M2 Multiplexing – EMTSP

October 6, 2010
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Today’s Agenda

M2 Multiplexing - The Basics

• What is Multiplexing??
• Basic M2 Multiplex Components
• Multiplexing Programming Example
• M2 Resources
Multiplexing – Why is it important?

- Multiplexing is important because it has a Direct Impact on a Users Bottom Line
  - A Vocational truck has no value until a body is installed
  - The ability of a truck to work seamlessly with the body has Value
    - Truck function can complement the Body
    - Facilitation of End customers Business
  - Has the opportunity to enhance Vehicle Safety
- It can significantly simplify Installation for Body Builder if done correctly
  - Can Prevent Cutting up Cabs
  - Reduces Wiring
  - Centralizes Connections
  - Programmable
  - Creates Infinite number of Interlocking options
What is Multiplexing?

- Multiplexing – Sending multiple electronic messages through the same signal path at the same time.
Multiplexing - Computer Network for your Truck

- Multiplexing can be compared to a computer network
- Multiple Control Modules communicate with each other to coordinate truck functions
  - ECM – Engine Control Module
  - TCM – Transmission Control Module
  - BHM – Bulkhead Module
  - CHM – Chassis Module
  - ICU – Instrument Cluster
- J1939 Data link – Communication Network
Multiplexing – Common Terms

- Parameter – Computer code (programming) used to customize the configuration of the system.
- Input - A device that feeds a signal into the system, or signal that feeds a message into the system.
- Output - The signal or message that comes out of a system component or device.
- High Current Switch – A switch in which the power to operate a piece of equipment flows through the switch (Hard Wired Switch).
- Low Current Switch – A switch that only signals the system to activate a feature (Smart Switch).
What is Multiplexing?

“Hard Wired” – Fused and Relayed

Multiplexed

High Current Switches

Low Current “Smart” Switches
What is Multiplexing?

“Hard Wired” – Fused and Relayed

- PDM (Power Dist. Module)
- Fuse 1
- Fuse 2
- Fuse 3
- Fuse 4
- Fuse 5
- MEGA Fuse 150A
- Battery
- High Current Switches
- Relays
- Ignition Switch

Multiplexed

- PDM
- Fuse 1
- MEGA Fuse 150A
- Battery
- Chassis Module (CHM)
- Bulkhead Module (BHM)
- J1939
- Low Current “Smart” Switches

Parameter Change Only!
What is Multiplexing?

“Hard Wired” – Fused and Relayed

Multiplexed

Low Current “Smart” Switches

Parameter Change Only!
What is Multiplexing?

M2 Multiplexing System Components

Stalk Switch

Instrument Cluster

ABS ECU

Engine ECU

Bulkhead Module

Park Brake Switch

Service Brake Switch

Chassis Module

ABS

TRANS

ICU

ENG

The J1939 Datalink

Backbone

Control Unit

Branch Circuit

Smart Switches

Air Manifold Unit

Underhood PDM (Power Distribution Module)

Standard and Vehicle Switches

Fuel Level

Throttle Pedal

Low Air Pressure Switch

Unit
• Primary Function
  - “Brains” of the operation
  - Makes all system decisions, commands all other modules
  - Contains all system Parameters
  - Controls power flow & circuit protection to the various components of the M2 electrical system
  - Supports up to 5 Smart Switches directly
  - Is reprogrammable
  - Every M2 vehicle is equipped with BHM
Chassis Module

• Primary Function
  - “Good kid” – Does what it’s told
  - Reports it’s input and output states to BHM
  - Provides power flow & circuit protection to the various components of the M2 electrical system
  - Every M2 vehicle is equipped with CHM
  - Not reprogrammable
Smart Switches

- Smart switches are optional low-current switches that are connected to the Bulkhead Module (BHM) or to an optional Switch Expansion Module (SEM) on a Business Class® M2 vehicle. A smart switch is used to activate an optional feature on the vehicle.

