

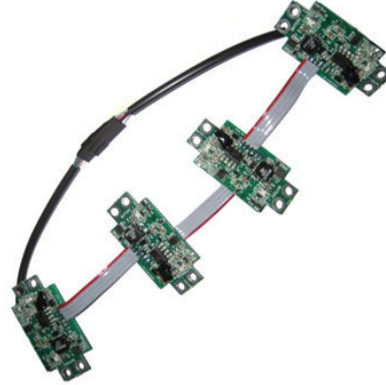
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## Integrated Battery Control System LBCS Step-by-Step Setup Guide



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## 1. Components of the System



### LBCS:

- Central hub of the system
- Manages 12-48V LiFeMnPO4 battery packs
- Directly disconnects for low voltage protection
- Output for fuel gauge
- MODbus data output standard
- 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
- Note: Appearance may be different depending on revision

## 2. Components of the System



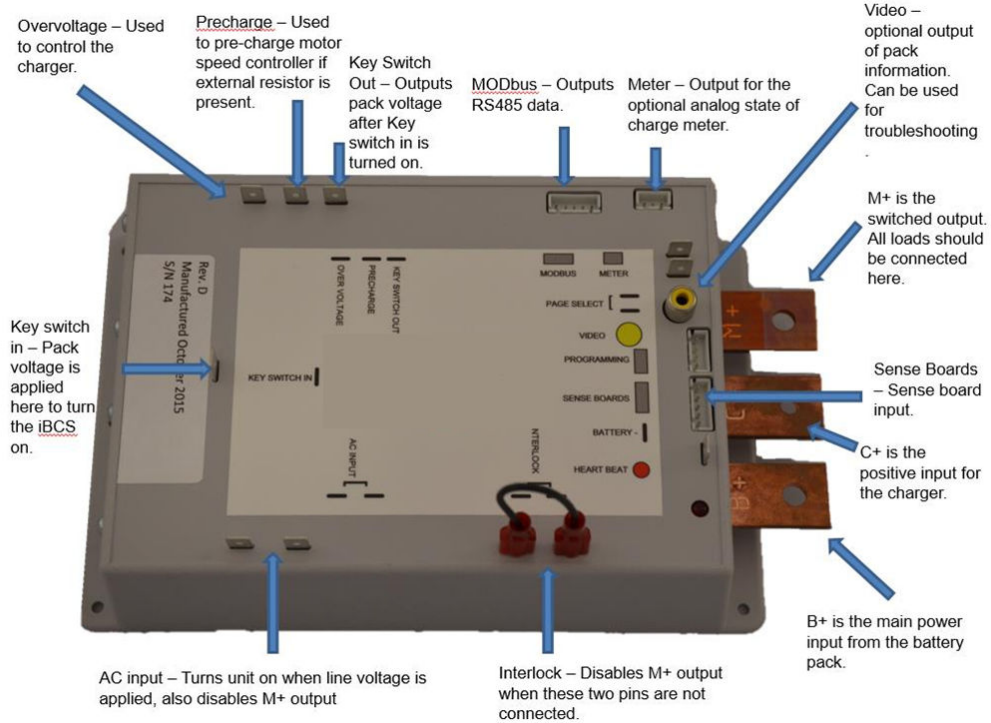
### Gauge (optional)

- Provides easy to read state of charge
- Illuminated background and needle
- QTY: 1 per system

### Harness

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

### 3. LBCS Overview



### 4. Battery Connections



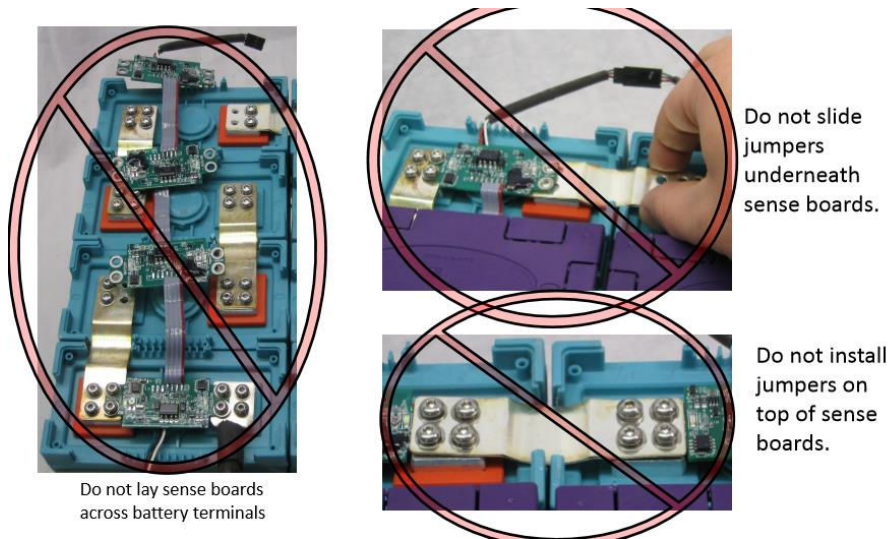
The first step is to setup the batteries main electrical connections. This example shows a 24V 100Ah battery pack.

Install all electrical hardware. Note that this can be either done with supplied jumpers or by making your own cable.

The inner four screws will be removed to install sense boards, so they can be left off during this step as shown.

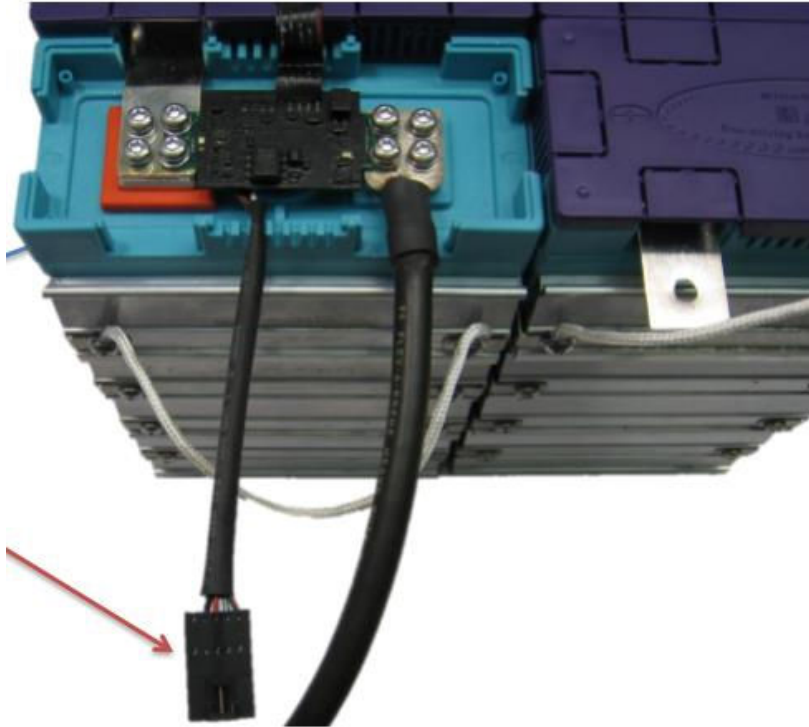
### 5. Sense Board Installation

Use Caution when installing sense boards in order to avoid damage to them.



