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Using the Delphi U2C (DC/DC Converter) with the PM Family Inverters

Revision 0.1



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Revision History

Version	Description of Versions / Changes	Responsible Party	Date
0.1	Initial version	Chris Brune	1/2/2013

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1. Introduction

This document describes the use of the Delphi U2C (DC/DC Converter) with the PM Family inverters.

The Delphi U2C is a Universal 2.2kW DC/DC Converter. The U2C can convert between a high voltage battery and the 12V battery in an electric or hybrid vehicle. The U2C is liquid cooled.

The U2C can operate in one of two modes, Buck Mode and Boost Mode. Buck Mode is the normal operating mode and will convert the high voltage (HV) battery down to the low voltage (LV) battery. The Boost Mode will convert the LV battery to the HV battery.

Basic Specifications

HV Battery Voltage (Buck Mode)	216V – 422V
HV Battery Voltage (Boost Mode)	194V – 358V
HV Output Current (Boost Mode)	0.25 to 2.35A, limited to 700W
LV Battery Voltage (minimum)	11.4 V
LV Battery Voltage (maximum)	15.5 V
LV Battery Voltage (nominal)	13.8 V
LV Output Current (Buck Mode)	5 to 175A, limited to 2.2kW
Coolant Temperature	-40 °C to +75 °C
Coolant Flow Rate	> 5 l/min minimum, 10 l/min optimal
Coolant Type	50/50 WEG

The Delphi U2C is controlled via CAN messages. It will NOT enable without receiving a CAN message. Some RMS customers do not have a separate controller available that can provide the CAN message necessary to enable the U2C. To assist these customers RMS is allowing the U2C to be connected to the PM inverter, and the PM inverter will provide the CAN message necessary to operate the U2C.

Because the PM inverter does not have adequate information to determine the operating mode of the U2C the inverter only operates the U2C in Buck Mode. Boost Mode operation is not possible with the U2C when the PM inverter is controlling it. If Boost Mode operation is desirable then the user will need to use a separate vehicle controller to provide the correct CAN messages.



2. Connections

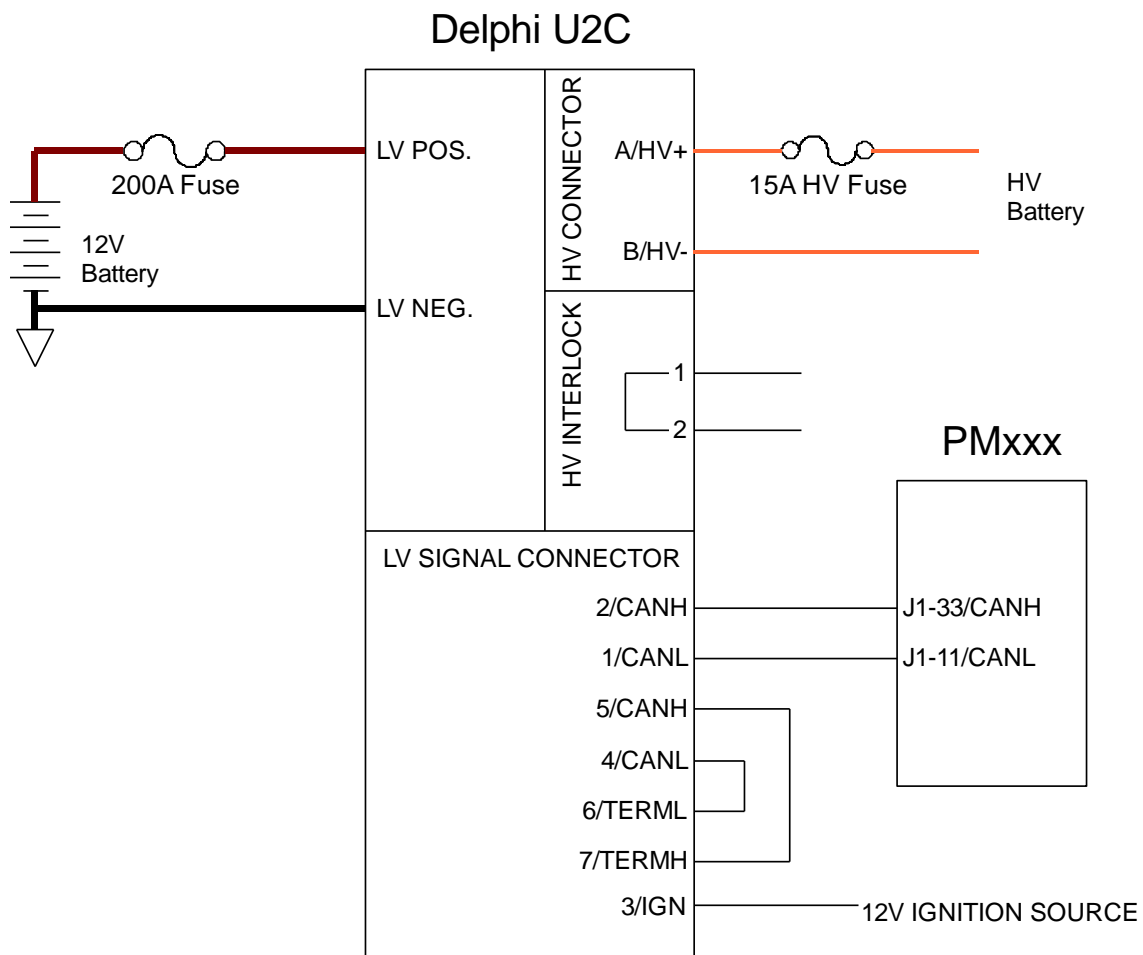
The U2C has several connections that must be made to the system.

