

# Eaton Cummins Automated Transmission Technologies - PTO Installation Guide TRIG2600 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.**

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## Selecting the Right PTO

There are a wide range of PTOs (Power Take-Off Units) available today, each ranging in design and features. This section will help the user understand every step that is required in understand what PTO will fit the customer's requirements.

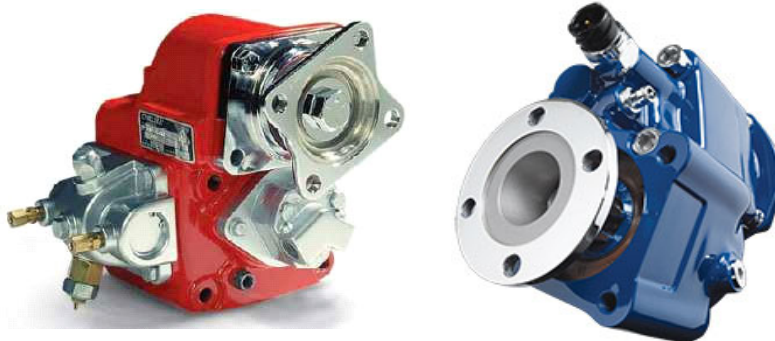
### Thru-Shaft



- Thru-Shaft design for Fuller transmissions.
- Three speed ratios available.
- Two shift options available.
- Direct mount pump flanges or driveshaft output options.

**Note:** Thru-Shaft is a PTO option that must be specified when ordering the vehicle.

### Rear Mount (Extended Countershaft)



- Fits Fuller transmission that have the extended countershaft option.
- Three speed ratios available.
- Comes standard with 1410 series output flange.
- Direct mount pump flanges available.

### Split Shaft (Chelsea)



- Used on medium-duty trucks that have applications requiring the torque capacity of an 8-Bolt PTO.
- Provides 100% of input speed.
- Mount in any orientation with the PTO shaft going to the front or rear of the truck.
- Designed for Class 3, 4, 5, and 6 trucks with automatic transmissions and no PTO opening or trucks requiring additional PTO openings.
- Several 6-Bolt and Reversible PTOs will fit on the 912 Series.
- Three 8-Bolt openings that allow you to operate a variety of auxiliary equipment.
- Wide variety of 6-Bolt, 8-Bolt, PowerShift, and Reversible PTOs fit the 912 Series.
- Air and Lever shift available.
- Split shaft PTOs can be used on all heavy-duty Fuller® manual, UltraShift PLUS, and AutoShift transmissions.
- Medium-duty wet clutch transmissions will have split shaft PTO capability with the spring 2006 software release.
- All other automated products do not have the ability to operate split shaft PTOs.

## Split Shaft (Muncie)



- Through torque to 21,600 lb-ft.
- Output torque to 936 lb-ft.
- 1410 or 1500 Series companion flange outputs.
- 1500, 1600, 1700, 1800 Series main shaft flanges.
- SAE “B”, “B-B”, “C”, “C-C” and “D” hydraulic mounts.
- Air-shift operation.
- Suitable for stationary or mobile applications.
- Precision ground gearing for quiet operation.
- Split shaft PTOs can be used on all heavy-duty Fuller® manual, UltraShift PLUS, and AutoShift transmissions.
- Medium-duty wet clutch transmissions will have split shaft PTO capability with the spring 2006 software release.
- All other automated products do not have the ability to operate split shaft PTOs.

## Geared PTO Adapters

### Chelsea

#### 626 Series

- Mounts a 6-Bolt PTO to a 6-Bolt transmission opening.
- Moves the PTO straight out from the transmission.
- Uses the same input gears as the 442 and 489 Series.
- Uses the same mounting hardware and spacers used to mount a 442 Series to a specific application.



#### 628 Series

- Mounts a 6-Bolt PTO to a 6-Bolt transmission opening.
- Moves the PTO straight out from the transmission.
- Uses the same input gears as the 442 and 489 Series.
- Uses the same mounting hardware and spacers used to mount a 489 Series to a specific application.



## 630 Series

- Mounts a 6-Bolt PTO to a 6-Bolt transmission opening.
- Moves the PTO down at a 30° angle, helping to eliminate interference problems.
- Uses the same input gears as the 442 and 489 Series.
- Special 630-02 adapter designed for the Fuller® UltraShift transmission. When the 8-Bolt PTO opening is needed for PTO usage, this 30° adapter allows the movement of the high capacity inertia brake from the 8-Bolt opening to the 6-Bolt opening and rotates the high capacity inertia brake to eliminate interference problems.



## 645 Series

- Mounts a 6-Bolt PTO to a 6-Bolt transmission opening.
- Moves the PTO down at a 45° angle, helping to eliminate interference problems.
- Uses the same input gears as the 442 and 489 Series.
- Same mounting hardware and spacers used to mount a 442 Series to a specific application.



## Muncie

### Single Gear Adapters

- Moves the 6-Bolt PTO flange outward away from the transmission.



### Angular Adapters

- Various angles available.
- 55° adapter available for relocating high capacity inertia brake on heavy-duty Fuller® UltraShift transmissions.



### 8-Bolt to 6-Bolt Adapter

- Converts an 8-Bolt PTO opening into a 6-Bolt PTO opening.



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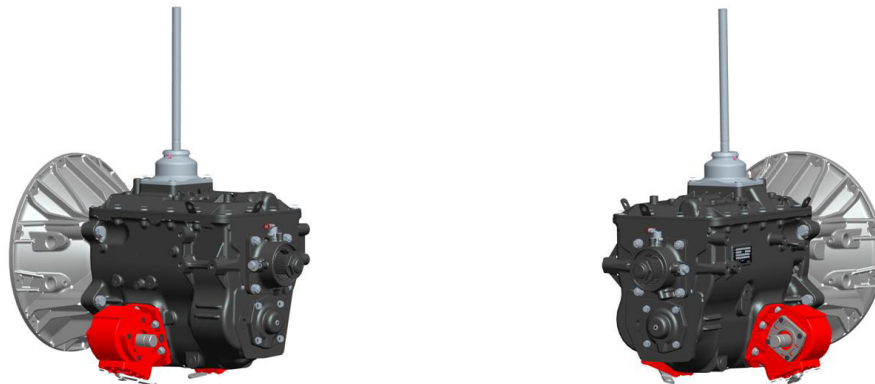
## Angular Offset Gear Adapter

- Offered in multiple gearing configurations.
- All adapters offered with a 10° offset.



## PTO Configurations by Model - Manual

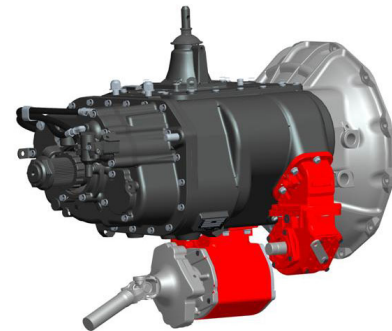
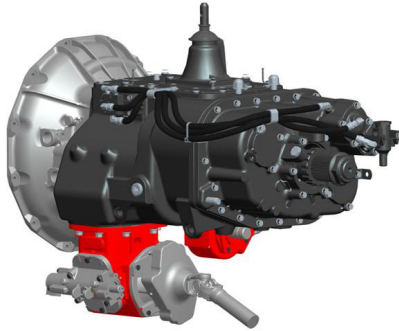
### Medium-Duty Manual



Model	8-Bolt	Gear Info.	6-Bolt	Gear Info.	Thru-shaft	Int. Spline Info.	Ext. Aux. Counter-shaft PTO <sup>1</sup>	Ext. Spline Info.	% of Engine Speed	Transmission Torque Limit for PTO use (lb-ft)
FS-4205A	N/A	N/A	Right & Left	28 Teeth 6.1P	N/A	N/A	N/A	N/A	46	500
FS-4205B	N/A	N/A	Right & Left	28 Teeth 6.1P	N/A	N/A	N/A	N/A	53	
FS-5205A	N/A	N/A	Right & Left	R=33 Teeth 7.0P, L=19 Teeth 6.1P	N/A	N/A	N/A	26 Teeth	L=44, R=46	
FS-5205B	N/A	N/A	Right & Left	R=33 Teeth 7.0P, L=19 Teeth 6.1P	N/A	N/A	N/A	26 Teeth	L=52, R=54	
FS-5406A	N/A	N/A	Right & Left	38 Teeth 6.35P	N/A	N/A	N/A	26 Teeth	52	
FS-6305A	N/A	N/A	Right & Left	39 Teeth 6.35P	N/A	N/A	N/A	26 Teeth	46	
FS-6305B	N/A	N/A	Right & Left	41 Teeth 6.5P	N/A	N/A	N/A	26 Teeth	46	
FS-6406A	N/A	N/A	Right & Left	38T 6.35P 22DEG R.H. HELIX	N/A	N/A	N/A	26T 45DEG PA	52	
FSB-5406B	N/A	N/A	Right & Left	38T 6.35P 22DEG R.H. HELIX	N/A	N/A	N/A	26T 45DEG PA	52	
FSB-6406B	N/A	N/A	Right & Left	38T 6.35P 22DEG R.H. HELIX	N/A	N/A	N/A	26T 45DEG PA	52	
FSO-6406A	N/A	N/A	Right & Left	48T 7.00P, 26DEG R.H. HELIX	N/A	N/A	N/A	26T 45DEG PA	68	
FSO-8406A	N/A	N/A	Right & Left	48T 7.00P, 26DEG R.H. HELIX	N/A	N/A	N/A	26T 45DEG PA	68	

**Note:** (1) - A rear mount PTO for Medium-Duty is available from Muncie Power Products, Inc.; however, it is not shown on this page. The rear mount PTO requires an adapter plate. Please contact Muncie Power Products for more information.

## Heavy-Duty Manual Transmission - RT Series



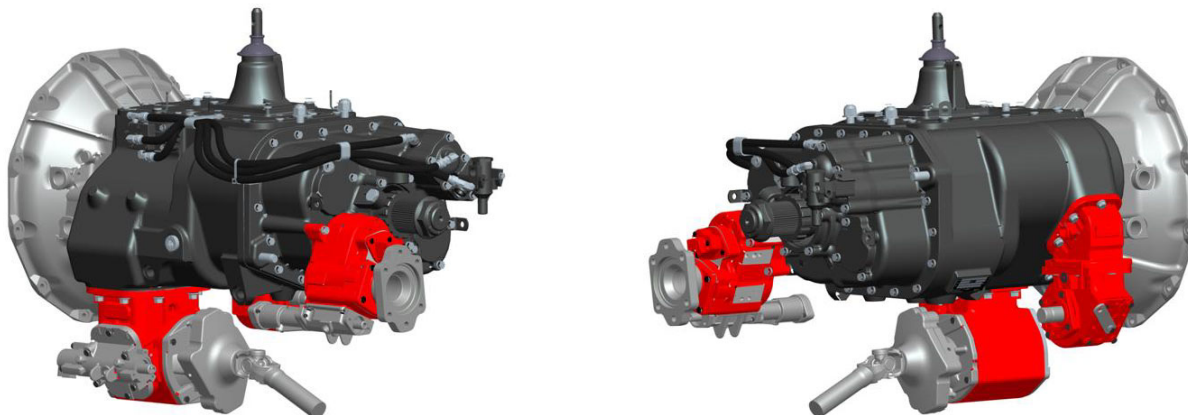
Model	8-Bolt	Gear Info.	6-Bolt	Gear Info.	Thru-shaft	Int. Spline Info.	Ext. Aux. Counter-shaft PTO	Ext. Spline Info.	% of Engine Speed	Transmission Torque Limit for PTO use (lb-ft)
RT-6609A	Yes	33T 6.0P, 20DEG A	Yes	33T 6.0P, 20DEG A	N/A	N/A	N/A	N/A	72	350
RT-8709B	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	Lower Left	32T 0.5P, 30DEG PA	N/A	N/A	70	500 <sup>6</sup>
RT-11709H	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	N/A	N/A	N/A	N/A	70	350 <sup>5</sup>
RT-12709H	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	N/A	N/A	N/A	N/A	70	
RT-13709H	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	N/A	N/A	N/A	N/A	70	
RT-14709H	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	N/A	N/A	N/A	N/A	70	
RTX-11609B	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	N/A	N/A	N/A	N/A	79	
RTX-12609B	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	Lower Left	32T 0.5P, 30DEG PA	N/A	N/A	79	
RTX-13609B	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	Lower Left	32T 0.5P, 30DEG PA	N/A	N/A	79	
RTX-14609B	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	Lower Left	32T 0.5P, 30DEG PA	N/A	N/A	79	
RTX-16709B	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	Lower Left	32T 0.5P, 30DEG PA	N/A	N/A	79	
T-14607A	Yes	47T 6.0P, 20DEG PA	Yes	45T 6.0P, 20DEG PA	N/A	N/A	N/A	N/A	51	
T-14607B	Yes	47T 6.0P, 20DEG PA	Yes	45T 6.0P, 20DEG PA	N/A	N/A	N/A	N/A	51	
TX-14607B	Yes	47T 6.0P, 20DEG PA	Yes	45T 6.0P, 20DEG PA	N/A	N/A	N/A	N/A	69	

**Note:** (4) - 6-bolt PTO will interfere with front mount oil filter. Rear or remote mount oil filter must be utilized.

**Note:** (5) - Transmission may be ordered with heavy-duty input bearing (4301417) to allow a combined PTO output of 500 lb-ft (continuous) and 750 lb-ft (intermittent) torque.

**Note:** (6) - Intermittent torque of up to 750 lb-ft at the countershaft is permitted for 5 minutes of each 15 minute PTO duty cycle.

## Heavy-Duty Manual Transmission - RT Vocational



Model	8-Bolt	Gear Info.	6-Bolt	Gear Info.	Thru-Shaft	Int. Spline Info.	Ext. Aux. Counter-shaft PTO	Ext. Spline Info.	% of Engine Speed	Transmission Torque Limit for PTO use (lb-ft)
RT-8608L	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	N/A	N/A	N/A	N/A	58	350 <sup>5</sup>
RT-8908LL	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	N/A	N/A	N/A	N/A	70	500 <sup>6</sup>
RT-14915	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	N/A	32T 0.5P, 30DEG PA	N/A	N/A	70	
RTO-11908LL	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	N/A	N/A	N/A	N/A	94	
RTO-11909ALL	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	N/A	N/A	N/A	N/A	79	
RTO-14908LL	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	Lower Left <sup>2</sup>	32T 0.5P, 30DEG PA	N/A	N/A	94	
RTO-14909ALL	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	Lower Left <sup>2</sup>	32T 0.5P, 30DEG PA	N/A	N/A	79	
RTO-14915	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	N/A	32T 0.5P, 30DEG PA	N/A	N/A	89	
RTO-16908LL	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	Lower Left <sup>2</sup>	32T 0.5P, 30DEG PA	N/A	N/A	94	
RTO-16909ALL	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	Lower Left <sup>2</sup>	32T 0.5P, 30DEG PA	N/A	N/A	79	
RTO-16915	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	N/A	32T 0.5P, 30DEG PA	N/A	N/A	89	

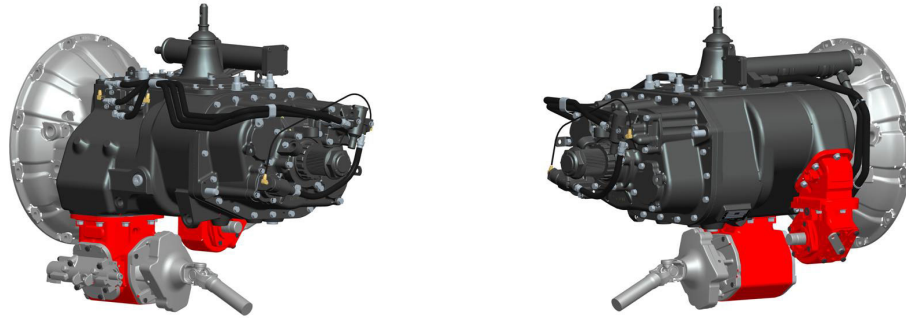
**Note:** (2) - Oil pump required.

**Note:** (4) - 6-bolt PTO will interfere with front mount oil filter. Rear or remote mount oil filter must be utilized.

**Note:** (5) - Transmission may be ordered with heavy-duty input bearing (4301417) to allow a combined PTO output of 500 lb-ft (continuous) and 750 lb-ft (intermittent) torque.

**Note:** (6) - Intermittent torque of up to 750 lb-ft at the countershaft is permitted for 5 minutes of each 15 minute PTO duty cycle.

## Heavy-Duty Manual Transmission - RT Performance



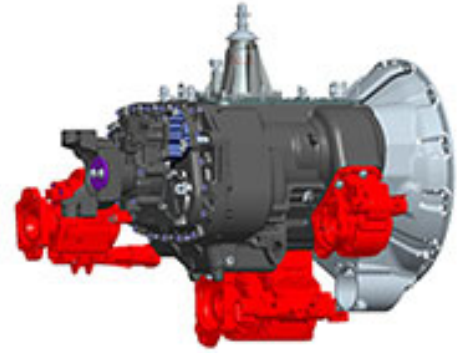
Model	8-Bolt	Gear Info.	6-Bolt	Gear Info.	Thru-Shaft	Int. Spline Info.	Ext. Aux. Counter-shaft PTO	Ext. Spline Info.	% of Engine Speed	Transmission Torque Limit for PTO use (lb-ft)
RTLO-12913A	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	N/A	N/A	N/A	N/A	79	350 <sup>5</sup>
RTLO-14913A	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	N/A	N/A	N/A	N/A	79	
RTLO-14918B	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	N/A	N/A	N/A	N/A	79	
RTLO-16913A	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	N/A	N/A	N/A	N/A	79	
RTLO-16918B	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	N/A	N/A	N/A	N/A	79	
RTLO-18913A	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	N/A	N/A	N/A	N/A	79	
RTLO-18918B	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	N/A	N/A	N/A	N/A	79	
RTLO-20913A	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	N/A	N/A	N/A	N/A	79	
RTLO-20918B	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	N/A	N/A	N/A	N/A	79	
RTLO-22918B	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	N/A	N/A	N/A	N/A	79	
RTLOC-16909A-T2	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	N/A	N/A	N/A	N/A	79	350 <sup>5</sup>
RTLOC-18909A-T2	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	N/A	N/A	N/A	N/A	79	500 <sup>6</sup>
RTOC-16909A	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	N/A	N/A	N/A	N/A	79	350 <sup>5</sup>
RTOC-18909A	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	N/A	N/A	N/A	N/A	79	500 <sup>6</sup>
RTOCM-16909A	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	N/A	N/A	N/A	N/A	79	350 <sup>5</sup>

**Note:** (4) - 6-bolt PTO will interfere with front mount oil filter. Rear or remote mount oil filter must be utilized.

**Note:** (5) - Transmission may be ordered with heavy-duty input bearing (4301417) to allow a combined PTO output of 500 lb-ft (continuous) and 750 lb-ft (intermittent) torque.

**Note:** (6) - Intermittent torque of up to 750 lb-ft at the countershaft is permitted for 5 minutes of each 15 minute PTO duty cycle.

