



Mack Maxitorque Transmission TRL1076 Manual

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MAXITORQUE TRANSMISSION TRL1076 and TRL1078

DESCRIPTION

The TRL1076 and TRL1078 are triple countershaft transmissions providing five forward speeds and one reverse speed. Short in length, light in weight and easy to service, this new transmission is designed for use in over the road trucks and tractors particularly in long distance operation on varied terrain. Both transmissions are identical except for the elimination of the upper left hand rear countershaft in the TRL1076.

The five speed gearset is housed in a high strength aluminum case which is constructed in two pieces for maximum convenience of disassembly and reassembly. See Figures 1 and 2.

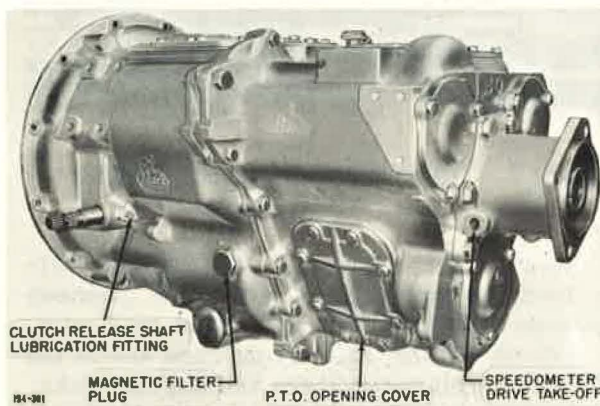


Figure 1. Left Rear View of Transmission

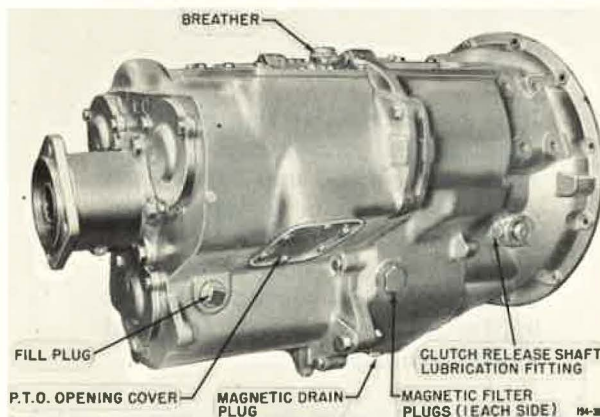


Figure 2. Right Rear View of Transmission

Cast iron liners are cast in aluminum case at all shaft bearing locations. These liners assure maximum service life plus the advantages of light weight construction.

Unlike conventional transmissions, three countershafts are equally spaced around the input shaft. This design provides extremely

high capacity in the shortest overall length. By distributing the load equally among three shafts, normal deflection is reduced to a minimum. Another unique design is that the mainshaft gears are self centered among the three countershafts, eliminating the need for gear bushings. The mainshaft gears are connected to the mainshaft only when engaged by a sliding clutch.

All gears of the gearset are of the spur type design and with the exception of reverse speed sliding gear, are in constant mesh with the countershaft gears. Other than reverse, driving engagement for the five forward speeds is effected by means of the sliding clutches. Reverse is obtained by engaging reverse sliding spur gear with the three individually mounted idler gears. Conventional forks spanning the sliding clutches and reverse gear, move these parts in response to the movement of the gear shifter hand control lever by the driver.

LUBRICATION

All rotating and sliding parts of the transmission are bathed in oil from gear throw-off when the engine is operating.

Removal of all foreign metallic particles within the transmission is accomplished by two magnetic oil filters, one on each side of the case. The filter consists of an integral open trough and baffle arrangement with a removable sheet metal cover. At the bottom of the baffle, a tapped hole in the case accommodates a large hex plug with a powerful built-in magnet installed from outside.

The oil from gear throw-off is collected by the filter and is made to pass the magnetic plugs which pull all ferrous metal particles out of the passing oil and holds them. After passing the magnet, clean and chip-free oil then rises to the outlet near the top of the filter and drops down into the transmission case. A magnetic drain plug is also provided at the bottom of the case.

To change oil, remove magnetic drain plug and drain oil from case while hot. If necessary, also flush case with flushing oil and drain thoroughly. Clean and replace magnetic drain plug. Remove fill plug and fill with recommended gear oil to level of filler plug hole at the intervals specified in OPERATION MANUAL. Reinstall filler plug. Follow schedule instructions closely and if operation requires it, make checks and changes more often.

capscrews and cover. See Figure 4. Tap on gear end of main driving pinion with a nylon mallet if necessary and remove assembly from case.

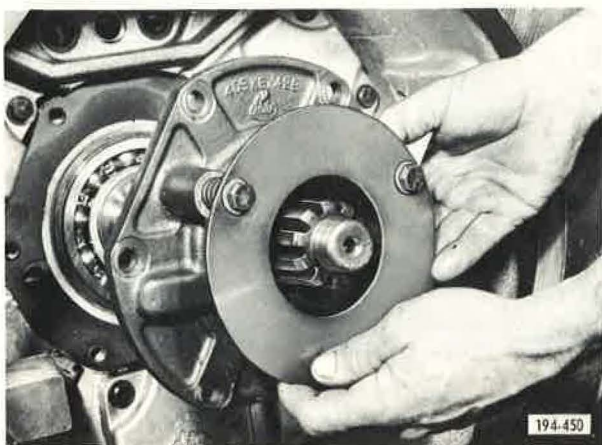


Figure 4. Removing Main Driving Pinion Bearing Cover

7. Remove fourth/fifth speed sliding clutch from mainshaft. See Figure 5.

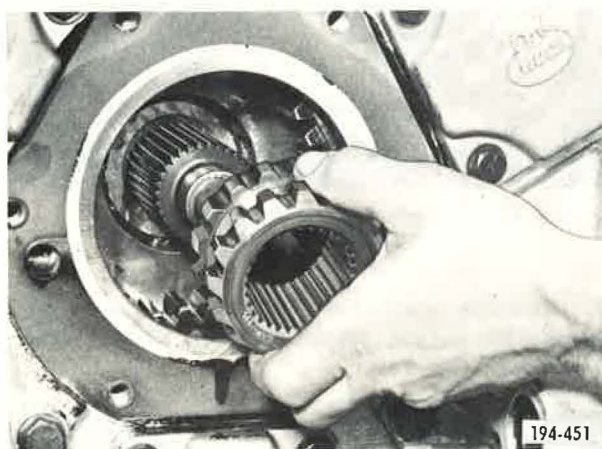


Figure 5. Removing Fourth/Fifth Speed Sliding Clutch

8. Through main driving pinion bearing opening, remove fourth speed gear selective thrust washer retaining snap ring. See Figure 6. Slide fourth speed gear selective thrust washer off of mainshaft. See Figure 7.

