

BASIC USER GUIDE

Outlast 660i-L Settings



REV 1.3



fsi-solutions.com

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INTRODUCTION

Dear Outlast Owner,

Congratulations and thank you for your purchase of your new Keystone Outlast 660i-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 or 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 OUTLAST 660i-L INCLUDES:

(2) 30A Solar Roof Ports



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



(270Ah) Dragonfly® Lithium Ion Battery



(660W) Future Solutions Solar Array



CS3 Solar Cable Splitters



VE Bus Smart Dongle



50A Victron Smart MPPT Controller



Victron SmartShunt Battery Monitor



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 or 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 VE Bus Smart Dongle. Your MultiPlus Inverter does not have Bluetooth capabilities, the VE Bus Smart Dongle will provide those 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 VE Bus Smart Dongle, 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 VE Bus Smart Dongle 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*.

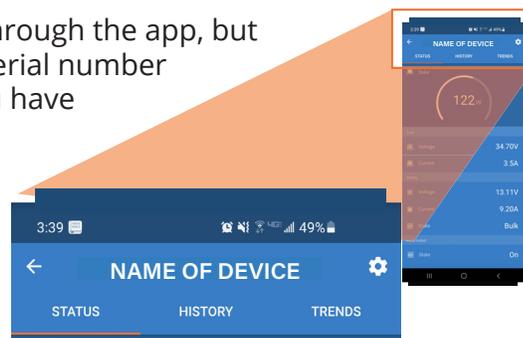
Main Tabs

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

Apple Store



Google Play Store



User Manual



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.

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

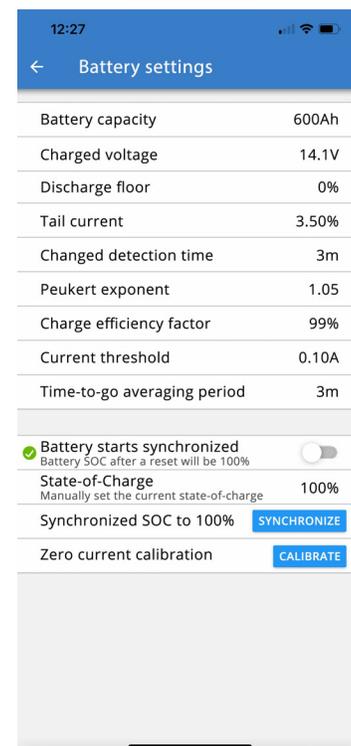
The charging state of the Controller can also be observed using the LED lights on the physical Solar Controller.

	LEDs	BULK	ABSORPTION	FLOAT
REGULAR OPERATION	Not charging (*1)	🌀	🟡	🟢
	Bulk (*2)	🟢	🟡	🟢
	Absorption (*2)	🟡	🟡	🟢
	Automatic equalization (*2)	🟡	🟡	🟢
	Float (*2)	🟡	🟡	🟢
FAULT SITUATION	Charger temperature too high	🟡	🟡	🌀
	Charger over-current	🌀	🟡	🌀
	Charger or panel over-voltage	🟡	🌀	🌀
	Internal error (*3)	🌀	🌀	🟡

Light Indicator Key:

- 🌀 Blinking
- 🟢 On
- 🟡 Off

- 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 16.

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

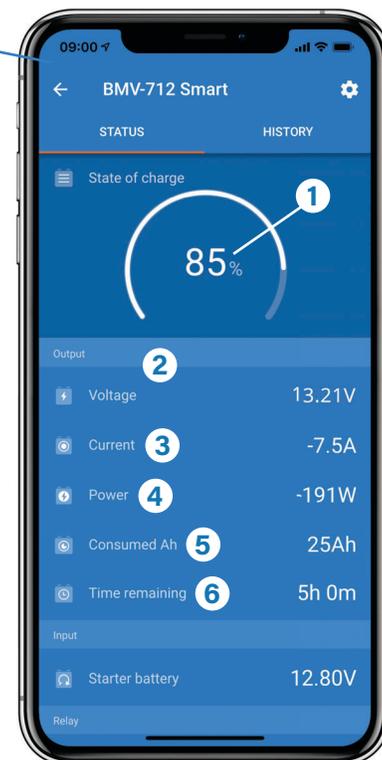
3) Current: A negative number indicates current (A) flowing from the battery bank; a positive number indicates current (A) flowing to the battery bank.

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.

660i-L with GC3 Batteries should be [set to 270Ah](#)

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 16.

