

LTV 2020 or Newer Models Installation of a Lithionics Battery and a 3000W Inverter Rev 2

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USE THIS GUIDE AT YOUR OWN RISK-This guide is for experienced/skilled Do It Yourselfers or Professionals. It is the responsibility of individuals to verify placement and fit, comply with applicable electrical codes/requirements, and manufacturer installation and operating instructions.

A 3000w inverter performs 2 functions: 1) when on Shore/Generator power (120vAC utility/residential power) the inverter passes through the power to the coach and charges the house battery, 2) When Shore/Generator power (120vAC utility/residential power) isn't available, then the inverter changes (inverts) battery power (12vDC) to 120vAC utility/residential power so you can continue to use all your appliances. Where 120vAC is alternating current type power and 12vDC is direct current type power.

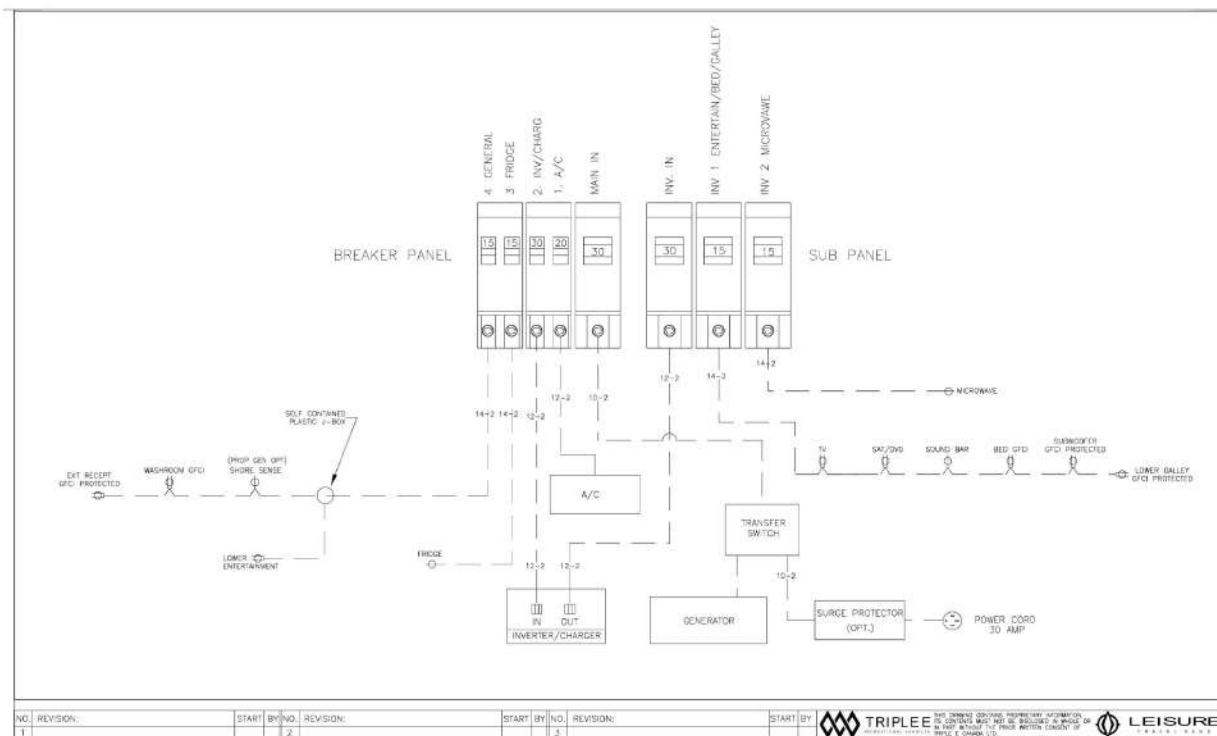
This guide is intended for use by experienced Do It Yourselfers or Professionals. It does not give step by step instructions but rather general information and knowledge to guide you through your own project. This guide uses a Xantrex Freedom XC Pro 3000w Inverter and Battery Charger, Xantrex Bluetooth Remote Display, and a Lithionics GTX12V315A (315ah) Lithium battery as the subject components for this installation, but the wiring would be very similar if you use a Kisae 3000w Inverter with 100a Battery charger (BIC1230100). I also added sections at the end of this guide to overview the installation of a Kisae.

Important: For those wanting to install 3- Lithionics 12V130A-G31-LRBM8 (130ah) batteries (at minimum of 3-130ah Lithionics batteries are required for use with a 3000w inverter) or a Victron Multiplus 3000w inverter, this guide is not to be used for smaller Lithionics battery or Victron inverter installations. Lithionics has specialized instructions for the installation of these and therefore you must consult and follow the latest Lithionics guidance. Download the [Lithionics 12V130A-G31-LRBM8 RV INSTALLATION KIT for 3000 WATT INVERTERS](#) or [Lithionics GTX12V315A-E2107-CS200 RV INSTALLATION KIT for VICTRON 3000 WATT INVERTER](#) document instructions, specifications, and wiring diagrams from the Lithionics support page on their website, <https://lithionicsbattery.com/support/>.

The wiring and size of wire used in replacing your current inverter with a 3000w inverter/battery charger is completely independent of the capacity of your battery bank total amp hours. What governs the wire sizing is the maximum draw of the inverter and the components it supplies. Another factor is wire length, the longer the wire the more voltage drop that occurs, that is why Lithionics specifies the minimum wire diameter size, wire length, and fuse and disconnect switch ratings. Lithionics specifies a minimum wire size of 2/0 awg and a minimum length of wire from the battery to the inverter of 4 feet. These minimum requirements work perfectly with the wire and fuse size Leisure uses in their 2000w inverter installation. So upgrading to a 3000w inverter with a Lithionics battery is a simple swap out, no new wiring!

If you are interested in obtaining your model Leisure wiring diagrams you can request those directly from Leisure. The wiring diagrams are the first place to start on electrical upgrade

projects because they answer so many questions when you study them. You can do this by calling Leisure's Willie Neufeld, email: WNeufeld@tripleerv.com or phone 877-992-9906 (ext. 319), and request this information. What I have found that works the best is if you first email Willie with your VIN# if you have one or Your name and that you have a Leisure on order, email address, and phone number. Requesting him to send you, via email, the PDF versions of your 120vAC and 12vDC electrical systems wiring diagrams for your Leisure year, make, model and any other information you need as referenced above. Then call him (877-992-9906, ask the operator to connect you to him) and leave a message on his voice-mail of what you are asking for and that you sent him an email with all your information. He usually very promptly sends you everything you requested by email. This information will help you as reference documents throughout your Leisure ownership so I recommend requesting this regardless of replacement of your batteries. Here is one such 120vAC diagram that shows how the breaker box and its circuits are wired to the rest of the coach.



Note: Leisure changed to separate single throw breakers in 2021 models instead of the tandem single throw breakers used in 2020 (and older models) as seen above on this wiring diagram for a 2020 model year. This drawing also refers to 12-2 wiring for the 2000w inverter, but Leisure actually uses 10-2 with ground orange Romex wire for the 30a breakers for the 2000w inverter wiring.

In this upgrade from a Xantrex 2000w inverter to a 3000w inverter, the standard Leisure AGM batteries or Optional Dragonfly Lithium Batteries will be replaced with a Lithionics 12v315GTX (315ah) Lithium battery. Only the single Lithionics 315ah or larger battery or 3 Lithionics 130ah batteries are suited for running from a 3000w inverter and the LTV Dometic 13,500 btu or 15,000 btu air conditioners with heat pump (with an EasyStart or SoftStart installed, see my guide, [LTV Air Conditioner Micro-Air EasyStart Installation Guide](#)).

Simply replacing the standard Leisure 6v AGM lead acid batteries or 12v Dragonfly Lithium batteries (not suitable for running the air conditioner more than short periods) with the more powerful Lithionics GTX315 Lithium battery is definitely something you can do yourself. I get more than 4 hours (time can vary depending on outside temperature and thermostat setting) of air conditioner run time from my single Lithionics GTX315 battery and 3000w inverter. The installation instructions for a Lithionics battery are included in this guide but I have also written separate battery planning and installation guides, [LTV Lithionics Battery Installation Planning Guide](#) and [LTV Lithionics Battery Installation Guide](#) that provide a little more focused information than is contained within this document.

In my opinion, Lithionics batteries are the highest quality Lithium batteries you can buy and they are packed with many advanced features (my favorites are Bluetooth internal Battery monitoring, automatic heater for safe cold weather use and battery charging, convenient on/off switch, and automatic safety and battery shutdown protections (includes low/high temperatures and low/high voltage cutoff). Most importantly they are more compact and powerful than other brands. A Lithionics GTX315 Lithium battery gets you the most power per cubic inch of your Unity battery box and the most output power at a maximum 250a discharge rate. Meaning it can easily power everything in your coach, including the air conditioner (EasyStart or SoftStart installation required). Making a Lithionics 12v315GTX battery the smarter choice. You'll probably never have to purchase another house battery again, because a Lithionics battery should last longer than 10 years if properly maintained!

Note: For installation of a Micro-Air EasyStart on your air conditioner get my [LTV Air Conditioner Micro-Air EasyStart Installation Guide](#).

You can get Lithionics batteries (<https://lithionicsbattery.com>) through an authorized Lithionics Battery Dealer or recognized Lithionics Battery Installer. You can contact Jackson D'Ettorre, Lithionics Point of Contact for LTV, at jackson@lithionicsbattery.com or 727-726-4204, and he'll direct you to the closest dealer/installer or if you prefer direct online ordering, then visit <https://pagosupply.co/shop/lithionics-products> to place your order today! Remember it takes at least a month to get a Lithionics battery so order well in advance of your project.

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2020 and Newer Leisure Models 3000w Inverter Installation Overview

Lithionics recently changed their 3000w inverter installation instructions because they discovered that 3000w inverters have a very large capacitive in-rush current which can damage the internal BMS under certain circumstances. The Lithionics battery is most vulnerable to the high capacitive in-rush current of inverters when it is powering on, using its unique power button. This is why the inverter battery disconnect switch is a vital part of the installation so you can keep the inverter disconnected from the battery until it is fully powered on. Once the battery is fully on there is no risk connecting the inverter to the battery. Since a Lithionics battery has virtually no internal impedance it is important to build in slightly more resistance to the inverter electrical installation to help slow down the high capacitive in-rush current of these 3000w and larger inverters. As such a Lithionics battery is the only Lithium battery that can use 2/0 awg cables (minimum 4 feet of cable from the battery to the inverter), 250a Mega Fuse, and 300a rated Blue Sea battery disconnect switch with a 3000w inverter installation. In the 2020 and Newer Models, Leisure installs, as standard, everything but the inverter battery disconnect switch with their Xantrex 2000w inverter installation. Being able to use the standard Leisure cables and fuse in a 3000w inverter replacement/swap is just another great benefit of a Lithionics battery. Here is a video of the complete installation, <https://youtu.be/eZ0nFo0OW0g>.

Other brands of Lithium batteries choose to build into the battery much greater internal resistance (which creates higher internal cell temperatures, reducing the lithium battery life), similar to what you find in lead acid batteries, therefore you have to use the larger diameter cables because these batteries need to be installed in a system with the least resistance built-in. Another reason why a Lithionics battery is more reliable and will outlive its warranty.

For those interested in installing a Xantrex or Kisae 3000w inverter/charger in a 2020 and newer Leisure model motorhome, here is an overview of what needs to be done. You will be re-using the existing 2/0 awg inverter battery cables and 250a Mega fuse that Leisure installs with all their Xantrex 2000w Inverters. One important addition that needs to be made is to add a 300a rated Blue Sea battery disconnect switch between the battery and 3000w inverter. It will probably be easiest to install this switch near the inverter by drilling out the existing lug connector to $\frac{3}{8}$ " so it will fit on the switch terminal and then add a short piece of 2/0 awg cable with a $\frac{3}{8}$ " lug on one end to fit the other switch terminal and a 5/16" lug on the other end to fit the inverter positive terminal. **Make sure to leave the switch in the off position.**

The inverter disconnect switch allows you to always control when you connect the inverter to the Lithionics battery and gives you a way to isolate the inverter from the battery in case issues arise with the inverter operation or if you need to turn off the Lithionics battery with its convenient on/off switch. Additionally you will use it to completely disconnect the inverter while you park/store your Leisure to ensure there are no inverter parasitic draws on the battery. You

want to get in the habit of using the inverter battery disconnect switch just like you use the coach battery disconnect switch. So build using it into your normal shutdown and startup routine, using it just like you use the coach battery switch, for your Leisure Travel Van.

