BODY BUILDER INSTRUCTIONS

Mack Trucks

Electrical Wiring and Connections
MD VECU-5
Section 3

Introduction

This information provides design and function, specification and procedure details for Electrical Wiring and Connections for MACK vehicles.

Note: For information on transmission PTO installation and wiring see Section 9 PTO Installation.

Note: For information on PTO parameter programming see Section 9 PTO Parameter Programming.

Unless stated otherwise, following a recommendation listed in this manual does not automatically guarantee compliance with applicable government regulations. Compliance with applicable government regulations is your responsibility as the party making the additions/modifications.

Please be advised that the Mack Trucks, Inc. vehicle warranty does not apply to any MACK vehicle that has been modified in any way, which in MACK's judgment might affect the vehicles stability or reliability.

Contents

ISO 26262 Functional Safety Manual

Scope

This section describes the functional safety aspects related to the interface between the vehicle and the body builder equipment.

Introduction

ISO 26262 is the functional safety standard for road vehicles. Functional safety addresses safety-related functionality implemented in electronics and software. During 2018, Mack initiated development of new vehicle functions and systems according to ISO 26262 after the standard became applicable to trucks, buses and trailers. Before ISO 26262, Mack followed other internal processes addressing functional safety.

The truck will gradually be made compliant to ISO 26262. However, it will take several years until the complete truck is compliant to the standard.

The status of the truck related to functional safety with regards to ISO 26262 will be described in this document. Continuous updates will be made to reflect the current status of the truck.

The ASILs of the body builder interface characteristics will be documented and it will be described in which sense the interfaces meet the different ASILs. This section will also contain information on requirements and constraints for the usage of the body builder interface. In case-specific safety measures have to be applied by the body builder, this shall be stated in this section.

When a body builder needs something that is not described or when the ASIL of the characteristic does not meet the body builders expectations, the body builder shall contact Mack for guidance. This section is referenced from other body builder sections when applicable.

Current status of the truck in relation to ISO 26262

The existing trucks are developed according to Mack's internal processes addressing functional safety, which were applicable before ISO 26262.

Presently no functions or systems in the trucks have been developed according to ISO 26262.

Security disclaimer

It is the responsibility of the body builder to ensure adequate cybersecurity of the bodywork electronics equipment added to the vehicle e.g., the integrity and authenticity of any wireless data communication.
The body builder is also responsible to fulfil UN R155 vehicle type approval work (when applicable considering national regulations) for additional electronics added to the vehicle. Also note that Mack UN R155 approval for the base vehicle is not valid if non-supported data communication network connections are used, see warning below.

⚠ WARNING

It is strictly forbidden to connect additional devices to internal data communication networks (CAN, LIN, Ethernet etc.). This could severely affect the drivability of the truck. Mack only allows data communication network connections for bodywork devices on the dedicated external data communication connectors that are intended for it.
All other connections or methods of access to the internal data communication networks are prohibited.

Abbreviations

Acronym	Description
ACC	Adaptive Cruise Control
ACM	Aftertreatment Control Module
BBM	Body Builder Module
BOC	Back of Cab
CAN	Controller Area Network
CDS	Customer Defined Statement (replaced by DCL)
DCL	DataMax Control Language
ECU	Electronic Control Unit
ECM	Engine Control Module
ECS	Electronic Speed Control
EHT	Electronic Hand Throttle
EMS	Engine Management System
ESC	Engine Speed Control
FMI	Failure Mode Identifier
GMT	Greenwich Mean Time
GSECU	Gear Selector Electronic Control Unit
LCM	Light Control Module
MID	Message Identifier (J1587 source)
NOx	Nitrogen Oxide
PGN	Parameter Group Number (J1939)
PID	Parameter Identification (J1587)
PTO	Power take-off
PTT2	Premium Tech Tool 2
SA	Source Address (J1939 unit identifier)
SCU	Satellite Control Unit (Qualcomm)
SID	Subsystem Identification (J1587)
SPN	Suspect Parameter Number (J1939)
SRS	Supplementary restraint system
SSC	Single Speed Control
TCM	Transmission control unit
TPM	Tire Pressure Monitor
VDA	Vehicle Data Administration (OEM database)
VECU	Vehicle Electronic Control Unit

General Wiring Definitions

The general wiring definitions provide a standardized list of terminology used in running wires, hoses, and cables throughout the vehicle.

Abrasive Surface	Items capable of causing damage to the routed commodity in a rubbing condition during vehicle operation
AWG	American Wire Gauge
Bundled With	A number of items tied, wrapped, or otherwise held together
Cable Tie	A nylon plastic self-sizing strap, UV resistant, capable of bundling specified load(s) during vehicle operation
Chafing	To wear away by rubbing
Contacts	Items touching each other.
Crimped	A routed commodity that is bent or pressed into ridges
Damaged	An item that differs from its original condition
Drooping	Routed items hanging downward, which are detrimental to safe vehicle operation
Dual Fall	(Pertaining to the Compressor Discharge Line) A high point in the routing of the Compressor Discharge Line (located on the engine) whereby any collected moisture is allowed to fall in two different directions where it is either dissipated by heat or is purged
High Current Electrical Cables	Wire sizes 13 mm sq. (0.5 inches sq.) (6 AWG) and larger
High Nut	Extended clamp length
Kinked	A tight bend, curl, or twist in the routed commodity causing flow to be restricted
Low Current Electrical Cables	Wire sizes 8 mm sq. (0.3-inches sq) (8 AWG) and smaller
Low Nut	Standard clamp length
Material Grade 30	Minimum yield strength of 30,000 psi
Material Grade 50	Minimum yield strength of 50,000 psi
May	Verb typically used in a statement of practice that is a permissive condition and carries no requirement or recommendation. It can be included to alter statements of mandate or recommendation
Not Secured	Items not fastened, bundled or tied
Plastic Conduit	Corrugated or smooth wall tubing used to protect hoses, wiring harnesses, cables, tubing, pipes, etc.
Puncture	Small hole or wound
Routed With	Items taking the same path but not attached to each other (i.e., parallel but separate)
Rubbing	Items that contact each other and have independent movement
Sharp Edge	A surface capable of cutting or piercing the routed commodity during vehicle operation
Twisted	Distorted from the routed commodities' original shape about it's cross-sectional centerline
Touch	Items that contact each other but do not have relative movement

Note: Accessory electrical circuits should always be fused. Where possible, use the designated spare fuses or circuit breakers that are already supplied. Never overload the circuit beyond the rated amperage of the fuse or circuit breaker. Inductive loads, such as motors, light bulbs, and relays, cause higher current draw (surge current) in electrical circuits during initial start-up or turn-on. These circuits may require slow-blow fuses or higher-rated fuses or circuit breakers. The installation of add-on circuits for the body installation may interfere with the proper operation of other vehicle electrical components. The body installer is responsible for ensuring the continued proper operation of all electrical systems on the vehicle concerning conducted or radiated signals from the installation.

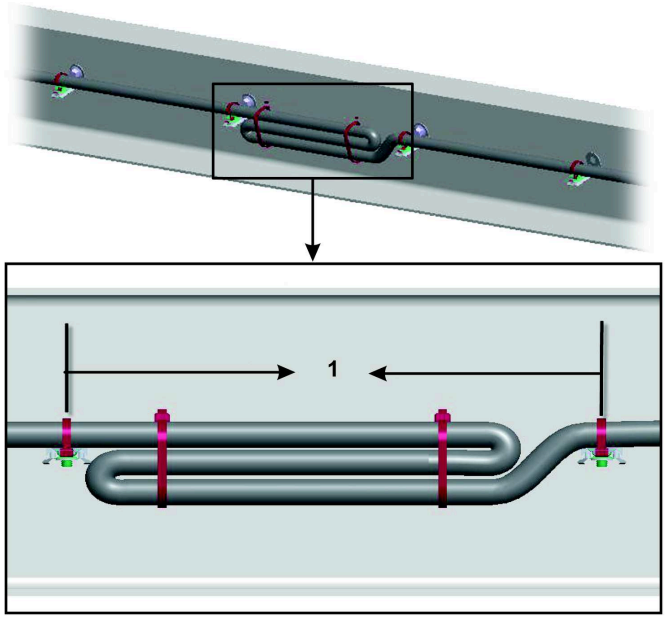
Routing and Clipping Guidelines

1 Brackets used in routing and clipping should be Material Grade 50 or better to ensure sufficient clamp load when sharing joint connections with cross members or other structural members. This applies only to joint connections using a low nut. Brackets of Material Grade 30 are acceptable provided the shared joint is using a high nut. The area of the clip bracket under the bolt head must be a least as large as the bolt head itself.

2 Clips that scratch exterior mounting surfaces shall not be used (i.e., barbed/spring type) unless the material is non-corroding (i.e., plastic). Clips must have rust protection.

3 Clip sizes should adequately secure the bundle without restricting flow, causing collapse, or preventing relative movement.

4 Bundles shall be supported at 24 inches (600 mm) maximum intervals. A cable tie should be used between clip points on bundles with the exception of electrical wiring harness. The electrical wiring harness can have a maximum support distance of 18 inches (450 mm) and a cable tie on bundles between clip points. When air and electrical lines are bundled together, the commodity with the greater cross-sectional area may determine the support spacing. A minimum of two cable ties shall be used between clip points to bundle electrical lines when the larger interval is used.



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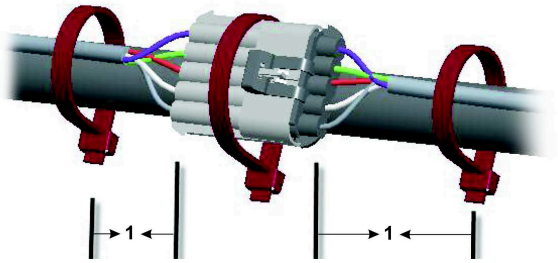
1 Support electrical cables every 18 inches (450 mm)

Notes

Support Distances, Continued



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1 Support cables near connectors every 4 inches (100 mm)

1 Electrical cables and wiring harnesses are to be secured 4 inches (100 mm) from the wire insertion end of the connector or clipped to the body.

2 Routing and clipping on purchased components (i.e., engine/transmission) should not include removing or replacing a bolt(s), nut(s) or screw(s) installed by the manufacturer. In such cases where this is unavoidable, the bolt(s), nut(s) or screw(s) shall be reinstalled to the manufacturer's specifications.

3 Bundles should not contact sharp edges of cross members. Contact may occur if it is against a smooth surface, a smooth radiused edge or a coined edge and the bundle is secured to prevent independent movement.

4 Hoses, tubing, pipes and electrical conduits shall not rub each other but may touch.

5 The fabric braided portion of the compressor discharge hose is compatible to be bundled with all routed air lines.

6 The compressor discharge pipe shall be routed independent of all other routing.

7 Electric cables/harnesses must not be bundled with fuel or hydraulic lines. The electrical cables/harnesses may be routed parallel with fuel or hydraulic lines, however must remain separated by approved clipping materials. When design control is possible, electrical cables/harnesses will be routed above fuel or hydraulic lines. If fuel or hydraulic lines must route above circuit protected electrical cables /harnesses, the fuel or hydraulic lines will have no fittings or potential leak points above electrical cables/harnesses and shall be minimized to the shortest distance possible over low current electrical cables/harnesses.

8 All associated markings on air and electrical harnesses should have a corresponding clipping apparatus.

9 Critical clipping locations shall be designated on the component to insure proper placement in the vehicle (i.e., tape).

10 Maximum support distance for compressor discharge rigid pipe, 30 inches (762 mm). Pipe to be isolated from support brackets (i.e. rubber isolator).

11 Maximum support distance for compressor discharge flex hose, 24 inches (600 mm).

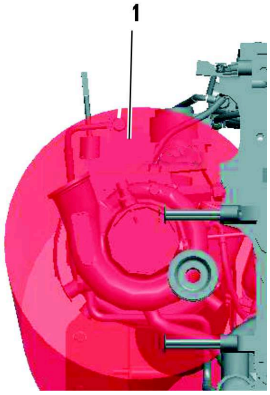
12 Compressor discharge line should have a constant fall from compressor to air dryer. A dual fall is allowable provided it occurs on the engine and within 24 inches (600 mm) of the compressor.

13 Maximum allowable dip in compressor discharge pipe/hose is one half the outer diameter of the pipe/hose. Preferred routing should have no dips in any of the routings. This is to avoid line blockage due to water collecting and freezing in the line.

Heating Specifications

In order to maintain the integrity of the cables and hoses, observe the following specifications for routing near a heat source.

Cable, hose, or harness type	Specification
Electrical cables and wiring harnesses	5 inches (130 mm) in all directions from turbocharger, exhaust components, and other high heat components
Unprotected hoses, tubing, harnesses, and cables	6 inches (150 mm) above, 5 inches (130 mm) beside and 4 inches (100 mm) below
Hoses, tubing, harnesses, and cables protected by reflective heat sheathing	3 inches (76 mm) above, 2 ½ inches (63.5 mm) beside and 2 inches (51 mm) below
Silicone transmission coolant hoses	2 inches (51 mm) from exhaust manifold and turbo (with reflective heat sleeving), 1 inch (25 mm) from exhaust pipe
Hoses, tubing, harnesses, and cables protected by a heat shield (no reflective sheathing)	3/8 inch (10 mm) between the component and the heat shield. (Not valid for fuel lines)
Refrigerant suction hoses	8 inches (200 mm)



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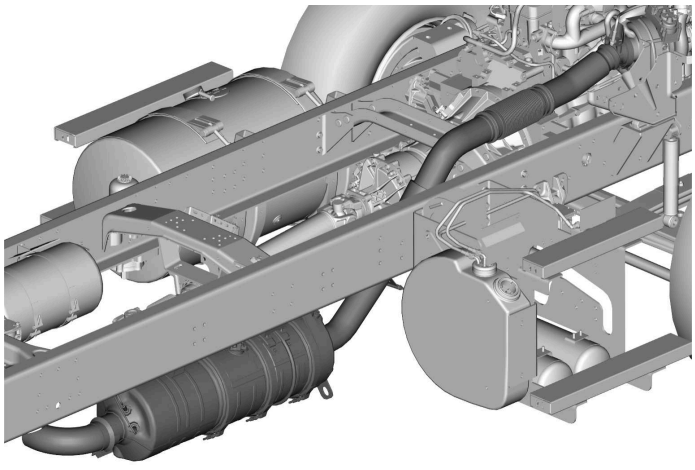
1 Heat Radius from the Turbocharger, Front: 5 inches (130 mm)



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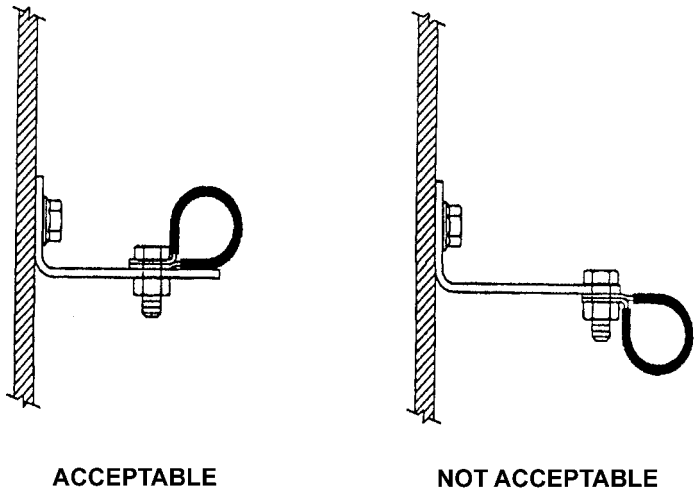
The DOC, DPF, SCR, and exhaust piping generate substantial heat. Keep electrical cables away from these components.

Clipping Guidelines

Clipping brackets should be designed and mounted to adequately support the bundle. Clips should be mounted in a hanging position or supported along three-quarters of the horizontal mounting surface. Orientations that do not conform to the illustrations shall be tested.

1 When hoses, wires, and cables cross one another, secure them with a clamp. This prevents the sawing motion that could abrade them.

2 When routing flex hoses that are bent in two planes, clip them to prevent twisting. Clamp the hose at the point where the hose changes planes. The clamp has the effect of dividing the hose into two assemblies. If the section of the hose is bent in the same plane as the movement, the bend restricts the movement and the hose will not twist.



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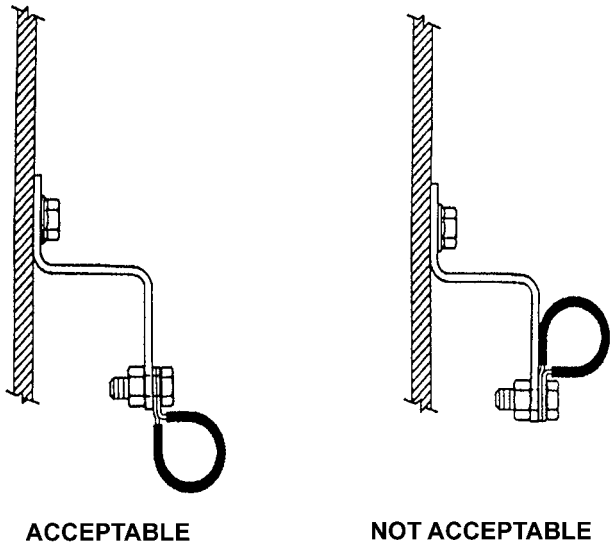

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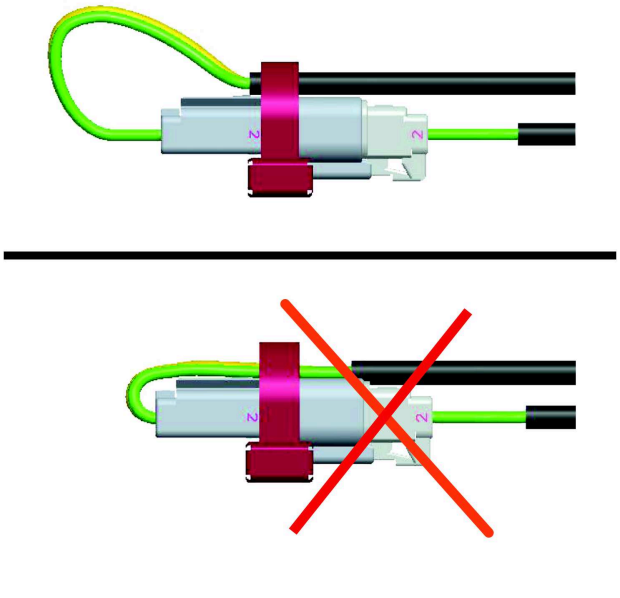
When routing connectors with cable ties, ensure that the cable ties do not contact the connector locking tab. Cable ties should also not contact the bare wire.



