Home Battery Backup

User Manual

HPS1022-AHL0210
HPS1522-AHL0310
HPS2522-AHL0610

EN

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Important Safety Instructions

Please reserve this manual for future review.

This manual contains all the safety, installation, and operation instructions for the HPS-AHL series Home Battery Backup ("HPS-AHL" referred to as this manual).

1. Explanation of symbols

To enable users to use the product efficiently and ensure personal and property safety, please read the related words carefully when you encounter the following symbols in the manual.

Symbol	Definition
Tip	Indicates any practical advice for reference
	IMPORTANT: Indicates a critical tip during the operation, if ignored, may cause the device to run in error.
	CAUTION: Indicates potential hazards, if not avoided, may cause the device damage.
	WARNING: Indicates the danger of electric shock, if not avoided, would cause casualties.
	WARNING HOT SURFACE: Indicates the risk of high temperature, if not avoided, would cause scalds.
	Read the user manual carefully before any operation.

WARNING:	The entire system should be installed by professional and technical personnel.

2. Requirements for professional and technical personnel

- Professionally trained.
- Familiar with related safety specifications for the electrical system.
- Read this manual carefully and master related safety cautions.

3. Professional and technical personnel is allowed to do

- Install the HPS-AHL to a specified location.
- Conduct trial operations for the HPS-AHL.
- Operate and maintain the HPS-AHL.

4. Safety cautions before installation

CAUTION	When receiving the HPS-AHL, please check if there is any damage in transportation. If you find any problem, please contact the transportation company or our company in time.
CAUTION	• When installing or moving the HPS-AHL, follow the instructions in the manual. • When installing the HPS-AHL, end-users must evaluate whether the operation area exists arc danger.
WARNING	• Keep the HPS-AHL out of the reach of children. • The HPS-AHL is only allowed for stand-alone operation. Connecting multiple units' AC output in parallel or series is prohibited. Otherwise, the HPS-AHL may be damaged.

5. Safety cautions for mechanical installation

WARNING	• Before installation, confirm the HPS-AHL has no electrical connection. • Ensure enough heat dissipation space for the HPS-AHL before installation. • Do not install the HPS-AHL in humid, high salt spray, corrosion, greasy, flammable, explosive, dust accumulative, or other severe environments. • Ensure the ground is flat and place the HPS-AHL horizontally.

6. Safety cautions for electrical connection

CAUTION	• Check whether wiring connections are tight to avoid the danger of heat accumulation due to loose connections. • The HPS-AHL shell shall be connected to the ground. The cross-section of the connection wire should not be less than $4mm^2$ • A fast-acting fuse or breaker, whose rated current is twice the HPS-AHL rated input current, should be used between the external battery and the HPS-AHL. **The external and internal batteries can be connected in parallel when their voltage are the same.**
WARNING	• The AC output terminal is only for the load connection. Do NOT connect it to another power source or Utility. Otherwise, the HPS-AHL will be damaged. Turn off the HPS-AHL before connecting the loads. And then, turn on the HPS-AHL again after connecting the loads successfully. • It is strictly forbidden to connect a transformer or a load with a surge power (VA) exceeding the overload power at the AC output port. Otherwise, damage will be caused to the HPS-AHL.

	• The loads' capacity of the HPS-AHL is limited by the discharge characteristics of the lithium battery, and the final interpretation belongs to our company. • Both the utility input and AC output are of high voltage, do not touch the wiring connection to avoid electric shock.

7. Safety cautions for HPS-AHL operation

WARNING HOT SURFACE	When the HPS-AHL works, the shell will generate much heat, and the temperature is very high. Please do not touch it, and keep it far from the equipment susceptible to high temperature.
CAUTION	• When the HPS-AHL is working, please do not open the HPS-AHL cabinet to operate. • When eliminating the fault that affects the safety performance of the HPS-AHL or disconnecting the DC input, turn off the HPS-AHL switch and operate it after the LCD is completely OFF.

8. The dangerous operations would cause an electric arc, fire, or explosion.

- Touch the wire end that hasn't been insulation treated and may be electriferous.
- Touch the wiring copper row, terminals, or internal modules that may be electriferous.
- The connection of the power cable is loose.
- Screw or other spare parts inadvertently falls into the HPS-AHL.
- Improper operations are carried out by untrained non-professional or technical personnel.

WARNING	Once an accident occurs, it must be handled by professional and technical personnel. Improper operations would cause more serious accidents.

9. Safety cautions for stopping the HPS-AHL

- First, turn off the AC output and disconnect the utility input breakers. Then, turn off the DC switch.
- After the input and output wires are disconnected for ten minutes, the internal conductive modules can be touched.
- No maintenance parts in the HPS-AHL. If maintenance service is required, please get in touch with our after-sales service personnel.

WARNING	Do NOT touch or open the shell after the HPS-AHL is powered off within ten minutes.

10. Safety cautions for maintenance

- It is recommended to check the HPS-AHL with testing equipment to ensure there is no voltage and current.
- When conducting the electrical connection and maintenance, post a temporary warning sign or put up barriers to prevent unrelated personnel from entering the electrical connection or maintenance area.
- Improper maintenance of the HPS-AHL may cause personal injury or equipment damage;
- It is recommended to wear an antistatic wrist strap or avoid unnecessary contact with the circuit board.

CAUTION	The safety mark, warning label, and nameplate on the HPS-AHL should be visible, not removed or covered.

Disclaimers

The warranty does not apply to the following conditions:

- Damage caused by improper use or inappropriate environment (such as the humid, high salt spray, corrosion, greasy, flammable, explosive, dust accumulative, or other severe environments).
- The actual current/voltage/power exceeds the limit value of the HPS-AHL.
- Damage caused by working temperature exceeding the rated range.
- Arc, fire, explosion, and other accidents caused by failure to follow the HPS-AHL stickers or manual instructions.
- Unauthorized dismantling or attempted repair.
- Damage caused by force majeure.
- Damage occurred during transportation or handling.

1 General Information

1.1 Overview

HPS-AHL series, upgrade home battery backup that support utility charging, oil generator charging, solar charging, utility output, inverter output, and energy management. With a built-in LiFePO4 lithium battery, the HPS-AHL home battery backup can meet customers' energy storage needs.

The DSP chip with an advanced control algorithm brings high response speed, reliability, and conversion efficiency.

Multiple charging and output modes to suit different scenarios.

Three-stage charging method (Bulk Charging, Constant Charging, and Float Charging) is adopted to ensure battery safety.

The large lattice LCD shows the operational status and full parameters.

The communication interface with the standard Modbus protocol allows end-users to expand their applications and is suitable for different monitoring requirements.

The new optimized MPPT tracking technology can fast-track the PV array's Max. power point in various situations and obtain the maximum energy in real time.

Adopting the advanced control algorithm, the AC to DC charging process brings the full digital PFC and dual closed-loop voltage-current control. It enables the input power factor close to 1 and improves the control accuracy.

The fully smart digital DC to AC inverting process adopts the advanced SPWM technology, outputs a pure sine wave, and converts the DC power to AC power. It is suitable for household appliances, power tools, industrial equipment, audio systems, and other electronics.

Multiple DC output ports can connect different DC loads, including 5VDC/3A port*2pcs and 12VDC/2A port*2pcs. In addition, two USB-C dedicated ports (5VDC/3A and 100W PD) meet the fast charging of mobile phones and notebooks.

End-users can choose energy sources according to actual needs to maximize solar energy utilization and flexibly take the Utility as a supplement in the hybrid system. This HPS-AHL home battery backup provides high-quality, high-stability, and high-reliability electric energy to the end-users by improving the solar system's power supply efficiency.

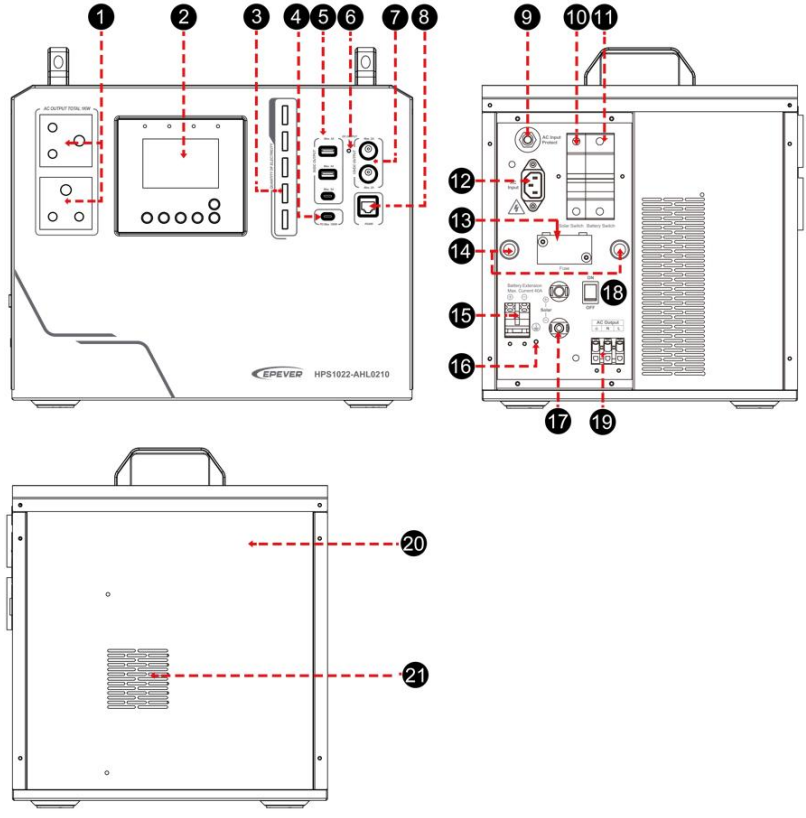
Features

- Circuit breaker on battery output for battery safety.
- Advanced MPPT technology, with Max. tracking efficiency higher than 99.5%.
- Circuit breaker on PV input for equipment safety.

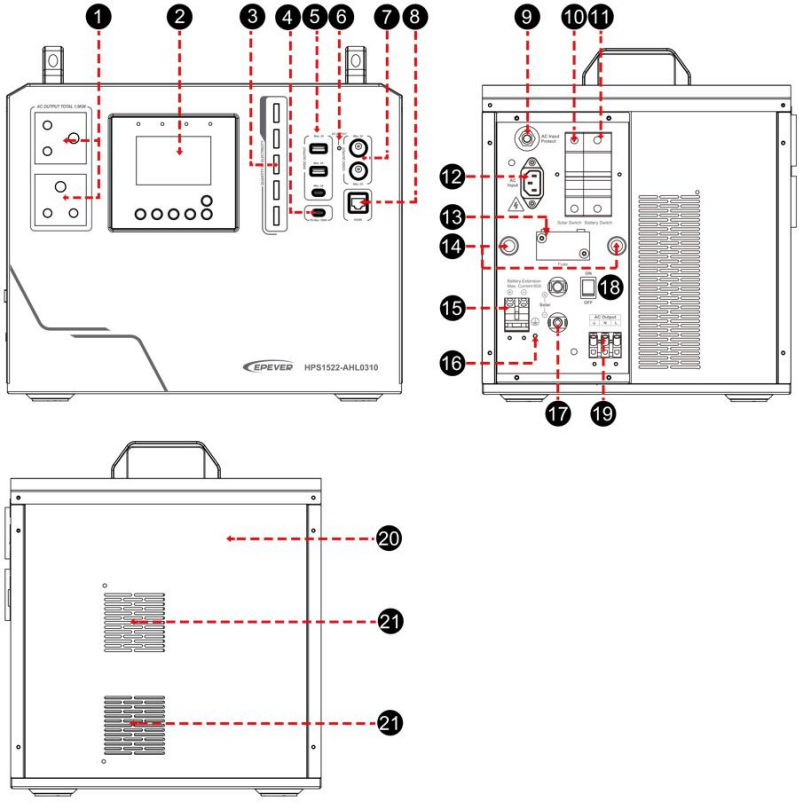
- AC input overload relay for disconnecting from the power grid when the fault occurs.
- PFC technology reduces the demand on the power grid capacity.
- Bidirectional high-frequency transformer isolation topology.
- Load continuous operates at full power for a long time.
- Pure sine wave output.
- EMC design on AC output to avoid interference with AC load.
- Large-sized LCD display for better status monitoring.
- Intuitive display of battery SOC via 5-bar indicator lights.
- Multiple DC output ports (5VDC/3A ports, 12VDC/2A ports, USB-C ports).
- RS485 communication interface with optional 4G, Wi-Fi, or TCP modules for remote monitoring.
- Built-in Bluetooth to adjust settings through EPEVER APP.
- Built-in LiFePO4 lithium battery.
- Comprehensive electronic protection.
- Excellent dust-proof performance with separate compartment design.

