



AA Portable Power Corp/www.BatterySpace.com

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Energy Management System Step by Step Setup

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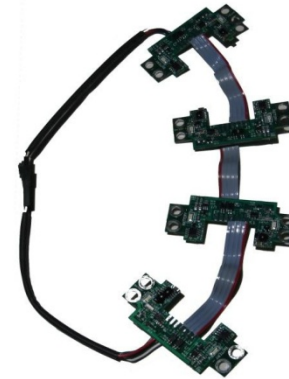
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1) Components of the System



CPU:

- Central hub of the system
- Powered by 12 volts DC
- Controls alarm output signals
- Measures current
- Calculates state of charge
- Outputs video signal
- Detects ground fault conditions
- CAN bus interface (optional)
- QTY: 1 per system

Four cell sense board string:

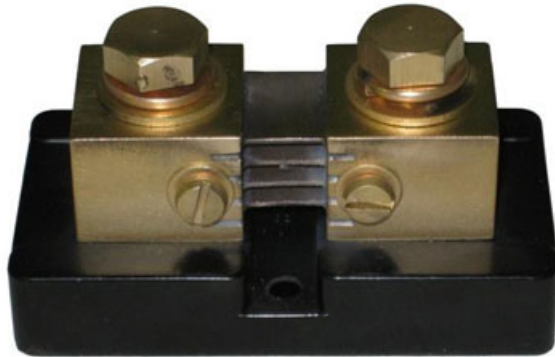
- Measures voltage and temperature of each cell
- Performs cell balancing
- Simple easy installation
- QTY: 1 per four cell pack



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2) Components of the System



Shunt:

- Measures current
- 50mv = 500A
- QTY: 1 per system



Harness:

- Connects CPU to sense boards
- QTY: 1 per system



3. CPU Overview

BT+: Battery pack positive for voltage reading

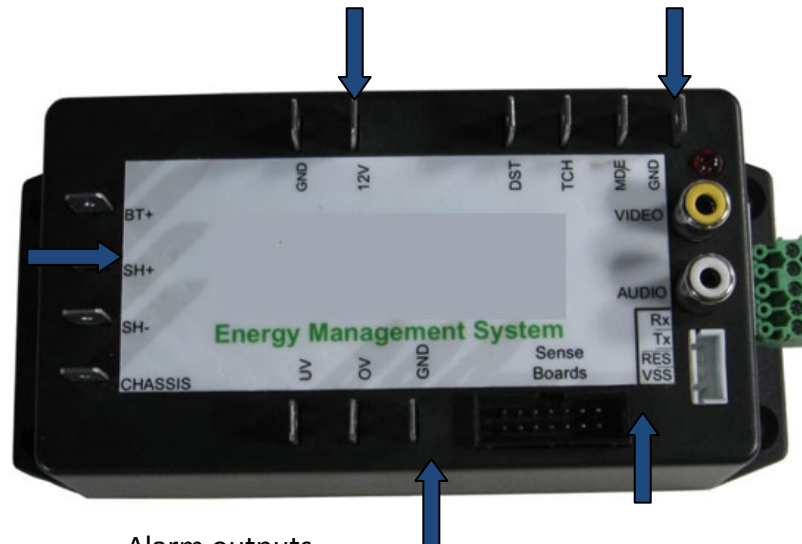
Constant 12 volt power and ground to power the CPU

MDE shorted to GND momentarily changes display mode

SH+: Shunt positive connection

SH-: Shunt negative connection

Chassis: Hard chassis ground connection for fault detection



Video output for display

(Optional) CAN Bus connection

Alarm outputs
UV: Under Voltage
OV: Over Voltage

Sense boards connection

Note: DST, TCH and Audio are not used in this revision

4. Initial Connections

Connect a constant 12 volt power source to the 12V and Gnd pins.



Connect the video output to a screen. The above will be displayed. "E.M.S. – 0" will be displayed. This is the number of sense boards the CPU has detected.



