

# Sun Fun Kits V3, V3 Heated, & V3 RTB Assembly Manual

Revision 1.2



### **Before you Begin:**

Thank you for purchasing your Sun Fun Kits DIY battery kit, the diy battery kits makes assembling your battery quick and easy and only requires basic tools and hardware. We recommend having a basic understanding of DC wiring in order to assemble your battery pack. 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 tape 1" to 2" in width
- Double Sided Sticky tape
- Velcro style loop
- DC Voltmeter
- DC Power Supply that is able to charge up battery cells (3.65 volts, 20 Amps)

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)



### **Video Manual:**

If you are more of a visual learner, you can view the build process on our official youtube channel: <https://youtu.be/tWm65Pu0GuI>

## 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 V3 Kit includes spacers and other items to ensure maximum compatibility for cells in this class (270-320 AH)



Certified Automotive Grade Cells generally do not require balancing; however, you may choose to balance your cells, we have a video explaining this process.

This process is explained in this tutorial video:  
<https://www.youtube.com/watch?v=JGbzozzCYvM>

**NOTE:** if you are using an RTB (ready to build kit) the active balancer will assist in top balancing your cells, simply assemble your pack, charge the battery at 5-110 amps and within 1-2 hours your cells should be even balanced. Again, certified cells that are included with your RTB kit will

balance very quickly and the active balancer is included simply to assist balancing during high amperage charging (over 80 amps).

**Assembling your battery cells:**

Begin by placing your cells in a series configuration with the left side of the battery having the **positive terminal on the lower left and the negative terminal on the lower right.**





**Note:** you may find some resistance installing your cells, this is because the EPE foam exerts pressure on the cells to keep them in place. We recommend adding the left most and right most cells first and then adding the remaining 2 inner cells in the end.



**PLEASE MAKE SURE TO PLACE CELLS CORRECTLY IN THE ORDER ABOVE.**

**Heated Kits:**

If you are building a heated kit, you will have pre-installed silicon rubber heated elements installed on your case, these will be joined to a t-plug.



The heated kits will provide additional resistance to cells when they are being installed, however, there is still sufficient space to insert the cells. It is recommended that you do not install fully charged cells as they will make the process challenging.



Once your cells are in the correct position; it is now time to install your bottom bracket. With our v3 kits we have made our cell bracket universal and it should fit virtually all cells in the 270-320 AH class. The one differentiating factor is cell height, these can vary from 200mm up to 205.25mm; to address this, the V3 includes 3 sets of shims, find the shim that best matches your cell height to ensure a level surface.



Install the bottom bracket with the M5 bolts and washers, you can use power tools to assist in this step. **NOTE:** Ensure the negative and positive signs on the plate match your cells.



The heated kits look similar to the regular v3 kits except they have a notch cut on the upper and lower middle to allow the wires from the rubber heating elements to extruded into the main case.



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

This step involves wiring up your cells, you will need a BMS system and optionally a supplementary balancing device to complete this step. You will also need to have the appropriate wiring done to complete the electrical setup. If you are using our SFK-150V2 4s Bms, all wiring and prep has been done for you; simply bolt onto your components; no crimping or cutting is necessary.

