



AIMS POWER™

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# Lithium Battery Pack 24V / 48V

## LFP24V400A / LFP48V200A

LiFePO4

Version 1.0



Read the instruction manual before installation and operation.

This manual is for the AIMS Power 24V/48V battery pack only and may not be copied or used in any other form.

The information included in this manual is based on the product at the time of publication. However, this manual is subject to change without prior notice. AIMS Power™ reserves the right to continuously improve the product. In addition, the illustrations in this manual are only meant to help explain system configuration concepts and installation instructions. Your system or application may be different than the examples used in this manual.

Read this entire document before installing or using this product. Failure to do so or to follow any of the instructions or warnings in this document may result in electrical shock, serious injury, or death. Damage to the battery may also occur, potentially rendering it inoperable.

After installation, the installer must explain the manual to the end-user and keep this manual nearby the product for future reference.

AIMS Power™ in no event shall be liable to anyone for collateral, incidental or consequential damages in connection with or arising out of the purchase or use of this product.

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# 1 Safety Information

## 1.1 Symbols



Caution. Risk of electric shock



Do not place or install near flammable or explosive materials



Install the product out of reach of children



Heavy! May cause serious injury to the back



Do not dispose of the product with household wastes



Recyclable



Disconnect the equipment before performing maintenance or repair



Observe precautions for handling electrostatic discharge sensitive devices



## 1.2 Safety Precautions

Operators and installers are responsible for familiarizing themselves with the contents of this manual and note all warnings before operating. The battery operates under possible dangerous voltages and AIMS Power strongly recommends all installations be performed by qualified and trained professionals.

Over-voltages or wrong wiring can damage the battery pack and cause deflagration, which can be extremely dangerous. Any damage to the case may lead to a leakage of electrolyte or flammable gas. Do not use if the case is damaged. Avoid installing the battery pack where flammable materials are stored. Do not install in places where explosive gas or chemicals are present. Check the surroundings and make sure all pipes and fittings don't contain dangerous gasses, chemicals or water.

**Battery Pack is not user serviceable.**

## 1.3 Battery Handling Guide

- ✓ Do not expose battery to open flame
- ✓ Do not place the battery near anything flammable. It may lead to fire or explosion.
- ✓ Do not expose or place near water sources like downspouts or sprinklers. Electric shock may occur.
- ✓ Do not store battery in a place exposed to direct sunlight
- ✓ Store and operate in a cool, dry, well ventilated area
- ✓ Store the battery on a flat surface
- ✓ Keep out of reach of children and animals
- ✓ Keep dust and dirt away from battery
- ✓ Do not disconnect, disassemble or repair by unqualified personnel. Service must be made by qualified personnel only.
- ✓ Do not drop, cut, puncture or penetrate the battery. It may cause leakage of electrolyte or fire.
- ✓ Do not touch if liquid is spilled on the product. There is a risk of electric shock. Use insulated gloves.
- ✓ Do not step on the battery. This could damage the battery.
- ✓ Do not place any foreign objects on the top of the battery
- ✓ Do not install the battery pack upside down
- ✓ Ensure polarity connection is correct. Do not reverse positive and negative wires to terminal block
- ✓ Do not attempt to charge or discharge a damaged battery
- ✓ Keep battery out of extreme weather elements. Store and operate indoors.
- ✓ Do not connect any AC conductors or photo-voltaic conductors directly to the battery pack
- ✓ Remove all jewelry during handling
- ✓ Do not smoke near the battery
- ✓ Do not use while on medication
- ✓ Do not drop tools or anything sharp on the battery. Shock can occur.

## 1.4 Response to Emergency Situations

The battery consists of multiple fused batteries and a sophisticated BMS that are designed to prevent hazards resulting from failure. However, we cannot guarantee their absolute safety if battery is mishandled. If a user happens to be exposed to internal materials of the battery cell due to damage to the outer casing, the following actions are recommended.

Inhalation: leave the contaminated area immediately and seek medical attention

Chemical eye burn: rinse eyes with running water for 15 minutes and seek medical attention

Contact with skin: wash the contacted area with soap thoroughly and seek medical attention

Ingestion: seek medical attention.

**Fire**

Use a foam extinguisher, CO<sub>2</sub>, ABC dry chemical, powdered graphite, copper powder or soda (sodium carbonate).

**1.5 Users / Operators**

- Users of this battery should understand the functional principles and operation of on-grid and off-grid (backup) systems
- Knowledge of the dangers and risks associated with installing and using electrical devices at possible dangerous voltages is the responsibility of the user not AIMS Power
- Electrical certification and/or training is strongly recommended



Make sure all power is off and wires are disconnected when maintaining/servicing the battery

**1.6 Recycling & Disposal**

The U.S. Environmental Protection Agency (EPA) does not regulate the disposal of batteries in small quantities; large quantities are regulated under the Universal rules of Hazardous Waste regulations (40 CFR PART 273). While there are no federal regulations for disposal of lithium batteries, individual states or localities have established their own guidelines for battery disposal and should be contacted for any disposal guidelines that they may have.

Batteries for commercial use should be in a discharged condition prior to their disposal. Generally, a primary lithium cell is considered to be discharged once its voltage reaches 2 volts or less under a current of C/100 (C is the rated capacity of the battery in ampere-hours).

Do not dispose with regular household trash. Contact local recycling or waste companies.

