

Eaton Cummins Automated Transmission Technologies - Endurant HD PTO Installation Guide TRIG2610 EN-US

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BACKED BY
Roadranger
SUPPORT

Warnings and Cautions

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.

Important 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.



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

Caution: Failure to follow indicated procedures may cause component damage or malfunction.

Important: Highly recommended procedures for proper service of this unit.

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.

Every effort has been made to ensure the accuracy of all information in this guide. However, Eaton makes no expressed or implied warranty or representation based on the enclosed information.

Warnings and Cautions

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PTO Configurations by Model - Automated

PTO and Auto Neutral Availability

	Split Shaft PTO	Countershaft PTO**	Auto Neutral
Endurant HD	N/A	Available (Default)	Available (Default)

Note: ** Thru-Shaft, extended countershaft, and extended auxiliary countershaft PTO availability can be found in the PTO Configuration by Model sections.

Heavy-Duty Automated - Endurant HD

Model	8-Bolt	8-Bolt Gear Info.	8-Bolt Speed	Rear PTO	Rear PTO Speed	Transmission Power Limit for PTO Use (HP and torque)
EEO-14F112C	Yes ¹	42T 3.156 MODULE, 20DEG PA, 28.9747 DEG H.A. LEFT HAND	137% Opposite of Engine	Yes ²	137% Opposite of Engine	95 HP/383 lb-ft @ 950 RPM min. ³
EEO-15F112C						
EEO-16F112C						
EEO-17F112C						
EEO-18F112C						

Note: (1) - Elastomer controlled squeeze seal required at PTO Transmission mounting sealing surfaces. 8-bolt PTO opening is standard on all transmissions.

Note: (2) - Rear PTO option is a Thru-Shaft PTO and is only available when the Dual PTO Transmission is ordered.

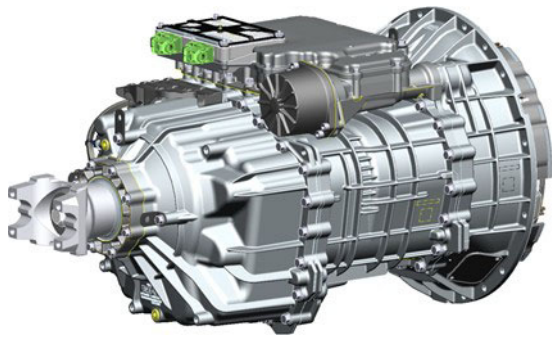
Note: (3) - PTO horsepower (HP) and torque rating is 8-bolt only, rear PTO only, or both PTO combined.



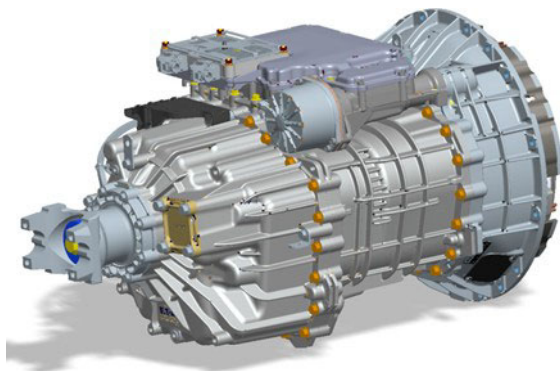
WARNING: Use of HOT SHIFT PTO not allowed on Endurant model transmissions.



The Endurant Transmission requires a new type of PTO, previous PTO models are not compatible. Contact PTO manufacturer with the information in the chart above to verify the correct PTO for the Endurant Transmission. Failure to use the correct PTO results in transmission damage.



Single PTO Transmission
(One 8-Bolt bottom mount PTO)



Dual PTO Transmission (One 8-Bolt bottom mount and
one 4-Bolt rear mount PTO)



CAUTION: Reference service bulletin *TAIB-1010: Single PTO Transmission Service Units built with Dual (4-Bolt) PTO Rear Housings.*



CAUTION: Do not install a 4-Bolt PTO onto a Single PTO TN-H04-12R or TN-H04-75RR replacement transmission service unit built with a Dual (4-Bolt) Rear Housing. These service units do not include the internal components to support 4-Bolt PTO operation. If a 4-Bolt PTO is installed, PTO and/or transmission component damage will occur.

Note: Original equipment Dual PTO transmissions and Dual PTO replacement transmission service units support 4-Bolt PTO operation.

Endurant HD - PTO Inputs and Configurations

The Endurant transmission is designed to provide enhanced controls for PTO applications. The Transmission Control Module (TCM) must be configured for PTO operation using ServiceRanger software. The default setting for this feature is Disabled.

NOTICE: Failure to configure the TCM for PTO operation results in transmission damage.

Transmission PTO System Engagement Sequence

1. The TCM receives a “PTO request” message or signal from the vehicle to enter into a PTO mode.
2. The TCM verifies conditions are met for PTO operation. If conditions are met, the TCM supplies a “PTO engage” output to allow PTO engagement.
3. The TCM receives a “PTO confirm” message or signal that the PTO is physically engaged and the system is ready for operation.

Note: Refer to Endurant Countershaft PTO Operation section to engage the PTO.

The TCM supports three PTO controlled systems

- J1939 Control
- Hardwire Control
- J1939 Request, J1939 Engage, Hardwire Confirmation - Required for CECU only equipped Peterbilt and Kenworth chassis (refer to OEM for proper PTO configuration).

Single PTO Configuration

- The Single PTO Transmission is designed to operate one bottom mount 8-Bolt PTO.
- Single PTO configurations:
 - J1939 Control, Hardwire Control or
 - J1939 Request, J1939 Engage, Hardwire Confirmation

Dual PTO Configuration

- The Dual PTO Transmission is designed to operate one bottom mount 8-Bolt PTO and/or one rear mount Thru-Shaft PTO.
- Dual PTO configurations:
 - One J1939 Control and one Hardwire Control or
 - Both J1939 Control (refer to OEM for proper PTO configuration)

PTO Wiring Requirements

- Hardwire controlled PTO operation requires a double pole single throw switch.
- Consult PTO manufacturer for power requirements needed for fuses, switches and wires on PTO circuitry.
- TCM request and confirmation circuit lines provide 1 milliamp of current for a 12-volt system.
- The TCM engage circuit load shall draw no more than 0.50 amps with 16 volts applied for a 12 volt vehicle system.
- An 18 AWG TXL cable is required at the TCM 20-way connector for sealing purposes.

Note: The wiring schematics on the following pages show the inactive state for all options. The schematics are for reference only, refer to OEM, body builder and/or PTO manufacturer to ensure proper installation and diagnosis of the PTO wiring.

