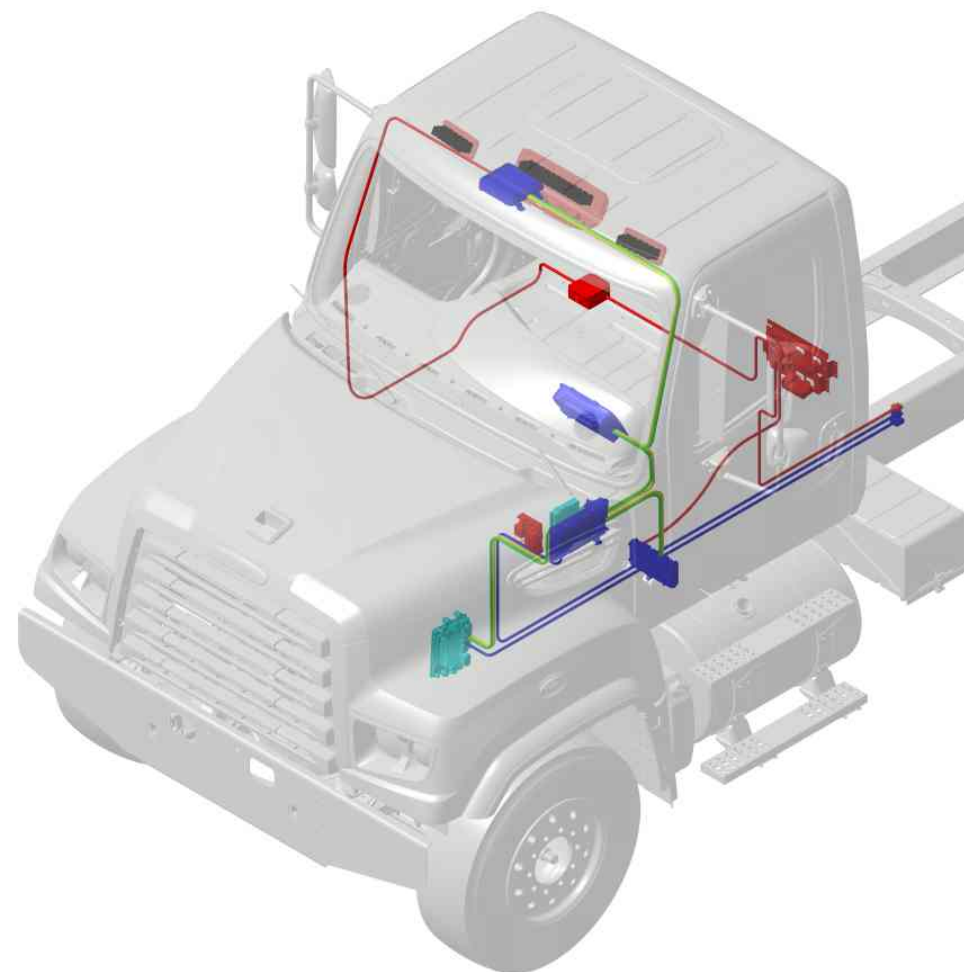




EPA 2010 Models

Electrical System Overview

EPA 2010 Electrical Models - M2106, M2112, 108SD, 114SD



Body Builder Reference Guide



EPA 2010 Models

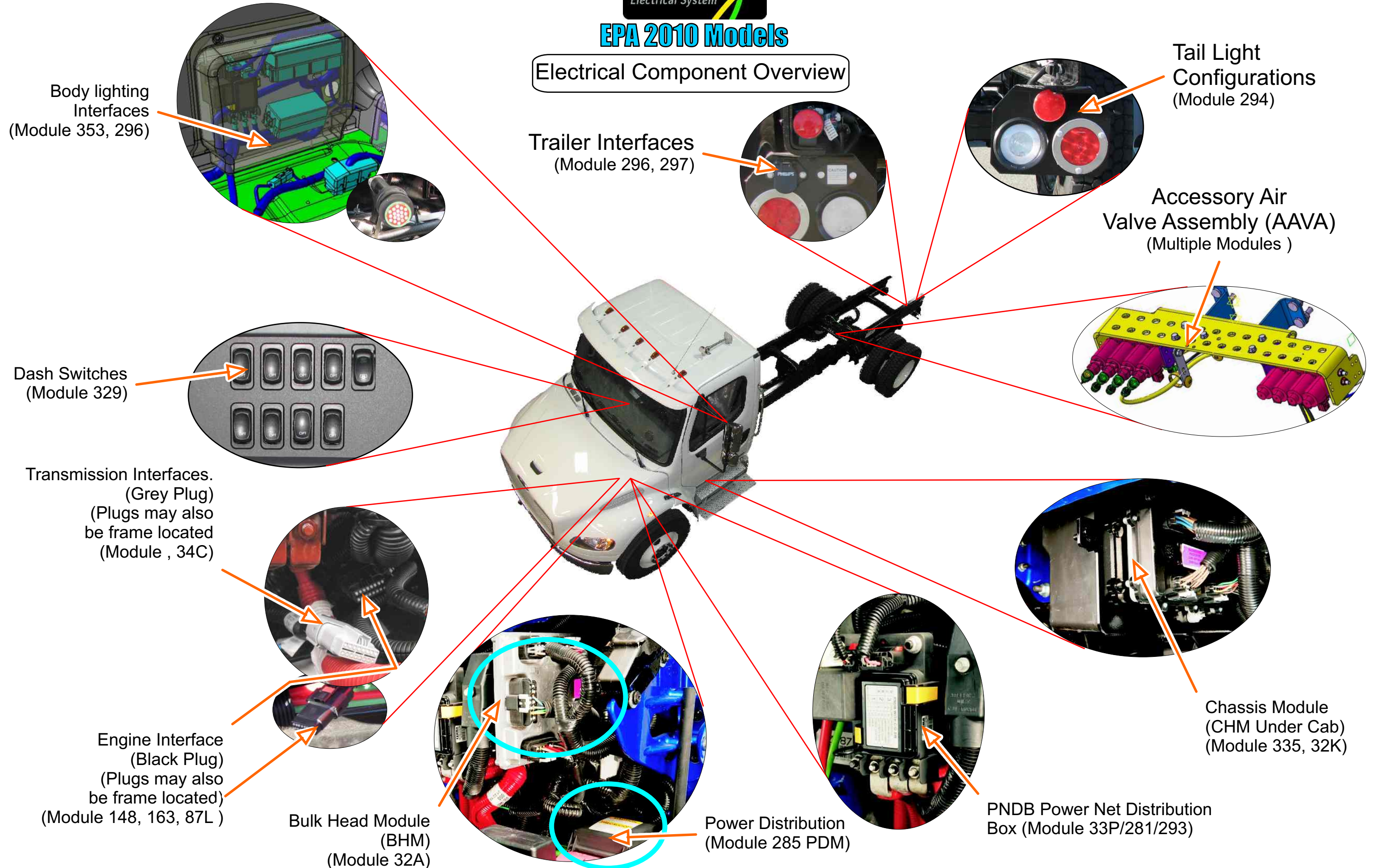
Electrical System Overview

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Page 21	High Current Switch Label Options	Page 42	SmartPlex VDR Connections

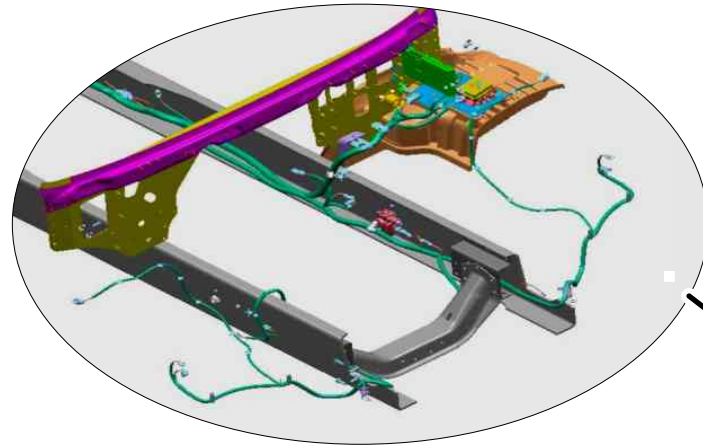
EPA 2010 Models

Electrical Component Overview



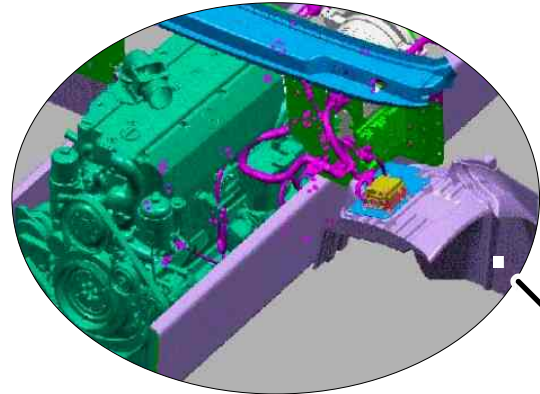
EPA 2010 Models

Electrical Harness Overview



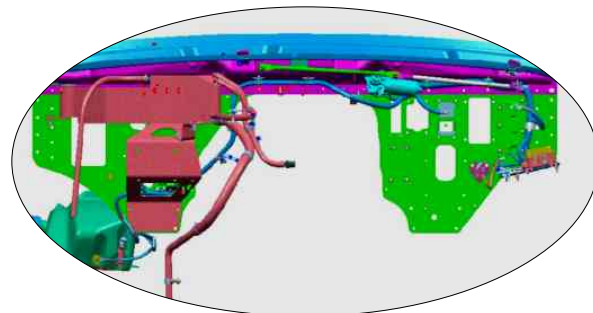
FORWARD CHASSIS HARNESS **Module 288**

- 1) Connections to Bulkhead module and Underhood PDM
- 2) Connections to headlamps
- 3) Connections to side marker/turn lamps
- 4) Connections to Chassis Module



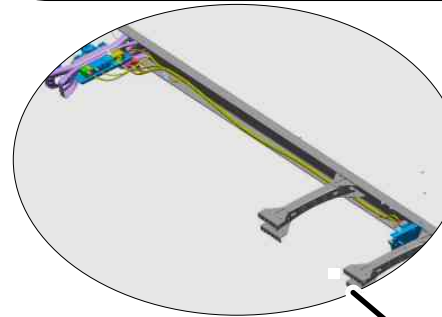
POWERTRAIN HARNESS **Module 286, 283**

- 1) Connections to the Bulkhead Module and Underhood PDM



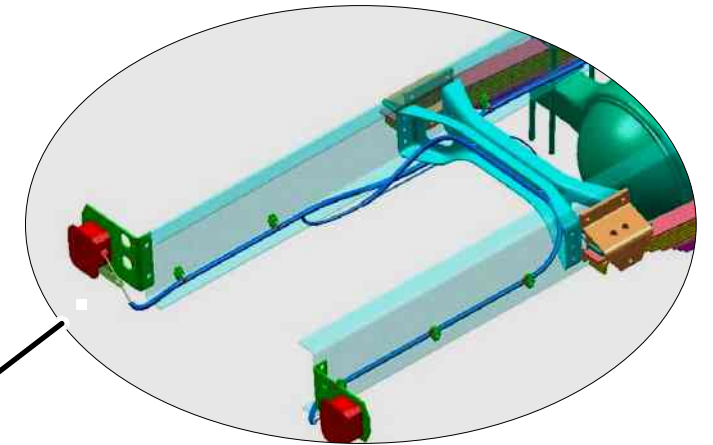
FRONTWALL HARNESS **Module 321**

- 1) Connections to Bulkhead Module and Underhood PDM
- 2) Connection to Starter Mag Switch
- 3) Connection to Wiper Motor
- 4) Connection to the low coolant level sensor and horn (under surge tank)
- 5) Connection under cab to Washer pump and level switch
- 6) Pass-thru connector to Main Cab Harness and Powertrain Harness



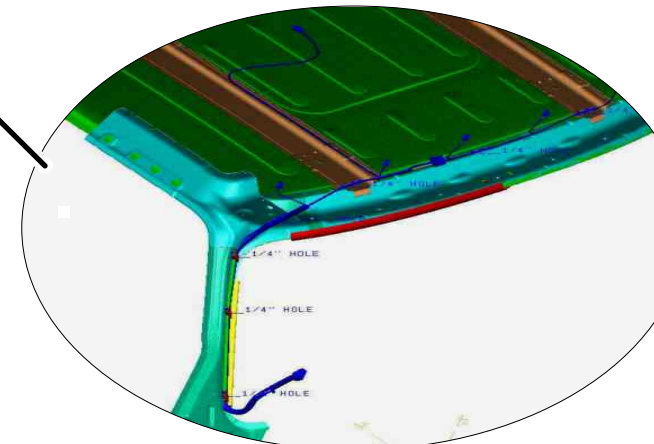
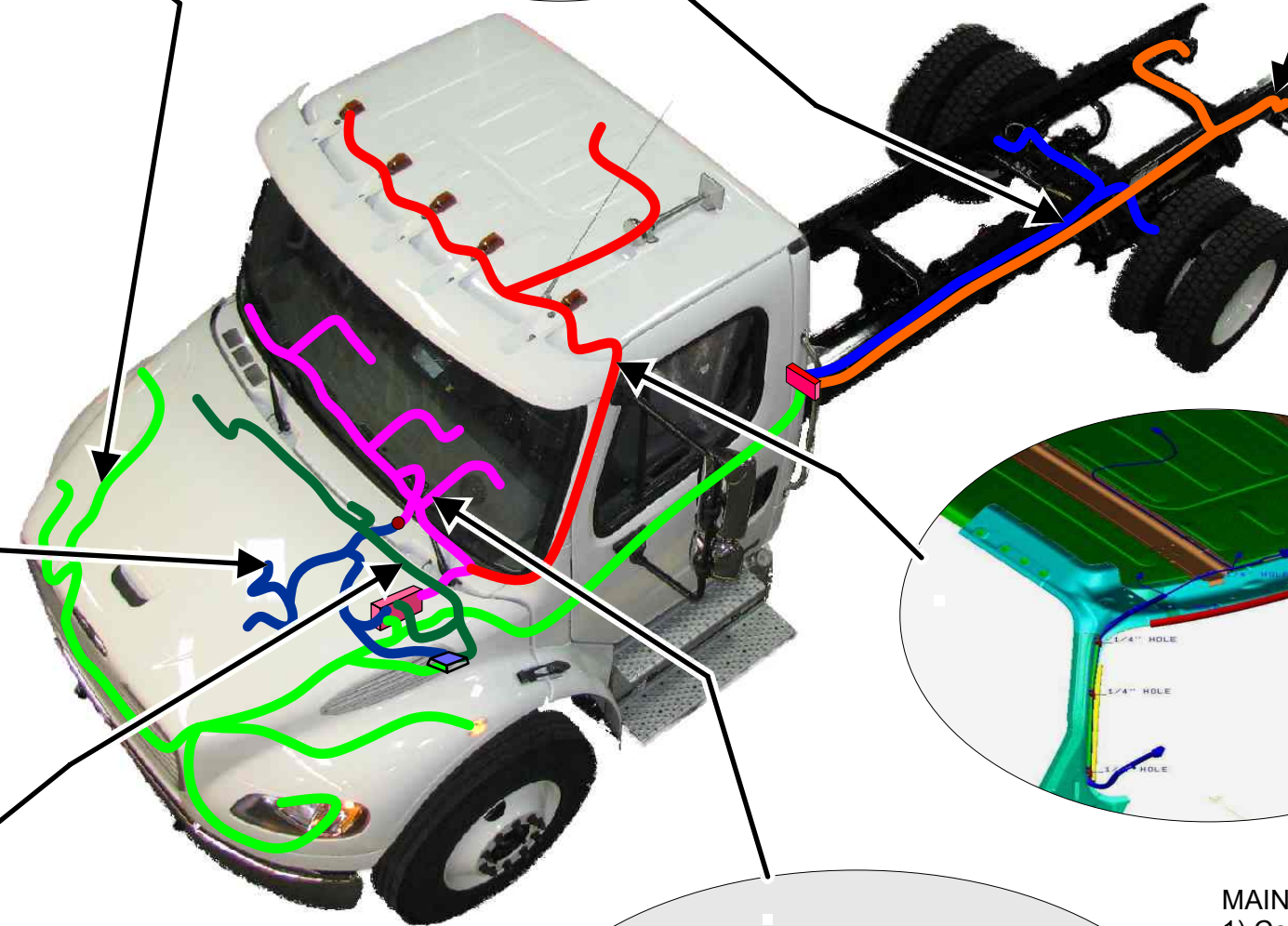
ABS/AMU HARNESS **Module 332**

- 1) Connections to Forward chassis harness and frame ground studs near Chassis module
- 2) Connections to AMU (Mod 877 without ABS)
- 3) Connections to Wabco ABS ECU
- 4) Connections to rear combo valves



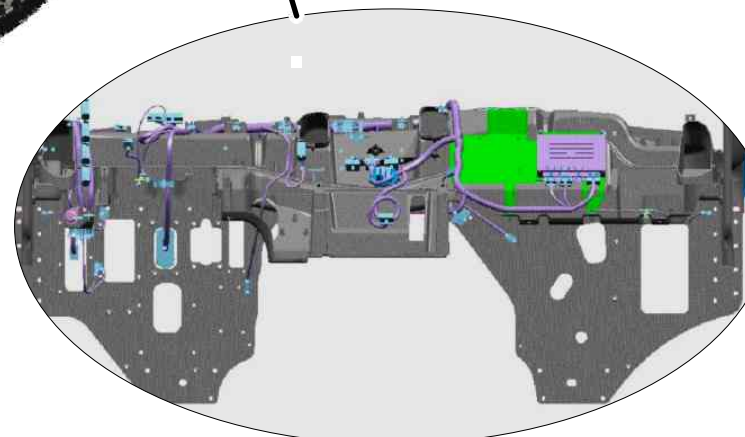
AFT CHASSIS HARNESS **Module 28A**

- 1) Connections to Chassis Module
- 2) Connections to tail lamps



OVERHEAD CAB HARNESS **Module 287**

- 1) Inline connection to Main cab Harness (at bottom of A pillar)
- 2) Connections to Marker Lamps
- 3) Connections to Dome Lamp



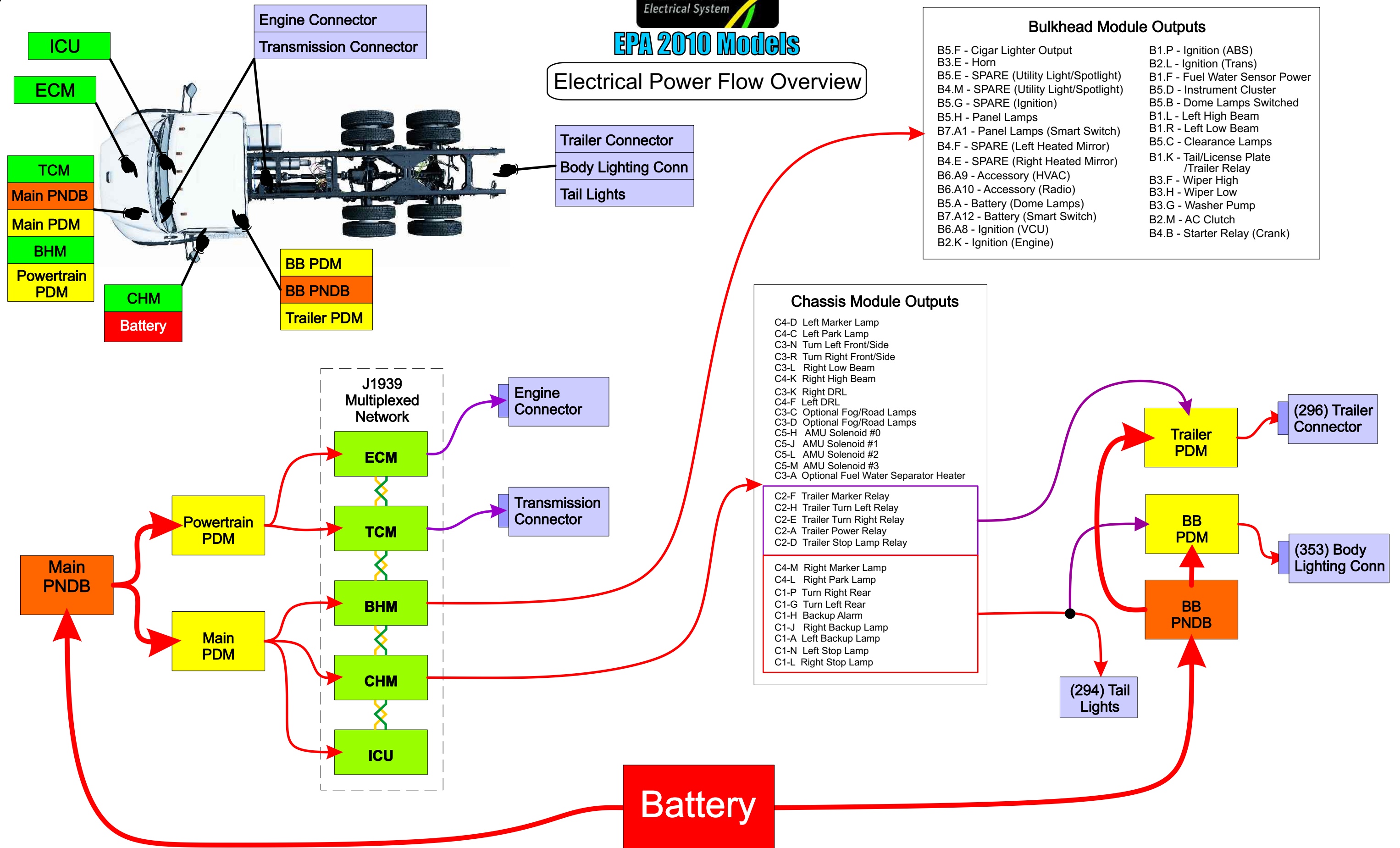
MAIN CAB HARNESS **Module 320**

- 1) Connections to bulkhead connector
- 2) Connections to diagnostic connector (behind ignition switch)
- 3) Connections to CPC
- 4) Pass-thru connector to engine compartment
- 5) Gauge Cluster
- 6) HVAC unit and controller
- 7) Steering wheel horn and windshield wiper



EPA 2010 Models

Electrical Power Flow Overview



Power Net Distribution Box (PNDB)

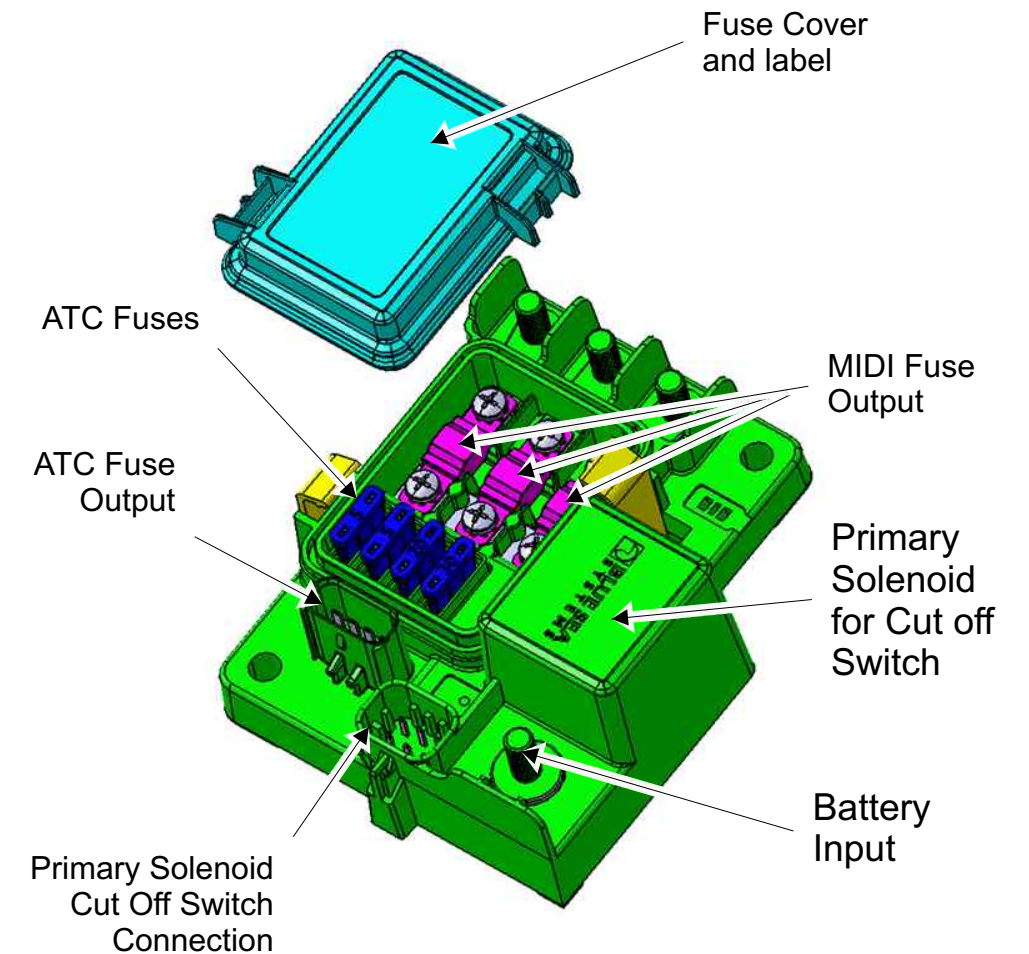
The PNDB is a new power delivery designed for the SmartPlex system to deliver more consistent and better protected power from the battery to the other components on the truck.

The PNDB also has protected keep alive circuits that maintain power even with the cutoff switch is in the off position. The primary reason for this change is to provide power to the 2010 DEF purge system which drains urea from the delivery system and prevents the system from freezing during cold conditions.

The PNDB located at the front wall is equipped with three MIDI fuses which supply power to the Main Power Distribution Module. These fuse connections have been relocated from the battery in 2010 to prevent corrosion and improve the trucks reliability in severe conditions.

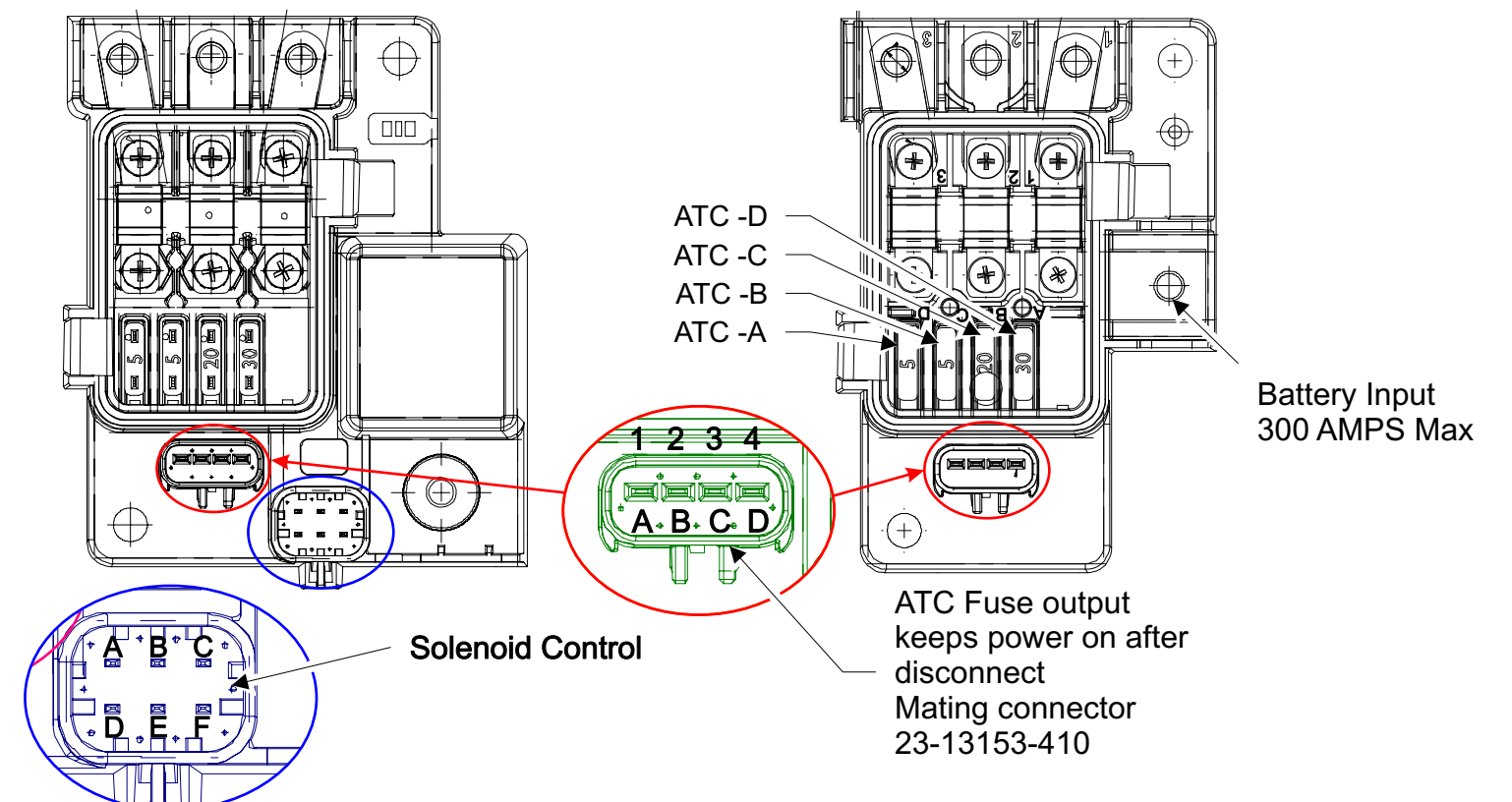
A secondary PNDB is available as an option for the body builder and will be located with the trailer and bodybuilder PDM located in the cab behind the drivers seat on day cabs or under the rear bench seat for crew cab units.

PNDB Power Net Distribution Box



CONNECTOR	PIN	DESCRIPTION
X2 KEEP ALIVE CIRCUIT	1	AFTER TREATMENT ECU
	2	EMERGENCY POWER
	3	RADIO AND CLOCK
	4	ALTERNATOR REMOTE SENSE
X1 SOLENOID CONTROL	A	GROUND
	B	SIGNAL OFF
	C	LED INDICATOR
	D	SIGNAL ON
	E	SIGNAL RETURN
	F	GROUND

Fuse	Description	Function	Rating	Max. Fuse Allowed
ATC-A	Keep Alive Power	After Treatment ECU	30 AMPS	30 AMPS
ATC-B	Keep Alive Power	Emergency Power	20 AMPS	30 AMPS
ATC-C	Keep Alive Power	Radio and Clock	5 AMPS	30 AMPS
ATC-D	Keep Alive Power	Alternator Remote Sense	5 AMPS	30 AMPS
MIDI-1 (Fuse 1)	High AMP Fuse	Powertrain PDM	175 AMPS	200 AMPS
MIDI-2 (Fuse 2)	High AMP Fuse	PDM #2	125 AMPS	200 AMPS
MIDI-3 (Fuse 3)	High AMP Fuse	PDM #1	125 AMPS	200 AMPS



Positive Disconnect Switch

The disconnect switch system for 2010 has been reconfigured to provide better application coverage and offer two levels of power disconnect based on the options ordered with the truck.

In cab disconnect switches will be offered in a locking or non locking configuration.

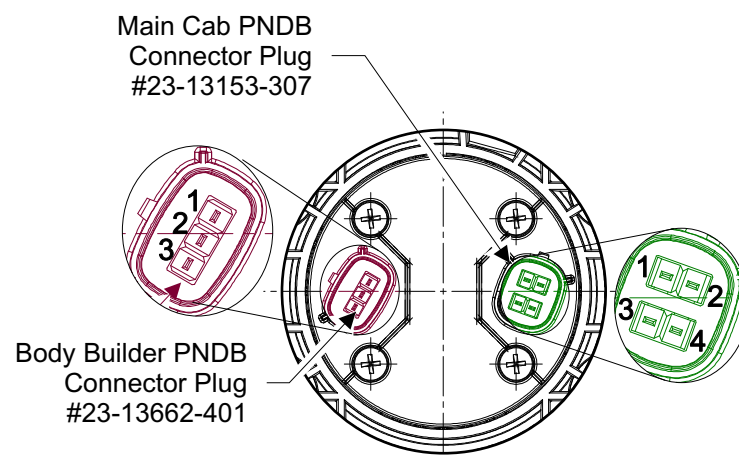
Exterior battery mounted switches will be offered in the locking configuration only.

Cutoff switches are equipped with red LED lights, which are illuminated when power is on.

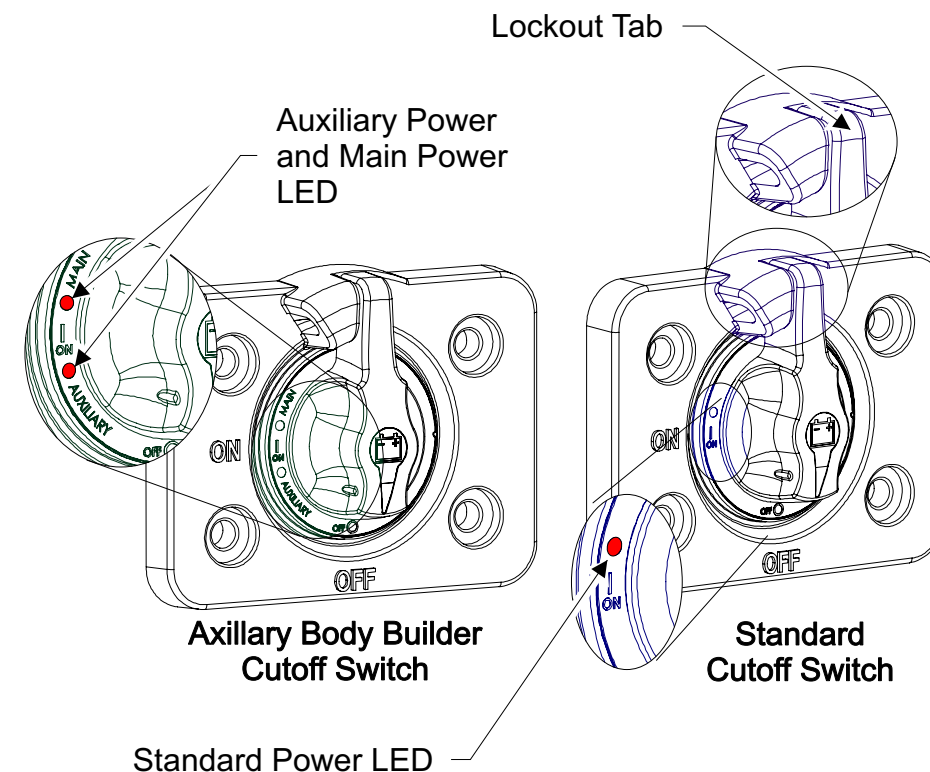
Trucks equipped with the body builder auxiliary power system will have an additional LED light on the switch.

Note: Both PNDB units will be deactivated when the switch is in the off position.

