SOLAR STIK®

PROGRAMMING AND MONITORING GUIDE FOR THE 24VDC POWER HUB 3500

P/N 20-0302204

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Interactive

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The Power Hub User Interface

The user interface consists of an LCD screen and buttons for navigating Pages, Menu, and submenu items. Using the buttons and navigating the contents is simple and highly intuitive.

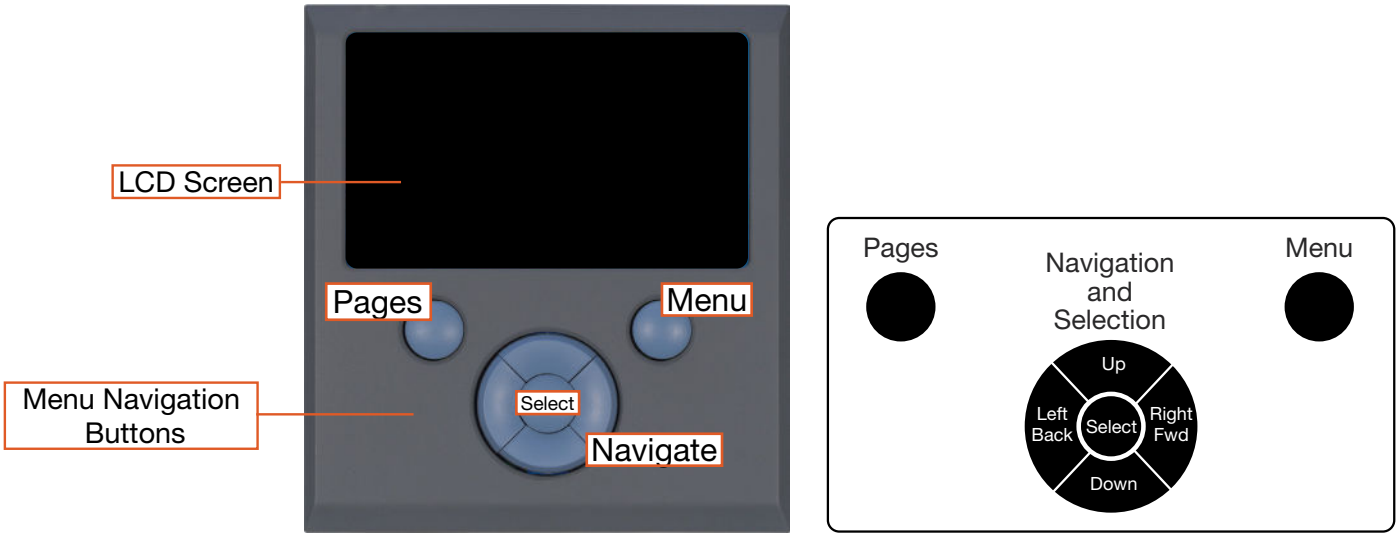


Figure 1. LCD user interface and navigation guide

Pages Button

At the basic level, the information available from the user interface is as follows:

- Power from the PV arrays
- System battery bank voltage
- Net current flowing to or from the System batteries.

Depending on how the System is configured, the LCD shows capabilities that may or may not be utilized by the Power Hub, so icons and windows are visible but may contain "--", indicating no data Consult the System Manual for additional information about available data and configuring for an application.

Figure 2. Data views displayed in "Pages"

PV Charger Icon: Reports the cumulative power from the PV arrays connected to the Power Hub. Specific information regarding the power being process by each of the two (2) solar charge controllers is reported in the device list displayed when pressing the Menu Button. Access to this information is described in the Monitoring PV Power: Current and Historical section.

Battery Icon: Reports battery SOC, voltage, and net current to/from the System battery. The SOC may be reported as "--" until the System batteries cycle enough to "learn" how to calculate accurately the SOC. Net battery current is the sum of all chargers and loads connected to the System batteries. A positive value is net charging; a negative value is net discharging. For example, +30 amps of charge current and -5 amps of load current will display a net current of +25.0 amps.

> **Note:** The net negative current will be observed when the Power Hub is the primary power management device in the System. If the Power Hub is not the primary power management device in the System, obtain the battery SOC from the primary power management device instead.

Status Icon: Reports the time of day and "alarms". A list of the alarms/notifications that may occur, their meanings, and their solutions is provided in subsequent sections of the manual.

> **Note:** The charging current reported may be at or near 0.0 A when the batteries are charged fully, even if the PV arrays are in full sun.

