

SECTION C

FOUR-SPEED MANUAL TRANSMISSION

SKYLARK GRAN SPORT

CONTENTS

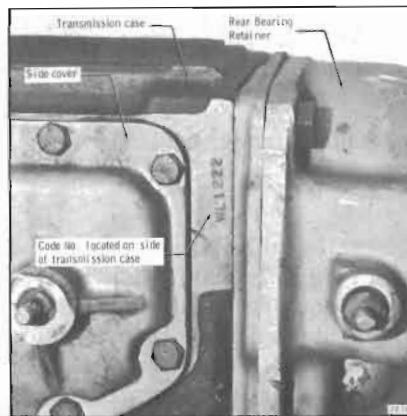
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DIVISION I SPECIFICATIONS AND ADJUSTMENTS

72-1 GENERAL SPECIFICATIONS

a. Transmission Identification

A production code number is stamped on all Skylark Gran Sport four-speed manual transmission. The code number is located in the



upper right hand corner of the transmission case. See Figure 72-100.

This number should always be furnished on all product reports, AFA forms, and all correspondence with the factory concerning a particular transmission.

Figure 72-100—Transmission Code Number

b. General Specifications

Type	All forward gears synchronized
Mounting	Unit with engine
Lubricant	
Type	SAE 80 or 80-90 Multi-Purpose
Capacity	2-1/2 Pints
Synchronization	1st, 2nd, 3rd and 4th
Gear Ratios	
1st	2.20 to 1
2nd	1.64 to 1
3rd	1.31 to 1
4th	1.00 to 1
Reverse	2.26 to 1
Gear Shifting	On floor
Speedometer Drive Gear	Press fit

c. Bolt Tightening Specifications

Front Main Bearing Retainer	15-20 lb. ft.
Side Cover to Case	15-20 lb. ft.
Rear Main Bearing Retainer	See Figure 72-126
Shift Lever to Shifter Shaft	

NOTE: These specifications are for clean and lubricated threads only. Dry or dirty threads produce increased friction which prevents accurate measurement of tightness.

Use a reliable torque wrench to tighten the attaching bolts of the above listed parts.

DIVISION II DESCRIPTION AND OPERATION**72-2 DESCRIPTION OF THE 4-SPEED
MANUAL TRANSMISSION**

The Skylark Gran Sport will have as optional equipment a 4-speed

manually operated transmission with all forward gears synchronized. All forward speed changes are accomplished with synchro-

nizer sleeves. See Figure 72-101.

Power flow in all gears is shown in Figure 72-102.

DIVISION III SERVICE PROCEDURES**72-3 REMOVAL AND INSTALLATION
OF TRANSMISSION****a. Removal**

1. Disconnect speedometer cable and remove driven gear.
2. Disconnect shift control rods from transmission.
3. Remove propeller shaft.
4. Support rear of engine and remove transmission support.
5. Remove the two (2) top transmission to flywheel housing bolts and insert guide pins.
6. Remove the two (2) lower transmission to flywheel housing attaching bolts.

7. Slide transmission straight back on guide pins until the main drive gear is free of splines in the clutch friction plate.

NOTE: If guide pins are not used damage to the clutch disc can result.

8. Remove transmission.

b. Installation

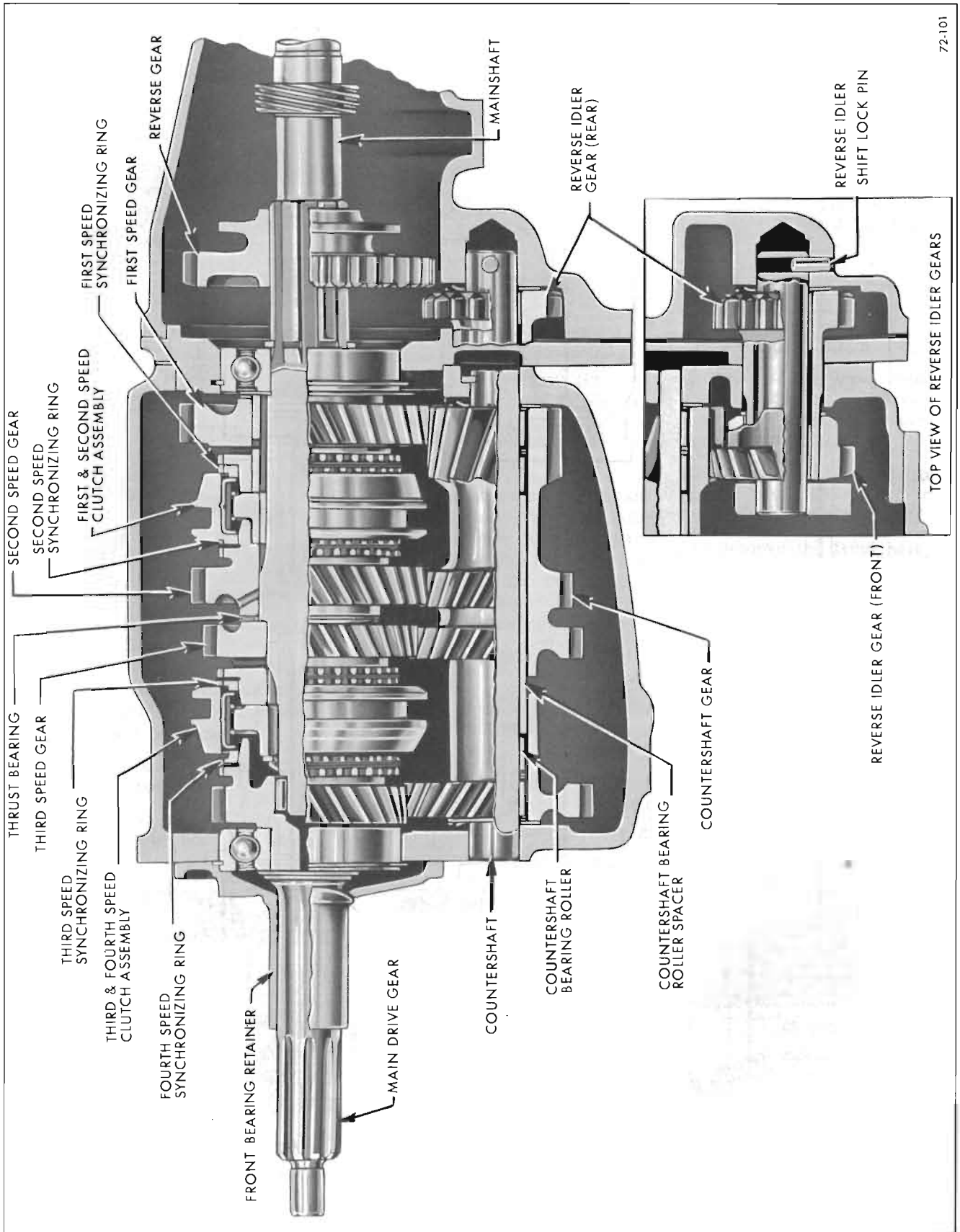
1. Install guide pin in upper and lower right transmission to flywheel housing bolt holes for alignment and place transmission on guide pins. Place transmission in third gear and rotate transmission mainshaft as necessary to start main drive gear into clutch disc.

