POWR2

POWRBANK

USER MANUAL

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1. Contents

1. Introduction

1.1 Foreword

Thank you for purchasing your POWR2 POWRBANK.

The POWR2 POWRBANK is rental ready power supply that integrates with diesel generator systems to optimize efficiency and reduce noise, emissions and fuel waste.

ECM, the Energy Control Module is the brain of the unit, a touchscreen control panel enabling high-level monitoring and control over the system.

POWR2 PORTAL, our Energy Management System (EMS) platform allows you to manage your fleet. It enables you to monitor and report on each unit and the entire fleet at multiple levels to support the various user groups you may have from end users to fleet manages to service engineers. POWR2 PORTAL provides the very best means of managing your energy storage allowing you to get the most out of the system and respond to your customers' needs more effectively.

This manual will take you through the steps needed to own and operate this equipment safely and effectively. You will also be able to manage and maintain the asset throughout its operational life.

POWR2 provides a one year return to base warranty on all its equipment. We offer various levels of service contracts designed to suit your needs so please contact us about your requirements.

Thank you for choosing POWR2 and we look forward to working alongside you on this energy journey towards a cleaner safer future.

1.2 Conventions

Throughout this user manual, the following symbols are used:

WARNING
This symbol warns of the presence of a dangerous voltage which could cause harm to the operator or others.

This symbol indicates the potential of damage to the unit or connected devices.

This symbol indicates important or useful information.

The following terms are used in this manual to provide greater clarity:

- POWR2 will be referred to as “The Manufacturer”.
- The POWR2 Hybrid Energy System will be referred to as “POWRBANK” or “Unit”.
- Any AC input or supply to the POWRBANK will be referred to as “AC source”.
- Any items that consume power will be referred to as “Loads”.
- POWRBANK internal power electronics will be referred to as “Inverter”
- Solar Charge Controller will be referred to as “MPPT”.

1.3 Warnings

This user manual is an important part of POWRBANK. It must be available to all operators and kept close to the unit so that it can be referred to at any time.

WARNING
When the unit is operating it generates potentially lethal voltages. Work must only be performed on the unit by the manufacturer or a qualified service engineer approved by the manufacturer under shutdown conditions. Maintenance of the unit under running conditions is strictly prohibited and will not constitute under warranty.

All items connected to the unit including distribution cables and boxes should be regularly checked and adhere to the same local regulations and standards as a regular grid-tied mains installation.

1.4 Disposal & Recycling

POWRBANK comprises of components that must be disposed of responsibly. For environmental purposes, many of the components within the unit can be recycled or reused. POWR2 will ensure the safe decommissioning and recycling of the unit at no charge if the unit is returned to the manufacturer. Otherwise, please contact the manufacturer for more information on safe and proper decommissioning of your POWRBANK.

1.5 POWR2 Contact Details

WEBSITE
powr2.com

PHONE
800-354-4502 (Calls within the United States)
+44.330.128.9175 (International calls)

EMAIL
customerservice@powr2.com

1.6 About POWR2

POWR2 is dedicated to developing and marketing solutions that give our clients a competitive edge, with groundbreaking offerings and new industry best practices. The POWRBANK has been designed by a team of industry experts who have had 10 years' experience in the renewable and energy storage sector.

POWR2 designs and builds Energy Storage Systems that seamlessly connect to solar inverters, mains grid or diesel generators to optimize performance and efficiency. The team has engineered state-of-the-art systems that are robust, cost-effective and reliable. Over the course of our evolution, we have evaluated and tested countless designs, components, and suppliers. We currently manage a diverse and complex supply chain of over fifty manufacturers, providing more than one hundred and twenty separate components.

We apply strict quality control methods to every aspect of the process, from design, to procurement, to manufacture, assembly and to testing.

2. Getting Started

WARNING
POWR2 offers no direct support for untrained individuals carrying out any action on the unit. Please, contact POWR2 to request training.

2.1 Storage

1. The internal energy storage must be maintained while the unit is not in use. See “4.1 Charging the Unit: Caring For The Energy Storage” on page 52.
2. POWRBANK is designed to be used and stored outside. However, it is recommended that the unit is stored undercover when possible to prevent unnecessary weathering.
3. If the unit is not used for long periods of time, please ensure that the doors and windows are properly closed, to prevent any accumulation of dust, debris, or water. It is advisable to move to a secure location if not in use.
4. Ensure that the device is kept away from any flammable material or hazardous substances to prevent any occurrence of a hazard.

2.2 Transporting, Lifting and Positioning

2.2.1 Transportation

Be sure to double check the capacity of lifting equipment before lifting the unit.

1. POWRBANK can be transported using a trailer or goods vehicle with adequate available payload. Check the relevant transportation documentation for suitability.
2. The gross weight of the unit can be found on the rating plate positioned on the central front door.
3. It is recommended that the unit is secured using suitable straps when in transit to prevent it from moving. This ensures that the unit is not subjected to heavy vibrations causing the internal components to fall off or get damaged during transit.

It is the user's responsibility to check local regulations for transport of POWRBANK as it contains lithium-based batteries. The unit is certified for UN3481 allowing the unit to be shipped and transported safely, but it is advisable to check with the local authority for any regulations based on transportation of the batteries.

2.2.2 Lifting (Loading/Unloading)

Always check the rating plate to ascertain the gross weight of the unit.

The unit must remain upright at all times.

1. POWRBANK must be loaded or unloaded using the correct equipment operated by suitably trained personnel.
2. Using the fork pockets, POWRBANK can be loaded or unloaded with a suitable fork-lift truck or telehandler.

2.2.3 Positioning

Ensure that the exhaust and hot air flow of diesel generators are directed away from POWRBANK.

1. The unit must be positioned upright on a flat, solid surface. Ensure that the unit is not at risk of being submersed in water above the fork pockets.
2. The unit should be positioned as close as possible to the chosen input source (e.g. diesel generator) and where applicable, close to its earth point.
3. At least 3 feet should be allowed for ventilation on all sides of the unit.
4. Ensure that vents are not obstructed and heat sources are not directed at the unit.
5. Ensure that the unit is not placed near any hazardous or flammable material to prevent any hazardous situation.
6. Ensure sufficient space to access the side doors for maintenance and emergency purposes.

2.3 The POWRBANK Control Panel

2.3.1 POWRBANK PRO (EU Version)

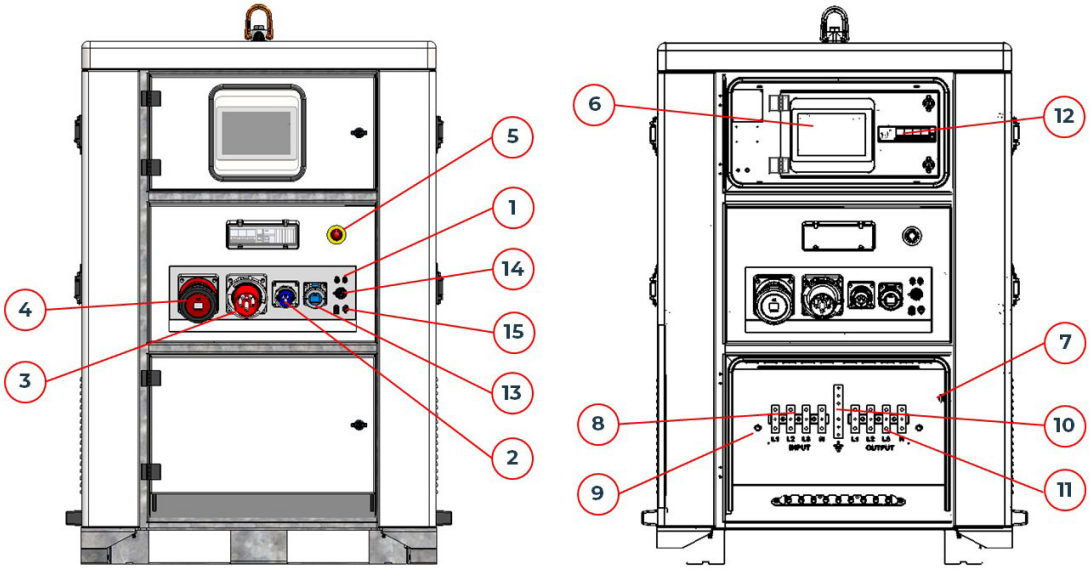


FIG 1 - EU VERSION OF CONTROL PANEL

1. **Generator Remote Start** Binding posts for connecting wires to send start and stop signals to a connected diesel generator (circuit is normally open).
2. **Panel Mount CEE-Form Inlet 16A 230V** maintenance charge inlet.
3. **Panel Mount CEE-Form Outlet 125A 400V**
4. **Panel Mount CEE-Form Inlet 125A 400V**
5. **Emergency stop** Press in to immediately shut down AC Output.
6. **ECM** The ADVANTAGE ECM is the central control and monitoring application for the POWRBANK that interfaces with the external system and provides data logging and remote access features with data logging and reporting.
7. **Safety Limit Switch** Switches off the AC Output when the bottom distribution door has been opened.
8. **AC Input Busbar Power Terminals**
9. **Generator RS485 Bus** Terminals for connecting the RS485 Bus from a generator control panel to the ECM.
10. **Earth Busbar** Earth Input/Output terminal for the unit.
11. **AC Output Busbar Power Terminals**
12. **Output circuit breaker**
13. **Panel Mount CEE-Form 16A Outlet 230V**
14. **RJ45 Connector (WAN)**

15 **MC4 Solar Input**

2.3.2 POWRBANK PRO (US Version)

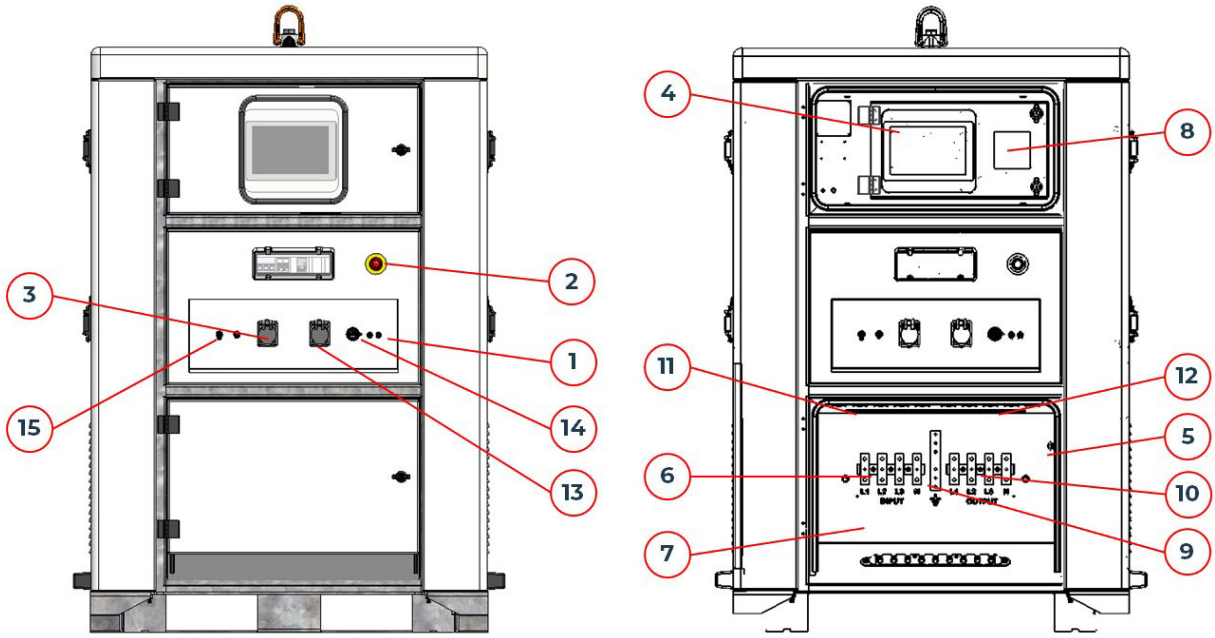


FIG 2 - US VERSION OF CONTROL PANEL

1 **Generator Remote Start** Binding posts for connecting wires to send start and stop signals to a connected diesel generator (circuit is normally open).
2 **Emergency stop** Press in to immediately shut down AC Output.
3 **Nema 5-15P Maintenance Charge Inlet**
4 **ECM Controller** The ADVANTAGE ECM is the central control and monitoring application for the POWRBANK that interfaces with the external system and provides data logging and remote access features with data logging and reporting.
5 **Safety Limit Switch** Switches off the AC Output when the bottom distribution door has been opened.
6 **Input Busbar Power Terminals**
7 **Generator RS485 Bus** Terminals for connecting the RS485 Bus from a generator control panel to the ECM.
8 **Output circuit breaker**
9 **Earth Busbar** Earth Input/Output terminal for the unit.
10 **Output Busbar Power Terminals**
11 **Input CAM Connectors**
12 **Output CAM Connectors**
13 **Nema 5-20R Outlet**
14 **RJ45 Connector (WAN)**

15 **MC4 Solar Input**

2.3.3 POWRBANK XPRO (EU Version)

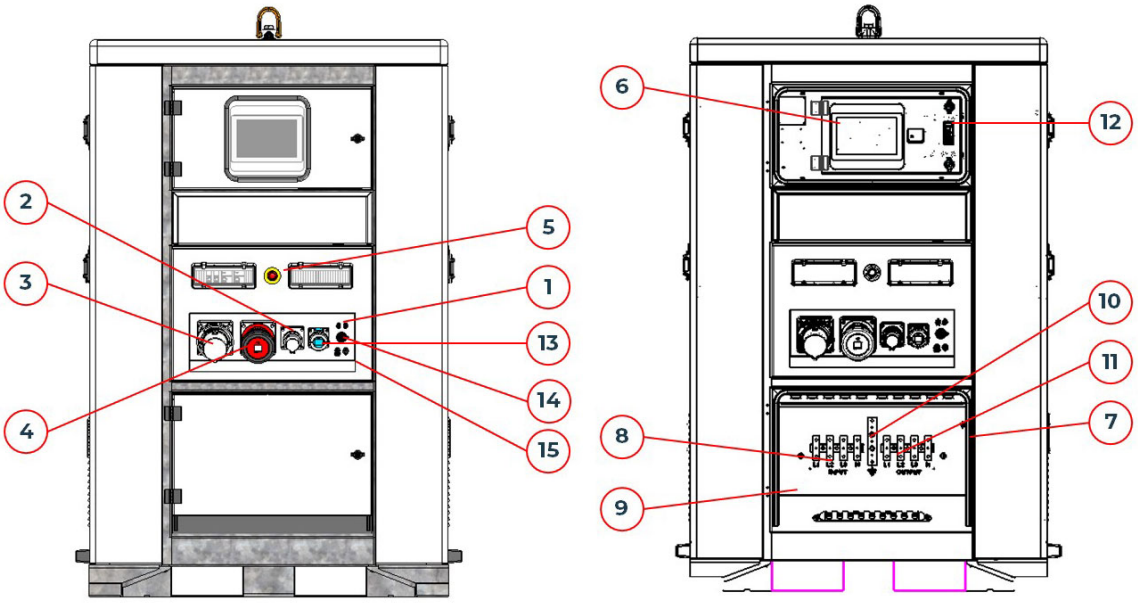


FIG 3 - EU VERSION OF CONTROL PANEL

1 **Generator Remote Start** Binding posts for connecting wires to send start and stop signals to a connected diesel generator (circuit is normally open).
2 **Panel Mount CEE-Form Inlet 16A 230V** maintenance charge inlet.
3 **Panel Mount CEE-Form Outlet 125A 400V**
4 **Panel Mount CEE-Form Inlet 125A 400V**
5 **Emergency stop** Press in to immediately shut down AC Output.
6 **ECM** The ADVANTAGE ECM is the central control and monitoring application for the POWRBANK that interfaces with the external system and provides data logging and remote access features with data logging and reporting.
7 **Safety Limit Switch** Switches off the AC Output when the bottom distribution door has been opened.
8 **AC Input Busbar Power Terminals**
9 **Generator RS485 Bus** Terminals for connecting the RS485 Bus from a generator control panel to the ECM.
10 **Earth Busbar** Earth Input/Output terminal for the unit.
11 **AC Output Busbar Power Terminals**
12 **Output circuit breaker**
13 **Panel Mount CEE-Form Outlet 16A 230V**
14 **RJ45 connector (WAN)**
15 **MC4 Solar Input**

2.3.4 POWRBANK XPRO (US Version)

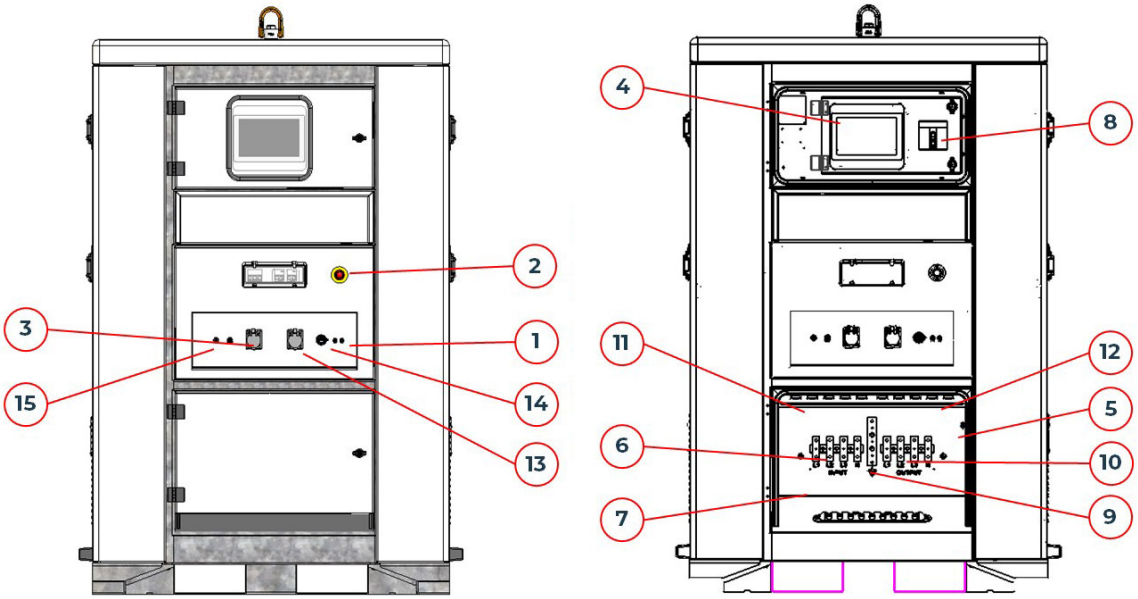


FIG 4 - US VERSION OF CONTROL PANEL

1. **Generator Remote Start** Binding posts for connecting wires to send start and stop signals to a connected diesel generator (circuit is normally open).
2. **Emergency stop** Press in to immediately shut down AC Output.
3. **Nema 5-15P Maintenance Charge Inlet**
4. **ECM Controller** The ADVANTAGE ECM is the central control and monitoring application for the POWRBANK that interfaces with the external system and provides data logging and remote access features with data logging and reporting.
5. **Safety Limit Switch** Switches off the AC Output when the bottom distribution door has been opened.
6. **Input Busbar Power Terminals**
7. **Generator RS485 Bus** Terminals for connecting the RS485 Bus from a generator control panel to the ECM.
8. **Output circuit breaker**
9. **Earth Busbar** Earth Input/Output terminal for the unit.
10. **Output Busbar Power Terminals**
11. **Input CAM Connectors**
12. **Output CAM Connectors**
13. **Nema 5-20R Outlet**
14. **RJ45 connector (WAN)**
15. **Solar MC4 Connectors**
16. **480V output Busbar Power terminals**

2.4 The Busbar Panel

The Busbar panel is located behind the lower distribution door. It is accessed by opening the lock at the right of the door.

