

# Sun Fun Kits V5 Quick Build Manual

Revision 1.0



### **Before you Begin:**

Thank you for purchasing your Sun Fun Kits V5 DIY heated battery kit, diy battery kits make assembling your battery quick and easy and only require basic tools and hardware to assemble. We recommend having a basic understanding of DC wiring in order to assemble your battery pack and you will also need the following tools:

- Hex driver set: 3mm, 4mm, 5mm, and 8mm
- Insulated drives for securing bolts
- Thread locking compound (such as blue Loctite)
- Kapton or PET tape 1" to 2" in width
- Double Sided Sticky tape
- Velcro style loop
- DC Voltmeter
- Standard scissors
- 90% isopropyl alcohol.
- Adjustable DC Power Supply that is able to charge up battery cells (3.65 volts, 20 Amps) if manually balancing or standard 13.6v to charge the battery.
- 300-400 grit sandpaper

Optional:

- Electrical Safe Silicone sealant (for those looking to make a water resistant battery)
- Hot glue gun (if you wish to secure wires using this method)



**Preparing your battery cells:**

Sun Fun Kits DIY battery kits support various prismatic cells, in this manual we will be using the EVE LF304 type, however the process is the same for other manufacturers such as CATL, REPT, Ganfeng and more, the V5 Kit has these cells picked and pre-installed for you with the heating pads and center fiberglass separator already installed.



Certified Automotive Grade Cells generally do not require balancing; the active balancer in v5 kits will assist in top balancing your cells, simply assemble your pack, charge the battery at 5-20 amps and within a few hours your cells should be evenly balanced.

With version 5, we are exclusively using the in-between cells heating method as based on customer response it is the preferred cell heating method, if you wish to use sidewall heating, please consider the V4 Premium Kit.



Find the pack of bus bars and set them aside or on the ledge of the V5 Kit, please take note of the cell orientation and ensure it matches the image above, if you find it does, STOP the build and contact Sun Fun Kits Immediately.

### **Setting Up Electronics & Cell wiring:**

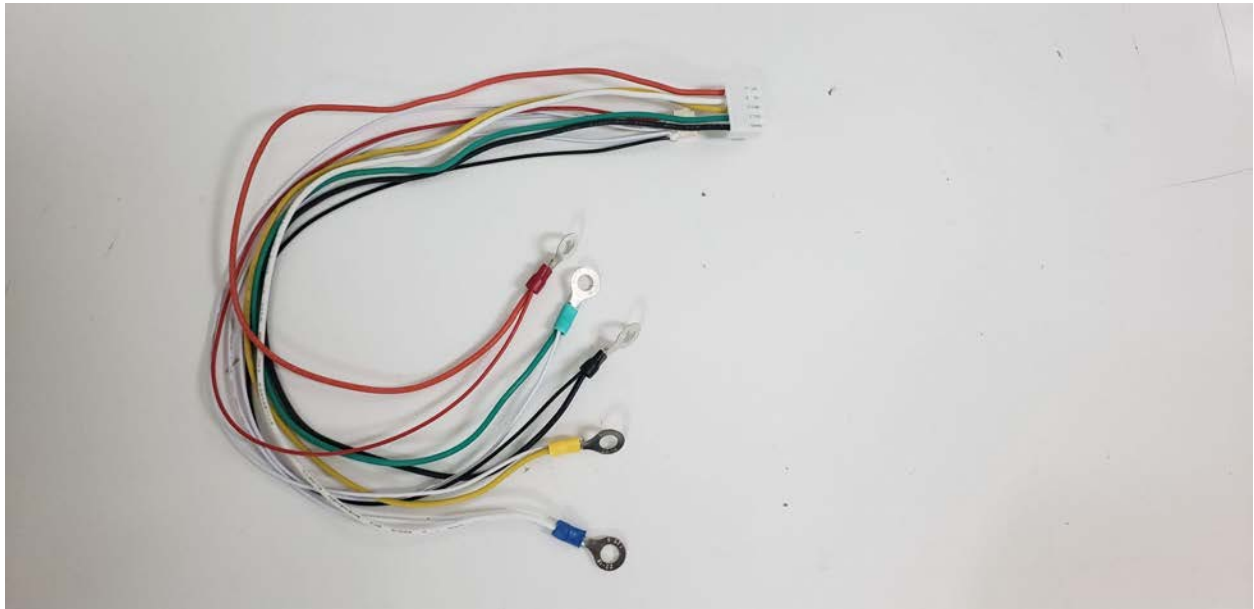
Version 5 kits come exclusively with the SFK-200 AMP Smart BMS with Dual Mode Heating, meaning that heating can be turned on manually via the GEN2 I/O switch, or is done automatically when the battery detects low temperature and the user attempts to charge the battery.



