35. **Installation.** To install the input shaft, proceed as follows:

- **a.** Fit a new spigot bushing into the rear of the new input shaft.
- **b.** Insert the input shaft through the case and into the main drive gear then install the internal snap ring. If necessary use an input bearing driver (refer to Para 5b) to install the input bearing.
- **c.** Install the drive gear spacer and bearing onto the input shaft, then fit the front bearing retaining snap ring.
- **d.** Install the front bearing cover with a new gasket, ensuring that the oil return hole in the case aligns with the hole in the cover.
- **e.** Fit the clutch housing in accordance with Para 42.

**NOTE**

When fitting the input shaft bearing, ensure the open side of the bearing is fitted towards the transmission case to enable lubrication.

37. **Disassembly.** To disassemble the shift bar housing, proceed as follows (refer to Figure 28):

**NOTE**

During disassembly, lay all parts on a clean bench in order of removal to facilitate correct assembly. Shift bars not being removed must be kept in the neutral position or interlock parts will lock bars.

- **a.** Secure the assembly in a vice, plunger side up and remove the gasket material.
- **b.** Remove the two cap screws from the oil trough and remove the assembly.
- **c.** Cut the lock wire and remove the lock screws from each shift bar and block.

**NOTE**

When removing the shift bars, start with the upper shift bar, move all the bars to the right and out of the rear boss bore.

- **d.** Move the 4th/5th speed shaft to the rear of housing, removing the yoke and block from bar as it is withdrawn.
- **e.** Move the 2nd/3rd speed shift bar to the rear of housing, removing the yoke and block from bar as it is withdrawn. As the neutral notch in the bar clears the rear boss, remove the small interlock pin from the bore at the detent notch.
- **f.** Remove the actuating plunger from the bore at top of the centre boss.

**NOTE**

As the 1st/Reverse shift bar is removed from housing, two low range interlock balls will drop from bottom bore of rear boss.

- **g.** Move the short 1st/Reverse speed shift bar to the rear of the housing, removing the yoke from bar as it is withdrawn.
- **h.** If necessary, remove the plug, spring and reverse stop plunger from the bore in the 1st/Reverse speed shift yoke.

38. **Cleaning and Inspection.** To clean and inspect the shift bar housing, proceed as follows:

- **a.** Clean all metal components with cleaning spirit and blow dry with low pressure air. Ensure all bores and galleries are free of foreign matter.
- **b.** Check for wear on the shift yokes and blocks at the pads and lever slot.
- **c.** Check the yokes for correct alignment and ensure the yokes are not sprung.
<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Item</th>
<th>Description</th>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.</td>
<td>Shift bar housing</td>
<td>15.</td>
<td>Plunger</td>
<td>27.</td>
<td>Yoke bar, 1st/2nd</td>
</tr>
<tr>
<td>5.</td>
<td>Screw, hex hd, 3/8 inch UNC × 1-1/2 inch lg</td>
<td>17.</td>
<td>Plug, shift detent, slotted</td>
<td>29.</td>
<td>Interlock pin</td>
</tr>
<tr>
<td>8.</td>
<td>Actuating pin</td>
<td>20.</td>
<td>Shift yoke, reverse/1st</td>
<td>32.</td>
<td>Actuator</td>
</tr>
<tr>
<td>9.</td>
<td>Compression spring (3)</td>
<td>21.</td>
<td>Shift block, 1st/2nd</td>
<td>33.</td>
<td>Yoke bar, reverse/Lo</td>
</tr>
<tr>
<td>10.</td>
<td>Steel ball 1/2 inch dia (3)</td>
<td>22.</td>
<td>Screw wire locking (short) (1)</td>
<td>34.</td>
<td>Shift yoke, reverse/Lo</td>
</tr>
</tbody>
</table>

**Figure 28 – Shift Bar Housing**
d. Check the lock screws in the yokes and blocks. Tighten and re-wire any found loose.

e. If the housing has been disassembled, check the neutral notches of the shift bars for wear from the interlock balls.

f. Replace worn or damaged components as required.

