Service Manual

Fuller Heavy Duty Transmissions TRSM0550

July 2010

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Warnings and Precautions

Before starting a vehicle always be seated in the driver's seat, place the transmission in neutral, set the parking brakes and disengage the clutch.

Before working on a vehicle place the transmission in neutral, set the parking brakes and block the wheels.

Before towing the vehicle place the transmission in neutral, and lift the rear wheels off the ground, remove the axle shafts, or disconnect the driveline to avoid damage to the transmission during towing.

The description and specifications contained in this service publication are current at the time of printing.

Eaton Corporation reserves the right to discontinue or modify its models and/or procedures and to change specifications at any time without notice.

Any reference to brand name in this publication is made as an example of the types of tools and materials recommended for use and should not be considered an endorsement. Equivalents may be used.

This symbol is used throughout this manual to call attention to procedures where carelessness or failure to follow specific instructions may result in personal injury and/or component damage.

Departure from the instructions, choice of tools, materials and recommended parts mentioned in this publication may jeopardize the personal safety of the service technical or vehicle operator.

Warning: Failure to follow indicated procedures creates a high risk of personal injury to servicing technician.

Caution: Failure to follow indicated procedures amy cause component damage of malfunction.

Note: Additional service information not covered in the service procedures.

Tip: Helpful removal and installation procedures to aid in the service of this unit.

Always use genuine Eaton replacement parts.

General Information

Preventive Maintenance

External Parts

Shift Bar Housing

Front Section

Auxiliary Section

Options

General Service Practices and Part Inspection

Disassembly

It is assumed in the detailed assembly instructions that the lubricant has been drained from the transmission, the necessary linkage and vehicle air lines disconnected and the transmission has been removed from vehicle chassis. Removal of the gear shift lever housing assembly (or remote control assembly) is included in the detailed instructions (External Parts/Shift Bar Housing/ How to Remove the Gear Shift Lever); however, this assembly MUST be detached from the shift bar housing before transmission can be removed.

CAUTION: Follow closely each procedure in the detailed instructions, make use of the text, illustrations, and photographs provided.

Assemblies
When disassembling the various assemblies, such as the mainshaft, countershafts, and shift bar housing, lay all parts on a clean bench in the same sequence as removed. This procedure will simplify assembly and reduce the possibility of losing parts.

Bearings
Carefully wash and lubricate all usable bearings as removed and protectively wrap until ready for use. Remove bearings planned to be reused with pullers designed for this purpose.

Cleanliness
Provide a clean place to work. It is important that no dirt or foreign material enters the unit during repairs. Dirt is an abrasive and can damage bearings. It is always good practice to clean the outside of the unit before starting the planned disassembly.

Input Shaft
The input shaft can be removed from the transmission without removing the countershaft, mainshaft, or main drive gear. Special procedures are required and provided in this manual.

Snap Rings
Remove snap rings with pliers designed for this purpose. Snap rings removed in this manner can be reused, if they are not sprung or loose.

When using Tools to Move Parts
Always apply force to shafts, housings, etc., with restraint. Movement of some parts is restricted. Never apply force to driven parts after they stop solidly. The use of soft hammers, soft bars, and mauls for all disassembly work is recommended.

For parts or service call us
Pro Gear & Transmission, Inc.

1 (877) 776-4600

(407) 872-1901

parts@eprogear.com

906 W. Gore St.

Orlando, FL 32805

Inspection

Before assembling the transmission, check each part carefully for abnormal or excessive wear and damage to determine reuse or replacement. When replacement is necessary, use only genuine Eaton® Fuller® Transmission parts to assure continued performance and extended life from your unit.

Since the cost of a new part is generally a small fraction of the total cost of downtime and labor, avoid reusing a questionable part which could lead to additional repairs and expense soon after assembly. To aid in determining the reuse or replacement of any transmission part, consideration should also be given to the unit's history, mileage, application, etc.

Recommended inspection procedures are provided in the following checklist.

Bearings

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

Bearing Covers

1. Check covers for wear from thrust of adjacent bearing. Replace covers damaged from thrust of bearing outer race.
2. Check cover bores for wear. Replace those worn or oversized.

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 bushing surfaces.

Gears

1. Check gear teeth for frosting and pitting. Frosting of gear teeth faces presents no threat of transmission failure. Often in continued operation of the unit, frosted gears "heal" and do 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 in the advanced stage of pitting should be replaced.
2. Check for gears with clutching teeth abnormally worn, tapered, or reduced in length from clashing during shifting. Replace gears found in any of these conditions.
3. Check axial clearance of gears.

Gear Shift Lever Housing Assembly

1. Check spring tension on shift lever. Replace tension spring if lever moves too freely.
2. If housing is disassembled, check gear shift lever bottom end and shift finger assembly for wear. Replace both gears if excessively worn.

Gray Iron Parts

1. Check all gray iron parts for cracks and breaks. Replace parts found to be damaged.

Oil Return Threads and Seals

1. Check oil return threads on the input shaft. If return action of threads has been destroyed, replace the input shaft.
2. Check oil seal in rear bearing cover. If sealing action of lip has been destroyed, replace seal.

O-Rings

1. Check all O-rings for cracks or distortion. Replace if worn.

Reverse Idler Gear Assemblies

1. Check for excessive wear from action of roller bearings.

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 lockscrews in yoke and blocks. Tighten and rewire those found loose.
4. If housing has been disassembled, check neutral notches of shift bars for wear from interlock balls.

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.

Splines

1. Check splines on all shafts for abnormal wear. If sliding clutch gears, companion flange, or clutch hub has worn marks in the spline sides, replace the specific shaft affected.

Synchronizer Assembly

1. Check synchronizer for burrs, uneven and excessive wear at contact surface, and metal particles.
2. Check blocker pins for excessive wear or looseness.
3. Check synchronizer contact surfaces on the synchronizer cups for wear.

Washers

1. Check surfaces of all washers. Washer scored or reduced in thickness should be replaced.

Assembly

Make sure that case interiors and housings are clean. It is important that dirt and other foreign materials are 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 assemble.

Axial Clearances
Maintain original axial clearances of .006" to .015" for mainshaft gears.

Bearings
Use a flange-end bearing driver for bearing installation. 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.

Capscrews
To prevent oil leakage and loosening, use Eaton/Fuller sealant #71205 on all capscrews.

Gaskets
Use new gaskets throughout the transmission as it is being rebuilt. Make sure all gaskets are installed. An omission of any gasket can result in oil leakage or misalignment of bearing covers.

Initial Lubrication
Coat all limit washers and shaft splines with Lubriplate during assembly to prevent scoring and galling of such parts.

O-Rings
Lubricate all O-rings with silicon lubricant.

Universal Joint Companion Flange or Yoke
Pull the companion flange or yoke tightly into place with the output shaft nut, using 450-500 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 can result in damage to the mainshaft rear bearing.

IMPORTANT: See the appropriate Illustrated Parts Lists (specified by model series) to ensure that proper parts are used during assemble of the transmission.

How to use this Manual

This manual is designed to provide detailed information necessary to service and repair the Eaton® Fuller® transmissions listed on the front.

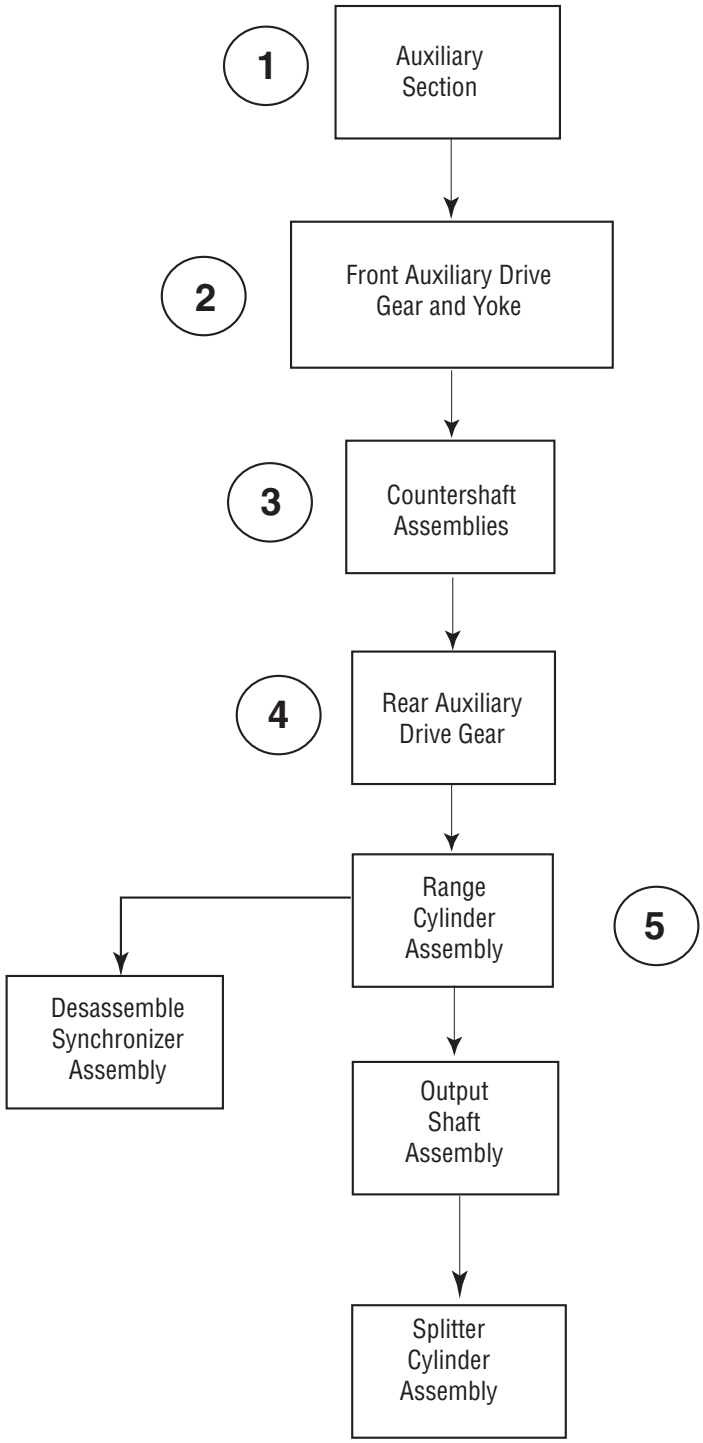
As outlined on the first page, the manual has been divided into its main components: external parts, shift bar housing, front section, auxiliary section, and options (if applicable). Each component has its own tabbed section. Each tabbed section has its own table of contents and procedural flow charts. The table of contents lists the procedures. The flow charts represent the order in which the transmission should be disassembled or assembled. The procedures have two parts, disassembly or removal and reassembly or installation.

As mentioned the flow charts represent the order in which the transmission should be disassembled or assembled.

The following is an example of how to disassemble the auxiliary section, specifically the range cylinder assembly.

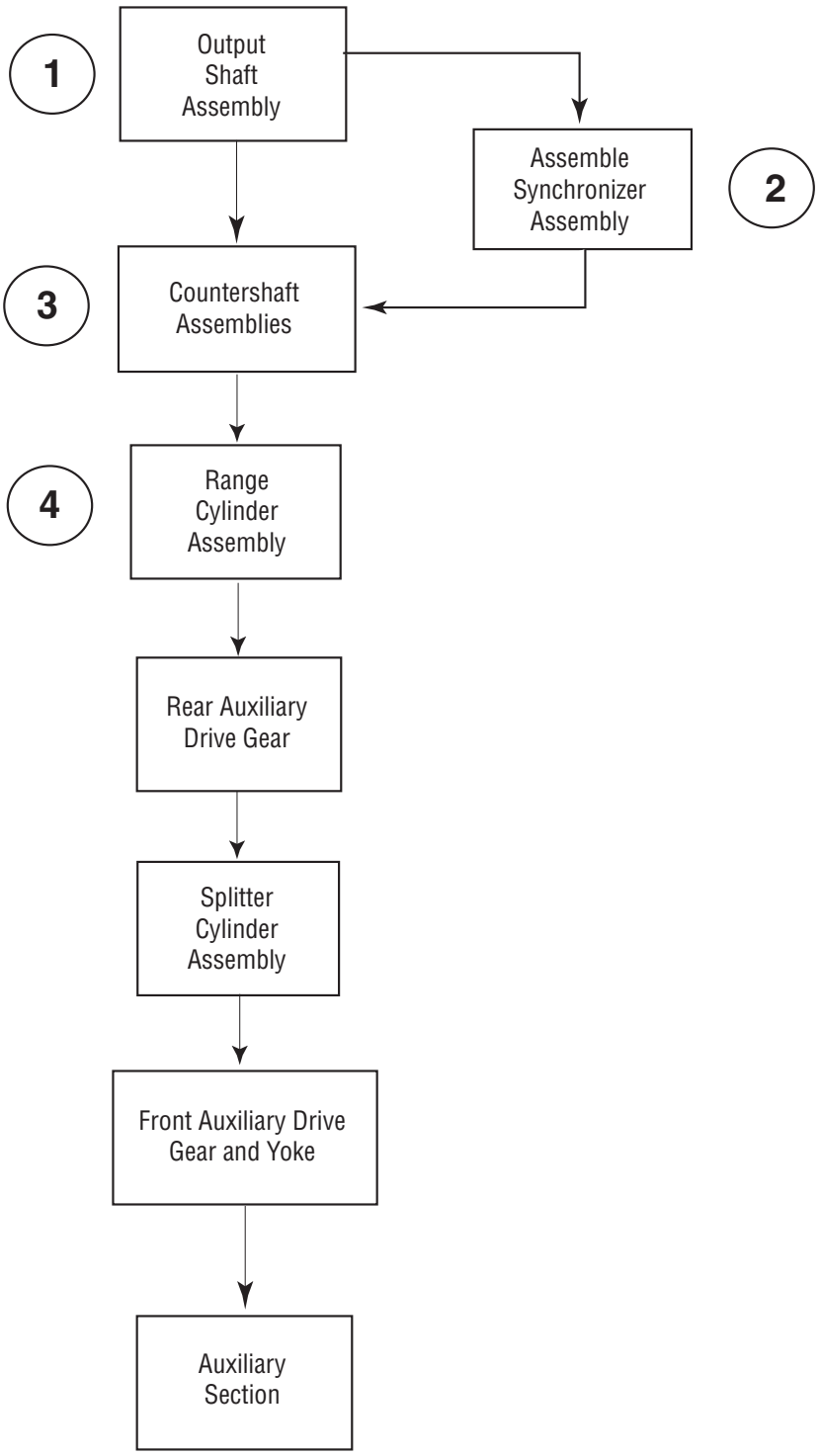
Follow the flow chart "How to Disassemble the Auxiliary Section".

1. Remove the auxiliary section from the front box.
2. Remove the front auxiliary drive gear and yoke.
3. Remove the countershaft assemblies.
4. Remove the rear auxiliary drive gear.
5. Remove the range cylinder assembly.



Once the range cylinder parts have been replaced, assemble the auxiliary section according to the **"How to Assemble the Auxiliary Section"**.

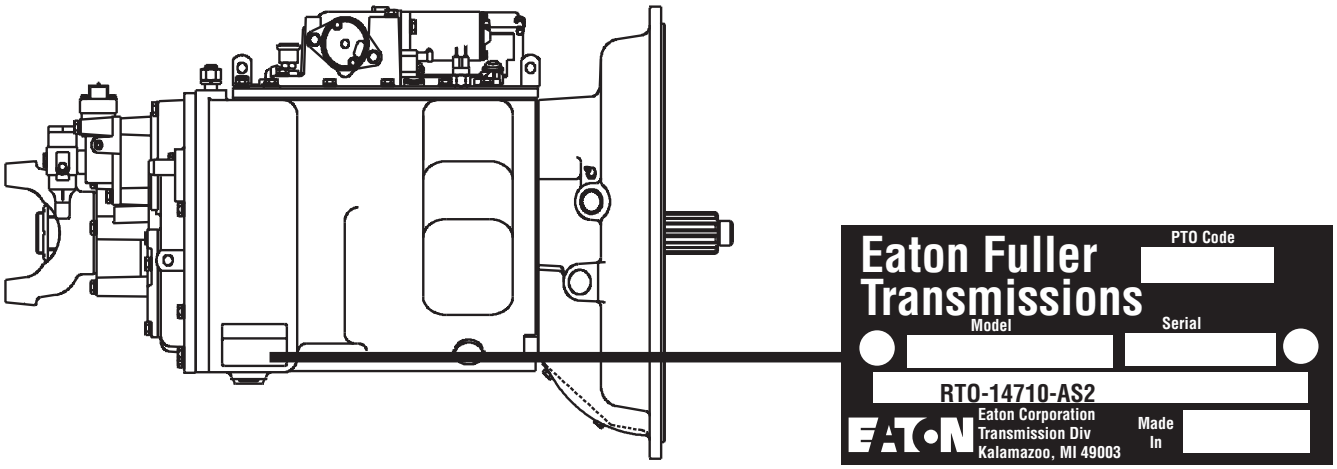
1. Assemble the output shaft assembly.
2. Assemble the synchronizer assembly, if it was disassembled.
3. Install the countershaft assemblies.
4. Install the range cylinder assembly.

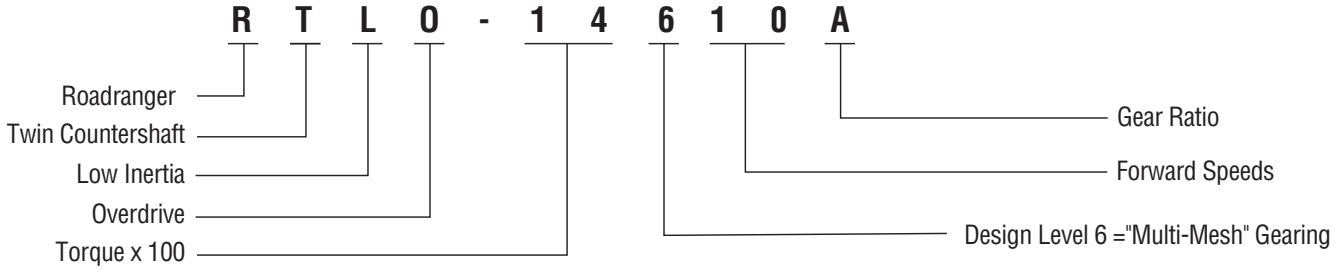


Model Designation

General Information and other transmission identification information are stamped on the transmission tag. To identify the transmission model designation and serial number, locate the tag on the transmission and then locate the numbers as shown.

WARNING: Do not remove or destroy the transmission identification tag.



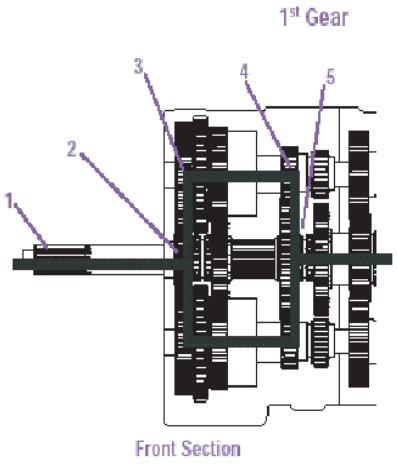


Power Flow

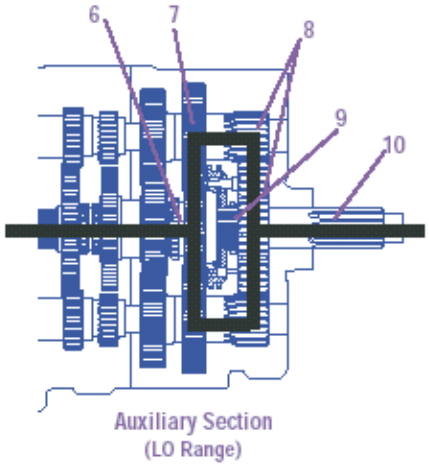
The transmission must efficiently transfer the engine's power to the vehicle's driveline. Knowledge of what takes place in the transmission is helpful when troubleshooting and making repairs.

1st Gear

- Power (torque) from the vehicle's engine is transferred to the transmission's input shaft.**(1)**
- The input shaft external splines engage the main drive gear internal splines.**(2)**
- Torque is split between the two countershaft drive gears.**(3)**
- Torque is delivered along both countershafts to the mating countershaft gears of the "engaged" mainshaft gear. The following cross section view illustrates a 1st speed gear engagement.**(4)**
- The external clutching teeth of the sliding clutch engage with the internal clutching teeth of the mainshaft gear which transfers torque to the mainshaft.**(5)**

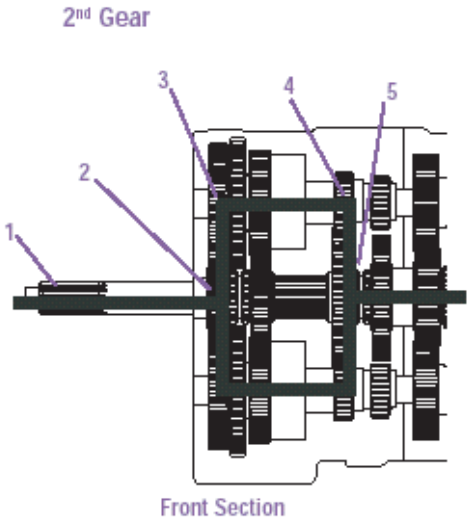


- The mainshaft transfers torque directly to the rear auxiliary drive gear sliding clutch which is in the rearward position.**(6)**
- The rear auxiliary drive gear splits torque between the two auxiliary countershaft drive gears.**(7)**
- Torque is delivered along both countershafts to the LO range gear in the auxiliary section.**(8)**
- The LO range gear delivers torque to the output shaft through the range synchronizer sliding clutch.**(9)**
- The output shaft delivers torque to the driveline components.**(10)**

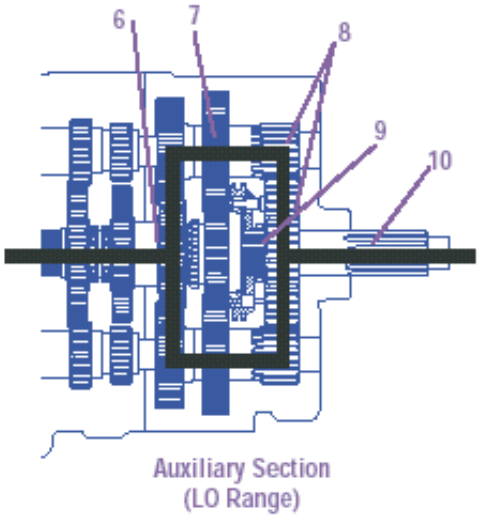


2nd Gear

- Power (torque) from the vehicle's engine is transferred to the transmission's input shaft.**(1)**
- The input shaft external splines engage the main drive gear internal splines.**(2)**
- Torque is split between the two countershaft drive gears.**(3)**
- Torque is delivered along both countershafts to the mating countershaft gears of the "engaged" mainshaft gear. The following cross section view illustrates a 2nd speed gear engagement.**(4)**
- The external clutching teeth of the sliding clutch engage with the internal clutching teeth of the mainshaft gear which transfers torque to the mainshaft.**(5)**

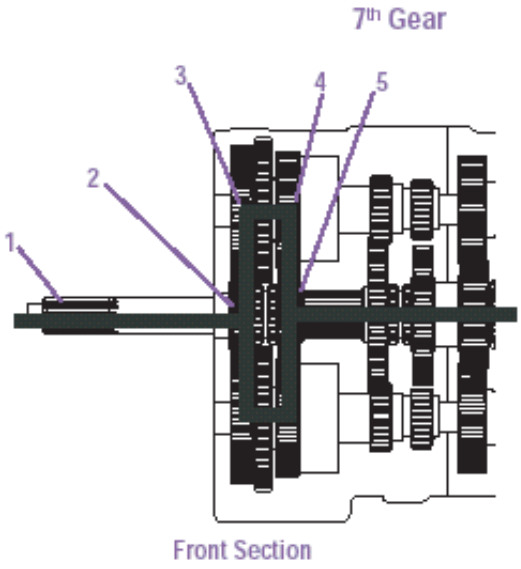


- The mainshaft transfers torque directly to the auxiliary drive gear sliding clutch which is in the forward position.**(6)**
- The auxiliary drive gear splits torque between the two auxiliary countershaft drive gears.**(7)**
- Torque is delivered along both countershafts to the LO range gear in the auxiliary section.**(8)**
- The LO range gear delivers torque to the output shaft through the range synchronizer sliding clutch.**(9)**
- The output shaft delivers torque to the driveline components.**(10)**

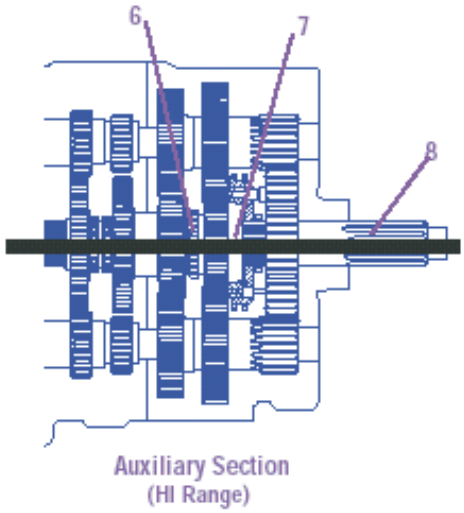


7th gear

- Power (torque) from the vehicle's engine is transferred to the transmission's input shaft.**(1)**
- The input shaft external splines engage the main drive gear internal splines.**(2)**
- Torque is split between the two countershaft drive gears.**(3)**
- Torque is delivered along both countershafts to the mating countershaft gears of the "engaged" mainshaft gear. The following cross section view illustrates a 7th speed gear engagement.**(4)**
- The external clutching teeth of the sliding clutch engage with the internal clutching teeth of the mainshaft gear which transfers torque to the mainshaft.**(5)**

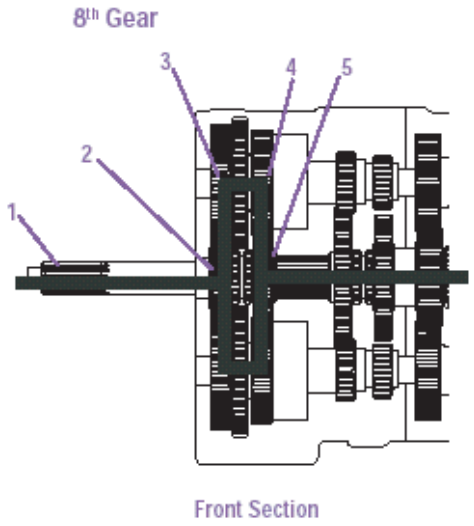


- The mainshaft transfers torque directly to the rear auxiliary drive gear sliding clutch which is in the rearward position.**(6)**
- Torque is delivered to the back of the rear auxiliary drive gear. The range synchronizer sliding clutch is in the forward position, transferring torque directly to the output shaft.**(7)**
- The output shaft delivers torque to the driveline components.**(8)**

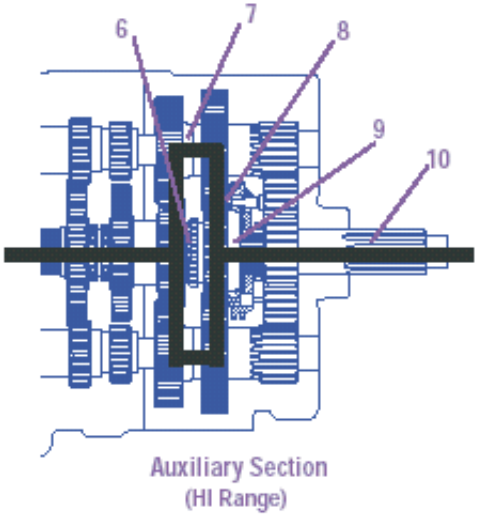


8th Gear

- Power (torque) from the vehicle's engine is transferred to the transmission's input shaft.**(1)**
- The input shaft external splines engage the main drive gear internal splines.**(2)**
- Torque is split between the two countershaft drive gears.**(3)**
- Torque is delivered along both countershafts to the mating countershaft gears of the "engaged" mainshaft gear. The following cross section view illustrates a 8th speed gear engagement.**(4)**
- The external clutching teeth of the sliding clutch engage with the internal clutching teeth of the mainshaft gear which transfers torque to the mainshaft.**(5)**



- The mainshaft transfers torque directly to the front auxiliary drive gear sliding clutch which is in the forward position.**(6)**
- The front auxiliary drive gear splits torque between the two auxiliary countershaft drive gears.**(7)**
- Torque is delivered along both countershafts to the rear auxiliary drive gear.**(8)**
- Torque is transferred to the range synchronizer sliding clutch which is in the forward position delivering torque directly to the output shaft.**(9)**
- The output shaft delivers torque to the driveline components.**(10)**



Timing Procedures

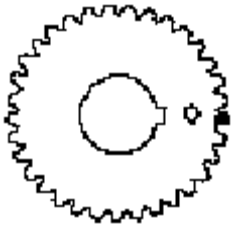
It is essential that both countershaft assemblies of the front and auxiliary sections are "timed." This assures proper tooth contact is made between mainshaft gears seeking to center on the mainshaft during torque transfer and mating countershaft gears that distribute the load evenly. If not properly timed, serious damage to the transmission is likely to result from unequal tooth contact causing the mainshaft gears to climb out of equilibrium.

Timing is a simply procedure of marking the appropriate teeth of a gear set prior to installation and placing them in proper mesh while in the transmission. In the front section, it is necessary to time only the drive gear set. And depending on the model, only the LO range, deep reduction, or splitter gear set is timed in the auxiliary section.

Front Section

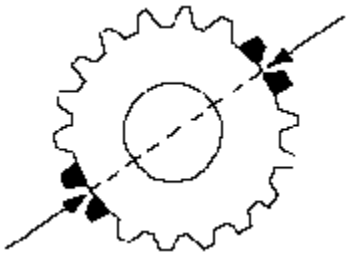
A. Marking countershaft drive teeth.

1. Prior to placing each countershaft assembly into the case, clearly mark the tooth located directly over the drive gear keyway as shown. This tooth is stamped with an "O" to aid identification.



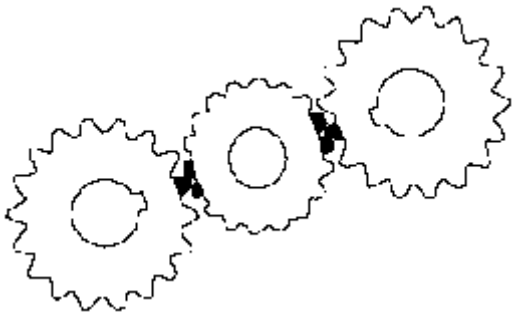
B. Marking main drive gear teeth.

1. Mark any two adjacent teeth on the main drive gear.
2. Mark the two adjacent teeth located directly opposite the first set marked on the main drive gear. As shown to the left, there should be an equal number of unmarked gear teeth on each side between the marked sets.



C. Meshing marked countershaft drive gear teeth with marked main drive gear teeth.
(After placing the mainshaft assembly into the case, the countershaft bearings are installed to complete installation of the countershaft assemblies.)

1. When installing the bearings on the left countershaft, mesh the countershaft drive gear marked tooth with either set of main drive gear two marked teeth.
2. Repeat the procedure when installing the bearings on the right countershaft, make use of the remaining set of main drive gear two marked teeth to time assembly.



Auxiliary Section

A. Timing the auxiliary countershafts.
Standard Auxiliary Section

1. Mark any two teeth on the LO range gear. Then mark two teeth located directly opposite the first marked.
2. Prior to placing each auxiliary countershaft assembly into housing, mark the tooth on each auxiliary countershaft assembly LO range gear stamped with the "O".
3. Follow the assembly procedures in the "Auxiliary Section".

Helical Auxiliary Section

1. Mark any tooth on the LO range gear. Then mark a tooth located directly opposite the first marked.
2. Prior to placing each auxiliary countershaft assembly into housing, mark the two teeth on each auxiliary countershaft assembly LO range gear stamped with the two "O"s. Repeat the procedure on each auxiliary countershaft reduction gear.
3. Follow the assembly procedures in the "Auxiliary Section".

Tool Reference

Some repair procedures pictured in this manual show the use of specialized tools. Their actual use is recommended as they make transmission repair easier, faster, and prevent costly damage to critical parts.

But for the most part, ordinary mechanic's tools such as socket wrenches, screwdrivers, etc., and other standard shop items such as a press, mauls and soft bars are all that is needed to successfully disassemble and reassemble any Eaton Fuller Transmission.

The specialized tools can be obtained from a tool supplier or made from tool prints as required by the individual user. Detailed Eaton Fuller Transmission Tool Prints are available upon request by writing to:

Roadranger Literature Services

Attn: Contract 4 / CA#182

1750 Wallace Ave.

St. Charles, IL 60174-3404

Phone: 888-ETN-INFO (386-4636)

Lubrication

For a list of Eaton Approved Synthetic Lubricants, see TCMT-0021 or call 1-800-826-HELP (4357)

The use of lubricants not meeting these requirements will affect warranty coverage.

Additives and friction modifiers must not be introduced.

Never mix engine oils and gear oils in the same transmission.

Buy from a reputable dealer

For a list of approved and reputable dealers, write to:

Eaton Corporation

Worldwide Marketing Services

P.O.Box 4013

Kalamazoo MI 49003

Transmission Operating Angles

If the transmission operating angle is more than 12°, improper lubrication will occur. The operating angle is the transmission mounting angle in the chassis plus the percent of upgrade (expressed in degrees).

For operating angles over 12°, the transmission must be equipped with an oil pump or cooler kit to insure proper lubrication.

Operating Temperatures with Oil Coolers

The transmission must not be operated consistently at temperatures above 250°F. However, intermittent operating temperatures to 300°F do not harm the transmission. Operating temperatures above 250°F increases the lubricant's oxidation rate and shortens its effective life. When the average operating temperature is above 250°F, the transmission can require more frequent oil changes or external cooling.

The following conditions in any combination can cause operating temperatures of over 250°F:

a. Operating consistently at slow speeds.
b. High ambient temperatures.
c. Restricted air flow around transmission.
d. Exhaust system too close to transmission.
e. High horsepower operation.

External oil coolers are available to reduce operating temperatures when the above conditions are encountered.

Oil Cooler Chart

Transmission Oil Coolers are:
Recommended With engines of 350 H.P. and above
Required -With engines 399 H.P. and above and GCW's over 90,000 lbs. -With engines 399 H.P. and above and 1400 lb.ft or greater torque. -With engines 450 H.P and above.

Preventative Maintenance

Everyday there are countless vehicles operating over the highways with transmissions in such a neglected mechanical condition, they can be referred to as failures looking for a place to break down. They lack a proper and organized preventive maintenance program.

Preventive maintenance is a general term which applies to all procedures necessary to have maximum life and satisfactory service at the lowest possible cost, short of removing and repairing the unit.

A number of conditions contrary to good preventive maintenance can generally be pointed to when inspecting a failed transmission. Taking a few minutes every so many hours or miles to do a few simple checks could help avoid eventual breakdown or reduce the repair cost. If the transmission is not cared for, it will breakdown.

Checks Before Transmission Removal

1. **Air System and Connections**

   Check for leaks, worn air lines, loose connections and capscrews. See SERVICING AIR SYSTEM.

2. **Clutch Housing Mounting**

   Check all capscrews of clutch housing flange for looseness.

3. **Clutch Release Bearing (Not Shown)**

   Remove hand hole cover and check radial and axial clearance in release bearing.

   Check relative position of thrust surface of release bearing with thrust sleeve on push-type clutches.

4. **Clutch Pedal Shaft and Bores**

   Pry upward on shafts to check wear.

   If excessive movement is found, remove clutch release mechanism and check bushings on bores and wear on shafts. See OEM literature.

5. **Lubricant**

   Change at specified service intervals.

   Use only the types and grades as recommended. See LUBRICANTS.

6. **Filler and Drain Plugs**

   Remove filler plugs and check level of lubricant at specified intervals. Tighten fill and drain plugs securely.

7. **Capscrews and Gaskets**

   Check all capscrews, especially those on PTO covers and rear bearing covers for looseness which would cause oil leakage.

   Check PTO opening and rear bearing covers for oil leakage due to faulty gasket.

8. **Gear Shift Lever**

   Check for looseness and free play in housing. If lever is loose in housing, proceed with Check No. 9.

9. **Gear Shift Lever Housing Assembly**

   Remove air lines at slave valve and remove the gear shift lever housing assembly from the transmission.

   Check the tension spring and washer for set and wear.

   Check the gear shift lever spade pin and slot for wear.

Check bottom end of gear shift lever for wear and check slot of yokes and blocks in shift bar housing for wear at contact points with shift lever.

Checks With Drive Line Dropped

10. **Universal Joint Companion Flange or Yoke Nut**

    Check for tightness. Tighten to recommended torque.

11. **Output Shaft**

    Pry upward against output shaft to check radial clearance in mainshaft rear bearing.

    Checks With Universal Joint Companion Flange or Yoke Removed.

    NOTE:If necessary, use solvent and shop rag to clean sealing surface of companion flange or yoke. **Do not use crocus cloth, emery paper, or other abrasive materials that will mar surface finish.**

12. **Splines on Output Shaft**

    Check for wear from movement and chucking action of the universal joint companion flange or yoke.

13. **Mainshaft Rear Bearing Cover**

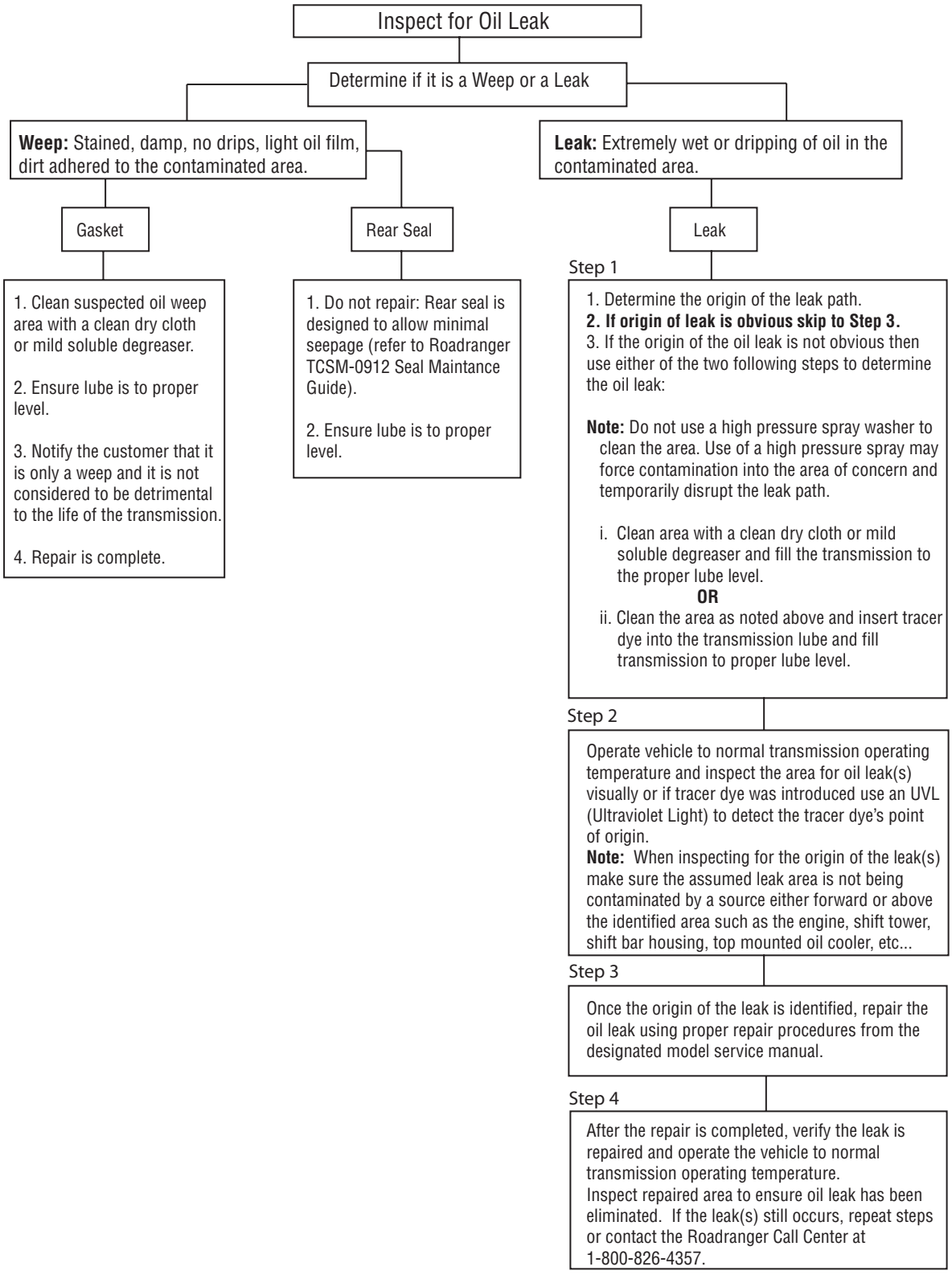
    Check oil seal for wear.

