PACCAR

Service Manual

SM056-001

(01/ 2025)

PACCAR Power Take-Off (PTO)

Contents

Chapter 1 | Safety

Safety Messages and Notes

Read and follow ALL safety messages in this manual. When followed, injury to yourself and others, damage to equipment and/or property, or other unknown hazards are reduced. Both safety messages and notes are emphasized using a safety message symbol and one of three signal words: WARNING, CAUTION, or NOTE. **Do not** ignore any of these messages.

Warnings

Safety messages that follow this symbol and signal word provide a warning concerning operating procedures, actions, or a lack of action that could result in death or injury. An unheeded warning may also result in damage to equipment, property, or the environment. Warning messages will identify the hazard, how to avoid it, and the probable consequence of not avoiding the hazard.

Example:

WARNING

DO NOT change hot engine oil as you could be burned. Let the engine cool down before changing the engine oil. Failure to comply may result in death, personal injury, equipment damage, or property damage.

Cautions

Safety messages that follow this symbol and signal word provide a caution against operating procedures, actions, or a lack of action that could result in equipment, property, or environmental damage. Caution messages will identify the hazard, how to avoid it, and the probable consequence of not avoiding the hazard.

Example:

CAUTION

DO NOT operate your vehicle with insufficient oil pressure as this will cause serious engine damage. Failure to comply may result in equipment or property damage.

Notes

Messages that follow this symbol and signal word provide important information that, while not safety related, should still be followed. A note will provide information that may be useful to the reader: clarifying the topic, providing valuable insight into the topic or process, or saving the reader time and effort.

Example:

NOTE
Pumping the accelerator pedal will not assist in starting the engine.

Chapter 2 | General Information

Introduction and Disclaimers

This manual is a guide when upfitting or integrating Power Take-Offs with a PACCAR chassis. For a basic introduction and instruction on integration into the vehicle, refer to the applicable Body Builder Manual, and the manufacturer's operator's manual. Instructions may vary based on the model of Power Take-off being installed.

NOTE

This manual is primarily intended for PACCAR vehicles equipped with the PACCAR MX11 or MX13 engines. For vehicles equipped with Cummins engines, refer to *Cummins Engine Interface and PTO Function* on page 61 of this manual and the Cummins CEB documents available via Cummins.

NOTE

This manual is primarily intended for PACCAR vehicles built after Model Year 2021. Though some of the features and recommended practices may be applicable to earlier model years.

NOTE

All electrical information in this manual is intended as a general guide and may vary from the actual vehicle. Refer to the chassis specific information provided by the E-CAT application for the most accurate information.

WARNING

All configuration, integration and wiring information provided in this manual represent PACCAR recommended practices. Deviating from these practices may lead to operator or equipment damage or unexpected equipment behavior. Failure to comply may result in death, personal injury, equipment damage, or property damage.

WARNING

Not following PACCAR recommended procedures outlined in this manual may lead to operator safety risk, equipment damage, vehicle damage and void PACCAR warranty coverage. Failure to comply may result in death, personal injury, equipment damage, or property damage.

Reference Sources

Refer to the following publications for more information regarding the topics covered in this manual.

Kenworth Bodybuilder manuals are available at `Kenworth.com/resources/truck-resources/`

Direct link to page: *http://Kenworth.com/resources/truck-resources/*

Peterbilt Bodybuilder manuals are available at `Peterbilt.com/resources/manuals`

Direct link to page: *Peterbilt.com/resources/manuals*

Programming Guide information is available through the PACCAR Vehicle Pro (PVP) app in PACCARnet.

Chapter 3 | Specifications

Electrical Connectors and Terminal Details

This chapter details the most common electrical connectors for vocational PTO integration to the chassis. It includes extra information pertaining part numbers, terminal numbers, and type wiring/ plating utilized.

> **NOTE**
>
> This manual is primarily intended for PACCAR vehicles equipped with the PACCAR MX11 or MX13 engines. For vehicles equipped with Cummins engines, refer to *Cummins Engine Interface and PTO Function* on page 61 of this manual and the Cummins CEB documents available via Cummins.

> **NOTE**
>
> All electrical information in this manual is intended as a generic guide and may vary from the actual vehicle. Refer to the chassis specific information provided by the E-CAT application for the most accurate information.

TRUCK SIDE

Truck Side Connector and Terminal Information

CONNECTOR				TERMINAL			
PACCAR		VENDOR		VENDOR			
CONNECTOR	PART NUMBER	NAME	PART NUMBER	NAME	PART NUMBER	WIRE GAUGE	PLATING
P197C	P20-1372-2112H	DEUTSCH	DT0612SA-CE06	DEUTSCH	1060-14-0122	14-18 AWG	NICKEL
P197N	P20-1372-2108H	DEUTSCH	DT06-08SA-CE06	DEUTSCH	1060-14-0122	14-18 AWG	NICKEL
P198	P20-1236-82049	TYCO	776524-3	TYCO	776492-2	14-18 AWG	NICKEL
RP1226(J091)	P20-6280-12142120	APTIV	54201412	APTIV	54001800	18-20 AWG	TIN

MATING SIDE

Mating Side Connector and Terminal Information

CONNECTOR			TERMINAL			
VENDOR			VENDOR			
MATING TO CONNECTOR	NAME	PART NUMBER	NAME	PART NUMBER	WIRE GAUGE	PLATING
>P197C	DEUTSCH	DT04-12PA-CE02	DEUTSCH	1062-14-0122	14-18 AWG	NICKEL
>P197N	DEUTSCH	DT04-08PA-CE02	DEUTSCH	1062-16-0122	14-18 AWG	NICKEL
>P198	TYCO	776536-3	TYCO	638112-3	14-18 AWG	NICKEL
>RP1226	APTIV	54201416	APTIV	54001801	18-20 AWG	TIN

Chapter 4 | Normal Operation

PACCAR Supported PTO Engagement Methods

Introduction

This chaper covers PACCAR supported PTO engagement methods. Customer Installed PTO engagement methods are discussed in *Customer Installed (C/I) Power Take-Off Engagement Methods* on page 30 . It is important to note that PTO engagement and the PTO mode function of the engine are independent of each other and can be configured, activated, and utilized separately.

Regardless of the PTO engagement method it is highly recommended or mandatory to provide PTO engagement feedback to the chassis. PTO engagement feedback is used for the following:

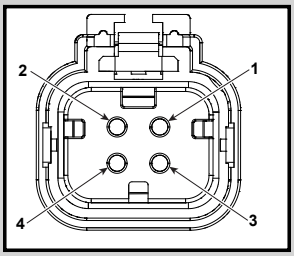
- Activate PTO Mode Control (PMC) on the engine
  - Min/max RPM limits, VSPD limit, PTO governor, interlocks
- Enable PTO Speed Control (PSC) of the engine
  - Set/Resume, 5v variable voltage throttle, preset speeds, etc.
- Incrementing PTO hour and fuel meters
- Operator notification on digital display
- Activation of transmission safeties and limits
  - Allison, TX8, TX12, TX18, TX18Pro
- PTO engagement feedback is often used to activate PTO functionality on Cummins powered trucks as well

P198-4 Pin PTO Connector

The most common location to provide PTO engagement feedback to the chassis.

- Common for both MX and Cummins powered vehicles
- Most often located on the LH frame rail, bundled length.
  - Refer to chassis routing drawing available on E-CAT for specific location
- May come connected to a further breakout harness to simplify PTO connection
  - Addition of this breakout harness is dependent upon vehicle specification and build
- PTO 1 engaged feedback via wire # GRA3511 is the same at P197 pin 5 PMC enable
  - Feedback to only one of these pins is required
- PTO 2 engaged feedback requires Chassis Module Secondary (CMS)
  - CMS is not standard and is driven by sales code
- Pump mode input is used for split shaft applications
- For further detail on this connector please see *Electrical Connectors and Terminal Details* on page 14

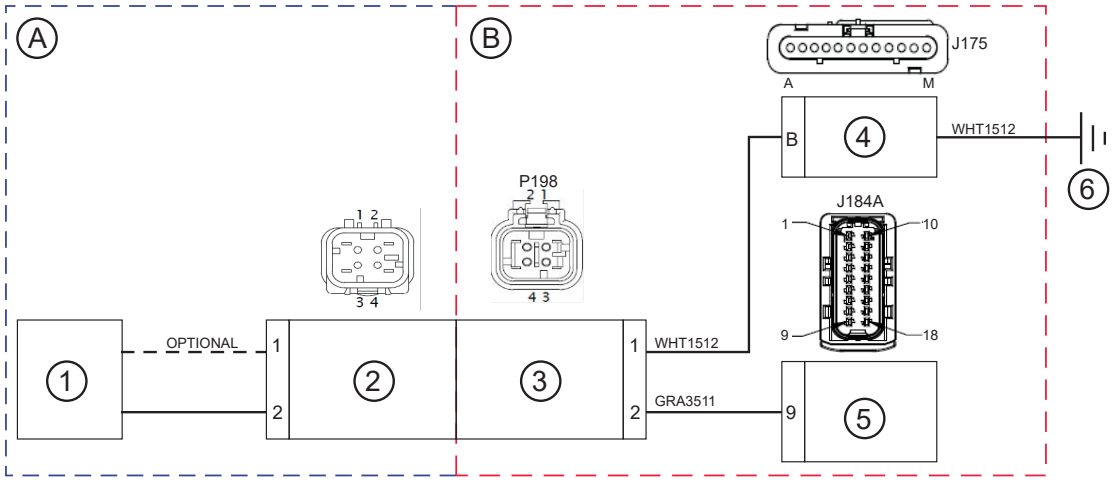
Figure 1: P198 Pin Out Drawing



Pin	Description
1	PTO 2 EngagedWire #: GRA3515-XX
2	Firewall Ground (T151) Wire #: WHT1512-XX
3	PTO Pump Mode Wire #: GRA4355-XX
4	PTO 1 Engaged / PTO On/Off Wire #: GRA3511-XX Note: Same circuit as P197c pin 5-PTO engaged/ PMC

- PTO 1 engaged feedback is the same at P197 pin 5 PMC enable – Wire #: GRA3511
- PTO 2 engaged feedback requires Chassis Module Secondary (CMS) – CMS is not standard and is driven by sales code
- Pump Mode input is used for Splitshaft applications

Figure 2: P198 generic ground and PTO 1 wiring



Generic P198 Wiring

Pin	Description
A	PTO Side, Body Builder Installed
B	Main Chassis Harness
1	PTO Ball Switch
2	PTO to Chassis Connector
3	PTO 4-Pin Connector - P198 Chassis

Generic P198 Wiring (continued)

Pin	Description
4	PTO Splice Block J175
5	Primary Chassis Module J184A
6	Firewall GND T151

NOTE

- Wire/Connector numbers may vary. For more specified information please consult the harnesses that coincide with your chassis through eCat/AR Tech/ VOG.
- Connectors may NOT show complete set of pins.
- GRAXXXX denotes PTO feedback signal.
- WHTXXXX denotes ground.

NOTE

Dashed line only included if clean ground is required. PTO to Chassis Connector will vary based on brand/type of PTO*

Figure 3: Physical location and routing of P198 connector on Peterbilt Heavy Duty Truck

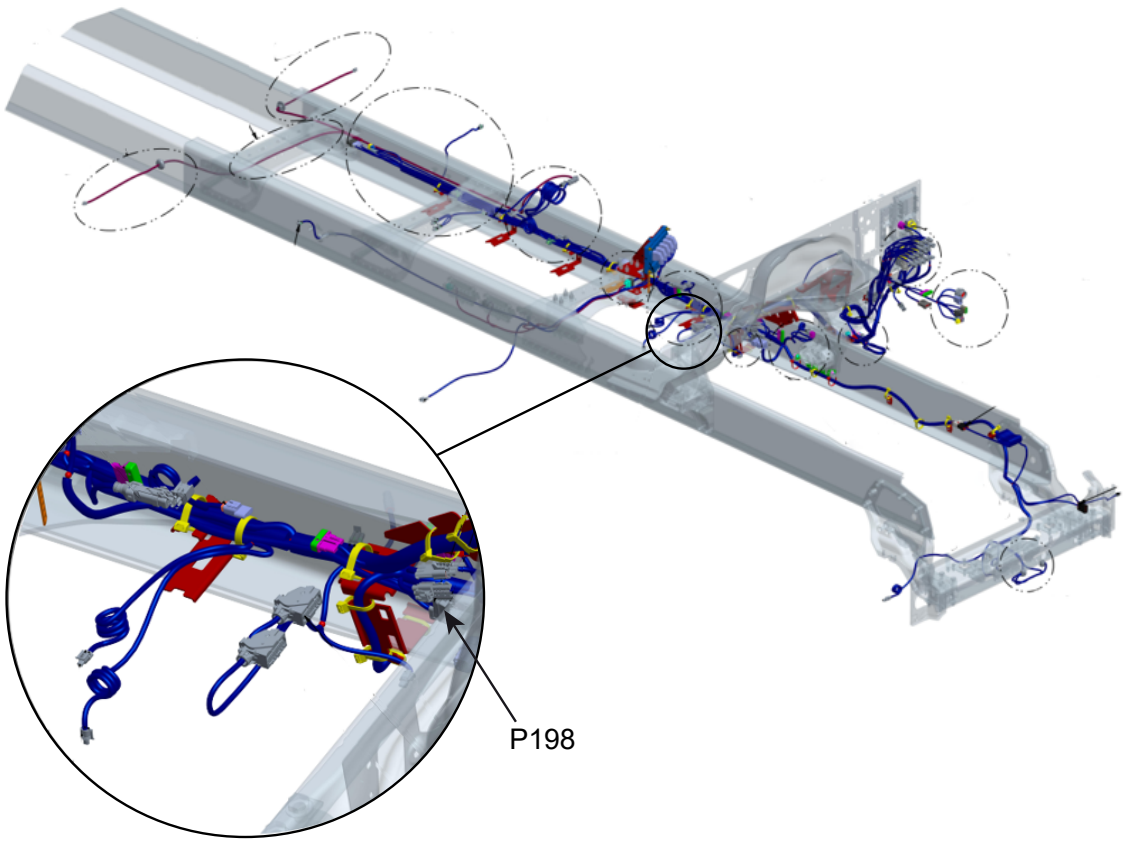


Figure 4: Physical location and routing of P198 connector on Kenworth Heavy Duty Truck

