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Notes, Cautions, and Warnings

**WARNING**: Follow the specified procedures in the indicated order to avoid personal injury.

**CAUTION**: Follow the specified procedures in the indicated order to avoid equipment malfunction or damage.

**NOTE**: Additional relevant information not covered in the service procedure.

Operational Warnings

Before starting a vehicle:
1. Sit in the driver’s seat.
2. Place the transmission in neutral.
3. Set the parking brake.
4. Disengage the clutch.

Before working on a vehicle or leaving the cab with the engine running:
1. Place the transmission in neutral.
2. Set the parking brake.
3. 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:
1. Place the transmission in neutral.
2. Set the parking brake.

To avoid damage to the transmission during towing:
1. Place the transmission in neutral.
2. Lift the drive wheels off the ground or disconnect the driveline.

Do not operate the vehicle if the alternator lamp is lit or if the gauges indicate low voltage.

Repair Warnings

When disassembling various assemblies, lay all parts on a clean bench in the same sequence as removed to simplify assembly and reduce the possibility of losing parts.

Provide a clean work area. Make sure no dirt or foreign materials enter the unit during repair and assembly.

Disconnect the vehicle's battery before removing or installing electronic parts.

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 that could lead to additional repairs and expense.

Use of other than recommended tools, parts, and instructions listed in this manual may place the safety of the service technician or vehicle driver in jeopardy.

The location of some components may vary with each OEM. The removal and installation procedure described for each component may vary for your vehicle.

Always use genuine Eaton replacement parts.

Every effort has been made to ensure the accuracy of the information contained in this manual. However, Eaton Corporation makes no warranty, expressed or implied, based on the information provided. If you have comments or questions regarding this manual, write to:

Eaton B.V.
P.O. Box 75777
1118 ZX Luchthaven Schiphol
The Netherlands
How to Use This Manual

This manual is designed to provide detailed information necessary to service and repair the automation portion of the Eaton® Fuller® AutoShift 16 transmission.

The service procedures in this manual are for transmission automation components only. To locate the information you need, simply locate the procedure in the table of contents, turn to the page specified, and follow the procedure.

To service the mechanical portion of the transmission system, refer to the model specific transmission service manual.

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.

When calling for service assistance or parts, have the model and serial numbers readily available.
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. Have the serial number available when calling for service assistance.

Bill of Material or Customer Number
This number may be located above the model and serial numbers. It is a reference number used by Eaton® Fuller®.
Preventive Maintenance Overview

To keep a vehicle running properly, it is important to perform preventive maintenance on the vehicle components. This ensures the vehicle and its subassemblies will operate properly throughout their useful life. To cover preventive maintenance completely, you must review the following subjects in detail.

- Recommended Lubricants
- Maintenance/Lubricants Change Intervals
- Transmission Inspections
- Changing the Lubricant
- Vehicle System Effects

1. Recommended Lubricants

Where transmissions are concerned, lubrication is possibly the most important part of keeping a vehicle operating.

Lubricants

Lubricant must be approved by Eaton Corporation to qualify for use in the AutoShift 16 transmission.

<table>
<thead>
<tr>
<th>Recommended Lubricants</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
</tr>
<tr>
<td>Heavy duty engine oil API - CD</td>
</tr>
<tr>
<td>Mid EP gear oil API-GL-4</td>
</tr>
<tr>
<td>Synthetic/semi-synthetic oil</td>
</tr>
</tbody>
</table>

- Multi-viscosity engine oils (such as 15W40) are not recommended without consulting Eaton.
- Do not mix engine oils and gear oils in the same transmission.
- Additives or friction modifiers should not be added.
2. Maintenance/Lubricant Change Intervals

Transmission inspections and lubricant changes depend on the type of lubricant used and whether the vehicle is used On- or Off-Highway.

On-Highway Lubricant – Vehicles operated on paved roads, interstate highways, and turnpikes are designated as on-highway vehicles. Lubricant change and inspection intervals are the most generous for on-highway vehicles using synthetic lubricants.

Off-Highway Lubricant – When operating vehicles with the AutoShift 16 transmission in off-highway applications such as coal trucks or mining vehicles, it is more important to use time rather than mileage to keep the transmission within its proper preventive maintenance schedule. Off-highway applications are divided into two categories, severe and normal. “Severe off-highway” is the designation used when there is excessive dust and dirt. “Normal off-highway” is for applications where dust and dirt are minimal.

<table>
<thead>
<tr>
<th>Lubrication Change and Inspection</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mineral Oil</strong></td>
</tr>
<tr>
<td><strong>Highway Use (90 % on highway, 10 % off highway)</strong></td>
</tr>
<tr>
<td>First 5,000 to 10,000 km</td>
</tr>
<tr>
<td>Every 20,000 km</td>
</tr>
<tr>
<td>Every 100,000 km or one year</td>
</tr>
<tr>
<td><strong>Off Highway Use (90 % off highway, 10 % on highway)</strong></td>
</tr>
<tr>
<td>First 30 hours</td>
</tr>
<tr>
<td>Every 40 hours</td>
</tr>
<tr>
<td>Every 500 hours</td>
</tr>
<tr>
<td>Every 1,000 hours</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Synthetic Oil</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Highway or Off Highway Use</strong></td>
</tr>
<tr>
<td>Every 300,000 km or three year</td>
</tr>
</tbody>
</table>
3. Transmission Inspections

When performing preventive maintenance (PM) inspections, several items must be checked. It is important to perform every step to ensure the transmission will meet its life expectancy. Proper PM consists of the following steps:

- Check Lubricant Level
- Inspect for Loose/Missing Capscrews
- Check for Air Leaks
- Check for Lubricant Leaks.

