

Eaton Fuller® HD FR/FRO Transmissions TRSM2400 EN-US

May 2016

FR-11210B	FRO-11210C	FROF-11210B
FR-12210B	FRO-12210B	FROF-11210C
FR-13210B	FRO-12210C	FROF-12210B
FR-14210B	FRO-13210B	FROF-12210C
FR-15210B	FRO-13210C	FROF-13210B
FR-9210B	FRO-14210B	FROF-13210C
FRF-11210B	FRO-14210C	FROF-14210B
FRF-12210B	FRO-15210B	FROF-14210C
FRF-13210B	FRO-15210C	FROF-15210B
FRF-14210B	FRO-16210B	FROF-15210C
FRF-15210B	FRO-16210C	FROF-16210B
FRF-9210B	FRO-17210C	FROF-16210C
FRO-11210B	FRO-18210C	



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Roadranger

SUPPORT

Warnings and Precautions

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 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 Technician or vehicle operator.



Failure to follow indicated procedures creates a high risk of personal injury to the Service Technician.



Failure to follow indicated procedures may cause component damage or 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.

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Purpose and Scope of Manual

This Manual is designed to provide information necessary to service and repair the Eaton Fuller Transmissions listed on the front.

How to use this Manual

The service procedures have been divided into two sections: In-Vehicle Service Procedures and Transmission Overhaul Procedures—Bench Service. In-Vehicle Service Procedures contain procedures that can be performed while the Transmission is still installed in the vehicle. Transmission Overhaul Procedures contain procedures that are performed after the Transmission has been removed from the vehicle.

The procedure sections are laid out with a general heading at the top outside edge of each page followed by more specific headings and the procedures. To find the information you need in these sections, first go to the section that contains the procedure you need. Then look at the heading at the top and outside edge of each page until you find the one that contains the procedure you need.

Transmission Overhaul Procedures follow the general steps for complete disassembly and then assembly of the Transmission.

Note: In some instances the Transmission appearance may be different from the illustrations, but the procedure is the same.

Disassemble Precautions

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 (How to Remove the Gear Shift Lever). This assembly **MUST** be detached from the Shift Bar Housing before the Transmission can be removed.

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 a 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 Countershafts, 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.

Introduction

Inspection Precautions

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

- 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.
- Lubricate bearings that are not pitted, discolored, or spalled and check for axial and radial clearances.
- Replace bearings with excessive clearances.
- Check bearing fit. Bearing inner races should be tight to shaft; outer races slightly tight to slightly loose in case bore. If the bearing spins freely in the bore the case should be replaced.

Bearing Covers

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

Clutch Release Parts

- Check clutch release parts. Replace yokes worn at cam surfaces and bearing carrier worn at contact pads.
- Check pedal shafts. Replace those worn at bushing surfaces.

Gears

- 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.
- 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.
- Check axial clearance of gears.

Gear Shift Lever Housing Assembly

- Check spring tension on Shift Lever. Replace Tension Spring if Lever moves too freely.
- 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

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

Oil Return Threads and Seals

- Check oil return threads on the Input Shaft. If return action of threads has been destroyed, replace the Input Shaft.
- Check Oil Seal in Rear Bearing Cover. If sealing action of lip has been destroyed, replace seal.

O-Rings

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

Reverse Idler Gear Assemblies

- Check for excessive wear from action of roller bearings.

Shift Bar Housing Assembly

- Check for wear on Shift Yokes and Block at pads and lever slot. Replace excessively worn parts.
- Check Yokes for correct alignment. Replace sprung Yokes.
- If housing has been disassembled, check Shift Shaft and all related parts for wear.

Sliding Clutches

- Check all Shift Yokes and Yoke Slots in Sliding Clutches for extreme wear or discoloration from heat.
- Check engaging teeth of Sliding Clutches for partial engagement pattern.

Splines

- Check splines on all shafts for abnormal wear. If Sliding Clutch Gears, Companion Flange, or Clutch Hub has wear marks in the spline sides, replace the specific shaft effected.

Synchronizer Assembly

- Check Synchronizer for burrs, uneven and excessive wear at contact surface, and metal particles.
- Check Blocker Pins for excessive wear or looseness.
- Check Synchronizer contact surfaces on the Synchronizer Cups for wear.

Washers

- Check surfaces of all washers. Washers scored or reduced in thickness should be replaced.

Introduction

Assembly Precautions

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 assembly.