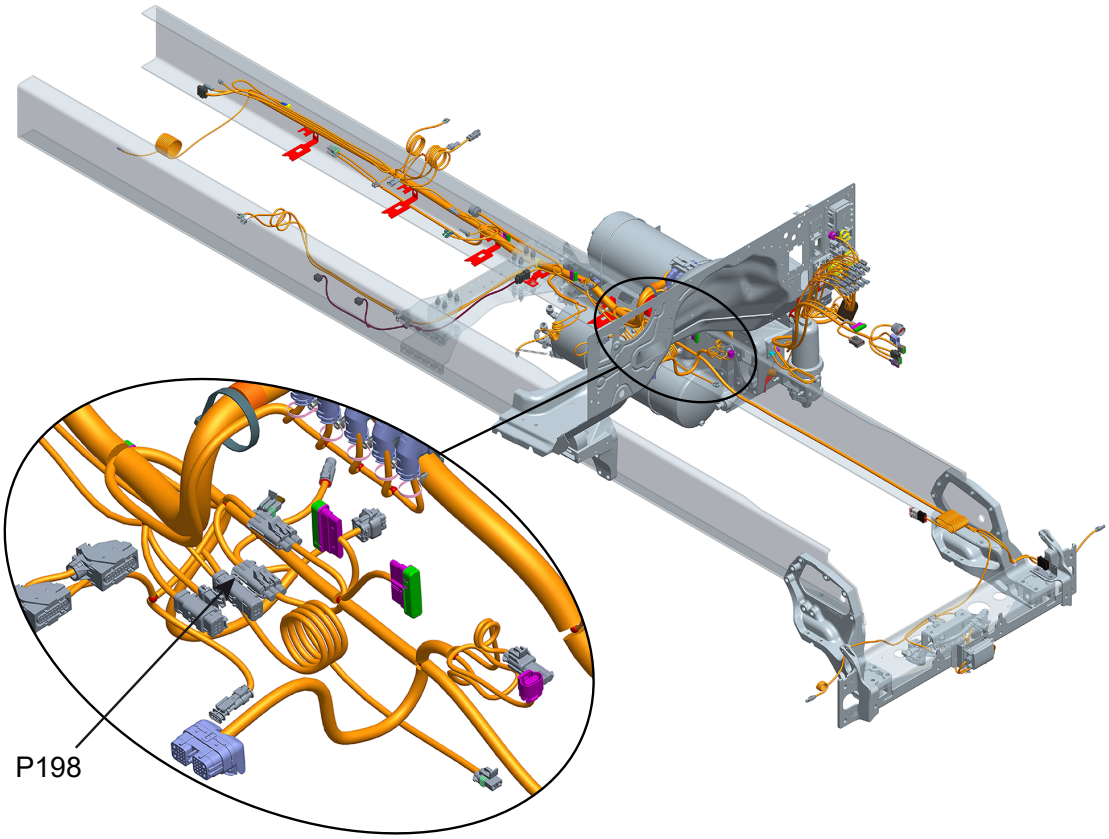
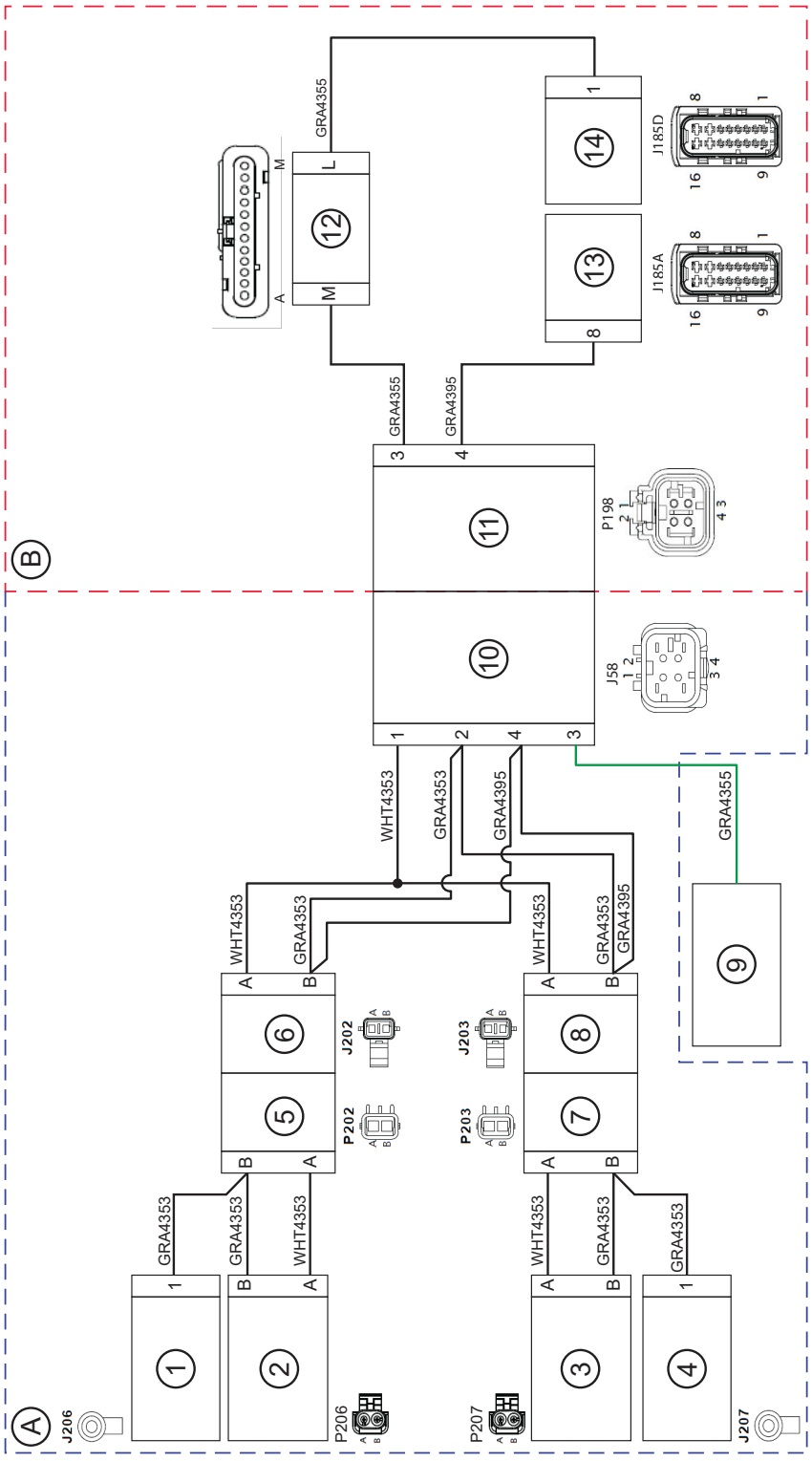


Figure 5: P198 Generic Wiring for PTO 1, 2, and Pump Mode Engaged Feedback Wiring



Generic P198 Wiring

Callout	Description
A	PTO Jumper Harness: Two PTOs Installed
B	Main Chassis Harness

Generic P198 Wiring (continued)

Callout	Description
1	Eaton Fuller RH PTO Switch J206
2	Allison RH PTO SwitchJ206
3	Allison BM PTO Switch J207
4	Eaton Fuller BM PTO Switch J207
5	RH Engage PTO P202
6	RH Engage PTO J202
7	BM Engage PTO P203
8	BM Engage PTO J203
9	PTO Pump Mode Engage Switch (On Pump) (Optional, if pump is notneeded GRA4355 is N/A)
10	PTO to ChassisConnector J58/J201<--PTO
11	PTO 4-Pin Connector P198 Chassis
12	PTO Splice Block J175
13	Secondary Chassis Module J185A
14	SecondaryChassisModule J185D

In pinouts with multiple routes, one wire is chosen NOT both

NOTE

PTO Jumper Harness shown as example of PTO integration. May not be included

NOTE

For total pin function of P198 see *Figure 1: P198 Pin Out Drawing* on page 17 . For pins 1 and 2 see *Figure 2: P198 generic ground and PTO 1 wiring* on page 17 .

NOTE

- Wire/Connector numbers may vary. For more specified information please consult the harnesses that coincides with your chassis through eCat/AR Tech/Peterbilt VOG.
- Connectors may NOT show complete set of pins.
- GRAXXXX denotes PTO feedback signal. WHTXXXX denotes ground.
- PTO Jumper Harness: RH = Right handed positioning, BM = Bottom positioning.
- Green line shown represents the wiring for a pump attached to the PTO

Electric Over Air (EOA) PTO Engagement-Manual Transmission

- Most common method for manual transmission equipped vehicles
- PTO engagement feedback to the chassis is highly recommended
- Details shown are specific for MX powered vehicles
  - Refer to *Cummins Engine Interface and PTO Function* on page 61 for Cummins specific details
- Requires a dash PTO1 switch

- PVP Configuration:
  - At least one EOA solenoid must be assigned to each EOA PTO
  - Electric over Hydraulic (EOH) PTO must=DISABLED
  - Ensure Tail speed interlock for PTO is set according to PTO use case
  - PTO mode parameters have no impact on PTO engagement
  - Refer to Programming Guide for further detail on PVP parameters (see *Reference Sources* on page 11)
- Refer to Body Builder Manual for further information on the following (see *Reference Sources* on page 11):
  - EOA assignment procedure
  - Air system requirements and integration
  - Use of PVP and DAVIE to program vehicle parameters

Figure 6: High-level Overview of EOA PTO Engagement for Manual Transmission Equipped Vehicle

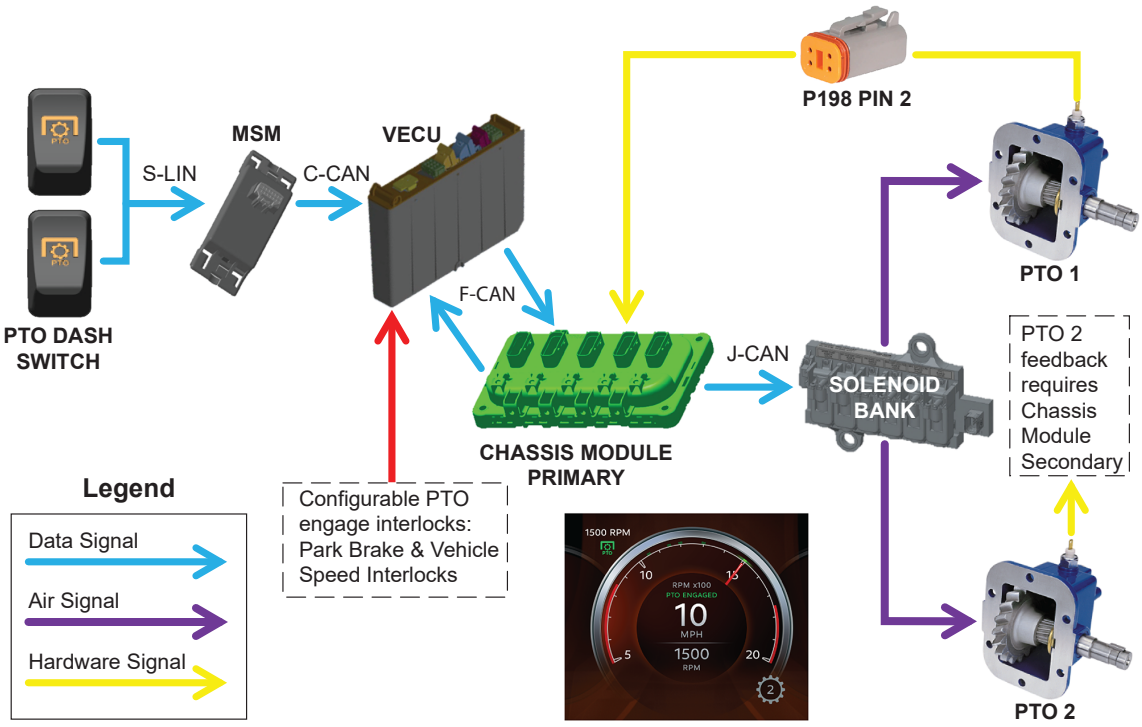
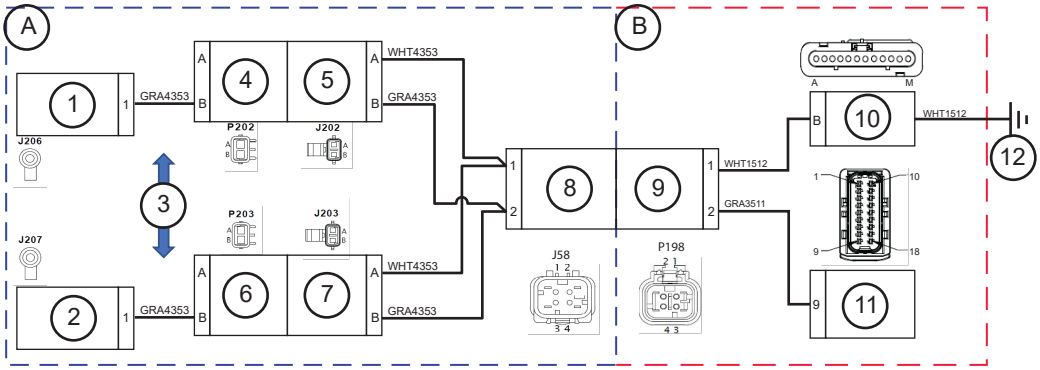


Figure 7: Generic Wiring for PTO Engaged Feedback for MX Engine



NOTE

- Wire/Connector numbers may vary. For more specified information please consult the harnesses that coincides with your chassis through eCat/AR Tech/VOG.
- Connectors may NOT show complete set of pins
- GRAXXXX denotes PTO feedback signal.
- WHTXXXX denotes ground.
- PTO Jumper Harness: RH = Right handed positioning, BM = Bottom positioning.

NOTE

PTO Jumper Harness shown as example of PTO integration. May not be included*

Callout	Description
A	PTO Jumper Harness
B	Main Chassis Harness
1	Eaton Fuller RH PTO Switch J206
2	Eaton Fuller BM PTO Switch J207
3	OR
4	RH Engage PTO P202
5	RH Engage PTO PJ202
6	BM Engage PTO P203
7	BM Engage PTO J203
8	PTO to Chassis Connector J58/J201
9	PTO 4-Pin Connector P198 Chassis
10	PTO Splice Block J175
11	Primary Chassis Module J184A
12	Firewall GND T151

Electric Over Hydraulic (EOH)-Allison 3000-4000 Series

- Most common method for Allison transmission equipped vehicles
- PTO engagement feedback to the chassis is highly recommended
- Utilizes a hardwired request/consent “handshake” between the VECU and Allison TCM
  - Utilizes fuses and relays within the PDC to energize the EOH solenoid
- Details shown are specific for MX powered vehicles
  - Refer to *Cummins Engine Interface and PTO Function* on page 61 for Cummins specific details
- Requires a dash PTO1 switch
- **PVP Configuration:**

- Set EOH PTO to Installed
  - Select PTO interlocks according to use case
- Set Defining the PTO 2 type if desired
  - Select PTO interlocks according to use case
- Ensure no EOA solenoids are assigned to PTO engagement
- Ensure tails peed interlock for PTO is set according to PTO use case
- PTO mode parameters have no impact on PTO engagement

- Refer to the Programming Guide based on electrical architecture for further detail on PVP parameters (see *Reference Sources* on page 11)
- Refer to Body Builder Manual (see *Reference Sources* on page 11) for further information on
  - EOA assignment procedure
  - Air system requirements and integration
  - Use of PVP and DAVIE to program vehicle parameters
- Use of Allison DOC for PTO engagement configuration may be necessary
- Refer to Allison support documents for further information
- Allison equipped vehicles will have the P635 Allison general input/output connector
  - Located on the engine side of the firewall
  - Provide easy customer access to the common Allison input/output pins
  - Wire numbering complies with Allison wire naming convention
    - Ex: BLUATD143 for PTO engagement request
  - See *Electrical Connectors and Terminal Details* on page 14 for further wiring detail

Figure 8: High-level overview of EOH PTO engagement for Allison transmission equipped vehicles

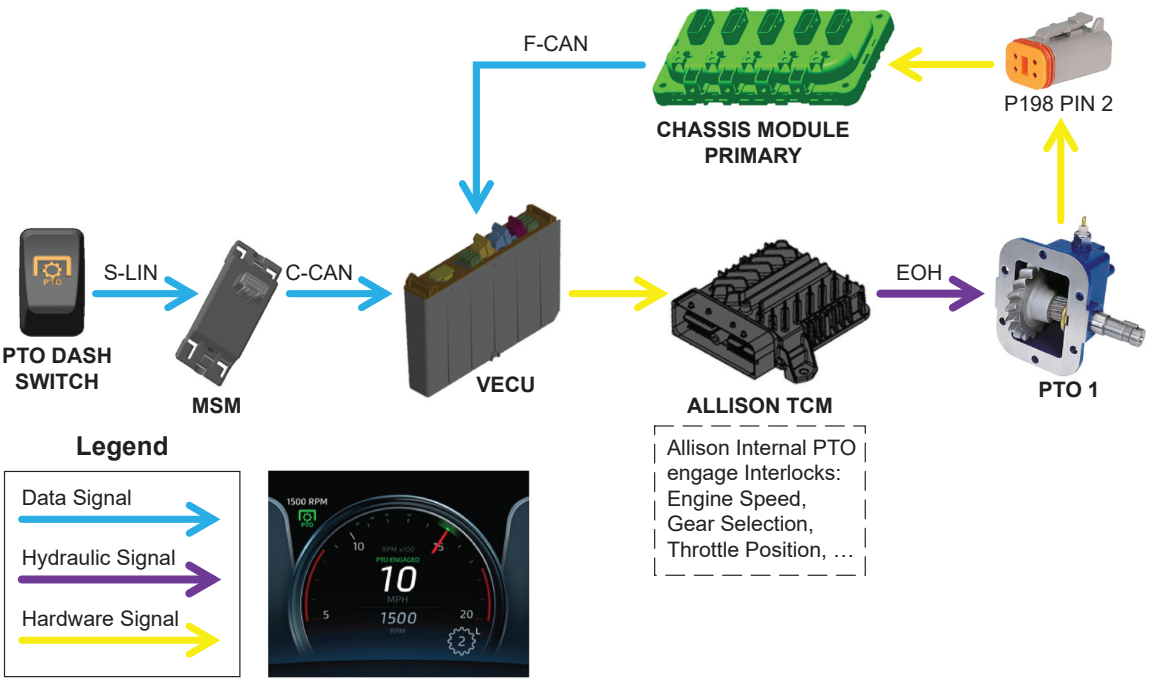
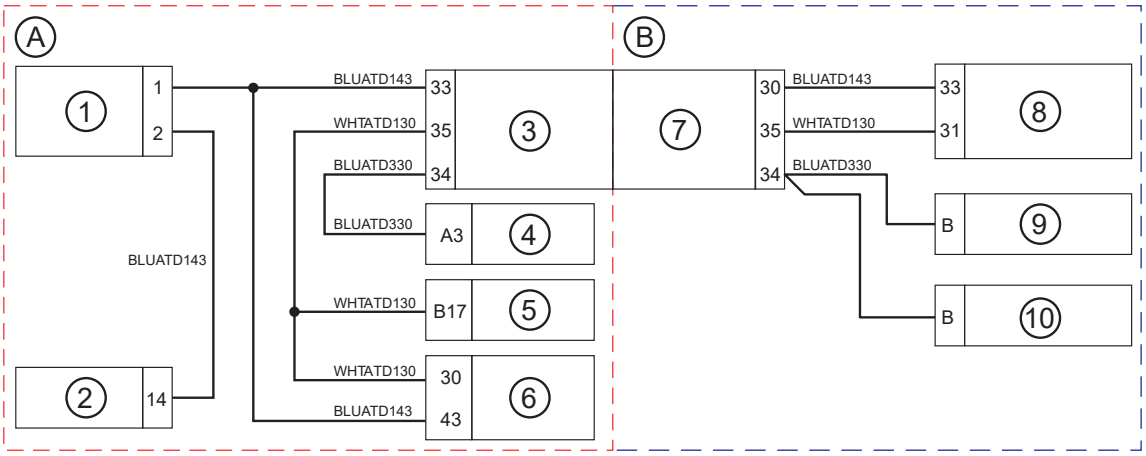


Figure 9: Generic wiring for EOH PTO engagement process



NOTE

- Wire/Connector numbers may vary. For more specified information please consult the harnesses that coincide with your chassis.
- Connectors may NOT show complete set of pins.
- Wire names for example BLUATDXXX, follows Allison naming nomenclature
- Applicable pin numbers are subject to change with Allison General Inputs/Outputs.