Check Lubricant Level

When checking the transmission lubricant there are two important points to know: where to check the lubricant and what the proper lubricant level is. Always be cautious when checking the transmission lubricant as it may be hot.

- **Checking Location** — Check the lubricant at the lubricant fill plug located on the left side of the main transmission case.

- **Proper Lubricant Level** — The lubricant is at the proper level when it is even with the bottom of the fill hole. When you remove the plug to check the lubricant level, lubricant should actually seep out. Do not use your finger to feel for the lubricant. Even if you can touch the lubricant, it may not be at the proper level. In a transmission, one inch of lubricant level equals about one gallon of lubricant.

![Improper Lubricant Level](image1.png)  ![Proper Lubricant Level](image2.png)

Inspect for Loose/Missing Capscrews

While you are under the vehicle checking the lubricant, make a quick check for loose or missing capscrews. Check all capscrews on the back box, PTO covers, shift bar housing, clutch housing, and Transmission ECU. Replace any missing or broken capscrews with the proper capscrews as called out in the illustrated parts listing. Follow the procedure defined in the manual transmission service manual when tightening any capscrews.

Check for Air Leaks

The two steps when checking for an air leak are inspection and repair.

- **Audible Inspection for Leaks** — To find air leaks, make sure the vehicle air system has at least 6.2 Bar (90 PSI) air pressure. Then, listen for leaks, making sure a vehicle leak is not mistaken for a transmission air leak.

- **Refer to Troubleshooting Procedures for Repair** — Once you find an air leak, use the troubleshooting guide to isolate the air leak to the faulty component.
Check for Lubricant Leaks

A lubricant leak could cause a catastrophic transmission failure. Check for leaks first at the gasket surfaces, input shaft, rear seal, and the transmission cooler.

- **Gaskets**
  Visually check each gasket to ensure that no leak is present. Typically a moist spot is acceptable; however drips or larger wet areas are not. Check for leaks at the rear housing, PTO, shift bar housing, electric shifter, and clutch housing gasket surfaces. It is also important to ensure that the leak is indeed coming from the transmission. Make sure the oil is not being blown back from the engine or another vehicle component.

- **Input Shaft**
  Check for leaks around the input shaft. Leaks in this area could be caused by a faulty gasket, the input shaft, or pressurization of the main transmission case by the air system. If you find a leak at the input shaft, make sure the air system is not leaking into the case before looking for leaking gaskets.

- **Rear Seal**
  The rear seal is very important in maintaining lubricant in the transmission. If the seal is improperly installed or has failed, the transmission may experience a catastrophic failure. Check the rear seal by performing the following steps:
    - **Visual Check for Leak** — Visually inspect the rear seal for a leak. If a rear seal leak is suspected, proper isolation is necessary.
    - **Verify the Leak Path** — Other leaks may give the impression the rear seal is leaking. One possible cause is the vehicle speed sensor. Any lubricant leak above and in front of the rear seal could cause lubricant to collect around the seal. Wipe the seal with a clean rag, operate the vehicle, and recheck to verify the leak path.

- **Transmission Cooler Leaks**
  If the vehicle is equipped with a transmission lubricant cooler, make sure there are no leaks at the lubricant cooler, hoses, and fittings of the cooler circuit.
4. Changing the Lubricant

When it is time to change the transmission lubricant, there are only a few steps to follow: draining and filling the transmission, draining and filling the cooler (if equipped), and changing the lubricant filter (if equipped). Remember to be careful when changing the transmission lubricant, as it may be hot.

Drain the Transmission

1. Locate the drain plug on the bottom of the transmission case.
2. Place a drain pan under the drain plug.
3. Remove the drain plug and allow the lubricant to drain completely.
4. Once drained, reinstall the drain plug and tighten to 61.0-74.6 Nm (45-55 lb-ft). Sealant is not required on the drain plug threads.

Drain the Cooler (If Equipped)

1. Remove both cooler lines at the transmission.
2. Pressurize one line with 2.1 Bar (30 PSI) of air pressure to force the lubricant out of the cooler.
3. Once drained, reconnect the coolant lines to the transmission. Make sure the lines are not crossed.

Fill the Transmission

1. Remove the transmission fill plug and fill the transmission with approved lubricant.
2. The transmission is full when the lubricant starts to flow out of the fill hole.
3. Replace the fill plug and tighten to 81.3-94.9 Nm (60-70 lb-ft).

Fill the Cooler (If Equipped)

1. Place the transmission in neutral and start the vehicle.
2. Release the clutch to rotate the input shaft of the transmission, allowing the pump to fill the cooler.
3. Run the vehicle for one minute.
4. Shut off the vehicle, recheck the transmission lubricant level and add lubricant as required.
5. Vehicle System Effects

Some vehicle systems can affect the transmission operation and possibly cause a failure. The air system is a major system that can affect the AutoShift components.

**Air System**

If the air system is not given recommended preventive maintenance, it can cause problems for the transmission system. Although the transmission has an Air Filter/Regulator, it can only protect the transmission from contaminants for so long. This is why it is important to follow OEM recommendations for air system preventive maintenance. It is important to regularly drain the air tanks and ensure that lubricant is not being pumped by the air compressor into the vehicle air system. If moisture is allowed to enter the transmission system, it can cause corrosion or, in cold climates, it could freeze and prevent the shift mechanisms from operating. If lubricant is allowed into the system, it could fill the air system components and cause them to lose valuable air volume, slowing or preventing movement.
6. Vehicle Components

The following components, although required for AutoShift operation, are OEM purchased and installed items. Refer to your OEM service information for removal and replacement procedures.

