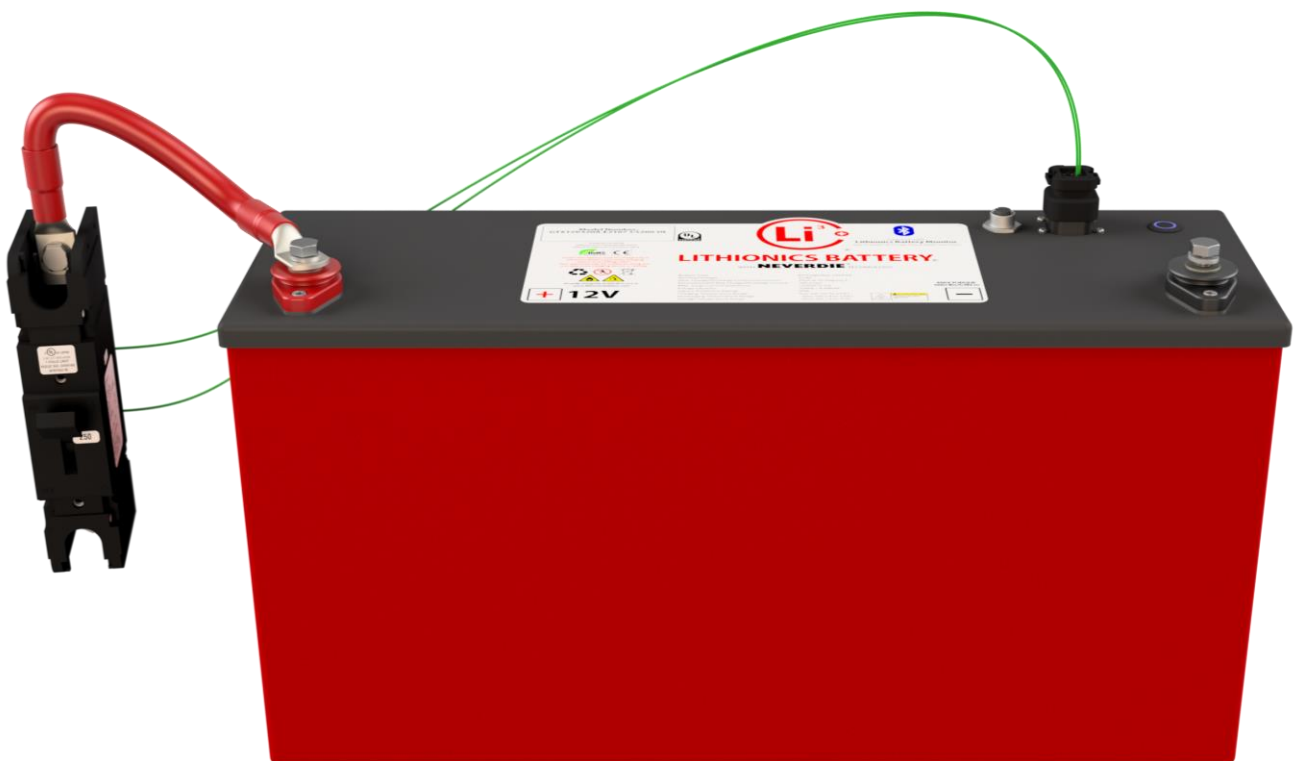




Lithionics Battery®

GTX12V320A-E2107-CS200-UL Installation Manual

NeverDie® Compact Series 200 Internal BMS



Important Safety Guidelines

This guide contains important safety instructions for the GTX12V320A-E2107-CS200-UL Battery System that must be followed during installation procedures. Completely read this manual and become familiar with all system components before attempting installation. **Save this installation manual for future reference.**

The following symbols and messages are used to identify potential hazards or to clarify the procedure.



The **CAUTION** symbol indicates a hazardous situation which, if not avoided, could result in moderate or minor injury.



The **DANGER** symbol indicates a hazardous situation which, if not avoided, will result in death or serious injury.