Positive Cutoff Switch



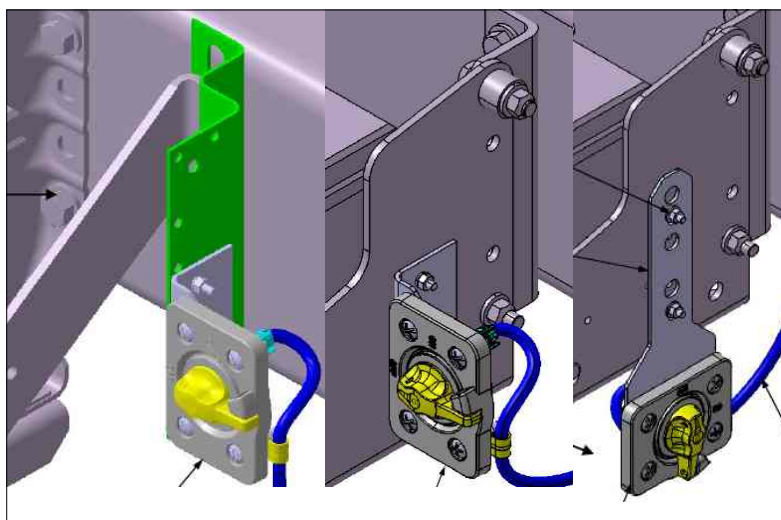
CONNECTOR	PIN	DESCRIPTION
X1, Main PNDB	1	ON SIGNAL
	2	RETURN SIGNAL
	3	LED INDICATOR
	4	OFF SIGNAL
X2, Aux PNDB	1	RETURN SIGNAL
	2	OFF SIGNAL
	3	LED INDICATOR



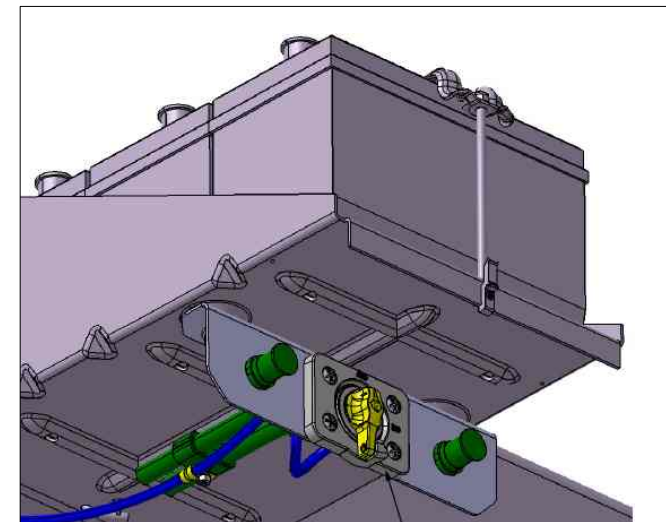
293-058	POSITIVE LOAD DISCONNECT W/CAB MTD CONTROL SWITCH MTD OB DR SEAT
293-060	POSITIVE LOAD DISCONNECT W/CAB MTD CTRL SW W/LOCKING PROV MTD OB DR DEAT
293-061	POSITIVE LOAD DISCONNECT W/BATTERY BOX CTRL SWITCH W/LOCKING PROVISION
293-057	NEGATIVE LOAD DISCONNECT W/CAB MTD DISCONNECT SWITCH
293-063	NEGATIVE LOAD DISCONNECT W/BATTERY BOX DISCONNECT SWITCH



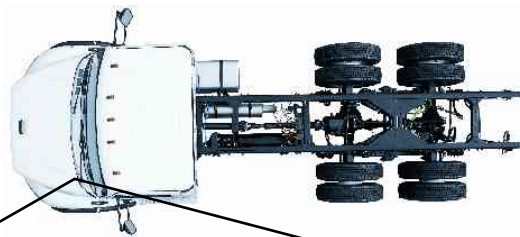
In Cab Mounted Disconnect
Switch Mounting
293-058



Battery Box Disconnect Switch Mounting
with box mounted air tanks
(brackets will vary depending on application)
293-061



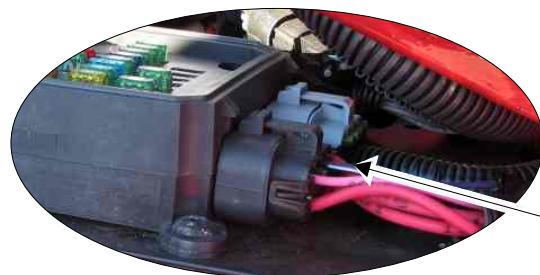
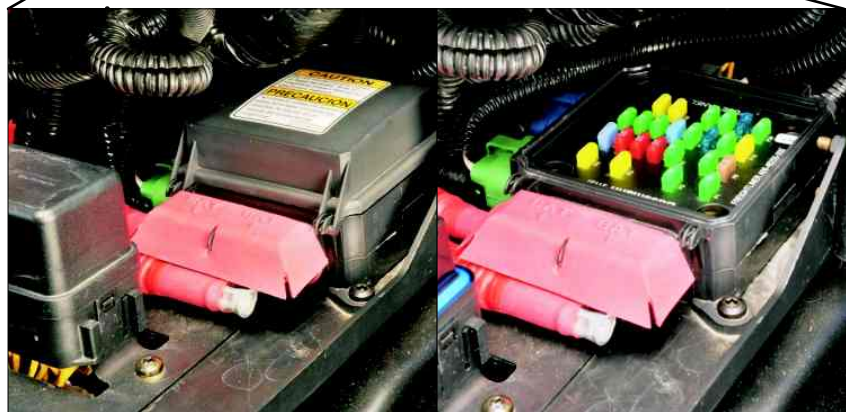
Battery Box Disconnect Switch Mounting
without box mounted air tanks
293-001, 293-061



BUSINESS CLASS M2
EPA 2010 Models

Main Power Distribution Module (PDM)

Pin part number for harness connection
23-13213-120 TERM-FEMALE,(20-16) PAC12077411
23-13213-121 TERM-FEMALE,(14-12) PAC12129493
23-13213-122 TERM-FEMALE,(10) PAC12077413



PDM Plugs contain output wires

Power Distribution Module Fuse Specifications*							
Fuse Location	MEGA Fuse	Output Connection	Primary Function	VBAT Fuse	Fuse Rating	Secondary Function	Fuse Rating
F1	1	Green A	Spare		{	{	{
F2	1	Green B	Blower Motor		30A	{	{
F3	2	Green H	Spare		{	{	30A
F4	2	Green G	Spare		{	{	30A
F5	1	Black D	Ignition Switch		5A	{	{
F6	1	Black C	Spare		{	Hydromax Relay	30A
F7	1	Gray F	Bulkhead Module	VBAT 5 BHM	30A	{	{
F8	2	Green C	ICU3-M2		10A	{	{
F9	2	Green D	Spare		{	{	30A+
F10	2	Blue G	Spare		{	{	{
		Green F					
F11	2	Blue H	Spare		{	{	{
F12	1	Black H	Radio/Diagnostic		20A	{	{
F13	1	Grey E	Chassis Module	VBAT 3 CHM	30A	{	{
F14	1	Black B	Spare		{	{	{
F15	2	Black A	Bulkhead Module	VBAT 4 BHM	30A	{	{
F16	2	Blue A	ABS ECU (pneumatic)		15A	ABS ECU (hydraulic)	25A
F17	2	Blue C	Chassis Module	VBAT 2 CHM	30A	{	{
F18	2	Blue B	Bulkhead Module	VBAT 3 BHM	30A	{	{
F19	2	Grey G	Chassis Module	VBAT 1 CHM	30A	{	{
F20	1	Black E	Bulkhead Module	VBAT 2 BHM	30A	{	{
F21	1	Black F	Spare		{	{	{
F22	1	Black G	Bulkhead Module	VBAT 1 BHM	30A	{	{
F23	1	Grey H	Spare		{	{	{
		Blue E					
F24	1	Grey D	Spare		{	Hydraulic Pump and Motor (hydraulic ABS)	25A
F25	2	Grey C	Spare		{	{	{
F26	2	Grey A	Spare		{	{	{
		Grey B					
		Blue D					

The main Power Distribution Module (PDM) distributes battery power to the various control modules on the vehicle.

The PDM contains mini fuses that protect the power feed circuits to these modules.

For most trucks there will be spare fuse slots available for customers to add additional wiring to the truck after it is purchased.

There are four plugs attaching to the module that supply output connections.

Common spare fuse sockets are listed below but may vary based on the options that have been requested.

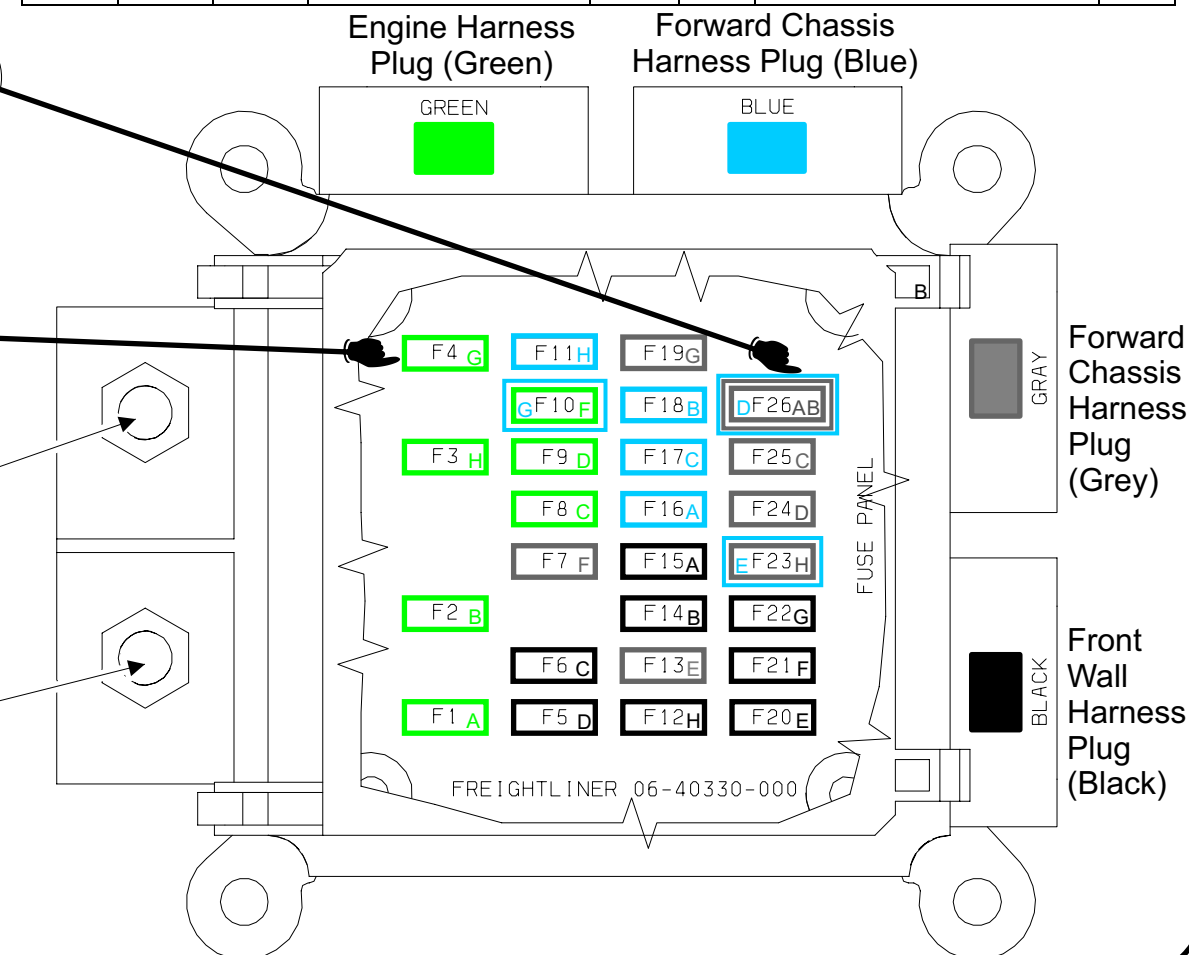
Common Spare Fuse locations
F6, F10, F11, F14, F21, F23, F25, F26

Multiple Wire output
Pin A & B on Grey
Plug and Pin D
on Blue Plug

Single Wire Output
found on Green
Plug in Pin G

PDM #1
(MIDI-3)

PDM #2
(MIDI-2)





EPA 2010 Models

PDM VBAT Fuse Coverage

VBAT Fuse System

BHM and CHM output pins are powered by multiple VBAT fuses through the main SmartPlex PDM unit. If one of these fuses is tripped or blown then all pins in the circuit will be affected.

For this reason seemingly unrelated issues can occur at the same time if a fuse is overloaded and trips.

The lists below show which pins are controlled with the VBAT fuses.

Chassis Module CHM

Power Supply Fuses and Associated Outputs for the Chassis Module				
CHM Power Input	CHM Power Input Pin	Fuse Supplying CHM Power Input	CHM Outputs Supplied	CHM Output Pin
Power In			Power Out	
VBAT1	C4.P	Fuse 19 (30A)	Right Low Beam	C3.L
			Turn Right Front/Side	C3.R
			Turn Right Rear	C1.P
			Right Stop Lamp	C1.L
			Left Stop Lamp	C1.N
			Right DRL	C3.K
			Fog/Road Lamps	C3.C/C3.D
			Trailer Turn Right	C2.E
VBAT2	C3.J	Fuse 17 (30A)	Left Park Lamp	C4.C
			Right Park Lamp	C4.L
			Left Marker Lamp	C4.D
			Right Marker Lamp	C4.M
			Trailer Marker Relay	C2.F
			Right High Beam	C4.K
			Left Backup Lamp	C1.A
			Right Backup Lamp	C1.J
			Backup Alarm	C1.H
			Turn Left Front/Side	C3.N
			Turn Left Rear	C1.G
			Left DRL	C4.F
VBAT3	C4.J	Fuse 13 (30A)	Trailer Turn Left	C2.H
			Fuel Water Separator Heater	C3.A
			AMU Solenoid 0	C5.H
			AMU Solenoid 1	C5.J
			AMU Solenoid 2	C5.L
			AMU Solenoid 3	C5.M

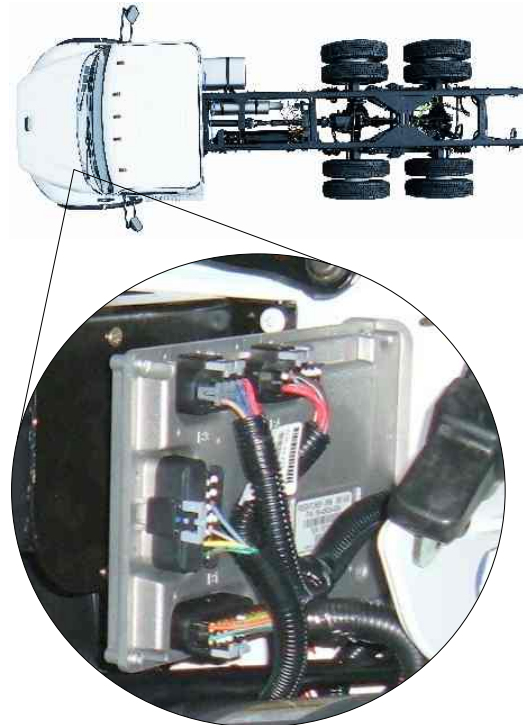
Bulkhead Module BHM

Power Supply Fuses and Associated Outputs for the Bulkhead Module				
BHM Power Input	BHM Power Input Pin	Fuse Supplying BHM Power Input	BHM Outputs Supplied	BHM Output Pin
Power In			Power Out	
VBAT1	B3.D	Fuse 22 (30A)	Battery (dome lamps)	B5.A
			Battery (smart switches)	B7.A12
			Ignition (VCU)	B6.A8
			Ignition (engine)	B2.K
			Ignition (ABS)	B1.P
			Ignition (trans)	B2.L
			Fuel Water Sensor Power	B1.F
			Dome Lamps Switched	B5.B
			Left Low Beam	B1.R
			A/C Clutch	B2.M
			Smart Switch 1 Indicator	B7.B4
			Smart Switch 2 Indicator	B7.B8
			Smart Switch 3 Indicator	B7.A5
			Smart Switch 4 Indicator	B7.A9
			Smart Switch 5 Indicator	B7.B10
VBAT2	B4.G	Fuse 20 (30A)	Battery (smart switch)	B7.A12
			Accessory (HVAC)	B6.A9
			Accessory (radio)	B6.A10
			Wake Up (instrument cluster)	B5.D
			Left High Beam	B1.L
			Wiper High	B3.F
VBAT3	B1.N	Fuse 18 (30A)	Horn	B3.E
			Wiper Low	B3.H
			Spare 8.0A HSD (ignition)	B5.G
			Panel Lamps	B5.H
VBAT4	B4.K	Fuse 15 (30A)	Panel Lamps (smart switch)	B7.A1
			Clearance Lamps	B5.C
			Tail Lamps/License Plate Lamp/Trailer Tail Relay	B1.K*
			Washer Pump	B3.G
VBAT5	B1.J	Fuse 7 (30A)	12V Output (cigar lighter)	B5.F
			Spare 8.5A (utility light/spotlight)	B5.E / B4.M
			Left Heated Mirror	B4.F
			Right Heated Mirror	B4.E



EPA 2010 Models

Bulk Head Module (BHM)



Pin part numbers for harness connection

Outside Cab Connections:
23-13212-120 TERM-FEMALE,(18-16) PAC153047191
23-13212-121 TERM-FEMALE,(14-12) PAC15304720
23-13212-122 TERM-FEMALE,(10) PAC15326004

Inside Cab Connections:
PAC12129494 TERM-FEMALE,(12-14)
PAC12034046 TERM-FEMALE,(16-18)

B2 Engine
Harness

B1 Forward Chassis
Harness

B3 Front
Wall Harness

B4 Front
Wall Harness

B5 Dash
Harness

B6 Dash
Harness

B7 Dash
Harness

The Bulkhead Module (BHM)

The BHM is the primary command module for the SmartPlex electrical system. The module controls the operation of the other component modules in the system either directly or indirectly using messages sent over the J1939 network.

The Bulkhead Module is mounted on the driver side of the front wall and connects to the interior wiring through an opening in the front wall.

The BHM has four harness connections on the engine side of the front wall and three harness connections to the cab interior.

The BHM Unit contains all system parameters and the unit controls power flow and circuit protection to the various components of the SmartPlex electrical system.

The BHM unit can also directly support up to 5 smart switches. The BHM is programmable and can be changed and updated by flashing the unit through service link.

Power supply for the BHM is supplied using VBAT fuses, which reside in the main PDM (see page 3)

The BHM is programmable and the feature screen in service link can be used to change or add parameters to the BHM

Key Bulkhead Module Outputs

- Bulkhead Module outputs have defined amperage limits.
- If higher loads are required, bulkhead module outputs should be used as signal power in conjunction with a relay.

20A	—	B5.F - Cigar Lighter Output
12A	—	B3.E - Horn
12A	—	B5.E - SPARE (Utility Light/Spotlight)
Combined	—	B4.M - SPARE (Utility Light/Spotlight)
12A	—	B5.G - SPARE (Ignition)
*	—	B5.H - Panel Lamps
Combined	—	B7.A1 - Panel Lamps (Smart Switch)
12A	—	B4.F - SPARE (Left Heated Mirror)
Combined	—	B4.E - SPARE (Right Heated Mirror)
6.7A	—	B6.A9 - Accessory (HVAC)
Combined	—	B6.A10 - Accessory (Radio)
6.7A	—	B5.A - Battery (Dome Lamps)
Combined	—	B7.A12 - Battery (Smart Switch)

6.7A	—	B6.A8 - Ignition (VCU)
Combined	—	B2.K - Ignition (Engine)
—	—	B1.P - Ignition (ABS)
—	—	B2.L - Ignition (Trans)
—	—	B1.F - Fuel Water Sensor Power
6.7A	—	B5.D - Wake Up (Instrument Cluster)
6.7A	—	B5.B - Dome Lamps Switched
6.7A	—	B1.L - Left High Beam
6.7A	—	B1.R - Left Low Beam
6.7A	—	B5.C - Clearance Lamps
Combined	—	B1.K - Tail/License Plate/Trailer Relay
6.7A	—	B3.F - Wiper High
6.7A	—	B3.H - Wiper Low
6.7A	—	B3.G - Washer Pump
6.7A	—	B2.M - AC Clutch
6.7A	—	B4.B - Starter Relay (Crank)



EPA 2010 Models

Bulk Head Module (BHM) Pin Detail



A B C D
E F G H

B3 Front
Wall Harness

Connector B3 Frontwall Harness Pinouts		
Connector Pin	Signal Name	Signal Type
B3-A	J1939{ Datalink	Datalink
B3-B	J1939+ Datalink	Datalink
B3-C	Wiper Parked Position	Digital Input
B3-D	Main Battery Power (VBAT1)	Power
B3-E	Horn	Digital Output
B3-F	Wiper Motor High Speed	Digital Output
B3-G	Washer Pump	Digital Output
B3-H	Wiper Motor Low Speed	Digital Output

B4 Front
Wall Harness

A B C D E F
G H J K L M

Connector B4 Frontwall Harness Pinouts		
Connector Pin	Signal Name	Signal Type
B4-A	Air Filter Restriction/Spare #9	Digital Input
B4-B	Starter Relay	Digital Output
B4-C	Ground	Ground
B4-D	Spare Digital Input 2	Digital Input
B4-E	Right Heated Mirror (spare digital output)	Digital Output
B4-F	Left Heated Mirror (spare digital output)	Digital Output
B4-G	Main Battery Power (VBAT2)	Power
B4-H	Module Wake-Up Signal	Digital Input/Output
B4-J	—	—
B4-K	Main Battery Power (VBAT4)	Power
B4-L	Washer Fluid Level (spare digital input 8)	Digital Input
B4-M	Utility Light/Spotlight (spare digital output)	Digital Output

B5 Dash
Harness

Connector B5 Dash Harness Pinouts		
Connector Pin	Signal Name	Signal Type
B5-A	Dome Lamps Battery	Digital Output
B5-B	Dome Lamps Switched	Digital Output
B5-C	Clearance Lamps (cab)	Digital Output
B5-D	Instrument Cluster Wake-Up	Digital Output
B5-E	Utility Light/Spotlight (spare digital output)	Digital Output
B5-F	Cigar Lighter	Digital Output
B5-G	Ignition Power, Other (spare digital output)	Digital Output
B5-H	Panel Lamps	Digital Output

B6 Dash
Harness

Connector B6 Dash Harness Pinouts		
Connector Pin	Signal Name	Signal Type
B6-A1	Ignition Switch Accessory Position	Digital Input
B6-A2	Module Wake-Up Signal	Digital Input
B6-A3	Ignition Switch On	Digital Input
B6-A4	—	—
B6-A5	Ignition Switch Start	Digital Input
B6-A6	Passenger Door Open (spare digital input 10)	Digital Input
B6-A7	Driver Door Open	Digital Input
B6-A8	VCU Ignition Power	Digital Output
B6-A9	HVAC Power	Digital Output
B6-A10	Radio Power	Digital Output
B6-A11	J1587{ Datalink	Datalink
B6-A12	J1587+ Datalink	Datalink
B6-B1	Horn Switch	Digital Input
B6-B2	Top of Clutch Switch (spare digital input 7)	Digital Input
B6-B3	Bottom of Clutch Switch (spare digital input 6)	Digital Input
B6-B4	—	—
B6-B5	Panel Lamps Increase	Digital Input
B6-B6	Panel Lamps Decrease	Digital Input
B6-B7	A/C Clutch Request	Digital Input
B6-B8	Hazard Switch	Digital Input
B6-B9	Headlamp Switch PARK Position	Digital Input
B6-B10	Headlamp Switch On Position	Digital Input
B6-B11	Headlamp Switch On 2 Position	Digital Input
B6-B12	—	—

B2 Engine
Harness

A B C D E F G
H J K L M N P

Connector B2 Engine Harness Pinouts		
Connector Pin	Signal Name	Signal Type
B2-A	J1587+ Datalink	Datalink
B2-B	J1939+ Datalink	Datalink
B2-C	J1587+ Datalink	Datalink
B2-D	J1587{ Datalink	Datalink
B2-E	—	—
B2-F	—	—
B2-G	Backup Switch (spare digital input 3)	Digital Input
B2-H	J1587{ Datalink	Datalink
B2-J	J1939{ Datalink	Datalink
B2-K	Engine ECU Ignition Power	Digital Output
B2-L	Transmission ECU Ignition Power	Digital Output
B2-M	A/C Clutch	Digital Output
B2-N	—	—
B2-P	Alternator Charging	Digital Input

B7 Dash
Harness

Connector B7 Dash Harness Pinouts		
Connector Pin	Signal Name	Signal Type
B7-A1	Panel Lamps (smart switch)	Digital Output
B7-A2	Smart Switch 3 ID 1	Analog Input
B7-A3	Smart Switch 3 ID 2	Analog Input
B7-A4	Smart Switch 3 Input	Analog Input
B7-A5	Smart Switch 3 Indicator	Digital Output
B7-A6	Smart Switch 4 ID 1	Analog Input
B7-A7	Smart Switch 4 ID 2	Analog Input
B7-A8	Smart Switch 4 Input	Analog Input
B7-A9	Smart Switch 4 Indicator	Digital Output
B7-A10	Smart Switch 5 ID 1	Analog Input
B7-A11	Smart Switch 5 ID 2	Analog Input
B7-A12	Smart Switch Battery Power	Digital Output
B7-B1	Smart Switch 1 ID 1	Analog Input
B7-B2	Smart Switch 1 ID 2	Analog Input
B7-B3	Smart Switch 1 Input	Analog Input
B7-B4	Smart Switch 1 Indicator	Digital Output
B7-B5	Smart Switch 2 ID 1	Analog Input
B7-B6	Smart Switch 2 ID 2	Analog Input
B7-B7	Smart Switch 2 Input	Analog Input
B7-B8	Smart Switch 2 Indicator	Digital Output
B7-B9	Ground	Signal Ground
B7-B10	Smart Switch 5 Indicator	Digital Output
B7-B11	Smart Switch 5 Input	Analog Input
B7-B12	—	—

B1 B2 B3 B4 B5 B6 B7 B8 B9 B10 B11 B12
A1 A2 A3 A4 A5 A6 A7 A8 A9 A10 A11 A12

B1 B2 B3 B4 B5 B6 B7 B8 B9 B10 B11 B12
A1 A2 A3 A4 A5 A6 A7 A8 A9 A10 A11 A12

B1 Forward
Chassis Harness

S R P N M L K J
H G F E D C B A

Connector B1 Forward Chassis Harness Pinouts		
Connector Pin	Signal Name	Signal Type
B1-A	—	—
B1-B	Module Wake-Up Signal	Digital Input/Output
B1-C	Spare Digital Input 4	Digital Input
B1-D	—	—
B1-E	Ground	Power Ground
B1-F	Fuel/Water Sensor Ignition Power	Digital Output
B1-G	Ground	Signal Ground
B1-H	J1587+ Datalink	Datalink
B1-J	Battery Power (VBAT5)	Power
B1-K	Tail Lamps/License Plate Lamp/Trailer Tail Relay	Digital Output
B1-L	Left High Beam	Digital Output
B1-M	Fuel/Water Separator (spare digital input 5)	Digital Input
B1-N	Battery Power (VBAT3)	Power
B1-P	ABS Ignition Power	Digital Output
B1-R	Left Low Beam	Digital Output
B1-S	J1587{ Datalink	Datalink

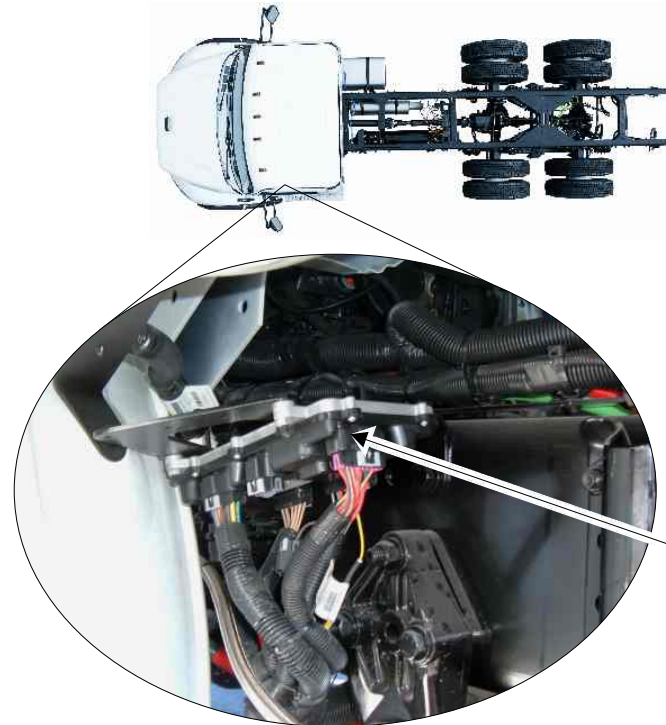


EPA 2010 Models

Chassis Module (CHM)

Pin part number for harness connection

23-13212-120 TERM-FEMALE,(18-16) PAC153047191
23-13212-121 TERM-FEMALE,(14-12) PAC15304720
23-13212-121 TERM-FEMALE,(10) PAC15326004



Only the Under cab location will be available for 2010 truck offerings to improve durability and free up frame space

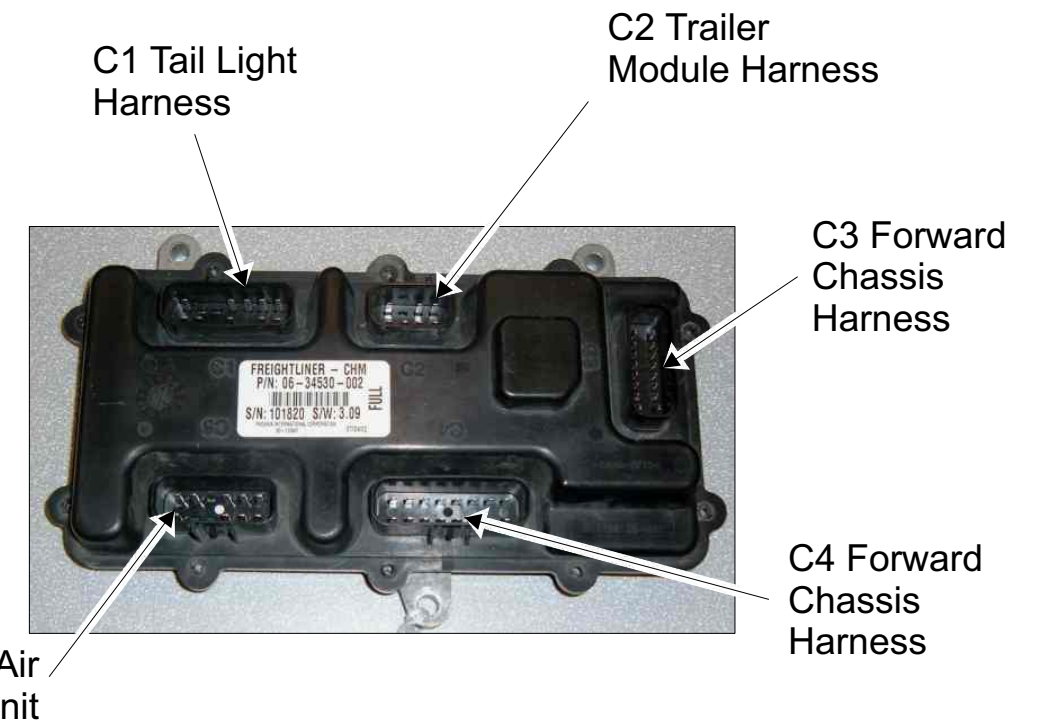
Chassis Module (CHM)

The Chassis Module (CHM) and the Expansion Module (EXM) both serve the same function in the **SmartPlex** electrical system by acting as dependants to the Bulkhead Module (BHM). The CHM and EXM respond to commands from the BHM and broadcast the status of the inputs and outputs that are sent to, and delivered by the module.

The **SmartPlex** system will always come equipped with chassis Module, but will only have an expansion module when optional features ordered with the unit require the additional space requirements. The CHM and EXM both have the same pin connections although they may not all be used in the same manner.

Locations:

The CHM will come standard in the under cab position for 2010 models to provide better protection from the elements and free up frame space for body components.



Key Chassis Module Outputs

- Chassis Module outputs have defined amperage limits.
- If higher loads are required, Chassis module outputs should be used as signal power in conjunction with a relay.

