PowerWalker
SOLAR INVERTER ZRO
(5000VA)
OFF-Grid Charger

Version: 2.0

Table Of Contents

ABOUT THIS MANUAL

Purpose

This manual describes the assembly, installation, operation and troubleshooting of this unit. Please read this manual carefully before installations and operations. Keep this manual for future reference.

Scope

This manual provides safety and installation guidelines as well as information on tools and wiring.

SAFETY INSTRUCTIONS

WARNING: This chapter contains important safety and operating instructions. Read and keep this manual for future reference.

1. Before using the unit, read all instructions and cautionary markings on the unit, the batteries and all appropriate sections of this manual.
2. **CAUTION** --To reduce risk of injury, charge only deep-cycle lead acid type rechargeable batteries. Other types of batteries may burst, causing personal injury and damage.
3. Do not disassemble the unit. Take it to a qualified service center when service or repair is required. Incorrect re-assembly may result in a risk of electric shock or fire.
4. To reduce risk of electric shock, disconnect all wirings before attempting any maintenance or cleaning. Turning off the unit will not reduce this risk.
5. **CAUTION** – Only qualified personnel can install this device with battery.
6. **NEVER** charge a frozen battery.
7. For optimum operation of this inverter/charger, please follow required spec to select appropriate cable size. It's very important to correctly operate this inverter/charger.
8. Be very cautious when working with metal tools on or around batteries. A potential risk exists to drop a tool to spark or short circuit batteries or other electrical parts and could cause an explosion.
9. Please strictly follow installation procedure when you want to disconnect AC or DC terminals. Please refer to INSTALLATION section of this manual for the details.
10. Fuses are provided as over-current protection for the battery supply.
11. GROUNDING INSTRUCTIONS -This inverter/charger should be connected to a permanent grounded wiring system. Be sure to comply with local requirements and regulation to install this inverter.
12. NEVER cause AC output and DC input short circuited. Do NOT connect to the mains when DC input short circuits.
13. **Warning!!** Only qualified service persons are able to service this device. If errors still persist after following troubleshooting table, please send this inverter/charger back to local dealer or service center for maintenance.

INTRODUCTION

This is a multi-function inverter/charger, combining functions of inverter, MPPT solar charger and battery charger to offer uninterruptible power support with portable size. Its comprehensive LCD display offers user-configurable and easy-accessible button operation such as battery charging current, AC/solar charger priority, and acceptable input voltage based on different applications.

Features

- Pure sine wave inverter
- Built-in MPPT solar charge controller
- Configurable input voltage range for home appliances and personal computers via LCD setting
- Configurable battery charging current based on applications via LCD setting
- Configurable AC/Solar Charger priority via LCD setting
- Compatible to mains voltage or generator power
- Auto restart while AC is recovering
- Overload/ Over temperature/ short circuit protection
- Smart battery charger design for optimized battery performance
- Cold start function
- Zero-transfer Time

Basic System Architecture

The following illustration shows basic application for this inverter/charger. It also includes following devices to have a complete running system:

- Generator or Utility.
- PV modules

Consult with your system integrator for other possible system architectures depending on your requirements. This inverter can power all kinds of appliances in home or office environment, including motor-type appliances such as tube light, fan, refrigerator and air conditioner.