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 Lubricant 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 650–700 lb. 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 assembly of the Transmission.

Serial Tag Information and Model Nomenclature

Transmission model designation and other Transmission Identification information are stamped on the Serial Tag. To identify the Transmission Model and Serial Number, locate the Tag on the Transmission and then locate the numbers as shown. Figure 1-1 below shows the Tag which is located on the Transmission.

When calling for service assistance or parts, have the Model and Serial Numbers handy.

Do not remove or destroy the Transmission Identification Tag!

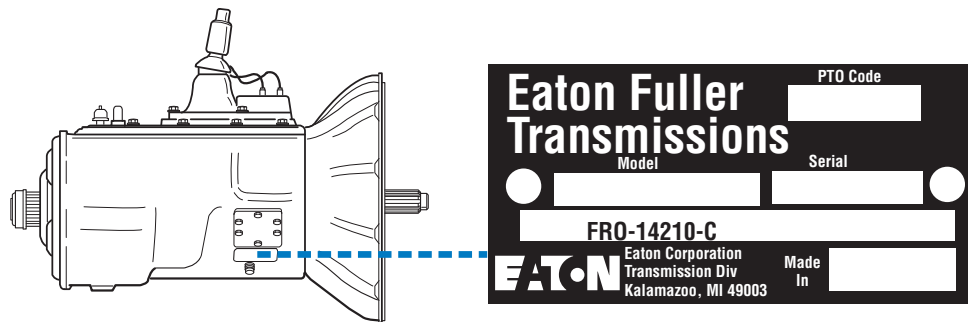
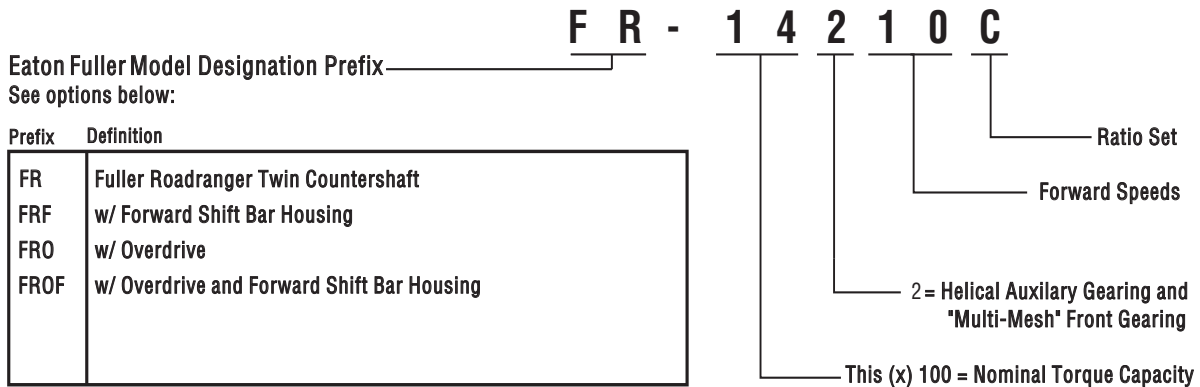


Fig 1-1

Transmission Tag and Location

Model Number

The Model Number gives basic information about the Transmission and is explained below. Use this number when calling for service assistance or replacement parts.



Serial Number

The Serial Number is the sequential identification number of the Transmission. Before calling for service assistance, write the number down as it may be needed.

Bill of Material or Customer Number

This number may be located below the Model and Serial Numbers. It is a reference number used by Eaton®.

Model Designations

Model Options

Torque Rating

The torque rating of the Transmission specified in the Model Number is the Input Torque Capacity in lb. ft. Various torque ratings are available. For more information, call the Roadranger Help Desk at 1-800-826-HELP (4357).

Two types of Shift Bar Housings are available for this Transmission. Both are described and shown below.

Shift Bar Housings

Standard: The standard Shift Bar Housing has a Gear Shift Lever opening that is located toward the rear of the Transmission. The Housing is shown in figure 1-2.

