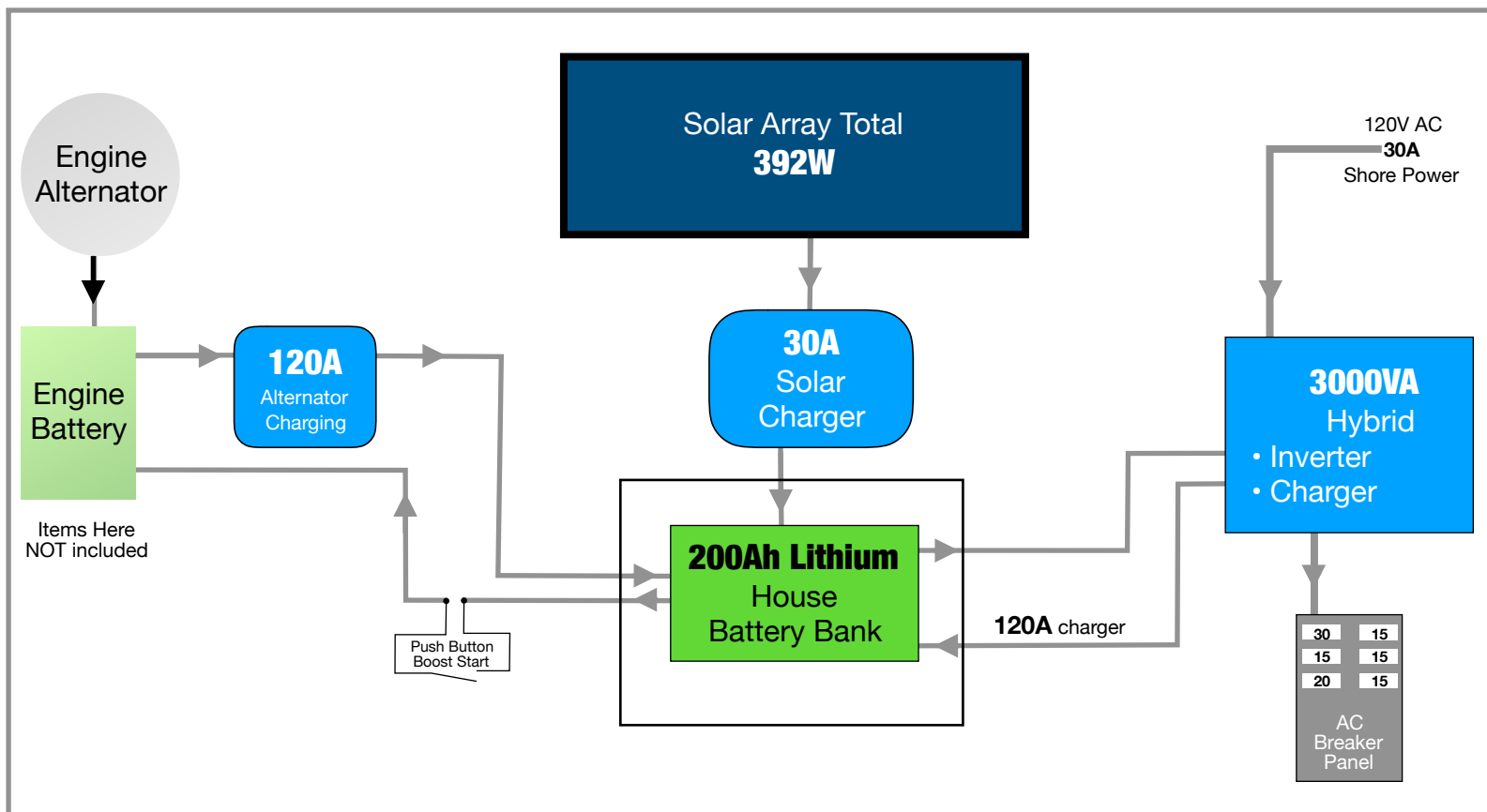




Installation Guide



Online Guide



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1. Tips and Tricks-----	Helpful tips and suggestions to ensure a successful installation and give you an accurate understand of what you are getting yourself into
2. Tools -----	Tool suggestions to prepare for the work ahead along with some friendly advice
3. System Overview -----	Diagram showing all of the various components, cables & connectors, detailing connections for each subsystem in the kit
4. Bill Of Materials-----	Complete bill of materials broken down by subsystem listing quantities, part numbers and descriptions with QR codes to link data sheets for major components
5. Installation: Battery Bank -----	Detail of the Battery Bank subsystem connections and components
6. Installation: Solar Charging -----	Detail of the Solar Charging subsystem connections and components
7. Installation: Alternator Charging & Boost -----	Detail of the Alternator Charging subsystem connections and components
8. Installation: AC Input and Output -----	Detail of the AC Input and Output subsystem connections and components
9. Installation: DC Distribution -----	Detail of the DC Distribution subsystem connections and components
10. Programming & Commissioning Your System	Detail of how to program the various different components of your system



General Guidelines and Tips

Congratulations on your purchase of a power system designed by AM Solar! We have assembled this kit to take the guess work out of putting together a complete solar solution. Now the fun begins - It's time for installation. Please read the guidelines below to help ensure a smooth project completion.

Stay safe

Remember that you will be working with both AC and DC power, so whenever possible avoid working with "live" components. Always use caution when working with electricity. When this guide is followed, you'll have a safe and successful installation. Be careful, not frightful - The installation can be fun when following these instructions and not cutting corners.

Keeping a realistic time frame for installation is important

This installation might take 4 to 5 days for an experienced AM Solar technician. So, establishing a realistic goal for completing the installation is helpful and avoids rushing aspects of the project. You'll want to stay consistent with your work beginning to end, without the need to rush.



Don't rush the layout and planning of component placement

The design/layout part of your build is the most important thing you'll do. Skoolies, by design, are great since they start empty and give you many different installation options. Grab some chalk, cardboard, rope and a ball of string - We're going to make some component placement templates. Use chalk to outline spots for smaller items such as breakers and the fuse panel. Use the string to make the small wire runs, rope for heavy gauge, and label them (tape and stickers works well). Then layout the all the components that fit the interior of your rig to prepare for installation.



Keep it organized

Stay organized by making your work tidy and well planned. Read the included product guides / instructions and **ABC** (Always Be Checking). If you are installing and find that something was missed during your layout and planning and can't be installed correctly or safely, don't worry! Just backtrack to that stage in your layout design, and find an alternative placement before moving forward.