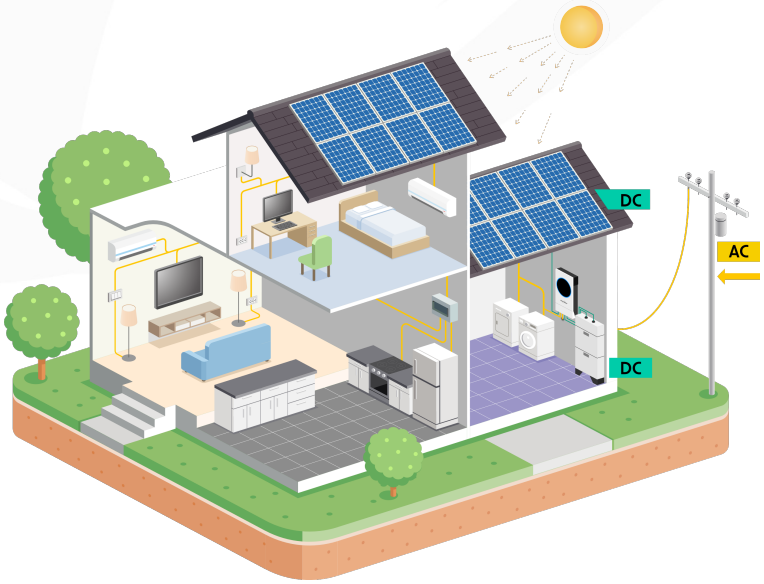
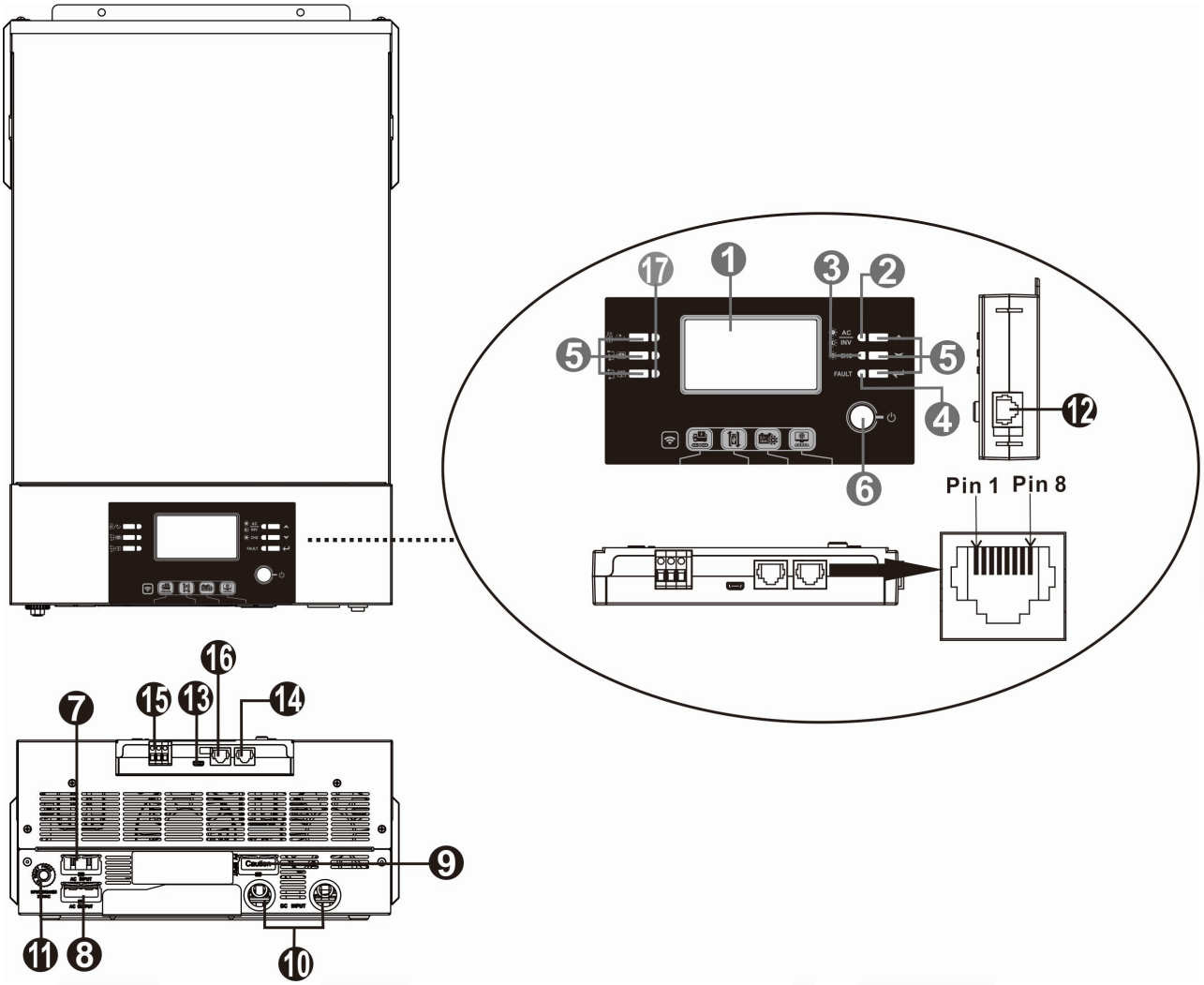