9. Carefully withdraw mainshaft from case through rear bearing opening. See Figure 8.

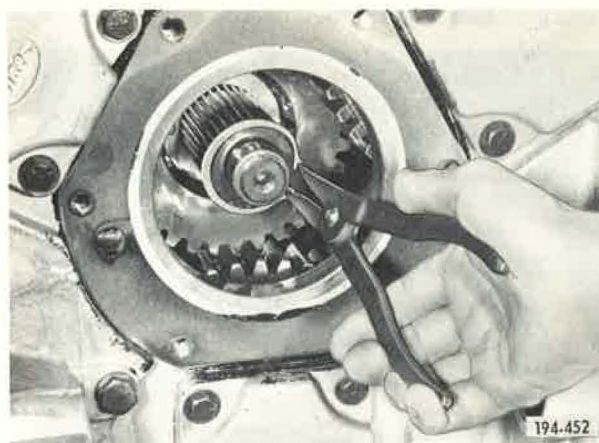


Figure 6. Removing Thrust Washer Retaining Snap Ring



Figure 7. Removing Fourth Speed Gear Selective Thrust Washer



Figure 8. Removing Mainshaft

10. Remove fourth speed gear and thrust washer through transmission case top cover opening. See Figure 9.

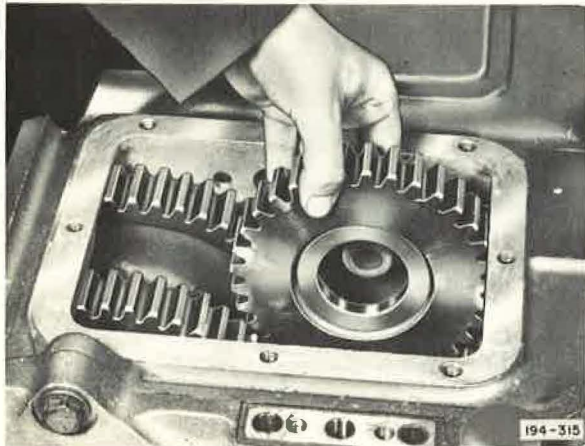


Figure 9. Removing Fourth Speed Gear

11. Remove countershaft rear bearing cover capscrews and cover. Remove power-take-off cover capscrews and covers. Remove the lower and right-hand rear countershaft oil slinger front snap rings, or power-take-off gear front snap ring when incorporated. See Figure 10.

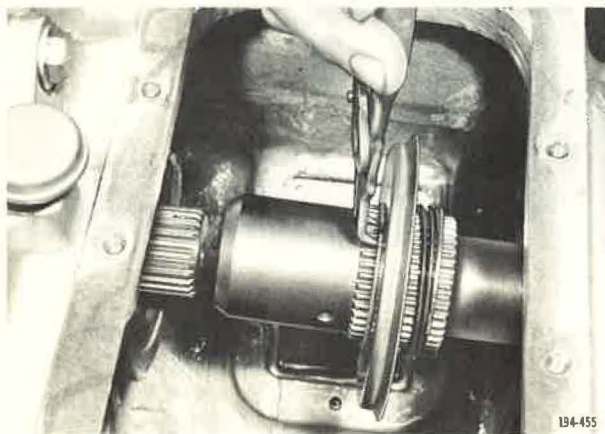


Figure 10. Removing Rear Countershaft Oil Slinger Front Snap Ring

12. Remove the three rear countershafts from case through rear bearing cover openings. While withdrawing the lower and right-hand countershafts, at the same time slide oil slinger and oil slinger retaining spring with its front snap ring off of shaft. Where power-take-off gear is incorporated instead of oil slinger, slide power-take-off gear with its front snap ring off of shaft.

13. Place main case in a vertical position. Remove all case-to-case dowel bolts and cap screws. With a nylon headed mallet, tap rear case and separate it from the front case. Remove rear case and place on bench.

14. Remove front countershaft thrust washer retaining snap ring, then remove thrust washer from countershafts. See Figures 11 and 12.