Menu Button

The Menu button provides access to more detailed information from the solar charge controllers and notifications (information about alarms if they occur). Push the Menu button once and the device list appears. This is the starting point for the detailed information about the solar chargers, System batteries (DC bus), notifications, and System settings. Use the navigation buttons of the user interface to navigate submenus under the menu items on the device list.

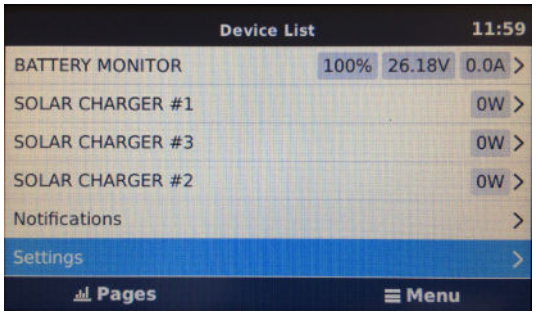


Figure 3. Device list on user interface

Device List: Power Hub Circuits

The Device List is populated automatically by detecting the internal components of the Power Hub and as such is a list of the major functional circuits of the Power Hub.

Battery Monitor Circuit

The battery monitor circuit reports the flow of power from the solar chargers, and other DC power sources onto the DC bus (batteries/Expander Paks) by measuring the DC bus current and voltage. More details about this circuit are in the Battery Monitor: Understanding Reported Values section.

Solar Charger Circuits

The PV controls convert the higher voltage of the PV arrays so it is compatible with other 24-volt components including batteries and power management. This circuit also uses an MPPT algorithm to extract maximum available power from PV arrays regardless of environmental conditions.