Safety Information

1. **Before using the Battery System, read all instructions and cautionary markings on the unit, the BMS, and all appropriate sections of this manual.**
2. The information in this manual is intended for qualified personnel. Qualified personnel have training, knowledge, and experience in:
 - Selecting and using Personal Protective Equipment (PPE).
 - Installing electrical equipment.
 - Applying all applicable local and national installation codes.
 - Analyzing and reducing the hazards involved in performing electrical work.
3. Use of accessories not recommended or sold by the manufacturer may result in a risk of fire, electric shock, or injury to persons.
4. To avoid a risk of fire and electric shock, make sure that existing wiring is in good condition and that wire is not undersized. Do not operate the battery system with damaged or substandard wiring.
5. Do not operate the battery system if it has been damaged in any way.
6. This unit does not have any user-serviceable parts. Do not disassemble the battery system except where noted for connecting wiring and cabling. Attempting to service the unit yourself may result in a risk of electrical shock or fire. Internal cells remain charged after all power is disconnected.
7. To reduce the chance of short-circuits, always use insulated tools when installing or working with this equipment.
8. Remove personal metal items such as rings, bracelets, necklaces, and watches when working with electrical equipment.



HAZARD OF ELECTROLYTE VAPOR

- The battery 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.



HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices.
- Always turn OFF all 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 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.
- 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.
- Always use a properly rated voltage sensing device to confirm all circuits are de-energized.



HAZARD OF HEAVY EQUIPMENT

- Use two people to lift and mount the battery.
- Always use proper lifting techniques during installation to prevent injury.
- Do not lift the battery by its power or signal wires as they will become damaged.

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

Do not expose this unit to direct sunlight, external heat sources or submersion in any liquid. This product is designed for closed compartment use only. Damage to any part of the battery system caused from direct sunlight, external heat sources or submersion in any liquid will not be covered by the product warranty.

The Battery 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].

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

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Safety

- All electrical work shall be performed in accordance with local and national electrical codes.
- Assume that voltage is present at the battery terminals, use insulated tools and gloves while working on the system.
- Always turn OFF equipment connected to the battery in addition to turning OFF the Power button on the battery to isolate it from other electrical circuits before performing any repairs, maintenance or diagnosis on the system.
- Always use proper wire sizes to connect the system to inverters, chargers, or other equipment.
- Always use crimped connections to connect to the battery terminals.
- Read and follow the inverter, charger, or other equipment manufacturers safety precautions prior to connecting the battery to that equipment.
- Always use charging equipment compatible with Lithium Iron Phosphate battery chemistry. See battery charging section below.

