

Where Do You Start for a Leisure Lithium Battery and Coach Electrical Upgrade?

Written by Sandy Johnson, a Leisure Owner since 2014 (aka SSTraveler on the Sprinter Source Forum).

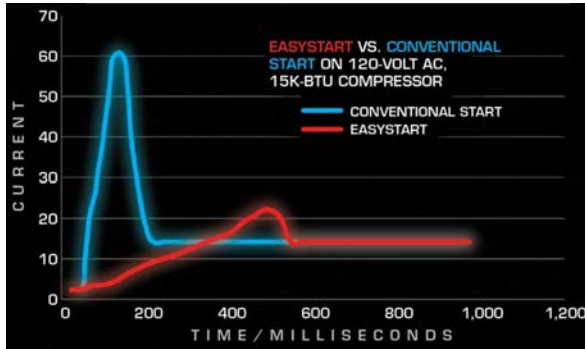
I originally started a Thread with this title on the Unity Section of the Sprinter Source Forum, <https://sprinter-source.com/forums/index.php?threads/93361/>. It was intended to walkthrough everything you need to consider when starting the process to expand your boondocking/off grid capabilities. But I have been getting so many questions from Leisure owners about where to begin on just deciding to switch to Lithium batteries that I decided to copy my original Thread posts and expand them into a guide.

The biggest decision points are how much battery capacity and what size Inverter do you need. In my opinion the Leisure Lithium battery option of 200 amp hours (ah) Dragonfly batteries and a 2000w Xantrex Inverter is really too small to be of great value. The Dragonfly batteries also won't support sustained large amp draw appliances such as running the Dometic 15,000 btu air conditioner with heat pump, even with an added Micro-Air EasyStart. Even running the Leisure Microwave/Convection Oven for longer than minutes is challenging for the Dragonfly lithium batteries. If you are interested in a meaningful lithium battery capability you should get the standard Leisure AGM batteries and upgrade to lithium batteries after you receive your coach.

To define how much battery capacity is needed for your off the grid boondocking camping style you must answer 2 questions. The first question you must answer is, Do I want to run the air conditioner? Because the air conditioner uses the most amps of any appliance in your coach. The answer to this question pretty much defines how much battery capacity and what size Inverter you need to run everything in your coach.

If the answer is No, then you should want to pack as many amp hours per square inch of high quality superior density lithium battery capacity into the Leisure battery storage area. This will ensure adequate capacity to run the Microwave Convection oven for more than an hour, run CPAP machines overnight, and power everything else in the coach (except the air conditioner) to give you full enjoyment of your Leisure from the batteries. Bottom line if you fail to define what appliances/items in your coach or that you bring with you (i.e. CPAP machines, portable ice maker/refrigerator/freezer, etc.) that needs to be able to run off the batteries, you may find it very costly and labor intensive to go back and upsize the wiring and to replace your new Inverter with another larger one, or try and find a way to add more batteries in an already very space limited small motorhome. Start with the End in Mind!

If the answer is Yes, I want to be able to run the air conditioner off my lithium batteries, then the next question that must be answered is, How long do I want to run the air conditioner with the batteries? The answer to this question pretty much defines how much battery capacity (watts/amp hours) you need. A good rule of thumb to use is that it takes about 1700 watts or 170 amp hours (ah) to run the air conditioner for 1 hour off lithium batteries. Additionally, a 3000w Inverter is required to run the air conditioner, but you must add an EasyStart/SoftStart to the air conditioner to dampen the high spike in amps that the compressor draws when it starts.



Here is a great video by James of FitRV that talks in more detail about the process of defining your needs, Comparing the Lithionics and Volta RV Battery Systems from Winnebago, https://youtu.be/VKjm_kWp6xw.

So let's break down what to expect from batteries. I'm going to use the term air conditioner as the umbrella term for an air conditioner with an EasyStart/SoftStart installed, I'm going to assume no solar contribution at this point (we'll discuss more on this later), and will assume that the propane powered appliances (3 way Refrigerator, Water Heater, cooking top, etc.) are running off propane (propane solenoid requires 0.75a from batteries to keep tank valve open) in the definition of entire coach operations from batteries. Today, 2020 and newer Leisure's come standard with lead acid AGM batteries. These will not run the air conditioner, but are adequate for short microwave operations. So if one wants to run the air conditioner from batteries you must replace lead acid batteries (Flooded Wet Cell or AGM) with Lithium batteries. The simple reason for this is that lead acid batteries drop in voltage very quickly under load (voltage sag) and it's not good to run lead acid batteries below 50% State of Charge (SOC). Even though AGMs can go as low as 75% SOC, many higher amp drawing appliances either won't work or stop operating very quickly on lead acid batteries because of the relatively quick voltage sag. Lithium batteries on the other hand don't experience voltage sag until the last 10% (10% SOC) so they can deliver usable power at higher loads for much longer. So let's lay out what you can expect from the various lithium battery capacity choices. I've gotten this information from posts of others' experiences.

Lithium Battery Capacity Approximate Air Conditioner Run Time (time will vary depending Thermostat setting and outside temperatures)

- 200 ah 45 minutes - 1 hour
- 300 ah 1.75 - 2.25 hours
- 400 ah 2.25 - 3.5 hours
- 500 ah 3 - 4.25 hours
- 600 ah 3.5 - 5 hours
- 800 ah 4.75 - 7 hours
- 900 ah 5.5 - 9 hours

So what's right for you if running the air conditioner is your expectation?

I had AGM batteries when I began considering switching to lithium batteries and wanted to understand more about their differences to do an adequate comparison. This video does a great job of explaining the differences between AGM and Lithium batteries and the advantages of lithium batteries, <https://youtu.be/fWd5SvdSOhM>.

When looking at the amount of amps you may need, remember all amps are not equal. Appliances/equipment in your coach either runs off 120v alternating current (ac) [shore/generator/inverted power] or directly off the batteries which is 12v direct current (dc). This is important to understand because you have to convert the amps used at 120vac to amps at 12vdc, to understand your true battery use/capacity needs. Having appliances/equipment (Dometic 3 way absorption refrigerator, cooktop, water heater, furnace) that runs off of Propane can be an advantage since those things only use 12vdc battery power to keep the propane solenoid open (0.75a) and to power the ignition of the item. A good rule of thumb is that for every 10 amps per hour (ah) required at 120vac [shore/generator/inverted power] you need about 110 amps at 12vdc from your batteries. So you can see why only being able to use about 100ah (50% SOC) out of 200ah Lead Acid batteries doesn't go very far!

Since I have replaced a number of my appliances, never use propane, and need to support 2-CPAP machines for sleeping, I would have to increase my amp hour need assumptions from what I previously described for just running the air conditioner. My Isotherm compressor refrigerator uses on average 2a (12vdc) per hour. I use my 2 way Suburban Water Heater on electric which draws 12a (120vac) when the heating element is on. I replaced my propane cooktop with a dual element induction cooktop, which can use up to 15a (120vac) when using both elements. I use a cube style space heater rather than the propane furnace at night, and it can use up to 14 amps (120vac) if I have it on full, but I typically only use it at about it's half setting. During the day after it gets above 40 degrees, I use the heat pump of the rooftop Dometic air conditioner/heat pump, which uses up to 15a (120vac). The CPAP machines use 120vac or 12vdc and use around 6a (12vdc) each. So you need to fully understand how you use your coach and account for the big draw items that your batteries will need to support if you plan not to use shore power hookups.

In planning for a big upgrade I never start with how much things cost. I believe that limits you in designing the optimal system/solution. As an engineer I like to define/design the best elements for a project and consider the cost at the end. I'd rather understand what the best approach is for me and then decide if that's what I'm willing to pay for. This is how I selected my Leisure, sure there were less expensive Sprinter motorhome options, but I thought the Leisure Unity was the best! I would encourage you not to limit your options by making the driver cost, because you might end up still spending a lot of money to be dissatisfied. I personally would rather pay a little extra to get the BEST, than be frustrated because I settled for less. The reason I haven't upgraded to Lithium before recently was because I didn't think there were good options for larger battery capacity needs, over 200ah, to maximum the Leisure battery box or other small spaces, and several other technical reasons that I feel I have resolved in my mind since I have gained experience helping others on their battery/electrical upgrades, particularly those who

have selected Lithionics batteries. Discovering the Lithionics battery with it's internal heater was particularly important, because I don't like the potential technical issues and fire hazard of exterior battery heating pads (like Leisure installs on their 200ah Dragonfly lithium batteries). Here is a video explaining the disadvantages of external heating pads, <https://youtu.be/smCms94wH88>. Here is a video that explains the Lithionics Lithium battery internal heating system, <https://youtu.be/11EDBAg2Qr0>.

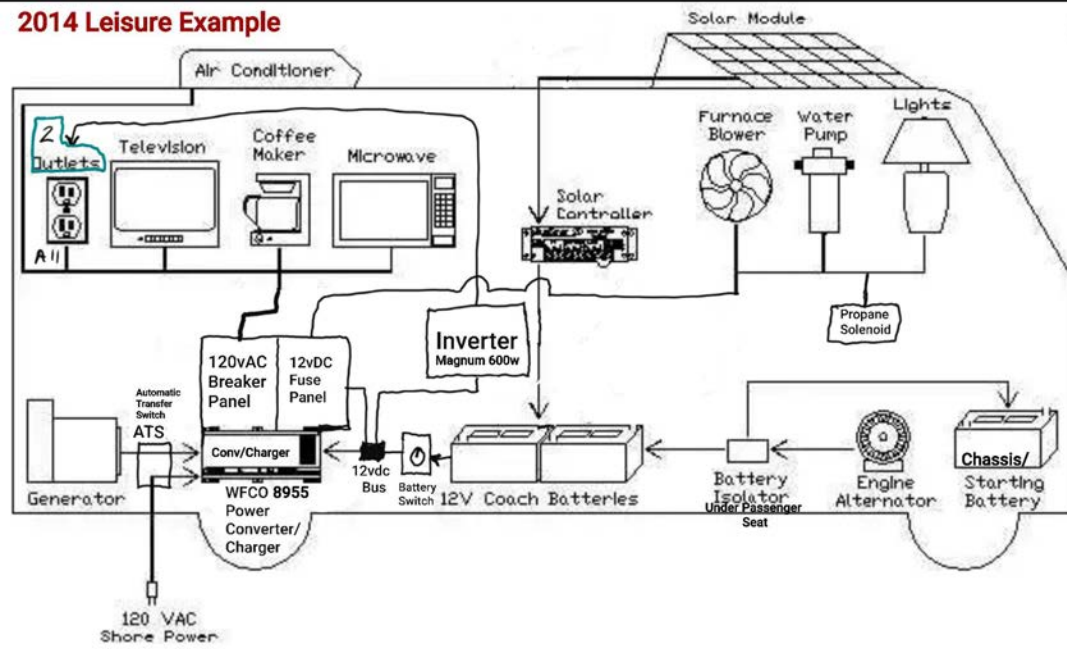
When I started my thread on the Sprinter Source Forum, it was to help others who were looking to do a big battery/electrical upgrade over the winter down time, but I found that I was making a case for myself to consider this kind of upgrade as well. So you'll see this document reflects my own thinking through the needs and options as well!

I would like to be able to run my air conditioner on batteries, since this is the maximum amp (120vac) using appliances in our coach. I do want to walk through the various options from just upgrading enough to continue to use my coach just the way it is (standard 600w inverter), or just upgrading to add use of the microwave, or upgrading to be able to run the entire coach including the air conditioner off batteries. I haven't decided just how much more capability I really need. So whoever is interested, come along, there are still lots of elements to cover, including how to keep the Lithium batteries charged!

Great! Now that we've covered the information one needs to really get an understanding of their battery capacity needs, based on how they use their Leisure. Let's look at the next big component, the Inverter. I like to define the various components/functions I need for a project and then see what is available on the market. I forgot to add earlier, that before you start any electrical project, you really need your coach's wiring diagrams. They are very easy to get, just send Leisure's Willie Neufeld, WNeufeld@tripleerv.com, an email with your VIN#, email address, and phone number. Requesting him to send me, via email, the PDF versions of your Leisure's 120vAC and 12vDC electrical systems wiring diagrams. Then follow it with a call to him (877-992-9906 ask the operator to connect you to him) and leave a message on his voice-mail of what your email requests. He will very promptly send a single or multiple emails transmitting your electrical system wiring diagrams. If you are a member of the Sprinter Source Forum, here is a thread, <https://sprinter-source.com/forums/index.php?threads/92289/>, that has some diagrams on it already that may match your Leisure. If you do get wiring diagrams please consider posting them on this thread, it may just help someone else.

Now let's consider how our coaches work on batteries (12vdc) and shore/generator/inverted power. Our coaches are equipped with a power distribution panel/box (120vac breaker/12vdc fuse box) and an inverter. Here is a simple chart (not intended to show every detail) that shows the simple power distribution on a 2014 Leisure (mine).

2014 Leisure Example



Different model years have differences on power distribution panel/box model and model/size Inverter/Charger, so this is why having the wiring diagram for your model/year/floorplan is important. But conceptually the functions are the same. If you look at post #27 here, <https://sprinter-source.com/forums/index.php?threads/91673/page-2>, you'll see a lot more detail on the panel differences and wiring. I'm going to get to that and everything on the chart later, but I want to focus on power distribution first.

As you can see power comes from 3 sources; batteries, shore/generator, or solar (if equipped) power. The batteries support everything in the coach that runs off 12vdc, which the batteries supply directly. Unless you have an older model like mine, which has a 120vac power converter to 12vdc when on shore/generator power. Items needing 12vdc to run are either connected directly to the batteries or fed through the 12vdc fuse box side of the power distribution panel/box. The batteries also supply the Inverter which converts the 12vdc battery voltage/direct current (dc) to 120vac (120 volt alternating current, same power as your house uses for household appliances or high amp draw equipment like air conditioner, microwave, hair dryer, washing machine/dryer, stove/oven, etc.). In my 2014, I only had a 600w Inverter, so it can only supply about 6 amps 120vac. Consequently, Leisure could only connect 2 outlets to this small inverter. So I can only use it to supply low amp simple things like tv, satellite, phone chargers, single CPAP machine, small LED lights, a curling iron, etc. or I will trip the breaker on the inverter. The inverter is also wired into one breaker on my 120vac power distribution panel/ breaker box so when on shore/generator power those 2 outlets are powered (but still limited to 6a, even though the wiring can support 15a) that way instead of having to always use batteries to supply those 2 outlets. This feature of the inverter is called pass-through, because when not performing its primary function, when on shore/generator power it simply let's that power pass-through to the circuit and outlets on that circuit. This is a very desirable feature to look for

when selecting a new inverter. My Leisure's original Magnum MM612 inverter doesn't have a battery charger (charges the batteries when on shore/generator power) with it so we'll cover battery charging later.

