AEM Performance Electronics
2205 W 126th Street, Unit A
Hawthorne, CA 90250

Phone (8am-5pm M-F PST): 310-484-2322
Fax: 310-484-0152
sales@aemev.com
tech@aemev.com

AEM EV
VCU200 Product Description

Revision G

AEM Performance Electronics
2205 W 126th Street, Unit A
Hawthorne, CA 90250

Phone (8am-5pm M-F PST): 310-484-2322
Fax: 310-484-0152
sales@aemev.com
tech@aemev.com

Revision History

Revision	Date	Change Description
A	5/14/2020	Initial Release
B	5/15/2020	Move Oil Pump Relay Driver from J1-L4 to J1-F4 Move Negative Contactor Driver from J1-H3 to J1-M4 Move Coolant Pump Wake from J1-L1 to J1-K4 Move PreCharge Contactor Driver from J1-H4 to J1-L1 Move Positive Contactor Driver from J1-K1 to J1-L2 Move Safety Light Relay Driver from J1-M4 to J1-H4 Move Brake Pressure from J2-F4 to J2-G4 J2-C1, Fix typo – change CAN3+ to CAN3- Add minimum required inputs Update header information
C	5/18/2020	Add cautions and warnings, PDU-8, CAN Keypad, Cooling Pump, Inverter and BMS support sections
D	5/19/2020	Add CAN network and PC comms requirements
E	6/3/2020	Update Cautions and Warning section
F	6/17/2020	Fix error in PRND schematic Remove graphics artifact from CAN network diagram
G	7/31/2020	Revise CAN network diagram

Cautions and Warnings

Working on tractive systems (which includes but is not limited to motor(s), inverter(s), high voltage battery packs and high voltage cables) requires special experience and training. AEM EV has implemented fault detection and failsafe logic into its vehicle control units ("VCU"), however this does not mean that your VCU installation will be safe or effective, or that your VCU installation will not interfere with other systems on your vehicle and create a hazardous situation. It is the responsibility of the installer to understand the implications of each stage of tractive system installation and testing and to recognize what might be unique about your application that presents potential hazards or safety issues – and it is the responsibility of the installer to solve or address any such hazards or issues.

The following list includes basic recommended practices. This is not a comprehensive list; as noted below, if you are not well-versed in the appropriate installation and testing procedures, you should refer the installation and calibration to a reputable installation facility or contact AEM EV for a referral in your area.

- When access is required near the battery pack, the cell segments must be separated by using an appropriate maintenance disconnect plug.
- When working on the battery pack or tractive system, safety gloves with side shields and appropriate insulated tools must be used.
- Always wear Class 0 gloves rated at 1000V with leather protectors.
- Only use CAT III rated digital multimeters (DMM) and test leads.
- When working on the battery pack or tractive system, work with one hand while keeping the other behind your back.

- During initial system power up and testing, the vehicle must be raised off the ground and supported appropriately. Wheels and tires should be removed.

- During the VCU firmware upgrade process, battery cell segments must be separated using an appropriate maintenance disconnect plug.

- Do not make calibration changes when the inverter pulse width modulation (PWM) is enabled.

USE THIS VCU WITH EXTREME CAUTION. MISUSE AND/OR IMPROPER INSTALLATION CAN CAUSE SIGNIFICANT DAMAGE TO YOUR VEHICLE AND PROPERTY BELONGING TO YOU OR OTHERS, AS WELL AS PERSONAL INJURY OR DEATH. IF YOU ARE NOT WELL VERSED IN THE INSTALLATION OF TRACTIVE SYSTEMS OR CONFIGURING THE CALIBRATIONS IN THE AEM EV VCU THAT ARE NECESSARY TO CONTROL THE VEHICLE, YOU SHOULD REFER THE INSTALLATION AND VCU CALIBRATION TO A REPUTABLE INSTALLATION FACILITY, OR CONTACT AEM EV FOR A REFERRAL IN YOUR AREA. IT IS THE RESPONSIBILITY OF THE INSTALLER TO ULTIMATELY CONFIRM THAT THE INSTALLATION AND CALIBRATIONS ARE SAFE FOR ITS INTENDED USE.