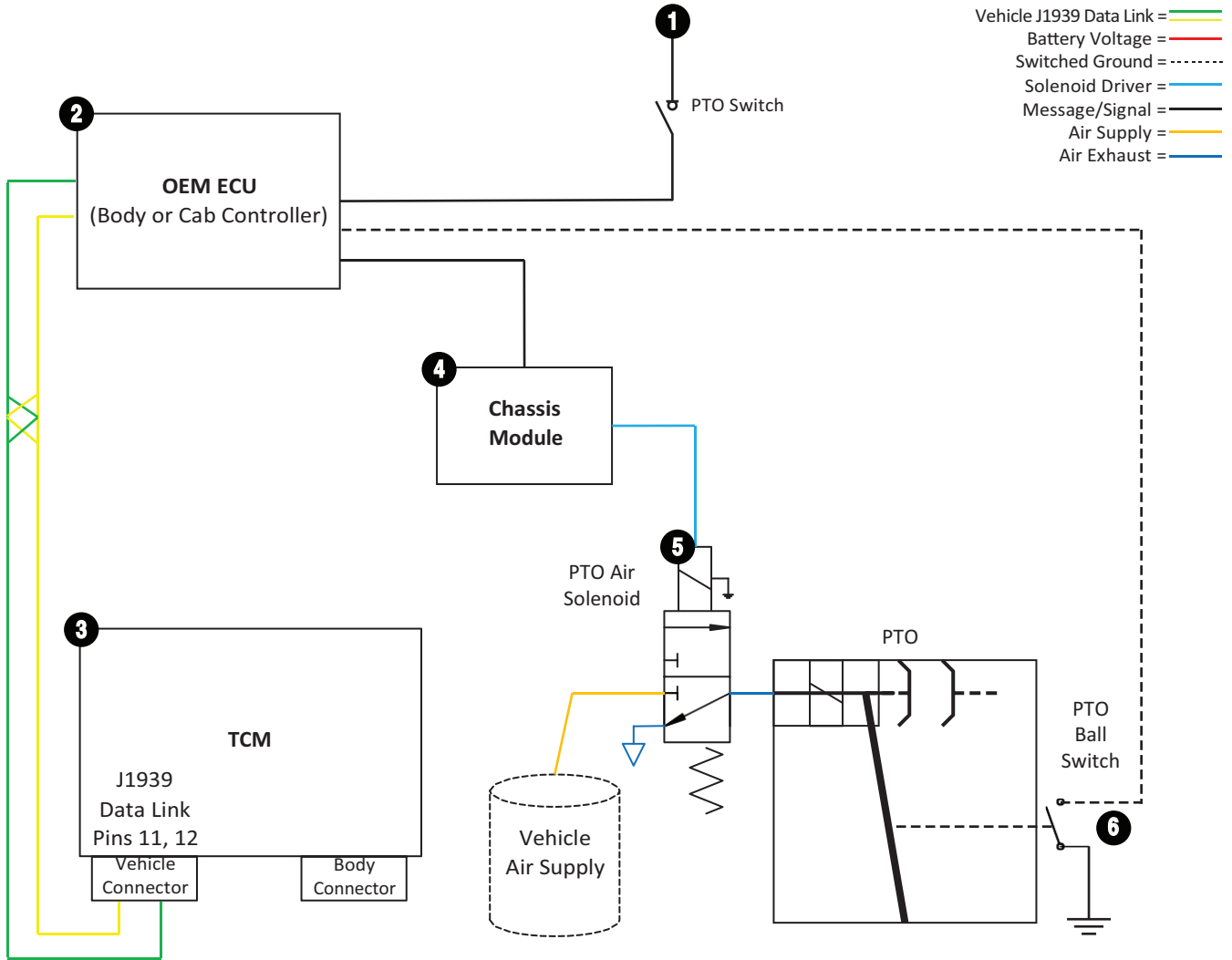
Endurant Auto Neutral Feature

An auto neutral feature is provided with this transmission which forces the transmission into neutral in all instances when the parking brake is applied. The Endurant system requires the use of the Park Brake Switch signal in the J1939 CCVS1 message to enable function of the Auto Neutral feature.

PTO Wiring Diagrams

Endurant J1939 PTO Control

Note: All switches shown inactive.



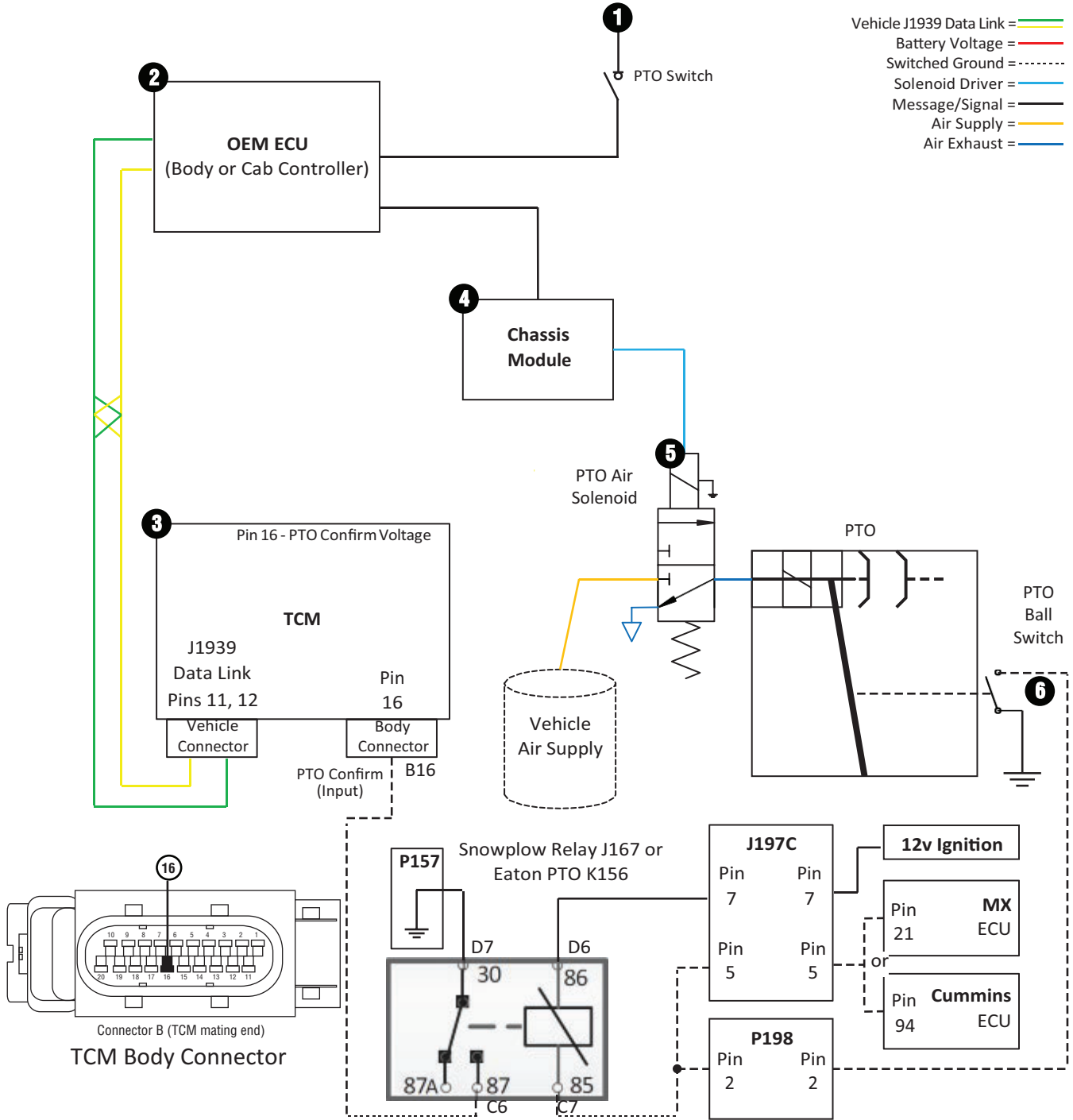
Note: Refer to table on next page for wiring diagram details.

NOTICE: PTO wiring is OEM or body builder installed. Refer to OEM, body builder and/or PTO manufacturer to ensure proper installation and diagnosis of the PTO wiring.

Endurant J1939 PTO Control					
Seq.	From (Diagram #)	Description	Method	To (Diagram #)	Status
1	PTO Switch (1)	sends PTO Engage request	J1939 or signal wire	OEM ECU (2)	Request
2	OEM ECU (2)	sends PTO Engage request	J1939	TCM (3)	Request
3	TCM (3)	sends the PTO Engage message once conditions are met	J1939	OEM ECU (2)	Engage
4	OEM ECU (2)	sends message to actuate the PTO Air Solenoid	J1939 or signal wire	Chassis Module (4)	Engage
5	Chassis Module (4)	energizes the PTO Air Solenoid to engage PTO	*	PTO Air Solenoid (5)	Engage
6	PTO Ball Switch-Ground (6)	closes and provides a ground (Confirmation) Indicating PTO is engaged	*	OEM ECU (2)	Confirm
7	OEM ECU (2)	OEM ECU sends Confirmation message; PTO ready for operation	J1939	TCM (3)	Confirm

Endurant J1939 Request, J1939 Engage, Hardwire Confirmation PTO Control

Note: All switches shown inactive.