Overview

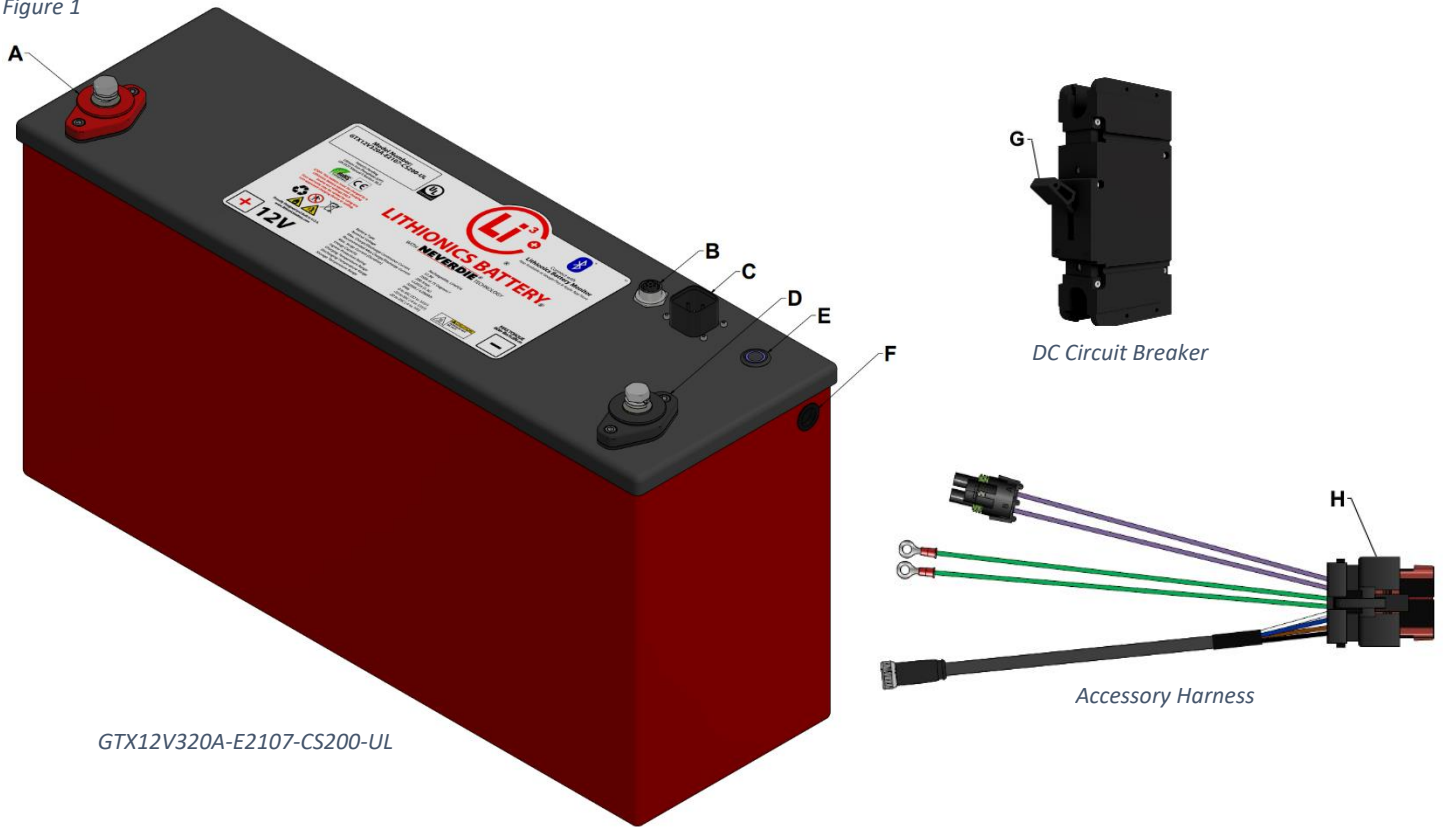
This Guide is intended to be used by qualified individuals in the installation of the GTX12V320A-E2107-CS200-UL battery system.

1. System Components

1.1 Components

- GTX12V320A-E2107-CS200-UL Battery
- Accessory Harness (#75-H1FCR-CS2-UL)
- DC Circuit Breaker (Sensata #JLE-1-41340-250)
- Protective DC Terminal Covers (not shown)
- Two Sets of M8x12x1.25mm Bolts and Lock Washers for the Terminals

Figure 1



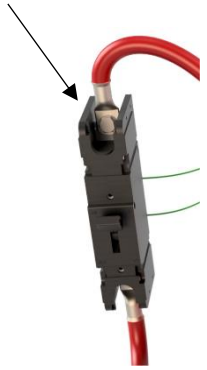
Reference	Feature	Description
A	Positive Terminal	Brass, Nickel Plated, M8-1.25 Thread, Torque to 108 - 132in-lbs (12.2 - 14.9N-m)
B	OptoLoop®+ Connector	RV-C CANBus Data, Remote Display Unit
C	Accessory Connector	FCC, Remote Power Button, Auxiliary DC Breaker
D	Negative Terminal	Brass, Nickel Plated, M8-1.25 Thread, Torque to 108 - 132in-lbs (12.2 - 14.9N-m)
E	Power Button	Power Button with Status Light
F	Vent	Pressure Balancing Vent
G	DC Circuit Breaker	Auxiliary DC Circuit Breaker for UL Compliance
H	Accessory Harness	Enables Integration of the Auxiliary DC Breaker, and optional Remote Power Button, and FCC

1.2 DC Circuit Breaker

The Auxiliary DC Breaker is one of the components required that enables the system to be a UL1973 Listed system. UL1973 Listing represents a high degree of safety tested by Underwriter Laboratories.

