Installation Manual Table of Contents

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Suggested Tools



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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























Victron 30A Core

Solar

This solar charging kit uses individually fused 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 to the videos on AM Solar's website.

4. **Install the panels.** On a metal roof, penetrations are rarely required. Don't let any part of the panel overhang the leading edge of the roof.

5. **Install the combiner box** by following the video instructions on the AM Solar Website.

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. If you have trouble, follow the video on AM Solar's website.

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.

Battery Bank

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The battery bank is the heart of the system. It's 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 three 100Ah 12V batteries and a battery monitoring system. By connecting the batteries in parallel you end up with a 300Ah 12V battery bank. 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 of the most positive battery.

5. **Check the connections** to make sure they are correct and tight.

6. **Parallel connect the batteries** by running the cables as shown. Ideally, these cables connecting each battery are as short as possible and all equal in length.

7. **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.

AC Input/Output 30A 3000VA 120A

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.

FUSE-CLST-400A

Zip tie the spare fuse nea

LUG-4/0-BI

93H-B3/

so you can find it quic

95F-CLST-400A

LUG-4/0

93H-B3/4

Inverter / Charger Master Disconnect

LUG-4/0-RING-3/8

LUG-4/0-BING-3/

4/0 Cable

93H-B3/4



CABLE-4/0-1-BLK

4/0 Cable

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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, therefor it is important to keep these cable run as short as possible, ideally less than 5'.

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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. **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 Class-T fuse is between the master disconnect switch and the positive terminal of the most positive battery. Secure your spare fuse nearby with a zip tie. Connect the temperature sensor to the battery negative.

 Verify Connections, check polarity, tighten terminals and permanently secure all components.
 Activate the system by turning on all the breakers and the Digital Multicontrol.



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DC Distribution Kit

DC Distribution

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.

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 IN post of the BP.

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 OUT post of the BP to the LOAD post of the breaker.

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

7. **Connect the switch to the BP65** with the 18ga duplex cable. Polarity doesn't matter.

8. **Install the red cable** between the breaker's LINE post and the positive terminal of the most positive battery.

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. This would be a good time to program the BP. If the DC loads do not work, toggle the DC load master switch.

12. Proceed with programming the BP65 per our specifications.



Programming: The BMV-712 Battery Monitor



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

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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.

- Select the BMV-712 on the Device List (picture 2).
- Press the gear icon in the top right corner (picture 3). 5.
- Enter "Battery" and change the values to match the colored box at the top right 6. (screen shown on picture 4):
- 7. Changing Battery Capacity: Enter the number of Ah of your entire battery bank.
- Charged Voltage: 13.9 8.
- Tail Current: 2% 9.
- 10. Peukert Exponent: 1.00
- 11. Charge Efficiency Factor: 99%
- Go back to Settings, enter "Misc"
- 13. Aux Input: Select "Temperature"
- 14. Temperature Unit: Select "Fahrenheit"
- 15. Temperature coefficient: .9%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 Battleborn 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: .9%cap/F

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	SmartLi	thium HQ1713GZ8DF		101			0W	Charge	ed voltage	14.1V
/ictronConnect	≝ 12V/300	Ah		Solar				Tail cu	rrent	2.00%
Victron Energy BV	SmartLi 12V/200	thium HQ171621BW6 Ah	:	-			0.01V	Charge	d detection time	3m
INSTALL	AM Sola	ar V4		<u>IO</u>			0.0A	Peuke	t exponent	1.10
	585 BMV-712	Smart		Battery				Charge	efficiency factor	97%
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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 Charge Controller

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Charge Control Settings for Battleborn 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: 30A (In this example)
 - Charger enabled: ON
 - Battery Preset: User defined
 - Expert Mode: ON
 - Absorption voltage: 14.40 V
 - Float voltage: 13.50 V
 - Equalization voltage: 14.40 V
 - Re-bulk voltage offset: 0.10V
 - Absorption Duration: Fixed (Must Enable Expert Mode within Victron Connect)
 - Absorption Time: 00:30 (30 minutes)
 - Tail Current: .5A per 100Ah of total capacity
 - Auto Equalization: Disabled (Off)
 - Temperature compensation: Disabled (Off)



Device list

VE.Direct Smart

MPPT 100/50

SmartLithium HQ171273YCR

14.4v
Yes
Fixed
30 minutes
13.5v
14.4v
.5 per 100Ah
No
Off

	¥
÷	Solar 🗘
STATUS	HISTORY
💿 Solar	0W
Solar	
	0.01V
O Current	0.0A
Battery	
	12.29V
Current	-0.1A
··· State	Off
Load output	
	On

Device List within VictronConnect

Q

MPPT Charge Controller Screen

← Settings					
Battery voltage	12V	-			
Max charge current		70A			
Charger enabled					
Battery preset	User def	fined 👻			
Expert mode					
Charge voltages					
Absorption voltage		14.40V			
Float voltage		13.50V			
Equalization voltage		14.40V			
Bulk					
Re-bulk voltage offset		0.10V			
Absorption					
Absorption duration		Fixed			
Absorption time		30m			
Tail current		2.0A			
Equalization					
Equalization current percentage		25%			

Battery Settings Screen

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Creating The Network

- 1. When in the Victron Connect App, click on the BMV-712.
- 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 the MPPT Charger.
- 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 6). Your battery monitor and charge controller are now communicating with each other.