20A	C3-A Optional Fuel Water Separator Heater
10A Combined	C4-C Left Park Lamp
	C4-L Right Park Lamp
	C4-D Left Marker Lamp
	C4-M Right Marker Lamp
	C2-F Trailer Marker Relay
7.5A * Combined	C3-N Turn Left Front/Side
	C1-G Turn Left Rear
	C2-H TrailerTurn Left
7.5A * Combined	C3-R Turn Right Front/Side
	C1-P Turn Right Rear
	C2-E TrailerTurn Right
6.7A Combined	C1-A Left Backup Lamp
	C1-J Right Backup Lamp
	C1-H Backup Alarm

6.7A	C3-L Right Low Beam
6.7A	C4-K Right High Beam
6.7A	C1-N Left Stop Lamp
6.7A	C1-L Right Stop Lamp
6.7A	C3-K Right DRL
6.7A	C4-F Left DRL
6.7A Combined	C3-C Optional Fog/Road Lamps
	C3-D Optional Fog/Road Lamps
0.85A	C5-H AMU Solenoid #0
0.85A	C5-J AMU Solenoid #1
0.85A	C5-L AMU Solenoid #2
0.85A	C5-M AMU Solenoid #3
0.2A	C2-A Trailer Power Relay



EPA 2010 Models

Chassis Module (CHM) Pin Detail



C2 Trailer
Module Harness

<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>
<u>E</u>	<u>F</u>	<u>G</u>	<u>H</u>

Trailer Module Harness Pinouts at Connector C2				
Connector and Pin Numbers	Signal Name	Signal Type	Full	Standard
C2-A	Trailer Power Relay	Digital Output	X	
C2-C	Ground	Power Ground	X	
C2-D	Trailer Stop Lamp Relay Pass-through	Pass-through	X	
C2-E	Trailer Right Turn Lamp	Digital Output	X	
C2-F	Trailer Marker Lamps Relay	Digital Output	X	
C2-G	Trailer Taillight Relay Pass-through	Pass-through	X	
C2-H	Trailer Left Turn Lamp	Digital Output	X	

C3 Forward
Chassis Harness

<u>H</u>	<u>G</u>	<u>F</u>	<u>E</u>	<u>D</u>	<u>C</u>	<u>B</u>	<u>A</u>
<u>J</u>	<u>K</u>	<u>L</u>	<u>M</u>	<u>N</u>	<u>P</u>	<u>R</u>	<u>S</u>

Forward Chassis Harness Pinouts at Connector C3				
Connector and Pin Numbers	Signal Name	Signal Type	Full	Standard
C3-A	Fuel/Water Separator Heater	Digital Output	X	
C3-B	J1587{ Datalink	Datalink	X	X
C3-C	Fog/Road Lamps	Digital Output	X	
C3-D	Fog/Road Lamps	Digital Output	X	
C3-E	Low Air Pressure	Digital Input (active low)	X	X
C3-F	Park Brake	Digital Input (active low)	X	X
C3-G	Service Brake	Digital Input (active low)	X	X
C3-H	Ground	Power Ground	X	X
C3-J	Main Battery Power (VBAT2)	Power	X	X
C3-K	Right DRL	Digital Output	X	
C3-L	Right Low Beam	Digital Output	X	X
C3-M	Ignition	Digital Input (active high)	X	X
C3-N	Left Front/Side Turn Lamp	Digital Output	X	X
C3-P	Taillight/License Plate Lamps Pass-through	Pass-through	X	X
C3-R	Right Front/Side Turn Lamp	Digital Output	X	X
C3-S	J1587+ Datalink	Datalink	X	X

C4 Forward
Chassis Harness

<u>S</u>	<u>R</u>	<u>P</u>	<u>N</u>	<u>M</u>	<u>L</u>	<u>K</u>	<u>J</u>
<u>H</u>	<u>G</u>	<u>F</u>	<u>E</u>	<u>D</u>	<u>C</u>	<u>B</u>	<u>A</u>

Forward Chassis Harness Pinouts at Connector C4				
Connector and Pin Numbers	Signal Name	Signal Type	Full	Standard
C4-A	Module Wake-up Signal	Digital Input/Output	X	X
C4-B	Address Identification A	Analog Input	X	X
C4-C	Left Park Lamp	Digital Output	X	X
C4-D	Left Marker Lamp	Digital Output	X	X
C4-E	Address Identification C	Analog Input	X	X
C4-F	Left DRL	Digital Output	X	
C4-G	J1939+ Datalink	Datalink	X	X
C4-H	Ground (address identification D)	Signal Ground	X	X
C4-J	Main Battery Power (VBAT3)	Power	X	
C4-K	Right High Beam	Digital Output	X	X
C4-L	Right Park Lamp	Digital Output	X	X
C4-M	Right Marker Lamp	Digital Output	X	X
C4-N	Address Identification B	Analog Input	X	X
C4-P	Main Battery Power (VBAT1)	Power	X	X
C4-R	J1939{ Datalink	Datalink	X	X
C4-S	Ground	Power Ground	X	X

<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>	<u>E</u>	<u>F</u>	<u>G</u>
<u>H</u>	<u>J</u>	<u>K</u>	<u>L</u>	<u>M</u>	<u>N</u>	<u>P</u>

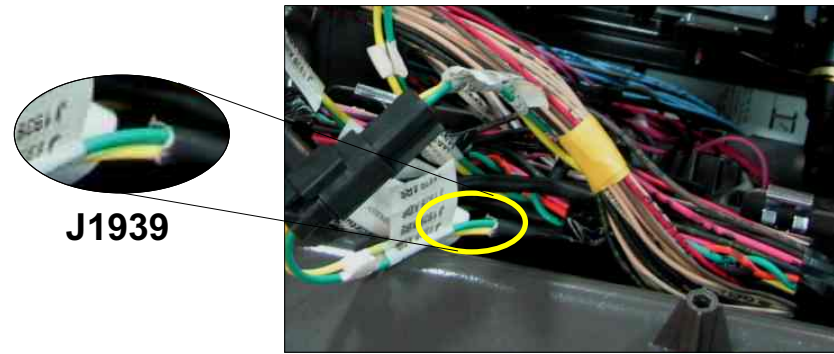
C1 Tail Light
Harness

Taillight Harness Pinouts at Connector C1				
Connector and Pin Numbers	Signal Name	Signal Type	Full	Standard
C1-A	Left Backup Lamp	Digital Output	X	X
C1-D	Left Taillight Pass-through	Pass-through	X	X
C1-E	Right Taillight Pass-through	Pass-through	X	X
C1-F	License Plate Lamp	Digital Output	X	X
C1-G	Left Rear Turn Lamp	Digital Output	X	X
C1-H	Backup Alarm	Digital Output	X	X
C1-J	Right Backup Lamp	Digital Output	X	X
C1-L	Right Stop Lamp	Digital Output	X	X
C1-N	Left Stop Lamp	Digital Output	X	X
C1-P	Right Rear Turn Lamp	Digital Output	X	X

C5 Air
Management Unit

<u>M</u>	<u>L</u>	<u>K</u>	<u>J</u>	<u>H</u>	<u>G</u>
<u>F</u>	<u>E</u>	<u>D</u>	<u>C</u>	<u>B</u>	<u>A</u>

Connector C5 Air Management Unit (AMU) Harness Pinouts				
Connector and Pin Numbers	Signal Name	Signal Type	Full	Standard
C5-A	AMU Analog Input 0	Digital Input (active low), Analog Input	X	
C5-B	AMU Analog Input 1	Digital Input (active low), Analog Input	X	
C5-C	Ground	Signal Ground	X	
C5-F	AMU Analog Input 2	Digital Input (active low), Analog Input	X	
C5-G	AMU Analog Input 3	Digital Input (active low), Analog Input	X	
C5-H	AMU Solenoid 0	Digital Output	X	
C5-J	AMU Solenoid 1	Digital Output	X	
C5-L	AMU Solenoid 2	Digital Output	X	
C5-M	AMU Solenoid 3	Digital Output	X	



J1939

Multiplexing System

The term "multiplexing" describes how the SmartPlex electrical system works.

Multiplexing is defined as the process of sending multiple electronic messages through the same signal path at the same time - in this case, through the data link.

The system communicates using two primary forms of communication called data links: J1939 datalink (High speed) and the J1708/J1587 datalink (low speed).

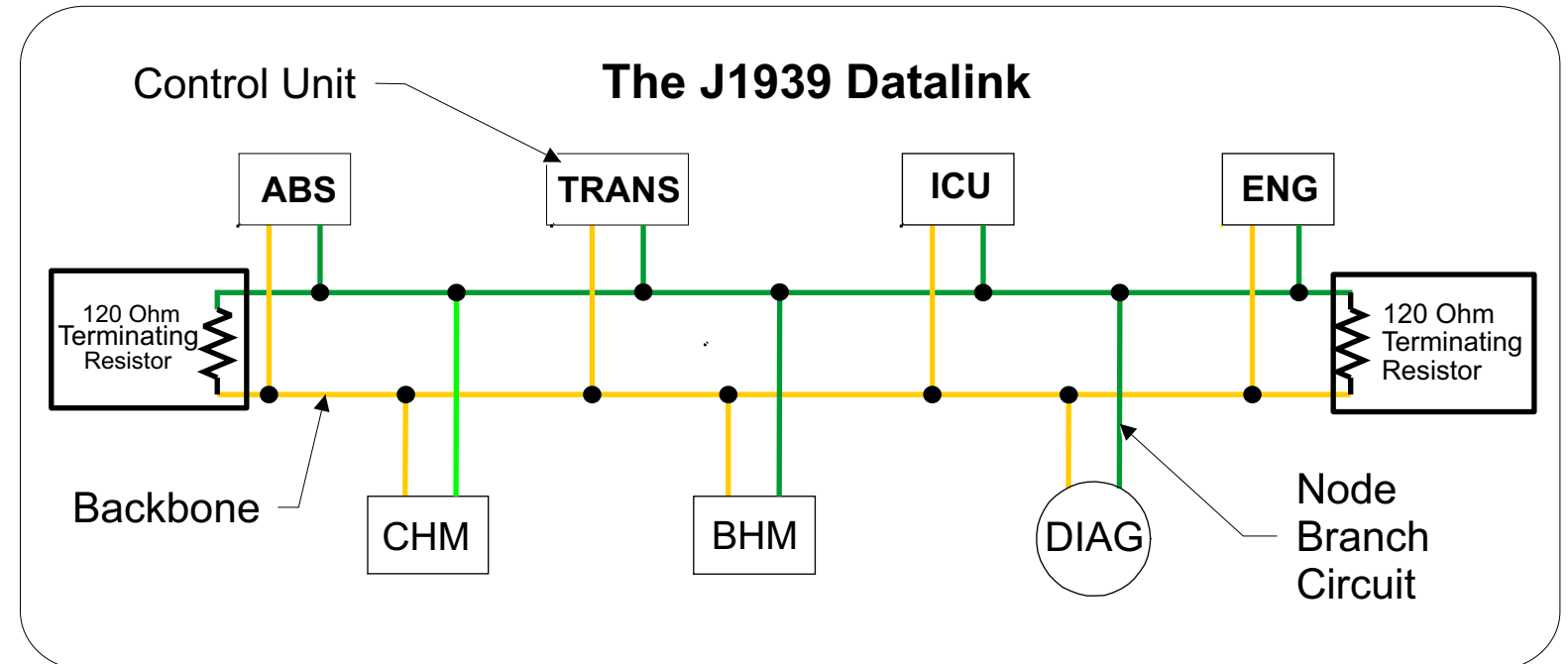
J1939 (Yellow J1939+ Green J1939– In a twisted pair covered with black loom)

- A high speed vehicle communications network, which permits devices to broadcast requests as well as receive information from all other devices on the network.
- Each message includes an identifier much like a CB channel setting that defines the message priority, who sent it, and what data is contained within it.
- A terminating resistor is installed at each end of the network to dampen feedback signals.

J1708/1587

Normally found in pre 2010 production models as a pair of wires which are dark green J1587+ Orange J1587–. The interface with this system will be removed for all trucks produced after 2009 and system information will only be available through J1939 or with the use of a gateway conversion system (see "Conversion Gateway" Page)

M2 J1939 Node Options			
Option Node	Status	Option Node	Status
Engine	Standard	Trans	Optional
Cluster	Standard	Allison Shifter	Optional
ABS	Standard	Qualcom	Optional
BHM	Standard	Data Recorder	Optional
CHM	Standard	Body Builder	Optional
Gateway	Optional	Axle control	Future



System Terminology

J1939 Backbone The main J1939 datalink wiring that lies between the two terminating resistors. It does not include the branch circuits to each ECU or to the diagnostic connector.

- * Minimum recommended length between any 2 nodes = 10 cm
- * Maximum recommended branch length = 3 meter
- * Maximum recommended total network length = 40 meters

Node Branch Circuit The section of J1939 datalink between the backbone and each control unit that has J1939, and between the backbone and the diagnostic connector.

Diagnostic Connector a 9-pin diagnostic connector is used for troubleshooting the electrical system.

Control Unit connects to the J1939 datalink via a branch circuit.

NODE A node is the connection point for a device or control unit. See "System Tap Points" for more information on adding nodes to the backbone

Gateway A gateway is a conversion device that translates information from J1939 into J1708 signals for use with systems that do not accept J1939 signals

Dash Tap Points

Ignition Power, Ground and Dash Illumination

Tapping into dash illumination and ignition power and ground can be accomplished by using the center tap point connections located in the center back wall of the dash.

Note:

- * Ignition power source will be powered during engine cranking
- * Ignition power source will not be powered when key is in accessory position.

J1939 Connections

Tying into the J1939 backbone is accomplished by tapping into the system using the terminating resistor tee's located at each end of the backbone

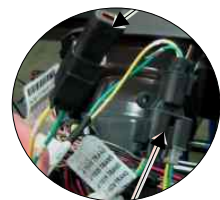
The Chassis terminating resistor is located in a tee along the left frame rail, usually behind the cab.

The cab terminating resistor is located in the dash tucked up above the dash tap points for the J1587.

The correct datlink resistance measured at any device, or at the diagnostic plug should be 60 ohms with the battery disconnected.

IMPORTANT:

- It is essential that both terminating resistors remain connected to the ends of the J1939 backbone to dampen feedback signals. Numerous J1939 problems can be attributed to terminated resistors are missing or disconnected.
- If connections under dash become disconnected. Connections should never be reconnected back together directly IE ABS with ABS as this creates an independent circuit in the system that is not connected to the backbone.



J1939 Connections for Body Builders

To connect easily to J1939 at dash or chassis locations order the following parts:

- (1) Tee and Jumper FTL# A06-37868-000
- (1) Jumper Plug # DUFDTM06 2S E004
- (2) Female Pins DUFWM2SB

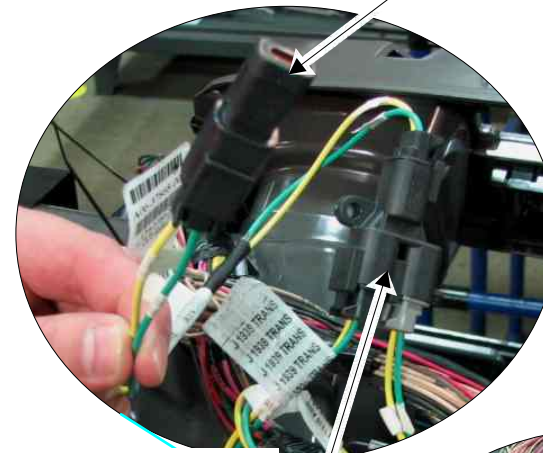
Component Module Locations

Component	Module Number
General J1939 harness drawings, schematics, and installation drawings	160
Engine harness, installation drawings and wiring diagrams	283 and 286
Transmission harness, installation drawings and wiring diagrams	34A, 34B and 343
ABS harness and installation drawings	330, 332, and 333
Gateway harness and installation drawings	860 and 835

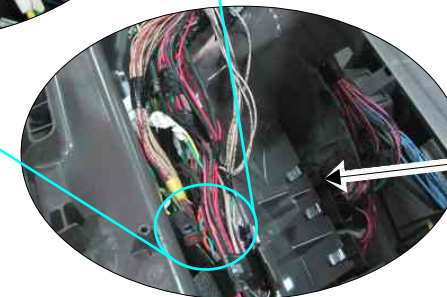


EPA 2010 Models

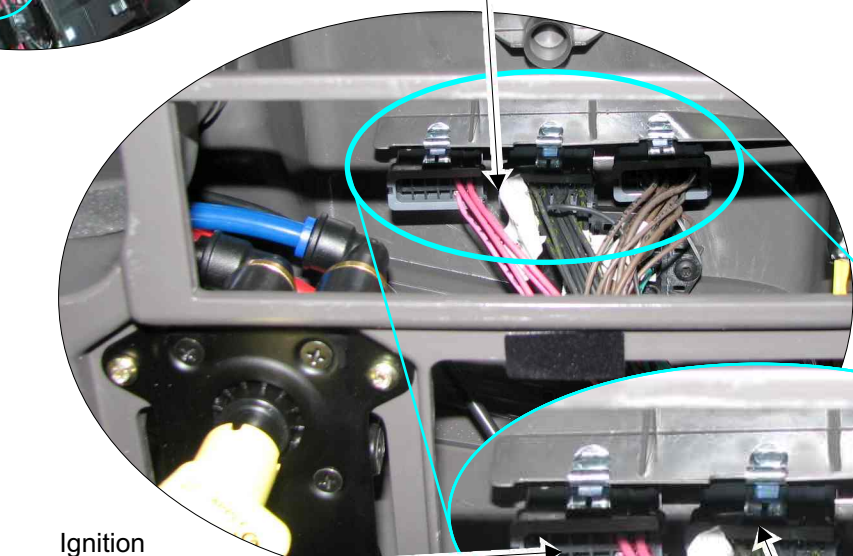
System Tap Points



J1939 Tee connection is used for Switch Expansion or adding additional devices Modules only and is not used on std assemblies (FTL # A06-37868-000)

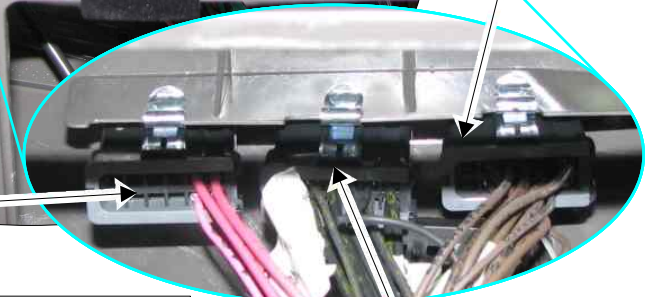


Dash Tap point



Ignition Circuit 81C
Max load: 5amps

Illumination Circuit 29A
Max load: 5amps

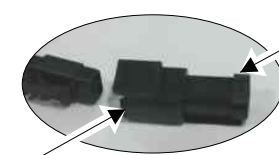


Ground Circuit GND
Max load: 10amps

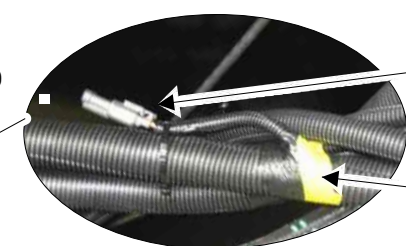
Pin part number for harness connection
TERM-FEMALE,(18-16) PAC12110844
TERM-FEMALE,(14-12) PAC12110842

Dash Tap Points

Resistor Receptor
Part FTL# 23-13303-902
Deutsch # DTM04 - 2P - EP10



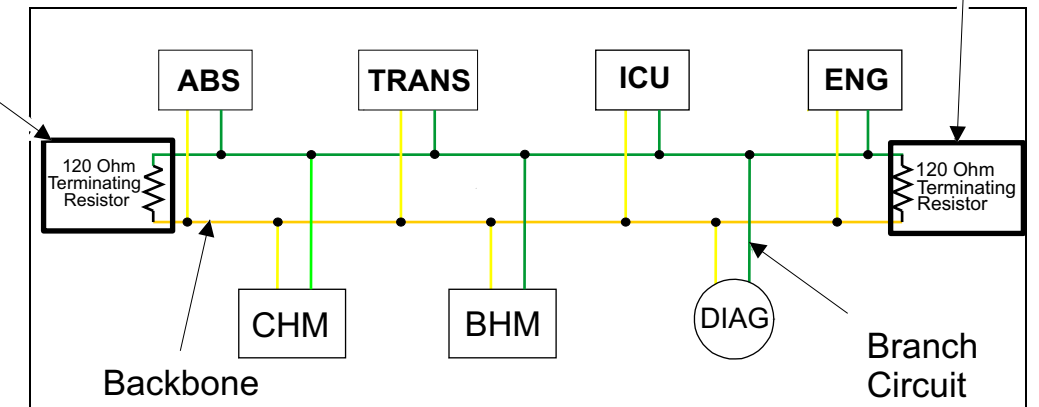
Cab resistor located in dash behind ICU panel



Chassis resistor located in chassis frame rear of cab

Look for Yellow or Red tape located at breakout point under cab Drivers side

The J1939 Datalink



J1939 Multiplexing System connections

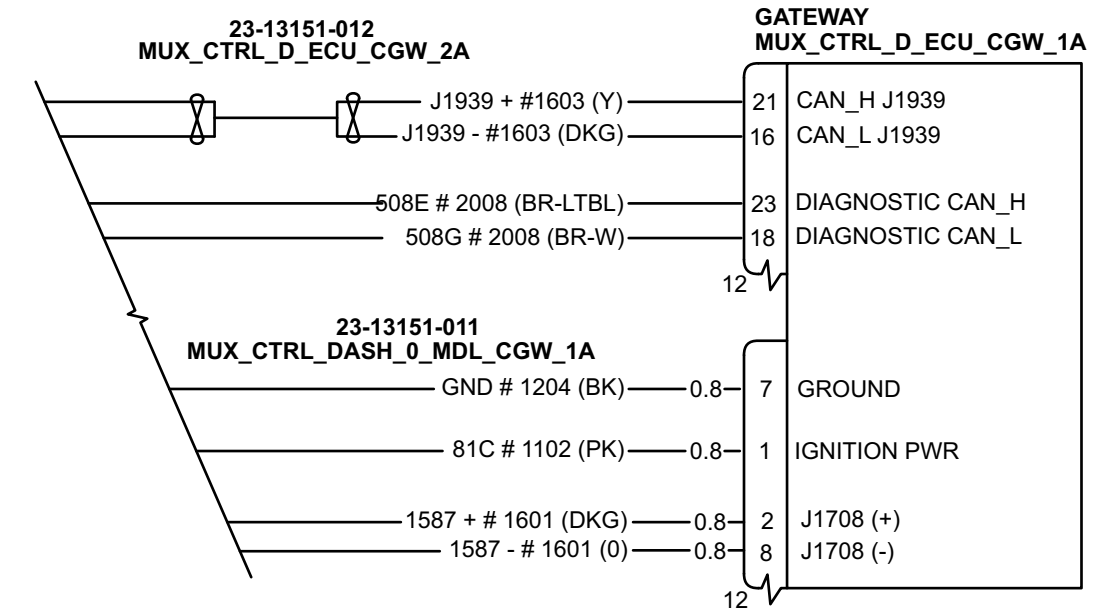
EPA 2010 Models

J1708 Gateway

J1708 Gateway location

New Gateway module still uses the standard J1708 Dash tap Point

9 Ppin Diagnostics Plug



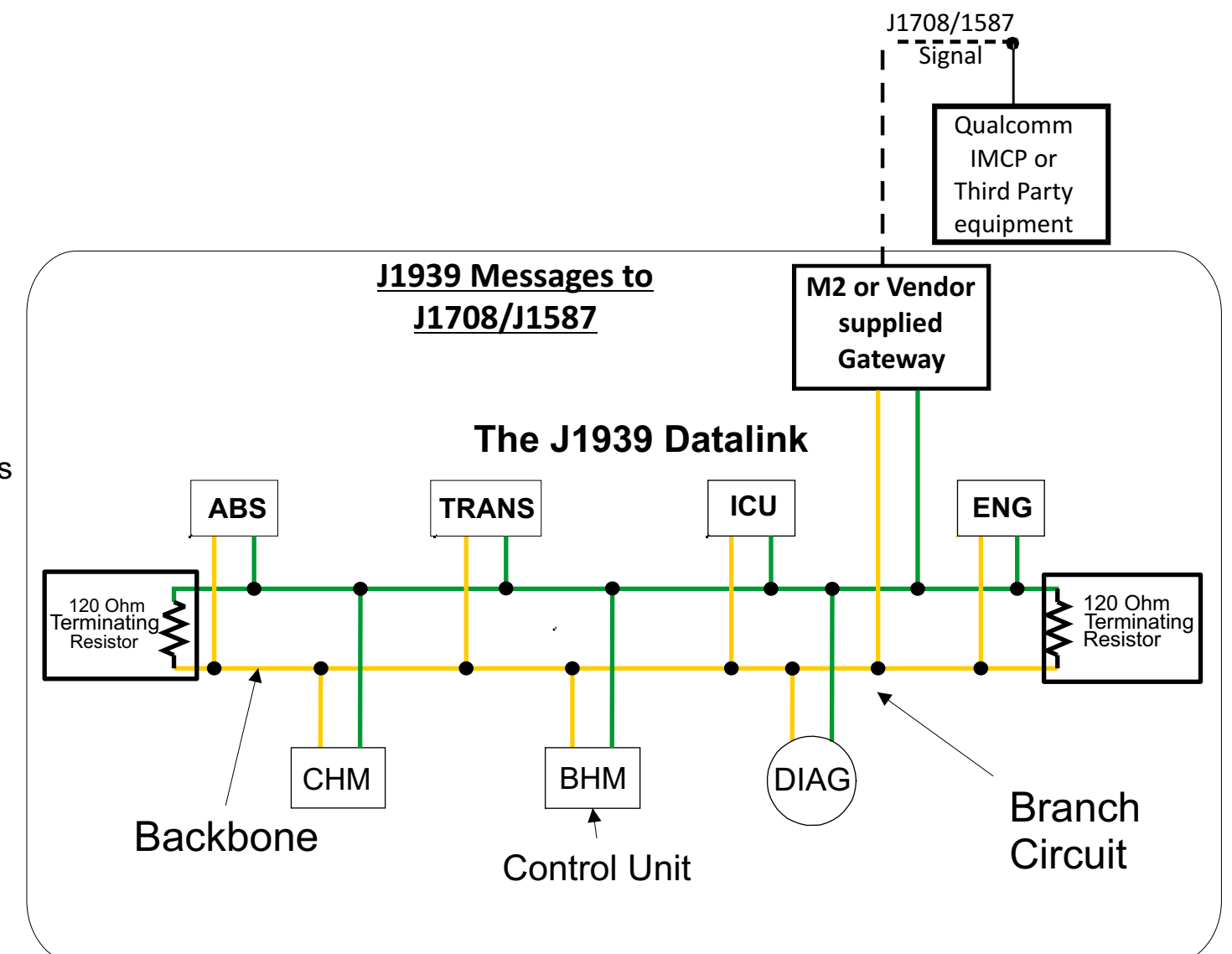
J1708 Gateway Communications

Option code 786-008 - Qualcomm and PeopleNet Gateway
160-026 - Diagnostics with Gateway

- On EPA2010 engines, manufacturers will no longer provide J1708/J1587 data bus and the system will be supported using one single communication system data bus – J1939 .
- To accommodate a few of the major systems that still use J1708 the 2010 SmartPlex offers a gateway module that translates a predefined subset of the standard J1939 messages into J1708/J1587 format.
- At this time only Qualcomm and PeopleNet telematics systems have been developed for the SmartPlex Gateway.

Third Party Connections

- Most third party systems will be converting to J1939 with 2010 or will offer their own proprietary gateway translation systems.
- To tie into the J1939 system see the SmartPlex system tap points page for connection instructions.





EPA 2010 Models

Low Current Smart Switches

Smart switches:

Smart switches are low current switches that use signals to communicate with the Bulk Head Module to tell what function they effect and what state they are in (on or off etc.). There are two primary types of Smart Switch

Two position switch: Supplies an on or off signal to the BHM

Three position switch: allows for an up down off signal to the BHM
(Used in applications where more than one input is required.)

Smart switches identify themselves by two voltage signals to the bulkhead module. Each switch has a unique combination of resistors that control the voltage signal to the BHM allowing it to identify the switch.

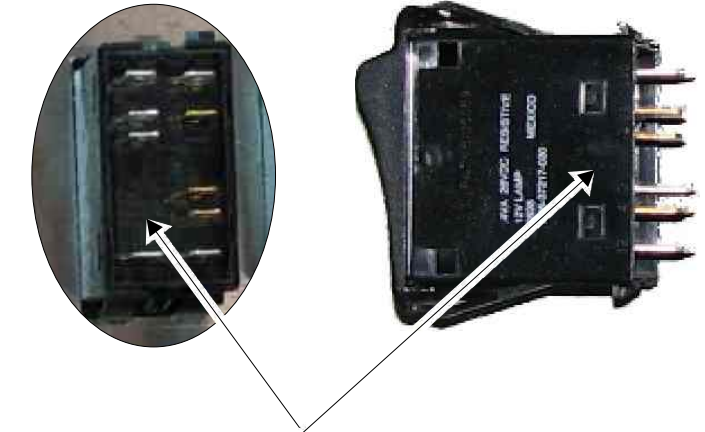
Each channel can talk independently to the Bulkhead module at the same time. In order for a smart switch to work on the vehicle the Bulk head module must be trained to hear it, this is done through the features screen using service link. Accessing the features screen can be accomplished on-site at the body builder if they are set up with Freightliner Service link and the data link harness.

Three common faults can occur with Smart Switches

Extra Smart Switch fault indicates that a smart switch has been installed that the vehicle is not programmed to utilize.

Duplicate Smart Switch fault indicates that there are two or more identical smart switches connected to either the BHM or SEM smart switch ports. To fix this error the duplicate smart switches must be removed from the system.

Missing Smart Switch fault indicates that a smart switch has been programmed but is not installed.



Low Current
Smart Switch

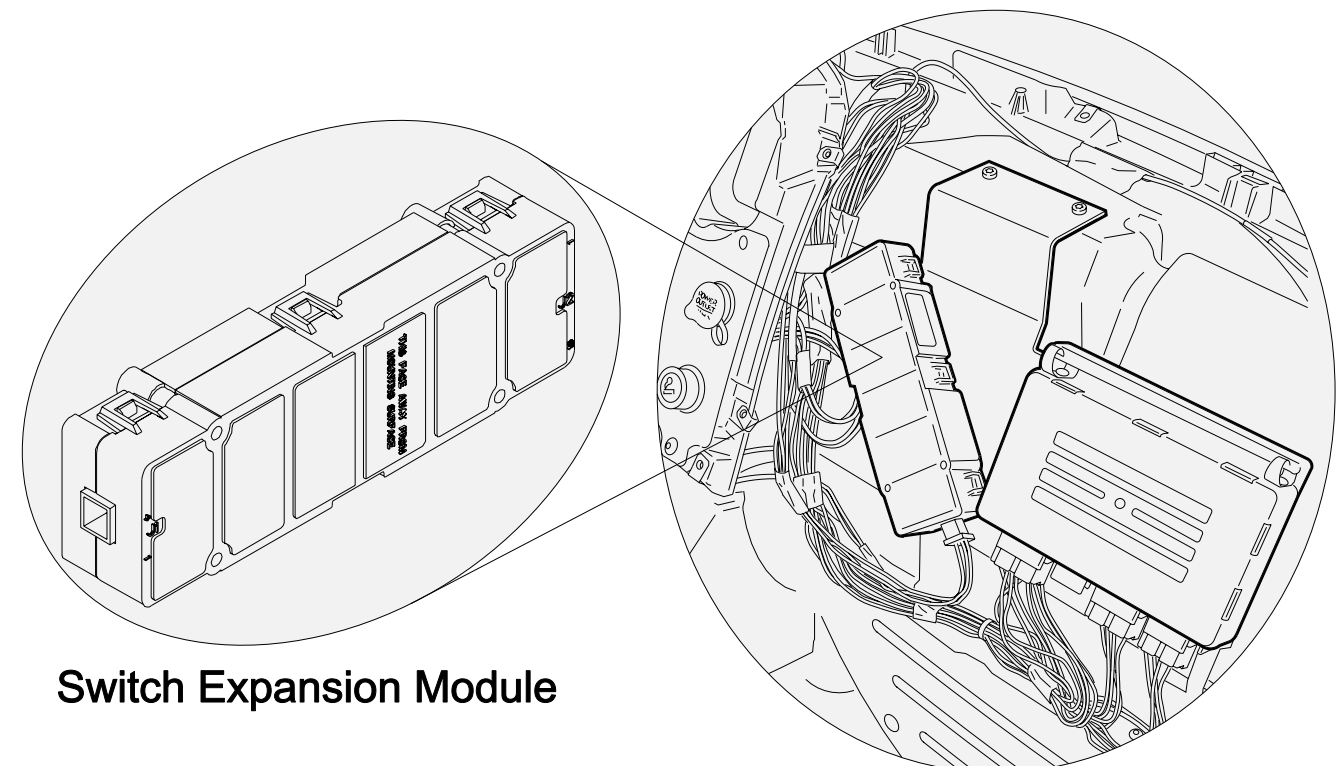
Easily identified by the
Black backing on the
switch

860-004 SMART SWITCH EXPANSION MODULE (SEM)

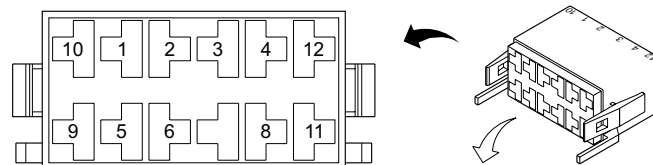
A Switch Expansion Module (SEM) is available for the SmartPlex vehicle when more than five smart switches are installed on the vehicle. Each adds up to 6 Smart Switches (beyond the standard 5 supported directly by BHM). SmartPlex can handle up to 4 expansion modules (Currently only one SEM is released)

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 datalink; Turn on the smart switch indicator lights when commanded to do so by the Bulkhead Module (BHM).



Switch Expansion Module



Smart Switch Pinout for Two Position Switch Pins

Pin	Circuit Number	Circuit Description
2	474B	Switch Position Input
7	474C	Switch Function ID 1 Input
8	474D	Switch Function ID 2 Input
9	GND	Ground
10	14E	Indicator (+)
11	29A	Backlighting (+)
12	474A	Indicator (I)

Smart Switch Pinout for a 3 position Switch Pins

Pin	Circuit Number	Circuit Description
2	474B	Switch Position Input
7	474C	Switch Function ID 1 Input
8	474D	Switch Function ID 2 Input
9	GND	Ground
11	29A	Backlighting (+)

Low Current Smart Switch Socket

EPA 2010 Models

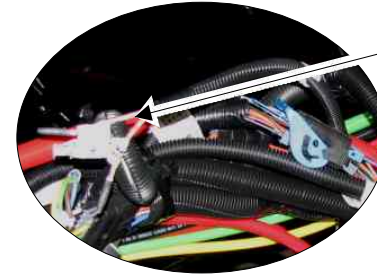
High current Switch (Battery Hot):

- Optional battery hot power switches are factory-installed, switch controlled power provisions that can be ordered for a SmartPlex vehicle.
- Optional switches can be ordered in various switch configurations as shown below.
- All optional high current switches mount on the dash, provide fuse protected battery power, and route to a customer access point ending in blunt cut wires.
- Optional switches are commonly used to provide battery-powered lighting, such as dome, spot, or beacon lights. Other applications include using the optional switch as a triggering mechanism to enable other features, such as hydraulic lift operations or access panel locks.

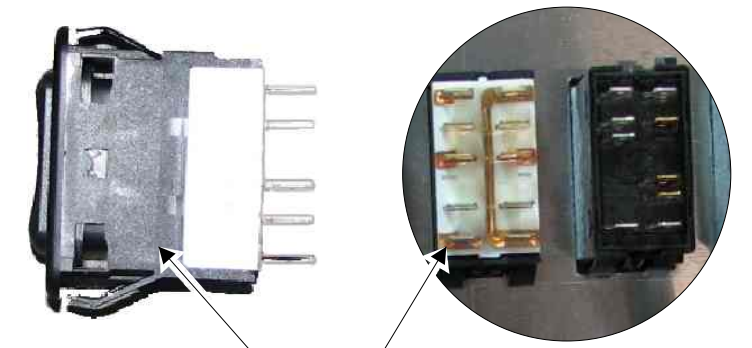
Module 329 Options (Battery Hot):

- 329-007** ILLUMINATED ROCKER SWITCH WITH WIRE TO BACK OF CAB AND MARKER LIGHT CIRCUIT TO JUNCTION BLOCK ON FRAME BACK OF CAB
- 329-010 (2)** EXTRA SWITCHES IN DASH WITH INDICATOR LAMP AND WIRE TO CHASSIS AT BACK OF CAB/SLEEPER
- 329-012 (4)** EXTRA SWITCHES IN DASH WITH INDICATOR LAMP AND WIRE TO CHASSIS AT BACK OF CAB/SLEEPER
- 329-015 (1)** ILLUMINATED ROCKER SWITCH WITH WIRE TO CHASSIS AT BACK OF CAB
- 329-017 (3)** EXTRA SWITCHES IN DASH WITH INDICATOR LAMP AND WIRE TO CHASSIS AT BACK OF CAB/SLEEPER
- 329-055 (4)** EXTRA SWITCHES IN DASH WITH INDICATOR LAMP AND WIRE TO CHASSIS BACK OF CAB/SLEEPER AND ONE EXTRA SWITCH IN DASH WITH NO WIRING
- 329-077 (8)** EXTRA SWITCHES IN DASH; (4) WITH INDICATOR LAMPS AND WIRES TO CHASSIS AT BACK OF CAB, (4) WIRED BY BODY BUILDER
- 329-082 (7)** EXTRA SWITCHES IN DASH; (4) WITH INDICATOR LAMPS AND WIRES TO CHASSIS AT BACK OF CAB, (3) WIRED BY BODY BUILDER
- 329-083 (6)** EXTRA SWITCHES IN DASH; (4) WITH INDICATOR LAMPS AND WIRES TO CHASSIS AT BACK OF CAB, (2) WIRED BY BODY BUILDER

High Current Switches (Battery Hot)



Blunt cut power wires from opt high current power switches located in frame BOC.



High Current Switch

Easily identified by the **White** backing on the switch

Optional Power Switches:

Additional un-wired dash switches can be ordered for optional switches 5 through 8. These switches will come mounted on the dash to the right of the steering column. Each switch is equipped with two LED lights; one LED provides switch illumination and on position indication. Constant fused power up to m15A is supplied to each switch from the Power Distribution Module (PDM).