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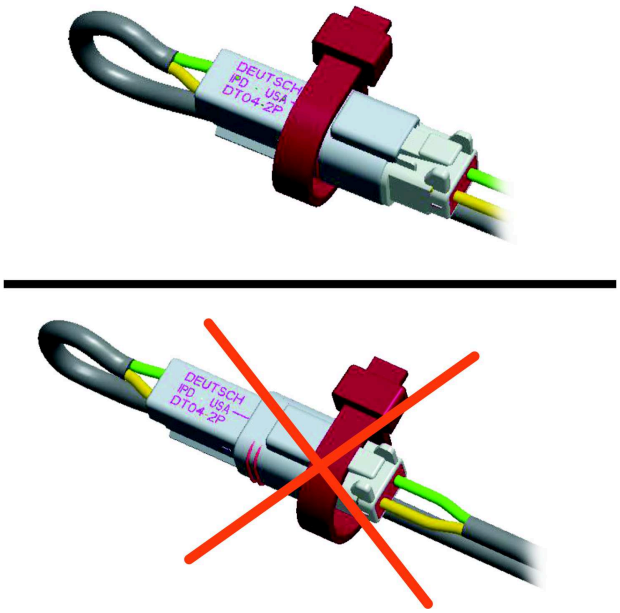

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Battery Cable Guidelines

The battery cable guidelines prevent electrical interference that can occur from improperly routed cables. In addition, the guidelines prevent cable damage through abrasion.

1 Battery cables with standard SAE stranding shall be supported at 16 inches (400 mm) maximum intervals. A separator type cable tie or an independent separator with cable tie may be used between clip points. No relative movement may occur between cables. If two (2) cable separators are used, they are to be installed equidistant from each other and arranged on a straight line, a maximum span between clip points of 24 inches (600 mm) may be used.

2 Strain relief clipping shall be provided for the battery and starter motor terminals. The strain relief clip shall be located with no relative motion to the terminals. The strain relief clip should be located close to these terminals and shall be within 20 inch (500 mm) cable length to the starter terminals.

3 Grommets shall be installed at points where cables pass through sheet metal or frames.

4 Routing shall avoid exposed edges of frame members, abrasive surfaces, and all sharp edges. When routing inside the frame, ensure that no contact with the frame is made with uncovered cables. Uncovered battery cables, external of the battery box, shall be routed independent of all other conduits. Covered cables may be bundled with other similarly covered conduits and air piping with a secured separator. **Do not route with/under fuel lines.**

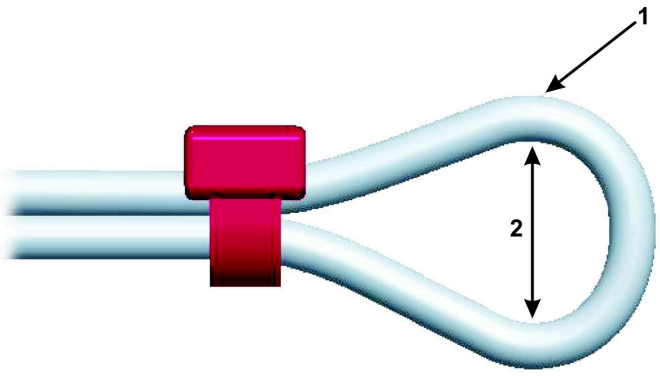
5 Cables should be clipped as close as possible to all cable bends.

6 Battery cables shall not be located within 5 inches (130 mm) of engine exhaust related components or other heat sources without heat coverings or heat shielding. Testing shall be performed to determine effects of closer allowances and the use of heat shields. Battery cables should not be installed in any area directly above engine exhaust related components.

7 Where cables flex between moving parts, the last supporting clip shall be securely mounted such that relative movement does not promote chaffing.

8 Battery cables shall not support any mechanical loads other than their own mass.

9 Minimum bend radii of battery cables should be three (2) times the cable diameter for standard SAE strand cable.



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1 Tube Diameter

2 Circle Diameter (3 x Tube Diameter)

Battery Guidelines, Continued

1 Star washers must not be used on electrical connections including grounds.

2 Asphalt type loom shall not be used for battery cable protection applications.

3 Battery cables shall not rub each other or surrounding items, but may touch when all items have no independent movement. Uncovered battery cables may not touch each other outside the battery box.

4 All exposed exterior circuit ends must be coated with a protective dielectric coating, as specified in the engineering documentation. If a wiring harness is required to be in an area of exposure, it must be approved by the appropriate wiring engineer.

5 Clip orientations should be per illustration or installation drawings utilizing compression or heavy duty clip.

6 Plastic conduit may be bundled and cable tied with covered battery cables when all items have no independent movement with each other. Battery cables may touch each other, plastic conduit or the battery, inside the battery box.

7 Covered battery cables may be securely tied or clamped to each other if no independent movement exists. Cables attached to the same terminal stud may be tied or clamped to each other.

8 First, position and install the battery cable ends at the starter motor posts. Next, assemble the engine harness terminals. Starter terminals that come with the starter may be first on the starter studs. Terminals shall not be reconfigured or bent.

9 When placing the frame bolt, adjacent to the battery box, the threaded end of the screw or bolt should face away from the battery box and any related cables. Wrench grip type bolts should not be used in the frame at the battery box area. Non-wrench grip type bolt or screw threaded ends may face towards the battery box only if clip bracketing or shielding is provided to prevent any possible cable contact with frame mounted hardware. Bolts that mount the battery box to the frame may be oriented toward the battery box.

10 Added abrasion protection should be used where the cable contacts other routed commodities or surfaces with no independent movement such as frame rail surfaces or transmission and engine castings. Polyethylene, polypropylene, nylon conduit and thick wall heat-shrink tubing may be used for added abrasion protection.

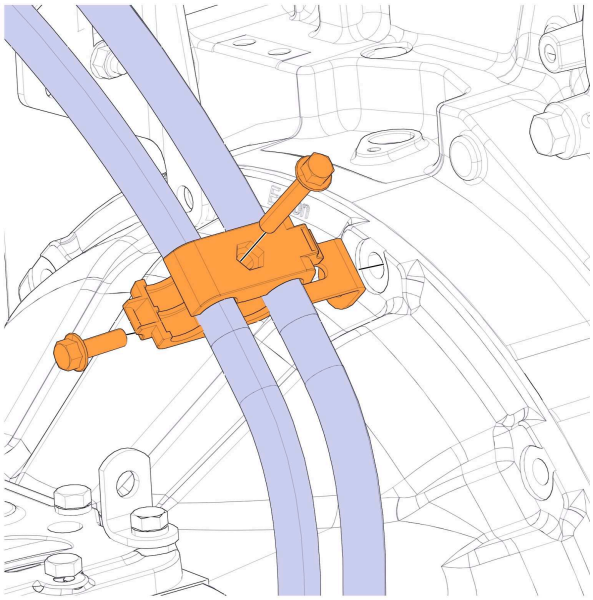
11 Cables should be located to afford protection from road splash, stones, abrasion, grease, oil and fuel. Cables exposed to such conditions should be further protected by either, or a combination of, the use of heavy wall thermoplastic insulated cable, additional tape application, plastic sleeve or conduit.

12 Anytime an existing fastener is used to secure a clipping bracket (or any similar device), the fastener shall be re-torqued to the value specified in the original documentation given for the fastener.

13 Each exposed exterior circuit end must be coated with a dielectric protective coating. Thickness to be 0.13 – 0.3 inches (3.5 – 7 mm) wet, full coverage, 3 inches (76.2 mm) diameter.

14 Do not use box clamps to secure battery cables.

15 In addition to Behringer clamps, use double-head tie clamps.



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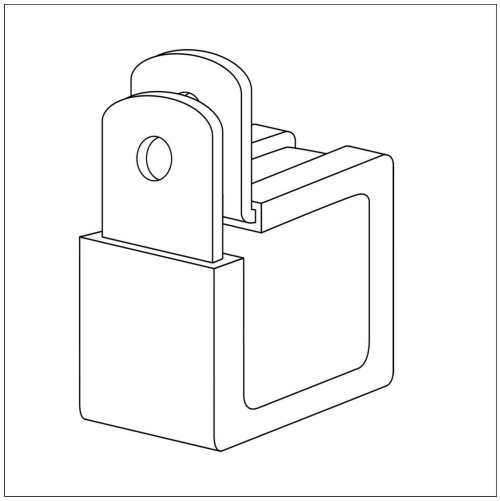
Berringer clamps are recommended for securing battery cables to each other.



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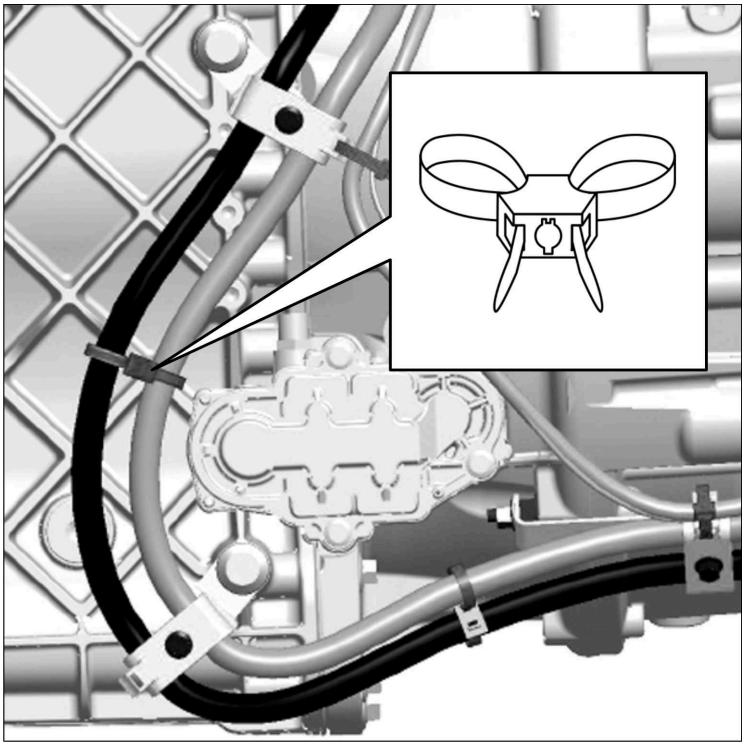
Box Clamps (shown above) are NOT to be used for securing battery cables to each other.



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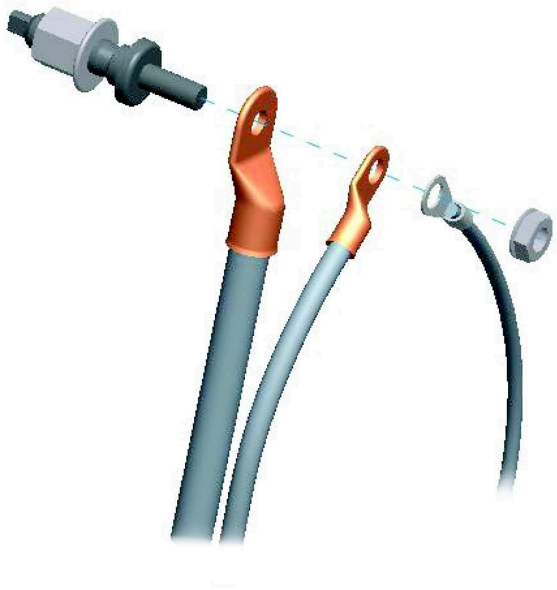
Double-head tie clamps may be used to route battery cables.

Ring Terminal Assembly

Assemble terminal carrying the highest current (largest gauge wire) first, then graduate to the smallest gauge up to the fastener. Use a maximum of three (3) terminals per stud (unless otherwise specified on an illustration drawing).



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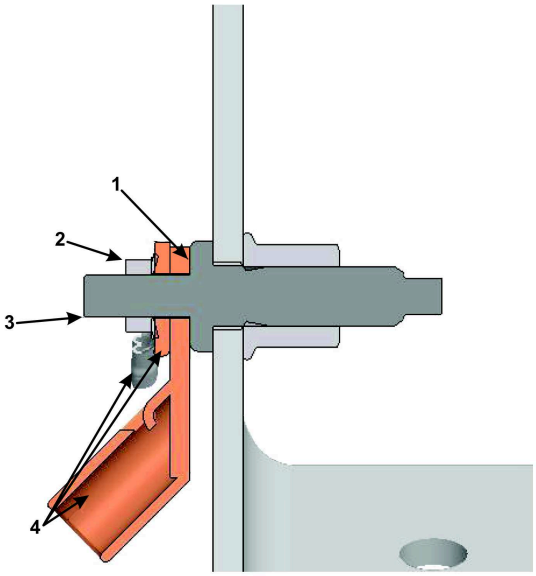
When attaching ring terminals with a fastener, tighten the fastener to appropriate torque so that the contact area touches the terminal at any point, in a full circle that is part of the terminal.



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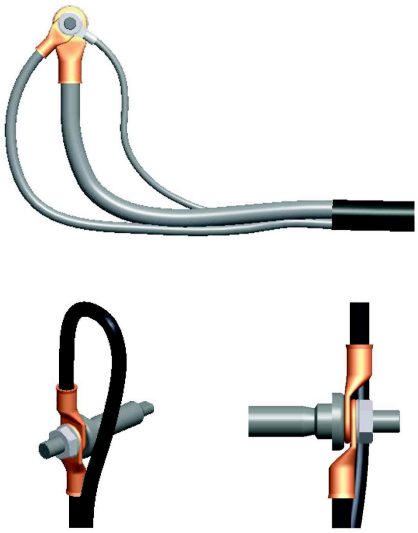
1 Contact Area
2 Fastener
3 Stud
4 Terminals

When attaching multiple terminals, position the terminals at an angle to allow maximum contact of the terminal surface. Terminals are not allowed to bend other than their natural form. Terminals may be stacked back to back.



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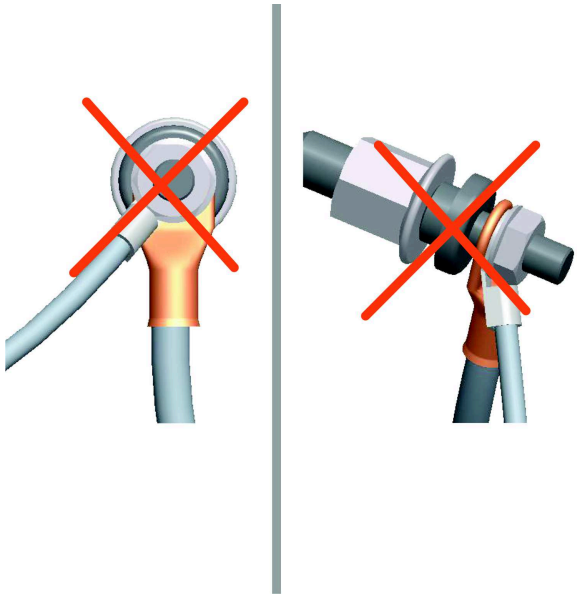
Improperly installed terminals result in unacceptable bends.



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Terminating Resistors

Terminating resistors are wired to each end of the SAE J1939 data link to prevent signal reflections. They must remain connected for the data link to function properly. The resistance value of each termination resistor is 110 – 130 Ω. When properly installed in the data link, their combined resistance is 50 – 70 Ω since they are connected in parallel.

The termination resistor at one end of the SAE J1939 data link is located in the fuse and relay center (FRC) near the vehicle electronic control unit (VECU) and the other near the engine control module (ECM). On vehicles equipped with Cummins engine, the termination resistor is located in the wiring harness area just outside of the ECM.

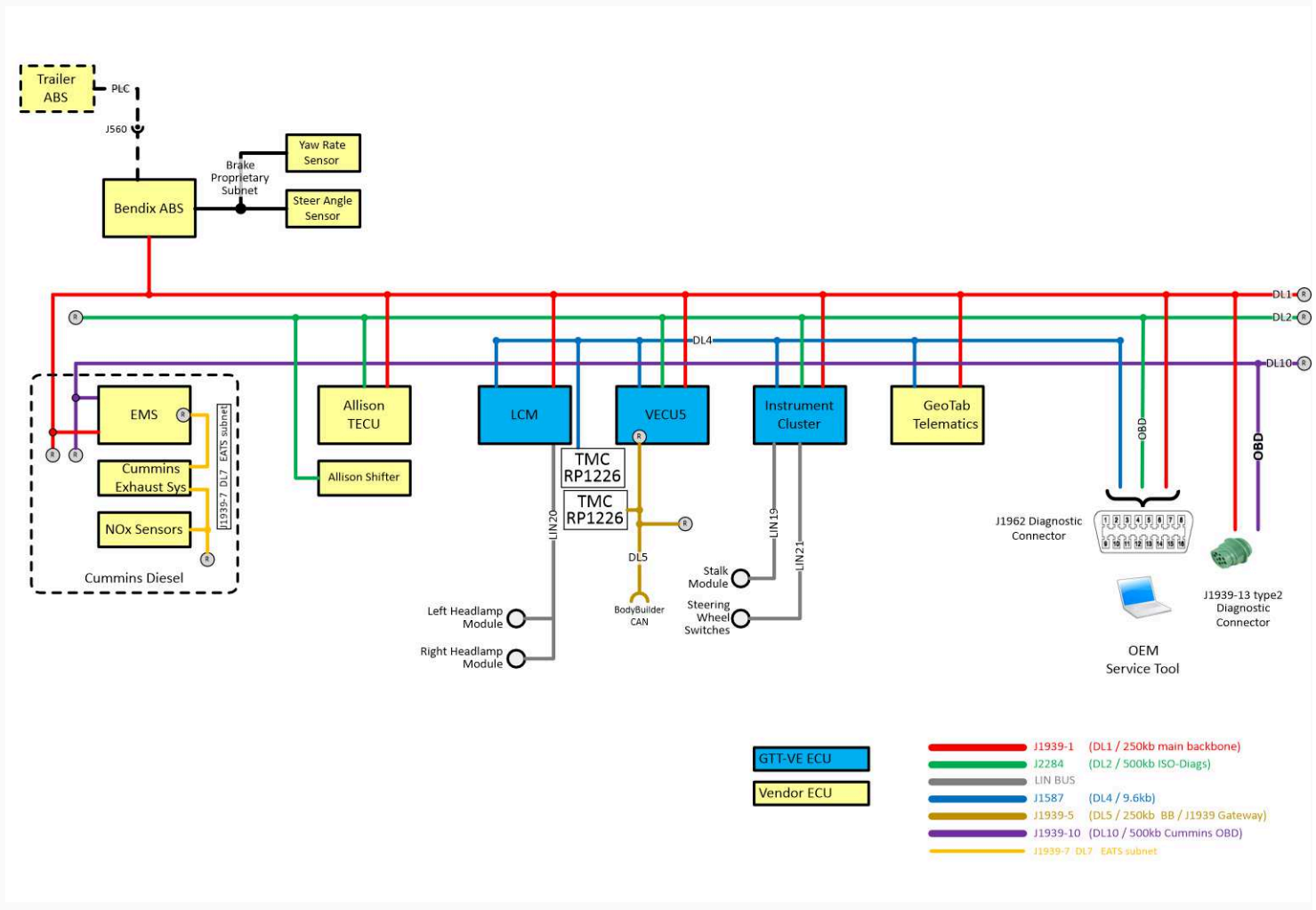
A SAE J1939 data link connection is located at the transmission area in the chassis harness. On vehicles equipped with an electronically controlled transmission (Allison), the connection to the transmission is located at the chassis harness.