ADVANCED ENGINE MANAGEMENT CO., INC. (“AEM”) AND ITS AFFILIATES, SHAREHOLDERS, DIRECTORS, OFFICERS, AGENTS, REPRESENTATIVES, SUCCESSORS AND ASSIGNS (COLLECTIVELY, THE “AEM PARTIES”) HOLD NO RESPONSIBILITY FOR ANY DAMAGE OR INJURY THAT RESULTS FROM INSTALLATION OR MISUSE OF ANY AEM PRODUCTS. EXCEPT FOR, TO THE EXTENT APPLICABLE TO THE PRODUCTS YOU HAVE PURCHASED, AEM’S 12 MONTH LIMITED WARRANTY (WHICH CAN BE FOUND AT https://www.aemelectronics.com/about-us/warranty-returns), ALL AEM PRODUCTS ARE PROVIDED “AS IS” AND THE AEM PARTIES EXPRESSLY DISCLAIM ALL WARRANTIES, WHETHER EXPRESS, IMPLIED, STATUTORY OR OTHERWISE. THE AEM PARTIES SPECIFICALLY DISCLAIM ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, AND ALL WARRANTIES ARISING FROM COURSE OF DEALING, COURSE OF PERFORMANCE, USAGE OR TRADE PRACTICE.
UNDER NO CIRCUMSTANCES SHALL ANY AEM PARTY BE LIABLE TO YOU OR ANY OTHER PERSON OR ENTITY FOR ANY DAMAGES OF ANY AMOUNT OR CHARACTER (INCLUDING, WITHOUT LIMITATION, ANY GENERAL, INDIRECT, SPECIAL, INCIDENTAL, EXEMPLARY, CONSEQUENTIAL OR PUNITIVE DAMAGES) ARISING OUT OF, RELATED TO, OR IN CONNECTION WITH (1) YOUR INSTALLATION OF ANY AEM PRODUCTS OR (2) YOUR MISUSE OF ANY AEM PRODUCTS. IN NO EVENT SHALL ANY AEM PARTY BE LIABLE TO YOU OR ANY OTHER PERSON OR ENTITY FOR ANY LOST OR CORRUPTED DATA, LOST PROFITS, LOST REVENUES, LOSS OF USE, DIMINUTION IN VALUE, LOSS OF OTHER INTANGIBLES OR ANY SPECIAL, INCIDENTAL, INDIRECT, EXEMPLARY, PUNITIVE OR CONSEQUENTIAL DAMAGES, WHETHER ARISING OUT OF BREACH OF CONTRACT, TORT (INCLUDING NEGLIGENCE) OR OTHERWISE, REGARDLESS OF WHETHER SUCH DAMAGES WERE FORESEEABLE AND WHETHER OR NOT THE AEM PARTIES WERE ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. SOME JURISDICTIONS MAY NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE EXCLUSIONS SHALL ONLY APPLY TO THE EXTENT PERMISSIBLE UNDER APPLICABLE LAW.

Electrical Safety Insulation Monitoring

The high voltage system in an electric vehicle is designed to be ungrounded (floating) with respect to the vehicle chassis (frame). Insulation faults can cause electric shock, personal injury and even death. An insulation monitoring device (IMD) must be used to protect against these faults. See Bender https://www.benderinc.com/ for more information.

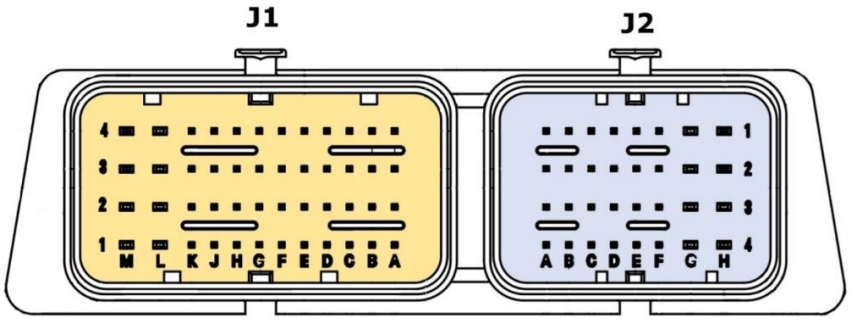
AEM Performance Electronics
2205 W 126th Street, Unit A
Hawthorne, CA 90250

Phone (8am-5pm M-F PST): 310-484-2322
Fax: 310-484-0152
sales@aemev.com
tech@aemev.com

Hardware Overview

AEM Part Number	30-8000
Microprocessor	NXP MPC5607B
Clock Speed	64 MHz
Environmental	IP6k7 Compliant
Operating Temperature	-40°C to +105°C
Operating Voltage	9 – 16V 16V is the absolute maximum rating. ***The module is not designed for use with 16V battery systems as they typically require ~18V to charge.***
Overvoltage Protection	16V
Current Draw: Off-State Current	1 mA
Wake Switch Power-on threshold	3.7V minimum
Wake Switch Power-down threshold	1.5V maximum
Communication Channels	CAN1, 500k, Internally Terminated, PC Comms
	CAN2, 500k, Internally Terminated, Peripheral Device Comms
	CAN3, 500k, Internally Terminated, Peripheral Device Comms and Data Transmit
	CAN4, RESERVED
Internal Logging Memory	**None** - External logging possible with AEM Dash units with logging capability and other compatible 3rd party displays and data loggers.