### 6. Sense Board Installation

Before installing plan the route of the sense boards. Although not required, for a typical installation it is recommended that the negative most cell is cell #1, which is the first sense board connected to the CPU. The male plug on the sense board strings is the input.

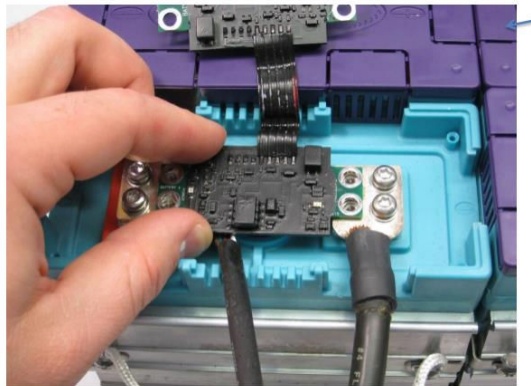


## 7. Sense Board Installation

Work with all covers installed to avoid any accidental electrical shorts.

Sense board strings have a defined input and output connectors. Male is the input, female is the output. Ensure that the string is oriented correctly before installation.

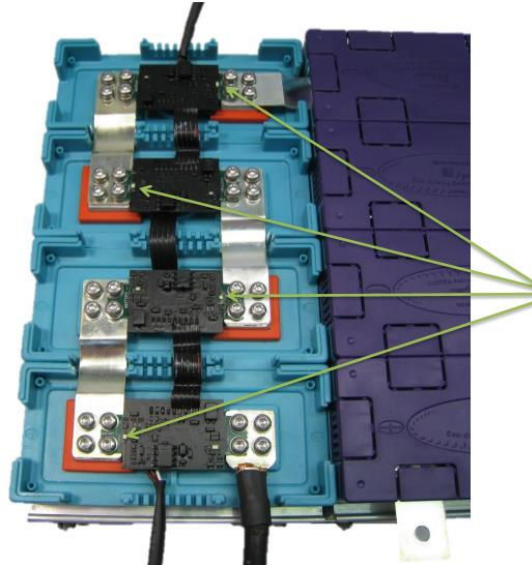
Remove the inner four screws and install the first sense board by placing it straight down on the terminals inner four screw holes and install the screws. Torque the screws to 30 in-lbs.



## 8. Sense Board Installation

Remove the cover for the next cell and repeat the installation process for all four cells. Always work with covers installed.

Green LED's on each board indicates board is connected properly and is receiving power from the battery cell.

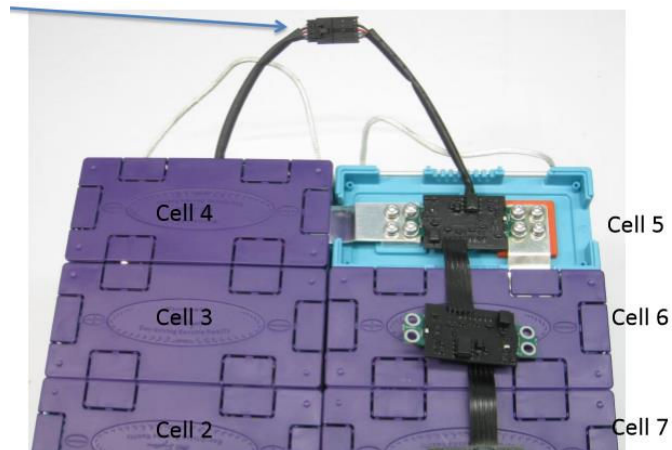


## 9. Sense Board Installation

Ensure ends mate before installing Sense Boards.

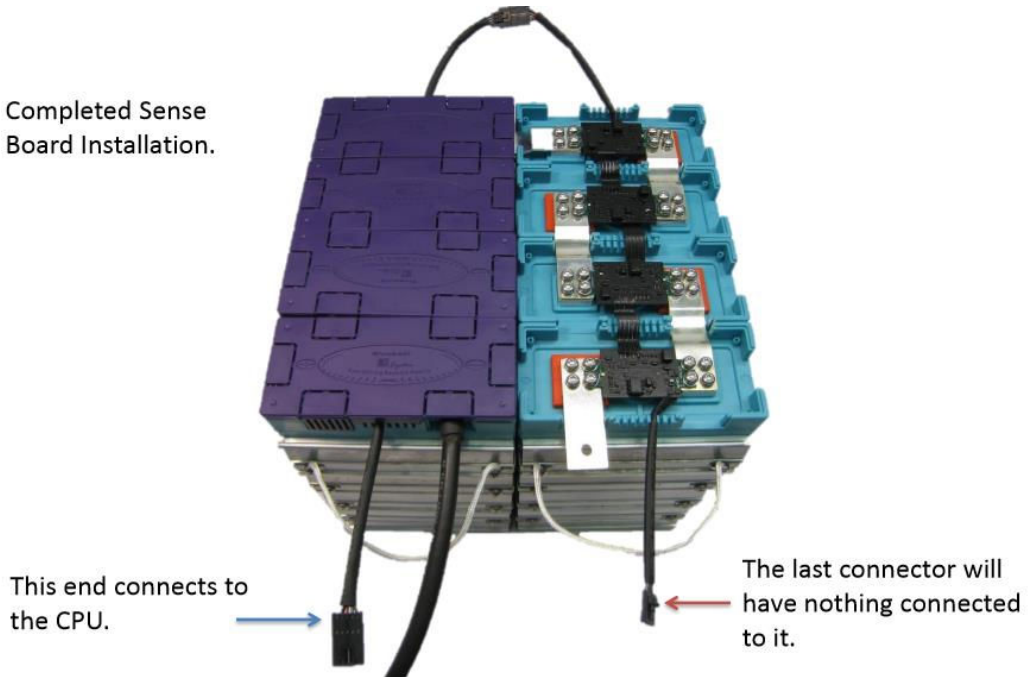
Cover the first Sense Board string and continue to the second and install the same as the first.

The LBCS supports up to 16 cells in series.