Inspection

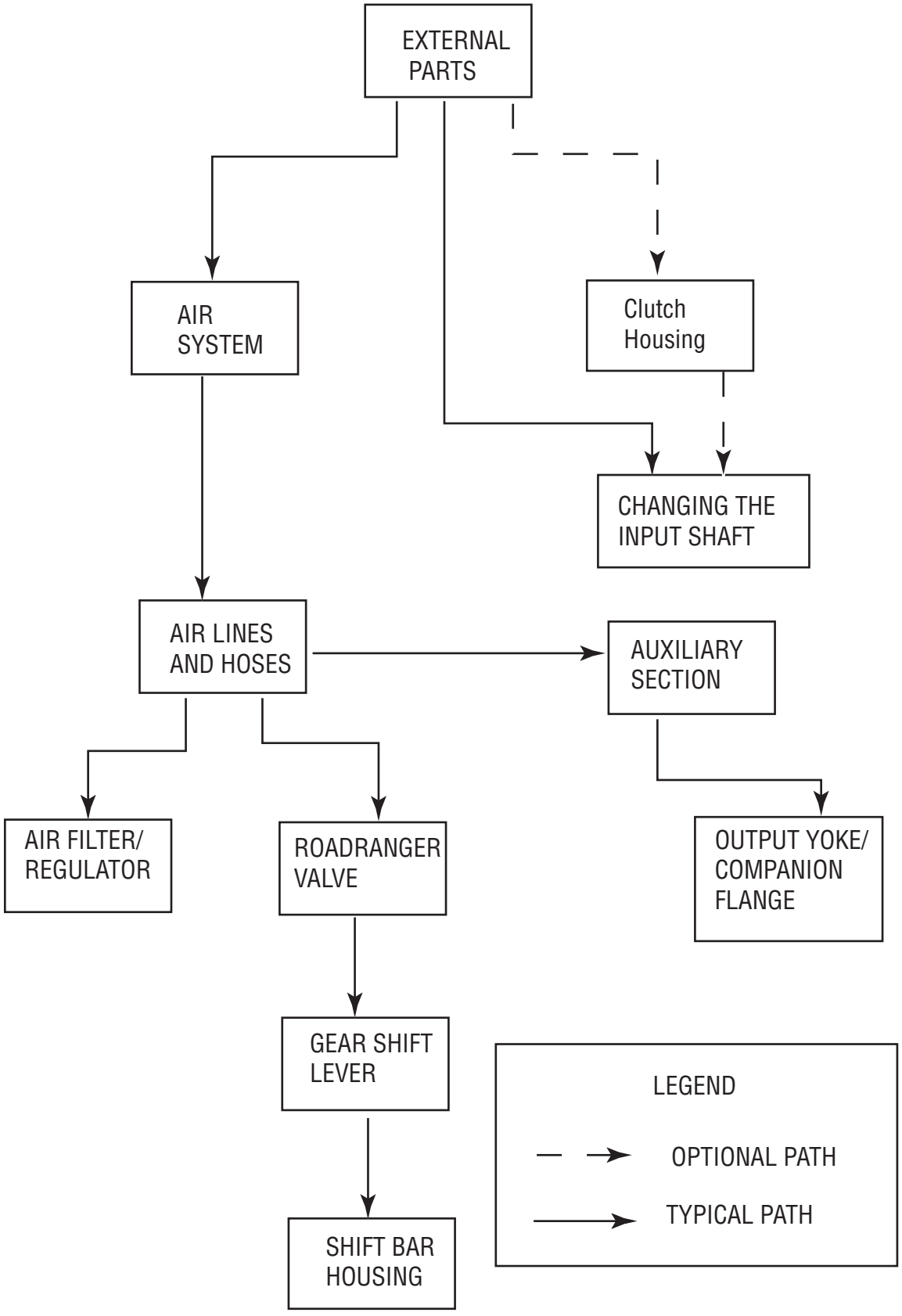
Table 1:

Part to inspect	What to Check For	Action to be Done
Speedometer Connections	Speedometer cables should not be loose. Should be an O-Ring or gasket between the mating speedometer sleeve and the rear bearing cover.	Applied hydraulic thread sealant #71208 to threads. Torque speedometer sleeve to 35-50 Lbf-ft. Replace the O-ring/gasket if damaged or missing.
Rear Bearing Cover capscrews, Gasket, and Nylon Collar	Check retaining capscrews for tightness. Verify nylon collar and gasket are installed at the chamfered hole, aligned near the mechanical speedometer opening. Verify that a rear bearing cover gasket is in place.	Apply Eaton Sealant #71205 to the capscrew threads. Torque capscrews to 35-45 Lbf-ft.Use new parts if need to replace. Apply Eaton Sealant #71205 to the capscrew threads. Torque capscrews to 35-45 Lbf-ft. Install a new gasket if rear bearing cover was removed.
Output Yoke Retaining Nut	Check the output yoke retaining nut for tightness.	Torque the output yoke retaining nut to 450-500 Lbf-ft. Do not over torque nut.
PTO Covers and Openings	Check the capscrews for tightness.	Apply Eaton Sealant #71205 to the capscrew threads. Tighten 6 bolt PTO capscrews to 35-45 Lbf-ft. Tighten 8 bolt PTO capscrews to 50-65 Lbf-ft.
Grey Iron Parts	Check front bearing cover, front case, shift bar housing, rear bearing cover, and clutch housing for cracks or breaks.	Replace parts found to be damaged.
Front Bearing Cover	Check return threads for damage. Check the capscrews for tightness.	If threads damaged, replace the input shaft. Tighten the capscrews to 35-45 Lbf-ft.
Oil Cooler and Oil Filter	Check all connections, fittings, hoses, and filter element for tightness.	Tighten any loose fittings.
Oil Drain Plug, Oil Fill Plug	Check the oil drain plug and the oil fill plug for leakage.	Torque the drain plug to 45-55 Lbf-ft. Torque the oil fill plug to 60-70 Lbf-ft.

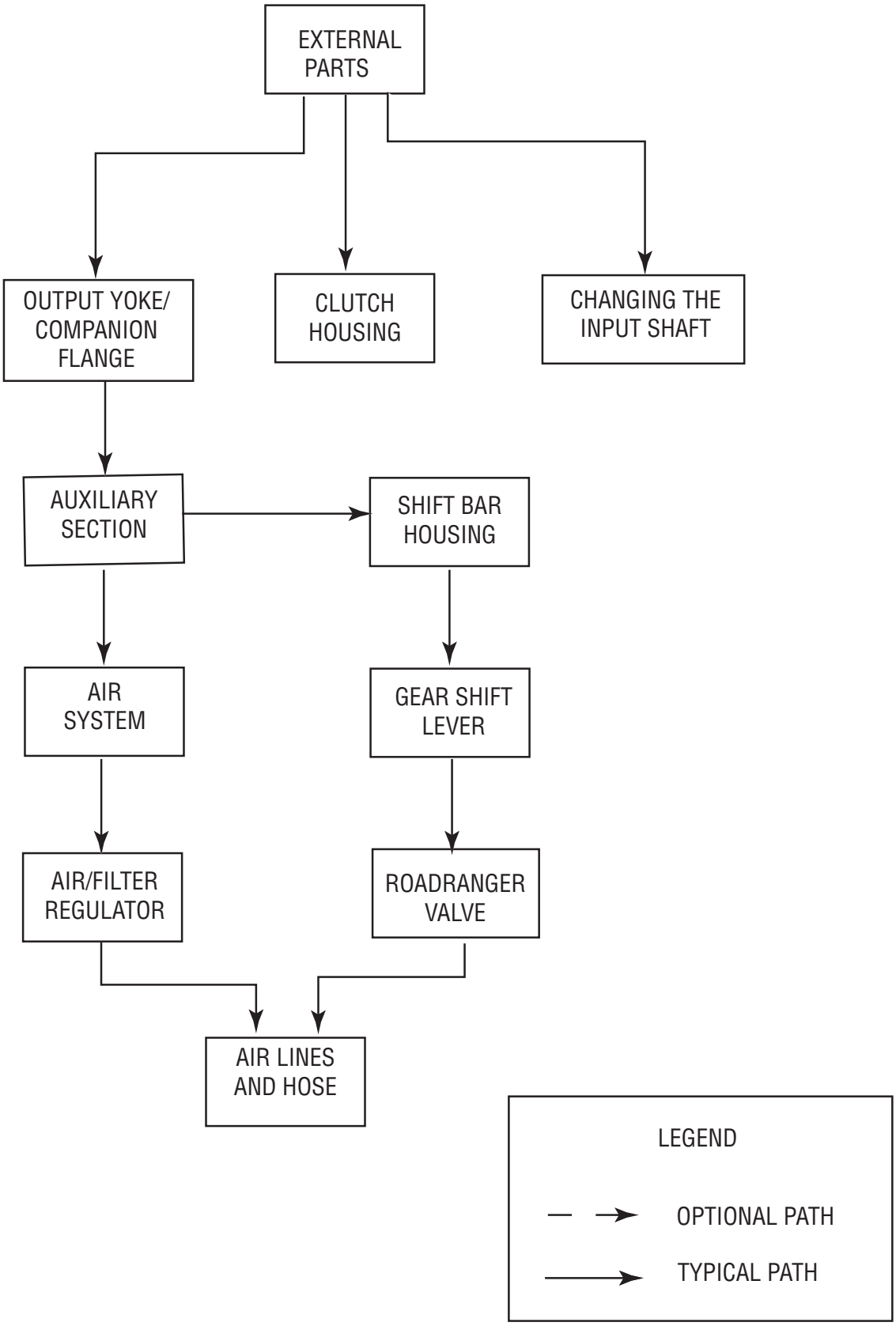
Oil Leak Inspection Process



How to Disassemble the External Parts



How to Assemble the External Parts



How to Remove the Air Lines and Hose

Special Instructions

Before removing the air lines and hose, label or record their location.

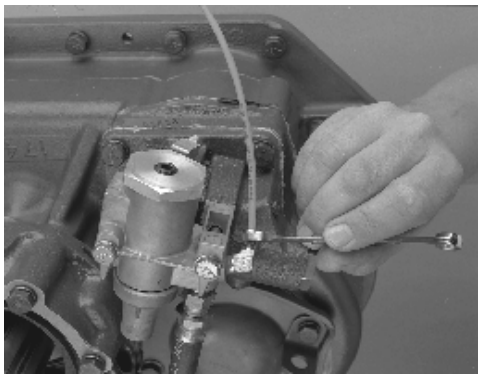
If, after you remove the air lines and hoses, you are unsure of their location, see the Air System “Troubleshooting/Operation Guide” TRTS-0920.

Special Tools

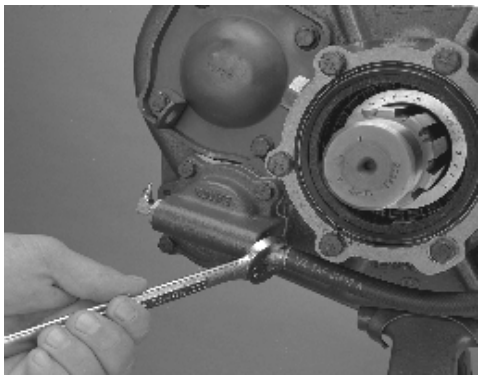
- Typical Service Tools
- For “push-to-connect” fittings, we recommend Eaton service tool kit K-2394. The kit contains the release tool and the tubing cutter.

Procedure -

1. Disconnect all air lines and hose.



2. Inspect the air lines and hose.
3. Inspect air fittings, remove if damaged.



How to Install the Air Lines and Hose

Special Instructions

Make sure air lines and hose are not damaged.

Install the air lines and hose at their proper location.

All externally threaded 1/8" or 5/32" air lines and pipe fittings that are not coated with pre-applied thread sealant must be coated with Eaton sealing material #71209 or equivalent for at least 5 complete and consecutive threads.

All externally threaded 1/4" air fittings that are not coated with pre-applied thread sealant must be coated with Eaton sealing material #71209 or equivalent for at least 3 complete and consecutive threads.

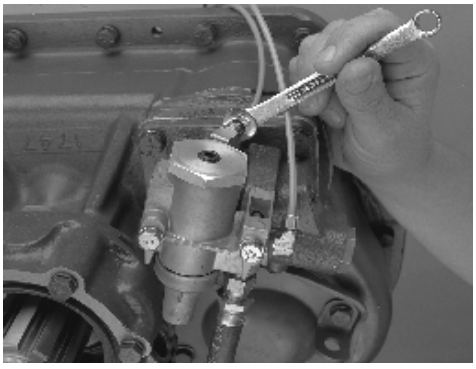
For the 1/4" I.D. air hoses, install the fixed nut end first.

To install the air lines and hose, the air filter/regulator must be in position.

If you are unsure of the air lines and hose location, see the Air System “Troubleshooting/Operation Guide” TRTS-0920.

Special Tools

- Typical Service Tools
- For ‘push-to-connect’ fittings, we recommend Eaton “Service Tool Kit” K-2394. The kit contains the release tool and a tubing cutter.



Procedure -

1. Replace removed air fittings.
2. Connect all removed air lines and hose.

Final Check

- Make sure fittings are tight.
- Make sure air lines are not kinked.

How to Remove the Air Filter/Regulator

Special Instructions

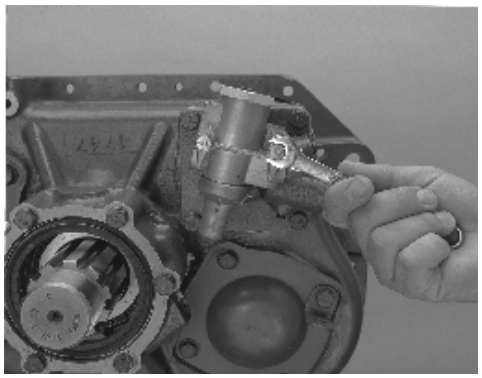
The air filter/regulator has two (2) O-rings located between the filter/regulator and the range cylinder cover.

Special Tools

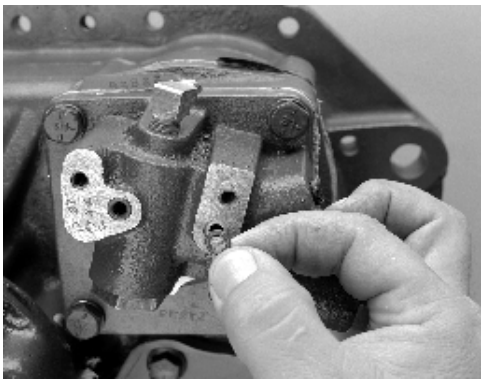
- Typical Service Tools

Procedure -

1. From the air filter/regulator, remove the two (2) capscrews.



2. From the range cylinder cover, remove the two (2) O-rings.
3. Inspect the O-rings for cracks or distortion.



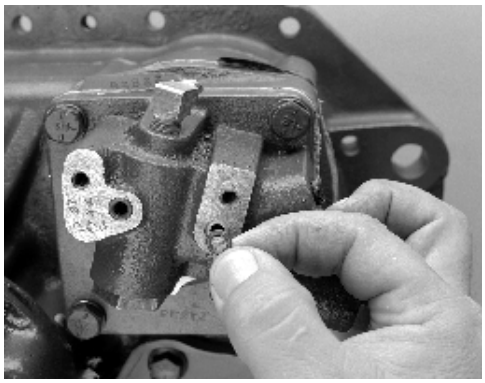
How to Install the Air Filter/Regulator

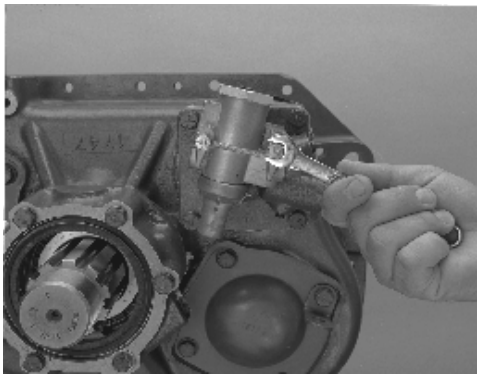
Special Instructions

The air filter/regulator has two (2) o-rings located between the filter/regulator and the auxiliary section.

Special Tools

- Typical Service Tools





Procedure -

1. On the range cylinder cover, position the two (2) o-rings.
2. Over the o-rings, position the air filter/regulator.
3. Apply eaton/fuller sealant #71205 or equivalent to the two (2) retaining capscrews.
4. Install the two (2) retaining capscrews, tighten to 8-12 lb-ft of torque.

Final Check

- Make sure the capscrews are properly torqued.

How to Remove a Roadranger Valve

Special Instructions

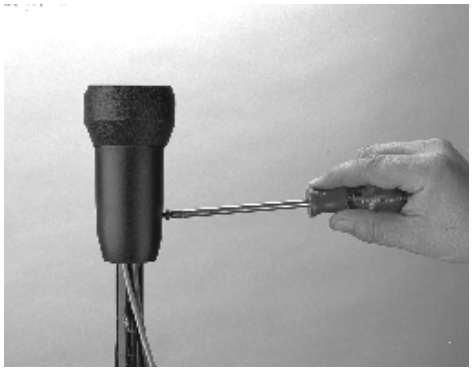
The air lines must be depressurized.

Special Tools

- Typical Service Tools

Procedure -

1. From the Roadranger valve cover, remove the two (2) mounting screws.



2. Slide the Roadranger valve cover down.
3. From the air fittings, disconnect the air lines.

4. From the Roadranger base, loosen the jam nut. Rotate the Roadranger valve until the valve is removed.
5. Inspect the parts: nut, valve cover, air lines, sheathing, and O-rings from the lever shaft.
6. On the Roadranger valve, inspect the air fittings; remove if damaged.

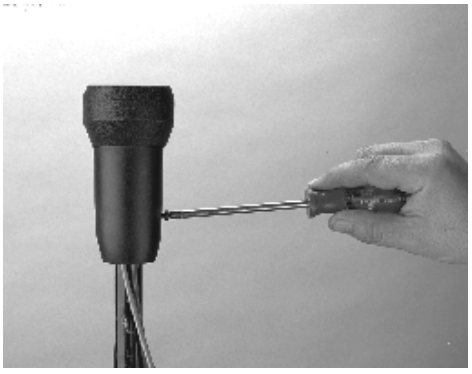
How to Install a Roadranger Valve

Special Instructions

To position the Roadranger valve: the range lever must be to the front or the splitter button to the left when facing forward.

Special Tools

- Typical Service Tools



Procedure -

1. Make sure the nut, valve cover, air lines, sheathing, and O-rings are in position on the lever shaft.
2. If previously removed, replace the air fittings.
3. Place the Roadranger valve on the lever shaft and rotate into position.
4. From the Roadranger valve bottom, tighten the jam nut.
5. Connect the air lines to the air fittings.
6. Slide the cover into position on the Roadranger valve.
7. Install the Roadranger valve cover two (2) mounting screws.

Final Check

- Make sure the air lines are seated fully

How to Remove the Range Actuator Valve

Special Instructions

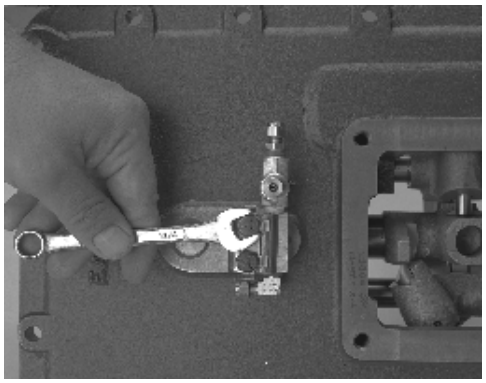
The air lines must be depressurized.

Special Tools

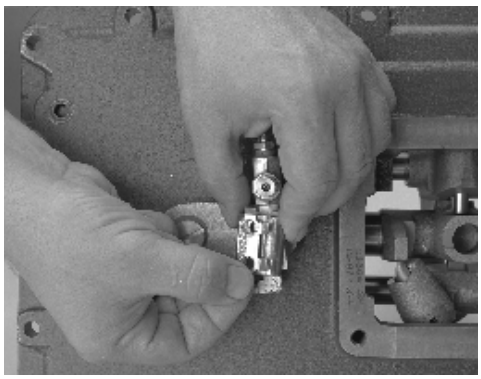
- Typical Service Tools

Procedure -

1. From the mounting screws, bend the lockwasher retaining tabs down.
2. From the range actuator valve bracket, remove the two (2) mounting screws. The newest design of the range actuator does not have the bracket.



3. Remove the range actuator valve lockwasher, bracket, and range actuator valve.
4. Inspect the air fittings, remove if damaged.
5. From the range actuator valve bore, remove the actuating pin.



6. Inspect the actuating pin for damage, replace if necessary.

How to Install the Range Actuator Valve

Special Instructions

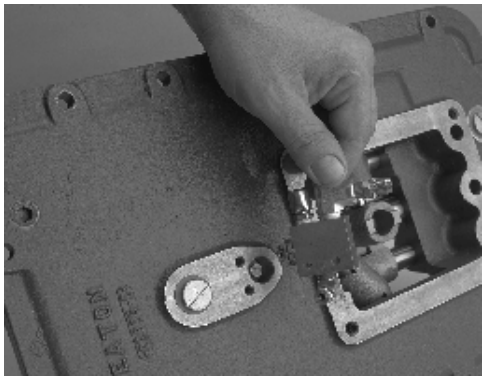
Apply Eaton lubricant #71214 or equivalent to the O-ring so a film covers the entire surface of each O-ring.

Special Tools

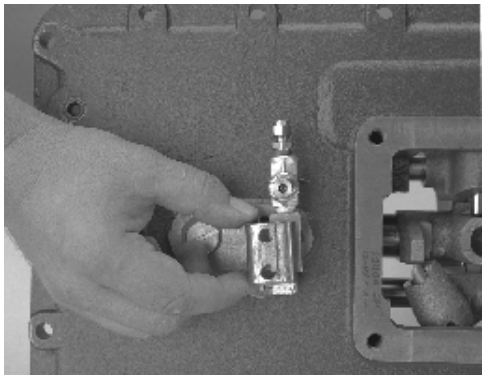
- Typical Service Tools

Procedure -

1. Install the actuating pin in the range actuator valve bore.



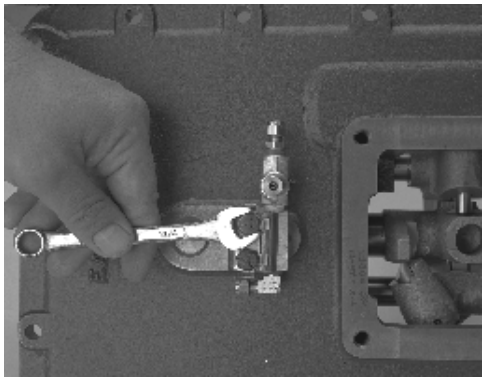
2. If previously removed, replace the air fittings
3. Install the range actuating valve.



4. Position the range actuating valve bracket and lockwasher over the capscrew openings. The newest design of the range actuator does not have the bracket.
5. Apply Eaton sealant #71205 or equivalent to the retaining capscrews.

6. Install the retaining capscrews, tighten to 8-12 lb-ft of torque.

7. Bend the retaining tabs on the lockwasher up.



Final Check

- Make sure the capscrews are properly torqued.

How to Remove the Top 2 Valve Assembly

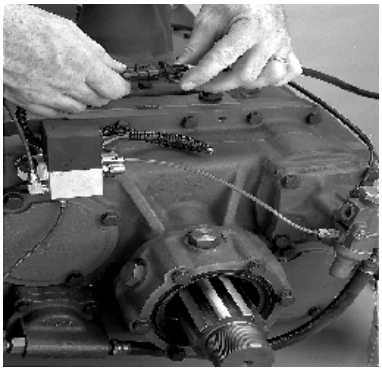
Special Instructions

The air lines must be depressurized.

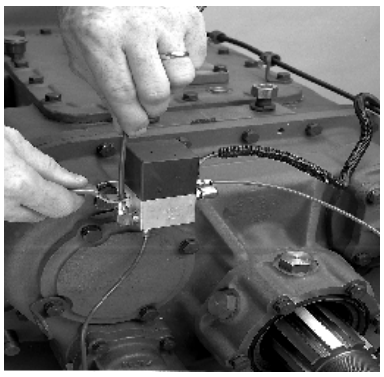
Special Tools

- Typical Service Tools

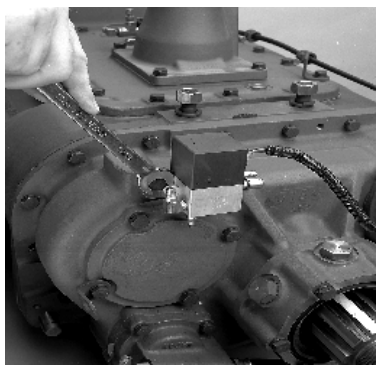
Procedure -



1. From the 3-way connector, disconnect the wire harness.



2. From the air fittings, disconnect the air lines.



3. From the Top-2 valve assembly, remove the two (2) cap-screws.

How to Install the Top 2 Valve Assembly

Special Instructions

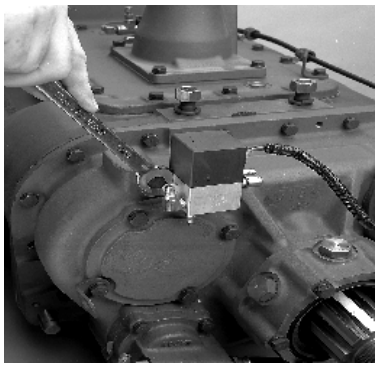
The air lines must be depressurized.

Special Tools

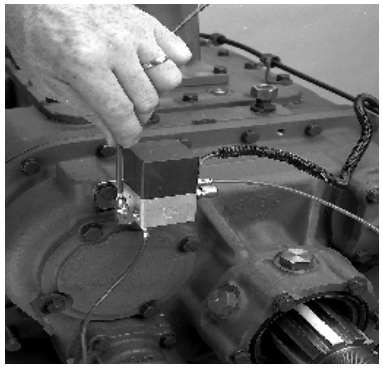
- Typical Service Tools

Procedure -

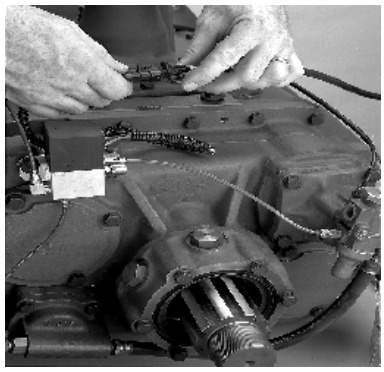
1. Install the two (2) retaining capscrews, tighten to 35-45 lb-ft of torque.



2. Connect the air lines to the air fittings.



3. Connect the 3-way connector to the harness.



How to Remove the Gear Shift Lever

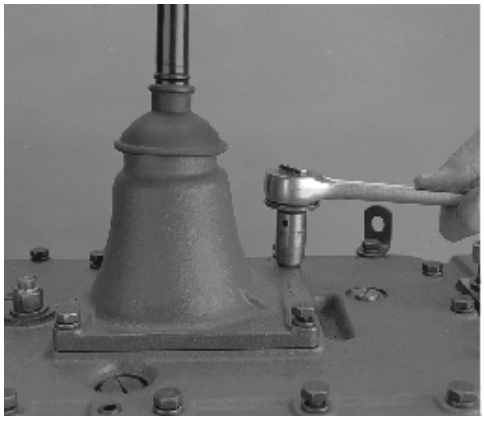
Special Instructions

The air lines must be disconnected from the transmission or from the Roadranger valve.

Remote control housings are removed the same way as gear shift levers.

Special Tools

- Typical Service Tools



Procedure -

1. From the gear shift lever base, remove the four (4) retaining capscrews.
2. To break the gasket seal, lightly jar the gear shift housing.
3. Remove the gear shift lever housing.
4. Remove the gasket and clean all mounting surfaces of gasket material.

How to Install the Gear Shift Lever

Special Instructions

Remote control housings are installed the same way as gear shift levers.

For standard and forward shift bar housings, make sure the two (2) balls and tension springs are in the shift bar housing top bores.

Make sure the shift block and yoke notches are aligned in the neutral position.

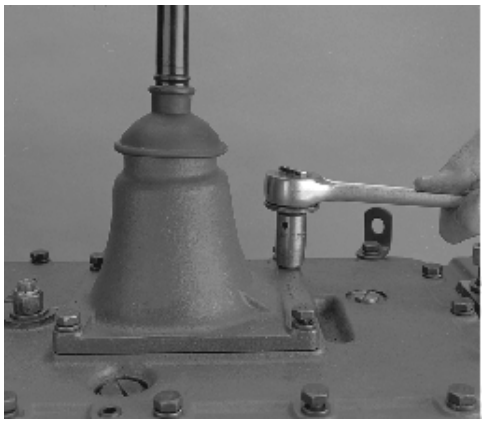
Special Tools

- Typical Service Tools

Procedure -

1. Position a new gear shift lever gasket on the gear shift lever mounting surface.
2. Fit the gear shift lever into the shift block.
3. Apply Eaton/Fuller Sealant #71205 or equivalent to the retaining capscrews.

4. Install the retaining capscrews, tighten to 35-45 lb-ft of torque.



Final Check

- Make sure the capscrews are properly torqued.
- Make sure you can shift the transmission.

How to Remove the Shift Bar Housing

Special Instructions

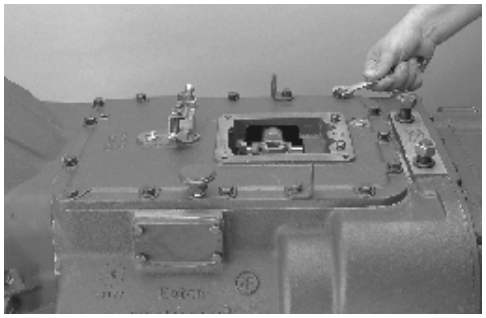
Before removing the shift bar housing, the air lines must be disconnected.

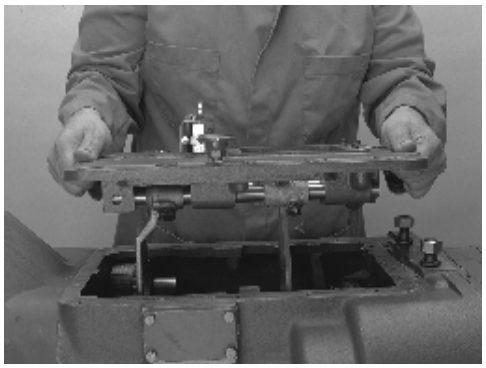
For models equipped with an oil pump and/or cooler assemblies, make sure to disconnect the lube line connected to the shift bar housing.

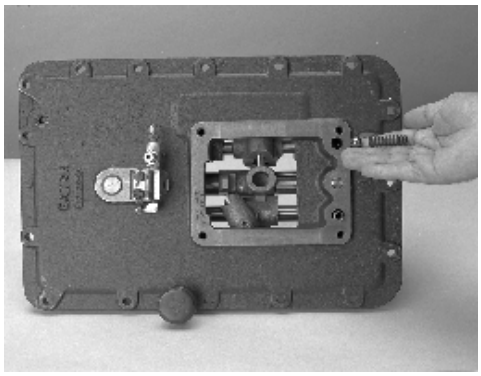
There are two (2) sizes of capscrews. The 1½" capscrews are used with the lifting eyes. Note their location.

Special Tools

- Typical Service Tools







Procedure -

1. From the shift bar housing rim, remove the retaining capscrews.
2. From the alignment stud, remove the nut and washer.
3. To break the gasket seal, jar the shift bar housing.
4. Remove the shift bar housing.
5. Remove the gasket and clean all mounting surfaces of gasket material.
6. If the two (2) sets of tension springs and balls from the housing top bores are loose, tilt the assembly and remove them. The anti-rotating pin can be removed also. Newer shift bar housings do not have the anti-rotating pin.

How to Install the Shift Bar Housing

Special Instructions

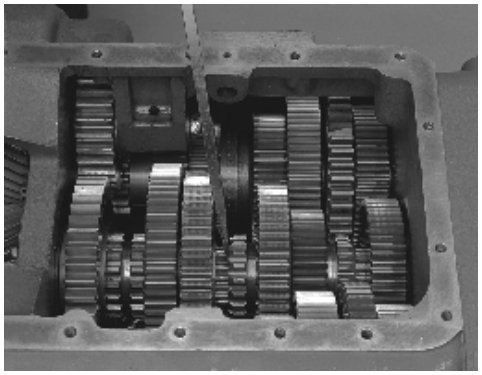
There are two (2) sizes of capscrews. The 1½" capscrews are used with the lifting eyes.

Special Tools

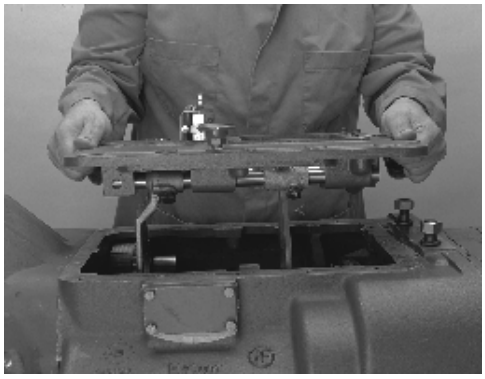
- Typical Service Tools

Procedure -

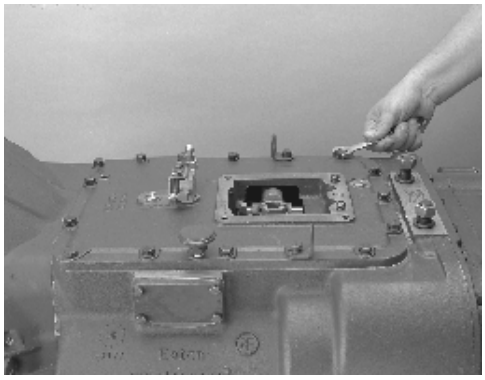
1. Place the shift bars in the neutral position.
2. Place the mainshaft sliding clutches in the neutral position.



3. Position a new shift bar housing gasket on the shift bar housing mounting surface.
4. As you install the shift bar housing, make sure the yokes fit into the corresponding clutch gears slots.
5. Apply Eaton/Fuller Sealant #71205 or equivalent to the retaining capscrews.



6. Install the retaining capscrews, tighten to 35-45 lb-ft of torque.
7. Install the washer and nut on the alignment stud.



Final Check

- Make sure the capscrews are properly torqued.

How to Remove the Output Yoke/Companion Flange

Special Instructions

You must remove the shift bar housing in order to lock the transmission.

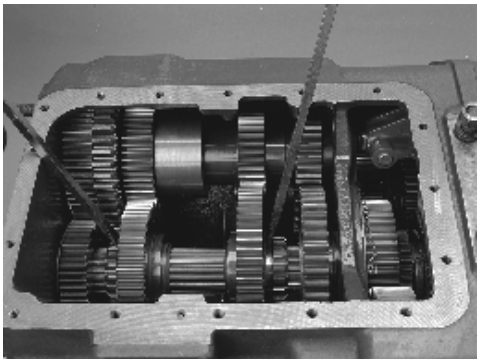
For proper cleaning and maintenance, see TCSM-0912 “Seal Maintenance Guide”.

After removal of the output yoke/companion flange, temporarily replace the output shaft nut to protect the output shaft threads during auxiliary section disassembly.

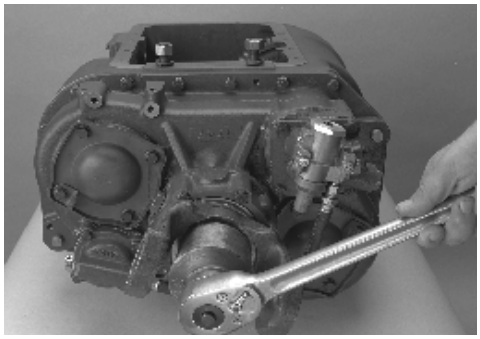
Special Tools

- Typical Service Tools
- A large breaker bar or air impact wrench

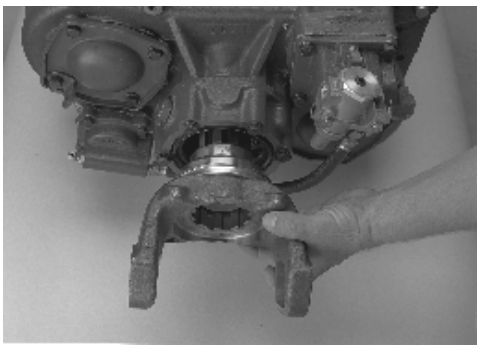
Procedure -



1. Engage two (2) mainshaft sliding clutches into two (2) mainshaft gears to lock the transmission.



2. Use a large breaker bar or air impact wrench to remove the output shaft nut.



3. Pull the yoke or flange straight to the rear and off the output shaft.

How to Install the Output Yoke/Companion Flange

Special Instructions

You must remove the shift bar housing in order to lock the transmission.

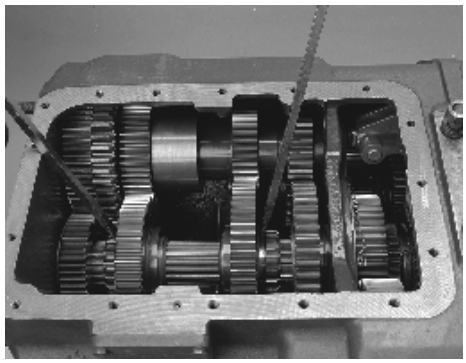
For proper cleaning and maintenance, see TCSM-0912 “Seal Maintenance Guide”.

Special Tools

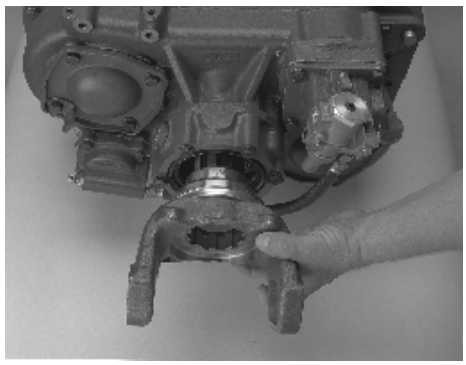
- Typical Service Tools
- Torque Wrench 500 lb-ft Capacity

Procedure -

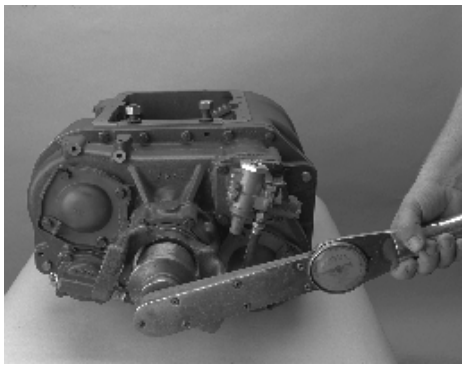
1. Engage two (2) mainshaft sliding clutches into two (2) mainshaft gears to lock the transmission.



2. Install the speedometer drive gear rotor or replacement spacer on the output shaft inside the rear bearing cover.
3. If the slinger on the yoke is damaged, replace using a Slinger/Seal kit.
4. Slide the companion flange or yoke onto the output shaft.



5. Install the output shaft nut, tighten to 450-500 lb-ft of torque.



Final Check

- Make sure the output shaft nut is properly torqued.
- Unlock the transmission.

How to Remove the Auxiliary Section Without Tapered Bearings

Special Instructions

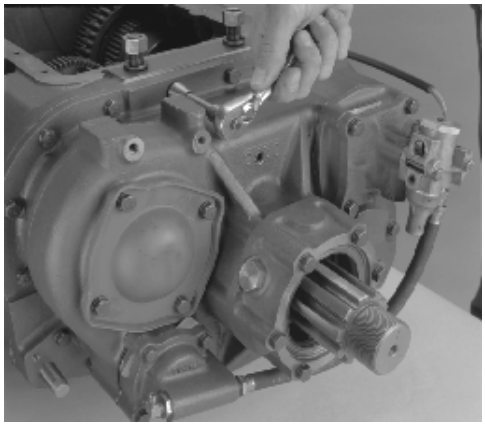
There can be different capscrew lengths, note their location.

Auxiliary sections can be removed either with the transmission in the horizontal position or the vertical position.

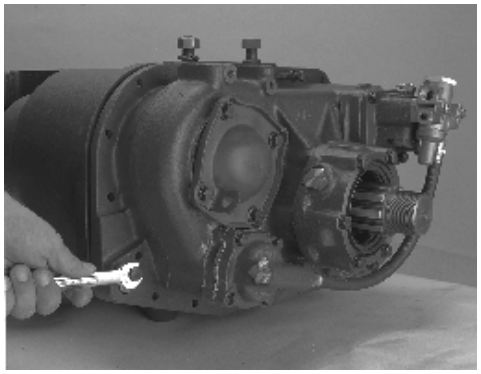
Special Tools

- Typical Service Tools
- An auxiliary section hanger bracket for horizontal removal
- A steel bar longer than the width of the output yoke for vertical removal
- A hoist with a lifting chain

Procedure - To remove the auxiliary section in the horizontal position.



1. From the auxiliary section housing, remove the retaining capscrews that attach the front section to the auxiliary section.



2. Insert the two (2) longest capscrews in the housing flange tapped holes. Tighten evenly to move the auxiliary section away from the front box. Go far enough to break the gasket seal.

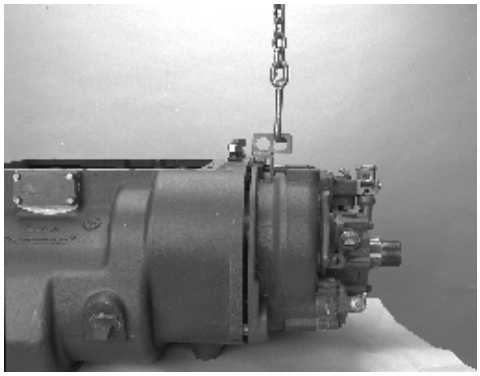
3. Remove the capscrews from the tapped holes.

4. Attach an auxiliary section hanger bracket to the auxiliary section top.

5. Attach a lifting chain to the auxiliary section hanger bracket.

6. Move assembly to the rear until auxiliary section is free.

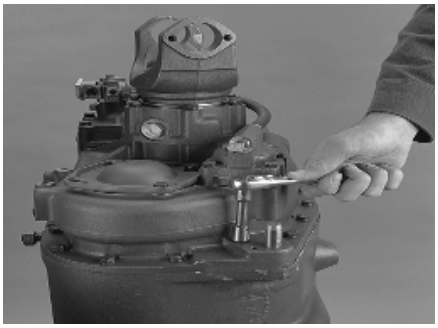
7. Remove the gasket and clean all mounting surfaces of gasket material.



Procedure - To remove the auxiliary section in the vertical position.

1. With blocks under the clutch housing to prevent input shaft damage, place transmission in the vertical position, clutch housing down.

2. From the auxiliary section housing, remove the retaining capscrews that attach the front box to the auxiliary section.

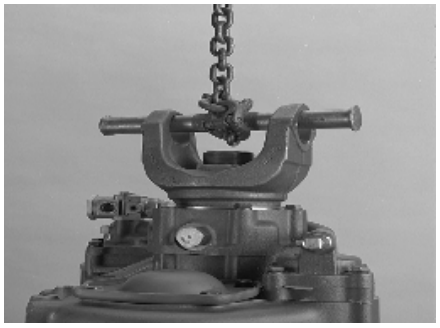


3. Install a steel bar through the yoke.

4. Attach a lifting chain to the steel bar.

5. Lift assembly from the front section.

6. Remove the gasket and clean all mounting surfaces of gasket material.



How to Install the Auxiliary Section Without Tapered Bearings

Special Instructions

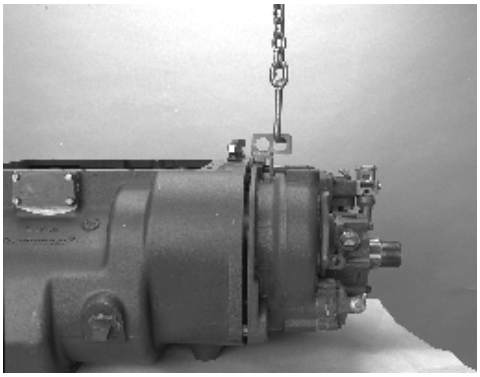
There are different capscrew lengths, install in the correct location.

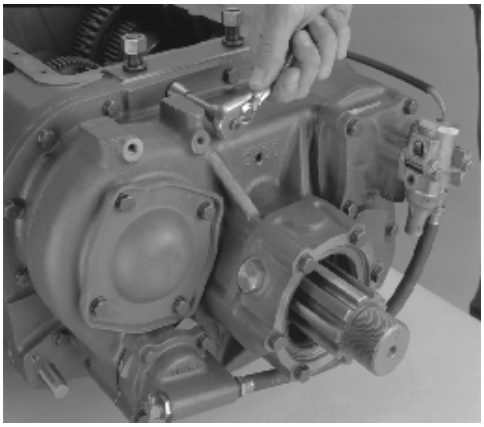
Auxiliary sections can be installed either with the transmission in the horizontal position or the vertical position.