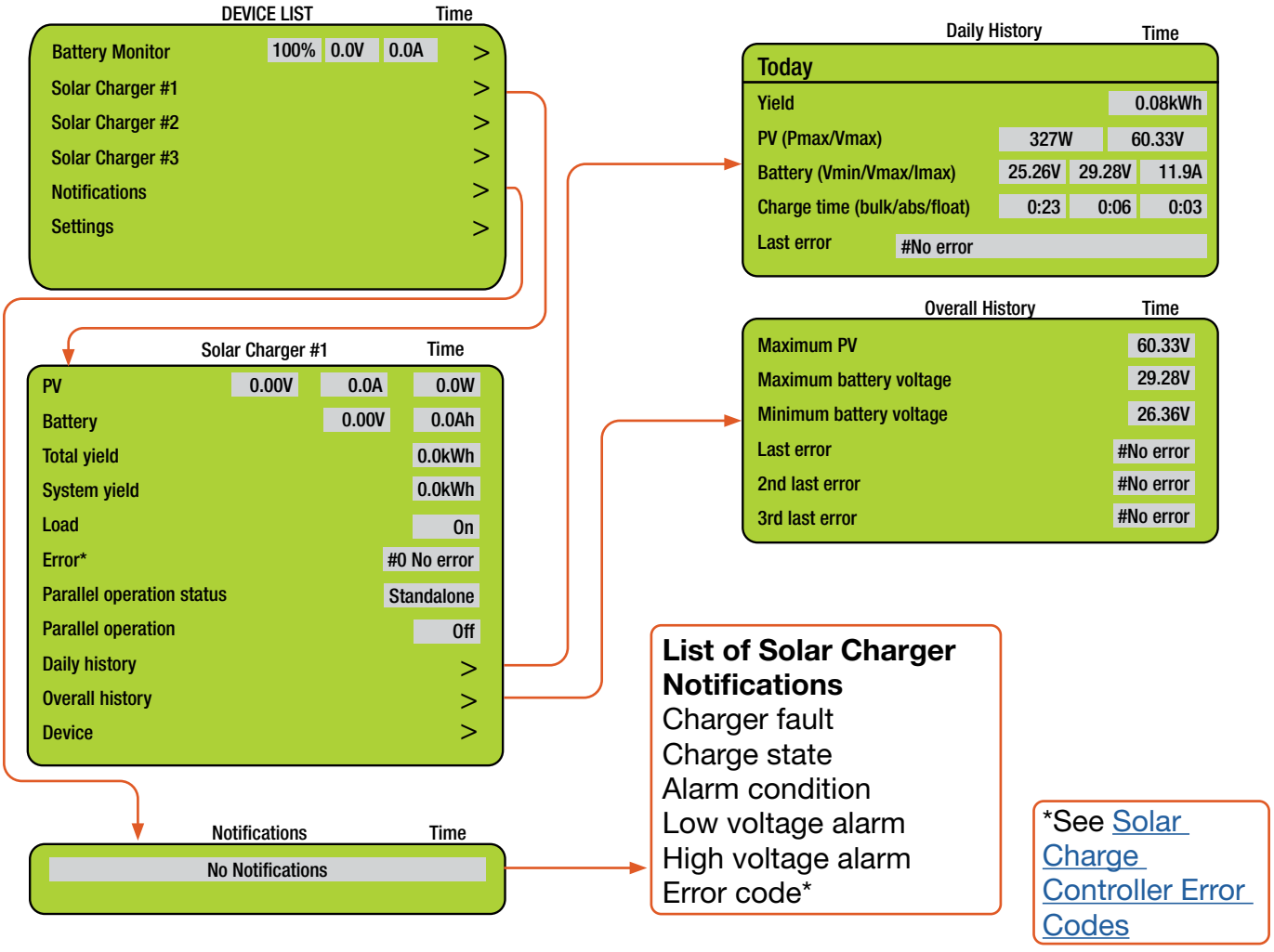
Power Hub Local Time and Date

Set the Power Hub to the local time and date prior to operating or collecting any data to ensure all events are associated with accurate time stamps. To find the time and date settings, press the Menu button to display the device list. Use the down button to highlight the settings line then press Select. Use the down button to scroll to the "Date and Time" (see User Interface Settings Menus) and press Select. Change the values in the submenu windows to reflect the correct local time and date.

Monitoring PV Power: Current and Historical

Press the Menu button one time to display the device list. The window that will appear is illustrated below. Solar Charger #1 and #2 will appear in lines 2–3. Use the Up/Down navigation buttons to highlight the any of the solar chargers. Press Right or Select to open the menu windows specific for that solar charger. The window that appears (Solar Charger #1 in the illustration below) provides an extensive report of the current status for that solar charger. Historical reports for Solar Charger #1 can be displayed by navigating down to the “Daily History” and “Overall History” lines then pressing Right or Select. Data reported in those windows are displayed in the illustration below. Notifications and errors related to solar chargers are found in the Notifications and History Menus.

Note: Values shown in all of the menu windows will vary.