## 2 Product Introduction

### 2.1 General Information

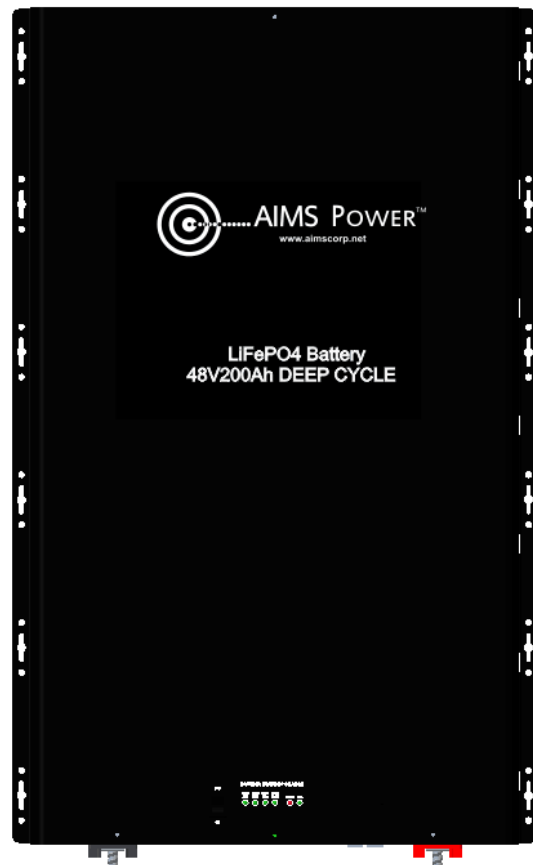
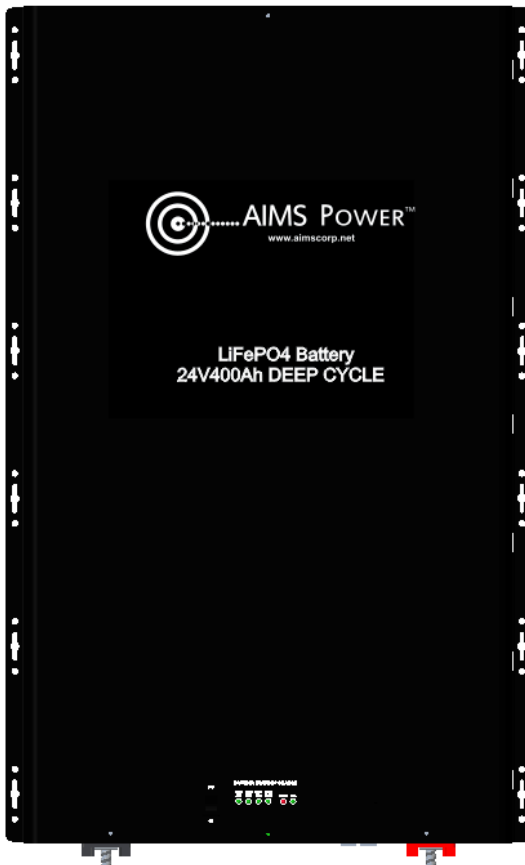
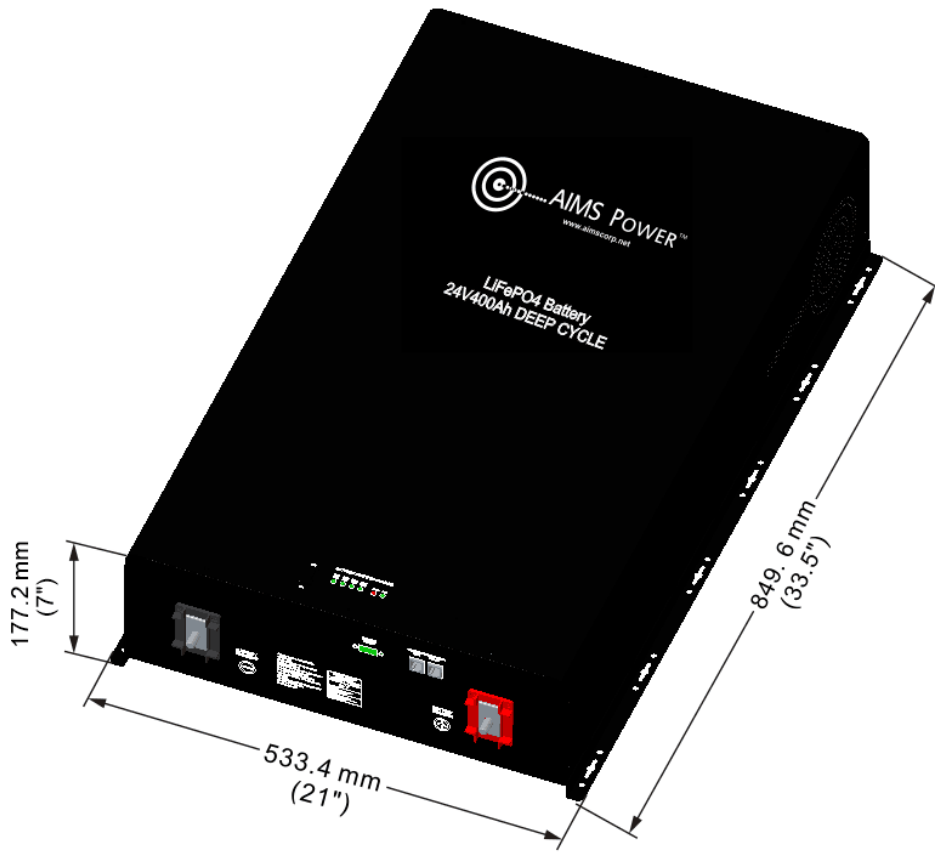
This battery is packed with power and delivers efficient power for battery systems requiring large amounts of power at 24 or 48 Volt. The AIMS Power 24V 400 amp or 48V 200 amp has large amp capacity in one battery and eliminates the need for multiple batteries without losing amperage. Compared to other battery technologies, this battery delivers large amounts of power, at half the weight and provides up to 8 times more cycles. Loaded with automatic safety features, such as a Battery Management System (BMS), which maintains individual cell integrity, low and high voltage protections and temperature management. The battery also uses automatic cell balancing, requires almost no maintenance and includes RS485 and CAN monitoring.

