

## Driver Instructions

### Video Instruction Available

Instructional videos are available for download at no charge at [roadranger.com](http://roadranger.com)

Videos are also available for purchase. To order, call 1-888-386-4636. Ask for item # RRSD0002

# Fuller Heavy Duty Transmissions TRDR0595 September 2007

RTO-11709MLL	RTOF-11909ALL
RTO-11909ALL	RTOF-11909MLL
RTO-11909MLL	RTOF-13707DLL
RTO-14709MLL	RTOF-13707MLL
RTO-14909ALL	RTOF-14709MLL
RTO-14909MLL	RTOF-14909ALL
RTO-16909ALL	RTOF-14909MLL
RTOF-11709MLL	RTOF-16909ALL



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SUPPORT

## *General Information*

### Warnings and Cautions



Read the entire driver instructions before operating this transmission.

Set the parking brakes before starting a vehicle, always be seated in the driver's seat, move the shift lever to neutral, and depress the master clutch.

If engine cranks in any gear other than neutral or without the master clutch depressed, service your vehicle neutral safety start circuit immediately.

Before working on a vehicle or when leaving the cab with the engine running, place the transmission in neutral, set the parking brakes, and block the wheels.

Do not release the parking brake or attempt to select a gear until the air pressure is at the correct level.

When parking the vehicle or leaving the cab, always place the shift lever in neutral and set the parking brakes.

If your vehicle is equipped with a remote throttle, before operation, the transmission must be in neutral.

**TOWING:** To avoid damage to the transmission during towing, disconnect the driveline.

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# ***General Information***

## **Purpose**

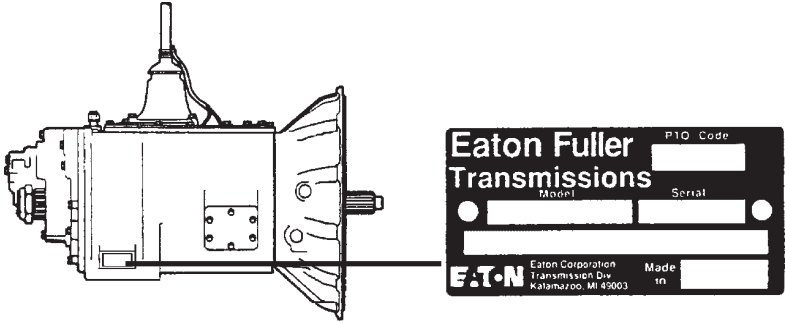
This manual is designed to provide detailed information necessary for the proper driving techniques of the Eaton® Fuller® transmissions listed on the cover.

## **How to Use This Manual**

Driver instructions are divided into two sections: Transmission Operation and Service and Maintenance. Transmission Operation contains information on driving techniques along with shift patterns. Service and Maintenance contains information items that deal with basic service and maintenance; such as, identification tags and lubrication information.

## Identification Tag

### Transmission Tag and Location



DO NOT REMOVE OR DESTROY THE TRANSMISSION IDENTIFICATION TAG.

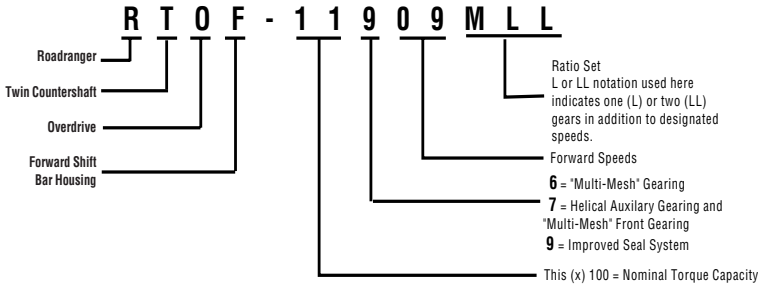
Transmission model designation and other transmission identification information are stamped on the transmission tag. To identify the transmission model designation and serial number, locate the tag on the transmission and then locate the numbers as shown (example: RTLO-14610B).

Record transmission identification data. Have these reference numbers handy when ordering replacement parts or requesting service information.

# Service and Maintenance

## Model Designation

### Nomenclature



## **General Information**

Models in this series provide eleven forward speeds and three reverse, consisting of a five-speed front section and a three-speed auxiliary section. The auxiliary section contains LO and HI range ratios, plus three deep reduction gears.

