

Fuller Automated Transmissions TRDR2500

July 2007

RTO-10910B-DM2

RTO-12910B-DM2

RTO-14910B-DM2

RTO-16910B-DM2



Powering Business Worldwide

BACKED BY

Roadranger

SUPPORT

Warnings & Cautions

Warnings & Cautions

WARNING

Read the entire driver instructions before operating this transmission.

Before starting a vehicle always be seated in the driver's seat, select "N" on the shift control, and set the parking brakes.

If engine cranks in any gear other than neutral, service your vehicle immediately!

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

For safety reasons, always engage the service brakes prior to selecting gear positions from "N".

CAUTION

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

Before operating the PTO, refer to "Transmission Power Take Off Operation".

Battery (+) and (-) must be disconnected prior to any type of welding on any UltraShift™ equipped vehicle.

IMPORTANT

It is a requirement that the driver of a commercial vehicle specified under paragraph A sections 1-6 of FMCSA regulation 392.10 need only cross railroad grade crossings in a gear that permits the vehicle to complete the crossing without a change of gears.

This can only be achieved by utilizing the Manual "M" mode. Please refer to pages 2 and 9 for correct manual mode operation.

Table of Contents

Operation

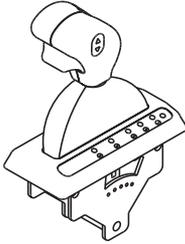
Shift Console Positions	1
Gear Display	2
Start-up and Power Down	3
Driving Tips	4
Reverse Mode	7
Drive Mode	8
MANUAL Mode	9
LOW Mode	11
Transmission Power Take Off	12

Service and Maintenance

General Model Information	13
Troubleshooting	14
Proper Lubrication	16
Vehicle Towing	18

Operation

Shift Console Positions

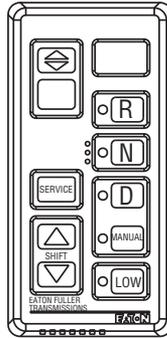


Button not used
PTO Indicator

Service Indicator

△ - Upshift

▽ - Downshift



R - Reverse

N - Neutral

D - Drive

MANUAL

LOW

- R Selects Reverse gear once vehicle speed is less than 2 mph.
- N Selects Neutral
- D Selects the default starting gear and automatically selects gears between the starting gear and top gear.
- MANUAL Allows the driver to hold current gear and manually select the appropriate gear for road conditions using the up/down buttons. MANUAL mode should be used whenever the driver wants to select the shifts instead of letting UltraShift select them automatically. For example, when the driver is moving around the yard, over railroad tracks, or on steep grades. (See the “Manual Mode” section for more details.)
- LOW Transmission downshifts at the earliest opportunity for maximum engine braking.
- Up / Down Buttons Used in the MANUAL mode to select upshifts and downshifts.
- PTO Power Take Off is activated and transmission is ready for PTO operation. (See “Transmission Countershaft Power Take Off” section for more details.)

⚠ WARNING

UltraShift™ initiates upshifts from “MANUAL” and “LOW” for engine over speed protection. Some engines do not use the Eaton engine overspeed protection.

Gear Display

The Gear Display shows the current gear position of the transmission. The Gear Display will flash the target gear position of the transmission when in neutral during a shift.

Satisfactory engagement in 5th gear



SOLID

Out of gear waiting for engine/trans rpm to reach synchronous



FLASHING

Satisfactory engagement in 6th gear



SOLID

Down arrows on the Gear Display indicate the transmission is waiting to verify decreased input shaft speed, before a gear engagement from Neutral can be completed.



The "DASH" indicates the transmission may be torque locked in gear (see Service and Maintenance Locked in Gear).



Operation

Start-up and Power Down

Start-up

1. Turn the ignition key to “ON” and allow the UltraShift to power-up.
 - Engine cranking is delayed until the transmission power-up is complete and the gear display shows a solid “N”.
2. Start the engine.
3. Apply service brake.
 - If the service brake is not applied while selecting a starting gear, the initial start gear will not be found and the driver will have to **re-select Neutral** and press the brake while re-selecting the desired mode.
4. Select the desired mode and starting gear, on the shift console.
5. Release the vehicle parking brakes.
6. Release service brake and apply accelerator.
 - The transmission is not intended to provide hill-hold capability. The service brakes should be used to stop and hold the vehicle on an incline. To prevent the vehicle from rolling when starting on an incline, place both feet on the brake pedal before sliding the right foot to the throttle pedal. Gradually back off the brake while applying as little throttle as necessary to move along the incline.