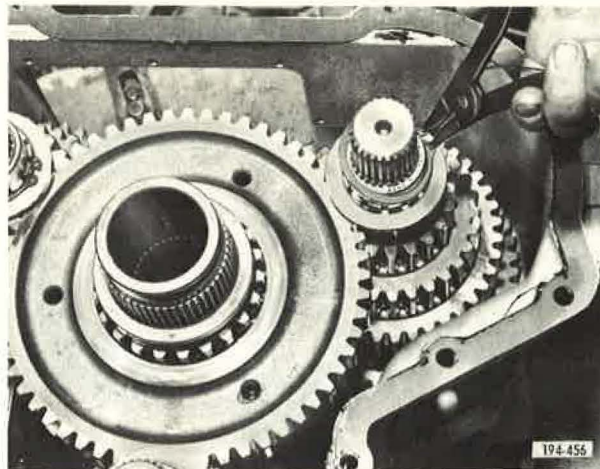


Figure 11. Removing Thrust Washer Retaining Snap Ring

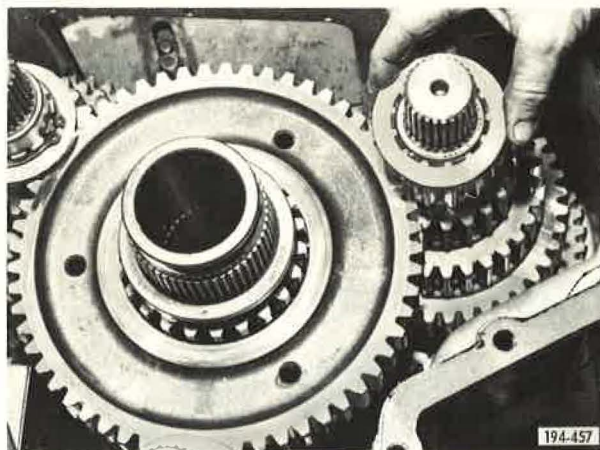


Figure 12. Removing Countershaft Thrust Washer

15. Remove mainshaft sliding clutches and gears with thrust washers from case. See Figures 13 and 14.



Figure 13. Removing First Speed Sliding Clutch

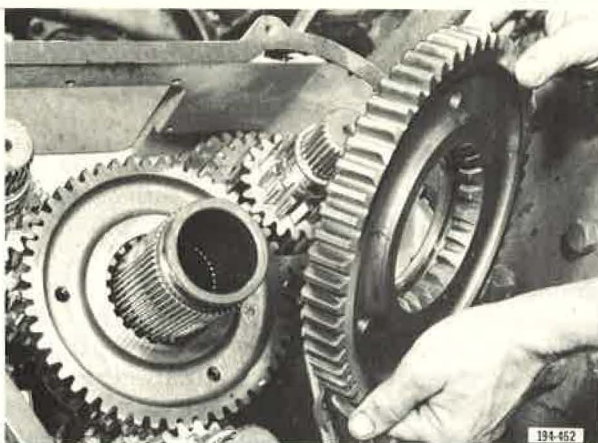


Figure 14. Removing First Speed Gear

16. Place transmission in a horizontal position and remove countershaft front bearing cover capscrews and covers. Remove snap rings from outer race of countershaft front bearings.

17. Position transmission vertically, then remove the three front countershaft assemblies from case. See Figure 15.



Figure 15. Removing Front Countershafts

SUB-ASSEMBLIES

Main Driving Pinion

Remove bearing retaining spirollox snap ring. See Figure 16. Remove the ball bearing by pressing or tapping off. Turn pinion over and remove retaining snap ring and spigot bearing.

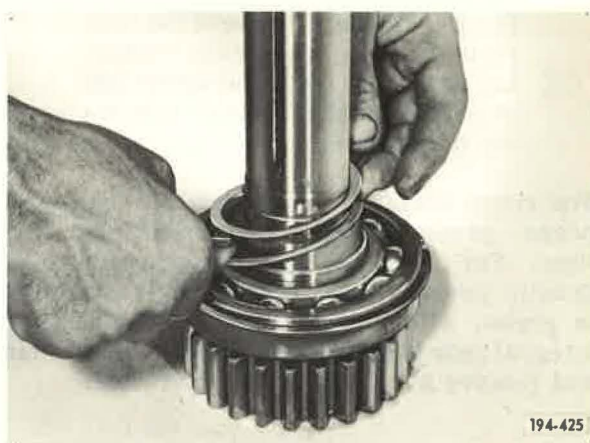


Figure 16. Removing Pinion Bearing Retaining Spirollox Snap Ring

Mainshaft

Remove mainshaft rear ball bearing positioning snap ring then press shaft out of rear ball bearing. Place mainshaft in vise having soft metal jaws and remove spigot bearing retaining snap ring and bearing inner race. Remove reverse stop snap ring from shaft.

Rear Case

Using a sharp tool, punch a hole in idler shaft expansion plug and pry out. With a suitable threaded puller withdraw the three idler gear shafts from case. Remove idler gears, bearings, thrust washers, and reverse speed gear from case. Remove countershaft roller bearing retaining snap rings and bearings from case.

Rear Countershafts

Remove countershaft rear bearing retaining snap ring and positioning snap ring, then press countershafts out of rear ball bearing.

Front Countershafts

Remove countershafts front bearing retaining snap ring. Remove countershafts front bearing and gear retaining snap ring. Turn countershafts over and remove roller bearing inner race from shafts.

NOTE

(TRL-1076 only) Remove the rear roller bearing inner race retaining snap ring from the upper left hand countershaft before removing inner race.

For shops having a small capacity hydraulic press, press off one countershaft gear at a time. For shops having a large capacity hydraulic press, place countershaft assembly in press, slide length of heavy tubing over integral gear to engage the second speed gear and remove all gears in one operation.

INSPECTION

Clean case, covers and all other parts of the transmission thoroughly using a suitable cleaning solvent to remove all grease and foreign matter. Dry parts with moisture-free compressed air.

Bearings - Soak bearings in a suitable cleaning solvent to loosen all hardened grease and foreign matter. Strike bearings flat against block of wood several times and again immerse in cleaning solvent turning races slowly. Repeat these operations until bearings are clean and then blow them dry with filtered moisture-free compressed air.

CAUTION

Do not spin bearings with compressed air as damage to the bearing may result.

Bearings - Check bearings for flaking, cracks and fractures, cavities and indentations, measurable wear, brinelling, fretting, corrosion, seizing, galling, scoring, nicking and cage failures. If any of these defects are apparent in any amount, replace bearings.

Gears - Replace gear if teeth show any sign of abrasive wear, scratching, ridging, scoring, surface fatigue, pitting, spalling, corrosive wear, digging in and cracking. Gears may also be checked by Magnaflux or similar system for cracks which would not otherwise be visible.

Shifter Fork, Sliding Clutch and Shift Rail -

Replace forks and/or clutches if side clearance in groove is in excess of specified limits, shown on "Screw Torques and Adjustment Chart." Replace shift rails if cracked in either the poppet or stake screw holes. In the case of wear, whereby the clearance between

the shift rail and the mating housing bore exceeds .010 inch maximum, check to determine which member is worn before replacing same. Shaft wear may be checked by comparing shaft diameter at an "unwearing" point as against the wear point.

Oil Seals - When a complete overhaul is required, replace all oil seals. For complete details, see GENERAL DATA, page 5-1.

Replace cases found to be cracked. Check all other parts for wear and damage. Replace all parts as required. Replace all gaskets, O-rings, and any part that shows mutilation. Replace poppet springs that have lost their tension. Clean up any threads that show mutilation.

REASSEMBLY

NOTE

Refer to "Screw Torques and Adjustment Chart" for fits and limits.

Sub-Assemblies

NOTE

All working parts, especially the bearings, should be coated with SAE 30 oil while the transmission is being assembled. This will insure immediate lubrication when first starting and will prevent seizing of these parts. As moving parts are assembled, check frequently to see that they move freely.