### 2.2 Product Features

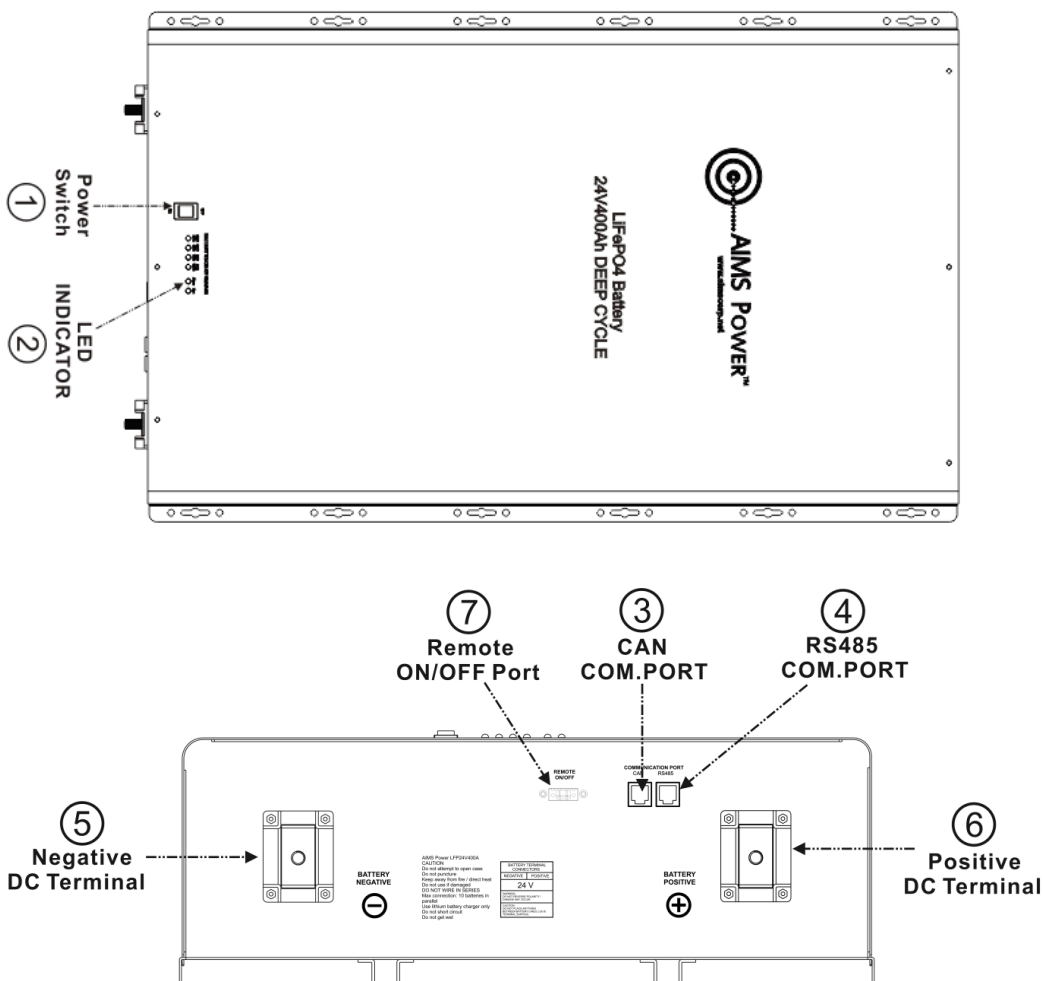
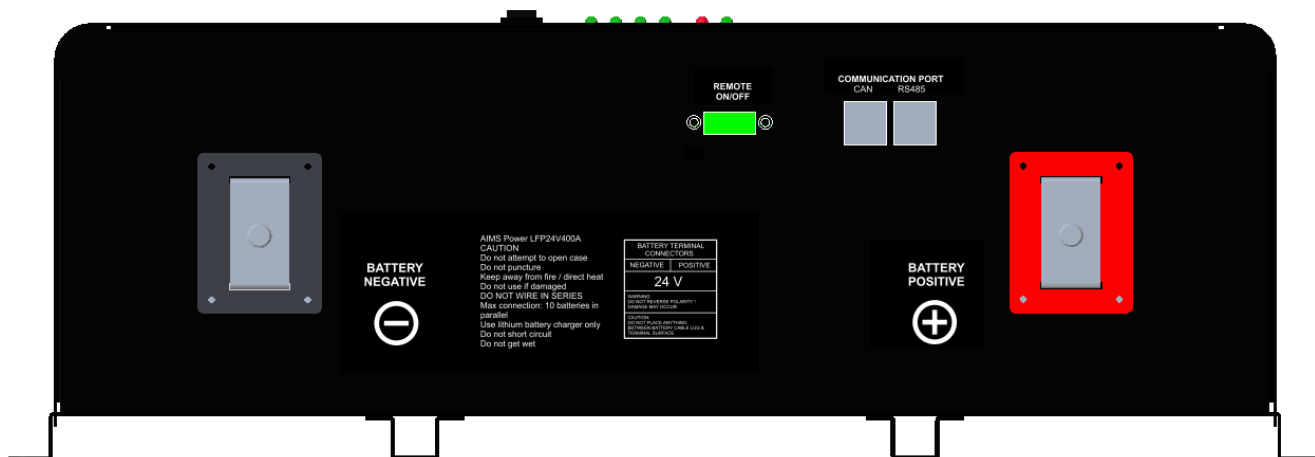
- ⦿ Up to 8 times more cycles compared to other battery technologies
- ⦿ 3500 cycles at 80% DoD, 6000 cycles at 60% DoD
- ⦿ Short circuit protection
- ⦿ Automatic low voltage shutdown
- ⦿ Over charge protection
- ⦿ Over discharge protection
- ⦿ Mount in any orientation
- ⦿ Multiple batteries: 10 batteries in parallel maximum
- ⦿ Automatic cell balancing
- ⦿ High output current for inverters
- ⦿ Battery status LED located on the front of the battery displays SOC percentage
- ⦿ RS485 & CAN ports
- ⦿ Power switch & Remote ON/OFF
- ⦿ Built in Battery Management System (BMS)
- ⦿ RoHS compliant
- ⦿ IP21
- ⦿ Reverse polarity protection (caution)
- ⦿ No venting or gassing
- ⦿ BMS temperature protection

**Battery Management System.** The built in BMS is a central hub inside the battery that maintains constant voltage, current and temperature. The BMS allows for maximum charging capacity for faster charging and efficient discharging. It also communicates with the desktop monitoring software via the RS485 or CAN port.

### 2.3 Mechanical Layout







**24V & 48V: Same design, dimensions, and features.**

## 2.4 Electrical Performance

<b>Battery Technology Specification</b>		
<b>Model</b>	<b>LFP24V400A</b>	<b>LFP48V200A</b>
Nominal Voltage	25.6Vdc	51.2Vdc
Battery Voltage	24V	48V
Battery Rated Capacity	400Ah	200Ah
Battery Rated Energy	10.24 kWh	10.24 kWh
Battery Cell Type	Prismatic Pouch	
Battery Cell	3.2V 100AH	3.2V 100AH
Battery Cell Configuration	8S4P	16S2P
Rated Charge Voltage	28.0Vdc	56.0Vdc
Max Charge Voltage	28.4Vdc	56.8Vdc
Overcharge Protection	29.2Vdc	58.4Vdc
Rated Charge Current	150A	100A
Peak Charge Current	180A	120A
Over Charge Protection Release	Restart	
Reverse Polarity Protection	Yes	
Battery Terminal Size	M10 / 7/16" / 12mm	
Self Discharge Rate	5% per month	
Charge Temp Range	0~45°C / 32~113°F	
Output Voltage Range	20~28Vdc	40~56Vdc
Rated Discharge Current	300A	200A
Peak Discharge Current	360A	240A
Over Discharge Protection BMS Disconnect	Charging, cut power to loads and restart	
Discharge Temp Range	-20~65°C / -4~149°F	
Humidity Storage	45-75 %	
Operating Humidity	5-90%	
Communication	RS485 / CAN for PC monitor	
Case Material	Metal	

## 2.5 BMS

The battery contains an internal LiFePO4 Battery Management System (BMS) that monitors and optimizes each single prismatic cell during charge & discharge and protects the battery pack of overcharge, over discharge and short circuit.

