MODEL T-176
4-SPEED TRANSMISSION

DISASSEMBLY

(1) Remove bolts attaching transfer case to transmission and remove transfer case.

(2) Remove shift control housing.

NOTE: *Two of the housing attaching bolts are dowel-type alignment bolts. Note the location of these bolts for assembly reference.*

(3) Drain lubricant from transmission case if not drained during removal.

(4) Remove countershaft using Arbor Tool J-29342 (fig. 2B-52). Tap countershaft out rear of case.

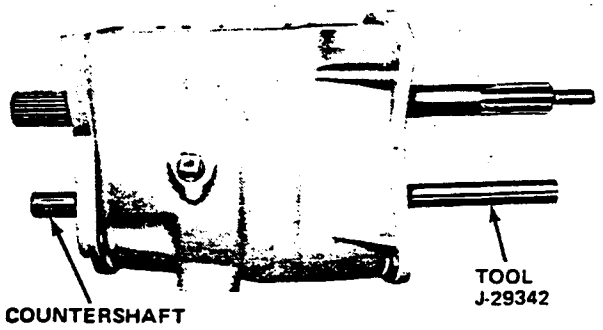


Fig. 2B-52 Countershaft Removal/Installation

(5) Remove locating ring and retaining snap ring from rear bearing.

(6) Remove rear bearing using Puller Set J-25152 (fig. 2B-53).

(7) Scribe or punch alignment reference marks in front bearing cap and transmission case.

(8) Remove front bearing cap and gasket.

(9) Remove and discard front bearing cap oil seal. Use screwdriver to pry seal out of cap.

(10) Remove locating ring and retaining snap ring from front bearing (fig. 2B-54).

(11) Remove clutch shaft and front bearing using Adapter J-29344 and Puller Set J-25152 (fig. 2B-55).

(12) Remove third-fourth blocking ring from clutch shaft or synchronizer hub.

(13) Remove front bearing from clutch shaft using Puller Set J-25152 (fig. 2B-56).

(14) Remove mainshaft pilot bearing rollers from clutch shaft (fig. 2B-54).

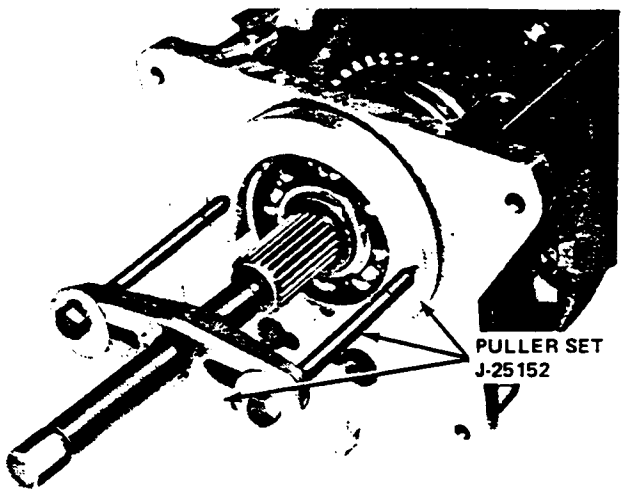


Fig. 2B-53 Rear Bearing Removal

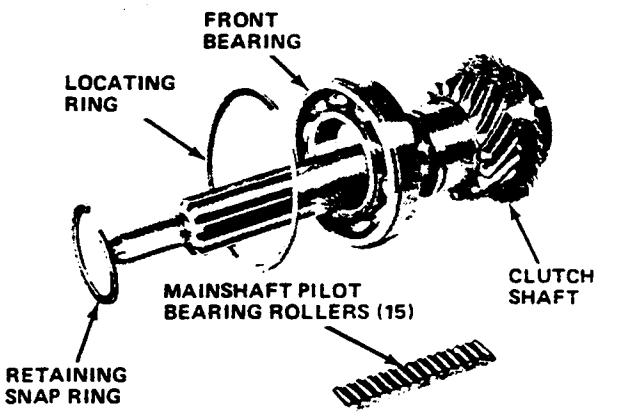


Fig. 2B-54 Clutch Shaft and Front Bearing Assembly

(15) Remove mainshaft and geartrain assembly. Move third-fourth synchronizer sleeve rearward (to third gear position). Tilt rear end of shaft downward and lift front end of shaft upward and out of case.

(16) Remove countershaft gear and arbor tool as assembly.

(17) Remove countershaft gear thrust washers and any mainshaft pilot bearing rollers that may have fallen into case during clutch shaft removal.

(18) Remove reverse idler gear assembly. Tap idler gear shaft out rear of case (fig. 2B-57). Remove gear assembly thrust washers.