- A smart switch is significantly different from a high current switch. Unlike a high-current switch, the smart switch is designed to control very low currents, and will be damaged if it is connected to a high-current circuit. A smart switch has an internal printed circuit board which contains:
  - A light-emitting diode (LED) for backlighting the switch when the headlights are turned on;
  - A light-emitting diode (LED) that, when on solid, indicates the feature is activated and, when blinking, indicates an error condition.
  - Two precision resistors that are used to create a unique switch identifier that allows the BHM to identify each switch that is connected;
  - Three precision resistors that are used to indicate the position of the switch.

- Reference Parameters are linked to resistive value of a Switch by the BHM.
Convenience Feature: Headlights - Automatic Headlights when Wipers Engaged

Data Codes:
Headlights with Wipers:
- 311-019: w/Daytime running lights
- 311-020: w/Daytime running lights, w/Rocker/Toggle momentary interrupter switch
- 311-021: no Daytime running lights

Models:
- M2 Platform

What
- Automatically engages headlights when driver turns on the windshield wipers

Why it’s important
- Safety feature
- Increases driver visibility
- Makes the truck more visible to oncoming traffic
Convenience Feature: Headlights - Alternating Flashing Headlights (Wig Wag)

Data Codes:
Alternating flashing headlamp system
- 27D-004: w/Body Builder Controlled Engagement
- 27D-012: w/Dash Switch
- 27D-013: w/Dash Switch and no park brake interlock (Railroad service truck only)

Models:
- M2 Platform

What
- NFPA complaint headlight warning system for emergency vehicles
- Dash Switch actuation or Customer supplied ground input

Why it’s important
- No 3rd party switches needed for the dash
- Eases truck equipment manufacturer body integration, provides OEM finish.
Convenience Feature: Wipers – Automatic Slowest Wiper Speed w/Park Brake

Data Codes:
- 660-025: Single Electric Windshield wiper motor with delay – Programmed to slowest speed with park brake set

Models:
- M2 Platform

Availability:
- October 2010

**What**
- Reduces wiper speed to Slowest Intermittent Speed setting when park brake is set regardless of Wiper Switch position

**Why it’s important**
- Reduces wear and tear on wiper motor
- Decreases frequency of wiper blade replacement
Safety Features: Audible Warnings – Door Open without Park Brake set

Data Codes:
Electric Horn Warning System for Park Brake not Set
- 275-060: With Door Open and Ignition Key off or Accessory Position
- 275-061 With Door Open and all ignition key positions

Models:
- M2 Platform

What
- Horn warning when driver door opened with park brake not set

Why it’s important
- Safety feature
- Warns drivers not to leave cab without park brake set
# Safety Features: Audible Warnings – Exterior Regen Notification

<table>
<thead>
<tr>
<th></th>
<th>Interior Dash Light Warning</th>
<th>Exterior Warning</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Stage</td>
<td>![Image 1]</td>
<td>10 Sec Horn Blast</td>
</tr>
<tr>
<td>Second Stage</td>
<td>![Image 2]</td>
<td>10 Sec Horn Blast &amp; Hazard Lamps</td>
</tr>
</tbody>
</table>

**Data Codes:**
- 275-063 2-STAGE ELECTRIC HORN AND HAZARD LAMP ALERT CONTROLLED BY PARTICULATE FILTER REGENERATION REQUIRED STATUS
- 275-064 ELECTRIC HORN WARNING SYS FOR PARK BRK NOT SET W/DOOR OPEN & ALL IGN KEY POSITIONS; 2-STAGE ELEC HORN & HAZARD LAMP ALERT CTRL BY PART FILTER REGEN REQ’D STATUS

**Models:**
- M2 Platform

**What**
- Combination horn and hazard lamp exterior warning for Stage 1 and 2 Regen notifications
- 275-064 includes driver door open/prk brk not set warning.

