

BODY BUILDER INSTRUCTIONS

Mack Trucks



Electrical Wiring and Connections CHU, CXU, GU, TD, MRU, LR 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 *mDrive* PTO installation and wiring see Section 9 PTO Installation, *mDrive*.

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.

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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 3 times the cable diameter for standard SAE strand cable.



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1 Tube Diameter

2 Circle Diameter (3 x Tube Diameter)

Description of VECU Pin Layout

VECU Connector A (Green)

Pin Number	Type	Mack Name
PA-1	DI-H	Cruise Control: Set/Decel
PA-2	DI-H	Cruise Control: Resume/Accel
PA-3	DI-H	Cruise Control: On/Off
PA-4	DI-H	A/C On
PA-5	DI-H	Service Brake
PA-6	DI-H	Key Switch Crank
PA-7	DI-H	—
PA-8	DI-H	Clutch
PA-9	DI-H	Neutral
PA-10	DI-H	Air Suspension Interlock
PA-11	DO-L (1A)	DRL Control
PA-12	—	Ground
PA-13	—	Battery (+ after PWR)
PA-14	DI-H	Key Switch Ignition
PA-15	—	J1939 + BBM
PA-16	—	J1939 – BBM
PA-17	DI-H	CDS 2 switch / PTO 4
PA-18	DI-H	IVS2 used for Volvo Automatic gearbox
PA-19	DI-H	Fan Override
PA-20	DI-H	Engine brake 2
PA-21	DI-H	Engine brake 1
PA-22	DI-H	EOL
PA-23	DI-H	IVS 1
PA-24	DI-L	—
PA-25	DI-L	Interwheel Lock
PA-26	DI-L	5th Wheel Slide Switch
PA-27	DI-L	Remote Engine Shutdown
PA-28	DI-L	Hood Tilt Switch
PA-29	DI-H	PTO1
PA-30	DI-H	DRL Override

3 Connect spare ignition and battery connector to main cab harness as follows: IGN_SP12 to IGN_SP1 or IGN_SP9, IGN_SP11 to BAT_SP4, IGN_SP10 to IGN_SP8 or BB_LP_PLUG, and BAT_SP3 to IGN_SP3.

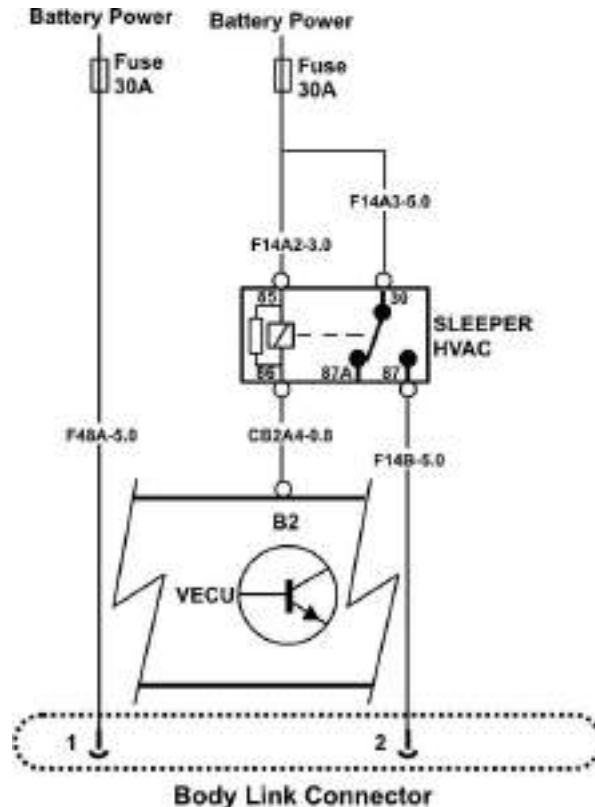
Power Connections

Some judgement must be made for powering body equipment with the following trade-offs:

Ignition power – Will power off during engine crank which may cause faults or other effects if power supplies inputs used by ECU's on EMS power. May also be disconnected for low voltage disconnect.

EMS Connections – Available with key off but may effect starter performance or be affected by starter power fluctuations.

