



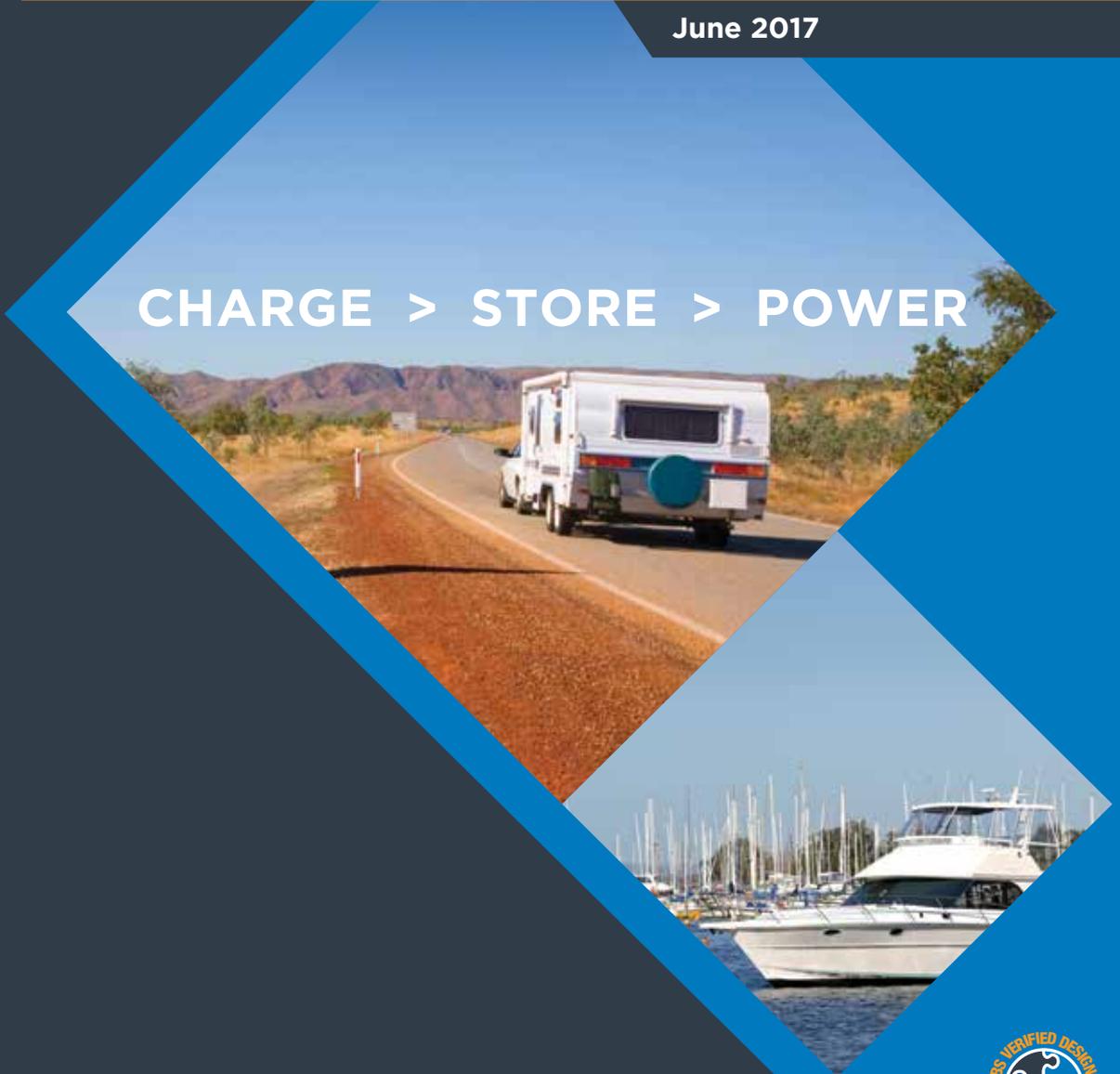
Powering Freedom™

LITHIUM BATTERY SYSTEMS

# Company Overview

June 2017

CHARGE > STORE > POWER



[www.lithiumbatterysystems.com.au](http://www.lithiumbatterysystems.com.au)