1.2 Appearance

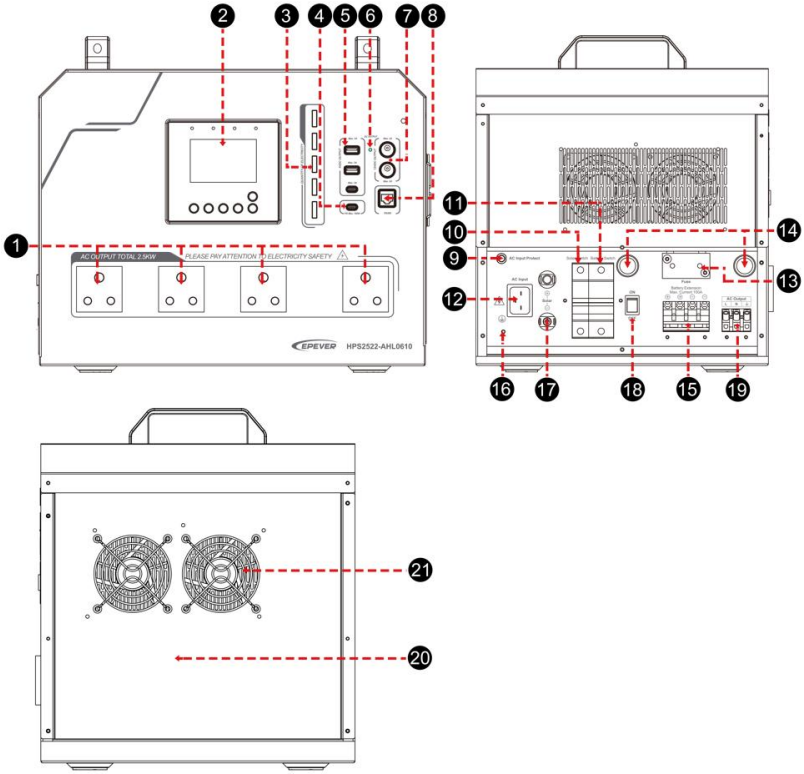
- **HPS1022-AHL0210**



- **HPS1522-AHL0310**



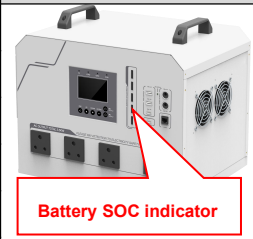
- **HPS2522-AHL0610**



No.	Instruction	No.	Instruction
❶	AC outlet	❿	PV input circuit breaker[4]
❷	LCD (see chapter 3)	⓫	Battery output circuit breaker[5]
❸	Battery SOC indicator[1]	⓬	AC input port
❹	USB-C port (100W PD)	⓭	Extension battery fuse[6]
❺	5VDC/3A output port *3	⓮	Outlet holes
❻	DC output indicator	⓯	Extension battery terminal
❼	12VDC/2A output port *2	⓰	Grounding terminal
❽	RS485 com. port[2]	⓱	PV input terminals
❾	Utility bypass overload relay[3]	⓲	Power switch

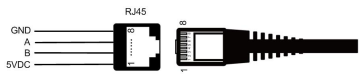
No.	Instruction	No.	Instruction
⑲	AC output terminal	㉑	Cooling fan
⑳	Battery container[7]		

（1） **Battery SOC indicator:** There are 5-bar LED indicators on the front of the HPS-AHL home battery backup, indicating the battery SOC of charging and discharging.

Charging SOC	Discharging SOC	SOC indicator	Location
0~9%	0~4%		
10%~19%	5%~14%		
20%~39%	15%~34%		
40%~59%	35%~54%		
60%~79%	55%~74%		
80%~100%	75%~100%		

Note: Enter the "Set Data Navigation" interface to set the "LED Switch" to "OPEN." If the "LED switch" is set to "CLOSE," the battery SOC indicator will not perform the above actions. For specific parameter settings; please refer to chapter 3.5.1 Parameters list.

（2） **Pin definition for the RS485 com. Port (RJ45):**



Pin	Definition	Pin	Definition
1	+5VDC	5	RS485-A
2	+5VDC	6	RS485-A
3	RS485-B	7	GND
4	RS485-B	8	GND

（3） **Specifications for the Utility bypass overload relay:** 7.5A/250VAC (HPS1022-AHL0210), 15A/250VAC (HPS2522-AHL0610/ HPS1522-AHL0310)

（4） **Specifications for the PV input circuit breaker:** 32A/220VDC (HPS1022-AHL0210/ HPS1522-AHL0310), 63A/125VDC (HPS2522-AHL0610)

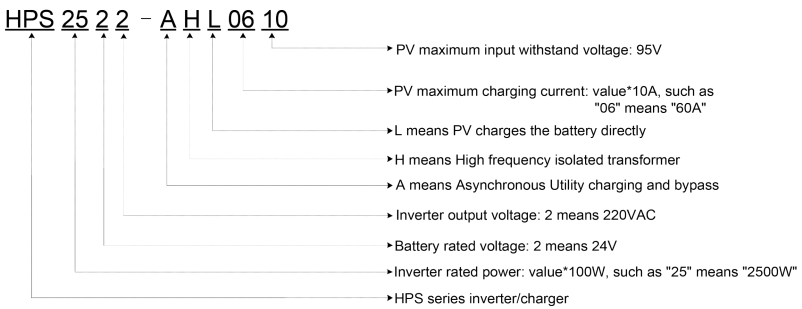
（5） **Specifications for the battery output circuit breaker:** 63A/60VDC (HPS1022-AHL0210),

80A/60VDC (HPS1522-AHL0310), 125A/60VDC (HPS2522-AHL0610)

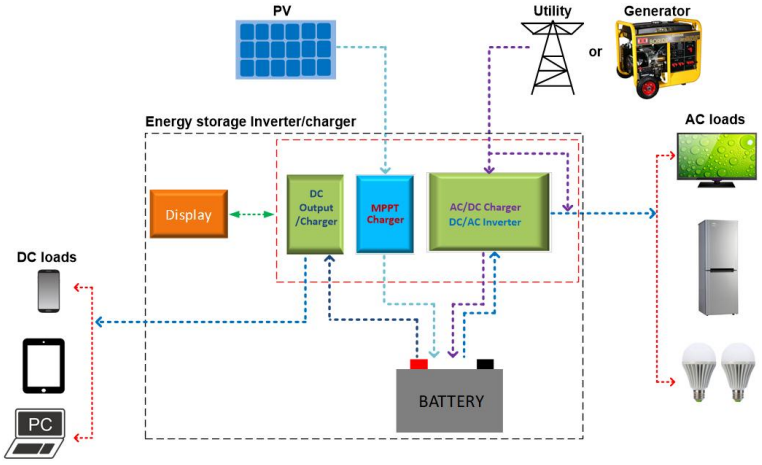
（6） The extension battery fuse is used in the positive pole between the extension battery and the internal battery, aiming to prevent damage to the HPS-AHL due to excessive current when the batteries are connected in parallel. Specification: 50A/32VDC (HPS1022-AHL0210), 80A/32VDC (HPS1522-AHL0310), 125A/32VDC (HPS2522-AHL0610)

（7） **The built-in battery is strictly prohibited from being replaced by end-users themselves. If replacement is necessary, it must be carried out by professionals. The operation guide video for replacing the battery can be found on the EPEVER official website.**

1.3 Naming Rules



1.4 Connection Diagram



CAUTION	There are many types of oil generators with complex output conditions, which must be tested before use.

2 Installation

2.1 Attention

- Please read the manual carefully to familiarize yourself with the installation steps.
- The HPS-AHL does not need to be fixed (placed on the ground directly). And the placed location is required to be no water, flat, strong, and clean.
- Ventilation is highly recommended if mounted in an enclosure.
- Ensure all switches and breakers are disconnected before wiring. Operate the HPS-AHL after checking that all wiring is correct.
- Loose connections and corroded wires may produce high heat that can melt wire insulation, burn surrounding materials, or even cause a fire. Ensure tight connections, use cable clamps to secure cables, and prevent them from swaying in motion.
- Select the system connection cables according to the current density no greater than 5A/mm^2.
- For outdoor using, avoid the direct sunshine and rain infiltration. Do not use the HPS-AHL in humid, high salt spray, corrosion, greasy, flammable, explosive, dust accumulative, or other severe environments.
- After turning off the switch, high voltage still exists inside the HPS-AHL. Do not open or touch the internal modules; wait ten minutes before conducting related operations.
- There is no reverse polarity protection for the external battery. Please ensure the correct polarity before connecting the external battery.
- Utility input and AC output are high voltage. Please do not touch the wiring connection.
- When the fan is working, please do not touch it to avoid injury.

2.2 Wire Size and Circuit Breaker

The wiring and installation methods must conform to all national and local electrical code requirements.

➢ **Recommended PV wire size**

Since the PV output current varies with the PV module's size, connection method, or sunlight angle, the minimum wire size can be calculated by the PV Isc (Max. short circuit current). Please refer to the Isc value in the PV module's specifications. When the PV modules are connected in series, the total Isc equals any PV module's Isc. When the PV modules are connected in parallel, the total Isc equals the sum of the PV module's Isc. The PV array's Isc must not exceed the maximum PV input current. For Max. PV input current and Max. PV wire size, please refer to the table below:

Model	PV wire size
HPS1022-AHL0210	4mm²/11AWG
HPS1522-AHL0310	4mm²/11AWG
HPS2522-AHL0610	10mm²/7AWG

CAUTION	When the PV modules are connected in series, the total voltage must not exceed the PV maximum input withstand voltage 95VDC (at minimum operating environment temperature).

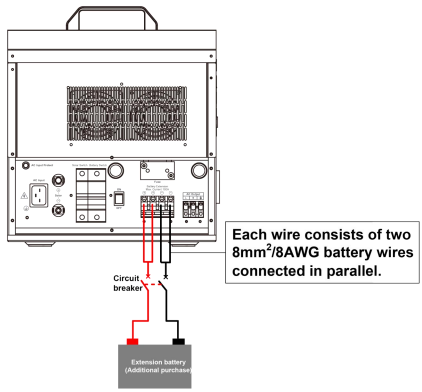
➢ **Recommended Utility wire size**

Model	Utility wire size
HPS1022-AHL0210	2.5mm²/13AWG
HPS1522-AHL0310	2.5mm²/13AWG
HPS2522-AHL0610	4mm²/11AWG

➢ **Recommended extension battery wire and breaker size**

Model	Extension battery wire size	Circuit-breaker size
HPS1022-AHL0210	8AWG	2P—63A/60VDC
HPS1522-AHL0310	8AWG	2P—80A/60VDC
HPS2522-AHL0610★	8AWG	2P—125A/60VDC

★ **HPS2522-AHL0610 is designed with a 4P battery terminals (2P for positive pole, and 2P for negative pole). According to the recommended external battery wire size, two 8mm²/8AWG battery wires connected in parallel is need for each terminal.**



CAUTION	The recommended battery breaker size is selected when the battery terminals are not connected to any additional inverter. **The external and internal batteries can be connected in parallel when their voltage are the same.**

➢ **Recommended AC output wire size**

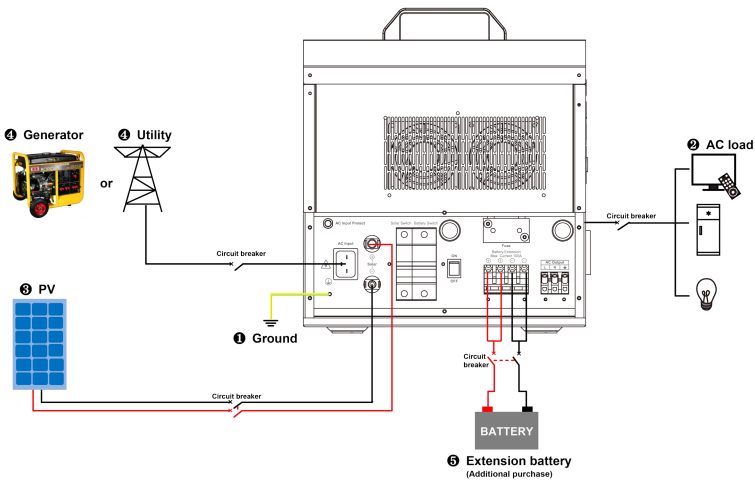
Model	Recommended AC output wire size
HPS1022-AHL0210	2.5mm²/13AWG
HPS1522-AHL0310	2.5mm²/13AWG
HPS2522-AHL0610	4mm²/11AWG

CAUTION	• The wire size is only for reference. Suppose a long distance exists between the PV array, the HPS-AHL, and the battery. In that case, larger wires shall be used to reduce the voltage drop and improve the system's performance. • The above wire and circuit breaker sizes are for reference only; please choose a suitable wire and circuit breaker according to the actual situation.