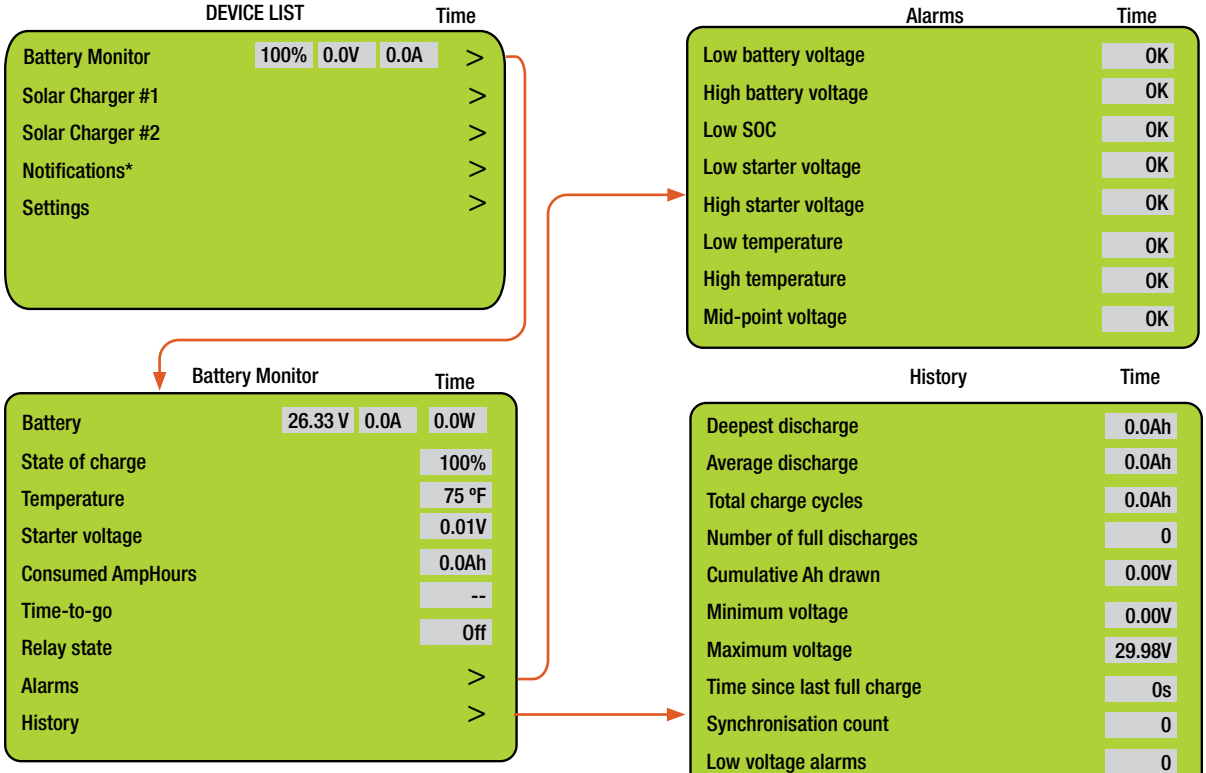
PV Power: Understanding Reported Values

The Power Hub solar charge controllers report the power they process to the user interface. Checking these readings often, over extended periods of time, will establish what is “normal” in the system and give the operator a greater ability to identify and correct deviations from “normal”.

Monitoring System Batteries: Current and Historical

Press the Menu button one time to display the device list. The window that will appear is illustrated below. The Battery Monitor will be the first device listed. Values for the current battery SOC, DC bus voltage, and current (amps) will appear in the fields on that line. Press the Select or Right button to open the Battery Monitor window to display current details about the batteries connected to the System. The temperature displayed here is the Power Hub internal temperature, not the temperature of the System batteries. Alarms and historical data related to the System batteries are found in the Alarms and History Menus.

As the System batteries approach a fully charged state, the charging current will approach zero (0) amps even if the sun is shining brightly and/or the generator is running. If this occurs, check the battery SOC to confirm that the batteries are nearing a full charge. If not approaching 100%, ensure the PV arrays are connected and functioning properly. Charging parameters can be changed if necessary. Please contact your FSR for assistance.



List of Battery Monitor Alarms

High voltage alarm
Low voltage alarm
High starter-voltage alarm
Low state-of-charge alarm
Low battery temperature alarm
High battery temperature alarm
Mid-voltage alarm
High charge current alarm
High discharge current alarm
Cell Imbalance alarm
Internal error alarm

Battery Monitor: Understanding Reported Values

The voltage and current flowing out of the Power Hub (reported in the Battery Monitor submenu) are accurate in any System configuration. The SOC reported by the battery monitor is accurate when both batteries and loads are connected directly to the Power Hub as shown in Figure 20.

The battery SOC is calculated based on (a) the programmed amp hour (Ah) capacity of the system batteries and (b) measuring the amps that flow into and out of the battery over time (Ah counting). Measuring the battery SOC requires current to move in and out through a “metered” port: into the batteries from a charging source and out from the batteries to support loads.

