

BATTLE BORN®

Unstoppable Power Solutions

Integrated Heating Instruction Guide



For Technical Support, please contact: 855.292.2831 | info@battlebornbatteries.com

Please read the accompanying battery manual prior to this guide.

Thank you for investing in a Battle Born Batteries system and welcome to the Battle Born Batteries family. This guide provides important information on how to install the heat-enable function on your Battle Born batteries. If you have purchased with us before, you will find this guide useful as a reference tool. If this is your first purchase with Battle Born Batteries, this guide can serve as an educational tool on how to properly install your heat-enable function.

Note: The BB10012H battery model is used in this guide's diagrams. Setup will be the same for all heated battery models.

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QR Codes will appear throughout the manual, linking to FAQ videos that may be useful.

To use the QR code, open a QR reader or the camera on your smartphone. Hold your device over the QR code so that the code is clearly visible within the device'sscreen. Your phone will automatically scan the code and pull in the corresponding weblink.



What is in the Box?

Included with Your Purchase:

Upon arrival, please verify your heated includes the items listed below.

- (1) SPST Rocker Switch (Figure 1)
- (1) 25' 12 AWG wire terminated with 0.187 QD and #8 ring lug (Figure 1)
- (1) 25' 12 AWG wire terminated with 0.187 QD and 5/16 ring lug (Figure 1)
- (1) Jump Wire (Figure 2)



Figure 1



Figure 2

If you need to modify the harness, use the following items:

- (2) 3/8" Ring Lugs
- (2) 3/8" Ring Lug
- (2) #8 Ring Lugs
- (4) 1-inch pieces of shrink wrap
- (1) Extra M4 x 4mm ong Philip head screw

If you purchased more than one heat battery you will receive a Heat Battery Add-on Kit (Figure 3) which provides the necessary components to daisy chain the heat-enable posts. This allows for each battery's heat function to be enabled and disabled via a single rocker switch.

Items in the Add-on Kit include:

If you are installing more than one heat-enabled battery you will need the Add-on Kit. See Figure 3.

- (1) 14-inch 18 AWG wire terminated with two #8 ring lugs
- (2) M4 x 5mm long Philip head screws
- (1) #8 ring lug
- (1) 1-inch piece of shrink wrap



Figure 3



**Additional Tools
Needed for Install**

Additional Tools Needed for Install

Upon arrival, please verify your heated includes the items listed below.

- #2 Philips Screwdriver
- 3/4 inch Forstner drill bit, step bit, or equivalent
- 220 grit sandpaper
- 1/2" wrench
- 1/2" socket wrench
- Torque wrench set to 10 ft-lbs.



Figure 4

User Note

To enable the heating circuit on your battery a connection from the heat-enable post to the positive terminal needs to be made. The heater will automatically activate when the internal temperature drops below approximately 35°F (1.6°C) and will shut off when the internal temperature exceeds approximately 45°F (7.2°C).

If the battery has been exposed to below-freezing temperatures for a long period of time without the heater enabled, it will take 2 to 4 hours for the internal components of the battery to heat up enough for the battery to accept a charge. The heater will continue to operate until the battery disconnects for low-voltage cutoff.

REMINDER: ALWAYS DISCONNECT THE HEATER WHEN STORING THE BATTERY.



Using Battery Heaters in Series

Using Battery Heaters in Series

When using the heat function with our batteries in 24v, 36v and 48v, they can sometimes drift out of balance quicker than batteries in 12v which results in having to balance the batteries more frequently than the traditional 1-year recommendation. The key reason is that each battery's internal Battery Management System (BMS) primarily balances cells only when the battery reaches 100% State of Charge (soc). Consistently hitting this full charge is crucial.

To help maintain balance in your series-connected heated battery bank:

Multi-bank Battery Chargers

Allows individual charging of each battery regularly to its full charge voltage (14.4v) without dismantling.

Battery Balancers

Attached to your bank to allow power to be moved between each battery for bank balancing.

Individual Charging

Breaking the bank apart regularly and recharging each battery individually to ensure each battery reaches its full charge voltage (14.4v).



