

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.

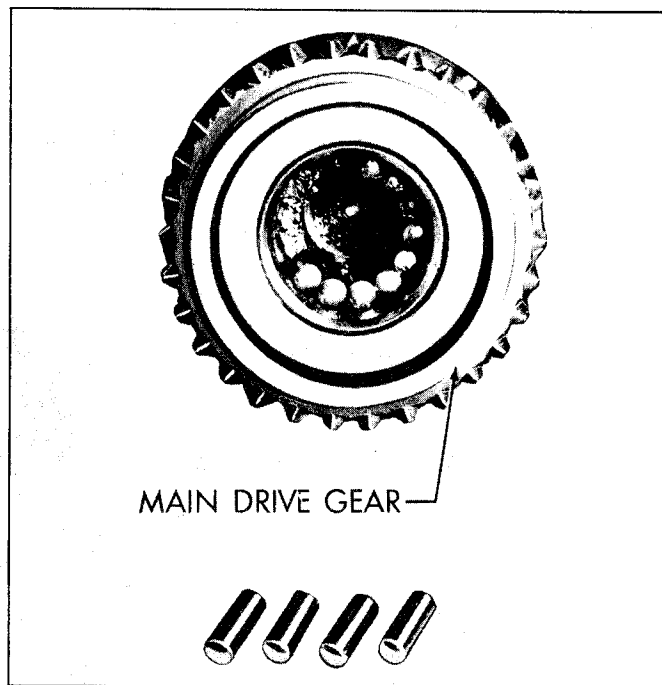


Fig. 7B-20J--Loading Mainshaft Bearings

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

INDEX

| | |
|---|-------|
| Disassembly of Transmission | 7B-30 |
| Disassembly of Mainshaft..... | 7B-34 |
| Cleaning and Inspection | 7B-35 |
| Transmission Case..... | 7B-35 |
| Bearing Rollers and Spacers..... | 7B-35 |
| Gears..... | 7B-35 |
| Front and Rear Bearings..... | 7B-35 |
| Repairs..... | 7B-36 |
| Clutch Keys and Springs Replacement | 7B-36 |

| | |
|---|-------|
| Extension Oil Seal and/or Bushing Replacement ... | 7B-36 |
| Drive Gear Bearing Retainer Oil..... | 7B-37 |
| Reverse Shifter Shaft and/or Seal Replacement | 7B-37 |
| Reverse Idler Shaft Replacement | 7B-37 |
| Transmission Side Cover | 7B-37 |
| Assembly of Countergear | 7B-37 |
| Checking Countergear End Play..... | 7B-37 |
| Assembly of Mainshaft..... | 7B-38 |
| Assembly of Transmission..... | 7B-38 |

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.