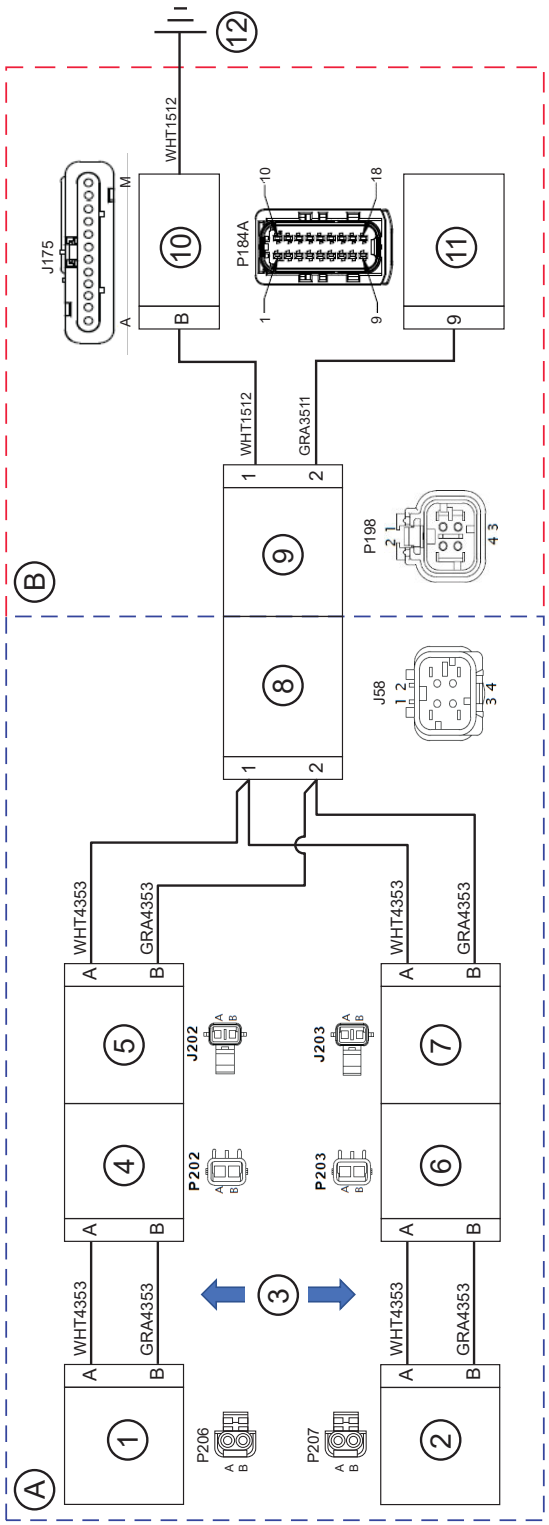
NOTE

On pinout 34 from J561 both circuits are considered BLUATDXXX. Only one should be chosen according to this diagram.

Allison VECU/TCM PTO Communication

Callout	Description
A	Main Cab Harness
B	Allison Chassis Harness
1	Allison PTO Diode P072
2	VECU B J051B
3	Firewall Allison Trans P02C
4	mPDC P002
5	mPDC P004
6	Allison TCM J03K
7	Firewall Allison Trans J03K2
8	Allison General In/Outputs P635
9	Muncie EOH J623A
10	Chelsea EOH J621A

Figure 10: Generic wiring for EOH PTO engaged feedback wiring for MX



NOTE

- Wire/Connector numbers may vary. For more specified information please consult the harnesses that coincide with your chassis through eCat/AR Tech/VOG..
- Connectors may NOT show complete set of pins.
- GRAXXXX denotes PTO Feedback signa. WHTXXXX denotes ground.
- PTO Jumper Harness: RH = Right handed positioning, BM = Bottom positioning

NOTE

PTO Jumper Harness shown as example of PTO integration. May not be included.

MX Engine Allison Automatic Transmission

Callout	Description
A	PTO Jumper Harness
B	Main Chassis Harness
1	Allison RH PTO Switch P206
2	Allison BM PTO Switch P207
3	OR
4	RH Engage PTO P202
5	RH Engage PTO J202
6	BM Engage PTO P203
7	BM Engage PTO J203
8	PTO to Chassis Connector J58/J201 PTO
9	PTO 4-Pin Connector P198 Chassis
10	PTO Splice Block J175
11	Primary Chassis Module J184A
12	Firewall GND T151

Power Take Off Drive Engagement (PTODE)-TX8, TX12 Family, TX18 Family Transmissions

- Most common method for TX8, TX12 family and TX18 family equipped vehicles
- PTO engagement feedback to chassis is MANDATORY
  - Without this feedback PTO engagement will be denied and transmission damage may occur
- Utilizes a CAN-based request/consent handshake between the VECU and transmission controller to control PTO engagement
  - Following SAE J-1939 CAN protocols
- Details shown are specific for MX powered vehicles
  - For Cummins power vehicles, Eaton Service Ranger must be used to configure PTO engagement parameters

- Refer to *Cummins Engine Interface and PTO Function* on page 61 for Cummins specific details
- Requires a dash PTO1 switch
- **PVP Configuration:**
  - Assign at least one EOA solenoid to each EOA PTO
  - Electric over Hydraulic (EOH) PTO must=DISABLED for EOA to function correctly
  - Ensure Tail speed interlock for PTO is set according to PTO use case
  - PTO Configuration for PTO1 and/or PTO2 must be set to J1939 Controlled
  - 18 Speed Installed=Not Installed
  - PTO mode parameters have no impact on PTO engagement
  - Refer to Programming Guide for further detail on PVP parameters (see *Reference Sources* on page 11)
- Refer to Body Builder Manual (see *Reference Sources* on page 11) for further information on
  - EOA assignment procedure
  - Air system requirements and integration
  - Use of PVP and DAVIE to program vehicle parameters
- Refer to Eaton support documents for further detail on PTO installation and engagement

Figure 11: High-level overview of PTODE PTO Engagement for TX8, TX12, and TX18 transmission equipped vehicles

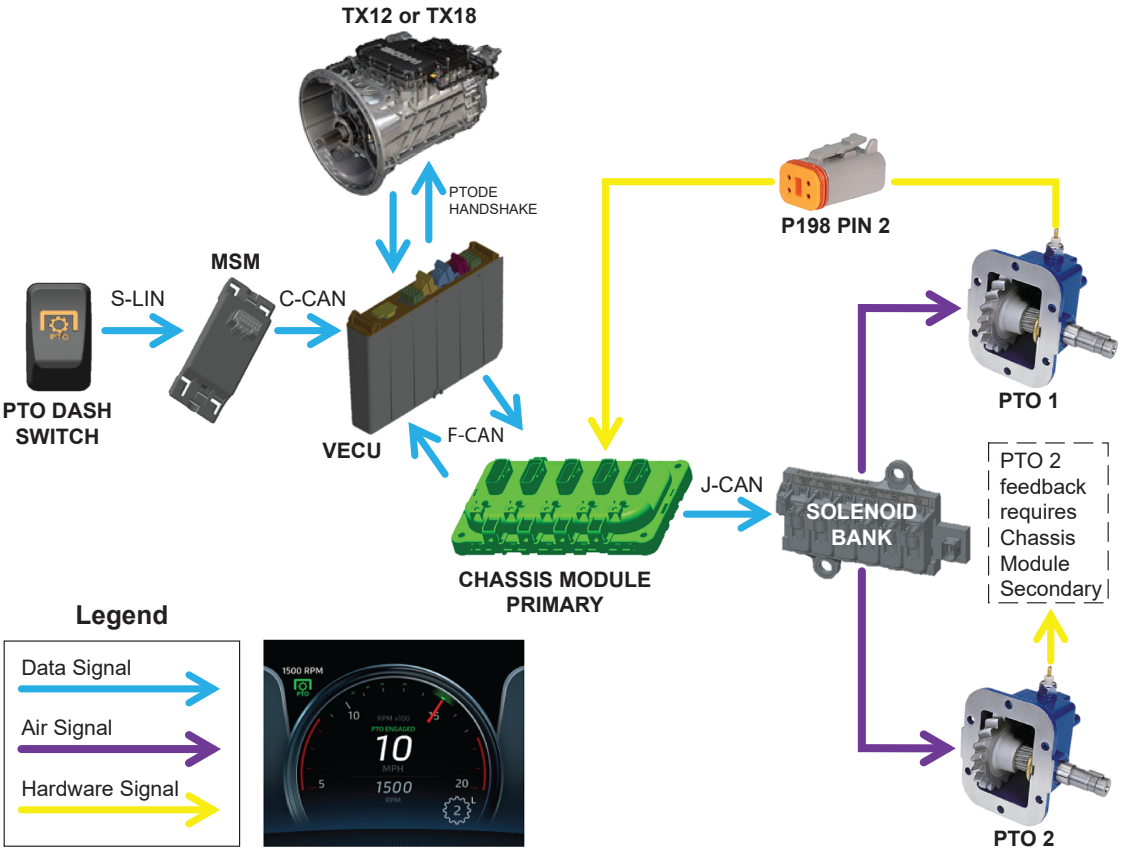
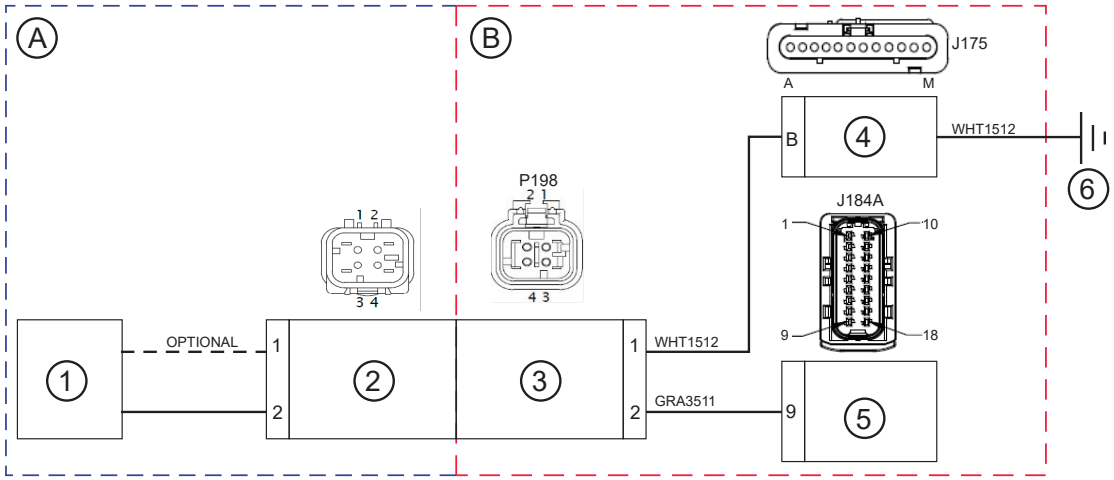


Figure 12: Generic info for PTO engaged feedback for MX engine



NOTE

- Wire/Connector numbers may vary. For more specified information please consult the harnesses that coincide with your chassis through eCat/AR Tech/VOG.
- Connectors may NOT show complete set of pins.
- GRAXXXX denotes PTO feedback signal.
- WHTXXXX denotes ground.

NOTE

PTO Jumper Harness shown as example of PTO integration. May not be included.

Generic P198 Wiring

Pin	Description
A	PTO Side, Body Builder Installed
B	Main Chassis Harness
1	PTO Ball Switch
2	PTO to Chassis Connector
3	PTO 4-Pin Connector - P198 Chassis
4	PTO Splice Block J175
5	Primary Chassis Module J184A
6	Firewall GND T151

Customer Installed (C/I) Power Take-Off Engagement Methods

Introduction

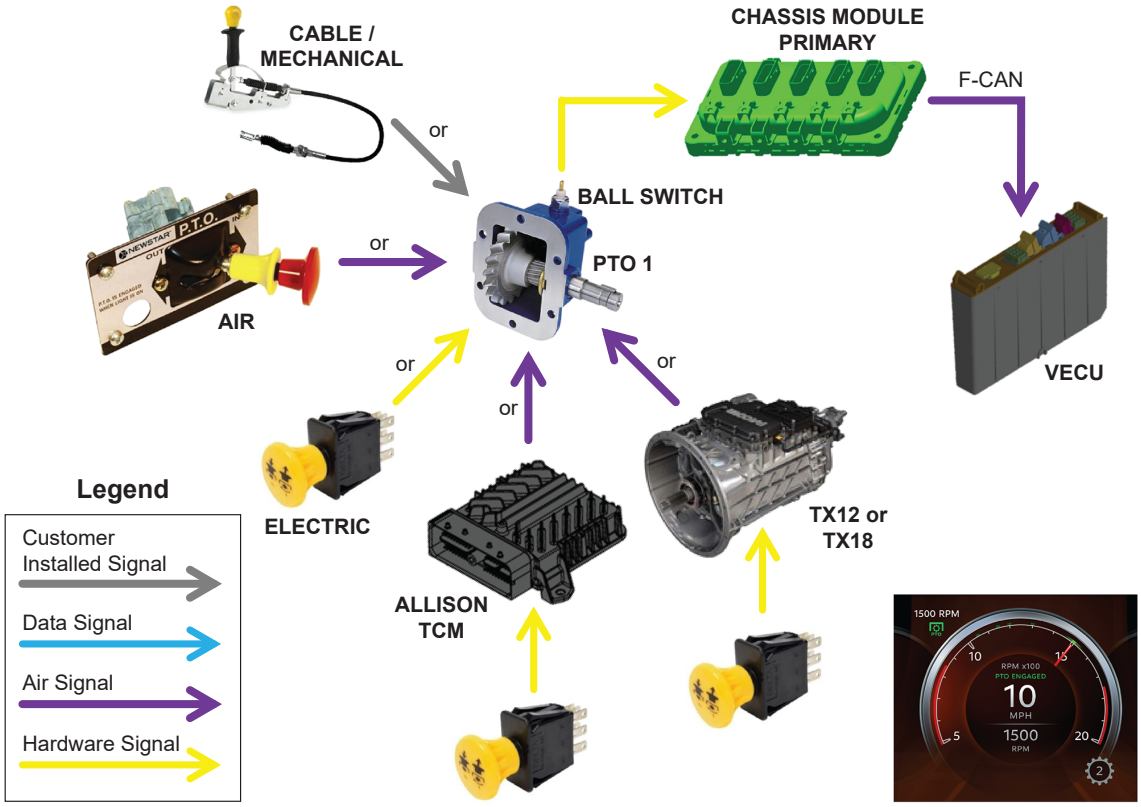
Outside of the PACCAR supported PTO engagement methods discussed in *PACCAR Supported PTO Engagement Methods* on page 16 , it is also common and acceptable for a body builder or customer to install their own PTO engagement method. Several of the most common methods include:

- Mechanical linkage
- Air switch on the dash or remote mounted
    - Often mounted just inside the driver's door to allow ground-level access
- Electro-mechanical
- Hardwired interface from the customer installed body controller to the Allison TCM
- Hardwired interface from the customer installed body controller to the Eaton TCM

All the above methods are allowable but cannot be used in conjunction with the PACCAR provided PTO processes or components. Use of C/I PTO engagement requires the installer to furnish their own components including:

- Electrical switches
- Wiring
- Relays
- Air switches
- EOA solenoids
- EOH solenoids
- Air piping and connections

Figure 13: High-Level Overview of Common C/I PTO Engagement Options



C/I PTO Engagement for Allison Equipped Vehicles

- Use of PACCAR supported EOH PTO engagement is recommended
- Allison is capable of supporting C/I PTO engagement via hardwire
- Use of the Allison DOC tool for PTO engagement configuration may be necessary
  - Refer to Allison support documents for further information
- The P635 Allison General I/O connector
  - Located on the engine side of the firewall
  - Provide easy customer access to the common Allison I/O pins
  - Wire numbering complies with the Allison wire naming convention
    - Ex: BLUATD143 for PTO engagement request
  - Some existing fuses and relays in the PDC may already be installed to support C/I installation
  - Refer to *Electrical Connectors and Terminal Details* on page 14 for further wiring detail
- PVP Configuration:
  - Ensure no EOA solenoids are assigned to PTO engagement
    - EOA activation for PTO engagement is only possible via the dash switches
  - Set EOH PTO is Installed to Not Installed
  - Set Defining the PTO2 type to Not Installed
  - PTO mode parameters have no impact on PTO engagement
  - Refer to Programming Guide for further detail on PVP parameters (see *Reference Sources* on page 11)
- For further support on Allison products with C/I PTO engagement visit Allison Hub.

- *https://allisontransmission.com/parts-service/service-information-tools/allison-hub*

NOTE
At this time C/I PTO engagement via CAN is not available or supported on PACCAR vehicles.

