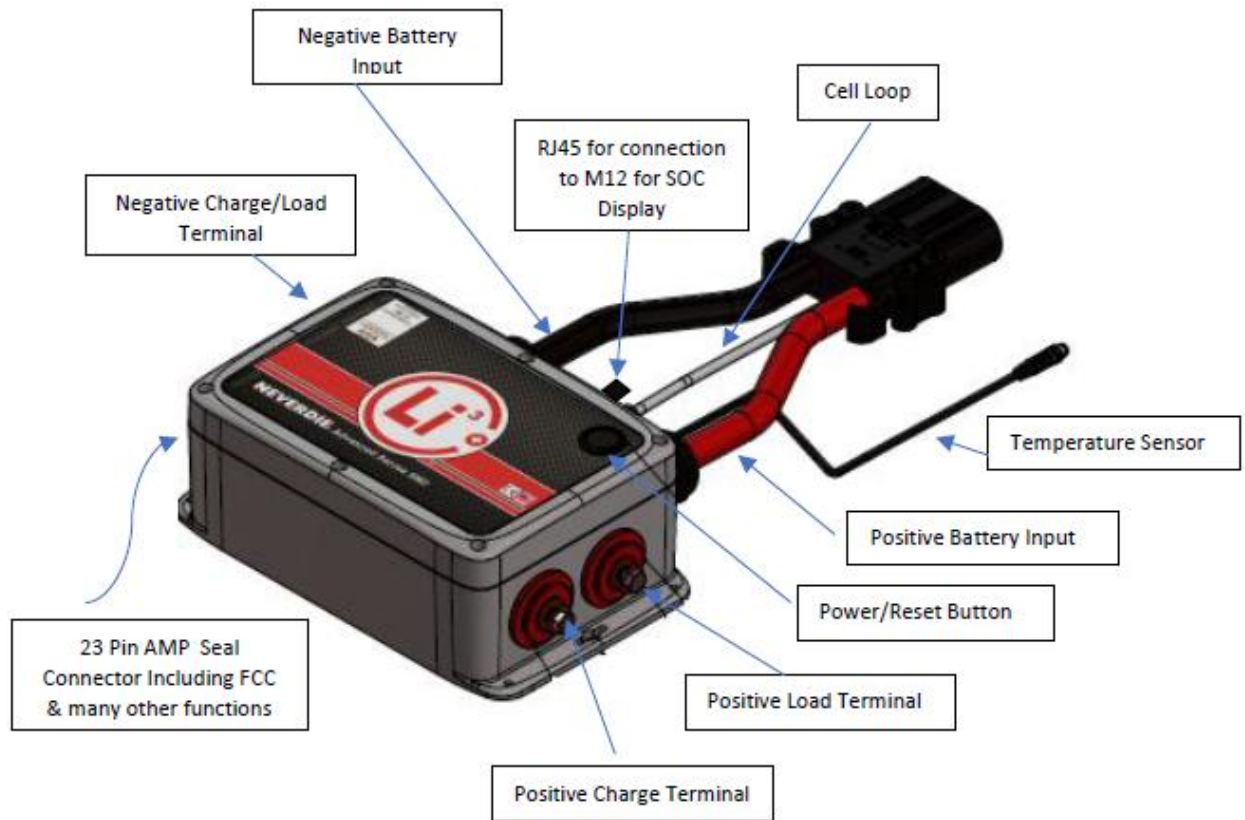# OPE-Li3 ND-DC BMS & Battery Module Operation & Installation Guide
December 2021

OPE-Li3 ND-DC BMS & Battery Module Operation & Installation

This manual is specifically for the OPE-Li3 system and not other Lithionics systems. OceanPlanet Energy is responsible for all information contained in this manual

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Positive Charge Terminal

Definition of Terms:

BMS- Battery Management System

Dual-Channel BMS- The OPE-Li3 BMS has separate channels for charging and for loads. This allows for specific settings on each channel that facilitate safe and smooth operation

LVC- Low Voltage Cutoff: the point at which the BMS isolates the batteries from loads due to a low pack voltage

Full LVC- Full Low Voltage Cutoff: the point at which the BMS isolates the batteries from both the loads and the charge sources due to a low cell voltage

HVC- High Voltage Cutoff: the point at which the BMS isolates the batteries from charging sources due to a high pack voltage

Full HVC- Full High Voltage Cutoff: the point at which the BMS isolates the batteries from both the charge sources and the loads due to a high cell voltage

RVC- Reserve Voltage Cutoff: a cutoff point above the LVC, at approximately 90% DOD

(Depth of Discharge) at which the BMS isolates the battery only from the load bus.

Cell Loop Monitor- A continuous circuit loop running through each battery pack's cells and the BMS. The cell loop will open (alerting the BMS) if any single cell is outside of acceptable parameters

SCC- Short Circuit Cutoff: if voltage dips below the SCC value of 7V (12V bank), 14V (24V Bank) both channels deactivate immediately, bypassing the delay timer. The channels will stay deactivated for 1 minute or until the power button is pushed.

Power Button- A momentary push-button (non-latching) round stainless steel button on top of BMS unit (available with wire leads to allow remote operation). When pressed and held for 1s, the BMS will power up and the relays are activated. If the BMS is already on (in the case of an RVC or HVC), pressing the button will activate the relays. When it is pressed and held for 5s, the BMS and the SOC monitor turn off, the relays deactivated, and the system is put into Sleep Mode

Sleep mode- Both the charge and load channels are deactivated and the BMS is off.

FCC- Field & Charge Control- circuit allowing the BMS to shut down the alternator or other charge sources just before the charge channel deactivates during an HVC-2A max

Operation of BMS Flow Chart & Overview:

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

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

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. 2s later, the BMS will isolate the charge sources on the charge bus.

