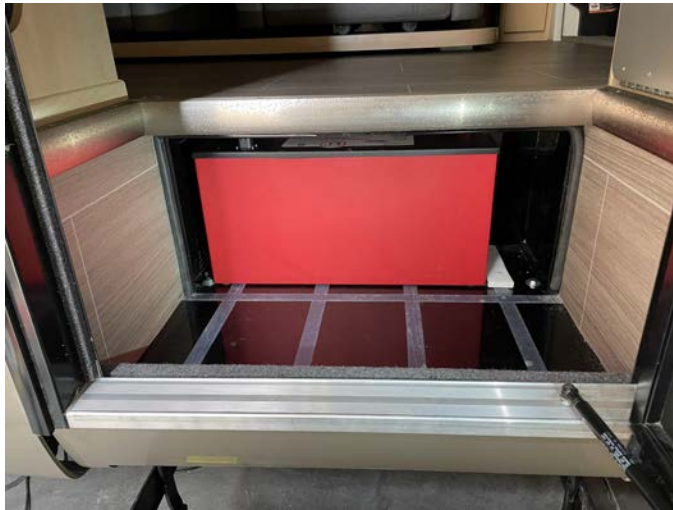


## LTV Unity Lithionics 12v315GTX or Dual 12V125A-G31 Installation Guide

Written by Sandy Johnson, a LTV Owner since 2014

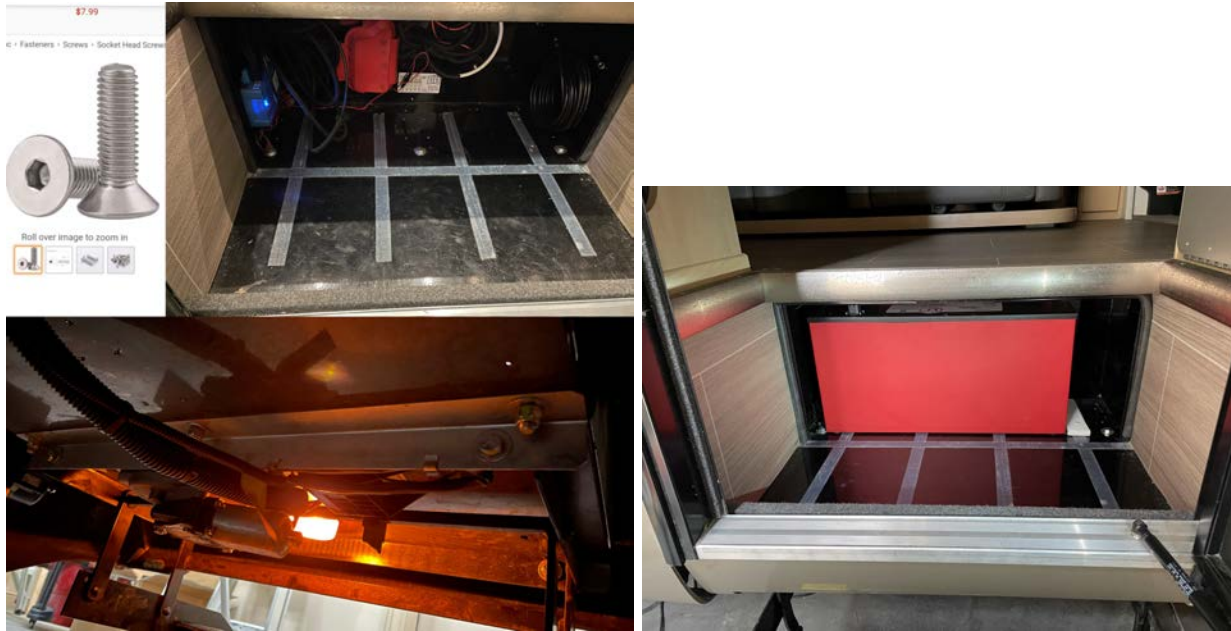
You will definitely get higher quality and more advanced features with a Lithionics 12v315GTX battery or dual 12V125A-G31-5CND batteries. Simply replacing the Leisure standard AGM batteries with Lithionics battery(s) is definitely something you can do yourself. Either Lithionics Lithium battery choice of a single Lithionics 12v315GTX or dual 12V125A-G31-5CND Lithionics batteries can fit in the Unity step battery box or side compartments. However, there are other possible locations that allow you to install one or more of the Lithionics GTX12V315A-E2107 batteries in the exterior compartments or using interior dead spaces of a Unity. Lots of Possibilities!