Figure 1 PV System overview

Product Overview



1. LCD display
2. Status indicator
3. Charging indicator
4. Fault indicator
5. Function buttons
6. Power on/off switch
7. AC input
8. AC output
9. PV connectors
10. Battery input
11. Circuit breaker
12. Remote LCD panel communication port
13. USB port: for communication port and USB function port
14. RS-232 communication port
15. Dry contact
16. BMS communication port: CAN and RS232 or RS485
17. LED indicator for USB function settings

INSTALLATION

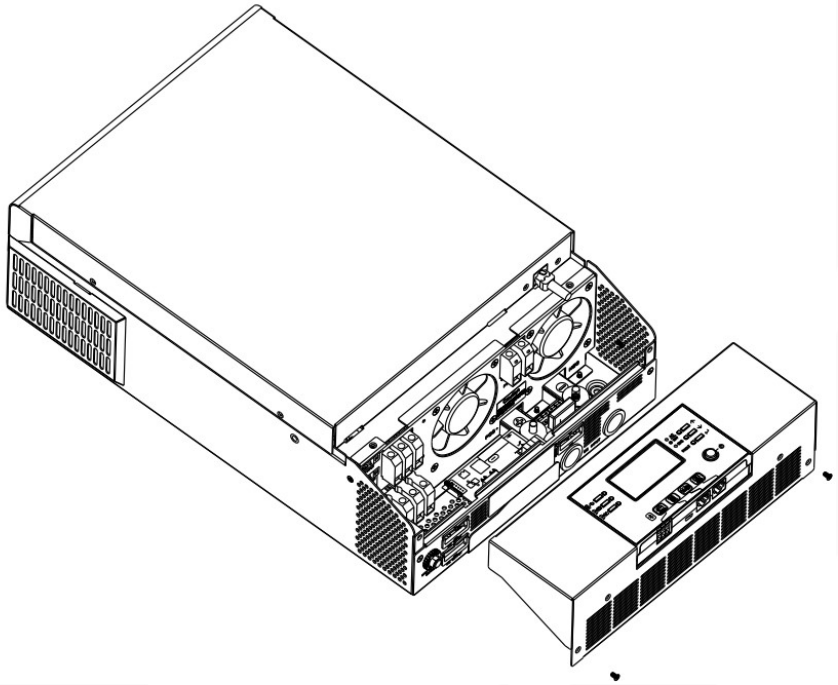
Unpacking and Inspection

Before installation, please inspect the unit. Be sure that nothing inside the package is damaged. You should have received the following items inside of package:

- The unit x 1
- User manual x 1
- Communication cable x 1
- Software CD x 1

Preparation

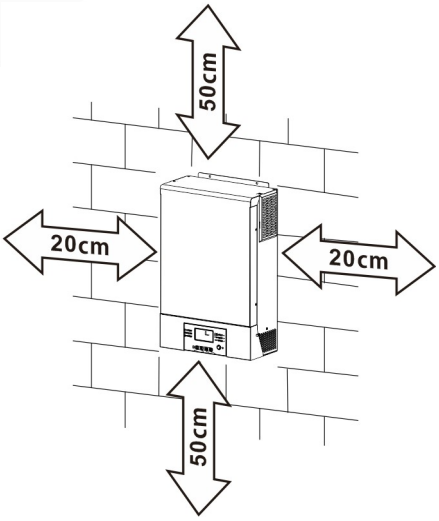
Before connecting all wirings, please take off bottom cover by removing two screws as shown below.