Making it last

No matter how long you plan on keeping this kit, it's only going to be useful and have value if it's in good order. This equipment doesn't react well to neglect or abuse. When planning and performing the installation, use proper technique and plan for the long run. Using duck tape to secure a part in place might be a good emergency fix, but you'll want to start as "clean" as possible from the beginning.



Component Proximity

Always keep high current lines as short as possible. The battery to inverter cable should be under 10 feet, 5 feet would be ideal. If you are mounting all the equipment in a very small area, be aware of the distance between all "connection points" - If a component comes loose and shifts for any reason, you will want to ensure it will not result in components touching each other and possibly causing a short.



Suggested Tools For Installation

Here is a list of some of the tools that might be needed for your installation. If you feel this list is too ambiguous or potentially intimidating, now would be a great time to schedule your installation work with the professionals at AM Solar.

- Sturdy Ladder
- Hammer Crimper
- Hammer
- Heat Gun
- Wire Crimper
- Wire stripper
- Cable Cutter
- Multimeter
- Screwdriver
- Smartphone
- PC
- Drill
- Box knife
- 91% Isopropyl Alcohol
- Cleaning rags
- Crescent wrench
- Safety glasses





Bill of Materials



Solar Panels



Lithium Battery

QTY	AMS PN	MFG PN	Description
SOLAR CHARGING			
4	SOLAR-ZS100		Solar Panel Z100
16	MOUNTA-35		Mount Adapter-35mm
8	MOUNTL-3		L Foot-3 Hole
8	MOUNTL-T3		L Foot-Tall 3 Hole
16	FSTBLT-TKNOB		T Mount Knob
16	FSNUT-ZMP-SPRING		Spring Nut for Zamp Omni Frame
16	FSTBLT-1412SS		Bolt-Hex 1/4-20x1/2 SS
16	FSWASH-FLT-5/16		Flat Washer 5/8 OD- 5/16 ID S
16	FSWASH-SPL-1/4		Washer-Split 1/4" SS
32	FSTSCW-1034SS		Screw-#10x3/4" PHP SMS SS
40	TAPE-VHB		3M VHB Tape-4950
1	30s-VT-MPP-30A		SunRunner Victron MPPT 30A
4	93C-ZCBNR		Zamp Plug & Strain relief for C-Box
1	20-ROOF		Roof Combiner Box
1	SEAL-SLVL		Dicor Self Leveling Sealant
2	SEAL-SKF		Sikaflex 221
ALTERNATOR CHARGING			
1	RELAY-VTC120	CYR0101204	(Li 120A) Cyrix-Li-ct 12/24V-120A Intelligent Li-ion battery combiner
2	LUG-18GA-FAST-F	30513	Female Fast-on 18 ga.
2	LUG-10GA-STD-1/4	32003	10-12 1/4" Stud Size Non-Insulated
1	LUG-10GA-STD-10	32002	10-12 #10 Stud Size Non-Insulated
1	FUSEHLD-MINI		Mini Fuse Holder & Cap
2	FUSE-MINI-002A		Mini Fuse-2 Amp
1	SPLICE-14-BUTT-SD		14-16 ga. Butt Step-Down
5	CABLE-18GA-1-BLK		18 ga. Black Wire
1	CABLE-18GA-1-RED		18 ga. Red Wire
1	LUG-18GA-RING-BR	30006	18-22 ga. Ring-Bare
0.5	HS-BLK-DWALL-3/8	HSDW38-0	Heat Shrink 3/8" Black
0.5	HS-RED-DWALL-3/8		Heat Shrink 3/8" Red
2	SPLICE-18-BUTT-HS	30980	18-22 ga. Butt-HS
BATTERY BANK			
1	MONITOR-VTBMV-S	BAM0307120	Victron Battery Monitor BMV-712 Smart
1	TEMP-VTBMV	ASS0001000	Victron Temperature sensor for BMV-700 series
1	BATTU-BB-100	BB10012	Battle Born LiFePO4 12V100Ah
2	LUG-4/0-RING-3/8	5339	4/0 Lug-3/8" Ring
2	93H-B3/4		Heat Shrink Black 1.5" x 3/4"
2	CABLE-4/0-1-BLK	4727	Cable-4/0
1	BATTU-BB-100	BB10012	Battle Born LiFePO4 12V100Ah
4	LUG-4/0-RING-3/8	5339	4/0 Lug-3/8" Ring
2	FSTBLT-516114SS		Bolt-Hex 5/16-18x1-1/4 SS
2	93H-R3/4		Heat Shrink Red 1.5" x 3/4"
2	93H-B3/4		Heat Shrink Black 1.5" x 3/4"
3	CABLE-4/0-1-BLK	4727	Cable-4/0
AC INPUT/OUTPUT			
1	INV-VT-2000	CMP1220201	MultiPlus C 12/2000/80-50 - 120V Inverter/Charger combi.
1	MONITOR-VTDM	DMC000200C	Digital M. Contr.200/200A GX
1	CABLE-VT-RJ45-5	ASS0300650	RJ45 UTP Cable 5 m
1	CABLE-VT-MK3USB	ASS0301400	Victron MK3-USB Interface
8	LUG-4/0-RING-3/8		4/0 Lug-3/8" Ring
12	CABLE-4/0-1-BLK		Cable 4/0
1	STRN-5-11/4	CHE 2633	Strain Relief 1-1/4"
6	93H-R3/4		Heat Shrink Red 1.5" x 3/4"
2	93H-B3/4		Heat Shrink Black 1.5" x 3/4"
1	95F-CLST-300A		300A Class T Fuse & Holder
1	FUSE-CLST-300A		Spare 300 Amp Fuse
1	WIRETIE-05	GT-40S-0	Black Wire Tie 5-7/8"
1	93S-MINI		Switch-Mini On/OFF with Screws
16	CABLE-10GA-3-GRY		Stranded 10/3
1	BOX-SPBS		Sub Panel Brkr. Box-Surface
1	BRKR-AC-BRKR-030A		AC Breaker 30A
1	BRKR-AC-BRKR-15/15		AC Breaker 15A/15A
1	BRKR-AC-BRKR-020A		AC Breaker 20A