LITHIUM BATTERY SYSTEMS

# Powering Freedom



## Outdoor Leisure & Recreational

**Camping, 4x4, RV,  
Marine.**



## Off-Grid

**REMOTE AREA  
Farms, recreational  
clubs & organisations,  
exploration  
geological.**



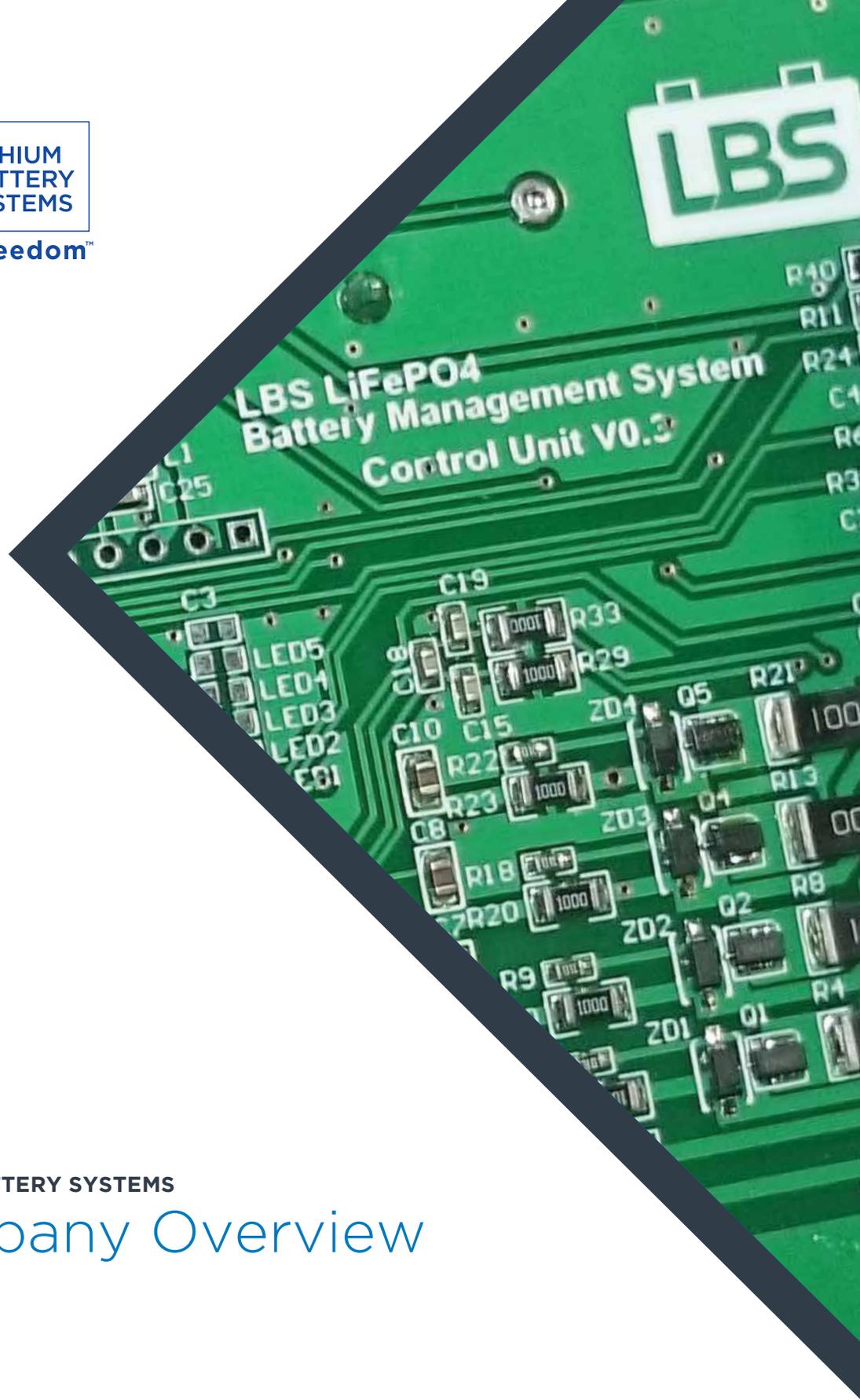
## Specialised Applications

**Golf carts, mobility scooters,  
robotics, industrial,  
mining.**

**CHARGE > STORE > POWER**



Powering Freedom™



LITHIUM BATTERY SYSTEMS

## Company Overview

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Lithium Battery Systems (LBS) is a wholly owned and operated Australia company based in Brisbane.

We have over 5 years' experience in lithium battery technology and the protection of lithium cells in electric vehicles. We have leveraged this knowledge to build lithium batteries with integrated protection electronics for outdoor leisure and recreation, off grid systems and specialty applications.

**Our Vision is POWERING FREEDOM™**

We believe that everyone deserves the freedom and independence to power their own lifestyle, and the ability to go anywhere, anytime. We also believe that power can and should be generated and stored in a way that is environmentally & economically sustainable.

# About LBS

## EXECUTIVE TEAM

### **Greg MacDonald CTO (Chief Technology Officer)**

Greg leads our R&D, Product Manufacturing and Technology Integration teams.

Greg studied Mechatronics Engineering and has held many senior engineering positions in Australia and New Zealand. Greg brings a keen interest in building electric vehicles and designing innovative solutions that push the boundaries of technology.

### **Spencer Smith COO (Chief Operating Officer)**

Spencer leads our Accounting, Compliance and Logistics teams.

Spencer studied Chemical Engineering and has held many engineering positions. Spencer started a company RV Solar Supplies which specialised in solar solutions for the RV industry. Spencer is an outdoor enthusiast and brings a keen interest in green energy and saving the planet using the sun as a renewable resource to power freedom.

### **Christopher Carrigan CSO (Chief Sales Officer)**

Chris leads our Sales, Marketing and Customer Care teams.