Mounting the Unit

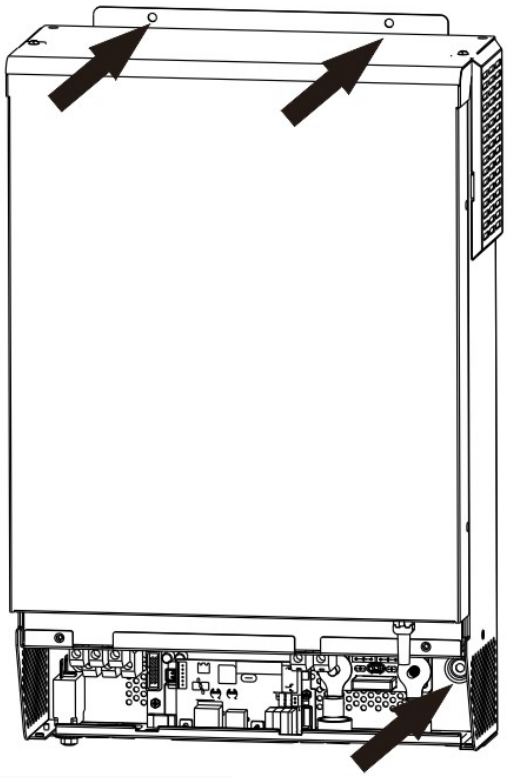
Consider the following points before selecting where to install:

- Do not mount the inverter on flammable construction materials.
- Mount on a solid surface
- Install this inverter at eye level in order to allow the LCD display to be read at all times.
- The ambient temperature should be between 0°C and 55°C to ensure optimal operation.
- The recommended installation position is to be adhered to the wall vertically.
- Be sure to keep other objects and surfaces as shown in the right diagram to guarantee sufficient heat dissipation and to have enough space for removing wires.



⚠ **SUITABLE FOR MOUNTING ON CONCRETE OR OTHER NON-COMBUSTIBLE SURFACE ONLY.**

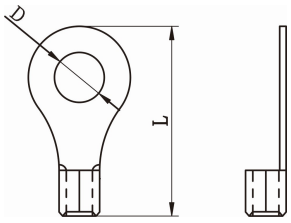
Install the unit by screwing three screws. It's recommended to use M4 or M5 screws.



Battery Connection

CAUTION: For safety operation and regulation compliance, it's requested to install a separate DC over-current protector or disconnect device between battery and inverter. It may not be requested to have a disconnect device in some applications, however, it's still requested to have over-current protection installed. Please refer to typical amperage in below table as required fuse or breaker size.

Ring terminal:



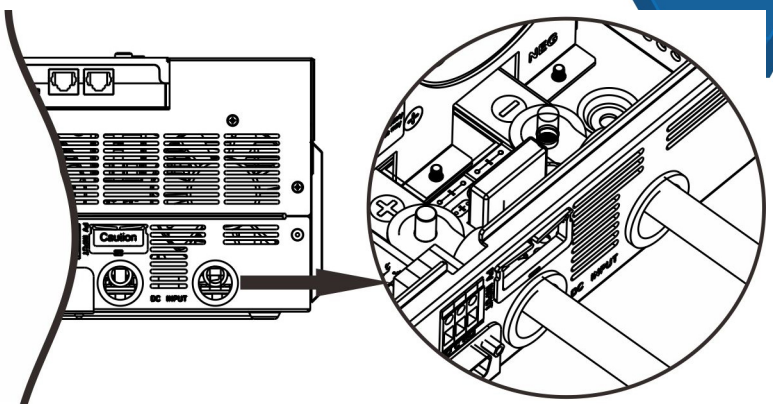
WARNING! All wiring must be performed by a qualified personnel.
WARNING! It's very important for system safety and efficient operation to use appropriate cable for battery connection. To reduce risk of injury, please use the proper recommended cable and terminal size as below.

Recommended battery cable and terminal size:

Model	Typical Amperage	Battery Capacity	Wire Size	Ring Terminal			Torque Value
				Cable mm²	Dimensions		
					D (mm)	L (mm)	
5KW/6KW	125A/150A	200AH	1*1/0AWG	60	6.4	49.7	2~3 Nm
			2*4AWG	44	6.4	49.7	

Please follow below steps to implement battery connection:

1. Assemble battery ring terminal based on recommended battery cable and terminal size.
2. Insert the ring terminal of battery cable flatly into battery connector of inverter and make sure the nuts are tightened with torque of 2-3 Nm. Make sure polarity at both the battery and the inverter/charge is correctly connected and ring terminals are tightly screwed to the battery terminals.



⚠	**WARNING: Shock Hazard** Installation must be performed with care due to high battery voltage in series.

⚠	**CAUTION!!** Do not place anything between the flat part of the inverter terminal and the ring terminal. Otherwise, overheating may occur. **CAUTION!!** Do not apply anti-oxidant substance on the terminals before terminals are connected tightly. **CAUTION!!** Before making the final DC connection or closing DC breaker/disconnector, be sure positive (+) must be connected to positive (+) and negative (-) must be connected to negative (-).