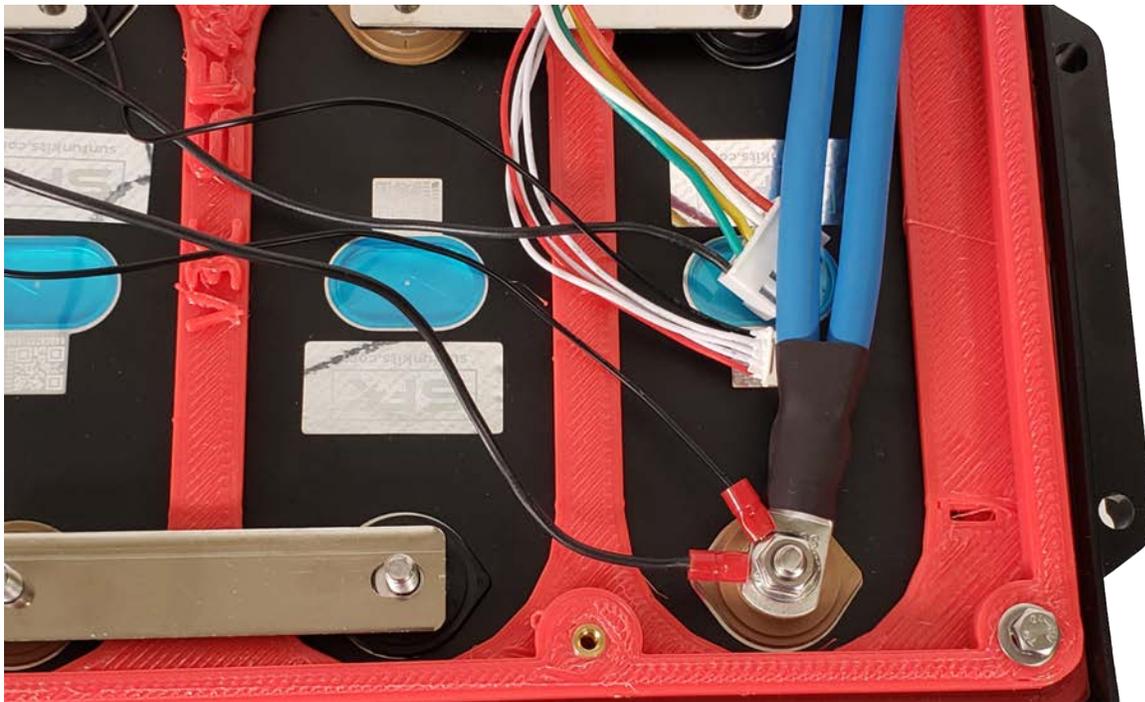
The V3 kit system supports various BMS devices from manufacturers such as JBD (SFK Series), Daly, Ant, QUCC, and more. New device support is being added constantly; if you need a specific mounting plate made, simply contact Sun Fun Kits support at [cs@sunfunkits.com](mailto:cs@sunfunkits.com)



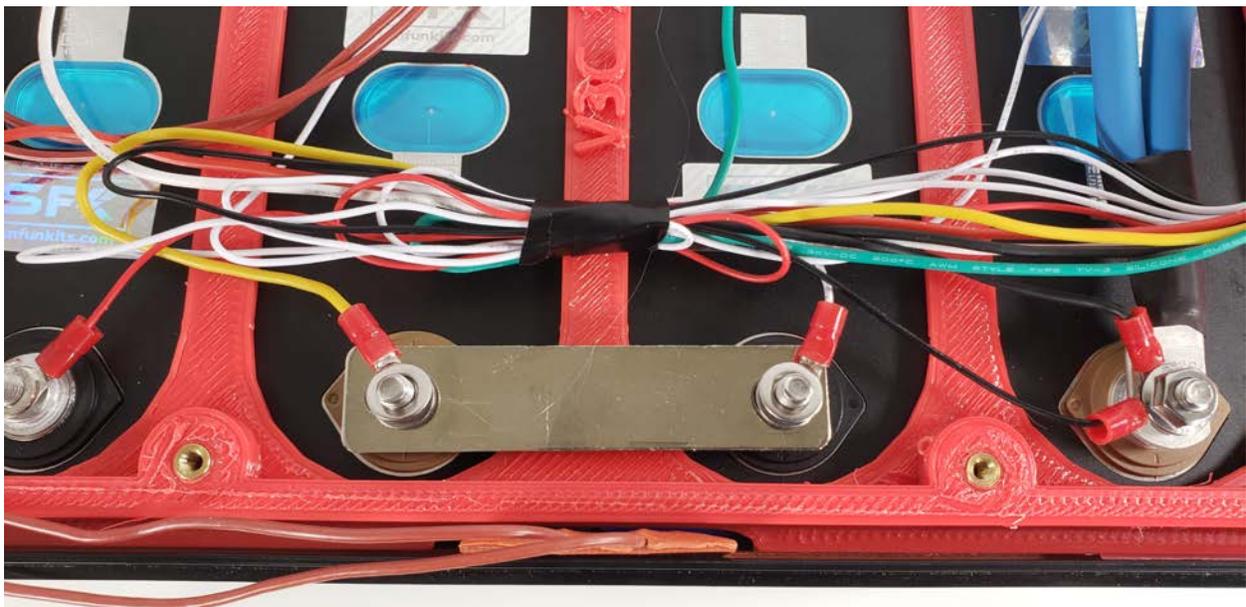
Begin by aligning your buss bars as follows:



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) :



NOTE: be sure to use the included washers for the BMS and Active balancer terminals. This is needed as many cells include serrated nuts that “dig” into the metal, the material on the balancing and active balancing rings may not be sufficient to handle this, hence a washer above and below the terminal is recommended.