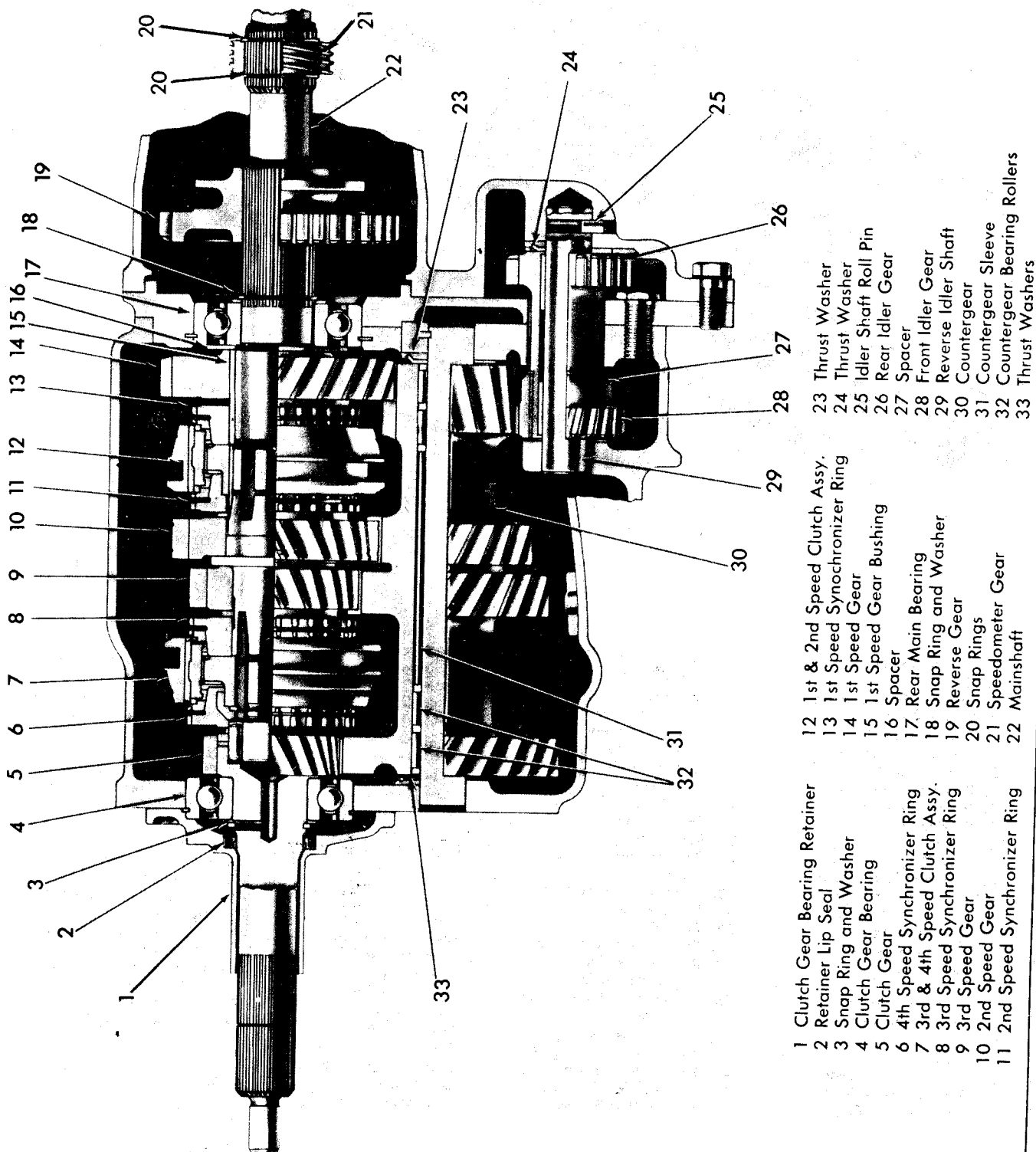
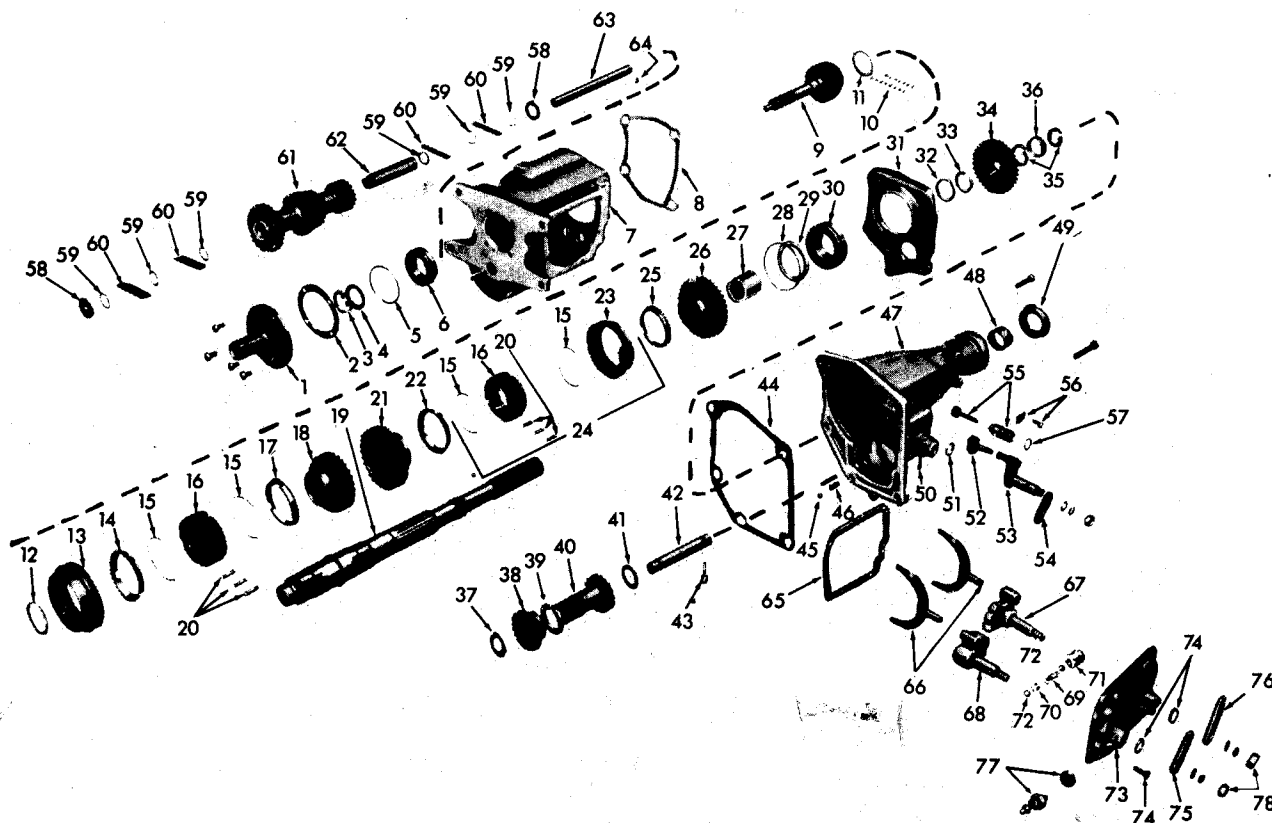


Fig. 7B-1K--Sectional View of 4-Speed (Warner) 83mm Transmission



- | | | | |
|--|--|--|--|
| 1. 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 and Fitting | 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

