



SOLAR STIK®

# TROUBLESHOOTING GUIDE FOR THE 24VDC POWER HUB 3500



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**Interactive**

# TROUBLESHOOTING PROCEDURES

## Power Hub Will Not Power Up

If the Power Hub 3500 is not powered up, it probably is not connected to an active 24 VDC battery and/or there is no PV input. The LCD user interface will power up and be navigable when connected to either of these power sources. Power from PV arrays will charge batteries once the voltage from the arrays is 5 volts greater than the battery voltage then continue charging as long as the voltage from the PV arrays is 1 volt higher than that of the batteries.

## Performance Issues, Causes and Solutions

Table 1. Symptoms and Solutions for the Most Common Power Hub Issues

| Symptom   | Possible Cause(s)  | Solution  |
|---|--|---|
| Battery SOC displays "--".                                  | Battery not fully charged for an extended period or has not been cycled enough times for the user interface to calculate SOC.      | Try to charge the battery fully often. Refer to the setup diagram to make sure that the System is assembled correctly.  |
| Battery SOC seems inaccurate                                | Power Hub is not the primary power management device.  | Normal operation. Read battery SOC from primary management device (e.g., PRO-Verter)  |
| Not registering charge current with panels operating in sun | <ol style="list-style-type: none"> <li>Power Hub overheated</li> <li>Batteries fully charged (29.0 VDC or near to that)</li> </ol> | <ol style="list-style-type: none"> <li>Check internal temperature and "battery" temperature on user interface. Derating begins at 104 °F; diminishing power as temp approaches 140 °F. Check for dirty, blocked air filters. Shade the Power Hub to reduce solar loading. Ensure that the internal cooling fans are operating (audible when operating).</li> <li>Normal operation.</li> </ol> |
| LCD inoperative   | <ol style="list-style-type: none"> <li>No power to the Hub</li> <li>The LCD screen is overheated/sunlight exposure</li> </ol>      | <ol style="list-style-type: none"> <li>Check connections and make sure batteries are active.</li> <li>Close lid and allow Power Hub to cool down.</li> </ol>  |

**Note:** The battery SOC and related readouts on the Power Hub 3500 LCD user interface are precise ONLY if the batteries are connected directly to the Power Hub 3500. If the batteries are connected to the PRO-Verter (indirectly to the Power Hub 3500), then information about the battery SOC and other parameters should be obtained from the PRO-Verter user interface or the optional RMK.

# Data Logging and Remote Monitoring

## Performance and Troubleshooting

The Power Hub user interface monitors and reports Power Hub-,PV-, and battery-related data in real time. These data are also stored in the user interface and provide a historical record of these events over time.

A complete list of the historical information available for PV power performance is found in [Monitoring PV Power: Current and Historical](#). The list for battery-related information is found in [Monitoring System Batteries: Current and Historical](#). Understanding the battery-related information will depend on how the Power Hub is being used. Please see the [Battery Monitor: Understanding Reported Values](#) section. [Error codes](#) related to the solar charge controllers and notifications are accessed in: Menu>Device List>Notifications.

These historical records can assist in troubleshooting and maintaining peak performance of the Power Hub and connected components such as PV arrays and batteries.

Performance, both current and historical can be monitored offline or online using a third-party application called the Victron Remote Monitoring (VRM) Portal. These methods are described in the following sections.

## Data Storage and Retrieval

The built-in nonvolatile storage can contain 48 hours worth of data. To extend this period, insert a micro SD card into the port on the bottom side of the user interface (Figure 28). The user interface will automatically transfer any data that may reside on the internal storage to it and will start using this external memory as backlog buffer.

A data logging interval of once per minute, will require about 25 MB per month, depending on the number of connected products. So with a 1 GB micro SD card, about 3 years of data can be stored. In other words, any micro SD card should be sufficient to store the 6 months of data.



Figure 1. Micro SD card port location

When the storage device is full, no more data will be logged. This is due to the nature of Sqlite (a software library and file type) files. Removing data from the Sqlite database doesn't free up usable disk space, and because of internal fragmentation, it doesn't guarantee more data storage.