The three lowest (LL1, LO, LL2) gear sets are used for road speed control. The other four ratios are used twice - once in LO range and once again in HI range.

Shifting is simple and easy with the Roadranger repeat "H" shift pattern. After shifting out of LO range, the gear shift lever position for 5th is the same as 1st, 6th the same as 2nd, 7th the same as 3rd, and 8th the same as 4th.

The range lever is used once during an upshift sequence and once during a downshift sequence. Deep reduction ratios are selected with the Roadranger valve deep reduction button on the control knob. The deep reduction shifts should only be made with the transmission in LO range.

Always preselect the range shift. After preselection, the transmission will automatically make the synchronizer range shift as the shift lever passes through neutral.

## **Road Speed Control**

The three lowest (LL1, LO, LL2) gear sets are used for road speed control. These gear positions are not intended to be used as progressive shifts.

# *General Information*

## **Shift Pattern Diagram**

A shift pattern diagram should be in your vehicle. If it has been lost, a replacement may be obtained by writing to:

Eaton Corporation

### **Truck Components**

Global Marketing Services

P.O. Box 4013

Kalamazoo, MI 49003

[www.roadranger.com](http://www.roadranger.com)

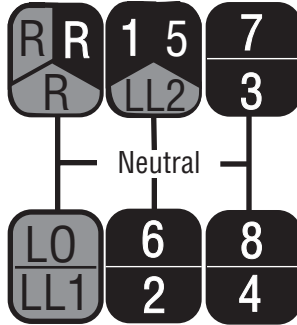
Please specify shifting controls used and transmission model number when making request.



## Shift Lever Positions

### RTO & RTOF Off Highway Ratios

**Note:** These ratios **are not** progressively shifted.

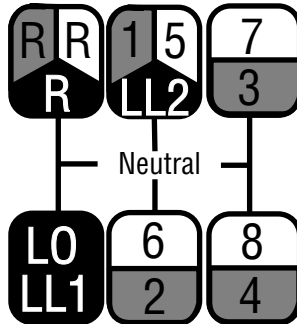


### RTO & RTOF On Highway Ratios

**Note:** These ratios **are** progressively shifted.



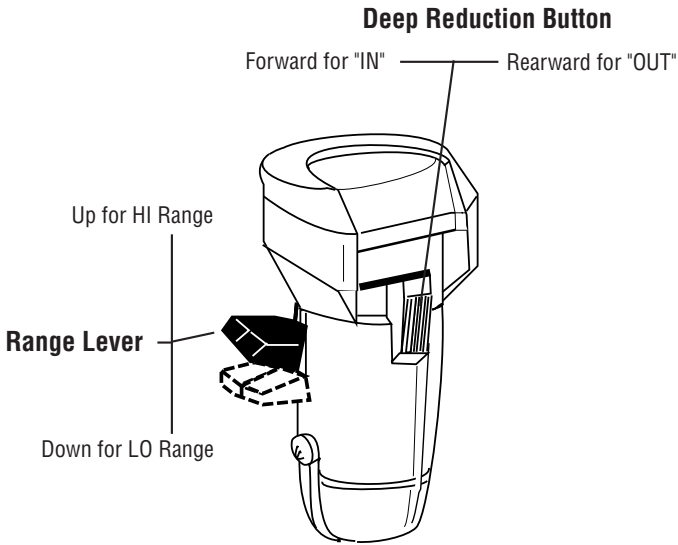
**CAUTION:** Do not change range while moving in reverse.



# Operation

## Shift Controls

### Roadranger Valve - A-5015



## Transmission Features

### Range Shift

The range lever selects LO or HI range. It is used once during an upshift sequence and once during a downshift sequence.

### Preselect

**IMPORTANT:** Always preselect all range shifts when upshifting or downshifting. Preselection requires that the range lever is moved to the needed position before starting the shift.

Preselected range shifts are completed automatically as the lever is moved through neutral and into the next gear. Preselecting all range shifts prevents damage to the transmission and provides for smoother shifts.

## Optional Equipment

For easier and faster gear engagement while the vehicle is standing still, some Eaton® Fuller® transmissions may be equipped with either a Countershaft Brake or a Clutch Brake.