To install in the vertical position, the clutch housing must be installed.

Special Tools

- Typical Service Tools
- An auxiliary section hanger bracket for horizontal removal
- A steel bar longer than the width of the output yoke for vertical removal
- A hoist with a lifting chain



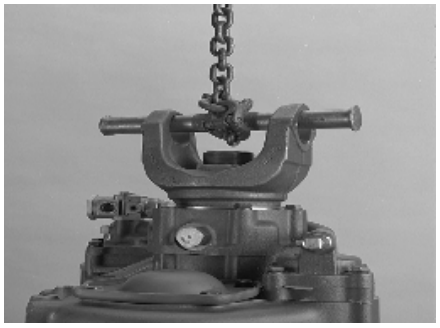


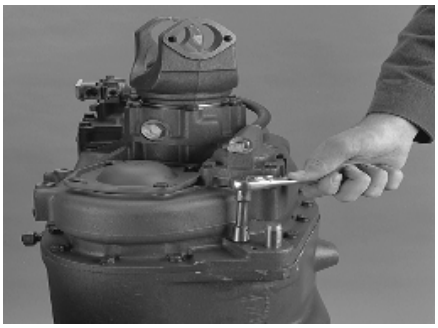
Procedure - To install the auxiliary section in the horizontal position.

1. Position a new gasket on the transmission mounting surface.
2. Attach an auxiliary section hanger bracket to the auxiliary section top.
3. Attach a lifting chain to the auxiliary section hanger bracket.
4. Position the auxiliary section on the two (2) dowel pins.
5. Slide the auxiliary section on until the hanger bracket contacts the front case back.
6. Remove the auxiliary section hanger bracket.
7. Slide the auxiliary section the rest of the way into position.
8. Apply Eaton/Fuller Sealant #71205 or equivalent to the retaining capscrews.
9. Install the retaining capscrews, tighten to 35-45 lb-ft of torque.

Procedure - To install the auxiliary section in the vertical position.

1. With blocks under the clutch housing to prevent input shaft damage, place the transmission in the vertical position, clutch housing down.
2. Position a new gasket on the transmission mounting surface.
3. Install a steel bar through the yoke.
4. Attach a lifting chain to the steel bar.
5. Position the auxiliary section over the two (2) dowel pins.
6. Slide the auxiliary section down the dowels.
7. Apply Eaton/Fuller Sealant #71205 or equivalent to the retaining capscrews.
8. Install the retaining capscrews, tighten to 35-45 lb-ft of torque.
9. Remove the steel bar and chain.





Final Check

- Make sure capscrews are properly torqued.
- Make sure the input shaft rotates.

How to Remove the Auxiliary Section With Tapered Bearings

Special Instructions

There can be different capscrew lengths, note their location.

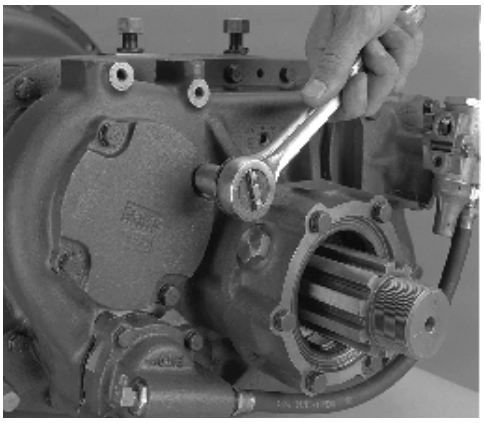
Auxiliary sections can be removed either with the transmission in the horizontal position or the vertical position.

Auxiliary countershaft retaining straps may be installed to hold the countershafts in place. Auxiliary can be removed without straps, use caution.

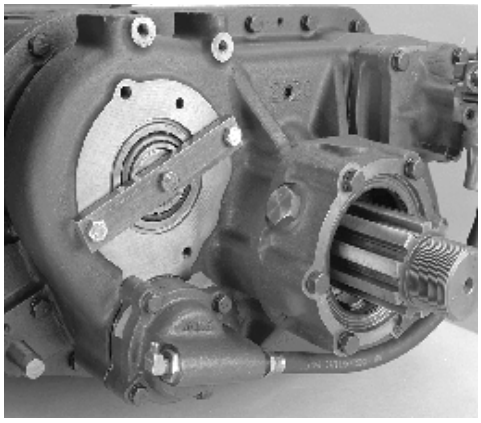
Special Tools

- Typical Service Tools
- An auxiliary section hanger bracket for horizontal removal
- A steel bar longer than the width of the output yoke for vertical removal
- A hoist with a lifting chain
- Auxiliary countershaft retaining straps

Procedure - To remove the auxiliary section in the horizontal position.



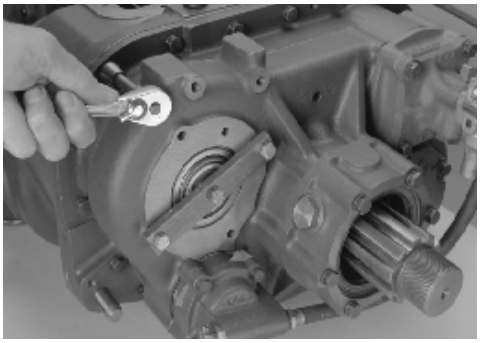
1. Remove the four (4) capscrews and the auxiliary countershaft rear bearing cover, gasket, and rear bearing shim.



2. Install the auxiliary countershaft retaining straps with 2-3/8" NC x 1" and 1-3/8" NC x 2-1/2" clean cap-screws.

WARNING: Do not use an air gun. Tighten by hand until the capscrews are snug.

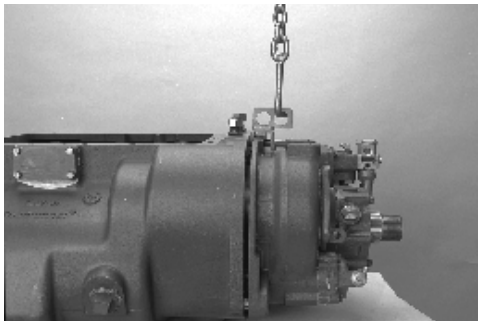
3. From the auxiliary section housing, remove the retaining capscrews that attach the front section to the auxiliary section.



4. Insert the two (2) longest capscrews in the housing flange tapped holes. Tighten evenly to move the auxiliary section away from the front box. Go far enough to break the gasket seal.

5. Remove the capscrews from the tapped holes.

6. Attach an auxiliary section hanger bracket to the auxiliary section top.



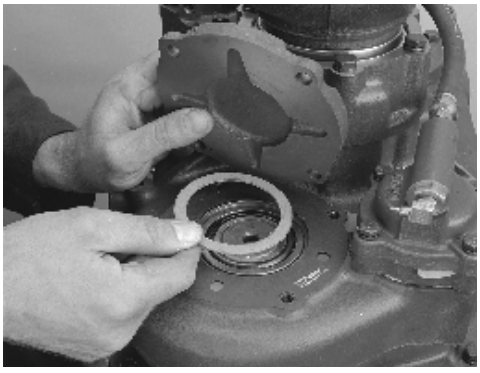
7. Attach a lifting chain to the auxiliary section hanger bracket.

8. Move assembly to the rear until auxiliary section is free.

9. Remove the gasket and clean all mounting surfaces of gasket material.

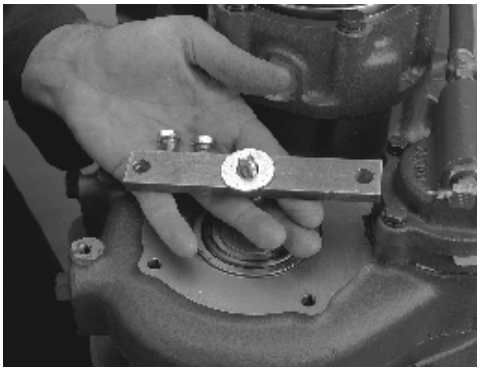
Procedure - To remove the auxiliary section in the vertical position.

1. With blocks under the clutch housing to prevent input shaft damage, place transmission in the vertical position, clutch housing down.

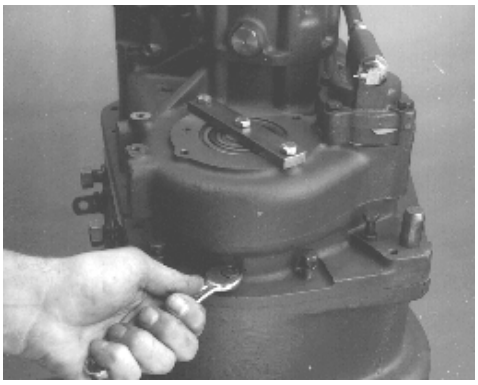


2. Remove the four (4) capscrews and the auxiliary countershaft rear bearing cover, gasket, and rear bearing shim.

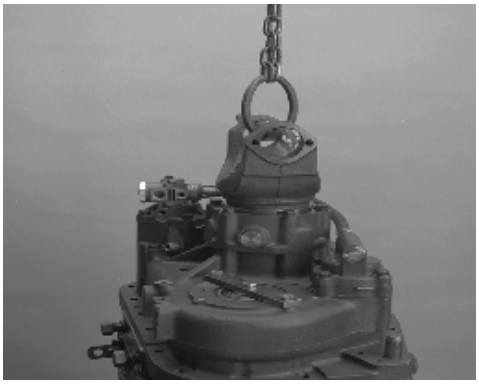
3. Install the auxiliary countershaft retaining straps with 2-3/8" NC x 1" and 1-3/8" NC x 2-1/2" clean capscrews.



WARNING: Do not use an air gun. Tighten by hand until capscrews are snug.



4. From the auxiliary section housing, remove the retaining capscrews that attach the front box to the auxiliary section.



5. Install a steel bar through the yoke.
6. Attach a lifting chain to the steel bar.
7. Lift assembly from the front section.
8. Remove the gasket and clean all mounting surfaces of gasket material.

How to Install the Auxiliary Section With Tapered Bearings

Special Instructions

There are different capscrew lengths, install in the correct location.

Auxiliary sections can be installed either with the transmission in the horizontal position or the vertical position.

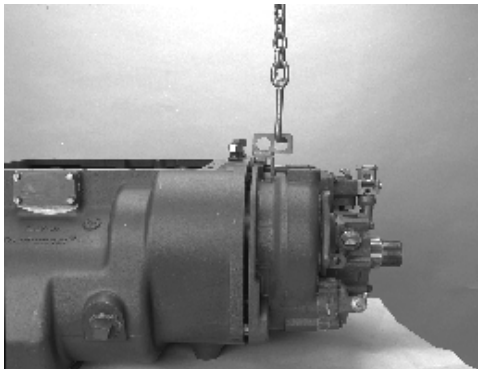
To install in the vertical position, the clutch housing must be installed.

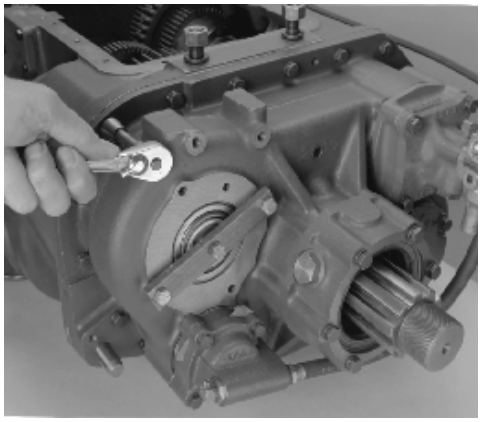
Special Tools

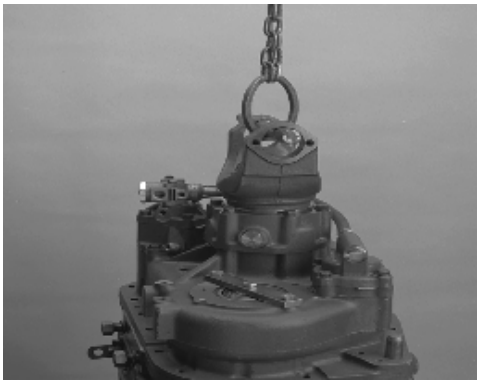
- Typical Service Tools
- An auxiliary section hanger bracket for horizontal removal
- A steel bar longer than the width of the output yoke for vertical removal
- A hoist with a lifting chain

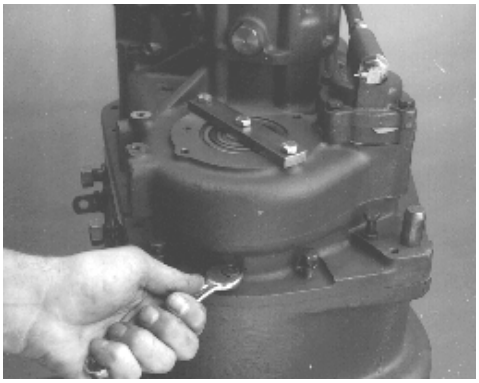
Procedure - To install the auxiliary section in the horizontal position.

1. Position a new gasket on the transmission mounting surface.
2. Attach an auxiliary section hanger bracket to the auxiliary section top.
3. Attach a lifting chain to the auxiliary section hanger bracket.
4. Position the auxiliary section on the two (2) dowel pins.
5. Slide the auxiliary section on until the hanger bracket contacts the front section back.
6. Remove the auxiliary section hanger bracket.
7. Slide the auxiliary section the rest of the way into position.
8. Apply Eaton/Fuller Sealant #71205 or equivalent to the retaining capscrews.
9. Install the retaining capscrews, tighten to 35-45 lb-ft of torque.
10. To finish installation, see "The Shimming Procedure for Tapered Bearings".









Procedure - To install the auxiliary section in the vertical position.

1. With blocks under the clutch housing to prevent input shaft damage, place the transmission in the vertical position, clutch housing down.
2. Position a new gasket on the transmission mounting surface.
3. Install a steel bar through the yoke.
4. Attach a lifting chain to the steel bar.
5. Position the auxiliary section over the two (2) dowel pins.
6. Slide the auxiliary section down the dowels.
7. Apply Eaton/Fuller Sealant #71205 or equivalent to the retaining capscrews.
8. Install the retaining capscrews, tighten to 35-45 lb-ft of torque.
9. Remove the steel bar and chain.
10. To finish installation, see "The Shimming Procedure for Tapered Bearings".

Final Check

- Make sure capscrews are properly torqued.
- Make sure the input shaft rotates.

The Shimming Procedure For Tapered Bearings

Special Instructions

The shimming procedure can be done in the horizontal or vertical position. The procedure is done the same.

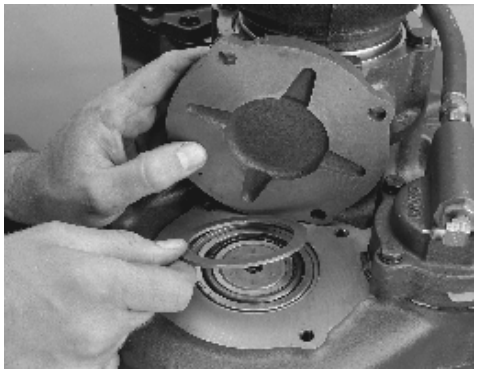
Shims must be aligned properly or else the rear bearing cover may be damaged when final torque is applied.

Special Tools

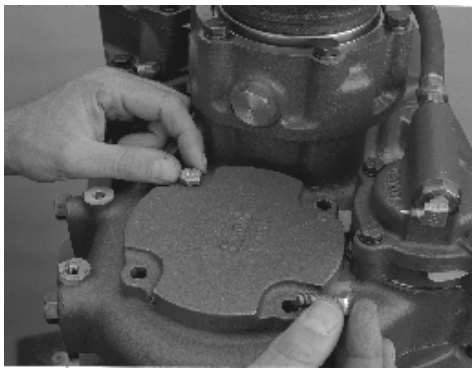
- Typical Service Tools

Procedure -

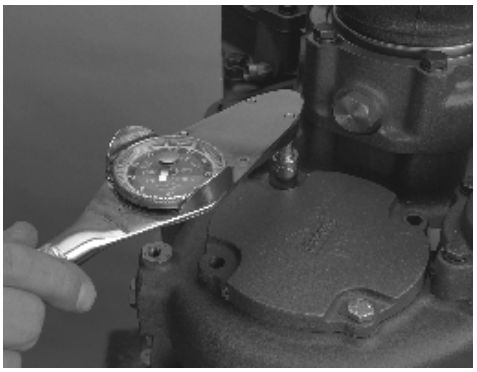
1. Remove the countershaft straps. Make sure a 0.125 countershaft rear bearing shim is installed. Be sure the countershaft rear bearing races are seated in the bearing bores.

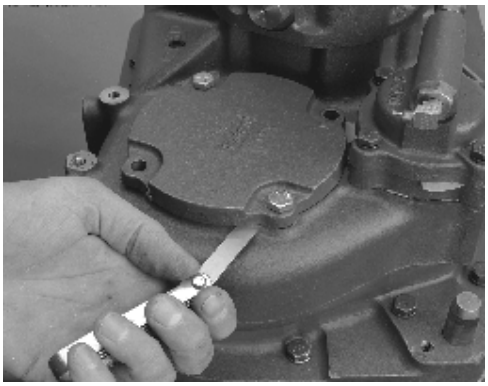


2. Install two (2) clean 3¦8" x 1" capscrews without washers directly across from each other in each bearing cover. Tapped holes in auxiliary case must be free of thread adhesive.

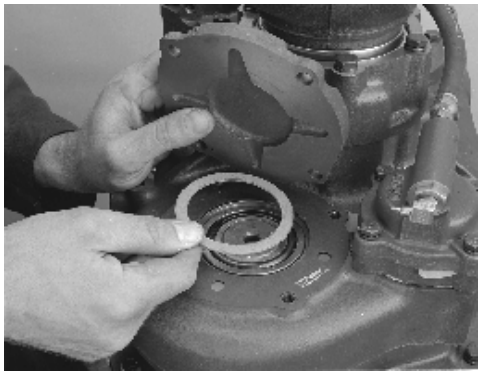


3. Tighten the capscrews to 7 Lbf·in of torque. Do not install the countershaft rear bearing cover gasket.

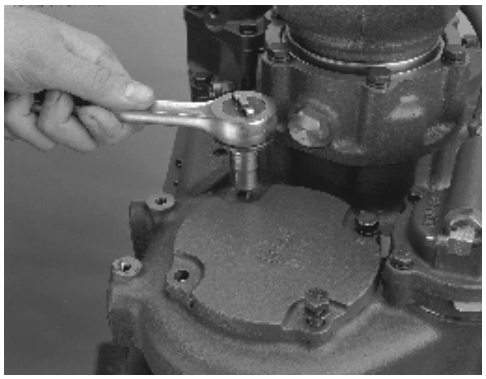




4. Rotate the output shaft six (6) times clockwise, then six (6) times counterclockwise to seat the countershaft rear bearings. Use a feeler gauge, as close to each capscrew location as possible, and measure the gap between the countershaft rear bearing cover and the auxiliary case. Record the measurements. Using the average measurement, refer to the shimming chart to identify the proper shim.



5. Remove the countershaft rear bearing cover and gauging shim.
6. Place the selected shim on the rear countershaft bearing race.
7. Position a new gasket on countershaft rear bearing cover mounting surface.



8. Position the countershaft rear bearing cover over the new gasket.
9. Apply Eaton/Fuller Sealant #71205 or equivalent to the retaining capscrews.
10. Install the retaining capscrews, tighten to 35-45 lb-ft of torque.
11. Repeat Steps 1-8 for the other countershaft rear bearing cover.

Final Check

- Make sure capscrews are properly torqued.
- Make sure the input shaft rotates.

Table 1:

Feeler Gauge Average Gap	Shim Thickness	Standard Shim Part number	Oil Pump Shim Part Number	Color Code
.088-.089	.042-.043	21454	21474	Brown
.085.0875	.045-.046	21455	21475	Tan

Table 1:

Feeler Gauge Average Gap	Shim Thickness	Standard Shim Part number	Oil Pump Shim Part Number	Color Code
.082-.0845	.048-.049	21456	21476	Orange
.079-.0815	.051-.052	21457	21477	Yellow
.076-.0785	.054-.055	21458	21478	Green
.073-.0755	.057-.058	21459	21479	Light Blue
.070-.0725	.060-.061	21460	21480	Lavender
.067-.0695	.063-.064	21461	21481	White
.064-.0665	.066-.067	21684	21686	Black
.061-.0635	.069-.070	21685	21687	Silver
.058-.0605	.072-.074	21452 + 21452	21472 + 21472	Red + Red
.055-.0575	.075-.077	21452 + 21453	21472 + 21473	Red + Pink
.052-.0545	.078-.080	21452 + 21454	21472 + 21474	Red + Brown
.049-.0515	.081-.083	21452 +21455	21472 + 21475	Red + Tan
.046-.0485	.084-.086	21452 + 21456	21472 + 21476	Red + Orange
.043-.0455	.087-.089	21452 + 21457	21472 + 21477	Red + Yellow
.040-.0425	.090-.092	21452 + 21458	21472 + 21478	Red + Green
.038-.0395	.093-.095	21452 + 21459	21472 + 21479	Red + Lt. Blue

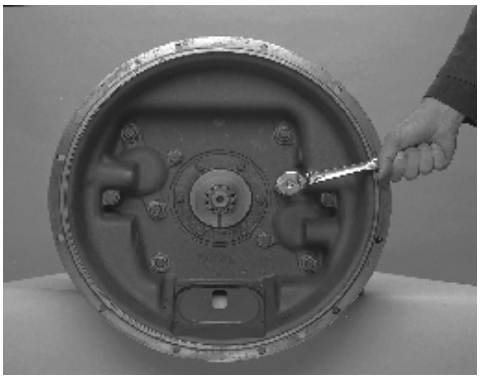
How to Remove the Clutch Housing

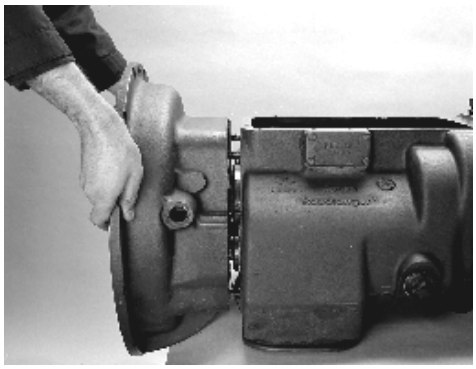
Special Instructions

Removal of the clutch housing is done in the horizontal position.

Special Tools

- Typical Service Tools





Procedure -

1. From inside the clutch housing, remove the nuts and washers.
2. From inside the clutch housing, remove the bolts.
3. Jar clutch housing to break gasket seal.
4. Pull the clutch housing from the studs and transmission case.
5. Remove the gasket and clean all mounting surfaces of gasket material.

How to Install the Clutch Housing

Special Instructions

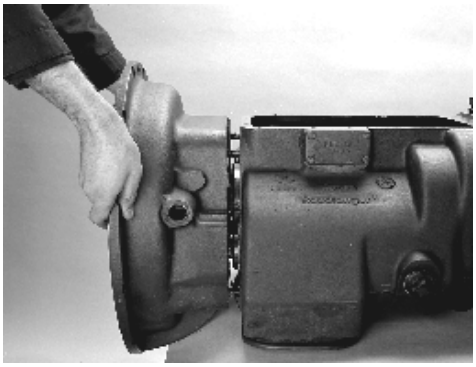
Installation of the clutch housing is done in the horizontal position.

Special Tools

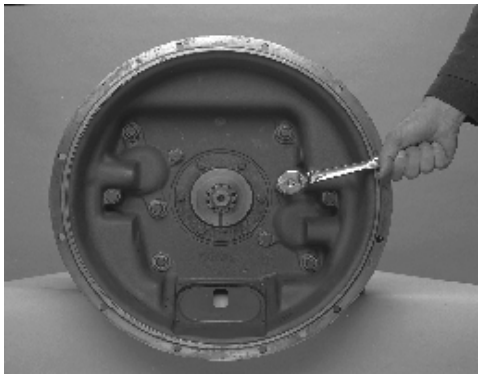
- Typical Service Tools

Procedure -

1. Position a new gasket on the housing mounting surface.
2. Install the clutch housing on the front box, pilot it on the six studs and drive gear bearing cover.



3. Install the nuts with washers or lockwashers on the studs, tighten to 35 lb-ft (47 N.m) + 90° CW rotation or 175 lb-ft (237 N.m) of torque.
4. Install the capscrews with lockwashers, tighten to 115 lb-ft (156 N.m) of torque.



Final Check

- Make sure the capscrews are properly torqued.

How to Remove the Input Shaft Without Disassembling the Transmission

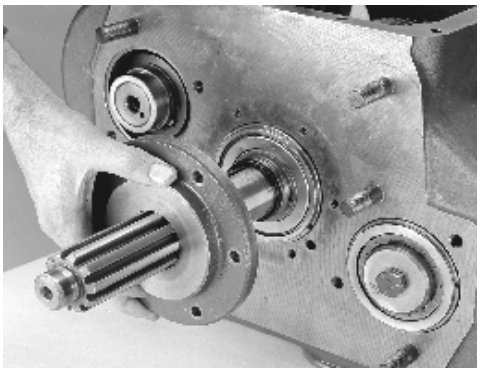
Special Instructions

Remove the transmission from the vehicle.

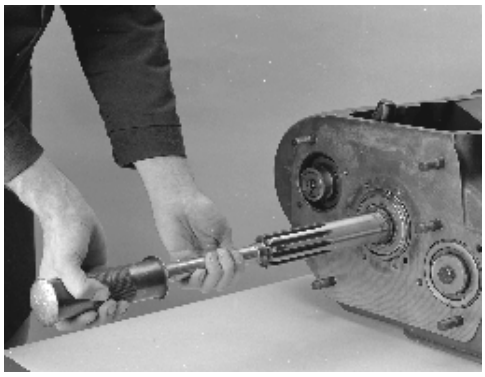
Special Tools

- Typical Service Tools

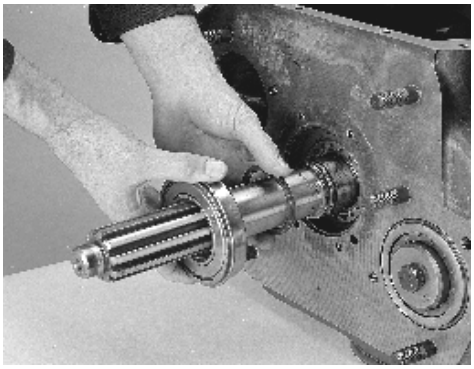
Procedure -



1. Remove the front bearing cover and gasket.
2. Remove the input shaft snap ring.

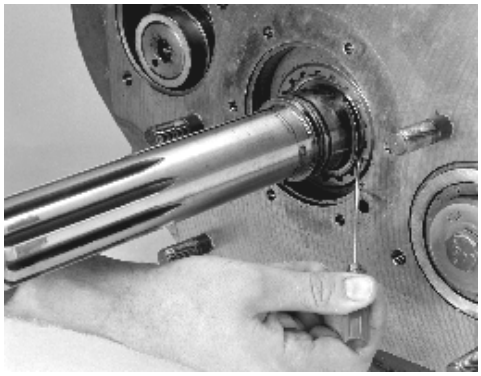


3. Drive the input shaft towards the transmission rear, through the bearing as far as possible.
4. Pull the input shaft forward to expose the bearing snap ring.
5. To complete bearing removal, use pry bars.

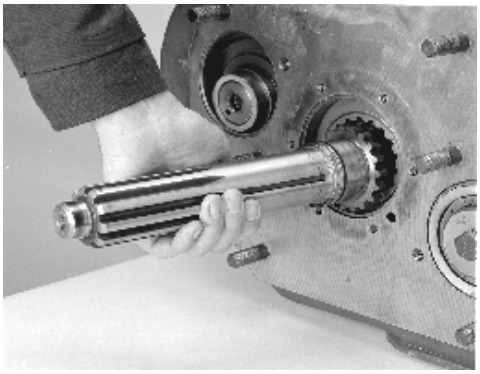


6. From the drive gear front, remove the drive gear spacer.

7. Remove the drive gear snap ring.



8. Pull the input shaft forward, out of the drive gear and transmission case.



How to Install the Input Shaft Without Disassembling the Transmission

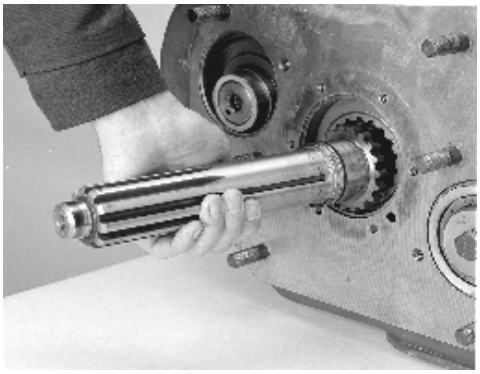
Special Instructions

Check the bushing in the input shaft pocket, replace if worn.

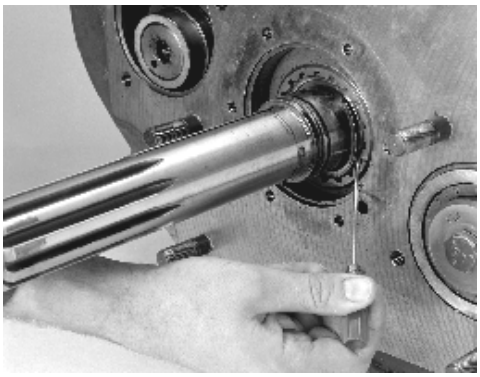
Special Tools

- Typical Service Tools
- Input Shaft Bearing Driver

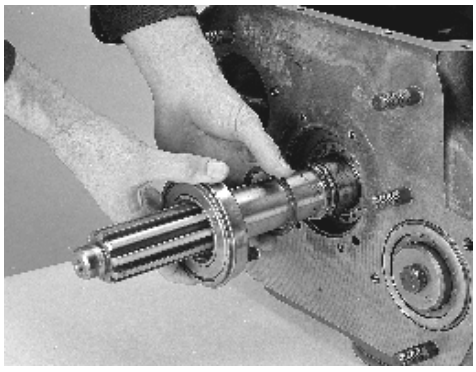
Procedure -



1. Install the new input shaft into main drive gear splines.

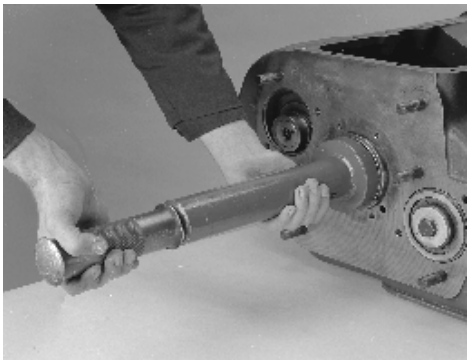


2. Position the input shaft just far enough into the gear to expose the drive gear I.D. snap ring groove.
3. Install the drive gear I.D. snap ring.



4. Install the drive gear spacer on the input shaft.
5. With the external snap ring to the outside, slide the drive gear bearing on the input shaft and position into the case bore.

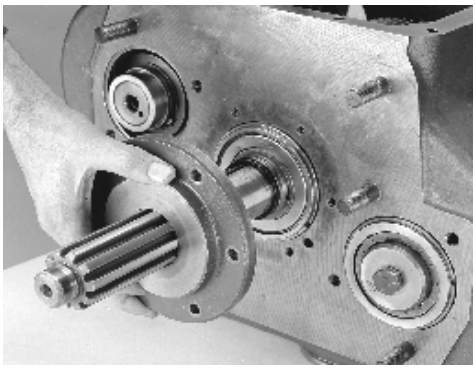
6. With the input shaft bearing driver, seat the bearing.



7. Install the bearing retainer snap ring.

8. Position a new gasket on the transmission mounting surface.

9. Position the front bearing cover on the input shaft, align the oil return hole in the cover with the oil return hole on the case.



10. Apply Eaton/Fuller sealant #71205 or equivalent to the retaining capscrews.

11. Install the retaining capscrews, tighten to 35-45 lb-ft of torque.

Final Check

- Make sure the input shaft turns freely.

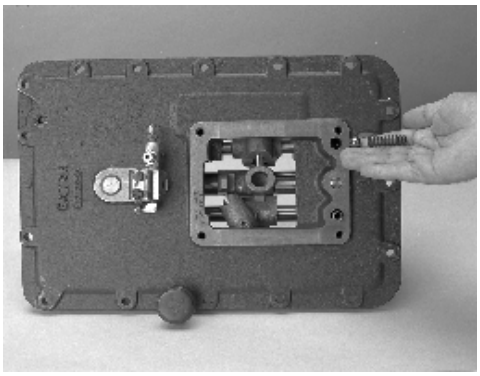
Functions of a Shift Bar Housing

Shift Bar Housing Identification

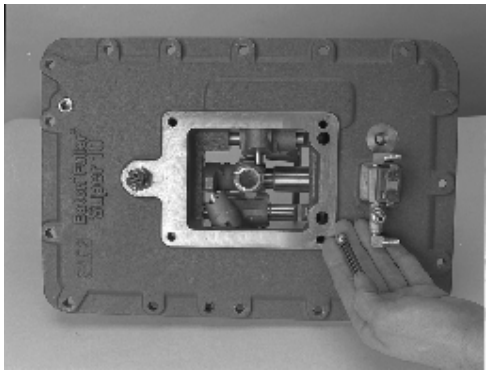
Shift bar housings are a very important part of the transmission. No matter what kind of shift bar housing your transmission has, they all provide the same functions

- Engage the transmission gearing.
- Prevents the driver from shifting into 2 gears at the same time.
- Prevents shifting into reverse without force.
- Actuates the back up lights.
- Actuates the neutral switches.

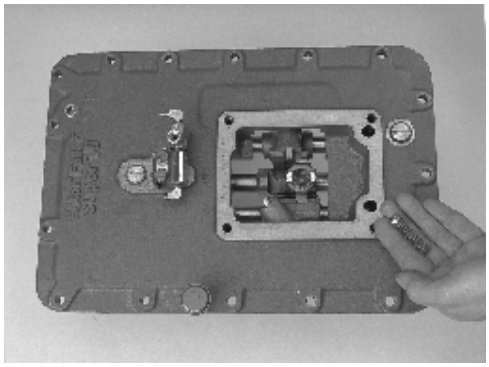
Standard Shift Bar housing



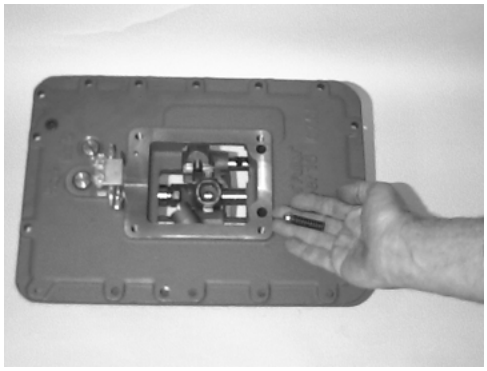
Forward Shift Bar Housing w/SUPER 10 on cover



Standard Shift Bar Housing w/SUPER 10 on cover



New Forward Shift Bar Housing w/SUPER 10 on cover



How to Disassemble the Gear Shift Lever

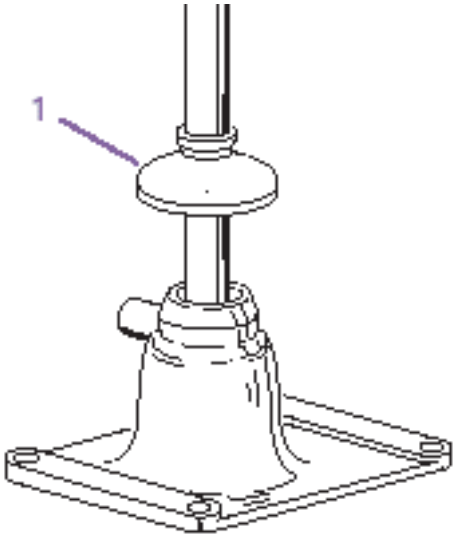
Special Instructions

If total disassembly is needed, the Roadranger valve must be removed first.

Release the spring one coil at a time.

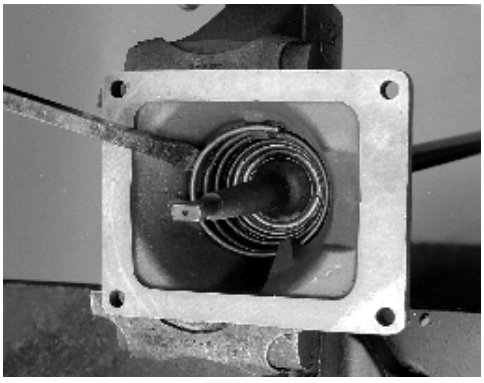
Special Tools

- Typical Service Tools
- A vise with brass jaws or wood blocks



Procedure -

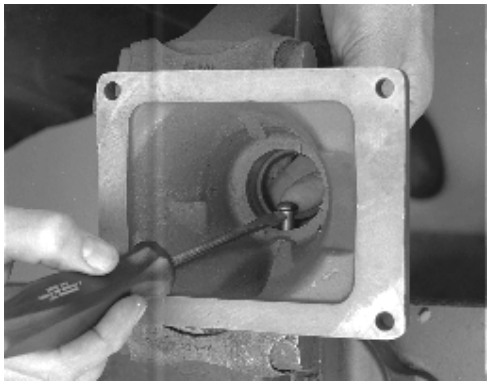
1. Slide the Boot up the shift lever shaft and remove



2. With housing bottom facing up, secure the assembly in a vise.
3. Use large screwdriver to twist between the spring and housing, forcing the spring from under the housing lugs.
4. From inside the housing tower, remove the tension spring, washer, and gear shift lever.
5. In models so equipped, from the housing bore, remove the nut and washer.

6. From the housing tower spade pin bore, remove and inspect the spade pin, discard if damaged.

7. From the housing tower inside groove, inspect the O-ring, discard if damaged.



How to Assemble the Gear Shift Lever

Special Instructions

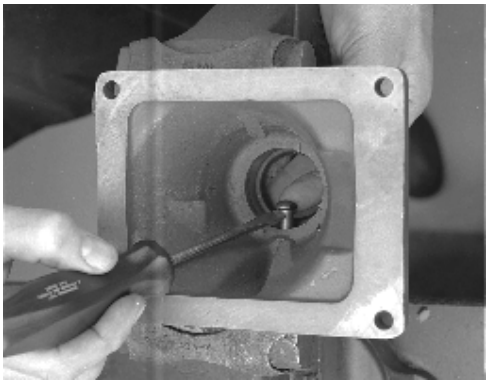
Inspect tension spring and washer for wear.

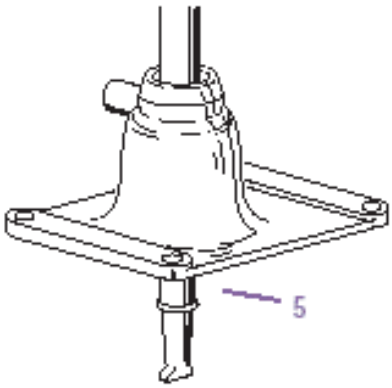
Apply Eaton rust preventative lubricant #71212 or equivalent to the shift lever pivot ball. A rust preventative lubricant film should cover all surfaces between and including the pivot ball.

Seat the tension spring one coil at a time.

Special Tools

- Typical Service Tools
- A vise with brass jaws or wood blocks
- Tension Spring Driver





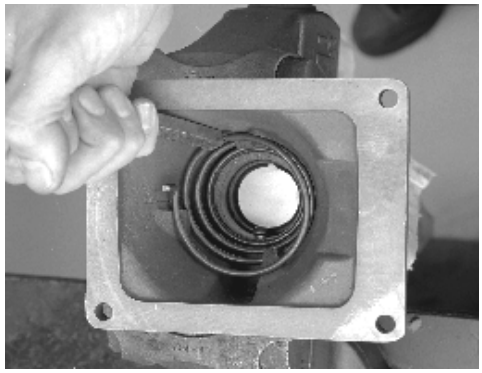
Procedure -

1. With housing bottom facing up, secure the assembly in a vise.
2. If the spade pin is damaged, replace and install the spade pin in housing tower bore.
3. In models so equipped, install the nut and washer in the housing bore.
4. If the O-ring is damaged, replace; lubricate the O-ring with Eaton/Fuller lubricant #71206 or equivalent. Install the O-ring in the housing tower inside groove.
5. Align the lever ball slot with the spade pin and position the gear shift lever in the housing tower.
6. With dished-side up, install the washer over the ball.

7. Use a tension spring driver to install the tension spring under the housing lugs.

8. Remove the assembly from the vise.

9. Install a rubber boot over the gear shift lever and against the housing.



Final Check

- Make sure the gear shift lever can move.

How to Disassemble the Standard Shift Bar Housing

Special Instructions

The shift bar housing must be removed from the transmission.

During disassembly, lay all parts on a clean bench in order of removal to facilitate assembly.

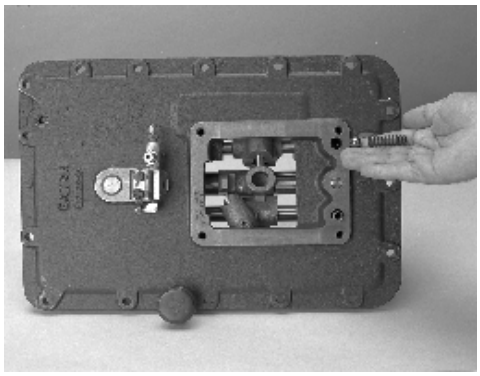
Shift bars not being removed must be kept in the neutral position or the interlocking parts lock the bars.

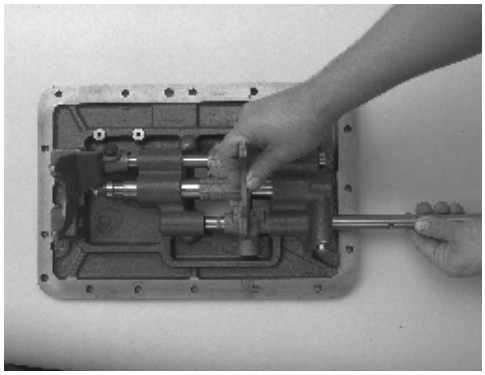
Start with the bottom shift bar.

Cut the lockwire and remove the lockscrews from each bar just before their removal.