If the Power Hub is connected to the internet (Tech Port) past and current data stored on a microSD card can be uploaded to VRM Portal (See Remote Monitoring). If the internet connection is intermittent data stored on the microSD card can be automatically uploaded to the VRM Portal each time the connection is reestablished. Instructions for accessing the VRM Portal are provided in Remote Monitoring below.

If the Power Hub is not connected to the internet, the user can upload the data backlog manually to the VRM Portal by using the following protocol. The first step is to use the Settings window to eject the storage; don't just remove the SD card (Settings > VRM online portal > Micro SD / USB). The storage device can then be removed from the user interface and inserted into a computer or laptop; the data file on it can be uploaded on the VRM Portal with the 'Upload CCGX File' option.

It's important to know that when the micro SD card is reinserted, the existing buffer—including its data—is used again. This allows for removing the micro SD card temporarily for whatever reason, but this also means when the data file has been uploaded to VRM, it needs to be renamed or cleared from the micro SD card before reinserting, otherwise the data will be transmitted again, sooner or later, online or offline.

### MicroSD Card Formatting

Micro SD cards must be formatted as FAT12, FAT16, or FAT32 file systems—not as exFAT or NTFS.

SD- and SDHC-type micro SD cards of 32 GB capacity and smaller are sold containing FAT12, FAT16, or FAT32. They can be used without a problem, unless they are subsequently reformatted to a different file system.

SDXC-type micro SD cards with greater than 32 GB capacity are often formatted with exFAT and therefore cannot be used with the user interface without reformatting and possibly repartitioning.

## Remote Monitoring

When the Power Hub is connected to the internet using the Tech Port, both current and historical performance data from the Power Hub can be monitored remotely. The information provide by the VRM Portal and how to use that information is describe in Performance Remote monitoring requires access to the VRM Portal. Instructions for accessing the VRM Portal are provided below.

### Getting Started

The process is straight forward and self guiding. First, create a VRM user account. And after that the installation, needs to be paired with that user account. It is possible to pair one installation to multiple user accounts.

### Requirements

- A computer connected to the internet
- The VRM Portal ID, which uniquely identifies your system
- Power Hub LCD user interface: The VRM Portal ID can be found in the menu Settings > VRM Logger. It looks like this: be300d83ff04.

### Step 1. Create a user account

1. Go to <https://vrm.victronenergy.com>.
2. Click 'Register for Free'.
3. Complete all the requested information.
4. A confirmation email will arrive to the registered account with a link to activate your account.

Account creation is now finished. Click 'Add Installation' to continue pairing the Power Hub to this user account. Each step will be prompted.

### Step 2. Add the Power Hub to the user account

**Note:** Make sure the Power Hub has already started communicating with the VRM Portal. Or, in case it is an off-grid installation where an SD card is used, first upload the data file.

Adding a Power Hub "Installation" is only possible after the VRM Portal has received the first data transmission from the Power Hub user interface.

Steps to add an installation:

1. Select the product you want to add.
2. Enter the IMEI or MAC Address number for the color control/User Interface.
3. Click 'Add' and your device is now paired with your VRM user account.

**Note:** In case you are the first user to add this installation to your account, you will automatically have Admin rights for this installation. Any subsequent users who add this installation to their account will become a normal user without the ability to change any settings. An Admin user can assign Admin rights to other users on the Settings page.

The Dashboard screen will appear with intuitive, interactive elements.

## Solar Charge Controller Error Codes

Detailed error codes can be read with a LCD user interface. **The vast majority of these errors will not be encountered when the Power Hub is operating in concert with other HPS components. All possible error codes are included for reference purposes.**

### **Err 2 - Battery voltage too high**

This error will auto-reset after the battery voltage has dropped. This error can be due to other charging equipment connected to the battery or a fault in the solar charge controller. This error can also occur if the battery voltage is set to a lower voltage than the actual battery voltage (e.g., 12 VDC for a 24 VDC battery).

### **Err 3, Err 4 - Remote temperature sensor failure**

Check if the T-sense connector is properly connected to a remote temperature sensor. Most likely cause: the remote T-sense connector is connected to the BAT+ or BAT- terminal. This error will auto-reset after proper connection.

