

SECTION 7B-6B

BORG-WARNER (T5) UNIT REPAIR

RPO M49

NOTICE: When fasteners are removed, always reinstall them at the same location from which they were removed. If a fastener needs to be replaced, use the correct part number fastener for that application. If the correct part number fastener is not available, a fastener of equal size and strength (or stronger) may be used. Fasteners that are not reused, and those requiring thread locking compound will be called out. The correct torque value must be used when installing fasteners that require it. If the above conditions are not followed, parts or system damage could result.

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UNIT DISASSEMBLY

TRANSMISSION DISASSEMBLY

Figures 1 through 18

**Clean**

- Exterior of the transmission assembly thoroughly with appropriate solvent.

**Disassemble**

Tools Required:

J 37359 Countershaft Bearing Remover

J 22912-01 Bearing and Gear Puller

- Remove drain bolt on transmission case and drain lubricant.

NOTICE: Removal of offset lever in position other than neutral (centered) may result in driving the roll pin into the detent plate without releasing lever, making further disassembly extremely difficult.

- Position offset lever in neutral gate (centered).
1. Roll pin attaching offset lever to shift rail (Figure 3).
 2. Extension housing-to-transmission case bolts.

NOTICE: Do not attempt to remove the offset lever while the extension housing is still bolted in place. The lever has a positioning lug engaged in the housing detent plate, which prevents moving the lever far enough for removal.

3. Housing and offset lever as an assembly (Figure 4).
4. Detent ball and spring from offset lever (Figure 5).
5. Roll pin from extension housing or offset lever.
6. Oiling funnel from rear of countershaft (Figure 6).
7. Bolts attaching transmission cover and shift fork assembly to case.
 - Two of the transmission cover attaching bolts are alignment-type dowel bolts. Note the location of these bolts for assembly reference.
8. Cover (Figure 7).
9. Reverse lever spring clip, pivot bolt and shift lever (Figure 8).
10. Backup lamp switch.
11. Fifth gear synchronizer snap ring and retainer from rear of countershaft (Figure 9).
12. Unhook reverse lock spring from front of transmission case (Figure 10).

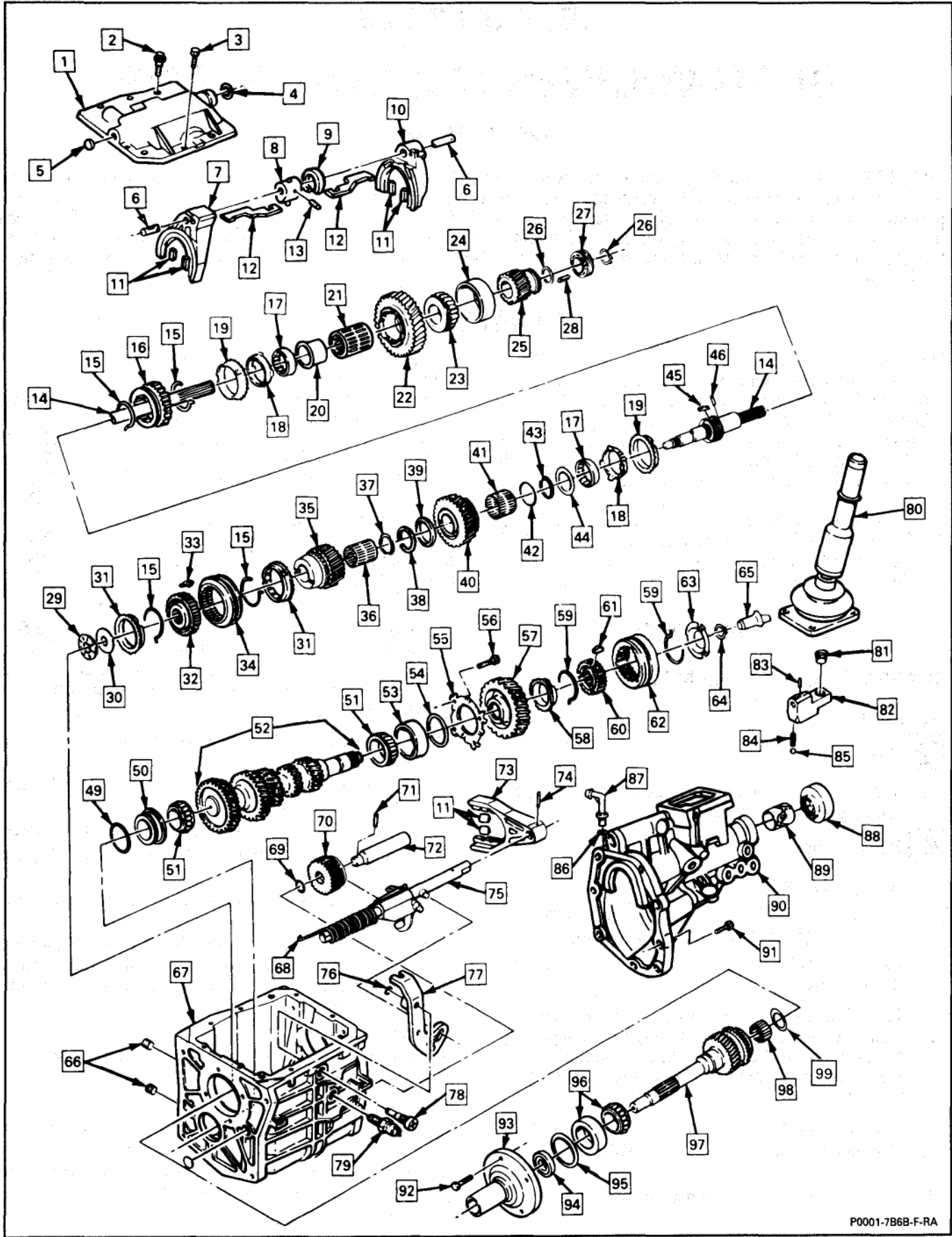


Figure 1 Disassembled View

1. COVER, TRANSMISSION
2. BOLT, ALIGNMENT DOWEL
3. BOLT
4. SEAL, O-RING
5. PLUG, SHIFT RAIL
6. RAIL, SHIFT
7. FORK, 3RD AND 4TH SHIFT
8. ARM, SELECTOR
9. PLATE, GEAR SELECT INTERLOCK
10. FORK, 1ST AND 2ND SHIFT
11. INSERT, SHIFT FORK
12. PLATE, SHIFT FORK
13. PIN, ROLL - SELECTOR ARM
14. SHAFT, MAIN WITH 1ST AND 2ND SYNCHRONIZER HUB
15. SPRING, SYNCHRONIZER
16. GEAR, REVERSE SLIDING
17. CONE, INNER - 1ST AND 2ND SYNCHRONIZER
18. CONE, OUTER - 1ST AND 2ND SYNCHRONIZER
19. RING, BLOCKER - 1ST AND 2ND SYNCHRONIZER
20. SLEEVE, 1ST GEAR BEARING
21. BEARING, 1ST GEAR
22. GEAR, 1ST SPEED
23. BEARING, MAINSHAFT REAR
24. RACE, MAINSHAFT REAR BEARING
25. GEAR, 5TH SPEED DRIVEN
26. RING, SNAP
27. GEAR, SPEEDOMETER DRIVE
28. CLIP, SPEEDOMETER DRIVE GEAR
29. BEARING, MAIN DRIVE-GEAR THRUST
30. RACE, MAIN DRIVE GEAR THRUST BEARING
31. RING, BLOCKER - 3RD AND 4TH SYNCHRONIZER
32. HUB, 3RD AND 4TH SYNCHRONIZER
33. KEY, SYNCHRONIZER
34. SLEEVE, 3RD AND 4TH SYNCHRONIZER
35. GEAR, 3RD SPEED
36. BEARING, 3RD GEAR
37. SPACER, 3RD GEAR BEARING
38. RING, SNAP 2ND GEAR THRUST WASHER
39. WASHER, THRUST - 2ND GEAR
40. GEAR, 2ND SPEED
41. BEARING, 2ND GEAR
42. SPACER, 2ND GEAR BEARING
43. RING, SPIRAL RETAINING - 2ND SYNCHRONIZER
44. WASHER, THRUST - 2ND SYNCHRONIZER
45. KEY, 1ST-2ND SYNCHRONIZER
46. PIN, LOCATING - 1ST SPEED BEARING SLEEVE
49. O-RING, BEARING RACE
50. RACE, FRONT COUNTERSHAFT BEARING
51. BEARING, COUNTERSHAFT
52. GEAR CLUSTER, COUNTERSHAFT
53. RACE, REAR COUNTERSHAFT
54. SHIM, COUNTERSHAFT BEARING ADJUSTMENT
55. RETAINER, COUNTERSHAFT
56. BOLT, COUNTERSHAFT RETAINER
57. GEAR, 5TH SPEED DRIVE
58. RING, BLOCKER - 5TH SYNCHRONIZER
59. SPRING, 5TH SYNCHRONIZER
60. HUB, 5TH SYNCHRONIZER
61. KEY, 5TH SYNCHRONIZER
62. SLEEVE, 5TH SYNCHRONIZER
63. RETAINER, 5TH SYNCHRONIZER
64. RING, SNAP - 5TH SYNCHRONIZER RETAINER
65. FUNNEL, TRANSMISSION OILING
66. PLUG, FILL AND DRAIN
67. CASE, TRANSMISSION
68. SPRING, REVERSE LOCK
69. O-RING, REVERSE IDLER
70. GEAR, REVERSE IDLER
71. PIN, ROLL - REVERSE IDLER
72. SHAFT, REVERSE IDLER
73. FORK, 5TH SHIFT
74. PIN, ROLL - SHIFT FORK
75. RAIL, 5TH AND REVERSE SHIFT
76. CLIP, SPRING - 5TH AND REVERSE LEVER
77. LEVER, 5TH AND REVERSE SHIFT
78. BOLT, 5TH AND REVERSE SHIFT LEVER PIVOT
79. SWITCH, REVERSE LAMP
80. CONTROL, TRANSMISSION SHIFT LEVER AND HOUSING
81. SLEEVE, SHIFT LEVER DAMPER
82. LEVER, OFFSET SHIFT
83. PIN, ROLL - OFFSET LEVER
84. SPRING, DETENT
85. BALL, DETENT
86. O-RING, EXTENSION HOUSING VENT
87. VENT, EXTENSION HOUSING
88. SEAL, EXTENSION HOUSING REAR OIL
89. BUSHING, EXTENSION HOUSING
90. HOUSING, EXTENSION
91. BOLT, EXTENSION HOUSING
92. BOLT, DRIVE GEAR BEARING RETAINER
93. RETAINER, DRIVE GEAR BEARING
94. SEAL, DRIVE GEAR BEARING RETAINER OIL
95. SHIM, MAINSHAFT BEARING ADJUSTMENT
96. RACE, MAIN DRIVE GEAR FRONT BEARING
97. GEAR, MAIN DRIVE
98. BEARINGS, ROLLER - MAIN DRIVE GEAR PILOT
99. SPACER

