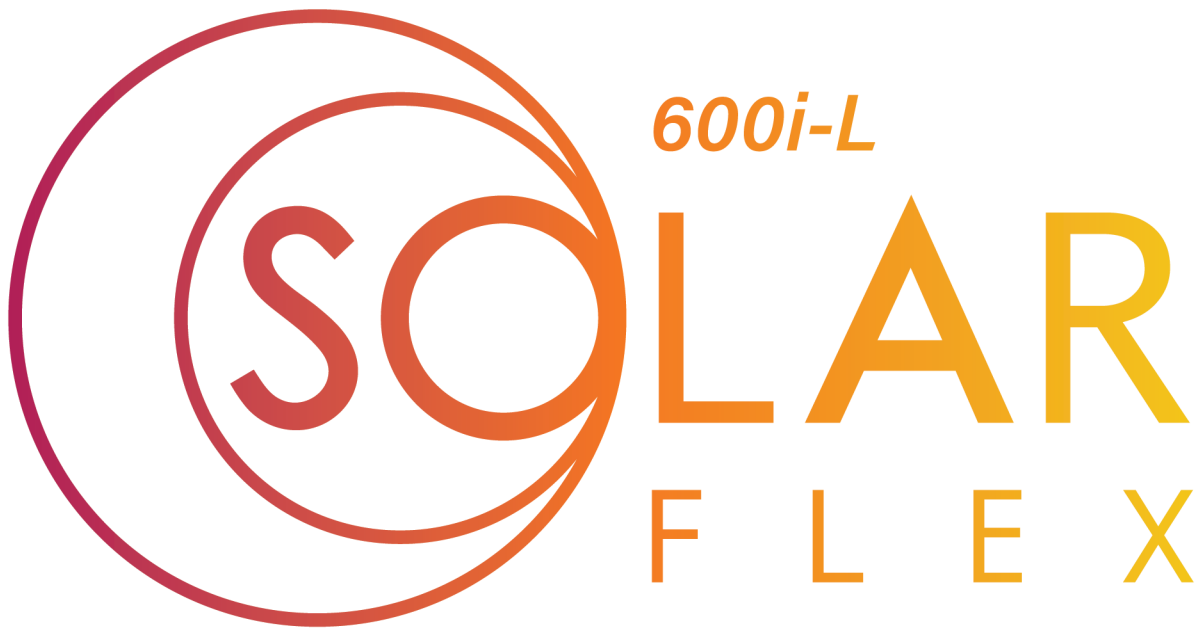


# BASIC USER GUIDE

## SolarFlex 600i-L Settings



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# INTRODUCTION

## Dear SolarFlex Owner,

Congratulations and thank you for your purchase of your new Keystone SolarFlex 600i-L System. We know this will help you on your journey with your new RV.

To help get you started, we encourage you to take a few minutes and review the Owner's Manual thoroughly. There are many components, system settings and equipment unique to a recreational vehicle. Getting an understanding of how they function will be important to safe operation, getting the most from your system, and your overall enjoyment.

If you have any questions, please contact your selling dealer or the Keystone Customer Service Group at 866-425-4369. Additional information and resources about your system can be found at [www.keystonerv.com](http://www.keystonerv.com) or [www.fsi-solutions.com/owners-manuals](http://www.fsi-solutions.com/owners-manuals).

The Future Solutions Team thanks you again for purchasing a Keystone product. Enjoy camping with your own power!

- The Future Solutions Team

## YOUR SOLARFLEX 600i-L INCLUDES:

(2) 30A Solar Roof Ports



(600W) Future Solutions Solar Array



50A Victron Smart MPPT Controller



Victron 3kW Inverter (with Built-in Transfer Switch)



(2) CS2 Solar Cable Splitters



Victron SmartShunt Battery Monitor



Battery Guardian System (With Low Voltage Disconnect)



(270Ahrs) Dragonfly® Lithium Ion Battery



Victron Cerbo GX



In Partnership With Future Solutions.

This manual is based on the latest information available at the time of publication. Due to continuous product development and improvements, Future Solutions reserves the right to make changes in product specifications and components without prior notice. The most recent version of the owner's manual can be found on our website at [www.fsi-solutions.com/owners-manuals](http://www.fsi-solutions.com/owners-manuals) or [www.keystonerv.com](http://www.keystonerv.com) under the Customer Service heading.

# VICTRONCONNECT APP



Your system includes components from Victron’s “Smart” energy line with Bluetooth connectivity in place of a physical remote display. This includes the SmartShunt, MPPT SmartSolar Controllers, and the Cerbo GX. Your MultiPlus Inverter does not have Bluetooth capabilities. The SmartShunt is monitoring your battery state and tracking how much power is flowing to or from the battery bank, giving you valuable information regarding your State-of-Charge (SOC).

The MPPT SmartSolar Controller is regulating the power produced by the solar panels to charge the batteries. Both of these devices have stand-alone Bluetooth connectivity and can be viewed individually by using the VictronConnect App on a smart phone or tablet. These devices also report to the Cerbo GX, which acts as a connectivity and monitoring hub for your system. This section contains details for each of these devices.

## Victron Connect

Opening the VictronConnect app will cause it to look for ANY Victron items with a Bluetooth signal within range. Specific items can be identified by the Icon, as well as the device “nick-name”. The default nickname is the device serial number. **Serial numbers** for your devices, as well as information needed to connect to your Cerbo GX are found on the sticker located on the cover of your component plate, as well as on the side of your battery.



The first time you connect to any device, you will have to enter the default password (000000). You can change the password when prompted if you choose, or you can also change the password in settings at a later time.

If you have lost or forgotten your password, they can be reset through the app, but this does require a PUK number (a special code) that is on the serial number sticker of the device. This number is required to ensure that you have physical possession of the device before clearing a password.

Each of your Bluetooth devices will have three tabs across the top: *Status, History, and Trends*.

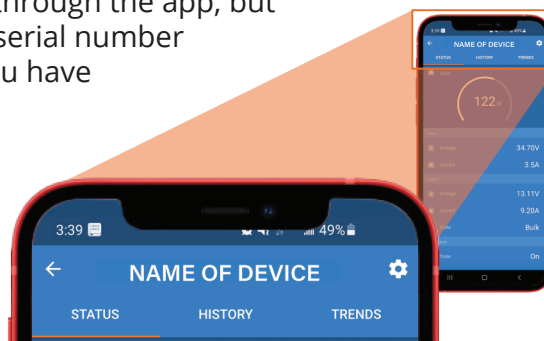
## Main Tabs

**STATUS:** Shows live-time information regarding battery conditions.

**HISTORY:** The device stores historical values in non-volatile memory. This means this data will not be lost when the power to the device has been interrupted. These can be used at a later date to evaluate usage patterns and battery health.

**TRENDS:** This section of VictronConnect enables data-logging, but only while the app is connected and communicating with the SmartShunt. It will simultaneously log two of the following parameters: Voltage, Current, Power consumed Ah, or State of Charge.

Once connected, you can change the device nick name, and change or add a password. To do this, click the settings (⚙) in the top right corner. Once in main settings menu, select the menu (⋮) in the top right corner, and choose “Product Info”. This is where you can change the name of the device, check for updated firmware, and change the password to log onto the device.



## VICTRONCONNECT APP CONTINUED

### Pairing Procedure

Default pincode is 000000.

After connecting, the pincode can be changed by going into "Settings" (⚙️), select "Menu" (⋮), "Product Info", and here you can change the product name and pincode.

Apple Store



Google Play Store



User Manual



### Reset Lost Password

You will need to "forget" the device from your device list. If you are not sure how to do this, a link will be displayed on your phone or tablet during the process that you can follow to learn how.

- 1) Locate and write down the PUK number from the device you are trying to reset.
  - a. On the SmartShunt and SmartSolar Controller: this is on a sticker on the side of the component. Reference below for label locations.
- 2) Select the Menu (⋮) to the right of the signal strength meter.
- 3) Choose "Reset PIN code".
- 4) If you have not removed the device from your Bluetooth list yet, follow the link at the bottom of the warning message, complete the removal, and start at *step 1* again. Otherwise, proceed to *step 5*.
- 5) Enter PUK number and click "OK".



