

# THUNDERSTRUCKMOTORS

## BMS Quick-Start Guide

The Dilithium Battery Management System is designed to monitor lithium battery packs. The BMS has been implemented as two assemblies (enclosures):

BMS Controller: a processor board and a measurement board

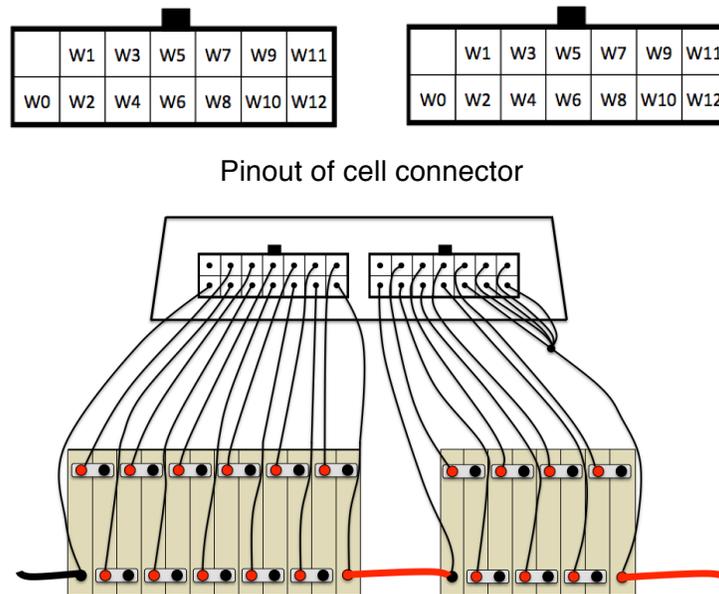
BMS Satellite: a measurement board

Each enclosure contains a measurement board, each supporting up to 24 cells. A BMS Controller can operate alone, and satellites can be added to support more cells. A BMS Satellite cannot operate alone.

### Cell Wiring

The first step in wiring the BMS is to determine the locations of the cell groups within the pack. A cell group refers to the cells monitored by a single measurement chip, and a cell group must contain at least 4 cells. All cells in a cell group must be wired consecutively with increasing voltage, and unused cell inputs should be connected to the last cell in the group, as shown below.

Wire 0 should be connected to the negative terminal of the first cell in each cell group. Notice that wire 0 and wire 12 connect to the same terminal between the cell groups above.



**WARNING: INCORRECT WIRING MAY DAMAGE THE BMS. VERIFY PROPER WIRING BEFORE INSERTING THE HARNESS INTO THE CONNECTOR. REMOVE THE HARNESS FROM THE CONNECTOR BEFORE ALTERING ANY BATTERY CONNECTIONS. DAMAGE CAUSED BY WIRING ERRORS ARE NOT COVERED BY WARRANTY.**

**NOTE:** A cell group must not span a fuse or other circuit protection device.

Wiring should be verified with the included cell verification tool before inserting the harness into the connector. Using a voltmeter, verify that each wire number matches each assigned cell number, and verify that the cell voltages increase consecutively with increasing cell number

## System Connections

IPO	IMO	CANH	CANL	LP1	LP2	12v	gnd
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Isolated 12V power should be connected to **+12V** and **GND**. The BMS should be powered when the vehicle is being driven or charged. For use with the Thunderstruck EVCC, the BMS may be powered by the 12V output wire “12V\_Sw.”

Either CAN or cell loop can be used to disable the charger:

The CAN wires, **CANH** and **CANL**, should be connected to other CANH and CANL wires in the network. CAN disables the charger with a CAN message.

The cell loop wires **LP1** and **LP2** connect to an internal solid-state relay rated to 200ma that is closed when there are no alerts, when the BMS is powered. The cell loop wires are an output that can be used to power an external relay, which can disable a charger.

The cell loop can also be used to drive an alarm or indicator when there are alerts.

The **IPO** and **IMO** pins are only used in systems with more than 24 cells. (See manual for details.)

## Software Configuration

Parameters must be configured by connecting to computer or other device with the provided serial cable. Information and downloads can be found at [www.thunderstruck-ev.com/BMS](http://www.thunderstruck-ev.com/BMS). Once connected to the interface, commands can be entered to change configuration.

```
bmasc> show config
lvc      : 2.400v
hvc      : 3.400v
bvc      : n/a
bvmin    : 3.000v
thmax    : 50C
bmasc> set hvc 4
bmasc> set lvc 3.1
bmasc> set bvmin 3.5
bmasc> enable balance
bmasc> show config
lvc      : 3.100v
hvc      : 4.000v
bvc      : n/a
bvmin    : 3.500v
thmax    : 50C
options  : balance (cell balancing is enabled)
bmasc> show map
ltc|pack|group|cells
----|----|-----|-----
 1 |  1 |   1 | (c1 -c12) . . . . .
 2 |  2 |   2 | (c13-c24) . . . . .
bmasc> lock
configuration locked
bmasc>
```

- **lvc**: low voltage cutoff
- **hvc**: high voltage cutoff
- **bvmin**: minimum balancing voltage

The **lock** command is used to save cell configuration; once the **lock** command has been entered, the BMS will generate an alert if any cells or LTCs are missing in the event of a loose wire or missing connector. (This is recommended but not required.)

The BMS uses a 24-ohm balancing resistor. As an example, a resistor will shunt about 170ma at 4V. When enabled, balancing will occur whenever the BMS is powered.

For more information, see the complete manual: [www.thunderstruck-ev.com/BMS](http://www.thunderstruck-ev.com/BMS). For technical support, call **707-578-7973**, or send an email to [connect@thunderstruck-ev.com](mailto:connect@thunderstruck-ev.com).