### **Err 5 - Remote temperature sensor failure (connection lost)**

Check if the T-sense connector is properly connected to a remote temperature sensor. This error will not auto-reset.

### **Err 6, Err 7 - Remote battery voltage sense failure**

Check if the V-sense connector is properly connected to the battery terminals. Most likely cause: the remote V-sense connector is connected in reverse polarity to the BAT+ or BAT- terminals.

### **Err 8 - Remote battery voltage sense failure (connection lost)**

Check if the V-sense connector is properly connected to the battery terminals.

### **Err 17 - Controller overheated despite reduced output current**

This error will auto-reset after the solar charge controller has cooled down. Check the ambient temperature and check for obstructions in the ventilation filters. Shade the Power Hub.

### **Err 18 - Controller over-current**

This error will auto-reset. If the error does not auto-reset disconnect the solar charge controller from all power-sources, wait 3 minutes, and power up again. If the error persists the solar charge controller is probably faulty. A cause for this error can be switching on a very large load on the battery side.

### **Err 20 - Maximum Bulk-time exceeded**

This error can only occur when the maximum bulk-time protection is active. This error will not auto-reset. This error is generated when the battery-absorption-voltage is not reached after 10 hours of charging.

Note: This protection is default disabled in all solar charge controllers. Do not enable it.

### **Err 21 - Current sensor issue**

This error will not auto-reset.

Disconnect all wires, and then reconnect all wires. Also, make sure the minus on the MPPT solar charge controller (PV minus/Battery minus) is not bypassing the solar charge controller.

If the error remains, please contact your FSR.

### **Err 26 - Terminal overheated**

Power terminals overheated, check wiring, including the wiring type and type of strands, and/or fasten bolts if possible.

This error will auto-reset.

### **Err 28 - Power stage issue**

This error will not auto-reset.

Disconnect all wires, and then reconnect all wires. If the error persists the solar charge controller is probably faulty. Contact FSR.

### **Err 33 - PV over-voltage**

This error will auto-reset after PV-voltage has dropped to safe limit. This error is an indication that the PV-array configuration with regard to open-circuit voltage is critical. Check the PV panel spec, configuration, and if required, re-organise panels.

### **Err 34 - PV over-current**

The current from the PV-panel array has exceeded 75A. This error could be generated due to an internal system fault. Disconnect the Power Hub from all power-sources, wait 3 minutes, and power-up again. If the error persists the controller is probably faulty, contact your FSR.

### **Err 38, Err 39 - PV Input shutdown**

To protect the battery from over-charging the panel input is shorted.

Possible reasons for this error to occur:

- There is another device connected to the battery, which is configured to a higher voltage.
- The battery is disconnected using a manual switch. Ideally the charger should be switched off before disconnecting the battery, this avoids a voltage overshoot on the charger output. If necessary the voltage trip-level for the PV Short protection can be increased by raising the Equalization voltage set-point (note: equalization does not have to be enabled in this case).

Error recovery:

- Error 38: First disconnect the PV panels and disconnect the battery. Wait for 3 minutes, then reconnect the battery first and next the panels.
- Error 39: The Power Hub will automatically resume operation once the battery voltage drops below the max charge level for 1 minute.

If the error persists the one or more solar charge controller is probably faulty. Contact FSR.

### **Information 65 - Communication warning**

Communication with one of the paralleled controllers in the Power Hub was lost. To clear the warning, cycle the power to the Power Hub.

### **Information 66 - Incompatible device**

The controller is being paralleled to another controller that has different settings and/or a different charge algorithm.

Make sure all settings are the same and update firmware on all solar charge controllers in the Power Hub to the latest version

### **Err 67 - BMS Connection lost**

The solar charge controller is configured to be controlled by a BMS, but it does not receive any control messages from a BMS. The charger stopped charging, as a safety precaution.

Check the connection between the charger and the BMS.

How to reset the solar charge controller to de-couple it from the BMS

When the charger needs to operate in stand-alone mode again, not controlled by a BMS, it needs to be reset:

- Solar chargers, go into the setup menu, and change setting 'BMS' from 'Y' to 'N' (setup item 31).
- Reset the solar charge controllers to factory defaults, and then reconfigure it.