Your cells should come with the bus bar, terminal studs or welded terminals. Tidy up your install using electrical tape, zip ties, or velcro strips. Setup the wiring schematic as follows:

black wire = cell 1 negative (**0.00 Volts**)

1st white wire = cell 1 **positive** / cell 2 negative bus bar (either post may be used) (**3.3 Volts**)

2nd white wire = cell 2 **positive** / cell 3 negative bus bar (either post may be used) (**6.6 Volts**)

3rd white wire = cell 3 **positive** / cell 4 negative bus bar (either post may be used) (**9.9 Volts**)

red wire = cell 4 **positive** (**13.2 Volts**)

\*The 1st white wire is the wire that is right next to the black wire, the subsequent wires will be white wire 2, and white wire 3.

The active balancer should be wired:

black wire = cell 1 negative (**0.00 Volts**)

green wire = cell 1 **positive** / cell 2 negative bus bar (either post may be used) (**3.3 Volts**)

yellow wire = cell 2 **positive** / cell 3 negative bus bar (either post may be used) (**6.6 Volts**)

white wire = cell 3 **positive** / cell 4 negative bus bar (either post may be used) (**9.9 Volts**)

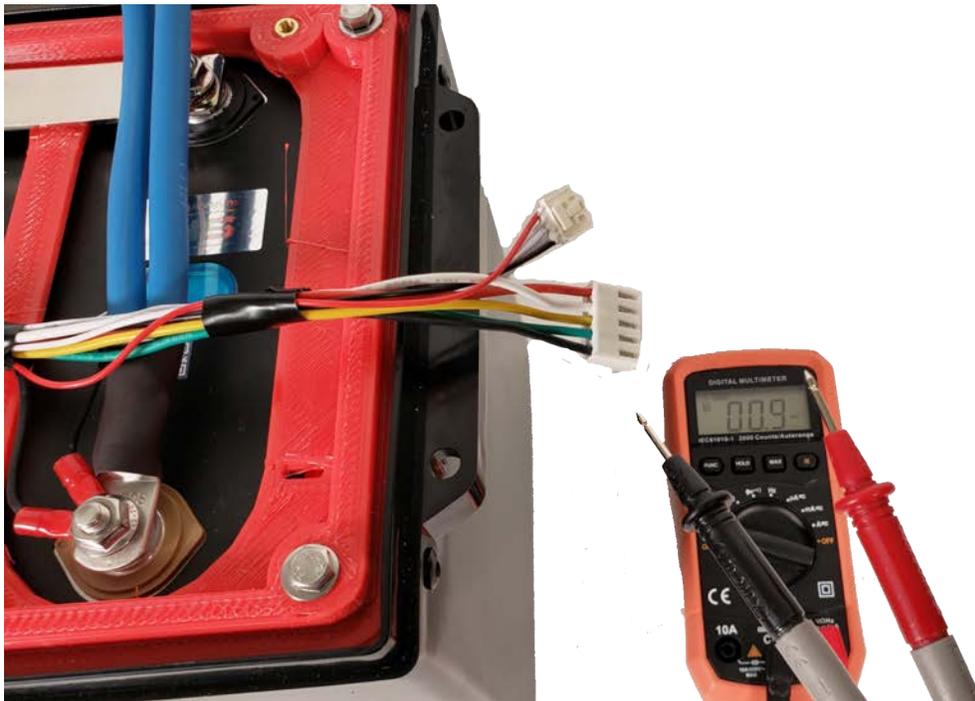
red wire = cell 4 **positive** (**13.2 Volts**)

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 6-8 NM. **WARNING! Loose terminals will cause the cells & batteries to fail.**

Your voltages should read:

**3.3, 6.6, 9.9,13.2 (Nominal Voltage).**

If you are using a supplementary balance, you should install this as well, you will need to share the final negative and positive terminals of the battery for multiple devices. **Make sure the wired main terminals are the ones that touch the cell terminal** and only stack the other rings on top.