Main Driving Pinion

Assemble mainshaft spigot bearing in gear end of main driving pinion and retain with snap ring. Turn pinion over and install pinion ball bearing with outer race snap ring toward pilot end of pinion. Install bearing retaining spirolox snap ring. See Figure 17.

Mainshaft

Install bearing inner race on mainshaft spigot and retain with snap ring. Position mainshaft in arbor press with spigot end down and press ball bearing on shaft. Install positioning snap ring in outer race of ball bearing. Install reverse stop snap ring on shaft.

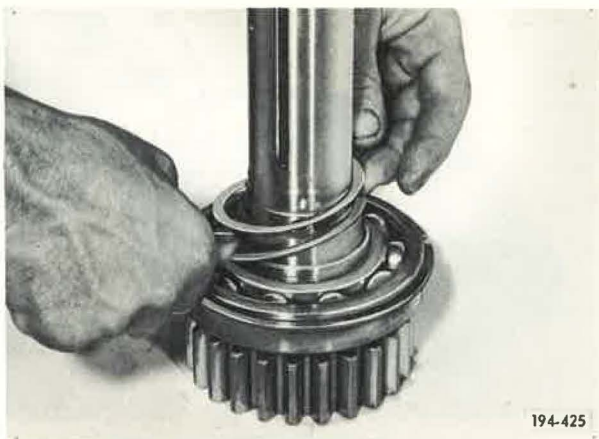


Figure 17. Installing Pinion Bearing Retaining Spirolox Snap Ring

Rear Case

Install roller bearing snap ring in inner retaining groove of case countershaft bores. Install and seat roller bearings against inner snap rings, then install outer snap ring in groove provided to retain bearings.

Position reverse idler gear shafts so that flats on end of shaft are pointing towards center line of countershaft bore. Start shafts into case. Assemble roller bearing in idler gear. Position assembled gear in case (rounded teeth of idlers forward) with thrust washers at each end, and with a nylon hammer, tap shaft into case through thrust washers and gear. For final seating of idler gear shafts, see Figure 18.

NOTE

Apply sealer around idler gear shafts before final seating. Then install expansion plugs.

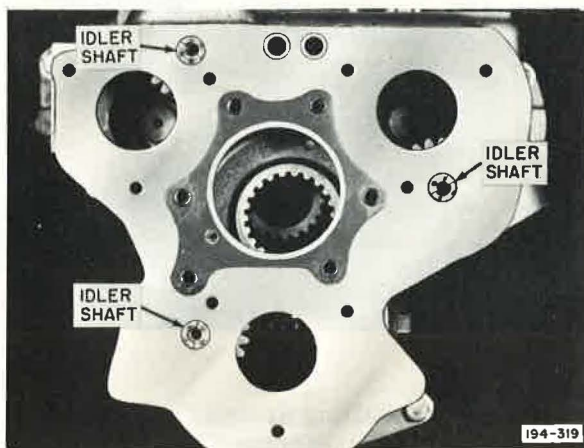


Figure 18. Final Seating of Idler Gears

Through top cover hole of case, install reverse speed gear (shifter groove of gear forward).

Rear Countershafts

Install lower and right-hand countershaft power-take-off gear inner snap ring in groove provided. Press rear ball bearing on end of countershafts and retain with snap ring. Install positioning snap ring in outer race of bearings.

Front Countershafts - See Figure 19.

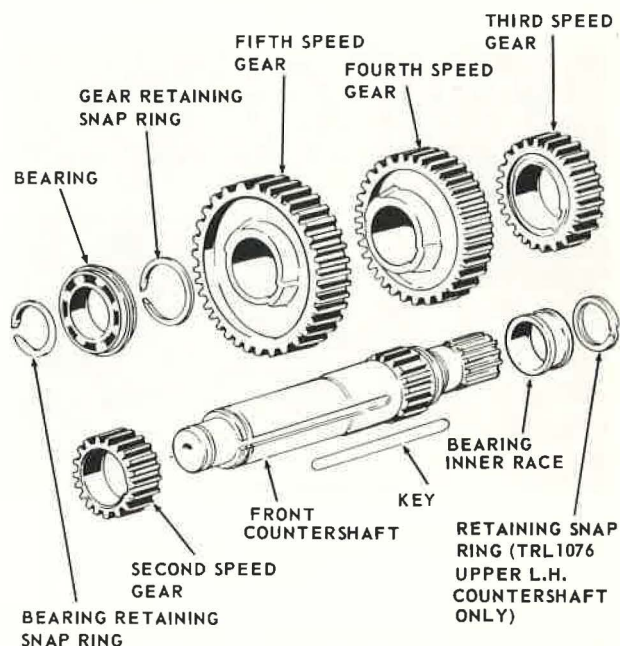


Figure 19. Front Countershaft Assembly

Press roller bearing inner race on rear end of countershafts.

NOTE

(TRL-1076 only) On the upper left hand countershaft install rear roller bearing inner race retaining snap ring.

Insert gear key in countershafts and press gears on one at a time. These gears have an interference fit and can be pressed on cold, but for best results, the gears should be heated. With a heat lamp or hot oil, heat gears 270 to 300° F. for a period of not more than 1/2 hour. Oil shaft for each gear. Install gear snap ring, then press ball bearings on end of shafts. Install ball bearing retaining snap rings.

MAIN COMPONENTS

NOTE

All working parts, especially the bearings, should be coated with SAE 30 oil while the transmission is being assembled. This will insure immediate lubrication when first starting and will prevent seizing of these parts. As moving parts are assembled, check frequently to see that they move freely.

1. Position transmission front case vertically and install the three front countershaft assemblies in case. See Figure 20.



Figure 20. Installing Front Countershaft Assembly

2. Position transmission front case horizontally. Install front countershaft ball bearing positioning snap rings in outer race of bearings, then tap countershaft assemblies rearward until positioning snap ring seats against case.

3. Position O-ring in countershaft front bearing covers. See Figure 21. Install covers with O-rings and capscrews. Tighten capscrews to recommended torque.

4. Place transmission front case in a vertical position. Install mainshaft third speed gear so that the three alignment "O" marks on face of gear mate with the alignment "O" marks on the countershafts third speed gears. See Figure 22.