Is the errant charge source continuing to be a problem?

Yes   **No**

Normal operation: Battery operates between 12.0V & 14.8V

If any cell ≥ 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 ≥ 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≤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.

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 or 10% SOC, the BMS will trigger a Reserve Voltage Cutoff (RVC) & isolate the

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

Charge Source Present?

Yes   **No**

Battery V ≤ 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 ≤ 2.5V, BMS triggers Full LVC & isolates both charge & load bus (sleep mode) Begin recharging immediately to prevent battery damage

If V≥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

OPE-Li3 Never Die Dual Channel BMS

The OPE-Li3 Dual Channel BMS configuration has a separate load bus/channel and charge bus/channel. This means that each channel pathway can be isolated individually. This allows more graceful operation during HVC and LVC events allowing more continuous system operation and the opportunity for a problem to be resolved early and with minimal impact.

HVC & Full HVC

At the cell level, the balancing electronics will begin shunting near the top end of a charge cycle to balance the battery cells. If the pack V reaches 14.8V (12V bank) or 29.6V (24V bank), the BMS will trigger an HVC after 10 seconds and deactivate the charge channel. In this case the load channel is still activated and the batteries can continue to be used. If any individual cell reaches 3.75V or the sensors detect excessive heat, the BMS will trigger a "Full HVC" and deactivate the load and charge channels. At this point, the battery will go into sleep mode.

Recovery after Full HVC

Make sure all charge sources are off. Press Power button for 1s. The BMS will turn back on and activate the load channel. If the battery does not stay on, that means the cells are still overcharged and will continue slow self-discharge until a safe operating voltage is reached. In this case, wait, and try to turn it on again later. As the battery discharges, when the pack voltage reaches 13.6V (12V bank) or 27.2V (24V bank), the charge channel will activate.

FCC operation

The FCC is set to open the circuit as soon as the pack voltage reaches the HVC setting of 14.8V (12V bank) or 29.6V (24V bank) and 2 seconds before the charge channel is deactivated in order to protect the battery, alternator & any other sensitive charge sources as well as deactivate any charge source that is on the load bus such as an inverter/charger. Additionally, the FCC will open 2s prior to the deactivation of the charge channel in any other case. For any charge source present, it must be determined if it is able to tolerate a cutoff from the battery while charging. If any source cannot tolerate a cutoff, it should be controlled by the FCC via a relay. Any circuit through the FCC should be limited/fused to 2A.

RVC & LVC

When discharging the battery, if the pack voltage reaches 12.0V (12V bank) or 24.0V (for 24V bank) or 10% SOC (whichever comes first) for over 30s, the BMS will trigger an RVC (Reserve Voltage Cutoff), warning the user that there is little capacity left. This will

deactivate the load channel however the charge channel will stay active in order to allow charging. The user can press the Power Button for 1s to activate the load channel again allowing access to the 10% reserve capacity. NOTE THAT RECHARGING SHOULD BEGIN AS SOON AS POSSIBLE TO REDUCE RISK OF DISCHARGING TO A FULL LVC. If the pack voltage reaches 11.6V (12V pack) or 23.2V (24V pack), the BMS will trigger an LVC and deactivate the load channel. This cannot be overridden with the power button, except for a 30s period unless a charge source is detected in which case the load relay will stay connected. Furthermore, if any individual cell voltage reaches 2.5V, the BMS will trigger a "Full LVC" and deactivate both the charge and load channels, thus putting the battery into sleep mode.

Recovery after Full LVC

After a Full LVC (both the charge and load channels are deactivated), the battery must be immediately recharged. The battery could be damaged if left in deeply discharged state for a long time. The charge relay will only close if a 13.2V charge source is detected on the system side of the charge relay. Once charging and the battery reaches 12.4V (12V bank) or 24.8 (24V bank), the load channel will activate.

Over-Current Protection

The BMS will limit maximum continuous charge or discharge current to enforce safe operating limits as stated in the battery datasheet. If the BMS detects continuous current above preset limit for over 2 minutes, the BMS will open the contactors to prevent potentially unsafe operation. The standard is 300A and it is 400A for the "high current" model.

Temperature Based Cutoff

When the temperature inside the battery goes below or above preset safe limits, the BMS will open the contactors to prevent further use of the battery until temperature returns under safe limits. Different temperature limits are enforced for charging and discharging due to nature of Lithium chemistry. Discharge safe range is -4°F/-20°C to 131°F/55°C. Charge safe range is 32°F/0°C to 113°F/55°C. If the battery temp reaches 113°F/55°C while charging, the BMS will trigger a high temp alarm and open the charge contactor after 20s. The contactor will automatically reconnect when the temperature goes below 109 °F/43°C. If the battery temp reaches 131°F/55°C while discharging, the BMS will trigger a high temp alarm and open the load contactor instantly. The contactor will automatically reconnect when the temperature goes below 127°F/53°C.

Cell Balancing

As the battery nears the end of charge cycle, the cells enter the upper knee of the charge curve, where voltage rise becomes faster and faster. Due to individual manufacturing differences between cells, some cells reach this stage earlier than others, causing voltage imbalances between cells. To counteract this process the BMS performs cell balancing by slightly discharging the higher voltage cells (a process called "shunting"), this allows the lower cells time to catch up. The shunting will occur when any cell is >3.65V or there is more than a 30mV differential between any two cells.

Power ON/OFF Button

(See NeverDie® BMS Switch Operation User Guide)

The Power button is used to turn the BMS on and off. Start the battery by pressing the Power button for 1s which will turn on the BMS and activate the relays. If all systems are within parameters, you will hear the channel relays inside the BMS unit activate and the battery will begin operating. The battery & BMS can be turned off by pressing and holding the Power button for 5s. If the battery is to remain unused for a period longer than 1 week, power-down the entire system and electronics by pressing the power switch for 5s. This greatly reduces the quiescent or parasitic drain of power from the BMS computers and sensors.