Extra dash switches are not connected and require a customer supplied mating plug and pins to connect the switches to additional wiring. (See plug part numbers on this page)

Connecting a Switch Using a Chassis Junction Block:

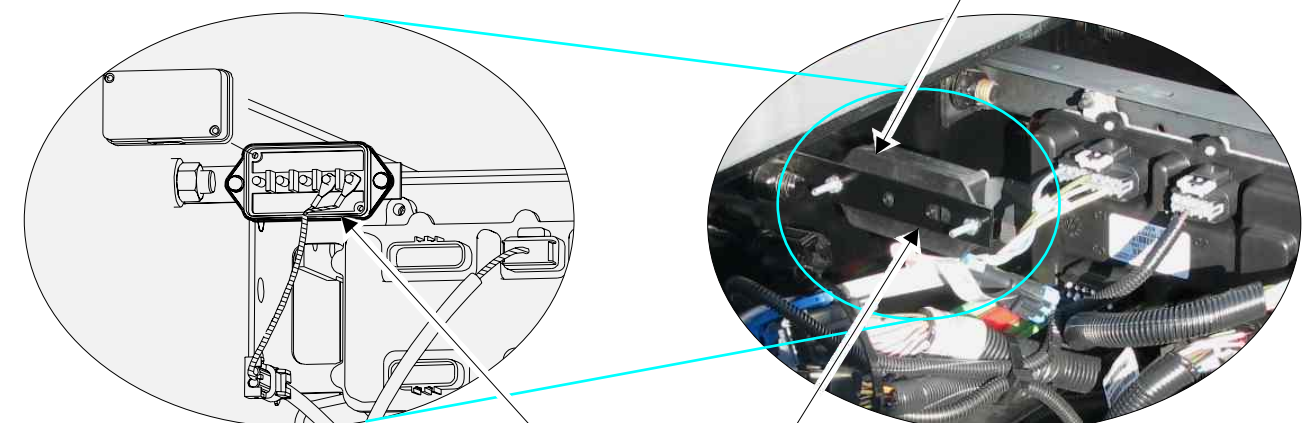
Ref service bulletin Power Switches and Connections # **SB-54.39**
Switches will be pre-wired to a Junction block attached to the frame rail near the Chassis Module (CHM.)

The red wire in the junction block receives power from the output circuit of the optional switch.

IMPORTANT: The power distribution module (PDM) fuse supplying power to the optional switch is rated for 15 amps and this load should not be exceeded by the combined current load of the circuit.

Ordered using Option 329-007

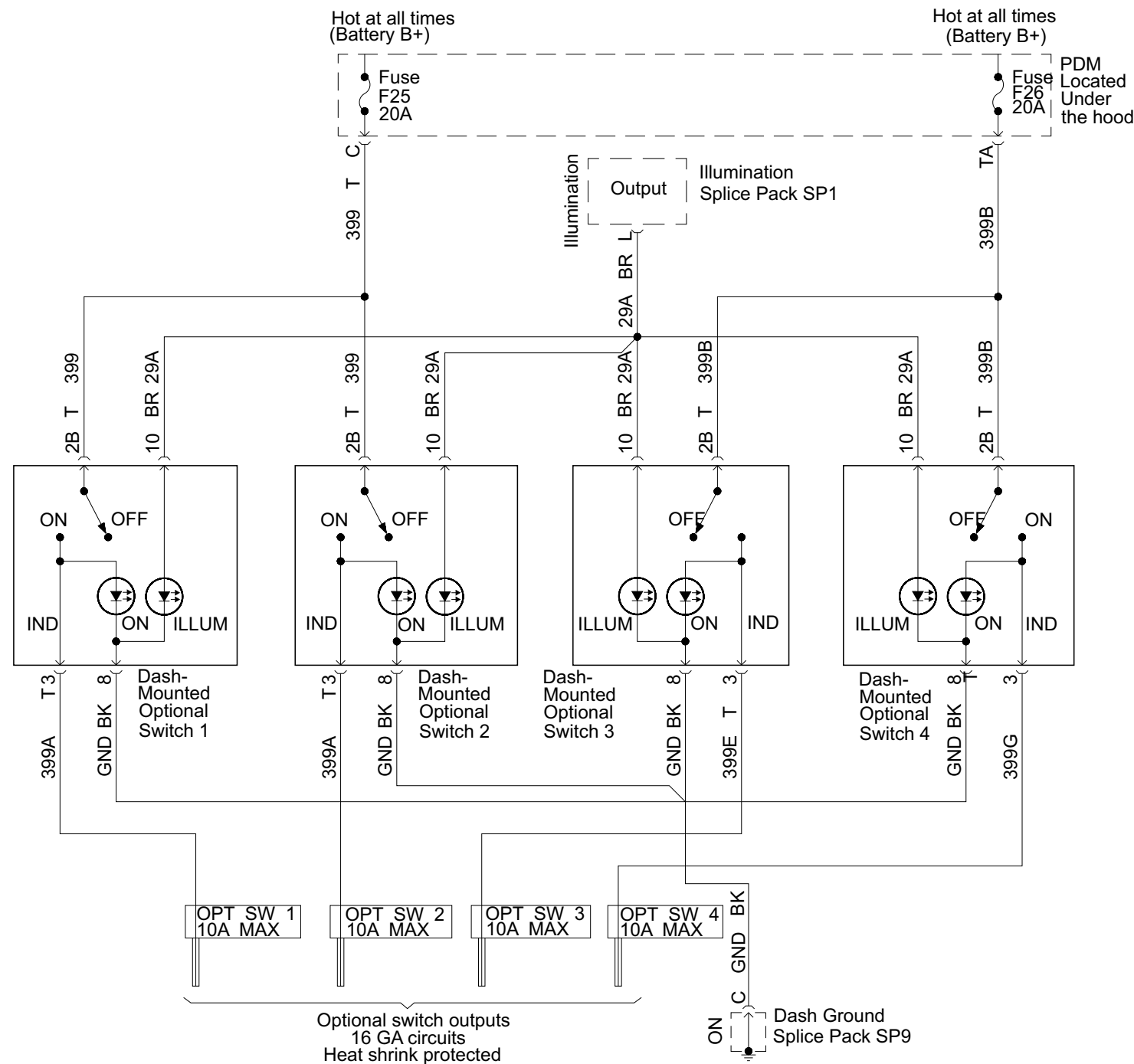
Optional-switch Current Capacity					
No. of Switches	PDM Fuse F25		PDM Fuse F26		Switch Output Current Capacity
	Rating	Switch Protected	Rating	Switch Protected	
1	15A	Switch 1			15A
2	30A	Shared by switch 1 and 2			15A
3	20A	Shared by switch 1 and 2	20A	Used by switch 3	10A
4	20A	Shared by switch 1 and 2	20A	Shared by switch 3 and 4	10A



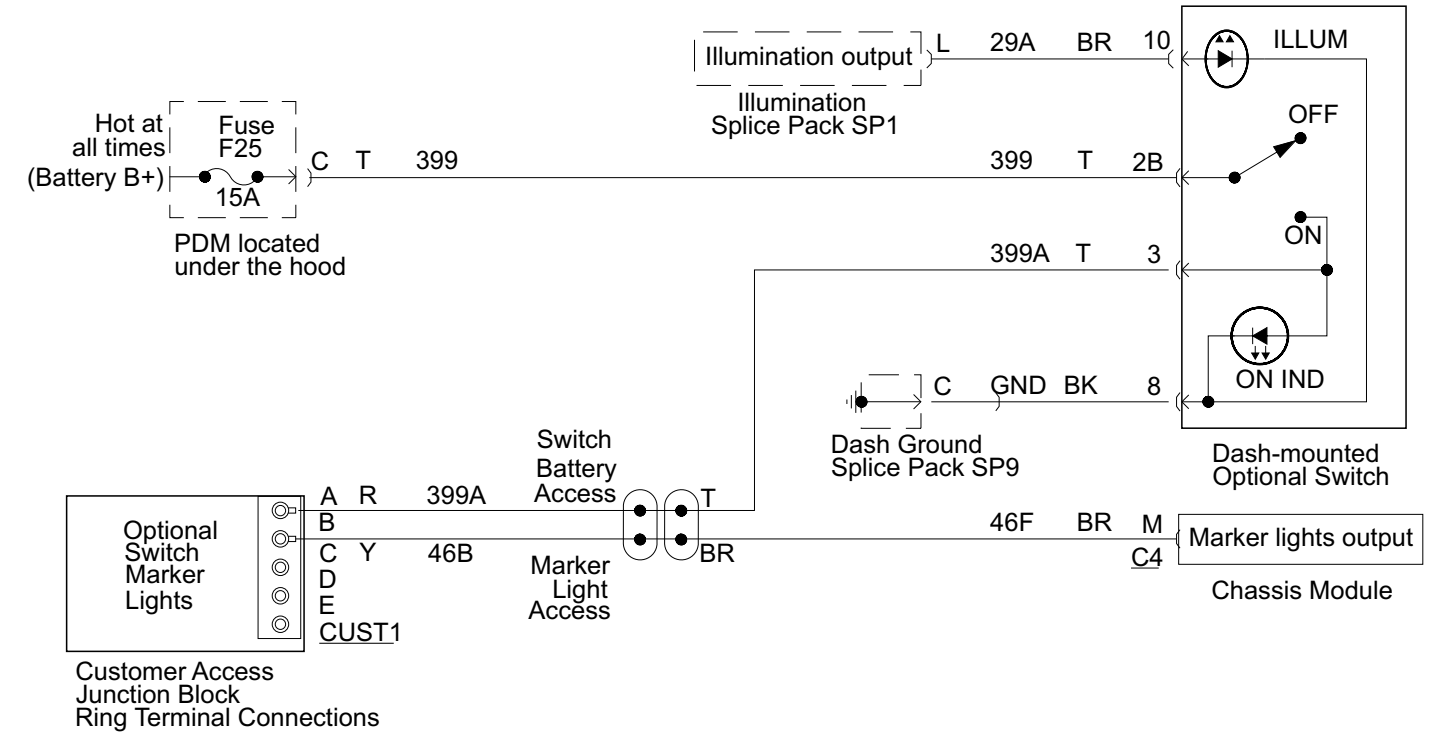
Junction Block

High Current Switch (BH) Schematics

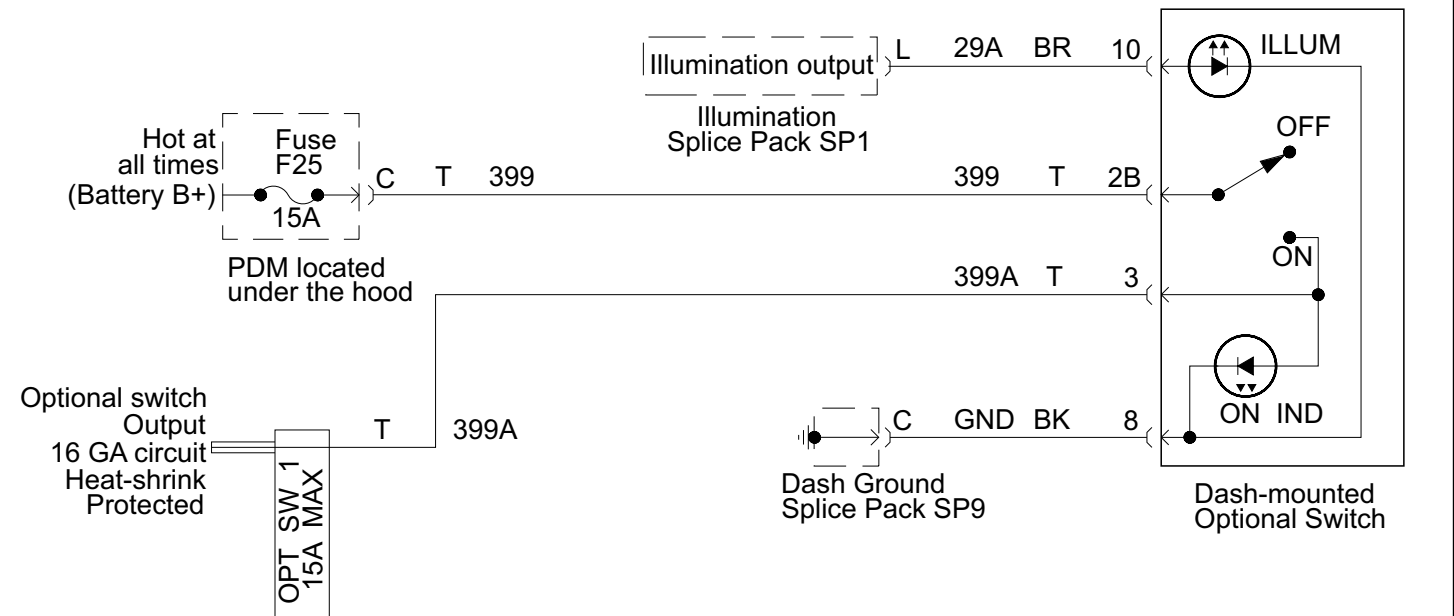
Four-switch Conguration Wiring Diagram



One-switch Conguration Wiring Diagram With Junction Block and market light feed



One-switch Conguration Wiring Diagram Without Junction Block



EPA 2010 Models

High Current Switches (Ignition Interlocked)

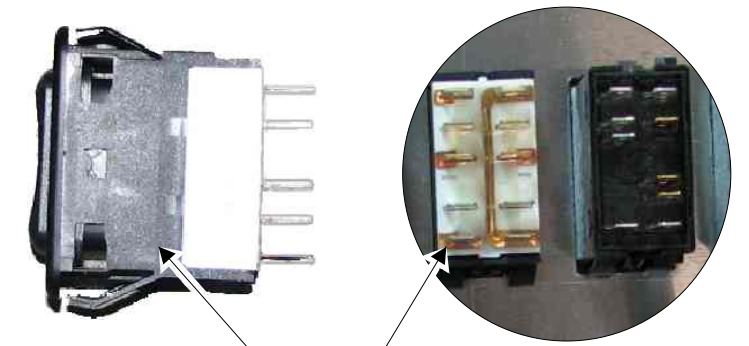
High current Switch (Ignition Interlocked):

- Optional ignition Interlocked power switches are, switch controlled power provisions that are factory-installed and can be ordered for a SmartPlex vehicle.
- Optional switches can be ordered in a (6)-, (8)-, or (10)-switch configurations.
- All optional high current switches mount on the dash, provide fuse protected and ignition interlocked battery power, and route to a customer access point ending in an in cab junction box.
- The junction box will be located under the passenger seat for fix base seat configurations.
- The junction box will be shipped loose for customer install for all non-fixed passenger seats.
- Optional switches are commonly used to provide battery-powered lighting, such as dome, spot, or beacon lights. Other applications include using the optional switch as a triggering mechanism to enable other features, such as hydraulic lift operations or access panel locks.

Module 329 Options (Ignition Interlocked):

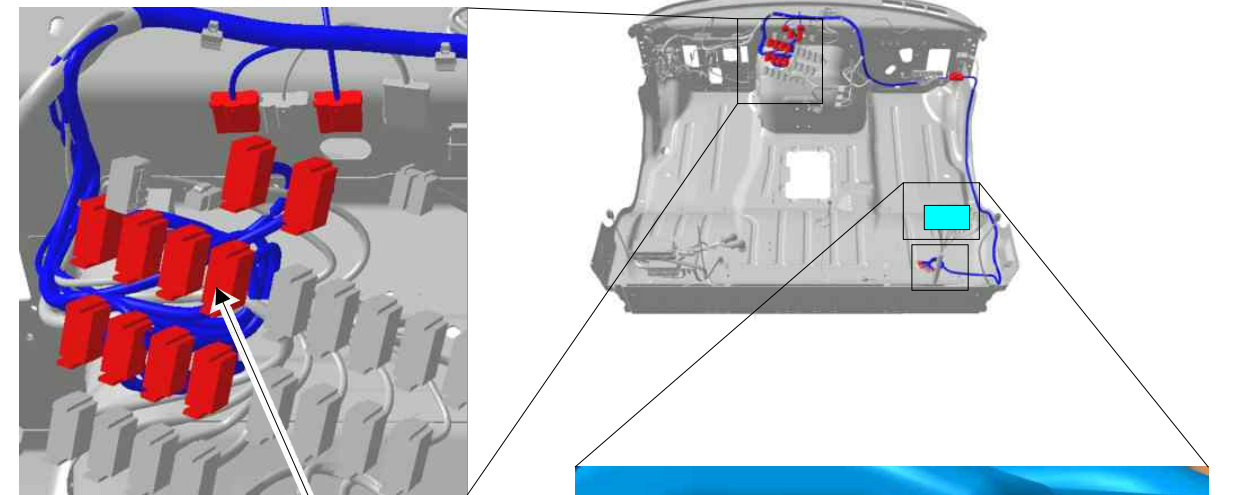
- 329-090** (10) IGNITION CONTROLLED EXTRA SWITCHES WITH INDICATOR LIGHTS WIRED TO POWER DISTRIBUTION BOX WITH RELAYS PROVIDING 20 AMPS PER CIRCUIT TO JUNCTION BLOCK
- 329-091** (6) IGNITION CONTROLLED EXTRA SWITCHES WITH INDICATOR LIGHTS WIRED TO POWER DISTRIBUTION BOX WITH RELAYS PROVIDING 20 AMPS PER CIRCUIT TO JUNCTION BLOCK
- 329-092** (8) IGNITION CONTROLLED EXTRA SWITCHES WITH INDICATOR LIGHTS WIRED TO POWER DISTRIBUTION BOX WITH RELAYS PROVIDING 20 AMPS PER CIRCUIT TO JUNCTION BLOCK

Ignition Interlock Optional-switch Current Capacity		
No. of Switches	Auxiliary PNDB Power Feed	
	Rating	Switch Protection
6	All 20A	All Switches independently fused
8	All 20A	All Switches independently fused
10	All 20A	All Switches independently fused

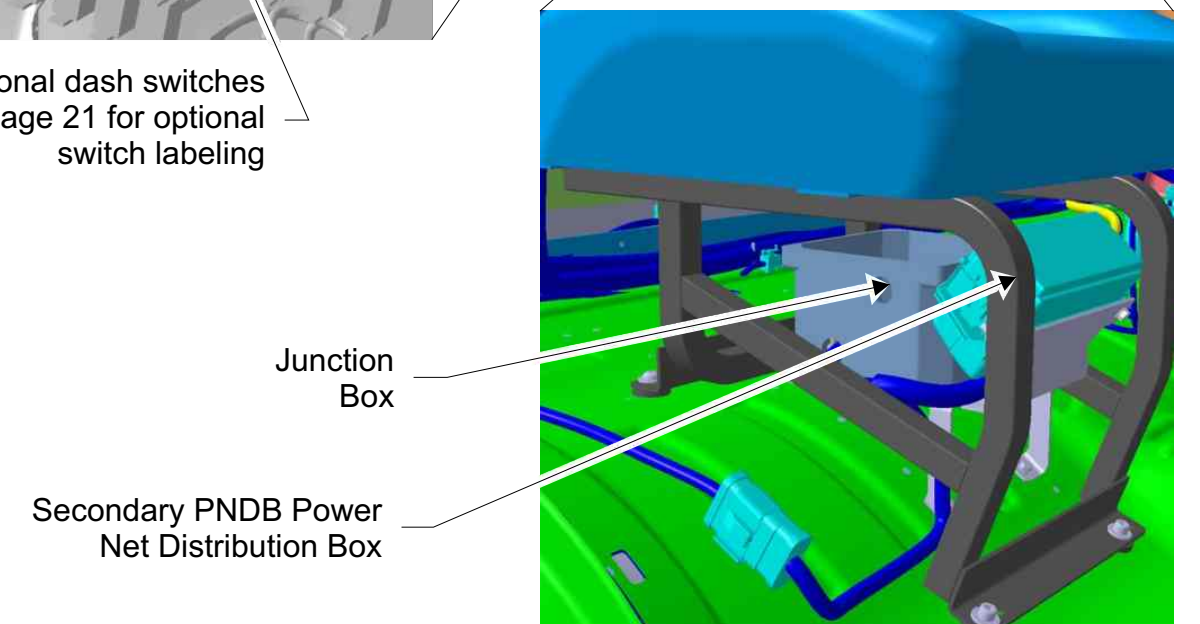


High Current Switch

Easily identified by the **White** backing on the switch



Additional dash switches see page 21 for optional switch labeling



Junction Box

Secondary PNDB Power Net Distribution Box

Note: For Non fixed passenger seat solutions the PNDB and junction block will be shipped loose in cab for customer install

Optional Switch (mod 329)
Fuse and Relay PDM

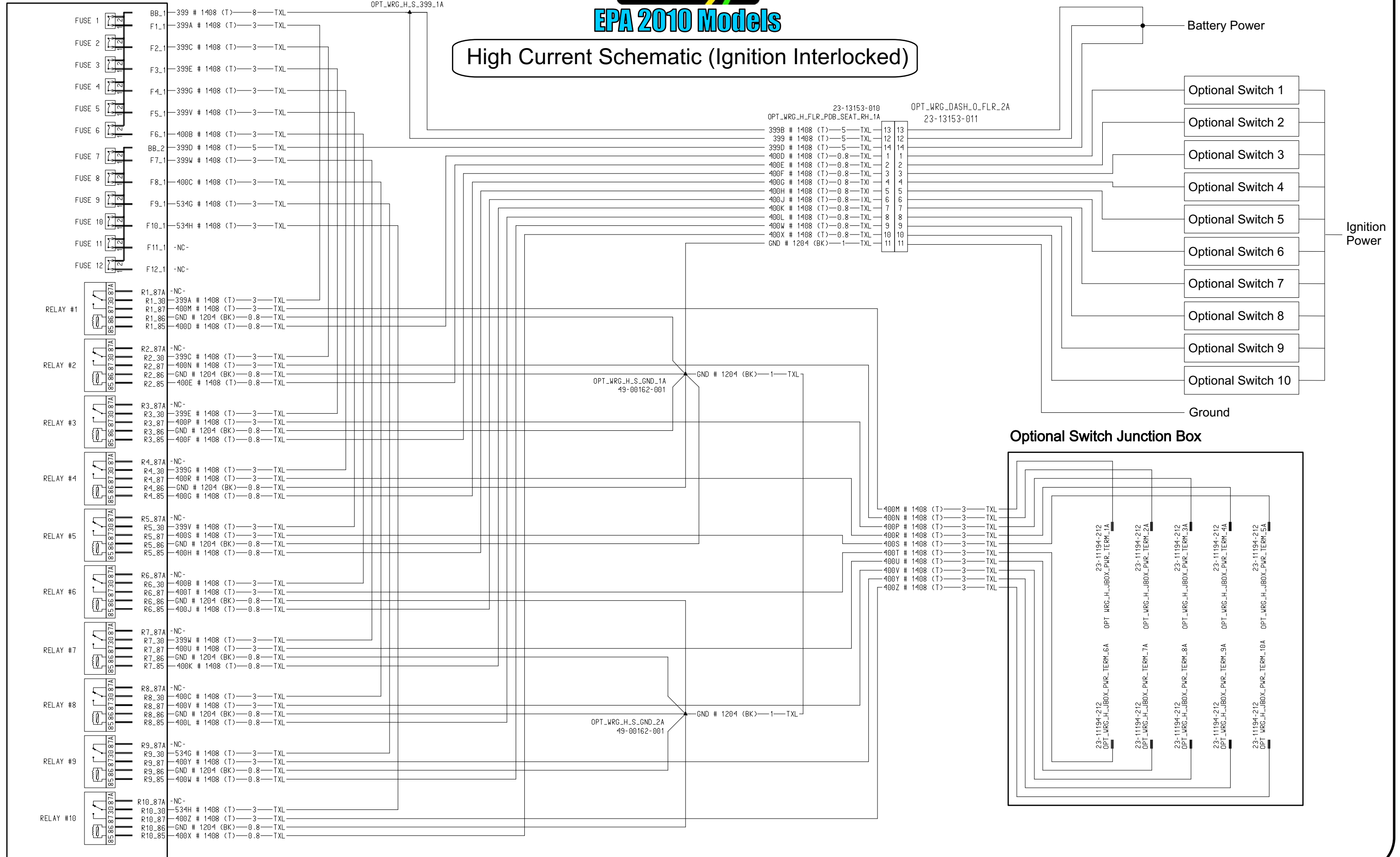
23-13305-017
OPT_WRG_H_PDB_SEAT_RH_1A

49-00162-001
OPT_WRG_H_S_399_1A



EPA 2010 Models

High Current Schematic (Ignition Interlocked)





EPA 2010 Models

High Current Switch Label Options

Pre labeled High Current Switch Options:

Mod 329 optional switch packages can be customized with the following predefined labels by adding a line note to the sales order.

Step 1

Select the 329-XXX option to drive the number of extra switches you require

Step 2

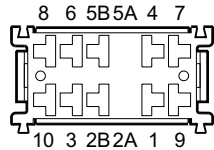
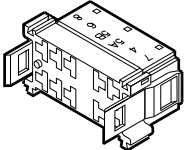
Have the dealer salesmen add the part numbers for the spare switches from the choices on this page that you would like pre installed.

The addition of the line note will drive a demand and the factory will install the corresponding switch displays in lieu of standard OPT switches in the truck.

Note:

Switches will come pre-wired as per the current optional switch data codes and will not be pre-wired to the locations defined by the switch label.

Option and Blank Switches		
	A06-30769-076	On (Mom)
	Option	Off None
	A06-30769-014	On Off
	Optional	None
	A06-30769-117	On Off
	Blank	None

Optional Switch Connector				
Connector Pin	Signal Name	Signal Type	Circuit Color	Circuit Number
 		FTL Switch Socket PN Socket 06-42557-000	Terminal Pin 23-13213-400 (20-18) Terminal Pin 23-13213-401 (16-14) Terminal Pin 23-13213-402 (12-10)	
		Vndr Switch Socket PN Socket PAC15393805	Terminal Pin PAC12015869 (20-18) Terminal Pin PAC12015870 (16-14) Terminal Pin PAC12015830 (12-10)	
				
1				
2B	Fused Battery Power	Input	T	399 for optional switches 1 and 2. 399B for optional switches 3 and 4.
3	Optional Switch Output	Output	T	399A for optional switch 1. 399C for optional switch 2. 399E for optional switch 3. 399G for optional switch 4.
4				
5B				
6				
7				
8	Ground	Ground	BK	GND
9				
10	Illumination Feed	Input	BR	29A

Chassis Lamps and Lights		
	A06-30769-158	On Off
	Plow 2 Lamp	None
	A06-30769-157	On Off
	Tail Gate Latch	None
	A06-30769-155	On Off
	Cab Strobe	None
	A06-30769-092	On Off
	Fog Lamp	None
	A06-30769-091	On Off
	Plow Lamp	None
	A06-30769-114	On Off
	Salt Light	None
	A06-30769-108	On Off
	Sander Lamp	None
	A06-30769-111	On Off
	Spot Lamp	None
	A06-30769-023	On Off
	Spot Lamp	None
	A06-30769-006	On Off
	Rear Fog Lamp	None
	A06-30769-003	On Off
	Utility Lamp	None
	A06-30769-004	On Off
	Road Lamp	None

Chassis Switches		
	A06-30769-081	On (Mom)
	Backup Alarm	Off None
	A06-30769-110	On Off
	Trailer Latch	None
	A06-30769-109	On Off
	Tailgate Latch	None
	A06-30769-025	On Off
	Trailer Aux	None
	A06-30769-077	On (Mom)
	Trailer Auxiliary	Off None
Roof Light Switches		
	A06-30769-075	On Off
	Alternate Flasher	None
	A06-30769-024	On Off
	Advertizing Light	None
	A06-30769-029	On Off
	Beacon Light	None
	A06-30769-013	On (Mom)
	Dome Light	Off None
	A06-30769-034	On Off
	Dome Light	None
	A06-30769-113	On Off
	Rear Strobe	None
	A06-30769-112	On Off
	Front Strobe	None
	A06-30769-107	On Off
	Sander Beacon	None
	A06-30769-005	On Off
	Foot well Light	None

Heater Switches		
	A06-30769-002	On Off
	Mirror Heat	None
	A06-30769-021	On Off
	Fuel Heater	None
	A06-30769-018	On Off
	Bunk Heater	None
	A06-30769-064	On Off
	Exhaust Heat	None
Drivetrain Switches		
	A06-30769-116	On Off
	Center Bal	None
	A06-30769-115	On Off
	Pump	None
	A06-30769-062	On Off
	Axle Shift	None
	A06-30769-082	On Off
	Axle Lift	None
	A06-30769-101	On Off
	Shift Tower	None
	A06-30769-098	On Off
	Trans Retarder	None
	A06-30769-096	On Off
	PTO	None
	A06-30769-031	On Off
	Engine Brake	None
	A06-30769-089	On Off
	HDWY Control	None
	A06-30769-149	On (Mom)
	Engine Start	Off None



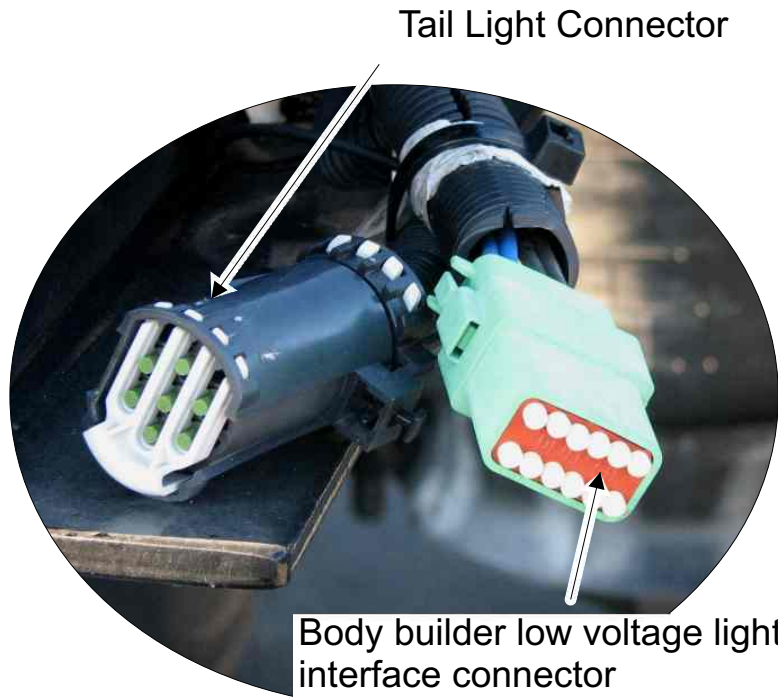
EPA 2010 Models

Body Builder Lighting Interfaces

Vehicle Interface Lighting

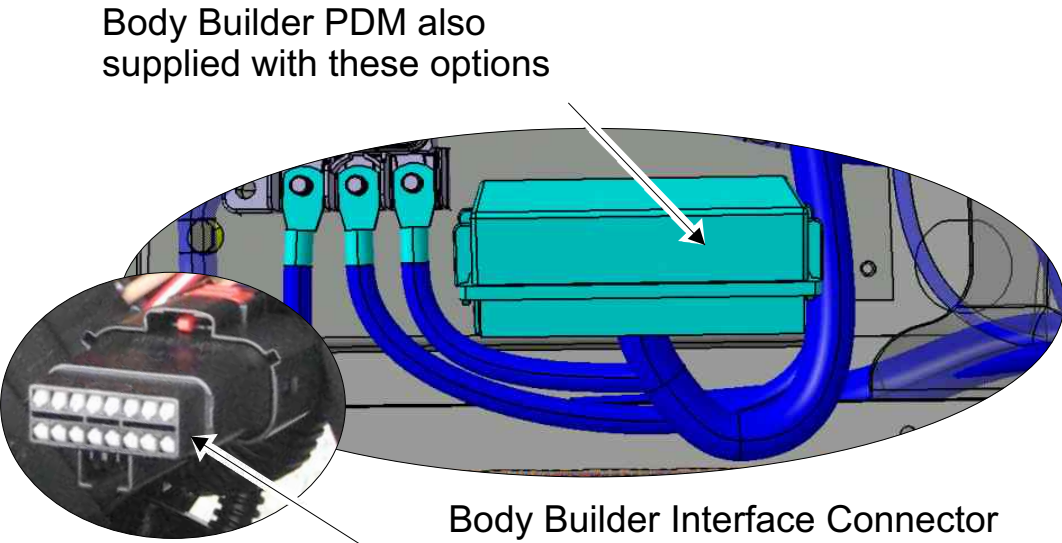
- 353-022 VEHICLE INTERFACE WIRING WITH BODY BUILDER CONNECTOR MOUNTED BACK OF CAB
- 353-023 VEHICLE INTERFACE WIRING WITH BODY BUILDER CONNECTOR MOUNTED END OF FRAME
- 353-026 VEHICLE INTERFACE WIRING AND PDM WITH BODY BUILDER CONNECTOR, BACK OF CAB
- 353-027 VEHICLE INTERFACE WIRING AND PDM WITH BODY BUILDER CONNECTOR AT END OF FRAME

	Option	Stop Lamps	Turn Lamps	Backup Lamps	Marker Lamps	Connection Point
Low Current Options	353 - 022	2.1 A per side	4.0 amps*	6.0 amps	6.0 amps	BOC, Marker Lamps to C- 4M
	353 - 023	2.1 A per side	4.0 amps*	6.0 amps	6.0 amps	EOF, Marker Lamps to C - 4M
High Current Options	353 - 026	20 A per side	20A per side	20 amps	20 amps	Back of Cab, PDM
	353 - 027	20 A per side	20A per side	20 amps	20 amps	End of Frame, PDM



Tail Light Connector

Body builder low voltage lighting interface connector supplied with 353-022 & 353-023 (See page 24for schematics)



Body Builder PDM also supplied with these options

Body Builder Interface Connector Supplied with 353-026 & 353-027 (See page 24 for schematics)

High-currentLightingInterfaceHarness Mod 353					
		Mating connector supplied with Chassis Apex Connector part Num FCI54201415 FTL Part # 23-13153-010 TERM-MALE,APEX2.8 FTL Part # 23-13211-010 FCI54001801, -011 FCI54001401 -012 FCI54001001, -013 FCI54001818, -014 FCI54001441			
Connector Pin	Signal Name	Signal Type	Circuit Color	Circuit Number	Current Capacity
1	Tail Lamp	+12V via PDM Fuse 7 With Relay 1 Active	BR	23	20 A
2	Back Up Lamp	+12V via PDM Fuse 12 With Relay 2 Active	DKBL	120B	20 A
3	Right Turn Lamp	+12V via PDM Fuse 1 With Relay 3 Active	DKG	38R	20 A
4	Right Stop Lamp	+12V via PDM Fuse 6 With Relay 4 Active	R-W	36P	20 A
5	Left Stop Lamp	+12V via PDM Fuse 2 With Relay 5 Active	R-W	36N	20 A
6	Left Turn Lamp	+12V via PDM Fuse 5 With Relay 6 Active	Y	38L	20 A
7	Marker Lamp	+12V via PDM Fuse 3 With Relay 7 Active	BR	46B	20 A
8	Ignition Power	+12V via PDM Fuse 4 With Relay 8 Active	PK	52F	20 A
9	Battery Power	+12V via PDM Fuse 11	R	14U	20 A
10	Battery Power	+12V via PDM Fuse 8	R	14U	20 A
11	Ground	Ground	BK	GND	-
12	Ground	Ground	BK	GND	-
13	Ground	Ground	BK	GND	-
14	Ground	Ground	BK	GND	-

Low-current Lighting Interface Harness A06-44388					
		TERM-MALE ,S16,SOL,16-18AWG (Solid) DUF 046020216141 TERM-MALE ,S16,SOL,14-16AWG (Solid) DUF 046021516141 TERM-MALE ,S16,,16-18AWG (stamped) DUF 1060 16 0122 PS TERM-MALE ,S16,,14-16AWG (stamped) DUF 1060 14 0122 PS			
Connector Pin	Signal Name	Signal Type	Circuit Color	Circuit Number	Current Capacity
1	Left Backup Light	Digital Output	DKBL	120B	7.45A*
2	Left Taillight	Digital Output	BR	23A	1.0A
3	Right Taillight	Digital Output	BR	23A	1.0A
4	Left Turn Light	Digital Output	Y	38L	7.45A
5	Backup Alarm	Digital Output	DKBL	120B	7.45A*
6	Right Backup Light	Digital Output	DKBL	120B	7.45A*
7	Right Stop Light or Right Stop/Turn Light	Digital Output	R-W	36	6.7A
8	Left Stop Light or Left Stop/Turn Light	Digital Output	R-W	36	6.7A
9	Right Turn Light	Digital Output	DKG	38R	7.45A
10 - 12					

* This pin is fed by CHM pins 1, 5, and 6. The maximum combined current capacity for all three pins is 7.45A.