**Note** that solar chargers automatically configure themselves to be BMS-controlled when they are connected to one, either directly or via the LCD user interface. The Power Hub was programmed to work independently from a BMS.

### **Err 114 - CPU temperature too high**

This error will reset after the CPU has cooled down. If the error persists, check the ambient temperature and check and or clean the air filters. Shade the Power Hub to reduce solar loading.

### **Err 116 - Calibration data lost**

If the unit does not work and error 116 pops up as the active error the unit is faulty, contact your FSR.

If the error is only present in the history data and the unit operates normally this error can be ignored safely. Explanation: when the units power up for the very first, it does not have calibration data and an error 116 is logged.

### **Err 119 - Settings data lost**

The Power Hub cannot read its configuration, and stopped. This error will not auto-reset. To get it working again:

- First, restore it to factory defaults. Contact your FSR for the values.
- Disconnect the Power Hub from all power-sources, wait 3 minutes, and power up again.
- Reconfigure the Power Hub.

# MAINTENANCE INSTRUCTIONS

## Preventive Care and Maintenance

**Note:** The function and efficiency of all electronic equipment is related to and dependent upon the temperature at which it is operating. It performs optimally within a narrow temperature range and less so as the temperature falls outside of that range. **Heat will cause the Power Hub to derate.** Please use the following measures to mitigate against heat and other environmental effects:

- Shade the Power Hub from direct sun exposure and shelter it from the elements as much as possible.
- Keep the case lid and Inter-Connect covers closed to prevent water/dust intrusion.
- Check the integrity of electrical connectors on a monthly basis.
- Turn off electrical appliances when they are not in use. This will save power, allowing more power to be available when it is needed.
- Clean the air filters of the Power Hub air intake vents monthly. Wash them with water, dry them thoroughly, and place them back in the intake vents. The filters must be cleaned more frequently when high winds are frequent and particulate levels are high. See below.

## Cleaning Power Hub Filters

The air intake vent and filter are on the back of the Power Hub. The louvered vent cover is secured by two (2) cross tip screws, one on each side. A fine cross tip screwdriver or angle driver will be required to remove the screws (Figure 29A). After exposing the filter (Figure 29B), lift it from the vent and wash thoroughly with water, dry thoroughly and reinstall the filter and louvered vent cover. Ensure the leading edge of the louvers are facing downward. The parts and tool required are shown in (Figure 29C).



Figure 2. Cleaning the air intake filter

## SUPPORTING INFORMATION

### Using the Power Hub to Monitor PV Array Performance

Failure of a single PV panel or array may not be noticed during normal operation if monitoring only the total/cumulative solar output current from multiple arrays in the pages menu of the LCD user interface.

PV array output fluctuates due to changing environmental conditions. PV power generation can degrade as the panel temperature rises, and the failure of an entire PV array may occur if a portion of a single panel is shaded. It is important to monitor the output of each solar charger independently from the device list to ensure the system is operating at its best.

### Assessing PV Array Performance

The amount of power that is produced by a PV panel depends primarily on two operating conditions:

- Direct sunlight onto the PV cell
- Temperature

MPPT charge controllers optimize the power production based on two factors:

- Available PV (solar) power
- Battery state of charge (SOC)

Solar array output fluctuates due to changing environmental conditions. PV generation can degrade as the panel temperature rises, and the failure of an entire solar array may occur if a portion of a single panel is shaded. It is important to occasionally monitor the DC values at each charge control unit in the Hub.

The DC readings should be approximately the same for every PV array across all charge controls.

### Troubleshooting Individual PV Arrays Using the Power Hub User Interface

Failure of a single solar panel or solar array may not be noticed during normal operation if monitoring only the total solar output current from multiple arrays in the main menu of the LCD User Interface.

If using a single PV array, the failure of a single (1) solar panel may cause the entire solar array to appear failed when the solar panels are wired in series. The output from the entire solar array will be zero (0), and therefore the current of a single (1) charge unit will be significantly lower.