Hardware Pinout



Pin #	Pin Function	Range	Conditioning	Type	Application Notes
J1-A1	Ground				
J1-A2	Sensor Power1			5V Supply	100mA max
J1-A3	Ground				
J1-A4	Sensor Power2			5V Supply	100mA max
J1-B1	Ground				
J1-B2	Sensor Power3			5V Supply	50mA max
J1-B3	Ground				
J1-B4	Sensor Power4			5V Supply	50mA max
J1-C1	Input 9	0 – 5V	1.3k Pullup	Analog	RESERVED
J1-C2	Ground				
J1-C3	Cooling Pump Control Relay Driver			Low Side	500mA max
J1-C4	Output 22			Low Side	500mA max, RESERVED
J1-D1	Negative Contactor FB	0 – 5V	10k Pullup	Analog	Switch to ground
J1-D2	Ground				

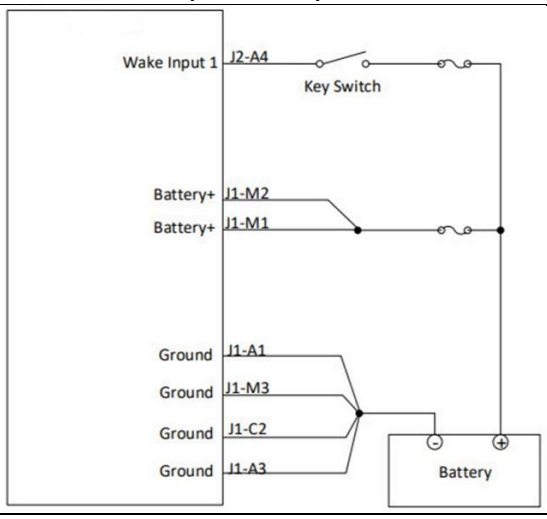
Pin #	Pin Function	Range	Conditioning	Type	Application Notes
J1-D3	Cooling Fan 1 Relay Driver			Low Side	500mA max
J1-D4	Cooling Fan 2 Relay Driver			Low Side	500mA max
J1-E1	Enable Switch	0 – 5V	10k Pullup	Analog	Switch to ground
J1-E2	Ground				
J1-E3	Output 7			Low Side	500mA max, RESERVED
J1-E4	Output 8			Low Side	500mA max, RESERVED
J1-F1	Coolant Temp 1	0 – 5V	2k Pullup	Analog	
J1-F2	Ground				
J1-F3	Output 5			Low Side	500mA max, RESERVED
J1-F4	Oil Pump Relay Driver			Low Side	500mA max
J1-G1	Parking Lamp Switch	0 – 5V	2k Pullup	Analog	Switch to ground
J1-G2	Ground				
J1-G3	HVIL Main Output			Low Side	100mA max, 100Hz, 50% DC
J1-G4	HVIL Charge Cable Output			Low Side	100mA max, 100Hz, 50% DC
J1-H1	Head Lamp Switch	0 – 5V	2k Pullup	Analog	Switch to ground
J1-H2	Ground				
J1-H3	Output 1			Low Side	100 mA max, RESERVED
J1-H4	Safety Light Relay Driver			Low Side	500 mA max
J1-J1	LIN1				RESERVED
J1-J2	CAN1+				PC Comms
J1-J3	Output 17			High Side	500mA max, RESERVED
J1-J4	NOT USED				
J1-K1	Output 14			Low Side	500 mA max, RESERVED
J1-K2	CAN 1-				PC Comms
J1-K3	Output 15			High Side	500 mA max, RESERVED
J1-K4	Cooling Pump Wake			High Side	500 mA max
J1-L1	Pre-Charge Contactor Driver			High Side	3.3 A max
J1-L2	Positive Contactor Driver			High Side	3.3 A max
J1-L3	Inverter 12V Power Relay Driver			Low Side	3.3 A max
J1-L4	Output 13			Low Side	3.3 A max, RESERVED
J1-M1	12V Battery Power (Permanent)				
J1-M2	12V Battery Power (Permanent)				
J1-M3	Ground				
J1-M4	Negative Contactor Driver			Low Side	3.3 A max
J2-A1	CAN 2-				Peripheral Comms
J2-A2	Ignition Switch	0 – 12V	3.3k Pulldown	Digital	Switch to Batt, 12V = ON
J2-A3	Wake Input 2	0 – 12V	3.3k Pulldown	Digital	RESERVED
J2-A4	Wake Input 1	0 – 12V	3.3k Pulldown	Digital	Switch to Batt, 12V = ON
J2-B1	CAN 2+				Peripheral Comms
J2-B2	IMD Input	0 – 12V	3.3k Pulldown	Digital	
J2-B3	Brake Switch 2	0 – 12V	3.3k Pulldown	Digital	
J2-B4	Wake Input 3	0 – 12V	3.3k Pulldown	Digital	RESERVED
J2-C1	CAN 3-				VCU Data Transmit
J2-C2	Park Switch	0 – 12V	3.3k Pullup	Digital	
J2-C3	Reverse Switch	0 – 12V	3.3k Pullup	Digital	