AC Input/Output Connection

CAUTION!! Before connecting to AC input power source, please install a **separate** AC breaker between inverter and AC input power source. This will ensure the inverter can be securely disconnected during maintenance and fully protected from over current of AC input. The recommended spec of AC breaker is 50A.
CAUTION!! There are two terminal blocks with "IN" and "OUT" markings. Please do NOT mis-connect input and output connectors.

WARNING! All wiring must be performed by a qualified personnel.
WARNING! It's very important for system safety and efficient operation to use appropriate cable for AC input connection. To reduce risk of injury, please use the proper recommended cable size as below.
Suggested cable requirement for AC wires

Model	Gauge	Torque Value
5KW/6KW	8 AWG	1.4~ 1.6Nm

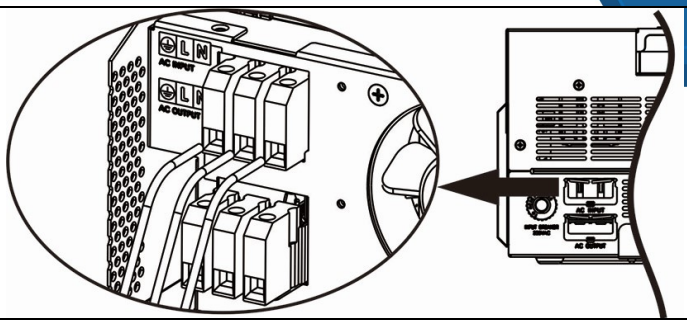
Please follow below steps to implement AC input/output connection:

1. Before making AC input/output connection, be sure to open DC protector or disconnector first.
2. Remove insulation sleeve 10mm for six conductors. And shorten phase L and neutral conductor N 3 mm.
3. Insert AC input wires according to polarities indicated on terminal block and tighten the terminal screws. Be sure to connect PE protective conductor (⏚) first.

   ⏚**→Ground (yellow-green)**

   L→LINE (brown or black)

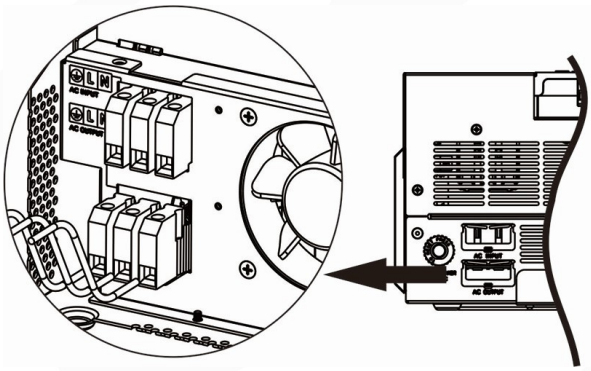
   N→Neutral (blue)



⚠	**WARNING:** Be sure that AC power source is disconnected before attempting to hardwire it to the unit.

4. Then, insert AC output wires according to polarities indicated on terminal block and tighten terminal screws. Be sure to connect PE protective conductor (⏚) first.
   ⏚**→Ground (yellow-green)**
   L→LINE (brown or black)

   N→Neutral (blue)



5. Make sure the wires are securely connected.

CAUTION: Important
Be sure to connect AC wires with correct polarity. If L and N wires are connected reversely, it may cause utility short-circuited when these inverters are worked in parallel operation.

CAUTION: Important
When input source is the generator, it's suggested to choose the generator by following parameters:
- The recommend generator rating should be at least 2X of inverter capacity.
- Generator output: Pure Sine Wave
- Generator output voltage rms range: 180 ~ 270Vac
- Generator output frequency range: 45Hz ~ 63Hz

It's recommended to test the generator with the inverter before the installation. Few generators complied above parameters may still not be accepted by the inverter as the input source.

CAUTION: Appliances such as air conditioner are required at least 2~3 minutes to restart because it's required to have enough time to balance refrigerant gas inside of circuits. If a power shortage occurs and recovers in a short time, it will cause damage to your connected appliances. To prevent this kind of damage, please check manufacturer of air conditioner if it's equipped with time-delay function before installation. Otherwise, this inverter/charger will trig overload fault and cut off output to protect your appliance but sometimes it still causes internal damage to the air conditioner.