39. Assembly. To assemble the shift bar housing, proceed as follows:

a. If previously removed, install the reverse stop plunger and spring in the 1st/Reverse shift yoke. Ensure that the plunger is fully seated in the bore at the yoke slot. Install the plug and tighten to compress the springs, back the plug out 1-1/2 turns after it bottoms.

b. Complete the yoke assembly process by staking the plug through the small hole in the yoke.

c. Install 1st/Reverse shift bar in the lower bore boss. Place the actuating plunger in its bore and place one ¾ inch diameter interlock ball in the interlock bore down against the 1st/reverse rail.

NOTE
Start with the lower shift bore of rear boss and move to the left (front of housing). Keep bars in the neutral position during installation. DO NOT EXCEED the recommended torque ratings for yoke lock screws as over-tightening may distort shift bars.

d. Holding the notched end of bar, install the 2nd/3rd speed shift bar in the middle bore of the housing boss, positioning the shift block on bar between the centre and rear bosses, and the yoke on the bar between the front and centre bosses, long hub to the front of housing. Just prior to inserting the notched end of bar in the rear boss, install the small interlock pin vertically in the bore at the neutral notch. Install the block and yoke lock screws, tighten and wire securely.

NOTE
It is necessary that the interlock pin remains in a vertical position during assembly as rotation of the bar will cause the pin to jam in the tension spring bores.

e. Install the other ¾ inch diameter ball in the bore at the top of the rear boss. This ball rides between the 2nd/3rd and 4th/5th speed shift bars.

f. Holding the notched end of the bar, install the 4th/5th speed shift bar in the upper bore of the housing boss, positioning the shift block on the bar between the centre and rear bosses, and the yoke on bar between the front and centre bosses with the long hub to the rear of housing. Install the block and yoke lock screws, tighten and wire securely.

g. Install the oil trough, apply a medium strength thread locking agent to the cap screws and tighten them to 11 to 16 N.m. (8 to 12 lbs. ft).

h. Remove the assembly from the vice and install the three tension balls, one in each bore in the top of the housing, place a detent spring over each ball to complete the assembly (refer to Figure 29).

40. Installation. To install the shift bar housing, proceed as follows:

a. Place all three mainshaft sliding clutches in the neutral position.

b. Install the new shift bar housing gasket into position on the transmission case. With all three shift bars in the neutral position, place the shift bar housing assembly onto the case, fitting the shift yokes into the slots of the corresponding sliding clutches.

c. Install the cap screws in the housing and tighten them to 48 to 61 N.m (35 to 45 lbf.ft).

d. Fit a cover plate or shift lever housing to prevent the detent springs and balls from falling out and contamination of transmission.

Figure 29 – Installation of Detent Balls and Springs
CLUTCH HOUSING

41. **Removal.** Loosen and remove the four cap screws and six nuts securing the clutch housing to the transmission case and remove the housing.

42. **Installation.** Position a new gasket onto the transmission case, ensuring that the side with the blue gasket sealant is against the transmission case then refit the clutch housing. Fit the nuts and cap screws. Tension the six nuts to 244 to 258 N.m (180 to 190 lbf.ft) and the four cap screws to 122 to 136 N.m (90 to 100 lbf.ft).

AUXILIARY SECTION

DRIVE YOKE AND OUTPUT SEAL

43. **Removal.** To remove the output seal and drive yoke, proceed as follows:

   a. Disconnect the propeller shaft from the drive yoke (refer to EMEI Vehicle G 703).

   b. Engaging 1st gear, low range to prevent the output yoke from turning then loosen and remove the nut from output shaft.

   c. Pull the yoke straight off the rear of the output shaft then remove the speedometer drive rotor and spacer from the output shaft.

   d. Remove the oil slinger from the yoke and pull the oil seal out of the bearing cover.