Heavy-Duty Manual Transmission - Fuller Advantage Series



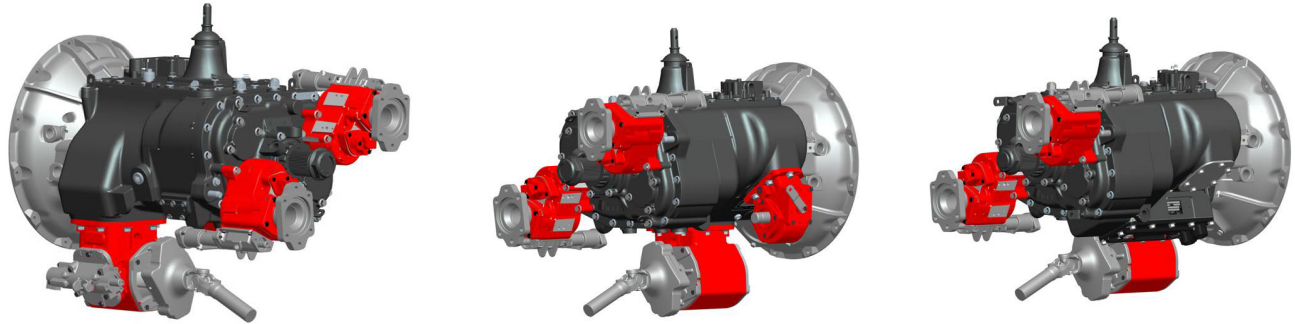
Model	8-Bolt	Gear Info.	6-Bolt	Gear Info.	Thru-Shaft	Int. Spline Info.	Ext. Aux. Counter-shaft PTO	Ext. Spline Info.	% of Engine Speed	Transmission Torque Limit for PTO use (lb-ft)
FA-14810B	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	Available upon request with application review	32T 0.5P, 30DEG PA	N/A	N/A	70	500 <sup>6</sup>
FA-15810B	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA		32T 0.5P, 30DEG PA	N/A	N/A	70	
FAM-14810B	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA		32T 0.5P, 30DEG PA	N/A	N/A	70	
FAM-15810B	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA		32T 0.5P, 30DEG PA	N/A	N/A	70	
FAOM-14810C	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA		32T 0.5P, 30DEG PA	N/A	N/A	79	
FAOM-15810C	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA		32T 0.5P, 30DEG PA	N/A	N/A	79	
FAOM-16810C	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA		32T 0.5P, 30DEG PA	N/A	N/A	79	
FAO-11810C	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA		32T 0.5P, 30DEG PA	N/A	N/A	79	
FAO-12810C	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA		32T 0.5P, 30DEG PA	N/A	N/A	79	
FAO-13810C	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA		32T 0.5P, 30DEG PA	N/A	N/A	79	
FAO-14810C	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA		32T 0.5P, 30DEG PA	N/A	N/A	79	
FAO-15810C	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA		32T 0.5P, 30DEG PA	N/A	N/A	79	
FAO-16810C	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA		32T 0.5P, 30DEG PA	N/A	N/A	79	

**Note:** (4) - 6-bolt PTO will interfere with front mount oil filter. Rear or remote mount oil filter must be utilized.

**Note:** (5) - Transmission may be ordered with heavy-duty input bearing (4301417) to allow a combined PTO output of 500 lb-ft (continuous) and 750 lb-ft (intermittent) torque.

**Note:** (6) - Intermittent torque of up to 750 lb-ft at the countershaft is permitted for 5 minutes of each 15 minute PTO duty cycle.

## Heavy-Duty Manual Transmission - FR Series



**Note:** (LL) Lower Left, (UR) Upper Right

Model	8-Bolt	Gear Info.	6-Bolt	Gear Info.	Thru-Shaft	Int. Spline Info.	Ext. Aux. Counter-shaft PTO	Ext. Spline Info.	% of Engine Speed	Transmission Torque Limit for PTO use (lb-ft)
FR-11210B	Yes	47T 6.0P, 20DEG PA	Yes <sup>9</sup>	45T 6.0P, 20DEG PA	LL & UR	32T 0.5P, 30DEG PA	N/A	N/A	65	500 <sup>6</sup>
FR-12210B	Yes	47T 6.0P, 20DEG PA	Yes <sup>9</sup>	45T 6.0P, 20DEG PA	LL & UR	32T 0.5P, 30DEG PA	N/A	N/A	65	
FR-13210B	Yes	47T 6.0P, 20DEG PA	Yes <sup>9</sup>	45T 6.0P, 20DEG PA	LL & UR	32T 0.5P, 30DEG PA	N/A	N/A	65	
FR-14210B	Yes	47T 6.0P, 20DEG PA	Yes <sup>9</sup>	45T 6.0P, 20DEG PA	LL & UR	32T 0.5P, 30DEG PA	N/A	N/A	65	
FR-15210B	Yes	47T 6.0P, 20DEG PA	Yes <sup>9</sup>	45T 6.0P, 20DEG PA	LL & UR	32T 0.5P, 30DEG PA	N/A	N/A	65	
FRW-15210B	Yes	47T 6.0P, 20DEG PA	Yes <sup>9</sup>	45T 6.0P, 20DEG PA	LL & UR	32T 0.5P, 30DEG PA	N/A	N/A	65	
FRM-15210B	Yes	47T 6.0P, 20DEG PA	Yes <sup>9</sup>	45T 6.0P, 20DEG PA	LL & UR	32T 0.5P, 30DEG PA	N/A	N/A	87	
FR-9210B	Yes	47T 6.0P, 20DEG PA	Yes <sup>9</sup>	45T 6.0P, 20DEG PA	LL & UR	32T 0.5P, 30DEG PA	N/A	N/A	65	
FRO-11210B	Yes	47T 6.0P, 20DEG PA	Yes <sup>9</sup>	45T 6.0P, 20DEG PA	LL & UR	32T 0.5P, 30DEG PA	N/A	N/A	87	
FRO-11210C	Yes	47T 6.0P, 20DEG PA	Yes <sup>9</sup>	45T 6.0P, 20DEG PA	LL & UR	32T 0.5P, 30DEG PA	N/A	N/A	84	
FRO-12210B	Yes	47T 6.0P, 20DEG PA	Yes <sup>9</sup>	45T 6.0P, 20DEG PA	LL & UR	32T 0.5P, 30DEG PA	N/A	N/A	87	
FRO-12210C	Yes	47T 6.0P, 20DEG PA	Yes <sup>9</sup>	45T 6.0P, 20DEG PA	LL & UR	32T 0.5P, 30DEG PA	N/A	N/A	84	
FRO-13210B	Yes	47T 6.0P, 20DEG PA	Yes <sup>9</sup>	45T 6.0P, 20DEG PA	LL & UR	32T 0.5P, 30DEG PA	N/A	N/A	87	

**Note:** (6) - Intermittent torque of up to 750 lb-ft at the countershaft is permitted for 5 minutes of each 15 minute PTO duty cycle.

**Note:** (9) - 6-Bolt Option not available on Integral Oil Cooler Case.

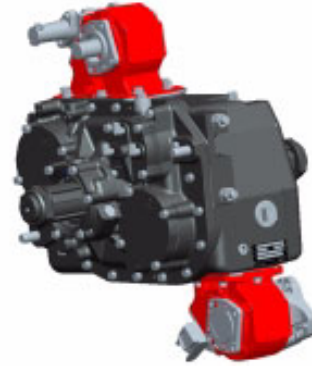
## PTO Configurations

Model	8-Bolt	Gear Info.	6-Bolt	Gear Info.	Thru-Shaft	Int. Spline Info.	Ext. Aux. Counter-shaft PTO	Ext. Spline Info.	% of Engine Speed	Transmission Torque Limit for PTO use (lb-ft)
FRO-13210C	Yes	47T 6.0P, 20DEG PA	Yes <sup>9</sup>	45T 6.0P, 20DEG PA	LL & UR	32T 0.5P, 30DEG PA	N/A	N/A	84	500 <sup>6</sup>
FRO-14210B	Yes	47T 6.0P, 20DEG PA	Yes <sup>9</sup>	45T 6.0P, 20DEG PA	LL & UR	32T 0.5P, 30DEG PA	N/A	N/A	87	
FRO-14210C	Yes	47T 6.0P, 20DEG PA	Yes <sup>9</sup>	45T 6.0P, 20DEG PA	LL & UR	32T 0.5P, 30DEG PA	N/A	N/A	84	
FRO-15210B	Yes	47T 6.0P, 20DEG PA	Yes <sup>9</sup>	45T 6.0P, 20DEG PA	LL & UR	32T 0.5P, 30DEG PA	N/A	N/A	87	
FRO-15210C	Yes	47T 6.0P, 20DEG PA	Yes <sup>9</sup>	45T 6.0P, 20DEG PA	LL & UR	32T 0.5P, 30DEG PA	N/A	N/A	84	
FRO-16210B	Yes	47T 6.0P, 20DEG PA	Yes <sup>9</sup>	45T 6.0P, 20DEG PA	LL & UR	32T 0.5P, 30DEG PA	N/A	N/A	87	
FRO-16210C	Yes	47T 6.0P, 20DEG PA	Yes <sup>9</sup>	45T 6.0P, 20DEG PA	LL & UR	32T 0.5P, 30DEG PA	N/A	N/A	84	
FRO-17210C	Yes	47T 6.0P, 20DEG PA	Yes <sup>9</sup>	45T 6.0P, 20DEG PA	LL & UR	32T 0.5P, 30DEG PA	N/A	N/A	84	
FRO-18210C	Yes	47T 6.0P, 20DEG PA	Yes <sup>9</sup>	45T 6.0P, 20DEG PA	LL & UR	32T 0.5P, 30DEG PA	N/A	N/A	84	

**Note:** (6) - Intermittent torque of up to 750 lb-ft at the countershaft is permitted for 5 minutes of each 15 minute PTO duty cycle.

**Note:** (9) - 6-Bolt Option not available on Integral Oil Cooler Case.

## Heavy-Duty Manual Transmission - Auxiliary Transmissions



Model	8-Bolt	Gear Info.	6-Bolt	Gear Info.	Thru-Shaft	Int. Spline Info.	Ext. Aux. Counter-shaft PTO	Ext. Spline Info.	% of Engine Speed	Transmission Torque Limit for PTO use (lb-ft)
AT-1202	Yes	30T 5.0P, 20DEG PA	Yes	30T 5.0P, 20DEG PA	N/A	N/A	N/A	N/A	93	500 <sup>6</sup>
2A-92	No	N/A	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A

**Note:** (6) - Intermittent torque of up to 750 lb-ft at the countershaft is permitted for 5 minutes of each 15 minute PTO duty cycle.

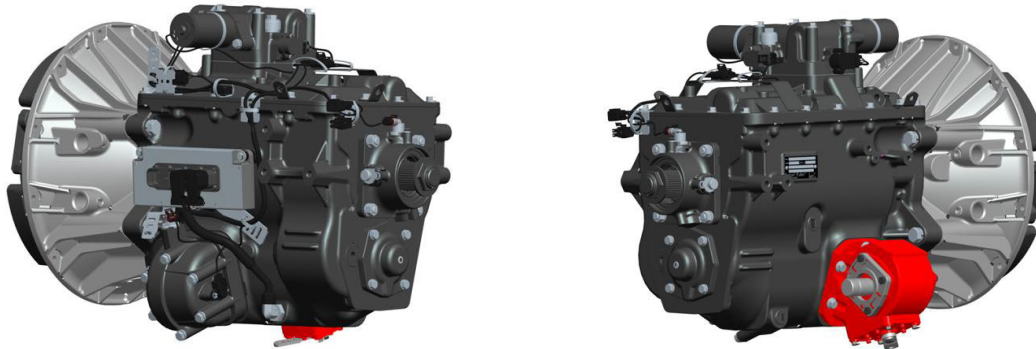
## PTO Configurations by Model - Automated

### PTO and Auto Neutral Availability

	<b>Split Shaft PTO</b>	<b>Countershaft PTO**</b>	<b>Auto Neutral</b>
MD Hybrid	N/A	Available (Default)	Available (Default)
UltraShift AW3	Available	Available (Default)	Available (Default)
UltraShift HV	N/A	Available (Default)	N/A
AutoShift	Available	Available (Default)	N/A
UltraShift DM3	N/A	Available (Default)	N/A
Fuller Advantage	Available	Available (Default)	Available (Default)
UltraShift <i>PLUS</i>	Available	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.

## Medium-Duty Automated



Model	8-Bolt	Gear Info.	6-Bolt	Gear Info.	Thru-Shaft	Int. Spline Info.	Ext. Aux. Counter-shaft PTO <sup>1</sup>	Ext. Spline Info.	% of Engine Speed	Transmission Torque Limit for PTO use (lb-ft)
F-5405B-DM3	N/A	N/A	Left or Right <sup>2</sup>	48T 7.00P, 26DEG R.H. HELIX	N/A	N/A	Yes	26T 45DEG PA	67	500
F-5505B-DM3	N/A	N/A	Left or Right <sup>2</sup>	48T 7.00P, 26DEG R.H. HELIX	N/A	N/A	Yes	26T 45DEG PA	67	
F-6405B-DM3	N/A	N/A	Left or Right <sup>2</sup>	48T 7.00P, 26DEG R.H. HELIX	N/A	N/A	Yes	26T 45DEG PA	67	
FO-5406B-DM3	N/A	N/A	Left or Right <sup>2</sup>	48T 7.00P, 26DEG R.H. HELIX	N/A	N/A	Yes	26T 45DEG PA	67	
FO-5506B-DM3	N/A	N/A	Left or Right <sup>2</sup>	48T 7.00P, 26DEG R.H. HELIX	N/A	N/A	Yes	26T 45DEG PA	67	
FO-6406B-DM3	N/A	N/A	Left or Right <sup>2</sup>	48T 7.00P, 26DEG R.H. HELIX	N/A	N/A	Yes	26T 45DEG PA	67	
FO-6506B-DM3	N/A	N/A	Left or Right <sup>2</sup>	48T 7.00P, 26DEG R.H. HELIX	N/A	N/A	Yes	26T 45DEG PA	67	
FO-6406A-ASX	N/A	N/A	Right Only	48T 7.00P, 26DEG R.H. HELIX	N/A	N/A	Yes	26T 45DEG PA	67	
FO-8406A-ASX	N/A	N/A	Right Only	48T 7.00P, 26DEG R.H. HELIX	N/A	N/A	Yes	26T 45DEG PA	67	
FO-6406A-AW3	N/A	N/A	Right Only	48T 7.00P, 26DEG R.H. HELIX	N/A	N/A	Yes	26T 45DEG PA	67	
FO-8406A-AW3	N/A	N/A	Right Only	48T 7.00P, 26DEG R.H. HELIX	N/A	N/A	Yes	26T 45DEG PA	67	

**Note:** (1) - A rear-mount PTO for medium-duty transmissions is available from Muncie Power Products; however, it is not shown on this page. The rear-mount PTO requires an adapter plate. Please contact Muncie Power Products for more information.

**Note:** (2) - Inertia brake can be moved from left-side 6-bolt opening to right-side 6-bolt opening. (Kit Number K-3742 is required to move).

Medium-Duty Dual Clutch - Precision



Model	8-Bolt	Gear Info.	6-Bolt	Gear Info.	Thru-Shaft	Int. Spline Info.	Ext. Aux. Counter-shaft PTO	Ext. Spline Info.	% of Engine Speed <sup>8</sup>	Transmission Torque Limit for PTO use (lb-ft) <sup>7</sup>
EDCO-6F107A	N/A	L= 23T LH Helix 5.64P 20DEG PA  R= 47T RH Helix 8.975P 17DEG PA	Left or Right	45T 6.0P, 20DEG PA	N/A	N/A	Yes	400mm 12T 20DEG PA	L=39 R=82	500
EDCO-6F107A-P	N/A		Left or Right	45T 6.0P, 20DEG PA	N/A	N/A	Yes			
EDCO-6F107A-M	N/A		Left or Right	45T 6.0P, 20DEG PA	N/A	N/A	Yes			
EDCO-6F107A-B	N/A		Left or Right	45T 6.0P, 20DEG PA	N/A	N/A	No	N/A		

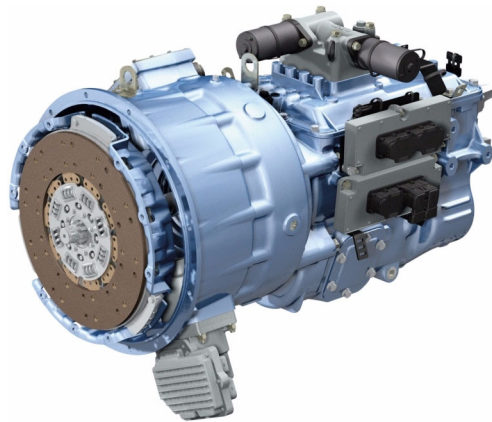
**Note:** (7) - Minimum Engine Speed 1100 RPM. Includes all PTOs in operation.

**Note:** (8) - Second clutch closed.

For stationary PTO operation, the minimum engine RPM to operate the PTO is calibrated in the TCM at the OEM based on the installed flywheel damper:

- Part number 811200 Flywheel Damper (Navistar): 900-950 RPM
- Part number 811201 Flywheel Damper (Freightliner): 1100-1150 RPM

## Medium-Duty Hybrid



Model	8-Bolt	Gear Info.	6-Bolt	Gear Info.	Thru-Shaft	Int. Spline Info.	Ext. Aux. Countershaft PTO	Ext. Spline Info.	% of Engine Speed	Transmission Torque Limit for PTO use (lb-ft)
EH-6E706B-BP	N/A	N/A	Left or Right	48T 7.00P, 26DEG R.H. HELIX	N/A	N/A	Yes	26T 45DEG PA	67	500
EH-6E706B-CD	N/A	N/A	Left or Right	48T 7.00P, 26DEG R.H. HELIX	N/A	N/A	Yes	26T 45DEG PA	67	
EH-8E406A-CD	N/A	N/A	Left or Right	48T 7.00P, 26DEG R.H. HELIX	N/A	N/A	Yes	26T 45DEG PA	67	
EH-8E406A-CDG	N/A	N/A	Left or Right	48T 7.00P, 26DEG R.H. HELIX	N/A	N/A	Yes	26T 45DEG PA	67	
EH-8E406A-CDR	N/A	N/A	Left or Right	48T 7.00P, 26DEG R.H. HELIX	N/A	N/A	Yes	26T 45DEG PA	67	
EH-8E406A-P	N/A	N/A	Left or Right	48T 7.00P, 26DEG R.H. HELIX	N/A	N/A	Yes	26T 45DEG PA	67	
EH-8FA0406A-PSB	N/A	N/A	Left or Right	48T 7.00P, 26DEG R.H. HELIX	N/A	N/A	Yes	26T 45DEG PA	67	
EH-8E406A-T	N/A	N/A	Left or Right	48T 7.00P, 26DEG R.H. HELIX	N/A	N/A	Yes	26T 45DEG PA	67	
EH-8E406A-UP	N/A	N/A	Left or Right	48T 7.00P, 26DEG R.H. HELIX	N/A	N/A	Yes	26T 45DEG PA	67	
EH-8E406A-UPG	N/A	N/A	Left or Right	48T 7.00P, 26DEG R.H. HELIX	N/A	N/A	Yes	26T 45DEG PA	67	
EH-6E706B-UPG	N/A	N/A	Left or Right	48T 7.00P, 26DEG R.H. HELIX	N/A	N/A	Yes	26T 45DEG PA	67	

**Note:** (1) - A rear-mount PTO for medium-duty transmissions is available from Muncie Power Products; however, it is not shown on this page. The rear-mount PTO requires an adapter plate. Please contact Muncie Power Products for more information.

## Heavy-Duty Automated - AutoShift / UltraShift / UltraShift *PLUS* 10-Speeds



Model	8-Bolt	Gear Info.	6-Bolt	Gear Info.	Thru-Shaft	Int. Spline Info.	Ext. Aux. Counter-shaft PTO	Ext. Spline Info.	% of Engine Speed	Transmission Torque Limit for PTO use (lb-ft)
FO-10E310C-VAS	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	Lower Left	32T 0.5P, 30DEG PA	N/A	N/A	79	500 <sup>6</sup>
RTO-10910B-AS3	Yes	47T 6.0P, 20DEG PA	Yes	45T 6.0P, 20DEG PA	Lower Left	32T 0.5P, 30DEG PA	N/A	N/A	94	350 <sup>5</sup>
RTO-10910B-DM3	Yes	47T 6.0P, 20DEG PA	Yes	45T 6.0P, 20DEG PA	Lower Left	32T 0.5P, 30DEG PA	N/A	N/A	94	
FO-12E310C-VAS	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	Lower Left	32T 0.5P, 30DEG PA	N/A	N/A	79	
RTO-12910B-AS3	Yes	47T 6.0P, 20DEG PA	Yes	45T 6.0P, 20DEG PA	Lower Left	32T 0.5P, 30DEG PA	N/A	N/A	94	
RTO-12910B-DM3	Yes	47T 6.0P, 20DEG PA	Yes	45T 6.0P, 20DEG PA	Lower Left	32T 0.5P, 30DEG PA	N/A	N/A	94	
FO-14E310C-VAS	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	Lower Left	32T 0.5P, 30DEG PA	N/A	N/A	79	
FO-14E310C-LAS	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	Lower Left	32T 0.5P, 30DEG PA	N/A	N/A	79	
FOM-14E310C-LAS	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	Lower Left	32T 0.5P, 30DEG PA	N/A	N/A	79	
FOM-14E310C-VAS	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	Lower Left	32T 0.5P, 30DEG PA	N/A	N/A	79	
FM-14E310B-LAS	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	Lower Left	32T 0.5P, 30DEG PA	N/A	N/A	70	
RTO-14910B-AS3	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	Lower Left	32T 0.5P, 30DEG PA	N/A	N/A	94	350 <sup>5</sup>
RTO-14910B-DM3	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	Lower Left	32T 0.5P, 30DEG PA	N/A	N/A	94	
FM-14D310B-LST	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	Lower Left	32T 0.5P, 30DEG PA	N/A	N/A	94	

**Note:** (4) - 6-bolt PTO will interfere with front mount oil filter. Rear or remote mount oil filter must be utilized.

**Note:** (5) - Transmission may be ordered with heavy-duty input bearing (4301417) to allow a combined PTO output of 500 lb-ft (continuous) and 750 lb-ft (intermittent) torque.