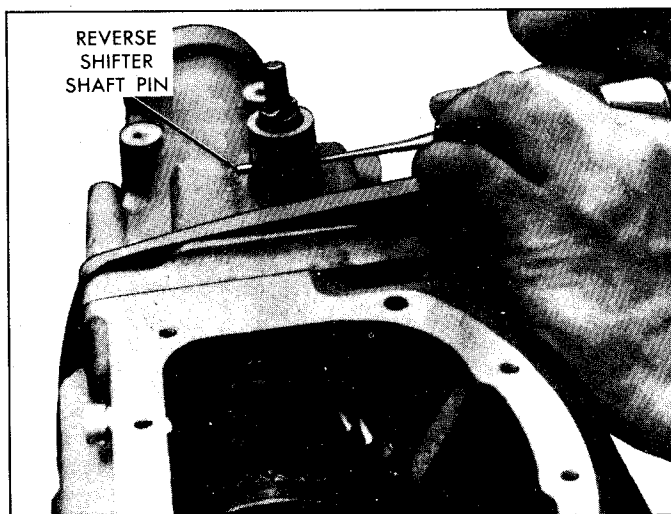


Fig. 7B-3K--Removing Reverse Shifter Shaft Lock Pin

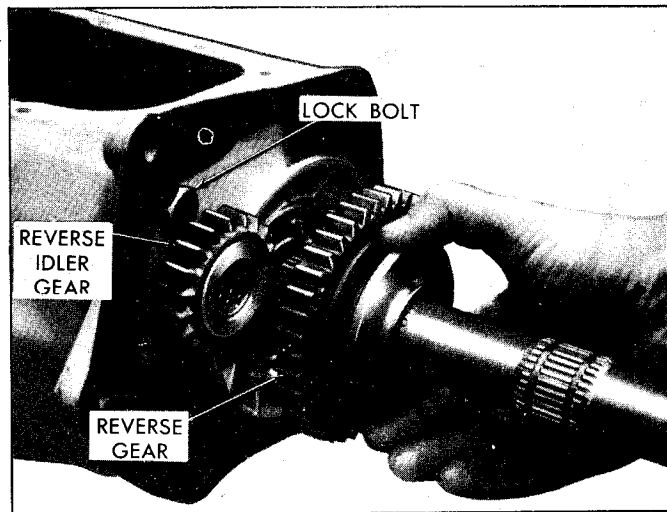


Fig. 7B-5K--Removing Reverse Gear

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.