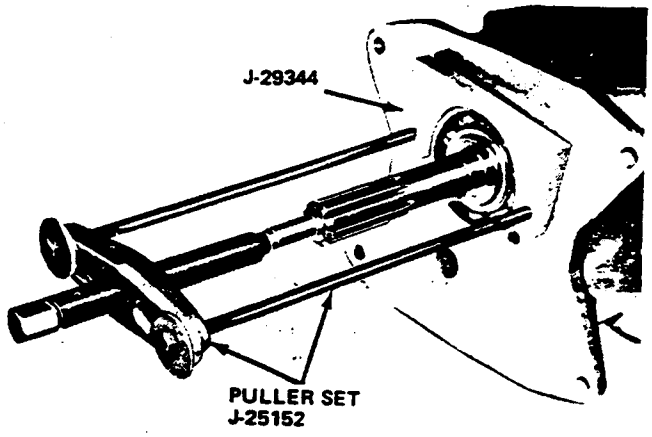


Fig. 2B-55 Clutch Shaft Front Bearing Removal

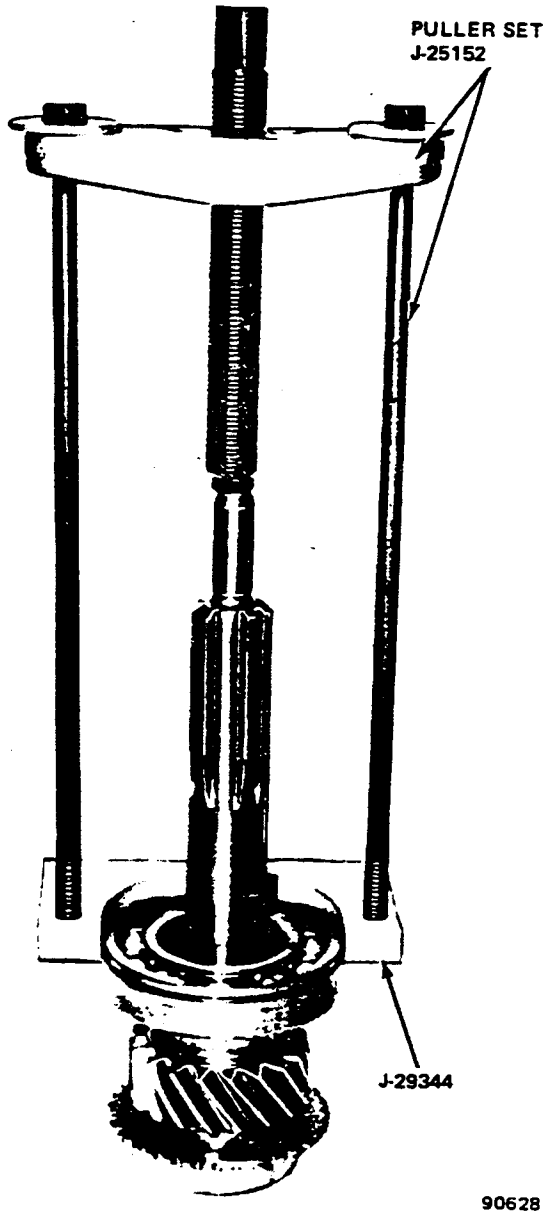


Fig. 2B-56 Removing Front Bearing from Clutch Shaft

(19) Remove needle bearings and bearing retainers from gear assembly (fig. 2B-58). Remove sliding gear from idler gear. Note position of sliding gear for assembly reference.

(20) Remove arbor tool from countershaft gear and remove needle bearings and bearing retainers (fig. 2B-59).

Disassembly Mainshaft Geartrain

(1) Remove third-fourth synchronizer snap ring from front end of mainshaft (fig. 2B-60).