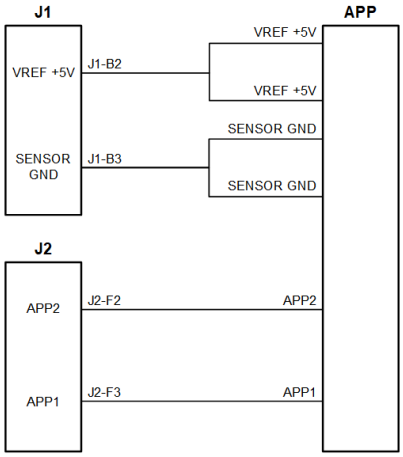
Pin #	Pin Function	Range	Conditioning	Type	Application Notes
J2-C4	Brake Switch 1	0 – 12V	3.3k Pullup	Digital	
J2-D1	CAN 3+				VCU Data Transmit
J2-D2	Neutral Switch	0 – 12V	3.3k Pullup	Digital	
J2-D3	Drive Switch	0 – 12V	3.3k Pullup	Digital	
J2-D4	Input 23	0 – 12V	3.3k Pullup	Digital	RESERVED
J2-E1	CAN 4-				RESERVED
J2-E2	Input 28	0 – 12V	3.3k Pullup	Digital	RESERVED
J2-E3	Input 27	0 – 12V	3.3k Pullup	Digital	RESERVED
J2-E4	Start Switch	0 – 12V	3.3k Pullup	Digital	
J2-F1	CAN 4+				RESERVED
J2-F2	Accel Pedal 2	0 – 5V	10k Pulldown	Analog	
J2-F3	Accel Pedal 1	0 – 5V	10k Pulldown	Analog	
J2-F4	Input 10	0 – 12V	33k Pulldown	Analog	RESERVED
J2-G1	Input 16	0 – 5V	100k Pulldown	Analog	RESERVED
J2-G2	Manual Regen Lever 2	0 – 5V	100k Pulldown	Analog	
J2-G3	Manual Regen Lever 1	0 – 5V	100k Pulldown	Analog	
J2-G4	Brake Pressure	0 – 5V	10k Pulldown	Analog	
J2-H1	Non-Driven Wheelspeed	0 – 5V	10k Pulldown	Frequency	20 – 2000 Hz
J2-H2	Driven Wheelspeed	0 – 5V	10k PU/PD	Frequency	20 – 2000 Hz
J2-H3	HVIL Charge Cable Input	0 – 5V	10k PU/PD	Frequency	20 – 2000 Hz
J2-H4	HVIL Main Input	0 – 5V	10k PU/PD	Frequency	20 – 2000 Hz

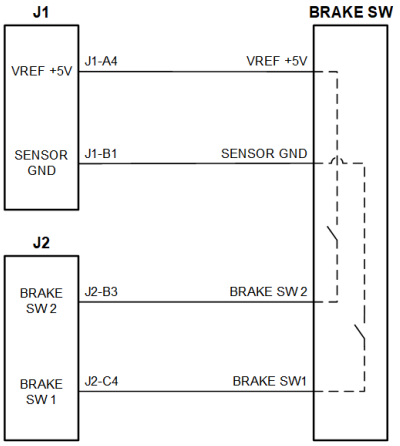
AEM Performance Electronics
2205 W 126th Street, Unit A
Hawthorne, CA 90250