**Note: Before beginning this step it is EXTREMELY IMPORTANT that you clean and wipe down all of your bus bars, washers, terminals and battery post with 90% isopropyl alcohol. Dirty terminals and connections will result in improper readings and poor results.**



Begin by placing your bus bars in the orientation shown below, you DO NOT need to put a washer on top of the bus bars as with V5 kits we have made the combination active balancer + bms monitoring a combination harness and are using a large lug connector that acts as a washer.

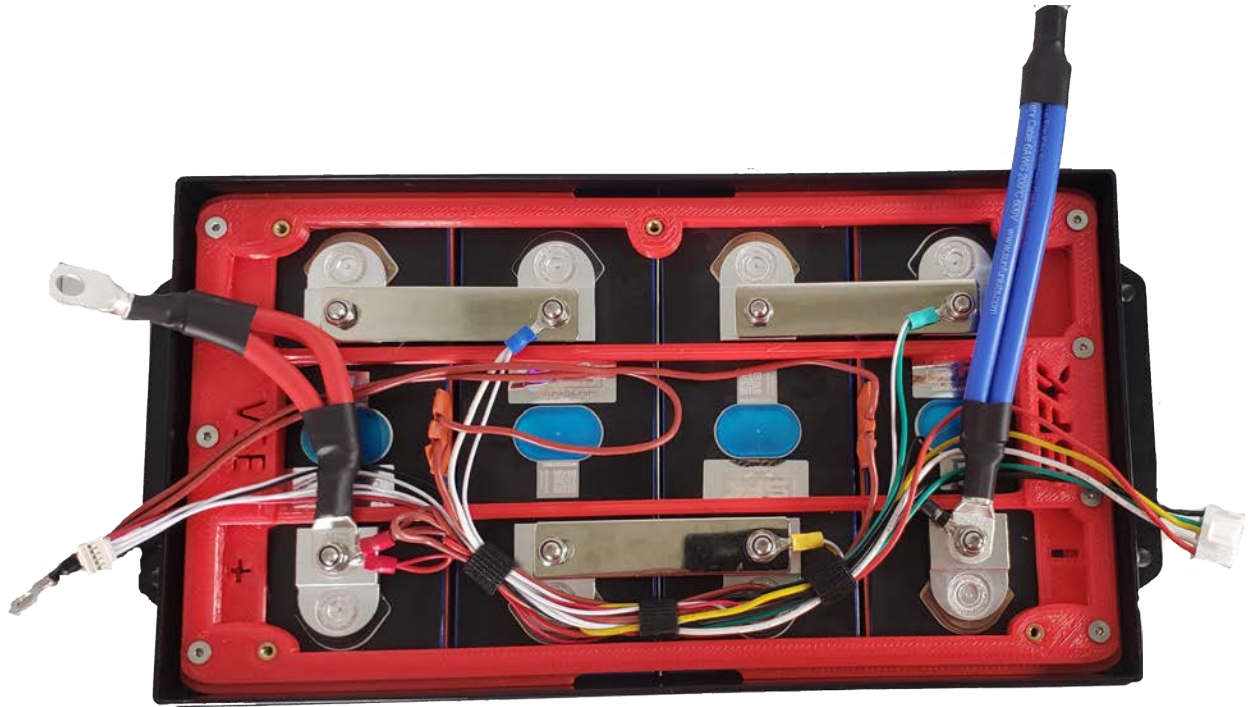




Now you will add your series terminals and BMS balancing/monitoring wires as well as the active balancer wires (NOTE the initial negative post; and the final positive post are shared between both the active balancer & BMS, all other posts may be separate for each cell).