- Clutch Actuator
- Clutch Solenoid
- Clutch Switch
- Gear Display
- Gear Selector
- Kick Down Switch
- Power Connect Relay
- System Manager ECU
- Transmission Interface Harness.
Transmission Protective Covers – Removal

Special Instructions

None

Required Tools

Basic Hand Tools

Removal

1. Using a flat blade screwdriver, remove the Transmission Protective Covers by turning the attaching screws 180 degrees.

Figure 1. Transmission Protective Covers Location
1. Turn Attachment Screws 180 Degrees

Figure 2. Transmission Protective Covers – Removal
Transmission Protective Covers – Installation

Special Instructions
None

Required Tools
Basic Hand Tools

Installation
1. Using a flat blade screwdriver, install the Transmission Protective Covers by turning the attaching screws 180 degrees.

Final Check
Make sure the mounting screws are locked in place.

Figure 3. Transmission Protective Covers Location
Figure 4. Transmission Protective Covers – Installation

1 Turn Attachment Screws 180 Degrees
Transmission ECU – Removal

Special Instructions
None

Required Tools
Basic Hand Tools

Removal
1. Using a flat blade screwdriver, remove the Transmission Protective Covers by turning the attaching screws 180 degrees.
2. Disconnect the following connectors:
   a. Negative battery cable
   b. Gear Select Motor
   c. Cross Gate Motor
   d. Power connector
   e. 24-way connector
   f. 32-way connector.
3. Using a 13 mm wrench, remove the two mounting capscrews at the bottom of the ECU.
4. Remove the Transmission ECU from the locating studs.

Figure 5. Transmission ECU Location
1. Remove Protective Covers (see p. 12 - 13)

2. Disconnect Five Transmission ECU Connectors

3. Remove The Two Mounting Capscrews

4. Lift And Remove Transmission ECU

Figure 6. Transmission ECU – Removal
Transmission ECU – Installation

Special Instructions
None

Required Tools
Basic Hand Tools

Installation

1. Position Transmission ECU on the two locating studs.
2. Using a 13 mm wrench, install the Transmission ECU mounting capscrews. Torque to 25-30 Nm (20-25 lb-ft).

3. Re-connect the following connectors:
   a. 32-way connector
   b. 24-way connector
   c. Power connector
   d. Cross Gate Motor
   e. Gear Select Motor
   f. Negative battery cable.

   NOTE: These connectors cannot be interchanged.

4. Using a flat blade screwdriver, install the Transmission Protective Covers by turning the attaching screws 180 degrees.

Final Check

Make sure the mounting capscrews are properly torqued.

Make sure all the connectors are properly connected and locked.

Figure 7. Transmission ECU Location
1. Install Transmission ECU

2. Install The Two Mounting Capscrews

3. Re-connect Five Transmission ECU Connectors

4. Install Protective Covers (see p. 14 - 15)

Figure 8. Transmission ECU – Installation
Transmission Harness – Removal

Special Instructions
None

Required Tools
Basic Hand Tools

Removal
1. Using a flat blade screwdriver, remove the Transmission Protective Covers by turning the attaching screws 180 degrees.
2. Disconnect the negative battery cable and the Transmission Interface Harness located on the right rear side of the Shift Bar Housing.
3. Disconnect the following connectors:
   a. Power connector
   b. 24-way connector
   c. 32-way connector.
4. Disconnect the Transmission Harness from the following components:
   a. Splitter Valve Assembly (S, D)
   b. Range Valve Assembly (L, H)
   c. Splitter Switch (M)
   d. Neutral Switch (N)
   e. Range Switch (R)
   f. Reverse Switch (P)
   g. Gear and Cross Gate Sensors (J, E)
   h. Speed Sensors (T, U, V)
   i. Low Air Switch (G)
   j. Upshift Brake Solenoid (K).
5. Using a Philips screwdriver, remove the four Transmission Interface Harness connector mounting screws and any cable ties securing the harness to the transmission. Remove the harness from the transmission.

Figure 9. Transmission Harness Location
Figure 10. Transmission Harness – Removal
Transmission Harness – Installation

Special Instructions
Clean all connectors before installation.

Required Tools
Basic Hand Tools

Installation
1. Install the Transmission Harness on the transmission. Using a Phillips screwdriver, install the four Transmission Interface Harness connector mounting screws and any cable ties securing the harness to the transmission.

2. Re-connect the Transmission Harness to the following components:
   a. Splitter Valve Assembly (S, D)
   b. Range Valve Assembly (L, H)
   c. Splitter Switch (M)
   d. Neutral Switch (N)
   e. Range Switch (R)
   f. Reverse Switch (P)
   g. Gear and Cross Gate Sensors (J, E)
   h. Speed Sensors (T, U, V)
   i. Low Air Switch (G)
   j. Upshift Brake Solenoid (K)

3. Re-connect the following connectors:
   a. Power connector
   b. 24-way connector
   c. 32-way connector.

   NOTE: These connectors cannot be interchanged.

4. Re-connect the Transmission Interface Harness located on the right rear side of the Shift Bar Housing, and the negative battery cable.

5. Using a flat blade screwdriver, install the Transmission Protective Covers by turning the attaching screws 180 degrees.

Final Check
Make sure all the connectors are properly connected and locked.

Figure 11. Transmission Harness Location
1. Install Interface Connector Mounting Screws

2. Re-connect Harness To Components

3. Re-connect Transmission ECU

4. Re-connect Transmission Interface Harness

5. Install Protective Covers (see p. 14 - 15)

Figure 12. Transmission Harness – Installation
Electric Shifter – Removal

Special Instructions
None

Required Tools
Basic Hand Tools

Removal

1. Using a flat blade screwdriver, remove the Transmission Protective Covers by turning the attaching screws 180 degrees.

2. Remove the cable ties from the motor wires. Disconnect the Transmission Harness from the Gear Select Sensor (J) and Cross Gate Sensor (E).