Only two termination resistors are used in each data link. Never install more than two terminator resistors in one data link. If more than two resistors exist in the SAE J1939 data link circuit, incorrect or absent signals may occur. You can easily check to see if you have two resistors by measuring the resistance between pin C and D for the 9-pin diagnostic connector, or pin 3 and 11 for the 16-pin diagnostic connector, with the ignition key in OFF position. The correct resistance is 50 – 70 Ω. The termination resistors should each have a resistance of 110 – 130 Ω when tested individually.

Notes

MD wiring toplogy

US2021 Emissions Engine



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Acronym	Description
ABS	Anti-Lock Braking System
BBM	Body Builder Module
EMS	Engine Management System
LCM	Light Control Module
NOx	Nitrogen Oxide
TECU	Transmission Electronic Control Unit
VECU	Vehicle Electronic Control Unit

Electrical Wiring and Connections

Main Power and Starting Circuits

Figure 1 shows the starter circuits. Note that the ECM and VECU directly control the starter relay. The ECM inhibits starter motor when the engine is running, starter motor is overheated and PTO is engaged. The VECU inhibits the starter motor when the transmission is in gear.

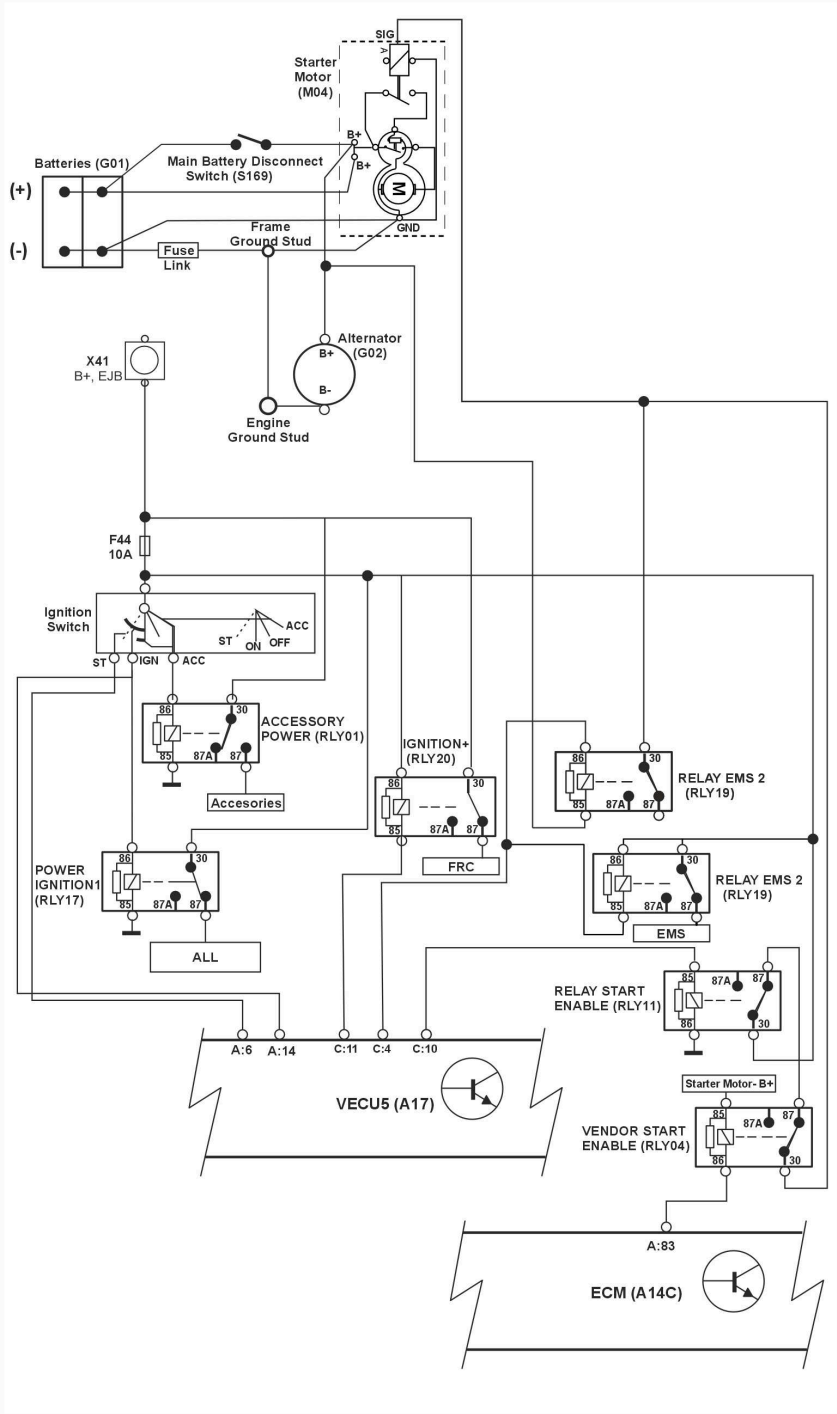

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Fig. 1 Main Power and Starting Circuit

Vehicle Control Unit (VECU) Connections

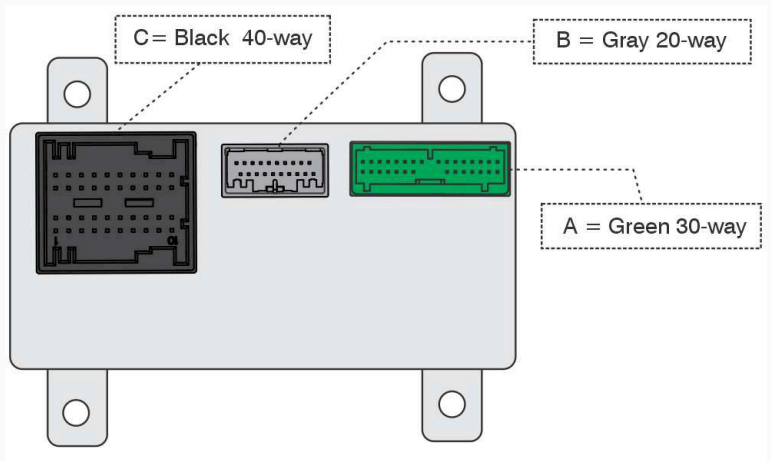


Fig. 2 Vehicle Control Unit (VECU) Connectors, Mack Conventional

Notes

VECU Connector A (Green)

Pin Number	Type	Function Description
A:1	DIH1	–
A:2	DIH2	–
A:3	DIH3	–
A:4	DIH4	–
A:5	DIH5	Brake Pedal
A:6	DIH6	Crank Position
A:7	DIH7	Spare
A:8	DIH8	–
A:9	DIH9	Spare
A:10	DIH10	AC ON/OFF
A:11	DOL8	Spare or Fifth wheel Slide
A:12	ECU GND	ECU Ground
A:13	ECU BATT	ECM Power
A:14	DIH11	Key Switch Ignition
A:15	CAN-2–H	J1939/ISO-2-H (BB2)
A:16	CAN-2–L	J1939/ISO-2-L (BB2)
A:17	DIH12	ACC Time Gap +
A:18	DIH13	–
A:19	DIH14	–
A:20	DIH15	Ebrake Set + Cummins
A:21	DIH16	Ebrake Set - Cummins
A:22	EOL	EOL
A:23	DIH18	IVS1
A:24	DIL1	Spare
A:25	DIL2	Inter-wheel Lock (front)
A:26	DIL3	–
A:27	DIL4	Spare
A:28	DIL5	–
A:29	DIH19	Spare
A:30	DIH20	–

VECU Connector B (Gray)

Pin Number	Type	Function Description
B:1	NO Connection	–
B:2	NO Connection	–
B:3	DIH24	ACC Time Gap -
B:4	DIH25	–
B:5	DIH26	Spare
B:6	DOL11	–
B:7	DOL12	Spare
B:8	AI6	Spare
B:9	AO3	Spare
B:10	AO4	Spare
B:11	NO Connection	–
B:12	NO Connection	–
B:13	AO6	Spare
B:14	CAN-4–H	Spare
B:15	CAN-4–L	Spare
B:16	CAN-5–H	Spare
B:17	CAN-5–L	Spare
B:18	A_GND 2	PB Sensor GND
B:19	A_GND 4	Spare
B:20	LIN	Spare

VECU Connector C (Black)

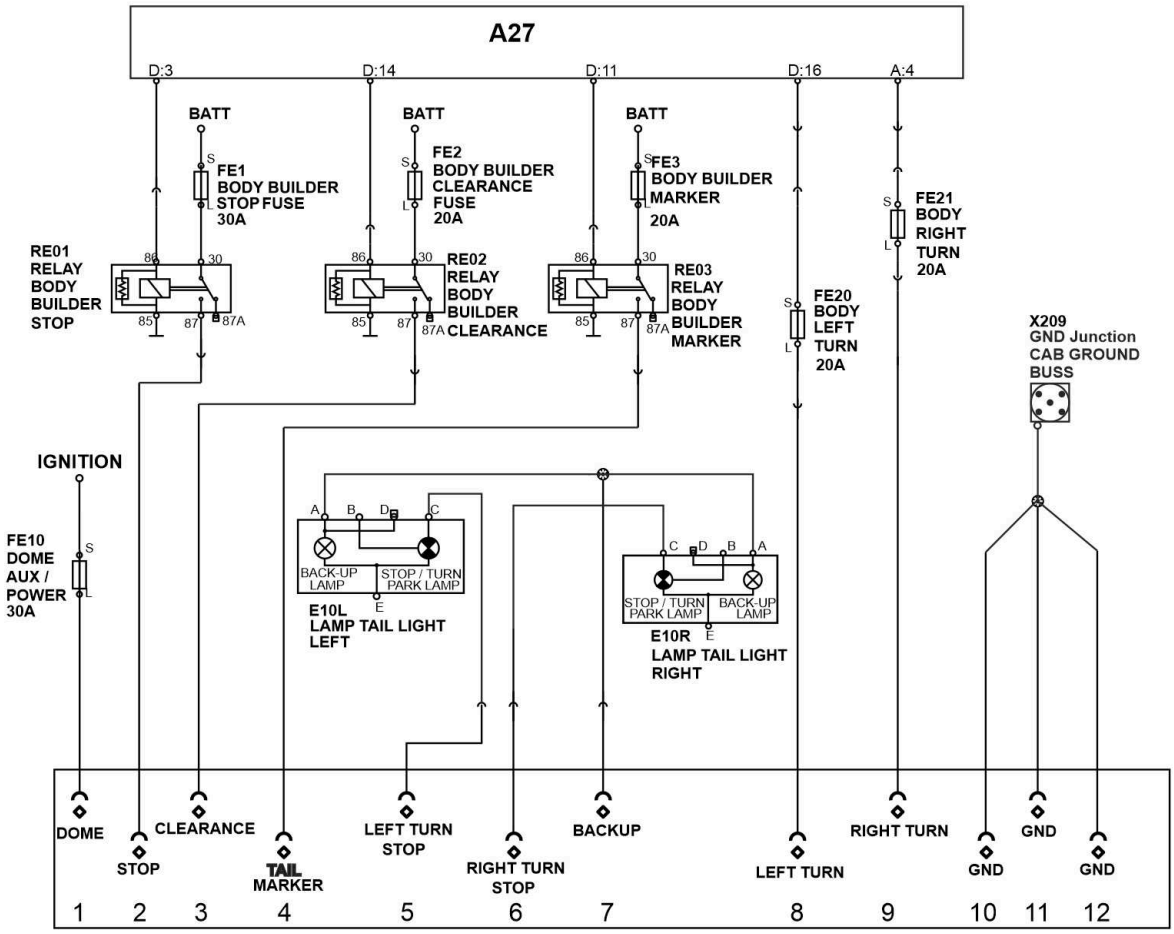
Pin Number	Signal Type	Function Description
C:1	DOL2	–
C:2	DOL3	Inter-wheel Differential Lock (rear or (front and rear))
C:3	DOL4	–
C:4	DOL5	EMS Relay
C:5	DOL6	Spare
C:6	DOL7	–
C:7	DOL9	Cummins IVS
C:8	DOL10	Spare
C:9	DOH1	–
C:10	DOH2	Starter Control
C:11	DOL1	Power Relay #1
C:12	DIL6	Spare
C:13	DIH17	–
C:14	DIH21	–
C:15	DIH22	Spare
C:16	DIH23	Spare
C:17	DIL7	Parking Brake
C:18	DIL8	–
C:19	DIL9	Spare
C:20	DOH3	–
C:21	AI1	Accelerator Pedal Signal
C:22	AI2	Spare
C:23	AI3	Parking Brake OBD
C:24	AI4	Spare
C:25	AI5	Service Brake
C:26	AO1	Output Supply 1 (5 V) - Accelerator Pedal
C:27	AO2	PB Sensor Power
C:28	AO7	Analog Supply IVS Switch
C:29	AO8	CC switch supply 12V
C:30	AO5	–
C:31	CAN-1-H	J1939-1-H (BB1)
C:32	CAN-1-L	J1939-1-L (BB1)
C:33	CAN-3-H	DL5H
C:34	CAN-3-L	DL5L
C:35	A_GND 1	Analog GROUND - Accelerator pedal
C:36	A_GND 3	Spare
C:37	J1587-A	J1587-A

Pin Number	Signal Type	Function Description
C:38	J1587-B	J1587-B
C:39	FI	–
C:40	FI_GND	–

Notes

Body Builder Wiring Inframe Connections

Body Builder Interface – Front Chassis BOC (Back Of Cab)



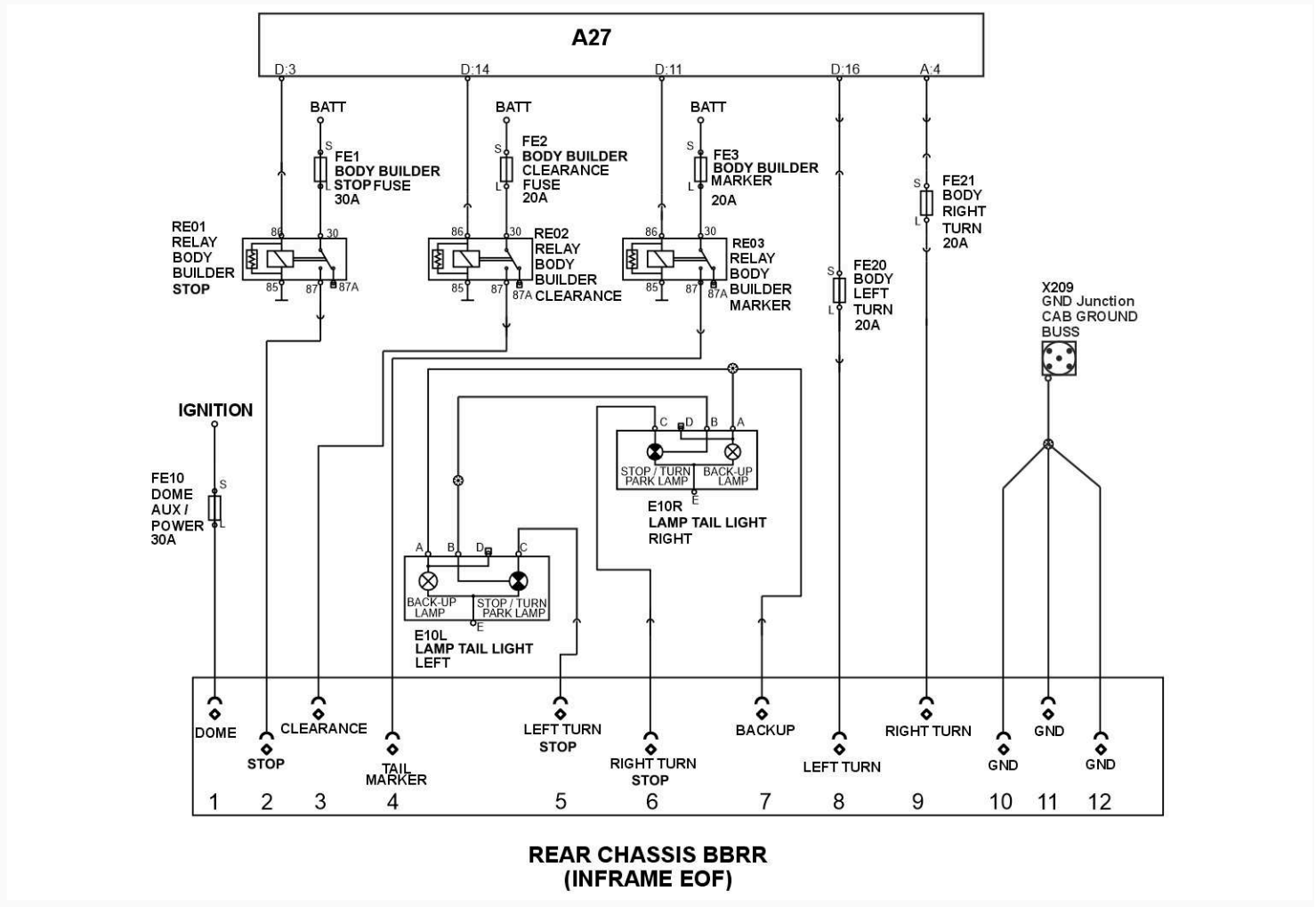
FRONT CHASSIS BBFR (INFRAME BOC)