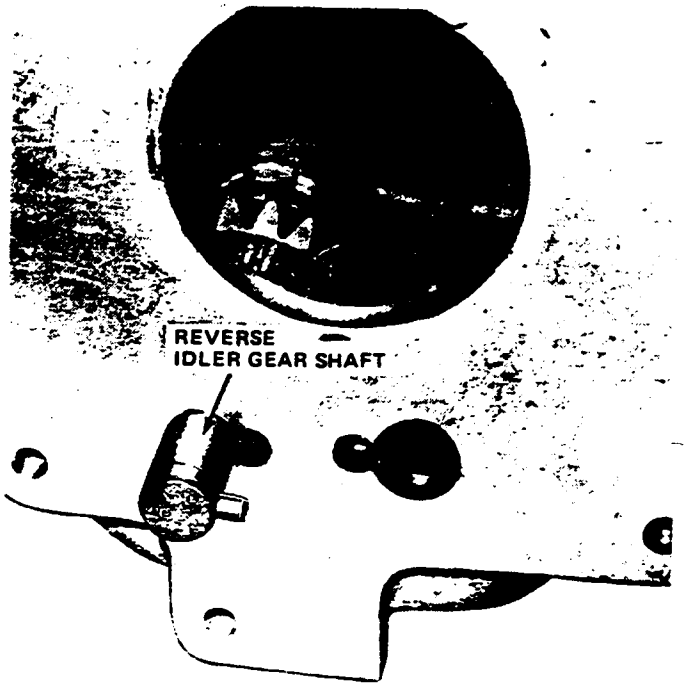


Fig. 2B-57 Reverse Idler Gear Shaft Removal/Installation

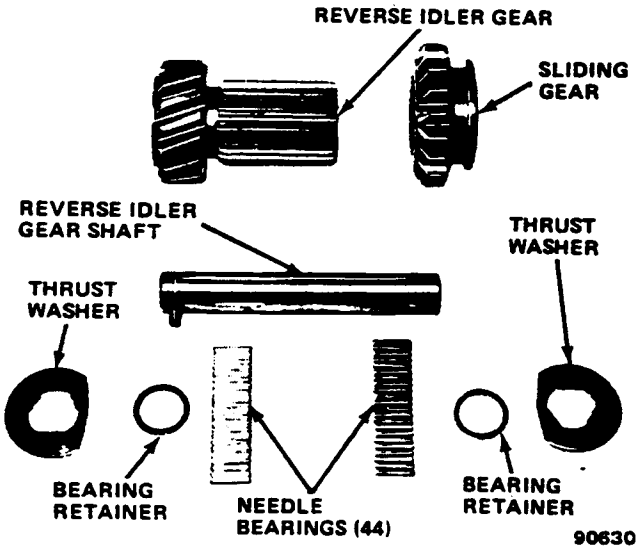


Fig. 2B-58 Reverse Idler Gear Assembly

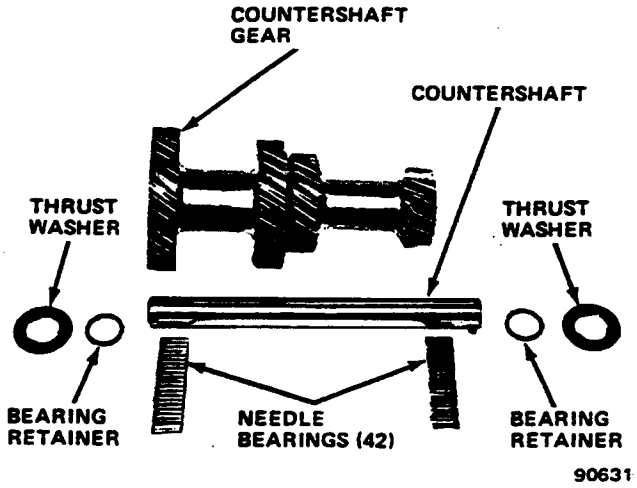


Fig. 2B-59 Countershaft Gear Assembly

(2) Remove third-fourth synchronizer assembly from mainshaft. Slide hub out of sleeve. Remove insert springs and three inserts and blocking ring. Note position of insert springs for assembly reference.

(3) Remove third gear from mainshaft.

(4) Remove second gear snap ring from mainshaft and remove second gear and blocking ring.

(5) Remove tabbed thrust washer from mainshaft (fig. 2B-60).

(6) Remove snap ring from first-second synchronizer hub. Remove hub and reverse gear and sleeve as assembly. Mark hub and sleeve for assembly reference. Remove insert springs from hub, remove three inserts, and remove sleeve and gear from hub.

(7) Remove first gear thrust washer from rear of shaft and remove first gear and blocking ring (if ring was not removed previously).

CLEANING AND INSPECTION

Cleaning

Thoroughly wash all parts in solvent and dry using compressed air. However, do not dry the bearings with compressed air. Air dry the bearings or wipe them dry using a clean shop cloth only.

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

Inspection

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

Case

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

Gear, Shaft and Synchronizer Assemblies

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

ASSEMBLY

(1) Lubricate reverse idler gear shaft bore and sliding gear with transmission lubricant. Install sliding gear on reverse idler gear (fig. 2B-58).

(2) Install Arbor Tool J-29343 in reverse idler gear and install 22 needle bearings and one bearing retainer at each end of gear (fig. 2B-61).

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

NOTE: *The thrust washers have flats on them. Be sure to install the washers so these flats will face the mainshaft. Also, be sure to engage the thrust washer locating tabs in the case locating slots.*

(4) Install reverse idler gear assembly (fig. 2B-62). Align gear bore, thrust washers, case bores, and install reverse idler gear shaft from rear of case. Be sure to seat roll pin in shaft, align roll pin with counterbore in case and push shaft into rear of case (fig. 2B-57).

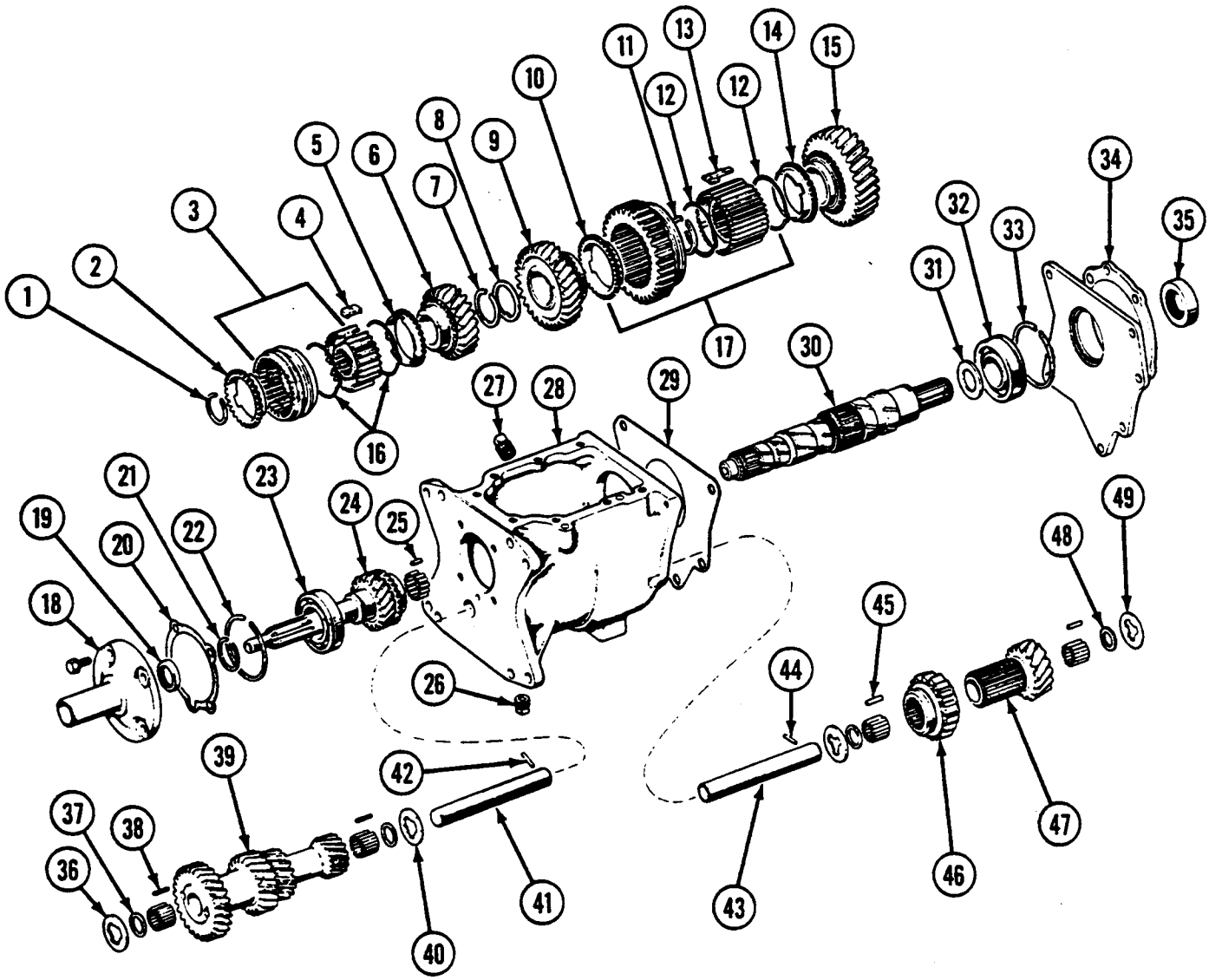
(5) Measure reverse idler gear end play by inserting feeler gauge between thrust washer and gear. End play should be 0.004 to 0.018 inch (0.10 to 0.45 mm). If end play exceeds 0.018 inch (0.45 mm), remove idler gear and replace thrust washers.

