AM Solar

Installation

Guide

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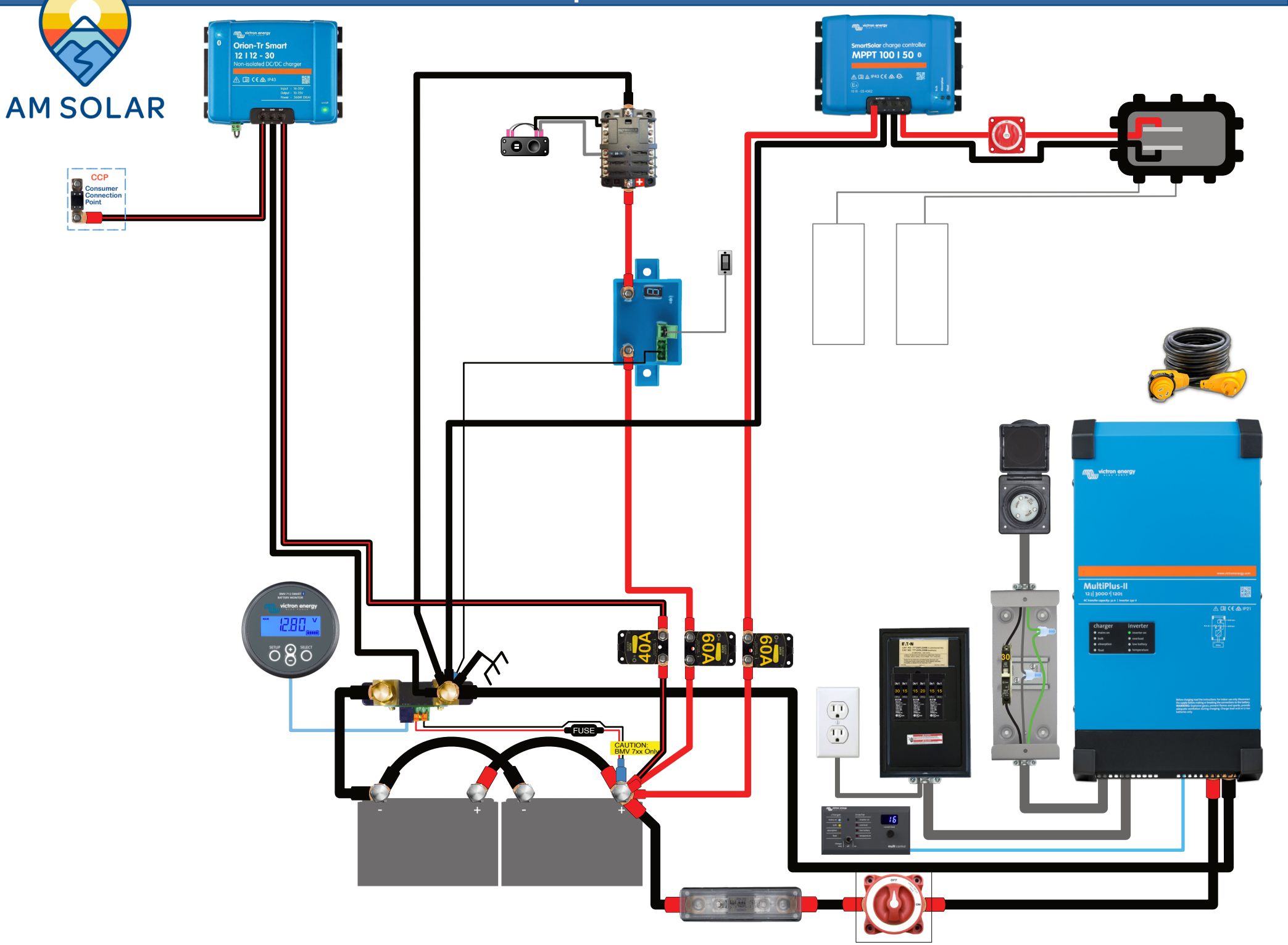
Suggested Tools For Your Installation

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

Complete Schematic



200Ah Lithium Battery Bank w/ BMV-712 Battery Monitor

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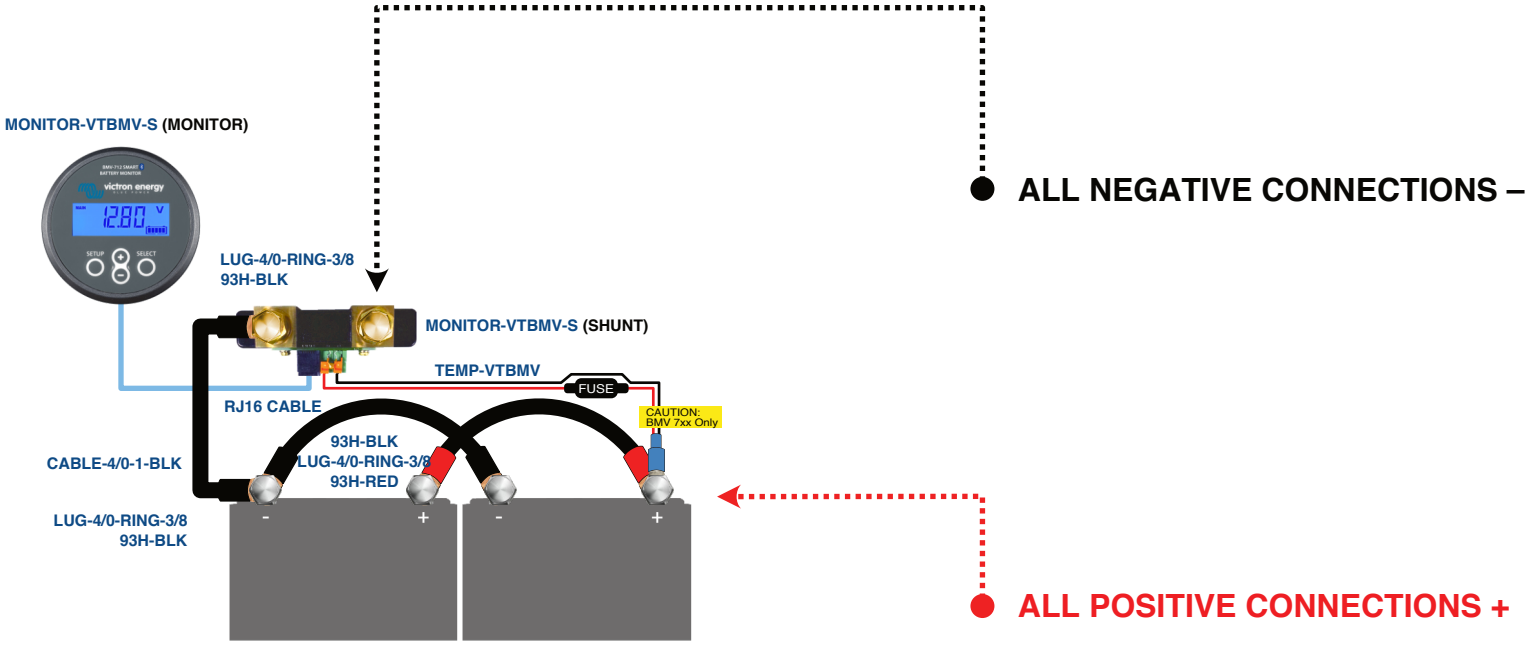
The battery bank is the heart of the system. Its components usually take up the most space and all other subsystems connect to it. That's why we recommend installing it first. This battery bank consists of two 100Ah 12V batteries and a battery monitoring system. The Bluetooth battery monitor reads all 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.

