



Lithionics Battery®

Installation Manual

*Model Numbers

GT12V450A-F24
GT12V600A-F24
GT24V300A-F24
GT48V150A-F24
GT51V150A-F24
GT12V600A-F27
GT24V300A-F27
GT48V150A-F27
GT51V150A-F27

*See Table 1 for model number details



NEVERDIE®
LITHIUM•ELECTRONICS • LITHIONICS BATTERY

MiniBMS®
TECHNOLOGY

OptoLoop®
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1. Important Safety Guidelines

1.1 General

- Completely read this manual before attempting installation. Save this installation manual for future use.
- The information in this manual is intended for qualified personnel. Qualified personnel have training, knowledge, and experience in:
 - Installing electrical equipment.
 - Applying all applicable local and national installation codes.
 - Analyzing and reducing the hazards involved in performing electrical work.
 - Selecting and using Personal Protective Equipment-(PPE).
- The GT Series Lithium Battery System contains no user-serviceable parts. Do not disassemble any components.
- **CAUTION** - Electrolyte vapor hazard
 - The battery module may emit a *non-toxic* pressurized electrolyte vapor if punctured.
 - Electrolyte vapor may cause temporary minor breathing congestion.
 - Electrolyte vapor can decrease visibility in closed compartments.
- **DANGER** - Short circuit hazard
 - Do not operate the system if it has received a sharp blow, been dropped, has cracks or openings in the enclosure.
 - Do not disassemble any part of the system. Internal cells remain charged after all power is disconnected.
 - Always turn off equipment connected to the system in addition to turning OFF the Power switch provided on the system to isolate the batteries from other electrical circuits, before performing any repairs or maintenance on the system.
 - Do not operate the system with damaged or substandard wiring.
 - Always use proper wire sizes to connect the system to inverters, chargers or other equipment.

- Voltage is present at the connector and output terminals. Always ensure that the BMS output terminals have the insulated protective boots in place.
- Always use crimped connections to connect to the output terminals.

- If the system is operated outside of its limits or used in combination with non-original components without authorization, the warranty is void.

1.2 Transportation

- The Battery Module and BMS is tested to comply with UN DOT 38.3, the testing requirement for Lithium Batteries per Part III; of the UN Recommendations on the TRANSPORT OF DANGEROUS GOODS (Manual of Tests and Criteria, Fifth revised edition); [ST/SG/AC.10/11/Rev.5].
- **CAUTION** – The GT Series Lithium Battery Module is heavy.
 - Use two people to lift and mount the unit.
 - Always use proper lifting techniques during installation to prevent injury.
 - Do not lift the battery module by its power or signal wires as they will become damaged.

1.3 Disposal

- This Battery Module contains no mercury and is RoHS Compliant. Please consult your local municipal authority for proper disposal.