Power Down

1. Select Neutral on the shift control.
 - If gear display does not show solid “N”, neutral has not yet been obtained.

Note: Neutral should always be reached before UltraShift power down is performed except in cases of emergency.

2. Set the vehicle parking brakes.
3. Turn off the ignition key and allow the engine to shut down.

Driving Tips

Proper Starting Gear

Choose a starting gear appropriate for the load and grade conditions, while at a stop in Drive and MANUAL modes by using the up/down buttons. Refer to Drive Mode for detailed information.

Skip Shifting

Performed in MANUAL by pressing the shift arrows more than once. Refer to MANUAL mode section for detailed information. Automatic Skip Shifts may occur in Drive Mode if conditions are appropriate.

Optimal Engine Braking

The LOW mode can be selected while moving. This initiates downshifts as soon as possible to maximize the effect of engine braking. Refer to Low mode section for detailed information.

Skid Conditions

If a skid condition occurs, the UltraShift senses the vehicle speed dropping rapidly. In this case, the UltraShift delays downshifting and will automatically disengage the master clutch if necessary.

Cruise Control

The UltraShift is totally compatible with cruise control. If a shift is required while cruise control is active, cruise is temporarily interrupted while the shift is performed and then automatically resumed after the shift.

Manual Mode

In Manual Mode UltraShift Allows the driver to hold current gear and manually select the appropriate gear for road conditions using the up/down buttons. Manual mode should be used whenever the driver wants to select the shifts instead of letting UltraShift select them automatically. Examples include, when the driver is moving around the yard, over railroad tracks, or on steep grades.

Operation

Load Based Shifting

In Drive, the UltraShift will adapt to the changing conditions of the vehicle. Right after power-up or after changing loads, UltraShift needs to learn the new conditions. While learning, it may hold a gear instead of upshifting. Simply push the Up button to start the upshift. It may take three or four shifts for the UltraShift to learn the new conditions. After that it will handle upshifts and downshift automatically.

Depending on conditions, UltraShift can activate the engine brake in order to bring the engine down faster for an upshift. This can happen even if the engine brake dash switch is OFF.

Coast Mode

When coasting to a stop in lower gears with your foot off the throttle, UltraShift may not finish downshifting until the driver gets back on the throttle. The system will automatically track vehicle and engine speed during this time and engage the appropriate gear when the throttle is re-applied. This is normal operation for the UltraShift when in Drive “D” mode only.

IMPORTANT DRIVER NOTICE

Clutch Protection

Even though this truck does not have a clutch pedal, it still has a mechanical clutch. As the driver slowly increases and decreases engine RPM from a stop, the clutch is engaging and disengaging, just like slipping the clutch with an AutoShift or a manual transmission.

If the vehicle is operated for long periods between engine idle and 1000 RPM during take off, the driver is slipping the clutch which, in turn, gets the clutch HOT. If the clutch starts to get too hot, a warning tone will sound and a “C” and then an “A” will flash on the gear display (**Clutch Abuse**) - See Figure 1. This is an indication that the driver is abusing the clutch and it is getting too hot to operate - potentially resulting in a failure.

Operation



Figure 1: Clutch Abuse Indication

If a “C” and then an “A” shows on the gear display during vehicle operation, **stop the vehicle for at least two minutes and let the clutch cool down.** Continuing operation with the “C” and “A” flashing on the gear display will cause the clutch to become even hotter and the transmission may attempt to down-shift into a lower start gear and/or limit the engine to idle speed until the clutch cools (approximately 3 minutes). Repeated incidents of clutch abuse may cause the clutch to fail and render the truck immobile, resulting in extended down time.

Below are some examples of situations that may initiate clutch abuse, and instructions on how to avoid them:

Example	How to Avoid
Holding on hills using the throttle rather than the service brake	Use the service brakes to hold on the hill. To start moving, apply the throttle and release the brakes as you feel the truck start to pull
Moving trailer tandems	Be sure to always start off in 1st gear when moving forward, and Low Reverse (R on Gear Display) when moving backwards.
Hooking up a trailer	Always be sure the trailer is high enough to back under. Use Low Reverse (R on Gear Display). Use light brake pedal pressure to reduce the “jerking” of the vehicle.

