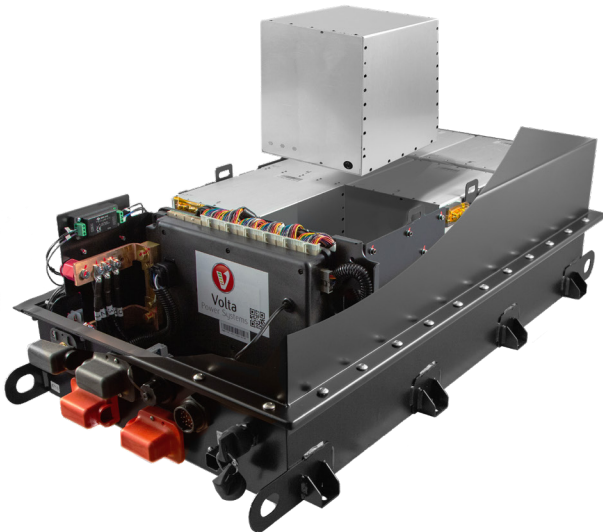




**Volta**  
Power Systems

# VIP-VSP SYSTEM

User Manual



Volta Power Systems



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# WELCOME TO VOLTA

Experience camping like you've only dreamed of. Volta's automotive-grade, advanced energy storage systems deliver a true off-grid adventure without sacrificing the comforts of home.

## Freedom to Roam

Gain access to REAL off-grid capability without sacrificing the amenities you want. Volta Systems provide all the power you need including all-night air conditioning with none of the noise or emissions of a generator.

## Quiet and Clean

Ditch the loud, smelly generator and choose clean, high-performance power instead. Gain access to pristine wilderness without disrupting it with fumes and noise. Unlike generators, our environmentally-conscious power systems charge from solar, shore, or while you drive, using otherwise wasted energy. Leave no trace with a Volta System.

## More Power

Experience all the power you need. Volta Systems leverage the highest energy density on the market to deliver more power in less space and with less weight. Run 110V appliances simultaneously, including air conditioning, all day or overnight. Take the comforts of home on the road without having to compromise.

## More Confidence

Built on the same automotive-grade technology that powers electric vehicles, Volta Systems are easy to use, virtually maintenance free, and will last the lifetime of your vehicle.

## More Safety

Protected by seven layers of safety, our systems are engineered and tested to meet rigorous auto-industry standards, ensuring a system that's safe and dependable for your whole family.

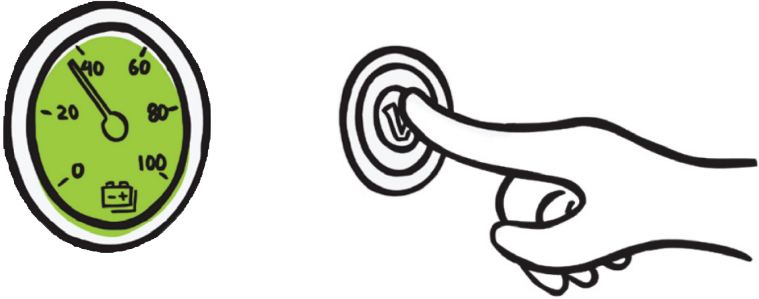
# QUICK START

## Turning On Your Volta System

To turn your system on, simply press the Volta Pushbutton. After a few seconds of system checks, the Volta System turns on.

## State Of Charge (SOC) Gauge

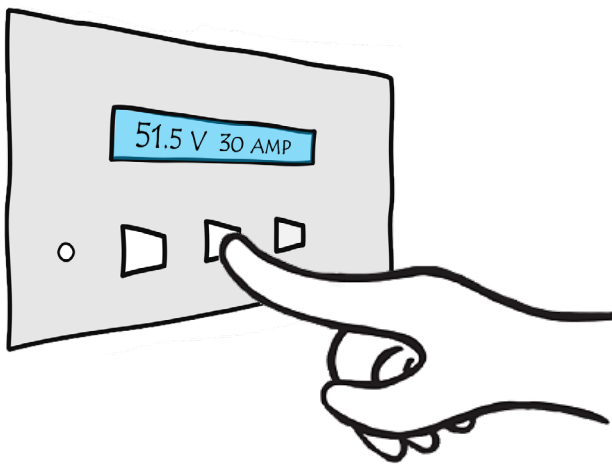
After the Volta System is turned on, the SOC gauge activates and illuminates to indicate system status. The gauge provides an approximate reading of how much energy remains in the Volta System.



## Using the Inverter Control Panel

Control, monitor, and adjust the Volta System inverter via the Inverter Control Panel.

To get the most of your Volta System's charge, turn off the inverter when not using 120 VAC devices.



# INTRODUCTION

## About this User Manual

This manual represents a range of Volta Power Systems equipment. Some of the systems or equipment described in this manual may not be available on your vehicle. Descriptions, graphics, photos, and specifications were correct at the time of publication. Volta Power Systems reserves the right to update or change equipment and products without obligation to provide, install, or modify the equipment on your vehicle.

The intellectual property contained in this manual is owned or licensed to Volta Power Systems, LLC and is protected by applicable copyright and trademark law.

The directions within this user manual represent basic operation of the Volta System and may not describe unique installations or operational elements installed by the Original Equipment Manufacturer (OEM).

## Servicing your Volta System

If your Volta Power Systems product is not working as expected, please review this user manual first for operation instructions and basic troubleshooting techniques. Never attempt to modify or repair electrical components yourself. Always work with an authorized dealer or maintenance facility for repairs.

If you purchased your vehicle with the Volta System already installed, you will need to work directly with your dealer or original manufacturer to arrange service.

If your vehicle was retrofitted with a Volta System, we can help with service through an authorized retrofit partner. A list of our retrofit partners is available at [www.VoltaPowerSystems.com](http://www.VoltaPowerSystems.com).

## Return Policy

Returns are based on a field analysis conducted by a certified technician.

## Contacting Volta Power Systems

Phone support is available during normal business hours. Visit the Volta Power Systems website for additional troubleshooting, Frequently Asked Questions, and instructional videos.

**Phone:** (616) – 226 – 4222

**Web:** [www.VoltaPowerSystems.com](http://www.VoltaPowerSystems.com)

## Definitions

Term	Definition
Volta System	The general term for the complete Volta energy system solution and its power distribution devices.



Term	Definition
Energy Storage Pack, Pack, or VIP/VSP	The Volta energy storage pack, composed of one or more electrochemical lithium-ion cells. It may include a mechanical frame, a thermal management system, an electronic management system, a power circuit, protection devices, and interfaces with external devices.
VIP or VSP	Volta Independent Pack or Volta Stackable Pack refers to the Energy Storage Pack.
End User	The owner/operator of the product into which a Volta System is integrated.
OEM	The company/organization, its staff, its subcontractors, or any other person working under its responsibility, its control, or appointed by it that is in charge of testing, using, or integrating the Volta System.
Volta Power Distribution Devices, Components, or Systems	These include but are not limited to the components that comprise the Volta System, such as inverters, chargers, and converters.
On/Off Push-button or Volta Pushbutton	Main system pushbutton that when pressed, turns on or off the Volta System.
SOC	State of Charge (SOC) indicates a percent of total pack charge.
Inverter Control Panel	Control panel for monitoring, adjusting, and turning the inverter on or off.
Touchscreen	Main system display.
Manufacturer Documentation	Supplemental documentation from the original manufacturer of components included in the Volta System.
120V or 120 VAC	Synonymous with 110 VAC when referring to household appliances, devices, or outlets

# SAFETY

The user is responsible for safe use of the Volta System and Volta Power Distribution Devices or Systems. Before using the Volta System, Volta recommends that all users read this manual and fully understand all instructions.