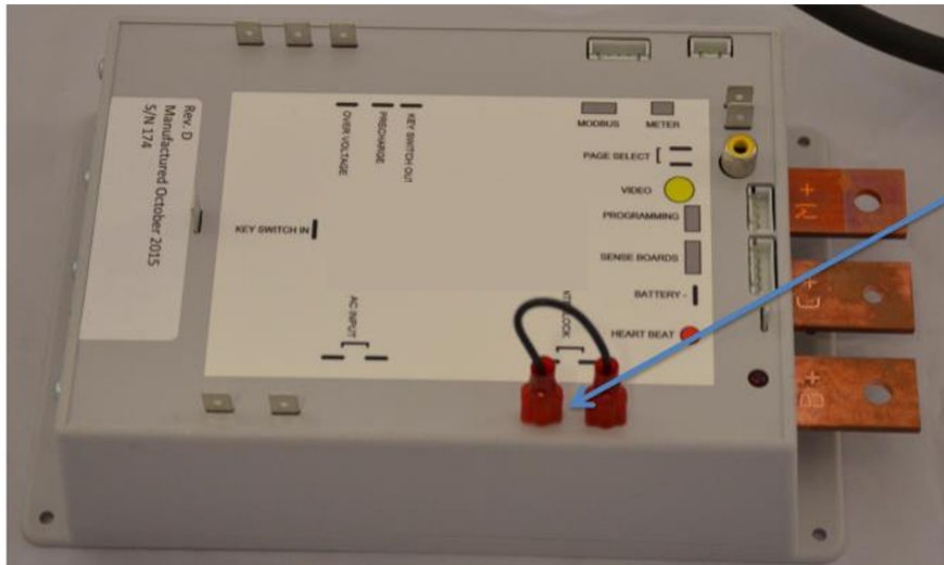
### 10. Sense Board Installation

Completed Sense Board Installation.



### 11. Connect Jumper to Interlock Connections

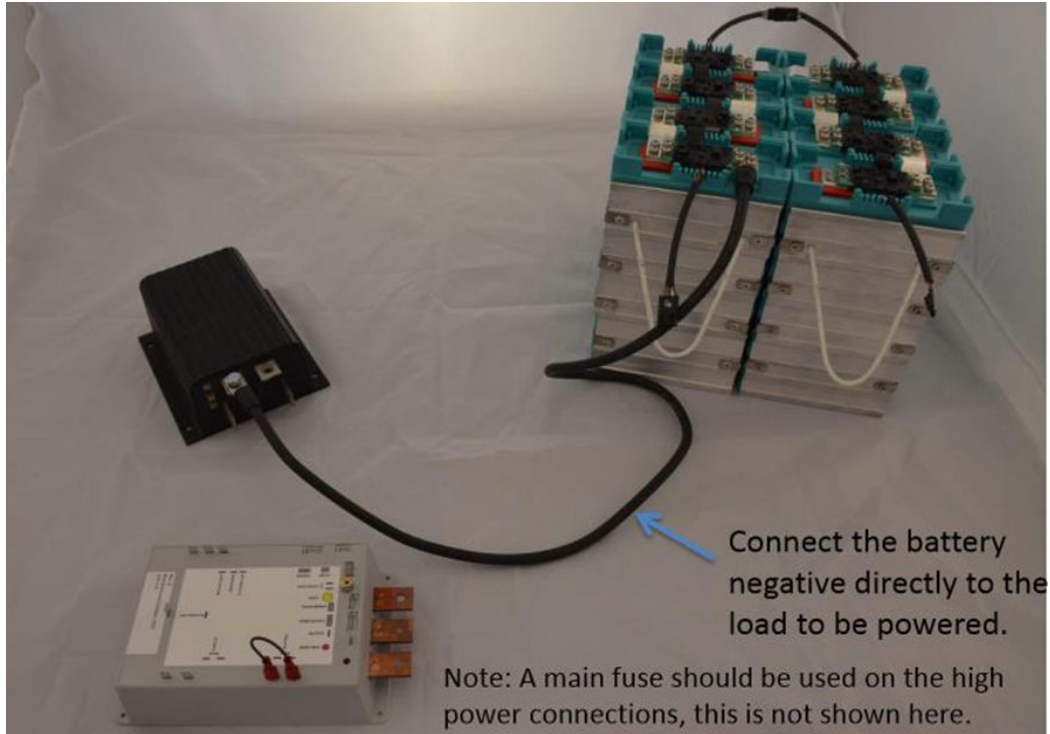
When the two interlock pins are connected together it allows operation of the M+ output if the LBCS has no alarms set. When these two pins are disconnected M+ is disabled.



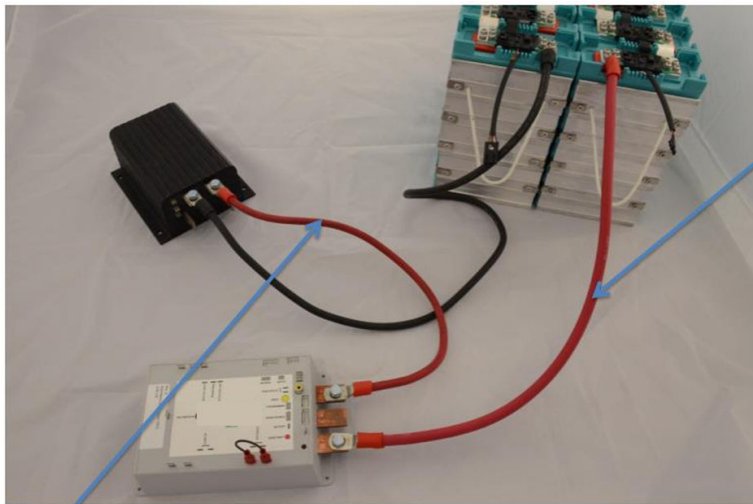
For most setups the provided jumpers should be installed here. If the charger is used off board this connection can be used to disable the vehicle from driving away while the charger is plugged in.

## 12. Battery Negative Connection

For the purposes of this guide the motor speed controller on the left will represent any loads attached to the LBCS system. Your setup may vary.



## 13. Battery Positive Connection

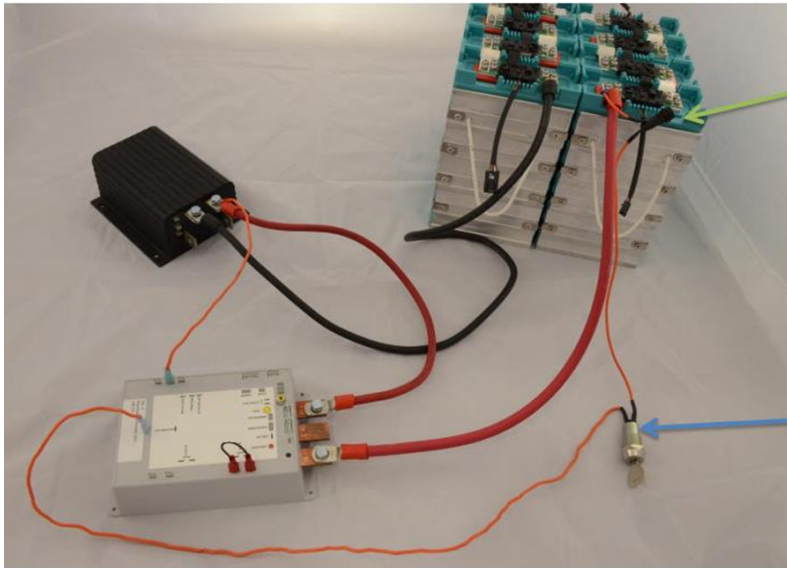


Connect the battery positive to the B+ terminal on the LBCS

All loads get connected to the M+ terminal of the LBCS. This output is controlled to prevent over discharge of the battery.