Special Tools

- Typical Service Tools





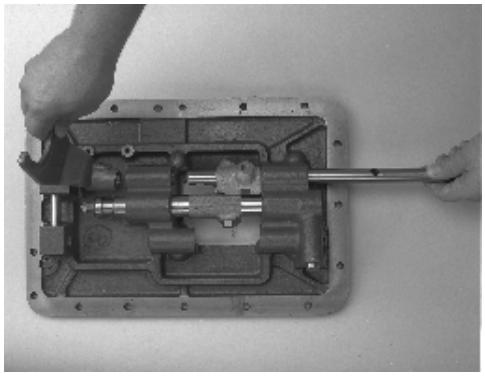
Procedure -

1. If the two (2) sets of tension springs and balls from housing bores and the anti-rotating pin have not been removed, place the shift bar housing on its side to remove them.

2. With the housing rear to the right, lay the assembly on a flat surface. If installed, remove the oil trough retaining cap-screws and oil trough.

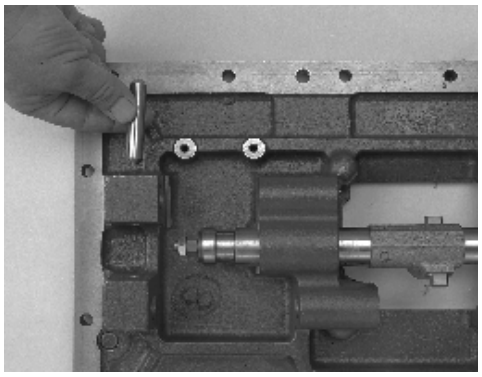
3. While removing the bottom yoke bar, remove the shift yoke.

4. While removing the top yoke bar, remove the shift yoke assembly and block assembly.

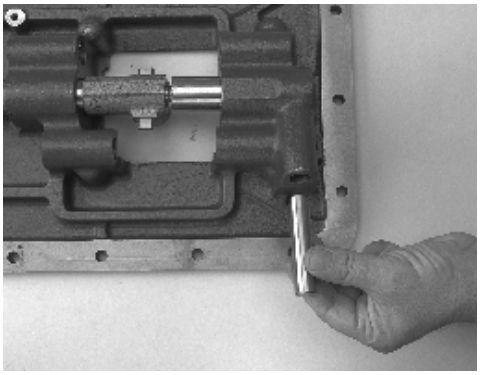


5. Remove the interlock pin.

6. From the middle yoke bar, remove the jam nut, plain nut, and washer.

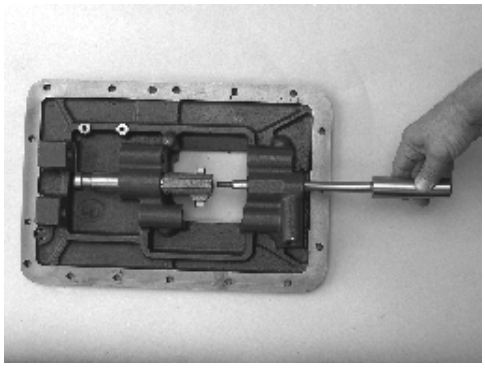


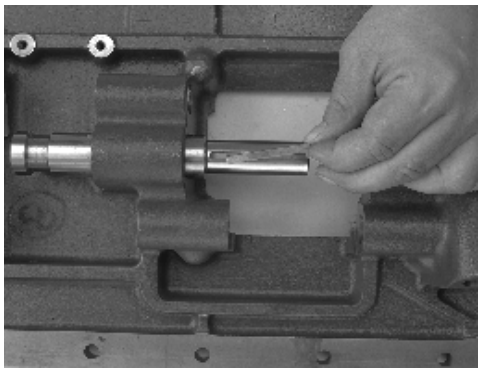
7. Remove the range interlock bar.



8. From the middle yoke bar, remove the select interlock bar to the right.

9. Pull the select tube to the left and remove the shift select block.





10. Remove the select tube with key to the left.

11. From the 1st & reverse shift yoke, remove the snap ring, washer, spring, and plunger. From the 3rd speed block, remove the plug, spring, and plunger.

12. Inspect the yoke or block parts, replace the worn parts.

How to Assemble the Standard Shift Bar Housing

Special Instructions

Inspect shift blocks and shift yokes for wear.

Apply Eaton sealant #71208 or equivalent to the shift bar housing plugs which are used to plug oil cooler provision holes. The sealant should be applied so that at least 5 complete threads are covered.

Apply Eaton lockwire #1819 or equivalent to all shift bar housing assembly set screws in both blocks and yokes. The wire should anchor the capscrew at least 2 complete 360° turns. The lockwire ends should be trimmed and bent out of the way of any part interference.

Keep yoke bars in neutral while assembling.

Special Tools

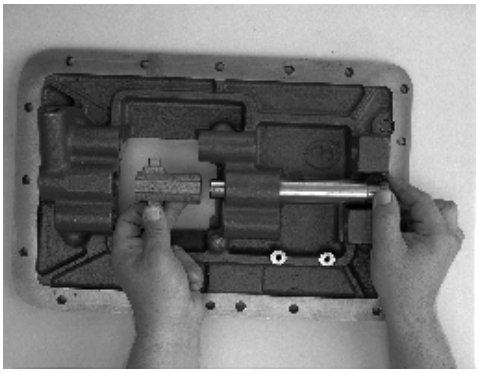
- Typical Service Tools

Procedure -

1. Assemble the 1st & reverse shift yoke assembly:
   a. Install the plunger in the 1st & reverse shift yoke bore, plunger shank to the outside.
   b. Install the spring into the bore over the plunger shank.
   c. Position the washer over the plunger shank.
   d. Install the snap ring.

2. Assemble the 3rd speed block assembly:
   a. Install the plunger in the 3rd shift block bore, plunger shank to the outside.
   b. Install the spring into the bore over the plunger shank.
   c. Install the plug and tighten to compress the spring.
   d. After plug bottoms out, back the plug out 1-11/2 turns.
   e. Complete the block assembly process by staking the plug through the small hole in block.

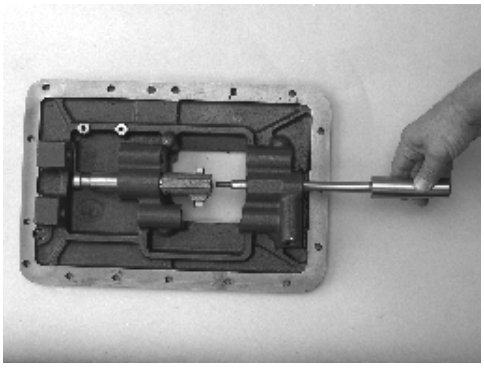
Shift Bar Housing



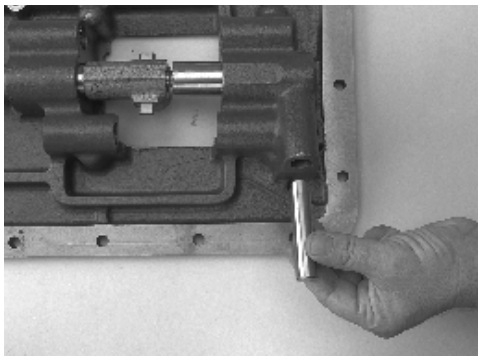
3. With the housing rear to the right, lay the assembly on a flat surface.

4. Install the select tube in the middle boss with key in the key slot.

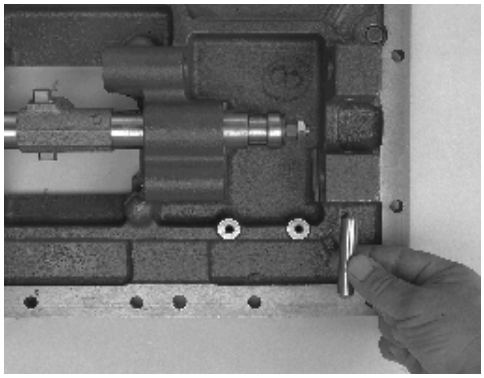
5. As the select tube passes through the first boss, install the shift select block.



6. From the right, install the select interlock bar.



7. Install the range interlock bar, chamfered end in, notched side down.

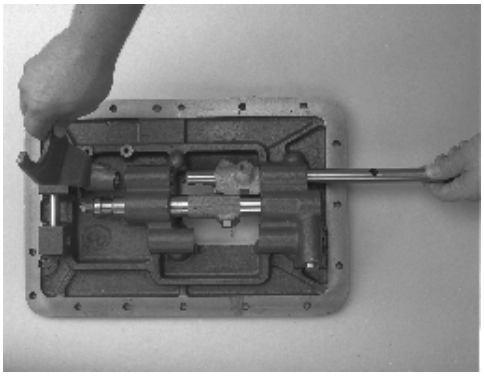


8. At the middle yoke bar front end, install the washer, plain nut, and jam nut.

9. Install the interlock pin, centered between bosses.

10. While installing the top yoke bar, position the shift yoke assembly and block assembly. The block assembly aligns with shift select block ear.

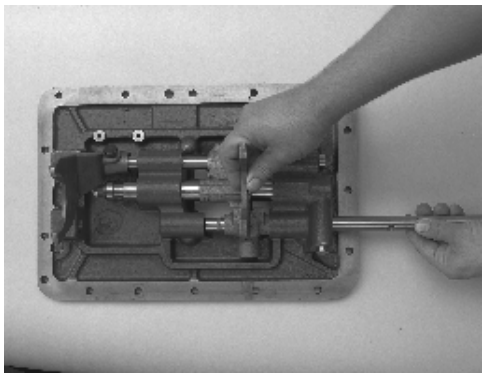
11. Install the lockscrews, tighten to 35-45 lb-ft of torque. Lockwire securely.



12. While installing the bottom yoke bar, position the shift yoke. The block assembly aligns with shift select block ear.

13. Install the lockscrew, tighten to 35-45 lb-ft of torque. Lockwire securely.

14. Turn the shift bar housing over, and install the anti-rotating pin and the two (2) sets of tension springs and balls.



Final Check

- Make sure interlocking system is working – can't shift into 2 gears at the same time.
- Make sure all capscrews are lockwired.
- Make sure the anti-rotating pin and the two (2) sets of tension springs and balls are installed.

How to Disassemble the Standard Shift Bar Housig (w/Super 10 on cover)

Special Instructions

The shift bar housing must be removed from the transmission.

During disassembly, lay all parts on a clean bench in order of removal to facilitate assembly.

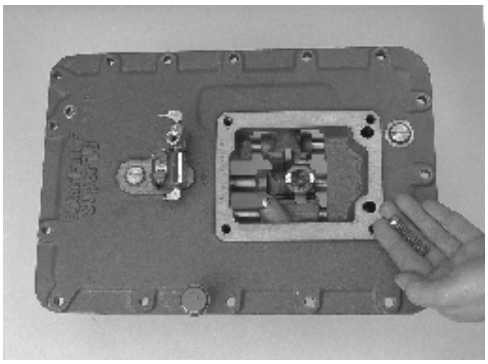
Shift bars not being removed must be kept in the neutral position or the interlocking parts lock the bars.

Start with the bottom shift bar.

Cut the lockwire and remove the lockscrews from each bar just before their removal.

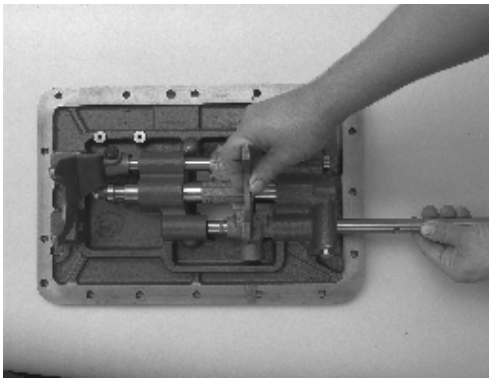
Special Tools

- Typical Service Tools



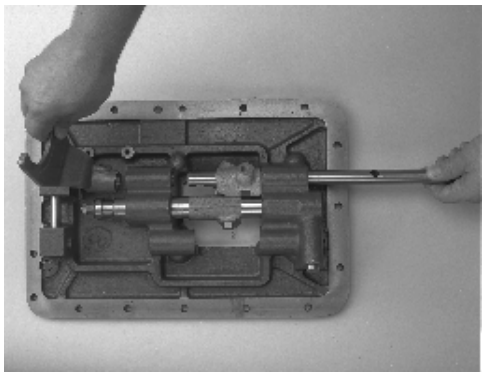
Procedure -

1. If the two (2) sets of tension springs and balls from housing bores have not been removed, place the shift bar housing on its side to remove them.

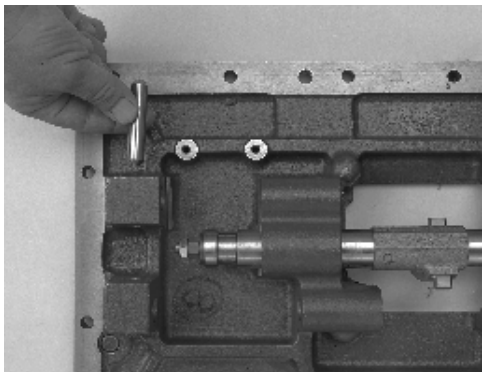


2. If installed, remove the oil trough retaining capscrews and oil trough.
3. With the housing rear to the right, lay the assembly on a flat surface.
4. While removing the bottom yoke bar, remove the shift yoke.

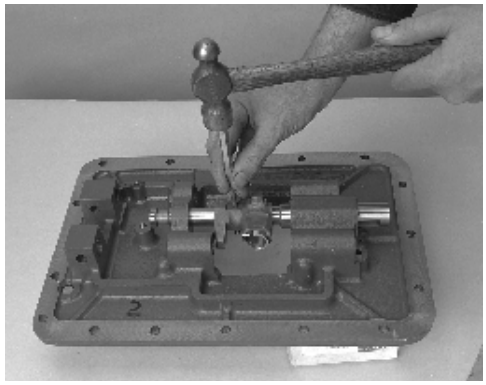
5. While removing the top yoke bar, remove the shift yoke assembly and block assembly.



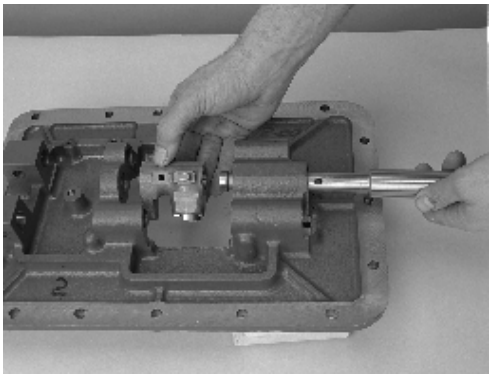
6. Remove the interlock pin.



7. From the middle yoke bar, drive center block roll pin out.



8. Pull the center bar to the right and remove the shift select block.



9. From the 1st & reverse shift yoke, remove the snap ring, washer, spring, and plunger. From the 3rd speed block, remove the plug, spring, and plunger.

10. Inspect the yoke or block parts, replace the worn parts.

How to Assemble the Standard Shift Bar Housing (w/Super 10 on cover)

Special Instructions

Inspect shift blocks and shift yokes for wear.

Apply Eaton sealant #71208 or equivalent to the shift bar housing plugs which are used to plug oil cooler provision holes. The sealant should be applied so that at least 5 complete threads are covered.

Apply Eaton lockwire #1819 or equivalent to all shift bar housing assembly set screws in both blocks and yokes. The wire should anchor the capscrew at least 2 complete 360° turns. The lockwire ends should be trimmed and bent out of the way of any part interference.

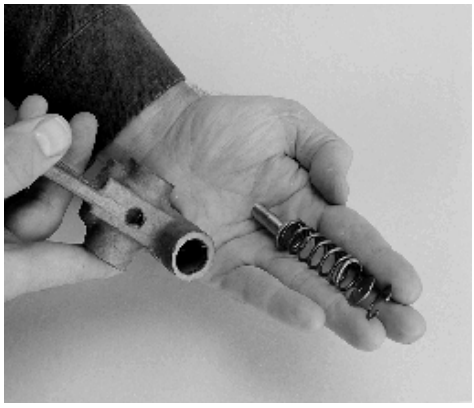
Keep yoke bars in neutral while assembling.

Special Tools

- Typical Service Tools

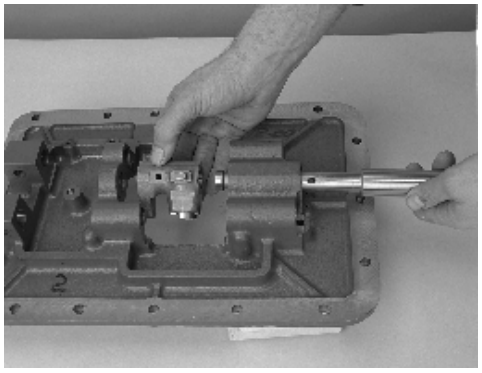
Procedure -

1. Assemble the 1st & reverse shift yoke assembly:
   a. Install the plunger in the 1st & reverse shift yoke bore, plunger shank to the outside.
   b. Install the spring into the bore over the plunger shank.
   c. Position the washer over the plunger shank.
   d. Install the snap ring.



2. Assemble the 3rd speed block assembly:
   a. Install the plunger in the 3rd shift block bore, plunger shank to the outside.
   b. Install the spring into the bore over the plunger shank.
   c. Install the plug and tighten to compress the spring.
   d. After plug bottoms out, back the plug out 1-11/2 turns.
   e. Complete the block assembly process by staking the plug through the small hole in block.

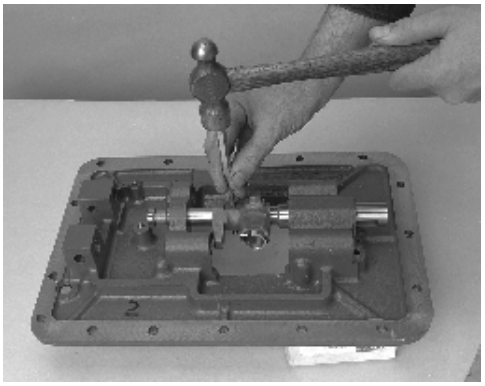
Shift Bar Housing



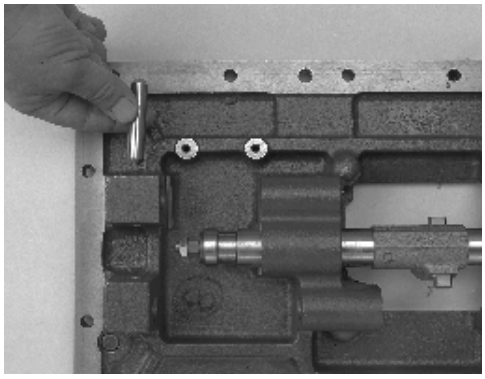
3. With the housing rear to the right, lay the assembly on a flat surface.

4. Install the center rail in the middle boss.

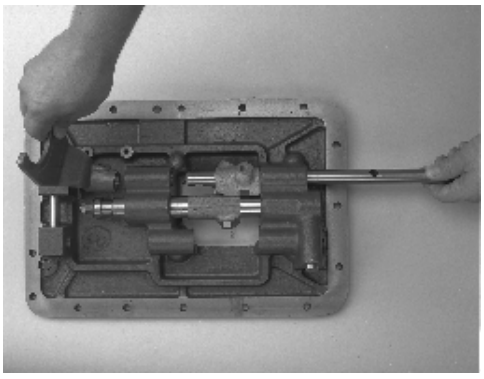
5. As the center rail passes through the first boss, install the shift block.



6. Drive the center block roll pin through the center bar to hold the center block in position.



7. Install the interlock pin, centered between bosses.



8. While installing the top yoke bar, position the shift yoke assembly and block assembly. The block assembly aligns with shift select block ear.

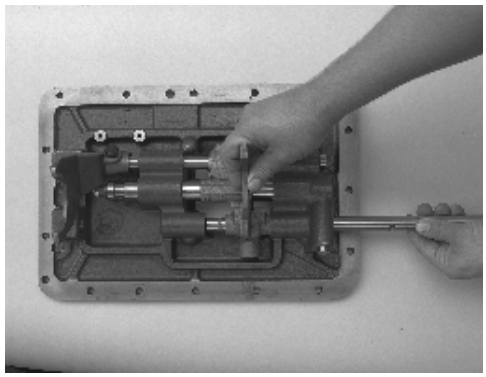
9. Install the lockscrews, tighten to 35-45 lb-ft of torque. Lockwire securely.

10. While installing the bottom yoke bar, position the shift yoke. The block assembly aligns with shift select block ear.

11. Install the lockscrew, tighten to 35-45 lb-ft of torque. Lockwire securely.

12. Install the oil trough and oil trough retaining capscrews.

13. Turn the shift bar housing over, and install the two (2) sets of tension springs and balls.



Final Check

- Make sure interlocking system is working – can't shift into 2 gears at the same time.
- Make sure all capscrews are lockwired.
- Make sure the two (2) sets of tension springs and balls are installed.

How to Disassemble the Forward Shift Bar Housing (w/Super 10 on cover)

Special Instructions

The shift bar housing must be removed from the transmission.

During disassembly, lay all parts on a clean bench in order of removal to facilitate assembly.

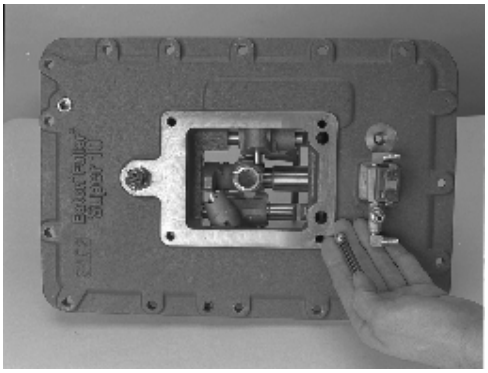
Shift bars not being removed must be kept in the neutral position or the interlocking parts lock the bars.

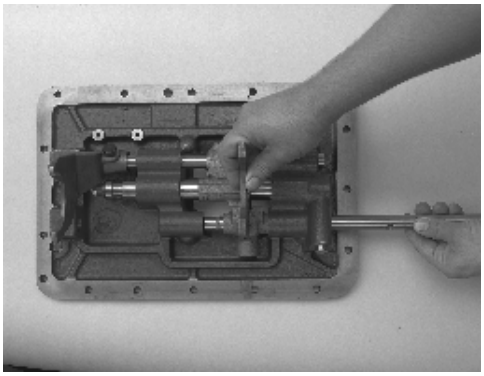
Start with the bottom shift bar.

Cut the lockwire and remove the lockscrews from each bar just before their removal.

Special Tools

- Typical Service Tools





Procedure -

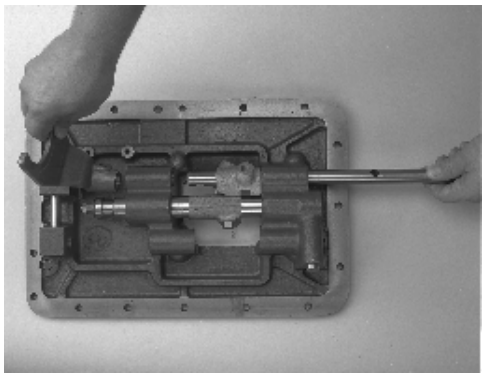
1. If the two (2) sets of tension springs and balls from housing bores have not been removed, place the shift bar housing on its side to remove them.

2. If installed, remove the oil trough retaining capscrews and oil trough.

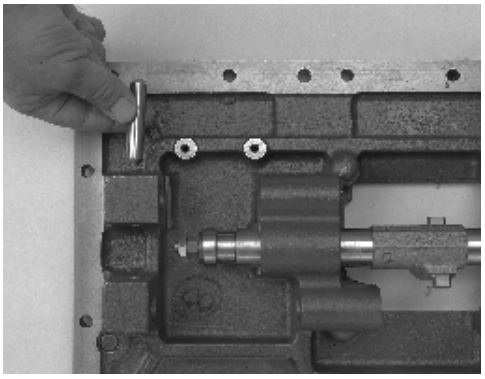
3. With the housing rear to the right, lay the assembly on a flat surface.

4. While removing the bottom yoke bar, remove the shift yoke.

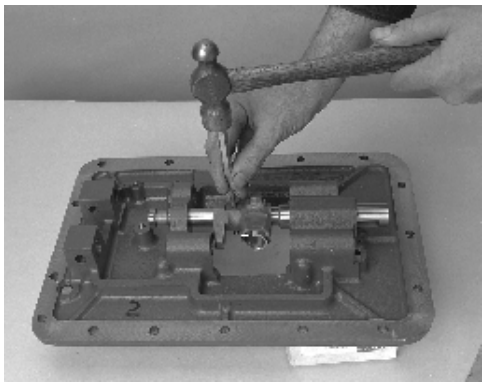
5. While removing the top yoke bar, remove the shift yoke assembly and block assembly.



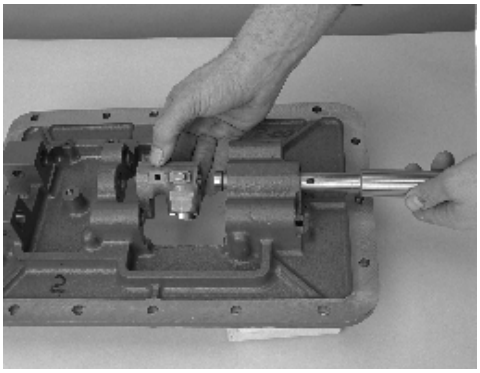
6. Remove the interlock pin.

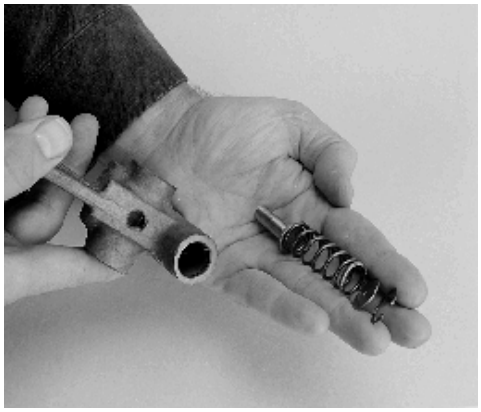


7. From the middle yoke bar, drive center block roll pin out.



8. Pull the center bar to the right and remove the shift select block.





9. From the 1st & reverse shift yoke, remove the snap ring, washer, spring, and plunger. From the 3rd speed block, remove the plug, spring, and plunger.

10. Inspect the yoke or block parts, replace the worn parts.

How to Assemble the Forward Shift Bar Housing(w/Super 10 on cover)

Special Instructions

Inspect shift blocks and shift yokes for wear.

Apply Eaton sealant #71208 or equivalent to the shift bar housing plugs which are used to plug oil cooler provision holes. The sealant should be applied so that at least 5 complete threads are covered.

Apply Eaton lockwire #1819 or equivalent to all shift bar housing assembly set screws in both blocks and yokes. The wire should anchor the capscrew at least 2 complete 360° turns. The lockwire ends should be trimmed and bent out of the way of any part interference.

Keep yoke bars in neutral while assembling.

Special Tools

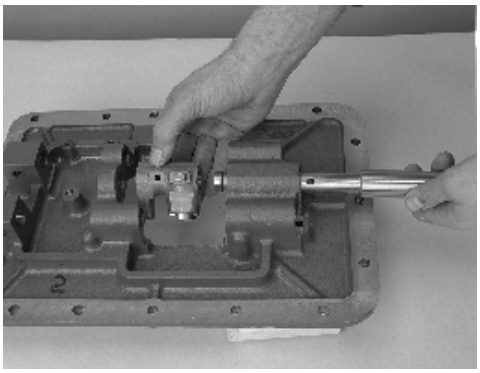
- Typical Service Tools

Procedure -

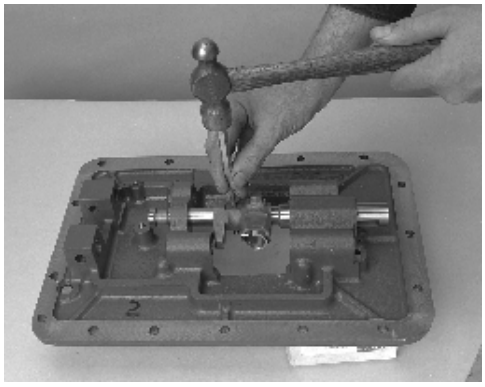
1. Assemble the 1st & reverse shift yoke assembly:
   a. Install the plunger in the 1st & reverse shift yoke bore, plunger shank to the outside.
   b. Install the spring into the bore over the plunger shank.
   c. Position the washer over the plunger shank.
   d. Install the snap ring.

2. Assemble the 3rd speed block assembly:
   a. Install the plunger in the 3rd shift block bore, plunger shank to the outside.
   b. Install the spring into the bore over the plunger shank.
   c. Install the plug and tighten to compress the spring.
   d. After plug bottoms out, back the plug out 1-11/2 turns.
   e. Complete the block assembly process by staking the plug through the small hole in block.

Shift Bar Housing



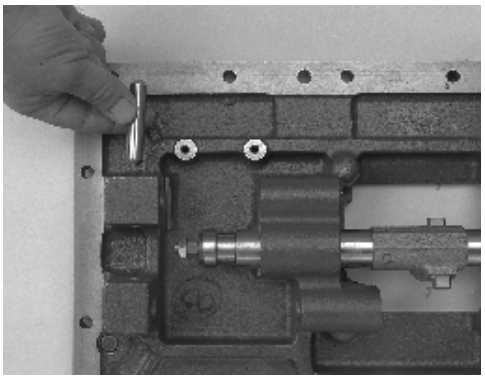
3. With the housing rear to the right, lay the assembly on a flat surface.



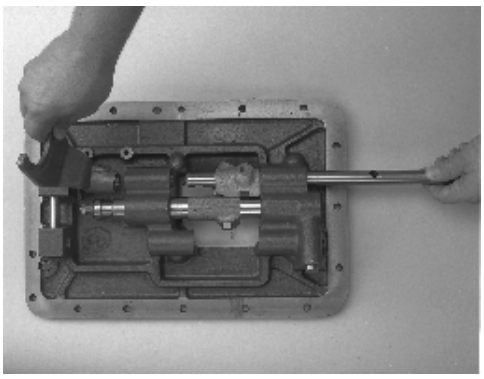
4. Install the center rail in the middle boss.

5. As the center rail passes through the first boss, install the shift block.

6. Drive the center block roll pin through the center bar to hold the center block in position.



7. Install the interlock pin, centered between bosses.



8. While installing the top yoke bar, position the shift yoke assembly and block assembly. The block assembly aligns with shift select block ear.

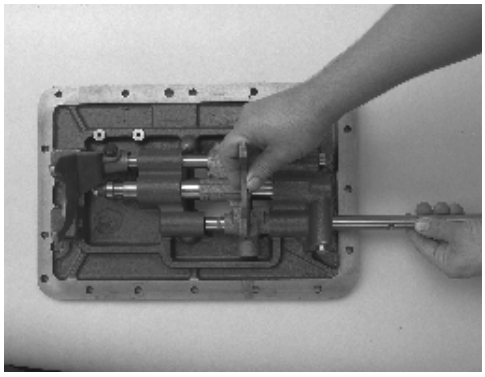
9. Install the lockscrews, tighten to 35-45 lb-ft of torque. Lockwire securely.

10. While installing the bottom yoke bar, position the shift yoke. The block assembly aligns with shift select block ear.

11. Install the lockscrew, tighten to 35-45 lb-ft of torque. Lockwire securely.

12. Install the oil trough and oil trough retaining capscrews.

13. Turn the shift bar housing over, and install the two (2) sets of tension springs and balls.



Final Check

- Make sure interlocking system is working – can't shift into 2 gears at the same time.
- Make sure all capscrews are lockwired.
- Make sure the two (2) sets of tension springs and balls are installed.

How to Disassemble the New Forward Shift Bar Housing (w/Super 10 on cover)

Special Instructions

The shift bar housing must be removed from the transmission.

During disassembly, lay all parts on a clean bench in order of removal to facilitate assembly.

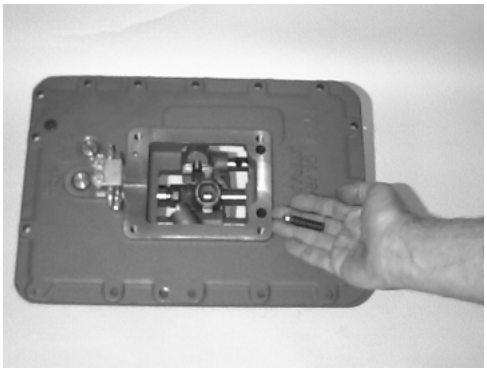
Shift bars not being removed must be kept in the neutral position or the interlocking parts lock the bars.

Start with the bottom shift bar.

Cut the lockwire and remove the lockscrews from each bar just before their removal.

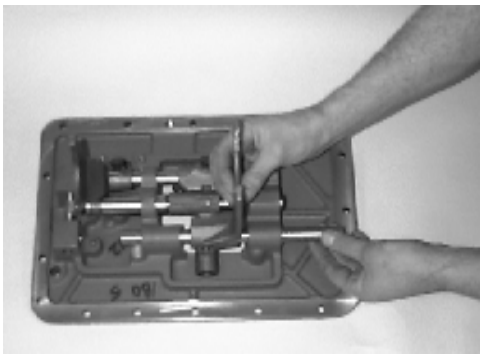
Special Tools

- Typical Service Tools



Procedure -

1. If the two (2) sets of tension springs and balls from housing bores have not been removed, place the shift bar housing on its side to remove them. Check the condition of the alignment pin, replace if necessary.

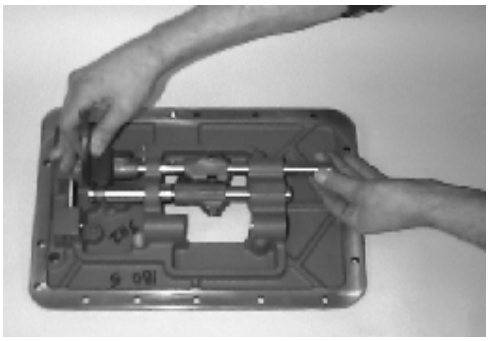


2. If installed, remove the oil trough retaining capscrews and oil trough.

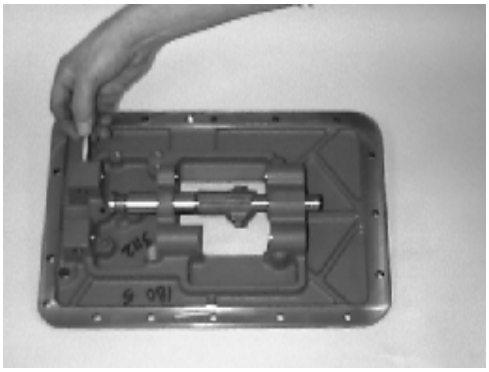
3. With the housing rear to the right, lay the assembly on a flat surface.

4. While removing the bottom yoke bar, remove the shift yoke.

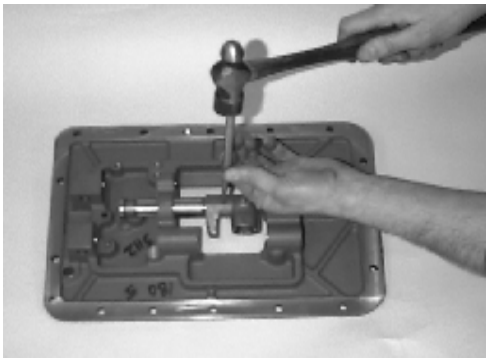
5. While removing the top yoke bar, remove the shift yoke assembly and block assembly.



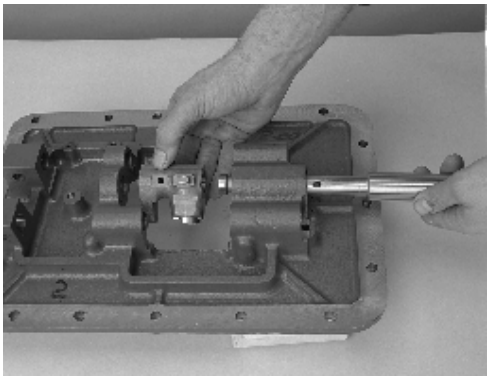
6. Remove the interlock pin.



7. From the middle yoke bar, drive center block roll pin out.



8. Pull the center bar to the right and remove the shift select block.



9. From the 1st & reverse shift yoke, remove the snap ring, washer, spring, and plunger. From the 3rd speed block, remove the plug, spring, and plunger.

10. Inspect the yoke or block parts, replace the worn parts.

How to Assemble the New Forward Shift Bar Housing (w/Super 10 on cover)

Special Instructions

Inspect shift blocks and shift yokes for wear.

Apply Eaton sealant #71208 or equivalent to the shift bar housing plugs which are used to plug oil cooler provision holes. The sealant should be applied so that at least 5 complete threads are covered.

Apply Eaton lockwire #1819 or equivalent to all shift bar housing assembly set screws in both blocks and yokes. The wire should anchor the capscrew at least 2 complete 360° turns. The lockwire ends should be trimmed and bent out of the way of any part interference.

Keep yoke bars in neutral while assembling.

Special Tools

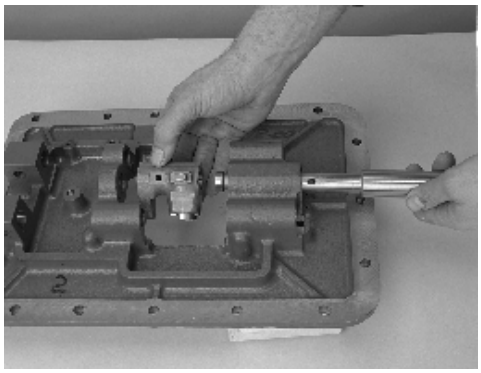
- Typical Service Tools

Procedure -

1. Assemble the 1st & reverse shift yoke assembly:
   a. Install the plunger in the 1st & reverse shift yoke bore, plunger shank to the outside.
   b. Install the spring into the bore over the plunger shank.
   c. Position the washer over the plunger shank.
   d. Install the snap ring.

2. Assemble the 3rd speed block assembly:
   a. Install the plunger in the 3rd shift block bore, plunger shank to the outside.
   b. Install the spring into the bore over the plunger shank.
   c. Install the plug and tighten to compress the spring.
   d. After plug bottoms out, back the plug out 1-11/2 turns.
   e. Complete the block assembly process by staking the plug through the small hole in block.

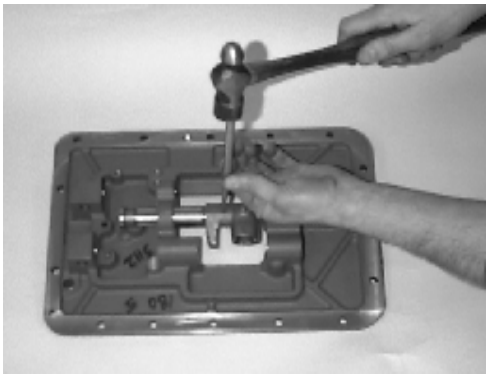
Shift Bar Housing



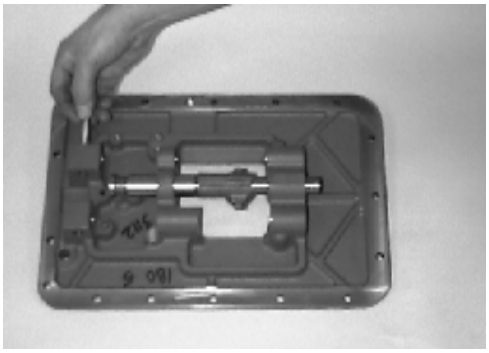
3. With the housing rear to the right, lay the assembly on a flat surface.

4. Install the center rail in the middle boss.

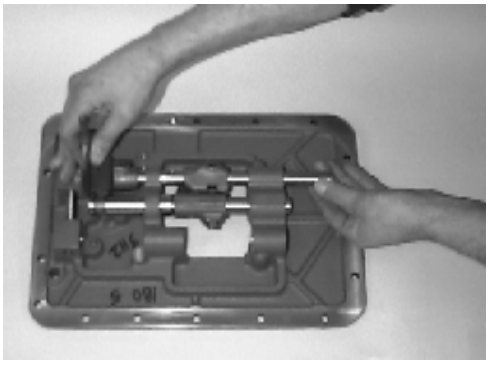
5. As the center rail passes through the first boss, install the shift block.



6. Drive the center block roll pin through the center bar to hold the center block in position.



7. Install the interlock pin, centered between bosses.



8. While installing the top yoke bar, position the shift yoke assembly and block assembly. The block assembly aligns with shift select block ear.

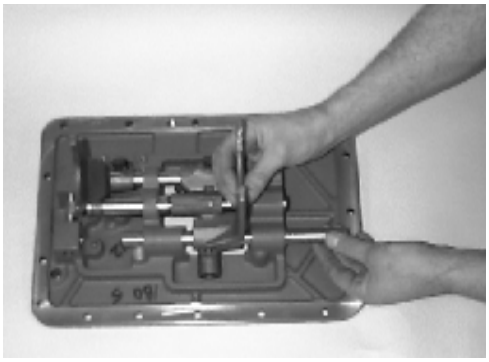
9. Install the lockscrews, tighten to 35-45 lb-ft of torque. Lockwire securely.

10. While installing the bottom yoke bar, position the shift yoke. The block assembly aligns with shift select block ear.