Figure 2 Disassembled View - Legend

13. Fifth gear, synchronizer, shift fork and shift rail as an assembly. If necessary, rotate rail to disengage from reverse lever assembly (Figure 11).
14. Circlip, speedometer gear and retaining clip.
15. Snap ring from fifth speed driven gear (Figure 12).
16. Front bearing retainer bolts.
17. Front bearing retainer.
18. Front bearing race and end play shims from front bearing retainer (Figure 13).
19. Rotate drive gear until flat surface faces countershaft and remove drive gear from the transmission case.
 - Be careful not to drop the 15 roller bearings, thrust bearing, or race from the rear of drive gear (Figure 14).
20. Fourth gear blocker ring from third/fourth synchronizer.
21. Mainshaft rear bearing race.
 - If the race sticks, it is probably misaligned in the case bore. To free the race, work the shaft back and fourth in the case.
 - Tilt mainshaft upward and remove assembly from transmission case (Figure 15).
22. Reverse fork assembly from transmission case.
23. Countershaft retainer and shims (Figure 16).
24. Roll pin from forward end of reverse idler shaft.
25. Remove reverse idler shaft, rubber O-ring and gear from the transmission case (Figure 17).
26. Rear countershaft bearing race.
27. Countershaft bearing using appropriate pullers (Figure 18).
- Move countershaft assembly rearward, tilt countershaft upward and remove from case.
28. Rear countershaft bearing from shaft using J 37359 with J 22912-01.