### **Countershaft Brake** (Used with push-type clutches) -

The control button is mounted on the shift lever just below the shift knob. To operate, disengage the clutch, press down the control button, and shift into LO or reverse. This is an air operated mechanical brake which slows down the transmission gearing by forcing a piston against the countershaft PTO gear. Never use the Countershaft Brake when upshifting or downshifting. Use **only** for initial gear engagement when the vehicle is standing still.

### **Clutch Brake** (Used with pull-type clutches) -

The clutch brake is applied by fully depressing the clutch pedal to the floor board. When applied the brake slows down and can stop the transmission front box gearing. It is a disc-type brake incorporated into the clutch and transmission drive gear assemblies. Never use the Clutch Brake when upshifting or downshifting. Use **only** for initial gear engagement when the vehicle is standing still.

# *Operation*

## **Driving Tips**

- Always select an initial starting gear that provides sufficient reduction for the load and terrain.
- Always use normal double-clutching procedures when making lever shifts.
- Never slam or jerk the shift lever to complete gear engagements.
- Never coast with the shift lever in the neutral position.
- Never move the range lever with the shift lever in neutral while the vehicle is moving.
- Never make a range shift while moving in reverse.
- Never downshift at too high of a road speed.
- In most cases, depending on the engine and axle ratios, you can save valuable fuel by operating the vehicle at less than governed RPM while cruising in top gear.
- Do not progressively shift the road speed control ratios.
- Never make a deep reduction shift while moving in reverse.

## Double-Clutching Procedure

### Special Instructions

Purpose:

- a. To break torque to allow the transmission to come out of gear, and...
- b. To disengage the engine from the transmission when shifting into gear.

### Procedure

1. Release accelerator.
2. Depress clutch pedal slightly to break torque enough to move the shift lever to neutral.

**Note:** Avoid depressing the clutch pedal too far and contacting the clutch brake.

3. When the shift lever is in neutral, let up on clutch pedal.

**Note:** Engaging the clutch with the shift lever in the neutral position connects the transmission input gearing to the engine. This allows the operator to speed up or slow down the transmission input gearing to properly match the desired gear speed to the current road speed.

- a. For upshifts - allow engine RPM to decrease to match road speed.
  - b. For downshifts - increase engine RPM to match road speed.
4. At the correct engine RPM, depress the clutch pedal slightly and **at the same time**, move the shift lever into the desired gear.
  5. Let up on the clutch pedal and apply accelerator.

# Operation

## Initial Start Up

### Special Instructions



**WARNING:** Before starting a vehicle always be seated in the driver's seat, move the shift lever to neutral, and set the parking brakes.



**CAUTION:** Before moving a vehicle, make sure you understand your shift pattern configuration. A shift label should be in your vehicle's cab. If not, refer to General Information to order one.

### Procedure

1. Make sure the shift lever is in neutral and the parking brakes are set.
2. Turn on the key switch, start the engine.
3. Allow the vehicle air pressure to build to the correct level. Refer to your "Operator and Service Manual" supplied with the truck.
4. Apply the service brakes.
5. Make sure the range lever is down in the LO range position.



Range Lever MUST be in the LO Range position for LO Range.

6. If the vehicle is loaded and you want to start in deep reduction (LL2 or LL1), move the deep reduction button forward.
7. Depress the clutch pedal to the floor.
8. Move the shift lever to desired initial gear.
9. Release the parking brakes on the vehicle.
10. Slowly release the clutch pedal and apply accelerator.

## Shifting Procedures

### Upshift Procedures

In the following instructions, it is assumed that the driver is familiar with operating heavy-duty trucks and tractors, and can coordinate the movement of the shift lever and clutch pedal to make smooth gear engagements while upshifting or downshifting. Always double-clutch when making lever shifts.



**CAUTION:** Never move the deep reduction button or the range lever with the shift lever in neutral while the vehicle is moving.

#### Deep Reduction Button Shift - LL2 to 1st

1. Pre-select just before making an upshift by moving the deep reduction button rearward while maintaining accelerator position.
2. Then, **immediately**, release the accelerator, depress the clutch pedal once to break torque, release the pedal to engage the clutch, allow the engine to decelerate until the shift is complete. Continue driving or upshifting. The transmission shifts from LL2 to 1st when synchronous is reached. Then accelerate.