T3183468

Mating connector for front chassis BBFR

- Mating connector: 20457411
- Lock : 22522334
- Terminal : 20388118
- Wire Seal : 20708372
- Plug seal : 20388120

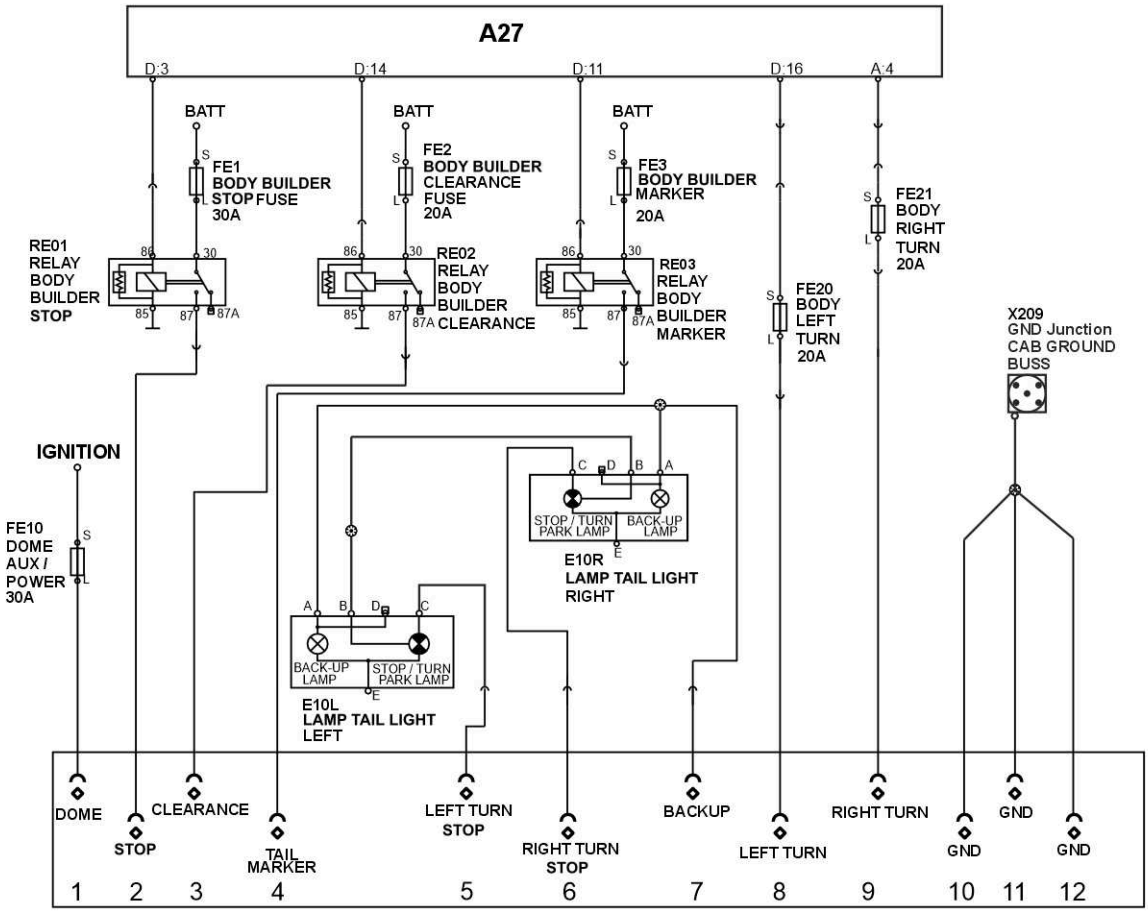
Body Builder Interface – Rear Chassis EOF (End Of Frame)



REAR CHASSIS BBRR
(INFRAME EOF)

T3210793

POST DESCRIPTION	
Front Chassis BBFR — Inframe BOC	Rear Chassis BBRR — Inframe EOF
1. Dome light	1. Dome light
2. Stop	2. Stop
3. Clearance	3. Clearance
4. Tail Lamp	4. Tail Lamp
5. Left turn stop	5. Left turn stop
6. Right turn stop	6. Right turn stop
7. Reverse	7. Reverse
8. Left turn	8. Left turn
9. Right turn	9. Right turn
10. Ground	10. Ground
11. Ground	11. Ground
12. Ground	12. Ground

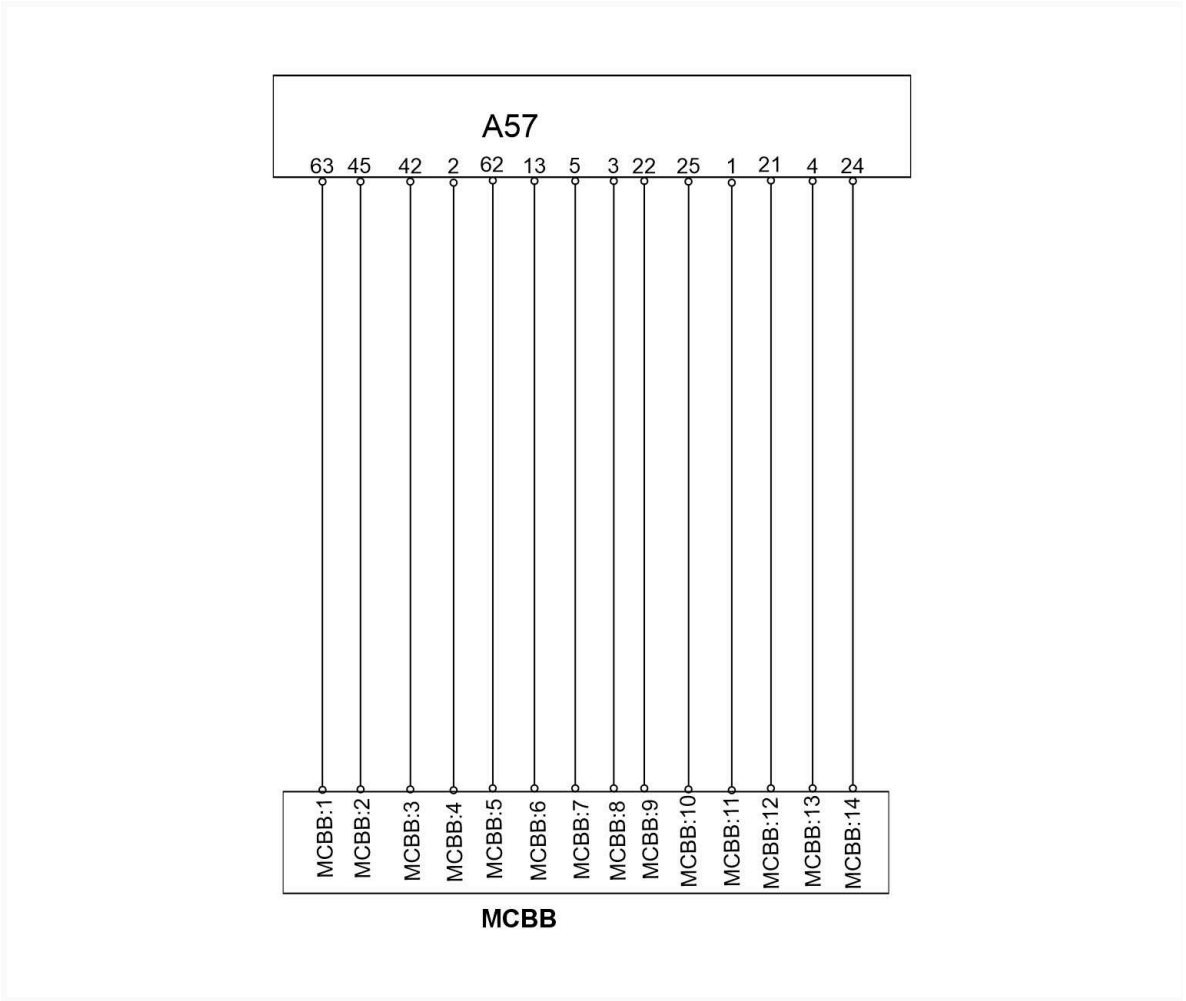


REAR CHASSIS BBRR (INFRAME EOF)

T3210793

POST DESCRIPTION	
Front Chassis BBFR — Inframe BOC	Rear Chassis BBRR — Inframe EOF
1. Dome light	1. Dome light
2. Stop	2. Stop
3. Clearance	3. Clearance
4. Tail Lamp	4. Tail Lamp
5. Left turn stop	5. Left turn stop
6. Right turn stop	6. Right turn stop
7. Reverse	7. Reverse
8. Left turn	8. Left turn
9. Right turn	9. Right turn
10. Ground	10. Ground
11. Ground	11. Ground
12. Ground	12. Ground

Transmission Interface MCBB – Allison 2500 Series with A57



T3212218

A57 – Transmission Electronic Control unit

MCBB – body builder connector interface

Note: Terminal part #978295 for the MCBB mating connector.

Pin Description

MCBB – body builder connector interface pin	TECU Pin	Pin description	
		Allison 2500 Series	**Allison 2500 Series**
MCBB:1	63	EMS (ignition) power	
MCBB:2	45	Range indicate	
MCBB:3	42	Secondary mode input	Auxiliary hold input
MCBB:4	2	Engine brake input	
MCBB:5	62	Service brake status input	
MCBB:6	13	Transmission service indicator	Secondary mode indicator
MCBB:7	5	Output speed indicator A	
MCBB:8	3	Signal return	
MCBB:9	22	Preselect request 1 input	Direction change input
MCBB:10	25	Speedometer	
MCBB:11	1	Range inhibit input	
MCBB:12	21	ABS input	
MCBB:13	4	Engine brake output	
MCBB:14	24	Range inhibit indicator	

Notes

BodyLink III

BodyLink III is the standard Mack MD straight truck body builder electrical interface. It consists of a 29-pin electrical quick-connector. Also available is a ‘BodyLamp’ dashboard light to indicate typically when the dump body is elevated. This lamp is activated via pin #17 when grounded.

Note: The BodyLink III connector comes with a cap. If you need additional pins or connectors, you can purchase them from your local Mack dealer. The connector housing is #25024037, and the terminal kit is #21750652.

There is a new display in Co-Pilot to alert the driver that the body is up or out of position.

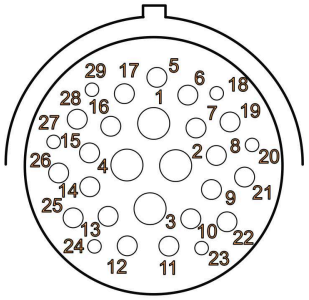
W8136998

Fig. 3 Body Raised Out of Position

Body Link III

Mating Connector Part : 25024037

Terminal Kit Part : 21750652



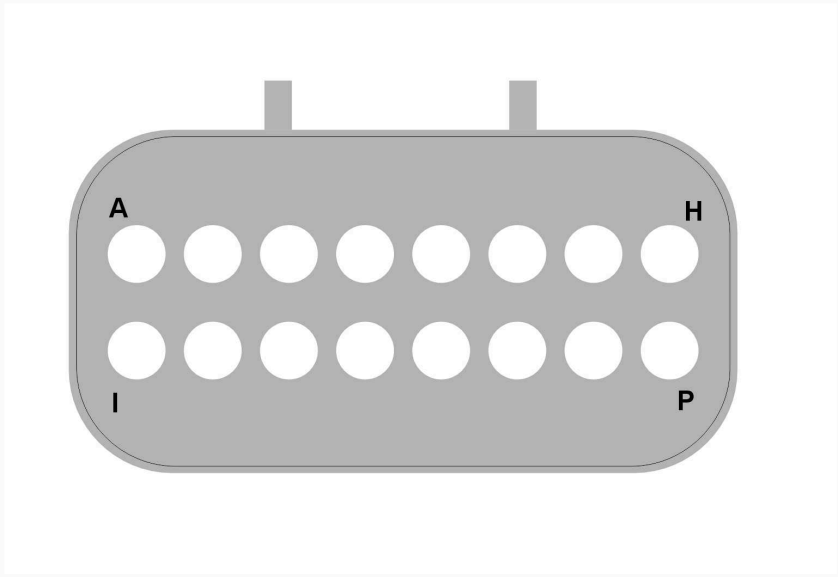
W3064928

Fig. 4 BodyLink III 29-pin Connector, Wire Insertion Side of Connector.

Pin Chart BodyLink III 29-pin Connector

Pole	Description
1	Battery power (30A)
2	Ignition power (30A)
3	Neutral power
4	–
5	Reverse signal
6	–
7	–
8	–
9	AUX switch #1
10	–
11	–
12	AUX switch #2
13	–
14	–
15	Parking brake
16	–
17	Body out-of-postion
18 (12v positive)	3000 PTO solenoid signal
19 (12v positive)	2500 PTO solenoid signal
20	Cummins PTO
21	–
22	–
23 (12v positive)	–
24 (12v positive)	–
25	Cummins switch return
26	–
27	–
28	–
29	–

Engine Bodybuilder Interface – Cummins Bodybuilder (CUBB)



T3211410

Note: Terminal part #20478204 for the CUBB mating connector.

Pin Description

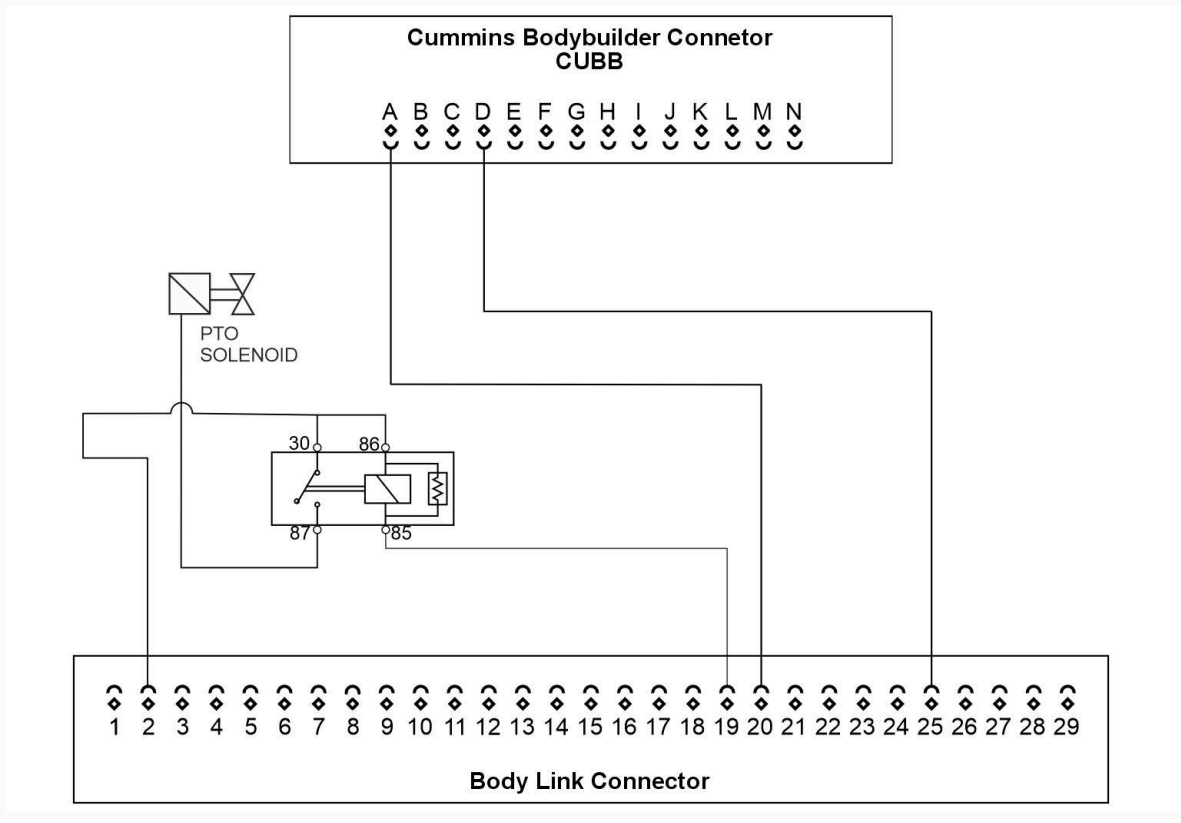
CUBB – body builder connector interface pin	Pin description
A	Remote PTO switch
B	Accelerator interlock
C	Remote accelerator enable switch
D	Signal return
E	Remote accelerator pedal
F	Regen inhibit
G	Vehicle speed limit
H	Cruise control on/off switch
I	-
J	OEM sensor supply
K	ECM sensor return
L	Cruise control set
M	Cruise control resume
N	Remote engine shutdown

Mack PTO and ESC activation with Allision transmission

For vehicles built after 2025 week 01, PTO and ESC (Engine speed control) can be activated by using the Bodylink connector.
The parts mentioned below are required to activate the ESC and PTO.