(6) Coat counter shaft gear bore, needle bearings and bearing bores in gear with petroleum jelly. Insert arbor tool in bore of gear and install 21 needle bearings and one retainer in each end of gear.

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

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

(8) Insert countershaft into rear case bore just far enough to hold rear thrust washer in position. This will



1. THIRD-FOURTH GEAR SNAP RING
2. FOURTH GEAR SYNCHRONIZER RING
3. THIRD-FOURTH GEAR CLUTCH ASSEMBLY
4. THIRD-FOURTH GEAR PLATE
5. THIRD GEAR SYNCHRONIZER RING
6. THIRD SPEED GEAR
7. SECOND GEAR SNAP RING
8. SECOND GEAR THRUST WASHER
9. SECOND SPEED GEAR
10. SECOND GEAR SYNCHRONIZER RING
11. MAIN SHAFT SNAP RING
12. FIRST-SECOND SYNCHRONIZER SPRING
13. LOW-SECOND PLATE
14. FIRST GEAR SYNCHRONIZER RING
15. FIRST GEAR
16. THIRD-FOURTH SYNCHRONIZER SPRING
17. FIRST-SECOND GEAR CLUTCH ASSEMBLY
18. FRONT BEARING CAP
19. OIL SEAL
20. GASKET
21. SNAP RING
22. LOCK RING
23. FRONT BALL BEARING
24. CLUTCH SHAFT
25. ROLLER BEARING
26. DRAIN PLUG
27. FILL PLUG
28. CASE
29. GASKET
30. SPLINE SHAFT
31. FIRST GEAR THRUST WASHER
32. REAR BALL BEARING
33. SNAP RING
34. ADAPTER PLATE
35. ADAPTER SEAL
36. FRONT COUNTERSHAFT GEAR THRUST WASHER
37. ROLLER WASHER
38. REAR ROLLER BEARING
39. COUNTERSHAFT GEAR
40. REAR COUNTERSHAFT THRUST WASHER
41. COUNTERSHAFT
42. PIN
43. IDLER GEAR SHAFT
44. PIN
45. IDLER GEAR ROLLER BEARING
46. REVERSE IDLER SLIDING GEAR
47. REVERSE IDLER GEAR
48. IDLER GEAR WASHER
49. IDLER GEAR THRUST WASHER

