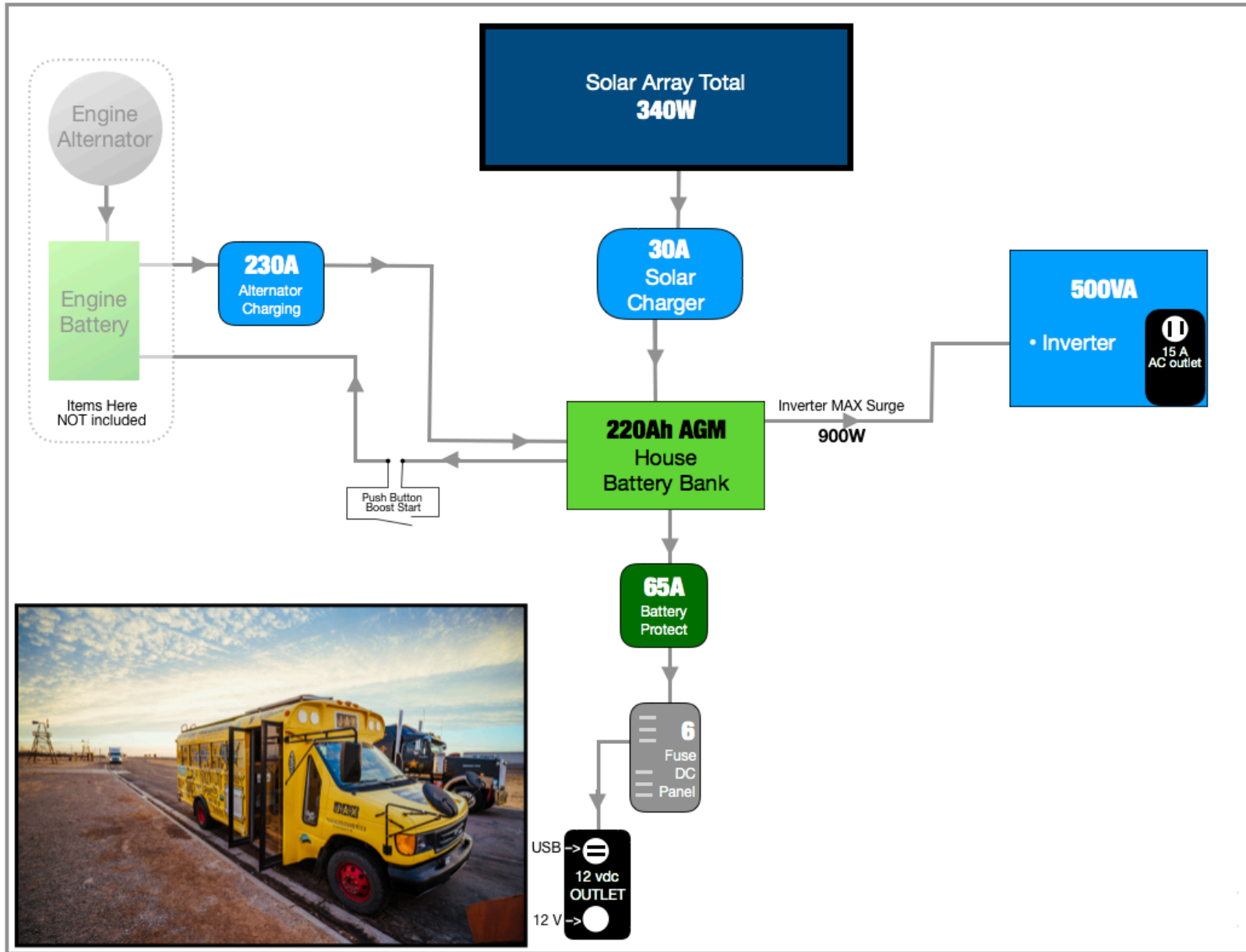




# Installation Guide



Online Guide



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<b>Tips and Tricks -----</b>	<b>Helpful tips and suggestions to ensure a successful installation and give you an accurate understand of what you are getting yourself into</b>
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<b>System Overview -----</b>	<b>Diagram showing all of the various components, cables &amp; connectors, detailing connections for each subsystem in the kit</b>
<b>Bill Of Materials -----</b>	<b>Complete bill of materials broken down by subsystem listing quantities, part numbers and descriptions with QR codes to link data sheets for major components</b>
<b>Complete Schematic -----</b>	<b>Detail of the entire system</b>
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<b>Programming &amp; Commissioning Your System -----</b>	<b>Detail of how to program the various different components of your system</b>



