Mitsubishi Five-Speed Manual Transmission

SECTION 16-18

APPLIES TO RANGER (4x4) AND BRONCO II VEHICLES

DESCRIPTION AND OPERATION

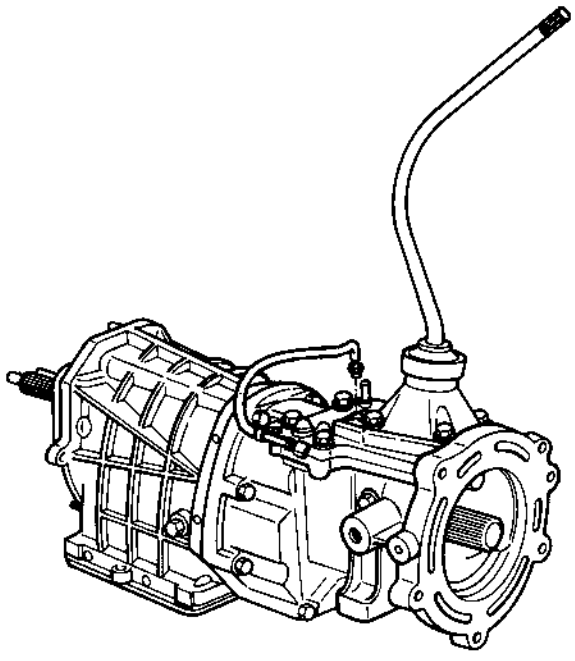
DESCRIPTION

The Mitsubishi Five Speed Manual Transmission (Model FM145) is used on Ranger (4x4) and Bronco II vehicles. The transmission has five forward gears (the fifth gear being an overdrive gear) and one reverse gear. It is fully synchronized in all forward gears. All gear changes are accomplished with synchronizer sleeves. Reverse gear uses a reverse idler gear which is in constant mesh with the countershaft gear.

The top mounted shifter operates shift rails through a set of shift forks. Shift forks mounted on the rails operate the synchronizer sleeves that allow shifts of 1-2, 3-4 and overdrive-reverse.

A shift interlock system, located in the side of the transmission case, prevents the shift rails from engaging two gears at the same time.

The transmission assembly is composed of five major components: a front bearing retainer, a transmission case, a transfer case adapter and a transfer cover assembly, all of which are cast aluminum. The fifth component is the under cover which is made from stamped aluminum.



C5526-1B

DESCRIPTION AND OPERATION (Continued)

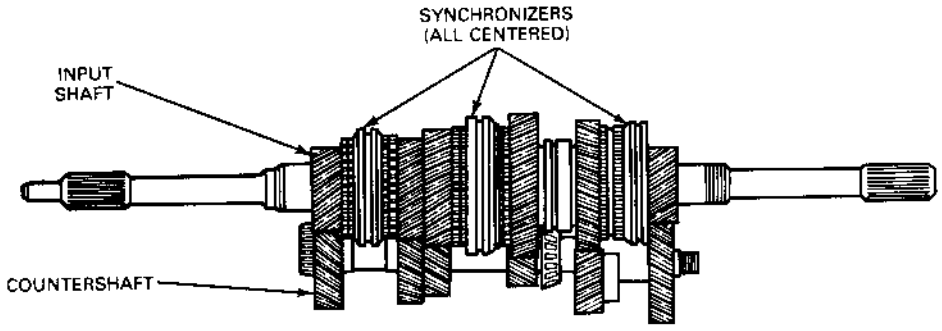
OPERATION

POWERFLOW

Neutral

In the neutral position, all the synchronizer sleeves are centered. The input shaft is driving the countershaft and the reverse idler. None of the gears are locked to the mainshaft and the mainshaft is not driven.

NEUTRAL

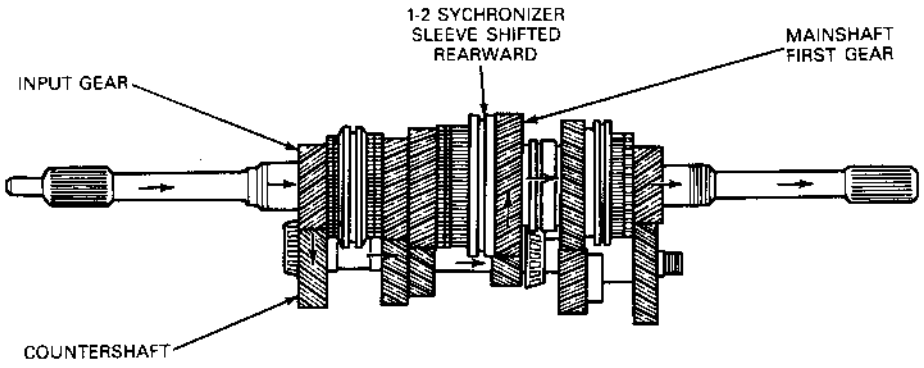


C5527-2B

First Gear

When the transmission is shifted into first gear, the 1-2 synchronizer sleeve is shifted rearward. The first gear is locked to the mainshaft through the synchronizer. The input gear drives the countershaft. The countershaft drives the first gear on the mainshaft. The first gear ratio is 3.967:1.

FIRST GEAR



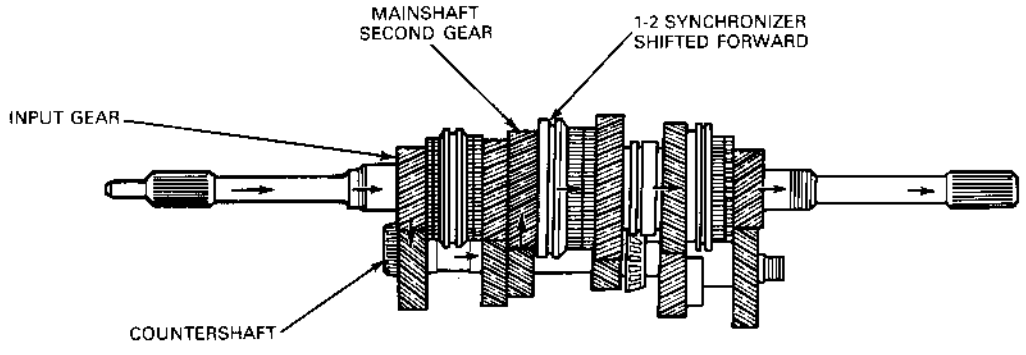
C5528-2A

DESCRIPTION AND OPERATION (Continued)

Second Gear

When the transmission is shifted into second gear, the 1-2 synchronizer sleeve is shifted forward. The second speed gear is locked to the mainshaft through the synchronizer. The input gear drives the countershaft. The countershaft drives the second gear on the mainshaft. The second gear ratio is 2.136:1.

SECOND GEAR

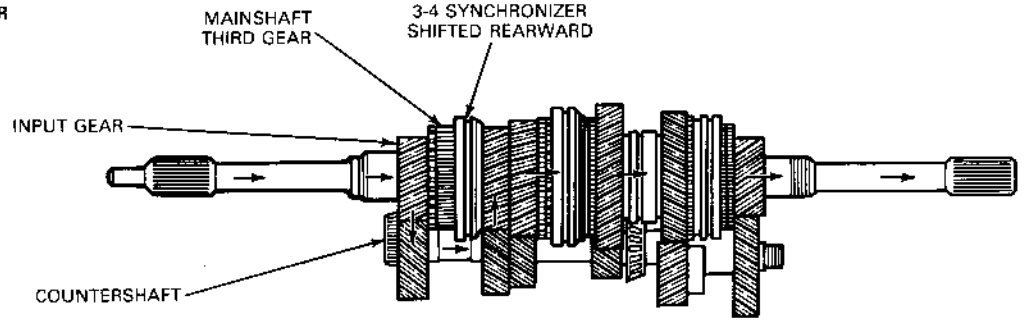


C5529-2A

Third Gear

When the transmission is shifted into third gear, the 3-4 synchronizer sleeve is shifted rearward. The third speed gear is locked to the mainshaft through the synchronizer. The input gear drives the countershaft. The third gear on the countershaft drives the third gear on the mainshaft. The third gear ratio is 1.360:1.

THIRD GEAR



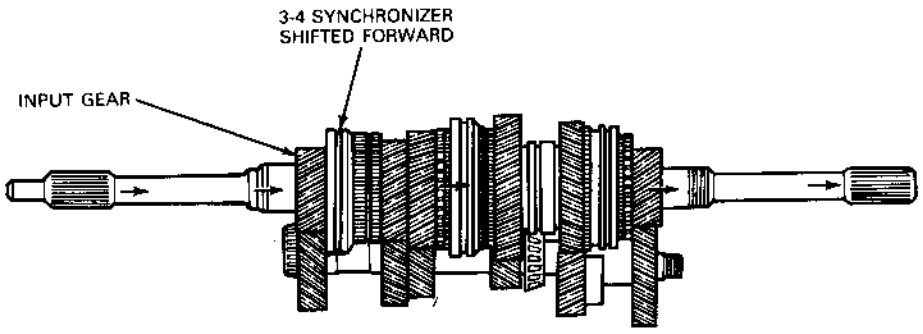
C5530-2A

DESCRIPTION AND OPERATION (Continued)

Fourth Gear

When the transmission is shifted into fourth gear, the 3-4 synchronizer sleeve is shifted forward. The input shaft is locked to the mainshaft through the 3-4 synchronizer. The two shafts are linked into a single unit and turn at the same speed. The fourth gear ratio is 1:1.

FOURTH GEAR

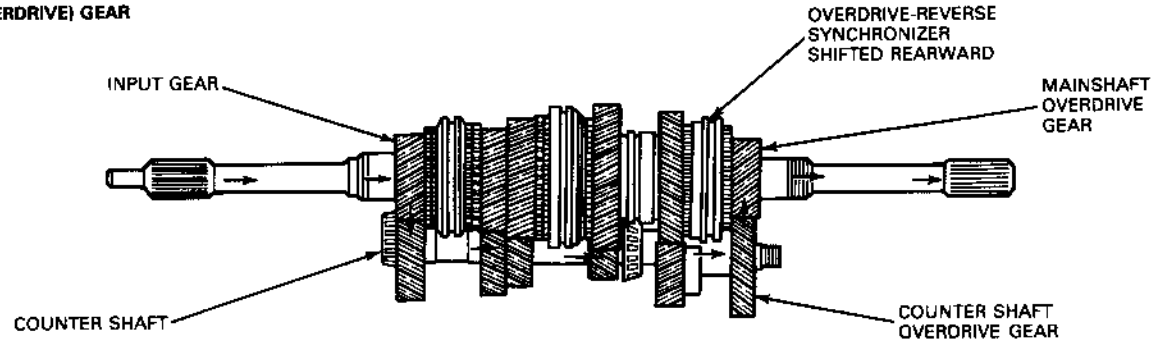


C5531-2A

Fifth (Overdrive) Gear

When the transmission is shifted into fifth (overdrive) gear, the overdrive-reverse synchronizer sleeve is shifted rearward. The overdrive gear is locked to the mainshaft. The input gear is driving the countershaft. The overdrive gear on the countershaft drives the overdrive gear on the mainshaft. The fifth (overdrive) gear ratio is 0.856:1.

FIFTH (OVERDRIVE) GEAR

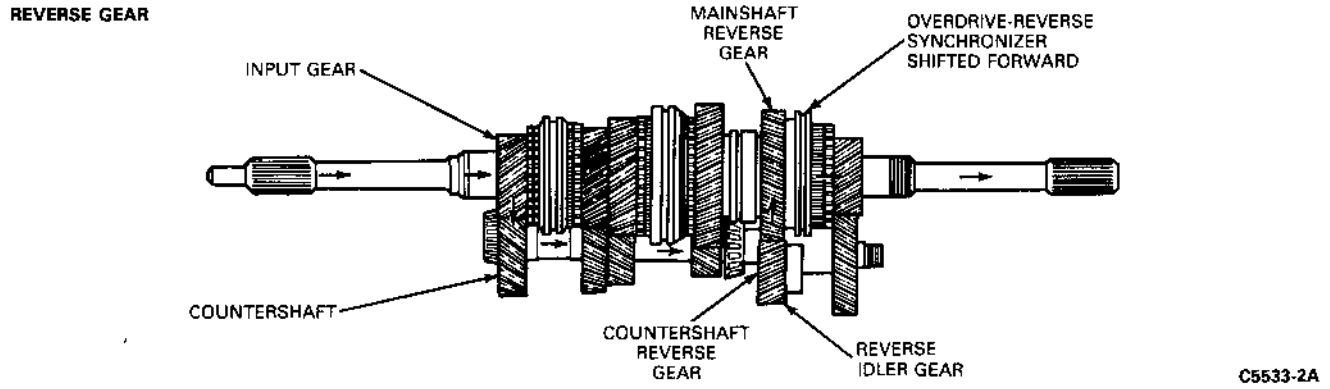


C5532-2B

DESCRIPTION AND OPERATION (Continued)

Reverse Gear

When the transmission is shifted into reverse gear, the overdrive-reverse synchronizer sleeve is shifted forward. The reverse gear is locked to the mainshaft. The input gear is driving the countershaft. The countershaft reverse gear drives the reverse idler gear. The reverse idler gear is in constant mesh with the countershaft. The reverse idler gear drives the reverse gear on the mainshaft and the mainshaft is driven in the reverse direction. The reverse gear ratio is 3.578:1.



DIAGNOSIS AND TESTING

Refer to Section 16-10, General Manual Transmission Service for diagnostic and testing procedures.

REMOVAL AND INSTALLATION

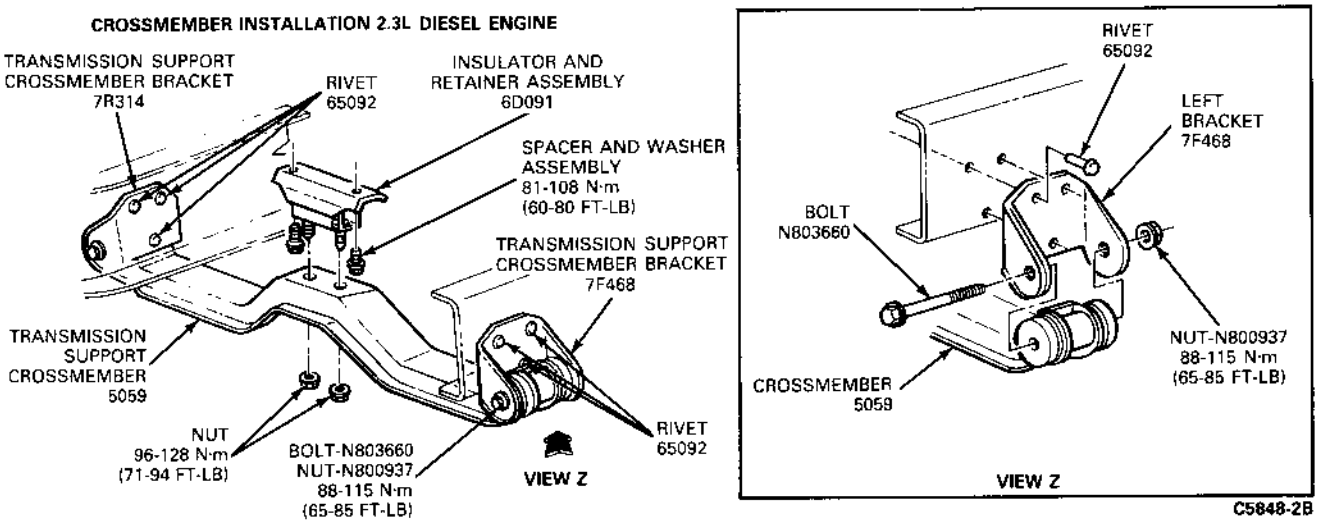
TRANSMISSION

Removal

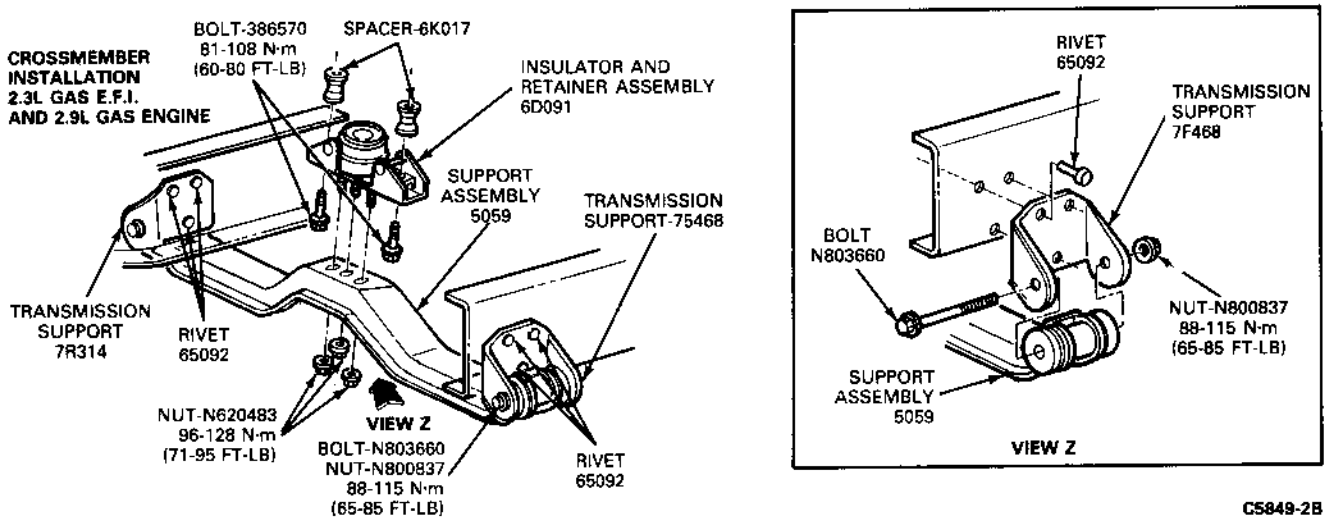
1. Place the gearshift selector in the neutral (N) position.
2. Remove the boot retainer bolts. Remove the bolts attaching the retainer cover to the gearshift lever retainer.
3. Pull the gearshift lever assembly out of the transfer case adapter.
4. Cover the opening in the transfer case adapter with a cloth to prevent dirt from falling into the adapter.
5. Open the hood and disconnect the negative battery cable from the battery terminal.
6. Raise the vehicle.
7. Index the rear driveshaft to the front axle flange and the transfer case. Disconnect the driveshaft at the rear axle flange.
8. Pull the rear driveshaft rearward and disconnect the driveshaft from the transmission. Install a suitable plug in the transfer case adapter to prevent lubricant leakage.
9. Disconnect the hydraulic fluid line from the clutch slave cylinder. Plug the line to prevent fluid leakage.
10. Disconnect the speedometer from the transfer case adapter.
11. Disconnect the starter motor cable, the back-up lamp switch wire, the shift indicator switch wire and the neutral position switch wire (if so equipped).
12. Place a jack under the engine block, protecting the oil pan with a wood block.
13. Remove the transfer case from the vehicle as described in Section 16-85, Borg Warner 1350 Transfer Case.

REMOVAL AND INSTALLATION (Continued)

14. Remove the starter. Place a transmission jack under the transmission.
15. Remove the bolts, lockwashers and flatwashers attaching the transmission to the engine and plate.
16. Remove the nuts and bolts attaching the transmission mount and damper to the crossmember.
17. Remove the nuts and bolts attaching the crossmember to the frame side rails and remove the crossmember.
18. Lower the engine jack. Work the clutch housing off the locating dowels and slide the transmission rearward until the input shaft clears the clutch disc. Remove the transmission from the vehicle.



REMOVAL AND INSTALLATION (Continued)



TRANSMISSION

Installation

1. Make sure that the machined mating surfaces and the locating dowels on the engine rear plate are free of burrs, dirt or paint. Check the mating face of the clutch housing and the locating dowel holes for burrs, dirt or paint.
2. Mount the transmission on transmission jack. Position it under the vehicle and start the input shaft into the clutch disc. Align the splines on the input shaft with the splines in the clutch disc. Move the transmission forward and carefully seat the clutch housing on the locating dowels of the engine rear plate. The engine plate dowels must not shave or burr the clutch housing dowel holes.
3. Install the bolts and flatwashers that attach the clutch housing to the engine rear plate and tighten to specifications. Remove the transmission jack.
4. Install the starter motor. Tighten the attaching nuts to specifications.
5. Raise the engine and install the rear crossmember, insulator and damper and attaching nuts and bolts. Tighten the nuts to specifications.
6. Install the bolts, nuts and washers attaching the transmission mount to the crossmember. Tighten the nuts to specifications. Remove the engine jack.
7. Install the transfer case as described in Section 16-85, Borg Warner 1350 Transfer Case.
8. Install the driveshaft in the transfer case adapter and attach it to the rear axle flange. Make sure the marks made during removal are in alignment. Install the attaching nuts and bolts and tighten to specifications.
9. Connect the starter cable, backup lamp switch wire, shift indicator wire and the neutral position switch wire (if so equipped).
10. Connect the clutch hydraulic line to slave cylinder on the input shaft. Bleed the hydraulic clutch system as described in Section 16-04, Hydraulic Clutch.
11. Install the speedometer cable.
12. Remove the fill plug and check the fluid level. The fluid level should be even with the bottom of the filler hole. If required, fill to the specified level with Standard Transmission Lubricant (SAE 80W), D8DZ-19C547-A (ESP-M2C83-C) or equivalent.
13. Lower the vehicle.
14. Connect the negative battery cable to the battery terminal.
15. Remove the cloth over the transfer case adapter opening. Avoid getting dirt in the adapter.

REMOVAL AND INSTALLATION (Continued)

16. Install the gearshift lever assembly in the transfer case adapter. Make sure the ball on the lever is in the socket in the adapter. Install the attaching bolts and tighten to specifications.
17. Install the boot cover and bolts.
18. Verify proper shifting and operation of the transmission.

SHIFT LEVER

NOTE: Remove only the shift ball if the shift ball, boot or lever is to be replaced. If either the ball, boot or lever is not being replaced, remove the ball, boot and lever as an assembly.