3. Disconnect the Gear Motor and Cross Gate Motor connector from the Transmission ECU.

4. Using a 15 mm wrench, remove the four mounting capscrews from the Electric Shifter.

5. Remove the Electric Shifter and gasket.

Figure 13. Electric Shifter Location
Service Procedures

Figure 14. Electric Shifter – Removal

1. Remove Protective Covers (see p. 12 - 13)

2. Disconnect Transmission Harness From Gear And Cross Gate Sensors

3. Disconnect Gear And Cross Gate Motors From ECU

4. Remove Mounting Capscrews

5. Slowly Lift Up And Remove The Electric Shifter
Electric Shifter – Installation

Special Instructions
Clean and remove old gasket material before installation.

Required Tools
Basic Hand Tools

Installation

1. Position a new gasket at the Electric Shifter mounting location. Check to ensure the transmission is in the neutral position, then move the Electric Shifter to the neutral position.

   NOTE: If the Electric Shifter is not properly aligned, it will not fit properly.

2. Position the Electric Shifter on the Shift Bar Housing, then using 15mm wrench, install the four mounting capscrews. Torque to 60-70 Nm (40-50 lb-ft).

3. Re-connect the Gear Motor and Cross Gate Motor connectors to the Transmission ECU. Using cable ties, secure the motor wires to the transmission in their previous position.

4. Re-connect the Transmission Harness to the Gear Select Sensor (J) and Cross Gate Sensor (E). Install cable ties to the harness.

5. Using a flat blade screwdriver, install the Transmission Protective Covers by turning the attaching screws 180 degrees.

Calibration
To operate properly, the system must be calibrated as follows:

1. Turn the ignition switch ON, and allow the transmission to power up.

2. Turn the ignition switch OFF and wait two minutes.

   CAUTION: The system must be calibrated before the vehicle is placed into operation.

Final Check
Make sure all the connectors are properly connected and locked.

Make sure that the mounting capscrews are properly torqued.

Be sure to perform the calibration procedure before operating the transmission.

Figure 15. Electric Shifter Location
Figure 16. Electric Shifter – Installation

1. Install New Gasket
2. Install Electric Shifter And Mounting Cap screws
3. Re-connect Gear And Cross Gate Motors
4. Re-connect Gear And Cross Gate Sensors
5. Install Protective Covers (see p. 14 - 15)
Cross Gate Sensor – Removal

Special Instructions

While removing the Cross Gate Sensor, hold the Cross Gate Sensor in place to prevent it from snapping out of position.

After removing the sensor, use your finger to push the sensor arm back in the sensor bore.

CAUTION: When removing the sensor carefully allow the sensor to rotate (not snap) to a relaxed position to prevent internal damage of the sensor.

Required Tools

Basic Hand Tools

Removal

1. Using a flat blade screwdriver, remove the Transmission Protective Covers by turning the attaching screws 180 degrees.

2. Disconnect the Transmission Harness from the Cross Gate Sensor (E).

3. Using a 5/16" wrench, remove the Cross Gate Sensor mounting capscrews.

4. Remove the Cross Gate Sensor, steel sleeves, and O-rings from the Electric Shifter.

Figure 17. Cross Gate Sensor Location
1. Remove Protective Covers (see p. 12 - 13)

2. Disconnect Transmission Harness From Sensor

3. Remove The Sensor Mounting Capscrews

4. Remove Sensor

Figure 18. Cross Gate Sensor – Removal
Cross Gate Sensor – Installation

Special Instructions

While installing the Cross Gate Sensor, align the sensor tab with the groove and insert the Cross Gate Sensor.

Install the Cross Gate Sensor with the connector-locking tab at the top.

Required Tools

Basic Hand Tools

Installation

1. Align the Cross Gate Sensor tab with the slot in the Electric Shifter.
2. Using a 5/16" wrench, install the Cross Gate Sensor mounting capscrews. Torque to 2.4-3.1 Nm (21-27 lb-in).
3. Install the Transmission Harness on the Cross Gate Sensor (E).
4. Using a flat blade screwdriver, install the Transmission Protective covers by turning the attaching screws 180 degrees.

Calibration

To operate properly, the system must be calibrated as follows:

1. Turn the ignition switch ON and allow the transmission to power up.
2. Turn the ignition switch OFF and wait two minutes.

⚠️ CAUTION: The system must be calibrated before the vehicle is placed into operation.

Final Check

Make sure that the capscrews are properly torqued.

Make sure that all of the connectors are properly connected and locked.

Be sure to perform the calibration procedure before operating the transmission.

Figure 19. Cross Gate Sensor Location
1. Install Sensor

2. Install Sensor Mounting Capscrews

3. Re-connect The Transmission Harness To Sensor

4. Install Protective Covers (see p. 14 - 15)

Figure 20. Cross Gate Sensor – Installation
Gear Select Sensor – Removal

Special Instructions

While removing the Gear Select Sensor, hold the Gear Select Sensor in place to prevent it from snapping out of position.

Required Tools

Basic Hand Tools

Removal

1. Using a flat blade screwdriver, remove the Transmission Protective Covers by turning the attaching screws 180 degrees.
2. Remove the cable ties from the motor wires. Disconnect the Transmission Harness from the Gear Select Sensor (J) and Cross Gate Sensor (E).
3. Disconnect the Gear Motor and Cross Gate Motor connectors from the Transmission ECU.
4. Using a 15 mm wrench, remove the four mounting capscrews from the Electric Shifter.
5. Remove Electric Shifter and gasket.
6. Using a 5/16" wrench, remove Gear Select Sensor mounting capscrews.

CAUTION: When removing the sensor carefully allow the sensor to rotate (not snap) to a relaxed position to prevent internal damage of the sensor.