44. **Cleaning and Inspection.** To clean and inspect the drive yoke and output shaft, proceed as follows:

   a. Clean all components using clean solvent and dry thoroughly.

   b. Inspect the splines on the output shaft and drive yoke for wear and damage.

   c. Inspect the sealing surface of the drive yoke for wear or scoring.

   d. Replace worn or damaged components as necessary.

45. **Installation.** To install the output seal, proceed as follows (refer to Figure 30):

   a. Refit the spacer and speedometer drive rotor onto the output shaft.

   b. Install a new output seal into the bearing cover using the output seal driver (refer Para 5a) and fit the new oil slinger onto the drive yoke.

   c. Refit the drive yoke and nyloc nut and tension to between 610 to 678 N.m (450 to 500 lbf.ft).

   d. Refit the propeller shaft in accordance with EMEI Vehicle G 703.

AUXILIARY HOUSING

46. **Removal.** To remove the auxiliary housing, proceed as follows:

   a. Clean the protruding portion of the housing alignment dowel pins with emery cloth prior to removal of auxiliary housing.

   b. Loosen the retaining cap screws around the auxiliary housing flange then remove both countershaft bearing covers and shims.

   c. Spray WD-40 or equivalent into the three threaded jacking screw holes then run a 3/8 inch UNC tap through to clean the threads prior to inserting jacking screws.

   **CAUTION**

   DO NOT USE EMERY CLOTH OR ANY OTHER ABRASIVE MEDIUM TO CLEAN THE SEALING SURFACE OF THE DRIVE YOKE. DOING SO MAY MAR THE SURFACE FINISH CAUSING PREMATURE SEAL FAILURE.

   c. Inspect the sealing surface of the drive yoke for wear or scoring.

   d. Replace worn or damaged components as necessary.

   **NOTE**

   This procedure can be performed with the transmission in either the vertical or horizontal positions.

   a. Clean the protruding portion of the housing alignment dowel pins with emery cloth prior to removal of auxiliary housing.

   b. Loosen the retaining cap screws around the auxiliary housing flange then remove both countershaft bearing covers and shims.

   c. Spray WD-40 or equivalent into the three threaded jacking screw holes then run a 3/8 inch UNC tap through to clean the threads prior to inserting jacking screws.
WARNING

AUXILIARY COUNTERSHAFT SHIM GAUGES OR RETAINING STRAPS MUST BE INSTALLED TO PREVENT AUXILIARY COUNTERSHAFTS FROM FALLING FREE.

d. Install a shim gauge (refer Para 5a) on each countershaft using 2 × 3/8 inch UNC × 1 inch long cap screws and 1 × 3/8 inch UNC × 1-1/2 inch long cap screw through the centre hole.

e. Remove the cap screws securing the auxiliary housing to the main case, insert three jacking screws and evenly wind in until the housing splits away.

f. Attach an appropriate crane securely to the auxiliary housing and carefully lift it clear of the main case. Secure the auxiliary section in a vice as shown at Figure 31.

47. Disassembly. To disassemble the auxiliary section, proceed as follows (refer to Figure 32 and Figure 33):

a. Secure the auxiliary housing in a vice and remove the four cap screws securing the range cylinder cover to the housing.

Figure 31 – Auxiliary Section Mounted in Vice

Figure 32 – Auxiliary Housing Assembly

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Auxiliary housing</td>
</tr>
<tr>
<td>2.</td>
<td>Rear bearing cover</td>
</tr>
<tr>
<td>3.</td>
<td>Oil seal and slinger</td>
</tr>
<tr>
<td>4.</td>
<td>Auxiliary countershaft bearing cover</td>
</tr>
<tr>
<td>5.</td>
<td>Shim</td>
</tr>
</tbody>
</table>
b. Remove the retaining nut from the end of the yoke bar and the four cylinder retaining cap screws, then remove the range cylinder assembly from the auxiliary housing (refer to Figure 34).

c. Remove the piston from the range cylinder and remove the inner and outer ‘O’ rings.