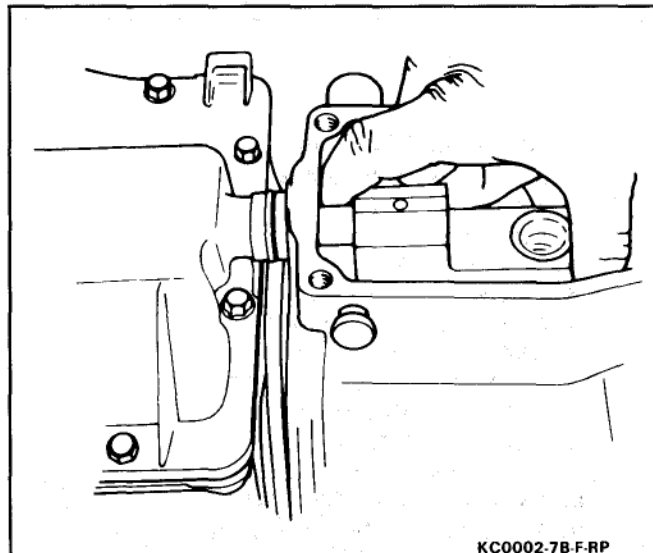


Figure 4 Extension Housing to Transmission Case

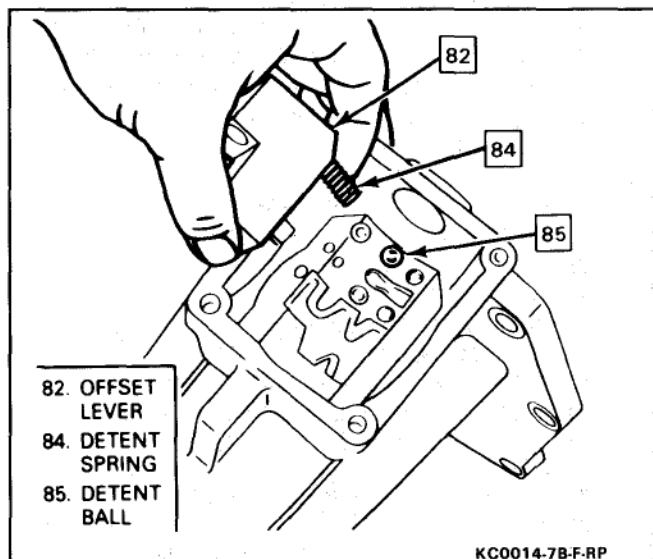


Figure 5 Detent and Offset Lever

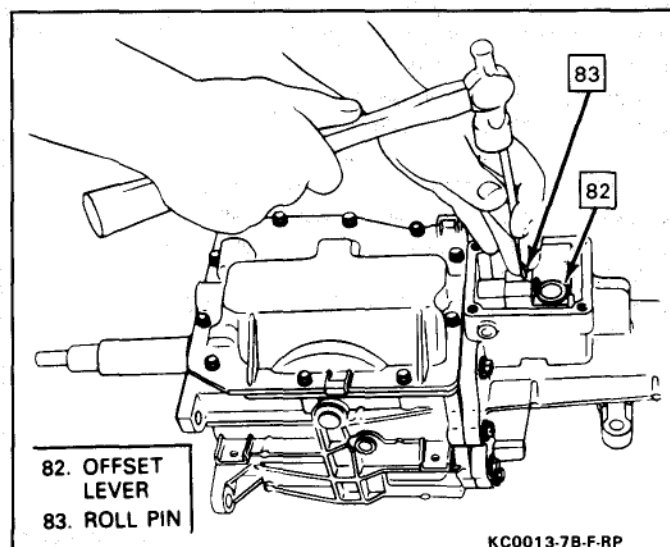


Figure 3 Offset Lever

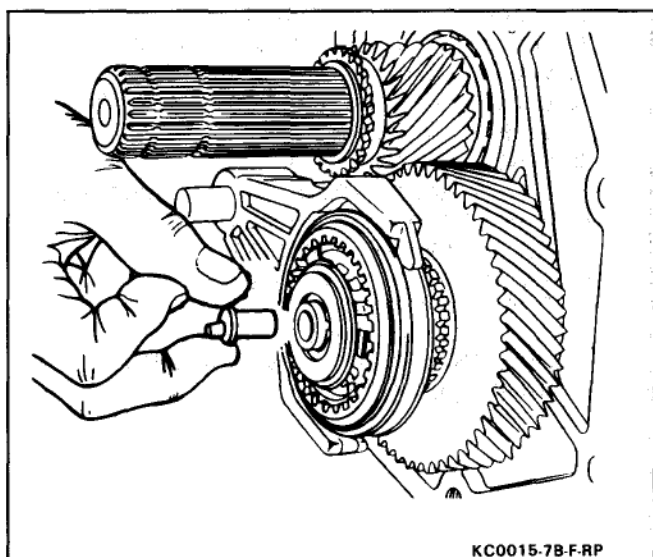


Figure 6 Oiling Funnel

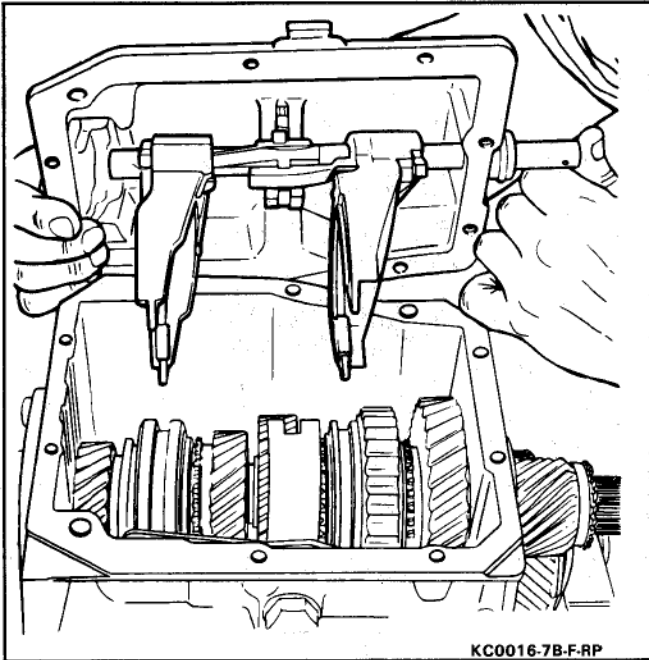


Figure 7 Transmission Cover

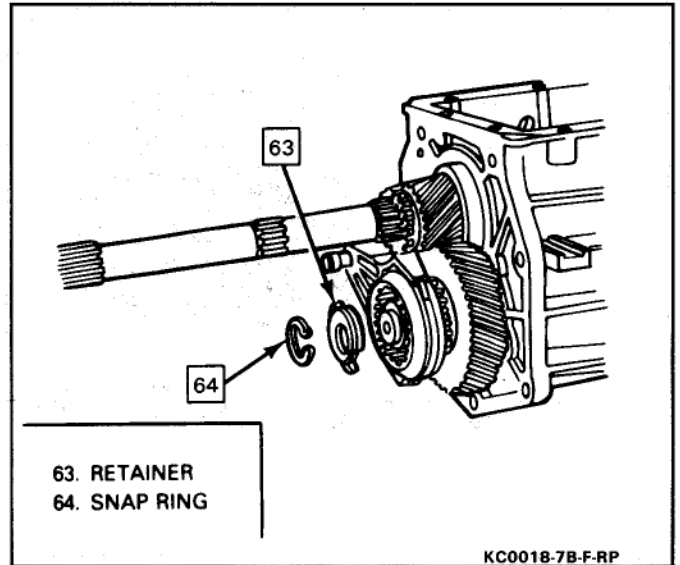


Figure 9 Fifth Gear Synchronizer Retainer

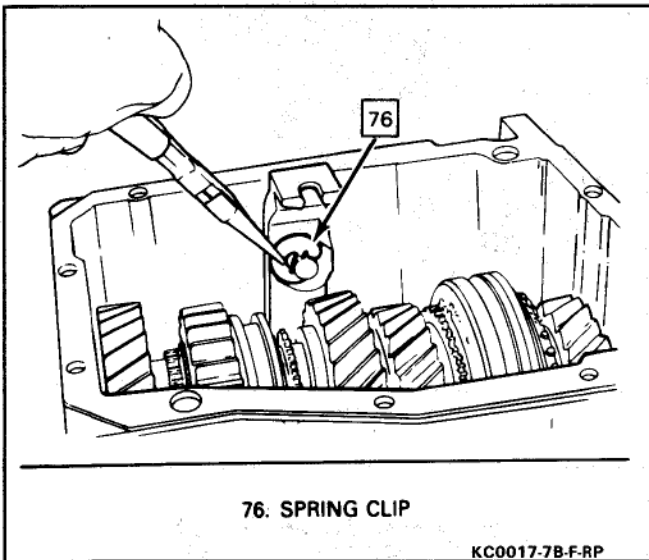


Figure 8 Reverse Lever Spring Clip

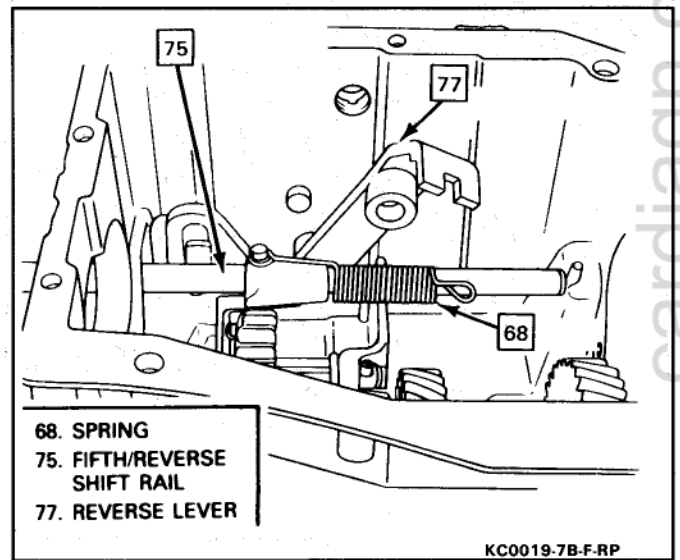


Figure 10 Reverse Lock Spring

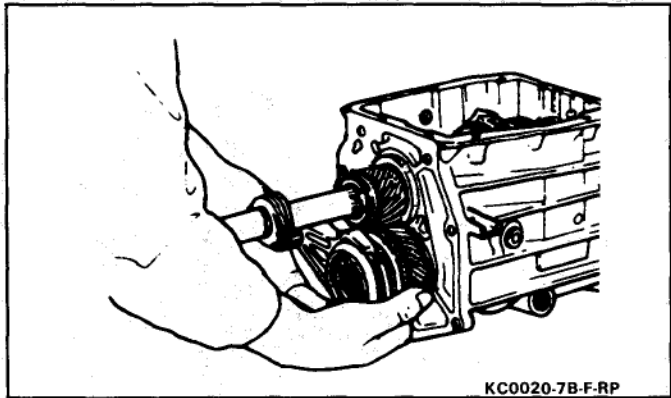


Figure 11 Fifth Gear Synchronizer

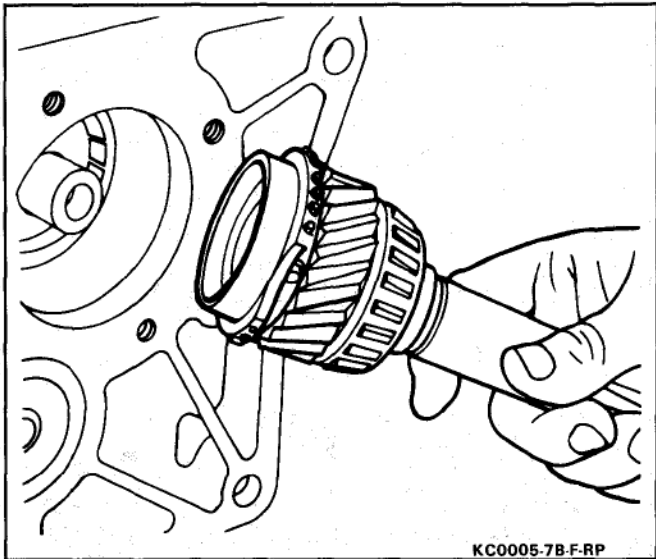


Figure 14 Drive Gear

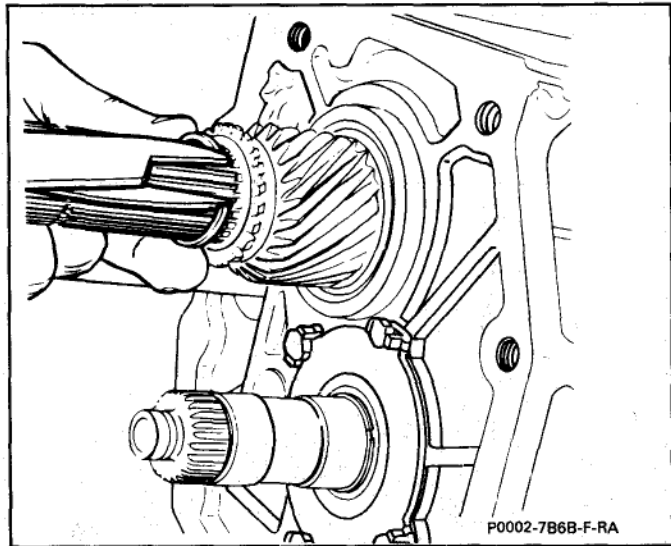


Figure 12 Fifth Gear Snap Ring

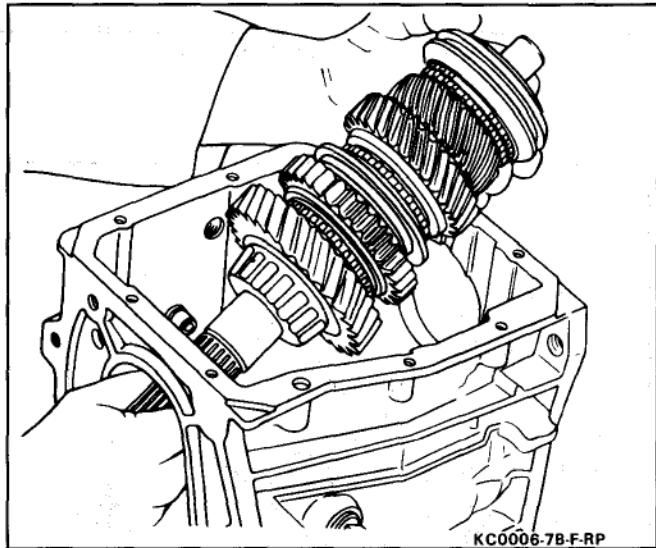


Figure 15 Mainshaft

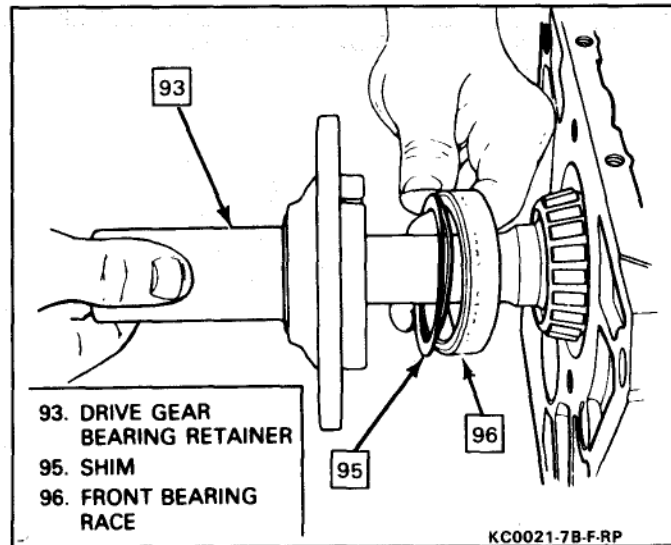


Figure 13 Bearing Retainer and Shims

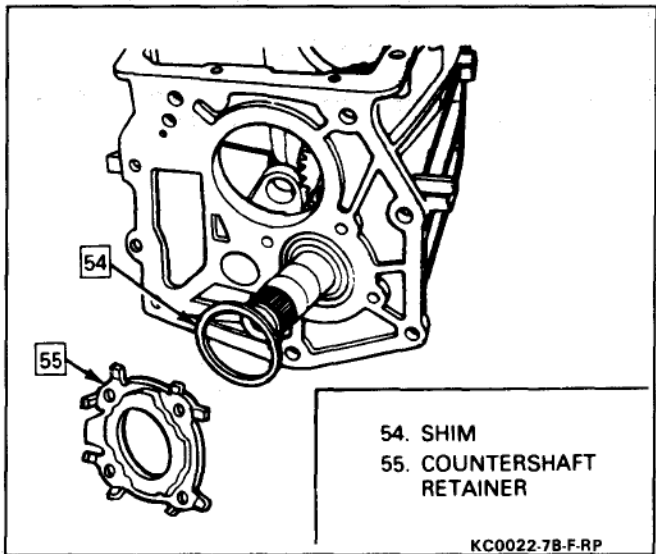


Figure 16 Countershaft Retainer

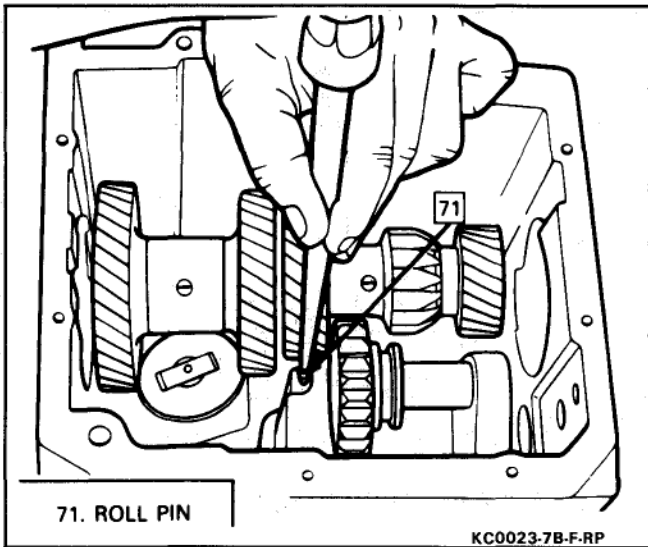


Figure 17 Removing Reverse Idler Shaft Roll Pin

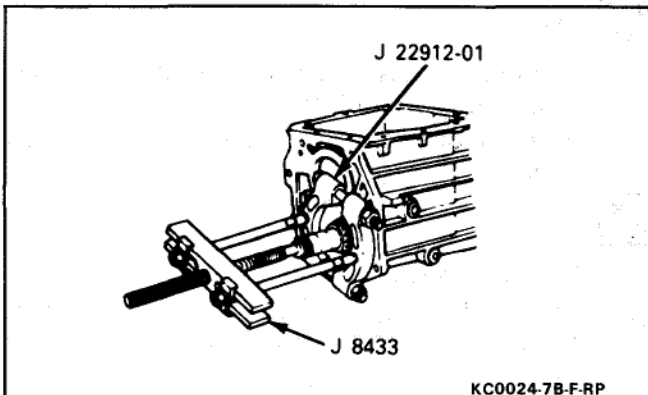


Figure 18 Removing Countershaft Bearing

MAINSHAFT DISASSEMBLY

Figures 19 through 21



Disassemble

Tool Required:

J 22912-01 Bearing and Gear Puller

1. Thrust bearing and race from front end of mainshaft.
- Scribe reference mark on third-fourth synchronizer hub and sleeve for reassembly.
2. Third-fourth synchronizer, third blocker ring, sleeve, hub and third gear as an assembly from mainshaft, using J 22912-01 and press.
3. Needle bearing assembly and spacer.
4. Second gear snap ring and thrust washer.
5. Second gear, spacer and needle bearing.
6. Spiral snap ring.
7. Thrust washer.
8. Three-piece second gear blocker ring assembly.
- Scribe reference mark on first-second synchronizer hub and sleeve for reassembly.

9. First/second synchronizer spring and keys from first-reverse sliding gear.
10. Sleeve from mainshaft hub.

NOTICE: Do not attempt to remove the first-second-reverse hub from mainshaft. The hub and shaft are permanently assembled and machined as a matched set.

11. Fifth gear, using J 22912-01 and press.
12. Mainshaft rear bearing assembly.
13. First gear.
14. Needle bearing and sleeve.
15. Locating pin.
16. Three-piece first gear blocker ring assembly.

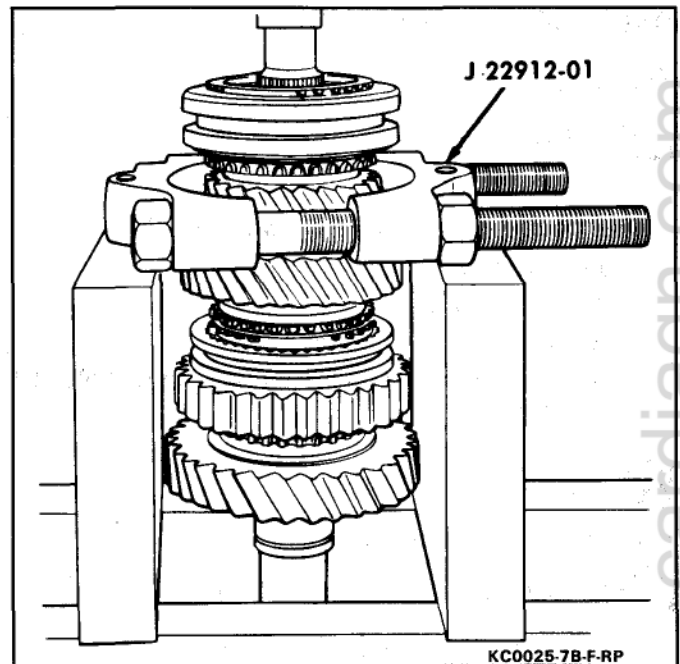


Figure 19 Removing Third-Fourth Synchronizer

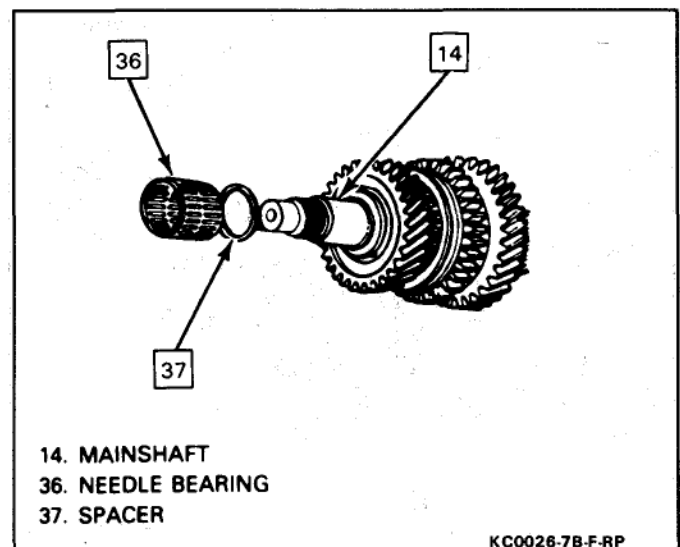


Figure 20 Needle Bearing and Spacer

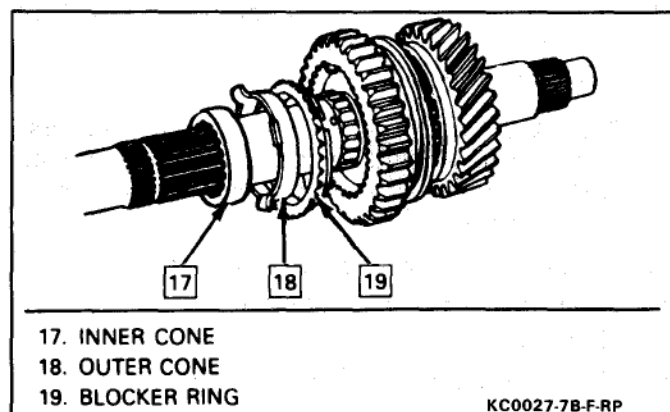


Figure 21 Three-Piece Blocker Ring

DRIVE GEAR DISASSEMBLY

Figures 22 and 23

Disassemble

Tool Required:

J 22912-01 Bearing and Gear Puller

1. Bearing race.
2. Thrust bearing.
3. Roller bearings from cavity of drive gear.
4. Remove bearing from drive gear using J 22912-01 and a press.

Clean

- Parts in appropriate solvent.

Inspect

- Gear teeth and shaft pilot for wear.

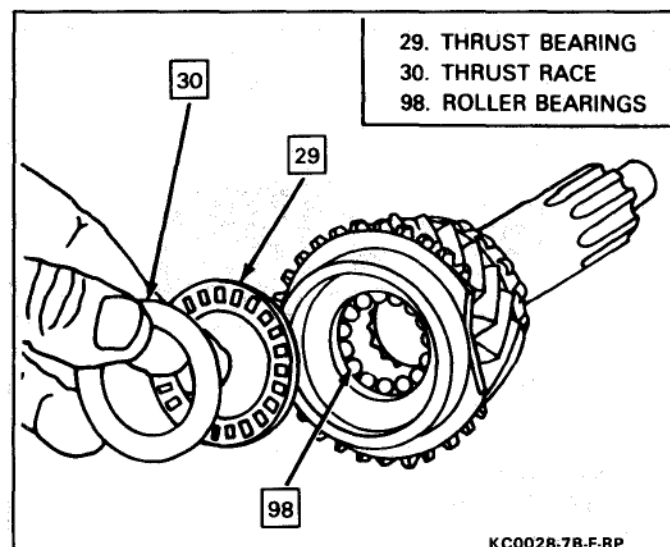


Figure 22 Drive Gear Bearings

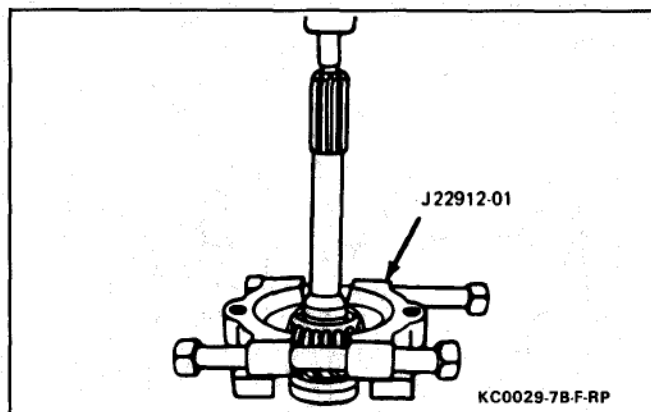


Figure 23 Removing Drive Gear Bearing

CLEANING AND INSPECTION

Transmission Case

Clean

1. Transmission case thoroughly inside and outside with appropriate solvent.
2. Magnetic disk at the bottom of the transmission case.

Inspect

1. Case for cracks.
2. Front and rear faces of the transmission case for burrs, and if present, dress them off with a fine mill file.

Bearing Rollers and Spacers

Inspect

- Drive gear bearing rollers.
- Reverse idler shaft.
- Spacers.

Gears

Inspect

- Drive gear bearing rollers for chips, cracks, or excessive wear and replace if necessary.
- Clutch sleeves to insure that they slide freely on their hubs.

Front and Rear Bearings

Clean

- Front and rear bearings thoroughly with appropriate solvent.

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

- Blow out bearings with compressed air.
- Lubricate bearings with transmission lubricant.



Inspect

- Bearings for roughness by slowly turning race by hand.

Synchronizer Blocker Rings

Figure 24

First/second synchronizer outer cone and third/fourth blocker ring are lined with friction material and cannot be checked visually for wear. Replacement is necessary when gap between blocker teeth and adjacent clutch teeth is significantly less than specified. Fifth gear blocker ring is brass and can be checked visually for wear and damage.

NOTICE: Make certain the blocker rings are correctly identified before assembly. First/second synchronizer blocker ring does not have friction material. The third/fourth synchronizer blocker ring has friction material. Assembling one in place of the other will result in serious damage to the transmission.



Inspect

- Fifth gear blocker ring for wear and damage.