Fig. 2B-60 Model T-176 Four-Speed Transmission

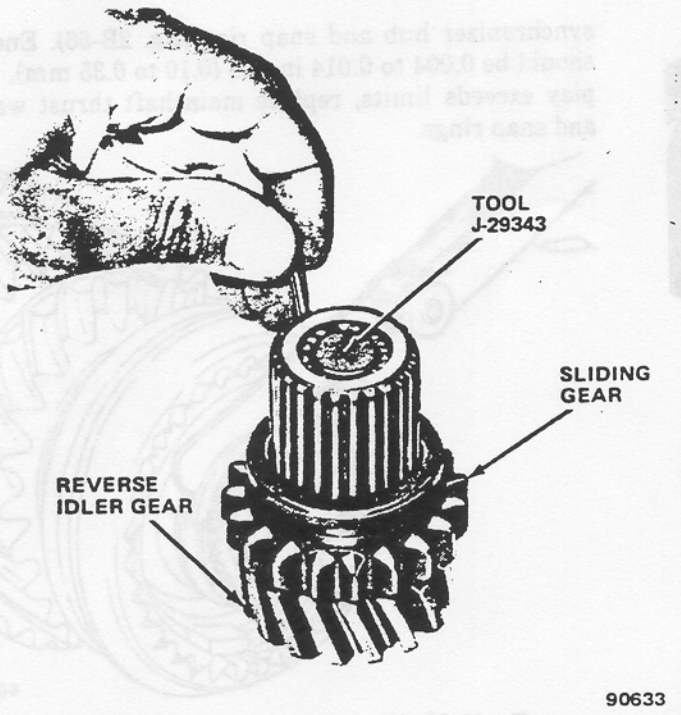


Fig. 2B-61 Reverse Idler Gear Needle Bearing Installation

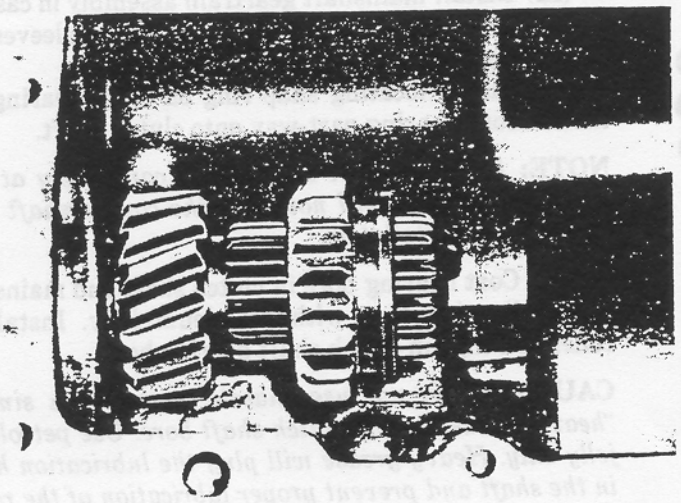


Fig. 2B-62 Reverse Idler Gear Installation

prevent washer from being displaced when countershaft gear is installed.

(9) Install countershaft gear. Align gear bore, thrust washers, bores in case, and install countershaft part-way into case. Be sure arbor tool enters shaft bore at front of case.

NOTE: *Do not remove the countershaft arbor tool completely.*

(10) Measure countershaft gear end play by inserting feeler gauge between washer and gear. End play should be 0.004 to 0.018 inch (0.10 to 0.45 mm). If end play exceeds 0.018 inch (0.45 mm), remove gear and replace thrust washers. After correct end play has been obtained, reinstall arbor tool in countershaft gear and allow gear to remain at bottom of case. Leave countershaft in rear case bore to hold rear thrust washer in place.

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

(11) Lubricate mainshaft, synchronizer assemblies and gear bores with transmission lubricant.

(12) Assemble first-second synchronizer hub and reverse gear and sleeve (fig. 2B-60):

(a) Install gear and sleeve on hub and place assembly flat on workbench.

(b) Drop inserts into hub slots.

(c) Install insert spring. Position loop-end of spring in one insert, compress spring ends and insert spring ends under lips of remaining two inserts. Be sure spring is under lip of each insert (fig. 2B-63).

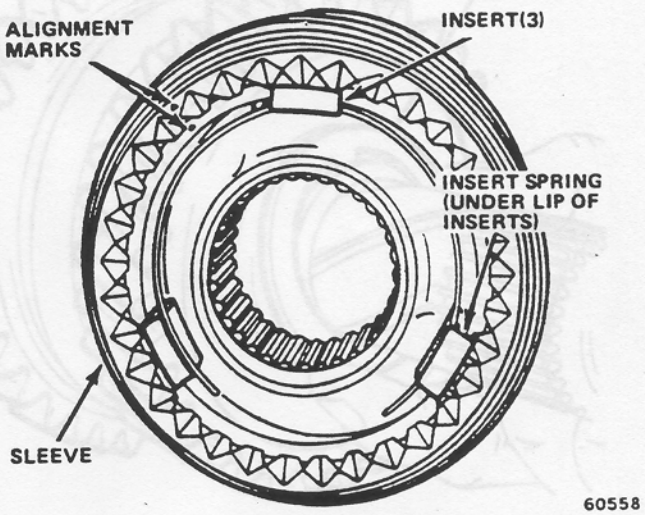


Fig. 2B-63 Synchronizer Insert Spring Installation

(d) Turn assembly over and install remaining insert spring as described in previous step. However, install this spring so open end faces 180° opposite first spring.

(13) Install assembled first-second synchronizer hub and reverse gear and sleeve on mainshaft.

(14) Install new first-second synchronizer snap ring on mainshaft (fig. 2B-60).

(15) Install first gear and blocking ring on rear of mainshaft and install first gear thrust washer (fig. 2B-64).

(16) Install new tabbed thrust washer on mainshaft. Be sure washer tab is seated in mainshaft tab bore (fig. 2B-65).

(17) Install second gear and blocking ring on mainshaft and install new second gear snap ring.

(18) Install third gear and blocking ring on mainshaft.