**Why it’s important**
- Notifies driver of manual regen required
- Warns drivers not to leave cab without park brake set
- Avoids potential plugging of DPF filter
Safety Features: Distraction Reduction - Radio off in Reverse

Data Codes:
Radio Wiring with Power Cutoff
- 74D-001: For Reverse or PTO Engaged
- 74D-002: When Vehicle in Reverse Gear

Models:
- M2 Platform

What
• Cuts power to radio when truck is in reverse or PTO engaged

Why it’s important
• Removes driver distraction while backing up
• Lowers noise level so driver can hear warnings
Access Freightliner provides “one stop shopping” to locate all the new 2010 body builder information

- New systems and information has been designed to help customers understand the changes and advantages coming in 2010 engines and components.
- New documents will be easier to access and easier to use with relevant information where and when you need it.

http://www.accessfreightliner.com/
E-mail – freightlinerbodybuilder@daimler.com
www.AccessFreightliner.com
M2 2010 Body Builder Book
EPA 2010 M2 Electrical

Body Builder Reference Guide
EPA 2010 Electrical Body Builder Book – March 2010 Release

- New Pages
  - Power Distribution Road Map
  - Power Net Distribution Box – Positive Battery Disconnect
  - High Current Switch Packages
  - High Current Switch Label Options
  - Bulkhead Connector Details
  - PTO Controls
  - PTO Control Schematics
  - Hybrid ePTO Connections
  - Remote Start Stop Controls
  - VDR Prep Information
Access Freightliner – Body Builder Profiles
Back Up
A Switch Expansion Module (SEM) is used on a Business Class® M2 vehicle when more than five smart switches are installed on the vehicle.

Each adds up to 6 Smart Switches (beyond 5 supported directly by BHM)

System can handle up to 4 SEMs on CAN network (Currently only one released)

The function of the SEM is to:
- Read all smart switch IDs and positions;
- Transmit the smart switch IDs and position data on the J1939 data link;
- Turn on the smart switch indicator lights when commanded to do so by the Bulkhead Module (BHM).

Ordered with Data Code:
- 860-004 SMART SWITCH EXPANSION MODULE
Converting Combination to Separate Stop/Turn Signal Lights

1. Shut down the engine, apply the parking brakes, and chock the tires.

2. Gather the necessary parts:
   - 2 Packard GT280 female terminals (15304717, 15304720, or equivalent for 16/14 AWG)
   - 2 Packard GT280 cable seals (15306067 or equivalent)
   - Appropriate wiring for connecting additional lighting

3. Disconnect the negative leads from the batteries or, if the vehicle is equipped with a battery disconnect switch, turn the switch to the off position.

4. Cut new wires to the required length to reach the left- and right-rear turn signal lights. Be sure to have enough length for routing the wires and installing cable terminals.

5. Crimp a terminal and terminal seal to one end of each of the wires.

6. Locate and disconnect connector C1 of the CHM. See Fig. 1.

7. Remove the seals from cavities G and P of CHM connector C1.

8. Install the wire for the left turn signal light into cavity G. Make sure the terminal is fully seated.

9. Install the wire for the right turn signal light into cavity P. Make sure the terminal is fully seated.

10. Route the new turn signal light wires to the rear of the truck. Use a split loom to protect the wires and tie-strap the loom to the existing harness where appropriate.

11. Connect wires to the rear turn signal lights.

12. Connect the negative leads to the batteries or, if the vehicle is equipped with a battery disconnect switch, turn the switch to the on position.

IMPORTANT: When converting a vehicle from combination stop/turn signal lights to separate stop/turn signal lights, you must follow the conversion information in Table 1 exactly. Using a different reference parameter may result in incorrect operation of either the rear lights or daytime running lights (DRL) and may have legal consequences for the vehicle owner, which may include fines and having vehicles placed out of service. The regulations in the Federal Motor Vehicle Safety Standards (FMVSS) and Canadian Motor Vehicle Safety Standards (CMVSS) control rear lighting and DRL functionality. Some jurisdictions enforce these regulations during vehicle inspections.