**Note:** (6) - Intermittent torque of up to 750 lb-ft at the countershaft is permitted for 5 minutes of each 15 minute PTO duty cycle.

## PTO Configurations

Model	8-Bolt	Gear Info.	6-Bolt	Gear Info.	Thru-Shaft	Int. Spline Info.	Ext. Aux. Counter-shaft PTO	Ext. Spline Info.	% of Engine Speed	Transmission Torque Limit for PTO use (lb-ft)
RTO-14910C-AS3	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	Lower Left	32T 0.5P, 30DEG PA	N/A	N/A	79	350 <sup>5</sup>
FOM-15E310C-LAS	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	Lower Left	32T 0.5P, 30DEG PA	N/A	N/A	79	500 <sup>6</sup>
FOM-15E310C-VAS	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	Lower Left	32T 0.5P, 30DEG PA	N/A	N/A	79	
FM-15E310B-LAS	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	Lower Left	32T 0.5P, 30DEG PA	N/A	N/A	70	
FM-15D310B-LST	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	Lower Left	32T 0.5P, 30DEG PA	N/A	N/A	94	350 <sup>5</sup>
FO-16E310C-LAS	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	Lower Left	32T 0.5P, 30DEG PA	N/A	N/A	79	500 <sup>6</sup>
FO-16E310C-VAS	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	Lower Left	32T 0.5P, 30DEG PA	N/A	N/A	79	
FOM-16E310C-LAS	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	Lower Left	32T 0.5P, 30DEG PA	N/A	N/A	79	
FOM-16E310C-VAS	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	Lower Left	32T 0.5P, 30DEG PA	N/A	N/A	79	
RTO-16910B-AS3	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	Lower Left	32T 0.5P, 30DEG PA	N/A	N/A	94	350 <sup>5</sup>
RTO/M-16910B-DM3	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	Lower Left	32T 0.5P, 30DEG PA	N/A	N/A	94	
RTO-16910C-AS3	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	Lower Left	32T 0.5P, 30DEG PA	N/A	N/A	79	
RTO-18910B-AS3	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	Lower Left	32T 0.5P, 30DEG PA	N/A	N/A	94	

**Note:** (4) - 6-bolt PTO will interfere with front mount oil filter. Rear or remote mount oil filter must be utilized.

**Note:** (5) - Transmission may be ordered with heavy-duty input bearing (4301417) to allow a combined PTO output of 500 lb-ft (continuous) and 750 lb-ft (intermittent) torque.

**Note:** (6) - Intermittent torque of up to 750 lb-ft at the countershaft is permitted for 5 minutes of each 15 minute PTO duty cycle.

Heavy-Duty Automated - Fuller Advantage Series

Model	8-Bolt	Gear Info.	6-Bolt	Gear Info.	Thru-Shaft	Int. Spline Info.	Ext. Aux. Counter-shaft PTO	Ext. Spline Info.	% of Engine Speed	Transmission Torque Limit for PTO use (lb-ft)
FAOM-13810S-EC3	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	Lower Left	32T 0.5P, 30DEG PA	N/A	N/A	79	500 <sup>6</sup>
FAOM-14810S-EC3	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	Lower Left	32T 0.5P, 30DEG PA	N/A	N/A	79	
FAOM-15810S-EC3	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	Lower Left	32T 0.5P, 30DEG PA	N/A	N/A	79	
FAOM-15810S-EP3	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	Lower Left	32T 0.5P, 30DEG PA	N/A	N/A	79	
FAO-16810S-EP3	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	Lower Left	32T 0.5P, 30DEG PA	N/A	N/A	79	
FAO-16810S-EN3	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	Lower Left	32T 0.5P, 30DEG PA	N/A	N/A	79	
FAOM-15810S-EN3	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	Lower Left	32T 0.5P, 30DEG PA	N/A	N/A	79	
FAO-14810C-EA3	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	Lower Left	32T 0.5P, 30DEG PA	N/A	N/A	79	
FAO-16810C-EA3	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	Lower Left	32T 0.5P, 30DEG PA	N/A	N/A	79	
FAOM-15810C-EA3	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	Lower Left	32T 0.5P, 30DEG PA	N/A	N/A	79	
FAOM-16810C-EA3	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	Lower Left	32T 0.5P, 30DEG PA	N/A	N/A	79	
FAM-14810B-EA3	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	Lower Left	32T 0.5P, 30DEG PA	N/A	N/A	79	
FAM-15810B-EA3	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	Lower Left	32T 0.5P, 30DEG PA	N/A	N/A	79	
RTO-16910B-AS3	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	Lower Left	32T 0.5P, 30DEG PA	N/A	N/A	94	350 <sup>5</sup>
RTO/M-16910B-DM3	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	Lower Left	32T 0.5P, 30DEG PA	N/A	N/A	94	
RTO-16910C-AS3	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	Lower Left	32T 0.5P, 30DEG PA	N/A	N/A	79	
FO-18E310C-LAS	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	Lower Left	32T 0.5P, 30DEG PA	N/A	N/A	79	500 <sup>6</sup>
RTO-18910B-AS3	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	Lower Left	32T 0.5P, 30DEG PA	N/A	N/A	94	350 <sup>5</sup>

**Note:** (4) - 6-bolt PTO will interfere with front mount oil filter. Rear or remote mount oil filter must be utilized.

**Note:** (5) - Transmission may be ordered with heavy-duty input bearing (4301417) to allow a combined PTO output of 500 lb-ft (continuous) and 750 lb-ft (intermittent) torque.

**Note:** (6) - Intermittent torque of up to 750 lb-ft at the countershaft is permitted for 5 minutes of each 15 minute PTO duty cycle.

## PTO Configurations

Model	8-Bolt	Gear Info.	6-Bolt	Gear Info.	Thru-Shaft	Int. Spline Info.	Ext. Aux. Counter-shaft PTO	Ext. Spline Info.	% of Engine Speed	Transmission Torque Limit for PTO use (lb-ft)
FAOM-14810S-EC3	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	Lower Left	32T 0.5P, 30DEG PA	N/A	N/A	79	500 <sup>6</sup>
FAOM-15810S-EC3	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	Lower Left	32T 0.5P, 30DEG PA	N/A	N/A	79	
FAOM-15810S-EP3	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	Lower Left	32T 0.5P, 30DEG PA	N/A	N/A	79	
FAO-16810S-EP3	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	Lower Left	32T 0.5P, 30DEG PA	N/A	N/A	79	
FAOM-15810S-EN3	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	Lower Left	32T 0.5P, 30DEG PA	N/A	N/A	79	
FAO-16810S-EN3	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	Lower Left	32T 0.5P, 30DEG PA	N/A	N/A	79	

**Note: (4)** - 6-bolt PTO will interfere with front mount oil filter. Rear or remote mount oil filter must be utilized.

**Note: (5)** - Transmission may be ordered with heavy-duty input bearing (4301417) to allow a of combined PTO output of 500 lb-ft (continuous) and 750 lb-ft (intermittent) torque.

**Note: (6)** - Intermittent torque of up to 750 lb-ft at the countershaft is permitted for 5 minutes of each 15 minute PTO duty cycle.

## Heavy-Duty Automated - UltraShift *PLUS* - VCS and VMS



Model	8-Bolt	Gear Info.	6-Bolt	Gear Info.	Thru-Shaft	Int. Spline Info.	Ext. Aux. Counter-shaft PTO	Ext. Spline Info.	% of Engine Speed	Transmission Torque Limit for PTO use (lb-ft)
FO-10E308LL-VCS	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	Lower Left	32T 0.5P, 30DEG PA	N/A	N/A	94	500 <sup>6</sup>
FO-11E308LL-VCS	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	Lower Left	32T 0.5P, 30DEG PA	N/A	N/A	94	
FO-12E308LL-VCS	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	Lower Left	32T 0.5P, 30DEG PA	N/A	N/A	94	
FO-14E308LL-VCS	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	Lower Left	32T 0.5P, 30DEG PA	N/A	N/A	94	
FO-16E308LL-VCS	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	Lower Left	32T 0.5P, 30DEG PA	N/A	N/A	94	
FO-17E308LL-VCS	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	Lower Left	32T 0.5P, 30DEG PA	N/A	N/A	94	
FO-10E309ALL-VMS	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	Lower Left	32T 0.5P, 30DEG PA	N/A	N/A	79	
FO-11E309ALL-VMS	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	Lower Left	32T 0.5P, 30DEG PA	N/A	N/A	79	
FO-12E309ALL-VMS	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	Lower Left	32T 0.5P, 30DEG PA	N/A	N/A	79	
FO-14E309ALL-VMS	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	Lower Left	32T 0.5P, 30DEG PA	N/A	N/A	79	
FO-16E309ALL-VMS	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	Lower Left	32T 0.5P, 30DEG PA	N/A	N/A	79	
FO-17E309ALL-VMS	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	Lower Left	32T 0.5P, 30DEG PA	N/A	N/A	79	

**Note:** (4) - 6-bolt PTO will interfere with front mount oil filter. Rear or remote mount oil filter must be used.

**Note:** (6) - Intermittent torque of up to 750 lb-ft at the countershaft is permitted for 5 minutes of each 15 minute PTO duty cycle.

## PTO Configurations

### Heavy-Duty Automated - AutoShift / UltraShift / UltraShift PLUS 13/16/18-Speed



Model	8-Bolt	Gear Info.	6-Bolt	Gear Info.	Thru-shaft	Int. Spline Info.	Ext. Aux. Counter-shaft PTO	Ext. Spline Info.	% of Engine Speed	Transmission Torque Limit for PTO use (lb-ft)
FO-14E313A-MHP	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	N/A	N/A	N/A	N/A	79	500 <sup>6</sup>
FO-14E318B-MXP	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	N/A	N/A	N/A	N/A	79	
FO-14E318B-VXP	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	N/A	N/A	N/A	N/A	79	
RTLO-14918A-AS3	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	N/A	N/A	N/A	N/A	79	350
FO-16E313A-MHP	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	N/A	N/A	N/A	N/A	79	500 <sup>6</sup>
FO-16E313A-VHP	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	N/A	N/A	N/A	N/A	79	
FO-16E318B-MXP	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	N/A	N/A	N/A	N/A	79	
FO-16E318B-VXP	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	N/A	N/A	N/A	N/A	79	
RTLO/M-16913L-DM3	N/A <sup>3</sup>	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	N/A	N/A	N/A	N/A	79	350
FO/M-16D313E-LEP	N/A <sup>3</sup>	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	N/A	N/A	N/A	N/A	79	
RTLO-16918A-AS3	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	N/A	N/A	N/A	N/A	79	
FO-18E313A-MHP	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	N/A	N/A	N/A	N/A	79	500 <sup>6</sup>
FO-18E313A-VHP	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	N/A	N/A	N/A	N/A	79	

**Note:** (4) - 6-bolt PTO will interfere with front mount oil filter. Rear or remote mount oil filter must be utilized.

**Note:** (5) - Transmission may be ordered with heavy-duty input bearing (4301417) to allow a combined PTO output of 500 lb-ft (continuous) and 750 lb-ft (intermittent) torque.

**Note:** (6) - Intermittent torque of up to 750 lb-ft at the countershaft is permitted for 5 minutes of each 15 minute PTO duty cycle.

## PTO Configurations

Model	8-Bolt	Gear Info.	6-Bolt	Gear Info.	Thru-shaft	Int. Spline Info.	Ext. Aux. Counter-shaft PTO	Ext. Spline Info.	% of Engine Speed	Transmission Torque Limit for PTO use (lb-ft) <sup>7</sup>
FO-18E318B-MXP	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	N/A	N/A	N/A	N/A	79	500 <sup>6</sup>
FO-18E318B-VXP	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	N/A	N/A	N/A	N/A	79	
RTLO-18918A-AS3	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	N/A	N/A	N/A	N/A	79	350
FO-20E313A-MHP	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	N/A	N/A	N/A	N/A	79	500 <sup>6</sup>
FO-20E313A-VHP	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	N/A	N/A	N/A	N/A	79	
FO-20E318B-MXP	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	N/A	N/A	N/A	N/A	79	
FO-20E318B-VXP	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	N/A	N/A	N/A	N/A	79	
RTLO-20918A-AS3	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	N/A	N/A	N/A	N/A	79	350
FO-22E318B-MXP	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	N/A	N/A	N/A	N/A	79	500 <sup>6</sup>
FO-22E318B-VXP	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	N/A	N/A	N/A	N/A	79	
RTLO-22918A-AS3	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	N/A	N/A	N/A	N/A	79	
F-14E16B-LSE	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	N/A	N/A	N/A	N/A	79	
F-15E16B-LSE	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	N/A	N/A	N/A	N/A	79	
F-17E16B-LSE	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	N/A	N/A	N/A	N/A	79	
FM-15E16B-LSE	Yes	47T 6.0P, 20DEG PA	Yes <sup>4</sup>	45T 6.0P, 20DEG PA	N/A	N/A	N/A	N/A	79	

**Note:** (3) - UltraShift 13-Speeds LHP & LEP: Inertia brake is installed on 8-Bolt PTO opening. Inertia brake cannot be moved to 6-Bolt opening.

**Note:** (4) - 6-bolt PTO will interfere with front mount oil filter. Rear or remote mount oil filter must be utilized.

**Note:** (6) - Intermittent torque of up to 750 lb-ft at the countershaft is permitted for 5 minutes of each 15 minute PTO duty cycle.

## Cable Configuration

The cable for the Deutsch connector shall be:

- 16 GXL max 18 TXL min for Communication and Control wires
- 12 GXL for Power Supply wires
- 12 GXL or 14 SXL for V-Ignition wires

The cable for the 3-Way Metri-Pack connector should be:

- 10 SXL for Power Supply wires to Electric Clutch Actuator

The cable for the 8-Way Metri-Pack connector shall be:

- 18 GXL max 18 TXL min. for Communication and control wires to Electric Clutch Actuator
- 18 GXL for V-Ignition wires

**Note:** These sizes ensure proper connector sealing and current carrying capacity.

- Splices must be ultrasonically welded per IPC/WHMA-A-620 and encapsulated and sealed to meet SAE-J1455.
- Convoluted Conduit shall have a service temperature of at least 257° F (125° C).
- Braided Loom shall have a service temperature of at least 280° F (138° C). Coverage: A minimum of 10 / maximum of 12 picks per inch. TWISTED CABLES

- 2 Cables = 10 Twists / 25.4 cm
- 3 Cables = 8 Twists / 25.4 cm
- (16 and 18 Gage Cable Only)

SAE Wire Size mm <sup>2</sup>	SAE Wire Size No.	Nominal Outside Diameter (mm)			Nominal Outside Diameter (in.)		
		TXL	GXL	SXL	TXL	GXL	SXL
0.8	18	1.98	2.39	2.72	0.08	0.09	0.11
1	16	2.24	2.59	3.05	0.09	0.10	0.12
2	14	2.62	2.97	3.58	0.10	0.12	0.14
3	12	3.25	3.63	4.14	0.13	0.14	0.16
5	10	3.96	4.45	4.95	0.16	0.18	0.20

Cable Connector (Deutsch) - DRC26-38S01-P017								
Seal Range (mm) (in)	/	Contact Size	Description	Cable Diameter Min (mm <sup>2</sup> )	Cable Diameter Max (mm <sup>2</sup> )	TXL	GXL	SXL
1.02 - 2.41 0.095	/0.040 -	20	Signal	1.02	2.41	16	6	NR
3.40 - 4.95 0.195	/0.134 -	12	Power	3.40	4.95	NR	12	NR
3.40 - 4.95 0.195	/0.134 -	12	Ignition	3.40	4.95	NR	12	14

# Cable Configuration

## Cable Connector (Metri-Pack) - 3-Way 12124685

Seal Range (mm) / (in)	Contact Size	Description	Cable Diameter Min (mm <sup>2</sup> )	Cable Diameter Max (mm <sup>2</sup> )	TX L	GX L	SX L
4.40 - 5.15 / .173 -.202	10	Power (ECA)	4.40	5.15	NR	NR	10

	Back Shell (Deutsch)	*Low Profile Back Shell (Deutsch)
Part Number	0528-004-3805	0528-005-3805
Conduit / OEM	Packard	Packard
Conduit P/N	*(R-69246 round) Convoluted Tubing; Size 13 mm [.500]; 125° C or higher temperature rating	(R-72506 profile) *(R-69246 round) Convoluted Tubing; Size 13 mm [.500]; 125° C or higher temperature rating

**Note:** (\*) Eaton® recommended component.

Recommended Bend Radius (6 X Hardness Diameter):

Inch		Metric (mm)	
Diameter	Bend Radius	Diameter	Bend Radius
3/16 (0.188)	1.1	5	29
1/4 (0.250)	1.5	6	38
3/8 (0.375)	2.3	10	57
1/2 (0.500)	3.0	13	76
5/8 (0.625)	3.8	16	95
3/4 (0.750)	4.5	19	114
1/1 (1.000)	6.0	25	152

## Contact Lubrication

Manufacturer: Nye Lubricants

Material: NyoGel 760G

Eaton® Part Number: 5564527 (service, 2 CC Foil), 5564528 (service, 30 CC Syringe)

Bosch Part Number: N28 FT7020-005

Ford: WSB-M1C239-A

GM: 9986087

DaimlerChrysler: MS-9469

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## Contact Lubrication Application

### Contact Lubrication Recommendation

**Note:** Eaton recommends the use of (NyoGel 760G) on all electrical contacts. The preferred method of application is to use a metered dispensing mechanism that places the material on the socket of the connector. It is also preferred that the material be placed immediately prior to connector mating to reduce the probability of contamination.

- For further information contact your Eaton OEM Engineering Support Group.
- The NyoGel 760G material shall not be applied to the transmission ECU 38-Way (Vehicle Interface) connector jackscrew. No anti-seize, lubricating, or foreign compound shall be applied to the connector jackscrew threads. The use of such compounds may affect jackscrew torque and prevent proper sealing of the connector.

The recommended minimum material volume for the MetricPack 150 speed sensor contact is 0.004 CC per socket.

The recommended minimum material volume for the Deutsch size 20 contact is 0.004 CC per socket.

The recommended minimum material volume for the Deutsch size 12 contact is 0.024 CC per socket.

### Transmission ECU Jackscrew Torque

Connector jackscrew torque shall be 25 +/- 3 lb-in. (2.82 +/- 0.33 Nm).

The Nyogel 760G material shall not be applied to the Transmission ECU 38-Way (Vehicle Interface) connector jackscrew. No antiseize, lubricating, or other foreign compound shall be applied to the connector jackscrew threads. The use of such compounds may affect jackscrew torque and prevent proper sealing of the connector.

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## Medium- and Heavy-Duty Gen 2 - PTO Inputs and Configurations

### Countershaft and Split Shaft PTOs

#### Electrical Interface Requirements

All countershaft-driven Power Take-Offs mounted on Fuller® UltraShift ASW transmissions must provide an electrical interface with the transmission. The PTO-mounted switch is used to activate the PTO operating mode of the transmission. This feature uses pin F1 of the 18-way transmission connector. See figure below for countershaft-driven PTO electrical interface diagram.

The Fuller UltraShift ASW transmission must have an input signal from the countershaft-driven Power Take-Off when it is active. In this active state, the clutch is engaged to drive the transmission main box countershaft. Incorrect or no PTO interface signal to the transmission will result in no clutch activation and therefore, no PTO operation.