It is also used to activate and deactivate the relays. It is used to bring the battery back online after any BMS trigger event including HVC, LVC or cell loop faults. Press and hold the Power button for 1s to activate the relays. After an RVC event, the Power button will turn the BMS on and activate the load channel in order to access the 10-15% reserve battery capacity. After an LVC event, the Power button will reconnect the charge channel for 30s during which time a charge source must be seen in order to keep the load channel activated. For an HVC event, the Power button will turn the BMS on to activate the load channel. If the cells are shunting, yet still outside of acceptable parameters, the BMS will turn off and deactivate the load channel again. The battery can be reset later.

Receiving & Storing the batteries

Batteries shipped via Air Cargo domestically or internationally are required to ship at 30% state of charge as of April 1, 2016. The customer is required to have on-hand, at the time of receipt, the appropriate Lithionics Battery-approved charging hardware and methods in place to balance modules and bring the system to a higher state of charge. This prevents "natural self-discharging" from causing the batteries to become over-discharged.

Batteries shipped via overland carrier methods will be shipped at 100% state of charge. The customer is requested to either begin use (cycling) of the batteries within 3 months of the date of shipment, or, cycle the batteries fully once per month to prevent calendar aging of cells held at full charge. See additional notes in the above paragraph.

STORAGE PROCEDURES

Storage		
Storage Temperature & Humidity Range	< 1 Month	-4~95°F (-20~35°C), 45~75%RH
	< 3 Months	14~86°F (-10~30°C), 45~75%RH
Long Term Storage	If the battery needs to be stored for > 1 month the voltage should be 13.2V for a 12V battery (or 3.3V x number of cells* in series) (~50%SOC), and stored at the recommended storage specifications shown above. Additionally, the battery needs at least one charge-discharge-recharge to 50% SOC cycle every three months.	
Self-discharge rate	≤3% per month	

Typical storage scenario < 1 month:
1. Fully charge the battery.
2. Turn the battery **OFF** by the On/Off/Storage switch.
3. Keep the battery in an environment according to the specifications shown above.

Typical storage scenario > 1 month, up to 3 months maximum:
1. Reduce the battery SOC to 3.3V/cell* which is 50% ±10% SOC.
   Note: See chart below for cell voltage calculation.
2. Turn the battery **OFF** via the On/Off/Storage switch.
3. Keep the battery in an environment according to the specifications shown above.
4. Every 3 months charge the battery to 100% SOC, then discharge the battery to LVC, then charge it back to 50% ±10% SOC.

Battery Voltage	*Number of Cells	~50% SOC Voltage
12V	4	13.2
16V	5	16.5
24V	8	26.4
36V	12	39.6
48V	15	49.5
51V	16	52.8
64V	20	66
76V	24	79.2
96V	30	99
102V	32	105.6
201V	63	207.9

Charging the battery

A full charge is recommended once a month to allow the BMS to balance the cells. The absorption period should be limited to 15-20 min. The recommended settings for charge sources are:

	12V bank	24V bank
Bulk	14.4V	28.8V
Float	13.4V	26.8V
Reset to bulk @	13.2-13.3V	26.4-26.6V

Note that adjustments to the settings above MAY be possible, but only with approval from Lithionics or OceanPlanet Energy. Please contact us with any questions.

Settings for 3rd Party Battery Monitors

The information that battery monitors will display can vary, depending on their input and SOC parameters. The suggested values below are good averages to start with, and the user may find that adjusting these slightly may be better for their own application. For example, the Charge Efficiency Factor could vary based on environmental conditions and charge rate. The parameters for "fully charged" may be adjusted slightly depending on whether the user would like the device to "sync" to "100%" SOC a bit sooner, rather than wait for that last 1-2%. Note that all monitors must be synced regularly to maintain accuracy.

Battery Type: **Other (unless "lithium" is a choice)**
Battery Capacity: **Total rated capacity of bank being monitored**
Nominal Voltage: **12V, 24, etc.** (Note that "real" nominal V is higher- ex. 12.8V, 26.6V, etc.)
Equalization: **NOT SUPPORTED**
Temp. Coeff: **Use 0%**
Peukerts: **1.04; If that input is not possible, use 1.0**
Charge Eff. Factor (CEF): **97%**
Fully Charged Voltage: **14.2, 28.4**, **etc**
Fully Charged Current: **6% (this is a % of the battery capacity)**
Fully Charged Time: **1 min**
Batt. Temp.: **Don't use battery temp compensation**. Setting doesn't matter.
Time Remaining Floor: **Typically we use 30% (70% discharged)**

Notes About Wind Generators

Most wind generators don't have controllers programmable for multi stage charging in which case they should be programmed to the float voltage (13.4V/26.8V). They are typically PM motors so they are hard to turn off, which is why most of them need a load dump so that they always have a place to send current. This means that any time the batteries are being charged above the float voltage, all current from the wind generator is being wasted unless it is going to some other load (heating water, etc). Because a wind

generator could sustain damage from a sudden battery cutoff while charging, it should be wired to the FCC along with the alternators & any other sensitive charge sources as discussed above.

Some of the windgen controllers have a cutoff switch that can be configured for the BMS FCC to control. Some windgen controllers actually CAN take a cutoff from the battery in an emergency, however it is not recommended to do this frequently.   For each windgen brand, the user will need to research the manual to see how (or if) they can be programmed, and shut down by the BMS.