2. System Specifications

2.1 System Operating Specifications

Table 1

System Model:	GT12V-450A-F24-CTRL300 External BMS	GT12V-600A-F24-CTRL300 External BMS	GT24V-300A-F24-CTRL300 External BMS	GT48V-150A-F24-CTRL300 External BMS	GT51V-150A-F24-CTRL300 External BMS	GT12V-600A-F27-CTRL300 Internal BMS	GT24V-300A-F27-CTRL300 Internal BMS	GT48V-150A-F27-CTRL300 Internal BMS	GT51V-150A-F27-CTRL300 Internal BMS
Capacity	450Ah	600Ah	300Ah	150Ah	150Ah	600Ah	300Ah	150Ah	
Nominal Voltage	12.8V		25.6V	48.0V	51.2V	12.8V	25.6V	48.0V	51.2V
Standard Full Charging Voltage	14.6V		29.2V	54.75V	58.4V	14.6V	29.2V	54.75V	58.4V
Overcharge Voltage Protection	14.8V		29.6V	55.5V	59.2V	14.8V	29.6V	55.5V	59.2V
Over-discharge Voltage Protection:	11.6V		23.2V	43.5V	46.4V	11.6V	23.2V	43.5V	46.4V
Standard Charging Current	150A (C/3)	200A (C/3)	100A (C/3)	50A (C/3)		200A (C/3)	100A (C/3)	50A (C/3)	
End of Charging Current	15A (C/30)	20A (C/30)	10A (C/30)	5A (C/30)		20A (C/30)	10A (C/30)	5A (C/30)	
Maximum Charging Current	300A @ 14.2V Charging Voltage		288A @ 28.4V Charging Voltage	144A @ 53.25V Charging Voltage	144A @ 56.8V Charging Voltage	300A @ 14.2V Charging Voltage	288A @ 28.4V Charging Voltage	144A @ 53.25V Charging Voltage	144A @ 56.8V Charging Voltage
Maximum Charging Voltage	14.6V @ Standard Charging Current		29.2V @ Standard Charging Current	54.75V @ Standard Charging Current	58.4V @ Standard Charging Current	14.6V @ Standard Charging Current	29.2V @ Standard Charging Current	54.75V @ Standard Charging Current	58.4V @ Standard Charging Current
Standard Discharging Current/Load	300A		288A	144A		300A	288A	144A	
Maximum Discharge Current/Load	300A								
Maximum Charging Temperature Range*	32 to 113°F (0 to 45°C)								
Maximum Discharging Temperature Range*	-4 to 131°F (-20 to 55°C)								
Module Dimensions	24.0" x 13.0" x 11.1" (610 x 330 x 282mm)					27.0" x 16.0" x 11.1" (686 x 406 x 282mm)			
Module Weight**	128lb (58.0kg)	160lb (72.5kg)	160lb (72.5kg)	152lb (68.9kg)	160lb (72.5kg)	178lb (80.7kg)		170lb (77.1kg)	178lb (80.7kg)
BMS Case Dimensions***	11.25" x 6.96" x 4.1" (286 x 177 x 104mm)					N/A			
BMS Weight**	7.7lb (3.5kg)					N/A			

* Maximum charging and discharging rates apply depending upon the ambient temperature and duty cycle of the system. UL1973 tests of maximum charge and discharge current were performed at 25°C/77°F.

** Does not include 4/0 power cable's weight as its length varies per application.

*** Does not include 4/0 power cable, main power connector, or terminals. Please see <http://www.lithionicsbattery.com> for dimensions.

2.2 Manufacturing Date Code Format

- MMDDYYYY001
 - MM: Month of Manufacture
 - DD: Day of that Month
 - YYYY: Year of Manufacture
 - 001: Sequence of Battery Produced on That Day
- Example: 01012018001 = manufactured on January 1, 2018 and it was the first battery produced on that day.

3. System Installation

3.1 Short Circuit Protection

- The battery system must be protected by a 300A fast acting DC fuse, for example:
 - Fuse: Eaton DFJ-300
 - Fuse holder: Eaton JM60400-1CR-1
 - Fuse placement must be directly after the positive power terminal on the BMS. (Fuse placement may be controlled by other industry standards such as ABYC or RVIA.)

3.2 Battery Module and NeverDIE BMS Unit Environment and Mounting orientation

- The Battery Module and BMS Unit should be mounted in an environment that does not receive direct sunlight, pressurized water or road debris.
- To avoid power interruption, your installation may need to consider controlling the ambient operating temperature.
- Mount the Battery Module in an upright position, i.e. black lid faces up.
 - Other orientations are NOT permitted and will void the warranty.
- The BMS Unit can be mounted in any orientation as long as all its features are accessible.
- Ensure that the BMS Unit is located in close proximity to the Battery Module so that all connectors can be mated in the following steps.

3.3 Temperature Sensor Connector

- The temperature sensor cable and connector exiting the battery module must be connected to the BMS.
- Connect the two M8 circular connectors together by first aligning their pins and pressing them together, then rotate the securing nuts until they stop snugly.
- **Do not use the temperature probe from the inverter-charger manufacturer.**

3.4 Main Power Connector

- The battery module has a large black female main power connector that must be inserted into the BMS' male main power connector. This is the connector with the large 4/0 red and black wires and single small gauge gray cable.
- Align the connectors and insert them together.

- Use 2 zip ties to bind the connectors together so that they may not separate during use.

3.5 NeverDIE BMS Unit Power Terminals

- Connect the BMS Unit Power Terminals to your DC bus, both Positive (Red) and negative (Black).
 - Use correctly sized wire conductors for the application.
 - Torque to 80 INCH pounds
 - Never stack ring terminals.
 - Never place the stainless-steel washer between the Power Terminal and ring terminal lug (see Figure 1 on Page 7).

3.6 Pressure Vent

- It is recommended to install a ventilation hose onto the pressure vent barb when the Battery Module is in a location with poor ventilation.
 - The hose should direct the gases to the atmosphere.