Stage	Status (for each cell)	Rating	Alarm LED (red)
Over charge	Over-charge warning	3700mv	once/3s flash, keep output
	Over-charge protection	3750mv	once/1s flash, relay cut off
	Over-charge warning release	3400mv	
	Over-charge protection release	3350mv	
	Over-charge release method	Restart and Discharge	
Over discharge	Over-discharge warning	2700mv	once/3s flash, keep output
	Over-discharge protection	2500mv	once/1s flash, relay cut off
	Over-discharge warning release	2900mv	
	Over-discharge protection release	2800mv	
	Over-discharge release method	Charging	
Over current	Over current warning	110% rated	once/1s flash, delay 1min relay cut off
	Over current protection (PEAK)	120% rated	Lightning, delay 5s relay cut off
	Over current release method (CHG)	Restart	
Over & Low Temp Discharge	Over temperature	Over current release method (DISCHG)	Cut off loads and Restart
		Warning @55°C	once/3s flash, keep output
		Protection @60°C	once/1s flash, relay cut off
		WarningRelease @50°C	
	Low temperature	Protection Release@55°C	
		Warning @-20°C	once/3s flash, keep output
		Protection @-25°C	once/1s flash, relay cut off
		WarningRelease @-15°C	
Over & Low Temp Charging	Over temperature	Protection Release@-20°C	
		Warning @45°C	once/3s flash, keep output
		Protection @50°C	once/1s flash, relay cut off
	Low temperature	WarningRelease @40°C	
		Protection Release@45°C	
		Warning @0°C	once/3s flash, keep output
	Protection @-5°C	once/1s flash, relay cut off	
	Warning Release @5°C		

## 2.6 Packaging

Battery is specifically packaged to ensure that it is not exposed to any harmful gases, chemical contamination, electrostatic, water or mechanical damage during handling, transportation and storage. The box is marked with the name of the product, the type and size of the product, the date of production, the quantity and the batch number for proper tracking.

	Model	LFP24V400A	LFP48V200A
1	Dimension(unit) L*W*H	849.6*533.4*177.2mm / 33.5"L * 21"W * 7"H	
2	Shipping Box L*W*H	1010*680*415mm / 39.8"L * 26.8"W * 16.4"H	
3	Weight - Battery	97kg / 214 lb	
4	Weight Boxed	105kg / 231 lb	

## 2.7 Transportation and Storage

Based on the characteristics of the cell, the proper environment for transportation of a LiFePO<sub>4</sub> battery pack must be followed to protect the battery. Battery should be stored at -20°C~35°C / -4°~95°F in a dry, clean, cool, shaded, and well-ventilated area. The battery should be charged to 45~55% SOC during transportation and stored at 60% SOC.

When in transport, it should be covered to avoid sunlight, and handled with care during loading and unloading. The outer box is designed for many types of transport. Direct moisture should be avoided during transportation.

Do not store in direct sunlight or damp/wet environments. Harmful gases, as well as flammable and explosive products and corrosive chemicals should not be stored near the battery. Check all pipes for possible water or chemical leaks. The battery should be stored 8" off the ground and 20" away from the wall, window, or the air inlet. For storage periods longer than 3 months the battery should be charged once, and not stored for more than 6 months without cycling the battery. For batteries stored longer than 1 year without cycling or maintenance, the battery must be carefully tested before use.

1	Storage Temperature	Less than 1 month	-20°~35°C   -4°~95°F
		Less than 6 months	-10°~30°C   14°~86°F
2	Storage humidity	45~75% RH	

## 3 Installation



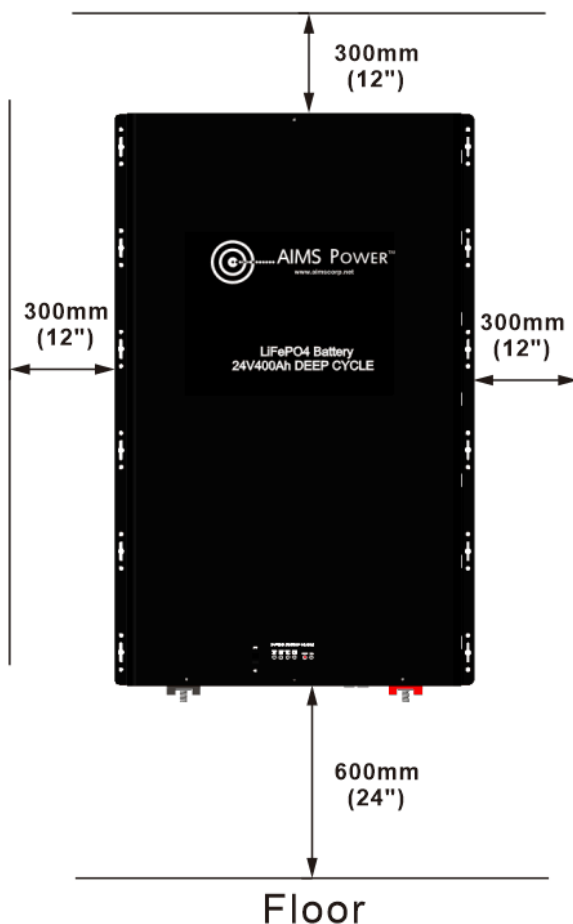
### 3.1 Location

- There must be no flammable or explosive materials near the battery
- The **recommended** ambient temperature should be  $-10^{\circ} \sim 45^{\circ}\text{C}$  /  $14^{\circ} \sim 113^{\circ}\text{F}$
- Operating temperature of  $-20^{\circ} \sim 65^{\circ}\text{C}$  /  $-4^{\circ} \sim 149^{\circ}\text{F}$
- Install and store indoors – keep out of wind, snow, rain and direct sun
- The structure and/or support for the battery should be designed to withstand earthquakes
- Waterproof and properly ventilated area
- Install battery on a flat wall, surface or heavy-duty cabinet. Use proper supports, brackets and/or straps to handle the weight of the battery.
- Keep battery away from passerbys

### CAUTION!

If the ambient temperature is outside of the operating range, the battery pack may stop operating to protect the internal components. The **optimal** temperature range for the battery pack to operate is from  $10^{\circ}\text{C}$  to  $30^{\circ}\text{C}$  /  $50^{\circ}\text{F}$  to  $86^{\circ}\text{F}$ . Frequent exposure to harsh temperatures may deteriorate the performance and overall life of the battery and will void the warranty.