Chris studied Chemical Engineering but spent most of his career in the IT industry including being a senior manager at global networking giant Cisco Systems. Chris is a boating enthusiast and also brings a keen interest in integrating the Internet of Things (IoT) to batteries to create Managed Battery Systems that are controlled over the internet.

## QUALITY

We believe that any product is only as good as the components that go into making it. So we have partnered with known, reliable brands which enables us to manufacture lithium batteries that are reliable, functional and of high quality.



*Proud members of the Energy Storage Council*



# Why lithium batteries?

When compared to lead acid batteries, lithium batteries offer several advantages.



## MORE POWER

Lithium batteries allow you to pull far more amps out of the same size battery. This allows you to run all of appliances from home that require a lot of power. We even have systems that can run air conditioning!



## LIGHT WEIGHT

Our batteries are less than half the weight of the equivalent lead acid battery; a 100Ah AGM is 32kg while our 100Ah lithium battery is under 15kg.

This is an important consideration for recreational vehicles as a weight saving in the battery means the owner can add more weight somewhere else without exceeding the legal towable weight.

It is also an advantage where portable batteries are required such as in a camping environment. Carrying a 15kg battery is a lot easier than carrying a 32kg lump of lead!



## MORE CAPACITY

LBS batteries provide more capacity than lead acid batteries, especially when used at high power. Deep discharging does not ruin the life of the LBS battery the way it does with lead acid batteries. You can use the battery longer before needing to recharge, without damage to the battery.



## LONGER LIFE

LBS batteries are rated for over 2,000 cycles, and much more if used carefully, giving you several times the life expectancy of standard lead acid batteries.



## COST EFFECTIVE OVER LIFE CYCLE

When considering the usable capacity and lifespan of lithium batteries, they are actually cheaper in the long run than lead acid.



## FASTER CHARGING

Lithium batteries charge more efficiently, and don't require as many stages during charging. Therefore they will charge faster, and hold more of the energy from solar panels and other charging devices.