NOTE: If guide pins are not used damage to the clutch disc can result.

2. Install two (2) lower transmission mounting bolts. Remove guide pin and install two (2) upper bolts. Torque bolts to 45 to 60 lb. ft.
3. Install transmission support.
4. Install propeller shaft.
5. Install speedometer driven gear, and connect speedometer cable.
6. Connect linkage and adjust as described in Group 73.

72-4 DISASSEMBLY OF TRANSMISSION

1. Drain lubricant.



72-101

Figure 72-101—Gear Synchronizers

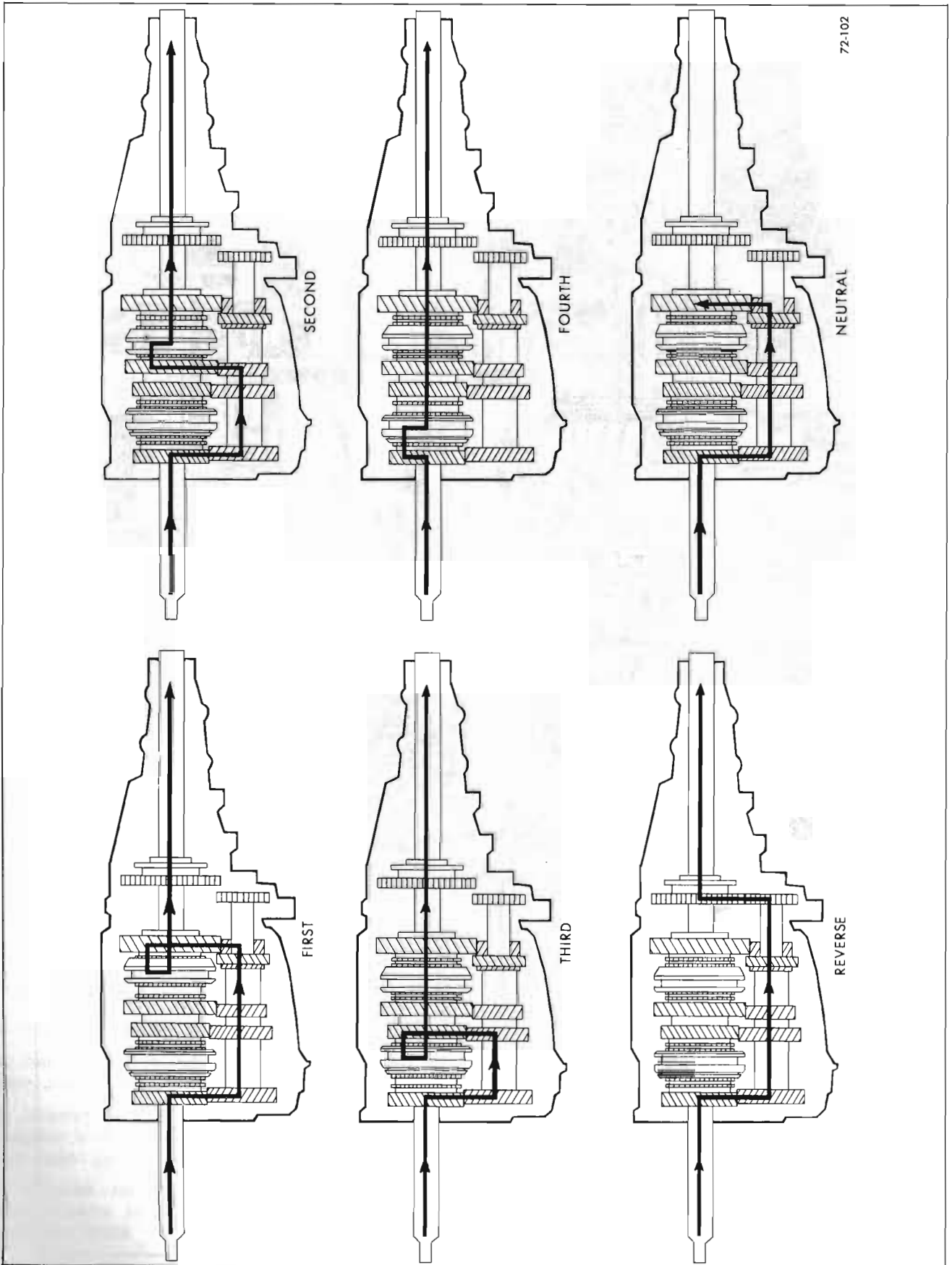


Figure 72-102—Power Flow

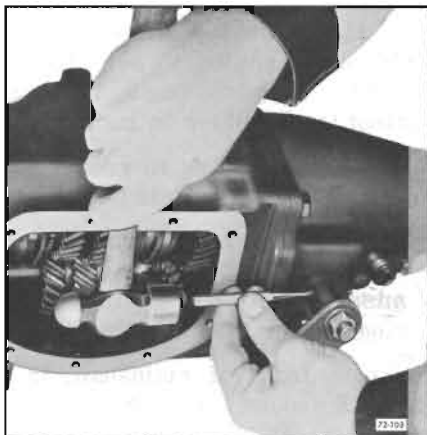


Figure 72-103—Removing Reverse Shifter Shaft Lock Pin

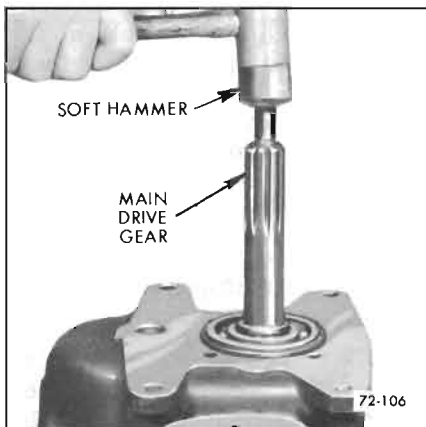


Figure 72-106—Removing Main Drive Gear

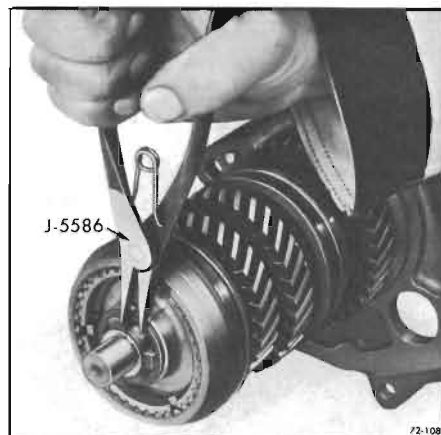


Figure 72-108

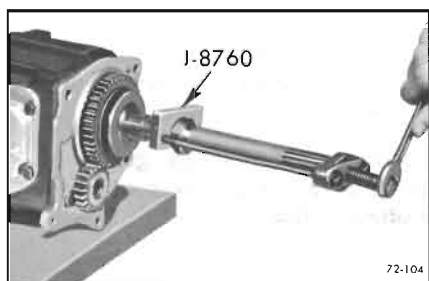


Figure 72-104—Removing Speedometer Drive Gear

in Figure 72-103, and pull shifter shaft out about 1/8". This disengages the reverse shift fork from reverse gear.

5. Remove rear extension to case attaching bolts. Tap extension with soft hammer in a rearward direction. When the reverse idler shaft is out as far as possible, move extension side ways so reverse fork clears reverse gear.

6. Remove rear bearing snap ring on mainshaft.

7. Remove speedometer drive gear with J-8760. See Figure 72-104.

8. Remove reverse gear, reverse idle gear and tanged thrust washer.

9. Remove self-locking bolt at-

