

SECTION 7B

MANUAL TRANSMISSION

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3-SPEED (SAGINAW) 76MM TRANSMISSION

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DISASSEMBLY OF TRANSMISSION (FIG. 7B-1A)

1. Remove side cover attaching bolts and side cover assembly.
2. Remove drive gear bearing retainer and gasket.
3. Remove drive gear bearing-to-gear stem snap ring, then remove clutch gear bearing by pulling outward on clutch gear until a screwdriver or other suitable tool can be inserted between bearing large snap ring and case to complete removal (Fig. 7B-2A). The clutch gear bearing is a slip fit on the gear and into the case bore. (This provides clearance for removal of clutch gear and mainshaft assembly.)
4. Remove speedometer driven gear from extension.
5. Remove extension to case attaching bolts.
6. Remove the reverse idler shaft "E" ring (Fig. 7B-3A).
7. Remove drive gear, mainshaft and extension assembly together through the rear case opening. Remove drive gear, needle bearings and synchronizer ring from mainshaft assembly.
8. Using snap ring pliers, expand the snap ring in the extension which retains the mainshaft rear bearing (Fig. 7B-4A) and remove the extension.
9. Using J-22246 at the front of the countershaft, drive the shaft and its woodruff key out the rear of the case (Fig. 7B-5A). Tool J-22246 will now hold the roller bearings in

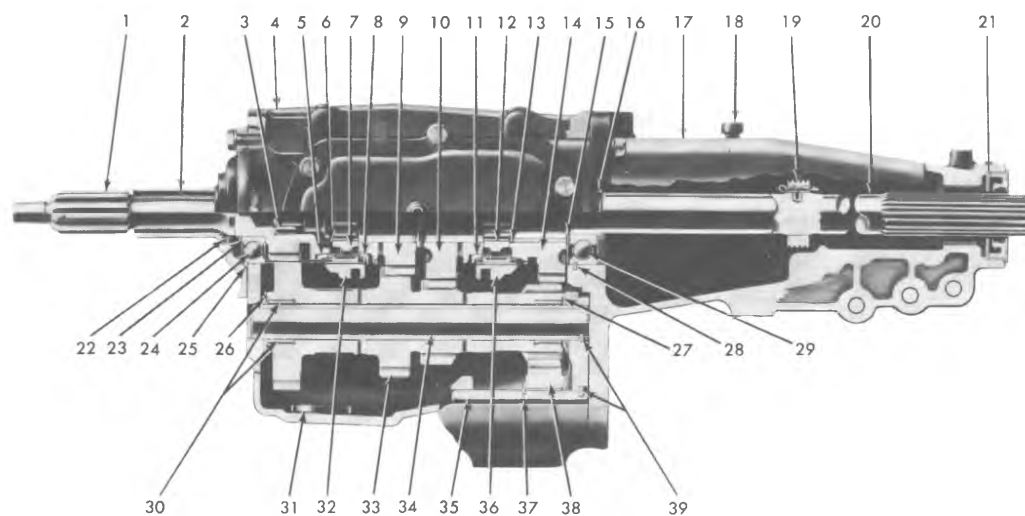
position within the countergear bore. Remove the gear, bearings and thrust washers.

10. Use a long drift or punch through the front bearing case bore and drive the reverse idler shaft and woodruff key through the rear of the case (Fig. 7B-6A).

DISASSEMBLY OF MAINSHAFT

1. Using snap ring pliers, remove the 2nd and 3rd speed sliding clutch hub snap ring from mainshaft and remove clutch assembly, second speed blocker ring and second speed gear from front of mainshaft. See Fig. 7B-7A.
2. Depress speedometer retaining clip and slide or tap gear from mainshaft.
3. Remove rear bearing snap ring from mainshaft groove. See Fig. 7B-8A.
4. Support reverse gear with press plates and press on rear of mainshaft to remove reverse gear, thrust washer, spring washer, rear bearing, and snap ring from rear of mainshaft. See Fig. 7B-9A.
5. Remove the 1st and Reverse sliding clutch hub snap ring from the mainshaft and remove the clutch assembly, 1st speed blocker ring and first speed gear from rear of the mainshaft.

NOTE: Under certain tolerance conditions, it may be necessary to press the synchronizer hub and gear from the mainshaft.



- | | | | | |
|---------------------------|--|--|------------------------------------|-----------------------------|
| 1. Clutch Gear | 10. 1st Speed Gear | 16. Snap Ring-Bearing to Mainshaft Extension | 24. Clutch Gear Bearing | 31. Magnet |
| 2. Bearing Retainer | 11. 1st Speed Blocker Ring | 17. Extension | 25. Snap Ring-Bearing to Case | 32. 2-3 Synch. Sleeve |
| 3. Pilot Bearings | 12. 1st Speed Synch. Hub | 18. Vent | 26. Thrust Washer-Front | 33. Countergear |
| 4. Case | 13. 1st Speed Synch. Snap Ring | 19. Speedometer Drive Gear and Clip | 27. Thrust Washer-Rear | 34. Counter Shaft |
| 5. 3rd Speed Blocker Ring | 14. Reverse Gear | 20. Mainshaft | 28. Snap Ring-Bearing to Extension | 35. Reverse Idler Shaft |
| 6. 2-3 Synch. Snap Ring | 15. Reverse Gear Thrust and Spring Washers | 21. Rear Oil Seal | 29. Rear Bearing | 36. 1st Speed Synch. Sleeve |
| 7. 2-3 Synch. Hub | | 22. Retainer Oil Seal | 30. Countergear Roller Bearings | 37. "E" Ring |
| 8. 2nd Speed Blocker Ring | | 23. Snap Ring-Bearing to Gear | | 38. Reverse Idler Gear |
| 9. 2nd Speed Gear | | | | 39. Woodruff Keys |

Fig. 7B-1A-3-Speed 76mm (Saginaw) Transmission Cross-Section

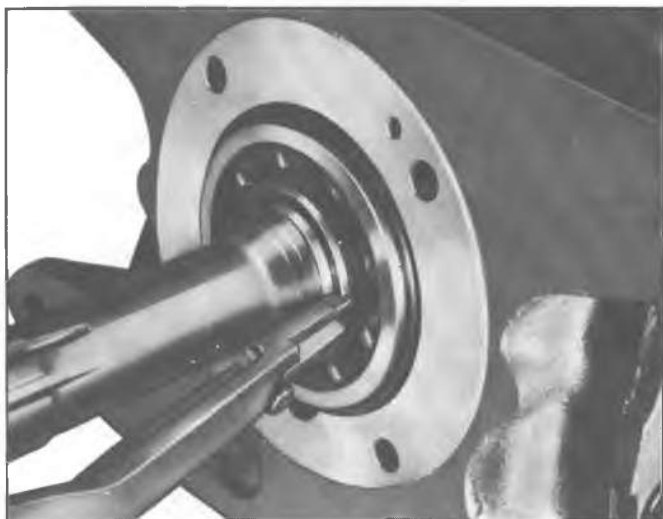


Fig. 7B-2A--Removing Clutch Gear Bearing Retaining Ring



Fig. 7B-5A--Removing Counter Gear Shaft

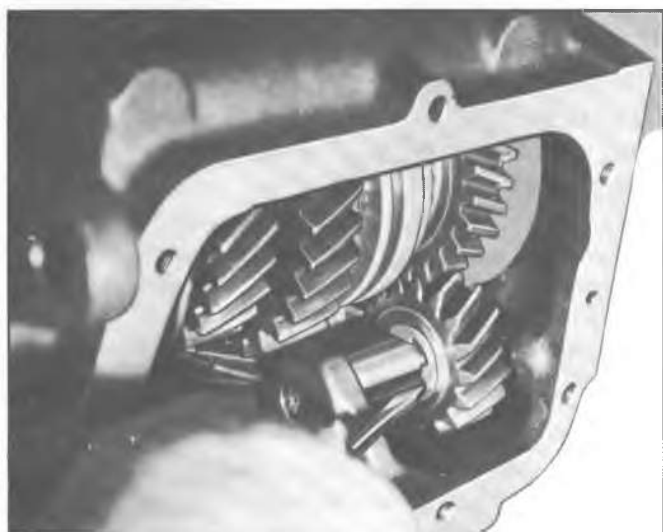


Fig. 7B-3A--Removing Reverse Idler Shaft "E" Ring

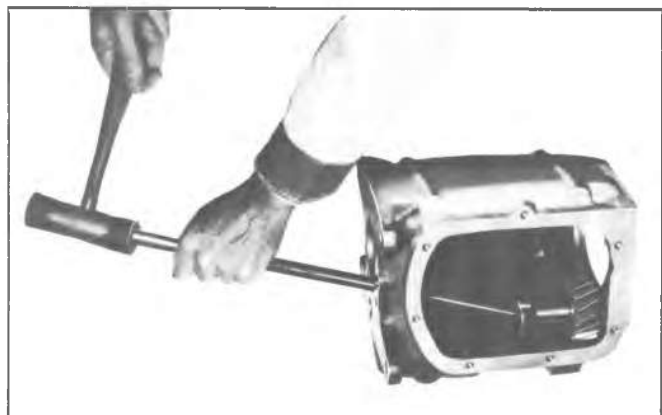


Fig. 7B-6A--Removing Reverse Idler Shaft

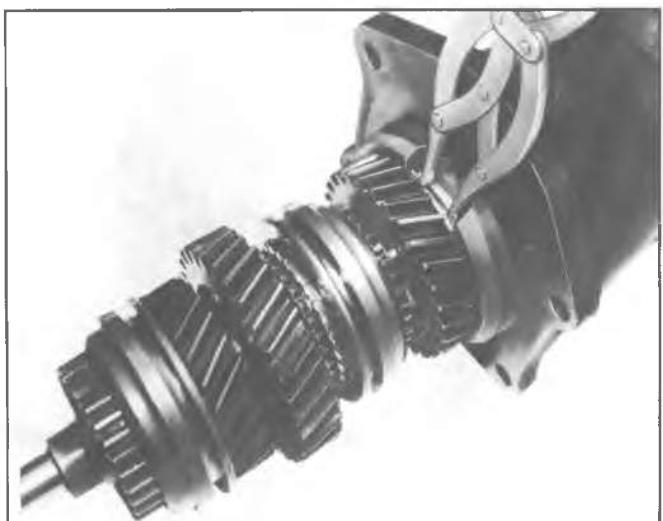


Fig. 7B-4A--Removing Rear Extension From Main Shaft

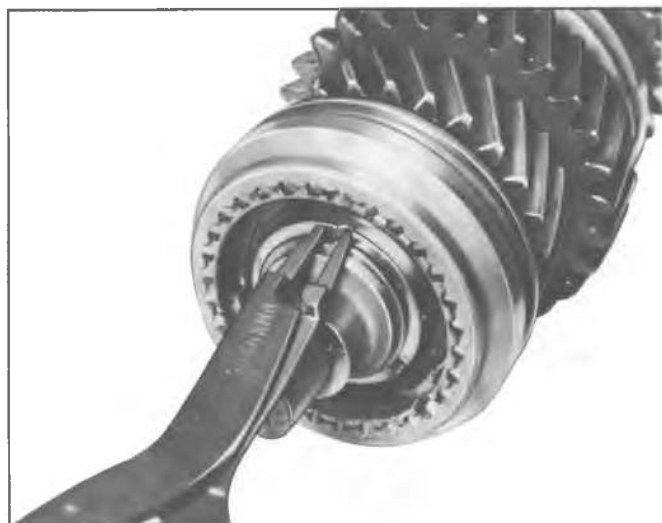


Fig. 7B-7A--Removing 2nd-3rd Clutch Hub Retaining Ring



Fig. 7B-8A--Removing Rear Bearing Retaining Ring

CLEANING AND INSPECTION

Transmission Case

1. Wash the transmission thoroughly inside and outside with cleaning solvent, then inspect the case for cracks.
2. Check the front and rear faces for burrs, and if present, dress them off with a fine mill file.
3. Check bearing bores in case and, if damaged, replace case.

Front and Rear Bearings

1. Wash the front and rear ball bearings thoroughly in a cleaning solvent.

2. Blow out bearings with compressed air.

CAUTION: Do not allow the bearings to spin, turn them slowly by hand. Spinning bearings may damage the race and balls.

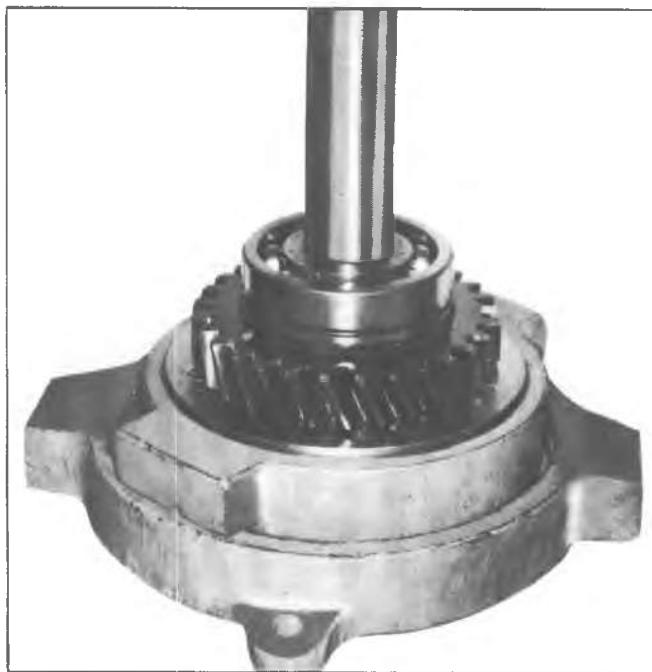


Fig. 7B-9A--Removing Rear Bearing From Mainshaft

3. Make sure bearings are clean, then lubricate with light engine oil and check them for roughness by slowly turning the race by hand.

Bearing Rollers

All clutch gear and counter gear bearing rollers should be inspected closely and replaced if they show wear. Inspect counter shaft and reverse idler shaft at the same time, replace if necessary. Replace all worn washers.

Gears

1. Inspect all gears for excessive wear, chips or cracks and replace any that are worn or damaged.
2. Inspect reverse gear bushing and if worn or damaged replace the entire gear.

NOTE: Reverse gear bushing is not serviced separately.

3. Check both clutch sleeves to see that they slide freely on their hubs.

Reverse Idler Gear Bushing

The bushing used in the idler gear is pressed into the gear and finished bored in place. This insures the positive alignment of the bushing and shaft as well as proper meshing of the gears. Because of the high degree of accuracy to which these parts are machined, the bushing is not serviced separately.

REPAIRS

Clutch Keys and Springs

Replacement

NOTE: The clutch hubs and sliding sleeves are a selected assembly and should be kept together as originally assembled, but the keys and two springs may be replaced if worn or broken.

1. Mark hub and sleeve so that they can be matched upon reassembly.
2. Push the hub from the sliding sleeve, the keys and the springs may be easily removed.
3. Place the three keys and two springs in position (one on each side of hub) so all three keys are engaged by both springs (Fig. 7B-10A). The tanged end of each synchronizer

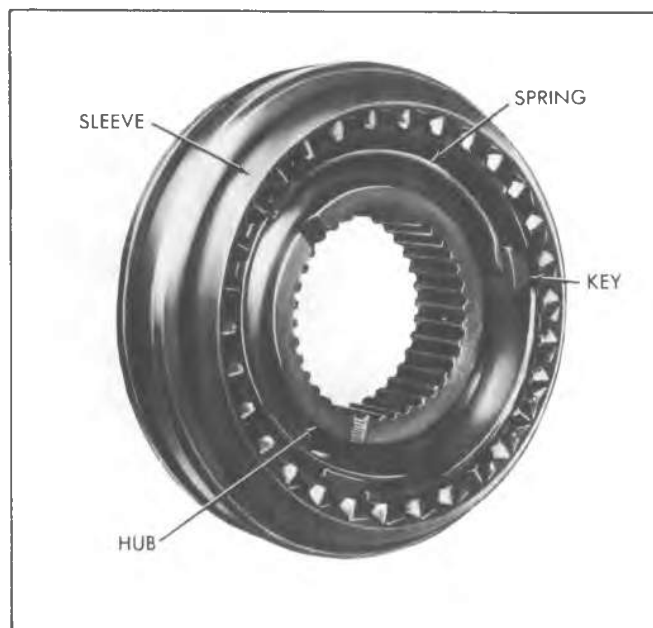


Fig. 7B-10A--Synchronizer Assembly

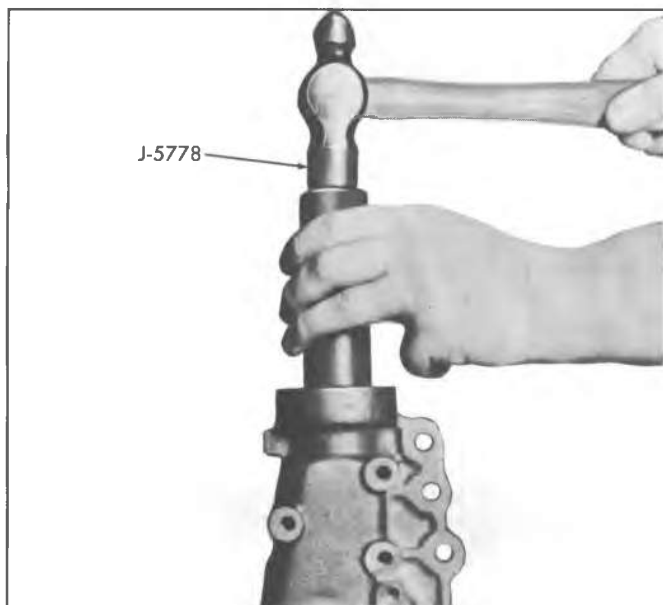


Fig. 7B-11A--Removing or Installing Rear Extension Bushing

spring should be installed into different key cavities on either side. Slide the sleeve onto the hub aligning the marks made before disassembly.

NOTE: A groove around the outside of the synchronizer hub identifies the end that must be opposite the fork slot in the sleeve when assembled. This groove indicates the end of the hub with a greater recess depth.

Extension Oil Seal or Bushing

If bushing in rear of extension requires replacement, remove seal and use Tool J-5778 to drive bushing into extension housing (Fig. 7B-11A). Using the same tool, drive new bushing in from the rear. Coat I.D. of bushing and seal with transmission lubricant, then install new oil seal using Tool J-21426 or J-5154 (Fig. 7B-12A).

Clutch Bearing Retainer Oil Seal

If the lip seal in the retainer needs replacement; pry the

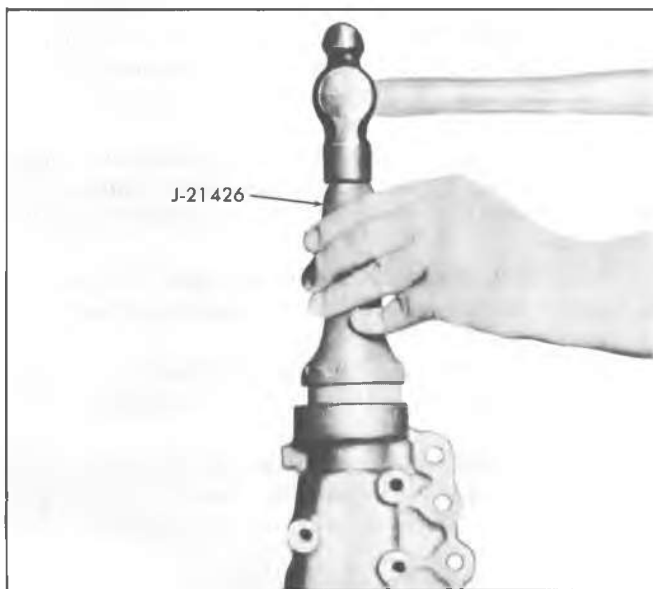


Fig. 7B-12A--Installing Rear Extension Seal



Fig. 7B-13A--Removing Drive Gear Bearing Retainer Seal

old seal out (Fig. 7B-13A) and replace with a new seal using Installer Tool J-23096, or similar tool, until seal seats in its bore (Fig. 7B-14A).

ASSEMBLY OF MAINSHAFT (FIG. 7B-15A)

Turn the front of the mainshaft upward. Install the following components of the mainshaft:

1. Install the second speed gear with clutching teeth upward; the rear face of the gear will abut against the flange on the mainshaft.
2. Install a blocking ring with clutching teeth downward over the synchronizing surface of the second speed gear. All three blocker rings used in this transmission are identical.

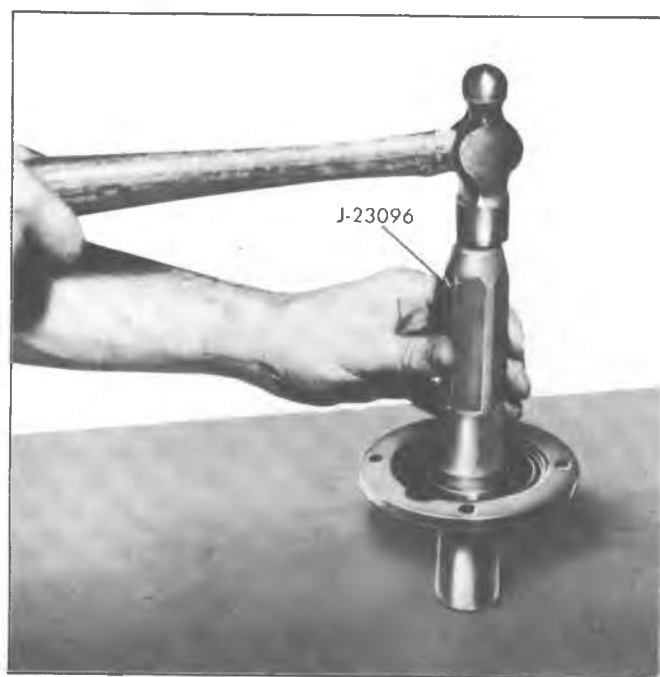


Fig. 7B-14A--Installing Clutch Gear Bearing Retainer Seal

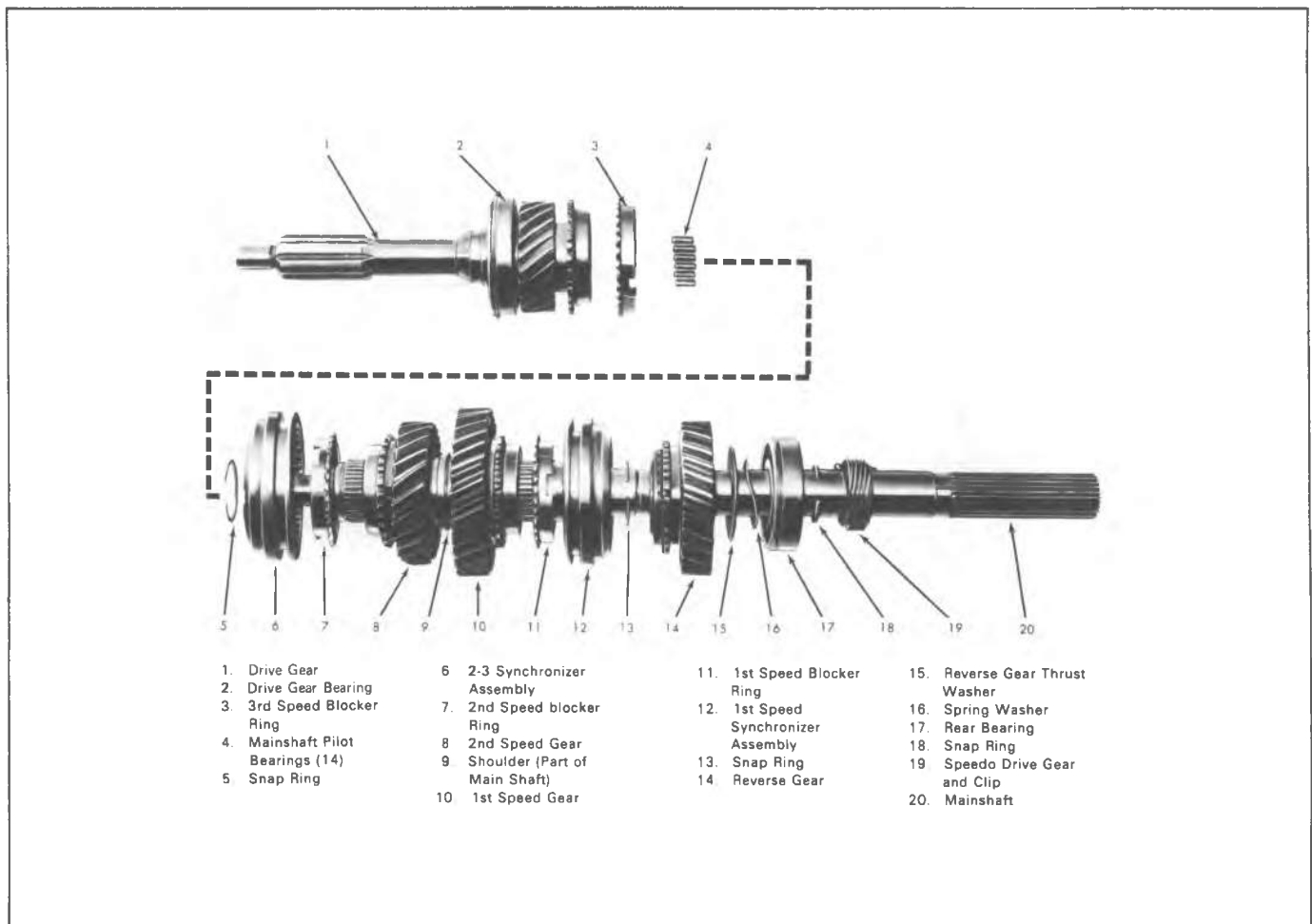


Fig. 7B-15A--Clutch Gear and Mainshaft Assembly

3. Install the second and third synchronizer assembly with the fork slot downward; press it onto splines on the mainshaft until it bottoms out. Both synchronizer assemblies used in this transmission are identical. (If sleeve becomes removed from 2-3 hub; notches on hub O.D. face forward end of mainshaft.)

CAUTION: *Be sure the notches of the blocker ring align with the keys of the synchronizer assembly.*

4. Install snap ring retaining synchronizer hub to mainshaft. Both synchronizer snap rings are identical. Turn the rear of the mainshaft upward. Install the following components on the mainshaft:

5. Install the first speed gear with clutching teeth upward; the front face of the gear will butt against the flange on the mainshaft.

6. Install a blocker ring with clutching teeth downward over synchronizing surface of the first speed gear.

7. Install the first and reverse synchronizer assembly with fork slot downward; push it onto splines on the mainshaft.

8. Install synchronizer hub to mainshaft snap ring.

CAUTION: *Be sure the notches of the blocker ring align with the keys of the synchronizer assembly.*

9. Install reverse gear with clutching teeth downward.

10. Install reverse gear thrust washer (steel).

11. Install reverse gear spring washer.

12. Install rear ball bearing with snap ring slot downward; press onto mainshaft.

13. Install rear bearing to mainshaft snap ring.

14. Install speedometer drive gear and retaining clip.

ASSEMBLY OF TRANSMISSION (FIG. 7B-18A)

1. Using Tool J-22246 load a row of roller bearings (27) and a bearing thrust washer at each end of the countergear. Use heavy grease to hold them in place (Fig. 7B-16A).

2. Place countergear assembly through case rear opening along with a tapered thrust washer (tang away from gear) at each end and install countergear shaft and woodruff key from rear of case.

CAUTION: *Be sure countershaft picks up both thrust washers and that the tangs are aligned with their notches in the case.*

3. Install reverse idler gear and shaft with its woodruff key from the rear of case. Do not install idler shaft "E" ring yet.

4. Using snap ring pliers, expand the snap ring in the extension and assemble extension over rear of mainshaft and onto rear bearing. Seat snap ring in rear bearing groove (Fig. 7B-4A).

5. Load the mainshaft pilot bearings (14) into the clutch gear cavity and assemble the 3rd speed blocker ring onto the clutch gear clutching surface with its teeth toward the gear.



Fig. 7B-16A--Loading Countergear

6. Pilot the clutch gear, pilot bearings and 3rd speed blocker ring assembly over the front of the mainshaft assembly. Do not assemble bearing to gear yet.

CAUTION: *Be sure the notches in the blocker ring align with the keys in the 2-3 synchronizer assembly.*

7. Place extension to case gasket at rear of case holding in place with grease and, from the rear of case, assemble the clutch gear, mainshaft and extension to case as an assembly.

8. Install extension to case retaining bolts.

9. Install front bearing outer snap ring to bearing and position bearing over stem of clutch gear and into front case bore.



Fig. 7B-17A--Loading Pilot Bearings

10. Install snap ring to clutch gear stem, and clutch gear bearing retainer and gasket to case.

NOTE: The retainer oil return hole should be at the bottom.

11. Install reverse idler gear retainer "E" ring to shaft.

12. Shift synchronizer sleeves to neutral positions and install cover, gasket and fork assembly to case. Be sure forks align with their synchronizer sleeve grooves.

13. Install speedometer driven gear in extension.

14. Tighten all bolts to specified torque.

15. Rotate clutch gear shaft and shift transmission to free rotation in all gears.

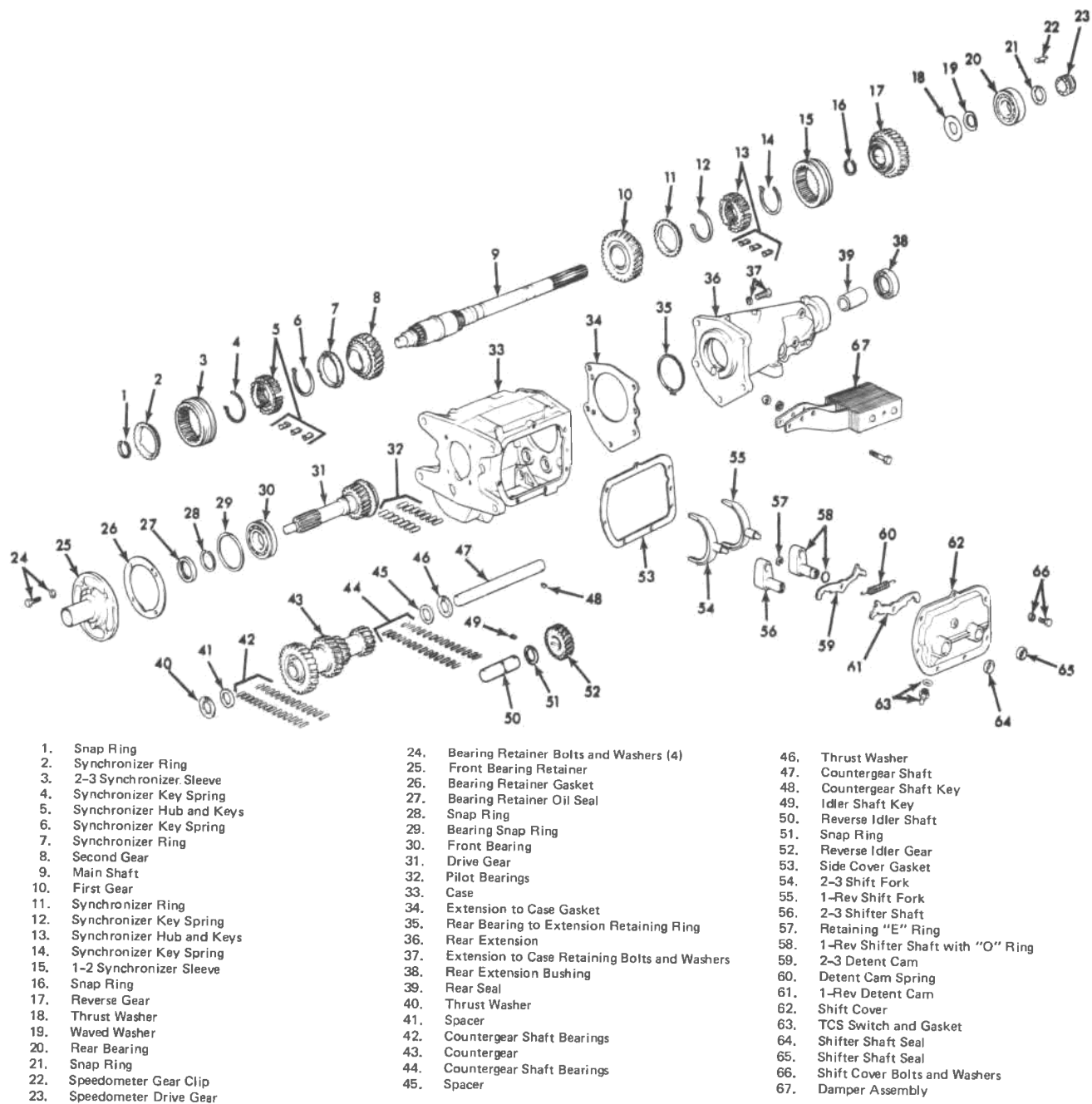


Fig. 7B-18A--3-Speed, 76mm Transmission Exploded View

3 SPEED (TREMATIC) 77MM TRANSMISSION

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OVERHAUL OPERATIONS

TRANSMISSION DISASSEMBLY

1. Remove lower extension housing bolt and drain transmission (Fig. 7B-3B).
2. Remove top cover and gasket from case.
3. Remove long spring that retains the detent plug in the case (Fig. 7B-4B). Remove the detent plug with a small magnet.
4. Remove extension housing and gasket.
5. Press down on speedometer gear retainer and remove speedometer drive gear and retainer from output shaft.
6. Remove fill plug from right side of case (Fig. 7B-3B). Working through the plug opening drive out countergear roll pin with a 3/16 inch pin punch that has been chamfered slightly.

NOTE: Do not attempt to retrieve pin at this time. Pin can easily be retrieved after output shaft assembly is removed.

7. Insert dummy shaft tool J-25232 into bore at front of case, tap lightly on tool to push countershaft out rear of case (Fig. 7B-5B).

NOTE: With countershaft removed, allow countergear to lie at bottom of case.

8. Punch alignment mark in front bearing retainer and transmission case to ensure correct assembly and remove front bearing retainer and gasket (Fig. 7B-6B).

9. Remove large locating snap ring from front bearing and smaller snap ring from clutch gear shaft.

10. Remove clutch shaft front bearing using tool J-6654-01 and tool J-8433-1 (Fig. 7B-7B).

NOTE: It may be necessary to alternate the tightening of the bolts between tools J-6654-01 and J-8433-1 to remove the front bearing.

11. Remove large locating snap ring from rear bearing and smaller retaining snap ring from output shaft.

NOTE: It may be necessary to place a screwdriver or a piece of bar stock between the case and the first-reverse sleeve and gear assembly. This will hold the output shaft assembly in place while removing the rear bearing.

12. Remove rear bearing from output shaft using tool J-8157-01 (Fig. 7B-8B).

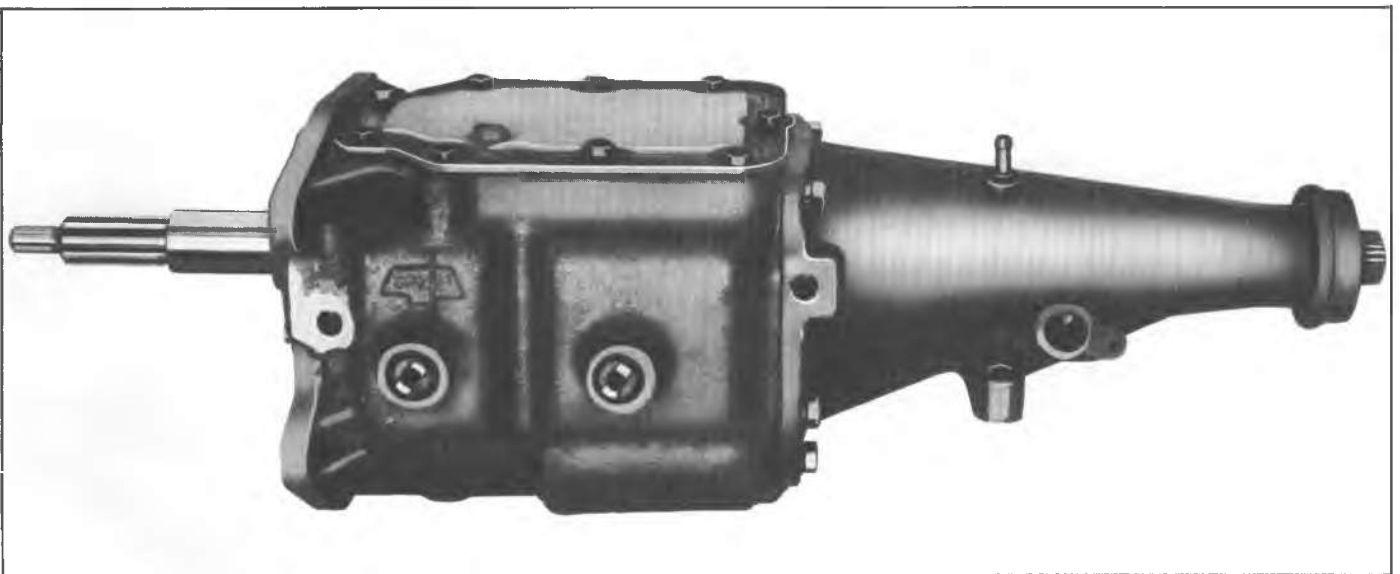
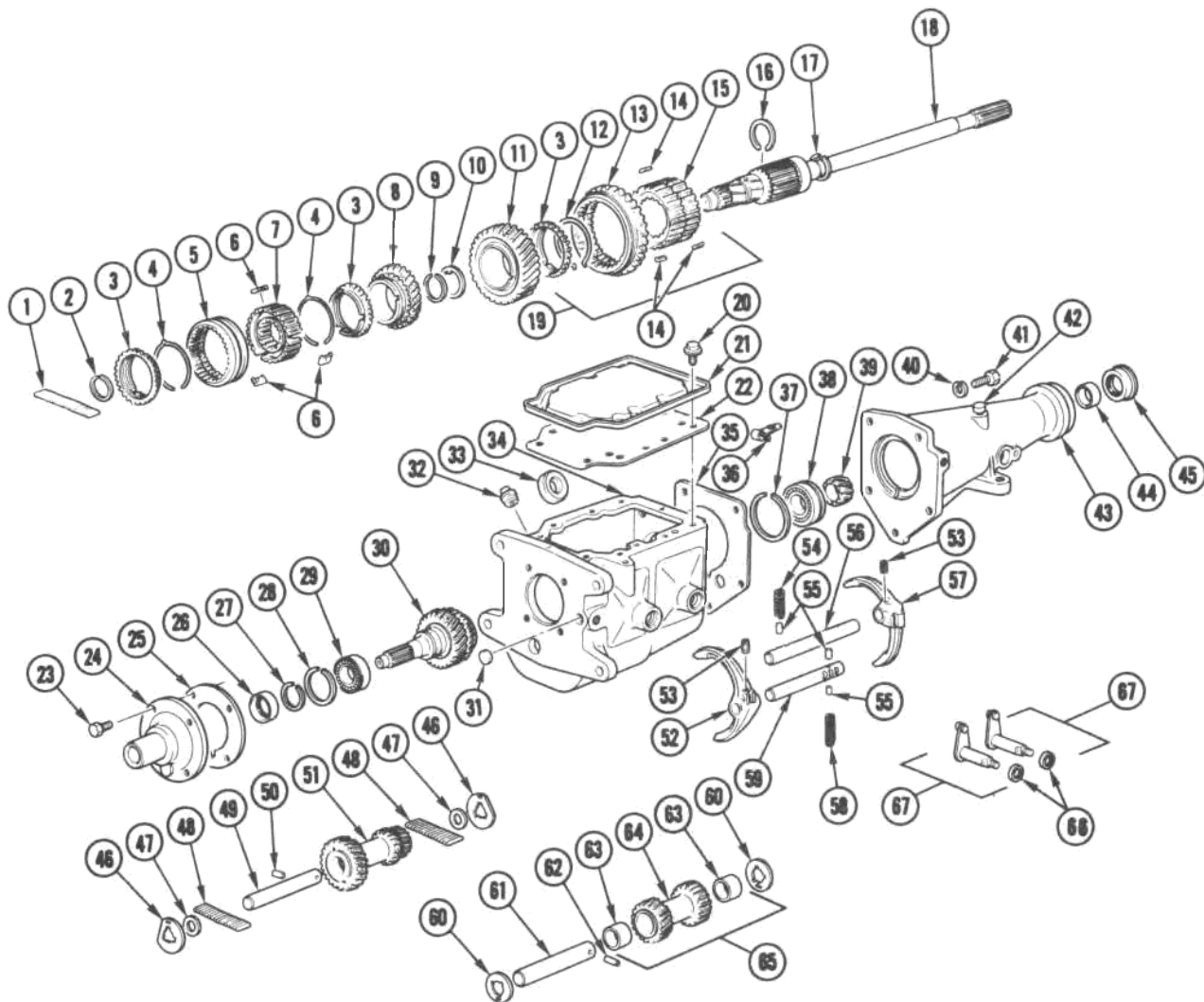


Fig. 7B-1B-3-Speed (Trematic) 77mm Transmission



- | | |
|--|---|
| 1. MAINSHAFT ROLLER BEARINGS | 35. EXTENSION HOUSING TO CASE GASKET |
| 2. 2ND & 3RD SYNCHRONIZER RETAINING RING | 36. SPEEDOMETER DRIVER GEAR RETAINING CLIP |
| 3. SYNCHRONIZER BLOCKER RINGS | 37. TRANSMISSION REAR BEARING LOCK RING |
| 4. 2ND & 3RD SYNCHRONIZER SPRING | 38. MAINSHAFT BEARING ASSEMBLY |
| 5. 2ND & 3RD SYNCHRONIZER SLEEVE | 39. SPEEDOMETER DRIVE GEAR |
| 6. 2ND & 3RD SYNCHRONIZER KEYS | 40. EXTENSION TO CASE WASHER |
| 7. 2ND & 3RD SYNCHRONIZER HUB | 41. EXTENSION TO CASE BOLT |
| 8. SECOND SPEED GEAR | 42. TRANSMISSION EXTENSION VENTILATOR ASSEMBLY |
| 9. 1ST SPEED GEAR RETAINING RING | 43. EXTENSION HOUSING ASSEMBLY |
| 10. 1ST SPEED GEAR TABBED WASHER | 44. EXTENSION HOUSING BUSHING |
| 11. 1ST SPEED GEAR | 45. EXTENSION HOUSING OIL SEAL ASSEMBLY |
| 12. REVERSE SYNCHRONIZER SPRING | 46. COUNTERGEAR THRUST WASHER |
| 13. 1ST & REVERSE SYNCHRONIZER SLEEVE & GEAR | 47. COUNTERGEAR SPACER |
| 14. REVERSE SYNCHRONIZER KEYS | 48. COUNTERGEAR ROLLER BEARINGS |
| 15. 1ST & REVERSE SYNCHRONIZER HUB | 49. COUNTERGEAR SHAFT |
| 16. 1ST & REVERSE SYNCHRONIZER RETAINING RING | 50. COUNTERGEAR SPRING PIN |
| 17. REAR BEARING RETAINING RING | 51. COUNTERGEAR |
| 18. TRANSMISSION MAINSHAFT | 52. 2ND & 3RD SHIFTER FORK |
| 19. REVERSE SYNCHRONIZER ASSEMBLY | 53. SHIFTER FORK LOCKING SCREW |
| 20. ACCESS COVER BOLTS | 54. 1ST & 2ND SHIFTER INTERLOCK SPRING |
| 21. ACCESS COVER | 55. SHIFTER INTERLOCK PIN |
| 22. ACCESS COVER GASKET | 56. 1ST & REVERSE SHIFTER RAIL |
| 23. BEARING RETAINER - TO CASE BOLTS | 57. 1ST & REVERSE SHIFTER FORK |
| 24. BEARING RETAINER - CLUTCH GEAR | 58. 2ND & 3RD SHIFTER INTERLOCK SPRING |
| 25. GASKET - CLUTCH GEAR BEARING RETAINER | 59. 2ND & 3RD SHIFTER RAIL |
| 26. SEAL ASSEMBLY - CLUTCH GEAR BEARING RETAINER | 60. REVERSE IDLER GEAR THRUST WASHER |
| 27. CLUTCH GEAR BEARING RETAINING RING | 61. REVERSE IDLER GEAR SHAFT |
| 28. CLUTCH GEAR BEARING LOCK RING | 62. SPRING PIN IDLER GEAR SHAFT |
| 29. CLUTCH GEAR BEARING ASSEMBLY | 63. REVERSE IDLER GEAR BUSHING |
| 30. CLUTCH GEAR | 64. REVERSE IDLER GEAR |
| 31. EXPANSION PLUG | 65. REVERSE IDLER GEAR ASSEMBLY |
| 32. FILLER PLUG | 66. SEAL TRANSMISSION SHIFTER |
| 33. TRANSMISSION CASE MAGNET | 67. TRANSMISSION SHIFTER SHAFT & LEVER ASSEMBLY |
| 34. CASE | |

Fig. 7B-2B--Exploded View - 3 Speed (Tremac) 77mm Transmission

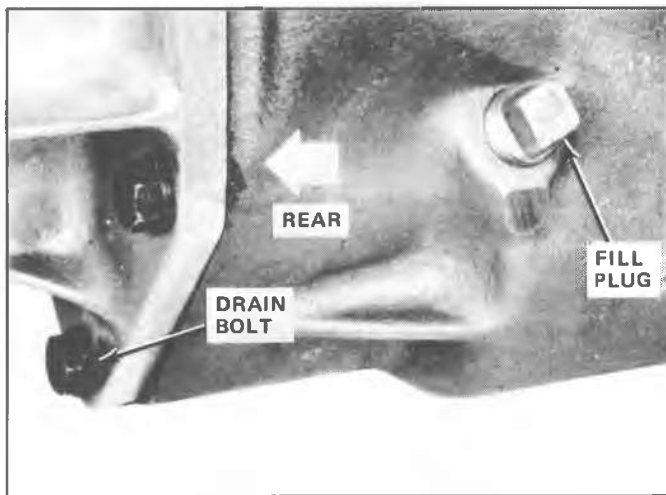


Fig. 7B-3B--Drain Transmission

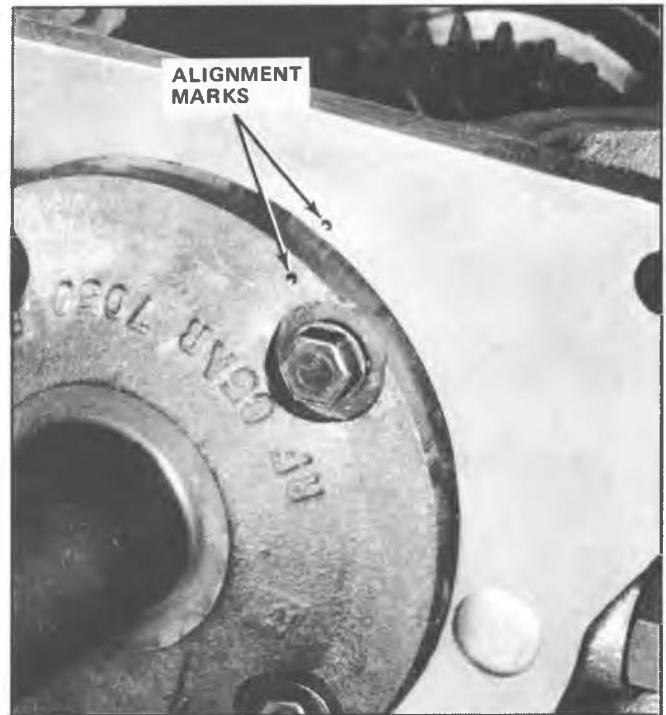


Fig. 7B-6B--Removing Front Bearing Retainer

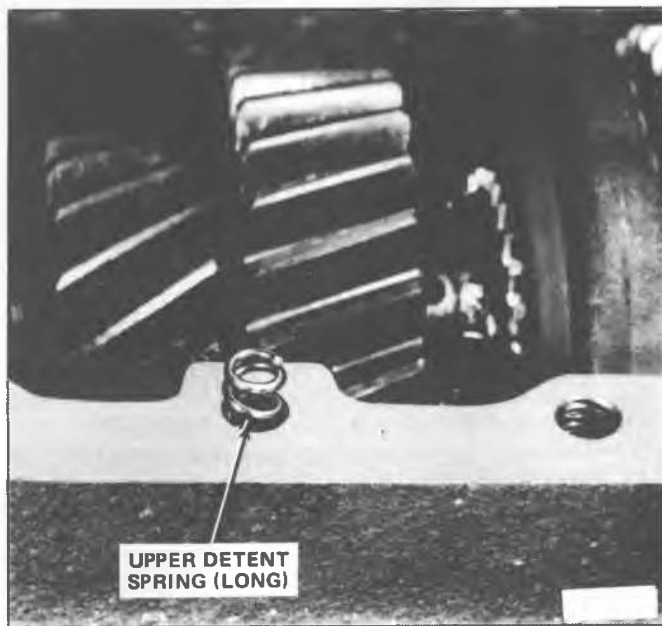


Fig. 7B-4B--Location of Upper Detent Spring

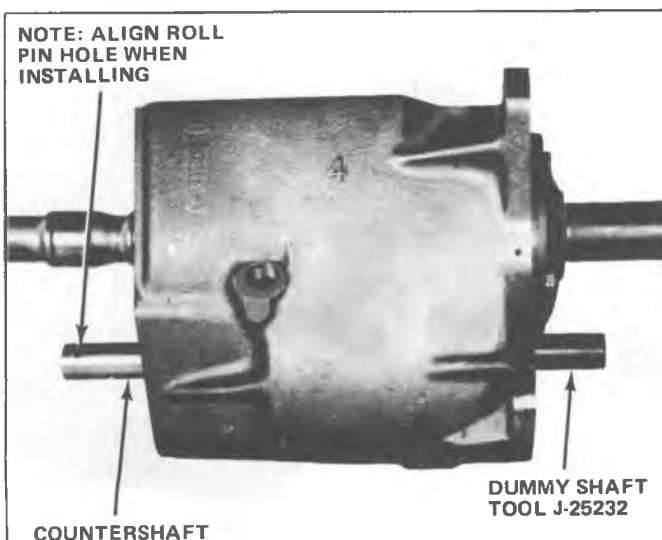


Fig. 7B-5B--Removing Countershaft

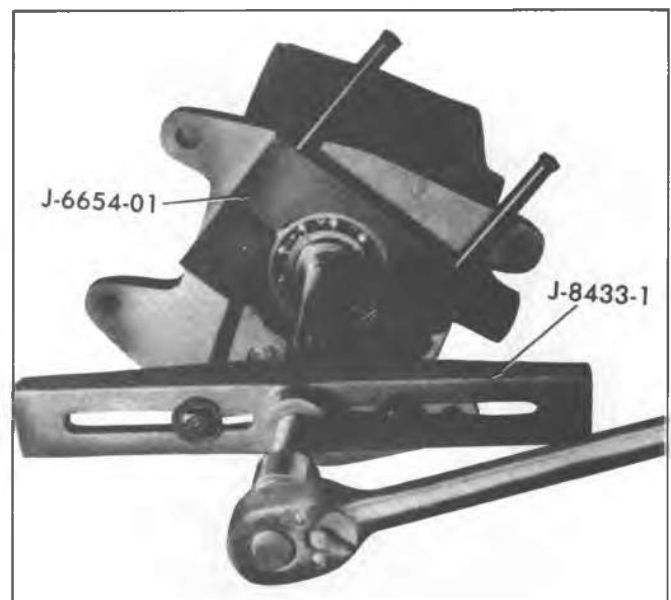


Fig. 7B-7B--Removing Front Bearing

13. Remove set screw from First-Reverse shifter fork and slide shift rail out rear of case.

14. Shift First-Reverse sleeve and gear all the way forward and rotate First-Reverse shifter fork upward and out of case. Remove First-Reverse Detent plug from case.