5. Install second/third speed sliding clutch and engage with third speed gear clutch teeth. See Figure 23.



Figure 21. Installing Bearing Cover O - Ring

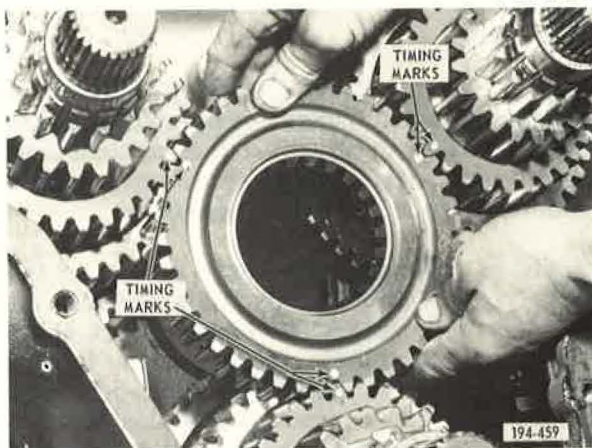


Figure 22. Installing Mainshaft Third Speed Gear

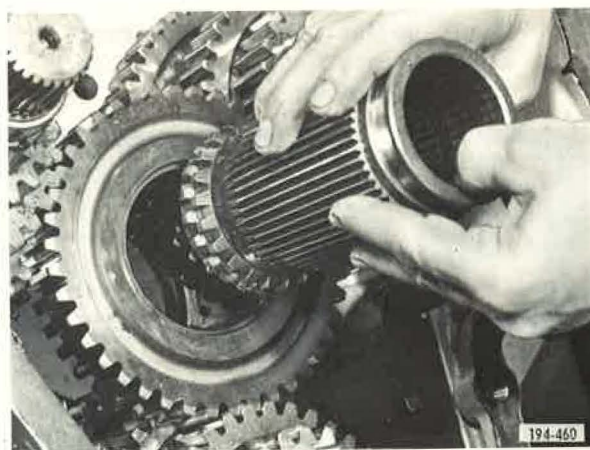


Figure 23. Installing Second/Third Speed Sliding Clutch

6. Apply a light coat of grease to thrust surface of second and first speed gear. Then place thrust washer on front face of gear hub. See Figure 24.

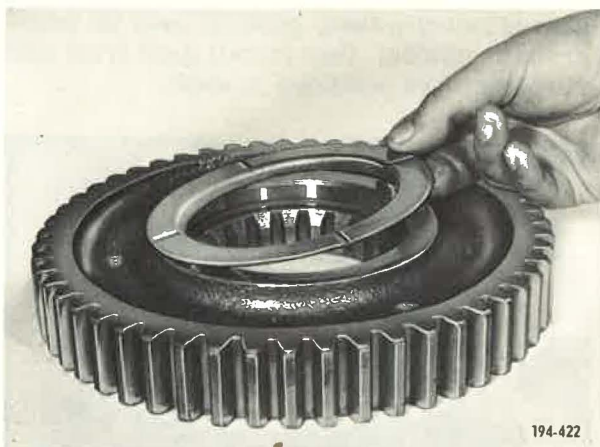


Figure 24. Installing Gear Thrust Washer on Gear

7. Install second speed gear (clutch teeth to the rear) with thrust washer over second/third speed sliding clutch and engage with the countershaft second speed gears. See Figure 25.

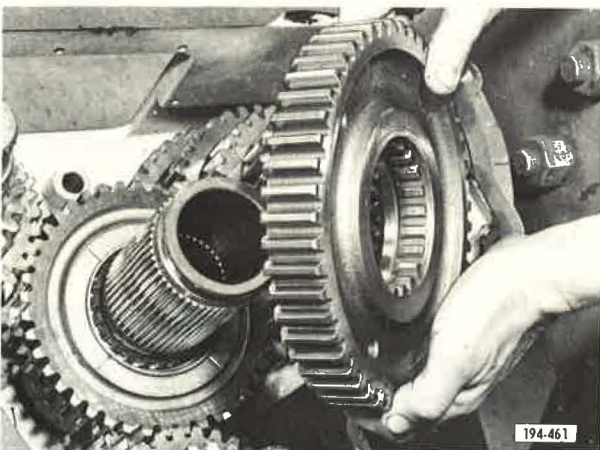


Figure 25. Installing Second Speed Gear

8. Install first speed gear (clutch teeth to the rear) with thrust washer and engage with countershaft first speed gears. See Figure 26.