11. Install the lockscrew, tighten to 35-45 lb-ft of torque. Lockwire securely.

12. Install the oil trough and oil trough retaining capscrews.

13. Turn the shift bar housing over, and install the two (2) sets of tension springs and balls.

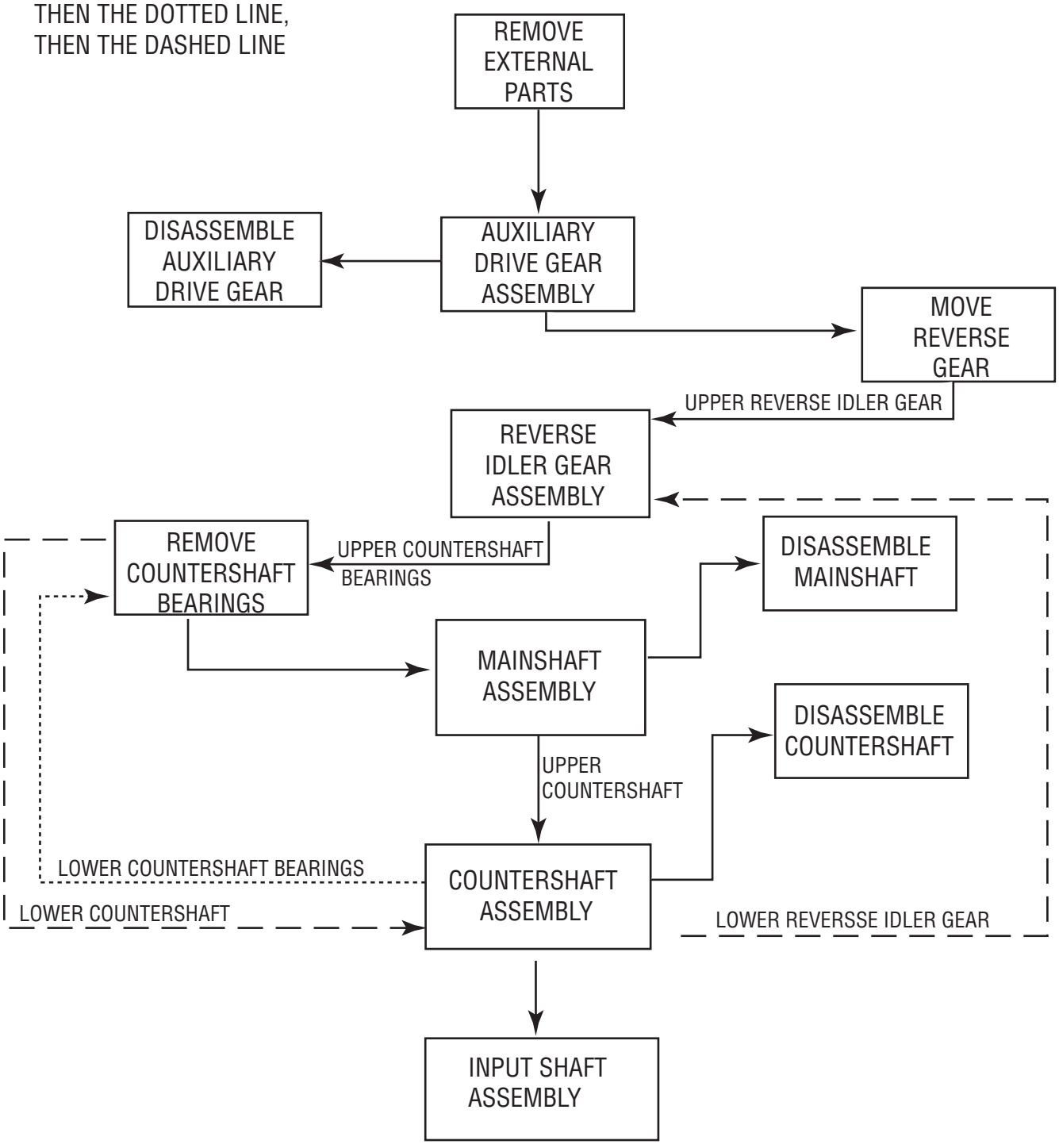


Final Check

- Make sure interlocking system is working – can't shift into 2 gears at the same time.
- Make sure all capscrews are lockwired.
- Make sure the two (2) sets of tension springs and balls are installed.

How to Disassemble the Front Section

FOLLOW THE SOLID LINE,
THEN THE DOTTED LINE,
THEN THE DASHED LINE



How to Remove the Auxiliary Drive Gear Assembly

Special Instructions

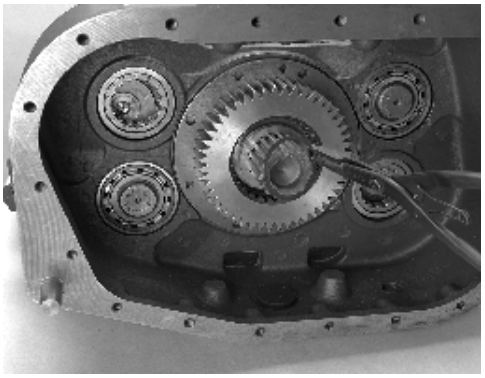
Before removing the auxiliary drive gear, the auxiliary section must be removed.

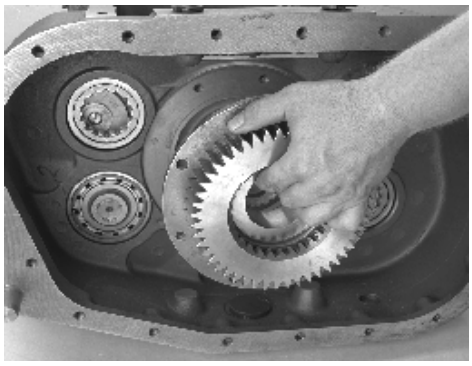
Special Tools

- Typical Service Tools
- Large pair of snap ring pliers

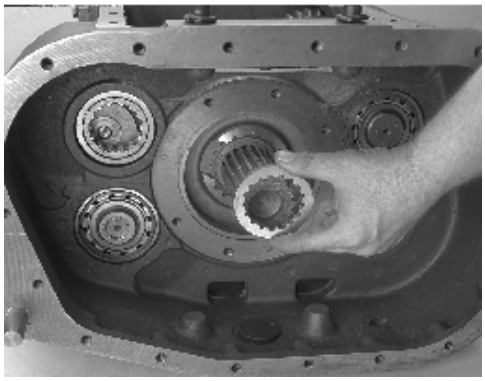
Procedure -

1. Remove the auxiliary bearing retainer ring capscrews.
2. Remove the mainshaft rear groove snap ring.
3. From inside the auxiliary drive gear assembly, remove the splined washer.
4. Insert three (3) of the capscrews in the specially tapped holes of the retainer ring.
5. Tighten the capscrews evenly to force the auxiliary drive gear assembly from the case.
6. Remove the auxiliary drive gear from the mainshaft.





7. From the mainshaft, remove the splined washer.



How to Remove the Reverse Idler Gear Assembly

Special Instructions

The following instructions are used to remove upper and lower reverse idler gears.

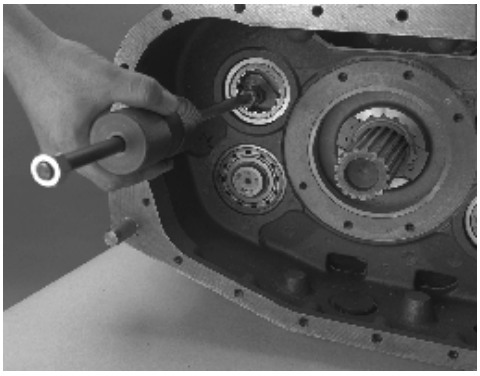
Before the upper reverse idler gear assembly can be removed, mainshaft reverse gear must be positioned forward against the next gear.

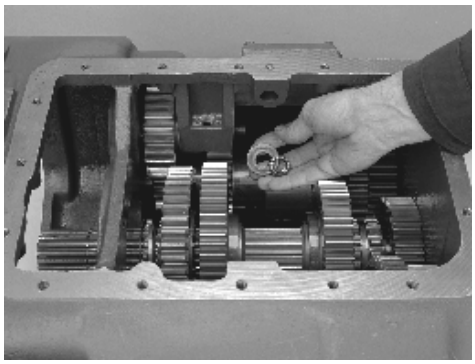
While removing the reverse idler shaft, the thrust washer can drop to the transmission case bottom.

The mainshaft reverse gear must be moved in order to remove the upper reverse idler gear, see “How to Remove the Mainshaft Assembly”, steps 1-3.

Special Tools

- Typical Service Tools
- Jaw Pullers or Impact Puller





Procedure -

1. From the reverse idler gear bore, use inside jaw pullers or an impact puller to remove the auxiliary countershaft front bearing.

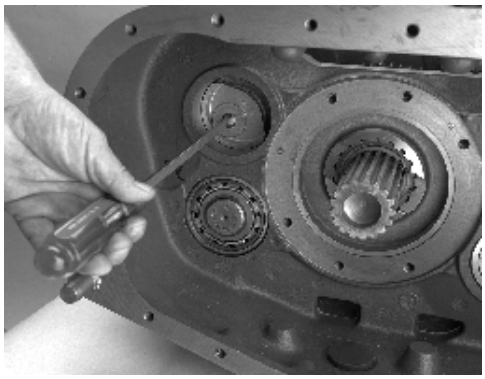
2. From the idler shaft, remove the loosened lock nut and washer.

3. From the idler shaft rear, remove the pipe plug.

4. Install an impact puller, 1¦2"-13 threaded end, and remove the shaft from case bore.

5. As the idler shaft and idler plate are removed, remove the thrust washer and gear.

6. Inspect the reverse gear assembly, remove the inner race and needle bearing, if damaged.



How to Remove the Countershaft Bearings

Special Instructions

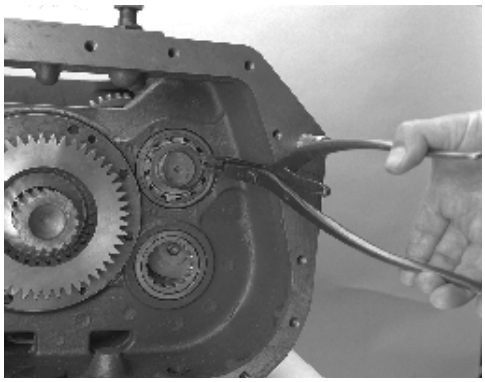
The following instructions are used to remove the upper and lower countershaft bearings. To remove the mainshaft assembly, only the upper countershaft bearings need to be removed.

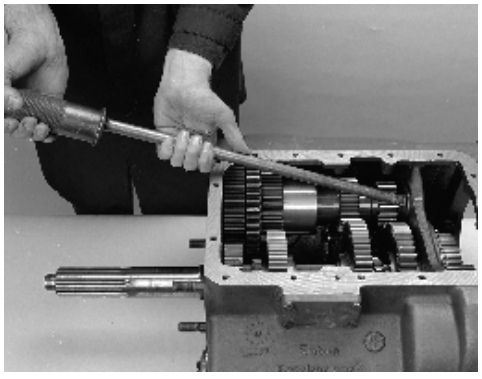
Performing the following instructions will damage the bearings and should be not be done unless bearing replacement is planned.

The bearing inner race remains pressed on the countershaft after removal of the front bearings.

Special Tools

- Typical Service Tools
- Soft bar and a maul
- Bearing puller or pry bars





Procedure -

1. To keep the mainshaft pilot from falling out of the input shaft pocket, temporarily install the auxiliary drive gear on the mainshaft.

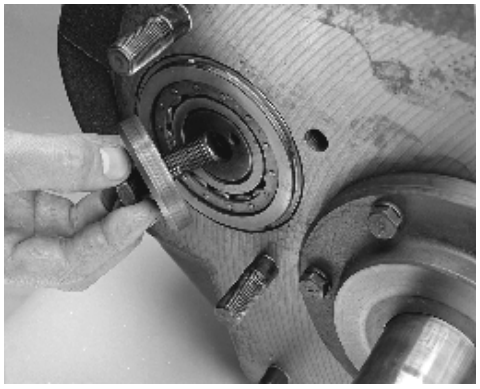
2. From each countershaft rear groove, remove the snap ring.

3. From inside the case, use a soft bar and maul to drive the countershaft rear bearings from the case bores.

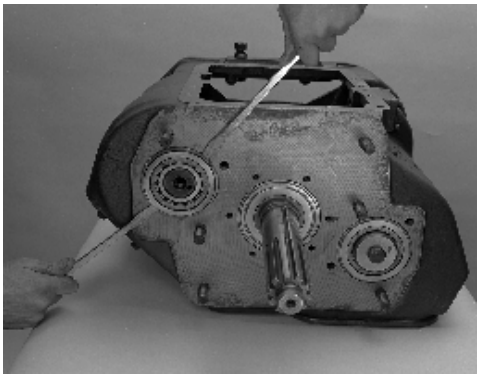
4. From the front of each countershaft, remove the capscrew and front retainer plate.

5. Use the soft bar and maul to drive each countershaft to the rear as far as possible. This partially unseats the front bearings.

6. Return to the case rear, and drive each countershaft forward as far as possible. This exposes the bearing snap rings.



7. Use a bearing puller or pry bars to remove the countershaft front bearings. If a bearing puller is used, the front bearing cover has to be removed.



How to Remove the Mainshaft Assembly

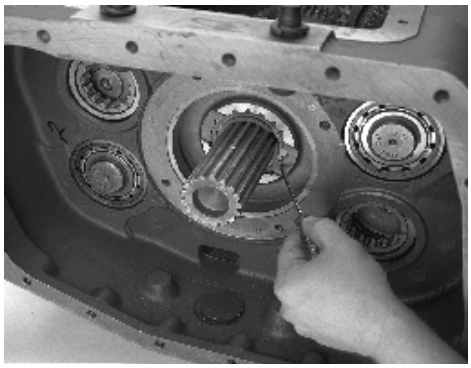
Special Instructions

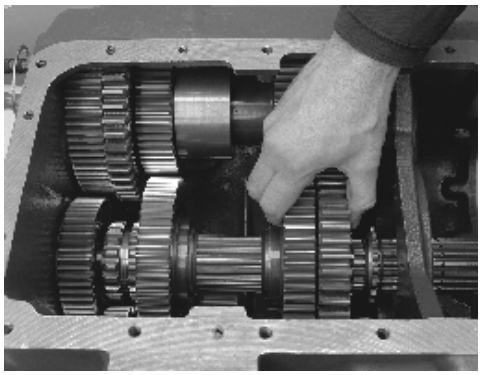
Be careful when removing the mainshaft assembly, the sliding clutch on the end can slip off the mainshaft.

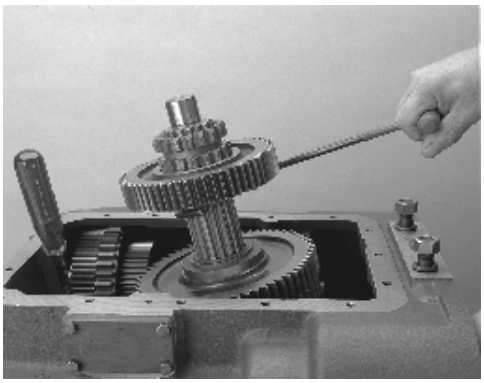
Reverse gear is also free and can fall off the shaft.

Special Tools

- Typical Service Tools
- Large hook or 3 foot piece of rope







Procedure -

1. From the mainshaft, remove the reverse gear retaining snap ring.

2. Move the mainshaft reverse gear as far to the rear as possible and remove reverse gear I.D. snap ring.

3. Move the reverse gear forward and against the next gear, engaging the mainshaft sliding clutch spline.

WARNING: If not removing the upper reverse idler gear assembly, you must remove the upper reverse idler gear assembly shaft and roll the gear to the outside, see “How to Remove the Reverse Idler Gear Assembly”, steps 1-4.

4. Use a large screwdriver and block the upper countershaft assembly against the case wall.

WARNING: If removing the upper reverse idler gear assembly, see “How to Remove the Reverse Idler Gear Assembly” at this time.

5. Position the hook or rope around the mainshaft.

6. Pull the mainshaft to the rear to free the pilot from the input shaft pocket.

7. Tilt mainshaft front up and lift assembly from the case.

How to Remove the Countershaft Assemblies

Special Instructions

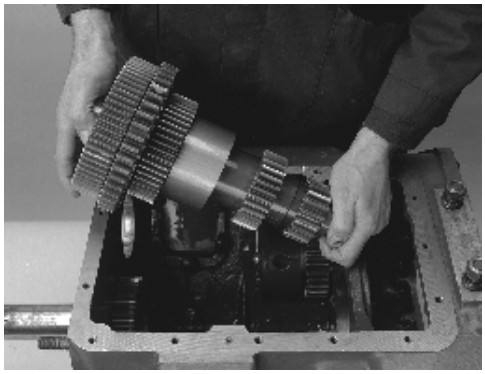
Expect for the PTO gears the upper and lower countershaft assemblies are the same. Make sure and mark each as they are removed.

Special Tools

- Typical Service Tools

Procedure -

1. Move the upper countershaft assembly to the rear as far as possible.
2. Swing the countershaft front to middle of the case.
3. Lift the countershaft assembly from the case.



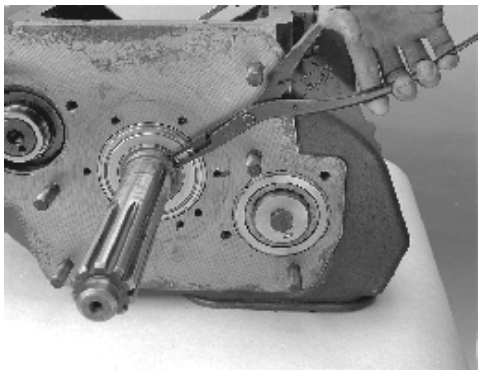
How to Remove the Input Shaft Assembly

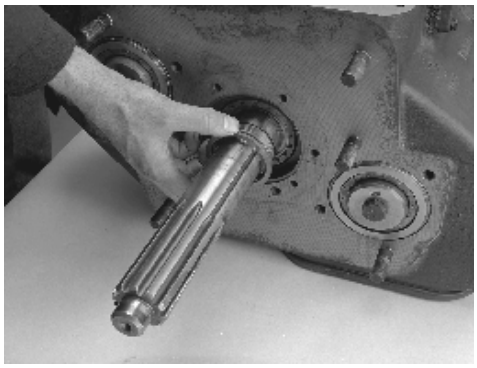
Special Instructions

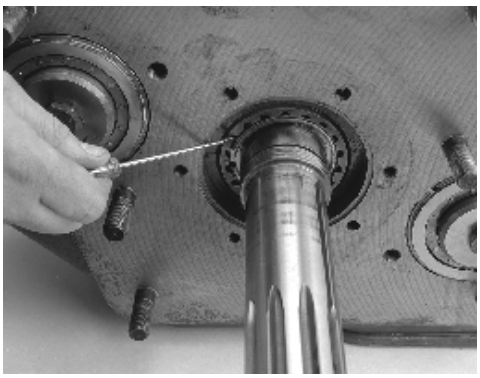
None

Special Tools

- Typical Service Tools
- Soft bar and a maul



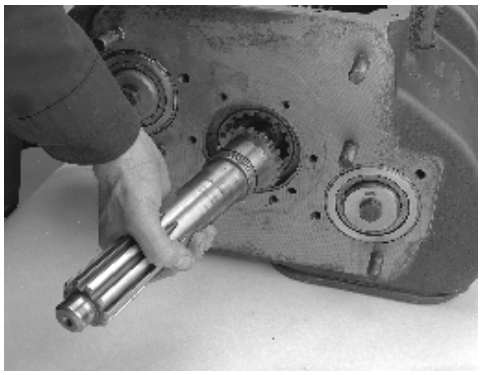




Procedure -

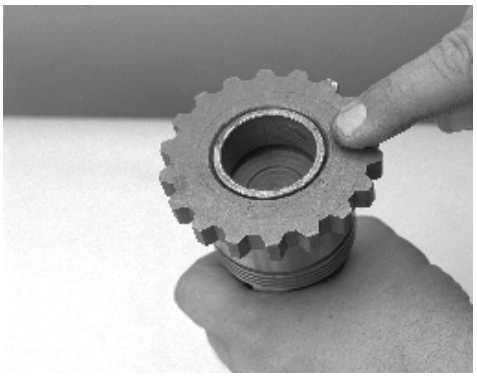
1. If the front bearing cover is still installed, remove the six (6) retaining capscrews and cover. Remove the any remaining gasket material from the case and cover.
2. From the input shaft groove, remove the bearing retaining snap ring.
3. Use a soft bar and maul and drive the input shaft toward the case rear as far as possible. Pull the input shaft forward.
4. Use pry bars or screwdrivers to complete removal of the bearing.
5. From the drive gear front remove drive gear spacer.
6. Remove the drive gear internal snap ring.

7. Pull the input shaft forward and out of the drive gear.

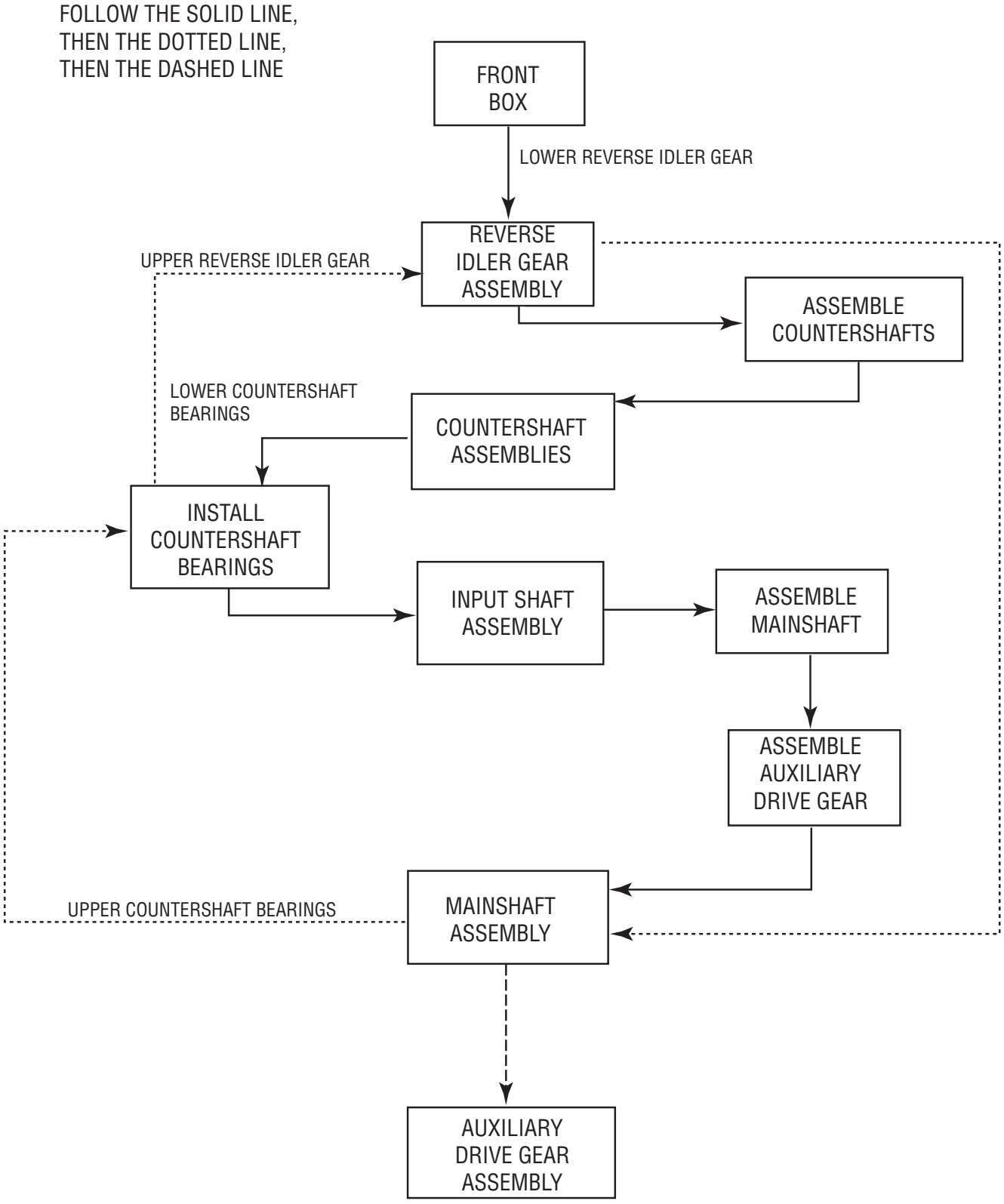


8. From inside the case, remove the drive gear.

9. Inspect the bushing in the input shaft pocket, remove if damaged.



How to Assemble the Front Section



How to Install the Reverse Idler Gear Assembly

Special Instructions

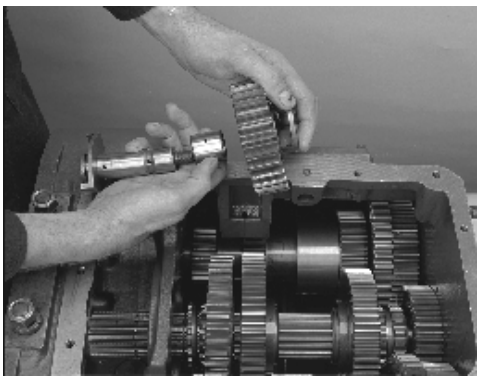
If you install the bottom reverse idler gear assembly, make sure the three (3) magnetic discs are securely in place at case bottom. Use Eaton Adhesive #71210 or equivalent.

Special Tools

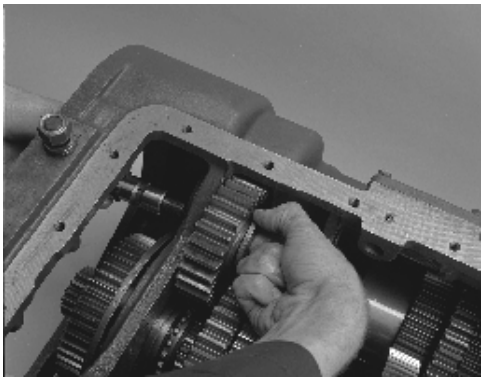
- Typical Service Tools

Procedure -

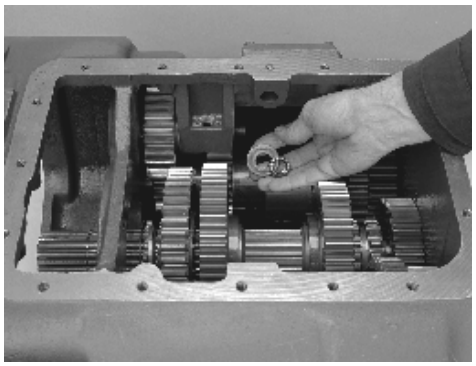
1. If reverse gear assembly is disassemble, position the needle bearing and inner race into the reverse idler gear.
2. Thread the pipe plug into the reverse idler shaft and tighten.
3. On the reverse idler shaft, position the idler shaft plate, flat side to the front.

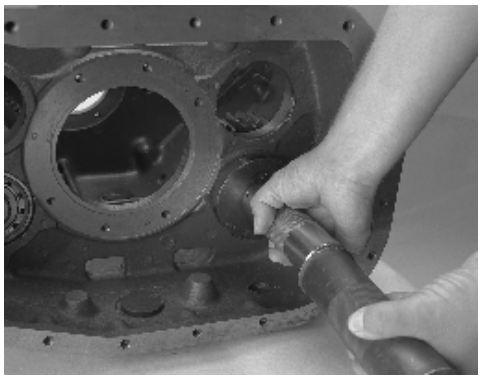


4. Insert the idler shaft into the case bore, threaded-end to the front. As the shaft passes through the case bore position the reverse idler gear on the shaft, long hub to the front. Insert the thrust washer between the reverse idler gear and the case support boss. Finish inserting the idler shaft.
5. Make sure the reverse idler shaft is seated in the support boss bore.



6. Install the washer and lock nut on shaft front. Tighten the stop nut to 50-60 lb-ft of torque.





7. Use a bearing driver and a maul and install the auxiliary countershaft front bearing outer race against the idler plate.

Final Check

- Make sure the stop nut is properly torqued.
- Make sure the bearing outer race is installed against the idler plate.

How to Install the Countershaft Assemblies

Special Instructions

Make sure the countershaft assemblies have been marked for proper position, 47-tooth PTO gear in the lower position.

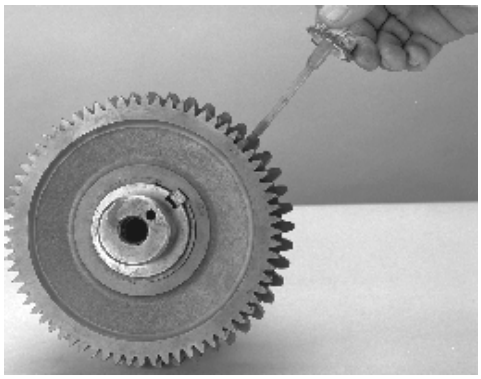
On the drive gear of each countershaft assembly, mark the tooth aligned with the gear keyway and stamped with an “O” for easy identification. A highly visible color of toolmaker’s dye is recommended for making timing marks.

Special Tools

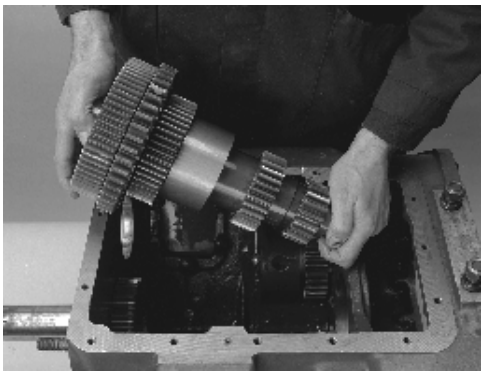
- Toolmaker's dye

Procedure -

1. Mark the countershaft drive gear for timing purposes.



2. Place the lower, 47-tooth PTO gear, assembly in the case, the inner bearing race end to the front.
3. Position as far to the left as possible (the opposition side as the lower reverse idler gear assemble.)
4. Place the upper, 45-tooth PTO gear, assembly in the case, the inner bearing race end to the front.
5. Position as far to the right as possible (the same side as the lower reverse idler gear assemble).



Final Check

- Make sure the upper and lower countershafts are in the right place.
- Make sure the timing marks are visible.

How to Install the Countershaft Bearings

Special Instructions

The front bearing inner race must be pressed on the countershaft front.

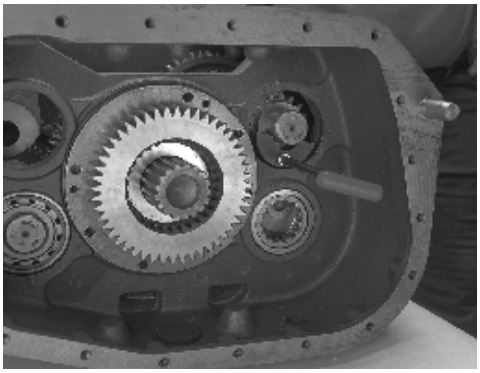
The flanged-end driver must cover the bearing outer race for proper installation.

Temporarily use the assembled auxiliary drive gear to hold the mainshaft in the input shaft pilot.

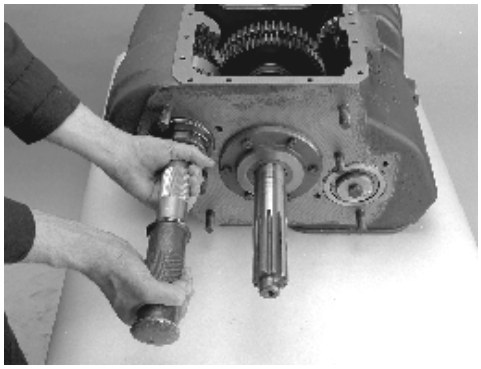
Special Tools

- Typical Service Tools
- Countershaft support tool
- Flanged-end driver and maul

Procedure -

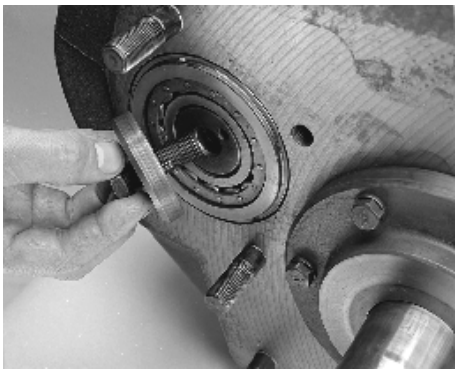


1. Move the countershaft to the rear and insert the countershaft support tool to center shaft in rear case bore.



2. Use a flanged-end driver to start the front bearing in case bore.

3. Use a screwdriver inserted in the countershaft capscrew bore to help center the countershaft.



4. Move the countershaft forward into the bearing.

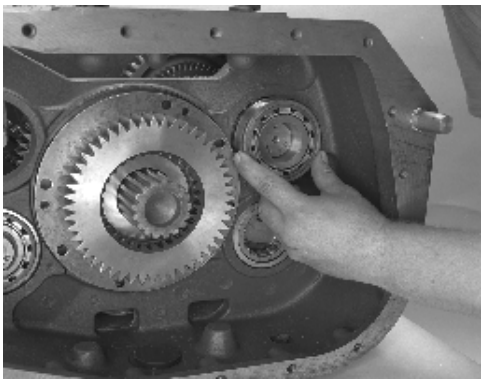
5. Use a flanged-end bearing driver and maul to completely seat the front bearing in case bore.

6. On the countershaft front, position the retainer plate with roll pin in hole at shaft end.

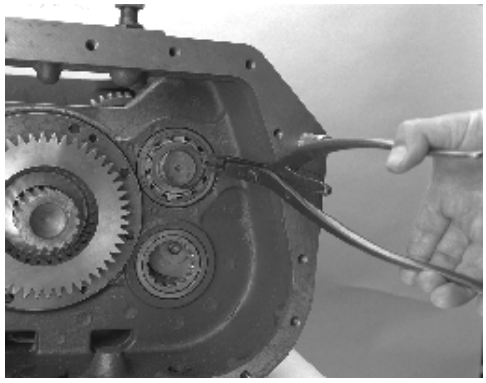
7. Secure with capscrew, tightening to 90-120 lb-ft of torque.

8. From the rear, remove the countershaft support tool.

9. With the larger I.D. lead chamfer to the shaft front, use a flanged-end bearing driver and install the rear bearing.



10. In the countershaft rear groove, install the rear snap ring.



Final Check

- Make sure the front bearing capscrew is properly torqued.
- Make sure the rear snap ring is in place.

How to Install the Input Shaft Assembly

Special Instructions

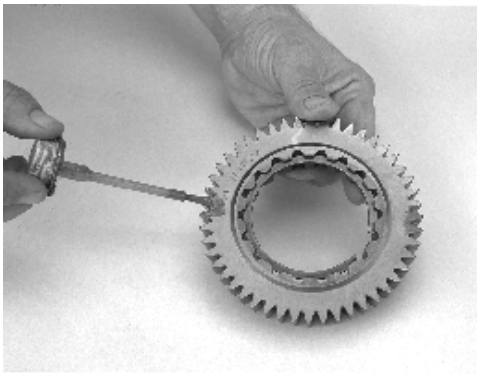
As part of assembling the input shaft assembly, the mainshaft drive gear must be installed and timed.

Replace the pilot bushing, if worn.

Apply Eaton lubricant #71215 or equivalent to the pilot bushing so that a film of lubricant covers the entire internal surface of the bushing.

Special Tools

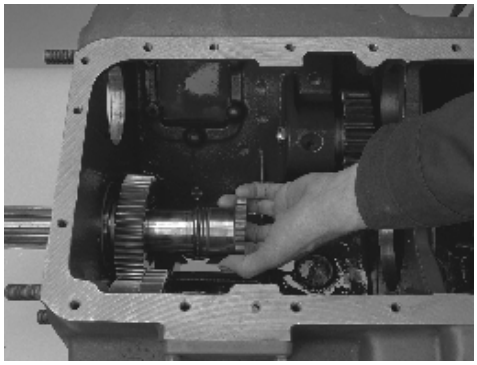
- Typical Service Tools
- Toolmaker's dye



Procedure -

1. In I.D. of main drive gear, install the snap ring.
2. Use toolmaker's dye and mark the main drive gear for timing purposes.

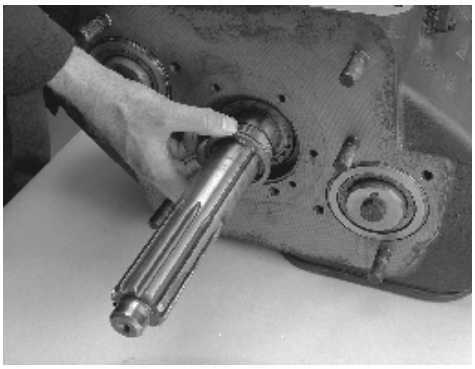
   Mark any two (2) adjacent teeth on the drive gear. Repeat the procedure for the two (2) adjacent teeth directly opposite the first set marked.



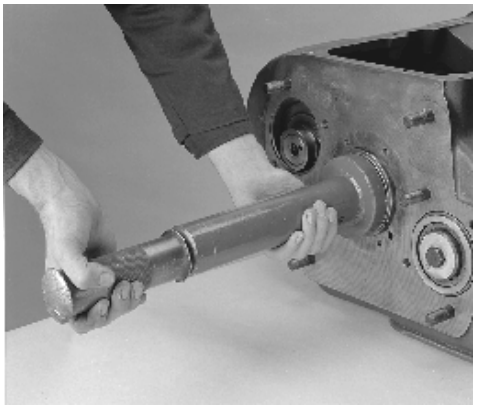
3. Inside the case, mesh the lower countershaft drive gear marked tooth with either set of marked teeth on the main drive gear.
4. Slide the input shaft through the main drive gear.

5. Over the input shaft, install the drive gear spacer.

6. With the bearing external snap ring to the outside, position the bearing on the input shaft.

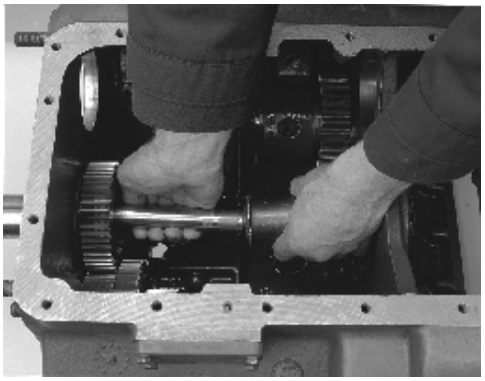


7. Use a flanged-end driver and maul to seat the input shaft bearing.

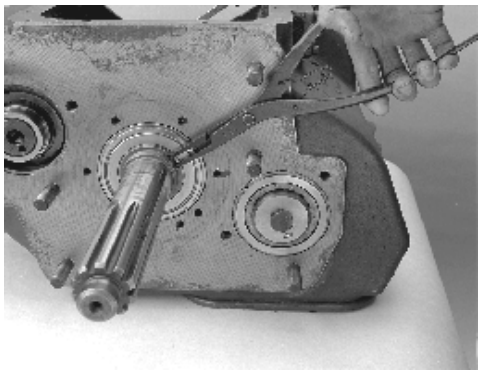


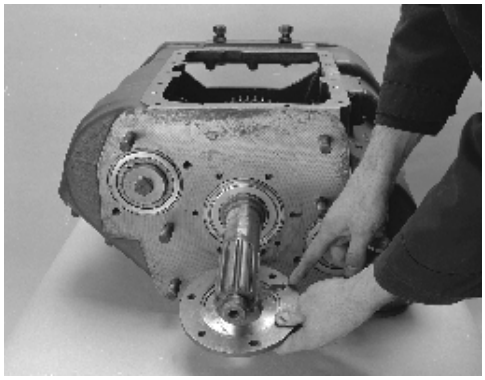
8. Temporarily install the front bearing cover.

9. From inside the case, use a soft bar and maul to drive the input shaft through the bearing. Remove the front bearing cover.



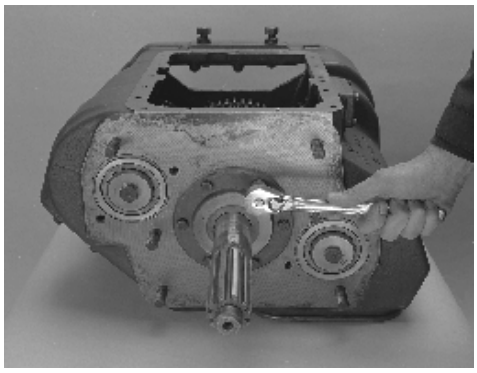
10. Install the bearing retainer snap ring.





11. Position a new gasket on the bearing cover mounting surface, making sure to align the gasket oil return hole with case oil return hole.

12. Position the front bearing cover, making sure to align the cover oil return hole with case oil return hole.



13. Secure the front bearing cover with six (6) capscrews, tighten to 35-45 lb-ft of torque.

Final Check

- Make sure the drive gear is timed with the lower Countershaft.
- Make sure the front bearing cover capscrews are tighten properly.

How to Install the Mainshaft Assembly

Special Instructions

The lower countershaft bearings and the input shaft must be installed.

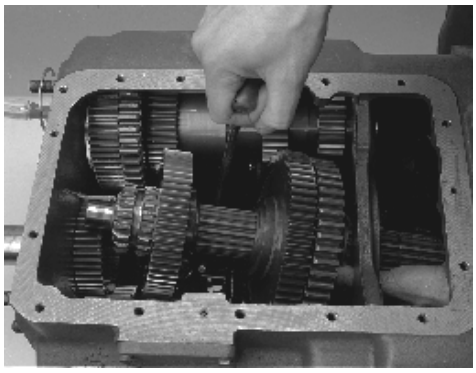
Check to make sure the lower countershaft drive gear marked tooth is in time with main drive gear set of marked teeth.

Special Tools

- Typical Service Tools
- A large hook or 3' piece of rope

Procedure -

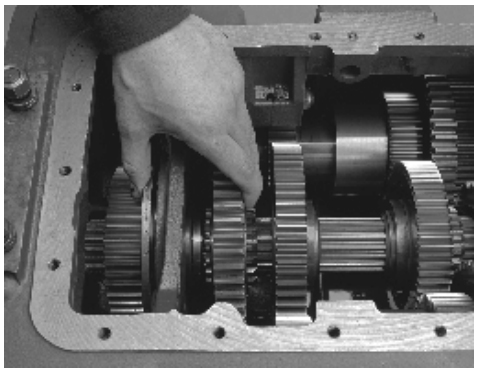
1. Block the upper countershaft against the case wall.



2. With reverse gear forward against the next speed gear, lower the mainshaft assembly while pulling the shaft rear through the case bore.

3. Move the mainshaft pilot-end into the input shaft pilot bushing. Mesh the mainshaft gears with the corresponding forward countershaft assembly gears.

4. Center the mainshaft rear in case bore and temporarily position the auxiliary drive gear on the mainshaft. Partially seat the bearing in the bore.

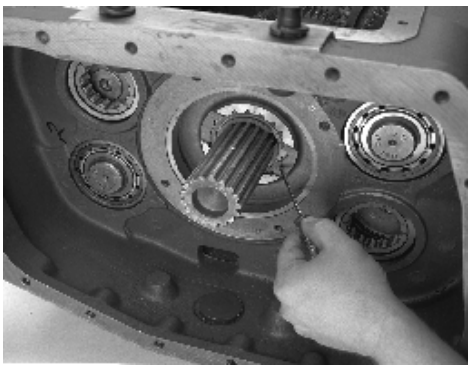


WARNING: At this time other components of the front section must be Installed before the mainshaft installation can be completed, see “How to Install the Countershaft Bearings”.

5. Mesh the reverse gear teeth with the reverse idler gear teeth and move the reverse gear to the rear as far as possible.

6. Remove the auxiliary drive gear.

7. Align the reverse gear spacer external splines with the reverse gear and move the spacer into the reverse gear.



8. Install the reverse gear I.D. snap ring and move the reverse gear forward on the mainshaft and against the reverse gear limit washer.