EPA 2010 Models

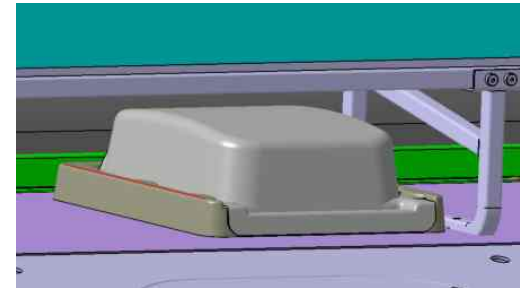
Bodybuilder PDM

Trailer and Body builder lighting Module

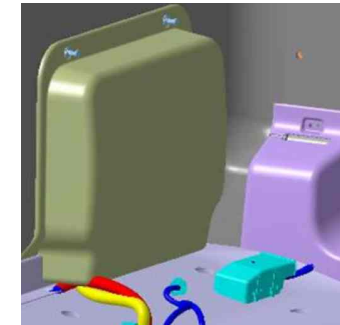
For all 2010 configurations specked with the trailer and bodybuilder options, Freightliner provides an in-cab lighting module that provides high current capacity circuits that are protected from the elements and easy to access for maintenance and assembly people.

The new unit also supplies the same frame connections that were available in 2007 models with an under cab harness mounted near the back wall. These harnesses run to the chassis and provide power connections in various locations.

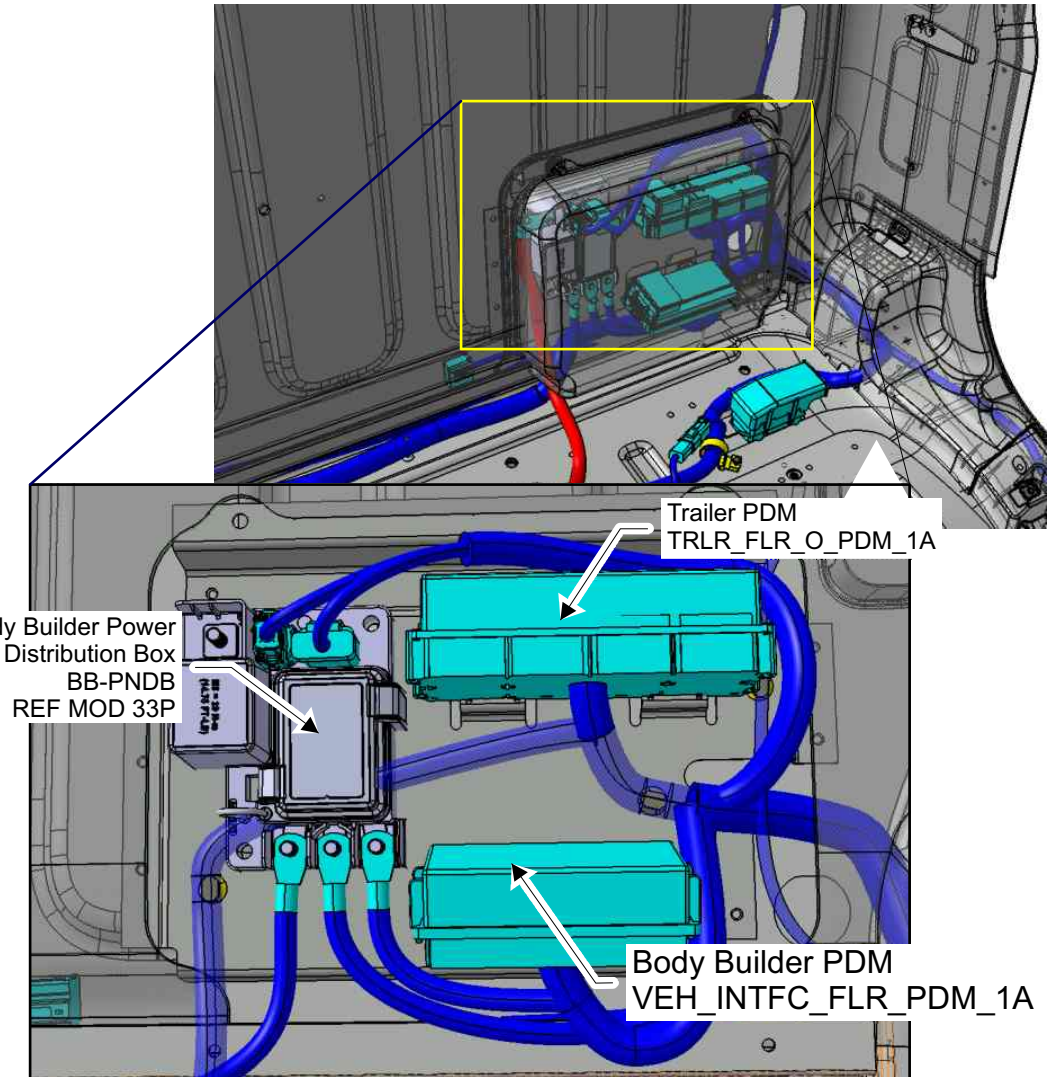
The unit is also available with a cut off switch option that is controlled by a separate PNDB unit located in the box. (See cutoff switch page for more information).



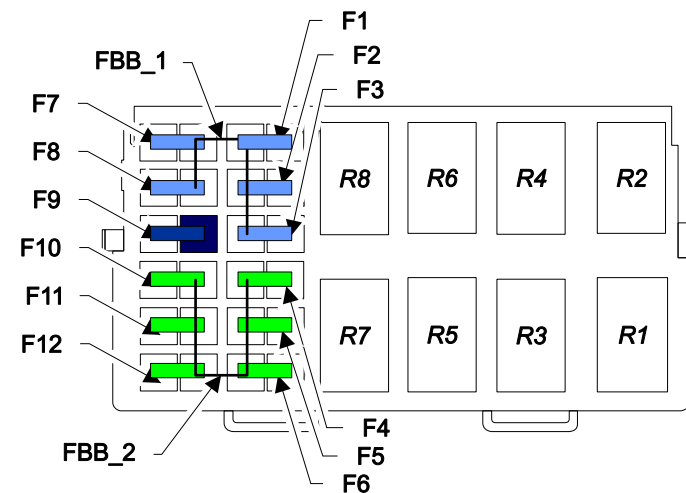
Floor Mount Configuration
for Extend Cab Units



Back wall Configuration
for Day Cab Units



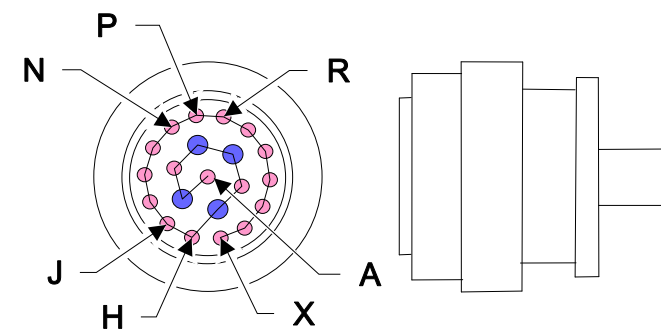
Body Builder PDM VEH_INTFC_FLR_PDM_1A



Fuse Location	Fuse Rating	Function	Relay Location	Relay Rating	Function
F1	20A	Right Turn Lamp	R1	Micro	Tail Lamp
F2	20A	Left Stop Lamp	R2	Micro	Backup Lamp
F3	20A	Marker Lamp	R3	Micro	Right Turn Lamp
F4	20A	Ignition Power	R4	Micro	Right Stop Lamp
F5	20A	Left Turn Lamp	R5	Micro	Left Stop Lamp
F6	20A	Right Stop Lamp	R6	Micro	Left Turn Lamp
F7	20A	Tail Lamp	R7	Micro	Marker Lamp
F8	20A	Battery Power	R8	Micro	Ignition Power
F9	---	Blocked			
F10	---	Spare			
F11	20A	Battery Power			
F12	20A	Backup Lamp			

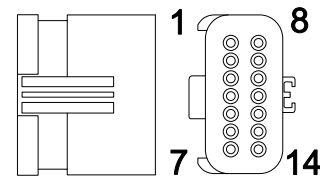
Cab Floor Connector Pinout

REF DES UCAB_H_FLR_3A
PART NO: 23-13148-067
MOD: K04

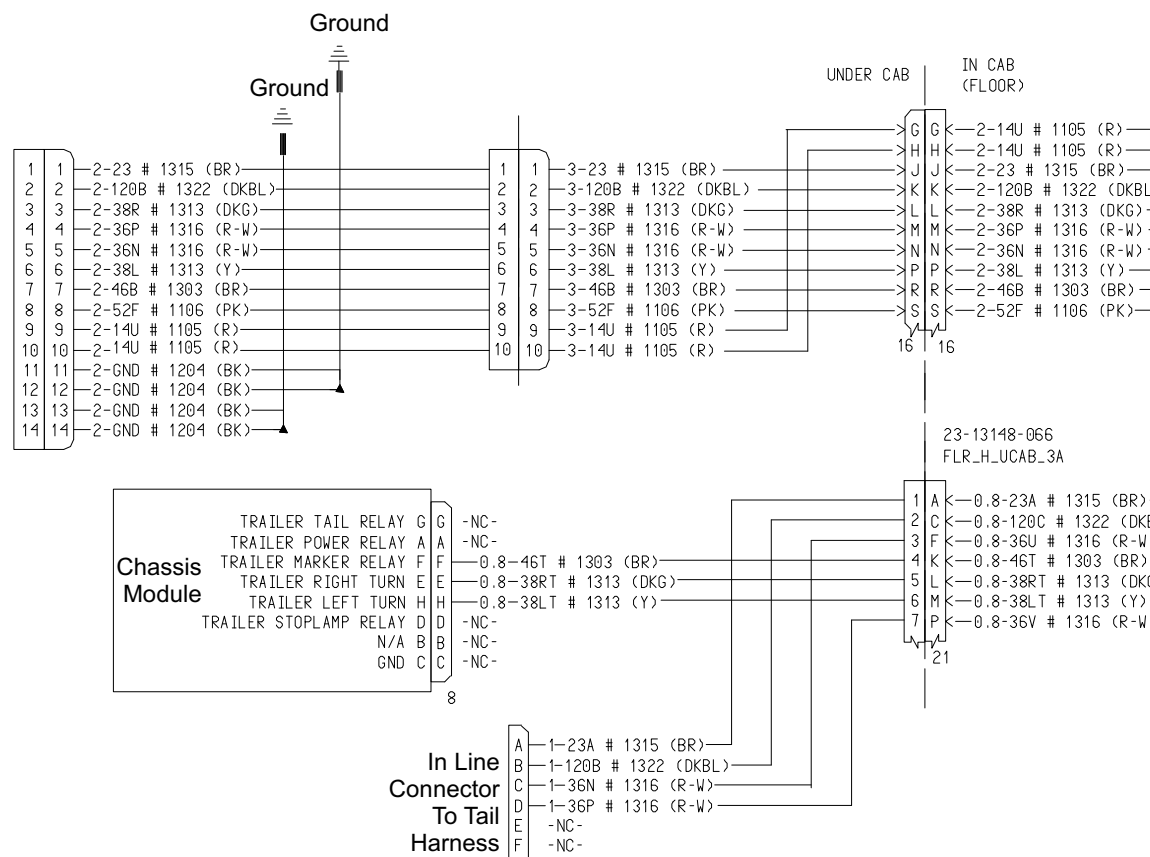


UCAB_H_FLR_2A			
Pin	Wire size	Usage Description	Circuit #
A	16-18	Marker Lamp Relay R4_87	46A
B	16-18	Left Turn Relay R6_87	38L
C	16-18	Stop Lamp Relay R5_87	36B
D	16-18	Right Turn Relay R7_87	38R
E	16-18	Tail Lamp Relay R3_87	23
F	16-18	Trailer Power R2_87	45
G	16-18	20 amp battery Fuses	14U
H	16-18	20 amp battery Fuses	14U
J	16-18	Left Tail Lamp	23
K	16-18	Backup Lamp	120B
L	16-18	Right Turn Lamp	38R
M	16-18	Right Stop Lamp	36P
N	16-18	Left Stop Lamp	36N
P	16-18	Left Turn Lamp	38L
R	16-18	Marker Lamp	46B
S	16-18	Ignition Power	52F

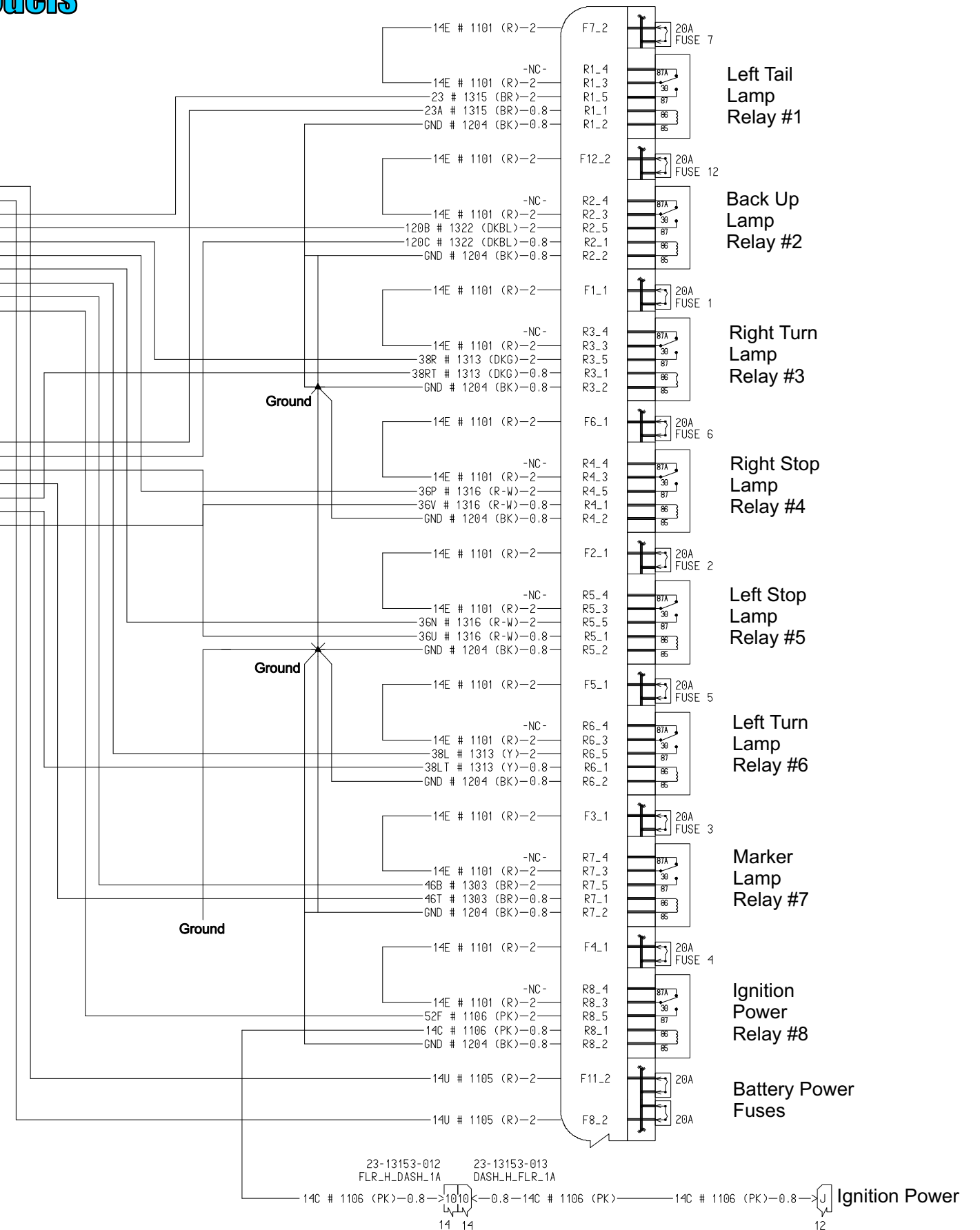
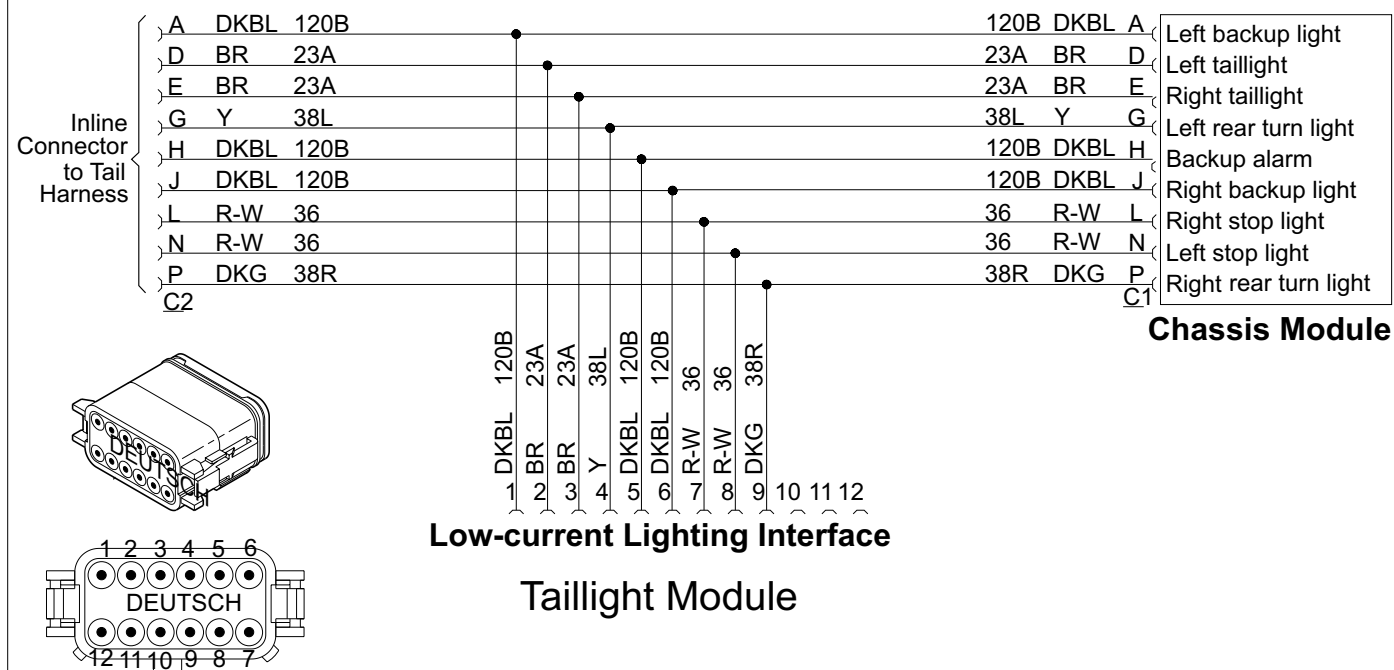
High Current InterfaceRef Harness A06-48218



Mating connector supplied with Chassis
Apex Connector part Num FCI54201415
FTL Part # 23-13153-010



Low Current Interface Ref Harness A06-44388

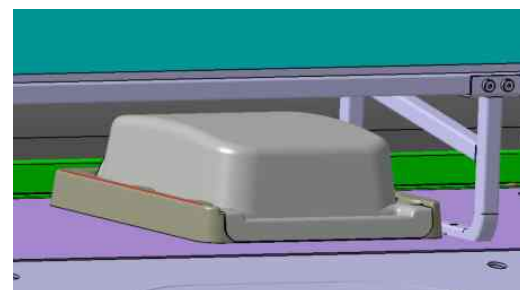


Body builder Trailer Module

For all 2010 configurations specked with the trailer and bodybuilder options, Freightliner provides an in-cab trailer control module that provides high current capacity circuits that are protected from the elements and easy to access for maintenance and assembly people.

The new unit also provides the same frame connection locations that where available in 2007 models with an under cab harness mounted near the back wall. These harnesses run to the chassis and provide trailer connections in various locations.

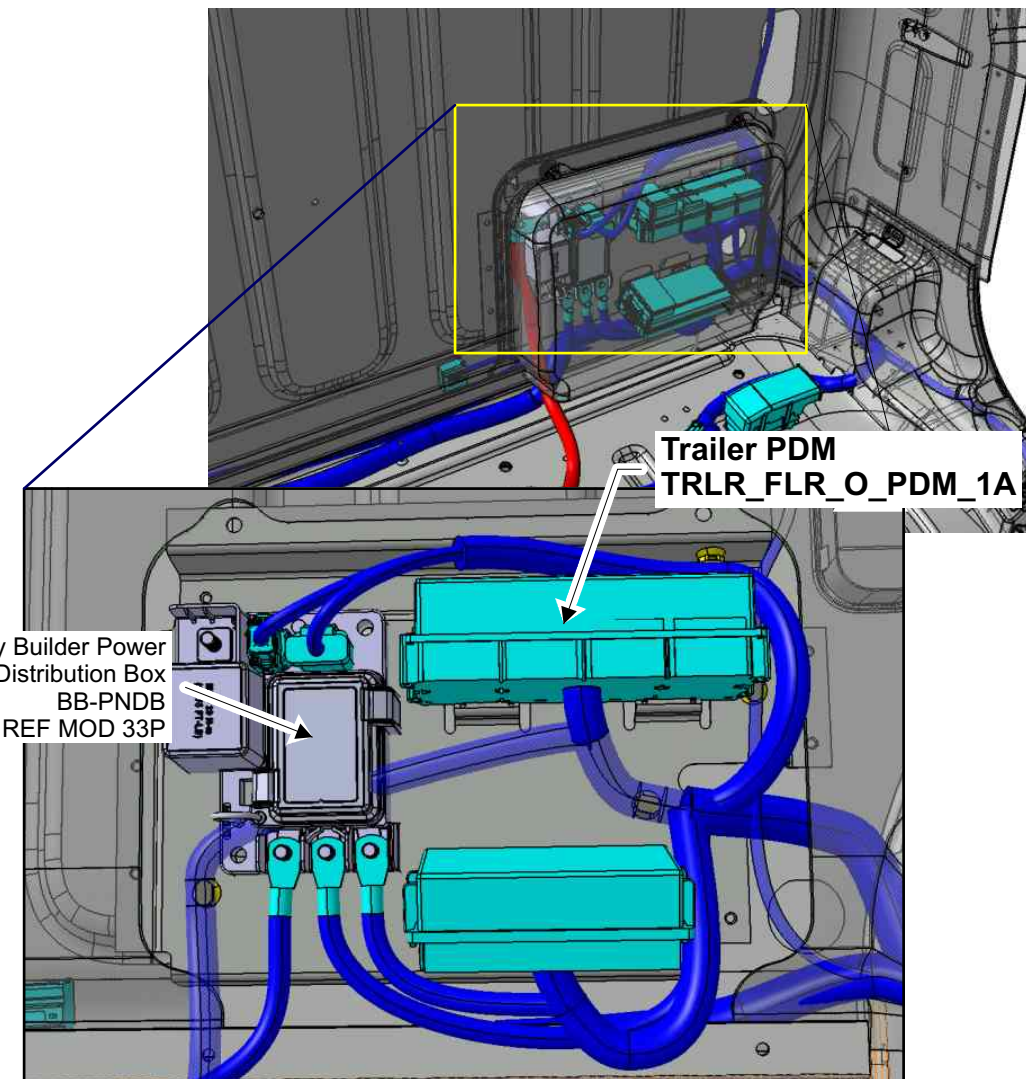
The unit is also available with a cut off switch option that is controlled by a separate PNDB unit located in the box. (See cutoff switch page for more information).



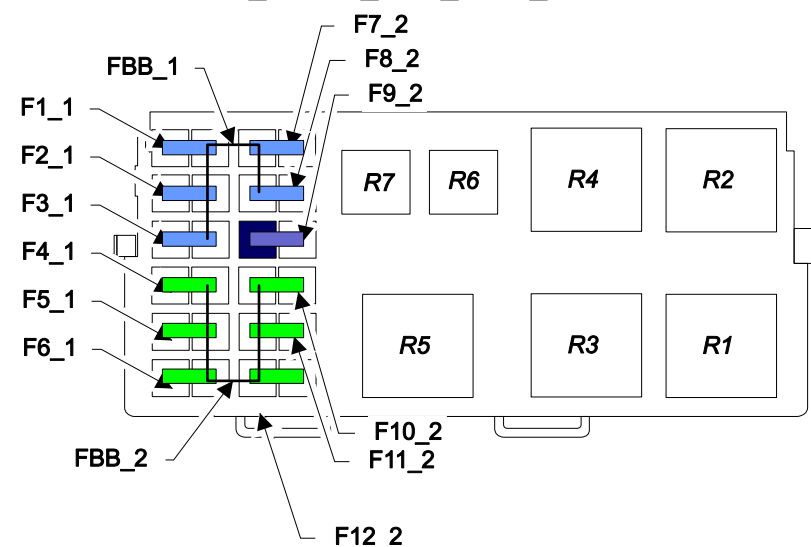
Floor Mount Configuration
for Extend Cab Units



Back wall Configuration
for Day Cab Units

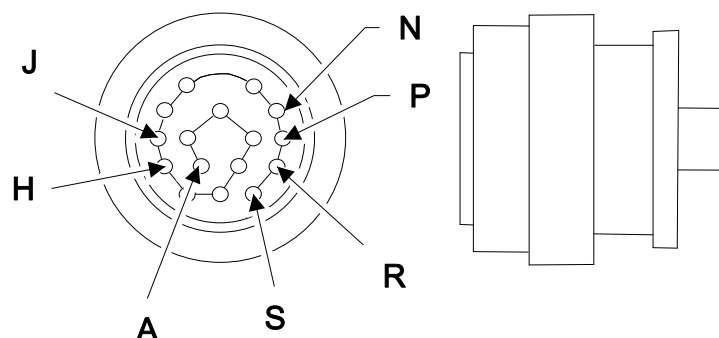


Body Builder PDM VEH_INTFC_FLR_PDM_1A



Fuse Location	Fuse Rating	Function	Relay Location	Relay Rating	Function
F1	20A	Supplemental Trailer	R1	Mini	Supplemental Trailer
F2	20A	Tail Lamp	R2	Mini	Trailer Power
F3	20A	Stop Lamp	R3	Mini	Tail Lamp
F4	20A	Right Turn Lamp	R4	Mini	Marker Lamp
F5	20A	Left Turn Lamp	R5	Mini	Stop Lamp
F6	20A	Marker Lamp	R6	Micro	Left Turn Lamp
F7	---	Spare	R7	Micro	Right Turn Lamp
F8	---	Spare			
F9	---	Blocked			
F10	---	Spare			
F11	---	Spare			
F12	30A	Trailer Power			

UCAB_H_FLR_2A MOD K03



UCAB_H_FLR_3A

Pin	Wire size	Usage Description	Circuit #
A	16-18	Left Tail Lamp R1_1	23A
B	12-14	---	
C	16-18	Back up Lamp R2_1	120C
D	12-14	PLC Filter Mod 296	376D
E	12-14	Plc Filtrr Mod 296	376C
F	16-18	Left Stop Lamp R5_1	36U
G	12-14	---	
H	16-18	Tail Lamp Relay R3_86	23A
J	16-18	Trailer Power Relay R2_85	52C
K	16-18	Trailer Marker Relay R7_1	46T
L	16-18	Trailer Right Turn R3_1	38RT
M	16-18	Trailer Left Turn R6_1	38LT
N	16-18	Stop Lamp R5_86	36
P	16-18	Right Stop Lamp R4_1	36V
R	16-18	Aux PNDB Disconnect Off Signal	425J
S	16-18	Aux PNDB Disconnect LED Indicator	425H
T	16-18	Aux PNDB Disconnect Return Signal	425K
U	16-18	Aux PNDB Disconnect GND	GNDE
V	16-18	---	
W	16-18	---	
X	16-18	---	

Mod 296/297 Separate Stop/Turn

296-010 PRIMARY CONNECTOR/RECEPTACLE CENTER PIN
POWERED THROUGH IGNITION

297-001 SAE J560 7-WAY PRIMARY TRAILER CABLE RECEPTACLE
MOUNTED END OF FRAME

297-005 SAE J560 7-WAY PRIMARY TRAILER CABLE RECEPTACLE
MOUNTED ON CHASSIS BACK OF CAB/SLEEPER

297-008 SAE J560 7-WAY PRIMARY TRAILER CABLE RECEPTACLE
BRACKET MOUNTED LH DECK BACK OF CAB

Trailer Electrical System (Seperate)

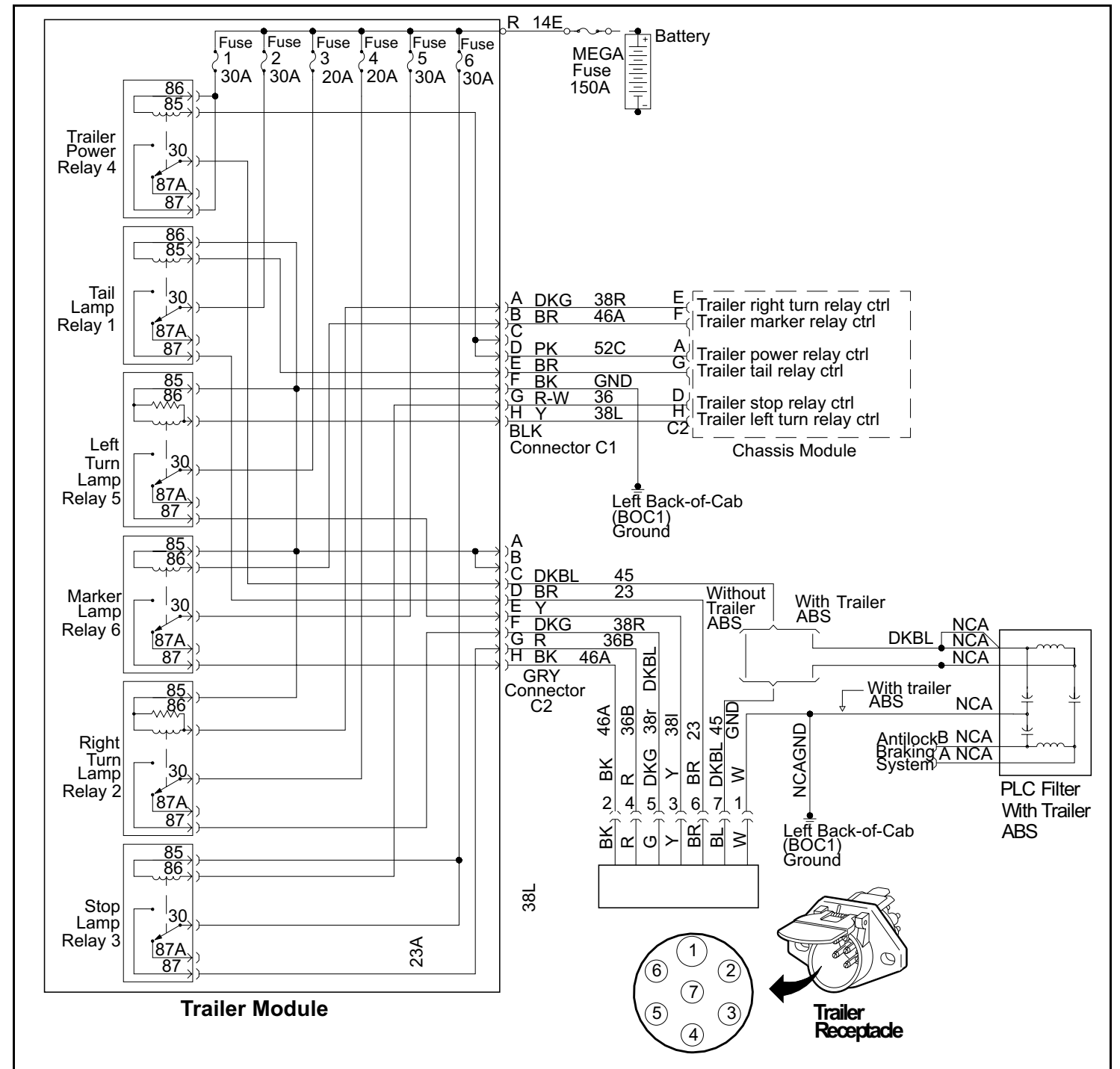
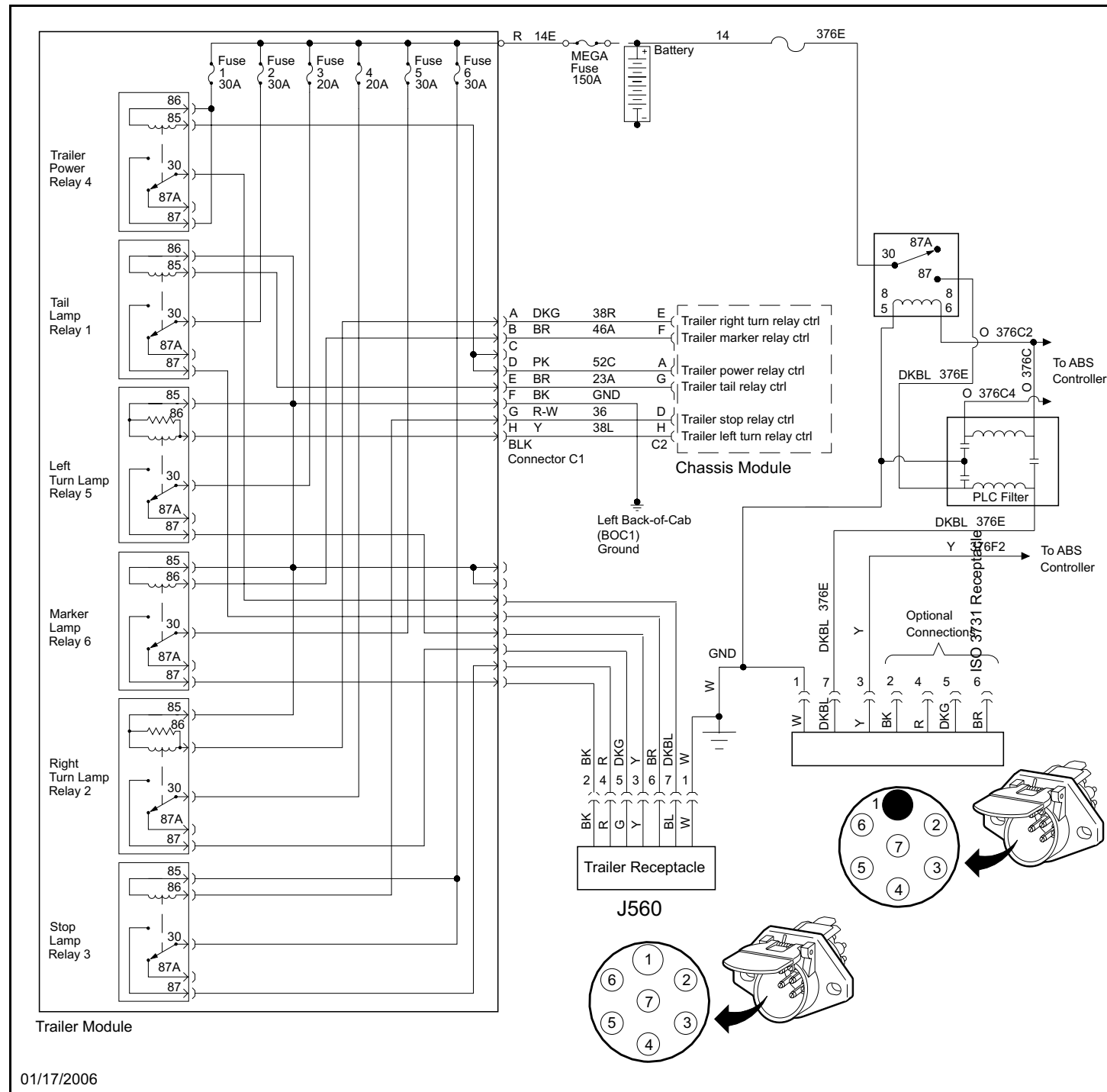


Fig. 2, Wiring Diagram of the Trailer Electrical System With Both J560 and ISO 3731 Connectors (primary and secondary receptacles)

Wiring Diagram of the Trailer Electrical System With Only a J560 Connector (primary receptacle)

Mod 296/297 Combination Stop/Turn

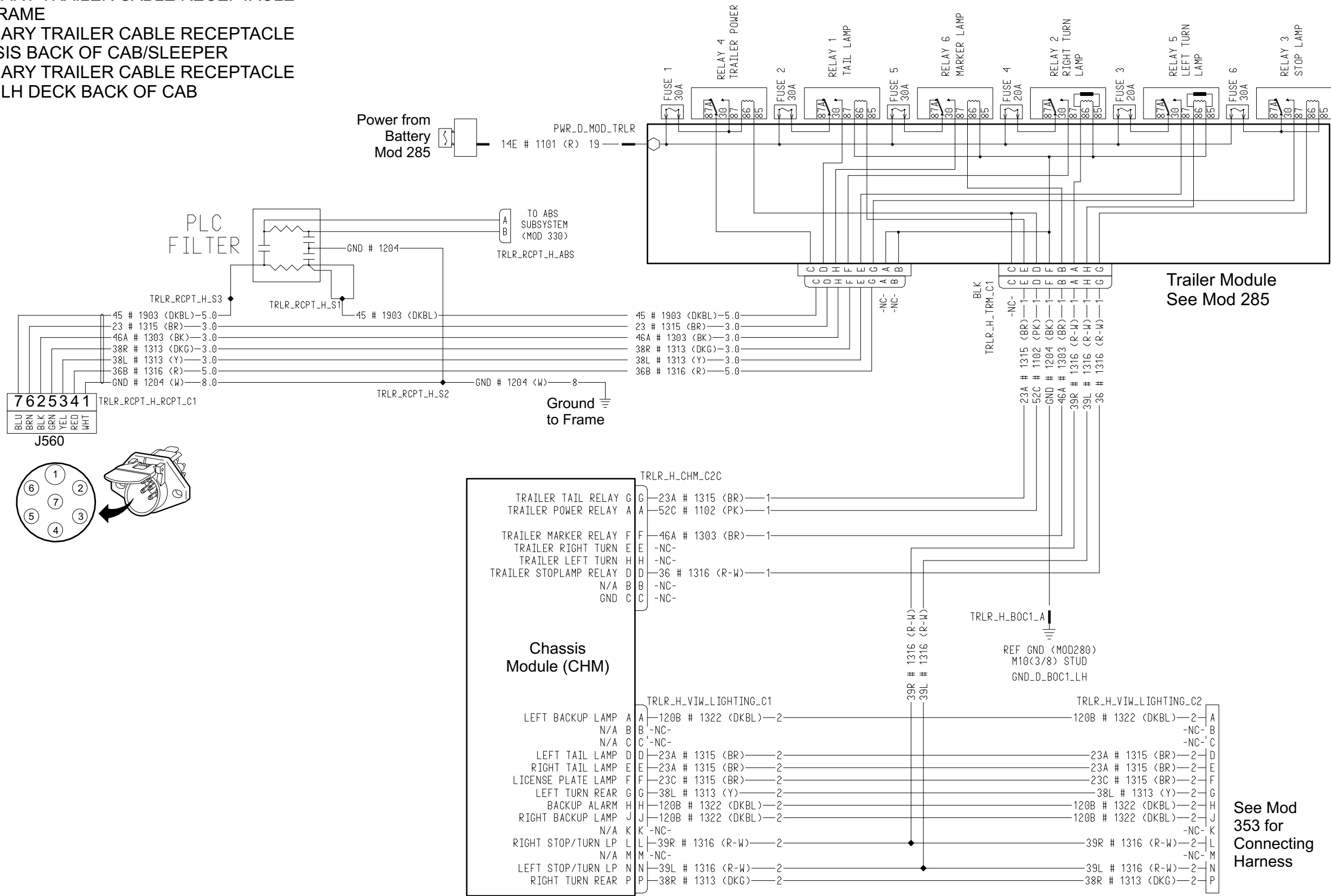


EPA 2010 Models

Trailer Electrical System (Combination)

- 296-025 PRIMARY CONNECTOR/RECEPTACLE WIRED FOR COMBINATION STOP/TURN, CENTER PIN POWERED THROUGH IGNITION
- 297-001 SAE J560 7-WAY PRIMARY TRAILER CABLE RECEPTACLE MOUNTED END OF FRAME
- 297-005 SAE J560 7-WAY PRIMARY TRAILER CABLE RECEPTACLE MOUNTED ON CHASSIS BACK OF CAB/SLEEPER
- 297-008 SAE J560 7-WAY PRIMARY TRAILER CABLE RECEPTACLE BRACKET MOUNTED LH DECK BACK OF CAB

Primary Trailer Recptical 90 deg or Streight Connector



M2 Wired Rite Prep Harness

A prep harness is available on the M2 system which makes it easy and efficient to install the wired-rite unit in the truck when specified in the truck order.