Phone (8am-5pm M-F PST): 310-484-2322
Fax: 310-484-0152
sales@aemev.com
tech@aemev.com

Minimum Required Inputs

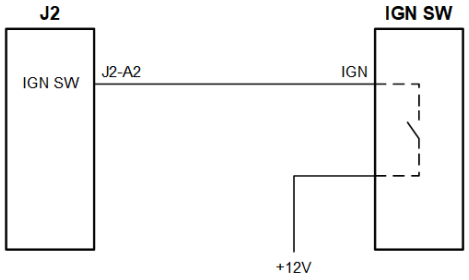


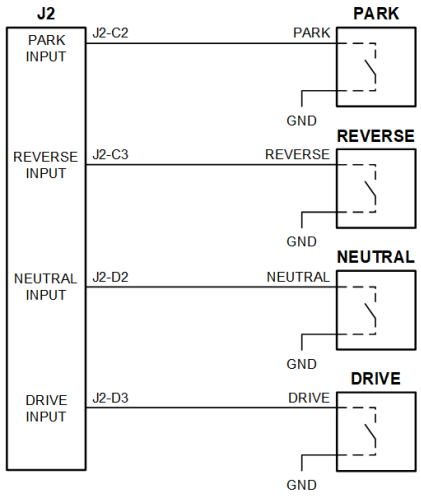




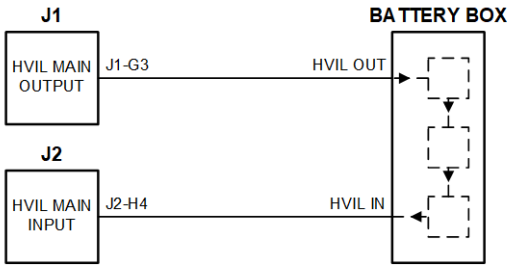
Signal polarity selectable to support both N.O. and N.C. switches

Choice between AND or OR logic





PRND CAN Keypad option for direct drive applications



AEM Performance Electronics
2205 W 126th Street, Unit A
Hawthorne, CA 90250

Phone (8am-5pm M-F PST): 310-484-2322
Fax: 310-484-0152
sales@aemev.com
tech@aemev.com

AEM PDU-8 Support

The VCU200 currently supports interfaces with up to two (2) AEM 30-8300 PDU-8 Power Distribution Units. The PDU-8 is a high current, lightweight module that is designed to be mounted near the devices requiring power. Its design philosophy is for multiple units to be part of a vehicle installation and to distribute the power throughout the vehicle rather than having it concentrated in a central area.

The PDU-8 is not a stand-alone device. It is designed to be operated as a satellite unit and controlled via CAN by either an AEM Vehicle Control Unit or a programmable 3rd party device that can generate the required CAN control messages. As such, the PDU-8 module itself is not programmable in any way and only carries out commands issued by other devices. When used with the VCU200, the function assignments are not configurable by the end user.

Specific PDU's are identified by grounding different combinations of configuration pins on the PDU connector. For proper function with the VCU200, the PDU-8 units must be configured as follows.

Unit ID	Config 1, Pin 24	Config 2, Pin 16	Config 3, Pin 10	Tx Msg 1 Address	Tx Msg 2 Address	Rx Msg 1 Address	Rx Msg 2 Address
1	O/C	O/C	O/C	0x000A0610	0x000A0611	0x000A0620	0x000A0630
2	Gnd	O/C	O/C	0x000A0612	0x000A0613	0x000A0621	0x000A0631

AEM PDU-8 / VCU Functional Pin Assignments

Unit ID 1

Pin	PDU Pin Name	VCU Function	Notes
1	High Side Driver 1	Negative Contactor Driver	20 Amp Max
2			
3	CAN-	VCU/PDU comms	Unterminated, VCU CAN2
4	CAN+	VCU/PDU comms	Unterminated, VCU CAN2
5	Ground		
6	High Side Driver 5	Peripheral switched 12V Supply Power (Inverter, Keypad, Dash)	20 Amp Max
7			
8	High Side Driver 2	PreCharge Contactor Driver	10 Amp Max
9			
10	Config 3	Leave unterminated	
11	Ground		
12	High Side Driver 6	High Voltage Safety Light	10 Amp Max
13			
14	High Side Driver 3	Positive Contactor Driver	10 Amp Max
15			
16	Config 2	Leave unterminated	
17	Not Used		
18	High Side Driver 7	PreCharge Contactor Driver	10 Amp Max
19			
20	High Side Driver 4	Cooling Pump 1 Power	20 Amp Max
21			