2.3 Connect the Home Battery Backup

Connect the HPS-AHL home battery backup in the order of "❶Ground > ❷load > ❸PV array > ❹Utility or generator > ❺optional accessories", and disconnect the HPS-AHL home battery backup in the reverse order.

The following wiring sequence is illustrated in the appearance of "HPS2522-AHL0610." For wiring positions of other models, please refer to the actual product appearance.

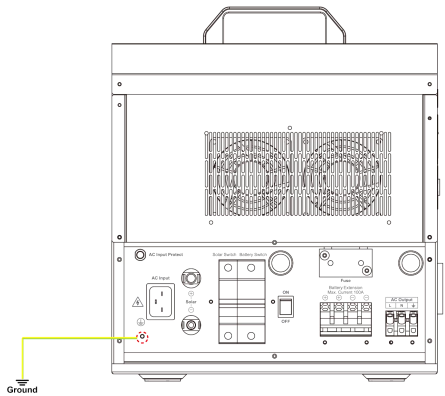


1. Grounding

The HPS-AHL has a dedicated grounding terminal, which must be grounded correctly and reliably. The

grounding wire size must be consistent with the recommended AC output wire specification. The grounding connection point shall be as close as possible to the HPS-AHL, and the total grounding wire shall be as short as possible.

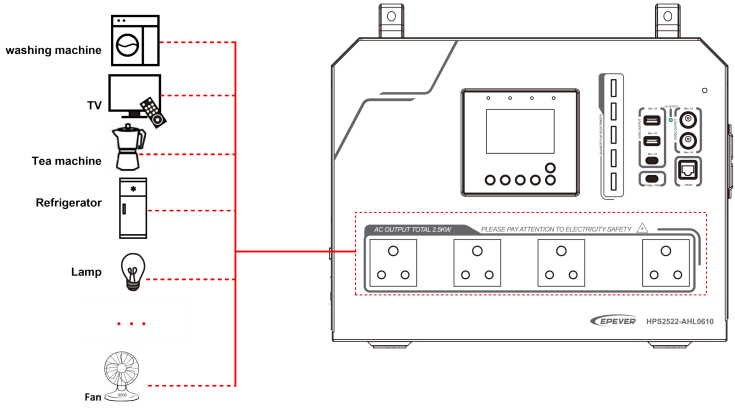
No grounding	☒ Do not ground the battery terminals.
	☒ Do not ground the PV terminals.
	☒ Do not ground the AC input L and N terminals between the HPS-AHL and the household power distribution cabinet.
	☒ Do not ground the AC output L and N terminals.
Grounding	☑ The cabinet of the HPS-AHL is connected to earth through the earth rail, along with the AC input and output's PE (Protective Earth) terminal.



2. Connect the AC loads

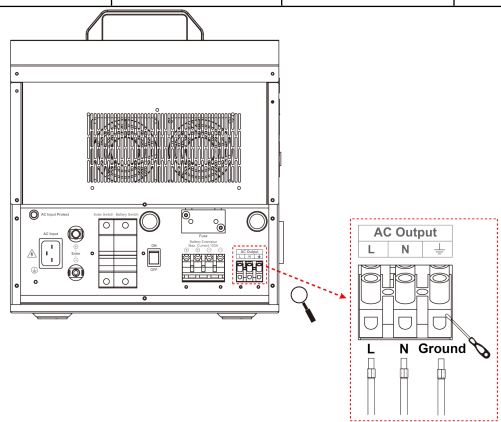
WARNING	• Risk of electric shock! When wiring the AC load, please disconnect the circuit breaker and ensure that the poles' leads are connected correctly. • The AC loads shall be determined by the continuous output power of the HPS-AHL. The AC load's surge power must be lower than the instantaneous surge power of the HPS-AHL, or the HPS-AHL will be damaged. • If inductive loads such as motors, or a bidirectional transfer switch is connected to the AC output terminal, a separate over-voltage and over-current protector (VA-Protector) needs to be installed at the AC output terminal. • The total power of all AC outputs must not exceed the rated value of the product silk-screen.

A. Connect the AC loads by AC outlets



B. Connect the AC load by the AC output terminal

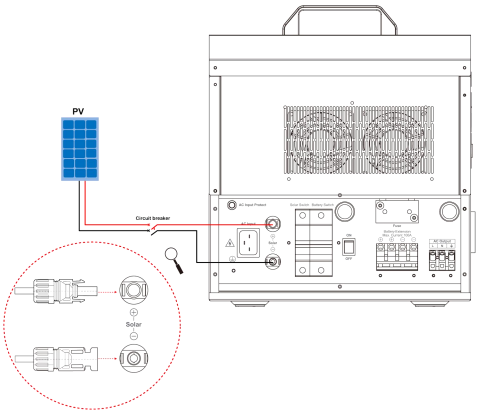
Silk-screen	Abbreviation	Name	Color
L	LINE	Live wire	Brown/black
N	Neutral	Neutral line	Blue
⏚	PE	Ground line	Yellowish-green



Note: The AC output terminal on the back of the product is suitable for AC loads that are not frequently unplugged.

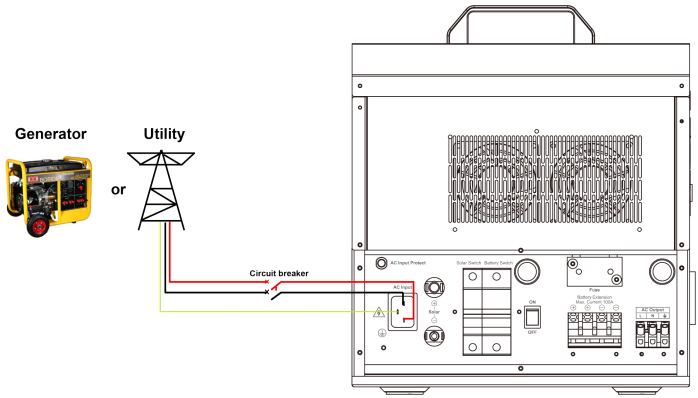
3. Connect the PV modules

WARNING	Risk of electric shock! The PV array can generate dangerous high-voltage! Disconnect the circuit breaker before wiring, and ensure that the leads of "+" and "-" poles are connected correctly.
CAUTION	Suppose the HPS-AHL home battery backup is used in an area with frequent lightning strikes. In that case, it is recommended to install an external surge arrester.



4. Connect the Utility or generator

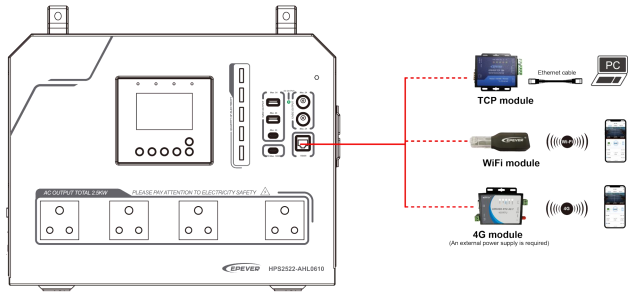
WARNING	• Risk of electric shock! The Utility input can generate dangerous high-voltage! Disconnect the circuit breaker or fast-acting fuse before wiring, and ensure that the poles' leads are connected correctly. • After the Utility is connected, the PV and battery cannot be grounded. In contrast, the HPS-AHL cover must be grounded reliably (to shield the outside electromagnetic interference effectively and prevent the cover from causing electric shock to the human body).
CAUTION	There are many types of oil generators with complex output conditions, which must be tested before use.



5. Connect optional accessories

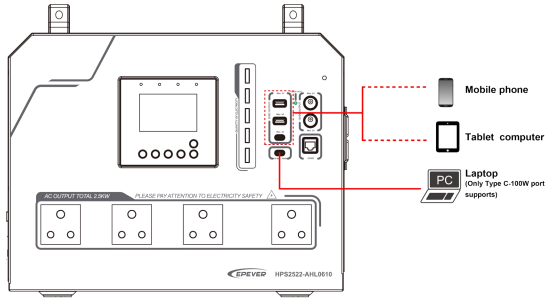
A. Connect the communication module

Connect the TCP module, WiFi module, or 4G module to the RS485 com. port (when connecting the 4G module, an external power supply is required). End-users can remote monitor the HPS-AHL or modify related parameters on the phone APP. For detailed settings, refer to the WiFi module or 4G module user manual.



Note: The HPS-AHL is designed with a built-in Bluetooth module. After turning on the phone Bluetooth switch, the end-users can remotely monitor the HPS-AHL or set the parameters through the APP. For detailed settings, refer to the Solar Guardian APP user manual.

B. Connect the mobile phone, or PC

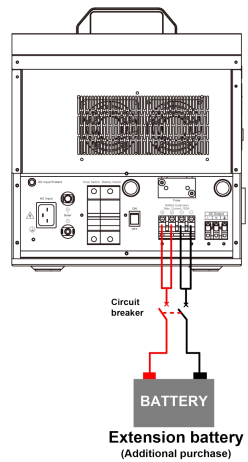


Charging the mobile phone, tablet computer, or laptop by the 5VDC/3A or USB-C (100W PD) port.

Note: Only the USB-C (100W PD) port can charge the laptop.

C. Connect the extension battery

CAUTION	• Please disconnect the circuit breaker before wiring the external battery and ensure that the leads of the "+" and "-" poles are polarity correctly. • A circuit breaker must be installed on the external battery side. For selection, please refer to chapter 2.2 Wire size and circuit breaker. **The external and internal batteries can be connected in parallel when their voltage are the same.**



2.4 Operate the Home Battery Backup

Step 1: Double-check whether the wire connection is correct.

Step 2: Connect the battery circuit breaker.

Step 3: Turn on the HPS-AHL switch. The LCD will be lit ON, which means the HPS-AHL works normally.

WARNING	• Connect the battery circuit breaker first. After the HPS-AHL normally works, connect the PV circuit breaker and the utility input plug. Otherwise, we won't assume any responsibility for not following the operation. • The AC output is ON by default after the HPS-AHL is powered. Before connect the battery circuit breaker, ensure the AC output is connected to loads correctly, and no safety hazard exists.

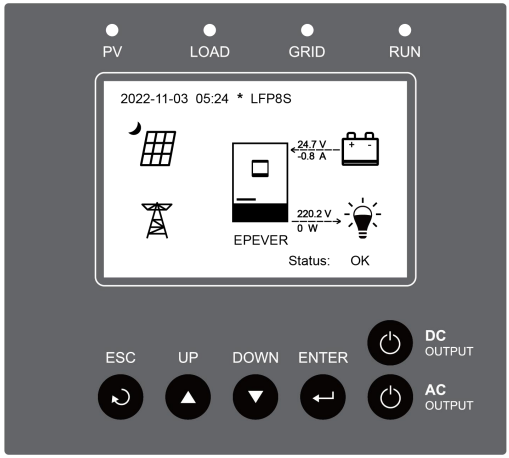
Step 4: Set parameters by the buttons.

Step 5: Use the HPS-AHL home battery backup.

Connect the load circuit breaker, the PV circuit breaker, and the utility input plug in sequence. After the AC output is normal, turn on the AC loads one by one. Do not turn on all the loads simultaneously to avoid protection action due to a large transient impulse from the current. The HPS-AHL will perform normal work according to the set working mode. See chapter 3.4 Interface.

CAUTION	• When supplying power for different AC loads, turning on the load with a larger impulse current is recommended first. After the load output is stable, turn on the load with a smaller impulse current later. • If the HPS-AHL cannot work properly or the LCD/indicator shows an abnormality, please refer to chapter 6 Troubleshooting or contact our after-sales personnel.

