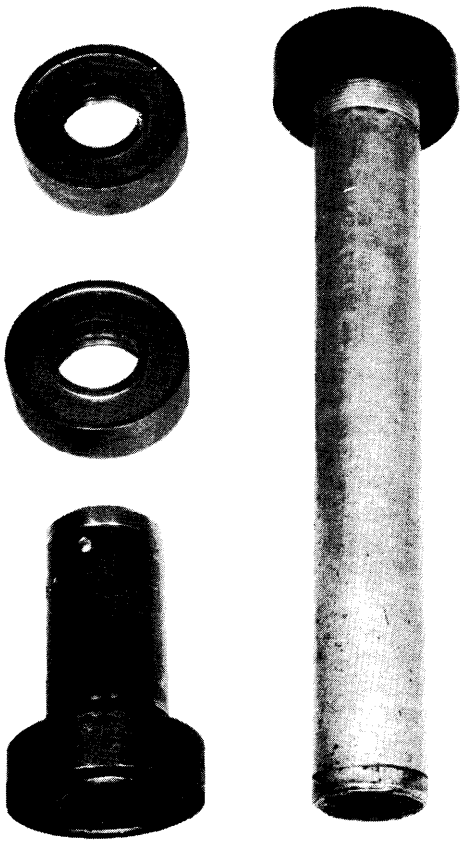


J-6654-01 FRONT BEARING REMOVER



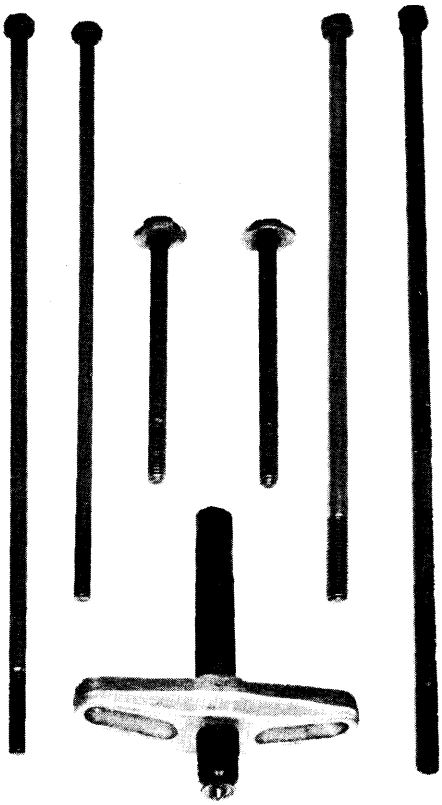
J-25233 FRONT BEARING CAP SEAL INSTALLER

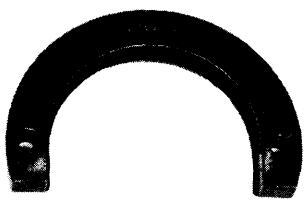
J-25232 ARBOR TOOL



J-25153 BEARING INSTALLER TOOLS

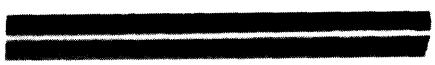
J-26852 SEAL INSTALLER



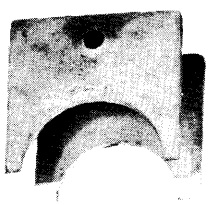


J-25152 BEARING REMOVER TOOLS

J-25203 REVERSE IDLER GEAR BEARING ARBOR



J-25199 ARBOR TOOL



J-25200 SYNCHRONIZER GEAR THRUST YOKE

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