## Warnings

The following symbol is used to denote a safety critical instruction or informational detail, which if not followed or fully understood, could result in death, serious injury, or voided warranty.



## Safety Guidelines

The following warnings represent instructions, which if not properly followed, could result in death, serious injury, or voided warranty:



**Warning:** Components and devices in Volta Systems shall not be opened or modified. Only Volta technicians or trained professionals with in-depth knowledge of Volta Systems should perform service work on a Volta system. Any attempt to service a system by unapproved personnel may cause damage to the system, voiding of the warranty, injury, or harm.



**Warning:** The Volta System is designed for connection and operation with Volta power distribution devices, or equipment expressly approved by Volta Power Systems. This ecosystem of approved devices is a layer of safety within a Volta System. Use of other devices compromises this layer of safety. Use of the Volta System with other external devices could present a hazard and is expressly prohibited by Volta Power Systems. Use of unapproved devices results in voiding of the Volta Power Systems warranty.



**Warning:** Do not place an Energy Storage Pack on, in, or near fires, or other high-temperature locations greater than 140°F (60°C). This includes intensive sunlight. Doing so may cause the Energy Storage Pack to overheat and may result in a loss of performance and/or a shortened life expectancy.



**Warning:** Careless handling of electrical components can be fatal. Never touch or use electrical components or appliances while feet are bare, while hands are wet, while standing in water, or while on wet ground.



**Warning:** Always remove jewelry and wear appropriate personal protective equipment (PPE) before handling the Volta System and Volta Power Distribution Devices or Systems.

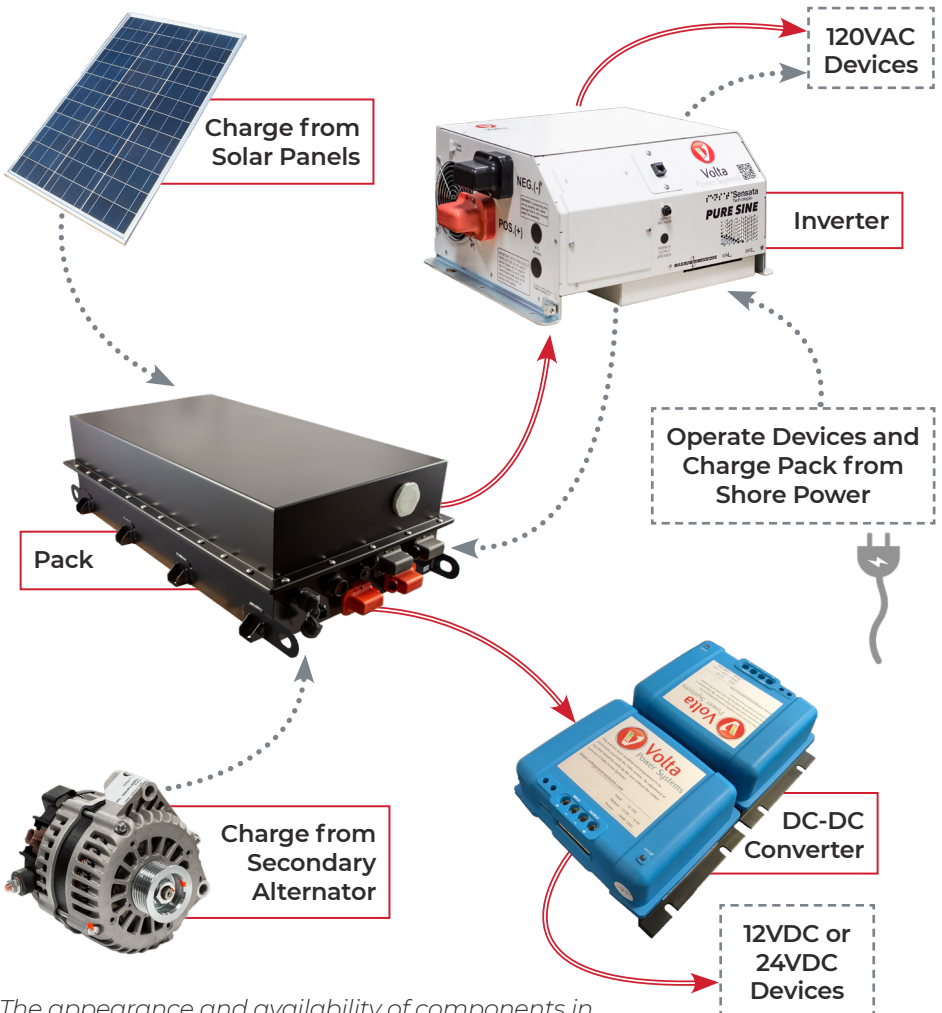


**Warning:** Vehicle exhaust fumes are toxic. Do not start your vehicle in an enclosed space.

# VOLTA SYSTEM OVERVIEW

A Volta System typically contains an energy storage source (VIP or VSP Energy Storage Pack), an alternator for charging during driving operations, an inverter/charger for shore power charging and 120 VAC power distribution, and converters to create DC power at various voltages. Your actual system may vary in size, complexity, power distribution devices used, or other application specific variations.

The Volta System and power distribution systems are similar in complexity to a vehicle engine or generator. Therefore, only Volta technicians or trained professionals with in-depth knowledge of Volta Systems should service these components.



*The appearance and availability of components in your Volta System may vary from what is shown.*

## Volta System Components

Your Volta System may be configured with the following options:

- **VIP or VSP (Energy Storage Pack):** The Pack is the energy source for your Volta System. A 14-gauge steel housing protects the lithium-ion cells, and an internal Battery Management System monitors the system, balances the cells, and controls energy output.
- **Inverter/Charger:** The inverter changes the pack's energy from direct current (DC) into alternating current (AC) to power the vehicle's 120V AC devices (air conditioner, heater, cook top, etc.). The inverter also converts shore power (AC) to direct current (DC) for charging the pack.
- **Inverter Control Panel:** Control, monitor, and adjust the Volta System inverter via the Inverter Control Panel.
- **DC-DC Converter:** The DC-DC converter drops the pack's energy from 58V DC to power your vehicle's 12V DC or 24V DC devices (vehicle electronics, lights, refrigerator, etc.).
- **Secondary Alternator:** The high-powered, secondary alternator provides charging power directly from your vehicle's engine to the pack.
- **Solar Controller:** The solar controller regulates solar power input from external solar panels into a stable, usable form of energy to charge the pack.
- **On/Off Pushbutton:** Press the On/Off pushbutton to turn on or off the Volta System.
- **SOC Gauge:** Provides an approximate reading of how much energy remains in the pack. It also serves as a simple communication center for basic system states through color changes and flash codes.
- **Touchscreen:** Use the Touchscreen to monitor and control the Volta System.

# VOLTA SYSTEM ON/OFF PUSHBUTTON

## Turning On the Volta System

### Pushbutton



Press the On/Off pushbutton to turn on the Volta System and power your vehicle's electrical systems and devices. When the On/Off pushbutton is pressed to turn on the Volta System, a 2 to 5 second system check occurs. If all systems checks are successful, the energy storage pack's internal contactor engages, supplying power to all Volta components, turning on the Volta System.

Do not repeatedly press the pushbutton. After pressing the button, wait 30 seconds for all system checks to occur before pressing the button again.

## Turning Off the Volta System

Press the On/Off pushbutton to turn off the Volta System. After pressing the pushbutton to turn off the Volta System, a few seconds will pass before the pushbutton LED turns off and the Touchscreen or SOC gauge shuts down, signaling that the Volta System is turned off.

Do not turn off the system while the vehicle is running.

If the Volta System is off, and shore power is connected, the Volta System turns on automatically.