CAUTION
Allison provides recommended PTO engagement procedures. Failure to comply with the recommended Allison PTO engagement procedures will result in equipment damage.

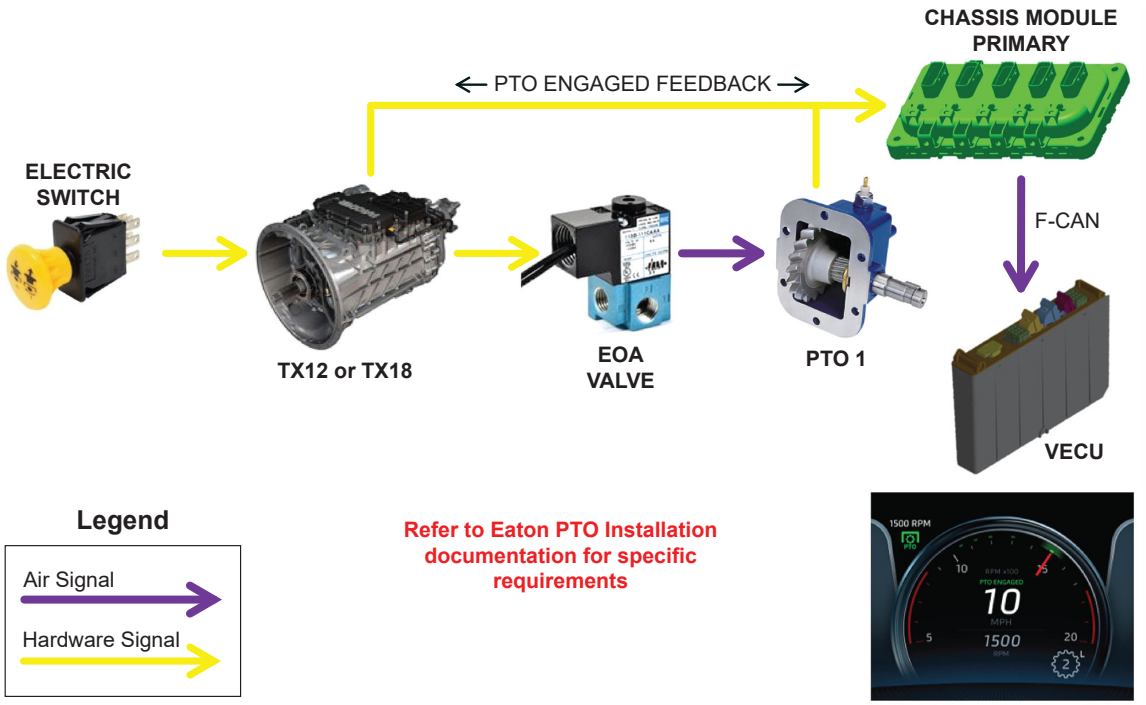
C/I PTO Engagement For TX12 Family and TX18 Family Equipped Vehicles

- Use of PACCAR supported PTODE PTO engagement is recommended
- TX12 and TX18 transmissions are capable of supporting C/I PTO engagement via hardwire
  - Refer to *Electrical Connectors and Terminal Details* on page 14 for further wiring detail
  - Refer to appropriate Eaton documents for further detail
- PVP Configuration:
  - Ensure no EOA solenoids are assigned to PTO engagement
    - EOA activation for PTO engagement is only possible via the dash switches
  - Set EOH PTO is Installed to Not Installed
  - Set Defining the PTO2 type to Not Installed
  - PTO Configuration for PTO1 and/or PTO2 must be set to Hardwire Control
  - PTO mode parameters have no impact on PTO engagement
  - Refer to Programming Guide for further detail on PVP parameters (see *Reference Sources* on page 11)
- For Cummins power vehicles, Eaton Service Ranger is required to configure PTO engagement parameters
- Refer to Eaton support documentation for further detail on PTO installation and engagement

NOTE
At this time C/I PTO engagement via CAN is not available or supported on PACCAR vehicles.

CAUTION
Eaton provides recommended PTO engagement procedures. Failure to comply with the recommended Eaton PTO engagement procedures will result in equipment damage.

Figure 14: High-level C/I PTO Engagement Method for TX12 and TX18 Transmission Equipped Vehicles



C/I PTO Engagement For TX8 Equipped Vehicles

Currently C/I PTO engagement via hardwire or CAN is not available or supported on TX8 equipped PACCAR vehicles. Vehicles utilizing TX8 transmission must utilize PACCAR supported PTO engagement method described in *PACCAR Supported PTO Engagement Methods* on page 16 .

MX Engine PTO Mode Control (PMC) and PTO Speed Control (PSC)

Introduction

It is necessary to note that PTO engagement and PTO mode functions of the engine are independent of each other and can be configured, activated, and utilized separately.

This chapter focuses on the configuration, activation and features of PTO Mode Control (PMC) and PTO Speed Control (PSC) activation for the MX engine family.

NOTE
This chapter is specific to the PTO functionality of the MX engine family. For Cummins PTO functionality see *Cummins Engine Interface and PTO Function* on page 61 .

2 Step PTO Process:

The MX engine family utilizes a 2-step PTO process to provide unparallel controls, flexibility, and safety for the operator, equipment, and chassis. The first step of the PTO process is PTO Mode Control (PMC). The second step is PTO Speed Control (PSC).

PTO Mode Control (PMC)

PMC is the first step of the PTO process and an entry condition to PTO Speed Control. When PMC is activated, the following actions take place:

- PTO Hour counter active
- PTO Fuel counter active
- PTO PMC notification on the Digital Display
- Limits and Safeties activate
  - Minimum engine speed
  - Maximum engine speed
  - Maximum vehicle speed
  - Cab accelerator pedal disable
    - Customer Configurable
  - Remote throttle enabled
    - Customer Configurable
- PTO interlocks enabled
  - Park brake
  - Neutral
  - Service brake pressed or service brake released
  - Customer operated custom

PTO Speed Control (PSC)

PSC is the second step of the PTO process and must be active before control of engine speed is possible. When PSC is activated, the following actions take place:

- PMC remains active, if it is not PSC will not engage
  - Limits and safeties remain active set from PMC
- Cab PTO Engine speed control methods are enabled
  - Throttle pedal
  - Set/resume
  - Presets 1, 2, 3
  - +/- Presets
- Remote PTO engine speed control methods are enabled
  - Cab throttle pedal
  - Set/resume
  - Presets 1, 2, 3
  - +/- Presets
  - CAN-based

PMC-PSC Functionality Flowchart

For a functional flowchart detailing the order in which PTO Mode Control and PTO Speed Control is activated visit the corresponding body builder manual (see *Reference Sources* on page 11).

NOTE
All features and functions described in this chapter are MX specific.

Limits

The following limits become active as soon as PMC is activated. All limits are configurable via PVP. PVP has built-in rules to provide a safe and effective range for each limit. Refer to the Programming guide for further details (see *Reference Sources* on page 11).

NOTE
These limits are often set by the body builder or customer to protect the operator, equipment, or chassis. DO NOT change these limits without consulting the body builder or customer.

- Minimum engine speed (RPM):
  - The base engine speed will change from idle and not drop below this limit as long a PMC is active. In the event of an active interlock, the engine will return to this RPM. This limit is configurable via PVP. PVP has built-in rules to provide a safe range for minimum engine speed. Refer to the Programming Guide for further details (see *Reference Sources* on page 11).
- Maximum engine speed-accelerator controlled (RPM):
  - The maximum engine speed achievable via the cab accelerator pedal or remote accelerator pedal options. Engine speed will not exceed this limit as long a PMC is active.
- Maximum engine speed-switch controlled (RPM):
  - The maximum engine speed achievable via switch inputs including steering wheel, dash, remote hardwired or CAN inputs. Engine speed will not exceed this limit as long a PMC is active.
- Vehicle speed maximum limit (MPH/KPH):
  - The vehicle speed will not exceed this limit as long as PMC is active.

- Maximum rate of engine speed increase/decrease (RPM/sec):
  - This engine speed will not increase or decrease faster than this rate. This feature can be disabled to allow rapid engine speed change. This limit is often used to protect PTO driven equipment that may be sensitive to rapid speed changes.
- Maximum engine torque output (lb-ft):
  - The maximum torque the engine can generate will be limited. This limit is often used to protect PTO driven equipment that may be sensitive to high loads.

NOTE

Setting these PMC limits to a low RPM/speed/rate may cause what many customers and technicians refer to as “dead pedal” where the vehicles feels like it is lacking adequate power or speed. Consult body builder or customer before changing these limits.

Interlocks

Several PTO speed control interlocks are available and configurable to provide maximum safety and flexibility suited to the application. When an interlock becomes active by certain limits being violated the following actions will occur:

- PMC remains active
  - Limits and safeties remain active
- PSC deactivates
- Engine speed returns to configured minimum engine speed in PMC
- Notification of active interlock will be displayed on Digital Display

WARNING

An active interlock WILL NOT cause a PTO to disengage. Unexpected disengagement of a PTO could represent a safety hazard to the operator, equipment, and vehicle. Failure to comply may result in death, personal injury, equipment damage, or property damage.

Once an interlock is no longer active, PSC input must be cycled OFF and back ON before PSC will be reactivated. This is provided as a safety feature against unexpected engine speed increase. The following interlocks are available:

Park brake interlock:

- Park brake must be set to allow PTO Speed Control (PSC) features:

Example: Bonny’s Bulk Hauling is unloading grain with a transmission PTO engaged. Bonny has a Park brake Interlock to ensure the Park brake must be set before she can increase engine speed during unloading. While unloading grain Bonny uses the SET button on the steering wheel to increase engine speed to 1000 RPM. Bonny accidently bumps the Park brake switch and releases the brake. Here is what will happen:

- The digital display will show RETURN TO PARK
- PSC will deactivate
- Engine speed will return to PTO Minimum engine speed
- Bonny will have to re-set the Park brake to reactivate PSC
- Bonny will have to use the SET steering wheel switch to increase engine speed back to 1000 RPM

Neutral interlock:

- Transmission must be in **Neutral** to allow PSC features.

Clutch interlock:

- Clutch must be engaged (clutch pedal released) to allow PSC features.

Service brake depressed interlock:

- Service brakes must be depressed to allow PSC features.

This feature is primarily intended for door-to-door refuse service but may be useful in other mobile applications.

Service brake released interlock:

- Service brake must be released to allow PSC features. This interlock is commonly used for mobile applications.

Custom interlock:

- This is a hardwired input on the P197n connector. When activated, it will not allow PSC features. Custom interlock can be configured to activate with a ground signal or in a “dead man” activation where a constant ground signal is required, and the interlock will activate when this signal is removed. See *Remote PTO Mode* on page 49 for further detail.

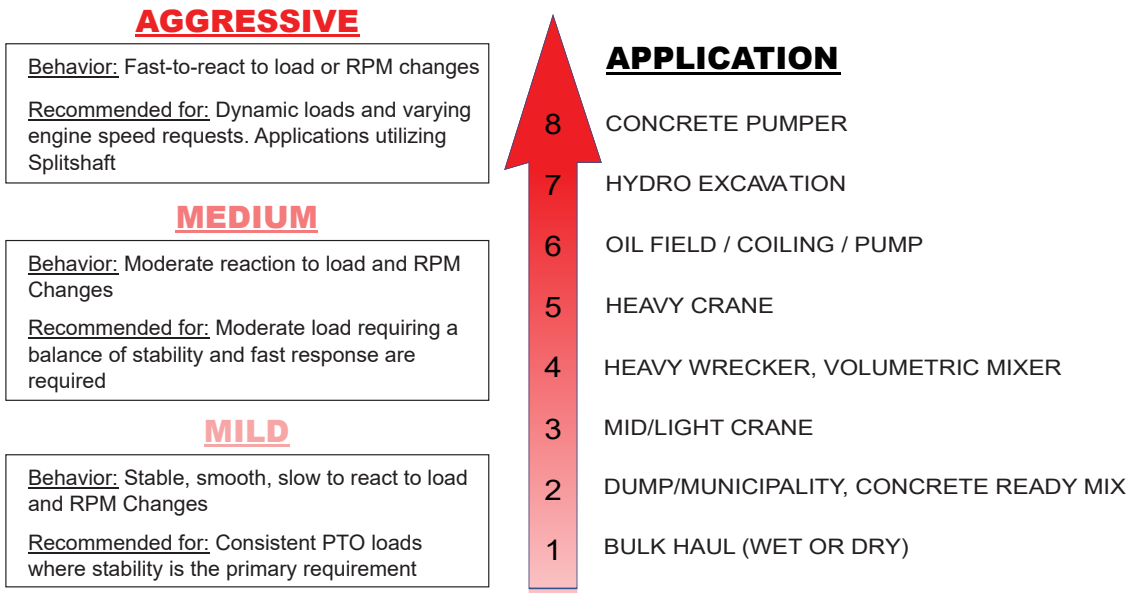
PTO Engine Governor

When PMC is activated, the MX engine switches from the standard engine governor to the PTO engine governor.

- Designed and tested to meet the demanding requirements of the vocational industry
- Customer configurable to allow fine-tuning
  - Configurable via PVP
- Tunable from 1 (default) to 8 (most aggressive)
- Applies to all PTO mode types
  - Cab and remote locations
  - Hardwire, CAN and dash switches
- Refer to Programming Guide for further PVP specific detail

NOTE
The following slide contains recommendations for PTO governor settings. In-situ testing is required to determine the best PTO gov for each application and customer.

Figure 15: MX engine PTO governor and common applications



Regeneration in PTO Mode (Cut Candidate)

Regeneration in the aftertreatment system can be affected when the truck is in PTO mode actively utilizing its equipment. The following are potential causes from PTO mode being active.

- Increased exhaust temperature
  - When the engine comes under load after PTO is engaged, exhaust gas temperature will rise. This may aid in the regeneration process by burning off accumulated soot in the diesel particulate filter (DPF).
  - May extend the regeneration intervals if the truck's engine is under load for an extended period of time.
- Specific operating conditions may affect normal regeneration in the aftertreatment system. If the truck is not spec'd correctly regeneration may not occur as often as expected.
- Refer to guidelines and follow recommended PTO operations based on application to ensure the proper function and longevity of the system.

Operator Notifications

NOTE
All features and functions described in this chapter are MX specific. For Cummins PTO notifications refer to *Cummins Engine Interface and PTO Function* on page 61 .

PTO notification for the operator has been greatly expanded with the addition of the new 15" digital display in the Heavy Duty Class 8 trucks and the 7" Digital Display in the Peterbilt 520. The following information is now available:

- PTO-specific transition from standard display
- PTO engaged status
- PMC activated
- PSC enabled/activated
- PMC control location
- Requested engine speed

- Preset speeds
- Active interlock
- Pump mode engaged

By scrolling to the menu section, the following PTO statistics can be reviewed

- PTO time
- PTO fuel use
- PTO % hours
- PTO % fuel used
- PTO fuel economy

By scrolling to the menu section, the following PTO configuration information can be previewed

- PTO interlocks Enabled or Disabled
- PTO Accel/decel preset speeds
- PTO 1, 2, 3, 4, 5 preset speeds

NOTE
These configurable parameters cannot be changed from this screen. PVP must be used to change these configurable parameters.