Please note your BMS wires should be routed to the positive terminal and the active balancer wires should be routed to the negative terminal:





**Note: CAUTION!!! In many prismatic cells the positive terminal is colored black and the negative terminal is colored brown! Please double check your cells with a volt/multimeter before continuing. THE BLUE WIRE SHOULD NOT TOUCH THE POSITIVE TERMINAL OF THE FIRST CELL OR IT WILL ARC AND DESTROY THE CELL.**

black wire = cell 1(**black lug**) negative (0.00 Volts)  
1st white wire (**green lug**) = cell 1 positive / (3.3 Volts)  
2nd white wire (**yellow lug**) = cell 2 positive / (6.6 Volts)  
3rd white wire (**blue lug**) = cell 3 positive / (9.9 Volts)  
red wire = cell 4 (**red lug**) positive (13.2 Volts)

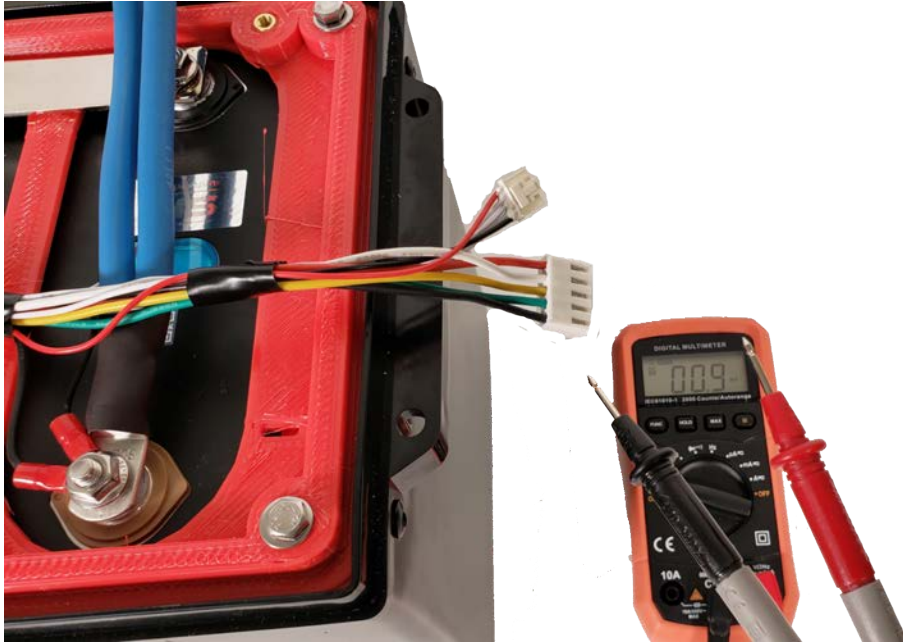
You will need to ensure a tight fit, take care not to strip your battery terminals, if you are using a torque wrench you will want to tighten down to 4-6 NM. **WARNING! Loose terminals will cause the cells & batteries to fail.**

The heating pad now shares the main positive of cell 4 and no longer requires a connection to the LID, you will want to make sure the heating pad lug sits on top of the bms/active balancer lug. The negative (black lug) of the heating pad will connect to the HT port on the BMS. Tidy up your install by using electrical tape, zip ties, or velcro loop strips.



