ALT-TECH
Sustainable Tech Solutions

LITHIUM BATTERY ASSEMBLY

Empowering your Energy Solution

Welcome to the world of custom built lithium batteries, where the power to harness energy meets your ingenuity.

In this guide, we will delve into the exciting realm of creating lithium batteries from scratch. From producing high-performance solutions to accommodating size preferences and cost-effective pursuits, custom lithium battery builds offer a range of benefits tailored to your energy goals.

WHY OPT FOR A CUSTOM LITHIUM BATTERY?

1. **High Performance:** With the option to choose your own cells and BMS, you can build yourself a high capacity, high discharge lithium pack to power even the biggest systems.
2. **Size:** The ability to arrange cells in whatever configuration you choose allows you to fit lithium packs in even the tightest of spaces.
3. **Customisation:** Custom lithium batteries allow you to tailor your battery build to perfectly suit your unique requirements.
4. **Low Cost:** With the ability to select from a range of lithium cells, including second life cells, you can build yourself a high performance battery while keeping your build affordable.

WARNING SUMMARY

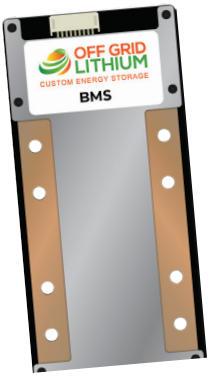
Remember, while custom lithium batteries offer incredible advantages, they also demand careful attention to safety. Handling lithium cells involves potential risks, and it's essential to prioritize **safety** at every stage of the process. A poorly built battery risks **damaging the battery cells** as well as surrounding property**.** If you decide to proceed, thorough **research**, proper **safety** precautions, and an understanding of electronics are essential to mitigate these risks.

WHAT YOU NEED

TOOLS Multimeter | Insulated Tools

CELLS

- **Capacity:** choose your cells to suit how much capacity you need. Capacity determines how long things will run for. Cells are measured in amp hours (Ah), capacity in kilowatt hours (Kwh).
- **Voltage:** choose the number of cells you need to achieve the voltage you require. Remember you are working with nominally 3V cells so, 4 cells in series gives you 12v, 8 cells 24V, etc.



BMS

A BMS is an absolutely necessary device that protects your cells from damage.

- **Cells:** Choose a BMS that suits the target voltage (12/24/48) you have chosen.
- **Current:** Choose a BMS that will have enough current to run the devices you require. Remember, Watts = Volts x Amps so 12V 200A will allow for around 2400W of power draw.

BALANCER

A balancer is a device that ensures that all your cells remain at the same voltage

- **Voltage:** choose a balancer suited to your target voltage (12/24/48).
- **Balance current:** we recommend a 5A active balancer to ensure cells remain balanced.

ASSEMBLY INSTRUCTIONS

A wiring diagram can be found in the central spread (p5 & 6).

WARNING & PRECAUTIONS

- **DO NOT connect your BMS or Balancer** (at the connector end) **until you finish the build** (Step 5).
- Protect the cells from physical damage.
- Insulation between cells is **REQUIRED** for metal cells.
- **Use only insulated tools**. A dropped spanner can easily short cells and ruin your pack.
- Avoid contact with moisture and dust.
- The BMS can get warm/hot when operating under high current, some ventilation is required.

Please Note: no components should be added on the B- side of the BMS. Devices (e.g. shunts) must be connected on the P- side.

1. **Add insulation between cells** (if casing is anything other than hard plastic) as show in image one. **Failure to do so WILL cause the cells to be destroyed. Safety hazard! If unsure - insulate.**

2. **Add link bars to the cells according to your wiring diagram, (cells in series).** Remember to check cell polarity, terminal colour does not always indicate polarity.

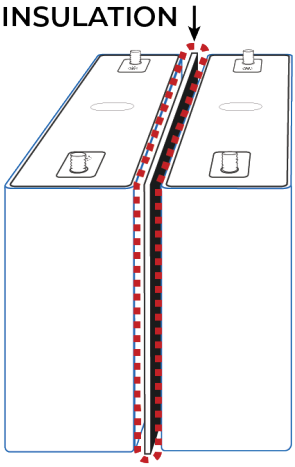


Image 1: Insulation between cells

Tip: tape can be used to hold the cells in place with insulation.

- Ensure that the wires are connected in the correct sequential order as illustrated in the wiring diagram.
- Note the correct order of link, lug, washer, etc (image 2).
- With a multimeter, measure the pins on the BMS and balancer connectors to ensure correct voltages - as illustrated alongside the wiring diagram.