# STATE OF CHARGE (SOC) GAUGE

## SOC Overview



The SOC gauge provides an approximate reading of how much energy remains in the pack. The flash codes and colors communicate basic system and fault states.

## SOC Gauge Flash Codes

System State	Color	SOC %
Loading System Data	Slow Blue Blink	10 - 95%
Normal Operation	Solid Green	21 - 95%
Low SOC	Solid Yellow	10 - 20%
Very Low SOC	Solid Red	Less than 10%
System Empty	6x Fast Red Flash	0%
System Fault	Slow Red Flash	10 - 95%
Too Hot to Charge	Solid Yellow for 5 seconds then off	10 - 95%
Too Cold to Charge	Solid Blue for 5 seconds then off	10 - 95%

# CHARGING THE SYSTEM AND INCREASING SYSTEM RUNTIME

The Volta System accepts charge from the sources described in the following sections. Monitor the SOC Gauge, the Inverter Control Panel, or the Touchscreen for any alerts that may prevent charging.

The Volta System only charges when required. There may be several factors preventing charging, even while connected to a charge source. The most common reasons are the energy storage pack is too cold to charge, or the BMS is inhibiting charge because of a high enough SOC.

## System Runtime

Similar to fuel tank levels responding to driving style, the time it takes to drain an Energy Storage Pack from “Full” to “Empty” depends on usage. The two largest loads in a vehicle that affect the runtime are typically heating and cooling. The more the heating and cooling systems run to maintain the desired temperature inside the vehicle, the more energy is used.

To maximize runtime:

- **Turn off the inverter if 120 VAC loads are not required:** When 120 VAC devices (air conditioner, heater, cooktop, etc.) are not in use, turn off the inverter via the Inverter Control Panel or Touchscreen.
- **Increase the thermostat in warm climates:** Increasing the desired vehicle temperature reduces the amount of time the air conditioner compressor needs to run in warm climates.
- **Decrease the thermostat in cool climates:** Decreasing the desired vehicle temperature reduces the amount of time the heating system needs to run in cold climates. Generally, heating using electricity uses almost twice the energy as cooling.

## Charging via Shore Power

Volta recommends a minimum 120V/30A rated shore power cord less than 50 ft. in length. The OEM should follow NEC or RVIA guidelines for the specific application requirements.

When plugged into shore power, the Energy Storage Pack samples incoming power for a few seconds to ensure uniformity requirements are met. If incoming power meets the requirements, the Volta System turns on and begins charging the Energy Storage Pack.

If the Volta System does not turn on, or the Energy Storage Pack does not begin to charge, the incoming power is likely not meeting the Volta System requirements. This feature protects the vehicle from brown outs due to insufficient power. Additionally, the system may not accept a charge if plugged into an electronic surge protector.

The rate at which the Volta System charges from shore power depends on your system configuration and the settings chosen on the Inverter Control Panel or



Touchscreen. *Refer to Inverter Screen on page 28 or Max Branch Amps (Charger Current Limit) Setting on page 22 for details on changing the charge rate selection.*

### 120 VAC vs 240 VAC Outlets



**Warning:** Do not connect the Volta System to a 240 VAC outlet. Connecting to a 240 VAC outlet may result in permanent damage not covered by the Volta Power Systems warranty.

RV owners are familiar with 30A outlets, so they may want to install a 30A outlet at their home. Unless this outlet is specifically installed as an RV outlet, the electrician may mistakenly wire the outlet to be 240 VAC, which is typically used for home appliances, such as electric dryers. RV outlets are 30A 120 VAC, but home 30A outlets are commonly 240 VAC. Do not connect to a 240 VAC outlet.

## Charging via the Secondary Alternator

A Volta secondary alternator powers the vehicle's electrical features while simultaneously charging the Energy Storage Pack when all of the following occur:

- The vehicle is running.
- The vehicle is maintaining a high enough RPM.
- The Volta System is turned on.

If the engine does not sustain a high enough RPM, the BMS sends a signal to turn off the alternator until the BMS determines it is appropriate to turn on the alternator.

## Charging via Generator

Similarly to charging via shore power, the Energy Storage Pack can charge via connection to a generator. An on-board RV generator or a traditional generator can charge the Energy Storage Pack if the generator meets the inverter/charger's requirements, such as AC input range and frequency.

When plugged into a generator, the inverter samples incoming power for a few seconds to ensure uniformity requirements are met. If incoming power meets the requirements, the Volta System turns on and begins charging the Energy Storage Pack.

If the pack does not charge from a generator, this condition may be due to unclean or unstable power from the generator.

The Volta System can be integrated with a generator using an auto-start and auto-shutoff feature, creating a hybridized charging system that increases efficiency for the Volta System and the generator.

## Charging via Solar Power

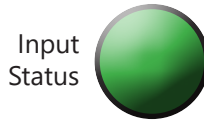
Your vehicle may be equipped with solar panels that supply additional energy to the Energy Storage Pack when there is sufficient sunlight.

The available charge from solar power varies by the capacity and number of solar panels on your vehicle.

The secondary alternator or a shore power connection are more effective in charging the pack than solar power. The solar charging system is primarily used to increase the time needed between charges.

### **Solar Controller LED Indicators**

Your system may include a solar controller with LEDs for monitoring the system. The solar controller has two LEDs that indicate the solar charging status. The following represent the typical LED indicator combinations:



*Both LEDs are Off:  
System is not on*

*Flashing Yellow  
and Solid Green:  
System charging*

*Both LEDs are Red:  
Pack fully charged /  
not charging*

If both lights are red, it indicates the system is not charging. This can be caused by the following:

- The system is fully charged.
- The pack is too cold to charge.
- The solar controller's internal temperature is too high.
- Insufficient sunlight to charge the system or the panels are dirty.

# RESETTING FAULTS AND SYSTEM EMPTY FAULTS

## How to Reset a Fault

When the SOC gauge is slowly blinking red, a system fault is present. To attempt to reset any fault, press the On/Off pushbutton to turn off the Volta System, wait 30 seconds, then press the On/Off button again.

If the fault does not clear, and the pack is above 0% on the SOC gauge, there is a fault that will need to be checked by a certified technician. Contact the vehicle OEM, Dealership, or other Volta approved technician.

## How to Reset from System Empty Fault

The Battery Management System shuts down the Volta System if the pack reaches a very low voltage limit or 0% State-of-Charge (SOC). When the Volta System reaches 0% SOC, the SOC gauge slowly flashes red and the needle will be at 0%. Do not attempt to turn on the system until a charge source is connected.

To reset your system after a system empty fault:

1. Turn off the vehicle and disconnect shore power.
2. Press the On/Off button to turn off the Volta System, if not off already.
3. Wait 30 seconds, then press the On/Off button to turn the Volta System on.
4. Within 120 seconds, connect a charging source: Connect your vehicle to shore power or start the vehicle and run at the high idle setpoint.

NOTE: If the battery system does not sense incoming power within 120 seconds from being re-awakened, it will go back to sleep. Restart the procedure if this occurs.

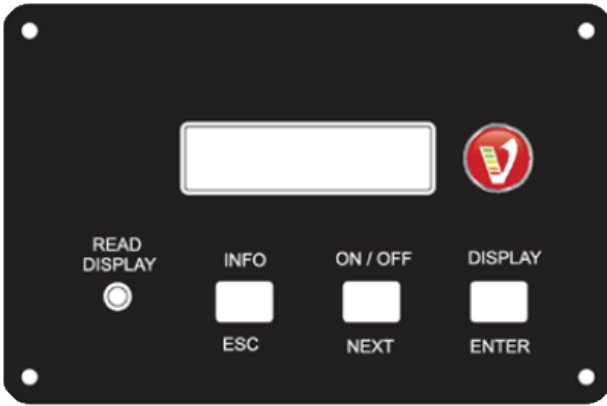
5. If charging via shore power, ensure the appropriate charge rate is selected via the Touchscreen or the Inverter Control Panel. **Refer to Inverter Screen on page 28 or Max Branch Amps (Charger Current Limit) Setting on page 22 for details on changing the charge rate selection.**
6. Charge the system to a SOC of greater than 20% before turning off the system, unplugging from shore power, or turning off the vehicle.