Since the Xantrex 2000w and 3000w inverters are identical in dimensional footprint, swapping them out is very straightforward. The mounting and all the connections are the same. If you choose to use the Kisae 3000w Inverter there may be a little bit of wiring customization that needs to occur with the 120vac connections. It should be relatively easy to just reorient the Kisae Inverter to make the connections line up.

You will also have to reconfigure the breaker box so the entire coach is supplied power by the inverter. A 3000w inverter can run everything in the coach, including the air conditioner (with the installation of an EasyStart or SoftStartRV, required). In order to supply the coach's breaker box from the larger inverter, you simply rearrange the breakers in the Progressive Dynamics (PD55K003) Power Distribution Center dual bus breaker box to put the 30a Main breaker, 30a Inverter AC IN breaker, and Refrigerator 15a breaker on one bus (left side) and the 30a Inverter AC OUT breaker, and all the other breakers, on the other bus (right side). You must also make sure you move the white neutral wires (for the black wires connected to each breaker) to the corresponding bus neutral bars. It is imperative that you properly align the breakers to the correct bus and their white neutral wires to the corresponding bus bar.

As far as the existing Sterling DC-DC charger and Solar Controller settings go, you don't need to change the Sterling DC-DC charger settings because the charging profile setting Leisure selects for either the AGM (Sealed) or Dragonfly Lithium (LifePO4) batteries are perfectly compatible with a Lithionics battery for alternator charging. If you have a solar controller with a Lithium setting then change its setting to that otherwise leave it on the AGM battery setting profile. The Xantrex 3000w Inverter settings are near the end of this document, you do use the LifePO4 battery profile setting with it.

ELECTRICAL SAFETY FIRST-DISCONNECTING ALL POWER

Before you start working, take pictures and label the wires/cables as to what/where each wire is and was connected to so you don't have to remember once it's removed. Take pictures with the wires labeled as well, you never know when you'll need to refer back to them.

Make sure you are disconnected from Shore power. Disconnect the solar panel power if you installed a switch or cover the solar panels with something dark to stop solar power production. You can also pull the solar fuse in the battery box. I've written a guide for the installation of a solar disconnect switch, [Adding a Solar Panel Power Disconnect Switch](#), so use that to install one, you'll be surprised how often you need to use it in the future.

Turn the house/coach battery switch to off. You want no power to any of the systems whatsoever! If you are not experienced with electrical work please turn this guide over to a professional to complete the work.

Next disconnect the house batteries (negative coach battery cable first) and completely remove them. For stock AGM batteries, save the long red battery cable that connects the 2 batteries, you'll need it later when installing the Lithionics 315ah battery because its positive terminal is in a different place, farther away and you will use it to replace the shorter coach red positive battery cable.

You won't be reconnecting the yellow Sterling DC-DC charger battery temperature sensor with a Lithionics battery installation. I just abandoned it in place by laying it between the battery bumper and the battery box wall just below the large fuse bus. You could also push it through the large center hole where the wires come into the battery box and it will come out of the back of the battery box where you can tie it out of the way. In later pictures you'll see it laying against the wall, it is yellow. No external temperature sensors are needed with a Lithionics battery. You want just the 2 coach battery cables left for connection back to the new Lithionics battery.

If you are replacing the Leisure Dragonfly Batteries then you'll need to pull the 2a fuse for the wires that supply power to the Dragonfly Battery heaters and lighted Leisure switch. There is a button looking screw connector on top of each of the Dragonfly Batteries where the small battery heater power wire connects. Remove those from the batteries.





The battery heater power 2a fuse is located under the driver's side dinette jump seat in the Unity RL, or the passenger side dinette jump seat in the Unity IB/TB, or behind the coach battery disconnect switch in the Unity MB/CB/FX. Once the battery heater power wires are de-energized you can deal with it in the same manner as the Sterling temperature sensor above, and abandon it in place. A Lithionics battery has its own automatic internal heater that requires no extra wires or switches, it is smart enough to maintain the battery temperature when using or charging the battery above a temperature of -4°F. The Lithionics heater maintains the battery temperature between 35-40°F.

Removal of the Old Xantrex Freedom XC or XC Pro 2000w Inverter

Leisure uses either the Xantrex Freedom XC or XC Pro 2000w inverter in their models. Before you remove the Xantrex 2000w Inverter, write on the wire casing what they were hooked onto and take pictures so you don't have to remember where they were connected once it's removed. In the case of the orange 10/2 Romex wires, mark them with the corresponding AC In and AC Out connection description so you can be sure to reconnect them exactly the same on the 3000w inverter. Remove the Xantrex 2000w Inverter by removing the 4 wall mounting screws. The new Xantrex Freedom XC Pro 3000w Inverter will be mounted using the same screws and compartment wall holes as the old 2000w inverter used.

But first, remove 2 sides (bottom and back) of the separation wall between the inverter and the rest of the door side exterior storage compartment. You could also completely remove the wall if you never plan to have anything flammable stored in it because inverters can give off sparks. I recommend disconnecting just the 2 sides so you can bend the separation wall up out of the way from between the inverter and the rest of the side exterior storage compartment. You'll need something to prop the wall open. If you do either of these things to the inverter bay separation wall it will be much easier to remove and replace the inverter.

If you want to just cut out or you've damaged the old wall, it is very easy to fabricate a new one. Just go to any hardware store and buy #6 self drilling sheet metal screws, sheet metal shears (Wiss Tin Shears, <https://thd.co/3otQOWS>), a sheet of thin aluminum, and 2 pieces of 1" angle aluminum stock (minimum 36" long), <https://thd.co/3rumihk>. Just line the storage compartment with the angle stock to make a new mount for the separation wall as these show.

The best way to remove the partition between the inverter bay and the rest of the large storage compartment is to cut around the carpet and walk seam, remove any screws and then use a hammer and sharp chisel or large screw driver to cut/pop all the spot welds, rivets, and adhesive caulk. An oscillating tool or other type cutting tool (cordless grinder with cutting wheel or Dremel tool) might be helpful as well.



The following pictures are examples of what others have done. Use of 1" angle bar stock to make a new frame to reattach a new aluminum sheet metal wall.



This 2020 person re-used their old wall buy trimming and reattaching it to 1" aluminum angle stock

On the 2021 and newer models Leisure has gone to just using screws to hold the wall in place. So it is much easier to cut around the carpet seam, remove the 2 sides of screws (back wall and floor), prop open, and then reattach after the new inverter installation is complete using the same screws. Adding a bead of Silicone caulk up around each corner and across the floor seam to prevent water that gets blown into the inverter area from leaking into the storage side.



2021 Unity

I helped a 2021 Unity RL owner do this upgrade and they were able to unscrew the screws on 2 sides and using a rubber mallet broke the wall free. Then we just bent it towards the compartment ceiling and propped it there with a board to make it easier to remove the Xantrex 2000w Inverter and install the 3000w version. I also discovered that Leisure switched to the Xantrex Freedom XC Pro 2000w inverter so the ACC input connector (more about this later) is already in place. So everything is plug and play between the 2000w Freedom XC Pro and 3000w Freedom XC Pro versions. Remember to label all your wires so you know what they were connected to. Use some blocks of wood to support the inverter while you remove its mounting screws. Remove the 2000w inverter, buy removing 4 screws. It is easier if you put some boards or other material under it to support the old inverter when you unscrew its mounting screws. Since the Xantrex 2000w and 3000w inverters are exactly the same size, uses some mounting holes, and the same connections, you'll be using the same supports to make it easy to get the new inverter into the right place to line up with the same wall holes, making it easier to screw the same screws in. Run a bead of Silicone caulk up around each corner and across the seam on the floor to prevent water that gets blown into the inverter area to leak into the storage side and get the carpet and everything stored there wet.

Disconnect all the wires and completely remove the 2000w inverter.



2021 Unity with inverter bay wall propped open and 2000w inverter removed

To get inside the inverter to disconnect the wires, simply unscrew the black thumb screw on the back of the panel then lift off the panel to reveal all the connections. Inside the Xantrex inverter flip the orange lever tabs up to release/open the 120vac Romex wire connectors. Remove the orange cable with white, bare, black wires but make sure you mark on the orange casing which port you removed them from so you'll know where they go on the new inverter.



Disconnect the red and black 2/0 awg battery cables, the inverter terminals are 5/16" diameter with 1/2" nuts, so use a 1/2" socket, 3" socket extension, and socket wrench.



Disconnect the yellow ACC control wire, as pictured on the left, by cutting it from the inverter. Or if you have the white plastic ACC 20 pin connector, as pictured on the right, with yellow and green wires connected, just unclip it. Unclip the Remote Display Control panel phone style connector.



Freedom XC 2000w



Freedom XC Pro 2000w

Lastly, disconnect the white case ground after you remove the 4 screws holding the inverter to the wall. It is the very last thing you disconnect before you actually remove the 2000w inverter.



3000W Inverter Installation

At this point you should have removed the old house batteries and the old 2000w inverter. Reuse the AC in and Out strain $\frac{3}{8}$ " relief connectors from the 2000w inverter.

You will reuse the Leisure provided white wire (6 awg) for the inverter case ground since it is more than adequate for the new 3000w Inverter. Connect it in the same manner as was on the Xantrex 2000w inverter. Connect this before you try to mount the 3000w inverter to the wall, otherwise you won't have room to install it once the inverter is mounted. The Xantrex Freedom XC Pro 3000w Inverter fits exactly in the same place as the old inverter, using the same screws and screw holes. Use the wood blocks/ supports you used to remove the old inverter, so they hold the new inverter up to the same place to make it easier to locate the screw holes. Re-use the old inverter mounting screws to install the new inverter on the inverter bay wall. Connect the 10/2 with ground Romex (solid copper) wires into the connector associated with the labels you wrote on the wires for the AC inverter In and Out connections. You can start reattaching all the cables (battery cables and case ground) to the new 3000w Inverter.

Connect the black battery cable to the inverter battery negative terminal. Check for clearance between the door support strut when the compartment door closes. If the strut hits the cable then you need to reposition the cable so the strut clears it in closing. You may possibly need to slightly bend the lug at the point where the flat meets the round part so the cable gives none clearance for the support strut when the door is closed.

NOTE: The way I tighten is to snug down the Nut or bolt until you think it is tight and then give it a last ¼" of turn just to give it that last teak of tightness. Once tight, the lug/connector should not be able to be moved by pushing or pulling on it. Use this for everything you tighten in the battery box, in the inverter, or on the battery. You never want to over tighten, this method helps you keep from doing that.

Before you reattach the red 2/0 awg battery cable to the 3000w inverter, one important addition needs to be made. You must add the 300a rated Blue Sea battery disconnect switch between the battery and 3000w inverter. Refer to the **Battery Box Preparation** section on page 22 and retrieve the short coach positive battery cable left over after you replaced it with the longer cable used with AGM batteries. If you removed Dragonfly Batteries, then get the long (21") red battery cable that connected your 2 batteries together. Or if you purchased the optional 12" red battery cable, have it ready. It will probably be easiest to install this switch near the inverter by drilling out the existing red battery cable (inverter) lug to ⅜" so it will fit on the switch terminal (⅜" with 9/16" nut) and then add the new piece of 2/0 awg cable, you may have to drill one end out, if you are re-using an existing cable, to ⅜" to fit the other switch terminal. Then connect the other end (5/16" lug on the other end) to the 3000w inverter positive terminal. Then zip tie the switch to the other cables to secure it. **Make sure to leave the switch in the OFF position.** Here are examples of the switch installation.



While the Lithionics battery has a convenient power button located on the battery, it can be used to completely disconnect the battery from the entire draw of power from the several coach components (connected through the Mega Fuses in the battery box), including the inverter if you ever need to work on the complete coach electrical system. However, you must always disconnect the inverter first using the inverter battery disconnect switch before you use the Lithionics battery power button. Always turn the Inverter battery switch OFF, disconnecting it from the battery. Only this inverter battery switch safely isolates the inverter from the battery. So always remember to turn the coach and inverter disconnect switches off before you use the Lithionics battery button to turn the battery off or on. Don't use the inverter or house battery switches to turn anything back on until after you have turned your Lithionics battery back on and it has stabilized for a minute or so once the blue light is on, meaning the battery is ready to supply power. Build using it into your normal shutdown and startup routine, using it just like you use the coach battery switch, for your Leisure Travel Van.