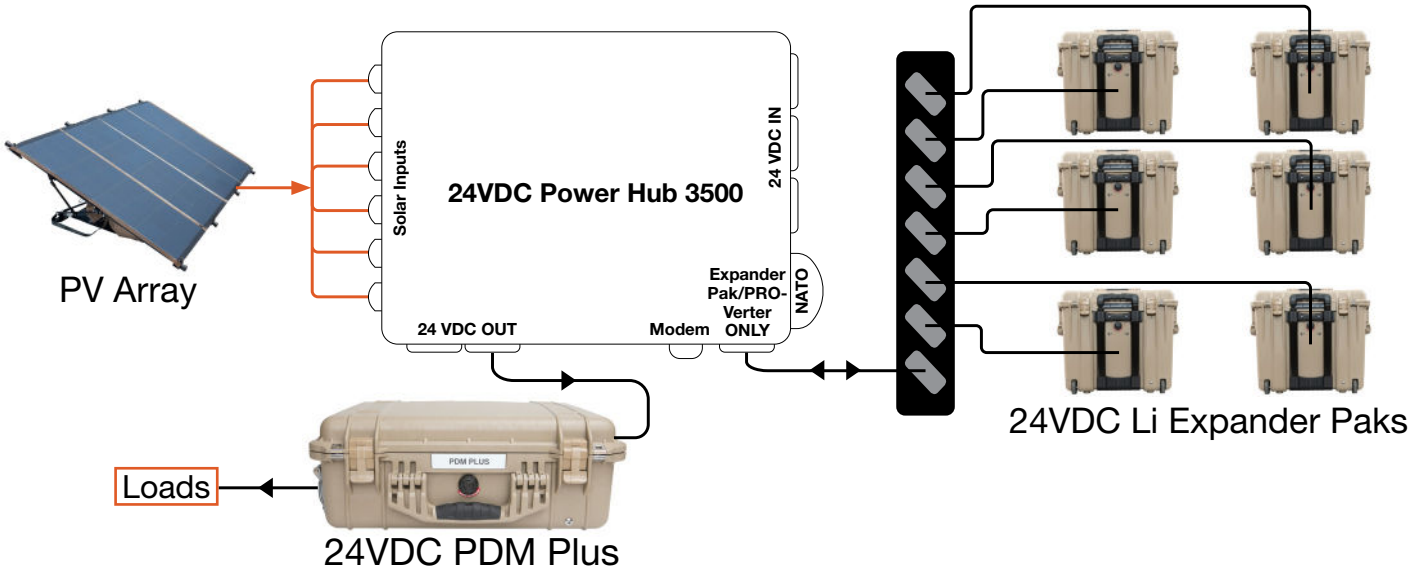


Figure 4. Power Hub as the primary power management device

If the Power Hub is connected to the system batteries indirectly, via another power management device such as a PRO-Verter (Figure 21) the Power Hub is no longer then primary Power Management component. In this case, the SOC reported by the PRO-Verter supersedes the SOC reported by the Power Hub because the energy stored in the batteries flows to the load via the metered port of the PRO-Verter and not the metered port of the Power Hub. In this configuration, the SOC reported by the Power Hub will report 100% when the system batteries become charged fully; the Power Hub SOC will remain at or near 100% until the power is cycled.

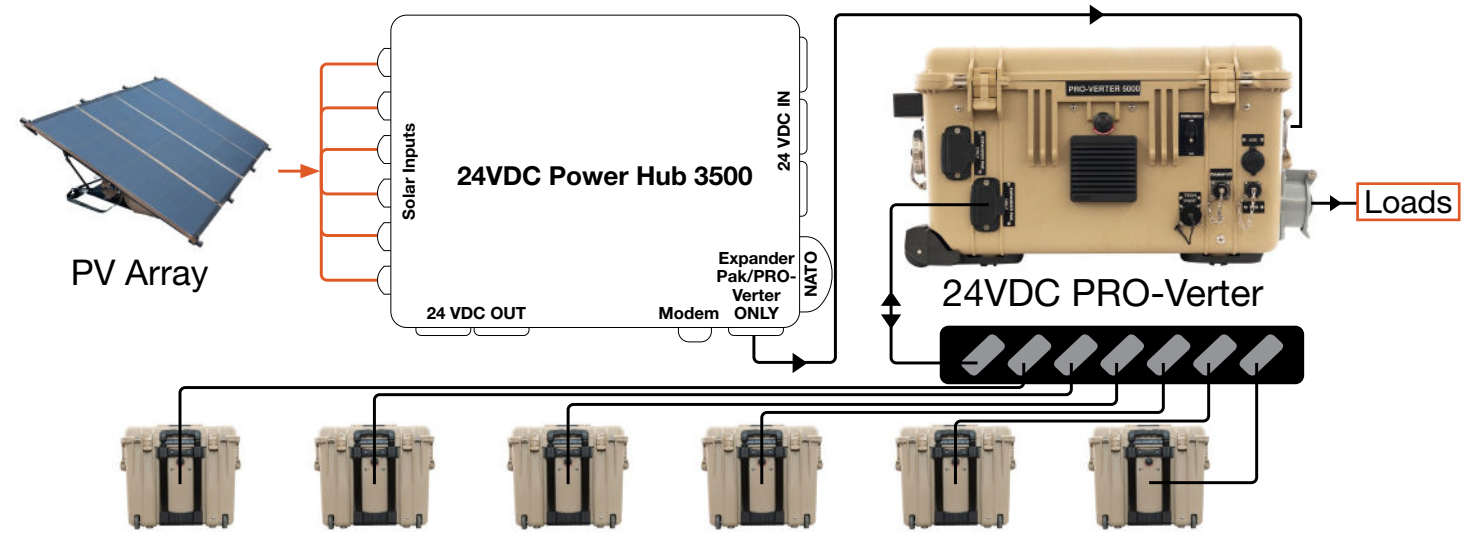


Figure 5. Power Hub as the secondary power management device

Heat and Derating

The function and efficiency of all electronic equipment is related to and dependent upon the temperature at which it is operating. All equipment performs optimally within a narrow temperature range and less so as the temperature exceeds the upper end of that range. PV panel output drops off significantly in high heat as well. The Power Hub generates heat as a by-product of processing incoming PV power. Under normal circumstances, the amount of heat generated in this way will not exceed the rated temperature for the Power Hub to function at its rated capacity.