If a system reset is successful, and the system empty fault is corrected, the SOC gauge will be solid red (not flashing). If this reset does not correct the System Empty Fault, please contact the vehicle OEM, Dealership, or other Volta approved technician.

Perform the recovery procedure as soon as possible. Failure to recover from a low voltage shutdown will result in further pack discharge, which may require service from a Volta technician.

Consider the Energy Storage Pack temperature when recovering from zero SOC. The Volta System will not charge if the Energy Storage Pack is too cold. **Refer to Cold Temperature Operation on page 31 for additional details and strategies.**

# INVERTER CONTROL PANEL



## Inverter Overview

Depending on your Volta System configuration, you may have an Inverter Control Panel to control your inverter.

The inverter changes energy from the Energy Storage Pack from direct current (DC) into alternating current (AC) to power the vehicle's 120 VAC devices (air conditioner, heater, cooktop, etc.).

Turn the inverter on or off using the On/Off button on the Inverter Control Panel (see image above). To get the most out of your system's charge, turn off the inverter when not using 120 VAC devices. When connected to shore power, the inverter cannot be turned off.

Control your inverter, adjust settings, and monitor energy usage via the Inverter Controller with LCD screen.

## Run Mode

The inverter turns on automatically each time the Volta System is turned on via the Volta On/Off pushbutton. While the inverter is on, it is in Run Mode, meaning that it is actively converting energy from the Energy Storage Pack.

While in Run Mode, the inverter controller displays the following:

```
INV#1 1500 WATT  
BATT 57.4 VOLTS
```

This example shows the inverter is on, the load is consuming 1500 watts, and the battery voltage is at 57.4 volts.

## Standby Mode

The inverter enters Standby mode when your vehicle connects to shore power. When in Standby Mode, the inverter charges the Energy Storage Pack (if needed) and all devices are powered via shore power. While in Standby mode,

the inverter controller displays the following:

**DEVICE - STANDBY  
OVERRIDE BY CHGR**

If shore power is disconnected, the inverter automatically switches from Standby mode to Run Mode. It returns to Standby Mode when shore power is restored.

When shore power is connected, the Volta System samples incoming power for a few seconds to ensure uniformity requirements are met. If incoming power meets the requirements, the Volta System turns on and begins charging.

## Charging Modes

When shore power is connected, the energy from shore power passes through the inverter and all loads operate directly from shore power. Simultaneously, if the Energy Storage Pack requires charge, the inverter charges the pack regardless of the inverter On/Off status.

The Energy Storage Pack charges via two charge modes:

### ***Constant Current (CC) Mode***

In CC mode, the pack is charged at a higher amperage until it reaches a programmed state of charge.

The following example shows the pack is charging in CC mode, the pack voltage is 54.5 volts, and the charge current is at 45 amps.

**CHG#1 – CC MODE  
54.5 VOLT, 45AMP**

### ***Constant Voltage (CV) Mode***

In CV mode, the pack charges at a lower current in order to maintain a constant voltage. This charge mode occurs when a high current isn't required because the pack is already at a higher state of charge.

The following example shows the pack is charging in CV mode, the pack voltage is 58.0 volts, and the current is at 30 amps.

**CHG#1 – CV MODE  
58.0 VOLT, 30AMP**

## Charge Current Limit

If the total AC input current from shore power exceeds the branch circuit rating of the inverter (as set via the Inverter Control Panel), the inverter displays the following message.

**CHG#1 POWER RAW  
LIMIT 20AMP DC**

You may need to adjust the max branch amps. Refer to *Max Branch Amps (Charger Current Limit) Setting on page 22*.

## Info Button

Press the Info button to cycle through the current system configuration and settings. The available information varies depending on the state of the inverter (On, Charging, Off, Off Due to Fault). The following message will display for a few seconds when the info button is pressed.



Device Status:  
• • • •

## Max Branch Amps (Charger Current Limit) Setting

The Charger Current Limit setting limits the current from shore power available for charging and powering devices. Adjusting this setting directly impacts how quickly the Volta System charges and how many devices can run when connected to shore power.

When connected to shore power, the Volta System first provides power to any accessories drawing power from the Energy Storage Pack. The remaining current is then used to charge the Volta System at the selected Charger Current Limit.

To adjust this setting, *refer to How to Adjust an Inverter Setting on page 23*.

Before adjusting this setting, confirm the amp rating at the shore power service location. For reference, most residential outlets are 15 amps and shore power services range from 20-30 amps.

Consider the following before adjusting this setting:

- The Charger Current Limit setting must be at or below the amp rating of the shore power outlet. For example, when connected to a residential outlet rated at 15 amps, the Charger Current Limit setting must be set to 15 amps or lower.
- If you plan on using 120 VAC devices or accessories while connected to shore power, the Volta System prioritizes those loads before charging the Volta System. To decrease the time required to charge the Volta System, turn off all unnecessary devices. This will deliver more current to the Energy Storage Pack and decrease charge time.
- If connecting to shore power causes the shore power's source fuse to blow or the circuit breaker to switch, decrease the Charger Current Limit setting before connecting to shore power.
- If the Charger Current Limit is set to a value higher than the shore power amp rating, the system will not charge, electric devices in the vehicle will not function, or a circuit breaker may trip.

## How to Adjust an Inverter Setting

To adjust an inverter setting:

1. Turn the inverter on using the On/Off button if the inverter is off.
2. Press and hold the Display button on the Inverter Controller for 5-10 seconds to enter Settings mode. The following message appears when in Settings mode:

**Settings Mode:  
Press [Next]**

3. Press the Next button to cycle through available settings and their currently set values.
4. Press Next until you reach the desired setting that you'd like to change. Press the Enter button to adjust the setting. An "S" appears in the display, indicating you can adjust the setting (see example below).

**Max Branch Amps:  
5 Amps S**

5. Press Next to cycle through the available setting's values.
6. When you reach the desired setting value, press Enter.
7. The screen will return to the Settings menu and the Read Display LED will blink twice confirming that a setting has been adjusted/changed
8. To adjust additional settings, follow the previous steps. At any time, press the ESC button to go back one level, then press Next to continue cycling through settings.
9. To exit settings mode, press the ESC button until you reach the main screen with run mode details.

If you adjust several settings, a system restart may be required before changes take effect. After adjusting settings, you will be prompted to restart the system.

## Restarting the Inverter Control Panel

To restart the Inverter Control Panel:

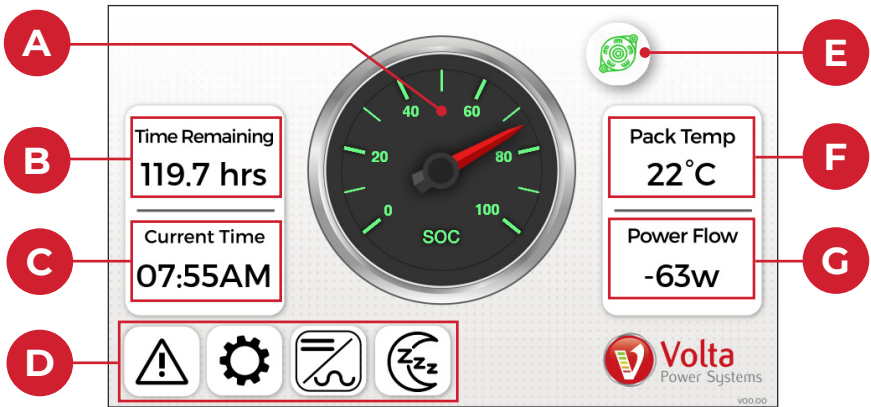
1. Press and hold the Display button on the Inverter Control Panel for 5 to 10 seconds to enter Settings mode.
2. Press the Next button until you reach the Manual Restart screen.
3. Press Enter to perform a system restart.
4. Press ESC to return to the main screen.