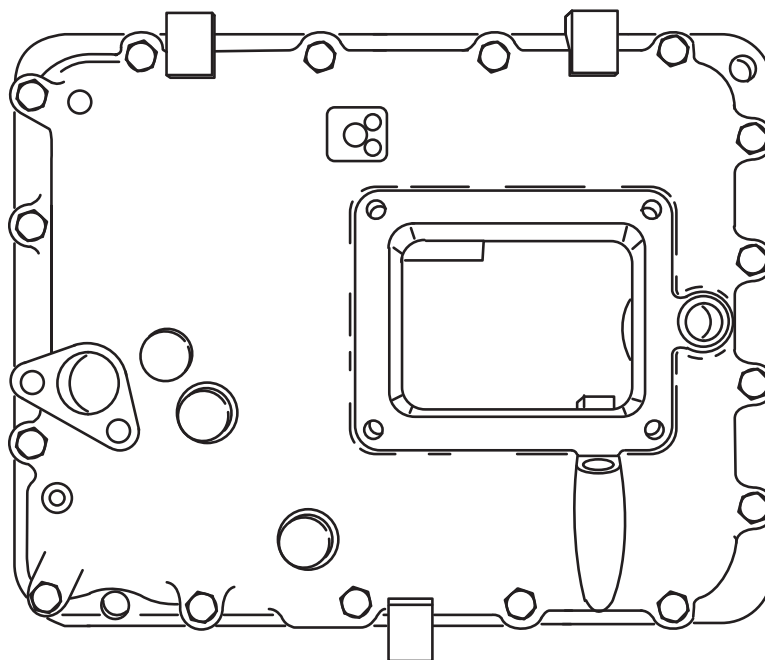


Fig 1-2

Forward Opening: The Forward Opening Shift Bar Housing has a Gear Shift Lever opening located three inches closer to the front of the Transmission than the standard opening. This forward design allows greater flexibility in mounting the Transmission and is indicated by an "F" in the Model Number. The Housing is shown in figure1-3.

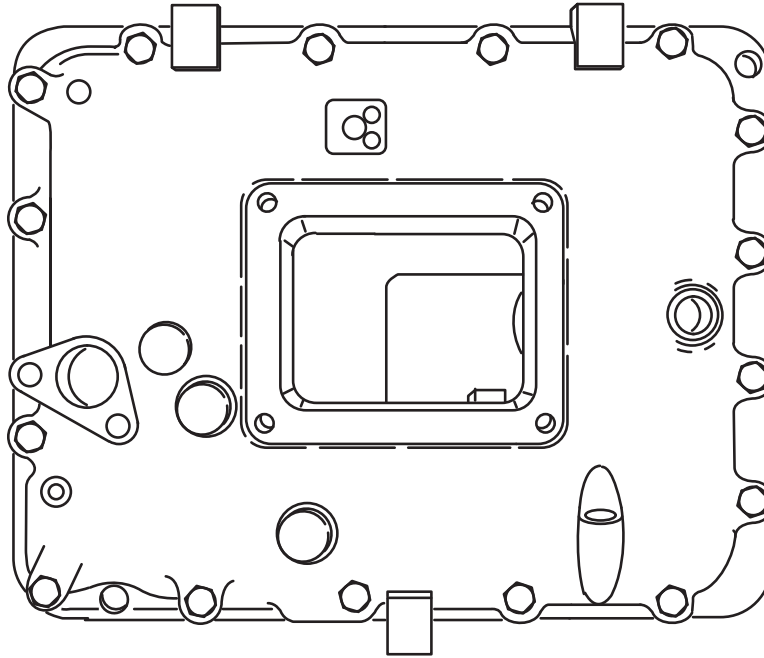


Fig 1-3

Lubrication Pumps

Two types of lubrication pumps are available for use on this Transmission and are described below:

PTO Driven: A PTO Driven Pump is externally mounted on the 6 or 8 bolt PTO openings and driven off the PTO Gear.

Auxiliary Countershaft: An Auxiliary Countershaft Pump is mounted on the rear of the Transmission and driven off the Auxiliary Countershaft.

Power Take Off (PTO) Usage

PTO's can be mounted in the following ways:

6 or 8 Bolt: The 6 or 8 bolt openings are standard with the Transmission. The PTO is mounted to the opening and driven from the PTO Gear on the Front Countershaft.

Thru-Shaft: The Thru-Shaft PTO mounts on the rear of the Transmission. It requires a special Auxiliary Housing and Main Case Countershaft with internal splines.