Note: An Inverter Battery disconnect switch is important for a number of reasons. First, to make the 3000w inverter installation meet all applicable safety code requirements (NEC, AYCB, and RVIA). You must be able to isolate electrical components in order to safely work on them or isolate them in case of issues. Second, disconnecting the inverter from the battery completely

stops any draw off the battery from the inverter. If you aren't using the inverter and just have it turned off at the remote display control panel, it is still drawing a smaller amount of power from the battery to stay in a state of readiness to be used. Third, most inverter Error Codes or Shutdown issues need to be addressed with a hard reset. A hard reset is where you must disconnect all power, shore and battery, and let the inverter sit isolated for 30 minutes and then reconnect to the battery. I've experienced these with my Xantrex inverter a number of times and I was so glad I installed an inverter battery disconnect switch between the battery and inverter so it was simple to perform a hard reset. Just flip the switch, wait 30 minutes, and flip the power back on to the inverter.

Before you mount the 3000w inverter make sure you connect the white case ground wire first or you won't be able to do it once it is mounted on the wall. After the 3000w inverter is mounted, reconnect all the wires exactly to the same locations as they were connected to the 2000w inverter and reattach the inverter bay wall. The connections are explained more below for reference if you need it.

120vAC Orange Casing Romex Wire Connections

Reuse the AC in and Out $\frac{3}{8}$ " wire holder/strain relief connectors from the 2000w inverter. Install these and then put the orange wire through and into the lever connectors inside. Make sure you put the AC in and Out (that you marked on the wire) in the corresponding AC in and Out connection port.



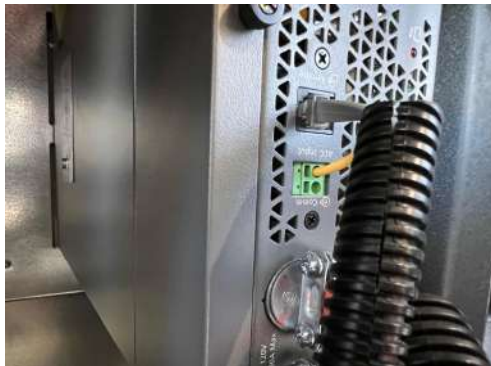
On the Xantrex 3000w inverter, feed the orange casing Romex wires back into the same orange tab lever connectors (lift up to open), being very careful to put them in the same locations. Also make sure you put the wires in the right order, N-white neutral wire, G-bare copper wire, L-black wire. Make sure only the bare wire goes inside the actual connector, you don't want any casing in-between the connection device and the wire. Then push each tab down to lock the wire in the connector. Do this for both AC wire ports (Inverter AC IN [bottom] and AC OUT [top]).



Tighten the screws on the 3/8" wire holder/strain relief. Don't tighten down the wire holder too tight, it is just supposed to hold the wire, not compress or deform it. See picture above.

ACC INPUT CONNECTION

Leisure mostly uses the Xantrex Freedom XC 2000w inverter with a 4 pin connector, but I have encountered the 2000w Freedom XC Pro which has the same 20 pin connector as the Xantrex Freedom XC Pro 3000w Inverter uses. However, the 2000w Freedom XC has a green 4 pin connector that has a single yellow wire connected to the ACC port pin. You will just cut it off of the inverter.



**Freedom XC 2000w Inverter
ACC Connection**



**Freedom XC Pro 2000w Inverter
ACC Connection**

The single yellow wire on the Freedom XC and the yellow wire with the writing on it to the left of the green wire on the Freedom XC Pro is an ignition control feature wire (12vdc trigger wire powered by the coach's battery switch through the fuse panel) that turns off the power to the inverter controls (inverter remote) automatically when you turn the coach's battery switch to off. The Xantrex Inverter Ignition Control settings allow you to choose whether you want the inverter controls to be powered on automatically or manually when the coach battery switch is turned on. The inverter ignition control setting Automatic turns the inverter on automatically with the coach battery switch and the Lockout setting requires you to manually turn on the inverter. Leisure uses the Lockout setting with their 2000w inverter. Regardless of the setting, Automatic or Lockout, the inverter control power is automatically turned off with the coach battery switch. This is really the most important aspect of the inverter ignition control feature. While the coach battery switch turns off the inverter control power, which is the largest draw when not using the inverter, you still need to remember to turn the inverter battery disconnect switch off as well so

you completely disconnect all battery power going to the inverter, particularly when storing your Leisure Travel Van, to ensure there are no inverter parasitic draws on the battery.

The inverter disconnect switch is the absolute inverter power cutoff because it completely disconnects the battery from the inverter. Religiously using the inverter disconnect switch, as you do the coach battery disconnect switch is something you must build into your routine, but the ignition control feature can serve as a safety net or backup to at least turn off the inverter control power if you forget to use the inverter battery disconnect switch to completely shut off the inverter.

To reconnect the yellow ignition control wire from the Freedom XC 2000w inverter, you need to buy a special 20 pin connector and splice it to the 3000w inverter corresponding to the ACC port location, more on this below.

Don't be confused by the name ignition control, the 12vdc signal is not related to the vehicle ignition switch in any way. The term ignition just means a switched 12vdc signal. The Leisure yellow wire is a fused positive 12vdc wire from the House 12vdc Fuse Panel in the Power Distribution Center, it is controlled by the Coach/House Battery Disconnect Switch. Leisure uses a 5a House Fuse panel circuit, Circuit #11 or Circuit #6 (in the Unity RL model) to supply this 12vdc power supply to the ACC ignition control switch port on the 2000w inverter and the 3000w inverter has the feature as well.

Old Freedom XC ACC Connection Modification

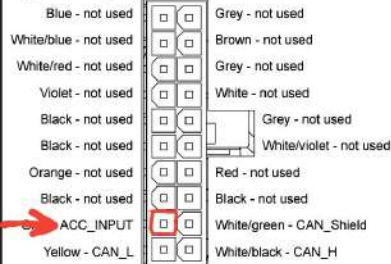
There is a big difference between a Freedom XC ACC connector, on the left below, and the Freedom XC Pro ACC connector on the right. The functions are the same despite different connectors. The XC uses a 4 pin port with one port for the ACC feature vs the XC Pro 20 pin connector using a single ACC pin Input.



To reattach the single yellow wire with the different connector from the 2000w Freedom XC ACC Input terminal pin to the Xantrex Freedom XC Pro 3000w Inverter you can just use the StarTech 20 pin connector and reattach the yellow Leisure ignition control wire to the ACC Input pin of the 20 pin connector for use with the 3000w Freedom XC Pro Inverter. Buy this 20 pin connector,

<https://www.amazon.com/StarTech-com-6in-Motherboard-Power-Adapter/dp/B0002GRQRW>, and cut the wires off of the smaller connector (20 pin male connector with female ferrules) that fits the Xantrex inverter, with the exception of the ACC position pin wire, as pictured. Splice the yellow Leisure wire, using a 14 awg blue butt connector, to the new orange 20 pin connector wire for the ACC position and push it into place on the Xantrex 3000w inverter. If you don't have a butt connector then you can use a small tan or blue wire nut, or even twist the bare wires together and secure them with electrical tape to splice them together.

Figure 16 20-pin CCPort Pinouts



Connecting to ACC Signal

With the 20-pin Communications Harness (PN: 808-0820), the Freedom XC PRO can be wired to inhibit inverter operation in the absence of a vehicle's (or vessel's) +12VDC ignition control signal. This feature can avoid unnecessary battery drain that would otherwise occur if the inverter/charger was operated without a charging source such as the vehicle alternator.

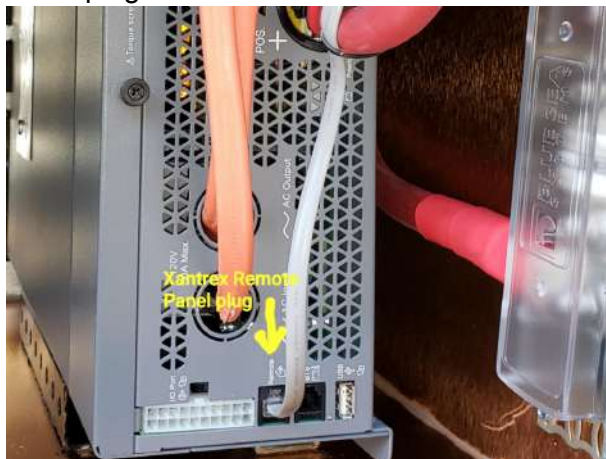
To enable ignition control:

1. Ensure that AC and DC power are both OFF.
2. Ensure the vehicle's ignition is turned to OFF position. It is highly recommended to remove battery power by disconnecting the vehicle's battery cables. Refer to the



Connect the Xantrex Remote Display

Now plug the standard Xantrex Inverter Remote Display phone cord into the 3000w inverter or you might want to do a direct replacement for a Bluetooth Remote Display. They are identical and completely interchangeable, both use the same RJ12- 6 wire connector phone style cord which plugs into the inverter's remote connection port.



Leisure installs the non-Bluetooth Xantrex Remote Display Control panel in all their models, so if you'd rather have the Bluetooth version it is very easy to just remove the Leisure supplied remote and replace it with the Xantrex Bluetooth version Remote Display panel. They are the same size with the same single phone style plug in connection, plug and play. You can simply swap out the standard non-Bluetooth Remote for the Bluetooth Remote in its current location, 2

screws. For those models with the Dometic Interactive or Firefly multiplex system that may not have come with the inverter remote display controller, you can either find a convenient location to mount the Bluetooth remote display or since it is Bluetooth you could simply cable tie it inside the Inverter bay if you don't want to mount it, pictured below.



2021 Unity Bluetooth Remote Cable Tied to 120vAC cables in the Inverter Bay

RL models with the Dometic Interactive or Firefly Multiplex System will find there is no easy way to change the 3000w inverter settings or see how the system is performing unless they purchase the Bluetooth Remote. So adding the Xantrex Bluetooth Remote Display is very helpful so you can easily adjust the inverter settings via Bluetooth and the Xantrex FXC Control App on a smart phone/tablet. The Interactive/Multiplex system and the Xantrex Bluetooth Remote all work together and you still have the very minimal inverter controls and information on the Dometic Interactive or Firefly Multiplex System as before with the 2000w inverter. I point this out as information for RL owners to consider, to show you that you don't need to mount the inverter remote display if you don't want to, and to validate that the 3000w inverter and Bluetooth Remote are completely compatible with the Interactive/Multiplex systems. Once the coach and inverter battery disconnect switches are turned on, the inverter display/controller turns off with the Leisure battery disconnect switch and the Dometic Interactive or Firefly Multiplex System inverter controls, so you really don't need to view or manually manipulate the remote display panel.

Reattaching the Inverter Compartment Separation Wall

Now that the 3000w inverter is mounted and all wires/cables are reattached, if you simply loosened the inverter bay wall go ahead and reattach using the original screws. Run a bead of Silicone caulk up around each corner and across the seam on the floor to prevent water that gets blown into the inverter area from leaking into the storage side and getting the carpet and everything stored there wet.

Note: You may inadvertently hit the silver inverter button with your arm while trying to reattach the wall. Verify that the silver button is popped out to enable the use of the inv remote display controller power button.



However if you completely removed the wall then it is important to understand that a Xantrex 3000w Inverter handles very high power and as such can produce sparks, so it is a good idea to reinstall the separation wall if you plan on storing things in the remainder of the compartment that might be flammable. If you plan on adding more Lithionics batteries (UL certified fire proof and crush proof) or won't be storing anything flammable in the compartment, then you don't need to reinstall the wall.

If you damaged the old wall and need to make a new one, it is very easy to fabricate a new one with aluminum sheeting, <https://www.lowes.com/pd/Steelworks-24-in-x-36-in-Aluminum-Solid/3057473> or cut the damage area off the old wall and frame the area with 1" aluminum angle stock. Just go to any hardware store and buy #6 x 1/2" self-drilling sheet metal screws (<https://www.lowes.com/pd/Hillman-6-x-1-2-in-Phillips-Drive-Sheet-Metal-Screws-100-Count/3010194>), sheet metal shears (Wiss Tin Shears, <https://www.homedepot.com/p/Wiss-12-5-in-Straight-Cut-Tin-Snip-A9N/204155040>), a sheet of thin aluminum, and 2 pieces of 1.25" x 48" angle aluminum stock (<https://www.homedepot.com/p/Everbilt-1-1-4-in-x-48-in-Aluminum-Angle-with-1-16-in-Thick-800037/204373304>). You may be able to cut out a new wall or reuse the old wall by cutting off the bent parts of the wall and then screwing them to an angle aluminum frame that you create. Use the Self tapping #6 screws to install everything back together.

So now you should have the new 3000w Inverter in place, all the wires reconnected, the inverter bay put back the way you want it, and sealed around the corners and floor. It is time to reconfigure the 120vAC breakers in the Power Distribution Center breaker box.