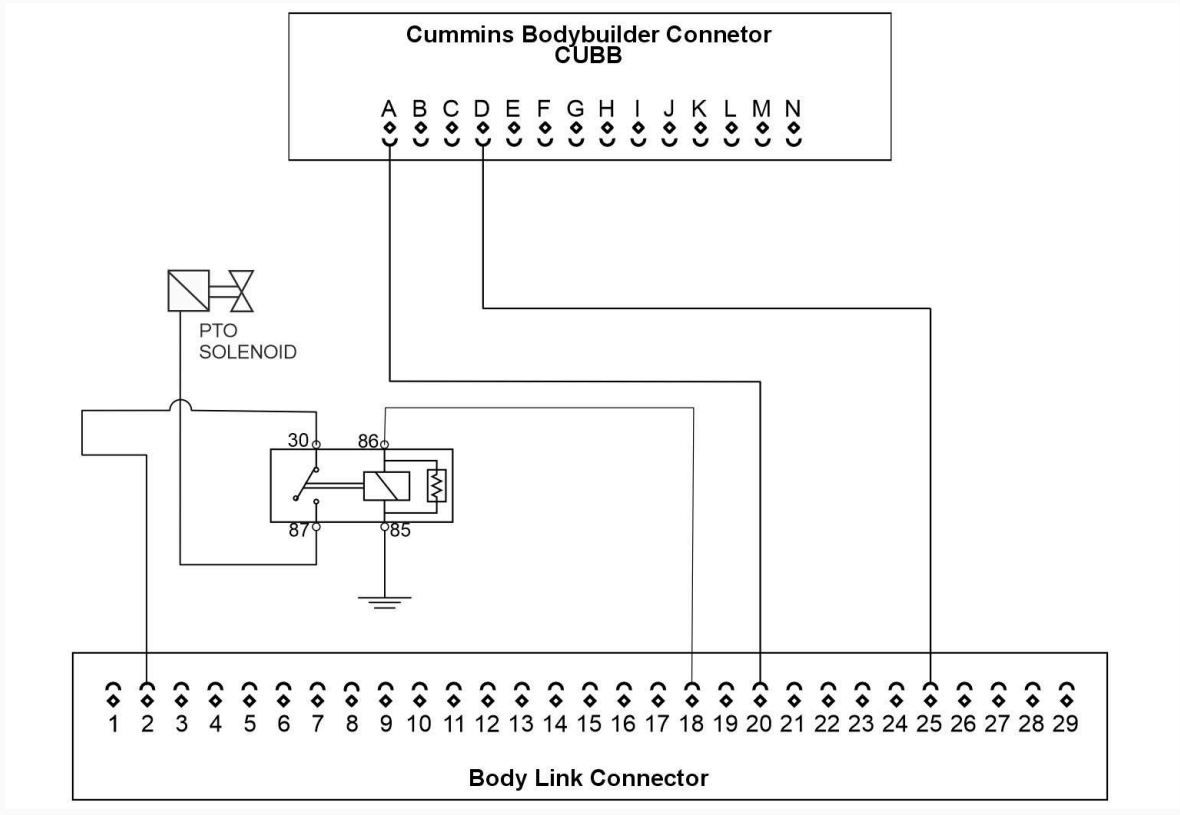
Sl.no	Part number	Description	Quantity
1	20388119	Terminal for Cummins BB connector	2
2	20708372	wire seal for cummins BB connector	2
3	25024037	MCBP (Bodylink pass through) mating connector	1
4	21750652	Terminal Kit for MCBP	1
5	–	Relay	1
6	20865681	Relay Connector	1
7	25157889	Relay lock	1
8	20865693	Terminal for relay connector	4
9	–	18 AWG stranded wire	–

The transmission and engine should be connected from bodylink connector as shown below.



T3212281

PTO Solenoid connection for Allision 2500 Series



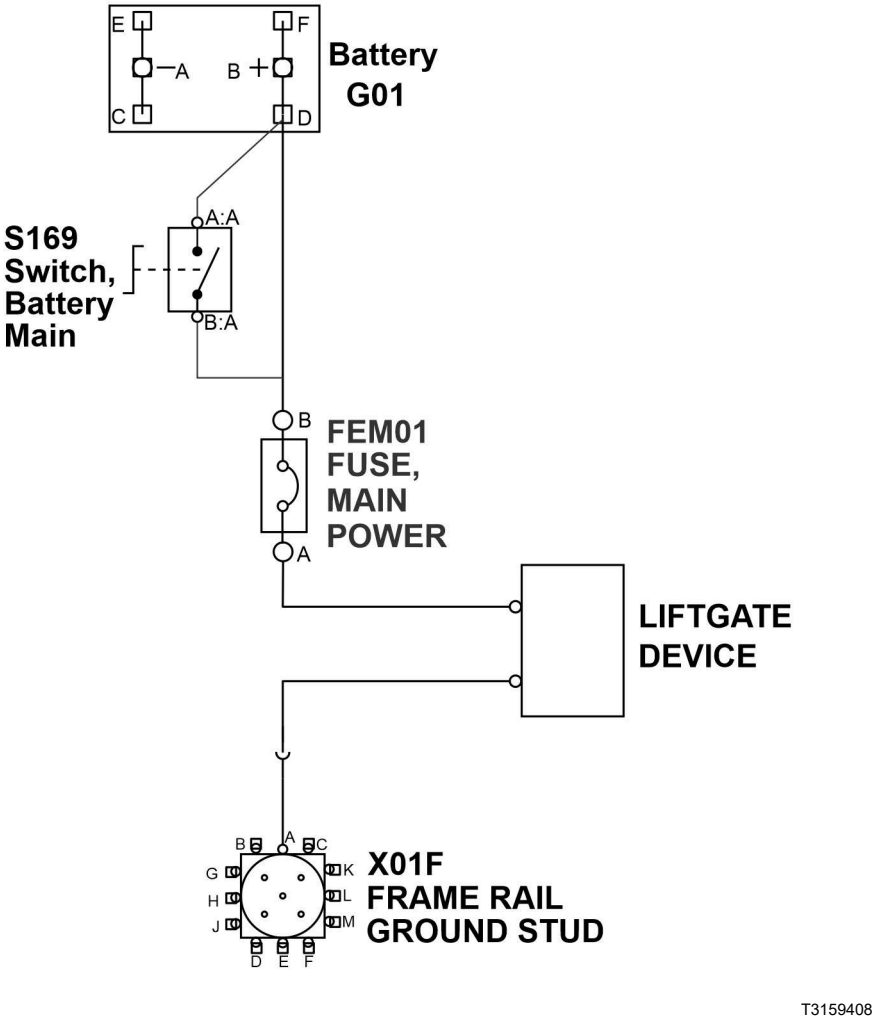
T3212219

PTO Solenoid connection for Allision 3000 Series

Notes

Recommended power liftgate wiring instructions

Power Liftgate with engine running– body builder Supplied



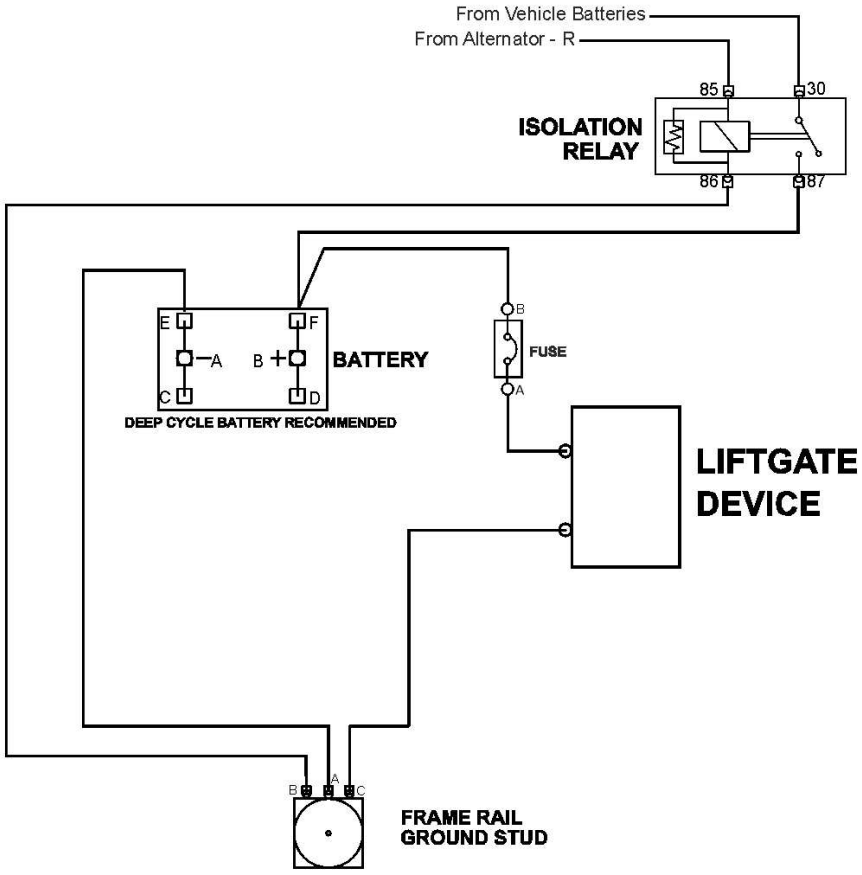
Note: When the vehicle is offered with battery disconnect switch, the liftgate wiring harness must not wired directly to the battery. The liftgate wiring harness must be wired to the battery disconnect switch.

Note: Properly sized/recommended cable must be used to carry the load.

Note: Use ground stud to ground the circuit. Never connects the Grounding circuit directly to the battery or ground fuse-link.

The ground stud is located on the frame rail near to the battery box. The ground stud is supplied with liftgate preparation and body builder package.

Power Liftgate with vehicle off– body builder Supplied



T3204402

Note: The ground stud is located on the frame rail near to the battery box. Multi-stud frame grounding plate is supplied with liftgate prep and body builder package. (multi-stud buss replaces single frame rail ground stud.)

Note: Properly sized/recommended cable must be used to carry the load.

Note: Use ground stud to ground the circuit. Never connects the grounding circuit directly to the battery or ground fuse-link.

Note: The liftgate wiring harness should not be directly wired to the additional battery. Instead, an appropriate fuse should be used.

Notes

Mack doesn't necessarily recommend or condone tapping into the J1939 databus. This is the main control bus and even devices only listening can improperly load the line and cause communication problems. The signals are fast enough that they are affected by the physics of the electrical charges traveling through the lines. So it matters how the device is designed and where it is placed in relation to other devices. However this method can save wiring and gives the body builder more flexibility and control in developing applications. To that end the following information is provided. However, it is recommended that applications be implemented with sufficient field testing to uncover any problems.

Here are two ways to properly connect to J1939 without damaging the cab harness.

1. Connect at the diagnostic connector.

The diagnostic port contains J1939 lines mainly for temporary connection for diagnostic tools. Since it also contains power and ground for diagnostic tools, it is a convenient choice for connection of control and monitoring devices. However, note that J1939 specifies one device per node. So, it would be incorrect to place two devices there.

2. Add the device at the terminating resistor.

This method effectively lengthens the "backbone" of the main CAN line and adds a node. The main CAN bus terminating resistor is located in the dashboard. To extend the main CAN line and add a node, a "T" harness can be used between the resistor and its connector (refer to the figure). Theoretically, more than one node could be placed this way. However, some trucks are already at or near the theoretical limit.

Mack follows SAE J1939 meaning it uses an unshielded, twisted pair and is theoretically limited to 10 devices.

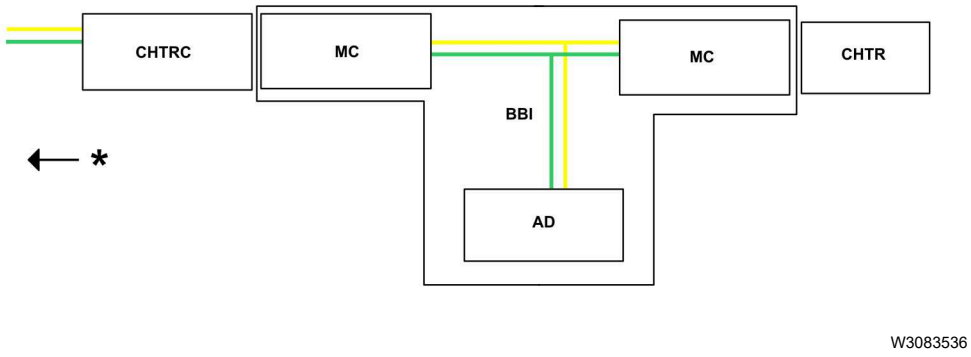


Fig. 5 Adding a node at the terminating resistor

* To Truck

The following parts can be used in the above “T” harness. Critical is that only two terminating resistor remain on the network (one is in the ECM). It may also be possible to have one terminating resistor in the aftermarket device if it is replacing the existing terminating resistor.

T Harness Part Numbers

T Harness		
Abbreviation	**Connector**	**Part Number MACK #**
CHTRC	Cab Harness Terminating Resistor Connector	21430472
CHTR	Cab Harness Terminating Resistor 120 Ω	21430457
CTCH	Connection to Cab harness	20500398
AD	Aftermarket Device	N/A
MC	Mating Connector	N/A
BBI	Body Builder Installed	N/A

Notes

Vehicle Accessory Connector (Mack Conventional)

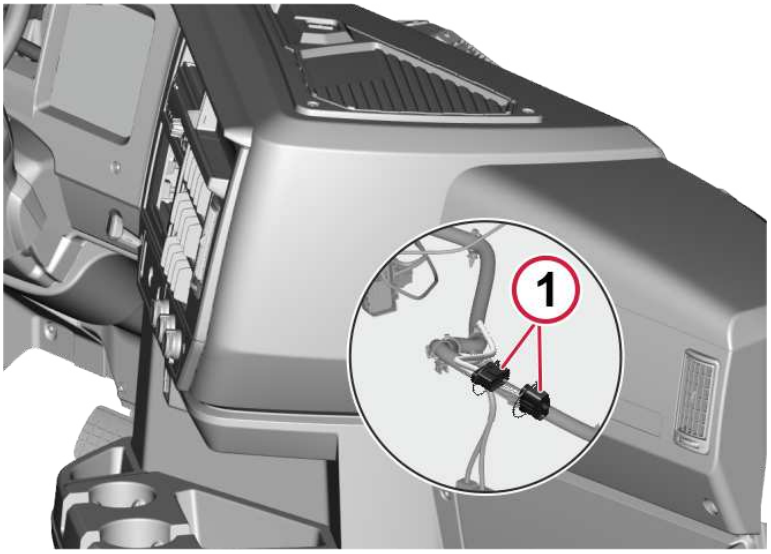
The purpose of vehicle accessory connector (TMC RP1226) is to connect the vendor device to the vehicle.

This connector provides an intuitive and quality assured interface between the vehicle and vendor device.

Location of the connectors

Two accessory connectors are located under the instrument panel. The connectors are used to connect the aftermarket Fleet Management devices. Only one vendor device is allowed to connect per connector.

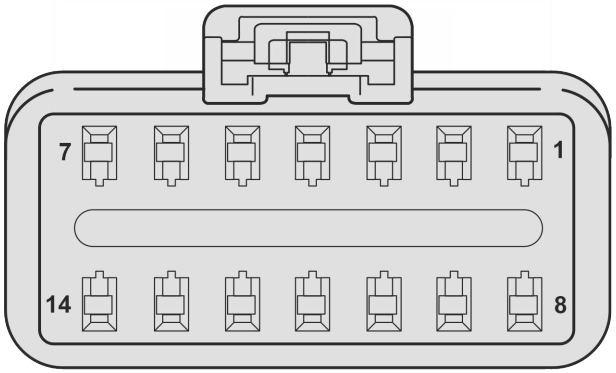
Note: The vendor device must not have an internal termination resistor.



T3159519

Notes

TMC RP1226 Connector

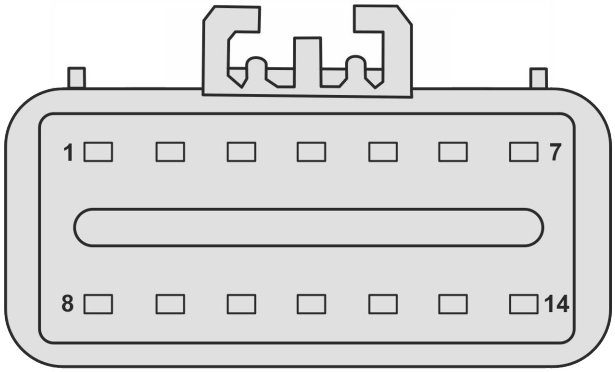


T3159520

Pin numbers	Description
1	+12 V After battery switch (10 A shared)
2	CAN-5
3	—
4	—
5	—
6	J1708A
7	+12 V After ignition (10 A shared)
8	Ground
9	CAN-5 Low
10	—
11	—
12	—
13	J1708B
14	+12 V Battery (10 A shared)

Mating Connector

The following connector and terminals must be used, if the vendor component connector not suitable to connect to the TMC RP1226 connector.

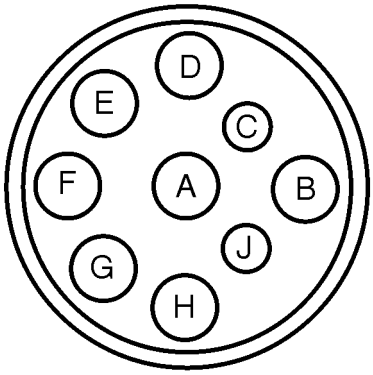


T3159741

Description	Part number
Mating connector	20734995
Terminals	21712912

Another more convenient way to connect to J1939 (or J1587) is through the diagnostic connector.