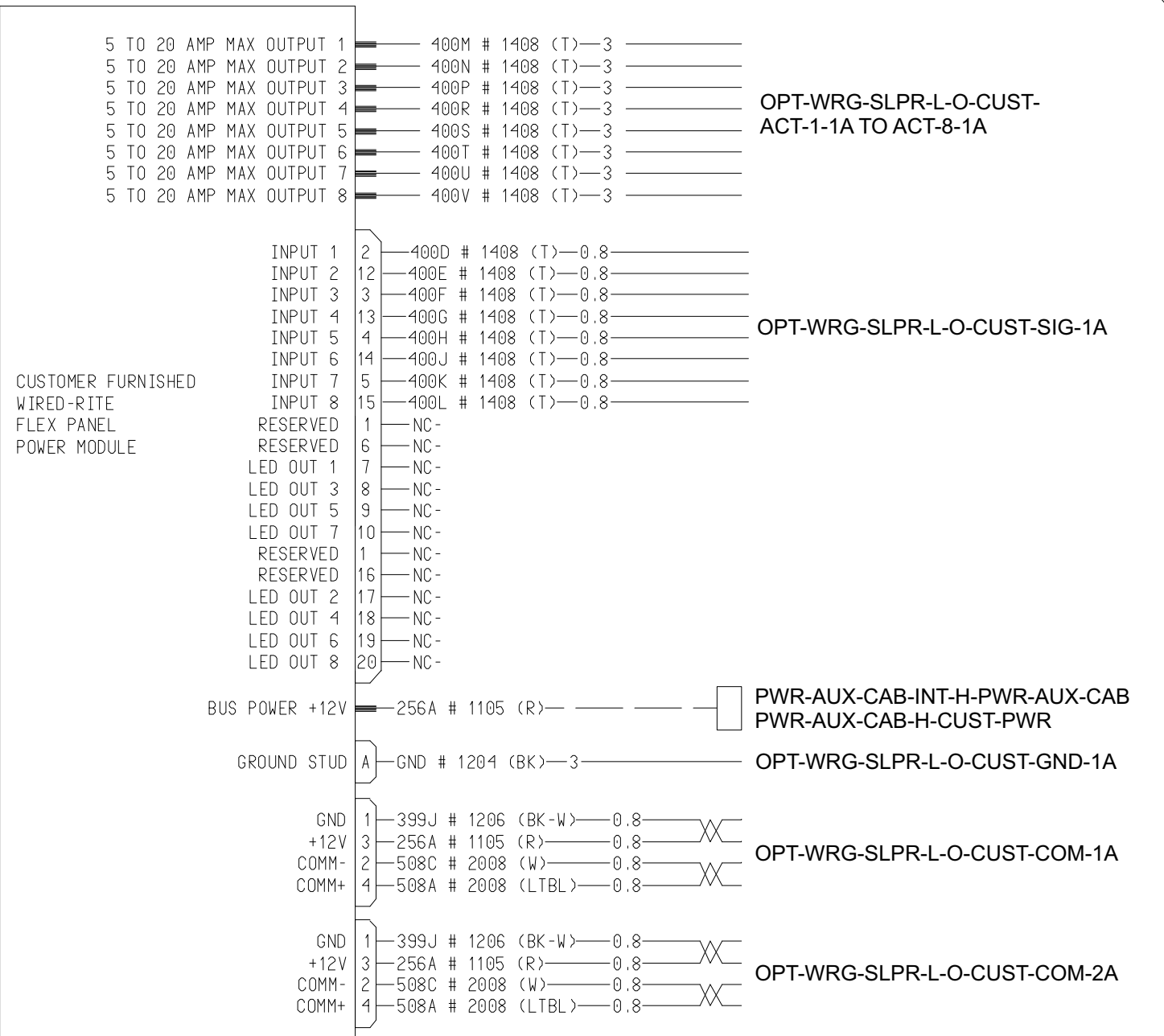
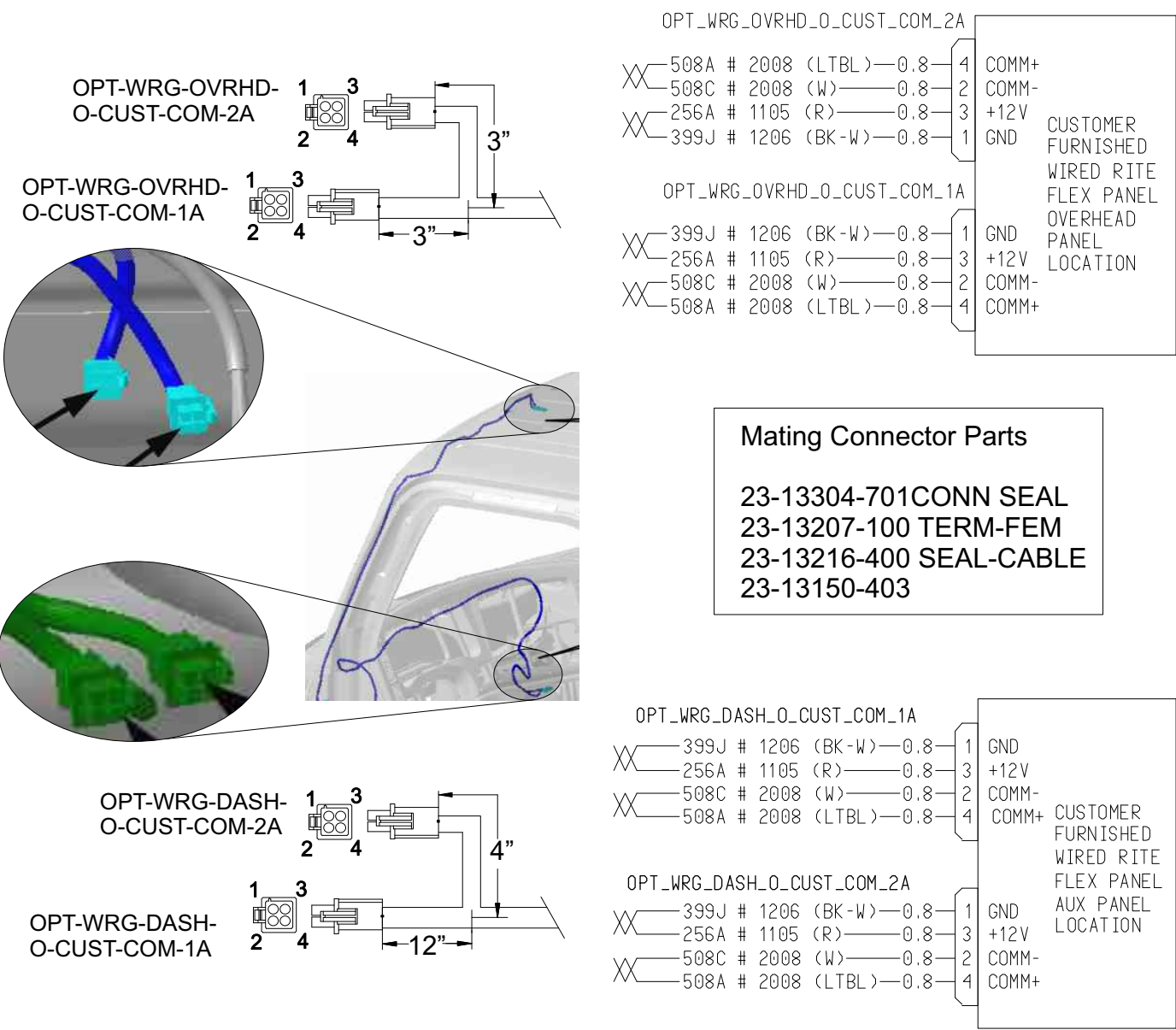
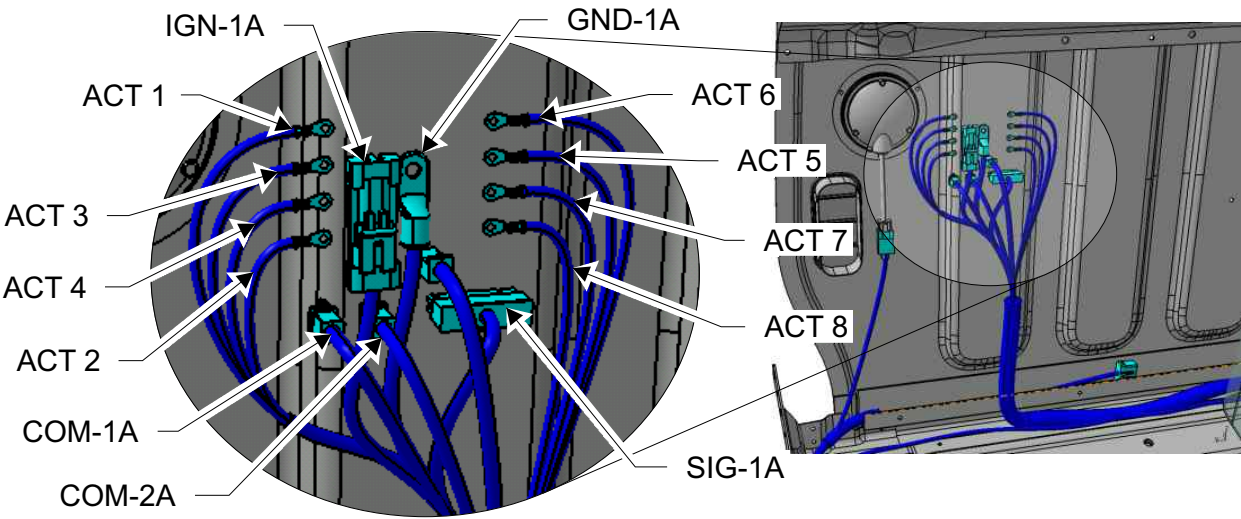
Wired right preps provide 8 20 amp capacity harnesses to the center of the cab back wall and corresponding switch harness to the overhead console and dash auxiliary panel. Console and dash harnesses are designed to connect to the 8 switch Wired Rite package and provides easy cross platform controls to be installed easily into the M2 product using the following options

- 829-ED3 100"106"112" M2 DAY CABS
- 829-DH1 EXTENDED CABS(M2)
- 829-DH2 CREW CABS(M2)

SmartPlex™
Electrical System

EPA 2010 Models

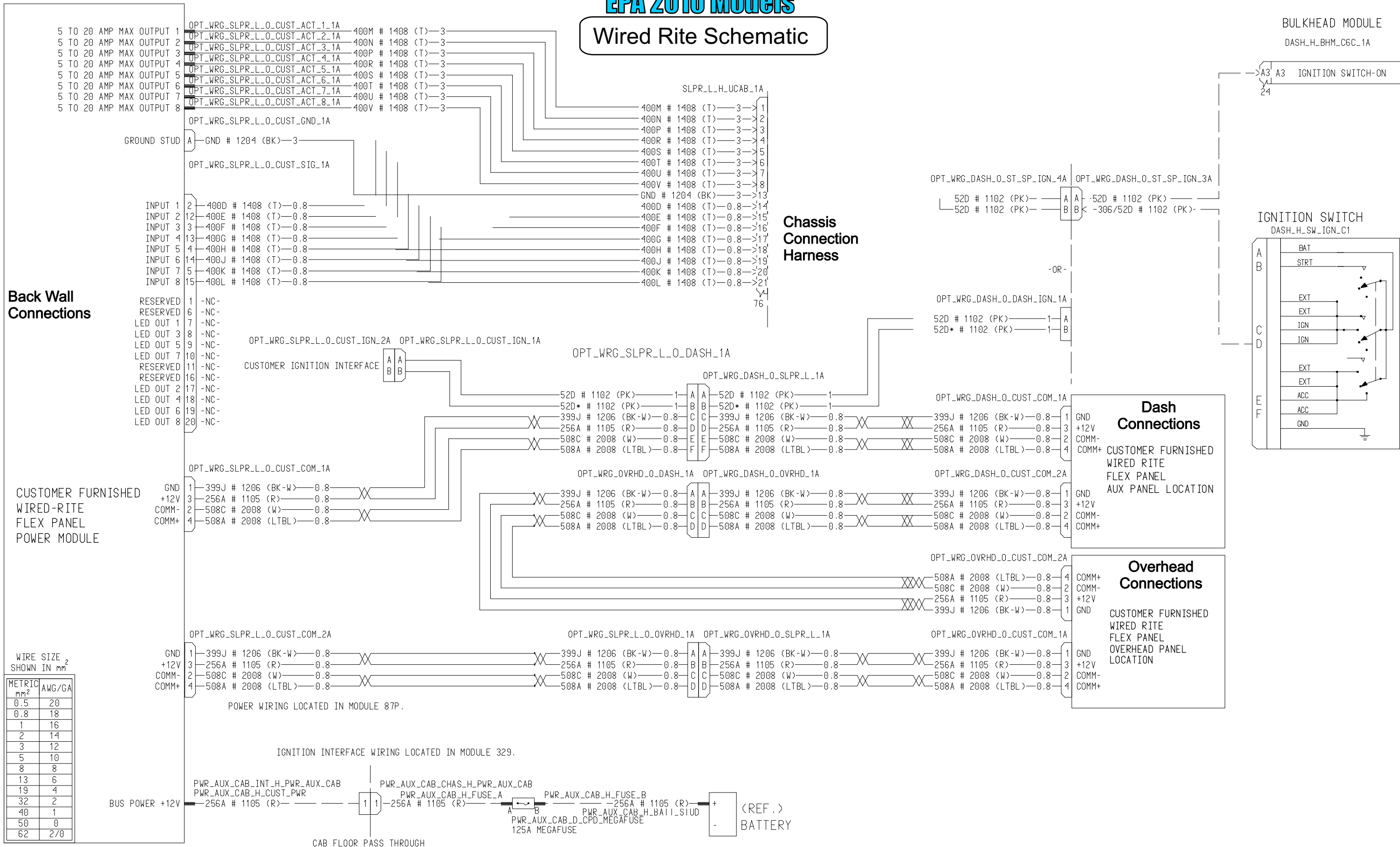
Wired Rite Prep





EPA 2010 Models

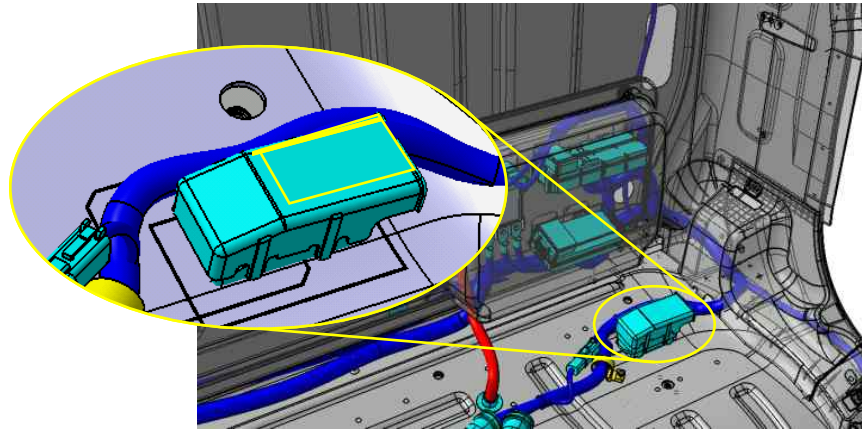
Wired Rite Schematic





EPA 2010 Models

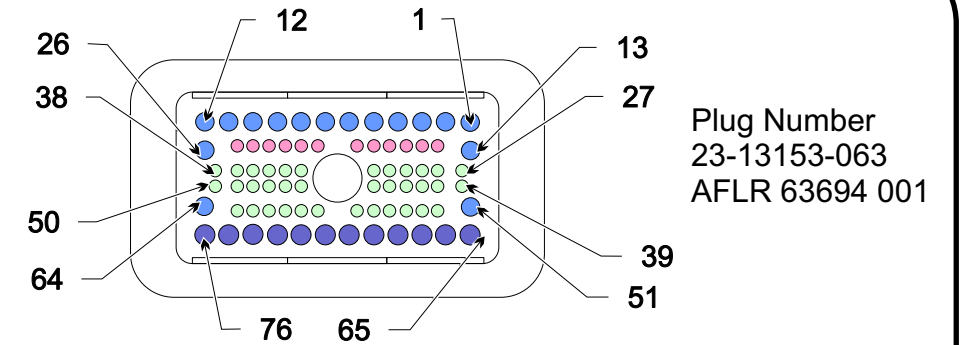
Trailer and Bodybuilder Floor Connections



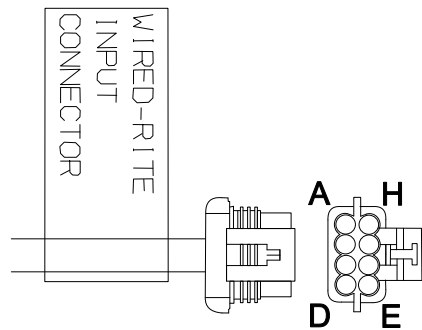
Body Builder Floor Plug Interface

Connections to the new Trailer and body builder unit are achieved using a 76Pin plug located on the cab floor rear of the driver seat.

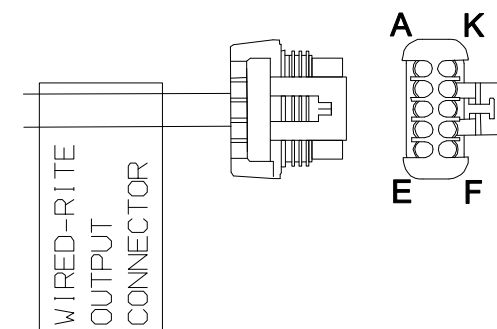
Refer to the diagram and chart on this page to determine what pins are used for connections and what pins are available for additional body builder connections.



Wired Rite Chassis output connectors



Wired Rite Input Connector	
Pin Cavity	Circuit
A	400D Input 1
B	400E Input 2
C	400F Input 3
D	400G Input 4
E	400H Input 5
F	400J Input 6
G	400K Input 7
H	400L Input 8



Wired Rite Output Connector	
Pin Cavity	Circuit
A	400M Output 1
B	400N Output 2
C	400P Output 3
D	400R Output 4
E	400S Output 5
F	400T Output 6
G	400U Output 7
H	400V Output 8
J	GROUND
K	---

UCAB_H_FLR_1A

Pin	Wire size	Usage Description	Circuit #	Pin	Pin size mm	Usage Description	Load Limit
1	12-14	Wired Rite output (5 to 20 Amp) ACT_1_1A	400M	39	16-18	--	
2	12-14	Wired Rite output (5 to 20 Amp) ACT_2_1A	400N	40	16-18	--	
3	12-14	Wired Rite output (5 to 20 Amp) ACT_3_1A	400P	41	16-18	--	
4	12-14	Wired Rite output (5 to 20 Amp) ACT_4_1A	400R	42	16-18	--	
5	12-14	Wired Rite output (5 to 20 Amp) ACT_5_1A	400S	43	16-18	--	
6	12-14	Wired Rite output (5 to 20 Amp) ACT_6_1A	400T	44	16-18	--	
7	12-14	Wired Rite output (5 to 20 Amp) ACT_7_1A	400U	45	16-18	--	
8	12-14	Wired Rite output (5 to 20 Amp) ACT_8_1A	400V	46	16-18	--	
9	12-14	--		47	16-18	Engine Control Dash	483Z
10	12-14	--		48	16-18	Remote VSG Select	439U
11	12-14	--		49	16-18	Cruise Control On/Off Enable	492U
12	12-14	--		50	16-18	Cruise Control Set/Coast	483A
13	12-14	Ground Stud (GND # 1284)	1284	51	12-14	--	
14	16-18	Wired Rite Input 1 (400D)	400D	52	16-18	Cruise Control Resume/Control	483B
15	16-18	Wired Rite Input 2 (400E)	400E	53	16-18	Limiter 8	439V1
16	16-18	Wired Rite Input 3 (400F)	400F	54	16-18	Limiter 1	439V2
17	16-18	Wired Rite Input 4 (400G)	400G	55	16-18	Tachometer	483E
18	16-18	Wired Rite Input 5 (400H)	400H	56	16-18	Throttle Inhibit	492Z
19	16-18	Wired Rite Input 6 (400J)	400J	57	16-18	Remote Accelerator Select	483N
20	16-18	Wired Rite Input 7 (400K)	400K	58	16-18	Variable Speed Governor	483C
21	16-18	Wired Rite Input 8 (400L)	400L	59	16-18	+5V Sensor Supply	483D
22	16-18	Disconnect Off Signal		60	16-18	Engine Control Dash	492Y
23	16-18	Disconnect LED Indicator		61	16-18	Dash Power and Ignition	439A
24	16-18	Disconnect Return Signal		62	16-18	CAV 15 -NC- (Reserved)	
25	16-18	Disconnect GND		63	16-18	CAV 16 -NC- (Reserved)	
26	12-14	--		64	12-14	--	
27	16-18	--		65	12-14	--	
28	16-18	--		66	12-14	--	
29	16-18	--		67	12-14	--	
30	16-18	--		68	12-14	--	
31	16-18	--		69	12-14	--	
32	16-18	--		70	12-14	--	
33	16-18	--		71	12-14	--	
34	16-18	--		72	12-14	--	
35	16-18	--		73	12-14	--	
36	16-18	--		74	12-14	--	
37	16-18	--		75	12-14	--	
38	16-18	--		76	12-14	--	

Tail Lights

Tail Lights and EOF Connections

Body builders utilizing factory lights and needing additional lighting interface should use the 353 data codes for body builder interfaces.

Body builders wishing to supply their own taillights can order the “Wiring Only” option shown below.

Many connectors come with mating connectors included and require only the terminals to be supplied by the body builder.

Wiring Only Options

Combination Stop/Turn/Tail, Separate Backup Light

294-090 OMIT STOP/TAIL/BACKUP LIGHTS AND PROVIDE WIRING FOR COMBINED STOP/TURN LIGHTS TO FOUR FEET BEYOND END OF FRAME

Combination Stop/Tail, Separate Turn Separate Backup Light

294-046 OMIT STOP/TAIL/BACKUP LIGHTS AND PROVIDE WIRING WITH SEPARATE STOP/TURN WIRES TO 4' BEYOND END OF FRAME

294-094 OMIT STOP/TAIL/BACKUP LIGHTS AND PROVIDE WIRING WITH SEPARATE STOP/TAIL WIRES TO 7' BEYOND END OF FRAME

Combination Stop/Turn/Tail/Backup Lights

294-001 INTEGRAL STOP/TAIL/BACKUP LIGHTS

294-017 INTEGRAL STOP/TAIL/BACKUP LIGHTS WITH 7' ADDITIONAL WIRE AT CHASSIS END OF FRAME

Combination Stop/Turn/Tail, Separate Backup Lights

LED Combination

294-042 FREIGHTLINER LED FLANGE MOUNTED STOP/TAIL/TURN LIGHTS WITH SEPARATE INCANDESCENT BACKUP LIGHTS

294-014 TRUCK-LITE 44 LED STOP/TAIL WITH SEPARATE BACKUP LIGHTS, GROMMET MOUNT

294-1AR TRUCK-LITE 44 LED STOP/TURN/BACKUP LIGHTS GROMMET MOUNTED WITH 3 FEET ADDITIONAL WIRE EACH SIDE FOR LATER RELOCATION

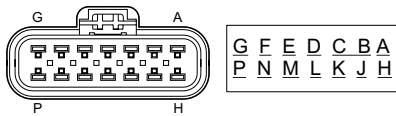
Incandescent Combination

294-002 TRUCK-LITE 40 STOP/TAIL WITH SEPARATE BACKUP LIGHTS GROMMET MOUNTED

Combination Stop/Tail, Separate Turn Separate Backup Lights

294-021 TRUCK-LITE 3 CHAMBER MODULES WITH 45 SERIES SEALED BEAM LAMPS

All Plugs viewed from Front

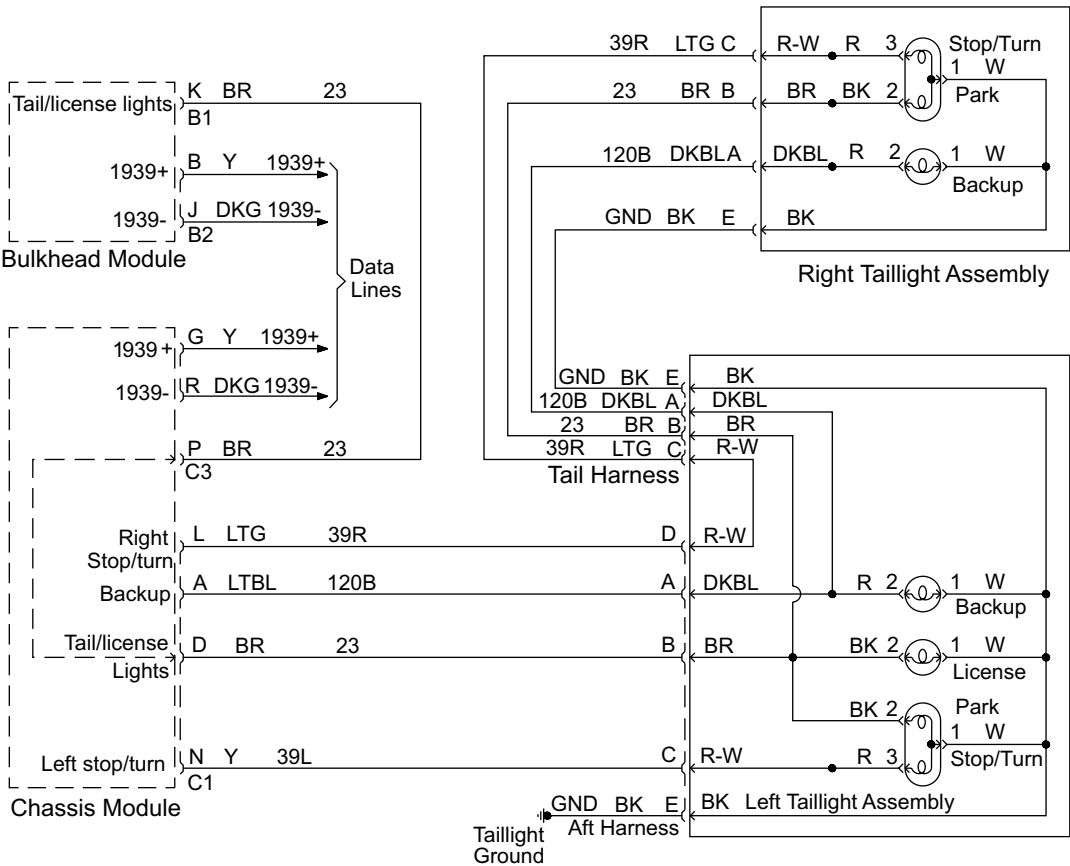


Pinouts at CHM Connector C1

Connector Pin	Signal Name	Signal Type	Circuit Color	Circuit Number	Current Capacity
C1-A	Left Backup Light (combination stop/turn signal)	Digital Output	LTBL	120B	7.45A*
C1-A	Left Backup Light (separate stop/turn signal)	Digital Output	DKBL	120B	7.45A*
C1-B			T	OPTA	
C1-C			T	OPTB	
C1-D	Left Taillight Pass-through	Pass-through	BR	23	1.0A†
C1-E	Right Taillight Pass-through	Pass-through	BR	23A	1.0A†
C1-F	License Plate Light	Digital Output	BR	23C	1.0A†
C1-G	Left Rear Turn Signal Light (separate stop/turn signal)	Digital Output	Y	38L	7.45A‡
C1-H	Backup Alarm	Digital Output	DKBL	120B	7.45A*
C1-J	Right Backup Light	Digital Output	DKBL	120B	7.45A*
C1-K			T	OPTC	
C1-L	Right Stop Light (combination stop/turn signal)	Digital Output	LTG	39R	7.45A
C1-L	Right Stop Light (separate stop/turn signal)	Digital Output	R-W	39R	7.45A
C1-M			T	OPTD	
C1-N	Left Stop/Turn Signal Light (combination stop/turn signal)	Digital Output	Y	39L	7.45A
C1-N	Left Stop Light (separate stop/turn signal)	Digital Output	R-W	39L	7.45A
C1-P	Right Rear Turn Signal Light (separate stop/turn signal)	Digital Output	DKG	38R	7.45A§

* Pins C1-A, C1-H, and C1-J are fed from the same CHM circuit board trace. The max combined current cap for all three pins is 7.45A.
† Pins C1-D, C1-E, and C1-F are fed from the same CHM circuit board trace. The max combined current cap for all three pins is 1A.
‡ Pins C1-G, C2-H, and C3-N are fed by the same CHM circuit board trace. The max combined current cap for all three pins is 7.45A.
§ Pins C1-P, C2-E, and C3-R are fed by the same CHM circuit board trace. The max combined current cap for all three pins is 7.45A.