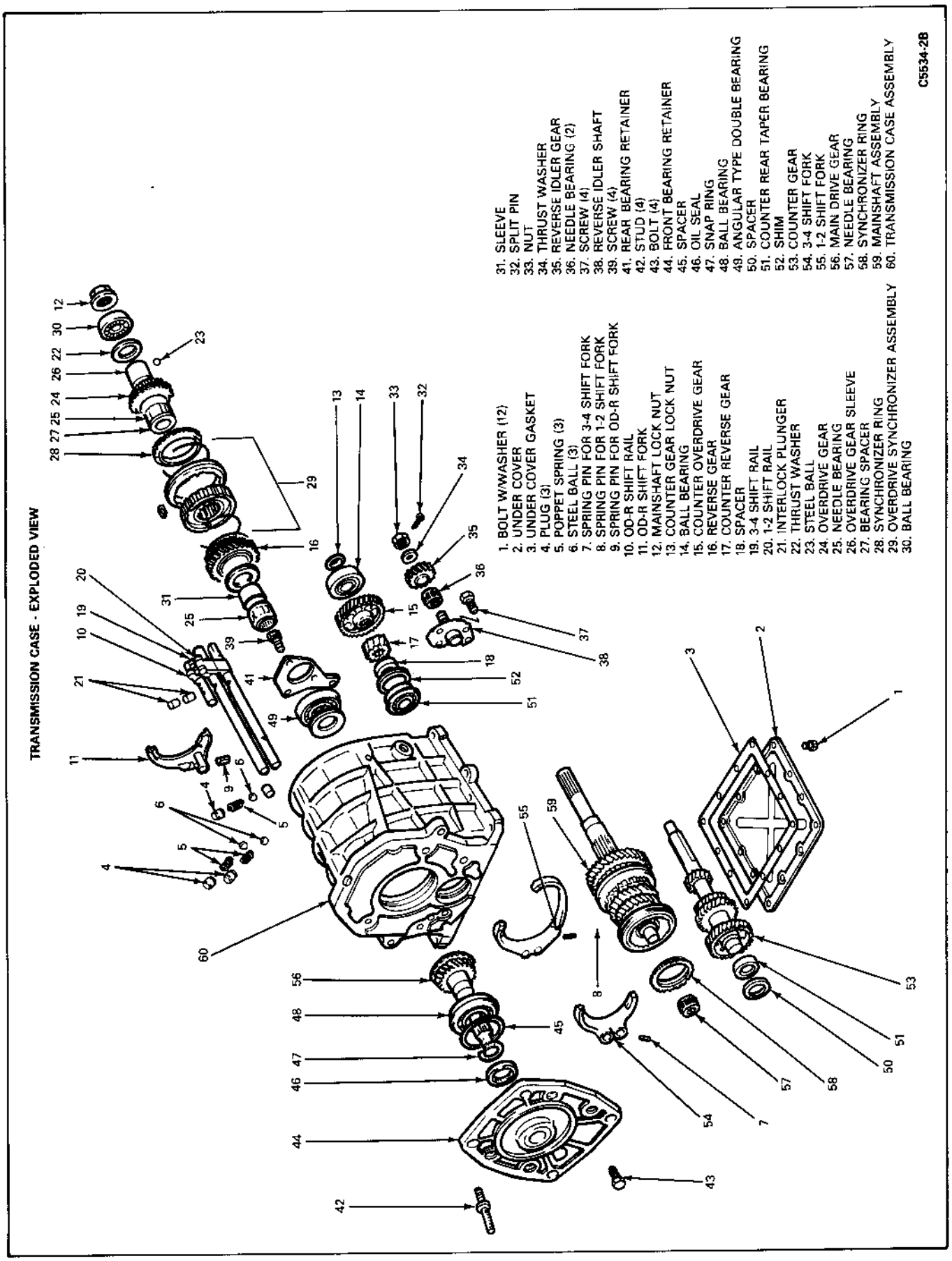
Removal

1. Remove the plastic insert from the shift ball. Warm the ball with a heat gun to 60°-82°C (140°-180°F). Knock the ball off the lever with a wood block and a hammer, taking care not to damage the finish on the shift lever.
2. Remove the rubber boot.
3. Remove the bolts retaining the shift lever to the transfer case adapter and remove the lever assembly.

Installation

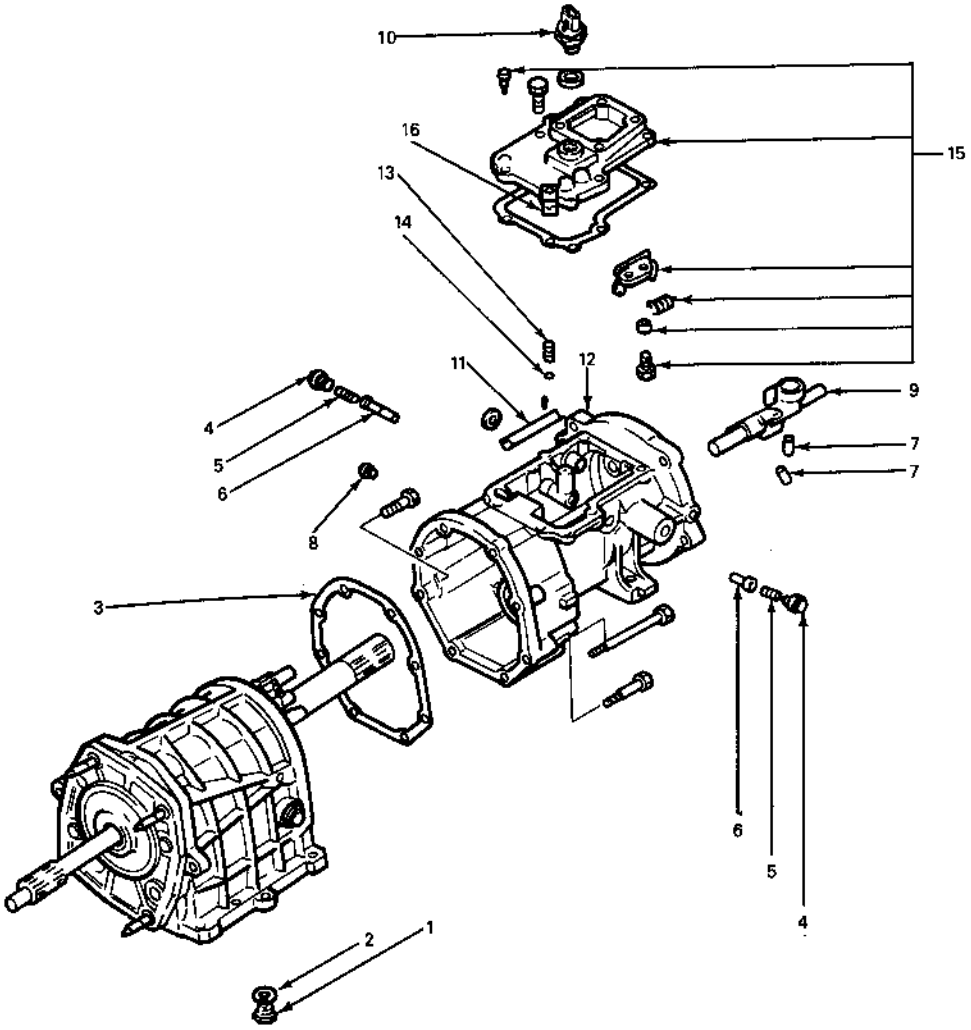
1. Lubricate the shift lever selector ball with Multi-Purpose Long-Life Lubricant, C1AZ-19590-B (ESA-M1C75-B) or equivalent. Position the lever in the transfer case adapter, making sure the selector ball is in the socket. Install the bolts and tighten to 8-14 Nm (6-10 ft-lbs).
2. Install the rubber boot and floor pan cover.
3. Warm the ball with a heat gun to 60°-82°C (140°-180°F) and tap the ball on the lever with a 7/16 inch socket and mallet. Install the plastic shift pattern insert.

REMOVAL AND INSTALLATION (Continued)



REMOVAL AND INSTALLATION (Continued)

TRANSFER CASE ADAPTER - EXPLODED VIEW



1. DRAIN PLUG
2. GASKET
3. GASKET
4. BOLT
5. NEUTRAL RETURN SPRING
6. PLUNGER
7. SPRING PIN
8. PLUG
9. CONTROL SHAFT ASSEMBLY
10. TOP SPEED DETECT SWITCH
11. AIR GUTTER
12. TRANSFER CASE ADAPTER
13. RESISTANCE SPRING
14. STEEL BALL
15. TRANSFER COVER ASSEMBLY
16. CLIP WIRE

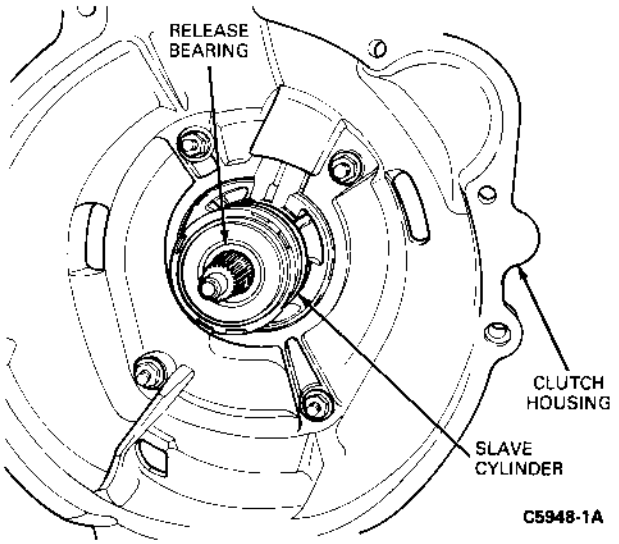
C5535-2B

DISASSEMBLY AND ASSEMBLY

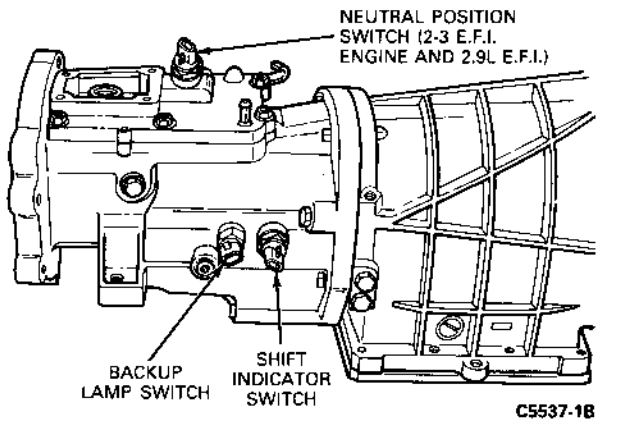
TRANSMISSION

Disassembly

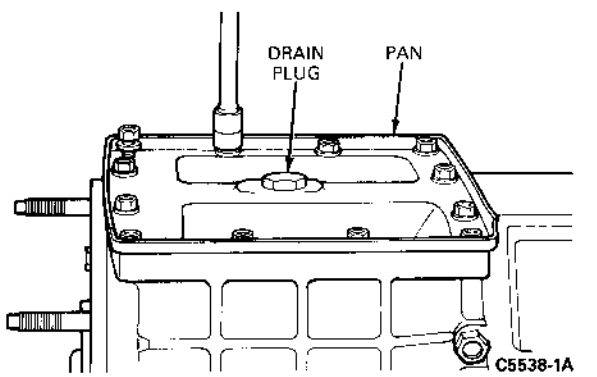
1. Remove the transmission as described in the Removal and Installation portion of this section. Make sure the transmission is in Neutral.
2. Remove the nuts retaining the clutch housing to the transmission and remove the housing. If not removed, remove the clutch slave cylinder from the input shaft.



3. Remove the backup lamp switch and shift indicator switch from the transmission.

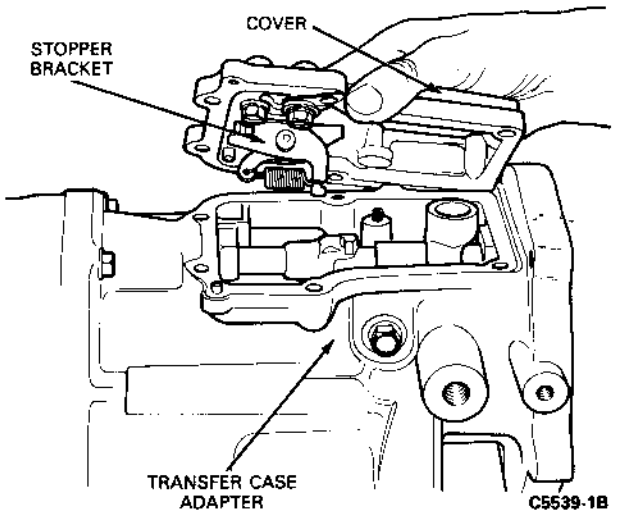


4. If required, drain the fluid from the transmission by removing the drain plug from the pan.
5. Remove the bolts retaining the pan to the case and remove the pan. Remove and discard the gasket. Remove all traces of the gasket from the mating surfaces of the pan and case.

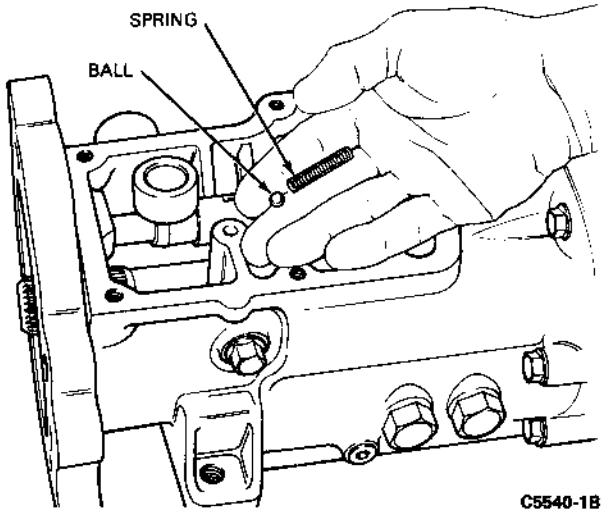


DISASSEMBLY AND ASSEMBLY (Continued)

6. Remove the bolts retaining the cover to the transfer case adapter and remove the cover (with stopper bracket inside). Remove and discard the gasket. Clean all traces of gasket material from the mating surfaces of the adapter and cover.

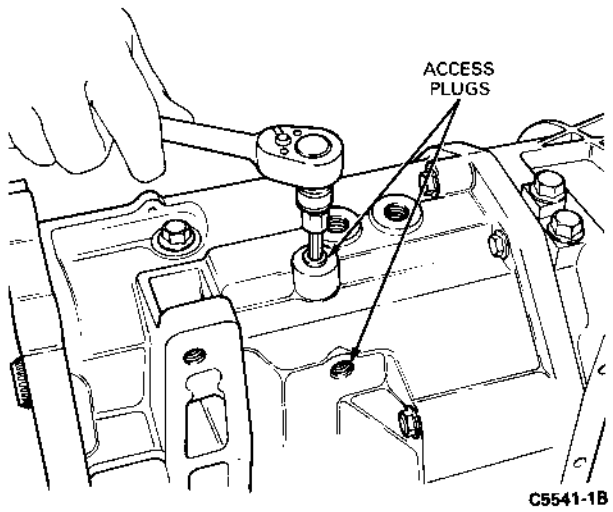


7. Remove the detent spring and ball from the adapter.

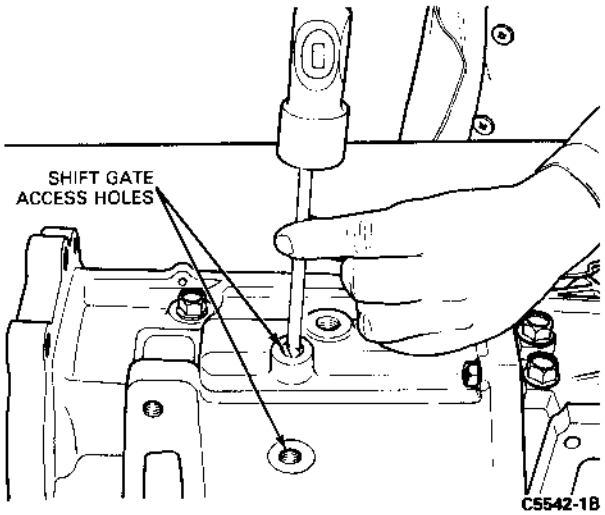


DISASSEMBLY AND ASSEMBLY (Continued)

8. Remove the three shift gate roll pin access plugs (two on the side, one on the bottom) with a 6mm allen-head wrench.

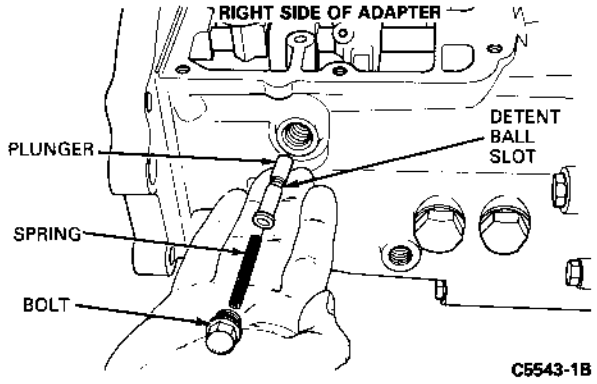


9. Using a punch, drive the roll pins from the shift gates through the access holes.

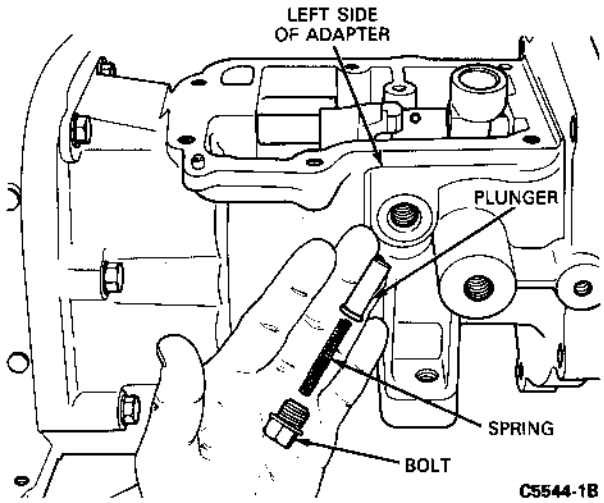


DISASSEMBLY AND ASSEMBLY (Continued)

10. From the right side of the adapter, remove the bolt, spring and neutral return plunger. Note that the plunger has a slot in the center for the detent ball.

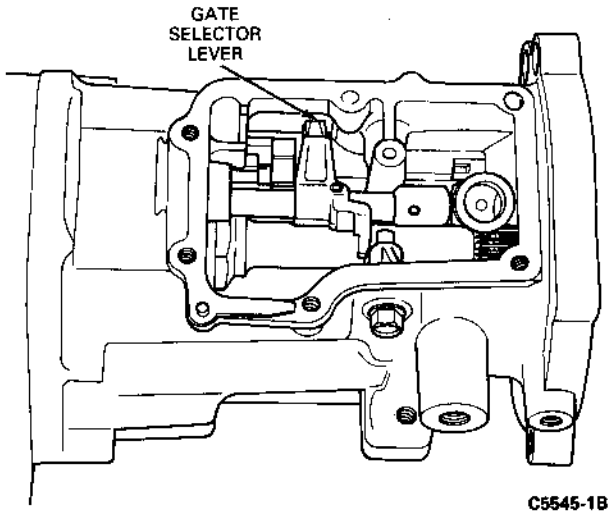


11. From the left side of the adapter, remove the bolt, spring and neutral return plunger.



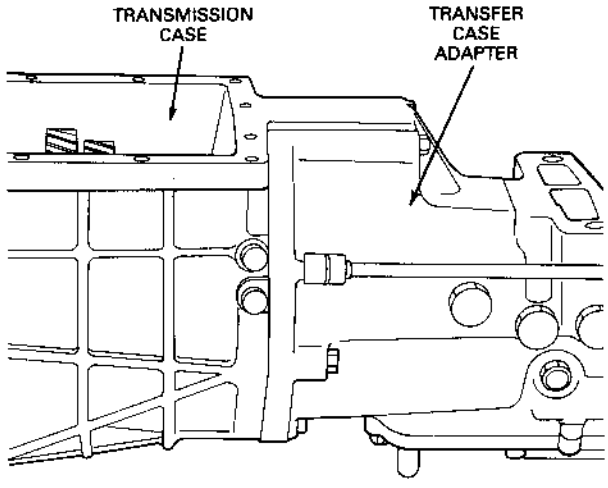
DISASSEMBLY AND ASSEMBLY (Continued)

12. Lift the gate selector lever out of the shift gates. Move the lever to the rear of the adapter as far as it will go. This will allow clearance to remove the adapter from case.



C5545-1B

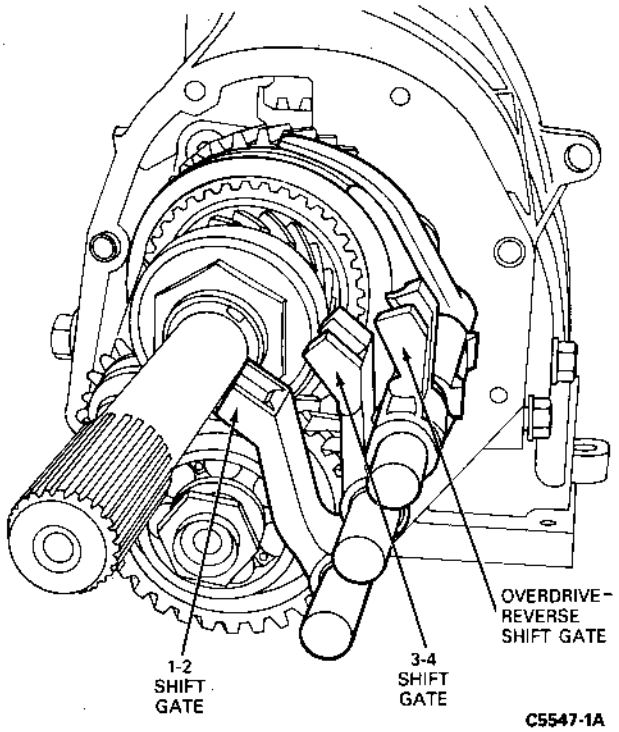
13. Remove the bolts retaining the transfer case adapter to the transmission case. Note that three different bolt sizes (35mm, 55mm, and 110mm) are used to retain the case to the adapter. Mark the bolt holes accordingly.