Lubrication

Transmission Lubrication

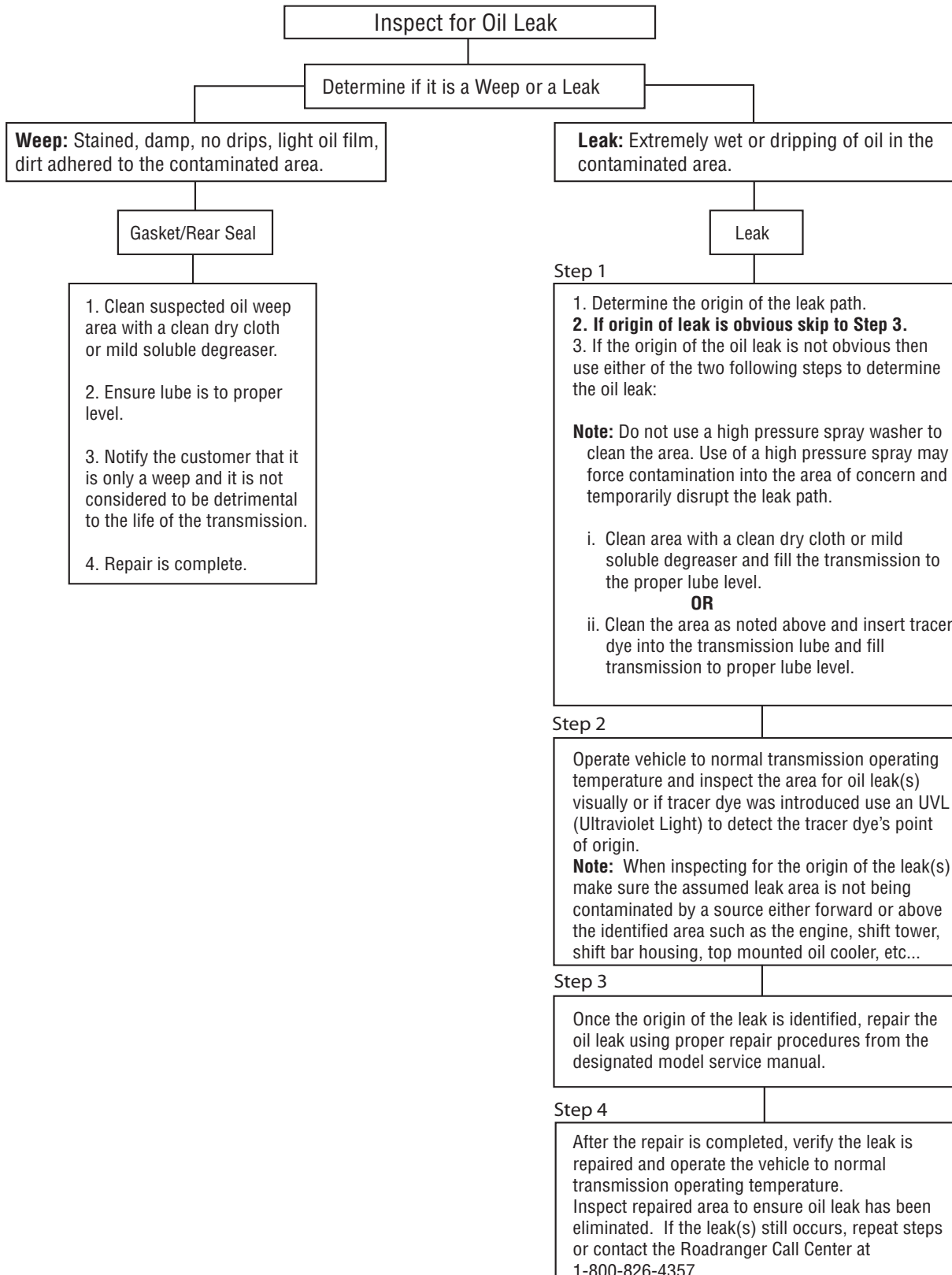
Reference Lubrication Manual TCMT-0021 on Roadranger.com or call 800-826-4357 for a list of approved transmission lubricants.

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



Transmission Filters should be changed during regular lube intervals. Inspection of the Transmission Filter should be conducted during preventive maintenance checks for damage or corrosion. Replace as necessary.

Oil Leak Inspection Process



Tools

Tool Specifications

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.

For the most part, ordinary mechanic's tools such as socket wrenches, screwdrivers, etc., and other standard shop items such as a Press, Mails and Soft Bars are the only tools needed to successfully disassemble and reassemble any Eaton®Fuller® Transmission.