#### 14. Key Switch Connection



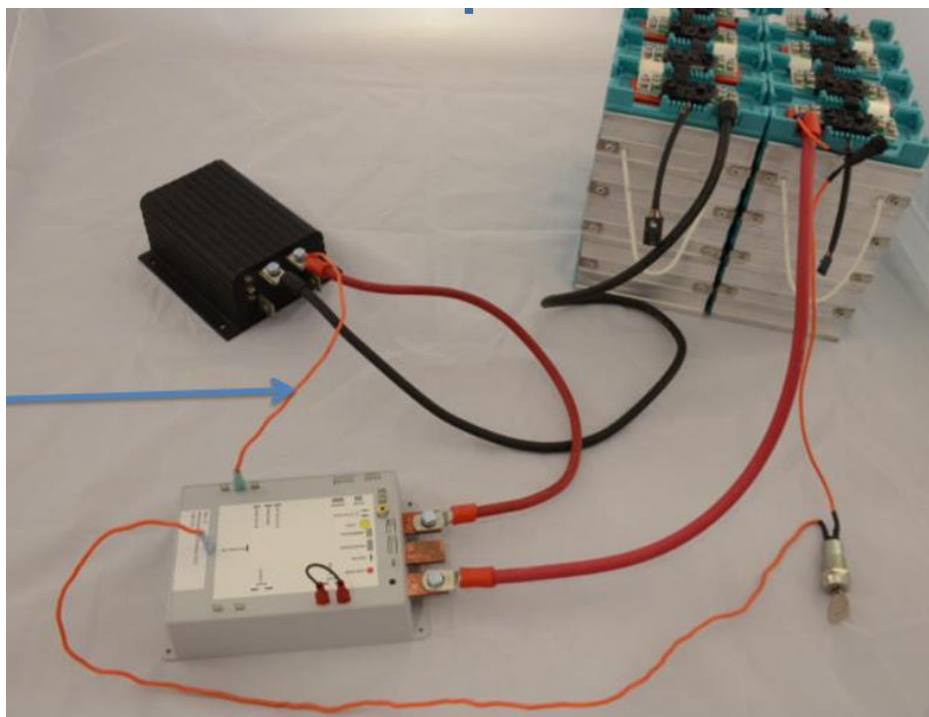
A 5A fuse should be used in line with key switch.

The key switch input will be connected directly to the battery pack and is used to turn the LBCS on and off.

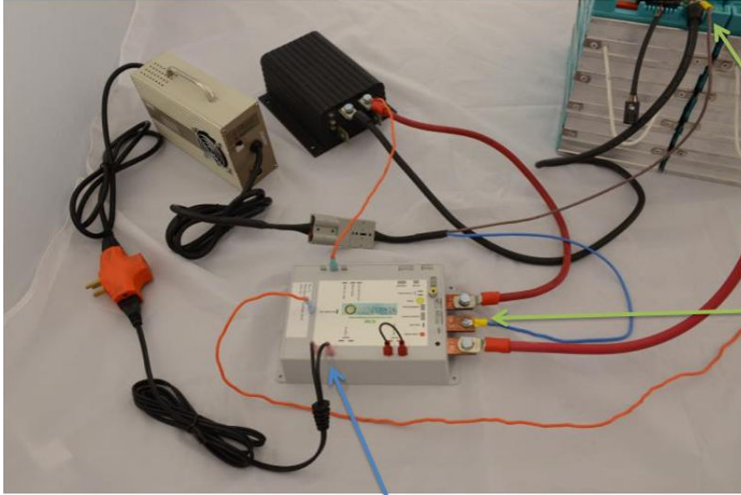
#### 15. Pre Charge Connection

If the LBCS is connected to a motor speed controller with an external pre-charge resistor remove it and connect the “Precharge” pin to the controller’s positive input.

Note: Most systems will not utilize this connection.



## 16. Battery Charger Connection



The battery charger negative connects directly to the battery negative.

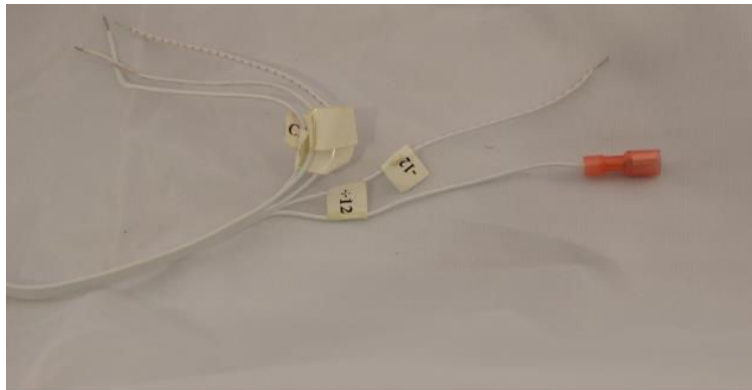
The battery charger positive connects to the C+ connection on the LBCS

Connect 120VAC input to the “AC Input” connection on the LBCS. This should have power whenever the system is plugged in to be recharged. This connection will turn the LBCS on so it can monitor charge and automatically protect the battery pack.

## 17. Charger Communication Connection

Locate the charger communication cable that comes with the battery charger. There are five wires labeled: CANH, CANL, GNG, +12 and -12. You will only use the two wires labeled +12 and -12.

Connect a terminal to the +12 wire, leave the -12 wire unconnected at this point.

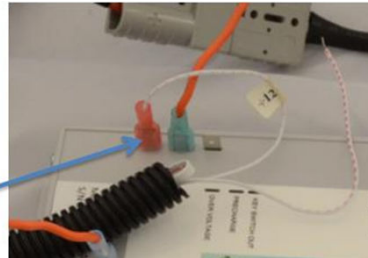


## 18. Charger Communication Connection



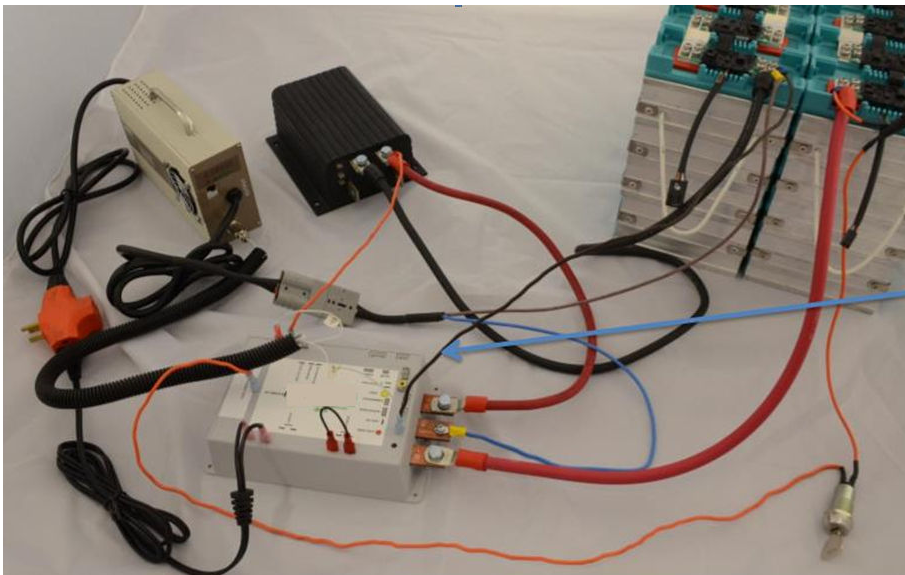
Connect the round charger communication connector to the charger and tighten the retention ring