PV Connection

CAUTION: Before connecting to PV modules, please install **separately** a DC circuit breaker between inverter and PV modules.

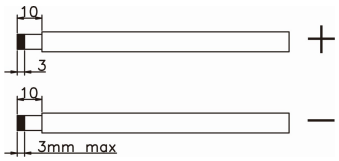
WARNING! All wiring must be performed by a qualified personnel.
WARNING! It'' very important for system safety and efficient operation to use appropriate cable for PV module connection. To reduce risk of injury, please use the proper recommended cable size as below.
WARNING! Never connect the positive and negative terminals of the solar panel to the ground.

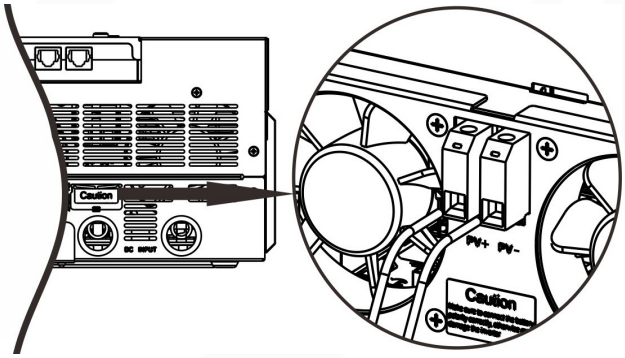
Model	Typical Amperage	Cable Size	Torque
5KW/6KW	27A	10 AWG	1.2~1.6 Nm

PV Module Selection:
When selecting proper PV modules, please be sure to consider below parameters:
1. Open circuit Voltage (Voc) of PV modules not exceeds max. PV array open circuit voltage of inverter.
2. Open circuit Voltage (Voc) of PV modules should be higher than min. battery voltage.

Solar Charging Mode	
INVERTER MODEL	**5KW/6KW**
Max. PV Array Open Circuit Voltage	500Vdc
PV Array MPPT Voltage Range	120~430Vdc

Please follow below steps to implement PV module connection:
1. Remove insulation sleeve 10 mm for positive and negative conductors.
2. Check correct polarity of connection cable from PV modules and PV input connectors. Then, connect positive pole (+) of connection cable to positive pole (+) of PV input connector. Connect negative pole (-) of connection cable to negative pole (-) of PV input connector.

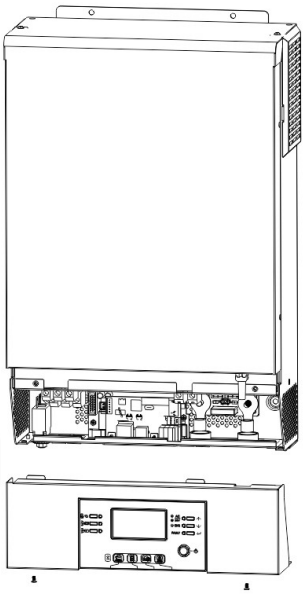




3. Make sure the wires are securely connected.

Final Assembly

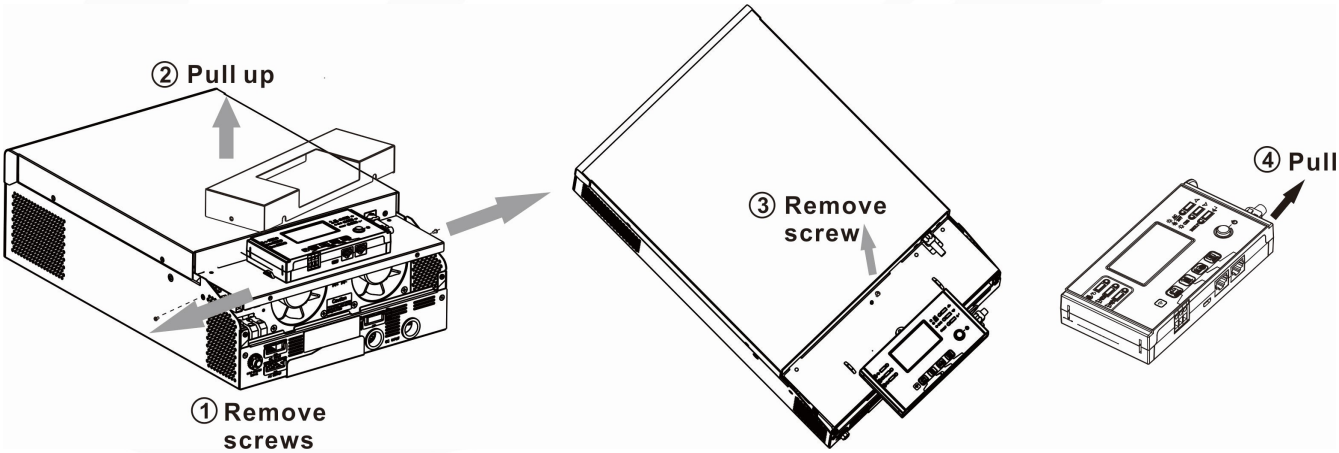
After connecting all wirings, please put bottom cover back by screwing two screws as shown on the below chart.