The following tables list and describe the typical tools required to properly service this model Transmission above and beyond the necessary basic wrenches, sockets, screwdrivers, and prybars.

General Tools

The following tools are available from several tool manufacturers such as Snap-On, Mac, Craftsman, OTC, and many others.

Tool	Purpose
0–100 lb. ft. 1/2" drive Torque Wrench	General torquing of fasteners (Typically 15–80 lb. ft.)
0–800 lb. ft. Torque Wrench	Torque Output Nut to 650–700 lb. ft.
0–50 lb. in. 3/8" drive Torque Wrench	General torquing of fasteners
0–30 lb. in. 1/4" drive Torque Wrench	Torquing of capscrews to 7 lb. in. during auxiliary countershaft bearing endplay setting procedure
70 MM or 2 3/4" Socket - Standard Depth	To remove the output yoke nut
Snap Ring Pliers - Large Standard External	To remove the snap rings at the auxiliary drive gear, input shaft bearing, and countershaft bearings
Feeler Gauges	To set mainshaft washer endplay and auxiliary tapered bearing endplay
Crow's Foot Pry Bar	To remove the auxiliary drive gear bearing
(2) Air Pressure Gauges 0–100 PSI	To troubleshoot and verify correct operation of air system
Bushing Driver	To remove and install clutch housing bushings. Bushing OD = 1.125", ID = 1.000"

Special Tools

The following Transmission Tools are available directly from K-Line Industries. To obtain any of these tools listed, contact K-Line by phone or visiting the online store.

K-Line Industries, Inc.
 315 Garden Avenue
 Holland, MI 49424
1-800-824-KLINE (5546)
<http://www.klineind.com/>

K-Line Part #	Tool	Tool Description
RR1001TR-1	Driver - Output Seal Slinger	Used to install Output Seal Protective Slinger on FR & RT-series (Gen 9) Transmission Output Yokes.
RR1001TR-2	Driver - Output Seal	Used to install Output Seal in Rear Bearing Cover on RT-series (Gen 6 & 7) Transmissions with 2.75" Output Shaft.
RR1001TR-8	Driver - Output Seal	Used with Seal Driver RR1001TR-2 to install Output Seal in Rear Bearing Cover on FR & RT-series (Gen 9) Transmissions.
RR1002TR	Auxiliary Countershaft Support Straps	Used to support the Auxiliary Countershaft Assemblies when servicing the Auxiliary Section on FR & RT-series (Gen 7 & 9) Transmissions.
RR1004TR	Mainshaft Lifting Hook	Used to remove/install Mainshaft Assembly into the Transmission Main Case.
RR1005TR	Driver - Input Shaft Bearing	Used to install the Input Bearing on Transmissions with 2" & 1.75" Input Shafts.
RR1006TR	Auxiliary Section Lifting Bracket	Used to lift Transmission Auxiliary Sections.
RR1007TR	Shimming Gauge - Auxiliary Countershaft (0.100")	Used for setting proper Auxiliary Countershaft Bearing clearance on FR-series and RT-series (Gen 7 & 9) Transmissions.
RR1010TR	Slide Hammer	Used to remove Bearing Races, Reverse Idler Shafts, and Seals.
RR1011TR-1	Slide Hammer Attachment	Used for removing Output Seals.
RR1011TR-2	Slide Hammer Attachment	Used for removing Bearing Races from the Transmission Case.
RR1011TR-3	Slide Hammer Attachment	Used for removing Bearing Races from the Transmission Case.
RR1011TR-4	Slide Hammer Attachment	Used for removing Reverse Idler Shafts on FR-series Transmissions.
RR1012TR-5	Driver - Auxiliary Countershaft Bearings	Used to install Auxiliary Countershaft Bearings on FR & RT-series Transmissions with Auxiliary Section Helical Gearing.
RR1013TR	Timing Block - RT-series Countershaft	Used to support the Upper Countershaft during Main Box assembly on RT-series Transmissions.
RR1014TR	Puller - Countershaft Front Bearings	Used to remove Front Countershaft Bearing on FR-series Transmissions.
RR1015TR	Driver - Countershaft Front/Rear Bearings	Used to install Front and Rear Countershaft Bearing on FR-series Transmissions.
RR1017TR	Pusher - Countershaft	Used to push the Countershaft Assembly rearward to create clearance for Bearing Puller on FR & RT-series Transmissions.
RR1019TR	Hand Maul	Used with Bearing and Seal Drivers for part installation/removal.
RR1020TR	Soft Bar	Used with Hand Maul to remove parts from the Transmission.
RR1022TR	Countershaft Support Tool	Used to support the Upper Countershaft during Main Box disassembly on FR & RT-series Transmissions.
RR1023TR	Puller - Input Bearing	Used to remove the Input Bearing on FR & RT-series Transmissions.
RR1024TR	Driver - Output Bearing	Used to install the Output Bearing on FR & RT-series Transmissions.
RR1025TR	Timing Block - FR-series Countershaft	Used to support the Upper Countershaft during Main Box assembly on FR-series Transmissions.