3 LCD



Note: The display screen can be viewed clearly when the angle between the end-user's horizontal sight and the display screen is within 90°. If the angle exceeds 90°, the information on the display screen cannot be viewed clearly.

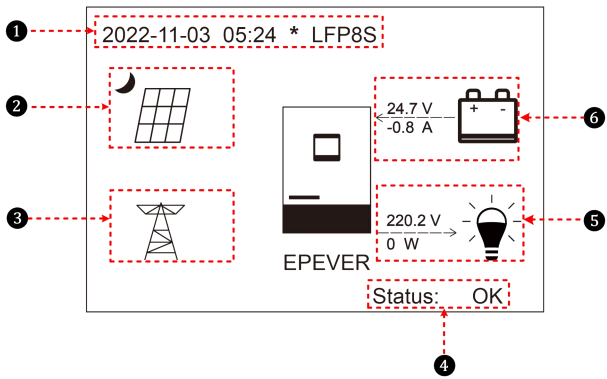
3.1 Indicators

Indicator	Status	Instruction
PV	OFF	No PV input, or PV connection normal but no charging
	Green ON	PV charging normal
	Red ON	PV charging fault
LOAD	OFF	No inverter output
	Green ON	Inverter output normal or the bypass is normal
	Red ON	Inverter fault
GRID	OFF	No utility input or utility fault
	Green ON	Utility charging the battery or supplying power to the load
	Green flashing (1Hz)	Oil generator charging the battery or supplying power to the load
	Red ON	Utility charging fault
RUN	Green flashing (1Hz)	Normal communication
	Red flashing (1Hz)	Communication fault

3.2 Buttons

Buttons	Operation	Instruction
ESC	Click	• Exit the current interface • Switch from the "home screen" to the "Main Table Data Information" screen.
UP / DOWN	Click	• Click on the parameter browse interface to scroll up or scroll down • Click on the parameter setting interface to increase or decrease the parameter per step size.
	Press and hold	Press and hold on the parameter setting interface to increase or decrease the parameter per ten times the step size.
ENTER	Click	• Click on the Home screen to enter the real-time data screen. • Click on the parameter browse interface to enter the parameter setting interface. • Confirm the setting parameter
	Press and hold	Press and hold on the home screen to enter the password interface. After verifying the password, enter the browse interface of setting parameters.
DC OUTPUT	Press and hold	Press and hold on the home screen to turn on/off the DC output (USB-C output etc.)
AC OUTPUT	Press and hold	Press and hold on the home screen to turn on/off the inverter output, the utility charging, or the utility bypass.

3.3 Home Screen



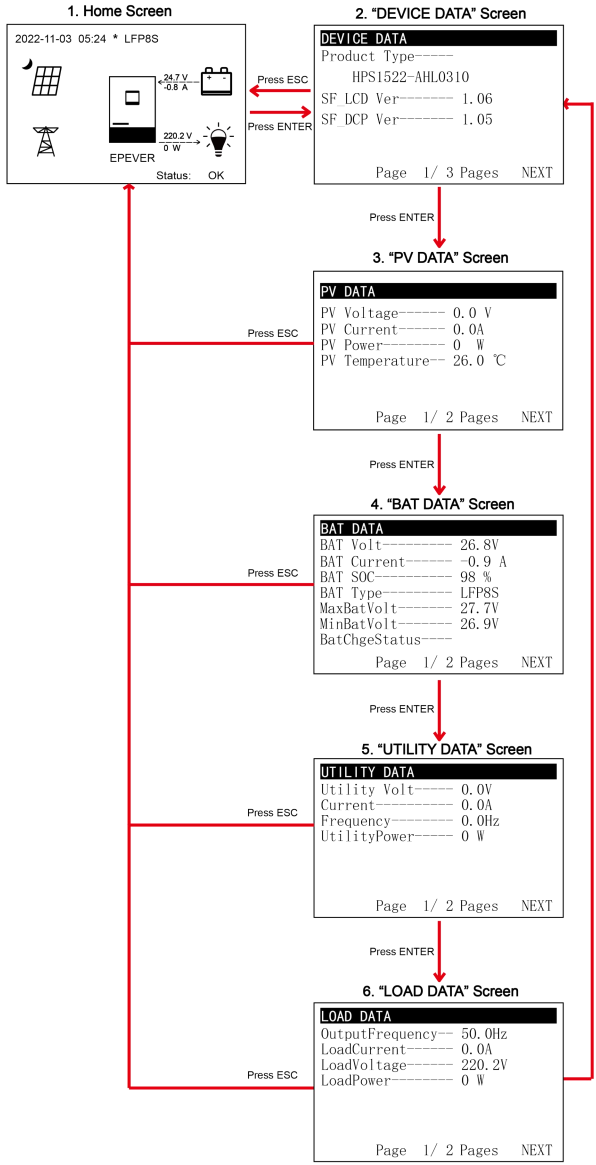
No.	Instruction
❶	Display the system time, current battery type, and charging stage. ✻ means a parameter has been modified.
❷	PV icon: PV connection is normal. No PV connection (or at night).
	Actual PV voltage / total PV power
❸	Utility icon: Utility connection is normal. No utility connection.
	Utility input voltage / Utility input power
❹	Status: When there are no faults, it displays "OK." When faults occur, it displays the minimum fault code. Note: On the home screen, click the "UP/DOWN" button to select the "Status" bar, and click the "ENTER" button to check the detailed fault.
❺	Load icon: AC output is normal. No AC output.
	AC output voltage / AC output power
❻	Battery status: ◄-------- The battery is discharging. --------► The battery is being charged.
	Battery voltage / battery current

Note: If the HPS-AHL is disconnected for a long time, the system time will automatically return to the factory default value. Please set the correct system time before using it again.

3.4 Interface

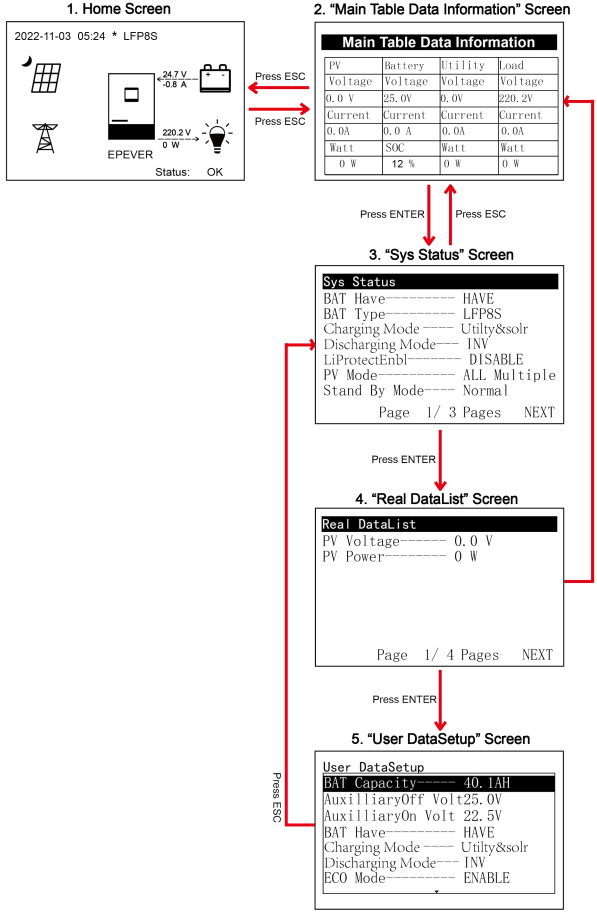
3.4.1 Real-time Data Interface

After powering on the HPS-AHL, the home screen shows up. Click the "ENTER" button to enter the real-time data screen. Click the "ENTER" button to enter the next real-time interface, or click the "ESC" button to return the home screen.


1. Home Screen
2022-11-03 05:24 * LFP8S
24.7 V
-0.8 A
220.2 V
0 W
EPEVER
Status: OK
Press ESC
Press ENTER
2. "DEVICE DATA" Screen
DEVICE DATA
Product Type------
HPS1522-AHL0310
SF_LCD Ver-------- 1.06
SF_DCP Ver-------- 1.05
Page 1/ 3 Pages NEXT
Press ENTER
3. "PV DATA" Screen
PV DATA
PV Voltage------- 0.0 V
PV Current------- 0.0A
PV Power--------- 0 W
PV Temperature-- 26.0 ℃
Page 1/ 2 Pages NEXT
Press ESC
Press ENTER
4. "BAT DATA" Screen
BAT DATA
BAT Volt---------- 26.8V
BAT Current------- -0.9 A
BAT SOC----------- 98 %
BAT Type---------- LFP8S
MaxBatVolt-------- 27.7V
MinBatVolt-------- 26.9V
BatChgeStatus-----
Page 1/ 2 Pages NEXT
Press ESC
Press ENTER
5. "UTILITY DATA" Screen
UTILITY DATA
Utility Volt------ 0.0V
Current----------- 0.0A
Frequency--------- 0.0Hz
UtilityPower------ 0 W
Page 1/ 2 Pages NEXT
Press ESC
Press ENTER
6. "LOAD DATA" Screen
LOAD DATA
OutputFrequency-- 50.0Hz
LoadCurrent------- 0.0A
LoadVoltage------- 220.2V
LoadPower--------- 0 W
Page 1/ 2 Pages NEXT
Press ESC
Press ENTER

3.4.2 User Interface

After powering on the HPS-AHL, the home screen shows up. Click the "ESC" button to enter the "Main Table Data Information" screen. Click the "ENTER" button to enter the next interface, or click the "UP/DOWN" button to browse the current screen display.



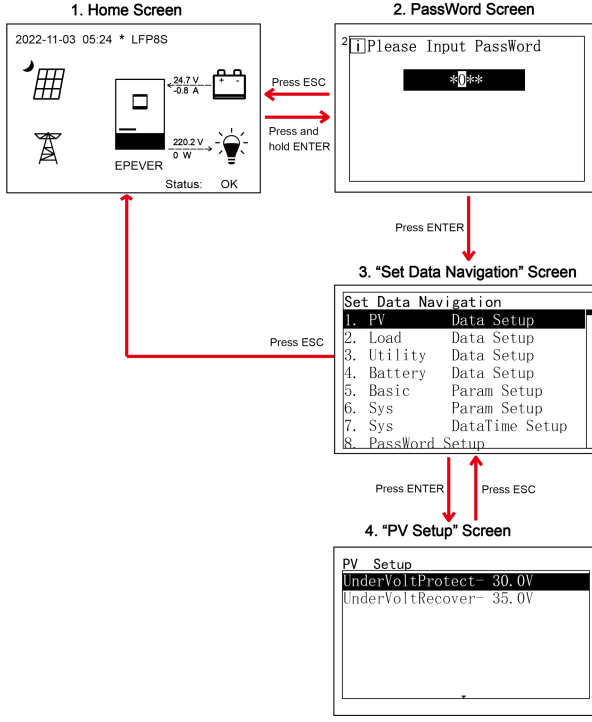
➢ **"User Data Setup" interface**

The end-users can modify common parameters on the "User Data Setup" interface without inputting the

password. The default parameters and setting range refer to chapter 3.5.1 Parameters list.

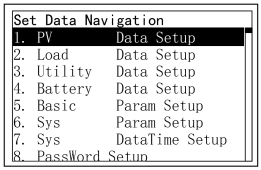
3.4.3 Administrator Interface

After powering on the HPS-AHL, the home screen shows up. Press and hold the "ENTER" button to enter the password interface. Input the password (0000 by default) correctly to check all parameters or modify them.



3.5 Parameters Setting

3.5.1 Parameters List



Enter the "Set Data Navigation" interface according to chapter 3.4.3 Administrator interface. Then click the "UP/DOWN" button to select navigation 1~9 for detail settings. Default parameters and setting ranges are shown in the following table.

Note: On the parameter setting interface, click the "UP/DOWN" button to increase/decrease the parameter value by one step size (step size is the minimum unit to modify the parameter). Press and hold the "UP/DOWN" button to increase/decrease the parameter value by ten times the step size. Press the "ENTER" button to confirm.