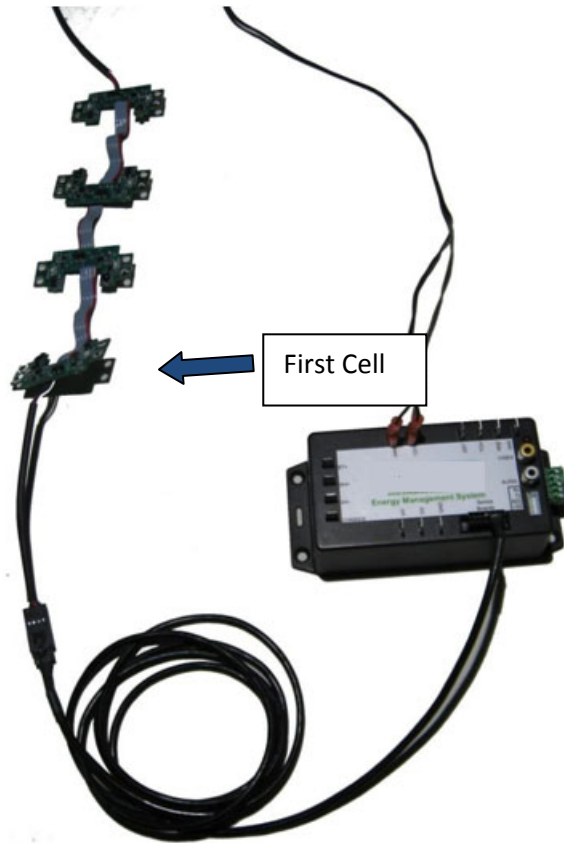
Red heartbeat LED will flash indicating system is working



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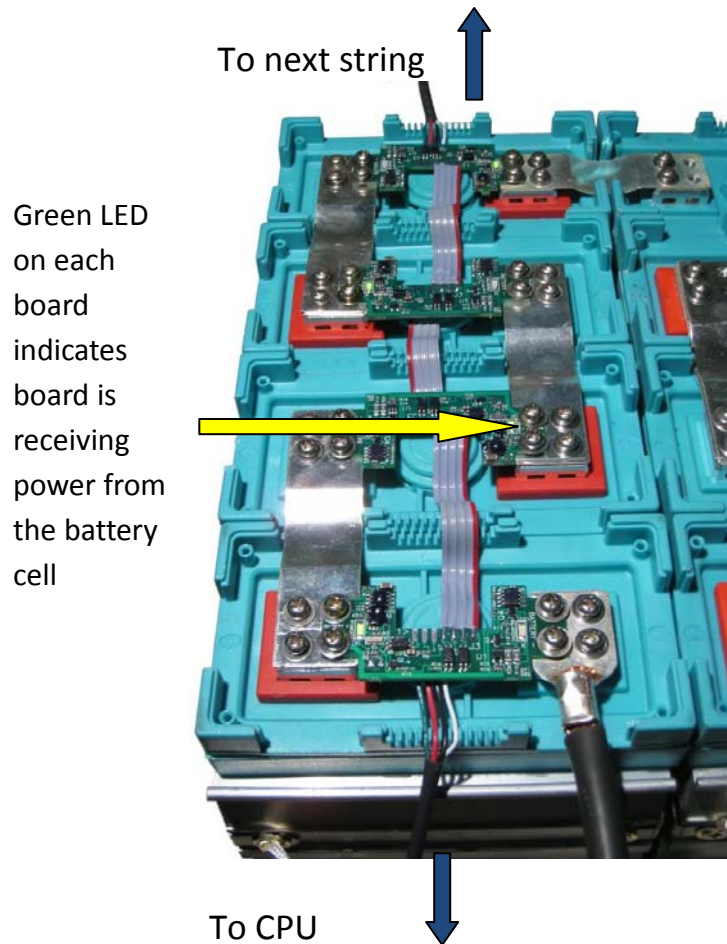
5. Sense Board Connection



The sense boards are connected in four cell strings. Plug the first string in to the main wiring harness and connect the harness to the CPU. The first board connected to the CPU will be cell #1. The sense boards can be wired from either the negative most battery to the positive most battery, or the positive most battery to the negative most battery. The string must follow the series connection of the batteries.

The entire battery pack, up to 156 cells in series, will form one series string of sense boards.