C5546-1A

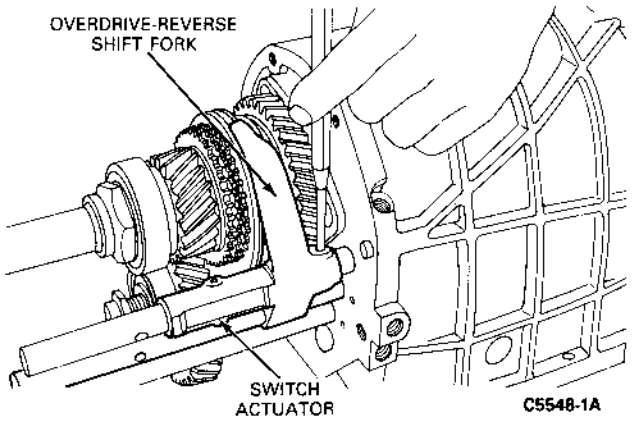
DISASSEMBLY AND ASSEMBLY (Continued)

14. Remove the adapter from the case. Make sure the shift gates do not bind in the adapter during removal. Rotate the gates on the rails as required. Remove and discard the gasket. Clean all traces of gasket material from the mating surfaces of the case and adapter.
15. Identify each shift rail and gate. Remove the gates from the rails.



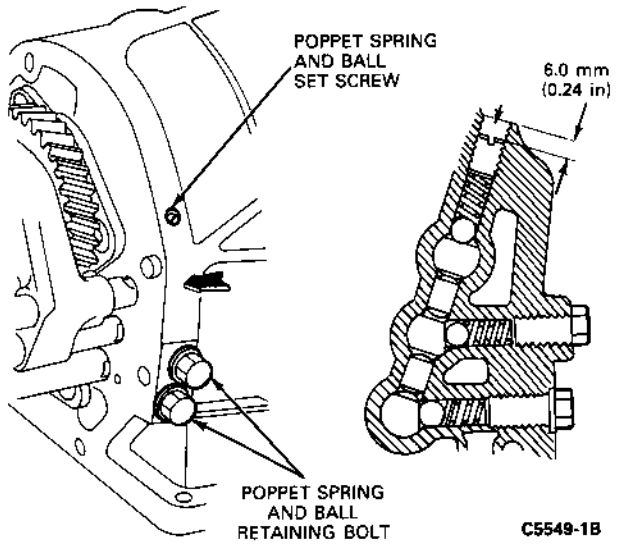
16. From inside the case, drive out the roll pins retaining the 1-2 and 3-4 shift forks to the rails. Remove the 1-2 shift fork.
17. Drive out the overdrive-reverse shift fork roll pin.

NOTE: The roll pin in the switch actuator does not need to be removed for transmission disassembly.



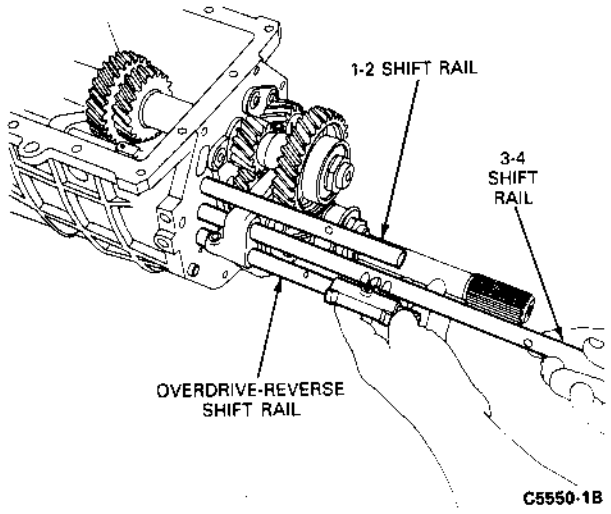
DISASSEMBLY AND ASSEMBLY (Continued)

18. Remove the set screw on the top of the case and remove the poppet spring and steel ball. Remove the two bolts on the side of the case. Remove the two poppet springs and two steel balls.



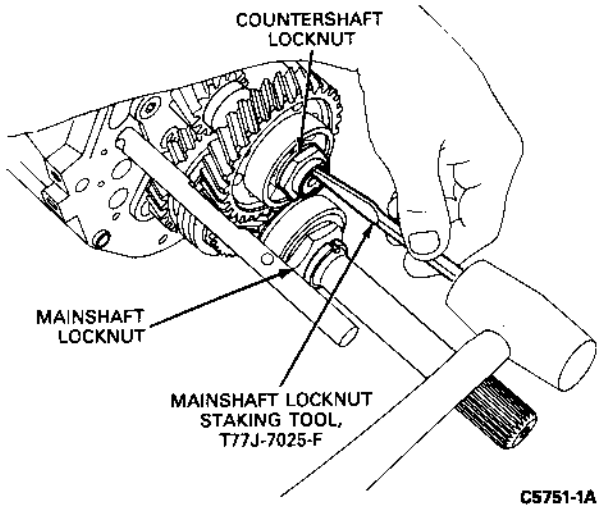
19. Remove the overdrive-reverse shift rail and the 3-4 shift rail from the case. Remove the overdrive-reverse shift fork. When the two shift rails are removed, the interlock pins can be removed from the case.

NOTE: The 1-2 shift rail is unable to be removed at this time.

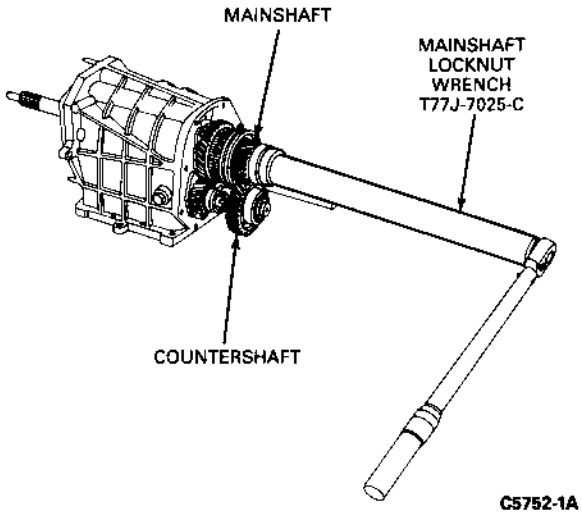


DISASSEMBLY AND ASSEMBLY (Continued)

20. Unstake the locknuts on the mainshaft and countershaft using Mainshaft Locknut Staking Tool, T77J-7025-F.

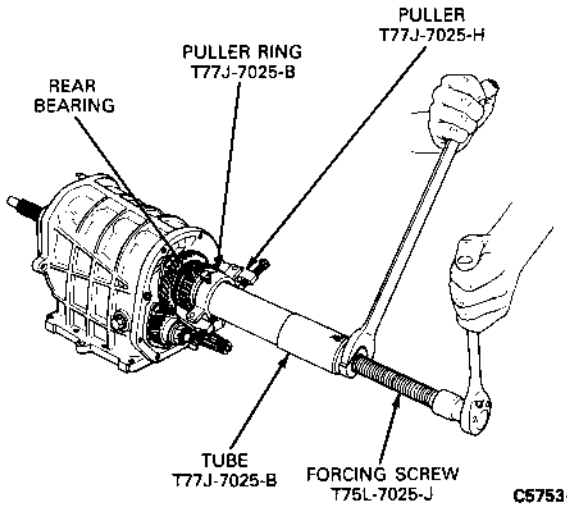


21. Double engage the transmission in two gears to lock up the transmission. This is done by engaging two of the synchronizers. This is necessary to remove the locknuts.
22. Remove the countershaft locknut with a 30mm socket. Discard the locknut.
23. Remove the mainshaft locknut with Mainshaft Locknut Wrench, T77J-7025-C. Discard the locknut.

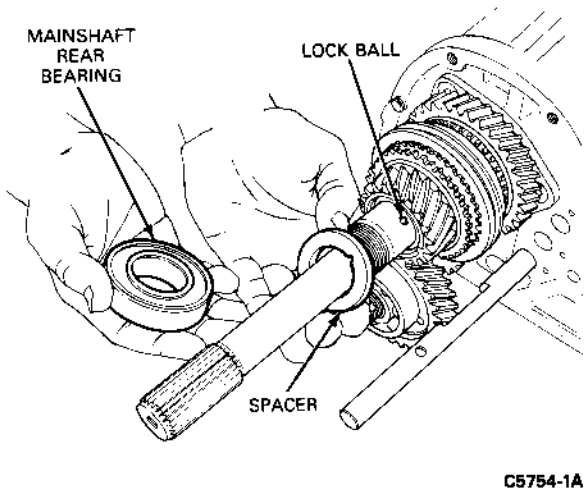


DISASSEMBLY AND ASSEMBLY (Continued)

24. Pull the rear bearing off the mainshaft using Tube, T77J-7025-B, Forcing Screw, T84T-7025-B, Puller, T77J-7025-H and Puller Ring, T77J-7025-J. Remove and discard the bearing.

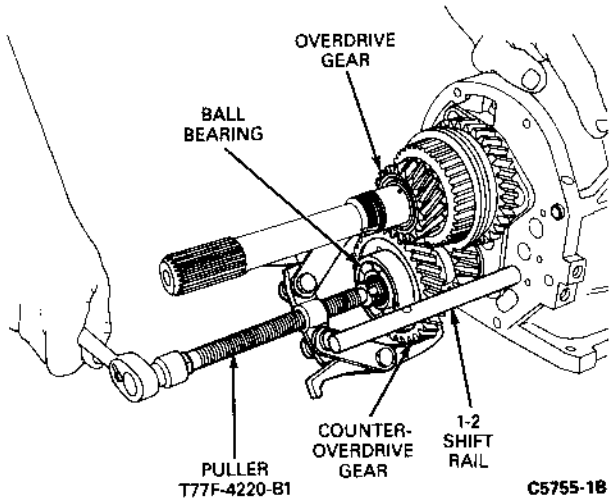


25. Remove the spacer and lock ball from the mainshaft.



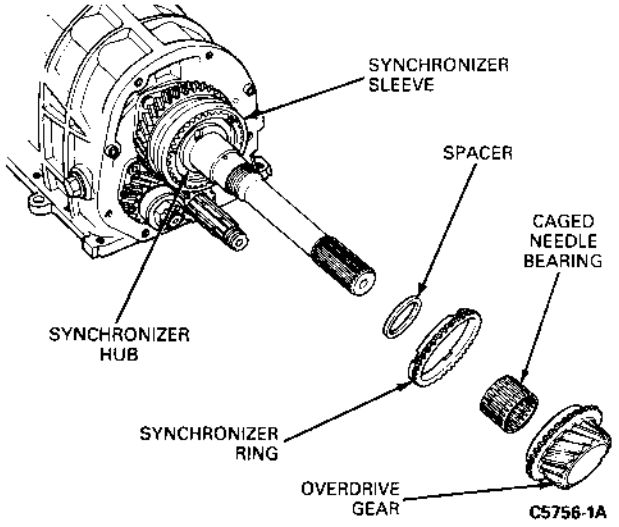
DISASSEMBLY AND ASSEMBLY (Continued)

26. Remove the counter-overdrive gear and ball bearing from the countershaft by installing the jaws of Puller, T77F-4220-B1 behind the gear. While removing the gear, remove the 1-2 shift rail from the case.



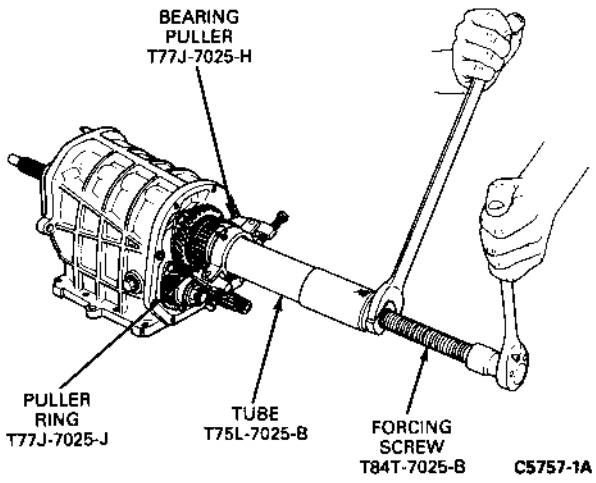
27. Remove the 1-2 and 3-4 shift forks from the case.
28. Remove the overdrive gear, needle bearing, spacer and synchronizer ring from the mainshaft.
29. Remove the overdrive synchronizer sleeve from the synchronizer hub on the mainshaft.

NOTE: Do not lose the three keys and two springs in the hub. A spring is located on each side of the hub.

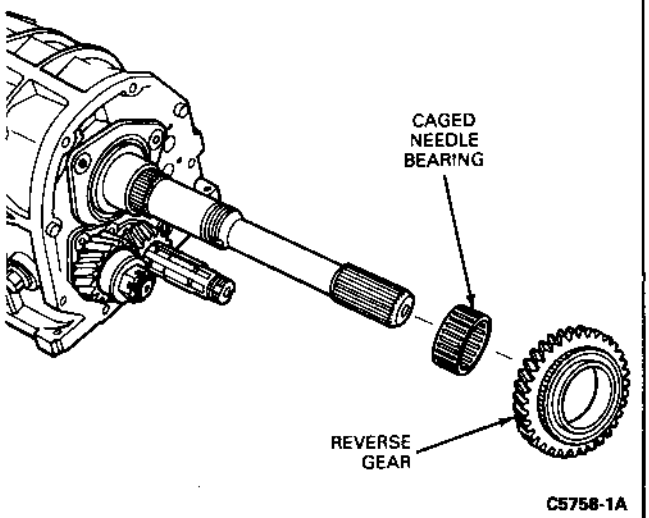


DISASSEMBLY AND ASSEMBLY (Continued)

30. Pull the overdrive synchronizer hub and overdrive gear bearing sleeve from the mainshaft using Bearing Puller, T77J-7025-H, Puller Ring, T77J-7025-J, Tube, T75L-7025-B and Forcing Screw, T84T-7025-B.

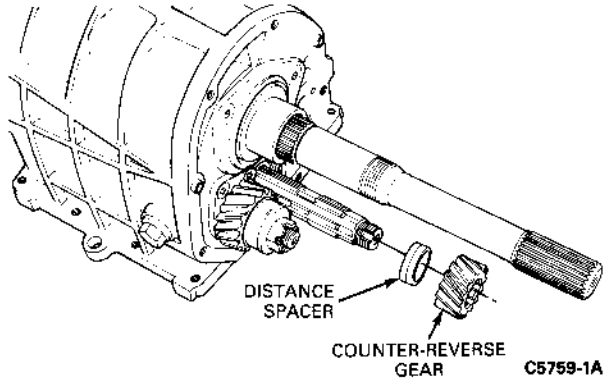


31. Slide the reverse gear and needle bearing assembly off the mainshaft.

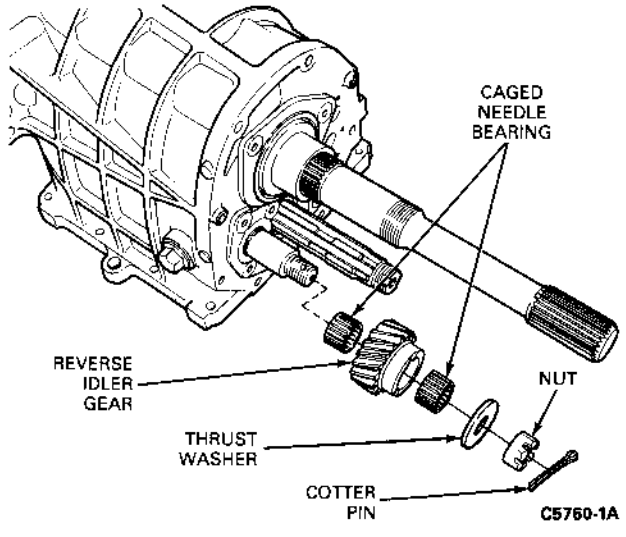


DISASSEMBLY AND ASSEMBLY (Continued)

32. Slide the counter-reverse gear and distance spacer off the countershaft.

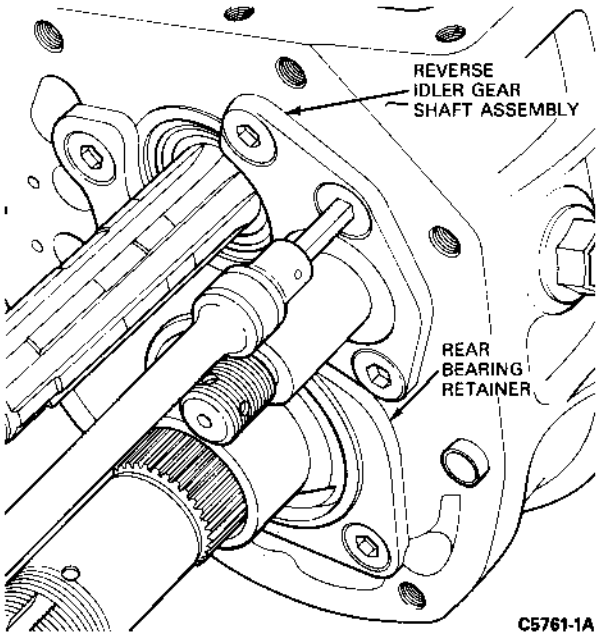


33. Remove the cotter pin and nut from the reverse idler shaft. Remove the thrust washer, reverse idler gear and two sets of needle bearings from the shaft.

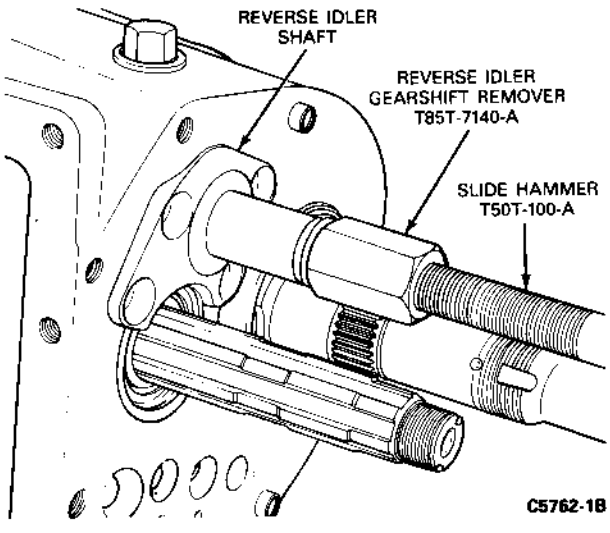


DISASSEMBLY AND ASSEMBLY (Continued)

34. Remove the 6mm allen-head bolts that attach the mainshaft rear bearing retainer to the case and remove the retainer. Remove and discard the gasket. Clean any traces of gasket material from the mating surfaces of the case and retainer.
35. Remove the 6mm allen-head bolts that retain the reverse idler gearshaft assembly to the case.

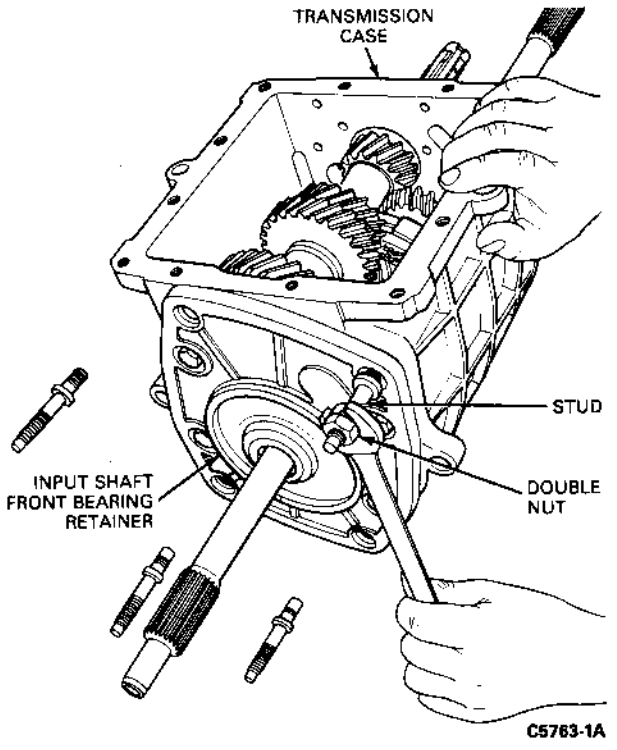


36. Pull the reverse-idler gearshaft assembly out of the case using Slide Hammer, T50T-100-A and Reverse Idler Gearshaft Remover, T85T-7140-A.

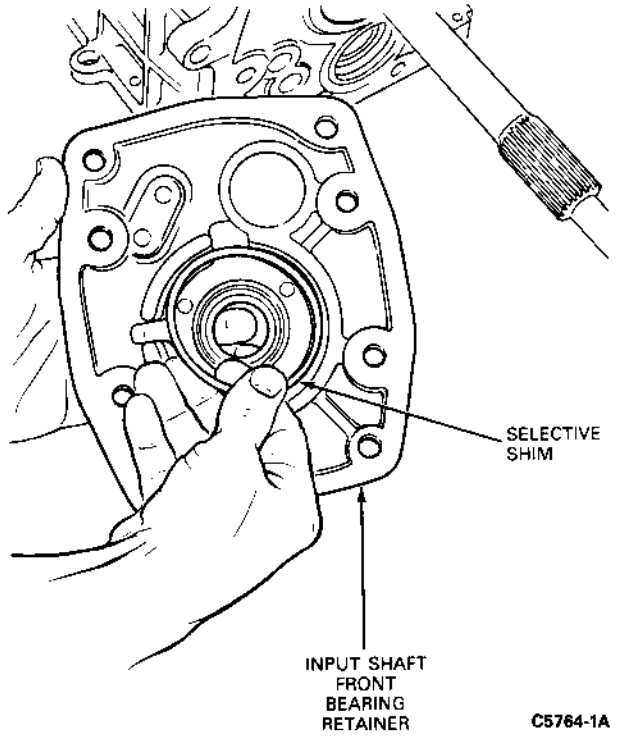


DISASSEMBLY AND ASSEMBLY (Continued)

37. Use a "double nut" procedure to remove the four studs that retain the input shaft front bearing retainer to the case. Remove the bolts that attach the retainer to the case.