Third/Fourth Blocker Rings

Figure 24



Assemble

1. Third gear blocker ring to third gear with twisting motion to fully seat.
2. Fourth gear blocker ring to main drive gear with twisting motion to fully seat.



Measure

- Gap between vertical faces of blocker teeth and clutch teeth. Nominal gap is 0.88-1.50 mm (0.035-0.059 inch) for new blocker rings (Figure 28).

First/Second Blocker Rings

Figure 24



Assemble

1. Three-piece first gear blocker ring assembly, using a twisting motion to fully seat.
2. Three-piece first gear blocker ring assembly, with needle bearing and bearing sleeve, to first gear.
3. Three-piece second gear blocker ring assembly, using a twisting motion to fully seat.
4. Three-piece second gear blocker ring assembly, with thrust washer, to second gear.



Measure

- Gap between vertical faces of blocker teeth and clutch teeth. Nominal gap is 0.81-1.40 mm (0.032-0.055 inch) for new blocker ring assemblies (Figure 28).

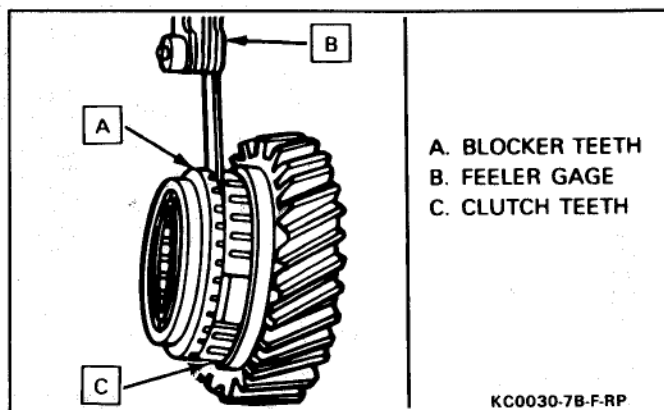


Figure 24 Measuring Blocker Ring Wear

SYNCHRONIZER KEYS AND SPRINGS

Figures 25 through 27

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



Remove or Disconnect

- Keys and springs.
 - If relation of hub and sleeve are not already marked, mark for assembly purposes.
 - Push the sliding sleeve from the hub. The keys will fall free and the springs may be easily removed.



Install or Connect

- Keys and springs.
 - Place a blocker ring on side of the hub and sleeve and install keys and retain with a spring.
 - Place a blocker ring on opposite side of the hub and sleeve and install remaining spring.

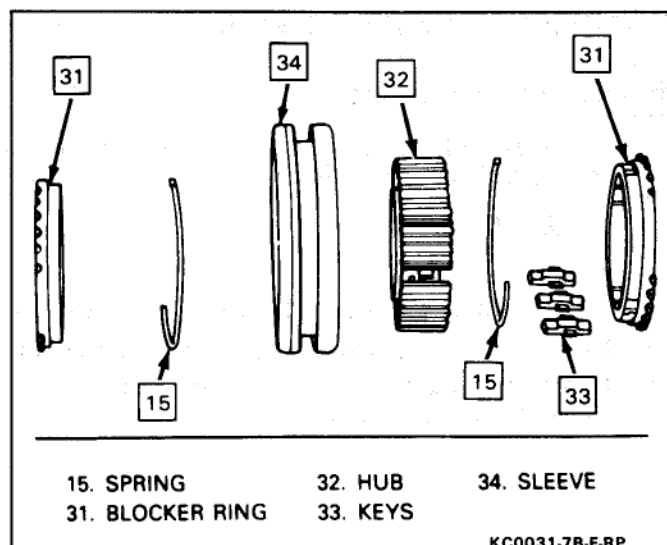


Figure 25 Third-Fourth Synchronizer Assembly

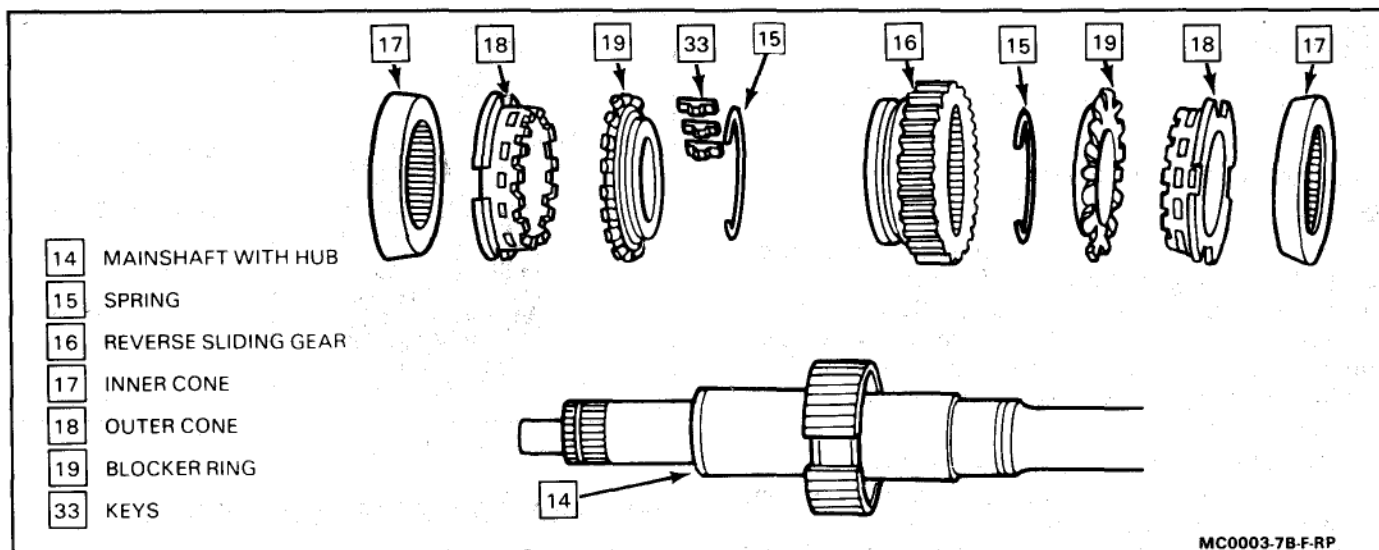


Figure 26 First-Second Synchronizer Assembly

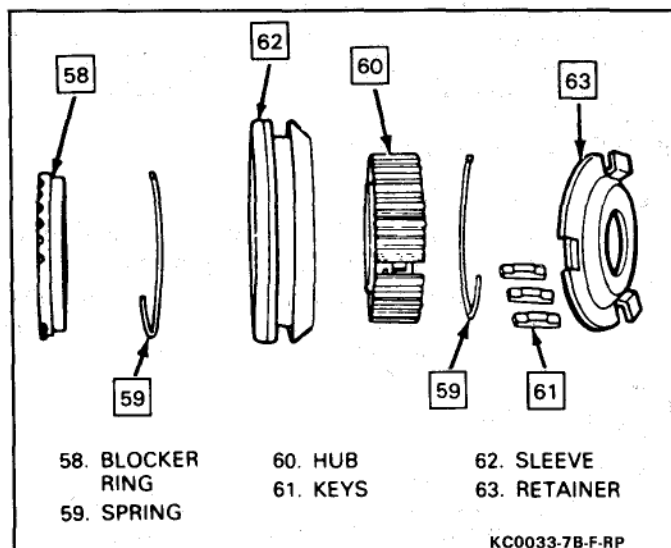


Figure 27 Fifth Gear Synchronizer Assembly

EXTENSION HOUSING OIL SEAL

Remove or Disconnect

- Oil seal out of extension housing, using a screwdriver or small chisel.

Install or Connect

Tool Required:

J 21426 Extension Housing Seal Installer

- New oil seal into extension housing using J 21426.
- Lubricate inside diameter of seal with transmission lubricant.

EXTENSION HOUSING BUSHING

Figure 28

Remove or Disconnect

Tools Required:

J 8092 Universal Driver Handle

J 23062-14 Extension Housing Bushing Remover and Installer

- Oil seal out of extension housing, using a screwdriver or small chisel.
- Bushing out of housing, using J 8092 with J 23062-14.

Install or Connect

Tools Required:

J 8092 Universal Driver Handle

J 23062-14 Extension Housing Bushing Remover and Installer

J 21426 Extension Housing Seal Installer

- Bushing in housing, using J 8092 with J 23062-14.
 - New oil seal into extension housing using J 21426.
- Lubricate inside diameter of seal with transmission lubricant.

DRIVE GEAR BEARING RETAINER OIL SEAL

Figure 29

Remove or Disconnect

- Oil seal, using a screwdriver or small chisel.

Install or Connect

Tool Required:

J 37375 Drive Gear Bearing Retainer Seal Installer

- New seal into retainer using J 37375 until it bottoms in bore.
- Lubricate inside diameter of seal with transmission lubricant.

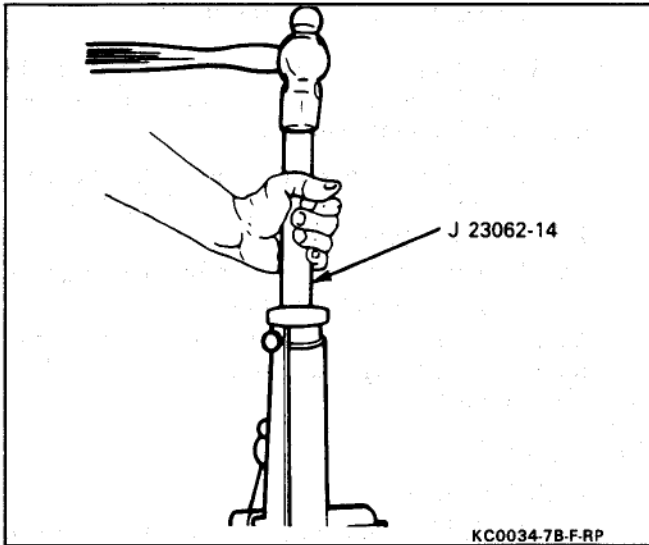


Figure 28 Installing Extension Housing Bushing

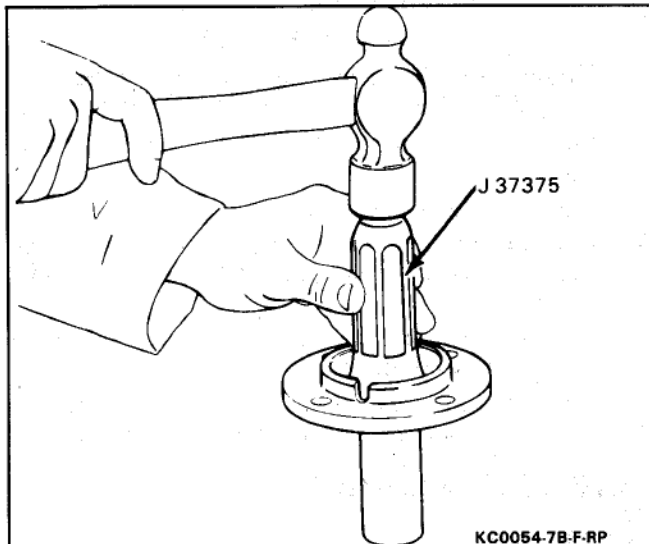


Figure 29 Installing Bearing Retainer Oil Seal

TRANSMISSION COVER

Figures 30 and 31

Disassemble

- Place selector arm plates and shift rail in neutral position (centered).
- Rotate shift rail until selector arm disengages from selector arm plates and roll pin is accessible.