taching rear bearing retainer to transmission case. Carefully remove the entire mainshaft assembly.

10. Unload needle bearings from main drive gear and remove fourth speed blocking ring.

11. Remove the front half of reverse idler gear and thrust washer.

12. Remove main drive gear snap ring. See Figure 72-105 and remove spacer washer.

13. With soft hammer, tap main drive gear down through front main bearing. See Figure 72-106.

14. Remove front main bearing from case.

15. Using countershaft alignment Tool J-9573, remove countergear

2. Remove side cover attaching bolts. Remove side cover assembly and gasket from case.

3. Remove front main bearing retainer and gasket.

4. Drive lock pin up from reverse shift lever boss, as shown

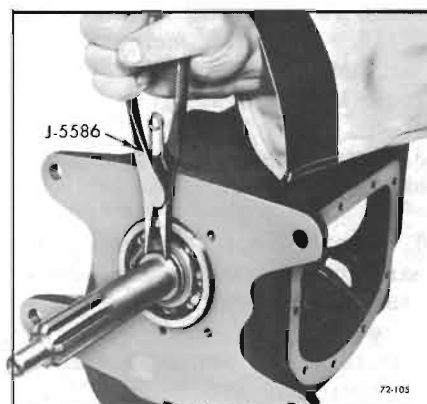


Figure 72-105—Removing Main Drive Gear Snap Ring

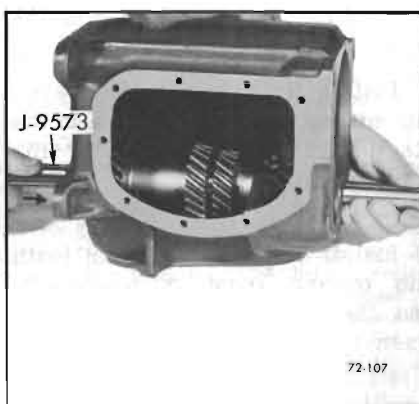


Figure 72-107—Removing Countershaft

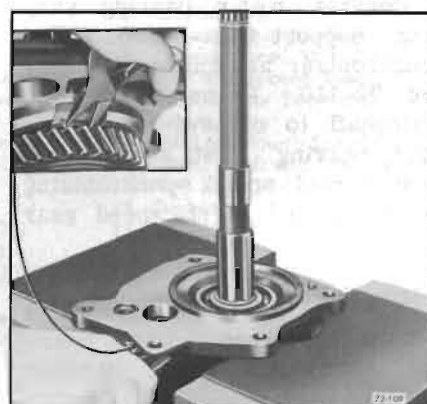


Figure 72-109—Removing Rear Bearing from Retainer



Figure 72-110—Removing Rear Bearing from Mainshaft

shaft. Remove two (2) tanged bronze thrust washers. See Figure 72-107.

72-5 MAINSHAFT ASSEMBLY

a. Disassembly

1. Remove third-fourth speed synchronizer assembly retaining snap ring. See Figure 72-108.

2. Slide third-fourth speed synchronizer assembly third speed gear, second and third speed gear thrust washer (needle roller bearing), second speed gear and second speed blocking ring from front of mainshaft.