### STEP COMPARTMENT



Some models have a carriage bolt head in the center of the battery box, which keeps the Lithionics battery from sitting flat, removing some clearance needed to get the battery to fit.

Some people just permanently remove it but I like to advise people to replace it with a taper headed bolt instead, that you can get at any hardware store.



2014 Leisure Unity Top Step Opening Battery Box



Another tip is for the terminal covers that Lithionics provides. Another tip, for the terminal covers that Lithionics provides, I found them much easier to deal with if you cut the tube portion straight down the center so you can slip them over the cable after you have tightened all the wires down. Here are more ideas for possible Lithionics battery locations.

## TWO LITHIONICS GTX12V315A IN A SIDE COMPARTMENT



## LITHIONICS 12V315GTX NEXT TO INVERTER

Fit a Lithionics 12v315GTX right next to the Inverter. You can even remove the wall since Lithionics batteries are UL Tested and Certified not to out gas, it is perfectly safe to install a Lithionics battery right next to the Inverter. This is not the case for AGM or other manufacturers of Lithium batteries. If you don't have them, I would call Leisure to get the exact dimensions of the two sections. This will help you determine if you need to remove the Wall. The wall is attached with screws and spot welds, which can be broken with a hammer and chisel. An oscillating tool could be used as well. If you add some boards to the bottom of the compartment, building it up level with the opening, a Lithionics 12v315GTX will fit perfectly straight in vs turned sideways as pictured above.

## CREATE A FALSE FLOOR UNDER THE DRIVER'S SIDE DINETTE

I Have seen people do this to install with 100ah Battleborn Batteries and there is enough space to easily put 2-Lithionics GTX12V315A batteries side by side. For Unity owners wanting to install the Lithionics 12v315GTX batteries, many install one next to the inverter in the outside storage compartment or they look for open dead space inside the coach. One such dead space area is under the Dinette seat where the breaker box is just behind the driver's cab seat.

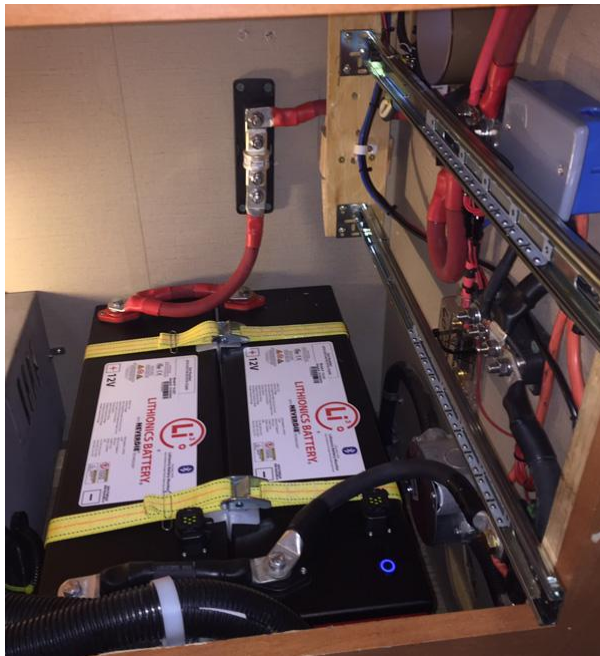
This is from a Leisure Unity Twin Bed model, the owner created a space 12.75"W x 24"L x 12"H to put 3 Battleborn batteries under it. See this thread on the Sprinter Source Forum, <https://sprinter-source.com/forums/index.php?threads/70376/page-11>, for more details. The person created a false floor with little legs that were positioned in such a way as to provide support around the wiring. So as you can see a single Lithionics 12v315GTX at 20.3" x 6.4" x 10" would easily fit. Quite ingenious!

That is a real advantage of a Lithionics battery, there is much more power per cubic inch of space. You could even actually fit a single Lithionics 630ah battery under the dinette as well!