## 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

		QTY	AMS PN	Description			QTY	AMS PN	Description		
99-VT0302X170	SOLAR CHARGING	2	SOLAR-ZS170	Solar Panel Z170	99-VT0500KIT	AC OUTPUT	1	INV-VT-500	Victron Phoenix 12/500-120V VE.D Invrtr		
		2	91M-35MZ	Mount Set - 35mm Zamp			4	FSTSCW-1034Z	Screw-#10x3/4" PHP SMS Z		
		1	30s-VT-MPP-30A	SunRunner Victron MPPT 30A			4	FSWASH-FLT-1/2	Flat Washer 1/2" OD- #10 ID Z		
		2	93C-ZCBNR	Zamp Plug & Strain relief for C-Box			5	CABLE-8GA-2-GRY	Duplex-8/2		
		1	20-ROOF	Roof Combiner Box			1	93B-120A	120 Amp DC Brkr. w/Screws		
		1	SEAL-SLVL	Dicor Self Leveling Sealant			1	93T-POS-8GA	8ga Brkr Pos Term Kit		
		1	SEAL-SKF	Sikaflex 221			1	93T-NEG-8GA	8ga Negative Terminal Kit		
		1	MONITOR-VTBMV-S	Victron Battery Monitor BMV-712 Smart			15	CABLE-18GA-2-GRY	Duplex-18/2		
		1	TEMP-VTBMV	Victron Temperature sensor for BMV-700 series			2	LUG-18GA-FAST-F	Female Fast-on 18 ga.		
		2	BATTAGM-06-220AH	AGM-GPL-4CT 6V 220Ah			1	SWITCH-WALL	12V Wall Switch, Chrm		
40-AGMBMV220	BATTERY BANK	4	LUG-4/0-RING-3/8	4/0 Lug-3/8" Ring	2	FSTSCW-612-SS	Screw-#6x1/2" PHP SS				
		3	93H-B3/4	Heat Shrink Black 1.5" x 3/4"	15	CABLE-6GA-2-GRY	Duplex-6/2				
		1	93H-R3/4	Heat Shrink Red 1.5" x 3/4"	1	FUSEHLDL-MULT	ST Fuse Block 6 Circuit				
		2	CABLE-4/0-1-BLK	Cable-4/0	1	BRKR-DC-BRKR-060A	60A DC Circuit Breaker				
		1	RELAY-VTCX	(AGM 230A) Victron Cyrix-ct 12/24V-230 Intelligent battery cmb	1	RELAY-VTSMBP65	Batt Protect, Smart 12/24-65A				
		9	LUG-2/0-RING-3/8	2/0 Lug-3/8" Ring	1	SWITCH-WALL	12V Wall Switch, Chrm				
		6	93H-R3/4	Heat Shrink Red 1.5" x 3/4"	2	FSTSCW-612-SS	Screw-#6x1/2" PHP SS				
		2	93H-B3/4	Heat Shrink Black 1.5" x 3/4"	4	FSTSCW-834B	Screw-#8x3/4 OHP BLK OX				
		35	CABLE-2/0-1-BLK	Cable-2/0	2	LUG-18GA-FAST-F	Female Fast-on 18 ga.				
		40	CABLE-18GA-1-RED	18 ga. Red Wire	15	CABLE-18GA-2-GRY	Duplex-18/2				
98-ALTCHG230	ALTERNATOR CHARGING	20	CABLE-18GA-1-BLK	18 ga. Black Wire	6	LUG-6GA-RING-3/8	6 ga. Lug-3/8" Ring				
		1	LUG-18GA-RING-BR	18-22 ga. Ring-Bare	2	LUG-6GA-RING-1/4	6 ga. Lug-1/4" Ring				
		1	HS-BLK-DWALL-1/8	Heat Shrink 1/8" Black	2	LUG-10GA-SPD-8	10-12 ga. #8 Block Spade-Bare				
		1	SPLICE-14-BUTT-SD	14-16 ga. Butt Step-Down	1	OUTLET-12USB	12V/USB Outlet				
		2	SPLICE-18-BUTT-HS	18-22 ga. Butt-HS	10	CABLE-10GA-2-WHT	Duplex-10/2 600V				
		1	FUSEHLDL-MINI	Mini Fuse Holder & Cap	6	HS-RED-DWALL-1/2	Heat Shrink 1/2" Red				
		2	FUSE-MINI-005A	Mini Fuse-5 Amp	2	HS-BLK-DWALL-1/2	Heat Shrink 1/2" Black (2x 1" pcs)				
		1	LUG-10GA-RING-HS	10-12 ga. Ring-H.S.	4	LUG-10GA-DISC-F	Female Disconnect 10 ga.				
		1	93B-200A	200 Amp DC Brkr. w/Screws							
		1	SWITCH-ESSCLD	Essential black momentary switch							
		1	PLATE-MOM	Faceplate for Momentary Switch							
		4	FSTSCW-612	Screw-#6x1/2" PHP BLK OX							
		96-VT5WITC	DC OUTPUT (AGM)				98-DCDAGM				