# SMARTSOLAR CONTROLLER



This system is utilizing the SmartSolar MPPT 100|50 Solar Controller. A Solar Controller charges a lower nominal-voltage battery from a higher nominal voltage PV array. The Solar Controller will charge the battery with a current up to its rated output. The SmartSolar MPPT 100|50 Solar Controller has a

maximum of 50 amps output. Selecting the SmartSolar Controller in VictronConnect will open the main screen.

**1) Wattage Readout (Solar):** This shows how many watts are being processed through this SmartSolar Controller.

**2) Solar (Voltage and Current):** This shows the voltage of your panels and how much current is coming from the panel array.

**3) Battery (Voltage, Current, and State):** This shows the battery bank voltage, charging current and the current charging state of the SmartSolar Controller.



## Settings

In the settings menu (⚙️), under the “Battery settings” section, you have the option to reduce the max charge current, disable the Charger, or change the battery type. It is recommended that the battery type be set to “rotary switch” and it should read “Position 7” in the info box.

**NOTE:** Battery type settings on VictronConnect App over-rides the rotary switch settings of charge Controller.

## Controller Status Lights

The charging state of the Controller can also be observed using the LED lights on the physical Solar Controller.

**Light Indicator Key:**

- 🔄 Blinking
- On
- Off

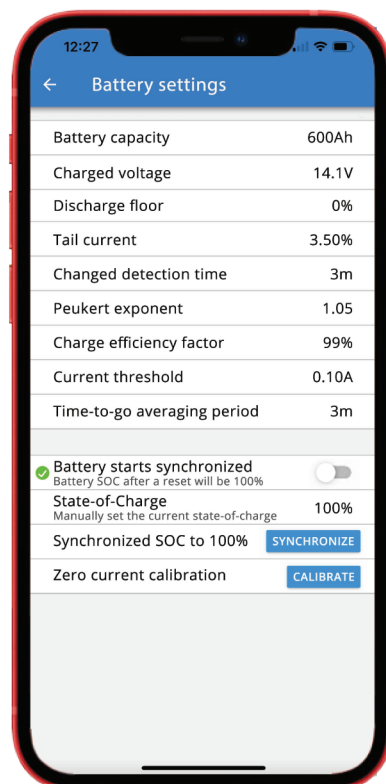
	LEDs	BULK	ABSORPTION	FLOAT
<b>REGULAR OPERATION</b>	Not charging (*1)	🔄	○	○
	Bulk (*2)	●	○	○
	Absorption (*2)	○	●	○
	Automatic equalization (*2)	○	●	●
	Float (*2)	○	○	●
<b>FAULT SITUATION</b>	Charger temperature too high	○	○	🔄
	Charger over-current	🔄	○	🔄
	Charger or panel over-voltage	○	🔄	🔄
	Internal error (*3)	🔄	🔄	○

**NOTE \*1)** The bulk LED will blink briefly every 3 seconds when the system is powered but this is insufficient power to start charging.

**NOTE \*2)** The LED(s) might blink every 4 seconds indicating that the Charger is receiving data from another device, this can be:

- A GX Device (e.g. Color Control with a Multi in ESS mode)
- A VE.Smart network link via Bluetooth (with other MPPT Chargers and/or a BMV or Smart Battery Sense)

**NOTE \*3)** e.g. Calibration and/or settings data lost, current sensor issue.



## SMARTSHUNT

The SmartShunt is a very valuable piece of equipment in your system. This is the component that is responsible for helping you keep track of just how much energy is left in your battery bank at any given time. This component simply measures battery voltage and current. With those measurements, and the info provided to it through the settings menu, SOC (State-of-Charge), and Time Remaining are calculated.



### Overview

**\*1) State of charge:** Percentage of energy in battery bank. This is a calculated number based on settings and should be periodically checked against the Voltage to SOC chart. See *At Rest Voltage vs SOC Chart* on pg 22.

**2) Voltage:** This is the battery bank voltage level.

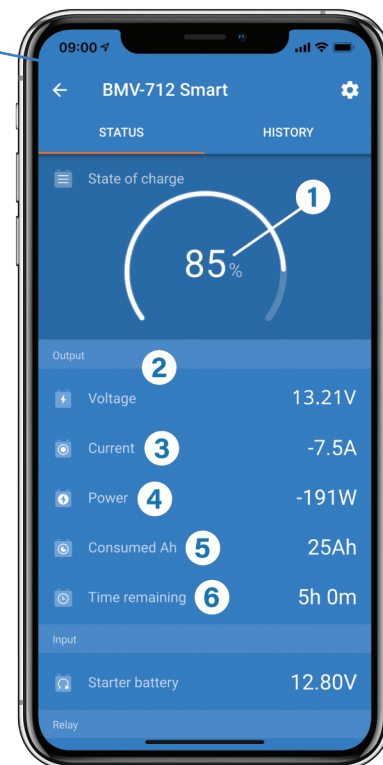
**3) Current:** A negative number indicates current (A) flowing from the battery bank; a positive number indicates current (A) flowing to the battery bank.

**4) Power:** This is the NET Power (Watts) flowing to or from the battery bank. A negative number indicates power (W) flowing from; a positive number indicates power (W) flowing to the battery bank.

**\*5) Consumed Ah:** The SmartShunt keeps track of the Amp-hours removed from the battery (compensated for the efficiency). Example: If a 10-amp load is ran for 4 hours, the read out will show -40.0 Ah (-10amps x 4 hour = -40.0).

**\*6) Time remaining:** This is an estimate of how long the battery bank can support the present load under the present conditions. If the loads being ran fluctuate heavily, it is best not to rely on this reading too much as it is a momentary readout and should be used as a guideline only.

Selecting the SmartShunt will open to the main info screen.



**\*NOTE:** If “- -” are shown, this means that the shunt is in an unsynchronized state. This can occur when the system has been left unpowered for a period of time and is powered up again. See paragraph 5.3 “Synchronizing the SmartShunt” in the SmartShunt Manual.

**NOTE:** **Current** is the NET current flow (adding all charging sources and subtracting all loads) flowing to or from the battery bank.

## SMARTSHUNT CONTINUED

### Recommended Settings

The settings on the SmartShunt need to be accurate in order to provide proper data regarding the Consumed Amp-hours, State of Charge, and Time Remaining readouts. If you find your readings are off, review your settings to ensure they are correct. *All settings are recommended by Dragonfly Energy.*

**Battery capacity:** This should be set to the size of your battery bank.

600i-L with GC3 Batteries should be [set to 270Ah](#)

600i-L with GC2 Batteries should be [set to 300Ah](#)

**Charged voltage:** This is the battery voltage that MUST be met before the SOC is reset to 100%.

DFE Recommended Setting – 14.1 V

**Discharge floor:** This setting is used in the “time to go” calculation.

DFE Recommended Setting – 0%

**Tail current:** This setting is used to determine when SOC is reset to 100%.

DFE Recommended Setting – 3.50%

**Charge detection time:** This setting is the amount of time that “Charged Voltage” and “Tail Current” must be met before the SOC is reset.

DFE Recommended Setting – 3m

**Peukert exponent:** This setting is used in calculations of SOC.

DFE Recommended Setting – 1.05

**Charge efficiency factor:** This setting compensates for the amp-hours lost to heat during charging.

DFE Recommended Setting – 99%

**Current threshold:** This setting controls the smallest value of current that the system will recognize.

DFE Recommended Setting – 0.10A

**Time-to-go averaging period:** This is the time period that is averaged to get the “Time-to-go” value.

DFE Recommended Setting – 3m

**Battery starts synchronized:** This selection will cause the SOC to reset to 100% anytime the Shunt is powered up after having been disconnected.

DFE Recommended Setting – Disabled

**State-of-Charge:** With this setting, you can manually set the state of charge value. This setting is only active after the SmartShunt has, at least once, been synchronized (automatically or manually). For more information on this, see *At Rest Voltage vs SOC Chart* in the appendix on pg 22.