# TOUCHSCREEN OVERVIEW

Monitor and control the Volta System via the touchscreen, if equipped with your Volta System. The appearance and availability of touchscreen features on your Volta System may vary from what is shown.

The touchscreen turns on a few seconds after the Volta pushbutton is pressed, a charge source is sensed, or the vehicle is turned on.

## Home Screen



- A) **State-of-Charge Gauge (SOC):** Displays the approximate SOC of the Energy Storage Pack. The SOC gauge's flash codes and colors communicate basic system and fault states. *Refer to State-of-Charge (SOC) Flash Codes on page 25.*
- B) **Charge Time Remaining:** Displays the approximate charge time remaining in the Energy Storage Pack. This value changes depending on the amount of load applied to the pack. For more information on increasing the system runtime, *refer to Charging the System and Increasing System Runtime on page 16.*
- C) **Current Time:** Displays the current time.
- D) **Menu Bar:** Touch the menu bar buttons to access the corresponding screens, including:



Alerts button: Refer to Alerts Screen on page 26.



Settings button: Refer to Settings Screen on page 27.



Inverter button: Refer to Inverter Screen on page 28.





Sleep button: Press to put the Touchscreen to sleep. Touch the screen to turn it back on.



Home button: Access the Home screen.

**E) System Indicators:** Appear to communicate system changes or statuses, including:



Alternator Charging: Energy Storage Pack is ready for charging from alternator, or is currently charging from alternator.



Energy Storage Pack Temperature Low: Pack is too cold to charge.



Heating Pads On: Heating pads are on and actively warming the Pack.



Pack Temperature High: Energy Storage Pack is at or near the high temperature shutdown limit.

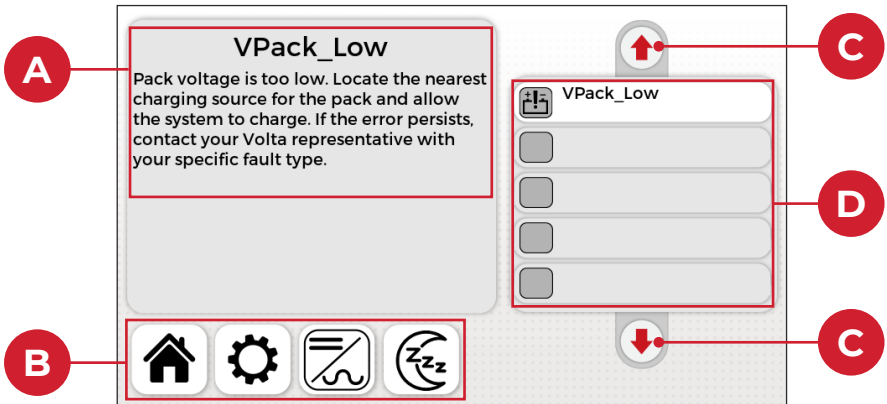
**F) Pack Temp:** Displays the current temperature of the pack.

**G) Power Flow:** Displays the power consumption (negative value) on the pack or the rate of charge (positive value) to the pack.

### **State-of-Charge (SOC) Flash Codes**

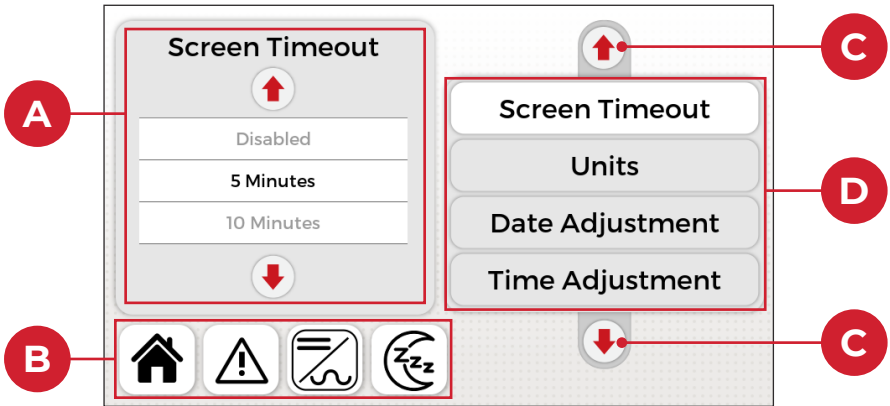
Gauge Color	System State
Solid Green	Normal Operating SOC (greater than 20%)
Solid Yellow	Low SOC (10-20%)
Solid Red	Very Low SOC (less than 10%)
Flashing Red	High Temperature
Slow Flashing Blue	Too Cold to Charge

## Alerts Screen



- A) **Alert Description:** Displays a description and potential troubleshooting of the selected alert.
- B) **Menu Bar:** Touch the menu bar buttons to access the corresponding screens, including:
- Home button: Accesses the Home screen.
  - Settings button: Accesses the Settings screen.
  - Inverter button: Accesses the Inverter screen.
  - Sleep button: Puts the Touchscreen into sleep mode.
- C) **Navigation Arrows:** Press to navigate the active alerts panel.
- D) **Active Alerts:** Displays the current system alerts. Alerts reset automatically after the alert condition is resolved.

## Settings Screen



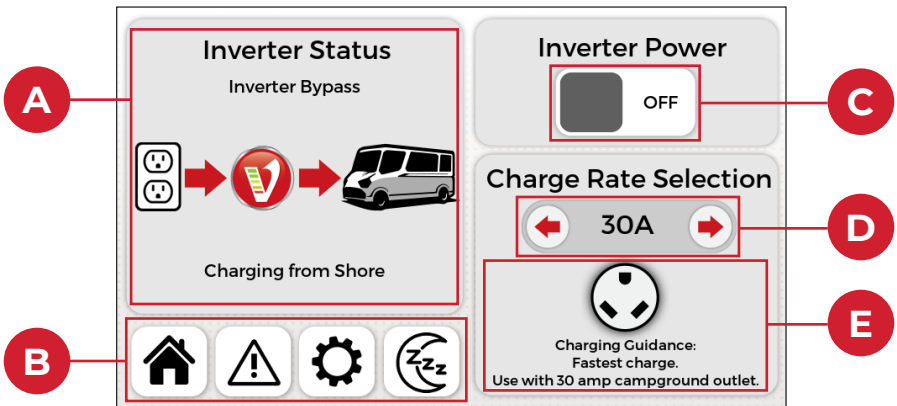
- A) Settings Adjustment Panel:** Displays the adjustable values or toggle buttons for the corresponding setting.
- B) Menu Bar:** Touch the menu bar buttons to access the corresponding screens, including:
- Home button: Accesses the Home screen.
  - Alerts button: Accesses the Settings screen.
  - Inverter button: Accesses the Inverter screen.
  - Sleep button: Puts the Touchscreen into sleep mode.
- C) Navigation Arrows:** Press to navigate the Settings Panel.
- D) Settings Panel:** Displays the adjustable settings. Use the arrow buttons to scroll through the settings, the press the setting to adjust. *Refer to the Available Settings section below for details.*

### Available Settings

Some screens require a password to edit the settings. These screens include settings that should only be adjusted by a Volta approved technician. The following screens have settings that are accessible to all users:

- Screen Timeout: The screen timeout value adjusts the time after inactivity before the touchscreen turns off. When disabled, the touchscreen never goes to sleep. Touch the screen to wake up the touchscreen.
- Units: Toggle the temperature units between °F or °C.
- Date Adjustment: Adjust the date (day, month, year).
- Time Adjustment: Adjust the current time (hour, minute, AM/PM, 12/24 hr).
- Theme: Toggle the touchscreen color theme.
- Screen Brightness: Adjust the screen brightness or toggle between Auto and Manual mode.