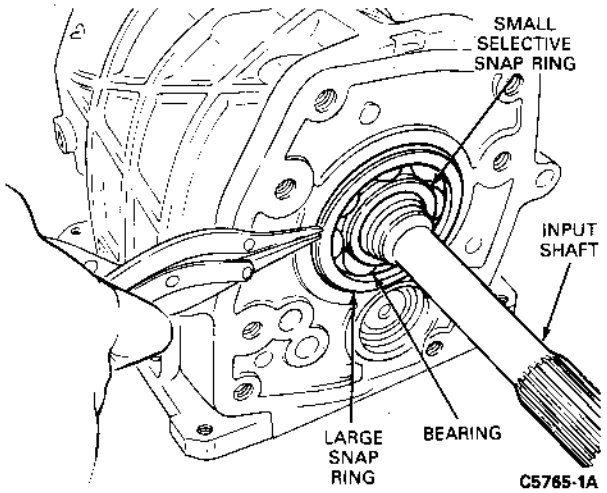


38. Remove the input shaft front bearing retainer from the case. Remove and discard the gasket. Clean all traces of gasket material from the mating surfaces of the case and retainer.
39. Remove the selective shim from inside the input shaft front bearing retainer. DO NOT DISCARD THE SELECTIVE SHIM.

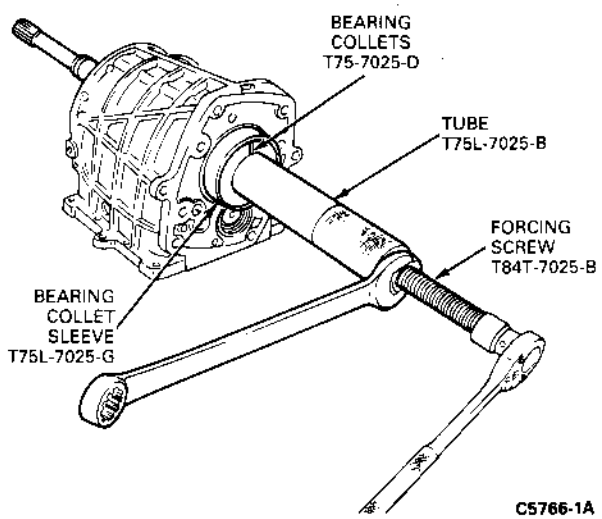


DISASSEMBLY AND ASSEMBLY (Continued)

40. Remove the small selective snap ring that retains the input shaft to the bearing. DO NOT DISCARD THE SELECTIVE SNAP RING.
41. Remove the large snap ring that retains the input shaft bearing to the case.

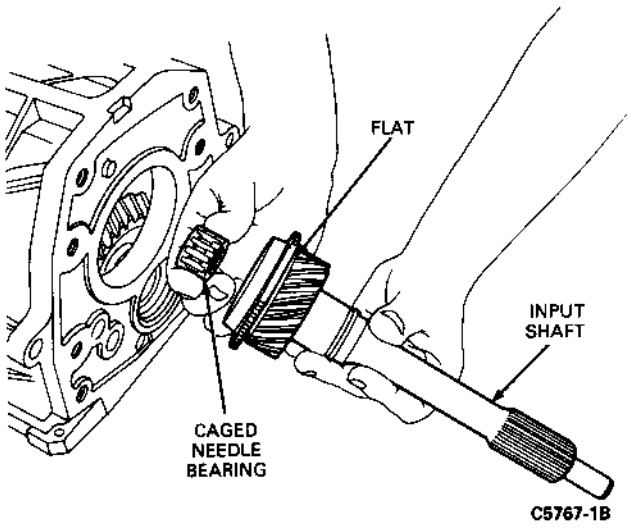


42. Remove the bearing from the input shaft and case using Tube, T75L-7025-B, Bearing Collets, T75L-7025-D, Bearing Collet Sleeve, T75L-7025-G and Forcing Screw, T84T-7025-B. Remove and discard the bearing.



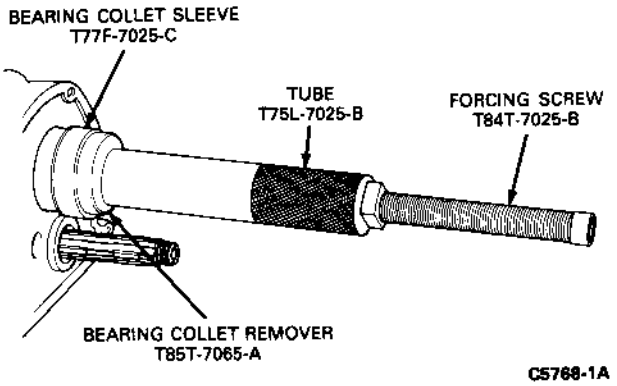
DISASSEMBLY AND ASSEMBLY (Continued)

43. Rotate the input shaft so the flats on the shaft face the countershaft, providing clearance to remove the input shaft. Remove the input shaft. The output shaft (mainshaft) may have to be pulled to the rear of the case. Remove the small caged needle bearing from the inside of the input gear.



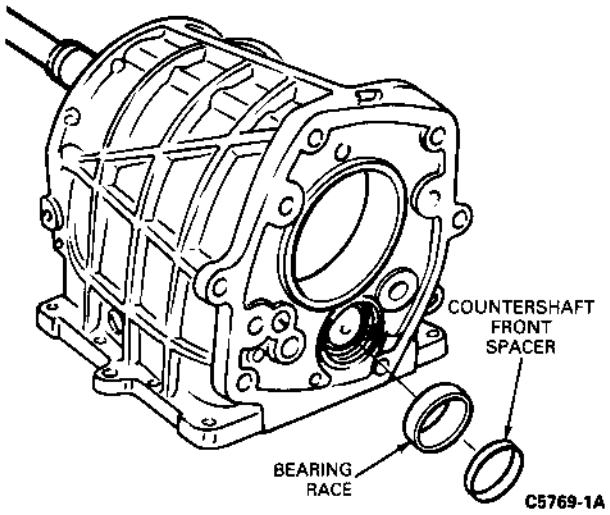
44. Remove the snap ring from the mainshaft (output shaft) outer bearing race.
45. Remove the outer mainshaft bearing race, ball bearing and bearing sleeve from the case using Tube, T75L-7025-B, Mainshaft Bearing Collet Remover, T85T-7065-A, Bearing Collet Sleeve, T77F-7025-C and Forcing Screw, T84T-7025-B. Discard the outer bearing race and ball bearing.

NOTE: The inner race of the front bearing will remain on the mainshaft.

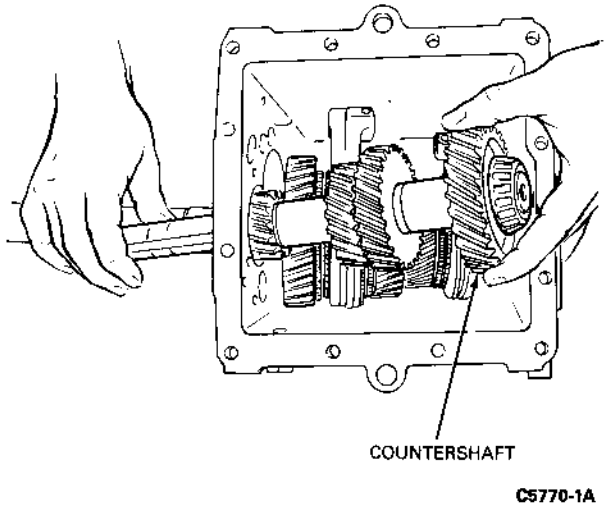


DISASSEMBLY AND ASSEMBLY (Continued)

46. Remove the countershaft front spacer and bearing race.

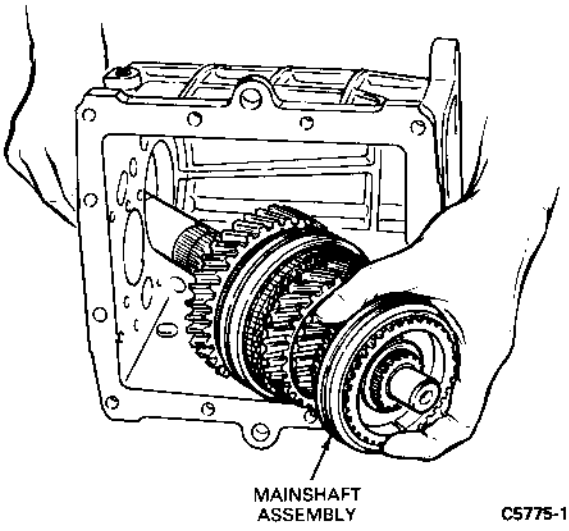


47. Remove the countershaft from the case. The mainshaft assembly may have to be moved slightly to the side to allow clearance for countershaft removal. If the countershaft bearings require servicing, refer to Countershaft — Disassembly and Assembly in this section.



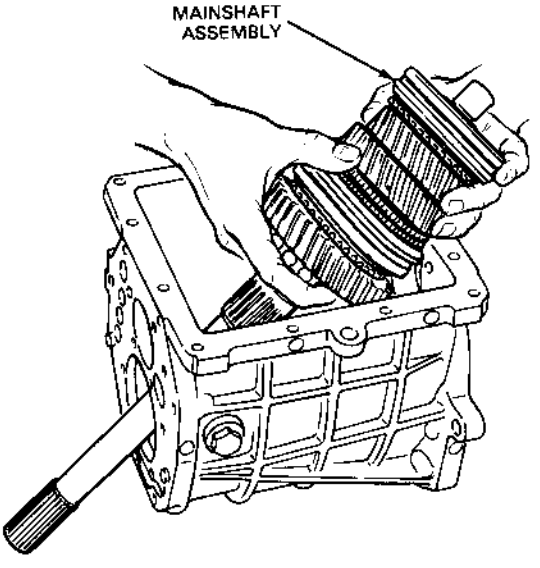
DISASSEMBLY AND ASSEMBLY (Continued)

48. Remove the mainshaft assembly from the case. If the mainshaft assembly requires servicing, refer to Mainshaft — Disassembly and Assembly in this section.



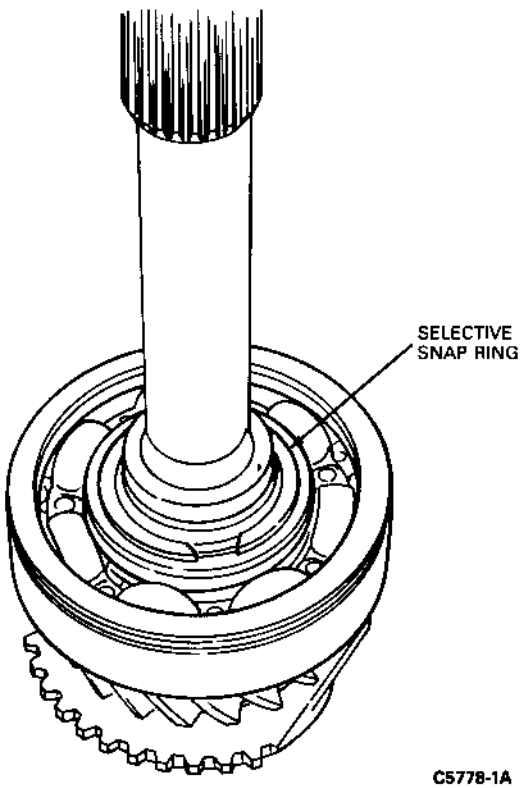
Assembly

1. Install the mainshaft assembly in the case.

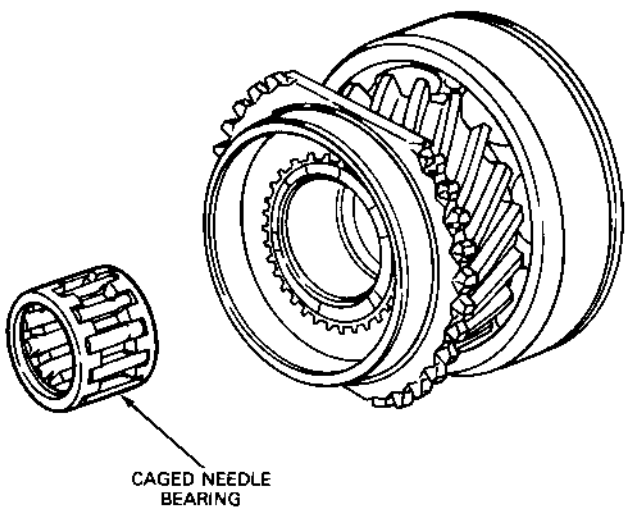


DISASSEMBLY AND ASSEMBLY (Continued)

2. Choose and install a new selective snap ring in front of the input shaft bearing. Select the thickest snap ring that will fit in the groove. Refer to Input Shaft Selective Snap Ring Chart in the Specifications portion of this section for the available sizes and identification colors.



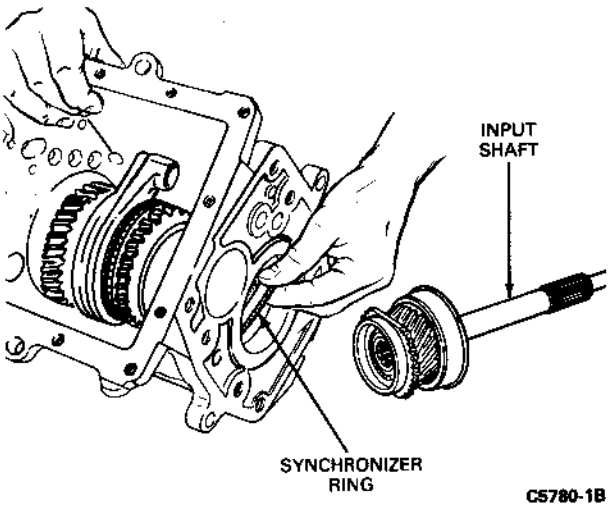
3. Install the small caged needle bearing inside the input gear. Install the synchronizer ring on the input shaft. Check the clearance between the ring and gear. If the clearance is less than 0.23mm (0.009 inch), replace the ring and/or input shaft.



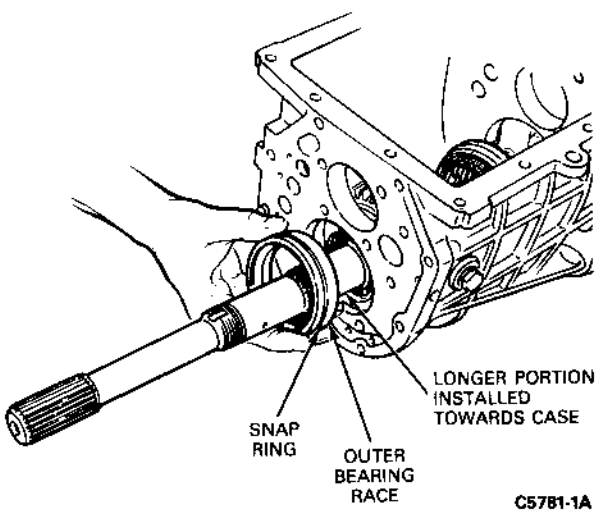
DISASSEMBLY AND ASSEMBLY (Continued)

4. Install the synchronizer ring and input shaft in the case. Rotate the input shaft so the flats face the countershaft to provide installation clearance.

NOTE: It may be necessary to tap the input shaft into position with a brass hammer.

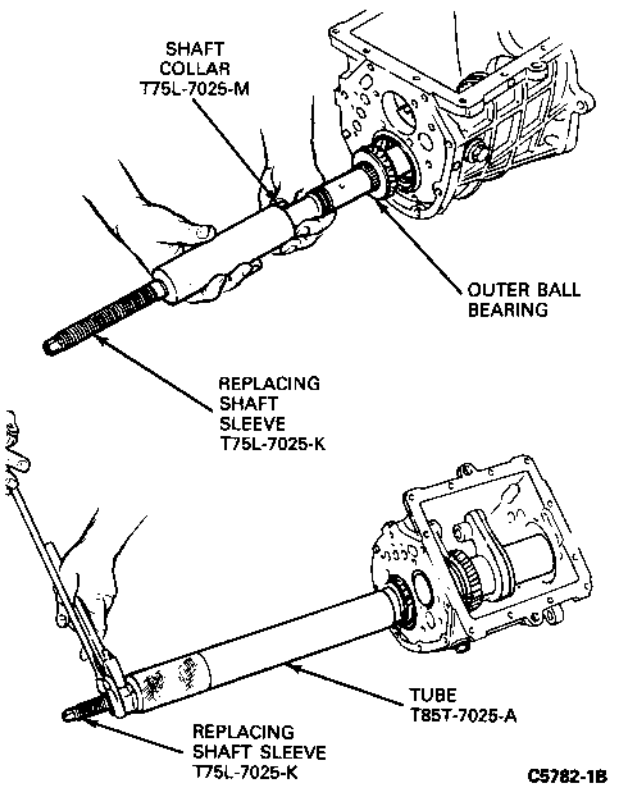


5. Install a new snap ring on the outer bearing race. The longer portion of the race must be installed in the case.

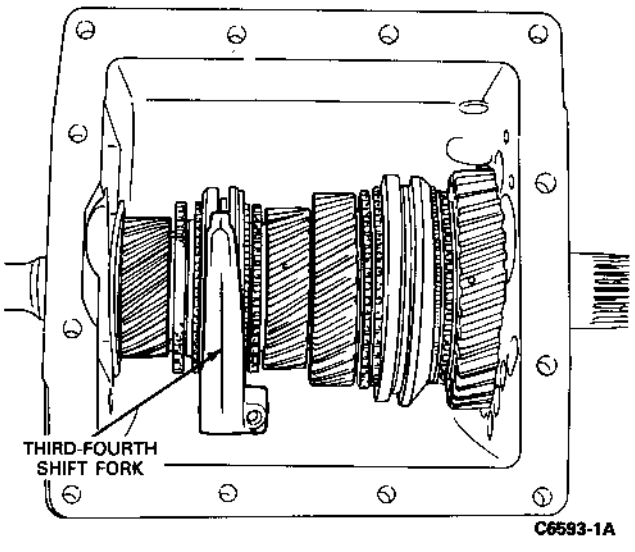


DISASSEMBLY AND ASSEMBLY (Continued)

6. Slide the outer ball bearing on the mainshaft. Press the bearing on the mainshaft and in the race using Tube, T85T-7025-A, Replacing Shaft Sleeve, T75L-7025-K and Shaft Collar, T75L-7025-M. When pressed in position, all gears and shafts must rotate freely.

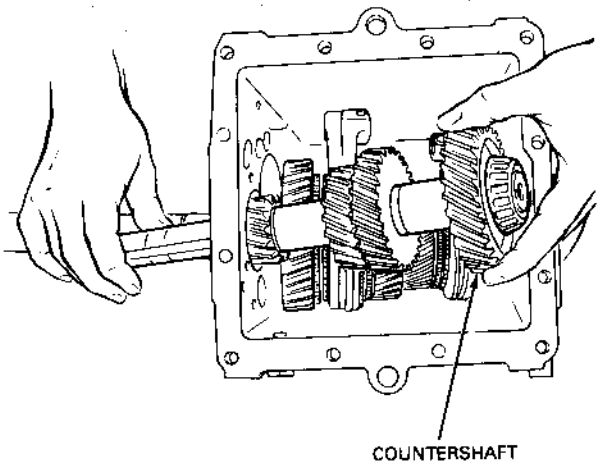


7. Install the 3-4 shift fork into its synchronizer sleeve. The roll pin boss on the fork must face to the rear.

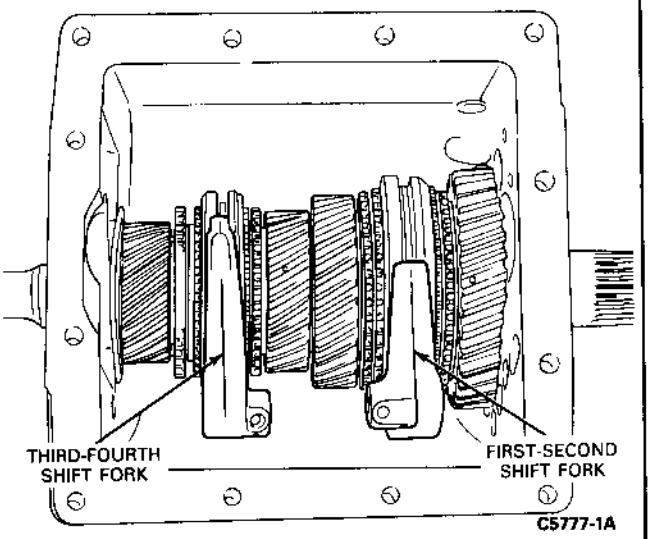


DISASSEMBLY AND ASSEMBLY (Continued)

8. Install the countershaft into the case. It may be necessary to move the mainshaft to one side in order for the countershaft to be easily inserted.

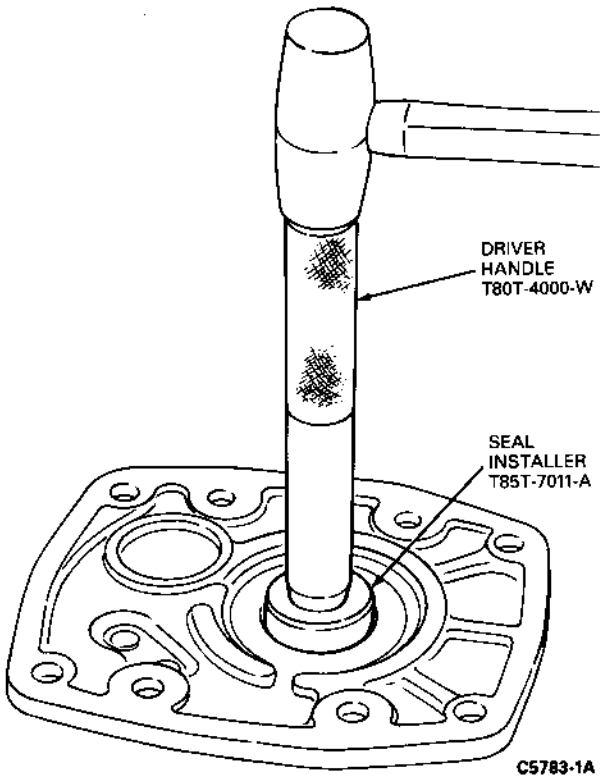


9. Install the 1-2 shift fork. The roll pin boss must face toward the 3-4 shift fork.



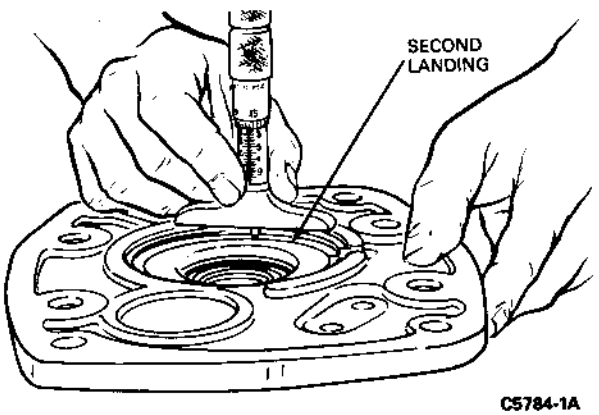
DISASSEMBLY AND ASSEMBLY (Continued)

10. If removed, drive a new seal into the input shaft front bearing retainer using Seal Installer, T85T-7011-A and Driver Handle, T80T-4000-W.