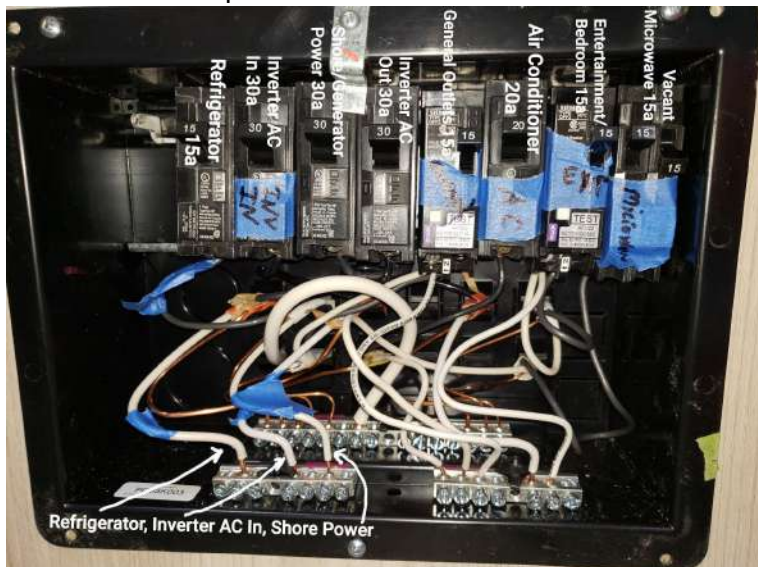
Reconfiguring the 120vAC Breakers

On the 2020 and newer models Leisure now makes it very easy to upgrade to a 3000w Inverter and have the entire coach operate from an Advanced Lithionics premium lithium battery(s) because they use 10/2 with ground Orange Romex solid copper wire and a true 120vAC dual bus power distribution center/breaker box as standard, a Progressive Dynamics PD55K003. This means there is no new 120vAC wire that needs to be pulled. The only thing you need to do is reconfigure your breaker box so the 3000w inverter can supply the coach appliances and outlets.

Before you begin, label each breaker. I use blue Painters tape and a marker to label each breaker right on the front of the actual breaker, because when you start disconnecting them and moving them around it is very easy to lose track of which breaker goes to what circuit. I also put blue painters on the black and white neutral wires of the Refrigerator 15a breaker, Inverter AC In 30a breaker, and Main 30a breaker (Shore and Generator Power) so I recognize that those stay on the left side bus and left side neutral bar of the breaker box. All the other white neutral wires will be moved to the right side neutral bar. If you have to disconnect any black wires from the other breakers to detangle the wires, then label that black wire as well so you get it back on the correct breaker. It is very easy to get confused about what goes where if you don't label things well. Take pictures, you might need to refer back to them.

To remove a breaker just pull the breaker straight out from the top and lift it out at the bottom to release it from the bus bar and reverse to reinstall it. If your refrigerator is connected to a tandem style breaker, double single pole breakers in one unit then you'll need to buy a separate 15a breaker so you can separate the refrigerator from the tandem breaker set. I typically see the Refrigerator and Microwave or the Refrigerator and General Outlets on Tandem breakers. I'll use the refrigerator and microwave tandem breaker as the example for my discussion. You'll need to buy a 15a Single-Pole Siemen's Type QP, or Square D Type HOM, or Eaton Type BR Circuit Breaker so you can move the refrigerator black wire and put it on the new separate breaker. The refrigerator needs to be on its own breaker so it can stay on the left side bus. Then you can move the Tandem breaker for the Microwave/Vacant tandem breaker to the right side bus so the inverter can power it. Remember to leave the vacant 15a position switch flipped off/down. I recommend leaving the refrigerator breaker on the left bus so you retain the automatic power source select feature of the Dometic refrigerator.

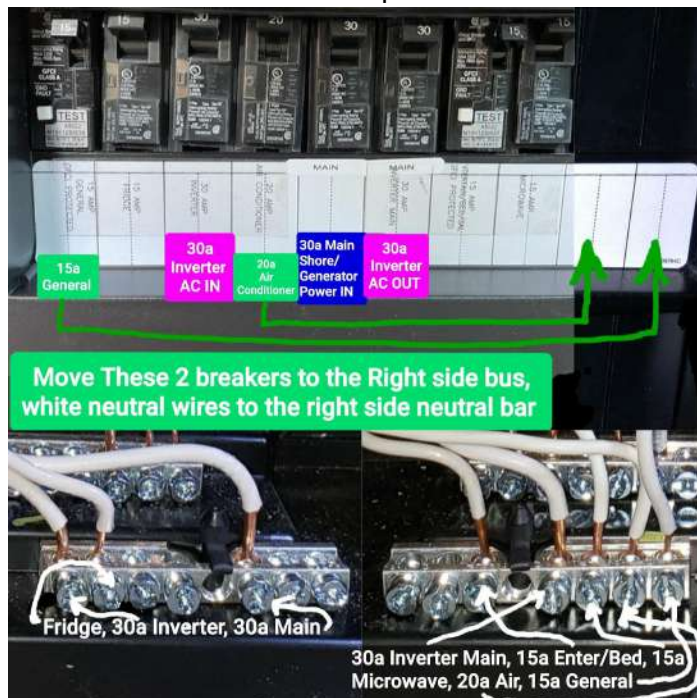
Moving some of the breakers from the far left to the far right can be challenging because the wire might not be long enough so you'll have to unseat some of the right side breakers and move them further right to make room for the left side breaker to fit on the right side bus. This is why labels are so important. I also found that there is a little slack in the wiring if you pull on the 3 wire set poking through the back wall of the breaker box. If you pull on the wire bundle you can get an extra 1/2-1" of length. This is just enough extra to get the breaker to fit on the right side bus closer to the Inverter AC Out 30a breaker. It is important not to move the Main 30a breaker (Shore and Generator Power) and Inverter AC Out 30a breakers from their positions as the first breaker on each of their respective buses, but the order of the other breakers don't matter. Here is a picture of how the breaker box looks when done.



Basically all you need to do is move breakers around, moving all the breakers, but the refrigerator, to the right side bus. The right side bus is fed by the 3000w inverter, InverterAC Out 30a breaker. The left side bus is for the 30a Main shore/generator power input, which feeds the 30a Inverter AC In breaker and Dometic Refrigerator breaker. In order for the Dometic refrigerator to retain the automatic power select feature the Fridge (Refrigerator) breaker must remain on the left side bus. Moving the breakers is only a part of the job, you must also align the breaker's black wire corresponding white neutral wire to the correct side neutral bar as well.

Bottomline, you are moving the 15a General and 20a Air Conditioner from the left bus to the right bus. If you find the Microwave on the left bus (varies by year and model) that needs to be moved to the right bus as well. Once you've reconfigured the breaker box remember to correct the descriptions on the panel face plate. You can also move the breakers on the left side closer together against the Main breaker so your blank spaces are at the far left end. Take your time and be very focused on moving the breaker and aligning the neutrals to the respective side its black wire/breaker is on. You'll also need to remove blank panels from the right side of your face plate to accommodate the new breakers you've added to the right side bus. There is no need to touch the bare ground wires, they can all stay together on their own unique grounding busbar.

The most critical thing about reconfiguring the breaker box is tracing all the white neutral wires back to their corresponding black load wires connected to breakers so the white wires are on the same side neutral bar as the bus the breaker was installed on. It is imperative that all the neutral (white) wires be aligned to the corresponding bus bar that the breaker is moved to/installed on. It doesn't matter what order or position, just that they are on the corresponding correct side neutral bar. This picture is of a breaker box with no tandem breakers to deal with.



Once you've reconfigured the breakers be sure to re-label your panel descriptions. Make sure all the breakers are flipped on or up. There are no issues having openings left over on the buses or face plate panel. I've added more details as a reference if you need it otherwise you can skip to the **Battery Box Preparation** section on page 21. Remember to leave the breakers on or flipped up.

How the Power Flows

Here is a description of how it all works. When on shore/generator power, power feeds the 30a Main breaker and supplies the left bus breakers with power. The power goes into the 30a Inverter AC In breaker then passes through the inverter unit, which passes through the shore/generator power to the right side bus, feeding the 30a Inverter AC Out breaker. The right side bus Main 30a Inverter AC Out Breaker then feeds all of the right side bus breakers, supplying the entire coach with shore/generator power. The inverter battery charger also charges the house battery when on shore/generator power.

When there is no shore/generator power, the inverter senses that and its internal Automatic Transfer Switch, tells the inverter to start inverting the 12vdc battery power to 120vac and feeds it to the breaker box through the 30a Inverter AC Out Breaker on the right side bus, which supplies all of the breakers on the right side bus. With the refrigerator breaker located on the left side bus (shore/generator powered side), if shore power is lost, then the refrigerator senses that it has lost 120vac power, so it automatically switches to propane or battery. You don't need it to be powered by the inverter because it can already run directly from propane or directly from the battery. If shore power is restored the Automatic Transfer Switch immediately senses this and restores the coach power to shore power. Because of the pass through function the inverter cannot be turned off when running on shore or generator power. The inverter turns on automatically in the presence of shore and generator power.

When you are boondocking the inverter is simply changing 12vdc battery power to 120vac residential power to run only the air conditioner, microwave, and anything plugged into outlets. Everything else in the coach is running directly from the battery power or off of propane. Remember it takes 3a-5a per hour of battery power just to have the inverter on and ready to supply 120vac residential power, so if you are boondocking it is better to turn off the Inverter Remote Display Controller when you don't need to run the air conditioner, microwave, or anything from the outlets. Keeping the inverter controller off until you need it will help to conserve battery power.

Battery Box Preparation

I've written a [LTV Lithionics Battery Installation Guide](#) that offers more detailed battery installation information. If you want to use it as a companion guide for installing the battery. Otherwise the following tells you pretty much everything you need to do to install a Lithionics battery.

If you are replacing AGM batteries with the Lithionics 315ah battery, you'll recall back in the **ELECTRICAL SAFETY FIRST** section of this guide that I told you to remove and save the long red 2/0 awg battery cable that connected your old AGM batteries together.



Now you'll want to replace the shorter red Leisure coach battery cable with this longer red one. You need a longer red cable to allow you to more easily connect the new Lithionics battery just outside the battery box. The Lithionics positive battery terminal is farther away from the coach's Mega Fuse block connection than the previous AGM battery positive terminal was.



Orientation of Mega Fuse bus may vary by year and model but the connections are the same for the coach positive battery cable and solar controller fuse on the main input bus bar of the Mega Fuse block

You will simply remove the 1/2" nut from the Mega fuse block terminal that holds the coach positive battery cable, solar controller output ring terminal, and the Automatic Start Generator Option fuse holder (5a fuse) (not shown). You may find a second fuse holder (5a fuse) for the Automatic Start Generator (AGS) Option connected even if that option wasn't ordered, the fuse holder will be empty. The same applies if you didn't get the Leisure solar option, the fuse holder will be connected and empty. Leisure installs these as a pre-wire. The fuse holder will be empty but still connected to the positive Mega fuse bus terminal. Replace the battery cable with the longer one, add the solar controller and AGS (if applicable) ring terminals back on, and tighten the terminal nut down tight. You'll want to position the cable connection pointing more toward the ceiling since the Lithionics battery is taller and the connection is made on the top of the battery.

NOTE: If you had any extra power feed wires on your old battery's positive battery terminal, then move and stack them on the main Mega fuse bar input terminal with the new longer battery cable and the solar controller/AGS fuse holder ring connectors. Same thing applies to the negative battery cables, any extra grounds should be added to the left side battery box ground bolt. You want only the 2 coach battery cables (positive and negative) for connection back to the new Lithionics battery.

I also previously told you to tidy up the battery box by addressing the Sterling DC-DC charger temperature sensor, and if applicable how to address the Dragonfly Battery heater power wires. A Lithionics battery has its own internal temperature sensor and automatic battery heater that requires no extra sensors, wires or switches, it is smart enough to maintain the battery temperature when using or charging the battery above temperatures of -4°F. The Lithionics heater maintains the battery temperature between 35-40°F and requires 1a per hour of battery power to run the heater.

Final prep step, remove the center battery bumpers that used to keep the old batteries in place and the center battery box bolt.