PTO Interface

CAUTION: Do not induce voltage onto the Return circuits (Pins 5 or 14) or TCM damage could occur. One or more fault codes 900, 905, 920, or 925 with FMI 5 set Active if voltage was induced on Pins 5 or 14.

Note: Refer to table on next page for wiring diagram details.

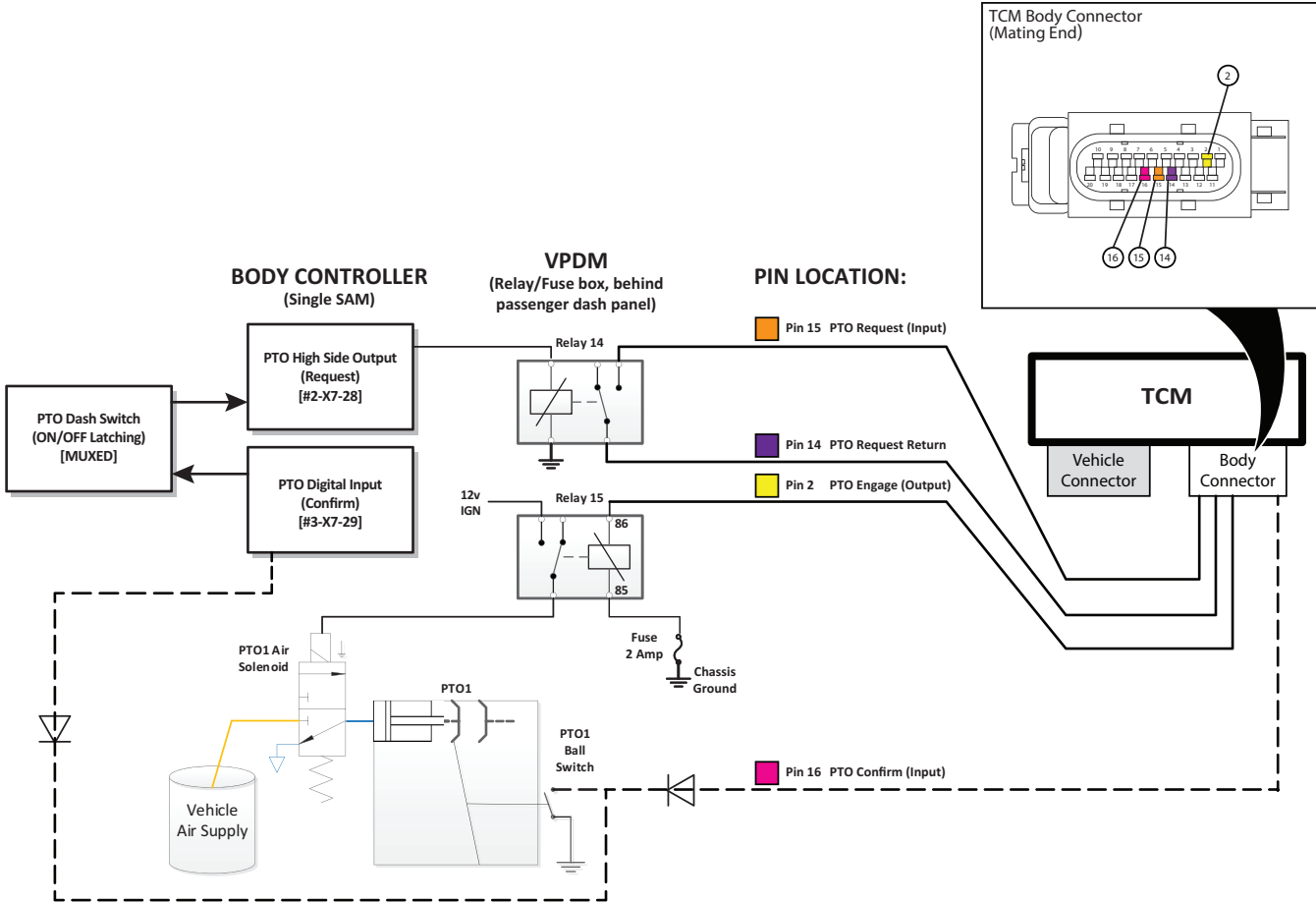
PTO Interface

NOTICE: PTO wiring is OEM or body builder installed. Refer to OEM, body builder and/or PTO manufacturer to ensure proper installation and diagnosis of the PTO wiring.

Endurant J1939 with Hardwire PTO Control					
Seq.	From (Diagram #)	Description	Method	To (Diagram #)	Status
1	PTO Switch (1)	sends PTO Engage request	J1939 or signal wire	OEM ECU (2)	Request
2	OEM ECU (2)	sends PTO Engage request	J1939	TCM (3)	Request
3	TCM (3)	sends the PTO Engage message once conditions are met	J1939	OEM ECU (2)	Engage
4	OEM ECU (2)	sends message to actuate the PTO Air Solenoid	J1939 or signal wire	Chassis Module (4)	Engage
5	Chassis Module (4)	energizes the PTO Air Solenoid to engage PTO	*	PTO Air Solenoid (5)	Engage
6	PTO Ball Switch-Ground (6)	closes and provides a ground (Confirmation) Indicating PTO is engaged	OEM wiring	TCM (3)	Confirm
7	TCM (3)	sends Confirmation message; PTO ready for operation	J1939	OEM ECU (2)	Confirm

PTO Interface

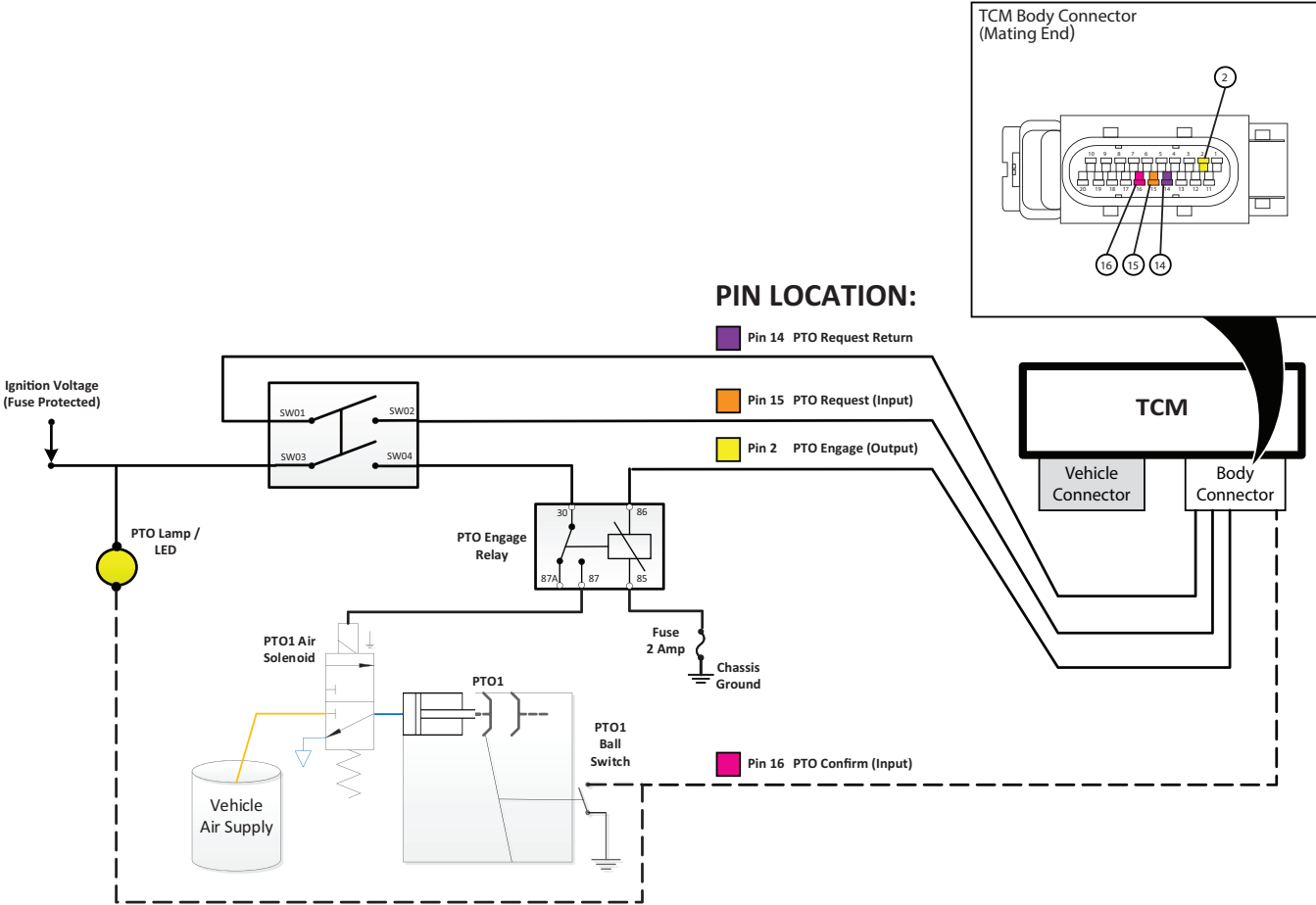
DTNA - Plant or Customer Installed PTO with DTNA Dash Switch and Prep Kit Control Schematic