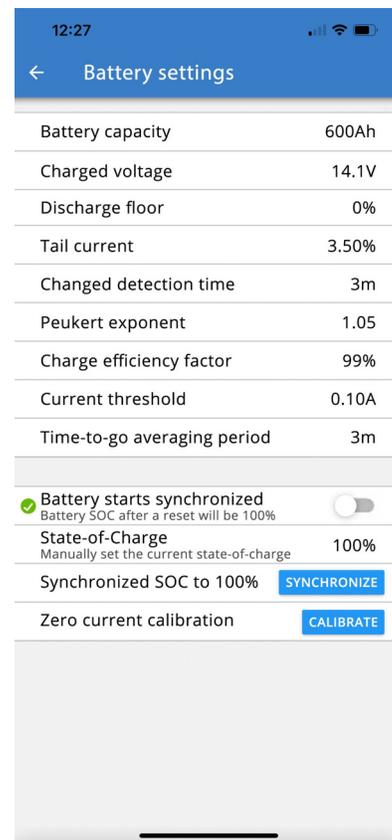
DFE Recommended Setting – N/A

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.

MULTIPLUS INVERTER

MultiPlus Inverter

The 660i-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 660i-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 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 VictronConnect App.

NOTE: Setting the rocker switch to “Charger Only” or “Off” over-rides the settings in the VictronConnect App.

VE. BUS SMART DONGLE

Introduction

The VE. Bus Smart Dongle is a Bluetooth accessory for inverter/chargers and inverters* with a VE. Bus port.

Features & Functions

- Remotely control the inverter/charger via Bluetooth and the VictronConnect app.
- The inverter/charger can be switched to on, off or charger-only and the AC input current limit can be adjusted.
- Remotely monitor the inverter/charger via Bluetooth and the VictronConnect app. The AC and DC parameters, device status, warnings or alarms can be monitored. This includes Instant Readout to display the most important data of the inverter/charger on the Device list page without the need to connect to the product.

This includes visual notifications of warnings, alarms, and errors that enable diagnostics at a glance. Please see the VictronConnect manual for details.
- The dongle can be connected to a single inverter/charger or multiple inverter/chargers set up in parallel and/or 3-phase.
- Measures the battery temperature and voltage.
- Can act as a battery temperature and voltage sensor for an inverter/charger and/or for VE.Smart Networking.
- Can be connected to an external temperature sensor, rather than using its own (default) temperature sensor.

*In the remainder of this document, we will refer to inverter/chargers instead of both inverter/chargers and inverters. If the dongle is used with an inverter, the charger-related features will not be available, such as monitoring AC parameters, switching a unit to "charger only" mode or adjusting the AC input current limit.

NOTE: The dongle cannot be used to configure an inverter/charger. It is also not possible to update the firmware of an inverter/charge via the dongle. Read the VictronConnect VE. Bus manual for more specific information on configuring and updating the firmware of an inverter/charger.

VE. BUS SMART DONGLE CONTINUED

Operation

When the dongle is connected to an inverter/charger and the inverter/charger has been switched on via its main power switch, it takes a bit of time before the dongle detects the inverter/charger. It is initially listed in the VictronConnect device list as a VE.Bus Smart dongle. Once the detection is complete, it will be listed as an inverter/charger. Note that it might be necessary to refresh the device list before the dongle is listed as an inverter/charger.

When the dongle is not connected to an inverter/charger, it is listed as a VE.Bus Smart Dongle. The dongle can be used without being connected to an inverter/charger. In this scenario, it operates as a voltage and temperature sensor and can be used for battery monitoring in VE.Smart Networking.



VictronConnect screens without and with inverter/charger connected.

The dongle can operate as a primary and as a background information source. It will assume either role automatically depending on whether a GX device is connected to the inverter/charger.

LED Status Codes

Blue LED	Red LED	Bluetooth connection State	Dongle state
Slow blinking	Off	Not connected	The dongle is operational and ready to connect to the VictronConnect app.
On	Off	Connected	The dongle is operational and is connected to the VictronConnect app.
Off	Off	Not connected	The dongle is not operational. Probably because it is not powered, check the fuse or the wires between the dongle and the battery connection.
Fast blinking (alternating)	Fast blinking (alternating)	Not connected	Firmware update.
On	Slow blinking	Connected	Firmware update.
On	Fast blinking	Uploading	Firmware update.
Fast blinking	Off	Programming	Firmware update.
On	On	Disabled	The dongle is not functional (hardware error). The dongle is not visible in the VictronConnect app and will not transmit battery temperature and voltage to the inverter/charger.