Figure 16: 15” Digital Display Transition from Standard Display to PTO Mode

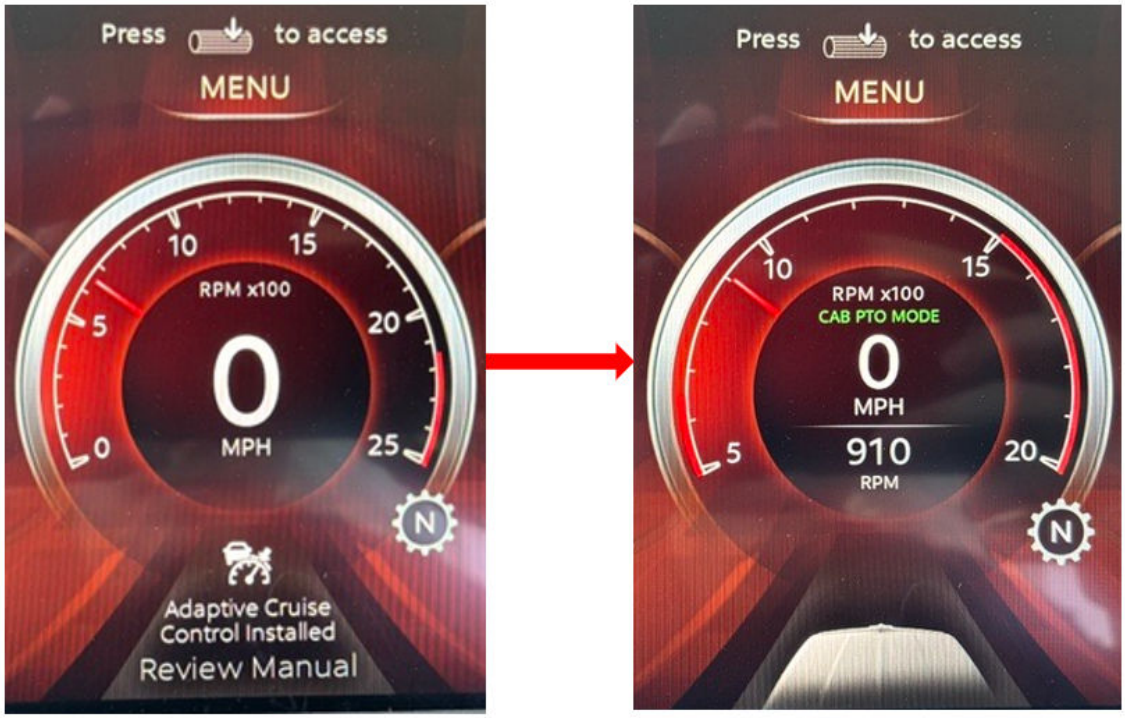


Figure 17: Peterbilt 15” Digital Display PTO mode notification

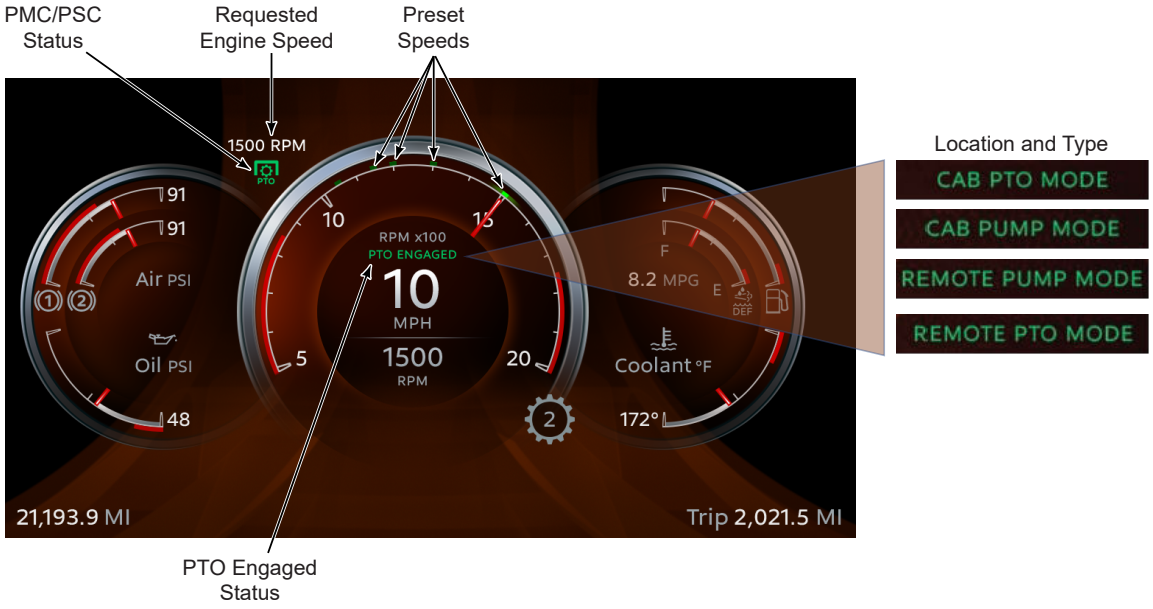


Figure 18: Peterbilt 15” Digital Display PTO mode configuration screen

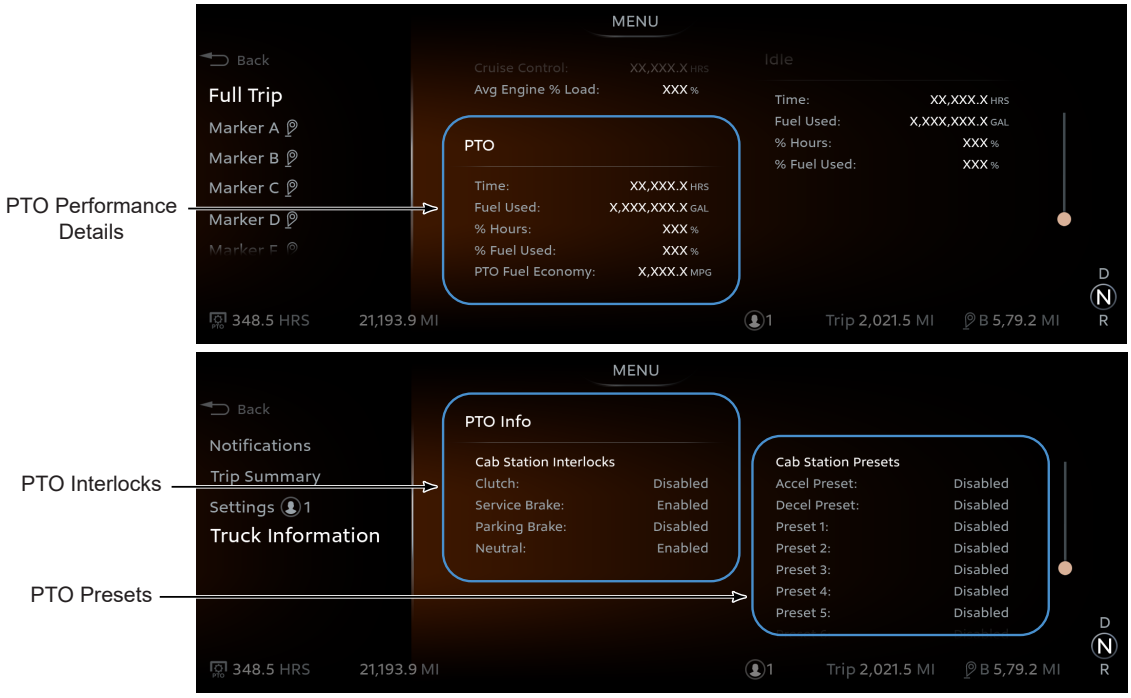


Figure 19: Kenworth 15” Digital Display PTO mode notification

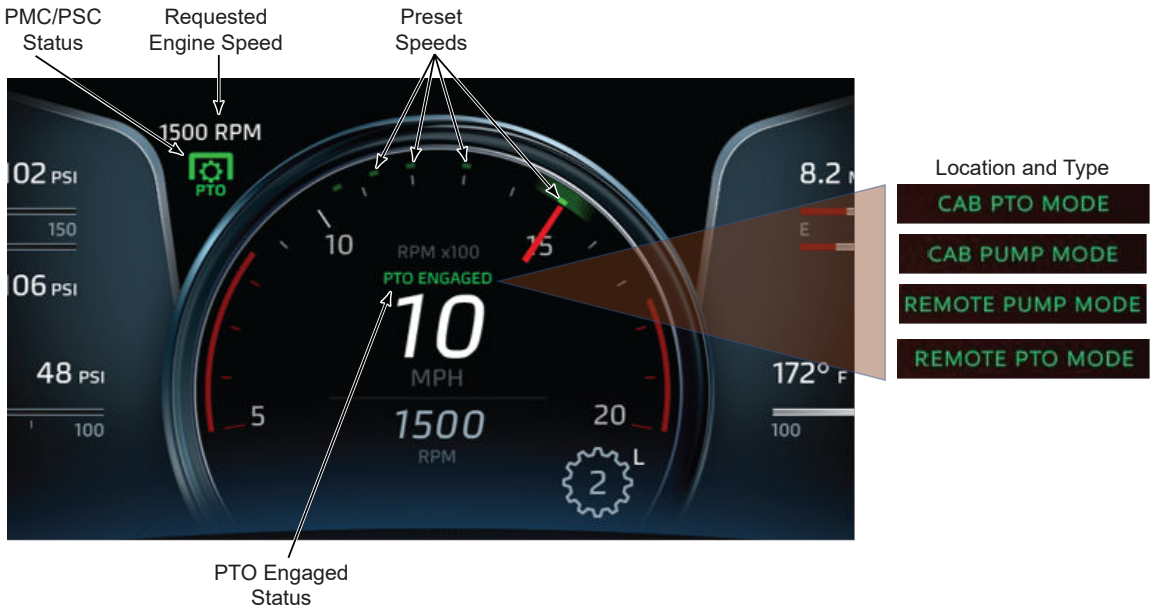


Figure 20: Kenworth 15” Digital Display PTO Mode Configuration Screen

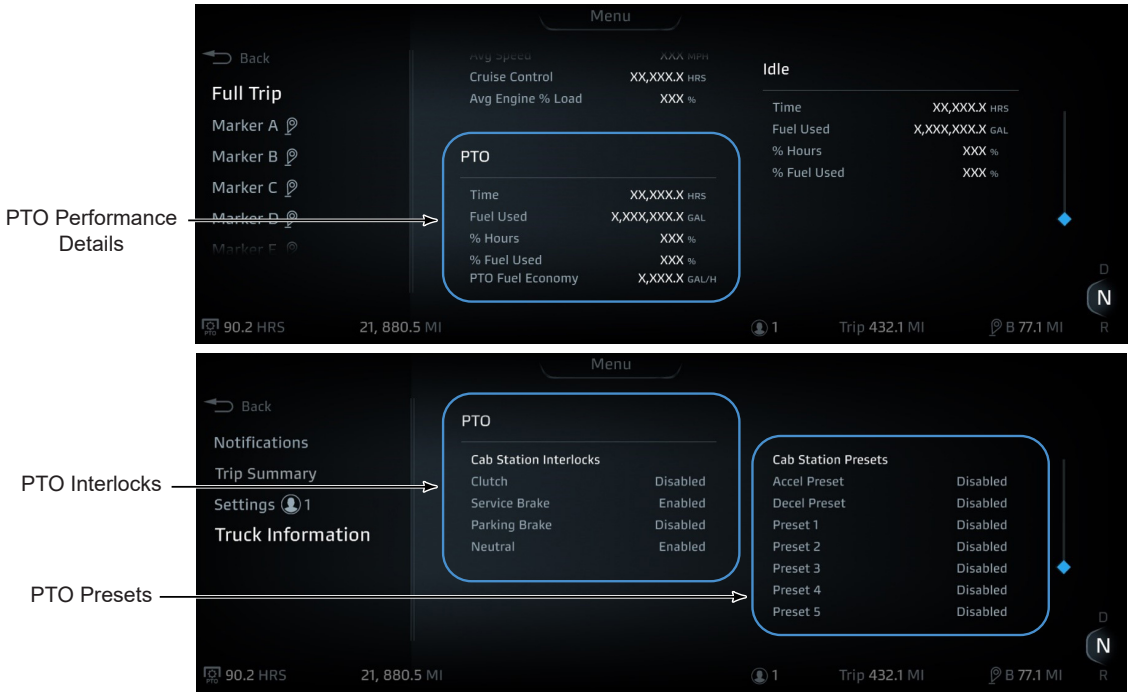
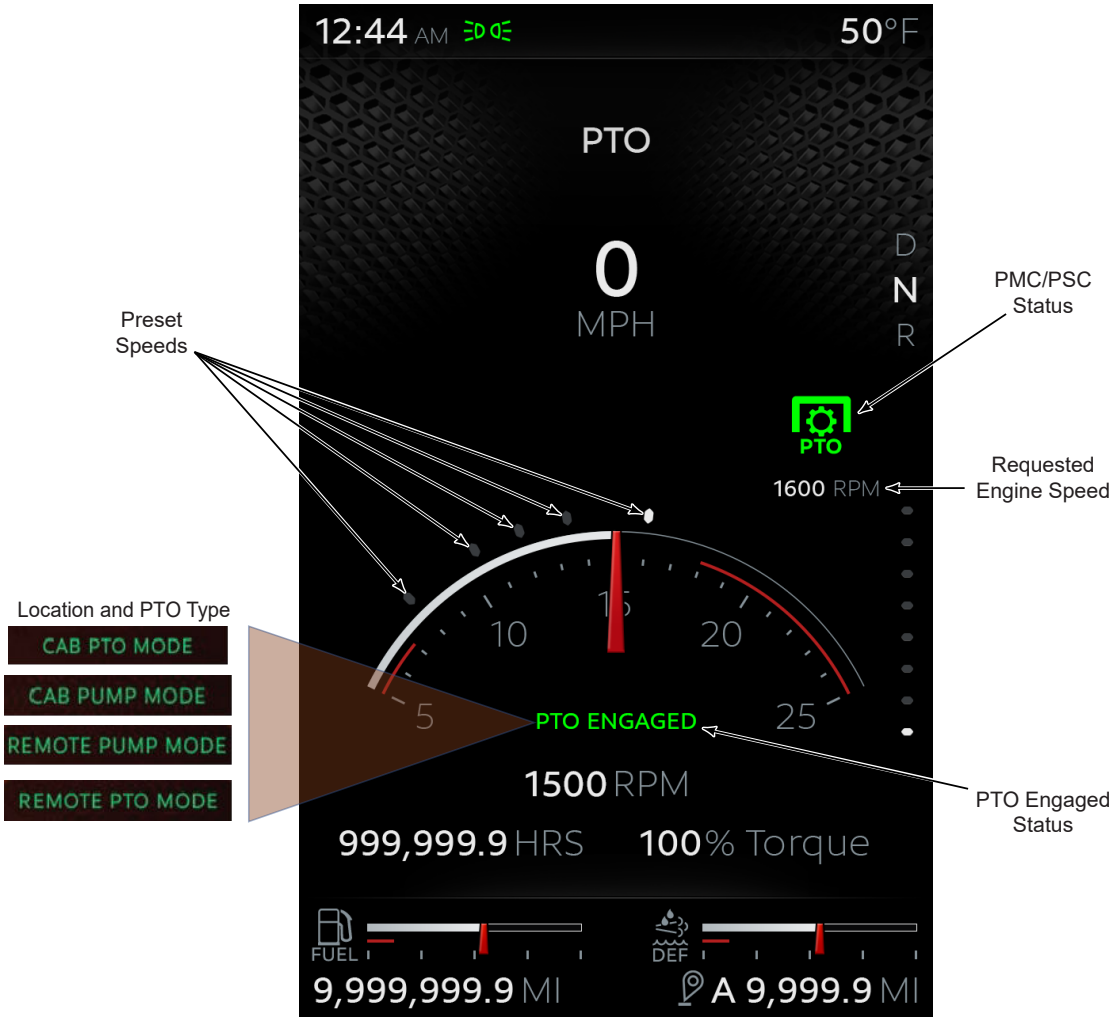


Figure 21: Peterbilt 7” Digital Display in MX-powered 520 PTO mode notification



NOTE
All features and functions described in this chapter are MX specific. For Cummins PTO notifications refer to *Cummins Engine Interface and PTO Function* on page 61 .

Dash and Steering Wheel Switches

PACCAR offers a large variety of PTO related steering wheel and dash switches to suit each application. If your vehicle is not equipped with one of these switches, any of the dash switches are available from your local dealership and can be easily installed, wired, and learned to your vehicle. Refer to the Body Builder Manual (see *Reference Sources* on page 11) for further detail on adding switches.

NOTE
Dash switches, connectors and LIN jumpers are not weather sealed and are not intended for use outside of the cab.

Steering wheel set/resume

- Used for engine speed control manipulation.
- Refer to *Cab PTO Mode* on page 46 for further detail

Figure 22: Set/Resume Buttons on Steering Wheel

Steering wheel cruise control ON/OFF

- Once PMC is activated, PMC can be activated via cruise control ON/OFF switch
- Switch must be cycled ON to reactivate PSC if it was deactivated by an interlock

Figure 23: Cruise control ON/OFF buttons on steering wheel

PTO Mode Control (PMC)

- PMC switch ON will activate PMC
  - Refer to the description of PMC at the beginning of this chapter for details
    - Subsequent PSC activation is achieved via the steering wheel cruise control On/Off switch, hardwired input or CAN signal
      - Refer to Cab Cruise control ON/OFF switch for further details
      - Refer to *Remote PTO Mode* on page 49 for hardwired and CAN details
- Excellent for FEPTO/REPTO applications where there is not PTO engaged feedback
  - Not required for FEPTO/REPTO application
- Excellent for vehicles requiring basic CAB PTO functionality
- Excellent for vehicles that lack PTO harnessing
  - Dealer stock vehicles

- Second life vehicles

NOTE
The PMC switch is not capable of controlling PTO engagement! Refer to *PACCAR Supported PTO Engagement Methods* on page 16 and *Customer Installed (C/I) Power Take-Off Engagement Methods* on page 30 for PTO engagement control options.

Figure 24: PTO Mode Control Dash Switch

PTO 1, 2, 3, 4

- These switches are used to control engagement of the specific PTO
- Activating a PTO switch will not activate PMC by itself
  - Hardwired feedback of PTO engaged sensor can be used to activate PMC
    - See *PACCAR Supported PTO Engagement Methods* on page 16 for PACCAR supported PTO engagement options
- In the case of EOA engaged PTO, the according PTO switch must be assigned to a solenoid in PVP
- In the case of EOH engaged PTO, the according EOH PTO switch must be assigned in PVP

Figure 25: PTO 1 and 2 Switches

NOTE
If more PTO switches are required they will be similar to the ones in *Figure 25: PTO 1 and 2 Switches* on page 44 . However cases that more than two PTO switches are used are very rare.

Pump Mode

- Used in applications where the transmission output shaft is used to drive a splitshaft
- Refer to Pump Mode section in this chapter for further detail

NOTE
Pump mode switch is not to be used for engagement of a transfer case for front axle drive. Refer to Body Builder Manual for 4x4 or 6x6 applications.