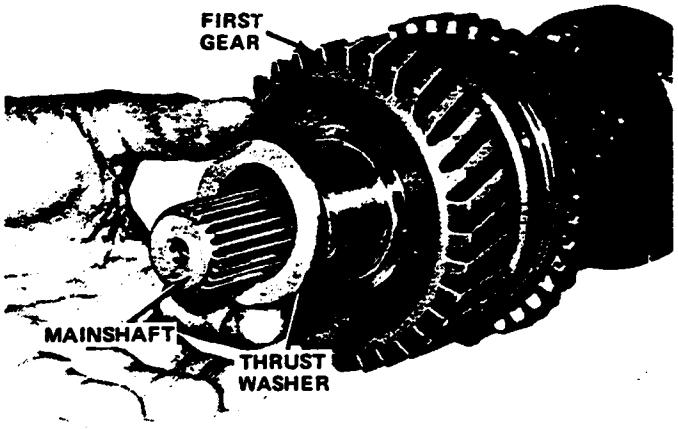


Fig. 2B-64 First Gear and Thrust Washer Installation

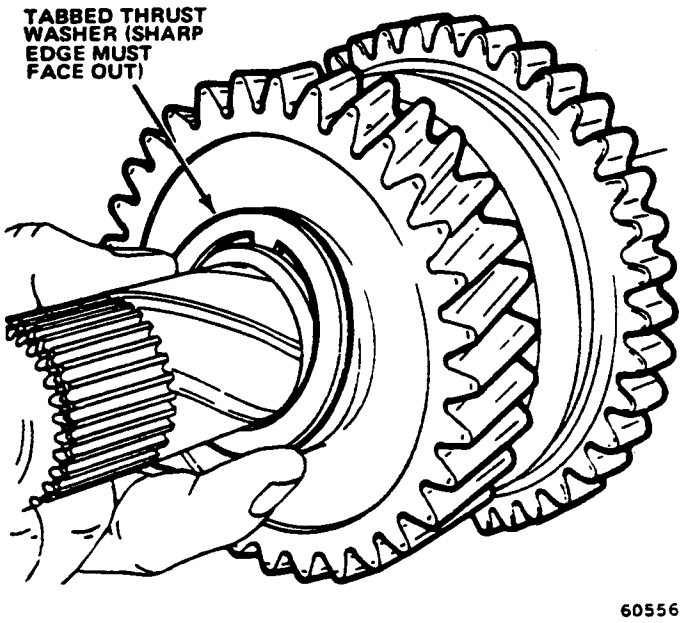


Fig. 2B-65 Tabbed Thrust Washer Installation

(19) Assemble third-fourth synchronizer (fig. 2B-60).

(a) Install sleeve on synchronizer hub. Align parts using reference marks.

(b) Place assembled hub and sleeve flat on workbench.

(c) Drop inserts into hub slots.

(d) Install insert spring. Position loop-end of spring in one insert, compress spring ends and insert spring ends under lips of remaining two inserts (fig. 2B-63).

(e) Turn assembly over and install remaining insert spring as described in previous step. However, position this spring so open end faces 180° opposite first spring.

(20) Install assembled third-fourth synchronizer assembly on mainshaft.

(21) Install new third-fourth synchronizer retaining snap ring on mainshaft and measure end play between synchronizer hub and snap ring (fig. 2B-66). End play should be 0.004 to 0.014 inches (0.10 to 0.35 mm). If end play exceeds limits, replace mainshaft thrust washer and snap rings.

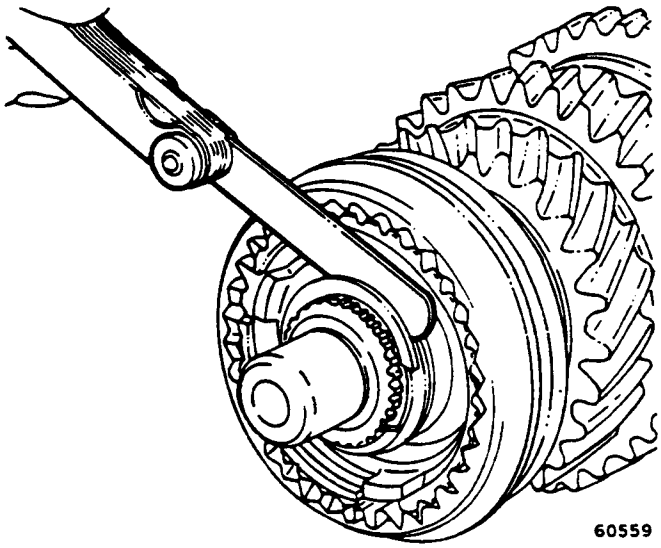


Fig. 2B-66 Checking Mainshaft Geartrain End Play

(22) Install mainshaft geartrain assembly in case. Be sure synchronizers are in neutral position so sleeves will clear top of case when assembly is installed.

(23) Install locating snap ring on front bearing and install front bearing part-way onto clutch shaft.

NOTE: *Do not install the bearing completely at this time as the shaft will not clear the countershaft gear and prevent installation.*

(24) Coat bearing bore in clutch shaft and mainshaft pilot roller bearings with petroleum jelly. Install 15 roller bearings in clutch shaft bearing bore.

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

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

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

(27) Install front bearing cap and tighten cap bolts finger-tight only.

(28) Position rear bearing on mainshaft. Do not install bearing locating ring at this time. Start bearing into shaft and into case bore using Tool J-29345. Remove tool and complete bearing installation using rawhide mallet. When bearing is fully seated on shaft, install bearing retaining snap ring.

NOTE: *In order to seat the rear bearing on the mainshaft, the bearing must be tapped into the case deeper than the locating snap ring would allow. For this reason, do not install the locating snap ring until after the bearing is fully seated on the shaft and the retaining snap ring is installed.*

(29) Remove front bearing cap, seat front bearing fully on clutch shaft and install bearing retaining snap ring.

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

(31) Remove front bearing cap oil seal using screwdriver and install replacement oil seal using Tool J-25233 (fig. 2B-67).

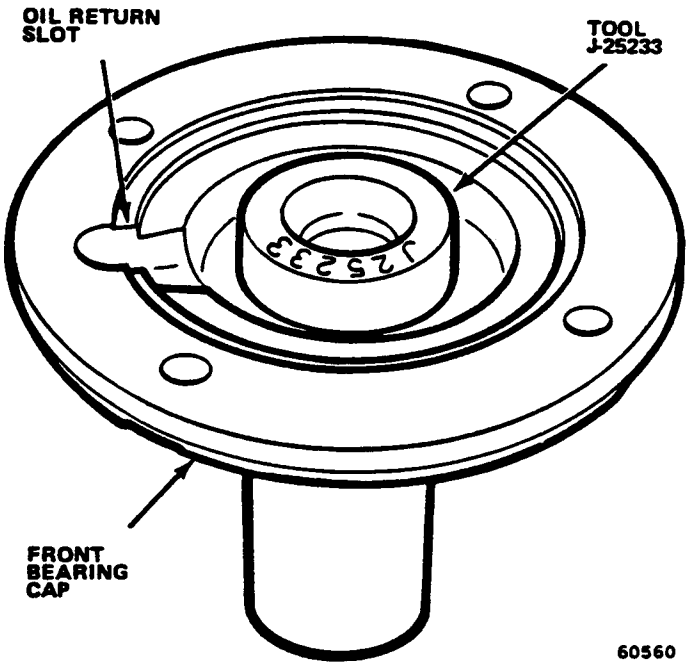


Fig. 2B-67 Front Bearing Cap Seal Installation

(32) Install front bearing cap. Tighten cap bolts to 12 foot-pounds (16 N•m) torque.