### 3.2 Clearance

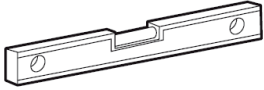


Recommended clearance is 12" on top, left and right sides of the battery and 24" on the bottom to allow for proper ventilation and air flow.

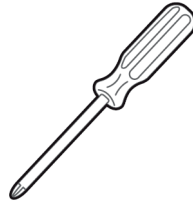
### 3.3 Tools & Safety

#### Tools

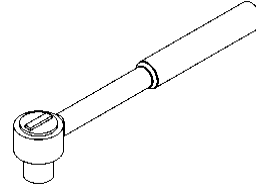
The following tools are required to install the battery pack:



Level



Screwdriver



M8 & M10 Torque wrench



Drill



Pencil or Marker

#### Safety gear for personal protection

It is recommended to wear the following safety gear when handling the battery pack.



Insulated gloves



Safety goggles

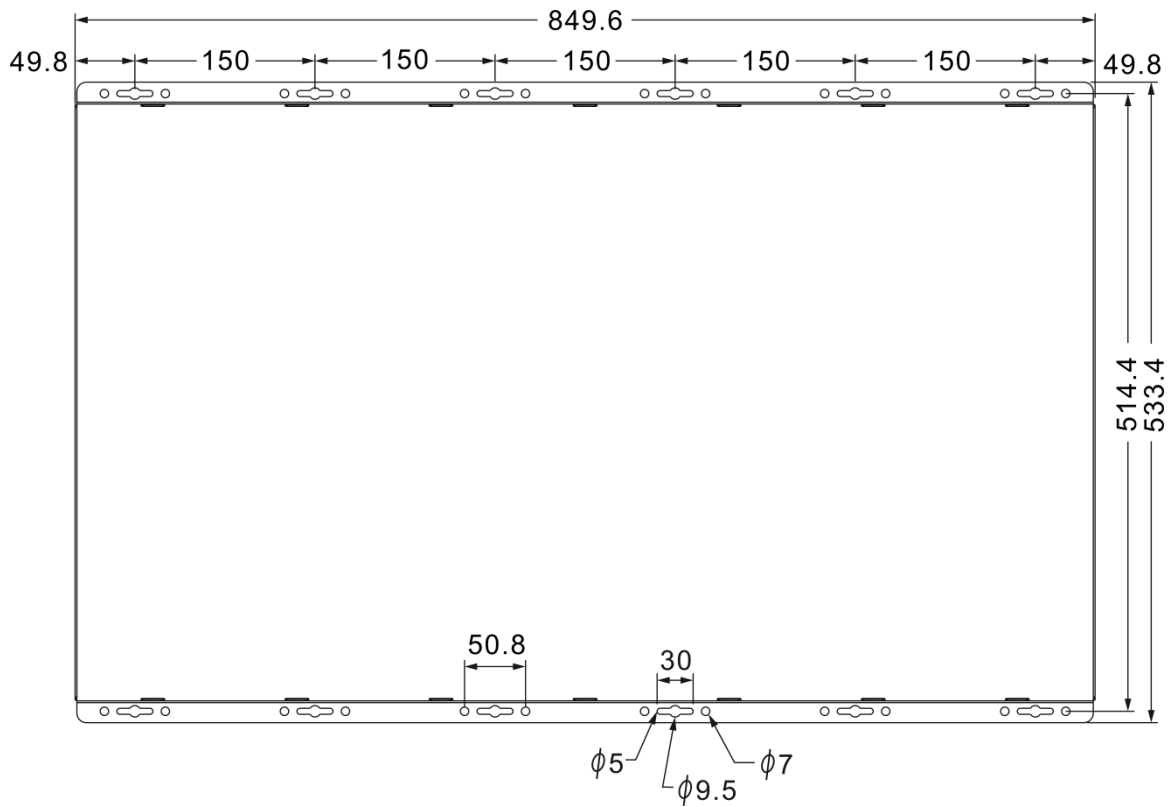


Safety shoes



The battery is heavy and may require two people to lift and move.

### 3.4 Mounting flange

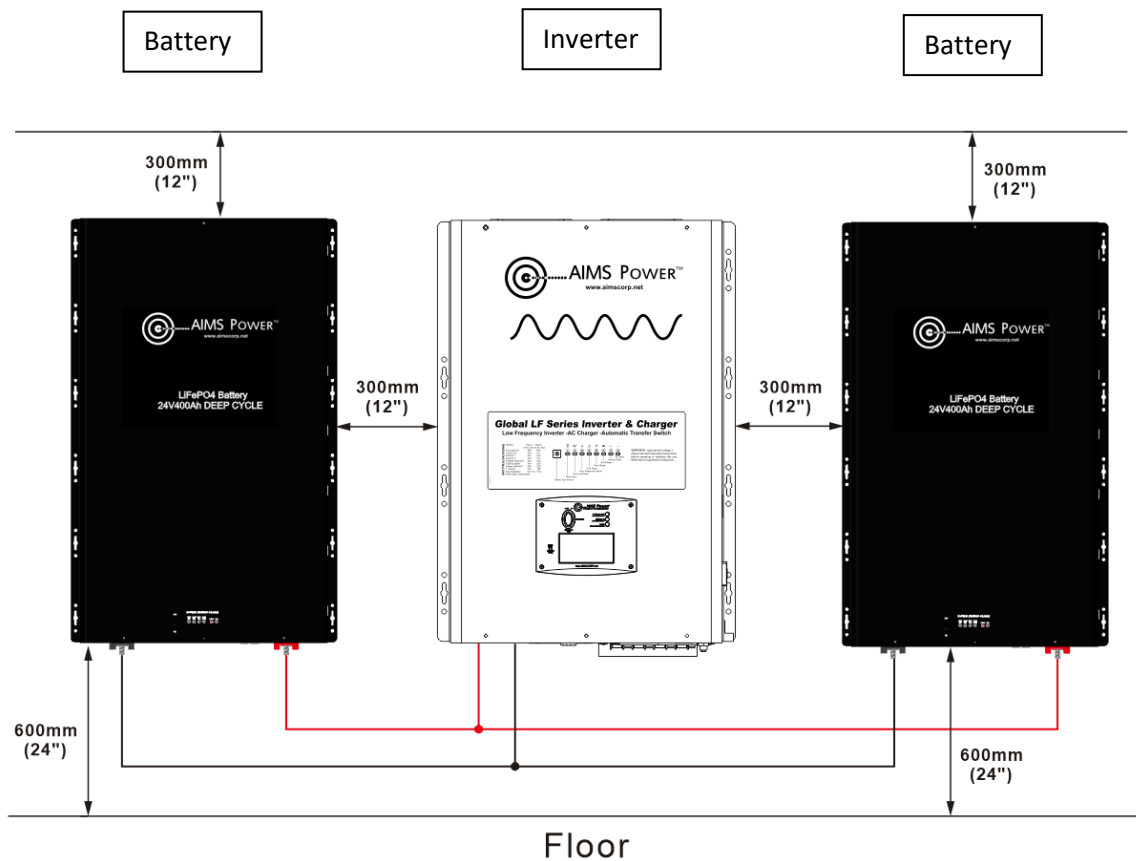


**CAUTION!**

Do not use if battery is damaged!