Connect the wire marked +12V to the “Overvoltage” pin on the LBCS. Do not connect the -12 wire to anything at this time

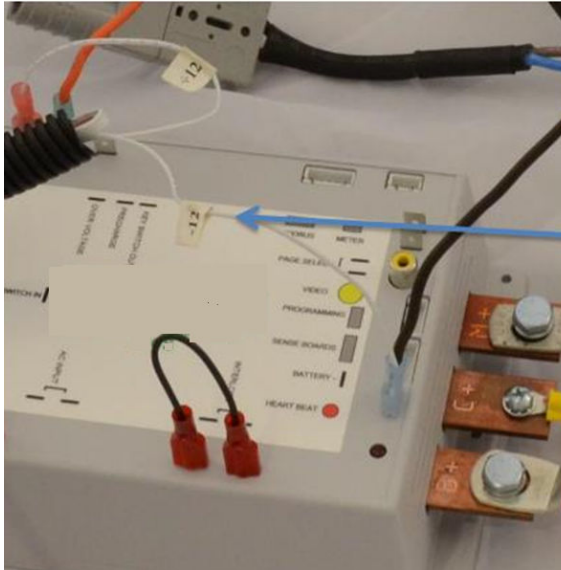


## 19. Battery Negative Connection

Connect the LBCS “Negative” to the battery negative. Also connect the wire of the charger communication harness labeled “-12” to this same connection.



## 20. Battery Negative Connection

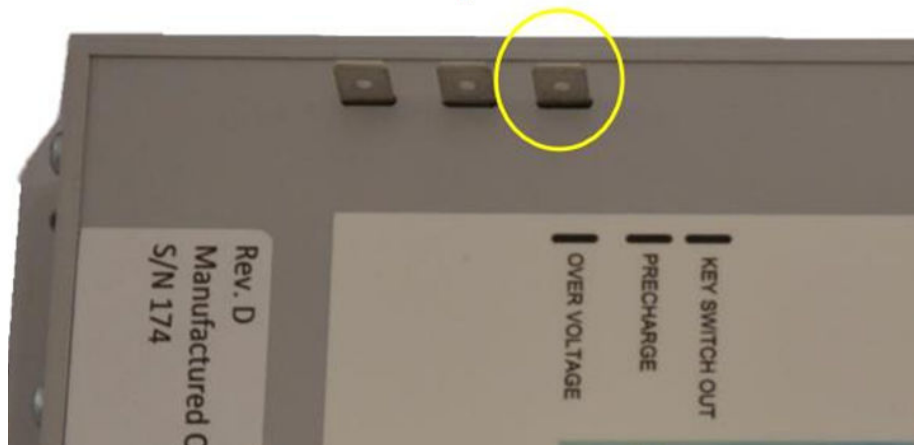


To battery pack negative

Charger communication cable -12 also connects here

## 21. Key Switch Out

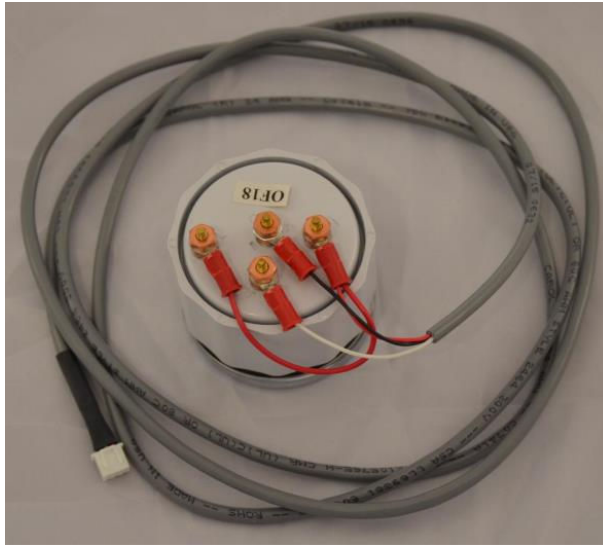
The key switch output is used primarily for low voltage vehicle such as golf cars. This output will turn on two seconds after the key switch in is turned on. This will output the battery pack voltage and can be used to turn on the rest of the vehicle electronics and/or the main contactor.



## 22. Gauge Connection

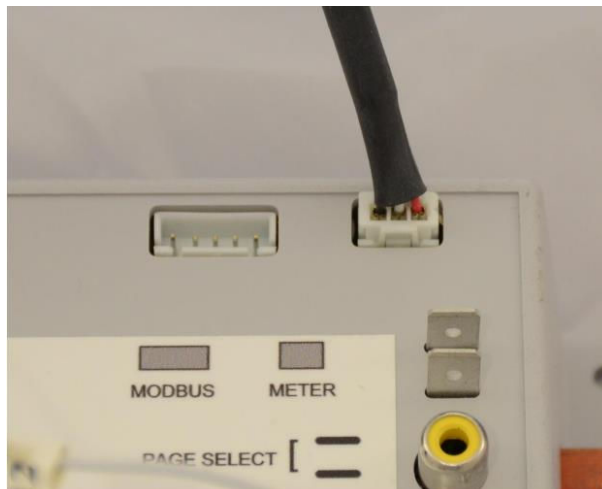
If you have purchased the optional fuel level gauge connect the four wires to the back of the gauge as follows:

Red – L and I White – S Black – G



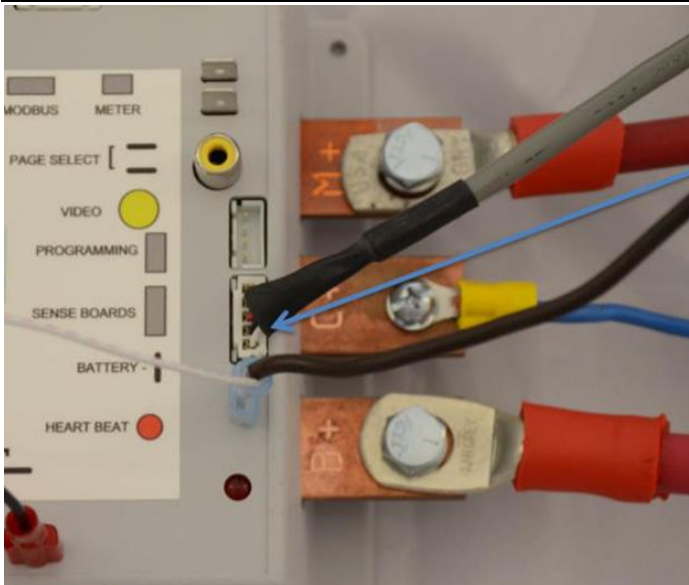
### 23. Gauge Connection

Connect the meter harness to the three pin connection labeled “Meter”.