NOTE
To complete the removal of the range yoke assembly the auxiliary countershaft must be removed.

d. Partially drive the output shaft forward using a brass drift to provide clearance for removal of the auxiliary countershaft.

e. Support the upper countershaft while removing the shim gauge from the rear of the countershaft. Place the countershaft on the bench and remove the countershaft rear bearing cup from the auxiliary housing bore. Repeat this procedure for the lower countershaft.

f. Using a bearing puller, remove the bearings from the auxiliary countershafts.

g. Remove the range shift yoke and synchronizer assembly from the auxiliary section by sliding it off the output shaft. Ensure the shift yoke is held to prevent it falling as the shaft clears the cylinder (refer to Figure 35).

h. Place the larger LO range synchronizer ring face down on the bench and cover the assembly with a cloth to prevent losing the three springs that will be released from the...
HI range synchronizer pin locations. Pull the HI range synchronizer from the blocker pins (refer to Figure 36).

i. Remove the high range synchronizer and sliding clutch from the low range synchronizer.

j. Support the low range gear and auxiliary mainshaft to prevent it falling then using a soft bar and maul, drive the shaft forward through the rear bearing assembly (refer to Figure 37).

k. Remove the bearing inner spacer then, using the front face of the low range gear as base, press the output shaft through the gear and bearing. Remove all components from the output shaft.

l. Remove the rear bearing cover taking care not to drop the rear bearing, then remove the bearing cup from the bore in the auxiliary case.

48. Assembly. To assemble the auxiliary section, proceed as follows:

a. Mark two opposing teeth on the synchroniser side of the low range gear as shown in Figure 38. Ensure that the marks are exactly 180° apart and the number of teeth between the marks are the same on each side.

b. Place the output shaft splined end down on the bench and install the spline washer.
c. Install the low range gear on the output shaft, lubricate the contact surfaces of the spacer washer and install it on the shaft (refer to Figure 39).

Figure 39 – Installation of Low Range Gear

d. Heat the front bearing cone in a bearing heater, ensuring the temperature does not exceed 136°C and install it onto the shaft against the spacer washer (refer to Figure 33).

NOTE
Compare the front and rear bearing cone inner diameters. The front bearing cone inner diameter is the larger of the two and is installed first.

e. Install the auxiliary rear bearing cup into the auxiliary housing.

f. Place the larger low range synchroniser ring face down on the bench and install the sliding clutch onto the blocker pins with the recessed side up as shown in Figure 36.

g. Fit the three springs into the bores in the high range synchroniser ring, then place the ring over the blocker pins of the low range synchroniser. Ensure that the springs seat against the blocker pins on the low range synchroniser.

h. Cover the synchroniser assembly with a clean cloth to prevent injury to hands. Apply downward pressure to the high range synchroniser ring while twisting anti-clockwise to compress the springs and fully seat the ring on the blocker pins of the low range synchroniser ring.

i. Install the synchroniser assembly onto the splines of the output shaft and place the assembly aside.

j. Locate the ‘O’ stamped in the top of each auxiliary countershaft and mark the adjoining teeth with a highly visible marking compound as shown in Figure 40.

Figure 40 – Timing Marks (Auxiliary Countershafts)

k. Install the countershaft spacer and bearing cones.

l. Position the auxiliary countershafts on a flat bench with the high range gears down, then locate the output shaft, low range gear and synchroniser assembly between the two auxiliary countershafts.

m. Ensure the timing marks on the low range gear are aligned between the marked teeth on both auxiliary countershaft gears.

n. Place the range yoke assembly into the synchroniser sliding clutch.

o. Lower the auxiliary housing over the output and auxiliary countershaft assemblies then install the two rear auxiliary countershaft bearing cups.