Under the Unity Murphy Bed Wardrobe Drawers





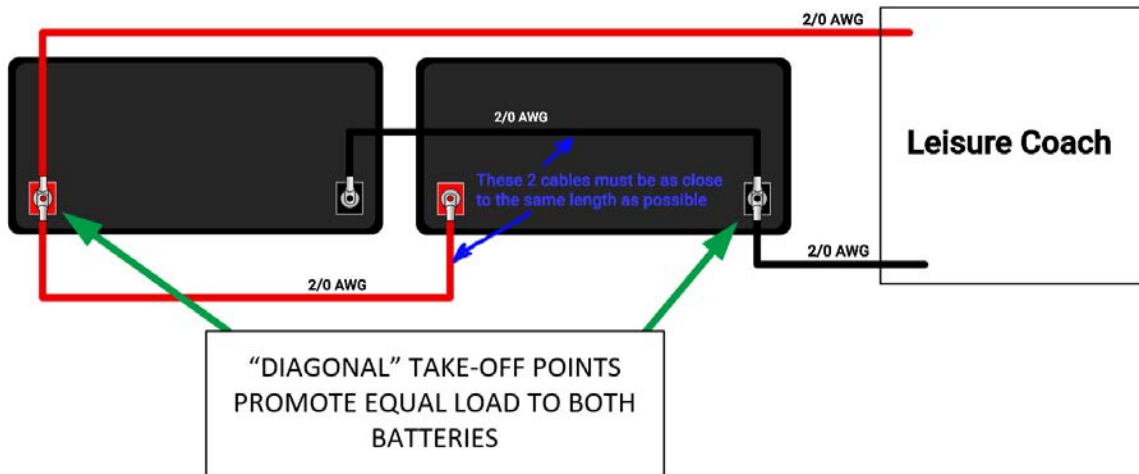
Then a couple of 945ah Lithionics GTX12V315A installations under the Wardrobe with the Furnace Removed



Also a 945ah Lithionics Installation Shortening the Wardrobe Drawers



Replacing the Leisure standard Flooded Wet Cell or AGM batteries with Lithionics battery(s) is definitely something you can do yourself. All you need to do is simply hook up a Lithionics battery like any other battery, using the Leisure battery box positive and negative cables. When installing the dual Lithionics batteries you must ensure you **wire them in parallel**, not series, which is how the standard Leisure 6v Flooded Wet Cell or AGM batteries are wired.



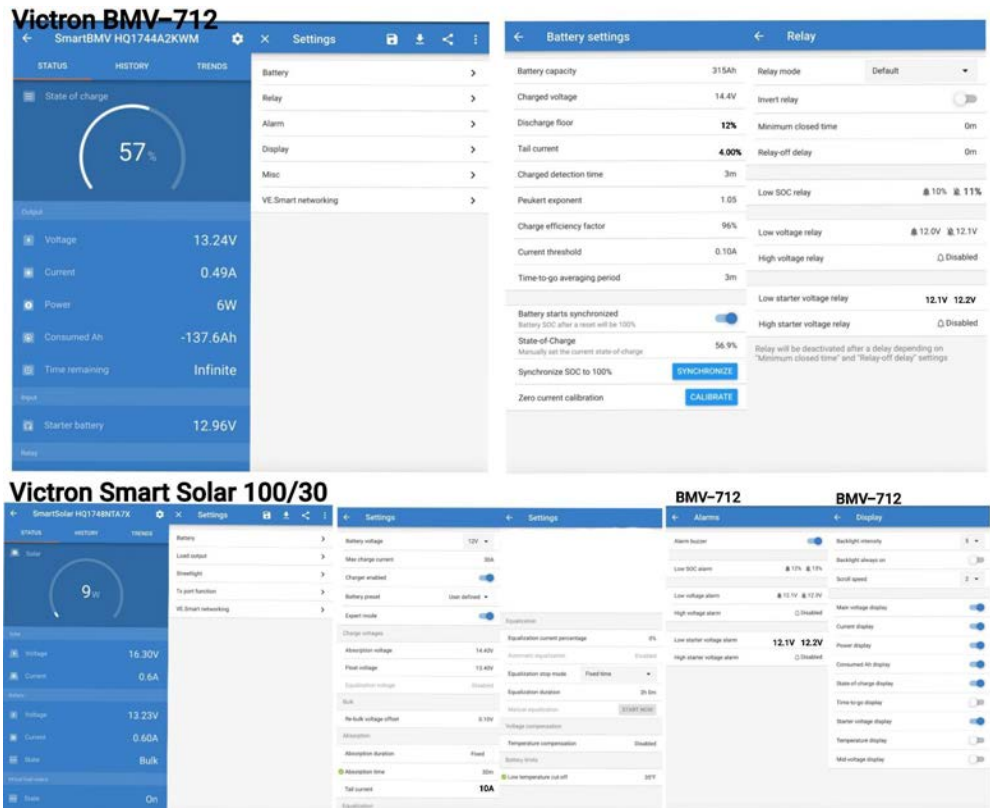
The Lithionics 12v315GTX is a great choice for cold weather use or storage conditions because it has a built-in internal heater that maintains the battery temperature between 35-40 degrees and only uses 1 amp per hour to do it. So 200w of solar is more than adequate to provide the power for the internal heater while still maintaining a full charge on your Lithionics battery.