Inverter / Charger



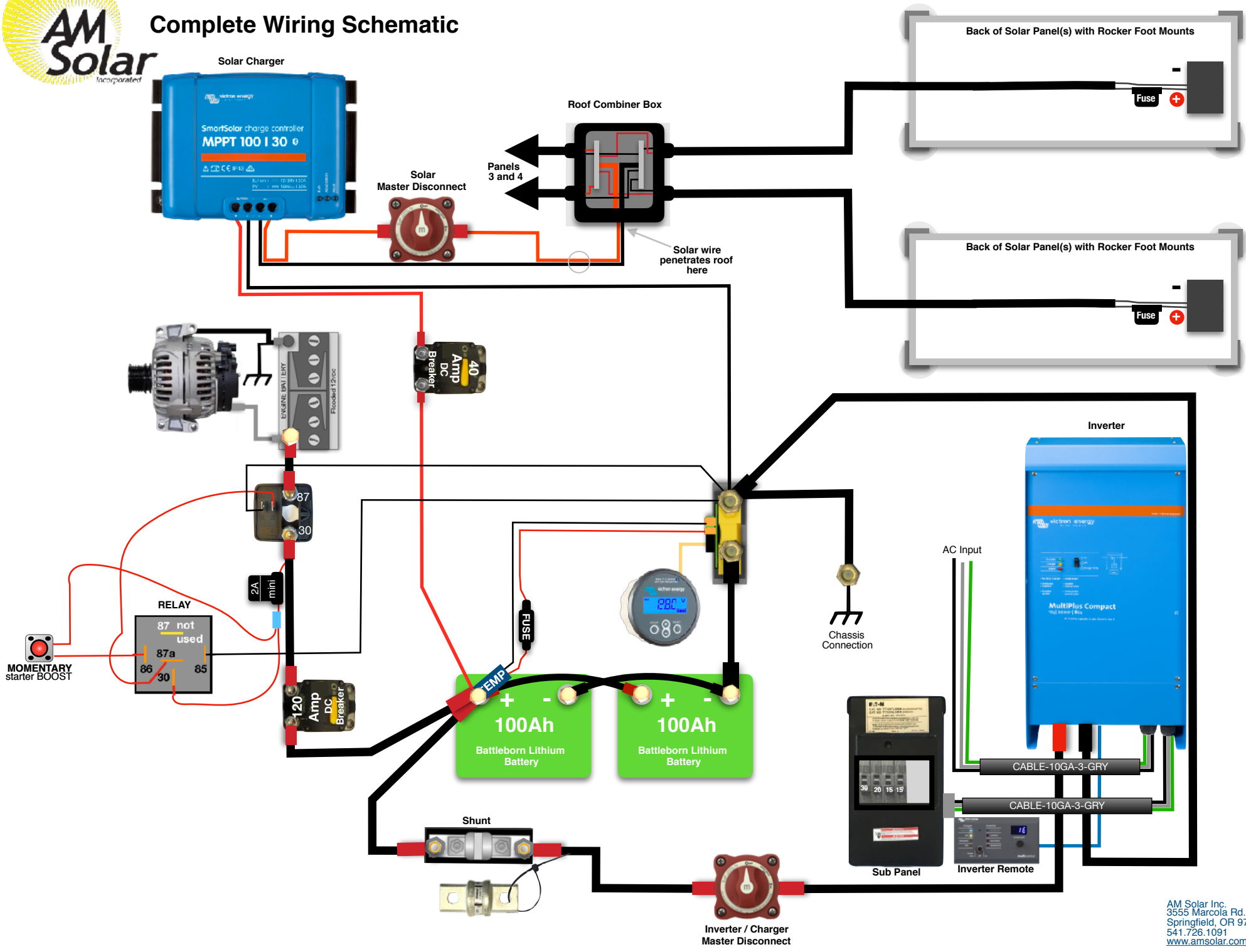
Charge Controller



Battery Monitor



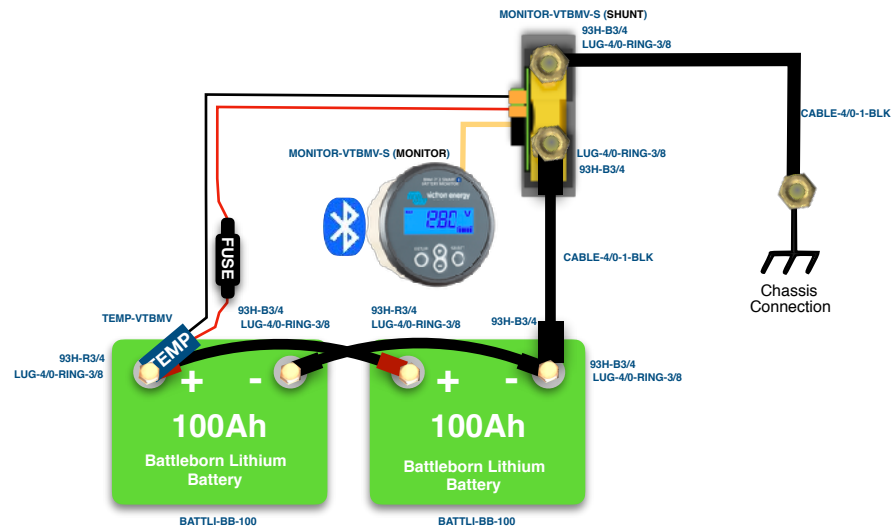
Complete Wiring Schematic

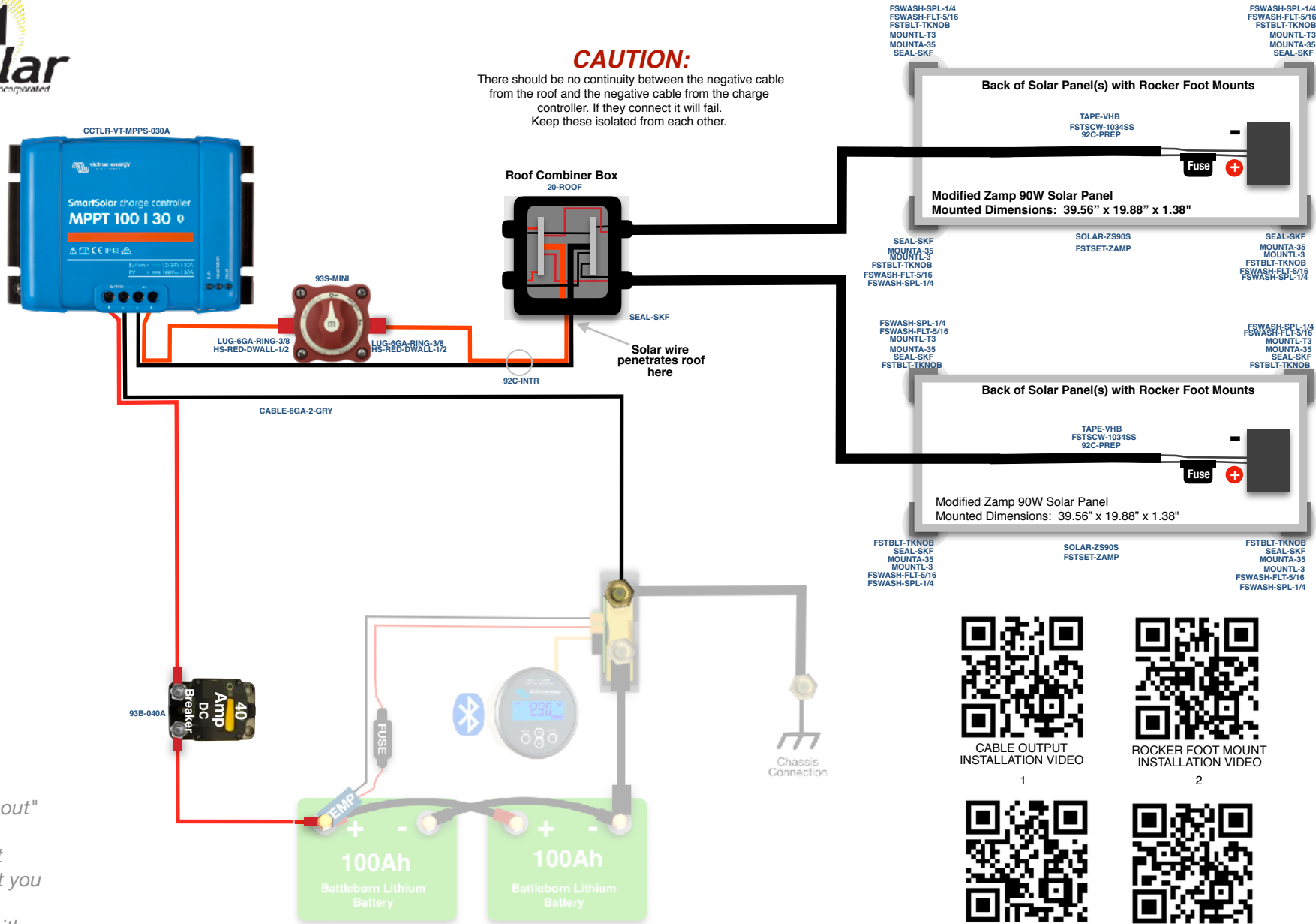




Battery Bank

The battery bank is the heart of the system. Its components usually take up the most space and all other subsystems connect to it. That's why we recommend installing it first. This battery bank consists of a 200Ah Lithium Battery. The Bluetooth battery monitor reads all charging and discharging current through a shunt and is able to interpret that data to