#### Shifting in LO Range (1st to 2nd to 3rd to 4th)

3. Move the shift lever, double-clutching, to the next desired gear position in LO range.

#### Range shift from LO to HI range (4th to 5th)

4. When in last gear position for LO range and ready for the next upshift, pull up the Range Lever and move the shift lever, double-clutching, to the next higher speed position according to your shift pattern. As the shift lever passes through neutral, the transmission will automatically shift from LO to HI range.



**CAUTION:** Never move the shift lever to the LO speed gear position after HI range preselection, or at anytime the transmission is in HI range.

# Operation

## Shifting in HI Range (5th to 6th to 7th to 8th)

5. Move the shift lever, double-clutching, to the next desired gear position in LO Range.

## Downshift Procedure



**CAUTION:** Never move the deep reduction button or the range lever with the shift lever in neutral while the vehicle is moving.

## Shifting in HI Range (8th to 7th to 6th to 5th)

6. Move the shift lever, double-clutching, to the next desired gear position in HI range.

## Range shift from HI Range to LO Range (5th to 4th)

7. While in 5th and ready for the next downshift, preselect LO range, push the range preselection lever down.
8. Move the shift lever, double-clutching, to the next desired gear position in LO range. As the shift lever passes through neutral, the transmission automatically shifts from HI range to LO range.

## Shifting in LO Range (4th to 3rd to 2nd to 1st)

9. Continue downshifting, double-clutching, to the next desired gear position in LO range.

## Deep Reduction Button Shift - 1st to LL2

10. Pre-select, just before making a downshift, by moving the deep reduction button forward while maintaining accelerator position.
11. Then, **immediately**, release the accelerator, depress the clutch pedal once to break torque, release the pedal to engage the clutch, and accelerate. The transmission shifts from LO to LL2 when synchronous is reached.



## Proper Lubrication

Proper lubrication procedures are the key to a good all-around maintenance program.

Eaton® Fuller® Transmissions are designed so that the internal parts operate in an oil circulating bath created by the motion of the gears and shafts.

All parts will be properly lubricated if these procedures are closely followed:

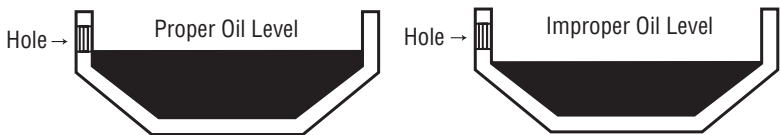
- Maintain oil level. Inspect regularly.
- Follow maintenance interval chart.
- Use the correct grade and type of oil.
- Buy from a reputable dealer.

## Maintain Proper Oil Level

Make sure oil is level with the filler opening. Being able to reach oil with your finger does not mean oil is at proper level. **(One inch of oil level is about one gallon of oil.)**

**When adding oil, never mix engine oils and gear oils in the same transmission.**

### Oil Level



# Service and Maintenance

## Oil Filter

HIGHWAY USE	
For transmissions equipped with oil filter, P/N 4304827	Inspect filter for leaks or damage replace as necessary.
OFF-HIGHWAY USE	
For transmissions equipped with oil filter, P/N 4304827	Change filter every two years

**If your vehicle has a transmission oil filter, you must change the filter when fluid or lubricant is changed.**

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

For a list of Eaton Approved Synthetic Lubricants see TCMT-0020.

### **Buy from a reputable dealer**

For a complete list of approved and reputable dealers see TCMT-0020 or write to:

Eaton Corporation

#### **Truck Components**

Global Marketing Services

P.O. Box 4013

Kalamazoo, MI 49003

[www.roadranger.com](http://www.roadranger.com)

## Transmission Operating Angles

If the transmission operating angle is more than 12 degrees, 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 degrees, the transmission must be equipped with an oil pump or cooler kit to insure proper lubrication.

## Oil Cooler Information

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:

- Operating consistently at slow speed.
- High ambient temperatures.
- Restricted air flow around transmission.
- Exhaust system too close to transmission.
- High horsepower operation.