Pin	PDU Pin Name	VCU Function	Notes
22	Not Used		
23	Not Used		
24	Config 1	Leave unterminated	
25	High Side Driver 8	Cooling Pump 1 Power	20 Amp Max
26			

Unit ID 2

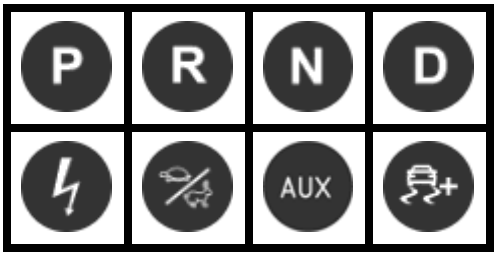
Pin	PDU Pin Name	VCU Function	Notes
1	High Side Driver 1	Head Lamps Driver	20 Amp Max
2			
3	CAN-	VCU/PDU comms	Unterminated, VCU CAN2
4	CAN+	VCU/PDU comms	Unterminated, VCU CAN2
5	Ground		
6	High Side Driver 5	Cooling Fan 1 Power	20 Amp Max
7			
8	High Side Driver 2	Park Lamps Driver	10 Amp Max
9			
10	Config 3	Leave unterminated	
11	Ground		
12	High Side Driver 6	Cooling Fan 2 Power	10 Amp Max
13			
14	High Side Driver 3	Brake Lamps Driver	10 Amp Max
15			
16	Config 2	Leave unterminated	
17	Not Used		
18	High Side Driver 7	Oil Pump Power	10 Amp Max
19			
20	High Side Driver 4	Reverse Lamps Driver	20 Amp Max
21			
22	Not Used		
23	Not Used		
24	Config 1	Ground for Unit ID 2	
25	High Side Driver 8	Auxiliary Power from Keypad	20 Amp Max
26			

AEM Performance Electronics
2205 W 126th Street, Unit A
Hawthorne, CA 90250

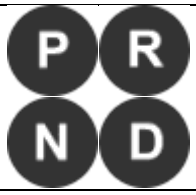
Phone (8am-5pm M-F PST): 310-484-2322
Fax: 310-484-0152
sales@aemev.com
tech@aemev.com

AEM 8-Button CAN Keypad Support

The VCU200 currently supports interfaces with the AEM 8-Button CAN Keypad for direct drive configurations only.



2x4 Keypad (AEM PN 30-8400)

Icon(s)	Function
	Direct Drive Park, Reverse, Neutral, Drive inputs Radio Button functionality
	GREEN = High Voltage Contactors Are Closed YELLOW = PreCharge in process YELLOW = Active Discharge in process (if supported) OFF = Contactors Open RED = ERROR - PreCharge failed, Contactors are open
	Performance Level Loop Toggle 1-4, on while pressed
	Slip Target (reserved for future use) Loop Toggle
	Aux Function User programmable PDU output

Keypad CAN Configuration:

VCU CAN Channel	CAN3
Baud Rate	500k

Supported Inverter Systems

The VCU200 currently supports all Cascadia Motion PM family inverters. This includes:

PM100 DX PM100 DXR PM100 DZ	PM150 DX PM150 DZ PM150 DZR	PM250 DX PM250 DZ PM250 DZR	PM500 DZ

Support for additional inverters will be added over time. Contact sales@aemev.com for more information.

Inverter CAN Configuration:

VCU CAN Channel	CAN2
Inverter Receive CAN ID	0x0C0
Baud Rate	500k

Resolver Calibration Process

It is important to correctly complete the resolver calibration process before attempting to run the motor. The resolver calibration process will ensure that the motor and resolver are properly connected to the inverter. A description of this process is beyond the scope of this document. Cascadia Motion provides a detailed document describing this process.

CAN Controlled Cooling Pump Support

The VCU200 supports CAN interface with a single EMP WP29/32 Brushless Electric Water Pump. The VCU includes a target motor speed table that allows the user to tailor the flow rate to their individual system requirements. For proper VCU control, the following requirements must be true.

Water Pump CAN Configuration:

VCU CAN Channel	CAN2
Pump Receive CAN ID	0x18EF20A3
Pump Transmit CAN ID	0x18FF0320
Baud Rate	500k

BMS Support

A Battery Management System (BMS) is an electronic system that manages a rechargeable battery pack. When configured properly, it can protect the battery pack from unsafe operating conditions. A BMS can also communicate state variables, limit data and detailed information about individual cells.