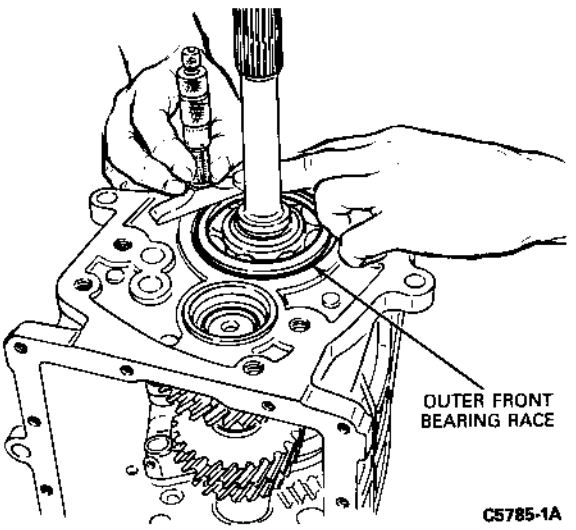
DISASSEMBLY AND ASSEMBLY (Continued)

11. Install the large snap ring that retains the input shaft bearing to the case.
12. Check the Input Shaft Front Bearing Retainer-to-Bearing Clearance as follows:
    a. With the retainer selective shim removed, use a depth micrometer to measure the distance between the top machined surface to the spacer surface (second landing). Record the reading.



C5784-1A

    b. Bottom the input shaft bearing so the snap ring is flush against the case.
    c. Using a depth micrometer, measure the distance from the top of the outer front bearing race to the machined surface of the case.

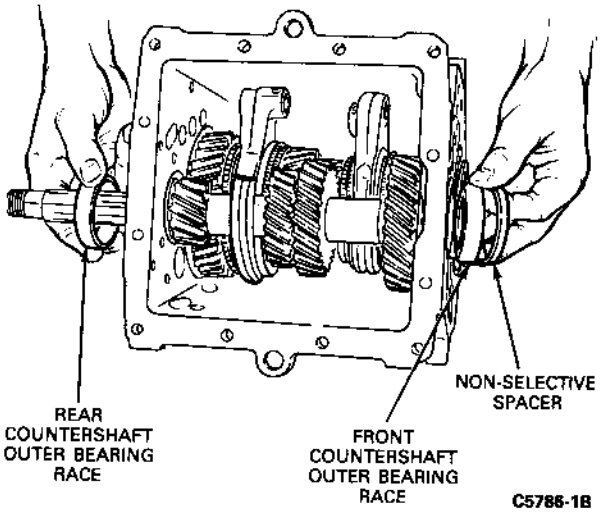


C5785-1A

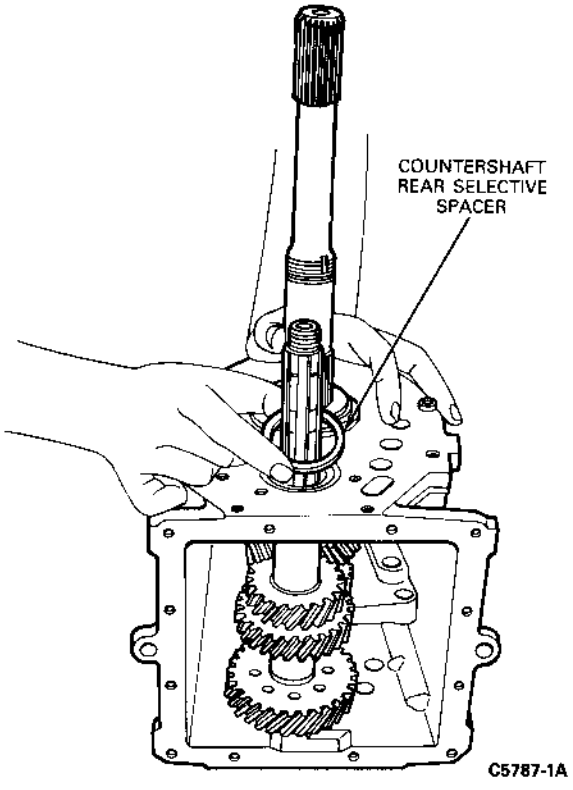
    d. Subtract the distance of the bearing-to-case from the retainer dimensions. This will give the required maximum selective shim size to obtain a 0.00-0.10mm (0.000-0.004 inch) clearance.
    e. Measure and install the appropriate size selective shim in the front bearing retainer. Refer to the Input Shaft Front Bearing Retainer-to-Bearing Selective Shim Chart in the Specifications portion of this section for the available shim sizes and identification colors.

DISASSEMBLY AND ASSEMBLY (Continued)

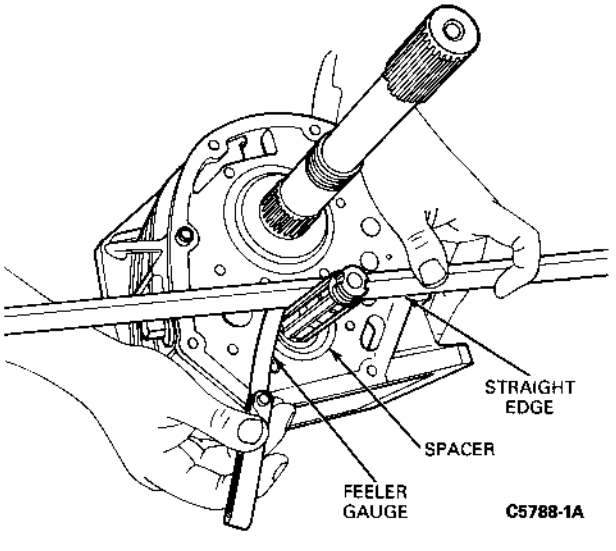
13. Install the countershaft front outer bearing race and non-selective spacer. Install the countershaft rear outer bearing race.
14. Install a new gasket between the front bearing retainer and case. Position the retainer on the case (with selective shim installed). Install the four bolts and four studs and tighten to 30-41 Nm (22-30 ft-lbs).



15. Check and adjust the countershaft end play as follows:
    a. Place the transmission so the rear of the mainshaft and countershaft face upward. Install the countershaft rear selective spacer.



    b. Force the countershaft downward so it bottoms against the front bearing retainer.
    c. Place a straight edge across the rear countershaft selective spacer in the case.
    d. Try to turn the spacer. If the spacer turns lightly, replace the spacer with the next larger size. Install a spacer so the clearance between the spacer and straight edge is 0.00-0.05mm (0.000-0.002 inch). Refer to the Countershaft End Play Selective Spacer Chart for the available sizes and identification markings on the spacer. Install the correct size spacer over the countershaft rear bearing cup.

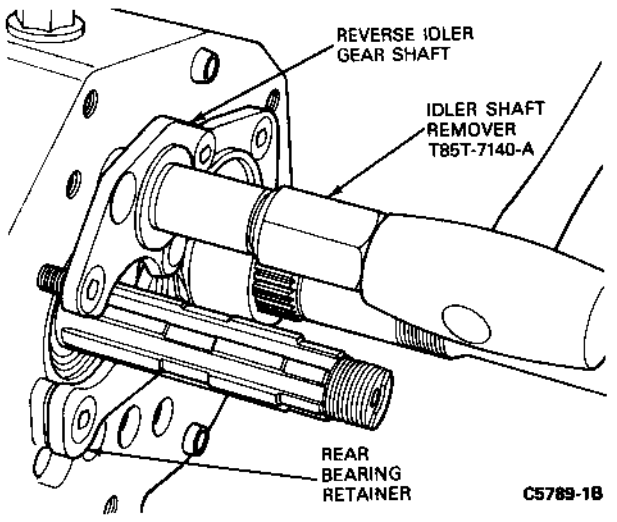


DISASSEMBLY AND ASSEMBLY (Continued)

16. Install the rear bearing retainer on the case with the four 6mm allen-head bolts. Tighten to 15-21 Nm (11-16 ft-lbs).

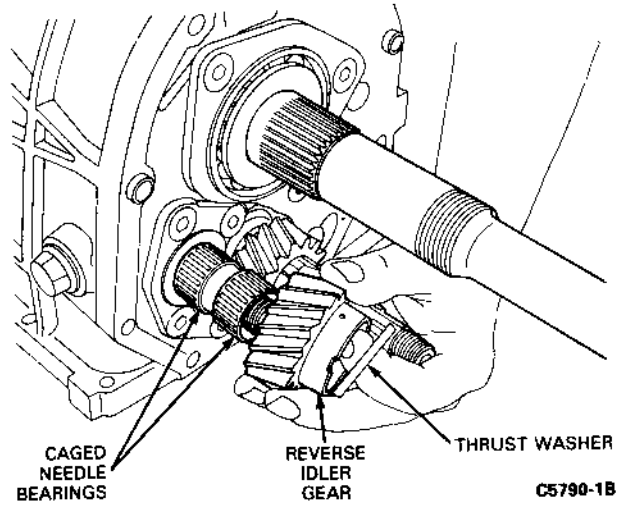
NOTE: Be sure the spacer installed in the previous step does not fall out of place when installing the rear bearing retainer.

17. Position the reverse idler gear shaft on the case. Install the 6mm allen-head bolts to act as a pilot. Install Reverse Idler Gear Shaft Remover, T85T-7140-A on the shaft and drive the assembly into place. Tighten the bolts to 15-21 Nm (11-16 ft-lbs).



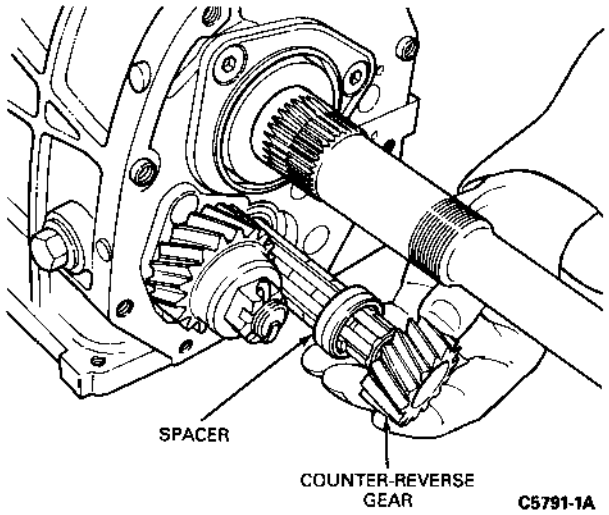
18. Install the two caged needle bearings, reverse idler gear and thrust washer on the idler shaft. The boss on the idler gear faces away from the transmission. Install the locknut and tighten to 20-58 Nm (15-42 ft-lbs). If required, advance the nut to the next castellation and install the cotter pin.

NOTE: If required, cut one end of the cotter pin when it is bent over to prevent interference with the counter-overdrive gear.

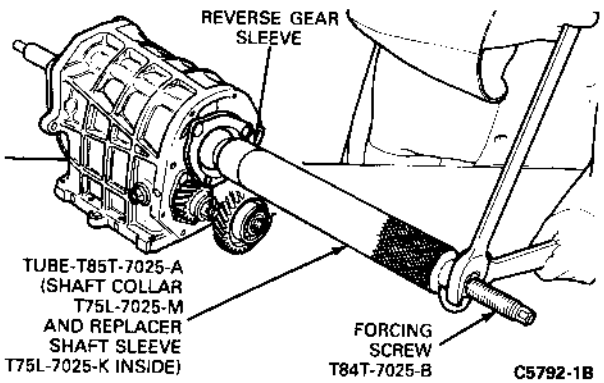


DISASSEMBLY AND ASSEMBLY (Continued)

19. Install the spacers and counter-reverse gear on the countershaft.

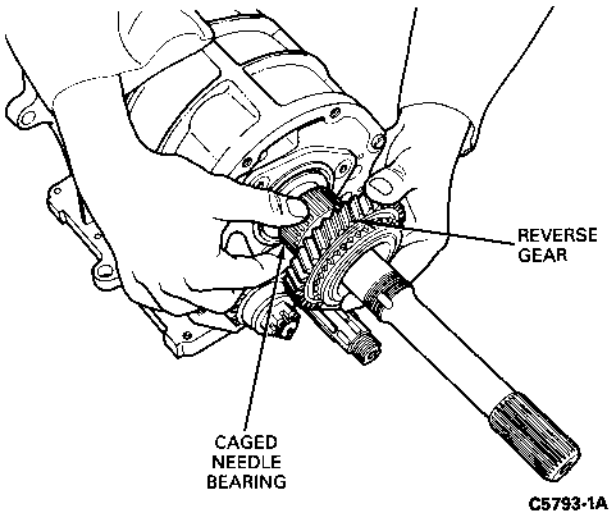


20. Press the reverse gear sleeve on the mainshaft using Tube, T85T-7025-A, Shaft Sleeve Replacer, T75L-7025-K, Shaft Collar, T75L-7025-M and Forcing Screw, T84T-7025-B.

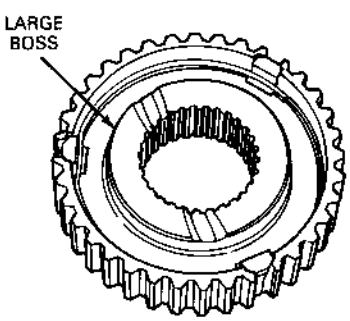


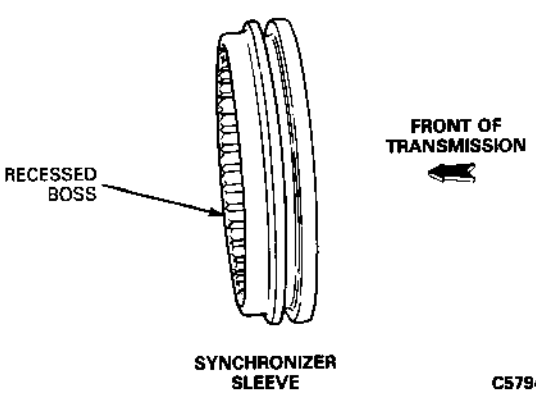
DISASSEMBLY AND ASSEMBLY (Continued)

21. Install the caged needle bearing and reverse gear on the mainshaft.

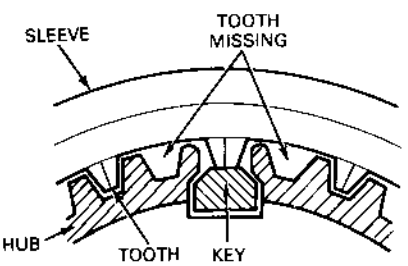


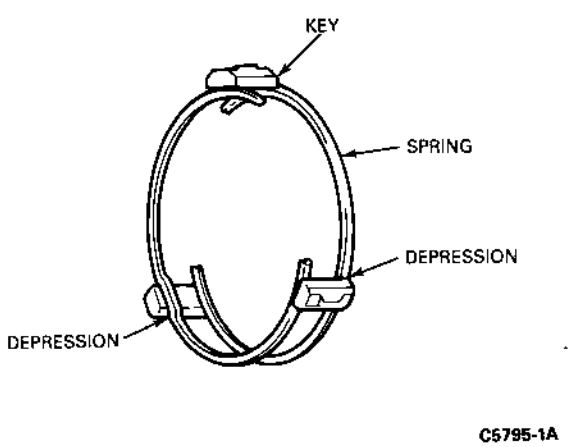
22. Assemble the overdrive synchronizer hub and sleeve as follows:
    a. Install the hub in the sleeve. The recessed boss on the sleeve must face the front of the transmission. The large boss on the hub must face the front of the transmission.





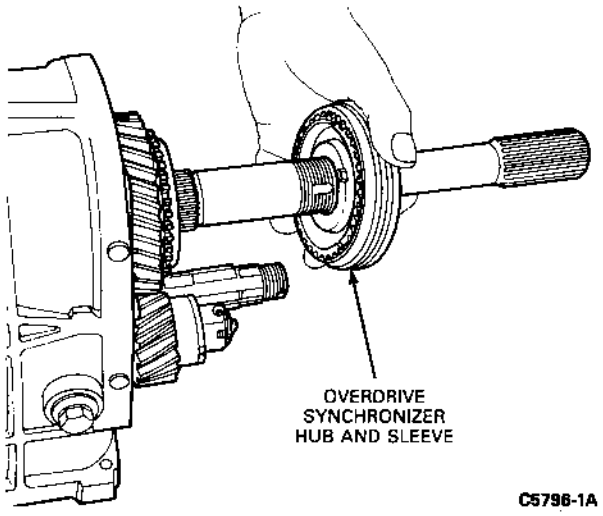
    b. When installing hub in the sleeve and the three keys, make sure that the single tooth between the two spaces will touch the key. Install the springs so the open ends do not face each other.



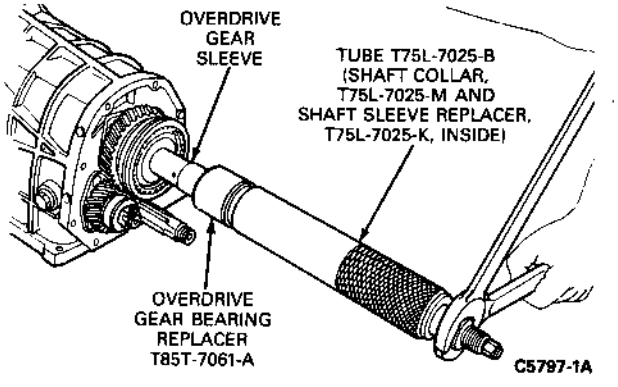


DISASSEMBLY AND ASSEMBLY (Continued)

23. Install the overdrive synchronizer on the mainshaft. The recessed boss of the sleeve must face the front of the transmission.

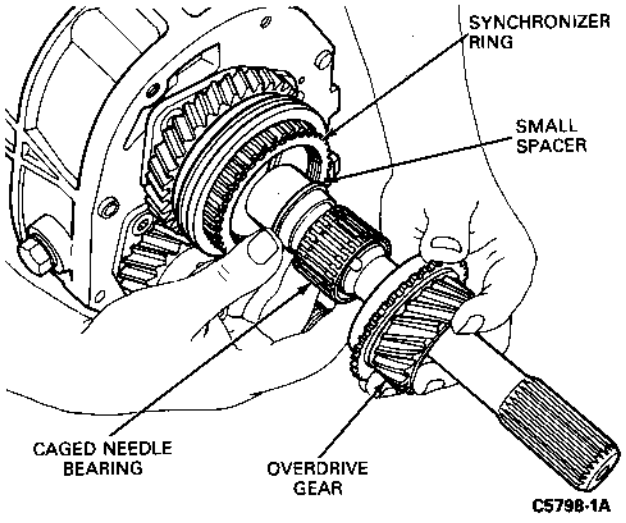


24. Press the sleeve of the overdrive gear on the mainshaft using Tube, T75L-7025-B, Shaft Sleeve Replacer, T75L-7025-K, Shaft Collar, T75L-7025-M and Overdrive Gear Bearing Replacer, T85T-7061-A.

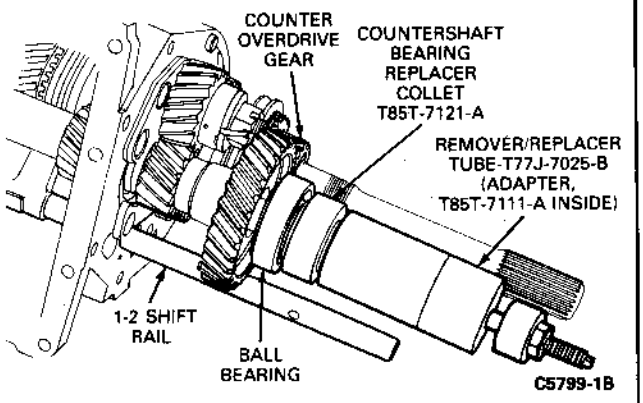


DISASSEMBLY AND ASSEMBLY (Continued)

25. Install the ring on the overdrive synchronizer.
26. Slide the small spacer, caged needle bearing and overdrive gear on the mainshaft. Check the clearance between the overdrive gear and synchronizer ring. If the clearance is less than 0.23mm (0.009 inch), replace the ring and/or overdrive gear.

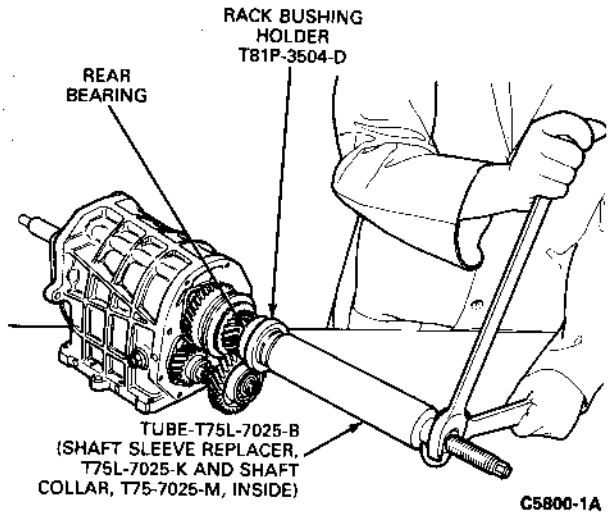


27. Install the counter-overdrive gear and ball bearing onto the countershaft along with the 1-2 shift rail. Seat the bearing into position using Countershaft Bearing Replacer Collet, T85T-7121-A, Rear Countershaft Bearing Installer Adapter, T85T-7111-A, and Remover and Replacer Tube, T77J-7025-B. Make sure the rail engages the forks.