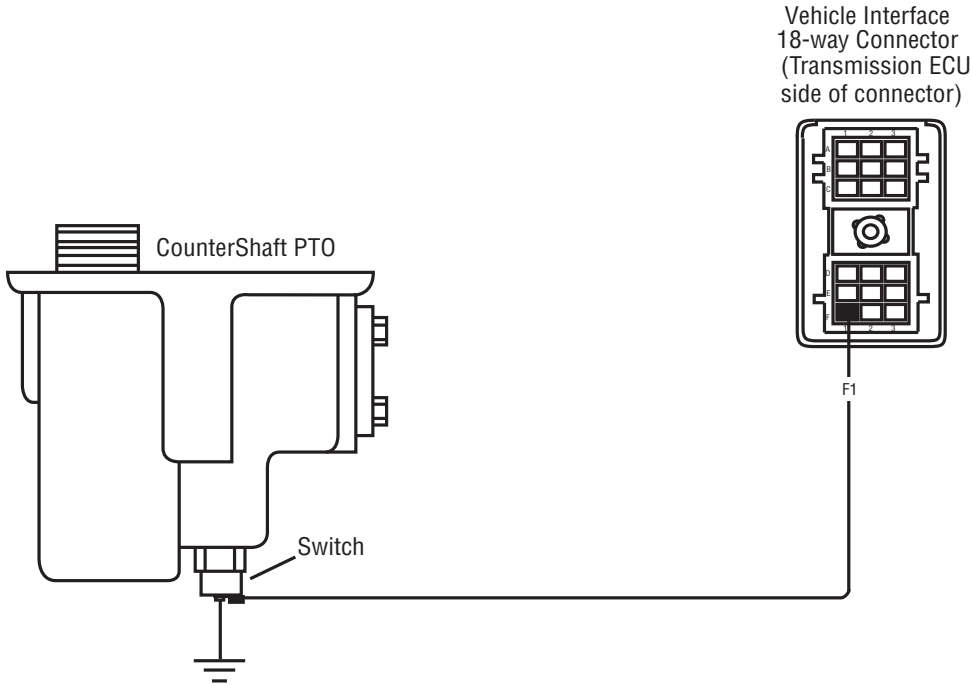
The active signal will illuminate the “Mode” indicator on the push button console.

The transmission default mode for the pin F1 input is for countershaft PTO operation. If the push button console is programmed for something other than countershaft PTO operation the PC-based service tool, ServiceRanger, must be used to enable the countershaft PTO feature.

**The input signal wire for the PTO must be isolated from other PTO-related circuits.**

# PTO Interface

The ground connection must be isolated from local power device ground returns. Frame rail ground is not recommended.



Interconnection Table

FROM	TO	Description
F1	PTO+	PTO+

## UltraShift ASW Auto Neutral Feature

### Electrical Interface Requirements

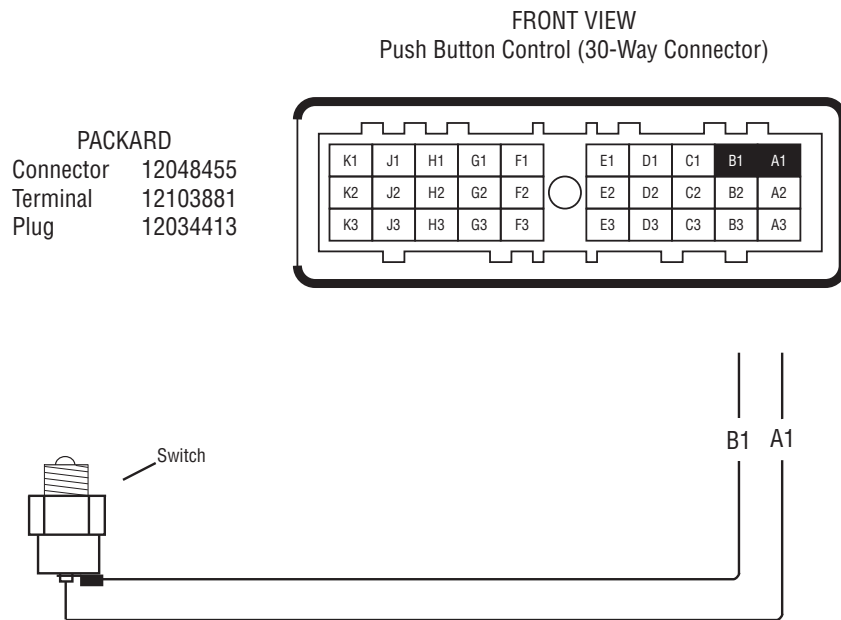
All devices mounted on the vehicle that require Auto Neutral function from the Fuller® UltraShift ASW transmission must provide an electrical interface with the transmission. A switch must be used to activate the Neutral mode of the transmission. This feature uses pin A1 and B1 of the 30-way push button connector. See the figure below for electrical interface diagram.

### Features

When engaged (switch closed), this feature causes the transmission to neutralize when the vehicle is stopped (i.e. stationary PTO operation) and a transmission gear engagement cannot be selected. When disengaged (switch opened), normal transmission gear engagement can be selected.

The Fuller AutoShift ASW transmission must have an input signal from the device to activate this feature.

**The input signal wires must be isolated from other related circuits.**



**Note:** The input signal wires for the Auto Neutral Device must be isolated from other related circuits.

#### Interconnection Table

FROM	TO	Description
A1	Switch	Auto Neutral Input
Switch	B1	Auto Neutral Return

## Medium- and Heavy-Duty Gen 3 - PTO Inputs and Configurations

### Countershaft, Thru-Shaft®, and Split Shaft PTOs

PTO input must be a normally open switch. The switch must close to ground whenever the PTO is activated. This input (active when pin 18 is shorted to ground) activates the split shaft PTO mode of the t

ransmission. This feature uses pin 18 of the transmission connector.

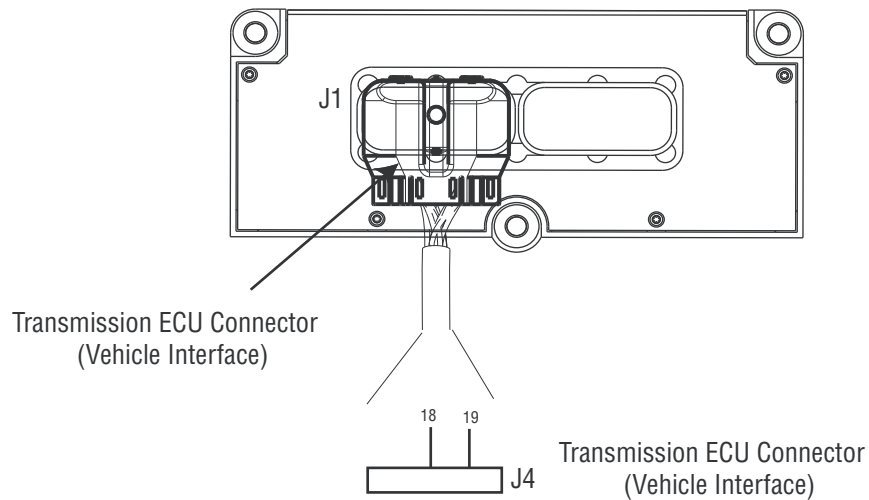
The transmission default mode for the pin 18 input is for countershaft PTO operation. Countershaft PTO operation is the default operating mode and no enabling of the countershaft PTO feature is required unless the push button console change to “TECU” was previously programmed for split shaft PTO operation.

The input signal wire for the PTO must be isolated from other PTO-related circuits. The connector must be compatible with 18 TXL wire.

**The ground connection must be isolated from local power device ground returns. Frame rail ground is not recommended.**

**This specific mode indicator light feature is for the Eaton push button only.**

**The split shaft PTO is not available on the UltraShift with a DM3 clutch.**



FROM	TO	Description
J1-18	J4	PTO Input
J1-19	J4	Auto Neutral Input (AW3)

---

## UltraShift AW3 Auto Neutral Feature

All devices mounted on the vehicle that require Auto Neutral function from the Eaton UltraShift AW3 transmission must provide an electrical interface with the transmission. A switch must be used to activate the Neutral mode of the transmission. This feature uses pin 19 of the vehicle connector.

When engaged (switch closed), this feature causes the transmission to neutralize when the vehicle is stopped (i.e. stationary PTO operation) and a transmission gear engagement cannot be selected. When disengaged (switch opened), normal transmission gear engagement can be selected.

The Eaton UltraShift AW3 transmission must have an input signal from the device to activate this feature.

**The input signal wire for Auto Neutral must be isolated from other Auto Neutral related circuits.**

**The ground connection must be isolated from local power device ground returns. Frame rail ground is not recommended.**

# UltraShift® PLUS and FA - PTO Inputs and Configurations

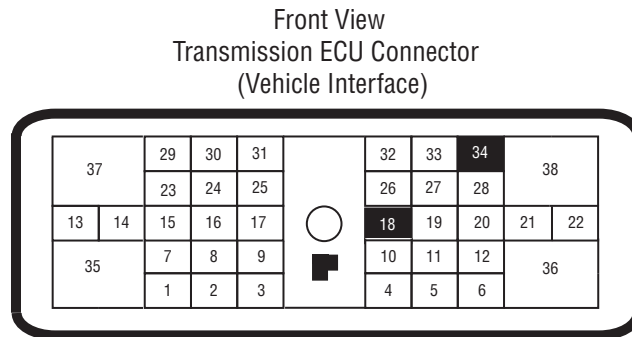
## Countershaft, Thru-Shaft®, and Split Shaft PTOs

In any case a PTO is used, regardless of PTO style, Eaton requires the OEM provide a “PTO active” input to the transmission ECU. The vehicle interface harness shall be pre-populated at the ECU 38-way connector with wiring and a connector needed to connect the PTO. This connector will contain the input and return wire necessary to support the input function.

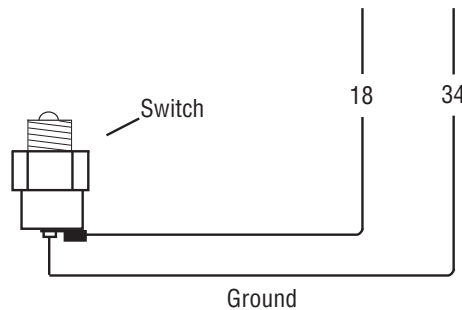
**Note:** Must use a dedicated return on pin 34, frame grounds are not acceptable.

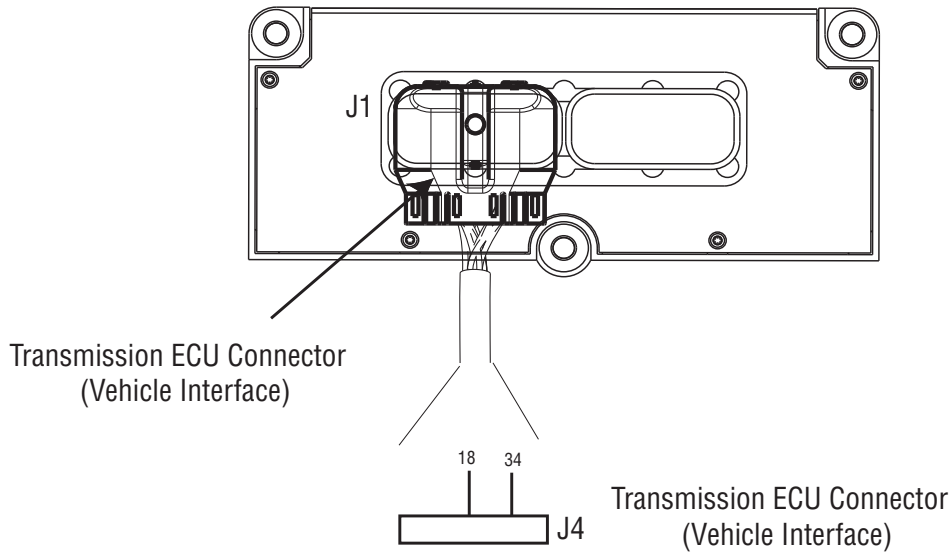
**Note:** Refer to Cable and Harness Construction section for correct wire and terminal pin sizes for communication and control wires.

- PTO input shall be a normally open switch.
- The switch shall close to the PTO return line (pin 34) whenever the PTO is activated. This input activates the PTO mode of the transmission. This feature uses pin 18 and 34 of the transmission connector, see illustration.
- The input signal wire for the PTO shall be isolated from other PTO related circuits.
- The ground connection shall be isolated from local power device ground returns.
- Proper wiring ensures the clutch stays engaged during PTO operation and clutch engagement rate is slower.



Pin Side View





From	Description
J1-18	PTO Signal Input
J1-34	PTO Return

## PTO Configurations



The transmission ECU contains configuration software for PTO mode. The default mode is set to “Countershaft PTO” operation which also supports “Through-Shaft PTO” operation. If the application requires use of a “Split Shaft PTO”, the transmission ECU configuration software shall be changed to reflect “Split-Shaft PTO”. The Eaton ServiceRanger tool is the recommended interface for changing the configuration setting.

## UltraShift® PLUS 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. This requires the OEM to “T” a pressure switch into the existing air line to the parking brake valve. Contact the brake manufacturer for pressure switch requirements. The pressure switch output and return wires are connected to the vehicle interface transmission ECU connector as follows:

Description	From	To
Auto Neutral Signal	Pin 19	Signal Wire
Auto Neutral Return	Pin 33	Return Wire

## Medium-Duty Hybrid - PTO Inputs and Configuration

Eaton recommends the OEM provide a connector and wiring coming from the Hybrid Control Module 38-Way (Vehicle Interface) with the PTO wires installed.

**Note:** Connector used must be compatible with 18 TXL.

**Note:** Refer to Cable section for correct wire and pin sizes.

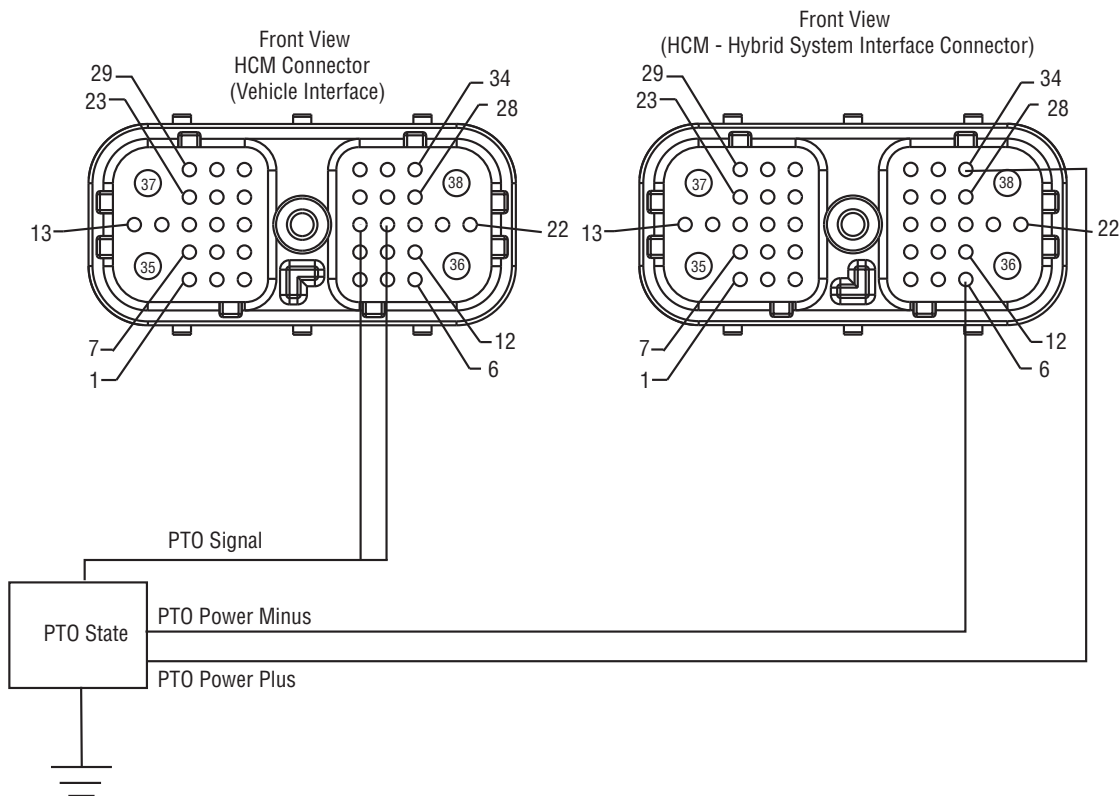
### Countershaft PTOs

Option 1 - ePTO selection input comes from the Push Button Shift Control, which is sent from the TECU over J1939 to the HCM. The transmission is confirmed in neutral and this message is sent to the vehicle Body or Chassis controller, which enables the PTO and then provides feedback to the HCM.

Option 2 - ePTO selection input comes from the Push Button Shift Control, which is sent from the TECU over J1939 to the HCM. The transmission will go to neutral and then the HCM will activate PTO pins 21 and 22, which enables the PTO. The PTO switch is grounded whenever the PTO is activated. This input (active when pin 18 is shorted to ground) verifies the countershaft PTO operation.

**Note:** The active signal will illuminate the “ePTO” indicator on the Eaton Push Button Shift Control.

**The PTO request signal from the Push Button Shift Control will only be available on J1939. Any devices that require the PTO state must be compatible with J1939.**



ePTO (HCM Analog Controlled)

Description	From	Pin#	To	Pin#	AWG
PTO Signal	HCM	18	ePTO		18
PTO Power Plus	HCM	34	ePTO		18
PTO Power Minus	HCM	6	ePTO		18

ePTO (HCM J1939 Controlled)

Description	From	Pin#	To	Pin#	AWG
J1939 Low (CAN)	HCM	2	J1939 Backbone	2	18
J1939 High (CAN)	HCM	3	J1939 Backbone	3	18

mPTO (HCM Controlled)

Description	From	Pin#	To	Pin#	AWG
PTO Signal	HCM	19	mPTO	PTO Grnd Switch	18

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## Medium-Duty Dual Clutch - PTO Inputs and Configurations

### Power Take-Off (PTO)

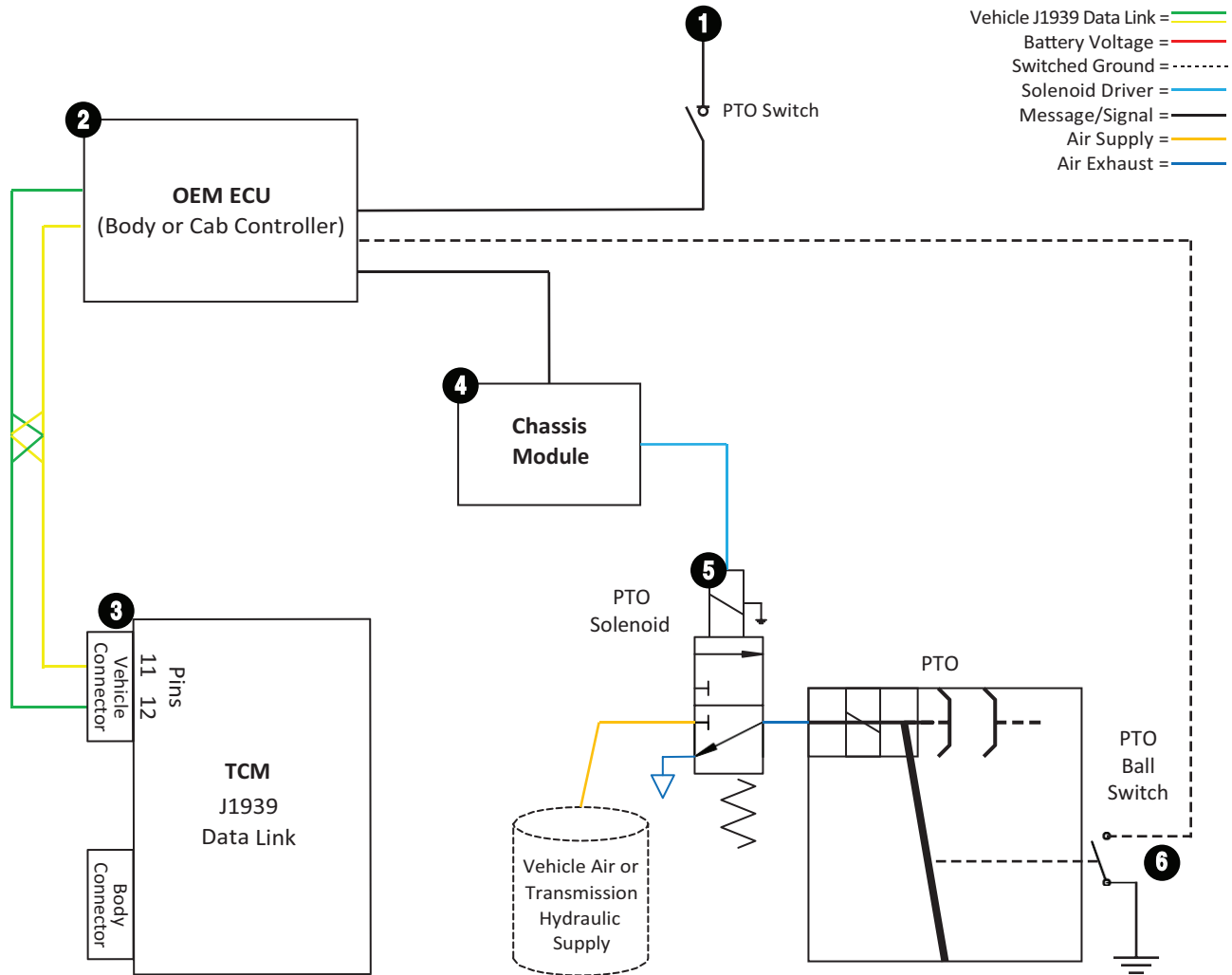
- The Precision Transmission is designed to provide an enhanced acknowledgment for PTO applications. Precision TCM will receive a “PTO Request” from the vehicle to enter into a PTO mode. If the TCM deems that conditions are suitable for PTO operations, the TCM will supply a “PTO Engage” output to allow the PTO engagement. A confirmation from the PTO returns to the TCM via the “PTO Confirm” line to complete the loop. The Precision TCM has the functionality to support two PTOs at the same time (one hardware control and one over the J-1939 network or both over the J-1939 network).
- 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 will provide 1 milliamp of current for both 12 volt and 24-volt vehicle systems.
- The TCM Engage circuit load shall draw no more than 0.50 amps with 16 volts applied for a 12 volt vehicle system or 32 volts applied for a 24 volt system.
- An 18 AWG TXL cable is required at the TCM 20-way connector for sealing purposes.
- The Precision TCM will also support PTO request via SAE J-1939 protocol.
- The following diagrams show the inactive state for all options:

**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.

## PTO Wiring Diagrams

### Procision J1939 PTO Control

**Note:** All switches shown inactive.

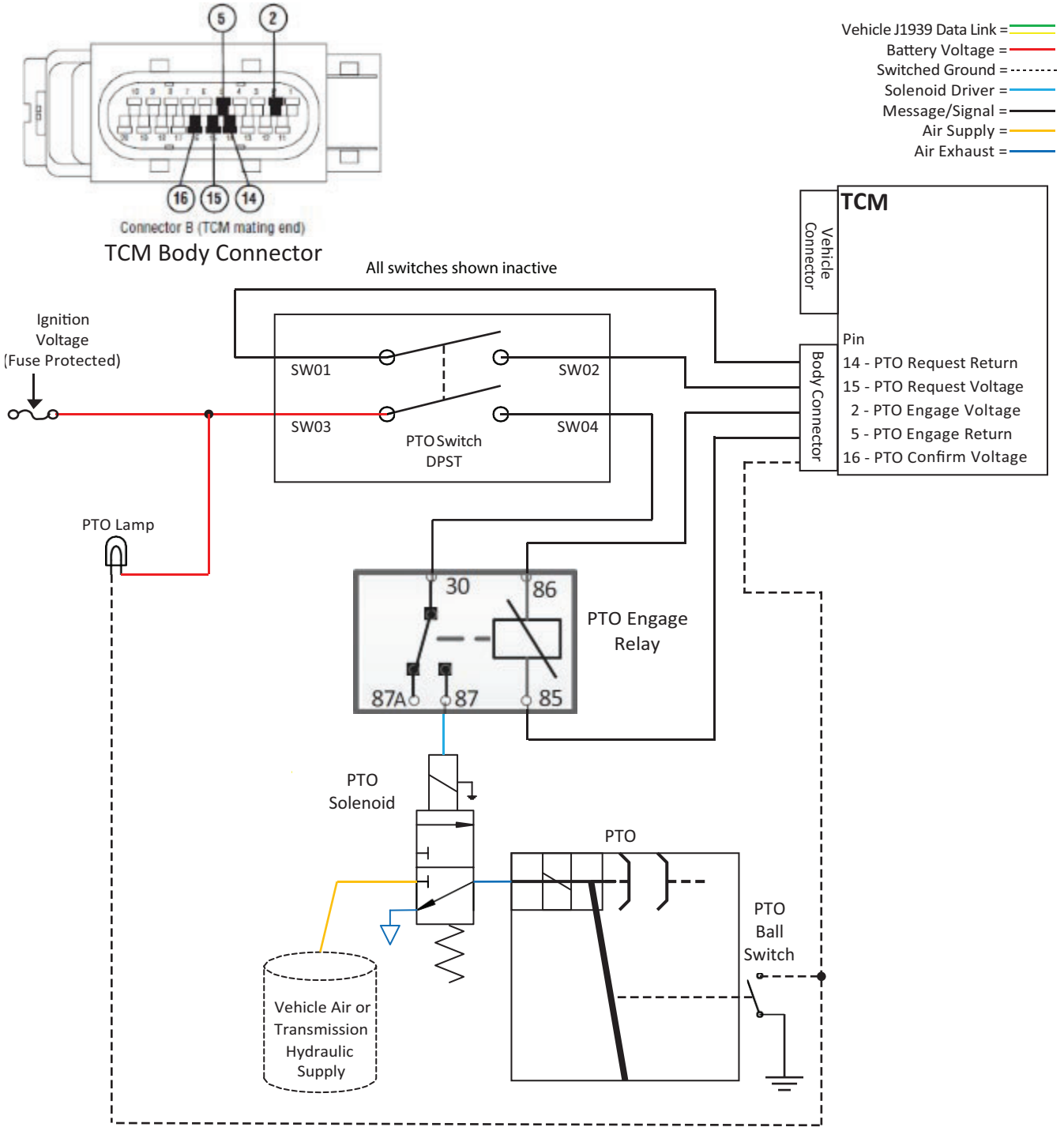


**Note:** Refer to table on next page for wiring diagram details.

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.

<b>J1939 PTO Control</b>					
<b>Seq.</b>	<b>From (Diagram #)</b>	<b>Description</b>	<b>Method</b>	<b>To (Diagram #)</b>	<b>Status</b>
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

## Procision Hardwire PTO Control with Confirm Switched to Ground



PTO Interface

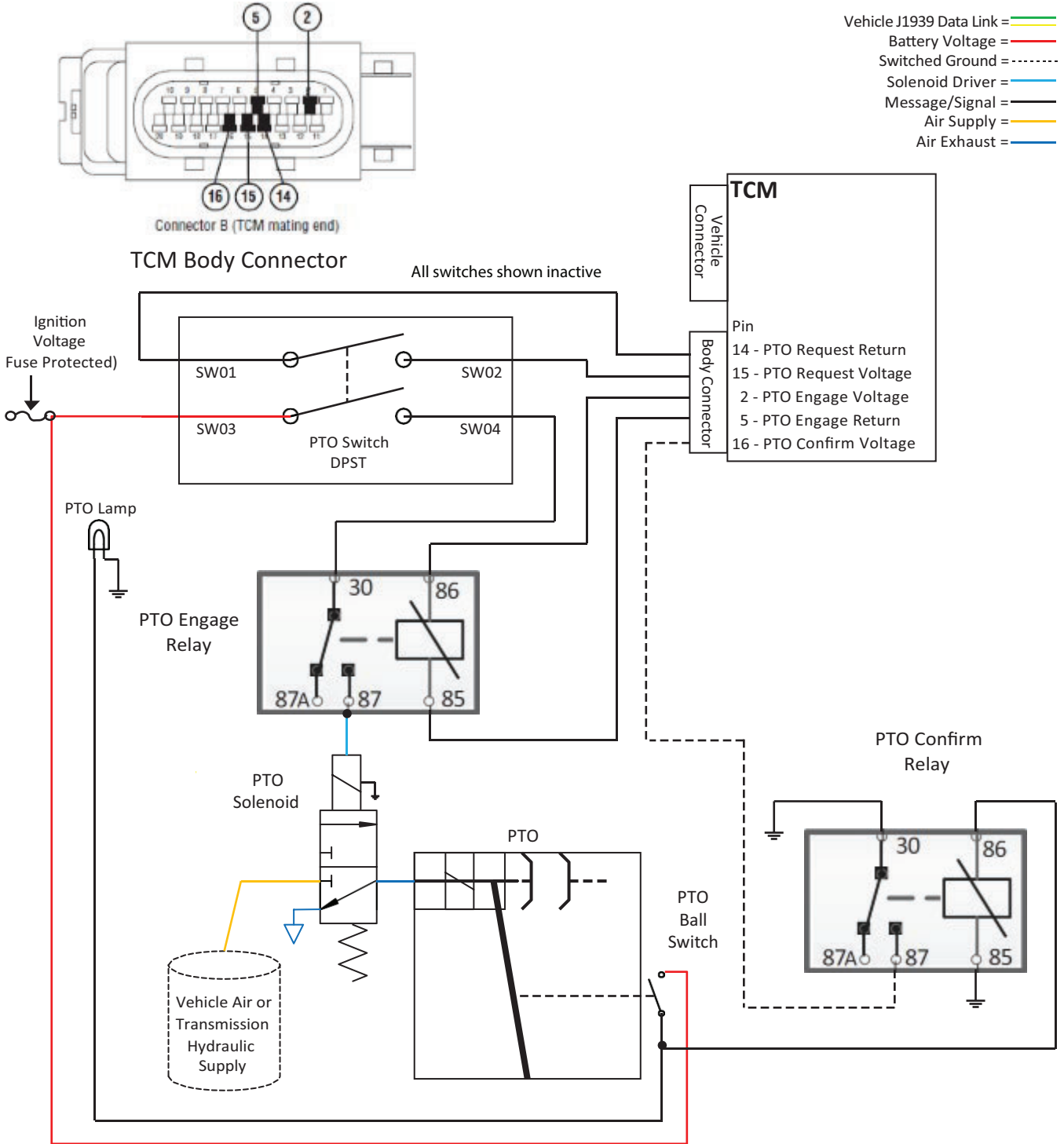
**CAUTION:** Do not induce voltage onto the Return circuits (Pins 5 or 14) or TCM damage could occur. One or more fault codes 900, 905, 920, or 925 with FMI 5 set Active if voltage was induced on Pins 5 or 14.

**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.

<b>Hardwire PTO Control with Confirm Switched to Ground</b>		
From	To	Description
SW01 - PTO Switch	Pin 14 - TCM Body Conn. (Return)	Request
Pin 15 - TCM Body Conn. (Voltage)	SW02 - PTO Switch	Request
Ignition Voltage (Fuse Protected)	SW03 - PTO Switch	Request
SW04 - PTO Switch	Pin 30 - PTO Engage Relay	Request
Pin 2 - TCM Body Conn. (Voltage)	Pin 86 - PTO Engage Relay	Engage
Pin 85 - PTO Engage Relay	Pin 5 - TCM Body Conn. (Return)	Engage
Pin 87 - PTO Engage Relay	PTO Solenoid	Engage
PTO Ball Switch (Ground)	Pin 16 - TCM Body Conn. (Voltage)	Confirm
	PTO Lamp (-)	Confirm
Ignition Voltage (Fuse Protected)	PTO Lamp (+)	Confirm

## Procision Hardwire PTO Control with Power Switched Confirmation



**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.

<b>Hardwire PTO Control with Confirm Switched to Power</b>		
<b>From</b>	<b>To</b>	<b>Description</b>
SW01 - PTO Switch	Pin 14 - TCM Body Conn. (Return)	Request
Pin 15 - TCM Body Conn. (Voltage)	SW02 - PTO Switch	Request
Ignition Voltage (Fuse Protected)	SW03 - PTO Switch	Request
SW04 - PTO Switch	Pin 30 - PTO Engage Relay	Request
Pin 2 - TCM Body Conn. (Voltage)	Pin 86 - PTO Engage Relay	Engage
Pin 85 - PTO Engage Relay	Pin 5 - TCM Body Conn. (Return)	Engage
Pin 87 - PTO Engage Relay (Voltage)	PTO Solenoid	Engage
	PTO Ball Switch	Confirm
PTO Ball Switch (Voltage)	Ignition Voltage (Fuse Protected)	Confirm
	PTO Lamp (+)	Confirm
Pin 87 - PTO Confirm Relay (Ground)	Pin 16 - TCM Body Conn. (Voltage)	Confirm

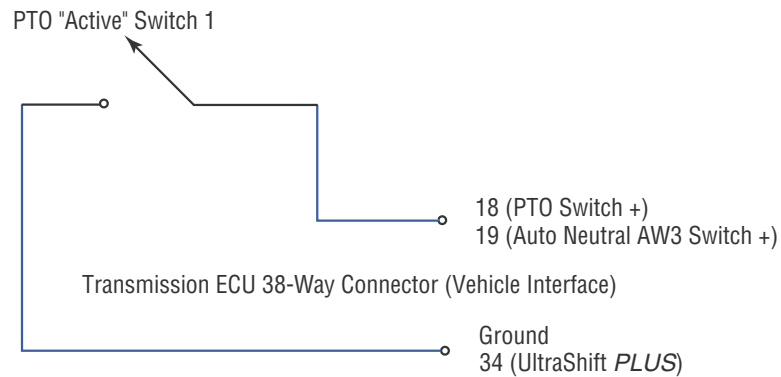
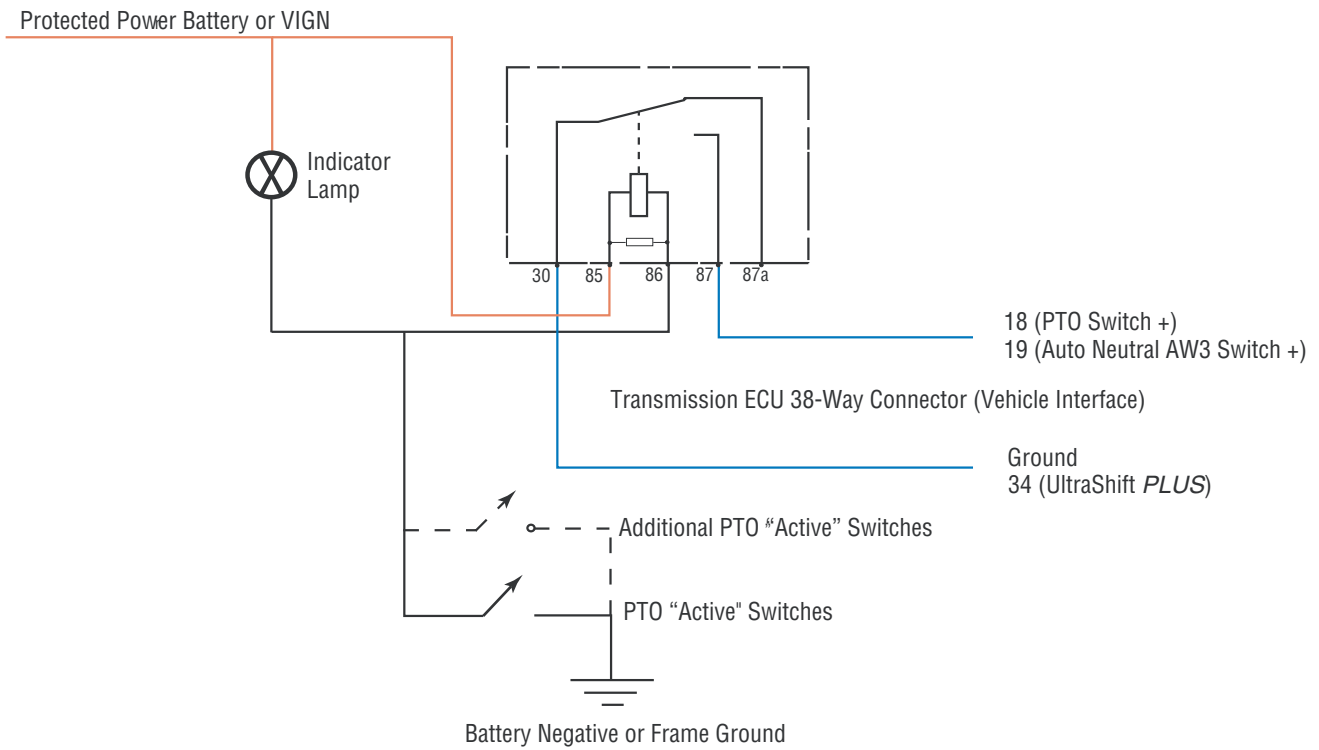
## Auto Neutral and PTO Wiring Diagrams

The typical relay used for Auto Neutral and PTO wiring is listed below.

- Bosch: 0332-209-151 (+12 volt), 0332-204-203 (+ 24 volt) or equivalent
- HELLA: 4RD 960 388-22 (+12 volt) (Recommended)
- SIEMENS W28-15F24-S01 (+12 volt)

**Note:** Use a normally open switch for the PTO “Active” Switch. It can be a mechanical ball switch or air switch.

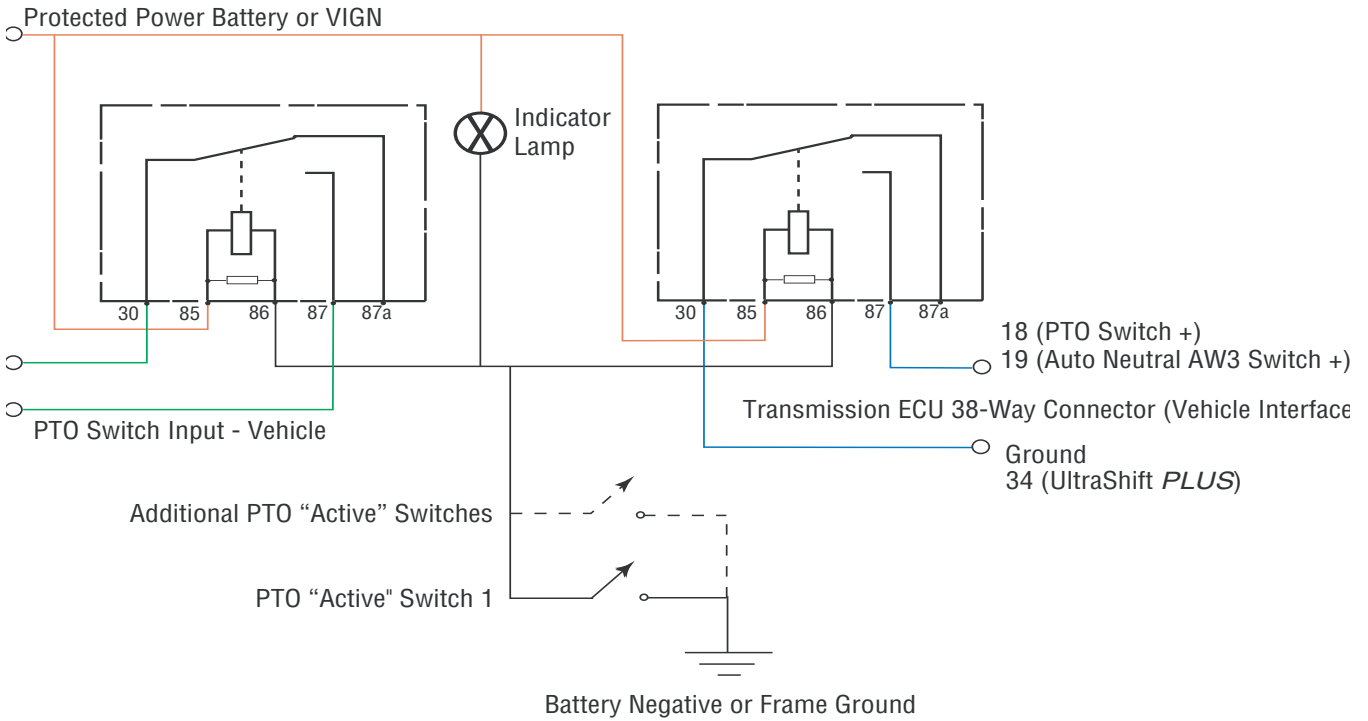
### Relay Isolated PTO Application



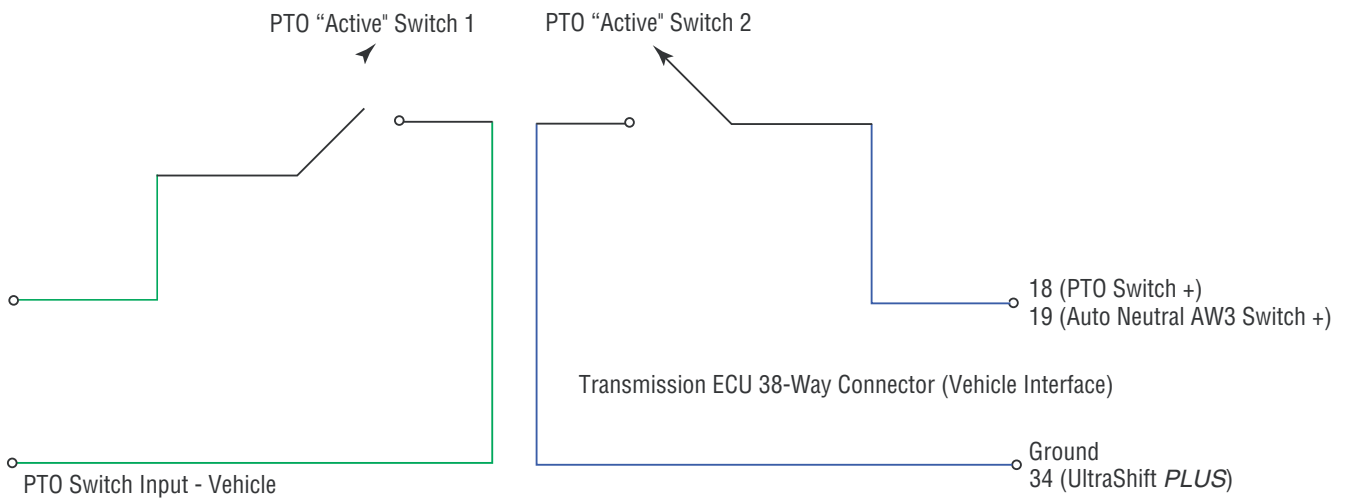
## Dual Relay PTO Application (Double Switch)

The dual relay option provides one input for transmission PTO operation and another input for the vehicle.