3.7 BMS Unit I/O Connector

- Some systems have a rectangular I/O connector to extend BMS Unit features remotely such as remote Power/Reset switch, LED indicator, or serial datalogging. Be sure to connect the I/O connector if so equipped.

3.8 Initial Charge Cycle

- Initially the system must be FULLY charged once to calibrate the BMS Unit to the Battery Module. Please read and follow the next section to perform this.

NOTE – For further system operation please refer to the *Advanced Series User Guide* available at: <http://www.lithionicsbattery.com/user-guides/>

4. System Operation

4.1 Powering the System On

- Press the momentary Power/Reset switch for 1 second.
 - The switch will illuminate once power is enabled.
 - You may notice an audible “thunk” noise of the internal contactor switching on.
 - Check that there is voltage at the Power Terminals with a voltmeter.

4.2 Powering the System Off

- Press and hold the momentary Power/Reset switch for 3 seconds.
 - The switch will cease to illuminate once power is disabled.
 - You may notice an audible “thunk” noise of the internal contactor switching off.
 - Check that there is 0V at the output terminals with a voltmeter.

4.2 Charging

- The charging device(s) connected to the GT Series Lithium Battery System must be programmed as per Table 1.
- Charging may be performed at any time the system is powered On.
 - **NOTE** - The GT Series Lithium Battery System will disconnect power if the voltage, amperage, or temperature limits are exceeded during charging.
 - Only use a Lithionics Battery approved charging source. Please contact Lithionics Battery for charger approval.

4.3 Initial Charging Cycle

- The initial charging cycle is required as it calibrates the NeverDIE BMS to the Battery Module for accurate State of Charge percentage (SoC) monitoring.
- During the initial charging cycle the system must reach a voltage level that is equal to the Standard Full Charging Voltage indicated in Table 1.

- Enable the charging device(s) so that they may complete a charge cycle. It is recommended to not have any discharge loads active during the initial charging cycle, especially towards the end of charging.

4.4 Discharging

- Discharging may be performed at any time the system is powered On.
 - **NOTE** - The GT Series Lithium Battery System will disconnect power if the voltage, amperage, or temperature limits are exceeded during discharging.
- The NeverDIE feature allows the system to have a “reserve” amount of energy left in the battery. Once the system is discharged to 12.0V or 10% State of Charge (SoC), whichever comes first, power will be disabled to leave a “reserve” amount of energy still left in the battery.
- To enable the remaining reserve energy of the system, press the momentary Power/Reset switch for 1 second.
 - **NOTE** - Once the reserve range is enabled the battery should be charged as soon as possible.
 - **WARNING** - If the reserve energy is used and the battery module is left in a deeply discharged state without immediate charging, the battery module will become permanently damaged.

4.4 System Storage Procedure

- Storing your battery at the correct specifications is important as it keeps the battery in the healthiest state possible for the fastest deployment when needed.
- If the GT Series Lithium Battery System will not be in use for greater than 2 weeks, it is recommended to enable system storage.
- Storage mode is simply a fully charged system in the Powered Off state.
- To enable System Storage:
 - Perform a full charge cycle, ensure that the System voltage reaches the Standard Full Charging Voltage indicated in Table 1.
 - Power off the System, press and hold the Power/Reset switch for 3 seconds. Check that the switch is no longer illuminated. Check

that there is 0V at the Power Terminals with a voltmeter.

- **4.4 System Storage Procedure (continued)**

Table 2

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 > 3 months 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 six months.	
Self-discharge rate	≤3% per month	

Typical storage scenario < 3 months:

1. Fully charge the battery.
2. Turn the battery **OFF** by the Power/Reset switch.
3. Store the battery in an environment according to the specifications shown above.

Typical storage scenario > 3 months:

1. Reduce the battery SOC to 3.3V/cell which is 50% ±10% SOC.
NOTE - See table 3 below for voltage calculation.
2. Turn the battery **OFF** via the Power/Reset switch.
3. Store the battery in an environment according to the specifications shown above.
4. Every 6 months charge the battery to 100% SOC, then discharge the battery to LVC, then charge it back to 50% ±10% SOC.

Table 3

Battery Voltage	Number of Cells	~50% SOC Voltage
12V	4	13.2
24V	8	26.4
48V	15	49.5
51V	16	52.8

Figure 1: System Example