15. Shift Second-Third Shifter fork rearward to gain access to setscrew, remove setscrew, rotate shift rail 90° with pliers to clear bottom detent plug and remove interlock plug with magnet (Fig. 7B-9B).

16. Using a long thin punch (1/4 inch diameter or less) insert through access hole in rear case to drive out shift rail and expansion plug located in shift rail bore at front of case.

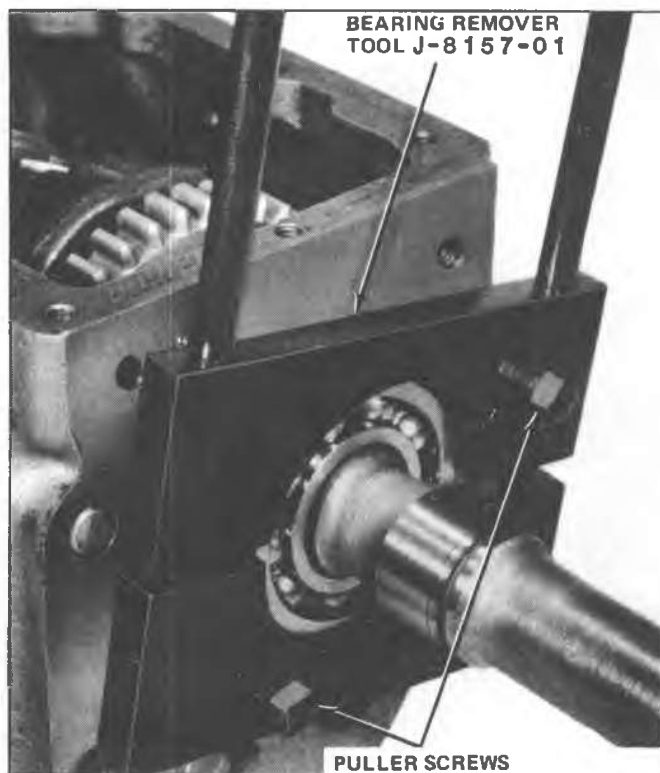


Fig. 7B-8B--Removing Rear Bearing

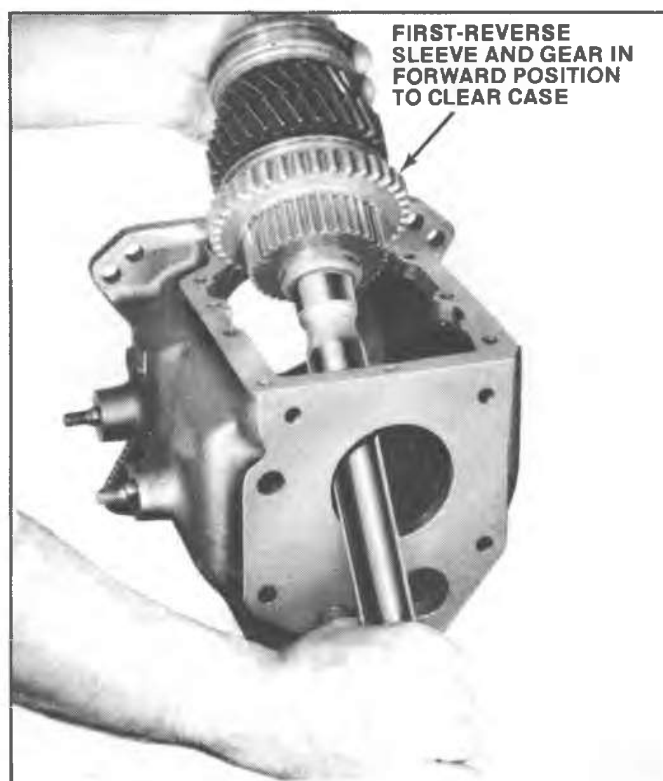


Fig. 7B-10B--Removing Output Shaft Assembly

17. Rotate second-third shifter fork upward and out of case.

18. Remove the bottom detent plug and short detent spring from case.

19. Separate clutch gear from output shaft and remove output shaft assembly (Fig. 7B-10B); tilt spline end of shaft downward and lift gear end upward and out of case.

NOTE: First and reverse sleeve and gear must pass through notch at right rear end of case.

20. Remove clutch gear through top of case.

21. Remove both shifter fork shafts (Fig. 7B-11B).

22. Remove countergear (with tool in place), thrust washers and roll pin.

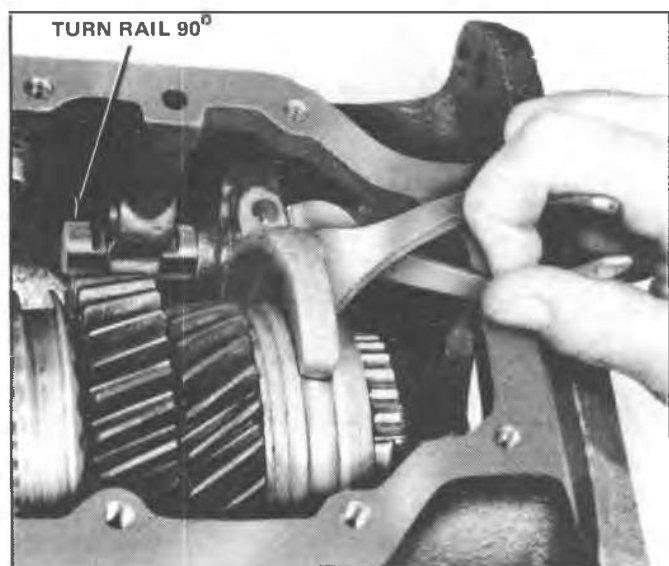


Fig. 7B-9B--Rotating Shift Rail

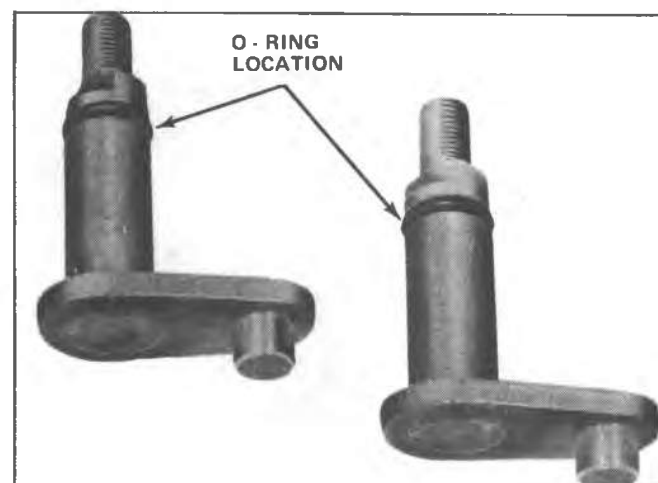


Fig. 7B-11B--Shift Fork Shafts

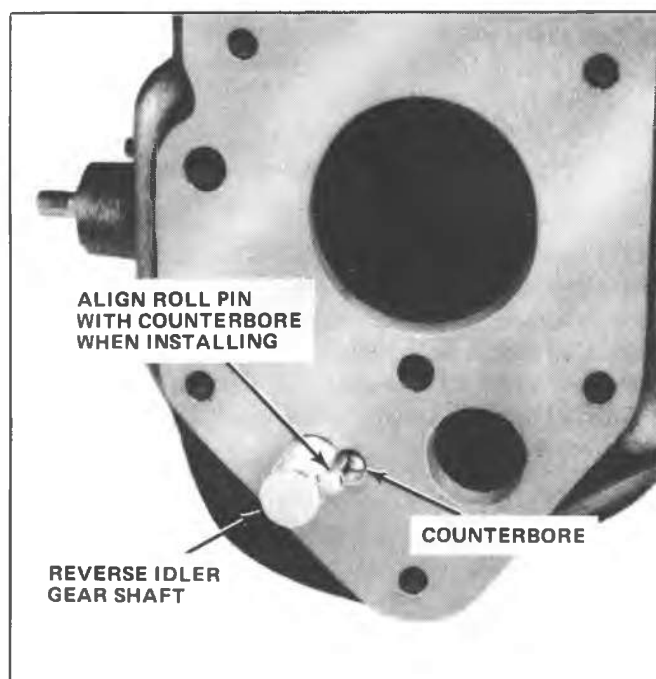


Fig. 7B-12B--Removing Reverse Idler Gear Shaft

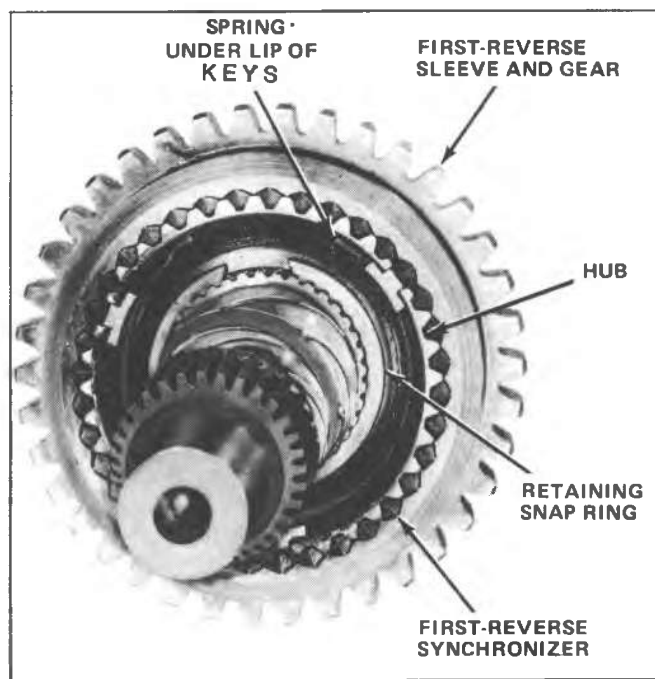


Fig. 7B-13B--First-Reverse Synchronizer Hub

23. Remove reverse idler gear and thrust washers by tapping shaft with hammer until end of idler gear shaft (end with roll pin) clears counterbore in rear of case and remove shaft (Fig. 7B-12B).

24. From the bottom of the case retrieve, clutch shaft roller bearing or countergear needle bearing that may have fallen into case during disassembly.

MAINSHAFT DISASSEMBLY

1. Remove snap ring from front of output shaft and remove Second-Third synchronizer assembly and second gear. Mark hub and sleeve for correct assembly.

2. Remove snap ring and tabbed thrust washer from shaft and remove first gear and blocking ring.

3. Remove First-Reverse hub retaining snap ring.

NOTE: Observe position of spring and keys before removal, also, mark hub and sleeve for correct assembly.

4. Remove sleeve and gear, spring and three keys from hub (Fig. 7B-13B).

5. Using an arbor press, remove hub from output shaft.

CLEANING AND INSPECTION

Transmission Case

1. Wash the transmission thoroughly inside and outside with cleaning solvent, then inspect the case for cracks.

2. Check the front and rear faces for burrs, and if present, dress them off with a fine mill file.

Front and Rear Bearings

1. Wash the front and rear ball bearings thoroughly in a cleaning solvent.

2. Blow out bearings with compressed air.

CAUTION: Do not allow the bearings to spin, turn them slowly by hand. Spinning bearings may damage the race and balls.

3. Make sure bearings are clean, then lubricate with light engine oil and check them for roughness by slowly turning the race by hand.

Bearing Rollers

All clutch gear and countergear bearing rollers should be inspected closely and replaced if they show wear. Inspect countershaft and reverse idler shaft at the same time, replace if necessary. Replace all worn washers.

Gears

1. Inspect all gears for excessive wear, chips, or cracks and replace any that are worn or damaged.

2. Check both clutch sleeves to see that they slide freely on their hubs.

REPAIRS

Synchronizer Keys and Spring Replacement

1. Mark hub and sleeve so they can be matched upon reassembly.

2. Push the hub from the sliding sleeve, the keys and the springs may be easily removed.

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

4. Place the three keys into hub slots and on top of spring, then push sleeve fully onto hub to engage keys in sleeve (Fig. 7B-14B).

5. Install remaining spring in exact same position as first spring. Ends of both spring must cover same slots in hub and not be staggered.

NOTE: Keys have small lip on each end. When correctly installed, this lip will fit over spring (Fig. 7B-14B).

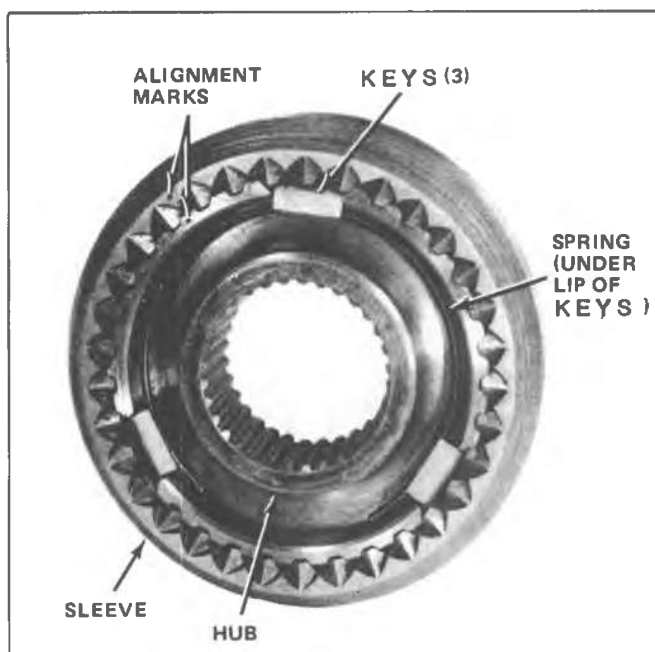


Fig. 7B-14B--Second-Third Synchronizer Assembly



Fig. 7B-16B--Installing Extension Housing Seal

Extension Oil Seal or Bushing

If bushing in rear of extension requires replacement, remove seal and use Tool J-5778 to drive bushing into extension housing (Fig. 7B-15B). Using the same tool, drive new bushing in from the rear. Coat I.D. of bushing and seal with transmission lubricant, then install new oil seal using Tool J-5154 (Fig. 7B-16B).

Clutch Bearing Retainer Oil Seal

If the lip seal in the retainer needs replacement; pry the old seal out and replace with a new seal using Installer Tool J-25233, or similar tool, until seal seats in its bore (Fig. 7B-17B).

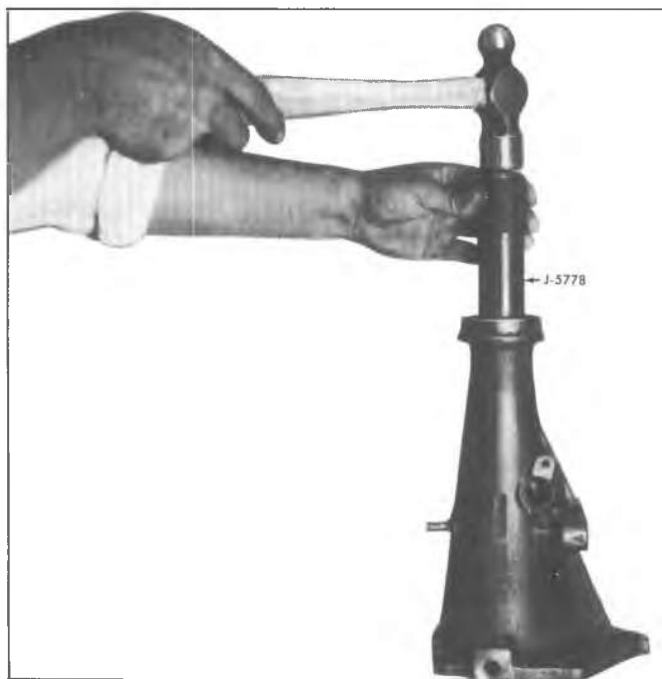


Fig. 7B-15B--Installing Extension Housing Bushing

ASSEMBLY OF MAINSHAFT

1. Install First-Reverse synchronizer hub on output shaft splines by hand. Slotted end of hub should face front of shaft. Use an arbor press to complete hub installation on shaft and install retaining snap ring (in most rearward groove).

CAUTION: *DO NOT attempt to drive hub onto shaft with hammer. Hammer blows will damage hub and splines.*

2. Install First-Reverse sleeve and gear half-way onto hub with gear end of sleeve facing rear of shaft. Index sleeve to hub with marks made during disassembly.



Fig. 7B-17B--Installing Clutch Bearing Retainer Seal

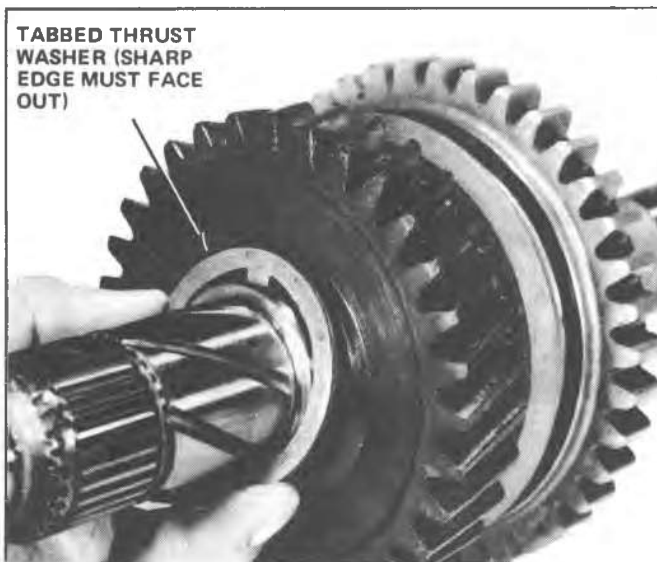


Fig. 7B-18B--Installing Tabbed Thrust Washer

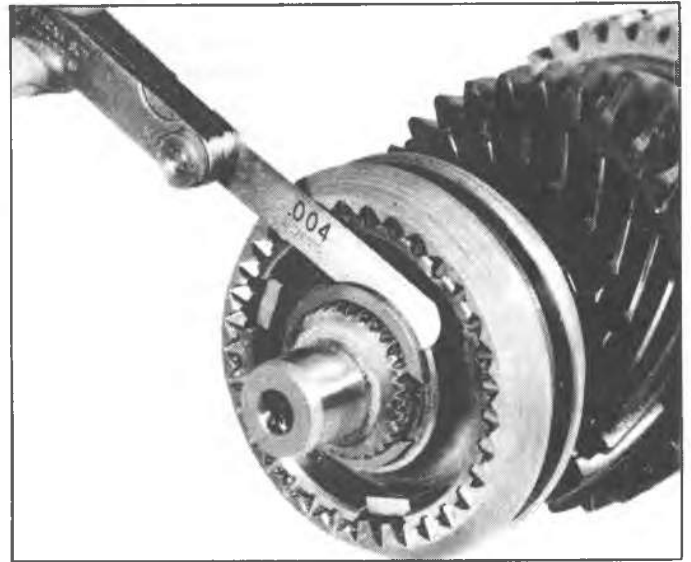


Fig. 7B-20B--Measuring Output Shaft End Play

3. Install spring in First-Reverse hub. (Make sure spring is bottomed in hub and covers all three key slots.) Position three synchronizer keys in hub, with small ends in hub slots and large ends inside hub. Push keys fully into hub so they seat on spring. Then slide First-Reverse sleeve and gear over keys until the keys engage in the synchronizer sleeve (Fig. 7B-13B).

4. Place first gear blocking ring on tapered surface of gear. Install First gear on output shaft. Rotate gear until notches in blocking ring engages keys in First-Reverse hub.

5. Install tabbed thrust washer (sharp edge facing out) and retaining snap ring on output shaft (Fig. 7B-18B).

6. Place second gear blocking ring on tapered surface of gear and install second gear on output shaft with tapered surface of gear facing front of output shaft (Fig. 7B-19B).

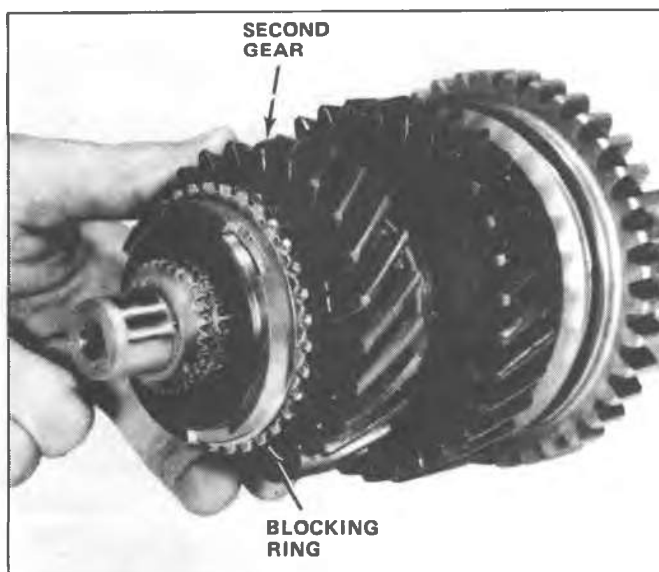


Fig. 7B-19B--Installing Second Gear

7. Install Second-Third synchronizer assembly with flat portion of synchronizer hub facing rearward on output shaft. Rotate Second gear until notches in blocking ring engages keys in Second-Third synchronizer assembly.

NOTE: It may be necessary to tap synchronizer with a plastic hammer to ease assembly.

8. Install retaining snap ring on output shaft and measure end play between snap ring and Second-Third synchronizer hub with feeler gauge (Fig. 7B-20B). End play should be 0.004 to 0.0014 inch. If end play exceeds 0.014 inch, replace thrust washer and all snap rings on output shaft assembly.

ASSEMBLY OF TRANSMISSION

1. Coat transmission case reverse idler gear thrust washer surfaces with Vaseline (or equivalent) and position thrust washer in case.

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

2. Install reverse idler gear with helical cut gear towards front of case. Align gear bore, thrust washers, case bores, and install reverse idler gear shaft from rear of case.

NOTE: Be sure to align and seat roll pin in shaft into counterbore in rear of case.

3. 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 washer.

4. Install shaft tool J-25232 in bore of countergear and load a row of needle bearing (25) in each end of gear. Use heavy grease or equivalent to hold them in place. Install one needle bearing retainer on each end of gear.

5. Position countergear thrust washer in case, use vaseline or equivalent to hold washers in place.

NOTE: Be sure to engage locating tabs on thrust washer in locating slots in case.

6. Insert countershaft into bore at rear of case just far enough to hold rear thrust washer from being displaced when the countergear is installed.

7. Align bore in countergear with countershaft and front thrust washer, then start countershaft into countergear.

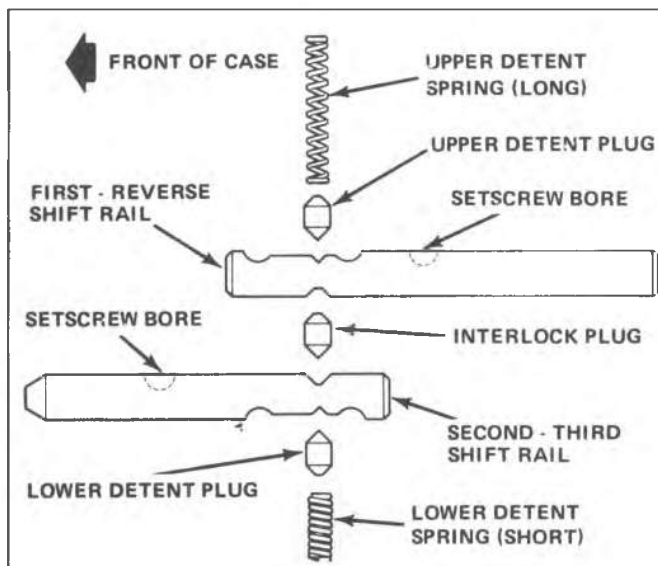


Fig. 7B-21B--Installation Sequence - Detent Plugs and Springs

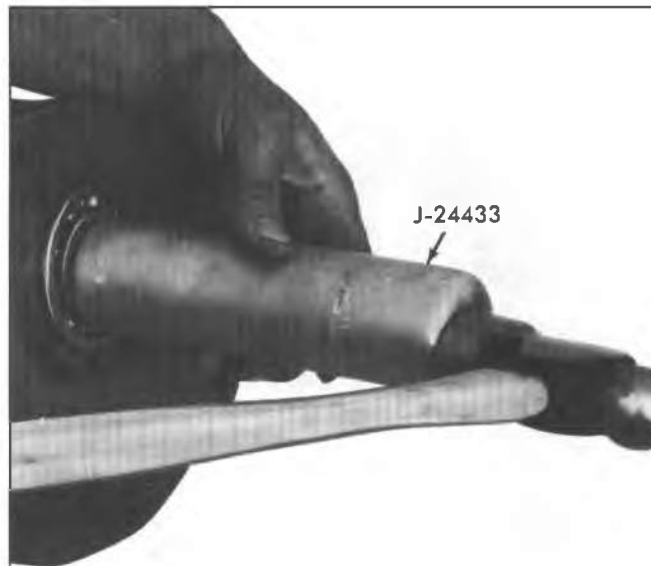


Fig. 7B-22B--Installing Front Bearing

Before countershaft is completely installed make sure that roll pin hole in countershaft is aligned with hole in case. When holes are aligned, tap countershaft into place, remove tool J-25232 (Fig. 7B-5B).

8. Measure countershaft end play by inserting feeler gauge between thrust washer and countergear. End play should be 0.004 to 0.018 inch. If end play exceeds 0.018 inch, remove gear and replace thrust washers.

9. After correct end play has been obtained, install roll pin in case.

10. Lower shorter detent spring in detent bore in case (Fig. 7B-21B). Allow spring to drop into place at bottom of Second-Third shift rail bore. Insert lower detent plug in detent bore on top of spring.

11. Install shifter fork shafts in their case bores with the pivot lug facing up.

NOTE: Shifter fork shafts are interchangeable.

12. Install (15) roller bearings in clutch shaft bore. Use vaseline (or equivalent) to hold bearings in place.

CAUTION: Do not use chassis grease or a similar "heavy" grease in clutch shaft bore. Heavy grease will plug the lubricant holes in the shaft and prevent proper lubrication of the roller bearing.

13. Install blocking ring on clutch gear and place clutch gear through top of case and position in front case bore.

14. Install output 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 notch in top of case when output shaft assembly is installed.

15. Assemble the clutch gear to the output shaft.

16. Move Second-Third sleeve rearward to Second gear position and position Second-Third shifter fork in groove of sleeve. Be sure setscrew hold in shifter fork is facing up.

NOTE: Second-Third fork is the smaller of the two shifter forks.

17. Engage Second-Third shifter fork in shifter fork shaft and insert Second-Third shift rail through front case bore and into shifter fork.

NOTE: Tapered end of rail faces front of case.

18. Turn shift rail until detent notches in rail face bottom

of case. Insert a phillips screwdriver in detent bore to depress lower detent plug and push shift rail into rear bore. Move rail inward until detent plug engages forward notch in shift rail (second gear position).

19. Secure fork to rail with setscrew and move second-third synchronizer to Neutral (centered) position.

20. Install interlock plug in detent bore. With Second-Third synchronizer in Neutral position, top of plug will be slightly below surface of First-Reverse shift rail bore.

21. Move first reverse synchronizer forward to first gear position. Place First-Reverse shifter fork in groove of sleeve. Be sure setscrew hole in fork is facing up. Rotate fork into position in case, engage fork in shifter fork shaft, and insert First-Reverse shift rail through rear case bore and shifter fork.

22. Turn shift rail until detent notches in rail face

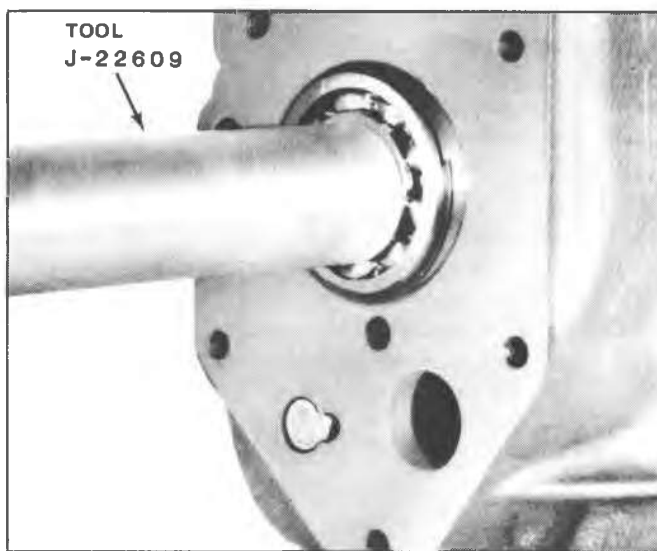


Fig. 7B-23B--Installing Rear Bearing



Fig. 7B-24B--Installing Speedometer Retainer and Gear

upward. Move rail inward until setscrew hole in fork and setscrew bore in shift rail are aligned. Secure fork to rail with setscrew and place First Reverse sleeve and gear into Neutral (centered) position (Fig. 7B-20B).

23. Install large snap ring on front bearing.

24. Install front bearing on clutch gear shaft by hand drive bearing on clutch gear shaft using tool J-24433 (Fig. 7B-22B).

25. Install smaller snap ring on clutch gear shaft.

26. Position bearing retainer gasket on case. Be sure cut-out in gasket is aligned with oil return hole in case.

27. Install front bearing retainer and tighten attaching bolts to 30 to 36 foot-pounds of torque. Be sure to index cap to case with alignment marks, and that oil return slot in cap is aligned with oil return hole in case.

28. Install large snap ring on rear bearing.

29. Install rear bearing on output shaft by hand. Drive bearing onto shaft and into case with tool J-22609, make sure snap ring groove is facing rear of shaft (Fig. 7B-23B).

30. Install smaller snap ring on output shaft to hold rear bearing in place.

31. Engage speedometer gear retainer in hole provided in output shaft, with retainer loop forward, slide speedometer gear over output shaft and into position (Fig. 7B-24B).

32. Position extension housing gasket on case and install extension housing to case. Tighten bolts to 42 to 50 foot pounds torque.

33. Install expansion plug in Second-Third shift rail bore in front of case. Be sure plug is fully seated in bore and is approximately 1/16 inch below front face of case.

34. Install upper detent plug in detent bore, then install long detent spring on top of plug. Install transmission fill plug and tighten 10 to 20 foot pounds torque.

35. Install top cover and gasket on case and secure with attaching bolts. Tighten bolts 20 to 25 foot pounds torque.

36. If removed, install backup light switch in extension housing and TCS switch in case. Tighten switches to 15 to 20 foot pounds torque.

3-SPEED (MUNCIE) 83MM TRANSMISSION

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DISASSEMBLY OF TRANSMISSION (Fig. 7B-1C)

1. Remove side cover attaching bolts, side cover assembly, gasket and shift forks.

2. Remove drive gear bearing retainer bolts, retainer and gasket.

3. Remove drive gear bearing to gear stem snap ring, then remove drive gear bearing by pulling outward on drive gear until a screw driver or other suitable tool can be inserted between bearing, large snap ring and case to complete removal. The drive gear bearing is a slip fit on the gear and into the case bore. (This provides clearance for removal of drive gear and mainshaft assembly.)

4. Remove extension to case attaching bolts.

5. Rotate extension to left until groove in extension housing flange lines up with the reverse idler shaft. Using a drift or other suitable tool, drive reverse idler shaft out of gear and case (Fig. 7B-2C).

6. Remove drive gear, mainshaft and extension assembly

together through case rear opening. Remove reverse idler gear from case.

7. Remove drive gear from mainshaft. Remove pilot bearings.

8. Using snap ring pliers, expand the snap ring in the extension which retains the mainshaft rear bearing (Fig. 7B-3C). Tap gently on end mainshaft and remove extension from mainshaft.

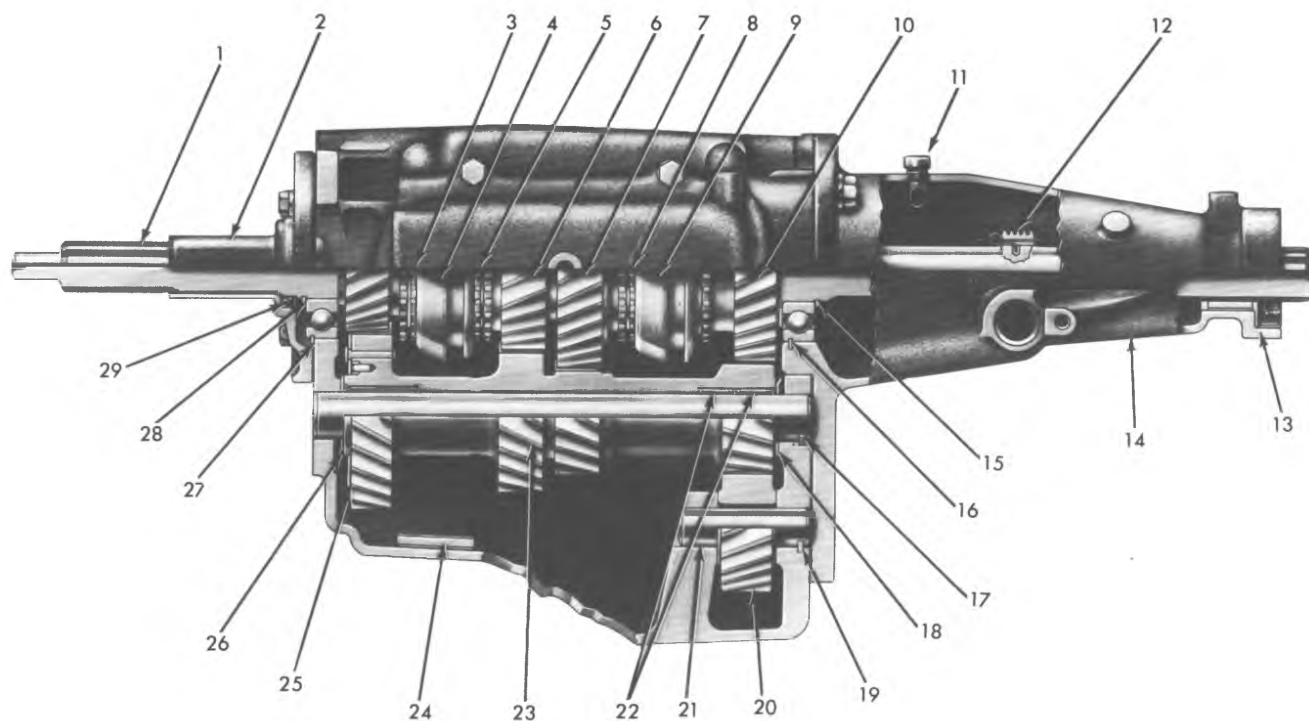
9. Using a brass drift, drive countergear shaft and woodruff key from case.

DISASSEMBLY OF MAINSHAFT (Fig. 7B-4C)

1. Depress speedometer gear retaining clip and slide gear from mainshaft.

2. Remove rear bearing snap ring from mainshaft groove.

3. Support reverse gear with press plates and press on rear of mainshaft to remove reverse gear, thrust washer and rear bearing from shaft.



- | | | | |
|--------------------------------|--------------------------------|---|--|
| 1. Drive Gear | 8. 1st Speed Synchronizer Ring | 15. Rear Bearing-to-Shaft Snap Ring | 21. Reverse Idler Shaft |
| 2. Drive Gear Bearing Retainer | 9. 1st Reverse Clutch Assy. | 16. Rear Bearing-to-Extension Snap Ring | 22. Countergear Bearings |
| 3. 3rd Speed Synchronizer Ring | 10. Reverse Gear | 17. Countergear Woodruff Key | 23. Countergear |
| 4. 2nd-3rd Speed Clutch Assy. | 11. Vent | 18. Thrust Washer | 24. Case Magnet |
| 5. 2nd Speed Synchronizer Ring | 12. Speedometer Gear and Clip | 19. Reverse Idler Shaft Woodruff Key | 25. Anti-Lash Plate Assy. (Pass. Only) |
| 6. 2nd Speed Gear | 13. Rear Extension Seal | 20. Reverse Idler Gear | 26. Thrust Washer |
| 7. 1st Speed Gear | 14. Rear Extension | | 27. Drive Gear Bearing |
| | | | 28. Snap Ring |
| | | | 29. Drive Gear Retainer Lip Seal |

Fig. 7B-1-C-3-Speed (Muncie) 83mm Transmission Cross Section



Fig. 7B-2C--Removing Reverse Idler Shaft

CAUTION: When pressing rear bearing be careful to center gear, washers, and bearing on shaft.

4. Remove 1st and reverse sliding clutch hub snap ring from the mainshaft.

5. Support 1st gear with press plates and push on rear of mainshaft to remove the clutch assembly, blocker ring and 1st speed gear.

CAUTION: Exercise care to prevent distortion of snap rings during expansion.

6. Using snap ring pliers, remove the 2nd and 3rd speed sliding clutch hub snap ring from mainshaft.

7. Support 2nd speed gear with press plates and press on front of mainshaft to remove clutch assembly, second speed blocker ring and second speed gear from shaft.

This completes the disassembly of mainshaft.

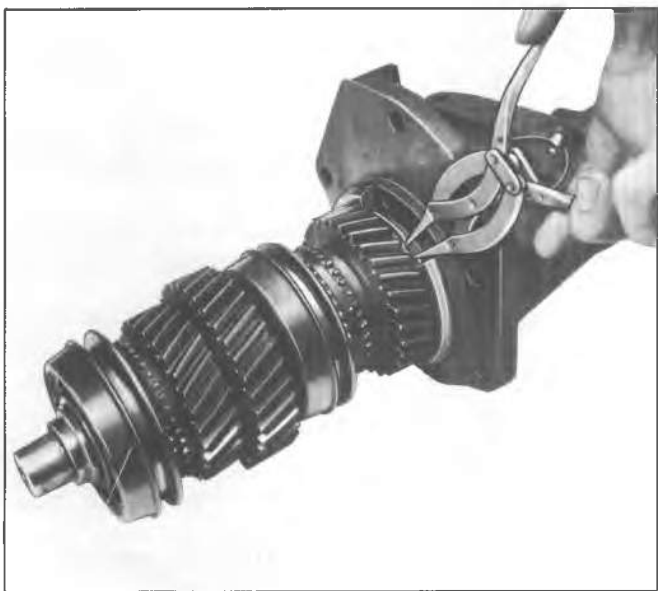


Fig. 7B-3C--Removing Rear Extension From Mainshaft

CLEANING AND INSPECTION

Transmission Case

1. Wash the transmission thoroughly inside and outside with cleaning solvent, then inspect the case for cracks.

2. Check the front and rear faces for burrs, and if present, dress them off with a fine mill file.

3. Check bearing bores in case and, if damaged, replace case.

Front and Rear Bearings

1. Wash the front and rear ball bearings, thoroughly in a cleaning solvent.

2. Blow out bearings with compressed air.

CAUTION: Do not allow the bearings to spin, turn them slowly by hand. Spinning bearings may damage the race and balls.

3. Make sure bearings are clean, then lubricate with light engine oil and check them for roughness by slowly turning the race by hand.

Bearing Rollers

All drive gear and countergear bearing rollers should be inspected closely and replaced if they show wear. Inspect counter shaft and reverse idler shaft at the same time, replace if necessary. Replace all worn washers.

Gears

1. Inspect all gears for excessive wear, chips or cracks and replace any that are worn or damaged.

2. Inspect reverse gear bushing and if worn or damaged replace the entire gear.

NOTE: Reverse gear bushing is not serviced separately.