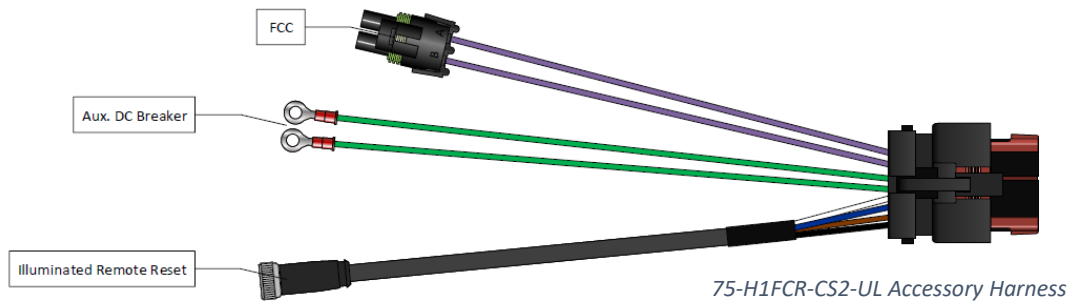
The battery operates by using the Auxiliary DC Breaker as a redundant disconnect device if the battery must be isolated from its loads. The Auxiliary DC Breaker replaces the need for a fuse and serves as a manual disconnect for storage and maintenance via its toggle switch.

The required and included DC breaker model is the Sensata Circuit Breaker #JLE-1-41340-250. The 2 control wires for this feature are wired via the battery accessory connector.



1.3 Accessory Harness

The Accessory Harness connects to the battery and is used to access the BMS's ported features. This allows implementation of the features shown below.



2. System Specifications

2.1 Operating Specifications

Table 1

System Model:	GTX12V320A-E2107-CS200-UL
Capacity	320Ah
Nominal Voltage	12.8V
Recommended Charging Voltage	14.4V
Maximum Charging Voltage	14.8V @ 200A
Over-discharge Voltage Protection	10.0V @ 230A
Standard Charging Current	150A
Maximum Charging Current	200A
Charge Termination Current	10A
Standard Discharging Current/Load	150A
Maximum Discharge Current/Load	230A
System Impedance at Terminals	$\leq 2.20\text{m}\Omega$
Ibf Bolted Fault Current at Nominal Voltage (N2)	5818A
Maximum Charging Temperature Range (N1)	32 to 131°F (0 to 55°C)
Maximum Discharging Temperature Range (N1)	-4 to 131°F (-20 to 55°C)
Battery Dimensions	20.3" x 6.4" x 10.0" (516 x 163 x 254mm)
Battery Weight	68lb (30.8kg)

Notes for Table 1:

(N1) 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.

(N2) "Bolted Fault Current" per NFPA-70E. See section 1.2 for details.

2.2 Arc Flash Energy Specifications

- An arc flash is the light and heat produced from an electric arc supplied with sufficient electrical energy to cause substantial damage, harm, fire, or injury.
 - An example of an arc flash event could be a direct short circuit caused by a metallic object such as a tool bridging between the positive and negative of an energized circuit.
 - Table 3 below quantifies the hazard level of arc flash energy that each battery system is capable of producing.

Per NFPA 70E D.5.1 "Maximum Power Method"

$I_{arc} = 0.5 \times I_{bf}$

$IEm = 0.01 \times V_{sys} \times I_{arc} \times T_{arc} / D^2$ (Arc Flash Energy)

Table 3

Tarc= 80mS circuit breaker clearing time	Configuration	Vsys	Impedance mΩ	Ibf, calc.	Iarc	IEm cal/cm ²	3x IEm cal/cm ²	Distance where IEm=1.2 (Arc Boundary), inches.	Hazard level
	GTX12V320A-E2107-CS200-UL	12.8	2.20	5818	2909	0.360	1.079	9	0

Hazard/risk classification as per NFPA 70E-2000

Category	Energy Level	Typical PPE Examples
0	N/A	Non-melting, flammable materials (e.g. untreated cotton, wool, rayon, etc.)
1	5 cal/cm ²	FR shirt and FR pants
2	8 cal/cm ²	Cotton underwear plus FR shirt & pants
3	25 cal/cm ²	Cotton underwear plus FR shirt & pants plus FR coverall
4	40 cal/cm ²	Cotton underwear plus FR shirt & pants plus double layer switching coat and pants

2.3 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: 01012020001 = manufactured on January 1, 2020 and it was the first battery produced on that day.