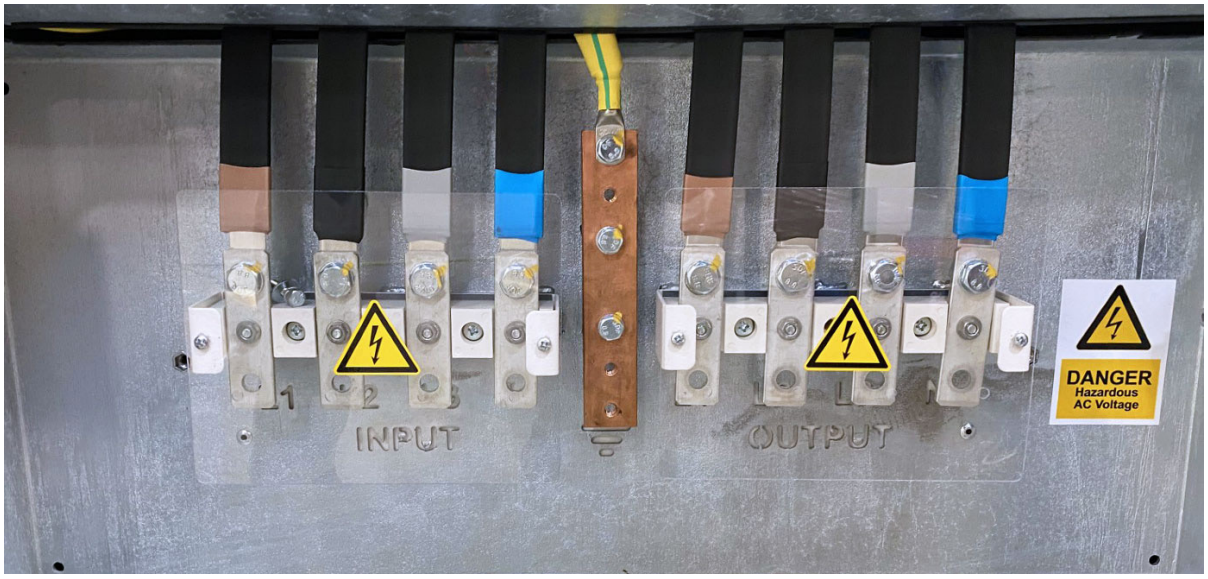


FIG 5 - 3-PHASE BUSBAR PANEL (LISTED LEFT TO RIGHT)

1. AC Input Busbar - (L1,L2,L3,N) For attachment of 10 mm ring terminals.
2. Earth Busbar - Earth connection for 8 mm ring terminals.
3. AC Output Busbar - (L1,L2,L3,N) For attachment of 10 mm ring terminals.

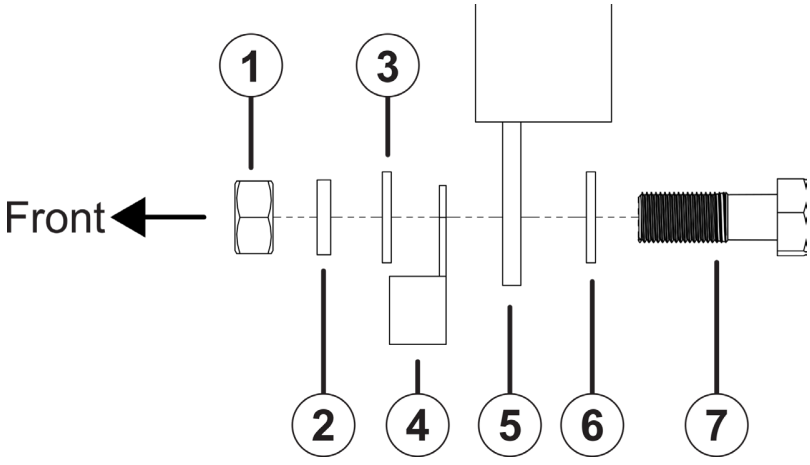


FIG 6 - BUSBAR CONNECTION DIAGRAM

1	M10 Plain Nut
2	M10 Spring Washer
3	M10 Flat Washer
4	M10 Ring Terminal
5	Busbar
6	M10 Flat Washer
7	M10 Bolt

*Replace with M8 for Earth Busbar

2.5 Isolator Switch

An isolator switch is designed to completely disconnect a part of an electrical system from the power source for safety purposes.

The original isolator switches are manually operated, while the new isolator switches are auto-operated.

Total Req. Qty –

POWRBANK PRO = 3

POWRBANK XPRO = 6

The new isolator switch is operated through the Pre-Charge Circuit Module.

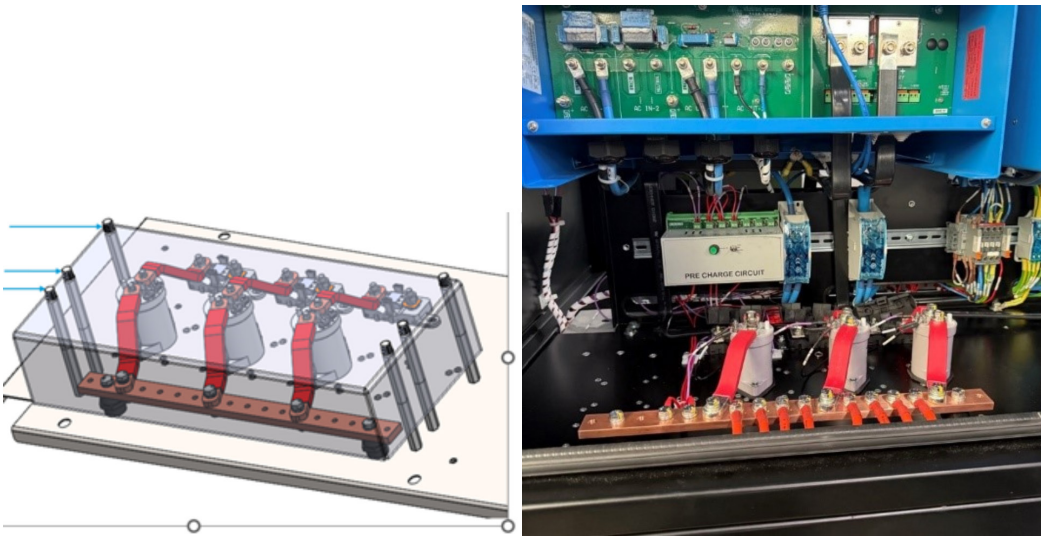


FIG 7 - ARRANGEMENT OF ISOLATOR SWITCH (LEFT) & PRE-CHARGE CIRCUIT MODULE (RIGHT)

2.5.1 Pre-charge Circuit Module

A pre-charge circuit module is a circuit that gradually charges a system's voltage or capacitance before the main power is turned on. The purpose of a pre-charge circuit is to limit the initial current spike, which can damage the system and its components.

Benefits –

- Protects components

- Increase lifespan
- Improves system reliability

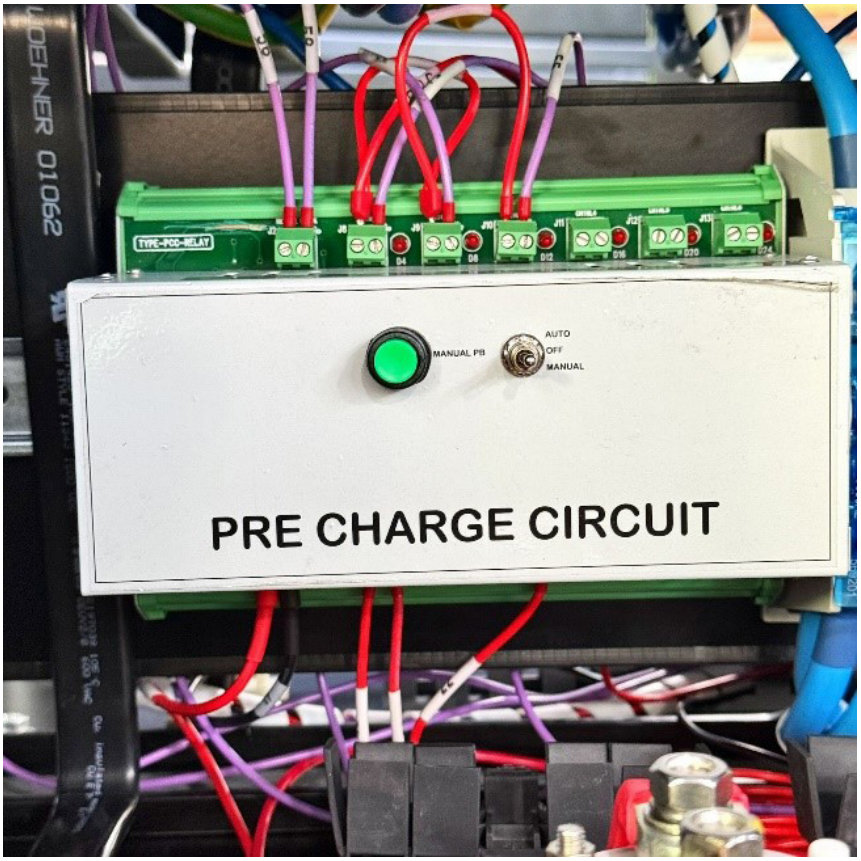


FIG 8 - PRE-CHARGE CIRCUIT MODULE

A pre-charge circuit slowly increases the system voltage while the power-up current is controlled. The pre-charge function ends when the circuit voltage is close to steady state.

A pre-charge circuit between a battery and its load is required if any of the following are issues:

- The load has input capacitors that will be damaged by the inrush current
- The main fuse will blow if asked to carry the inrush current

- The contactors, if present, will be damaged by the inrush current
- The battery cells are not rated for the inrush current

2.5.2 Operating Steps

The isolator switch is connected between the batteries and inverter, which is operated through the Pre-Charge Circuit Module. Follow the steps below in sequential order:

1. Before turning on batteries, inverters and pre-charge circuit module, please ensure that all the isolator switches are connected properly to busbar, pre-charge circuit, etc.
2. Ensure the pre-charge circuit module connections are correct.
3. Set the pre-charge circuit in manual mode and press the ON (Green) button.
4. Initially the pre-charge circuit turns ON; this step is required to charge the capacitor within the inverters to prevent the inrush current.
5. When the inverters are charged, the main isolator switch will turn ON.
6. Once the isolator switch turns ON, the normal mode of operation commences.

2.6 Connecting POWRBANK

2.6.1 Earth Connection

WARNING

A protective earth must be connected to POWRBANK in compliance with applicable local standards and regulations.

When the unit is connected to an AC source, a separate earth connection should not be connected to the earth busbar, only when working as stand alone. Refer to **“Fig. 2 - US Version Control Panel” on page 9.**

2.6.2 Input Options

The unit can accept input from a 3-phase AC power source or a Split phase AC power source depending on its configuration. Further information on connecting an AC Input is provided in section **“2.7 Connect the main AC Input” on page 18**.

WARNING

The unit will only accept a specific range of voltage according to its configuration. If a higher voltage source is used it could severely damage the system and this will invalidate the product warranty!

In Maintenance charge the AC Input current is limited automatically allowing the unit to be charged from a single phase AC sources with lower current capacity.

2.7 Connect the main AC Input

2.7.1 Connecting by Hard-Wiring into the AC Input Busbar or CAM Terminals

1. Ensure that the circuit breaker of the AC source being connected to the unit is switched OFF.
2. Turn inverters OFF on the ECM onboard screen by selecting OFF mode (Home tab-System OFF)
3. Switch OFF the output circuit breaker.
4. Open the lower distribution door. See “2.3 The POWRBANK Control Panel” on page 8.
5. The Input busbar is located centrally and is the left hand side set. Ensure power terminals are dry; wipe off any excess moisture with an absorbent cloth. The Input CAM terminal set is located at the bottom right corner and is the top set.
6. Attach the AC supply connectors to the inlet CAM connectors (only applicable for US version) or ring terminals to input power terminals.
7. Close the lower distribution door.
8. Turn the inverters ON on the ECM onboard screen by selecting Operation mode (Home tab System ON).
9. Switch on the AC input’s power supply.
10. Switch ON the output circuit breaker.

2.7.2 Connecting by using the 125/3 CEE-Form Inlet (For EU Version Only)

1. Ensure that the circuit breaker of the AC source being connected to the unit is switched OFF.
2. Turn inverters OFF on the ECM onboard screen by selecting OFF mode (Home tab-System OFF)
3. Switch OFF the output circuit breaker.
4. Attach the AC input source 125/3 CEE-Form in-line socket
5. Turn the inverters ON on the ECM onboard screen by selecting Operation mode (Home tab System ON).
6. Switch ON the AC input's power supply.
7. Switch ON the output circuit breaker.

2.8 Connecting to a Diesel Generator for Automatic Stop/Start

A Remote Generator Start function is provided to automatically control a diesel generator. The Start and Stop conditions are programmed using the ECM.

2.8.1 Remote Generator Start Binding Posts Connection

Remote Generator Start terminals are located on the front plate. See “Fig. 1 - EU Version Control Panel” on page 8 or “Fig. 2 - US Version Control Panel” on page 9. This is a connection that is used to send a start or stop signal to a remote fuel powered generator using its auto-start lead.

2.9 Setting Up a Diesel Generator to Be Part of a Hybrid System

When setting up a hybrid system the overall performance of combining POWRBANK with the diesel generator can be enhanced by making some simple adjustments to the diesel set.

WARNING
If the generator is not configured to the right voltage, this will severely damage the unit and void the warranty. Ensure the correct voltage levels are selected before connecting the unit.

In automatic mode some diesel sets will start and run as soon as a start signal is received, however some have a number of delays which can hinder the diesel generator from starting up and generating power as quickly as possible. These delays should be minimized wherever practical.

2.9.1 Common Causes of Diesel Generator Startup Delays

2.9.1.1 Start Delay

This delay allows for short “false start” signals and can be as long as five seconds, when used with the hybrid unit it is important that the diesel generator starts immediately. Where possible this delay should be removed.

2.9.1.2 Pre-Heat Delay, Safety On Timer & Warm Up Timer

Always try to reduce the delays to the minimum acceptable level.

2.9.1.3 Automatic Mode

Ensure diesel generator is switched to automatic mode.

2.10 Connect the AC Output

NOTE: If the unit has been put into SLEEP MODE it will be necessary to WAKE the unit by following the procedure in section 8.2

2.10.1 Connecting by Hard-Wiring Into The AC Output Busbar or CAM Terminals (For US Version Only)

1. Ensure that the circuit breaker of the AC source being connected to the unit is switched OFF.
2. Turn inverters OFF on the ECM onboard screen by selecting OFF mode (Home tab-System OFF)
3. Switch OFF the output circuit breaker.
4. Open the lower distribution door. See “2.3 The POWRBANK Control Panel” on page 8.
5. The Output busbar is located centrally and is the right hand side set. Ensure power terminals are dry; wipe off any excess moisture with an absorbent cloth. The output CAM terminal set is located at the bottom right corner and is the bottom set.
6. Attach the load connectors to the outlet CAM connectors or ring terminals to output power terminals.

7 Close the lower distribution door.

8 Turn the inverters ON on the ECM onboard screen by selecting Operation mode (Home tab System ON).

9 Switch on the AC input's power supply

10 Switch ON the output circuit breaker.

2.10.2 Connecting with CEE-Form output sockets (For EU Version Only)

1 Ensure that the circuit breaker of the AC source being connected to the unit is switched OFF.

2 Turn inverters OFF on the ECM onboard screen by selecting OFF mode (Home tab-System OFF)

3 Switch OFF the output circuit breaker.

4 Attach 125/3 CEE-Form in-line plug

5 Turn the inverters ON on the ECM onboard screen by selecting Operation mode (Home tab System ON).

6 Switch ON the AC input's power supply.

7 Switch ON the output circuit breaker.

3. General Operation

3.1 Turning the Power On

NOTE: If the unit has been put into SLEEP MODE it will be necessary to WAKE the unit by following the procedure in section 8.2

Once all connections are complete, the unit is ready to be switched on.

3.1.1 Turn ON sequence

Ensure that the lower distribution door is closed.

Switch ON the output circuit breaker (UP position).

Turn the inverters ON on the ECM onboard screen by selecting Operation mode (Home tab-System ON).

The load metrics can now be observed on the ECM and POWR2 Portal.

3.2 Turning the Power Off

When Power is not needed at the output, the unit can be turned off.

3.2.1 Turn OFF sequence

Turn inverters OFF on the ECM onboard screen by selecting OFF mode (Home tab-System OFF).