9. Install the reverse gear retaining snap ring in the mainshaft second snap ring groove.

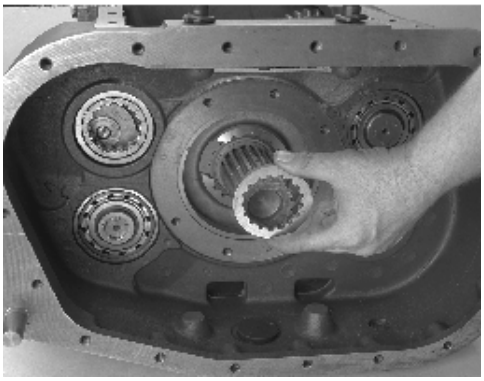
How to Install the Auxiliary Drive Gear Assembly

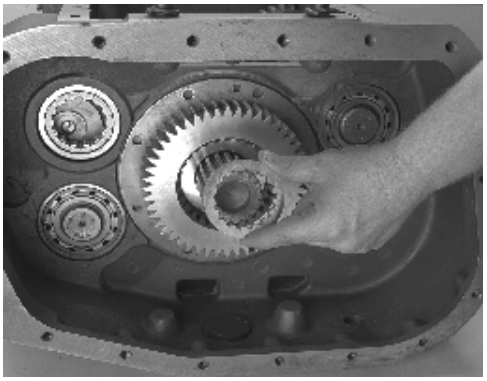
Special Instructions

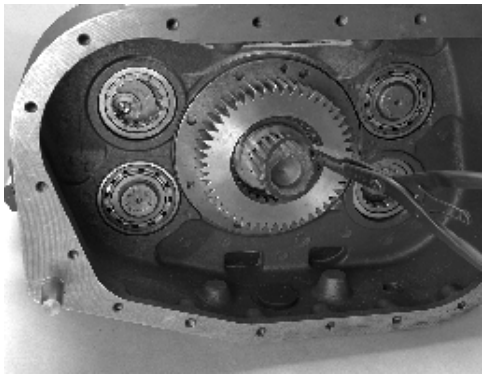
Before installing the auxiliary drive gear, the mainshaft must be completely installed.

Special Tools

- Typical Service Tools
- Large pair of snap ring pliers
- Flanged-end driver and maul







Procedure -

1. Install the splined washer on the mainshaft, against the reverse gear retaining snap ring.
2. Position the auxiliary drive gear assembly on the mainshaft.
3. Use a flanged-end driver and maul to seat the auxiliary drive gear bearing.
4. Align the retainer ring capscrew holes with the tapped holes.
5. Apply Eaton/Fuller sealant #71205 or equivalent to the retaining capscrews.
6. Install the retaining capscrews, tighten to 35-45 lb-ft of torque.
7. Install the splined washer inside the auxiliary drive gear assembly.
8. Install the auxiliary drive gear retaining snap ring in the mainshaft snap ring groove.

How to Disassemble the Auxiliary Drive Gear Assembly

Special Instructions

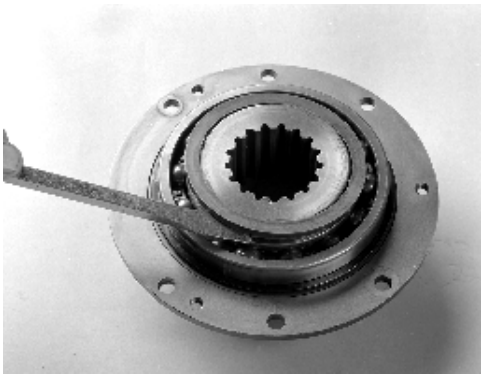
To disassemble, the auxiliary drive gear must be removed.

Special Tools

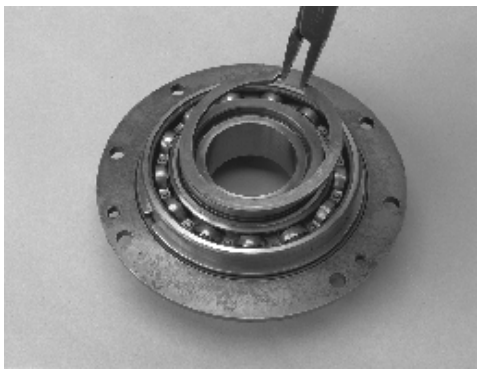
- Typical Service Tools
- A large pair of snap ring pliers

Procedure -

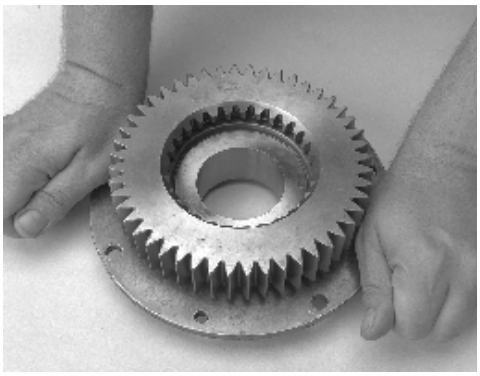
1. Lay the front auxiliary drive gear on a clean, flat surface.
2. From the front auxiliary drive gear hub, use a screwdriver to pry off the snap ring retainer.

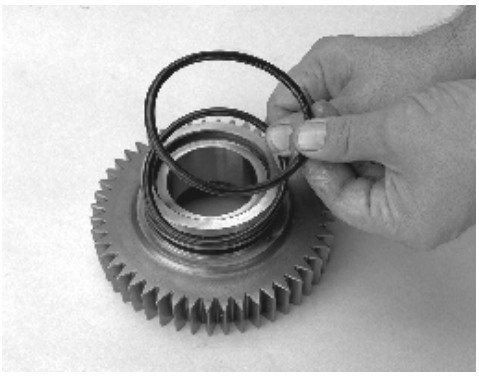


3. From the front auxiliary drive gear hub, remove the snap ring.



4. Use the front hub as a base and press the retaining ring and bearing off.





5. From the front auxiliary drive gear hub, inspect the O-rings, remove if damaged.

How to Assemble the Auxiliary Drive Gear Assembly

Special Instructions

Inspect the O-rings and replace if damaged.

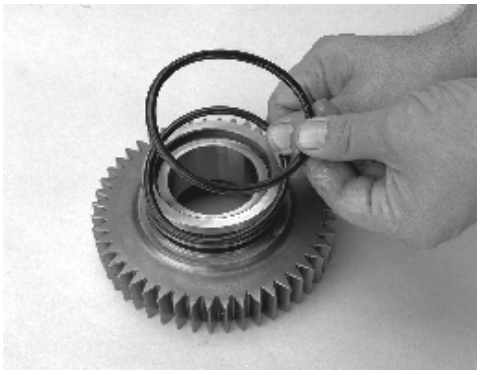
Apply Eaton Lubricant #71214 or equivalent to the auxiliary drive gear O-rings.

Special Tools

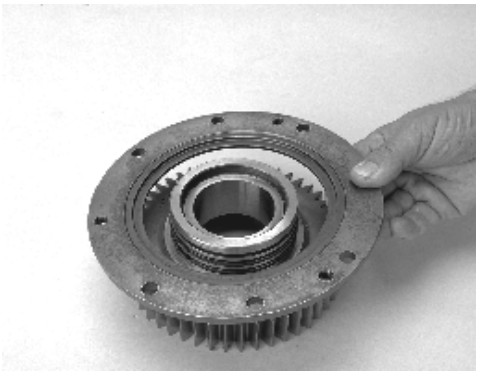
- Typical Service Tools
- A flanged-end driver and a maul

Procedure -

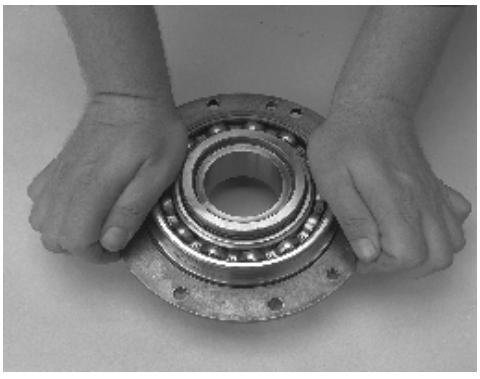
1. Lay the front auxiliary drive gear on a clean, flat surface.
2. Install the O-rings on the front auxiliary drive gear hub.

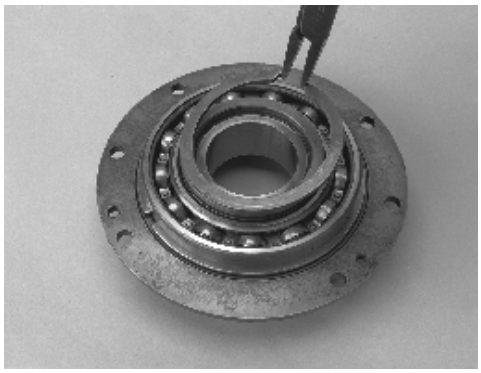


3. With snap ring groove away from gear teeth, install the retaining ring on the front auxiliary drive gear.



4. With bearing snap ring facing groove in bearing ring, install the bearing.





5. To retain the bearing, install the snap ring in front gear hub groove.

6. With grooved side down, use a flanged-end driver and install the outer retainer ring.

Final Check

- Make sure the outer retainer ring is seated.

How to Disassemble the Countershaft Assembly

Special Instructions

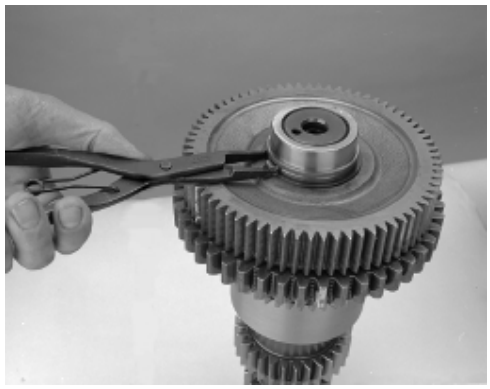
Never use the PTO gear as a pressing base. The narrow width of this gear can cause breakage.

Special Tools

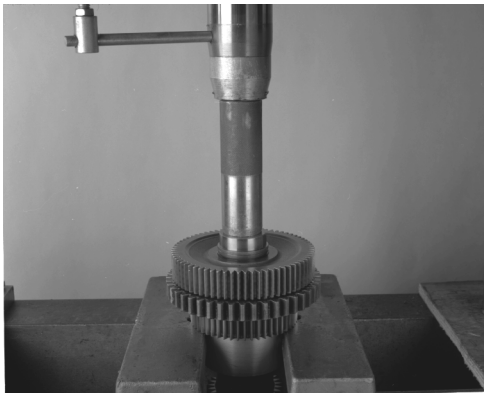
- Snap Ring pliers
- Press

Procedure -

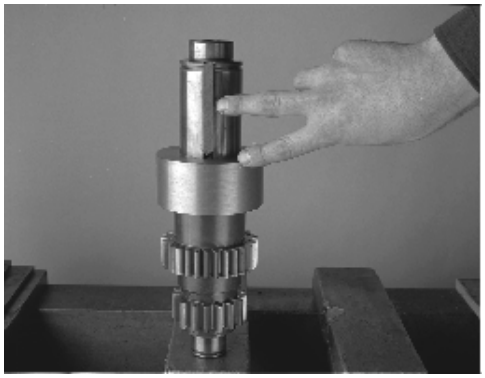
1. From each countershaft front remove the drive gear retaining snap ring.



2. Using the rear face of 3rd speed gear as a base, press the drive gear, PTO gear, and 3rd speed gear from each countershaft. This removes the front bearing inner race.



3. Inspect the key and roll pin, remove if damaged.



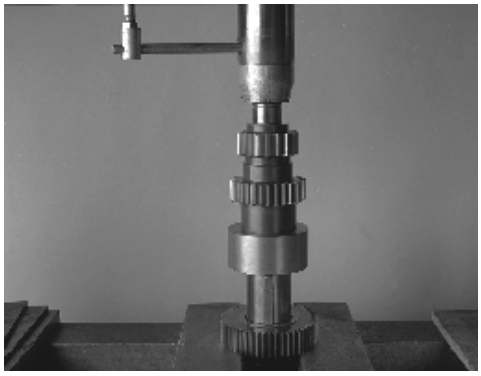
How to Assemble the Countershaft Assembly

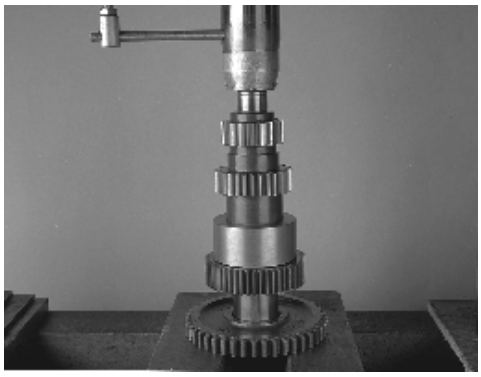
Special Instructions

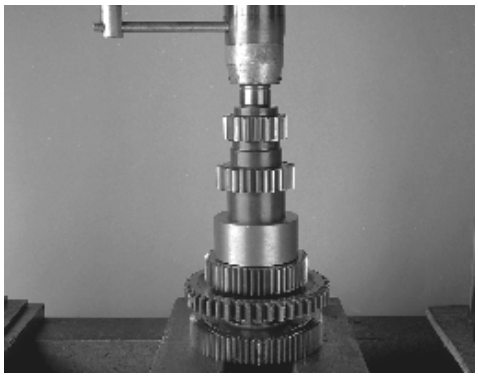
Except for the PTO gears, the upper and lower countershaft assemblies are the same. To avoid confusion during installation, mark the upper countershaft (45-tooth PTO gear) with an “U”. The lower countershaft has a 47-tooth PTO gear.

Special Tools

- Snap ring pliers
- Press







Procedure -

1. If previously removed, install the roll pin and key in countershaft keyway.

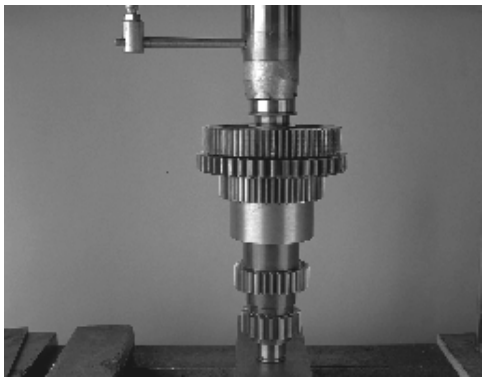
2. Align 3rd speed gear keyway with the countershaft key and press the gear on the countershaft.

3. Align PTO gear keyway with the countershaft key and press the gear on the countershaft.

4. Align drive gear keyway with the countershaft key and press the gear on the countershaft.

5. On each countershaft front, install the drive gear retaining snap ring in groove.

6. Use a flanged-driver or the press to install the bearing inner race on the countershaft front against the drive gear.



Final Check

- Make sure all gears are pressed into place.
- Make sure the bearing inner race is installed.

How to Disassemble the Mainshaft Assembly

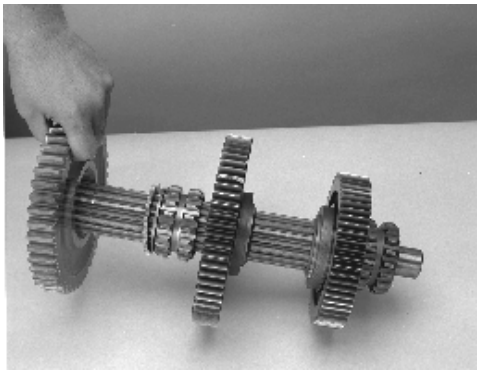
Special Instructions

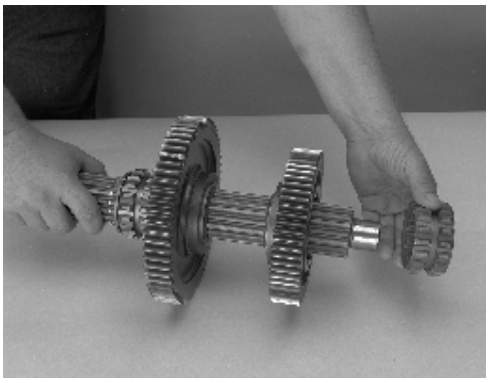
During disassembly, lay all parts on a clean bench in order of removal to facilitate reassembly.

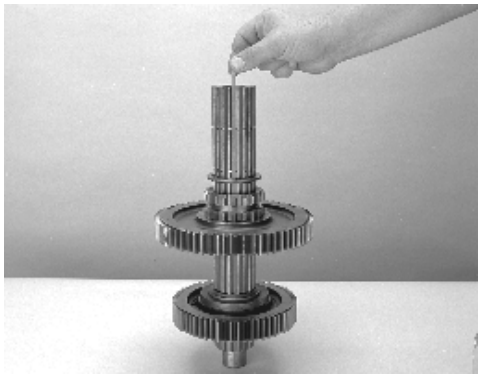
When removing limit washers, spacers and gears, note their location. Keep the internal-splined washers and external-splined spacers with the gear from which they were removed. There is only one limit washer and one spacer belonging to each gear.

Special Tools

- Typical Service Tools







Procedure -

1. Remove reverse gear.
2. Remove reverse gear spline spacer.
3. Tilt the mainshaft up, and from the opposite end, remove the sliding clutch.
4. Place the mainshaft in a vertical position.
5. Remove the mainshaft key snap ring.
6. From the mainshaft rear, pull the mainshaft key from the mainshaft key way.
7. Turn the reverse gear limit washer to align its splines with the mainshaft and remove the washer.
8. Remove the reverse-1st speed sliding clutch.

9. Remove 1st gear and spline spacer.

10. Remove 1st gear spacer.

11. Turn the 1st gear limit washer to align its splines with the mainshaft and remove the washer.

12. Turn the 3rd gear limit washer to align its splines with the mainshaft and remove the washer.

13. Remove the 3rd gear spacer.

14. Remove 3rd gear.

15. Remove 3rd gear spline spacer.

16. Turn the 3rd gear limit washer to align Its splines with the mainshaft and remove the washer.

17. Inspect the roll pin, remove if damaged.

How to Assemble the Mainshaft Assembly

Special Instructions

Each mainshaft gear must have its I.D. snap ring installed before placement on the mainshaft. Do not replace reverse gear I.D. snap ring.

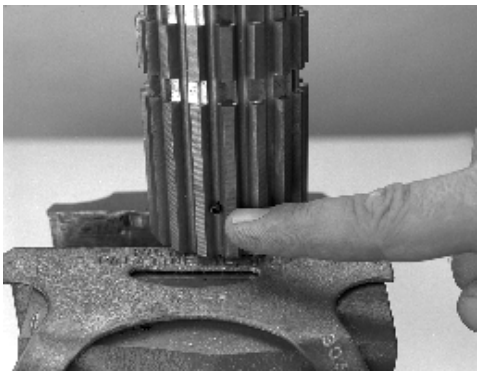
Gear limit washers are internally splined and locked to the mainshaft by the key. Gear spacers are externally splined to engage with gear hub clutching teeth. There is one limit washer and one spacer for each mainshaft gear.

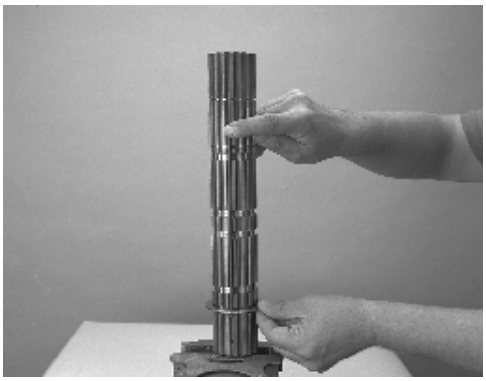
Axial clearance (end-play) limits are .006"-.015" for all mainshaft gears.

If the axial clearance is less than the minimum .006" tolerance, the limit washer should be replaced with a thinner limit washer. This will increase the axial clearance between the gears. If the axial clearance is greater than the maximum .015" tolerance, a thicker limit washer should be installed. This will decrease the axial clearance between the gears.

Special Tools

- A vise with brass jaws or wood blocks
- Feeler gauges
- A piece of 5/32" air line, 1' long





Procedure -

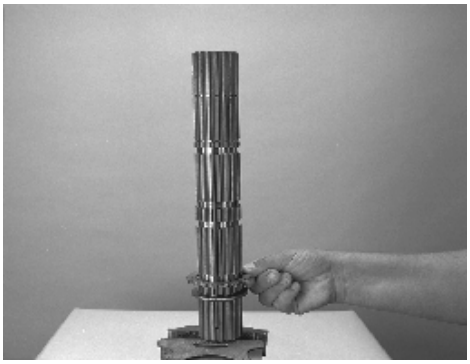
1. With mainshaft pilot-end down, secure the mainshaft in a vise equipped with brass jaws or wood blocks.

2. If previously removed, install the roll pin in keyway.

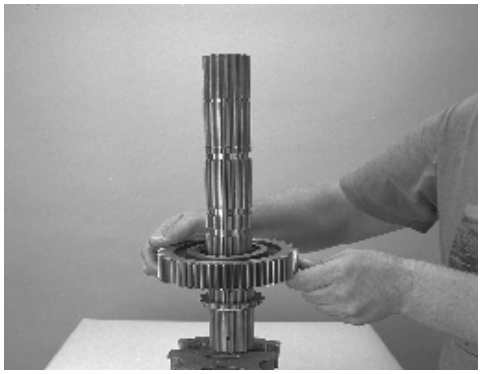
3. With the washer flat side up, position the 3rd speed gear limit washer (white) in the mainshaft 1st or bottom groove. Rotate the washer until the washer splines and mainshaft splines align.

4. Start at the mainshaft bottom and install the air line in the keyway to lock the washer in place. As limit washers and gears are installed, continue to push the air line up.

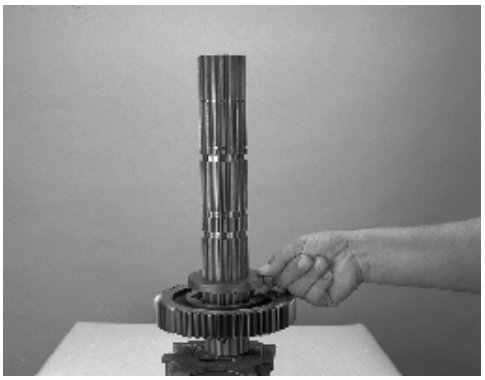
5. Against the 3rd speed gear washer, position the 3rd speed gear spacer.



6. With clutching teeth down and engaged with the spacer external splines, position the 3rd speed gear on the mainshaft.

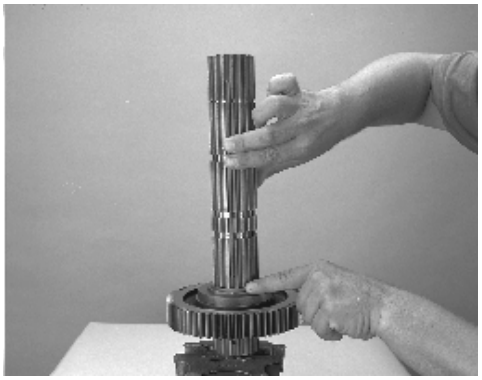


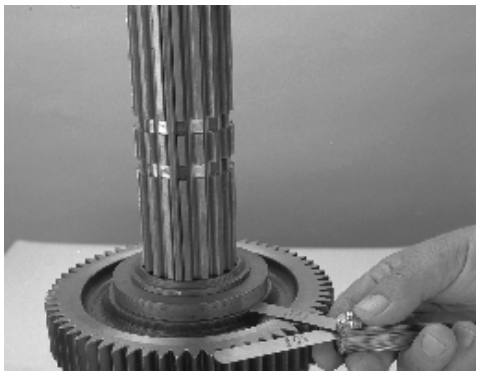
7. Against 3rd speed gear, position a mainshaft spacer.



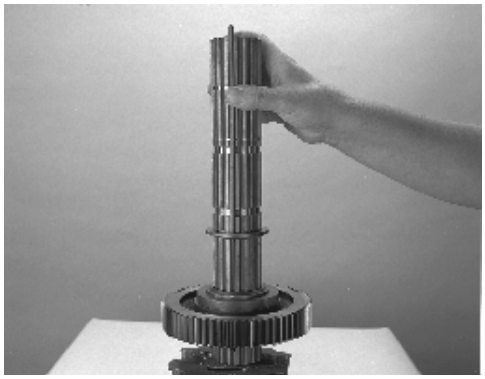
8. With the washer flat side down, position the limit washer against the spacer. Rotate the washer until the washer splines and mainshaft splines align.

9. Push the air line up to lock the washer on the mainshaft.



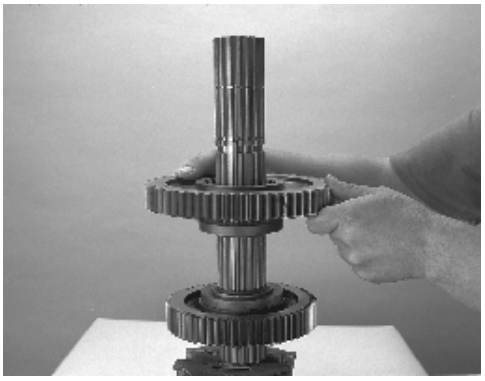


10. Between the gear hub and mainshaft spacer, insert .006" feeler gauge and .015" feeler gauge. If out of tolerance, change the limit against the mainshaft spacer. See “Special Instructions” for further information.



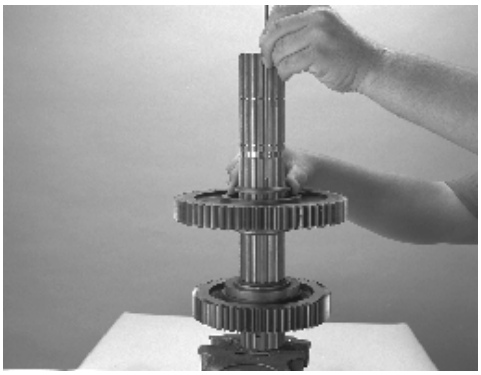
11. With the flat side up, position the 1st speed gear limit washer (white) in the next available groove. Rotate the washer until the washer splines and mainshaft splines align.

12. Push the air line up to lock the washer on the mainshaft.



13. Against the limit washer, position the mainshaft spacer.

14. With clutching teeth up, position the 1st speed gear on the mainshaft against the spacer.

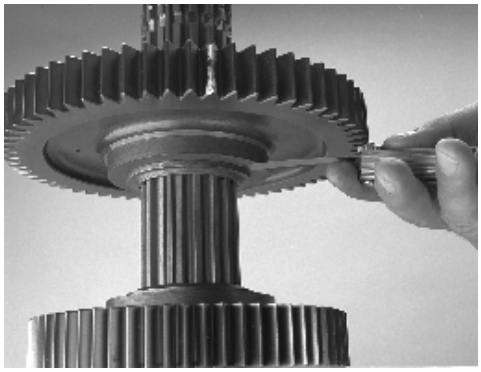


15. Position 1st speed gear spacer against 1st speed gear, engaging the spacer external splines with gear clutching teeth.

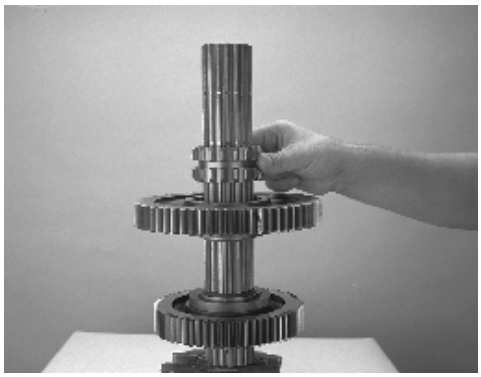
16. With washer flat side down, position the limit washer against the spacer. Rotate the washer until the washer splines and mainshaft splines align.

17. Push the air line up to lock the washer on the mainshaft.

18. Between the gear hub and mainshaft spacer, insert .006" feeler gauge and .015" feeler gauge. If out of tolerance, change the limit against the mainshaft spacer. See 'Special Instructions' for further information.

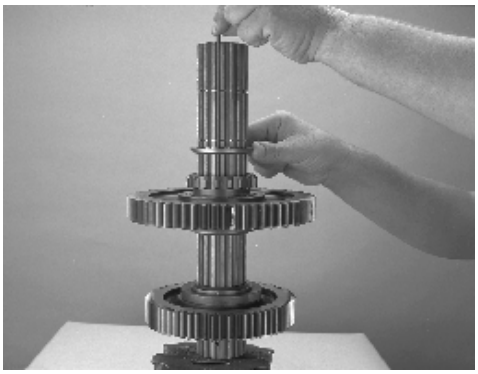


19. Align the sliding clutch missing internal spline with the mainshaft key and install the 1st-Reverse speed sliding clutch.

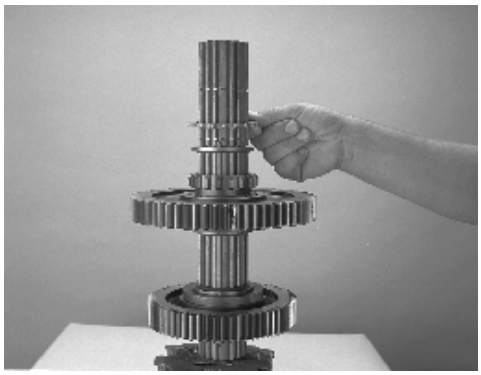


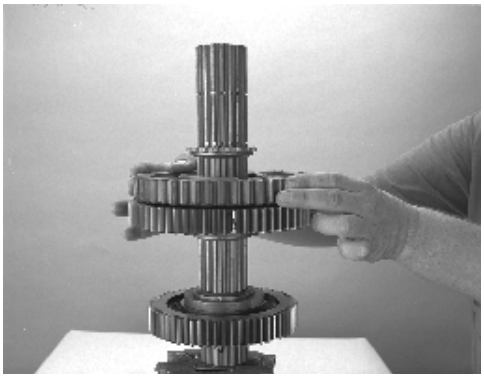
20. With the flat side up, position the Reverse speed gear limit washer (white) in the next available groove. Rotate the washer until the washer splines and mainshaft splines align.

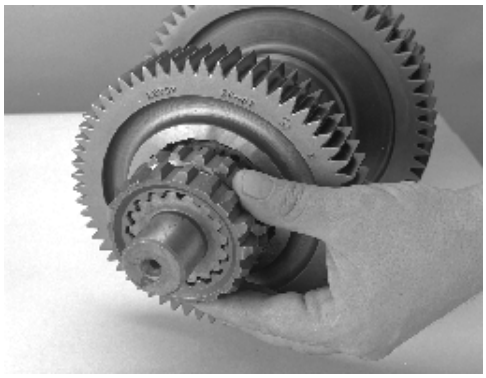
21. Push the air line up to lock the washer on the mainshaft.



22. Against the limit washer, position reverse speed gear spacer.







23. Install reverse gear on the mainshaft. Engage the gear clutching teeth with spacer splines and sliding clutch. Move the reverse gear down against the 1st speed gear.

24. At this time remove the air line and insert the mainshaft key.

WARNING: Be careful not to move the gears while doing this procedure, the limit washers are unlocked and can rotate which would cause the gears to drop.

25. Install the mainshaft key snap ring.

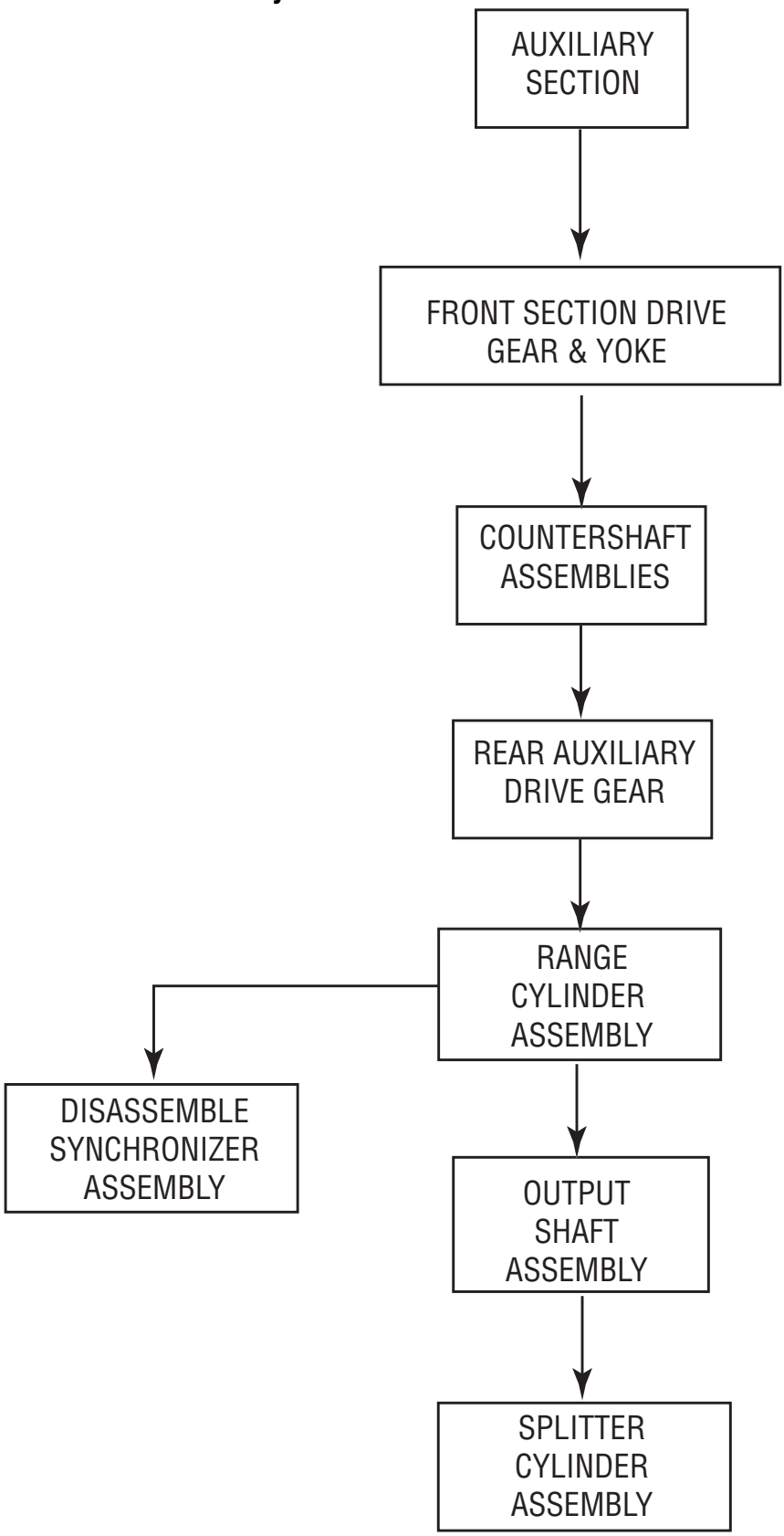
26. Remove the mainshaft from the vise.

27. On the shaft front, align the sliding clutch missing internal spline with the mainshaft key and install the 3rd-Drive gear sliding clutch. Engage the sliding clutch external splines with the 3rd speed gear clutching teeth.

Final Check

- Make sure reverse gear is against 1st speed gear.
- Make sure the mainshaft key is in the keyway.
- Make sure the 3rd speed sliding clutch is engaged into 3rd speed gear.

How to Disassemble the Auxiliary Section

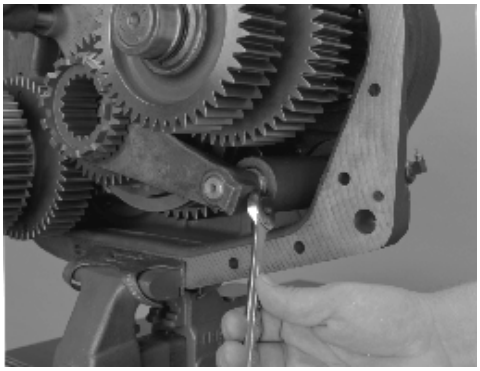


How to Remove the Front Auxiliary Drive Gear

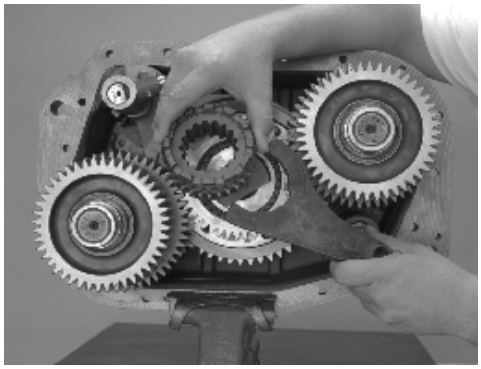
Special Tools

- Typical Service Tools
- A vise with brass jaws or wood blocks

Procedure -



1. From the splitter cylinder shift yoke, remove the lockwire and capscrew.



2. Pull the sliding clutch and shift yoke straight out to remove them.

How to Remove the Countershaft Assemblies (w/Tapered Bearings)

Special Instructions

For "A" Series, go to “A” Series Section.

For ease of disassembly, mount the auxiliary section upright in a vise.

Both countershafts are removed the same.

Make sure the countershaft retaining straps are installed.

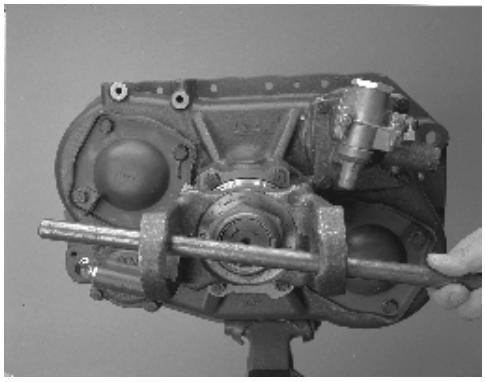
As the countershaft strap is removed, support the countershaft; it can fall.

Special Tools

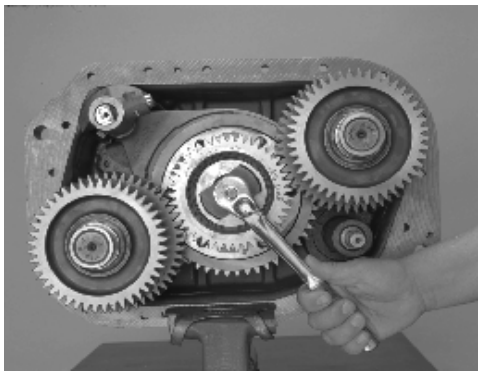
- Typical Service Tools
- Vise with brass jaws or wood blocks
- Bearing puller
- Soft bar and a maul

Procedure -

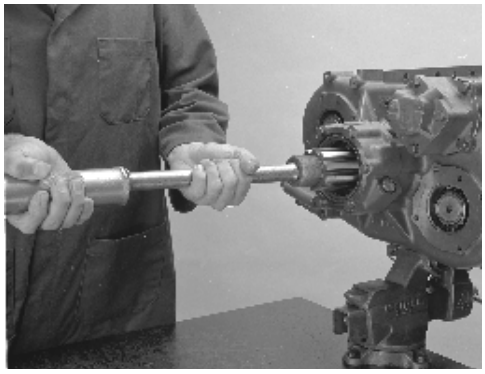
1. On the output shaft, temporarily install a output yoke.
2. To keep the output shaft from turning, insert a breaker bar.



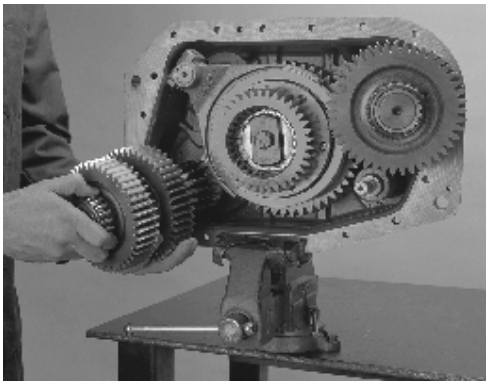
3. From the output shaft, loosen the 15/16" capscrew and retainer. Do not remove the capscrew. Remove the bar and output yoke.



How to Disassemble the Auxiliary Section



4. Use a sort bar and maul to drive the output shaft forward far enough to partially unseat the bearing.



5. Support the auxiliary countershaft while removing the auxiliary countershaft retaining strap.

6. Remove the auxiliary countershafts.

7. If necessary, secure the countershaft assemblies in a vise and remove both the front and rear bearings with a bearing separator and jaw pullers.

How to Remove the Countershaft Assemblies (w/Ball Bearings) A Series

Special Instructions

For ease of disassembly, mount the auxiliary section upright in a vise.

Both countershafts are removed the same.

When driving that countershaft to the rear, be careful not to damage the bearing inner race.

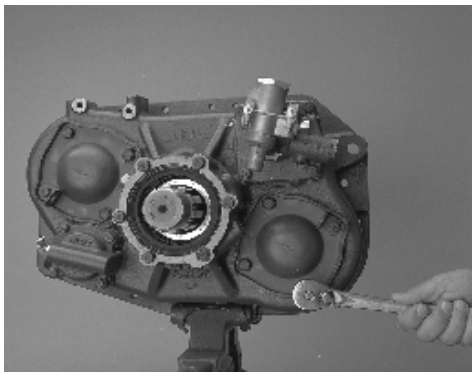
As the rear bearing is removed, the countershaft will fall.

Special Tools

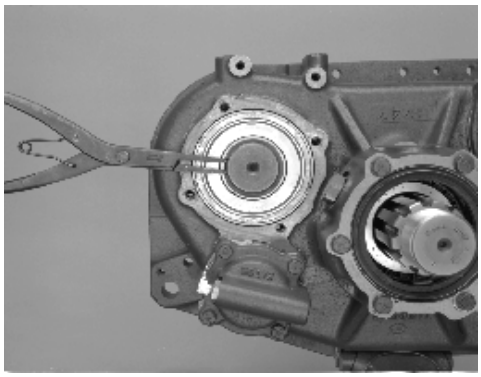
- Typical Service Tools
- Vise with brass jaws or wood blocks
- Bearing puller
- Soft bar and a maul

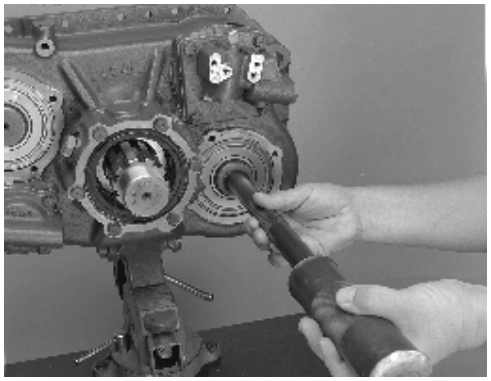
Procedure -

1. From the countershaft rear bearing cover, remove the cap-screws, cover, and gasket.

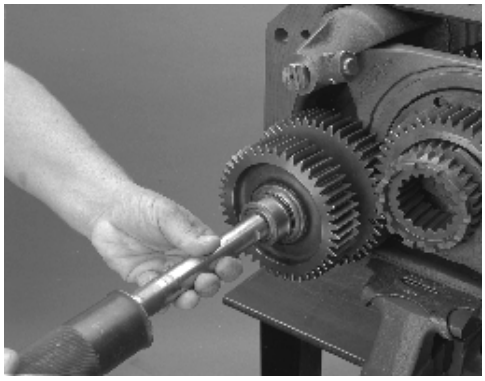


2. Clean the gasket mounting surface of gasket material.
3. From the countershaft rear, remove the snap ring.





4. Use a sort bar and maul to drive the countershaft forward far enough to partially unseat the bearing.



5. Use a soft bar and maul to drive the countershaft to the rear. This exposes the bearing snap ring.

6. Use a bearing puller and remove the countershaft bearing and countershaft.

7. Inspect the countershaft bearing inner race, remove if necessary.

How to Remove the Rear Auxiliary Drive Gear

Special Instructions

None

Special Tools

- Typical Service Tools
- A vise with brass jaws or wood blocks

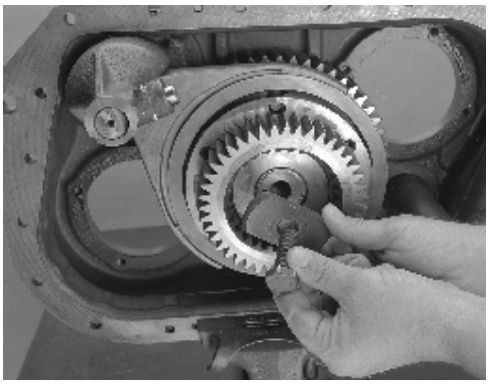
Procedure -

1. **Retainer rectangular in shape.**

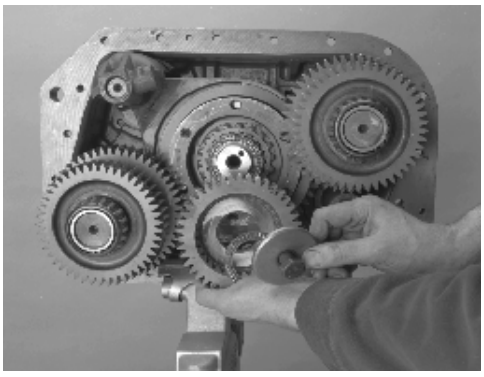
   From the output shaft, remove the 15/16" capscrew and retainer.