3. System Installation

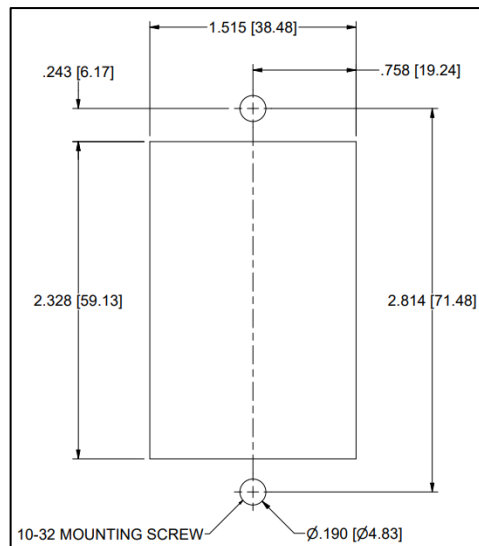
3.1 Circuit Breaker

- The battery system must be operated with the included circuit breaker. The model listed in this document was evaluated and tested by Underwriter Laboratories. The circuit breaker is to be provided downstream of the battery on the positive side before the load or supply in all cases. The use of any other circuit breaker voids the UL Listing of the model.
- The circuit breaker must be installed into an enclosure with a NEMA Type 4 rating or better, see **Reference 1** and **Figure 2** below.
- Use 10-32 screws to mount the circuit breaker into the enclosure. The screw depth into the circuit breaker (not including the enclosure material thickness) must be within .230 to .315 max. Torque the 10/32 screws between 10-12 Inch Pounds.

Reference 1 Enclosure Rating

Enclosure Rating	 National Electrical Manufacturers Association (NEMA Standard 250)	 Underwriters Laboratories, Inc. (UL50 and UL 508)
Type 4	Indoor or outdoor use to provide a degree of protection to personnel against access to hazardous parts; to provide a degree of protection of the equipment inside the enclosure against ingress of solid foreign objects (falling dirt and windblown dust); to provide a degree of protection with respect to harmful effects on the equipment due to the ingress of water (rain, sleet, snow, splashing water, and hose directed water); and that will be undamaged by the external formation of ice on the enclosure.	Indoor or outdoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment; to provide a degree of protection against falling dirt, rain, sleet, snow, windblown dust, splashing water, and hose-directed water; and that will be undamaged by the external formation of ice on the enclosure.

Figure 2
Panel Mounting Dimensions



3.2 Battery Environment and Mounting orientation

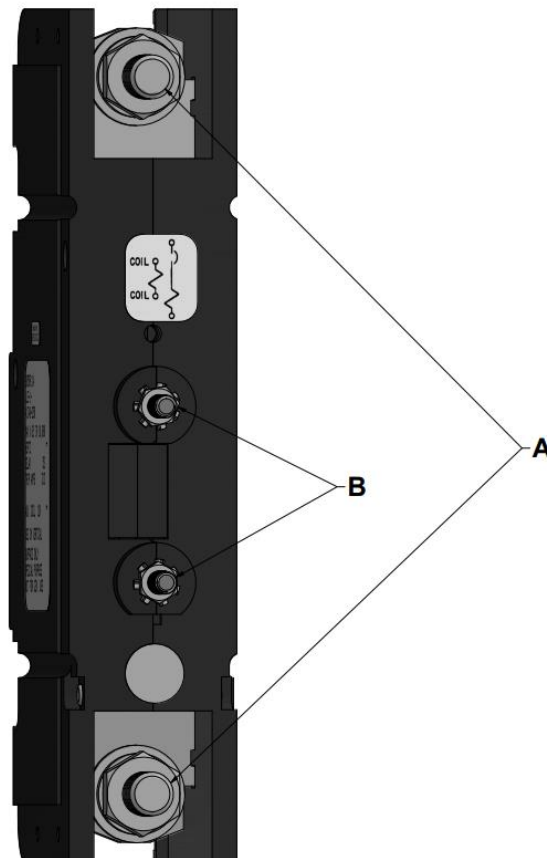
- The Battery needs to be mounted in an environment that does not receive direct sunlight, pressurized water or road debris.

- To avoid power interruption, your installation may need to consider controlling the ambient operating temperature.
- Mount the Battery in an upright position, i.e. black lid faces up.
 - Other orientations are NOT permitted and will void the warranty.