NOTE
Only tighten the cap screws securing the shim gauges until snug.

p. Place a shim gauge over each bearing and secure using two 3/8 inch UNC by 1 in lg cap screws in the outer holes, and one 3/8 inch UNC by 2-1/2 inch cap screw through the centre hole into the auxiliary countershaft. Lift the assembly up and secure it in a bench vice as shown in Figure 31.

q. Install the range cylinder into the auxiliary section bore, apply medium strength thread locking compound to the threads of the bolts and tighten to 47 to 61 N.m (35 to 45 lbf.ft).

r. Lubricate the range piston ‘O’ rings with pneumatic grease and fit them to the piston, then install it into the bore of the range cylinder and tighten the piston retaining nut to 95 to 115 N.m (70 to 85 lbf.ft).
s. Fit a new gasket to the range cylinder cover and position onto the range cylinder, apply medium strength thread locking compound to the threads of the cap screws and tighten to 47 to 61 N.m (35 to 45 lbf.ft).

t. Install the bearing spacer on the output shaft, then heat the rear bearing cone in a bearing heater. Ensure the temperature does not exceed 136°C. Install the bearing onto the shaft until seated against the spacer.

u. Fit the rear bearing housing using a new gasket, apply a medium strength thread locking compound to the bolt threads and tighten to 47 to 61 N.m (35 to 45 lbf.ft).

v. Install the spacer ring and speedometer rotor over the output shaft followed by the drive yoke and nut.

FRONT SECTION

49. **Removal and Disassembly of Auxiliary Drive Gear Assembly.** To remove and disassemble the auxiliary drive gear assembly, proceed as follows:

a. Remove the snap ring from the groove at the rear of the mainshaft then remove the cap screws from the bearing retainer ring.

b. Insert three 3/8 inch UNC by 1-½ inch lg jacking screws into the tapped holes in the retainer ring as shown in Figure 41, then evenly wind them in to pull the auxiliary drive gear assembly from the case bore.

c. Remove the retaining ring from the front of the auxiliary drive gear as shown in Figure 42, then remove the snap ring from the auxiliary drive gear hub.

d. Press the drive gear out of the bearing by hand (refer to Figure 43).

50. **Removal and Disassembly of Reverse Idler Gears**

To remove and disassemble the reverse idler assemblies, proceed as follows (refer to Figure 49):

a. Move the mainshaft reverse gear as far rearward as possible and remove the snap ring from the inside diameter of the gear.

b. Remove both front auxiliary countershaft bearing cups from the case bores.

c. Remove the retaining screw and washer from the reverse idler shaft, move reverse gear forward against the 10th speed gear then, using a slide hammer with ½ in UNF threaded end, remove the idler shafts from the case bore.

d. As the idler shaft is withdrawn, remove the thrust washers and gear from the case.
NOTE
Use this procedure to remove the lower reverse idler assembly after removal of the lower countershaft.

Removal of Countershaft Bearings and Input Shaft

CAUTION

THE FOLLOWING PROCEDURE WILL DAMAGE THE BEARINGS AND THEREFORE SHOULD NOT BE ATTEMPTED UNLESS THE BEARINGS ARE TO BE REPLACED.

NOTE
The following instructions detail the removal of both countershaft bearings. If there is only a need to remove the mainshaft, only remove the bearings from the upper countershaft.

51. To remove the counter bearings and input shaft, proceed as follows:
   a. Remove the snap rings from the rear of each countershaft then, using a brass drift and maul, drive the rear countershaft bearings rearwards and out of the case bores (refer to Figure 44).
   b. Remove the cap screws and front bearing retainer plates from both countershafts.
   c. Using a brass drift and maul, drive each countershaft rearward as far as possible to partially unseat the front bearings.
   d. From the rear of the case, use a brass drift and maul to drive each countershaft forward to unseat the front bearings and expose the bearing snap rings then, using a puller or pry bars remove the front bearings.

