

# BATTERY USER GUIDE

V1.1



## Lithium Battery LBS-12200-ME-AIP

12V | 200Ah | Medium Enclosure | AIP

This User Guide describes the electrical characteristics of the **LBS-12200-ME-AIP** battery and how to connect and operate the battery. As with all batteries, you should consider the mechanical and environmental conditions that you intend to operate the battery in to maximise overall performance and achieve the longest battery life. LBS offer these general guidelines, however you should seek LBS advice or that of a qualified electrical tradesperson if you are in doubt.



LBS-12200-ME-AIP

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## Do's and Don'ts – General Battery Safety & Performance

### 1. Ensure the battery is physically secure

As a rule of thumb and good practice, in a *mobile* environment such as a caravan, you should ensure that all fixings that restrain the battery are up to 20x the weight of the battery. As an example, the LBS-12200-ME-AIP is ~25kg and so your total fixing strength could require up to 500kg of restraining force. To operate safely in a *stationary* environment, the battery can be mounted at a lower rating to a mobile environment. In summary, think about the battery operating environment and ensure the battery is physically safe and secure before operation.

### 2. Ensure the battery is operating within an acceptable temperature range

Like all batteries, LBS batteries operate and perform the best as well as last the longest in a cool and stable temperature environment of between 10°C and 25°C. The maximum window of acceptable operation is 0-45°C. If you regularly operate outside of this suggested range you should change the battery location or actively cool or heat the environment. If the ambient temperature that the battery operates in is >60°C you should cease use immediately and rectify this. Operating outside of these guidelines diminishes the life and performance of the battery.

### 3. Ensure the battery is not exposed to repeated shock and vibration

Whilst the battery is robustly constructed it is not designed to operate continuously in high shock or high vibration environments. Please contact LBS to discuss suitable options if this is your requirement.

### 4. Ensure the battery is not exposed to water or high humidity

Whilst the battery is mechanically protected, the enclosure is not designed for a wet or high humidity environment. Please contact LBS to discuss suitable options if this is your requirement.

### 5. Ensure you do not short circuit the battery

Whilst the BMS will protect the internal cells it is highly recommended to avoid short circuiting the battery. Pay attention when using metallic tools in the vicinity of the terminals as accidentally contacting the positive and negative terminal with a metallic object like a spanner will cause a short circuit. Always perform work on passive wiring with the battery in the **OFF** position. If you are unsure how to install your battery seek advice from LBS or a suitably qualified 12V electrical tradesperson.

## 1.0 Battery Components

The battery has a number of ways to connect loads and charging sources.

1. Battery Terminals - Positive (Red) and Negative (Black)
2. Anderson Connectors - Grey, Black, Yellow

### 1.1 Battery Terminals

The Battery Terminals have either a M8 (standard) or M10 (high power) bolt. A typical connection to this would be a standard M8/M10 Ring terminal. You will need to use suitable

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cable depending on the current and distance to your load or charge source. The battery terminals are rated to the maximum capacity of the battery. This is 100A for the Standard Power (SP) version or 200A for the High Power (HP) version.

## 1.2 Anderson Connectors

The Anderson connectors are rated to a maximum of 50A continuous operation for either charge or load connections. The different colour Andersons have different internal connections, so it is important that you connect to the correct Anderson plug as per the following:

Grey	General-purpose input or output (50A max)
Yellow	Solar (unregulated) charging input (10-50V, 40A max)
Black	DC charging input (10-30V, 40A max)

You will need to consider the correct size of cable to connect to the Anderson plugs. LBS have an extensive range of cables that are designed to operate safely at the rated current and distance you would need. Contact LBS if you are not sure.

## 2.0 Battery Control Systems

The battery has 2 control systems:

1. BMS (Battery Management System)
2. AIP Controller (Solar and DC charge controller)

### 2.1 BMS (Battery Management System)

The Battery Management System is the brains of the battery and ensures the battery is safe and has a long life of trouble free usage.

The BMS provides the following functions:

- Protects the battery from over-charge, over discharge, dead shorts or excessive loads.
- Balances the individual cells during charging.

During normal operation simply turn the battery ON knowing that the BMS is sitting in the background keeping the battery safe and sound.

The BMS has:

- Master OFF/ON switch
- Reset button
- Initialization (Init) button
- Status light
- Level/ State of Charge (SOC) button
- 5 LED's to show Level / SOC (20/40/60/80/100%)

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For normal operation slide the OFF/ON switch to the right and the blue LBS logo will light up. By depressing the SOC button the battery will display 1-5 of the SOC LED's to indicate how full (SOC) the battery is.