1. Mount the batteries securely in a custom made cabinet, or use straps. They are very heavy and not something you want tumbling around during a wreck. Weight distribution and maintaining balance may also be a concern for your installation.
2. Mount the shunt and connect the battery side (polarity matters) to the negative terminal of the most negative battery using heavy cable.
3. Mount the display in a convenient place and connect it to the shunt with the communication cable. This can be mounted on a wall or hidden away. Since the display communicates over Bluetooth, you don't actually need to interact with it.
4. Connect the temperature sensor. The temperature sensor also serves as the positive leg to power the battery monitor, therefore it must be connected to the positive terminal.
5. Check the connections to make sure they are correct and tight.
6. Test the system by checking that the battery monitor display is working. You can skip ahead to the programming section of this manual to program the battery monitor at this time.



Alternator Charging

Rev.20210520

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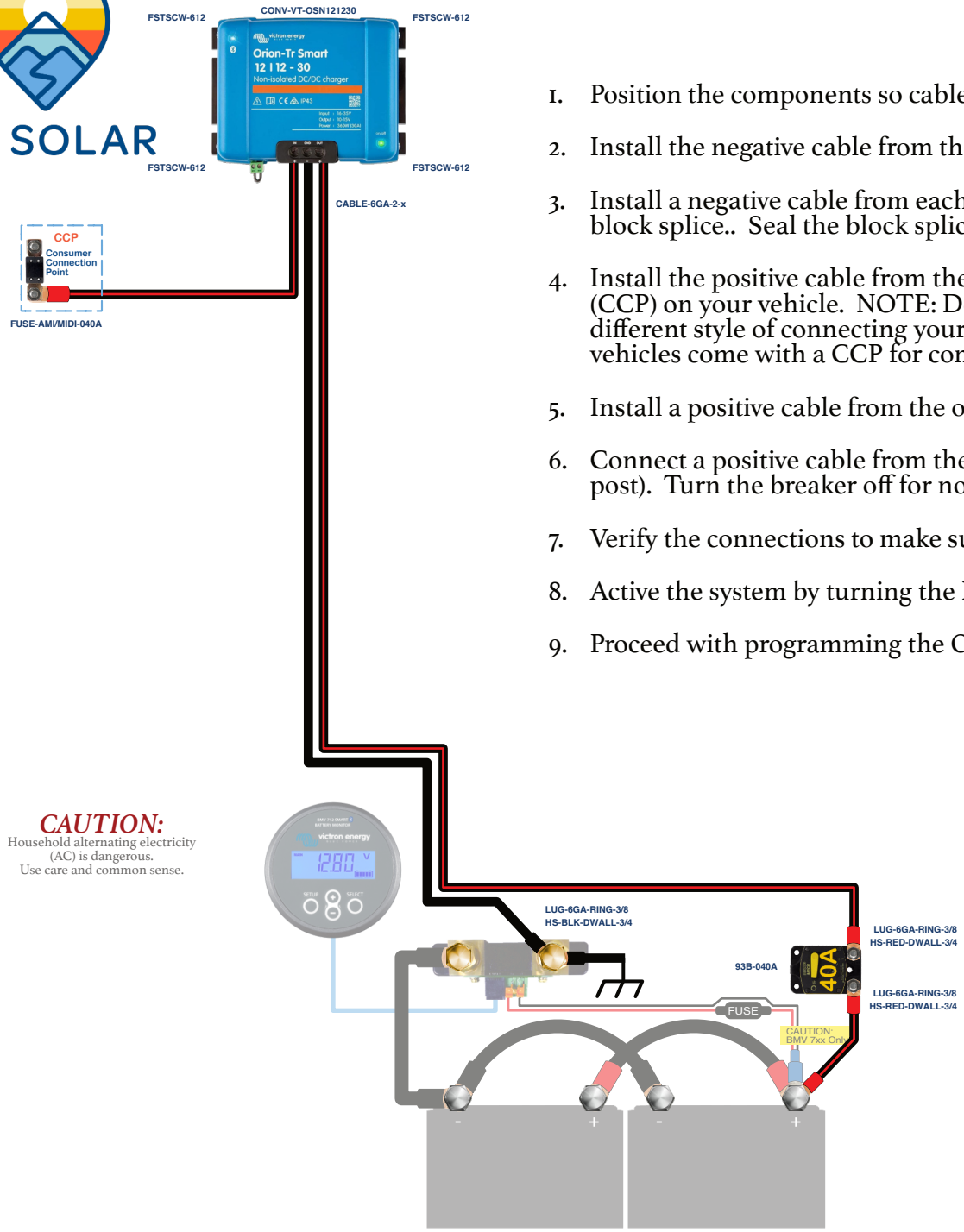