## Inverter Screen



- A) **Inverter Status:** Displays a description of the current inverter action or status.
- B) **Menu Bar:** Touch the menu bar buttons to access the corresponding screens, including:
- Home button: Accesses the Home screen.
  - Alerts button: Accesses the Settings screen.
  - Settings button: Accesses the Setting screen.
  - Sleep button: Puts the Touchscreen into sleep mode.
- C) **Inverter Power:** Toggles the inverter On or Off. Whenever the inverter is not needed (not using 120V devices), turn off the inverter to conserve Volta System SOC. *Refer to **Charging the System and Increasing System Runtime on page 16.***
- D) **Charge Rate Selection:** Displays the current charge rate. Use the arrow buttons to raise or lower the charge rate. The charging guidance below the Charge Rate Selection aids in selecting the proper charge rate for your system based on usage and charge source.
- E) **Charging Guidance:** Displays a description of the recommended use for the currently selected charge rate.

# USING THE AUTO START SYSTEM



**Warning:** Do not start the vehicle engine in closed garages or other enclosed areas. Vehicle exhaust fumes are toxic.

## Auto Start System Overview

The Volta System may be integrated with an Auto Start System. The Auto Start System automatically starts and stops the vehicle's engine, allowing the secondary alternator to charge the Volta System.

The functionality of the Auto Start System varies depending on the OEM and the model of Auto Start System installed on your vehicle. For complete instructions and specifications, refer to the OEM documentation.

## Auto Start System - RAM ProMaster Chassis Only

The following information applies to Volta Systems equipped with an Auto Start System on Ram ProMaster Chassis. The Auto Start System functionality may vary depending on the parameters and configurations set by the OEM. For a complete description of the Auto Start System functionality and troubleshooting, refer to the manufacturer documentation, which is available upon request from Volta, or contact your vehicle OEM.

### ***Enabling Monitor Mode - RAM ProMaster Chassis with Auto Start***

The Auto Start System “monitors” the pack voltage. When Monitor Mode is enabled, the engine automatically starts when the pack voltage reaches a preset low point. The engine then shuts off automatically after the pack voltage reaches a preset high point, when a preset engine timeout timer expires, or if the fuel level drops below 1/4 tank.

To enable Monitor Mode:

1. Turn on the Volta System.
2. Place the vehicle transmission in park (P).
3. Verify the vehicle's fuel is above 1/4 tank.
4. Verify the vehicle's hood is closed and latched.
5. Apply the parking brake.
6. If using the Auto Start button to enable Monitor Mode, switch the ignition to the ON/RUN position.
7. Press and hold the Auto Start button (for preset amount of time) on the instrument panel near the steering column OR quickly press the Lock button on the remote control (3) times.
8. When Monitor Mode is successfully enabled:
  - o Auto Start button LED turns on.
  - o If enabled using the remote control, the horn sounds (2) times, headlamps flash (2) times, and the instrument cluster illuminates for 10 to 30 seconds.

When Monitor Mode is enabled, the ignition can be switched off.

If the brake pedal is pressed while Monitor Mode is enabled, Monitor Mode is temporarily disabled for a preset time and the Auto Start button LED flashes. If the brake pedal is pressed while Monitor Mode is enabled and the engine is running, the engine shuts off. Additionally, the Auto Start System does not function if the engine coolant temperature is too high.

### ***Disabling Monitor Mode - RAM ProMaster Chassis with Auto Start***

To disable Monitor Mode, press and hold the Auto Start button for a preset amount of time, or press the unlock buttons on the remote control, alternating between the Front Doors Unlock and Cargo Unlock buttons, a total of (3) times. If successfully disabled, the Auto Start button LED turns off.

### ***Manual Start Mode - RAM ProMaster Chassis with Auto Start***

When Manual Start Mode is activated, the engine starts immediately, allowing the Volta System to charge, and then shuts off automatically after the pack voltage reaches a preset high point, when a preset engine timeout timer expires, or if the fuel level drops below 1/4 tank.

Manual Start Mode is best used to raise the Volta System SOC before leaving the vehicle short term or going to bed.

To activate Manual Start Mode:

1. Turn on the Volta System.
2. Place the vehicle transmission in park (P).
3. Verify the vehicle's fuel is above 1/4 tank.
4. Verify the vehicle's hood is closed and latched.
5. Apply the parking brake.
6. Press the Auto Start button (3) times within (3) seconds.

The engine starts after the third button press.

### ***Troubleshooting and Resetting the Auto Start System after a Fault - RAM ProMaster Chassis with Auto Start***

During normal operation, the Auto Start button LED is on. If the LED is flashing, the Auto Start System has detected a fault or the brake pedal has been pressed.

To reset the fault, disable and re-enable Monitor Mode as described previously, or if the LED is flashing after pressing the brake pedal, wait for the system timeout to expire, and Monitor Mode automatically re-enables if no other faults are present.

If the faults persist, refer to the manufacturer documentation for additional troubleshooting or contact Volta Power Systems.

# USING THE VOLTA SYSTEM IN HOT AND COLD TEMPERATURES

Refer to *Temperature Limits on page 33* for details on the hot and cold temperature operating limits.

Monitor your SOC gauge flashcodes or any indicators on your touchscreen to assist in hot or cold climate operation.

## High Temperature Operation

The Energy Storage Pack is designed with passive cooling. The BMS shuts down the pack or prevents charging at elevated temperatures to allow the pack to cool.

The Volta System charges normally and distributes power normally up to 116°F (47°C). At or above 116°F (47°C), the Battery Management System (BMS) prevents charging. At or above 134°F (57°C) the BMS shuts down the system.

To protect the pack, avoid using or storing the pack at or above 134°F (57°C). Storage of the energy storage pack at elevated temperatures is not recommended, as it will reduce the lifetime and capacity of the pack.

## Cold Temperature Operation

The Volta System is capable of powering electrical systems below freezing temperatures. However, if the Energy Storage Pack temperature is too low, the system does not charge.

For system operation in cold environments, and to maintain the Energy Storage Pack at charge-accepting temperatures, the pack may be equipped with heating pads. Or, these heating pads are available for purchase from Volta.

The internal heating system operates automatically, as needed, assuming sufficient energy is available from energy storage pack and the inverter is turned on.

If you are unable to connect to a charge source in cold temperatures, monitor the State of Charge to ensure the electrical systems and the heating pads do not fully deplete the Volta System SOC.



## Cold Temperature Operating Strategies

Monitor the SOC Gauge or touchscreen alerts when the Energy Storage Pack is too cold to charge to ensure precautions are in place to prevent the SOC from dropping too low.

If the Energy Storage Pack is too cold to charge, the SOC flashes blue or a snow flake appears on the touchscreen.