Switch OFF the input and output circuit breaker (DOWN position)

ONLY use the emergency stop button in an emergency.

3.3 Emergency Stop Button

1. If there is an emergency and it is necessary to turn off the unit's power, press the Emergency Stop Button on the Upper Control Panel Door.
2. The unit will then shut down and the main output breaker will trip. POWRBANK can not be switched on again until the Emergency Stop Button is released by rotating it clockwise.
3. Once the problem has been rectified, follow the instructions in "3.1 Turning the Power On" on page 23 to switch the power back on.

3.4 Power Assist

The Power Assist facility will activate automatically as required with no programming required by the customer.

It will activate when the load demand rises above the input limit of the AC source, when activated the inverter(s) will synchronize themselves with the AC source and add their power to the incoming power. This function is useful when a high load demand is needed at intervals which the POWRBANK cannot supply.

When using Power Assist please note that although there is an incoming supply, the storage will be depleted whilst Power Assist is being used. [Only in the condition that the AC source is not big enough. If the AC source is big enough then the storage would not be depleted.]

Please contact the manufacturer for further information.

3.5 Monitoring and Controlling the POWRBANK using ECM

The primary User Interface (UI) of the POWRBANK is as follows —

FIG 9 - ECM HOME SCREEN

The POWRBANK User Interface is divided into the following distinct sections —

Header Bar

The horizontal bar at the top of the screen is the **Header Bar**. It provides the system details viz. the Serial Number and Plant Number, the current date and time along with the current logged in user details. The system connectivity status is displayed beside the Serial Number. The warning and notification status is also displayed on the header bar.

FIG 10 - HEADER BAR

Navigation Menu

The vertical section on the left contains NAVIGATION used for accessing Dashboard, Overview and Settings tab. The individual POWRBANK subsystems and peripheral systems viz. the Generator, Grid & Solar, Load, Battery along with the Graphs and User Manual via the COMPONENTS menu. The menu also provides options to open the help menu using Get Help button. The user can log out from the system using the Log out button.

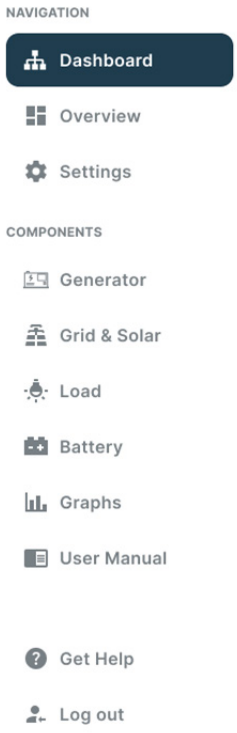


FIG 11 - NAVIGATION MENU

Main Viewport

This section displays the contents of the current selected tab from the NAVIGATION and COMPONENTS menu. The contents of the viewport change based on the selected tab.

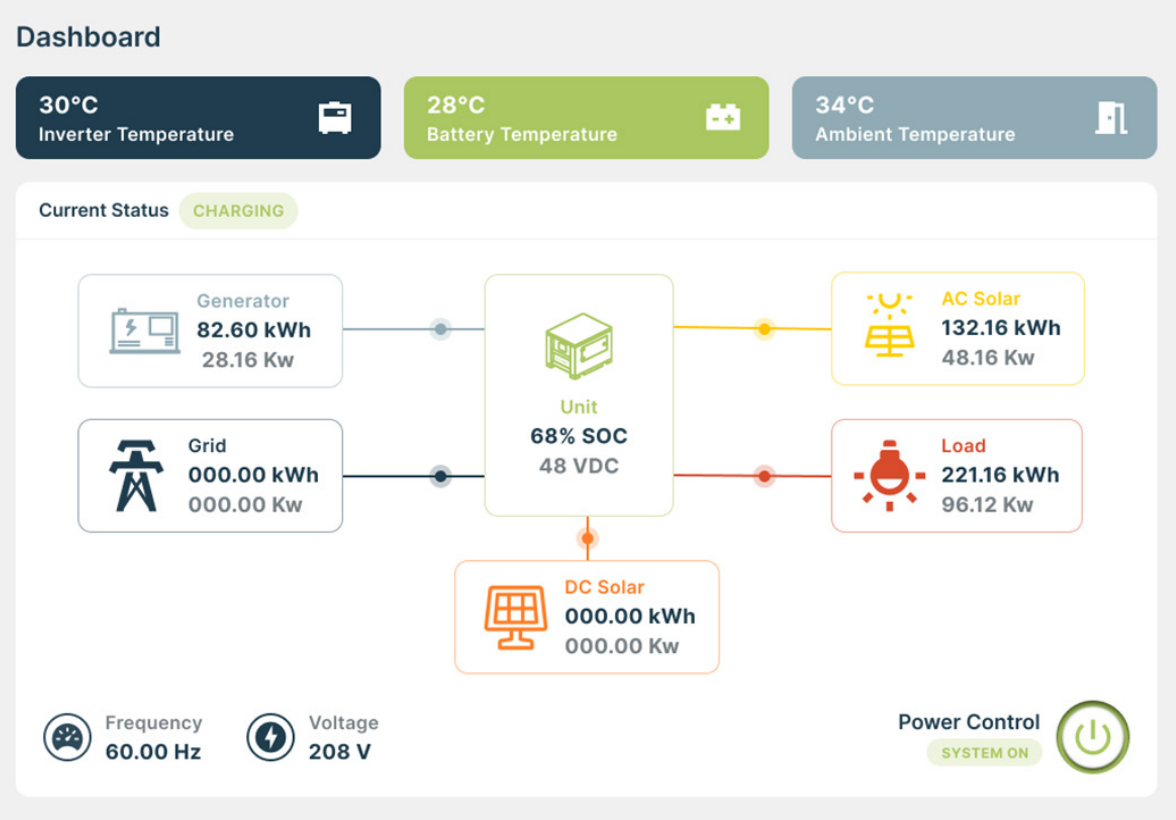


FIG 12 - MAIN VIEWPORT

Note: For representation of graphical interface system

3.5.1 Dashboard Screen

The Dashboard tab allows users to visualize the current system performance as well as turn ON / OFF the POWRBANK with a tap on the Power Control button on the bottom right of the screen.

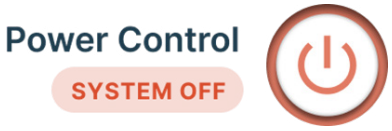


FIG 13 - POWER CONTROL BUTTON WHEN SYSTEM IS OFF

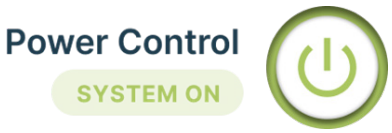


FIG 14 - POWER CONTROL BUTTON WHEN SYSTEM IS ON

The OFF state of the system is visualized on the screen as follows where all the individual subsystems of the POWRBANK are grayed out.

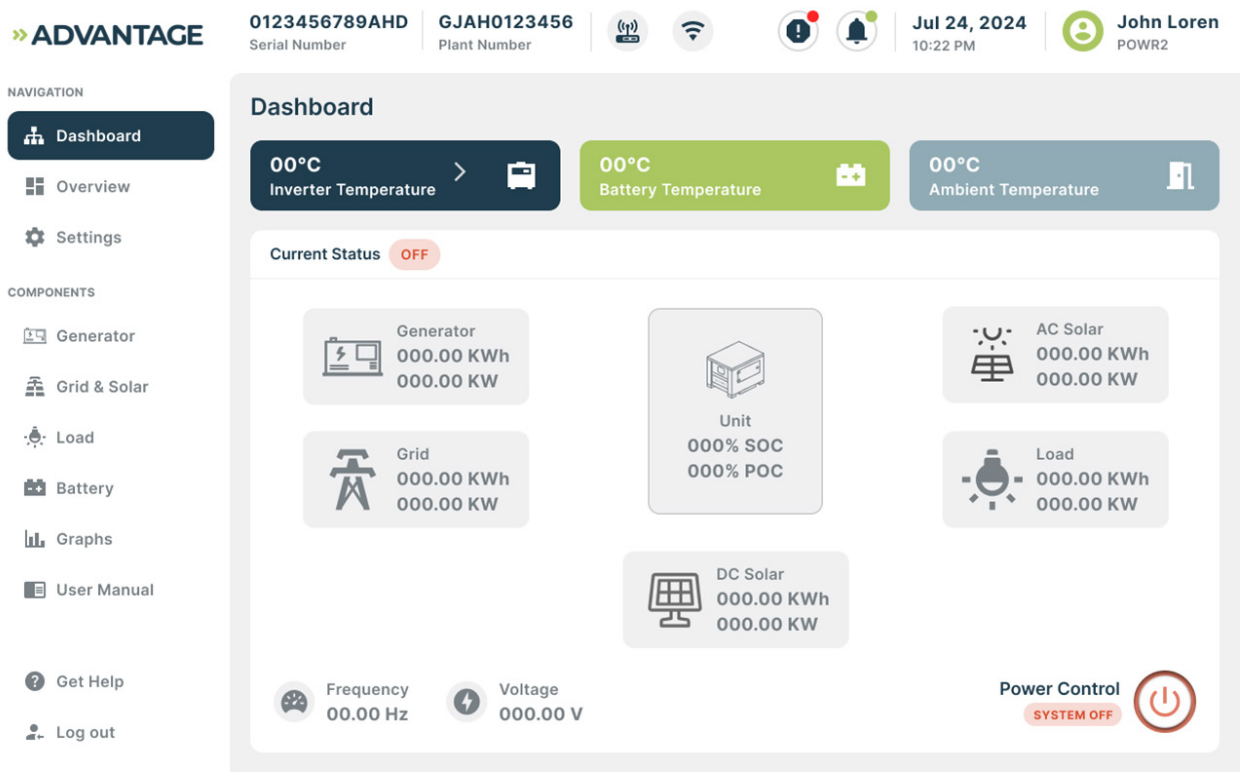


FIG 15 - SYSTEM STATE OFF SUBSYSTEMS GRAYED OUT

The main viewport also shows the OFF tile for Current Status at the top.

FIG 16 - CURRENT STATUS OFF TILE

The Inverter Temperature, Battery Temperature and the Ambient Temperature system states of the POWRBANK is displayed using distinct colored tiles at the top of the Dashboard screen.

FIG 17 - SYSTEM STATE TILES

Tapping on the Power Control button when the system is in the OFF state opens a pop-up screen which asks the user for confirmation. User needs to tap on the Power On button to start the system.

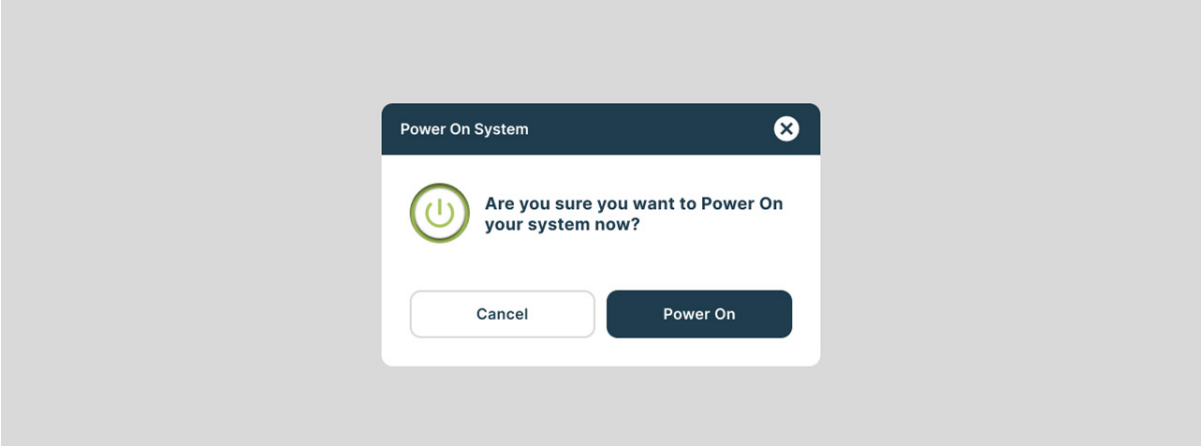
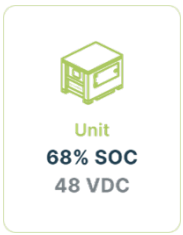


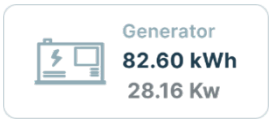
FIG 18 - POWER ON SYSTEM POP-UP SCREEN

Once user provides the confirmation the system is turned ON and the subsystem components on the Dashboard screen are enabled. The unit description is as follows —

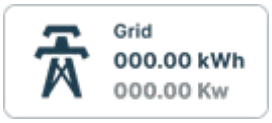
The unit in the middle represents the status of the POWRBANK



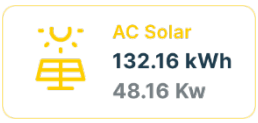
The unit on the top left represents the status of Generator. The values displayed are of the real time total input power along with the day cumulative kWh.



The unit on the bottom left represents the status of Grid. The values displayed are of the real time total maintenance power along with the day cumulative kWh.

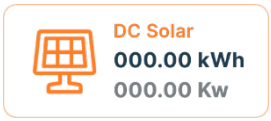


The unit on top right represents the status of AC Solar. The values displayed are of the real time total AC Solar power along with the day cumulative kWh.



The unit on bottom right represents the status of Load. The values displayed are of the real time total output power along with the day cumulative kWh.

The unit on bottom middle represents the status of DC Solar. The values displayed are of the real time total DC Solar power along with the day cumulative kWh.



The power flow between the POWRBANK and the peripheral subsystems is denoted using the circle animation which also provides the directional power flow information.

If no power is flowing between POWRBANK and the peripheral subsystem the circle animation is disabled.

The frequency in hertz (Hz) and the system output voltage in volts (V) of the POWRBANK is displayed in the bottom left of the Dashboard screen.

3.5.2 Overview Screen

The Overview tab provides user the details of the system states and savings for the selected duration. The user can select the date using the Select Date Range button on the top right of the Overview tab screen.

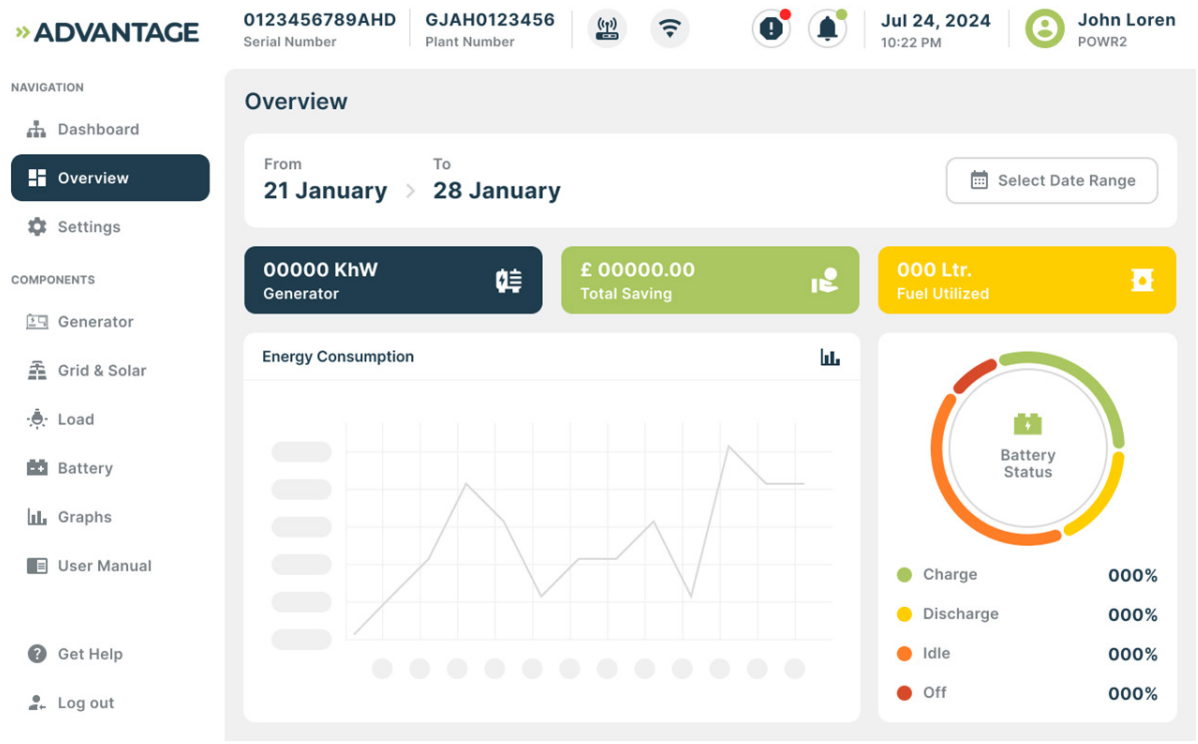


FIG 19 - OVERVIEW SCREEN

The tiles below display the aggregate parameter data for the selected date range. The Energy Consumption section tile displays the overall system statistics in a graph format for the selected date range.

The overall battery state percentage distribution for the selected date range is displayed on the bottom right side of the screen using a pie chart for the following state parameters — Charge, Discharge, Idle, Off.

Tapping on the Select Date Range button opens a pop-up screen which allows the user to set the FROM DATE and the TO DATE. After setting the date user needs to tap on the Change Date button to apply the date range for the system statistics displayed in the previous Overview screen.