7. Remove the Gear Select Sensor, steel sleeves, and O-rings from the Electric Shifter.

Figure 21. Gear Select Sensor Location
1. Remove Protective Covers (see p. 12 - 13)

2. Disconnect Transmission Harness From Gear And Cross Gate Sensors

3. Disconnect Gear And Cross Gate Motors From ECU

4. Remove Mounting Capscrews

5. Remove Electric Shifter And Gasket

6. Remove Sensor Mounting Capscrews

7. Remove Sensor

Figure 22. Gear Select Sensor – Removal
Gear Select Sensor – Installation

Special Instructions

Clean and remove old gasket material before installation.

While installing the Gear Select Sensor, align the sensor tab with the groove and insert the Gear Select Sensor.

Install the Gear Select Sensor with the connector-locking tab at the top.

Required Tools

Basic Hand Tools

Installation

1. Align the Gear Select Sensor tab with the slot in the Electric Shifter, then insert the sensor, steel sleeves, and O-rings on the Electric Shifter.

2. Using a 5/16” wrench, install Gear Select Sensor mounting capscrews. Torque to 2.4-3.1 Nm (21-27 lb-in).

3. Position a new gasket at the Electric Shifter mounting location. Check to ensure the transmission is in the neutral position, then move the Electric Shifter to the neutral position.

   NOTE: If the Electric Shifter is not properly aligned, it will not fit properly.

4. Position the Electric Shifter on the Shift Bar Housing, then using 15mm wrench, install the four mounting capscrews. Torque to 60-70 Nm (44-52 lb-ft).

5. Re-connect the Gear Motor and Cross Gate Motor connectors to the Transmission ECU. Using cable ties, secure the motor wires to the transmission in their previous position.

6. Re-connect the Transmission Harness to the Gear Select Sensor (J) and Cross Gate Sensor (E). Install cable ties to the harness.

7. Using a flat blade screwdriver, install the Transmission Protective covers by turning the attaching screws 180 degrees.

Calibration

To operate properly, the system must be calibrated as follows:

1. Turn the ignition switch ON and allow the transmission to power up.

2. Turn the ignition switch OFF and wait two minutes.

   CAUTION: The system must be calibrated before the vehicle is placed into operation.

Final Check

Make sure all the connectors are properly connected and locked.

Make sure that the mounting capscrews are properly torqued.

Be sure to perform the calibration procedure before operating the transmission.
Figure 24. Gear Select Sensor – Installation

1. Install Sensor

2. Install Sensor Mounting Capscrews

3. Install Electric Shifter And Gasket

4. Install Mounting Capscrews

5. Re-connect Gear And Cross Gate Motors To ECU

6. Re-connect Transmission Harness To Gear And Cross Gate Sensors

7. Install Protective Covers (see p. 14 - 15)
Range Switch – Removal

Special Instructions
None

Required Tools
Basic Hand Tools

Removal

1. Using a flat blade screwdriver, remove the Transmission Protective Covers by turning the attaching screws 180 degrees.

2. Disconnect the Transmission Harness from the Range Switch (R).

3. Using a 27 mm wrench, remove the Range Switch.
1. Remove Protective Covers (see p. 12 - 13)

2. Disconnect Transmission Harness

3. Remove Range Switch

Figure 26. Range Switch – Removal
Range Switch – Installation

Special Instructions
None

Required Tools
Basic Hand Tools

Installation

1. Using a 27 mm wrench, install the Range Switch. Torque to 20-25 Nm (15-20 lb-ft).

2. Re-connect the Transmission Harness to the Range Switch (R).

3. Using a flat blade screwdriver, install the Transmission Protective Covers by turning the attaching screws 180 degrees.

Final Check
Make sure the Range Switch is properly torqued.
Make sure all of the connectors are properly connected and locked.

Figure 27. Range Switch Location
Figure 28. Range Switch – Installation

1. Install Range Switch

2. Re-connect Transmission Harness

3. Install Protective Covers (see p. 14 - 15)
Range Solenoid Assembly – Removal

Special Instructions
None

Required Tools
Basic Hand Tools

Removal
1. Drain air system. Using a flat blade screwdriver, remove the Transmission Protective Covers by turning the attaching screws 180 degrees.
2. Disconnect the Transmission Harness from the Range Solenoid Assemblies (L & H).
3. Using an 11mm wrench, remove the air supply hose between the Air Filter Regulator and the Range Solenoid Assembly.
4. Using an 11mm wrench, remove the Upshift Brake air supply line from the Range Solenoid Assembly.
5. Using a 14 mm wrench, remove the air pipe between the Range Solenoid Assembly and the Splitter Solenoid Assembly.
   NOTE: Take note of the copper washers at the ends of the air pipe.
6. Using a 13 mm wrench, remove the two mounting capscrews from the Range Solenoid Assembly.
7. Lift the Range Solenoid Assembly from the Shift Bar Housing.
   NOTE: Take note of the two O-rings at the air ports. Do not lose them.

Figure 29. Range Solenoid Assembly Location
1. Remove Protective Coves (see p. 12 - 13)

2. Disconnect Transmission Harnesses

3. Remove The Air Supply Hose

4. Disconnect Transmission Harness

5. Remove The Air Pipe

6. Remove Mounting Capscrews

7. Remove Range Solenoid Assembly

Figure 30. Range Solenoid Assembly Removal
Range Solenoid Assembly – Installation

Special Instructions

Use care when installing O-rings.

Lubricate O-rings with Eaton / Fuller silicone #71214 or equivalent.

Required Tools

Basic Hand Tools

Installation

NOTE: Make sure O-rings are in place on the Shift Bar Housing.