The solar power also charges the batteries, which are supplying the coach. So if your solar system is supplying 10a (12vdc) and the coach/house is using 10a then your batteries stay at 100% charged while still providing power for the coach to use. We will discuss battery charging and solar input more later as well.

Now the 120vac breaker panel side of the power distribution panel/box is fed by the Automatic Transfer Switch (ATS) which is supplied by 120vac from either Shore power hookups or from the generator operating. The ATS senses which 120vac power supply is available and sends it to the 120vac side of the breaker box. My power distribution panel/box is a WFCO 8955, which also includes a battery charger and a power converter that converts 120vac to 12vdc, so when I'm hooked up to shore power or using the generator, my house/coach batteries get charged and the coach gets supplied with 12vdc so the batteries don't have to provide supply. I think Leisure switched to a WFCO 8930/50 in 2016, which doesn't have these extra features, rather they went with an inverter that has a battery charger (that charges the house batteries by pass-through power from shore/generator) and rely on just the batteries to supply all 12vdc to the coach. In the 2020 and newer models Leisure changed to separate 120vac breaker box, Progressive Dynamics dual buss PD55K003, and 12vdc Progressive Dynamics fuse box. The PD55K003 dual buss makes it so easy to upgrade the electrical system because you don't need to run new wiring from the inverter to the breaker box, you simply install a larger inverter and rearrange the breakers on the dual buss bars to supply the coach with 120vac power as you define. However, you will need to run larger 4/0 awg cables from the battery to a 3000w inverter.

So in looking at the 120vac side of the power distribution panel/breaker box, you need to decide what functions, or all of them, you want to be able to run off batteries. Because you need that information to determine what size pass-through style Inverter you need. You'll want an inverter that has a battery charging function as well, but we'll look at that part of it later. I just want to focus on figuring out what size Inverter you need. So here's about how the sizing goes.

Everything in your entire coach runs off of a 30a 120vac power supply, so that means you'll need at least a 3000w Inverter to run those same things off your batteries. And remember when running the 120vac side of the house things off batteries, you are also still supplying all the 12vdc items from your batteries. So now you are running absolutely everything in your coach off batteries, including the air conditioner. This distinction is important because that's what you need to remember when determining how much battery capacity you think you need.

Remember to consider the difference between 120vac amps and 12vdc amps (10a 120vac = about 110a of 12vdc power) for battery capacity needs! If you want to just run most everything, including the microwave but not the Air-conditioning, then you'll need at least a 2000w inverter. If you just want to supply the outlets up to their 15a rating, water heater, entertainment systems, etc. Then you'll need a 1500w inverter. If you only want some of your outlets supplied up to 12a, and entertainment systems then a 1200w inverter is fine. And then if you want a couple of 10a max outlets a 1000w inverter is fine. You can use this understanding of the power distribution to

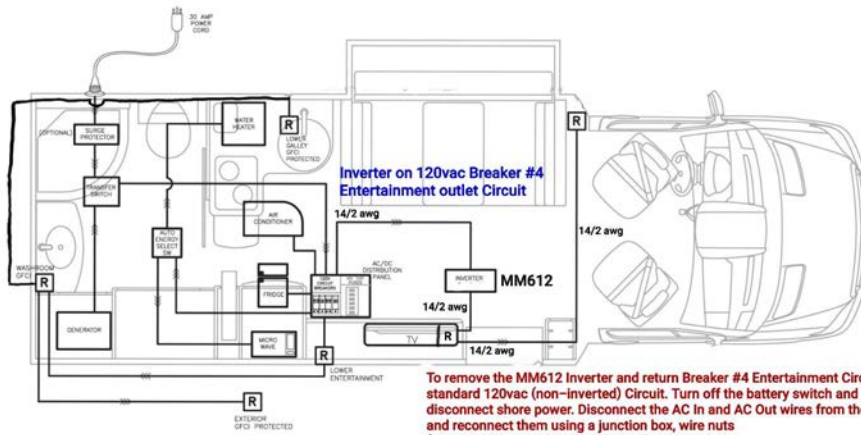
start thinking what size Inverter you want. If you know you want at least 2000w of capabilities and aren't sure if you want to add the air conditioner operation to the batteries, then my advice is to select a 3000w Inverter, because there is only a couple hundred dollars difference between the two. Selecting a 3000w Inverter gives you the ability to expand your system to add the air conditioner later. I like to choose components that give me future options if I am undecided on some things. But based on the experiences that others have shared, it seems most decide that more is better! The same with batteries, size your wires with the possibility of adding more, but we'll get into that later. Keep in mind, that the bigger the inverter the more power it uses to do its job inverting 12vdc battery power to 120vac residential power, even just sitting with nothing plugged in, but ready for action. This power drain may seem small but over the course of a day it adds up. Depending on the size of the inverter, when on/standby, it uses 1-3 amps per hour, regardless of activity.

Here is a new video from Mike Mas that is very educational for what I've covered, IonGen Power Your Adventure, <https://youtu.be/R2QHubB-VXk>.

In preparation for installing a larger Inverter to power some or all of your 120vac circuits, you must remove your current Leisure Inverter to return the Circuits they supply to standard 120vac (non-inverted) Circuits in your 120vac Power Distribution panel/breaker box. This couldn't be easier. The pictures below step through what I have to do in my 2014 Unity Murphy Bed. If you have your wiring diagrams or your Leisure Owners Manual schematic of the 120vac wiring for your floor plan, you can use that to see what circuit(s) the inverter supplies. If you have a newer model Leisure, your inverter/charger maybe supplying more than one circuit. If this is the case you will completely remove it because you'll be rewiring your 120vac Power Distribution panel/breaker box differently from what I have to do because my power distribution breaker box is a single 30 amp service box. Which we'll cover later when we discuss the wiring of the power distribution panel. Consult your wiring diagrams and Leisure Owners Manual for greater detail. Everyone with an inverter or inverter/charger supplying a single circuit like mine does, can use the following process. I have a Magnum MM612 inverter with no battery charger. It is attached to the circuit wiring of Breaker #4, the Entertainment outlets, 2 outlets used to power the TV cabinet and behind the driver seat near the bed outlet. The wire is 14/2 awg Romex solid wire (typical residential wire) rated at 15 amps. So once the inverter is removed and it's wires spliced together the circuit will be returned to a standard 15 amp rated circuit and outlets (not the 6 amp limited by the inverter circuit you had before).

To remove the MM612 Inverter, first switch the main battery switch to off and either completely disconnect from shore/generator power or flip the #4 Entertainment breaker off. Also disconnect the negative battery cable from the battery. Disconnect the AC In and AC Out wires from the Inverter and reconnect them using a junction box, wire nuts (wrap with electrical tape), and install a cover plate. Now you've returned circuit breaker #4 to a standard 15a circuit, the outlets can now be used for items rated up to 15a. To completely remove the Inverter; Disconnect, remove, and tape off the battery wire connections (-12vdc & +12vdc & ground wire) until you decide next steps. Remember they are still connected to the batteries when you turn the battery switch back on, so make sure the positive cable is taped off well so it won't short on anything.

U24MB 30 amp 120V Wiring Schematic

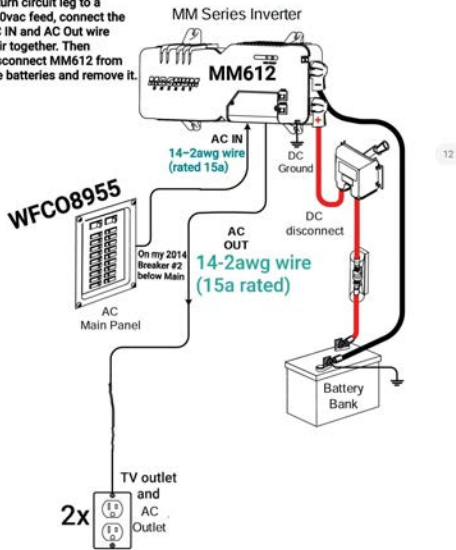


To remove the MM612 Inverter and return Breaker #4 Entertainment Circuit to a standard 120vac (non-inverted) Circuit. Turn off the battery switch and disconnect shore power. Disconnect the AC In and AC Out wires from the Inverter and reconnect them using a junction box, wire nuts (wrap with electrical tape, and install a cover plate).
 To completely remove Inverter: Disconnect, remove and tape off battery wire connections (-12vdc & +12vdc & ground wire) until you decide next steps. Remember they are still connected to the batteries when you turn battery switch on so make sure the positive is taped off well.

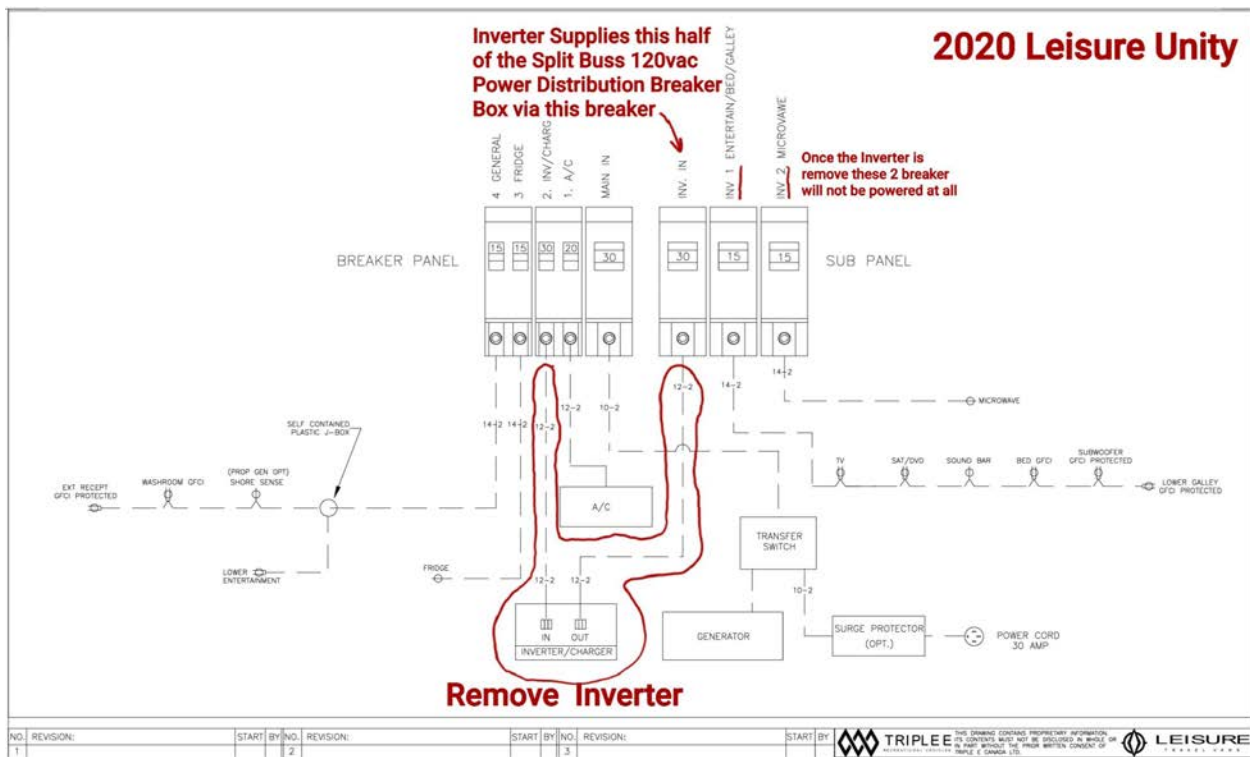


Magnum Inv...B-MM-Series PDF
Leisure's Wire Sizing for Inverter

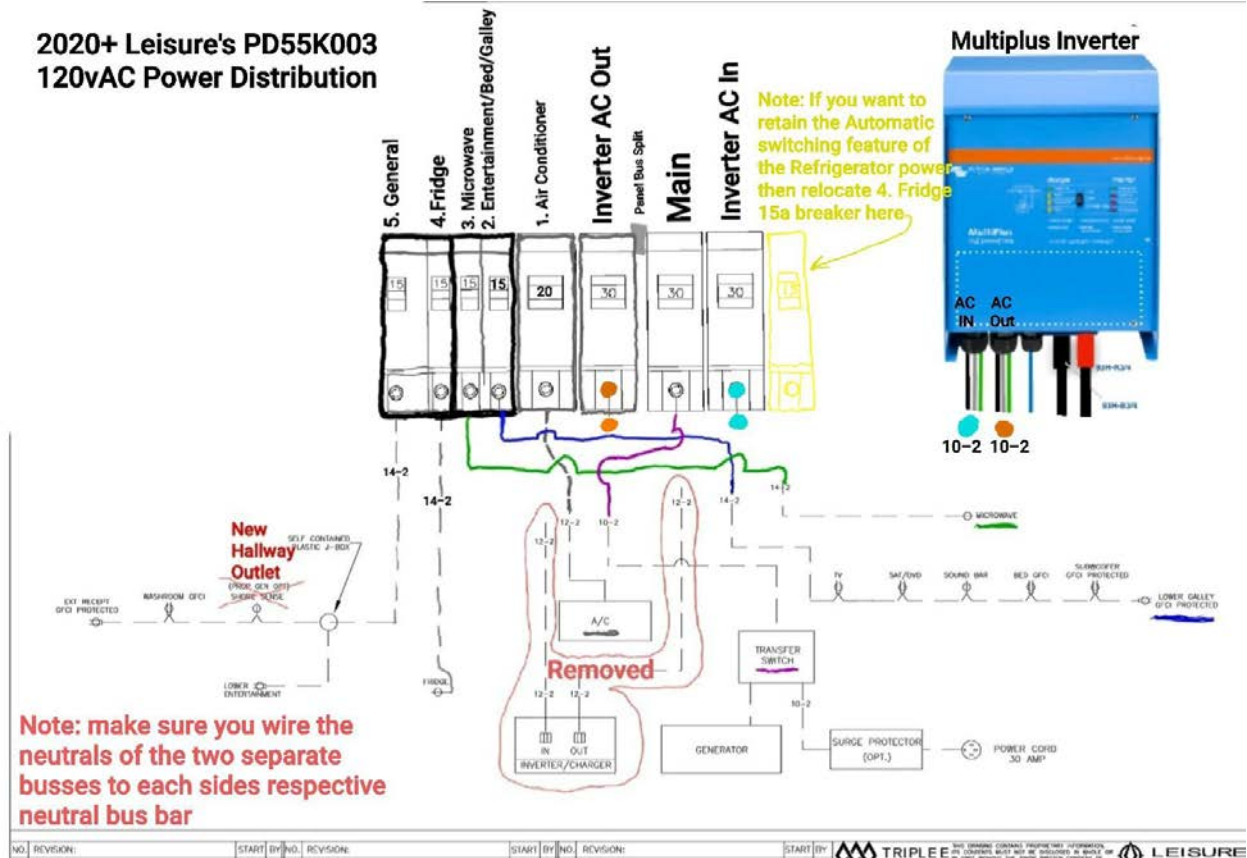
To remove MM612 and return circuit leg to a 120vac feed, connect the AC IN and AC Out wire pair together. Then disconnect MM612 from the batteries and remove it.