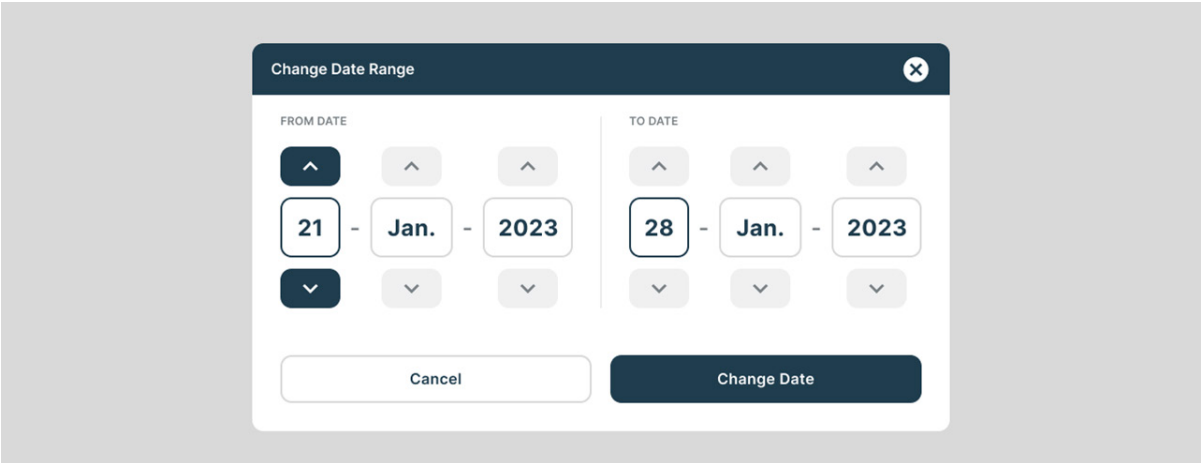


FIG 20 - CHANGE DATE RANGE POP-UP SCREEN

3.5.3 Settings Screen

The Settings tab provides individual setting buttons for the system.

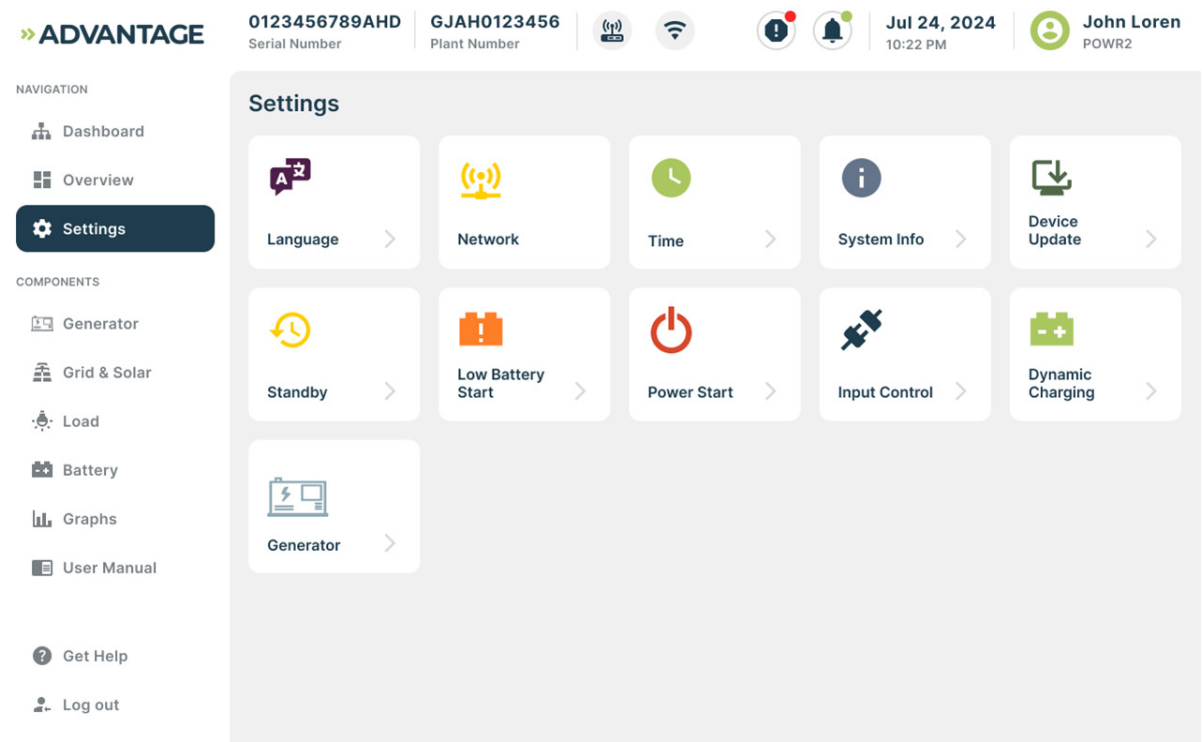


FIG 21 - SETTINGS TAB

3.5.3.1 Language

To set the language of the ECM application tap on the Language button on the Settings tab.

This opens a pop-up screen which displays the CURRENT LANGUAGE. The default language is English. Tap on the radio button corresponding to the language of choice and then tap on Set Language button to confirm the language choice. Tap on the Cancel button to exit to the previous Setting tab.

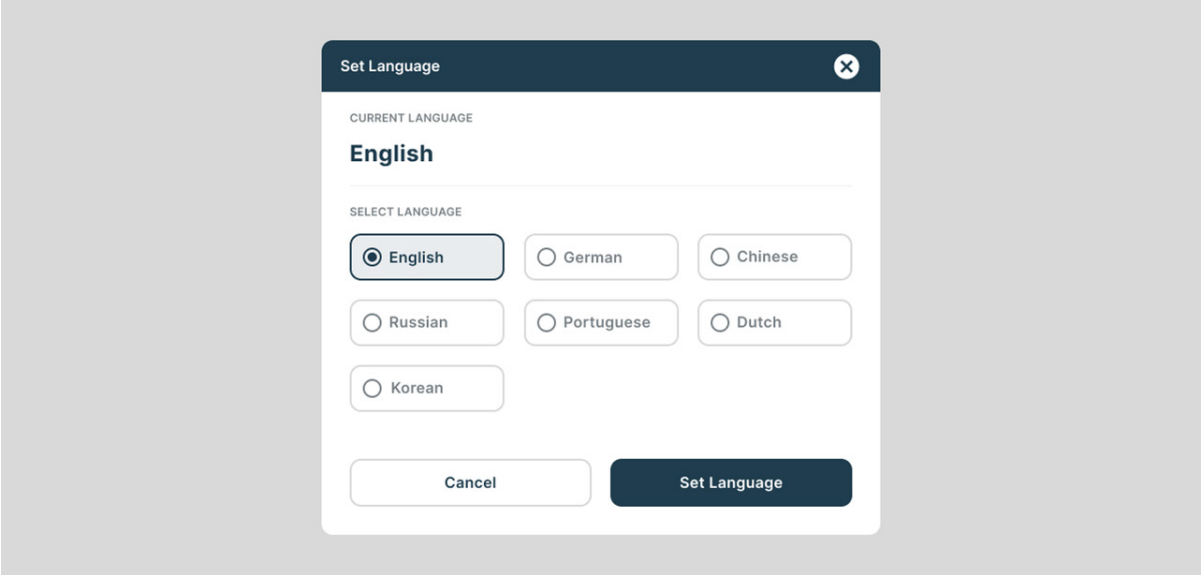


FIG 22 - SET LANGUAGE POP-UP SCREEN

3.5.3.2 Network

To change the network settings, tap on the Network button on the Settings tab. This opens a pop-up screen which provides options to configure the network configuration in Auto and Manual mode. In the auto mode, the device can automatically scan for the live Internet connection and connect to the live connection for data transfer. This feature allows the ECM to automatically connect to the live connections. For ex: If the wifi connection fails, the ECM will fall back on the Ethernet connection for sending the data packets.

The network type can be selected from the following set of checkbox options — GSM, Ethernet, Wi-Fi.

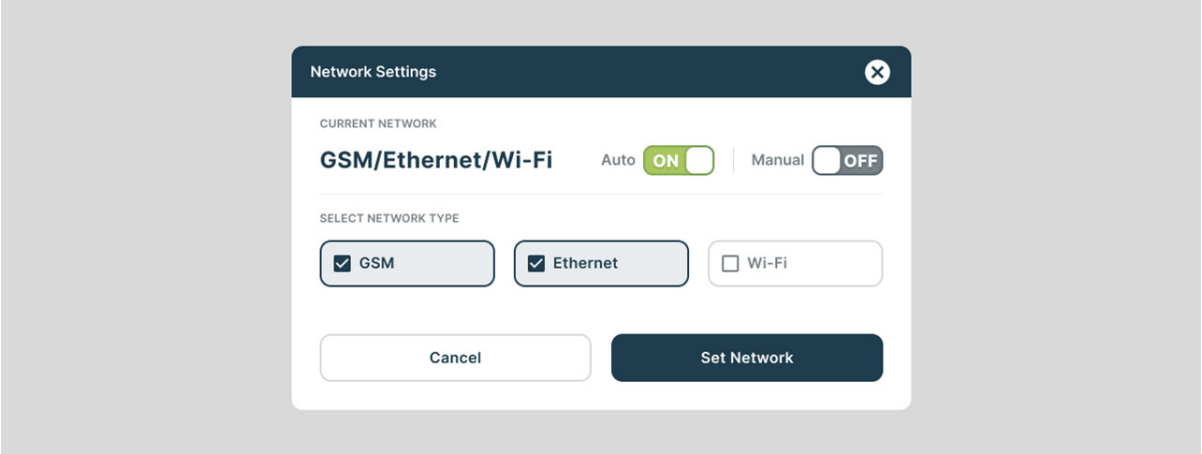


FIG 23 - NETWORK SETTINGS WITH AUTO MODE ENABLED

Prior to setting the wifi configuration – make sure to set the SSID and the password of the Wi-Fi.

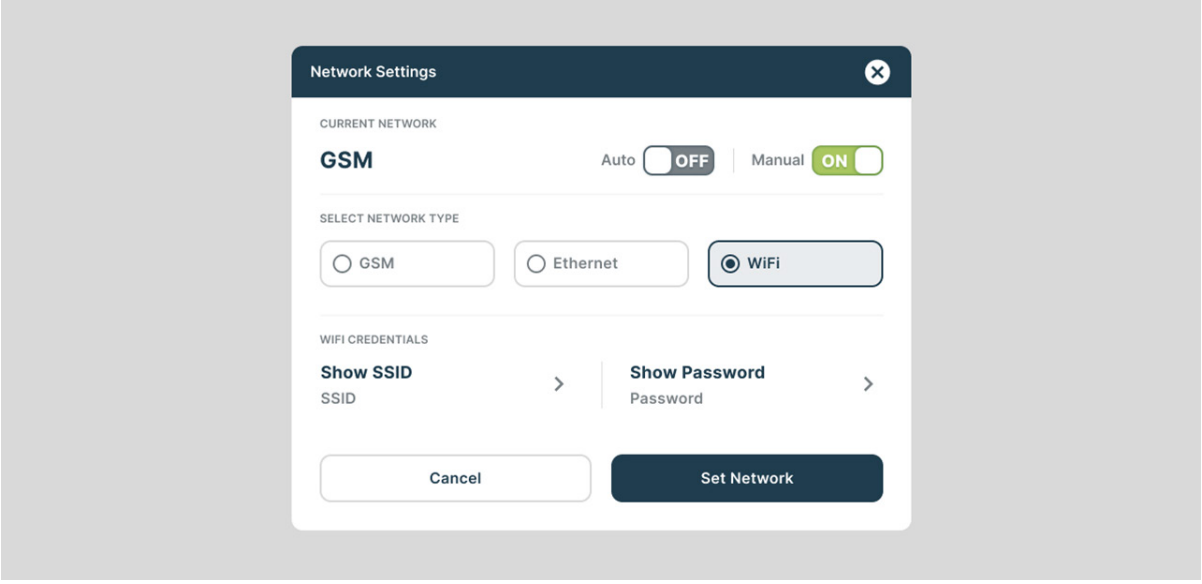


FIG 24 - NETWORK SETTINGS WITH MANUAL MODE ENABLED

3.5.3.3 Time

To change the time and date tap on the Time button in the Settings tab. This will open a pop-up screen which lets the user set the Date and Time. Tap on Change Date and Time button to update the time and date.

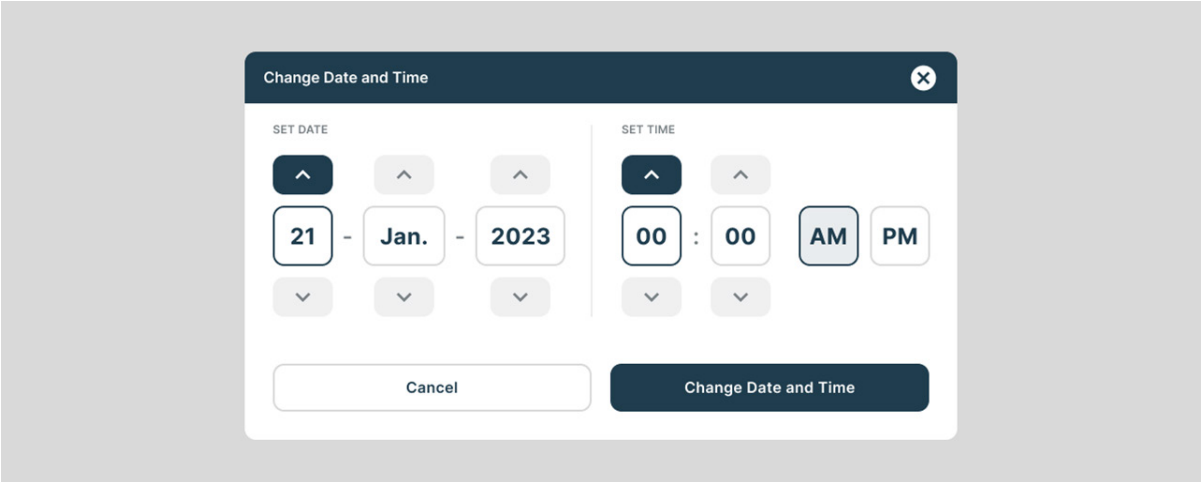


FIG 25 - CHANGE DATE AND TIME POP-UP SCREEN

3.5.3.4 System Information

THIS IS ONLY AVAILABLE FOR DEVELOPER — MODE NOT FOR USERS

To view the system information, tap on the System Info button in the Settings tab. This will open a pop-up screen which displays the system information.

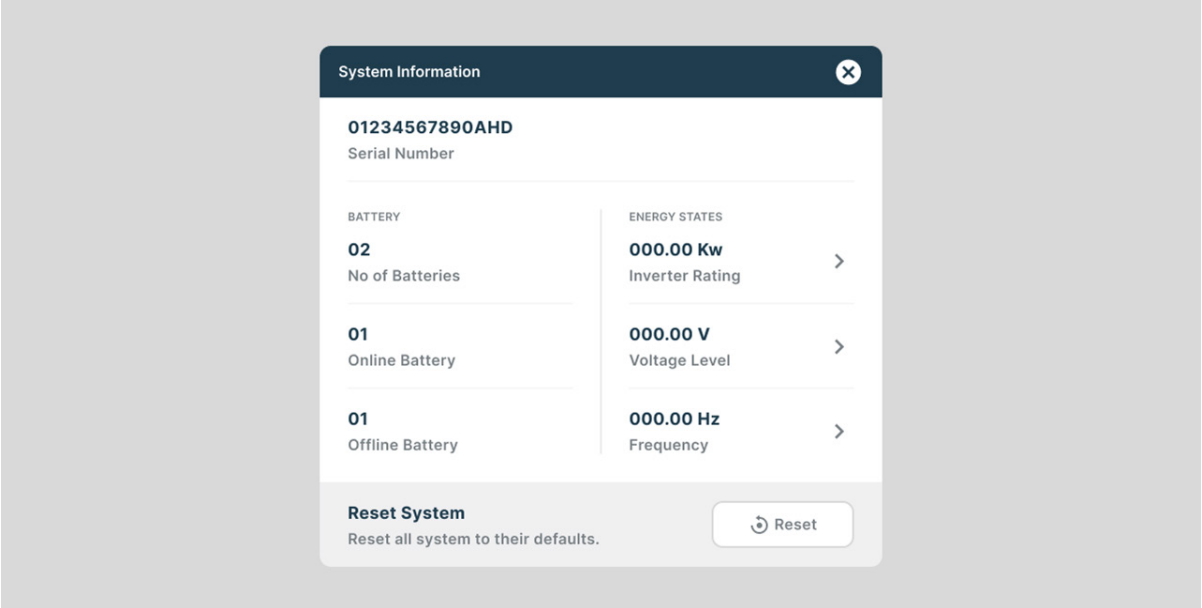


FIG 26 - SYSTEM INFORMATION POP-UP SCREEN

3.5.3.5 Standby

To set the Low Power Limit and Turn Off Time tap on the Standby button in the Settings tab. If the units output power remains below the low power limit for the specified amount of time- then the unit will turn off.

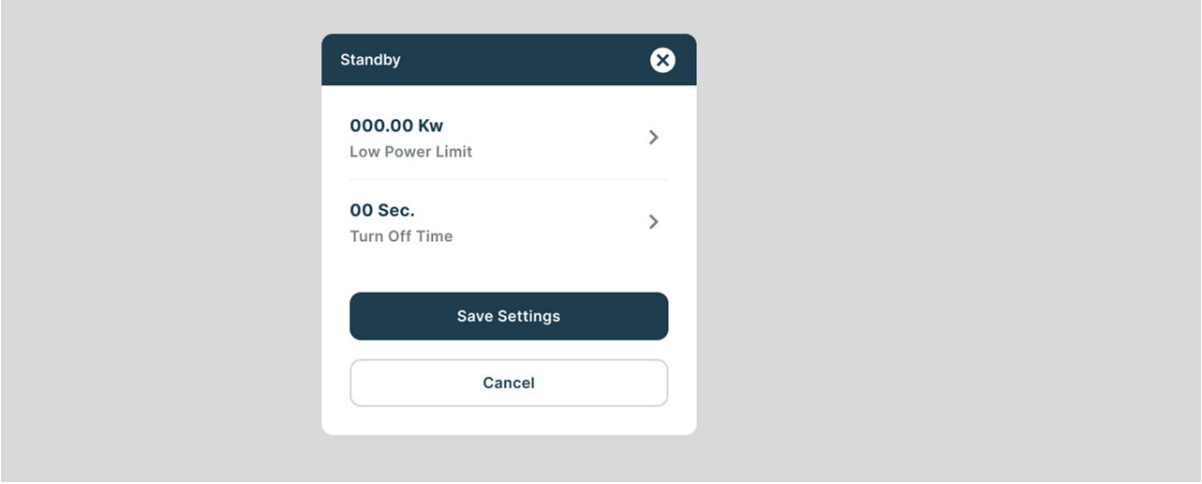


FIG 27 - STANDBY POP-UP SCREEN

3.5.3.6 Low Battery Start

To enable the Low Battery Start, tap on Low Battery Start button in the Settings tab. This opens a pop-up screen which lets the user set the Low SoC and the High SoC. Tap on Save Settings button to apply the changes. The Low SoC and the High SoC level allows the user to set the battery levels when the unit will turn on and turn off.