Parameters	Default	User define
1. PV Data Setup		
UnderVoltProtect (PV Under Voltage Protect Voltage)	30.0V	Read-only
UnderVoltRecover (PV Under Voltage Recover Voltage)	35.0V	Read-only
2. Load Data Setup		
OutputVoltLevel (Output voltage level)	220.0V	User define: 220.0V / 230.0V
OutputFrequency (Output frequency)	50Hz	User define: 50Hz / 60Hz **Note: When the utility power is connected and the utility frequency is detected, the output frequency will be in accordance with the utility frequency.**
3. Utility Data Setup		
OverVoltDisconect (Utility over voltage disconnect voltage)	265.0V	User define: (Utility over voltage reconnect voltage +10V)~285.0V, step size: 0.1V
OverVoltReconnect (Utility over voltage reconnect voltage)	255.0V	User define: 235.0V~(Utility over voltage disconnect voltage-10V), step size: 0.1V
Low Volt Disconct (Utility low voltage disconnect voltage)	175.0V	User define: 175.0V~(Utility low voltage reconnect voltage-10V), step size: 0.1V
LowVolt Reconnect (Utility low voltage reconnect voltage)	185.0V	User define: (Utility low voltage disconnect voltage+10V)~200.0V, step size: 0.1V

Parameters	Default	User define
OverFreqDisconnect (Utility over frequency disconnect)	70.0Hz	User define: (Utility under frequency disconnect+0.5Hz)~70.0Hz, step size: 0.1Hz **Note: In the bypass state, when the actual utility input frequency is higher than this value, the HPS-AHL will be switched to the inverter output state.**
UnderFreqDisconct (Utility under frequency disconnect)	40.0Hz	User define: 40.0Hz~(Utility over frequency disconnect-0.5Hz), step size: 0.1Hz **Note: In the bypass state, when the actual utility input frequency is lower than this value, the HPS-AHL will be switched to the inverter output state.**
MaxCharge Current (Maximum Utility charging current)	60.0A	Namely, the maximum current at the battery end when the utility charges the battery. User define: 0~60.0A, step size: 0.1A (HPS2522-AHL0610)
	30.0A	User define: 0~30.0A, step size: 0.1A (HPS1522-AHL0310)
	20.0A	User define: 0~20.0A, step size: 0.1A (HPS1022-AHL0210)
4. Battery Data Setup		
BAT Set Mode (Battery set mode)	Expert	Read-only
BAT Capacity (Battery capacity)	100.0AH	User define: 0~200.0AH, step size: 0.1AH (HPS2522-AHL0610)
	60.0AH	User define: 0~120.0AH, step size: 0.1AH (HPS1522-AHL0310)
	40.0AH	User define: 0~80.0AH, step size: 0.1AH (HPS1022-AHL0210)
Boost Time (Battery boost charging time)	120 Min	User define: 10~180Mins, step size: 1Min
AuxiliaryOff Volt (Auxiliary module Off voltage)	25.0V	Under certain working modes, the utility will stop charging the battery if the battery voltage exceeds this value. User define: 21.4~30.0V, step size: 0.1V **Note: (Auxiliary module ON voltage+0.2*N) ≤ Auxiliary module Off voltage ≤ Charging limit voltage (N=Rated battery voltage/12)**

Parameters	Default	User define
Auxiliary On Volt (Auxiliary module ON voltage)	22.5V	Under certain working modes, the utility will charge the battery if the battery voltage is lower than this value. User define: 21.0~29.6V, step size: 0.1V **Note: Low voltage disconnect voltage ≤ Auxiliary module ON voltage ≤ (Auxiliary module Off voltage-0.2*N) (N=Rated battery voltage/12)**
MaxCharginCurrent (Battery Max. charging current)	60.0A	Namely, the maximum allowable charge current on the battery side. User define: 0~60.0A, step size: 0.1A (HPS2522-AHL0610)
	30.0A	User define: 0~30.0A, step size: 0.1A (HPS1522-AHL0310)
	20.0A	User define: 0~20.0A, step size: 0.1A (HPS1022-AHL0210)
LimitDisChgCurrt (Battery limit discharging current)	100.0A	User define: 10.0~100.0A, step size: 0.1A (HPS2522-AHL0610)
	108.0A	User define: 10.0~100.0A, step size: 0.1A (HPS1522-AHL0310)
	72.0A	User define: 10.0~100.0A, step size: 0.1A (HPS1022-AHL0210)
ChargeControlMode (Battery charge control mode)	SOC	User define: VOLT, SOC **VOLT:** The battery voltage control parameters take effect after setting this value as “VOLT.” **SOC:** The SOC parameters take effect after setting this value as “SOC.” **WARNING: Each time the HPS-AHL is powered on, an initial SOC value is approximated according to the internal algorithm, and this initial SOC value is not the true SOC value. The true SOC value is obtained by setting the correct battery capacity and learning through multiple charge and discharge cycles.**

Parameters	Default	User define
Full Discnnct Soc (Full energy disconnect Soc)	100%	It takes effect after the “ChargeControlMode” is set as “SOC.” When the battery SOC is higher than or equals to this value, the HPS-AHL will stop charging the battery. User define: (Full energy disconnect recover Soc+5%)~100%, step size: 1% **Note: The minimum value of this parameter can be set to 80%.**
FulDiscnctRecvSoc (Full energy disconnect recover Soc)	90%	It takes effect after the “ChargeControlMode” is set as “SOC.” When the battery SOC is lower than this value, the HPS-AHL will charge the battery. User define: 60%~(Full energy disconnect SOC -5%), step size: 1%
LwEngyDisRecvrSoc (Low energy disconnect recover Soc)	40%	It takes effect after the “ChargeControlMode” is set as “SOC.” It cannot be set separately (equals the "Low energy disconnect recover Soc").
UnderEngyAlarmSoc (Under energy alarm Soc)	25%	It takes effect after the “ChargeControlMode” is set as “SOC.” User define: 10~35%, step size: 1%
LwEgyDnctRecvrSoc (Low energy disconnect recover Soc)	40%	It takes effect after the “ChargeControlMode” is set as “SOC.” User define: 20%~60%, step size: 1%
LowEngyDiscnctSoc (Low energy disconnect Soc)	0%	It takes effect after the “ChargeControlMode” is set as “SOC.” When the battery SOC is lower than this value, the battery will stop discharging. User define: 0~5%, step size: 1%
UtiltyChargeOnSoc (Utility charging on Soc)	30%	It takes effect after the “ChargeControlMode” is set as “SOC.” User define: 20~50%, step size: 1%
UtiltyChargeOfSoc (Utility charging off Soc)	60%	It takes effect after the “ChargeControlMode” is set as “SOC.” User define: (Utility charging on Soc)~100%, step size: 1%

Parameters	Default	User define
LimitChgTemp (Limit charging temperature)	0.0℃	When the environment or the battery temperature is lower than this value, the HPS-AHL will stop charging the battery. User define: 0~10.0℃, step size: 0.1℃
LimitDisChgTem (Limit discharging temperature)	-20.0℃	When the environment or the battery temperature is lower than this value, the HPS-AHL will stop discharging. User define: -20.0℃~0℃, step size: 0.1℃
BATOverTemp (Battery over temperature protect)	50.0℃	User define: (Battery over temperature protect recover +5℃)~50.0℃, step size: 0.1 ℃
BATOverTempRecovr (Battery over temperature protect recover)	45.0℃	User define: 30.0℃~(Battery over temperature protect -5℃), step size: 0.1 ℃
5. Basic Param Setup		
BAT Have (Battery have or not)	HAVE	Only the “HAVE” mode is valid.
Charging Mode	Utily & solr	User define: Solar, SolarPrior, Utily & solr(Utility & solar) **Note: For detailed working modes, refer to chapter 4.2.**
Discharging Mode	INV (Inverter)	User define: INV (Inverter), Bypass **Note: For detailed working modes, refer to chapter 4.2.**
LiProtectEnbl (Lithium battery protection enable)	ENABLE	User define: DISABLE, ENABLE (Set this value as "ENABLE," the charge/discharge low temperature limit function is effective.)
PV Mode	ALL MULTIPLE	User define: Auto, ALL SINGLE, ALL MULTIPLE **Note: This parameter is invalid for current system.**
Stand By Mode	Normal	User define: Normal, Standby (Set this value as "Standby," the AC output will be stopped.)
ECO Mode	ENABLE	User define: DISABLE, ENABLE (Set this value as "ENABLE," the HPS-AHL will enter the low power consumption mode when certain conditions are met, such as no PV and utility, or low battery voltage, etc.)
CalibrationMode (Calibration mode)	OFF	User define: OFF, ON **Note: This parameter is invalid for current system.**

Parameters	Default	User define
FR (fault reset)	--	Exit the current fault state and resume normal operation (the parameter will not clear the historical fault records).
Load Open/Close	OPEN	Open or close the loads.This parameter and the load output switch are the same control quantity, change the state of one of them, the other will change with it. User define: CLOSE, OPEN
DisCharge Enable	OPEN	User define: CLOSE, OPEN
ClearAccum Energy (Clear accumulated energy)	--	Press the “ENTER” button to clear all accumulated charge and discharge energy.
AC Input mode	Grid	User define: Grid, Generator (When the AC input is a generator, this parameter needs to be set to "Generator" to improve the charging capability.)
DCLoadOpen/Close	Open	Read-only
Return FactorySet (Return to the factory settings)	--	Press the “ENTER” button to return the control parameters to the factory settings.
6. Sys Param Setup		
Back Light Time	Always	User define: 6S, 30S, 60S, Always
BuzzerAlert	ON	User define: OFF, ON (If set to "ON," the buzzer will sound when an error occurs and will keep silence when the error is cleared. If set to "OFF," the buzzer will not sound even if an error occurs.)
BckLightOnOff (Back Light On/Off)	ON	User define: OFF, ON (The "BckLightOnOff" has priority over "Back Light Time")
BaudRate	115200	User define: 115200, 4800, 9600, 19200, 38400, 57600
Address	1	User define: 1~254, step size: 1
BlueValid	VALID	To control the built-in bluetooth module. User define: INVALID, VALID
Temperature Unit	℃	User define: ℃, ℉
Led Switch	OPEN	Open or close the battery SOC indicator and the system status indicator. User define: OPEN, CLOSE
7. Sys DataTime Setup (See chapter 3.5.3)		
8. Password Setup (See chapter 3.5.4)		

Parameters	Default	User define
9. Bat Control Data Setup		
Bat Set Mode (Battery set mode)	Expert	Read-only
Level	24V	Read-only
BAT Type (Battery type)	LFP8S	Read-only
OverVoltDiscnect (Over voltage disconnect voltage)	30.0V	User define: (Charging limit voltage AND Over voltage reconnect voltage+0.1*N) ＜ Over voltage disconnect voltage ≤ 30.0V, step size: 0.1V **Note: N=Rated battery voltage/12.**
ChargingLimitVolt (Charging limit voltage)	28.9V	User define: Boost charging voltage＜Charging limit voltage＜Over voltage disconnect voltage (max. value can be set as 29.0V), step size: 0.1V
OverVoltReconect (Over voltage reconnect voltage)	28.9V	User define: Boost charging voltage≤Over voltage reconnect voltage＜Over voltage disconnect voltage-0.1*N, step size: 0.1V **Note: N=Rated battery voltage/12.**
EqualizeChagVolt (Equalize charging voltage)	28.8V	Read-only
BoostCharginVolt (Boost charging voltage)	28.8V	User define: Float charging voltage ≤ Boost charging voltage＜Charging limit voltage, step size: 0.1V
FloatChagingVolt (Float charging voltage)	27.6V	User define: Boost voltage reconnect voltage＜Float charging voltage≤Boost charging voltage, step size: 0.1V
BoostRecnectVolt (Boost voltage reconnect voltage)	26.4V	User define: Low voltage reconnect voltage＜Boost voltage reconnect voltage＜Float charging voltage, step size: 0.1V
LowVoltReconect (Low voltage reconnect voltage)	25.6V	User define: (Low voltage disconnect voltage+0.1N)＜Low voltage reconnect voltage ＜(Boost voltage reconnect voltage, step size: 0.1V
UndrVltWarnRecvr (Under voltage warning recover voltage)	24.4V	User define: (Under voltage warning voltage+0.1*N)≤Under voltage warning recover voltage ≤(Low voltage reconnect voltage, step size: 0.1V **Note: N=Rated battery voltage/12.**

Parameters	Default	User define
UnderVolt Warn (Under voltage warning voltage)	24.0V	User define: Low voltage disconnect voltage＜ Under voltage warning voltage≤(Under voltage warning recover voltage-0.1*N), step size: 0.1V **Note: N=Rated battery voltage/12.**
LowVoltDisconect (Low voltage disconnect voltage)	23.5V	User define: Discharging limit voltage ≤ Low voltage disconnect voltage ＜ Under voltage warning voltage, step size: 0.1V
DischrgeLimitVolt (Discharging limit voltage)	21.0V	Read-only

3.5.2 Battery Voltage Control Parameters (Expert)

After setting the "BAT Set Mode" as "Expert," all battery voltage control parameters can be modified.