Enabling the Heat Function

Enabling the Heat Function for a Single Battery:

To install a single heat battery, you will need the standard heat-enable jumper wire. See Figure 2.

Use the provided jumper to connect the POSITIVE terminal and the heat-enable post. The terminals are labeled and color-coded (Figure 5.)

- **Red** for positive (+)
- **Black** for negative (-)

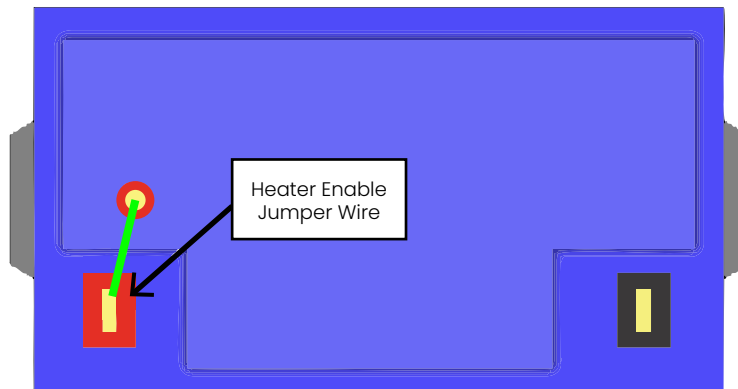


Figure 5: Heat-enabled Jumper Wire Setup

Step One: Making a Connection on the Positive Terminal

The 5/16" side of the heat-enable jumper wire should go on the positive terminal connection between the washer and the nylok. See Figure 6. The connection should then be torqued down using a ½" wrench, a ½" socket, and a torque wrench set to 10 ft-lbs

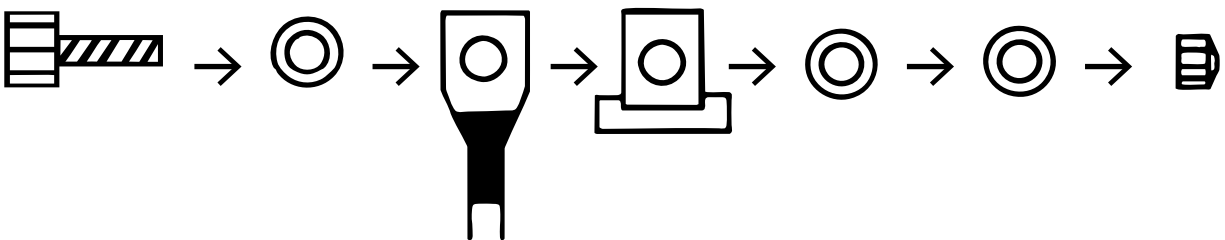


Figure 6: Proper order of hardware to connect cables. When going from left to right in the diagram the correct order is: bolt, washer, lug, terminal, washer, jumper wire, and nut. If multiple lugs are used, they should be on the same side of the terminal.

Note: The heat-enable post is not current-carrying, so when a connection is made it should not spark. However, once the connection has been made to the heat-enable jumper wire, the connection will be live at 12V. Take care to avoid any contact with other live wires or grounds.

Step Two: Enabling the Heat Function

To enable the heat function on the battery, remove the screw and place the other end of your jumper wire onto the post. It is important that you do not over-tighten this connection. The connection should be tightened just enough to engage the lock washer feature on the ring terminal itself, so that vibration does not rattle the connection loose. Now that the connection is tightened down, the internal heating function of the battery will be activated.

Step Three: Deactivating the Heat-Enable Function

To deactivate the heat-enable function on your heated Battle Born Battery, simply remove the heat-enable jumper wire from the heat-enable post. Remember to tape down the end of heat-enable jumper wire with electrical tape and cover the ring terminal so it does not make contact with other live wires or grounds. Be sure to put the heat-enable screw back into the post so you don't lose it.