3. Spread rear bearing retainer snap ring and press mainshaft out of retainer. See Figure 72-109.

4. Remove rear bearing snap ring. Support first-second speed synchronizer assembly. See Figure 72-110. Press on rear of mainshaft to remove shaft from rear bearing, first speed gear, first-second speed synchronizing assembly and first speed gear bushing.

b. Inspection

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

2. Blow out bearings with compressed air.

CAUTION: Do not allow the bearings to spin, but turn them slowly by hand. Make certain bearings are clean, then lubricate with light engine oil and check for roughness by slowly turning the race by hand.

3. Check synchronizer hubs, sliding keys and springs and if necessary replace as follows:

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

a. Mark hub and sleeve so they can be reassembled in the same position.

b. Remove sliding sleeve from synchronizer hub.

c. Place three (3) keys and two springs in position (one on each side of hub) so all three (3) keys are engaged by both springs. See Figure 72-111. Synchronizer springs should be installed so tanged end of each spring falls into the same key in the hub. Slide the sleeve onto the hub aligning the marks made at disassembly.

c. Assembly

1. From rear of mainshaft, assemble first and second speed synchronizer assembly to mainshaft. Using Press Plate J-8853 press first gear bushing on mainshaft. See Figure 72-112.

2. Install first speed gear synchronizing ring so notches in the ring align to the keys in the synchronizing hub. See Figure 72-113.

3. Install first speed gear (with hub toward front of mainshaft) and the first speed gear thrust washer. Make certain that the grooves in the washer are facing the first speed gear.

4. Using Press Plate J-8853, press on rear bearing. Other

snap ring groove must be toward front of transmission. See Figure 72-114. Firmly seat bearing against the shoulder on mainshaft.

5. Install snap ring in groove in mainshaft behind rear bearing.

NOTE: Always use new snap rings when reassembling transmission. Do not expand snap ring further than necessary.

6. From front of mainshaft, install the second speed gear blocking ring. Notches in ring must align with keys in hub.

7. Install second speed gear with hub of gear toward rear of transmission.

8. Install second-third speed gear thrust washer. (needle roller bearing)

9. Install third speed gear with hub of gear toward front of transmission. Install third speed blocking ring.

10. Install third-fourth speed synchronizer assembly.

NOTE: Make certain keys in hub align with notches in third speed blocking ring.

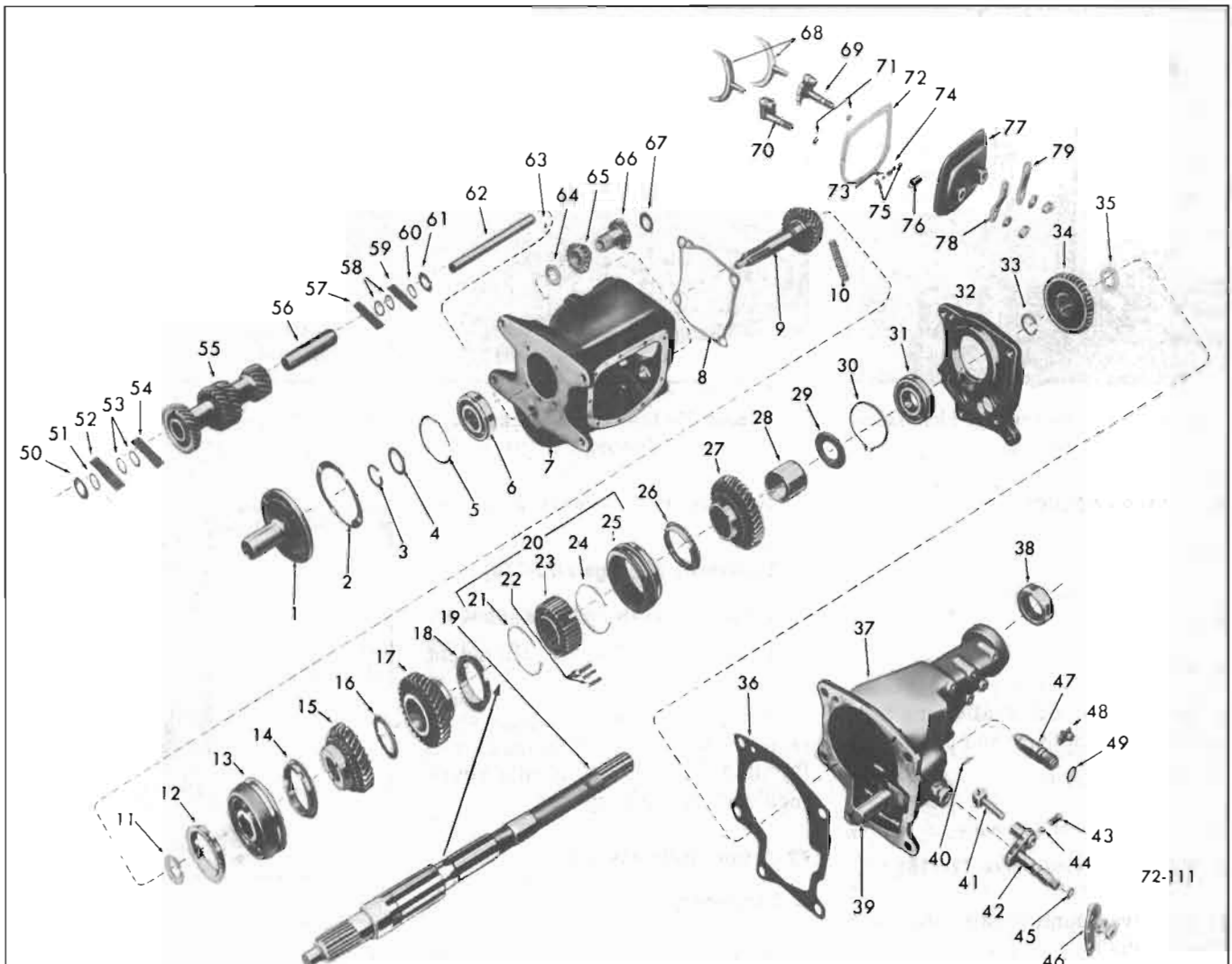
11. Install third-fourth speed synchronizer assembly retaining snap ring.