Installation of the OPE-Li3 ND-DC battery system:

Precautions
Never under any circumstances make connections (temporary or permanent) directly to the batteries or to the "battery side" of the OPE-Li3 ND-DC BMS. All chargers and loads must be isolated from the batteries by the BMS unit which contains the charge and load channel relays. The BMS controls the relays and will activate them when all parameters are within limits for safe battery operation. Direct connections to the battery other than through the BMS will invalidate the warranty and may create a risk of battery damage or fire.

Never open up the battery module casing. It can be dangerous and cause damage to the battery. Never open the ND-DC BMS module for the same reasons.

Protect the battery and BMS from water. Install the BMS in the vicinity of the battery in a location where it will not be exposed to water. The modules are water resistant to splashes from any direction but if they are sitting in water or exposed to large amounts of splashing, the warranty will be void.

Do not short circuit the battery. If both terminals are exposed, take care with tools, etc. to avoid a short circuit across the terminals which would lead to serious battery and component damage.

Except for the GTR (which can be installed on it's side), the battery modules need to be installed upright. They must be securely strapped, lashed, or fastened in their compartment regardless of orientation.
Proper fusing and cable sizing as per ABYC recommendations are the responsibility of the installer. If the conductor from the battery to the connector or from the connector to the BMS cannot be properly fused in the distance available, it must be sheathed or contained in conduit as per ABYC standards.