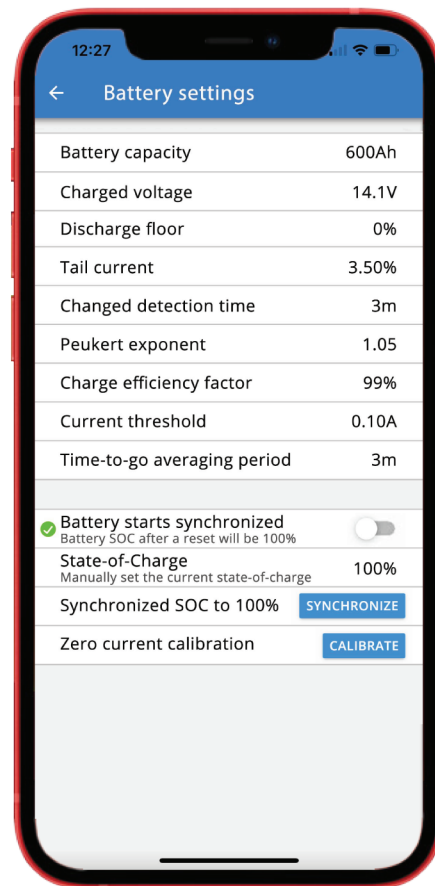
DFE Recommended Setting – N/A

**Synchronize SOC to 100%:** This option can be used to manually synchronize the SmartShunt.

DFE Recommended Setting – N/A

**Zero current calibration:** This option can be used to calibrate the zero reading if the battery monitor reads a non-zero current even when there is no load, and the battery is not being charged.

DFE Recommended Setting – N/A





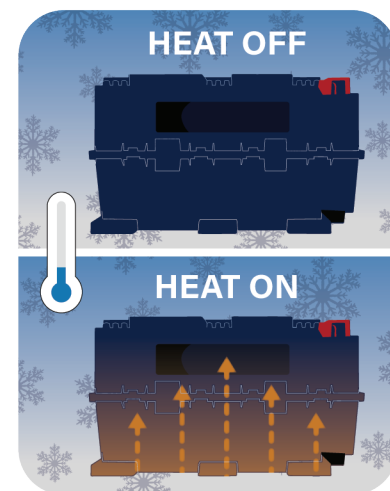
## BATTERIES

### Battery Heat Overview

Your batteries are equipped with built in battery heaters to ensure cold climate does not stop your batteries from charging. The heaters are enabled or disabled by a lighted switch inside of the coach or on the iN-Command Display Commander's Battery Heat Trigger. When the switch is turned on, the heaters will automatically activate when the internal temperature of the battery drops below approximately 35°F (1.6°C) and will automatically shut off when the internal temperature exceeds approximately 45°F (7.2°C).

**NOTE:** If the battery has been cold soaked (exposed to below freezing temperatures for a long period of time without the heater enabled), it will take 2-4 hours for the internal components of the battery to heat up enough for the battery to accept a charge.

The heaters draw 1.8 amps (per battery) of power and typically run on a 30% duty cycle. This means at 0°F, the heaters will be on 30% of the time, and off 70% of the time. That means if it is cold, we can expect 0.6 Ah of energy (per battery) to be used to keep the batteries at proper charging temperatures.



### When to Turn On Battery Heat

If you are using the coach and the temperature is below freezing, you will want to turn on the battery heat to ensure you are able to take advantage of charging from your solar set up. The heat can either be turned on just prior to charging, or left on while the coach is in use. Both options have pro's and con's and are based on personal preference and use case.

While leaving the heat on while the coach is in use, you could be using energy to keep the batteries warm when it is not necessary (remember: it is only really necessary when trying to charge) it also ensures that if you are charging from solar, the batteries are always able to accept power when it is available.

Only enabling the heat prior to charging will conserve more battery power, but it can also take an extended period of time for the batteries to warm up to be able to charge if they are cold soaked. In the end, the important thing to remember is if the temperature is at or below 35°F, you will need to activate the battery heat in order to charge the batteries.

**NOTE:** DRAGONFLY DOES NOT RECOMMEND BATTERY HEATER BE ACTIVE WHEN STORING THE BATTERY.

Precision Circuit Products

## BATTERY GUARDIAN AUTO

The Battery Guardian Auto installed in your system acts as a smart battery disconnect switch. The DC loads inside of your coach are running through this component. When the switch is turned on, the BGA is monitoring the battery voltage. If your battery bank voltage reaches 11.5 VDC for 2 minutes, the BGA will turn off, disconnecting all interior loads from DC power. When the BGA senses the battery is being charged, it will automatically turn back on. You can manually disconnect the DC loads inside of the coach by turning off the BGA switch.



Auto-Disconnect Voltage: < 11.5VDC for 2 min.

Auto-Reconnect Voltage:

When BGA senses battery is being charged.



**Coach Disconnect**  
(if located outside coach)

## MULTIPLUS INVERTER

### MultiPlus Inverter

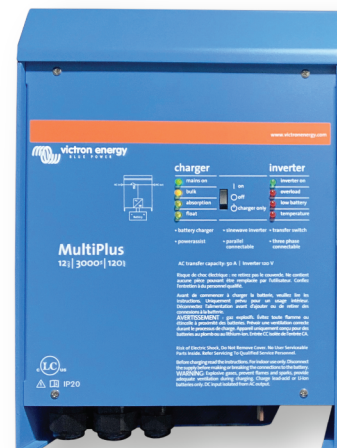
The 600i-L is equipped with a Victron MultiPlus 3kVA Inverter. The MultiPlus is a powerful true sine wave Inverter and sophisticated battery charger all in one package. When on shore or generator power, the MultiPlus will pass power through to the loads from the source. Any available power that is not used for the loads will be dedicated to battery charging.

The MultiPlus comes from the factory programmed for charging the Lithium battery bank that is on the system. If the need arises to change the programming, you **MUST** reach out to a trained professional.

On the 600i-L, the Inverter is running a specific set of AC circuits. The main panel provides power to the Inverter when on shore or generator power and the Inverter passes that power through to a sub-panel. The sub-panel powers a circuit of general outlets as well as one of the air conditioners. When shore or generator power is not present, the Inverter will draw power from the battery bank and alter it from DC to AC power to run the items on the sub-panel.

- The Inverter is set up in Unlimited Power Supply (UPS) mode. This means that when the unit is plugged in to shore or a generator, if the breaker trips or a power outage occurs, the Inverter will automatically take over and keep the inverted circuits from shutting down.
- The Inverter only monitors the loads that are powered through the sub panel. This means, when plugged in to a smaller shore outlet (or running a portable generator), you can still run more loads than the power source can supply. If this happens, the breaker will trip and only the inverted loads on the sub-panel will remain powered. Some suggestions can be found in the Tech Tips section for using a small shore outlet or portable generator.
- The Inverter can be monitored and controlled through the Cerbo using the Remote Console. This is discussed in more detail in the Remote Console section of this manual starting on pg 12.
- The Inverter has a rocker switch on the cover that can limit the functionality to “Charger Only” or “Off”. When the rocker switch is in the “On” position, the state of the Inverter can be changed through the Remote Console.

**NOTE:** Setting the rocker switch to “Charger Only” or “Off” over-rides the settings in the Remote Console.

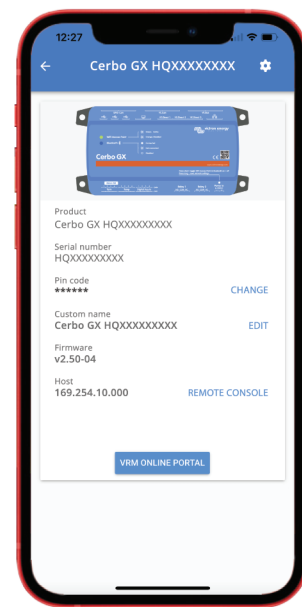


# CERBO GX



## Dashboard

This all-new communication center allows you to always have control over your system from wherever you are. All of your Victron equipment is reporting to the Cerbo GX which then displays the data on an intuitive interface that is easy to understand and operate. The Cerbo GX has built in Bluetooth, built in Wi-Fi access point, as well as the ability to connect to a local LAN or Wi-Fi Network.



## Connecting to the Cerbo

The Bluetooth option on the Cerbo GX has limited functionality. It is intended to be used to assist with initial connection and networking configuration. Review the section for VictronConnect (pg 2) for instructions on how to connect a device with Bluetooth. Once opened, you will be able to set the PIN, name your device, and select external Wi-Fi networks.