(33) Install locating ring on rear bearing. If necessary, reseat bearing in case using rawhide mallet.

(34) Install countershaft as follows:

(a) Turn transmission case on end. Position case at edge of workbench with clutch shaft pointing downward. Be sure countershaft bore in front of case is accessible.

(b) Have helper hold case in position.

(c) Align countershaft gear bores with thrust washers and case bores and tap shaft into place. Do not let arbor tool drop onto floor as shaft is installed.

CAUTION: *Do not damage the thrust washers during countershaft installation. Be sure they are aligned with the case bores and gear bores before tapping the countershaft into place.*

(35) Shift synchronizer sleeves into all gear positions and check operation. If clutch shaft and mainshaft appear to bind in Neutral position, check for blocking rings sticking on tapered portion of gears. Use screwdriver to free any sticking blocking rings.

(36) Fill transmission with 3.5 pints (1.7 liters) of SAE 85W-90 gear lubricant.

(37) Position new shift control housing gasket on case and install control housing. Tighten housing bolts to 12 foot-pounds (16 N•m) torque.

(38) Install transmission on transfer case.

SHIFT CONTROL HOUSING

Disassembly

(1) Remove shift lever cover, control housing cap, retainer and remove shift lever and spring.

(2) Position transmission case cover in vise so shift forks are facing upward. Use wood blocks to protect cover from vise jaws and do not overtighten vise.

(3) Place all shift forks in neutral position.

(4) Remove shift rail support plate attaching bolts and tabbed washers and remove support plates (fig. 2B-68).

(5) Remove first-second shift rail.

(6) Remove third-fourth shift rail, shift lug and interlock pin.

(7) Remove reverse shift rail.

(8) Remove poppet balls.

(9) Remove shifter interlock rings.

(10) Remove poppet springs.

(11) Remove fulcrum pins.

(12) Remove cover from vise.

(13) Clean all components in solvent and dry using compressed air.

(14) Inspect all components. Replace any components that are nicked, cracked, broken or excessively worn.

Assembly

(1) Clamp transmission case cover in vise using protective wood blocks and install fulcrum pins in cover.

CAUTION: *To avoid damaging the cover do not overtighten the vise jaws.*

(2) Lubricate shift rails and shift rail grooves in cover with petroleum jelly.

(3) Install poppet springs in transmission case cover bores.

(4) Install poppet balls (one on each spring).

(5) Position reverse gear shift rail and fork on reverse rocker arm in transmission case cover.

NOTE: *Be sure the notch on the shift rail is positioned over the reverse poppet ball and that reverse rocker arm is engaged in the reverse fork slot.*

(6) Install third-fourth shift rail and shift fork assembly in transmission case cover.

NOTE: *Be sure the interlock pin is in position in the shift rail before further assembly.*

(7) Install first-second shift rail and fork assembly. Be sure shift rail notch is over poppet ball in transmission case cover.

(8) Install shifter interlock rings in cover and between poppet balls.

(9) Press downward on shift rails to compress poppet balls and springs. Use wood block long enough to contact all three shift rails to press rails downward evenly.

(10) While holding shift rails downward, position shift rail retaining plates on housing and install plate attaching bolts and tabbed washers finger-tight.

(11) Remove wood block and tighten shift rail retaining bolts to 12 to 15 foot-pounds (16 to 19 N•m) torque. Be sure tabbed washers are in correct position before bending washer tabs.

(12) Check shift rail operation. Each rail must slide smoothly in cover groove. Be sure it is not possible to overshift into another gear position. After checking shift operation, place forks in third gear position.

(13) Install shift lever, spring, spring retainer and control housing cap (fig. 1). Push cap downward and turn lever retainer clockwise to install and seat.