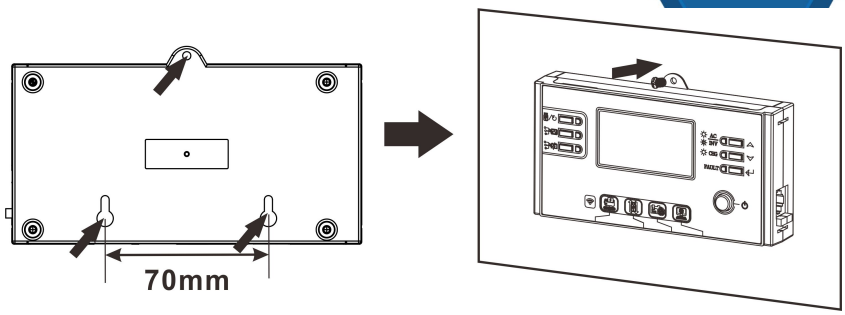
Remote Display Panel Installation

The LCD panel can be removable and installed in a remote site with an optional communication cable. Please follow below steps to implement this remote panel installation.

Step 1. Loosen the screw on the two sides of bottom case and push up the case cover. Then, remove screw on the top of the display panel. Now, the display can be removed from the bottom case. Then, pull out the cable from the remote communication port.