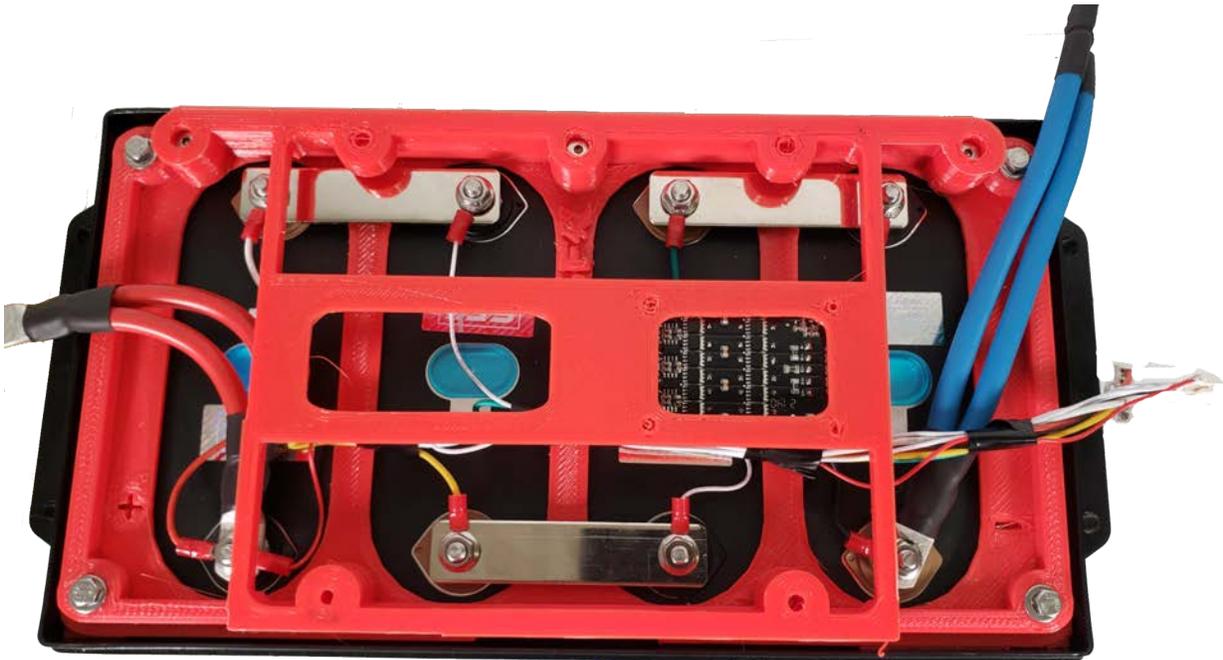
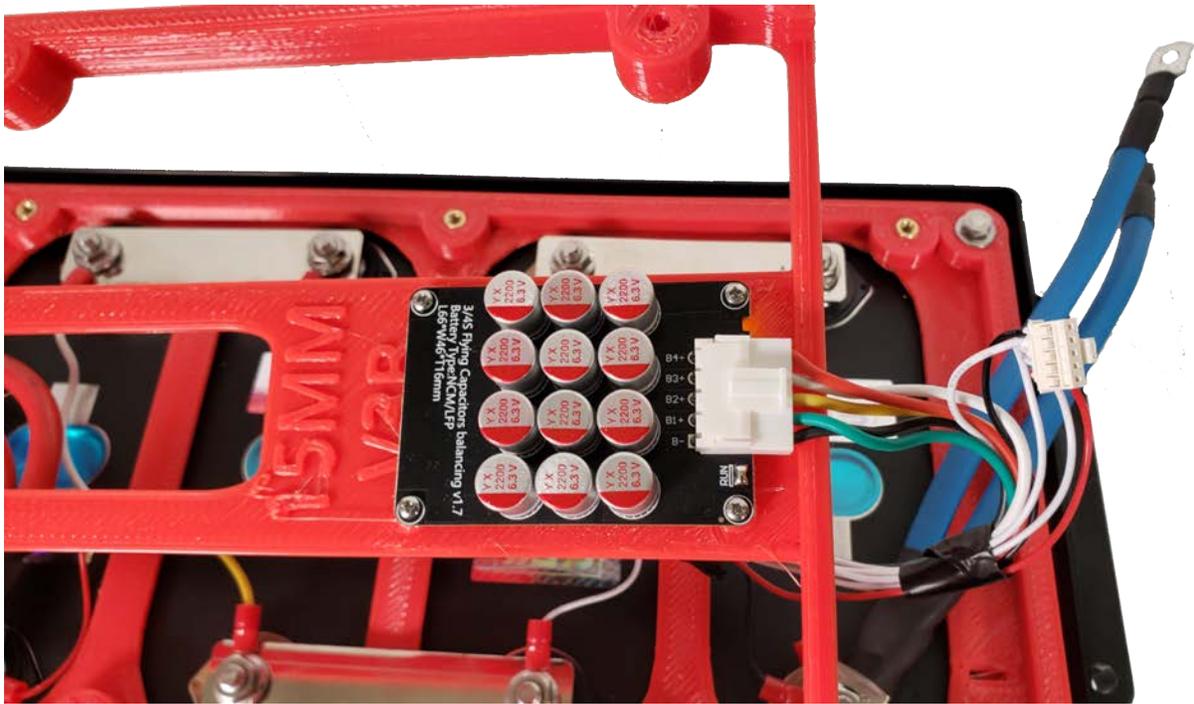