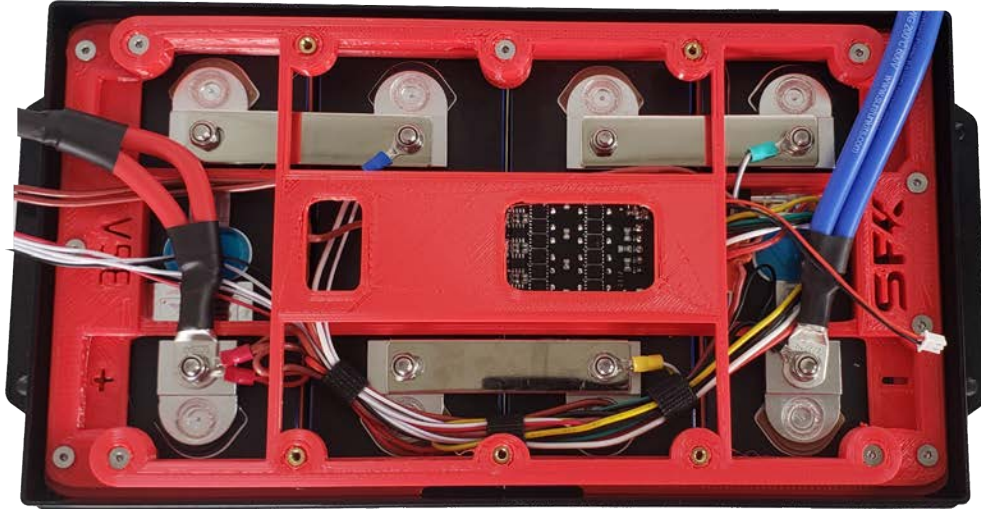
## Verify your voltages using a volt/multi-meter

Once you have verified the wiring has been installed correctly, you can now begin by attaching the top plate & your BMS.



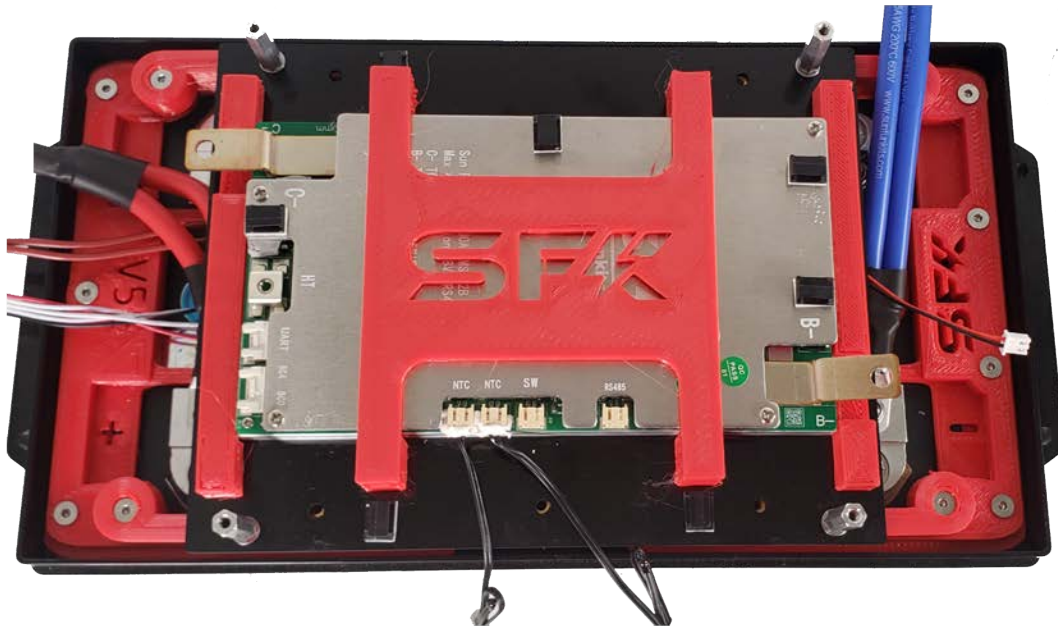
## Installing riser and BMS mounting plates:

After you have verified that your cells are mounted correctly **AND VERIFIED** they have correct voltage readings, you can now begin mounting the BMS and other related electronics. Begin by mounting the riser plate by first inserting the active balancer connector into the balancing unit and then rotate it so that it matches the mounting holes on the main kit plate:

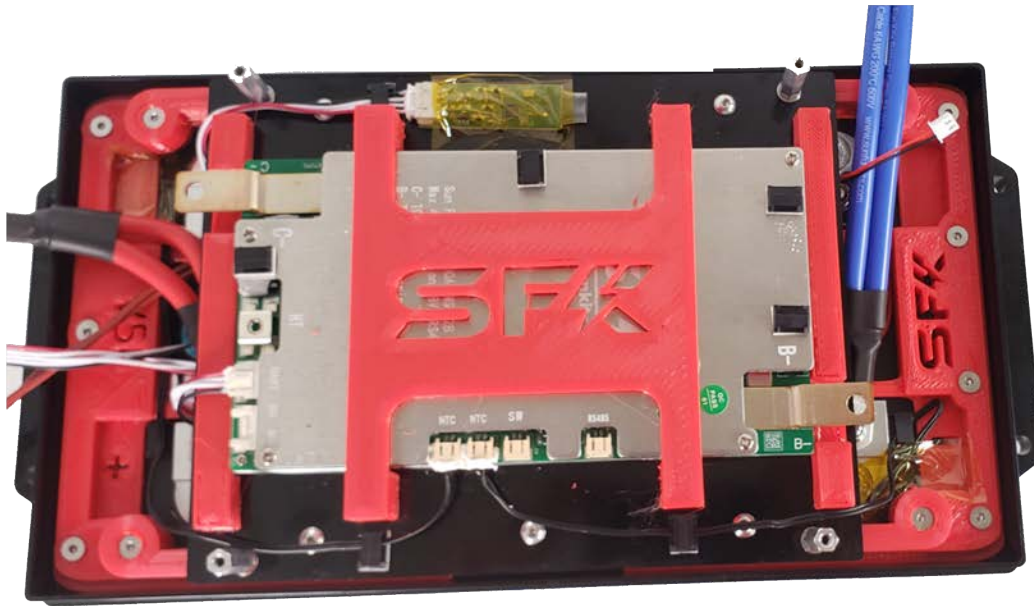


Secure the riser plate using the 4 countersunk M4x20mm screws on the sides. We recommend only using hand tools for this process.

After this process we will now install the BMS plate. You will use 5 of the M4x16mm button head screws with a washer to secure the plate to the riser. With version 5 all bolts are now exactly the same.



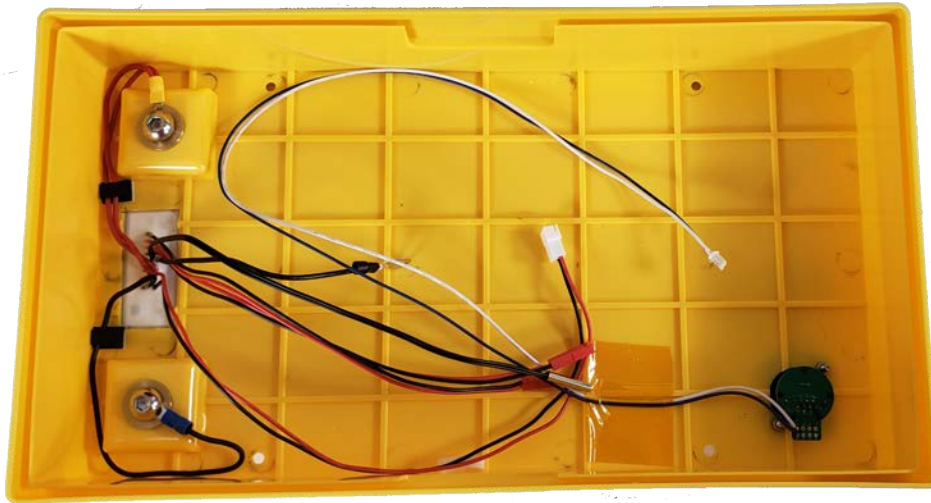
You can place some of the stick on wire keeps as needed, this will assist in securing wires used by the Gen 2 I/O switch. The SFK-200 BMS includes 2 external temp probes, these can be mounted in the positions of your choice, use the included stick-on wire keeps as well as Kapton tape to mount them into position.