SOLAR PANELS



BATTERIES



BATTERY MONITOR

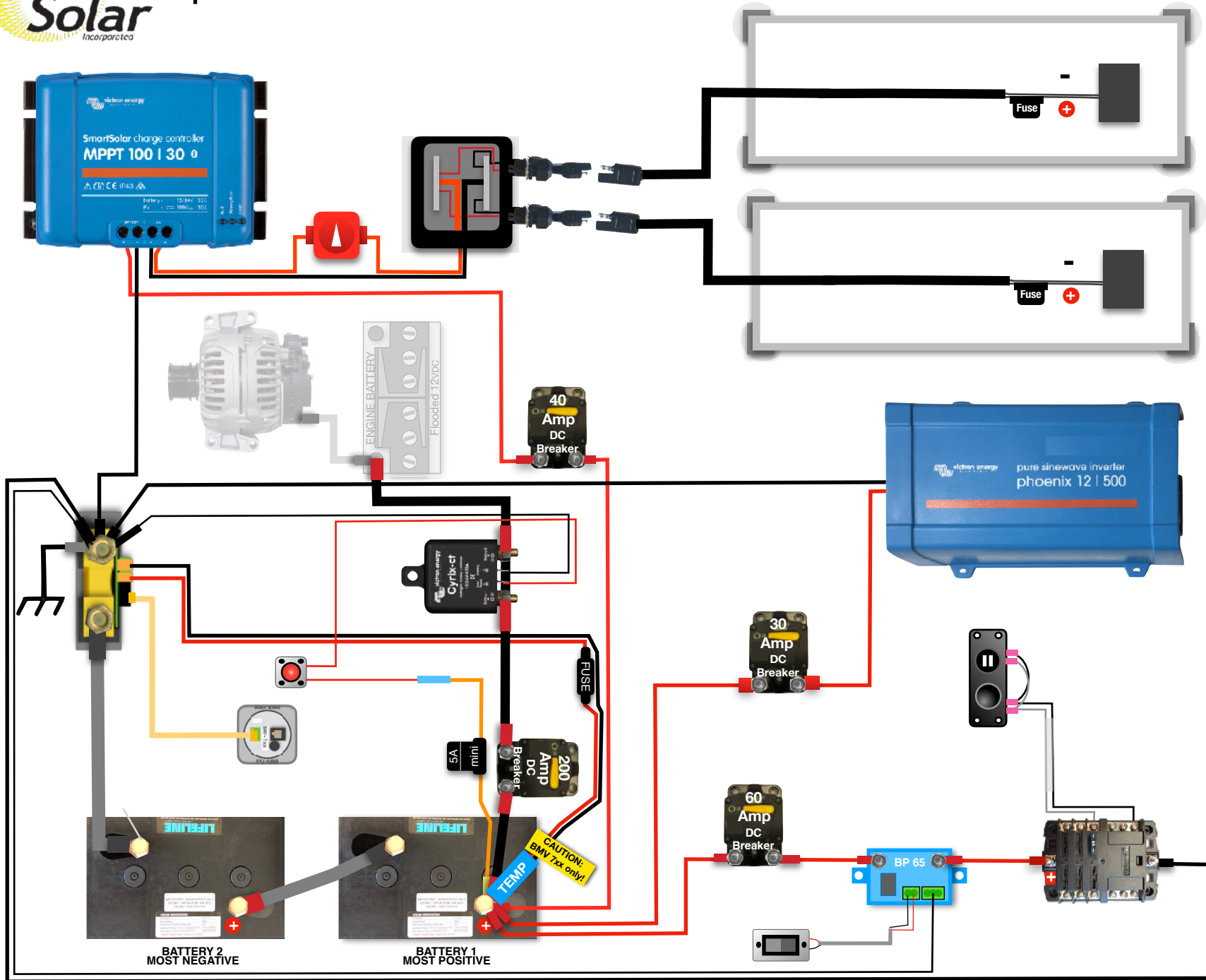


INVERTER





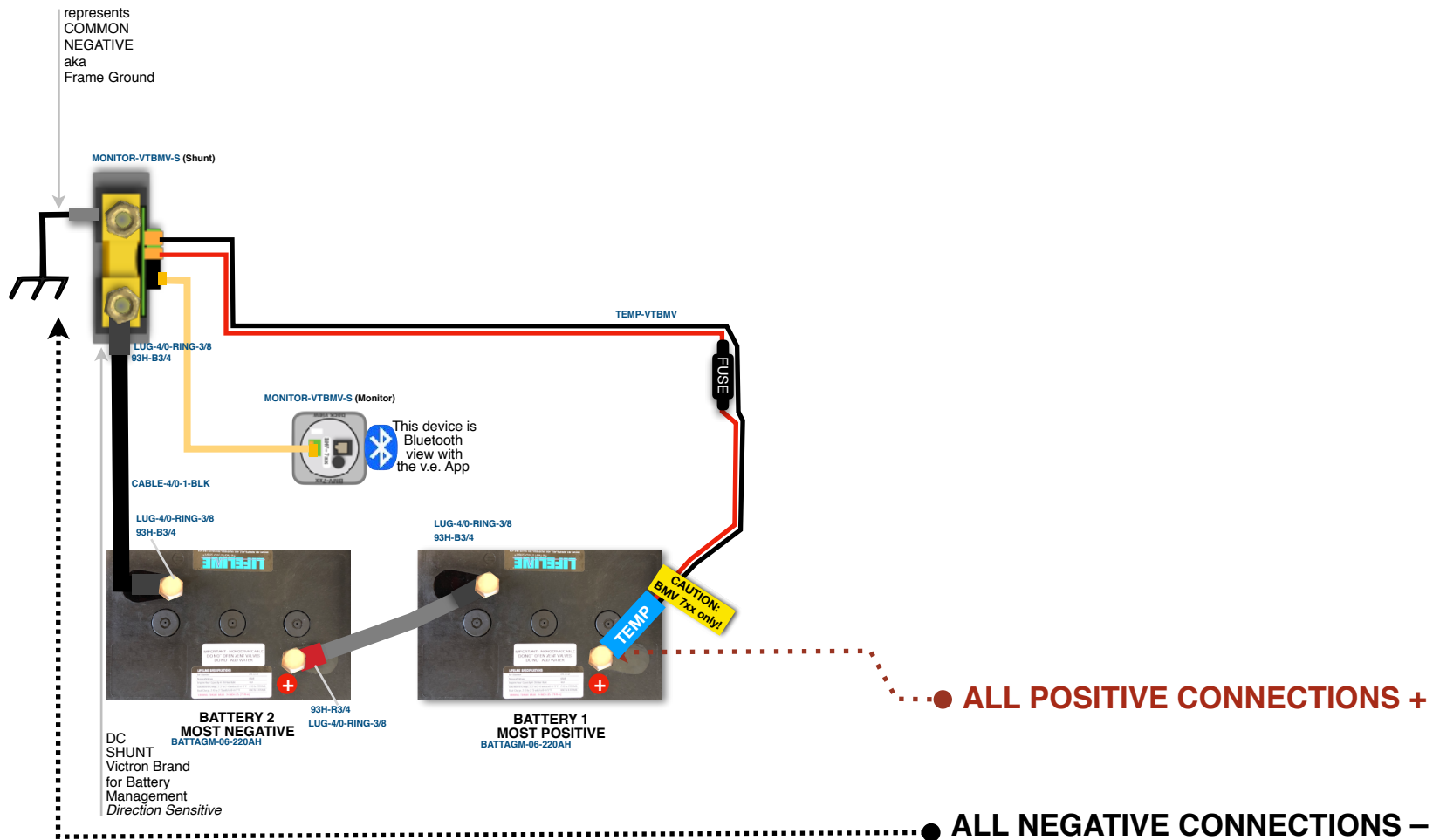
Complete Schematic

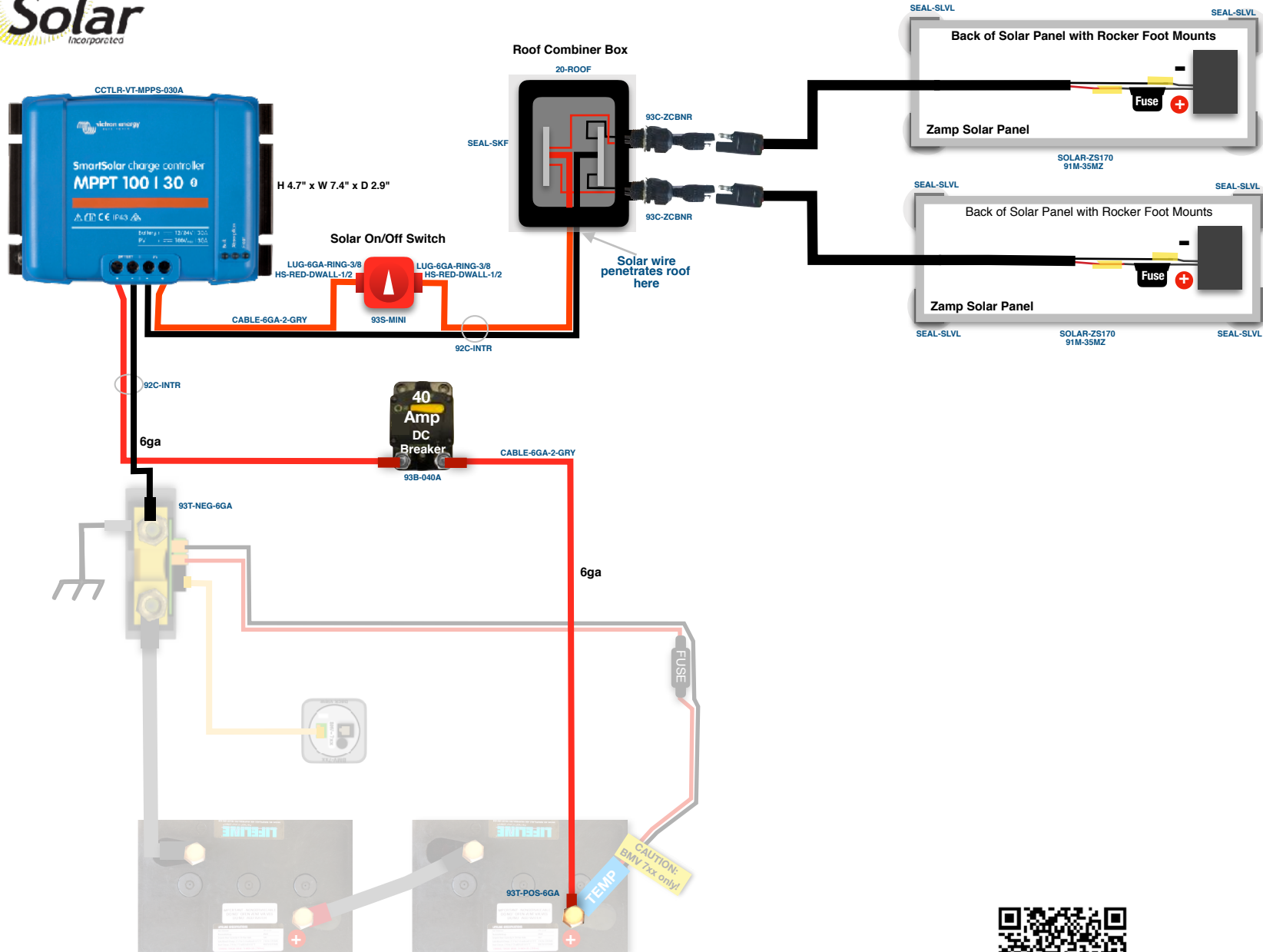




## Battery Bank

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 two 200Ah AGM Batteries. 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.





**NOTICE:**

The "greyed out" battery bank with monitor as well as the solar panels are not included, but you will be interacting with them.