### 3.5 System Clearance

Battery requires adequate clearance for installation, cabling and airflow. See below for minimum clearance recommendation:



### 3.6 Battery Pack Installation

#### CAUTION!

Make sure the DC load is in the off position and any disconnects (if used) are turned off before connecting the power cable to the battery pack.

#### NOTE!

**USE PROPER BRACKETS, SUPPORTS, AND/OR STRAPS TO HANDLE THE WEIGHT OF THE BATTERY. WELL VENTILATED, HEAVY DUTY BATTERY CABINET IS RECOMMENDED.**

### 3.7 DC Wiring

AIMS Power recommends keeping the battery pack as close as possible to the DC load. Refer to the below chart for minimum wire size. If the length of cable is longer than 4 feet, use the next larger size of cable.

Model	DC Output Voltage	Typical Wire Gauge
LFP24V400A	25.6Vdc	4/0 AWG (4 AWT)
LFP48V200A	51.2Vdc	1/0 AWG (1 AWT)

**\*NOTE: THE CABLE USED MUST BE RATED FOR A MINIMUM OF 240a FOR 48V 200A AND 360A FOR 24V 400A.**

Performance is improved by using a thicker cable and shorter runs. If unsure, round up and keep the length as short as possible.

For wiring configurations for your specific system, please contact AIMS Power for more information.

#### WARNING

The torque rating range for DC terminal is 19.8NM-24.6NM, and the suggested torque rating is 22.5NM. Over torquing may cause the bolt to break.

## WARNING

**Max batteries connected in parallel is up to 10 batteries. Only use identical batteries. All cables must be the same length and size.**

**DO NOT WIRE IN SERIES!**



## 4 Operation

### 4.1 Recommended Operating Conditions

Installation location	Indoors (wall or flat mounted)
Operating temperature	@ -4°F to 149°F (-20 to 65°C)
Operating temperature (Recommended)	59°F to 86°F (15 to 30°C)
Humidity	5% to 95%
Altitude	Max 6,562ft (2,000m)
Cooling	Natural Convection

### 4.2 Powering Battery Pack

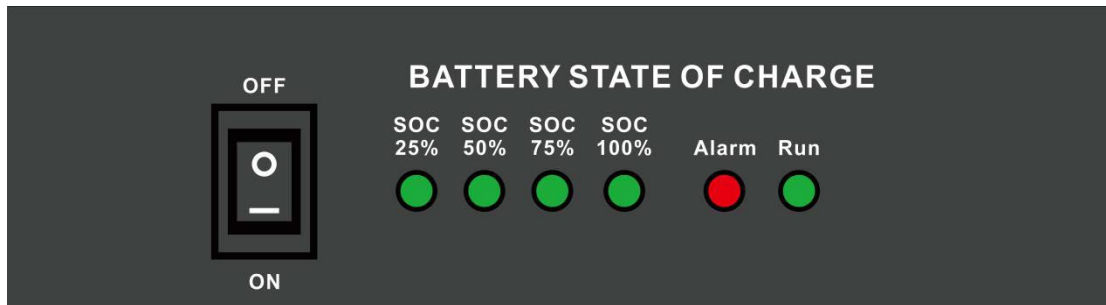
1. Turn on power switch after installing the battery pack. For parallel connected batteries, turn on power switch one by one.
2. Within seconds, the internal main relay will turn on, all LEDs will light up.
3. If the battery pack initializes successfully, the RUN LED indicator on the front will turn green. The SOC LED indicator will show the current capacity.
4. Turn on inverter.

#### **CAUTION**

If battery doesn't turn on and indicates a FAULT or fails to operate, do not use the battery pack and contact AIMS Power.

### 4.3 LED Indicators

The LED indicators on the front of the battery pack show its operational state as follows:



<b>RUN LED(green)</b>	System working normal
<b>Alarm LED(red)</b>	once/3S Flash: system warning
	once/1S Flash: system protection
	Lit continuously: system fault
<b>SOC LEDs (4 green)</b>	<p><b>In Charging Mode</b></p> <p>SOC&lt;25%, LED1, LED2, LED3, LED4 flash in turn</p> <p>25%&lt;SOC &lt;50%, LED1 lit, LED2, LED3, LED4 flash in turn</p> <p>50%&lt;SOC&lt;75%, LED1, LED2 lit, LED3, LED4 flash in turn</p> <p>75%&lt;SOC&lt;95%, LED1, LED2, LED3 lit, LED4 flash</p> <p>SOC&gt;95%, LED1, LED2, LED3, LED4 lit</p> <p><b>In Discharging Mode</b></p> <p>SOC&lt; 10%, LED1, LED2, LED3, LED4 off</p> <p>10%&lt;SOC&lt;25%, LED1 flash, LED2, LED3, LED4 off</p> <p>25% &lt;SOC&lt;50%, LED1 lighting, LED2 flash, LED3, LED4 off</p> <p>50% &lt;SOC &lt;75%, LED1, LED2 lit, LED3 flash, LED4 off</p> <p>SOC&gt;75%, LED1, LED2, LED3 lit, LED4 flash</p>

### LED Flashes at point of SOC

### 4.4 Turning Off the Battery Pack

1. Turn off DC load (inverter).
2. Turn off battery pack. For parallel connected batteries, turn off power switch one by one.
3. Within a few seconds, the internal main relay will cut off, all LEDs off.