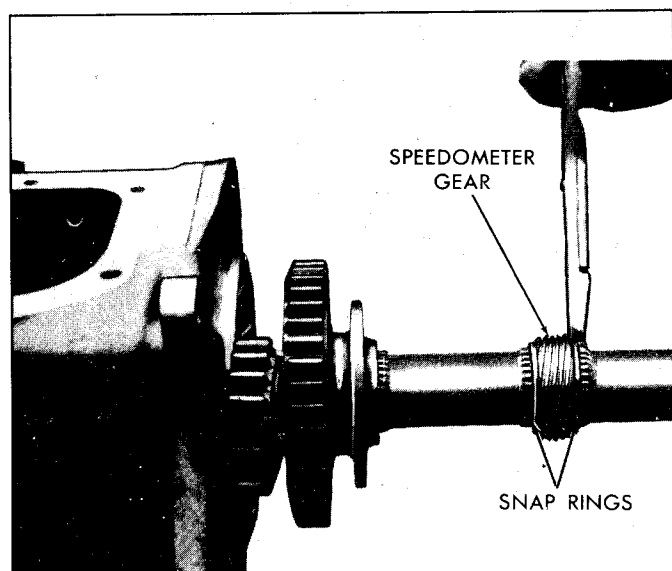


Fig. 7B-4K--Speedometer Gear and Retaining Rings

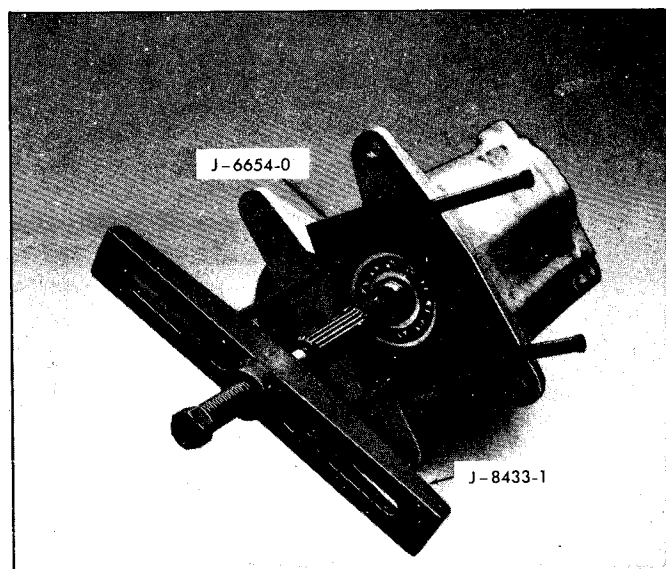


Fig. 7B-6K--Removing Main Drive Gear Bearing

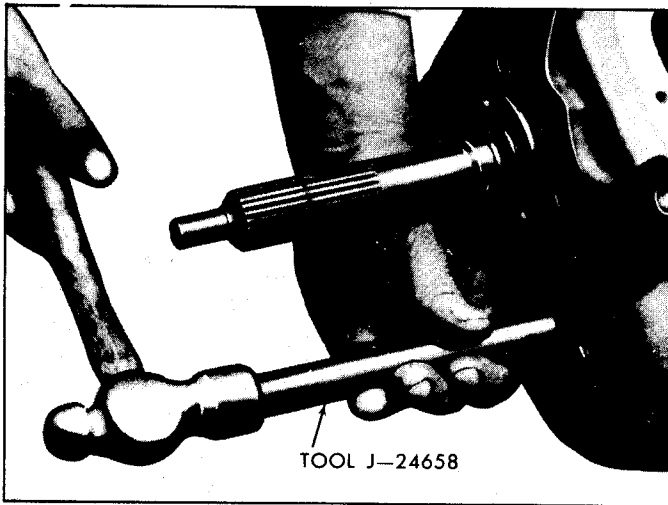


Fig. 7B-7K--Removing Countergear Shaft

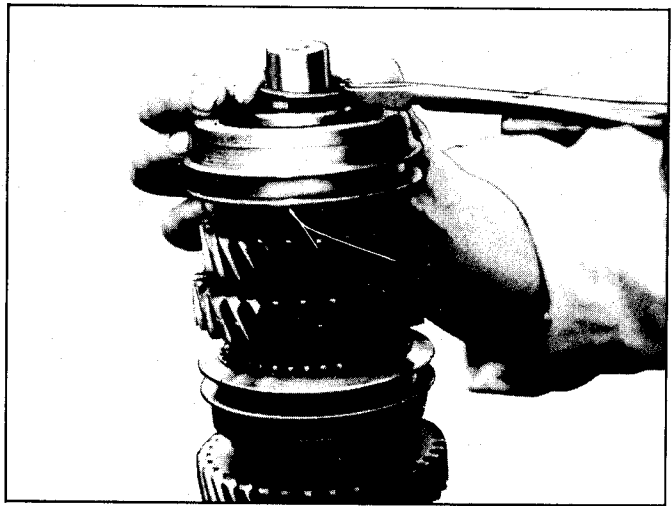


Fig. 7B-9K--Removing 3-4 Clutch Assembly Retainer

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).