**Note:** Vehicle can be wired for normally open or normally closed (87 or 87a).



## Dual Switch PTO Application



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# Medium-Duty and Heavy-Duty Automated PTO Operating Instructions

## AutoShift Countershaft and Split Shaft PTO Operation

### Stationary PTO Operation

The transmission countershaft PTO is used in this application.

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

1. Select “N” on the Shift Control.PTO Operation
2. Apply the parking brake.
3. Depress clutch fully to engage clutch brake (this stops countershaft rotation for PTO engagement).
4. Engage the PTO.
5. Release clutch pedal.
6. Raise engine speed up to operate the PTO.

### Mobile PTO Operation

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

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

1. Select “N” on the Shift Control.
2. Apply the parking brake.
3. Depress clutch fully to engage clutch brake (this stops countershaft rotation for PTO engagement).
4. Engage the PTO.
5. Select “D”, “MANUAL”, “Neutral” or, “Reverse”, as required for vehicle movement.
6. Release clutch pedal.
7. Raise engine speed as required to move vehicle / operate PTO.

---

## UltraShift® Countershaft PTO Operation

Fuller® UltraShift® transmissions are not approved for PTO applications that would require the engine to operate at less than 1000 RPM for heavy-duty transmissions and 1200 RPM for medium-duty transmissions.

### Stationary PTO Operation

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. Apply the service brake.
3. Select “D” on the Shift Control (this stops countershaft rotation for PTO engagement).
4. Engage the PTO.
5. Select “N” on the Shift Control.
6. Release the service brake.
7. Raise engine speed up (minimum of 1000 RPM for heavy-duty transmissions) to operate the PTO. Remote throttle controls are not approved for use with UltraShift®. ASW / AW3: No required minimum engine speed for split shaft or countershaft PTO operation.

### Mobile PTO Operation

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

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

1. Depress service brake.
2. Release parking brake.
3. Select “D” on the Shift Control (this stops countershaft rotation for PTO engagement).
4. Engage the PTO.
5. Select “D”, “MANUAL”, “Neutral” or, “Reverse”, as required for vehicle movement.
6. Release service brake.
7. Raise engine speed as required to move vehicle / operate PTO.

## UltraShift® PLUS and FA Countershaft and Split Shaft PTO Operation

### Stationary PTO Operation

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. Depress the service brake.
3. Select “D” on the Shift Control (this stops countershaft rotation for PTO engagement).
4. Engage the PTO.
5. Select “N” on the Shift Control.
6. Release the service brake to engage the clutch and power the PTO.
7. Engine speed must be raised to engage the Split Shaft PTO.

### Mobile PTO Operation

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

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

1. Depress the service brake.
2. Release the parking brake.
3. Select “D” on the Shift Control (this stops countershaft rotation for PTO engagement).
4. Engage the PTO.
5. Select “D”, “MANUAL”, “Neutral” or, “Reverse”, as required for vehicle movement.
6. Release the service brake to engage the clutch and power the PTO.
7. Raise the engine speed as required to move vehicle / operate PTO.

### Split Shaft PTO Operation

The drive line, split shaft, or transfer case PTO is used in this application and provides stationary operation only.

1. With Vehicle stopped, set the park brake and select Neutral.
2. Press the service brake (to disengage the clutch)
3. Turn on the split shaft PTO switch. The associated switch lamp should be on.
4. It is critical that the split shaft PTO is truly engage to prevent vehicle movement. Ensure the split shaft PTO lamp is lit.
5. Select Manual Mode and button up or down as desired (the default gear ratio is 1:1). The gear display will flash the split shaft PTO gear.
6. Release the service brake, then press the throttle pedal down to launch the split shaft PTO until the gear display stops flashing (this indicates the clutch is closed)
7. The operator can then use cruise control, the throttle pedal, or remote throttle to reach the desired split shaft PTO speed.

- 
8. The operator can stop the split shaft PTO process normally by either turning off the split shaft PTO switch, moving the PRNDL out of Manual Mode, releasing the parking brake, or pressing the Service Brake. The TECU then exits split shaft process normally by ramping engine down to its idle speed, opening the clutch and shifting to Auto Neutral.

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## Eaton Hybrid Countershaft PTO Operation

### Stationary Mechanical PTO Operation

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. Depress the service brake.
3. Select “D” on the Shift Control (this stops countershaft rotation for PTO engagement).
4. Engage the PTO.
5. Select “N” on the Shift Control.
6. Release the service brake to engage the clutch and the PTO.
7. Raise engine speed as required to operate PTO.

### Mobile Mechanical PTO Operation

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

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

1. Depress the service brake.
2. Release the parking brake.
3. Select “D” on the Shift Control (this stops countershaft rotation for PTO engagement).
4. Engage the PTO.
5. Select “D”, “MANUAL”, “Neutral” or, “Reverse”, as required for vehicle movement.
6. Release the service brake to engage the clutch and the PTO.
7. Raise the engine speed as required to move vehicle / operate PTO.

### Engine-off Power Take-Off (ePTO) Operation

The ePTO provides standard hydraulic functions without continuous diesel engine operation. The PTO drive power is provided by the hybrid motor and hybrid batteries. If the hybrid batteries become depleted, the diesel engine will automatically start to recharge the batteries, while providing PTO drive power. Once the batteries are fully charged, the engine will shut down automatically.

#### **ePTO Startup Procedure:**

1. Apply the parking brake.
2. Turn key to ON position. Do NOT start the engine.
3. Push and release “ePTO” on shift console.
4. Use the hydraulic controls in the normal manner.

**Note:** Refer to Truck Equipment Manufacturer/Body Company manuals for proper use of PTO tools and equipment.

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**Note:** The electric motor powering the ePTO is activated by a hydraulic demand signal generated by the hydraulic system. It will start and stop with hydraulic usage.

**ePTO Shutdown Procedure:**

1. Shutdown and return PTO driven equipment to storage position.
2. Push “ePTO” button on shift console once to shut down electric power take-off.
3. Turn key to “off” position to shutdown vehicle or turn key to “start” position to start engine for driving.

**Note:** Refer to Truck Equipment Manufacturer/Body Company manuals for proper use of PTO tools and equipment.

**Note:** The electric motor powering the ePTO is activated by a hydraulic demand signal generated by the hydraulic system. It will start and stop with hydraulic usage.

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# High Capacity Inertia Brake Relocation - UltraShift Transmissions

## Medium-Duty UltraShift Transmissions

The high capacity inertia brake is installed on the left side 6-Bolt PTO opening of all medium-duty UltraShift transmissions. Kit K-3742 is required to move the inertia brake.

## Heavy-Duty UltraShift Transmissions

The high capacity inertia brake (HCIB) is installed on the 8-Bolt PTO opening of all heavy-duty Fuller® UltraShift transmissions; however, the HCIB can be moved to the 6-Bolt PTO opening if desired. Depending on the application, the HCIB can either be directly mounted to the 6-Bolt PTO opening using Eaton Kit numbers K-3683 for Generation II transmissions, K-3739 for Generation 3 transmissions, or can be offset with the use of an adapter from Chelsea or Muncie to clear frame and suspension components.

Both Chelsea and Muncie have produced adapters to rotate the HCIB away from potential vehicle interferences. The Chelsea adapter kit is 630-2 (30 degree). The Muncie adapter kit is 40TF-6855-1 (55 degree). Prior experience has shown that only the Muncie 55 degree adapter works in the Kenworth T800 chassis, specifically with set back front axles. If ordering an UltraShift that would require the HCIB to be relocated, please contact the vehicle OEM to ensure that the HCIB (with or without an adapter) adequately clears any obstructions prior to purchase.

## Moving I-Brake to 6-Bolt PTO Opening

For heavy-duty UltraShift Generation 2 transmissions, see “Generation 2 Inertia Brake Relocation Instructions (8 to 6-Bolt PTO Opening).”

For heavy-duty UltraShift Generation 3 transmissions, see “Generation 3 Inertia Brake Relocation Instructions (8 to 6-Bolt PTO Opening).”

**Note:** The high capacity inertia break cannot be relocated on the FO(M)-16D313E-LEP or the RTLO(M)-16913L-DM3.

## Inertia Brake Right-Hand Mounting Installation Instructions - Medium-Duty

This kit provides hardware and instructions for moving a Medium-Duty inertia brake from the left side to the right side of the transmission. This kit is only for use with transmissions already fitted with inertia brakes that can be mounted in either location. This is easily determined by the existence of 2 speed sensor adapter ports on the inertia brake casting. If the transmission does not already have this style inertia brake, a different kit containing the correct inertia brake needs to be ordered. The correct inertia brake is required to keep the speed sensor pointing upwards to prevent oil leakage.

Items in kit:

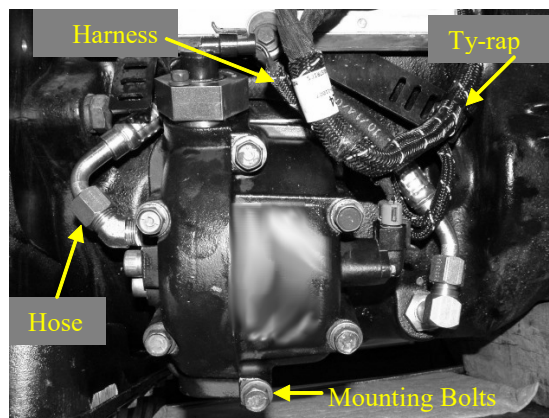
- (3) PTO Cover Gaskets (4305309)
- (1) Jumper Harness (4306106)
- (1) Harness Strap Bracket (4305794)
- (4) Ty-rap (5559348)
- (1) Thread Sealant (71205)
- (1) Thread Adhesive (71232)
- (1) Wire Harness Terminal Lubricant (Nyogel) (5564527)

### Drain Oil from Transmission

Remove drain plug and drain oil out of transmission.

**CAUTION**

**Oil may be hot.**



## Remove Left Side Inertia Brake

1. Disconnect harness at 2 connector locations and remove ty-raps from inertia brake.

**Note:** Take care not to damage harness. Protect connector ends from dirt contamination.

2. Disconnect oil hose from inertia brake and transmission case.
3. Remove (6) mounting bolts from the inertia brake.

**CAUTION**

**Inertia brake is heavy. Be prepared to handle the weight of the brake when the bolts are removed.**

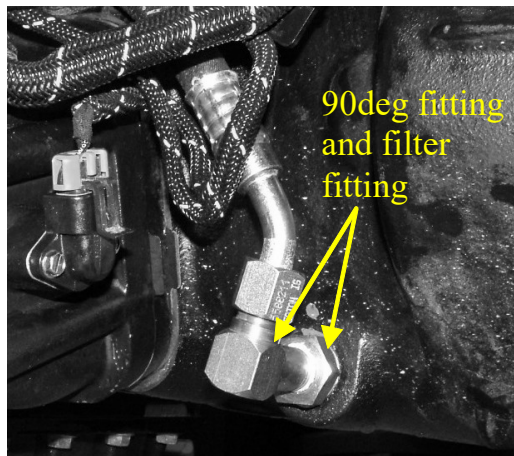
**There may be some residual oil in the inertia brake.**

4. Remove the inertia brake, spacer plate, and gaskets from the transmission.

**Note:** Clean and remove all old gasket material from the mating surfaces of the inertia brake and transmission PTO openings.

**Note:** Some transmissions may not use a spacer plate with the inertia brake.

5. Remove the 90° fitting and filter fitting from transmission case that was connected to the oil supply hose.



## Remove Right Side PTO Cover

1. Remove (6) bolts from the right side PTO cover.
2. Remove cover

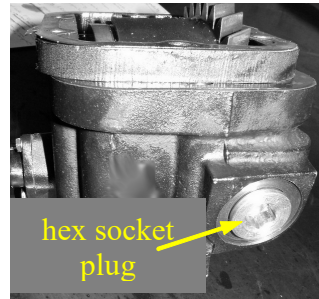
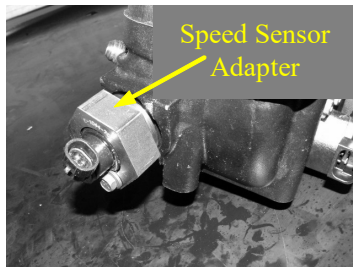
**Note:** Clean and remove all old gasket material from the mating surfaces of the PTO cover and opening on the transmission case.

## Install PTO Cover on Left Side

1. Install PTO cover and gasket on the left side of the transmission.

**Note:** Make sure cover and transmission opening is clean and dry.

2. Apply thread adhesive to bolt threads.
3. Torque bolts to 10-20 lb-ft. (14-27 Nm) in a cross pattern.



4. Apply thread sealant and install Drain Plug on Left side of transmission and torque to 45-55 lb-ft (61-75 Nm)

## Prepare Inertia Brake

1. Clean gasket material from inertia brake and both sides of the spacer.

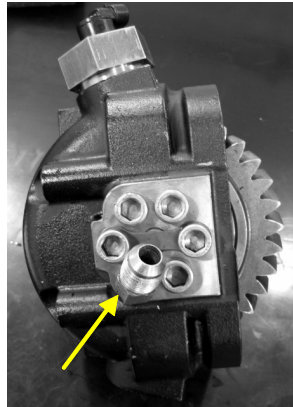
**Note:** Some transmission models do not use a spacer with the inertia brake.

2. Remove the Speed Sensor Adapter
3. Remove hex socket plug
4. Apply thread adhesive to the speed sensor adapter threads.
5. Install the Speed Sensor adapter where the hex socket plug was. Torque to 80-90 lb-ft. (108-122 Nm)
6. Install hex socket plug where the speed sensor adapter was. Torque to 80-90 lb-ft. (108-122 Nm)

**Note:** When inertia brake is installed on the transmission, the speed sensor must point upwards to prevent oil leakage.

7. Remove 45° oil fitting from inertia brake.
8. Apply thread sealant to the 45° oil fitting.

9. Install the 45° oil fitting into the inertia brake. Torque to 25 lb-ft. (34 Nm) minimum then continue to rotate to position and orient as shown.

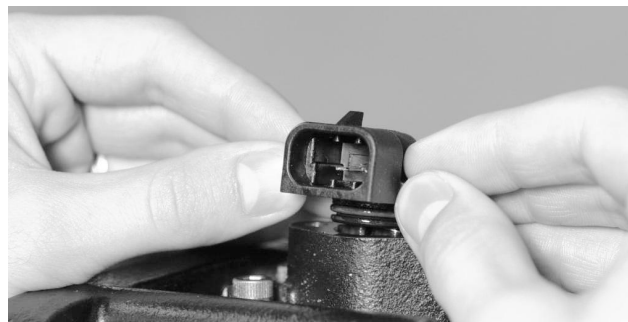
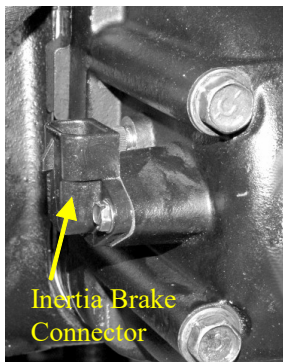


10. Remove the inertia brake electrical connector by removing the two cap screws and gently pulling the connector free from the inertia brake. (Internal wires must remain attached.)
11. Rotate the connector 180 degrees, so the connector is facing the speed sensor. (The connector will be pointing up when the inertia brake is installed. (See photo for the connector orientation when installed on the transmission.)

**Note:** Carefully rotate the connector; do not forcefully twist the wires.

12. Gently guide the wires back into the inertia brake and install the connector.

**Note:** Use caution to prevent pinching the wires or damaging the o-ring



**Note:** Gently guide wires back into the Inertia Brake Housing. Align connector screw holes with housing screw holes and insert connector into mounting hole. (Note orientation of Connector.) Use caution to prevent pinching of wires or damaging the o-ring. Reinstall (2) Screws and torque to 22-27 lb-in [2.5-3.1 Nm].

13. Apply thread adhesive to the screws and reinstall. Torque to 1.84 - 2.28 lb-ft (22-27 lb-in.) (2.5 -3.1 Nm).

## Install Inertia Brake on Right Side

1. Apply thread adhesive to (6) mounting bolt threads
2. Using the six mounting bolts, install the new gaskets, spacer, and inertia brake onto transmission.

**CAUTION**

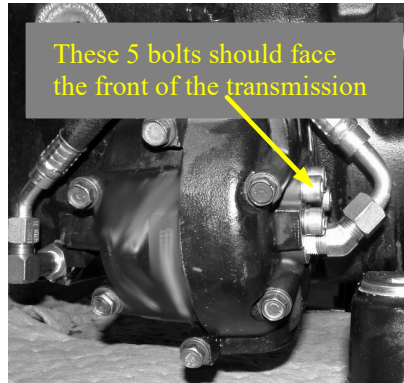
**Inertia Brake is heavy. Be prepared to handle the inertia brake weight when installing.**

## Inertia Brake

**Note:** If transmission does not require the spacer, only one gasket is to be installed with the inertia brake.

3. Tighten mounting bolts to 40-45 lb-ft. (54-61 Nm) using a cross pattern

**Note:** The inertia brake is mounted so that the speed sensor is pointed upwards and the 5 allen head bolts and oil hose fitting are facing the front of the transmission.

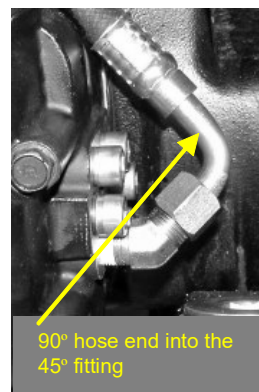
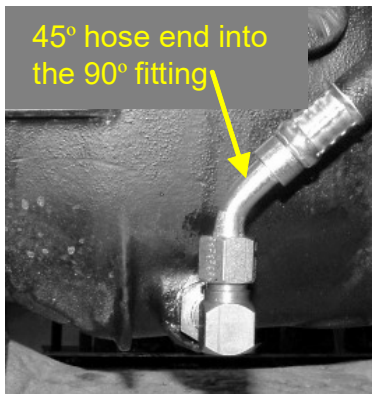


Inertia Brake should be mounted in this orientation on the right side.

