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GMC TRUCK

UNIT OVERHAUL MANUAL

TRANSMISSION

CORPORATION MODEL SM318
3-SPEED

GMC TRUCK & COACH DIVISION
GENERAL MOTORS CORPORATION
PONTIAC, MICHIGAN

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INTRODUCTION

This manual contains overhaul procedures for the unit(s) indicated on the cover, with the unit(s) removed from the vehicle. For all on-vehicle service information and unit replacement procedures, refer to the applicable TRUCK SERVICE MANUAL.

TRANSMISSIONS
(CORPORATION 3-SPEED MODEL SM318)

Contents of this Manual are listed in Index below:

GENERAL INFORMATION

DESCRIPTION

The SM318 transmission (Muncie) has a clutch driven disc installed on the transmission main drive gear splines. The drive gear is supported by a pilot bearing at the rear of the engine crankshaft.

The transmission gears have helical teeth. The countershaft gear is cluster-type, mounted on needle-type roller bearings, and supported on a solid steel countershaft which is a press fit in the transmission case. Three sets of teeth are integral with the countershaft gear. Teeth at the front are constantly meshed with the main drive gear, while teeth at the rear end are always meshed with the mainshaft 2nd speed gear. The reverse idler gear is driven by the countershaft gear, and the mainshaft 1st and reverse gear engages teeth on the countershaft gear for first speed operation, or with the reverse idler gear teeth for reverse operation.

Bushings in the reverse idler gear are press fit, then peened into holes in the bores. This locks the bushings into place. The bushings are accurately bored with special boring tools to insure positive alignment with the shaft, and proper meshing of gears. Replacement of bushings is not recommended.

The mainshaft is carried by two sets of bearing rollers located in a recess at the rear of the main drive gear. A ball bearing assembly supports the mainshaft at the rear of the transmission case, and the rear end of the mainshaft is supported by a universal joint yoke, within a bushing, in the case extension.

The 2nd and 3rd speed clutch has internal and external helical splines. Internal splines mate with mainshaft splines. External splines mesh with the 1st and reverse sliding gear.

Shift forks mounted in transmission side cover at left-hand side of transmission case locate 1st and reverse gear and 2nd and 3rd speed clutch. Plan view in figure 1 shows how shift forks engage gear and clutch on mainshaft.

Synchronizing mechanism provided at either end of 2nd and 3rd speed clutch, at transmission main drive gear, and mainshaft 2nd speed gear assures smooth, quiet shift into second and third speeds.

SHIFTING MECHANISM

Shifting is accomplished through a steering column gearshift. An interlock assembly, inside the transmission side cover, determines the position of the shift levers and prevents simultaneous shifting into two gears. For information on shift control linkage refer to "TRANSMISSION SHIFT CONTROL LINKAGE" section in applicable Truck Service Manual.

TRANSMISSION COVER

Transmission cover, installed at left-hand side of transmission case, contains shifting mechanism. Cover is located on transmission case by a dowel pin and retained by bolts and lock washers. An oil seal is used to prevent lubricant leakage where each shaft passes through cover. Levers are clamped on outer ends of the shifter shafts and are interconnected by rods to controls at steering column. Two levers are brazed to inner ends of shafts. On these levers are mounted forks which engage mainshaft sliding gear, and 2nd and 3rd speed clutch on mainshaft. Spring loaded detent cams engage depressions on shifter

shaft plate assemblies to hold the shift forks in the position selected. Interlock engages notches in inner levers to hold either lever in "Neutral" while other lever is shifted out of "Neutral."

SYNCHROMESH MECHANISM

There are three definite steps in operation of the synchromesh mechanism. Operation is the same when shifting into either 2nd or 3rd speed. Description which follows describes sequence of events as shift into 3rd or high speed is made.

In first step, 2nd and 3rd speed clutch assembly moves forward causing synchronizer ring to contact synchronizer cone (pressed into clutch) as lugs on ring come into contact with energizing spring. Friction between synchronizer cone and ring synchronizes speed of main drive gear with that of 2nd and 3rd speed clutch. In second step, continued movement of synchronizer ring produces enough pressure to compress energizing spring permitting ring to pass over it so that in step three, the internal teeth on 2nd and 3rd speed clutch are brought into engagement with teeth on main drive gear without clashing. Note that synchronizer ring and 2nd speed gear has been pulled forward but the lugs on same are still engaged with slots between banks of teeth on 2nd speed gear.

PRELIMINARY OPERATIONS

In addition to normal shop equipment (hand tools, arbor press, etc.), various special tools are needed to facilitate overhaul of the transmissions covered by this manual. References are made to the use of these tools throughout the manual. A complete list is given under SPECIAL TOOLS, found at the end of this manual.

Cleanliness is extremely important and an absolute must when repairing or overhauling the transmission. Before attempting overhaul procedures, thoroughly clean exterior of the transmission with steam or cleaning solvent to prevent dirt from getting into the gear mechanism.

Drain lubricant from transmission case, providing this operation was not performed when the transmission was removed from the vehicle.

The transmission should be overhauled in the sequence outlined, unless only one particular area is to be worked on.

TROUBLESHOOTING

The following troubleshooting information will assist in locating transmission troubles, but in addition will serve as a guide to find the "cause" to prevent reoccurrence.

Whenever possible, road test the vehicle prior to overhaul. Technicians usually get second or third hand reports of trouble experienced with the unit and these reports do not always accurately describe the actual conditions. Sometimes symptoms seem to indicate trouble in the transmission, while actually the trouble may be caused by the axle, propeller shaft, universal joints, engine or clutch. Therefore, before removing transmission or related components to locate trouble, always road test to check possibility that trouble may exist in other closely associated units. If the technician can drive, road testing will be more effective; however, just riding can be very informative.

Many times the answer to the trouble is apparent when the unit is inspected prior to disassembly, but this evidence is often lost when the parts are separated. If possible, check the unit prior to disassembly. Bear in mind that a careful inspection of the unit should be made as each disassembly step is performed.

It is poor practice to disassemble a unit or complete transmission as quickly as possible without bothering to examine the parts as they come down. It happens many times that a technician has completely disassembled a unit and failed to find the cause of the trouble because he did not bother to examine the parts as they came apart. After the transmission is disassembled, check the lubricant for foreign particles which often reveal sources of trouble that are overlooked during the disassembly.

NOISY OPERATION

Noise is usually very elusive and generally not the fault of the transmission; therefore, technicians should road test to determine if the driver's complaint of noise is actually in the transmission.

Noise Arising Outside Transmission

In numerous instances, drivers have insisted that the noise was in the transmission, however, investigations revealed the noise to be caused by one of the following conditions:

1. Fan out-of-balance or blades were bent.
2. Defective vibration damper.
3. Crankshaft out-of-balance.
4. Flywheel out-of-balance.
5. Flywheel mounting bolts loose.
6. Engine rough at idle producing rattle in gear train.
7. Clutch assembly out-of-balance.
8. Engine mounts loose or broken.
9. Universal joints worn out.

10. Propeller shafts out-of-balance.
11. Universal joint angles out of plane or at excessive angle.
12. Center bearings in drive line dry - not mounted properly, etc.
13. Wheels out-of-balance.
14. Tire treads humming or vibrating at certain speeds.
15. Air leaks on suction side of induction system.

Noise Arising In Transmission

Technicians should try to locate and eliminate noise by means other than transmission removal, or overhaul. However, if the noise appears to be in the transmission try to break it down into the following classifications. If possible, determine what position the gearshift lever is in when the noise occurs. If the noise is evident in only one gear position, the cause of the noise is generally traceable to the gears in operation.

1. Growl and Humming, or more serious, a grinding noise. These noises are caused by worn, chipped, rough, or cracked gears. As gears continue to wear, the grinding noise will be noticeable, particularly in the gear position that throws the greatest load on the worn gear.

2. Hissing, or more serious, a thumping or bumping-type noise. Hissing noises could be caused by bad bearings. As bearings wear and retainers start to break up, etc., the noise could change to a thumping or bumping.

3. Metallic Rattles within the transmission usually result from engine torsional vibrations transmitted to the transmission through the clutch.

4. Improper lubricants, or lack of lubricant can produce noises. Transmissions with low oil levels sometimes run hotter than normal, as there is insufficient lubricant to cool and cover the gears.

5. Squealing, particularly when the transmission is operating at higher speeds, could be caused by the free-running gear seizing on the thrust face or fluted diameter of mainshaft temporarily and then letting go. In general, a mild seizure will clear itself up and the transmission will continue to operate very satisfactorily without this defect being known. Refer to Step 6 following:

6. Gear Seizure at high speed, usually accompanied with loud squealing noise. This type of seizure is readily apparent to the driver since the truck will suddenly slow down as if the brakes were being applied. If the truck continues to move ahead, even though the gearshift lever is placed in neutral, it would indicate the floating gear on the mainshaft had seized. Depressing the clutch should interrupt the driving torque. The seized gear could be checked quite readily by depressing clutch and checking the action with the gearshift lever progressively in all shift positions. If releasing the clutch tends to kill the engine, then this gear position has not seized. In other words, the transmission would be in two gears at the same time. By a process of elimination, the gear at fault can be readily identified. Refer to Step 7 following:

7. Vibration: Gear seizures on thrust faces or fluted diameters are usually caused by vibrations in the power train; this could be engine, propeller shaft, joint angle, rear axle, differentials, etc.

a. Improved highways permit sustained high speeds. The fact that engines and entire power trains can now cruise at a high rpm can introduce vibration frequencies, that were not critical in the past. At slower speeds these items would get by or only pass through critical periods while accelerating or decelerating through the gears.

b. In the past, drive line vibrations such as bent tubes, joints out of phase or alignment, clutch out of balance, gears and shafts in transmission out of balance, were fairly obvious. These items will become more critical in vehicles running at sustained high speeds.

c. Critical vibrations associated with higher speeds are not the old thumping or bumping type, but are high frequency vibrations. This type of vibration could cause gear seizures, damaged synchronizers, bearing failure due to retainer bolt failures, promote brinelling, fretting corrosion, etc.