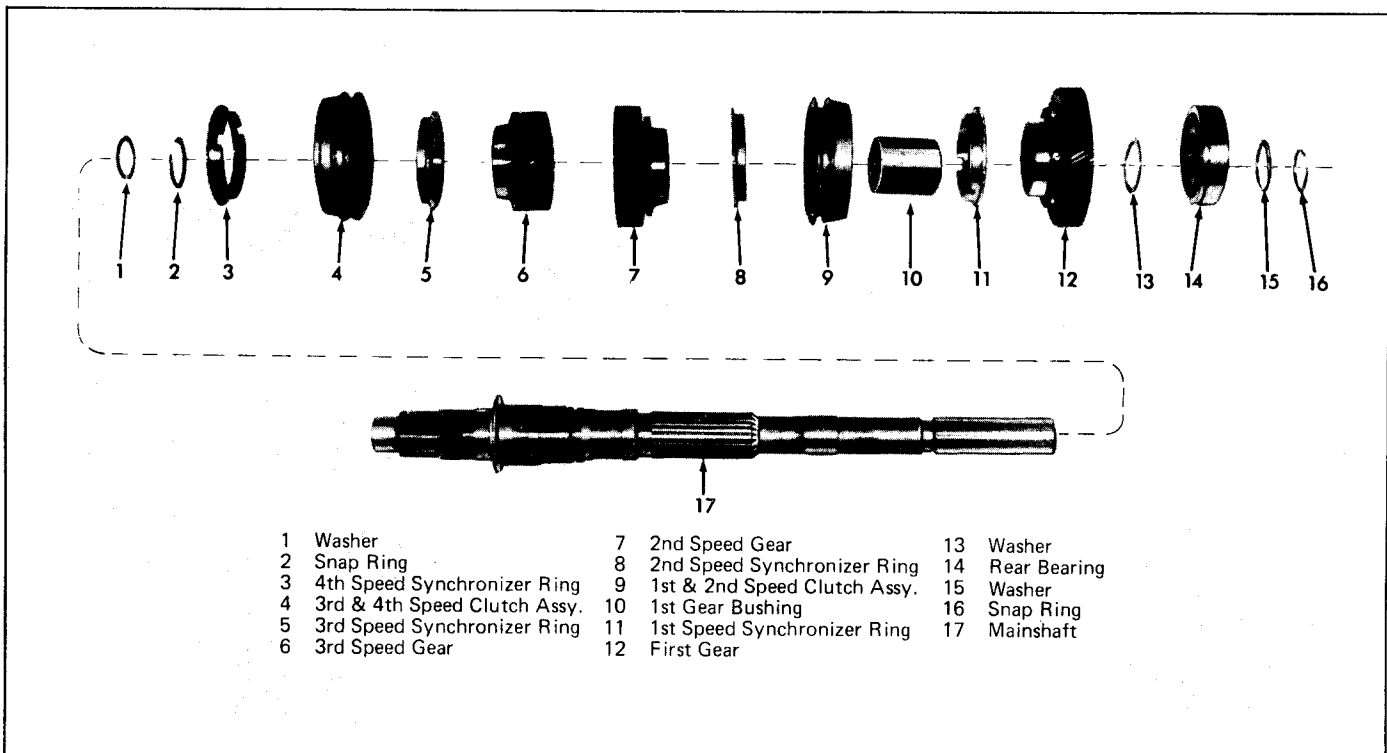


Fig. 7B-8K--Mainshaft Assembly Components

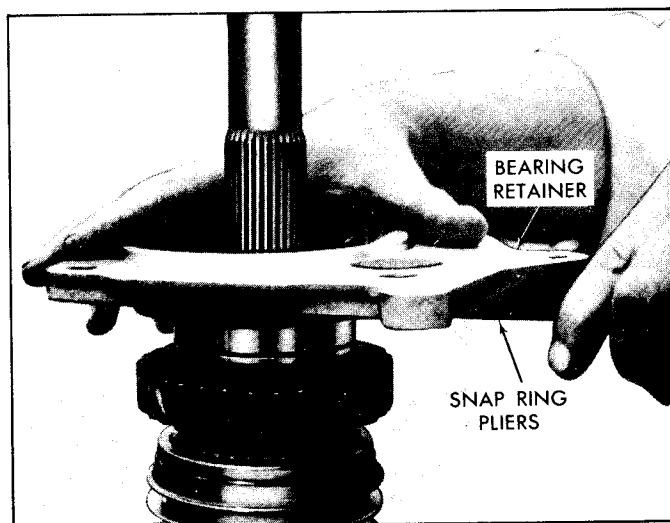


Fig. 7B-10K--Removing Rear Bearing Retainer

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.

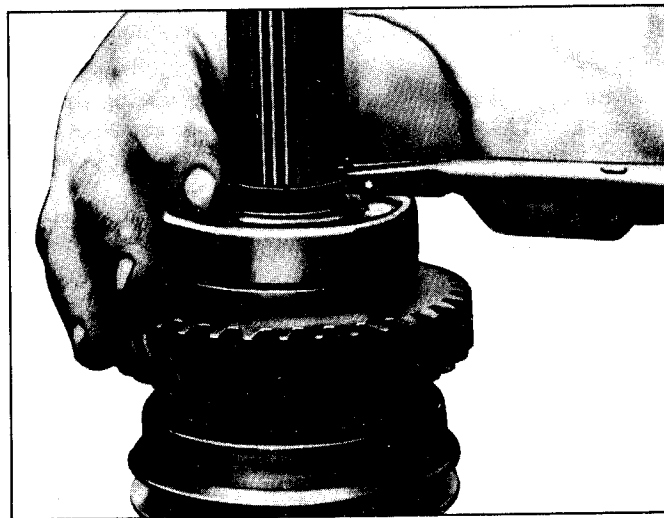


Fig. 7B-11K--Removing Rear Bearing Snap Ring

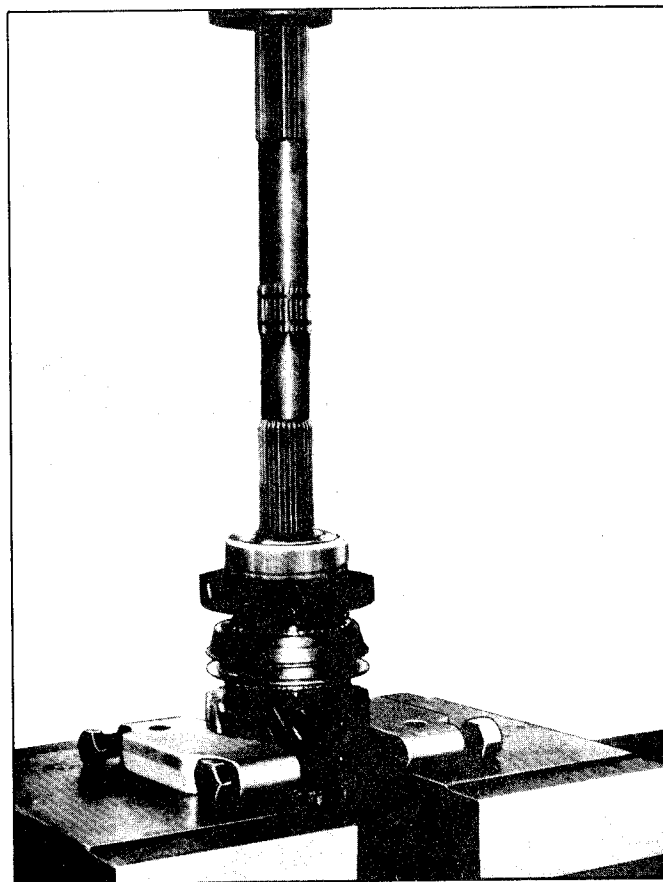


Fig. 7B-12K--Pressing Rear Bearing From Mainshaft

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.