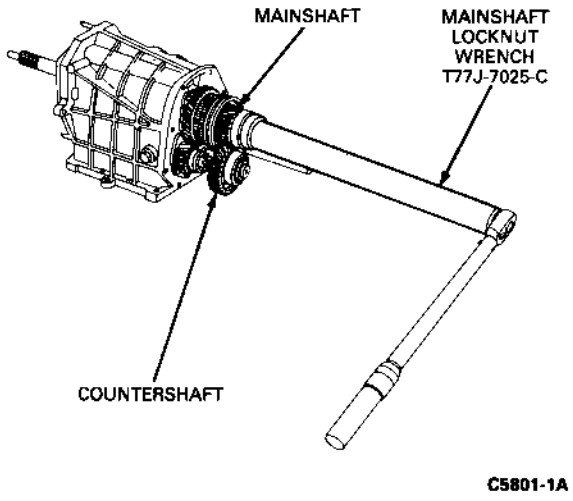


DISASSEMBLY AND ASSEMBLY (Continued)

28. Install the lock ball and spacer on the mainshaft.
29. Place the rear bearing over the mainshaft and press the bearing in position using Rack Bushing Holder, T81P-3504-D (or an appropriate size washer), Tube T75L-7025-B, Shaft Sleeve Replacer, T75L-7025-K and Shaft Collar, T75L-7025-M.

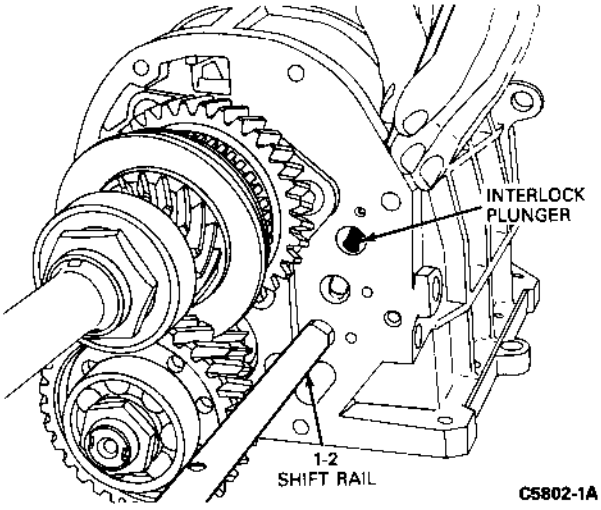


30. Install new locknuts on the countershaft and mainshaft. Double engage the transmission in two gears to prevent the shafts from turning. Tighten the mainshaft locknut to 245-265 Nm (180-195 ft-lbs) using Mainshaft Locknut Wrench, T77J-7025-C. Tighten the countershaft locknut to 157-186 Nm (115-137 ft-lbs) using a 30mm socket. Disengage the transmission.
31. Stake the locknuts on the mainshaft and countershaft using Locknut Staking Tool, T77J-7025-F.

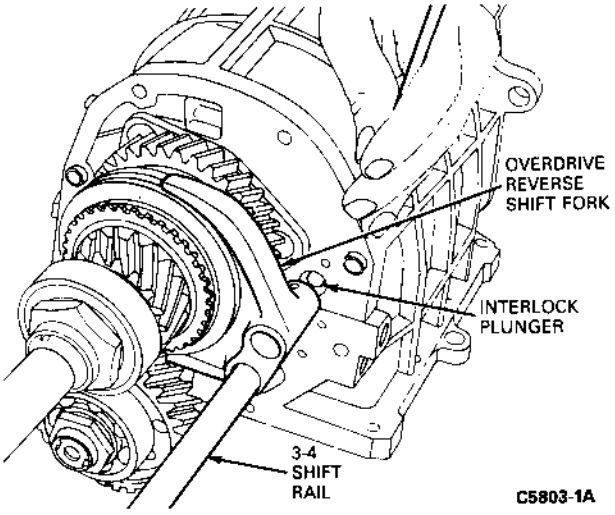


DISASSEMBLY AND ASSEMBLY (Continued)

32. Install the interlock plunger in the bore between the 1-2 and 3-4 shift rails. Reposition the 1-2 shift rail so the flats for the poppet ball and spring and the interlock plunger are in the correct position. Make sure the roll pin holes for the shift forks are in alignment.

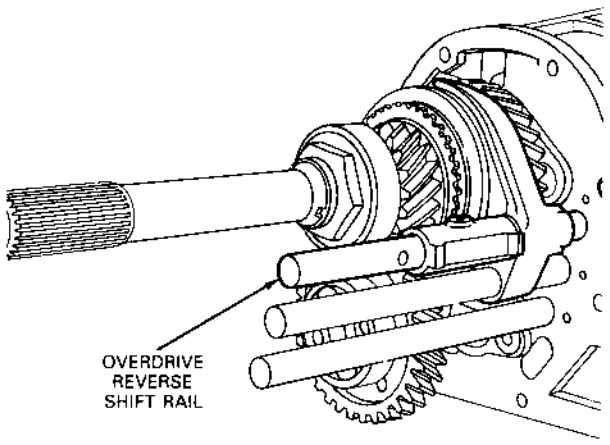


33. Install the overdrive-reverse shift fork on the synchronizer sleeve. Slide the 3-4 shift rail through the overdrive-reverse shift fork into the case and into the 3-4 shift fork inside the case. Position the shift rail flats to accept the poppet balls and interlock plunger. Insert the interlock plunger in the bore between the 3-4 shift rail and overdrive-reverse shift rail. Make sure the roll pin holes in the fork are in alignment.



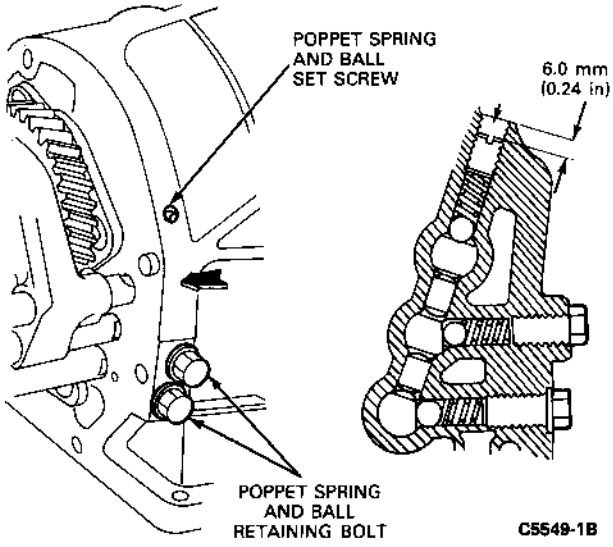
DISASSEMBLY AND ASSEMBLY (Continued)

34. Insert the overdrive-reverse shift rail so it engages the forks in the case. Make sure the roll pin holes in the fork and rail are in alignment.



C5804-1A

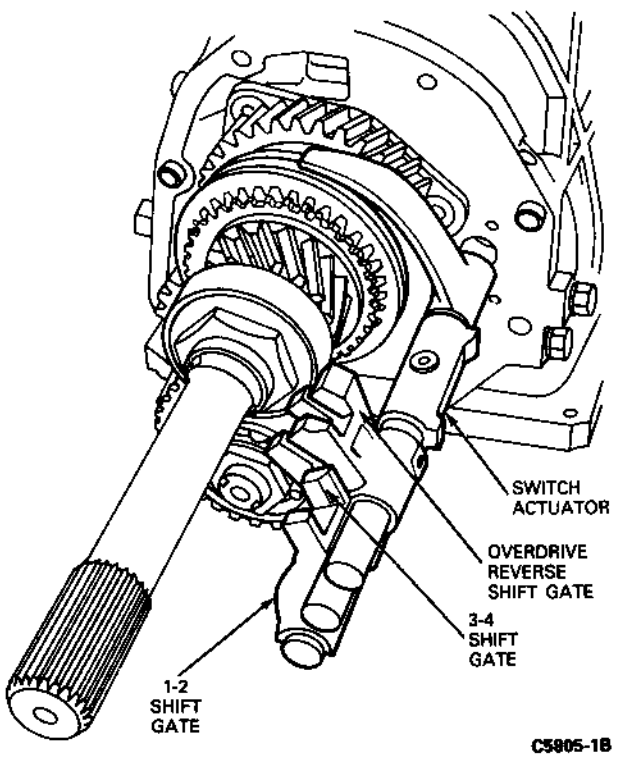
35. Insert the poppet ball and spring in the overdrive-reverse (upper) bore in the case. The small end of the spring should be installed towards the ball. Install the set screw and tighten until the set screw head is 6mm (0.24 inch) below the top of the bore.
36. Insert a poppet spring and poppet ball in the 3-4 and 1-2 bore (side two bores in the case). The small end of the spring must face towards the ball. Install and tighten the bolts.



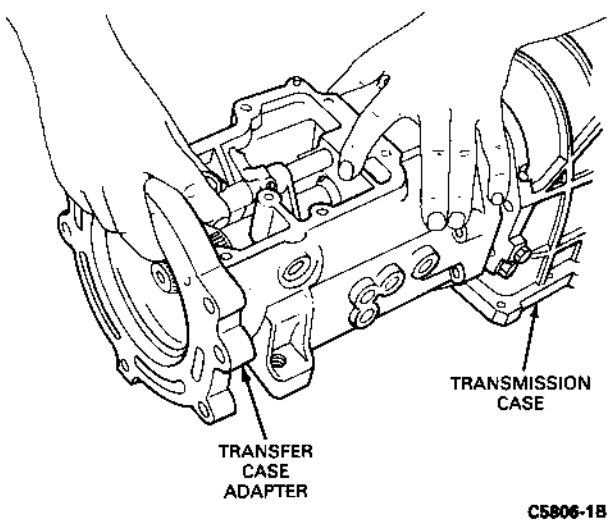
C5549-1B

DISASSEMBLY AND ASSEMBLY (Continued)

37. Install the roll pins in the 1-2 and 3-4 shift forks.
38. Install the shift gates on the appropriate shift rails. Move the 1-2 gate and 3-4 gate to the rear of the rail.

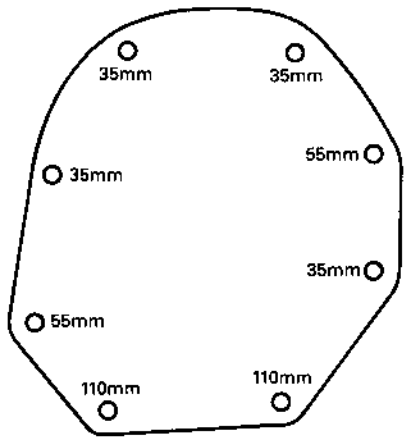


39. Position a new gasket between the transmission case and the transfer case adapter. Make sure the selector arm is out of the gates and the change shifter is at the rear of the adapter. Position the adapter on the case making sure the shift gates clear the adapter. Make sure the shift rails and rear bearings line up with the bores in the adapter.



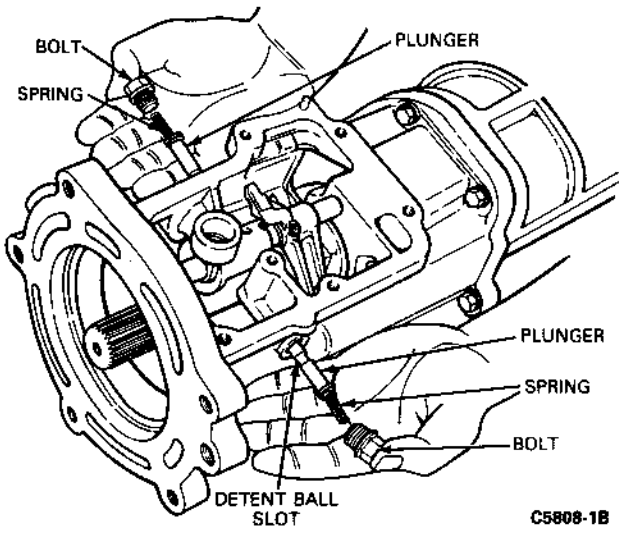
DISASSEMBLY AND ASSEMBLY (Continued)

40. Install the three sizes of bolts (35mm, 55mm and 110mm) in the appropriate holes in the adapter. Tighten the bolts to 15-21 Nm (11-16 ft-lbs).



VIEW FROM REAR C5807-1A

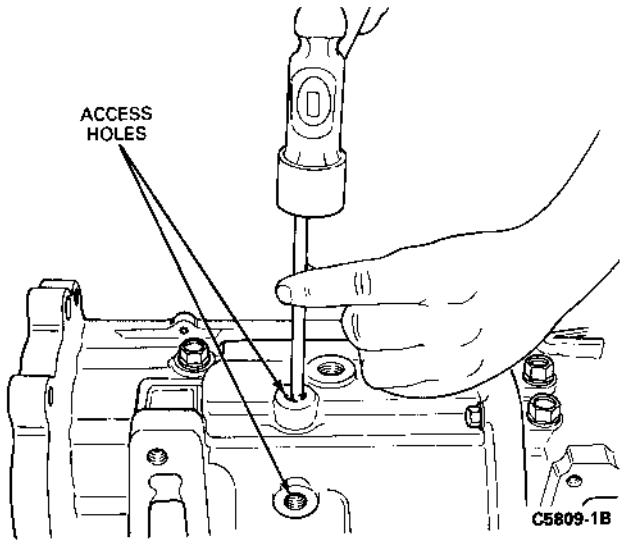
41. Install the neutral return plungers, springs and bolts in the adapter. The longer plunger with the slot for the detent ball is installed on the right side of the adapter.



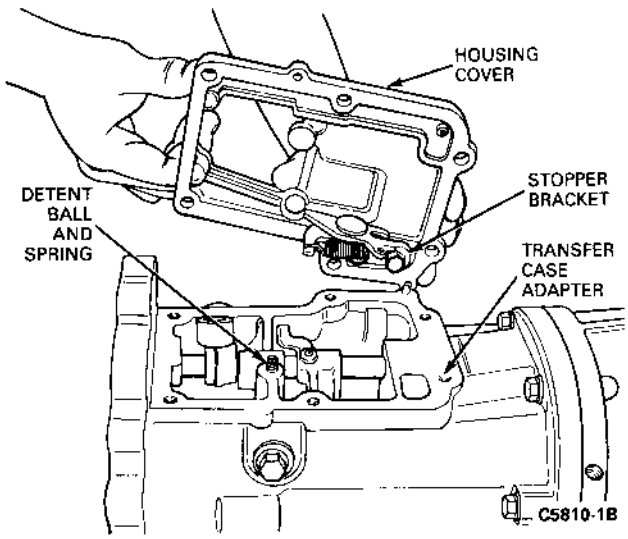
C5808-1B

DISASSEMBLY AND ASSEMBLY (Continued)

42. Position the shift gates so the roll pin holes in the gates and rails are in alignment. Install the roll pins through the access holes. Install the access hole plugs.

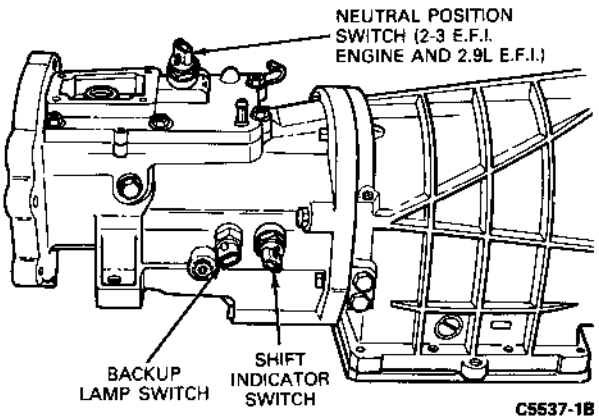


43. Position the pan and new gasket on the case. Install the bolts and tighten to 15-21 Nm (11-16 ft-lbs). DO NOT OVERTIGHTEN. Install the drain plug and tighten to 35-44 Nm (25-32 ft-lbs).
44. Insert the plunger detent ball and spring in the hole above the neutral return plunger in the adapter case.
45. Make sure the stopper bracket assembly on the cover for the transfer case adapter moves smoothly. Position a new gasket on the adapter and install the housing cover. Install and tighten the bolts to 15-21 Nm (11-16 ft-lbs).



DISASSEMBLY AND ASSEMBLY (Continued)

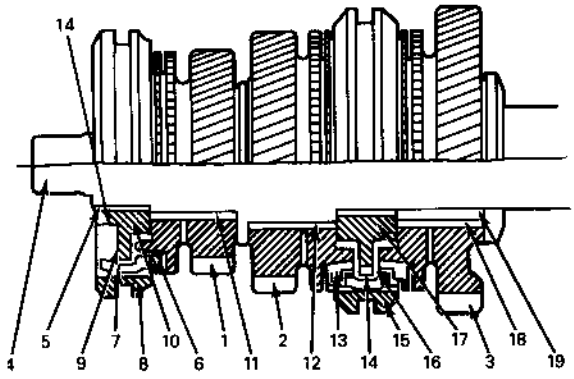
46. Install the backup lamp switch and the shift indicator lamp switch in the adapter.
47. Remove the fill plug and fill the transmission to the bottom of the fill hole with Standard Transmission Lube (SAE 80W) D8DZ-19C547-A (ESP-M2C83-C) or equivalent. The fluid capacity is 2.3 liters (9 U.S. pints or 2.0 Imperial quarts). Install the fill plug and tighten to 30-34 Nm (22-25 ft-lbs).
48. Position the clutch slave cylinder on the input shaft. Position the clutch housing on the transmission case and install and tighten the nuts.



C5537-1B

SUBASSEMBLY OPERATIONS

MAINSHAFT

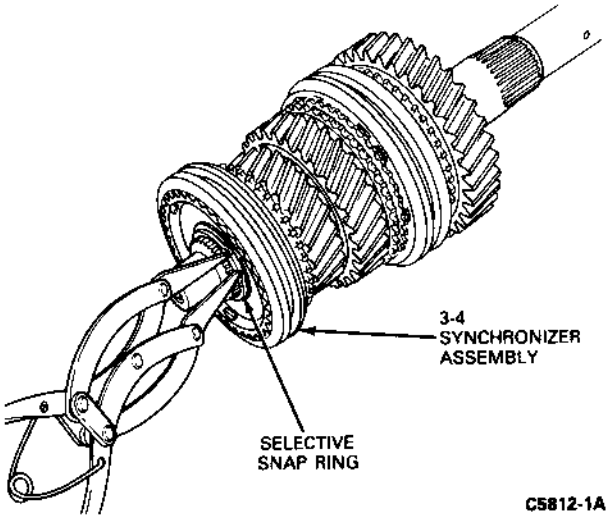


1-3RD SPEED GEAR
2-2ND SPEED GEAR
3-1ST SPEED GEAR
4-MAINSHAFT
5-SNAP RING
6-SYNCHRONIZER RING (3-4)
7-SYNCHRONIZER KEY
8-SYNCHRONIZER SLEEVE (3-4)
9-SYNCHRONIZER SPRING (3-4)
10-SYNCHRONIZER HUB (3-4)
11-NEEDLE BEARING (3RD SPEED GEAR)
12-NEEDLE BEARING (2ND SPEED GEAR)
13-SYNCHRONIZER RING (1-2)
14-SYNCHRONIZER KEY
15-SYNCHRONIZER SLEEVE (1-2)
16-SYNCHRONIZER SPRING (1-2)
17-SYNCHRONIZER HUB (1-2)
18-NEEDLE BEARING (1ST SPEED GEAR)
19-1ST GEAR BEARING SLEEVE

C5811-1B

Disassembly

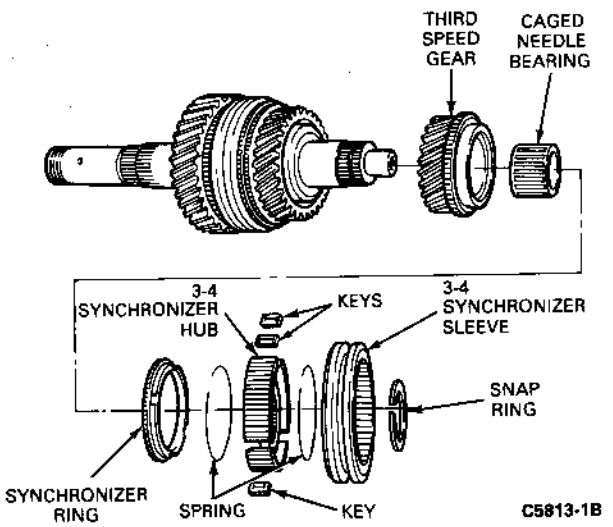
1. Remove the selective snap ring that retains the 3-4 synchronizer assembly to the mainshaft. A new snap ring will be used in the assembly.



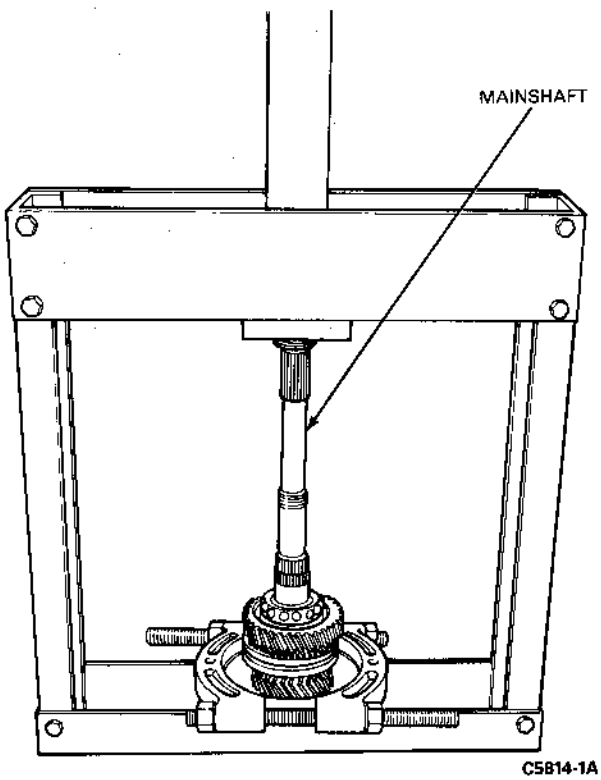
C5812-1A

DISASSEMBLY AND ASSEMBLY (Continued)

2. Remove the 3-4 synchronizer assembly (hub, sleeve, spring and keys), synchronizer ring, third speed gear and caged needle bearing from the front of the mainshaft. Note the position of the synchronizer hub and sleeve during disassembly.