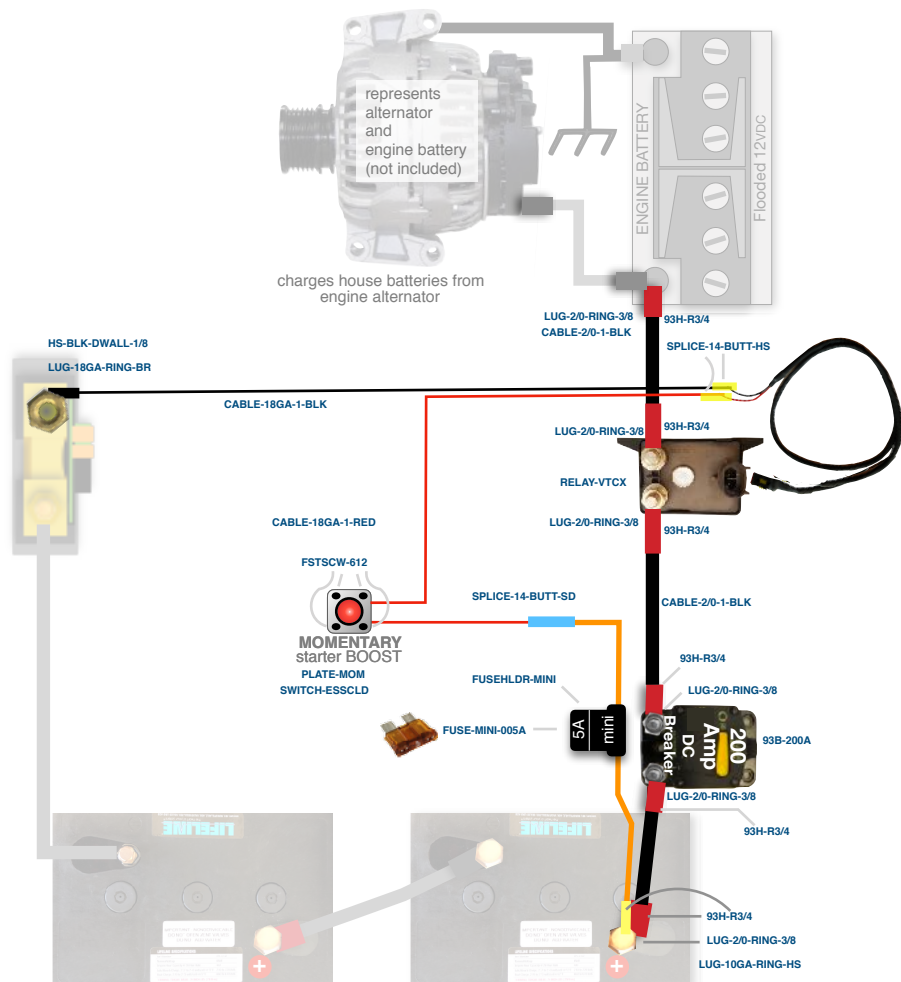


If the connections seem tight on the MPPT, that is normal. Scan here for assistance.





The alternator charging kit uses a device called a Cyrix that interrupts the circuit connecting your starter battery and your house battery bank. When your vehicle isn't running, this connection will be open, to allow your two battery banks to sit at their separate resting voltages. When the ignition is started and the alternator starts sending current, the Cyrix will detect the higher voltage on the starter battery and close the connection between the battery banks. Since the alternator charge will be at a higher voltage than both battery banks, current will only be flowing into batteries from the alternator, not from one battery to another. The boost button overrides the alternator voltage sense of the Cyrix and manually connects the battery banks. This is fine for short periods of time and it is used in situations when your starter battery is dead and you need to use your house battery to start your ignition.



1. **Position components** so cable routes can be planned.
2. **Connect the 2ga cable** between either that starter battery positive, the positive output of the alternator, or some other attachment point with continuity to those two points. Make the connection to whatever position allows for the easiest cable route to your house battery bank. (Do not connect the cable to the house battery bank yet.)
3. **Install the DC breaker** along the 2ga cable in an easily accessible location near the house battery. Polarity is important, meaning that the LOAD post of the breaker should go to the house battery bank, matching the diagram. Keep the breaker in the OFF position for now.
4. **Install the Cyrix** between the alternator/starter battery and the breaker. Plug in the pigtail.
5. **Install the boost button** in a location accessible from the driver's seat (you will be holding it while you turn your ignition key). Connect a red wire between one lead of the boost button (polarity doesn't matter) and the red wire in the pigtail coming off the Cyrix.
6. **Connect a black wire** between the load side of the shunt and the black wire in the pigtail coming off the Cyrix.
7. **Install the fuse holder** (with the fuse removed) onto the positive battery terminal, and splice a red wire on the other end of the fuse holder. Connect the other end of that red wire to the remaining lead on the boost button.
8. **Activate the system** by checking that all the connections are correct and tight, permanently mounting components, installing the fuse and turning ON the breaker.
9. **Test the system** by turning on the ignition and verifying with the battery monitor that current is flowing into the house battery bank. Then, turn off the system and push the boost button for a couple seconds to see current flowing out of the house battery.

**IMPORTANT NOTICE:**

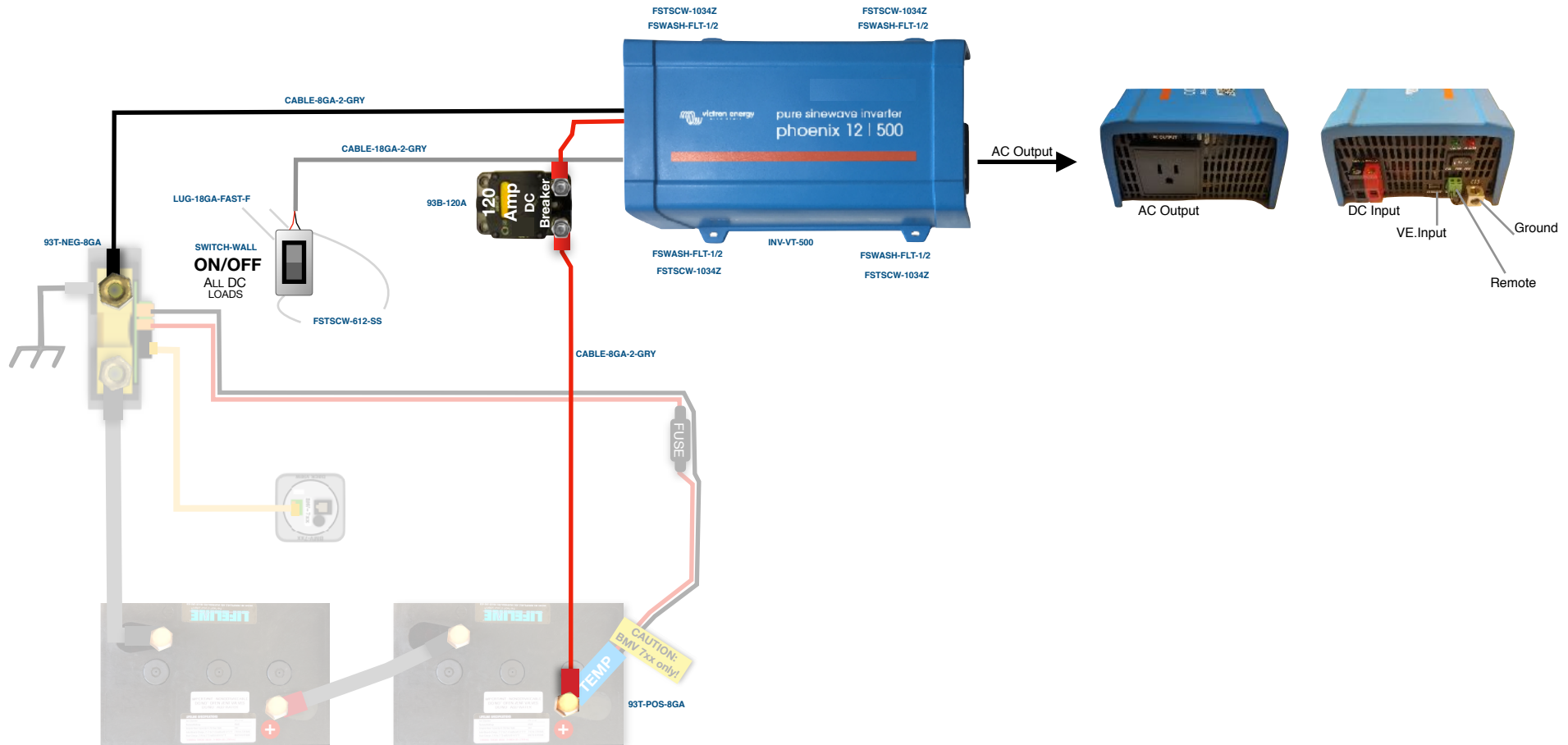
All the "greyed out" items were previously installed. You will need to interact with them in this phase.