The battery can operate by itself or with a connected Remote Monitoring Screen (RMS).

The battery has an illuminated blue LBS logo which will glow when the battery is **ON**.

## **What do I do if the battery does not seem to be operating?**

Turn the battery OFF and back ON by sliding the OFF/ON switch. If the blue logo is backlit you should be up and running again. By depressing the Level (SOC) button you can check how full the battery is as a State Of Charge %. You will get 1-5 LED's to show:

- 1) 0-20% (flashing if very low)
- 2) 20-40%
- 3) 40-60%
- 4) 60-80%
- 5) 80-100%

## **What do I do if the battery Status LED displays a red light?**

Press the Reset button. If this does not work then turn the battery OFF and back ON as above.

## **Optional Remote Monitoring Screen (RMS)**

Most LBS batteries including the AIP have the option to use a Remote Monitoring Screen (RMS). The screen is connected via the RJ12 socket on the battery and using the correct cable you can monitor and control the battery from the screen.

The Remote Monitoring Screen has two buttons:

**Left button** is the ON/OFF for the screen

- If the screen is off you can turn it on depressing the left button
- If the screen is on you can turn it off depressing the left button

**Right button** is Mode/Reset button

The right button scrolls through 3 modes or screens. You go through these modes by continuing to depress the right button.

1. **Level:** A simple picture to show how full the battery is: Level (SOC)
2. **Detail:** More information including the current Amps in or out and how long to charge or discharge the battery at the current state of use.
3. **Diagnostics:** Detailed information such as individual cell voltages and temperatures.

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If there is an error you can reset this by pressing the right button once momentarily. If a reset is required then the reset on the remote monitoring screen is the same as resetting at the battery and may be more convenient for you.

For normal operation with the remote monitoring screen you would depress the left button to illuminate the screen. After a time, it will go into low power mode and the screen will not be illuminated. The level (how full the battery is) screen will be displayed as the default screen and by depressing the right button you can get into the other screens if further information is required.

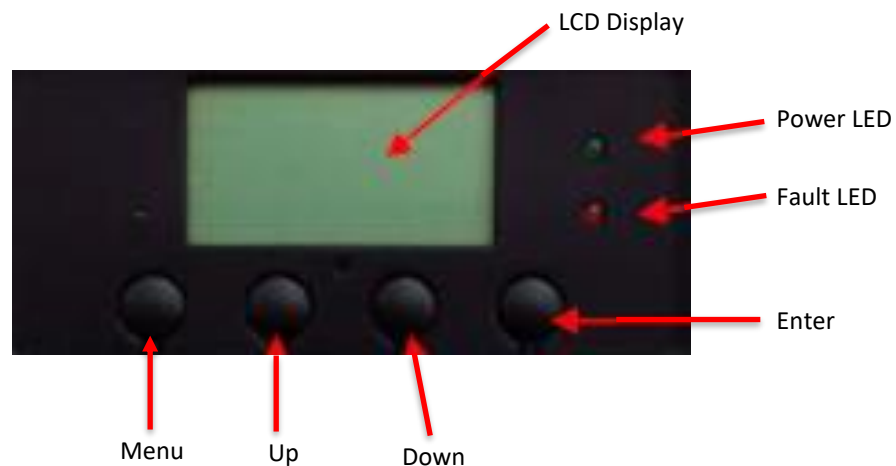
## 2.2 AIP Controller

The battery has an inbuilt Solar and DC Charge Controller called the AIP. By integrating these functions into the battery, you reduce the need for these external elements and ensure connection to the battery is done in a way to optimise the operation of your battery as a complete integrated system.

The AIP controller has 4 buttons and 2 LED status indicators. The buttons are from left to right:

<b>Menu</b>	Switching display and enter setting mode
<b>Up</b>	Scrolling up menu options
<b>Down</b>	Scrolling down menu options
<b>Enter</b>	Confirming program changes

The top LED indicates when POWER is present to the system and the bottom LED will indicate when a FAULT/WARNING is present.



The AIP has the following features:

- Dual charge input source for PV and DC;

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- PV input range from 10-50V (40A max, 500W max);
- DC input range from 10-30V with programmable disconnect and reconnect voltage points;
- Automatic selection between PV or DC;
- User programmable charge voltages that are optimized for Lithium Battery requirements;
- MPPT charging algorithm to achieve optimal PV collection;
- LCD display for Battery Voltage, Charging Current, Input Voltage (PV/DC), Input Current (PV/DC).