Leisure is making it much easier for owners to do their own Lithium battery upgrades since starting in the 2020 Unity models, Leisure is installing a 30a Sterling DC-DC charger as standard. This means that when driving the Sterling DC-DC charger is charging your house battery(s) at 30a per hour. The Sterling DC-DC charger is very important because it protects your engine alternator. Another thing that makes upgrading to Lithionics Lithium batteries very easy is that there is no need to change the Sterling DC-DC charger setting (under the passenger seat or dinette) or the GoPower Solar Controller settings because the Leisure factory AGM settings on these 2 devices are better aligned and are safer for the Lithionics battery charging profile (14.4v Bulk and 13.4v Float). Since the Lithionics batteries have their own internal battery monitoring system with temperature sensors you don't need to reinstall the yellow battery temperature sensor from the Sterling, so you can remove that. Since that temperature sensor is a two wire item that connects directly to the Sterling under the passenger seat, some people cut the sensor off and use the 2 wires for Chassis battery voltage monitoring. They just unhook them from the temperature terminals of the Sterling and re-attached them to the Sterling Chassis battery connection and ground.

However, you will want to change your Xantrex 2000w inverter setting to LifePo4, the Lithionics Lithium battery setting. This is very easy and described in the manual using your Xantrex Inverter control panel located in the Unity control center above the door.

For the 2019 and older model Unity's, you'll have to replace your Isolator Solenoid (located under the passenger seat or dinette) with some brand of DC-DC charger (must be less than 60a to be protective of the engine alternator). A DC-DC charger limits the Alternator charging when the engine is running to 30-60a, depending on the size of the DC-DC charger installed, in order to prevent the lithium batteries from drawing too many amps from the Alternator, which could damage it. With the dual Lithionics 125ah batteries it isn't imperative that you add a DC-DC charger, but it is recommended to be protective of the alternator long-term. This Sprinter Source Forum thread, <https://sprinter-source.com/forums/index.php?threads/93929/>, maybe particularly helpful as it contains lots of how to information.

For non Xantrex inverters, you'll want to make sure the Leisure Inverter/Charger setting is on AGM, because this setting is closer to the Lithionics charging profile than any other setting. If you have the Leisure solar option with the GoPower controller, you'll need to make sure it is set to the AGM setting as well (the Magnum Inverter and GoPower solar controller has a very poor quality battery charger. The GoPower controller in particular is terrible and it's Lithium setting will overcharge, which is harmful, to a Lithium Battery (for these, the AGM setting is the closest safe charging voltage profile for Lithionics). If you have another type Solar Controller like a Victron Smart Solar Controller then you'll need to put it on Lithium (preset number 7) or use the "User Defined" option and Expert Mode to enter the settings for the Lithionics charging parameters of 14.4v Absorption and 13.4v float, See below image for recommended settings.



That's all it takes to switch to the Lithionics advanced Lithium battery.