### 24. Sense Board Connection

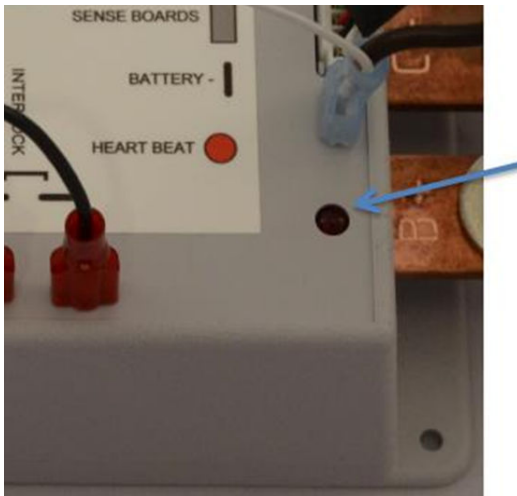
Connect the Sense Board harness to the five pin connector labeled “Sense Boards”.  
Connect the other end of the harness to the first set of sense boards in the string.



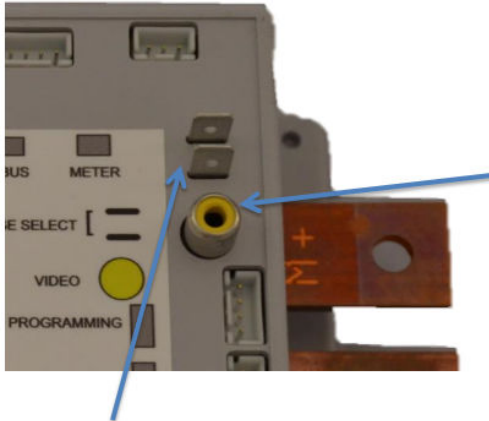
## 25. Turning on the System

At this point the all necessary system connections have been made. Double check that all connections are correct and turn on the key switch. The “Heart Beat” LED will begin flashing once per second. The internal cooling fan will briefly spin up, the pre-charge output will immediately become live and the key switch output will become live two seconds later.

The gauge will illuminate and the needle will show approximately 50%.



## 26. Video Output (optional)



The video output can provide additional information from the system and can be used as either a main display or for troubleshooting purposes.

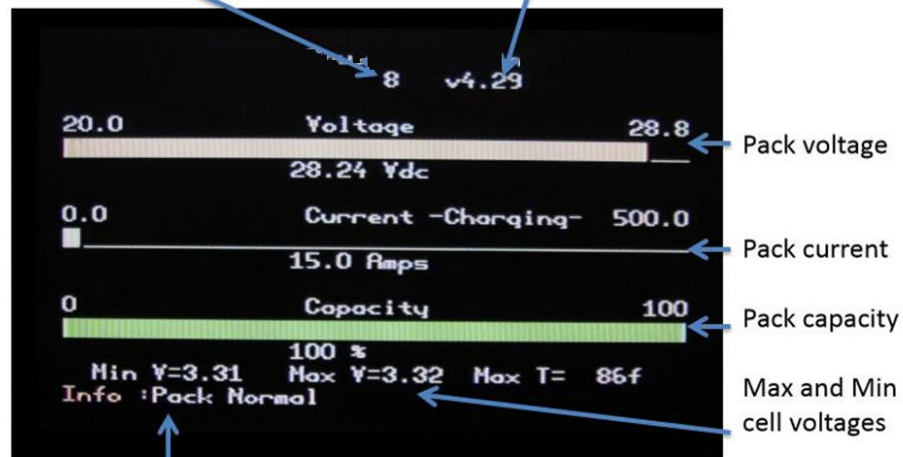
EPS can provide a LCD screen or you may use a display you already have. The video signal is standard composite video and can plug in to many types of displays, even televisions.

The page select pins are momentarily shorted together to change the page displayed. A normally open momentary switch can be installed across these two pins.

## 27. Video Output – Main Screen

Number of cells the system is programmed for.

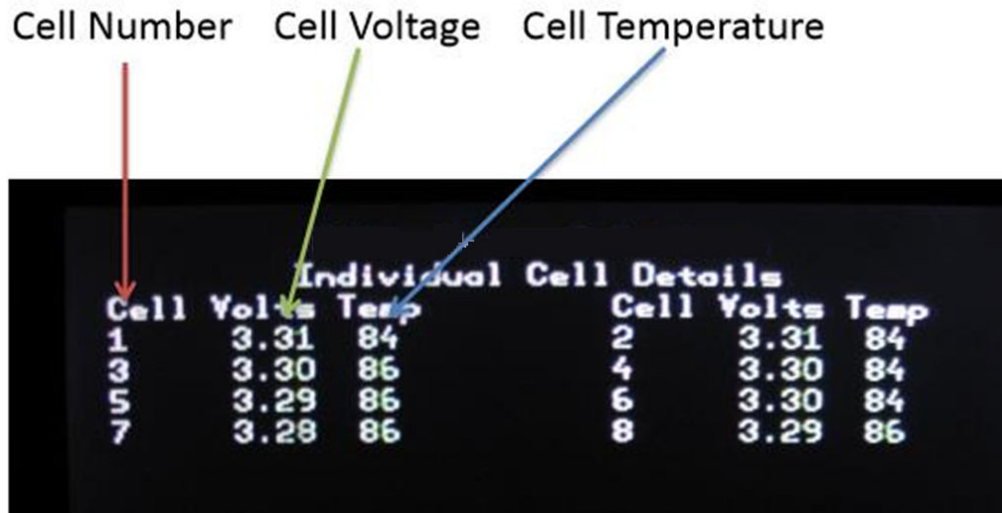
Firmware version



Alarm information

## 28. Individual Cell Screen

To access the individual cell screen short the two Page Select pins together or press the button between these two pins if you have installed one. The screen should change to the individual cell detail page. This page shows the voltage and temperature of each individual cell. Confirm that all cells are shown. Any parameters outside of normal operating ranges will be in red text. Shorting these two pins together again will return the LBCS to the main screen.