compute battery usage, remaining energy, percent charge, etc. When a shunt is used, the load side of the shunt becomes the new negative battery terminal and no negatives will connect to the actual battery.

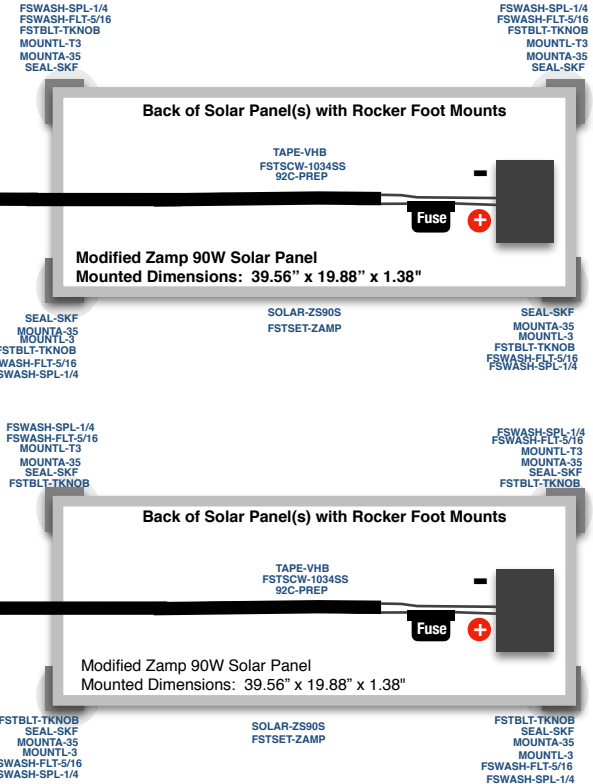




CAUTION:

There should be no continuity between the negative cable from the roof and the negative cable from the charge controller. If they connect it will fail. Keep these isolated from each other.

Solar wire penetrates roof here



NOTICE:
The "greyed out" battery bank items are not included, but you will be interacting with them.