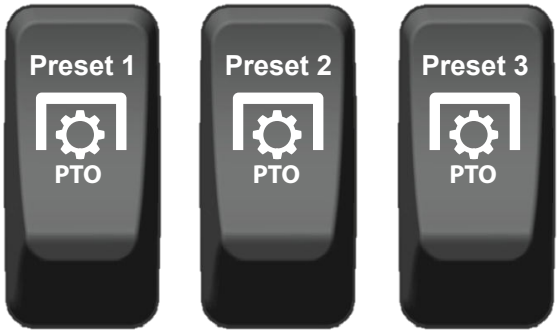
NOTE
Common industry terminology for pump mode may include splitshaft, dropbox, Namco, Fabco, Omsi.

Figure 26: PTO Pump Mode Dash Switch

Custom Preset 1, 2, 3

- Used for engine speed control manipulation
- Refer to *Cab PTO Mode* on page 46 for further detail

Figure 27: PTO mode control dash switch



Preset +/-

- Used for engine speed control manipulation.
- Refer to *Cab PTO Mode* on page 46 Cab PTO mode section for further detail
- As of MY22, the steering wheel +/- switch is no longer available

Figure 28: PTO +/- Preset dash switch

Cab/Remote Location Selection

- Used to select whether PSC will be controlled from the cab switches or remote location
- Cab or Remote PTO must be configured in PVP for use of Cab/Remote location selection switch
- See *Cab PTO Mode* on page 46 or *Remote PTO Mode* on page 49 for further details

NOTE
If configured for Cab/Remote PTO and the Cab/Remote location selection switch is not installed, PSC control will be blocked and engine speed control will not be possible.

Figure 29: PTO Cab/Remote Location Selection Dash Switch

Cab PTO Mode

Cab PTO control is intended for applications where the operator can engage the PTO and select the appropriate engine speed from inside the cab the without the need to control engine speed outside the cab. Typical applications may include:

- Dry and wet bulk haul
- Dump truck
- Municipality/multipurpose truck
- Feedlot
- Regional delivery

Several different PSC methods are available in CAB PTO Mode

- A combination of these methods can be used concurrently
  - Use of the minimal number of PSC methods is recommended to avoid unintended engine speed changes

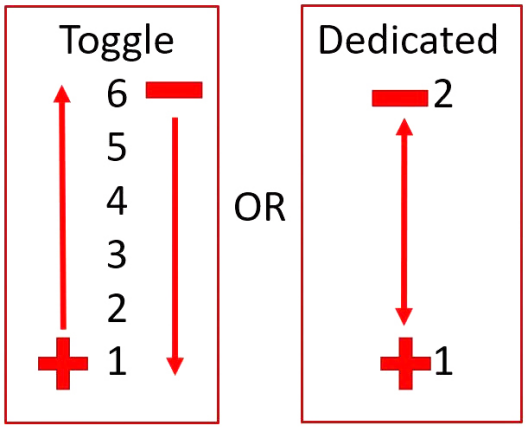
Set/Resume steering wheel switches

- PMC and PSC must be activated to allow set/resume switch to control engine speed
- Short press will bump engine speed up or down by configured increment/decrement size
- Long press will accelerate or decelerate engine speed at the rate configured (RPM/sec)

Preset 1, 2, 3 dash switches

- PMC and PSC must be activated to allow the preset switch to control engine speed
- These preset switches are used to activate specific engine speeds
- Specific engine speed must be configured via PVP
- Can be configured to latching or momentary function
  - Latching: Preset speed will remain active once the switch is activated
  - Momentary: Preset speed will only be active as long as switch is depressed
- Regardless of configured engine speed, preset priority is Preset 1 > Preset 2 > Preset 3
  - Example: If preset 3 is active and preset 2 is activated, engine speed will change to preset 2
- Presets will be disabled by active interlock and must be cycled ON->OFF->ON to be reactivated

Figure 30: Example of Toggle and Dedicated function of Preset +/- switch concepts



Cab accelerator pedal

- PMC must be active to allow cab accelerator to control engine speed
  - PSC activated is NOT required
- Can be disabled in PTO mode via PVP configuration
- Can be disabled only during active interlock via PVP configuration
- Digital display will not display requested engine speed when using cab accelerator

Variable voltage remote throttle (VVRT) hardwired input @ P197c

- PMC must be active to allow remote accelerator to control engine speed
  - PSC activated is NOT required
- Can be disabled in PTO mode via PVP configuration
- Can be disabled during active interlock via PVP configuration
- Digital display will not display requested engine speed when using remote accelerator
- Voltage Range aligns with the most common aftermarket hand and foot throttles

- 0.75v=0% throttle
- 4.75v=100% throttle

- Must see 0% throttle upon entering PSC before engine speed control is allowed
  - This is a safety feature to prevent unexpected engine speed change
- Must see 0% throttle after active interlock before engine speed control is allowed
  - This is a safety feature to prevent unexpected engine speed change
- Refer to *Electrical Connectors and Terminal Details* on page 14 for P197c PTO connector details

NOTE
VVRT/Analog pedals are the ONLY pedal type that is compatible with the MX engine. Pulse with modulation pedals will NOT function when installed.

Figure 31: Variable Voltage Remote Throttle at the P197c PTO connector

Remote custom preset 1, 2, 3 hardwired input @ P197n

- PMC and PSC must be active to allow remote custom presets to control engine speed
- Can be connected directly to an operator activated switch or activated by a specific body function
  - Refer to *Figure 33: Custom Presets wiring at the P197n PTO optional connector* on page 49 for example
- Can be configured to latching or momentary function
  - Latching: Preset speed will be activated as soon as a signal is applied
  - Momentary: Preset speed will remain active as long as signal is applied
- Regardless of configured engine speed, preset priority is Preset 1 > Preset 2 > Preset 3
  - Example: If preset 3 is active and preset 2 is activated, engine speed will change to preset 2
- Presets will be disabled by active interlock and must be cycled ON>OFF>ON to be reactivated
- Requires Optional PTO sales code options that drive addition of P197n connector
- Refer to *Electrical Connectors and Terminal Details* on page 14 for P197n PTO optional connector details

> **NOTE**
>
> Wiring the Remote hardwired presets to specific functions of the body helps to alleviate the operator proper RPM selection or prevent intentional operator abuse by over-speeding the equipment or engine.

Figure 32: Example of possible uses for Remote Custom Presets on heavy wrecker body

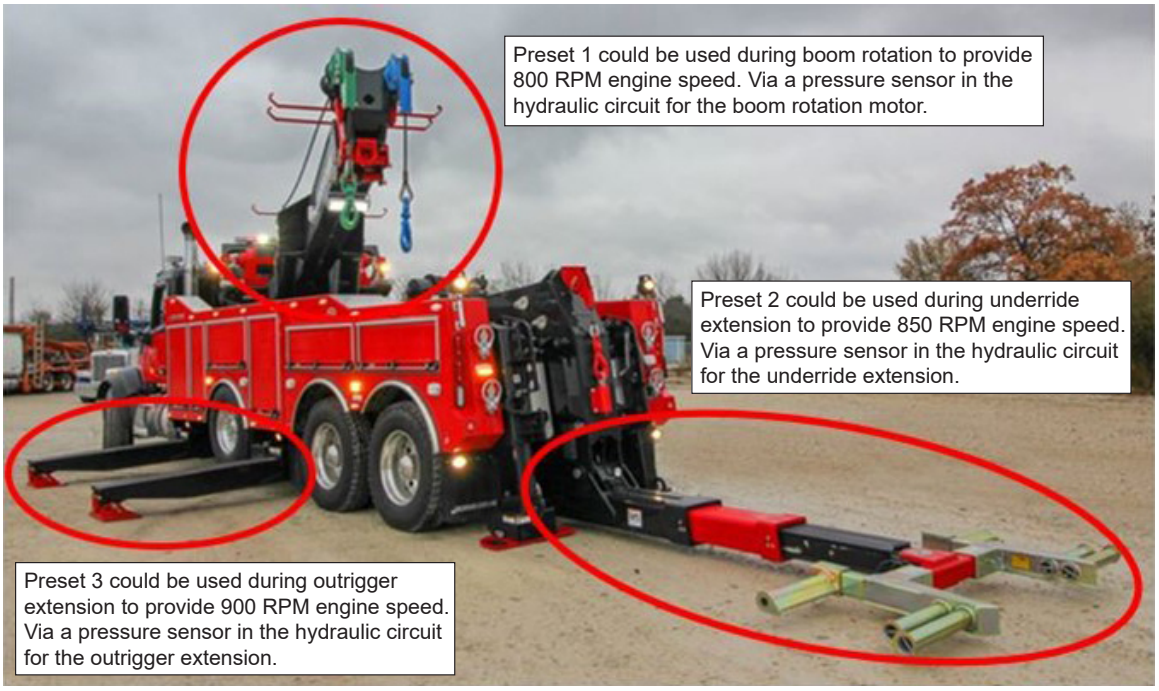


Figure 33: Custom Presets wiring at the P197n PTO optional connector

Remote PTO: P197N-Custom Presets

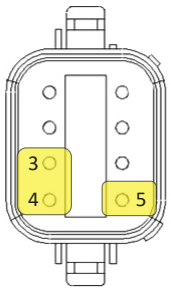
- PMC and PSC must be enabled to use Remote Custom Presets
- AA00044, AA00046, AA00048=Custom Presets RPM
- AA00043, AA00045, AA00047=Custom Preset Functionality

- Cancel/Momentary: Preset RPM will be held as long as ground signal is applied to the pin
- Latch: Once activated by ground signal, preset RPM will be held until one of the following:
  - Interrupted by PTO interlock
  - PTO speed control is exited
  - Higher priority preset is activated

- Presets priority
  Preset 1>Preset 2>Preset 3
  Regardless of configured RPM

PTO: Cab And/Or Remote Station Custom Presets

Parameter Name	Value		Status
Custom Preset 1 Functionality (AA00043)	Cancel		P
Custom Preset 1 (AA00044)	750	RPM	P
Custom Preset 2 Functionality (AA00045)	Cancel		P
Custom Preset 2 (AA00046)	850	RPM	P
Custom Preset 3 Functionality (AA00047)	Cancel		P
Custom Preset 3 (AA00048)	950	RPM	P



Remote PTO Mode

Several different PSC methods are available in Remote PTO Mode

- A combination of these methods can be used concurrently

- Use of the minimal number of PSC methods is recommended to avoid unintended engine speed changes

Set/Resume hardwired input @ P197c

- PMC and PSC must be activated to allow set/resume switch to control engine speed
- Short press will bump engine speed up or down by configured increment/decrement size
- Long press will accelerate or decelerate engine speed at the rate configured (RPM/sec)

Preset +/- hardwired input @ P197n or P197c

- PMC and PSC must be activated to allow preset switch to control engine speed
- Three position momentary switch: + or OFF or -
- Must be configured for toggled or dedicated function
  - Toggled: Provides six engine speed presets that can be toggled thru from 1→6
  - Dedicated: Provides two preset engine speeds
- On MY21 and later MX-powered vehicles, there is a configurable parameter in PVP that allows the Set/resume pins on the P197c PTO connector to be reassigned to toggled/dedicated presets
- Presets will be disabled by active interlock and must be cycled ON>OFF>ON to be reactivated

Figure 34: Example of Toggle and Dedicated function of Preset +/- switch concepts

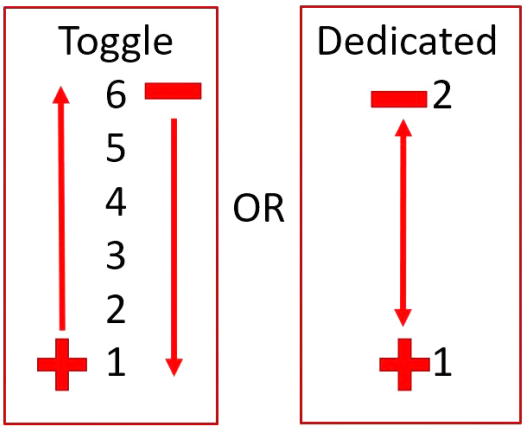
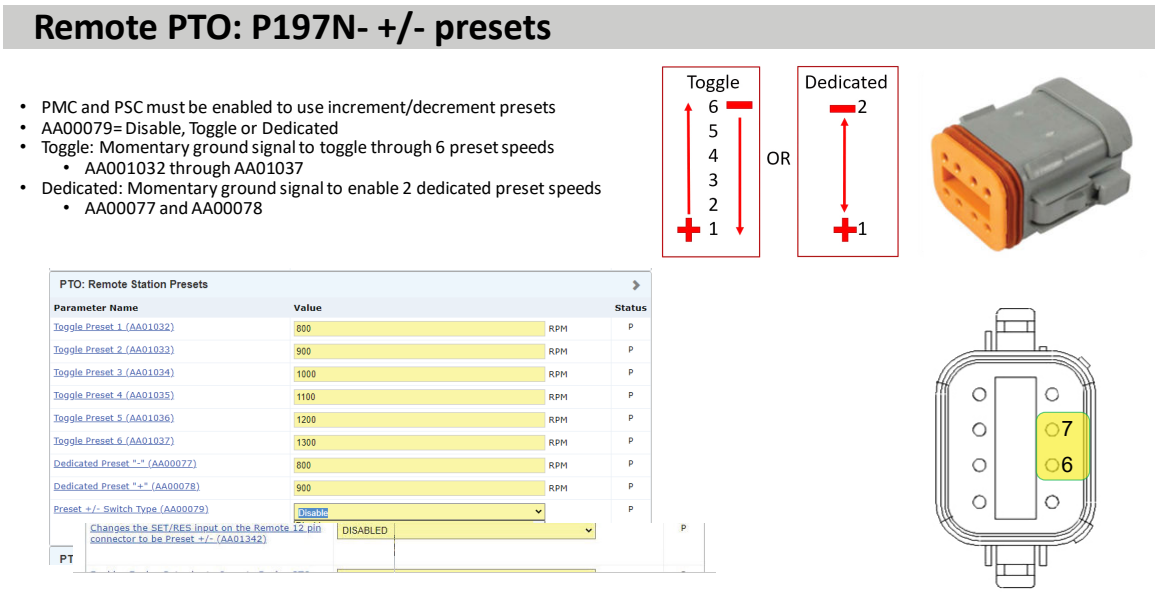


Figure 35: Hardwired Remote Toggle and Dedicated Presets on P197n



Variable voltage remote throttle (VVRT) hardwired input @ P197c

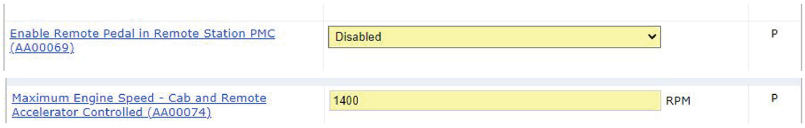
- PMC must be active to allow remote accelerator to control engine speed
- Can be disabled in PTO mode via PVP configuration
- Can be disabled during active interlock via PVP configuration
- Digital display will not display requested engine speed when using remote accelerator
- Voltage Range aligns with the most common aftermarket hand and foot throttles
- Must see 0% throttle upon entering PSC before engine speed control is allowed
- Must see 0 throttle after active interlock before engine speed control is allowed
- Refer to *Electrical Connectors and Terminal Details* on page 14 for P197c PTO connector details

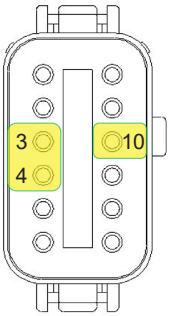
NOTE
VVRT/Analog pedals are the ONLY pedal type that is compatible with the MX engine. Pulse with modulation pedals will NOT function when installed.

Figure 36: Variable Voltage Remote Throttle at the P197c PTO connector

Remote PTO: P197C-VVRT

- Variable Voltage Remote Throttle-VVRT
- AA00069=ENABLED required to enable VVRT
- PMC must be enabled to use VVRT
  - PSC is not required
- Voltage range:
  - .75V=0% throttle
  - 4.75=100% throttle
  - Voltage range aligns with most common aftermarket hand and foot throttles
- Must see 0% throttle before enabling VVRT
- Must see 0% throttle to re-enable VVRT after interlock





Remote custom preset 1, 2, 3 hardwired inputs @ P197n

- PMC and PSC must be active to allow Remote Custom Presets to control engine speed
- Can be connected directly to an operator activated switch or activated by a specific body function
  - See *Figure 36: Variable Voltage Remote Throttle at the P197c PTO connector* on page 51 for example
- Can be configured to latching or momentary function
  - Latching: Preset speed will be activated as soon as a signal is applied
  - Momentary: Preset speed will remain active as long as signal is applied
- Regardless of configured engine speed, preset priority is Preset 1 > Preset 2 > Preset 3
  - Example: If preset 3 is active and preset 2 is activated, engine speed will change to preset 2
- Presets will be disabled by any active interlock and must be cycled ON->OFF->ON to be reactivated
- Requires Optional PTO sales code options that drive addition of P197n connector
- Refer to *Electrical Connectors and Terminal Details* on page 14 for P197n PTO Option connector details

Wiring the remote hardwired presets to specific functions of the body helps to alleviate the operator proper RPM selection or prevent intentional operator abuse by overspeeding the equipment or engine.