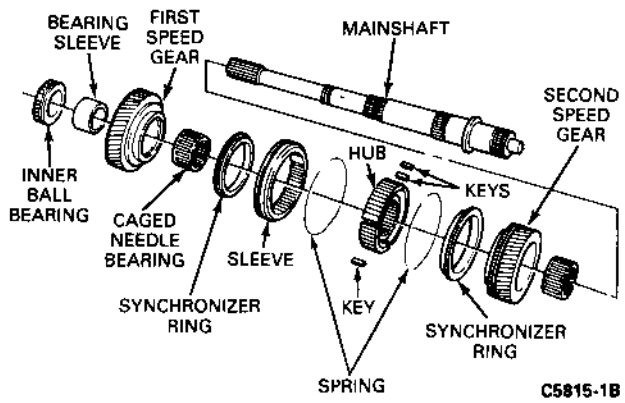


3. Position the mainshaft assembly in a press so the second speed gear is supported by the press bed. Press the mainshaft down and out from the 1-2 gear assembly.



DISASSEMBLY AND ASSEMBLY (Continued)

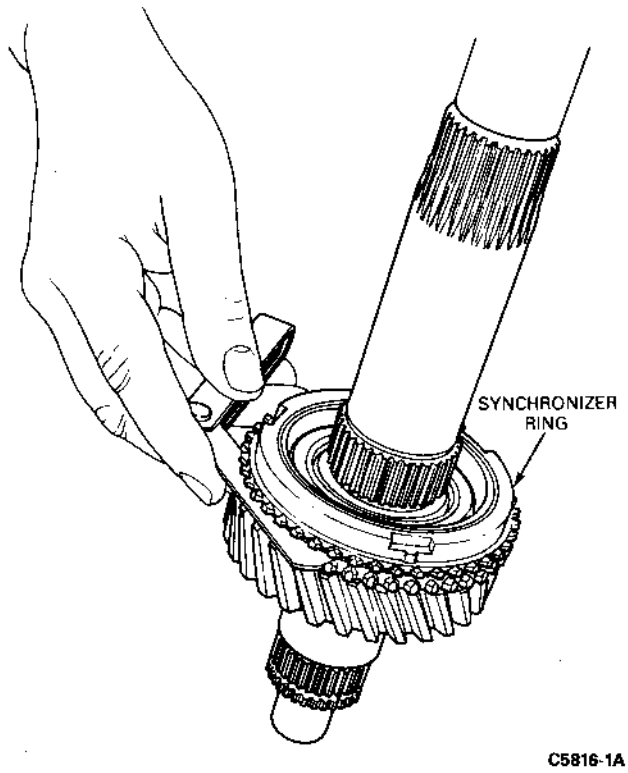
4. Separate the inner ball bearing, bearing sleeve, first speed gear, caged needle bearing,1-2 synchronizer assembly (hub, sleeve, two rings and three keys), second speed gear and caged needle bearing. Note the direction of 1-2 synchronizer hub and sleeve during disassembly. Discard the inner ball bearing.



Assembly

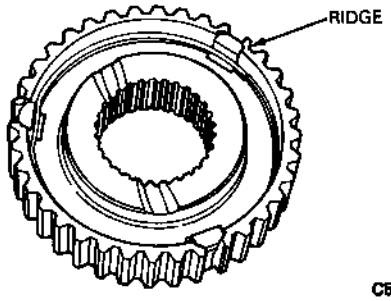
NOTE: Prior to assembly, lubricate all components with Standard Transmission Lubricant (SAE 80W), D8DZ-19C547-A (ESP-M2C83-C) or equivalent.

1. Check the clearance between the synchronizer rings and gears. Install the ring on the gear and insert a feeler gauge between the ring teeth and gear. If the clearance is less than 0.23 mm (0.009 inch), replace the ring and/or gear.
2. From the rear of the mainshaft, install the caged needle bearing for the second speed gear.
3. Position the second speed gear on the mainshaft with the synchronizer ring surface facing the rear of the shaft.
4. Install the synchronizer ring on the second speed gear.



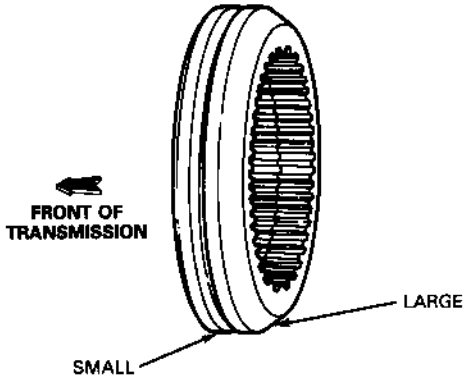
DISASSEMBLY AND ASSEMBLY (Continued)

5. Position the 1-2 synchronizer assembly on the rear of the mainshaft, making sure that:
   a. The splines of the mainshaft and synchronizer are properly aligned.
   b. The rear of the 1-2 hub is identified by a ridge machined on the rear surface. The ridge must face the rear of the mainshaft.



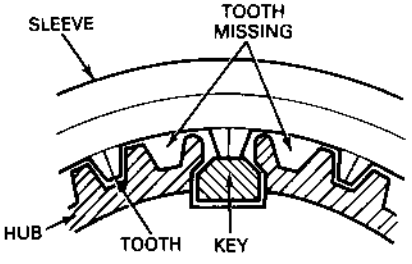
C5817-1A

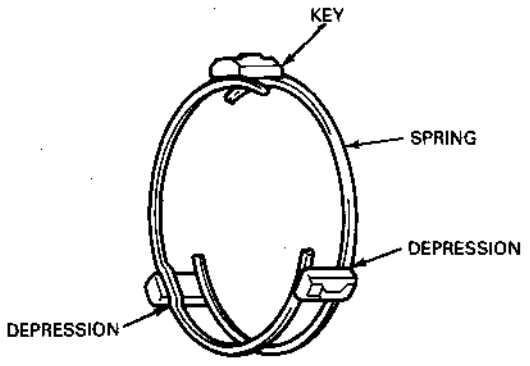
   c. The small bevel angle of the sleeve faces the front of the mainshaft.



C5818-1B

   d. The synchronizer sleeve has a tooth missing at six positions. Assemble the hub to the sleeve so the single tooth between the two missing portions will touch the synchronizer key.
   e. The synchronizer keys and springs are properly installed. The open ends of the spring do not face each other.

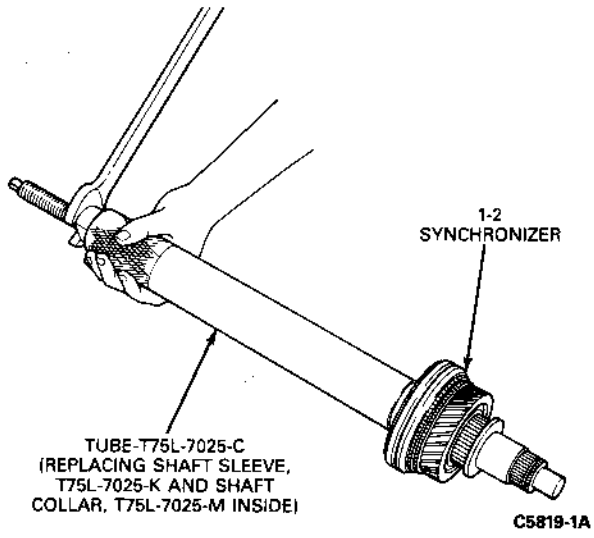




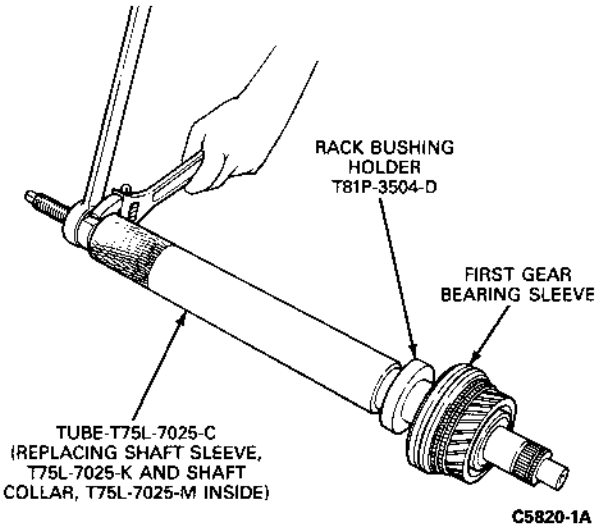
C5795-1A

DISASSEMBLY AND ASSEMBLY (Continued)

6. Press the 1-2 synchronizer assembly on position on the mainshaft using Replacing Shaft Sleeve, T75L-7025-K, Shaft Collar, T75L-7025-M and Tube, T75L-7025-C. If properly installed, the second speed gear should rotate freely.

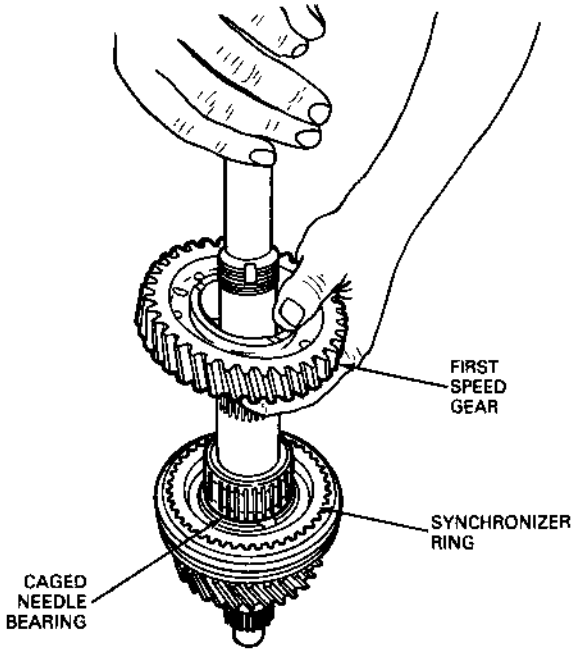


7. Position the first gear bearing sleeve on the mainshaft. Press the sleeve on the shaft using Replacing Shaft Sleeve, T75L-7025-K, Shaft Collar, T75L-7025-M, Rack Bushing Holder, T81P-3504-D (or an appropriate washer) and Tube, T75L-7025-C. When properly installed, the sleeve should be against the synchronizer hub. Make sure the gears rotate freely.



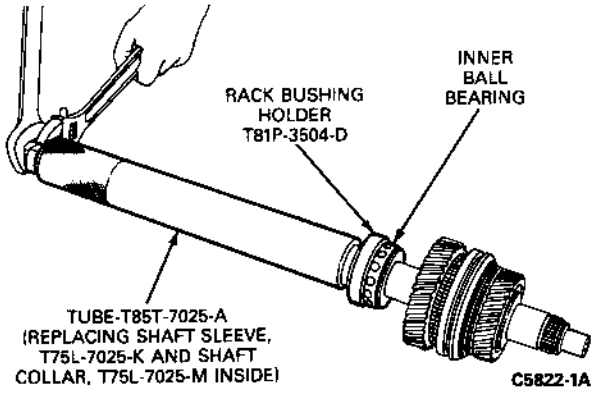
DISASSEMBLY AND ASSEMBLY (Continued)

8. Install the synchronizer ring on the 1-2 synchronizer assembly.
9. Install the caged needle bearing and first speed gear.



C5821-1A

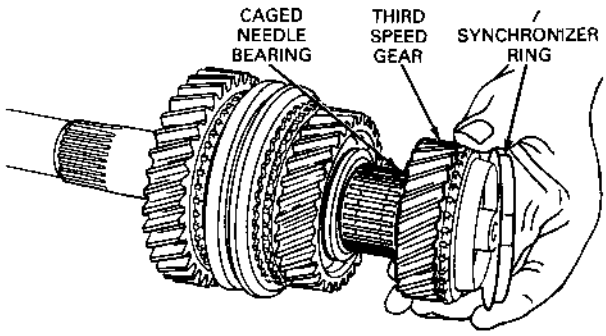
10. Slide the inner ball bearing in position on the mainshaft.
11. Press the inner ball bearing on the mainshaft using Rack Bushing Holder, T81P-3504-D (or an appropriate size washer), Tube, T85T-7025-A, Replacing Shaft Sleeve, T75L-7025-K, and Shaft Collar, T75L-7025-M. When properly installed, the gears should rotate freely.



C5822-1A

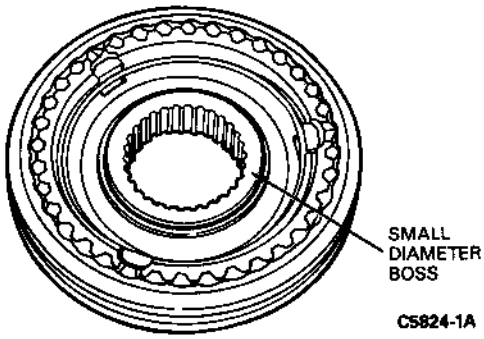
DISASSEMBLY AND ASSEMBLY (Continued)

12. Install the third speed gear and caged needle bearing over the front of the mainshaft.
13. Install the synchronizer ring against the third speed gear.



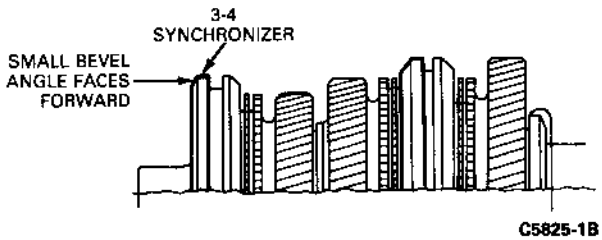
C5823-1A

14. Make sure the 3-4 synchronizer assembly is properly installed. Be sure that:
    a. The splines of the mainshaft and synchronizer are properly aligned.
    b. The small diameter boss of the hub faces the front of the mainshaft.



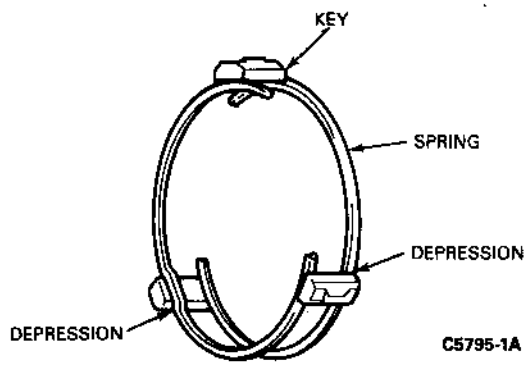
C5824-1A

    c. The small bevel angle of the sleeve faces the front of the mainshaft.

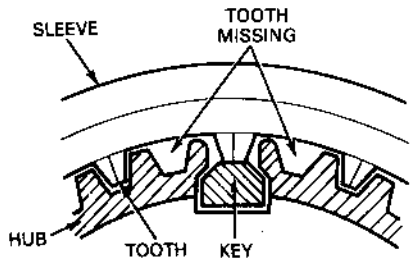


C5825-1B

    d. The synchronizer sleeve has a tooth missing at six positions. Assemble the hub to the sleeve so the single tooth between the two missing portions will touch the synchronizer key.
    e. The synchronizer springs and keys are properly installed. The open ends of each spring do not face each other.

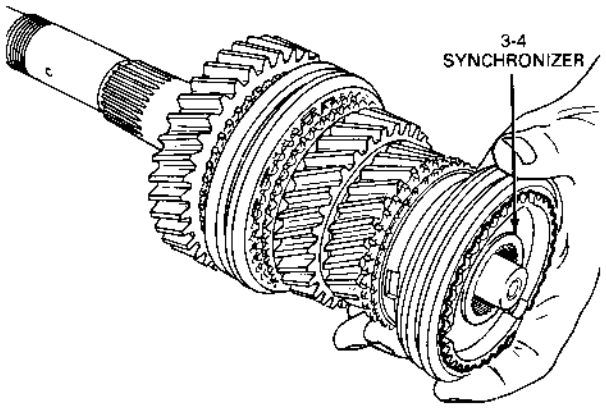


C5795-1A



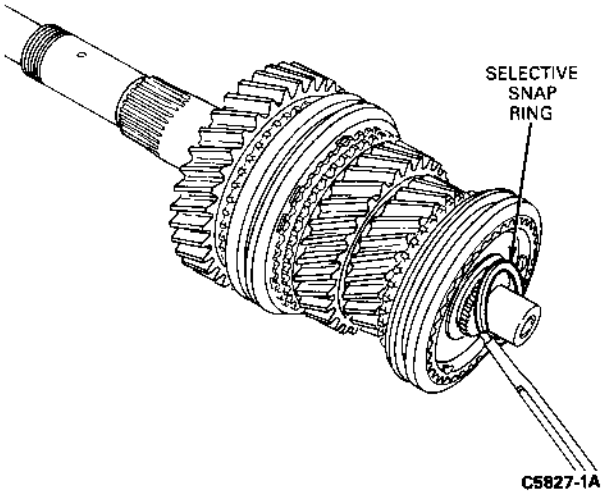
DISASSEMBLY AND ASSEMBLY (Continued)

15. Install the 3-4 synchronizer assembly on the front of the mainshaft.



C5826-1A

16. Install a new selective snap ring that retains the 3-4 synchronizer assembly to the mainshaft. Select the thickest snap ring that fits in the groove. Refer to the Mainshaft Selective Snap Ring Chart in the Specifications portion of this section for available sizes and identification colors of the snap rings.

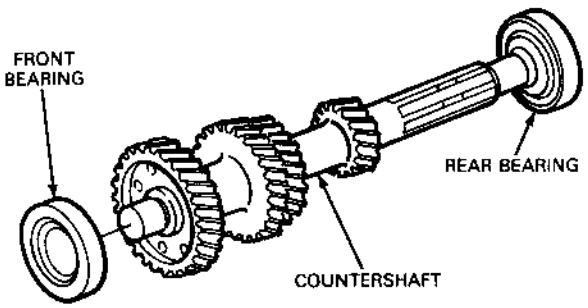


C5827-1A

DISASSEMBLY AND ASSEMBLY (Continued)

COUNTERSHAFT

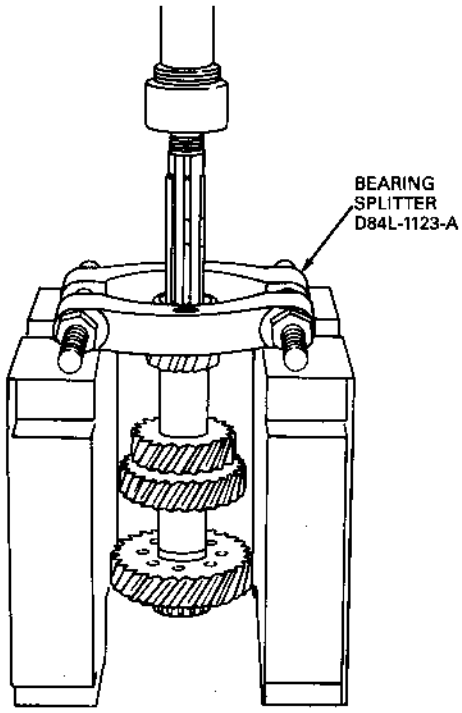
COUNTERSHAFT - EXPLODED VIEW



C5828-1A

Disassembly

1. If required, press the front and rear bearing off the countershaft, using Bearing Splitter, D84L-1123-A. Remove and discard the bearings.

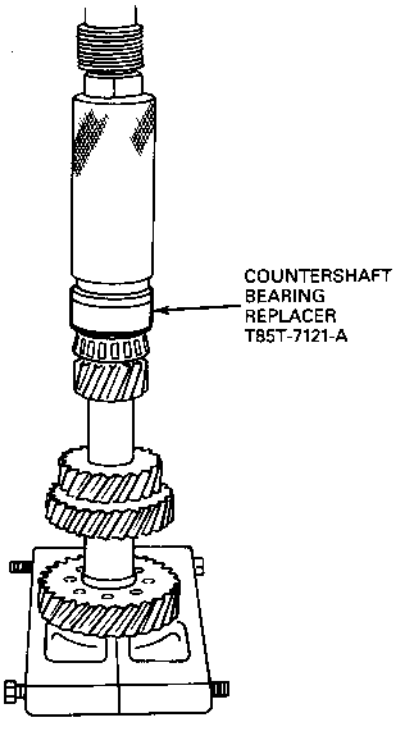


C5829-1A

DISASSEMBLY AND ASSEMBLY (Continued)

Assembly

1. Press new bearings on the countershaft using a press and Countershaft Bearing Replacer, T85T-7121-A.

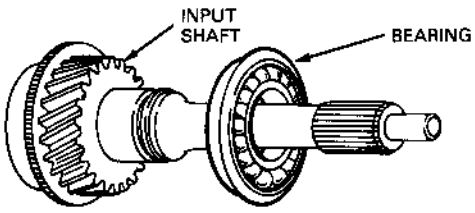


C5830-1A

INPUT SHAFT

Disassembly

1. Position Bearing Splitter, D84L-1123-A behind the bearing and press the input shaft out of the bearing. Discard the bearing.

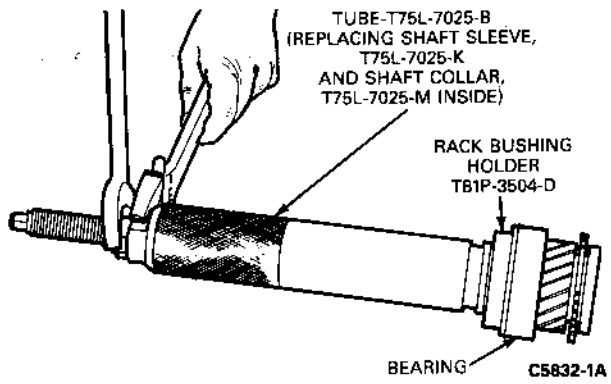


INPUT SHAFT - EXPLODED VIEW C5831-1B

DISASSEMBLY AND ASSEMBLY (Continued)

Assembly

1. Position a new bearing on the input shaft and press the bearing onto the shaft using Tube, T75L-7025-B, Replacing Shaft Sleeve, T75L-7025-K, Shaft Collar, T75L-7025-M and Rack Bushing Holder, T81P-3504-D (or an appropriate size washer).