**All V3 RTB kits include the active balancer, and we highly recommend using it as it reduces the balancing stress on your BMS and is able to balance out cells significantly faster during charging.**

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

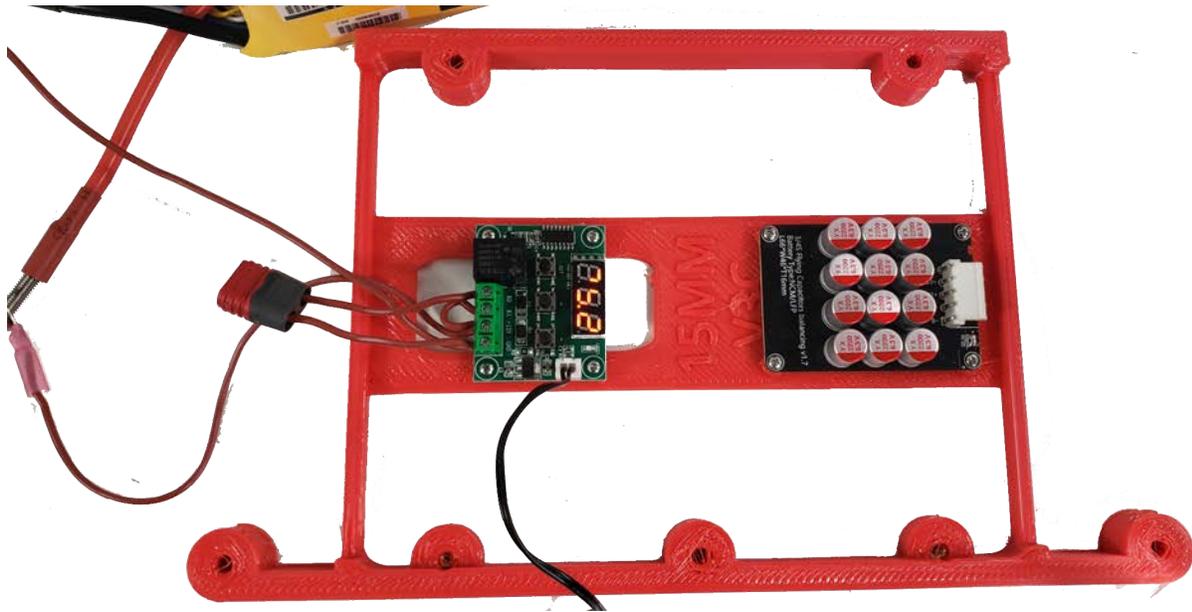
### **Installing riser and BMS mounting plates:**

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:

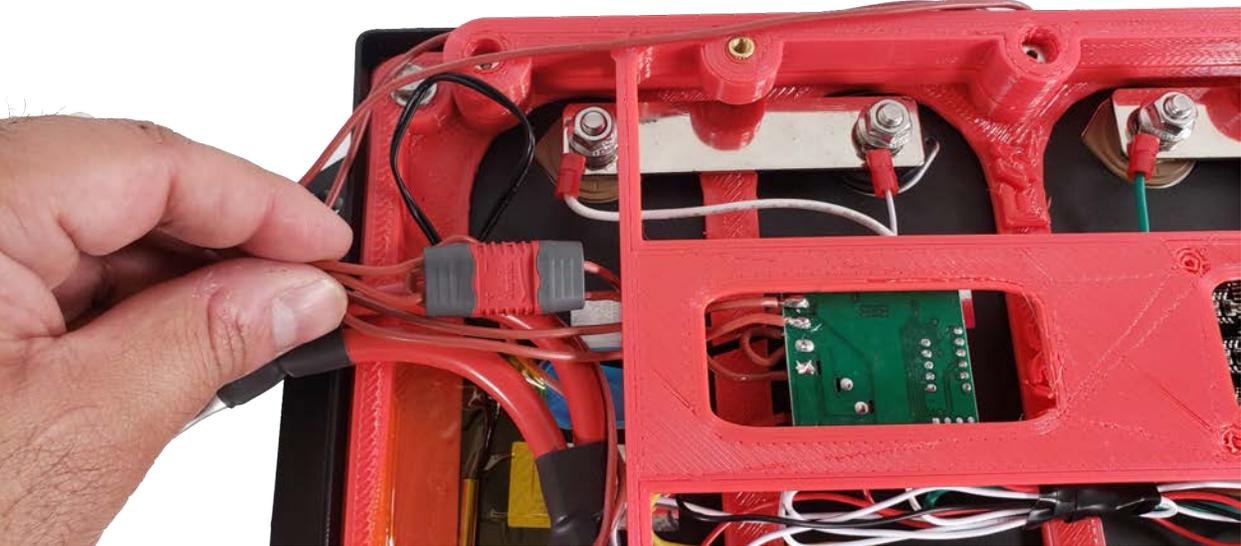


Secure the riser plate using the 3 countersunk M4 screws. We recommend only using hand tools for this process (despite the youtube videos where the installer and author of this manual uses an impact hammer... 😞).

The heated kits will power the silicon rubber heating elements either form dedicated ports on the BMS, or they will use a temperature active switch that is included with the v3 heated kits. If using the thermal switch, it has been pre-programmed to provide heating to the battery to maintain 70 degrees internal case temperature. This will turn on / off as needed to maintain this thermal threshold. The thermal switch can be adjusted to different temperatures as needed to suit your requirements.



For heated kits it is recommended to use kapton tape to secure the wires and flap of the silicon rubber heating elements to the sides of the riser plate.



For heated kits you will connect the T-plug to the thermal switch feed to provide the heating elements with power. Tuck under the riser plate and secure it using zip ties, velcro strips, or electrical tape.

With the riser plate installed, it is now time to install the BMS mounting plate. For this install we will be using the SFK-150V2 BMS; this is the BMS we recommend for our kits and works extremely well giving the most flexibility and reliability.



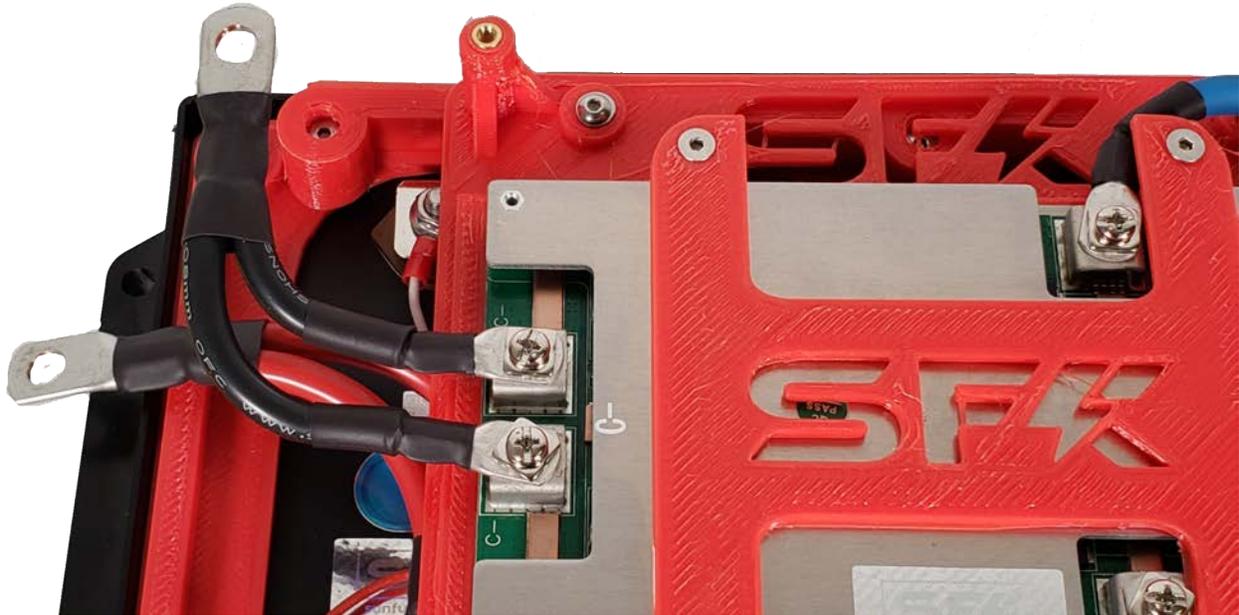
Install the m4x25-30 mm bolts on the bottom, and the m4x15mm bolts on the top.