CABLE OUTPUT INSTALLATION VIDEO

1



ROCKER FOOT MOUNT INSTALLATION VIDEO

2



SOLAR PANEL INSTALLATION VIDEO

3



ROOF COMBINER BOX INSTALLATION VIDEO

4



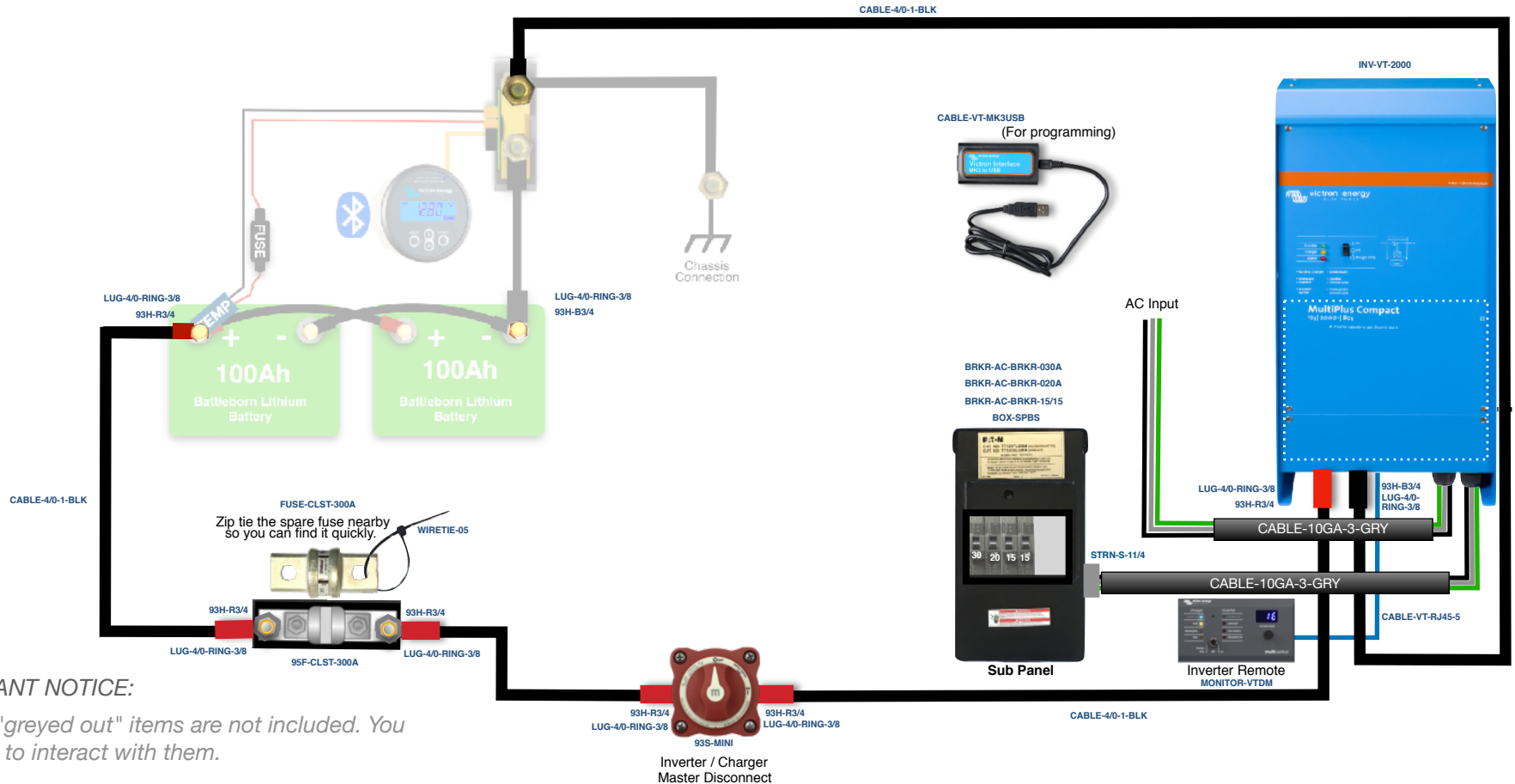
If the connections seem tight on the MPPT, that is normal. Scan here for assistance.



AC Input & Output

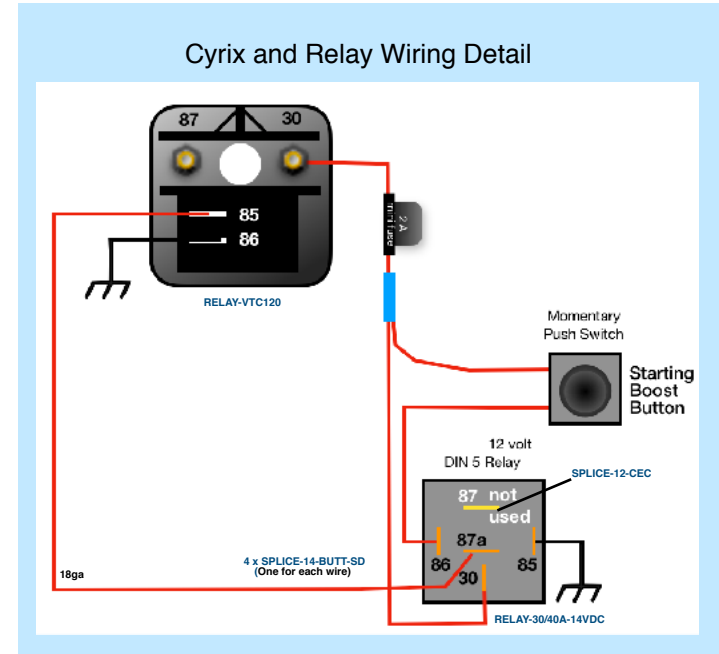
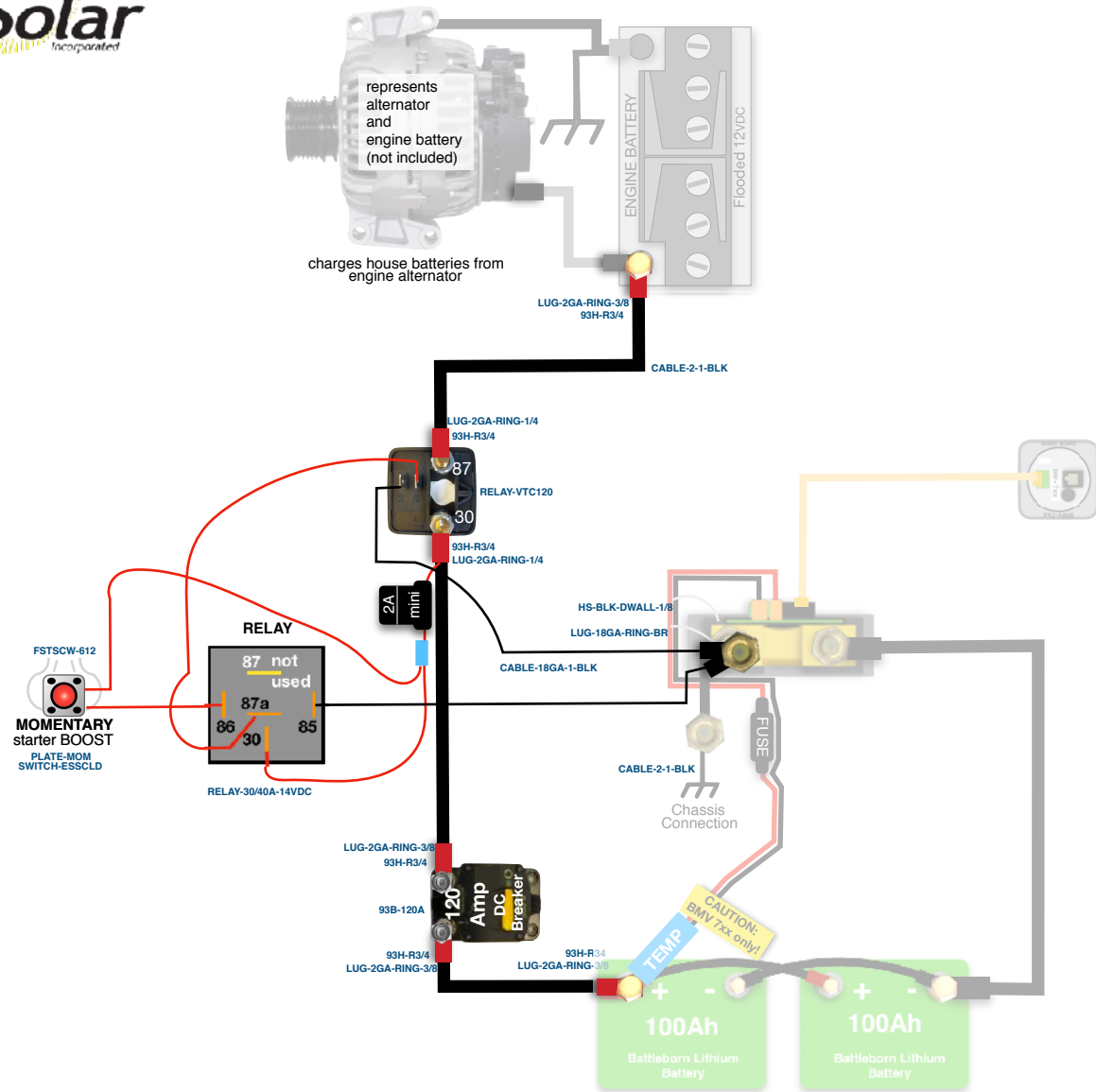
The AC Input/Output system is capable of plugging into a standard 30A shore power outlet. (Note: Adapters from 30A to 15A outlets can be purchased at hardware or RV supply stores). The shore power charges the battery bank and can also be passed through the inverter to the AC loads. If the loads draw more current than the shore power connection can provide, the inverter can meet the demand up to the rating of the inverter by simultaneously drawing from the battery bank. When not plugged into shore power, the inverter will draw from the battery bank to power the AC loads. When not in use, save energy by turning off the inverter via Digital Multicontrol included in the kit.