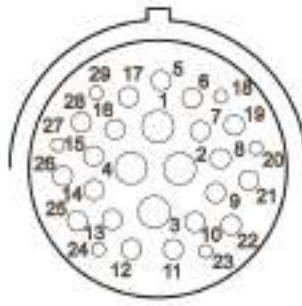
Battery Connections – Always available but will contribute to key off battery drain as well as effect, and be affected by, starter as above.



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Fig. 11 Power Connections

Interrupted at ENGINE CRANK and LOW VOLTAGE DISCONNECT.



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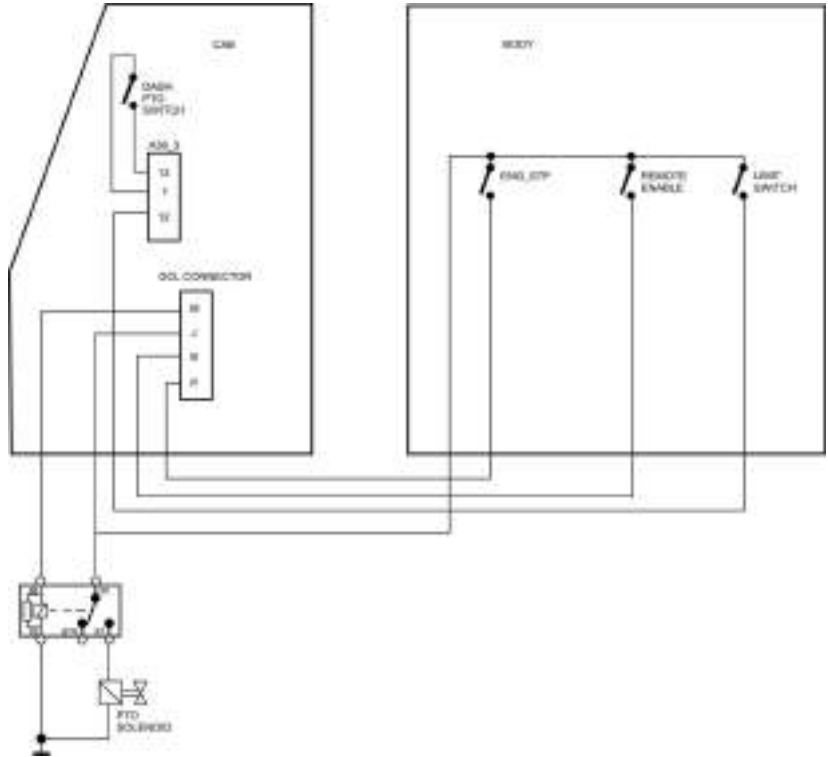
Fig. 20 MRU/LR/LEU Control Link II 29-pin Connector, Wire Insertion Side of Connector

Pin Assignments for MRU/LR/LEU Control Link II 29-pin Body Builder Connector

Pole	Wire ID	Description
1	F39B-5.0	IGNITION POWER (30A)
2	FABA-5.0	BATTERY POWER (30A)
3	F40B1-3.0	IGNITION POWER (25A)
4	XABA-5.0	CLEAN GROUND
5	F42B1-1.0	REVERSE SIGNAL
6-11	-	-
12	CA29-1.0	VMAC PTO# 2
13	CB7-1.0	VMAC PTO# 1
14	HA23-1.0	ENGINE RPM SIGNAL
15	N164-0.8	TRANSMISSION TEMPERATURE SIGNAL
16	NA16-1.0	ECU GROUND
17	F18A1-1.0	IGNITION SIGNAL
18	N145NO-0.8	ALLISON #145 (12V)
19	X2A113-2.0	CAB GROUND
20	N143-0.8	ALLISON #143
21	DL5HB1-0.8	BBM J1939 (H)
22	DL5LB1-0.8	BBM J1939 (L)
23	N130NO-0.8	ALLISON # 130
24	N162-0.8	ALLISON # 162
25	N105-0.8	ALLISON # 105
26	N145B-0.8	ALLISON # 145
27	N103A-0.8	ALLISON # 103
28	N142A-0.8	ALLISON # 142
29	N117A-0.8	ALLISON # 117