If you're not a member of the Sprinter Source Forum, I highly encourage you to join/register because the Leisure Unity Section of this Forum is very technically active and you'll be able to research and find virtually everything you need about Leisure's, we have many Wonder and Serenity Owners who participate with us on the Unity Forum. If you can't find what you are looking for, just ask a question and you'll get lots of input. The various Leisure Models are more similar than different. In fact I'm installing a Xantrex 3000w Inverter, Lithionics 315ah battery, DC-DC charger in my 2014 Unity and posting all about how I did it on Sprinter Source Forum in the link referenced above. Another thread you may find helpful is, <https://sprinter-source.com/forums/index.php?threads/93361/>.

I also recommend you contact Leisure and get your wiring diagrams. The wiring diagrams are the first place to start on these projects because they answer so many questions when you study them. You should request the 120vAC and 12vDC electrical systems wiring diagrams, Isolator Solenoid location and /or Sterling DC-DC Charger location (I believe yours is probably under the Passenger seat or dinette seat, just like in the Unity, but you should verify this with Leisure if you aren't sure of its location). Also battery box and compartment dimensions from Leisure. You can do this by calling Leisure's Willie Neufeld, email: [WNeufeld@tripleerv.com](mailto:WNeufeld@tripleerv.com) or phone 877-992-9906, 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.

For those interested in installing a larger inverter/charger it's pretty straightforward but you do have to pull new larger cables from the battery to the inverter to meet electrical safety requirements for the more powerful unit. Leisure uses 1/0 cables on their 1000/1200w Magnum or 1000w Xantrex inverter installations, and 2/0 cables for the Xantrex 2000w Inverter/charger installation. To upgrade to a 2000w inverter you must pull 2/0 battery connection cables (2 of them + and -). To upgrade to a 3000w inverter you must pull 4/0 battery connection cables (2 of them + and -). You'll also need to add a large Class T Fuse [Class T fuses have a much higher AIC rating (AIC = amperage interrupt current) which makes them a better fuse for possible high current situations than the ANL/Mega Fuse. Leisure uses a small multi-Mega Fuse bus located near their batteries, which isn't adequate for larger inverter upgrades], see the inverter manual for more details. For Leisure models with the separate inverter bay within a side exterior compartment, it's easier if you remove the compartment wall for the inverter bay so you have room to remove the old one and mount the new one. The wall is attached with screws and spot welds, which can be broken with a hammer and chisel. An oscillating tool could be used as well. If you are just replacing the inverter, you may be able to just disconnect 2 sides of the



compartment separator wall, the roof and back wall attachments, then you can bend it outward for more room to maneuver.

You will also have to rewire the breaker box so the entire coach is supplied power by the inverter. A 2000w inverter can run everything but the air conditioner, and the 3000w inverter can run everything, including the air conditioner (installation of an EasyStart is required). In order to supply the coach's breaker box with the larger inverter, you must add a new main breaker, turning your current breaker box into a subpanel. The Inverter is wired in between the new main breaker and the current breaker box. Since the inverter is a pass-through for shore power when it's not inverting, it's a very easy modification. The newer model Leisures use a dual bus breaker box so it's even easier to reconfigure. I discuss all the DIY how to information on the Sprinter Source Forum. Just Register by clicking on the far right option. Once you are a member of the Forum and can access all pictures and downloads you'll have everything you need at your fingertips to do your upgrade. These Forum threads will give you all the information you need to perform these modifications <https://sprinter-source.com/forums/index.php?threads/93361/> or <https://sprinter-source.com/forums/index.php?threads/93929/page-6#post-1003542> or <https://sprinter-source.com/forums/index.php?threads/91673/>.

Since the GoPower Solar Controller isn't very efficient, you should consider replacing it with a better one. Here is a simple video, [https://youtu.be/CBKf3uKeu\\_I](https://youtu.be/CBKf3uKeu_I), showing you why switching out your Leisure GoPower PWM controller for a MPPT Controller gets you up to 30% more power from your solar panels and offers a higher quality battery charging capability. A MPPT charge controller and glass monocrystalline solar panels are a must, in my opinion, for the highest quality and most efficient solar harvesting. I selected the Victron Smart Controller 100v/30a,