1. Install the Range Solenoid Assembly on the Shift Bar Housing.

2. Using a 13 mm wrench, install the two mounting capscrews. Torque to 40-45 Nm (30-33 lb-ft).

3. Using a 14 mm wrench, install the air pipe between the Splitter Solenoid Assembly and the Range Solenoid Assembly.

4. Using an 11 mm wrench, install the Upshift Brake air supply line to the Range Solenoid Assembly.

5. Using an 11 mm wrench, install the air supply hose between the Air Filter Regulator and the Range Solenoid Assembly.

6. Re-connect the Transmission Harness to the Range Solenoid Assembly (L & H).

7. Using a flat blade screwdriver, install the Transmission Protective Covers by turning the attaching screws 180 degrees.

Final Check

Make sure the mounting capscrews are properly torqued.

Make sure there are no air leaks.

Make sure that all of the connectors are properly connected and locked.

Figure 31. Range Solenoid Assembly Location
Figure 32. Range Solenoid Assembly – Installation

1. Install Range Solenoid Assembly
2. Install Mounting Capscrews
3. Install The Air Pipe
4. Install The Upshift Brake Air Supply Line
5. Install The Air Supply Hose
6. Re-connect Transmission Harness
7. Install Protective Covers (see p. 14 - 15)
Neutral Switch – Removal

Special Instructions
None

Required Tools
Basic Hand Tools

Removal

1. Using a flat blade screwdriver, remove the Transmission Protective Covers by turning the attaching screws 180 degrees.

2. Disconnect the Transmission Harness from the Neutral Switch (N).

3. Using a 27 mm wrench, remove the Neutral Switch.

Figure 33. Neutral Switch Location
1. Remove Protective Covers (see p. 12 - 13)

2. Disconnect Transmission Harness

3. Remove Neutral Switch

Figure 34. Neutral Switch – Removal
Neutral Switch – Installation

Special Instructions

None

Required Tools

Basic Hand Tools

Installation

1. Using a 27 mm wrench, install the Neutral Switch. Torque to 20-25 Nm (15-20 lb-ft).

2. Re-connect the Transmission Harness to the Neutral Switch (N).

3. Using a flat blade screwdriver, install the Transmission Protective Covers by turning the attaching screws 180 degrees.

Final Check

Make sure the Neutral Switch is properly torqued.

Make sure that all of the connectors are properly connected and locked.

Figure 35. Neutral Switch Location
Figure 36. Neutral Switch – Installation

1. Install Neutral Switch

2. Re-connect Transmission Harness

3. Install Protective Covers (see p. 14 - 15)
Reverse Switch — Removal

Special Instructions
None

Required Tools
Basic Hand Tools

Removal
1. Using a flat blade screwdriver, remove the Transmission Protective Covers by turning the attaching screws 180 degrees.
2. Disconnect the Transmission Harness from the Reverse Switch (P).
3. Using a 27 mm wrench, remove the Reverse Switch.

Figure 37. Reverse Switch Location
1. Remove Protective Covers (see p. 12 - 13)

2. Disconnect Transmission Harness

3. Remove Reverse Switch

Figure 38. Reverse Switch – Removal
Reverse Switch – Installation

Special Instructions
None

Required Tools
Basic Hand Tools

Installation

1. Using a 27 mm wrench, install the Reverse Switch. Torque to 20-25 Nm (15-20 lb-ft).
2. Re-connect the Transmission Harness to the Reverse Switch (P).
3. Using a flat blade screwdriver, install the Transmission Protective Covers by turning the attaching screws 180 degrees.

Final Check
Make sure that all of the connectors are properly connected and locked.
Make sure that the Reverse Switch is properly torqued.

Figure 39. Reverse Switch Location
1. Install Reverse Switch

2. Re-connect Transmission Harness

3. Install Protective Covers (see p. 14 - 15)

Figure 40. Reverse Switch – Installation
Splitter Switch – Removal

Special Instructions

None

Required Tools

Basic Hand Tools

Removal

1. Using a flat blade screwdriver, remove the Transmission Protective Covers by turning the attaching screws 180 degrees.

2. Disconnect the Transmission Harness from the Splitter Switch (M).

3. Using a 27 mm wrench, remove the Splitter Switch.

Figure 41. Splitter Switch Location
Figure 42. Splitter Switch – Removal

1. Remove Protective Covers (see p. 12 - 13)

2. Disconnect Transmission Harness

3. Remove Splitter Switches
Splitter Switch – Installation

Special Instructions
None

Required Tools
Basic Hand Tools

Installation

1. Using a 27 mm wrench, install the Splitter Switch. Torque to 20-25 Nm (15-20 lb-ft).

2. Re-connect the Transmission Harness to the Splitter Switch (M).

3. Using a flat blade screwdriver, install the Transmission Protective Covers by turning the attaching screws 180 degrees.

Final Check
Make sure that all of the connectors are properly connected and locked.
Make sure that the Splitter Switch is properly torqued.
1. Install Splitter Switch

2. Re-connect Transmission Harness

3. Install Protective Covers (see p. 14 - 15)

Figure 44. Splitter Switch – Installation
Splitter Solenoid Assembly – Removal

Special Instructions

None

Required Tools

Basic Hand Tools

Removal

1. Drain air system. Using a flat blade screwdriver, remove the Transmission Protective Covers by turning the attaching screws 180 degrees.

2. Remove Transmission Harness from the Splitter Solenoid Assembly (S and D).

3. Using a 14 mm wrench, remove the air pipe between the Splitter Solenoid Assembly and the Range Solenoid Assembly.

   NOTE: Take note of the copper washers at the ends of the air pipe.