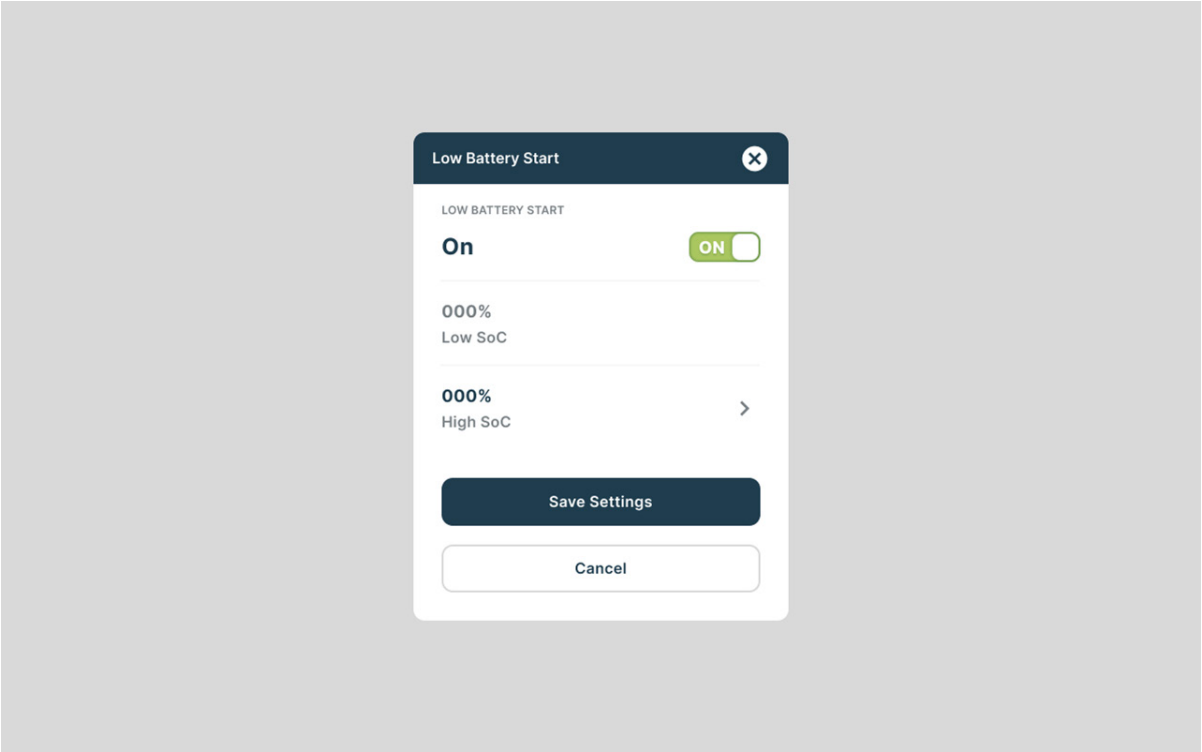


FIG 28 - LOW BATTERY START POP-UP SCREEN

3.5.3.7 Power Start

To enable the Power Start tap on Power Start button in the Settings tab. This opens a pop-up screen which lets the user set the Per Phase Power Start and Per Phase Delayed Start in kilowatts (kW) and the Time Delay for Power Start in HH : MM : SS format.

The power start is usually used to determine the level of power above which the genset is required to turn on. This is particularly set to prevent the power spikes from causing the damage to the PCS. If the load level exceeds the set power limit level for

the immediate and the delayed power start – then the genset will be provided with the turn on command. The user can then decide after what time the genset can be turned off. The immediate power start reacts if the load power per phase exceeds the set power limit for a period of 30s and the delayed start reacts if the load power limit exceeds the delayed limit for a period of 60s.

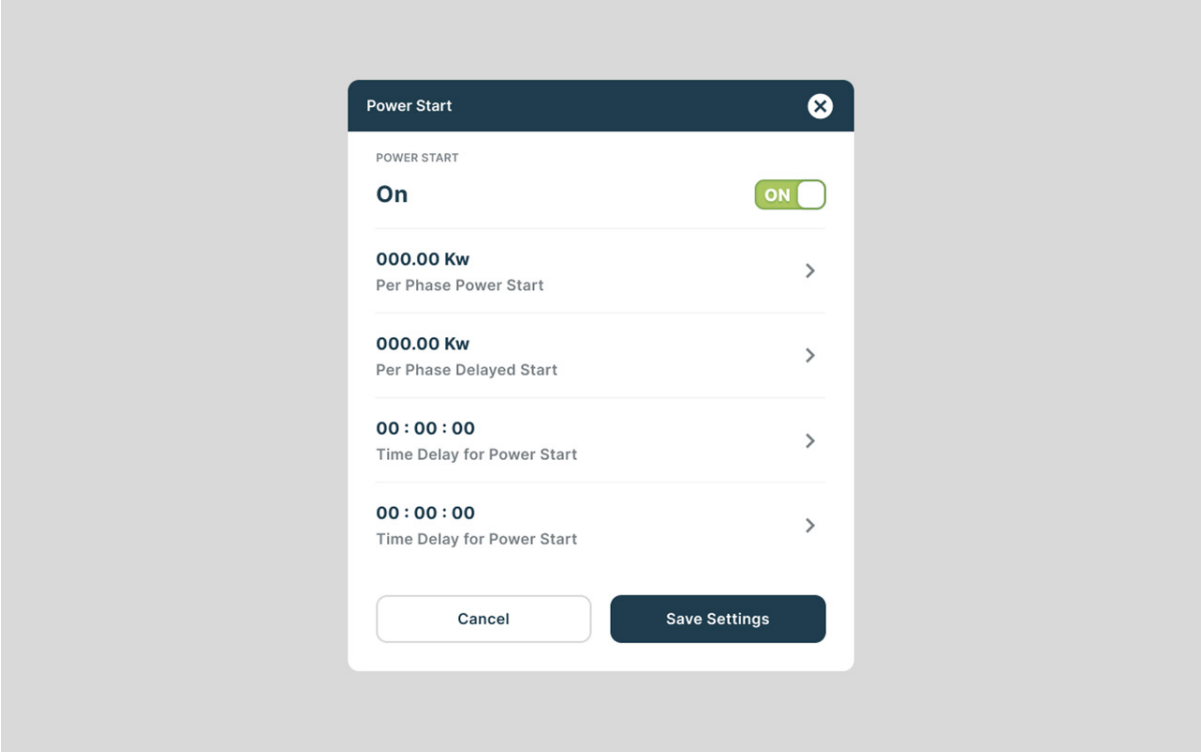


FIG 29 - POWER START POP-UP SCREEN

3.5.3.8 Input Control

To toggle individual peripheral inputs to the POWRBANK unit tap on the Input Control button in the Settings tab. This opens a pop-up screen which provides the option to enable or disable Input Control and peripherals using toggle button with ON and OFF state.

The input control consists of 4 conditions.

a **Solar Charger Status** — The solar charger can be turned off or on depending on whether the solar charger will be needed to be enabled.

b **AC input Control** — This feature if activated allows the user to automatically connect or disconnect to the input power supply using the inbuilt system relays based on the other preset conditions of remote start (low SoC or Power start).

c **Inverter Enable** — If the unit needs to disable the inverter then the enable command can be used to enable or disable the inverter. This allows the inverters to be turned off and for solar chargers and batteries to remain on continuously.

d **Disable** — This feature prevents the user disable the charging and only be in the inverting mode.

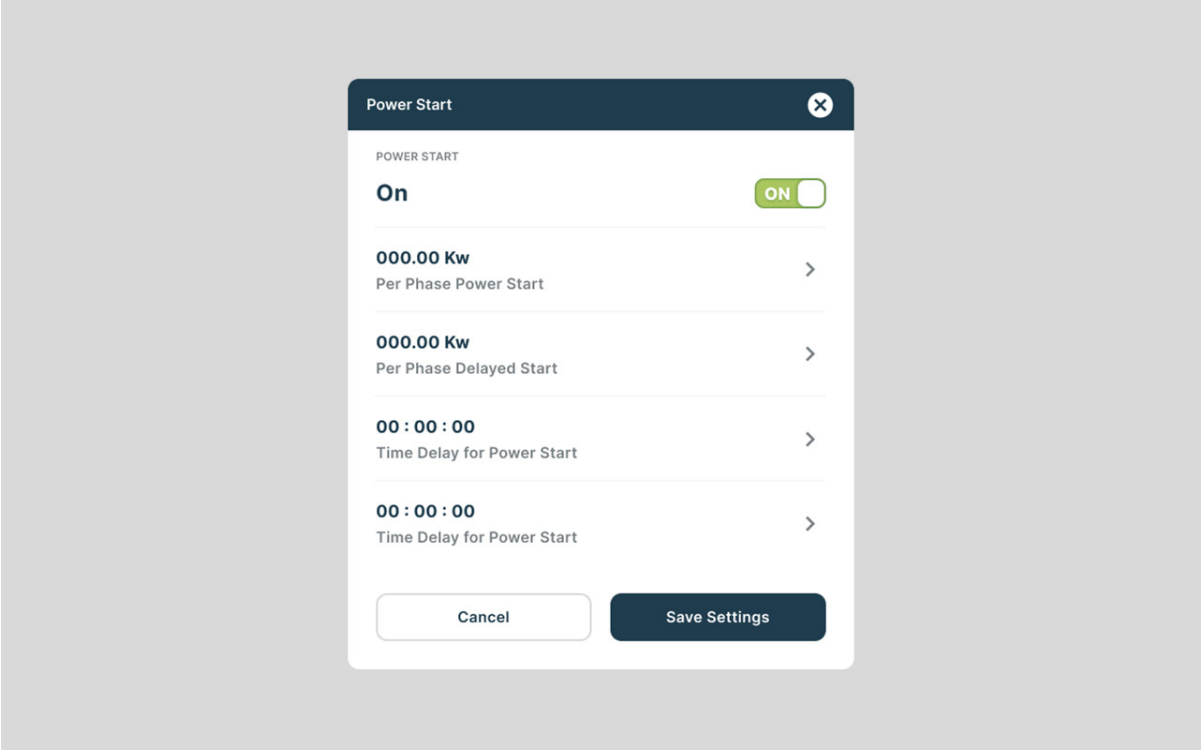


FIG 30 - INPUT CONTROL POP-UP SCREEN

3.5.3.9 Dynamic Charging

To enable Dynamic Charging tap on Dynamic Charging button in the Settings tab. This opens a pop-up screen which provides the option to enable or disable Dynamic Charging using a toggle button with ON and OFF state. The time stage in seconds and the charging current can be set for individual dynamic charging stages.

The dynamic charging is a setup allowing for a gradual increase in the charging current from the typical sudden increase in current from 0A to full charge current. The function allows for a gradual increase in current based on the time limit set up for the charging current to increase from 0A to the full load current in steps.

FIG 31 - BATTERY DYNAMIC CHARGING POP-UP SCREEN

Generator — Only for Admins

To set the properties of the input Generator tap on Generator button in the Settings tab. This opens a pop-up screen which provides the option to set the following generator properties — used for the correct computation of the fuel costs

No	Generator Property	Unit
1	Phases	-
2	Frequency	Hz
3	Rated Output	kW
4	Rated Voltage	V
5	Rated Current	A
6	PF	-
7	Model Name	-
8	Type Name	-
9	Rated Speed	RPM
10	Fuel Tank Capacity	Ltr

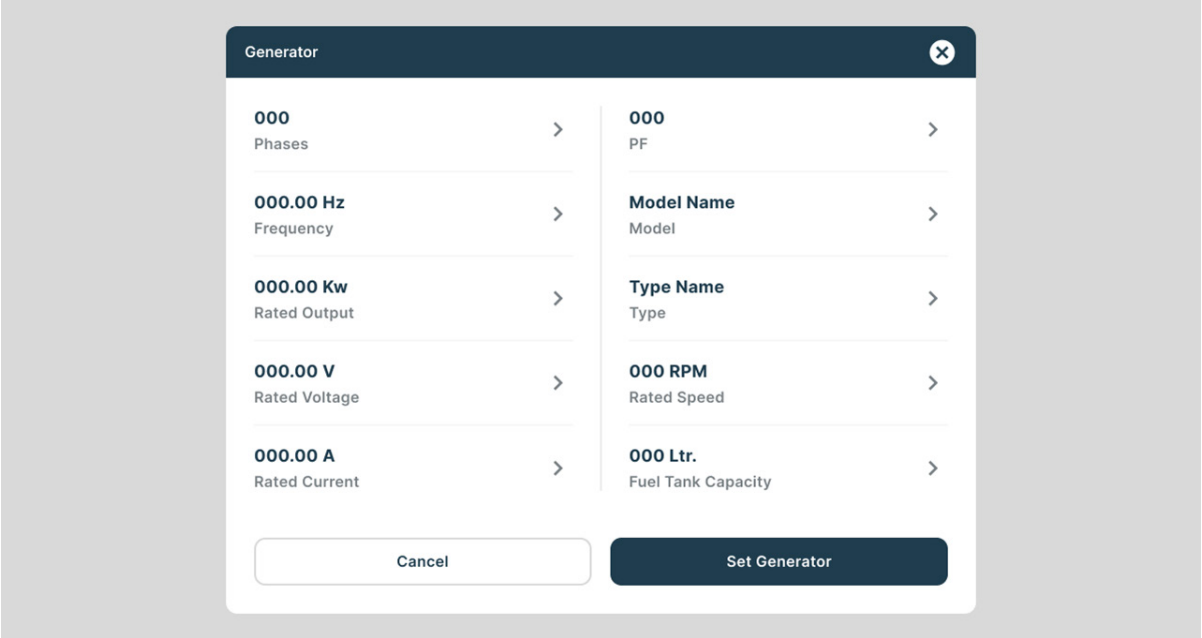


FIG 32 - GENERATOR POP-UP SCREEN

3.5.4 Generator Screen

To view the Generator properties, tap on the Generator button in the Navigation Pane.

FIG 33 - GENERATOR SCREEN

The Voltage in volts, Current in ampere and Power in kilowatts for individual generator phases is displayed along with line to line voltage in volts, frequency in hertz and total power in kilowatts.

The overall Genset Runtime, kWh utilization and fuel utilization are also displayed. The Genset to Battery and Genset to Load power in kW is also displayed as tiles.

User can set timer to turn the genset ON using Auto or Manual mode. The manual mode allows user to specify the days of week to utilize the generator power for charging.

The Generator Input Limit is a user input which can be set by tapping on the Set Limit button in the bottom right of the screen. This opens a pop-up screen allows the

user to set the Genset Input Limit. Tap on the minus or plus button to increment or decrement the limit respectively. User can also use the slider to set the limit. Tap on Set Limit button to update the Genset Input Limit. The genset current limit allows the user to set up a limit for input current to be provided to the system.

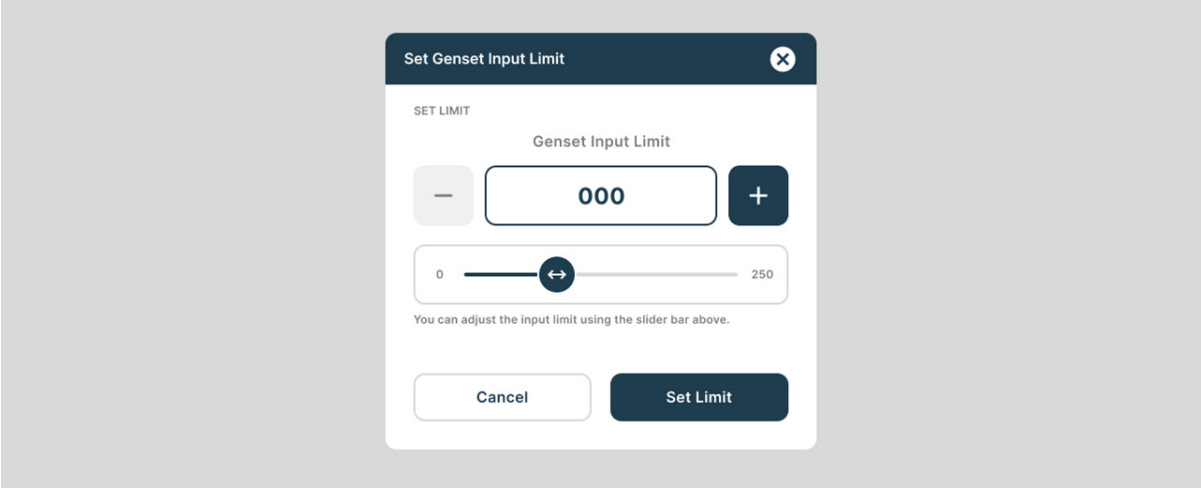


FIG 34 - SET GENSET INPUT LIMIT POP-UP SCREEN

3.5.5 Grid & Solar Screen

To view the Grid & Solar properties, tap on the Grid & Solar button in the Navigation Pane.

FIG 35 - GRID & SOLAR SCREEN

The top of the screen displays the following titles — Grid Energy, DC Solar Energy, AC Solar Energy.

The screen also provides the following titles — Grid Run Time, kWh Utilized, Battery Charged, Solar to Battery, Solar to Load, Solar to Grid.

The grid for the POWRBANKs are for the maintenance charges only. The other aspects include the detailed parameter display for DC solar charger and combination with AC solar inverter.

The Cooling Mode and Heating Mode can be turned on using the individual buttons on the screen. The HVAC Mode status is also displayed on the bottom right of the

screen. (The HVAC will only be applicable to units that has an HVAC fitted to the system and will be only an indication for displaying the status of the HVAC).

3.5.6 Load Screen

To view the Load properties, tap on the Load button in the Navigation Pane.

FIG 36 - LOAD SCREEN

The Voltage in volts, Current in ampere and Power in kilowatts for individual phases of the connected load is displayed along with line-to-line voltage in volts, frequency in hertz and total power in kilowatts.