Tools

Shop Equipment

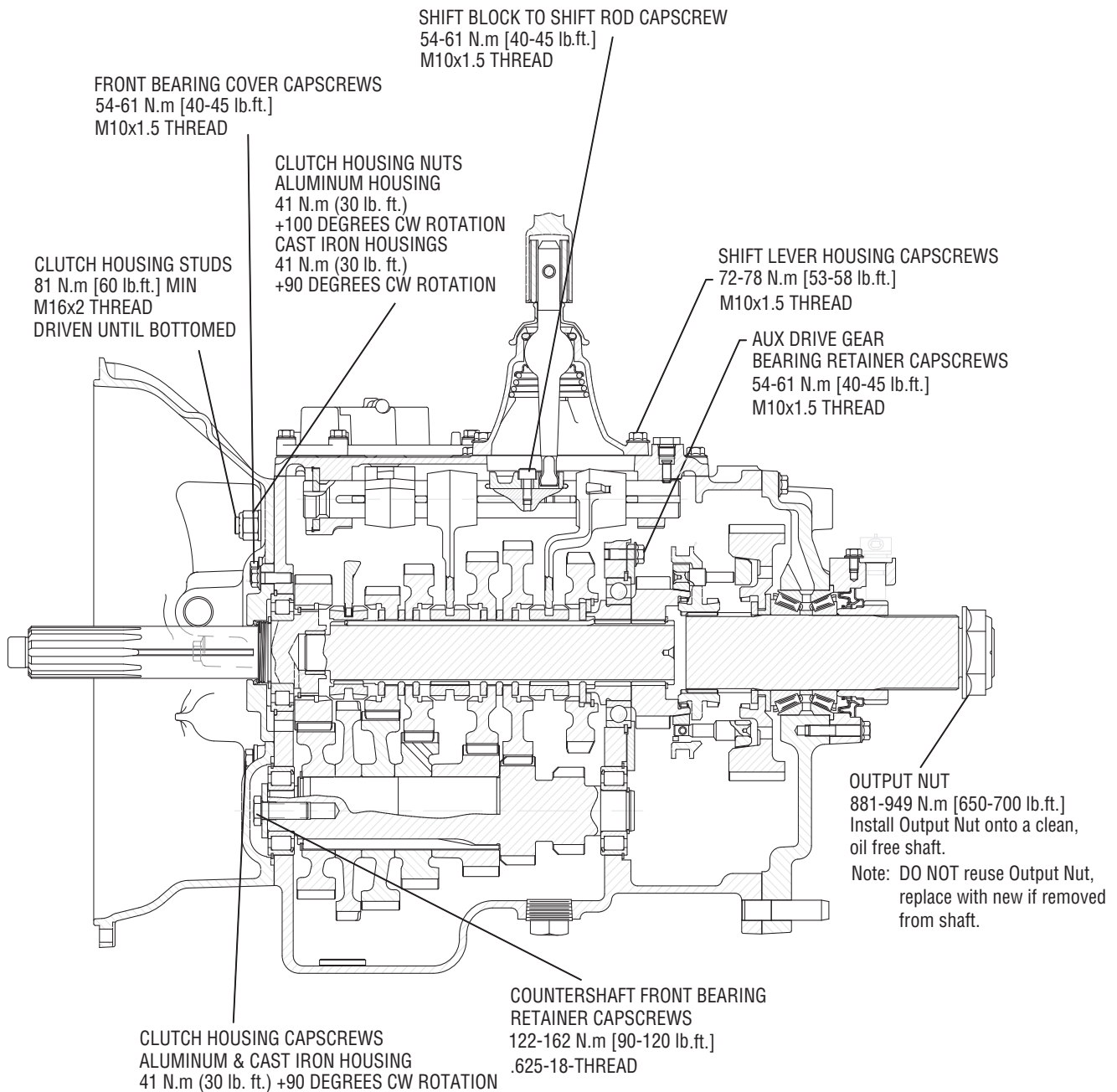
20 Ton Capacity Press	To press Countershaft Gears from Countershaft.
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Eaton Aftermarket Parts