## 29. Using the System

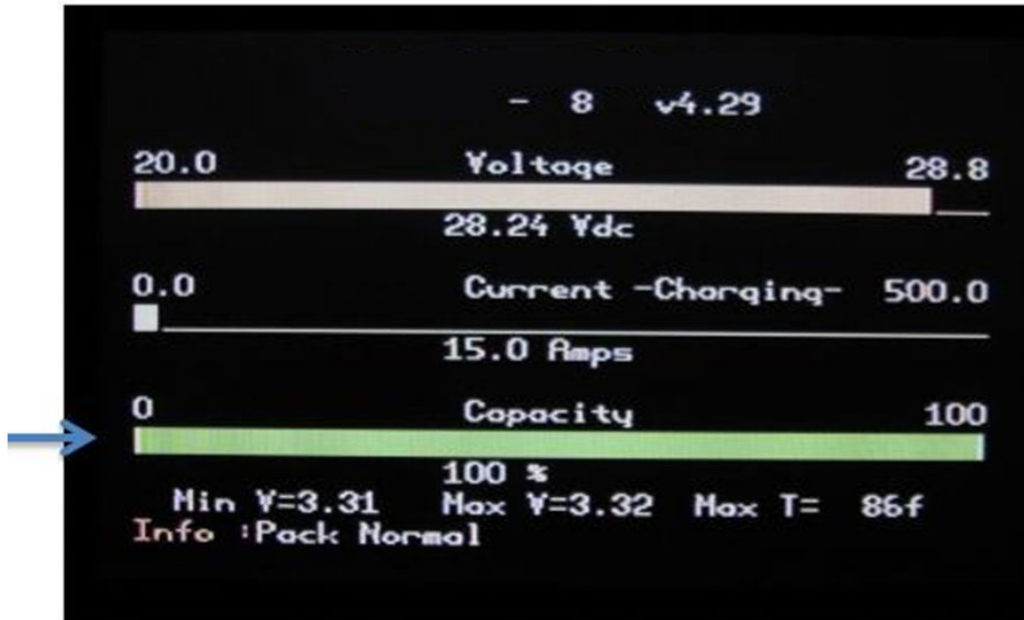
Upon initial power up the system defaults to 50% capacity. The battery pack will need to be fully charged prior to first use and in order to sync the capacity measurement with the actual battery capacity. When the system sees total pack voltage which averages 3.52 volts per cell, and charging current is in a normal charging range, it will default to 100%. Allow the charger finish fully charging the battery after this point indicated by all the green LED's on the charger being lit solid.

The various bars on the screen will change colors when they are nearing their limits. This does not indicate a problem or error condition.

After the capacity is initially synced, the capacity is then calculated by how many amp hours are counted being discharged and charged in and out of the battery.

Thank you for purchasing our Integrated Battery Control System.

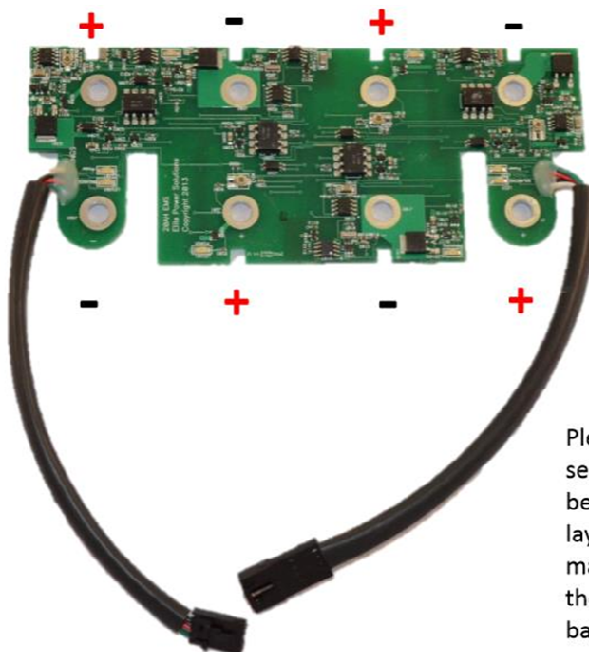




### 30. 20Ah Sense Board Installation Supplement

BMS Setup Guide 20Ah Sense Board

### 31. 20Ah Sense Board Layout

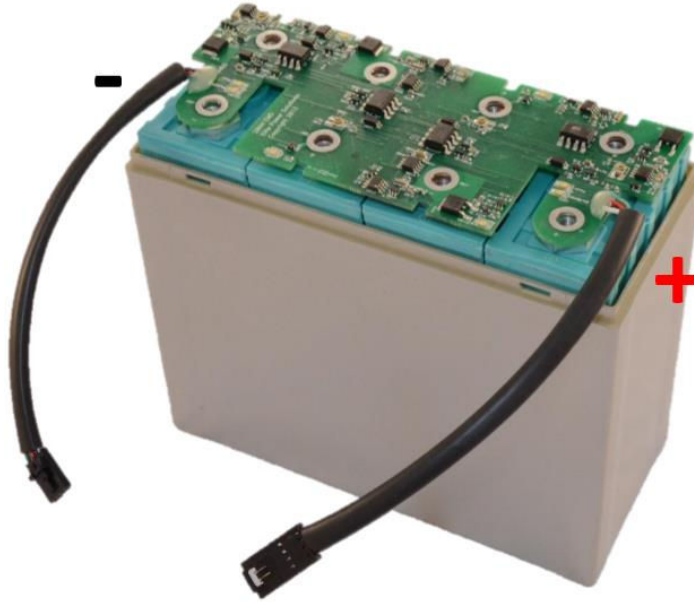


Please note the 20Ah sense board layout before continuing. The layout is intended to match the polarity of the standard 20Ah battery pack only.

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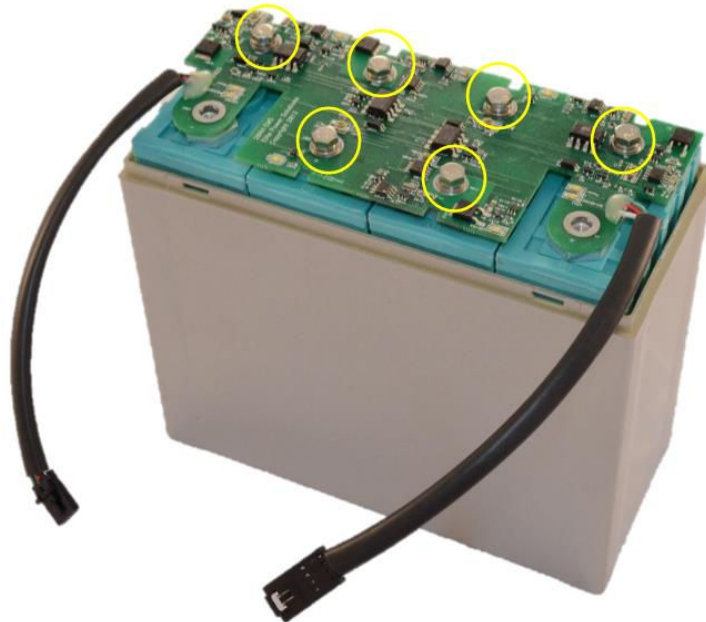
### 32. 20Ah Sense Board Installation

Remove the battery cover by pulling up on it, a flat head screw driver can be used to gently pry open at the seam. Remove all eight bolts leaving the copper jumpers in place. Use caution to not cause a short circuit on the battery during this step.