3.3 Battery Power Terminals (see Figure 5 for diagram)

- Connect the Battery Negative Terminal to your DC negative bus.
 - Use 2/0 wire and 2/0 3/8" stud ring terminals.
 - The battery negative wire is recommended to be 3ft or less.
 - Torque the battery negative power terminal to 108 - 132in-lbs (12.2 - 14.9N-m).
- Connect the Battery Positive Terminal to either one of the power terminals on the circuit breaker (Figure 3, A).
 - Use 2/0 wire and 2/0 3/8" stud ring terminals.
 - The battery positive wire (between battery and circuit breaker) is recommended to be 3ft or less.
 - Torque the battery positive power terminal to 108 - 132in-lbs (12.2 - 14.9N-m).
 - Torque the 3/8" nuts on the circuit breaker to 250-260 inch pounds.
 - Never stack ring terminals.
 - Never place the stainless-steel washer or lock-washer between the conductive power terminal and ring terminal lug (see Figure 4 on Page 12).
- Connect the opposite end circuit breaker power terminal to your DC positive bus.
 - Use 2/0 wire and 2/0 3/8" stud ring terminals.
 - The battery positive and negative wires are recommended to be 3ft or less.

Figure 3



3.4 Accessory Harness

- Connect the 2x #10 stud ring terminals to the Circuit Breaker (Figure 3, B).
 - Torque the 2x 5/16" nuts to 30-40 inch pounds.
- Connect the Accessory Harness to the Accessory Connector on the Battery (Figure 1, C).

3.5 Initial Charge Cycle

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

4. System Operation

4.1 Powering the System On

- Ensure that the circuit breaker lever is in the ON position.
- Short-press the Power switch for 1 second.
 - The switch will illuminate once power is enabled.
 - Check that there is voltage at the Power Terminals with a voltmeter.

4.2 Powering the System Off

- Long-press the Power switch for 3 seconds.
 - The switch will cease to illuminate once power is disabled.
 - Check that there is 0V at the output terminals with a voltmeter.
 - NOTE: During normal operation, the circuit breaker can be left in the ON position when powering off the battery. For maintenance/storage turn the circuit breaker OFF.

4.3 Charging

- The charging device(s) connected to the Lithium Battery System must be programmed as per Table 1.
- Charging may be performed at any time the system is powered On.
 - **NOTE** – The Battery 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.

4.4 Initial Charging Cycle

- The initial charging cycle is required as it calibrates the Battery 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.

4.5 Discharging

- Discharging may be performed at any time the system is powered On.
 - **NOTE** - The Battery 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, short-press the Power 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 is left in a deeply discharged state without immediate charging, the battery will become permanently damaged.

4.6 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 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, long-press the Power switch for 3 seconds. Check that the switch is no longer illuminated. Check that there is 0V at the Power Terminals with a voltmeter.

Table 3

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 (50%SOC), and stored at the recommended storage specifications shown above. Additionally, the battery needs at least one charge & discharge cycle every six months.	
Self-discharge rate	≤3% per month	

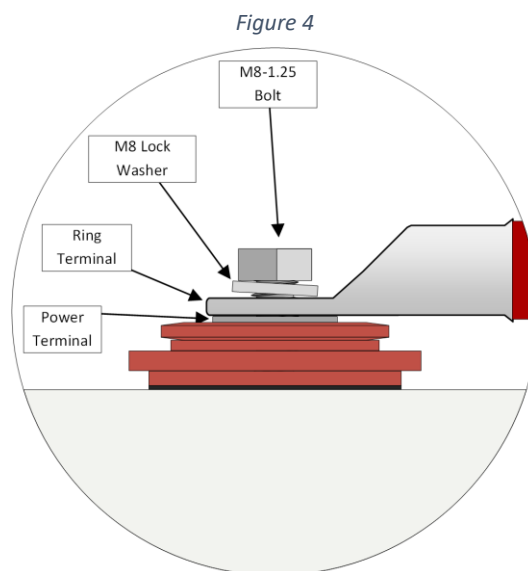
Storage conditions < 3 months:

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.