VE. BUS SMART DONGLE CONTINUED

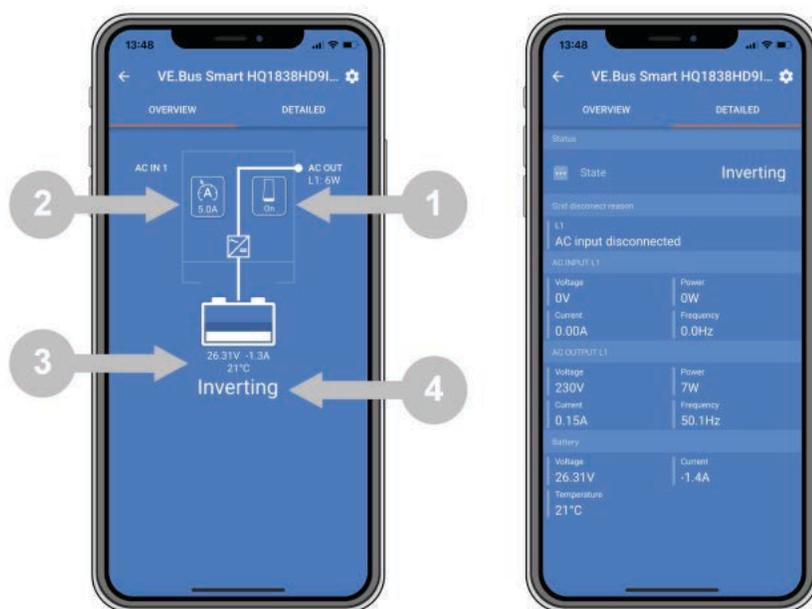
Inverter/Charger Control and Monitoring

The dongle can control and monitor the inverter/charger via the VictronConnect app.

The "overview" page contains the following:

- 1.) The inverter/charger can be turned on, off or set to charger-only mode via the switch symbol as indicated in the below image.
- 2.) The AC input limit of the inverter/charger can be adjusted via the dial symbol as indicated in the below image.
- 3.) Battery voltage, current and temperature are shown.
- 4.) The device status is shown.

More detailed inverter/charger information can be seen on the "detailed" page.



VictronConnect app "overview" and "detailed" screens.

NOTE: If a Digital Multi Control (DMC) is connected to the same system as the dongle, the DMC will override the on/off/charger-only and current limit control features of the dongle. The dongle can only monitor the battery and inverter/charger parameters and act as a temperature and voltage sensor but cannot control the inverter/charger.



VE Bus Smart Dongle FAQs

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 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 16.

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

Typically, this can be left to 30 amps on the 660i-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.

I only see a battery page screen in the VictronConnect app, but I don't see inverter/charger pages.

The dongle is not communicating with the inverter/charger. Check if it is plugged into the inverter/charger via an RJ45 UTP cable. Or, if it is plugged in, check the integrity of the RJ45 cable.

I cannot see the inveter/charger data; only the battery data is displayed in the VictronConnect app.

Check if the inverter/charger has been turned on via its main switch, and check if the dongle is plugged into the inverter/charger via an RJ45 UTP cable. Or, if it is plugged in, check the integrity of the RJ45 cable.

Can the dongle be used together with the Digital Multi Control panel (DMC)

Yes, but in this scenario, the dongle cannot switch the inverter/charger to on, off or to charger-only, only the DMC can.

Can the dongle be used together with a VE. Bus BMS?

Yes, but in this scenario, the dongle cannot switch the inverter/charger to on, off or to charger-only, only the VE.Bus BMS can. If full functionality of the dongle is required, use a VE.Bus BMS V2 instead.

It is not possible to change the AC current limit.

Update the inverter/charger firmware to version xxxx419 or higher.

What are the terminal connections marked "CD" and "Relay" used for?

These connections have no function and are not used.

The dongle is measuring a too low battery voltage and an external battery sensor is used.

The inverter/charger is overcharging the batteries as a result of this.

Check that the B- wire is connected to the battery minus. If this wire is not connected the dongle measures a too low battery voltage. See VE Bus Smart Dongle User Manual – Chapter 2.3 : Installation with an external battery sensor, pg 16.

The dongle battery voltage reading is approximately 0.6V too high in a 12V system, 1.2V in a 24V and 2.4V in a 48V system. The inverter/charger is undercharging the batteries as a result.

The dongle is faulty.

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 VE Bus Smart Dongle, so it is possible for the accuracy to stray slightly. The VE Bus Smart Dongle 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 Outlast 660i-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 won't my Charger turn on with shore power?

When the Inverter is plugged into the VE Bus Smart Dongle, the VE Bus Smart Dongle 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 VE Bus Smart Dongle. 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 VE Bus Smart Dongle, the communication cable can be plugged back in.