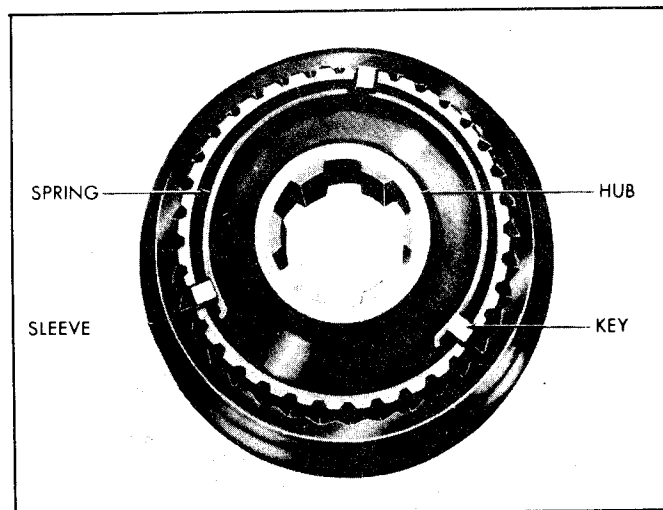


Fig. 7B-13K--Synchronizer Assembly



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

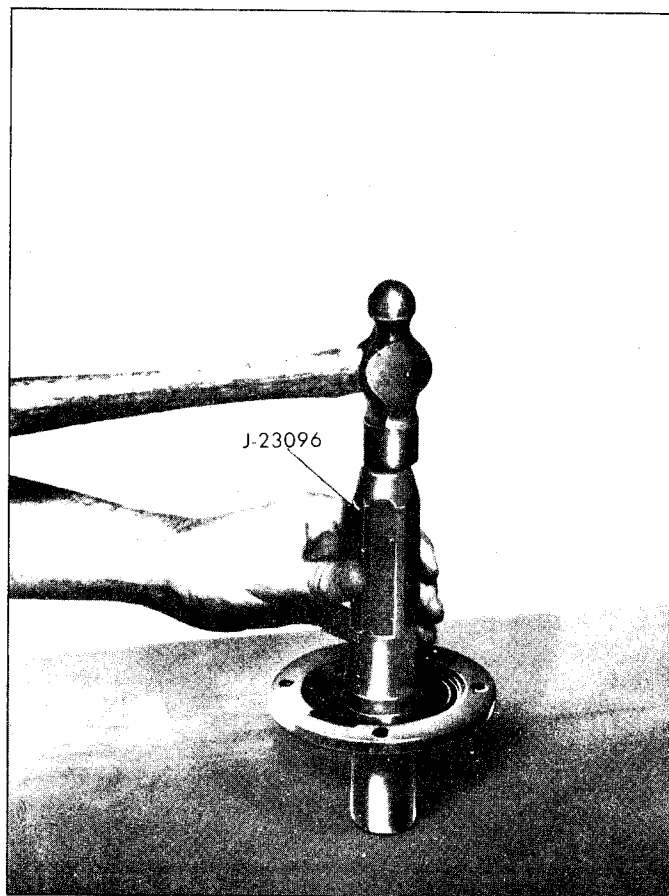


Fig. 7B-15K--Installing Rear Extension Seal

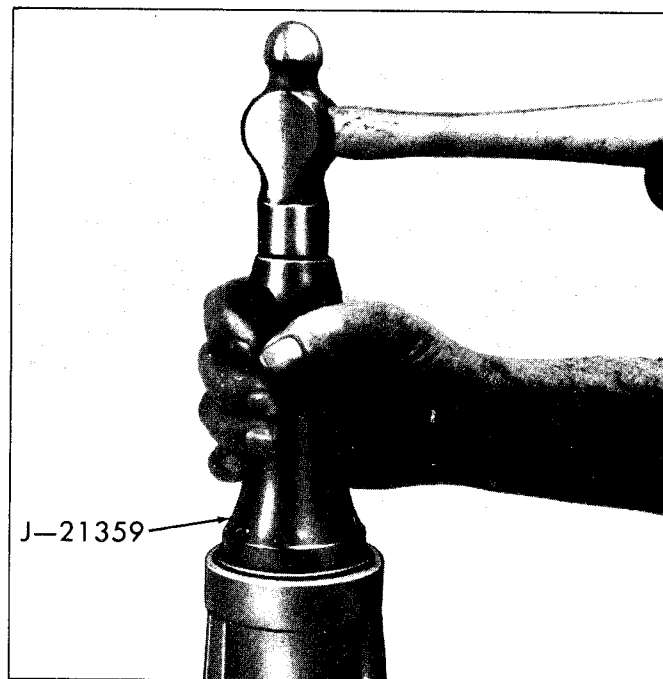


Fig. 7B-16K--Installing Drive Gear Bearing Retainer Seal

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).