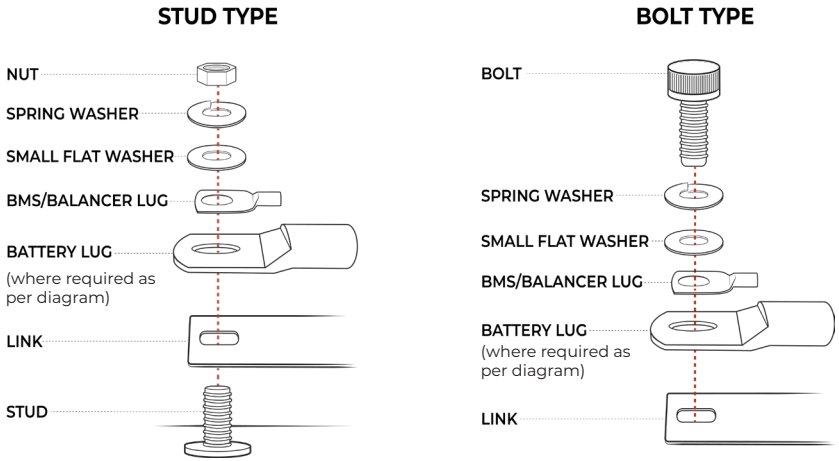


Image 2: correct order of components when connecting to cells. Note: lugs are only present when connecting to the BMS, balancer or power cables, some posts will not have lugs.

3. **Connect the lug end of the BMS and balancer wires to the cells** (Ensure the wiring looms are NOT plugged in).

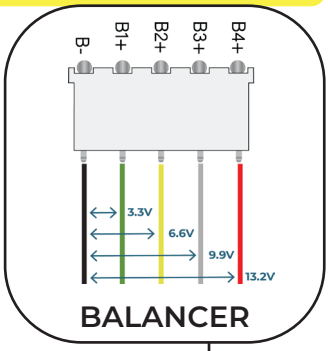
- **Make note of the P- and B- labels.**
  P- is the side of the BMS that connects to the external system, loads and chargers. The B- means battery negative and connects to the cells (Mixing these up is a common mistake).
- **Double check everything** before connecting to the cells.

4. **Wire up the main power cables according to the diagram on the center pages** (With BMS and balancer still disconnected).
   - Tidy up your cables to ensure they are well organised.
   - Protect your cables using conduit or sheathing.
   - Make sure cabling has strain relief (not too tight).
   - Now is the time to double check everything
     - Check everything is correctly tightened, this **must** also be checked periodically throughout the life of the system.
   - Charge your pack with a lithium charger prior to use.
   - Monitor it closely to make sure everything behaves as expected, especially for your first use.