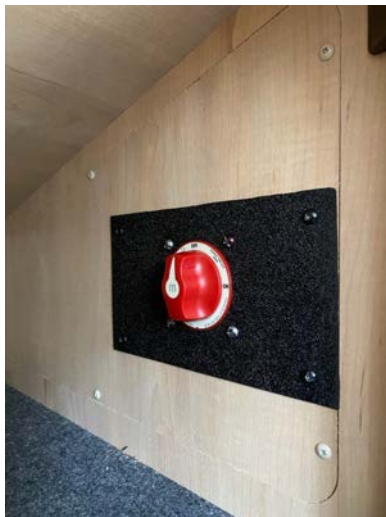
[https://www.amazon.com/SmartSolar-MPPT-100-Charge-Controller/dp/B073ZJ3L13/ref=sr\\_1\\_1\\_\\_sspa?crd=31YM7IYQV758E&dchild=1&keywords=victron+solar+charge+controller&qid=1614164872&sprefix=Victron%2Caps%2C259&sr=8-1-spons&psc=1&smid=A2VHGGOHXF24LJ&spLa=ZW5jcnlwdGVkUXVhbGlmaWVyPUEwSjYySkk2VTNTQjVXJmVuY3J5cHRIZEikPUEwNzEwNjg3M0RBWVNFm08xSIIFVyZlBmNyeXB0ZWZlZCkPUEwMzk4OTIyM1FKMTJUVkdJNzQ0OCZ3aWRnZXROYW1IPXNwX2F0ZiZlY3Rpb249Y2xpY2tSZWRpcmVjdCZkb05vdExvZ0NsaWNrPXRydWU=](https://www.amazon.com/SmartSolar-MPPT-100-Charge-Controller/dp/B073ZJ3L13/ref=sr_1_1__sspa?crd=31YM7IYQV758E&dchild=1&keywords=victron+solar+charge+controller&qid=1614164872&sprefix=Victron%2Caps%2C259&sr=8-1-spons&psc=1&smid=A2VHGGOHXF24LJ&spLa=ZW5jcnlwdGVkUXVhbGlmaWVyPUEwSjYySkk2VTNTQjVXJmVuY3J5cHRIZEikPUEwNzEwNjg3M0RBWVNFm08xSIIFVyZlBmNyeXB0ZWZlZCkPUEwMzk4OTIyM1FKMTJUVkdJNzQ0OCZ3aWRnZXROYW1IPXNwX2F0ZiZlY3Rpb249Y2xpY2tSZWRpcmVjdCZkb05vdExvZ0NsaWNrPXRydWU=), for my 400w glass solar panel installation. Changing out the GoPower is a very straightforward replacement. I previously posted a lot of information on that in this post, [https://m.facebook.com/story/graphql\\_permalink/?graphql\\_id=UzpfSTEwMDAwMDMzNTI5NzY4NDpWSzo0OTU0NjgzNjcxMjcyMDI5](https://m.facebook.com/story/graphql_permalink/?graphql_id=UzpfSTEwMDAwMDMzNTI5NzY4NDpWSzo0OTU0NjgzNjcxMjcyMDI5). If you are interested in expanding to more than 400w then by a 100v/50a sized MPPT solar charge controller.

The easiest method to replace the GoPower is as follows. You need to add a switch between the solar panels and the solar controller. This is important because you should always have a means to disconnect the solar panel power input to the solar controller. You can damage a solar controller if it is not connected to the load source like the battery. So if you ever need to disconnect the battery to work on the system you need to disconnect the panels from the solar controller first before you disconnect the battery(s). The easiest method would be to just install a switch and corresponding connectors like these,

[https://www.amazon.com/gp/product/B08623N19Z/ref=ox\\_sc\\_act\\_title\\_4?smid=AXDXPO2RICYQJ&psc=1](https://www.amazon.com/gp/product/B08623N19Z/ref=ox_sc_act_title_4?smid=AXDXPO2RICYQJ&psc=1) and