Causes of Overheating

The two (2) most common reasons for the Power Hub to overheat are high ambient temperature and solar loading (heat accumulation due to the sun shining directly the Power Hub). These two factors work together to elevate the internal operating temperature to the point where the solar chargers may automatically derate or even temporarily suspend output to prevent damage to their internal electronics. The solar chargers are rated to provide full power up to 104 ºF (40 ºC). Performance of the Power Hub will decline (charging current reduced) as the temperature increases or is sustained above this value.

> **Note:** The charging current reported by the Power Hub battery monitor will also approach zero (0) A as the batteries approach a fully-charged state.

Power Hub Internal Cooling

Thermostat-controlled, internal cooling fans turn on at ~104 ºF (40 ºC) to maintain the internal temperature within the optimal operating range. The fans are audible when operating. Clogged air intake filters can significantly exacerbate heat-related problems, so they should be cleaned as often as necessary to maintain maximum airflow. Clean or replace the air filter monthly, or more frequently if operating in very dusty environments. Do not operate the Power Hub in direct sunlight or directly on the ground. It should be placed in a shaded, well-ventilated location. Proper air filter maintenance and shading the Power Hub will help to ensure that the internal temperature does not reach critical levels.

Power Hub Internal Temperature Report

The Power Hub has a sensor that measures and reports the internal temperature. The internal temperature of the Power Hub (NOT the batteries) is reported in the Battery Monitor menu page. To access this and other battery-related data, press the Menu button to show the device list. Select/ highlight “Battery Monitor” and either right-click or press the Select button to display.