8. Gear Whine is usually caused by lack of backlash between mating gears.

Noise In Neutral

1. Misalignment of transmission.
2. Worn or scored main drive gear and/or countershaft bearings.
3. Scuffed gear tooth contact surfaces on gears.
4. Unmatched constant mesh gears.
5. Worn, rough reverse idler gear.
6. Sprung or worn countershaft.
7. Excessive backlash in constant mesh gear.
8. Excessive end play in countershaft, or reverse idler pinion.
9. Worn mainshaft pilot bearing.
10. Scuffed gear tooth contact surface, insufficient lubrication.
11. Incorrect grade of lubricant.
12. Incorrect clutch linkage adjustment.

Noise In Gear

1. Worn, or rough mainshaft rear bearing.
2. Rough, chipped or tapered sliding gear teeth.
3. Noisy speedometer gears.
4. Excessive end play of mainshaft gears.
5. Refer to conditions listed under "Noise in Neutral."

WALKING OR SLIPPING OUT OF GEAR

1. If the units are walking out of gear it could be caused by:

a. Interference or resistance in the shift mechanism preventing full engagement of the sliding clutch gear, or -

b. If the gear has been shifted completely into position some other malfunction which could move the gear out of its proper location.

2. A number of items which would prevent full engagement of gears are:

a. Shift fork pads or groove in sliding gear or collar worn excessively.

b. Worn taper on gear clutch teeth.

c. Transmission and engine out of alignment either vertically or horizontally.

3. A few items which could move the gear or shaft out of proper position, particularly on rough roads are:

a. Shift rod cam detent spring broken.

b. Shift rod cam notches worn.

NOTE: When gearshift lever can be held in to prevent jump-out, cam detent modifications or cam replacement will often correct it. When a gear has been allowed to jump out for a long period generally the cause must be corrected plus replacement of the affected gears.

c. Excessive end-play in drive gear, mainshaft or countershaft, caused by worn bearings, retainers, etc.

d. Thrust washers or faces worn excessively, missing, etc.

HARD SHIFTING

1. Sliding gear tight on clutch.
2. Insufficient chamfer of sliding gear teeth.
3. Burred mainshaft or sliding gear splines.
4. Misaligned mainshaft.
5. Damaged synchronizing unit.
6. Improper adjustment of shifting linkage or excessively worn linkage.
7. Worn shifter shafts.
8. Worn, sprung shifter fork.
9. Wrong lubricant--especially if extreme pressure type lubricants are added.
10. Free-running gear, seized or galled on either the thrust face or shaft.

STICKING IN GEAR

1. Insufficient chamfer on detent cam notches.
2. Chips wedged between or under splines of shaft and gear.
3. Misaligned mainshaft and/or countershaft.

CRASH SHIFTING OR RAKING OF GEARS

Raking of gears during the shift is usually caused by a defective synchronizer or improper shifting technique.

When the shift lever moves directly into the shift position without resistance, the raking of teeth will be audible and felt through the gearshift lever. This condition does not always mean the synchronizer is worn out. The following may cause this condition:

1. Quite often, small chips may lodge in the synchronizer temporarily, which prevents proper synchronization and causes raking shifts. Continued operation of the transmission may either embed the chip below the surface of the bronze or reject it and the synchronizer will return to normal functioning.

2. Use of improper oils often causes raking of synchronizer. Heavy oil prevents the synchronizer from breaking through the oil film and doing the job properly. The above condition usually occurs with cold, heavy oil, but the synchronizer begins to work properly when the transmission oil reaches normal operating temperature.

The use of extreme pressure type lubricants is not recommended. Glazing of the synchronizer cone due to breakdown of oil is especially common with extreme pressure additives found in multipurpose or rear axle type lubricants.

Broken synchronizer components sometimes jam preventing proper movement of synchronizer cone, resulting in crash shifts.

Worn synchronizer components with the loss of clutching action are usually caused by poor driver technique. Failure to control engine speed drop-off during upshift, or failure to bring engine speed nearly up to top speed when downshifting, causes overwork of synchronizer and failure to shift. Drivers who try to shift without using the clutch will burn or wear out synchronizers at relatively low mileage.

OIL LEAKS

1. Oil level too high.
2. Wrong lubricant in unit.
3. Seals at extension defective or omitted.
4. Attaching cap screws loose, omitted or missing.
5. Welch "seal" plug loose or missing entirely from machined opening in case.
6. Oil drain-back openings in bearing cap, extension (adapter), or case plugged with varnish, dirt, covered with gasket material, etc.
7. Broken gaskets, gaskets shifted or squeezed out of position, pieces still under bearing caps, clutch housing, and covers, etc.
8. Cracks or holes in castings.
9. Drain plug loose.
10. Loose idler gear shaft retainer pin.

BEARING FAILURES

More than 90% of all bearing failures are caused by dirt which is always abrasive.

Dirt may enter the bearings during assembly of the units or be carried into the bearing by the lubricant while in service. Dirt may enter through

seals, or even dirty containers used for addition or change of lubricant.

Softer material such as dirt, dust, etc., usually forms abrasive paste or lapping compound within the bearings themselves since the unit pressure between the balls and raceways makes a perfect pulverizer. The rolling motion tends to entrap and hold the abrasives. As the balls and raceways wear, the bearings become noisy. The lapping action tends to increase rapidly as the fine steel from the balls and rollway adds to the lapping material.

Hard coarse material such as chips, etc., may enter the bearings during assembly from hammers, drifts, etc., or be manufactured within the unit during service from raking teeth, etc. These chips produce small indentation in balls and races. Jamming of these hard particles between balls and races may cause the inner race to turn on shaft, or the outer race to turn in the housing.

Corrosion

Water, acid, and corrosive materials formed by deterioration of lubricant, will produce reddish-brown coating and small etched holes over outer and exposed surfaces of race. Corrosive oxides also act as lapping agent.

Fatigue

All bearings are subject to fatigue and must be replaced eventually. Your own operating experience will dictate mileage replacement of bearings showing only normal wear.

Shaft Fits

Excessive looseness under load is very objectionable because it produces a creeping or slipping of the inner ring of bearing on the rotating shaft. This causes the surface metal of shafts to scrub or wear off.

Bearing fits on rotating shafts are usually specified as tight. When play or looseness, even 0.001 inch, exists between the bearing and shaft, there is a very powerful force tending to rotate the inner race on the shaft; this force is caused by the looseness or lost motion between the parts and disappears when no looseness exists.

BEARING REPLACEMENT

It is far more difficult to remove bearings from a shaft than to put them on. In most cases it is necessary to remove the bearing by pulling on the outer race which can damage the balls or races. Since such damage is seldom visible, it does not become known until after complete reassembly. If a bearing is not going to be replaced, avoid removal during low mileage rebuild.

Brinelling is caused by improper assembly or removal -- usually hammering with off-center blows. Use drivers, preferably under an arbor, or pullers.

DISASSEMBLY INTO SUBASSEMBLIES

GENERAL

Certain precautions should be observed when overhauling the transmission. Unless proper care is exercised, considerable damage may be done to the various components of the transmission (fig. 1).

Overhaul of the transmission should not be attempted where dirt or other foreign materials are present. Before attempting to disassemble the transmission, the exterior of the case should be thoroughly cleaned to prevent the possibility of dirt entering the transmission internal mechanism. During overhaul procedures, all parts should be thoroughly cleaned in cleaning solvent and then air dried. Wiping cloths or rags should not be used to dry parts as lint may be deposited on the parts which may cause later trouble. All parts, except those being actually worked on, should be kept covered with clean paper.

When assembling the transmission or subassemblies during overhaul procedures, lubricate each moving part before part is installed. Use new snap rings, gaskets, and oil seals when assembling the transmission.