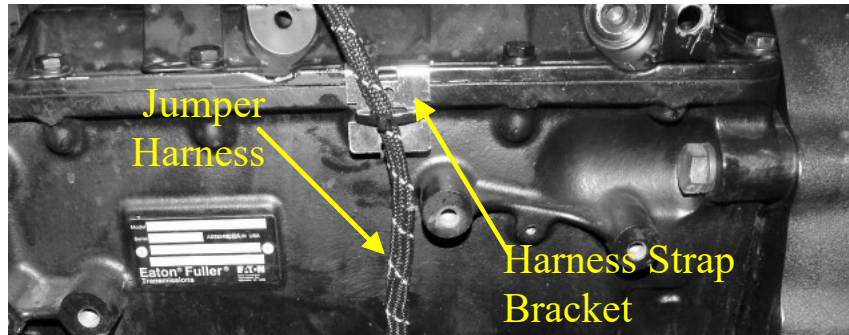
### Install Trim Components

1. Apply thread sealant to filter fitting and install into right side of the transmission case. Torque to 45-55 lb-ft. (61-75 Nm).
2. Apply thread sealant to the 90° fitting. Install into filter fitting. Torque to 25 lb-ft. (34 Nm) minimum then continue to rotate to position and orient upwards as shown.
3. Install oil supply hose. Connect the 45° end of the hose to the 90° fitting installed in the transmission. Connect the 90° end of the hose to the 45° fitting on the inertia brake. Tighten hose fittings to 42-48 lb-ft. (57-65 Nm).

**Note:** Prevent the oil supply line from kinking by adjusting the orientation of the two fittings.



4. Install harness strap bracket to the shift bar housing. Remove the shift bar housing bolt and place bracket as shown. Torque shift bar housing bolt to 35-40 lb-ft (47-54 Nm).

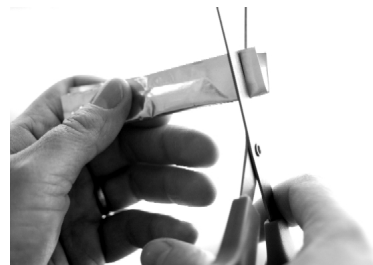
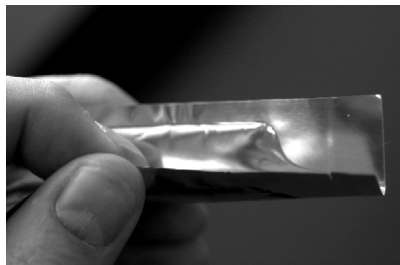


## Install Jumper Harness

A jumper harness is supplied to connect between the transmission harness and the inertia brake connectors. Take care not to damage the connectors during installation.

1. Inspect mating connector pins on transmission harness for damage or dirt. If pins need cleaning, use clean shop air or an approved spray cleaner specifically for electrical contacts.
2. Route the jumper harness over the transmission with the correct connectors on the right side for the inertia brake and the correct connectors on the left side for the harness.
3. Using the enclosed package of wire harness terminal lubricant (nyogel), lubricate the harness connectors using the following procedure:

**Note:** The connector should be connected immediately after terminal lubrication is applied.



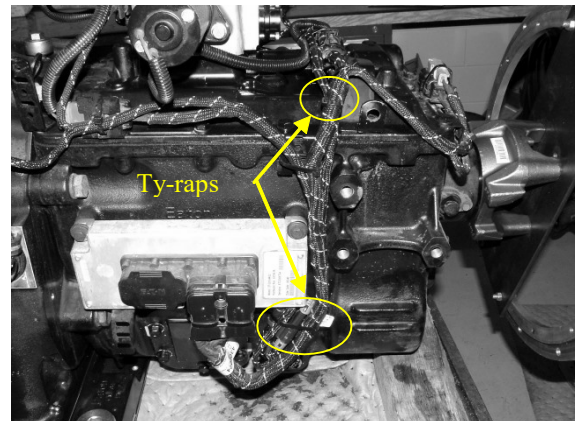
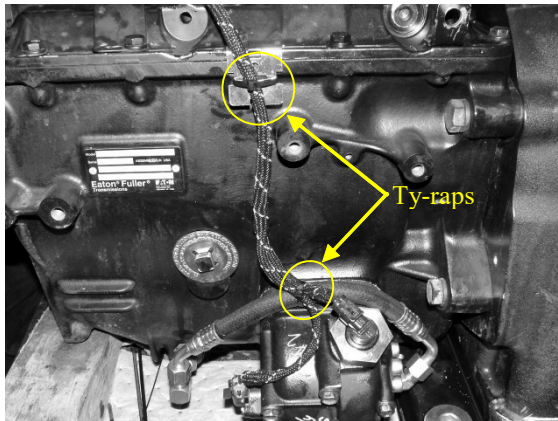
- a. To ease dispensing, fold and cut package as shown.
- b. Dispense a small amount of lubricant onto each terminal of harness as shown in the figure. The amount should be just enough to cover the end of the contact. Use care to prevent damage to the terminal. Apply to all female terminals on all connectors, but attach connector immediately after applying lubrication.

**Note:** Use only Eaton lubricant part number 5564527 (Nye Lubricants NYOGEL 760G) - For MSDS safety sheet or other information see [www.nyelubricants.com](http://www.nyelubricants.com)



4. Make sure all connectors (2 on the right side, 2 on the left side) are fully mated and latches are locked.
5. Tie down jumper harness with ty-raps as shown below.

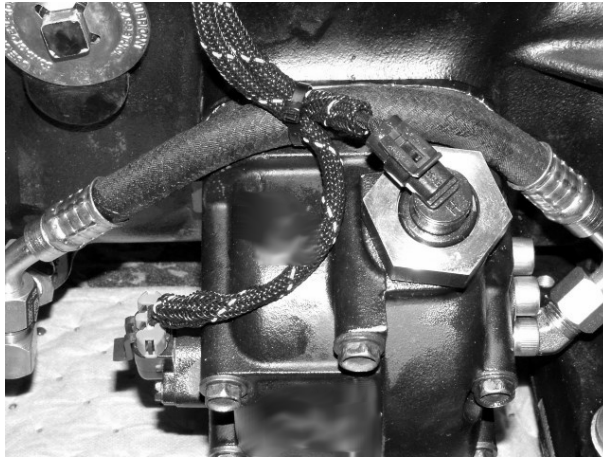
**Note:** Do not over tighten ty-raps.



## Fill Transmission and Road Test

1. Fill transmission with synthetic transmission oil per Eaton publication TCMT-0021 "Lubrication Manual."
2. Look for leaks.
3. Road test vehicle.

4. Recheck for leaks.



## Final Check

1. Make sure all bolts are properly tightened.
2. Make sure the oil supply line and fittings are properly tightened.
3. Make sure transmission is properly filled with lubricant.
4. Make sure harness is connected and properly secured.
5. Look for leaks and repair as necessary.
6. Check the inertia brake for significant clearance to prevent contacting tanks, brackets, frame rails, exhaust, or any part of the vehicle. If there is contact, damage to the inertia brake could occur.
7. If a PTO is installed, instruct driver on PTO operation with an Ultrashift transmission. (Information can be found in the transmission's Driver Manual (TRDR0940))

## Generation 2 - Inertia Brake Relocation Instructions - Heavy-Duty (8- to 6-Bolt PTO Opening)

 CAUTION

**Oil may be hot.**

**Note:** Drain the lubricant from the transmission. Drain the lubricant from the Inertia Brake. On older product the Inertia Brake will still remain full of lubricant (no drain plug).

### Removal

1. Disconnect the Transmission Harness from the Inertia Brake Coil and remove tie straps restraining this harness branch.

**Note:** Use care not to damage the harness.

2. Disconnect the lubricant supply line from the Inertia Brake.

 CAUTION

The Inertia Brake is heavy. Be prepared to handle the weight of the Inertia Brake when the mounting bolts are removed.

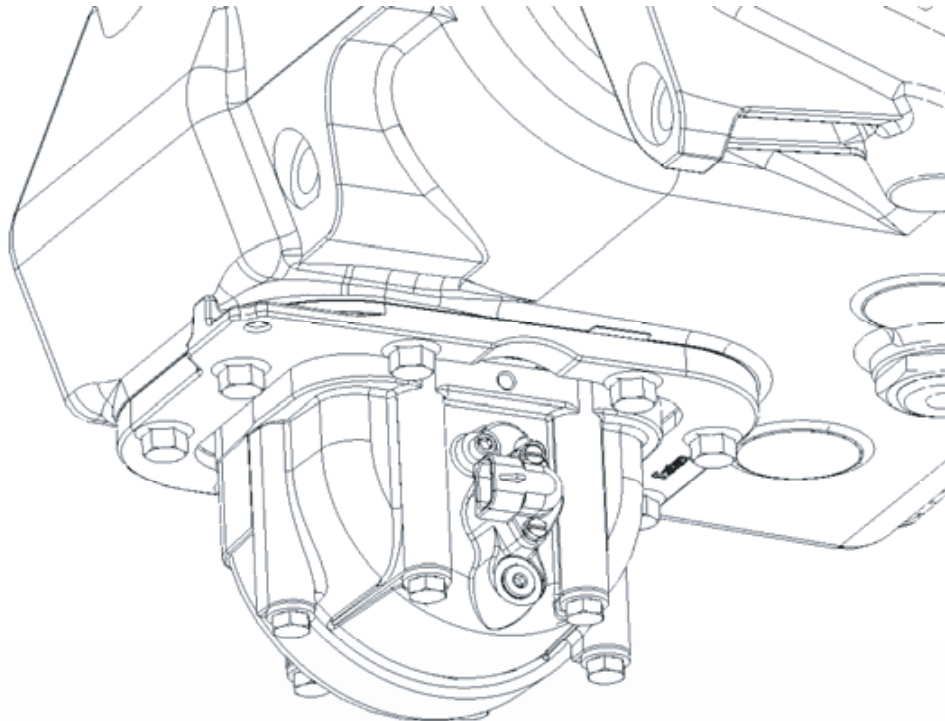
3. Remove the six (6) mounting bolts from the Inertia Brake.
4. Remove the Inertia Brake and gasket from the adapter plate.
5. Remove the eight (8) mounting bolts from the adapter plate.
6. Remove and discard the adapter plate and gasket from the transmission.
7. Remove the six (6) mounting bolts from the 6-bolt PTO cover.
8. Remove and discard the 6-bolt PTO cover and gasket from the transmission.

**Note:** Clean and remove all old gasket material from the mating surfaces of the Inertia Brake and transmission PTO openings. Locate the harness push-in anchor point for reference during re-installation to 6-bolt opening.

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Standard Inertia Brake mounting to 8 bolt PTO opening as viewed from rear of transmission

## Installation

1. Clean and thoroughly dry all mating surfaces (including the gasket) prior to assembly.

**Note:** The transmission inertia brake may be mounted to the 6-bolt PTO opening directly, or mounted utilizing a 6-bolt PTO Angle Adapter to assist in aiding chassis clearance.

2. If a 6-bolt PTO Angle Adapter is required, install the angle adapter to the 6-bolt PTO opening following the manufacturers instructions. See picture of 6-bolt installation with angle adapter.
3. If the Inertia brake is installed directly mounted to the 6-bolt opening, proper orientation must be followed as shown in the “Final Check” section. A directly mounted Inertia Brake also requires a new lubrication hose, Eaton part number 5588209.
4. Using the six (6) 3/8” mounting bolts, install the Inertia Brake and gasket, being careful to align the Inertia Brake gear with the drive gear. Tighten mounting bolts to 40-45 lb-ft (54-61 Nm) using a cross pattern.

**Note:** When mounted directly - orient the inertia brake housing with hose connection forward / electrical connection rearward as shown in the “Final Check” section (same orientation as 8-bolt). When mounted to a 6-bolt PTO Angle Adapter - orient the inertia brake housing with hose connection rearward / electrical connection forward as shown in the “Final Check” section. Ensure gasket, inertia brake, and mating mounting faces are assembled dry (no lubricant or grease).

**CAUTION**

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The Inertia Brake is heavy. Be prepared to handle the weight of the Inertia Brake until the mounting bolts are installed.

5. Reconnect the lubricant supply line to the Inertia Brake and tighten to 20-22 lb-ft. (27-30 Nm). For Inertia Brakes directly mounted to the 6-bolt opening - orient the 45 degree elbow facing inboard, and connect the 45 degree elbow fitting end of the 5588209 hose to the Inertia Brake elbow. Connect the straight fitting end of the hose to the case port 90 degree elbow.

For Inertia Brakes mounted to a 6-bolt PTO angle Adapter – connect the 90 degree elbow fitting end of the 5588210 hose to the case port 90 degree elbow. Connect the straight fitting end of the hose to the Inertia Brake 45 degree elbow.

6. Reroute and reconnect the Transmission Harness to the Inertia Brake Coil. Dress the harness along the transmission case from the inertia brake up to the top of the transmission. Install the harness push-in anchor to the threaded-hole anchor point in the inertia brake housing. Install tie wraps every 6-10 inches. The harness should not have sharp bends or be under tension.
7. Install the PTO to the 8-bolt PTO opening following the manufacturers instructions.

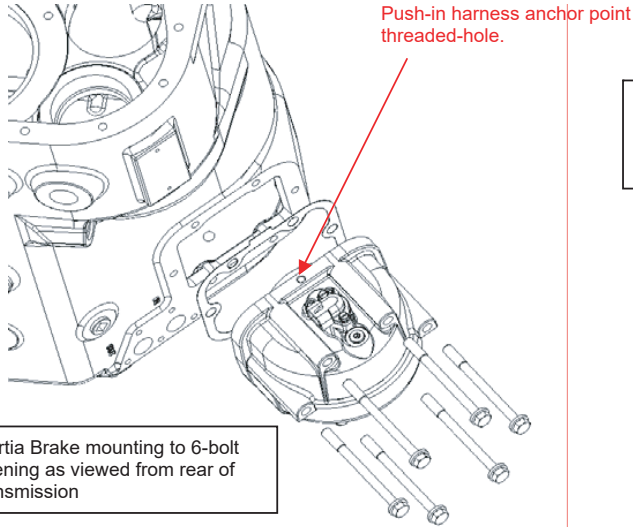
**Note:** Fill the transmission with lubricant.

## Final Check

- Make sure the mounting bolts are properly tightened.
- Make sure the lubricant supply line is properly tightened.
- Make sure the transmission is properly filled with lubricant.
- Make sure the Transmission Harness is connected and locked.
- Check for lubricant leaks after operating the vehicle.

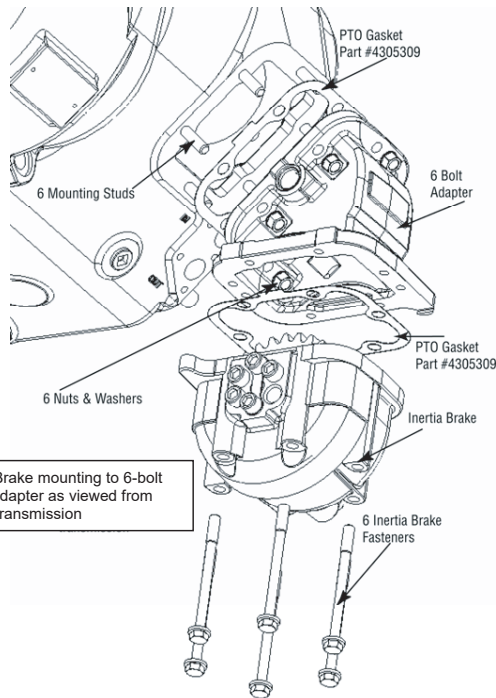
- Check that the inertia brake has sufficient clearance to prevent contacting tanks, brackets, frame rails, exhaust, or any other part of the vehicle. Contacting anything when stationary or moving will cause damage to inertia brake, angle adapter, or other vehicle equipment.

Drawing shows Inertia Brake directly mounted to the 6-bolt opening



Inertia Brake mounting to 6-bolt opening as viewed from rear of transmission

Note orientation of connector end of Inertia Brake when directly mounted to 6-bolt opening

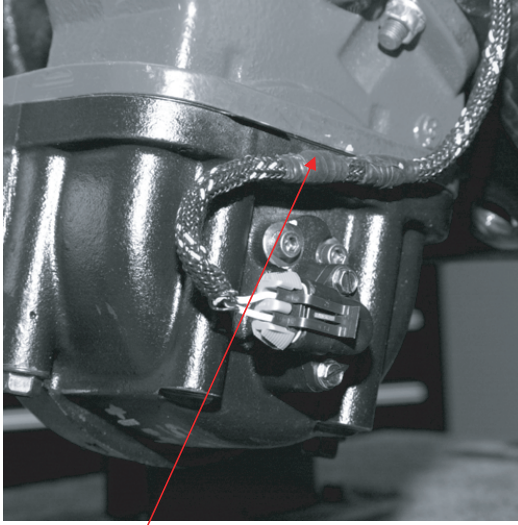


Inertia Brake mounting to 6-bolt Angle Adapter as viewed from rear of transmission

Drawing shows inertia brake with angle adaptor. Please see instructions above for installation without angle adaptor.

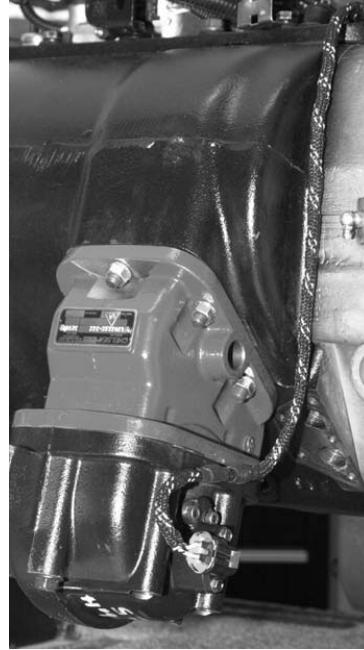
Note orientation of hose connection end of Inertia Brake when mounted to a PTO Angle Adapter

## Inertia Brake



Push-in harness anchor  
point threaded-hole.

Mate inertia brake connector and insert push-in harness anchor into threaded hole as shown. Route the harness up along side of the transmission case as indicated. For installation without angle adapter, use push-in anchor and route harness up along case. With either installation, use a tie wrap at the top of transmission to remove excess slack.



# Generation 3 - Inertia Brake Relocation Instructions - Heavy-Duty (8 to 6-Bolt PTO Opening)

**CAUTION**

**Oil may be hot.**

**Note:** Drain the lubricant from the transmission. Drain the lubricant from the Inertia Brake. On older product the Inertia Brake will still remain full of lubricant (no drain plug).

## Removal

1. Disconnect the Transmission Harness from the Inertia Brake and remove tie straps restraining this harness branch.

**Note:** Use care not to damage the harness. Protect the connector end from dirt contamination.

2. Disconnect the lubricant supply line from the Inertia Brake.

**CAUTION**

The Inertia Brake is heavy. Be prepared to handle the weight of the Inertia Brake when the mounting bolts are removed. Protect the connector body from impact and contamination.

3. Remove the six (6) mounting bolts from the Inertia Brake.
4. Remove the Inertia Brake and gasket from the adapter plate.
5. Remove the eight (8) mounting bolts from the adapter plate.
6. Remove and discard the adapter plate and gasket from the transmission.
7. Remove the six (6) mounting bolts from the 6-bolt PTO cover.
8. Remove and discard the 6-bolt PTO cover and gasket from the transmission.

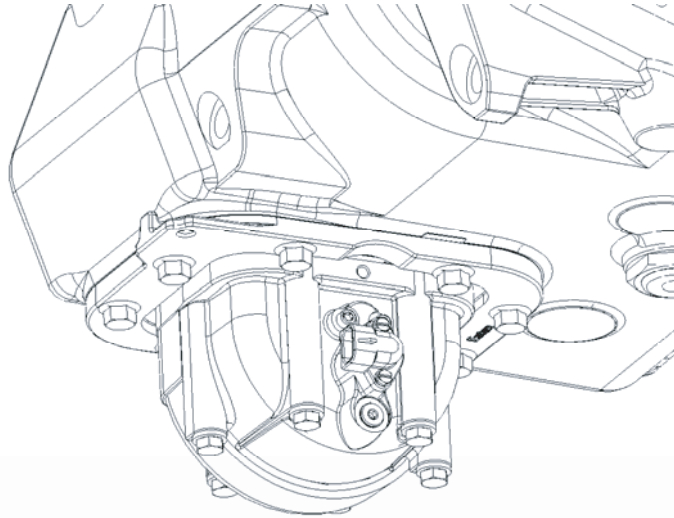
**Note:** Clean and remove all old gasket material from the mating surfaces of the Inertia Brake and transmission PTO openings. Locate the harness push-in anchor point for reference during re-installation to 6-bolt opening.

