LITHIONICS BATTERY®

LITHIUM-ION IRON PHOSPHATE BATTERY SYSTEMS

Frequently Asked Questions:

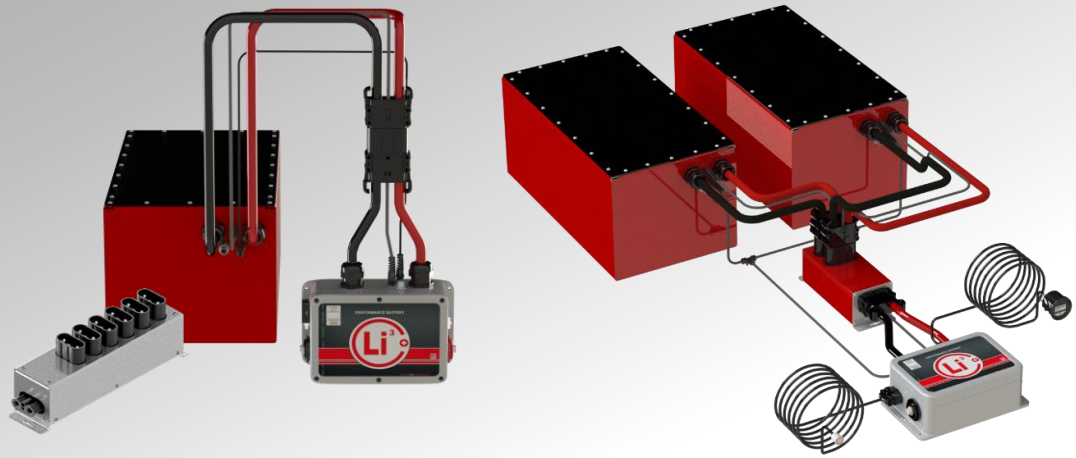
What are the differences between an internal BMS (battery management system) and an external BMS?

Lithionics Battery designs and manufactures 2 types of BMS: Internal (Compact Series) and External (Advanced Series). "Batteries" have a Compact BMS located inside them, whereas "Modules" use the Advanced BMS connected to them externally.

NOTE: SEE COMPARISON CHART AND TECHNICAL DATA ON PG.2

Shown Below: Internal BMS Battery Examples

Shown Below: Modular-Expandable External BMS Plug & Play Systems



LITHIONICS BATTERY®	COMPACT SERIES	ADVANCED SERIES	Notes: Advantages or Rating
Attribute	**Internal**	**External**	**Both Internal and External Series are UL1973/UL991/UL1998 Listed**
Disconnect Device Type	Electronic Switch	Contactor Switch	Contactor is larger and more robust. Electronic Switch (MOSFET technology) is more compact and fits inside a battery case
Continuous Rating, Nominal/Recommended	160A	350A	Advantage: Advanced BMS
Surge Current	600A	2000A	Advantage: Advanced BMS
Parallel Connectivity	Yes	Yes	Advantage: Advanced BMS, as a single Advanced BMS controls up to 6 battery modules, and provides single-point metering. Parallel connected Compact/Internal BMS units will have 1 APP instance per battery.
Overall System Space Requirements	Advantage		Compact Seris BMS consumes less space
Voltage Range	12V only	12-300V	Advanced BMS can be configured to any voltage. High voltage electronic switch BMS's have high failure rates under load and lower power ratings.
Series Connection to Make Higher Voltages	No	Yes	Asian imports permit series connecting of 12 volt BMS units to make 24, 36 and 48 volts, however, over time they are highly prone to failure of the electronic switches when run at higher voltages than 12V
Parallel Connection to Make Higher Capacities	No	Yes	Advanced BMS modules available in 12, 24 and 48 volts, therefore, when parallel connecting modules at the same voltages, true redundancy, and, natural balancing occurs. Series connection of Compact BMS batteries eventually leads to inter-battery imbalance in states of charge and WILL require balance charging frequently at the 12 volt level, thus you are adding an imporant maintenance requirement.
IonBus (CANbus data backbone) compatible?	Yes	Yes	Lithionics IonBus creates a total system with EDGE CONNECTORS for adding 3rd party devices such as Wakespeed and Victron Inverter telemetry.
Field Servicable? Mean-Time-Between-Failures?	No	Yes	Replace a BMS in the field vs shipping an entire Compact BMS-Battery/HazMat. 99% of any issues are in the BMS, not the cells. Advanced BMS is more robust and fault-tolerant
BMS Cost Advantage	Advantage		Compact BMS is lower in power delivery but lower in cost
Single vs Multipoint Metering		Advantage	Advanced BMS is a single data stream regardless of system size. Compactl BMS in parallel creates multiple data streams to manage
Plug and Play, No Tools, No Cables		Advantage	The Lithionics Battery Plug-and-Play configuration comes pre-cabled for fast and easy expansion of capacity by consumers vs by dealers