3. Check both clutch sleeves to see that they slide freely on their hubs.

Reverse Idler Gear Bushing

The bushing used in the idler gear is pressed into the gear and finish bored in place. This insures the positive alignment of the bushing and shaft as well as proper meshing of the gears. Because of the high degree of accuracy to which these parts are machined, the bushing is not serviced separately.

REPAIRS

Clutch Keys and Springs Replacement

NOTE: The clutch hubs and sliding sleeves are a selected assembly and should be kept together as originally assembled, but the keys and two springs may be replaced if worn or broken.

1. Mark hub and sleeve so they can be matched upon reassembly.

2. Push the hub from the sliding sleeve, the keys and the springs may be easily removed.

3. Place the three keys and two springs in position (one on each side of hub), so all three keys are engaged by both springs (Fig. 7B-5C). Slide the sleeve onto the hub aligning the marks made before disassembly.

Extension Oil Seal or Bushing

If bushing in rear of extension requires replacement, remove seal and use Tool J-5778 to drive bushing into extension housing. Using the same tool, drive new bushing in from the rear. Coat I.D. of bushing and seal with transmission lubricant, then install new oil seal using Tool J-5154.

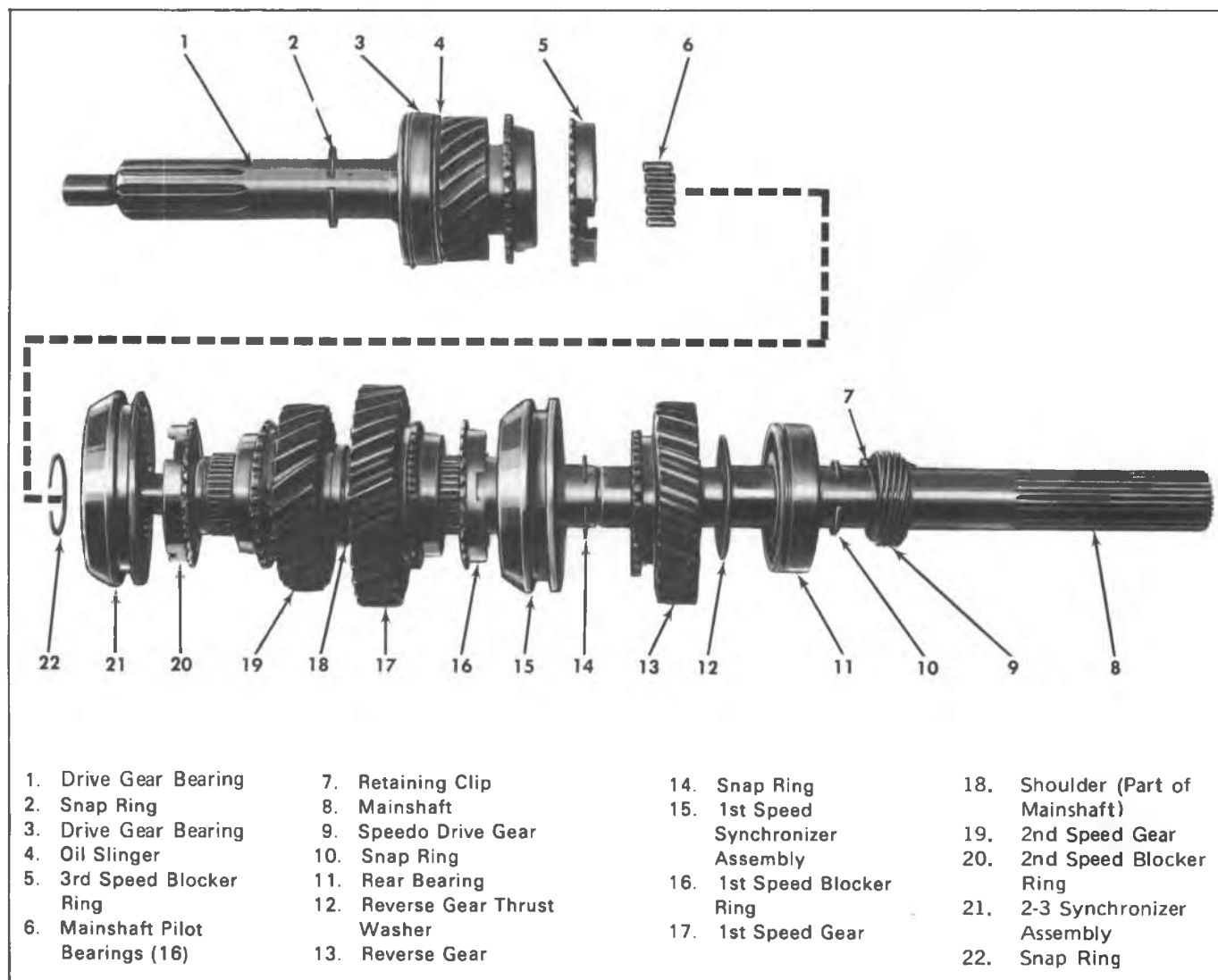


Fig. 7B-4C—Drive Gear and Mainshaft Assembly

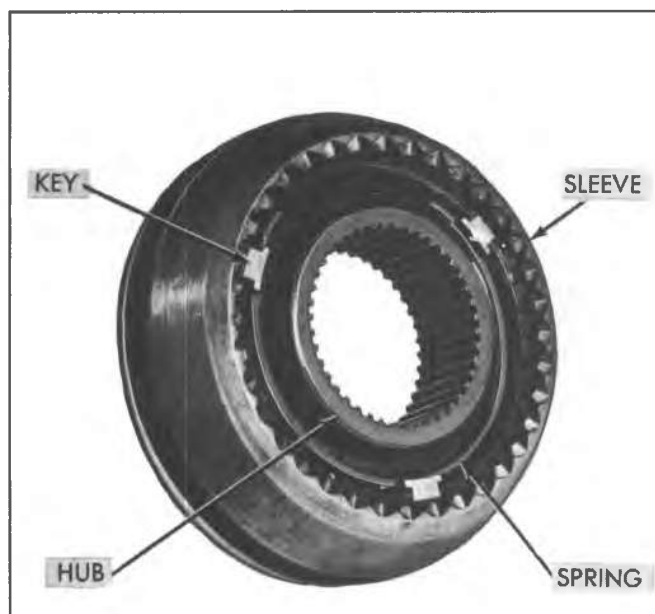


Fig. 7B-5C—Synchronizer Assembly

Clutch Bearing Retainer Oil Seal

If the lip seal in the retainer needs replacement; pry the old seal out and replace with a new seal using Installer Tool J-23096 or similar tool, until seal seats in its bore.

ASSEMBLY OF MAINSHAFT (Fig. 7B-4C)

Turn the front of the mainshaft upward. Install the following components on the mainshaft:

1. Install the second speed gear with clutching teeth upward; the rear face of the gear will butt against the flange on the mainshaft.

2. Install a blocking ring with clutching teeth downward over the synchronizing surface of the second speed gear. All three blocker rings used in this transmission are identical.

3. Install the second and third synchronizer assembly with the fork slot downward; press it onto splines on the mainshaft until it bottoms out. Both synchronizer assemblies are identical but assembled differently. The 2nd-3rd speed hub and sleeve is assembled with the fork slot in the sleeve toward the thrust face of the hub. The 1st-reverse hub and sleeve is assembled with the fork slot in the sleeve opposite the thrust face (Fig. 7B-4C).

CAUTION: Be sure the notches of the blocker ring

align with the keys of the synchronizer assembly.

4. Install synchronizer hub to mainshaft snap ring. Both synchronizer snap rings are identical.

Turn the rear of the mainshaft upward. Install the following components on the mainshaft:

5. Install the first speed gear with clutching teeth upward; the front face of the gear will butt against the flange on the mainshaft.

6. Install a blocker ring with clutching teeth downward over synchronizing surface of the first speed gear.

7. Install the first and reverse synchronizer assembly with fork slot up; press it onto splines on the mainshaft.

CAUTION: *Be sure the notches of the blocker ring align with the keys of the synchronizer assembly and that both synchronizer sleeves face the front of the mainshaft.*

8. Install synchronizer hub to mainshaft snap ring.

9. Install reverse gear with clutching teeth downward.

10. Install reverse gear steel thrust washer (align flats).

11. Install rear ball bearing with snap ring slot downward; press onto mainshaft.

12. Install rear bearing to mainshaft snap ring.

13. Install speedometer drive gear and retaining clip.

This completes the assembly of the mainshaft.

ASSEMBLY OF TRANSMISSION (Fig. 7B-6C)

1. Load a double row of roller bearings (29) and the bearing thrust washers in the countergear (Fig. 7B-6C). Use heavy grease to hold them in place.

2. Place countergear assembly through case rear opening along with a tanged thrust washer (tang away from gear) at each end and install countergear shaft and woodruff key from rear of case. End of shaft must be flush with case.

NOTE: Be sure countershaft picks up both thrust washers and that the tangs are aligned with their notches in the case.

3. Position reverse idler gear in case. Do not install shaft until mainshaft is in place.

4. Using snap ring pliers, expand the snap ring in the extension and assemble extension over rear of mainshaft and onto rear bearing. Seat snap ring in rear bearing groove (Fig. 7B-3C).

5. Load the mainshaft pilot bearings (16) into the drive gear cavity and assemble the 3rd speed blocker ring onto the drive gear clutching surface with its teeth toward the gear.

6. Pilot the drive gear, pilot bearings and 3rd speed blocker ring assembly over the front of the mainshaft assembly. Do not assemble bearing to gear yet.

NOTE: Be sure the notches in the blocker ring align with the keys in the 2-3 synchronizer assembly.

7. Place extension to case gasket on extension holding it in place with grease and, from the rear of case, assemble the clutch gear, mainshaft and extension to case as an assembly.

NOTE: Be sure the clutch gear engages the teeth of the countergear anti-lash plate and that the oil slinger is in place on the clutch gear.

8. Rotate extension and install reverse idler shaft and woodruff key.

9. Install extension to case retaining bolts.

NOTE: Apply sealer to all through bolts.

10. Install front bearing outer snap ring to bearing and install bearing on stem of clutch gear and into front case bore.

11. Install snap ring to clutch gear stem, and clutch gear bearing retainer and gasket to case.

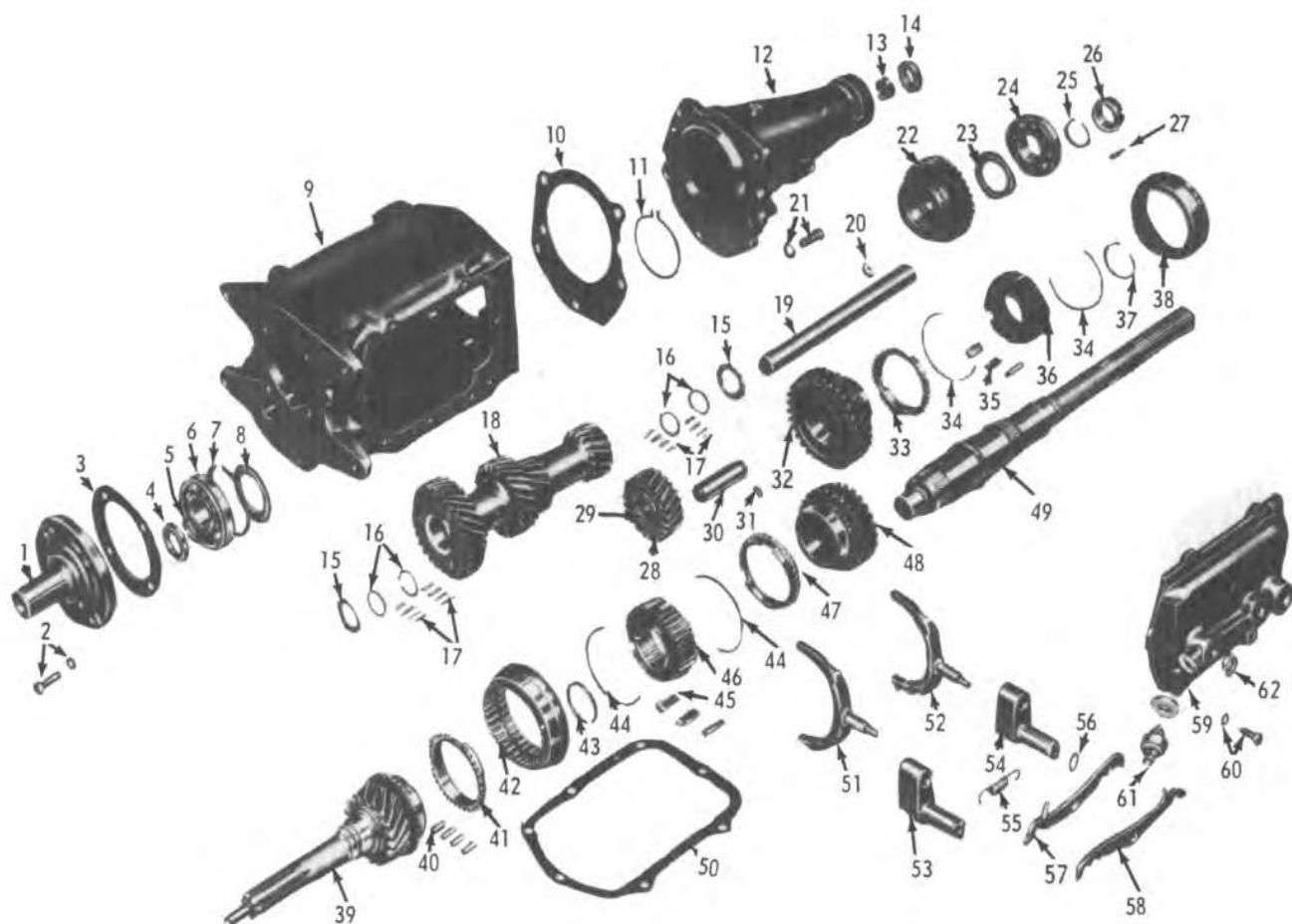
NOTE: The retainer oil return hole should be at the bottom.

12. Shift synchronizer sleeves to neutral positions and install cover, gasket and fork assembly to case. Be sure forks align with their synchronizer sleeve grooves.

13. Tighten all bolts to specified torque.

NOTE: Apply sealer to all through bolts.

14. Rotate clutch gear and shift transmission through gears to check free rotation of gears.



- | | | | |
|---|------------------------------|---|--|
| 1. Bearing Retainer | 18. Countergear | 35. Synchronizer Keys | 50. Gasket |
| 2. Bolt and Lock Washer | 19. Countershaft | 36. 1st and Reverse Synchronizer Hub Assembly | 51. 2nd and 3rd Shifter Fork |
| 3. Gasket | 20. Woodruff Key | 37. Snap Ring | 52. 1st and Reverse Shifter Fork |
| 4. Oil Seal | 21. Bolt (Extension-to-Case) | 38. 1st and Reverse Synchronizer Collar | 53. 2-3 Shifter Shaft Assembly |
| 5. Snap Ring (Bearing-to-Main Drive Gear) | 22. Reverse Gear | 39. Main Drive Gear | 54. 1st and Reverse Shifter Shaft Assembly |
| 6. Main Drive Gear Bearing | 23. Thrust Washer | 40. Pilot Bearings | 55. Spring |
| 7. Snap Ring Bearing | 24. Rear Bearing | 41. 3rd Speed Blocker Ring | 56. O-Ring Seal |
| 8. Oil Slinger | 25. Snap Ring | 42. 2nd and 3rd Synchronizer Collar | 57. 1st and Reverse Detent Cam |
| 9. Case | 26. Speedometer Drive Gear | 43. Snap Ring | 58. 2nd and 3rd Detent Cam |
| 10. Gasket | 27. Retainer Clip | 44. Synchronizer Key Spring | 59. Side Cover |
| 11. Snap Ring (Rear Bearing-to-Extension) | 28. Reverse Idler Gear | 45. Synchronizer Keys | 60. Bolt and Lock Washer |
| 12. Extension | 29. Reverse Idler Bushing | 46. 2nd and 3rd Synchronizer Hub Ring | 61. TCS Switch and Gasket |
| 13. Extension Bushing | 30. Reverse Idler Shaft | 47. 2nd Speed Blocker Ring | 62. Lip Seal |
| 14. Oil Seal | 31. Woodruff Key | 48. 2nd Speed Gear | |
| 15. Thrust Washer | 32. 1st Speed Gear | 49. Mainshaft | |
| 16. Bearing Washer | 33. 1st Speed Blocker Ring | | |
| 17. Needle Bearings | 34. Synchronizer Key Spring | | |

Fig. 7B-6C--3-Speed (Muncie) 83mm Transmission Exploded View

4-SPEED (SAGINAW) 76MM TRANSMISSION

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DISASSEMBLY OF TRANSMISSION (Fig. 7B-1J)

1. Remove side cover attaching bolts and remove side cover assembly.
2. Remove clutch gear bearing retainer bolts, retainer and gasket.
3. Remove clutch gear bearing to gear stem snap ring, then remove clutch gear bearing by pulling outward on clutch gear until a screwdriver or other suitable tool can be inserted between bearing, large snap ring and case to complete removal (Fig. 7B-2J). The clutch gear bearing is a slip fit on the gear and into the case bore. This provides clearance for removal of clutch gear and mainshaft assembly.
4. Remove extension to case attaching bolts.
5. Remove clutch gear, mainshaft and extension assembly together through the rear case opening (Fig. 7B-3J).
6. Using snap ring pliers, expand the snap ring in the extension which retains the mainshaft rear bearing (Fig. 7B-4J) and remove the extension.
7. Using J-22246 at the front of the countershaft, drive the shaft and its woodruff key out the rear of the case. Tool J-22246 will now hold the roller bearings in position within the counter gear bore. Remove the gear and bearings (Fig. 7B-5J).
8. Remove reverse idler gear stop ring. Use a long drift or punch through the front bearing case bore and drive the reverse idler shaft and woodruff key through the rear of the case (Fig. 7B-6J).

DISASSEMBLY OF MAINSHAFT

1. Using snap ring pliers, remove the 3rd and 4th speed sliding clutch hub snap ring from mainshaft and remove clutch assembly, third gear blocker ring and third speed gear from front of mainshaft (Fig. 7B-7J).
2. Depress speedometer retaining clip and slide gear from mainshaft.
3. Remove rear bearing snap ring from mainshaft groove (Fig. 7B-8J).
4. Support first gear with press plates and press on rear of mainshaft to remove first gear, thrust washer, spring washer and rear bearing from rear of mainshaft (Fig. 7B-9J).
5. Remove the 1st and 2nd sliding clutch hub snap ring from the mainshaft and remove the clutch assembly, 2nd speed blocker ring and 2nd speed gear from the rear of the mainshaft (Fig. 7B-10J).

CLEANING AND INSPECTION

Transmission Case

1. Wash the transmission thoroughly inside and outside with cleaning solvent, then inspect the case for cracks.
2. Check the front and rear faces for burrs, and if present, dress them off with a fine mill file.

Front and Rear Bearings

1. Wash the front and rear ball bearings thoroughly in a cleaning solvent.

2. Blow out bearings with compressed air.

CAUTION: Do not allow the bearings to spin, turn them slowly by hand. Spinning bearings may damage the race and balls.

3. Make sure bearings are clean, then lubricate with light engine oil and check them for roughness by slowly turning the race by hand.

Bearing Rollers

All clutch gear and countergear bearing rollers should be inspected closely and replaced if they show wear. Inspect counter shaft and reverse idler shaft at the same time, replace if necessary. Replace all worn washers.

Gears

1. Inspect all gears for excessive wear, chips, or cracks and replace any that are worn or damaged.
2. Check both clutch sleeves to see that they slide freely on their hubs.

Reverse Idler Gear Bushings

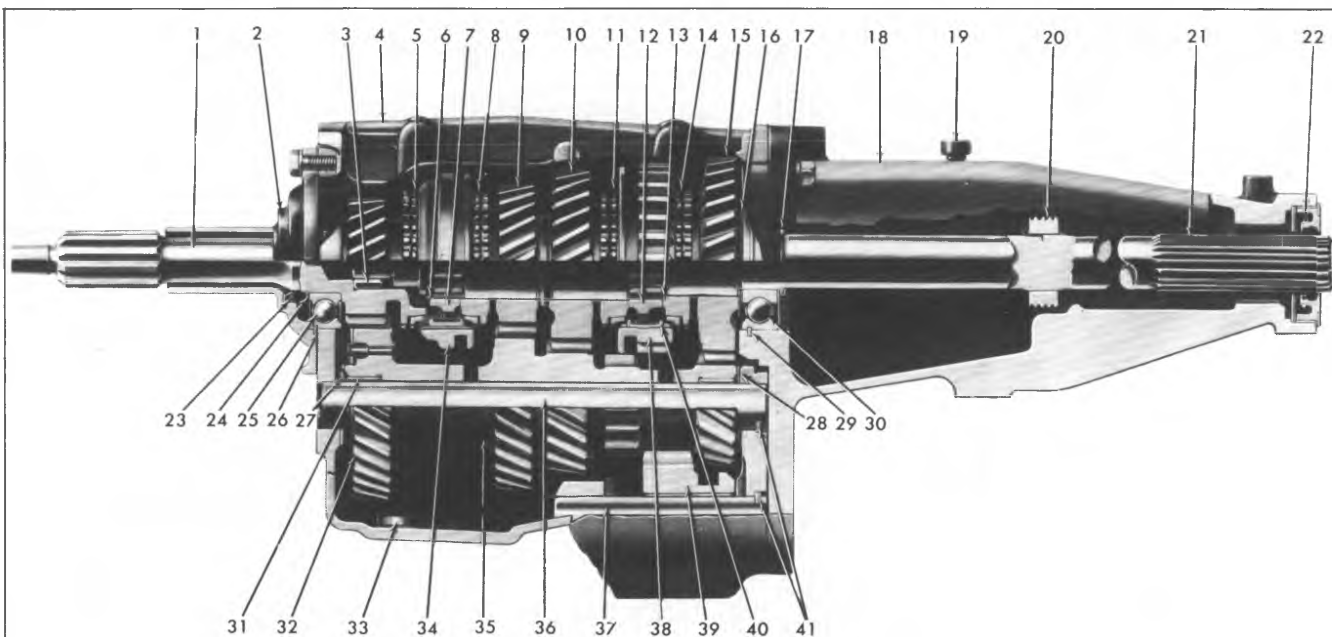
The bushing used in the idler gear is pressed into the gear and finish bored in place. This insures the positive alignment of the bushing and shaft as well as proper meshing of the gears. Because of the high degree of accuracy to which these parts are machined, the bushing is not serviced separately.

REPAIRS

Clutch Keys and Springs

NOTE: The clutch hubs and sliding sleeves are a selected assembly and should be kept together as originally assembled, but the keys and two springs may be replaced if worn or broken.

1. Mark hub and sleeve so they can be matched upon reassembly.



- | | | | | |
|---------------------------|--|-------------------------------------|------------------------------------|--|
| 1. Drive Gear | 11. 2nd Speed Blocker Ring | 18. Extension | 27. Thrust Washer-Front | 35. Countergear Assembly |
| 2. Bearing Retainer | 12. 1-2 Speed Synch. Hub | 19. Vent | 28. Thrust Washer-Rear | 36. Counter Shaft |
| 3. Pilot Bearings | 13. 1-2 Speed Synch. Snap Ring | 20. Speedometer Drive Gear and Clip | 29. Snap Ring-Bearing to Extension | 37. Reverse Idler Shaft |
| 4. Case | 14. 1st Speed Blocker Ring | 21. Mainshaft | 30. Rear Bearing | 38. 1-2 Speed Synch. Sleeve and Reverse Gear |
| 5. 4th Speed Blocker Ring | 15. First Gear | 22. Rear Oil Seal | 31. Countergear Roller Bearings | 39. Reverse Idler Gear (Sliding) |
| 6. 4-3 Synch. Snap Ring | 16. Reverse Gear Thrust and Spring Washers | 23. Retainer Oil Seal | 32. Anti-Lash Plate Assembly | 40. Clutch Key |
| 7. 4-3 Synch. Hub | 17. Snap Ring-Bearing to Mainshaft | 24. Snap Ring-Bearing to Gear | 33. Magnet | 41. Woodruff Key |
| 8. 3rd Speed Blocker Ring | | 25. Drive Gear Bearing | 34. 4-3 Synch. Sleeve | |
| 9. 3rd Speed Gear | | 26. Snap Ring-Bearing to Case | | |
| 10. 2nd Speed Gear | | | | |

Fig. 7B-1J-4-Speed 76mm (Saginaw) Transmission Cross Section

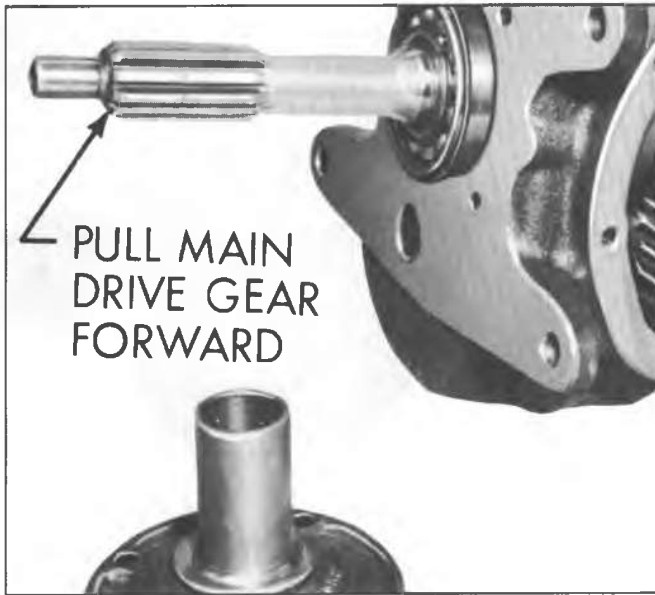


Fig. 7B-2J--Removing Clutch Gear Bearing



Fig. 7B-5J--Removing Countershaft



Fig. 7B-3J--Removing Clutch Gear and Mainshaft



Fig. 7B-6J--Removing Reverse Idler Gear Shaft

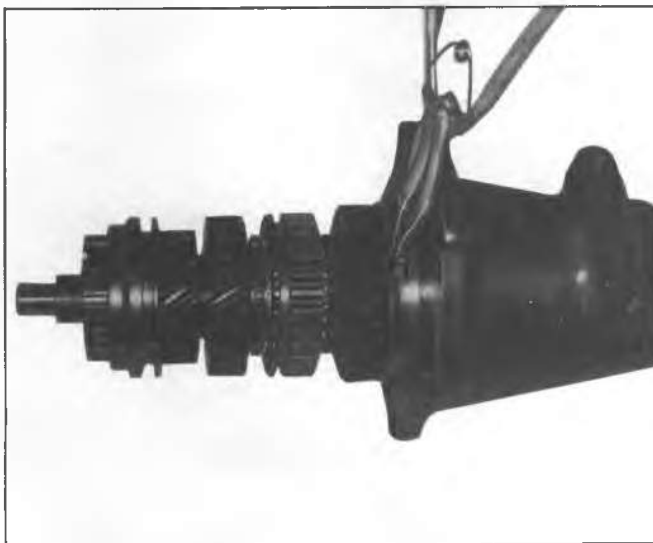


Fig. 7B-4J--Removing Extension to Rear Bearing Snap Ring



Fig. 7B-7J--Removing 3rd and 4th Synchronizer Snap Ring



Fig. 7B-8J--Rear Bearing to Mainshaft Snap Ring

2. Push the hub from the sliding sleeve, the keys and the springs may be easily removed.

3. Place the three keys and two springs in position (one on each side of hub), so all three keys are engaged by both springs (Fig. 7B-11J). The tanged end of each synchronizer spring should be installed into different key cavities on either side. Slide the sleeve onto the hub aligning the marks made before disassembly.



Fig. 7B-9J--Removing Rear Bearing and 1st Speed Gear

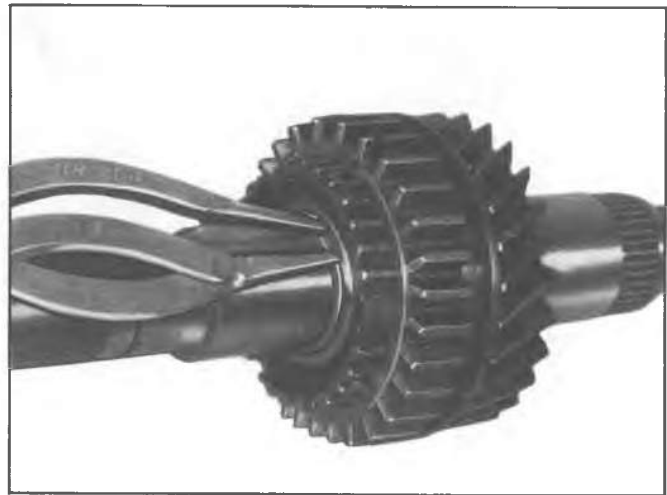


Fig. 7B-10J--Removing 1st and 2nd Synchronizer Snap Ring

NOTE: A groove around the outside of the synchronizer hub identifies the end that must be opposite the fork slot in the sleeve when assembled. This groove indicates the end of the hub with a greater recess depth.

Extension Oil Seal or Bushing

If bushing in rear of extension requires replacement, remove seal and use Tool J-5778 to drive bushing into extension housing (Fig. 7B-12J). Using the same tool, drive new bushing in from the rear. Coat I.D. of bushing and seal with transmission lubricant, then install new oil seal using Tool J-5154 (Fig. 7B-13J).

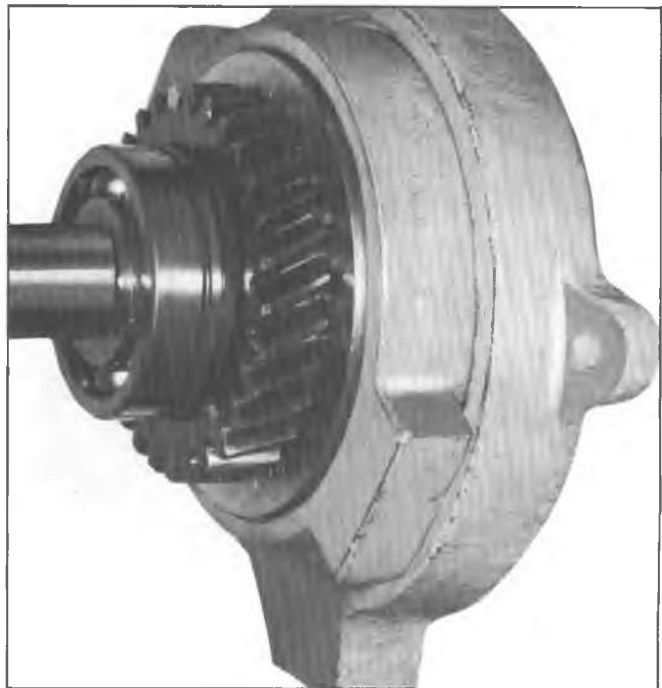


Fig. 7B-11J--3-4 Synchronizer Assembly

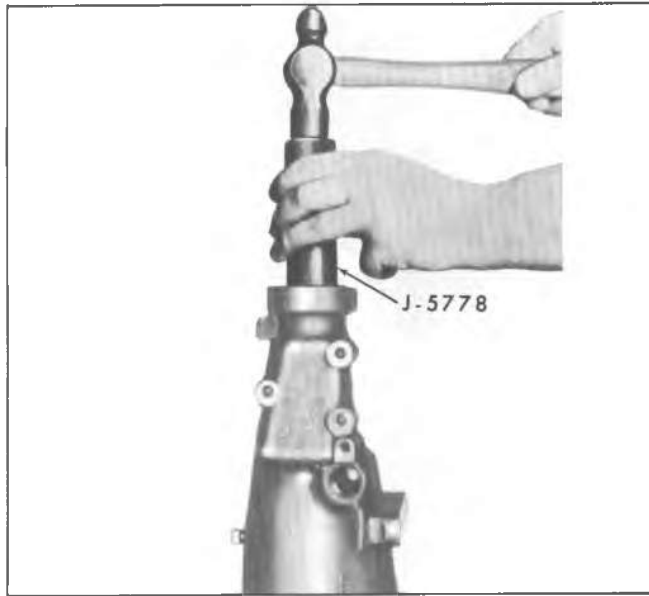


Fig. 7B-12J--Extension Bushing Replacement



Fig. 7B-14J--Removing Bearing Retainer Oil Seal

Clutch Gear Bearing Retainer Oil Seal

If the lip seal in the retainer needs replacement; pry the oil seal out and replace with a new seal using Tool J-23096 until seal seats in its bore (Figs. 7B-14J and 7B-15J).

NOTE: Lip of seal must face rear of bearing retainer.

ASSEMBLY OF MAINSHAFT (Fig. 7B-16J)

Turn the front of the mainshaft upward. Install the following components on the mainshaft:

1. Install the third speed gear with clutching teeth upward; the rear face of the gear will butt against the flange on the mainshaft.
2. Install a blocking ring with clutching teeth downward over the synchronizing surface of the third speed gear. All four blocker rings used in this transmission are identical.
3. Install the 3rd and 4th synchronizer assembly with the fork slot downward on the mainshaft until it bottoms out against flange.

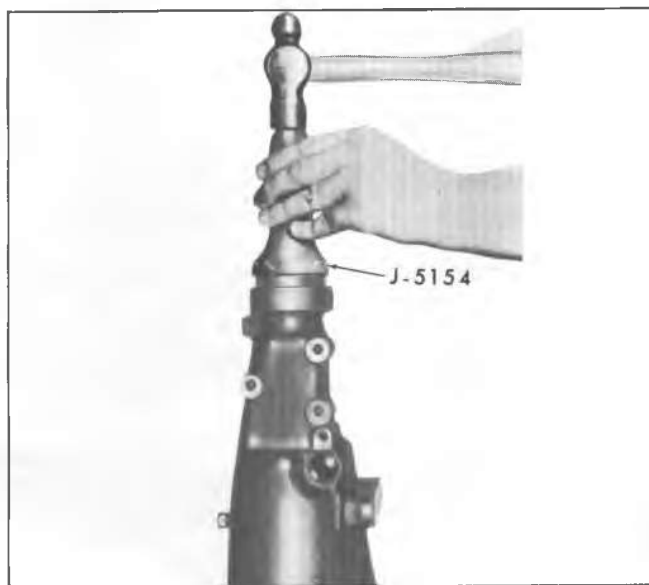


Fig. 7B-13J--Installing Extension Oil Seal

CAUTION: Be sure the notches of the blocker ring align with the keys at the synchronizer assembly.

4. Install synchronizer hub to mainshaft snap ring (Fig. 7B-7J). Both synchronizer snap rings are identical. Turn the rear of the mainshaft upward. Install the following components on the mainshaft:

5. Install the second speed gear with clutching teeth upward; the front face of the gear will butt against the flange on the mainshaft.
6. Install a blocker ring with clutching teeth downward over synchronizing surface of the second speed gear.
7. Install the first and second synchronizer assembly with fork slot downwards.
8. Install synchronizer hub to mainshaft snap ring (Fig. 7B-10J).

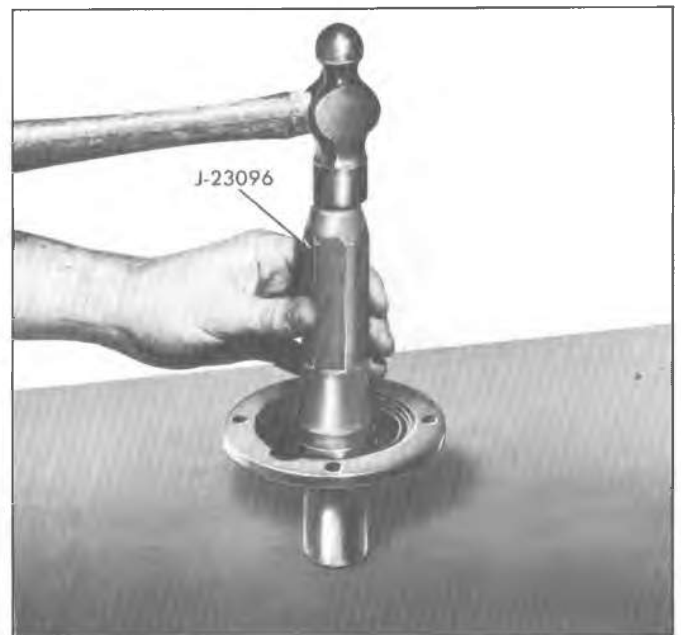


Fig. 7B-15J--Installing Bearing Retainer Oil Seal

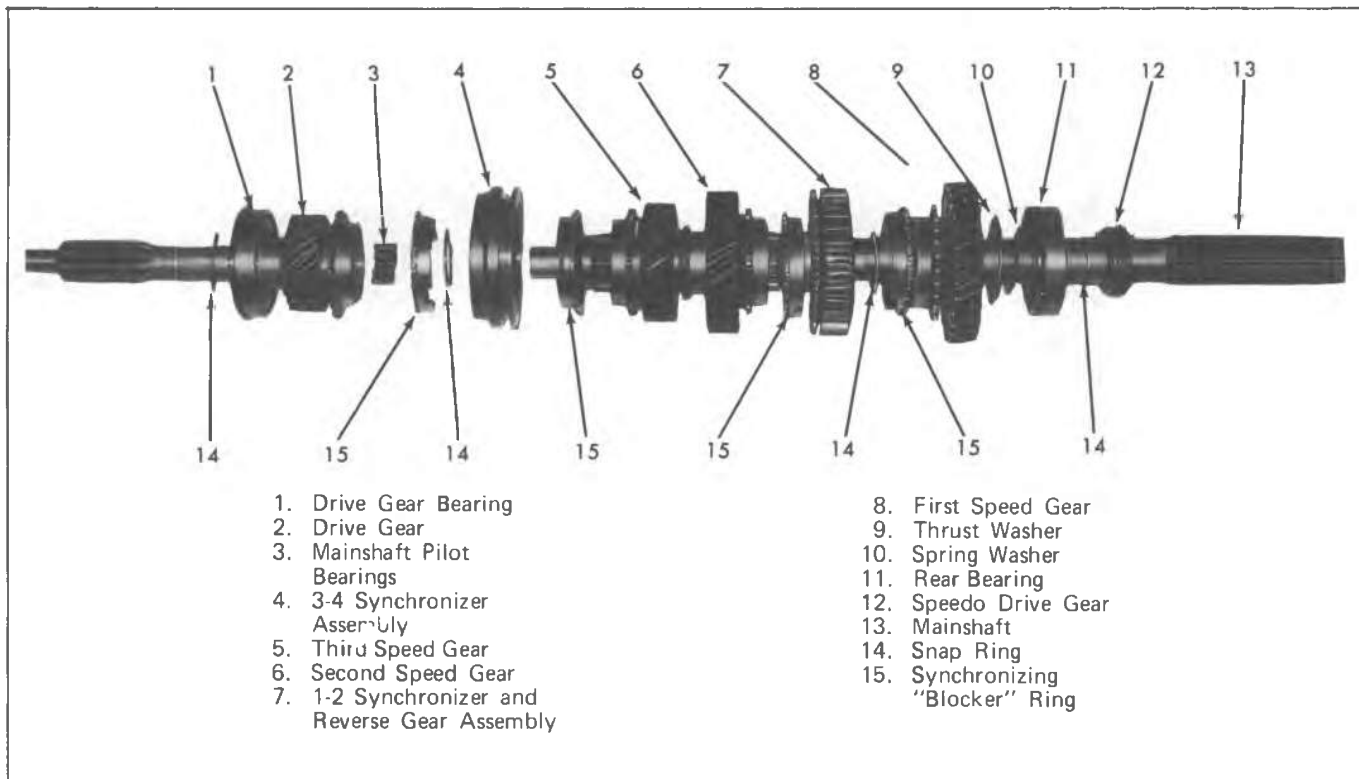


Fig. 7B-16J--Clutch Gear and Mainshaft Details

9. Install a blocker ring with notches downward so they align with the keys of the 1-2 synchronizer assembly.
10. Install first gear with clutching teeth downward.
11. Install first gear thrust washer (steel).



Fig. 7B-17J--Installing Rear Bearing

CAUTION: *Be sure the notches of the blocker ring align with the keys of the synchronizer assembly.*

12. Install first gear spring washer.
 13. Install rear ball bearing with snap ring slot downward; press onto mainshaft (Fig. 7B-17J).
 14. Install rear bearing to mainshaft snap ring (Fig. 7B-8J).
 15. Install speedometer drive gear and clip.
- This completes the assembly of the mainshaft.

ASSEMBLY OF TRANSMISSION (Fig. 7B-18J)

1. Using Tool J-22246 load a row of roller bearings (27) and a bearing thrust washer at each end of the countergear. Use heavy grease to hold them in place (Fig. 7B-19J).

2. Place countergear assembly through case rear opening along with a tanged thrust washer (tang away from gear) at each end and install countergear shaft and woodruff key from rear of case.

CAUTION: *Be sure countershaft picks up both thrust washers and that the tangs are aligned with their notches in the case.*

3. Install reverse idler gear and shaft with its woodruff key from the rear of case.

4. Using snap ring pliers, expand the snap ring in the extension and assembly extension over rear of mainshaft and onto rear bearing. Seat snap ring in rear bearing groove (Fig. 7B-4J).

5. Load the mainshaft pilot bearings (14) into the clutch gear cavity and assemble the 4th speed blocker ring onto the clutch gear clutching surface with its clutching teeth toward the gear (Fig. 7B-20J).

6. Pilot the clutch gear, pilot bearings and 4th speed blocker ring assembly over the front of the mainshaft assembly. Do not assemble bearing to gear yet.

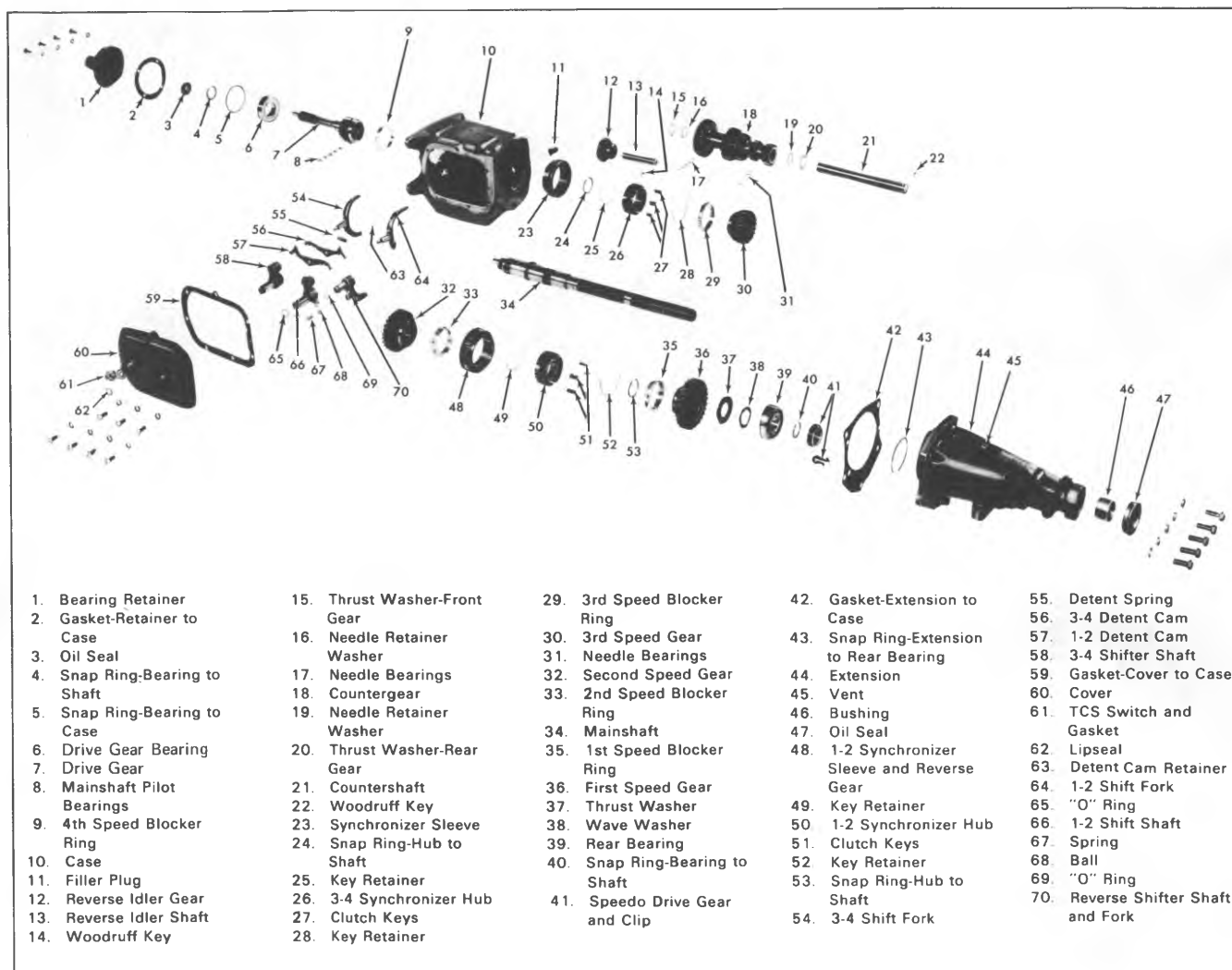


Fig. 7B-18J-4-Speed (Saginaw) 76mm Transmission-Exploded View



Fig. 7B-19J--Loading Countergear Bearing

CAUTION: Be sure the notches in the blocker ring align with the keys in the 3-4 synchronizer assembly.

7. Place extension to case gasket at rear of case holding in place with grease and, from the rear of the case, assemble the clutch gear, mainshaft and extension to case as an assembly.