## External Wi-Fi

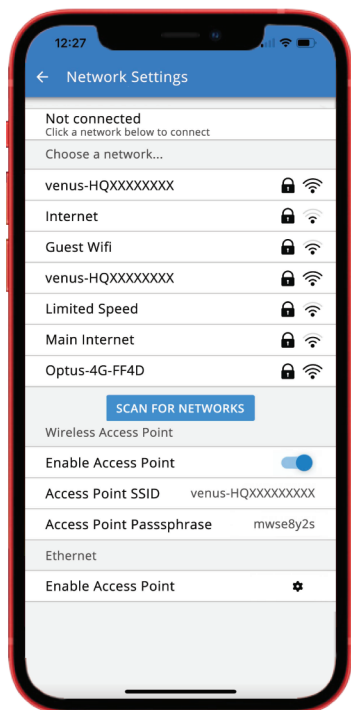
If you have a Wi-Fi signal you would like to use to access the Cerbo GX (possibly through a hot-spot or other mobile network) you can log the Cerbo GX onto the network through the Bluetooth connection.

- 1) From the main screen, select the Settings (⚙️).
- 2) Choose your desired network from the list of available networks.
- 3) Enter your network password.

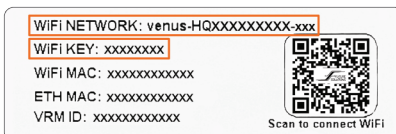
**NOTE:** This Wi-Fi access point does not have an internet connection and is only used to view the remote console when you are near the unit. You can access this network in two ways.

## Internal Wi-Fi

If you do not have a Wi-Fi signal, you can still access the remote console by accessing the internal Wi-Fi access point of the Cerbo GX.



- 1) Connecting automatically via the QR code:
  - a. Locate the QR code sticker on the component plate of your system.
  - b. Scan the QR code using your phone's camera function or a QR code scanning app.
  - c. If supported by your phone, this will prompt you to connect to the Wi-Fi access point.
  - d. Once connected, open VictronConnect.
  - e. Select the GX device from the list then open the Remote Console.
- 2) Manually Connecting:
  - a. Stand as close as possible to the Cerbo GX (within a few meters).
  - b. Go to the Wi-Fi settings on your phone or tablet.
  - c. After searching for local networks, the Cerbo GX will show up in the list as something like "Venus-HQ1940DEFR4-3b6".
  - d. Connect to Wi-Fi using the Wi-Fi key printed on the sticker on your component plate.
  - e. Open VictronConnect, it will start automatically scanning the Wi-Fi network.
  - f. Once found, select the GX device from the list.
  - g. Open the Remote Console. Read more about this on pg 12.



# CERBO GX CONTINUED

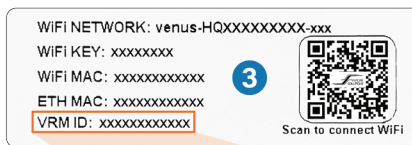
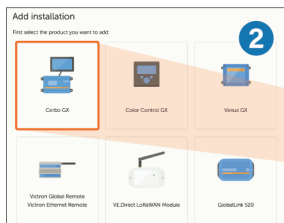
## VRM Set-up and Linking System

**NOTE:** CERBO GX NEEDS TO BE POWERED UP AND BE LINKED TO A WI-FI NETWORK WITH INTERNET ACCESS.

1) Go to <http://www.victronenergy.com>, click on the 'Login' tab and select 'VRM'. Select the 'Register for Free' icon below the log in screen. Here, you will need to provide your name, email address, phone number, city, country, and select a new password.

2) You should receive a verification email with a link to your new account. Next time you go to the VRM homepage, you will simply have to enter your email and your password. Clicking on the link takes you to a page to

add your installation. Click 'Cerbo GX'.

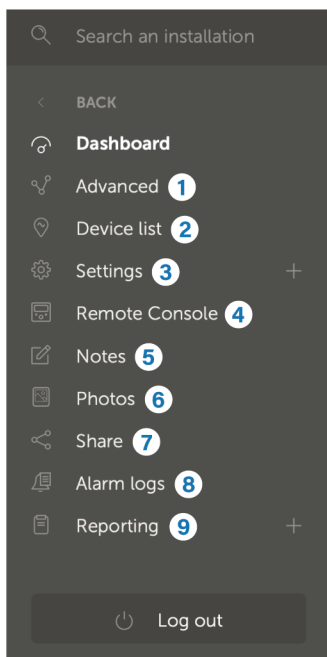


3) It will ask for an Installation ID and an Installation name. The Installation ID can be found on the serial number sticker of your 600i-L system. This should be located on the cover of the plate. It can also be found on a sticker on the bottom of the Cerbo GX. The VRM ID can also be found using the Remote Console. For more on that, see Remote Console section starting on pg 12.

4) Enter the alpha-numeric code for the VRM Portal ID and you can choose to name the installation anything you want (example: Jones RV).

## Menu

Once your Cerbo is linked to your new VRM account, you will see an overview of your system as the main backdrop, with a menu of options on the left.



1) **Advanced:** Opens the data tracking portion of the portal. Under 'widgets' in the top right corner, you can find all of the different options of data available for each of your devices.

2) **Device List:** This opens a screen that shows each of your connected components. Clicking on a component shows you the serial number, firmware version, and much more.

3) **Settings:** Options here include adding other users to the account, changing the name of the installation, and unlinking an installation.

4) **Remote Console:** This allows you to access the menu for your Cerbo from any computer. To use this, the Cerbo must be linked to the internet and the two-way communication option must be enabled.

5) **Notes:** Allows you to save notes for long term information.

6) **Photos:** Allows you to upload photos.

7) **Share:** Enables others to openly view your harvest information.

8) **Alarm Logs:** Shows any alarms that have occurred with a time stamp.

9) **Reporting:** Enables you to have data emailed to you.

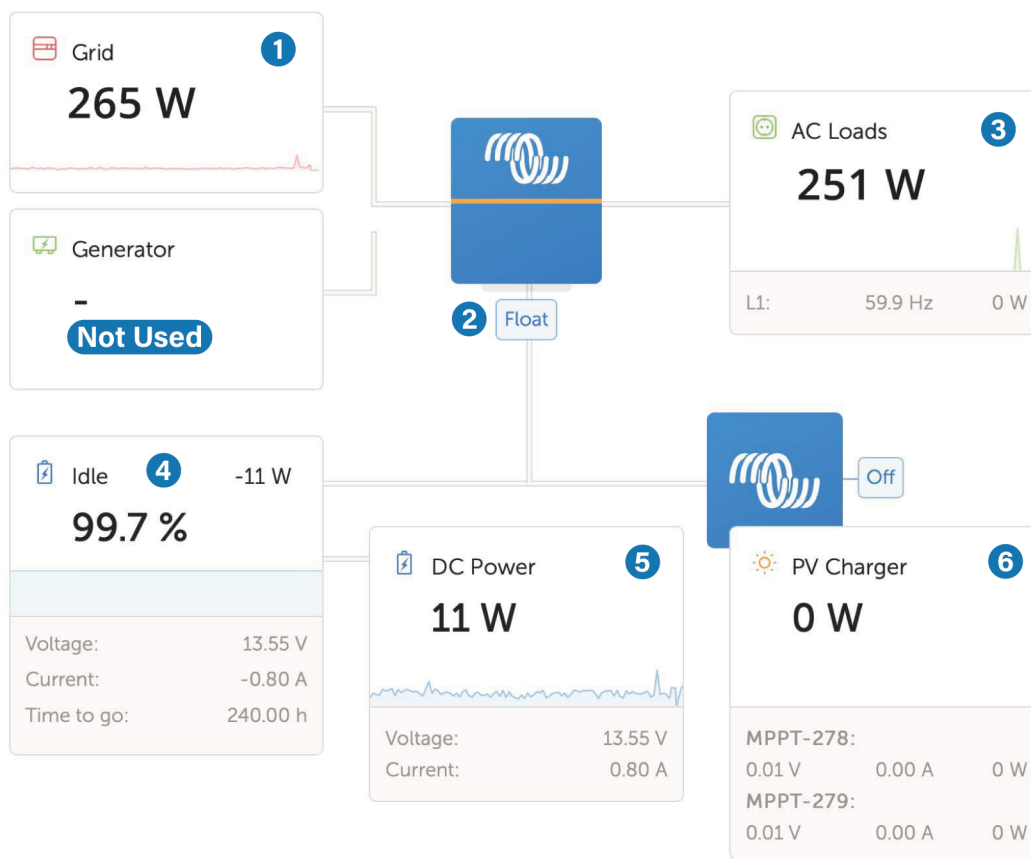
## VRM PORTAL

## VRM Portal



## Smith Family RV

[Hide details](#)

 Last updated:  
 Realtime 


**1) Grid:** Shows the amount of power from the available source (shore or generator) that is being used by the Charger and the loads on the sub-panel.