6. Sense Board Installation



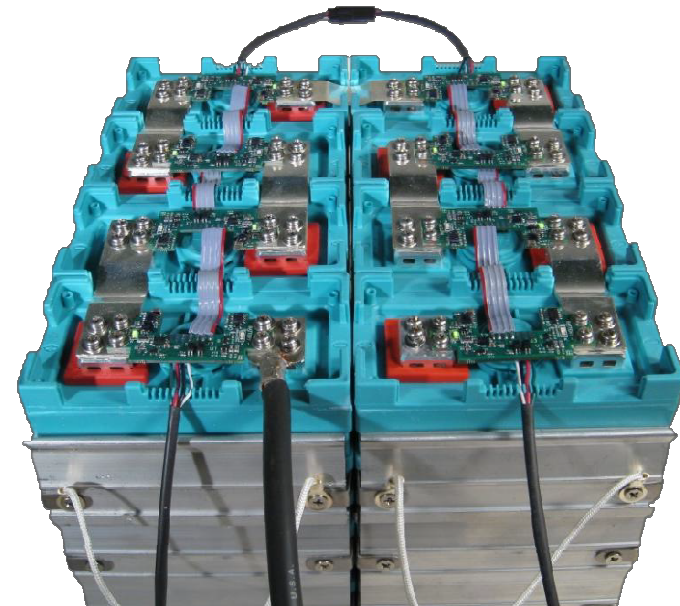
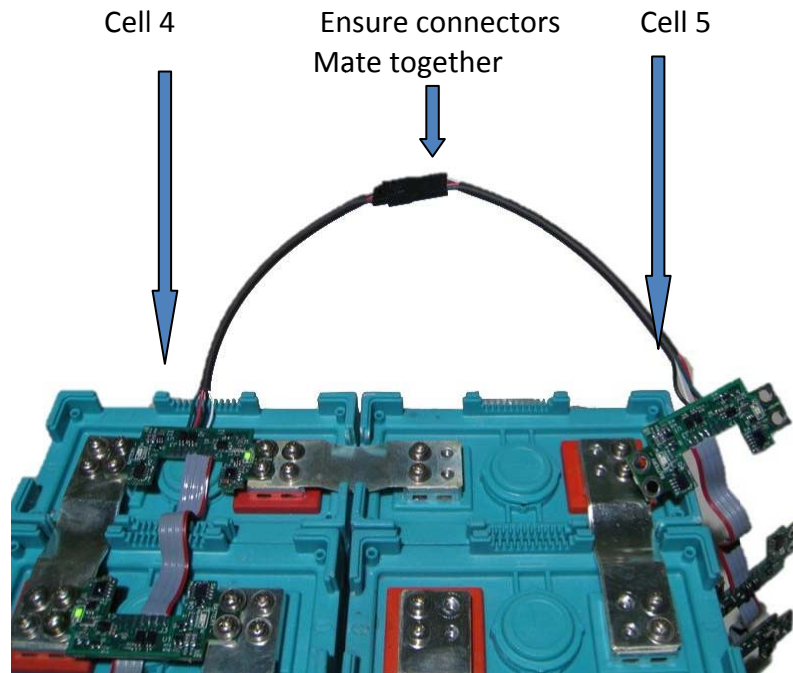
Connect the battery pack in series and install any other electrical hardware before installing the sense boards.

Remove the inner two screws from each battery terminal. The sense boards are marked for polarity. Orient the board correctly and install it on the battery. Reinstall the screws, lock washers and flat washers. A green LED indicates that each board is connect correctly.

On the display the title will change to E.M.S – 1 when the first cell is connected and communicating. Connect the remaining sense boards in sequence and ensure the title adds one to the count as each board is connected.

7. Sense Board Installation (Continued)

Connect the first string of sense boards to the second. Install sense boards one at a time making sure that the display updates the E.M.S number as each board is added.