8. Install extension to case retaining bolts. Using seal cement on bottom bolt only.

9. Install front bearing outer snap ring to bearing and position bearing over stem of drive gear and into front case bore.

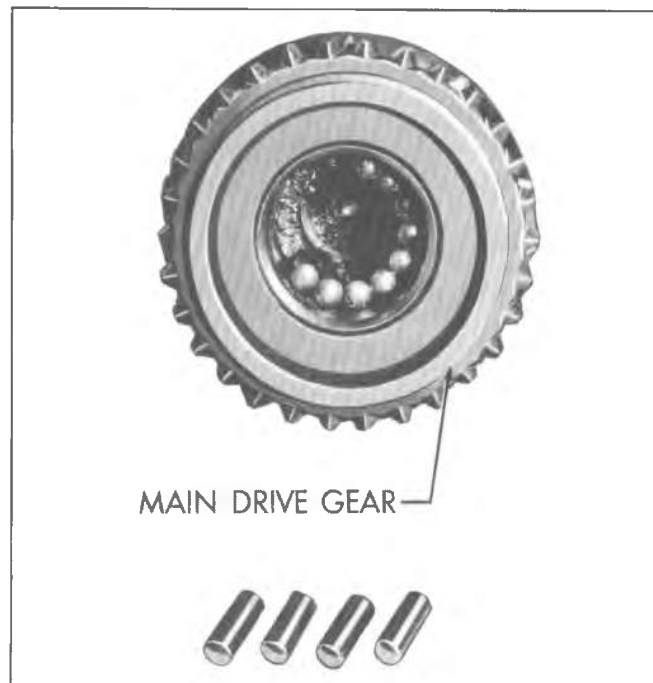


Fig. 7B-20J--Loading Mainshaft Bearings

10. Install snap ring to drive gear stem, and drive gear bearing retainer and gasket to case.

NOTE: The retainer oil return hole should be at the bottom.

11. Shift synchronizer sleeves to neutral positions and install cover, gasket and fork assembly to case. Be sure forks align with their synchronizer sleeve grooves.

12. Tighten all bolts to specified torque.

4-SPEED (WARNER) 83MM TRANSMISSION

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DISASSEMBLY OF TRANSMISSION

NOTE: Sectional and exploded view of the transmission are provided in Figures 7B-1K and 7B-2K to assist in the disassembly of the transmission.

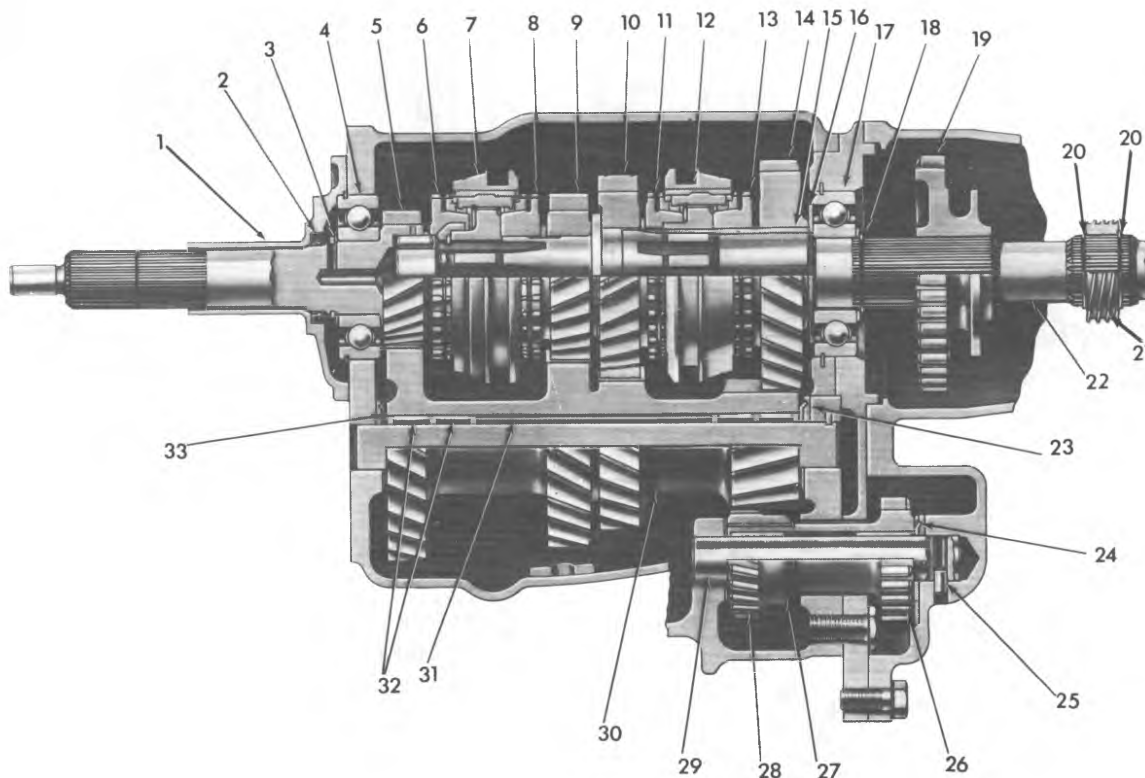
1. Thoroughly clean the exterior of the transmission assembly.

2. Shift transmission into second gear, remove drain plug from lower right of case and drain lubricant from transmission.

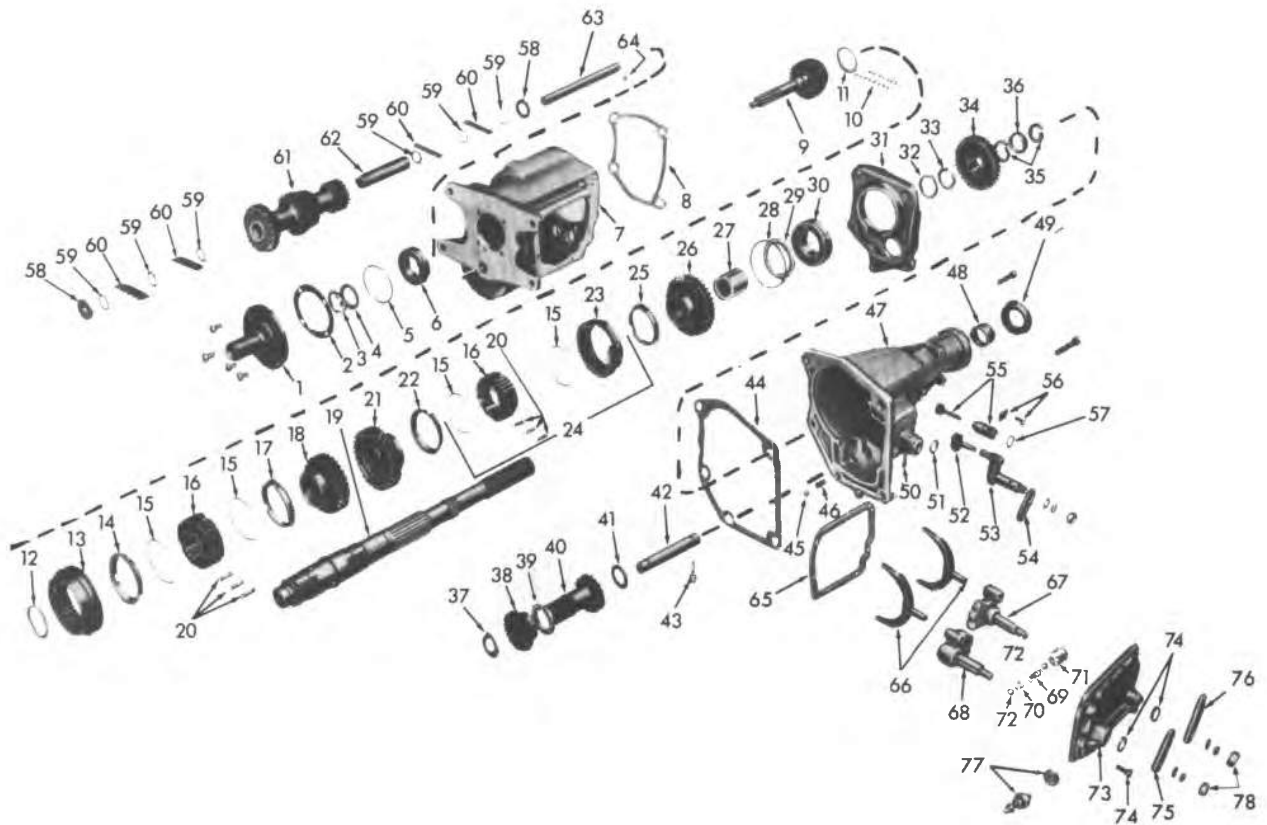
3. Remove nine (9) shift cover attaching bolts, cover assembly and gasket. Remove both shift forks.

4. Remove four (4) drive gear bearing retainer bolts, retainer and gasket from front of transmission.

Fig. 7B-1K--Sectional View of 4-Speed (Warner) 83mm Transmission



- | | | |
|--------------------------------|---------------------------------|--------------------------------|
| 1 Clutch Gear Bearing Retainer | 12 1st & 2nd Speed Clutch Assy. | 23 Thrust Washer |
| 2 Retainer Lip Seal | 13 1st Speed Synochronizer Ring | 24 Thrust Washer |
| 3 Snap Ring and Washer | 14 1st Speed Gear | 25 Idler Shaft Roll Pin |
| 4 Clutch Gear Bearing | 15 1st Speed Gear Bushing | 26 Rear Idler Gear |
| 5 Clutch Gear | 16 Spacer | 27 Spacer |
| 6 4th Speed Synchronizer Ring | 17 Rear Main Bearing | 28 Front Idler Gear |
| 7 3rd & 4th Speed Clutch Assy. | 18 Snap Ring and Washer | 29 Reverse Idler Shaft |
| 8 3rd Speed Synchronizer Ring | 19 Reverse Gear | 30 Countergear |
| 9 3rd Speed Gear | 20 Snap Rings | 31 Countergear Sleeve |
| 10 2nd Speed Gear | 21 Speedometer Gear | 32 Countergear Bearing Rollers |
| 11 2nd Speed Synchronizer Ring | 22 Mainshaft | 33 Thrust Washers |



- | | | | |
|--|--|--|--|
| 1. Bearing Retainer | 23. First and Second Speed Clutch Sliding Sleeve | 44. Rear Bearing Retainer To Case Extension Gasket | 63. Countershaft |
| 2. Gasket | 24. First and Second Speed Clutch Assembly | 45. Reverse Shifter Shaft Detent Ball | 64. Countershaft Woodruff Key |
| 3. Selective Fit Snap Ring | 25. First Speed Gear Synchronizing Ring | 46. Reverse Shifter Shaft Ball Detent Spring | 65. Gasket |
| 4. Spacer Washer | 26. First Speed Gear | 47. Case Extension | 66. Forward Speed Shift Forks |
| 5. Bearing Snap Ring | 27. First Speed Gear Sleeve | 48. Extension Bushing | 67. First and Second Speed Gear Shifter Shaft and Detent Plate |
| 6. Main Drive Gear Bearing | 28. Rear Bearing Snap Ring | 49. Rear Oil Seal | 68. Third and Fourth Speed Gear Shifter Shaft and Detent Plate |
| 7. Transmission Case | 29. Thrust Washer | 50. Reverse Shifter Shaft Lock Pin | 69. Poppet Spring |
| 8. Rear Bearing Retainer Gasket | 30. Rear Bearing | 51. Reverse Shifter Shaft "O" Ring Seal | 70. Interlock Pin |
| 9. Main Drive Gear | 31. Rear Bearing Retainer | 52. Reverse Shift Fork | 71. Interlock Sleeve |
| 10. Bearing Rollers (16) | 32. Washer | 53. Reverse Shifter Shaft and Detent Plate | 72. Detent Balls |
| 11. Washer | 33. Selective Fit Snap Ring | 54. Reverse Shifter Lever | 73. Transmission Side Cover |
| 12. Snap Ring | 34. Reverse Gear | 55. Speedometer Driven Gear and Fitting | 74. Lip Seals |
| 13. Third and Fourth Speed Clutch Sliding Sleeve | 35. Snap Ring | 56. Retainer and Bolt | 75. Third and Fourth Speed Shifter Lever |
| 14. Fourth Speed Gear Synchronizing Ring | 36. Speedometer Drive Gear | 57. "O" Ring Seal | 76. First and Second Speed Shifter Lever |
| 15. Clutch Key Spring | 37. Reverse Idler Front Thrust Washer (Flat) | 58. Washer (Tanged) | 77. T.C.S. Switch and Gasket |
| 16. Clutch Hub | 38. Reverse Idler Gear (Front) | 59. Spacer (.050") | 78. Lever Attaching Nuts |
| 17. Third Speed Gear Synchronizing Ring | 39. Snap Ring | 60. Bearing Rollers (28) | |
| 18. Third Speed Gear | 40. Reverse Idler Gear (Rear) | 61. Countergear | |
| 19. Mainshaft | 41. Thrust Washer (Tanged) | 62. Countergear Roller Spacer | |
| 20. Clutch Keys (3) | 42. Reverse Idler Shaft | | |
| 21. Second Speed Gear | 43. Reverse Idler Shaft Lock Pin and Welch Plug | | |
| 22. Second Speed Gear Synchronizing Ring | | | |

Fig. 7B-2K--Exploded View of 4-Speed (Warner) 83mm Transmission

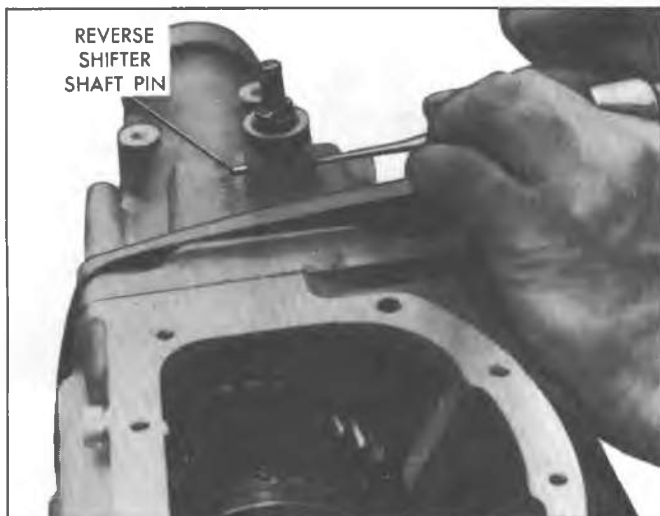


Fig. 7B-3K--Removing Reverse Shifter Shaft Lock Pin

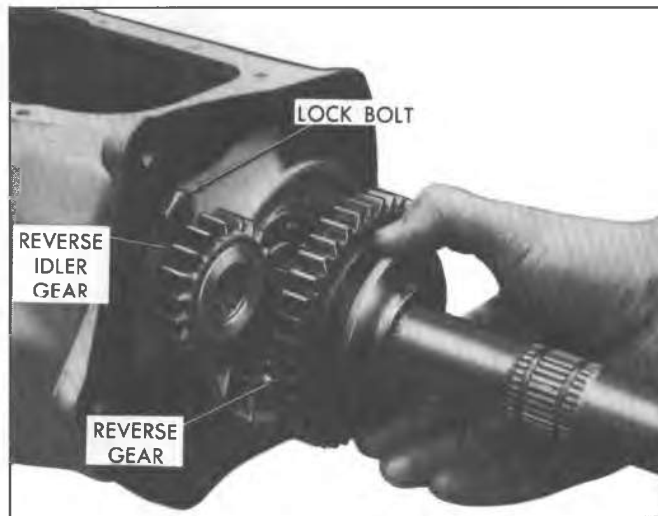


Fig. 7B-5K--Removing Reverse Gear

5. Remove lock pin from reverse shifter lever boss (Fig. 7B-3K) and pull shifter shaft partially out to disengage the reverse shifter fork from the reverse gear.

6. Remove five (5) rear extension attaching bolts, tap extension rearward with a soft hammer to start removal. Slide extension rearward until reverse idler shaft is clear of reverse idler gears. Then rotate extension to the left to free shift fork from collar of reverse gear and remove the case extension. Remove and discard gasket.

7. Remove speedometer gear outer snap ring (Fig. 7B-4K). Tap or slide speedometer gear from mainshaft, then remove second snap ring.

8. Slide the reverse gear from the mainshaft (Fig. 7B-5K), and slide the rear portion of the reverse idler gear from the transmission case.

9. Remove four (4) front bearing retainer bolts, gasket, and front bearing retainer from case.

10. Remove front bearing snap ring selective fit snap ring and spacer washer.

11. Using Tool J-6654-01, remove front main drive gear bearing from transmission case (Fig. 7B-6K).

12. Remove the rear retainer lock bolt.

13. Shift first-second and third-fourth clutch sliding sleeves forward to permit adequate clearance for mainshaft removal. Remove mainshaft and rear bearing retainer assembly from the transmission case.

14. Remove front reverse idler gear and thrust washer from case.

NOTE: Gear teeth face toward front of transmission.

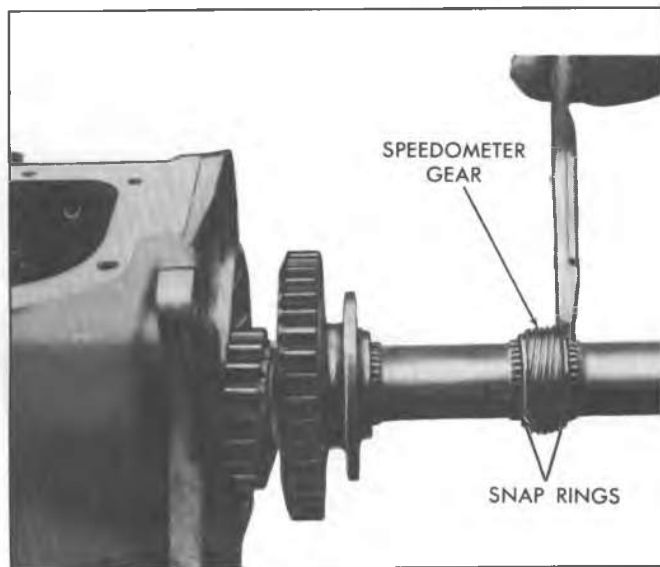


Fig. 7B-4K--Speedometer Gear and Retaining Rings

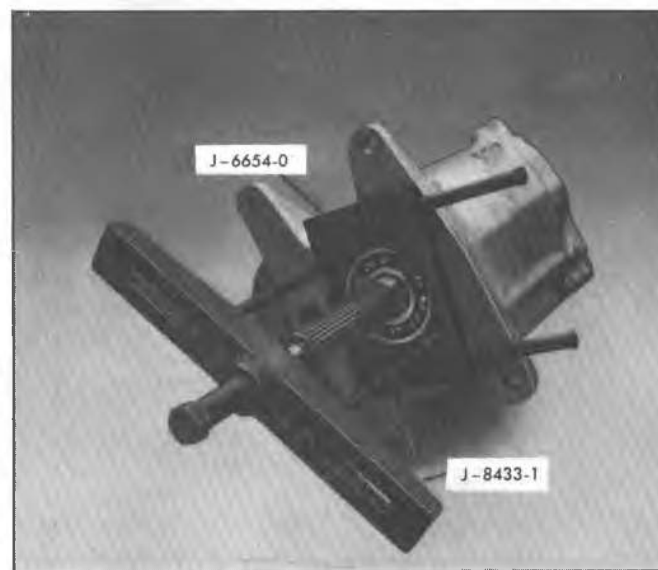


Fig. 7B-6K--Removing Main Drive Gear Bearing

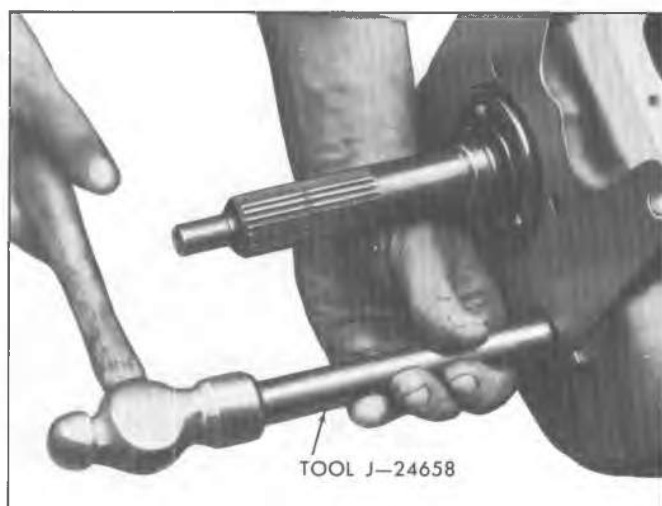


Fig. 7B-7K--Removing Countergear Shaft



Fig. 7B-9K--Removing 3-4 Clutch Assembly Retainer

15. Using a dummy shaft J-24658 drive countergear shaft out of countergear (Fig. 7B-7K) and remove countergear and tanged thrust washers from case. Check bottom of case for pilot bearings or other loose components.

DISASSEMBLY OF MAINSHAFT (Fig. 7B-8K)

1. Using snap ring pliers, remove 3-4 clutch assembly retaining ring at front of mainshaft (Fig. 7B-9K). Slide washer, synchronizer and clutch assembly, synchronizer ring 3rd speed gear from mainshaft.

2. Spread rear bearing retainer snap ring (Fig. 7B-10K) and slide retainer from mainshaft.

3. Remove rear bearing-to-mainshaft snap ring (Fig. 7B-11K).

4. Support mainshaft under 2nd gear and press mainshaft from rear bearing, 1st gear and sleeve, 1-2 clutch and synchronizer assembly, and the second gear (Fig. 7B-12K).

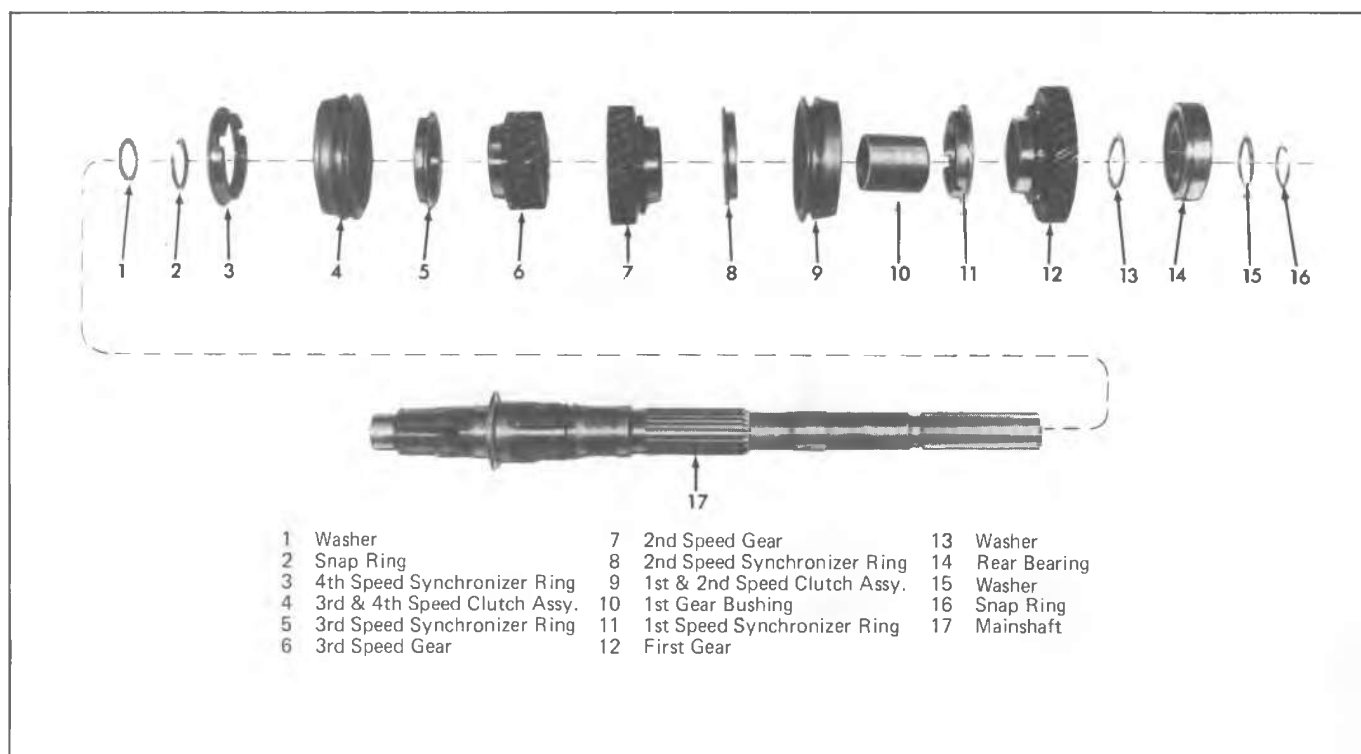


Fig. 7B-8K--Mainshaft Assembly Components

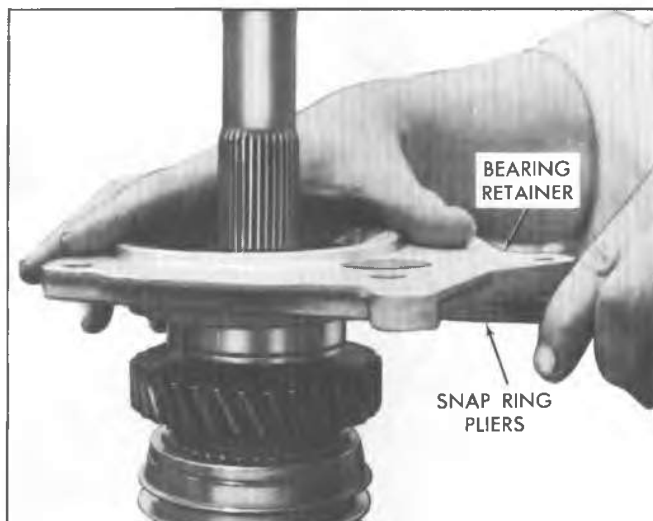


Fig. 7B-10K--Removing Rear Bearing Retainer

CLEANING AND INSPECTION

Transmission Case

1. Wash the transmission thoroughly inside and outside with cleaning solvent, then inspect the case for cracks.
2. Check the front and rear faces for burrs, and if present, dress them off with a fine mill file.
3. Make sure bearings are clean, then lubricate with light engine oil and check them for roughness by slowly turning the race by hand.

Roller Bearings and Spacers

All main drive gear and countergear bearing rollers should be inspected closely and replaced if they show wear. Inspect countershaft and reverse idler shaft at the same time, replace if necessary. Replace all worn spacers.

Gears

1. Inspect all gears for excessive wear, chips or cracks and replace any that are worn or damaged.



Fig. 7B-11K--Removing Rear Bearing Snap Ring

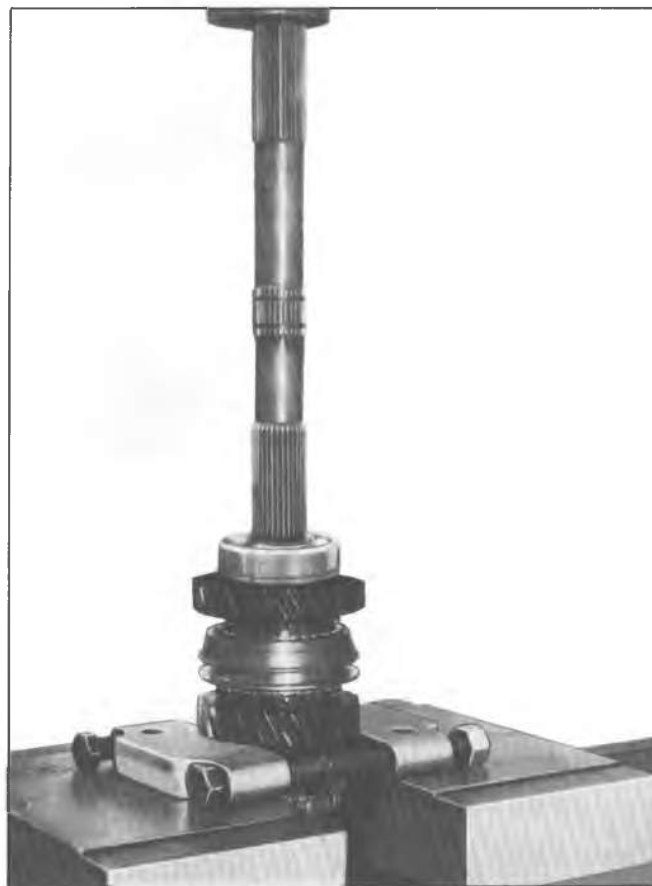


Fig. 7B-12K--Pressing Rear Bearing From Mainshaft

2. Inspect reverse gear bushing and if worn or damaged replace the entire gear (reverse gear bushing is not serviced separately).

3. Check both clutch sleeves to see that they slide freely on their hubs.

Front and Rear Bearings

1. Wash the front and rear ball bearings thoroughly in a cleaning solvent.
2. Blow out bearings with compressed air.

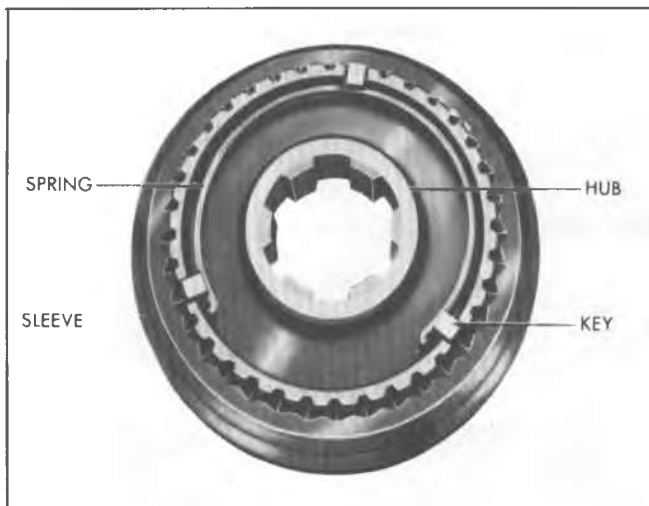


Fig. 7B-13K--Synchronizer Assembly



Fig. 7B-14K--Removing Rear Extension Bushing

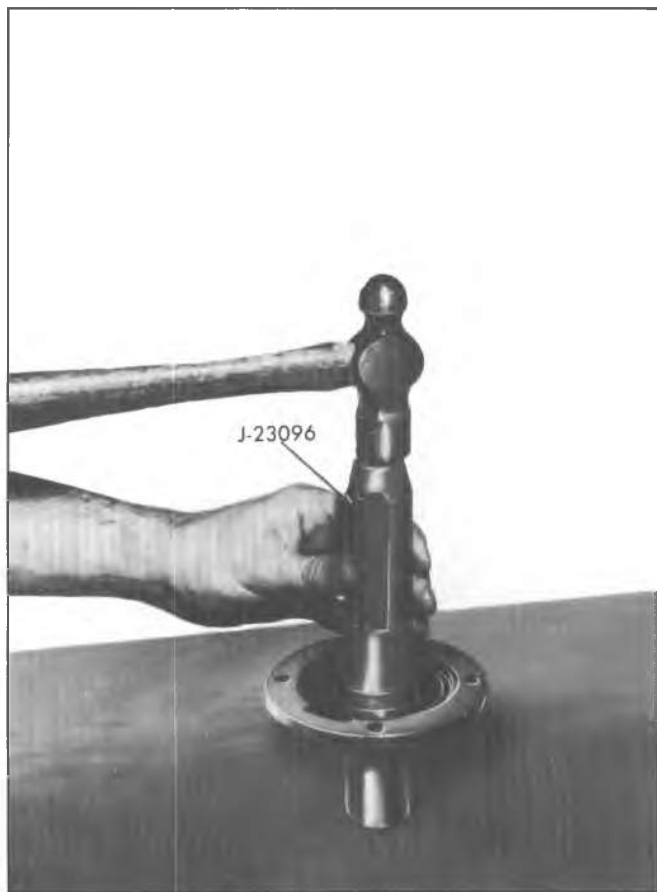


Fig. 7B-15K--Installing Rear Extension Seal



Fig. 7B-16K--Installing Drive Gear Bearing Retainer Seal

CAUTION: Do not allow the bearings to spin. Turn them slowly by hand. Spinning bearings may damage the race and balls.

REPAIRS

Synchronizer Keys and Springs

Replacement

The synchronizer hubs and sliding sleeves are a selected assembly and should be kept together as originally assembled, but the keys and two springs may be replaced if worn or broken.

1. If relation of hub and sleeve are not already marked, mark for assembly purposes.
2. Push the hub from the sliding sleeve; the keys will fall free and the springs may be easily removed.
3. Place the two springs in position (one on each side of hub), so all three keys are engaged by both springs (Fig. 7B-13K).

Place the keys in position and while holding them in place, slide the sleeve onto the hub, aligning the marks made before disassembly.

Extension Oil Seal and/or

Bushing Replacement

1. Pry seal from rear of extension.
2. Remove bushing using Tool J-21465-17 with Handle J-8092. Drive bushing from rear of extension housing (Fig. 7B-14K).
3. Using a new bushing and Tool J-21465-17 with Handle J-8092, press bushing into extension from rear of extension.
4. Coat I.D. of bushing and seal with transmission lubricant. Install new seal using Tool J-21359 (Fig. 7B-15K).

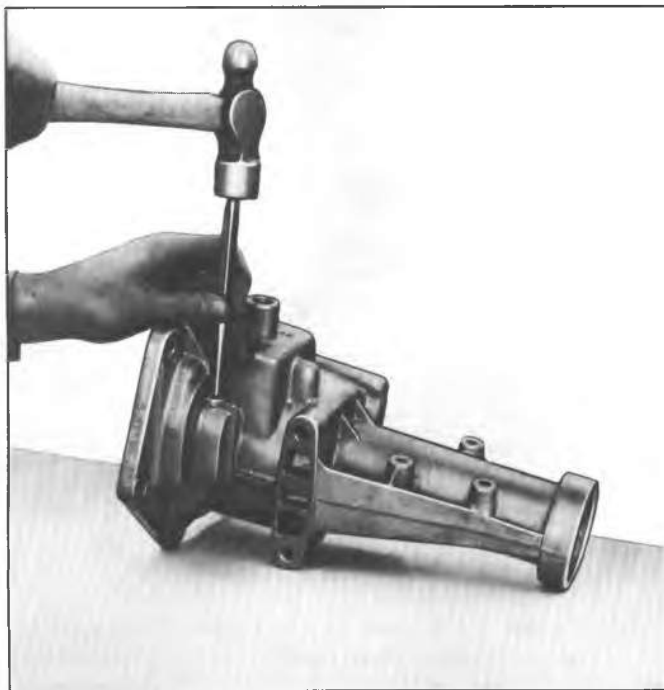


Fig. 7B-17K--Removing Reverse Idler Shaft Roll Pin

Drive Gear Bearing Retainer Oil Seal Replacement

1. Pry out old seal.
2. Using a new seal, install new seal into retainer using Tool J-21359 until it bottoms in bore (Fig. 7B-16K). Lubricate I.D. of seal with transmission lubricant.

Reverse Shifter Shaft and/or Seal Replacement

1. With case extension removed from transmission the reverse shifter shaft lock pin will already be removed. (see Step 5 under Transmission Disassembly).
2. Remove shift fork.
3. Carefully drive shifter shaft into case extension, allowing ball detent to drop into case. Remove shaft and ball detent spring. Remove "O" ring seal from shaft.
4. Place ball detent spring into detent spring hole and start reverse shifter shaft into hole in boss.
5. Place detent ball on spring and while holding ball down, push the shifter shaft into place and turn until the ball drops into place in detent on the shaft detent plate.
6. Install "O" ring seal on shaft.
7. Install shift fork.

NOTE: Do not drive the shifter shaft lock pin into place until the extension has been installed on the transmission case.

Reverse Idler Shaft Replacement

1. Place a small punch into hole in extension's reverse idler shaft boss and drive the welch plug and pin into the shaft (Fig. 7B-17K) until the shaft can be pulled from rear extension.
2. Insert new idler shaft into extension until hole in shaft lines up with hole in boss.
3. Insert roller pin in transmission boss opening and

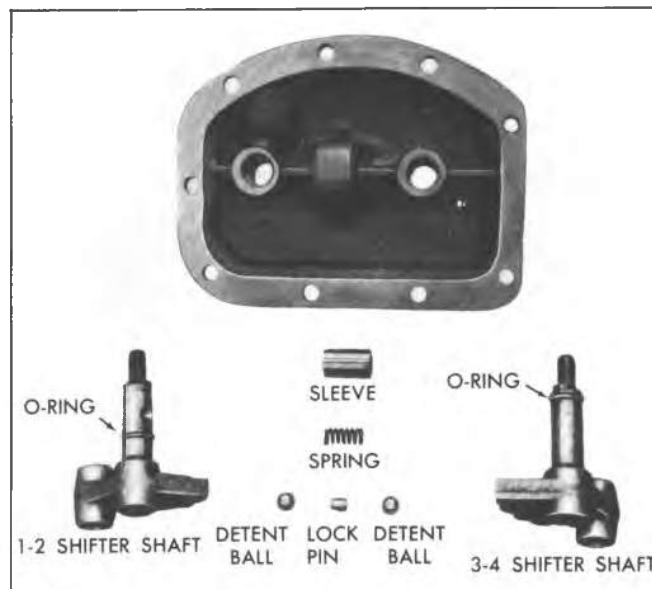


Fig. 7B-18K--Shift Cover Assembly

drive the pin into the extension until the shaft is securely locked in place. Install new welch plug, with sealer, in boss opening.

Transmission Side Cover

Although service of the side cover is covered here, the transmission does not have to be removed to perform these operations. To remove the side cover on-the-vehicle, simply drain the transmission, disconnect the 1st/2nd cross shaft and 3rd/4th linkage and remove the attaching bolts.

1. Remove the outer shifter lever nuts and lockwasher and pull levers from shafts.
2. Carefully push the shifter shafts into cover, allowing the detent balls to fall free, then remove both shifter shafts.
3. Remove interlock sleeve, interlock pin and poppet spring.
4. Replace necessary parts (Fig. 7B-18K) and assembly by reversing Steps 1-3.

ASSEMBLY OF COUNTERGEAR

1. Install roller spacer in countergear (if removed).
2. Using heavy grease to retain rollers, install spacer, rollers, spacer, rollers, and spacer in either end of countergear. Repeat in other end of countergear (Fig. 7B-19K).
3. Insert a dummy shaft or loading Tool J-24658 into countergear.

CHECKING COUNTERGEAR END PLAY

1. Rest the transmission case on its side with the side cover opening toward the assembler. Put countergear tanged thrust washers in place, retaining them with heavy grease, making sure the tangs are resting in the notches of the case.
2. Set countergear in place in bottom of transmission case, making sure that tanged thrust washers are not knocked out of place.
3. Position the transmission case resting on its front face.
4. Lubricate and insert countergear (pushing loading Tool J-24658 out front of case) until woodruff key slot is in its relative installed position (do not install key).
5. Attach a dial indicator as shown in Fig. 7B-20K and check end play of the countergear. If end play is greater than .025", a new thrust washers must be installed.

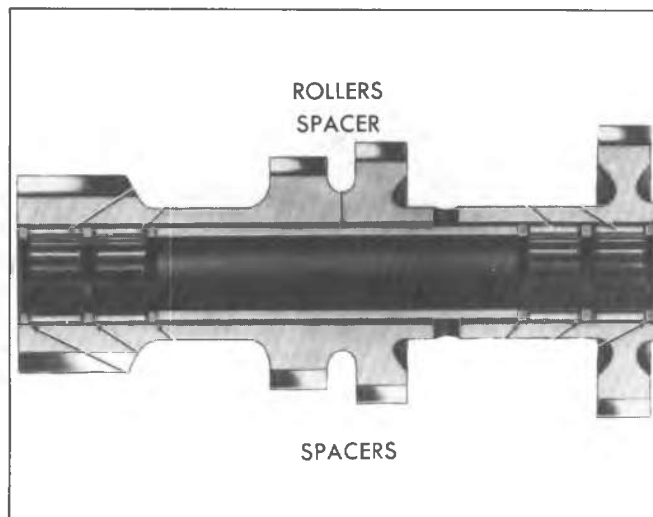


Fig. 7B-19K--Countergear Cross Section

ASSEMBLY OF MAINSHAFT

1. From rear of mainshaft, assemble the 2nd speed gear (with hub of gear toward rear of shaft).

2. Install 1st-2nd synchronizer clutch assembly (sliding clutch sleeve taper toward rear, hub to front) on the mainshaft together with a synchronizer ring on both sides of the clutch assemblies.

3. Position the 1st gear sleeve on the shaft and press the sleeve onto the mainshaft until the 2nd gear, clutch assembly and sleeve bottom against the shoulder of the mainshaft (Fig. 7B-21K).

4. Install 1st speed gear (with hub toward front) and supporting inner race, press the rear bearing onto the mainshaft with the snap ring groove toward front of the transmission (Fig. 7B-22K).

5. Install spacer and new correct selective fit (thickest that will assemble) snap ring in mainshaft behind rear bearing.

6. Install the 3rd speed gear (hub to front of transmission) and the 3rd speed gear synchronizing ring (notches to front of transmission).



Fig. 7B-20K--Checking Countergear End Play

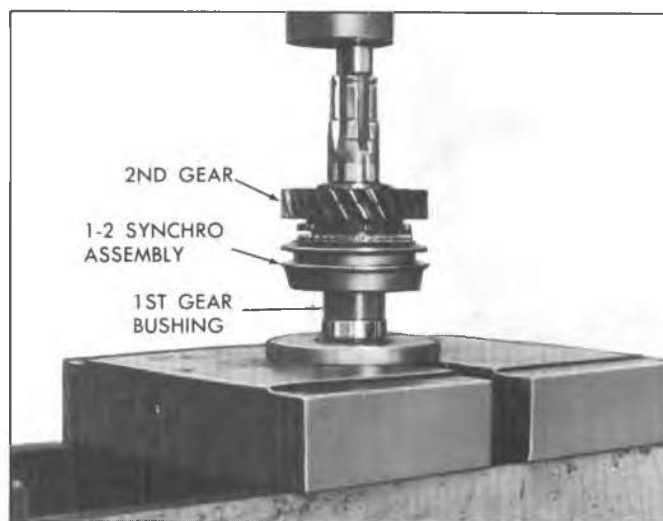


Fig. 7B-21K--Installing 1st Gear Sleeve

7. Install the 3rd and 4th speed gear clutch assembly (hub and sliding sleeve) with taper toward the front making sure that the keys in the hub correspond to the notches in the 3rd speed gear synchronizing ring.

8. Install new selective fit snap ring (thickest that will install) in the groove in mainshaft in front of the 3rd and 4th speed clutch assembly.

9. Install the rear bearing retainer over end of mainshaft. Spread the snap ring to drop around the rear bearing. Release snap ring when it aligns with groove in rear bearing.

10. Install the reverse gear (shift collar to rear).

11. Install a snap ring, the speedometer drive gear and a second snap ring, onto the mainshaft.

ASSEMBLY OF TRANSMISSION

1. Place the transmission case on its side with the shift cover opening toward the assembler. Position the countergear tanged washers in place, using a heavy grease to retain them.

NOTE: Be sure the tangs are in the notches of the thrust face.

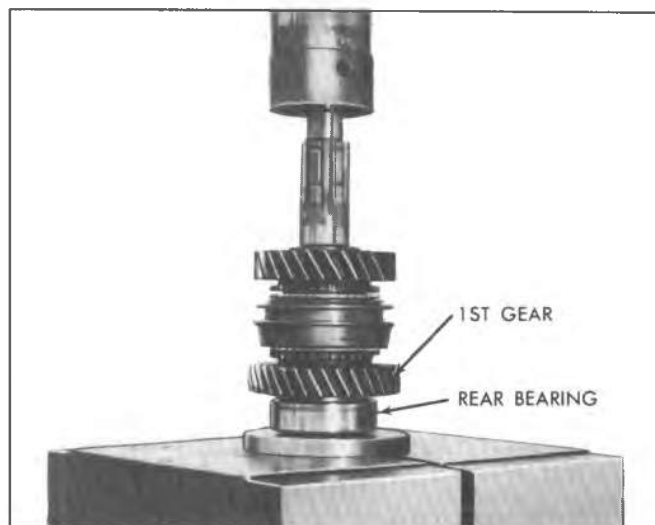


Fig. 7B-22K--Installing Rear Bearing

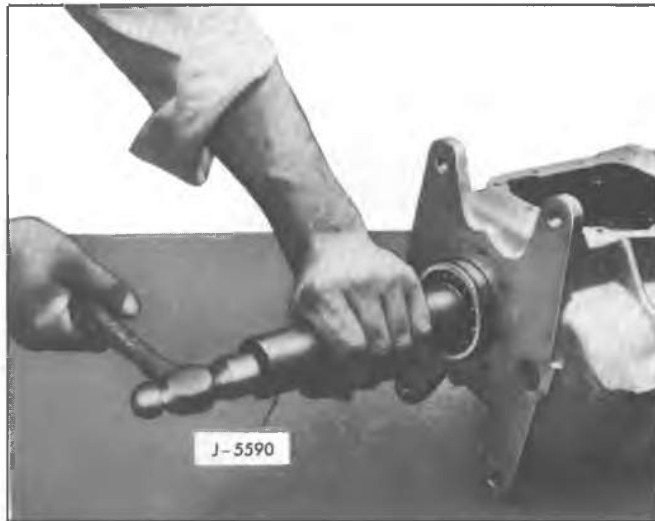


Fig. 7B-23K--Installing Front Main Bearing

2. Install the countergear in the case, aligning the bore of the countergear with the case opening. With the thrust washers in place, slide the loading tool to the front of the case and install the countergear shaft from the rear of the case. Install the woodruff key and tap shaft into gear until shaft is flush with rear face of transmission case.