#### CAUTION

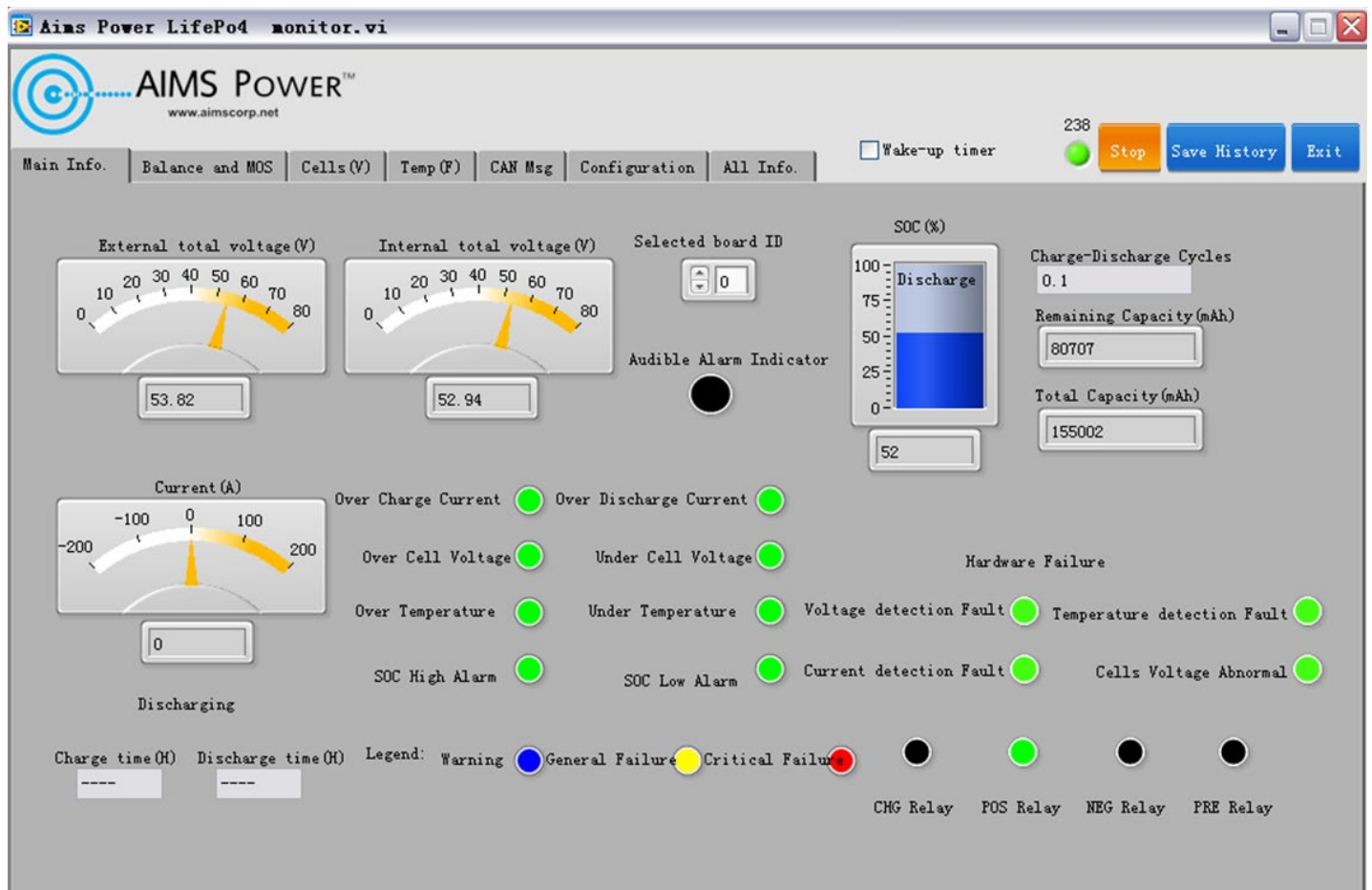
If not using the battery pack for a long period of time or if there is any fault on the pack, turn off the power switch.

## 4.5 Communication

### 4.5.1 CAN Port for PC Monitoring

Connect the CAN communication card from the battery pack to the computer, after installing the AIMS Power LiFePO4 monitor, the information displays on 7 different tabs.

1. Main Info tab: SOC%, voltage, current, cycles, capacity and running status
2. Balance & MOS tab: cell balancing
3. Cells tab: cell voltage
4. Temp tab: internal cell temperature
5. CAN Msg
6. Configuration tab:
  - Bus
  - Diagnostics - displays voltage, temp and current
  - Data storage
7. All Info tab: summary of all info per battery if more than one battery is being used (max 10 batteries in parallel)



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236  Wake-up timer Stop Save History Exit

Main Info. Balance and MOS Cells (V) Temp (F) CAN Msg Configuration All Info.

1st Cell Balanced State  5th Cell Balanced State  9th Cell Balanced State  13th Cell Balanced State   
 2nd Cell Balanced State  6th Cell Balanced State  10th Cell Balanced State  14th Cell Balanced State   
 3rd Cell Balanced State  7th Cell Balanced State  11th Cell Balanced State  15th Cell Balanced State   
 4th Cell Balanced State  8th Cell Balanced State  12th Cell Balanced State  16th Cell Balanced State

Balance Voltage (mV)

Balance Voltage Setting Balance Voltage Setting  
 Balance Voltage Inquiry Balance Voltage Inquiry

NEG MOS  PRE MOS  Equalizer Settings Equalizer Settings MOS Switch Settings MOS Switch Settings  
 CHG MOS  POS MOS