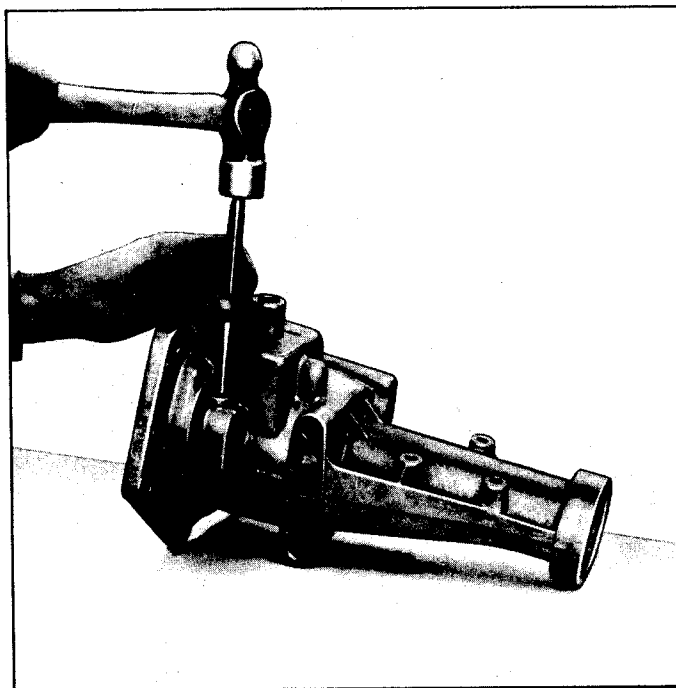


Fig. 7B-17K--Removing Reverse Idler Shaft Roll Pin

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

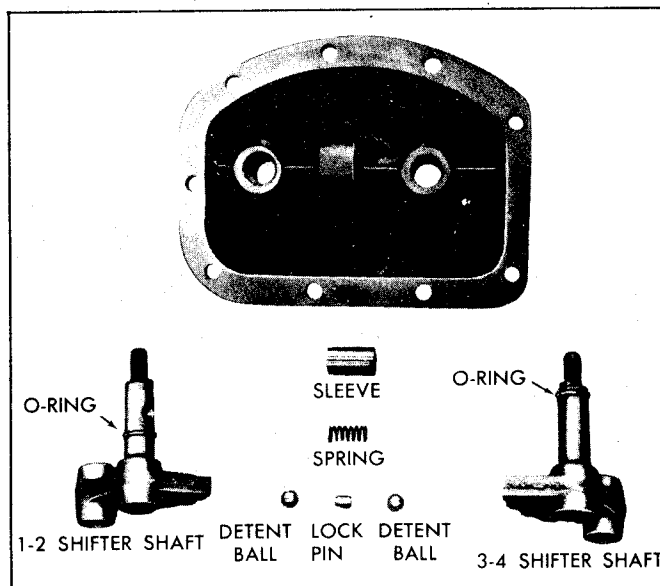


Fig. 7B-18K--Shift Cover Assembly

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

CHECKING COUNTERGEAR END PLAY

1. Rest the transmission case on its side with the side cover opening toward the assembler. Put counter gear tanged thrust washers in place, retaining them with heavy grease, making sure the tangs are resting in the notches of the case.
2. Set counter gear 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 counter gear (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 counter gear. If end play is greater than .025", a new thrust washers must be installed.

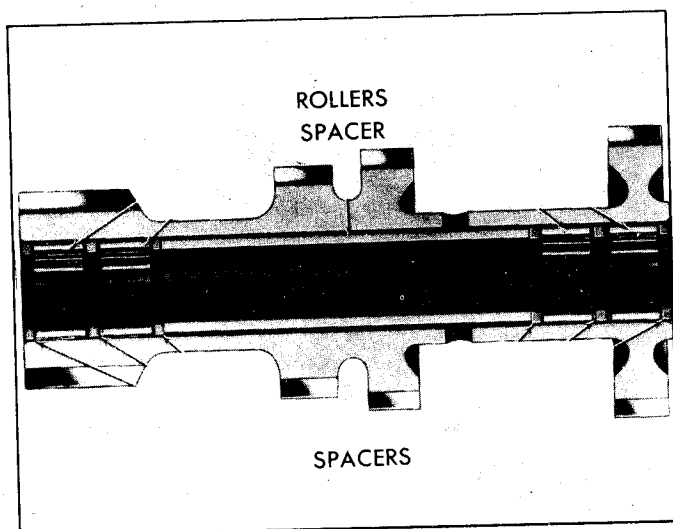


Fig. 7B-19K-Countergear Cross Section

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).