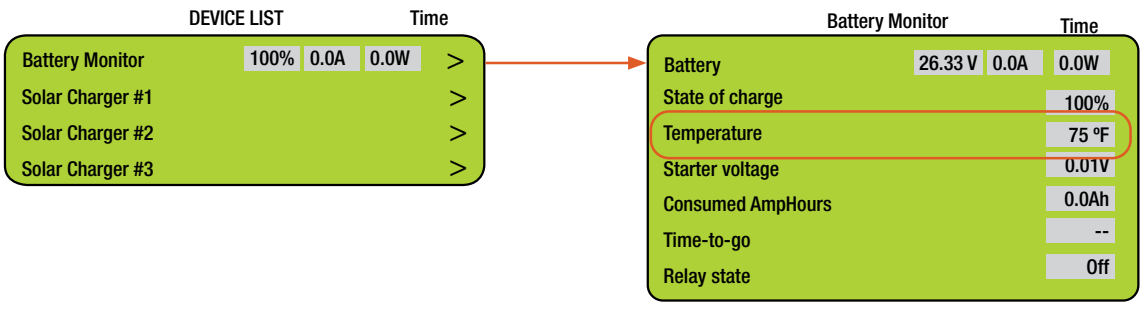
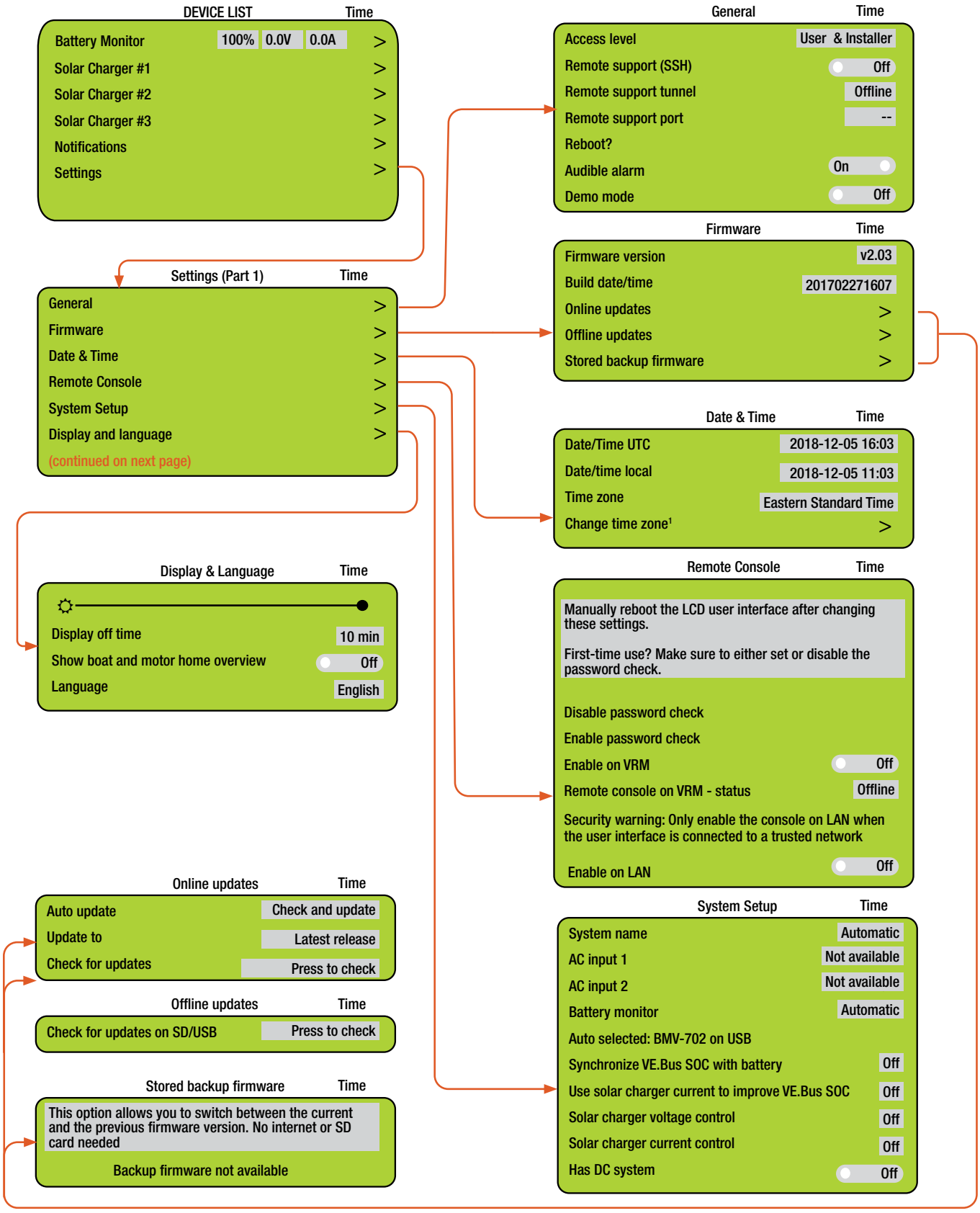
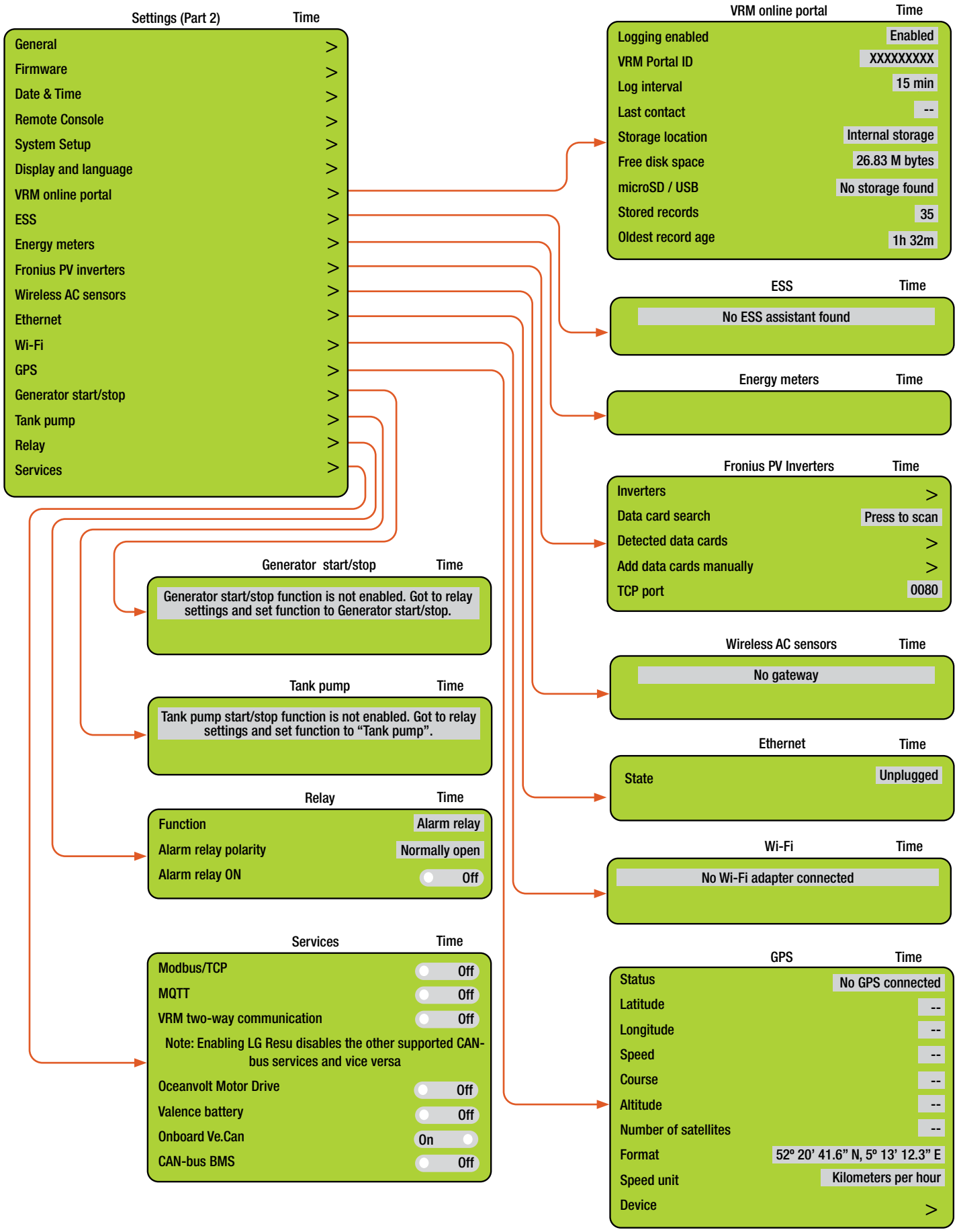