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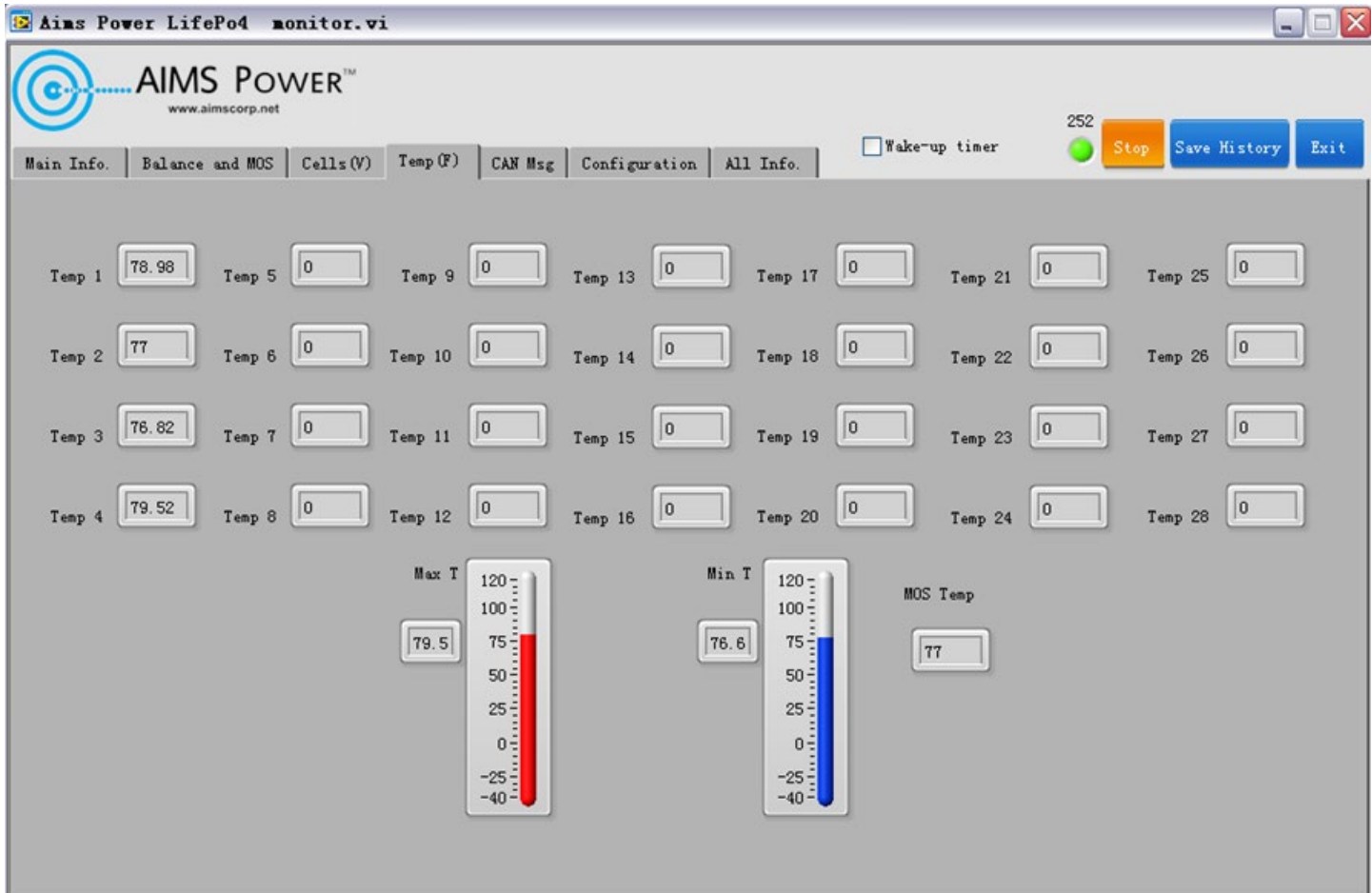
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215  Wake-up timer Stop Save History Exit

Main Info. Balance and MOS Cells (V) Temp (F) CAN Msg Configuration All Info.

Volt 1  Volt 5  Volt 9  Volt 13   
 Volt 2  Volt 6  Volt 10  Volt 14   
 Volt 3  Volt 7  Volt 11  Volt 15   
 Volt 4  Volt 8  Volt 12  Volt 16

Max Cell Volt (V) 3.311 Min Cell Volt (V) 3.306 System Voltage (V)



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83  Wake-up timer Stop Save History Exit

Main Info. | Balance and MOS | Cells(V) | Temp(F) | CAN Msg | Configuration | All Info.

Bus | Diagnostics | Data Storage

Total Capacity Setting(mAh)  Board ID  Board No.  Serial Number  Send

Import Config Export Config Board Setting

Over Voltage Lv1 (mV) <input type="text" value="3600"/>	Restore (mV) <input type="text" value="3400"/>	Over Temperature Lv1 (F) <input type="text" value="122"/>	Restore (F) <input type="text" value="113"/>	Over Discharge Current Lv1 (A) <input type="text" value="150"/>	<span>SN Setting</span> <span>Parameter Inquiry</span> <span>CAN to RS485</span> <span>RS485 to CAN</span> <span>Power Off</span>
Over Voltage Lv2 (mV) <input type="text" value="3650"/>	Restore (mV) <input type="text" value="3350"/>	Over Temperature Lv2 (F) <input type="text" value="131"/>	Restore (F) <input type="text" value="122"/>	Over Discharge Current Lv2 (A) <input type="text" value="165"/>	
Under Voltage Lv1 (mV) <input type="text" value="2700"/>	Restore (mV) <input type="text" value="2900"/>	Under Temperature Lv1 (F) <input type="text" value="32"/>	Restore (F) <input type="text" value="41"/>	Over Charge Current Lv1 (A) <input type="text" value="75"/>	
Under Voltage Lv2 (mV) <input type="text" value="2500"/>	Restore (mV) <input type="text" value="2800"/>	Under Temperature Lv2 (F) <input type="text" value="23"/>	Restore (F) <input type="text" value="32"/>	Over Charge Current Lv2 (A) <input type="text" value="80"/>	

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144  Wake-up timer Stop Save History Exit

Main Info. | Balance and MOS | Cells(V) | Temp(F) | CAN Msg | Configuration | All Info.

ID	ExTV	InTV	Cur	Soc	Cap	Cyc	MaxV	MinV	MaxT	MinT	State
0	53.79	52.95	0	52	80707	0.1	3.311	3.306	34.5	31.9	0
1	53.85	52.92	-0.038	54.2	81448	0.1	3.31	3.304	34.8	32.4	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0

## 5 Troubleshooting

Check the indicators on the front of the battery to determine the status of the battery pack. A warning state is triggered when a condition, such as voltage or temperature, is outside battery's rating. When the battery pack status falls outside of set limits, it enters a warning state. When a warning is reported, turn off the DC load immediately.

Use the monitoring software to identify the cause of the warning.

### **Warning Alarms**

Battery Over Voltage

Battery Under Voltage

Battery Over Temperature

Battery Under Temperature

Battery Discharge Over Current

Battery Charge Over Current

The fault state is cleared when the battery pack recovers to normal operation. If battery pack is not working correctly and the issue persists, contact a qualified technician or AIMS Power.

If the battery pack or the inverter indicates FAULT or fails to operate, contact AIMS Power immediately.

## 6 Warranty

AIMS Power™ lithium batteries include a 10 year limited , prorated, warranty against manufacturer defects.

Within the warranty coverage period, AIMS Power™ will either repair or replace, at its sole discretion, the defective product.

Any shipping charges that occur as a result of a warranty return or exchange are NOT covered by the warranty and are the responsibility of the customer.

The warranty does not cover the following:

- Products that AIMS Power™ determine, in its sole discretion, to be free of any material or workmanship defects or flaws
- Products evidencing excessive wear, misuse or alteration
- Products with missing or defaced labels, stickers, or other identifying information
- Improper care or storage (e.g. water damage, damp environments, exposure to extreme heat or cold temperatures, unsanitary environment)
- Alterations or customizations
- Improper use or wiring
- Items that were purchased second hand, or from an unauthorized seller
- Items outside of the covered warranty period
- Normal wear and tear of the product