Figure 44 – Removal of Rear Countershaft Bearings

52. To remove and disassemble the mainshaft assembly, proceed as follows:

CAUTION

THE REVERSE GEAR IS FREE AND MAY FALL FROM THE SHAFT AS IT IS REMOVED.

   a. Block the right countershaft assembly against the wall of the case, move the mainshaft assembly rearward, tilt the front of the shaft up and lift the assembly from the case.
   b. Remove the 4th/5th speed sliding clutch from the front of the mainshaft.
   c. Remove the snap ring from the groove at the rear of the mainshaft then remove the reverse gear and spacer.
   d. Remove the key from the rear of the mainshaft then, turn the reverse gear limit washer to align its splines with those of the mainshaft, remove the washer and 1st/reverse sliding clutch at the same time.
   e. Lift and rotate 1st gear to align the splines of the limit washer. Remove the limit washer, spacer and 1st gear from the shaft.
   f. Lift and remove the 2nd gear limit washer, spacer, gear and the 2nd/3rd sliding clutch from the shaft.
   g. Remove each remaining gear, limit washer, spacer and sliding clutch from the mainshaft. If necessary remove the snap rings from the inside diameter of each gear.

NOTE
Ensure all components are laid out in order and their positions on the mainshaft noted to facilitate correct assembly. Keep internally and externally splined washers with the gear they were removed from.
Removal and Disassembly of Countershafts

53. To remove and disassemble the countershaft assemblies, proceed as follows:

NOTE
With the exception of the PTO gears both countershafts are identical and disassembled in the same manner.

a. Move the upper countershaft as far rearward as possible to disengage the forward end of the shaft from the case, then move the front of the shaft towards the centre of the case and lift it out. Repeat the procedure for the lower shaft.

NOTE
The lower reverse idler assembly may be removed and disassembled at this point, if required, as detailed in Para 50.

b. Remove the drive gear retaining snap ring from the front of each countershaft then, using the face of the overdrive gear as a base, press the bearing inner ring, drive, PTO and overdrive gears from each countershaft as a cluster (refer to Figure 45).

c. Using the rear face of 2nd gear as a base, press the 3rd and 2nd gears from each countershaft as a cluster (refer to Figure 45).

d. If necessary, remove the key and roll pin from the countershaft.

Removal and Disassembly of Oil Pump

NOTE
The oil pump is only available as a complete assembly. Disassembly is only required for inspection purposes.

54. To remove and disassemble the oil pump assemblies, proceed as follows (refer to Figure 47):

a. Straighten the tube lock on the suction tube, then remove the tube by pulling it away from the pump. Remove the ‘O’ ring from the tube.

b. Remove the three cap screws retaining the pump to the case, then remove the pump assembly from inside the case.

c. Remove the oil pump retainer, withdraw the outer pump element from the housing, then remove the drive gear retaining snap ring, drive gear and key from the shaft.

d. Remove the snap ring and internal pump element from the shaft.

e. Remove the internal element drive keys from the shaft, then remove the shaft from the housing. If required, remove the rear drive gear retaining snap ring.

f. Remove the relief valve retaining plug, spring and ball from the bore of the housing.
g. If necessary the front case plug can be removed by pushing it out through the front of the case. Remove the ‘O’ ring from the plug.

INSPECTION PROCEDURES

55. Before reassembling the transmission, inspect each part carefully for abnormal or excessive wear and damage to determine reuse or replacement.

56. Recommended inspection procedures are provided in the following checklist.

a. **Bearings:**
   1. Wash all bearings in clean solvent. Check balls, rollers and raceways for pitting, discoloration, and spalled areas. Replace bearings that are pitted, discoloured, or spalled.
   2. Lubricate bearings that are not pitted, discoloured, or spalled and check for axial and radial clearances.
   3. Replace bearings with excessive clearances.
   4. Check bearing fits. Bearing inner races should be tight to shaft; outer races slightly tight to slightly loose in case bore. If bearing spins freely in bore, however, the case should be replaced.

b. **Gears:**
   1. Check gear teeth for frosting and pitting. Frosting of gear tooth faces presents no threat of transmission failure. Often in continued operation, frosted gears will ‘heal’ and not progress to the pitting stage. In most cases, gears with light to moderate pitted teeth have considerable gear life remaining and can be reused. But gears with advanced stage pitting should be replaced.
   2. Check for gears with clenching teeth abnormally worn, tapered, or reduced in length from clashing in shifting. Replace gears found in any of these conditions.
   3. Check axial clearance of gears. Where excessive clearance is found, check gear snap ring, washer, spacer, and gear hub for excessive wear. Maintain 0.127 to 0.305 mm (0.005 to 0.012 inch) axial clearance between mainshaft gears.