3. Install front reverse idler gear (teeth forward) and thrust washer in case. Use a heavy grease to hold thrust washer in position.

4. Using a heavy grease install sixteen (16) roller bearings and washer into main drive gear. Mate main drive gear with mainshaft assembly. Position 3rd-4th clutch sliding sleeve forward. This will provide clearance for installation as well as hold the assembly together.

5. Position new rear bearing retainer to case extension gasket on rear of case. Install mainshaft and drive gear assembly into case.

6. Align rear bearing retainer with transmission case. Install retainer to case locating pin and retainer locking bolt. Torque to recommended specifications.

7. Place bearing snap ring on front main bearing. Position front main bearing to case opening and with a hollow shaft, or tool J-5590, tap bearing into case (Fig. 7B-23K). Install spacer washer and selective fit snap ring to secure main drive bearing.

8. Install front bearing retainer and gasket. Apply sealer to bolts and torque to recommended specification.

9. Install rear reverse idler gear engaging the splines with the portion of the gear within the case.

10. Place new rear bearing retainer to case extension gasket into position on rear face of bearing retainer. Slide reverse gear on shaft. Install speedometer gear and two selective fit snap rings.

11. Install idler shaft into extension until hole in shaft

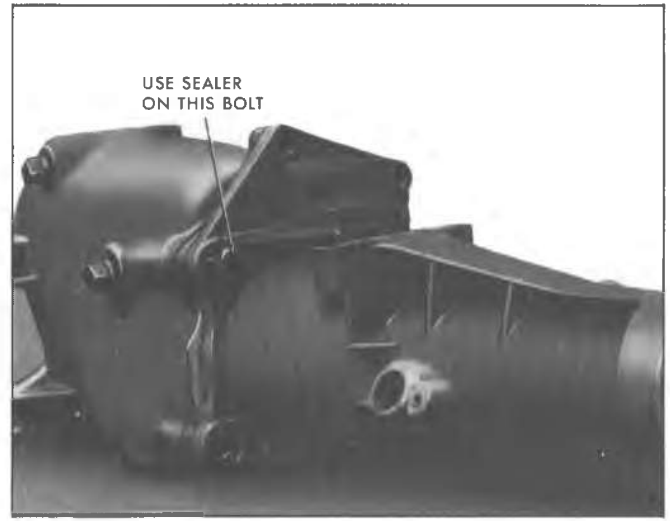


Fig. 7B-24K--Extension Bolt

lines up with hole in boss. Insert reverse idler shaft lock pin in transmission boss opening and drive the pin into the extension until the shaft is securely locked in place. Install new welch plug, with sealer, in boss opening.

12. Install reverse shifter shaft and detent plate into extension. Locate reverse shift fork in reverse shifter shaft. Use a heavy grease to hold reverse shift fork in position.

NOTE: Be sure reverse shifter shaft "O" ring is placed on reverse shifter shaft after the shaft has been installed in the extension housing.

13. Install tanged thrust washer on reverse idler shaft with tang of washer in notch of idler thrust face of extension.

14. Place the 1st-2nd speed and 3rd-4th speed clutch sliding sleeve in neutral position. Pull reverse shift shaft partially out of extension and reverse shift fork as far forward in as possible. Start the extension onto the mainshaft while pushing in on the shifter shaft to engage the shift fork with the reverse gear shift collar. When the fork engages, rotate the shifter shaft to move the reverse gear rearward permitting the extension to mate against the transmission case.

15. Install reverse shifter shaft lock pin.

16. Install rear extension housing-to-case bolts. Install rear extension to rear bearing retainer bolts (short bolts). Torque all bolts to recommended specification.

NOTE: It is essential that sealer be used on the extension bolt as indicated in Fig. 7B-24K.

17. Position 1st-2nd speed clutch sliding sleeve into 2nd gear and 3rd-4th speed clutch sliding sleeve into neutral. Position forward shift forks in sliding sleeves.

18. Position 1st-2nd speed gear shifter shaft and detent plate into 2nd gear position and using a sealer, install cover gasket and side cover assembly to transmission.

19. Check operation of transmission.

4-SPEED (MUNCIE CH465) 117MM TRANSMISSION

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DISASSEMBLY OF TRANSMISSION

Refer to Figures 7B-1L and 7B-2L

1. Mount transmission in suitable holding fixture and remove cap screws attaching transmission cover assembly to transmission case. If required, insert two 5/16 x 18 screws in cover flange threaded holes and turn evenly to raise cover dowel pins from case.

NOTE: Move reverse shifter fork so that reverse idler gear is partially engaged before attempting to remove cover. Forks must be positioned so rear edge of the slot in the reverse fork is in line with the front edge of the slot in the forward forks as viewed through tower opening.

2. Place transmission in two gears at once to lock gears. Remove the universal joint flange nut, universal joint front flange and brake drum assembly.

NOTE: On models equipped with 4-wheel drive transfer case, use Tool J-23070 to remove mainshaft rear lock nut (Fig. 7B-26L).

3. Remove parking brake and brake flange plate assembly on models equipped with propeller shaft parking brake. Refer to Section 5, Truck Service Manual.

4. Remove rear bearing retainer and gasket.

5. Slide speedometer drive gear off mainshaft.

6. Remove drive gear bearing retainers and gasket.

7. Remove countergear front bearing cap and gasket.

8. Pry countergear front bearing out by inserting screw drivers into groove at cast slots in case.

9. Remove countergear rear bearing retaining rings (snap ring) from shaft and bearing. Using Tool J-22832 and J-8433-1, remove countergear rear bearings (Fig. 7B-3L). This will allow countergear assembly to rest on bottom of case.

CAUTION: Make sure Tool J-22832 engages full circumference of groove in bearing to prevent tool damage.

10. Remove drive gear bearing outer race to case retaining ring.

11. Remove drive gear and bearing by tapping gently on bottom side of drive gear shaft and prying directly opposite against the case and bearing snap ring groove at the same time. Remove 4th gear synchronizer ring.

CAUTION: Index cut out section of drive gear in down position with countergear to obtain clearance for removing clutch gear.

12. Remove rear mainshaft bearing retainer ring (snap ring) and using Tool J-22832 and J-8433-1, remove bearing from case (Fig. 7B-4L). Slide 1st speed gear thrust washer off mainshaft.

13. Raise rear of mainshaft assembly and push rearward in case bore, then swing front end up and lift from case. Remove synchronizer cone from shaft.

14. Slide reverse idler gear rearward and move countergear rearward until front end is free of case, then lift to remove from case.

15. To remove reverse idler gear, drive reverse idler gear shaft out of case from front to rear using a drive. Remove reverse idler gear from case.

SUBASSEMBLY OPERATIONS

TRANSMISSION COVER

Disassembly (Fig. 7B-5L)

1. Using a small punch drive out pins retaining 1st-2nd and 3rd-4th shifter forks to shifter shafts and also drive out expansion plugs.

NOTE: The pin retaining the third and fourth shifter fork to the shaft must be removed, and the shifter fork removed from the cover before the reverse shifter head pin can be removed.

2. With shifter shafts in neutral position, drive shafts out of cover and shifter forks.

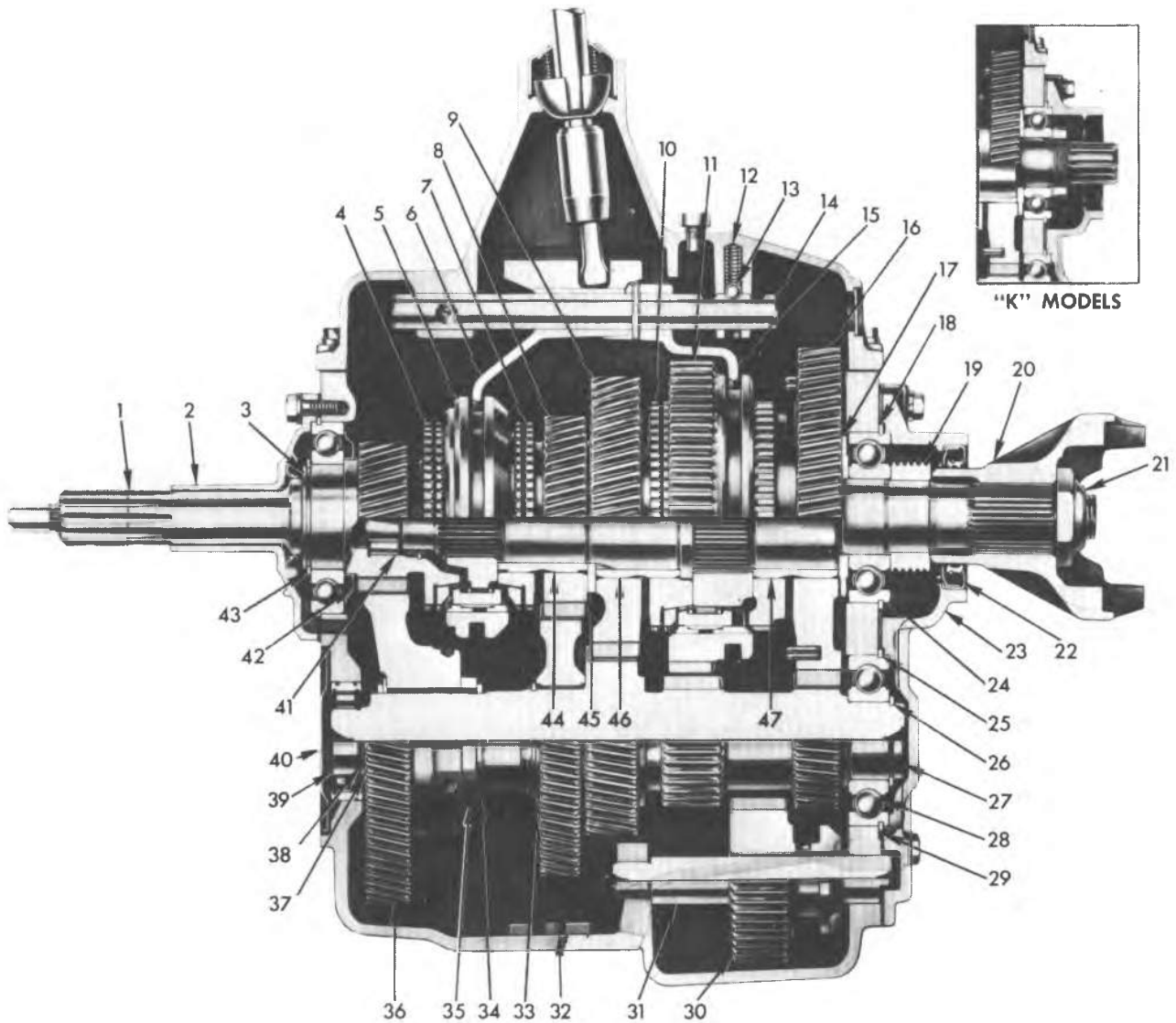
CAUTION: Exercise care so shaft detent balls, springs and innerlock pin located in the cover are not lost as the shifter shafts are removed.

3. Drive out pin holding reverse shifter head and drive out the shaft.

CAUTION: Exercise extreme care during shaft removal since detent balls are under spring tension in the rear rail boss holes.

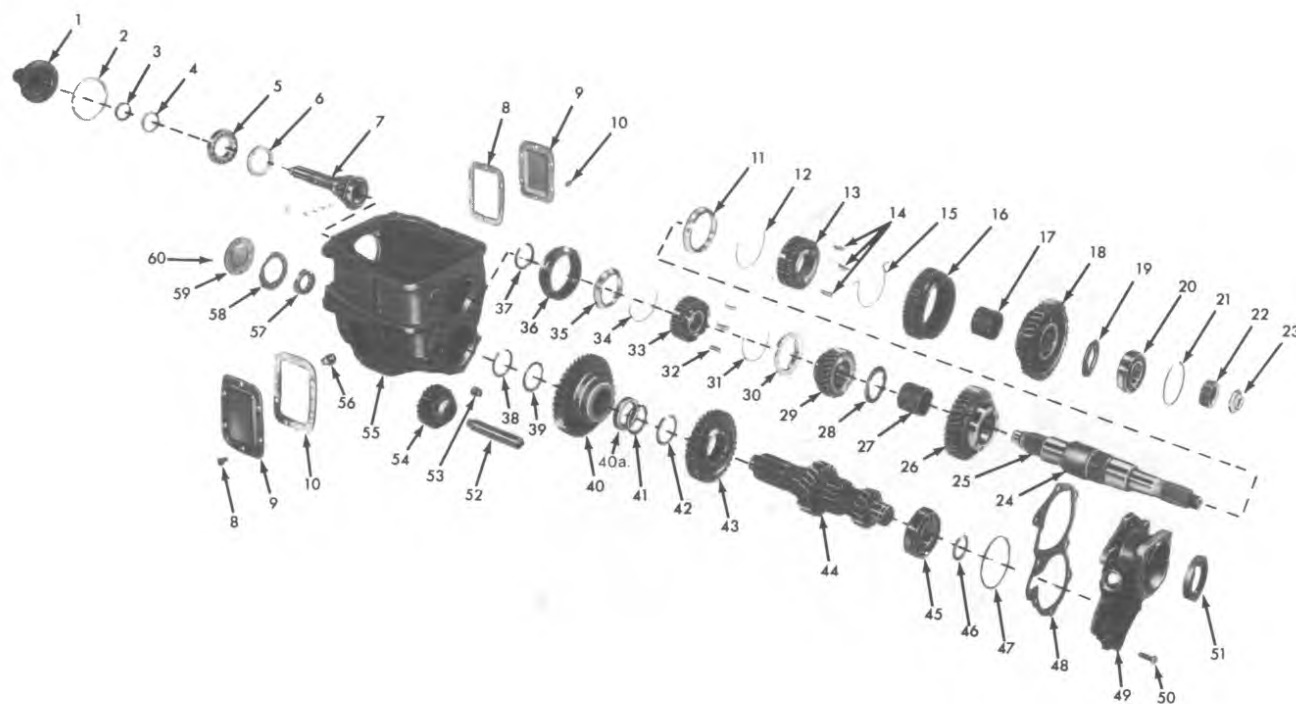
Assembly (Fig. 7B-6L)

1. In reassembling the transmission cover, care must be used in installing the shifter shafts. They should be installed in the order shown in Fig. 7B-7L, namely, reverse, 3rd-4th, and 1st-2nd. Fig. 7B-6L illustrates the difference in the shafts.



- | | | | |
|--|------------------------------------|-------------------------------|--------------------------------|
| 1. Main Drive Gear | 11. Reverse Driven Gear | 24. Mainshaft Rear Bearing | 37. Thrust Washer |
| 2. Drive Gear Bearing Retainer | 12. Poppet Spring | 25. Rear Bearing Snap Ring | 38. Snap Ring |
| 3. Snap Ring-Outer | 13. Poppet Ball | 26. Snap Ring | 39. Front Countershaft Bearing |
| 4. 3rd and 4th Synchronizer Ring | 14. Shift Rail | 27. Countershaft | 40. Countergear Front Cover |
| 5. 3rd and 4th Synchronizer Collar | 15. 1st and 2nd Shift Fork | 28. Countershaft Rear Bearing | 41. Pilot Bearing Rollers |
| 6. 3rd and 4th Shift Fork | 16. 1st Speed Gear | 29. Bearing Snap Ring | 42. Clutch Gear Oil Slinger |
| 7. 3rd and 4th Speed Synchronizer Ring | 17. Thrust Washer | 30. Reverse Idler Gear | 43. Snap Ring |
| 8. 3rd Speed Gear | 18. Bearing Snap Ring | 31. Reverse Idler Shaft | 44. 3rd Speed Gear Bushing |
| 9. 2nd Speed Gear | 19. Speedometer Drive Gear | 32. Case Magnet | 45. Thrust Washer |
| 10. 1st and 2nd Synchronizer Assembly | 20. Output Yoke | 33. Snap Ring | 46. 2nd Speed Gear Bushing |
| | 21. Flange Nut | 34. Snap Ring | 47. 1st Speed Gear Bushing |
| | 22. Rear Bearing Retainer Oil Seal | 35. Spacer | |
| | 23. Rear Bearing Retainer | 36. Countergear | |

Fig. 7B-1L-4-Speed (Muncie CH465) 117mm Transmission Assembly-Cross Section



- | | | | | |
|----------------------------------|------------------------------------|---------------------------------------|------------------------------|-------------------------------|
| 1. Drive Gear Bearing Retainer | 13. 1st-2nd Speed Synchronizer Hub | 26. 2nd Speed Gear | 37. Snap Ring | 48. Rear Retainer Gasket |
| 2. Retainer Gasket | 14. Synchronizer Keys | 27. 3rd Gear Bushing | 38. Snap Ring | 49. Rear Retainer |
| 3. Lip Seal | 15. Synchronizer Spring | 28. Thrust Washer | 39. Thrust Washer | 50. Retainer Bolts |
| 4. Snap Ring | 16. Reverse Driven Gear | 29. 3rd Speed Gear | 40. Clutch Countergear | 51. Retainer Lip Seal |
| 5. Drive Gear Bearing | 17. 1st Gear Bushing | 30. 3rd Speed Blocker Ring | 40a. Spacer | 52. Reverse Idler Shaft |
| 6. Oil Slinger | 18. 1st Gear | 31. Synchronizer Spring | 41. Snap Ring | 53. Drain Plug |
| 7. Drive Gear and Pilot Bearings | 19. Thrust Washer | 32. Synchronizer Keys | 42. Snap Ring | 54. Reverse Idler Gear |
| 8. Power Take-Off Cover Gasket | 20. Rear Main Bearing | 33. 3rd-4th Synchronizer Hub | 43. 3rd Speed Countergear | 55. Case |
| 9. Power Take-Off Cover | 21. Bearing Snap Ring | 34. Synchronizer Spring | 44. Countergear Shaft | 56. Fill Plug |
| 10. Retaining Screws | 22. Speedometer Gear | 35. 3rd-4th Speed Blocker Ring | 45. Countergear Rear Bearing | 57. Countergear Front Bearing |
| 11. 1st-2nd Speed Blocker Ring | 23. Rear Mainshaft Lock Nut | 36. 3rd-4th Speed Synchronizer Sleeve | 46. Snap Ring | 58. Gasket |
| 12. Synchronizer Spring | 24. 2nd Speed Bushing (On Shaft) | | 47. Bearing Outer Snap Ring | 59. Front Cover |
| | 25. Mainshaft | | | 60. Cover Screws |

Fig. 7B-2L-4-Speed (Muncie CH465) 17mm Transmission Exploded View

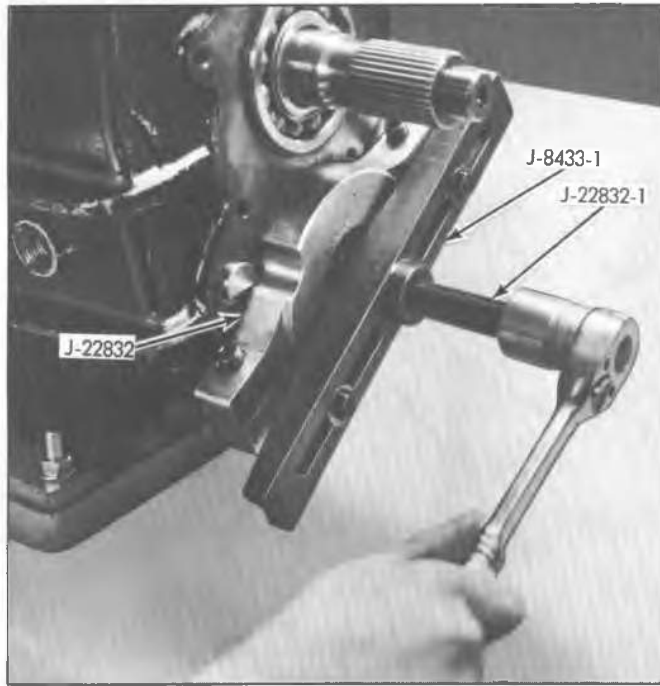


Fig. 7B-3L--Removing Countergear Rear Bearing

2. Place fork detent ball springs and balls in position in holes in cover.

3. Start shifter shafts into cover; depress detent balls with small punch and push shafts on over balls. (See Fig. 7B-7L). Hold reverse fork in position and push shaft through yoke. Install split pin in fork and shaft; then, push fork in neutral position.

4. Hold 3rd and 4th fork in position and push shaft through yoke, but not through front support bore.

5. Place two (2) interlock balls in cross-bore in front support boss between reverse and 3rd and 4th shifter shaft. Install the interlock pin in the 3rd and 4th shifter shaft hole.

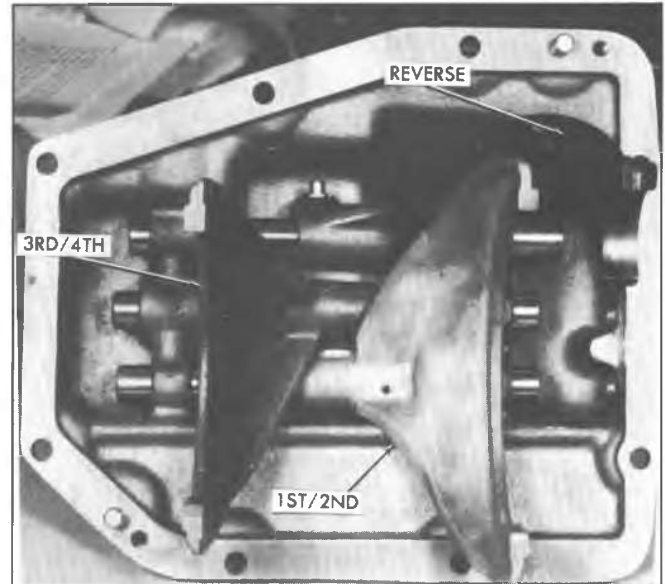


Fig. 7B-5L--Cover Assembly

Apply grease to hold in place. Push 3rd and 4th shaft through fork and cover bore, keeping both balls and pin in position between shafts until retaining holes line up in fork and shaft. Install retaining pin and move to neutral position.

6. Place two (2) interlock balls between the 1st and 2nd shifter shaft and 3rd and 4th shifter shaft in the cross-bore of the front support boss. Hold 1st and 2nd fork in position and push shaft through cover bore in fork until retainer hole and fork line up with hole in shaft. Install retainer pin and move to neutral position.

7. Install new shifter shaft hole expansion plugs and expand in place.

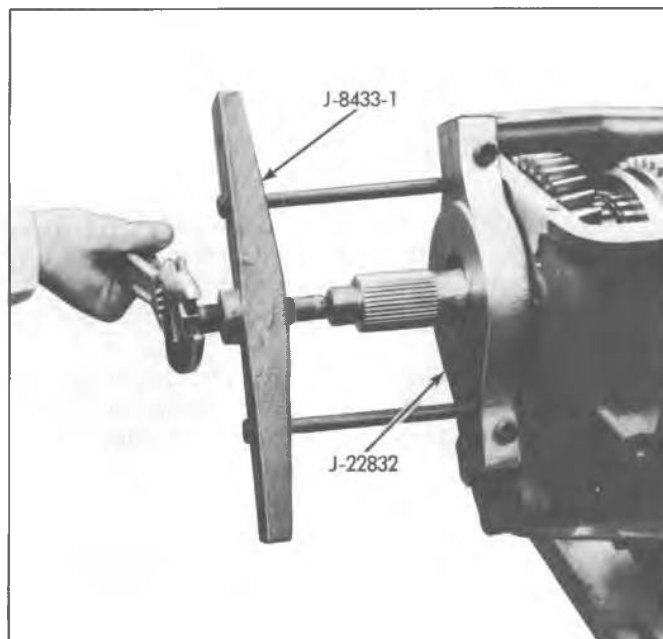


Fig. 7B-4L--Removing Mainshaft Rear Bearing

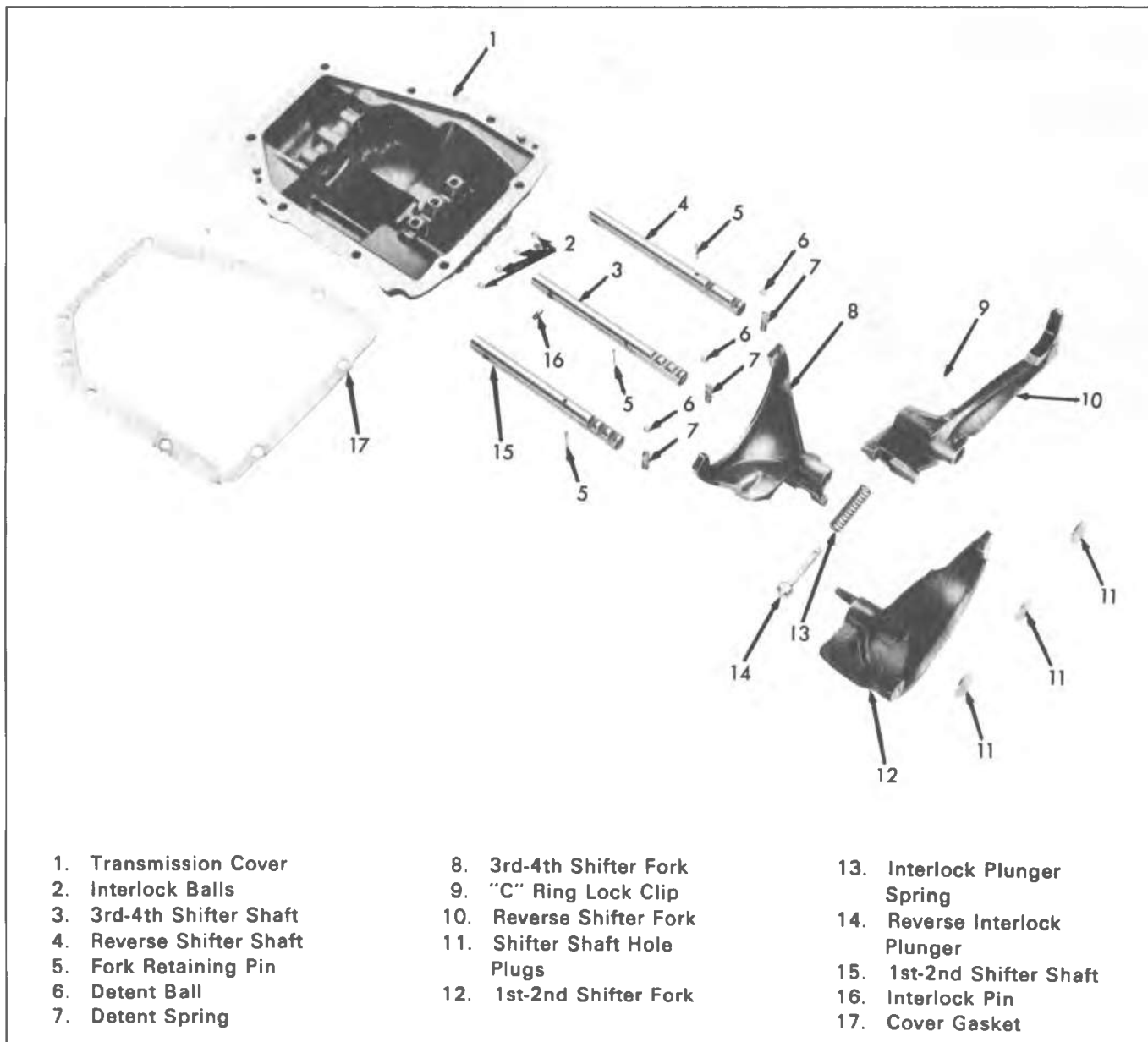


Fig. 7B-6L--Cover Assembly Exploded View

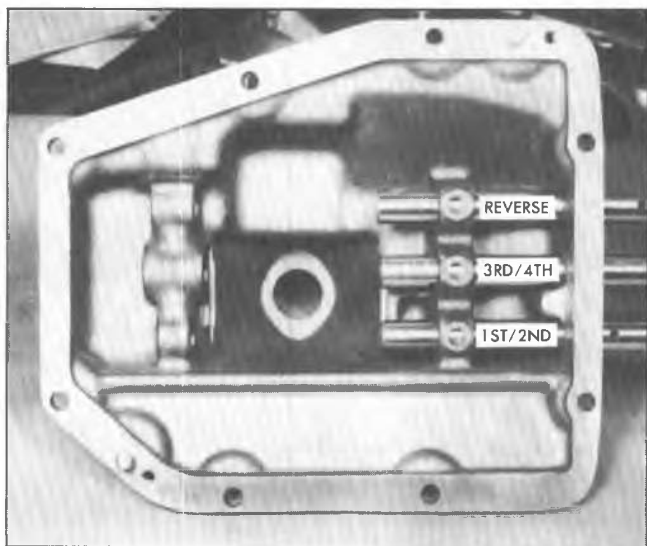


Fig. 7B-7L--Shifter Shaft Installation

DRIVE GEAR (FIG. 7B-8L)**Disassembly**

1. Remove mainshaft pilot bearing rollers (17) from drive gear if not already removed, and remove roller retainer. Do not remove snap ring on inside of drive gear.

2. Remove snap ring securing bearing on stem of drive gear.

3. To remove bearing, position Tool J-22872 to the bearing (Fig. 7B-9L) and using an arbor press and Tool J-0358 press gear and shaft out of bearing (Fig. 7B-10L).

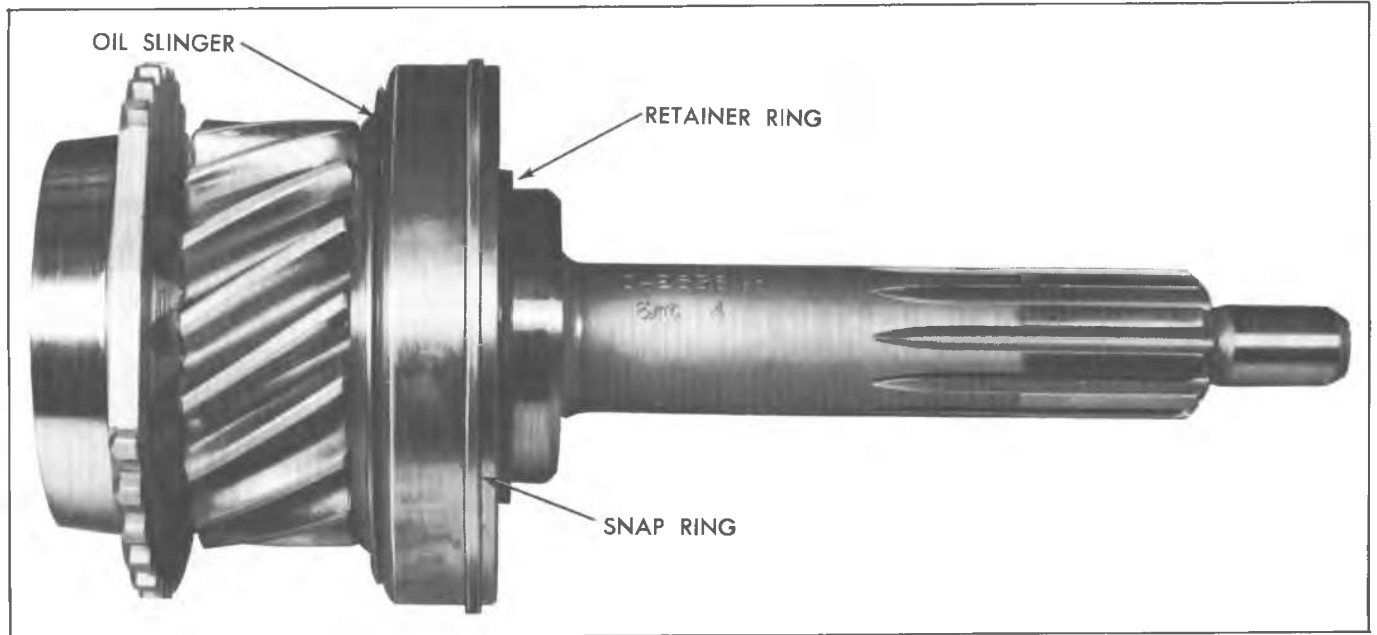


Fig. 7B-8L--Drive Gear Assembly



Fig. 7B-9L--Positioning Tool J-22872 to Drive Gear

Inspection

1. Wash all parts in clearing solvent.
2. Inspect roller bearings for pits or galling.
3. Inspect bearing diameter in shaft recess for galling.
4. Inspect gear teeth for excessive wear.
5. Inspect clutch shaft pilot for excessive wear.
6. Re-oil bearing, then rotate drive gear bearing slowly by hand and check for roughness.

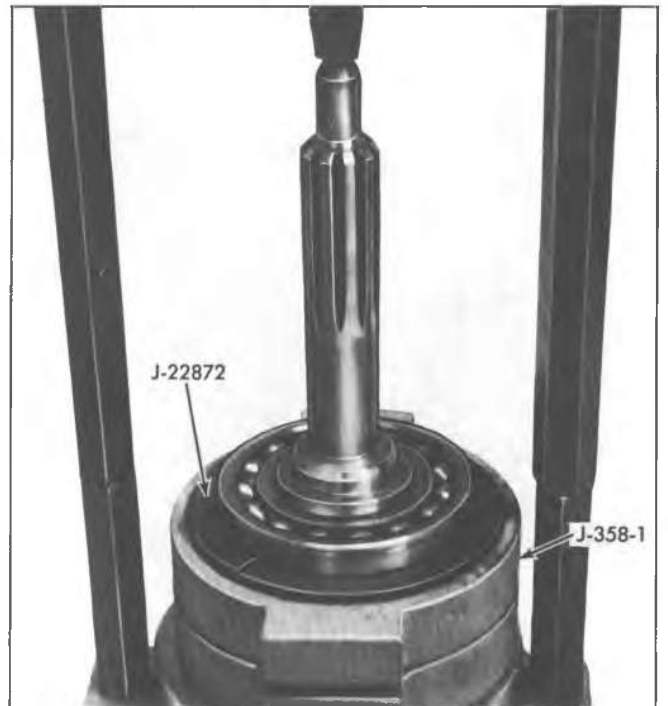


Fig. 7B-10L--Removing Drive Gear Bearing

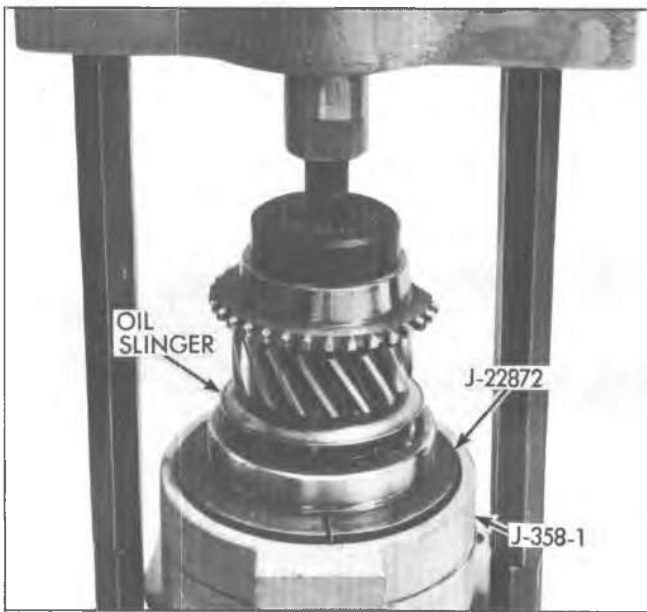


Fig. 7B-11L--Replacing Drive Gear Bearing

Assembly

1. Press bearing and new oil slinger onto drive gear shaft using Tool J-22872 (Fig. 7B-11L). Slinger should be located flush with bearing shoulder on drive gear. See Figure 7B-8L for direction of slinger installation.

CAUTION: Exercise care to prevent distortion of the oil slinger.

2. Install snap ring to secure bearing on drive gear shaft.

3. Install bearing retainer ring in groove on O.D. of bearing.



Fig. 7B-12L--Pilot Roller Bearing Installed

CAUTION: The bearing must turn freely, after it is installed on the shaft.

4. Install snap ring on I.D. of mainshaft pilot bearing bore in clutch gear (if previously removed).

5. Apply a small amount of grease to bearing surface in shaft recess, install transmission mainshaft pilot roller bearings (17) and install roller bearing retainer (Fig. 7B-12L).

NOTE: This roller bearing retainer holds bearing in position and in final transmission assembly is pushed forward into recess by mainshaft pilot.

DRIVE GEAR BEARING RETAINER OIL SEAL

Replacement

1. Remove retainer and oil seal assembly and gasket.

2. Pry oil seal out of retainer.

3. Install new seal on Tool J-22833 with lip of seal toward flange of tool.

4. Support front surface of retainer in press, start seal and tool in retainer bore and drive seal into retainer until flange of tool bottoms on retainer (Fig. 7B-13L).

5. Install new gasket on retainer and install retainer on transmission case (when assembling transmission).

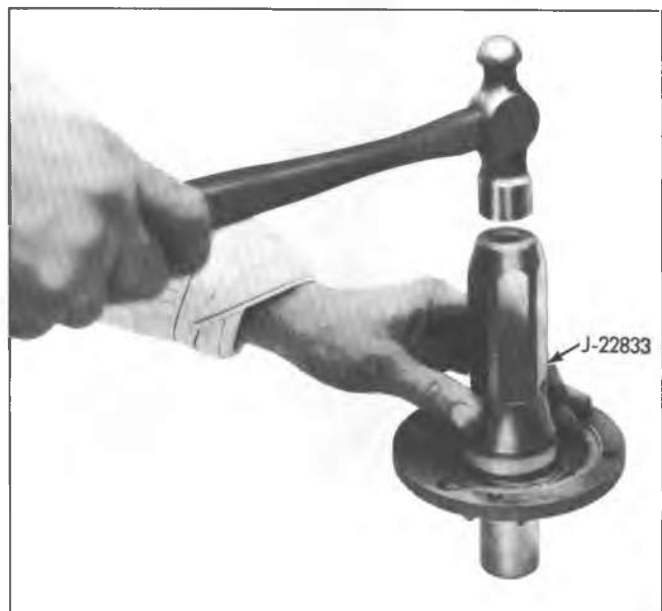


Fig. 7B-13L--Installing Bearing Retainer Oil Seal

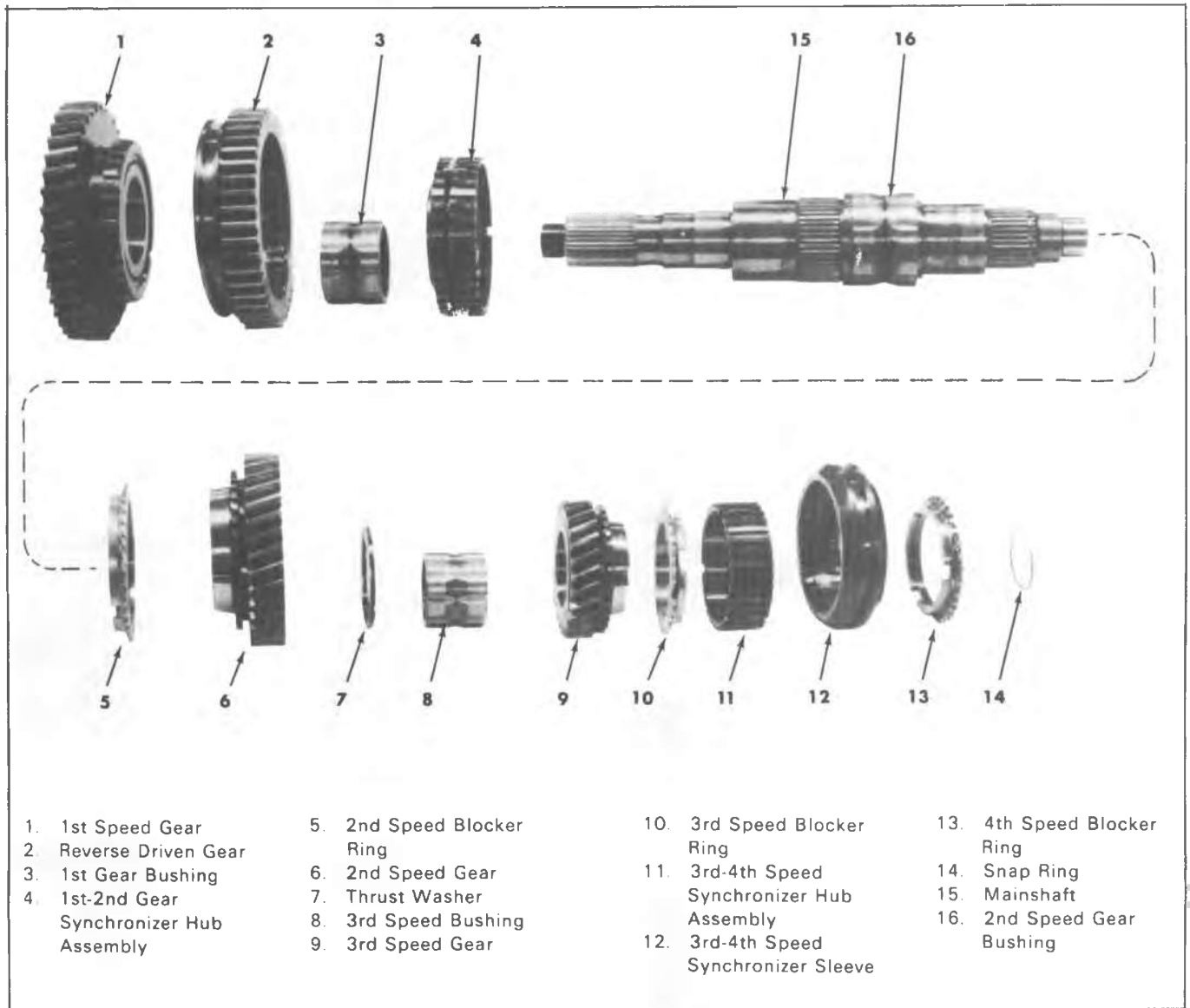


Fig. 7B-14L—Mainshaft Assembly Exploded View

MAINSHAFT ASSEMBLY**Disassembly (Fig. 7B-14L)**

1. Remove first speed gear and thrust washer.
2. Remove snap ring in front of 3rd-4th synchronizer assembly.
3. Remove reverse driven gear.
4. Press behind second speed gear to remove 3rd-4th synchronizer assembly, 3rd speed gear and 2nd speed gear along with 3rd speed gear bushing and thrust washer (Fig. 7B-15L).
5. Remove 2nd speed synchronizer ring.
6. Supporting 2nd speed synchronizer hub at front face, press mainshaft through removing 1st speed gear bushing and 2nd speed synchronizer hub.
7. Split 2nd speed gear bushing with chisel and remove bushing from shaft.

CAUTION: Exercise care not to damage mainshaft.

Inspection

1. Wash all parts in cleaning solvent.
2. Inspect mainshaft for scoring or excessive wear at thrust surfaces or splines.

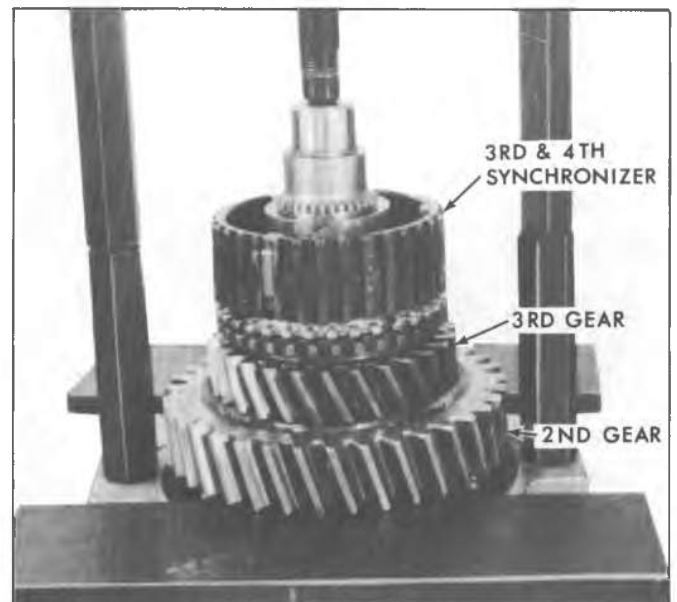


Fig. 7B-15L—Disassembly of Mainshaft

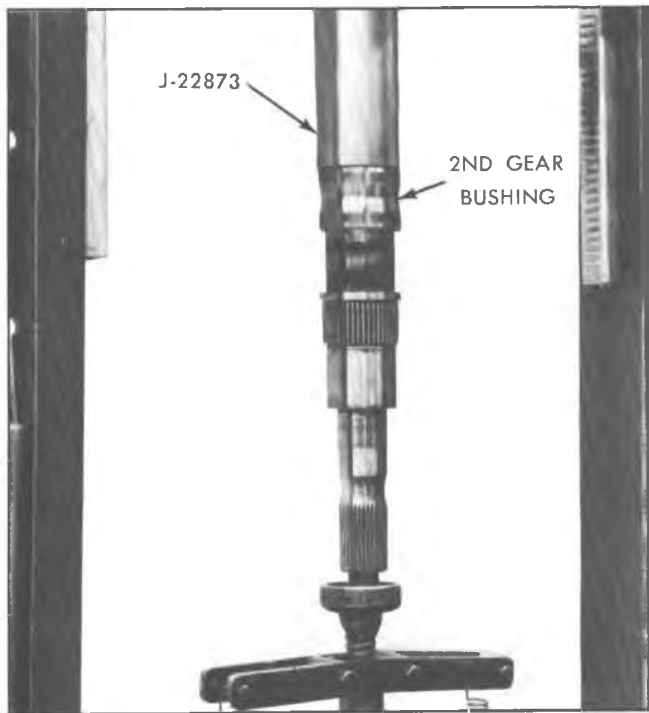


Fig. 7B-16L—Installing 2nd Speed Gear Bushing

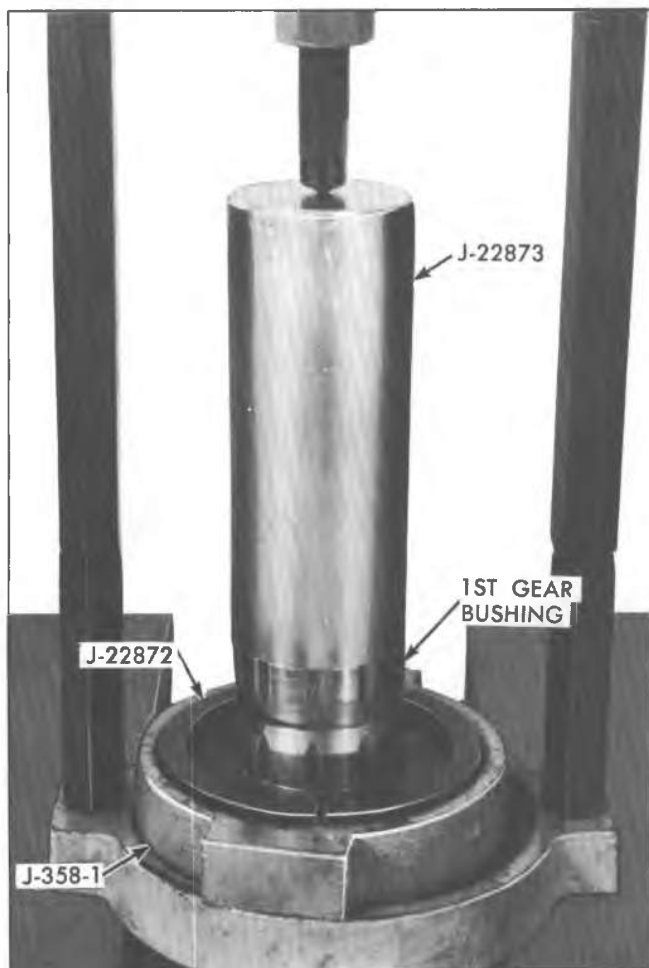


Fig. 7B-17L—Installing 3rd Speed Gear Bushing

3. Inspect clutch hub and clutch sleeve for excessive wear and make sure sleeve slides freely on clutch hub. Also check fit of clutch hub on mainshaft splines.