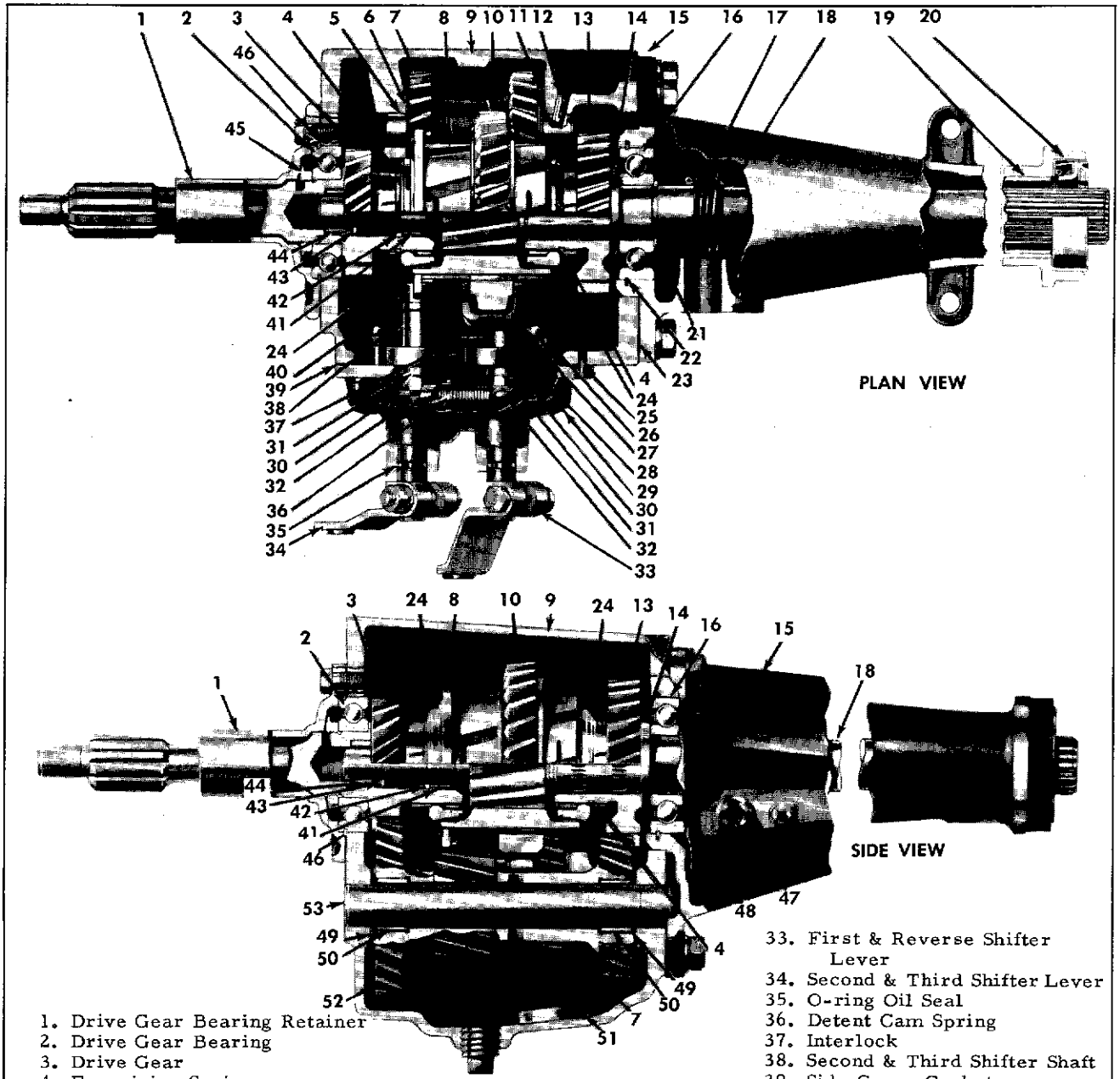
DISASSEMBLY

(Key Numbers Refer to Figure 1)

The following procedures cover complete overhaul of the transmission. The transmission should be overhauled in the sequence described unless only one subassembly is to be repaired. Special tools required for disassembly are mentioned in the text and some tool applications are illustrated.

1. Mount the transmission in transmission holding fixture (J-5752) or equivalent and drain lubricant by removing drain plug.
2. Remove the cap screws from the transmission side cover (29) and remove side cover and gasket (39). Discard gasket.
3. Remove slip joint yoke from rear of transmission mainshaft.
4. Remove the four clutch gear bearing retainer screws and washers and remove the retainer (1). Note that screw holes in the retainer are unevenly spaced to insure that retainer will be correctly installed to the case (retainer oil return slot matched with hole in case).

CORP. 3-SPD. MODEL SM318



1. Drive Gear Bearing Retainer
2. Drive Gear Bearing
3. Drive Gear
4. Energizing Spring
5. Reverse Idler Shaft
6. Thrust Washer
7. Reverse Idler Gear
8. Second and Third Spd. Clutch
9. Transmission Case
10. First & Reverse Sliding Gear
11. Thrust Bearing and Washer
12. Reverse Idler Shaft Pin
13. Second Speed Gear
14. Thrust Washer
15. Extension
16. Mainshaft Rear Bearing
17. Speedometer Drive Gear and Clip
18. Mainshaft
19. Extension Bushing
20. Extension Oil Seal
21. Mainshaft Retaining Ring
22. Rear Bearing Lock Ring
23. Extension Gasket
24. Synchronizer Ring
25. Cover Locating Pin
26. Interlock Retainer
27. First & Reverse Shifter Fork
28. First & Reverse Shifter Shaft and Plate Assembly
29. Side Cover
30. Detent Cam
31. Roller
32. Fork Retainer Ring & Washer
33. First & Reverse Shifter Lever
34. Second & Third Shifter Lever
35. O-ring Oil Seal
36. Detent Cam Spring
37. Interlock
38. Second & Third Shifter Shaft
39. Side Cover Gasket
40. Second & Third Shifter Fork
41. Rear Pilot Bearing Rollers
42. Thrust Washer
43. Thrust Washer
44. Front Pilot Bearing Rollers
45. Drive Gear Bearing Nut
46. Drive Gear Bearing Lock Ring
47. Lock Plate
48. Speedometer Shaft Fitting
49. Thrust Washer
50. Roller Bearing
51. Magnet
52. Countergear Assembly
53. Countershaft

T-5460

Figure 1—3-Speed Transmission - Corporation Model SM318

5. Install special main drive gear shaft and bearing puller tool (J-937) by threading sleeve (left-hand threads) onto main drive gear shaft (3). Turning the puller handle will remove the main drive gear and bearing assembly without damage to mainshaft pilot bearing rollers (fig. 2).

NOTE: Instructions for removing retaining nut (45) and bearing (2) from drive gear assembly is explained later in this manual.

6. Remove rear pilot roller bearings (41) and washer (42).

NOTE: On 4-wheel drive models, the extension is replaced by an adapter assembly. Removal of the adapter follows the same procedure as for the extension. If the transmission is equipped with an extension, remove the speedometer driven gear fitting by removing the cap screw and lock plate.

IMPORTANT: While performing the following step, do not force the mainshaft. Rotate 2nd and 3rd speed clutch gear to align gear lugs with mainshaft splines (fig. 3).

7. Remove bolts and lock washers attaching case extension (15) to case (9). Lift extension with mainshaft assembly from case leaving 2nd and 3rd speed clutch assembly (8), and 1st and reverse gear (10) in transmission case.

8. Remove 2nd and 3rd speed clutch (8) and 1st and reverse gear (10) through transmission side cover opening.

9. Drive the countershaft (53) out of the transmission case from the front toward the rear, using a soft drift and hammer. Raise the countershaft cluster gear (52) and remove gear through the opening in the case. Remove the thrust washers (49) and bearing rollers (50) from the bottom of the case or cluster.

NOTE: It is necessary to remove the countergear before removing the idler shaft; otherwise, the idler shaft will contact the countergear.

10. Drive the idler shaft lock pin (12) into the shaft as shown in figure 4. This pin is shorter than the diameter of the shaft; the shaft may be slipped out when the pin is driven in.

11. Position transmission case with drain plug upward then, using a soft drift pin, tap the rear of the shaft to drive out the plug ahead of the shaft.

IMPORTANT: Do not turn the shaft during removal or the lock pin may drop down between the idler gear bushings. If this should occur it will be necessary to tip the case and jar the pin back into shaft.

12. Remove reverse idler gear (7), front and rear thrust washers (6), and thrust bearing (11) from inside of transmission case.

13. To remove mainshaft from extension or adapter on 4-wheel drive, expand the bearing retaining ring (21) using expander-type snap ring pliers. Tap the rear of the mainshaft with a soft hammer to drive the shaft, speedometer drive