## SAFER PERFORMANCE

LBS batteries use Lithium Ferrous Phosphate (LFP) cells which are regarded as the safest type of lithium ion chemistry. LBS batteries use our own proprietary Battery Management System (BMS) designed and built in Australia to ensure the safe use of the battery. The LBS battery is powerful and totally safe to push it to its limits. And you'll certainly not find any venting of hydrogen, or acid leaking out!

# What sets LBS apart?

## SYSTEMS APPROACH



We believe that a battery by itself is of little value unless it can be charged or discharged with compatible components. We have our own **LBS Verified Designs** which takes the risk out of buying a lithium battery only to find that it is not compatible with an existing charger.

## BMS MADE IN AUSTRALIA



The Battery Management System or BMS in a lithium battery is a vital component which performs numerous protective functions to ensure the battery operates within its safe operating envelope. By designing and manufacturing our very own BMS right here in Brisbane we are better able to control functionality, quality and reliability.

## METAL ENCLOSURE

Safety and protection of the lithium battery cells is of paramount importance which is why we use aluminium enclosures to house the cells, the BMS and wiring. Especially when it comes to mobile Recreational Vehicles, it is important that the battery is contained in the event of a road accident.

## CUSTOMISATION

Because we assemble our own batteries in Brisbane, we are able to provide our customers with a degree of customisation. This might be in the form of different enclosure dimensions to suit a specific space, different sockets/plugs or different functionality built into the BMS. We can also engineer and design a battery for unique one off applications to suit a customer's specific requirements for power and energy .

## MANAGED BATTERY SERVICES (MBS)

LBS can remotely monitor the health and status of any of its batteries to predict issues and ensure optimum lifespan. This optional service provides the user with peace of mind knowing that even in the remotest of locations, their battery is being monitored. We also provide monthly usage reports straight to an email address.



## LOCAL ASSEMBLY AND TESTING

All LBS batteries are assembled in Brisbane using local labour. This means we can control every aspect of what goes inside each battery and ensure that each one is rigorously tested prior to delivery.



LBS-12-100AH  
4x 3.2V, 100AH cells  
Lithium Iron Phosphate (LFP)  
100AH  
12.8V  
2,000 cycles (80% DOD)  
between 13.8V and 14.6V  
100A  
250A  
0 to 45 degrees C  
15kg

# MultiVolt Batteries

Electrical systems in cars, caravans, boats and other applications were designed to use 12V. So why use 24V or 48V?

For certain applications LBS uses MultiVolt batteries. These operate internally at 24V or 48V with a corresponding 24V or 48V Power Management Unit. However our MultiVolt batteries still provide a 12V input and output to maintain compatibility with 12V systems.

For high power applications a MultiVolt battery may be the best choice. So why use higher voltages?

## POWER

Every piece of equipment needs a certain amount of power to do its work. In electrical terms, that  $\text{Power} = \text{Voltage} \times \text{Current}$ . When you double the voltage, you halve the current required to get the same amount of power.

## EFFICIENCY

The efficiency of something is how much power you get out, compared to how much power you put in. You will always get out a bit less than what you put in, because of losses - nothing is 100% efficient.

## LOSSES

Losses are proportional to the square of the current. Therefore when you halve the current in a cable, the losses are reduced to a quarter of what it was previously. The same is true for other types of conductors within an appliance.

This means that most of the components (incl cables) within a piece of equipment will be far more efficient when operating at a lower current (and higher voltage).

This means that less of the energy is wasted in the equipment as heat, and more is transferred to the desired application.

## COST

With lower currents, many components can be smaller (eg thinner cables) while still having a higher efficiency. Smaller components typically cost less, so the total cost of the product can be reduced.

Therefore the higher voltage of a MultiVolt battery can provide a system that is more efficient, and lower cost, than the 12V equivalent.