NOTE: Third and fourth speed clutch sleeve should slide freely on third and fourth speed clutch hub but clutch hub should be snug fit on shaft splines.

4. Inspect 3rd speed gear thrust surfaces for excessive scoring and inspect third speed gear mainshaft bushing for excessive wear.

NOTE: Third speed gear must be a running fit on mainshaft bushing and mainshaft bushing should be press fit on shaft.

5. Check second speed thrust washer for excessive scoring.

6. Inspect 2nd speed gear for excessive wear at thrust surface. Check synchronizer springs for looseness or breakage.

7. Inspect second gear synchronizing ring for excessive wear.

8. Inspect bronze synchronizer cone on 2nd speed gear for excessive wear or damage. Also inspect clutch gear synchronizer cone and third speed gear synchronizer cone for excessive wear or damage.

NOTE: First and reverse sliding gear must be sliding fit on synchronizer hub and must not have excessive radial or circumferential play. If sliding gear is not free on hub, inspect for burrs which may have rolled up on front end of half-tooth internal splines and remove by honing as necessary.

9. Inspect all gear teeth for excessive wear.

Assembly

1. Using Tool J-22873 press 2nd speed bushing onto mainshaft until it bottoms against shoulder (Fig. 7B-16L).

NOTE: Lubricate bushing with E.P. oil before pressing.

CAUTION: 1st, 2nd and 3rd speed gear bushings are sintered iron, exercise care when installing.

2. Press 1st and 2nd speed synchronizer hub onto mainshaft until it bottoms against shoulder with annulus toward rear of shaft.

3. Install 1st and 2nd synchronizer keys and springs (if previously removed).

4. Using Tool J-22873 press 1st speed gear bushing onto mainshaft until it bottoms against hub (Fig. 7B-17L).

NOTE: Lubricate all bushings with E.P. oil before installation of gears.

5. Install synchronizer blocker ring and 2nd speed gear onto mainshaft and against synchronizer hub. Index synchronizer key slots with keys in synchronizer hub.

6. Install 3rd speed gear thrust washer onto mainshaft with tang on thrust washer in slot on shaft and against 2nd speed gear bushing. Then press 3rd speed gear bushing onto mainshaft using Tool J-22875 until it bottoms against thrust washer (Fig. 7B-18L).

7. Install 3rd speed gear synchronizer blocker ring and 3rd speed gear onto mainshaft, against 3rd speed gear thrust washer.

8. Index synchronizer ring key slots with synchronizer assembly keys and press 3rd and 4th synchronizer assembly onto mainshaft using Tool J-22875 and against 3rd speed gear bushing thrust face toward 3rd speed gear (Fig. 7B-19L). Retain synchronizer assembly with snap ring.

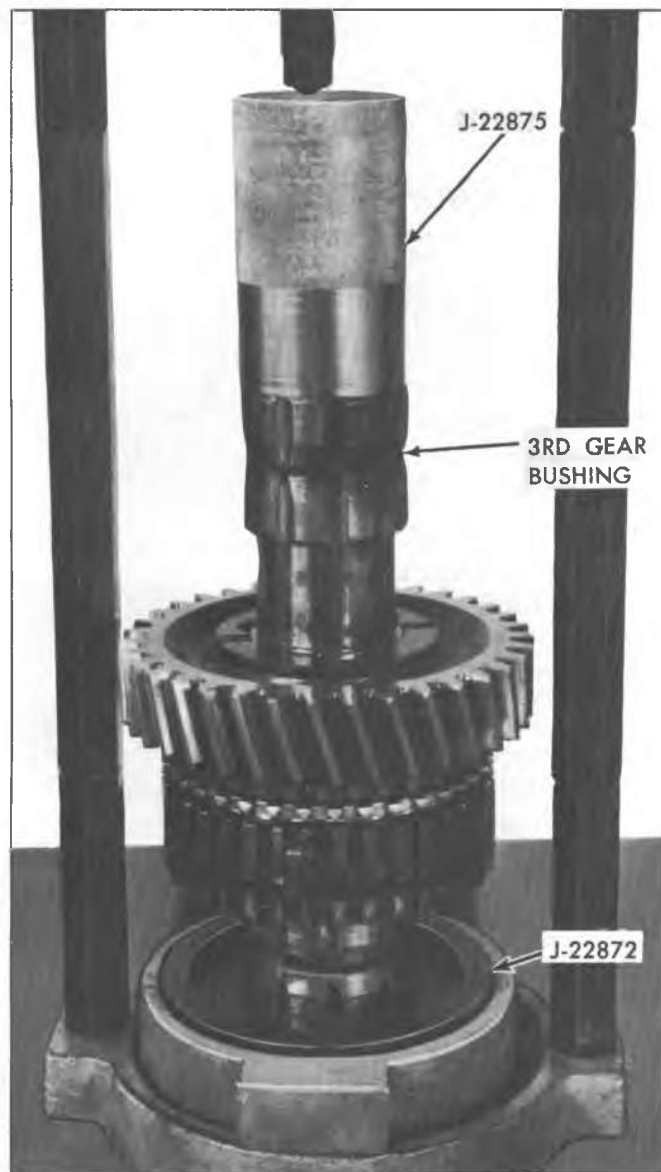


Fig. 7B-18L--Installing 3rd Speed Gear Bushing

9. Install reverse driven gear with fork groove toward rear.

10. Install 1st speed gear onto mainshaft and against 1st and 2nd synchronizer hub. Install 1st speed gear thrust washer.

COUNTERSHAFT ASSEMBLY

Disassembly

1. Remove front countergear retaining ring and thrust washer. Discard snap ring.

2. Install Tool J-22832 or suitable press plates on countershaft, open side to spacer, (Fig. 7B-20L); support assembly in an arbor press and press countershaft out of clutch countergear assembly.

NOTE: Countergear is a slip fit and pressing may not be required.

3. Remove clutch countergear rear retaining ring. Discard snap ring.

4. Remove 3rd speed countergear retaining ring. Discard snap ring.

5. Position assembly on an arbor press and press shaft from 3rd speed countergear.

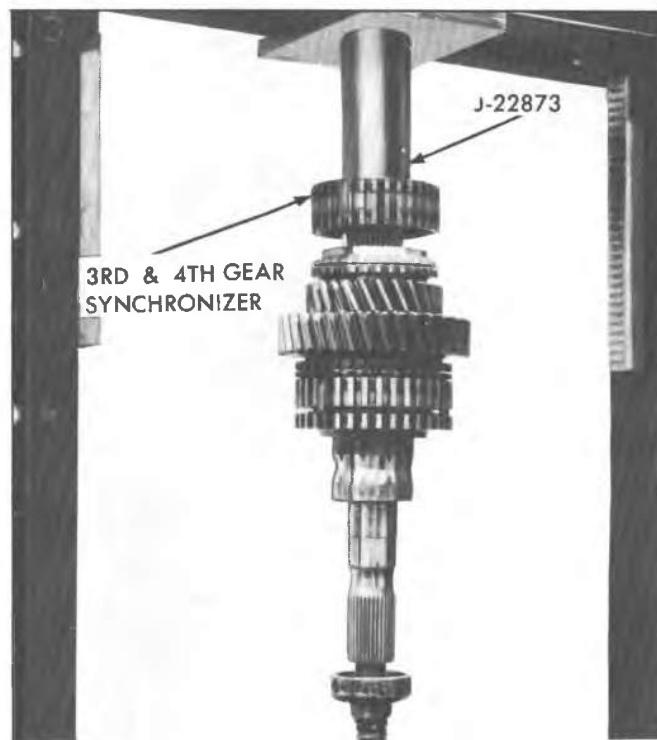


Fig. 7B-19L--Installing 3rd and 4th Gear Synchronizer

Assembly

1. Position 3rd speed countergear and shaft in arbor press and press the gear onto the shaft. Gear should be installed on shaft with the side having the splines extending the full length of the bore towards the front of the shaft.

NOTE: A force of approximately 1500 lbs. is required to press the gear onto the shaft.

2. Install new 3rd speed countergear retaining ring using snap ring pliers.

3. Install new clutch countergear rear retaining ring using Tool J-22830, J-22873 and snap ring pliers as follows: Install Tool J-22830 on end of shaft and position snap ring

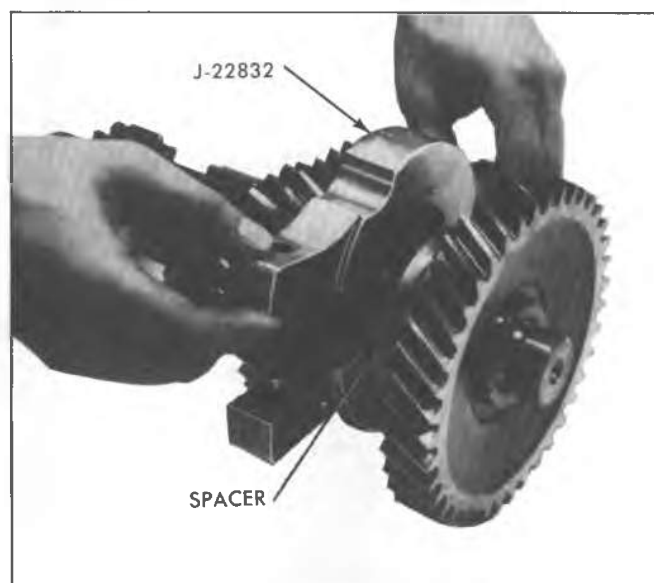


Fig. 7B-20L--Positioning Tool J-22832 on Countershaft

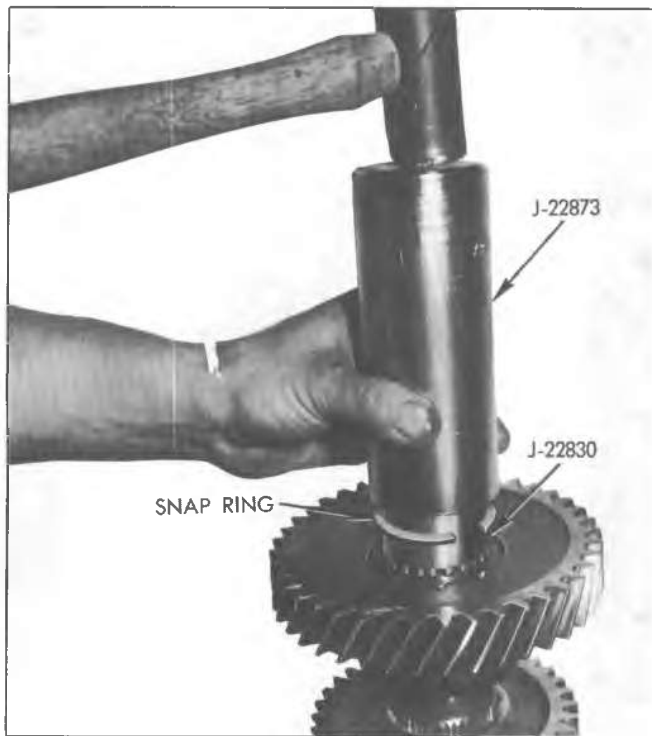


Fig. 7B-21L--Installing Counter Gear Snap Ring

on Tool (Fig. 7B-21L). Using Tool J-22873, push down on snap ring until it engages groove on shaft. Using snap ring pliers, carefully expand ring until it just slides onto splines, then push ring down shaft until it engages groove on shaft.

CAUTION: Do not over stress snap ring.

4. Position clutch countergear and spacer on shaft and press countergear onto shaft against snap ring using Tool J-22873, (Fig. 7B-22L).

NOTE: Countergear is a slip fit and pressing may not be required.

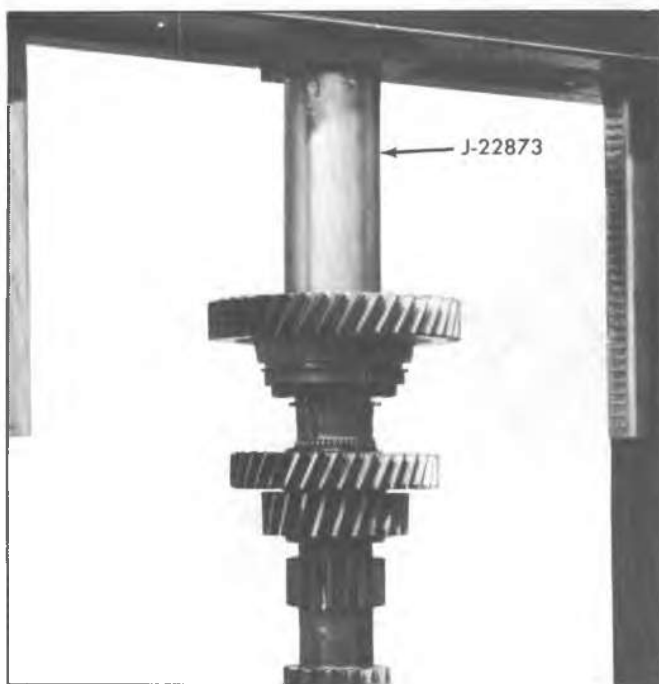


Fig. 7B-22L--Installing Clutch Countergear

5. Install clutch countergear thrust washer and front retaining ring using Tool J-22830 and J-22873 (Fig. 7B-21L).

CAUTION: Do not over stress snap ring. Ring should be tight in groove without side play.

ASSEMBLY OF TRANSMISSION

1. Lower the countergear into the case until it rests on bottoms of case.

2. Place reverse idler gear in transmission case with gear teeth toward the front. Install idler gear shaft from rear to front, being careful to have slot in end of shaft in facing down. Shaft slot face must be at least flush with case.

3. Install mainshaft assembly into case with rear of shaft protruding out rear bearing hole in case. Position Tool J-22874 in clutch gear case opening and engaging front mainshaft (Fig. 7B-23L). Rotate case onto front end.

NOTE: Install 1st speed gear thrust washer on shaft, if not previously installed.

4. Install snap ring on bearing O.D. and position rear mainshaft bearing on shaft. Using Tool J-22874-1 drive bearing onto shaft and into case (Fig. 7B-23L). Rotate case and remove Tool J-22874-5.

5. Install synchronizer cone on pilot end of mainshaft and slide rearward to clutch hub.

CAUTION: Make sure three cut out sections of 4th speed synchronizer cone align with three clutch keys in clutch assembly.

6. Install snap ring on drive gear bearing O.D. Index cut out portion of drive gear teeth to obtain clearance over countershaft drive gear teeth, and install clutch gear assembly onto case. Raise mainshaft to get clutch gear started and tap bearing outer race with plastic tip hammer.

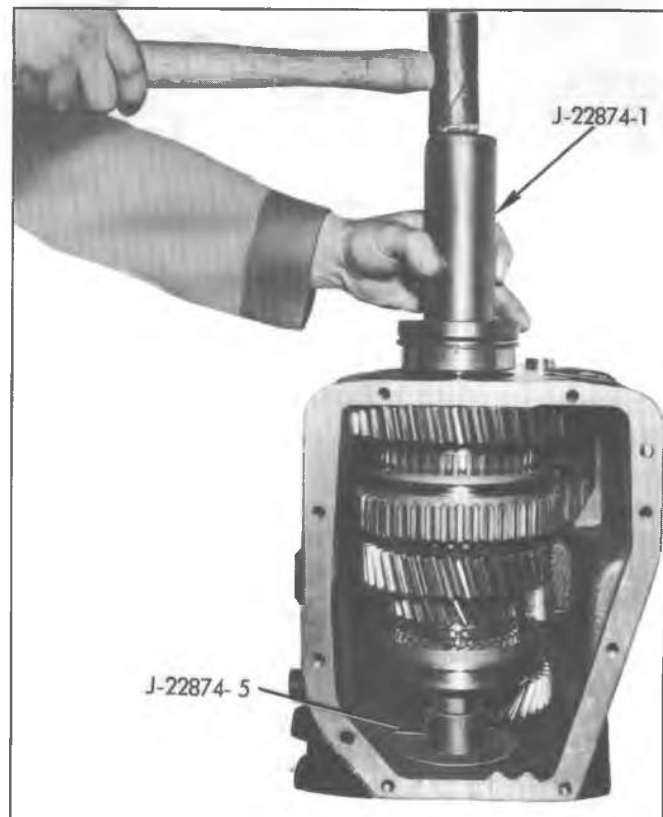


Fig. 7B-23L--Installing Mainshaft Rear Bearing

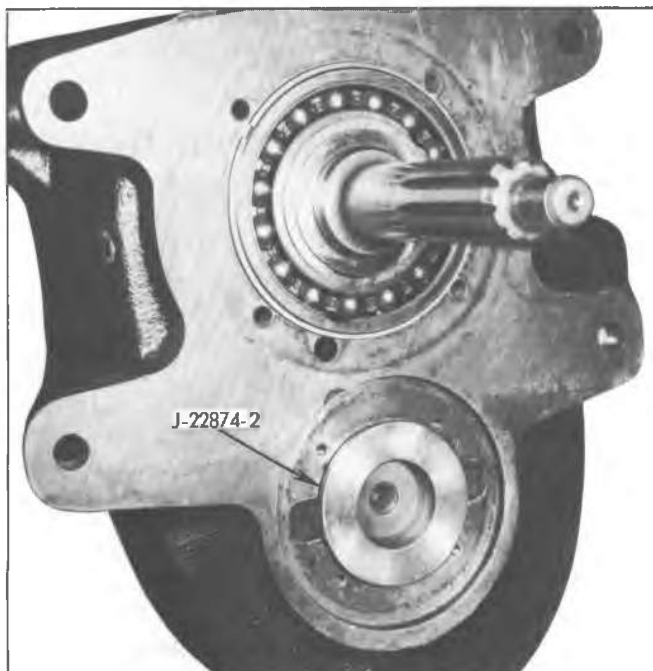


Fig. 7B-24L--Countergear Front Support Tool

7. Install drive gear bearing retainer using a new gasket. Install bolts and tighten to 15-18 ft. lbs.

8. Install Tool J-22874-2 in countergear front bearing opening in case to support countergear and rotate case onto front end. (Fig. 7B-24L).

9. Install snap ring on countergear rear bearing O.D., position bearing on countergear and using Tool J-22874-2, drive bearing into place (Fig. 7B-25L). Rotate case, install snap ring on countershaft at rear bearing and then remove Tool J-22874-2.

10. Tap countergear front bearing assembly into case.

11. Install countergear front bearing cap and new gasket. Torque screws to 20-30 in. lbs.

12. Slide speedometer drive gear over mainshaft to bearing.

13. Install rear bearing retainer with new gasket. Be sure snap ring ends are in lube slot and cut out in bearing retainer. Install bolts and tighten to 15-18 ft. lbs. Install brake backing plate assembly on models equipped with propeller shaft brake.

NOTE: On models equipped with 4-wheel drive, install rear lock nut and washer using Tool J-23070 (Fig. 7B-26L). Torque lock nut to 120 ft. lbs. and bend washer tangs to fit slots in nut.

14. Install parking brake drum and/or universal joint flange.

NOTE: Apply light coat of oil to seal surface.

15. Lock transmission in two gears at once. Install universal joint flange locknut and tighten to 90-120 ft. lbs.

16. Move all transmission gears to neutral except the



Fig. 7B-25L--Installing Countergear Rear Bearing

reverse idler gear which should be engaged approximately 3/8 of an inch (leading edge of reverse idler gear teeth lines up with the front edge of the 1st speed gear). Install cover assembly with new gasket to transmission case. Shifting forks must slide into their proper positions on clutch sleeves and reverse idler gear. Forks must be positioned as in removal.

17. Install cover attaching bolts and torque to 20-25 ft. lbs.

18. Using Tool J-8109, replace gearshift lever and check operation of transmission.

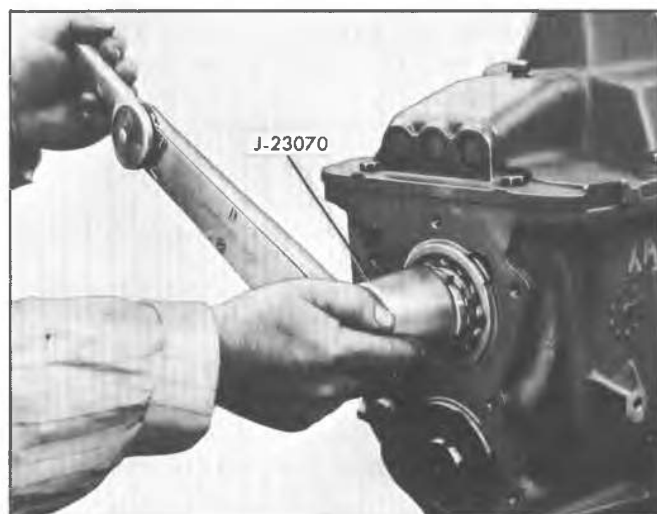


Fig. 7B-26L--Installing Mainshaft Rear Bearing Lock Nut (4-Wheel Drive only)

NEW PROCESS MODEL 205 (PART TIME) TRANSFER CASE

INDEX

Disassembly of Transfer Case	7B-52	Assembly of Transfer Case.....	7B-55
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Shift Rail and Fork Assemblies	7B-52	Front Output Shaft Assembly	7B-57
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DISASSEMBLY OF TRANSFER CASE (FIG. 7B-1R)

Rear Output Shaft and Yoke Assembly

1. Loosen rear output shaft yoke nut.
2. Remove rear output shaft housing bolts and remove housing and retainer assembly from case.
3. Remove retaining nut and yoke from shaft, then remove shaft assembly from housing.
4. Remove snap ring using Tool J-23432 and discard.
5. Remove thrust washer and washer pin.
6. Remove tanged bronze washer. Remove gear needle bearings (32 per row), spacer and second row of needle bearings.
7. Remove tanged bronze thrust washer from shaft.
8. Remove pilot rollers (15), retainer ring and washer.
9. Remove oil seal retainer, ball bearing, speedometer gear and spacer. Discard all gaskets. Press out bearing as required.
10. Remove oil seal from the retainer.

Front Output Shaft Assembly (Fig. 7B-3R)

1. Remove lock nut, washer and yoke.
2. Remove front bearing retainer attaching bolts and retainer.
3. Remove front output shaft rear bearing retainer attaching bolts.
4. Tap on output shaft with a soft hammer (Fig. 7B-4R) and remove shaft, gear assembly, and rear bearing retainer from case.

NOTE: Remove the sliding clutch from output high gear, washer, and bearing which will have remained in the case.

5. Using large snap ring picks, such as J-23432-1, remove the gear retaining ring from the shaft (Fig. 7B-5R) and discard.
6. Remove thrust washer and pin from shaft.
7. Remove gear, needle bearings (32 per row) and spacer.
8. If necessary to replace front output shaft rear bearing, support cover and press bearing from cover. Position new bearing to outside face of cover and using a piece of pipe or wood to cover outside diameter of bearing, press bearing into cover until flush with opening.

Shift Rail and Fork Assemblies

1. Remove the two poppet nuts on top of case, two poppet springs, and using a magnet, remove the poppet bails.
2. Drive cup plugs into case using a 1/4 inch punch.
3. Position both shift rails in neutral and using a long, narrow punch, drive shift fork pins through shift rails into the case (Fig. 7B-6R).
4. Remove clevis pins and shift rail link.
5. Remove shift rails (Fig. 7B-7R), upper (range) rail first, then lower (4-wheel) rail.
6. Remove shift forks and sliding clutch from case.
7. Remove the front output high gear, washer, and bearing from the case. Remove the shift rail cup plugs and pins from the case.

Input Shaft Assembly

8. Remove snap ring in front of bearing. Using a soft hammer, tap shaft out rear of case. Tap bearing out front of case.
9. Tip case on P.T.O. and remove two interlock pins from inside of case.

Idler Gear

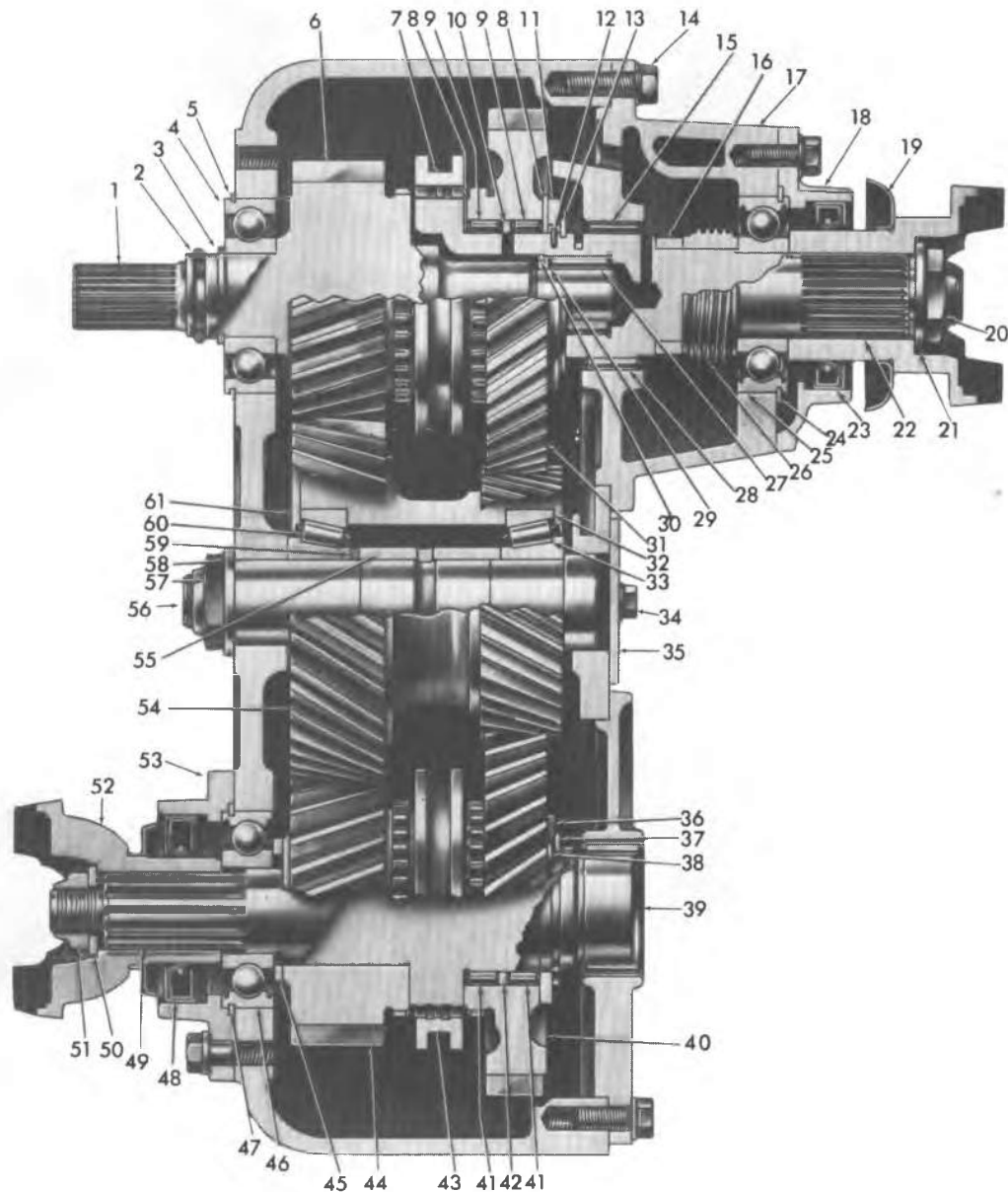
1. Remove idler gear shaft nut.
2. Remove idler shaft rear cover.
3. Remove idler gear shaft using a soft hammer and tool J-23429 (Fig. 7B-8R).
4. Roll idler gear to front output shaft hole and remove from case.
5. Remove bearing cups (2) as required from idler gear.

CLEANING AND INSPECTION

Bearings --Place all bearings and rollers in cleaning solution and allow to remain long enough to loosen all accumulated lubricant. Bearings should be sloshed up and down and turned slowly below surface of solution to remove as much lubricant as possible. Remove bearings and blow out with compressed air, being careful to direct air across bearing so that bearings do not spin.

Shafts and Gears --Clean all shafts in cleaning solution to remove all accumulations. Dry with compressed air.

Case, Cover and Bearing Cups --Transfer case, cover, and bearing cups must be thoroughly cleaned in solution to remove all accumulation of lubricant and dirt. Remove all trace of gaskets from surface where used.



- | | | | |
|--------------------------------|-------------------------------------|--|-------------------------|
| 1. Input Shaft | 18. Rear Bearing Retainer | 32. Idler Gear Shaft Bearing Cup | 43. Sliding Clutch |
| 2. "O" Ring | 19. Rear Yoke Assembly | 33. Idler Shaft Bearing Cone | 44. Front Wheel Hi-Gear |
| 3. Snap Ring | 20. Locknut | 34. Idler Shaft Cover Bolts and Lockwasher | 45. Spacer |
| 4. Bearing | 21. Washer | 35. Idler Shaft Gear Cover and Gasket | 46. Bearing |
| 5. Snap Ring | 22. Rear Output Shaft | 36. Thrust Washer | 47. Snap Ring |
| 6. Input Shaft Gear | 23. Bearing Retainer Seal | 37. Snap Ring | 48. Seal |
| 7. Sliding Clutch | 24. Snap Ring | 38. Thrust Washer Pin | 49. Front Output Shaft |
| 8. Tanged Bronze Thrust Washer | 25. Bearing | 39. Rear Bearing Retainer and Output Shaft Cover | 50. Washer |
| 9. Roller Bearings | 26. Speedometer Gear | 40. Front Wheel Drive Low Gear | 51. Locknut |
| 10. Spacer | 27. Pilot Bearings | 41. Roller Bearings | 52. Output Yoke |
| 11. Thrust Washer | 28. Rear Output Shaft Front Bearing | 42. Spacer | 53. Bearing Retainer |
| 12. Thrust Washer Pin | 29. Washer | | 54. Idler Gear |
| 13. Snap Ring | 30. Bearing Retainer | | 55. Idler Gear Spacer |
| 14. Bolt and Lockwasher | 31. Rear Wheel Drive Low Gear | | 56. Idler Shaft |
| 15. Needle Bearings | | | 57. Locknut |
| 16. Spacer | | | 58. Washer |
| 17. Rear Output Shaft Housing | | | 59. Bearing Cone |
| | | | 60. Bearing Cup |

Fig. 7B-1R--New Process Model 205 Transfer Case Cross Section

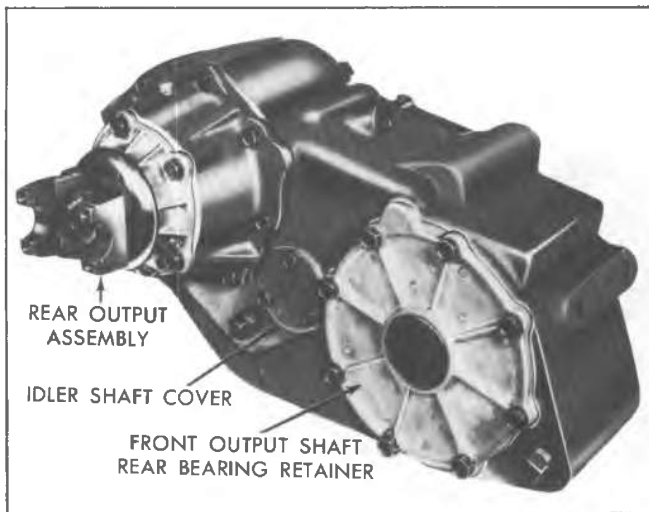


Fig. 7B-2R--Rear View of Transfer Case

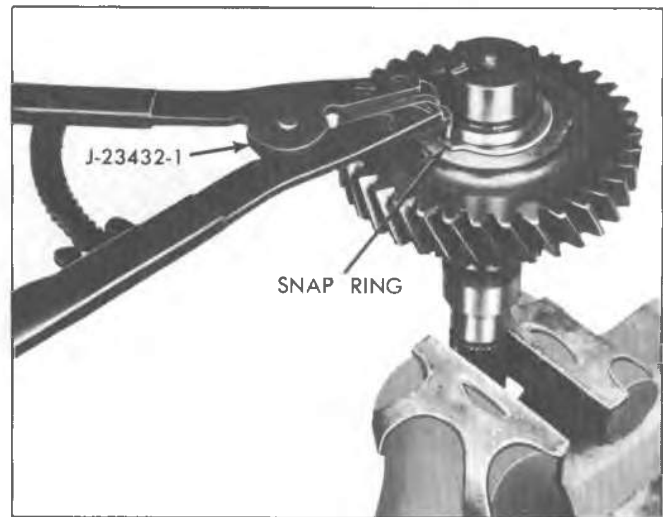


Fig. 7B-5R--Removing Gear Retaining Ring

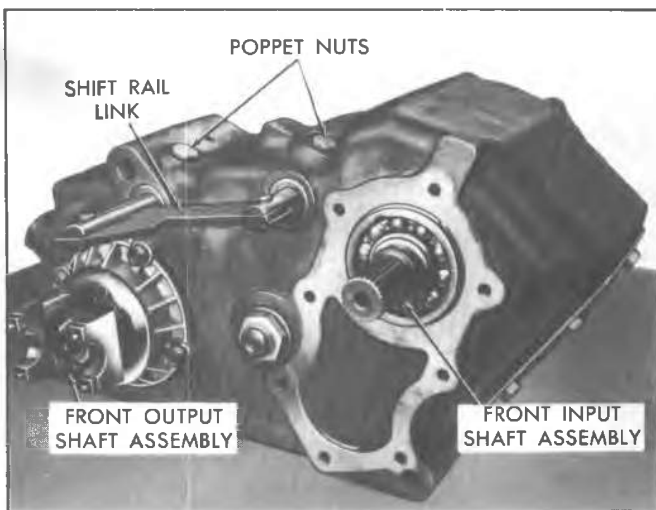


Fig. 7B-3R--Front View of Transfer Case



Fig. 7B-6R--Removing Shift Fork Pins

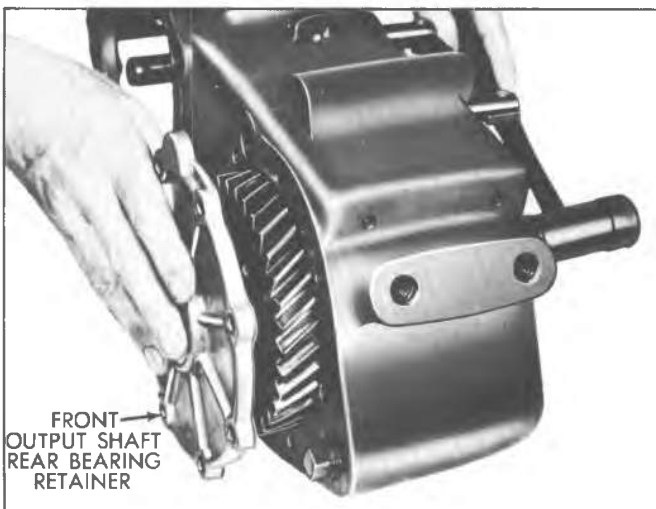


Fig. 7B-4R--Removing Front Output Shaft Rear Bearing Retainer

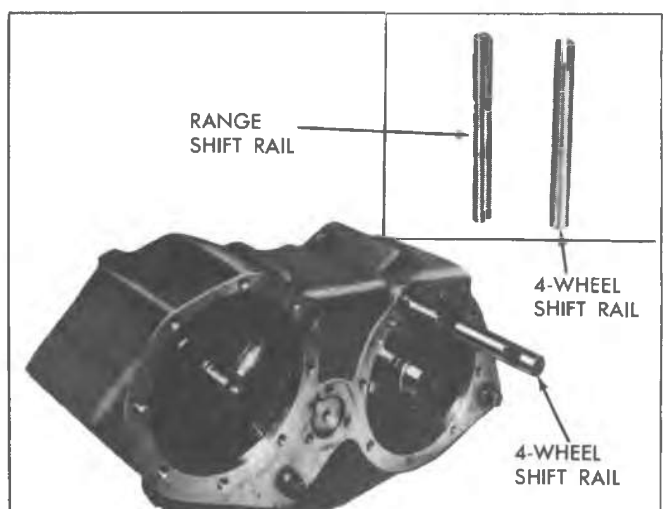


Fig. 7B-7R--Shift Rail Removal



Fig. 7B-8R--Removing Idler Gear Shaft

Inspection --Carefully inspect all bearings and rollers for evidence of chipping, cracks, or worn spots that would render bearing unfit for further service. Bearings are non-adjustable and if worn or damaged, must be replaced with new parts.

Inspect shaft splines and gears. If any indication of failure, such as chipped teeth or excessive wear, is indicated, those parts should be replaced with new parts.

ASSEMBLY OF TRANSFER CASE (FIG. 7B-9R)

Idler Gear

1. Press the two bearing cups in the idler gear (if previously removed) using Tool J-9276-2 and Handle J-8092 (Fig. 7B-10R).

2. Assemble the two bearing cones, spacer, shims and idler gear on dummy shaft J-23429 with bore up. Check end play (Fig. 7B-11R). Limits are .001 to .002 inch.

3. Install idler gear assembly with dummy shaft into case through front output bore, large end first (Fig. 7B-12R).

4. Install idler shaft from large bore side and drive through using a soft hammer (Fig. 7B-13R).

5. Install washer and new locknut. Check for end play and free rotation. Torque nut to 150 ft. lbs.

6. Install idler shaft cover and gasket. Torque bolts to 20 ft. lbs.

NOTE: Flat on cover must be located adjacent to front output shaft rear cover (Fig. 7B-14R).

Shift Rail and Fork Assemblies

1. Press the two rail seals into the caSe. Seals should be installed with metal lip outward.

2. Install interlock pins through large bore or P.T.O. opening.

3. Start front output drive shift rail into case from back, slotted end first, with poppet notches up.

4. Install shift fork (long end inward) into rail, push rail through to neutral position.

5. Install input shaft bearing and shaft into case.

6. Start range rail into case from front, with poppet notches up.

7. Install sliding clutch onto fork, place over input shaft in case. Position to receive range rail and push rail through to neutral position.

8. Install new lock pins through holes at top of case and drive them into the forks (Fig. 7B-15R).

NOTE: Tip case on P.T.O. opening when installing range rail lock pin.

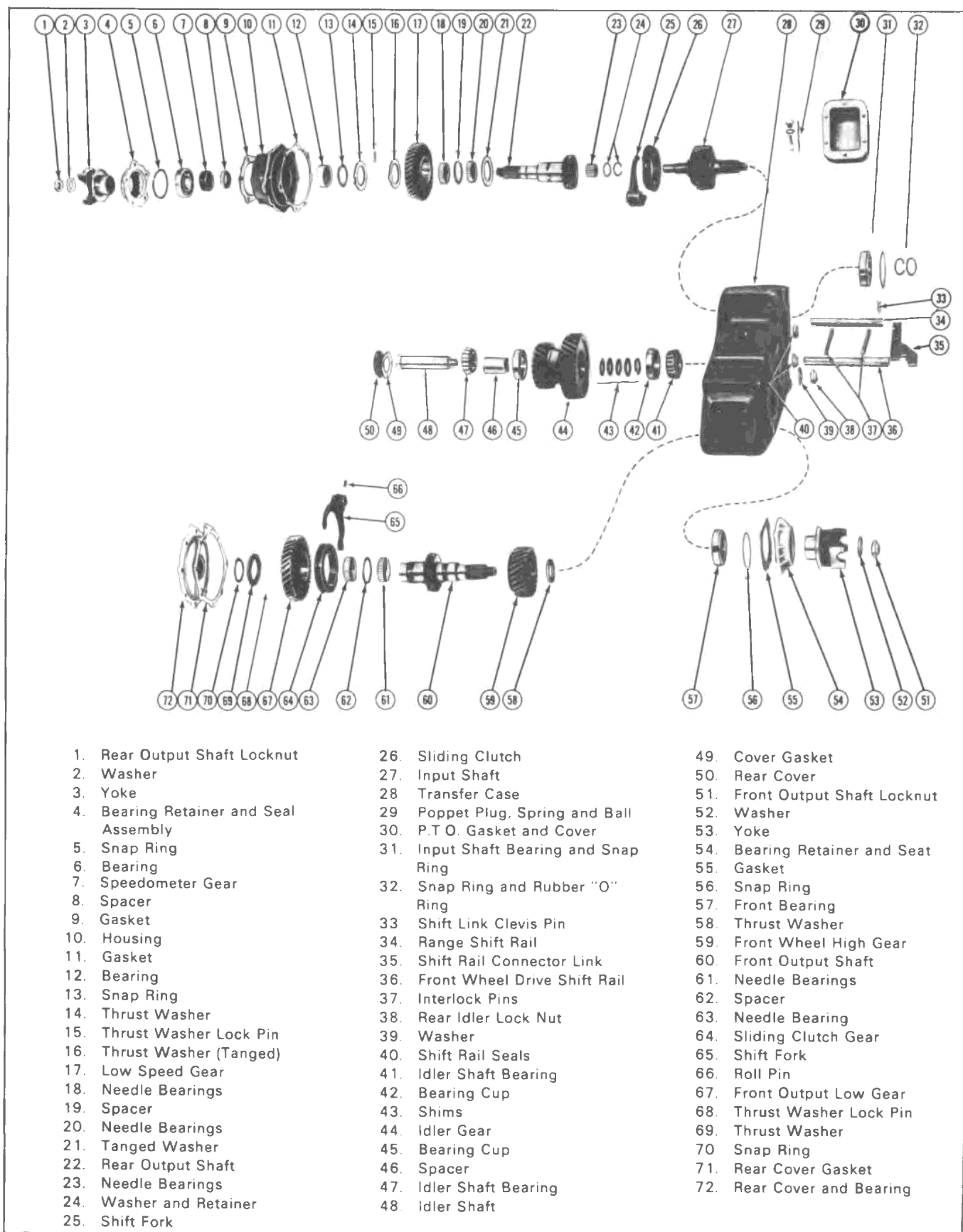


Fig. 7B-9R--New Process Model 205 Transfer Case Exploded View

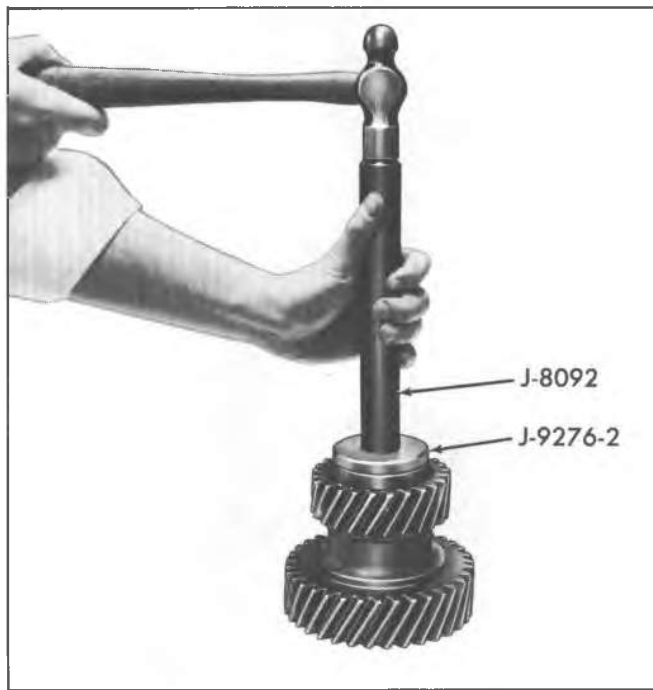


Fig. 7B-10R-Installing New Bearing Cups

Front Output Shaft and Gear Assembly

1. Install two rows of needle bearings (32 each) separated by a spacer in the front low output gear and retain with a sufficient amount of grease.