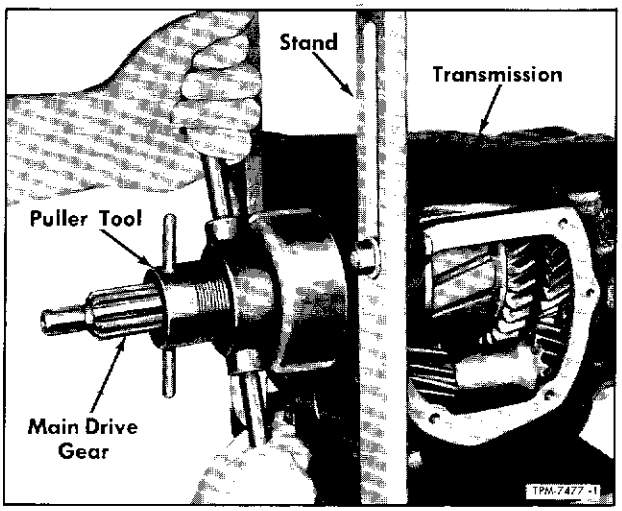


Figure 2—Removing Main Drive Gear Assembly

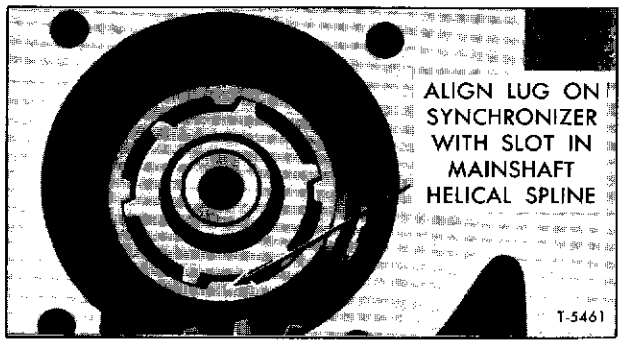


Figure 3—Synchronizer Alignment

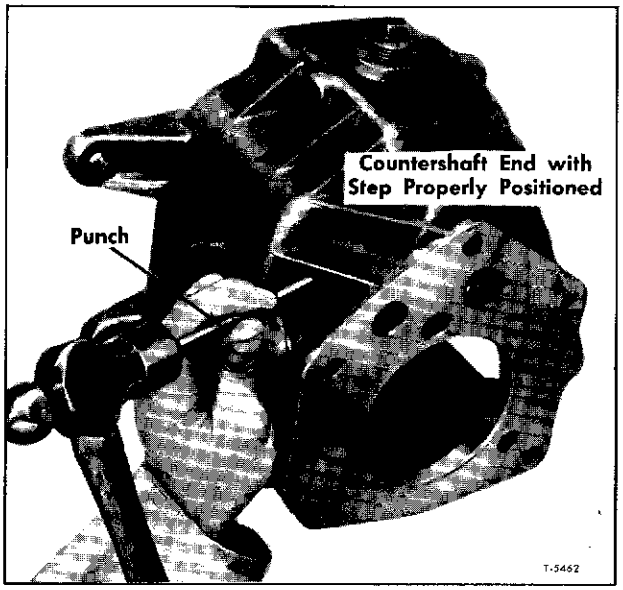
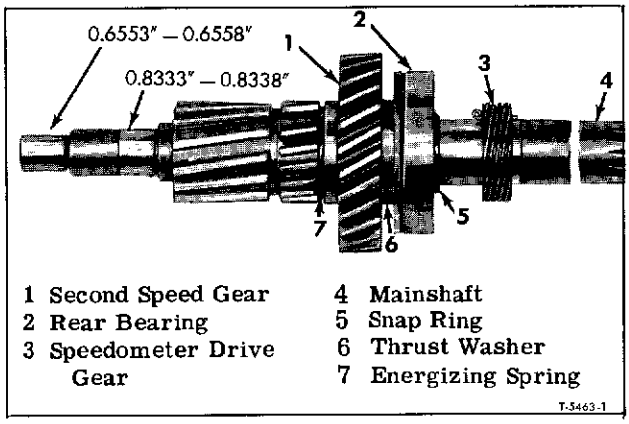


Figure 4—Driving Lock Pin into Reverse Idler Gear Shaft



1 Second Speed Gear
2 Rear Bearing
3 Speedometer Drive Gear
4 Mainshaft
5 Snap Ring
6 Thrust Washer
7 Energizing Spring

Figure 5—Mainshaft Assembled

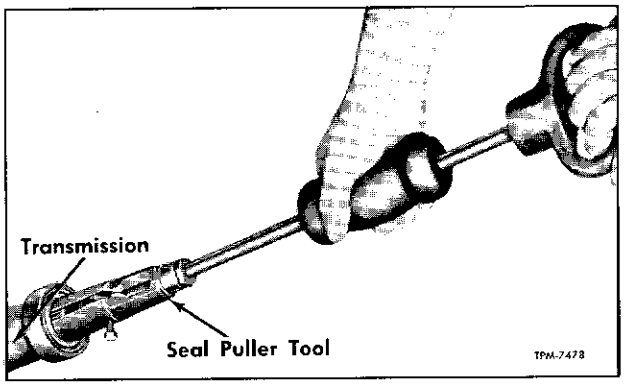


Figure 6—Removing Rear Oil Seal from Extension

gear (if used), 2nd speed gear and bearing, as an assembly, out of the extension or adapter (fig. 5).

14. To remove the extension rear oil seal (20) from extension (15), attach oil seal puller tool (J-5859) and remove seal (fig. 6).

DISASSEMBLY OF SUBASSEMBLIES

DISASSEMBLY OF MAINSHAFT

(Key Numbers Refer to Figure 5)

1. Depress retaining clip and slide nylon speedometer drive gear (3) from mainshaft (4).

2. Using snap ring pliers, remove mainshaft rear bearing snap ring (5) from mainshaft (4). Slide bearing (2) and thrust washer (6) from the shaft.

3. Slide mainshaft 2nd speed gear (1) with energizing spring (7) from mainshaft (4).

DISASSEMBLY OF TRANSMISSION SIDE COVER

(Key Numbers Refer to Figure 7)

1. Remove clamp bolts from shifter levers at outer ends of shifter shafts (48 and 55); then remove levers.

2. Bend nut locks (51) away from stud nuts (52); then remove nuts which hold interlock retainer bar (50). Carefully remove retainer bar from transmission cover (57).

3. Remove interlock (54) from transmission cover.

4. Remove detent cam retainer (43) then carefully pull detent cams (40 and 42) from mounting stud in cover. Disengage cam detent spring (41).

5. Pull both shift shaft assemblies (48 and 55) from cover. Remove O-rings (44 and 56) from shafts.

6. Remove small retainer (45), washer (46) and roller (47) from shaft end of each shift fork. Pull forks (49 and 53) from shift shaft.

CLEANING, INSPECTION, AND REPAIR

(Refer to Figure 7)

CLEANING

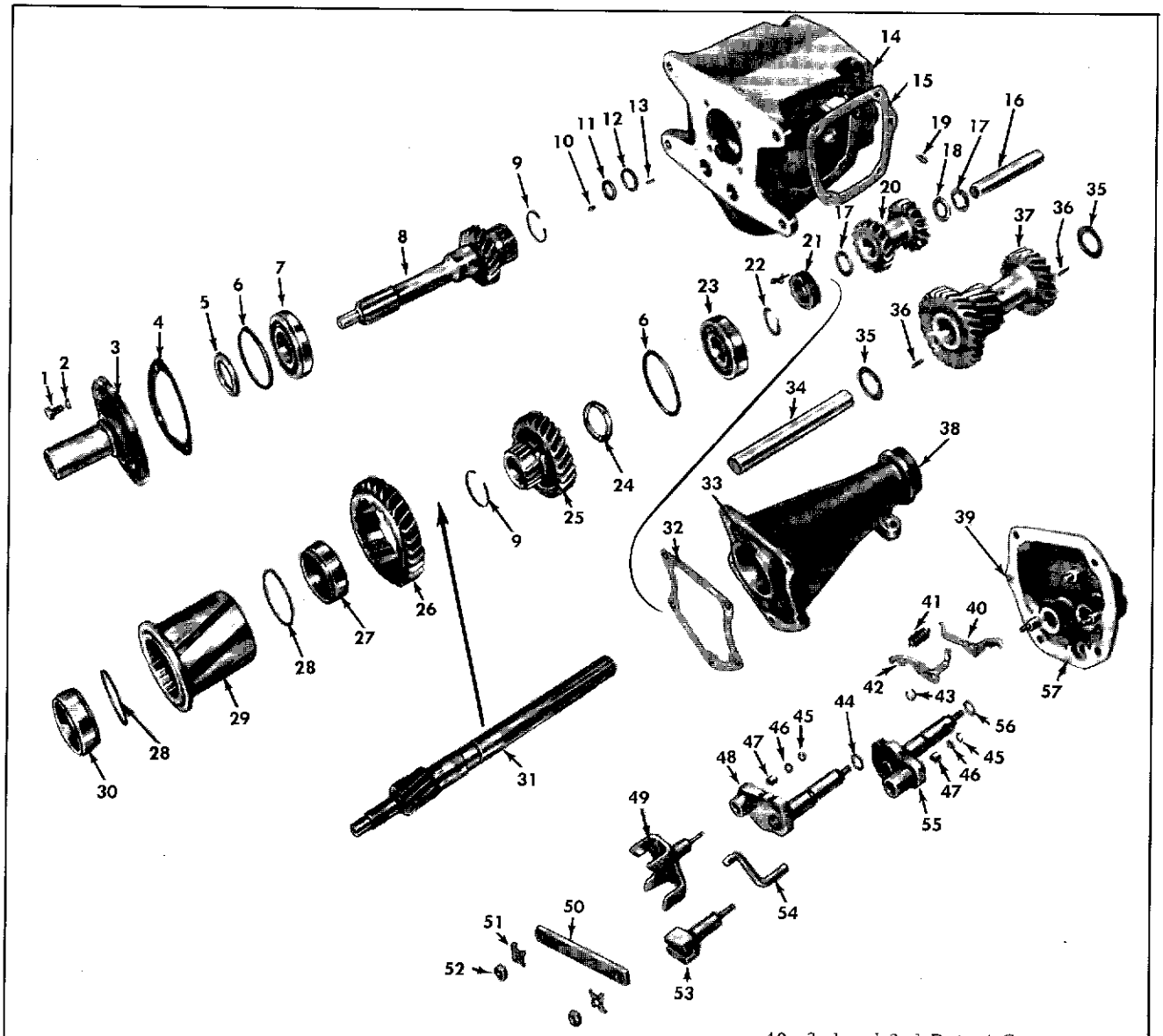
During overhaul procedures all components of the transmission (except bearing assemblies) should be thoroughly cleaned with cleaning solvent and dried with air pressure prior to inspection and reassembly of the transmission.