This is a Leisure wiring diagram for a 2020 model (applicable to 2020 and newer Unity/Serenity Models) that shows the dual buss configuration of the PD55K003 120vac power distribution center/breaker box. If you install a 3000w Inverter all you need to do is reconfigure the arrangement of the breakers as depicted in the second picture (Victron Multiplus 3000w Inverter shown for example). You are rewiring the right buss to be fed by Shore/Generator power as the Main breaker, which in turn feeds all the breakers you put on that side. This includes the Inverter AC IN. The Inverter passes the Shore/Generator power through and to the left side, second buss (typically considered a Sub-Panel), which in turn powers the breakers of the coach you want supplied by the Inverter as well. When there is no shore/generator power then the Inverter turns the 12vdc battery power into 120vac and supplies it the left hand side buss via the Inverter AC Out. So you see it is very easy to reconfigure 2020 and newer model Unity/Serenity with the PD55K003 breaker box. No new 120vac wires are needed!



2020+ Leisure's PD55K003 120vAC Power Distribution



Nate from Explorist Life on YouTube puts out great, cover the basics (on all fronts of electrical), videos for DIY RV enthusiasts that you may find helpful, <https://youtube.com/c/EXPLORISTlife>.

While removing the Leisure inverter isn't that complicated, turning the older Leisure model current 120vac power distribution panel/breaker box into a sub panel supplied by a New Main 30a Breaker is a little more complicated. The Newer model Leisures are easier because essentially they have a main buss and sub panel buss inside one power distribution box. With the older Leisure models you must add/create a new 30a main breaker. Some Leisure Models with a WFCO8930/50 breaker box can be modified to become a dual busses breaker box by simply cutting out a 1/2" piece from the center of the neutral bar to make 2 neutral bars so you can wire each bus with separate neutrals. Rewiring the 120vac power distribution panel/breaker box on Leisure models can be one of the more complicated elements of an Electrical upgrade so don't try it yourself if you are unfamiliar with electrical work.

When installing a 3000w or smaller inverter, you must decide which 120vac circuits in your breaker box you want to run off the inverter/batteries. In the case of a 3000w Inverter, it can supply 120vac (inverted 12vdc battery power) for the entire coach including your air conditioner. I personally think the only inverter size to choose is a 3000w Inverter because there's only about \$200 difference between a 2000w and 3000w inverter so why not just put the larger one in and

then you always have the ability to use anything in the coach, as your battery capacity supports. Even if you only have 200ah of Lithium batteries you would still be able to run the air conditioner for about 45 minutes if you wanted too. If you are going through all this effort to upgrade then why not set yourself up with complete coach functionality. You choose what you want to run, and later if you realize you do want to have more air conditioner, microwave, or any other large appliance/equipment run time. You'll only need to add more batteries. I see the electrical upgrade as the foundation for all future upgrades. Whether you want to change to a compressor refrigerator, induction cooktop, Mini toaster Oven, electric furnace heating, CPAP machine, more Lithium batteries, etc., your electrical system upgrade is ready to handle your wants and needs!

The power distribution panels/breakers boxes used by Leisure over the years have gotten more DIY upgrade friendly over the model years. The breaker box in the pre-2016 models, is a WFCO8955 power distribution box with a typical single 30a service breaker box on one side and a 12vdc Fuse panel on the other side. it also has a 120vac to 12vdc power converter (supplies 12vdc to coach so your batteries don't have too) and a 3 stage battery charger (for lead acid batteries only). The WFCO8955 only has 5 slots for breakers in it. So in order to add a 3000w Inverter, as a new 120vac power supply/shore or generator power supply pass-through, a new 30a AC main breaker (Blue Sea 8077) must be added between the Automatic Transfer Switch and the Leisure breaker box (see fig. 1). Then the output of that new main becomes the input of the inverter and the inverter output becomes the new Sub-Panel or main input of the coach through the Leisure WFCO8955 breaker box. In essence, making it a sub panel fed by a new main breaker/inverter.

I believe in 2016 Leisure started using a WFCO8930/50 which has split busses or 2 busses that can be used for a single 30a service or using both to create a 50a service or a split 30a service. Before the WFCO8930/50 can support its use as a split buss system, you must remove a small section (1/2") from the center of the neutral buss bar (see fig. 2) because the inverter must not share a neutral buss with a different power supply, in this case the shore/generator power supply. The inverter has it's very own phase so the circuit breaker box must have the capability for two separate phases, positive and neutral can't be mixed. Each incoming power supply to must be wired to one of the two Split busses. For example, Shore/Generator power to the Left and the left neutral and inverter power to the right and right neutral.

Many people perform the modification to separate the single neutral bar into 2 because then you can use the WFCO8930/50 to create two 30a service busses (just like the 2020 and newer models already have) to use to connect an inverter into (see fig. 3 [figure 3 is for a 2020 Leisure the power distribution concept is exactly the same with the split busses and split neutrals]) the power distribution system versus adding a new 30a main breaker (as described above for pre-2016 models with the WFCO8955). You can use either method, whichever way you think is easiest.

Xantrex Freedom XC Pro Manual

Fig. 1

Figure 5 Typical Recreational Vehicle and Fleet Vehicle Installation

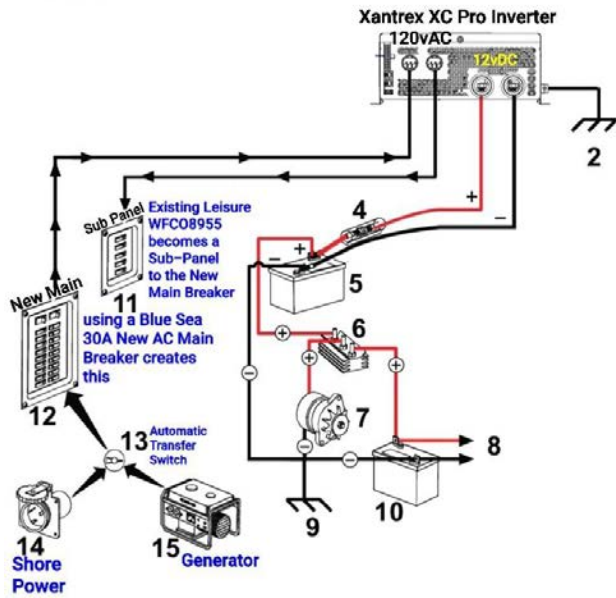
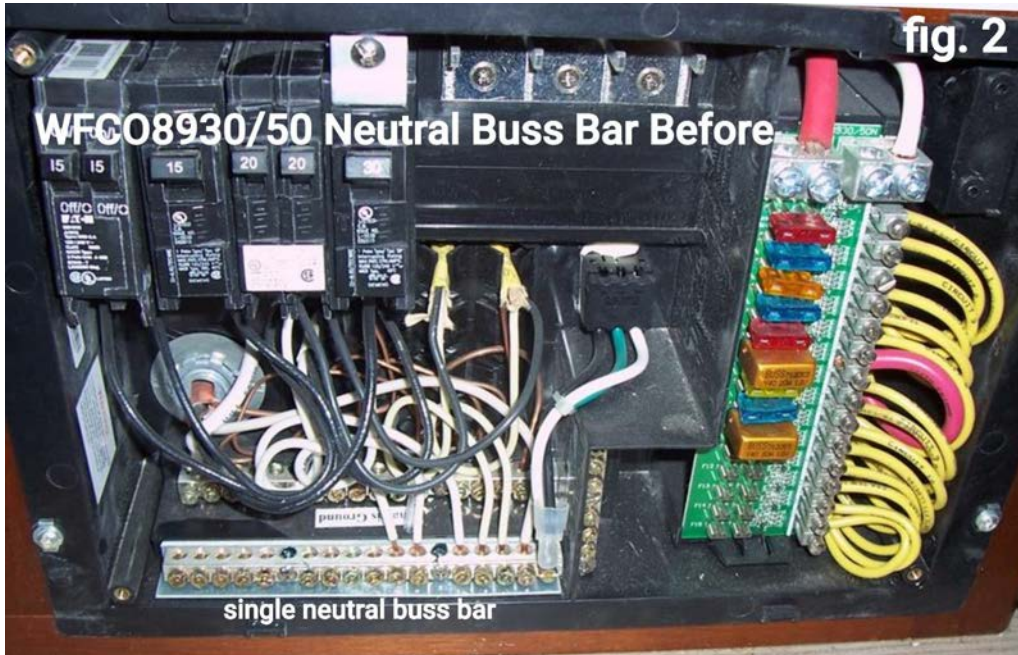


fig. 2

WFC08930/50 Neutral Buss Bar Before



Split Neutral Buss Bar After



Split Neutral Bar so you have separate neutral bars for shore power and inverter neutral connections. This provides protection from phase differences between Shore Power/Generator and Inverter power.

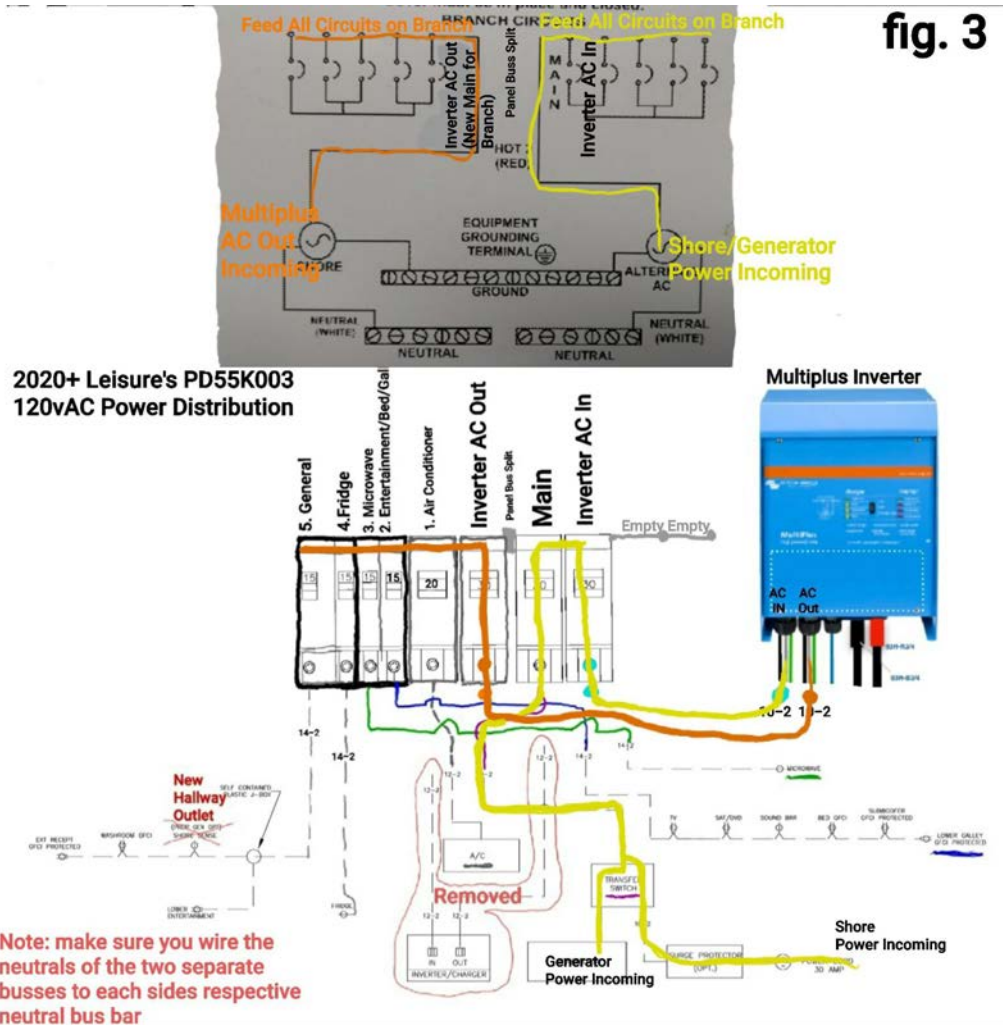


fig. 3

On the 2020 and newer models, Leisure has gone to the Progressive Dynamics PD55K003, which is exclusively a 120vac power distribution panel/breaker box. It is designed to support 2 separate 30a services and has the split neutrals to boot! So it's a great panel to support Lithium battery/major electrical upgrades. The 2020 and newer owners are fortunate that Leisure switched to a panel that easily supports future electrical upgrades, which Leisure must be considering as well. Figures 4-6, show the details for the integration of a Victron Multiplus 3000w Inverter (typically the same for all 3000w Inverters) the entire coach when on battery power. As you can see the split busses are used to bring the Shore/Generator power into the main on the right bus, which feeds the Inverter AC In. Then the Inverter AC Out feeds the Left side Bus and supplies the entire coach of breakers. In this way the Inverter functions as a Passthrough, so when on shore/generator power the coach will be supplied with 120vac. When not on Shore/Generator power, the Inverter supplies 120vac to the entire coach using the batteries. The legend on the overall coach wiring diagram was changed to reflect the before and after configuration.