4. Using a 13 mm wrench, remove the two mounting capscrews from the Splitter Solenoid Assembly.

5. Remove Splitter Solenoid Assembly from the Shift Bar Housing.

   NOTE: Take note of the two O-rings at the air ports. Do not lose them.
Figure 46. Splitter Solenoid Assembly – Removal

1. Drain Air System, Remove Protective Covers (see p. 12 - 13)
2. Disconnect Transmission Harness
3. Remove The Air Pipe
4. Remove Mounting Capscrews
5. Remove Splitter Solenoid

O-rings
Splitter Solenoid Assembly – Installation

Special Instructions
Lubricate O-rings with Eaton/Fuller silicone #71214 or equivalent.
Use care when installing the O-rings.

Required Tools
Basic Hand Tools

Installation

NOTE: Make sure that the O-rings are in place on the Shift Bar Housing.

1. Install the Splitter Solenoid Assembly on the Shift Bar Housing.
2. Using a 13 mm wrench, install the two mounting capscrews. Torque to 40-45 Nm (30-33 lb-ft).
3. Using a 14 mm wrench, install the air pipe between the Splitter Solenoid Assembly and the Range Solenoid Assembly.
4. Re-connect the Transmission Harness to the Splitter Solenoid Assembly (S and D).
5. Using a flat blade screwdriver, install the Transmission Protective Covers by turning the attaching screws 180 degrees.

Final Check
Make sure the mounting capscrews are properly torqued.
Make sure there are no air leaks.
Make sure that all of the connectors are properly connected and locked.

Figure 47. Splitter Solenoid Assembly Location
1. Install Splitter Solenoid Assembly
2. Install Mounting Capscrews
3. Install The Air Pipe
4. Re-connect Transmission Harnesses
5. Install Protective Covers (see p. 14 - 15)

Figure 48. Splitter Solenoid Assembly – Installation
Upshift Brake Solenoid – Removal

Special Instructions
None

Required Tools
Basic Hand Tools

Removal

1. Drain the air system. Disconnect the Transmission Harness from the Front Counter Shaft Speed Sensor (T) and the Upshift Brake Solenoid (K).

2. Using a 16 mm wrench, disconnect the air supply line from the Range Solenoid Assembly.

3. Using a 14 mm wrench, remove the air pipe between the Upshift Brake and the Upshift Brake Solenoid.

   **NOTE:** Take note of the brass washers on the air pipe capscrews.

4. Using a 13 mm wrench, remove the Upshift Brake Solenoid and bracket. Using a flat blade screwdriver, remove the bracket from the solenoid.

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Figure 49. Upshift Brake Solenoid Location
Figure 50. Upshift Brake Solenoid – Removal

1. Drain Air System, Disconnect Transmission Harness
2. Disconnect The Air Line
3. Remove Air Pipe
4. Remove Upshift Brake Solenoid
Upshift Brake Solenoid – Installation

Special Instructions
None

Required Tools
Basic Hand Tools

Installation

1. Using a flat blade screwdriver, install the bracket onto the solenoid. Torque to 2-2.5 Nm (12-24 lb-in). Using a 13 mm wrench, install the Upshift Brake Solenoid and bracket to the Upshift Brake. Torque to 37-42 Nm (27-32 lb-ft).

2. Using a 16 mm wrench, connect the air line from the Range Solenoid Assembly to the Upshift Brake Solenoid.

3. Using a 14 mm wrench, install the air pipe between the Upshift Brake and the Upshift Brake Solenoid.

   NOTE: Take note of the brass washers on the air pipe capscrews.

4. Re-connect the Transmission Harness to the Upshift Brake Solenoid (K) and the Front Counter Shaft Speed Sensor (T).

Final Check

Make sure that all of the connectors are properly connected and locked.

Make sure there are no air leaks.

Make sure that the mounting capscrews are properly torqued.

Figure 51. Upshift Brake Solenoid Location
Figure 52. Upshift Brake Solenoid – Installation

1. Install Upshift Brake Solenoid
2. Re-Connect The Air Line
3. Install The Air Pipe
4. Re-connect The Transmission Harness
Upshift Brake – Removal

Special Instructions

⚠️ WARNING: Hot oil may be present when removing the Upshift Brake.

Required Tools

Basic Hand Tools

Removal

1. Prepare the Upshift Brake for removal as follows.
   a. Drain transmission lubricant.
   b. Disconnect the Transmission Harness from the Front Counter Shaft Speed Sensor (T) and Upshift Brake Solenoid (K).

2. Using a 14 mm wrench, remove the air pipe between the Upshift Brake Solenoid and the Upshift Brake.

   NOTE: Take note of the brass washer on the air pipe capscrews.

3. Using a 13 mm wrench, remove the Upshift Brake Solenoid Assembly and bracket.

   ⚠️ WARNING: Upshift Brake is heavy.

4. Using a 15 mm wrench, remove the six mounting capscrews from the Upshift Brake.

5. Remove the Upshift Brake and gasket from the transmission.

   ⚠️ WARNING: Hot oil may be present in the Upshift Brake.

Figure 53. Upshift Brake Location
1. Disconnect Transmission Harness
2. Remove Air Pipe
3. Remove Upshift Brake Solenoid And Bracket
4. Remove Mounting Capscrews
5. Remove Upshift Brake And Gasket

Figure 54. Upshift Brake – Removal
Upshift Brake – Installation

Special Instructions

Clean and remove old gasket material before installation.

Be sure to use sealing-type washers on the Upshift Brake mounting capscrews.

Required Tools

Basic Hand Tools

Installation

⚠️ WARNING: Upshift Brake is heavy.

1. Install the Upshift Brake and new gasket to the transmission case by aligning the Upshift Brake Gear to the Transmission PTO Gear.