The active outlet is highlighted along with the TIMER ENABLED status.

The Load Run Time, kWh Utilized, and Power Bank Run Time are displayed as tiles.

User can set timer to turn the load outlets ON using Auto or Manual mode. The manual mode allows user to specify the days of week to deliver power to the load.

The Load Variation Limit is a user input which can be set by tapping on the Set Limit button in the bottom right of the screen. This opens a pop-up screen allows the user to set the Load Variation Limit. Tap on the minus or plus button to increment or decrement the limit respectively. User can also use the slider to set the limit. Tap on Set Limit button to update the Load Variation Limit. (Not applicable for the current system)

FIG 37 - SET LOAD VARIATION LIMIT POP-UP SCREEN

3.5.7 Battery Screen

To view the Battery properties, tap on the Battery button in the Navigation Pane.

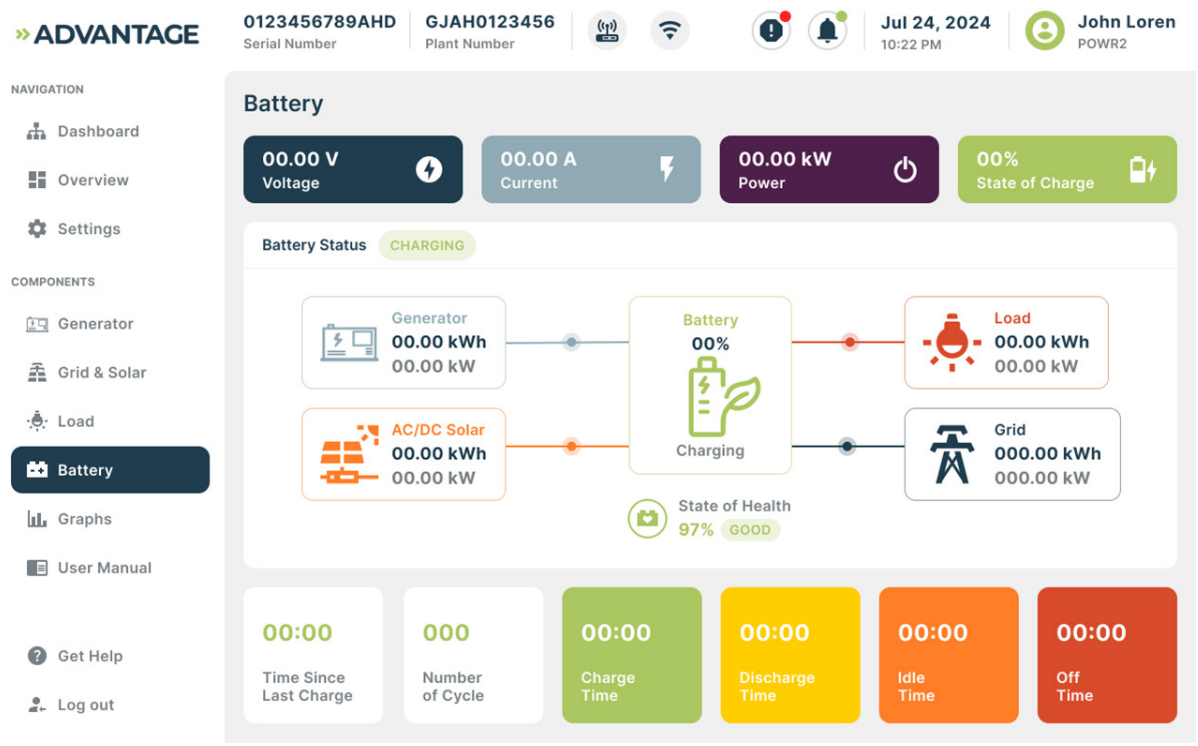
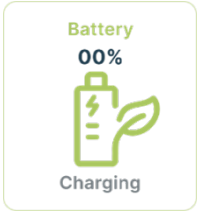


FIG 38 - BATTERY SCREEN

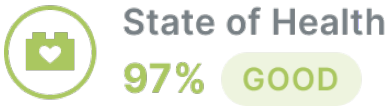
The battery charge status is shown as a tile after Battery Status.

The unit description is as follows —

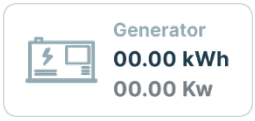
The unit in the middle represents the status charging Battery.



The State of Health is displayed below the Battery charging status tile.

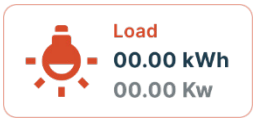


The unit on the top left represents the status of Generator.

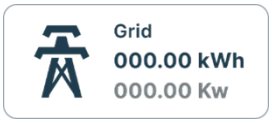


The unit on the bottom left represents the status of AC/DC Solar.

The unit on top right represents the status of the Load.



The unit on the bottom right represents the status of the Grid.



The power flow between the POWRBANK battery and the peripheral systems is denoted using the circle animation which also provides the directional power flow information.

Refer to POWR2 ADVANTAGE User Manual for additional instructions on monitoring and control through the online energy control platform. The ADVANTAGE User Manual can be found at:

https://info.powr2.com/knowledge/user-manuals

4.Care and Maintenance

4.1 Charging the Unit: Caring For The Energy Storage

POWRBANK requires regular storage maintenance charging when not in use by connecting an AC source either all of the time or at least every 4 weeks, ensuring a full charge is maintained.

Storage maintenance charging must be performed from a single phase source, from either the AC grid or a secondary power system e.g. Diesel generator.

While the unit is in storage, an AC source must be made available to allow storage maintenance as described in this section.

Failure to correctly maintain the health of the batteries by keeping them charged will invalidate the warranty!

4.1.1 Performing Storage Maintenance Charging

While the unit is in storage, a constant AC single phase supply should be connected to the dedicated maintenance charge input. Follow this procedure for maintenance charge:

1. On the ECM Home screen press the “Inverter Switch” soft button to turn the inverters OFF.
2. Switch OFF the output circuit breaker.
3. Connect an AC source to the AC maintenance charge inlet. See “Fig. 2 - Control/ Distribution Panel” on page 8.
4. On the ECM Home screen press the “Inverter Switch” soft button to turn the inverters ON.

5 Turn ON the circuit breaker for the AC maintenance charge inlet.

6 The unit should now charge at a low rate to prevent battery depletion.

If a constant AC supply is not available, it will be necessary to provide a temporary AC supply source. In order to maintain the storage, perform the relevant following procedure:

4.1.2 Rotational Storage Maintenance

1 Perform a Storage Maintenance charge until 100% State of Charge is reached.

2 It is recommended that the AC supply is left constantly plugged in. If this is not possible, to maintain the product warranty it is necessary to charge the POWRBANK unit at least every 3 weeks or when the state of charge depletes to 10%.

4.1.2.1 ADDENDUM

Section 4.1 Charging the Unit

NOTE: Applicable for US units only. GFCI outlets are not compatible for maintenance charge, please use non GFCI receptacles to perform maintenance charging.

NOTE: Charging the unit using the AC maintenance charge inlet, as described in section 4.1.1, is only possible when battery SOC is above 10%, the operator must use the main AC input to recharge the batteries as described in section 2.6. Please, check the maintenance tab of the ECM to make sure the batteries are getting charge as described on section 3.5.2.

NOTE: Maintenance charge inlet is not meant to be used as your main AC input on site. If the output current exceed the maintenance charge inlet current rating, the input breaker will trip.

4.2 Servicing

For safety, peak performance and to maintain the warranty, POWRBANK must be serviced annually by a qualified technician.

Failure to comply with The Manufacturer's servicing schedule will invalidate the warranty!

Any repair, maintenance of the unit, or accessing internal parts should be performed with the unit completely shut down, powering off any input power supplies and tagging with a LOTO tag indicating that the unit is under repair to prevent accidents.

POWR2 will not take any responsibility if maintenance or repairs are made when the unit is under live working conditions. Warranty will be voided.

4.2.1 Annual Service Procedure

1 All connections should be checked. Torque values should be as follows:

Torque Values	
Connection	**Nm (MAX)**
Inverter Battery Terminals	14
Inverter AC in and AC out terminals	7
Battery Terminals	14
Lifting Ring	250

For torquing values on M6 and M8 Bolts, please consult with POWR2.

2 Unit must be kept clean and away from moisture and oil/soot/vapors. Air filters should ideally be replaced every three months and inspected every month, ensuring they are installed in the right air flow direction.

PRO			
Item	Manufacturer	Manufacturer P.N.	Qty
Pleated Panel filter, G4 Grade, 394x495x20mm	RS Pro	730-2886	2
Pleated Panel filter, G3 Grade, 495x622x20mm	RS Pro	730-2909	1

XPRO			
Item	Manufacturer	Manufacturer P.N.	Qty
Pleated Panel filter, G4 Grade, 394x495x20mm	RS Pro	730-2886	2
Pleated Panel filter, G3 Grade, 495x622x20mm	RS Pro	730-2909	1

3 Contact POWR2 to check whether or not the unit needs any firmware or software configuration update.

4.2.2 Service Log

Date	Work Carried Out	Technician

5. Safety & Protection

5.1 Earthing POWRBANK

The POWRBANK system must be earthed. See “2.6.1 Earth Connection” on page 16.

5.2 Safety Notice Regarding The Unit’s Batteries

Servicing of the batteries should be performed or supervised by personnel knowledgeable about batteries and required precautions.

When replacing batteries, replace with the same type and number of batteries.

CAUTION: Do not dispose of batteries in a fire. The batteries may explode.

CAUTION: Do not open or mutilate batteries. Released electrolyte is harmful to the skin and eyes. It may be toxic.

Any damaged battery should be safely packed and shipped back to POWR2 for safe handling and disposal or should be disposed off at a designated battery waste collection site.

Contact POWR2 for details regarding waste battery collection points.

Battery replacement is only to be performed by The Manufacturer or an authorized service partner. Tampering with the batteries or monitoring systems may be dangerous and will invalidate the warranty.

6. Pre-delivery & Post-Rental/Post-Hire Inspections

6.1 Pre-delivery

PDI checks should be carried prior delivering a POWRBANK to site and/or hand over to a client to ensure that the POWRBANK is ready to be installed:

Pre-Delivery Inspection	Checked?
All casing free from dust, dirt, marks and scratches	
All bolts present and securely tightened	
Lifting ring is securely tightened with right Torque (250Nm)	
Inspect the alignment of all doors/panels is correct and there are no visible gaps	
Inlet and outlet filters are clean	
All safety stickers present	
Dangerous goods stickers present at both sides	
Keys present	
All doors except top front one are locked with key and all door latches are properly working	
Battery Bank SOC ≥ 50%	
Battery-Inverter Isolators ON	
Unit can be turn ON/OFF through the soft switch on the ECM. Leave unit in OFF mode	
Unit is online on POWR2 Remote Portal and SIM Card has data	
ECM: Alarms are cleared	
Update time zone on ECM if needed (Setting tab / system / clock setting)	
Output Breaker is switched OFF	

Pre-Delivery Inspection	Checked?
Unit is ready to be used by customer	

6.2 Post-Rental/Post-Hire Inspection

Return to yard checks should be carried out to ensure the POWRBANK is prepared properly for storage:

Post-Rental/Post-Hire Inspection	Checked?
All casing free from dust, dirt, marks and scratches. Also ensure that there is no rust developed on any of the surface because of scratch or abrasion to the unit.	
All bolts present and securely tightened	
Lifting ring is securely tightened with right Torque (250Nm)	
Inspect the alignment of all doors/panels is correct and there are no visible gaps.	
Keys present	
All doors except top front one are locked with key and all door latches are properly working.	
Inspect the gasket conditions for all doors and panels. If worn out, contact POWR2 for replacement.	
Battery Bank is ON and SOC ≥ 50%	
Battery-Inverter Isolators ON	
Unit can be turn ON/OFF through the soft switch on the ECM. Leave unit in OFF mode	
Unit is online on POWR2 Remote Portal and SIM Card has data	
ECM: Alarms are cleared - refer to section 3.5.8	
Update time zone on ECM if needed (Setting tab / system / clock setting)	

Post-Rental/Post-Hire Inspection	Checked?
Output Breaker is switched OFF	
Check air filters and replace if soiled	
Return unit to default settings via the ECM - refer to section 6.3 below	
Unit is ready for storage - refer to sections 2.1 & 4.1 for proper storage instructions	

6.3 Default Settings

Default settings can be restored on the ECM as follows:

GENERATOR Screen (refer to section 3.5.4):

Set **GENERATOR REMOTE CONTROL** to **AUTO**

Set GENSET CURRENT LIMIT to the highest value

LOAD Screen (refer to section 3.5.6):

Set **LOAD CONTROL** to **MAN-ON**

7. Troubleshooting

7.1 General Troubleshooting

Issue	Possible cause	Suggestion
Unit on but there is no output power.	The output circuit breaker may not be switched on	Check that the circuit breaker is pushed up to the on position
	Emergency Stop may be activated	Turn clockwise to deactivate the emergency stop
	Inverter Physical Switch is in OFF position	Check the inverter switch and put it on ON position
	Battery SoC is below 10% and no source of power is connected to the POWRBANK.	Connect your chosen renewable power source, from an AC grid connection or secondary power system to the POWRBANK
	Battery-Inverter Isolator switches are OFF	Switch ON Battery-Inverter Isolator switches
	 Unit inverters may be in Off mode	1. Select OFF mode 2. Wait 10 seconds 3. Select ON mode Note: Check that the 480V protection contactor and relay closes properly (manually push in)

Issue	Possible cause	Suggestion
External power source is active (e.g. diesel generator is running) but POWRBANK not synchronizing	Phase rotation of diesel generator or its connecting cable is incorrect	Check the phase rotation of the supplying generator
	Damaged cable between diesel generator and POWRBANK	Test or replace cables and connectors
	Input MCB may not be switched ON	Check the input MCBs are pushed up to the on position
	Generator Output breaker may not be switched ON	Check Generator Output breaker is switched ON
The system power has been switched on but there is no display on ECM	The ECM Fuse may have blown	Replace the ECM Fuse
	The 24V DC Regulator Fuse may have blown	Replace the 24V DC Regulator Fuse
There is power being sent to POWRBANK but it is not charging or passing through power	The battery isolator switch is in OFF position	Turn it ON
	The ECM “Load Control” is OFF	Review the configured “Load Control” or change to ON
External power source is active (e.g. diesel generator is running) but power only passing through on first phase (L1)	Phase rotation of diesel generator or its connecting cable is incorrect	Check the phase rotation of the supplying generator and its cable
	Damaged cable between diesel generator and POWRBANK	Test or replace cables and connectors
Output voltage is lower than 400 V AC over distance	If the distance between the unit and the consumers is more than 50 meters the voltage can drop too low	Contact POWR2 Technical services to arrange adjustment of system settings

Issue	Possible cause	Suggestion
SoC reading 0% and AC Output disconnected	This indicates that the storage voltage has reached its lower limit and has turned off its output to protect the batteries	Charge POWRBANK from your chosen renewable power source, from an AC grid connection or secondary power system
Output circuit breaker continually trips	The consumers being connected draw too much power for the rated output of the unit	Refer to the maximum output rating on the unit's rating plate and reduce the total power draw accordingly. For 50Hz units, also check if the RCD is properly adjusted.
Remote Generator Start not working	Generator Remote Start signal cable is loose or has been damaged	Reattach or replace the cable
	Remote start switching mode incorrect (normally open/ normally closed)	For further details on changing the switching mode, please contact POWR2 technical services for assistance
	Diesel generator is in manual mode	Switch diesel generator to automatic mode
	Generator remote start not configured properly	Contact Technical services for the party responsible for the generator
	Generator remote control might be in MANUAL	Set up Generator Remote Control to AUTO
Diesel generator constantly running	POWRBANK may be in manual ON generator mode	Check the AC input fuses, connect or replace if necessary
	There may be a phase imbalance: too much power is being drawn on one phase.	Consumers should be distributed evenly across the three phases as much as possible
	The load may be too high	Reduce the load
The RCD continually trips	There is an electrical fault with the consumers connected to the AC output	Check the electrical integrity of the consumers being connected to the unit

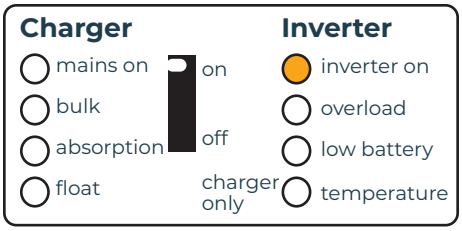
Issue	Possible cause	Suggestion
Output breaker on diesel set tripping on start-up / shut down	There may be an RCD conflict	Increase the tripping current limit on the diesel generator's RCD and adjust Variable RCD on POWRBANK. Adjustment to any RCD must be made by a qualified electrician in compliance with applicable local standards and regulations.
Output voltage drops when the generator switches OFF	Generator output voltage is outside the acceptable voltage range for seamless transition to inverter mode	Check the Voltage per phase on the generator to make sure is according to the electrical standards of the unit (230V or 120V depending on the configuration)
Maintenance charge isn't properly charging the unit	Will not take charge if SoC is below 10% There is a reverse polarity	Make sure the contactor and relay are closed properly Check that the input wires are installed correctly

7.2 Inverter LED indications and their meaning

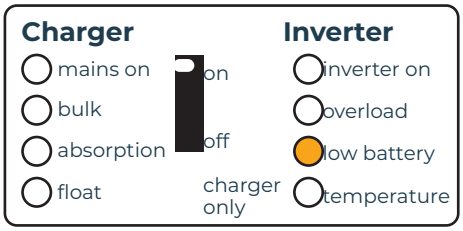
The inverters are located behind the service doors at both sides of the unit. There are some indicator lights on the front panel of each inverter.

○ LED off ● LED lights

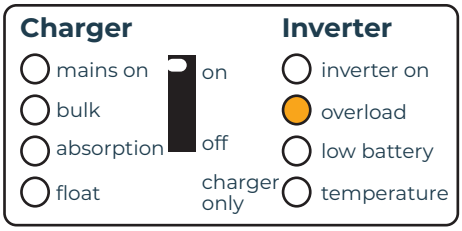
Inverter



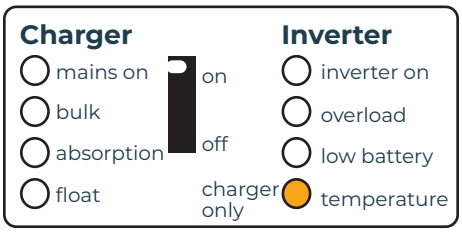
The inverter is on, and supplies power to the load.