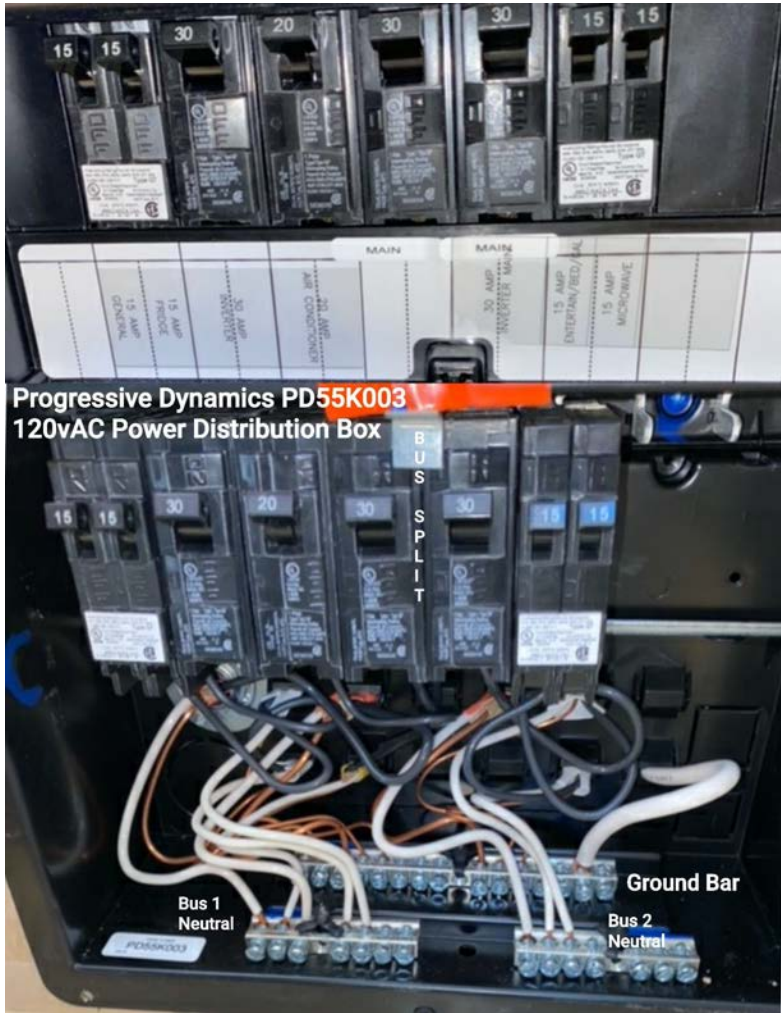
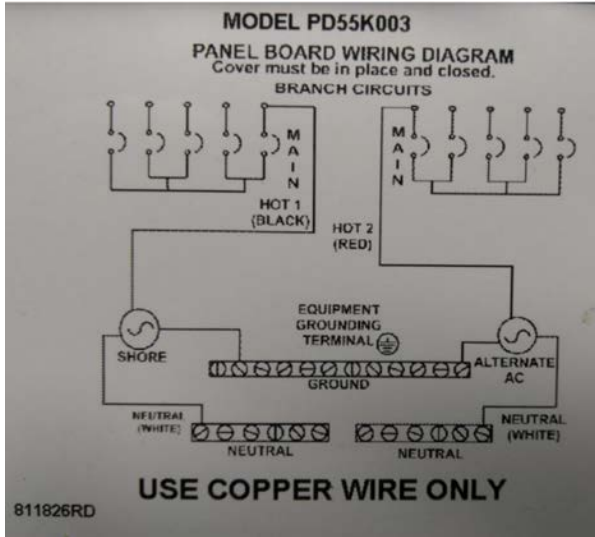
Note: When rewiring the WFCO8930/50 or PD55K003 as described above, you lose the Automatic Switching feature of the Dometic 3 way refrigerator power supplies. If you were to

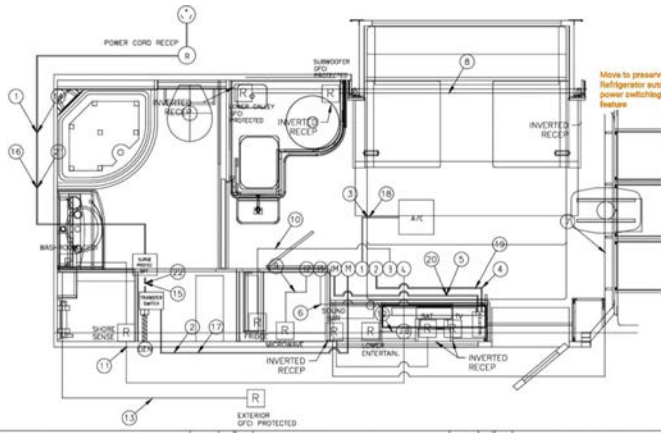
maintain this feature, simply move the refrigerator breaker to the right side bus (shore/generator power fed Main breaker).

Another point of interest, for owners who opted for the Automatic Generator Starting (AGS) feature, the Shore Sensing adapter is plugged into an outlet underneath the Wardrobe in the UMB models (shown on the diagrams as a "New Hallway Outlet"). I created a new outlet in my own upgrade so I can use it to plug in my small cube style space heater. I also added a furnace outlet for more heat output when using that.



Definitely having an outlet near the floor in the bathroom is very handy. You'll also want to disconnect the Dometic AGS air conditioner module located under the wardrobe, since you'll no longer rely upon the thermostat to start your generator to supply the air conditioner since you have Lithium batteries/3000w inverter capable of operating the Air conditioner (only with an EasyStart added).





After

CIRCUIT BREAKER REFERENCE	
M	30 AMP Inverter AC Out
1	30 AMP A/C
2	15 AMP Enter/Bed/Galley
3	15 AMP Microwave
4	15 AMP Fridge
5	15 AMP General
SUB PANEL CIRCUIT BREAKER REFERENCE	
M	30 AMP Power Cord
1	30 AMP Inverter AC In

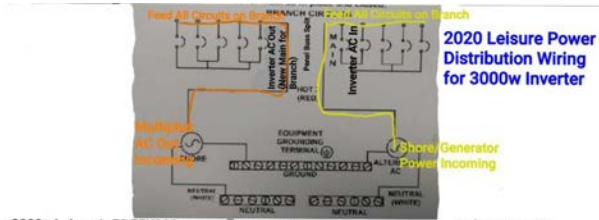
Before

CIRCUIT BREAKER REFERENCE	
M	30 AMP POWER CORD
1	30 AMP A/C
2	30 AMP INVERTER
3	15 AMP FRIDGE
4	15 AMP GENERAL
SUB PANEL CIRCUIT BREAKER REFERENCE	
M	30 AMP INVERTER MAIN
1	15 AMP ENTER/IN/BD/GALLEY
2	15 AMP MICROWAVE

NO.	REVISION:	START BY	NO.	REVISION:	START BY	NO.	REVISION:	START BY	
1	REVISED AFTER PROTO JUN 11/2019	29337	AC	2	UPDATED LABELS GWR 8415 JUN 28/1929410	RM	3	CREATED 120V HARNESS NOV 20/1929748	AE
4	UPDATED HARNESS LENGTH DEC 10/19	29795	AE	5			6		
7				8			9		
10				11			12		
13				14			15		

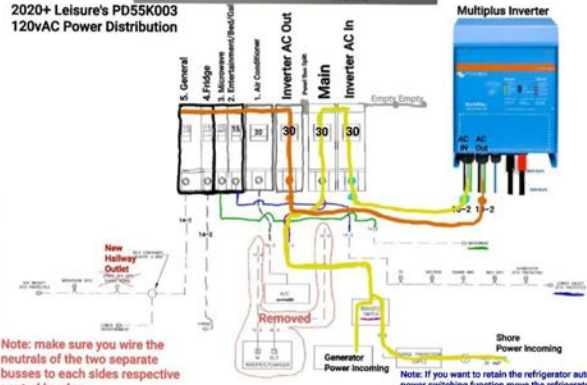


MATERIALS:
DRAWN BY: AE
START: 2020



2020 Leisure Power Distribution Wiring for 3000w Inverter

2020+ Leisure's PD55K003 120vAC Power Distribution

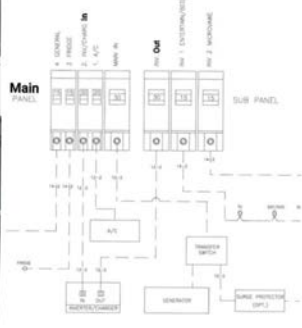


Note: make sure you wire the neutrals of the two separate busses to each sides respective neutral bus bar

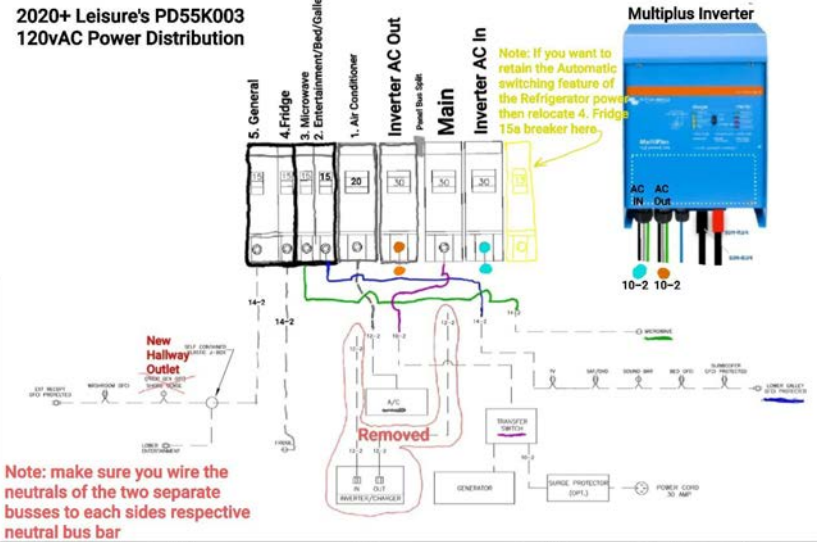
Note: If you want to retain the refrigerator automatic power switching function move the refrigerator breaker to the right side buss bar feed by the Shore/Generator power Main breaker



Original 2020 Leisure 120vAC Power



2020+ Leisure's PD55K003 120vAC Power Distribution



Note: make sure you wire the neutrals of the two separate busses to each sides respective neutral bus bar

Let's talk battery charging, there are several ways the House batteries are charged. There is no charging of the chassis battery from the house side. The only way the chassis battery gets charged, is when the engine is running and the alternator charges it (if you do a search you'll find lots of chassis battery trickle charging solutions you can consider). The House batteries get charged in 4 ways;

1) For 2019 and older models, there is Alternator charging when the Engine is running via the isolator solenoid under the passenger seat. The isolator solenoid and isolation relay delay (IRD) makes sure the chassis battery gets charged before the isolator solenoid is told to connect the house battery to get alternator charging. This solenoid ties the engine alternator charging system to the House batteries. When the engine is shut off the alternator charging stops. For 2020 and newer models Leisure replaced the isolator solenoid/IRD with a 30a Sterling DC-DC charger for battery charging via the alternator when the engine is running. With regard to charging from a Mercedes Sprinter, Mercedes recommends limiting the alternator charging to less than 50 amps. That means the maximum amps the alternator supplies to the house batteries must be limited by a DC-DC charger. If you have the Sterling 30a DC-DC charger that means the house batteries will charge at a rate of 30a per hour when the engine is running using the alternator. But you need to remember that Mercedes doesn't recommend idling a Sprinter engine for longer than 15 minutes. So you must be driving your Leisure Sprinter motorhome to recharge your battery. If the 30a DC-DC charger charges at a rate of 30a/hour, then it takes 6 hours to recharge 300ah of battery capacity. Same concept for shore/generator power charging from an inverter. If the inverter charge setting is set at 50a (which also means per hour) then 200ah of batteries recharge in 4 hours.

2) Shore Power comes to the coach through the Automatic Transfer Switch (selects shore or generator power, whichever it senses) and battery charging occurs via the on board battery chargers as follows; WFCO 8955 Power Distribution panel/box 55a battery charger (2011-2015 models), Magnum 1000w/1200w inverter/battery chargers (2015-2018 models), and the Xantrex 2000w Freedom inverter with 80a battery charger. All these on board battery chargers charge the house batteries when the battery switch is on and you are on Shore/Generator power, consult your Leisure owners manual for more information. The early model chargers were only for lead acid batteries (flooded wet cell or AGM batteries), the newer models with Pure Sine Wave inverter/chargers or the new Xantrex 2000w inverter/charger have more advanced settings that include Lithium battery charging profiles (consult your manual for more information). Having an inverter battery charger with a Lithium battery setting makes it easier to upgrade to Lithium batteries. In the case of the Xantrex inverter it actually has the Lithionics Lithium battery charging profile uploaded as the LifePo4/LFP charger setting, so pairing the Xantrex with Lithionics batteries makes for a very nice power system and the setup is super easy.

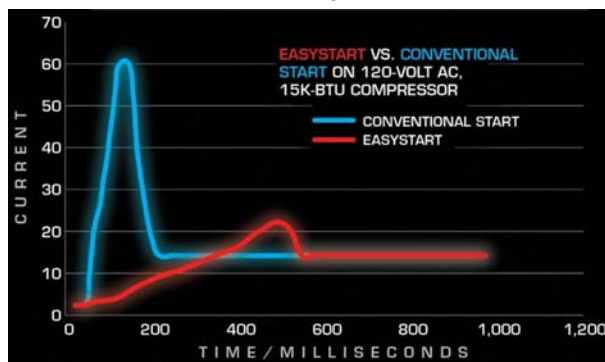
3) Generator charging occurs virtually the same as the shore power description above, with the generator's 120v AC power being routed to the coach through the Automatic Transfer Switch (ATS), which senses when the generator is on and available to provide power. As the same when plugged into the shore power, the ATS will automatically provide generator power to all AC

appliances. To operate your appliances from the on-board generator, simply start the generator and the ATS will (after 20-30 seconds) automatically transfer the electrical power to the AC appliances. The time delay of 20-30 seconds allows the generator voltage to stabilize.

Lastly, 4) Solar charging via 200w or 400w Leisure's flexible solar panel option and the GoPower 30a PWM (Pulse Width Modulation) solar charge controller. If your Leisure was equipped with this optional solar system, then your batteries are always being charged via this system. The solar panel/controller output is connected directly to the batteries, so it doesn't matter which position your battery switch is in to receive solar power. I believe the GoPower controller has a setting for Lithium batteries, but I would not recommend using it because it will overcharge the batteries. It's best to leave the GoPower on the AGM setting. Since the GoPower is a PWM charge controller, which isn't the best quality and less efficient, I recommend replacing it with a Victron Smart MPPT (Maximum Power Point Tracking) Charge Controller because it is much more efficient, has a more advanced Lithium battery charging profile setting, and would do a much better job of charging Lithium batteries and maximizes the solar panel output to the highest extent possible.

