

General Installation Tips

There are many right ways (and a few wrong ways) to build a system from our kits, so while we cannot give you an exact guide customized to your vehicle, we can at least provide some useful tips for working with the hardware that we provide. You should have guides for most of our major components, such as the inverter and charge controller, and this guide will serve to fill in the gaps.

General Install Tips

- **ALL CONNECTIONS MUST BE TIGHT!** The most common issues we encounter when troubleshooting come from loose connections. A loose connection is often the culprit behind poor system performance, but more importantly it can generate large amounts of heat and even start fires and/or damage expensive components. It is absolutely critical that every connection be tight to the point where you can yank hard on the wire and get no movement at the point where it connects. This is particularly critical in vehicles.
- When crimping lugs onto wires, it is possible to under-crimp the wires, especially the first couple times you do it. If you under crimp the lug, when you pull on the wire, it pulls right out. This will provide poor electrical contact, and can pull out when driving. It is sometimes possible to slide the wire back into the lug and try again, but sometimes the wire just won't fit back in the lug after it's pulled out. We include at least one extra lug of each size in your kit, so you have a backup if this happens. So always test your crimps by pulling on them, you've got a spare if they pull out. We also include heat shrink tubing, which is technically optional but it makes everything look cleaner, reduces strain on the lug/wire connection, and reduces the amount of exposed conductive metal.
- We suggest keeping all of your components fairly close together, i.e. in a "power box". The batteries can be tight together since they do not generate much heat, but you should leave a few inches around and above most of the other major components. You should install anything with cooling fins in a vertical orientation and with a few inches above it for passive airflow. The inverter can be installed in any orientation and can be installed above Lithium batteries if desired. Note that the Victron manual advises against mounting the inverter directly above your batteries. This is because Lead Acid batteries can off-gas hydrogen, which is flammable. If you are using LiFePO4 batteries, you can ignore this warning.

Lion Energy UT1300 Lithium Iron Phosphate Batteries

- The terminals of the batteries have both a post and wingnuts on top of the post. The posts are stainless steel and have a fairly high resistance, so it's best to ignore the wingnuts for the main connections, and use the posts to attach instead. You can use the wingnuts on top for small wires, i.e. voltage sensing wires, but you want the main connections to the system to be under the posts.
- When installing, we suggest connecting the batteries to the breakers first, with the breakers in the off position, then continuing with your install. This will ensure you are working safely as you connect the other components, and can switch the breakers on after you have checked your work.
- You want the system to pull power from each battery evenly, which requires each battery be connected to the distribution blocks via wires of the same length. This means each positive line to each breaker, and then to the distribution block, needs to be the same length for each battery, and the negative wires from each battery to the negative distribution block (or BMV) should be the same length, but the positive wires do not need to be the same length as the negative wires. For example, with three batteries you could have three 2ft lengths of positive and three 3ft

lengths of negative, but not a 2ft positive and two 3ft positive. You can include the breakers in this length or not, just make sure to do the same for each battery, even if one battery is physically closer. This generally means using the length it takes to connect the furthest away battery for all of the batteries. This ensures that power is pulled equally from all the batteries because the resistance of the wires is the same.

Distribution Blocks (Grey blocks marked with Eriflex, Ferraz-Shawmut or Mersen branding)

- The wires can sometimes be tough to get into the ports, it's one of the most common problems our customers have during the install process. The standard block we use has 11 small ports in the front that will accept wire sizes up to #2, and on the other side has a large port that typically is for the largest wire provided in the kit, which is typically the inverter. If you're having trouble getting wires to fit, we suggest cutting the wire at a slight angle of roughly 20-30 degrees, stripping about ½ inch of insulation, and using the longer end to help guide the wire threads in. A gentle twist can also help. We've also heard of customers making plastic or cardstock funnels to help guide the wires in successfully. Because the blocks are single-polarity (positive or negative) a few loose threads aren't a huge deal because they won't cause a short, but you ideally want every bit of wire in the port.
- You will need a set of Metric (a.k.a. Hex) wrenches to tighten the connections. You want to tighten each connection as much as possible by hand. You should be able to pull quite hard on the wires without them coming out of the block. If you can't get the wires secure, you may need to use pliers or turn the hex wrench 1/4-1/2 turn further than you can by hand.