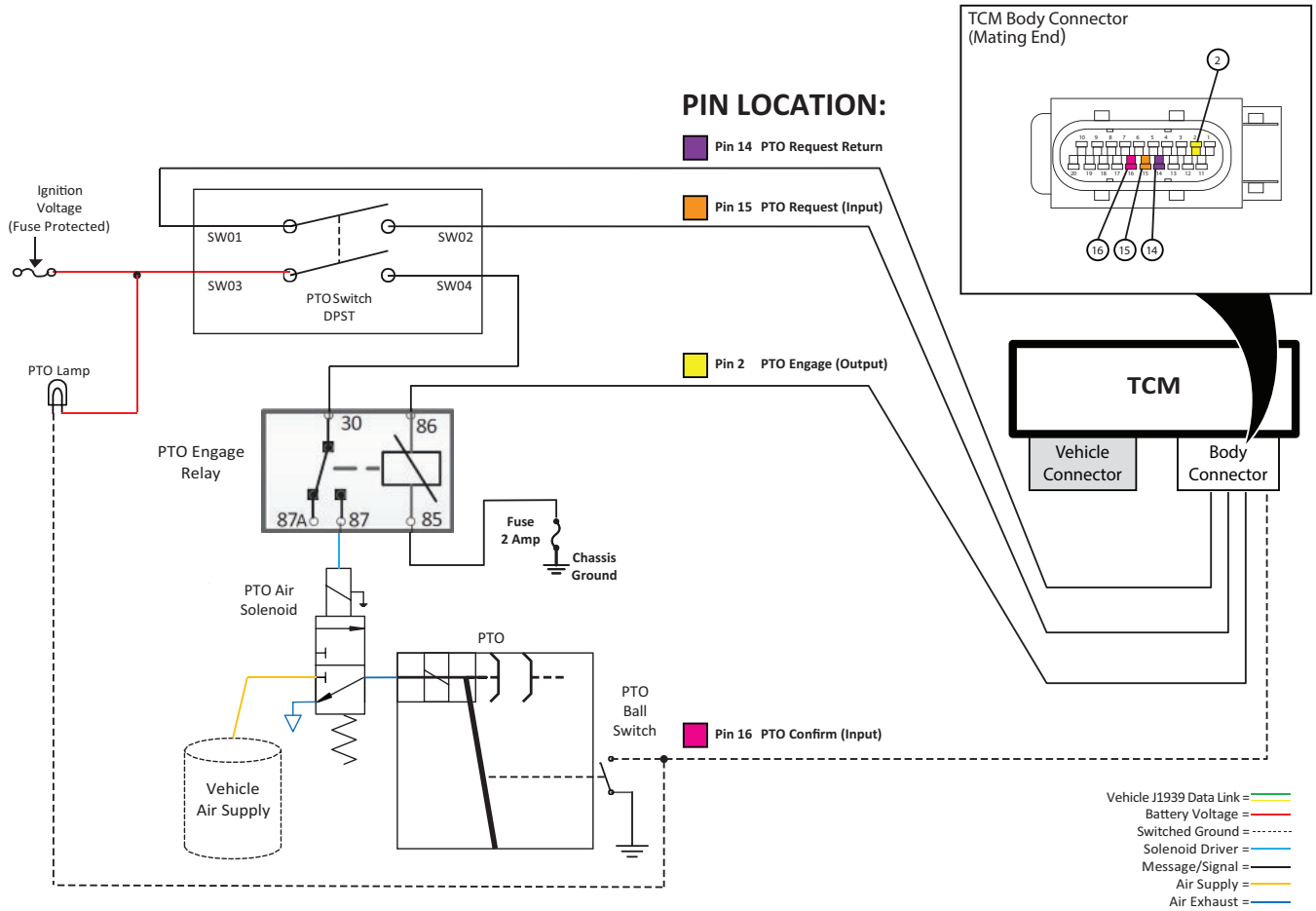
PTO Interface

PTO Interface

DTNA – Costumer Installed PTO without DTNA Dash Switch or Prep-Kit Control Schematic



Endurant Hardwire PTO Control with Confirm Switched to Ground





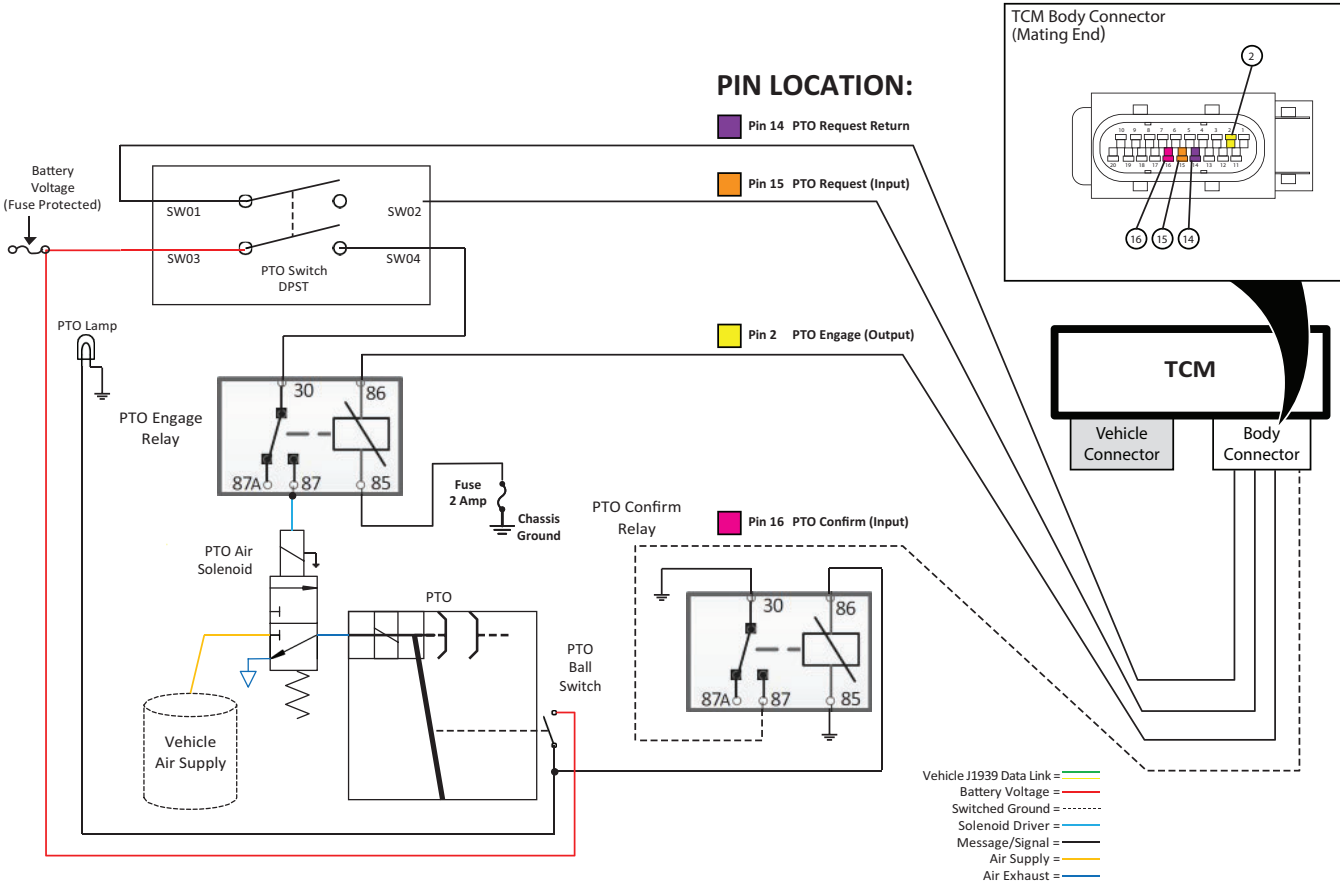
CAUTION: Do not induce voltage onto the Return circuits (Pins 5 or 14) or TCM damage could occur. One or more fault codes 900, 905, 920, or 925 with FMI 5 set Active if voltage was induced on Pins 5 or 14.