### 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.



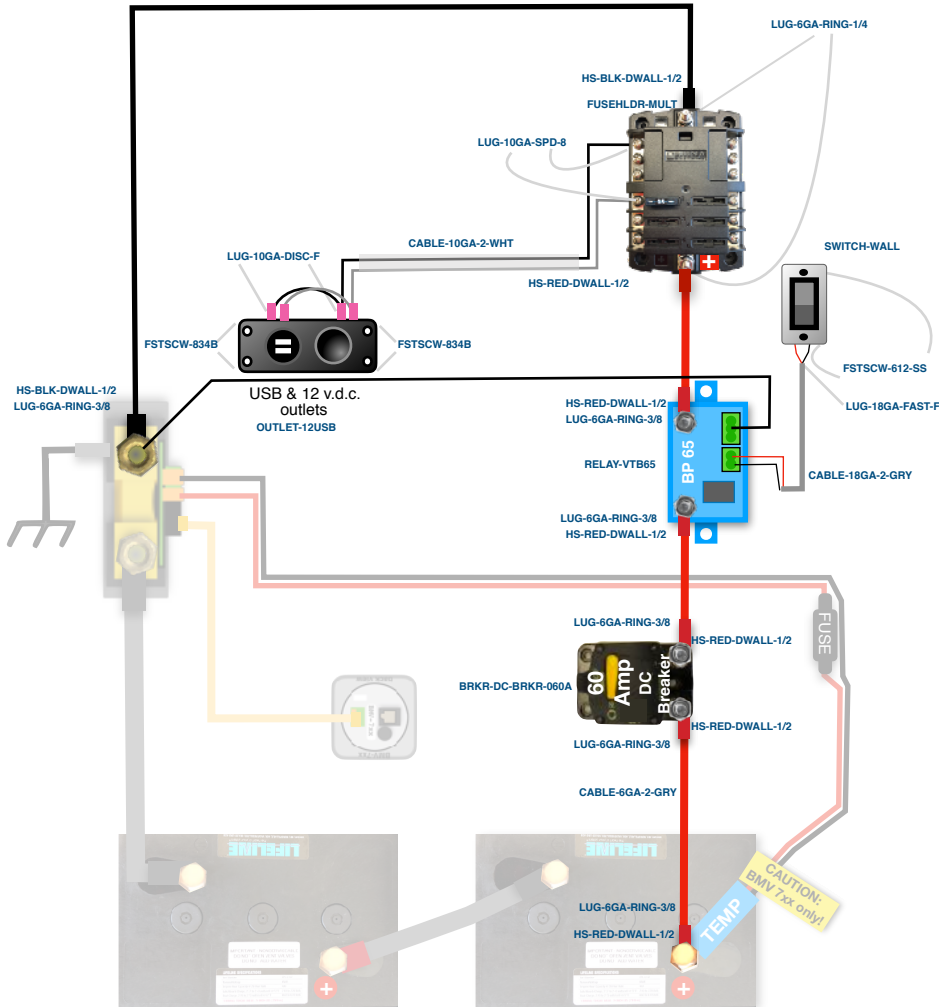
**IMPORTANT NOTICE:**

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



### DC Distribution

A Victron Battery Protect 65 (BP65) monitors the voltage of the house battery bank and disconnects the DC fuse block when the battery voltage gets low. This protects the battery bank from being accidentally over-discharged when a load like a light or fan are left on too long. The BP65 can be manually opened with a remote switch which serves as a master disconnect for all DC loads (a convenient feature for safely storing your vehicle for extended periods of time). The BP65 and cable to the six position fuse block are protected by a 60A resettable DC breaker. One DC outlet with dual USB and standard 12V is included. Additional outlets can be connected to the fuse block or wired in parallel to the existing outlet.