2. Place front output shaft in soft jawed vise, spline end down. Install front low gear over shaft with clutch gear facing down and install thrust washer pin, thrust washer and new snap ring using Tool J-23432.

NOTE: Position the snap ring so that the opening is opposite the pin.

3. Position front wheel hi-gear and washer in case. Install sliding clutch in the shift fork, then put fork and rail in the front wheel drive (4-Hi) position with the clutch teeth in mesh with the teeth of the front wheel hi-gear.

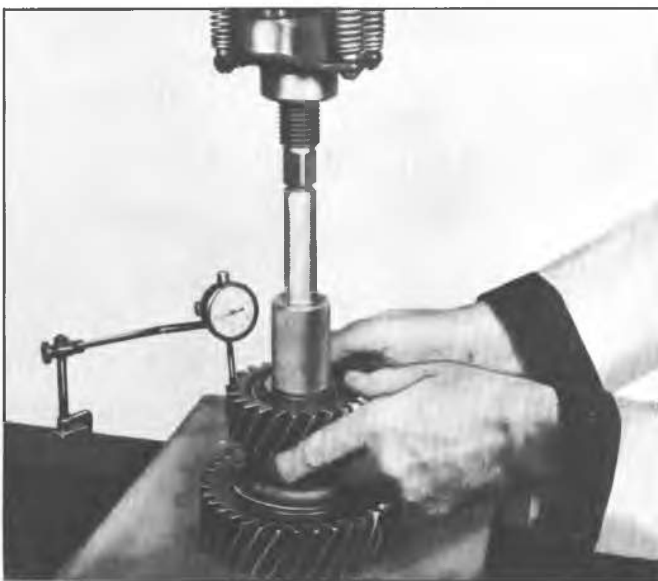


Fig. 7B-11R-Checking Idler Gear End Play

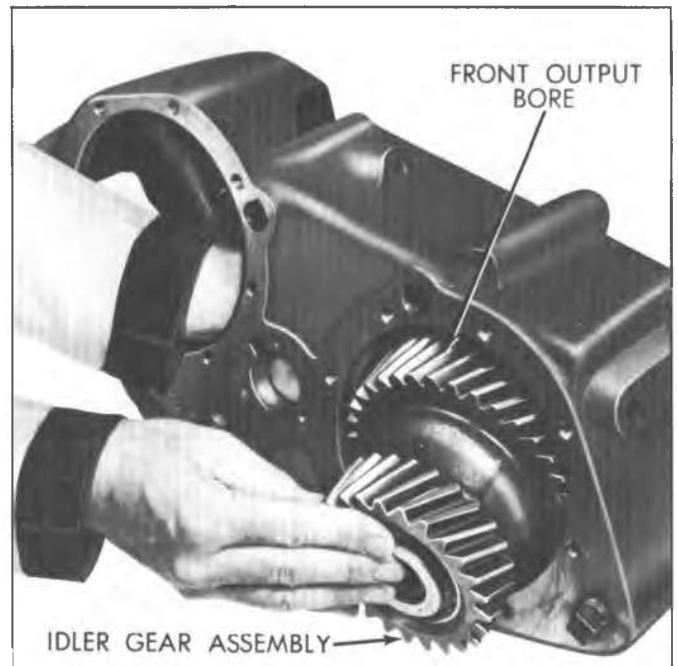


Fig. 7B-12R-Installing Idler Gear

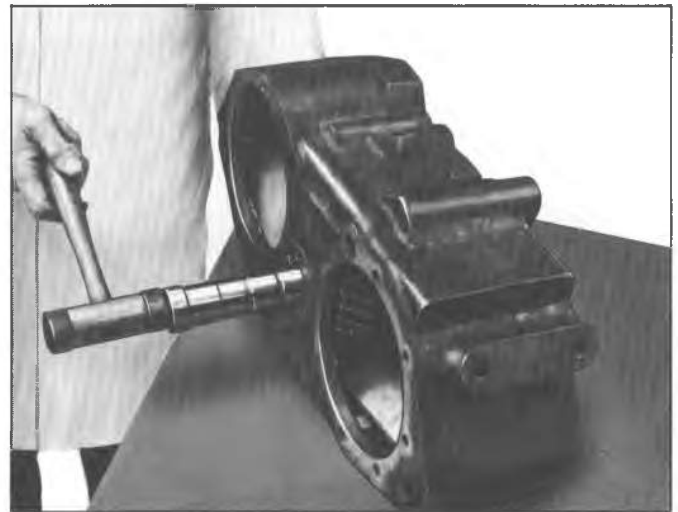


Fig. 7B-13R-Installing Idler Shaft

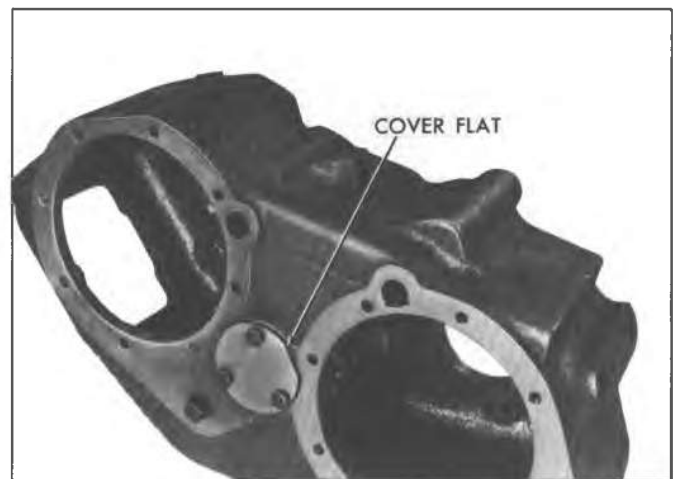


Fig. 7B-14R-Installing Idler Shaft Rear Cover

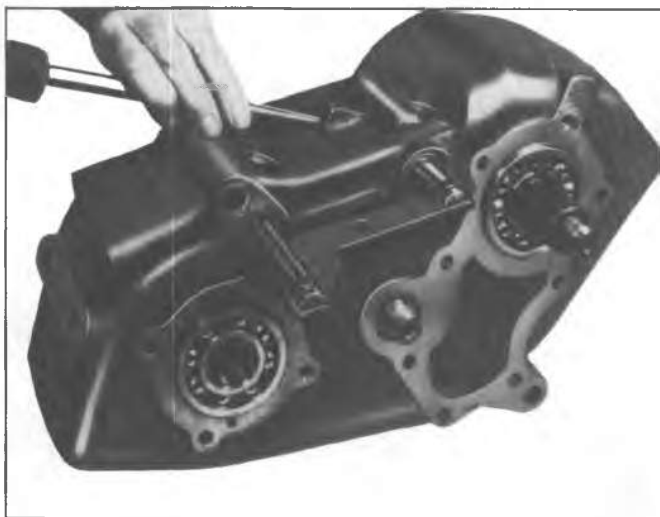


Fig. 7B-15R—Installing Shift Rail Lock Pins

4. Line up washer, high gear, and sliding clutch with bearing bore. Insert front output shaft and low gear assembly through the high gear assembly.

5. Install new seal in bearing retainer using Tool J-22836 (Fig. 7B-16R) and install the front output bearing and retainer in the case.

6. Clean and grease rollers in front output rear bearing retainer. Install onto case using one gasket. Dip bolts into sealant. Install bolts and torque to 30 ft. lbs.

7. Install front output yoke, washer and lock nut. Torque nut to 150 ft. lbs.

Rear Output Shaft Assembly

1. Install two rows of needle bearings (32 each) separated by a spacer into the output low gear.

NOTE: Use sufficient grease to retain needles.

2. Install thrust washer onto rear output shaft, tang



Fig. 7B-16R—Installing Front Output Bearing Retainer Seal



Fig. 7B-17R—Installing Rear Output Shaft Housing Bearing

down in clutch gear groove. Install output low gear onto shaft with clutch teeth facing down.

3. Install thrust washer over gear with tab pointing up and away from gear. Install washer pin and also large thrust washer over shaft and pin. Rotate washer until tab fits into slot approximately 90 degrees away from pin. Finally, install snap ring using Tool J-23423 and J-23423-1 and check end play which should be within .002-.027 inch.

4. Grease pilot bore or rear output shaft and install needle bearings (15). Install thrust washer and new snap ring in bore.

5. Clean, grease, and install new bearing in retainer housing using Tool J-23431 (Fig. 7B-17R).

6. Install housing onto output shaft assembly, install spacer and speedometer gear, then install bearing (Fig. 7B-18R).



Fig. 7B-18R—Installing Rear Output Shaft Spacer and Speedometer Gear

7. Install rear bearing retainer seal using Tool J-21359 or J-22834-2 (Fig. 7B-19R).

8. Install bearing retainer assembly onto housing with one or two gaskets, depending on clearance. Torque bolts to 30 ft. lbs.

9. Install yoke, washer, and lock nut output shaft.

10. Position range rail in 'high' and install output shaft and retainer assembly on transfer case. Torque housing bolts to 30 ft. lbs.

Miscellaneous

1. Install P.T.O. cover and gasket. Torque bolts to 15 ft. lbs.

2. Install and seal cup plugs at rail pin holes, if not previously done.

3. Install drain and filler plugs and torque to 30 ft. lbs.

4. Install shift rail cross link, clevis pins and lock pins.

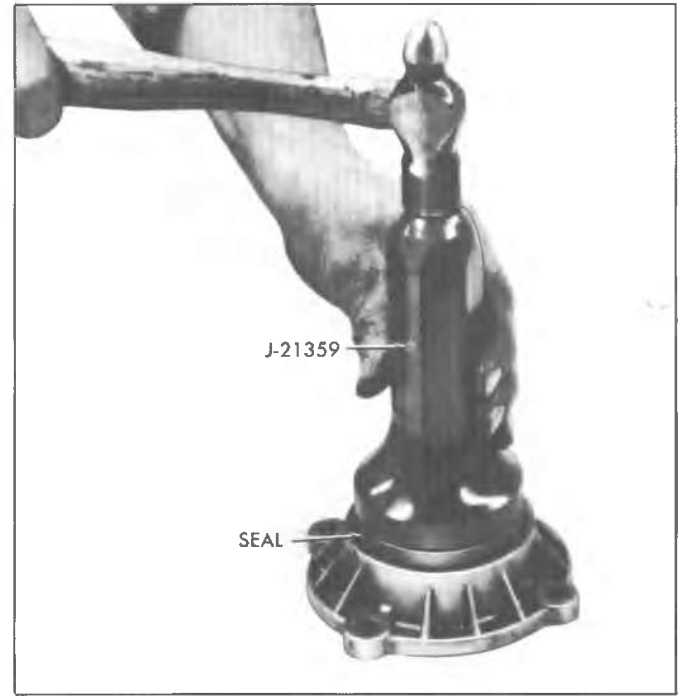


Fig. 7B-19R—Installing Rear Bearing Retainer Seal

NEW PROCESS MODEL 203 (FULL TIME) TRANSFER CASE

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DISASSEMBLY OF TRANSFER CASE

Refer to Figs. 7B-1S, 7B-11S and 7B-12S for cross sectional and exploded views of the transfer case.

1. Position transfer case on work bench or suitable work table.

NOTE: If lubricant was not drained from unit prior to removal from vehicle, remove front output rear cover and P.T.O. cover lower bolts and drain lubricant into waste container.

2. Using Tool J-8614-1, loosen rear output shaft flange retaining nut (Fig. 7B-4S).

3. Using Tool J-8614-1, remove front output shaft flange retaining nut, washer and flange.

NOTE: Tap dust shield rearward on shaft (away from bolts) to obtain clearance to remove bolts from flange and allow installation of Tool J-8614-1.

4. Remove bolts retaining front output shaft front bearing retainer (Fig. 7B-5S). Remove bearing retainer and gasket from transfer case. Discard gasket.

5. Using a hoist or other suitable lifting tool, position assembly on blocks (Fig. 7B-6S).

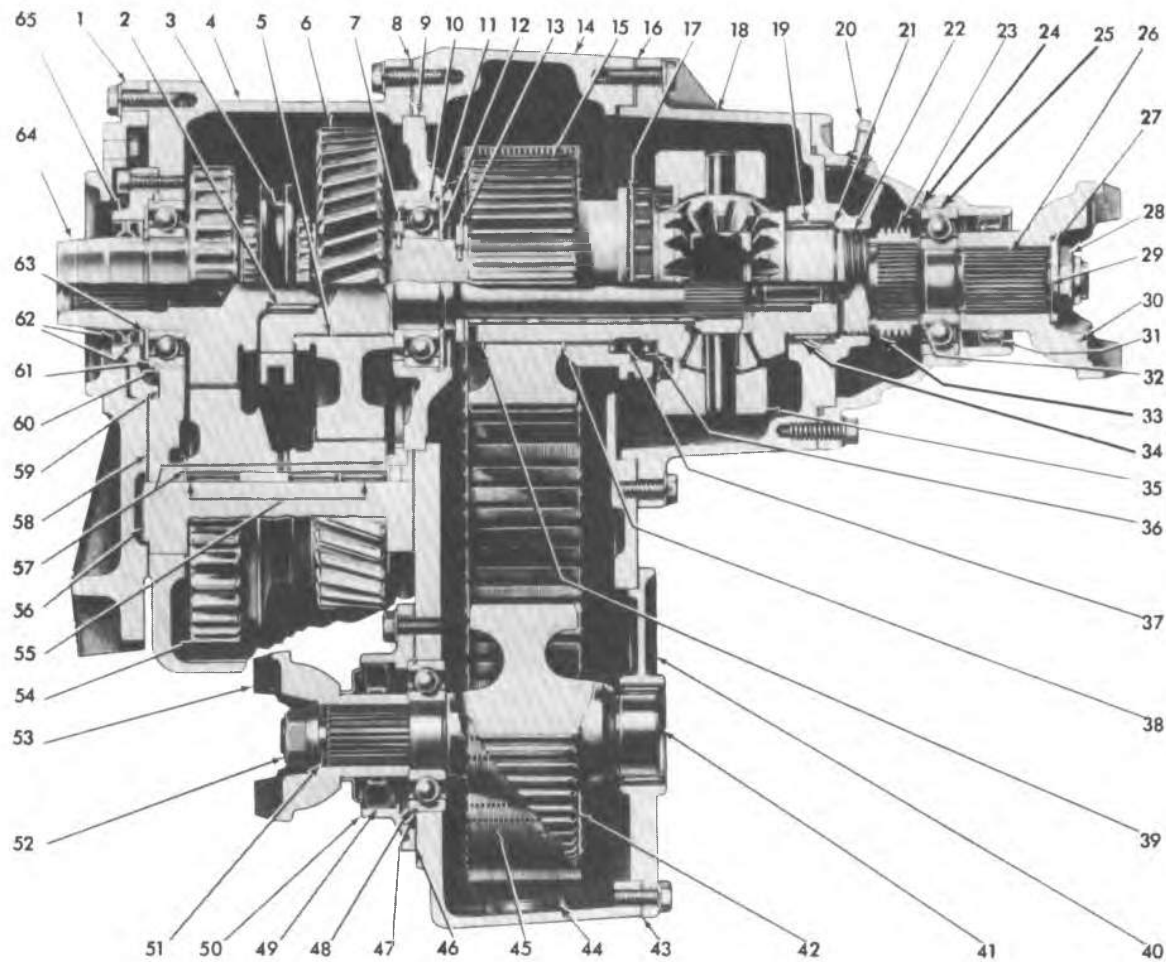
6. Remove bolts retaining rear section of rear output housing from front section of rear output housing, and disengage. Remove shims and speedometer gear from output shaft.

a. Remove bolts retaining front section of rear output housing assembly from transfer case. Remove housing from case.

b. Remove "O" ring seal from front section of rear output housing and discard.

c. Disengage rear output shaft from differential carrier assembly.

7. Slide carrier unit from shaft.



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

Fig. 7B-1S--Model 203 Transfer Case Cross Sectional View

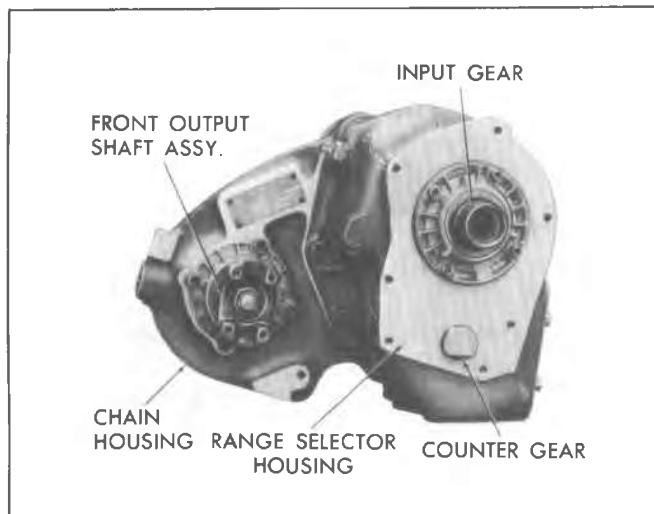


Fig. 7B-2S--Front View of Transfer Case

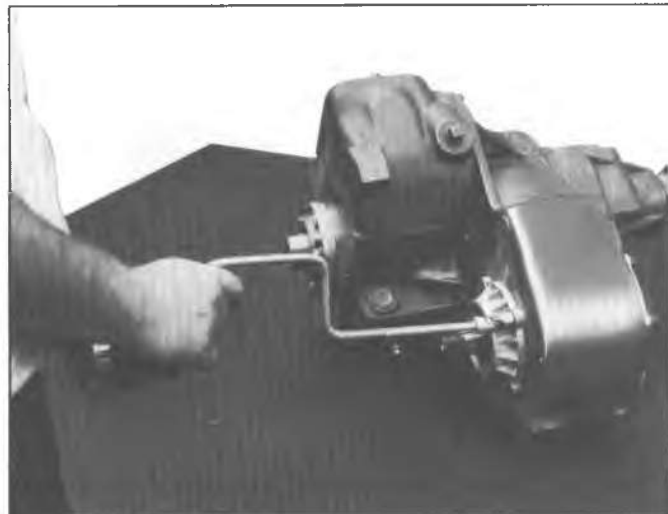


Fig. 7B-5S--Removing Front Output Shaft Front Bearing Retainer

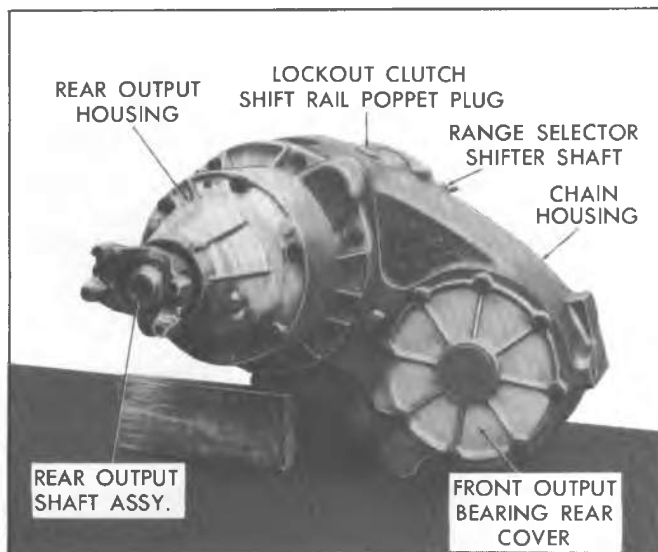


Fig. 7B-3S--Rear View of Transfer Case

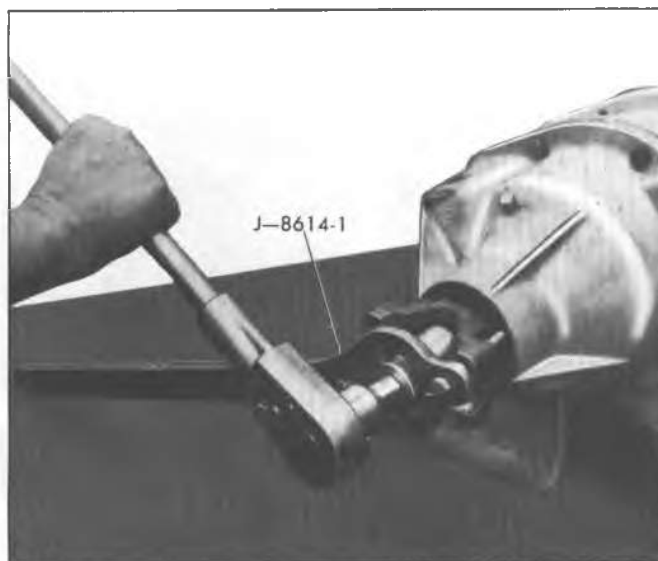


Fig. 7B-4S--Removing Rear Output Shaft Flange Nut

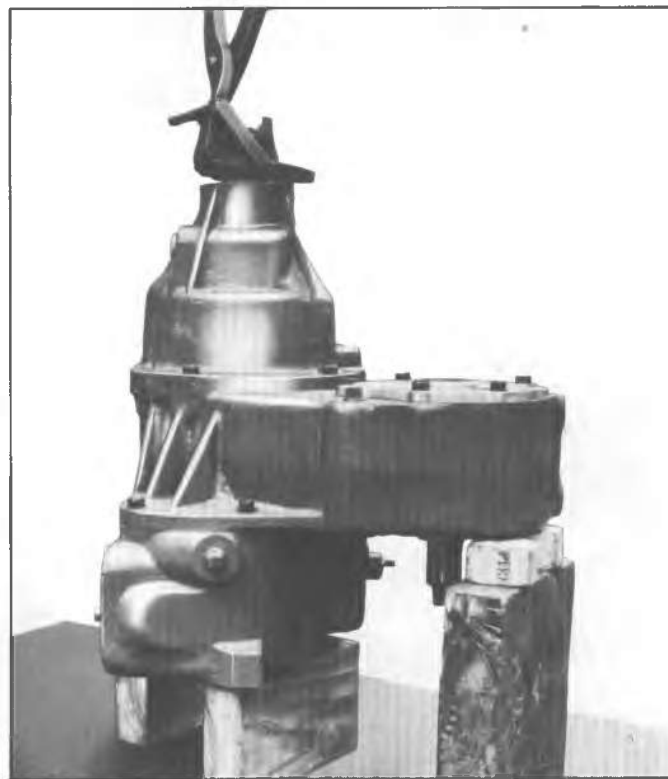


Fig. 7B-6S--Positioning Transfer Case for Disassembly

NOTE: A 1-1/2" to 2" water hose band type clamp may be installed on the input shaft at this time to prevent loosening bearings when removing input shaft assembly from the range box.

8. Raise shift rail and drive out pin retaining shift fork to rail (Fig. 7B-7S).

9. Remove shift rail poppet ball plug, gasket spring and ball from case (Fig. 7B-8S). A small magnet may be used to remove ball from case.

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

11. Remove bolts retaining front output shaft rear



Fig. 7B-7S--Removing Shift Fork Retaining Pin

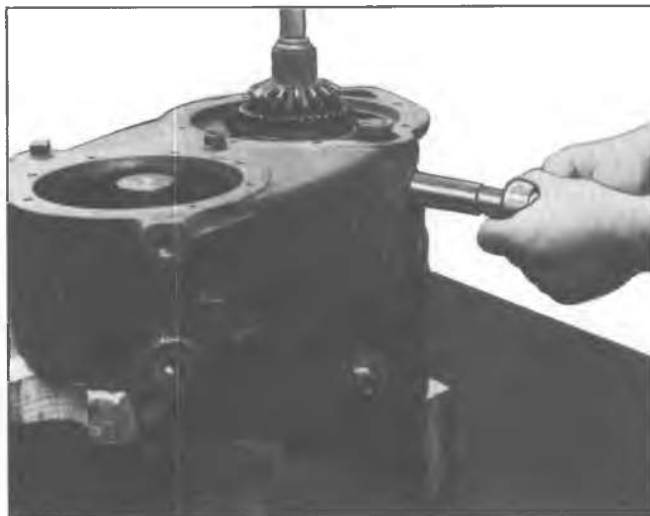


Fig. 7B-8S--Removing or Installing Poppet Ball Plug

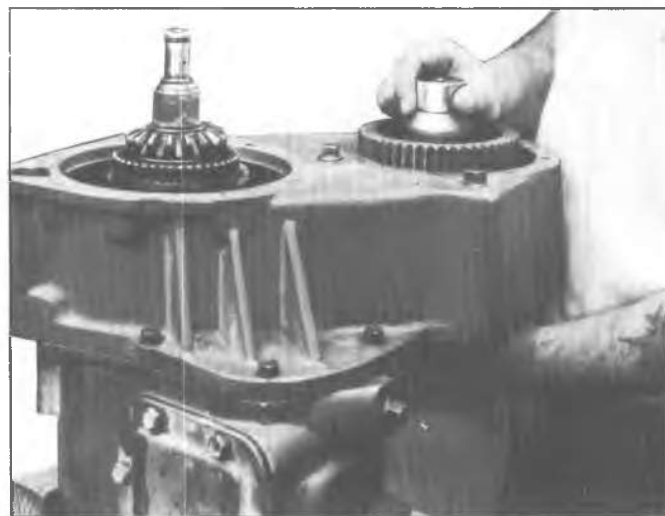


Fig. 7B-9S--Removing Front Output Shaft

bearing retainer to transfer case. Tap on front of shaft or carefully pry retainer away from case. Remove retainer from shaft and discard gasket. Recover any roller bearings which may fall from rear cover.

NOTE: If necessary to replace rear bearing, support cover and press bearing from cover. Position new bearing to outside face of cover and press bearing into cover with a .06 inch overhang.

12. From lower side of case, remove (pry) output shaft front bearing.

13. Disengage front output shaft from chain and remove shaft from transfer case (Fig. 7B-9S).

14. Remove bolts attaching intermediate chain housing to range box. Lift or using a chain hoist, remove intermediate housing from range box (Fig. 7B-10S).

15. Remove chain from intermediate housing.

16. Remove lockout clutch, drive gear and input shaft assembly from range box.

NOTE: A 1 1/2" to 2" hose clamp may be installed on end of the input shaft to prevent losing the roller bearings (123) which may fall out of clutch assembly if it is pulled off the input shaft.

17. Pull up on shift rail and disconnect rail from link.

18. Remove (lift) input shaft assembly from range box.

NOTE: At this point the transfer case is completely disassembled into its subassemblies. Each of these subassemblies should then be disassembled for cleaning and inspection.

CLEANING AND INSPECTION

BEARINGS--Place all bearings and rollers in cleaning solution and allow to remain long enough to loosen all accumulated lubricant. Bearings should be sloshed up and down and turned slowly below surface of solution to remove as much lubricant as possible. Remove bearings and blow dry with compressed air, being careful to direct air across bearing so that bearings do not spin.

SHAFTS AND GEARS--Clean all shafts and gears in cleaning solution to remove all accumulations. Dry with compressed air.

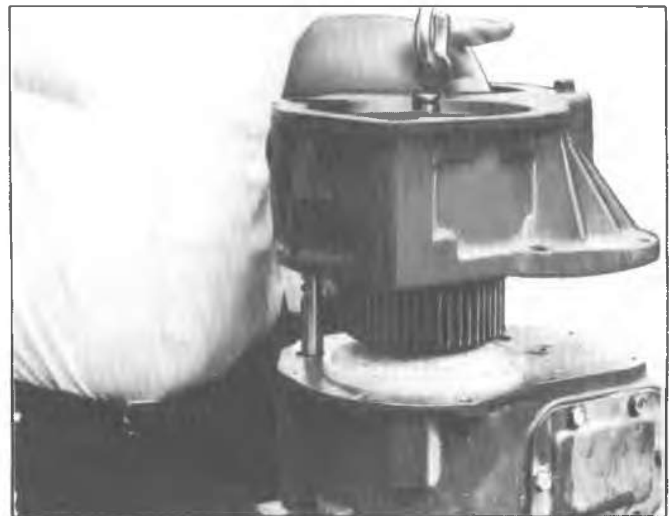


Fig. 7B-10S--Removing Intermediate (Chain) Housing

CASE, COVER AND HOUSINGS--Transfer case, cover, and housings must be thoroughly cleaned in solution to remove all accumulation of lubricant and dirt. Remove all trace of gaskets from surfaces where used.

INSPECTION--Carefully inspect all bearings and rollers for evidence of chipping, cracks, or worn spots that would render bearing unfit for further service. Bearings are non-adjustable and if worn or damaged, must be replaced with new parts. Inspect shaft splines drive chain and gears. If any indication of failure, such as chipped teeth or excessive wear, is indicated, those parts should be replaced with new parts.

SUBASSEMBLY REPAIRS

NOTE: Refer to figure 7B-12S for exploded view of subassemblies.

Differential Carrier Assembly (Fig. 7B-12S)

Disassembly

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

2. Lift the pinion gear and spider assembly from carrier.

NOTE: Observe that undercut side of pinion gear spider faces toward front side gear.

3. Remove the pinion thrust washers, pinion roller washers pinion gears and roller bearings from the spider unit.

4. Clean and inspect all components. Replace all worn or broken parts.

Assembly

1. Using a petroleum jelly, load roller bearings in pinion gears (132 required, 33 each pinion).

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

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

4. Align marks on carrier sections and position carrier halves together. Install retaining bolts and tighten to specifications.

Lockout Clutch Assembly (Fig. 7B-11S)

Disassembly

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

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

3. Using snap ring pliers, remove lower snap ring.

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

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

Assembly

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

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

3. Using a petroleum jelly, load roller bearings (123) and spacers in the front side gear.

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

5. Slide drive sprocket on to clutch splines and install retaining ring.

Input Shaft Assembly (Fig. 7B-11S)

Disassembly

1. Slide thrust washer and spacer from shaft.

2. Using snap ring pliers, remove snap ring retaining input bearing retainer assembly to shaft (Fig. 7B-13S) and remove bearing retainer assembly from shaft.

3. Support low speed gear (large gear) and tap shaft from gear and thrust washer.

NOTE: Observe thrust washer pin(s) located in shaft (Fig. 7B-11S).

4. Using a screw driver, pry behind open end of large snap ring retaining input bearing in bearing retainer (Fig. 7B-14S) and remove ring from retainer. Tap bearing from retainer.

5. Remove pilot roller bearings (15) from end of input shaft.

6. Remove "O" ring from end of shaft and discard.

7. Clean and inspect all components. Replace as required.

Assembly

1. Position bearing to retainer and tap or press into place. Ball loading slots should be toward concave side of retainer.

2. Install large snap ring securing bearing in retainer.

NOTE: Snap ring is a select fit. Use size A, B, C or D as required to provide tightest fit.

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

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

5. Position input bearing retainer on shaft and install snap ring, holding bearing in place on shaft.

NOTE: Snap ring is a select fit. Use size A, B, C or D as required to provide tightest fit.

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

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

8. Install new rubber "O" ring on end of shaft.

Range Selector Housing (Range Box)

Disassembly (Fig. 7B-11S)

Removing Shifter Assembly

1. Remove poppet plate spring, plug and gasket. Discard gasket.

2. Disengage sliding clutch gear from input gear and remove clutch fork and sliding gear from case.

3. Remove shift lever assembly retaining nut and upper shift lever from shifter shaft.

4. Remove shift lever snap ring and lower lever.

5. Push shifter shaft assembly downward and remove lockout clutch connector link.

NOTE: Long end of connector link engages poppet plate.

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

7. Inspect poppet plate for damage. If necessary to remove, drive pivot shaft from case. Remove poppet plate and spring from bottom of case.

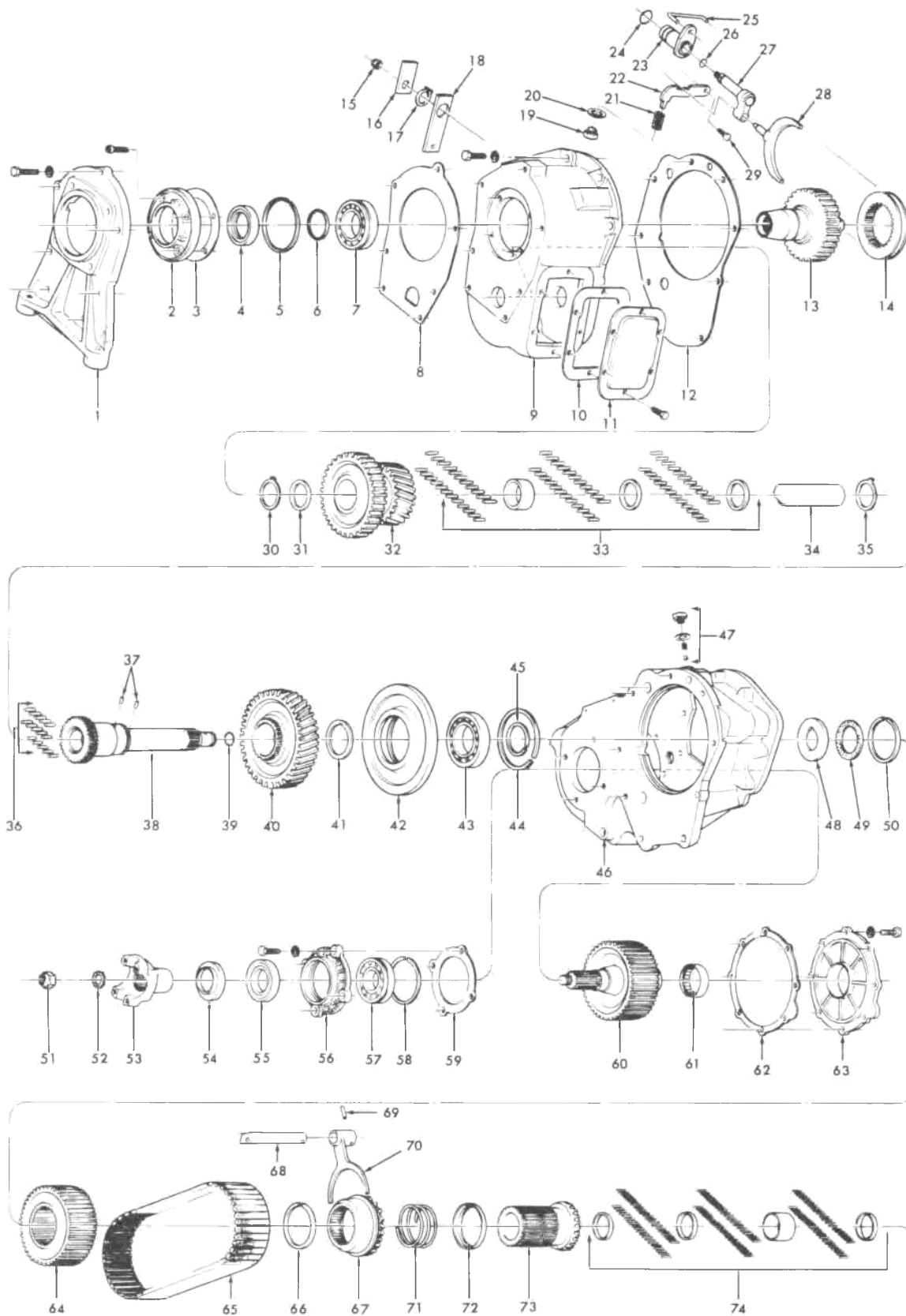


Fig. 7B-11S--Model 203 Transfer Case Exploded View

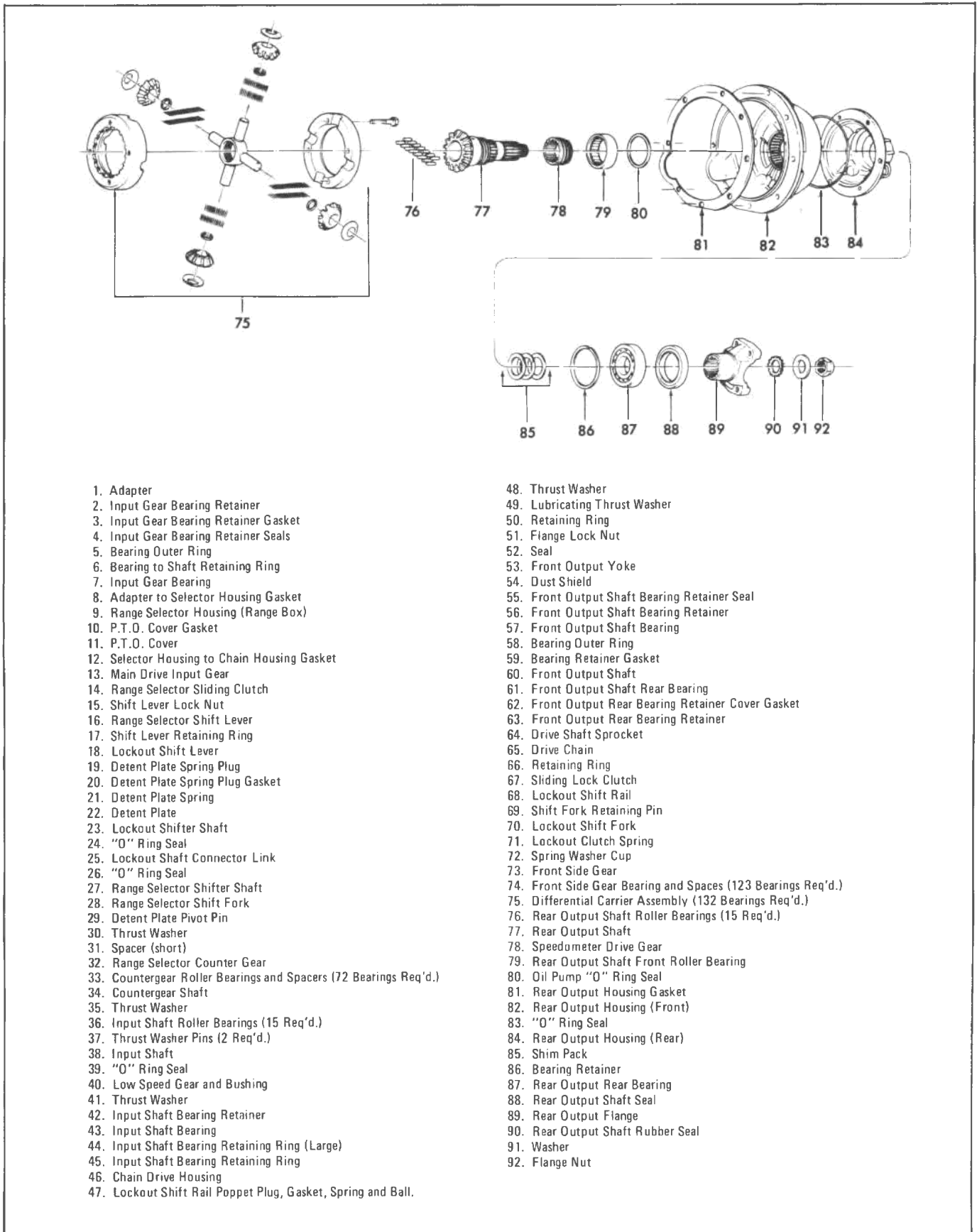


Fig. 7B-12S--Model 203 Transfer Case Exploded View Continued

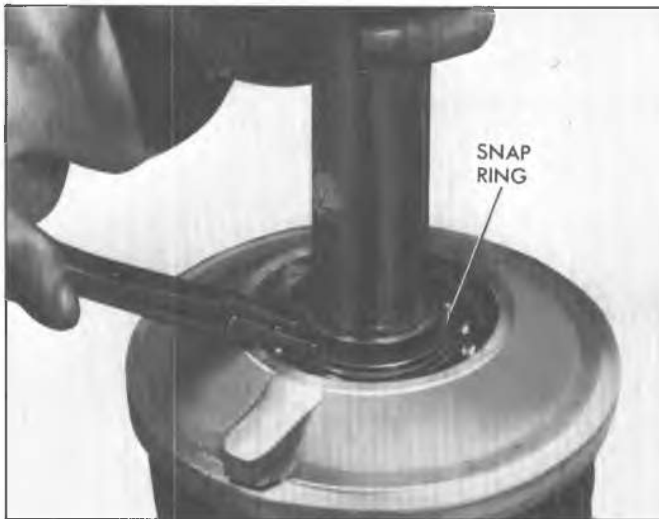


Fig. 7B-13S--Removing Input Shaft-to-Bearing Snap Ring

Removing Input Gear Assembly

8. Remove input gear bearing retainer and seal assembly. Discard gasket.
9. Remove large snap ring from bearing outer diameter.
10. Tap input gear and bearing from case.
11. Remove snap ring retaining input shaft bearing to shaft and remove bearing from input gear.

NOTE: This is a select fit snap ring. Snap rings, size A, B, C, and D are released for service. Select tightest fit.

Removing Cluster Gear Assembly (Fig. 7B-15S)

12. From intermediate case side, remove counter shaft from cluster gear and case using Tool J-24745. Remove cluster gear assembly from case.

NOTE: Recover roller bearings (72 required) from gear case and shaft.

13. Remove cluster gear thrust washers from case.
14. Clean and inspect all components. Replace worn and defective parts.

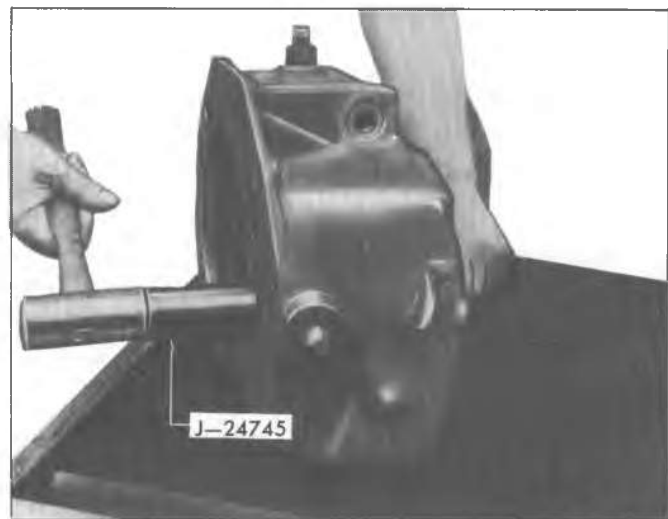


Fig. 7B-15S--Removing Cluster Gear Shaft

Assembly (Fig. 7B-11S)

Installing Countergear Assembly

1. Using Tool J-24745 and a heavy grease, install roller bearings (72 required) and spacers in clustergear bore.
2. Using a heavy grease, position countershaft thrust washers in case. Engage tab on washers with a slot in case thrust surface.
3. Position cluster gear assembly in case and install countershaft through front face of range box into gear assembly. Countershaft face with flat should face forward and must be aligned with case gasket.

Installing Input Gear Assembly

4. Install bearing (without large snap ring) on input gear shaft positioning snap ring groove outward and install new retaining ring on shaft. Position input gear and bearing in housing.

NOTE: The retaining ring is a select fit. Use service ring size A, B, C or D as required to provide tightest fit.

5. Install snap ring in outside diameter of bearing.
6. Align oil slot in retainer with drain hold in case and install input gear bearing retainer, gasket and retaining bolts. Tighten bolts to specifications.

Installing Shifter Shaft Assembly

7. If removed, install poppet plate and pivot pin assembly in housing. Use sealant on pin.
8. Install new "O" rings on the inner and outer shifter shafts. Lubricate "O" rings and assemble inner shaft in the outer shaft.
9. Push the shifter shafts into the housing, engaging the long end of the lockout clutch connector link to the outer shifter shaft before the shaft assembly bottoms out.
10. Install lower shift lever and retaining ring.
11. Install upper shift lever and shifter shaft retaining nut.

12. Install shift fork and sliding clutch gear. Push fork up into shifter shaft assembly to engage poppet plate, sliding clutch gear forward onto the input shaft gear.

13. Install poppet spring, gasket and plug in top of housing. Check spring engagement with poppet plate.

Input Gear Bearing Replacement

1. Remove bearing retainer attaching bolts, retainer and gasket from housing. Discard gasket.

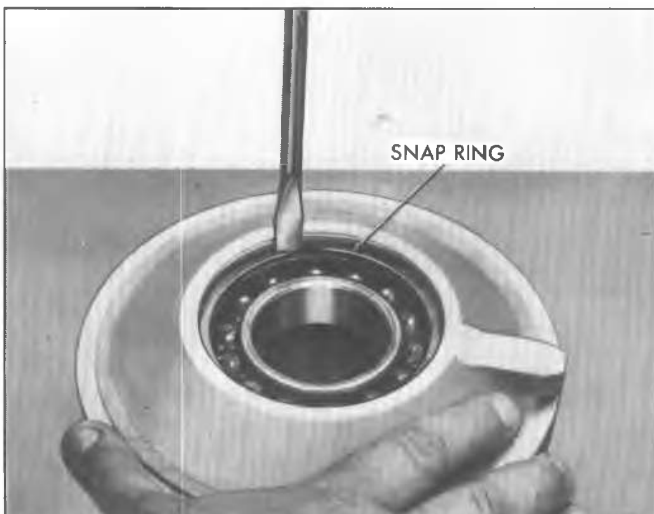


Fig. 7B-14S--Removing Input Shaft Bearing-to-Retainer Snap Ring

2. Using snap ring pliers, remove snap ring retaining bearing on shaft. Discard snap ring.
3. Using a screwdriver or other suitable tool, pry the bearing from case and remove it from the shaft.

NOTE: Inspect input gear for defects such as burrs, scoring, heat discoloration, etc. Inspect seal in bearing retainer. Replace as required.