9-pin Cummins diagnostic connector (Green)



W9000628

Fig. 6 9-pin Diagnostic Connector

9-pin Diagnostic Connector

9-pin Diagnostic Connector	
PIN	**Definition**
A	Ground
B	Battery
C	DL10 (J1939 H-Yellow)
D	DL10 (J1939 L-Green)
E	Not used (Shield)
F	CAN H – DL1 (J1939 H-Yellow)
G	CAN L – DL1 (J1939 L-Green)
H	Not Used
J	Ignition + (Key Switch)

Notes

16-pin Diagnostic Connector

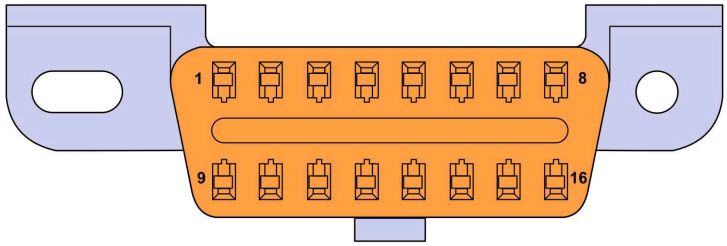


Fig. 7 16-pin Diagnostic Connector (OBD 13)

16-pin Diagnostic Connector (OBD 13) Pin Allocation

16-pin Diagnostic Connector (OBD 13 SAE J1962-Type A Connector)	
Pin	**Definition**
1	OEM discretionary (assigned as: Key switch – ignition signal for AM tool)
2	(Not Used)
3	OEM discretionary (assigned as: SAE J1939-1_CAN_H)
4	Chassis ground
5	Chassis ground
6	CAN_H line of ISO
7	(Not Used)
8	(Not Used)
9	(Not Used)
10	(Not Used)
11	OEM discretionary (assigned as: SAE J1939-1_CAN_L)
12	OEM discretionary (assigned as: SAE J1587_CAN_H positive)
13	OEM discretionary (assigned as: SAE J1587_CAN_L negative)
14	CAN_L line of ISO
15	(Not Used)
16	Battery positive voltage

Notes

Data Link System

This section provides information on the design and function of the vehicle communications data links. These communication links are based on SAE J1587, J1708 and J1939 Recommended Practices and the ISO 14229 Standard. For more specific information about the ISO 14229 Standard, please refer to the ISO website (www.iso.org).

The data links are used to relay shared vehicle information between control modules and diagnostic, service and (in the case of On-Board Diagnostics (OBD) information) scan tools. The data link types used are SAE J1939 and SAE J1587/J1708.

SAE J1939 (DL1)

DL1 is the primary data link for communication between vehicle modules and powertrain control modules. Vehicle and powertrain control modules utilize the SAE J1939 communication protocol on DL1 to share information with vehicle and engine control. Limited diagnostic functionality takes place on this data link.

DL1 consists of a pair of 18 gauge, unshielded, twisted wires. The designations of the individual wires are DL1H (yellow) and DL1L (green). The nominal twist rate required is 0.89 twists per 25.4 mm (1 inch) or 33 twists per meter (3.28 feet). This twist protects against electrical interference.

DL1 is electrically terminated at each end with a termination resistor. Each DL1 network has two termination resistors. The termination resistor can be located externally as part of the wiring harness, or integrated internally in the ECM (Engine Control Module). An ECM that does not contain the termination resistor is referred to as Type 1. An ECM that contains the termination resistor is referred to as TYPE II. The correct number of termination resistors can be checked by measuring the resistance across the DL1 circuit at the 16-pin diagnostic connector. The correct resistance is 50- 70 ohms. The terminating resistors should each have a resistance of 110 – 130 ohms when tested individually.

Do not splice into a VECU, ABS/ATC or any other electronic control unit harness.

Note: Do not cut or tap into the J1939 green/yellow twisted wires or any other wire or harness used on this vehicle. Use the provided connectors, and only add approved J1939 components with validated software. Failure to comply may result in personal injury or equipment damage. Any cutting, splicing, alteration or modification to the wiring will Void the Mack Trucks Warranty on the Electrical System.

Notes

Supported DL1 SAE J1939 Serial Messages

Note: Mack does not recommend broadcasting on the databus. However, it is known that there are devices on the market which affect an engine speed control.

Mack broadcasts the following with message and signal definition per SAE J1939-71. Exceptions noted. Dates are build dates rather than model year. Most changes correspond with emissions regulation.

SAE J1939 Messages

SAE J1939 Messages						
PGN	**Message Name**	**Source Address**	**SPN**	**Signal Name**	**Usage**	**Notes**
65198	Air Supply Pressure	23	1087	Service Brake Circuit 1 Air Pressure	Conventional Since 2007	
			1088	Service Brake Circuit 2 Air Pressure		
			46	Pneumatic Supply Pressure		
65269	Ambient Conditions	0, 17, 23	171	Ambient Air Temperature	SA 23 Since 2007 & SA 0.17 since 2010	23 – Sensor Source
		0	108	Barometric Pressure	Since 2007	
			172	Engine Air Intake Temperature		
64891	Aftertreatment 1 Service	0	3719	Aftertreatment Diesel Particulate Filter 1 Soot Load Percent	Since 2007	
			3720	Aftertreatment Diesel Particulate Filter 1 AshLoad Percent		
65110	Aftertreatment 1 SCR Reagent Tank 1 Information	0	1761	Aftertreatment 1 SCR Catalyst Tank Level	Since 2010	
			3517	Aftertreatment 1 SCR Catalyst tank Level 2		
			5245	Aftertreatment 1 DEF Tank Low-Level Indicator		
			5246	Aftertreatment SCR Operator Inducement Severity		
64946	Aftertreatment 1 Intermediate Gas	0	3251	Aftertreatment 1 Diesel Particulate Filter Differential Pressure	Since 2007	
64947	Aftertreatment 1 Outlet Gas 2	0	3246	Aftertreatment 1 Diesel Particulate Filter Outlet Gas Temperature	Since 2007	

SAE J1939 Messages						
PGN	**Message Name**	**Source Address**	**SPN**	**Signal Name**	**Usage**	**Notes**
64948	Aftertreatment 1 intake Gas 2	0	3242	Aftertreatment 1 Diesel Particulate Filter Intake Gas Temperature	Since 2007	
65265	Cruise Control/Vehicle Speed	17	84	Wheel-Based Vehicle Speed	All	
			86	Cruise Control Set Speed		
			595	Cruise Control Active		
			596	Cruise Control Enable Switch		
			597	Brake Switch		
			598	Clutch Switch		
			599	Cruise Control Set Switch		
			600	Cruise Control Coast (Decelerate) Switch		
			601	Cruise Control Resume Switch		
			602	Cruise Control Accelerate Switch		
			976	PTO Governor State		Reflects engine speed control state not PTO input or output state.
			527	Cruise Control States		
			70	Parking Brake Switch		
57344	Cab Message 1	23	3695	Diesel Particulate Filter Regeneration Inhibit Switch	Since 2007	
			3696	Diesel Particulate Filter Regeneration Force Switch		
			1856	Seat Belt Switch	Since 2010	
65276	Dashboard Display	23	96	Fuel Level 1	Since 2007	

SAE J1939 Messages						
PGN	**Message Name**	**Source Address**	**SPN**	**Signal Name**	**Usage**	**Notes**
64892	Diesel Particulate Filter Control 1	0	3697	Diesel Particulate Filter Lamp Command	Since 2007	
			3698	Exhaust System High Temperature Lamp Command		
			3699	Diesel Particulate Filter Passive Regeneration Status		
			3700	Diesel Particulate Filter Active Regeneration Status		
			3701	Diesel Particulate Filter Status		
			3702	Diesel Particulate Filter Active Regeneration Inhibited Status		
			3703	Diesel Particulate Filter Active Regeneration Inhibited Due to Inhibit Switch		
			3706	Diesel Particulate Filter Active Regeneration Inhibited Due to PTO Active		
			3707	Diesel Particulate Filter Active Regeneration Inhibited Due to Accelerator Pedal Off Idle		
			3709	Diesel Particulate Filter Active Regeneration Inhibited Due to Vehicle Speed Above Allowed Speed		
			3710	Diesel Particulate Filter Active Regeneration Inhibited Due to Parking Brake Not Set		
			3711	Diesel Particulate Filter Active Regeneration Inhibited Due to Low Exhaust Gas Temperature		
			3712	Diesel Particulate Filter Active Regeneration Inhibited Due to System Fault Active		

SAE J1939 Messages						
PGN	**Message Name**	**Source Address**	**SPN**	**Signal Name**	**Usage**	**Notes**
64892 (cont.)	Diesel Particulate Filter Control 1	0	3714	Diesel Particulate Filter Active Regeneration Inhibited Due to Temporary System Lockout	Since 2007	
			3715	Diesel Particulate Filter Active Regeneration Inhibited Due to Permanent System Lockout		
			3716	Diesel Particulate Filter Active Regeneration Inhibited Due to Engine Not Warmed Up		
			3698	Exhaust System High Temperature Lamp Command		
61441	Electronic Brake Controller 1	11	561	ASR Engine Control Active	Per ABS type	
			562	ASR Brake Control Active	Per ABS type	
			563	Anti-Lock Braking (ABS) Active		
			1121	EBS Brake Switch	Not Used	
			521	Brake Pedal Position	Not Used	
			575	ABS Off-road Switch	Per ABS type	
			576	ASR Off-road Switch	Per ABS type	
			577	ASR "Hill Holder" Switch	With I-shift/*m*DRIVE	
			1238	Traction Control Override Switch	Per ABS type	
			1243	ABS Fully Operational		
			1438	ABS/EBS Amber Warning Signal (Powered Vehicle)		
			1793	ATC/ASR Information Signal	Per ABS type	
			1481	Source Address of Controlling Device for Brake Control	Per ABS type	
			1836	Trailer ABS Status	Per ABS type	
			1792	Tractor-Mounted Trailer ABS Warning Signal	Per ABS type	

SAE J1939 Messages						
PGN	**Message Name**	**Source Address**	**SPN**	**Signal Name**	**Usage**	**Notes**
65215	Wheel Speed Information	11	904	Front Axle Speed	All	
			905	Relative Speed; Front Axle, Left Wheel		
			906	Relative Speed; Front Axle, Right Wheel		
			907	Relative Speed; Rear Axle #1, Left Wheel		
			908	Relative Speed; Rear Axle #1, Right Wheel		
			909	Relative Speed; Rear Axle #2, Left Wheel		
			910	Relative Speed; Rear Axle #2, Right Wheel		
64964	Electronic Brake Controller 5	11	2912	Hill holder mode	With Ishift/ *m*Drive	
61444	Electronic Engine Controller 1	0	899	Engine Torque Mode	All	20 ms fixed rate
			512	Driver's Demand Engine - Percent Torque		
			513	Actual Engine - Percent Torque		
			190	Engine Speed		
			1483	Source Address of Controlling Device for Engine Control		
			1675	Engine Starter Mode		
61443	Electronic Engine Controller 2	0	558		All	
			91	Accelerator Pedal Position 1		From SA 17 with Cummins
			92	Engine Percent Load At Current Speed		
65247	Electronic Engine Controller 3	0	514	Nominal Friction - Percent Torque	All	
64981	Electronic Engine Controller 5		2791	Engine Exhaust Gas Recirculation 1 (EGR1) Valve Control	Since 2007	
			2795	Engine Variable Geometry Turbocharger (VGT) 1 Actuator Position	All	

SAE J1939 Messages						
PGN	**Message Name**	**Source Address**	**SPN**	**Signal Name**	**Usage**	**Notes**
65263	Engine Fluid Level/Pressure 1	0	94	Engine Fuel Delivery Pressure	All	
			98	Engine Oil Level		
			100	Engine Oil Pressure		
			101	Engine Crankcase Pressure		
			111	Engine Coolant Level		
65251	Engine Configuration 1	0			30 bytes	
61440	Electronic Retarder Controller 1	0, 15	900	Retarder Torque Mode	SA 15 before 2007	
			520	Actual Retarder - Percent Torque		
65262	Engine Temperature 1		110	Engine Coolant Temperature	All	
			174	Engine Fuel Temperature 1		
			175	Engine Oil Temperature 1		
61442	Electronic Transmission Controller 1	3	161	Transmission Input Shaft Speed	Automated transmissions	
			560	Transmission Driveline Engaged		
			573	Transmission Torque Converter Lockup Engaged		
			574	Transmission Shift In Process		
			4816	Transmission Torque Converter Lockup Transition in Process		
			191	Transmission Output Shaft Speed		SA 17 with Cummins
			522	Percent Clutch Slip		
			606	Engine Momentary Overspeed Enable		
			607	Progressive Shift Disable		
			5015	Momentary Engine Maximum Power Enable		
61445	Electronic Transmission Controller 2	3	524	Transmission Selected Gear	Automated transmissions	
			523	Transmission Current Gear		
			526	Transmission Actual Gear Ratio		

SAE J1939 Messages						
PGN	**Message Name**	**Source Address**	**SPN**	**Signal Name**	**Usage**	**Notes**
65134	High-Resolution Wheel Speed	11	1592	Front Axle, Left Wheel Speed	Since 2007	
			1593	Front axle, right wheel speed		
			1594	Rear axle, left wheel speed		
			1595	Rear axle, right wheel speed		
65270	Intake/Exhaust Conditions 1	0	173	Engine Exhaust Gas Temperature	Since 2007 SA 23 from 2004-2007	
			102	Engine Intake Manifold #1 Pressure	Since 2007	
			105	Engine Intake Manifold 1 Temperature		
			106	Engine Air Intake Pressure		
			107	Engine Air Filter 1 Differential Pressure		
65266	Fuel Economy (Liquid)	0	183	Engine Fuel Rate	Since 2007	
			184	Engine Instantaneous Fuel Economy		
			185	Engine Average Fuel Economy		
65254	Time/Date	23	959	Seconds	All	
			960	Minutes		UTC/GMT
			961	Hours		UTC/GMT
			962	Day		
			963	Month		
			964	Year		
			1601	Local minute offset		Display clock
			1602	Local hour offset		Display clock
65272	Transmission Fluids 1	3	177	Transmission Oil Temperature	Automated Transmissions	
0	Torque/Speed Control 1	3,11,17, 42, 230	695	Engine Override Control Mode	By options – engine brake, transmission, etc.	
			898	Engine Requested Speed/ Speed Limit		
			518	Engine Requested Torque/ Torque Limit		

SAE J1939 Messages						
PGN	**Message Name**	**Source Address**	**SPN**	**Signal Name**	**Usage**	**Notes**
61449	Vehicle Dynamic Stability Control 2	11	1807	Steering Wheel Angle	Trucks with stability control	
			1808	Yaw Rate		
			1809	Lateral Acceleration		
			1810	Longitudinal Acceleration		
			1811	Steering Wheel Turn Counter		
			1812	Steering Wheel Angle Sensor Type		
65103	Vehicle Dynamic Stability Control 1	11	1813	VDC Information Signal	Trucks with stability control	
			1814	VDC Fully Operational		
			1815	VDC brake light request		
			1816	ROP Engine Control active		
			1817	YC Engine Control active		
			1818	ROP Brake Control active		
			1819	YC Brake Control active		
65217	High-Resolution Vehicle Distance	23	917	High-Resolution Total Vehicle Distance	All	
			918	High-Resolution Trip Distance		
65271	Vehicle Electrical Power 1	0	158	Key switch Battery Potential	Since 2007	
65260	Vehicle Identification	0	237	Vehicle Identification Number	Since 2010	
65135	Adaptive Cruise Control	42	1586	Speed of forward vehicle	By option	
			1587	Distance to forward vehicle		
			1588	Adaptive Cruise Control Set Speed		
			1589	Adaptive cruise control set distance mode		
			1590	Adaptive Cruise Control Mode		
			1796	ACC Distance Alert Signal		
			1797	ACC System Shutoff Warning		
			1798	ACC Target Detected		
			5022	Forward Collision Warning		

SAE J1939 Messages						
PGN	**Message Name**	**Source Address**	**SPN**	**Signal Name**	**Usage**	**Notes**
65264	Power take-off Information	17	980	Engine PTO Governor Enable Switch	Mack	
			984	Engine PTO Governor Set Switch		
256	Transmission Control 1	11	681	Transmission Gear Shift Inhibit Request	By ABS type with Automatic Transmission	

SAE J1939 for Cummins engine (DL10)

The SAE J1939 (DL10) data link is a dedicated data link for emissions diagnostics and Cummins specific diagnostics.

The J1939 data link consists of a pair of 18 gauge unshielded twisted wires. The designations of the individual wires are DL1H (yellow) and DL1L (green). The nominal twist rate required is 0.89 twists per 25.4 mm (1 inch) or 33 twists per metre (3.28 feet). This twist protects against electrical interference.

The J1939 data link is electrically terminated at each end with a termination resistor. Each J1939 network has two termination resistors associated with it. Only two termination resistors are allowed within a network. The termination resistor can be located externally as part of the wiring harness, or integrated internally in the ECU/ECM. Any ECU/ECM that does not contain the termination resistor is referred to as Type 1, and an ECU/ECM that contains the termination resistor is referred to as TYPE II. The correct number of termination resistors can be easily checked by measuring the resistance across the DL10 circuit at the 9-pin diagnostic connector. The correct resistance is 50 – 70 ohms. The terminating resistors should each have a resistance of 110 – 130 ohms when tested individually.

SAE J1587/J1708

SAE 1587/1708 is a communications link between stand-alone vehicle modules.

It is used primarily to transmit shared information between stand-alone modules. Fault messages or diagnostic information also transmits across this link. J1587/J1708 defines parameters that relate primarily to hardware and basic software compatibility. J1587/1708 defines the actual data to be transmitted by particular modules.

The J1587/1708 data link consists of a pair of 18 gauge twisted wires. The nominal rate of twist required is 1 twist per 25.4 mm (1 inch) or 40 twists per meter (3.28 feet). This twist helps protect against electrical interference. A fault in this data link can affect the transfer of information, and can make it difficult to communicate with the source in order to carry out tests. An indication that there is a problem with SAE J1587/1708 can be that faults from a certain control unit cannot be corrected, erased or reset.

LIN (Local Interconnect Network)

A local interconnect network allows modules or components to communicate. A local interconnect network is not connected to a data link and does not have a diagnostic connector.

The following components communicate using a LIN:

- Turn signal stalk switch to instrument cluster
- Wiper-washer stalk switch to instrument cluster

Data Link Faults

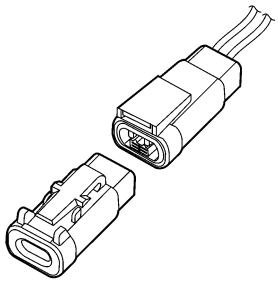
W3005017

Whenever a data link fault is present, refer to Guided Diagnostics found in the manufacturer's scan tool (Premium Tech Tool or PTT) for diagnostic information.