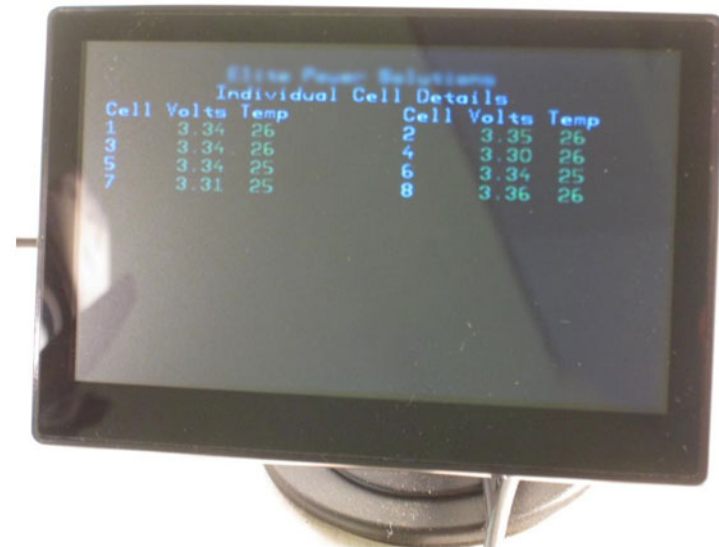
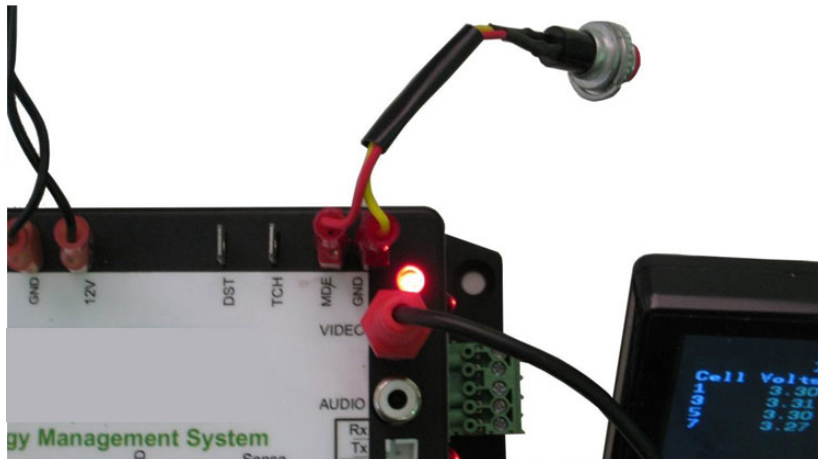
The above is an example of a completed EMS-8 setup. Up to 156 boards can be added to the string



8. Mode Button

Install a momentary switch (not included) between the MDE and GND connections. When this button is pressed it will advance the display to show individual cell information. This mode will

display up to 20 cells per page. If there are more than 20 cells in the pack pressing the button again will advance to another page. After all cells are displayed pressing this button again will return to the main screen.