The connectors are:

- HV Connector, mating connector is Delphi 13737728
- HV Interlock, mating connector is Delphi 13738743
- LV Signal Connector (Ignition and CAN), mating connector is Tyco p/n 776286-1 with 770854-1 terminals
- LV Battery Positive (M8x1.25 threaded Stud), use M8 ring terminal
- LV Battery Negative (Chassis Ground, M8x1.25 Threaded hole), use M8 ring terminal

A kit of all connectors can be ordered from RMS, refer to p/n G1-0008-01.

A pre-built HV Cable can also be ordered from RMS, refer to p/n G1-0007-01.





Ensure that wiring and fusing of the LV battery connections is capable of operation with 175A. The recommended cable size is 35mm^2 (2 AWG)

The U2C is equipped with a HV Interlock connector. This connector can be used with HV distribution systems that utilize an interlock system. The 2 pins on the U2C are connected together allowing a loop type interlock system. The 2 pins have no electrical functionality within the U2C. If the vehicle HV system does not utilize a HV interlock system then it is not necessary to make connections to the wires of the HV Interlock connector. However, to maintain the environmental integrity of the unit the connector should be plugged in place.

The HV Input to the U2C should come directly from the vehicle HV Battery through a fuse. The HV input should be fused with a fuse rated for 15A. The fuse must be rated for HV DC operation. An example fuse would be Cooper Bussmann, FWH-015A6F. The HV input will draw a maximum of 0.63mA from the HV Battery when it is not active. This low current draw should allow continuous connection to the HV Battery.

The U2C is not rated to be mounted in an area where it will experience repeated contact with water (splash). It should be mounted in an area that would normally be free of water. If the U2C is mounted to a vertical surface it should be mounted with the coolant tubes facing up to facilitate the removal of air from the unit.

The Wakeup input of the LV I/O connector would normally be connected to the vehicle Ignition signal (12V). This signal is required for the U2C to enable. Use of this signal will turn on the U2C, but it will not produce power until the CAN message is received. The Wakeup input has an internal impedance of 9.7k ohm and should be between 11 and 16V for proper operation.



3. Setup

Once the proper connections are made, there are three EEPROM parameters that must be configured.

EEPROM Parameter	Description
CAN_Bit_Rate_EEPROM_(kbps)	The baud rate of the inverter must be set to 500 kbps. The U2C will only operate with this baud rate.
U2C_Enable_EEPROM	Set to 1 to enable sending the CAN Messages from the PM inverter to the U2C.
U2C_SetPoint_EEPROM_(Vx10)	Set the value of the LV output voltage. The default value is 138 (13.8V).

From the RMS GUI it is possible to monitor several parameters of the U2C.

GUI Parameter	Description
U2C_Output_Current_(Ax10)	The output current of the U2C, resolution is 2 amps.
U2C_Output_Voltage_(Vx10)	The output voltage of the U2C, resolution is 0.1V.
U2C_Status	The Status of the U2C: 0 = not receiving messages 1 = Enabled and not faulted 2XX = Faulted, XX represents the Diagnostic Trouble Code (DTC) as shown below

DTC Code	Description
00	Low Voltage System Fault
01	Unused
02	High Voltage Fault - High
03	High Voltage Fault - Low
06	Low Voltage Fault - High
07	Low Voltage Fault - Low
08	Buck On Voltage Fault – Low
12	Boost On Hi Voltage Fault – Low
13	Loss of COM (3 Second Timeout)
14	Heat Plate Temperature Fault
15	14V Current Diagnostic
16	Current Balance Diagnostic
17	14V ILIM Diagnostic
18	ILIM Occurred Indication