12. Install rear bearing retainer. Spread snap ring in the retainer to allow the snap ring to drop around rear bearing. See Figure 72-115. Press on end of mainshaft until the snap ring engages groove in rear bearing.

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

14. Press speedometer drive gear onto mainshaft, using J-8853, press plate. Position speedometer gear 4-1/2 from center of gear to rear bearing retainer. See Figure 72-116.

15. Install rear bearing snap ring on mainshaft.



- | | | | |
|---|--|--|--|
| 1. Bearing Retainer | 20. First and Second Speed Clutch Assembly | 41. Reverse Shift Fork | 61. Tanged Washer |
| 2. Gasket | 21. Clutch Key Spring | 42. Reverse Shifter Fork and Detent Plate | 62. Countershaft |
| 3. Selective Fit Snap Ring | 22. Clutch Keys | 43. Reverse Shifter Shaft Ball Detent Spring | 63. Countershaft Woodruff Key |
| 4. Spacer Washer | 23. Clutch Hub | 44. Reverse Shifter Shaft Detent Ball | 64. Reverse Idler Front Thrust Washer (Flat) |
| 5. Bearing Snap Ring | 24. Clutch Key Spring | 45. Reverse Shifter Shaft "O" Ring Seal | 65. Reverse Idler Gear (Front) |
| 6. Main Drive Gear Bearing | 25. First and Second Speed Clutch Sliding Sleeve | 46. Reverse Shifter Lever | 66. Reverse Idler Gear (Rear) |
| 7. Transmission Case | 26. First Speed Gear Synchronizing Ring | 47. Speedometer Driven Gear and Fitting | 67. Tanged Thrust Washer |
| 8. Rear Bearing Retainer Gasket | 27. First Speed Gear | 48. Retainer and Bolt | 68. Forward Speed Shift Forks |
| 9. Main Drive Gear | 28. First Speed Gear Bushing | 49. "O" Ring Seal | 69. First and Second Speed Gear Shifter Shaft and Detent Plate |
| 10. Bearing Rollers (14) | 29. First Speed Gear Thrust Washer | 50. Tanged Washer | 70. Third and Fourth Speed Gear Shifter Shaft and Detent Plate |
| 11. Snap Ring (.086" to .088") | 30. Rear Bearing Snap Ring | 51. Spacer (.050") | 71. "O" Ring Seals |
| 12. Fourth Speed Gear Synchronizing Ring | 31. Rear Bearing | 52. Bearing Rollers (20) | 72. Gasket |
| 13. Third and Fourth Speed Clutch Sliding Sleeve | 32. Rear Bearing Retainer | 53. Spacer (2-.050") | 73. Interlock Pin |
| 14. Third Speed Synchronizing Ring | 33. Selective Fit Snap Ring | 54. Bearing Rollers (20) | 74. Poppet Spring |
| 15. Third Speed Gear | 34. Reverse Gear | 55. Countergear | 75. Detent Balls |
| 16. Second and Third Speed Gear Thrust Washer (Needle Roller Bearing) | 35. Speedometer Drive Gear | 56. Countergear Roller Spacer | 76. Interlock Sleeve |
| 17. Second Speed Gear | 36. Rear Bearing Retainer to Case Extension Gasket | 57. Bearing Rollers (20) | 77. Transmission Side Cover |
| 18. Second Speed Gear Synchronizing Ring | 37. Case Extension | 58. Spacers (2-.050") | 78. Third and Fourth Speed Shifter Lever |
| 19. Mainshaft | 38. Rear Oil Seal | 59. Bearing Rollers (20) | 79. First and Second Speed Shifter Lever |
| | 39. Reverse Idler Shaft | 60. Spacer (.050") | |
| | 40. Reverse Shifter Shaft Lock Pin | | |

Figure 72-111—Exploded View of Transmission

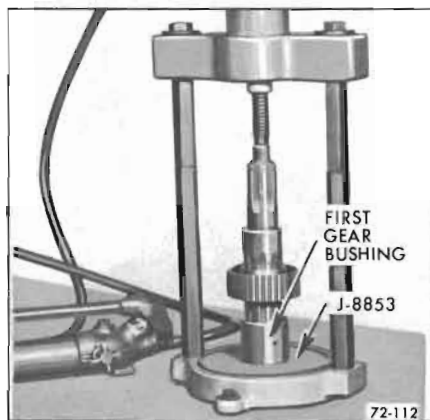


Figure 72-112—Installing First Gear Bushing

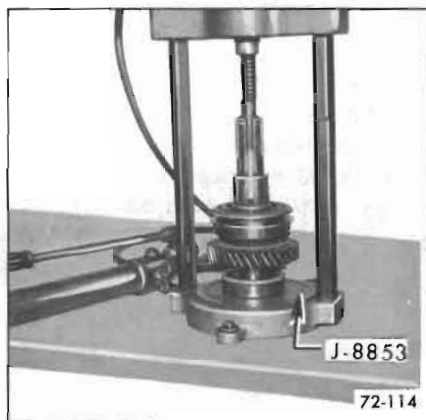


Figure 72-114—Installing Rear Bearing

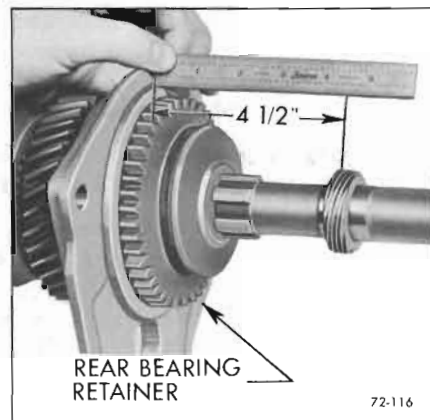


Figure 72-116—Locating Speedometer Gear

72-6 REAR EXTENSION SEAL

a. Removal

1. Using screwdriver remove oil seal.

b. Installation

1. Install new oil seal using Seal Installer J-8864. See Figure 72-117.

72-7 Counter Gear Assembly

a. Disassembly (See Figure 72-118)

1. Remove countershaft alignment Tool J-9573.
2. From each end of countergear remove three (3) spacers and 40 needle bearings.