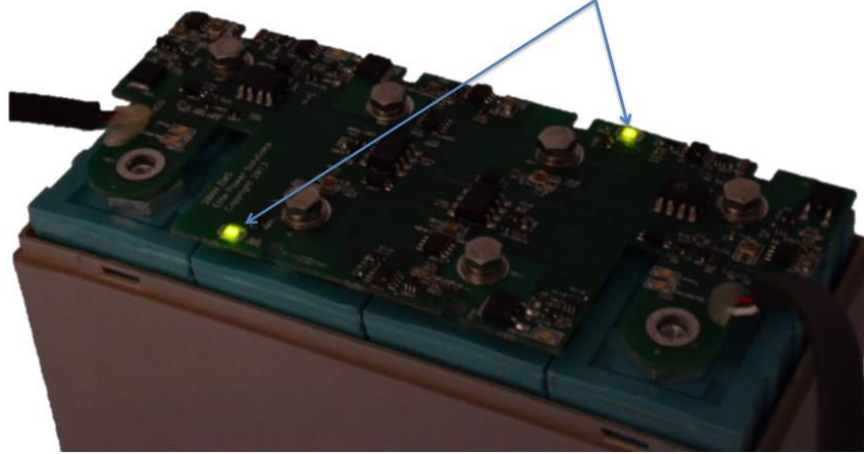
### 33. 20Ah Sense Board Installation

Install these six bolts. Do not install the main positive and negative bolts at this time.



### 34. 20Ah Sense Board LED Check

Ensure that these two green LED's are lit at this point.



### 35. 20Ah Battery Cover



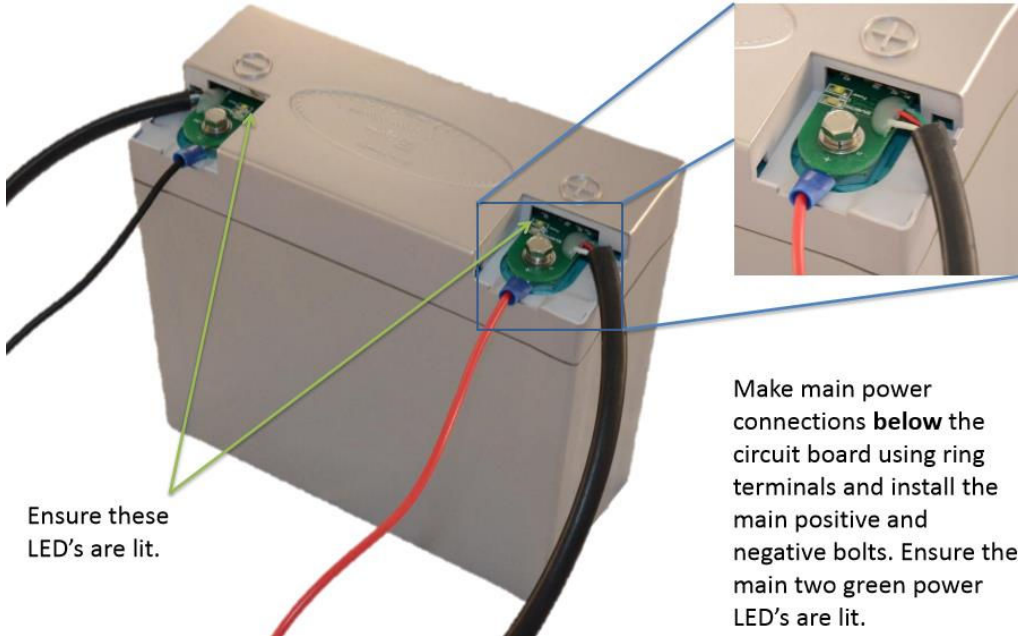
Press here to  
remove terminal  
covers.



To install sense boards with covers

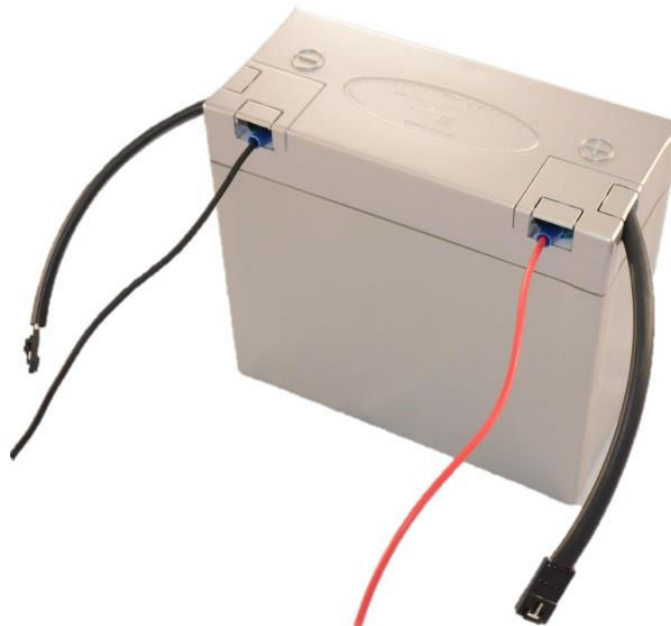
- Remove the main terminal covers by pressing out from the bottom side.
- Feed the data wires through the holes and press the cover in place.

### 36. 20Ah Battery Main Connections



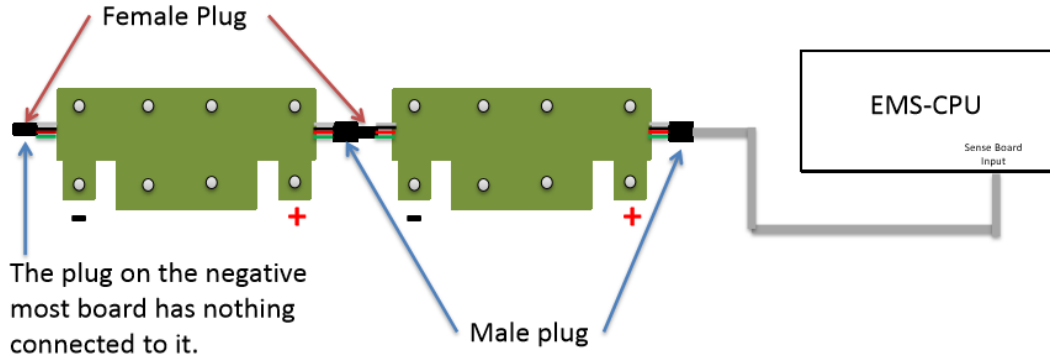
### 37. Terminal Covers

Terminal covers should be reinstalled for safety. Knockouts on either side can be removed in order to accommodate data and power wires as shown.



### 38. Data Wire Connection Path

Daisy chain connections for data wires will be the same as other size sense boards, except 20Ah boards will connect from positive most to negative most.



### 39. 200Ah Sense Board Installation

BMS Setup Guide 200Ah Sense Board