When a BMS is used with the VCU200 the following features are possible:

- Inverter Pre Charge using measured battery pack voltage as a reference
- Torque request deratings based on battery pack discharge/charge current limits, pack high temp, pack low temp, cell voltage min, cell voltage max, pack state of charge % (SOC) and overall pack voltage.

The VCU200 currently supports the following BMS systems:

- Orion BMS2
- Lithium Balance s-BMS

Most BMS systems are highly configurable. For the VCU200 to communicate with the BMS properly, the following CAN configurations are required:

Orion BMS2
VCU CAN channel: CAN 3
Message: 0x6B0
Byte Order: Motorola
Baud Rate: 500k

Signal	Start bit	Length [bit]	Value Type	Factor	Offset	Min	Max
Pack_Current	8	16	Signed	0.1	0	-32768	3276.7
Pack_Inst_Voltage	24	16	Unsigned	0.1	0	0	6553.5
Pack_SOC	32	8	Unsigned	0.5	0	0	127.5
MPI2_State	40	1	Unsigned	1	0	0	1
MPI3_State	41	1	Unsigned	1	0	0	1
MPO2_State	43	1	Unsigned	1	0	0	1
MPO3_State	44	1	Unsigned	1	0	0	1
MPO4_State	45	1	Unsigned	1	0	0	1
MP_Enable_State	46	1	Unsigned	1	0	0	1
MPO1_State	47	1	Unsigned	1	0	0	1
Discharge_Relay_State	48	1	Unsigned	1	0	0	1
Charge_Relay_State	49	1	Unsigned	1	0	0	1
Charger_Safety_State	50	1	Unsigned	1	0	0	1
MIL_State	51	1	Unsigned	1	0	0	1
MPI1_State	52	1	Unsigned	1	0	0	1
AlwaysOn_State	53	1	Unsigned	1	0	0	1
Is_Ready_State	54	1	Unsigned	1	0	0	1
Is_Charging_State	55	1	Unsigned	1	0	0	1

Orion BMS2
VCU CAN channel: CAN 3
Message: 0x6B1
Byte Order: Motorola
Baud Rate: 500k

Signal	Start bit	Length [bit]	Value Type	Factor	Offset	Min	Max
Pack_DCL	8	16	Unsigned	1	0	0	65535
Pack_CCL	16	8	Unsigned	1	0	0	255
Pack_High_Temp	32	8	Signed	1	0	-128	127
Pack_Low_Temp	40	8	Signed	1	0	-128	127

Lithium Balance sBMS
VCU CAN channel: CAN 3
Message: 0x500
Byte Order: Intel
Baud Rate: 500k

Signal	Start bit	Length [bit]	Value Type	Factor	Offset	Min	Max
BMS_Cell_Voltage_Avg	0	16	Unsigned	0.001	0	0	65.535
BMS_Cell_Voltage_Max	16	16	Unsigned	0.001	0	0	65.535
BMS_Cell_Voltage_Min	32	16	Unsigned	0.001	0	0	65.535
BMS_Cell_Voltage_Delta	48	16	Unsigned	0.001	0	0	65.535

Lithium Balance sBMS
Message: 0x501
Byte Order: Intel
Baud Rate: 500k

Signal	Start bit	Length [bit]	Value Type	Factor	Offset	Min	Max
BMS_Pack_Current	0	16	Signed	0.1	0	-3276.8	3276.7
BMS_Pack_Temp_High	16	8	Signed	1	0	-128	127
BMS_Pack_Temp_Low	24	8	Signed	1	0	-128	127
BMS_Pack_Voltage	32	16	Unsigned	0.1	0	0	6553.5
BMS_Pack-Sum_Cell_Voltage	48	16	Unsigned	1	0	0	65535

Lithium Balance sBMS
Message: 0x502
Byte Order: Intel
Baud Rate: 500k

Signal	Start bit	Length [bit]	Value Type	Factor	Offset	Min	Max
BMS_System_State	0	8	Unsigned	1	0	0	255
BMS_SOC	8	8	Unsigned	1	0	0	255
BMS_SOH	16	8	Unsigned	1	0	0	255

Smart Voltage/Current Sensor Support

The VCU200 supports the IVT-Series Current and Voltage sensors for battery management systems from Isabellenhutte. The IVT series are intelligent, digital voltage and current sensors with a CANbus 2.0 interface.

