



By Lithionics



## OPE-Li3 ND-DC BMS

### Battery Management System for use with Lithionics Batteries

#### What makes the OPE-Li3 with Lithionics the best battery system for marine applications?

**Dual Channel System-** "Dual-Channel" means that the charge side of your system can be isolated from the load side of your system by the BMS. In the uncommon case of a high voltage cutoff (HVC), the BMS will isolate the battery module from any charge sources so as to stop the battery from overcharging. At this point the loads will still be connected so the electrical system on board is still functional. When the loads bring the voltage down to a reasonable level, the BMS will automatically reengage the charge bus for future charging. Conversely, in the case of a low voltage cutoff, the BMS will only isolate the loads so that the charge sources can continue charging the battery as able. In any cases of extreme high or low voltage, the BMS will totally isolate the batteries until the problem can be rectified.

**Automatic System Recovery** even if unattended. As described above, in a situation where the BMS must isolate either the load or charge bus, the system programming paired with the dual bus will allow the system to recover from the event with no intervention.

**Multi-level protection system.** The BMS pack level computers are backed up by cell-level sensors, communicating via a rugged "cell loop" (vs. the fragile communication cables of other lithium systems). The result is continuous protection at both the cell and pack levels that is resistant to both water and physical damage. In addition to monitoring the individual voltage at the cell level, the electronics on each cell will shunt current in order to help maintain a proper balance between the cells.

**FCC (Field Circuit Control) Alternator/ charge source protection:** All OPE-Li3 BMS units come with a simple alternator disconnect circuit. The BMS will automatically turn off the alternator or other sensitive charge source before a high voltage cutoff, thus protecting your alternator(s)/charge sources in an HVC situation. This is a simpler and more robust solution than having the BMS communicate with the alternator through the CANbus network.

**Reserve Capacity** The BMS is intelligently programmed for system management and is designed to initiate the first load cutoff at 80% discharge which leaves a 20% reserve capacity. It provides an early warning so that charging can be initiated but it is very easy to override the cutoff with a simple button push at the BMS.

## How it works:

### HVC & Full HVC Events

**IF** one of your charge sources tries to overcharge the battery or if the cells are out of balance and one cell is becoming overcharged

When the pack V reaches 14.8V, The BMS initiates a High Voltage Cutoff (HVC). It will open the FCC to turn the alternator or other charge sources connected to FCC off. 10s later, the BMS will isolate the charge sources on the charge bus.

**Is the errant charge source continuing to be a problem?**

Yes No

If any cell  $\geq 3.75V$ , or the BMS detects excessive heat, the BMS triggers a Full HVC. The charge bus is disconnected and the FCC is opened. If there is still a cell  $\geq 3.75V$ , then 5s later, the load bus is disconnected & the BMS is in sleep mode.

Loads will stay connected and when the battery  $V \leq 13.6V$ , BMS will reconnect charge sources at the charge bus and reconnect the FCC.

Press POWER button for 1s. The BMS will activate the charge and load bus unless battery  $V > 14.8V$  in which case it will only activate the load bus. After the cell loop closes, the BMS will reconnect the FCC automatically but will delay closing 15s longer for each Full HVC occurrence.

**Does the BMS immediately turn off?**

Yes No

Wait and let the cells self-discharge to a safe operating voltage.

Start battery by depressing the POWER button for 1s. If system is within parameters, you will hear relays close & system will be engaged. If at any time you want to turn the battery off, press & hold the POWER button for 5s

**Normal operation: Battery operates between 12.0V & 14.8V**

### RVC, LVC & Full LVC Events

**IF** the battery is discharged too low, you may have an RVC or LVC event as follows...

When the pack V reaches 12.0V, the BMS will trigger a Reserve Voltage Cutoff (RVC) & isolate the loads.

Press the POWER button for 1s to reactivate the loads & utilize the 10-15% reserve capacity

**Charge Source Present?**

Yes No

Battery  $V \leq 11.6V$ , the BMS triggers Low Voltage Cutoff (LVC) and isolates the loads

Press POWER button for 1s. Loads will activate for 30s then stay activated only if a charge source is present

**Is a Charge Source Present?**

Yes No

Any cell voltage  $\leq 2.5V$ , BMS triggers Full LVC & isolates both charge & load bus (sleep mode) Begin recharging immediately to prevent battery damage

If  $V \geq 13.2V$  is detected on the system side of the charge relay, the charge relay will close. When the V reaches 12.4V after a LVC or 13.2 after an RVC, the load relay will close