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**Genasun Battery
Management System
Cell Module
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CAUTION: Cell modules can generate high temperatures. To avoid the risk of fire and other damage, DO NOT place Genasun BMS cell modules in direct contact with lithium cell casings.

BMS CELL MODULE OVERVIEW

The BMS cell modules monitor cell voltage and temperature, perform cell balancing, display visual indications of cell state, and communicate to the BMS Master over an optoisolated link in order to coordinate these functions. Each cell module consists of a conformally-coated circuit board with the cell connections at each end, a permanently attached thermistor temperature probe, and a cable for communications with the BMS Master.

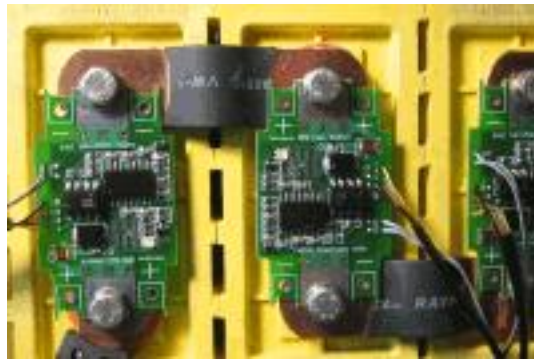
The BMS cell modules may be installed in a variety of ways depending on the configuration of the battery pack. While the cell modules are conformally coated to resist humidity, they should be protected from direct exposure to moisture, as well as physical damage. The cell modules are protected against reverse polarity connection to the cell, although they will draw current from the cell, and may result in overdischarge if left in this state for extended periods. When installing the cell modules, nothing should be connected to the battery pack until all of the pack and cell module connections have been securely tightened, or soldered (as applicable). The cell module connections should be made as close as possible to the cell terminals in order to reduce the effects of wiring resistance on the voltage measurement. This is especially important with battery packs that will be used at high currents.

When a battery pack is made up of cells in series and parallel, such as 14s10p, connect all cells in each 10-cell group in parallel, and use one cell module per group of paralleled cells. For greatest safety, the thermistor temperature sensor should be placed in the center of the group, or the area likely to get hottest. If the pack will be used at high currents, use wiring symmetry or other techniques to ensure that the cells will share current equally. Genasun engineers are available for consulting if additional help is needed in pack design.

INSTALLATION WITH LARGE-FORMAT CELLS

The BMS cell modules will bolt directly to Thunder Sky 40Ah or 60Ah or similar large-format cells. Please observe the "+" and "-" polarity markings on the cell module PCB. The cell modules should be placed on top of the bus bars. The thermistor temperature probe should be placed in close thermal proximity to the cells, such as in the channels between cells, or glued to the cell casing. If your cells use aluminum terminals, pay special attention to ensure a good connection: Wire brush the terminals before making the connection to remove oxidation, and use a terminal treatment like Penetrox or Noalox, or a serrated washer, etc., to ensure good electrical contact.

Adapter PCBs for larger cells are available from Genasun, or may be fabricated to suit.



Genasun cell modules installed on large format lithium cells.

INSTALLATION WITH 18650 or 26650 CYLINDRICAL CELLS

The BMS cell modules are slightly less than 65mm long, so they may be easily incorporated into packs made from cylindrical cells. Connections may be made to the solder pads at the ends of the cell module. Because the cell modules may generate high temperatures during normal operation, DO NOT place cell modules in direct contact with lithium cells. Make sure that the thermistor temperature probe is in good thermal contact with the cells in the pack.

CELL MODULE OPERATION

After assembly, the cell modules are designed for permanent connection to their associated cell. The self-consumption is well below the self-discharge rates of most batteries. When the BMS cell module is first connected to the cell, the red and green elements of the bi-color LED will light briefly. If you do not see this blink during assembly, please check that the cell module is connected with the correct polarity. If the cell module is connected backwards, there will be a moderate current draw from the battery, and the circuit protector on the cell module PCB will become hot to the touch. Correct operation will resume when the polarity is corrected.

When the cells are not connected to the BMS master, or the BMS master is not powered on, the cells will function in a very simple disconnected mode, and will shunt current at a preset maximum cell voltage, lighting the green LED. This provides limited protection against extreme cell overcharge, and is a simple form of cell balancing. The voltage set-point is programmed at the factory and is not user-configurable.

When the cell modules are connected to a powered BMS master, they will perform on-the-fly cell balancing, and report cell voltage and temperature back to the master. If the cell voltage or temperature exceeds the programmed limits, the red LED will light, providing an easy way to identify the cell experiencing or causing the fault. The cell balancing algorithm is factory programmed for a particular chemistry, and is not user-configurable. The green LEDs will sometimes light under normal operation, and indicate the operation of the BMS cell-balancing function. If the LED appears orange, this indicates that the green and red LEDs are lit simultaneously, and usually indicates a cell-overvoltage condition, although the red

and green LEDs may also be lit simultaneously during an over-temperature condition.

WARRANTY

Please contact the company you purchased the system from for warranty terms or service. A battery management system is only a small part of a safe and reliable battery system, and Genasun LLC not be held liable for incidental or consequential damages resulting from the use or misuse of this product.

BMS CELL MODULE SPECIFICATIONS

Size:	2.59x1.50"
Nominal Bolt Spacing:	2.36"
Bolt Slot Width:	0.25"
Voltage Resolution:	1mV
Voltage Accuracy:	+5mV typ.
Voltage Measurement Range:	1.9V-5.3V
Temperature Resolution:	0.1C
Environmental:	Conformally Coated
Balancing:	Dissipative