MPPT is the algorithm “Maximum Power Point Tracking” and is designed to collect the maximum power from the solar panels and compensates for the variance in voltage that is produced depending on temperature and solar irradiation levels. MPPT tracks the most efficient operating point and adjusts in real time to achieve that level.

## **AIP Charge Input Connections:**

The battery has a number of Anderson connectors (yellow, black, grey).  
The battery also has positive and negative M8 or M10 terminals.

The Solar and DC controller are connected internally to the following:

Yellow Anderson – Solar Input (10-50V)

Black Anderson – DC Input (10-30V)

These 2 Andersons are only available for charge input.

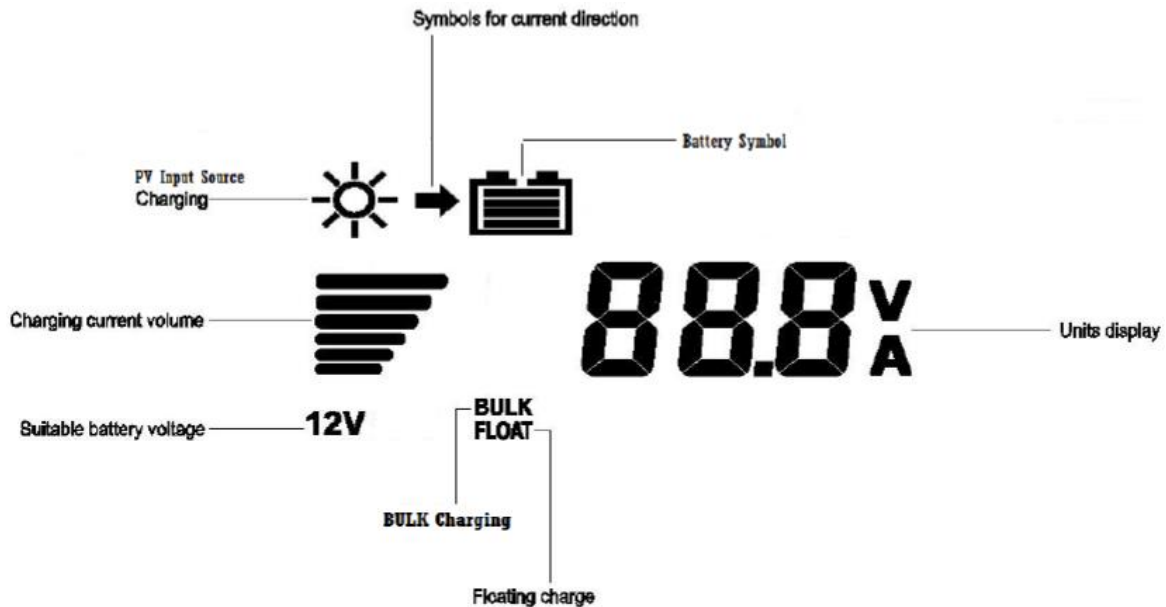
The Grey Anderson and the positive and negative terminals are connected directly to the battery and can be either input or output.

## **AIP Display**

The LCD screen has the following symbols:

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## Top Left

Sun Symbol – Displayed when there is charge input from Solar  
Right Arrow – Displayed when charging is active  
Battery Symbol – Displayed when Battery is on

## Bottom Left

Charging current Level – 1-6 bars display depending on level of current  
12V – Displays to indicate the system is a nominal 12V system

## Bottom

Bulk – Displays to indicate that charging is in bulk mode  
Float – Displays to indicate that charging is in float mode

## Large Numeric Display

XX.X is the value in volts or amps  
V/A - display what units the numeric display is in

## Default Screen:

When there is no charge and everything is normal and battery is charged:

- The numeric display will show 13.3- 13.4V
- The Battery symbol will display
- The 12V display will indicate a nominal 12V system

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## Charging with PV Input:

When the PV input is between 10V and 50V then the system will commence charging from the PV source.