CAUTION:
Household alternating electricity (AC) is dangerous. Use care and common sense.



IMPORTANT NOTICE:

ALL the "greyed out" items are not included. You will need to interact with them.



Cyrix (Enlarged)



Cyrix Connections





Programming / Commissioning Your System - The Charge Controller

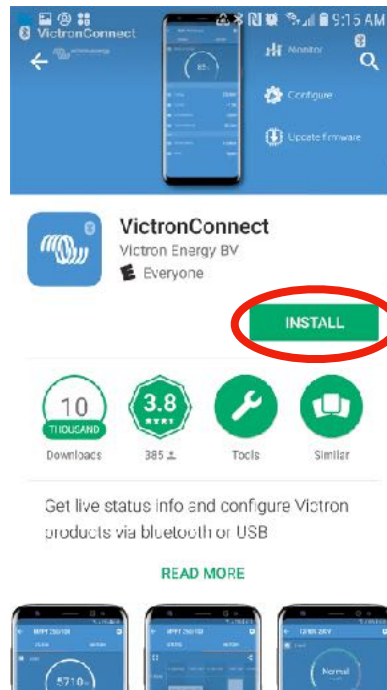


Charge Control Settings for Lithium Batteries:

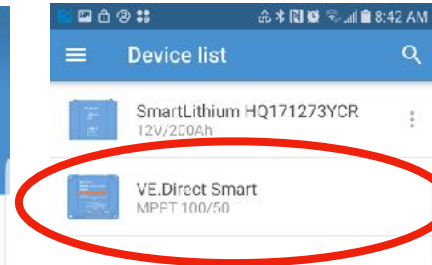
1. Download the "VictronConnect" App to your phone.
2. Open the App.
3. You'll see a selection for your SmartSolar MPPT Charger, select it.
4. Type **000000** to login for the first time.
NOTE: To change the PIN code, go back one step to the main screen. Click on the 3 buttons to the right of the controller image, and select "Reset PIN Code".
5. Click on the **gear** in the top right corner.
6. Click on "Battery".
7. Click on the settings and adjust them accordingly to match below:
 - Battery voltage: 12V
 - Max charge current: 50A (In this example)
 - Use default charge settings: OFF
 - Charger: ON
 - Absorption voltage: 14.30 V
 - Absorption Time Limit: 01:00
 - Float voltage: 13.70 V
 - Equalization voltage: 14.30 V
 - Auto Equalization: DISABLE (OFF)
 - Temperature compensation: OFF

Victron Blue Solar MPPT with Bluetooth or MPPT Control

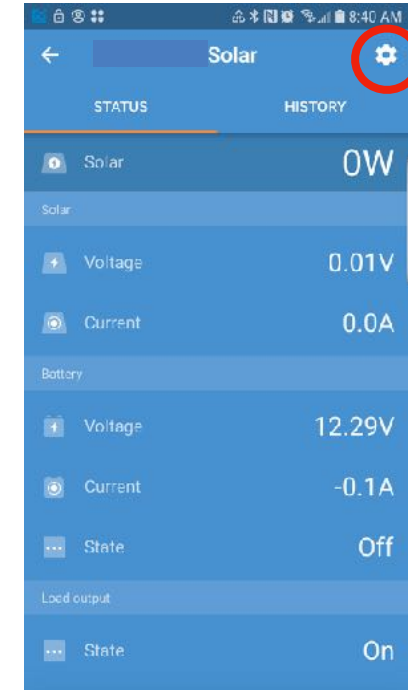
Absorption Voltage	14.30V
Absorption Time limit	1:00
Float Voltage	13.70V
Equalization Voltage	14.30V
Auto Equalization	OFF
Temperature Compensation	OFF
Temperature Compensation	OFF



Download VictronConnect In App Store



Device List within VictronConnect



MPPT Charge Controller Screen



Updating Firmware and Programming a Multiplus Inverter

What you are trying to accomplish:

Victron inverters don't always ship out from the factory with the latest version of firmware. You will want to install the latest version of the firmware and install the custom settings that depend on the type of battery bank you are using. The firmware is developed by Victron. The custom settings are developed by AM Solar to work with the systems that we designed. This required adapter cable is included with the kit, so you'll have it on hand for any future updates.