13. Using ServiceLink, apply the appropriate reference parameter to the vehicle. See Table 1.

14. Verify the proper operation of the lights.

15. Remove the chocks from the tires.

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| Reference Parameters for a Conversion from Combination to Separate Stop/Turn Signal Lights |
|-----------------------------------------------|-----------------------------------------------|
| **Existing Parameter** | **New Parameter** |
| 26-01020-000 or 26-01020-010 | 26-01020-004 or 26-01020-009 |
| 26-01020-001 | 26-01020-003 |
| 26-01020-006 | 26-01020-007 |
| 26-01020-012 | 26-01020-013 |

Table 1. Reference Parameters for a Conversion from Combination to Separate Stop/Turn Signal Lights
Lighting Interfaces – Taillight Converting

Converting Separate to Combination Stop/Turn Signal Lights

1. Shut down the engine, apply the parking brakes, and chock the tires.
2. Locate the existing turn signal wires where they terminate at the rear turn signal lights.
   2.1 Cut the wires.
   2.2 Apply heat shrink to the chassis side of the wires to seal the wire.
   2.3 Tuck the wires into the harness loom.
3. Locate the existing stop light wires where they terminate at the stop lights.
   3.1 Route the wires as needed to the new combination stop/turn signal lights.
   3.2 Use convoluted tubing to protect the wires, and use tie-strap to secure the wires to the existing harness.

   NOTE: If the total current draw for the combination stop/turn signal light circuit on either side will exceed 8.7 amps, install relays.

   IMPORTANT: When converting a vehicle from separate stop/turn signal lights to combination stop/turn signal lights, you must follow the conversion information in Table 2 exactly. Using a different reference parameter may result in incorrect operation of either the rear lights or daytime running lights (DRL) and may have legal consequences for the vehicle owner, which may include fines and having vehicles placed out of service. The regulations in the Federal Motor Vehicle Safety Standards (FMVSS) and Canadian Motor Vehicle Safety Standards (CMVSS) control rear lighting and DRL functionality. Some jurisdictions enforce these regulations during vehicle inspections.

4. Using ServiceLink, apply the appropriate reference parameter to the vehicle. See Table 2.
5. Verify the correct operation of the lighting.
6. Remove the chocks from the tires.

Table 1, Stop/Turn Signal Light Reference Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>26-01020-000</td>
<td>Combination stop/turn signal</td>
</tr>
<tr>
<td>26-01020-001</td>
<td>Combination stop/turn signal with DRL</td>
</tr>
<tr>
<td>26-01020-002</td>
<td>Combination stop/turn signal</td>
</tr>
<tr>
<td>26-01020-003</td>
<td>Separate stop/turn signal with DRL</td>
</tr>
<tr>
<td>26-01020-004</td>
<td>Separate stop/turn signal</td>
</tr>
<tr>
<td>26-01020-006</td>
<td>Combination stop/turn signal with DRL</td>
</tr>
<tr>
<td>26-01020-007</td>
<td>Separate stop/turn signal with DRL</td>
</tr>
<tr>
<td>26-01020-009</td>
<td>Separate stop/turn signal</td>
</tr>
<tr>
<td>26-01020-010</td>
<td>Combination stop/turn signal</td>
</tr>
<tr>
<td>26-01020-011</td>
<td>Combination stop/turn signal</td>
</tr>
<tr>
<td>26-01020-012</td>
<td>Combination stop/turn signal with DRL</td>
</tr>
<tr>
<td>26-01020-013</td>
<td>Separate stop/turn signal with DRL</td>
</tr>
<tr>
<td>26-01020-014</td>
<td>Combination stop</td>
</tr>
<tr>
<td>26-01020-015</td>
<td>Separate stop</td>
</tr>
<tr>
<td>26-01020-018</td>
<td>Combination stop/turn signal with DRL, front side marker and taillight on with DRL</td>
</tr>
</tbody>
</table>

Table 2, Reference Parameters for a Conversion from Separate to Combination Stop/Turn Signal Lights