Summary

Figure 31 shows examples of what the control pins could be used for in an application. The PTO inputs are programmable and can affect a conditional output, engine ramp, engine limits, etc. See programming section for details. Note that full safety evaluation of the system should be carried out. I.E., adequate interlocks should be programmed or wired, so that the engine will not accelerate in unintended situations. Interlocks can be done by powering switches using switched power (for example neutral power) or by software parameters or both. For example, most applications should only have the engine ramp using body controls when the park brake is on and the transmission is in neutral. Exceptions should be carefully considered..



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Fig. 29 Example MRU showing Body Builder supplied wiring for Controls

Notes

0802013 Electrical System Version 3 Parameters

Parameter List

Group	DOID	Parameter	Caption	Description
Cruise Control	AI	AI	Cruise Control Max Speed	The maximum speed that can be set in the cruise control.
Engine Fan Controls	P112F	FTX	Fan Enable With Engine Brake	This flag will enable the fan with the engine brake. 0 = Disabled, 1 = Enabled
Engine Governor	P1103	AZQ	High Idle Governor For Hilgh Gears	Engine speed where the governor output crosses the max torque curve. Used for high gear ratios.
	P1104	AZO	High Idle Enable Flag For Low Gears	If this flag is set to TRUE, it is possible to use a higher end governor engine speed for low gears.
	P1105	AZR	High Idle Gear Ratio For Low Gears	Gear ratio for the gear P1103 setting should be used. For higher gears the end governor speed is used.
	P1118	AZS	High Idle Ratio For High gears	Gear ratio for the gear where end governor engine speed is used. For lower gears the P1103 setting should be used.
Engine Idle Settings	P1F9W	YA	Engine Idle, Target Speed	Target engine speed at idle.
Engine Protection	P1119	FVS	Customer Shut Down For Oil Pressure	Customer shut down status, 0 = No action, 1 = Forced idle, 2 = Shut off engine
	P1117	FVU	Customer Shutdown For Coolant Level	Customer shut down status, 0 = No action, 1 = Forced idle, 2 = Shut off engine
	P112B	FVY	Customer Shutdown For Transmission Temperature	Customer shut down status, 0 = No action, 1 = Forced idle, 2 = Shut off engine
	P112A	GHA	Customer Shutdown For Oil Temperature	Customer shut down status, 0 = No action, 1 = Forced idle, 2 = Shut off engine
	P1118	FVW	Customer Shutdown For Coolant Temperature	Customer shut down status, 0 = No action, 1 = Forced idle, 2 = Shut off engine
Engine Speed Limit	P1ANA	AU	Max Engine Speed Stationary	Maximum engine speed allowed when the vehicle is stationary. The maximum engine speed varies between approximately 1200 - 2600 rpm depending on engine type.

SAE J1939 Messages						
PGN	Message Name	Source Address	SPN	Signal Name	Usage	Notes
				Inhibited Due to Temporary System Lockout		
			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/ mDrive	
			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	CAN Network	Source of Message	Receiver of Message	Update Rate	PGN Signal Names (SPN)
TSC1 (PGN 0)	J1939-1	VECU	EMS	10ms	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	10ms	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	1s	Transmission Oil Temperature 177, etc.
TRF2 (PGN 64917)	J1939-X	VECU (as TECU)	Ext CAN	1s	Transmission Overheat Indicator SPN 5345
RF (PGN 65275)	J1939-X	VECU (as TECU)	Ext CAN	1s	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	100ms	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 Takeoff 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 sec	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	100ms	VDC Information Signal, etc.
VP190 (PGN 65470)	J1939-X	VECU (as EMS)	Ext CAN	15s	SCR used
VP60	J1939-1	VECU	TECU (I shift)	100ms	Reverse Inhibit, Inhibit gear engaged (from TC1), PTO Conditions #1, PTO Conditions #2
VEP1 (PGN 65271)	J1939-X	VECU (as IC)	Ext CAN	1s	SPN 168 Battery Potential / Power Input 1

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