Note: Refer to table on next page for wiring diagram details.

NOTICE: PTO wiring is OEM or body builder installed. Refer to OEM, body builder and/or PTO manufacturer to ensure proper installation and diagnosis of the PTO wiring.

Endurant Hardwire PTO Control with Confirm Switched to Ground		
From	To	Description
SW01 - PTO Switch	Pin 14 - TCM Body Conn. (Return)	Request
Pin 15 - TCM Body Conn. (Input)	SW02 - PTO Switch	Request
Battery Voltage (Fuse Protected)	SW03 - PTO Switch	Request
SW04 - PTO Switch	Pin 30 - PTO Engage Relay	Request
Pin 2 - TCM Body Conn. (Output)	Pin 86 - PTO Engage Relay	Engage
Pin 85 - PTO Engage Relay	Chassis Ground	Engage
Pin 87 - PTO Engage Relay	PTO Air Solenoid	Engage
PTO Ball Switch (Ground)	Pin 16 - TCM Body Conn. (Input)	Confirm
	PTO Lamp (-)	Confirm
Battery Voltage (Fuse Protected)	PTO Lamp (+)	Confirm

Endurant Hardwire PTO Control with Power Switched Confirmation



PTO Interface



CAUTION: Do not induce voltage onto the Return circuits (Pins 5 or 14) or TCM damage could occur. One or more fault codes 900, 905, 920, or 925 with FMI 5 set Active if voltage was induced on Pins 5 or 14.

Note: Refer to table on next page for wiring diagram details.

NOTICE: PTO wiring is OEM or body builder installed. Refer to OEM, body builder and/or PTO manufacturer to ensure proper installation and diagnosis of the PTO wiring.

Hardwire PTO Control with Confirm Switched to Power		
From	To	Description
SW01 - PTO Switch	Pin 14 - TCM Body Conn. (Return)	Request
Pin 15 - TCM Body Conn. (Input)	SW02 - PTO Switch	Request
Battery Voltage (Fuse Protected)	SW03 - PTO Switch	Request
SW04 - PTO Switch	Pin 30 - PTO Engage Relay	Request
Pin 2 - TCM Body Conn. (Output)	Pin 86 - PTO Engage Relay	Engage
Pin 85 - PTO Engage Relay	Chassis Ground	Engage
Pin 87 - PTO Engage Relay (Voltage)	PTO Air Solenoid	Engage
	PTO Ball Switch	Confirm
PTO Ball Switch (Voltage)	Pin 86 - PTO Confirm Relay	Confirm
	PTO Lamp (+)	Confirm
Pin 87 - PTO Confirm Relay (Ground)	Pin 16 - TCM Body Conn. (Input)	Confirm

PTO Cover Replacement and Lube Tube Fill Procedure for PTO Installation

4-Bolt PTO Cover

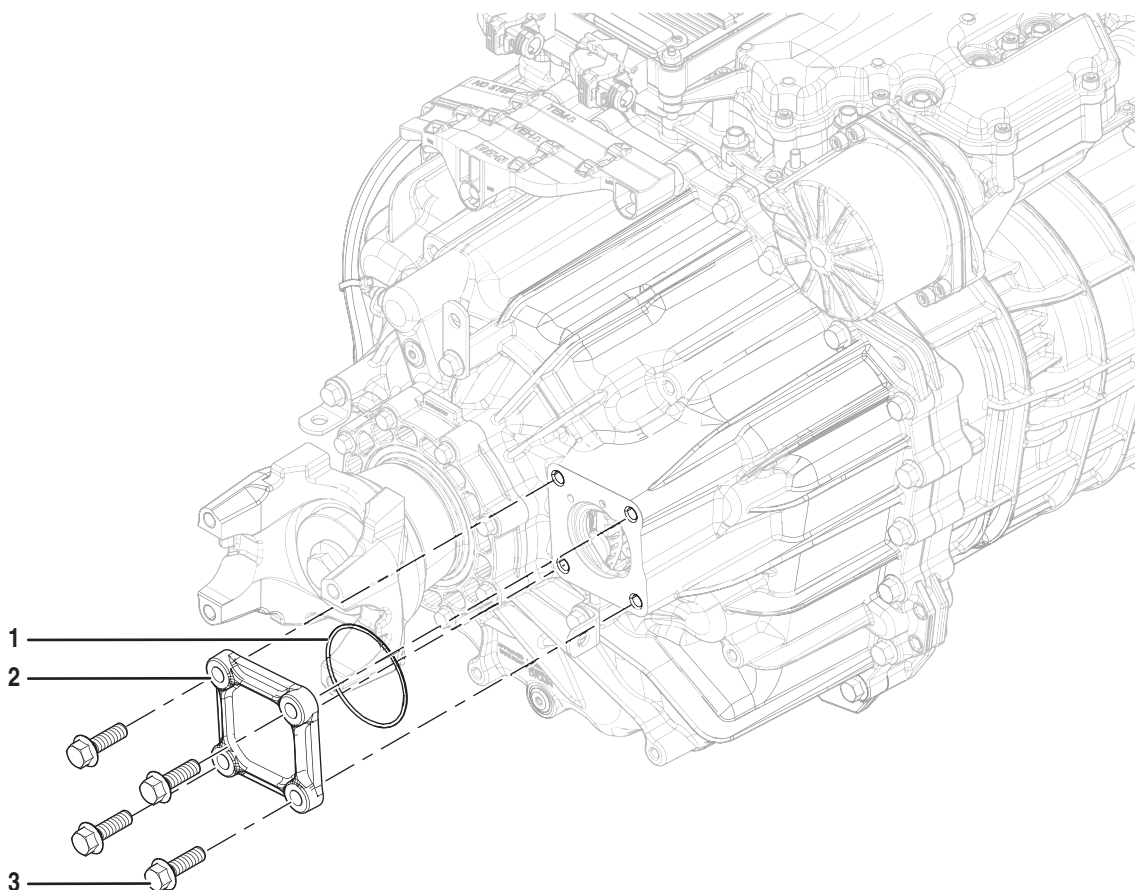
Special Instructions

Only equipped with a Dual PTO Endurant HD transmission.
The 4-Bolt PTO Cover can be removed and installed with the transmission in-vehicle.

Special Tools

None

Component Identification



1. O-ring
2. 4-Bolt PTO Cover
3. Cap Screws (x4) - 18mm

Remove the 4-Bolt PTO Cover

1. Remove 4 Rear PTO Cover 18 mm cap screws.



2. Using a soft-faced hammer at the 3 o'clock position, lightly tap to separate the PTO cover from the Rear Housing.



Caution: Keep fingers clear to avoid personal injury.