1. Selector arm roll pin using a pin punch and hammer (Figure 31).
2. Shift rail, shift forks, shift fork plates, selector arm, interlock plate and roll pin.
3. Transmission cover to extension housing O-ring seal using a screwdriver.
4. Nylon inserts and shift fork plates from shift forks.
 - Note position of inserts and plates for assembly reference.

Assemble

1. Nylon inserts and shift fork plates in shift forks.
 - If removed, coat edges of shift rail plug with sealer GM p/n 1052624, or equivalent, before installing.
 - Coat shift rail and rail bores with transmission lubricant.
2. Shift rail in cover until flush with inside edge of cover.
3. Place first-second shift fork in cover with fork offset facing rear of cover and push shift rail through fork.
 - The first-second shift fork is the larger of the two forks.
4. Selector arm and C-shaped interlock plate in cover and insert shift rail through arm.
 - Widest part of interlock plate must face away from cover, and selector arm roll pin hole must face downward and toward rear of cover.
5. Third-fourth shift fork in cover with fork offset facing rear of cover.
 - Third-fourth shift fork plate must be under first-second shift fork plate.
6. Shift rail through third-fourth shift fork and into front bore in cover.
 - Rotate shift rail until shift fork plate at forward end of rail faces away from, but is parallel to cover.
 - Align roll pin holes in selector arm and shift rail and install roll pin.
 - Roll pin must be flush with surface of selector arm to prevent pin from contacting shift fork plates during shifts.
7. New transmission cover to extension housing O-ring seal.
 - Coat O-ring seal with transmission lubricant.

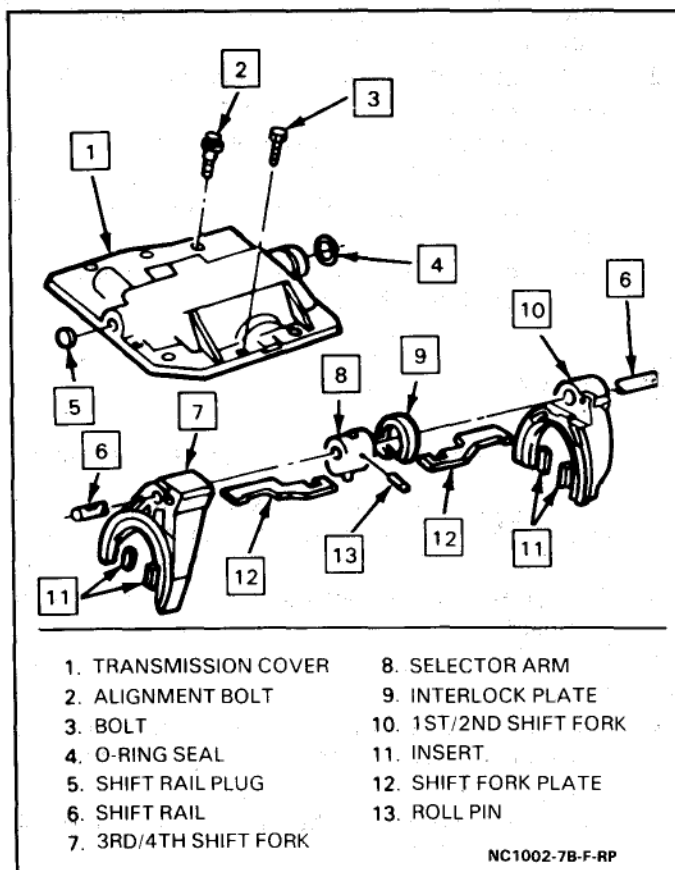


Figure 30 Transmission Cover

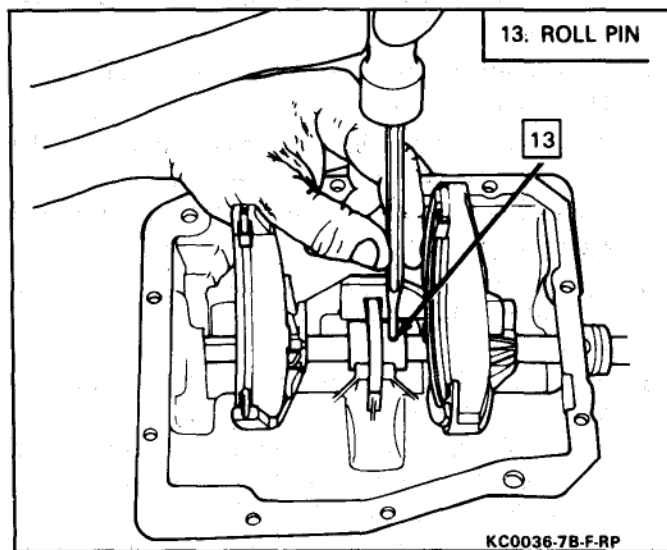


Figure 31 Removing Selector Arm Roll Pin

FRONT COUNTERSHAFT BEARING

Figures 32 through 35

Remove or Disconnect

Tools Required:

- J 37358-1, -2 Bearing Race Receiver and Case Support
- J 22912-01 Bearing and Gear Puller
- J 37359 Countershaft Bearing Remover
- J 8092 Universal Driver Handle

NOTICE: Failure to support the case properly will result in permanent distortion of the case during bearing race removal.

1. Countershaft front bearing race and O-ring from the transmission case, using J 37358-1 with J 37358-2 and a press.
 - Remove the front countershaft bearing race only if it is worn or damaged.
2. Countershaft front bearing from the countershaft, using J 22912-01 with J 37359, J 8092 and a press.

Install or Connect

Tools Required:

- J 37357 Countershaft Bearing and Race Remover and Installer
- J 22912-01 Bearing and Gear Puller
- J 8092 Universal Driver Handle

1. Countershaft front bearing onto the countershaft, using J 37357 with J 22912-01, J 8092 and a press.
2. New O-ring onto the countershaft front bearing race.
 - Lubricate the O-ring.
3. Countershaft front bearing race into the transmission case, using J 37357 with J 8092 and a press.
 - Lightly tap the race into its bore until the O-ring is compressed.
 - Use a press to install the race until its shoulder rests on the inside of the case.

DRIVE GEAR ASSEMBLY

Assemble

Tools Required:

- J 22912-01 Bearing and Gear Puller
- J 6133-01 Installer

1. Bearing onto the drive gear, using J 22912-01 with J 6133-01 and a press.
 - Coat roller bearings and drive gear bearing bore with lightweight grease.
2. Roller bearings into the bore of the drive gear.
3. Thrust bearing and race into the drive gear.