**2) Inverter Status:** Shows the state the Inverter is currently in. Bulk, Absorb, and Float indicate charging. Inverting indicates no shore or generator power is present and the Inverter is supplying power to the sub-panel.

**3) AC Loads:** Shows the amount of power consumed by loads on the sub-panel. (NOT ALL AC LOADS.)

**4) Battery Monitor:** Shows SOC%, Battery Bank Voltage, Current Flow, and Time to go calculations.

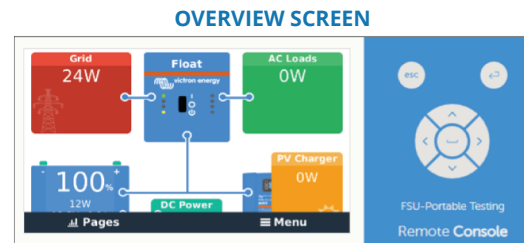
**5) DC Power:** This is a calculated value that shows how much of your power is consumed by DC loads. Any power consumed or presented to the system, not from a Victron component, is included in this calculation.

**6) PV Charger:** This shows the total power all monitored Solar Controllers are producing. If solar is expanded, the new Controller must be plugged in to the Cerbo with a VE.Direct cable for this to be accurate.

# REMOTE CONSOLE

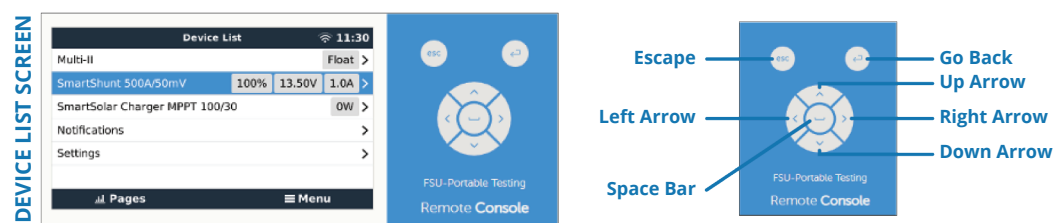
## Understanding the Remote Console

Opening the Remote Console will bring up the system overview screen. This shows your battery information and total combined solar power. On the home screen there is also a moving graphic that represents where the power is coming from and going to in your system. The Cerbo GX has a lot of functionality that goes beyond the scope of this manual. For purposes of this manual, we will cover the basic items that a user needs to know to be able to utilize the off grid system. If you are interested in more detailed information about the capabilities of the Cerbo, please see the User Manual for the Cerbo GX (link on pg 23).



## Remote Console Navigation

By selecting the space bar, the selection bar will momentarily pop up at the bottom of the screen. This is used to toggle between the Menu, and the home screen. Selecting "Pages" will return you to this home screen.

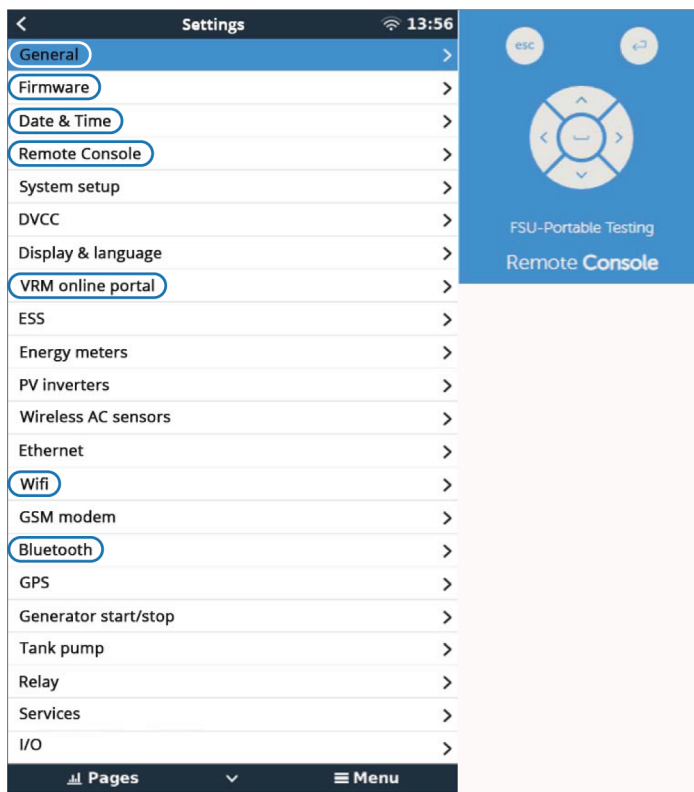


Selecting Menu will open to the main menu where you can select between the individual components hooked up to a Cerbo GX or you can go into settings of the Cerbo GX itself. Selecting any one of the components will allow you to view more detailed information about what that component is doing. Below the components is a 'Notifications' tab that will open a screen that will show the report of any error logged by the system. At the bottom of the list is the Settings tab.

## Settings

Opening the Settings Menu will bring up a vast selection of functions (shown to the right). Many of these options are used with various other configurations of Victron Equipment. Not all apply to the SolarFlex system. Only items that pertain to the SolarFlex system will be discussed.

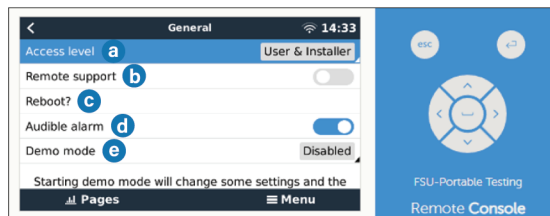
For more information on any of the settings, please refer to the Cerbo GX Owners Manual (link on pg 23).



# REMOTE CONSOLE CONTINUED

## Understanding Settings

### 1) General



**a. Access level:** Allows for you to choose who can access your system.

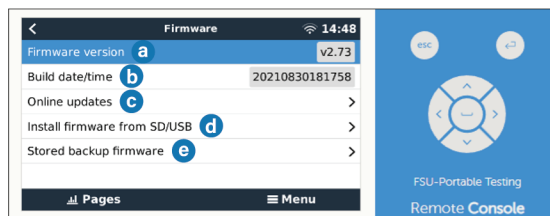
**b. Remote support:** This option opens a support tunnel between secure servers at Victron and your Cerbo GX. This is not used and should remain off.

**c. Reboot?:** This will reboot your Cerbo GX in the event of certain settings changing or a communication glitch.

**d. Audible alarm:** Enable or disable an audible alarm when a fault occurs.

**e. Demo mode:** This should remain off.

### 2) Firmware



**a. Firmware version:** This is the firmware version the Cerbo GX is currently running.

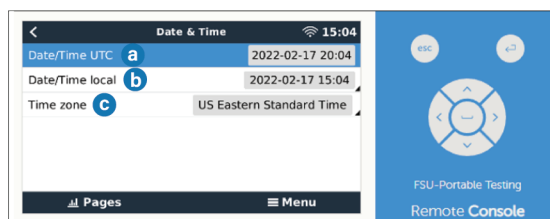
**b. Build date/time:** This code allows Victron Engineers to trace firmware.