1. Position the components so cable routes can be planned
2. Install the negative cable from the load side of the shunt to the block splice
3. Install a negative cable from each of the negative terminals on the Orion and lead them to the block splice.. Seal the block splice in heat shrink so not metal is exposed.
4. Install the positive cable from the input side of the Orion to the Consumer Connection Point (CCP) on your vehicle. NOTE: Depending on the make/model of your vehicle, you may have a different style of connecting your Orion to your vehicles's stock alternator output. Most vehicles come with a CCP for connecting the Orion to your engine battery.
5. Install a positive cable from the output side of the Orion to the DC breaker.
6. Connect a positive cable from the DC breaker to the battery positive terminal (or junction post). Turn the breaker off for now.
7. Verify the connections to make sure they are correct and tight
8. Active the system by turning the DC breaker to ON.
9. Proceed with programming the Orion per our specifications..

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

Solar System

Rev.20210520

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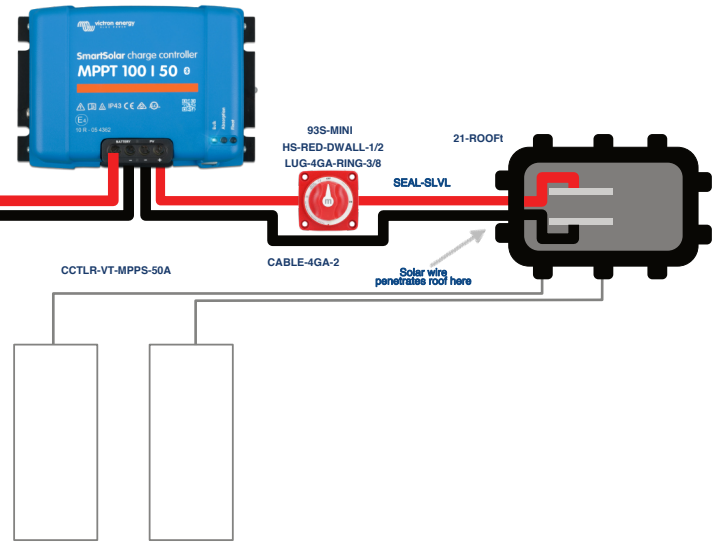
This solar charging kit uses individual solar panels, connected in parallel inside a combiner box to optimize partial shade performance. The output of the combiner box is routed to a master disconnect switch, then to an MPPT charge controller with Bluetooth programming and monitoring. The output of the charge controller is protected by a resettable breaker and fed onto the battery bank.



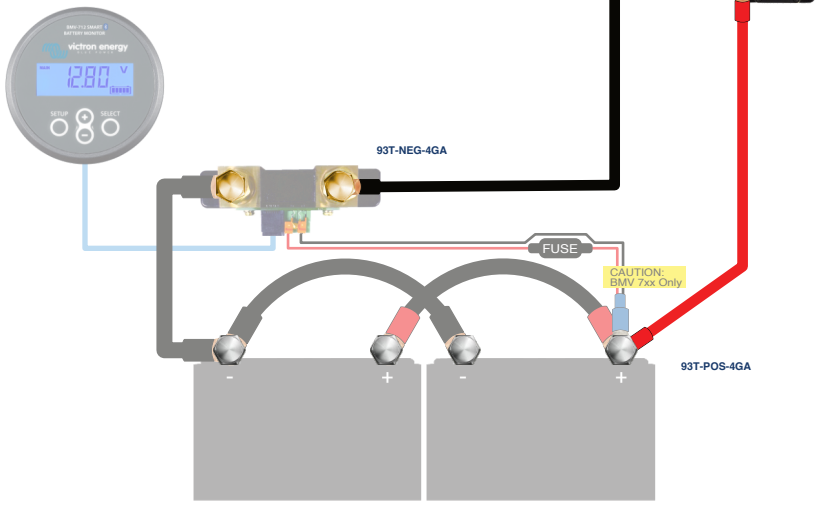
1. Plan the placement of the components. By using the cardboard boxes that the panels shipped in, you can strategize your optimum array layout and avoid shade from other roof-mounted obstructions. The combiner covers the roof penetration, so plan it's placement with the wire route to the battery bay in mind. The charge controller should be mounted adjacent to or inside the same enclosure as your battery bank for temperature sensing. If this isn't possible, contact AM Solar for a remote temp sensor.

2. Prep the panels by installing the output cable. In some cases your panels may come shipped already prepped. The DIY INSTRUCTIONS page on our website will provide detailed instructions.

3. Attach panel mounts according the video on our website.

4. Install the panels according to the video on our website. On a metal roof, penetrations are rarely required. Don't let any part of the panel overhang the leading edge of the roof.

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



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5. Install the combiner box by following the video instructions on our website. It's a good idea to check polarity before making any connections.

6. Route the roof cable from the combiner box, through the roof penetration down to the battery bay. Install the Master Disconnect switch with the switch in the OFF position and connect to the charge controller. It may be difficult to connect thick cables to the charge controller.

7. Connect to the batteries by routing a segment of remaining roof cable from the charge controller to the breaker to the battery bank.

8. Permanently mount components and verify all connections.

9. Activate your solar charger by turning on the breaker then the Master Disconnect switch. Skip ahead to the programming section of this manual to program the charge controller.