<table>
<thead>
<tr>
<th>Existing Parameter</th>
<th>New Parameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>26-01020-004 or 26-01020-009</td>
<td>26-01020-000 or 26-01020-010</td>
</tr>
<tr>
<td>26-01020-003</td>
<td>26-01020-001</td>
</tr>
<tr>
<td>26-01020-007</td>
<td>26-01020-006</td>
</tr>
<tr>
<td>26-01020-013</td>
<td>26-01020-012</td>
</tr>
<tr>
<td>26-01020-015</td>
<td>26-01020-014</td>
</tr>
</tbody>
</table>
Body Builder and Trailer PDM’s

- Body Builder and Trailer PDM’s relocated from Chassis Frame to Cab
- Avoids the harsh rail environment.
- New location is back wall behind Driver’s seat.
- Factory Pass through provided for Power outputs to chassis.
- Body Builder Connectors on Frame at BOC or EOF
Body Builder Lighting – Module 353

- Vehicle Interface Lighting Connector Change (High Amperage option only)
  - 353-026 VEHICLE INTERFACE WIRING AND PDM WITH BODY BUILDER CONNECTOR, BACK OF CAB
  - 353-027 VEHICLE INTERFACE WIRING AND PDM WITH BODY BUILDER CONNECTOR AT END OF FRAME

2007 EPA Trucks

2010 EPA Trucks
Body Builder Lighting – Module 353

- High Amperage Vehicle Interface Lighting Output Change – Data Codes 353-026 & 353-027
- Additional Outputs for 2010
  - 2 - 20 Amp Battery Outputs  
  - 1 - 20 Amp Ignition Output

2007 EPA Trucks

<table>
<thead>
<tr>
<th>Connector Pin</th>
<th>Signal Name</th>
<th>Signal Type</th>
<th>Circuit Color</th>
<th>Circuit Number</th>
<th>Current Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-5</td>
<td>Ground</td>
<td>Ground</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Ground</td>
<td>Ground</td>
<td>BK</td>
<td>GND 2</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Backup Light</td>
<td>+12V via PDM Fuse 2 (20A) With relay 1 (backup light) active.</td>
<td>DKBL</td>
<td>120B</td>
<td>20A</td>
</tr>
<tr>
<td>8*</td>
<td>Right Stop Light</td>
<td>+12V via PDM Fuse 4 (20A) With relay 2 (right stop light) Active.</td>
<td>R-W</td>
<td>36</td>
<td>20A</td>
</tr>
<tr>
<td>9</td>
<td>Ground</td>
<td>Ground</td>
<td>BK</td>
<td>GND 1</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Right Stop Light or Right Stop/ Turn Light</td>
<td>+12V via PDM Fuse 6 (20A) With relay 3 (right turn light) Active.</td>
<td>DKG</td>
<td>38R</td>
<td>20A</td>
</tr>
<tr>
<td>11</td>
<td>Ground</td>
<td>Ground</td>
<td>BK</td>
<td>GND 2</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Left Taillight</td>
<td>+12V via PDM Fuse 1 (20A) With relay 4 (left taillight) active.</td>
<td>BR</td>
<td>23A</td>
<td>20A</td>
</tr>
<tr>
<td>13</td>
<td>Ground</td>
<td>Ground</td>
<td>BK</td>
<td>GND 2</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Left Taillight</td>
<td>+12V via PDM Fuse 5 (20A) With relay 5 (left stop light) active.</td>
<td>Y</td>
<td>38L</td>
<td>20A</td>
</tr>
<tr>
<td>15</td>
<td>Ground</td>
<td>Ground</td>
<td>BK</td>
<td>GND 1</td>
<td></td>
</tr>
</tbody>
</table>