Figure 37: Example of possible uses for Remote Custom Presets on heavy wrecker body

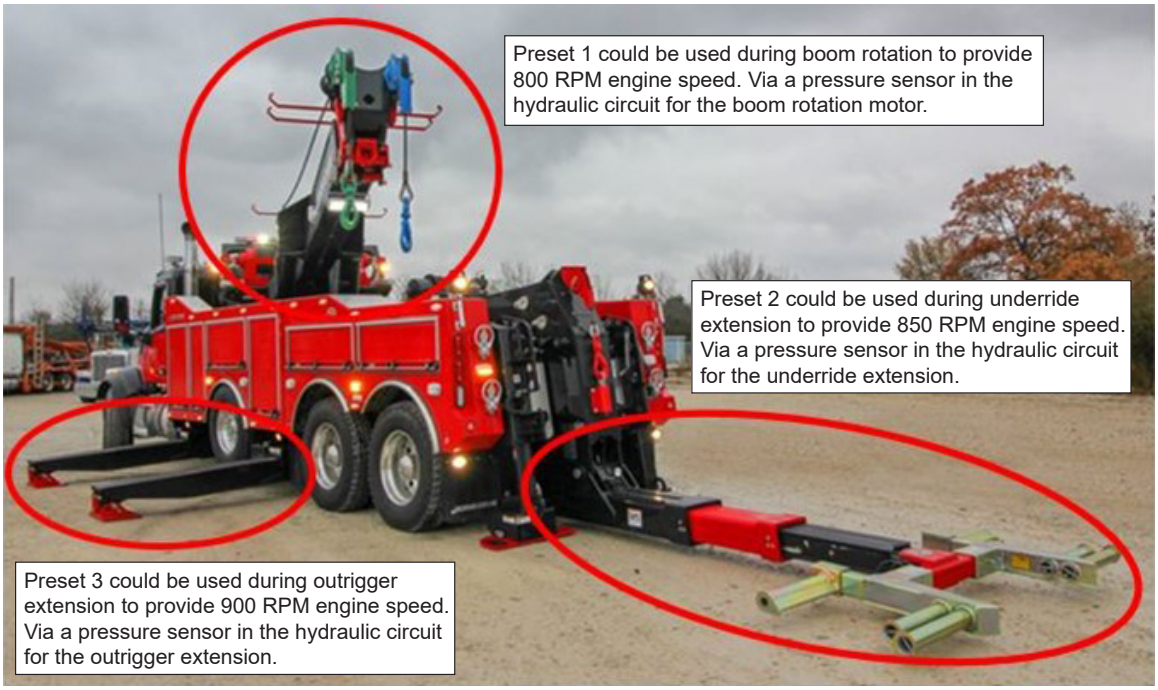


Figure 38: Custom Presets wiring at the P197n PTO optional connector

Remote PTO: P197N-Custom Presets

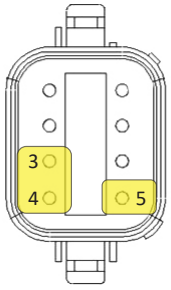
- PMC and PSC must be enabled to use Remote Custom Presets
- AA00044, AA00046, AA00048=Custom Presets RPM
- AA00043, AA00045, AA00047=Custom Preset Functionality

- Cancel/Momentary: Preset RPM will be held as long as ground signal is applied to the pin
- Latch: Once activated by ground signal, preset RPM will be held until one of the following:
  - Interrupted by PTO interlock
  - PTO speed control is exited
  - Higher priority preset is activated

- Presets priority
  Preset 1>Preset 2>Preset 3
  Regardless of configured RPM

PTO: Cab And/Or Remote Station Custom Presets

Parameter Name	Value		Status
Custom Preset 1 Functionality (AA00043)	Cancel		P
Custom Preset 1 (AA00044)	750	RPM	P
Custom Preset 2 Functionality (AA00045)	Cancel		P
Custom Preset 2 (AA00046)	850	RPM	P
Custom Preset 3 Functionality (AA00047)	Cancel		P
Custom Preset 3 (AA00048)	950	RPM	P



Cab accelerator pedal

- PMC must be active to allow cab accelerator to control engine speed
  - PSC activated is NOT required
- Can be disabled in PTO mode via PVP configuration
- Can be disabled only during active interlock via PVP configuration
- Digital display will not display requested engine speed when using remote accelerator
- Must see 0% throttle upon entering PSC before engine speed control is allowed
  - This is a safety feature to prevent unexpected engine speed change
- Must see 0% throttle after active interlock before engine speed control is allowed

- This is a safety feature to prevent unexpected engine speed change

CAN-based engine speed control WIP

Many body builders have transitioned from hardwired to CAN-based interface to control PTO mode and PTO speed control

- All follow SAE J1939-71 recommended practices
- Familiarity with SAE J1939 and CAN protocols are necessary to utilize these CAN based PSC methods
- TSC1
  - Describe that TSC1 can be used to activate PMC without controlling RPM
  - Describe that Override control mode 0=No PTO

> **NOTE**
>
> Previous MX-power vehicles required a combination of PSN 90 and TSC1 to control PTO engine behavior. This is not possible with the MY19 or later MX-powered vehicles. TSC1 and SPN 980 ARE NOT to be used together.

- EEC2
  - RPM request not displayed

PTO SPNs

- Describe that SPN 980 can be used to activate PMC without controlling RPM
- SPN 980 first

> **NOTE**
>
> Previous MX-power vehicles required a combination of PSN 90 and TSC1 to control PTO engine behavior. This is not possible with the MY19 or later MX-powered vehicles. TSC1 and SPN 980 ARE NOT to be used together.

> **NOTE**
>
> About engine speed control re-activating immediately after an active interlock***

- Refer to Body Builder Manual for further CAN integration information (see *Reference Sources* on page 11)
- Refer to Body Builder Manual for complete list of gatewayed messages (see *Reference Sources* on page 11)
- Refer to SAE J1939 recommended practices for information on CAN communication

Cab & Remote PTO Mode

Allows control of PSC from either cab or remote locations but requires the cab/remote location selection switch to determine which location is in control.

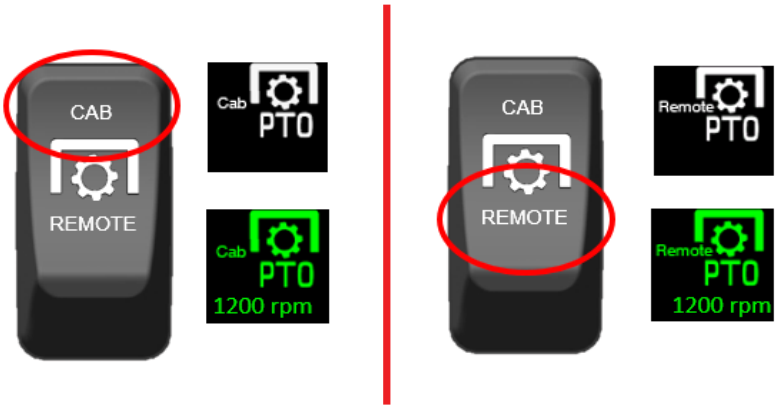
- Each location features independent limits and interlocks
- Perfect for applications requiring two distinct PTO operations
  - Ex: Configure Cab PTO for mobile operation and Remote PTO for stationary operation
- Effectively allows location “lockout” to prevent PSC from Cab and Remote locations concurrently
- Full capabilities of each location
  - Not a downsized or limited version

- Requires Cab/Remote location selection switch
  - Without switch, engine speed control is disabled in both locations
  - Can be added in the aftermarket
  - Available from PACCAR Parts
  - Require DAVIE switch learn
- Refer to *Cab PTO Mode* on page 46 and *Remote PTO Mode* on page 49 for more specific detail on each type of PTO mode.

NOTE
If Cab/Remote location selection switch is not installed, engine speed control will be disabled in both locations!

Figure 39: PTO Cab/Remote Location Selection Dash Switch

Figure 40: PTO Cab/Remote Selection Dash Indicators



Cab with Remote Inputs PTO Mode

This is a variation of CAB PTO where the Remote PTO inputs are allowed, effectively allowing cab and remote locations concurrently.

- Utilizes CAB PTO interlocks and limits
- Cab/Remote location switch not required
- Perfect for applications requiring concurrent use of multiple locations
  - Ready Mix concrete, Striper/Grinder, Wrecker
- Full capabilities of each location
  - Not a downsized or limited version
- Only available in MY22 and later vehicles

  - Any truck with Digital Display
- Not available for previous CVMUX
  - MY17-MY21
- Refer to Programming Guide for further details (see *Reference Sources* on page 11)

PSC Control Method Priority

Depending on where PTO Speed Control is activated from there are varying priorities the truck considers. The three major scenarios of priorities that will be considered are cab, remote, and cab/remote. In this section, all three scenarios will be covered, including what control methods are included, and their place in the hierarchy when determining where the PTO should take its speed commands from. However, in most applications should only need a single type or method of PTO control.

NOTE
PACCAR does not recommend using multiple speed controls at once. Using specifically one form of speed control is the optimal and preferred way to control PTO speed during operation.

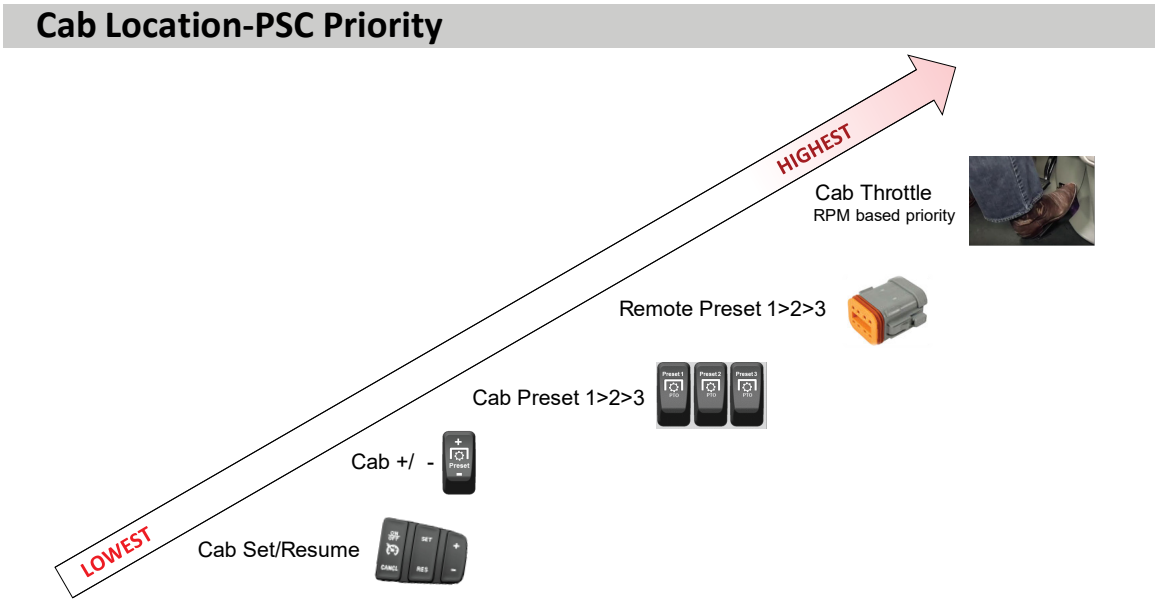
Cab Location PTO Speed Control

Methods:

- Set/Resume Steering Wheel Switch
- +/- Preset Dash Switch
- Preset 1,2,3 Dash Switches
- Cab Throttle Pedal
- Remote Custom Presets (P197N-8 Pin)
  - 1>2>3

Refer to *Cab PTO Mode* on page 46 for more information on this control method.

Figure 41: Cab Location PTO Speed Control Input Priority



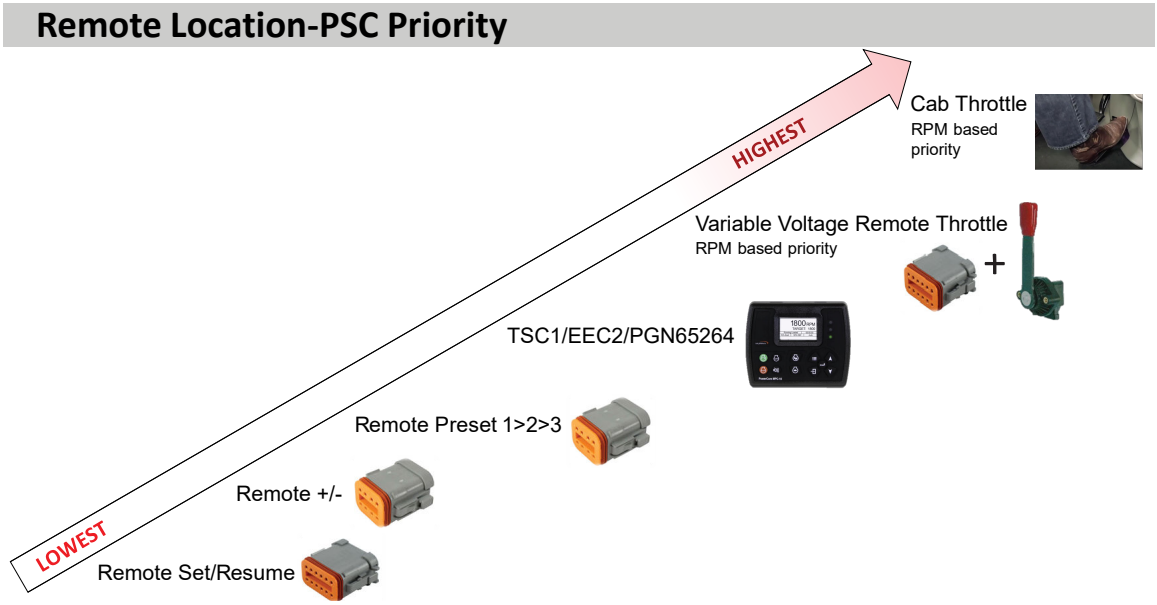
Remote Location PTO Speed Control

Methods:

- Remote Set/Resume
- Remote +/-
- Remote Custom Presets (P197N-8 Pin)
  - 1>2>3
- Remote CAN based method
  - TSC1/EEC2/PGN65264
  - For more information on this control method, see *Remote PTO Mode* on page 49 for CAN based engine speed control.
- Variable Voltage Remote Throttle (VVRT)
- Cab Throttle

Refer to *Remote PTO Mode* on page 49 for more information on this control method.

Figure 42: Remote Location PTO Speed Control Input Priority



Cab with Remote Inputs PTO Speed Control/Cab and Remote PTO Speed Control

There is a defined difference between “Cab and Remote PTO Speed Control” and Cab with Remote PTO Speed Control”

Cab with Remote Inputs PSC: This description is provided above. This method is only used in special circumstances.

Cab and Remote PSC: This is where the choice is given between the two control methods. Refer to the individual section for more information on both. It cannot use both concurrently like the Cab with Remote inputs can.

Cab with remote input PTO speed control allows for concurrent control from the cab and a remote station.

- See the separate Cab and Remote portions of this section for the priority list for individual cab OR remote speed control. This part of the section is combining the two.

NOTE

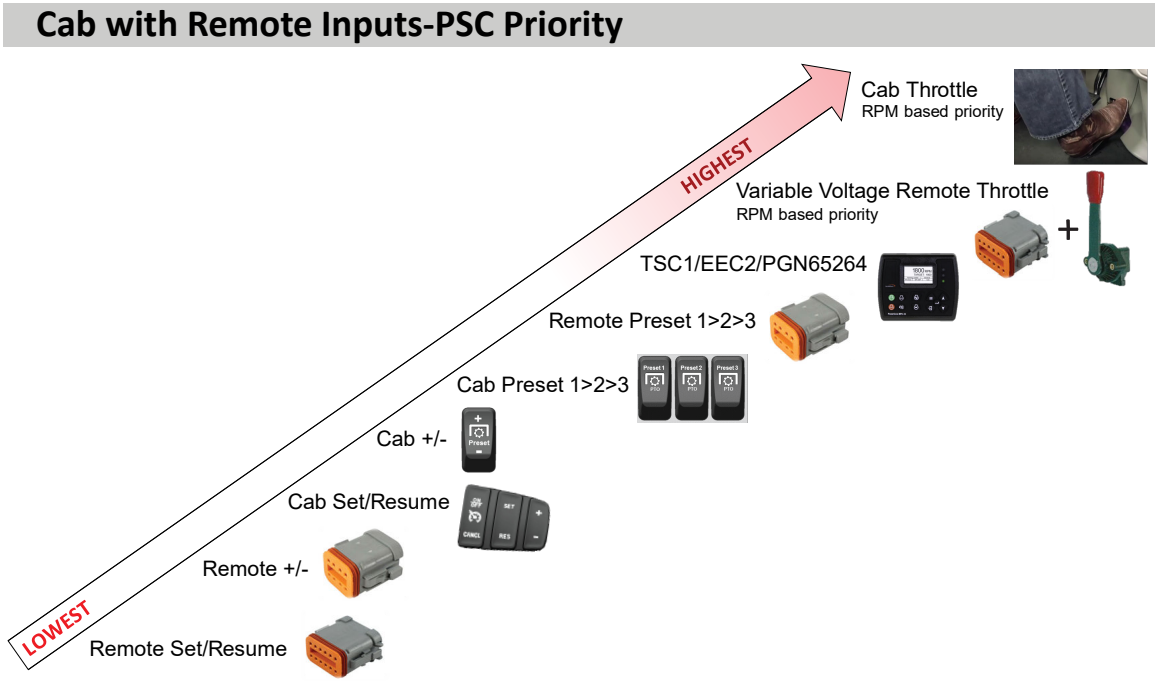
PACCAR does not recommend using multiple speed controls at once. Using specifically one form of speed control is optimal and the safest way to control PTO speed during operation.