Note: The transmission is not intended to provide hill-hold capability. The service brakes should be used to stop and hold the vehicle on an incline. To prevent the vehicle from rolling when starting on an incline, place both feet on the brake pedal before sliding the right foot to the throttle pedal. Gradually back off the brake while applying as little throttle as necessary to move along the incline.

Operation

Reverse Mode

The vehicle speed must be less than 2 mph before Reverse is permitted. If the driver requests Reverse above 2 mph, the shift is not performed until the speed has dropped below 2 mph.

Depending on the transmission model, there may be more than one reverse gear available. Each time Reverse is selected from Neutral, the default Reverse gear is engaged.

While the vehicle is stopped in Reverse, the up/down buttons are used to change the reverse gear. This selection is only maintained until another mode is selected. The driver should only select a higher reverse gear if the vehicle loading and road conditions are appropriate.

There is a speed limit on the reverse engagements, yet the driver can effectively rock the vehicle by moving the shift control from reverse to drive and drive to reverse.

10-Speed



LO Range



HI Range

Drive Mode

Depending on the transmission model and Shift Control configuration, there may be alternate forward starting gears available. While the vehicle is stopped in Drive, the up/down buttons are used to change the starting gear. This selection becomes the default starting gear until it is changed by the driver again, or the UltraShift is powered down.

In Drive mode, all upshifts and downshifts are performed automatically based on vehicle and transmission conditions.

The driver can advance a shift (by about 75 rpm) by pressing the proper up/down button (up for upshifts, down for downshifts) when the transmission is within 75 rpm of the load based shift point.

The Gear Display shows the status of the shift:

- The current gear is displayed solid.
- At the start of the shift, the current gear is displayed solid until the transmission is pulled to the neutral position.
- While the transmission is in neutral and synchronizing for the target gear, the target gear is flashed.
- When the shift is complete, the new current gear is displayed solid.

Operation

MANUAL Mode

MANUAL mode should be used whenever the driver wants to select the shifts instead of letting UltraShift select them automatically. For example, when the driver is moving around the yard, over railroad tracks, or on steep grades.

Selecting MANUAL from Neutral:

- As described in Drive mode, the starting gear can be changed in exactly the same way in MANUAL mode.
- If MANUAL mode is selected from a stop, the starting gear is maintained - no automatic shifts are performed, except for conditions noted below.
- The driver can request shifts using the proper up/down button (up for upshifts, down for downshifts). The upshift or downshift is performed by the UltraShift provided the resulting engine speed is not outside of defined limits. For upshifts, the resulting engine speed must be greater than 900 rpm; for downshifts, the resulting engine speed must be less than engine rated speed.

Selecting MANUAL from Drive or LOW while moving:

- If MANUAL mode is selected while moving, the current gear is maintained - no shifts are performed, except for conditions noted below.
- As described above, the driver can request shifts using the proper up/down button (up for upshifts, down for downshifts) within the same limits described.

 **WARNING**

Some engines do not use the Eaton engine overspeed protection.

Transmission Manual Override:

- If the vehicle is being back driven and the engine is approaching a higher than normal level (approximately 300 rpm above rated speed), the UltraShift overrides the MANUAL position and performs an upshift to prevent engine damage.
- If the gear being maintained is higher than the starting gear, and the driver depresses the throttle pedal, the UltraShift system will override the MANUAL mode and shift to the best available gear if the engine lugs excessively.

Operation

LOW Mode

LOW mode should be used any time you want to maximize engine braking and minimize the use of the brake pedal. For example, when driving down long grades or when coming to a stop.

Selecting LOW from Neutral:

- If LOW mode is selected from Neutral while stopped, the starting gear is always 1st gear. The starting gear cannot be changed in LOW mode.
- If LOW mode is selected from Neutral while stopped, 1st gear is maintained - no shifts are performed, except for conditions noted below.

Selecting LOW from Drive or MANUAL while moving:

- If LOW mode is selected while moving, no upshifts are performed, except for override conditions noted below.
- Downshifts are performed at higher rpm's than normal to enhance engine braking. The downshift point is chosen so engine speed after the shift is about 50 rpm below engine rated speed.