- The Sun Icon will display
- The Right Arrow will indicate a flow of charge
- The Battery Icon will indicate all is normal
- The 12V will display
- The Bulk or Float mode will display the current mode
- The voltage of the system will display



## Charging with DC input:

When the DC input goes above 13.5V (adjustable) the system will charge at a maximum of 30A output (which may draw more than 30A input)

- The Right Arrow will indicate a flow of charge
- The Battery Icon will indicate all is normal
- The 12V will display



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- The Bulk or Float mode will display current mode
- The voltage of the system will display



## Changing Display Windows:

From the home screen press menu:

- 1 time – display charging current (if charging is occurring)
- 2 times – display charging input voltage (if charging is occurring)
- 3 times – display charging input current (if charging is occurring)

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## Checking or adjusting Charge Voltages

### Bulk charging voltage:

Press and hold the menu button for 2 seconds to enter programming mode.

### **The default and recommended is 14.2V**

To change this press enter once and then up or down arrows to get to the required voltage. Press enter or menu to save.

### Float charging voltage:

Press and hold the menu button for 2 seconds to enter programming mode.

Press the down key to enter float setting mode.

### **The default and recommended is 13.5V**

To change this press enter once and then up or down arrows to get to the required voltage. Press enter or menu to save.

### DC Input Low Voltage shut Off:

Press and hold the menu button for 2 seconds to enter programming mode.

Press the down key twice to enter DC low voltage shut off setting.

The default is 10V. This is dependent on your own system. Discuss with LBS the voltage that would be suitable for your installed system. For example, when connecting to the start battery or alternator in a car it is normal to set this to **12.5V**.

### DC Input Recover voltage:

Press and hold the menu button for 2 seconds to enter programming mode.

Press the down key three times to enter DC input recover voltage programming mode. The default is 15V. This is dependent on your own system. Discuss with LBS the voltage that would be suitable for your installed system. For example, when connecting to the start battery or alternator in a car it is normal to set this at **13.5V**.

## Charging Source Priority

Press and hold the menu button for 2 seconds to enter programming mode. Press the down button 4 times to enter input source priority. The default is DC input but you can change this to Solar by changing the setting to ON by pressing the down button. OFF is DC has priority, ON is Solar has priority. Press Enter to store this change. We recommend having DC as priority, so that when driving it charges at the full current. Otherwise it will only use what is available from solar, which could be very little during cloudy times.

## Sleep Mode:

- If insufficient voltage input is available from either solar or DC the LCD will display E0.
- If this remains for 5 minutes the system will enter sleep mode and the display will display 5LP.
- Pressing any button will wake up the system.
- If a charge current becomes available the system will wake up within 2 minutes.

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## AIP ERROR MESSAGES

Whenever an error is detected the following codes will appear on the screen and the fault LED will turn red.

E0 – no PV or Solar voltage or voltages are below 10V

E3 – Input current too high (solar panels > 500W)

E5 – LBS Battery Voltage above 16V (Should never happen as protected by BMS)

E6 – PV/DC voltage too high Solar (VoC > 55V)

E7 – System is too hot.

Once your system is operational the only error message that is normal is E0 which is often when the system is not being used and ready to enter sleep mode.

E0 would occur when there is no enough PV radiation to give enough voltage within the voltage range or the connection to the DC source is OFF or outside the Low Voltage/Recovery window (ie vehicle engine is not running).

If any of the other error messages occur during normal operation immediately stop using the battery, turn it off and contact LBS immediately for advice on how to remedy the fault.

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<b>SPECIFICATIONS:</b>		<b>CAUTION:</b> <ul style="list-style-type: none"><li>- Do not short the battery terminals</li><li>- Do not throw on to fire</li><li>- Do not allow water to enter the battery</li><li>- Do not disassemble</li><li>- Do not expose battery to &gt; 60°C ambient</li><li>- Avoid mechanical shock</li></ul> <b>Risk of fire, explosion or burn if misused</b>
Model	LBS-12200-ME-AIP	
Capacity	200Ah	
Nominal Voltage	12.8V	
Cells	16 x 3.2V 50Ah	
Type	LiFePO4	
Charge Voltage	13.8V - 14.4V	
Charge Current	Max 100A	
Discharge Current	100A/500A surge	
Operating Temp	0-45°C	
Weight	<25kg	
Cycles at 80% DoD	2,000	
Cycles at 50% DoD	5,000	
<b>CONNECTORS:</b>		
Terminals	Direct connection I/O	
Grey:	Direct connection I/O 50A	
Yellow	Solar Input 10-50V 40A max	
Black:	DC Input 10-50V 40A max VSR Settable	
BMS DESIGNED & ENGINEERED IN AUSTRALIA		

**Nameplate LBS-12200-ME-AIP**

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## CONTACTS

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