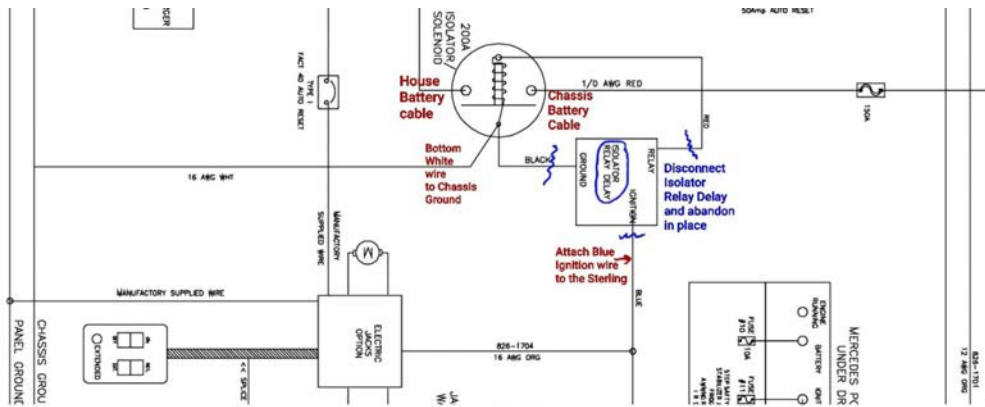
So with this information you can decide which charging components might need replacing to support a move to Lithium batteries.

I decided I want to be able to run my whole coach off the batteries. So I need to replace my Magnum 600w inverter with a 3000w to achieve that. I would also want the more sophisticated advanced Lithium battery charging that these inverter brands offer. So I can remove the WFCO8955 converter/ battery charger or simply flip its breaker to off. After going through all this information, I think it is a waste to replace my old inverter with anything less than a 3000w inverter/battery charger, because the price difference is so small between a 2000w and a 3000w, why not set yourself up with the ability to run your whole coach from battery if you choose? In order to run the air conditioner from a 3000w Inverter you must add an EasyStart to dampen the compressor amp spike from like 60a to 21a. Then a 3000w inverter can run the air conditioner with everything else with no worries of tripping a breaker or motors overheating, which increases the number of amps to operate. Leisure really should add a 3000w Inverter to their future Lithium battery option.

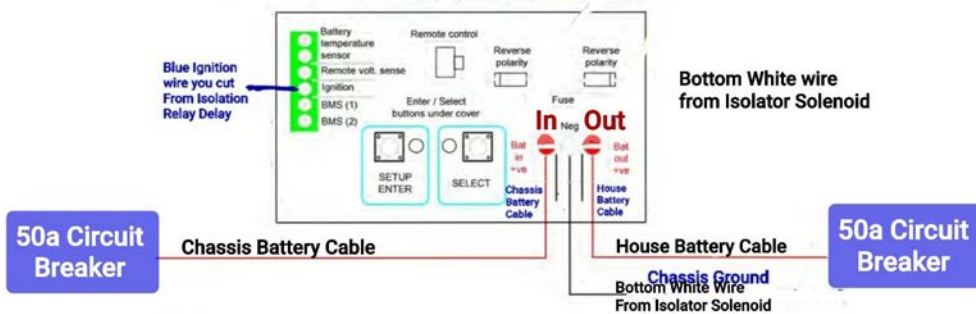


I did not get the Leisure solar option, rather I installed my own Monocrystalline glass panels and Victron 100/30a Smart MPPT Controller, which has advanced Lithium battery settings. I believe the GoPower PWM controller has a Lithium setting but it is not really that efficient. I would recommend replacing it with a Victron Smart MPPT. It is very easy to replace since the connections are very similar. I would also replace the flexible solar panels and go with the monocrystalline glass panels, as they are much better power producers than the flexible panels. If you do a search you'll find lots of information on replacing the flexible panels and GoPower controller.

When I analyze my charging systems ability to support Lithium batteries, I realize several things will have to be replaced. In my 2014, I had an isolator solenoid/IRD and when it failed, I replaced it with a BlueSea ML-ACR automatic isolator relay. So I will need to replace that with a DC-DC charger like the Sterling 30a version that Leisure uses in it's newer models. There are many power variations of a DC-DC charger on the market, but it is widely recommended for Mercedes Sprinters not to exceed 50a of alternator charging draw to lithium house batteries. There is a great possibility that if the house battery charging from the alternator is not limited to 50a, then you could burn up your alternator. Lithium batteries have a much higher rate of charge than lead acid batteries and as such can draw as much as 250a of charge current (larger banks). Therefore, you need a DC-DC charger to limit the amount of charging power the house Lithium batteries can draw when the engine is running and the alternator is charging. The isolator solenoid is rated at 200a so that is why it must be replaced with a DC-DC charger. The other feature you want in a DC-DC charger, is that it isolates the chassis battery from the 12vdc house/ battery system when the engine is off and the alternator is no longer charging. If the chassis battery isn't isolated from the house side then the chassis battery could be discharged from the house side when parked. A Unity owner I helped with this upgrade gave me his old Sterling BB1230 DC-DC charger because he wanted to replace it with a Renogy DCC50S, 50a Charger and MPPT Solar Controller. The Sterling is an easy installation.



STERLING BB 1230



I need to get a new Inverter that has a more sophisticated Lithium battery charging capability. I currently have a Magnum 600w inverter that has no charging feature. I would replace this with a 3000w Victron Multiplus or Xantrex Inverter/charger because if I change to Lithium batteries, I want to be able to run my whole coach off battery/inverter. I would also want the more sophisticated advanced Lithium battery charging that these inverter brands offer. I can use the inverter, in charge only mode, when on shore/generator power to charge the Lithium batteries at up to 150a amps. I picked the Xantrex 3000w Inverter because it is very simple to install and program. Video: New Xantrex FREEDOM XC PRO Inverter/Charger, <https://youtu.be/QGcWMIBo1WE>

I did not get the Leisure solar option, rather I installed my own Monocrystalline glass panels and Victron 100/30a Smart MPPT Controller, which has advanced Lithium battery settings. I believe the GoPower PWM controller has a Lithium setting but it is not really that efficient. I would recommend replacing it with a Victron Smart MPPT. It is very easy to replace since the connections are very similar. I would also replace the flexible solar panels and go with the monocrystalline glass panels, as they are much better power producers than the flexible panels.

If you do a search you'll find lots of information on replacing the flexible panels and GoPower controller.

I selected the Lithionics 12v315GTX (315ah) Lithium battery for mainly the following reasons;

- Uses cells with lower Internal resistance (critical factor for battery life and Battery Monitoring)
- Advanced Smart Internal Battery Monitoring System (with Bluetooth connectivity)
- Powder coated aircraft grade Aluminum case that is IP67 Rated (Ingress protection code [IP] 67 means battery can be immersed into water 1m deep for 30 minutes)
- Superior High Power Density (30% smaller than 3 x 100ah batteries)
- Up to 250a continuous charge/discharge current
- Underwriters Laboratories (UL) testing and advanced safety features (Every component in the Lithionics battery is &L listed)
- Battery switch on the battery itself to turn it on/off
- Grade A Battery Cell Technology (Large Prismatic cells with only 0.25 - 0.50 milli-ohm cell impedance)
- Higher discharge surge rate (meaning it can handle heavy load surges like when the air conditioner compressor turns on)
- Internal Battery Heater (uses 1a/hour to maintain Battery temperature between 35-40° F)
- And the list goes on and on, See this thread for more information, <https://sprinter-source.com/forums/index.php?threads/91673/page-3>.

This 315GTX addresses all my wants for a Lithium Battery. I particularly love that it gives me 315ah in my step located battery box (my 2014 box measures 25.75"x11.5"x9.25" with a top side opening of 25-3/16"x8-3/8") and that it has an internal Bluetooth battery monitoring system, internal heater and on/off safety switch. I contacted Lithionics yesterday and Steve Tartaglia, the Owner/General Manager responded to me personally. He was so nice, he patiently listened and responded to all my questions. He said I should get over 2 hours of air conditioner operation from the 315ah. I'll really just be overjoyed with 2 hours, so that was good to hear. He's an avid RVer himself and simply loves Leisure's. Since I don't need any technical support, I got what I believe to be an outstanding price, so I ordered one and should get it in the next couple of weeks. As Klipstr points out, we can be our own best technical support!

So contact Lithionics, make sure you mention you are a Leisure owner, describe your project, how many 12v315GTX battery (s) you are looking for, what DIY level of capability you have (I believe the less technical support you need the better the price), and see what Lithionics can do for you. He doesn't just want to push batteries out the door, he wants to make sure Lithionics batteries meet the need and are safely installed, so he won't just give a flat price. But take it from me, the Special Pricing for Leisure owners, was very competitive with other batteries I've considered. The fact that Lithionics offers such a high quality battery, superior capacity in a compact size, (fits in the step battery box), with all the advanced features, I didn't hesitate, I ordered one!

Lots of informative videos on their YouTube account, <https://youtube.com/c/LithionicsBattery>.

LITHIONICS BATTERY

LITHIUM-ION IRON PHOSPHATE BATTERY SYSTEMS



MODEL NUMBER:
GTX12V315A-E2107-CS200

Designed with Bluetooth® Wireless Monitoring,
Internal Heater Kit, Aluminum Alloy Enclosure

INTERNAL BMS
VERSION



Wireless Battery Monitoring via
[Lithionics Battery® Monitor App](#)



Item	Description
Model	GTX12V315A-E2107-CS200
Nominal Voltage	12.8V
Nominal Capacity	315AH
Nominal Watt Hours	4032Wh
Internal Resistance	<3mΩ
Charge	
Charging temperature range	32°F/0C to 131°F/55C
Charge voltage	14.4V
Recommended float charge voltage(for standby use)	13.4-13.6V
Recommended max charge current*	157.5A
Allowed max charge current*	250A
Discharge	
Discharging temperature range	-4F/-20C to 131F/55C
Operating Voltage Range	11.6-13.4V
Recommended max discharge current*	200A
Max discharge current*	250A
Pulse discharge current (1 second)	1200A
Discharge cut-off voltage	NeverDie® Power Reserve @ 12.0V Low Voltage Cut-Off @11.6V
Mechanical	
Dimensions	Length 20.3" Width 6.4" Height 10.0"
Weight	Approx. 68lbs (30.8kg)
Terminal Bolt Size	M8-1.25x14mm
Storage	
Storage Temperature & Humidity Range	< 1 Month: -4~95°F (-20~35°C), 45~75%RH < 3 Months: 14~86°F (-10~30°C), 45~75%RH
Recommended storage	59~99°F (15~35°C), 45%RH~75%RH
Long Term Storage	If the battery needs to be stored for > 3 months the voltage should be 13.2V (50%SOC), and stored at the recommended storage specifications shown above. Additionally, the battery needs at least one charge & discharge cycle every six months.
Self-discharge rate	Residual capacity: 5.3% per month; 5.15% per year Reversible capacity: 1.5% per month; 5.6% per year

* Maximum charging and discharging rates apply depending upon the ambient temperature and duty cycle of the system.
CS200 units of maximum charge and discharge current were performed at 25°C/77°F

INTERNAL NEVERDIE® BMS FEATURES



30% Smaller than 3 x 100AH Group31
Batteries, with Extra 15AH to Spare

- NeverDie® Power Reserve (Spare Fuel) for Hotel Loads and Engine Cranking
- Over-Charge, Over-Discharge and Short-Circuit Protection (LVC, HVC, SCC)
- Low/High Temperature Charge Protection
- Internal Heating Kit: Permits Charging as low as -20C/-4F
- Pushbutton On/Off switch for Safety and Storage
- Battery Gauge and Status Codes for Health Monitoring
- Bluetooth wireless telemetry with iOS and Android apps
- CANbus telemetry in the RVIA RV-C format
- An alternator communication link (FCC)
- Remote LED illuminated On/Off Power switch
- Up to 250A continuous charge/discharge current

ENERGY

315 AMP HOURS
PULSE AMPS: 1200 (1 SEC)
4032 WATT-HOURS



WWW.LITHIONICSBATTERY.COM

REV.5

LITHIONICS BATTERY

LITHIUM-ION IRON PHOSPHATE BATTERY SYSTEMS



Introducing the Highest Energy Density 12 Volt Battery In the World: GTX12V315A-E2107-CS200

A Single GTX12V315A Compared to 3 Imported 12V100A Batteries:

Length: 20.3 Inches Vs 38 Inches!

Weight: 68 Pounds Vs 96 Pounds!

Aircraft Aluminum Powder Coated
Crash-Proof Case Vs Low Grade
Flammable Plastics



▶ We Have, They Don't:

- ✓ Bluetooth
- ✓ Diagnostics
- ✓ RVIA RV-C CANbus for Silverleaf/ Firefly/ Spyder
- ✓ On-Off-Storage Safety Switch
- ✓ Remote Switch
- ✓ Alternator Control Link
- ✓ Engine Cranking
- ✓ Built In Heater
- ✓ Faster Installation, Less Cables



www.lithionicsbattery.com

Lithionics Battery® Monitor: Bluetooth® App

Bluetooth® Telemetry Available for NeverDie® Compact Series, Standard Series & Advanced Series Battery Management Systems.



- Main Screen:**
- A. SoC Percentage
 - B. Voltage
 - C. Amperage
 - D. Wattage
 - E. Battery Temp
 - F. BMS Temp
 - G. Power State
 - H. Status Code

LITHIONICS BATTERY, CLEARWATER, FL 33765 USA | PH: 727.726.4204 | FAX: 727.797.8046 | WEB: LITHIONICS.BATTERY

To connect to Bluetooth® telemetry:
 1) The Battery Management System must be in the ON position.
 2) Bluetooth® must be enabled on your smart device and support BLE 5.0.
 3) Open the Lithionics Battery® Monitor App.
 4) Under Settings, select the correct Battery Type.
 5) Under the Device List, select the battery device you would like to monitor.

<p>B. Battery Voltage Reading: GREEN = normal voltage RED = voltage too low or too high</p> <p>Voltage 12.91V</p>	<p>C. Net Current Draw in Amps. RED Indicates Discharging Current. GREEN indicates Charging Current.</p> <p>Current 87A</p>
<p>D. Net Current Draw in Watts. RED Indicates Discharging Current. GREEN indicates Charging Current.</p> <p>Power 1.1kW</p>	<p>E. Internal Battery Cell Temperature: GREEN = normal temp RED = temp too low or too high</p> <p>Battery 79F</p>
<p>F. Battery Management System Temperature: GREEN = normal temp RED = temp too low or too high</p> <p>BMS Temp 100F</p>	<p>G. Power ON / OFF</p> <p>State ON</p>

H. Status Code:

Basic Advanced

Select **Basic Battery Type** under Settings for 12V125A and Compact Series BMS models.