1. Clean the bearing assemblies as follows:

a. Careful and proper cleaning of bearings is of utmost importance. Bearings should always be cleaned separately from other parts.

b. Soak all bearing assemblies in CLEAN cleaning solvent. Gasoline is not recommended. Bearings should never be cleaned in a hot solution tank.

c. Slush bearings in solvent until all old lubricant is loosened. Hold bearing races so bearings will not rotate; then brush bearings with a



1. Bearing Retainer Bolt
2. Bearing Retainer Lock Washer
3. Drive Gear Bearing Retainer
4. Bearing Retainer Gasket
5. Drive Gear Bearing Retaining Nut
6. Drive Gear Bearing Snap Ring
7. Main Drive Gear Bearing
8. Main Drive Gear
9. Energizing Spring
10. Front Pilot Bearing Rollers
11. Thrust Washer
12. Thrust Washer
13. Rear Pilot Bearing Rollers
14. Transmission Case
15. Side Cover Gasket
16. Reverse Idler Gear Shaft
17. Thrust Bearing Washer
18. Thrust Bearing
19. Reverse Idler Shaft Pin
20. Reverse Idler Gear
21. Speedometer Drive Gear & Clip
22. Snap Ring
23. Mainshaft Rear Bearing
24. Thrust Washer
25. Second Speed Gear
26. First & Reverse Sliding Gear
27. Synchronizer Ring
28. Synchronizer Ring Retainer
29. 2nd and 3rd Speed Clutch
30. Synchronizer Ring
31. Mainshaft
32. Extension Gasket
33. Rear Bearing Snap Ring Groove
34. Countershaft
35. Thrust Washer
36. Countershaft Bearing Rollers
37. Countergear
38. Transmission Case Extension
39. Cover Locating Pin
40. 2nd and 3rd Detent Cam
41. Detent Cam Spring
42. 1st and Reverse Detent Cam
43. Detent Cam Retainer
44. 1st and Reverse Shifter Shaft O-ring
45. Shifter Fork Retainer
46. Shifter Fork Washer
47. Shifter Fork Roller
48. 1st and Reverse Shifter Shaft and Plate Assembly
49. 1st and Reverse Shifter Fork
50. Shifter Interlock Retainer
51. Interlock Retainer Stud Nut Lock
52. Interlock Retainer Stud Nut
53. 2nd and 3rd Shifter Fork
54. Shifter Interlock
55. 2nd and 3rd Shifter Shaft and Plate Assembly
56. 2nd and 3rd Shifter Shaft O-ring
57. Side Cover

T-5464

Figure 7—Transmission Components - Corporation Model SM318

soft bristled brush until ALL DIRT has been removed. Remove loose particles of dirt by striking bearing flat against a block of wood.

d. Rinse bearings in clean solvent; then blow bearings dry with air pressure. DO NOT SPIN BEARINGS WHILE DRYING.

e. Rotate each bearing slowly while examining balls or rollers for roughness, damage, or excessive wear. Replace all bearings that are not in first class condition.

NOTE: After cleaning and inspecting bearings as directed, lubricate bearings generously with lubricant recommended in LUBRICATION (SEC. 0) in applicable Truck Service Manual; then wrap each bearing in clean paper until ready to reinstall in transmission.

2. Remove all portions of old gaskets from parts, using a stiff brush or scraper.

INSPECTION

NOTE: When inspecting transmission components refer to SPECIFICATIONS at rear of this manual.

1. Inspect all parts for discoloration or warping due to heat.

2. Examine all gear teeth and splines for chipped, worn, broken, or nicked teeth or splines. Small nicks or burrs may be removed with a fine abrasive stone.

3. Check 1st and reverse sliding gear to see that it slides freely on clutch splines. Check 2nd and 3rd speed clutch to see that it slides freely on mainshaft splines.

4. Check all threaded parts for damaged, stripped, or crossed threads.

5. Replace all gaskets, oil seals, and snap rings.

6. Examine housings and cover for cracks or other damage. Since repairs by welding, brazing, etc., are not recommended, replace damaged parts.

7. Check reverse idler gear bushings for excessive wear by using a feeler gauge between idler gear shaft and bushings. Proper clearance is from 0.002 inch to 0.004 inch.

8. Inspect shift forks for wear, distortion, or other damage.

9. Check cam detent spring for stretched condition.

10. Inspect thrust washers, synchronizer rings, and spacers for wear or damage.

11. Check fit of bearings on their respective shafts and in their bores. Inspect bearings, shafts, and case for wear. If installation of a new bearing does not correct conditions, install new shafts or replace transmission case.

12. Inspect all bearing rollers for pitting or galling.

13. Inspect bushing in transmission case extension. Insert universal joint yoke through bushing; then measure fit with a narrow feeler gauge. Clearance in excess of 0.0045 inch indicates worn parts. If bushing or yoke are scored or worn they must be replaced.

14. Replace all worn or damaged parts. When assembling the transmission, coat all moving parts with lubricant recommended in LUBRICATION (SEC. 0) in applicable Truck Service Manual.

REPAIR

CLUTCH SLEEVE AND SYNCHRONIZER RINGS

Disassembly

1. Remove the first and reverse sliding gear.

2. Turn the synchronizer ring in the clutch sleeve until the ends of the synchronizer ring retainer can be seen through the slot in the clutch sleeve.

3. Using synchronizer ring retainer pliers (J-932), expand the retainer into the counterbore in clutch sleeve. This raises the retainer from the groove in the ring so ring may be easily slipped out (fig. 8).

4. Check the synchronizing cones for wear or looseness in the clutch sleeve. If cones are

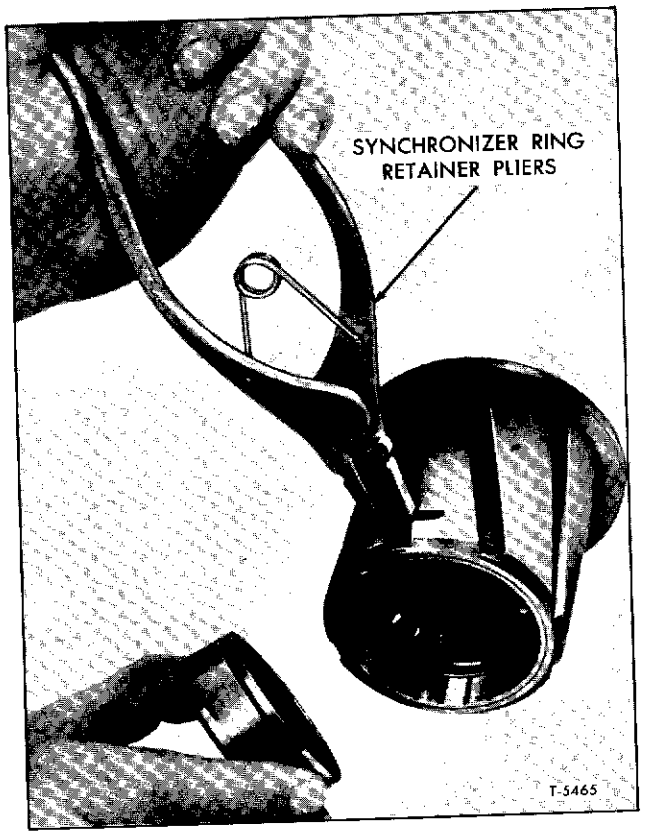


Figure 8—Removing or Installing Synchronizer Rings

damaged in any way, replace the clutch sleeve and both synchronizer rings as an assembly.

5. Inspect the synchronizer rings for smoothness or wear.

6. Place the synchronizer rings in the synchronizing cones and check with thumbs to see that rings do not rock. Excessive rocking indicates a poor fit between the rings and cone, which will not permit proper synchronizing of gears during shifting.

Assembly

1. Install the synchronizer ring retainers in the counterbores in the ends of the clutch.

2. Using synchronizer ring retainer pliers (J-932) in slot in clutch, expand each retainer in the counterbore, lubricate each synchronizer ring with light oil and install rings in clutch.

NOTE: Make sure retainers seat in groove all the way around the rings so ring will be free to move.

3. Install the first and reverse sliding gear on the clutch sleeve.

SYNCHRONIZER ENERGIZING SPRINGS (Items 9 in Figure 7).

1. It will be noticed upon examining these springs that one of the ends is slightly offset. Each spring must be assembled in its groove in the main drive gear and the second speed gear with the offset or locking end between the third and fourth teeth of either of the two banks of teeth on these gears, thus keeping the spring from turning in its groove (fig. 9).

2. Under normal operation it should never be necessary to replace the energizing springs; however, should an energizing spring be removed for any reason, a new spring should be installed. The spring may be removed by slipping a thin blade under the spring and raising it sufficiently to slide it off over the gear teeth.

IMPORTANT: In replacing energizing spring, be very careful not to distort the spring when expanding it over the gear teeth.

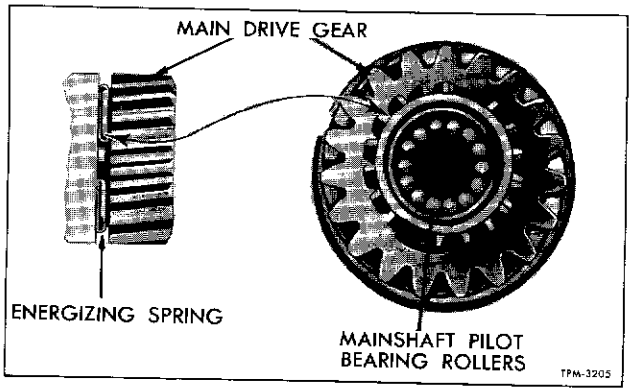


Figure 9—Energizing Spring Installed on Main Drive Gear

REVERSE IDLER GEAR BUSHINGS

1. The bushings used in the idler gear are pressed into the gear then peened into holes in the bores to lock them into place, and are accurately bored with special diamond boring tools. This insures the positive alignment of the bushings and their shafts, as well as proper meshing of the gears. Because of the high degree of accuracy to which these parts are machined, the bushings are not serviced separately.