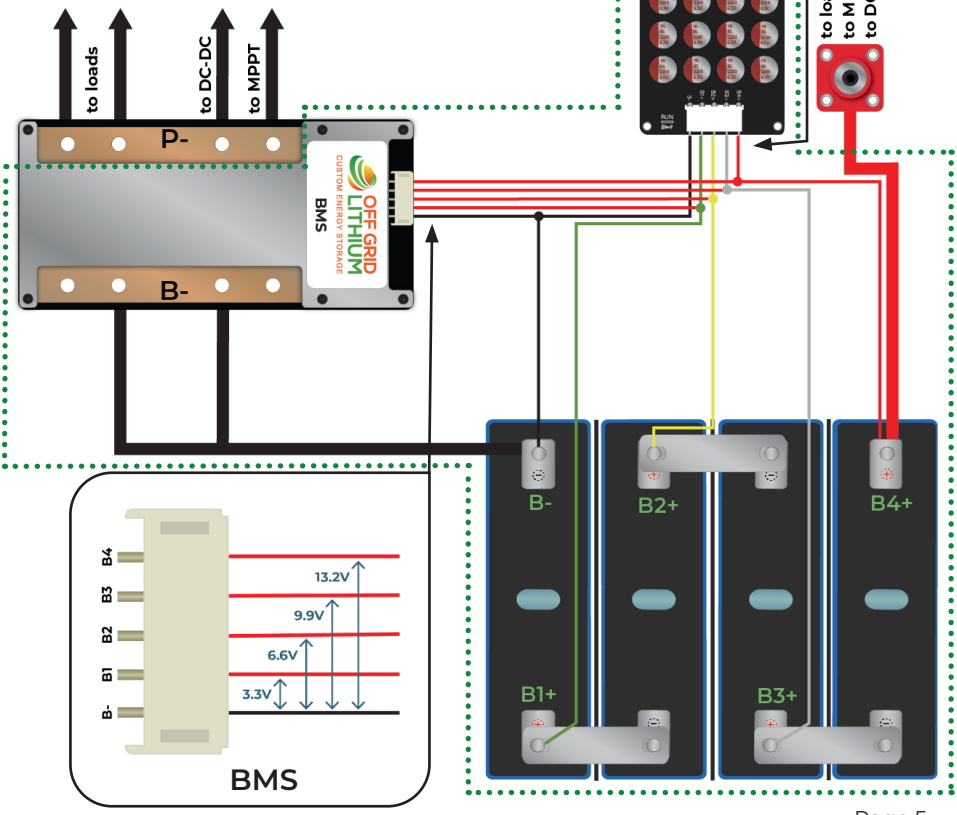
WIRING DIAGRAM

CAUTION Always unplug both the BMS and balancer prior to changing wiring.

BEFORE plugging leads into your BMS and balancer, measure the voltage at the pins with a multimeter to ensure they are wired correctly.
Start at the negative and measure each positive - you should get (roughly), 3.3V, 6.6v, 9.9V etc. Take care not to short across two pins with the multimeter probe.



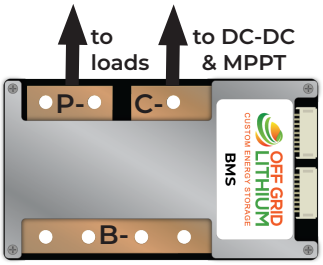
DO NOT alter anything within the green dotted line whilst the BMS & Balancer are connected!



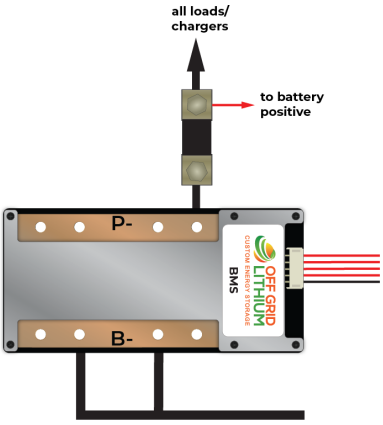
SYSTEM VARIATIONS

This pamphlet provides an overview of how to create a lithium battery, however differing componants or system size may affect wiring. We have included a few common differences which you may encounter.

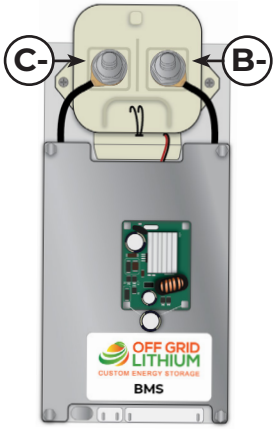
If you have any doubt about wiring please call us to lodge a product support ticket.



If your system includes a **split port BMS** ensure loads are on P- and chargers/ MPPT's are on C-.



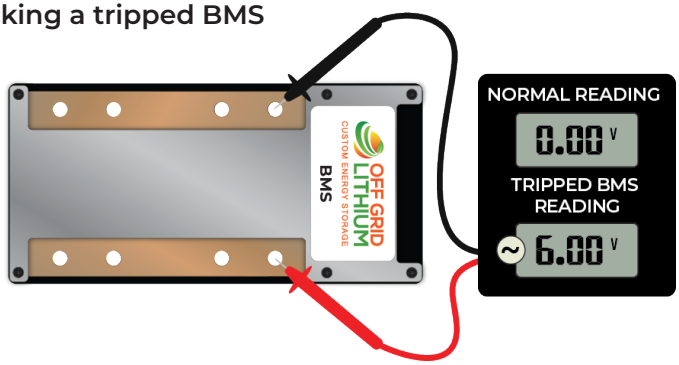
Shunt wiring - all loads connect via the shunt.



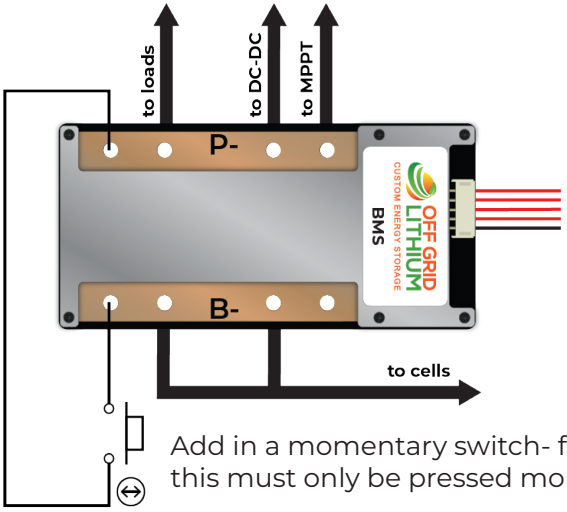
If your system includes a 48v (350A) **contactor based BMS**, be aware that P- (loads & chargers) will be labelled C-.