Refer to *Cab & Remote PTO Mode* on page 54 for more information on this control mode.

Refer to *Cab with Remote Inputs PTO Mode* on page 55 for more information about this control mode.

- The priority list does not change between the two methods of control and will remain the same.

Figure 43: Cab With Remote Inputs PTO Speed Control Priority



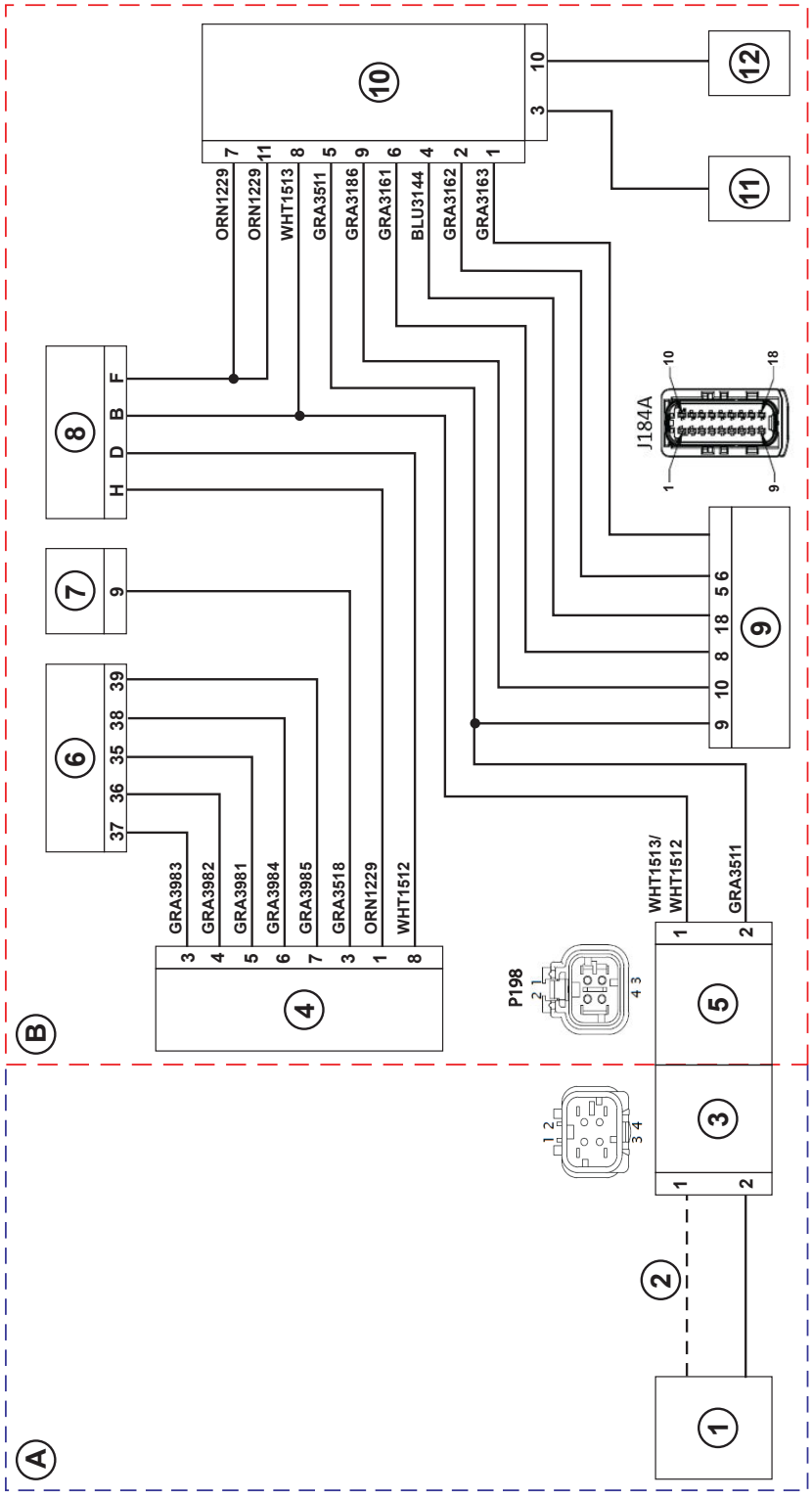
Wire Diagram for PTO Remote Throttle/Presets using P197C & P197N

The hardwire connections when considering remote throttle and presets on an MX engine only are illustrated below.

NOTE

This diagram has generic connector and circuit numbers. It is meant to be a helpful overview in tracing numerous circuits around the truck if necessary. Please consult the diagrams specific to the individual truck while using this as a guide.

Figure 44: Generic wire diagram for PTO remote throttle control and presets utilizing connectors P197C and/or P197N


A
B
1
2
3
4
5
6
7
8
9
10
11
12
J184A
P198
GRA3983
GRA3982
GRA3981
GRA3984
GRA3985
GRA3518
ORN1229
WHT1512
WHT1513/
WHT1512
GRA3511
ORN1229
ORN1229
WHT1513
GRA3511
GRA3186
GRA3161
BLU3144
GRA3162
GRA3163

NOTE

- Wire/Connector numbers may vary. For more specified information please consult the harnesses that coincide with your chassis through eCat/AR Tech/VOG.
- Connectors may NOT show complete set of pins.
- GRAXXXX denotes PTO feedback signal.
- WHTXXXX denotes ground.
- P197C Pins 3 and 10 shown are a part of the same harness
- This diagram is intended to use in tandem with other resources, not standalone.

NOTE

Dashed linke only included if clean graound is required. PTO to Chassis Connector will bary based on brand/type of PTO.

NOTE

Circuit numbers presented are corresponding to the line UNDER the number.

MX Engine PTO Remote Throttle Presets P197C and P197N

Callout	Description
A	PTO Side, Body Builder Installed
B	Main Chassis Harness
1	PTO Ball Switch
2	OPTIONAL
3	PTO to Chassis Connector
4	Remote Presets P197N
5	PTO 4-Pin Connector P198Chassis
6	IP/4th Bay HarnessJ199
7	Secondary Chassis Module J185B
8	PTO Splice Block J175
9	Primary Chassis Module J184A
10	Remote Throttle P197C
11	Ground Source Splice Block
12	5V Splice Block

Cummins Engine Interface and PTO Function

Introduction

This chapter is intended as an introduction to Cummins engine integration and PTO functionality. It will highlight simple differences, give a wiring overview, and touch on CAN-based control.

Please refer to Cummins CEB and customer support resources for further detail. See *Cummins Reference Sources* on page 63 .

Differences vs MX

Differences between a Cummins engine interface and a MX engine interface are highlighted in this section.

- Presence of a PTO Engage Diode in path of engage signal before reaching the Chassis Module Primary.

NOTE
Ensure this is seated correctly to promote proper function.

- PTO engage signal has a hardwired connection to communicate directly with the Cummins engine ECU
  - This is unlike the MX engine where the hardwired connection goes to the Chassis Module Primary, that signal is then multiplexed to the VECU through the CAN backbone
- Mounting locations and clearances may vary, it is recommend to consult the coinciding engine manufacturer’s resources to ensure compatibility

Figure 45: High level overview of PTODE on a manual or automated manual transmission with a Cummins engine

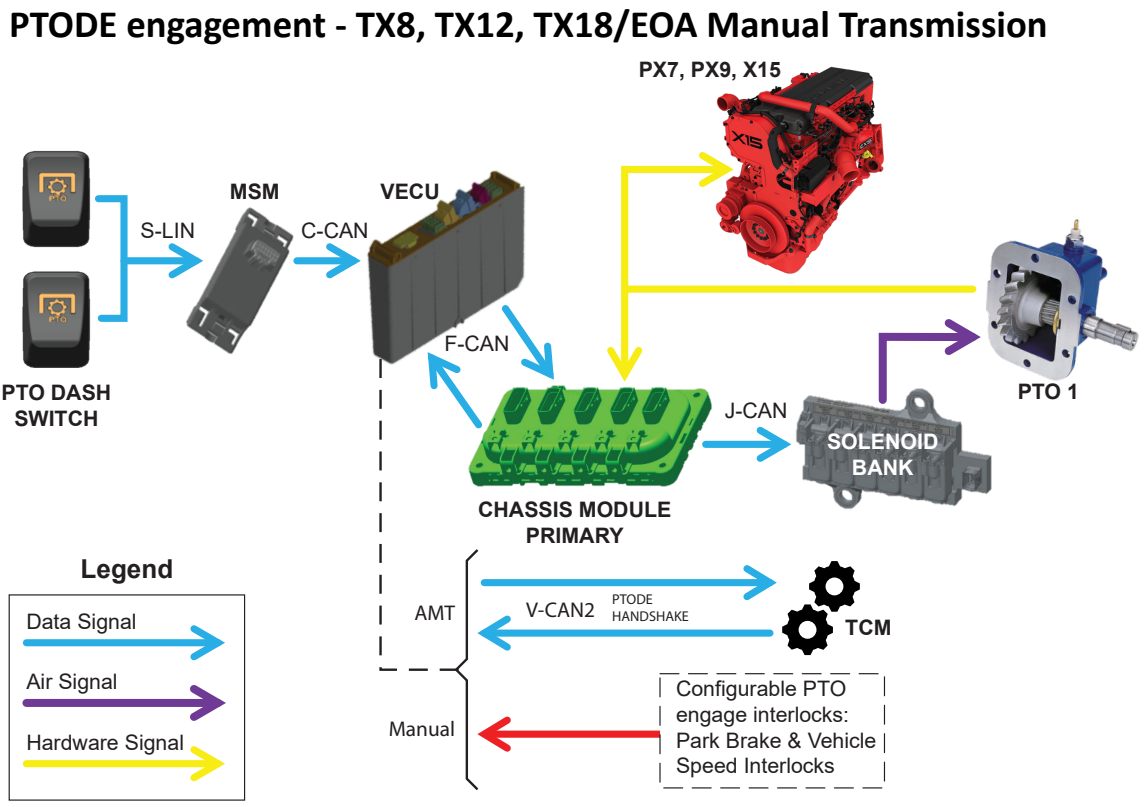


Figure 46: High level overview of PTO engagement with an Allison transmission and Cummins engine

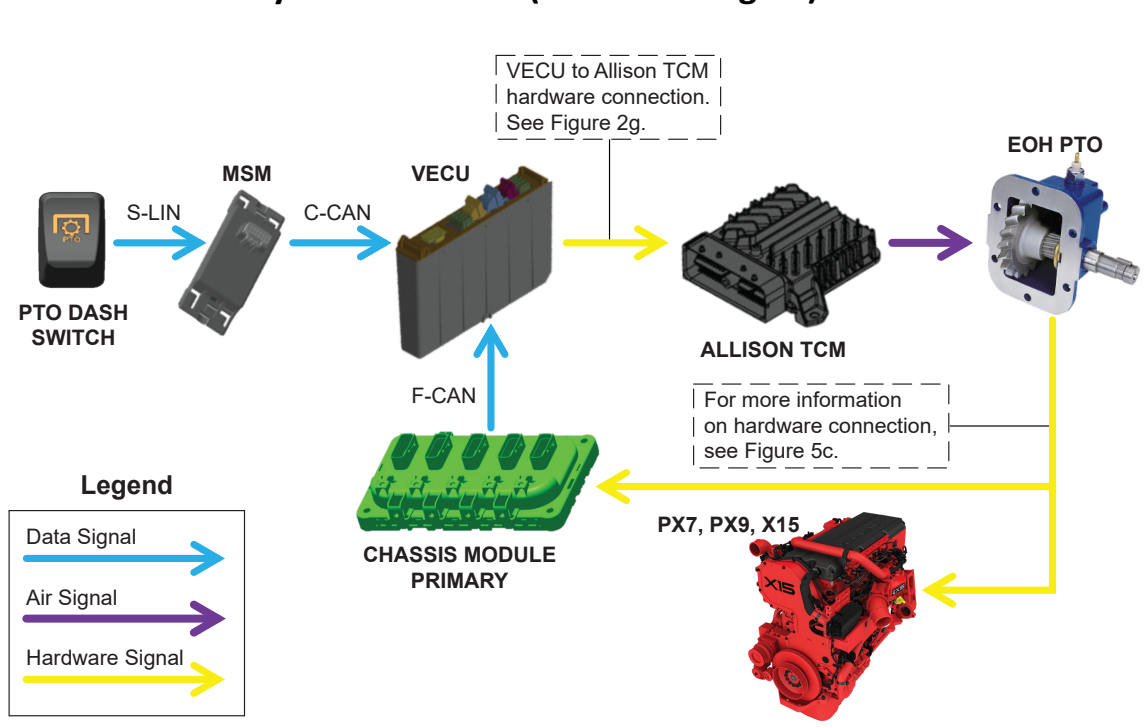
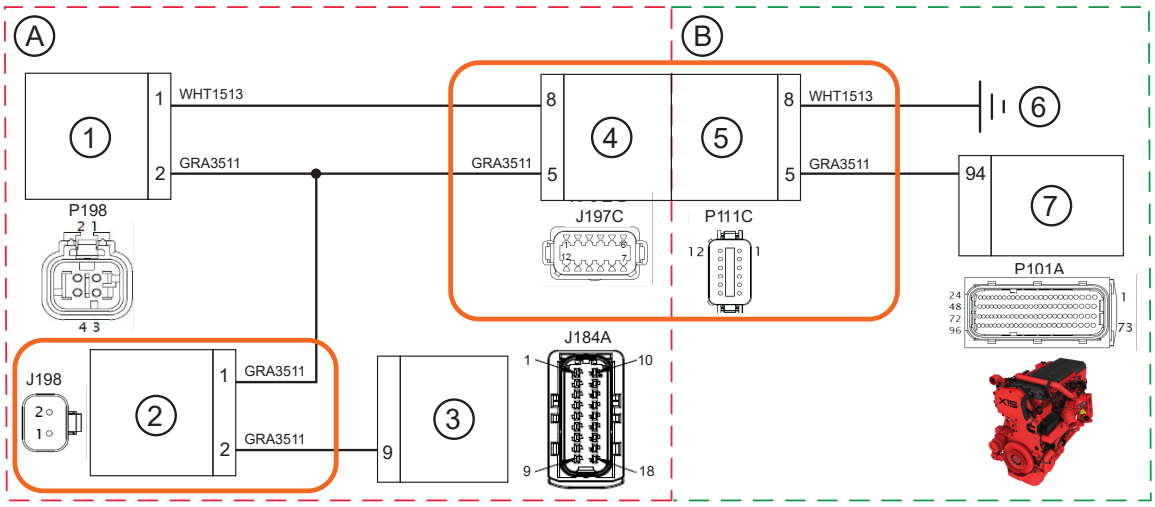


Figure 47: Wiring differences between Cummins and MX engines



NOTE

- Wire/Connector numbers may vary. For more specified information please consult the harnesses that coincide with your chassis through eCat/AR Tech/VOG.
- Connectors may NOT show complete set of pins.
- GRAXXXX denotes PTO feedback signal.
- WHTXXXX denotes ground.

Cummins Engine PTO Wiring Differences

A	Main Chassis Harness
B	Engine Harness
1	PTO 4-Pin Connector P198 Chassis
2	PTO Engage Diode J198
3	Primary Chassis Harness J184A
4	Chassis Harness J197C
5	Engine Harness P111C
6	P131a Engine
7	Cummins Engine ECU P101A

Cummins Reference Sources

- • Cummins Literature on Demand
  - *https://www.cummins.com/components/drivetrain-systems/literature-on-demand*
- • Cummins QuickServe Online (QSOL) *Access Required*
  - *https://mylogin.cummins.com/web/Cummins_Login?startURL=%2Fweb%2FIAM_Authorize%3Fappid%3Da1a4N00000DEdub*

Glossary

Controller Area Network (CAN) - A vehicle bus standard designed to allow microcontrollers and devices to communicate with each other within a vehicle without a host computer.

DAVIE4 - A diagnostic tool used for programming and troubleshooting *Electronic Control Unit (ECU)*s on the vehicle.

Electronic Catalog - System dealers and service personnel use to look up the specific chassis components when a truck comes in for service.

Electronic Control Unit (ECU) - A device responsible for overseeing, regulating, and altering the operation of the truck's electronic systems.

Original Equipment Manufacturer (OEM) - Refers to the company that originally manufactured the product, often synonymous with the truck makers/truck divisions unless otherwise noted.

PACCAR Vehicle Pro (PVP) - North American software application used to make changes or adjust engine parameters.

Power Take Off (PTO) - A term for methods of taking power from an operating power source, such as a running engine, which can be used to provide power to attachments or separate machines.

Vehicle Identification Number (VIN) - Unique code, including a serial number, used to identify a vehicle.

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