2. Check bushings for excessive wear by using a narrow feeler gauge between the shaft and the bushing. The proper clearance is from 0.002 inch to 0.004 inch.

COUNTERGEAR NEEDLE BEARINGS

All countergear needle bearings should be inspected closely and, if excessive wear shows, they should all be replaced as well as the shaft.

TRANSMISSION CASE EXTENSION BUSHING

If bushing in rear of extension requires replacement, use extension housing bushing remover and installer (J-5778) to drive bushing out of case extension and, using the same tool, drive new bushing in from rear until end of bushing is slightly below counterbore for oil seal. Ream bushing to a dimension of 1.5045 inches to 1.5065 inches. Lubricate bushing with clean transmission oil.

MAIN DRIVE GEAR BEARING

Removal

1. Place the gear in a vise with soft jaws, and remove the bearing retainer nut and oil slinger, using bearing nut wrench (J-933-01) (fig. 10). The retaining nut and oil slinger is a one piece steel casting machined with a left-handed thread and is locked in place on the gearshaft by being staked into a hole provided for that purpose.

2. To remove the gear bearing, place bearing press plate (J-936) over the gear and against

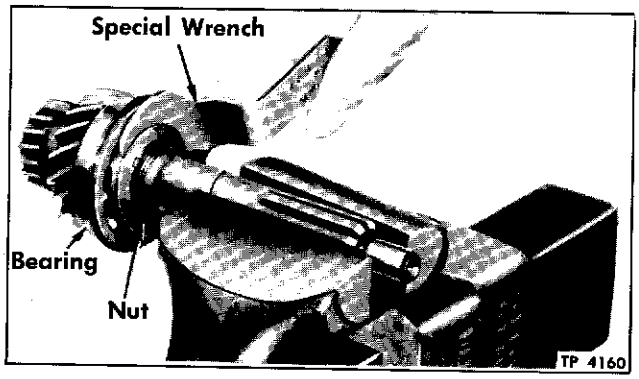


Figure 10—Removing Drive Gear Bearing Retaining Nut

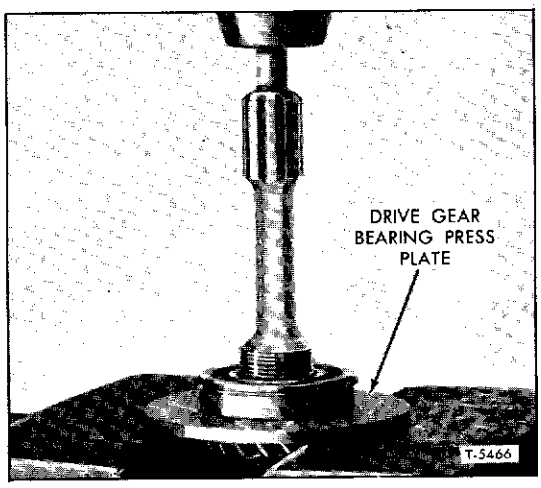


Figure 11—Removing Main Drive Gear Bearing

the bearing. Using an arbor press, press the shaft out of the bearing (fig. 11).

> CAUTION: Do not attempt to drive the shaft out of the bearing or the bearing will be seriously damaged.

Installation

1. Using an arbor press, press the gear bearing onto the gear with the locating ring toward the front of the gearshaft so that the bearing will enter the case to the maximum possible depth.
2. Install the combination bearing retaining nut and oil slinger on the gearshaft and draw it up tight (40 ft. lbs. torque) using bearing nut wrench (J-933-02).
3. Lock the retaining nut oil slinger in place by staking it into the hole with a center punch. Care must be used not to damage the threads on the shaft.

> CAUTION: The bearing must turn as freely after it is installed to the shaft as it turned before being placed on the shaft.

TRANSMISSION CASE AND EXTENSION

No repairs of the transmission case or extension are recommended. Lubricant passages through case and extension must be unobstructed. If inspection shows any indication of damage, case or extension must be replaced. Ensure magnet at bottom of transmission case near drain plug is clean and firmly in position.

ASSEMBLY OF SUBASSEMBLIES

ASSEMBLY OF TRANSMISSION SIDE COVER

(Key Numbers Refer to Figure 7)

1. Coat shifter shafts (48 and 55), and new O-ring seals (44 and 56) with transmission lubricant.
2. Position interlock (54) in hole in side cover.
3. Assemble shifter forks (49 and 53) on shafts (48 and 55). Install a roller (47), washer (46) and retainer (45) at the rear of each shifter fork.
4. Install new O-rings (44 and 56) on each shifter shaft and insert shafts into side cover.
5. Place detent cams (40 and 42) in cover and secure with retainer (43). Second and third detent cam (40) should be mounted closest to the cover. Connect the detent cam spring (41) to the upper tip of each cam.
6. Install interlock retainer bar (50) and secure with stud nut locks (51) and stud nuts (52). Tighten stud nuts to 3 to 5 foot-pounds torque. Bend the tabs of the nut locks over against the nuts.
7. Install shift levers on outer ends of shifter shafts. Tighten clamp bolt nuts to 14 to 16 foot-pounds torque.
8. Check operation of shifter forks.

ASSEMBLY OF MAINSHAFT

(Key Numbers Refer to Figure 5)

1. Coat 2nd speed gear with transmission lubricant. Position mainshaft 2nd speed gear (1) on mainshaft (4), with hub of gear toward the front as shown in figure 5.
2. Slide mainshaft thrust washer (6) onto shaft with oil grooves of washer toward front.
3. With snap ring groove of mainshaft rear bearing (2) toward front, press bearing onto mainshaft (4) applying pressure to inner race of bearing only.
4. Install mainshaft bearing retainer snap ring (5) into groove of mainshaft using snap ring pliers.

NOTE: Snap ring (5) is available in the following thicknesses (0.087 inch, 0.090 inch, 0.093 inch, and 0.096 inch) to prevent end play of mainshaft in bearing which is not to exceed 0.004 inch.

5. Start speedometer drive gear (3) onto mainshaft (4) with chamfered I.D. of gear toward bearing (2). Position the retaining clip on the shaft with the tang inserted in the hole on the shaft. Align the slot on the gear with the clip and slide the speedometer drive gear (3) over the clip.

ASSEMBLY OF TRANSMISSION

(Key Numbers Refer to Figure 7 Unless Otherwise Specified)

NOTE: Apply transmission lubricant to each moving part while assembling the transmission. This will provide initial lubrication and prevent rusting. Use necessary precautions to keep all parts clean during assembly operations. Use new gaskets, oil seals, snap rings, and lock washers during assembly procedures. Assemble transmission in sequence described in the following text:

INSTALLATION OF REVERSE IDLER GEAR

1. Hold reverse idler gear (20), front and rear thrust washers (17), and thrust bearing (18) between bosses in transmission case. Gear teeth rounded ends must be toward rear of case. Referring to figure 12, note angle of pin hole in idler shaft (16) when installed. With shaft aligned accordingly, and with lock pin hole toward rear of case, insert idler gear shaft (16) through either the front or rear hole in transmission case.

2. Move idler gear shaft into place with hole aligned with pin hole in case. Recheck angles of hole in case and shaft to see if they are aligned as shown in figure 12.

3. Use a new idler shaft lock pin (19), coat pin with Permatex and drive it in approximately 1/16" beyond flush with case; peen hole in case slightly. Lock pin must be a tight fit in transmission case to prevent lubricant leakage.

4. Install new idler shaft expansion plug in case.

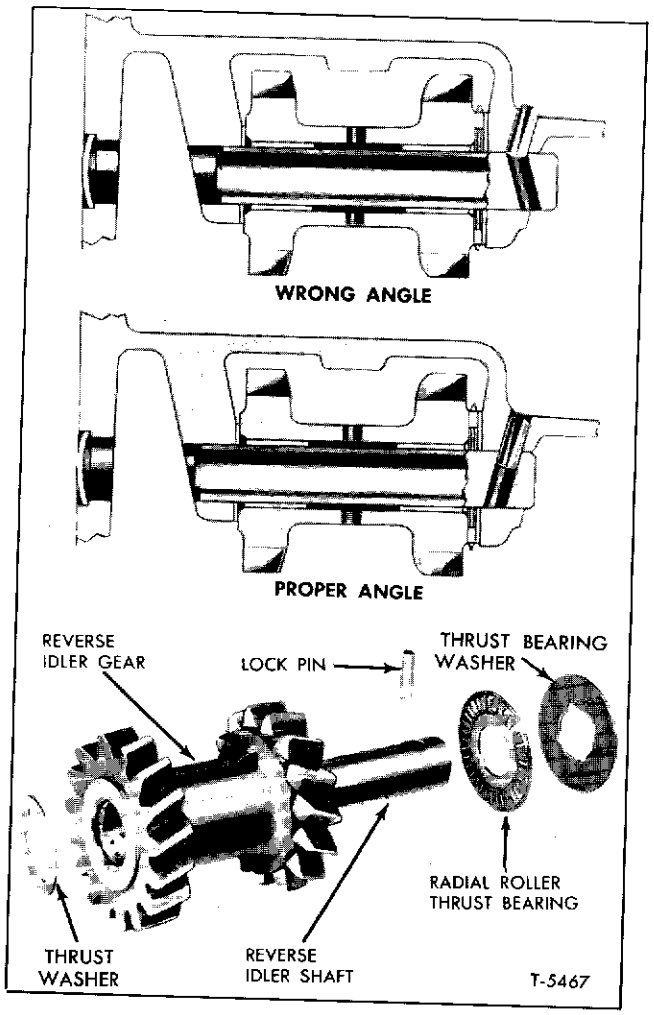


Figure 12—Reverse Idler Gear Shaft and Lock Pin

INSTALLATION OF COUNTERSHAFT GEAR AND SHAFT

1. Apply clean heavy grease in counterbore at each end of countershaft gear (37); then arrange 25 bearing rollers (36) in each counterbore. The grease should hold the rollers in place while installing (fig. 13).