**c. Online updates:** Options to update firmware if internet is available.

**d. Install firmware from SD/USB:** Option to upload firmware downloaded to a USB drive or SD card from a PC.

**e. Stored backup firmware:** Stores previous version of firmware.

### 3) Date and Time



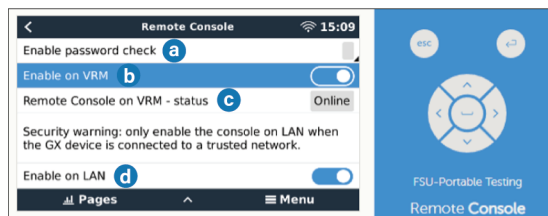
**a. Date/Time UTC:** This is the date and time in Coordinated Universal Time.

**b. Date/Time local:** This displays local time. You can also adjust the time and date manually here.

**c. Time zone:** This allows you to choose a time zone to set the local date and time by.

## REMOTE CONSOLE CONTINUED

### 4) Remote Console



**a. Disable password check:** This allows connection to the Remote Console from the VRM or VictronConnect without an additional password.

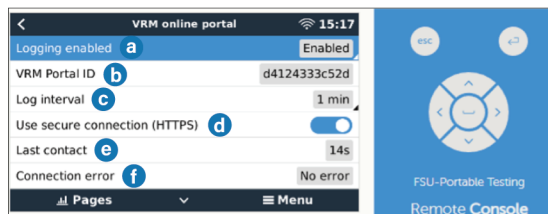
**a. Enable password check:** Allows an additional password to be entered before remote console can be activated.

**b. Enable on VRM:** Allows remote console to be opened through the VRM portal.

**c. Remote Console on VRM - status:** Indicates if the Remote Console is currently connected through the VRM portal.

**d. Enable on LAN:** Enables a device to open the Remote Console if it is on the same network as the Cerbo GX.

### 5) VRM Online Portal



**a. Logging enabled:** Enable or disable data logging.

**b. VRM Portal ID:** Device identifier for VRM.

**c. Log interval:** How often data is logged.

**d. Use secure connection (HTTPS):** Only allow connection through secure channels.

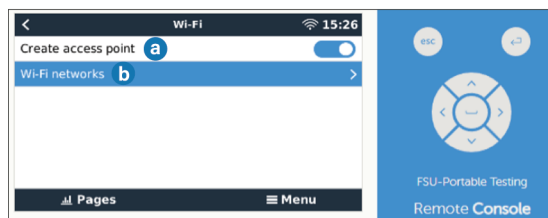
**e. Last contact:** Time since last communication between VRM and Cerbo GX.

**f. Connection error:** Report of any communication error between VRM and Cerbo GX.

**g. VRM two-way communication:** Allows for data to be sent to the Cerbo from the VRM for Remote Console and other features.

**h. Reboot device when no contact:** If there is an error connecting to Wi-Fi, enabling this will automatically cause the Cerbo GX to re-boot in an attempt to clear the error.

### 6) Wi-Fi



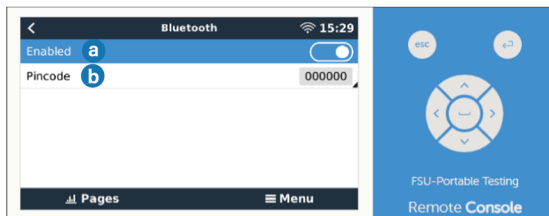
**a. Create access point:** This allows the Cerbo GX to enable the internal Wi-Fi option to provide a means of linking a smartphone or tablet if no other network is available.

**b. Wi-Fi networks:** This will allow you to connect to any available Wi-Fi network.



## REMOTE CONSOLE CONTINUED

### 7) Bluetooth



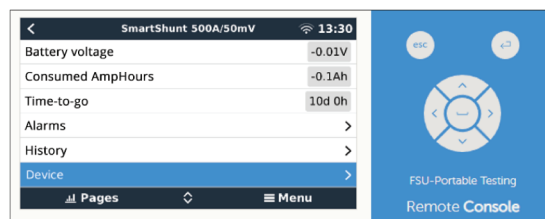
**a. Enabled:** Enable or disable Bluetooth communication from the Cerbo GX.

**b. Pincode:** Change the pincode needed to connect to the Cerbo GX via Bluetooth.

### SmartShunt on Remote Console

Selecting the SmartShunt will allow you to view some of the more detailed information not seen on the home screen.

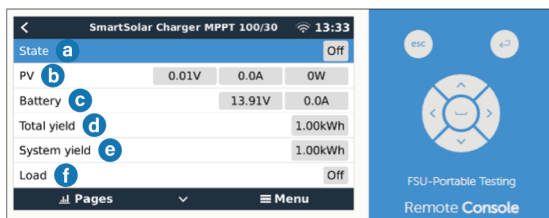
**NOTE:** All settings must be changed through the Bluetooth connection for the SmartShunt. The Cerbo GX will only display information from this device. For more information on settings for the SmartShunt, see pg 6.



### SmartSolar Controller on Remote Console

Each SmartSolar Controller will have its own item line in the main menu screen. By selecting one of the Controllers, the details screen will open to show valuable information regarding that specific Solar Controller.

**NOTE:** All settings must be changed through the Bluetooth connection for the SmartSolar Controllers. The Cerbo GX will only display information from this device. See pg 4 for more information SmartSolar Controller settings.



**a) State:** This shows if the Controller is on or off, and what charge stage it is in.

**b) PV:** This shows the voltage and current that the solar panels are providing to this Controller.

**c) Battery:** This shows the battery voltage as read at the output terminals of the Solar Controller and charging current the Controller is producing.

**d) Total yield:** Total amount of watts the system has produced with one Charger.

**e) System yield:** Total amount of watts the system has produced overall.

**f) Load:** This is not used on this system.

# REMOTE CONSOLE CONTINUED

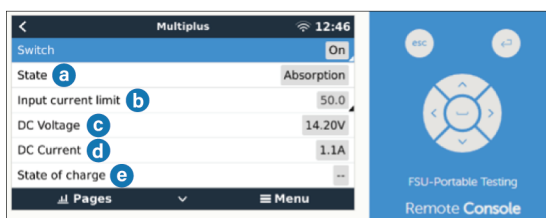
## Inverter on Remote Console

Selecting the MultiPlus from the menu opens the details page where information regarding the Inverter can be found. You can scroll through the list by pressing the down arrow. The only settings that can be changed from the Remote Console are the input current limit, and switch state. These settings are identified with a black triangle in the lower left corner of the line item. To change one of these settings, use the down arrow to select the desired setting, press the center space bar to open the edit screen, change to the desired value, and press the green arrow at the bottom of the page.



**Switch:** This allows you to change the Inverter mode from the Remote Console. Normal usage will only call for the use of ON or OFF.

- **On-** This will allow the Inverter to automatically toggle between inverting and charging depending on the availability of shore power.
- **Inverter Only-** This will allow the Inverter to be on when shore power is NOT available, but will turn the unit off if shore power is available. The Charger will not turn on when shore power is available.
- **Charger Only-** This will allow the Charger to turn on if shore power is available, but will turn the unit off if shore power is NOT available. The Inverter will not turn on when shore power is not available.
- **Off-** This will turn off both the Inverter and Charger regardless of what power is available.



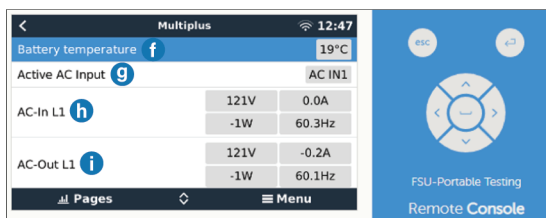
**a) State:** This shows what the present state of the Inverter is.

**b) Input current limit:** This sets the threshold at which the Inverter will try not to allow the coach to exceed when using shore power or a generator. As the draw from shore power approaches the limit set here, the Inverter will take steps in an attempt to reduce the draw to remain under the limit. It will first reduce the power used for charging and if the draw is still too high.

**c) DC Voltage:** This is the battery voltage measured at the Inverters DC terminals.

**d) DC Current:** This is the current the Inverter is removing from, or adding to the battery bank. A negative number here means the Inverter is drawing power from the battery bank.

**e) State of charge:** SOC of battery bank.



**f) Battery temperature:** Default values as there is no temperature sensor installed.

**g) Active AC Input:** This indicates if shore power is present at the Inverter.

**h) AC-In L1:** This is the voltage and current that the Inverter is seeing from shore power. If you are not plugged in, this will be blank.