C5832-1A

SPECIFICATIONS

MITSUBISHI FIVE SPEED MANUAL TRANSMISSION LUBRICANT CAPACITY

Lubricant	Liters	Imp. Pints	U.S. Pints
Standard Transmission Lubricant (SAE 80W) D8DZ-19C547-A (ESP-M2C83-C) or equivalent	2.3	4.0	4.8

CC5833-2B

MITSUBISHI FIVE SPEED MANUAL TRANSMISSION GEAR RATIOS

Gear	Ratio
First	3.967:1
Second	2.136:1
Third	1.360:1
Fourth	1:1
Fifth (Overdrive)	0.856:1
Reverse	3.578:1

CC5834-1A

INPUT SHAFT BEARING RETAINER-TO-BEARING SELECTIVE SHIM CHART

Shim Thickness		Identification Color
mm.	Inch	
0.84	0.033	Black
0.93	0.037	None
1.02	0.040	Red
1.11	0.044	White
1.20	0.047	Yellow
1.29	0.051	Blue
1.38	0.054	Green

CC5836-1A

SPECIFICATIONS (Continued)

MITSUBISHI FIVE SPEED MANUAL TRANSMISSION TORQUE SPECIFICATIONS

Description	Torque	
	N·m	Ft-Lbs
Clutch Housing to Engine	38-51	28-38
Clutch Housing to Transmission	41-54	30-40
Countershaft Locknut	157-186	115-137
Damper to Insulator on Crossmember	97-127	71-94
Drain Plug	35-44	25-32
Fill Plug	30-34	22-25
Front Bearing Retainer to Case	30-41	22-30
Housing Cover to Transfer Case Adapter	15-21	11-16
Insulator to Transmission	81-108	60-80
Crossmember to Side Rail Bracket	88-115	65-85
Mainshaft Locknut	245-265	180-195
Pan to Case	15-21	11-16
Rear Bearing to Case	30-41	22-30
Reverse Idler Gear Nut	20-58	15-42
Reverse Idler Gearshaft Assembly to Case	15-21	11-16
Shift Lever Assembly to Transfer Case Adapter	8-14	6-10
Starter Motor to Clutch Housing	21-27	15-20
Stud to Front Retainer and Case	30-41	22-30

CC5839-1B

COUNTERSHAFT END PLAY SELECTIVE SPACER CHART

Spacer Thickness		Identification Mark
mm.	Inch	
1.84	0.0724	84
1.87	0.0736	87
1.90	0.0748	90
1.93	0.0760	93
1.96	0.0772	96
1.99	0.0783	99
2.02	0.0795	02
2.05	0.0807	06
2.08	0.0819	08
2.11	0.0831	11
2.14	0.0843	14
2.17	0.0854	17
2.20	0.0866	20
2.23	0.0878	23
2.26	0.0890	26
2.29	0.0902	29
2.32	0.0913	32
2.35	0.0925	35
2.38	0.0937	38
2.41	0.0949	41
2.44	0.0961	44
2.47	0.0972	47
2.50	0.0984	50
2.53	0.0996	53
2.56	0.1008	56
2.59	0.1020	59
2.62	0.1031	62
2.65	0.1043	65
2.68	0.1055	68

CC5838-1A

General Manual Transmission Service

SECTION 16-10

APPLIES TO ALL MODELS

DESCRIPTION

IDENTIFICATION

Refer to Section 10-00, Identification Codes for the code used to identify the different five-speed manual transmissions.

Manual transmissions have service identification tags to identify transmissions for service purposes (Figs. 1 and 2). The tag is found at the side of the main case.

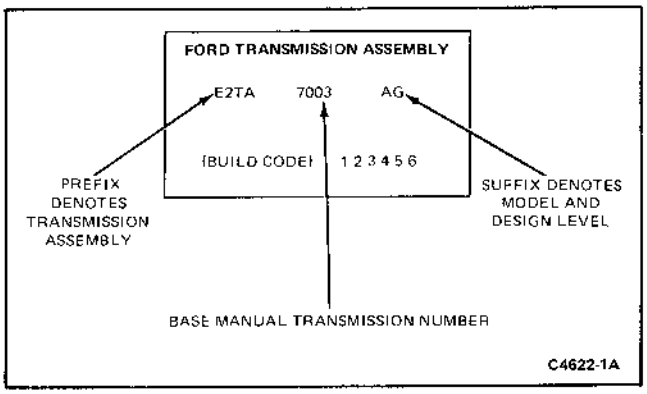


FIG. 1 Transmission Identification Tag for 5-Speed (Mazda) (4x2 or 4x4)

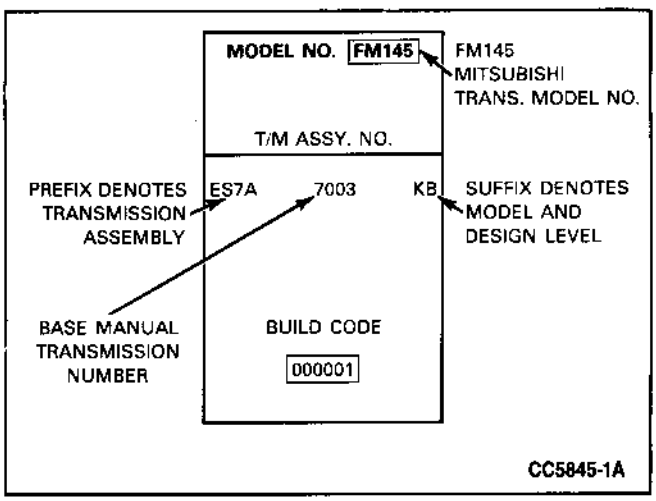


FIG. 2 Transmission Identification Tag for Mitsubishi 5-Speed (4x4 only)

DIAGNOSIS

DIAGNOSIS GUIDES

The following guides can be used as an aid when diagnosing manual transmissions.

CONDITION	POSSIBLE CAUSE	RESOLUTION
Transmission shifts hard.	1. Transmission fluid low or improper type.	1. Add lubricant or change lubricant as required.
	2. Shift lever binding or worn.	2. Remove cap from shift tower. Eliminate binding condition or replace components as required.
	3. Worn or damaged internal shift mechanism.	3. Remove transmission cover. Check internal shift mechanism by shifting into and out of all gears. Repair or replace as required.
	4. Binding of sliding gears and/or synchronizers.	4. Check for free movement of gears and synchronizers. Repair or replace as required.
	5. Housings and/or shafts out of alignment.	5. Remove transmission and check for binding condition between input shaft and engine crankshaft pilot bearing or bushing. Check flywheel housing alignment. Repair or replace as required.
Noisy in forward gears.*	1. Lubricant level low, or improper type.	1. Add lubricant, or refill with specified lubricant.
	2. Components grinding on transmission.	2. Check for screws, bolts, etc., of cab or other components grinding. Correct as required.
	3. Component housing bolts loose.	3. Check torque on transmission to flywheel housing bolts, output shaft flange nut and flywheel housing to engine block bolts. Tighten bolts to specification.
	4. Flywheel housing to engine crankshaft alignment.	4. Check and align flywheel housing to engine crankshaft.
	5. Noisy bearings or gears.	5. Remove and disassemble transmission. Inspect input, output and countershaft bearings. Inspect speedometer gear and gear teeth for wear or damage. Replace as required.
Gears clash when shifting from one forward gear to another.	1. Engine idle speed too high.	1. Adjust engine idle speed.
	2. Improper manual shift linkage.	2. Adjust and repair manual shift linkage as required.
	3. Pilot bearing binding.	3. Remove transmission and check for a binding condition between input shaft and engine crankshaft pilot bearing. Replace as required.
	4. Damaged gear teeth and/or synchronizer.	4. Disassemble transmission, repair or replace as required.

*While verifying the condition, determine whether the noise is gear roll-over noise, release bearing rub or some other transmission related noise.
Gear roll-over noise, inherent in manual transmissions, is caused by the constant mesh gears turning at engine idle speed, while the clutch is engaged and the transmission is in neutral; and release bearing rub is sometimes mistaken for mainshaft bearing noise.
Gear roll-over noise will disappear when the clutch is disengaged or when the transmission is engaged in gear.
Release bearing rub will disappear when the clutch is engaged. In the event that a bearing is damaged, the noise is more pronounced while engaged in gear under load or coast than in neutral.

CC4623-2B

CONDITION	POSSIBLE CAUSE	RESOLUTION
Transmission jumps out of gear.	1. Loose transmission to clutch housing mounting bolts, or loose levers.	1. Tighten transmission to flywheel housing, and flywheel housing to engine block bolts to specifications. Loosen all bolts and reseat flywheel housing. Tighten all bolts. Tighten levers if necessary.
	2. Flywheel housing to engine crankshaft out of line.	2. Shim or replace housing as required.
	3. Crankshaft pilot bearing worn.	3. Replace bearing.
	4. Interior components damage.	4. Disassemble transmission. Inspect the synchronizer sleeves for free movement on their hubs. Inspect the synchronizer blocking rings for widened index slots, rounded clutch teeth and smooth internal surface. Check countershaft cluster gear for excessive end play. Check shift forks for loose mounting on shift rails. Inspect synchronizer sliding sleeve and gear clutch teeth for wear or damage. Repair or replace as required.
	5. Worn gear teeth due to partial engagement.	5. Replace worn or damaged gears.
Transmission will not shift into one gear — all others OK.	1. Back-up switch ball frozen.	1. If reverse is problem, check back-up switch for ball frozen in extended position (if so equipped).
	2. Internal components.	2. Remove transmission. If transmission will not shift into reverse, remove transmission, check for damaged reverse gear train, in single rail shift transmission. Also, check for misaligned reverse relay lever. Inspect shift rail and fork system synchronizer system and gear clutch teeth for restricted travel. Repair or replace as required.

CC6588-2A

CONDITION	POSSIBLE CAUSE	RESOLUTION
Transmission is locked in one gear. It cannot be shifted out of that gear.	1. Manual-shift linkage out of adjustment, binding or damaged.	1. Disconnect the problem shift rod from transmission shift lever. Try to shift the transmission lever into and out of gear position. If OK, repair or replace linkage parts.
	2. Internal components.	2. Remove transmission. Inspect problem gears, shift rails and forks and synchronizer for wear or damage. Repair as required. Check for broken fork slot tabs on single rail transmissions.
	3. Loose fork on rail.	3. On single rail shift, check for broken selector arm pin or selector plate. Repair or replace as necessary.
Transmission leaks.	1. Improper amount of lubricant — wrong type.	1. Check level and type. Fill to bottom of filler plug hole.
	2. Other component leaking.	2. Identify leaking fluid as engine, power steering or transmission. Repair as required.
	3. False report.	3. Remove all traces of lube on exposed transmission surfaces. Check vent for free breathing. Operate transmission and inspect for new leakage. Repair as required.
	4. Internal components.	4. Remove transmission. Inspect for leaks at the input shaft bearing retainer seal and gasket, and shift rail expansion plug. Inspect for leaks at the top cover gasket. Inspect case for sand holes or cracks. Repair or replace as required.
	5. Improper installation torque.	5. Tighten to specified torque value.
Shift lever loose.	1. Retaining bolts loose	1. Tighten to specified torque.
	2. Improper stack-up of attaching parts.	2. Add shims to the top of the upper bushing. Refer to Adjustments in Section 16-22, Five-Speed Manual Transmission.
Shift lever tight.	1. Improper stack-up of attaching parts.	1. Add shims below the lower boot. Refer to Adjustments in Section 16-22, Five-Speed Manual Transmission.
	2. Worn or damaged shift lever lower bushing.	2. Inspect shift lever assembly. Remove and replace parts as required.

CC4624-2C

CONDITION	POSSIBLE CAUSE	RESOLUTION
Transfer case makes noise.	1. Incorrect tire inflation pressures and/or incorrect size tires and wheels.	1. Assure that all tires and wheels are the same size, and that inflation pressures are correct.
	2. Excessive tire tread wear.	2. Check tire tread wear to see if there is more than .06 inch difference in tread wear between front and rear. Interchange one front and one rear wheel. Re-inflate tires to specifications.
	3. Internal components.	3. Operate vehicle in all transmission gears with transfer case in 2HI, or HI range. — If there is noise in transmission in neutral gear, or in some gears and not in others, remove and repair transmission. — If there is noise in all gears, operate vehicle in all transfer case ranges. If noisy in all ranges, disassemble transfer case. Check input gear, planetary gear assembly, sprockets, chain and single cardan U-joint for damage. Replace as necessary.
4-wheel drive transfer case jumps out of gear.	1. Incomplete shift linkage travel.	1. Check for interference to shift boot or body.
	2. Loose mounting bolts.	2. Tighten mounting bolts.
	3. Front and rear driveshaft slip yokes dry or loose.	3. Lubricate and repair slip yokes as required. Tighten flange yoke attaching nut to specifications.
	4. Internal components.	4. Disassemble transfer case. Inspect input gear, planetary gear assembly, sliding shift collar hubs and detent spring for damage. Replace as required.

CC4894-2A

CLEANING AND INSPECTION

CLEANING

After the transmission has been disassembled, soak the parts, except the bearings, in a cleaning solvent until all the old lubricant is dissolved or loosened. Brush or scrape all foreign matter from the parts. Be careful not to damage any of the parts with the scraper.

An excessive amount of foreign material usually results from a bearing failure, gear seizure, tooth breakage, extreme synchronizer wear, or clashing gears. **In such cases, the input and output shaft bearings should be carefully inspected and replaced if necessary. Since countershaft bearings, output shaft pilot bearings, and reverse idler bearings are not so susceptible to damage from foreign material in the lubricant, they need not be replaced if they seem satisfactory.**

Wipe the parts or blow compressed air on them until they are thoroughly dry.

To clean the bearings, rotate them in clean solvent until all lubricant is removed. Hold the bearing assembly, to prevent it from rotating, and dry it with compressed air.

When the bearings are dry, lubricate them thoroughly with transmission lubricant, and cover them with a clean, lint-free cloth until ready for use.

INSPECTION

Inspect all transmission parts before reassembly to determine if they should be replaced.

ALUMINUM TRANSMISSION CASE SERVICE

If an aluminum transmission case thread is damaged, service kits may be purchased from local jobbers. To service a damaged thread, the following procedures should be carefully followed.

1. Drill out the damaged threads, **using the same drill size as the thread OD.** For example, use a 5/16 inch drill for a 5/16 18 thread.
2. Select the proper special tap and tap the drilled hole. The tap is marked for the size of the thread being serviced. Thus, the special tap marked 5/16 18 will not cut the same thread as a standard 5/16 18 tap. It does cut a thread large enough to accommodate the insert, and after the insert is installed the original thread size (5/16 18) is restored.

3. Select the proper coil inserting tool. These tools are marked with the thread size being serviced. Place the insert on the tool and adjust the sleeve to the length of the insert being used. Press the insert against the face of the tapped hole. Turn the tool clockwise and wind the insert into the hole until the insert is 1/2 turn below the face.
4. Working through the insert, bend the insert tang straight up and down until it breaks off at the notch.
5. Improperly installed inserts can be removed with the extractor tool. Place the extractor tool in the insert so that the blade rests against the top coil 1/4 to 1/2 turn away from the end of the coil. Tap the tool sharply with a hammer so that the blade cuts into the insert. Exert downward pressure on the tool and turn it counterclockwise until the insert is removed.

   These tools are marked with the thread size being serviced. Place the insert on the tool and adjust the sleeve to the length of the insert being used. Press the insert against the face of the tapped hole. Turn the tool clockwise and wind the insert into the hole until the insert is 1/2 turn below the face.

SYNCHRONIZER BLOCKING RINGS

Inspect the synchronizer blocking rings for widened index slots, rounded clutch teeth and smooth internal surfaces (must have machined grooves). With the blocker ring on the cone, the distance between the face of the gear clutching teeth and the face of the blocking ring must not be less than 0.3mm (0.012 inch).

Check the synchronizer sleeves for free movement on the hubs. Make sure the alignment marks (etched or paint marks) are properly indexed.

Replace the seal in the input shaft bearing retainer.

Replace the seals on the cam and shafts.

SEALS AND GASKETS

Examine and replace if necessary, input and output shaft bearing retainer seals and gaskets.

FLYWHEEL CLUTCH FACE RUNOUT

Install a dial indicator so that the indicator point bears against the flywheel face (Fig. 3). Turn the flywheel making sure that it is full forward or rearward so that crankshaft end play will not be indicated as flywheel runout.

If the flywheel clutch face runout exceeds specifications, (refer to the appropriate engine Section) remove the flywheel and check for burrs between the flywheel and the face of the crankshaft mounting flange. If no burrs exist, check the runout of the crankshaft mounting flange. Replace the flywheel or machine the crankshaft-flywheel mounting face if the mounting face flange runout is excessive. If the ring gear runout exceeds 0.25mm (0.10 inch), check installation of the gear to the flywheel flange. If it is not properly seated, re-install it to the flywheel. If it is properly seated, replace it. Refer to Ring Gear Replacement in Section 21-01 General Gasoline Engine Service for the proper procedure. For flywheel runout specifications, refer to the appropriate engine section under Specifications.

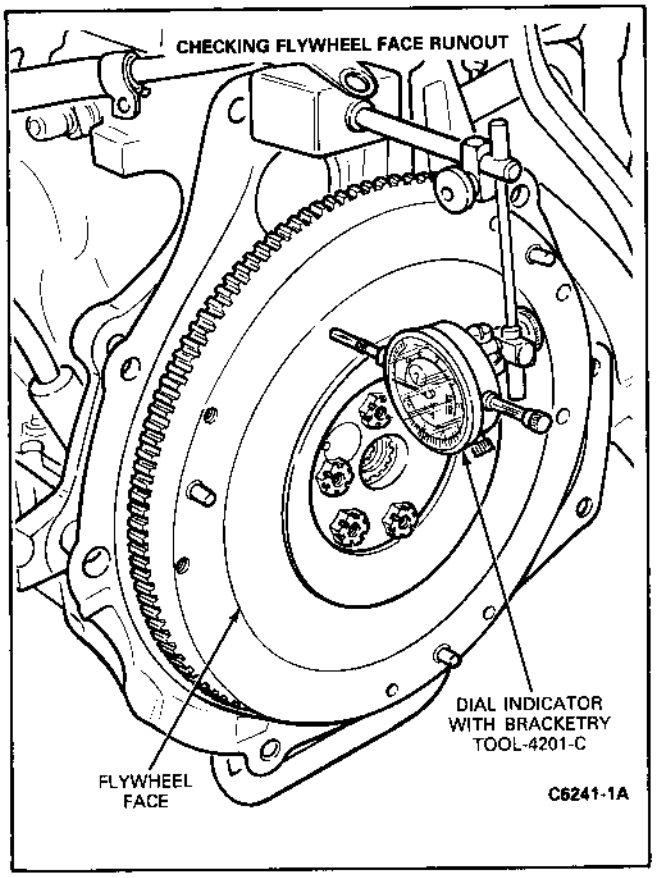


FIG. 3 Checking Flywheel Face Runout — Manual Transmission — Typical

SPECIFICATIONS

SPECIAL SERVICE TOOLS

NUMBER	DESCRIPTION	APPLICATION
D79P-100-A	Impact Slide Hammer	Universal
T50T-100-A	Impact Slide Hammer	Universal
T59L-100-B	Impact Slide Hammer	Universal
T58L-101-A	Puller Attachment	Removal Procedures — Use with Slide Hammer
T57L-500-B	Bench Mounted Holding Fixture	Universal
Tool-1175-AC	Seal Remover	Seal Removal — Use with Slide Hammer
T75L-4201-A	Clutch Housing Alignment Adapter	Clutch Installation
T75L-4201-B	Clutch Housing Alignment Adapter	Clutch Installation
Tool-4201-C	Dial Indicator with Bracketry	Clutch Measurements
D79L-7000-A	Retaining Ring Pliers	Universal

CC4625-2A

SPECIFICATIONS (Continued)

SPECIAL SERVICE TOOLS

Number	Description
T50T-100-A	Impact Slide Hammer
D84L-1123-A	Bearing Splitter
T81P-3504-D	Rack Bushing Holder
T80T-4000-W	Driver Handle
D80P-4201-A	Depth Micrometer
D82L-4201-C	Metric Depth Micrometer
D83L-4201-A	Straight Edge
T77F-4220-B1	Puller
T85T-7011-A	Seal Installer
T75L-7025-B	Tube
T75L-7025-C	Tube
T75L-7025-D	Bearing Collet
T75L-7025-G	Bearing Collet Sleeve
T84T-7025-B	Forcing Screw
T75L-7025-K	Replacing Shaft Sleeve
T75L-7025-M	Shaft Collar
T77F-7025-C	Bearing Collet Sleeve
T77J-7025-B	Tube
T77J-7025-C	Mainshaft Locknut Wrench
T77J-7025-F	Mainshaft Locknut Staking Tool
T77J-7025-H	Puller
T77J-7025-J	Puller Ring
T85T-7025-A	Tube
T85T-7061-A	Overdrive Gear Bearing Replacer
T85T-7065-A	Mainshaft Bearing Collet Remover
T85T-7121-A	Countershaft Bearing Replacer
T85T-7111-A	Threaded Shaft Adapter Replacer
T85T-7140-A	Reverse Idler Gearshaft Replacer

CC5840-1A

INPUT SHAFT SELECTIVE SNAP RING CHART

Snap Ring Thickness		Identification Color
mm.	Inch	
2.15	0.085	Blue
2.22	0.087	None
2.29	0.090	Brown
2.36	0.093	White

CC5835-1A

MAINSHAFT SELECTIVE SNAP RING CHART

Snap Ring Thickness		Identification Color
mm.	Inch	
2.30	0.091	White
2.35	0.093	Brown
2.40	0.094	None
2.45	0.096	Blue
2.50	0.098	Yellow

CC5837-1A