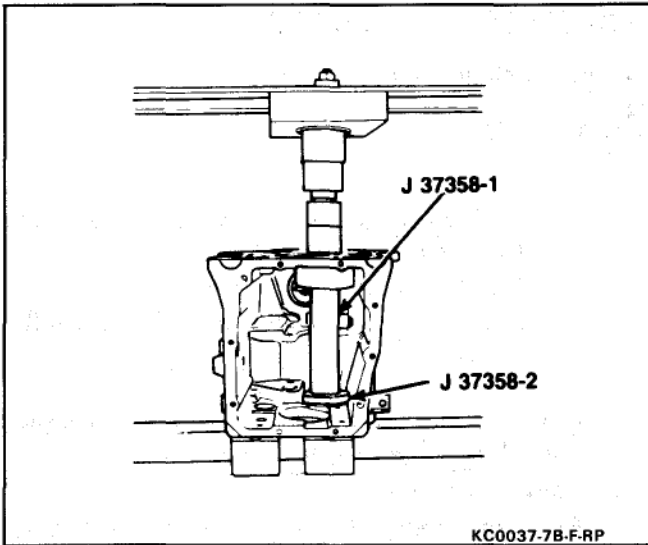


Figure 32 Removing Bearing Race from Case

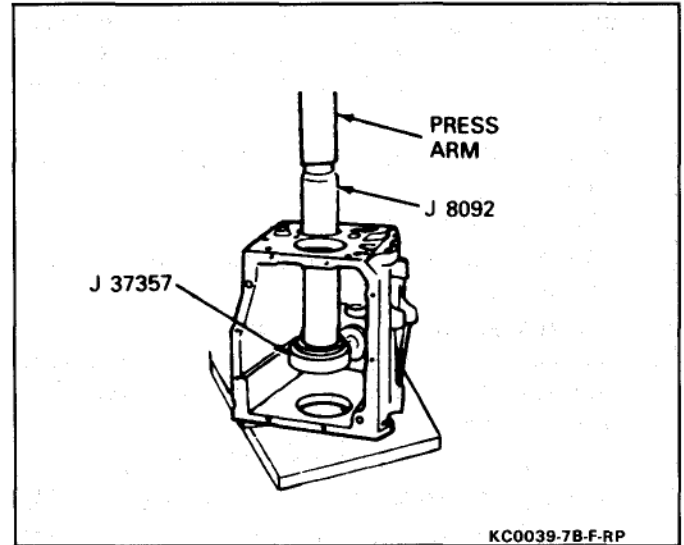


Figure 35 Installing Bearing Race to Case

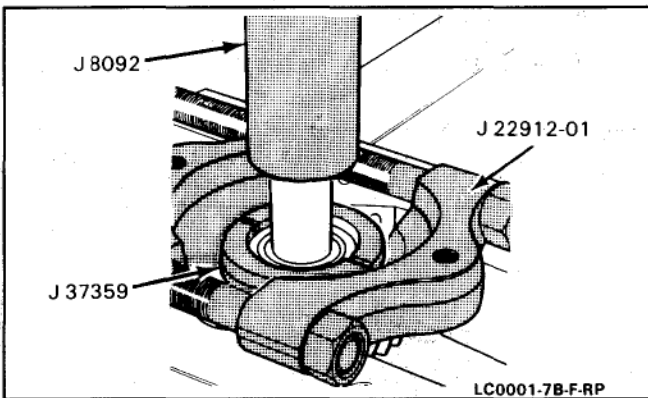


Figure 33 Removing Bearing from Countershaft

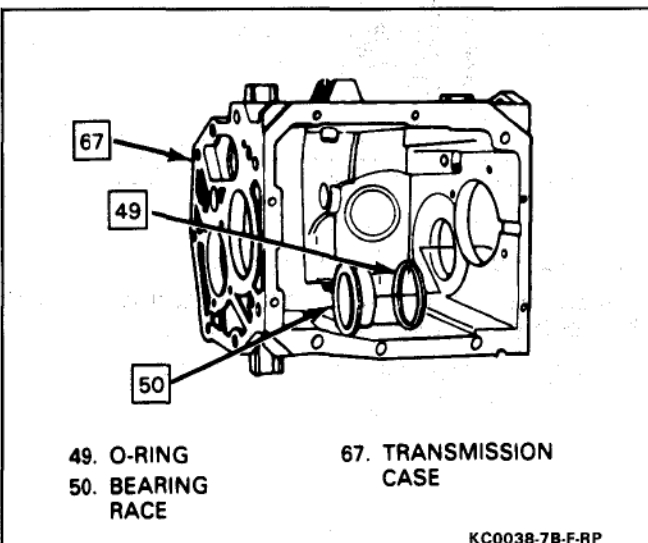


Figure 34 Front Countershaft Bearing Assembly

MAINSHAFT ASSEMBLY

Figures 19, 20, 21 and 36

Assemble

Tools Required:

- J 25234 Front and Rear Bearing Installer
- J 37360 Spiral Snap Ring Installer
- J 37372 Synchronizer and Gear Installer

NOTICE: If replacing first/second or third/fourth synchronizer blocker rings, soak new blocker ring assemblies for 10 minutes in Dexron®-IIE or equivalent before assembly on mainshaft.

- Coat mainshaft and gear bores with transmission lubricant.
- 1. First-second synchronizer sleeve on mainshaft hub aligning marks made at disassembly.

NOTICE: Use care in synchronizer spring placement. If synchronizer is assembled with improper spring replacement, hard shifting will result.

- 2. First-second synchronizer keys and springs.
 - Engage tang end of each spring in same synchronizer key, but position open end of springs opposite of each other.
- 3. Three-piece first gear blocker ring assembly.
- 4. Locating pin into mainshaft.
- 5. Sleeve and needle bearing onto mainshaft, aligning notch in sleeve with locating pin.
- 6. First gear, aligning slots in first gear with tabs on blocker ring assembly.
- 7. Rear mainshaft bearing with taper facing rear of shaft.
 - Lubricate fifth gear splines with petroleum jelly.

NOTICE: Carefully align the mainshaft and gear splines. If splines are improperly aligned, damage could occur when the gear is pressed onto the mainshaft.

8. Fifth gear onto mainshaft, using J 25234 and a press.
9. Fifth gear snap ring.
10. Three-piece second gear blocker ring assembly and thrust washer.
11. Spiral snap ring, using J 37360.
12. Second gear spacer, needle bearing and gear, aligning slots in second gear with tabs on blocker ring assembly.
13. Second gear thrust washer and snap ring.
14. Third gear spacer and needle bearing assembly.
 - Make sure the bearing spacer is not trapped between the gear face and snap ring. The spacer runs inside the gear bore.
15. Third-fourth synchronizer, third blocker ring, sleeve, hub and third gear as an assembly, using J 37372 and a press.
16. Thrust bearing and race to front end of mainshaft.

! Important

- Before pressing components together, make sure the synchronizer hub faces the short end of the mainshaft. Hold third gear against the synchronizer to maintain blocker ring alignment with keys.

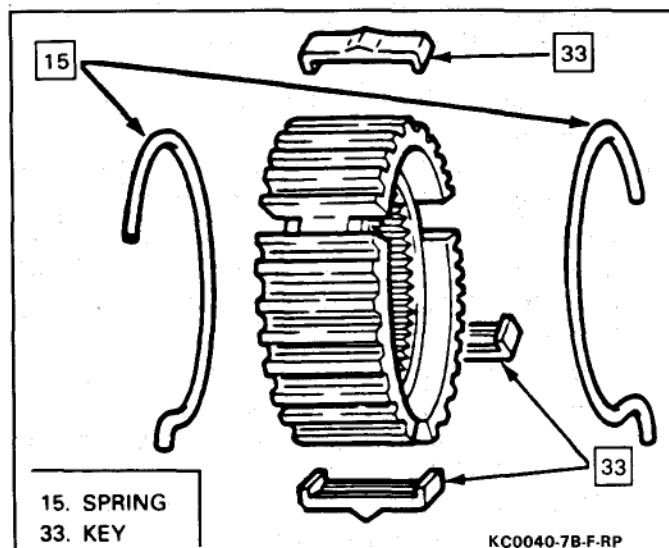


Figure 36 Synchronizer Springs

TRANSMISSION ASSEMBLY

Figures 1 through 18 and 37 through 39



Assemble

Tools Required:

- J 37357 Countershaft Bearing and Race Remover and Installer
- J 8092 Universal Driver Handle
- J 37372 Synchronizer and Gear Installer
- J 8001 Dial Indicator

1. Front countershaft bearing onto countershaft using J 37357 with J 8092 and a press.
2. Countershaft in case.
3. Rear countershaft bearing to countershaft using J 37372 and a press (Figure 37).

NOTICE: Failure to properly support the countershaft may result in permanent distortion of the case during installation.

- Support the countershaft with J 37357.

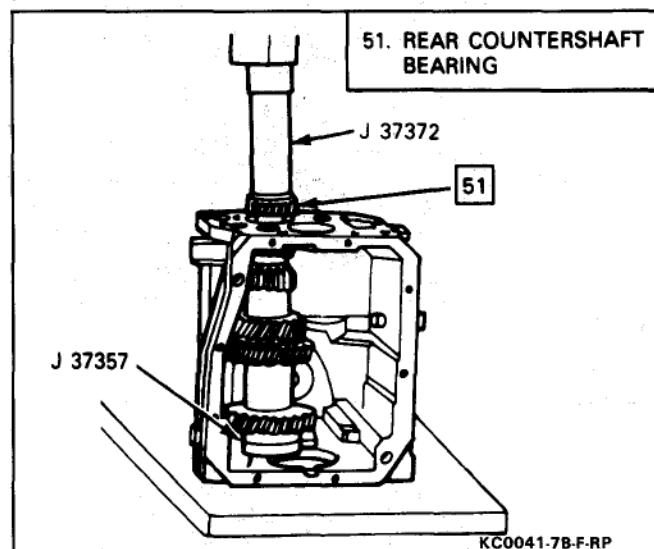


Figure 37 Installing Rear Countershaft Bearing

4. Rear countershaft bearing race.
5. Rubber O-ring and reverse idler gear in case with shift lever groove facing rear of case.
6. Reverse idler shaft from rear of case.
7. Roll pin in idler shaft.

8. Countershaft retainer (without shims) to transmission housing.



Tighten

- Countershaft retainer bolts to 20 N·m (15 lb. ft.).



Measure

- Countershaft end play using dial indicator J 8001.

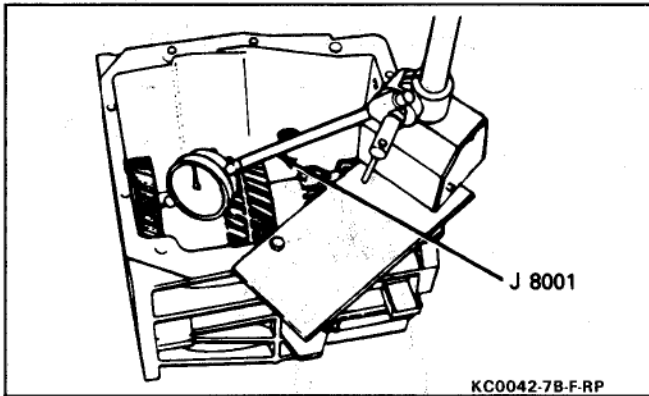


Figure 38 Measuring Countershaft End Play

- Remove retainer and install shim(s) as necessary to provide proper end play. Zero end play with no preload is ideal, but up to 0.10 mm (0.004 inch) end play is allowable. Do not preload bearing with shim(s) larger than original end play measurement. Refer to "Specifications" in this section.
- Reinstall retainer and bolts.
- Tighten**

 - Bolts to 20 N·m (15 lb. ft.).
 - Bend tabs over the four attaching bolts.
9. Reverse shift fork in case.
 10. Assembled mainshaft in transmission case.
 11. Rear mainshaft bearing race in case.
 12. Drive gear in case (make sure rollers, thrust bearing and washer are in place), and engage in third-fourth synchronizer sleeve and blocker ring.
 13. Front bearing race in front bearing retainer.
 - Do not install shims in front bearing retainer at this time.
 - Temporarily install front bearing retainer.
 14. Fifth gear on countershaft.
 - Slide shift rail/fifth gear shift fork assembly into case. As shift rail enters case, align reverse shift fork and slide rail through fork. Position lever return spring in case with long end of spring to rear, and slide rail through spring (Figure 10).

15. Blocker ring and fifth gear synchronizer in fifth gear shift fork.

- Slide fork rail assembly and synchronizer into position.

16. Fifth gear synchronizer retainer and snap ring (Figure 9).

17. Oiling funnel into rear of countershaft (Figure 6).

18. Fifth/reverse shift lever in case.

19. Lever return spring to front of case.

- Make sure reverse shift fork pin and fifth gear shift rail pin are engaged with shift lever.