2010 EPA Trucks

<table>
<thead>
<tr>
<th>Connector Pin</th>
<th>Signal Name</th>
<th>Signal Type</th>
<th>Circuit Color</th>
<th>Circuit Number</th>
<th>Current Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Tail Lamp</td>
<td>+12V via PDM Fuse 7 With Relay 1 Active</td>
<td>BR</td>
<td>23</td>
<td>20A</td>
</tr>
<tr>
<td>2</td>
<td>Back Up Lamp</td>
<td>+12V via PDM Fuse 12 With Relay 2 Active</td>
<td>DKBL</td>
<td>120B</td>
<td>20A</td>
</tr>
<tr>
<td>3</td>
<td>Left Stop Lamp</td>
<td>+12V via PDM Fuse 1 With Relay 3 Active</td>
<td>DKG</td>
<td>38R</td>
<td>20A</td>
</tr>
<tr>
<td>4</td>
<td>Right Stop Lamp</td>
<td>+12V via PDM Fuse 6 With Relay 4 Active</td>
<td>R-W</td>
<td>36P</td>
<td>20A</td>
</tr>
<tr>
<td>5</td>
<td>Left Stop Lamp</td>
<td>+12V via PDM Fuse 2 With Relay 5 Active</td>
<td>R-W</td>
<td>36N</td>
<td>20A</td>
</tr>
<tr>
<td>6</td>
<td>Left Taillamp</td>
<td>+12V via PDM Fuse 5 With Relay 6 Active</td>
<td>Y</td>
<td>38L</td>
<td>20A</td>
</tr>
<tr>
<td>7</td>
<td>Marker Lamp</td>
<td>+12V via PDM Fuse 3 With Relay 7 Active</td>
<td>BR</td>
<td>46B</td>
<td>20A</td>
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<tr>
<td>8</td>
<td>Left Taillight</td>
<td>+12V via PDM Fuse 4 With Relay 8 Active</td>
<td>PK</td>
<td>52F</td>
<td>20A</td>
</tr>
<tr>
<td>9</td>
<td>Battery Power</td>
<td>+12V via PDM Fuse 11 With Relay 9 Active</td>
<td>R</td>
<td>14U</td>
<td>20A</td>
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<tr>
<td>10</td>
<td>Battery Power</td>
<td>+12V via PDM Fuse 8 With Relay 10 Active</td>
<td>R</td>
<td>14U</td>
<td>20A</td>
</tr>
</tbody>
</table>
Transmission Interface - Module 34C

- Transmission Interface is a Convenience Package
- Allows Body Builders to access Features of the Allison transmission at a convenient location
- The option provides a harness that connects circuits from the Inputs and Outputs of the Allison Transmission Control Module to a Connector the Body Builder can access
- Connector can be located in 3 different places:
  - Firewall Mounting
  - Back of Cab (Left Hand Frame Rail)
  - End of Frame
- Data Codes

<table>
<thead>
<tr>
<th>Data Book Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>34C-001</td>
<td>Transmission Interface Harness at the Frontwall</td>
</tr>
<tr>
<td>34C-002</td>
<td>Transmission Interface Harness at Back of Cab</td>
</tr>
<tr>
<td>34C-003</td>
<td>Transmission Interface at End of Frame</td>
</tr>
</tbody>
</table>
Transmission Interface - Module 34C

- The transmission interface harness changes depending on whether the Truck Spec has a 1000/2000 Series or a 3000/4000 Series transmission.

- The transmission interface harness provides most of the optional I/O circuits, and the speedometer signal.
Power Distribution Road Map

[Diagram of Power Distribution System with labels for various components such as ECM, ICU, TCM, Main PNDB, Main PDM, BHM, Powertrain PDM, CHM, Battery, Engine Connector, Transmission Connector, Trailer Connector, Body Lighting Conn, and Tail Lights.]

Chassis Module Outputs:
- C4-D: Left Marker Lamp
- C4-C: Left Park Lamp
- C3-N: Turn Left Front/Slide
- C3-S: Turn Right Front/Slide
- C3-L: Right Low Beam
- C4-K: Right High Beam
- C4-F: Left DRL
- C3-C: Optional Fog/Road Lamps
- C3-D: Optional Fog/Road Lamps
- C5-H: AMI Solenoid #0
- C5-J: AMI Solenoid #1
- C5-L: AMI Solenoid #2
- C5-M: AMI Solenoid #3
- C3-A: Optional Fuel Water Separator Heater