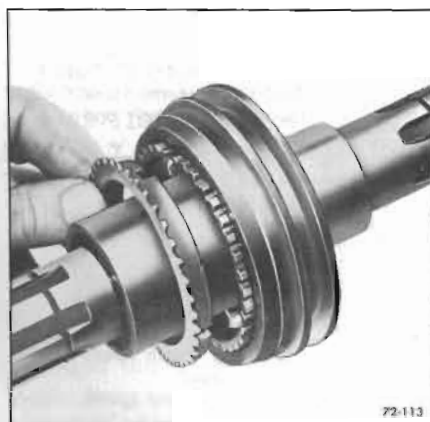


Figure 72-113—Installing Synchronizing Ring

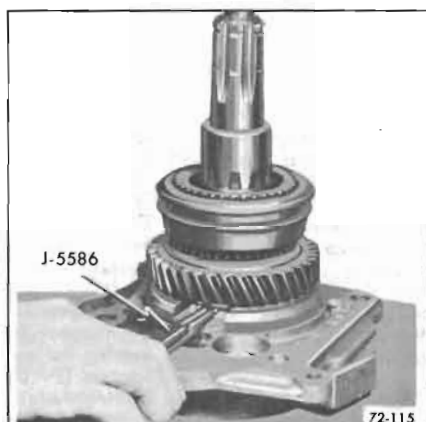


Figure 72-115—Installing Rear Bearing Retainer

3. Remove needle bearing spacer.

b. Reassembly (See Figure 72-118)

1. Install needle bearing spacer.
2. Install countershaft alignment Tool J-9573.
3. From each end of countershaft install 20 needle bearings, two (2) .050 spacers, 20 needle bearings and one .050 spacer.

72-8 SIDE COVER ASSEMBLY

a. Disassembly

1. Remove outer shift lever nuts and lockwashers and pull levers from shafts.
2. Carefully push the shifter



Figure 72-117—Installing Rear Extension Oil Seal

shafts into cover, allowing the detent balls to fall free, then remove both shifter shafts.

3. Remove interlock sleeve, interlock pin and poppet spring.

b. Installation

1. Install interlock sleeve and one shifter shaft. Place detent ball

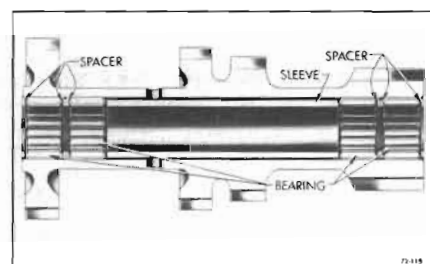


Figure 72-118—Countergear Assembly

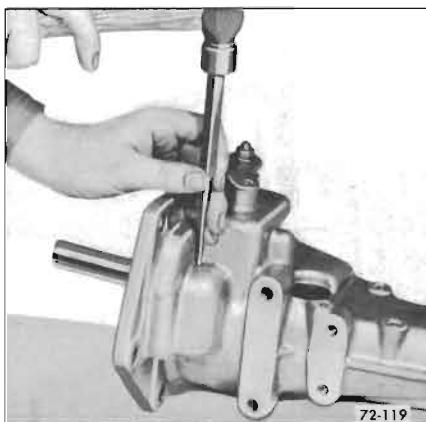


Figure 72-119—Removing Reverse Idler Shaft Lock Pin

into sleeve followed by poppet spring and interlock pin.

2. Start second shifter shaft into position and place second detent ball on poppet spring. Compress ball and spring with screwdriver and push the shifter shaft fully in.

72-9 REVERSE IDLER SHAFT REPLACEMENT

1. With case extension removed from transmission, drive reverse idler shaft lock pin into case. See Figure 72-119.

2. Remove shaft from case extension.

3. Line up lock pin hole in shaft with hole in extension. Install



Figure 72-120—Installing Front Main Bearing

taper pin to lock idler shaft in case.

72-10 REVERSE SHIFTER SHAFT AND SEAL REPLACEMENT

1. With case extension removed from transmission and the reverse shifter shaft lock pin will be already removed.

2. Remove shift fork.

3. Carefully drive shifter shaft into case extension allowing ball detent to drop into case. Remove shaft and ball detent spring. Remove "O" ring seal.

4. Install new "O" ring seal on reverse shifter shaft.

5. Place ball detent spring into detent spring hole and start reverse shifter shaft into hole in boss.

6. Place detent ball on spring and holding ball down with a suitable tool push shifter shaft into place and turn; the ball will drop into place on shaft detent plate.

7. Install shift fork.

72-11 TRANSMISSION REASSEMBLY

1. Retain countergear tanged thrust washer on ends of countergear.

2. Set countergear in place in bottom of transmission case.

NOTE: Make certain tanged thrust washers are correctly positioned in case.

3. Press front main bearing onto main drive gear. See Figure 72-120.

4. Install spacer washer and selective fit snap ring in groove on main drive gear.

NOTE: Snap rings are available in three (3) thicknesses. Use the ring that will produce

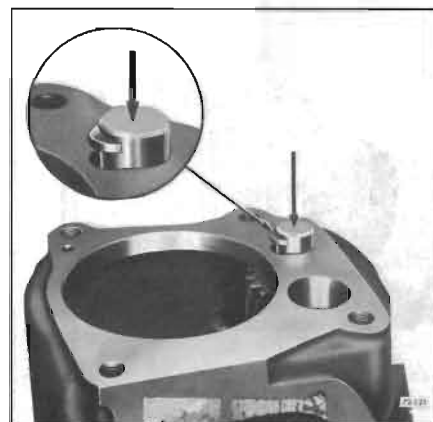


Figure 72-121—Installing Countershaft

from zero to .005" clearance between the rear face of the snap ring and the front face of the spacer washer.

5. Install the main drive gear and bearing assembly through the side cover opening and into position in transmission front bore. Tap lightly into place, if necessary, with a plastic hammer.