Enabling the Heat Function for Multiple Batteries

If you purchased multiple heated batteries, there are two ways in which you can set up the heat-enable function for your battery bank. As with all our battery models it is recommended that you only connect identical battery models. This is true for the heated battery models as well. Do not connect mismatched battery models.

Option Two: Daisy Chained

For option two, you will use the Add-on Kit. We suggest that you configure your daisy chain set up first, then install the jumper from the heat-enable post to the positive terminal with the on/off switch in line. Whether your system is in series, parallel, or series-parallel you can daisy chain the enables together to control the heat function from a single switch.

ALWAYS ENABLE FROM THE HIGHEST VOLTAGE.

For example, if you have a 48V system, make sure you connect the jumper wire from the positive terminal that is at 48 volts to the heat-enable post. See the "Wiring Diagrams" section on page x

Installing the Add-on Kit:

To install the Add-on Kit, you will still need to install the heat-enable jumper wire on one battery. For systems set up in series, the heat-enable jumper wire should be installed on the battery with the highest voltage.

Step One: Making a Connection on the Positive Terminal

After identifying the battery with the highest voltage, remove the M4 x 4mm long screw that comes standard for the heat-enable post. Place the 14-inch jumper on the enable post with the main jumper and use the M4 x 5mm long screw from the Heat Battery Kit bag and tighten them down together. Take the free end of the jumper wire and install it onto the next battery.

Step Two: Connecting Three or More Batteries

Repeat installation of the 14-inch jumper wire for all batteries in the bank. For each heat-enable post you have two jumper wires connected to, you will need to swap out the M4 x 4mm screw that comes standard out for the M5 x 5mm screw that comes in the Addon Kit.



Installing the ON/OFF Switch

Installing the ON/OFF Switch

The Heat Battery Kit provides the components for you to install a remote switch for enabling/disabling the heat function of the battery, however it is not a requirement. If you have multiple batteries, we suggest that you configure your daisy chain first, then, instead of installing the jumper from the stud to the positive terminal you install the switch (Figure 8.)

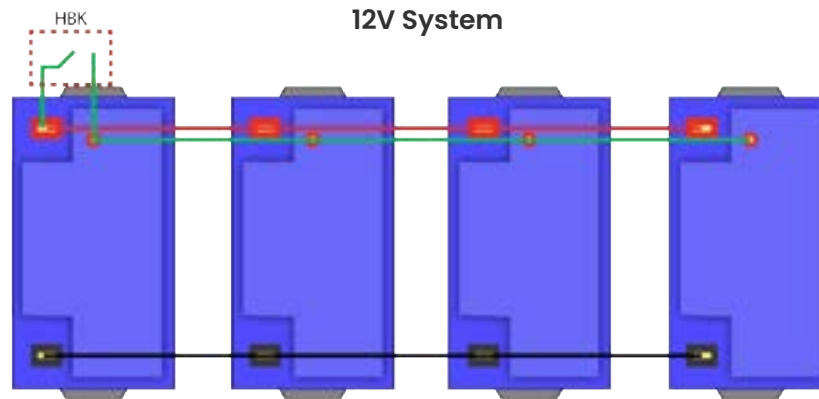


Figure 8: 12V daisy chained enable wires set up in parallel

Installation Steps

1. Choose a location that works best for your toggle switch within your space. The kit comes with 25-foot wires so you can install somewhere in the coach or right next to the batteries.
2. If the location you chose requires drilling a hole, apply some painters tape to the area you plan to drill. Doing so will reduce the chance of material chipping around the hole.
3. Drill a $\frac{3}{4}$ inch hole using a Forstner or any other appropriately sized drill bit. Be sure to check behind the surface you are drilling so you do not accidentally damage something when you poke through.
4. After drilling the hole, remove the nut from the switch body and test fit the switch. Use sandpaper if necessary. You want the switch to fit snug, but not so snug that you damage the threads when installing.
5. Once you have a good fit, take the quick disconnect sides of the Heat Battery Kit harness and pass them through the plastic nut you just removed. Ensure that the teeth on the nut are facing towards the quick disconnects. Then feed the quick disconnects through the back of the hole you just drilled (Figure 9.)