If multiple PV arrays are connected and have equal exposure to sunlight, then the output current from each PV array should be approximately the same. The output of individual arrays can be monitored independently at the User Interface.

To identify suspect arrays responsible for the decrease in current in that charge unit:

- Disconnect all but one PV array and view the performance metrics reported by the user interface.
- Cycle each PV array onto the Hub at the same connection, making note of the performance for each panel.

Some deviation between multiple panel performances is acceptable. If there is a significant delta between two or more arrays, it is likely that the arrays have a failed cell or other mitigating factor that should be investigated. Refer to the individual PV array manual or the System manual for further troubleshooting steps.

## Specifications

| General           |  |
|-------------------|--|
| Operating Voltage | 20–30 VDC programmable                   |
| User Interface    | LCD and push button menu controls        |
| Internal Cooling  | Forced convection with (2) internal fans |
| Case              | Pelican 1600                             |
| Warranty          | 1-year materials and workmanship         |

| Charge Controller Specifications (@77 °F/25 °C) |  |
|---|--|
| Maximum PV Input Voltage                        | 100 VDC                                    |
| Maximum PV Input Current                        | 100 A (@ 24 V nominal)                     |
| Maximum PV Power                                | 1166 W per charge controller, 3500 W total |
| Efficiency                                      | 98% (typical)                              |
| Battery Charging                                | 29.0 VDC (programmable).                   |
| Charge Control Method                           | Maximum Power Point Tracking (MPPT)        |

| Safety             |   |
|--------------------|---|
| Circuit Protection | Charger protected against reverse polarity and transient voltage surges |

| Connections     |   |
|-----------------|---|
| Input(s)        | <ul style="list-style-type: none"> <li>• (6) 24 VDC 30 A (per charge unit) Solar inputs (Amphenol bayonet CB2-22-2SC)</li> <li>• (3) 24 VDC 100 A (total) Inter-Connect* (regulated)</li> </ul> |
| Output(s)       | <ul style="list-style-type: none"> <li>• (1) 24 VDC 100 A PRO-Verter/Expander Pak Inter-Connect*</li> <li>• (1) Remote Monitoring (RJ45)</li> </ul>   |
| Input/Output(s) | <ul style="list-style-type: none"> <li>• (2) 24 VDC 100 A load/bus Inter-Connect*</li> <li>• (1) NATO receptacle</li> </ul>   |

| Environmental         |   |
|-----------------------|---|
| Operating Temperature | 30 °C to + 60 °C (-22 °F to +140 °F)<br>Full rated output to 40 °C (104 °F) |
| Operating Humidity    | 95% RH non-condensing   |

| Weights and Dimensions (L x W x H) |   |
|------------------------------------|---|
| Weight                             | 40.6 lb (18.4 kg)                               |
| Dimensions                         | 24.39 x 19.36 x 8.79 in (62.0 x 49.2 x 22.3 cm) |

| Includes                       |  |
|--------------------------------|--|
| (1) 5-foot Inter-Connect Cable |  |

*Inter-Connect Cable can be stored inside case*

*\*Deltran 224-0061-BK*

## ABOUT SOLAR STIK, INC.



### **Mission Statement**

Using American-made components and constant innovation, Solar Stik creates portable power solutions that enable self-sufficiency for the soldier, the sailor, and beyond. In doing so, we save lives, change lives, and help revive American manufacturing.

### **STIKopedia**

[STIKopedia](#) is a compilation of everything you would ever want to know about portable Hybrid Power Systems, including the philosophy and mechanics of high-efficiency circuits, and the individual technologies used to create them.

### **Solar Stik Training and Education**

- **Solar School (St. Augustine, FL)** provides an introduction to the design and support of small-scale, renewable-energy, power generation systems, with detailed explanation of system components. Advanced configuration options with hands-on deployment of actual systems will enhance student understanding.
- **Solar Stik New Equipment Training (on site)** teaches Hybrid System configuration options with hands-on deployment of actual systems to enhance student understanding.

Solar Stik Training Courses are tailored to the specific needs of the students. To schedule Solar Stik Training or to learn more about the curriculum, please contact us.

### **Contact**

#### **Technical Support Line**

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