**i) AC-Out L1:** This is how much the AC loads are requiring through the Inverter. If on shore power, this is the amount of power passed through the Inverter. If you are not plugged in this is the amount of power the Inverter is producing to support the loads.

## FAQs

### Cerbo GX FAQs

#### Why do I see tank sensors on my settings menu?

This is a default setting in the Cerbo GX and can be deactivated. Deactivating the tank sensor inputs will remove the unused items from the menu list. To do this:

- 1) Open the Remote Console.
- 2) Enter Menu and select "Settings".
- 3) Use down arrow to scroll down to I/O (bottom of settings list).
- 4) Enter I/O and select Analog Inputs.
- 5) Turn off all inputs in list.
- 6) Use left arrow to back out to Main Settings Menu.
- 7) Use up arrow to scroll to General (at the top of the settings list).
- 8) Enter General and select "Reboot".

#### How are DC loads measured?

This reading is actually a calculation done by the Cerbo, so it is possible for the accuracy to stray. The Cerbo uses information from the connected Victron equipment to determine where power is going. Any power that is not consumed or presented by a piece of Victron equipment that is connected to the Cerbo is accredited to DC loads.

#### What should my shore power limit be set to for my Inverter?

A good rule of thumb is to ALWAYS set the input current rating to match the breaker size on your shore outlet or portable generator.

#### My unit was connected to Wi-Fi but now I am showing a communication error?

Sometimes, communication can be lost when changing between mobile towers. Most often this is corrected by simply re-booting the Cerbo.

#### I can not access the remote portal from the VRM

This can happen when your system first connects to the internet after being offline for a period of time. This is because the system is unloading the logged data to the VRM. When observing the VRM portal from a computer, you should notice the "last connected" time getting smaller until it reaches "real-time". At this point you should be able to open the remote console.

If your system has not been offline, or if you are still having issues, follow these steps to verify settings and reboot the Cerbo.

- 1) Ensure you are connected to a Wi-Fi network with an internet connection.
- 2) Open the menu, select "Settings", then select "Remote Console".
  - a. Select "Disable Password".
  - b. Ensure "Enable on VRM" is selected (slider should be blue).
- 3) Back out of Remote Console, select "VRM Portal".
  - a. Ensure Logging is Enabled.
  - b. Ensure last contact is less than the log interval.
  - c. Ensure Connection error shows 'NO ERROR'.
  - d. Ensure VRM two-way communication is enabled.
- 4) Back out of Remote Console, select general, select "Reboot Device".

#### I can not access the remote portal from my smartphone or tablet.

In order to access the remote portal from a smartphone or tablet, you must either have your smartphone or tablet on the same Wi-Fi network as the Cerbo GX, or have the Cerbo GX connected to the VRM through an internet connection. See "Connecting to the Cerbo" section of manual (pg 9).



## FAQs CONTINUED

### Cerbo GX FAQs Continued

#### When and how should I update the firmware?

The Solar Controllers, battery monitor, and Cerbo GX all have Firmware that can be updated.

For SmartSolar Controllers and SmartShunt:

- 1) Open the VictronConnect app on a smartphone or tablet and connect to the device.
- 2) Select the Settings (⚙️) in the top right corner.
- 3) Select the Menu (☰) in the top right corner and open Product Info. If new firmware is available, you will be able to select 'Update' to download and install. This will need to be done for each Solar Controller and the SmartShunt separately.

For the Cerbo GX:

- 1) Open Remote Console.
- 2) Enter Menu, select Firmware.
- 3) Select Online Updates.
- 4) Select "Press to check for update" and follow prompts.

For the MultiPlus Inverter:

It is not required to keep your Inverter updated to the latest firmware version. Stable systems should be left with their current firmware. Firmware updates should only be done when it is recommended to fix an issue you are experiencing or add a new feature that is required by the installation.

**NOTE:** After updating firmware, all settings will be reset to their factory defaults. The unit will be in stand-alone mode and all programmed battery charging parameters will be reset.

#### Can I change the name shown for my component?

Changing the name of the individual components is easiest through the Remote Console. To accomplish this:

- 1) Open the Remote Console.
- 2) Open the Menu, select the device.
- 3) At the bottom of the details menu for each device is an option named 'Device'.
- 4) Select this option, and here you can change the name displayed for your device.
- 5) Enter new name and select the green check mark at the bottom of the screen.

### General FAQs

#### Why don't I have power to my DC loads? (BGA)

Most often, this is caused when the BGA is off or when the BGA goes in to low voltage protection mode. If switch is on, BGA is in low voltage protection mode. This happens when your battery voltage has dropped to 11.5 volts for 2 minutes. This means the batteries need to be recharged. The options to do so are:

- 1) Leave things off and let solar charge the battery bank.
- 2) Plug in to shore power or a portable generator and let the Inverter/Charger charge the battery bank.

In either case, when the BGA senses that the batteries are charging it will reconnect the loads.

#### My DC loads shut down, but my battery monitor says I have plenty of SOC left.

Settings may need adjusted on your battery monitor. DFE recommended setting values are found on pg 6. You can also verify the SOC of the battery bank by using the *At Rest Voltage vs SOC Chart* on pg 22.

#### What should my Input Current Limit be set to for my Inverter?

Typically, this can be left to 30 amps on the 600i-L. Reducing the Input Current Limit on this system will only reduce the Chargers output if the loads begin to approach the limit. This is discussed more in the question, "How do I use a smaller shore plug or portable generator?" on the next page.



## FAQs CONTINUED

### How do I expand my system?

Your system can be expanded through additional batteries and/or additional solar panels depending on floorplan. When adding batteries, it is important to use the same Manufacturer and Model of battery as the original equipment. When adding solar panels, you will need to keep the panel voltage the same as your original equipment.

### What steps can I take to maximize my run-time?

#### Conserve 12V power whenever possible.

Turn off any items not in use. Even small loads add up.

#### Take advantage of the sun.

While the sun is out, energy is essentially being replaced in the battery bank as it is being used. Running any heavy items during the day and minimizing what is ran at night can greatly improve your experience.

#### Consider using a small portable generator.

Whether due to poor sun conditions, or high load draws, it is likely that at some point in time the solar will not be able to put in as much energy as you are using. For times like these, a small portable generator can be used to supplement the battery charging power.

### How are my DC loads measured?

This reading is actually a calculation done by the Cerbo, so it is possible for the accuracy to stray slightly. The Cerbo GX uses information from the SmartShunt to determine how much power is being pulled from the battery bank. It then subtracts the power consumed by the Inverter from that number. Finally, it totals the amount of power coming from the Solar Controllers and will roughly equal the amount of DC loads the coach is drawing. Items that would be consuming this power are things like interior LED lighting, ceiling vent fans, water pump and much more.

### How do I use a smaller shore plug or portable generator?

Since the 600i-L is powering loads from a sub-panel, the Inverter is not monitoring all of the power the coach is using. This means that running from a small portable generator or a small shore outlet can be tricky. There are three basic ways to effectively use a smaller power source.

- 1) Shut off the breaker that feeds the Inverter shore power. This means that all of the items on the sub-panel will be powered from the Inverter, and the Inverter will not be charging the batteries. When the batteries are low, loads can be reduced, and the feed breaker can be turned back on to allow the Charger to run.
- 2) Limit loads and reduce the AC Input Current limit for the Inverter. The Charger can draw just over 15 amps for bulk charging of a low SOC battery bank. By setting the Input Current limit to 10 amps, the Charger is automatically reduced to remain under that threshold. It is important to remember that the loads in the sub-panel are the highest priority. If the loads exceed the reduced input current limit the Charger will not turn on. When using this method, it is best to only power small things from the sub-panel and avoid running large loads for long periods of time.
- 3) Turn off the breakers for larger loads and limit what is ran at one time. This will allow the charging to continue at the fastest rate and help prevent nuisance tripping for the shore power or generator breaker.

### My batteries are dead, why wont my Charger turn on with shore power?

When plugged in to the Cerbo GX, the Cerbo needs to be turned on for the Inverter to operate. If the batteries are fully discharged and the low voltage disconnect has been triggered, the Inverter communication line needs to be unplugged from the Cerbo. Once this is unplugged, the unit can be plugged in to shore power and the Charger will begin working. Once the blue and green lights begin to flash on the Cerbo, the communication cable can be plugged back in.