Figure 6. Power Hub internal temperature report on user interface

User Interface Settings Menus

Settings are accessed from the device list. The settings menus contain several parameters that may need to be changed during the course of normal operation. Many of the options are not relevant to the Power Hub.




Settings (Part 2) Time
General >
Firmware >
Date & Time >
Remote Console >
System Setup >
Display and language >
VRM online portal >
ESS >
Energy meters >
Fronius PV inverters >
Wireless AC sensors >
Ethernet >
Wi-Fi >
GPS >
Generator start/stop >
Tank pump >
Relay >
Services >
VRM online portal Time
Logging enabled Enabled
VRM Portal ID XXXXXXXXX
Log interval 15 min
Last contact --
Storage location Internal storage
Free disk space 26.83 M bytes
microSD / USB No storage found
Stored records 35
Oldest record age 1h 32m
ESS Time
No ESS assistant found
Energy meters Time
Fronius PV Inverters Time
Inverters >
Data card search Press to scan
Detected data cards >
Add data cards manually >
TCP port 0080
Generator start/stop Time
Generator start/stop function is not enabled. Got to relay settings and set function to Generator start/stop.
Wireless AC sensors Time
No gateway
Tank pump Time
Tank pump start/stop function is not enabled. Got to relay settings and set function to “Tank pump”.
Ethernet Time
State Unplugged
Relay Time
Function Alarm relay
Alarm relay polarity Normally open
Alarm relay ON Off
Wi-Fi Time
No Wi-Fi adapter connected
Services Time
Modbus/TCP Off
MQTT Off
VRM two-way communication Off
Note: Enabling LG Resu disables the other supported CAN-bus services and vice versa
Oceanvolt Motor Drive Off
Valence battery Off
Onboard Ve.Can On
CAN-bus BMS Off
GPS Time
Status No GPS connected
Latitude --
Longitude --
Speed --
Course --
Altitude --
Number of satellites --
Format 52º 20’ 41.6” N, 5º 13’ 12.3” E
Speed unit Kilometers per hour
Device >