ALL charging sources must be programmable and/or programmed to required settings
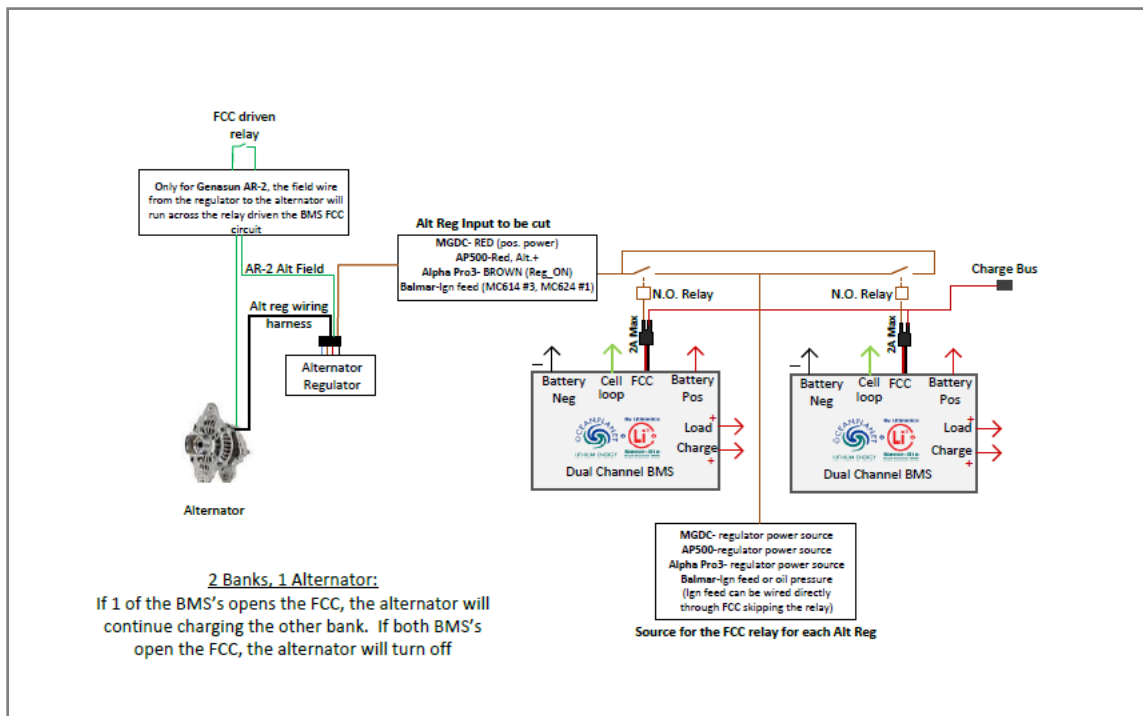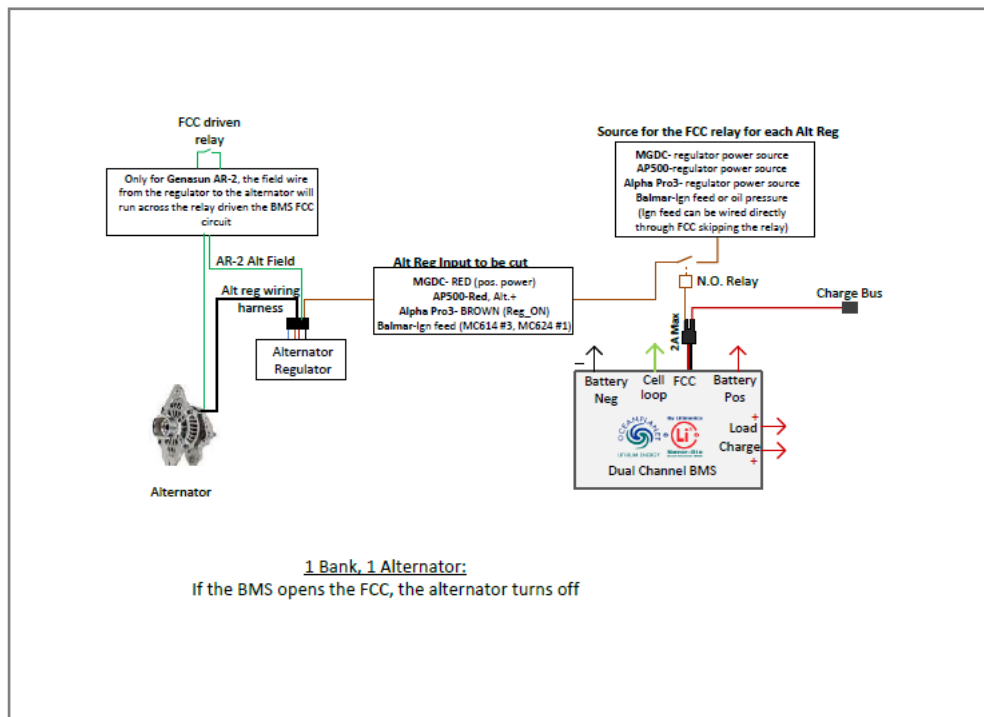
Electrical Installation (See FCC installation & full system diagrams below for reference)
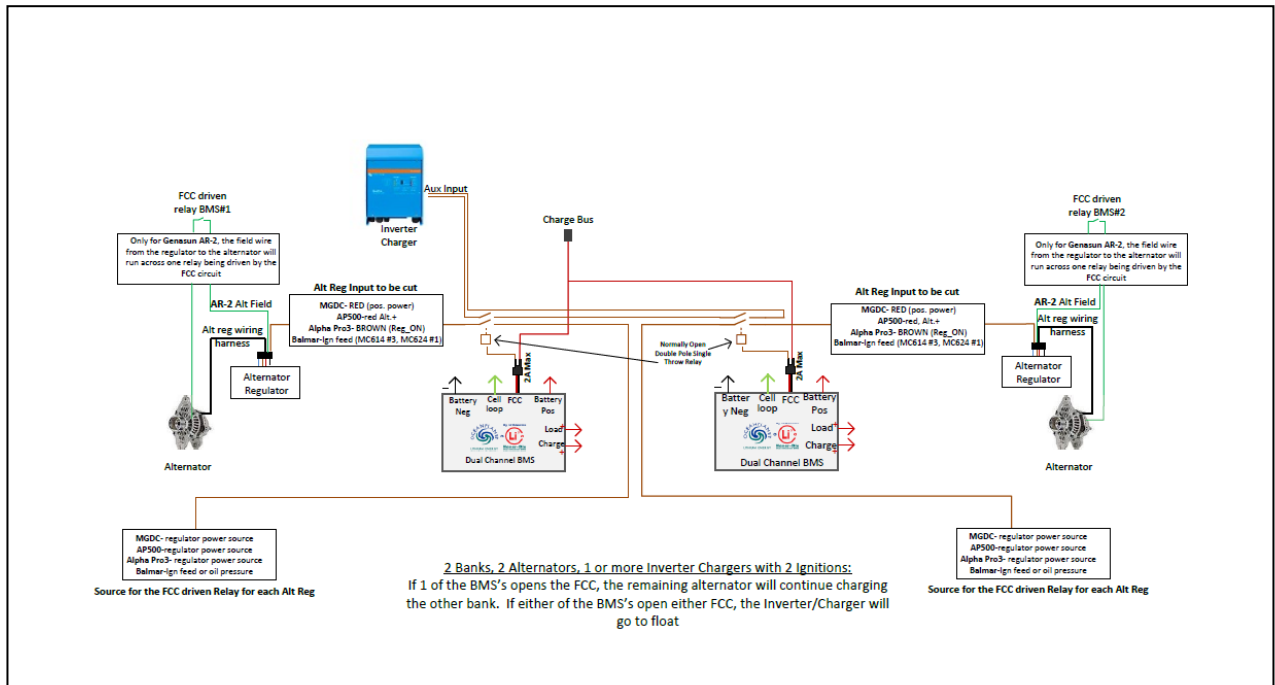
- ***Note: the cell loop, negative reference, positive battery input, & negative battery input could all be part of the Euro-DIN or SBC connector with the "plug & play" version. If that is the case, disregard the following three bullet points
- Connect both legs of the green cell loop wire from the battery module to both legs of the green cell loop wire at the BMS unit.
- Connect the negative reference wire (black #18 AWG) from the battery to the same on the BMS unit.
- Connect the positive battery input connector on the BMS to the positive battery cable.
- Follow all ABYC recommendations for installation. Note that a Class T fuse may need to be installed on the positive battery cable if conditions warrant. If there is not enough length to be fused, the cable must be sheathed or protected as per ABYC standards. If you are unfamiliar with the ABYC recommendations please consult a qualified marine electrician.
- Run one of the following through a relay driven by the FCC: the power to the alternator regulator, the ignition input, or the field output wire. See diagram below.
- Follow all applicable standards for wire sizing and fusing for all connections to both the positive charge and load terminals on the BMS, all branch circuits, the negative battery terminal, etc.
- Refer to the SOC Meter User Guide or see below for details on connecting and using the optional state of charge meter.
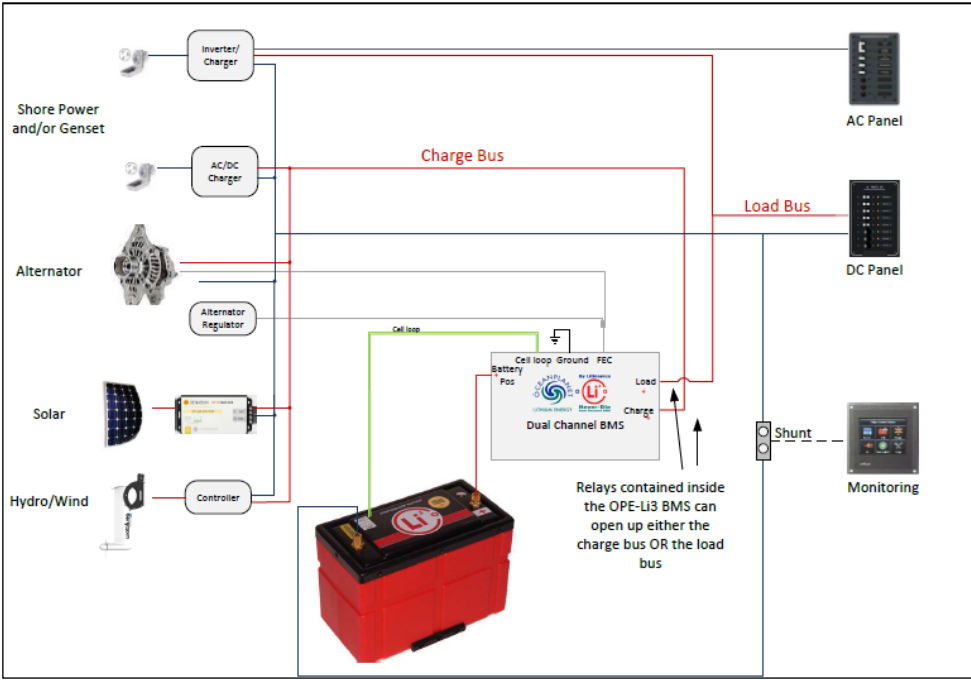
BMS Configuration & Troubleshooting