**NOTE:** Make sure the balancing lead is **NOT** connected to the BMS! This will be inserted in a later step.

Examine the underside of the LID. V5 kits include the option of a RS-485 Data port that uses a RJ45 connector. The SFK-200 BMS is set up to use half-duplex transmission mode and uses PINS 1 & 2 of the connector as RS-485A and RS-485B wires. Also included are power transmission cables for the Bluetooth adapter that allow V5 kits to hard cut power to the bluetooth dongle thereby turning off BLE functionality.

Also of note is the active balancer control that allows the GEN2 switch to configure how the active balancer will function in the kit (it can be set to ON the entire time, ON only during periods of high voltage or near fully charged, or it can be disabled where only the standard passive balancer of the BMS will manage the cells).



During the injection molding process some residual abs material may have gotten deposited onto the main brass conductor rings, these need to be cleaned. Using 300-400 grit sandpaper, gently scrub the conductor ring until all traces of residual abs plastic are removed.



Once cleaned, use isopropyl alcohol to wipe clean and then begin to attach the main BMS and cell wires.





Mount the black main lug to the BMS using the included M6 bolts and hex nuts. Secure the blue wire to the bms using the same method. A M10 wrench is recommended to keep the hex nut in place.

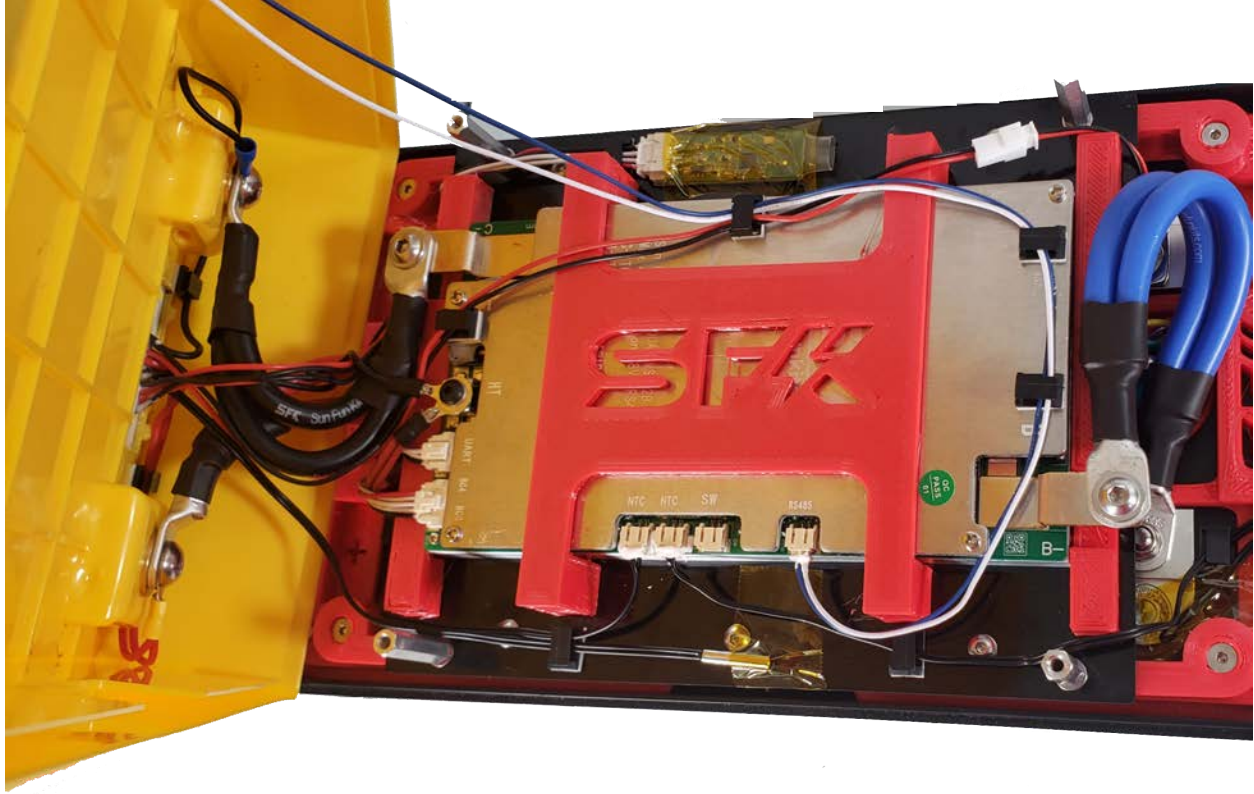
Position the lid on the side of the case and begin by installing the main black lug, make sure it has direct contact to the main brass terminal and the black wire with the blue lug is on top of it, secure with the included m8x10 button bolt.