1. **Position the components** so cable routes can be planned. The BP65 should be within about 12" of the shunt.
2. **Install the negative cable** from the load side of the shunt to the negative post of the DC fuse block.
3. **Connect the positive cable** from the positive side of the DC fuse block to the LOAD post of the breaker. Turn the breaker to the OFF position.
4. **Install the outlet** and connect it to the fuse block. A parallel connection between the two sets of outlet posts will have to be made by fitting two sets of cable into a positive and a negative female spade lug.
5. **Install the positive cable** from the breaker LINE post to the OUT post of the BP65.
6. **Connect the black cable** that comes with the BP65 from the load side of the shunt to the three position green terminal block on the BP65.
7. **Connect the switch to the BP65** with the 18ga duplex cable. Polarity doesn't matter.
8. **Install the red cable** between the BP65 IN post and the positive terminal of the most positive battery.
9. **Verify the connections** to make sure that they are correct and tight.
10. **Activate the system** by turning the DC breaker to ON. This would be a good time to skip ahead to the programming section of the manual and program the BP65. If the DC loads do not work, toggle the DC load master switch.

**CAUTION:**

Before "going live" with the DC power, check and double check all connections and fittings. Look for looseness, routing issues and polarity (+, etc.)



## Programming Your BMV-712 Smart Battery Monitor for AGM 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.

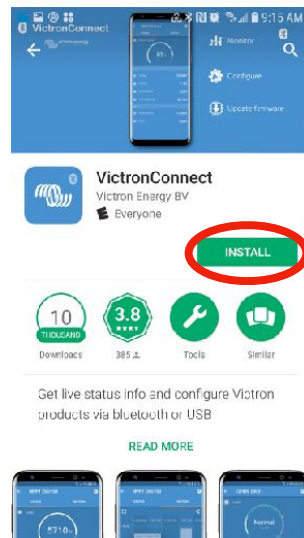
NOTE: If your device is not shown, it is probably signal interference. Try closing the app and moving to a different location before re-entering the app in a location that can pick up the BMV's signal.

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):

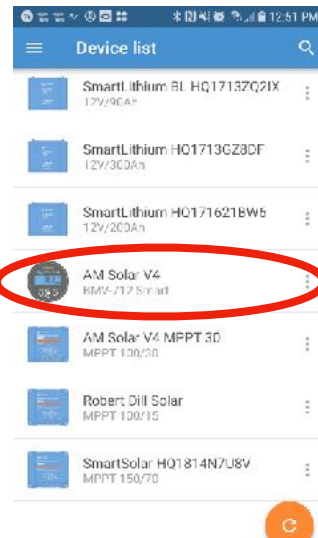
7. **Changing Battery Capacity:** Enter the number of Ah of your entire battery bank
8. **Charged Voltage:** 14.1
9. **Tail Current:** 2%
10. **Peukert Exponent:** 1.12
11. **Charge Efficiency Factor:** 97%
12. Go back to Settings, enter "Misc"
13. Enter "Relay"
14. Change Low SOC relay to 50/50
15. **Aux Input:** Select "Temperature"
16. **Temperature Unit:** Select "Fahrenheit"
17. Exit from settings, you have completed programming.

### Program Settings for AGM Batteries

- **Battery Capacity:** Enter the total battery capacity in Amp Hours.
- **Charged Voltage:** 14.1
- **Tail Current:** 2%
- **Peukert Exponent:** 1.12
- **Charge Efficiency Factor:** 97%
- **Aux Input:** "Temperature"
- **Temperature Unit:** "Celsius" or "Fahrenheit"



1



2



3



4

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.

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".

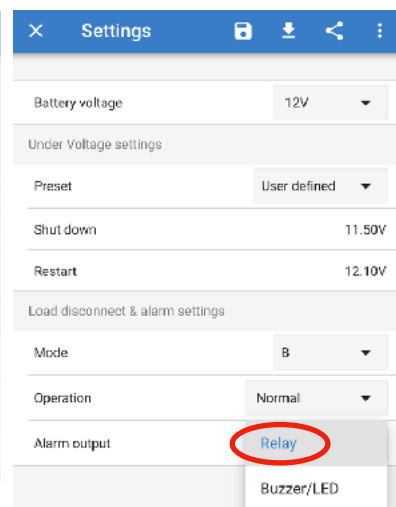
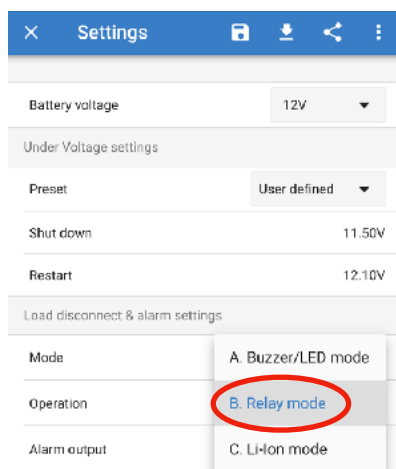
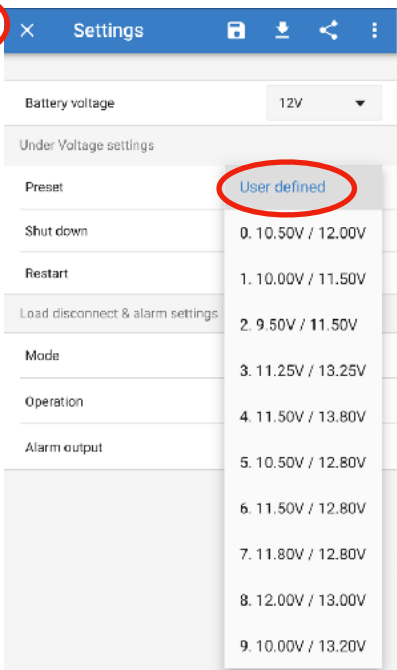
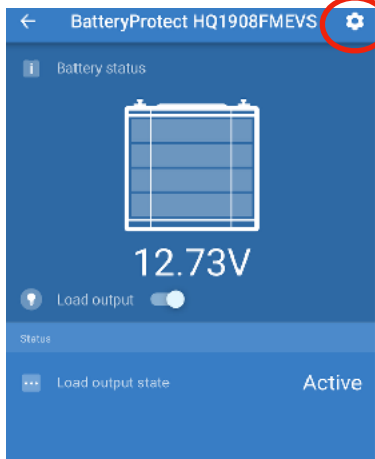
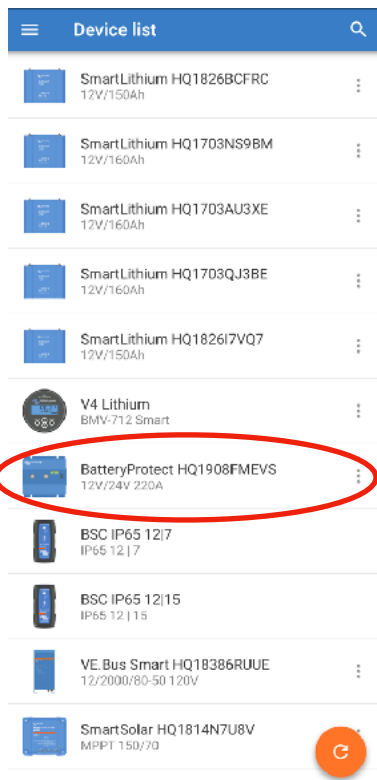
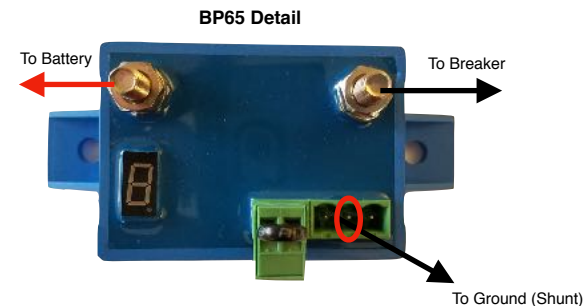