- For all details to related to configuring the BMS, troubleshooting the BMS, the AMPseal harness, or the BT app, see the Lithionics "Never-Die Advanced BMS User Guide"

FCC Installation Diagrams

FCC driven relay

Only for Genasun AR-2, the field wire from the regulator to the alternator will run across the relay driven the BMS FCC circuit

Source for the FCC relay for each Alt Reg

MGDC- regulator power source
AP500-regulator power source
Alpha Pro3- regulator power source
Balmar-Ign feed or oil pressure
(Ign feed can be wired directly through FCC skipping the relay)

AR-2 Alt Field

Alt reg wiring harness

Alt Reg Input to be cut
MGDC- RED (pos. power)
AP500-Red, Alt.+
Alpha Pro3- BROWN (Reg_ON)
Balmar-Ign feed (MC614 #3, MC624 #1)

N.O. Relay

Charge Bus

Alternator Regulator

2A Max

Battery Neg | Cell loop | FCC | Battery Pos

Load +
Charge +

Dual Channel BMS

Alternator

1 Bank, 1 Alternator:
If the BMS opens the FCC, the alternator turns off

FCC driven relay

Only for Genasun AR-2, the field wire from the regulator to the alternator will run across the relay driven the BMS FCC circuit

Alt Reg Input to be cut
MGDC- RED (pos. power)
AP500-Red, Alt.+
Alpha Pro3- BROWN (Reg_ON)
Balmar-Ign feed (MC614 #3, MC624 #1)

AR-2 Alt Field

Alt reg wiring harness

N.O. Relay

N.O. Relay

Charge Bus

Alternator Regulator

2A Max

2A Max

Battery Neg | Cell loop | FCC | Battery Pos

Battery Neg | Cell loop | FCC | Battery Pos

Load +
Charge +

Load +
Charge +

Dual Channel BMS

Dual Channel BMS

Alternator

2 Banks, 1 Alternator:
If 1 of the BMS's opens the FCC, the alternator will continue charging the other bank. If both BMS's open the FCC, the alternator will turn off

MGDC- regulator power source
AP500-regulator power source
Alpha Pro3- regulator power source
Balmar-Ign feed or oil pressure
(Ign feed can be wired directly through FCC skipping the relay)

Source for the FCC relay for each Alt Reg

FCC driven relay BMS#1

Only for Genasun AR-2, the field wire from the regulator to the alternator will run across one relay being driven by the FCC circuit

AR-2 Alt Field

Alt reg wiring harness

Alternator Regulator

Alternator

MGDC- regulator power source
AP500-regulator power source
Alpha Pro3- regulator power source
Balmar-Ign feed or oil pressure

Source for the FCC driven Relay for each Alt Reg

Inverter Charger

Aux Input

Charge Bus

Alt Reg Input to be cut
MGDC- RED (pos. power)
AP500-red Alt.+
Alpha Pro3- BROWN (Reg_ON)
Balmar-Ign feed (MC614 #3, MC624 #1)

Normally Open
Double Pole Single
Throw Relay

2A Max

Battery Neg | Cell loop | FCC | Battery Pos

Load
Charge

Dual Channel BMS

Batter y Neg | Cell loop | FCC | Battery Pos

2A Max

Load
Charge

Dual Channel BMS

Alt Reg Input to be cut
MGDC- RED (pos. power)
AP500-red, Alt.+
Alpha Pro3- BROWN (Reg_ON)
Balmar-Ign feed (MC614 #3, MC624 #1)

FCC driven relay BMS#2

Only for Genasun AR-2, the field wire from the regulator to the alternator will run across one relay being driven by the FCC circuit

AR-2 Alt Field

Alt reg wiring harness

Alternator Regulator

Alternator

MGDC- regulator power source
AP500-regulator power source
Alpha Pro3- regulator power source
Balmar-Ign feed or oil pressure