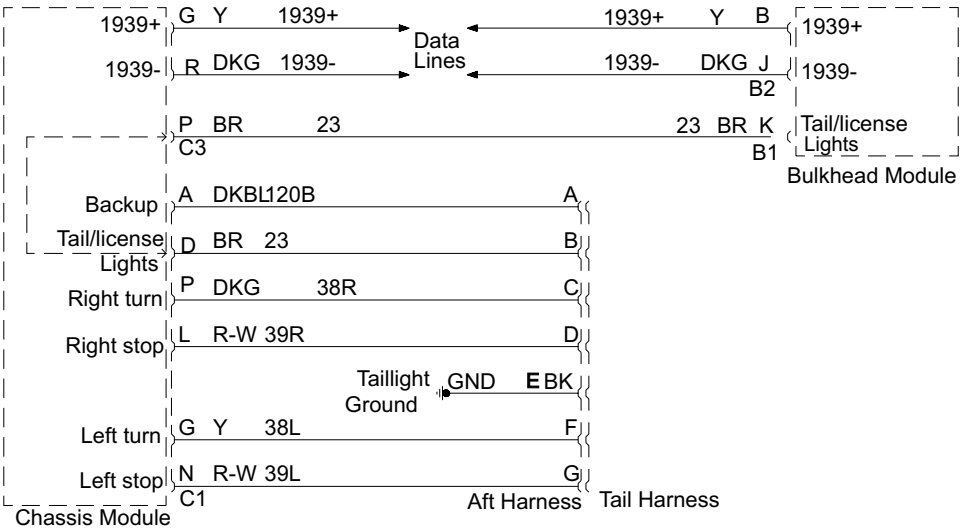
Lighting Outputs For Integrated Rear Lights
(Combination stop/turn signal)



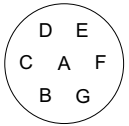
EPA 2010 Models

Tail Lights Schematics

Rear Lighting Connection (separate stop/turn signal)

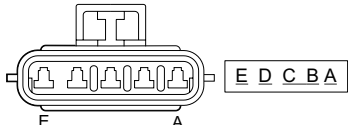


Rear Light Connector (separate stop/turn signal)



Mating connector supplied with Chassis
Packard Connector PAC 12110751
Terminal supplied by Body Builder
Packard Terminal PAC 15304719
Freightliner Seal Part# 23-12497-282

Connector Pin	Signal Name	Signal Type	Circuit Color	Circuit Number
A	Backup Light	Output	DKBL	120B
B	Taillights and License Light	Output	BR	23
C	Right Turn Signal Light	Output	DKG	38R
D	Right Stop Light	Output	R-W	39R
E	Ground	Ground	BK	GND
F	Left Turn Signal Light	Output	Y	38L
G	Left Stop Light	Output	R-W	39L

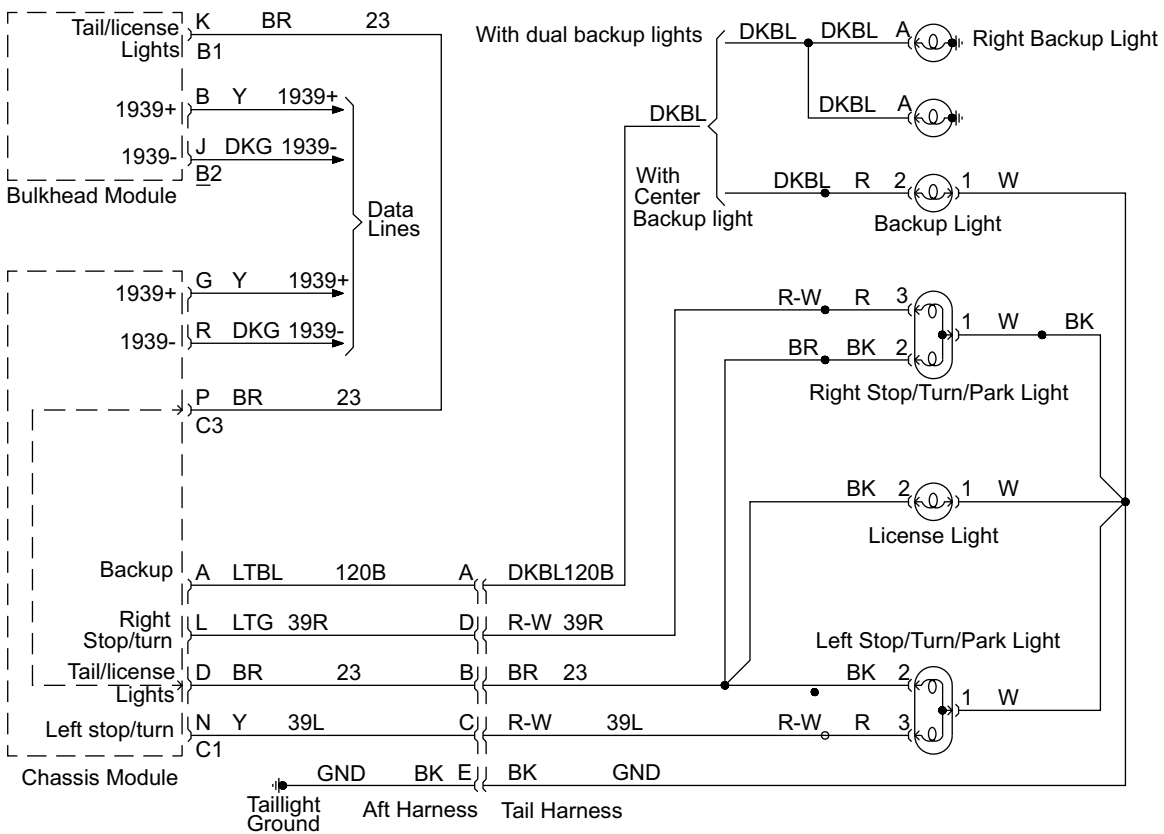


Mating connector supplied by Body Builder
Packard Connector 12186400
Terminal supplied by Body Builder
Packard Terminal 12129497
Freightliner Part# 23-13213-131

Rear Light Connector (combination stop/turn signal)

Connector Pin	Signal Name	Signal Type	Circuit Color	Circuit Number
A	Backup Light	Output	LTBL	120B
B	Taillights and License Light	Output	BR	23
C	Left Stop/Turn Signal Light	Output	Y	39L
D	Right Stop/Turn Signal Light	Output	LTG	39R
E	Ground	Ground	BK	GND

Lighting Outputs For Individual Rear Lights
(Combination stop/turn signal)

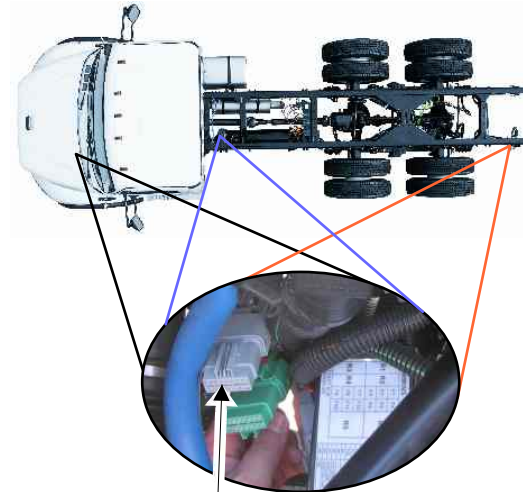


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Transmission Interface

Transmission Interface:

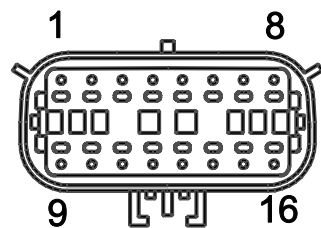
- Depending on the transmission that is installed in the vehicle, the transmission interface harness provides the VIW connection for the current generation of 1000/2000 series or 3000/4000 Series electronic controls.
- The transmission interface harness provides most of the optional I/O circuits and speedometer signal, in a conveniently located connector.
- Connectors can be ordered in three locations using the options shown below.



Transmission
(Grey Plug)

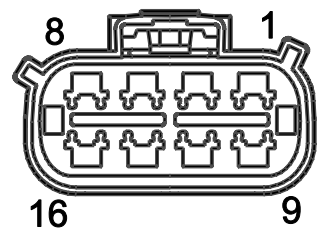
Data Book Codes for the EPA 2007 Transmission Interface Harnesses	
Data Book Code	Description
34C-001	Transmission Interface Harness at the Frontwall
34C-002	Transmission Interface Harness at Back of Cab
34C-003	Transmission Interface at End of Frame

Transmission Interface (Grey Plug)



1 2 3 4 5 6 7 8
9 10 11 12 13 14 15 16

FTL Male Part Number
Connector 23-13153-057
Terminal Pin 23-13211-031
Vndr Male Part Number
Connector 54241601
Terminal Pin 54001626



8 7 6 5 4 3 2 1
16 15 14 13 12 11 10 9

FTL Female Part Number
Connector 23-13153-056
Terminal Pin 23-13211-021
Vndr Female Part Number
Connector 54241631
Terminal Pin 54001625

Transmission Interface Connector Pinout Assignments on M2 Vehicles				
Pin No.	Freightliner Circuit No.	Allison Transmission® Circuit No.	Allison Transmission Function†	
			1000/2000 Series	3000/4000 Series
1	232E	163	Ignition Signal	Ignition Signal
2	497C7 (O†)	150	PTO Enable	—
3	497C8 (O)	113	—	Secondary Mode Indicator Range Indicator Engine Overspeed Indicator
4	497Y	103	Digital Ground	Digital Ground
5	497K (O)	125	Vehicle Speed Sensor	Vehicle Speed Sensor
6	497C4 (O)	105	Output Speed Indicator A	Output Speed Indicator A
7	497C3 (O)	145	Neutral Indicator for PTO Two-Speed Axle Enable	Neutral Indicator for PTO Two-Speed Axle Enable
8	497D3 (I§)	143	PTO Enable	Direction Change Enable PTO Enable Reverse Enable
9	497C1 (O)	130	—	Engine Overspeed Indicator PTO Enable Secondary Mode Indicator
10	497D5 (I)	142	Secondary Mode Input	Auxiliary Hold Secondary Mode Input Two-Speed Axle Enable Automatic Neutral-Dual Input With Park Brake Auto Neutral-Dual Input With Service Brake Status Auxiliary Function Range Inhibit (special) Auto Neutral-Dual Input With Service Brake Status
11	497D6 (I)	101	Auxiliary Function Range Inhibit (standard)	Auxiliary Function Range Inhibit (standard) Automatic Neutral-Dual Input With Park Brake Shift Selector Transition Two-Speed Axle Enable Shift Selector Transition/Secondary Shift Schedule Auxiliary Function Range Inhibit (special)
12	497D10 (I)	117	—	Automatic Neutral-Single Input Direction Change Enable Reverse Enable Automatic Neutral-Dual Input With Park Brake Auto Neutral-Dual Input With Service Brake Status
13	497C6 (O)	164	Sump Retarder Temperature Indicator	Sump Retarder Temperature Indicator
14	497D1 (I)	123	3rd Lockup Pump Mode	4th Lockup Pump Mode Kickdown Direction Change Enable
15	497D4 (I)	122	3rd Lockup Pump Mode Transfer Case Low	4th Lockup Pump Mode Refuse Packer Step Switch Reduced Engine Load at Stop
16	497C3 (O)	145	Neutral Indicator for PTO Two-Speed Axle Enable	Neutral Indicator for PTO Two-Speed Axle Enable

† When more than one function is listed, see the Allison Transmission Vocational Model Guide for the applicable function.

§§ Output

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Engine Interface

Engine Interface:

Freightliner provides an engine interface harness when an rpm control system is ordered for optional body builder features and PTO (power takeoff) applications.

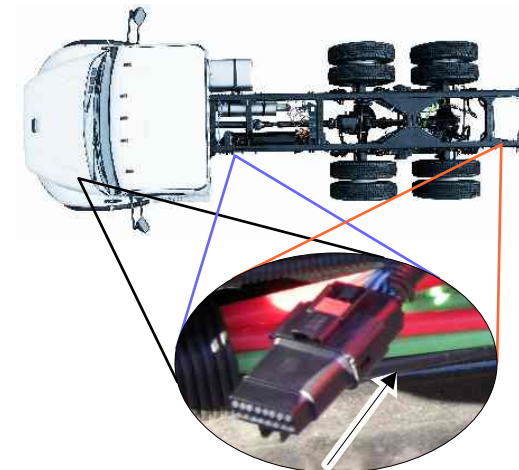
The optional features provided by this harness include:

- Fast idle
- Increment/decrement
- Multiple fixed speeds
- Variable RPM title

Mod 148 determines the **type of remote engine throttle**

Mod 163 determines the **location of the interface connector**

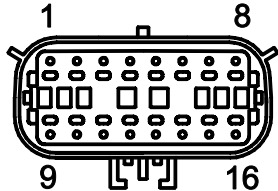
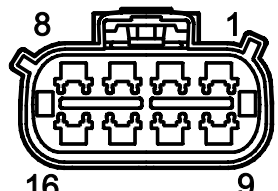
Mod 87L determines the **interlock requirements**



Engine
(Black Plug)

Data Book Codes for Engine Remote Interface Harnesses (ERIH)	
Data Book Code	Description
148-070	ERIH With Fixed Single Speed
148-071	ERIH With Increment/Decrement
148-072	ERIH With Multiple Set Speeds
148-073	ERIH for Remote Throttle
148-074	ERIH Not Configured
163-001	ERIH at Back of Cab
163-002	ERIH at End of Frame
163-003	ERIH at End of Frame w/6-ft Harness
163-004	ERIHs in Engine Compartment
163-005	ERIH Behind Front Bumper
163-006	ERIH Inside the Cab Under the Dash
87L-001	ERIH With Park Brake Interlock
87L-003	ERIH With Park Brake and Neutral Interlocks
87L-005	ERIH Without Interlocks

Engine Interface (Black Plug)

		FTL Male Part Number Connector 23-13153-031 Terminal Pin 23-13211-031 Vndr Male Part Number Connector 54241600 Terminal Pin 54001626
		FTL Female Part Number Connector 23-13153-030 Terminal Pin 23-13211-021 Vndr Female Part Number Connector 54241630 Terminal Pin 54001625

DD13 Interface			
Pin	Harness	Usage Description	Circuit #
1	Eng Control Dash	Dash Engine Control	483Z
2	Engine Control	Remote VSG Select	439U
3	Engine Control	Cruise Control On/Off Enable	492U
4	Engine Control	Cruise Control Set/Coast	483A
5	Engine Control	Cruise Control Resume/Accel	483B
6	Engine Control	Limiter 0	439V1
7	Engine Control	Limiter 1	439V2
8	Engine Control	Tachometer	483E
9	Engine Control	Throttle Inhibit	492Z
10	Engine Control	Remote Accelerator Select	483N
11	Engine Control	Variable Speed Governor	483C
12	Engine Control	+5V Sensor Supply	483D
13	Eng Control Dash	Dash Engine Control	492Y
14	Power Ignition	Dash Power	439A
15	Spare	---	Cav 15
16	Spare	---	Cav 16

Cummins Interface			
Pin	Harness	Usage Description	Circuit #
1	Eng Control Dash	Engine RPM Chass	400G
2	Engine Control	Remote PTO	439U
3	Engine Control	CC/PTO On/Off Switch w/RPM	492U
4	Engine Control	CC/PTO Set w/RPM	483A
5	Engine Control	CC/PTO Resume w/RPM	483B
6	Engine Control	Max Operating Speed/Gov	483R
7	Spare	---	Cav 7
8	Engine Control	Tachometer	483E
9	Spare	---	Cav 9
10	Engine Control	Remote Throttle On/Off	483N
11	Engine Control	Remote Throttle Signal w/RPM	483C
12	Engine Control	Remote Throttle Power	483D
13	Engine Control	Eeng #1 Snsr Com Ground w/RPM	492Y
14	Spare	---	Cav 14
15	Spare	---	Cav 15
16	Spare	---	Cav 16



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PTO Compatibility

All SmartPlex PTO controls employ a Multiplexed dash mounted Smart Switch. PTO Control wiring and air piping is driven by several different factors on the M2 and SD Platforms.

Factors include but are not limited to:

- Transmission type, Transmission programming package,
- PTO make and model, PTO Interlock type

PTO controls are pre-wired specifically to match the transmission and PTO combination. For this reason data code combinations for Modules 372 and 362 are critical.

Module 372 specifies the Number and Type of PTO Controls

- Single or Dual controls
- Interlock Scheme (Park Brake Interlock, Neutral Interlock, Park Brake & Neutral Interlock)

Module 362 specifies which PTO will be installed. This can be specified two ways

- For factory installed PTO can be chosen (Contact CAE representative for quote)
- For "Customer Installed" data codes select from the options in Chart Below

If a 372 code other than 372-998 or 372-051 is specified, a corresponding 362 data code must be specified to ensure the correct wiring, PTO connector style and air piping connections are in place.

The charts on this page are designed to guide you through the compatibility process.



PTO Installation Compatibility

Customer Installed PTO Compatibility Chart

Mod 362 PTO Options	Option Description	Electric over Air Shift PTO Control		Electric Over Hydraulic Shift PTO Control
		All Manual Transmissions	Allison Automatic Transmissions w/PTO provisions	Allison Automatic Transmissions w/PTO provisions
362-801	MUNCIE RS4 SERIES REAR MOUNT PTO, CUSTOMER INSTALLED	X	X	
362-1T7	CHELSEA 221 SERIES, CUSTOMER INSTALLED PTO	X	X	
362-1T9	CHELSEA 230 SERIES, CUSTOMER INSTALLED PTO	X	X	
362-1BU	CHELSEA 230/231/236 SERIES, CUSTOMER INSTALLED PTO	X	X	
362-1M2	CHELSEA 236 SERIES, CUSTOMER INSTALLED PTO	X	X	
362-802	CHELSEA 442 SERIES, CUSTOMER INSTALLED PTO	X	X	
362-1T6	CHELSEA 489 SERIES, CUSTOMER INSTALLED PTO	X	X	
362-1PB	CHELSEA 541 SERIES REAR MOUNT, CUSTOMER INSTALLED PTO	X	X	
362-1T8	CHELSEA 812 SERIES, CUSTOMER INSTALLED PTO	X	X	
362-039	CHELSEA SERIES 880 & 910, CUSTOMER INSTALLED PTO	X	X	
362-037	CHELSEA SRS 221,442,489,812, CUSTOMER INSTALLED PTO	X	X	
362-805	MUNCIE 82 SERIES, CUSTOMER INSTALLED PTO	X	X	
362-803	MUNCIE SERIES CS6 WITH ELEC/AIR CONTROLS, CUSTOMER INSTALLED PTO	X	X	
362-800	MUNCIE SERIES CS8, CUSTOMER INSTALLED PTO	X	X	
362-040	MUNCIE SERIES TG6 & TG8, CUSTOMER INSTALLED PTO	X	X	
362-1U0	MUNCIE SERIES TG6, CUSTOMER INSTALLED PTO	X	X	
362-1U1	MUNCIE SERIES TG8, CUSTOMER INSTALLED PTO	X	X	
362-1BV	CHELSEA 270 SERIES, CUSTOMER INSTALLED PTO			X
362-1DV	CHELSEA 277 SERIES WITH REMOTE SOLENOID, CUSTOMER INSTALLED PTO			X
362-035	CHELSEA 277 SERIES, CUSTOMER INSTALLED PTO			X
362-158	CUSTOMER INSTALLED MUNCIE CS10 SERIES PTO			X
362-807	CUSTOMER INSTALLED MUNCIE 41 SERIES PTO			X
362-157	MUNCIE SERIES CS20, CUSTOMER INSTALLED PTO			X
362-804	MUNCIE SERIES CS6 WITH ELEC/HYD CONT, CUSTOMER INSTALLED PTO			X

Factory installed PTO's are available and can also be selected (Contact CAE representative for quotes and availability)



EPA 2010 Models

PTO Controls

PTO Controls

All SmartPlex PTO controls employ a Multiplexed dash mounted Smart Switch. PTO Control wiring and air piping is driven by several different factors on the M2 Platform.

Factors include but are not limited to:

- Transmission type, Transmission programming package,
- PTO make and model, PTO Interlock type

PTO controls are pre-wired specifically to match the transmission and PTO combination.

For this reason data code combinations for Modules 372 and 362 are critical.

Module 372 specifies the Number and Type of PTO Controls

- Single or Dual controls
- Interlock Scheme (Park Brake Interlock, Neutral Interlock, Park Brake & Neutral Interlock)

Module 362 specifies which PTO will be installed. This can be specified two ways

- For factory installed PTO can be chosen (Contact CAE representative for quote)
- For "Customer Installed" data codes select from the options in Chart Below

If a 372 code other than 372-998 or 372-051 is specified, a corresponding 362 data code must be specified to ensure the correct wiring, PTO connector style and air piping connections are in place.

The charts on this page are designed to guide you through the compatibility process.



Factory Installed PTO Control Compatibility Chart

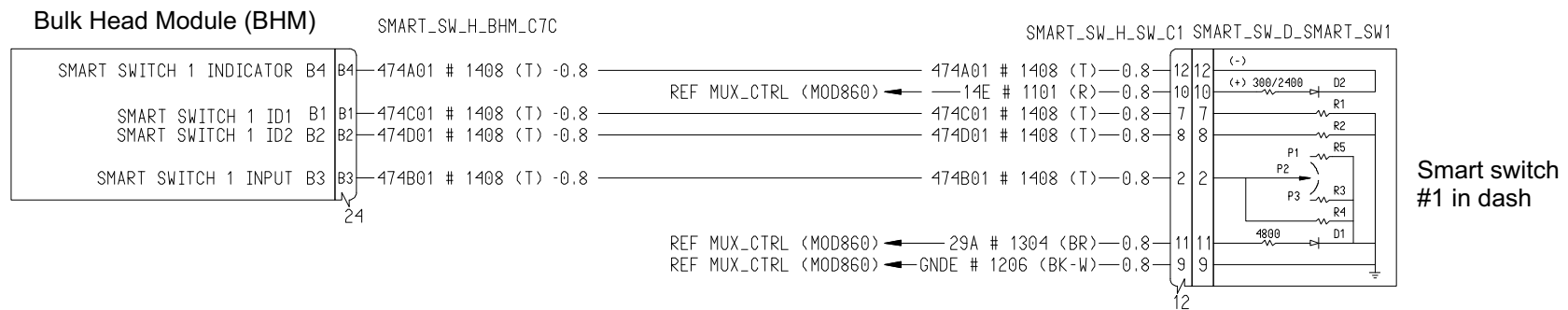
Factory Installed PTO Control Compatibility Chart													
Mod 372 PTO Control Options	Option Description	PTO Installation		Electric over Air Shift PTO Control			Electric Over Hyd Shift PTO Control	Controls		Safety Interlocks		Availability	
		Factory Installed	Customer Installed	Manual Transmissions	AGS2 Transmissions	Allison Automatic Transmissions w/PTO provisions	Allison Automatic Transmissions w/PTO provisions	Single Dash Switch	Dual Dash Switches	Park Brake Interlock	Neutral Interlock	Data Book / Spec Pro Published	Unpublished - Avail via Price Quote
372-035	(1) DASH MTD PTO SWITCH W/IND LAMP	X		X		X	X	X				X	
372-063	(1) DASH MTD PTO SWITCH W/IND LAMP FOR CUST INST PTO		X	X		X	X	X				X	
372-036	(1) DASH MTD PTO SWITCH W/IND LAMP - PK BRK INTERLOCK	X		X		X	X	X		X		X	
372-065	(1) DASH MTD PTO SWITCH W/IND LAMP - PK BRK INTERLOCK FOR CUST INST PTO		X	X		X	X	X		X		X	
372-037	(1) DASH MTD PTO SWITCH W/IND LAMP - NEUT INTERLOCK	X				X	X	X			X	X	
372-067	(1) DASH MTD PTO SWITCH W/IND LAMP - NEUT INTERLOCK FOR CUST INST PTO		X			X	X	X			X	X	
372-043	(1) DASH MTD PTO SWITCH W/IND LAMP - PK BRK & NEUT INTERLOCK	X				X	X	X		X	X	X	
372-073	(1) DASH MTD PTO SWITCH W/IND LAMP - PK BRK & NEUT INTERLOCK FOR CUST INST PTO		X			X	X	X		X	X	X	
372-058	(1) DASH MTD PTO SWITCH W/IND LAMP WITH PDI MODIFICATION TO INCREASE ENGINE RPM TO HIGH IDLE WHEN PTO IS ENGAGED	X		X		X		X					X
372-068	(1) DASH MTD PTO SWITCH W/IND LAMP WITH PDI MODIFICATION TO INCREASE ENGINE RPM TO HIGH IDLE WHEN PTO IS ENGAGED FOR CUST INST PTO		X	X		X		X					X
372-044	(1) DASH MTD PTO SWITCH W/IND LAMP FOR AGS2 TRANS - STATIONARY MODE	X			X			X					X
372-066	(1) DASH MTD PTO SWITCH W/IND LAMP FOR AGS2 TRANS - STATIONARY MODE FOR CUST INST PTO		X		X			X					X
372-045	(1) DASH MTD PTO SWITCH W/IND LAMP FOR AGS2 TRANS - MOBILE MODE	X			X			X					X
372-064	(1) DASH MTD PTO SWITCH W/IND LAMP FOR AGS2 TRANS - MOBILE MODE FOR CUST INST PTO		X		X			X					X
372-051	CUSTOMER FURNISHED AND INSTALLED PTO CONTROLS **		X	X	X	X	X					X	
372-060	(2) DASH MTD PTO SWITCHES W/IND LAMPS	X		X		X	X		X				X
372-069	(2) DASH MTD PTO SWITCHES W/IND LAMPS FOR CUST INST PTO		X	X		X	X		X				X
372-054	(2) DASH MTD PTO SWITCHES W/IND LAMPS - PK BRK INTERLOCKS	X		X		X	X		X	X			X
372-072	(2) DASH MTD PTO SWITCHES W/IND LAMPS - PK BRK INTERLOCKS FOR CUST INST PTO		X	X		X	X		X	X			X
372-062	(2) DASH MTD PTO SWITCHES W/IND LAMPS - NEUT INTERLOCKS	X				X	X		X		X		X
372-071	(2) DASH MTD PTO SWITCHES W/IND LAMPS - NEUT INTERLOCKS FOR CUST INST PTO		X			X	X		X		X		X
372-061	(2) DASH MTD PTO SWITCHES W/IND LAMPS - PK BRK & NEUT INTERLOCKS	X				X	X		X	X	X		X
372-070	(2) DASH MTD PTO SWITCHES W/IND LAMPS - PK BRK & NEUT INTERLOCKS FOR CUST INST PTO		X			X	X		X	X	X		X
372-998	NO PTO CONTROLS ***			X	X	X	X					X	
(X) Designates avalaiability of PTO control/ PTO control type and transmission													
** If customer is supplying their own controls and does not require factory installed parts 372-051 should be specified to notify the plant to route clearance for pto Install													
*** 372-998 should be specified only when a PTO will not be needed or added in the future. (no routing provision will be done)													