BatteryType / Voltage control parameters	LFP	
	LFP8S	User define
Over Voltage Disconnect Voltage	30.0 V	21.0~30.0V
Charging Limit Voltage	28.9 V	21.0~30.0V
Over Voltage Reconnect Voltage	28.9 V	21.0~30.0V
Equalize Charging Voltage	28.8 V	Read-only
Boost Charging Voltage	28.8 V	21.0~30.0V
Float Charging Voltage	27.6 V	21.0~30.0V
Boost Voltage Reconnect Voltage	26.4 V	21.0~30.0V
Low Voltage Reconnect Voltage	25.6 V	21.0~30.0V
Under Voltage Warning Recover Voltage	24.4 V	21.0~30.0V
Under Voltage Warning Voltage	24.0 V	21.0~30.0V
Low Voltage Disconnect Voltage	23.5 V	21.0~30.0V
Discharging Limit Voltage	21.0 V	Read-only

When setting the Lithium battery voltage control parameters, the following rules must be obeyed.

A. Over Voltage Disconnect Voltage < Over Charging Protection Voltage (BMS Circuit Protection Modules)-0.2V

B. Over Voltage Disconnect Voltage > Charging Limit Voltage ≥ Equalize Charging Voltage ≥ Boost Charging Voltage ≥ Float Charging Voltage > Boost Voltage Reconnect Voltage

C. Over Voltage Disconnect Voltage > Over Voltage Reconnect Voltage

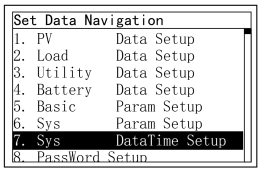
D. Boost Voltage Reconnect Voltage > Low Voltage Reconnect Voltage > Low Voltage Disconnect Voltage ≥ Discharging Limit Voltage

E. Under Voltage Warning Recover Voltage > Under Voltage Warning Voltage ≥ Discharging Limit Voltage

F. Low Voltage Disconnect Voltage ≥ Over Discharging Protection Voltage (BMS Circuit Protection Modules) +0.2V

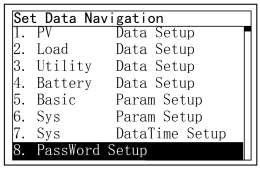
CAUTION	The BMS circuit protection module's voltage control accuracy must be at least ±0.2V. The [Over Voltage Disconnect Voltage] shall be lower than the protection voltage of the BMS circuit protection module. In contrast, the [Low Voltage Disconnect Voltage] shall be higher. The increased voltage of the [Over Voltage Disconnect Voltage] and the [Low Voltage Disconnect Voltage] is determined by the control accuracy of the BMS circuit protection module.

3.5.3 Time Setting



Enter the "Set Data Navigation" interface according to chapter 3.4.3 Administrator interface. Then click the "UP/DOWN" button to select "7 Sys Data Time Setup", and click the "ENTER" button to enter the system time setting interface. On the system time setting interface, click the "ENTER" button to move the cursor right and left, and click the "UP/DOWN" button to adjust the value. After the time setting is completed, click the "ENTER" to confirm. The system time will be updated if the setting value complies with the range.

3.5.4 Password Modifying



Enter the "Set Data Navigation" interface according to chapter 3.4.3 Administrator interface. Then click the "UP/DOWN" button to select "8 Pass Word Setup", and click the "ENTER" button to enter the password modifying interface. Click the "ENTER" button to move the cursor right and left, and click the "UP/DOWN" button to adjust the value. After the password is modified, click the "ENTER" button to confirm.

Note: The default password is "0000", which is set to prevent non-professional operations. Please memorize the new password after modifying it. If forgetting the password, press and hold the "AC OUTPUT" button on the password inputting page; the password will be automatically reset to "0000."

4 Working Modes

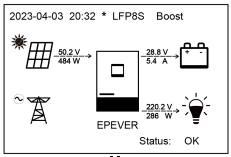
4.1 Abbreviation

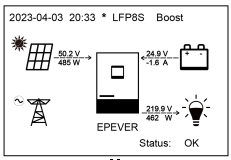
Abbreviation	Instruction
P_{PV}	PV power
P_{LOAD}	Load power
V_{BAT}	Battery voltage
LVD	Low Voltage Disconnect Voltage
LVR	Low Voltage Reconnect Voltage
LED	Low Energy Disconnect SOC
LER	Low Energy Disconnect Recover SOC
FCV	Float Charging Voltage
AOF	Auxiliary module OFF voltage (namely, Utility charging OFF voltage)
AON	Auxiliary module ON voltage (namely, Utility charging ON voltage)
UCF	Utility Charging OFF SOC
UCO	Utility Charging ON SOC
MCC	Battery Max. Charging Current
SOC	The battery charging state, which indicates the ratio of the current storage capacity dividing the maximum storage capacity. This value is automatically read from the BMS and displayed on the "BAT DATA" screen.

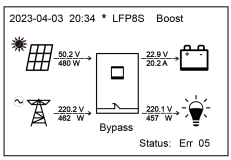
CAUTION	• Set the "Charge Control Mode" as "VOLT"; the working mode is determined by the battery voltage value. • Set the "Charge Control Mode" as "SOC," the working mode is determined by the battery SOC. The battery SOC value will be more accurate after a full charge-discharge cycle. • For setting the "Charge Control Mode", refer to chapter 3.5.1 Parameters list.

4.2 Battery Mode

4.2.1 Scenario A: Both PV and Utility are available.

<table>
<tr><td rowspan="2">（A-1）
PV ☑
Utility ☑</td><td>Charging Mode: "Solar"</td><td>Discharging Mode: "Inverter"</td></tr>
<tr><td>


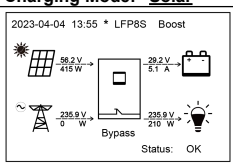
$P_{PV} > P_{LOAD}$ ⇵ $P_{PV} \le P_{LOAD}$


$V_{BAT} \ge$ LVR / SOC ≥ LER ⇵ $V_{BAT} \le$ LVD / SOC ≤ LED


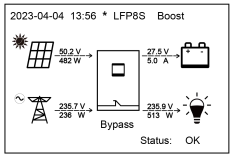
</td><td>❶ When the PV power is greater than load power, the PV charges the battery and supplies extra power to the load.

❷ When the PV power is lower than or equal to the load power, the PV will not charge the battery, the battery will cut in to supply power to the load together with the PV.

❸ Any of the following is satisfied, the Utility supplies power to the load and the PV charges the battery.
• The battery voltage is lower than or equal to the LVD value.
• The battery SOC is lower than or equal to the LED value.</td></tr>
<tr><td colspan="3">Note: When the battery voltage is greater than or equal to the LVR value, or the battery SOC is greater than or equal to the LER value, the working mode returns to state❷.</td></tr>
</table>

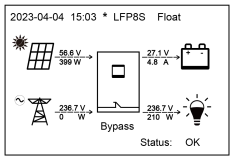
<table>
<tr><td rowspan="2">（A-2）
PV ☑
Utility ☑</td><td>Charging Mode: "Solar"</td><td>Discharging Mode: "Bypass"</td></tr>
<tr><td>


$P_{PV} > P_{LOAD}$ ⇵ $P_{PV} \le P_{LOAD}$
</td><td>❶ When the PV power is greater than load power, the PV charges the battery and supplies extra power to the load.</td></tr>
</table>



❷ When the PV power is lower than or equal to the load power, the Utility will cut in to supply power to the load together with the PV, and the PV charges the battery simultaneously.

$V_{BAT} \leq FCV$



❸ When the HPS-AHL enters the float charging status and the battery voltage is lower than or equal to the **FCV** value, the PV charges the battery and supplies extra power to the load.

Note: In the mode❸, the HPS-AHL will return to the mode❷ when it exits from the floating charging status.

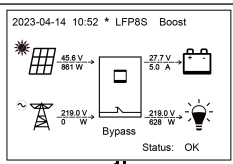
Charging Mode: "Solar prior"

Discharging Mode: "Bypass"

（A-3）

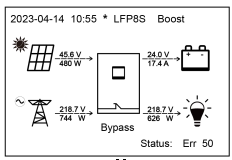
PV ☑

Utility ☑



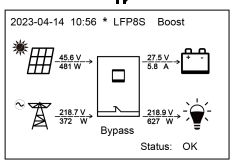
❶ When the PV power is greater than the load power, the PV charges the battery and supplies extra power to the load.

$P_{PV} > P_{LOAD}$ ‖ $P_{PV} \leq P_{LOAD}$



❷ When the PV power is lower than or equal to the load power, the Utility supplies power to the load, and the PV charges the battery.

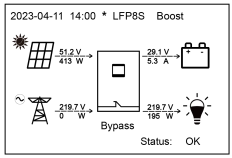
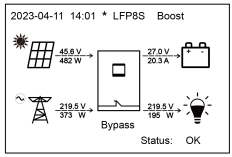
$V_{BAT} \geq AOF$ / $SOC \geq UCF$ ‖ $V_{BAT} \leq AON$ / $SOC \leq UCO$



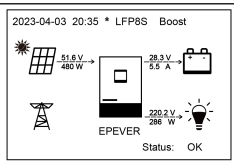
❸ Any of the following is satisfied, the Utility and PV charge the battery, and the Utility supplies power to the load simultaneously.

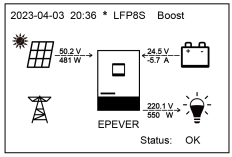
- The battery voltage is lower than or equal to the **AON** value.
- The battery SOC is lower than or equal to the **UCO** value.

	Note: When the battery voltage is greater than or equal to the **AOF** value, or the battery SOC is greater than or equal to the **UCF** value, the working mode returns to state❷. Working mode ❷/❸ are distinguished only by the difference in utility power. For working mode ❷, the utility will not charge the battery, and for working mode ❸, the utility charges the battery.

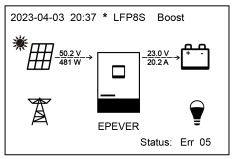
(A-4)	**Charging Mode: "Utly & solr"**	**Discharging Mode: "Bypass"**
PV ☑ Utility ☑		❶ When the PV power is greater than the "load power+(MCC*battery voltage)," the PV charges the battery and supplies extra power to the load.
	$P_{PV} > P_{LOAD}+MCC*V_{BAT}$ ⇅ $P_{PV} \le P_{LOAD}+MCC*V_{BAT}$	
		❷When the PV power is lower than or equal to the "load power+(MCC*battery voltage)," the Utility will cut in to supply power to the load together with the PV, and the PV charges the battery simultaneously.

4.2.2 Scenario B: PV is available, but the Utility is not available.

(B)	**Regardless of the charging mode and discharging mode, the working mode is as follows.**
PV ☑ Utility ☒	 $P_{PV} > P_{LOAD}$ ⇅ $P_{PV} \le P_{LOAD}$
	❶ When the PV power is greater than the load power, the PV charges the battery and supplies extra power to the load.

<table>
<tr>
<td></td>
<td>


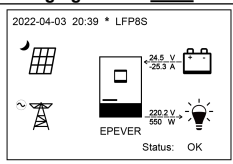
$V_{BAT} \geq LVR$ / $SOC \geq LER$ ⇅ $V_{BAT} \leq LVD$ / $SOC \leq LED$

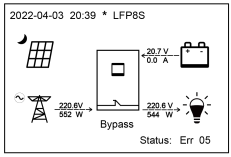
</td>
<td>❷ When the PV power is lower than or equal to the load power, the PV will not charge the battery, the battery will cut in to supply power to the load together with the PV.