Bulkhead Module Outputs:
- B1.F: Ignition (ABS)
- B2.L: Ignition (Tires)
- B1.E: SPARE (Utility Light/Spotlight)
- B6.M: SPARE (Utility Light/Spotlight)
- B5.D: Instrument Cluster
- B5.B: Dome Lamps Switched
- B1.L: Left High Beam
- B1.R: Right Low Beam
- B3.C: Clearance Lamps
- B3.K: Tail License Plate/Tail Relay
- B3.F: Wiper High
- B3.H: Wiper Low
- B5.A: Battery (Dome Lamps)
- B7.A.12: Battery (Switches)
- B6.A8: Ignition (VCU)
- B2.K: Ignition (Engine)

2010 M2 Electrical Body Builder Reference Page # 4 Rev: New
Remote Engine Interface & PTO Controls

• The Remote Engine Interface Controls and PTO Controls work in conjunction with each other
  • Remote Engine Interface – Controls the RPM of the engine.
  • PTO Controls – Controls the engagement of the PTO.

• Both Remote Engine Interface and PTO Controls can have independent functional interlocks.

• Interlocks are conditions that have to be met prior to a function engaging
  • Neutral Interlock
  • Park Brake Interlock
  • Customer Supplied signal
Remote Engine Interface - Module 148, 163, 87L

- Remote Engine Interface is a Convenience Package
- Allows Body Builders to access Electronic Features of either a Cummins, MBE or DD Engine at a convenient location
- The option provides a harness that connects circuits from the Inputs and Outputs of the Engine Control Module to a Connector the Body Builder can access
- The optional features provided by this harness include:
  - Fast Idle
  - Increment/Decrement
  - Multiple Fixed Set Speeds
  - Variable RPM Throttle

<table>
<thead>
<tr>
<th>Cavity</th>
<th>Circuit</th>
<th>Circuit Description</th>
<th>Engine</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>483Z</td>
<td>Sensor Common Ground With Interlock</td>
<td>All engines</td>
</tr>
<tr>
<td>2</td>
<td>439U</td>
<td>Remote PTO</td>
<td>All engines</td>
</tr>
<tr>
<td>3</td>
<td>492U</td>
<td>Cruise Control PTO Remote On/Off</td>
<td>All engines except CAT</td>
</tr>
<tr>
<td>4</td>
<td>483A</td>
<td>PTO Set</td>
<td>All engines</td>
</tr>
<tr>
<td>5</td>
<td>483B</td>
<td>PTO Resume</td>
<td>All engines</td>
</tr>
<tr>
<td>6</td>
<td>439V1</td>
<td>PTO Set Speed A Signal</td>
<td>Detroit Diesel, Mercedes, CAT (M2 only)</td>
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<tr>
<td>6</td>
<td>483R</td>
<td>Maximum Operating Speed/Governor</td>
<td>Cummins only</td>
</tr>
<tr>
<td>7</td>
<td>439V2</td>
<td>PTO Set Speed B Signal</td>
<td>Detroit Diesel, Mercedes, CAT (M2 only)</td>
</tr>
<tr>
<td>8</td>
<td>483E</td>
<td>Tachometer + Signal, Engine rpm</td>
<td>All engines</td>
</tr>
<tr>
<td>9</td>
<td>483F</td>
<td>Tachometer – Signal, Engine rpm</td>
<td>Caterpillar only</td>
</tr>
<tr>
<td></td>
<td>492Z</td>
<td>Throttle Inhibit</td>
<td>Detroit Diesel and Mercedes-Benz only</td>
</tr>
<tr>
<td>10</td>
<td>483N</td>
<td>Remote Throttle On/Off</td>
<td>All engines except CAT</td>
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<tr>
<td>11</td>
<td>483C</td>
<td>Remote Throttle Signal</td>
<td>All engines</td>
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<td>12</td>
<td>483D</td>
<td>Remote Throttle Power</td>
<td>All engines</td>
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<tr>
<td>13</td>
<td>492Y</td>
<td>Remote Signal Ground</td>
<td>All engines</td>
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<tr>
<td>14</td>
<td>492W</td>
<td>PTO Active</td>
<td>Caterpillar only</td>
</tr>
<tr>
<td>15</td>
<td>Optional</td>
<td>Optional Circuit</td>
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</tr>
<tr>
<td>16</td>
<td>Optional</td>
<td>Optional Circuit</td>
<td>All engines</td>
</tr>
</tbody>
</table>
Remote Engine Interface - Module 148, 163, 87L