You will find a carriage or hex head bolt in the middle of your battery box. It holds the step frame underneath the battery box. If not replaced it makes the Lithionics battery sit too high, not flat in the batterybox. This reduces the clearance needed to get the battery to slide in under the step and fit properly. As such, this bolt needs to be replaced with a stainless steel or zinc 5/16" x 1" or 3/8" x 1" taper head/flat head machine screw and matching nut. You'll probably find a 5/16" flat head bolt easier than the 3/8" but I give you links to both sizes because they are hard to find. My Lowes store offered these in their Specialty Hardware section over any of the other hardware stores in my area. You need the flat tapered head so it will sit flatter in the hole while still making contact with the hole to secure the step frame under the coach. You are just replacing the Leisure carriage bolt and nut setup with the new 5/16" x 1" or 3/8" x 1" machine screw, and matching nut * with a Silicone locking insert, tension nut or you can use a free spinning locking nut (as pictured right). You won't use any part of the old bolt/nut set. Now with the flat head screw the battery box floor is essentially flat in the center and the battery will slide in nicely with the clearance it needs. Below are Pictures and information on the 3/8" flat head screw, but I found the 5/16" flat head screw works just as well and might be easier to find.



Optional suggestion: if your battery will be exposed to temperatures below 10°F while in winter storage. With battery box wiring preparation completed, use Eternabond Tape, spray foam, foam sheets, etc. to seal off the battery box vents, screw holes, and cable openings. This will insulate the Lithionics Lithium battery(s) from greater exposure to outside temperatures. It needs no ventilation because it is vacuum sealed and UL Tested and Certified not to off gas.



Lithionics Battery Preparation

Before trying to put the battery in place, make sure and get all the wires sticking off the back wall behind the back black battery bumper. Make sure the Sterling DC-DC yellow temperature sensor and the Dragonfly heater wires (if equipped) are tucked behind the bumper as well. All wires need to be even with the red Silicone cover and behind the black plastic battery bumper. You don't want any wires pinched between the bumper and battery, keeping the battery from sitting completely back against the back bump stop. Make sure the wires being connected to the battery are placed in such a way that when you slide the battery in they don't become an impediment to keep the battery from sliding fully back into place against the bumper. You don't want to pinch any wires or cables between the battery and bumper. This is very important because the space is very tight and you need the battery to slide completely back into place unimpeded.

Your new Lithionics 315 battery may or may not come with the things I'm going to discuss in this section so follow these instructions as applicable. Remove the felt pads from the bottom of the battery. Disregard the straps that is how Lithionics used to ship batteries, the new batteries only have felt feet on the bottom that need to be removed.



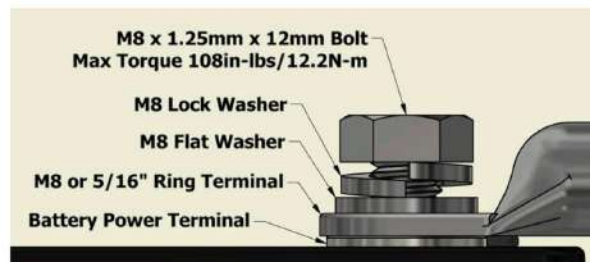
The Lithionics 315ah battery weighs 68 lbs so it may take 2 people to lift it onto the coach step in front of the battery box opening. Then put the red and black terminal cover caps over the ends of each coach battery cable. Pull the lugs through the terminal covers and push the cover down the cable a bit so you have adequate room to put the lugs on the battery terminals.

Lithionics Battery Installation

All you need to do is simply hook up a Lithionics battery like any other battery, using the 2 coach battery cable lugs, black cable to the negative battery terminal and red cable to the positive. If you pulled the solar fuse reinstall it now but recognize the positive battery cable will be energized if the solar panels are getting sun. Keep the positive terminal covered so it can't come in contact with metal. Put the positive cable on first and the negative cable on last. Then add a washer, lock washer, and bolt onto the lug (see picture below). A 13mm wrench is required to tighten the battery bolts. You don't need to torque the bolts if you don't have a torque wrench, just make sure they are tightened down well. Be careful not to over do it. The way I tighten is to snug down the bolt until you think it is tight and then give it a last 1/4" - 1/2" of turn just to give it that last teak of tightness. Once tight, the lug/connector should not be able to be moved by pushing or pulling on it. You never want to over tighten, this method helps you keep from doing that.

Note: Remember you never want to add any washers between the lugs or Battery Power Terminal, nor do you want heat shrink to get between the lugs or Battery Power Terminal. You want clean metal to metal lug and Battery Power Terminal contact.

The battery is equipped with two flat threaded terminals designed for a 5/16" or M8 size ring terminal lug and secured by included M8 bolts, flat washers and lock washers. When using flat washers, it is critical to place the ring terminal lug in direct contact with the top surface of the power terminal and then place the washers on top of the lug. Connect the positive and negative battery cables with correct polarity and double check the polarity of battery circuit to avoid potential equipment and battery damage.



DO NOT place any washers between the battery power terminal and the ring terminal lug, as this could create a high resistance path and cause excessive heating of the connection which could then lead to permanent battery damage or fire.

If you must attach more than one lug to each terminal, make sure at least 1/4" or 6mm of thread is available to secure the connection. Additionally, the ring terminal lugs need to be "clocked" in such a way that they do not interfere with their flat conducting surfaces. Acquire and use longer M8x1.25mm bolts if necessary.

Tighten both M8 power terminal bolts to a maximum of 108in-lbs/12.2Nm to ensure there is good contact with the ring terminal lug.

CAUTION: Over-tightening the terminal bolts can damage the terminal. Loose terminal bolts can result in a high resistance connection which could then lead to permanent battery damage and/or fire.

Now the battery cables are connected and you can pull the battery terminal covers into place and push them down into place over the lugs so that the whole terminal and the connections are covered. You'll feel them snap into place.



If you forget to put the terminal covers over the cables before you connect the cables to the battery. Take the red and black terminal covers that Lithionics provides and cut the tube portion straight down the bottom center so you can easily slip them over the 2/0 cable and push/snap them into place over the battery terminal bolts.



Before you slide the battery under the step make sure the **battery is off, NO blue light is on** around the battery button. Be careful when handling the battery in the battery box because it is very easy to accidentally turn ON the battery by touching the on/off button. You don't want to turn the battery on accidentally until it is in place and you are ready to do so later (process described later).

Now the Lithionics battery should slide into its place under the step. The vertical clearance of the battery box is very tight, you may have to lift and tilt the front of the battery up so you can get the battery terminal/covers under the lip of the battery box first. Use your fingertips to try and keep the terminal caps on but they may get pushed off somewhat by the opening lip. After you get the covers past the opening lip then realign the caps and make sure they are snapped down on the terminal before you completely push the battery into place. Once past the opening lip there is room to work on the caps to get them securely back in place if need be.



Lithionics battery

Straps no longer shipped on a

You may have to move the battery around a bit and push it a little forcefully to get it to sit all the way back against the back wall battery stop/bumper, but you need it to sit just a bit back behind the opening so it is in the correct position to get the battery box cover back into place. Before you can put the battery box cover back in its place, you need to add some black Lithionics packing foam to keep the battery from sliding around. Just cut pieces and stuff them in

the sides around the battery to keep it snugly in place. You don't want it sliding around when traveling. Re-purposing the black shipping foam that came with your Lithionics battery to fill in some of the spaces is an easy way to keep your battery securely in place. Use as much as you like!



Don't put the battery box cover on until you turn the Lithionics battery on and check for a firmware update as described on the next page. I wouldn't button up the battery box until you verify everything is working properly. In order to get the battery box cover back on you need to remove the 2 metal angle pieces and possibly the black carpeted bumpers off the step cover face in order for it to go back into place. Just remove the metal pieces and try to make it fit that way first.



Now the step cover should go back in place and the latch secured. The final step floor cover will keep the step opening cover snugly in place. You may need to give the step floor cover a good push to get it to fit down in the floor, it needs to be snugly in place.

BIG FINISH! Turning the Power Back On

Once you have everything installed it's time to check if it all works. The very first thing you need to do is verify that the Lithionics Battery Firmware is up to date. This is very important because. Lithionics puts out new battery firmware as they learn new things in field testing, like how to address the high capacitive in-rush current of large inverters, or make advancements in battery design and power curve efficiency. Before you turn on the Lithionics battery, first make sure the new inverter battery disconnect switch is off and then turn on the Lithionics battery with its little blue lighted power button on top. Download the Lithionics Li3 Battery APP and it will immediately connect to the Lithionics battery. Click on the wheel cog in the upper right corner and the next screen will give you an option to check the firmware. This video will guide you to

check for any Lithionics firmware updates, https://youtu.be/jJsIDYVr1_Y. You can name your battery as well if you would like a unique name, <https://youtu.be/o4vfwnLVpWY>.

IMPORTANT Before Proceeding: If you hear loud unexpected noises or smell any kind of hot burning smells as you begin to turn things on and test your installation, immediately turn everything off and re-check your wiring.

Wait a minute or so for the Lithionics battery to fully power on and stabilize. Turn the Leisure house/coach battery switch on. Turn the solar panel power back on (your installed switch or remove solar panel covering). Verify that all your breakers in the breaker box are flipped up/on, except the vacant tandem breaker if you have one.

Now turn the inverter battery disconnect switch on. You should immediately hear the Xantrex Inverter Fans start running. If the fans don't run immediately, then you may have a problem. I look for the Microwave clock to be blinking as my verification that the inverter is making 120vac power. If you don't see this then check the remote display to see if you have any warning messages. If the inverter isn't working, turn the house battery switch and inverter battery switch off and re-check all your wiring and connections. There is a problem somewhere and you must correct it before proceeding. It could be as simple as you forgot to have all the breakers flipped up and on.

When everything is working, verify that the voltage shown on the Xantrex Remote Display is nearly identical to the Lithionics battery voltage as seen on the Lithionics APP.

NOTE: If these voltages do not match then you have a connection problem somewhere. For troubleshooting you will need a voltmeter so you can begin doing voltage checks from the battery to the inverter to find out why the inverter isn't getting the same voltage as the battery is reading. Check every connection to ensure it is tight, no wire/cable should be able to be moved. Check the voltage of every connection between the battery and inverter terminals. They must read the same exact voltage as the battery terminals are reading or you have something wrong with connections, crimps, wire, fuse, washers or heat shrink where they should not be, etc. Every connection must be checked for the correct voltage until you find the cause of the low voltage. If you find issues then turn off the inverter switch, Leisure battery switch, and battery, then replace fuse, re-tighten, repair, the offending element(s).

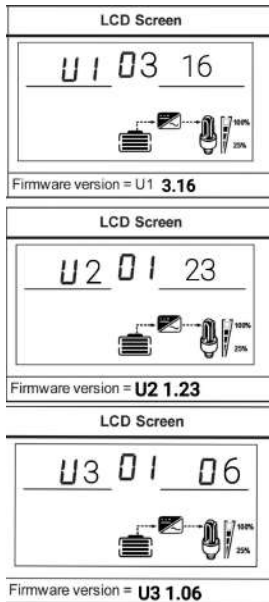
You must find the cause of the DC voltage issue or you could damage the battery or inverter. Once you track down the bad connection, turn the Lithionics battery on, the Leisure battery switch back on, and restore the DC power to the inverter by turning the inverter battery disconnect switch back on, then the inverter fan should start running immediately. If this doesn't occur you'll have to keep troubleshooting. But if the inverter battery terminals are reading the same voltage as the battery then the issue you had should be resolved, unless there is something wrong with the inverter itself.

So far so good, everything is working as expected. Now let's get everything setup.

Download the Xantrex **FXC Control APP** and follow the prompts to connect via Bluetooth to your phone. It is easy to adjust the settings on a Xantrex Inverter via Bluetooth and the FXC Control APP. Xantrex has a number of different APPs but only the **FXC Control App** will work with the Xantrex Freedom X/XC Bluetooth Remote Display Controller.

Inverter Firmware

You must be unplugged from shore power to complete the setup. It is easy to set up a Xantrex Inverter with the Bluetooth Remote Display and the FXC Control App. But the first thing you should do is check to see if your firmware for the Inverter and Bluetooth Remote Display are the latest versions. First verify the Firmware Version by viewing the version numbers on screens U2 and U3 of the actual Xantrex Remote Display panel unit. The U2 and U3 screens are the last 2 screens, use the center button with the pointing arrow to the right to scroll through the screens. Verify that your Remote firmware revision on the U2 Screen is 1.23 or higher. Verify the inverter firmware version on the U3 screen is 1.06 or higher.