## TECH TIPS

### BATTERIES

#### How Batteries are Rated

**Amp Hours (Ah)**- Unit of electric charge; 1A of current flowing for 1 hour.

**Reserve Capacity (RC)**- # of minutes a battery can maintain a useful voltage under a 25A discharge.

**Conversion from Reserve Capacity to Ah:**  $Ah = ((Reserve\ Capacity \times 60) \times 25) / 3600$  or  $Ah = Reserve\ Capacity / 2.4$

### SYSTEM

#### Inverter prioritizes coach loads.

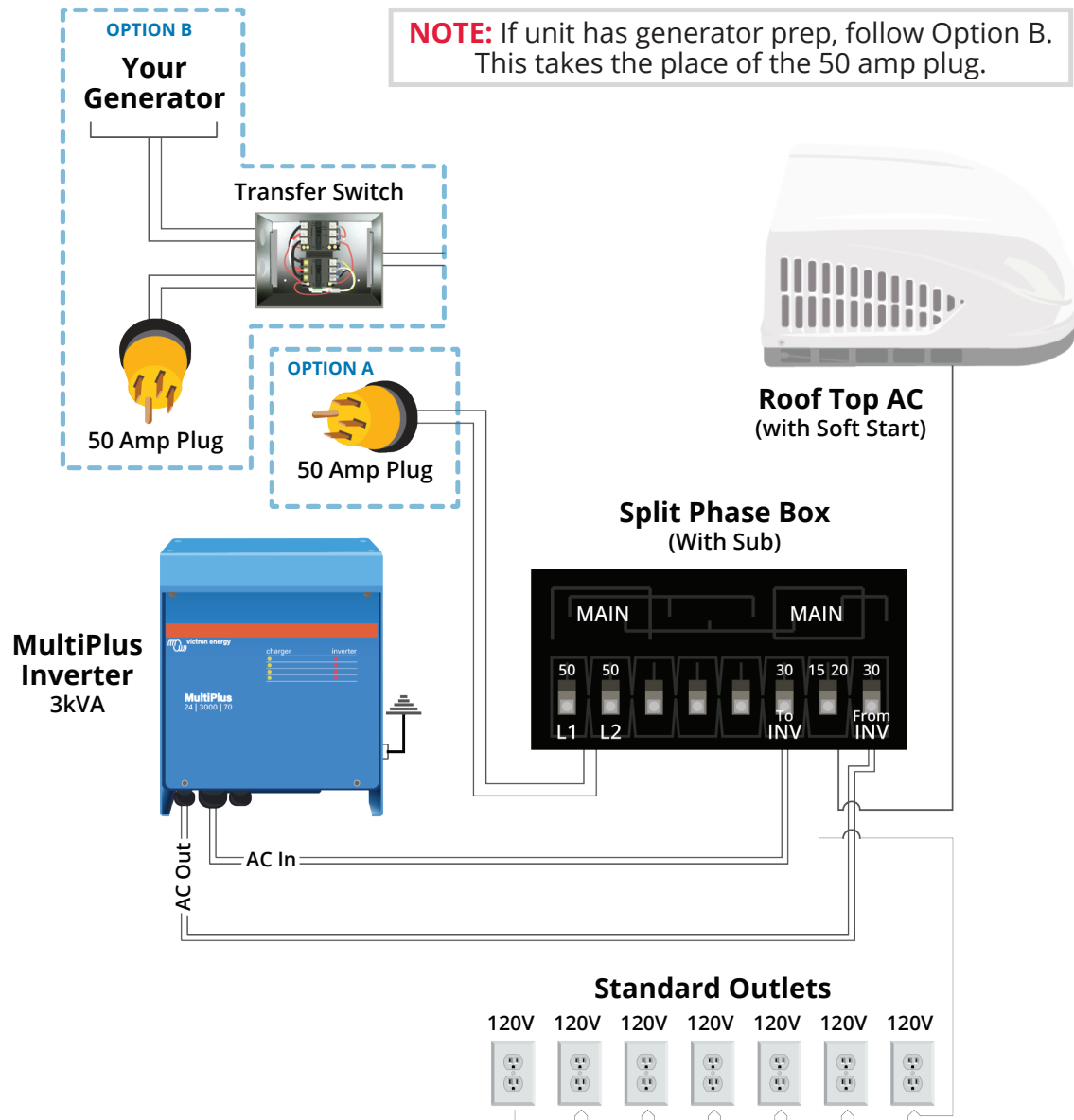
When on shore power, the Inverter prioritizes the loads on the sub-panel over battery charging. In other words, when a decision has to be made about what to power, the Inverter will always choose the loads over battery charging. When the power used for charging and the power of the sub-panel loads begins to approach the limit set in 'Input Current Limit' setting of the Inverter, the Inverter will reduce the charge rate, consuming less power and extending charging time.

#### Charging - C rate explanation.

C Rate is a term that can be found on any battery manufacturers charging recommendations. The C Rate of a battery is simply the highest amount of current that should be delivered to the battery during charging. The rating is typically listed as a number such as C / 5 or 0.2C. The variable C can be found by adding up the entire amp-hour capacity of the battery bank. For example, (2) 100 amp-hour batteries connected in parallel would make a battery bank of 200 amp-hours (2 x 100 amp-hours). Dragonfly Energy recommends a charging rate of 0.5C. This means that with a single 270 amp-hour GC3 battery, the sum of all charging sources should not exceed 135 amps DC (0.5 x 270). This is not a safety concern, but can effect the longevity of the battery bank. The charging rate for the Inverter can be reduced by lowering the Input Current Limit setting on the Remote Console. The Solar Controller can have the charge rate reduced through the settings in the app.

**TECH TIPS**

**System Wiring Diagram**



# APENDEX: CHARTS

## At Rest Voltage vs SOC Chart

To accurately use this chart to verify State of Charge readout from the SmartShunt, the batteries must be at rest. This means there should be no (or very little) current flowing in or out of the batteries. To use this chart, turn off as many items in the coach as possible. This includes turning off charging sources such as Solar Controllers temporarily. Ideally, there should be less than 20 amps of current flowing in or out of the batteries for 5 minutes, then compare the battery bank voltage to the listings on the chart. This will provide a fairly accurate estimate of SOC in a healthy battery bank.

VOLTAGE	CAPACITY
14.4V	100%
13.6V	100%
13.4V	99%
13.3V	90%
13.2V	70%
13.1V	40%
13.0V	30%
12.9V	20%
12.8V	17%
12.5V	14%
12.0V	9%
10.0V	0%



## APENDEX: LINKS

### Future Solutions

#### Keystone Owners Manuals

<https://www.fsi-solutions.com/owners-manuals>

### Precision Circuits

#### Battery Guardian Auto User Manual

<https://www.precisioncircuitsinc.com/product/battery-guard-autoselect-225-amps/>

#### Keystone Owners Manuals

<https://www.keystonerv.com>

### Victron Energy

#### Cerbo GX User Manual

[https://www.victronenergy.com/media/pg/Cerbo\\_GX/en/index-en.html](https://www.victronenergy.com/media/pg/Cerbo_GX/en/index-en.html)

#### MultiPlus 3kW Inverter

<https://www.victronenergy.com/upload/documents/Manual%20-%20MultiPlus%203k%20120V%20Ve.Bus%20enabled%20-%20rev%2000%20-%20EN.pdf>

#### SmartSolar Controller User Manual

<https://www.victronenergy.com/upload/documents/Manual-SmartSolar-charge-controller-MPPT-100-30---100-50-EN-NL-FR-DE-ES-SE.pdf>

#### SmartShunt User Manual

<https://www.victronenergy.com/media/pg/SmartShunt/en/index-en.html>

#### VictronConnect User Manual

[https://www.victronenergy.com/media/pg/VictronConnect\\_Manual/en/index-en.html](https://www.victronenergy.com/media/pg/VictronConnect_Manual/en/index-en.html)

#### VRM Portal Documentation

[https://www.victronenergy.com/live/vrm\\_portal:start](https://www.victronenergy.com/live/vrm_portal:start)