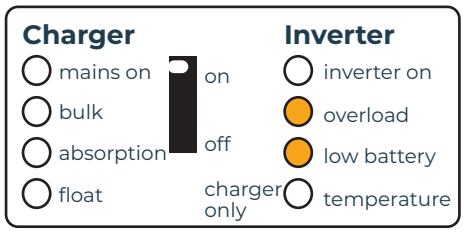
The inverter is switched off due to low battery voltage.



The inverter is switched off due to overload or short circuit.

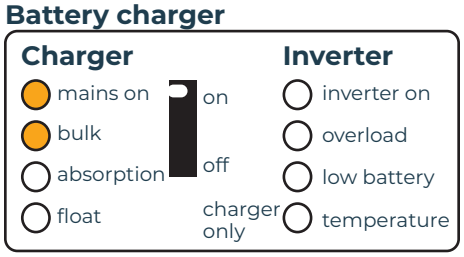


The inverter is switched off due to excessively high internal temperature.

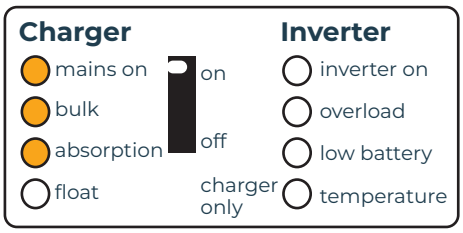


The inverter is switched off due to an excessively high ripple voltage on the battery connection.

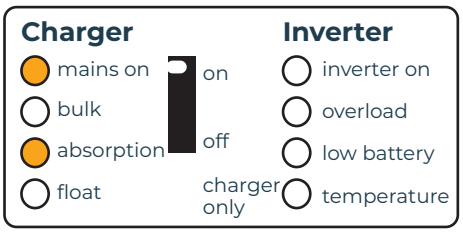
Battery charger



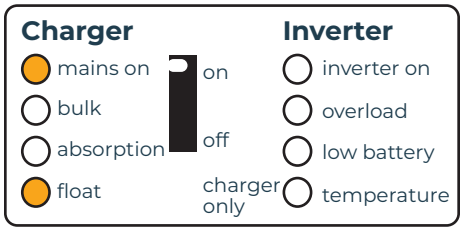
The AC voltage on AC-in-1 or AC-in-2 is switched through, and the charger operates in bulk phase.



The AC voltage on AC-in-1 or AC-in-2 is switched through and the charger operates, but the set absorption voltage has not yet been reached (battery protection mode).



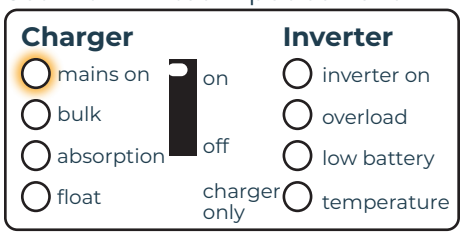
The AC voltage on AC-in-1 or AC-in-2 is switched through, and the charger operates in absorption phase.



The AC voltage on AC-in-1 or AC-in-2 is switched through, and the charger operates in float or storage phase.

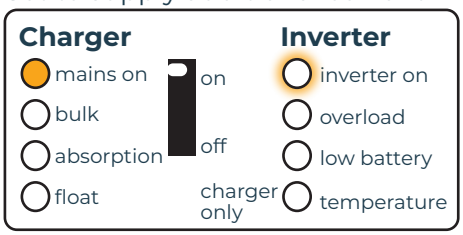
Special indications

Set with limited input current



The AC voltage on AC-in-1 or AC-in-2 is switched through, and the charger operates in bulk phase.

Set to supply additional current



The AC voltage on AC-in-1 or AC-in-2 is switched through and the charger operates, but the set absorption voltage has not yet been reached (battery protection mode).

General error indications

Problem	Cause	Solution
“Low battery” LED flashes.	The battery voltage is low.	Charge the battery or check the battery connections.
“Low battery” LED lights.	The converter switches off because the battery voltage is too low.	Charge the battery or check the battery connections.
“Overload” LED flashes.	The converter load is higher than the nominal load.	Reduce the load.
“Overload” LED lights.	The converter is switched off due to excessively high load.	Reduce the load.
“Temperature” LED flashes or lights.	The environmental temperature is high, or the load is too high.	Install the unit in cool and well-ventilated environment, or reduce the load.
“Low battery” and “overload” LEDs flash intermittently.	Low battery voltage and excessively high load.	Charge the batteries, disconnect or reduce the load,
One alarm LED lights and the second flashes.	The inverter is switched off due to alarm activation by the lighted LED. The flashing LED indicates that the inverter was about to switch off due to the related alarm.	Check this table for appropriate measures in regard to this alarm state.
“Mains on” flashes and there is no output voltage.	The device is in “charger only” operation and mains supply is present. The device rejects the mains supply or is still synchronizing	If the unit does not synchronize with the ac input supply, check that AC supply is within the voltage and frequency parameters accepted by the unit.

7.3 VE.Bus Error Codes and their meanings

The Inverters VE Bus system can display various error codes. These codes are displayed with the “inverter on”, “bulk”, “absorption” and “float” LEDs

Problem	Code	Cause	Solution
	1	Device is switched off because one of the other phases in the system has switched off.	Check the failing phase.
	3	Not all, or more than, the expected devices were found in the system.	Communication cable error. Check the cables and switch all equipment off, and then on again.
	4	No other device whatsoever detected.	Check the communication cables.
	5	Overvoltage on AC-out.	Check the AC cables.
	10	System time synchronization problem occurred.	Should not occur in correctly installed equipment. Check the communication cables.
	14	Device cannot transmit data.	Check the communication cables
	17	One of the devices has assumed ‘master’ status because the original master failed.	Check the failing unit. Check the communication cables.

Problem	Code	Cause	Solution
☀ ○ ○	18	Overvoltage has occurred.	Check AC cables.
☀ ☀ ☀	26	Internal error.	Should not occur. Switch all equipment off, and then on again. Contact POWR2 if the problem persists.

7.4 Alarm indicated by the LV Hub and Solution

LED indicator	Possible cause	Solution
Status: RED solid	No battery connected or at least one of the groups is off line.	Option 1: Switch off the LV Hub and disconnect and connect all the rj45 communication cable. Switch on the LV Hub again. Option 2: Press the reset button for 4s to restart the LV Hub. Wait until the LV Hub is communicating with the battery modules and the Venus. Option 3: Replace the LV Hub.
Indicator 1: Flash	Battery group 2 is missing on the LV Hub	Option 1: Check the connection between master battery of group 2 and LV Hub. Make sure all batteries are switched on and signal cables are properly connected. Option 2: Reset LV Hub by pressing its reset button for 4s.

7.5 Alarm displayed on Battery Module US3000

Alarm is indicated by a solid red light on the ALM led.

Possible cause	Solution
Short Circuit	CONTACT POWR2
High / Low Temperature (cell / BMS)	
Charge / Discharge Over Current	
Charge Over Voltage	
Discharge Under Voltage	
Power Cable Reverse	
Charge / Discharge End	

8. SLEEP & WAKE PROCEDURES

8.1 POWRBANK Sleep Mode Procedure

POWRBANKs must be always kept ON and charged, however, if the unit is going to be shipped, in transport or not accessible for maintenance charge for longer than 3 weeks, the batteries should be switched to “Sleep Mode” to prevent over-discharging.

In Sleep Mode, the batteries will remain in standby, the electronics will be powered off and the unit offline, therefore the consumption will be minimum. However, in order to maintain the warranty, the POWRBANK must not be not left in sleep mode unattended for longer than 6 months without a maintenance charge.

The following steps must be followed in the correct order:

8.1.1 POWRBANK PRO

1. **Ensure that:**
   - Batteries are fully charged. Do not perform Sleep mode with batteries at lower SOC.
   - POWRBANK is in turned OFF mode on the ECM screen (Home tab-System OFF).
   - Battery-Inverter isolator switches are in the OFF position.
   - E-Stop is in OFF position
   - Main output breaker is in OFF position
   - Inverter toggle switches are in ON position

2 **Press the SW red button of the Master Battery for 3 seconds.**

- The Master Module is located at front top row on the left hand side of the unit. It can also be identified as the one with the empty link port 0 and the CAN port connected. Labeled as the master battery.
- Rest of modules will turn OFF (double check that RUN, ALM and SOC LEDs are all OFF).
- All switches can be accessed through the side doors without having to remove the battery side panel.

3 **Switch OFF the power switch of the Master Battery**

4 **The unit should now be in sleep mode and there should not be any voltage presence on the unit.**

Follow POWRBANK “Wake Up” procedure when switching the unit back ON.

8.1.2 POWRBANK XPRO

1 **Ensure that:**

- Batteries are fully charged. Do not perform Sleep mode with batteries at lower SOC.
- POWRBANK is in turned OFF mode on the ECM screen (Home tab-System OFF).
- Battery-Inverter isolator switches are in the OFF position.
- E-Stop is in OFF position
- Main output breaker is in OFF position
- Inverter toggle switches are in ON position
- LV-HUB switch is in ON position

2 **Press the SW red button of the Group 3 Master Battery for 3 seconds.**

- The Group 3 Master Module is located at the rear top row at the right-hand side of the unit, where LV Hub and battery-inverter isolator switches are located. It is identified as the one with empty link port 0. Labeled as master battery 1, 2 and 3.
- All switches can be accessed through the side doors without having to remove the battery side panel.

3 **Switch OFF the power switch of the Group 3 Master Battery**

- Group 3 slave modules will turn OFF (double check that RUN, ALM and SOC LEDs are all OFF).

4 **Press the SW red button of the Group 2 Master Battery for 3 seconds.**

- The Group 2 Master Module is located at the middle top row at the right-hand side of the unit, where LV Hub and battery-inverter isolator switches are located. It is identified as the one with empty link port 0.
- All switches can be accessed through the side doors without having to remove the battery side panel.

5 **Switch OFF the power switch of the Group 2 Master Battery.**

- Group 2 slave modules will turn OFF (double check that RUN, ALM and SOC LEDs are all OFF).

6 **Press the SW red button of the Group 1 Master Battery for 3 seconds.**

- The Group 1 Master Module is located at the front top row at the right-hand side of the unit, where LV Hub and battery-inverter isolator switches are located. It is identified as the one with empty link port 0.
- All switches can be accessed through the side doors without having to remove the battery side panel.

7 **Switch OFF the power switch of the Group 1 Master Battery.**

- Group 1 slave modules will turn OFF (double check that RUN, ALM and SOC LEDs are all OFF).

8 **Change group 1 Master Battery dip switch address from 0100 to ADD: 0000.**

9 **Switch OFF the power switch of the LV-HUB.**

The unit should now be in sleep mode and there should not be any voltage presence on the unit.

Follow POWRBANK “Wake Up” procedure when switching unit back ON.

8.2 POWRBANK Wake Up Procedure

When a brand-new unit is shipped or when a unit is left in storage for a long period of time, it is switched to sleep mode for safety reasons. To initialize and wake up the unit, the following steps must be followed in the correct order:

8.2.1 POWRBANK PRO

1. **Ensure that:**
   - There is no voltage presence on the unit.
   - Battery-Inverter isolator switches are in the OFF position.
   - E-Stop is in OFF position
   - Main output breaker is in OFF position
   - Inverter toggle switches are in ON position
2. **Switch ON the power switch of the Master Battery module.**
   - The Master Module is located at front top row on the left hand side of the unit. It can also be identified as the one with the empty link port 0 and the CAN port connected.
   - All switches can be accessed through the side door without having to remove the battery side panel.

3 **Press the red SW button of Master Battery module to power ON**

- All batteries' LED lights will be turned on one by one by the Master battery.
- Turn ON Battery-Inverter isolator switches one at a time waiting 20 seconds between each one to allow inverter capacitors to charge without putting strain on the battery.

4 **Wait for the control panel to start up.** The ECM will take one to five minutes to start communicating with the rest of electronic devices. This can be checked by looking at the GX Communication Error alarm that should be green on the ECM onboard screen (System tab).

5 **Turn system ON** by pressing on System ON mode on the ECM Home tab.

The unit is now initialized, please refer to the appropriate user manual sections for set up and operation instructions.

8.2.2 POWRBANK XPRO

1 Ensure that:

- There is no voltage presence on the unit.
- Battery-Inverter isolator switches are in the OFF position.
- E-Stop is in OFF position
- Main output breaker is in OFF position
- Inverter toggle switches are in ON position
- LV-HUB switch is in ON position
- Group 1 Master Battery ADD is 0000.

2 Switch ON the power switches of the Groups 1, 2 & 3 Master Battery modules.

- The Master Modules are located at the top rows at the right hand side of the unit, where LV Hub and battery-inverter isolator switches are located. They can also be identified as the ones with the empty link port 0. Group 1 (front); Group 2 (middle) and Group 3 (rear).
- All switches can be accessed through the side door without having to remove the battery side panel.

3 Press the red SW button of the group 1 Master Battery module to power ON

- All batteries' LED lights will be turned on one by one by the Master battery.
- After all batteries running and buzzer of master battery in group 1 rings 3 times. Means all groups are online.

4. Change the dip switch of master battery in group 1 (front) from 0000 to 0100.
5. Turn ON LV-HUB.
   - NUMBER/BIN 1 and 2 LEDs must be solid green. That means that the 3 groups are communicating.
6. Turn ON Battery-Inverter isolator switches one at a time waiting 20 seconds between each one to allow inverter capacitors to charge without putting strain on the battery.

Wait for the control panel to start up. The ECM will take one to five minutes to start communicating with the rest of electronic devices. This can be checked by looking at the GX Communication Error alarm that should be green on the ECM onboard screen (System tab).

7. Turn system ON by pressing on System ON mode on the ECM Home tab.
   - The unit is now initialized. Make sure no warnings and alarms are displayed on the ECM. Please refer to the appropriate user manual sections for set up and operation instructions.

9. Flat Batteries — Recovery Procedure

POWRBANKs require regular maintenance charging when not in use ensuring charge of the batteries is maintained. Failure to correctly maintain the health by letting the batteries to go down to 0% will damage the batteries and invalidate the warranty. In case the batteries go flat and disconnect from the system, please immediately follow this procedure to re-charge the batteries and bring the unit online:

1. Connect the unit to an available ac power supply. Wait for several minutes to allow the unit to recover itself. If the batteries and inverters are not automatically turning them on and start charging the batteries, do the following steps:
2. Make sure unit is disconnected by following steps on chapter 8.1. Ignore first step.
3. Make sure unit is connected by following steps on chapter 8.2. Ignore steps 12 & 13.
4. Try again step 1. If POWRBANK is not capable to charge the batteries, do the following steps:
5. Make sure unit is disconnected by following steps on chapter 8.1. Ignore first step.
6. Connect an external DC Power Supply to the DC Busbar.
7. Follow steps on chapter 8.2 until step 7 to turn on the batteries. Make sure battery isolators are switched off.
8. Set up Power Supply to 53.2V and leave batteries charging until the voltage reaches 49V. (This value will be visible on the ECM Screen)
9. In case is there is any module/s with the red ALM led in solid red, those module/s have to be charged individually by following this procedure:
    a. Switch all battery modules OFF.
    b. Disconnect Power cables from the Module/s with Alarm/s. Isolate cable lead terminals to prevent any short circuit.
    c. Disconnect communication cables.

d Connect DC Power Supply to P+ and P- Terminals

e Set up Power Supply to 50V and charge module/s until the voltage reaches 49V.

f Re-connect battery module/s to the system by re-connecting the power cables and the communication cables

g Switch all battery modules ON.

h Press the red button SW located at the bottom of the POWER button ONLY on the master module from group 1 which is the first module below the LV hub. Once pressed, rest of battery modules will automatically turn to operation mode too.

10 All modules on the system should be at 49V and status led in solid green with no ALM LEDs.

11 Switch ON the LV Hub.

12 Disconnect DC Power supply.

13 Turn ON Battery-Inverter isolators one at a time waiting 20 seconds between each one to allow inverter capacitors to charge without putting strain on the battery.

14 When ECM is capable of communicating with the inverters, turn the system ON. You can check if there is communication by looking at the system tab / System Mode. Make sure the bottom front door is closed and E-Stop button is released.

15 Connect an AC input power source to the POWRBANK.

16 POWRBANK should start charging the batteries. Leave the unit charging up to 100%.

17 Once the battery SoC level has reached 100%, close the bottom side door panels.

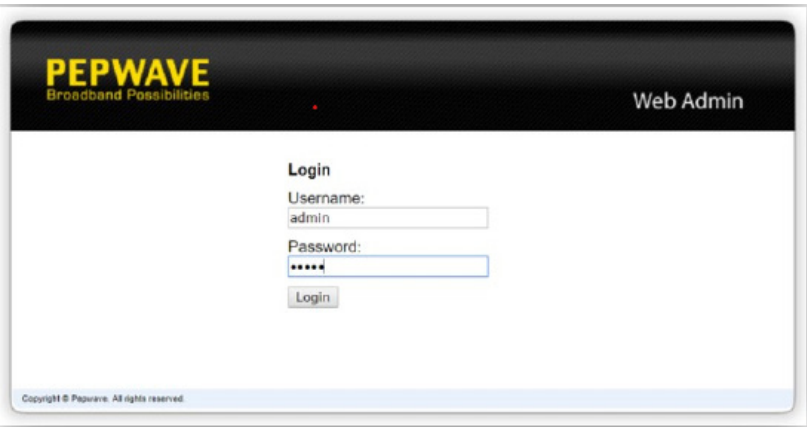
10. HES Sim Card Installation

10.1 US

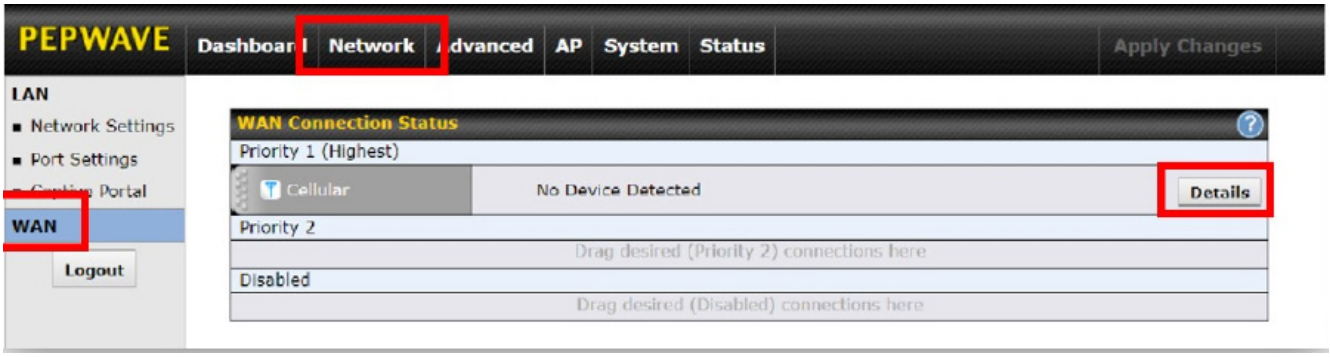
Note: Remove the rear panel of the unit to have better access to the router's sim card slot. Rear panel has three bolts at the top attached to the frame as well as a cable connection on the fan.