What you need:

- Tablet/Laptop/PC running Windows with an internet connection and a USB port
- Philips screw driver
- MK3-USB adapter cable
- RJ45 cable
- Victron Multiplus Inverter

NOTE: Before you connect your MK3 for the first time, be sure you are connected to the internet.



Step 1:

Download the communication software from Victron.

You will need the latest versions of VEFash and VEConfig downloaded from the Victron website onto your PC.

- Go to this website: <https://www.victronenergy.com/support-and-downloads/software>
- On the right side of the page click the download link for **VE Configuration tools** and download the file to your desktop.
NOTE: Remember the location of the download on your computer, so you can open the file later.
- You will now install the program. Double click the file you downloaded.
- Your PC may prompt you with a message "Do you want to allow..." click **YES**.
- A window will pop up that says "Welcome to the VE Configure tools Setup Wizard". Click **Next>**.
- The window will say "Select Additional Tasks", check the boxes next to **VEConfig** and **VEFlash**, this will put the programs on your desktop so you can find them easily. Click **Next >**.
- The window will say "Ready to Install", click **Install**.
- The window will say "Completing the VE Configure tools Setup Wizard", uncheck **Start VEConfig when setup finished**, and click **Finish**.

Step 2:

Download the program files from the AM Solar website.

- Go to: <http://amsolar.com/victron/cable-vt-mk3usb> or you can navigate to this page by going to www.amsolar.com, typing "**Mk3**" into the search bar below the picture, click **ENTER**, and then on the next page click on the link to the **Victron MK3-USB Interface**.
- Scroll down to the black boxes with white lettering with labels "Firmware" and "Battery settings".
- Click to download the firmware corresponding to the inverter model that you are using, this is either MULTIPLUS 2000 or MULTIPLUS 3000, save the .vff file to your desktop. Your computer may ask you what program to use to open the file, close out of that. You don't want to open the file, you just want to download it. Only an inverter can open that file.
- Click to download the appropriate battery settings for the type of system you have. This could be "V4 SIGNATURE LITHIUM" or "LIFELINE AGM" as examples. Save the file to your desktop.



Step 3:

Preparing your inverter and physically connecting your PC.

In order to do this step, your inverter system needs to be fully installed and connected to the battery bank.

- a) Turn the black inverter switch on the faceplate to the OFF position (middle position for the rocker switch).
- b) Turn any breakers supplying the inverter with AC to the OFF position.
- c) Using a Philips screw driver remove the four screws on the inverter faceplate and remove the faceplate.
- d) Unplug all RJ45 cables.
- e) Plug the MK3-USB Adapter's USB port into your PC's USB port.
- f) Plug one end of an RJ45 cable into the MK3-USB Adapter's port and plug the other end into one of the inverter's ports.

Step 4:

Updating the firmware.

If the steps on this list don't exactly match up with what your computer does, you may want to try using a different PC. Sometimes the "Next>" button is missing. If that happens, just click ENTER to go to the next step.

- a) Find the VEFash icon on your desktop and double click it.
- b) A "Welcome" screen will pop up. Click **Start**.
- c) The window will say "Select required action", leave the toggle on "Update the firmware" and click **Next>**.
- d) The window will say "Warning", click **Next>**.
- e) The window will say "Select file", click **Browse**.
- f) Select the .vff firmware file you downloaded to the desktop in Step 2 and click **Open**, then click **Next>**.
- g) The window will say "Prepare your system", click **Next>**.
- h) Turn the inverter ON by pushing the black button upward (away from the cables coming out the bottom).
- i) The window will say "Select a comport", click **Auto detect comport**. A window will pop up while it searches for the comport. After the window disappears click **Next>**.
- j) The window will say "Connect part 1", turn the inverter OFF by pushing the black button back toward the center position. Click **Next>**.
- k) The window will say "Connect part 2", turn the inverter back ON with the black button. Click **Next>**.
- l) The window will say "Ready to program", click **Next>**.
- m) The window will "Busy" as an animation shows data going into a microprocessor. When the animation stops, click **OK**.
- n) The window will disappear and your inverter firmware will have been updated.
- o) Disconnect power to the inverter and then reconnect it.

Step 5:

Uploading battery settings.

- a) Find the VEConfig icon on your desktop and double click on it.
- b) A warning window will pop up. Click **OK**. The warning will disappear, leaving the VEConfigure window.
- c) Click on the **Port selection** tab, mouse over **Com port**, click on **Auto detect (not for MK1)**.
- d) After a couple seconds of initialization the window will show inverter status. Click on the **File** tab and click on **Load settings**.
- e) A browsing window will pop up. Select the battery settings file you downloaded in Step 2. Click **Open**.
- f) A window will pop up saying "It is not allowed to make this charge in the grid code..." Click **No**.
- g) Click on the **Send settings** button.
- h) Click on the "**all settings**" toggle, then click **OK**.
- i) A window will pop up saying "Would you like to send the assistant setup to the device?" Click **Yes**.
- j) A window will pop up saying "Writing block..." this will count through several blocks then disappear. A new window will pop up saying "Assistant setup successfully written to target." Click **OK**.
- k) Congratulations, your inverter is now fully programmed. You can close out of the VE Configure program.

Step 6:

Put the inverter back together.

- a) Turn the inverter OFF with the black button by pushing it down to the center position.
- b) Physically unplug the RJ45 cable that is connected to the MK3-USB adapter from the inverter.



What To Do if the Port is not Recognized - Getting MK3 Compatible USB Drivers

- Open VE Configure.
- Go to the Special Tab at the top —> Dropdown to USB Drivers.
- It will pull up a message screen, click yes.
- You will download a file now, it will bring up the download destination screen. Put the file in a location you can find later.
- You will see a success message.
 - You can close VEConfigure after getting that driver downloaded.
- Next go to to the Device Manager on your PC.
 - If you can't locate it, just search for "Device Manager" in the search bar.
- Scroll down to "Universal Serial Bus Controller" which should be near the bottom.
 - Expand the list of devices
- Take a photo of the list of devices
- Unplug the MK3 from the USB port.
- See which device was removed when compared to the photo. It should be "USB Serial Converter".
- Plug the MK3 back in to the USB port.
- The device will reappear. Highlight the device and click on properties.
- Go to "General" at the top.
- Click on "Change" Settings.
- Click on "Drivers" at the top.
- Click on "Update Drivers".
- Click on "Browse my computer for driver software"
- Locate the folder that you downloaded it to at the beginning, select the folder.
- It will state the driver is installed - You are finished with this portion.