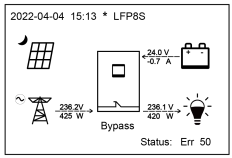
❸Any of the following is satisfied, the PV and the battery stop supplying power to the load. The PV charges the battery only.
• The battery voltage is lower than or equal to the LVD value.
• The battery SOC is lower than or equal to the LED value.</td>
</tr>
<tr>
<td></td>
<td colspan="2">Note: When the battery voltage is greater than or equal to the LVR value, or the battery SOC is greater than or equal to the LER value, the working mode returns to state ❷.</td>
</tr>
</table>

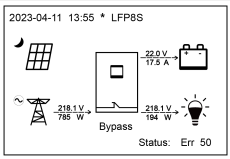
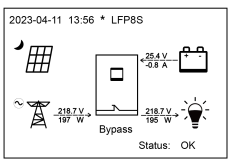
4.2.3 Scenario C: The PV is not available, but the Utility is available.

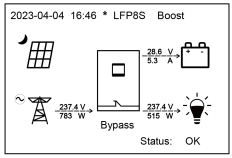
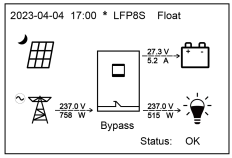
<table>
<tr>
<td rowspan="2">（C-1）
PV ☒
Utility ☑</td>
<td>Charging Mode: "Solar"</td>
<td>Discharging Mode: "Inverter"</td>
</tr>
<tr>
<td>


$V_{BAT} \geq LVR$ / $SOC \geq LER$ ⇅ $V_{BAT} \leq LVD$ / $SOC \leq LED$
</td>
<td>❶Any of the following is satisfied, the battery supplies the load.
• No under voltage protection occurs, the battery voltage is greater than or equal to the LVD value.
• After under voltage protection occurs, the battery voltage is greater than or equal to the LVR value.
• No SOC low-energy disconnect occurs, the battery SOC is greater than or equal to the LED value.
• After SOC low-energy disconnect occurs, the battery SOC is greater than or equal to the LER value.</td>
</tr>
</table>

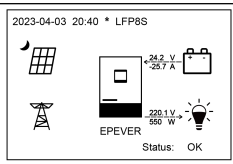
		❷ Any of the following is satisfied, the Utility supplies power to the load. • The battery voltage is lower than or equal to the **LVD** value. • The battery SOC is lower than or equal to the **LED** value.

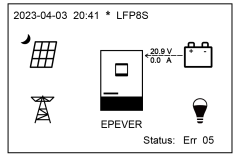
(C-2) PV ☒ Utility ☑	**Charging Mode: "Solar"**	**Discharging Mode: "Bypass"**
		The Utility supplies power to the load.

(C-3) PV ☒ Utility ☑	**Charging Mode: "Solar prior"**	**Discharging Mode: "Bypass"**
	 $V_{BAT} \leq AON$ / $SOC \leq UCO$ ⇅ $V_{BAT} \geq AOF$ / $SOC \geq UCF$ 	❶ Any of the following is satisfied, the Utility supplies power to the load and charges the battery simultaneously. • The battery voltage is lower than or equal to the **AON** value. • The battery SOC is lower than or equal to the **UCO** value. ❷ Any of the following is satisfied, the Utility supplies power to the load only and stops charging the battery. • The battery voltage is higher than or equal to the **AOF** value. • The battery SOC is greater than or equal to the **UCF** value.

	Charging Mode: "Utly & solr"	Discharging Mode: "Bypass"
（C-4） PV ☒ Utility ☑	 $V_{BAT} \leq FCV$  	❶When the HPS-AHL is in the boost charging status, the Utility supplies power to the load and charges the battery simultaneously. ❷ When the HPS-AHL enters the float charging status and the battery voltage is lower than or equal to the **FCV** value, the Utility supplies power to the load and charges the battery simultaneously.
	Note: In the mode❷, the HPS-AHL will return to the mode❶ when it exits from the floating charging status.	

4.2.4 Scenario D: Both PV and Utility are not available.

（D） PV ☒ Utility ☒	**Regardless of the charging mode and discharging mode, the working mode is as follows.**	
	 $V_{BAT} \geq LVR$ / $SOC \geq LER$ ‖ $V_{BAT} \leq LVD$ / $SOC \leq LED$	❶Any of the following is satisfied, the battery supplies the load. • No under voltage protection occurs, the battery voltage is greater than or equal to the **LVD** value. • After under voltage protection occurs, the battery voltage is greater than or equal to the **LVR** value. • No SOC low-energy disconnect occurs, the battery SOC is greater than or equal to the **LED** value. • After SOC low-energy disconnect occurs, the battery SOC is greater than or equal to the **LER** value.

		❷Any of the following is satisfied, the battery stops supplying the load. • The battery voltage is lower than or equal to the **LVD** value. • The battery SOC is lower than or equal to the **LED** value.

5 Protections

No.	Protections	Instruction
1	PV limit Current/Power	When the PV array's actual charging current/power exceeds its rated current/power, it will charge the battery as per the rated current/power.
2	PV reverse polarity	Fully protect against PV reverse polarity, correct the wire connection to resume normal operation. ⚠**CAUTION: If the PV open-circuit voltage ≥ 100V, the HPS-AHL will be damaged.**
3	Night reverse charging	Prevent the battery from discharging through the PV module at night.
4	Utility input overvoltage	When the utility voltage exceeds the setting value of "Utility Over Voltage Disconnect Voltage", the utility stops charging the battery and supplying the load.
5	Utility input under-voltage	When the utility voltage is lower than the setting value of "Utility Low Voltage Disconnect Voltage", the utility stops charging the battery and supplying the load.
6	Utility over current	When the actual Utility current triggers the protection strategy of the "AC input overload relay", the "AC input overload relay" is disconnected. The Utility input is recovered after the user reset the "AC input overload relay" manually. When the Utility supplies the load and charges the battery, the actual Utility input current exceeds the "Max. Utility Input Current" setting value, the overload protection strategy will be triggered.
7	Battery polarity reverse	⚠**CAUTION: ① If the battery is reversed when the PV is connected correctly and online, the HPS-AHL will be damaged.** **② If the extension battery is reversed, the HPS-AHL will be damaged.**
8	Battery overvoltage	When the battery voltage goes higher than the [Over Voltage Disconnect Voltage], the HPS-AHL will stop charging the battery to protect the battery from being over-charged.
9	Battery over-discharge	When the battery voltage goes lower than the [Low Voltage Disconnect Voltage], the HPS-AHL will stop discharging the battery to protect the battery from being over-discharged.

<table>
<tr><th>No.</th><th>Protections</th><th colspan="3">Instruction</th></tr>
<tr><td>10</td><td>Battery low/high temperature</td><td colspan="3">The HPS-AHL reserves a battery temperature sensor port. The battery will stop discharging when its temperature is higher than 50℃ or lower than -20℃, and it will resume discharging when its temperature is normal. The battery will stop charging when its temperature is higher than 50℃ or lower than 0℃, and it will resume charging when its temperature is normal. This function ensures battery safety and extends the battery life.</td></tr>
<tr><td>11</td><td>Load output short circuit</td><td colspan="3">The output is turned off immediately in the occurrence of short-circuiting. And then, the output is recovered automatically after a delay time of 5s, 10s, and 15s separately (less than three times recovery within 5 minutes, it will be recounted). The HPS-AHL stops working after the 4th protection and can resume working after resetting or restarting.
Clear the fault in time because it may damage the HPS-AHL.</td></tr>
<tr><td rowspan="11">12</td><td rowspan="3">Load output overload (HPS1022-AHL0210)</td><td>Load power</td><td>Working time</td><td rowspan="11">Note
The HPS-AHL performs the protection strategy after reaching the working time. And then, it will recover the load output after a delay time. The HPS-AHL stops working after the 4th protection and can resume working after resetting or restarting.
① The HPS-AHL works always without protection occurs.
② Recover the load output after a delay time of 4 seconds.
③ Trigger the protection strategy immediately.</td></tr>
<tr><td>P_{LOAD}＜1010W</td><td>Always①</td></tr>
<tr><td>1010W≤P_{LOAD}＜1800W</td><td>4 seconds②</td></tr>
<tr><td>P_{LOAD}≥2000W</td><td>Immediately③</td></tr>
<tr><td rowspan="3">Load output overload (HPS1522-AHL0310)</td><td>Load power</td><td>Working time</td></tr>
<tr><td>P_{LOAD}＜1515W</td><td>Always①</td></tr>
<tr><td>1515W≤P_{LOAD}＜2700W</td><td>4 seconds②</td></tr>
<tr><td rowspan="3">Load output overload (HPS2522-AHL0610)</td><td>P_{LOAD}≥3000W</td><td>Immediately③</td></tr>
<tr><td>Load power</td><td>Working time</td></tr>
<tr><td>P_{LOAD}＜2525W</td><td>Always①</td></tr>
<tr><td>2525W≤P_{LOAD}＜4500W</td><td>4 seconds②</td></tr>
<tr><td>P_{LOAD}≥5000W</td><td>Immediately③</td></tr>
<tr><td>13</td><td>Device overheating</td><td colspan="3">When the internal temperature overheats, the HPS-AHL will stop charging/discharging.
The HPS-AHL will resume charging/discharging when the internal temperature recovers normal.</td></tr>
</table>

6 Troubleshooting

CAUTION	After the HPS-AHL home battery backup is powered on, the meter displays the boot screen all the time (unable to enter the home screen) and the red "RUN" indicator flashes. It means the communication is error. When the above fault occurs, check whether the communication cable is disconnected. If not, don't hesitate to contact our after-sales engineer.

6.1 Battery Faults

No.	Fault/Status	Error code①	Indicator	Buzzer	Solution
1	BAT OVP (Battery over voltage protection)	Err4	--	--	Disconnect the utility and PV sides, and check whether the extension battery voltage is too high. Or check if the "over voltage disconnect voltage" setting value is too low. After the battery voltage is lower than the "over voltage reconnect voltage" setting value, the alarm will be automatically cleared.
2	BAT UVP (Battery under voltage protection)	Err5			Wait until the battery voltage resume to or above the "low voltage reconnect voltage."
3	BAT OTP (Battery over temperature protection)	Err11			Ensure the HPS-AHL is installed in a cool and well-ventilated place. It resumes normal work when the battery cools down to below the "Battery over temperature protect recover."
4	BAT OCP (Battery over current protection)	Err37			Check that the battery actual charging and discharging current does not exceed the setting values of "Battery Max. charging current " and "Battery limit discharging current."

No.	Fault/Status	Error code①	Indicator	Buzzer	Solution
5	BAT UNDERVOLT WARN (Battery under voltage warning)	Err50	--	--	Check whether the extension battery voltage is lower than the “low voltage disconnect voltage.” Reduce the use of loads or supple power to the battery through the Utility or PV in time.
6	BAT FTA (Battery fail to activate)	Err56			Check the internal battery status by a professional personnel.

①The error code is displayed at the "Status" bar in the lower right corner of the LCD interface. If multiple errors exist, only the minimum error code will be displayed.

6.2 PV Faults

No.	Fault/Status	Error code①	Indicator	Buzzer②	Solution
1	PV1 OTP (PV1 over temperature protection)	Err13	PV indicator green on	--	Ensure the HPS-AHL is installed in a cool and well-ventilated place.
2	PV1 OVP (PV1 over voltage protection)	Err15	PV indicator red on	Intermittent beeps	Check if the PV open-circuit voltage is too high (greater than 100 V). The alarm is released when the PV open-circuit voltage is below 95 V.
3	PV1 UVP (PV1 under voltage protection)	Err16	--	--	Check if the PV open-circuit voltage is lower than the "PV under voltage protect voltage" setting value, or whether the PV capacity is insufficient. The alarm is released when the PV open-circuit voltage is restored to the "PV under voltage recover voltage" or above.

No.	Fault/Status	Error code①	Indicator	Buzzer②	Solution
4	PV1 OCP (PV1 over current protection)	Err17	PV indicator green on	--	Turn off the HPS-AHL first, wait for 5 minutes and then turn on the HPS-AHL to check if it resumes normal. If it is still abnormal, please contact our technical support.
5	PV HARD FAULT (PV hardware fault)	Err30	PV indicator red on	Intermittent beeps	Turn off the HPS-AHL first, wait for 5 minutes and then turn on the HPS-AHL to check if it resumes normal. If it is still abnormal, please contact our technical support.
6	PV1TS NC (PV1 temperature sensor no connection)	Err43	PV indicator green on	--	

①The error code is displayed at the "Status" bar in the lower right corner of the LCD interface. If multiple errors exist, only the minimum error code will be displayed.