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

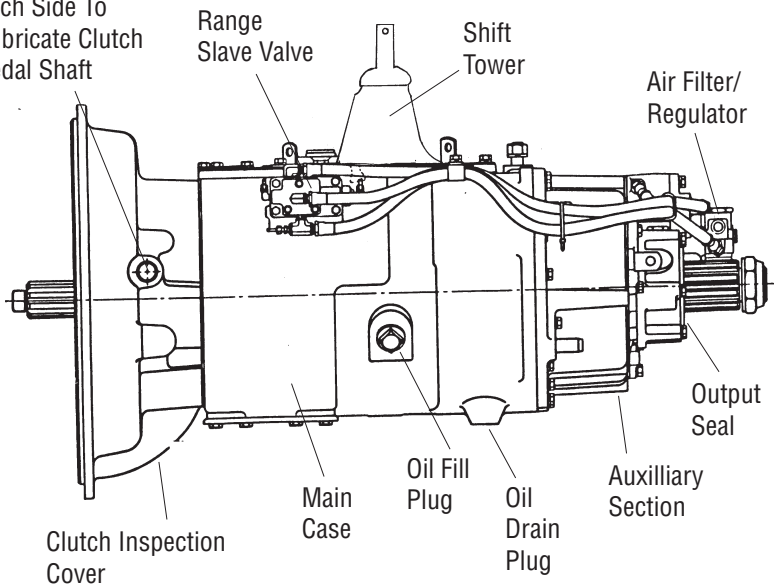
## Oil Cooler Chart

Transmission Oil Coolers are:
Recommended
<ul style="list-style-type: none"><li>• With engines of 350 H.P. and above.</li></ul>
Required
<ul style="list-style-type: none"><li>• With engines 399 H.P. and above and GCW's over 90,000 lbs.</li></ul>
<ul style="list-style-type: none"><li>• With engines 399 H.P. and above and 1400 Lb f .ft or greater torque.</li></ul>
<ul style="list-style-type: none"><li>• With engines 450 H.P. and above.</li></ul>
<ul style="list-style-type: none"><li>• 18-Speed AutoShift's require use of an Eaton supplied oil-to-water cooler or approved equivalent.</li></ul>

# Service and Maintenance

## Preventive Maintenance

Grease Fitting On  
Each Side To  
Lubricate Clutch  
Pedal Shaft



## Air System and Connections

- Check for leaks, worn air lines, loose connections and capscrews.

## Clutch Housing Mounting

- Check all capscrews of the clutch housing flange for looseness.

## Clutch Release Bearing (Not Shown)

- Remove hand hole cover and check radial and axial clearance in release bearing.
- Check relative positive of thrust surface of release bearing with thrust sleeve on push-type clutches.

## **Clutch Pedal Shaft and Bores**

- Pry upward on shafts to check wear.
- If excessive movement is found, remove clutch release mechanism and check bushing on bores and wear on shafts.

## **Lubricant**

- Change at specified service intervals.
- Use only the types and grades recommended.

## **Filler and Drain Plugs**

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

## **Capscrews and Gaskets**

- Check all capscrews, especially those on P.T.O. covers and rear bearing covers for looseness which would cause oil leakage.
- Check P.T.O. opening and rear bearing covers for oil leakage due to faulty gasket.

## **Shift Lever**

- Check for looseness and free play in housing. If lever is loose in housing, proceed with Shift Lever Housing Assembly.

## **Shift Lever Housing Assembly**

- Remove air lines at slave valve and remove the shift lever housing assembly from transmission.
- Check tension spring and washer for set and wear.
- Check the shift lever spade pin and slot for wear.
- Check bottom end of shift lever for wear and check slot yokes and blocks in shift bar housing for wear at contact points with shift lever.

# Reference

## Definitions/Glossary of Terms for Transmission Operation

The following terms are used in describing the transmission operating procedures.

Break Torque	Releasing engine power or load from the transmission and drivetrain by releasing throttle or depressing clutch pedal.
Double-Clutch	The shifting technique used when moving the shift lever to the next lever position. Procedures: Depress clutch pedal, move lever to neutral, let up clutch pedal, accelerate or decelerate engine to obtain synchronous, depress clutch pedal again, and move lever into gear.
Preselect	Moving the shift button just prior to starting the shift. The shift button should not be moved while the shift lever is in neutral.
Ratio Step	Amount of change between two gear ratios expressed as a percentage. Example: The ratio step from 1st gear to 2nd gear is 35%.
Shift Button	The button on the side of the shift knob used to change gears.
Synchronous	The point at which the input gearing speed (engine speed) matches the output gearing speed (road speed) and a shift can occur without grinding.



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**For spec'ing or service assistance, call 1-800-826-HELP (4357) or visit [www.eaton.com/roadranger](http://www.eaton.com/roadranger). In Mexico, call 001-800-826-4357.**

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**Eaton Corporation**

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