Life State	Cell 1 Voltage	Cell 2 Voltage	Cell 3 Voltage	Cell 4 Voltage	Cell 5 Voltage	Cell 6 Voltage	Cell 7 Voltage	Cell 8 Voltage	Cell 9 Voltage	Cell 10 Voltage	Cell 11 Voltage	Cell 12 Voltage	Cell 13 Voltage	Cell 14 Voltage	Cell 15 Voltage	Cell 16 Voltage	Cell 17 Voltage	Cell 18 Voltage	Cell 19 Voltage	Cell 20 Voltage	Cell 21 Voltage	Cell 22 Voltage	Cell 23 Voltage	Cell 24 Voltage	Cell 25 Voltage	Cell 26 Voltage	Cell 27 Voltage	Cell 28 Voltage	Cell 29 Voltage	Cell 30 Voltage	Cell 31 Voltage	Cell 32 Voltage	Cell 33 Voltage	Cell 34 Voltage	Cell 35 Voltage	Cell 36 Voltage	Cell 37 Voltage	Cell 38 Voltage	Cell 39 Voltage	Cell 40 Voltage	Cell 41 Voltage	Cell 42 Voltage	Cell 43 Voltage	Cell 44 Voltage	Cell 45 Voltage	Cell 46 Voltage	Cell 47 Voltage	Cell 48 Voltage	Cell 49 Voltage	Cell 50 Voltage	Cell 51 Voltage	Cell 52 Voltage	Cell 53 Voltage	Cell 54 Voltage	Cell 55 Voltage	Cell 56 Voltage	Cell 57 Voltage	Cell 58 Voltage	Cell 59 Voltage	Cell 60 Voltage	Cell 61 Voltage	Cell 62 Voltage	Cell 63 Voltage	Cell 64 Voltage	Cell 65 Voltage	Cell 66 Voltage	Cell 67 Voltage	Cell 68 Voltage	Cell 69 Voltage	Cell 70 Voltage	Cell 71 Voltage	Cell 72 Voltage	Cell 73 Voltage	Cell 74 Voltage	Cell 75 Voltage	Cell 76 Voltage	Cell 77 Voltage	Cell 78 Voltage	Cell 79 Voltage	Cell 80 Voltage	Cell 81 Voltage	Cell 82 Voltage	Cell 83 Voltage	Cell 84 Voltage	Cell 85 Voltage	Cell 86 Voltage	Cell 87 Voltage	Cell 88 Voltage	Cell 89 Voltage	Cell 90 Voltage	Cell 91 Voltage	Cell 92 Voltage	Cell 93 Voltage	Cell 94 Voltage	Cell 95 Voltage	Cell 96 Voltage	Cell 97 Voltage	Cell 98 Voltage	Cell 99 Voltage	Cell 100 Voltage
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Basic Battery Type Interface

Select **Advanced Battery Type** under Settings for Standard and Advanced Series BMS models.

Cell 1 Voltage	Cell 2 Voltage	Cell 3 Voltage	Cell 4 Voltage	Cell 5 Voltage	Cell 6 Voltage	Cell 7 Voltage	Cell 8 Voltage	Cell 9 Voltage	Cell 10 Voltage	Cell 11 Voltage	Cell 12 Voltage	Cell 13 Voltage	Cell 14 Voltage	Cell 15 Voltage	Cell 16 Voltage	Cell 17 Voltage	Cell 18 Voltage	Cell 19 Voltage	Cell 20 Voltage	Cell 21 Voltage	Cell 22 Voltage	Cell 23 Voltage	Cell 24 Voltage	Cell 25 Voltage	Cell 26 Voltage	Cell 27 Voltage	Cell 28 Voltage	Cell 29 Voltage	Cell 30 Voltage	Cell 31 Voltage	Cell 32 Voltage	Cell 33 Voltage	Cell 34 Voltage	Cell 35 Voltage	Cell 36 Voltage	Cell 37 Voltage	Cell 38 Voltage	Cell 39 Voltage	Cell 40 Voltage	Cell 41 Voltage	Cell 42 Voltage	Cell 43 Voltage	Cell 44 Voltage	Cell 45 Voltage	Cell 46 Voltage	Cell 47 Voltage	Cell 48 Voltage	Cell 49 Voltage	Cell 50 Voltage	Cell 51 Voltage	Cell 52 Voltage	Cell 53 Voltage	Cell 54 Voltage	Cell 55 Voltage	Cell 56 Voltage	Cell 57 Voltage	Cell 58 Voltage	Cell 59 Voltage	Cell 60 Voltage	Cell 61 Voltage	Cell 62 Voltage	Cell 63 Voltage	Cell 64 Voltage	Cell 65 Voltage	Cell 66 Voltage	Cell 67 Voltage	Cell 68 Voltage	Cell 69 Voltage	Cell 70 Voltage	Cell 71 Voltage	Cell 72 Voltage	Cell 73 Voltage	Cell 74 Voltage	Cell 75 Voltage	Cell 76 Voltage	Cell 77 Voltage	Cell 78 Voltage	Cell 79 Voltage	Cell 80 Voltage	Cell 81 Voltage	Cell 82 Voltage	Cell 83 Voltage	Cell 84 Voltage	Cell 85 Voltage	Cell 86 Voltage	Cell 87 Voltage	Cell 88 Voltage	Cell 89 Voltage	Cell 90 Voltage	Cell 91 Voltage	Cell 92 Voltage	Cell 93 Voltage	Cell 94 Voltage	Cell 95 Voltage	Cell 96 Voltage	Cell 97 Voltage	Cell 98 Voltage	Cell 99 Voltage	Cell 100 Voltage
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Advanced Battery Type Interface

NOTE: A Status Code can be manually entered within the app by using the Status Code Reader button available at the bottom of the Settings screen.





Cold Weather Testing: of GTX12V315A-E2107-CS200 with Internal Heater Kit

Test 1: Normal Temperature Use for Consumers

Cold weather testing with production at 20F (-7C) versus at the max. heater limit of -4F/-20C: 20F is a realistic test for customer-use as an average between night/day temperatures. Heater Duty Cycle:

	Seconds	Minutes
On Time	2522	42.03333
Off Time	7325	122.0833
Total time	9847	164.1167
Duty Cycle	25.6%	

RESULTS: 4A @ 25% duty cycle is 1A per hour, or 13 days of self heating after full charge.

Test 2: Extreme Conditions/Medical Freezer set to -4F/-20C

Heater duty cycle:

	Seconds	Minutes
On Time	3937	65.61667
Off Time	2663	44.38333
Total time	6600	110
Duty Cycle	59.7%	

RESULTS: 35W X 60% Duty Cycle = 21 Watts per Hour. 21 Watts / 12 Volts = 1.75 Amps Per Hour at -4F (sub-zero!) 315 amp hours / 1.75 amps = 180 hours of battery power or 180 / 24 hours = 7.5 Days of self heating after full charge.

So now that I have the Lithionics 12v315GTX 315ah battery selected and plan on installing it in my step box, replacing my two 6v AGM batteries, I need to figure out which inverter I'm selecting. Since I want to be able to run my air conditioner, which I already added a Micro-Air Easy-Start too, I need a 3000w pass-through Inverter/Charger (just going to refer to this as Inverter for the rest of my discussion). The only two Inverters I would consider are the Victron Multiplus 12v 3000w and the Xantrex Freedom XC Pro 12v 3000w with the optional Bluetooth Remote Panel. I love Victron components and consider them to be top of the line, but since I need to install an Inverter as close to the battery as possible for the maximum power efficiency (the shorter the length of wires between batteries and components the more power efficient) then i need to examine the space I have nearby. There really is only one place and that is in the exterior compartment to the left of the door. Actually Leisure started installing the inverters in this compartment starting with 2017 models, I believe. So in looking at this exterior compartment, which I really rely upon for storage, I realize I don't want to give up much of it to an Inverter. The basic power and charging technical specifications of both inverters are

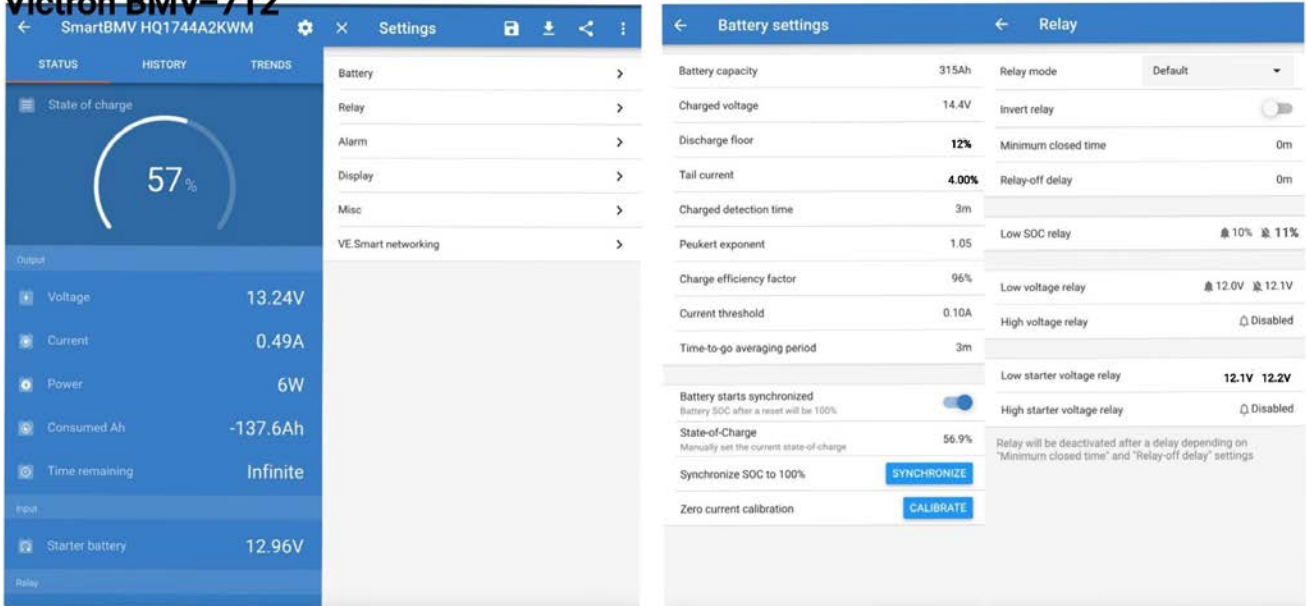
essentially equal. So I'm selecting the Xantrex Freedom XC Pro 12v 3000w Inverter because it is smaller at 16"L x5"h x12"w, particularly important is it's only 5" high, pretty slim!

I currently have a Victron SmartSolar 100/30 MPPT Bluetooth controller and a Victron BMV-712 Bluetooth Battery Monitor. It would have been nice to stay with Victron components but if I look at the system I'd want to install to stay with Victron Multiplus Inverter, I'd have to add the Cerbo GX (Victron compartment integration), and the Victron Touch 50 color Monitor for the Cerbo GX. Plus the Victron Multiplus Inverter is more complicated with lots of settings. You need other adapters and a computer to perform future firmware updates and to access all the settings. Bottom line, the Victron Multiplus is more complicated. Yes, it has lots of extra features but how many of those will you really be using? So I opted for a Xantrex Freedom XC Pro 12v 3000w, which is a simpler, smaller, highly capable pass-through Inverter/Charger. I really like that Lithionics and Xantrex have partnered together and as such Xantrex uploaded the Lithionics Lithium battery charge profile into the Xantrex, so its super easy to program the Xantrex for the Lithionics by just selecting one mode. I also like the Xantrex Remote Bluetooth Control panel and I plan on installing next to my other panel on the side of the TV cabinet at my door. Since the Lithionics 12v315GTX has a fabulous built in Bluetooth Battery Monitoring Sytem, I may remove my Victron BMV-712 since I don't really need it with the Lithionics battery. If I do keep it, thankfully Lithionics puts out a Settings guide so I can program it to be more accuratly matched with the Lithionics Internal Battery Monitoring Sytem. I may just install the Xantrex Remote display in the BMV-712 spot, I'll figure that out during my installation. It's really just an expensive battery voltage display! I then will just have the Victron SmartSolar controller, that I will continue to view via Bluetooth on my phone/tablet. In doing my comparison of Inverters I realized to really create a top of the line system for the batteries you have more complexity and more components, that look great and integrate well, but may not be completely necessary if you really plan on just turning the inverter on/off when you want to use it for inverting the battery to 120vac and/or using the battery charging feature.

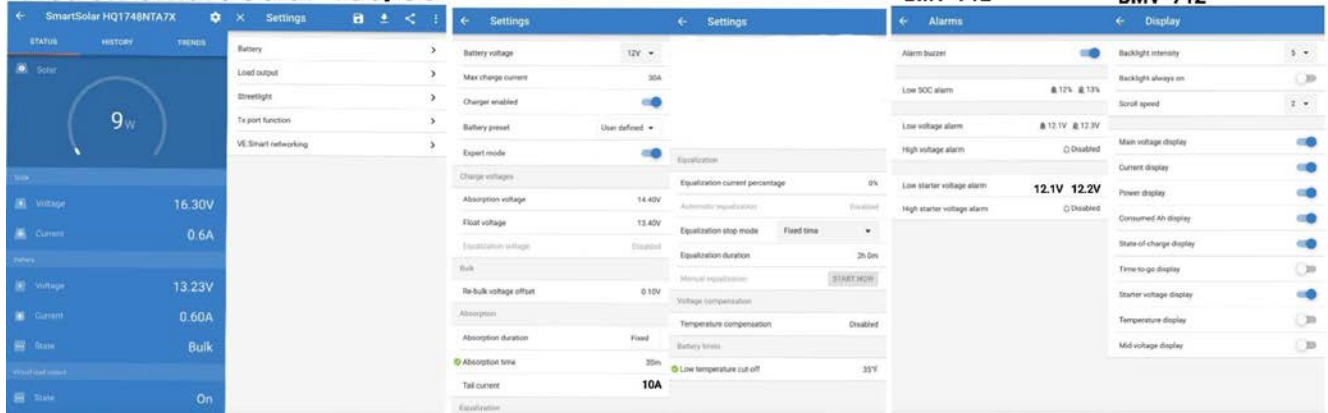
I think if you are installing more than 600ah of batteries, the the Victron components would make for a nice system, because you have more space options than just trying to stay within a few feet of the door's step battery box.



Victron BMV-712



Victron Smart Solar 100/30



solar to be more for maintenance, Leisure Travel Vans just don't have the roof space for any sizable solar contribution. So for me 400w is fine and since solar panels aren't covering every available space on my roof I can still move around it to clean the panels and the roof, and do maintenance.