c. **Splines.** Check splines on all shafts for abnormal wear. If sliding clutch gears, companion flange, or clutch hub have worn into the sides of the splines, replace the specific shaft affected.

d. **Tolerance/ Limit Washers.** Check surfaces of all limit washers. Washers scored or reduced in thickness should be replaced.

e. **Reverse Idler Gear Assemblies.** Check for excessive wear from action of roller bearings.

f. **Grey Iron Parts.** Check all grey iron parts for cracks and breaks. Replace parts found to be damaged.

g. **Clutch Release Parts:**
   1. Check clutch release parts. Replace yokes worn at cam surfaces and bearing carrier worn at contact pads.
   2. Check pedal shafts. Replace those worn at bearing surfaces.

h. **Shift Bar Housing Assembly:**
   1. Check for wear on shift yokes and blocks at pads and lever slot. Replace excessively worn parts.
   2. Check yokes for correct alignment. Replace sprung yokes.
   3. Check the lock screws in the yokes and blocks. Tighten and rewire those found to be loose.
   4. If the housing has been disassembled, check the neutral notches of the shift bars for wear from interlock balls.

i. **Gear Shift Lever Housing Assembly:**
   1. Check the spring tension on shift lever. Replace tension spring and washer if lever moves too freely (refer to EMEI Vehicle D 323).
   2. If the housing is disassembled, check the spade pin and corresponding slot in the lever for wear. Replace both parts if excessively worn (refer to EMEI Vehicle D 323).

j. **Bearing Covers:**
   1. Check covers for wear from thrust of adjacent bearing. Replace covers damaged from thrust of bearing outer race.
   2. Check bores of covers for wear. Replace those worn oversize.

k. **Oil Return Threads and Seals:**
   1. Check oil return threads on input shaft. If sealing action of threads has been destroyed by contact with bearing cover, replace input shaft.
(2) Check oil seal in rear bearing cover. If sealing action of lip has been destroyed, replace seal.

1. **Sliding Clutches:**
   (1) Check all shift yokes and yoke slots in sliding clutches for extreme wear or discoloration from heat.
   (2) Check engaging teeth of sliding clutches for partial engagement pattern.

2. **Synchroniser Assembly:**
   (1) Check synchroniser for burrs, uneven and excessive wear at contact surface, and metal particles.
   (2) Check blocker pins for excessive wear or looseness.
   (3) Check synchroniser contact surfaces on the auxiliary drive and low range gears for excessive wear.

3. **O’ Rings.** Check all ‘O’ rings for cracks or distortion. Replace if worn.

**Assembly**

57. Make sure that interiors of case and housings are clean. It is important that dirt and other foreign materials be kept out of the transmission during assembly. Dirt is an abrasive and can damage polished surfaces of bearings and washers. Use certain precautions, as listed below, during assembly.

   a. **Gaskets.** Use new gaskets throughout the transmission rebuild procedure. Make sure all gaskets are installed. An omission of any gasket can result in oil leakage or misalignment of bearing covers.

   b. **Cap Screws.** To prevent oil leakage, use Loctite 242 thread sealant on all cap screws and tighten to recommended torque settings.

   c. **O’ Rings.** Lubricate all ‘O’ rings with silicon lubricant.

   d. **Assembly.** Refer to the illustrations provided in the detailed disassembly instructions as a guide to assembly.

   e. **Initial Lubrication.** Coat all limit washers and splines of shafts with lubricant during assembly to prevent scoring and galling of such parts.

   f. **Bearings.** Use of flanged-end bearing drivers is recommended for the installation of bearings. These special drivers apply equal force to both bearing races, preventing damage to balls/rollers and races while maintaining correct bearing alignment with bore and shaft. Avoid using a tubular or sleeve-type driver, whenever possible, as force is applied to only one of the bearing races.

   g. **Universal Joint Yoke.** Pull the companion flange or yoke tightly into place with the output shaft nut, using 610 to 678 N.m (450 to 500 lbf.ft) of torque. Make sure the speedometer drive gear or a replacement spacer of the same width has been installed. Failure to pull the companion flange or yoke tightly into place will permit the output shaft to move axially with resultant damage to the rear bearing.