- The type of FMI/FTB that an individual electronic control unit (ECU) can monitor is dependent on the software in the ECU. All FMIs/FTBs cannot be recognized by all ECUs.
- The ECU reporting the diagnostic trouble code (DTC) may not be the ECU that is involved at the site of the specific failure. For example, The engine control module (ECM) may report a data link fault that is actually at the vehicle electronic control unit (VECU). The VECU would not be able to report if the data link is broken between the VECU and data link backbone.

Notes

Termination Resistor



W3005518

Termination Resistor, 2–pin

Termination Resistor – J1939

Termination resistors are wired to each end of the SAE J1939 data link to prevent signal reflections. They must remain connected for the data link to function properly. The resistance value of each termination resistor is 110 – 130 Ω. When properly installed in the data link, their combined resistance is 50 – 70 Ω since they are connected in parallel.

The termination resistor at one end of the SAE J1939 data link is located in the fuse/relay center (FRC) near the vehicle electronic control unit (VECU) and the other near the engine control module (ECM). On vehicles equipped with MACK engines, the termination resistor at the engine end is located inside the ECM. On vehicles equipped with Cummins engine, the termination resistor is located in the harness area just outside of the ECM.

A SAE J1939 data link connection is located at the transmission area in the chassis harness. On vehicles equipped with an electronically controlled transmission (Allison/Autoshift II/Meritor Freedom Line), the connection to the transmission is located at the chassis harness. On vehicles equipped with a manual non-electronically controlled transmission - the connector stub will have an unterminated blanking plug installed.

Only two termination resistors are used in each data link. Never install more than two terminator resistors in one data link. If more than two resistors exist in the SAE J1939 data link circuit, incorrect or absent signals may occur. You can easily check to see if you have two resistors by measuring the resistance between pin C and D for the 9-pin diagnostic connector, or pin 3 and 11 for the 16-pin diagnostic connector, with the ignition key in OFF position. The correct resistance is 50 – 70 Ω. The termination resistors should each have a resistance of 110–130 Ω when tested individually.

Notes

Multiplexing DL5 J1939 CAN for RP1226 messaging

The multiplexing system J1939 CAN is used to provide control and communication between all major functional areas on a vehicle (engine, electrical, transmission, etc). The system offers simplified communication between the body builder module and other related electrical systems. Multiple signals are sent over a single pair of twisted wires, as opposed to individual wires for each function. The J1939 data link is used to send these signals.

Note: DL5 CAN messaging is not supported at the BodyLink III connector on MD chassis.

Note: Messaging through RP1226 is listen-only and cannot issue commands.

Multiplexing Parameters

SAE	CAN Network	Source of Message	Receiver of Message	Update Rate	PGN Signal Names (SPN)
ACC1 (65135)	J1939-X	VECU (as ACB)	Ext CAN	100 ms	Forward vehicle speed Forward vehicle distance ACC Set Speed ACC Mode ACC set distance mode Road curvature ACC Target Detected ACC System Shutoff Warning ACC Distance Alert Signal
ACC Status (65296)	J1939-X	VECU (as ACB)	Ext CAN	100 ms	(Proprietary message from ACB) Audible Following Distance Alert Visual Following Distance Alert Vehicle Following Distance Vehicle Following Interval ACB tell-tale Indicator Status
ACB Critical Events (PGN 65297)	J1939-X	VECU (as ACB)	Ext CAN	100 ms	CMT Intervention Impact Alert
AIR1	J1939-X	VECU	Ext CAN	1 second	Pneumatic Supply Pressure 46
AMB (65269)	J1939-X	VECU (as EMS)	Ext CAN	1 second	Ambient Air Temperature, Barometric pressure
AT1S (PGN 64891)	J1939-X	VECU (per reply)	Ext CAN	On Request	Diesel Particulate Filter 1 Soot Load Percent 3719 Diesel Particulate Filter 1 Ash Load Percent 3720
AT1T1I (PGN 65110)	J1939-X	VECU (as ACM)	Ext CAN	1 second	Aftertreatment 1 SCR Catalyst Tank Level 1761 Aftertreatment 1 SCR Catalyst Tank Temperature 3031 Aftertreatment 1 SCR Catalyst Tank Level 2 3517 Aftertreatment 1 DEF Tank Low-Level Indicator 5245 Aftertreatment SCR Operator Inducement Severity 5246

SAE	CAN Network	Source of Message	Receiver of Message	Update Rate	PGN Signal Names (SPN)
B1 (PGN 65274)	J1939-X	VECU (as IC)	Ext CAN	1 second	Brake Application Pressure (SPN 116) Brake Primary Pressure (SPN 117) Brake Secondary Pressure (SPN 118) Parking Brake Red Warning Signal (SPN 3557)
CCVS (65265)	J1939-X	VECU	Ext CAN	100 ms	Vehicle speed, etc.
CI (PGN 65259)	J1939-X	VECU (as EMS)	Ext CAN	On Request	Component ID, etc.
CVW (PGN 65136)	J1939-X	VECU (per reply)	Ext CAN	On Request	Weights
DD (65276)	J1939-X	VECU (as IC)	Ext CAN	1 second	Washer Fluid Level (SPN 80) Fuel Level 1 (SPN 96)
DM1	J1939-X	VECU (as received)	Ext CAN	1 second	Fault lamps, etc.
DPFC1 (PGN 64892)	J1939-X	VECU (as EMS)	Ext CAN	1 second	DPF status, etc.
EBC1 (PGN 61441)	J1939-X	VECU (as ABS)	Ext CAN	100 ms	Anti-Lock Braking (ABS) Active, etc.
EBC1 (PGN 61441)	J1939-X	Ext CAN	VECU	100 ms	Remote Accelerator Pedal Enable Switch, Accelerator Interlock Switch
EBC1 (PGN 61441)	J1939-X	VECU	Cummins	100 ms	Remote Accelerator Pedal Enable Switch (SPN 969), Accelerator Interlock Switch (SPN 972) Engine retarder selection (SPN 973)
EBC2 (WSI PGN 65215	J1939-X	VECU (as ABS)	Ext CAN	100 ms	Wheel speeds
EBC5 (PGN 64964)	J1939-X	VECU (as ABS)	Ext CAN	100 ms	Hill Holder Mode
EEC1 (61444)	J1939-X	VECU (as EMS)	Ext CAN	As received	Engine Speed, etc
EEC2 (61443)	J1939-X	VECU	Ext CAN	50 ms	Accelerator Pedal Position
EEC2 (61443)	J1939-X	Ext CAN	VECU	50 ms	Remote Accelerator Pedal Position
EEC2 (61443)	J1939	VECU	Cummins	50 ms	Accelerator Pedal Position 1 Remote Accelerator Pedal Position

SAE	CAN Network	Source of Message	Receiver of Message	Update Rate	PGN Signal Names (SPN)
EFL/P1 (PGN 65263)	J1939-X	VECU (as EMS)	Ext CAN	500 ms	Engine Oil Level 98 Engine Oil Pressure 100 Engine Crankcase Pressure 101 Engine Coolant Level 111
ET1 (PGN 65262)	J1939-X	VECU (as EMS)	Ext CAN	1 second	Engine Coolant Temperature 110 Engine Fuel Temperature 1 174 Engine Oil Temperature 1 175
ETC1	J1939-X	VECU (as TECU)	Ext CAN	10 ms	Driveline engaged status
ETC2	J1939-X	VECU (as TECU)	Ext CAN	100 ms	Current gear status, requested gear status
ETC7	J1939-X	VECU (as TECU)	Ext CAN	100 ms	Shift and mode indicators, etc.
GFC (PGN 65199)	J1939-1	VECU (as EMS)	Ext CAN	On request	Trip Fuel (Gaseous) 1039 Total Fuel Used (Gaseous) 1040
HOURS (PGN 65253)	J1939-X	VECU (as EMS)	Ext CAN	On request	Engine Total Hours of Operation 247 Engine Total Revolutions 249
HRLFC (PGN 64777)	J1939-X	VECU (as EMS)	Ext CAN	1 second	High-Resolution Engine Trip Fuel 5053 High-Resolution Engine Total Fuel Used 5054
HRW (PGN 65134)	J1939-X	VECU (as ABS)	Ext CAN	20 ms	Wheel speeds
IO (PGN 65244)	J1939-X	VECU (as EMS)	Ext CAN	On request	Engine Total Idle Fuel Used 236 Engine Total Idle Hours 235
IC1 (PGN 65270)	J1939-X	VECU (as EMS)	Ext CAN	500 ms	Engine Exhaust Gas Temperature, etc.
LC (PGN 65089)	J1939-X	VECU (as LCM)	Ext CAN	1 second and change of state	Light switches, etc.
LC (PGN 65089)	J1939-X	VECU (as LCM)	Ext CAN	1 second and change of state	Light switches, etc.
LFC (PGN 65257)	J1939-X	VECU (as EMS)	Ext CAN	On request	Engine Trip Fuel 182 Engine Total Fuel Used 250
LFE (PGN 26266)	J1939-X	VECU (as EMS)	Ext CAN	100 ms	Engine Fuel Rate 183 Engine Instantaneous Fuel Economy 184 Engine Average Fuel Economy 185
OEL (PGN 64972)	J1939-X	VECU (as IC)	Ext CAN	1 second and change of state	Main Light Switch 2872 Turn Signal Switch 2876 Hazard Light Switch 2875 High-Low Beam Switch 2874 Operators Desired Back-light 2878

SAE	CAN Network	Source of Message	Receiver of Message	Update Rate	PGN Signal Names (SPN)
PTO (PGN 65264)	J1939-X	VECU	Ext CAN	100 ms	Power take-off Set Speed 187 Engine PTO Governor Enable Switch 980 Engine Remote PTO Governor Preprogrammed Speed Control Switch 979 Engine Remote PTO Governor Variable Speed Control Switch 978 Engine PTO Governor Set Switch 984 Engine PTO Governor Coast/Decelerate Switch 983 Engine PTO Governor Resume Switch 982
PTODE (PGN 64932)	J1939-X	VECU (as TECU)	Ext CAN	100 ms	Engagement Consent – Transmission input shaft PTO 2 (SPN 3457) Engagement Consent – Transmission input shaft PTO 1 (SPN 3456) Engagement consent – Transmission output shaft PTO (SPN 3458)
PTODE (PGN 64932)	J1939-1	VECU	TECU, Allison	100 ms	Enable switch – Transmission input shaft PTO 2 (SPN 3453) Enable switch – Transmission input shaft PTO 1 (SPN 3452)
PTODE (PGN 64932)	J1939-1	EXT CAN	VECU	100 ms	Enable switch – Transmission input shaft PTO 2 (SPN 3453) Enable switch – Transmission input shaft PTO 1 (SPN 3452) Enable switch - PTO engine accessory drive 1
Request	J1939-X	Ext CAN	VECU		PGN
Request	J1939–1	VECU	As received	As received in most cases	PGN
SERV (PGN 65216)	J1939-X	VECU	Ext CAN	On request	Service component identification Service distance (associated to upper Service component ID) Service component identification Service delay/calendar time based (associated to upper Service component ID) Service component identification Service delay/operational time based (associated to upper Service component ID)
SOFT (PGN 65242)	J1939-1	VECU	Ext CAN	On request	Variable length
TCFG (PGN 65250)	J1939-1	VECU	Ext CAN	On request	Number of Reverse Gear Ratios 958 Number of Forward Gear Ratios 957 Transmission Gear Ratio 581

SAE	CAN Network	Source of Message	Receiver of Message	Update Rate	PGN Signal Names (SPN)
TC1 (PGN 256)	J1939-1	VECU	TECU (Allison)	50 ms (when active)	See Allison data link Communication Guide
TC1 (PGN 256)	J1939-X	VECU (as Shifter 05 and 06)	Ext CAN	50 ms (when active)	See Allison data link Communication Guide
TC1 (PGN 256)	J1939-1	Allison Shifter	VECU	50 ms (when active)	See Allison data link Communication Guide
TC1 (PGN 256)	J1939-X	EXT CAN (DA TECU)	VECU	50 ms (when active)	See Allison data link Communication Guide
TD (PGN 65254)	J1939-X	VECU (as IC)	Ext CAN	On Request	Time & date
TSC1 (PGN 0)	J1939-1	VECU	EMS	10 ms	Engine override control mode Override control mode priority Engine requested torque/torque limit Engine Requested Speed/Speed Limit 898
TSC1 (PGN 0)	J1939-1	Ext CAN (DA EMS)	VECU	10 ms	Engine override control mode Override control mode priority Engine requested torque/torque limit Engine Requested Speed/Speed Limit 898
TRF1 (PGN 65272)	J1939-X	VECU (as TECU)	Ext CAN	1 second	Transmission Oil Temperature 177, etc.
TRF2 (PGN 64917)	J1939-X	VECU (as TECU)	Ext CAN	1 second	Transmission Overheat Indicator SPN 5345
RF (PGN 65275)	J1939-X	VECU (as TECU)	Ext CAN	second	Hydraulic Retarder Oil Temperature, Driveline Retarder Overheat Indicator
VD (PGN 65248)	J1939-X	VECU (as IC)	Ext CAN	1 second	Total Vehicle Distance 245 Convert from VDHR
VDC1 (PGN 65103)	J1939-X	VECU (as ABS)	Ext CAN	100 ms	VDC Information Signal, etc.
VDHR (PGN 65217)	J1939-X	VECU (as IC)	Ext CAN	1 second	High-Resolution Total Vehicle Distance 917
VH (PGN 65255)	J1939-X	VECU	Ext CAN	On request	Total Vehicle Hours 246 Total power take-off Hours 248
VI (PGN 65260)	J1939-X	VECU (as EMS)	Ext CAN	On request	VIN
VW (PGN 65258)	J1939-X	VECU (as ECS)	Ext CAN	1 second	Weights (note this is multiframe so is difficult to re-spond to so will gateway at received rate)
VDC1 (PGN 65103)	J1939-X	VECU (as ACB)	Ext CAN	100 ms	VDC Information Signal, etc.

SAE	CAN Network	Source of Message	Receiver of Message	Update Rate	PGN Signal Names (SPN)
VP190 (PGN 65470)	J1939-X	VECU (as EMS)	Ext CAN	15 second	SCR used
VEP1 (PGN 65271)	J1939-X	VECU (as IC)	Ext CAN	1 second	SPN 168 Battery Potential/Power Input 1

Note: Although the VECU sends output messages, the source address shows the ECU that originally generated the information.

PTO

Allison Transmissions can accept PTODE to request PTO engagement through the “enable switch” signals. PTODE is also a response from the transmission to these requests through the “engagement consent” signals.

Source Addresses and Unit Acronyms

Control Unit	ECU	Source address (SA) or Destination Address (DA) in Hex
Engine Management System	EMS	0x00
Transmission Electronic Control Unit	TECU	0x03
Anti-lock Brake System	ABS	0x0B
Engine Brake	EB	0x0F
Vehicle Electronic Control Unit	VECU	0x11
Instrument Cluster	IC	0x17
Adaptive Cruise with Braking function	ACB	0x2A
Aftertreatment Control Module	ACM	0x3D

Support Inbound and Outbound DL1 J-1939 Message Information

Note: MACK does not recommend broadcasting on the data bus. However, it is known that there are devices on the market which affect an engine speed control. MACK broadcasts the following with message and signal definition per SAE J1939-71.

Instrument Cluster

Message	Bus	From ECU	To ECU	Update Rate	Content
B (65274)	J1939–1	IC	VECU	1 s	Brake Application Pressure (SPN 116) Brake Primary Pressure (SPN 117) Brake Secondary Pressure (SPN 118) Parking Brake Red Warning Signal (SPN 3557)
CL (53248)	J1939-1	IC	VECU	5 s and state change	Illumination Brightness Percent (SPN 1487)
CM1 (57344)	J1939-1	IC	VECU	1 s	Seat Belt Switch (SPN 1856) Diesel Particulate Filter Regeneration Inhibit Switch (SPN 3695) Diesel Particulate Filter Regeneration Force Switch (SNP 3696)
DD (65276)	J1939-1	IC	VECU	1 s	Washer Fluid Level (SPN 80) Fuel Level 1 (SPN 96)
LC (PGN 65089)	J1939-1	IC	VECU	1 s and change of state	Low Beam Headlight Command 2349 High Beam Headlight Command 2347 Right Turn Signal Lights Command 2369 Left Turn Signal Lights 2367 Rotating Beacon Light Command (Hazard) 2385
OEL (PGN 64972)	J1939-1	IC	VECU	1 s and change of state	Main Light Switch 2872 Turn Signal Switch 2876 Hazard Light Switch 2875 High-Low Beam Switch 2874 Operators Desired Back-light 2878
TD (PGN 65254)	J1939-1	IC	VECU	1 s	Time & date
VEP1 (PGN 65271)	J1939-1	IC	VECU	1 s	SPN 168 Battery Potential/Power Input 1
VDHR (PGN 65217)	J1939-1	IC	VECU	1 s	High-Resolution Total Vehicle Distance 917

ACC/ABS

Message	Bus	From ECU	To ECU	Update Rate	Content
ACC1 (PGN 65135)	J1939-1	ACB (0x2A)	VECU	100 ms	Forward Vehicle Speed Forward Vehicle Distance ACC Set Speed ACC Mode ACC Set Distance Mode Road Curvature ACC Target Detected ACC System Shutoff Warning ACC Distance Alert Signal
ACC Status (PGN 65296)	J1939-1	ACB	VECU	100 ms	(Proprietary message from ACB) Audible Following Distance Alert Visual Following Distance Alert Vehicle Following Distance Vehicle Following Interval ACB tell-tale Indicator Status
ACB Critical Events (PGN 65297)	J1939-1	ACB	VECU	100 ms	CMT Intervention Impact Alert
EBC5 (PGN 64964)	J1939-1	ABS	VECU	100 ms	Hill Holder Mode
EBC1 (PGN 61441)	J1939-1	ABS	VECU	100 ms	Anti-Lock Braking (ABS) Active, etc.
EBC2 (WSI PGN 65215	J1939-1	ABS	VECU	100 ms	Wheel speeds
HRW (PGN 65134)	J1939-1	ABS	VECU	20 ms	Wheel speeds
VDC1 (PGN 65103)	J1939-1	ABS	VECU	100 ms	VDC Information Signal, etc.