Storage conditions > 3 months:

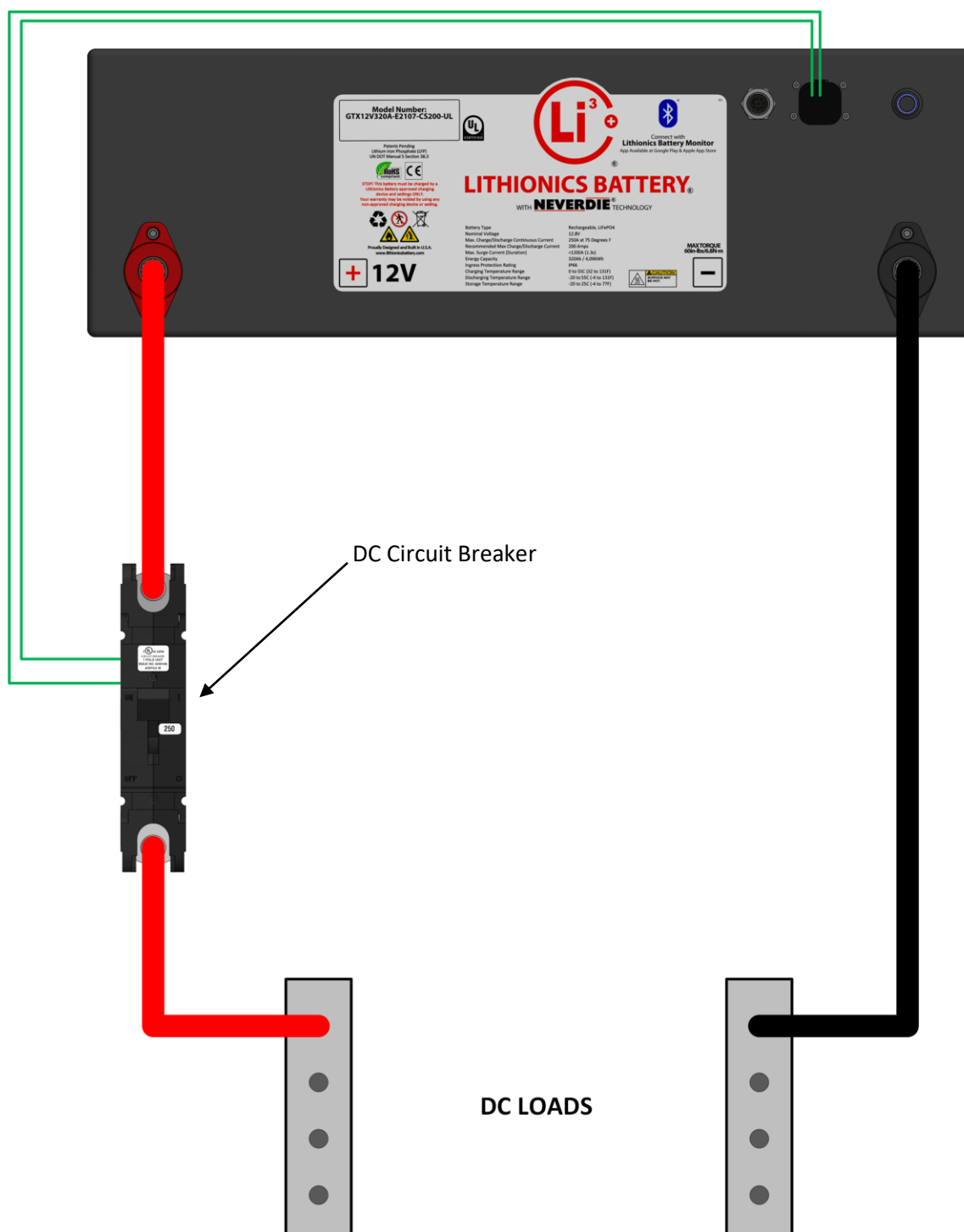
1. Reduce the battery SOC to 13.2V which is 50% ±10% SOC.
2. Turn the battery **OFF** via the Power/Reset switch.
3. Store the battery in an environment according to the specifications shown in table 3 above.
4. Every 6 months charge the battery to 100% SOC, then discharge the battery to LVC, then charge it to 50% ±10% SOC.

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



LITHIONICS BATTERY, 1770 CALUMET ST, CLEARWATER, FL 33765 USA
PH: 727.726.4204 | FAX: 727.797.8046 | WEB: LITHIONICSBATTERY.COM

Figure 5



Contact Information

For technical or warranty support please first contact the dealer where the system was purchased.

Additionally, for factory support please send an email with your battery's serial number to Support@LithionicsBattery.com.

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