2. Insert the countershaft and bearing assembly tool (J-1617) in the countergear (37).

3. Apply grease to countergear thrust washers (35) and place one at each end of the countergear.

4. Insert the countergear (using tool J-1617) in transmission case and align the tool with countershaft holes in the case.

5. Lubricate and insert the countershaft (plain end toward front) in rear of case, pushing the assembly tool out of front of case (fig. 14).

6. Rotate countershaft so flat on end of shaft is horizontal and at the bottom of the shaft as shown in figure 4. Make sure front end of shaft is in line with hole at front end of case, and drive shaft into case until flat on shaft is flush with rear of case.

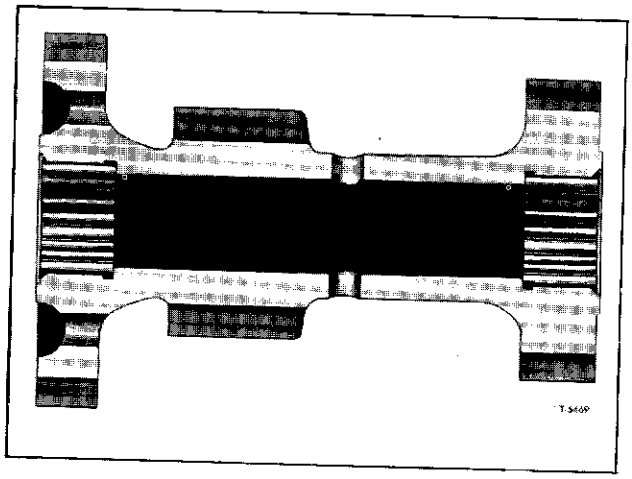


Figure 13—Roller Bearing Countergear

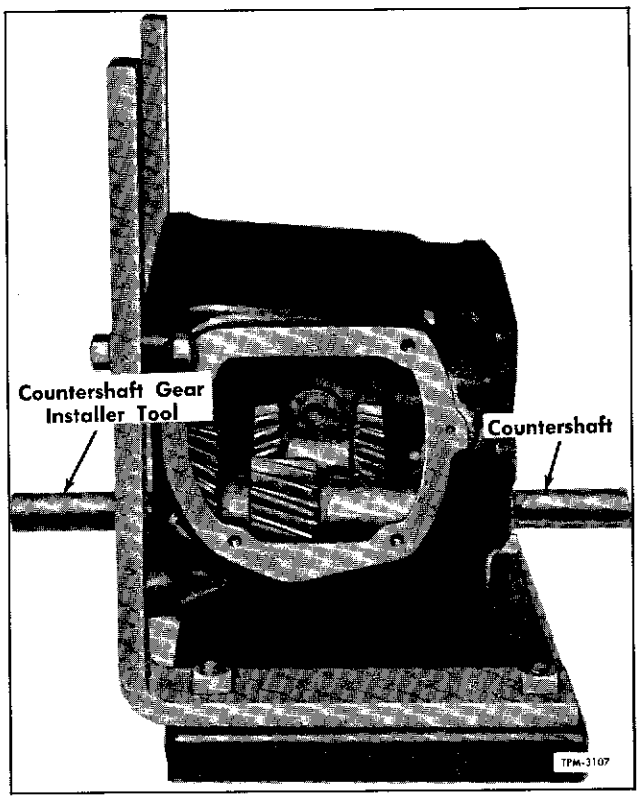


Figure 14—Installing Countershaft and Gear

NOTE: The flat on the shaft must be horizontal and at the bottom, or the transmission case extension cannot be assembled to the transmission case.

INSTALLATION OF 2ND AND 3RD SPEED CLUTCH

Place the assembled clutch with 1st and reverse sliding gear, in transmission case.

NOTE: The shift fork ring on clutch must be toward front.

INSTALLATION OF MAINSHAFT AND TRANSMISSION CASE EXTENSION OR ADAPTER

1. With bearing retainer snap ring (6) positioned in groove of transmission case extension (38) or adapter and ends of ring held spread apart with snap ring pliers, insert rear end of mainshaft (31) into front end of extension case (or adapter) as shown in figure 15. Insert shaft until groove in mainshaft rear bearing aligns with bearing retainer snap ring. Release ends of retainer ring to lock bearing in position.

2. If not previously installed, assemble synchronizer rings (30 and 27) in ends of 2nd and 3rd speed clutch (29), using special pliers (J-932) to expand snap ring retainers (28) while rings are set into place. Be sure retainers seat in groove all the way around rings. Position mainshaft 1st and reverse gear (26) on clutch assembly (29).

3. Through side cover opening in side of transmission case, insert clutch (29) with mainshaft 1st and reverse gear (26).

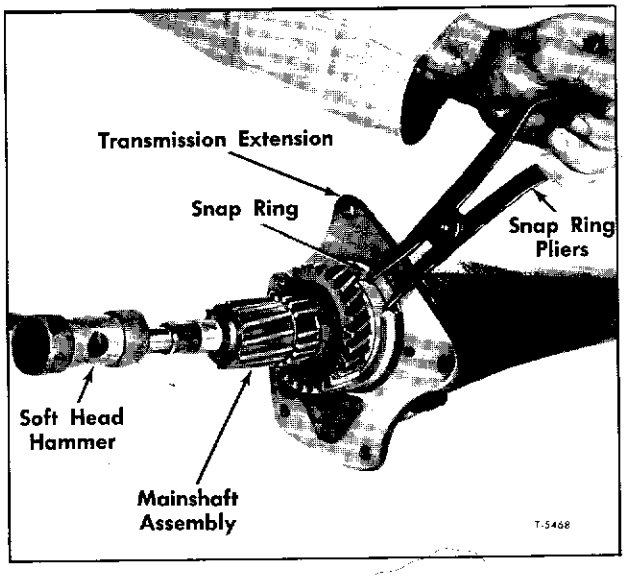


Figure 15—Installing Mainshaft Assembly in Transmission Case Extension

NOTE: Shift lever clutch ring on 2nd and 3rd speed clutch (29) must be positioned toward front.

4. Position new gasket (32) on transmission case (14), then referring to figure 16, insert mainshaft and extension or adapter assembly into transmission case.

NOTE: Turn 2nd and 3rd speed clutch slightly to permit alignment of mainshaft splines with splines of clutch. Turn mainshaft 2nd speed gear (25) to align gear teeth with teeth of countershaft gear (37).

5. Apply sealing cement to threads of five bolts which attach extension to transmission case. Install bolts with lock washers. Tighten bolts to 40 to 45 foot-pounds torque.

6. Install new rubber oil seal ring into groove of speedometer driven gear and fitting.

7. Apply clean engine oil to shaft of speedometer driven gear shaft, then insert shaft into gear fitting (48, fig. 1).

8. Insert speedometer driven gear and fitting into hole in side of extension case (15, fig. 1). Secure fitting with lock plate (47, fig. 1) and cap screw.

9. Using care not to damage lip of seal (1, fig. 20), press or drive new oil seal evenly into output end of transmission case extension.

10. Wrap splines of mainshaft (31) with clean paper for protection if unit is to be stored.

INSTALLATION OF MAIN DRIVE GEAR

1. Arrange 14 mainshaft pilot bearing front rollers (10) in cavity of main drive gear (8), then place front roller thrust washer (11) against end of rollers. If necessary, use heavy grease to hold rollers and thrust washer in place.

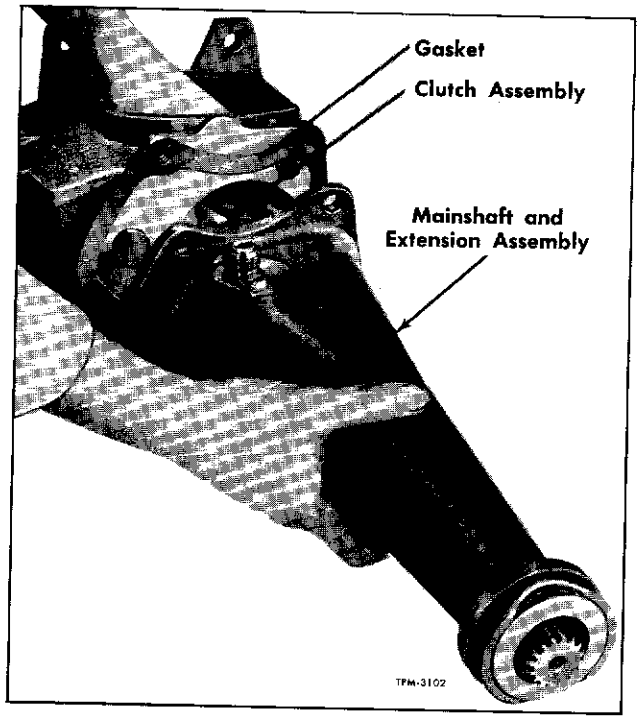


Figure 16—Installing Mainshaft and Extension Assembly

2. Position rear roller thrust washer (12) in cavity at rear of main drive gear. Using heavy grease to hold rollers (13) in place, position 24 pilot bearing rear rollers (13) in cavity of main drive gear. (Refer to figure 17.)