For those who did take the Leisure solar option, my advice is to replace the flexible panels, since they have been proven to damage your roof, with longer lasting, more efficient, higher quality monocrystalline glass panels and replace the GoPower PWM solar controller with a Victron 100/30 SmartSolar MPPT Bluetooth Controller. The Victron controller has an advanced Lithium battery setting and is highly reliable and the most efficient battery charger on the market, IMHO!

Installing a better solar system isn't that hard and can be done without drilling any new holes in the roof. If you search the Unity section of the Forum, you'll get lots of installations to pick from

and pattern your own installation after. The elements of the solar system that Leisure installs can support up to 400w of panels with no other changes. So it's very easy to expand a 200w option to 400w. At a minimum, I recommend replacing the GoPower controller, since it is a very poor quality device for Lithium battery charging. It's very easy, the 4 wires connected to it simply attach in the corresponding positions on the Victron controller. Here is a picture of the back of the GoPower, as you can see it's just 4 wires. You should also take the opportunity to add 30a circuit breakers (can also be used as an on/off switch) to both sides of the controller so you protect the wiring and have the ability to isolate the panels and/or controller from the batteries. You can damage a solar controller if you do not disconnect the panels output to it before disconnecting the batteries. The panels can burn up the controller making it the load when the batteries, which are the actual load, is disconnected first. Then reverse to put the panels back on line (connect batteries, connect controller, connect panels). Without circuit breakers or switches and fuses the only way to stop the panel output power is to cover them from the sun. Quite a hassle!

For circuit breakers on both sides of a new Victron solar controller you should consider one of these styles,

<https://www.amazon.com/Tocas-Surfac...lja1JIZGlyZWN0JmRvTm90TG9nQ2xpY2s9dHJ1ZQ&th=1> or

<https://www.amazon.com/Tocas-Surfac...jbGlja1JIZGlyZWN0JmRvTm90TG9nQ2xpY2s9dHJ1ZQ==>.

It's important to get a dc circuit breaker that is rated for up to 72v because depending on how you wire your panels together, 400w could have as high an output voltage of 64v (24a). Since the Victron controller is Bluetooth enabled you don't need to install it so its visible, because you read it's data from a Bluetooth connected device like your phone/tablet. You just want to be able to get to it and the circuit breaker when you might need to. I installed mine in my TV cabinet. I added magnets to my fire extinguisher so it's easily removed for access!

I think I've covered everything you need to consider/know when planning to switch to Lithium battery(s) and/or modifying your coach electrical system to expand the use of the Lithium battery(s) to more or all of the coach's equipment! Now on to defining and buying everything you need for the installation, and the actual installation! Stay tuned for my installation of a Lithionics 315ah battery, Sterling 30a DC-DC charger, Xantrex Freedom XC Pro 3000w with Remote Display, and the addition of 200w of Renogy solar panels on another thread!



SmartSolar charge controller
MPPT 100 I 30

Solar controller circuit breaker on/off

solar panel circuit breaker on/off



I like the option of the Bluetooth connectivity on the Xantrex or Victron components, but I also like that Xantrex offers a simple remote display as well. The Xantrex display offers the simplicity I'm looking for by just having a simple on/off button. So whether I want the extensive displays and information the Xantrex Bluetooth App offers or just the simplicity of an actual display with ease of accessing the most used features the Xantrex is easy and small. Don't get me wrong, I love Victron stuff, but in considering that the Lithionics battery has such an advanced battery monitoring system, I realize it doesn't need to be paired with an overly complicated integration system with more battery monitoring. In my comparison the inverter choice seemed to boil down to smaller sized and more intuitive/simplistic compared to larger, more components, complicated, harder/more time to install, but beautifully integrated. So I picked the Xantrex inverter, smaller, easy and simple as the right compliment to the magnificent Lithionics battery!

Bluetooth Remote Panel and FXC Control App Walkthrough Ft. Mike Mas,
<https://youtu.be/gSj2wEgTcWM>

Here is a interesting video from a Leisure Owner going through regrets that he didn't choose a Lithionics Battery! This video certainly makes my point that you need to define your battery needs, research/consider all possibilities, and definitely don't just make a choice based on price or you may have regrets!

Leisure Travel Van Lithium battery upgrade. Battle Born or Lithionics, which brand is best?
https://youtu.be/_F2uvwWmYFk

Stephen Tartaglia, Owner/General Manager of Lithionics has assigned Jackson D'Ettorre as our Lithionics Leisure Travel Van Point of Contact, here is his contact information:

Jackson D'Ettore
Product Manager
1770 Calumet Street
Clearwater, FL 33765 USA
jackson@lithionicsbattery.com
Office: 727-726-4204 | Web: LithionicsBattery.com

Here are the Lithionics Installation Guides for their batteries installed with a Xantrex XC Pro 2000w and 3000w Inverters and the Victron Multiplus 2000w and 3000w Inverters. The number and type of Lithionics Batteries doesn't matter, so you fill in that blank and the rest of the installation is defined in the attached guides.

<http://lithionicsbattery.com/user-guides/>

I have been inundated with questions by Leisure Unity and Wonder owners about my Lithionics 315ah Battery so here is a cost comparison sheet that may be helpful to others considering a Lithium battery upgrade. I've also attached the Lithionics full spec sheets on the 2 sizes of Lithionics Batteries that will fit in Leisure step battery boxes. I believe the Lithionics 315ah with Bluetooth internal Battery Monitor and heater fits in the step box of all Unity models and some Wonder models. Two Lithionics 125ah (250ah total) with Bluetooth internal Battery Monitor and lots of other features fit in the rest of the Wonder models.

I wouldn't dismiss the Lithionics batteries based on it's MSRP alone. Lithionics is offering promotional discounts to Leisure Owners if you contact them directly. Their Factory direct price makes their cost very close to other leading battery manufacturers and considering all the extra features it's well worth the investment. It's worth a few extra bucks to get all the advanced features and to pack as many amp hours as I can into my step compartment battery box. When you contact Lithionics, you'll see that you can get a Lithionics 315ah Lithium battery with built-in automatic heater and Bluetooth Battery Monitor for about the same price as the Leisure cost of \$3770 for the 200ah Lithium battery option with external heating pad. Two Lithionics 125ah batteries give you 250ah of Advanced Lithionics Lithium battery capability in your step compartment for much less than the cost of the Leisure 200ah battery option! You are really wasting your money on the Leisure Lithium option!

The fact that you can get a Lithionics Battery for about the same price as the Leisure Lithium Option is particularly noteworthy for the 2020 and newer Unity and Wonder models because Leisure now installs a Sterling 30a DC-DC charger for safe engine alternator charging when driving and the Xantrex 2000w Inverter for safe fast charging from Shore/Generator power, both have Lithium battery charging settings! So the new Leisure Unity's come completely ready for you to do your own simple battery replacement from the standard AGM batteries to a Lithionics 315ah or dual 125ah (250ah) Advanced Lithium Batteries. No extra modifications required! This is another reason why new Leisure owners shouldn't waste their money on the inadequate Leisure Lithium battery option! Call or email Jackson D'Ettore find out more about Lithionics batteries!

Jackson D'Ettore
Product Manager
1770 Calumet Street
Clearwater, FL 33765 USA
jackson@lithionicsbattery.com
Office: 727-726-4204 | Web: LithionicsBattery.com

One last recommendation, to verify the Leisure electrical attributes of your particular model I suggest you contact Leisure's Willie Neufeld, WNeufeld@tripleerv.com. Email him first with your VIN#, email address, and phone number and request him to send you, via email, the PDF versions of your Leisure model 120vAC and 12vDC electrical systems wiring diagrams. Then follow up that email with a call to him (877-992-9906 ask the operator to connect you to him) and leave a message on his voice-mail of what you are requesting and that you sent an email with this request, containing all your Leisure and contact information. He will very promptly send you PDFs of your wiring diagrams. These diagrams are helpful on many levels so you should get them regardless of any changes or modifications you might be considering.

LITHIONICS BATTERY

LITHIUM-ION IRON PHOSPHATE BATTERY SYSTEMS



MODEL NUMBER:
GTX12V315A-E2107-CS200

Designed with Bluetooth® Wireless Monitoring,
Internal Heater Kit, Aluminum Alloy Enclosure



INTERNAL BMS
VERSION



Wireless Battery Monitoring via
[Lithionics Battery® Monitor App](#)



Item	Description
Model	GTX12V315A-E2107-CS200
Nominal Voltage	12.8V
Nominal Capacity	315AH
Nominal Watt Hours	4032Wh
Internal Resistance	<3mΩ
Charge	
Charging temperature range	32°F/0C to 131°F/55C
Charge voltage	14.4V
Recommended float charge voltage(for standby use)	13.4-13.6V
Recommended max charge current*	157.5A
Allowed max charge current*	250A
Discharge	
Discharging temperature range	-4F/-20C to 131F/55C
Operating Voltage Range	11.6-13.4V
Recommended max discharge current*	200A
Max discharge current*	250A
Pulse discharge current (1 second)	1200A
Discharge cut-off voltage	NeverDie® Power Reserve @ 12.0V Low Voltage Cut-Off @11.6V
Mechanical	
Dimensions	Length 20.3" Width 6.4" Height 10.0"
Weight	Approx. 68lbs (30.8kg)
Terminal Bolt Size	M6-1.25x14mm
Storage	
Storage Temperature & Humidity Range	< 1 Month -4~95°F (-20~35°C), 45~75%RH < 3 Months 14~86°F (-10~30°C), 45~75%RH
Recommended storage	50~95°F (10~35°C), 45%RH~75%RH
Long Term Storage	If the battery needs to be stored for > 3 months the voltage should be 13.2V (50%SOC), and stored at the recommended storage specifications shown above. Additionally, the battery needs at least one charge & discharge cycle every six months.
Self-discharge rate	Residual capacity 5.3% per month; 5.15% per year Reversible capacity 1.5% per month; 5.6% per year

* Maximum charging and discharging rates apply depending upon the ambient temperature and duty cycle of the system.
13,187 units of maximum charge and discharge current were performed at 25°C/77°F

INTERNAL NEVERDIE® BMS FEATURES



30% Smaller than 3 x 100AH Group31
Batteries, with Extra 15AH to Spare

- NeverDie® Power Reserve (Spare Fuel) for Hotel Loads and Engine Cranking
- Over-Charge, Over-Discharge and Short-Circuit Protection (LVC, HVC, SCC)
- Low/High Temperature Charge Protection
- Internal Heating Kit: Permits Charging as low as -20C/-4F
- Pushbutton On/Off switch for Safety and Storage
- Battery Gauge and Status Codes for Health Monitoring
- Bluetooth wireless telemetry with iOS and Android apps
- CANbus telemetry in the RVIA RV-C format
- An alternator communication link (FCC)
- Remote LED illuminated On/Off Power switch
- Up to 250A continuous charge/discharge current

ENERGY

315 AMP HOURS
PULSE AMPS: 1200 (1 SEC)
4032 WATT-HOURS



WWW.LITHIONICSBATTERY.COM

REV.5

LITHIONICS BATTERY®

LITHIUM ION IRON PHOSPHATE BATTERY SYSTEMS



MODEL NUMBER:
12V125A-G31-5CND-LRB

INTERNAL BMS
VERSION



Item	Description
Model	12V125A-G31-5CND-LRB
Nominal Voltage	12.8V
Nominal Capacity	125Ah
Internal Resistance	<2mΩ
Features	NeverDie® Reserve, High and Low Voltage Cutoff, High and Low Temperature Cutoff, Short Circuit Protection, Bluetooth® App Support
* May Not Be Connected in Series to Make 24 Volts.	
Charge	
Charging temperature range	32~113°F (0~45°C)
Charge voltage	14.4V Recommended (14.6V Max.)
Recommended float charge voltage (for 12V)	13.4
Recommended charge current	±50A
Allowed max charge current	100A with starting temp of 77°F (25°C)
Discharge	
Discharging temperature range	-4~131°F (-20~55°C)
Output Voltage Range	10.0~14.6V
Recommended discharge current	±100A
Max continuous discharge current	100A with starting temp of 77°F (25°C)
Surge discharge current	±400A for 30s max with starting temp of 77°F (25°C)
Pulse discharge current	±1000A for 1s max with starting temp of 77°F (25°C)
Reserve cut-off voltage	12.0V/40.00V
Discharge cut-off voltage	11.280.1V
Mechanical Characteristics	
Dimensions	Length: 12.5in (318mm) Width: 6.5in (165mm) Height: 8.4in (215mm) (Lange position only (terminals up))
Mounting Orientation	Approx. 33.4lbs (15.1kg)
Weight	
Storage	
Storage Temperature & Humidity Range	< 1 Month: -4~60°F (-20~30°C), 45~75%RH < 3 Months: 14~60°F (-10~30°C), 45~75%RH Recommended storage: 50~95°F (15~35°C), 40%RH~75%RH
Long Term Storage	If the battery needs to be stored for > 3 months the voltage should be 13.2V (50%SOC), and stored at the recommended storage specifications shown above. Additionally, the battery needs at least one charge & discharge cycle every six months.
Self-discharge rate	Residual capacity: ≤3% per month; ≤10% per year Reversible: ≤1.5%per month; ≤8% per year capacity

INTERNAL NEVERDIE® COMPACT SERIES FEATURES

- miniBMS® Cell/Module Sensors and Microprocessors with Automatic Cell Balancing
- NeverDie® Power Reserve (Spare Fuel) for Heavy Loads and Worry-Free Power for Engine Cranking
- Over-Charge, Over-Discharge and Short-Circuit Protection (LVC, HVC, SCC)
- Push-Button Storage Operation
- Available Optional Bluetooth®: Monitor Battery Voltage, State-of-Charge, Temperature, Current & Status Code remotely from your mobile device. Available for download on [Google Play](#) & [Apple App Store](#).



ENERGY

625 CRANKING AMPS
PULSE AMPS: 1000 (1 SEC)
1600 WATT-HOURS

WARNING

- LITHIUM BATTERIES ARE NOT DESIGNED FOR CHARGING IN SUB-FREEZING TEMPERATURES. CONTACT LITHIONICS BATTERY® FOR DETAILS ON OUR COLD WEATHER PACKAGE
- INSTALLATION: IT IS REQUIRED THAT THE BATTERY BE INSTALLED TERMINAL SIDE UP.

NOTE: CONTACT LITHIONICS BATTERY® FOR A USER INSTALLATION GUIDE & STORAGE PROCEDURES. FOLLOW THE GUIDE TO ENSURE FITNESS OF USE & WARRANTY.