U2 and U3 screens read as firmware versions 1.23 and 1.06, respectively. These or higher numbers reflect the most up to date firmware. If either of the U2 or U3 firmware versions need updated then follow the instructions below. [Otherwise Skip to page 31, Inverter Settings Section.](#)

Updating the Xantrex Inverter and/or Remote Display Unit Firmware

Download the files exactly as the Xantrex instructions direct. You can find instructions and the latest firmware here, <https://www.xantrex.com/power-products/inverter-chargers/freedom-xcpro.aspx>. You must use a USB Flash drive of at least 2GB, standard formatted on the computer. You'll need to create a folder called **FreedomX_Firmware** and then you download the inverter firmware Zip file from the Xantrex website. Unzip the file and move the 2 firmware update files **fxcc.enc** and **fxcc_manifest.cbor** into the FreedomX_Firmware folder. Then download the Bluetooth Remote firmware update and move it into the FreedomX_Firmware folder on the flash drive as well. Rename the Bluetooth Remote file to REMOTE.bin. Then make sure the Xantrex inverter is on, Green light next to the center button of the Remote Display Control panel or by turning it on with the power button on the Remote Display Control panel. Plug the USB flash drive into the USB port on the right bottom corner of the inverter unit itself.



The inverter will immediately start processing the download, indicated by flashing lights on the USB drive. Wait about 10 minutes. You'll know the download is done when the flash drive and inverter stop the flashing lights and the Xantrex Remote Display shuts off. Then turn the Remote Display back on with the power button and verify the updated Firmware Version numbers. Remove the USB Flash Drive.



Communications Firmware for FREEDOM XC PRO Inverter/Charger

818-2010 and 818-3010

WHAT YOU NEED:

Download the latest firmware version from www.xantrex.com
Computer | Internet Connection | USB Drive | Access to FREEDOM XC PRO Inverter/Charger

<p>STEP 1</p> <p>USB must have a capacity between 1GB to 256GB</p> <p>On a USB stick, create a folder titled exactly: FreedomX_Firmware</p>	<p>STEP 5</p> <p>LEDs will flash between yellow and green. The flashing will stop when the process is complete.</p> <p>Insert the USB into the inverter/charger unit. Upon inserting the USB stick, the FREEDOM XC Inverter/charger LED should flash showing that the USB is recognized and the firmware is being downloaded.</p>
<p>STEP 2</p> <p>Place both FREEDOM X firmware files fcc.exe and fcc_manifest.chr onto the USB stick inside the FreedomX_Firmware folder.</p>	<p>STEP 6</p> <p>After the LED has stopped flashing, power cycle the inverter/charger (turn the inverter/charger off and on). Wait about 10 minutes before you remove USB. The Xantrex Remote Display will shut off. Then turn it on and verify the Firmware Version numbers. Then remove the USB.</p> <p>STEP 7</p> <p>After the LED has stopped flashing, use the Inverter's local display to view FREEDOM X firmware screen (U3) which should show the new firmware version 01 06 (Press the 'scroll' button on the Inverter/charger).</p>
<p>STEP 3</p> <p>Safely eject the USB from the PC.</p>	
<p>STEP 4</p> <p>Turn off all AC loads and turn off the vehicle engine. Ensure that the inverter/charger remains powered on.</p>	



Upgrade Procedure for FREEDOM X Bluetooth Remote Panel Firmware through FREEDOM XC PRO Inverter/Charger

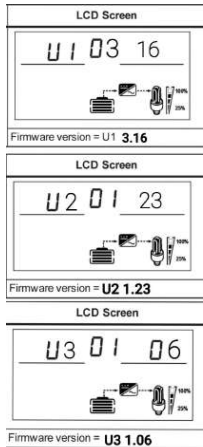
808-0817-02

WHAT YOU NEED:

Download the latest firmware version from www.xantrex.com
Computer | Internet Connection | USB Drive | Access to FREEDOM XC PRO Inverter/Charger

<p>STEP 1</p> <p>USB must have a capacity between 1GB to 256GB</p> <p>On a USB stick, create a folder titled exactly: FreedomX_Firmware</p>	<p>STEP 5</p> <p>LED will flash between yellow and green. The flashing will stop when the process is complete.</p> <p>Insert the USB into the inverter/charger unit. Upon inserting the USB stick, the FREEDOM XC PRO Inverter/charger LED should flash showing that the USB is recognized and the firmware is being downloaded.</p> <p>During this update, all LEDs on the remote panel should be on and the remote will not be functional.</p>
<p>STEP 2</p> <p>Place the desired remote firmware file REMOTE.bin onto the stick inside the FreedomX_Firmware folder. Note that the remote firmware file must be renamed exactly to REMOTE.bin.</p>	<p>STEP 6</p> <p>After the LED has stopped flashing, use the remote's local display to view the remote firmware screen (U2) which should show the new remote firmware version.</p> <p>Do not remove when USB stops flashing, Wait 10 minutes before you remove the USB.</p>
<p>STEP 3</p> <p>Safely eject the USB from the PC.</p>	
<p>STEP 4</p> <p>Turn off all AC loads and turn off the vehicle engine. Ensure that the inverter/charger remains powered on.</p>	

Verify the Firmware updates completed by viewing the version numbers on screens U2 and U3 of the Xantrex Remote Display panel.



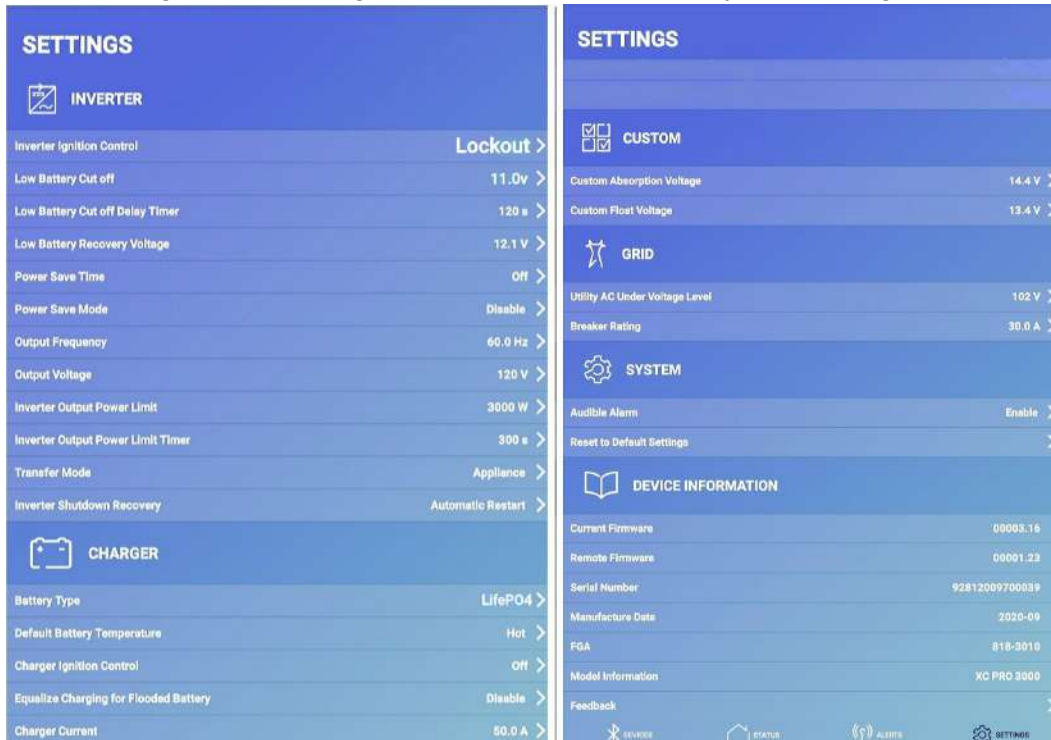
U2 and U3 screens read as firmware versions 1.23 and 1.06, respectively.

Now go to Inverter Settings below and input the settings for the Xantrex 3000w Inverter. You don't need to change the Sterling DC-DC charger settings because the charging profile setting Leisure selects for either the AGM (Sealed) or Dragonfly Lithium (LifePO4) batteries are perfectly compatible with a Lithionics battery for alternator charging. If you have a solar controller with a Lithium setting then change its setting to that otherwise leave it on the AGM battery setting profile. Make sure you turn your solar panels back on and enjoy your new power!

You can also close up the battery box if you haven't already done so.


Inverter Settings

The following are the settings I recommend based on my own testing and operation.



Once you are sure the inverter is functioning properly (refer to the Testing in Battery Mode section from the manual, pictured below), only then plug into shore power to Test in Grid Mode.

Step 8: Testing Your Installation

 WARNING
ELECTRIC SHOCK HAZARD Pressing the Power button to turn the Freedom XC PRO inverter to Standby mode on the display panel does not disconnect DC or AC input power to the Freedom XC PRO. If shore power is present at AC input terminals, it will pass through to the AC output. Failure to follow these instructions can result in death, serious injury, or equipment damage.

There are two tests to be performed. The first test verifies that the Freedom XC PRO is inverting DC battery power and delivering AC power to its output.

The second test is intended for installations where AC input and output is hard wired to the Freedom XC PRO. This test verifies that the Freedom XC PRO transfers from inverter power to shore power when shore power is present.

NOTE: Shore power (pass-through) refers to the AC input power from a utility grid, generator or external AC source.

When you are ready to test your installation and operate the Freedom XC PRO, close the DC fuse and Disconnect or the DC circuit breaker to supply DC power to the Freedom XC PRO.

Testing in Battery Mode

To test the Freedom XC PRO:

1. For hard wired installations, ensure shore power is not present.
2. Press the Power button to turn the inverter/charger on. The green LED indicating Battery mode (Inverter mode) turns on and the LCD screen displays the **BATT. MODE** icon.
3. Plug a test load, such as a lamp within the power rating of the inverter/charger into the Freedom XC PRO GFCI or an AC outlet hard wired to the Freedom XC PRO.
4. Turn the lamp on to verify that it operates.

If the lamp operates, your installation is successful. If your installation has AC input and output hard wired to the Freedom XC PRO, proceed to *Testing in Grid Mode*.

If the status LED on the display panel glows red, see the Troubleshooting chapter.

Testing in Grid Mode

To test the Freedom XC PRO:

- With the test load from the previous test still connected and operating, connect the shore power source.
- The Freedom XC PRO transfers the test load to shore power. The green LED indicating grid mode turns on and the LCD screen displays the **AC MODE** icon.
- If the test load operates, your installation is successful.

NOTE: If the Power button on the Freedom XC PRO is turned ON, the Freedom XC PRO will automatically supply the appliances with inverter power if the shore power source fails or becomes disconnected.

If the Power button on the Freedom XC PRO is turned ON and shore power voltage is too low (less than 90 volts AC), the unit will transfer to inverter power to continue running your appliances.

NOTE: Whether or not the Power button is turned ON, shore power will pass through the Freedom XC PRO to the output when shore power is within normal operating range. The unit also starts charging the battery after the transfer to grid mode.

NOTE: In the event of low or no battery voltage, shore power will pass through the Freedom XC PRO to the output even when shore power is outside the normal operating range.

More Detailed Settings and Operational Information

The ACC Input- Ignition Control wire you connected as I described earlier, has features for **Inverter Ignition Control** and **Charger Ignition Control**. Both have 3 settings to choose from. I recommend the setting of **Lockout** for the **Inverter Ignition Control** and **Off** for the **Charger Ignition Control** setting. Then the Leisure Coach Battery Switch will signal the Inverter Control System (power to the inverter remote display controller) to turn Off with the Leisure battery switch. The Lockout setting requires you to manually manipulate the inverter remote display controller to turn the inverter on or off while boondocking. Remember the inverter is always on when connected to Shore power or running the generator. This is because their power must always pass through the inverter in order to supply the inverter bus on the right side of the breaker box.

You can also adjust the **Charger Current** setting to your desired charging parameter, but I recommend you set it at less than 50a until you get accustomed to its operation. You may have to play with this setting depending on your needs because it doesn't always balance the loads properly and you may find you have to reduce the charger current very low depending on the capacity of a shore power outlet or the generator, particularly if you are trying to run the air conditioner at the same time. Running the air conditioner and battery charging from a 20a shore power connection or the generator may cause problems. With how things function so be aware of this and keep adjusting the battery Charger Current setting lower and lower until the anomalies dissuade. I've had to adjust the battery charger current down to 5a to get my air conditioner compressor to run properly.

Under normal 30a shore power use, I leave my Charger Current set on 50a because I mostly recharge my Lithionics battery at Campgrounds when I have a 30a power pedestal to plug into and I'm also using the air conditioner and the rest of the coach. I set it at 50a because I don't want to draw so much charging power for the battery when I need much of the 30a shore power to run everything else in the coach as well. Battery charging at 50a per hour will fully charge my Lithionics 315 ah battery in 6 hours so that's perfect because we overnight on shore power. The Xantrex is supposed to be smart enough to balance your shore power usage needs against the need to charge the battery and then automatically adjust the Charger Current depending on how much unused current is available. I found this doesn't always work at the higher Charger

Current setting. The manual describes its operation like this, "The charger is power factor corrected to use AC current as efficiently as possible. Minimizing the AC current used by the charger means more current is available for your AC loads. The Freedom XC PRO has a power share feature which prioritizes your AC loads by reducing the Charger Current and maintaining the total input current to less than the breaker setting." I don't find this to work if the Charger Current setting is set to high, in fact if it is set to high and you are running the air conditioner the charger won't turn on at all or the charger works but the air conditioner compressor won't turn on. Some people have reported to me that they trip breakers, so a number of things can go wrong if the air conditioner operation and battery charger loads aren't managed properly.