Attach the Bluetooth switch control using the JST connectors, then tuck the remaining wire underneath the BMS plate.

Attach the white active balancer activation wire to the active balancer and use one of the stick on wire keeps to keep the wire in place.

Secure the temperature probes at the location of your choice and mount with kapton tape. Attach the black lug of the thermal pads and the black lug of the GEN2 switch to the **HT** port on the BMS and secure it with the m4 bolt.

Finally attach the GEN 2 Switch's temperature sensor to the position of your choice, for our install it near the BMS as it will get the ambient inside case temperature reading to determine if the heating pads should turn on or not (when heating is enabled on the switch).



Once done, review your wire installation and make sure when the lid is closed it is **NOT PINCHING** any wires **AND ONLY WHEN ALL THIS IS DONE, SHOULD YOU INSERT THE BMS BALANCING WIRES into the BMS** to complete the inside install.





Finish up the install by securing the lid with the included countersunk M4x10mm screws. Optionally, if you would like to have a moisture/water resistant seal, you can use electrical safe silicone (low order) sealant between the lid and the lip of the battery. A good example is this brand:



Simply apply a bead of it before closing the lid, we have a video of this process (shown on a v4 kit):

<https://www.youtube.com/watch?v=gLge2xds6gE>



Verify your install works by turning on the bluetooth function, press the bluetooth icon and it will illuminate as **blue** indicating bluetooth is active. Press again to deactivate bluetooth functionality.

You can turn on the active balancer by pressing the active balancer icon; the **blue** light indicates the balancer is on and working in normal mode. If you prefer the active balancer only works when the battery is near high voltage (about 3.35v/cell or 13.4v or higher) then press the button again and you will see a **green** light, this is called Hi-Mode. To turn off the active balancer altogether, press again.

V5 kits have dual heating modes: low temperature charging mode and stand by heating mode. The low temperature charging mode is always on, meaning if you attempt to charge the battery below the threshold set in the app, the battery will turn on the heating pads and divert incoming power to the heating pads, once the temperature has risen above the threshold normal charging can resume.

Standby heating on the other hand will keep the battery around 60 degree Fahrenheit or about 16 degrees celsius and will turn the heating pads on/off as needed to maintain temperature. To turn on standby heating simply press the heating icon. When standby heating is active it will appear as **white** icon, if the GEN2 switch detects low temperature it the icon will switch to **red** letting you know that the heating pads are active.

### **Monitoring Apps & Tests:**

You can now connect to your battery and perform tests; visit Google Play Store or Apple IOS App store and search for: Sun Fun Kits BMS

<https://play.google.com/store/apps/details?id=com.companyname.sfkble&hl=en&gl=US>

<https://apps.apple.com/tt/app/sun-fun-kits-bms/id1600445506>