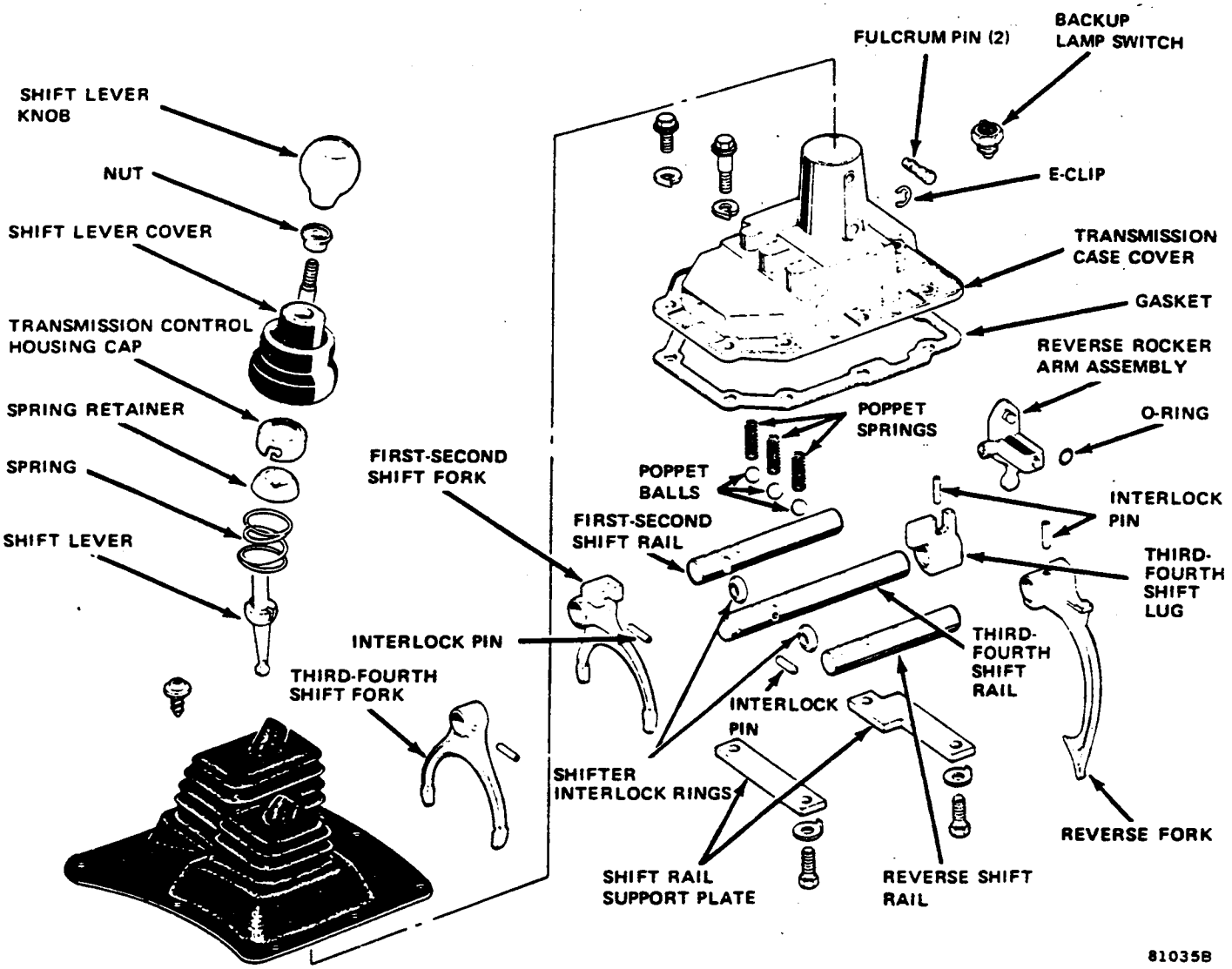


Fig. 2B-68 Shift Control Housing—T-176

SPECIFICATIONS

Lubricant Capacity and End Play Tolerances — Model T-176

End Play Tolerances:
- Countershaft Gear to Case . .0.004 to 0.018 inch (0.10 to 0.45 mm)
- Reverse Idler Gear to Case . .0.004 to 0.018 inch (0.10 to 0.45 mm)
- Mainshaft Gear Train . . . . .0.004 to 0.018 inch (0.10 to 0.45 mm)

Lubricant Capacity . . . . . 3.5 pints (1.7 liters)
Lubricant Type . . . . . SAE 85W-90, API GL5

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Torque Specifications — Model T-176

Service Set-To Torques should be used when assembling components. Service In-Use Recheck Torques should be used for checking a pre-tightened item.

	USA (ft-lbs)		Metric (N·m)	
	Service Set-To Torque	Service In-Use Recheck Torque	Service Set-To Torque	Service In-Use Recheck Torque
Backup Lamp Switch	15	10-20	20	14-27
Drain and Fill Plugs	15	10-20	20	14-27
Front Bearing Cap Bolts	13	11-15	18	15-20
Shift Housing-to-Transmission Case Bolts	13	11-15	18	15-20
Support Plate Bolts	18	15-20	24	20-27

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

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MODEL T-18A 4-SPEED TRANSMISSION

DISASSEMBLY

(1) Remove transmission-to-transfer case adapter stud nuts, and remove transmission from transfer case.

(2) Remove and discard transmission-to-transfer case gasket (fig. 2B-69).

(3) Position shift lever in reverse, remove case cover bolts, remove shift control housing.

(4) Punch alignment marks on the front bearing cap, remove capscrews and bearing cap.

(5) Remove front bearing lock ring and snap ring.

(6) Remove front bearing from clutch shaft using Puller J-25152 (fig. 2B-70).

(7) Remove front bearing retainer washer from clutch shaft.

(8) Remove rear adapter housing retaining bolts and housing.

(9) Remove rear bearing lock ring and snap ring.

(10) Install front bearing cap temporarily.

(11) Remove rear bearing using Puller Set J-25152.

NOTE: *If the bearing puller plates will not seat in the bearing snap ring groove, tap the end of the clutch shaft with a lead hammer to move the mainshaft rearward and expose the bearing groove fully.*

(12) Remove front bearing cap.

(13) Rotate clutch shaft until flat area of fourth speed gear is in line with the countershaft gear.

(14) Move mainshaft to rear of case and separate clutch shaft from mainshaft by pulling toward front bearing bore. 22 needle bearings will be displaced.

NOTE: *On six-cylinder models the clutch shaft will come out of front bearing bore. On eight-cylinder models the clutch shaft is removed from inside the case after mainshaft assembly removal.*

(15) Remove bearing roller spacer from mainshaft pilot hub (fig. 2B-69).

(16) Remove mainshaft assembly through top of case.