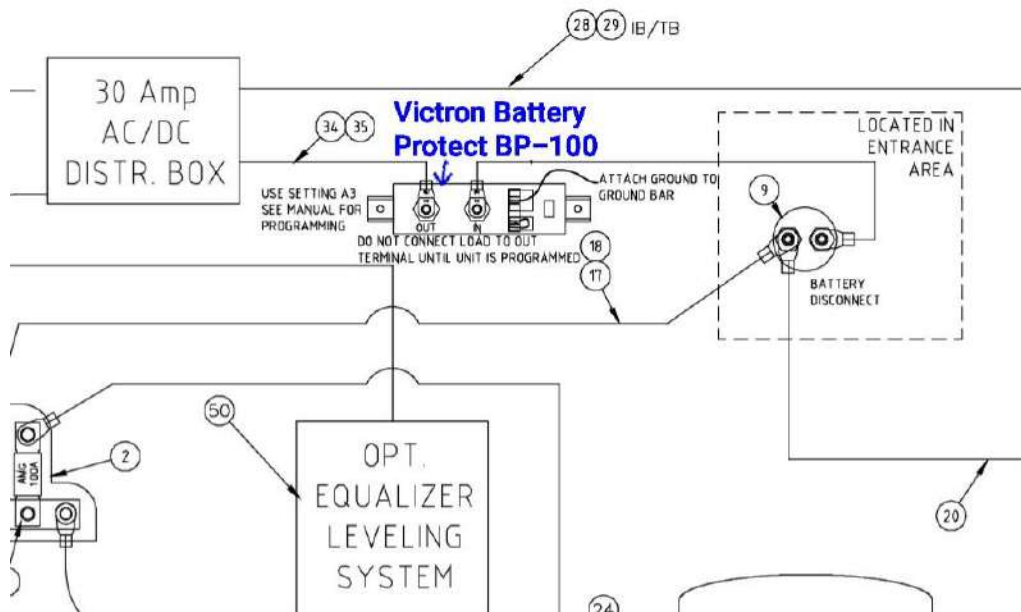
Even though the Xantrex inverter is supposed to manage the loads automatically, with priority to supplying the coach loads first. This means it is supposed to only provide battery charging from any power that is leftover after the coach power is supplied. But I have noticed when at some campgrounds that don't have good power or when using the generator, that the Xantrex automatic load management doesn't always occur either, particularly when running the high power demand air conditioner. In some circumstances, you may discover the inverter isn't charging the battery at all because the power demand of the coach is too great. As a result, you need to reduce the inverter Charger Current setting to a smaller number. I found when running the air conditioner that the inverter automatic load management feature works best with a Charger Current setting of less than 50a. My point is when using shore or generator power, always be prepared to dial down the battery charger if things are running as expected in the coach.

Note: I set the Low Battery Cut Off Delay Timer to 120s to give myself time to shutdown the air conditioner when I get the warning alert before the Inverter turns itself off. Sometimes a hard shutdown of high amp appliances, like the air conditioner, in mid operation can cause damage.

Xantrex provides several preset standard battery type settings to choose from, the LifePO4 preset is the correct setting for Lithionics batteries.

As far as your other related Leisure component settings go, you don't need to change the Sterling DC-DC charger or GoPower/Zamp Solar Controller (if installed) settings from Leisure's factory settings, because the Leisure factory AGM settings on these devices are better aligned and are safer for the Lithionics lithium battery charging profile (14.4v Bulk and 13.4v Float).

Be aware that Leisure does install a Victron Battery Protection device, the Victron Battery Protect BP-100, on the 12vdc power supply cable coming off the coach's battery disconnect with the standard AGM batteries. You don't need to do anything with the Victron Battery Protect since the Leisure low voltage cutoff setting is 11.25v, plenty low to not interfere with the Lithionics ultimate low battery voltage cutoff of 11.6v. Just be mindful that the battery protect device exists because there have been reports of the Victron Battery Protect failing so if you don't want to worry about that down the road it would be better to disconnect the input and attach it to the output terminal. This way you are taking it completely out of your Leisure 12vdc system. You may have to ask Leisure where yours is located. You should find the Battery Protect device behind the coach battery switch area or behind the Power Distribution Center (breaker box/fuse panel). It is located somewhere between the coach battery switch and breaker box. Some are rather difficult to access. I have seen them in the TV cabinet, but I don't have good information on the locations for the various floor plans. It will be between the house battery switch and the 12vdc power distribution center fuse panel.



I highly recommend running your battery down to 20-15% State of Charge (SOC) (battery symbol percentage icon on App), fully testing your air conditioner operation, because you need to know what you can expect before you trust the system completely. Don't be surprised when you see that the Xantrex battery voltage and battery percentage doesn't accurately align with the Lithionics App readings. This is going to happen because of the voltage drop you get when the inverter is powering high amperage appliances. So only rely on the Lithionics Battery Monitoring App for accurate information about the Lithionics battery.



If you are boondocking I highly recommend you run the refrigerator from propane because on battery it uses 14a-20a per hour (ah) and you could run your battery down 50% using the refrigerator overnight on battery vs propane which requires less than 1ah from the battery to keep the propane valve open. Running the refrigerator off battery while driving is just fine because you have solar and engine alternator charging from the Sterling DC-DC charger (24ah) when driving. But be aware if you need battery charging you won't get much because the refrigerator can take up to 20a from the Sterling alternator charging.

Remember the Lithionics NeverDie battery cutoff is 10% SOC or 12.0v whichever occurs first. Once the NeverDie battery cutoff occurs you must manually turn the battery back on with its blue lighted power button. If you turn the battery back on after it shuts off at the NeverDie cutoff you can continue to use the battery until it shuts off again at 0% SOC or 11.6v, whichever comes first. When using this last 10% it is recommended only for 12vdc needs as if you continue to try and use it for 120vac loads from the inverter, like the air conditioner, you'll go to 0% SOC in less than 2 minutes. The last 10% of battery use should really be for just emergency things until you can get the generator started or plugged into shore power or start the engine and get on the road driving to begin recharging the battery. You must take immediate action to charge the battery once it has reached 10% or lower SOC. Letting a battery sit discharged for any length of time will cause battery damage.

Note on Mercedes Sprinter Engine Idling and use of Biodiesel: It is widely thought that Mercedes doesn't recommend idling the Sprinter Diesel engine for longer than 5 minutes or there may be engine/ emission issues. This is partially true, because whether you can idle the engine or not is completely dependent on whether your fuel contains biodiesel and at what percentage. Here are some better defined parameters on idling your Unity. If you use diesel fuel that contains no Biodiesel or a biodiesel content of B5 or less, then it is OK to idle the engine for 2-3 hours so long as you immediately hit the road and run at highway/interstate speeds for at least 20 minutes for the regen cycle to run. If you only occasionally use greater (>) than B5 biodiesel fuel, then you can still idle as described above. The occasional tank of >B5 fuel isn't harmful (just don't store it with >B5, especially in cold weather). I use the same rule with greater than B5 fuel, it's fine to use as long as you are running it hot and long on the highways/interstates. My saying for it being OK to use up to B20 fuel is only if you can Drive It Like You Stole It! However, if you have a consistently steady use of greater than B5 fuel and cannot drive in this manner, then it is imperative to limit the idling to 5 minutes or less and change the engine oil more frequently.

More on Managing Your Loads and Your Air Conditioner

More things I've learned about the Xantrex Freedom XC Pro 3000w Inverter from mine and others' experience. But much of what I am learning has to do with ensuring you get good air conditioner operation. So many people question why their air conditioner isn't cooling and often the solution is to just reduce your other loads. In particular, the battery charger current setting being too high is the biggest reason for poor air conditioner and other coach appliance operation issues. So always consider reducing your inverter battery charger current setting as your first action. Managing loads means you only run one high amp draw appliance like the air conditioner, microwave, coffee maker, hair dryer, induction cooktop, space heater, or inverter battery charger (on high amps) at a time.

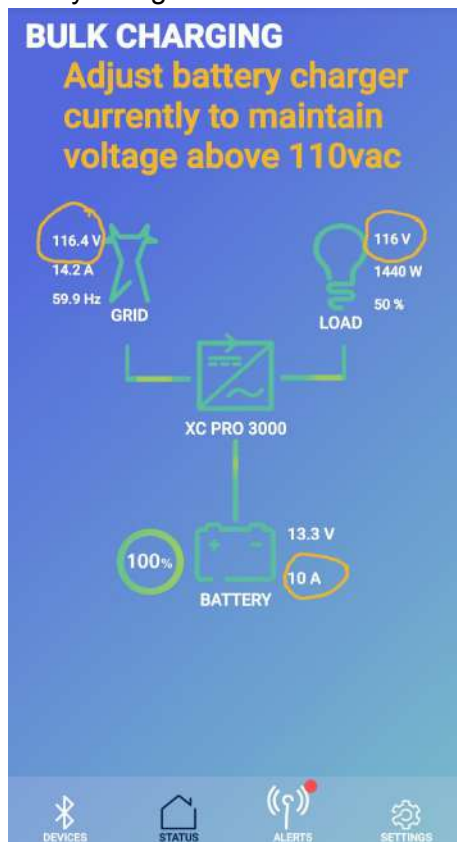
The Xantrex Inverter is not reliable for management of loads as its manual claims. So you must understand the limitations of your system and take action. Oftentimes when on shore/generator power, reducing the inverter battery charging current to the lowest setting of 5a , and switching

the Dometic refrigerator to propane is very easy and gives your air conditioner an immediate benefit if it is struggling to cool.

When you are using 20a shore power to run the Air Conditioner (whenever the air conditioner is referred to it is understood that an EasyStart/SoftStart has been installed) you basically can't be running anything else. Remember the inverter is always on when plugged into shore power and as such would need to have the battery charger current setting reduced to its lowest setting, 5a. Otherwise when trying to run the air conditioner from a 20a shore power breaker it may trip when the compressor kicks on.

Additionally, the refrigerator can draw more than 14a when it is on startup and trying to cool down. As such you won't be able to run it if you are running the air conditioner and a small amount of battery charging on a 20a outlet. It is critical that you experiment with your system so you understand and can recognize when you need to adjust the inverter battery charger current, and switch the refrigerator to propane, and/or not use other high amperage items, and/or turn other things you are running off.

This also applies to generator operation because it puts out lower voltage power (110-116v) more closely related to what you experience when trying to use a 20a outlet, it does not provide the same strong voltage (120-124vAC) that a 30a power service supplies, so you should treat generator power with the same limitations as described above. Also be prepared to manage your loads when you encounter low voltage/low power 30a service as you experience in some campgrounds. In the summer, when all campers are running their air conditioners, you may find low voltage situations as well. You have to be prepared to limit the operation of the inverter battery charger and other items when in low power situations!



Never run the air conditioner if grid voltage or load voltage is less than 110V. I personally try and not let my power voltage drop below 114v.

I recommend 50a as a general battery charger setting but you still may find yourself at Campgrounds with low voltage power and need to drop the setting more. I don't recall what inverter you have but what you want to do is keep your shore or generator power above 110vAC, no lower. As you can see, in the picture of my Bluetooth Remote Xantrex App status screen, I like to maintain mine to stay above 114vAC. To do this when running the air conditioner as the priority, you must manage your loads by shedding power demands. The first way you can do that is turn your battery charger current to its lowest setting of 5a. If you find after you've reduced the battery charger current you are still at or below 110vAC you need to look at what else you are powering and shed those loads. Go around and unplug everything from the outlets, make sure the refrigerator is running on propane, and don't try to run the microwave.

Additionally these same operating limitations apply to when you are using the Inverter. While the battery charger operation isn't a concern when running the air conditioner off the inverter/battery, the air conditioner takes the same position, it will not compete for the battery power! So it may not run properly if you are also trying to run high wattage/amp draw items like the refrigerator off electric, microwave (for more than seconds), water heaters, furnace fan, coffee machines, hair dryer, etc. The air conditioner is always going to protect itself from low voltage/low amperage situations by not running the compressor. It may even decide it's too iffy to run the fan motor. A low power situation can seriously damage motors and compressors, so that is why they have protection features that keep them from trying to compete with other power hungry items. The Dometic refrigerator is very power hungry when trying to run from electricity!