## Programming / Commissioning Your System - The BP-65 Battery Protection

1. Supply 12V power to BP (+ to IN post, - to GND pin).
2. Open VictronConnect and select the Battery Protect.
3. The first screen has a switch to manually toggle the relay.
4. Click the gear in the top right to enter Settings.
5. Select "user defined" from the Preset menu.
6. Enter the following values:  
Shut down: 12.1v  
Restart: 12.7v
7. Mode: Leave on "B"
8. Alarm output: Select "Relay" from the menu.

**NOTE:** These settings were chosen on the conservative side, but can be adjusted depending on your needs. Do not lower the shut down voltage until you are very familiar with your system, since dropping below 12v may result in battery degradation.

If your battery protect shuts down your loads, it's important you recharge your batteries up to a full charge as soon as possible.



4. Press the gear icon

5. Select "User defined" from the Preset menu

7. Mode should be set to "Relay mode"

8. Alarm output: Select "Relay"

2. Select BatteryProtect from VictronConnect





# Programming / Commissioning Your System - The Charge Controller



## Charge Control Settings for AGM 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: 30A (In this example)
  - Use default charge settings: OFF
  - Charger: ON
  - Absorption voltage: 14.40 V
  - Absorption Time Limit: 02:00
  - Float voltage: 13.30 V
  - Equalization voltage: 15.20 V
  - Auto Equalization: DISABLE (OFF)
  - Temperature Compensation: ON
  - Temperature Compensation: -20.00

### Victron BMV-702 & BMV-712

- 02. Charge Voltage
- 03. Tail Current
- 05. Peukert Exponent
- 06. Charge Efficiency Factor

Flooded	Lifeline AGM	Victron Lithium
14.2V	14.1V	13.9V
4%	2%	2%
1.25	1.1	1.1
94%	97%	98%

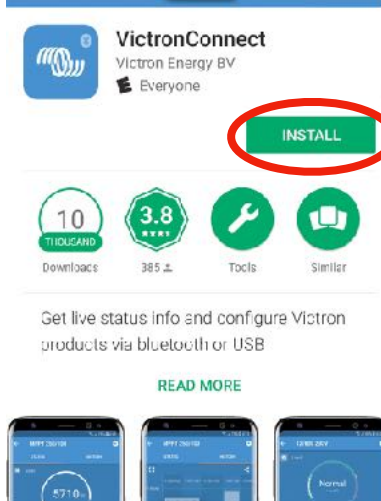
### Victron Blue Solar MPPT with Bluetooth or MPPT Control

- Absorption Voltage
- Absorption Time limit
- Float Voltage
- Equalization Voltage
- Auto Equalization
- Temperature Compensation
- Temperature Compensation

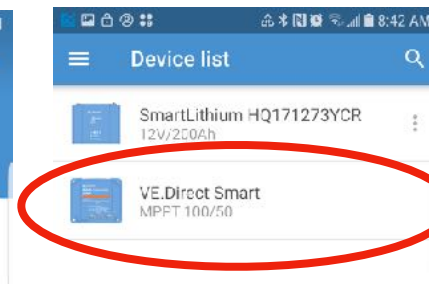
Flooded	Lifeline AGM	Victron Lithium
14.60V	14.40V	14.20V
2:00	2:00	1:00
13.40V	13.30V	13.50V
15.20V	15.20V	14.20V
OFF	OFF	OFF
ON	ON	OFF
-20.00mV/°C	-20.00mV/°C	

### Victron Blue Solar MPPT Dial Setting (not preferred)

Dial	7	2	7



Download VictronConnect In App Store



Device List within VictronConnect



MPPT Charge Controller Screen