With the plate secured, it is now time to start attaching the terminal cables to the BMS, this will vary depending on which BMS you are using, for all Sun Fun Kits BMS, we provide the BMS to you with appropriately sized crimped and ready-to-install wires that you easily attach to your kit.



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



Most BMS units will include one or more NTP probes, these can be mounted at the position of your choice. For The SFK-150V2 BMS unit, you may place these on one of the cells and on a mounting plate (to get internal case temperature).

Heated kits will include 2 additional terminals that will need to be installed, these will vary based on the BMS and or thermal switch you are using. For most BMS units, you will attach the positive to the main battery terminal post on the lid, followed by the negative terminal which is connected to the output port of the BMS **NOTE: it is extremely important that you do not hook up the thermal switch or silicone heater pads directly to the posts on your cells, this will by pass your BMS which may cause your cells to drain below the critical 2.5 volts level.**



**Installing the kit lid and selecting lug mounting options:**

With your cables prepped and mounted, it's now time to determine how you will want to mount your cable lugs to your battery kit. The V3 kits include 2 options: Terminal Studs as well as flanged top bolts. The terminal stud option is preferred as it offers the best flexibility in terms of parallel and series connections, however the flanged top bolts provide a height benefit as they are about one inch shorter.





Once you have determined your mounting preference, take your preferred mounting option and attach your top lid.