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.

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.

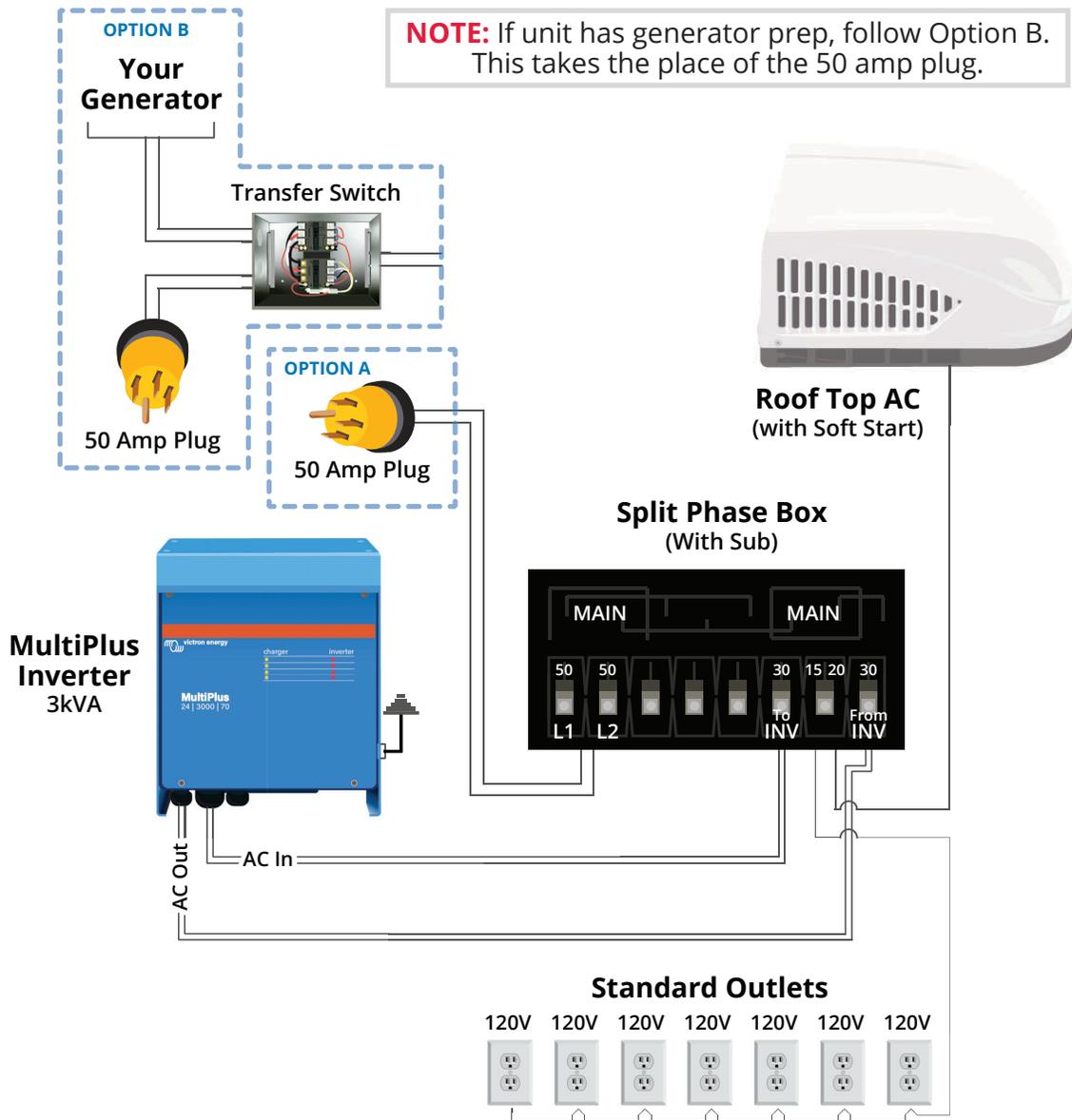
When on shore power, the Inverter prioritizes the loads on the sub-panel over battery charging. In other words, when a decision has to be made about what to power, the Inverter will always choose the loads over battery charging. When the power used for charging and the power of the sub-panel loads begins 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

Keystone Owners Manuals

<https://www.keystonerv.com>

Victron Energy

VE Bus Smart Dongle User Manual

https://www.victronenergy.com/upload/documents/VE.Bus_Smart_Dongle/106441-VE_Bus_Smart_Dongle-pdf-en.pdf

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