6. With the transmission case resting on its front face, move countergear into mesh with main drive gear. Make certain thrust washers remain in place. Install woodruff key into end of countershaft and press shaft (Figure 72-121) until end of shaft is flush with rear face of transmission case.

7. Attach a dial indicator as shown in Figure 72-122 and check

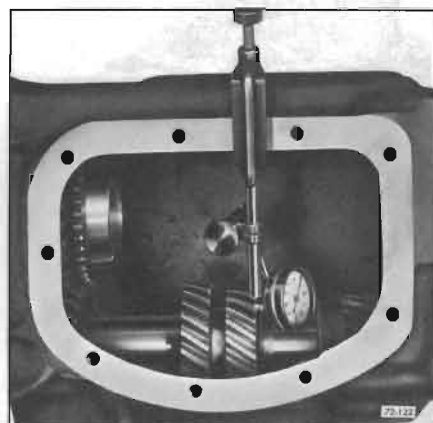


Figure 72-122—Checking Countergear End Play



Figure 72-123—Installing Mainshaft

the end play of the countergear. End play must not be more than .025".

8. Install the fourteen needle bearings into the main drive gear, using heavy grease to hold the bearing in place.

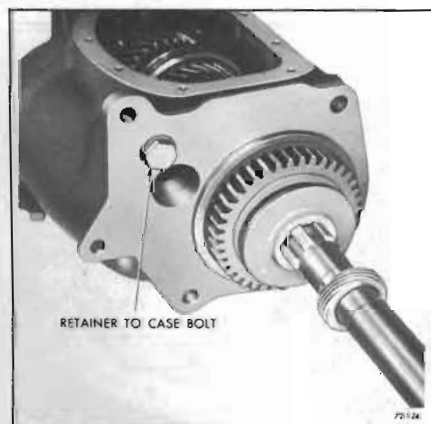


Figure 72-124—Bearing Retainer To Transmission Bolt

9. Using heavy grease, place gasket in position on front face of rear bearing retainer.

10. Install fourth speed blocking ring on main drive gear.

NOTE: Make certain notches in blocking ring align with keys in synchronizer.

11. Position the reverse idler gear thrust washer (untanged) on the machined face of the ear cast for the reverse idler shaft. Position the front reverse idler gear on top of the thrust washer, with the hub facing forward rear of the case.

12. Lower the mainshaft assembly into the case, making certain that the notches on the fourth speed blocking ring correspond to the keys in the clutch assembly. See Figure 72-123.

13. Install the self-locking bolt attaching rear bearing retainer to transmission case. Torque to 20 to 30 lbs. ft. See Figure 72-124.

14. From the rear of the case, insert the rear reverse idler gear, engaging the splines with the portion of the gear, within the case.

15. Using heavy grease, place gasket into position on rear face of rear bearing retainer.

16. Using heavy grease, install the remaining thrust washer into place on the reverse idler shaft, making sure tang on the thrust washer is in the notch in the idler thrust face of the extension.

17. Place the two synchronizer assemblies in neutral position. Pull reverse shifter shaft to left side of extension and rotate shaft to bring reverse shift fork as far forward in extension as possible. Start the extension onto the transmission case (Figure 72-125) while slowly pushing in on the shifter shaft to engage the shift fork with the reverse gear shift collar. When the fork engages,

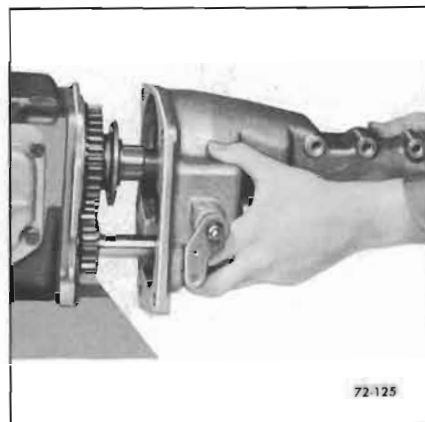


Figure 72-125—Installing Extension

rotate the shifter shaft to move the reverse gear rearward, permitting the extension to slide onto the transmission case.

18. Install three extension to case attaching bolts (torque to 35 to 45 lbs. ft.). Install two short bolts as shown in Figure 72-126.

19. Move reverse shifter shaft to line up with the hole in the boss and drive in the lock pin. Install shifter lever.

20. Install the front main bearing retainer, gasket and four attaching bolts, using a suitable sealer on bolts. Torque to 15 to 20 lbs. ft.