Source for the FCC driven Relay for each Alt Reg

2 Banks, 2 Alternators, 1 or more Inverter Chargers with 2 Ignitions:
If 1 of the BMS's opens the FCC, the remaining alternator will continue charging the other bank. If either of the BMS's open either FCC, the Inverter/Charger will go to float
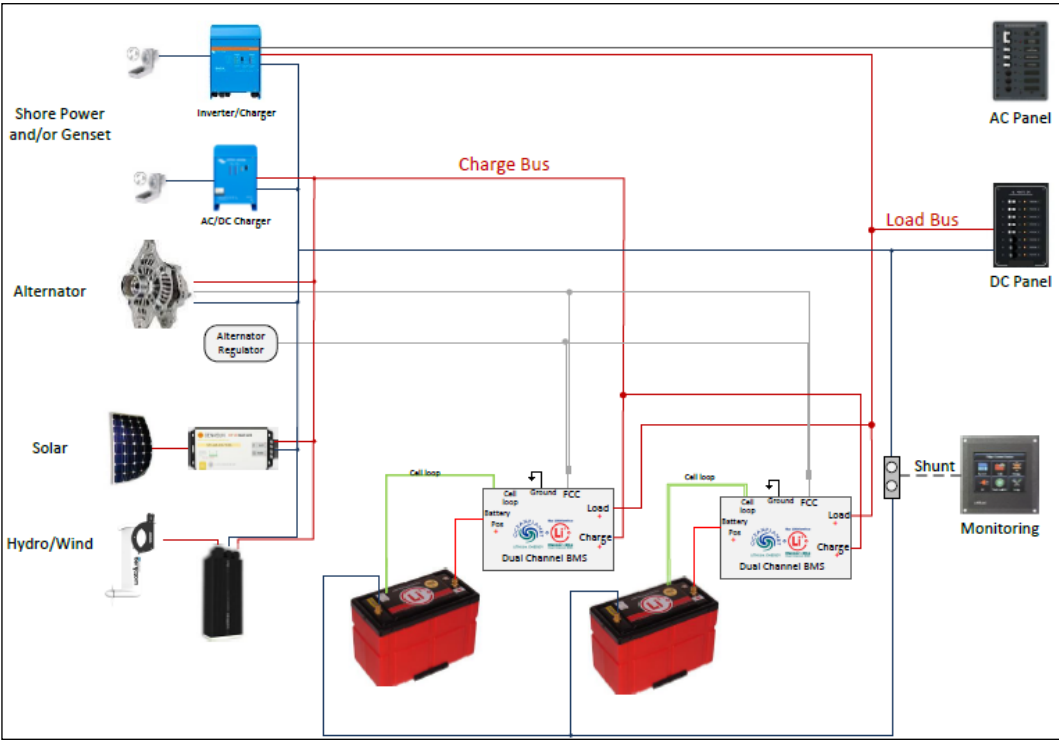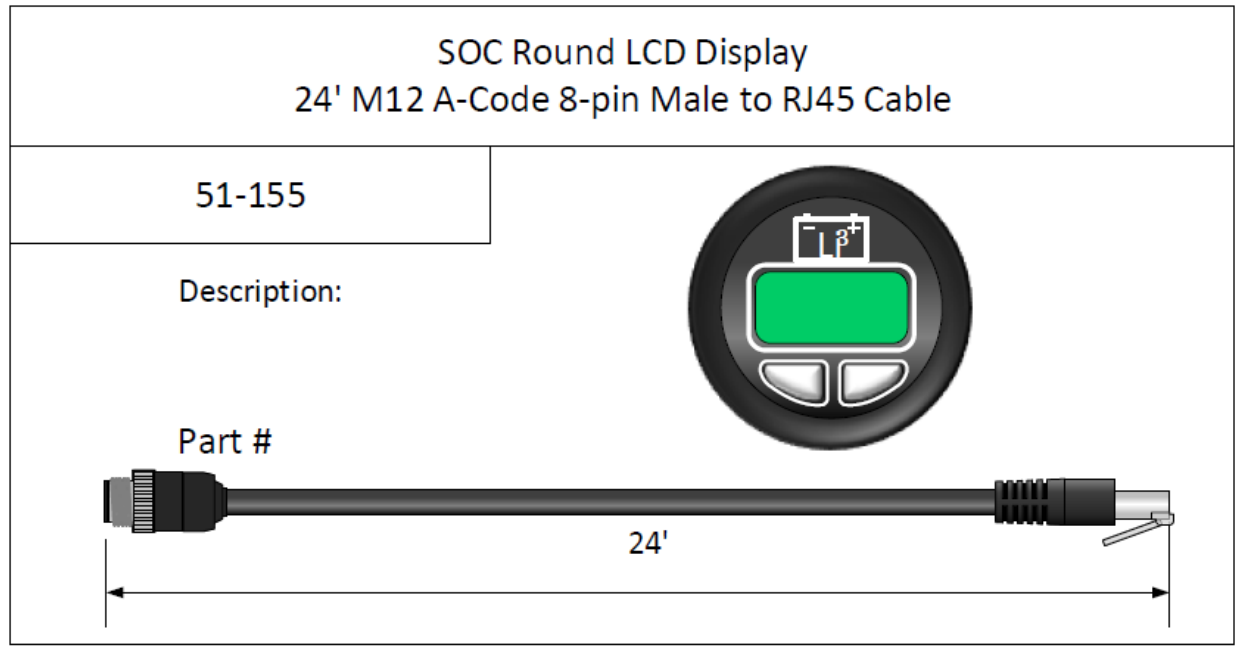
Example Full System Diagrams

System Diagram- 1 Battery & 1 BMS

System Diagram- 2 Batteries & 2 BMS's

Electrical Installation of SOC meter

Included with Display:

SOC Round LCD Display
24' M12 A-Code 8-pin Male to RJ45 Cable

51-155

Description:

Part #

24'

Upon unpacking, please inspect all components for obvious damage due to shipping.

1. Begin by turning off ALL connected devices both charging and discharging. Turn the battery and BMS off.

2. Connect the RJ45 connector to the top of the BMS & the M12 connector to the back of the SOC display.

3. Power the battery & BMS unit back on.

4. To calibrate the SoC Meter to the batteries actual SOC%, please allow 1 charge cycle to complete fully.

5. See the SOC meter user guide for more info on the operation & programming of the display.

Warranty Quick Summary
******See the complete warranty document for full details*******

OPE-Li3 External NeverDie® Battery Management System (BMS)

    A. Lithionics Battery warrants each NeverDie®-branded BMS sold by Lithionics Battery or any of its authorized distributors or dealers in the United States and Canada to be free from defects in material and workmanship for a period of 3 years or 6,000 cycles. In the event that the NeverDie® BMS is not repairable, a new unit shall be offered for sale at a price prorated for benefit-of-use.