TROUBLESHOOTING

- **Checking a tripped BMS**



- **Fixing a tripped BMS**
  The first step would be connecting an AC charger to kick start the BMS. If this does not work you can try the following:



- **Things to check:**
  - Check everything is properly tightened
  - Charge the battery
  - Check your BMS and Balancer wires are in the correct order
  - Check you have your B- and P- the correct way around

- Alt-Tech is a supply-only company, however we have an online product support system which will allow you to communicate with our in-house tech team, give us a call to lodge a ticket.

CUSTOM LITHIUM BATTERY REQUIREMENTS CHECKLIST

Any damaged caused by incorrect installation or improper use is not covered by warranty.

- ☐ Cells must be protected by a suitable protection BMS.
- ☐ All battery wiring shall be appropriately protected, constrained and managed (strain relief).
- ☐ Cells must be electrically insulated from contact with other cells, and conductive materials.
- ☐ Cells must be protected from physical damage:
  - Scratches, dents, puncture, movement, etc.
  - moisture, dust and heat.
- ☐ Battery wiring must be correctly sized to meet current requirements:
  - Includes, main pack cables, BMS sense wires, and balance wiring.
- ☐ All connections and terminations must be tight and secure.

CHARGE SETTINGS

If you are using a Victron charger, use the smart lithium profile

Absorption: 14.20V
Float: 13.50V
Equalisation: disabled
Temperature compensation: disabled

VICTRON SMART SHUNT/BMV SETTINGS

FINDING SETTINGS

To locate these settings:

» Open the VictronConnect app
» Find your SmartShunt in the product list
» Open the settings menu
» Then select battery

Battery Capacity Battery bank Ah

Charged Voltage 14.0v, 28.2v & 56.4v
(just below the absorption voltage from your charger)

Discharge Floor 20%

Tail Current 2%

Charged Detection Time 1m

Charge Efficiency Factor 98%

Peukert's Constant 1.02

Current Threshold 0.10A

Time-to-go averaging period 3m

Battery SOC on reset Set to Keep SOC

ABOUT ALT-TECH

Alt-Tech is a family run business and we're proudly WA owned & operated from our base in Welshpool. Our warehouse is stocked with a huge range of both new and used sustainable off-grid solar components.

Our mission is to live and breathe the mantra reduce/reuse/re-purpose.

Second Life Solar Panels

Circular Economic Principles

Second Life Batteries & Cells

Alongside new products we also retail refurbished used goods and warehouse seconds giving them a second lease on life and our customers access to a genuinely 'greener' more sustainable option.

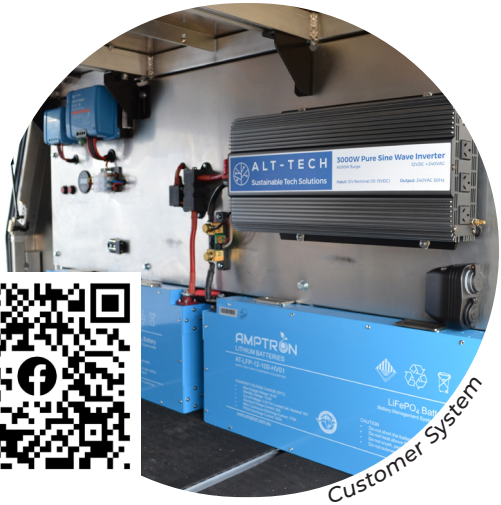
We do this because we recognise the value of maximising usable product life, repurposing and finally recycling once an item has truly reached the end of its life. This reflects a circular economic model, an alternative to current linear consumption patterns which preserves our valuable & finite resources.

Our aim is to provide sustainable tech solutions...
and our customers tell us we have the BEST off-grid toys in WA!

* This pamphlet offers guidance only. It is the responsibility of the installer to ensure that the system complies to all relevant standards and guidelines. All advice is general.*

Join the ALT-TECH community

Access exclusive member only deals, ask questions, share stories, help one another out and inspire others on their off grid journey.



Scan the QR or visit:

https://www.facebook.com/groups/alt.tech.community

If you'd like a chance to have your build featured on our social media you can email your images to us at community@alt-tech.com.au, we will be in touch to get permission before publishing any of your photos.

Shop Online Anytime

alt-tech.com.au

or visit us at:
234 Planet St
Welshpool
WA 6106

Monday - Friday
8.30AM - 5PM

Saturday
8AM - 4PM

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