Notes

EMS/ACM

Message	Bus	From ECU	To ECU	Update Rate	Content
AT1T1I	J1939-1	EMS	VECU	1 s	Aftertreatment 1 DEF Tank Low-Level Indicator 5245 Aftertreatment SCR Operator Inducement Severity 5246
AT1T1I	J1939-1	ACM	VECU	1 s	Aftertreatment 1 SCR Catalyst Tank Level 1761 Aftertreatment 1 SCR Catalyst Tank Temperature 3031 Aftertreatment 1 SCR Catalyst Tank Level 2 3517
AT1S (PGN 64891)	J1939-1	EMS	VECU	On Request (1 s)	Diesel Particulate Filter 1 Soot Load Percent 3719 Diesel Particulate Filter 1 Ash Load Percent 3720
CI (PGN 65259)	J1939-1	EMS	VECU	10 s	Component ID, etc.
DPFC1 (PGN 64892)	J1939-1	EMS	VECU	1 s	DPF status, etc
EEC1 (61444)	J1939-1	EMS	VECU	20 ms Variable?	Engine Speed, etc
ET1 (PGN 65262)	J1939-1	EMS	VECU	1 s	Engine Coolant Temperature 110 Engine Fuel Temperature 1 174 Engine Oil Temperature 1 175
EFL/P1 (PGN 65263)	J1939-1	EMS	VECU	500 ms	Engine Oil Level 98 Engine Oil Pressure 100 Engine Crankcase Pressure 101 Engine Coolant Level 111
ERC1 (PGN 61440)	J1939-1	EMS (as retarder)	VECU	100 ms	Retarder Torque Mode 900 Actual Retarder - Percent Torque 520 Etc.
IC1 (PGN 65270)	J1939-1	EMS	VECU	500 ms	Engine Intake Manifold #1 Pressure 102 Engine Intake Manifold 1 Temperature 105 Engine Air Intake Pressure 106 Engine Exhaust Gas Temperature 173
IO (PGN 65244)	J1939-1	EMS	VECU	On Request (1 s)	Engine Total Idle Fuel Used 236 Engine Total Idle Hours 235
GFC (PGN 65199)	J1939-1	EMS	VECU	Currently Not Supported	Trip Fuel (Gaseous) 1039 Total Fuel Used (Gaseous) 1040
HRLFC (PGN 64777)	J1939-1	EMS	VECU	1 s	High-Resolution Engine Trip Fuel 5053 High Engine Total Fuel Used 5054
HOURS (PGN 65253)	J1939-1	EMS	VECU	15 s (on request)	Engine Total Hours of Operation 247 Engine Total Revolutions 249
LFE (PGN 26266)	J1939-1	EMS	VECU	100 ms	Engine Fuel Rate 183 Engine Instantaneous Fuel Economy 184 Engine Average Fuel Economy 185
LFC (PGN 65257)	J1939-1	EMS	VECU	On request (1 s)	Engine Trip Fuel 182 Engine Total Fuel Used 250
VI (PGN 65260)	J1939-1	EMS	VECU	On request (3 s)	VIN

VECU

Message	Bus	From ECU	To ECU	Update Rate	Content
AIR1	J1939-X	VECU	Ext CAN	1 s	Pneumatic Supply Pressure 46
AMB (65269)	J1939-X	VECU (as EMS)	Ext CAN	1 s	Ambient Air Temperature Barometric pressure
AT1S (PGN 64891)	J1939-X	VECU (per reply)	Ext CAN	On Request	Diesel Particulate Filter 1 Soot Load Percent 3719 Diesel Particulate Filter 1 Ash Load Percent 3720
AT1T1I	J1939-X	VECU (as ACM)	Ext CAN	1 s	Aftertreatment 1 SCR Catalyst Tank Level 1761 Aftertreatment 1 SCR Catalyst Tank Temperature 3031 Aftertreatment 1 SCR Catalyst Tank Level 2 3517 Aftertreatment 1 DEF Tank Low-Level Indicator 5245 Aftertreatment SCR Operator Inducement Severity 5246
B	J1939-X	VECU (as IC)	Ext CAN	1 s	Brake Application Pressure (SPN 116) Brake Primary Pressure (SPN 117) Brake Secondary Pressure (SPN 118) Parking Brake Red Warning Signal (SPN 3557)
CCVS (65265)	J1939-X	VECU	Ext CAN	100 ms	Vehicle Speed, etc.
CI (PGN 65259)	J1939-X	VECU (as EMS)	Ext CAN	On Request	Component ID, etc.
CVW (PGN 65136)	J1939-X	VECU (per reply)	Ext CAN	1 s	Weights
DD (65276)	J1939-X	VECU (as IC)	Ext CAN	1 s	Washer Fluid Level (SPN 80) Fuel Level 1 (SPN 96)
DM1	J1939-X	VECU (as received)	Ext CAN	1 s	Fault lamps, etc.
DPFC1 (PGN 64892)	J1939-X	VECU (as EMS)	Ext CAN	1 s	DPF status, etc.
EBC1 (PGN 61441)	J1939-X	VECU (as ABS)	Ext CAN	100 ms	Anti-Lock Braking (ABS) Active, etc.
EBC1 (PGN 61441)	J1939-X	Ext CAN	VECU	100 ms	Remote Accelerator Pedal Enable Switch Accelerator Interlock Switch
EBC1 (PGN 61441)	J1939-X	VECU	Cummins	100 ms	Remote Accelerator Pedal Enable Switch (SPN 969) Accelerator Interlock Switch (SPN 972) Engine retarder selection (SPN 973)

Message	Bus	From ECU	To ECU	Update Rate	Content
EBC2 (WSI PGN 65215)	J1939-X	VECU (as ABS)	Ext CAN	100 ms	Wheel Speeds
EBC5 (PGN 64964)	J1939-X	VECU (as ABS)	Ext CAN	100 ms	Hill Holder Mode
EEC1 (61444)	J1939-X	VECU (as EMS)	Ext CAN	As received	Engine Speed, etc
EEC2 (61443)	J1939-X	VECU	Ext CAN	50 ms	Accelerator Pedal Position
EEC2 (61443)	J1939-X	Ext CAN	VECU	50 ms	Remote Accelerator Pedal Position
EEC2 (61443)	J1939	VECU	Cummins	50 ms	Accelerator Pedal Position 1 Remote Accelerator Pedal Position
EFL/P1 (PGN 65263	J1939-X	VECU (as EMS)	Ext CAN	500 ms	Engine Oil Level 98 Engine Oil Pressure 100 Engine Crankcase Pressure 101 Engine Coolant Level 111
ET1 (PGN 65262)	J1939-X	VECU (as EMS)	Ext CAN	1 s	Engine Coolant Temperature 110 Engine Fuel Temperature 1 174 Engine Oil Temperature 1 175
ETC1	J1939-X	VECU (as TECU)	Ext CAN	10 ms	Driveline engaged status
ETC2	J1939-X	VECU (as TECU)	Ext CAN	100 ms	Current Gear Status Requested gear status
ETC7	J1939-X	VECU (as TECU)	Ext CAN	100 ms	Shift and mode indicators, etc.
GFC (PGN 65199)	J1939-1	VECU (as EMS)	Ext CAN	On Request	Trip Fuel (Gaseous) 1039 Total Fuel Used (Gaseous) 1040
HOURS (PGN 65253)	J1939-X	VECU (as EMS)	Ext CAN	On Request	Engine Total Hours of Operation 247 Engine Total Revolutions 249
HRLFC (PGN 64777)	J1939-X	VECU (as EMS)	Ext CAN	1 s	High-Resolution Engine Trip Fuel 5053 High Engine Total Fuel Used 5054
HRW (PGN 65134)	J1939-X	VECU (as ABS)	Ext CAN	20 ms	Wheel speeds
IO (PGN 65244)	J1939-X	VECU (as EMS)	Ext CAN	On Request	Engine Total Idle Fuel Used 236 Engine Total Idle Hours 235
IC1 (PGN 65270)	J1939-X	VECU (as EMS)	Ext CAN	500 ms	Engine Exhaust Gas Temperature, etc
LC (PGN 65089)	J1939-X	VECU (as LCM)	Ext CAN	1 s and change of state	Light switches, etc.
LFE (PGN 26266)	J1939-X	VECU (as EMS)	Ext CAN	100 ms	Engine Fuel Rate 183 Engine Instantaneous Fuel Economy 184 Engine Average Fuel Economy 185

Message	Bus	From ECU	To ECU	Update Rate	Content
OEL (PGN 64972)	J1939-X	VECU (as IC)	Ext CAN	1 s and change of state	Main Light Switch 2872 Turn Signal Switch 2876 Hazard Light Switch 2875 High-Low Beam Switch 2874 Operators Desired Back-light 2878
PTO (PGN 65264)	J1939-X	VECU	Ext CAN	100 ms	Power take-off Set Speed 187 Engine PTO Governor Enable Switch 980 Engine Remote PTO Governor Preprog-rammed Speed Control Switch 979 Engine Remote PTO Governor Variable Speed Control Switch 978 Engine PTO Governor Set Switch 984 Engine PTO Governor Coast/Decelerate Switch 983 Engine PTO Governor Resume Switch 982
PTODE (PGN 64932)	J1939-X	VECU (as TECU)	Ext CAN	100 ms	Engagement Consent – Transmission input shaft PTO 2 (SPN 3457) Engagement Consent – Transmission input shaft PTO 1 (SPN 3456) Engagement Consent – Transmission output shaft PTO (SPN 3458)
PTODE (PGN 64932)	J1939-1	VECU	TECU, Allison	100 ms	Enable Switch – Transmission input shaft PTO 2 (SPN 3453) Enable Switch – Transmission input shaft PTO 1 (SPN 3452)
PTODE (PGN 64932)	J1939-1	Ext CAN	VECU	100 ms	Enable Switch – Transmission input shaft PTO 2 (SPN 3453) Enable Switch – Transmission input shaft PTO 1 (SPN 3452) Enable Switch - PTO Engine Accessory Drive 1
Request	J1939-X	Ext CAN	VECU		PGN
Request	J1939-1	VECU	As received	As received in most cases	PGN
SERV (PGN 65216)	J1939-X	VECU	Ext CAN	On Request	Service Component Identification Service Distance (associated to upper Service component ID) Service Component Identification Service delay/calendar time based (associated to upper Service component ID) Service Component Identification Service Delay/Operational Time Based (asso-ciated to upper Service component ID)
SOFT (PGN 65242)	J1939-1	VECU	Ext CAN	On Request	Variable length
TCFG (PGN 65250)	J1939-1	VECU	Ext CAN	On Request	Number of Reverse Gear Ratios 958 Number of Forward Gear Ratios 957 Transmission Gear Ratio 581

Message	Bus	From ECU	To ECU	Update Rate	Content
TC1 (PGN 256)	J1939-1	VECU	TECU (Allison)	50 ms (when active)	See Allison data link Communication Guide
TC1 (PGN 256)	J1939-X	VECU (as Shifter 05 and 06)	Ext CAN	50 ms (when active)	See Allison data link Communication Guide
TC1 (PGN 256)	J1939-1	Allison Shifter	VECU	50 ms (when active)	See Allison data link Communication Guide
TC1 (PGN 256)	J1939-X	EXT CAN (DA TECU)	VECU	50 ms (when active)	See Allison data link Communication Guide
TD (PGN 65254)	J1939-X	VECU (as IC)	Ext CAN	On Request	Time & date
TSC1 (PGN 0)	J1939-1	VECU	EMS	10 ms	Engine Override Control Mode Override Control mode Priority Engine Requested Torque/Torque Limit Engine Requested Speed/Speed Limit 898
TSC1 (PGN 0)	J1939-1	Ext CAN (DA EMS)	VECU	10 ms	Engine Override Control Mode Override Control Mode Priority Engine Requested Torque/Torque Limit Engine Requested Speed/Speed Limit 898
TRF1 (PGN 65272)	J1939-X	VECU (as TECU)	Ext CAN	1 s	Transmission Oil Temperature 177, etc.
TRF2 (PGN 64917)	J1939-X	VECU (as TECU)	Ext CAN	1 s	Transmission Overheat Indicator SPN 5345
RF (PGN 65275)	J1939-X	VECU (as TECU)	Ext CAN	1 s	Hydraulic Retarder Oil Temperature Driveline Retarder Overheat Indicator
VD (PGN 65248)	J1939-X	VECU (as IC)	Ext CAN	1 s	Total Vehicle Distance 245 Convert from VDHR
VDC1 (PGN 65103)	J1939-X	VECU (as ABS)	Ext CAN	100 ms	VDC Information Signal, etc.
VDHR (PGN 65217)	J1939-X	VECU (as IC)	Ext CAN	1 s	High-Resolution Total Vehicle Distance 917
VH (PGN 65255)	J1939-X	VECU	Ext CAN	On Request	Total Vehicle Hours 246 Total power take-off Hours 248
VI (PGN 65260)	J1939-X	VECU (as EMS)	Ext CAN	On Request	VIN
VW (PGN 65258)	J1939-X	VECU (as ECS)	Ext CAN	1 s	Weights (note this is multiframe so is difficult to respond to so will gateway at received rate)
VDC1 (PGN 65103)	J1939-X	VECU (as ACB)	Ext CAN	100 ms	VDC Information Signal, etc.
VP190 (PGN 65470)	J1939-X	VECU (as EMS)	Ext CAN	15 s	SCR used
VEP1 (PGN 65271)	J1939-X	VECU (as IC)	Ext CAN	1 s	SPN 168 Battery Potential/Power Input 1

Transmission

Message	Bus	From ECU	To ECU	Update Rate	Content
ETC1	J1939-1	Automated Trans	VECU	10 ms	Driveline engaged status
ETC2	J1939-1	Automated Trans	VECU	100 ms	Current gear status, requested gear status
ETC7	J1939-1	Allison	VECU	100 ms	Range Display, Mode indicator
PTODE (PGN 64932)	J1939-1	TECU (Allison)	VECU	100 ms	Engagement Consent – Transmission input shaft PTO 2 (SPN 3457) Engagement Consent – Transmission input shaft PTO 1 (SPN 3456) Engagement Consent – Transmission output shaft PTO (SPN 3458)
PTODE (PGN 64932)	J1939-1	VECU, EXT CAN (SA 33, SA 23)	TECU (Allison)	100 ms	Enable Switch – Transmission input shaft PTO 2 (SPN 3453) Enable Switch – Transmission input shaft PTO 1 (SPN 3452) Engagement Consent – Transmission output shaft PTO (SPN 3458)
SOFT (PGN 65242)	J1939-1	Allison	VECU	On Request	Variable Length
TranTC1 (256)	J1939-1	EXT CAN, Allison Shifter	TECU (Allison)	50 ms (when active)	See Allison data link Communication Guide
TCFG (PGN 65250)	J1939-1	Allison	VECU	On Request	Number of Reverse Gear Ratios 958 Number of Forward Gear Ratios 957 Transmission Gear Ratio 581
TRF1 (PGN 65272)	J1939-1	Automated Trans	VECU	1 s	Transmission Oil Temperature 177, etc.
TRF2 (PGN 64917)	J1939-1	Allison	VECU	1 s	Transmission Overheat Indicator SPN 5345
RF (PGN 65275)	J1939-1	Allison	VECU	1 s	Hydraulic Retarder Oil Temperature Driveline Retarder Overheat Indicator

ECS

Message	Bus	From ECU	To ECU	Update Rate	Content
VW (PGN 65258)	J1939-X	ECS	VECU	1 second (SAE says On Request)	Weight by axle (1 frame for each axle)

Parameters Description and Location

Caption Description	Location	Resolution	Min Value	Max Value	Default	Parameter ID
Enables the Vehicle Electronic Control Unit (VECU) to accept body commands from devices on the Bodybuilder CAN.	VECU	1	0	1	0	Level 4 P1SZR
Enables gateway of messages from J1939-1 bus to DL5 bus. **Note:** This parameter is to only be updated when third party telematics is installed on the vehicle.	VECU	1	0	1	0 (set to 1 per project)	Level 4 P1SZL
SA for device (Note F1 & F9 SA for TSC1, PTODE, VP45, EEC2, EBC1) ***If a device on the Ext CAN will request messages or send commands to the truck then this needs to reflect the source address of the added device. Also set P1SZR Take note of P1SZQ***	VECU	1	0	255	229	Level 4 P1TPZ (Scalar 2)
SA for device (Note F1SA for TC1) ***If a device on the Ext CAN is to broadcast TC1 commands then this needs to be set to what the transmission will accept and the device needs to send with this source address. However this cannot be the same as any on-vehicle shifter broadcasting per P1TPZ. Also set parameter P1SZR.***	VECU	1	0	255	6	Level 4 P1TPZ (Scalar 4)
SA for GFC (Note: F4 SA of message used to respond to device request) ***This parameter should reflect the source address of the vehicle device responding to a request for message GFC.***	VECU	1	0	255	0	Level 4 P1TPZ (Scalar 3)
SA for CVW	VECU	1	0	255	3	Level 4 P1TPZ (Scalar 1)
SA for TCFG (Note: F4 SA) ***This parameter should reflect the source address of the vehicle device responding to a request for message TCFG.***	VECU	1	0	255	3	Level 4 P1TPZ (Scalar 6)
SA for TC1 (Note: F2 SA) ***This parameter should reflect the source address of the vehicle device supplying message TC1***	VECU	1	0	255	5	Level 4 P1TPZ (Scalar 5)
Ext CAN Break Pedal Override ***If this parameter is set then Ext CAN accelerator pedal position and engine speed commands will be set to idle while the service brake is pressed.***	VECU	1	0	255	1	Level 4 P1SZQ

Road Speed Signal

Note: Allison transmission provides a road speed signal at the Allison Body Builder connector located left of the steering column behind the kick panel.
MCBB connector pin 6 wire #N125.

T3183667

Fig. 8 MCBB Connector Part #3987483 Terminal #978295

Notes