Install the 4-Bolt PTO Cover

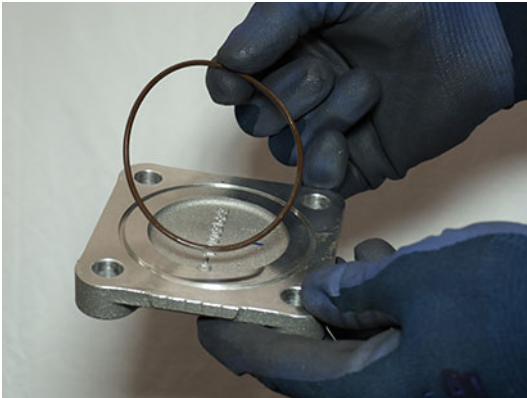
1. Clean sealing surfaces on the rear housing and 4-Bolt PTO Cover.

NOTICE: Do not use abrasive scrapers or powered tools to clean sealing surfaces or sealing surfaces may be damaged and leak.

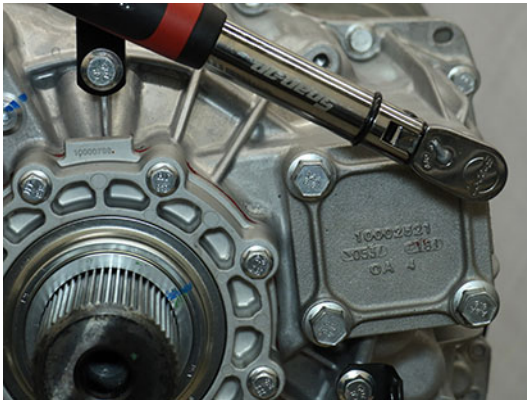
2. Inspect threaded bolt holes for debris and clean if necessary.

NOTICE: Ensure there is nothing in the threaded bolt holes or the transmission may be damaged when cap screws are tightened.

3. Insert a new 4-Bolt PTO Cover O-ring into groove until fully seated.



4. Install the 4-Bolt PTO Cover onto Rear Housing with 4 18mm cap screws and torque to 69-81 Nm (51-60 lb-ft) in a criss-cross pattern.



8-Bolt PTO Cover

Special Instructions

The 8-Bolt PTO Cover can be removed and installed with the transmission in-vehicle.

Special Tools

- Gasket Sealant (Loctite 5188)
- Plastic Scraper
- Non-Chlorinated Brake Cleaner (Gasket Remover)

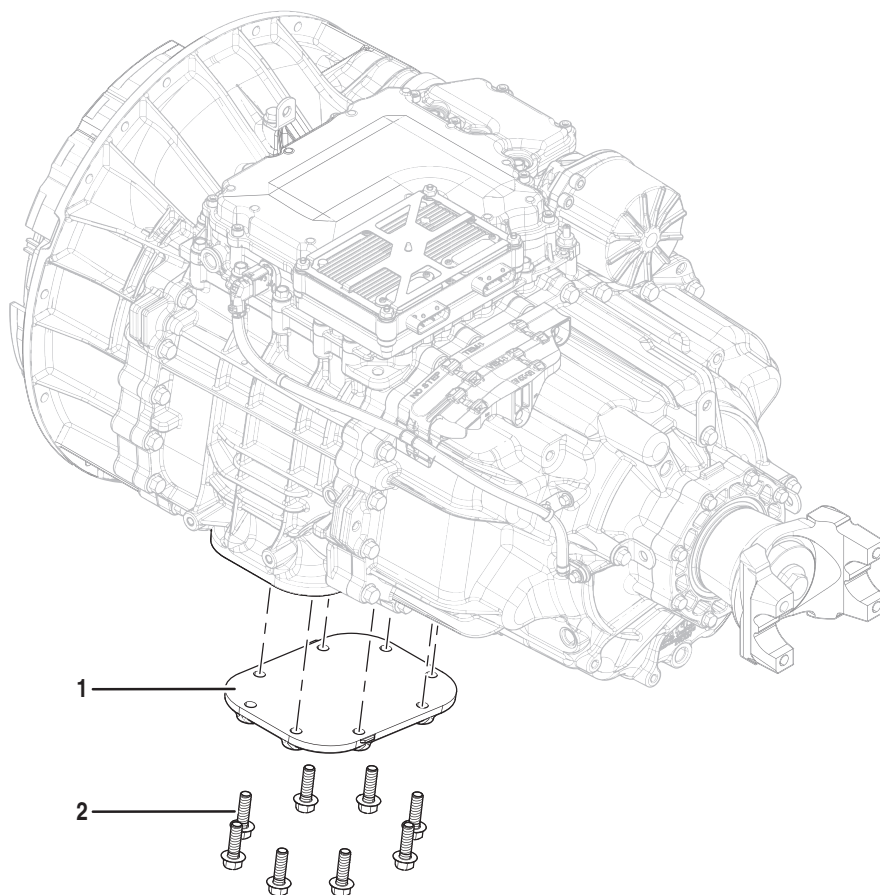


DANGER: Do not handle non-chlorinated brake cleaner until all manufacturer precautions have been read and understood. Failure to follow precautions will result in serious personal injury or death.



CAUTION: Avoid contact between non-chlorinated brake cleaner and the transmission plastic components, electrical wiring and connectors. Failure to avoid contact will result in transmission component damage.

Component Identification



1. 8-Bolt PTO Cover
2. PTO Cover Cap Screws (x8) - 18mm

Drain Oil

1. Locate the Oil Drain Plug on the back of the rear housing.
2. Place a suitable container under the Oil Drain Plug.

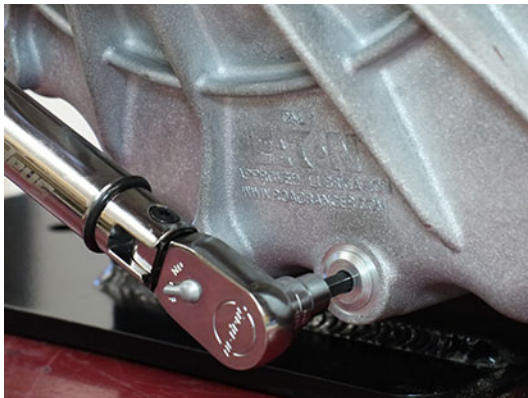
Note: If reusing oil, use a clean container free of contamination and debris.

3. Remove the Oil Drain Plug with a 6mm hex key and drain the oil.



4. If PTO-equipped, remove PTO and drain the oil.
5. Inspect Oil Drain Plug and O-ring for damage. If damaged, replace the Oil Drain Plug; O-ring is serviced with plug.
6. Install the Oil Drain Plug (6 mm) and torque to 24.5-29.5 Nm (18-22 lb-ft).

NOTICE: Do not over-torque drain plug or transmission damage may occur.

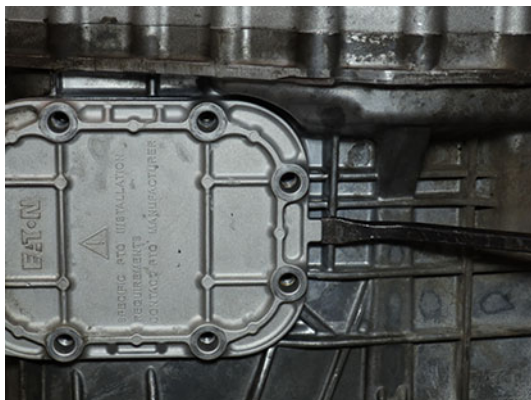
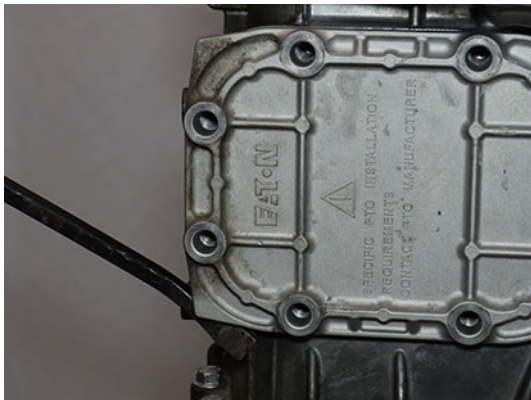


Remove the 8-Bolt PTO Cover

1. Remove 8-Bolt PTO Cover 18mm cap screws.



2. Separate 8-Bolt PTO Cover from Main Housing at the 2 pry points.



Install the 8-Bolt PTO Cover

1. Clean the sealing surface on the transmission and 8-Bolt PTO cover with gasket remover and a plastic scraper. Let air dry then wipe with a clean dry cloth.