## SAFETY?

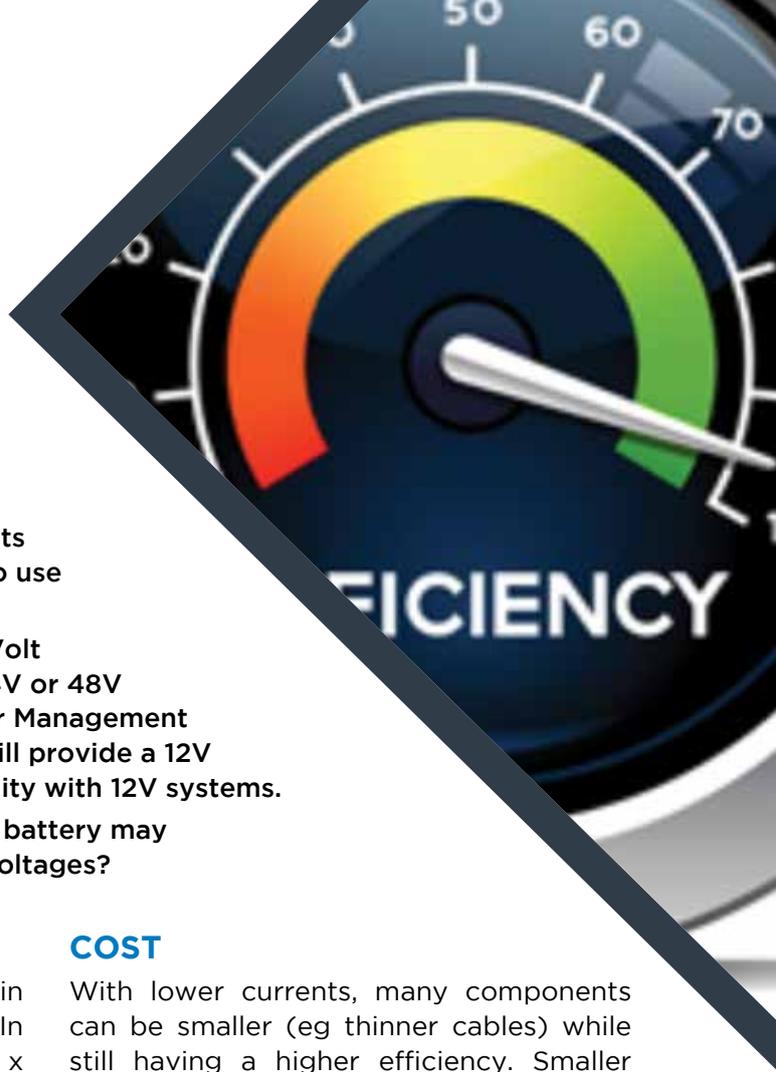
People often ask about safety when using higher voltage batteries, 48V may sound high when compared to 12V, but it's still very low compared to the 240V running around your home. In fact a 48V system is officially classified as Extra Low Voltage by the Australian regulations, because its considered low enough to still be safe.

## LIFESPAN

Battery loss generates heat which reduces the lifespan of equipment. More efficient batteries and equipment have significantly lower losses, therefore resulting in a longer lasting battery.

## HOME STORAGE

Nowadays almost all home storage systems are 48V as people have realised the benefits of higher voltage.

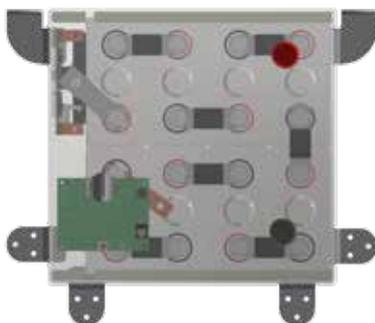




# Our Lithium Batteries

The LBS range of batteries are CAD designed from the ground up by our experienced engineering team. This ensures that we capture all aspects of design from mechanical, to vibration and marine protection through to internal layout of the circuit board. We have also considered safe mounting options, vital for mobile applications such as recreational vehicles.

Our optional mounting bracket kit makes use of slots cut in the base of the aluminium enclosure ensuring secure fixing to a wall or floor.