3. Insert main drive gear assembly through bore in front of transmission case (14) and mesh with splines of 2nd and 3rd speed clutch (29).

4. Tap on outer race of main drive gear bearing to seat locating snap ring against transmission case; then place new bearing cap gasket (4) on transmission case with cut-out in gasket aligned with oil passage through case. Install main drive gear bearing cap (3), being sure to align lubricant passages. Apply sealing cement to threads of cap retaining bolts, then install bolts with new lock washers. Tighten bolts to 12 to 15 foot-pounds torque.

INSTALLATION OF SIDE COVER

1. With transmission gears in "Neutral" and shifter forks in "Neutral" position, install transmission side cover (fig. 18) to transmission case (14) using a new gasket (15).

NOTE: Hump on first and reverse shifter fork must be toward rear of transmission.

2. Carefully note if the locating pin (39) in cover flange is indexed with locating pin hole in transmission case. Apply sealing cement to threads of cover retaining bolts, then install the four bolts and lock washers. Tighten bolts to 15 to 18 foot-pounds torque.

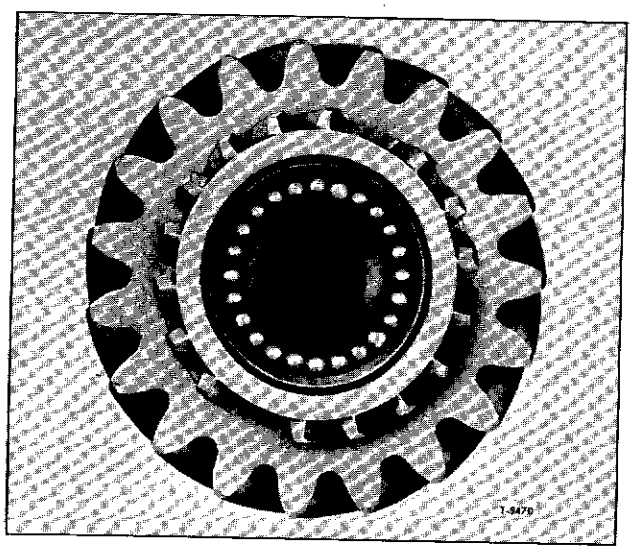


Figure 17—Mainshaft Pilot Roller Bearings in Drive Gear

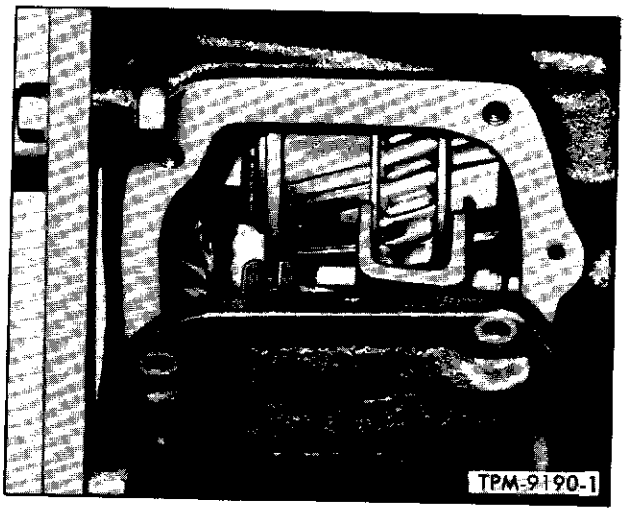


Figure 18—Installing Transmission Side Cover

3. Check operation of outer shifter levers (48 and 55) at side cover to determine if shift forks are properly engaged with gears and if gears operate freely.

PRE-INSTALLATION CHECK

Upon completion of transmission overhaul, check all shift positions. Rotate main drive gear and check for binding condition. Drive gear should turn with equal degree of resistance for complete cycle in each gear. If binding condition is encountered, unit should be inspected for cause.

IMPORTANT: After overhauled unit has been in service for 3,000 miles, the unit should be drained and refilled with recommended lubricant. Refer to applicable Service Manual for instructions.

SPECIAL TOOLS

References are made to special tools in the various sections of this manual. These tools, or their equivalent, are necessary and are recommended to readily and efficiently accomplish certain service operations. The tools, however, are not supplied by GMC Truck and Coach Division. Information regarding availability of these tools can be obtained from the Zone Office or from the Technical Publications Department at the factory.

Tool No.	Tool Name
J-5752	Transmission Holding Fixture
J-937	Drive Gear Shaft and Bearing Puller
J-5859	Oil Seal Puller
J-933-02	Bearing Nut Wrench
J-936	Bearing Press Plate
J-932	Synchronizer Ring Retainer Pliers
J-5778	Extension Housing Bushing Remover and Installer
J-1617	Countershaft and Bearing Assembly Tool

SPECIFICATIONS

GENERAL DATA
- Type ..... 3-Speed Synchromesh 2nd and 3rd Speeds
- Model SM318

GEAR RATIOS
- 1st Speed ..... 2.94 to 1
- 2nd Speed ..... 1.68 to 1
- 3rd Speed ..... 1 to 1
- Reverse ..... 3.14 to 1

THRUST WASHERS (THICKNESS)
- Reverse Idler Gear ..... 0.030"-0.032"
- Countershaft Gear ..... 0.0615"-0.0635"
- Mainshaft 2nd Speed Gear..... 0.195"-0.197"

MAINSHAFT BEARING SNAP RING
- Selective Fit to Maintain End Play of..... 0.004" or Less
- Thicknesses Available.... 0.087"-0.090"-0.093"-0.096"

REVERSE IDLER GEAR BUSHING
- Bushing Bore ..... 0.7515"-0.7525"
- Bushing-to-Shaft Clearance .. 0.0028"-0.0045"

TRANSMISSION EXTENSION BUSHING
- Bushing Bore ..... 1.5045"-1.5065"
- Bushing-to-U-Joint Yoke Clearance ..... 0.0015"-0.0045"

BEARINGS
- Main Drive Gear Bearing
  - Type ..... Single Row Ball w/Snap Ring
  - Outside Diameter ..... 2.8339"-2.8348"
  - Inside Diameter ..... 1.3773"-1.3782"
  - Length ..... 0.6643"-0.6693"
  - Balls ..... (9) 15/32" Diameter
- Mainshaft Rear Bearing
  - Type ..... Single Row Ball w/Snap Ring
  - Outside Diameter ..... 2.8341"-2.8346"
  - Inside Diameter..... 1.1806"-1.1812"
  - Length ..... 0.7430"-0.7480"
  - Balls ..... (7) 17/32" Diameter
- Mainshaft Front Pilot Bearings
  - Type ..... Needle Bearing Rollers
  - Number Required 14
  - Diameter..... 0.1873"-0.1875"
  - Length ..... 0.512"-0.527"
- Mainshaft Rear Pilot Bearings
  - Type ..... Needle Bearing Rollers
  - Number Required 24
  - Diameter..... 0.1248"-0.1250"
  - Length ..... 0.470"-0.490"
- Mainshaft Bearing Surfaces
  - Mainshaft Front Pilot Bearing Surface ..... 0.6553"-0.6558"
  - Mainshaft Rear Pilot Bearing Surface ..... 0.8333"-0.8338" (Refer to figure 5.)
- Countergear Bearing
  - Type ..... Needle Bearing Rollers
  - Number Required..... 25
  - Diameter ..... 0.1248"-0.1250"
  - Length ..... 0.735"-0.750"
- Reverse Idler Gear Thrust Bearing
  - Type ..... Roller Bearing Assembly
  - Number Required 1
  - Inner Diameter..... 0.752"-0.757"
  - Outside Diameter..... 1.800"-1.810"
  - Thickness ..... 0.0779"-0.0781"

CAM DETENT SPRING
- Approximate Free Length..... 1.27"

SHIFT FORK ROLLERS
- Number Required 2
- Inner Diameter ..... 0.1874"-0.1894"
- Outer Diameter..... 0.3115"-0.3135"
- Length ..... 0.265"-0.269"

TORQUE WRENCH SPECIFICATIONS
- Drain Plug ..... 25 to 35 ft.-lbs.
- Filler Plug..... 25 to 35 ft.-lbs.
- Drive Gear Bearing Retainer Bolts ..... 12 to 15 ft.-lbs.
- Transmission Cover Bolts ... 15 to 18 ft.-lbs.
- Transmission Extension Bolts ..... 40 to 45 ft.-lbs.
- Shifter Lever Clamp Bolt Nuts..... 14 to 16 ft.-lbs.
- Shifter Interlock Retainer Nuts ..... 3 to 5 ft.-lbs.
- Drive Gear Bearing Retainer Nut ..... 39 to 41 ft.-lbs.