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Standard Inertia Brake mounting to 8 bolt PTO opening  
as viewed from rear of transmission

## Installation

1. Clean and thoroughly dry all mating surfaces (including the gasket) prior to assembly.

**Note:** The transmission inertia brake may be mounted to the 6-bolt PTO opening directly, or mounted utilizing a 6-bolt PTO Angle Adapter to assist in aiding chassis clearance.

2. If a 6-bolt PTO Angle Adapter is required, install the angle adapter to the 6-bolt PTO opening following the manufacturers instructions. See picture of 6-bolt installation with angle adapter in the “Final Check” section.
3. If the Inertia brake is installed directly mounted to the 6-bolt opening, proper orientation must be followed as shown in the illustration in the “Final Check” section. A directly mounted Inertia Brake also requires a new lubrication hose, Eaton part number 5588209.
4. Using the six (6) 3/8 mounting bolts, install the Inertia Brake and gasket, being careful to align the Inertia Brake gear with the drive gear. Tighten mounting bolts to 40-45 lb-ft. (54-61 Nm) using a cross pattern.

**Note:** When mounted directly - orient the inertia brake housing with hose connection forward / electrical connection rearward as shown in the “Final Check” section (same orientation as 8-bolt). When mounted to a 6-bolt PTO Angle Adapter - orient the inertia brake housing with hose connection rearward / electrical connection forward as shown in the illustration in the “Final Check” section. Ensure gasket, inertia brake and mating mounting faces are assembled dry (no lubricant or grease).

**CAUTION**

The Inertia Brake is heavy. Be prepared to handle the weight of the Inertia Brake until the mounting bolts are installed.

5. Reconnect the lubricant supply line to the Inertia Brake and tighten to 20-22 lb-ft (27-30 Nm). For Inertia Brakes directly mounted to the 6-bolt opening: Orient the 45 degree elbow facing inboard, and connect the 45 degree elbow fitting end of the 5588209 hose to the Inertia Brake elbow. Connect the straight fitting end of the hose to the case port 90 degree elbow. For Inertia Brakes mounted to a 6-bolt PTO angle Adapter: Connect the 90 degree elbow fitting end of the 5588210 hose to the case port 90 degree elbow. Connect the straight fitting end of the hose to the Inertia Brake 45 degree elbow.

6. Apply contact lubrication to jumper harness per instructions in the “How to Apply Contact Lubrication to Eaton Transmission Harnesses” section then connect the jumper harness to the transmission harness.

Reroute and reconnect the Transmission Harness to the Inertia Brake. Dress the harness along the transmission case from the inertia brake up to the top of the transmission. Install the harness push-in anchor to the threaded-hole anchor point in the inertia brake housing. Install tie wraps every 6-10 inches. The harness should not have sharp bends or be under tension. See illustrations in the “How to Apply Contact Lubrication to Eaton Transmission Harnesses” section.

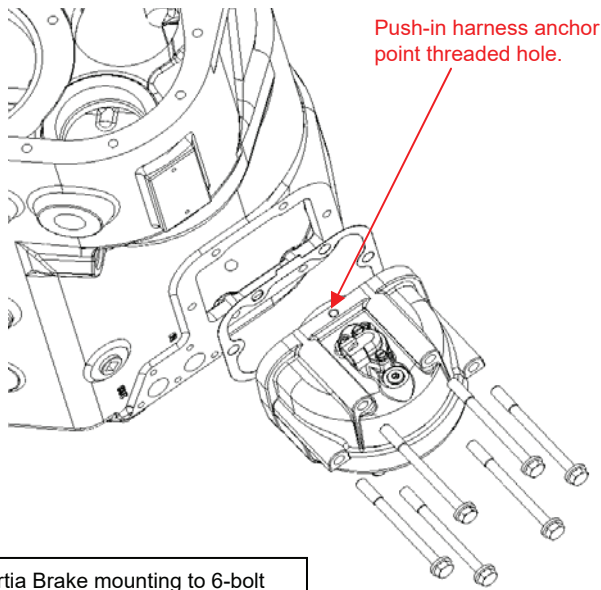
7. Add UltraShift PTO Instruction Label to dash near PTO switch or a location in view of the driver.
8. Install the PTO to the 8-bolt PTO opening following the manufacturers instructions.

**Note:** Fill the transmission with lubricant.

## Final Check

- Make sure the mounting bolts are properly tightened.
- Make sure the lubricant supply line is properly tightened.
- Make sure the transmission is properly filled with lubricant.
- Make sure the Transmission Harness is connected and locked.
- Check for lubricant leaks after operating the vehicle.
- Check that the inertia brake has sufficient clearance to prevent contacting tanks, brackets, frame rails, exhaust, or any other part of the vehicle. Contacting anything when stationary or moving will cause damage to inertia brake, angle adapter, or other vehicle equipment.
- Instruct Driver on PTO operation with Fuller® UltraShift Transmissions.

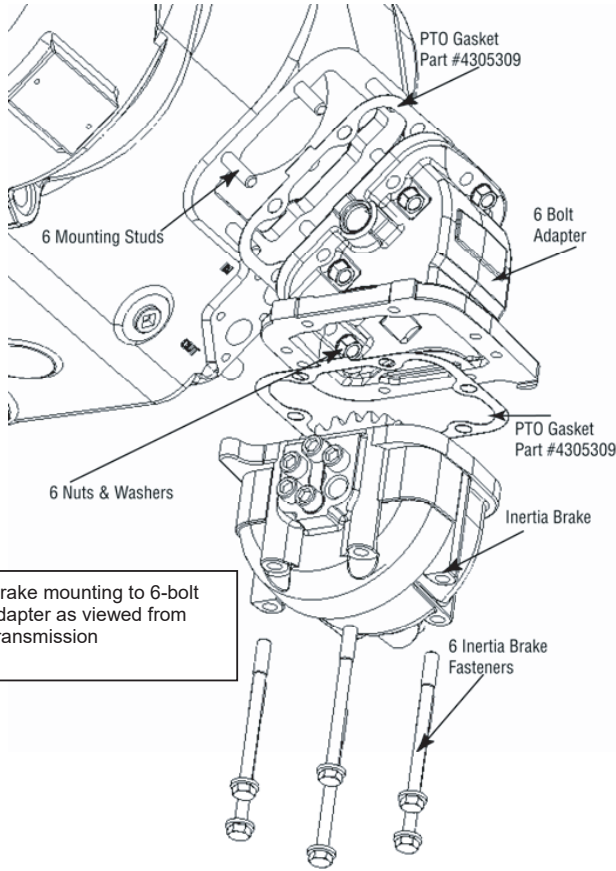
# Inertia Brake



Inertia Brake mounting to 6-bolt opening as viewed from rear of transmission

Drawing shows Inertia Brake directly mounted to the 6-bolt opening

Note orientation of connector end of Inertia Brake when directly mounted to 6-bolt opening



Inertia Brake mounting to 6-bolt Angle Adapter as viewed from rear of transmission

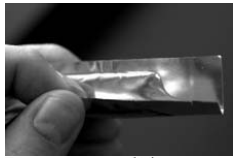
Drawing shows inertia brake with angle adaptor. Please see instructions above for installation without angle adaptor.

Note orientation of hose connection end of Inertia Brake when mounted to a PTO Angle Adapter

**Note:** Before installing I-Brake Harness, apply contact lubricant to terminals

## How to Apply Contact Lubrication to Eaton Transmission Harnesses

Please use the enclosed package of electrical contact lubrication when installing or replacing the I-Brake harness. Lubrication is provided to ease assembly and to restore electrical connector protection. Apply material to harness connectors and mate immediately to prevent contamination with grime and dirt.



Fold package length-wise.



Snip off tip of foil at cut-line.



Dispense with package folded as shown for ease of flow and control.

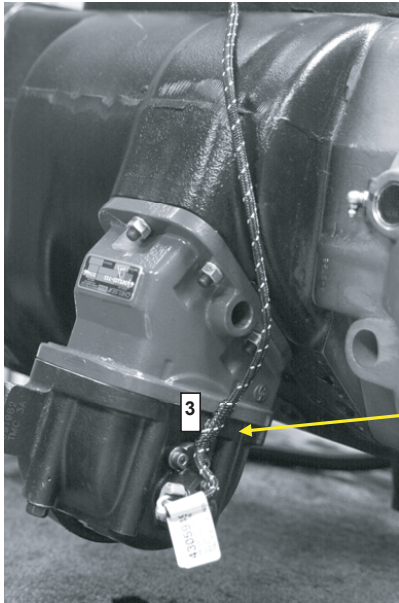
Use just enough material to cover end of terminal.

Before starting, inspect mating connector pins on transmission for damage or dirt. If pins need cleaning, use clean shop air or an approved spray cleaner specifically for electrical contacts. To ease dispensing, fold and cut package as shown above.

Dispensing a small amount of lubricant onto each terminal of harness. The amount should be just enough to cover the end of the contact – about the size of a BB. Use care to prevent damage to the terminal. Each package contains enough material for one harness installation. Apply to all female terminals on all connectors. Mate connector immediately after applying lubrication.

Use only Eaton lubricant part number 5564527 (Nye Lubricants NYOGEL 760G - For MSDS safety or other information see [www.nyelubricants.com](http://www.nyelubricants.com)).

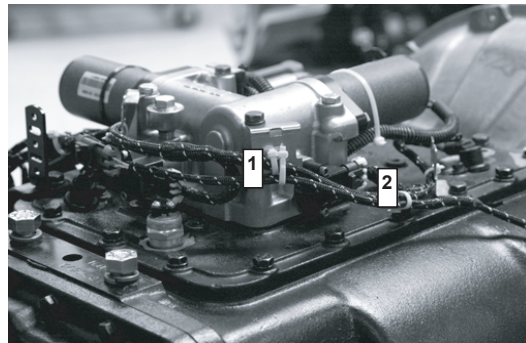
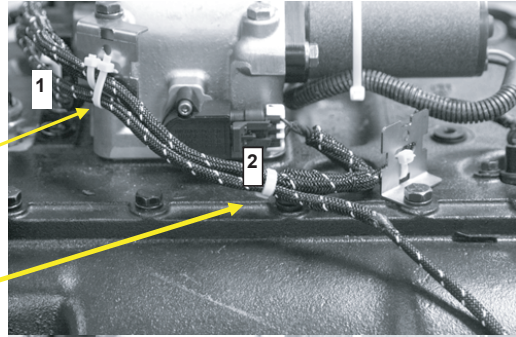
# I-Brake Harness Routing Scheme



1 Tie Wrap to Bracket

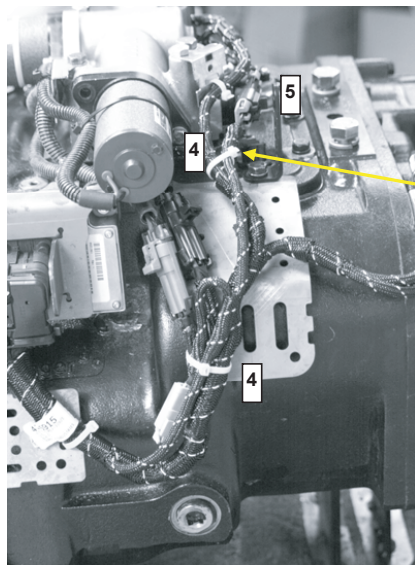
2 Tie Wrap to harness

3 Push-in Anchor



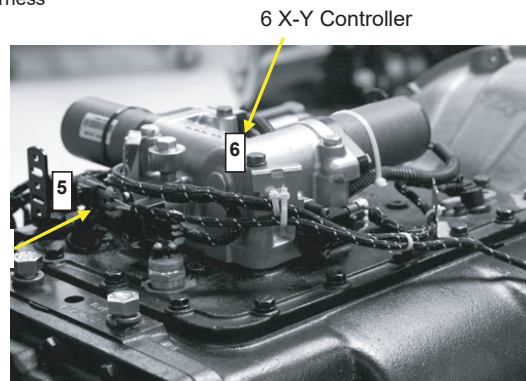
Mate inertia brake connector and insert push-in harness anchor into threaded hole as shown. Route the harness up along side of the transmission case as indicated. With any installation scheme, use tie wraps at the top and side of transmission to remove excess slack.

Route the harness along rear of X-Y Controller as shown. Attach connector to Transmission harness. Add additional tie-wraps to adequately secure harness.



4 Tie Wrap to harness

5 Connector



6 X-Y Controller

---

## PTO Manufacturers - Contact Information

### ***Bezares USA***

27634 Commerce Oaks Dr.

Oak Ridge North, TX 77385

(888) 663-1786

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

### **Chelsea Products Division**

8225 Hacks Cross Road

Olive Branch, MS 38654

(662) 895-1011

[www.parker.com/chelsea](http://www.parker.com/chelsea)

### **Muncie Power Products, Inc.**

P.O. Box 548

Muncie, IN 47308-0548

(765)284-7721

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

## Change Control Log

Last Revised Date	Description of Clarifications and Updates
May 2022	Removed all references to Endurant
March 2022	Updated DTNA PTO Schematics
July 2019	Updated Endurant and Procision PTO Diagrams Updated Medium-Duty Dual Clutch - Procision PTO Configurations Updated Power Take-Off (PTO)
November 2018	Updated Heavy-Duty Automated Endurant PTO Inputs, Configurations and Wiring Diagrams. Updated PTO Manufacturers - Contact Information. Added Endurant PTO Support Brackets and Sealing Section.
March 2018	Updated Endurant Countershaft PTO Operation.
August 2017	Added Endurant Transmission.
February 2016	Added Table information for Heavy-Duty Manual and Fuller Advantage Series transmissions.
March 2014	Added EP3 Model information to Heavy-Duty Automated PTO Configurations section. Added EN3 Model information to Heavy-Duty Automated PTO Configurations section.
November 2013	Added Fuller Advantage Model PTO information.  Added the note "Transmission rated at a continuous 500 lb-ft at the countershaft. Maximum intermittent torque at the countershaft is 750 lb-ft." to the following sections: <b>Heavy-Duty Manual Transmission - RT Linehaul</b> <b>Heavy-Duty Manual Transmission - RT Vocational</b> <b>Heavy-Duty Manual Transmission - RT Performance</b> <b>Heavy-Duty Manual Transmission - FR Series</b> <b>Heavy-Duty Manual Transmission - Auxiliary Transmission</b> <b>Heavy-Duty Automated - 10-Speed</b> <b>Heavy-Duty Automated - UltraShift® PLUS - VCS and VMS</b> <b>Heavy-Duty Automated - 13/18/16-Speed</b>
March 2013	Added UltraShift PLUS LSE Model PTO information  <b>UltraShift® PLUS - PTO Inputs and Configurations section:</b> <u>Removed</u> - "Note: The active signal will illuminate the "Mode" indicator only on the Eaton® push button console when the transmission direct drive gear is engaged for split shaft PTO operation."  <b>Medium- and Heavy-Duty Gen 3 - PTO Inputs and Configurations:</b> <u>Removed</u> - "Note: The active signal will illuminate the "Mode" indicator only on the Eaton® push button console when the transmission direct drive gear is engaged for split shaft PTO operation."

<b>Last Revised Date</b>	<b>Description of Clarifications and Updates</b>
June 2012	<p>Updated front and back covers to new Eaton Standard Format</p> <p><b><u>General Types of PTO section:</u></b>  <u>Added</u> - “Countershaft” to the 6-Bolt and 8-Bolt headers  <u>Added</u> - Note to the end of the Thru-Shaft section  <u>Added</u> - “UltraShift PLUS” to the Split Shaft (Chelsea) and (Muncie) sections</p> <p><b><u>PTO Configurations section:</u></b>  <b>PTO and Auto Neutral Availability table -</b>  <u>Changed</u> - “N/A” with “Available”  <b>Medium-Duty Hybrid table -</b>  <u>Changed</u> - “EH-8E306A-CD” to “EH-8E406A-CD”, “EH-8E306A-T” to “EH-8E406A-T”, “EH-8E306A-UP” to “EH-8E406A-UP”, and “EH-8E306A-UPG” to “EH-8E406A-UPG”  <u>Removed</u> - “EH-8E306A-U” and “EH-6E606A-CD”  <u>Added</u> - “EH-8E406A-CDG”, “EH-8E406A-CDR”, “EH-8E406A-P”, “EH-6E706B-CD”, “EH-6E706B-BP”, “EH-6E706B-UPG”, and “EH-8FA0406A-PSB”</p> <p><b><u>UltraShift PLUS - PTO Inputs and Configuration section:</u></b>  <b>Countershaft, Thru-Shaft®, and Split Shaft PTO section -</b>  <u>Added</u> - new bullet “Proper wiring ensures the clutch stays engaged during PTO operation and clutch engagement rate is slower”  <u>Edited</u> - Image of TECU to fill in connector 34 and added the switch and ground</p> <p><b><u>Auto Neutral and PTO Wiring Diagrams section:</u></b>  <u>Edited</u> - Images on “Relay Isolated PTO Application”, “Dual Relay PTO Application (Double Switch), and “Dual Switch PTO Application” schematics by adding “34 (UltraShift PLUS) to each of the grounds</p> <p><b><u>Medium-Duty and Heavy-Duty Automated PTO Operating Instructions section:</u></b>  <b>AutoShift Countershaft and Split Shaft PTO Operation section -</b>  <u>Changed</u> - Item #4 from “Select the transmission PTO switch” to “Engage PTO”  Mobile PTO Operation section -  <u>Changed</u> - item #4 from “Select the transmission PTO switch” to “Engage PTO”  <b>UltraShift Countershaft PTO Operation section -</b>  <u>Changed</u> - item #4 from “Select the transmission PTO switch” to “Engage PTO”  Mobile PTO Operation section -  <u>Changed</u> - Item #4 from “Select the transmission PTO switch” to “Engage PTO”</p>
June 2012	<p><b><u>UltraShift PLUS Countershaft PTO Operation section -</u></b>  Changed Section name from “UltraShift PLUS Countershaft PTO Operation” to UltraShift PLUS Countershaft and Split Shaft PTO Operation”  Stationary PTO Operation section -  <u>Changed</u> - “The transmission countershaft PTO is used in this application” to “The transmission countershaft PTO and Split Shaft PTO is used in this application”  <u>Changed</u> - Item #4 from “Select the transmission PTO switch” to “Engage PTO”  <u>Changed</u> - Item #6 from “Release the service brake to engage the clutch and the PTO” to “Release the service brake to engage the clutch and power the PTO”  <u>Changed</u> - Item #7 from “Raise engine speed as required to operate PTO” to “Engine speed must be raised to engage the Split Shaft PTO”</p>

Last Revised Date	Description of Clarifications and Updates
June 2012	<p><b><u>Medium-Duty and Heavy-Duty Automated PTO Operating Instructions section:</u></b>  <b>UltraShift PLUS Countershaft PTO Operation section -</b>            Mobile PTO Operation section -  <u>Changed</u> - item #4 from “Select the transmission PTO switch” to “Engage PTO”  <u>Changed</u> - Item #6 from “Release the service brake to engage the clutch and the PTO” to “Release the service brake to engage the clutch and power the PTO”</p>
September 2011	<p>Added to Heavy-Duty Automated - 10 Speed table the following Models:            FO-10E310C-VAS, FO-12E310C-VAS, FO-14E310C-VAS, FOM-14E310C-VAS, FOM-15E310C-VAS, FO-16E310C-VAS &amp; FOM-16E310C-VAS</p> <p>Added to Heavy-Duty Automated - 13/18 Speed table the following Models:            FO-16E313A-VHP</p> <p>Corrected typo in call the model name for Heavy-Duty Automated - 13/18 Speed table for Model FO-16E318B-MXP</p> <p>Added to Heavy-Duty Automated - UltraShift PLUS - VCS and VMS table the following Models:            FO-18E313A-VHP &amp; FO-20E313A-VHP</p> <p>Added last note on Inertia Break Relocate Section</p>
December 2009	<p>Added K-3834 to UltraShift PLUS PTO pin out configuration notes            Updated and changed the PTO operation instructions for all automated transmission types</p>
May 2009	<p>Added UltraShift PLUS and MD Hybrid units to PTO configuration and PTO Interface sections            Reformatted/consolidated the PTO Interface Section</p>
September 2007	<p>Major updates.            Thru-Shaft changed to N/A on RTO-1X915 models on page 12.            Added UltraShift VCS, VMS, VXP, MXP, and MHP row to table on pg 23.</p>
January 2007	<p>Updated model nomenclature in Heavy-Duty Automated PTO Configuration table(s).</p>
June 2006	<p>New</p>

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P.O. Box 4013  
Kalamazoo, MI 49003 USA  
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