2. Using a 15 mm wrench, install the six mounting capscrews with new sealing washers. Torque to 45-70 Nm (33-52 lb-ft).

3. Using a 13 mm wrench, install the Upshift Brake Solenoid and bracket. Torque to 37-42 Nm (27-31 lb-ft).

4. Using a 14 mm wrench, install the air pipe between the Upshift Brake Solenoid and the Upshift Brake.

   NOTE: Take note of the two brass washers.

5. Re-connect the Transmission Harness to the Upshift Brake Solenoid (K) and the Front Counter Shaft Speed Sensor (T).

Final Inspection

Make sure that mounting capscrews are properly torqued.

Refill and check the transmission lubricant level before driving the vehicle.

Make sure there are no air leaks.

Make sure that all of the connectors are properly connected and locked.

Check for lubricant leaks after operating the vehicle.

Figure 55. Upshift Brake Location
1. Install Upshift Brake and Gasket

2. Install Mounting Capscrews With New Sealing Washers

3. Install Upshift Brake Solenoid And Bracket

4. Install The Air Pipe And Brass Washers

5. Re-connect Transmission Harness

Figure 56. Upshift Brake – Installation
Front Counter Shaft / Main Shaft / Output Shaft Speed Sensor – Removal

Special Instructions

Drain the transmission lubricant before removing the Front Counter Shaft Speed Sensor.

Required Tools

Basic Hand Tools

Removal

1. Disconnect the Transmission Harness from the Speed Sensor.

   **NOTE:** Before removing Front Counter Shaft Speed Sensor, drain the lubricant from transmission.

2. Using a 10 mm wrench, remove the sensor retainer cap screws and lock plate.

3. Remove the sensor and O-ring from the transmission housing.

**WARNING:** Hot oil may be present when removing the Front Counter Shaft Speed Sensor.
Figure 58. Front Counter Shaft / Main Shaft / Output Shaft Speed Sensor – Removal

1. Disconnect Transmission Harness

2. Remove Mounting Capscrews And Plate

3. Remove Sensor
Front Counter Shaft / Main Shaft / Output Shaft Speed Sensor – Installation

Special Instructions
Lubricate the O-ring with Eaton Fuller silicone # 71214 or equivalent.

Required Tools
Basic Hand Tools

Installation
1. Using a smooth, twisting motion, fully install sensor in the transmission housing opening.
2. Using a 10 mm wrench, install the sensor retainer capscrews and plate. Torque to 10-13 Nm (8-10 lb-ft).
3. Re-connect the Transmission Harness to the Speed Sensor.

Final Check
Refill and check transmission lubricant level before driving vehicle.
Make sure that the mounting capscrew is properly torqued.
Make sure that all of the connectors are properly connected and locked.
Check for lubricant leaks after operating the vehicle.

Figure 59. Front Counter Shaft / Main Shaft / Output Shaft Speed Sensor Location
Figure 60. Front Counter Shaft / Main Shaft / Output Shaft Speed Sensor – Installation

1. Install Sensor

2. Install Mounting Capscrews And Plate

3. Re-connect Transmission Harness
Air Filter Regulator – Removal

Special Instructions
None

Required Tools
Basic Hand Tools

Removal

1. Drain air system. Disconnect the Transmission Harness from the Low Air Switch (G).
2. Using a 19 mm wrench, remove the Low Air Switch from the Air Filter Regulator.
3. Using a 16 mm wrench, remove the air lines from the Air Filter Regulator.
4. Using a 10 mm wrench, remove the two mounting capscrews and remove the Air Filter Regulator.

Figure 61. Air Filter Regulator Location
1. Drain Air System, Disconnect Transmission Harness

2. Remove Low Air Switch

3. Remove Air Lines

4. Remove Mounting Capscrews And Air Filter Regulator

Figure 62. Air Filter Regulator – Removal
Air Filter Regulator – Installation

Special Instructions
None

Required Tools
Basic Hand Tools

Final Check
Make sure that all of the connectors are properly connected and locked.

Make sure there are no air leaks.

Make sure the mounting capscrews are properly torqued.

Installation

1. Using a 10 mm wrench, install the Air Filter Regulator to the transmission. Torque to 10-13 Nm (8-10 lb-ft).

2. Using a 16 mm wrench, install the air lines to the Air Filter Regulator.

3. Using a 19 mm wrench, install the Low Air Switch to the Air Filter Regulator. Torque to 10-15 Nm (8-12 lb-ft).

4. Re-connect the Transmission Harness to the Low Air Switch (G).

Figure 63. Air Filter Regulator Location
1. Install Air Filter Regulator

2. Install Air Lines

3. Install Low Air Switch

4. Re-connect Transmission Harness

Figure 64. Air Filter Regulator – Installation
Low Air Switch – Removal

Special Instructions
None

Required Tools
Basic Hand Tools

Removal

1. Drain air system. Disconnect the Transmission Harness from the Low Air Switch (G).
2. Using a 19 mm wrench, remove the Low Air Switch from the Air Filter Regulator.

Figure 65. Low Air Switch Location
1. Drain Air System, Disconnect Transmission Harness

2. Remove Low Air Switch

Figure 66. Low Air Switch – Removal
Low Air Switch — Installation

Special Instructions
None

Required Tools
Basic Hand Tools

Installation
1. Using a 19 mm wrench, install the Low Air Switch on the Air Filter Regulator. Torque to 10-15 Nm (8-12 lb-ft).
2. Re-connect the Transmission Harness to the Low Air Switch (G).

Final Check
Make sure there are no air leaks.
Make sure that all of the connectors are properly connected and locked.
Make sure that the Low Air Switch is properly torqued.

Figure 67. Low Air Switch Location
1. Install Air Filter Switch

2. Re-connect Transmission Harness

Figure 68. Low Air Switch – Installation