▲ WARNING

Some engines do not use the Eaton engine overspeed protection.

Transmission LOW Override

- If the vehicle is being back driven and the engine is approaching a higher than normal level (approximately 300 rpm above rated speed), the UltraShift overrides the LOW position and performs an upshift to prevent engine damage.

Transmission Power Take Off

Stationary PTO Operation



This transmission is not approved for PTO applications that would require the engine to operate at less than 1000 RPM.

The transmission countershaft PTO is used in this application.

To engage the PTO for stationary operation perform the following steps:

1. Apply the parking brake.
2. Select "D" on the Shift Control (this stops countershaft rotation for PTO engagement).
3. Select the transmission PTO switch.
4. Select "N" on the Shift Control.
5. Raise engine speed up to a minimum of 1000 RPM engine speed to operate the PTO. Remote throttle controls are not approved for use with UltraShift DM2 models.

Mobile PTO operation

The Transmission countershaft PTO is used in this application, and provides limited mobile operation in the starting gears.

To engage the PTO for mobile operation perform the following steps:

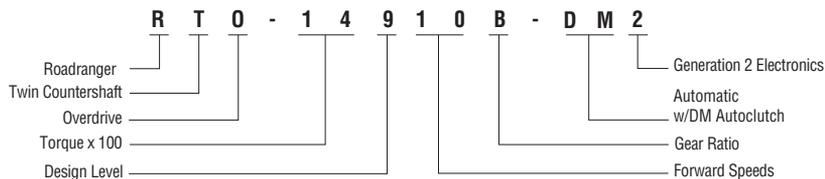
1. Depress service brake.
2. Release parking brake.
3. Select "MANUAL" on the Shift Control (this stops countershaft rotation for PTO engagement).
4. Select the transmission PTO switch.
5. Select "MANUAL", "Neutral" or, "Reverse", as required for vehicle movement.
6. Release service brake.
7. Raise engine speed to move vehicle / operate PTO. Remote throttle controls are not approved for use with UltraShift DM2 models.

Note: The bottom HD 8 bolt PTO is restricted for availability. Contact your Eaton Roadranger representative for specific information.

Service & Maintenance

General Model Information

Nomenclature



Tag Location

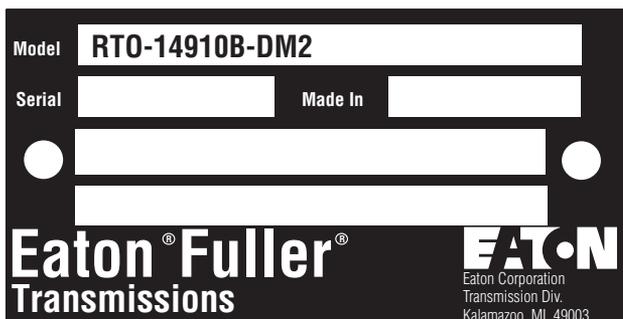
Transmission model designation and other transmission identification information are stamped on the transmission tag. To identify the transmission model designation and serial number, locate the tag on the transmission bottom and then locate the numbers as shown.

DO NOT REMOVE OR DESTROY THE TRANSMISSION IDENTIFICATION TAG.

The blank spaces provided below are for recording transmission identification data. Have these reference numbers handy when ordering replacement parts or requesting service information:

Transmission Model _____

Transmission Serial Number _____



Troubleshooting

Diagnostics

In the event there is a problem with the UltraShift, there are three primary tasks the driver should perform:

1. Note the driving condition under which the problem occurred.
2. Note the condition of the UltraShift under which the problem occurred (i.e. operation mode (Drive, MANUAL, LOW), current gear, engine speed, etc).
3. Reset the system following the sequence below.

Transmission Reset Procedure

In some cases, proper transmission operation can be restored by “resetting” the transmission Electronic Control Unit (ECU). Use the following procedure to reset the ECU.

1. When it is safe to do so, stop the vehicle.
2. Place the transmission shift lever in neutral and turn the ignition key to the “off” position.
3. Wait at least 2 minutes.
4. Restart the engine.
5. If the problem continues, contact a service facility to have the vehicle and transmission system evaluated.