20. Fifth gear/reverse lever pivot bolts and retaining clip.

- Coat pivot bolt threads with pipe thread sealant GM p/n 1052080.



Tighten

- Pivot bolt to 27 N·m (20 lb. ft.).

21. Backup lamp switch.

- Coat threads with pipe thread sealant GM p/n 1052080.

22. Speedometer gear and retaining clip.

23. Circlip.

- Apply 3 mm (1/8-inch) bead of RTV Sealant GM p/n 12345739 to transmission cover assembly.

- Make sure all synchronizers are in the neutral position and that the shift forks in the cover are in the neutral (center) position.

- Lower cover onto case while aligning shift forks and synchronizer sleeves.

24. Cover and install two dowel bolts.

25. Remaining cover bolts.



Tighten

- Cover bolts to 13 N·m (115 lb. in.).

- Apply 3 mm (1/8-inch) bead of RTV Sealant GM p/n 12345739 to extension housing mating surface.

- Coat detent spring with petroleum jelly and insert in offset lever.

- Lubricate detent plate and install detent ball in neutral position on plate.

- Position offset lever in extension housing with spring over detent ball. Slide lever and extension into position as an assembly.

26. Extension housing vent.

- Press downward on offset lever to compress detent spring and push lever and housing into position.

27. Extension housing bolts.

- Apply pipe thread sealant GM p/n 1052080 to threads of bolts.



Tighten

- Extension housing bolts to 30 N·m (22 lb. ft.).

28. Roll pin in offset lever and shift rail.
29. Damper sleeve in offset lever.
 - Turn transmission case on end, and mount a dial indicator on extension housing with indicator on the end of mainshaft (Figure 39).



Measure

- Mainshaft end play.
 - Rotate mainshaft and zero dial indicator. Pull upward on mainshaft until end play is removed and record reading.
 - Ideal mainshaft end play is zero with plus or minus 0.02 mm (0.001 inch) allowable.
 - To set preload, select a shim pack equal to the dial indicator reading recorded.
 - Remove front bearing retainer and front bearing race.
 - Install necessary shims and reinstall bearing race. Refer to "Specifications" in this section.
 - Apply a 3 mm diameter (1/8-inch) bead of RTV Sealant GM p/n 12345739 on case mating surface of front bearing retainer.
30. Bearing retainer.
 - Apply pipe thread sealant GM p/n 1052080 to the threads of the retainer bolts.
 31. Retainer bolts.



Tighten

- Retainer bolts to 20 N·m (15 lb. ft.).

- Apply pipe thread sealant GM p/n 1052080 to the threads of the drain and fill plugs.
32. Drain plug.



Tighten

- Drain plug to 27 N·m (20 lb. ft.).
 - Fill the transmission to its proper level with Dexron®-IIIE.
33. Fill plug.



Tighten

- Fill plug to 27 N·m (20 lb. ft.).

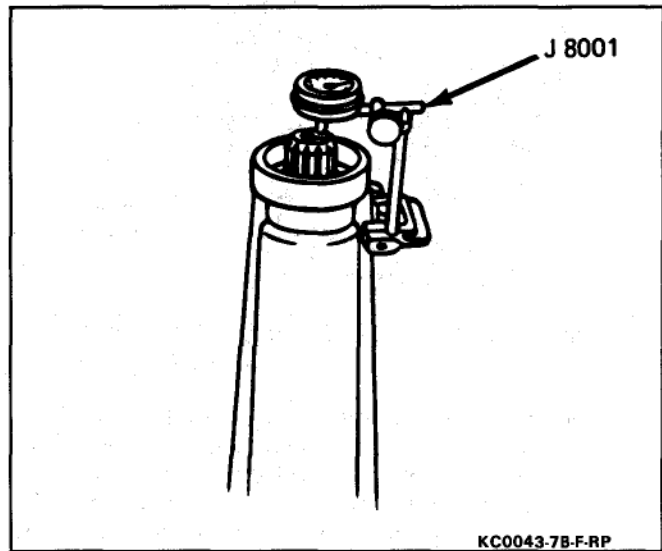


Figure 39 Measuring Mainshaft End Play

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Catalytic Converter-to-Transmission Nut	52 N·m (38 lb. ft.)
Transmission-to-Flywheel Housing Bolt	75 N·m (55 lb. ft.)
Extension Housing Bolt	30 N·m (22 lb. ft.)
Transmission Cover-to-Case Bolt	13 N·m (115 lb. in.)
Front Bearing Retainer Bolt	20 N·m (15 lb. ft.)
Countershaft Retainer Bolt	20 N·m (15 lb. ft.)
Reverse Pivot Bolt	27 N·m (20 lb. ft.)
Fill Plug	27 N·m (20 lb. ft.)
Drain Plug	27 N·m (20 lb. ft.)
Support-to-Rail Bolt	54 N·m (40 lb. ft.)
Transmission Mount-to-Transmission Bolt	54 N·m (40 lb. ft.)
Transmission Mount-to-Support Nut	47 N·m (35 lb. ft.)
Transmission Mount-to-Support Bolt	54 N·m (40 lb. ft.)
Speed Sensor Retainer Bolt	10 N·m (89 lb. in.)
Shift Control Assembly Boot Screw	6 N·m (53 lb. in.)
Shift Control Assembly Bolt	17 N·m (13 lb. ft.)
Vehicle Speed Sensor Retainer Bolt	10 N·m (89 lb. in.)
Torque Arm Outer Bracket Nut	41 N·m (30 lb. ft.)
Torque Arm-to-Rear Axle Differential Nut	133 N·m (98 lb. ft.)

LUBRICANT SPECIFICATIONS

Lubricant Capacity (approximate)	2.8 Liters (2.96 quarts)
Lubricant Recommended	Dexron®-IIE

SPEEDOMETER GEAR CHART

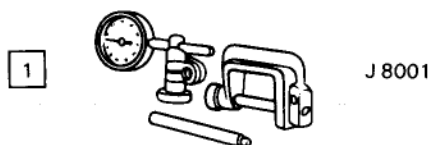
SPEEDOMETER GEAR CHART						
TIRE SIZE	AXLE RATIO	TRANSMISSION	DRIVE GEAR		DRIVEN GEAR	
			COLOR	TEETH	COLOR	TEETH
P215/65R15 P235/55R16 P245/50ZR16	3.08	M39	RED	9	GREY	22
P215/65R15 P245/50ZR16	3.42	MB1 MK6	PURPLE	7	WHITE	19

MC0004-7B-F-RP

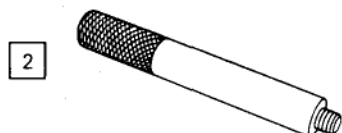
SHIM SPECIFICATIONS

Input/Mainshaft		Countershaft	
Thickness (inches)	GM P/N	Thickness (inches)	GM P/N
0.012	14050783	0.1005	10117781
0.014	14050780	0.102	10117782
0.016	14050781	0.1035	10117783
0.018	14050782	0.105	10117784
0.020	14050784	0.1065	10117785
0.022	14050786	0.108	10117786
0.023	14050787	0.1095	10117787
0.024	14069868	0.111	10117788
0.025	14069869	0.1125	10117789
0.026	14069870	0.114	10117790
0.027	14069871	0.1155	10117791
0.028	14069872	0.117	10117792
0.029	14069873	0.1185	10117793
0.030	14069874	0.120	10117794
0.031	14069875	0.1215	10117795
0.032	14069876	0.123	10117796
0.033	14069877	0.1245	10117797
0.034	14069878	0.126	10117798
0.035	14069879	0.1275	10117799
0.036	14050785	0.129	10117800
0.037	14069880	0.1305	10117801
0.038	14069881	0.132	10117802
0.039	14069882	0.1335	10117803
0.040	14069883	0.135	10117804
0.041	14069884	0.1365	10117805
0.042	14069885	0.138	10117806
0.043	14069886	0.1395	10117807
0.044	14069887	0.141	10117808
		0.1425	10117809
		0.144	10117810
		0.1455	10117811
		0.147	10117812
		0.1485	10117813
		0.150	10117814
		0.1515	10117815
		0.1530	10117816

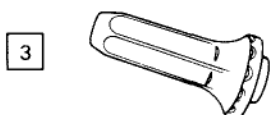
SPECIAL TOOLS



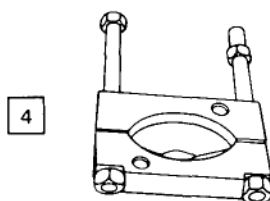
J 8001



J 8092



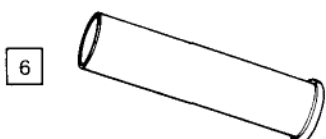
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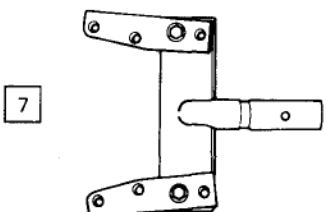
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J 23062-14



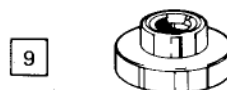
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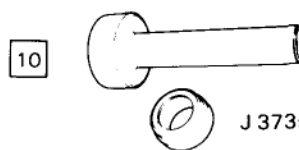
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J 37357



J 37358-1

J 37358-2



J 37359



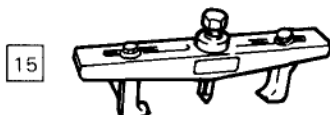
J 37360



J 37372



J 37375



J 8433

- 1 DIAL INDICATOR
- 2 UNIVERSAL DRIVER HANDLE
- 3 EXTENSION HOUSING SEAL INSTALLER
- 4 BEARING AND GEAR PULLER
- 5 EXTENSION HOUSING BUSHING REMOVER AND INSTALLER
- 6 FRONT AND REAR BEARING INSTALLER
- 7 HOLDING FIXTURE
- 8 INSTALLER

- 9 COUNTERSHAFT BEARING AND RACE REMOVER AND INSTALLER
- 10 BEARING RACE RECEIVER AND CASE SUPPORT
- 11 COUNTERSHAFT BEARING REMOVER
- 12 SPIRAL SNAP RING INSTALLER
- 13 SYNCHRONIZER AND GEAR INSTALLER
- 14 DRIVE GEAR BEARING RETAINER SEAL INSTALLER
- 15 HEAVY DUTY PULLEY PULLER