9. Position first speed sliding clutch on second/third speed sliding clutch. See Figure 27.

10. Install thrust washer on each front countershaft and retain with snap ring. See Figures 28 and 29.

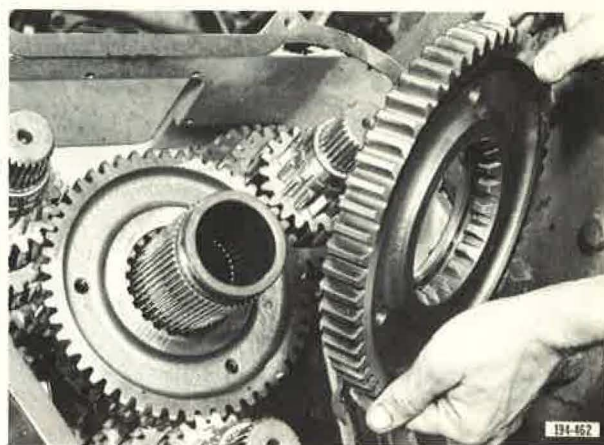


Figure 26. Installing First Speed Gear



Figure 27. Installing First Speed Sliding Clutch

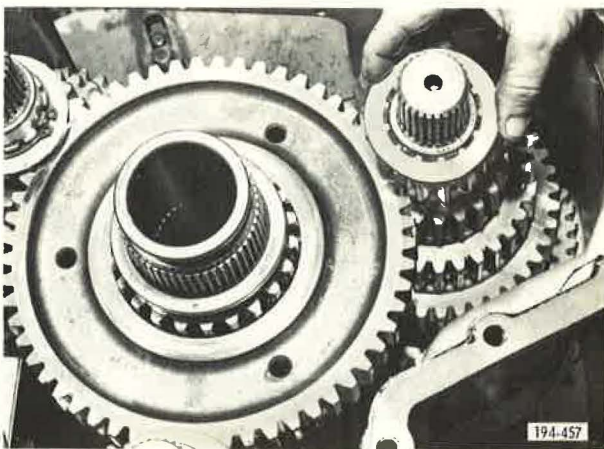


Figure 28. Installing Countershaft Thrust Washer

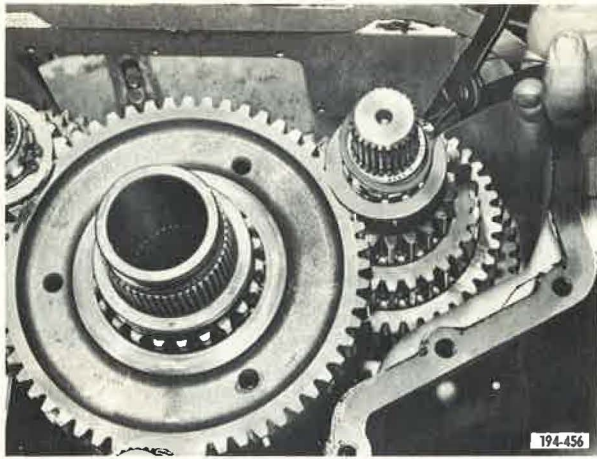


Figure 29. Installing Thrust Washer Retaining Snap Ring

11. Paint end of front case with a good gasket sealer compound and install case-to-case gasket. Paint rim of gasket with sealer and lower rear case assembly over assembled countershafts. Tap case into position so that bearings are seated properly, then install case-to-case capscrews and dowel bolts and tighten to recommended torque.

NOTE

The following step will include the installation of all three rear countershafts. (Two countershafts for TRL1076) The only exception in the TRL1078 will be that the upper left-hand countershaft does not require a power-take-off gear or an oil slinger.

12. Position the transmission horizontally. Start rear countershaft through rear bearing opening in case. See Figure 30.



Figure 30. Installing Rear Countershaft

13. While advancing countershaft, install oil slinger retaining spring on shaft. With flared lip of slinger toward the rear, install slinger on countershaft splines. Compress retaining spring with slinger and install slinger front snap ring in groove, provided to retain slinger. See Figure 31. Where power-take-off gear is incorporated, position gear on countershaft splines, then install gear front snap ring in groove provided in shaft.

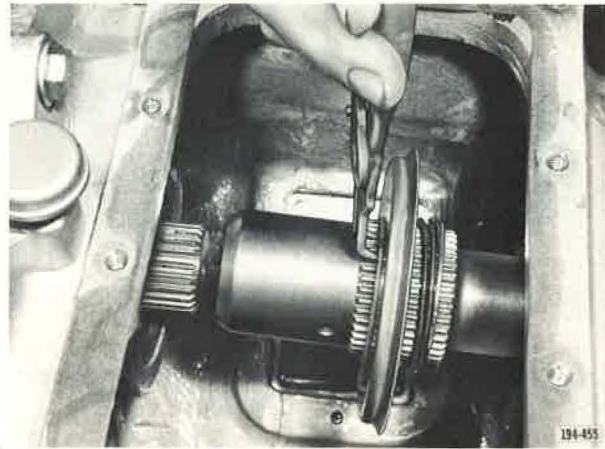


Figure 31. Installing Oil Slinger Retaining Front Snap Ring

14. Observe timing "O" marks on front and rear countershaft splines. See Figure 32. Align timing "O" marks on rear countershaft with timing "O" marks on front countershaft and continue advancing shaft until the countershaft rear bearing positioning snap ring seats against case.



Figure 32. Aligning Timing "O" Mark on Rear Countershaft with Front Countershaft

15. Install O-rings in countershaft rear bearing covers. See Figure 33. Install covers with capscrews and washers, then tighten capscrews to recommended torque.



Figure 33. Installing O-Rings in Rear Bearing Cover

16. Install third speed gear thrust washer in third speed gear.

17. Install fourth speed gear in case (clutch teeth forward) with thrust washer and engage with countershaft gears. See Figure 34. Engage reverse speed sliding gear with the reverse idler gears.



Figure 34. Installing Fourth Speed Gear

18. Start mainshaft in case through gear bearing opening. See Figure 35. Advance shaft through reverse speed gear, second and third speed sliding clutch and fourth speed gear until rear bearing positioning snap ring seats against case. Install speedometer drive gear on shaft. Apply sealer compound and install rear bearing cover gasket and cover. Install cover capscrews and tighten to recommended torque. Oil lip of cover oil seal, and install clamp plate and screw.