   Retainer round in shape.

   From the output shaft, remove the 15/16" capscrew and retainer, and thrust washer.



2. From the output shaft, remove the auxiliary drive gear. If the retainer, from Step 1, is round, there will also be a thrust washer behind the auxiliary drive gear to remove.



How to Disassemble the Range Cylinder Assembly

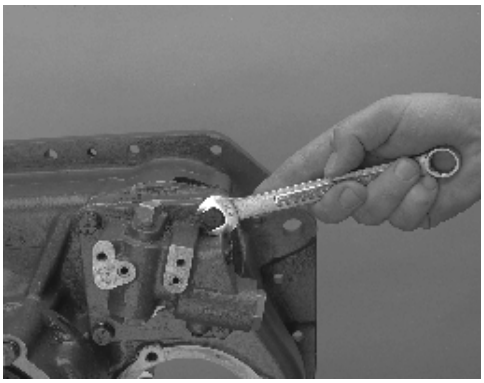
Special Instructions

When removing the range cylinder cover insert valves, note the direction the insert valve was positioned (nipple in or out).

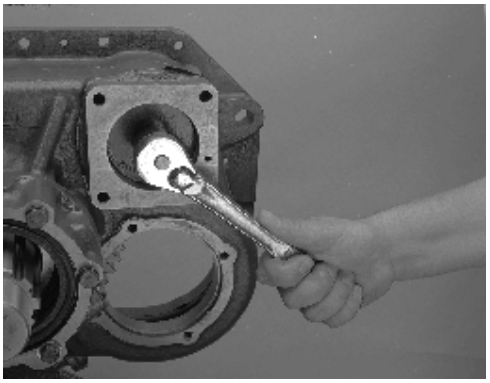
Special Tools

- Typical Service Tools

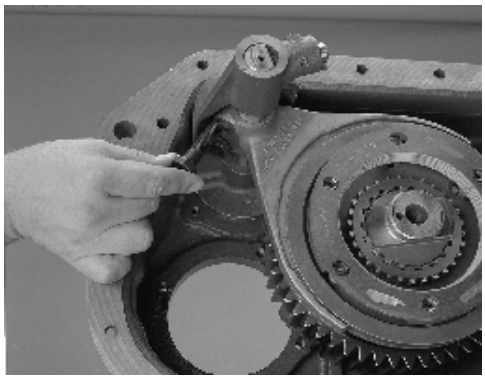
Procedure -



1. From the range cylinder cover, remove the capscrews, cover, and gasket.

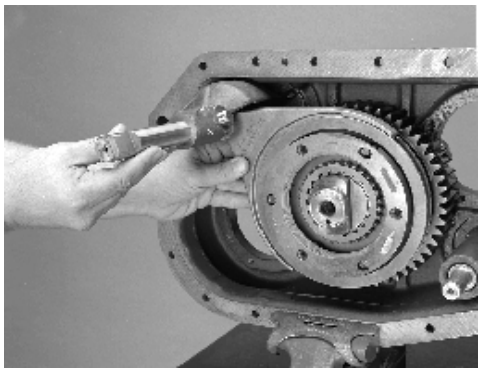


2. Clean the gasket mounting surfaces of all gasket material.
3. From the range cylinder housing bore, remove the nut.

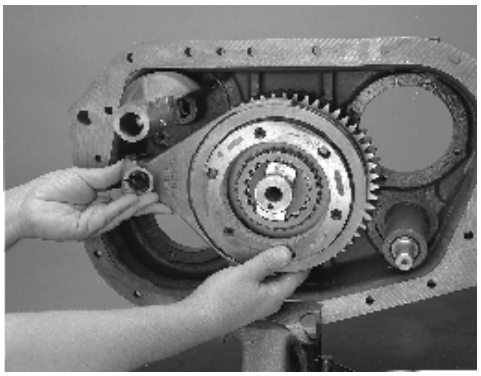


4. From the auxiliary section front, remove the two (2) yoke bar retaining capscrews.

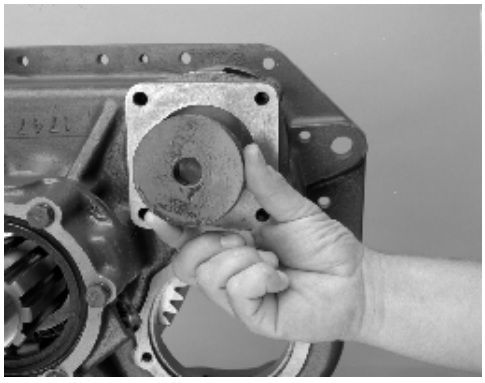
5. From the cylinder housing bore, remove the yoke bar.



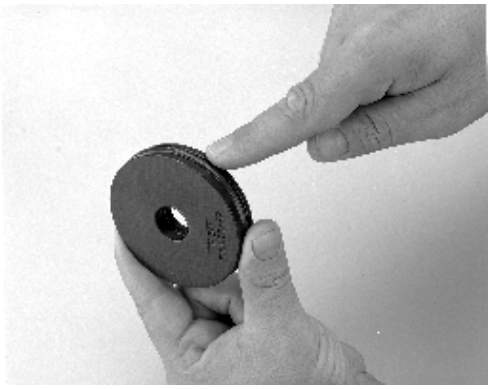
6. From the shaft, pull the synchronizer shift yoke and the synchronizer assembly.

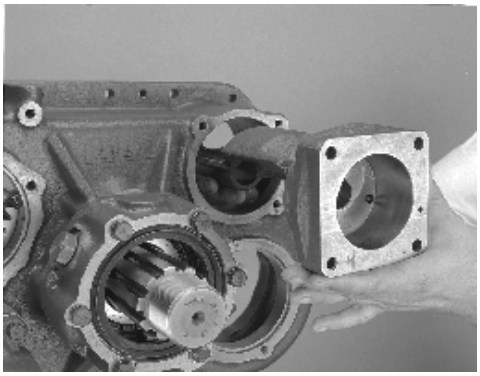


7. From the cylinder housing bore, remove the range piston.

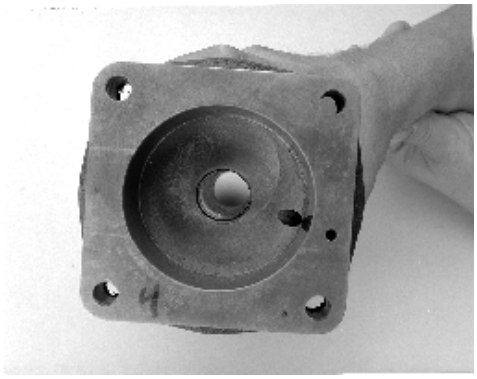


8. Inspect the range piston O-rings, remove if damaged.



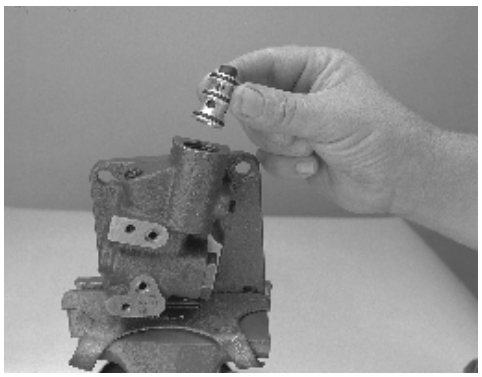


9. From the range cylinder housing, remove the housing and gasket.



10. Clean the gasket mounting surfaces of all gasket material.

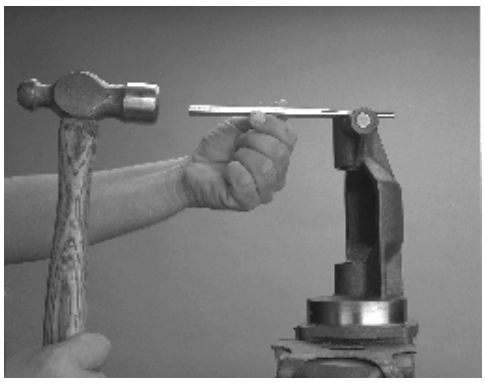
11. Inspect the O-ring inside the range cylinder housing bore, remove if damaged.



12. Place the range cylinder cover in a vise, remove one insert valve retaining nut and insert valve.

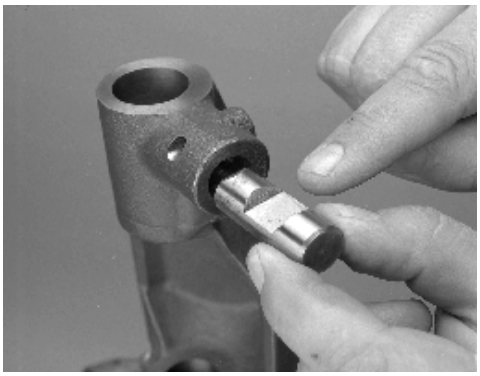
13. Inspect the insert valve and the cover bore for damage. Repeat for other insert valve.

For 14610A Models, go to Steps 14 and 15.



14. Place the range cylinder housing in a vise, remove the roll pin.

15. Remove the interlock pin. Inspect the pin, replace if damaged.



How to Disassemble the Output Shaft Assembly

Special Instructions

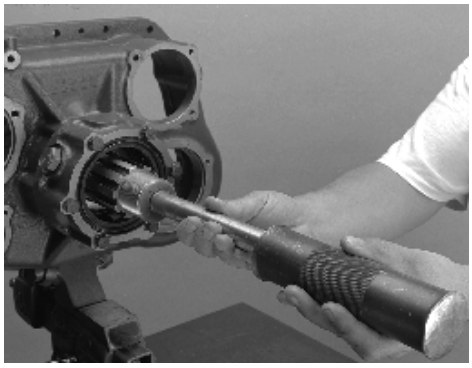
When using the soft bar and maul on the output shaft, be careful not to damage the threads.

When removing the rear bearing cover, the rear bearing cone drops from the housing bore.

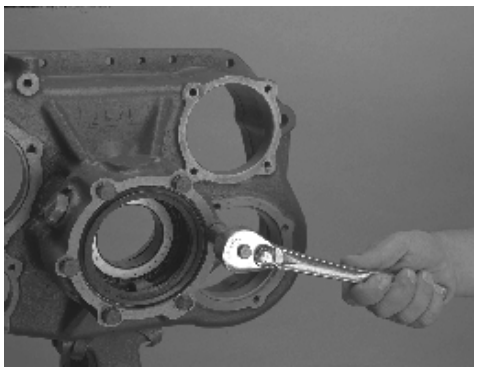
Special Tools

- Typical Service Tools
- Vise with brass jaws or wood blocks
- Press
- Soft bar and a maul

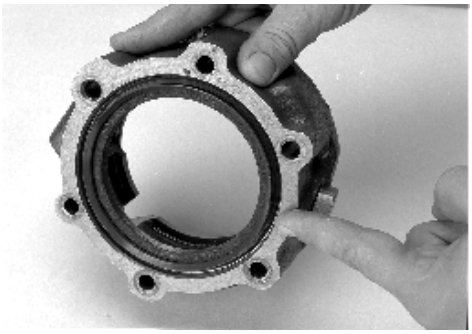
Procedure -



1. Use a soft bar and maul to drive the output shaft forward and through the rear bearing assembly.

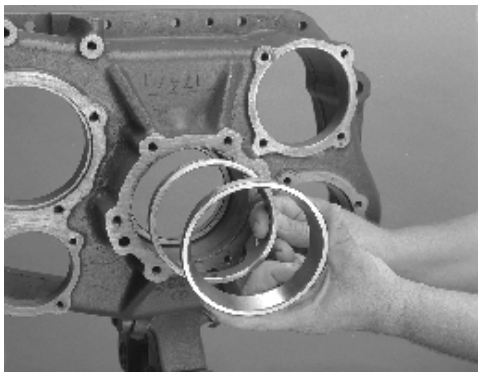


2. From the auxiliary housing rear, remove the rear bearing retaining capscrews, cover, and gasket.
3. Clean the gasket mounting surface of gasket material.

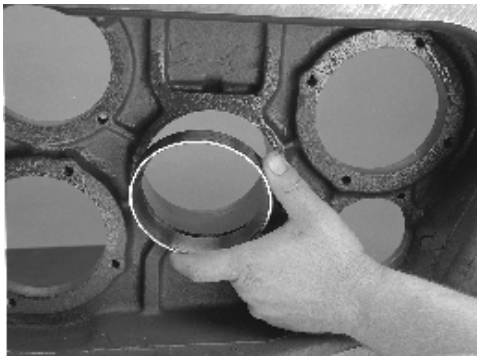


4. Inspect the rear bearing cover oil seal for damage, remove if damaged.

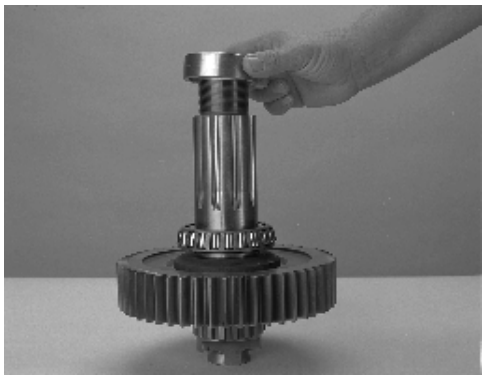
5. From the auxiliary housing rear, remove the bearing cup and spacer.



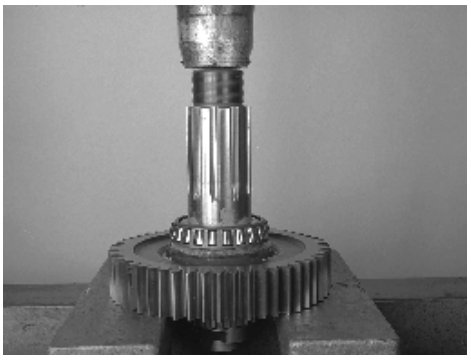
6. From the auxiliary housing front, remove the remaining bearing cup.



7. From the output shaft, remove the bearing inner spacer.



8. Use the output shaft assemble gear front face as a base, press the output shaft through the bearing and gear.



How to Disassemble the Splitter Cylinder Assembly

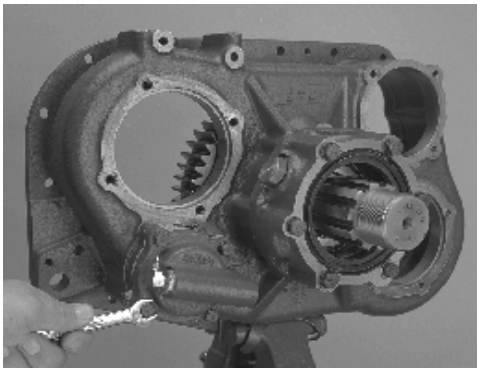
Special Instructions

When removing the splitter cylinder cover insert valve, note the direction the insert valve was positioned (nipple in or out).

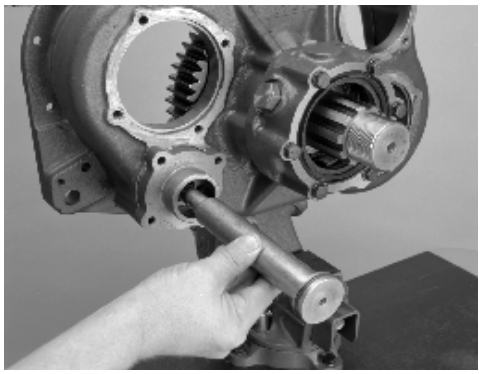
Special Tools

- Typical Service Tools
- A vise with brass jaws or wood blocks

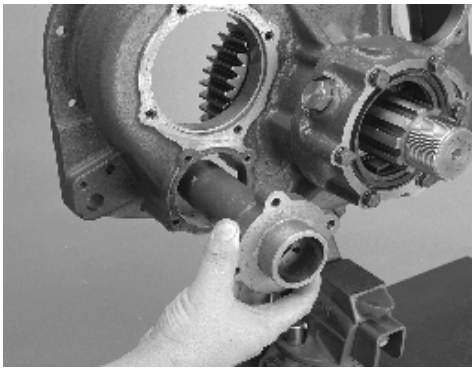
Procedure -



1. From the splitter cylinder cover, remove the capscrews, cover, and gasket.



2. Clean the gasket mounting surface of gasket material.
3. From the cylinder housing, remove the yoke bar.



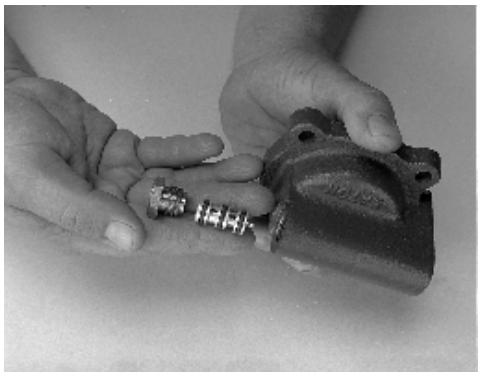
4. From the auxiliary housing, remove the splitter cylinder housing.

5. From the splitter cylinder cover, remove the insert valve retaining nut and insert valve.

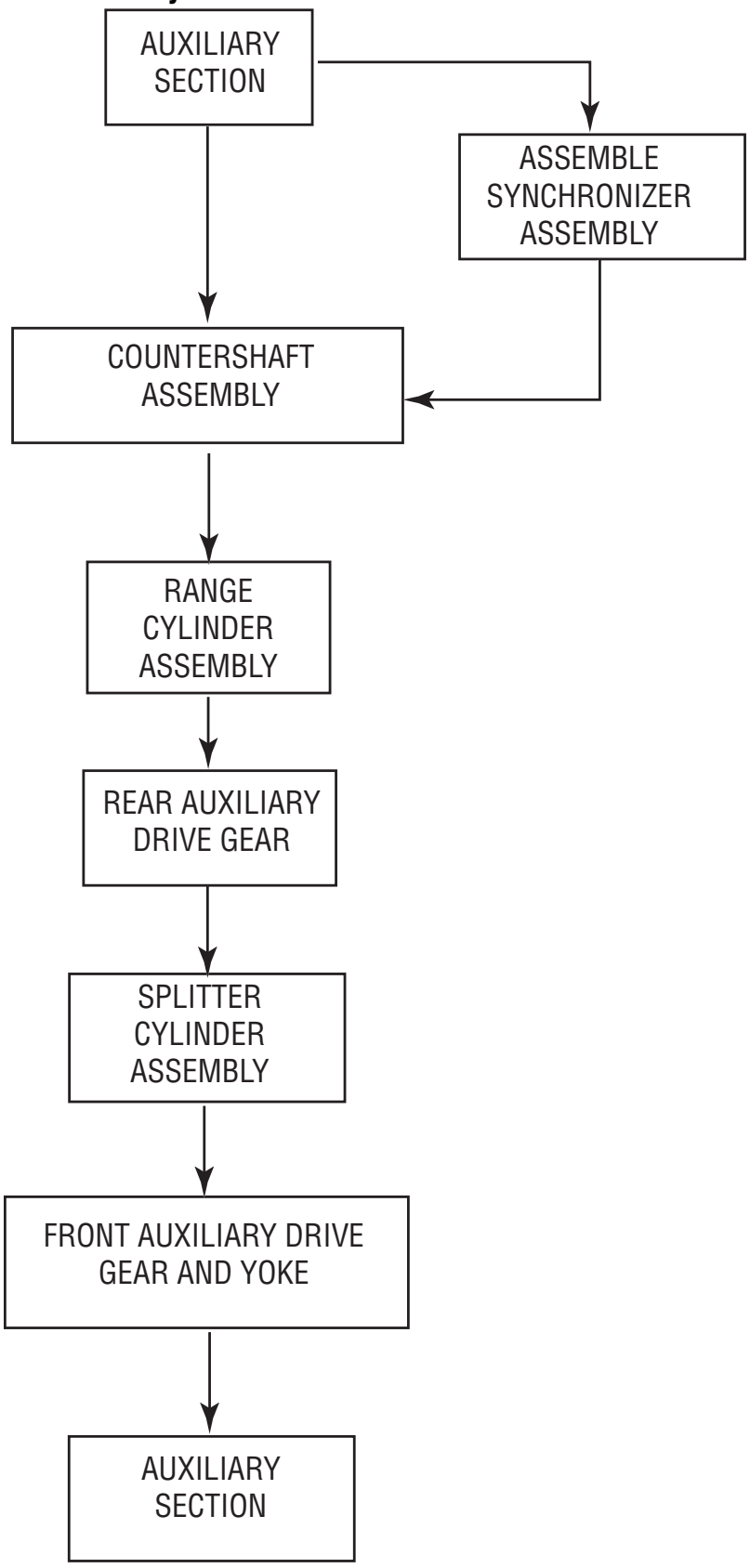
6. Inspect the insert valve and the cover bore for damage.

7. Inspect the yoke bar O-ring; remove if necessary.

8. Inside the cylinder housing bore; inspect the small O-ring, remove if damaged.



How to Assemble the Auxiliary Section



How to Assemble the Output Shaft Assembly

Special Instructions

For "A" Series, go to “A” Series Section.

Make sure the magnetic plugs are installed in the auxiliary housing.

Output shaft stack up should be done on a clean, flat surface.

When heating the bearings, do not heat bearings above 275°F (136°C).

When installing the rear bearing race, the proper depth is when the race shoulder is seated on bearing bore top.

Because the collar becomes distorted when compressed, do not use an old nylon collar in the rear bearing cover.

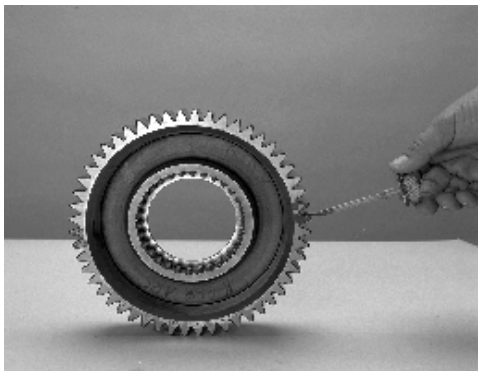
Special Tools

- Typical Service Tools
- Toolmaker’s dye
- Heat lamp or hot plate and oil
- Oil seal installation tool

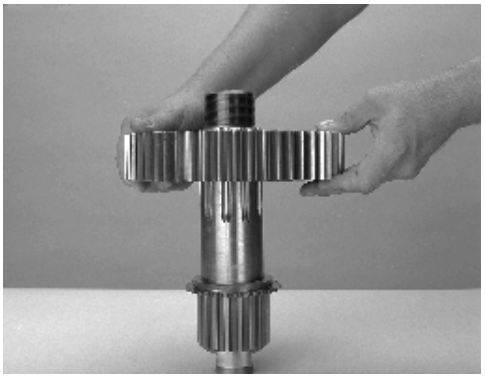
Procedure -

1. Use toolmaker’s dye and mark the LO range gear for timing purposes.

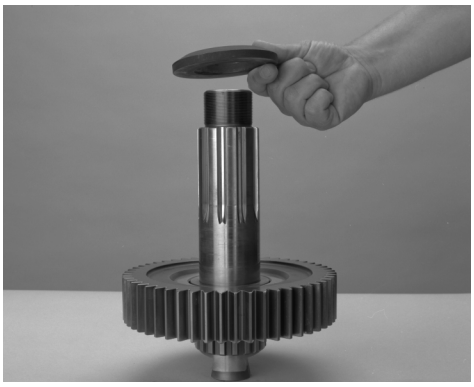
   Mark any two (2) adjacent teeth on the LO range gear. Repeat the procedure for the two (2) adjacent teeth directly opposite the first set marked.



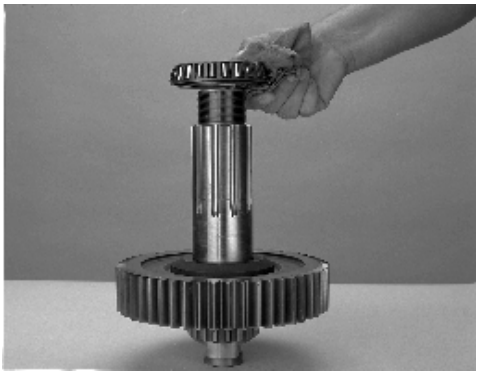
2. With splined washer facing up, place the washer on the output shaft shoulder.



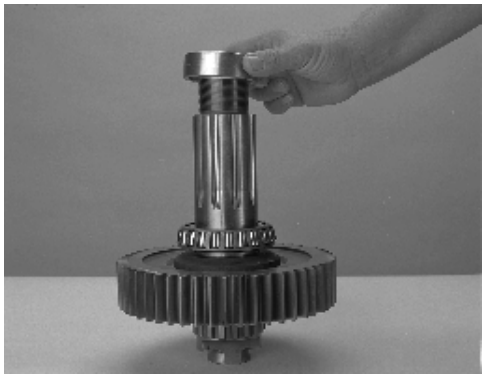
3. With LO range gear clutching teeth down, position LO range gear on the output shaft, engage the washer splines.



4. With chamfer side up, position the LO range gear rear washer on the output shaft against the LO range gear.

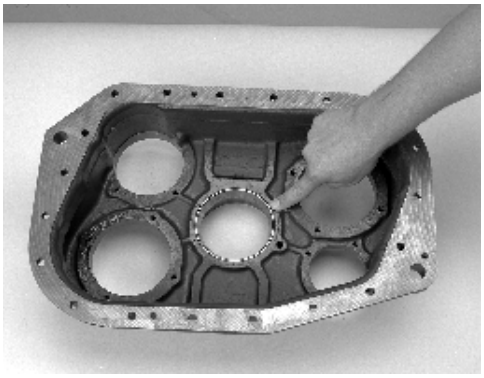


5. With tapered side up, use heat or appropriate driver and install the output shaft front rear bearing.

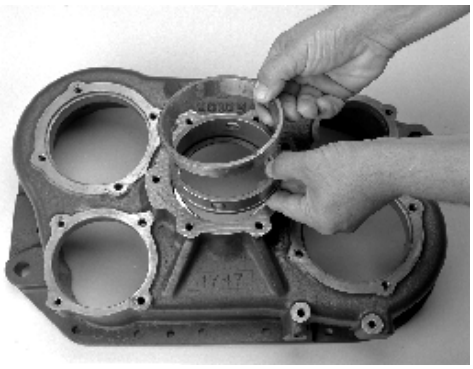


6. On the output shaft, position the bearing inner spacer. Set aside.

7. Lay the auxiliary housing front face up on a clean, flat surface. Install the front bearing cup.



8. Turn the auxiliary housing over, install the rear bearing spacer and rear bearing race in the bearing bore.



How to Assemble the Output Shaft Assembly (A Series)

Special Instructions

Make sure the magnetic plugs are installed in the auxiliary housing.

Output shaft stack up should be done on a clean, flat surface.

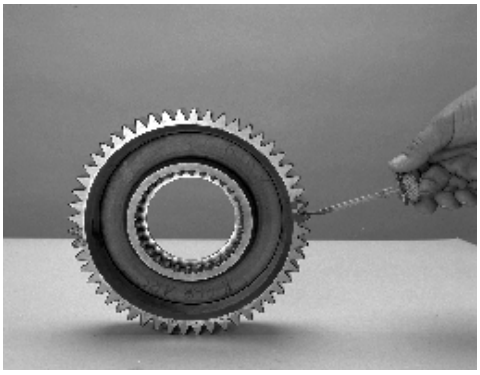
When heating the bearings, do not heat bearings above 275°F (136°C).

When installing the rear bearing race, the proper depth is when the race shoulder is seated on bearing bore top.

Because the collar becomes distorted when compressed, do not use old nylon collar on rear bearing cover.

Special Tools

- Typical Service Tools
- Toolmaker's dye
- Heat lamp or hot plate and oil
- Oil seal installation tool



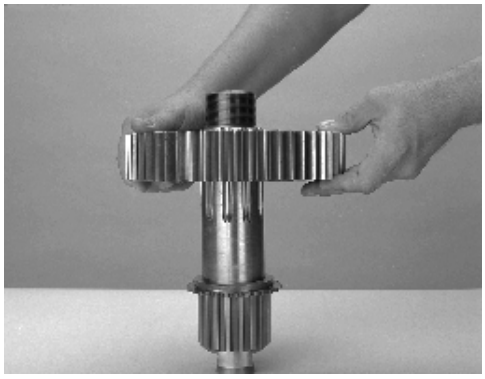
Procedure -

1. Use toolmaker's dye and mark the LO range gear for timing purposes.

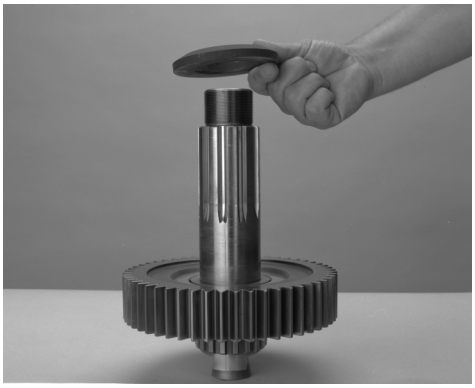
   Mark any two (2) adjacent teeth on the LO range gear. Repeat the procedure for the two (2) adjacent teeth directly opposite the first set marked.

2. With splined washer facing up, place the washer on the output shaft shoulder.

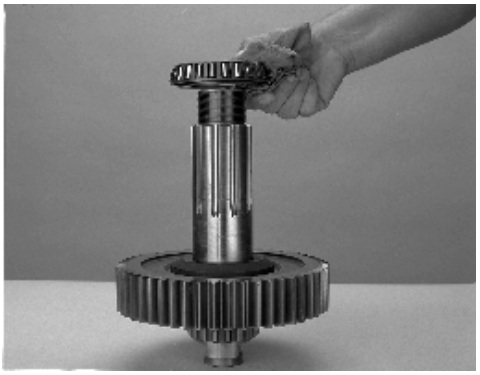
3. With LO range gear clutching teeth down, position LO range gear on the output shaft, engage the washer splines.



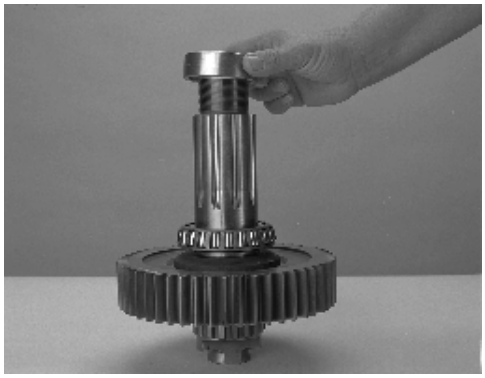
4. With chamfer side up, position the LO range gear rear washer on the output shaft against the LO range gear.

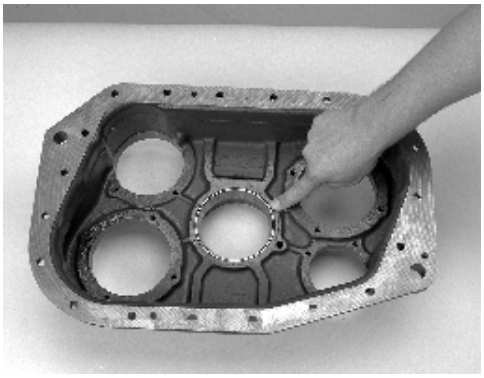


5. With tapered side up, use heat or appropriate driver and install the output shaft front rear bearing.

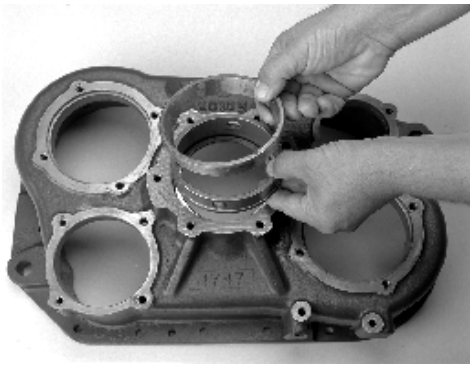


6. On the output shaft, position the bearing inner spacer. Set aside.

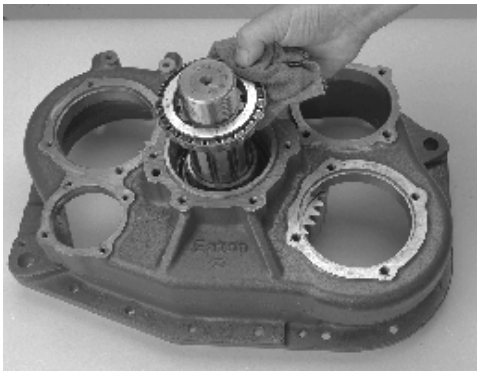




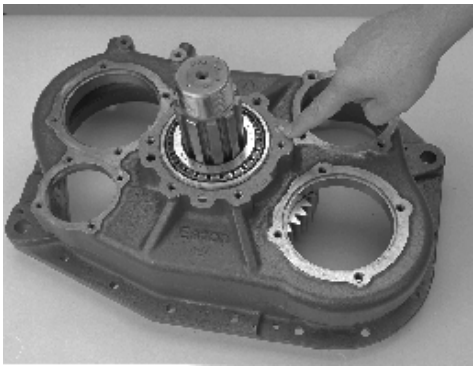
7. Lay the auxiliary housing front face up on a clean, flat surface. Install the front bearing cup.



8. Turn the auxiliary housing over, install the rear bearing spacer and rear bearing race in the bearing bore.



9. With the auxiliary housing rear up, set the housing over the output shaft.



10. With tapered side down, use heat or appropriate driver and install the output shaft rear bearing.

11. Position a new gasket on the rear bearing cover mounting surface, making sure the gasket oil return holes align with the case oil return holes.

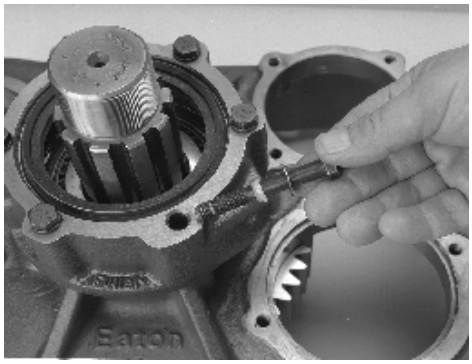
12. If previously removed, use an oil seal installation tool and install the oil seal in the rear bearing cover.

13. Position the rear bearing cover over the new gasket.

14. Apply Eaton/Fuller Sealant #71205 or equivalent to the retaining capscrews.

15. Install the five (5) retaining capscrews in the non-chamfered hole, tighten to 35-45 lb-ft of torque.

16. Install the nylon collar and brass washer in the chamfered hole, tighten to 35-45 lb-ft of torque.



Final Check

- Make sure the rear bearing is seated.
- Make sure the rear bearing capscrews are properly torqued.
- Make sure the output shaft rotates freely.

How to Install the Countershaft Assemblies (w/Tapered Bearings)

Special Instructions

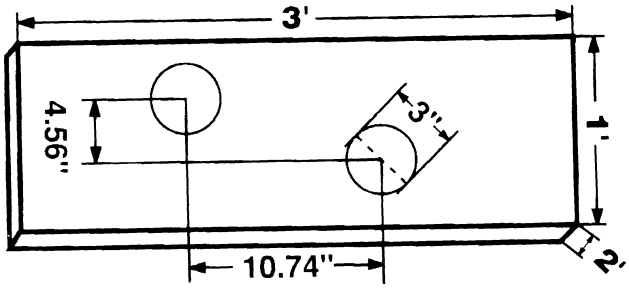
For "A" Series, go to “A” Series Section.

To make auxiliary section assembly easier, you can make an auxiliary section fixture out of a 2" x 12".

Make sure to use an auxiliary drive gear retaining bolt with thread sealant material.

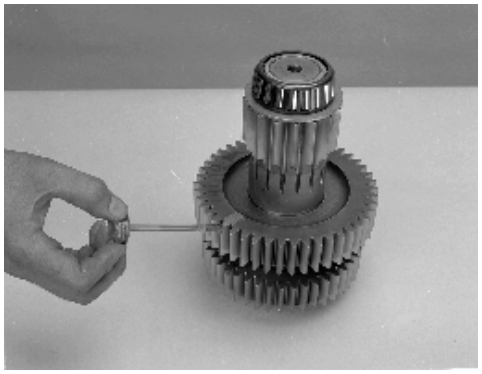
Special Tools

- Typical Service Tools
- Auxiliary countershaft retaining straps
- Toolmaker’s dye

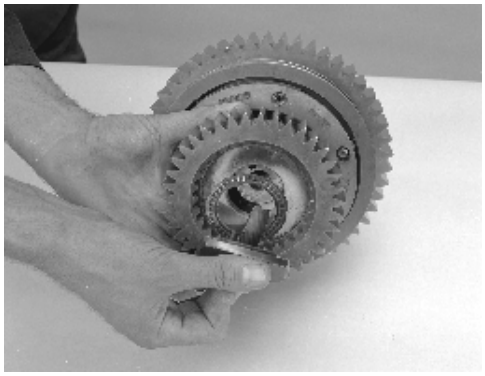


Procedure -

1. Place the countershaft assembly vertical on a clean, flat surface. If previously removed, use the proper driver and maul to install the countershaft bearings.



2. Mark each countershaft for correct timing. Locate the "O" stamped on the countershaft and mark the tooth with highly visible toolmaker's dye or paint.

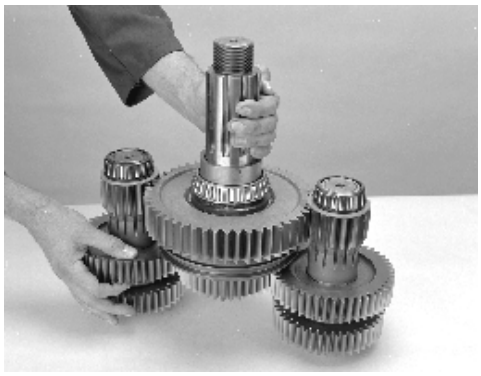


3. Install the synchronizer assembly on output shaft front.

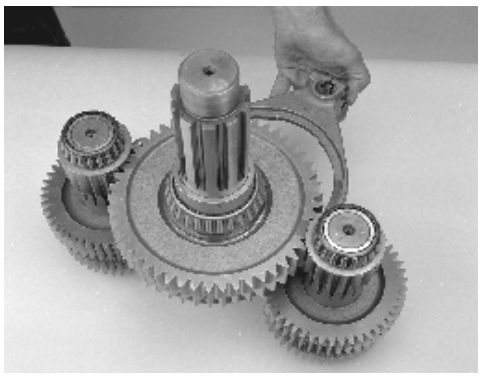
4. Place the thrust washer, the rear auxiliary drive gear, the thrust washer, the retainer and the 15/16" capscrew on the output shaft assembly. Finger tighten the capscrew.

5. Place the countershafts in the fixture or on a flat surface for reassembly. Turn the countershafts so that the two teeth marked on each LO range gear are towards the middle.

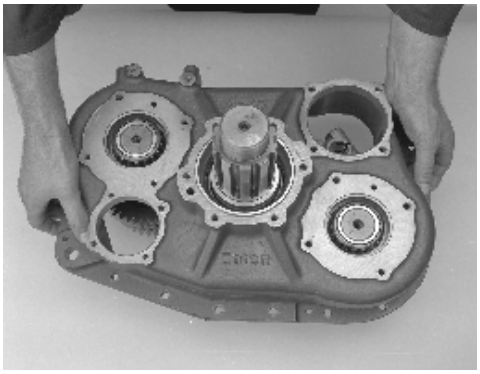
6. Align the output shaft between the countershafts, match the timing marks.



7. With range yoke offset side facing down, install into the synchronizer sliding slot.

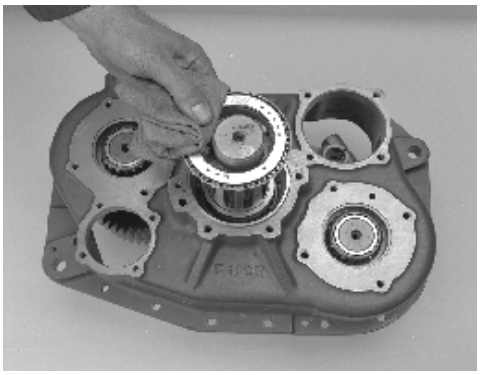


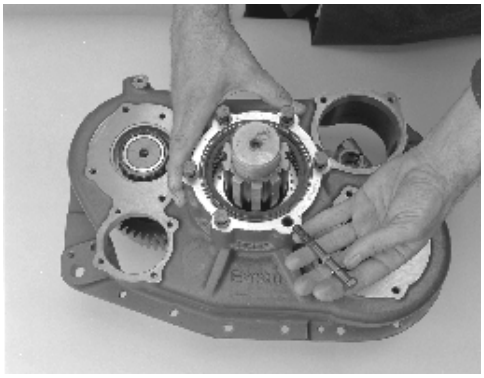
8. Place the auxiliary housing over the countershaft assemblies and the output shaft assemble.