Figure 9: Heat Battery Kit harness through plastic nut

Installation Steps

6. Connect the wires to the back of the rocker switch. Please note that it does not matter the order or location of the quick disconnects on the back of the rocker switch. Give the connections a decent tug to ensure that the connection is solid and will not fall off due to vibration (Figure 10.)
7. Thread the plastic nut onto the switch and tighten by hand. Do not over-tighten. The "I" indicates that the switch is in the ON position. When the "O" is pressed down the switch is in the open or OFF position. See Figure 11 for an example if the switch in the ON position.
8. Route the other end of the wires from the Heat Battery Kit to your battery bank. Place the 5/16" ring lug between the nylok nut and the washer, as seen in Figure 12. Be sure to tighten and torque all terminal connections to 10 ft-lbs.
Note: when this connection is made the wire will be live at 12 volts (or higher if connected in series).
9. Install the #8 ring terminal onto the heat-enable post and tighten it down firmly to engage the internal teeth. Inspect the connection to see if vibration could cause it to come loose (Figure 13.)
10. Roll up and zip tie any slack left in the harness, and this completes the install of the heater enable remote switch.



Figure 10: Heat Battery Kit harness connected to rocker plastic nut from rocker switch

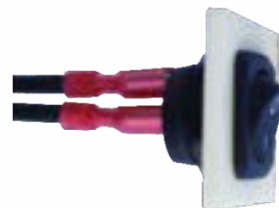


Figure 11: Rocker switch fully installed and in the "ON" position



Figure 12: Bolt, washer, battery cable, positive terminal, washer, 5/16" heat-enable wire, nylok



Figure 13: #8 ring terminal onto the heater enable post

You can visit battlebornbatteries.com/product/heated-100ah-12v-battery/ to view the installation video or scan the "Heat-Enable Set Up" QR code to watch a step by step tutorial. The installation video covers all the installation methods discussed in this guide. You will also find some helpful tips and FAQs about your new heated battery on this page as well.

Low-Voltage Disconnect

If your battery is at room temperature and goes into a low voltage disconnect, simply apply a 12-volt charge and your battery will start accepting a charge. If you are in a cold environment and your battery goes into low voltage disconnect, your battery will also experience a cold temperature disconnect and will not accept a charge. In this instance, you will still need to connect a 12-volt charge because the internal heating function will still operate bringing the battery up to a safe internal temperature where it will be able to accept a charge.



Heat-Enable Set Up



Low-Voltage
Disconnect

Power Consumed by Heating Function

The internal heating function of your battery consumes about 1.8 amps of power. At 0° F (-17.7°C) and no insulation, the heater function will be continuously on. With no external loads and no external charging, this will give you roughly 48 hours of heating capability before your battery will go into low voltage disconnect. With warmer temperatures and, or insulation, you will consume less power allowing you to extend the usage time



Power Consumed
by Heating Function

Note: This information is based on the BB10012H model and may vary between models.

Heated Batteries and Your External Monitoring Devices

All of the power used for the internal heating function is within the battery. This means if you have an external monitoring device, such as a BMV, that power will not be recorded if or when the heating function turns on. The monitoring device will need to be recalibrated.