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. 5

Solar Panel Detail

Rev.20210520

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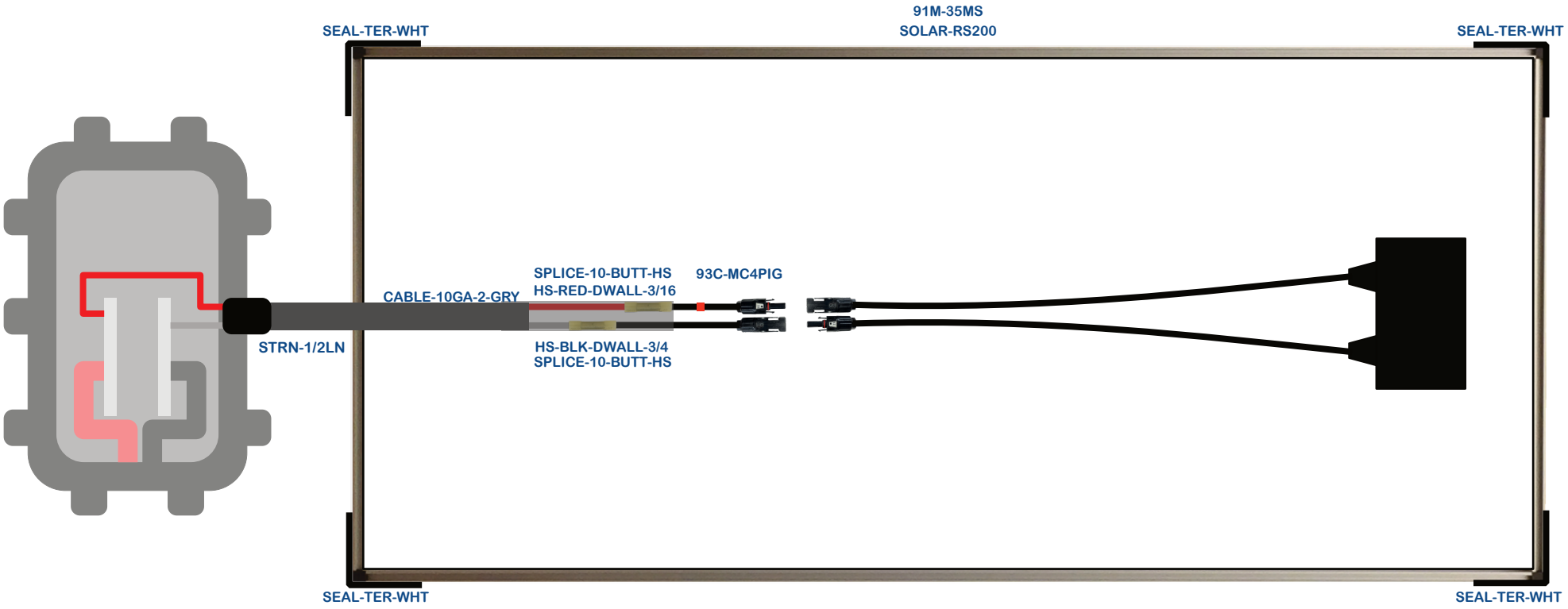

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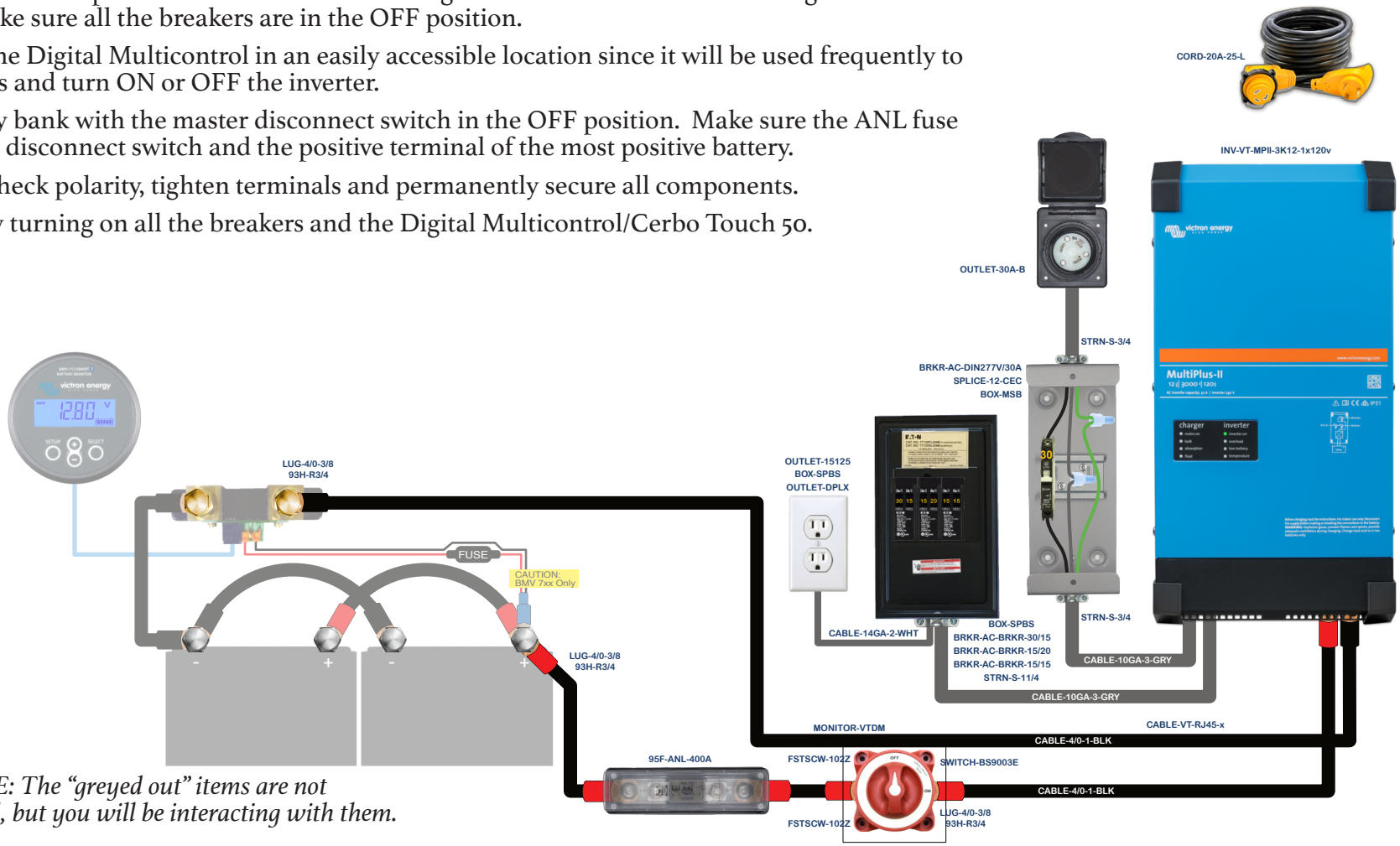
The AC Input/Output system is capable of plugging into a standard 30A shore power outlet. (Note: Adapters from 30A to 15A outlets can be purchased at hardware or RV supply stores). The shore power charges the battery bank and can also be passed through the inverter to the AC loads. If the loads draw 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 the Digital Multicontrol or Cerbo Touch 50.