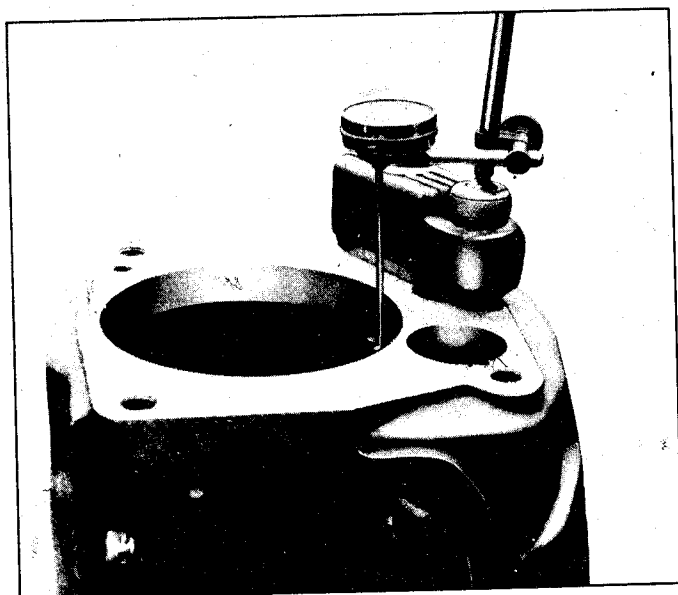


Fig. 7B-20K-Checking Countergear End Play

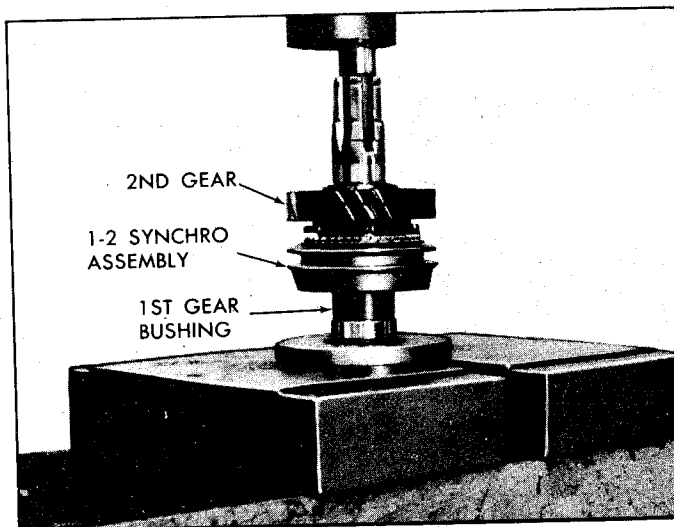


Fig. 7B-21K-Installing 1st Gear Sleeve

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.

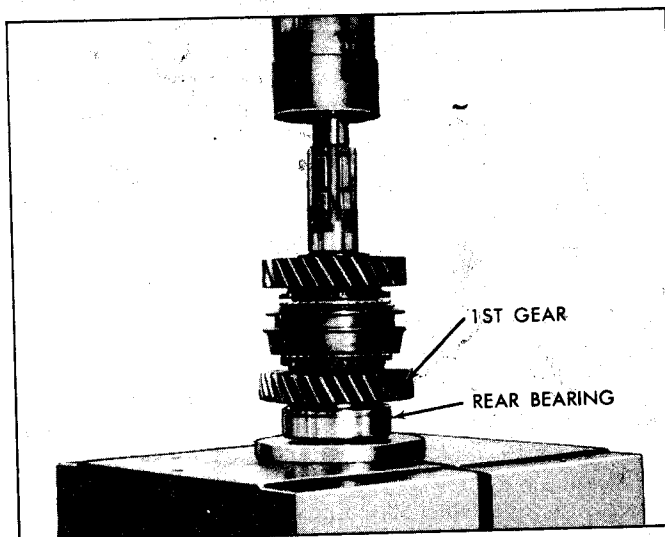


Fig. 7B-22K-Installing Rear Bearing

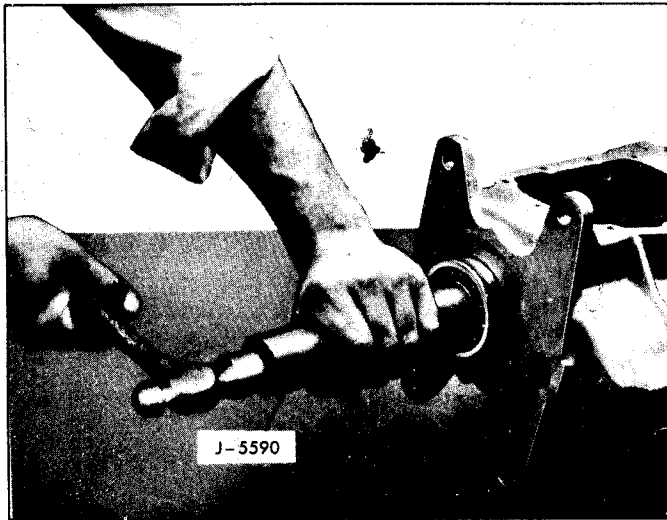


Fig. 7B-23K--Installing Front Main Bearing

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

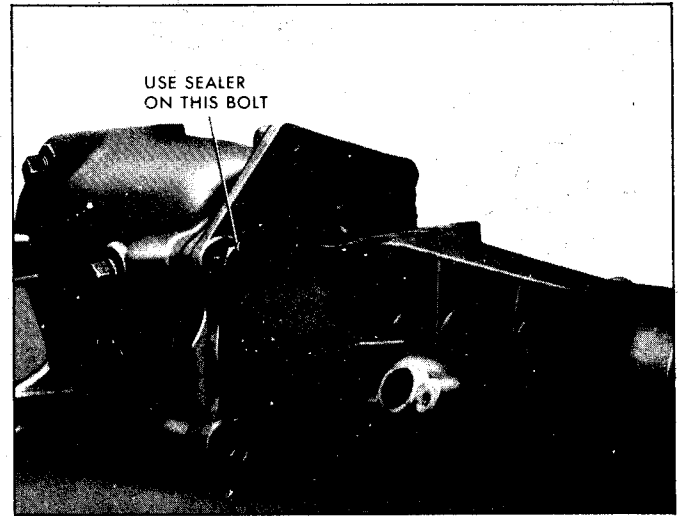


Fig. 7B-24K--Extension Bolt

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.