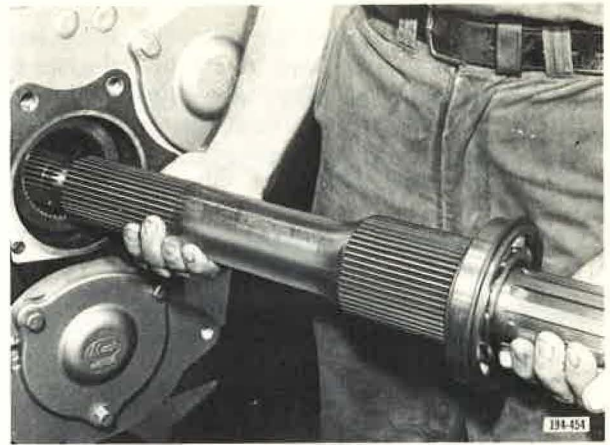


Figure 35. Installing Mainshaft

19. Place transmission in two gears which will lock up assembly. Tighten clamp plate screw to recommended torque.

20. Install fourth speed gear selective thrust washer on mainshaft. See Figure 36.

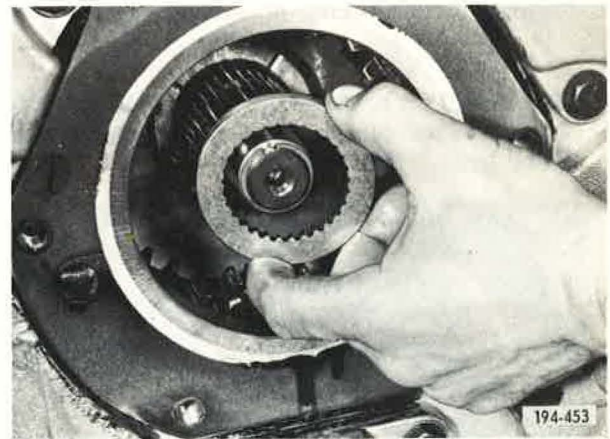


Figure 36. Installing Fourth Speed Gear Selective Thrust Washer

21. Install fourth speed gear selective thrust washer retaining snap ring. See Figure 37.

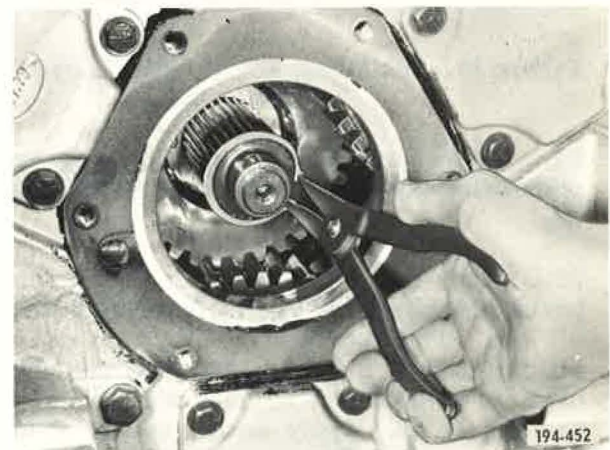


Figure 37. Installing Thrust Washer Retaining Snap Ring

22. With two feeler gages, check between third speed washer and fourth speed gear for recommended end-play. See Figure 38. Refer to "Screw Torques and Adjustment Chart" for selective thrust washers to obtain recommended end-play.

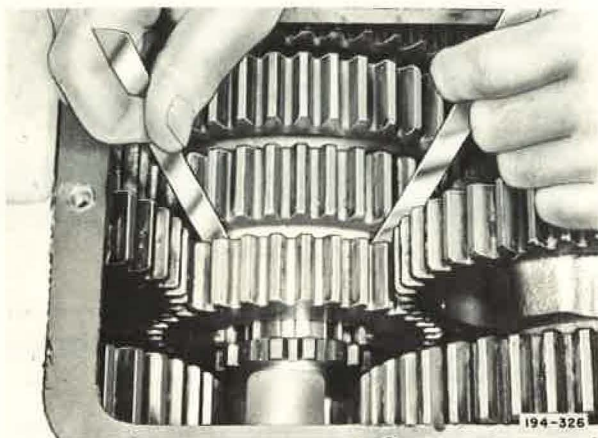


Figure 38. Checking Mainshaft Gear End-Play

23. Install fourth and fifth speed sliding clutch on splines of pinion, and engage with fourth speed gear. See Figure 39.

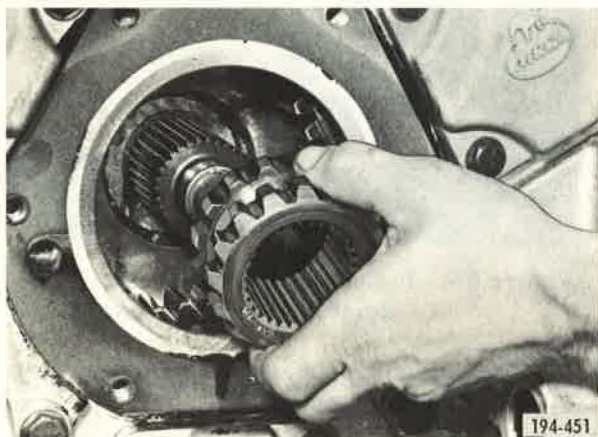


Figure 39. Installing Fourth/Fifth Speed Sliding Clutch

24. Position and drive pinion assembly into place being careful not to damage spigot bearing.

25. Install tool J23796 in main driving pinion bearing cover and carefully through cover oil seal. This tool will eliminate the possibility of cutting oil seal when installing cover over the splined end of main driving pinion. See Figure 40. Apply sealer compound and install gasket and cover assembly. Remove tool from cover assembly. Install cover cap-screws and tighten to recommended torque.



Figure 40. Installing Main Driving Pinion Bearing Cover Assembly

26. Install reverse speed fork on reverse speed sliding gear and install first speed fork on first speed sliding clutch. See Figures 41 and 42.

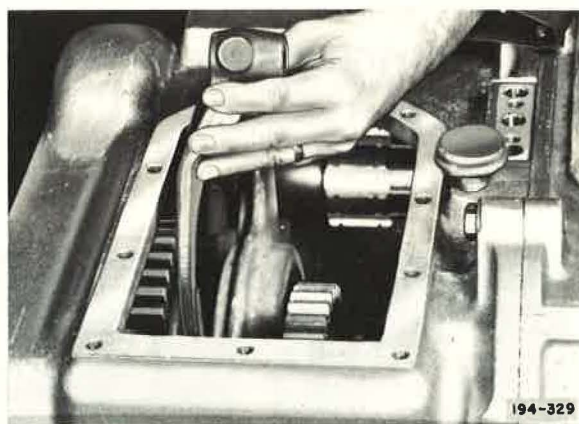


Figure 41. Installing Reverse Speed Shifter Fork

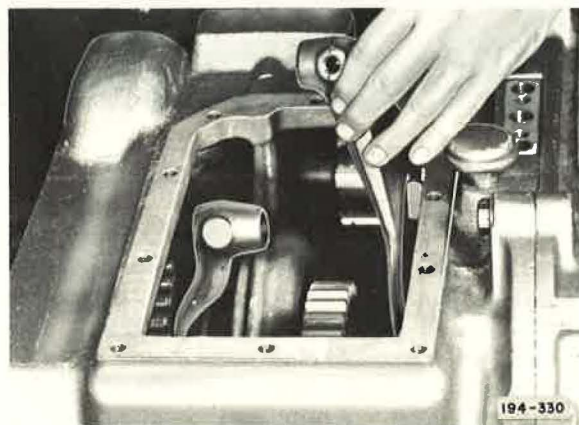


Figure 42. Installing First Speed Shifter Fork

27. Install first and reverse speed shifter rail through front of case and first and reverse speed shifter. See Figure 43. Advance rail through intermediate bore of case, first speed fork, front snap ring, reverse speed fork and rear snap ring until rail reaches neutral position. Install fork and shifter setscrews and tighten to recommended torque.