1. Turn off the router by disconnecting its power cable.
2. Connect the SIM card on slot A. Following video tutorial shows how to insert sim cards: https://www.youtube.com/watch?v=ch-6SffIwTw
3. Turn on the router by connecting back its power cable.
4. Once the status light is green, connect to the router wifi.
   - Name: Unit ID wifi. E.g., S1909-00014 wifi
   - Pw: P0wr2wifi (same to all of the POWR2 HES units)
5. Once you are connected to the router wifi, open the following link on a browser:
   - 192.168.50.1
6. Login details:
   - Username: admin

- Pw: admin or Admin12345

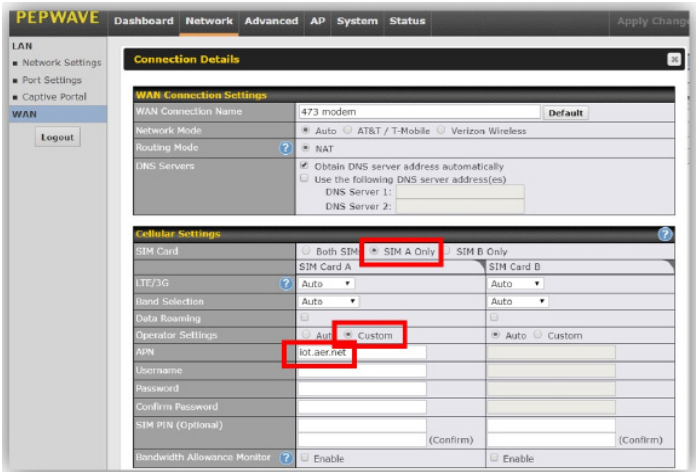


7 Go to Network, WAN and under “Cellular 1” click on details



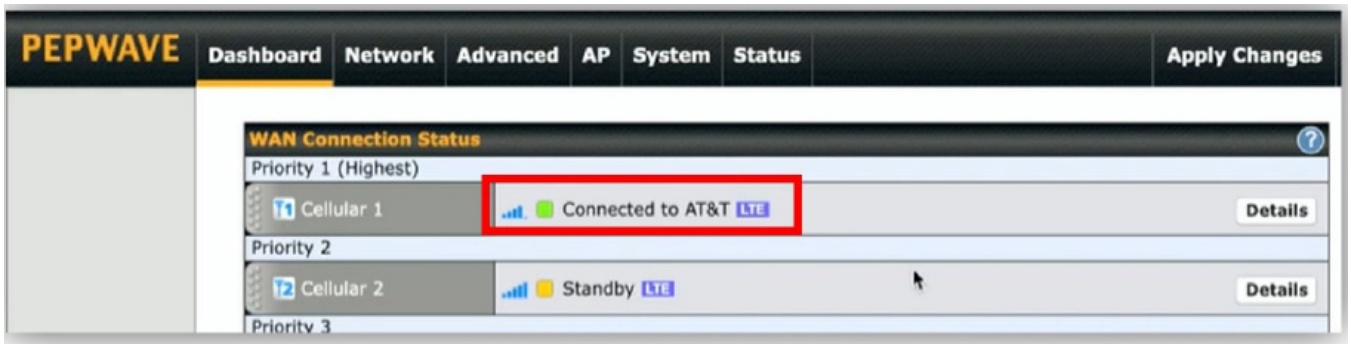
8 Under “Cellular Settings”, add the following details:

- Select “SIM A Only”
- Select “Custom” on “Operator Settings”
- Add the APN and click on Save



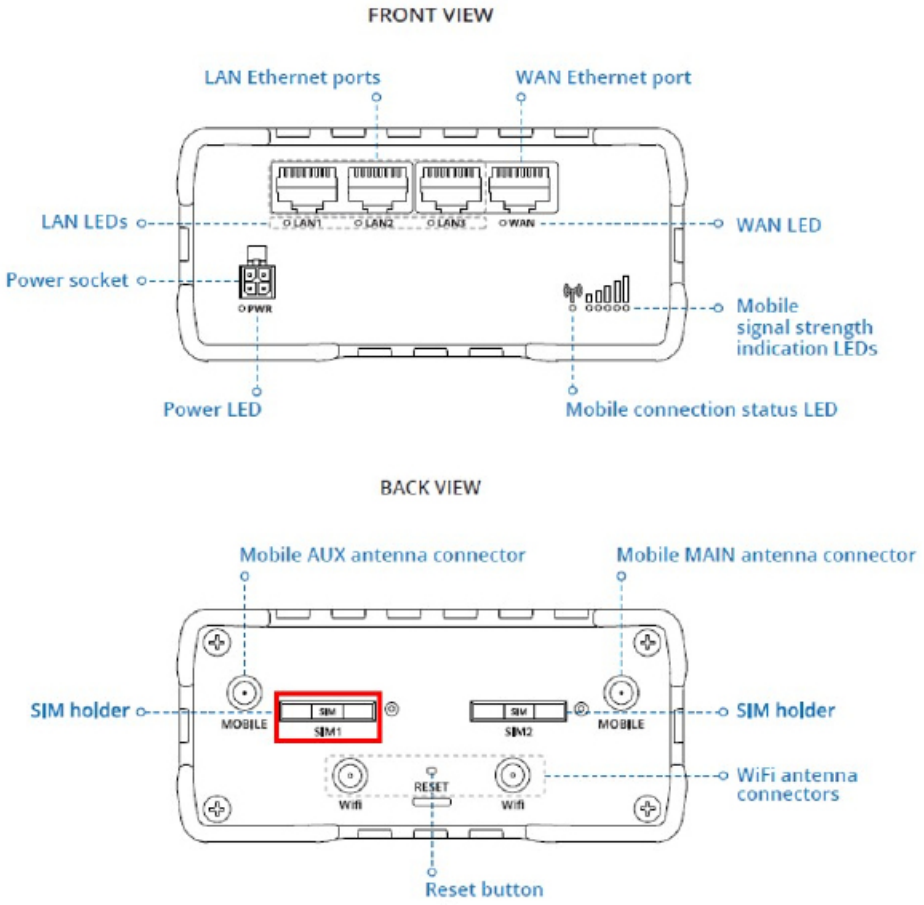
9 Check router is online by the following methods

- Go to Dashboard and check the status of Cellular 1



10 At this point you should be able to navigate through internet using the router wifi.

10.2 Rest of the World



Note: Remove the rear panel of the unit to have better access to the router's sim card slot. Rear panel has three bolts at the top attached to the frame as well as a cable connection on the fans.

1. Turn off the router by disconnecting its power cable.
2. Push the SIM1 holder button with the SIM needle.
3. Pull out the SIM holder.
4. Insert your SIM card into the SIM holder.
5. Slide the SIM holder back into the router.

6 Following video tutorial shows how to insert sim cards from 0:50 to 1:16: https://www.youtube.com/watch?v=jSVu31DoiMk

7 Turn on the router by connecting back its power cable.

8 Once the status light is green, connect to the router wifi.

- Name: Unit ID wifi. E.g., S1909-00021 wifi
- Pw: P0wr2wifi (same to all of the POWR2 HES units)

9 Once you are connected to the router wifi, open the following link on a browser:

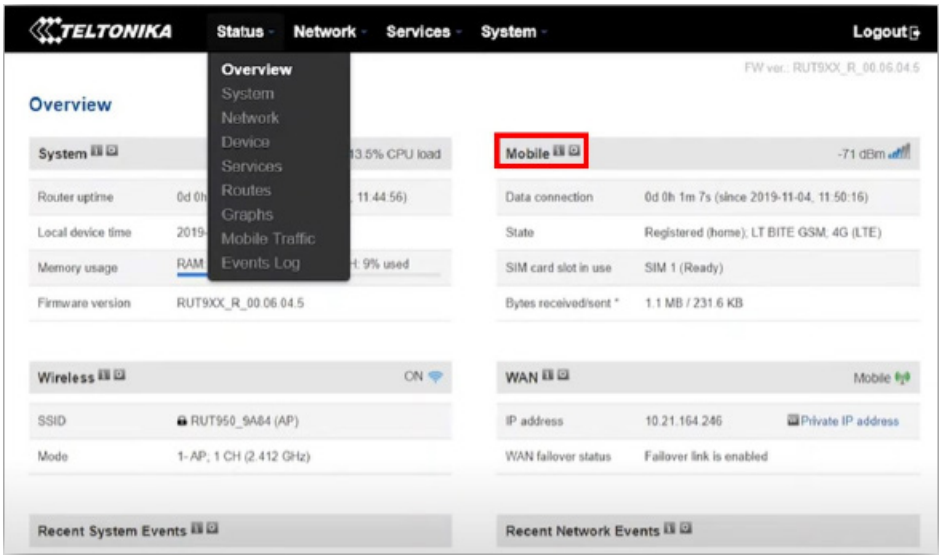
- 192.168.1.1

10 Login details:

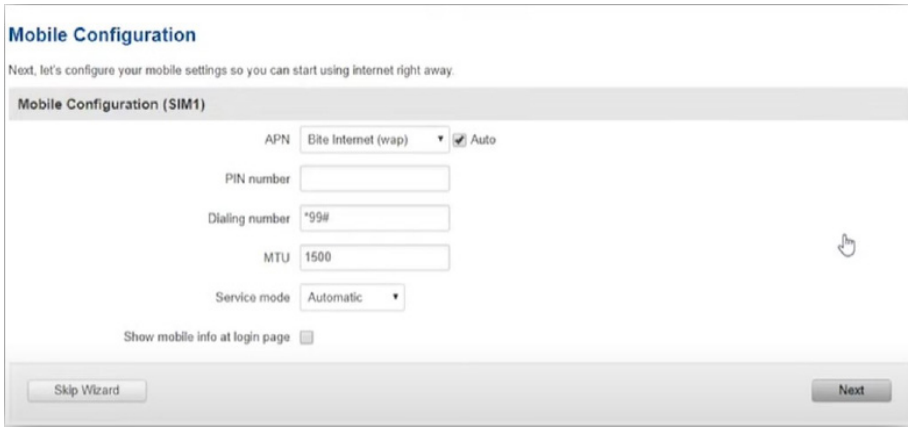
- Username: admin
- Pw: P0wr2wifi

For firmware earlier than v7.02.1

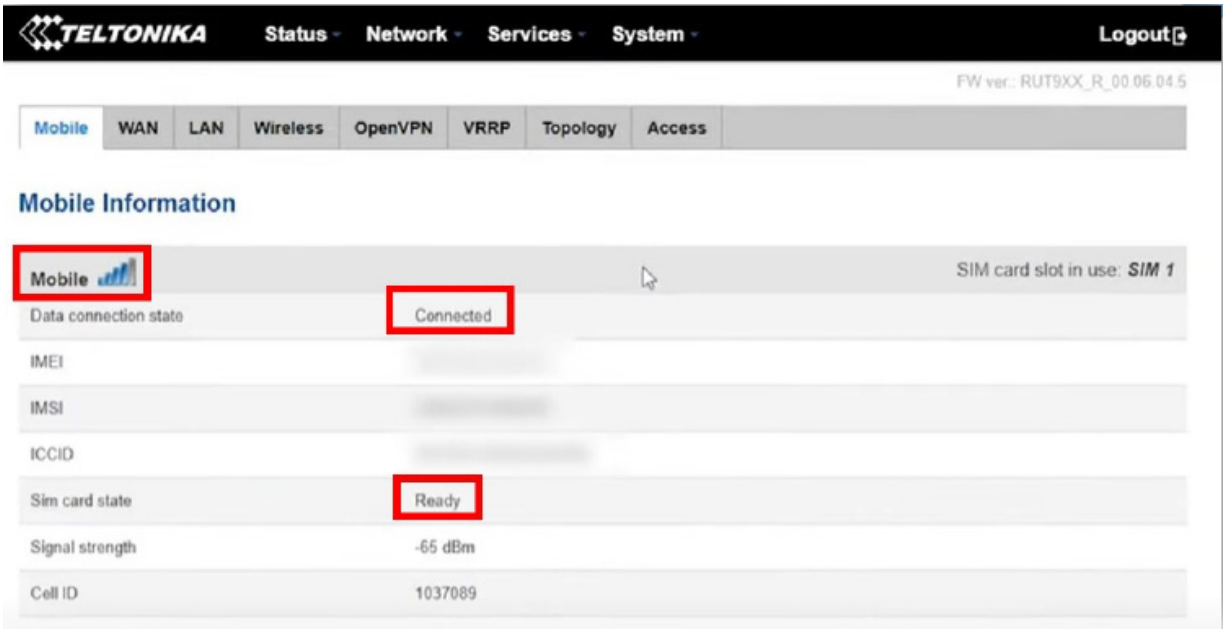
11 Go to Status / Overview and click on the gear icon on “Mobile” section. Alternatively, you can access through Network / Mobile.



12 Enter the APN details of your SIM card.



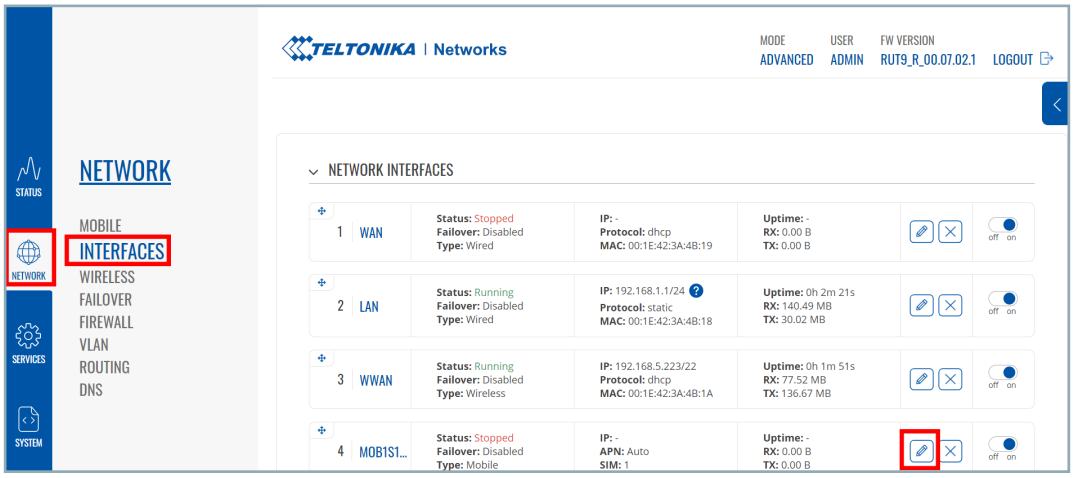
13 Check the router is online by going to Status / Network / Mobile



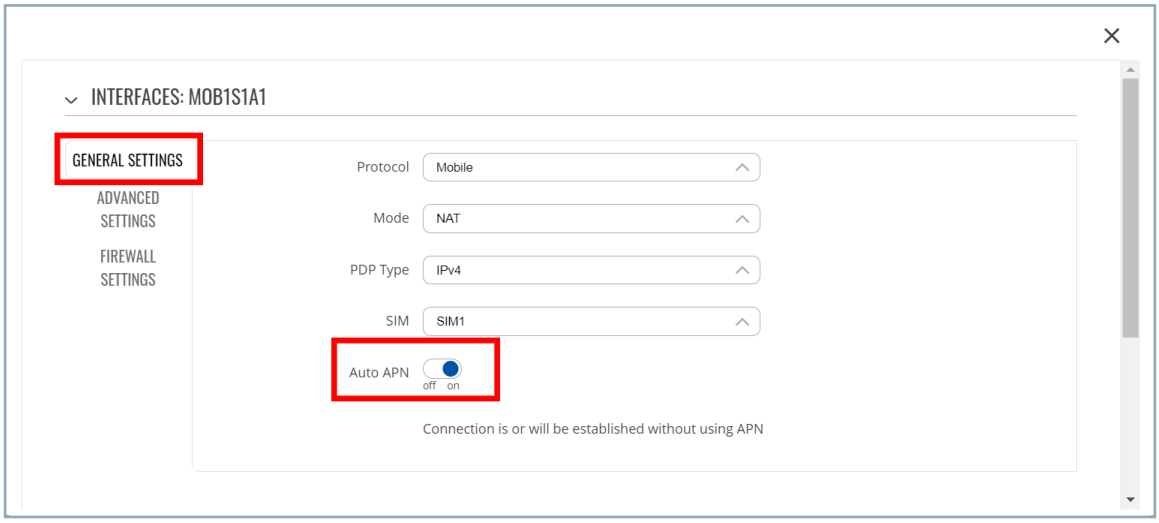
14 At this point you should be able to navigate through internet using router wifi.

For firmware v7.02.1 or later

1 Go to Network / Interfaces / MOB1S1A1 and click on “Edit”



2 Under general settings, enter the settings of your SIM card and select Auto APN “on”



3 At this point you should be able to navigate through internet using router wifi.

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