NOTICE: Do not use abrasive scrapers or powered tools to clean sealing surfaces or sealing surfaces may be damaged and leak.

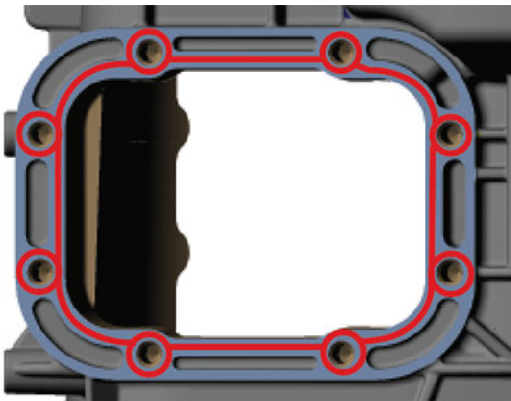
2. Inspect threaded bolt holes for debris and clean if necessary.

NOTICE: Ensure there is nothing in the threaded bolt holes or the transmission may be damaged when cap screws are tightened.

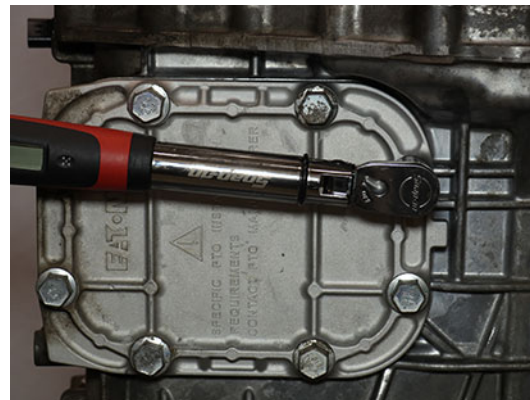
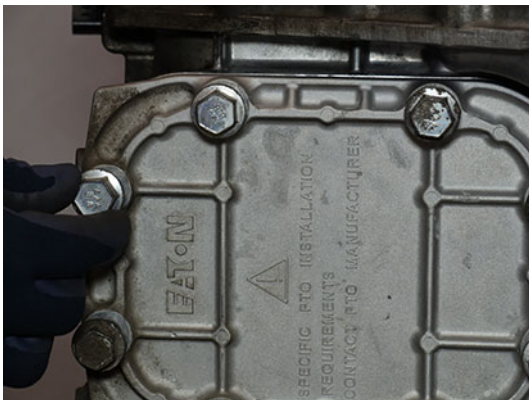
3. Apply Gasket Sealant with a bead width of 1.4-2.4 mm (0.055-0.094 inch) to Main Housing as shown in pattern below.

NOTICE: Ensure there is nothing in the threaded bolt holes or the transmission may be damaged when cap screws are tightened.

Note: Parts must be assembled within 10 minutes of applying Gasket Sealant.



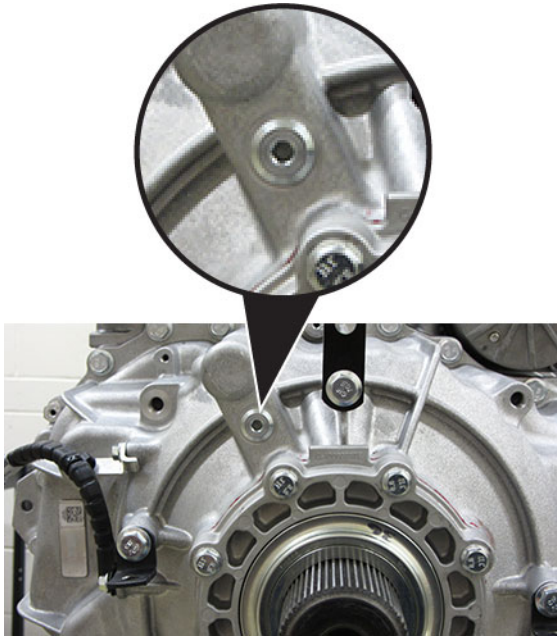
4. Install the 8-Bolt PTO Cover onto Main Housing with 8 18mm cap screws and torque to 69-81 Nm (51-60 lb-ft) in a criss-cross pattern.



Fill Oil

Note: Perform the transmission fill procedure with transmission installed in vehicle to ensure proper transmission angle.

1. Remove the Oil Fill Plug with a 6 mm hex key.

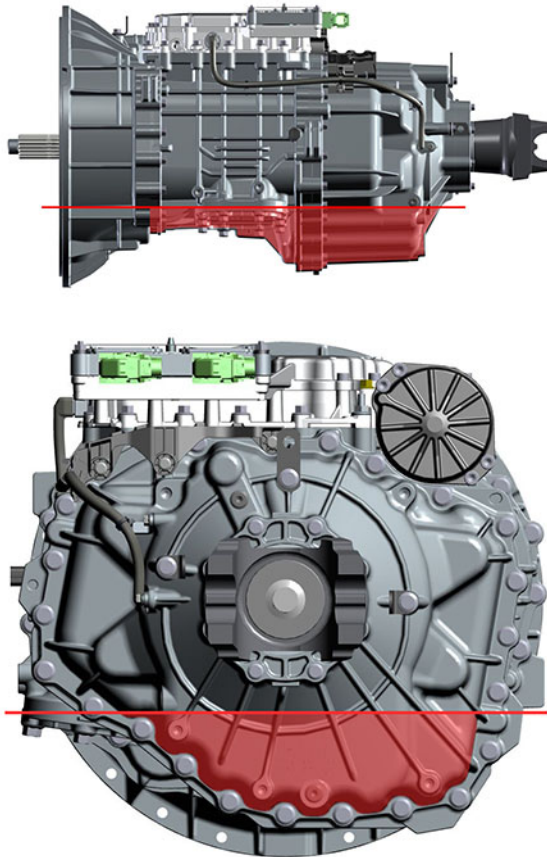


2. Place a suitable container under the Oil Check Plug and remove the Oil Check Plug with a 6 mm hex key.



3. Fill the transmission with PS-386 lube until a small amount of oil runs out of the Oil Check Plug hole.

Note: Fill capacity is approximately 7.5-8.5 liters (16-18 pints) depending on the transmission angle.



4. Inspect Oil Check Plug and O-ring for damage. If damaged, replace the Oil Check Plug; O-ring is serviced with plug.
5. Install the Oil Check Plug (6 mm) and torque to 24.5-29.5 Nm (18-22 lb-ft).

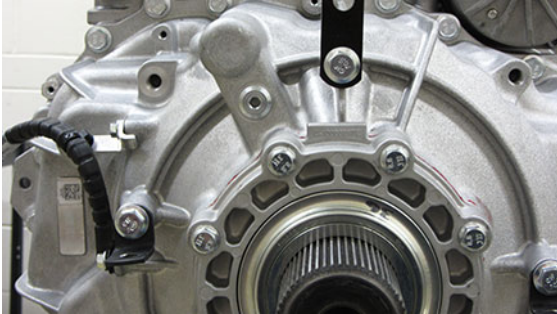
NOTICE: Do not over-torque the Oil Fill Plug or transmission damage may occur.



6. Inspect Oil Fill Plug and O-ring for damage. If damaged, replace the Oil Fill Plug; O-ring is serviced with plug.
7. Install the Oil Fill Plug (6 mm) and torque to 24.5-29.5 Nm (18-22 lb-ft).