1. Position the components prior to connecting the cables. The cable run from the battery bank to the inverter has the potential for the highest current in the entire system, therefore it is important to keep these cable runs as short as possible, ideally less than 5'.
2. Install the AC Input cable from the shore power inlet to the Main AC Panel with the breaker (in the OFF position) to the inverter. Be sure to use the strain reliefs around the cable.
3. Install the AC Sub Panel with its three duplex breakers and connect the AC outlet. Additional outlets and AC loads can be connected to the panel. Be sure the current rating of the load is less than the rating of the breaker it is connected to. Make sure all the breakers are in the OFF position.
4. If applicable, install the Digital Multicontrol in an easily accessible location since it will be used frequently to adjust charger settings and turn ON or OFF the inverter.
5. Connect to the battery bank with the master disconnect switch in the OFF position. Make sure the ANL fuse is between the master disconnect switch and the positive terminal of the most positive battery.
6. Verify Connections, check polarity, tighten terminals and permanently secure all components.
7. Activate the system by turning on all the breakers and the Digital Multicontrol/Cerbo Touch 50.

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



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

98-DCDBP

Rev.20210520

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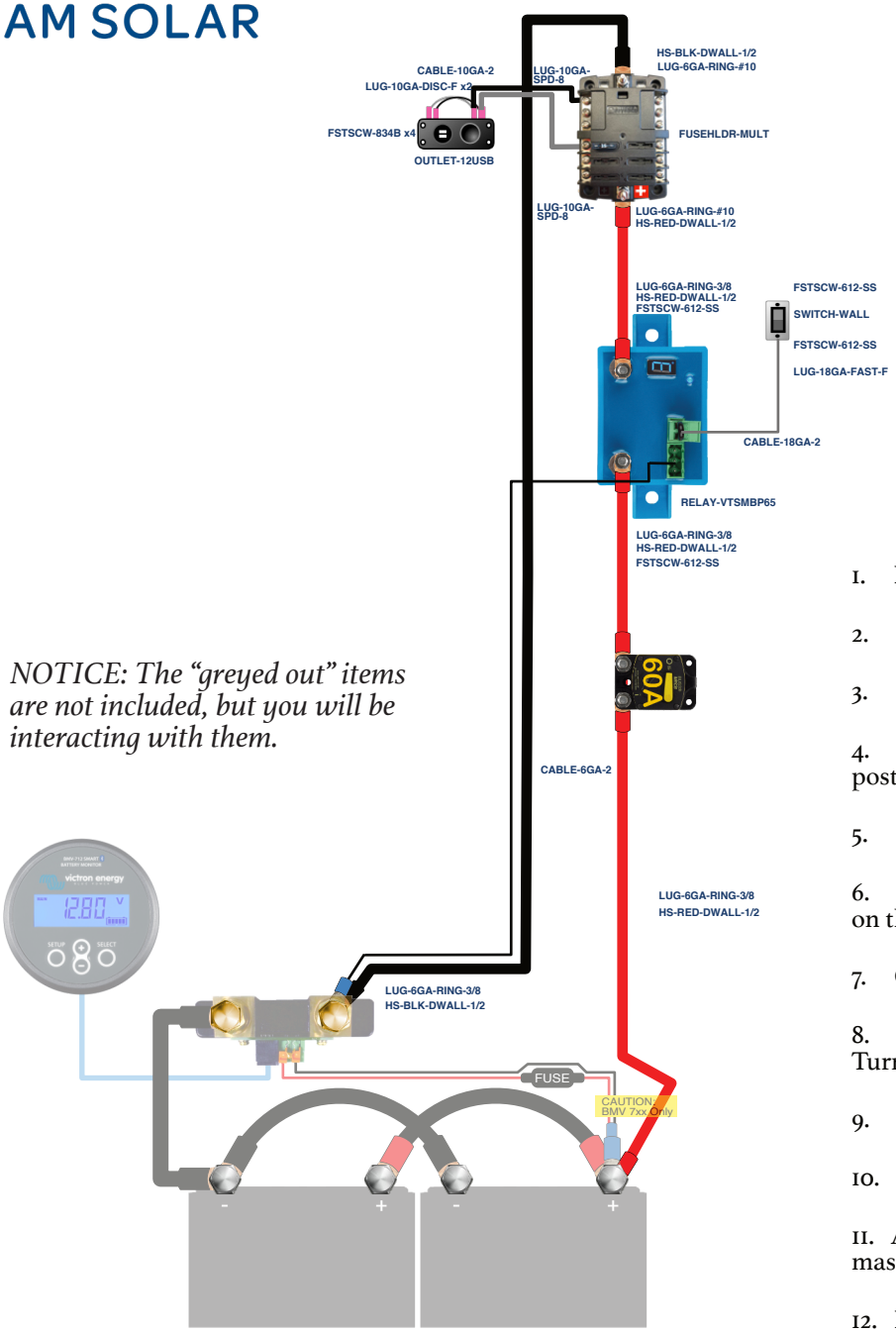
A Victron Smart Battery Protect 65 (BP65) monitors the voltage of the house battery bank and disconnects the DC fuse block when the battery voltage gets low. This protects the battery bank from being accidentally over-discharged when a load like a light or fan are left on too long.

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.