## 12V BATTERIES

The LBS range of 12V batteries are available in a range of capacities ranging from 50Ah to a massive 400Ah making them ideal for outdoor leisure and recreation applications such as caravans, motorhomes, campervans, camper trailers and we even have a portable 12V 50Ah battery for camping!

**SAFETY** - we use lithium iron phosphate (LiFePO<sub>4</sub>) cells, the safest and most stable lithium chemistry available, making them the perfect choice for use in our batteries. The cells have been manufactured to the highest standards and are protected by our advanced BMS.

**BATTERY MANAGEMENT SYSTEM (BMS)** - designed, engineered and manufactured in Australia, the BMS is the control center of the battery. The BMS permits fast charge and discharge (up to 200A) allowing the user to operate high power appliances.

**DC CONNECTIONS** - each 12V battery is supplied as standard with four Anderson plug connectors (1x Blue 120A Input, 3x Grey 50A Input/Output).

## Features

- Capacities: 50 / 100 / 200 / 400 Ah
- Nominal voltage: 12.8V
- Charging voltage: 13.8V to 14.6V
- BMS: LBS proprietary
- Connections: 4 Anderson plug sockets
- Lifespan: 2,000 cycles at 80% DOD
- Enclosure: 2mm anodised aluminium plate
- Mounting: via bottom slots (brackets optional)
- High & low voltage disconnect
- Over current protection
- Over temperature protection
- Indicators - alarm LED, alarm buzzer
- Reset - push button
- Isolation - on/off isolator switch
- State of charge - LED lights

## MULTIVOLT BATTERIES

### Why MultiVolt Batteries?

For certain applications LBS recommends our MultiVolt batteries. These operate with a higher internal voltage of 24V or 48V but still provide 12V input and output to maintain compatibility with any 12V systems. For high power applications such as powering air conditioners, winches, chair lifts or to power the home, a LBS MultiVolt battery may be the best choice.

### Features

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Internal voltage – 24V and 48V  
Capacities – 1.2 / 2.4 / 4.8 kWh  
BMS - LBS proprietary made  
Connectors – 4 Anderson plugs as standard  
Lifespan - 2,000 cycles at 80% DOD  
Enclosure - 2mm anodised aluminium plate  
Mounting – via bottom slots (brackets optional)  
High & low voltage disconnect  
Over current protection  
Over temperature protection  
Indicators – alarm LED, alarm buzzer  
Reset – push button  
Isolation - on/off isolator switch  
State of charge – LED lights on top of battery

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### Optional add ons

**DC CHARGING INPUTS** – choose from either one or two 20A DC-DC charging inputs or one 40A DC-DC charging input.

**VIBRATION & MARINE PROTECTION** – Our batteries can be supplied with optional vibration protection recommended for mobile applications like recreational vehicles. Marine protection is also available for boat enthusiasts making the battery corrosion resistant in a marine environment.

**TERMINALS** – we can provide positive and negative terminal posts on request.

**HANDLES** - Add handles and the battery becomes easier to handle and install.

**BATTERY MONITORING** - For visual display of state of charge, battery power, voltage and other variables we offer either a wall mounted LCD display with 10m cable connected to the battery, or a wireless tablet which communicates with the battery using a wireless access point. The tablet is supplied already loaded with our custom software which displays a battery dashboard in full colour.

**BATTERY MOUNTING** - Securing the battery for safety reasons is paramount. Particularly for recreational vehicles it is important to ensure the battery is mounted with appropriate brackets either to a wall or floor (or preferably both). Our batteries have slots at the base of the enclosure for use with our mounting bracket kit to safely secure the battery during transit.

## PORTABLE 12V 50AH BATTERY

Our 12V 50Ah battery can be turned into a portable version, ideal for when power is required while camping, fishing or in a remote area.

The LBS Portable 12V Battery is designed to power a fridge/freezer, LED lights, radio, phones, iPads etc in the evening and overnight while camping, and then be recharged during the day with solar and/or vehicle charging.