Remember, before charging the vehicle, consider the charge source and ensure the appropriate charge rate is selected via the Touchscreen or Inverter Control Panel. **Refer to Inverter Screen on page 28 or Max Branch Amps (Charger Current Limit) Setting on page 22 for details.**

Refer to the following operating and charging strategies while in cold weather:

- If planning a trip during cold weather, connect the vehicle to shore power and ensure the inverter is turned on a day prior to leaving. Depending on ambient temperature, this should allow sufficient time for the heating pads to warm the energy storage pack.
- Leave the Volta System and inverter on while in cold temperatures. The heating pads only activate when the Volta System and inverter are on.
- Connect to shore power whenever possible. When connected to shore power, the heating pads will draw power from shore power instead of the energy storage pack. When the pack warms enough to accept charge, the charge from shore power begins automatically.
- If shore power is not available, turn on the Volta System and ensure the inverter is on to warm the pack via the heating pads. When the pack warms enough to accept charge (SOC is not flashing blue or the touchscreen does not indicate too cold to charge), turn on the vehicle and drive the vehicle to charge the system via the alternator.
- If a charge source is not available, and the SOC is too low to activate the heating pads long enough to warm the pack, turn off the Volta System to limit power consumption. If possible, park the vehicle in a warmer location to raise the pack temperature, or contact Volta Power Systems for additional strategies to warm the pack.



# TEMPERATURE LIMITS

The Volta System is programmed with several operational temperature limits to protect the pack and prolong its life.

F °	C °	Limit	Description
140	60	Maximum storage temperature	Do not store the pack at or above this temperature. Doing so may cause the pack to overheat and may result in a loss of performance and/or a shortened life expectancy.
134.6	57	High temperature fault	Volta System shuts down and does not function above this temperature.
131	55	High temperature warning	Volta System is near the high temperature fault. SOC gauge may flash yellow or an indicator may appear on the touchscreen.
125.6	52	High temperature fault recovery	If the pack reaches the high temperature fault limit (134.6°F or 52°C), the Volta System will not restart until it cools below this temperature.
116.6	47	Too hot to charge	Above this temperature, the Volta System powers devices, but the System will not charge, even if connected to shore power.
109.4	43	Too hot to charge recovery	If the pack reaches the too hot to charge temperature (116.6°F or 47°C), the Volta System will not allow charging again until it cools to this temperature.
68	20	Heating control off temperature	At this temperature, the pack heating control turns off if previously on.
59	15	Heating control on temperature	When the pack is below this temperature, the pack heating control is on to actively warm the pack.
42.8	6	Too cold to charge recovery	If the pack reaches the too cold to charge temperature (37.4°F or 3°C), the Volta System will not allow charging again until it reaches this temperature.
41	5	Low temperature warning	Volta System is near the too cold to charge limit. SOC gauge may flash blue or an indicator may appear on the touchscreen.
37.4	3	Too cold to charge temperature	Below this temperature, the Volta System powers devices, but the System will not charge, even if connected to shore power.
-4	-20	Low temperature fault	Volta System shuts down and does not function below this temperature.

*The values listed in this table represent approximate values that may vary by system specification, application, and environmental conditions.*

## Temperature Ranges

Review the table below for an overview of operational temperature ranges for your Volta System.

F° (C°)	Range	Description
-4°F to 140°F (-20°C to 60°C)	Safe Storage Range	The Energy Storage Pack may be stored within this range. At certain temperatures within this range, Volta System functionality may be prevented.
37.4°F to 116.6°F (3°C to 47°C)	Charging Range	Within this temperature range, the Volta System accepts charge and has full functionality.
-4°F to 134.6°F (-20°C to 57°C)	Discharging Range	Within this temperature range, the Volta System turns on and powers devices. Refer to the Charging Range (within this table) to identify the range within the Discharging Range at which the Volta System does not charge.
-4°F to 59°F (-20°C to 15°C)	Heating Control On Range - Shore Power	If equipped with internal heating pads, the Volta System's heating control is on to actively warm the Energy Storage Pack when connected to AC power (shore power) and within this temperature range.
-4°F to 42.8°F (-20°C to 6°C)	Heating Control On Range	If equipped with internal heating pads, the Volta System's heating control is on to actively warm the Energy Storage Pack when within this temperature range.

*The values listed in this table represent approximate values that may vary by system specification, application, and environmental conditions.*

## STORING VEHICLES WITH A VOLTA SYSTEM



**Warning:** Do not store the Volta System at low State-of-Charge. The system is designed with a limited energy reserve, in case the system is left on and the low voltage shutdown occurs. This reserve may last for three months until irreversible damage could occur. Neglecting system maintenance and allowing the Energy Storage Pack to come to this state will result in voiding the warranty.



**Warning:** Failure to turn off the Volta System before storing your vehicle long term (greater than 3 months) will cause the Energy Storage Pack(s) charge to deplete faster, even if all loads on the system are removed, which can cause permanent damage to the Energy Storage Pack.

Storage methods vary by customer and environment. Also, *refer to Temperature Limits on page 33* for safe storage temperatures.

### Long Term Storage (Greater than 3 Months)

Preparations should be made to protect the life and performance of the Energy Storage Pack when not in use. When leaving the vehicle in storage, turn off the Volta System by pressing the On/Off pushbutton.

To prepare for long-term storage:

1. Charge the Volta System to greater than 70% SOC as indicated on the SOC Gauge or Touchscreen.
2. Press the On/Off pushbutton and verify that the pushbutton LED and SOC gauge/touchscreen turn off, indicating the Volta System is off.
3. Turn on the Volta System every three months to verify the pack is maintaining a high SOC. If necessary, charge the system to above 70% SOC before storing the vehicle again.

# INSTALLING MYVOLTA BLUETOOTH MODULE

The myVolta Bluetooth Low Energy (BLE) device enables users to access their Volta system's information from a Bluetooth-connected device.

You can purchase the Bluetooth module at [www.VoltaPowerSystems.com](http://www.VoltaPowerSystems.com).

The kit includes:

- Bluetooth Communication Module
- Adapter Harness

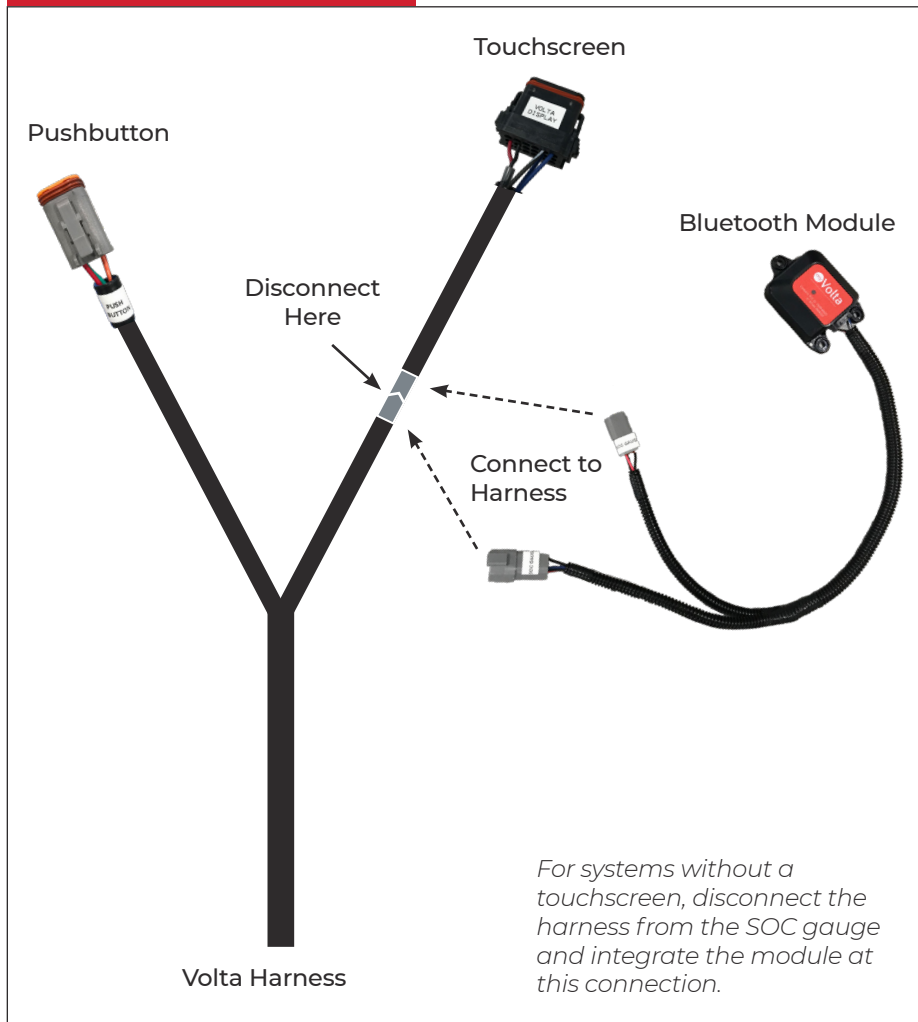
The Bluetooth module integrates with the existing State-of-Charge (SOC) gauge or Touchscreen in your vehicle. To install, refer to the video on [www.VoltaPowerSystems.com](http://www.VoltaPowerSystems.com) or follow these instructions and the graphic on the following page:



1. Locate the SOC gauge or Touchscreen, then turn off the Volta System via the On/Off button. Wait a few seconds for the system to shut down.
2. When the SOC gauge or Touchscreen and the On/Off button are no longer illuminated, remove any mounting hardware to access the back of the SOC gauge or Touchscreen.
3. Vehicles with Touchscreen Only:
  - a. The Bluetooth adapter harness is connected to the Touchscreen branch of the harness, but not directly to the back of the touchscreen. Instead, disconnect the touchscreen harness branch at the position shown in the graphic.
  - b. Connect the Bluetooth adapter harness to the Bluetooth module.
  - c. Connect the Bluetooth adapter between the connectors on the Touchscreen branch of the Volta harness. The adapter harness has three unique connections, ensuring the connections cannot be made in the wrong order or position.
4. Vehicles without Touchscreen (SOC Gauge Only):
  - a. Disconnect the Volta harness from the back of the SOC Gauge.
  - b. Connect the Bluetooth adapter harness to the Bluetooth module.
  - c. Connect the Bluetooth adapter between the back of the SOC gauge and the Volta harness. The adapter harness has three unique connections, ensuring the connections cannot be made in the wrong order or position.
5. Feed the harness and cables back into their original locations.
6. Remove the top layer of tape over the adhesive tape on the Bluetooth module, then adhere the Bluetooth module to a suitable surface.

7. Reinstall the SOC gauge or Touchscreen and the On/Off button unit using the four screws.
8. Press the On/Off button to turn on the Volta system.
9. Follow the instructions in the myVolta app to pair your mobile device with the Volta system.

## Bluetooth Module Install



## MyVolta App

Download the myVolta app to your mobile device, then follow instructions in the app to pair with your Bluetooth module. You can view the following information from your Volta System in the myVolta app:

- Performance Data

- Estimated Runtime Remaining
- Charging Status
- Pack Temperature
- Warnings, Faults, or Errors

# TROUBLESHOOTING AND FAQs

## How long will my Volta System run?

Runtime is directly related to how much power you are using and how much energy your system can store. On the Volta touchscreen, you can monitor the Time Remaining indicator. This displays the approximate charge time remaining in the pack.

You can also calculate an approximate runtime. For example, if you have a 12 kWh Energy Storage Pack, and your Power Flow indicator on the touchscreen is reading -1,000 W, then you can estimate that you have approximately 12 hours of runtime remaining.

Overall, the more appliances, devices, and electrical systems you use, the quicker your State of Charge will deplete. On lighter loads, it's possible for the system to last for several days. *Refer to System Runtime on page 16 for more information.*

## Why is there a system delay after I press the On/Off pushbutton?

When the On/Off pushbutton is pressed to turn on the Volta System, a system check occurs. After all system checks are successful, the Energy Storage Pack supplies power to all the Volta System components, turning the system on.

## Why won't my Volta System charge?

There may be several reasons why the Volta System isn't charging, even while connected to shore power:

- The State-of-Charge is too high. If you are attempting to charge the SOC to 100% from a SOC greater than approximately 90-95%, the system will need to deplete to below approximately 90-95% before the system begins to charge again.
- The Energy Storage Pack is too cold or too hot to charge. *Refer to Using the Volta System in Hot and Cold Temperatures on page 31.*
- The shore power connection does not meet the charging requirements controlled by the BMS. *Refer to Charging via Shore Power on page 16.*
- The selected charge rate is not appropriate for the shore power connection. You may need to raise or lower the Charge Rate Selection on the touchscreen or the Max Branch Amps in the Inverter Control Panel. *Refer to Inverter Screen on page 28 or Max Branch Amps (Charger Current Limit) Setting on page 22.*
- If you're using a plug-in surge protector, but you're experiencing problems with your Volta System not connecting to the attached shore power, attempt the following test: Remove the surge protector and plug the shore cord directly into your vehicle. If your system is now able to

receive shore power, it may be that your surge protector is not compatible with the Volta System.

## How can I tell if my solar panels are working?

Depending on your usage, and the size of your solar panels, it may be difficult to monitor the incoming charge.

The electrical systems in your vehicle likely draw more power than the solar panels generate, therefore solar power is not as efficient in charging the Volta System as connecting to shore power or the secondary alternator. Solar power is better used as a way to increase the time between charges.

In ideal conditions, some incremental charging can be experienced, but you shouldn't rely on your system's solar panels to charge your Volta system. If you have access to the LEDs on the solar controller, **refer to *Charging via Solar Power on page 17 for details on the LEDs.***

## Why can't I connect my phone to my Volta System?

To connect your phone to the Volta System to monitor performance data, runtime remaining, charge status, pack temperature, and other system data, you must have the Bluetooth Module installed in your vehicle and have the MyVolta app installed on your phone.

Your RV's OEM may have installed a Bluetooth module. If so, simply download the MyVolta app to your phone, then follow the instructions in the app to pair to the Bluetooth module.

If your RV is not equipped with the Bluetooth module, it is available for purchase from [www.VoltaPowerSystems.com](http://www.VoltaPowerSystems.com). **Refer to *Installing MyVolta Bluetooth Module on page 36 for further instructions.***

To determine if you currently have the Bluetooth module installed:

- Check with your OEM or consult any OEM documentation provided with your RV.
- Attempt to connect the MyVolta app.
- Check behind the SOC gauge or Touchscreen to see if the Bluetooth module is connected.

## How do I recover my Volta System if it reaches 0% SOC?

The Battery Management System in your Energy Storage Pack is programmed to prevent the lithium-ion cells from reaching potentially harmful low-voltage thresholds. If the Volta System is discharged to the programmed threshold (approximately 0% SOC), the Volta System shuts down. In this state, electrical systems are disabled.

To recover from this shutdown, the Volta System will only restart if a charge source is connected. To perform the system recovery, **refer to *How to Reset from System Empty Fault on page 19.***



## Why do I need to adjust my charge rate?

Have you ever tripped a circuit breaker in your house after using too many electrical appliances at once? This happens when the amount of energy being pulled from the outlet exceeds what it's able to give. For example, if you're trying to use 20 amps of energy but the outlet can only provide 15 amps, the breaker will trip and the electrical current will be cut off, preventing a potentially dangerous situation.

When you're connected to shore power, your Volta System is just like an appliance. To prevent the shore-power breakers from tripping, it's important to ensure that your system's charge amps are properly adjusted.

The inverter/charger has an adjustable charge rate. You can adjust the Charge Rate Selection via the touchscreen or the Inverter Control Panel in 5A increments. This allows you to adjust the charge rate to match the shore power source and to meet your system use requirements. ***Refer to Inverter Screen on page 28 or Max Branch Amps (Charger Current Limit) Setting on page 22 for more information on adjusting the charge rate.***



**Volta** Power Systems