Service & Maintenance

Locked in Gear

If the truck is shut down in gear, the UltraShift may become locked in gear. The transmission will attempt to get to Neutral during the next power up if the shifter is in Neutral. If Neutral is achieved, a solid “N” appears on the Gear Display. If Neutral can not be achieved, a “DASH” will appear on the display and the engine will not start. If a dash appears during power up and the lever is in Neutral try the following:



1. Turn the key OFF and let the transmission power down for at least 2 minutes.
2. Depress the brake pedal.
3. Release the parking brake.
4. Make sure the shifter is in Neutral.
5. Turn the key to the ON position.
6. The transmission will attempt to shift into Neutral once you turn the key ON, but you may have to slightly release the brake pedal to help let the torque off the drive line.
7. Once it reaches Neutral a solid “N” will appear on the Gear Display and the truck will start. If a dash still appears after this procedure take the vehicle to a local service center.

Proper Lubrication

Proper lubrication procedures are key to a good all-around maintenance program. If the lubricant is not doing its job or if the lubricant level is ignored, all the maintenance procedures in the world are not going to keep the transmission running or assure long transmission life.

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

Thus, all parts are amply lubricated if these procedures are closely followed:

1. Maintain lubricant level and inspect regularly.
2. Follow maintenance interval chart.
3. Use the correct grade and type of lubricant.
4. Buy lubricant from an approved dealer.

Mixing of Oil Types



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

Engine oils and gear oils may not be compatible; mixing can cause breakdown of the lubricant and affect component performance. When switching between types of lubricants, all areas of each affected component must be thoroughly flushed.

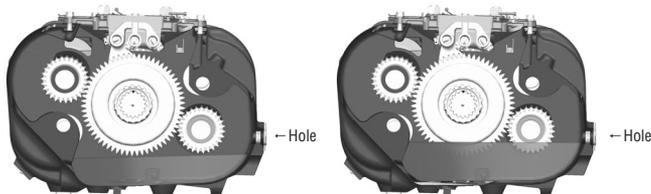
Note: For a list of Eaton Approved Synthetic Lubricants, see TCMT-0021 or call 1-800-826-HELP (4357).

Note: Additives and friction modifiers must not be introduced.

Service & Maintenance

Proper Transmission Lubrication Level

Make sure the transmission lubricant is level with the bottom of the fill opening. Being able to reach the lubricant with your finger does not mean the lubricant is at the proper level. (On heavy duty transmissions, one inch of lubricant level equals about one gallon of lubricant.)



Improper Oil Level

Proper Oil Level

If the transmission operating angle is more than 12 degrees, improper lubrication can occur. The operating angle is the transmission mounting angle in the chassis plus the grade (expressed in degrees).

Any time the transmission operating angle of 12 degrees is exceeded for an extended period of time, the transmission must be equipped with an oil pump or cooler kit to insure proper lubrication.

Lube Change Intervals

Lubricant changes should be based on a combination of the intervals shown in TCMT-0021 Lubrication Specification MANUAL, and user judgement based on the application and operating environment. Extending drain intervals beyond those shown in the tables is not recommended and will put warranties at risk.

Note: The first lube change for a Line-Haul vehicle may be extended to 500,000 miles (800,000 km) when a new transmission has been factory filled with a lube that is Eaton approved for 500,000 miles (800,000 km) (E-500, PS-164).

Note: Vocational service applications are those which require components to be consistently operated at heavy loads, in contaminated environments or on steep grades. For these applications, the Vocational Service section in TCMT-0021 should be referenced.

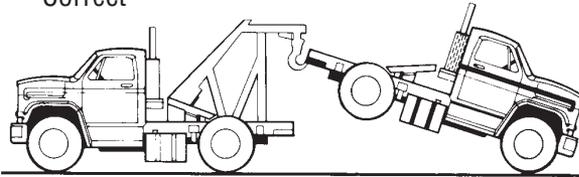
Vehicle Towing

When towing the vehicle, the output shaft of the transmission must not be allowed to spin or turn. If the vehicle is towed with the drive wheels still in contact with the road surface, the vehicle axle shafts or driveline must be removed or disconnected.

 CAUTION

Serious Internal transmission damage can result from improper vehicle towing.

Correct



WRONG



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

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