②Set the "BuzzerAlert" parameter as "ON"; the buzzer beeps after an error occurs. After the error is cleared, the buzzer is automatically silent. If the "BuzzerAlert" parameter is set as "OFF," the buzzer will not beep even if there is an error.

6.3 Inverter Faults

No.	Fault/Status	Error code①	Indicator	Buzzer②	Solution
1	INV OCP (Inverter over current protection)	Err2	LOAD indicator red ON	Intermittent beeps	Check if the load actual power exceeds the rated power (namely, the HPS-AHL's continuous output power), disconnect the load completely and turn off the HPS-AHL. Wait 5 minutes and then turn on the HPS-AHL to check if it resumes normal. If it is still abnormal, please contact our technical support.

No.	Fault/Status	Error code①	Indicator	Buzzer②	Solution
2	INV OVP (Inverter over voltage protection)	Err7	LOAD indicator red ON	Intermittent beeps	Disconnect the load completely and turn off the HPS-AHL. Wait 5 minutes and then turn on the HPS-AHL to check if it resumes normal. If it is still abnormal, please contact our technical support.
3	INV OTP (Inverter over temperature protection)	Err10	--	--	Ensure the HPS-AHL is installed in a cool and well-ventilated place.
4	HARD INV OVP (Inverter hardware over voltage protection)	Err22	LOAD indicator red ON	Intermittent beeps	Disconnect the load completely and turn off the HPS-AHL. Wait 5 minutes and then turn on the HPS-AHL to check if it resumes normal. If it is still abnormal, please contact our technical support.
5	HARD INV OCP (Inverter hardware over current protection)	Err23			
6	INV VOLT OFFSET ERR (Inverter voltage offset error)	Err32	--	--	
7	INV CURR OFFSET ERR (Inverter current offset error)	Err35	--	--	Disconnect the load completely and turn off the HPS-AHL. Wait 5 minutes and then turn on the HPS-AHL to check if it resumes normal. If it is still abnormal, please contact our technical support.
8	ITS NC (Inverter temperature sensor no connection)	Err45	LOAD indicator green ON	--	Turn off the HPS-AHL. Wait 5 minutes and then turn on the HPS-AHL to check if it resumes normal. If it is still abnormal, please contact our technical support.
9	INV UVP (Inverter under voltage protection)	Err49	LOAD indicator red ON	Intermittent beeps	Check if the load actual power exceeds the rated power (namely, the HPS-AHL's continuous output power), disconnect the load completely and turn off the HPS-AHL. Wait 5 minutes and then turn on the HPS-AHL to check if it resumes normal. If still abnormal, contact our technical support.

①The error code is displayed at the "Status" bar in the lower right corner of the LCD interface. If multiple errors exist, only the minimum error code will be displayed.

②Set the "BuzzerAlert" parameter as "ON"; the buzzer beeps after an error occurs. After the error is cleared, the buzzer is automatically silent. If the "BuzzerAlert" parameter is set as "OFF," the buzzer will not beep even if there is an error.

6.4 Utility Faults

No.	Fault/Status	Error code①	Indicator	Buzzer②	Solution
1	AC OVP (AC over voltage protection)	Err8	GRID indicator red on	Intermittent beeps	Check if the utility voltage is normal (i.e. within the “Utility work voltage range”), disconnect the AC input completely and turn off the HPS-AHL. Wait 5 minutes and then turn on the HPS-AHL to check if it resumes normal. If it is still abnormal, please contact our technical support.
2	AC OCP (AC over current protection)	Err9	GRID indicator red on	Intermittent beeps	Check if the load actual power exceeds the rated power (namely, the HPS-AHL’s continuous output power), disconnect the load completely and turn off the HPS-AHL. Wait 5 minutes and then turn on the HPS-AHL to check if it resumes normal. If it is still abnormal, please contact our technical support.
3	AC UVP (AC under voltage protection)	Err25	GRID indicator red on	--	
4	AC PRECHG OUT (AC pre-charge timeout)	Err28	GRID indicator green on	--	Disconnect the AC input completely and turn off the HPS-AHL. Wait 5 minutes and then turn on the HPS-AHL to check if it resumes normal. If it is still abnormal, please contact our technical support.
5	AC RELAY Adhesion (AC relay adhesion. Namely, AC relay abnormal)	Err29			
6	AC FREQ ERR (AC frequency error)	Err31	GRID indicator red on	Intermittent beeps	

①The error code is displayed at the "Status" bar in the lower right corner of the LCD interface. If multiple errors exist, only the minimum error code will be displayed.

②Set the "BuzzerAlert" parameter as "ON"; the buzzer beeps after an error occurs. After the error is cleared, the buzzer is automatically silent. If the "BuzzerAlert" parameter is set as "OFF," the buzzer will not beep even if there is an error.

6.5 Load Faults

No.	Fault/Status	Error code①	Indicator	Buzzer②	Solution
1	LAOD CURR OFFSET ERR (Load current offset error)	Err3	--	--	Disconnect the load completely and turn off the HPS-AHL. Wait 5 minutes and then turn on the HPS-AHL to check if it resumes normal. If it is still abnormal, please contact our technical support.
2	OVERLOAD (Overload)	Err48	LOAD indicator red ON	Intermitte nt beeps	
3	OVERLOAD LOCK (Overload lock)	Err55			

①The error code is displayed at the "Status" bar in the lower right corner of the LCD interface. If multiple errors exist, only the minimum error code will be displayed.

②Set the "BuzzerAlert" parameter as "ON"; the buzzer beeps after an error occurs. After the error is cleared, the buzzer is automatically silent. If the "BuzzerAlert" parameter is set as "OFF," the buzzer will not beep even if there is an error.

6.6 Others

No.	Fault/Status	Error code①	Indicator	Buzzer	Solution
1	BUS OVP (DC bus over voltage protection)	Err0	--	--	Turn off the HPS-AHL. Wait 5 minutes and then turn on the HPS-AHL to check if it resumes normal. If it is still abnormal, please contact our technical support.
2	BUS UVP (DC bus under voltage protection)	Err6			
3	AMBIENT OTP (Ambient over temperature protection)	Err12			Ensure the HPS-AHL is installed in a cool and well-ventilated place.
4	HARD OVP (Hardware over voltage protection)	Err21			Turn off the HPS-AHL. Wait 5 minutes and then turn on the HPS-AHL to check if it resumes normal. If it is still abnormal, please contact our technical support.
5	BAT CHG OCP (Battery charge over current protection)	Err24			
6	CHG CURR OFFSET ERR (Charge current offset error)	Err36			
7	PUSH DRV ERR (Push driver error)	Err38			
8	APS ERR (Auxiliary power supply error)	Err40			
9	RTS NC (Remote temperature sensor no connection)	Err41			Check whether the remote temperature sensor is connected normally.

No.	Fault/Status	Error code①	Indicator	Buzzer	Solution
10	ATS NC (Ambient temperature sensor no connection)	Err42	--	--	Turn off the HPS-AHL. Wait 5 minutes and then turn on the HPS-AHL to check if it resumes normal. If it is still abnormal, please contact our technical support.
11	LIMITCHG (Low temperature limit charging)	Err46			Check whether the ambient temperature is lower than the set "Charge low temperature limit" and "Discharge low temperature limit."
12	LIMITDISCHG (Low temperature limit discharging)	Err47			
13	EEP ERR (EEPROM error)	Err54			Turn off the HPS-AHL. Wait 5 minutes and then turn on the HPS-AHL to check if it resumes normal. If it is still abnormal, please contact our technical support.

①The error code is displayed at the "Status" bar in the lower right corner of the LCD interface. If multiple errors exist, only the minimum error code will be displayed.

7 Maintenance

The following inspections and maintenance tasks are recommended at least twice yearly for best performance.

- Make sure no block on airflow around the HPS-AHL. Clear up dirt and fragments on the radiator.
- Check all the wired cables to ensure insulation is not damaged for serious solarization, frictional wear, dryness, insects or rats, etc. Repair or replace some wires if necessary.
- Check and confirm that LED or LCD is consistent with the required. Pay attention to any troubleshooting or error indication. Take necessary corrective action.
- Confirm that all the terminals have no corrosion, insulation damage, high temperature, or burnt/discolored sign. Tighten terminal screws to the suggested torque.
- Check for dirt, nesting insects, and corrosion. If so, clear up in time.
- Check and confirm that the lightning arrester is in good condition. Replace a new one in time to avoid damaging the HPS-AHL and other equipment.
- If the HPS-AHL is not used for a long time; please keep the battery SOC≥50%. Charge and discharge the battery every 3 months.

WARNING	Risk of electric shock! Turn off all the power before the above operations and follow the corresponding inspections and operations.

8 Specifications

Model		HPS1022-AHL0210	HPS1522-AHL0310	HPS2522-AHL0610
Utility Input	Utility Rated Voltage	220VAC		
	Utility Voltage	200~240VAC		
	Failure Voltage	290VAC		
	Utility Frequency	50Hz/60Hz		
	Utility Maximum Work Current (Charging + Bypass)	7A@220VAC	10A@220VAC	15A@220VAC
	Switch Response Time	Switch Response Time-Utility to Inverter: ≤20ms Switch Response Time-Inverter to Utility: ≤20ms		
	AC Input Overload Relay	HAVE		
Inverter Output	Inverter Rated Power (@25℃)	1000W	1500W	2500W
	4-second Transient Surge Output Power	1800W	2700W	4500W
	Inverter Output Voltage	220VAC±3%		
	Inverter Frequency	50Hz/60Hz±0.2%		
	Output Voltage Waveform	Pure sine wave		
	Output Voltage Harmonic Distortion Rate	≤3% (Resistive load)		
	Output Gradual Start	HAVE		

Model		HPS1022-AHL0210	HPS1522-AHL0310	HPS2522-AHL0610
Solar Controller	PV Maximum Input Withstand Voltage	95VDC (at minimum operating environment temperature)		
	Solar Controller Type	MPPT		
	MPPT Maximum Efficiency	≥99.5%		
	MPPT Voltage Range	24~76VDC	24~76VDC	24~76VDC
	MPPT Input Channels	One way	One way	One way
	PV Maximum Charging Current	20A	30A	60A
Battery	Battery Type	LFP8S2P	LFP8S3P	LFP8S1P
	Battery Rated Capacity	40Ah	60Ah	100Ah
	Cell Dimension	Diameter: 40.0+0.5/-0mm Height: 136.25±0.5mm	Diameter: 40.0+0.5/-0mm Height: 136.25±0.5mm	Length: 160.0±0.8mm Height: 118.5±0.5mm Width: 50.1±0.5mm
	Battery Rated Voltage	25.6VDC		
	Maximum Continuous Charging Current	1C		
	Maximum Continuous Discharging Current	1.8C	1.8C	1C
	Battery Work Voltage Range	21.0VDC~30.0VDC		
	Battery Work Temperature Range	Discharging Mode: -20℃~50℃ Charging Mode: 0℃~50℃		
	Cycle Times	2000 times①	2000 times①	5000 times②

Model		HPS1022-AHL0210	HPS1522-AHL0310	HPS2522-AHL0610
DC Output	12V DC Output (x2)	12V⎓2A, Max. 24W/port, Total 48W		
	USB-A Output (x2)	5V⎓3A, Max. 15W/port, Total 30W		
	USB-C Output (x1)	5V⎓3A, Max. 15W		
	USB-C Output (x1)	5/9/12/15V⎓3A, 20V⎓5A, Max. 100W		
	DC Output Switch	HAVE		
Others	Work Temperature Range	-20℃~50℃③ (when the environment temperature exceeds 30℃, the charging power and load power will be reduced appropriately; working of full load is not supported.)		
	Enclosure	IP30		
	Communication Method	Bluetooth, RS485 (WiFi optional)		
	LCD	Monochrome LCD, English interface		
	Warranty	Two years		
	Dimension (Length x Width x Height)	385x307x345mm (with floor mats and handles)	385x307x345mm (with floor mats and handles)	427x325.4x368mm (with floor mats and handles)
	Net Weight	20.0kg	24.0kg	37.0kg

① 25±2℃, charging at 0.5C, discharging at 1C, 90%DOD (SOC range: 100%~10%), cycle to 80% of nominal capacity.

② 25±2℃, charging at 0.5C, discharging at 0.5C, capacity≥80%.

③ The actual output power is reduced with the temperature: From 30℃ to 50℃; the actual output power will be reduced by 5% for each 1℃ increase.

Any changes without prior notice! Version number: V1.0

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