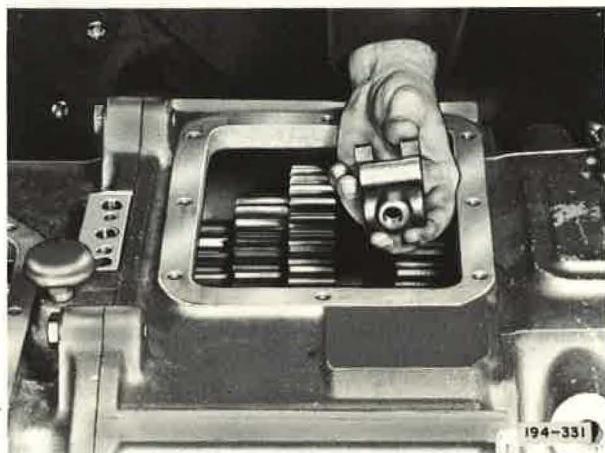


Figure 43. Installing First and Reverse Shifter

NOTE

Assemble snap rings with rounded edge of rings against shifter fork. After assembling the snap rings, rotate 30 degrees to assure rings are properly seated.

28. Start second and third speed shifter rail through hole provided in rear of case. Engage second and third speed fork with second and third speed sliding clutch. See Figure 44. Advance rail through hub of fork and intermediate bore of case.

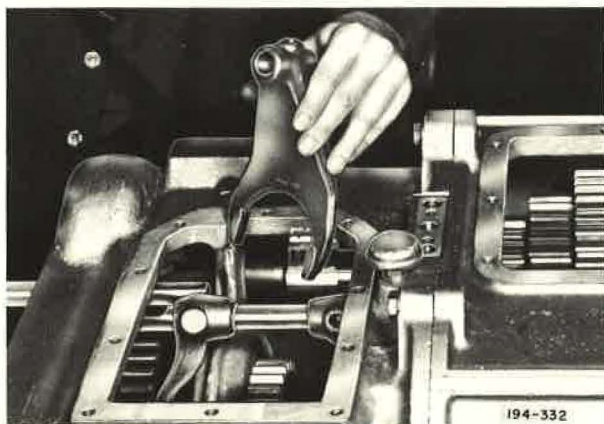


Figure 44. Installing Second and Third Speed Shifter Fork

29. Install second and third speed shifter on rail, see Figure 45, and continue advancing rail into front support until it reaches neutral position. Install fork and shifter setscrew and tighten to recommended torque.



Figure 45. Installing Second and Third Speed Shifter

30. Start fourth and fifth speed shifter rail in hole provided in front of case. Engage fourth and fifth speed fork with fourth and fifth speed sliding clutch. See Figure 46.

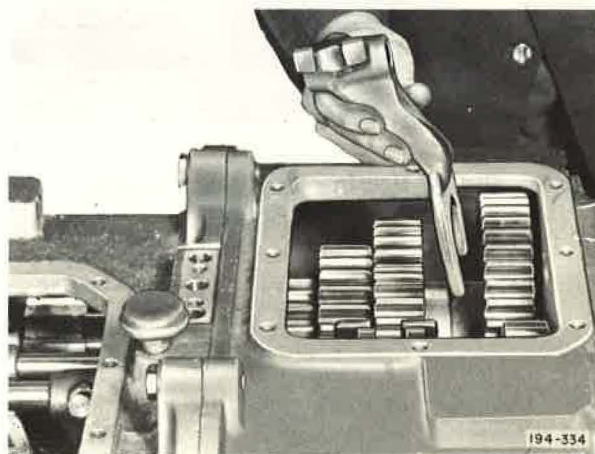


Figure 46. Installing Fourth and Fifth Speed Shifter Fork

Advance rail through hub of fork and intermediate bore until rail reaches neutral position. Install fork setscrew and tighten to recommended torque. At this point make sure that the two shift rail oil seals and one expansion plug are installed at the front of the case and the two shift rail expansion plugs are in place at the rear of the case.

31. Install shift rail poppet balls and springs in holes provided at top of case. See Figures 47 and 48.

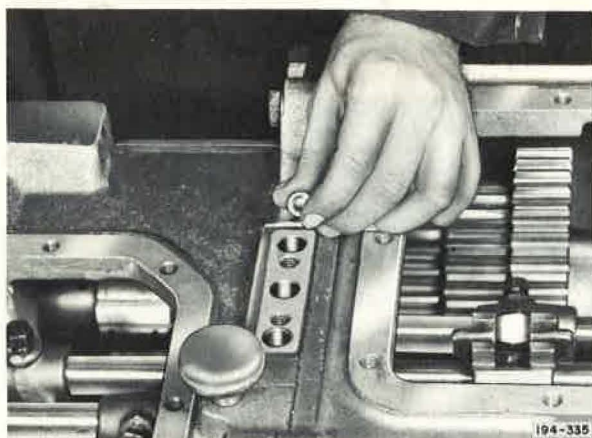


Figure 47. Installing Shift Rail Poppet Ball



Figure 48. Installing Shift Rail Poppet Ball Spring

32. Install poppet ball cover with capscrews and tighten capscrews to recommended torque. See Figure 49.

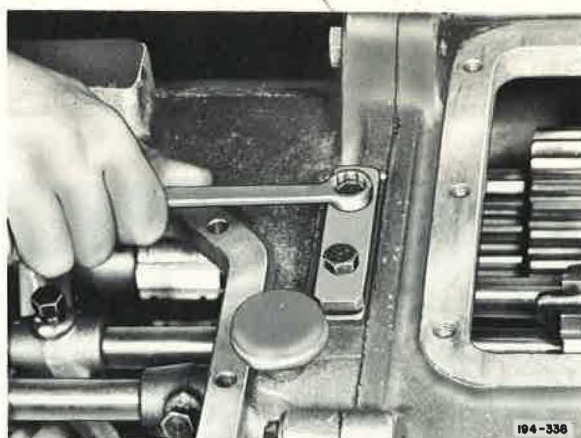


Figure 49. Tightening Shift Rail Poppet Ball Cover Capscrews

33. Apply sealer compound to transmission case top cover gaskets and install on case, then install covers with capscrews and tighten to recommended torque. Apply sealer compound to surface of power-take-off covers. Install covers with capscrews and tighten.