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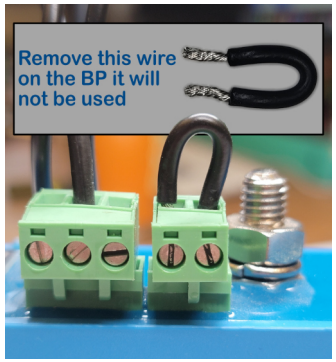

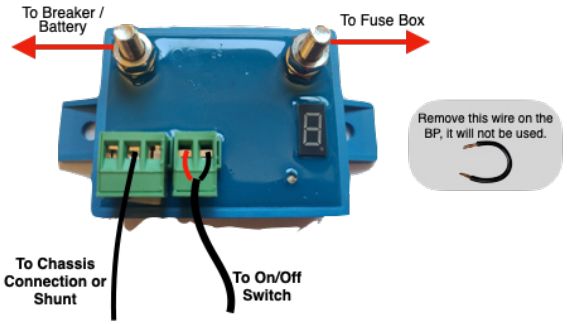

1. Position the components so cable routes can be planned.

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 OUT side of the BP65.

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 DC breaker post to the IN post of the BP65.

6. Connect the black cable that comes with the BP65 from the load side of the shunt to the center position on the BP65 three position green terminal block.

7. Connect the switch to the BP65 with the 10ga duplex cable. Polarity doesn't matter.

8. Install the red cable between the DC Breaker and the positive terminal of the most positive battery. Turn the DC breaker off for now.

9. Verify the connections to make sure that they are correct and tight.

10. Remove the black jumper wire that bridges the remote ports.

11. Activate the system by turning the DC breaker to ON. If the DC loads do not work, toggle the DC load master switch.

12. Proceed with programming the BP per our specifications.

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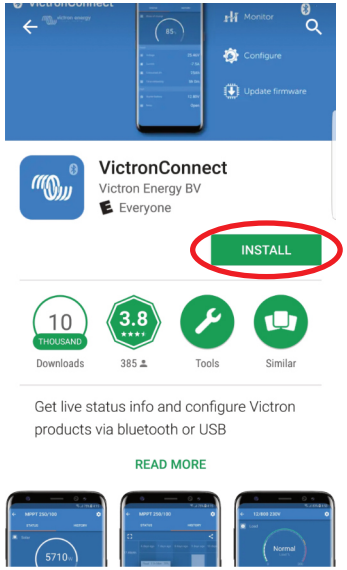
Programming the BMV-712 through VictronConnect

1. Download "VictronConnect" from the Google Play or Apple App 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 (picture 4):
7. Changing Battery Capacity: Enter the number of Ah of your entire battery bank.
8. Charged Voltage: 13.9
9. Tail Current: 2%
10. Peukert Exponent: 1.00
11. Charge Efficiency Factor: 99%
12. Go back to Settings, enter "Misc"
13. Aux Input: Select "Temperature"
14. Temperature Unit: Select "Fahrenheit"
15. Temperature coefficient: 0.3%cap/F
16. 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 LifeBlue Lithium Batteries

- **Battery Capacity:** Enter the total battery capacity in Amp Hours.
- **Charged Voltage:** 13.9
- **Tail Current:** 2%
- **Peukert Exponent:** 1.00
- **Charge Efficiency Factor:** 99%
- **Aux Input:** "Temperature"
- **Temperature Unit:** "Celsius" or "Fahrenheit"
- **Temperature coefficient:** 0.3%cap/F



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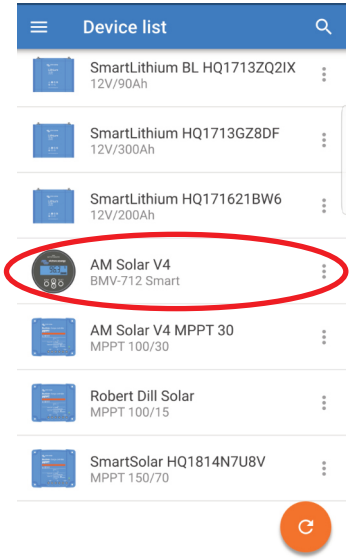

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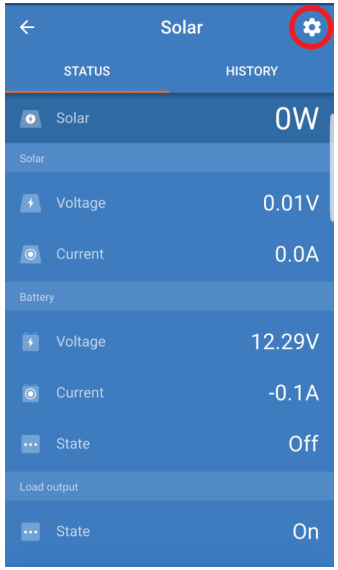

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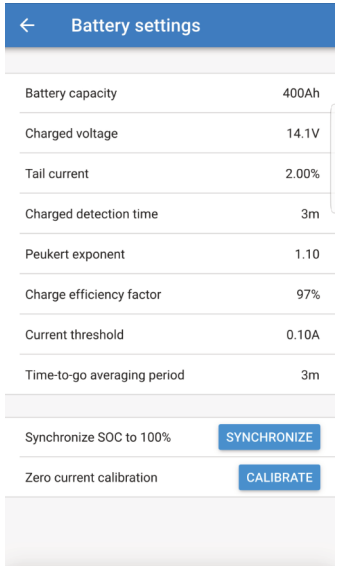

4

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".

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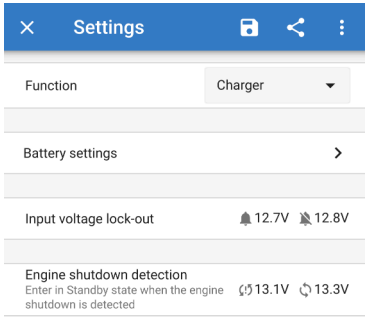
Programming the Orion through VictronConnect

1. Download “VictronConnect” from the Google Play Store.
2. Open the Victron Connect app, and after it takes a moment to scan it will recognize your Orion.
3. Select the Orion, and press the gear icon in the top right corner.
4. Under Settings, enter the following information: (See pictures):
   - Function: Charger (picture 1)
   - Input Voltage Lockout Enabled: 12.7v / 12.9v (picture 2)
   - Engine shutdown detection: Enable (picture 3)
   - Alternator type: Regular Alternator
   - Start Voltage: 14.0v
   - Delayed Start Voltage: 13.8v
   - Delayed start voltage delay: 120s
   - Shutdown voltage: 13.5v
5. Enter “Battery settings” and change the values to match those below (picture 4):
6. Battery preset: Select “User-defined” from the drop down menu
7. Absorption Voltage: 14.4
8. Float Voltage: 13.5
9. Adaptive Absorption Time: Disable (no blue showing on slider)
10. Fixed Absorption Time: 1 hour
11. Exit from settings, you have completed programming.