[https://www.amazon.com/gp/product/B07MPMJRY1/ref=ox\\_sc\\_act\\_title\\_2?smid=A205VE1PUGXUMQ&psc=1](https://www.amazon.com/gp/product/B07MPMJRY1/ref=ox_sc_act_title_2?smid=A205VE1PUGXUMQ&psc=1), on the positive wire from the Solar panels just before the new solar controller

using this switch and screw terminal connectors. This doesn't require any special tools, just a screwdriver, utility knife, and wire cutter. When adding the heat shrink covering, just use a lighter to add a little heat to make the heat shrink smaller or just wrap with black electrical tape to cover the metal body of the connector. Take the positive solar panel wire that you disconnected from the GoPower and cut it around 6" or so back, correct length between switch and controller. Remove about 1/2" of the wire cover sheath to expose the wire and insert it into the connector and tighten the screw tight. Cover the terminal body with heat shrink or electrical tape to protect from coming into contact with any other metal objects. Add a connector to both ends of the positive solar panel wire and the short piece of positive red wire. Then attach each connector to the back of the switch. You are wiring the switch in just before the controller and then wire the new controller in place. Just mount the Victron controller to the back of a cover panel (made from a thin sheet of plastic or wood) and install the switch on the front side. Since the Victron is Bluetooth it doesn't need it to be visible. Screw the new cover panel, using existing GoPower controller mounting screws/holes. I hope this makes it easier to add a switch and new Victron controller. Here is a picture of what someone did but using a much larger Blue Sea switch.



The beauty of a Victron Smart Controller with Bluetooth is you can install it on the backside of a panel you make as the GoPower hole covering. People use this plastic sheet, [https://www.amazon.com/Install-Bay-89-00-9031-Plastic-8-Inch/dp/B0007WTF02/ref=sr\\_1\\_3?dc\\_hild=1&keywords=abs+plastic+sheet+1%2F8+inch+thick&qid=1614182574&sr=8-3](https://www.amazon.com/Install-Bay-89-00-9031-Plastic-8-Inch/dp/B0007WTF02/ref=sr_1_3?dc_hild=1&keywords=abs+plastic+sheet+1%2F8+inch+thick&qid=1614182574&sr=8-3), to make a new panel to mount the Victron on the back side of and add the switch to the front facing side. You can also use a thin piece of wood sheeting that you can buy from most hardware stores. Bottomline you can make a cover panel for the GoPower opening from any thin stiff sheet of just about any material you like. It is good to add a switch so you have a way to disconnect the panels from the solar controller. If you ever need to turn the battery off, you must turn the solar

panel output off/disconnect first. Since the output of the controller has no place to go without the battery on/connected that load can damage the controller.

Also, if you have the maple interior this vinyl veneer covering matches perfectly with Leisure Sierra maple veneer,

[https://www.amazon.com/d-c-fix-346-0219-Decorative-Self-Adhesive-Maple/dp/B002TDVPCI/ref=sr\\_1\\_1?crd=1KFLN49RDRP1C&dchild=1&keywords=maple+vinyl+wrap&qid=1614183095&sprefix=Maple+vinyl%2Cindustrial%2C258&sr=8-1](https://www.amazon.com/d-c-fix-346-0219-Decorative-Self-Adhesive-Maple/dp/B002TDVPCI/ref=sr_1_1?crd=1KFLN49RDRP1C&dchild=1&keywords=maple+vinyl+wrap&qid=1614183095&sprefix=Maple+vinyl%2Cindustrial%2C258&sr=8-1). You could cover a thin piece of wood sheeting that you can get in lots of sizes at Lowe's and make your own GoPower hole cover to mount the Victron on the back side and switch on front. Just screw holes in the panel so you can mount it into the same hole used by the GoPower controller.

At some point you should consider reconfiguring your solar panels. Leisure wires all their panels together in a single array. The optimum solar panel configuration is one in a Series/Parallel dual configuration (see picture below), because when a solar panel gets shaded, it brings the efficiency down of a single array, resulting in a voltage drop at the MPPT Controller. Therefore if you break up a single array by wiring it in a dual series and parallel array, it has a better chance of maintaining the voltages necessary for optimal MPPT charge controller operations and Lithium battery charging, since Lithium batteries need a higher voltage for longer periods of the day to fully charge. The Battery University offers a lot of helpful information, [https://batteryuniversity.com/learn/article/charging\\_with\\_solar\\_and\\_turbine](https://batteryuniversity.com/learn/article/charging_with_solar_and_turbine). Another good learning resource is the Explorist Life YouTube video channel, <https://youtube.com/c/EXPLORISTLife>. He covers just about everything you ever need to know in his multiple part educational series.

### Wired in 2 sets of Series and Then Those Wired in Parallel Example