12V
ENERGY
SERIES

LITHIONICS BATTERY®

LITHIUM-ION IRON PHOSPHATE BATTERY SYSTEMS



BATTLEBORN 12V100A VS LITHIONICS 12V125A

Battleborn 12V100A Retail Price: \$950.00

-Measures 95 Amp Hours
 -ADD metering to Battleborn: \$950.00
 +Victron Temp Sensor \$25.00 + Victron
 BMV712 \$207.00 = \$1,182.00

\$1,182.00 divided by 95 Net Amp Hours
 = **\$12.44 Per Amp Hour** for Battleborn



12V100A



12V125A-G31

A premium quality battery
 that has value-added
 features for a better user
 experience.

Lithionics Battery® 12V125A Retail Price: \$1,399.00

-Measures 130 Amp Hours

-Included features that Battleborn does not have:

1. On-off LED control switch with Remote Control Switch For In-Coach Access
2. Bluetooth® APP and Full Battery Diagnostics with Battery Life Indicator for Warranty
3. Engine cranking capabilities... works with your battery boost switch.
4. 250 amp hours in the same space as 190 amp hours of Battleborn batteries.
5. The NeverDie® Power Reserve.
6. Surge capability to start roof-top air conditioner (2 in parallel) WITHOUT a Soft Start Cost

\$1,399.00 divided by 130 Net Amp Hours
 = **\$10.76 Per Amp Hour** for Lithionics Battery®

VS LITHIONICS GTX12V315A

Lithionics Battery® GTX12V315A-E2107-CS200 Retail Price: \$4,499.00

-Includes \$600.00 of Accessories: Internal Shunt, Heater Kit, Switch Control, Bluetooth, + more

Advantages of the GTX12V315A:

1. **World's Highest Energy Density, 315 Amp Hour in just 1.8 Square Feet!**
2. **World's 1st UL Listed Heater Kit allows subfreezing operation! "Power Your Adventures!"**
3. Stronger BMS with greater engine cranking. Designed to run rooftop A/C on a single battery
4. Powder coated aircraft aluminum metal enclosure: fireproof and crash-tested
5. Comes with a product safety insurance policy on your RV or yacht
6. RV-C CANbus output for Spyder, Firefly and Silverleaf systems.
7. Alternator Communication and Control Output: Balmar and Wakespeed Regulators
8. Firmware Upgrades for Life via your phone or tablet!
9. On-battery LED indicator control switch plus a remote-control switch option
10. Bluetooth® APP and Full Battery Diagnostics with Battery Life Indicator for Warranty



LITHIONICS BATTERY | PHONE: 727.726.4204 | EMAIL: info@lithionicsbattery.com | WEB: lithionicsbattery.com

And now the New 12v630GTX, pre-order now for delivery in July 2021.

LITHIONICS BATTERY

LITHIUM-ION IRON PHOSPHATE BATTERY SYSTEMS



MODEL NUMBER:
GTx12V630A-E2112-CS200

Designed with Bluetooth® Wireless Monitoring,
Internal Heater Kit, UL Aux. DC Breaker support,
Aluminum Alloy Enclosure

INTERNAL BMS
VERSION



Item	Description
Model	GTx12V630A-E2112-CS200
Nominal Voltage	12.8V
Nominal Capacity	630Ah
Nominal Watt Hours	8064Wh
Internal Resistance	<3mΩ
Charge	
Charging temperature range	32°F/0°C to 131°F/55°C
Charge voltage	14.4V
Recommended float charge voltage (for standby use)	13.4-13.6V
Recommended max charge current*	150A
Allowed max charge current*	250A
Discharge	
Discharging temperature range	-4F/-20C to 131F/55C
Operating Voltage Range	10.4-13.4V
Recommended max discharge current*	200A
Max discharge current*	250A
Pulse discharge current (1 second)	1200A
Discharge cut-off voltage	NeverDie® Power Reserve @ 12.2V Low-Voltage Cut-Off @ 10.4V
Mechanical	
Dimensions	Length 20.3" Width 12.3" Height 10.6"
Mounting Orientation	Upright position only (terminals up)
Weight	Approx. 128lbs (58.0kg)
Terminal Bolt Size	M8-1.25x14mm
Storage	
Storage Temperature & Humidity Range	< 1 Month: -4~95°F (-20~35°C), 45~75%RH < 3 Months: 14~86°F (-10~30°C), 45~75%RH
Recommended storage	59~79°F (15~30°C), 45%RH~75%RH
Long Term Storage	If the battery needs to be stored for > 3 months the voltage should be 13.2V (50%SOC), and stored at the recommended storage specifications shown above. Additionally, the battery needs at least one charge & discharge cycle every six months.
Self-discharge rate	Residual capacity: ≤3% per month; ≤15% per year Reversible capacity: ≤1.5%per month; ≤8% per year

* Maximum charging and discharging rates apply depending upon the ambient temperature and duty cycle of the system.
UL 9542 tests of maximum-charge and discharge current were performed at 25°C/77°F



30% Smaller than 6 x 100Ah Group31
Batteries, with Extra 30Ah to Spare!

INTERNAL NEVERDIE® BMS FEATURES

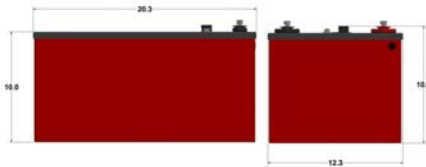
- NeverDie® Power Reserve (Spare Fuel) for Hotel Loads and Engine Cranking
- Over-Charge, Over-Discharge and Short-Circuit Protection (LVC, HVC, SCC)
- Low/High Temperature Charge/Discharge Protection
- Internal Heating Kit: Permits Charging as low as -20C/-4F
- Pushbutton On/Off switch for Safety and Storage
- Battery Gauge and Status Codes for Health Monitoring
- Bluetooth wireless telemetry with Lithionics Battery iOS and Android app
- CANbus telemetry in the RVIA RV-C format (AMPSEAL8)
- An alternator Field Control Circuit (FCC) (AMPSEAL8)
- Remote LED illuminated On/Off Power switch (AMPSEAL8)
- Up to 250A continuous charge/discharge current

ENERGY

630 AMP HOURS

PULSE AMPS: 1200 (1 SEC)

8064 WATT-HOURS





Lithionics Battery: GTX Super-Density
12V Series



GTX12V630A-E2112-CS200* 8,200 Watt Hours
Compared with Typical Group 31 Imports
*Accepting pre-orders for shipping in Summer 2021

GTX12V320A-E2107-CS200 4,100 Watt Hours
Compared with Typical Group 31 Imports



Here is a video by Nate, Explorist Life, on a complete installation covering many of the things I've discussed in the thread. Nate is a very knowledgeable and provides excellent reference videos and web site information and tutorials, <https://www.explorist.life/how-series-vs-parallel-wired-solar-panels-affects-amps-and-volts/>, that covers everything you might want to do from an Electrical upgrade perspective.

How to Install Solar & Electrical in a DIY Camper (A Complete Walkthrough)
<https://youtu.be/JMqtVBN26NQ>

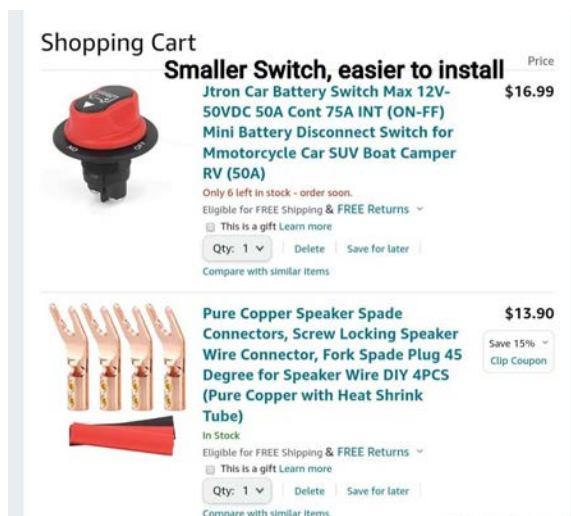
Here is a simple video, showing why switching out your Leisure GoPower PWM controller for a MPPT Controller gets you up to 30% more power from your solar panels and offers a higher quality battery charging capability. A MPPT charge controller and glass monocrystalline panels are a must, in my opinion, for the highest quality and most efficient solar system. I selected the Victron Smart Controller 100v/30a, <https://www.amazon.com/SmartSolar-M...9Y2xpY2tSZWRpcmVjdCZkb05vdExvZ0NsaWNrPXRydWU=>, 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/graphq...wMDAwMDMzNTI5NzY4NDpWSzo0OTU0NjgzNjcxMjcyMDI5>. If you are interested in expanding to more than 400w then by a 100v/50a sized MPPT solar charge controller.

Many have been asking me for the easiest method to replace their GoPower so here is what I came up with. The easiest method would be to just install a switch and corresponding connectors,

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, on the positive wire from the Solar panels just before the new solar controller using this switch and screw terminal connectors. 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 wire and cut it 6" or so back, correct length between switch and controller. Then add a connector to two ends so you can wire the switch in just before the controller and 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.

MPPT vs PWM: Determining Which Type of Charge Controller You Need - Xantrex Solar
https://youtu.be/CBKf3uKeu_I



Shopping Cart

Smaller Switch, easier to install Price
Jtron Car Battery Switch Max 12V-50VDC 50A Cont 75A INT (ON-OFF) Mini Battery Disconnect Switch for Motorcycle Car SUV Boat Camper RV (50A) **\$16.99**

Only 6 left in stock - order soon.
Eligible for FREE Shipping & FREE Returns
 This is a gift Learn more
Qty: 1
[Compare with similar items](#)

Pure Copper Speaker Spade Connectors, Screw Locking Speaker Wire Connector, Fork Spade Plug 45 Degree for Speaker Wire DIY 4PCS (Pure Copper with Heat Shrink Tube) **\$13.90**

Save 15%
In Stock
Eligible for FREE Shipping & FREE Returns
 This is a gift Learn more
Qty: 1
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Great job and thank you for taking the time to document it. I'm going to tackle the inverter install next weekend.

Did you find any easy way to get the partition between the inverter and the storage bay out?

Are the terminal posts on the Lithtronics batteries 5/16?



I've never used VHB tape, there are so many different kinds I'm not sure which 3M number to use. Of course I'm looking for high bond strength but also something that will hold up to the desert heat when it gets into the 120's. What would you suggest?

I didn't have an inverter bay, so maybe someone else will chime in with tips to remove the wall. DiverBob may have explained how he did it in his electrical upgrade thread. Search for it. The Lithionics battery bolt is metric M8-1.25, so you use 5/16" lugs for the cables. The Xantrex inverter also takes 5/16" lugs for the battery and case ground connections. See post #89, <https://sprinter-source.com/forums/index.php?threads/93929/page-5>. I believe 3M 5952 VHB tape is the best for adhesion and high temperatures. Here is a chart I posted before when someone questioned choice of 5952 over 4950. I just finished my inverter installation and am posting about it here in #109, <https://sprinter-source.com/forums/index.php?threads/93929/page-6>. Good luck on you inverter installation.

3M™ VHB™ Tapes Product Range

	Adhesive type	Product Number	Tape Thickness	Colour	Temperature Resistance		Relative Adhesion		Liner Type	Application Ideas
					Minutes Hours	Days Weeks	HSE Material	LSE Material		
General Purpose VHB Tapes	Modified adhesive on both sides of a soft foam	5925	0.64mm	Black adhesive, grey core	149 °C	121°C	High	Medium	Red Film	Excellent adhesion to the widest variety of surfaces, including most powder coated paints and plastics.
		5952	1.1mm	Black adhesive, grey core	300°F 149 °C	250°F 121°C	High	Medium	Red Film	
		5962	1.55mm	Black adhesive, grey core	149 °C	121°C	High	Medium	Red Film	
	Firm adhesive on one side and a soft adhesive on the other side of a medium foam	4618	0.64mm	White	121°C	93°C	High	Low	Green Film	Good adhesion to a wide range of surfaces.
		4622	1.1mm	White	121°C	93°C	High	Low	Green Film	
		4624	1.55mm	White	121°C	93°C	High	Low	Green Film	
VHB Tapes	Firm adhesive on both sides of a firm foam	4930	0.64mm	White	300°F 149 °C	93°C	High	Low	Paper	Use with metals where high dynamic stresses are involved.
		4950	1.1mm	White	149 °C	93 °C	High	Low	Paper	
		4959	3.0mm	White	204°C	149°C	High	Low	Clear Film	
	Soft adhesive on both sides of a firm foam	4945	1.1mm	White	149°C	93°C	High	Low	Paper	Use with metals and HSE plastics where high dynamic stresses are involved.
		4936	0.64mm	Grey	149°C	93°C	High	Medium	Paper	
		4941	1.1mm	Grey	149°C	93°C	High	Medium	Paper	
Soft adhesive on both sides of a medium foam	4991	2.3mm	Grey	121°C	93°C	High	Medium	Red Film	Excellent adhesion to a wide range of materials including plasticised vinyl.	
	4905	0.5mm	Clear	149°C	93°C	High	Low	Red Film		

3M™ VHB™ Tapes Product Performance Guide

General Purpose VHB Tapes

Tape #	4618	4622	4624	5925	5952	5962
Peel Adhesion N/100mm	300	350	350	300	350	350
Normal Tensile kPa	580	480	380	620	620	620
Dynamic Shear kPa	550	445	410	620	550	550
Static Shear g 22°C	1000	1000	1000	1000	1000	1000
150°F 66°C	250	250	250	500	500	500
93°C	250	250	250	500	500	500
121°C				250	250	250

Special Feature VHB Tapes

Tape #	4611	4905	4910	4915	4918	4930	4941	4945	4950	4951	4957	4959	4991	9473
Peel Adhesion N/100mm	315	210	260	260	260	350	350	440	440	315	350	350	350	160
Normal Tensile kPa	590	690	690	690	690	1100	585	970	970	760	515	520	480	690
Dynamic Shear kPa	445	480	480		690	480	550	550	550	480	380	450	550	
Static Shear g 22°C	1500	1000	1000	1000	1000	1500	1000	1500	1500	1250	1000	1500	1000	1000
150°F 66°C	750	500	500	500	500	500	500	500	1000	500	500	1000	500	1000
93°C	750	500	500	500	500	500	500	500	500	500	500	750	500	1000
121°C	750											750		1000
149°C	750											750		1000

Here is a video of an 800ah Lithionics Lithium battery upgrade on a Leisure Wonder RTB, <https://youtu.be/5JJVvasaj18>.