The distinction is the voltage part of the power equation, $\text{Amp} \times \text{Voltage} = \text{Watt}$. I discovered when trying to install the EasyStart, when I ran my air conditioner off the generator the AC voltage was 110-116v and when on 30a shore power it was 120-124v. This is why EasyStart recommends using shore power for the EasyStart Learn Process; it needs strong, higher voltage power to properly learn. After the learning process is completed the fact that the EasyStart dampens the amp surge of the air conditioner only helps it to run in lower voltage power situations. This is an important distinction because the recommended power voltage range for running sensitive electrical equipment or appliances with motors/compressors is 114vac to 126vac. Motors can overheat and even fail if their operating voltage is too low because they try to draw more current. Usually running the microwave for seconds doesn't pose a challenge, it is when you must run it for minutes that you need to be aware of the impact, particularly when running the air conditioner.

Low voltage means more amps are required to provide the same amount of watts or power. So managing/balancing your power needs (volts and amps) when relying upon air conditioner operation, whether they are constant or changing for periods of time, is critical if you want good air conditioner performance. So many people question why their air conditioner isn't cooling and often the solution is to just reduce your other loads. Reducing the inverter battery charging current or turning it off, and/or switching the Dometic refrigerator to propane is very easy and gives your air conditioner an immediate benefit if it is struggling to cool. Leisure leaves the default inverter battery charger current settings on the inverters default setting, which is typically the maximum charging capacity, 80a or higher. This inverter battery charging current alone can tip the scales of air conditioner performance. Then if you couple high battery charging current with a low voltage power situation, the air conditioner is not going to compete!

Parts

These upgrades are made much simpler now with a Lithionics battery since you can simply reuse all the existing wiring that Leisure installed with the original 2000w inverter. **Basically these are all the items you will need, including a 3000w inverter** (used a Xantrex Inverter for this demonstration) **and Lithionics 315ah Battery, for this electrical upgrade.**

- 1) Lithionics 315ah battery, <https://pagosupply.co/shop/lithionics-products>
- 2) Xantrex Freedom XC Pro 3000w Inverter, <https://www.amazon.com/dp/B08C1VRWZL>
- 3) Blue Sea 300a battery switch (6006) ($\frac{3}{8}$ " terminals), choose Black or Red, <https://amzn.com/dp/B00558LSJE>
- 4) StarTech 20 pin connector for ACC Ignition Control Feature, <https://www.amazon.com/dp/B0002GRQRW>, for adaptation of the Xantrex Freedom XC 2000w inverter ignition control feature, more in ACC INPUT and CONNECTION sections above.
- 5) Quick Change Step Drill Bit, <https://www.amazon.com/dp/B098TQJD1S>
- 6) Cable/Zip Tie Assortment, <https://www.amazon.com/dp/B07JBCKX7M>
- 7) 5/16" or $\frac{3}{8}$ " Flat Head Machine Screw (whichever you can find)
 - A. Hillman 5/16-in-18 x 1-in Allen-Drive Screws (2-Count) <https://www.lowes.com/pd/Hillman-5-16-in-18-x-1-in-Allen-Drive-Cap-Screws-2-Count/50088854> and Hillman 5/16-in x 18 Zinc-plated Steel Nylon Insert Nut, <https://www.lowes.com/pd/Hillman-5-16-in-Zinc-Plated-Standard-SAE-Nylon-Insert-Lock-Nut/3058723> or 5/16" x 18 tension hex nut, <https://www.lowes.com/pd/Hillman-5-16-in-x-18-Black-Phosphate-Steel-Hex-Nut-2-Count/3012474>
 - OR
 - B. Lowes Specialty Hardware Section, Grade 8- $\frac{3}{8}$ " Flat Head Machine Screw, <https://www.lowes.com/pd/Hillman-3-8-in-16-x-1-in-Allen-Drive-Cap-Screws-2-Count/50088914> and Lowes Specialty Hardware Section, Grade 8- $\frac{3}{8}$ " Free Spinning Washered Nut, <https://www.lowes.com/pd/Hillman-3-8-in-x-16-Black-Phosphate-Steel-Hex-Nut-2-Count/3012485>
- 8) If you have a Tandem breaker for the Fridge and General circuits, then you'll need to go buy a 15a Single-Pole Siemen's Type QP or Square D Type HOM, or Eaton Type BR Circuit Breaker. You can find these at any hardware store like Home Depot or Lowes.
 - <https://www.homedepot.com/p/Siemens-15-Amp-Single-Pole-Type-QP-Circuit-Breaker-Q115U/100053443?MERCH=>
 - <https://www.homedepot.com/p/Square-D-Homeline-15-Amp-Single-Pole-Circuit-Breaker-HOM115CP/100153952?mtc=>

- <https://www.lowes.com/pd/Eaton-Type-BR-15-Amp-1-Pole-Standard-Trip-Circuit-Breaker/1114089>
- 9) **Optional:** Xantrex Freedom X/XC Bluetooth Remote, <https://www.amazon.com/dp/B08C1SFRFP>
 - 10) **Optional:** Black 2" Eternabond Tape to seal Battery box openings (recommended for battery use or battery charging in temperatures below freezing (32°F), <https://www.amazon.com/dp/B00CEL0T2M>
 - 11) **Optional:** ½" Split loom to cover the switch cable, <https://www.amazon.com/dp/B07TCDTFL2>
 - 12) **Optional:** WindyNations 2/0 awg cable 12", <https://amzn.to/3B8dG3i>
Note: You can reuse the battery cables from the coach or old batteries, or buy this short one with the correct size lugs. If you use an old cable you will have to drill out one end to fit the 3/8" Blue Sea switch terminal just like you have to do on the inverter battery cable.

Tools and Duration

The installation of a 3000W Inverter and Lithionics 315ah Battery is estimated at 5 hours. The tools you'll need are;

- 1) Electric or Battery Powered Drill
- 2) Various standard and deep well sockets and socket wrench (½", 9/16", 13mm (battery bolt/nut) will most commonly be used). Also a 3" socket extension.
- 3) Allen Wrenches
- 4) Screwdrivers with Flat, Phillips and #1 and #2 Roberson square tip
- 5) Rubber mallet, hammer, large screwdriver or chisel, and various other tools to aid in freeing the inverter bay wall
- 6) Wood blocks to support the inverter
- 7) Wire cutter
- 8) Snap blade utility knife,
- 9) Blue butt splice connector or small blue or tan wire nut or electrical tape to secure the ignition control wire splice
- 10) Blue Painters tape and black marker

OTHER INVERTER CHOICES:

Kisae 3000w Inverter and 100a Battery Charger (BIC1230100)

I also installed a Kisae 3000w Inverter and 100a Battery charger and it is a really high quality machine. It holds the voltage drop steady so you don't get spurious inverter shutdowns like you can with the Xantrex inverter. It installs exactly the same as the Xantrex Inverter previously discussed. You can read about this more in my [630AH of Lithionics Lithium Batteries and 6000W of Inverter Power!](#) Which can be downloaded from the How to Guides on the Unity Section of the Sprinter Source Forum or from the LTV groups file section.



Victron also makes high quality inverters (Multiplus and Multiplus II) and integration components like the Cerbo GX and Touch 50/70 color screen, but they are a little more complicated, and a bit larger and heavier so you'll want to do more research and get the Lithionics installation specifications for Victron inverters. Go to the Lithionics Support web page, <https://lithionicsbattery.com/support/>.

Installation of Multiple Batteries for a Larger Capacity Battery Bank

Remember that the inverter installation is completely independent of the size of a battery bank. The 3000w inverter power output is limited by its design to 250a or around 250a of draw from a Lithionics 315 battery. So if you want to increase the size of your battery capacity nothing needs to change relative to the inverter installation. The only change might be where the batteries connect to supply the coach and inverter with power.

If you are interested in installing more Lithionics batteries together to create a larger capacity battery bank then it is important to use the correct parallel connection method. The Battery-To-Bus Bar method should be used for the optimal efficiency, so the draw from the batteries and charging of the batteries is balanced among the batteries as equally as possible. The Diagonal Takeoff method is still an acceptable method for installing 2 or more Lithionics 315 ah batteries. As you can see from the data chart, below, a test on Lithium and AGM batteries, the battery to bus bar method balances the batteries to the greatest extent possible.

Lithionics Battery: Internal BMS Battery

Parallel Connection Options

- Optimal: Battery-to-Bus Bar
For Large batteries like GTX12V315A

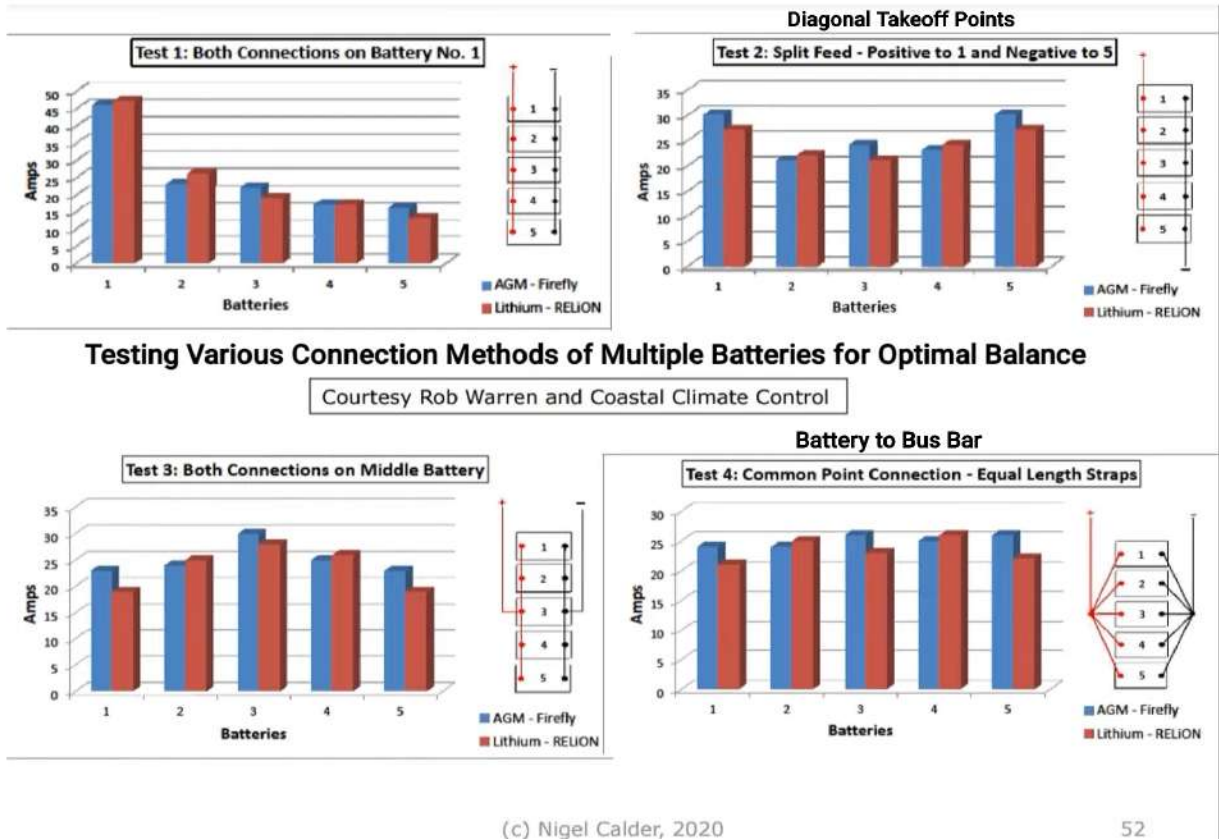


These can be connected in parallel, and Lithionics recommends using bus bars for wiring. Add a Blue Sea 300A Terminal Fuse to each positive.

- Option: Diagonal Take-Off
For small batteries like 12V130A (no more than 3)



Positive



I used a Victron Lynx Power In 1000a dual bus bar system for my dual Lithionics 315 battery installation. I put one 315 in the battery box and one next to the inverter and wired everything together, batteries, solar, ClassT Fuse, inverter battery disconnect switch and inverter using the Victron Lynx Power In. It made for a very organized and clean installation. You can read about this more in my [630AH of Lithionics Lithium Batteries and 6000W of Inverter Power!](#) Which can be downloaded from the How to Guides on the Unity Section of the Sprinter Source Forum or from the LTV Enthusiasts, Upgrades, or Help groups file section.