External Monitoring
Devices

Wiring Examples for Heat-Enable

12V System

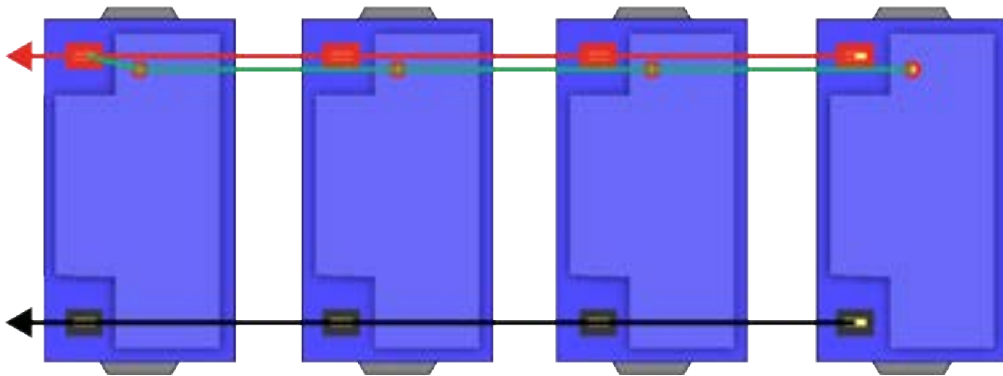


Figure 14: Heat-Enable daisy chained in 12V parallel

24V System

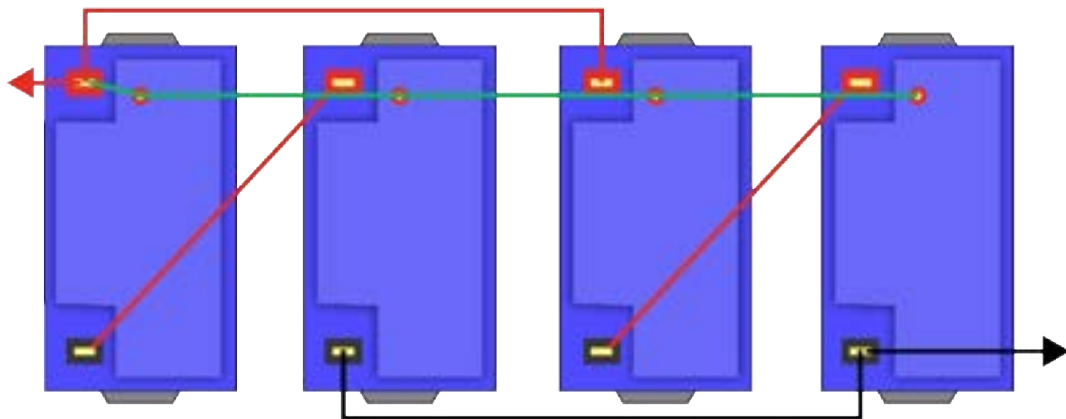


Figure 15: Heat-Enable daisy chained in 24V series/parallel

48V System

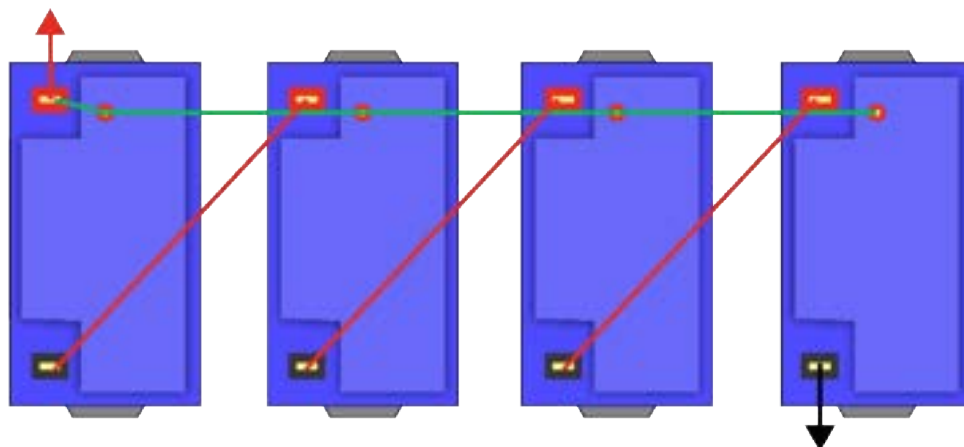


Figure 16: Heat-Enable daisy chained in 48V series

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For additional product information, please visit our website. You will be able to find additional product information on any of our internally heated batteries at battlebornbatteries.com/product-category/lifepo4-batteries/ under the specific model's product listing. You will also find additional information such as frequently asked questions, installation videos, battery manuals and warranty information.

If you have any questions, please contact us by calling 855-292-2831 or email us at info@battlebornbatteries.com.

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