21. Install a shift fork in each clutch synchronizer sleeve.

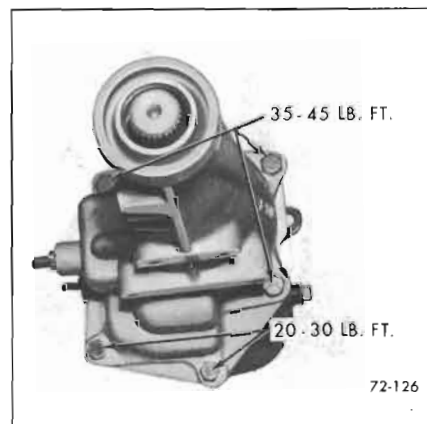


Figure 72-126—Torquing Extension Housing

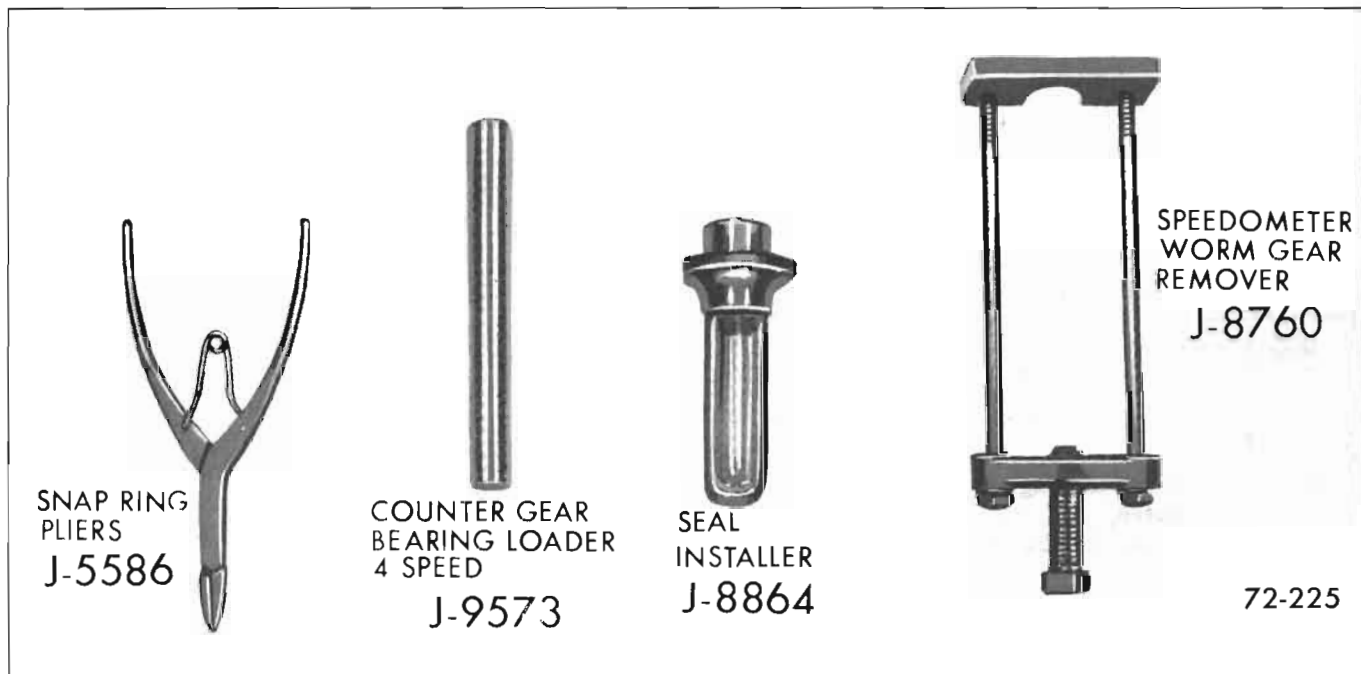


Figure 72-127—Four Speed Synchromesh Tools

22. Place both clutches in neutral, install side cover gasket and carefully lower side cover

into place. Install attaching bolts and tighten evenly to avoid side cover distortion. Use suitable

sealer when installing the lower right bolt.

DIVISION IV

TROUBLE DIAGNOSIS

72-12 4-SPEED SYNCHROMESH TRANSMISSION TROUBLE DIAGNOSIS

SYMPTOM AND PROBABLE CAUSE	PROBABLE REMEDY
SHIFTS HARD	
a. Clutch not releasing engine or slow to release.	a. Adjust or repair clutch.
b. Shift linkage binding or selector not properly adjusted.	b. Free up and adjust as required.
SHIFTS HARD ON DOWNSHIFT	
a. Downshifting at too high an engine speed.	a. Shifting into low gear above 45 MPH and second above 65 MPH causes extra work for synchronizers and will require extra time or more force on lever to complete. There is also danger of over-speeding the engine if low or second is used at high car speeds.
DISENGAGES FROM GEAR	
a. Dirt between transmission case and clutch housing.	a. Clean mating surfaces.
b. Does not fully engage.	b. Check linkage for interference. Adjust or replace damaged shift linkage.
c. Clutching teeth worn or defective and/or clutch hub spline worn.	c. Replace gear, clutch sleeve and clutch hub.
NOISY	
a. Gears worn, scored or broken.	a. Replace gears.
b. Bearing dirty, worn.	b. Flush transmission with kerosene. If noise is still present, replace bearings and examine gears as above.
c. Interference of clutch sleeve with countergear.	c. Replace worn shift forks, countergear, and idler gear thrust washers to restore gears and clutch sleeve to proper location. Examine thrust faces on these gears for wear. Replace if worn excessively.
LEAKS LUBRICANT	
a. Excessive amount of lubricant in transmission.	a. Drain to correct level.

SYMPTOMS AND PROBABLE CAUSE	PROBABLE REMEDY
LEAKS LUBRICANT (CONT'D.)	
b. Loose or broken clutch gear bearing retainer.	b. Tighten or replace retainer.
c. Clutch gear bearing retainer gasket damaged.	c. Replace gasket.
d. Cover loose or gasket damaged.	d. Tighten cover or replace gasket.
e. Operating shaft seal leaks.	e. Replace operating shaft seal.
f. Idler shaft expansion plugs loose.	f. Replace expansion plugs.
g. Countershaft loose in case.	g. Replace case.
h. Lack of sealant on bolts.	h. Coat bolts with sealant.
i. Worn extension oil seal.	i. Replace seal.
EXCESSIVE BACKLASH IN ALL REDUCTION GEARS	
a. Worn countergear bearings.	a. Replace countergear bearings and shaft.
b. Excessive end play in countergear.	b. Replace countergear thrust washers.
NOISY IN ALL REDUCTION GEARS	
a. Insufficient lubricant.	a. Fill to correct level
b. Worn or damaged clutch gear or countergear.	b. Replace faulty or damaged gears.
NOISY IN ALL GEARS	
a. Insufficient lubricant.	a. Fill to correct level.
b. Worn countergear bearings.	b. Replace countergear bearings and shaft.
c. Worn or damaged clutch gear and countershaft drive gear.	c. Replace worn or damaged gears.
d. Damaged clutch gear or mainshaft ball bearings.	d. Replace damaged bearings.
e. Damaged speedometer gears.	e. Replace damaged gears.
NOISY IN HIGH GEAR	
a. Damaged clutch gear bearing.	a. Replace damaged bearing.
b. Damaged mainshaft bearing.	b. Replace damaged bearing.
c. Damaged speedometer gears.	c. Replace speedometer gears.
NOISY IN NEUTRAL WITH ENGINE RUNNING	
a. Damaged clutch gear bearing.	a. Replace damaged bearing.
b. Damaged mainshaft pilot bearing roller.	b. Replace damaged bearing roller.