These devices connect via Bluetooth to communicate with a smartphone using the VictronConnect app.

NOTE: These settings will work with or without the ignition signal. Typically we don't recommend using the ignition signal, and suggest leaving the jumper in with remote plug.

If an ignition signal is being used, remove the jumper wire. The H terminal (right) of the two-pole connector can be switched to battery plus, or the L terminal (left) of the two pole connector can be switched to battery minus (or the chassis of a vehicle, for example).



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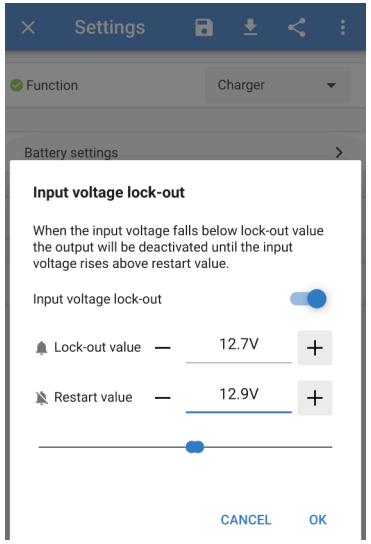

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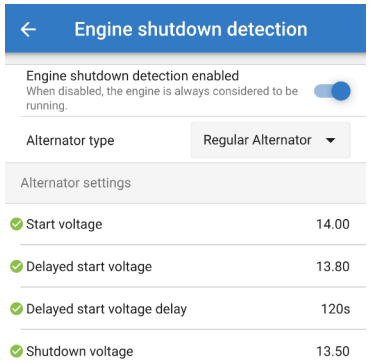

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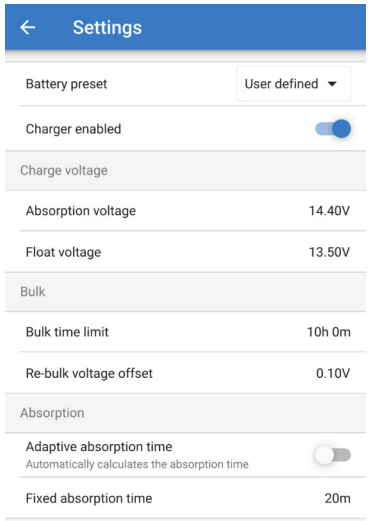

4

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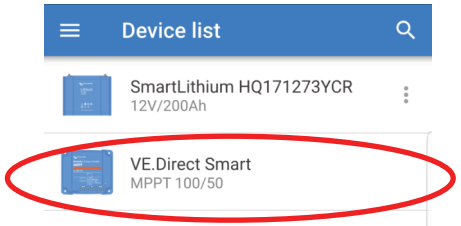
Programming the MPPT Charge Controller through VictronConnect

1. Download the VictronConnect app to your phone.
2. Open VictronConnect.
3. Under "Device list", select your SmartSolar MPPT Charger (picture 1).
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 three buttons to the right of the controller image and select "Reset PIN Code".*
5. Click on the gear in the top right corner (picture 2).
6. Select "Battery".
7. Click on the following settings and adjust them accordingly (picture 3):
   - Battery voltage: 12V
   - Max charge current: 50A (in this example)
   - Charger enabled: On
   - Battery Preset: User defined
   - Expert mode: On
   - Absorption voltage: 14.50V
   - Float voltage: 13.70V
   - Equalization voltage: 14.50V
   - Re-bulk voltage offset: 0.10V
   - Absorption duration: Fixed (must enable Expert mode to adjust)
   - Absorption time: 00:20 (20 minutes)
   - Tail current: .5A per 100Ah of total capacity
   - Auto equalization: Disabled (off)
   - Temperature compensation: Disabled (off)

Absorption voltage:	14.5V
Activate Expert mode:	Yes
Absorption duration:	Fixed
Absorption time limit:	20 minutes
Float voltage:	13.7V
Equalization voltage:	14.5V
Tail current:	.5A per 100Ah
Auto equalization:	No
Temperature compensation:	Off



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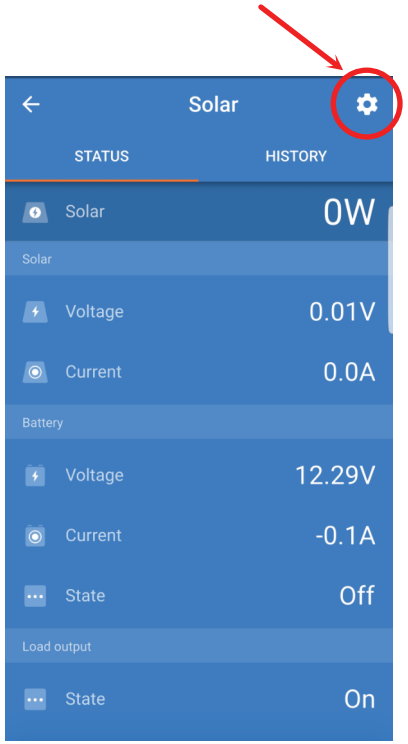

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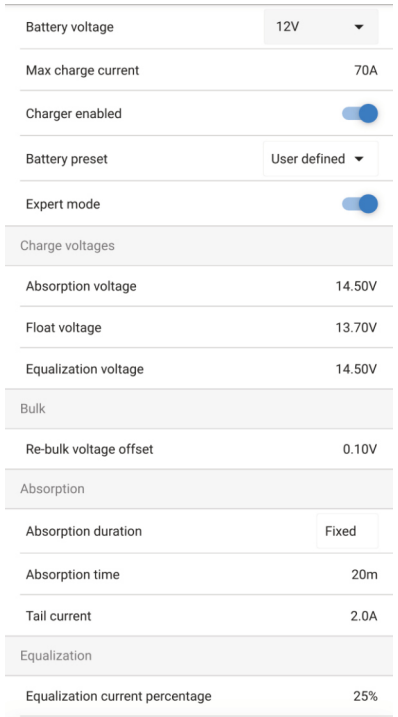