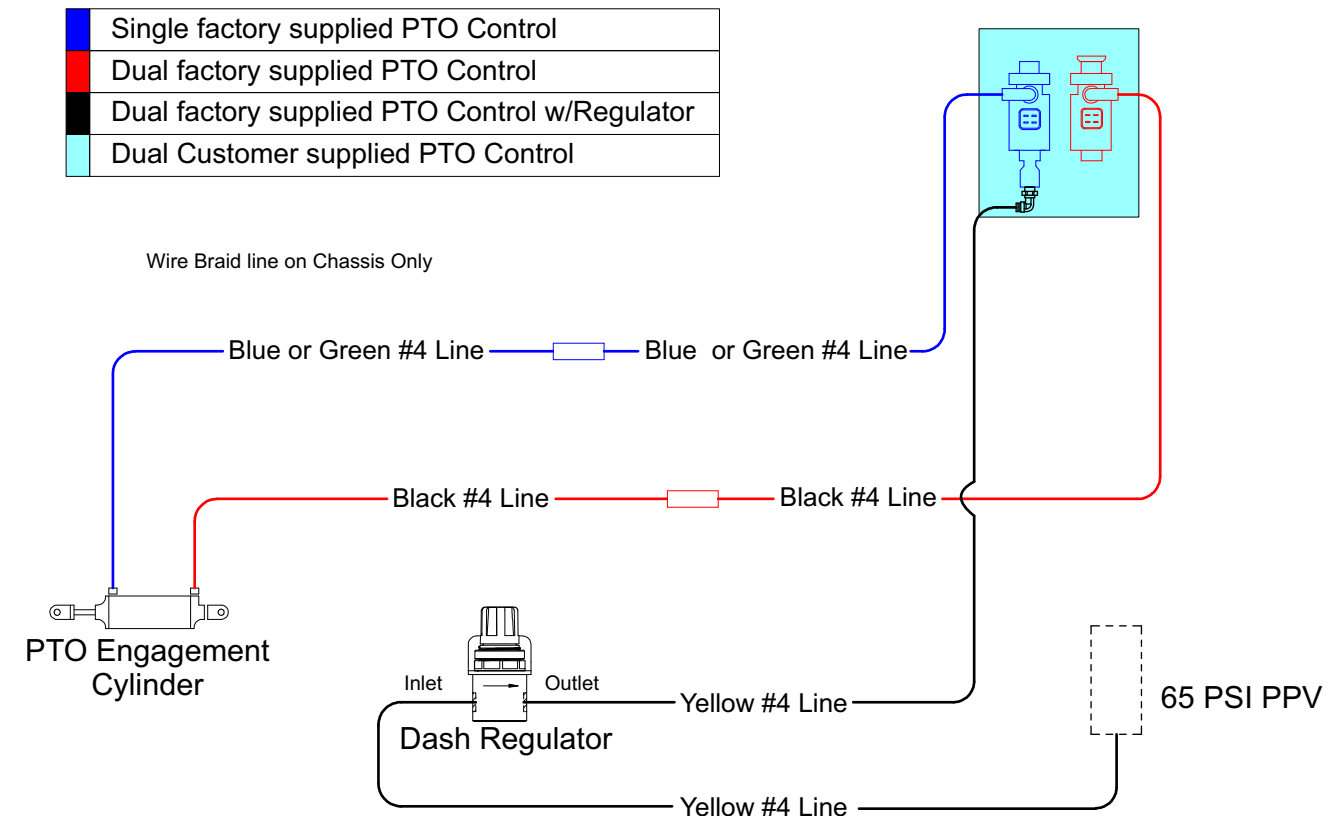
EPA 2010 Models

PTO Air Control Schematics

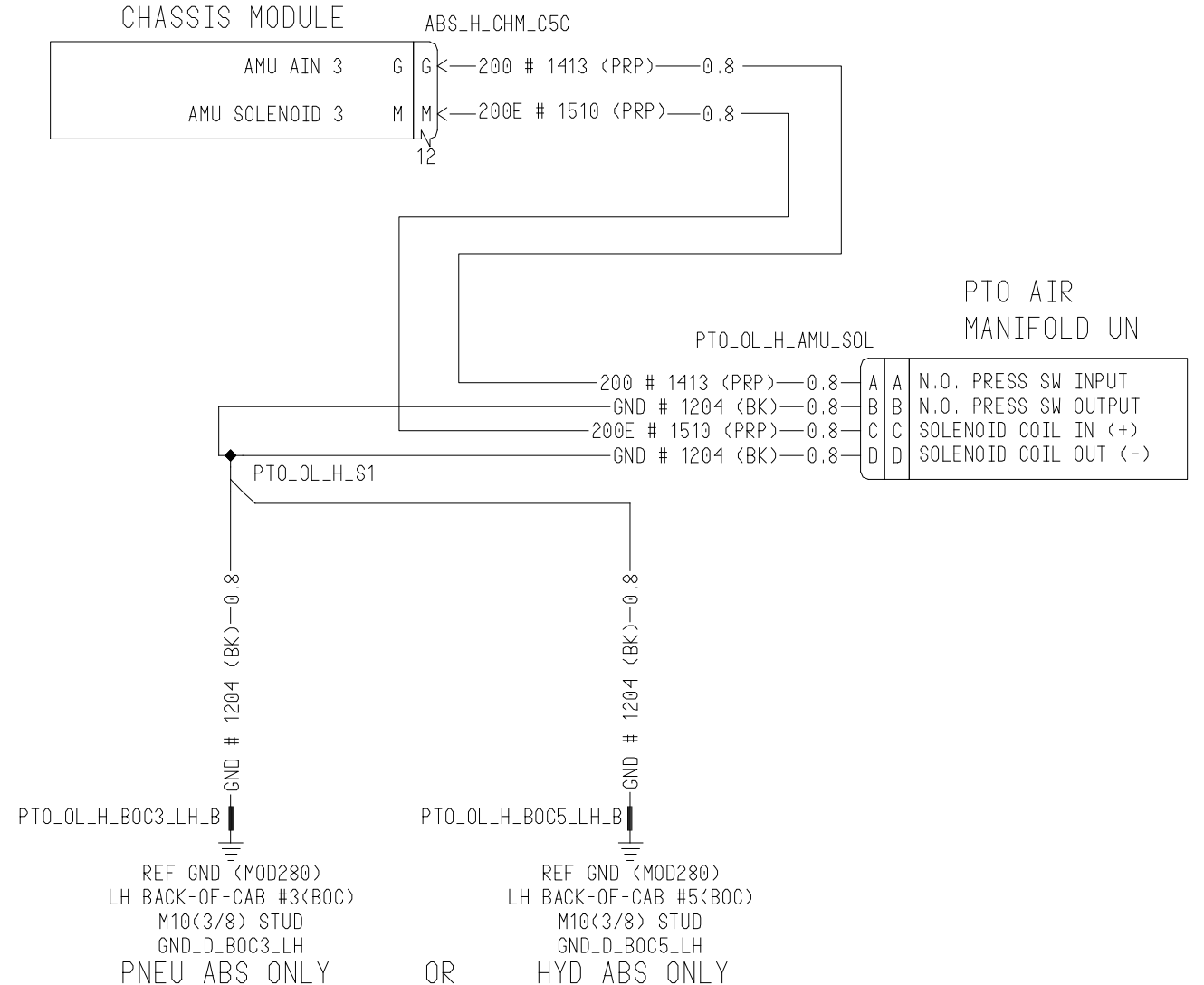
Switch Control Schematic



PTO Air Schematics



CHASSIS MODULE

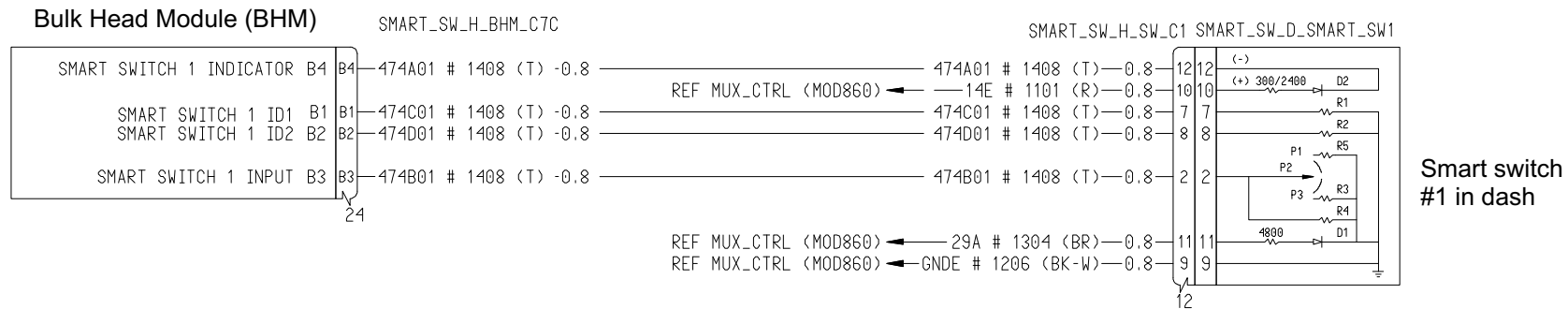




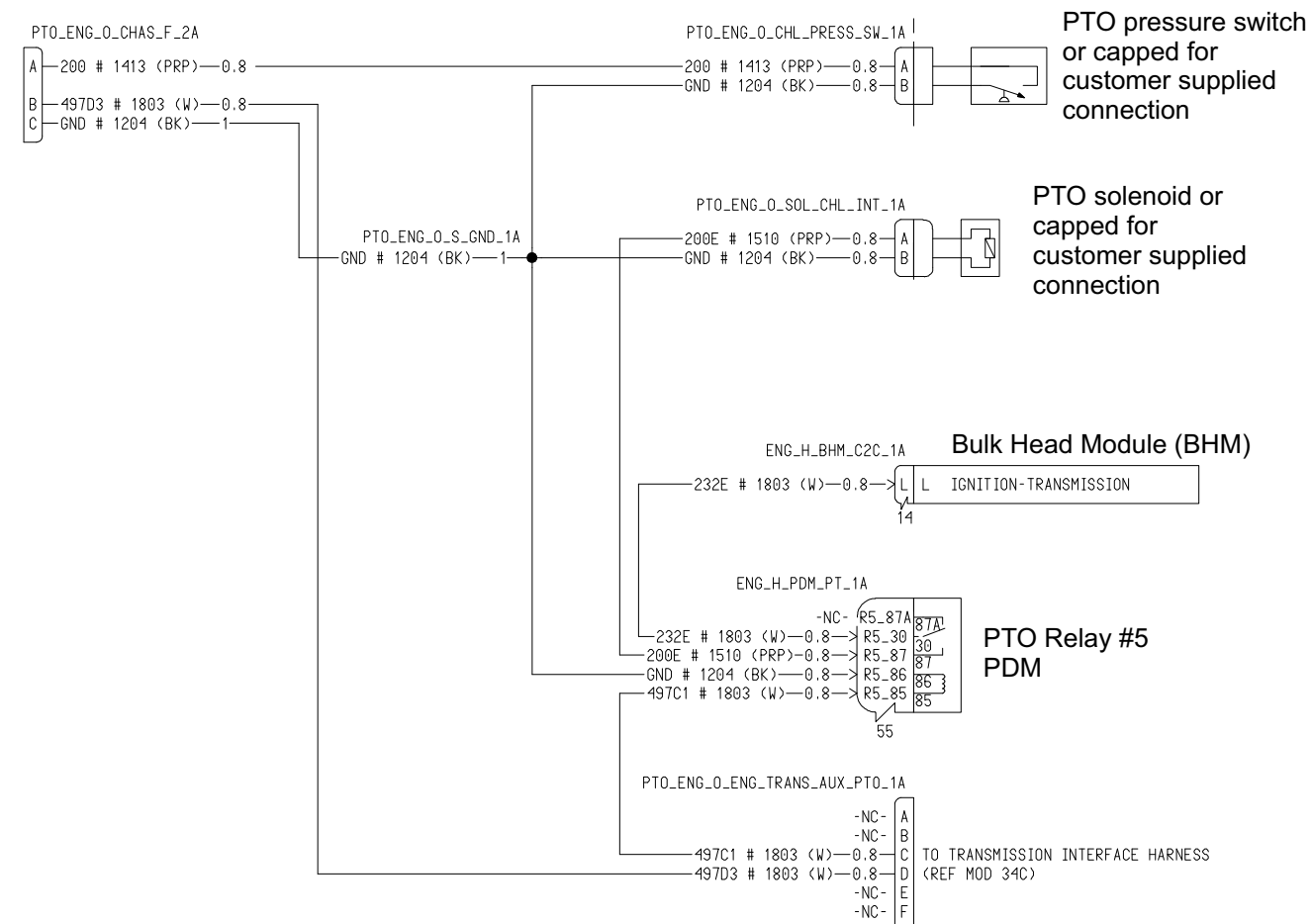
EPA 2010 Models

PTO Electric Control Schematics

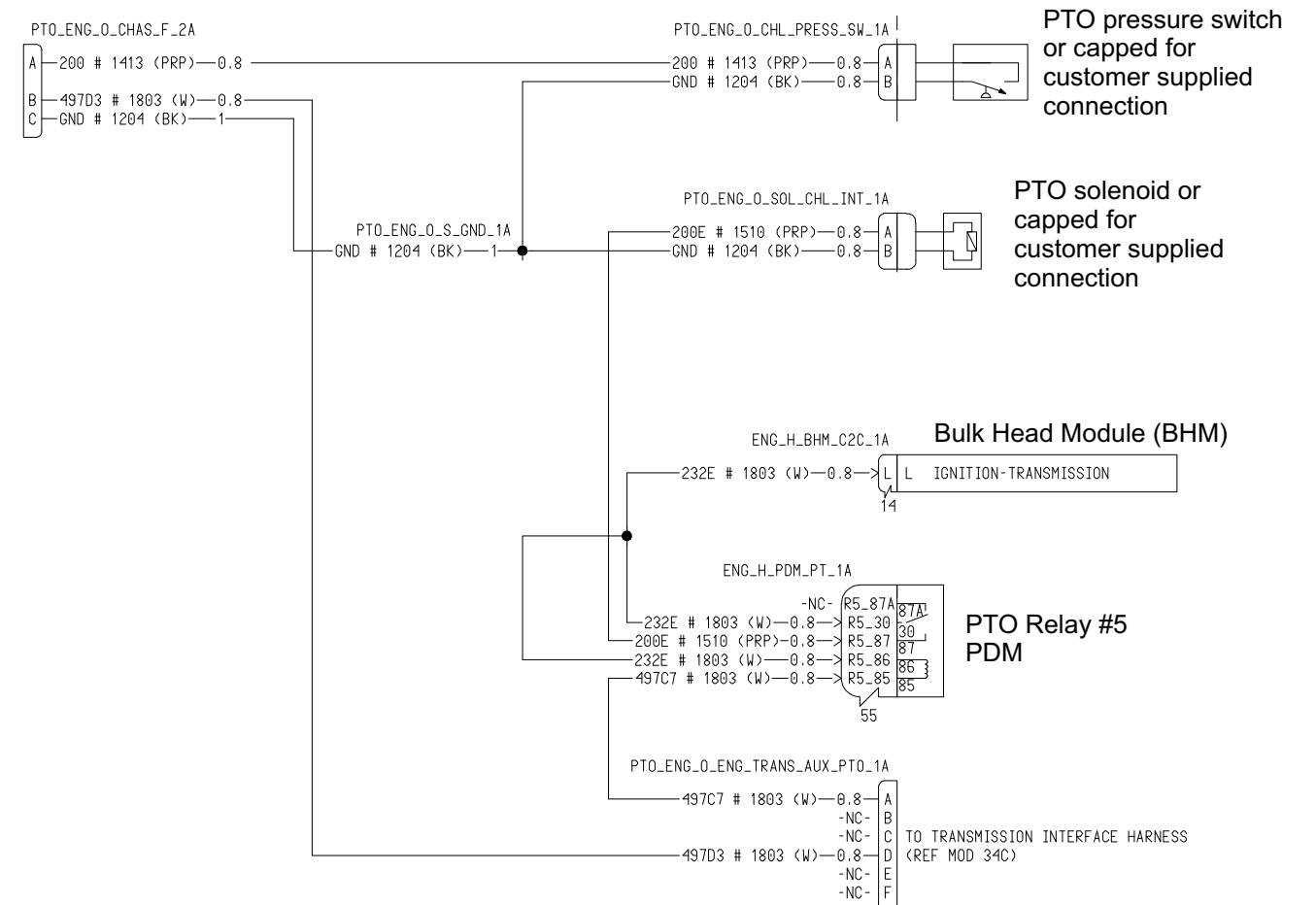
Switch Control Schematic



PTO Control Schematic Allison 3000/4000 series



PTO Control Schematic Allison 1000/2000 series



Hybrid PTO Connections

New Hybrid connections and components have been added for 2010 which provide bodybuilders with factory ready connections.

For easy connection to the PTO unit a break out harness with blunt cut ends has been added to the main transmission harness under Mod 34C.

A hood switch will also be factory installed with harnesses found in Mod 29B

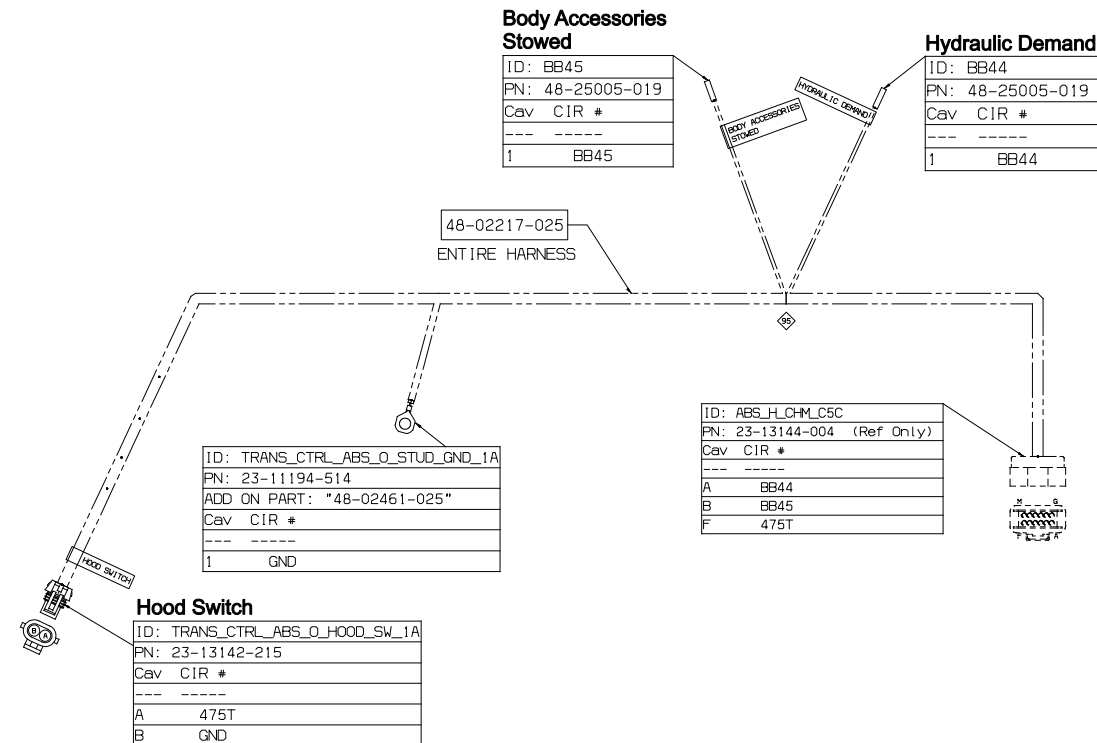
Two versions of the new harness will be available depending on the signal type desired

885-023 will drive analog controlled signals.

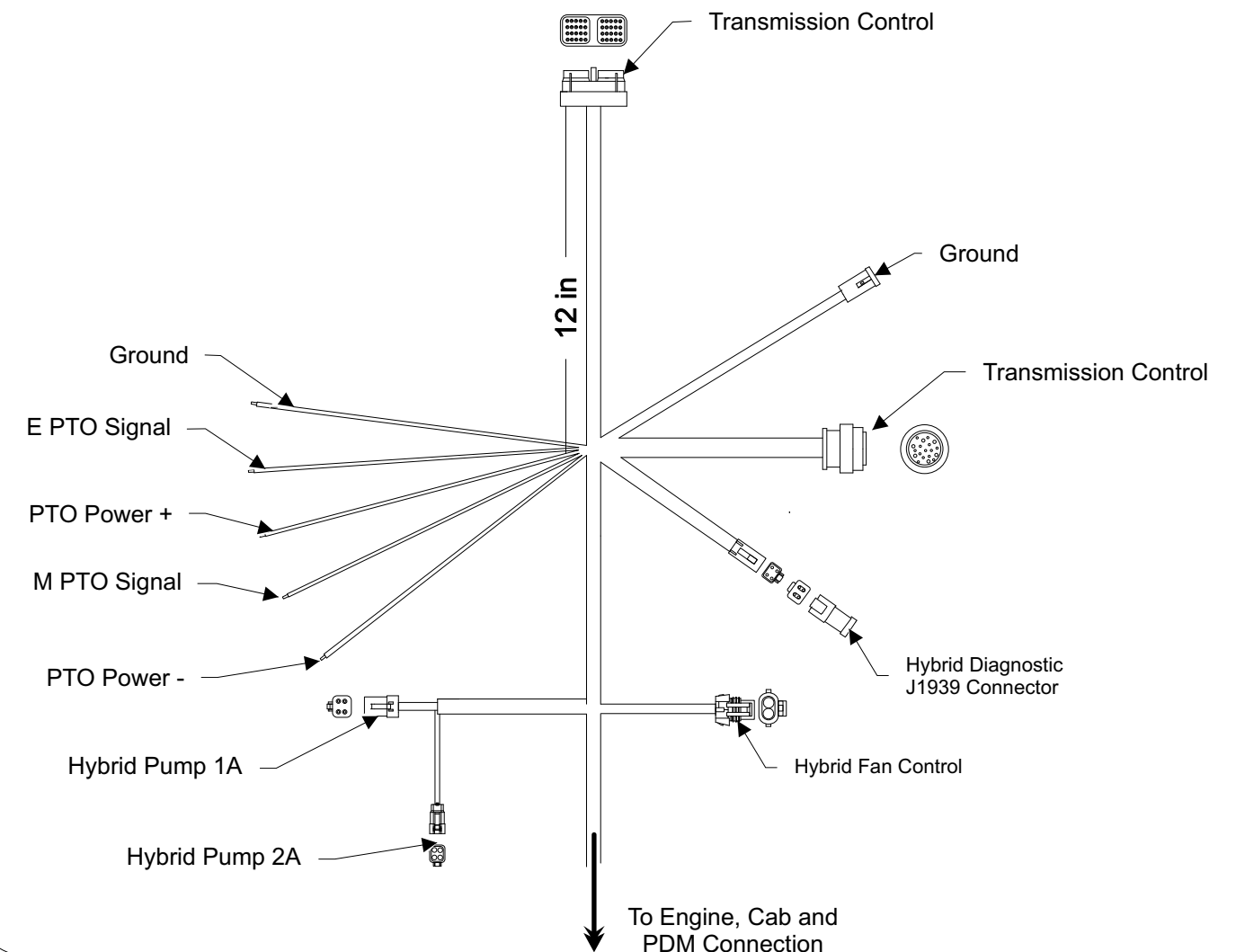
885-024 will drive J1939 controlled signals.

New breakouts include

Ground, ePTO signal, PTO Power+ and PTO Power - and mPTO Signal



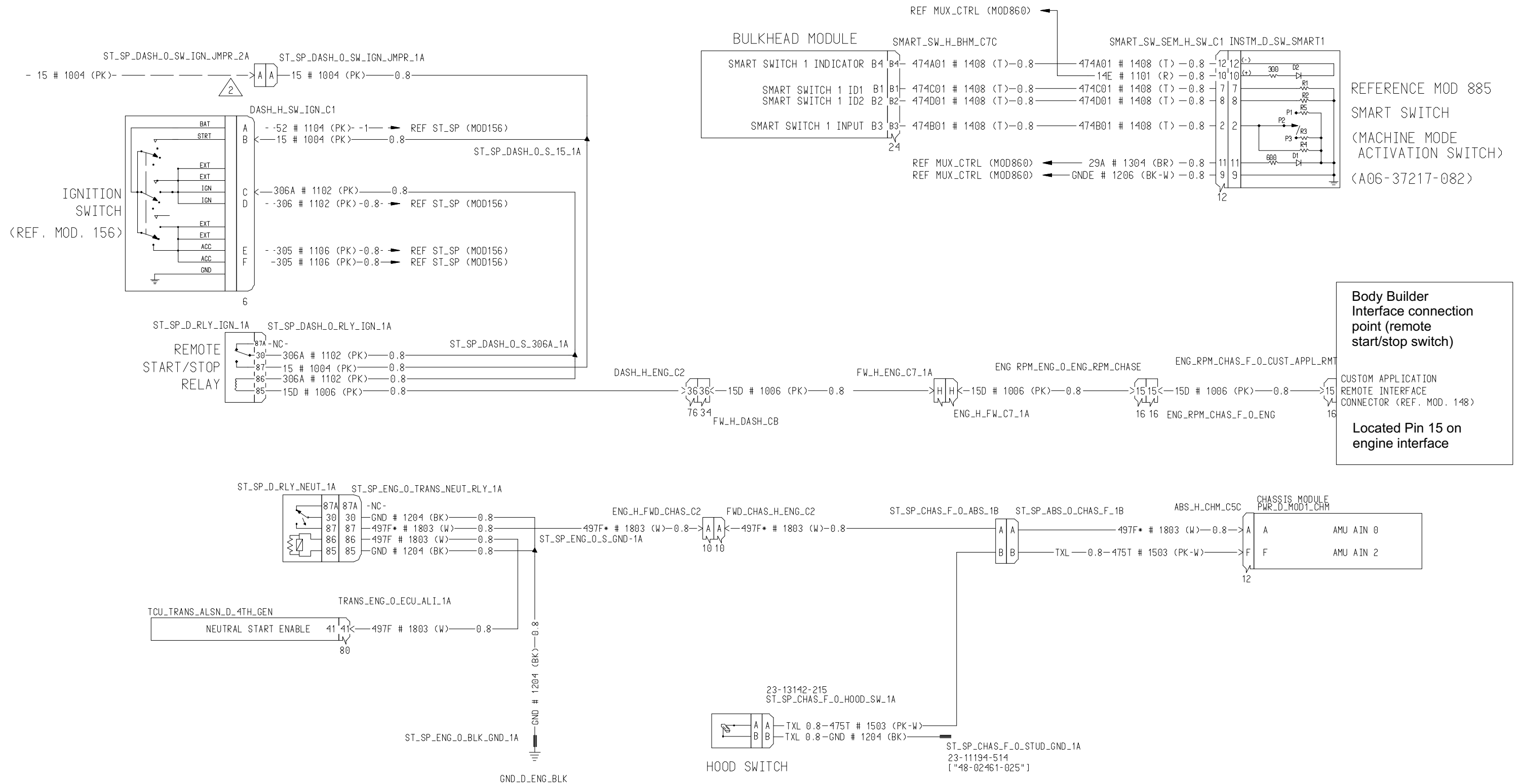
Hybrid PTO Connection Points





EPA 2010 Models

Remote Start Stop Controls



The VDR Prep Harness comes standard with all SmartPlex that require NFPA 1901 compliant seat options 756-1E7 / 756-1F2 and or 760-1E8 / 760-1E9 / 760-1F0 760-1E7 / 760-1F1 / 760-1BX / 760-014 / 760-997

Module 74F

Schematic Dwg G06-73876

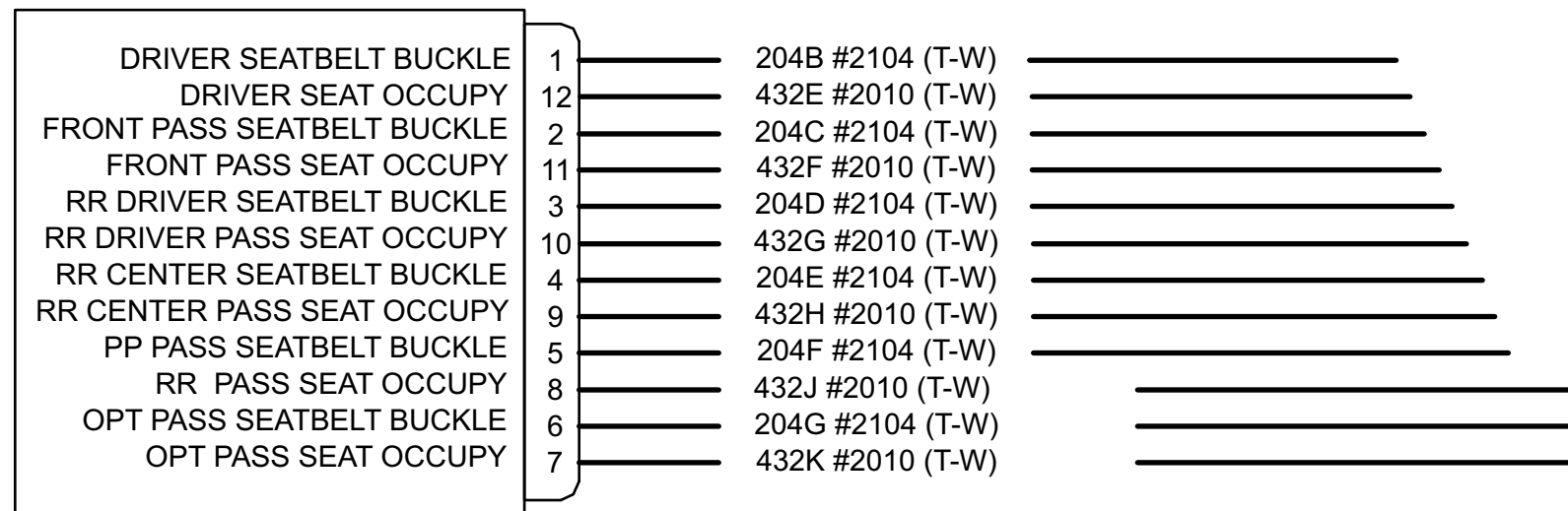
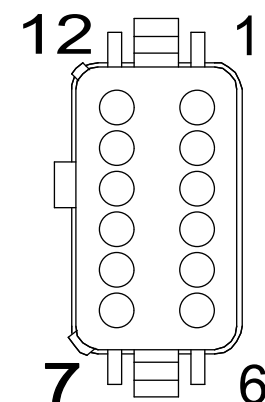
Harness Dwg A06-73889 and A06-73890

Install Dwg D06-74250



EPA 2010 Models

VDR Prep Information



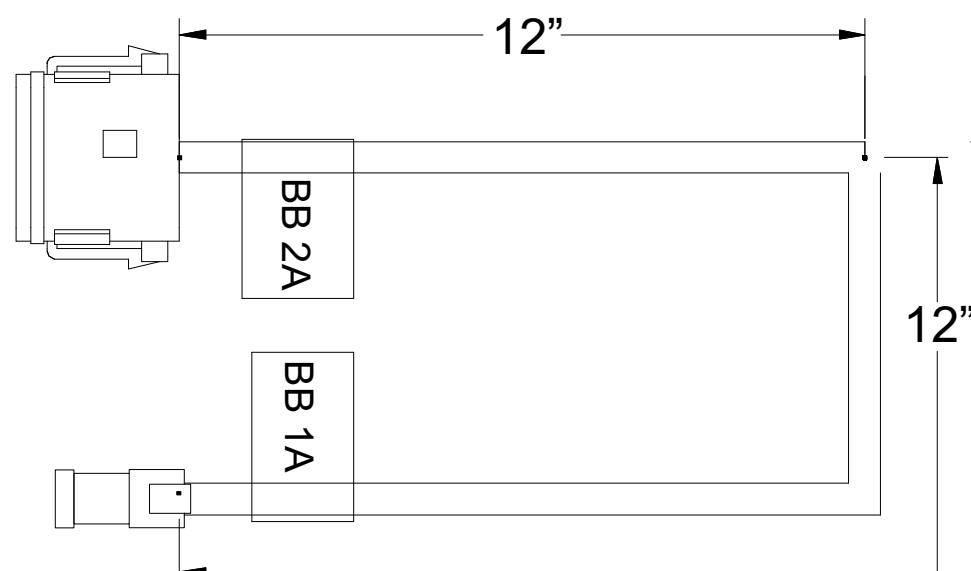
DRCDG_DASH_0_JMPR_BB_2A

FTL Connector #
DUFDTM06-12SB

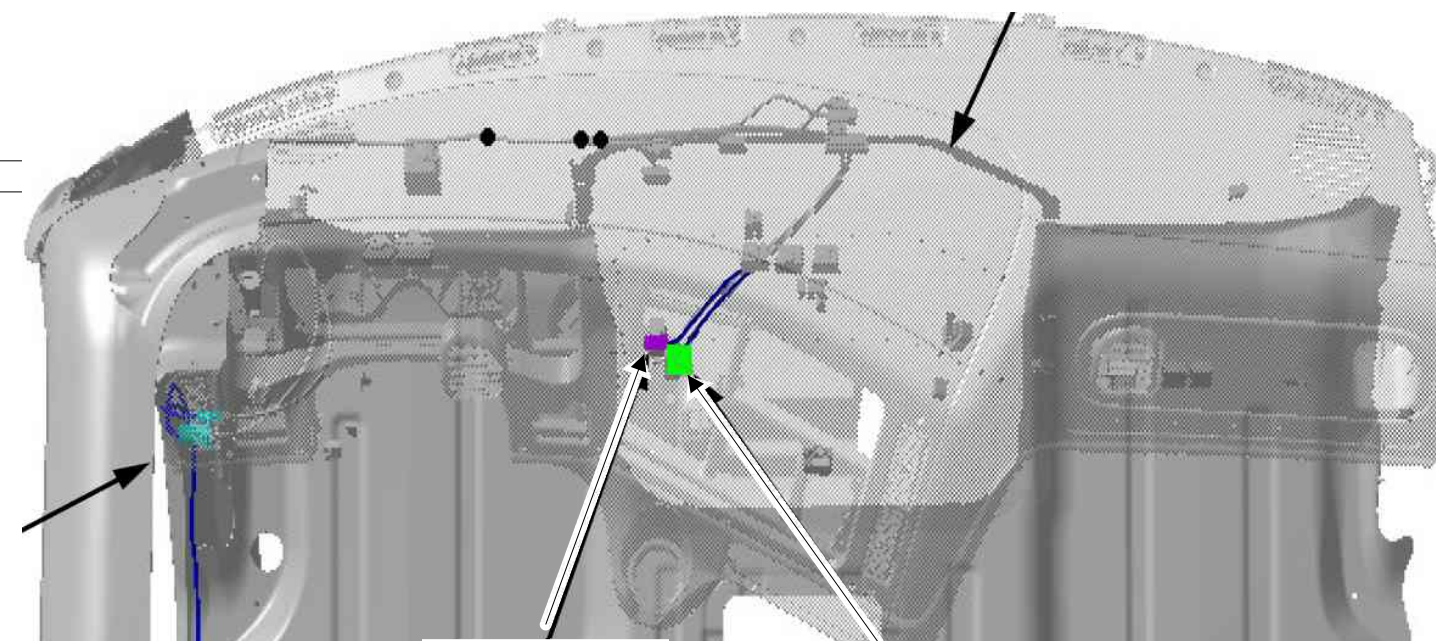
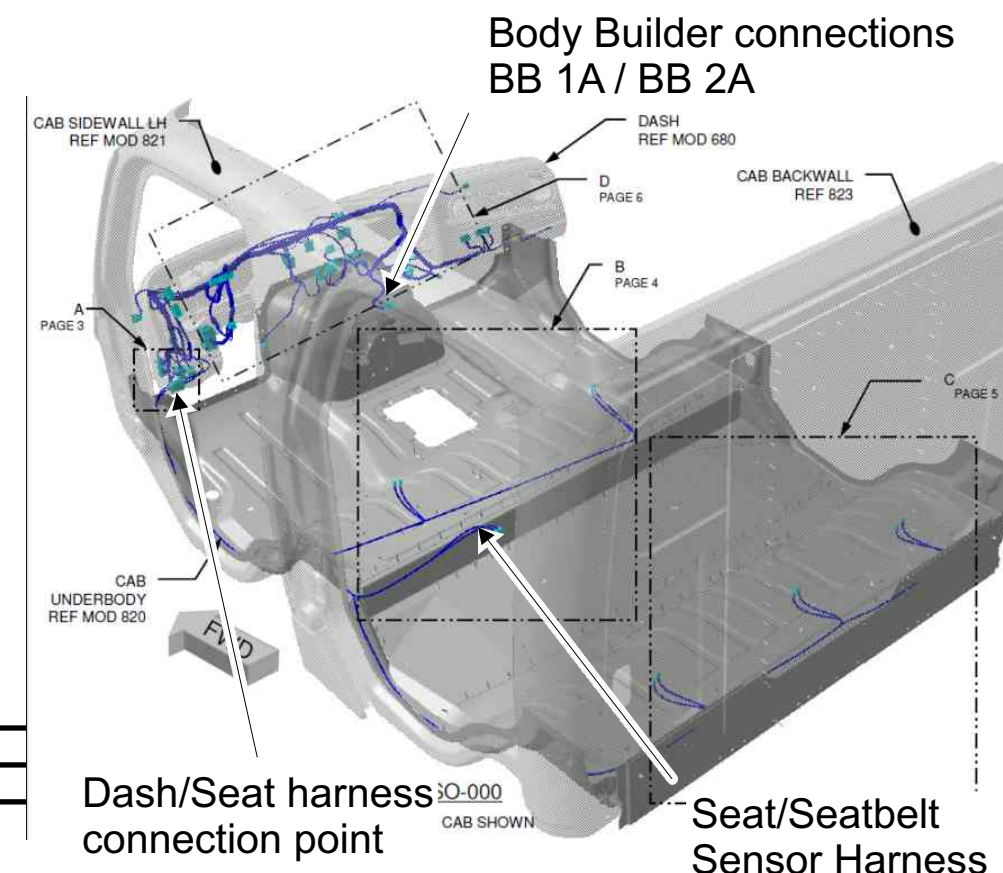
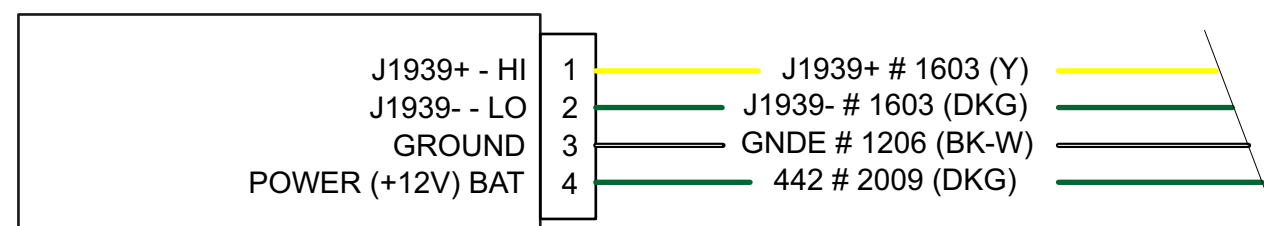
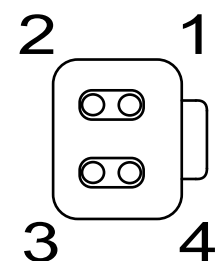
Mating Socket
DUFDTM04-12PB

Deutsch
Connector p/n
Dt04 4P

Mating Socket
DUFDT06 4S



DRCDG_DASH_0_JMPR_BB_1A



BB 1A

BB 2A

The VDR prep harness supplies a centrally located EDR black box connection under center of dash and includes all the connections needed for connection to the primary J1939 compliant VDR / EDR Units (see next page).

VDR Connections to SmartPlex



[Http://www.weldoninc.com](http://www.weldoninc.com)

Weldon Vehicle Data Recorder to FTL Harness

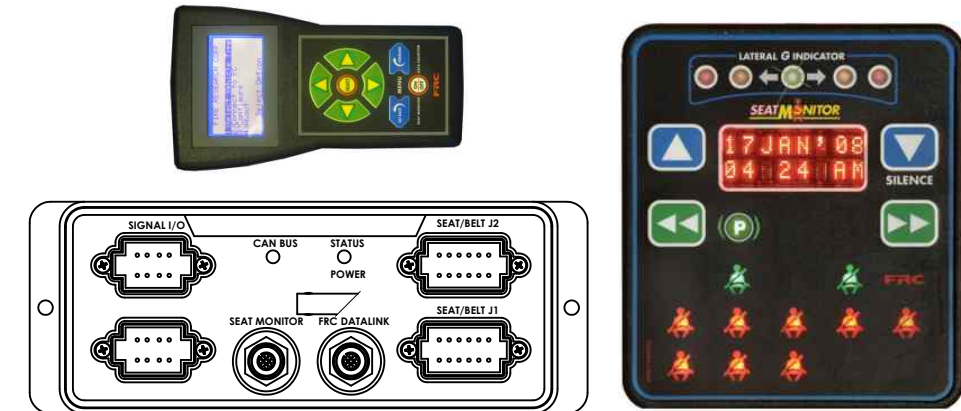
Connector "B DTM06-12SB" to **FTL Connector** DRCDG_DASH_0_JMPR_BB_2A

I	INPUT	TYPE	BB2A Pin	INPUT	TYPE
1	Seat Belt 1 Status	Gnd/Batt	1	DRIVER SEATBELT BUCKLE	Gnd
2	Seat Belt 2 Status	Gnd/Batt	2	FRONT PASS SEATBELT BUCKLE	Gnd
3	Seat Belt 3 Status	Gnd/Batt	3	RR DRIVER SEATBELT BUCKLE	Gnd
4	Seat Belt 4 Status	Gnd/Batt	4	RR CENTER SEATBELT BUCKLE	Gnd
5	Seat Belt 5 Status	Gnd/Batt	5	PP PASS SEATBELT BUCKLE	Gnd
6	Seat Belt 6 Status	Gnd/Batt	6	OPT PASS SEATBELT BUCKLE	Gnd
7	Occupancy 6 status	Gnd/Batt	7	OPT PASS SEAT OCCUPY	Gnd
8	Occupancy 5 status	Gnd/Batt	8	RR PASS SEAT OCCUPY	Gnd
9	Occupancy 4 status	Gnd/Batt	9	RR CENTER PASS SEAT OCCUPY	Gnd
10	Occupancy 3 status	Gnd/Batt	10	RR DRIVER PASS SEAT OCCUPY	Gnd
11	Occupancy 2 status	Gnd/Batt	11	FRONT PASS SEAT OCCUPY	Gnd
12	Occupancy 1 status	Gnd/Batt	12	DRIVER SEAT OCCUPY	Gnd

Connector "A DTM06-12SA" to **FTL Connector** DRCDG_DASH_0_JMPR_BB_1A

I	INPUT	TYPE	BB2A Pin	INPUT	TYPE
1	Park Brake Status	Gnd/Batt	N/R	Supplied by J1939	Hi/Lo
2	Service Brake	Gnd/Batt	N/R	Supplied by J1939	Hi/Lo
3	E-master Status	Gnd/Batt	N/R	Body Builder Supplied (optional)	Gnd/Batt
4	CAN 2 – Lo	Lo	N/R	Body Builder Supplied (optional)	Lo
5	CAN 1 – Lo	Lo	2	J1939 - _ LO	Lo
6	V-MUX – B	Lo	VDR	Body Builder Supplied	Lo
7	V-MUX – A	Hi	VDR	Body Builder Supplied	Hi
8	CAN 1 – Hi	Hi	1	J1939 + _ HI	Hi
9	CAN 2 – Hi	Hi	N/R	Body Builder Supplied (optional)	Hi
10	System Power	Vbatt	4	POWER (+12V) BAT	Vbatt
11	Red Indicator	Gnd (Out)	N/R	Body Builder Supplied (optional)	Gnd (Out)
12	System Ground	GND	3	GROUND	GND

For M2 Models Service brake and ABS signals are broadcasting via J1939. The Weldon V-Mux VDR can accept M2 information via J1939 connection So no need additional hard wiring is required with this harness.



[Http://www.firereseach.com](http://www.firereseach.com)

FRC Vehicle Data Recorder to FTL Harness

Connector "Seat/Belt J1 DT06-8SB" to **FTL Connector** DRCDG_DASH_0_JMPR_BB_2A

I	INPUT	TYPE	BB2A Pin	INPUT	TYPE
12	Seat Belt 1 Status	Gnd/Batt	1	DRIVER SEATBELT BUCKLE	Gnd
11	Seat Belt 2 Status	Gnd/Batt	2	FRONT PASS SEATBELT BUCKLE	Gnd
10	Seat Belt 3 Status	Gnd/Batt	3	RR DRIVER SEATBELT BUCKLE	Gnd
9	Seat Belt 4 Status	Gnd/Batt	4	RR CENTER SEATBELT BUCKLE	Gnd
8	Seat Belt 5 Status	Gnd/Batt	5	PP PASS SEATBELT BUCKLE	Gnd
7	Seat Belt 6 Status	Gnd/Batt	6	OPT PASS SEATBELT BUCKLE	Gnd
6	Occupancy 6 status	Gnd/Batt	7	OPT PASS SEAT OCCUPY	Gnd
5	Occupancy 5 status	Gnd/Batt	8	RR PASS SEAT OCCUPY	Gnd
4	Occupancy 4 status	Gnd/Batt	9	RR CENTER PASS SEAT OCCUPY	Gnd
3	Occupancy 3 status	Gnd/Batt	10	RR DRIVER PASS SEAT OCCUPY	Gnd
2	Occupancy 2 status	Gnd/Batt	11	FRONT PASS SEAT OCCUPY	Gnd
1	Occupancy 1 status	Gnd/Batt	12	DRIVER SEAT OCCUPY	Gnd

Connector "POWER/DATABUS DT06-8SA" to **FTL Connector** DRCDG_DASH_0_JMPR_BB_1A

	INPUT	TYPE	BB2A Pin	INPUT	TYPE
1	Supply + (Battery)	Batt	4	Vbatt	Vbatt
2	Supply - (GND)	Gnd	3	Ground	Gnd
3	Ignition	IGN (12V)	N/R	Body Builder Supplied	IGN (+12V)
4	Parking Brake Signal	Gnd/Batt	N/R	Supplied by J1939	Hi/Lo
5	Master Optical Warning	Gnd/Batt	N/R	Body Builder Supplied (optional)	
6	J1939 (shield)	Gnd	N/R	Not Required	
7	J1939 (-)	Lo	2	J1939 - _ LO	Lo
8	J1939 (+)	Hi	1	J1939 + _ HI	Hi