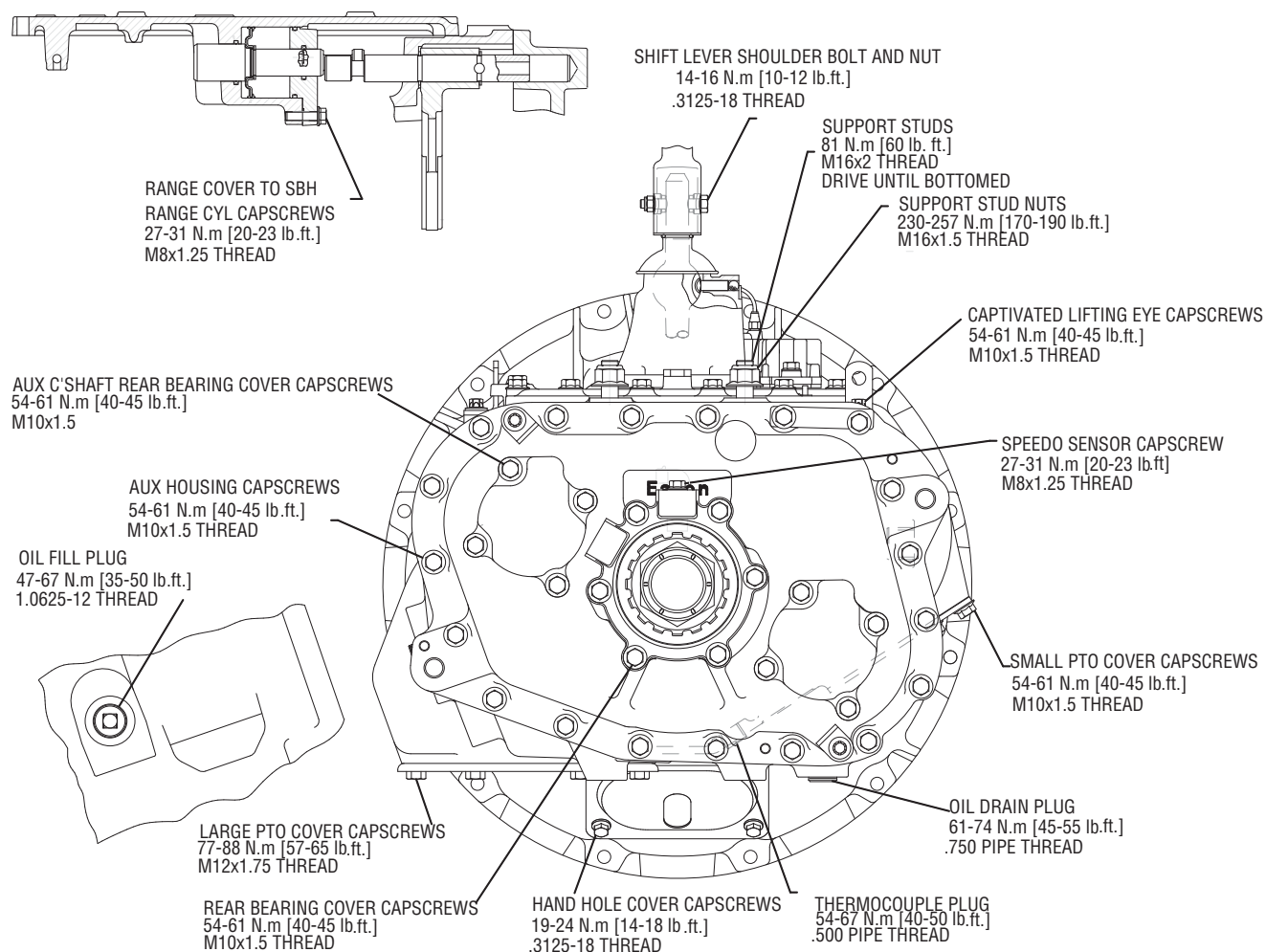
The following tools are available through Eaton Aftermarket Parts. To obtain any of the tools listed, contact your local Eaton parts distributor:

Tool	Purpose	Eaton Part Number
5/32" Air Line Release Tool	To remove 5/32" air lines from push-to-connect fittings.	P/N 4301157 included in Kit K-2394.
Air Line Cutting Tool	To cut plastic air lines smoothly and squarely.	P/N 4301158 included in Kit K-2394.