3

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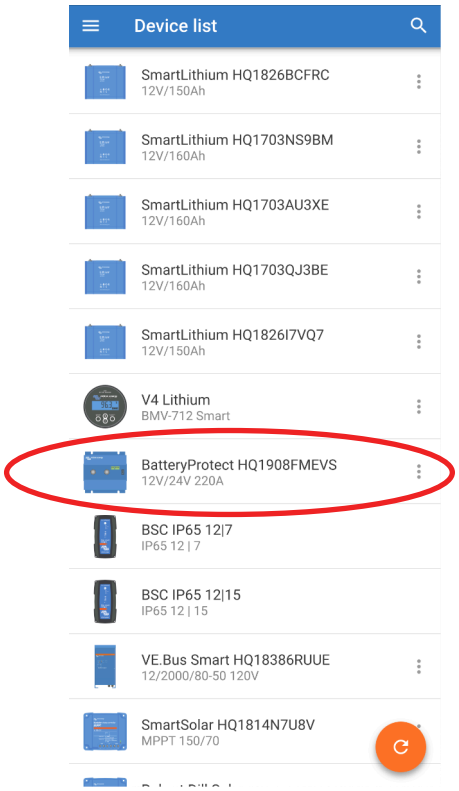
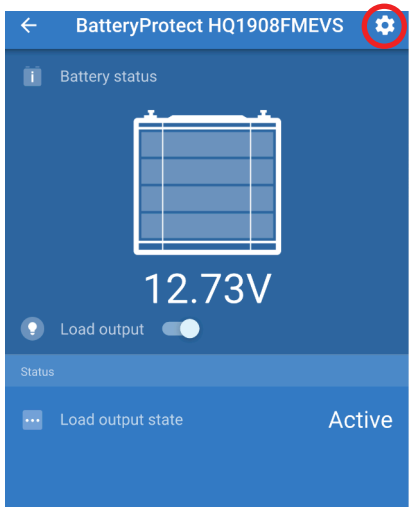
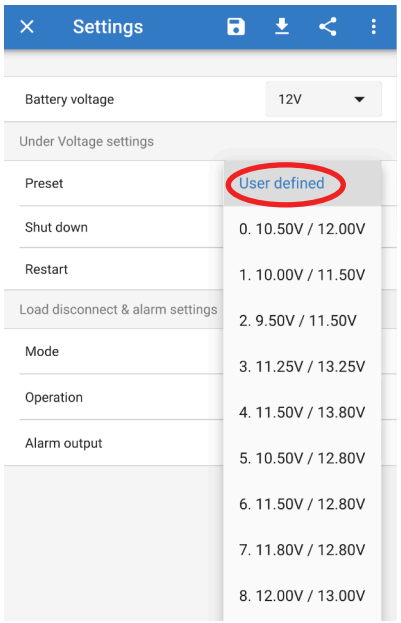
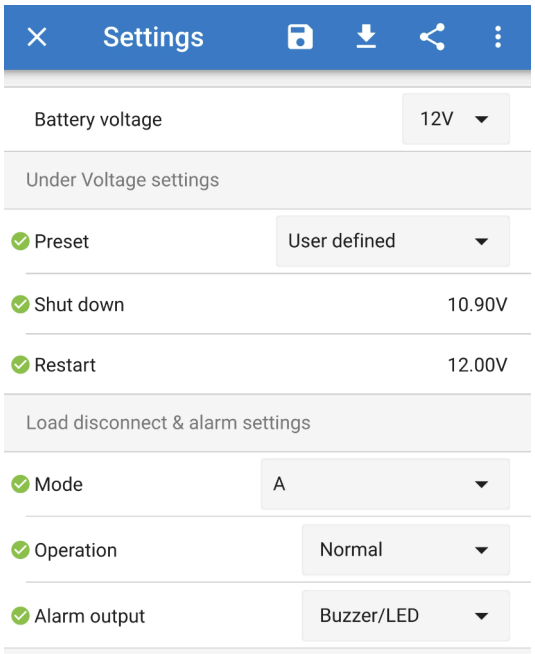
Programming the BP65 through VictronConnect

1. Supply 12V power to the 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: 10.9v
   - Restart: 12.00v
   - Mode: Change to “A”
   - Operation: “Normal“
   - Alarm output: “Buzzer/LED mode”.









NOTE: These setting 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.

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Initial Troubleshooting Steps

1. Get a voltmeter and test the voltage of the batteries directly to ensure they are not drained.

   - If you are not familiar with how to operate your voltmeter, test it on a known power source, like your car's starter battery, to ensure you are reading it correctly. Make sure the "range" setting is on the "200" value for DC Voltage.

2. Check all connection points to ensure there are no loose connections.
3. Check all on/off switches to ensure they are all on, and all DC breakers are reset.
4. Check all inline fuses to ensure they have not blown. You *may* have the following fuses:

   - Temperature sensor fuse
   - DC breaker mini ATC fuse(s)
   - Victron BMS 15A fuse
   - Inverter Class T or ANL fuse

5. Power cycle the entire system by turning the master electrical on/off switch to off, wait 5 seconds then turn it back on.
6. If your problem is related to solar:

   - Reset your solar system. First, disconnect the panels from the charge controller. This is usually done with an on/off switch. Then, disconnect the battery from the controller, wait about 10 seconds, then reconnect the battery connections. Wait 15 seconds. Turn the solar on/off back to on.

7. If your problem is related to your inverter:

   - Power cycle your inverter by powering it off and back on.
   - Check the display(s) to ensure it is not remotely powered off, or the current limit is set so low it will not allow enough power from shore.

If you are still having trouble with your system, call AM Solar at 541-726-1091 to get in touch with our dedicated support staff. Give us a shout before you get a headache and we'll help you through things! **Please have a voltmeter handy and have performed all the applicable steps above before contacting us.**