Not Covered by Any Warranty:

- Capacitive Inrush Currents and Transient Voltage. Please ensure your inverters, motor controllers, etc. have the proper pre-charge functions. If your hardware does not provide its own capacitor pre-charging, please inform Lithionics Battery and add our Advanced Series Pre-Charge Function hardware-software options.
- Use a current-limiting fuse or set your motor-controller to current-limit the discharge rates to prevent over "amp'ing" the battery.
- Inductive Kickback. If you suspect your system creates this type of transient voltage, please advise of this and features to control this will be added and qualified.

Section 2. Power Modules and Batteries with Internal NeverDie® BMS
(The Lithionics Battery NeverDie® User Guide Provides Further Warranty Conditions for the Installation. Please Obtain a Copy.)

A. Lithionics Battery LLC ("Manufacturer") warrants each NeverDie® -branded batteries with a BMS sold by Lithionics Battery or any of its authorized distributors or dealers in the United States and Canada* ("Battery") to be free of defects in material and workmanship for a period of 36 months or 2,000 full depth-of-discharge cycles*, prorated-for-benefit-of-use. This is based on the original date stamp (serial number) on the battery (see Note 1.) Within the Warranty period, subject to the exclusions listed below, Manufacturer will repair the Battery free of charge if replacement is necessary due to defects in material or workmanship. The customer is required to pay for the return-shipping costs for batteries suspected to have a manufacturing defect. In the event that a defect is found, Lithionics Battery will pay for non-expedited return shipping costs only. Lithionics Battery will not reimburse the customer for the cost to ship the batteries from the using location to its location in Clearwater, Florida, USA. This Limited Warranty is limited to the original purchaser of the Battery, and is not transferable to any other person or entity. It is not valid if removed from the original installation and transferred to use in a different application or new installation.

*A discharge cycle is considered to valid if the capacity measured during the discharge cycle is within 70% of the SOIC or State-Of-Initial-Capacity. I.E., a 100 amp hour battery is deemed usable if its capacity is 70 usable amp hours up until the 2,200th cycle. Cycle life is higher when the depth of discharge is reduced via opportunity-charging cycles.

B. Between the 12th month and the 36th month of use, in the event that the battery cannot be re-built and the battery must be replaced by a new battery, a prorated credit shall be issued to the purchaser.

C. Warranty Validation Requirements:

1. The customer is required to show proof at the time of installation that the battery was installed per the approved Lithionics Battery wiring diagram. This may be done by the use of photographs.

2. The customer is required to confirm that it is operating the battery within specified and agreed-upon charging and discharging limits.

3. Warranties are not valid in the event that the customer chooses to use a non-approved charging method or algorithm. Be sure to get approvals in advance of your installation to prevent your warranty from being voided.

> **Note:**
>
> The installer must fill out the **Chargers Setup Checklist** and send to support@oceanplanetenergy.com along with photos (if available) of the installation.
>
> Manufacturer has no obligation under this Limited Warranty with respect to any defects or damage to the Battery arising from any abuse or mishandling of the Battery, or from any one or more of the following:

• Neglect, such damage from shipping, loose wiring, or rusted or corroded hardware including transient voltage/current events such as capacitive inrush or inductive kickback.

• Misapplied or improperly sized Battery for the application;

• Batteries exposed to excessive heat or cold temperatures;

• Batteries that are stored in winter freezing conditions;

• Batteries that have had the manufacturing date codes destroyed or tampered with;

• Breakage, freezing, explosion, fire, wreckage, overcharging, undercharging, over discharging, charging or installing in reverse polarity, improper maintenance, melted and or broken terminals, improper storage, immersion in water or any other fluid.

• Failure to properly install the Battery.

• Batteries that have been stored in an insufficiently-charged state and returned in an over-discharged state.

• Batteries that have been stored for more than 6 months without use.

• Batteries that have been charged by a non-approved charger.

• Lithionics Battery provides a warranty to the **original purchaser** that this battery is free of defects in material and workmanship for the number of months indicated for each battery. (See Attached) LITHIONICS BATTERY WARRANTY IS LIMITED TO REPLACEMENT OF THE BATTERY ACCORDING TO THE TERMS AND CONDITIONS. LITHIONICS BATTERY WILL NOT BE RESPONSIBLE FOR ANY EXPENSES FOR INSTALLATION, TOWING, ELECTRICAL SYSTEM TESTS, CHARGING A BATTERY, LOSS OF TIME, OR OTHER EXPENSES WHICH WOULD BE CONSIDERED AS INCIDENTAL OR CONSEQUENTIAL DAMAGES. THIS WARRANTY DOES NOT COVER DAMAGE TO THE BATTERY CAUSED BY ABUSE OR NEGLECT, A FAILURE TO KEEP THE BATTERY PROPERLY CHARGED OR MAINTAINED, FIRE, COLLISION, EXPLOSION, FREEZING, THEFT, OR OVERCHARGING.

• The warranty applies to the original purchaser of-record and is not transferable.

• This warranty shall be IN LIEU OF any other warranty, express or implied, including but not limited to, any implied warranty of MERCHANTABILITY or fitness for a particular purpose.

• Note: Some states do not allow limitations on how long an implied warranty lasts, or exclusion or limitation of incidental or consequential damages, so the above limitations may not apply to you. This warranty gives you specific legal rights, and you may have other legal rights, which may vary from state to state.