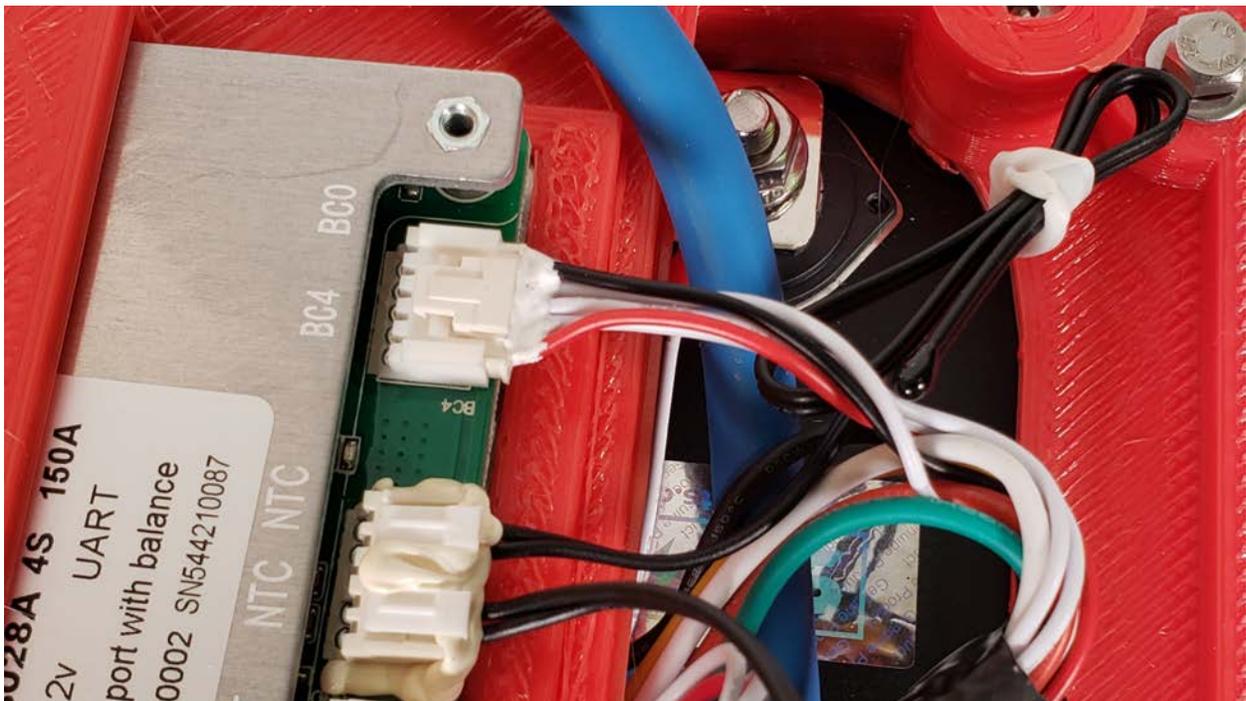


**ENSURE A TIGHT FIT!** You must make sure the bolt is making proper and solid contact to the brass insert, a loose contact will generate heat and can lead to battery failure. Ensure at least 10-15 NM torque setting (appx 140 inch/lbs).

Heated kits shall attach the positive terminal of the thermal switch/silicone heater terminal to the final post on the lid. **NOTE: be sure that the heater terminal sits ABOVE THE MAIN LUG, it should never be below it as this will result in a poor connection resulting in a high resistance and will cause damage to your battery.**



Once the lid wires are secured, you can now insert the balancing wires into your BMS.



Finish off by bolting down the top lid using the 4x15mm countersunk 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:



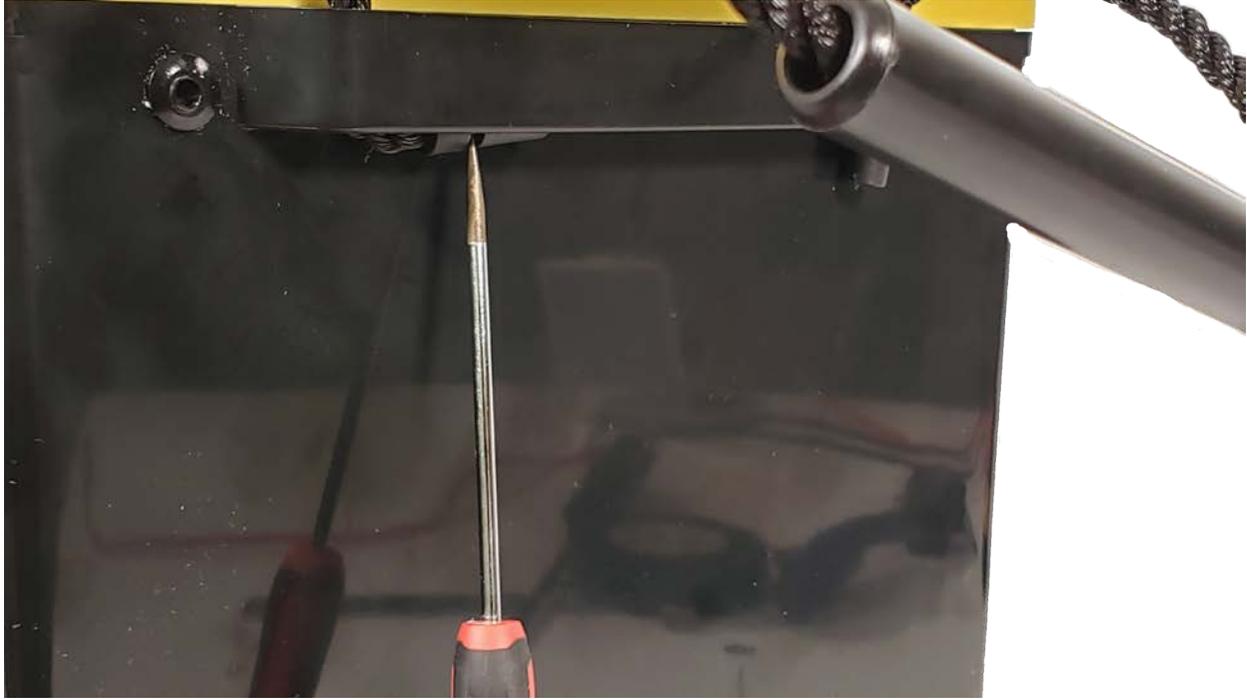
Simply apply a bead of it before closing the lid, we have a video of this process (shown on a v1 kit):

<https://www.youtube.com/watch?v=g7AIX0kE1Lw>

The last step in your kit assembly is to attach the handles & grips. This process is very simple: thread the nylon rope through the plastic barrel and through the hole on the kit handles.



Once through simply insert the nylon barrel into the built in latch using a flat head screwdriver:



Once done your kit is now complete and ready for testing.

### **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>