It can also be charged from a mains power point at home or at powered campsites.

### Features

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Weight: 10kg (approx)  
Anodised aluminium enclosure for harsh environments  
Ergonomic carry handle  
Plug Connections:  
2x Accessory (cigarette sockets)  
1x merit plug socket  
4x USB ports  
Amps reading  
Volts Reading  
2x Anderson (Direct: inverter output, fridge output, regulated solar panel input, etc)  
1x Anderson (Vehicle charging input)  
6A Vehicle (DC-DC) Charger with cable to cigarette lighter plug  
6A Mains (AC) Charger with connecting cable and plug  
State of Charge LED display  
Power switch: avoid self-discharge during storage – trickle charging not required.  
Protection: short circuit, over-current, over-voltage, under-voltage, over-temperature

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# Safety first



TRIPLE  
GUARD

Fires, explosions, smoke. Whilst the media have greatly overarched and made much drama of the safety of lithium batteries there are some legitimate concerns.

There is enormous amount of stored energy inside a lithium battery and this potential needs to be controlled. Just like the fuel tank in a car which stores enormous potential energy, the safe containment of this stored energy in a lithium battery can be rigidly and safely controlled.

## LiFePO<sub>4</sub>

### LITHIUM ION CHEMISTRY

Lithium Iron Phosphate (LFP) is the safest lithium Ion chemistry to use for the applications we design our batteries for. We also use high quality cells internally that have a robust cell casing and have strict quality control procedures in their manufacturing. This is the 1st line of defense.

### BATTERY MANAGEMENT SYSTEM

The LBS Battery Management System (BMS) is a circuit board designed and manufactured in Australia using local engineers and best practices.

This gives us the ability to control functionality, reliability and quality during board manufacture and not rely on overseas imported BMS's.

The BMS is the brains to monitor and control the lithium cells during charging and use of the batteries. The BMS ensures the cells are balanced and regulated and in the rare case of any issues are safely shut down. This is the 2nd line of defense.



### METAL ENCLOSURE

LBS batteries are housed in a strong rigid metal enclosure. This lightweight yet super strong casing acts as the last line of defense and ensures that any possible problem with the cells is safely contained within the enclosure.

This is rarely required but gives peace of mind that no matter what conditions the batteries are subject to the final fortress of strength around the batteries ensures they are always safe.

At Lithium Battery Systems the safe use of lithium battery technology is our primary focus. We use a Triple Guard design approach to ensure that lithium battery technology is safe and reliable.

# Testimonial

from one of our happy customers



Rick and Sue from Toowoomba purchased a lithium battery system from us in January 2016 for their 35' fifth wheeler. They were going travelling for one year and expecting to go off grid for lengthy periods of time. We installed the following:

**2 x 100Ah 12V lithium batteries with integrated Australian made BMS**

**40A AC battery charger**

**2kW pure sine wave inverter**

**50A MPPT solar charge controller**

**3 x 150W flex solar panels to go on the roof**

A year later in January 2017 we caught up with Rick & Sue to hear about their adventures and their experience with the battery system.



**What was the longest period you were disconnected from mains power?**

*It was 10 nights.... from Darwin to Alice Springs that we didn't have any (mains) power.*

**And did the batteries keep you going for that period?**

*Absolutely... they were brilliant the whole time, never had a spot of bother with them and had plenty of power.*



Powering Freedom™

**BRISBANE**

BTP One

Level 1 / 7 Clunies Ross Court

Brisbane Technology Park,

Eight Mile Plains, QLD 4113

p: 0404 041 189

e: [info@lithiumbatterysystems.com.au](mailto:info@lithiumbatterysystems.com.au)



Powering Freedom™



ABN 16 608 590 503

Lithium Battery Systems is a wholly owned and operated Australian company. All LBS batteries are assembled and tested using local labour. A commitment to sustainable and ethical business practices is followed.

[lithiumbatterysystems.com.au](http://lithiumbatterysystems.com.au)