- The option is spec’d by using a combination of 3 different data codes
  - Module 148 – Determines the type of Remote Throttle
  - Module 163 – Determines the location of Interface Connector
  - Module 87L – Determines the Interlock requirements

<table>
<thead>
<tr>
<th>Data Book Code</th>
<th>Description</th>
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<tbody>
<tr>
<td>148-070</td>
<td>ERIH With Fixed Single Speed</td>
</tr>
<tr>
<td>148-071</td>
<td>ERIH With Increment/Decrement</td>
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<tr>
<td>148-072</td>
<td>ERIH With Multiple Set Speeds</td>
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<tr>
<td>148-073</td>
<td>ERIH for Remote Throttle</td>
</tr>
<tr>
<td>163-001</td>
<td>ERIH at Back of Cab</td>
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<tr>
<td>163-002</td>
<td>ERIH at End of Frame</td>
</tr>
<tr>
<td>163-003</td>
<td>ERIH at End of Frame w/6-ft Harness</td>
</tr>
<tr>
<td>163-004</td>
<td>ERIHs in Engine Compartment</td>
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<tr>
<td>163-005</td>
<td>ERIH Behind Front Bumper</td>
</tr>
<tr>
<td>163-006</td>
<td>ERIH Inside the Cab Under the Dash</td>
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<tr>
<td>87L-001</td>
<td>ERIH With Park Brake Interlock</td>
</tr>
<tr>
<td>87L-003</td>
<td>ERIH With Park Brake and Neutral Interlocks</td>
</tr>
<tr>
<td>87L-005</td>
<td>ERIH Without Interlocks</td>
</tr>
</tbody>
</table>
Remote Engine Interface - Module 148, 163, 87L

- Feature Descriptions
  - Remote PTO – This feature is useful when set programmed engine speeds are required. (Cummins – 5 Set Speeds, DD/MBE – 3 Set Speeds)
  - Remote Throttle – This feature provides ability for the installation of a Remote Variable throttle.
  - Throttle Inhibit – This feature prevents the engine from responding to the foot pedal or remote throttle.
PTO Controls – Module 372

- PTO Controls – Provide the combination of wiring and pneumatic plumbing to engage the PTO.

- Data Code Descriptions can be misleading
  - “Electric/Air” does not necessarily mean Electric over air
  - We can accommodate
    - Electric over air
    - Electric over hydraulic
    - Dual PTO Controls
    - Double Shift

- PTO Wiring and Plumbing are Driven by 4 Modules
  - 372 Module – Control and Interlock Scheme
  - 362 Module – PTO to be installed
    - Factory
    - Customer Supplied
  - 363 Module – PTO Mounting Location
  - 342 Module – Transmission Type
Remote Start/Stop – Module 157

- Data Codes
  - 157-004 - MANUAL REMOTE ENGINE START/STOP
  - 157-007 - MANUAL REMOTE ENGINE START/STOP WITH PTO RE-ENGAGE
- Functionality
  - 157-004 - The functionality includes a dash mounted "Machine Mode" switch that when engaged in the on position allows the driver to exit the cab and remotely stop the engine and subsequently later remotely restart the engine without having to re-enter the cab.
  - 157-007 - Same as -004 with additional functionality added that allows for the PTO to also be re-engaged automatically after re-start is completed.
- Feature is Interlocked with Park Brake and Transmission Neutral.
- Interface point for the Body Builder is the Remote Engine Interface connector
- Not available with Manual transmission