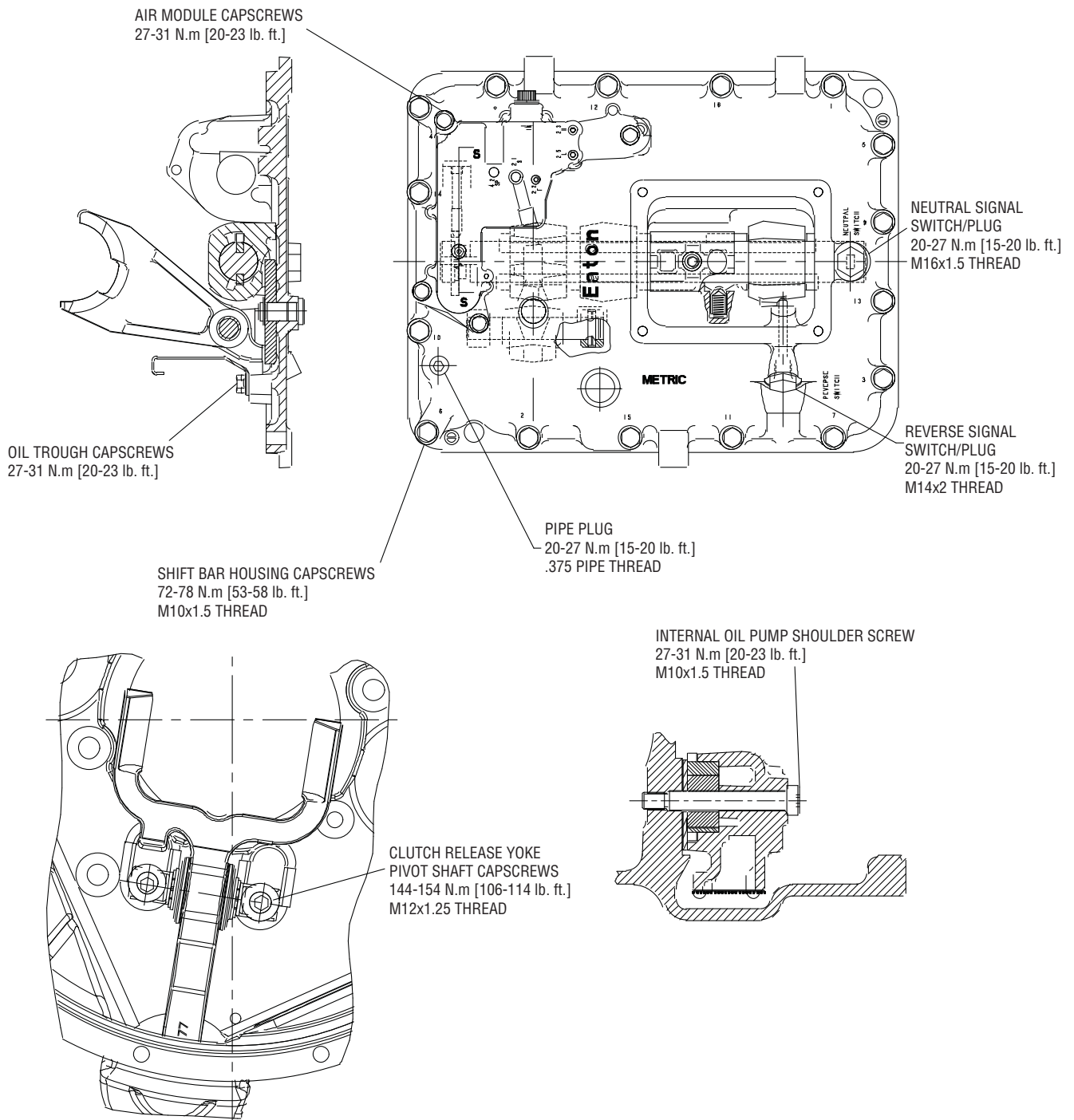
Torque Specifications



Torque Specifications



Torque Specifications



Torque Specifications