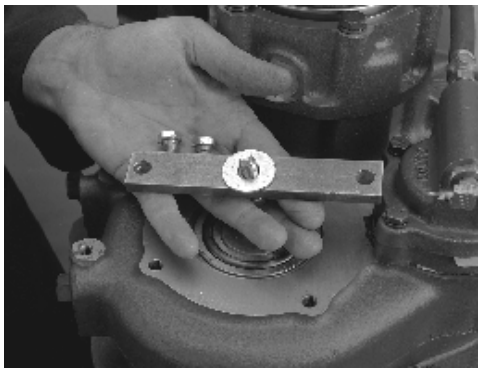


9. Heat the rear output bearing cone and install the bearing, tapered side down, on the shaft.

10. Position a new gasket on the rear bearing cover mounting surface.







11. Position the rear bearing cover.

12. Apply Eaton/Fuller Sealant #71205 or equivalent to the retaining capscrews.

13. Install the five (5) retaining capscrews in the non-chamfered hole, tighten to 35-45 lb-ft of torque.

14. Install the nylon collar and brass washer in the chamfered hole, tighten to 35-45 lb-ft of torque.

15. Install each auxiliary countershaft retaining strap with 2 - 3/8" NC x 1" and 1 - 3/8" NC x 2 -1/2" clean capscrews.

WARNING: Do not use an air gun. Tighten by hand until the capscrews are snug.

How to Install the Countershaft Assemblies (w/Ball Bearings) A Series

Special Instructions

For ease of assembly, mount the auxiliary section in a vise.

When Installing the countershaft assemblies into the countershaft bearings, keep the countershaft assemblies straight. Do not cock the countershafts.

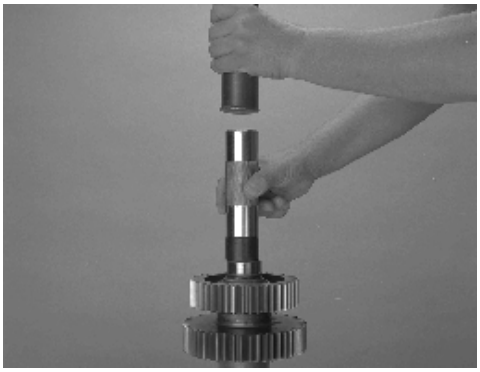
If, when the countershaft bearing cover is removed and you can not see the snap ring groove, install the cover and drive the countershaft further until you can see the groove.

Special Tools

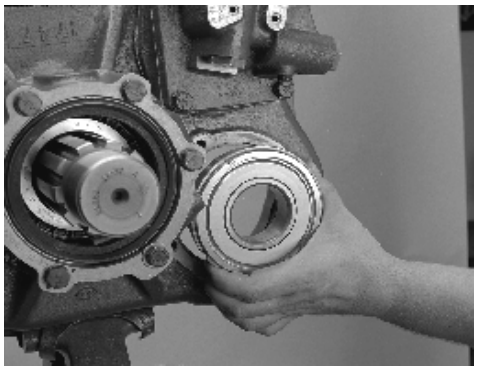
- Typical Service Tools
- Vise with brass jaws or wood blocks
- Bearing driver and a maul
- Toolmaker's dye
- Large snap ring pliers

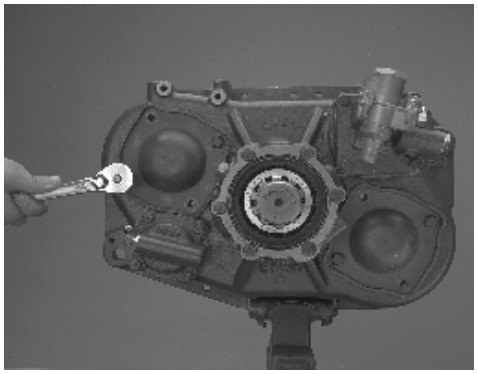
Procedure -

1. Place the countershaft assembly vertical on a clean, flat surface. If previously removed, using the proper driver and maul install the countershaft bearing race.

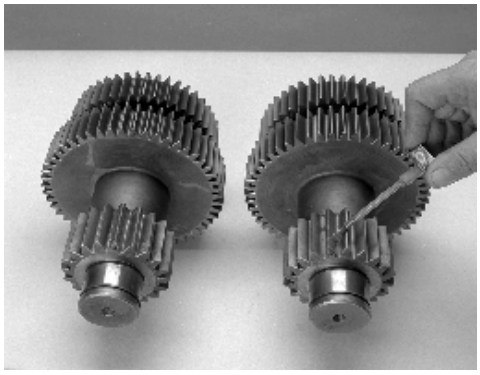


2. In the countershaft rear bearing bore, using the proper driver and maul, install the countershaft bearing.

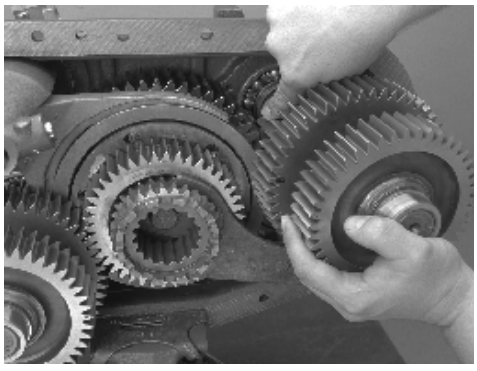




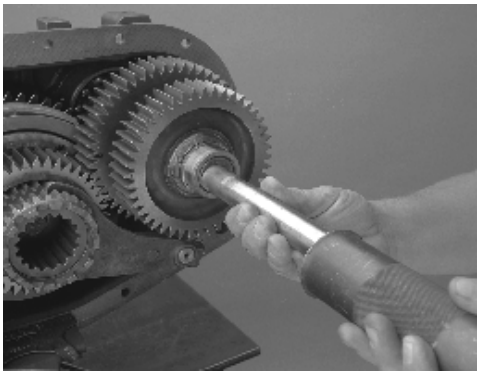
3. Temporarily install the rear bearing cover, use two (2) cap-screws and no gasket. The cover holds the bearing as the countershaft is driven into the bearing.



4. Use toolmaker's dye and mark the smaller LO range gear tooth that aligns with countershaft gear marked with an "O".



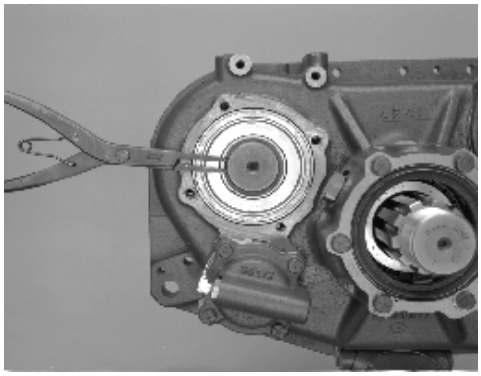
5. Position the countershaft in the auxiliary housing. Mesh the countershaft marked tooth with either set of LO range gear marked teeth.



6. Use a sort bar and maul and drive the countershaft into the countershaft bearing.

7. From the auxiliary housing rear, remove the countershaft bearing cover and install the rear countershaft snap ring in the snap ring groove.

8. Position a new gasket on the countershaft bearing cover mounting surface.

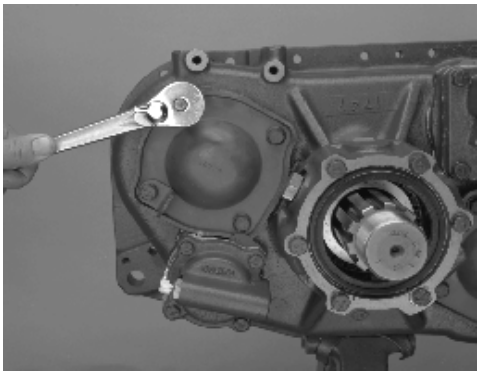


9. Position the countershaft bearing cover over the gasket.

10. Apply Eaton/Fuller sealant #71205 or equivalent to the retaining capscrews.

11. Install the capscrews, tighten to 35-45 lb-ft of torque.

12. Repeat all steps for other countershaft installation.



Final Check

- Check both countershafts for timing; the output shaft should rotate freely.
- Check capscrews for proper torque.

How to Assemble the Range Cylinder Assembly

Special Instructions

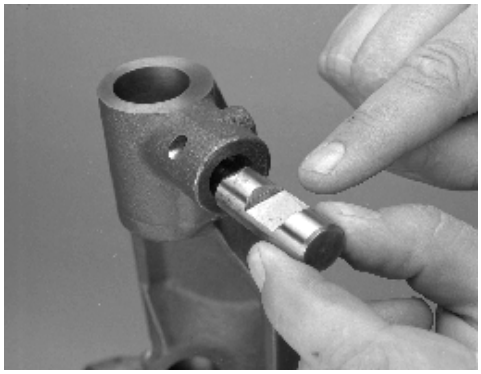
Apply Eaton lubricant #71214 or equivalent to all shift cylinder assembly and insert valve O-rings so a film covers the entire surface of each O-ring.

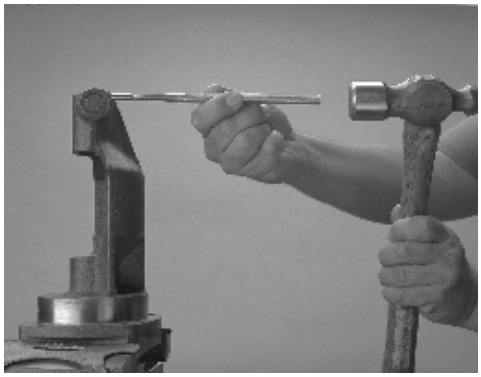
Apply Eaton rust preventative #71213 or equivalent to all shift cylinder walls and yoke bars, cover the entire yoke bar surface that comes in contact with the shift cylinder O-ring.

Apply Eaton lockwire #1619 or equivalent to the shift yoke capscrews. The lockwire should anchor each capscrew head securely to the yoke or to the second capscrew which fastens to the yoke bar. The lockwire should be twisted together, trimmed, and bent out of the way of other parts.

Special Tools

- Typical Service Tools



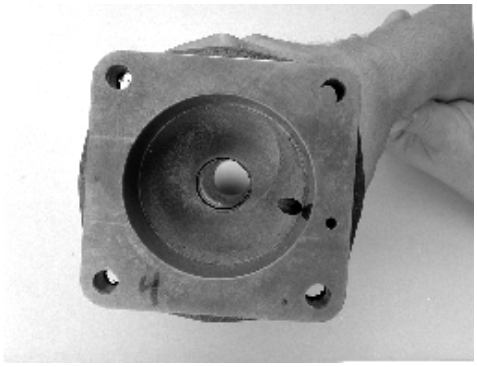


Procedure -

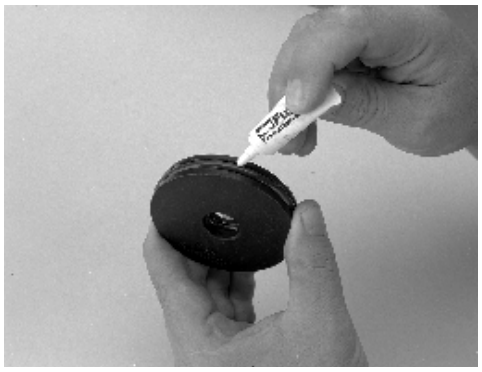
1. If previously removed, install the interlock pin in the cylinder housing. ("A" Series Only).

2. If previously removed, install the roll pin. ("A" Series Only).

3. If previously removed, in the cylinder housing bore, install the small O-ring.

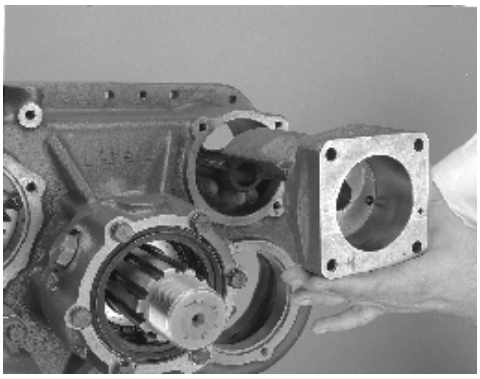


4. If previously removed, on the piston I.D. and O.D., install the piston O-rings.



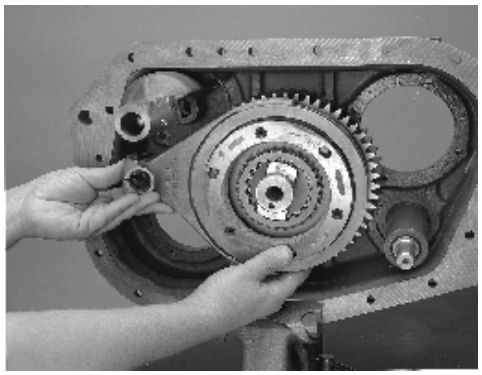
5. Position a new gasket on the cylinder housing mounting surface.

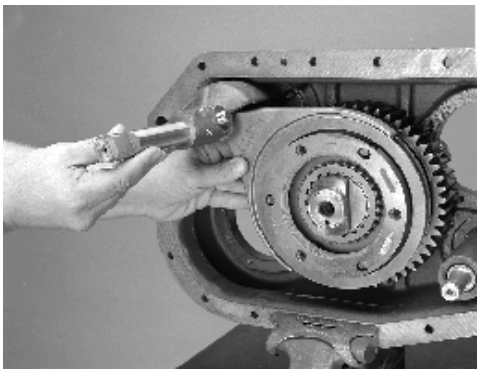
6. From the rear, with the air passage away from the rear bearing cover, install the cylinder housing.



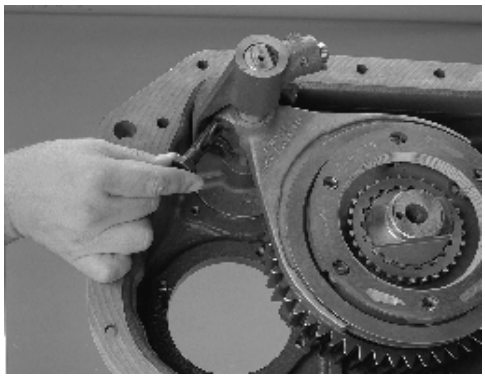
7. Place the range shift yoke, with the threaded yoke hub up and HI range synchronizer towards the front, in the sliding clutch slot.

8. Place the range shift yoke and synchronizer assembly on the output shaft, engaging the sliding clutch splines.

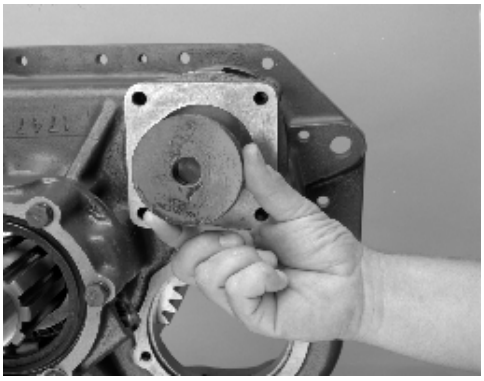




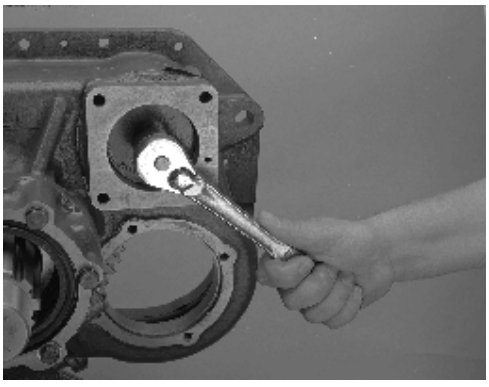
9. With the yoke bar threaded-end, insert the yoke bar into the range cylinder housing bore, through the range shift yoke hub. Align the bar notches with range shift yoke lockscrew holes.



10. Install the two (2) yoke bar retaining capscrews, tighten to 50-65 lb-ft of torque.

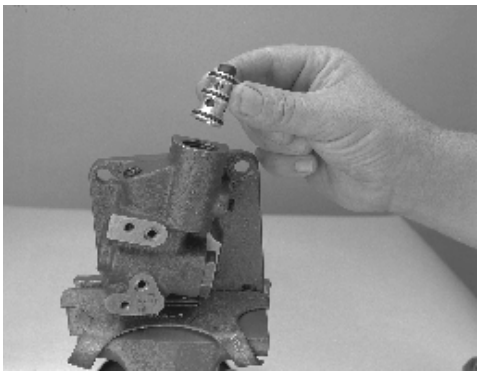


11. From the rear, insert the piston. Push it in as far as it will go.



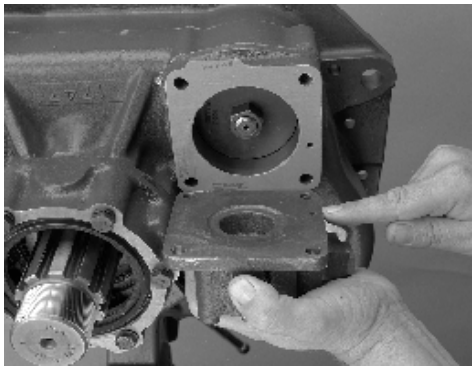
12. Secure the piston with the retaining nut, tighten to 70-85 lb-ft of torque.

13. If previously removed, install, in one of the cylinder cover bores, the insert valve, nipple in the proper direction.



14. If previously removed, install, over the insert valve, the insert valve retaining nut. Tighten the retaining nut to 40-50 lb-ft of torque. Repeat for other insert valve.

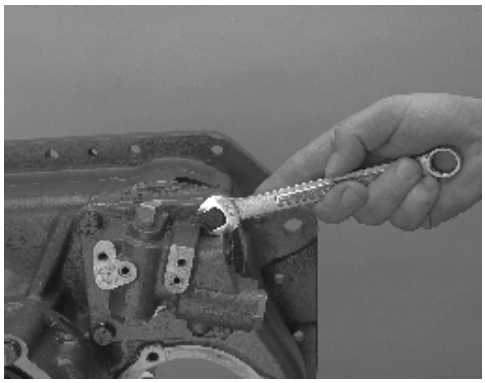
15. Position a new gasket on the cylinder housing cover mounting surface. The gasket air passage must align with the housing air passage.



16. Over the gasket, position the range cylinder cover.

17. Apply Eaton/Fuller sealant #71205 or equivalent to the retaining capscrews.

18. Install the capscrews, tighten to 20-25 lb-ft of torque.



Final Check

- Make sure all capscrews are tighten to their proper torque.
- Make sure gaskets were used at the appropriate positions.

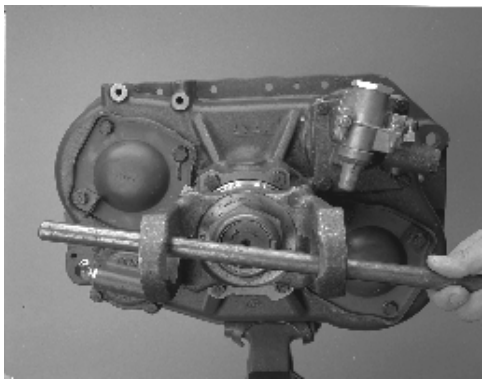
How to Install the Rear Auxiliary Drive Gear

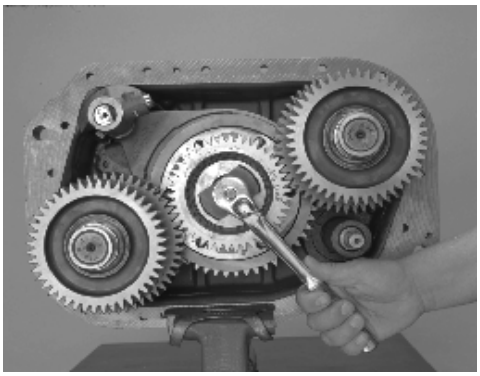
Special Instructions

None

Special Tools

- Typical Service Tools
- A vise with brass jaws or wood blocks
- Output yoke and breaker bar





Procedure -

1. Temporarily install the output yoke.
2. To keep the output shaft from turning, insert and hold the breaker bar.
3. Tighten the auxiliary drive gear retainer bolt to 90-120 lb-ft of torque. Remove the breaker bar and output yoke.

Final Check

- Make sure the auxiliary drive gear retainer bolt is properly torqued.

How to Assemble the Splitter Cylinder Assembly

Special Instructions

Apply Eaton lubricant #71214 or equivalent to all shift cylinder assembly and insert valve O-rings so a film covers the entire surface of each O-ring.

Apply Eaton rust preventative #71213 or equivalent to all shift cylinder walls and yoke bars, cover the entire yoke bar surface that comes in contact with the shift cylinder O-ring.

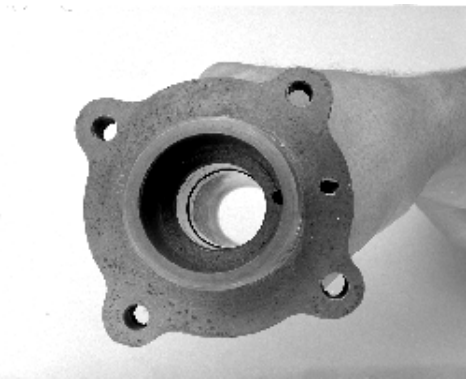
Apply Eaton lockwire #1619 or equivalent to the shift yoke capscrews. The lockwire should anchor each capscrew head securely to the yoke or to the second capscrew which fastens to the yoke bar. The lockwire should be twisted together, trimmed, and bend out of the way of other parts.

Special Tools

- Typical Service Tools
- A vise with brass jaws or wood blocks

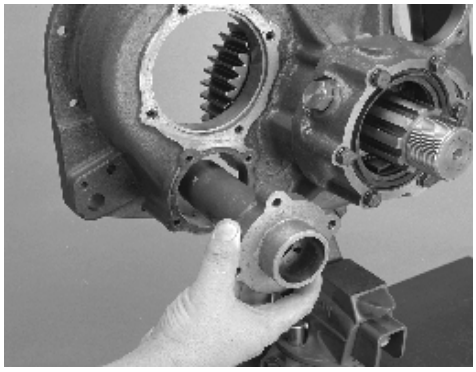
Procedure -

1. If previously removed, in the cylinder housing bore, install the small O-ring.



2. If previously removed, on the piston O.D., install the piston O-ring.

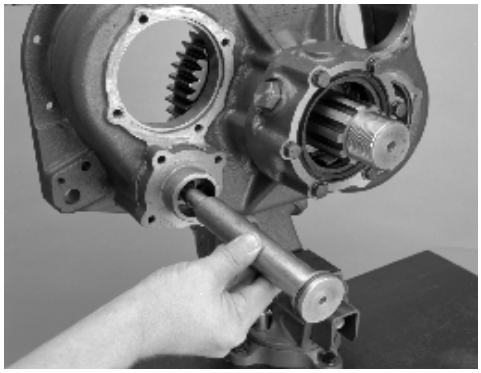
How to Assemble the Auxiliary Section



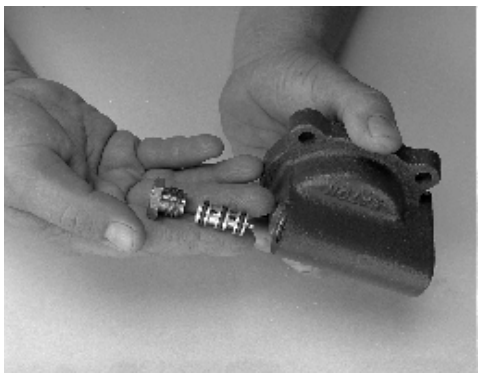
3. Place the auxiliary housing upright in a vise.

4. Position a new gasket on the cylinder housing mounting surface.

5. From the rear, with the air passage towards the rear bearing cover, install the cylinder housing.

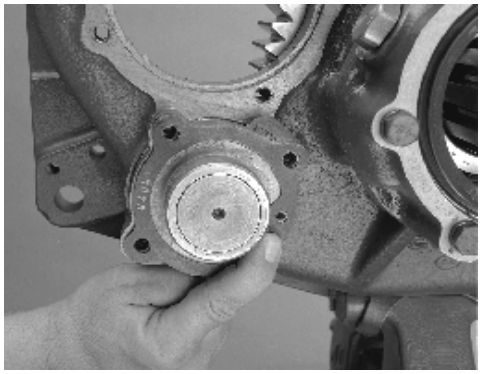


6. From the rear, insert the piston. Make it flush with the cylinder housing.



7. If previously removed, install in the cylinder cover bore the insert valve, nipple in the proper direction.

8. If previously removed, install over the insert valve the insert valve retaining nut. Tighten the retaining nut to 40-50 lb-ft of torque.

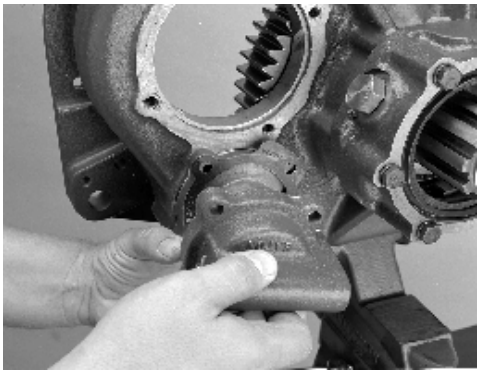


9. Position a new gasket on the cylinder housing cover mounting surface. The gasket air passage must align with the housing air passage.

10. Position the splitter cylinder cover over the gasket.

11. Apply Eaton/Fuller sealant #71205 or equivalent to the retaining capscrews.

12. Install and tighten the retaining capscrews to 20-25 lb-ft of torque.



Final Check

- Make sure the retaining nut and capscrews are tighten to proper torque.
- Make sure gaskets were used at appropriate positions.

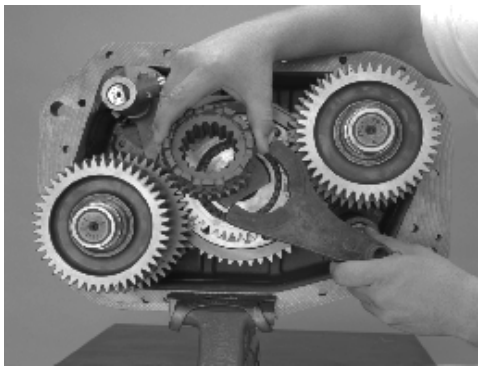
How to Install the Front Auxiliary Drive Gear

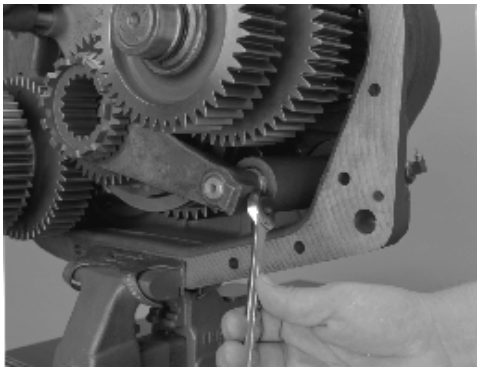
Special Instructions

Make sure the splitter yoke bar lockscrew hole aligns with the yoke lockscrew hole.

Special Tools

- Typical Service Tools
- A vise with brass jaws or wood blocks





Procedure -

1. Place the shift yoke in splitter sliding clutch slot. Install the clutch and yoke on the splitter yoke bar.

2. Install the lockscrew and tighten to 35-45 lb-ft of torque. Lockwire securely.

How to Disassemble the Synchronizer Assembly

Special Instructions

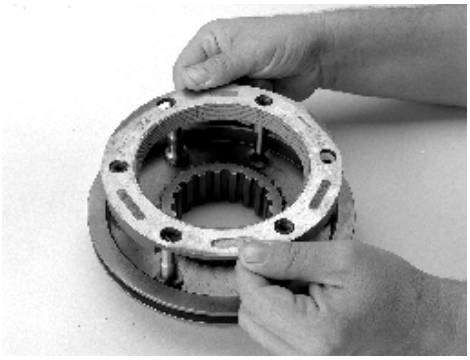
Place the synchronizer assembly on a clean, flat surface. Cover the synchronizer assembly with a shop rag to prevent losing the three (3) springs under pressure from the HI range synchronizer pin locations.

Special Tools

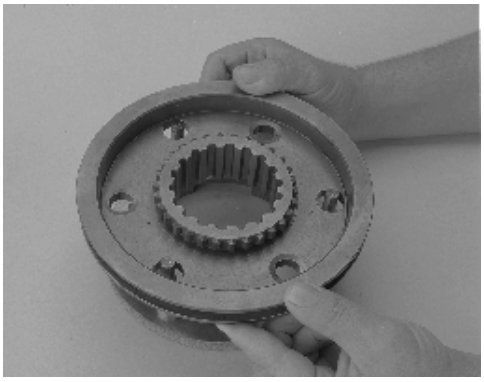
- Shop rag

Procedure -

1. Place the larger LO range synchronizer ring on the bench.
2. Grab both sides of the HI range synchronizer and pull.



3. From the synchronizer ring LO range pins, remove the sliding clutch.



How to Assemble the Synchronizer Assembly

Special Instructions

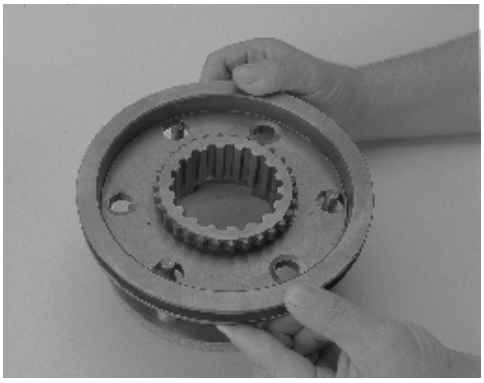
Assembly should be done on a clean, flat surface slightly lower than your waist.

Pins on the Low range synchronizer must line up with the chamfered holes on the sliding clutch bottom.

When compress the HI range synchronizer springs cover with a shop rag. In the event compression is not achieved the first time, this prevents the springs from leaving the bench area.

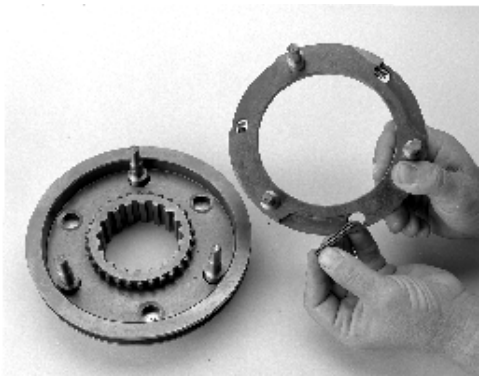
Special Tools

- Shop rag



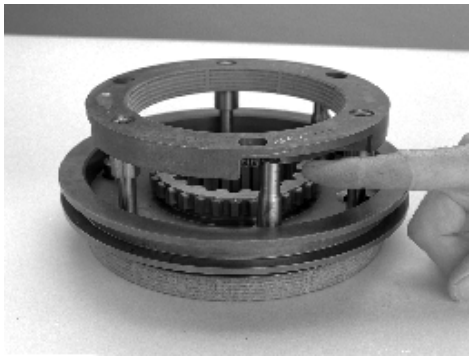
Procedure -

1. On the bench place the larger LO range synchronizer ring face down with pins up.
2. With the sliding clutch recessed side up, place the sliding clutch on the LO range synchronizer pins.



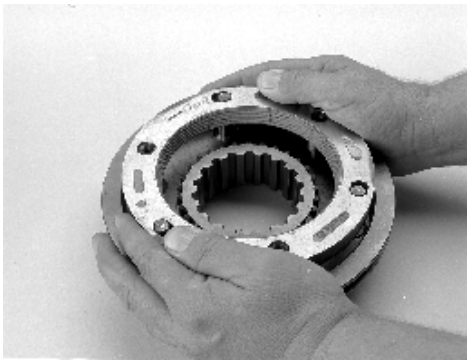
3. In the HI range synchronizer bores, install the three (3) springs.

4. Place the HI range synchronizer ring over the LO range synchronizer ring. Rotate the HI range synchronizer until the springs are seated against the pins.



5. With the shop rag, cover the assembly.

6. Apply downward pressure to the HI range synchronizer ring while twisting counterclockwise. This compresses the springs to fully seat HI range on the LO range synchronizer.



Final Check

- Make sure there are three springs and are fully compressed.
- Make sure you can move the sliding clutch from HI to LO range and back.

How to Remove the Integral Oil Pump

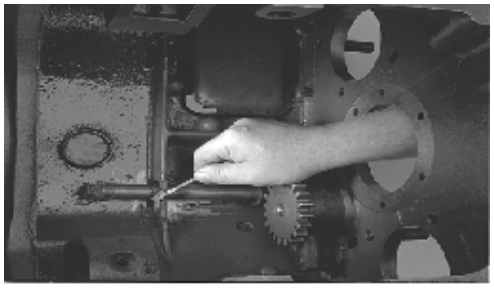
Special Instructions

None

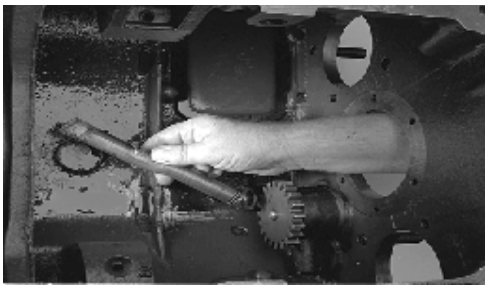
Special Tools

- Typical Service Tools

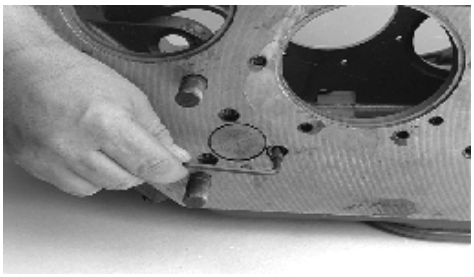
Procedure -



1. Straighten tube lock on suction tube.



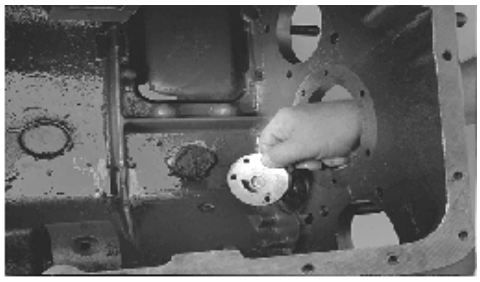
2. Remove suction tube from oil pump. If necessary, remove O-ring from suction tube.



3. Remove three (3) allen head capscrews and washers that retain the integral oil pump to the case.

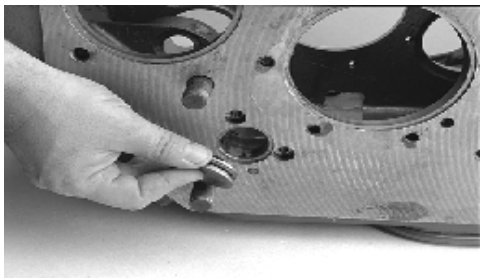
4. Remove the integral oil pump assembly from inside the case.

5. Remove the integral oil pump retainer plate from inside the case.



6. If necessary, the front case plug can be removed from the case. To remove, insert a bar from inside the case and tap the plug out.

7. Inspect the plug O-ring, replace if damaged.



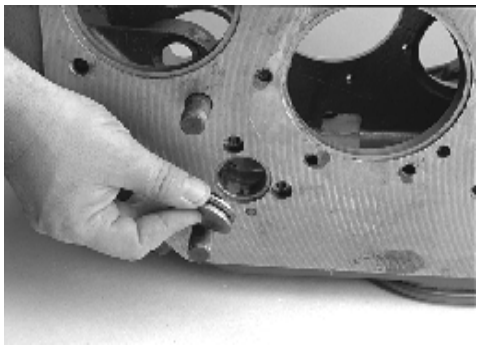
How to Install the Integral Oil Pump

Special Instructions

Lubricate the case front plug O-ring with Eaton/Fuller lubricant #71206 or equivalent.

Special Tools

- Typical Service Tools

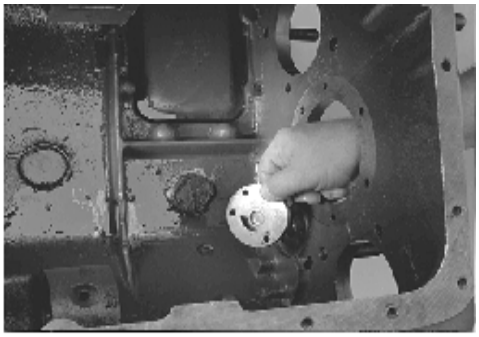


Procedure -

1. If removed, replace the front case pump plug O-ring. lubricate the grove of the plug, install the O-ring onto the plug, and then lubricate the outer diameter of the O-ring.

2. Seat the front case pump plug in the case bore by hand. Do not install the pump plug using any type of impact tool (i.e. hammer, maul, etc.).

   Note: P/N 4303107 retainer plate, which has a smaller outside diameter, must be used with maincase machined after April 1995. If an older oil pump assembly is installed into a new case, P/N 20510 retainer plate will not seat properly in the spot face machined in the case wall

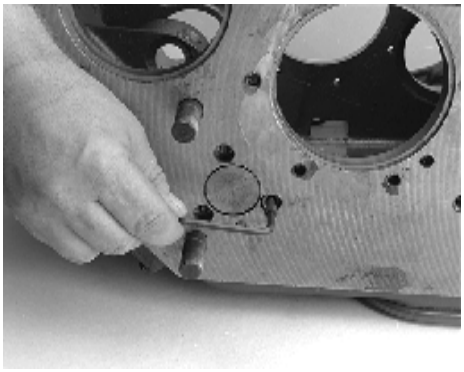


3. With the retainer bore facing the case rear, install the integral oil pump over the alignment pin inside the case.

4. Align oil pump with retainer and alignment pin and install the integral oil pump assembly.

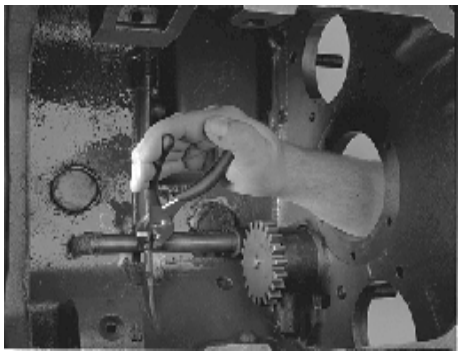
5. Install three (3) allen head capscrews and washers through the case front and into the pump housing. Tighten the capscrews to 8-12 lb-ft of torque.

6. Replace the O-ring on the suction tube.



7. Install the tube under the case rib and into the integral oil pump.

8. Bend the suction tube lock over the case rib.



Final Check

- Make sure the integral oil pump drive gear can turn.

How to Disassemble the Integral Oil Pump

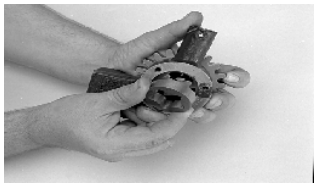
Special Instructions

None

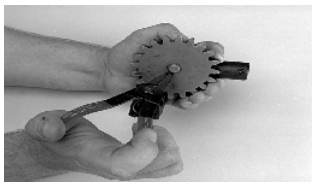
Special Tools

- Typical Service Tools
- A vise with brass jaws or wood blocks

Procedure -



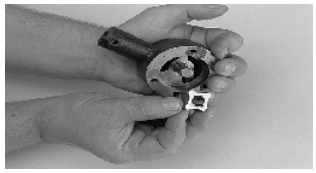
1. From the assembly, remove the outer oil pump element.



2. From the drive shaft, remove the drive gear retaining snap ring.
3. From the pump drive shaft, remove the drive gear.

4. From the drive shaft keyway, remove the key.

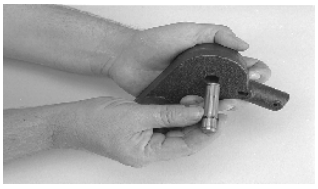
5. From the drive shaft, remove the element snap ring.



6. From the drive shaft, remove the internal oil pump element.

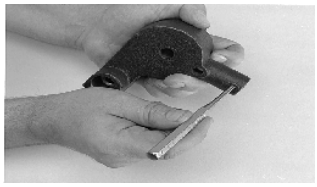
7. From the drive shaft keyways, remove the two (2) keys.

8. From the integral oil pump housing, remove the drive shaft.

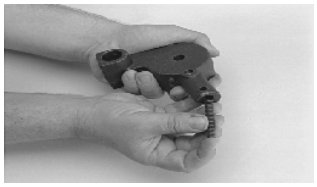


9. If damaged, from the drive shaft, remove the rear drive gear retention snap ring.

10. From the pump housing, remove the relief valve roll pin.

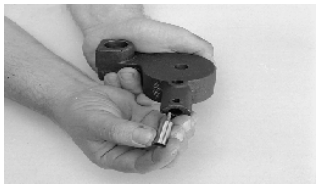


11. From the relief valve housing bore, remove the relief valve spring.



12. From the housing bore, remove the relief valve.

13. Inspect all parts for damage, replace damaged parts.



How to Assemble the Integral Oil Pump

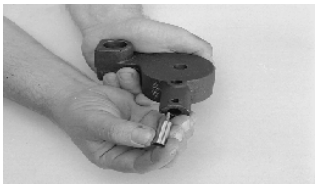
Special Instructions

When installing the drive shaft keys, the round key goes in the round keyway and the square key in the square keyway.

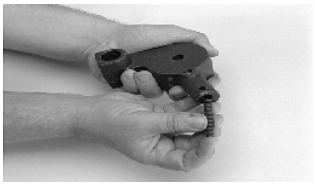
Special Tools

- Typical Service Tools
- A vise with brass jaws or wood blocks

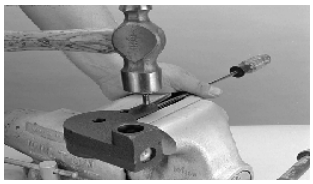
Procedure -



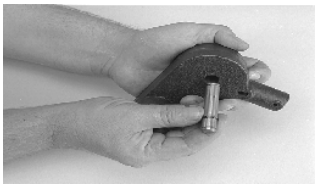
1. Install the relief valve in the integral oil pump housing.



2. Install the relief valve spring in oil pump housing.

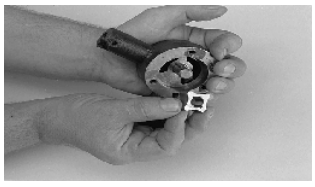


3. Secure the oil pump housing in a vice.
4. Depress the relief valve spring and drive the relief valve retention roll pin into the roll pin bore.



5. If removed, replace the drive shaft snap ring on the pump drive shaft.
6. Insert the drive shaft through the pump housing bore.

7. Install the two (2) keys on the drive shaft.



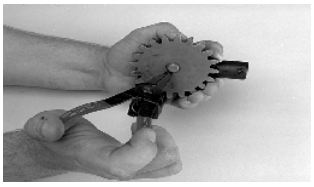
8. Align the inner element keyways with the drive shaft keys and install the integral oil pump inner element.

9. Install the inner element retention snap ring in drive shaft snap ring groove.

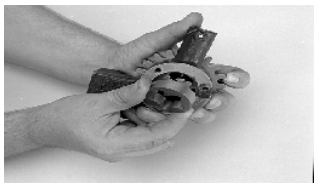
10. Install drive gear key in drive shaft keyway.

11. Align drive gear keyway with drive shaft key and install the drive gear on the drive shaft.

12. Install the outer drive gear retention snap ring in drive shaft groove.



13. Install the outer integral oil pump element over the inner element.



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