IVT CAN Configuration:

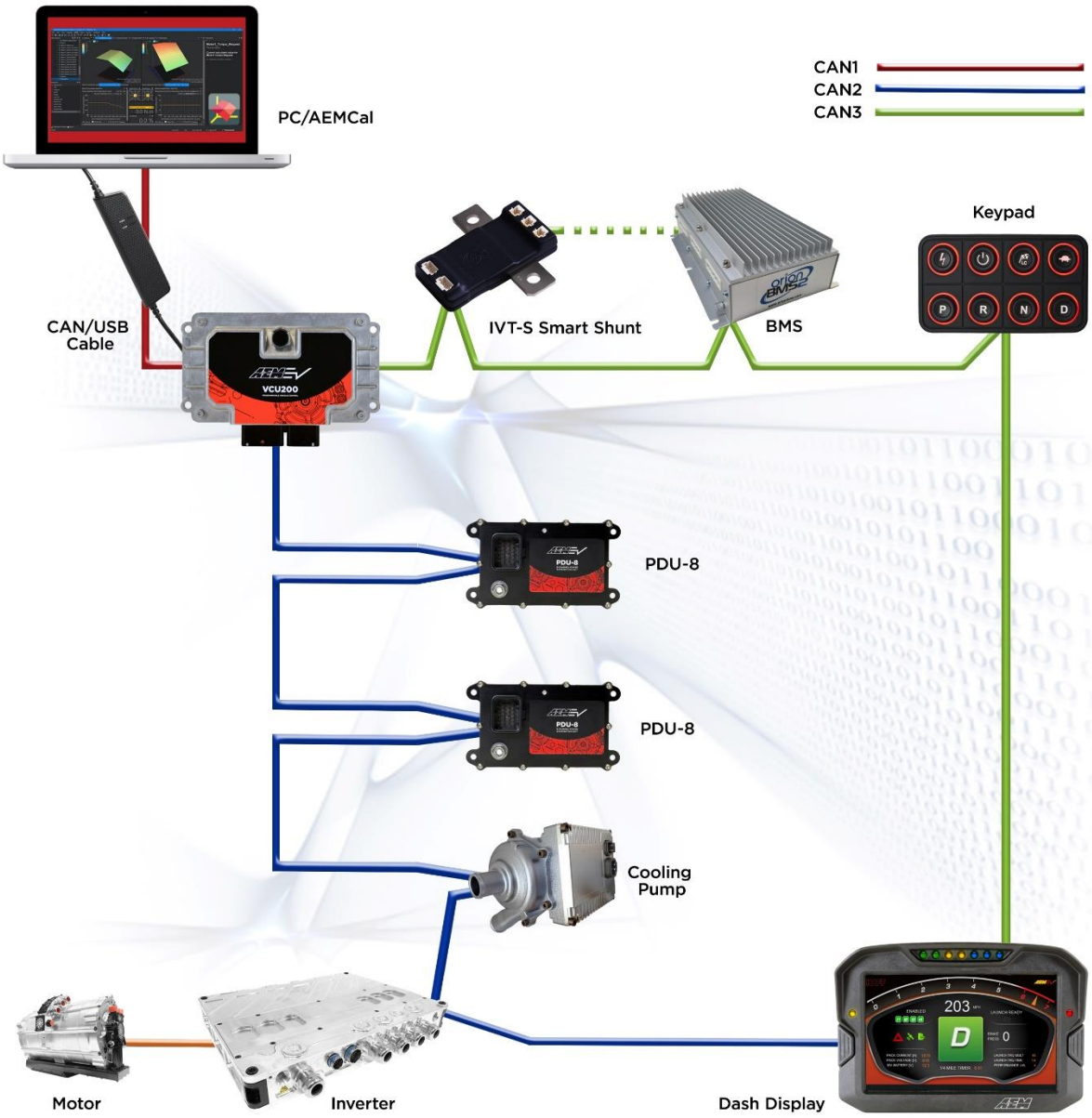
VCU CAN Channel	CAN3
Baud Rate	500k

CAN Network Requirements

The following diagram describes the basic network requirements. Three separate CAN networks are represented. The network channel assignment for each device is not reconfigurable by the end user. All CAN channels in the VCU200 are internally terminated. The VCU must always be located at the physical end of a bus. All busses must be terminated with a 120 ohm resistor at the physical end.

PERFORMANCE EV CONTROL SOLUTIONS

VCU200 CAN Networking



PC Communications with AEMCal

The VCU200 communicates with the PC over the CAN1 network. A CAN to USB converter device is required. For best performance, AEM recommends the Kvaser Leaf Light HS v2 https://www.kvaser.com/product/kvaser-leaf-light-hs-v2/