4. Install new bearing with snap ring on input gear shaft. Position bearing to case and tap into place with a soft hammer.

NOTE: Select service ring, size A, B, C or D, that will provide tightest fit.

5. Install new snap ring to retain bearing on the shaft.
6. Position new gasket and the bearing retainer to housing. Install retaining bolts, tightening to specifications.

Input Gear Bearing Retainer Seal Replacement

1. Remove bearing retainer attaching bolts, retainer and gasket from housing. Discard gasket.
2. Pry seal out of reatiner and discard.
3. Position new seal to retainer and install using tool J-21359 (Fig. 7B-16S).
4. Position bearing retainer and gasket to housing. Install attaching bolts and tighten to specifications.

REAR OUTPUT SHAFT HOUSING (REAR)

Disassembly

1. Remove speedometer driven gear from rear section of rear output housing.
2. Pry old seal out of bore, using screwdriver or other suitable tool.
3. Using a screwdriver, pry behind open ends of snap ring and remove snap ring retaining rear bearing in housing (Fig. 7B-17S).
4. Pull or tap bearing from housing.
5. To remove the front bearing, insert a long drift through rear opening and drive the bearing from the housing (Fig. 7B-18S). Rmeove and discard rubber seal.



Fig. 7B-16S--Installing Input Shaft Bearing Retainer Seal

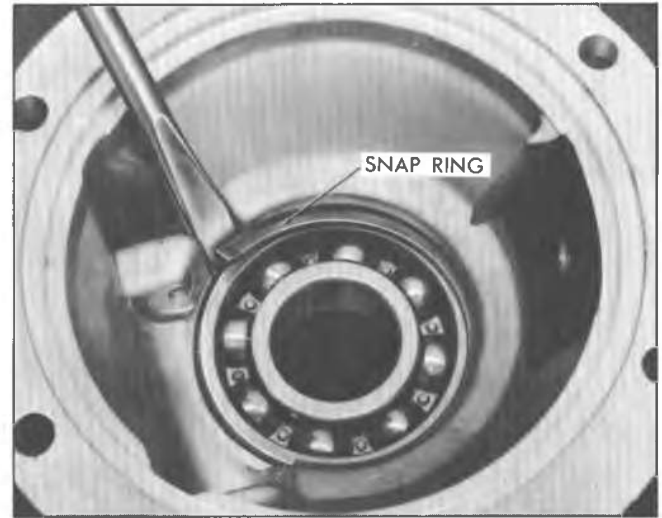


Fig. 7B-17S--Removing Rear Output Bearing Retaining Ring

Assembly

1. Position rear bearing in housing and tap into place.
 2. Install snap ring retaining bearing to case.
- NOTE:** Retaining ring is a select fit. Use service ring size A, B, C or D as required to provide tightest fit.
3. Position rear seal to bore and drive into place using tool J-22388 (Fig. 7B-19S) or other suitable tool until approximately 1/8" to 3/16" below housing face.
 4. If the vent seal falls out or is knocked out during disassembly, reinstall new seal or thoroughly clean and dry the area and re-cement the old seal in place.

REAR OUTPUT SHAFT HOUSING (FRONT)

Disassembly

1. Remove "O" ring from rear output shaft housing (front) and discard.



Fig. 7B-18S--Removing Rear Output Shaft Front Bearing



Fig. 7B-19S--Installing Rear Output Shaft Seal

2. To remove roller bearings from housing, insert a long drift through rear opening and drive bearing from housing (Fig. 7B-18S). Remove and discard rubber seal.

Assembly

1. Position rubber seal in bearing bore. Use grease to hold in place. Position roller bearing in bore and press into place until bearing bottoms out in housing.

2. Position new "O" ring on housing.

Front Output Shaft Bearing Retainer Seal Replacement (Fig. 7B-20S)

1. Pry or drive out existing seal from retainer bore.
2. Clean and inspect retainer.
3. Apply sealer to outer diameter of new seal.
4. Position seal to retainer bore and using Tool J-22836 or equivalent, install seal in retainer.

Front Output Shaft Rear Bearing Replacement

1. Remove rear cover from transfer case. Remove gasket and discard.
2. Support rear cover and press bearing from cover.
3. Position new bearing to outside face of cover and using a piece of wood to cover bearing, press bearing into cover until flush with opening.
4. Position gasket and cover to transfer case and tap into place.
5. Install cover retaining bolts and torque to specifications.

ASSEMBLY OF TRANSFER CASE (FIGS. 7B-1S and 7B-11S)

1. Place range box on blocks, with input gear side toward bench (Fig. 7B-21S).

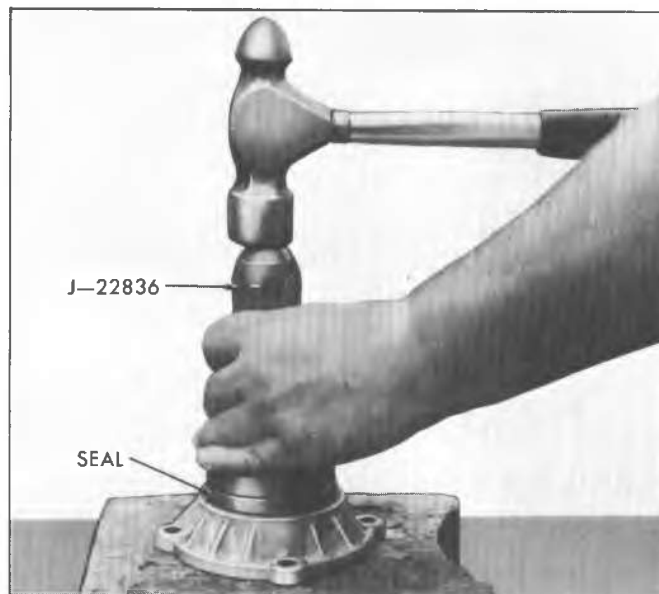


Fig. 7B-20S--Installing Front Output Bearing Retainer Seal

2. Position range box-to-transfer case housing gasket on input housing.

3. Install lockout clutch and drive sprocket assembly on the input shaft assembly.

NOTE: A 2" band clamp may be installed on end of shaft to prevent loosening bearings from clutch assembly.

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

5. Connect lockout clutch shift rail to the connector link and position rail in housing bore (Fig. 7B-22S). Rotate shifter shaft while lowering shift rail into the housing, to prevent the link and rail from being disconnected.

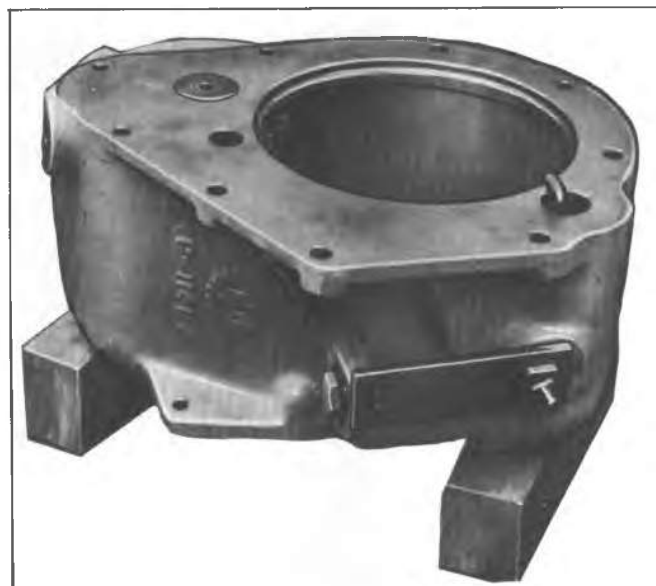


Fig. 7B-21S--Positioning Range Box for Assembly

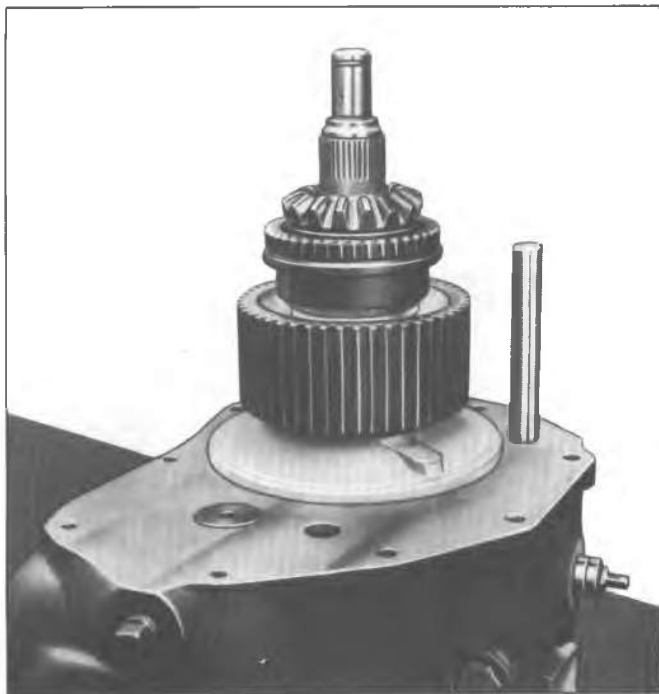


Fig. 7B-22S--Drive Gear and Lockout Clutch Assembly Installed

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

7. Install the chain housing on the range box (Fig. 7B-23S), engaging the shift rail channel of the housing to the shift rail. Position chain on the input drive sprocket.

8. Install the front output sprocket in the case, engaging the drive chain to the sprocket. Rotate clutch drive gear to assist in positioning chain on the drive sprocket.

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

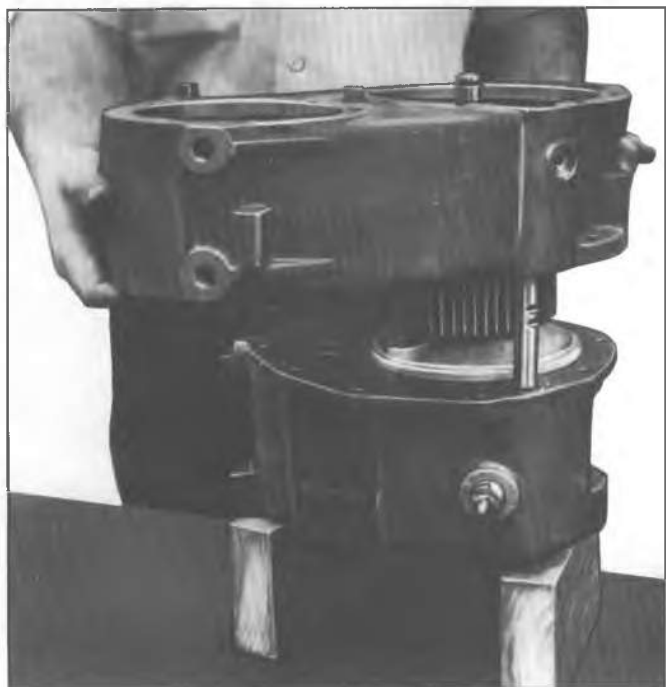


Fig. 7B-23S--Installing Intermediate Housing to Range Box

10. Install front output shaft bearing.

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

12. Install the front output shaft flange, gasket, seal, washer and retaining nut. Tap dust shield back in place after installing bolts in flange.

13. Install front output shaft rear bearing retainer, gasket and retaining bolts.

NOTE: If rear bearing was removed, position new bearing to outside face of cover and press into cover until bearing is flush with opening.

14. Install differential carrier assembly on the input shaft. Carrier bolt heads should face rear of shaft.

15. Position rear output shaft to differential carrier assembly (load bearings in pinion shaft).

a. Install rear output housing (front) assembly, gasket, and retaining bolts.

b. Install speedometer gear and shims (approximately .050 inch thickness) on output shaft.

c. Position rear output housing (rear) assembly to rear output housing (front). Be sure "O" ring is in proper position on front section of output housing.

NOTE: Be sure vent is in upward position.

d. Install flange, washer, and retaining nut. Leave nut loose (approximately .060 inch) until shim requirements are determined.

16. Install shim pack onto shaft, in front of rear bearing, to control end play to within .001" to .005". Hold rear flange and rotate front output shaft to check for binding of the rear output shaft (Fig. 7B-24S).

17. Install speedometer driven gear in housing.

18. Install lockout clutch shift rail poppet ball, spring and screw plug in case.

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

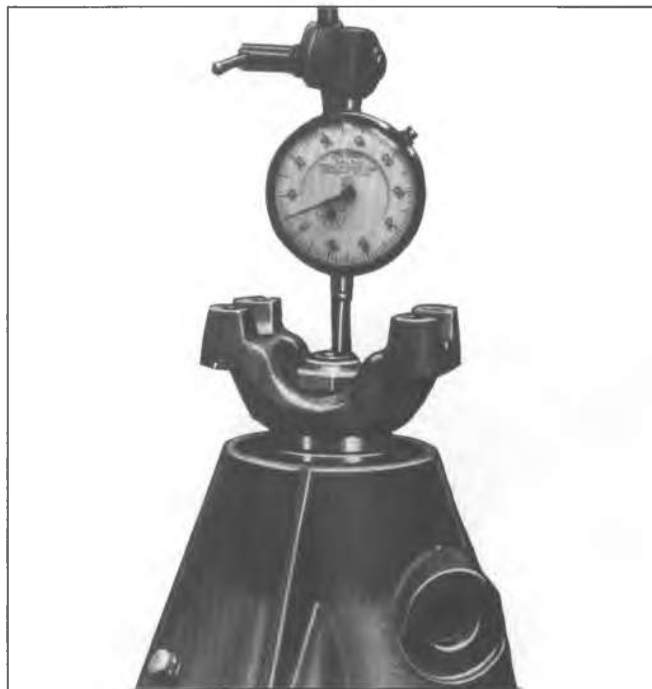


Fig. 7B-24S--Checking Rear Output Shaft End Play

20. Install shift levers on the range box shifter shaft, if not left on linkage in vehicle.

21. Torque all bolts, locknuts and plugs (except filler plug) to specifications.

22. Fill transfer case to proper level with specified lubricant.

23. Install and tighten filler plug to specifications.

ADAPTER ASSEMBLIES

ADAPTERS USED WITH MANUAL TRANSMISSIONS

Adapters Used With The Model 205 (Part Time) Transfer Case

Disassembly of Adapter (Figs. 7B-1T and 7B-2T)

1. Using a brass drift or other suitable tool, tap sleeve from adapter.
2. Using a brass drift, punch out oil seal from adapter bore.

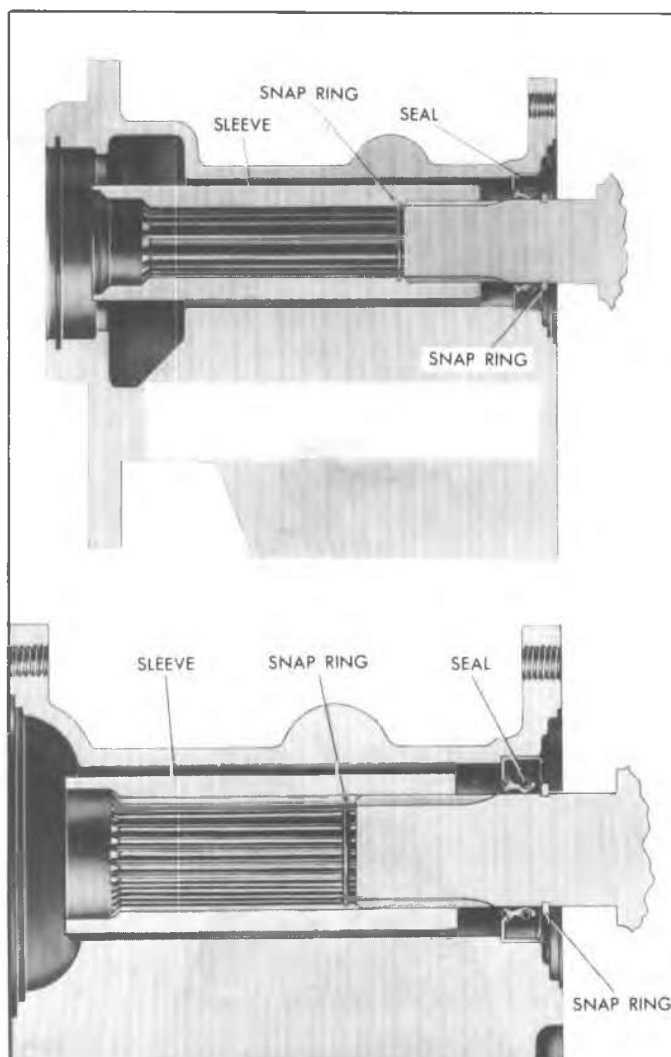


Fig. 7B-1T-Manual Transmission Adapter Assemblies Used With Model 205 (Part Time) Transfer Case

Inspection

Inspect the sleeve for any indication of failure. If the sleeve has chipped teeth or excessive wear, it should be replaced. Check internal snap ring in sleeve. Replace if bent or broken.

Assembly of Adapter

1. Position sleeve to adapter bore and tap into place using a suitable piece of pipe.

NOTE: Assemble drive sleeve with oil groove facing transmission side. Lubricate sleeve spline with transmission oil before assembly.

2. Coat O.D. of seal with sealing compound and install seal using Tool J-23504 and Handle J-8092 in a similar manner as shown in Fig. 7B-3T.

Model 203 (Full Time) Transfer Case Assemblies

Adapters used with the full time 4-wheel drive transfer case assemblies do not require service since there are no internal components such as seals, sleeves or bearings (Fig. 7B-3T).

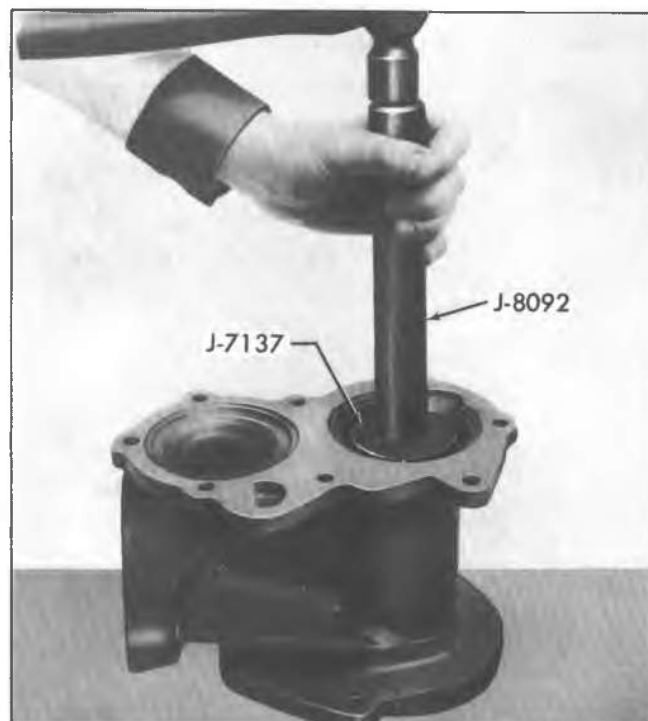


Fig. 7B-2T-Installing Adapter Seal

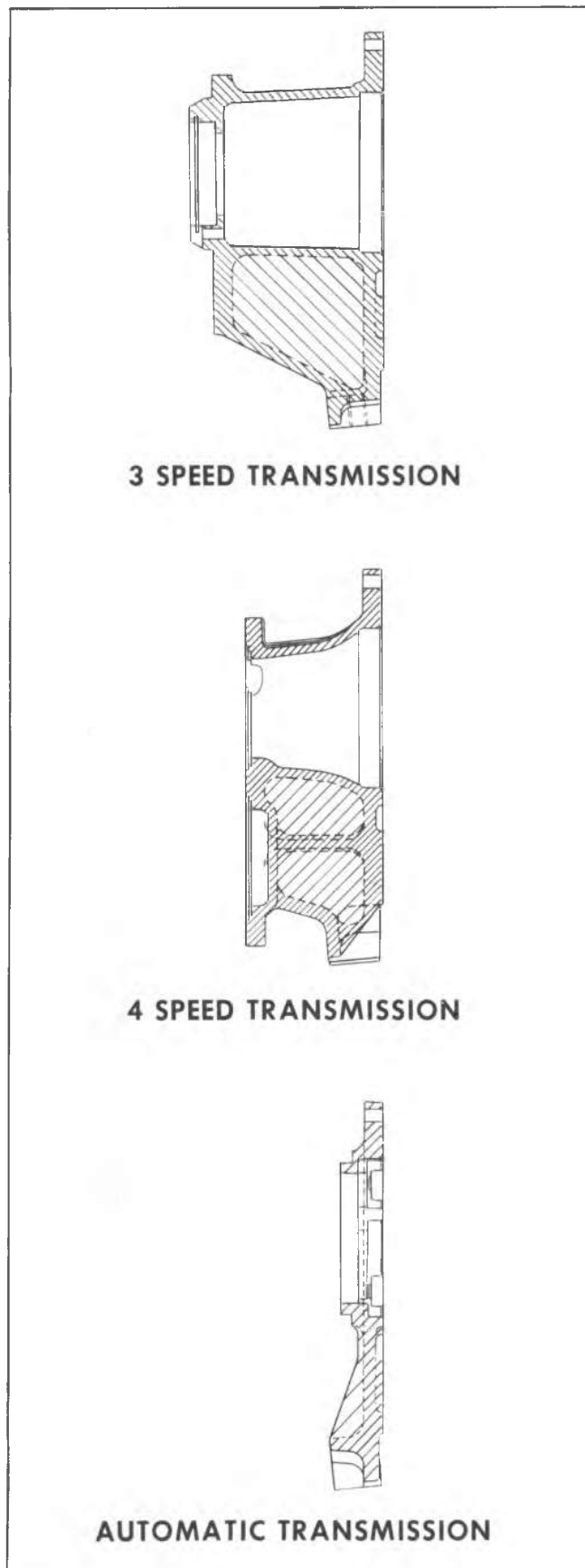


Fig. 7B-3T-Adapter Assemblies Used With the Model 203 (Full Time) Transfer Case

ADAPTERS USED WITH AUTOMATIC TRANSMISSIONS

All Except Full Time 4-Wheel Drive Units

Disassembly of Adapter (Fig. 7B-4T)

1. Using a brass drift or other suitable tool, tap sleeve through seals and out of adapter.
2. Using a suitable punch or drift, drive seals from adapter.

Inspection

Inspect the sleeve for any indication of failure. If the sleeve has chipped teeth or excessive wear, it should be replaced. Check internal snap ring in sleeve. Replace if bent or broken.

Assembly of Adapter

1. Install new seals in adapter using Tool J-7137 and J-8092 as shown in Figure 7B-2T.
2. Insert sleeve through seals into adapter bore and tap into place.

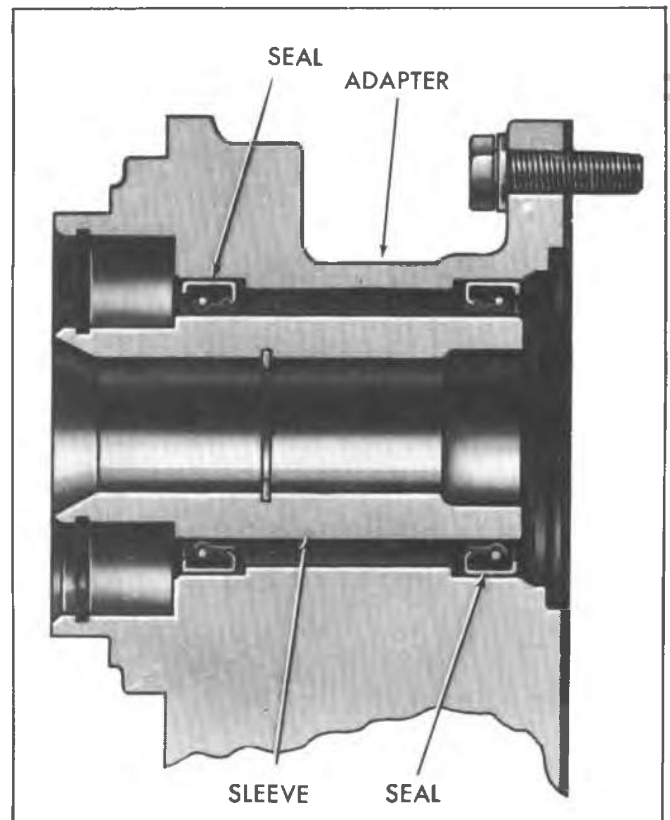


Fig. 7B-4T--Automatic Transmission Adapter Used With Model 205 (Part Time) Transfer Case

SPECIFICATIONS

THREE SPEED SAGINAW (76mm)

Clutch Gear Retainer to Case Bolts	15 ft. lbs.
Side Cover to Case Bolts	15 ft. lbs.
Extension to Case Bolts	45 ft. lbs.
Shift Lever to Shifter Shaft Bolts	25 ft. lbs.
Lubrication Filler Plug	13 ft. lbs.
Transmission Case to Clutch Housing Bolts . .	75 ft. lbs.
Crossmember to Frame Nuts	25 ft. lbs.
Crossmember to Mount Bolts	40 ft. lbs.
2-3 Cross Over Shaft Bracket Retaining Nut .	18 ft. lbs.
1-Rev. Swivel Attaching Bolt	20 ft. lbs.
Mount to Transmission Bolt	50 ft. lbs.

THREE SPEED TREMEC (77mm)

Clutch Gear Retainer to Case Bolts	35 ft. lbs.
Top Cover to Case Bolts	30 ft. lbs.
Extension to Case Bolts	45 ft. lbs.
Shift Lever to Shifter Shaft Bolts	25 ft. lbs.
Lubrication Filler Plug	15 ft. lbs.
Transmission Case to Clutch Housing Bolts . .	75 ft. lbs.
Crossmember to Frame Nuts	25 ft. lbs.
Crossmember to Mount Bolts	40 ft. lbs.
2-3 Cross Over Shaft Bracket Retaining Nut .	18 ft. lbs.
1- Rev. Swivel Attaching Bolt	20 ft. lbs.
Mount to Transmission Bolt	50 ft. lbs.

THREE SPEED MUNCIE (83mm)

Clutch Gear Retainer to Case Bolts	15 ft. lbs.
Side Cover to Case Bolts	15 ft. lbs.
Extension to Case Bolts	45 ft. lbs.
Shift Lever to Shifter Shaft Bolts	25 ft. lbs.
Lubrication Filler Plugs	13 ft. lbs.
Transmission Case to Clutch Housing Bolts . .	75 ft. lbs.
Crossmember to Frame Nuts	25 ft. lbs.
Crossmember to Mount Bolts	40 ft. lbs.
Transmission Drain Plug	30 ft. lbs.
2-3 Cross Over Shaft Bracket Retaining Nut .	18 ft. lbs.
1-Rev. Swivel Attaching Bolt	20 ft. lbs.
Mount to Transmission Bolt	50 ft. lbs.

NEW PROCESS TRANSFER CASE MODEL 205

Idler Shaft Lock Nut	200 ft. lbs.
Idler Shaft Cover Bolts	18 ft. lbs.
Front Output Shaft Front Bearing Retainer Bolts	30 ft. lbs.
Front Output Shaft Yoke Lock Nut	200 ft. lbs.
Rear Output Shaft Bearing Retainer Bolts . . .	30 ft. lbs.
Rear Output Shaft Housing Bolts	30 ft. lbs.
Rear Output Shaft Yoke Lock Nut	150 ft. lbs.
P.T.O. Cover Bolts	15 ft. lbs.
Front Output Shaft Rear Bearing Retainer Bolts	30 ft. lbs.
Drain and Filler Plugs	30 ft. lbs.
Transfer Case to Frame Bolts	130 ft. lbs.
Transfer Case to Adapter Bolts	25 ft. lbs.
Adapter Mount Bolts	25 ft. lbs.
Transfer Case Bracket to Frame Nuts (Upper)	30 ft. lbs.
Transfer Case Bracket to Frame Nuts (Lower)	65 ft. lbs.
Adapter to Transmission Bolts -(Manual Transmission)	22 ft. lbs.
Adapter to Transmission Bolts - (Automatic Transmission)	35 ft. lbs.
Transfer Case Control Mounting Bolt	100 ft. lbs.

FOUR-SPEED (SAGINAW) 76mm

Clutch Gear Retainer to Case Bolts	15 ft. lbs.
Side Cover to Case Bolts	15 ft. lbs.
Extension to Case Bolts	45 ft. lbs.
Shift Lever to Shifter Shaft Bolts	25 ft. lbs.
Lubrication Filler Plug	18 ft. lbs.
Transmission Case to Clutch Housing Bolts	75 ft. lbs.
Crossmember to Frame Nuts	25 ft. lbs.
Crossmember to Mount and Mount to Extension Bolts	40 ft. lbs.
Mount-To-Transmission Bolts	32 ft. lbs.

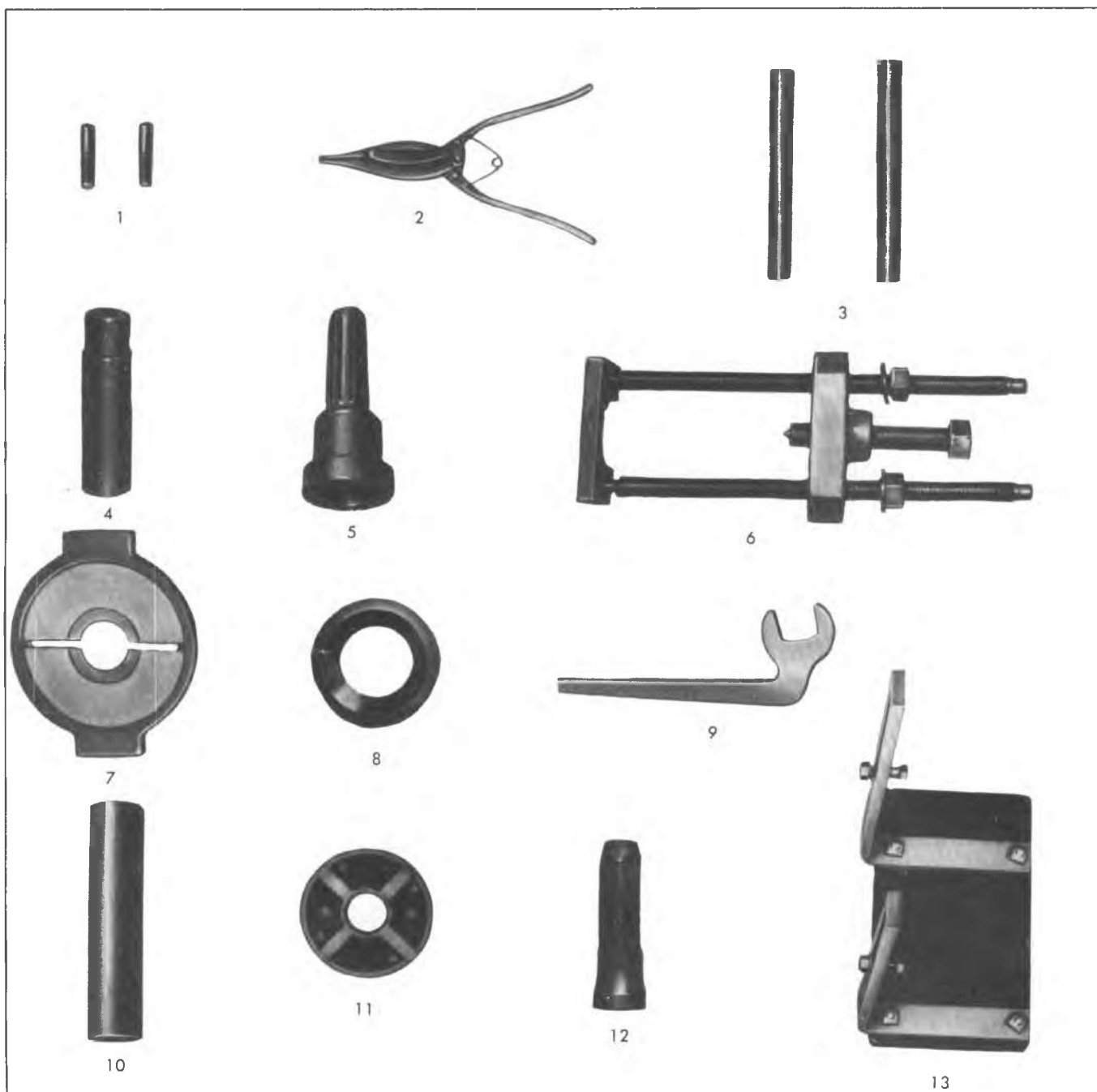
FOUR-SPEED (WARNER) 83mm

Clutch Gear Retainer to Case Bolts	18 ft. lbs.
Side Cover to Case Bolts	18 ft. lbs.
Extension to Case Bolts	40 ft. lbs.
Shift Lever to Shifter Shaft Bolts	20 ft. lbs.
Lubrication Filler Plug	15 ft. lbs.
Transmission Case to Clutch Housing Bolts	52 ft. lbs.
Crossmember to Mount and Mount to Extension Bolts	25 ft. lbs.
Rear Bearing Retainer to Case Bolts	25 ft. lbs.
Extension to Rear Bearing Retainer Bolts (Short)	25 ft. lbs.
Retainer to Case Bolt	35 ft. lbs.
Transmission Drain Plug	20 ft. lbs.

FOUR-SPEED (MUNCIE CH465) 117mm

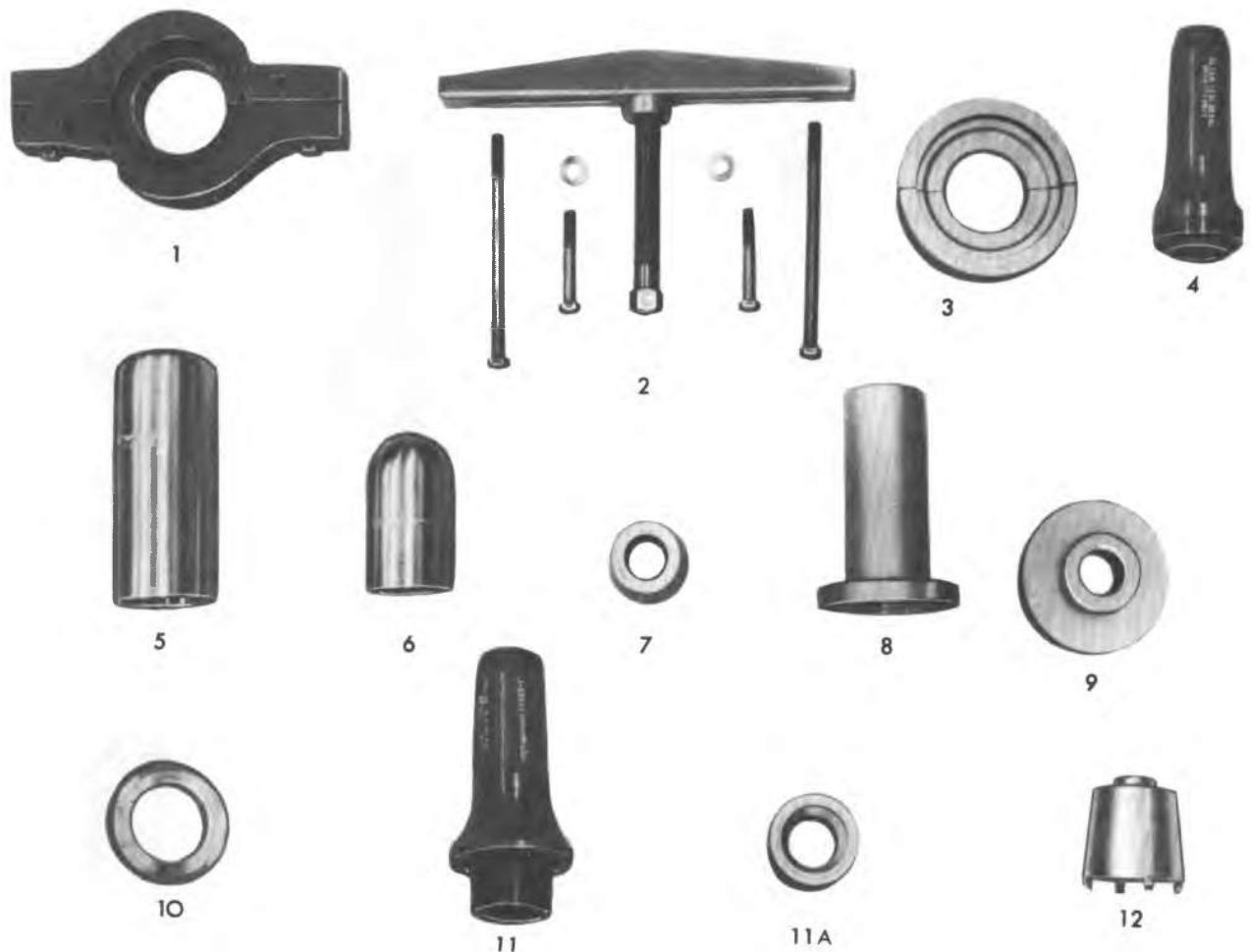
Clutch Gear Bearing Retainer to Case Bolts	25 ft. lbs.
Cover to Case Bolts	20 ft. lbs.
Extension and Retainer to Case Bolts—(Upper)	20 ft. lbs.
—(Lower)	30 ft. lbs.
Lubrication Filler Plug	30 ft. lbs.
Shift Lever to Shifter Shaft Nut	20 ft. lbs.
Mount-To-Transmission Bolts	32 ft. lbs.

SPECIAL TOOLS



- | | | | |
|--------------------|--|--------------|--|
| 1. J--1126 | Transmission Guide Pins | 7. J-1453-01 | Speedometer Drive Gear Press Plates and Press Plate Holder J-358-1 |
| 2. J-8059 | Retainer Snap Ring Pliers | 8. J-2228 | Rear Bearing Press Plates |
| 3. J-22246/J-22379 | Countergear Loading Tool | 9. J-933 | Main Drive Gear Wrench |
| 4. J-5778 | Extension Bushing Remover and Installer | 10. J-5590 | Clutch Gear Bearing Installer |
| 5. J-5154 | Extension Seal Installer | 11. J-9772 | Clutch Gear Bearing Installer |
| 6. J-5814-01 | Speedometer Drive Gear Remover and Adapter J-5814-15 | 12. J-23096 | Clutch Gear Retainer Seal Installer |
| | | 13. J-5752 | Transmission Holding Fixture |

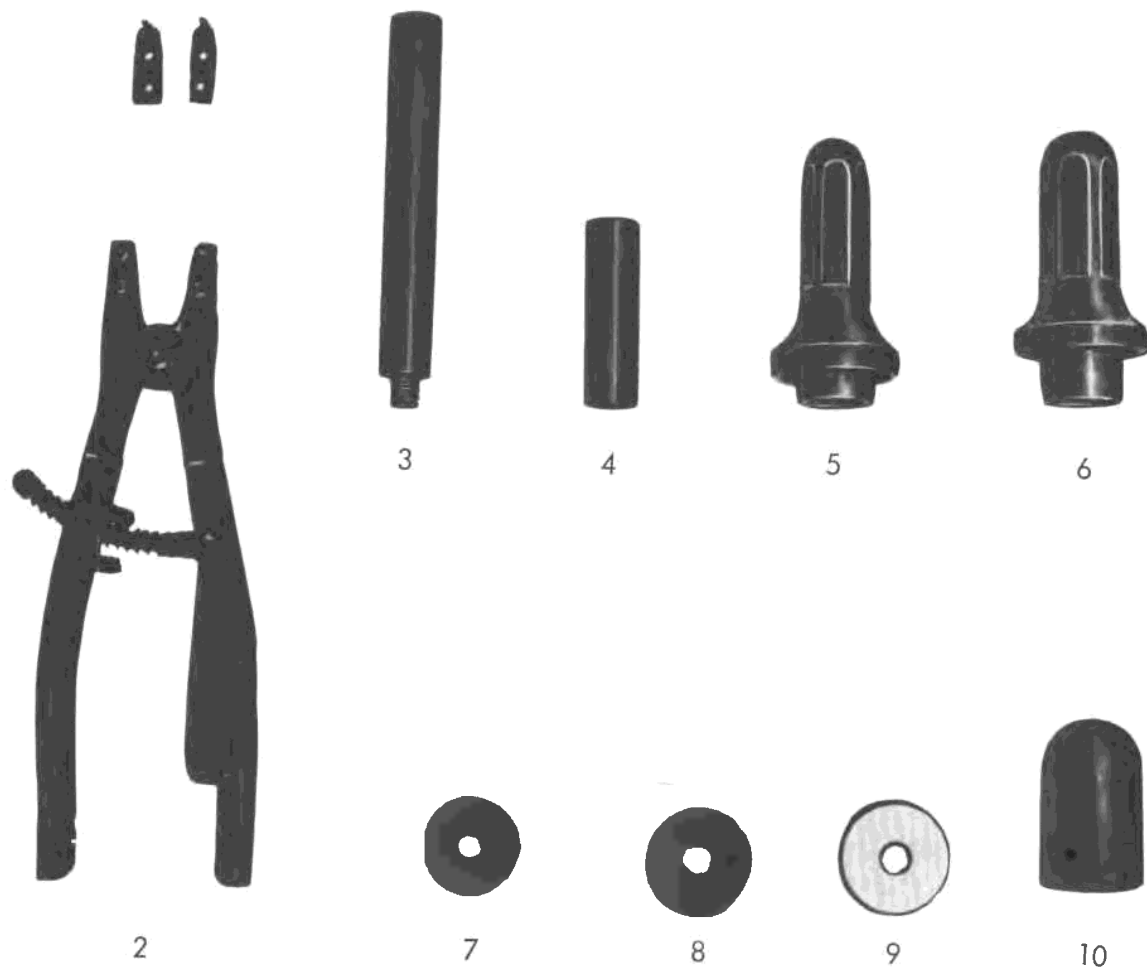
Fig. 7B-1ST--Manual Transmission Special Tools (Except 4-Speed Muncie 117mm, CH465)



1. J-22832 Countergear Rear Bearing Remover
2. J-8433-1 Bearing Puller
3. J-22872 Clutch Gear Bearing Remover and Installer
4. J-22833 Front Bearing Retainer Seal Installer
5. J-22873 2nd Speed Bushing Installer
6. J-22875 3rd Speed Bushing Installer
7. J-22830 Snap Ring Installer

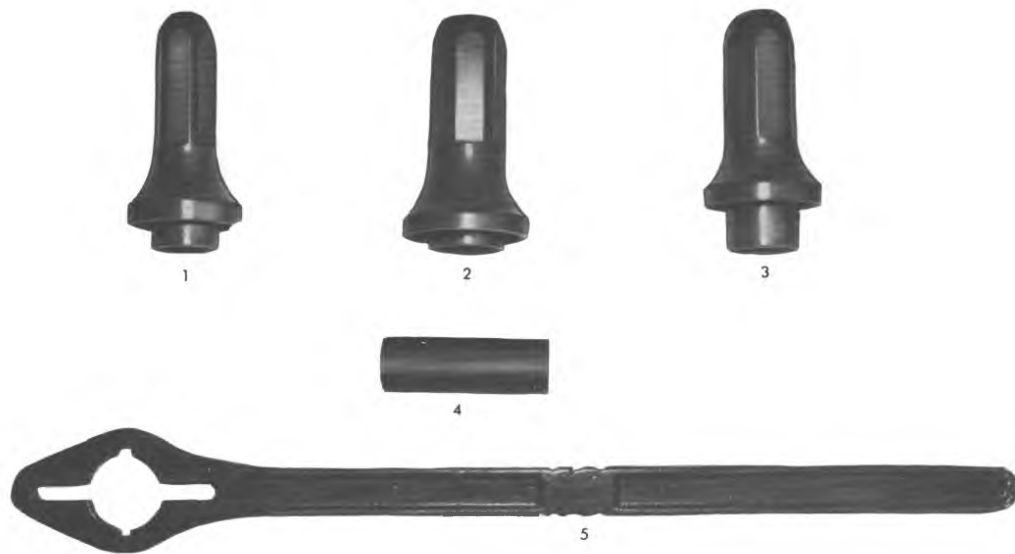
8. J-22874-1 Bearing Installer
9. J-22874-5 Mainshaft Support Tool
10. J-22874-2 Countershaft Support Tool
11. J-22834-2 Rear Bearing Retainer Seal Installer
- 11a. J-22834-1 Adapter
12. J-23070 Mainshaft Rear Bearing Lock Nut Installer

Fig. 7B-2ST--4-Speed Muncie Transmission Model CH 465 Special Tools



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|--------------|--|
| 1. J-23432-1 | Snap Ring Picks. |
| 2. J-23432 | Snap Ring Pliers. |
| 3. J-8092 | Handle. |
| 4. J-23429 | Intermediate Shaft Remover and Installer. |
| 5. J-22836 | Front Output Shaft Bearing Retainer Seal Installer. |
| 6. J-21359 | Rear Output Shaft Bearing Retainer Seal Installer. |
| 7. J-23431 | Rear Output Shaft Housing Bearing Remover and Installer. |
| 8. J-7137 | Adapter Seal Installer. |
| 9. J-9276 2 | Intermediate Gear Bearing Cup Installer. |
| 10. J-22875 | Rear Output Shaft Rear Bearing Installer. |

Fig. 7B-3ST--New Process Model 205 (Part Time) Transfer Case Special Tools



1. J-22836 – Front Output Shaft Bearing Retainer Seal Installer
2. J-22388 – Rear Output Shaft Seal Installer
3. J-21359 – Input gear Bearing Retainer Seal Installer
4. J-24745 – Cluster Gear Loading Tool
5. J-8614-1 – Companion Flange Remover

Fig. 7B-4ST--New Process Model 203 (Full Time) Transfer Case Special Tools