**ASSEMBLY**

**Preparation of Main Case**

58. To prepare the main case for assembly, proceed as follows:

   a. Ensure that the three magnetic discs are securely in place in their wells in the base of the case. The magnets can be secured using Scotch Grip Rubber Adhesive or equivalent.

   b. Ensure that the dowel pins at the rear of the case are fitted with the front (large diameter) of the pin flush with the front of the case. 9.5 to 13 mm (3/8 to 1/2 inch) of the large diameter of the pin must engage with the auxiliary housing when assembled (refer to Figure 46).

   ![Figure 46 – Installation of Dowel Pins](image)
Assembly and Installation of Oil Pump

59. To assemble and install the oil pump, proceed as follows (refer to Figure 47):

a. Replace the ‘O’ ring on the front case plug and install the plug.
b. Install the relief valve ball, spring and plug into the bore.
c. If removed, install the drive shaft snap ring on the pump drive shaft and insert the shaft through the pump housing bore.
d. Install the two keys into the drive shaft keyways and install the inner element, aligning the keys on the drive shaft with their respective keyways on the inner element.
e. Fit the inner element retaining snap ring into the groove in the drive shaft.
f. Install the drive gear key in the keyway of the drive shaft.
g. Install the drive gear onto the drive shaft, aligning the key and keyway.
h. Install the outer drive gear retaining snap ring.
i. Install the outer oil pump element and refit the oil pump retainer.
j. Install the oil pump retainer over the alignment pin inside the case with the bore retainer facing the rear of the case.
k. Fit the pump assembly into the case, aligning the oil pump retainer and alignment pin. Install and tighten the three cap screws to 11 to 16 N.m (8 to 12 lbf.ft).
l. Fit a new ‘O’ ring to the suction tube and install the tube under the case rib and into the pump housing. Bend the tube lock on the suction tube over the case rib to hold it in position.

Assembly of Auxiliary Drive Gear

60. To assemble the auxiliary drive gear, proceed as follows:

a. Install the bearing retainer on the front auxiliary drive gear with the snap ring groove facing up (refer to Figure 48).
b. Start the bearing on the hub and press into position by hand until fully seated. Install the snap ring then fit and seat the outer retaining ring.
Assembly and Installation of Reverse Idler Gears

61. To assemble and install the reverse idlers, proceed as follows (refer to Figure 49):

a. Fit a new bearing into the reverse idler gear (refer to Figure 50). Fit the retaining ring and rear idler plate onto the idler shaft.

b. Position the reverse idler gear into position with the long hub facing forward, then insert the idler shaft through the main case bearing bore and into the reverse idler gear bearing from the rear with the tapped hole pointing forwards. As the shaft moves through the bearing, locate the front idler plate and continue sliding the idler shaft through into the case support boss.

c. Gently tap the idler shaft through from the rear until resistance is felt then install the washer and cap screw. Apply Loctite 242 to the threads of the capscrew and tension to 68 to 81 N.m (50 to 65 lbf.ft).

d. Install the auxiliary countershaft bearing cups into the case bores.

Assembly and Partial Installation of Countershafts

62. To assemble the countershaft, proceed as follows (refer to Figure 45):

NOTE
With the exception of the PTO gears both countershafts are identical and assembled in the same manner.

a. If previously removed, install the roll pin and key into the keyway of the countershaft.

b. Position the 2nd speed gear into a press, long hub facing down. Align the key on the front of the countershaft with the keyway of the gear then press the shaft through until it bottoms.

c. Position the 3rd speed gear into the press, long hub facing up. Align the key on the front of the countershaft with the keyway of the gear then press the shaft through until it meets the hub of the 2nd speed gear.