NOTICE: Do not over-torque the Oil Fill Plug or transmission damage may occur.

NOTICE: If PTO-equipped, start the engine and run for 1 to 2 minutes to fill the PTO with oil, key off and repeat the Oil Fill Procedure.



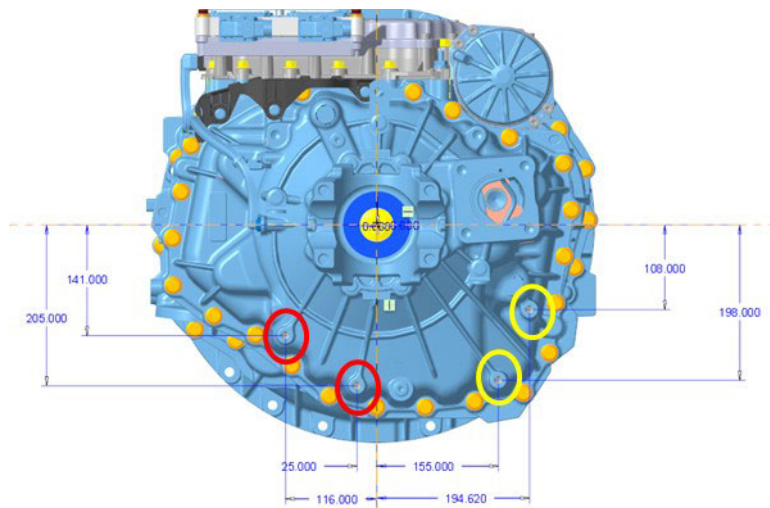
8. Install the Oil Fill Plug and torque to 24.5-29.5 Nm (18-22 lb-ft).

Endurant - PTO Support Brackets and Sealing

The Endurant transmission is equipped with threaded support bosses for PTO and pump support brackets at designated mounting locations. Consult PTO manufacturers for specific requirements. The following are included as a guideline for fabrication of support brackets and mounting.

Endurant PTO Support Brackets

Note: Threaded support bosses highlighted in Red are for 8-Bolt PTO and highlighted in Yellow are for Rear PTO.



Note: Threaded Support Boss M10 x 1.5, thread depth 25 mm

WARNING

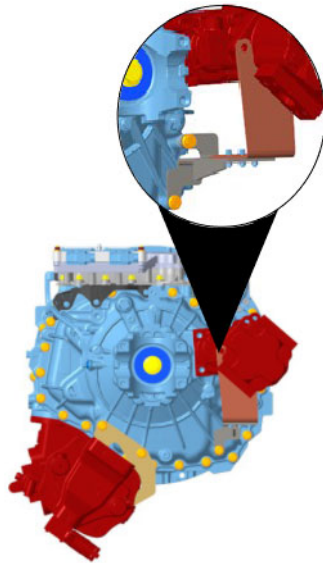
Use only Eaton approved support mounting locations. Not using the proper location could result in transmission damage.

Note: Lifting eyes may be removed after transmission is installed to the engine for installation of additional brackets/clips.

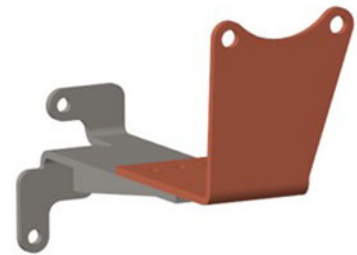
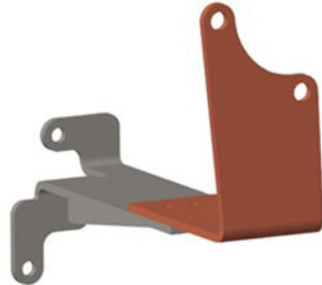
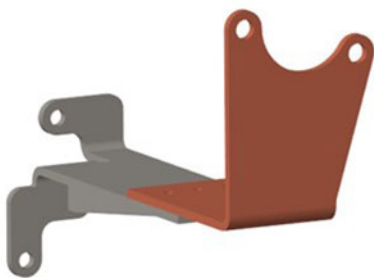
WARNING

Follow PTO manufacturers guidelines for support requirements of their PTO.

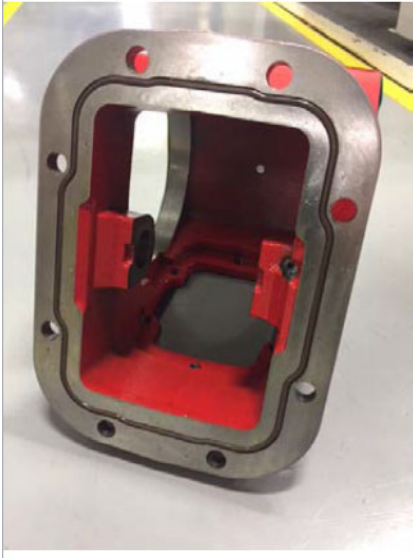
Example of 8-Bolt Bottom Mount and Rear Mount PTO Support Brackets:



Example Rear Mount PTO Support Brackets:



Endurant PTO Sealing Configuration Examples:



Chelsea: Push in place elastomer O-ring type seal

Muncie: Steel gasket with Edge molded elastomer seal

Bezares: Steel gasket with raised seal surface and elastomer coating on entire gasket surface

Endurant HD Countershaft PTO Operation

The transmission PTO feature is available in Neutral Mode for Stationary PTO operation and Forward and Reverse Mode start gears 2nd, 4th and R2 for Mobile PTO operation. The forward start gear (2nd or 4th) is automatically selected by the transmission based on grade, load and vehicle weight. All Endurant 12-Speed transmissions are equipped with a bottom mount 8-Bolt PTO opening. An optional rear mount 4-Bolt PTO opening transmission is also available. The default setting for this feature is Disabled unless Enabled at the OEM.

PTO Operation

To engage the PTO:

1. Ensure the vehicle is at a complete stop.
2. Select Neutral Mode.
3. Depress and hold the service brake for Mobile PTO operation.



4. Set the vehicle parking brake for Stationary PTO operation.

Apply parking brake and follow vehicle manufacturer parking instructions. Failure to follow these instructions could cause unintended vehicle movement resulting in death, serious injury or damage to property.

5. Switch the transmission PTO switch to On.

Note: PTO is engaged when the PTO indicator lamp is illuminated and/or display message is indicated.

- For Stationary PTO operation, raise engine RPM as required to operate PTO.
- For Mobile PTO operation, select Forward or Reverse Mode as required for vehicle movement.

To disengage the PTO:

1. Ensure the vehicle is at a complete stop.
2. Depress and hold the service brake.
3. Switch the transmission PTO switch Off.

PTO Manufacturers - Contact Information

Bezares USA

27634 Commerce Oaks Dr.

Oak Ridge North, TX 77385

(888) 663-1786

www.bezares.com

Chelsea Products Division

8225 Hacks Cross Road

Olive Branch, MS 38654

(662) 895-1011

www.parker.com/chelsea

Muncie Power Products, Inc.

P.O. Box 548

Muncie, IN 47308-0548

(765)284-7721

www.munciepower.com

Change Control Log

Last Revised Date	Description of Clarifications and Updates
March 2024	Updated: Wiring diagrams to change PTO engage relay Pin 85 to chassis ground with fuse. Pin 2, 15, 16 circuit descriptions.
February 2024	Updated: DTNA Configs, Endurant Hardwire PTO Configs
January 2024	Added: Endurant HD PTO Configuration Cautions / Reference to TAIB-1010
October 2023	Added: PTO Cover Replacement and Lube Tube Fill Procedure
May 2022	Updated: Endurant HD PTO Inputs and Configs PTO Manufacturers - Contact Information
January 2021	Document Created

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Eaton Cummins Automated Transmission Technologies
P.O. Box 4013
Kalamazoo, MI 49003 USA
800-826-HELP (4357)
www.eaton.com/roadranger

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