

## **600 AH Lithium Battery Installation**

This is a project we did to improve and enhance the function of our coach for the way we choose to use it. You might choose to do it a different way or not do it at all.

### **What we did:**

600 amp hrs of Battle Born LiFePO4 GC2 were batteries installed in the space used by 2 8Ds.

Each battery has its own 36 watt heaters powered by the batteries themselves.

Each battery is wired to common bus bars.

Both plus and minus connections are switched.

The plus side is fused. The minus side has a shunt with temperature sensor for a Victron BMV 702 battery monitor

A battery temperature sensor is connected for the Victron 3000VA Multiplus inverter/charger.

A battery temperature sensor is connected for the Sterling 120 amp Battery to Battery Charger.

A custom made battery rack was fabricated.

A Sterling 120 amp Battery to Battery Charger was installed with a remote control/display panel.

### **The Battle Born batteries and start batteries are charged in several ways.**

- While driving the ignition controlled Sterling 120 amp Battery to Battery Charger provides up to 120 amps to the Battle Born batteries using a 4 stage lithium battery charge profile. The 240 amp Delco Remy 40si alternator charges the start batteries and provides power to the Sterling B2B charger. The Sterling B2B charger prioritizes the charge level at the start batteries.
- 1200 watts of roof top solar charges both the Battle Born batteries and the start batteries using a Victron SmartSolar MPPT Charge Controller and a Victron Argofet zero voltage drop isolator.
- A Sterling ProCharge Ultra 40 amp 4 stage smart charger charges both the Battle Born batteries and the start batteries using a 4 stage lithium battery charge profile if it is on.
- The Victron 3000VA Multiplus will charge the Battle Born batteries in a multi-stage lithium friendly change profile if the charger is on.
- The Victron 3000VA Multiplus will charge the start batteries as well if it is on.

### **Cold Weather Operation.**

I added two 18 watt thin film heating panels (about 3"x3"), one on each side of the batteries and covered them with a layer of thin foil backed insulation. The pair of heating panels provide up to 36 watts of heat to each battery. There is an on/off switch for the heating system and a high/low switch as well. For all six batteries the total of the contact heating panels is 216 watts.

The batteries themselves provide power to the heaters. In extreme conditions the heat generated by the panels as well as the internal heat in the batteries because they are providing about 3 amps each will warm the batteries enough so that they will begin to charge. Once they start to charge that process generates more internal heat until the batteries are fully functional even at low temperatures. It is really the internal battery temperature that drives this process not the ambient temperature.

### **Connections.**

There is no longer a House and Start battery isolator. There are no combiners or any other inter-battery bank connections. The boost solenoid is still functional if that need arises.

The Sterling Battery to Battery Charger is located in the LP bay (no big LP tank any longer). Power to it comes via a fused 4/0 cable from the start battery power stud in the engine bay to a bus bar in the LP bay. The B2B charger in and out sides (120 amp max) are connected with short 2/0 cables. The output side is fused and connects to another bus bar. A 3/0 cable from that bus bar connects to a coach common positive stud behind the white panel in the main storage bay. When not powered the Sterling B2B charger effectively isolates the start and lithium batteries.

Power from the lithium battery connected bus bars in the LP bay power a smaller Victron 800VA inverter located about 4 ft away through a switch and fuse. This smaller inverter powers the residential refrigerator and all of the front end electronics through a distribution panel and circuit breaker.

The Delco Remy 240 amp 40si alternator connects to the start battery power stud in the engine bay with a 4/0 cable. A short cable connects to the start battery side of the boost solenoid and then another cable to the start batteries.

A house battery power stud in the engine bay connects to a coach common positive stud behind the white panel up front with a 4/0 cable. A short cable from the engine bay house battery power stud connects to the house battery side of the boost solenoid.

Solar power and the Sterling ProCharge Ultra charger are connect to the start battery power stud and the house battery power stud both in the engine bay. Solar power uses a small Victron Argofet zero voltage drop isolator to split power to the house and start sides. The Sterling UltraPro charger has independent outputs for the house and start sides.

### **Results**

After removing our 8 year old Lifelines and the upper and lower battery racks (about 580 lbs) and the 4-DC400-6 Full River Batteries and the battery rack (about 550 lbs) and replacing them with 6 Battle Born GC2 batteries and a new rack and cables (about 180 lbs) our coach is lighter by about 950 lbs.

The Full River DC400-6 batteries found a new home in Ted and Karen's coach. My three aging but functional Lifelines as well as Ted's two aging but functional 8D batteries are now being charged by our home rooftop solar array and will provide 2-3 days of basic lighting, well pump operation and refrigerator power in the event of a power failure. In 19 years our longest power outage has been an hour.

Comparing notes with other Lithium battery users confirms my expectations that on most days solar will fulfill or exceed our daily needs and leave the batteries at or near full charge. We expect to be independent of power connections or generator use when we choose for extended periods of time. We expect to never have to replace a house battery during the time we think we will continue to own and use the coach.

## Parts

Batteries

[100Ah 12V GC2 LiFePO4 Deep Cycle Battery - Battle Born Batteries](#)

Battery to Battery Charger

[Sterling Battery-to-Battery Charger - 12V-12V 120 Amp](#) Sterling Battery-to-Battery

Charger - 12V-12V 120 Amp

Victron Argofet Isolator

[Victron Argofet Battery Isolator](#)

## Was it worth it?

Many will ask this question. This is definitely an upscale extra cost choice. Lithium battery prices are coming down. the Charge while driving and cold weather operation issues are easily dealt with. Most of us are never going to be anywhere where the high temperature limits are exceeded. It is worth considering if:

- You plan on owning your coach for a longer period of time.
- Independence from land lines and a generator are a priority.
- Weight savings is a consideration.
- You have or are going to add sufficient solar capacity.
- Your power demands are going up, maybe from a 12v or 120v refrigerator conversion or a residential refrigerator.
- Or maybe you just want to do it.

We think it will prove to be worth the effort and expense for our purposes. Nothing else really matters.

## Special Thanks

No project like this is done without some help and learning from others experience.

**Alan Ferber** at Bay Marine Supply for his endless support, encouragement and help with prices.

**Peter Flemming** whose encouragement and critical thinking help make some of these projects work.

**Ted and Karen** whose choice to move up to Full River Batteries forced me to make a choice helped make this a bit more affordable.

**George Denninghoff** whose trail blazing I followed and real world experience helped me see what was possible.

Thanks!