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0	Current		0.0A







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

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- 1. Supply 12V power to the BP (+ to IN post, to GND pin).
- Open VictronConnect and select the Battery Protect. 2.
- The first screen has a switch to manually toggle the relay. 3.
- Click the gear in the top right to enter Settings. 4.
- Select "user defined" from the Preset menu. 5.
- 6. Enter the following values:

Shut down: 12.4v

Restart: 13.0v

7. Operation: Select "Li-ion" from the dropdown menu.



	Device list	Q		× Settings	🖻 ± < 🗄	× Settings	🖬 🛨	< :
100 100	SmartLithium HQ1826BCFRC 12V/150Ah	:	i Battery status	Battery voltage	12V 👻	Dettermine		101/
14. 15.	SmartLithium HQ1703NS9BM 12V/160Ah	0 0 0		Under Voltage settings	-	Battery voltage		120 👻
1	SmartLithium HQ1703AU3XE 12V/160Ah	0 0 0		Preset	User defined	Preset	Li-ion	~
i i i	SmartLithium HQ1703QJ3BE	* 0 0	12.73V	Restart	1. 10.00V / 11.50V	Shut down		10.00V
16.5	SmartLithium HQ1826I7VQ7	:	Load output	Load disconnect & alarm settings	2. 9.50V / 11.50V	Restart		13.00V
	V4 Lithium	* *	••• Load output state Active	Operation	3. 11.25V / 13.25V	Load disconnect & alarm	settings	
080	BatteryProtect HQ1908FMEVS	:	4. Select the gear icon	Alarm output	5. 10.50V / 12.80V	🔗 Mode	С	•
	12V/24V 220A	/	4. Select the gear icon		6. 11.50V / 12.80V	🤣 Operation	Li-ion) · (
8	IP65 12 7				7. 11.80V / 12.80V	🛇 Alarm output	Disabled	Ŧ
B	IP65 12 15			5. Select "User defined"	from the Preset	5. Select "Li-ion" mode	for operation	
	VE.BUS Smart HQ18386RUUE 12/2000/80-50 120V	0 0 0		menu				
	SmartSolar HQ1814N7U8V MPPT 150/70		NOTE: These setting wer	re chosen on the conserva	ative side, but can be adju	usted depending on your ne	eds. Do not low	er the shut (

own voltage until you are very familiar with your system, since dropping below 12v may result in battery degradation.

2. Select BatteryProtect from VictronConnect

1.000.00.0

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





Troubleshooting Steps

Steps to take before calling AM Solar:

1. Get a voltmeter and test the voltage of the batteries directly to ensure they aren't drained.

- If you aren't familiar with how to operate your voltmeter, test it on a known power source like your car starter battery to ensure you are reading it correctly.

2. If your problem is related to solar:

- Perform a system reset on the solar side. First disconnect the panels from the controller, usually done with an on/off switch. Then disconnect the battery from the controller. After 10 seconds, reconnect the battery to the controller and give it 15 seconds to boot up. Then reconnect solar.

- Download the latest version of the VictronConnect App to your device, and attempt to reconnect

3. If you problems is related to the inverter:

- Power cycle the inverter by powering it off and back on.

- Check the display(s) to ensure it isn't remotely powered off, or the current limit is set too low to not allow enough power from shore.

- 4. Check all connection points to ensure there are no loose connections.
- 5. Check all on/off switches to ensure they are on, and all DC breakers are reset.
- 6. Check all inline fuses to ensure they haven't blown. You have the following fuses in this kit, with a spare included for each:
 - Inverter 300Amp Class T Fuse
 - Victron BMS 15A fuse
 - Temperature Sensor Fuse
 - Solar 20A ATC Fuse
- 7. Power cycling the entire system by turning the master electrical on/off switch to off, give it 5 seconds, and then back on.

If you are still having issues with your system, call AM Solar at 541-726-1091 to be put into our troubleshooting queue. Give us a shout **before** you get a headache and we'll help you through things! Please have a volt meter handy and performed the applicable tests above before contacting us. We'll be glad to help get you back up and running as quickly as possible!