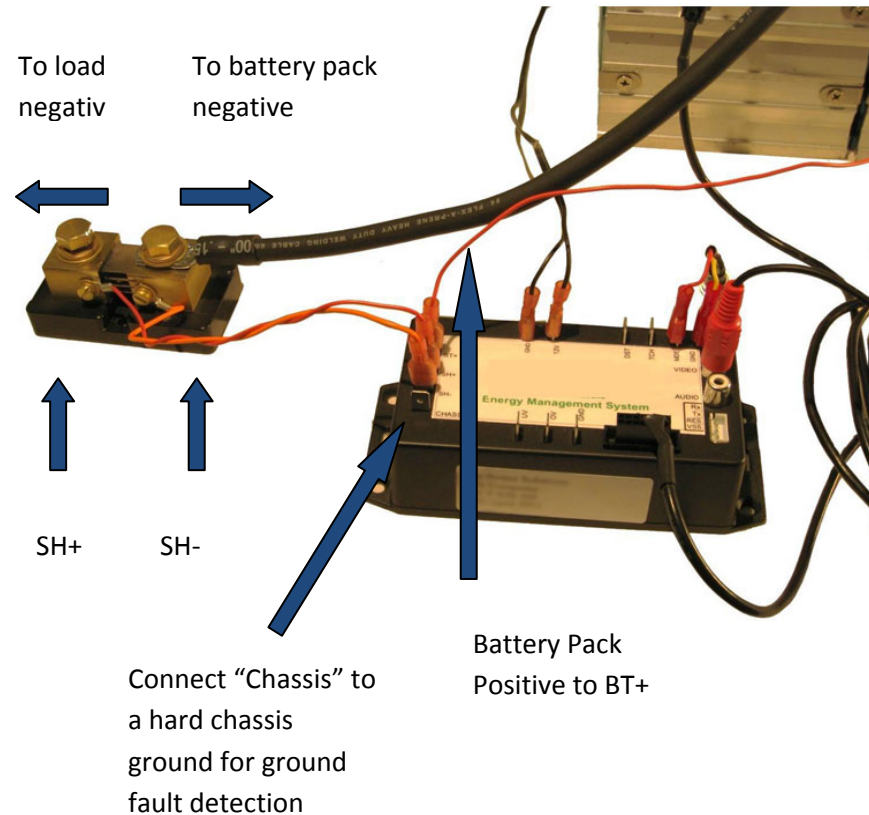


Ensure that all cells in your system are reporting

9. Shunt Connection

The current shunt is used to measure the current going in and out of the battery pack so that the CPU can calculate the battery capacity. All power going in or out of the battery pack must go through the current shunt, otherwise the capacity reading will be inaccurate. The shunt must be installed on the negative side of the battery pack.

The shunt should be installed as close to the CPU as possible with a twisted pair of wires going to the CPU. Shunt negative (SH-) is the side of the shunt that is connected to the battery pack negative.





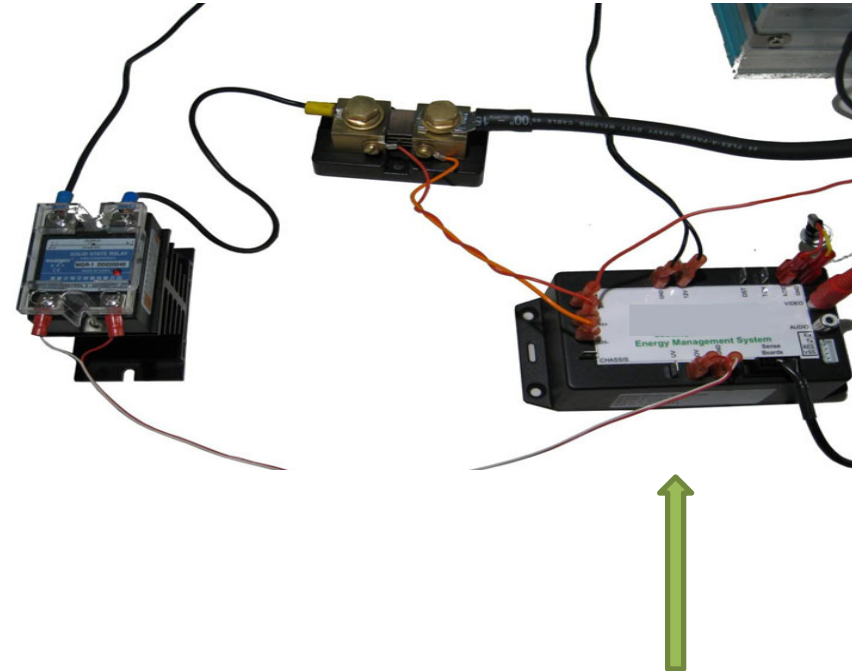
10 Alarm Outputs

The alarm outputs are crucial for proper protection of the battery pack. Two outputs are provided, UV and OV.

UV: Under Voltage – activates when lowest cell is below 2.5 volts for 30 seconds.

OV: Over voltage – activates when highest cell is above 3.7 volts for 30 seconds.

Both alarm outputs are referenced to the GND ground pin and pass the 12 volt input voltage through. The outputs are normally 12 volts during normal conditions and drop to 0 volts during an alarm condition. Each output can directly drive a relay at up to 400ma continuous.



In this example a solid state relay controls the chargers output to the battery pack. The relay is controlled by the OV output which turns on the relay during normal conditions and turns it off during a high voltage cell situation to prevent over charging.



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11. CAN Connection (Optional)



CANH and CANL transmit data packets

The Communications Area Network (CAN) is used to send out the BMS data to other integrated vehicle systems. Please see separate documentation for a full spec list of the information available from the unit.

CAN High – CANH, CAN Low –CANL and ground are the primary used connections. 12V supplies power if needed.

Non-CAN units can be upgraded to have this option. Please contact Elite Power Solutions for more information.



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12 Using the System

Upon initial power up the system defaults to 50% capacity. The battery pack will need to be fully charged prior to first use and in order to sync the capacity measurement with the actual battery capacity. When the system sees total pack voltage which averages 3.5 volts per cell it will default to 100%. The bar display will change color when the numbers are near their limits.

After the initial capacity sync the capacity is calculated by how many amp hours are counted being discharged and charged.