Now we want to go back to step 4 above, and the port should be recognized with the MK3.

Troubleshooting:

If the cable is connected to the inverter and powered on without internet connectivity.

- a) The update file will be corrupted, and must be re-installed from step one. Be sure to be connected to the internet before plugging in the MK3 into the inverter and power cycling.



Programming Your BMV-712 Smart Battery Monitor for Battleborn Lithium Batteries

Programming on the BMV-712 Battery Monitor in the Victron Connect App:

1. Download "VictronConnect" from the Google Play Store (picture 1).
2. Turn on your Phone's Bluetooth, and get as close as possible to your Victron Component(s).
3. Open the Victron Connect app, and after it takes a moment to scan it will recognize your BMV-712.

NOTE: If your device is not shown, it is probably signal interference. Try closing the app and moving to a different location before re-entering the app in a location that can pick up the BMV's signal.

4. Select the BMV-712 on the Device List (picture 2).
5. Press the gear icon in the top right corner (picture 3).
6. Enter "Battery" and change the values to match the colored box at the top right (screen shown on picture 4):

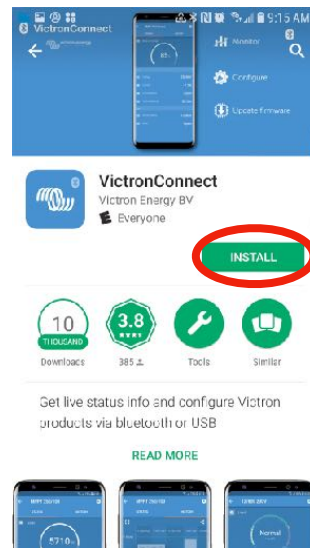
7. **Changing Battery Capacity:** Enter the number of Ah of your entire battery bank.
8. **Charged Voltage:** 14.3
9. **Tail Current:** 2%
10. **Peukert Exponent:** 1.1
11. **Charge Efficiency Factor:** 98%
12. Go back to Settings, enter "Misc"
13. **Aux Input:** Select "Temperature"
14. **Temperature Unit:** Select "Fahrenheit"
15. Exit from settings, you have completed programming.

NOTE: Only one phone can be connected to each device at a time. Be sure to completely disconnect and close the app to log out.

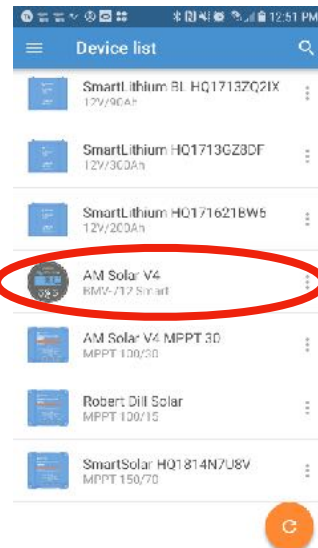


Program Settings for Battleborn Batteries

- **Battery Capacity:** Enter the total battery capacity in Amp Hours.
- **Charged Voltage:** 14.3
- **Tail Current:** 2%
- **Peukert Exponent:** 1.1
- **Charge Efficiency Factor:** 98%
- **Aux Input:** "Temperature"
- **Temperature Unit:** "Celsius" or "Fahrenheit"



1



2



3



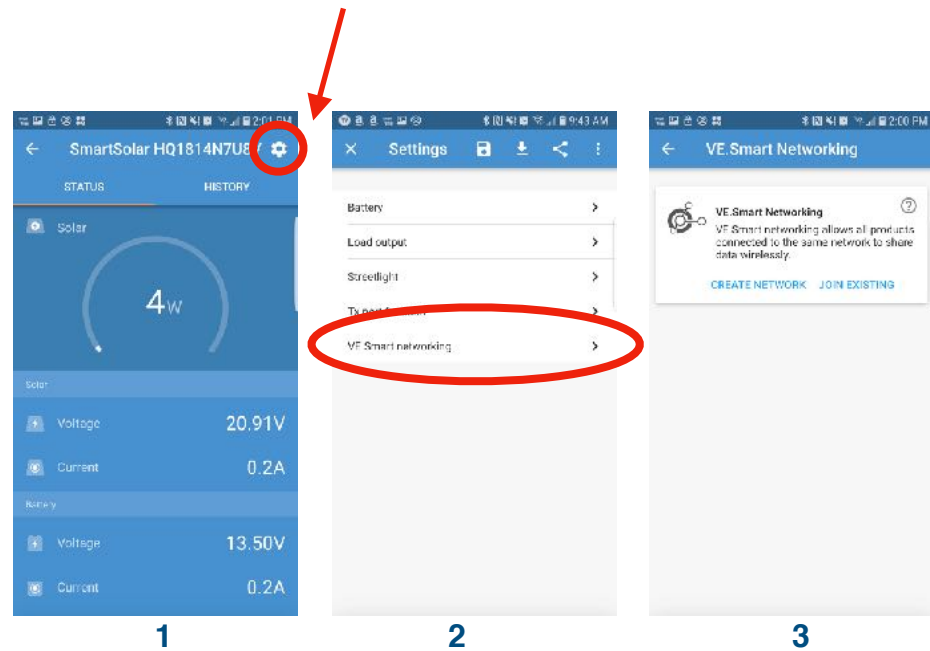
4

NOTE: To change the PIN code from the app, go back to the device list page in the app. Click on the three circles to the right of your device, and select "Reset PIN code".



Creating The Network

1. When in the Victron Connect App, click on one of your devices.
2. Go to “Settings” (shown as a gear symbol in the top right, picture 1).
3. Go to “VE.Smart networking” (picture 2).
4. Go to “Create Network” (picture 3).
5. Enter a name for your network (picture 4).



Linking Each Device:

1. Enter the Victron Connect App and click on a device.
2. Go to “Settings” (shown as a gear symbol in the top right, picture 1).
3. Go to “VE.Smart networking” (picture 2)
4. Go to “Join Existing Network” (picture 3)
5. Select the network you just created (picture 5).
6. This device is now joined to the network (picture 7). Repeat this step for every other bluetooth enabled device.