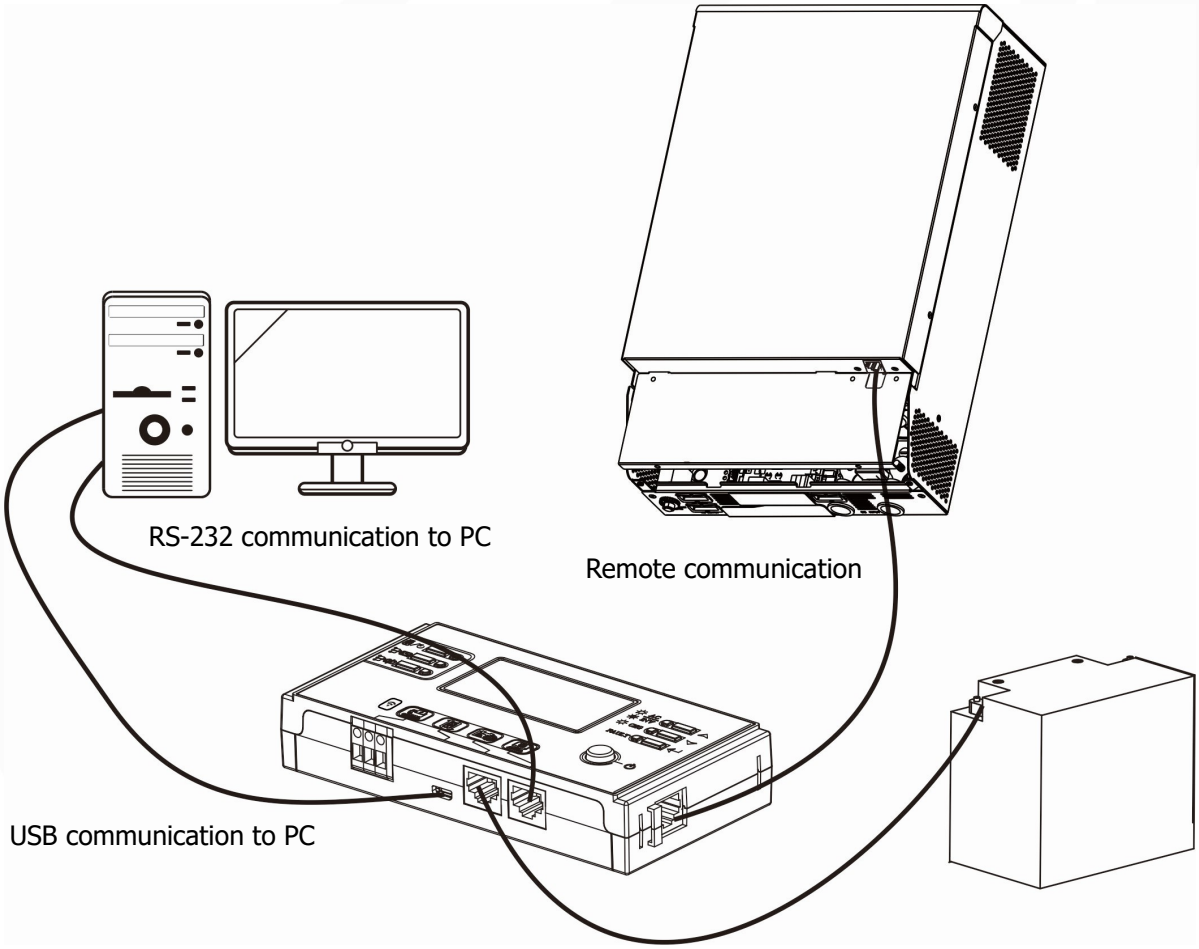


Step 2. Drill two holes in the marked locations with two screws as shown below chart. Place the panel on the surface and align the mounting holes with the two screws. Then, use one more screw on the top to fix the panel to the wall and check if the remote panel is firmly secured.



Note: Installation to the wall should be implemented with the proper screws. Refer chart for recommended spec of screws.

Step 3. Connect LCD panel to the inverter with an optional RJ45 communication cable as below chart.



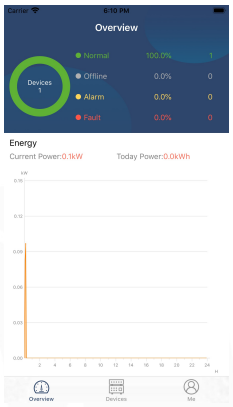
Communication Connection

Serial Connection

Please use supplied communication cable to connect to inverter and PC. Insert bundled CD into a computer and follow on-screen instruction to install the monitoring software. For the detailed software operation, please check user manual of software inside of CD.

Wi-Fi Connection

This unit is equipped with a Wi-Fi transmitter. Wi-Fi transmitter can enable wireless communication between off-grid inverters and monitoring platform. Users can access and control the monitored inverter with downloaded APP. You may find "**Energy Mate**" app from the Apple® Store or Google® Play Store. All data loggers and parameters are saved in iCloud. For quick installation and operation, please check Appendix C.



Dry Contact Signal

There is one dry contact (3A/250VAC) available on the rear panel. It could be used to deliver signal to external device when battery voltage reaches warning level.

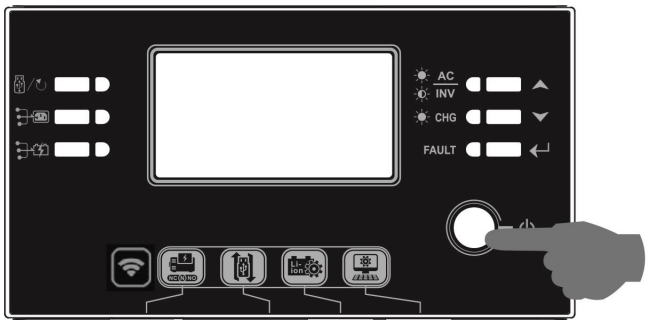
Unit Status	Condition			Dry contact port: 	
				NC & C	NO & C
Power Off	Unit is off and no output is powered.			Close	Open
Power On	Output is powered from Utility.			Close	Open
	Output is powered from Battery power or Solar energy.	Program 01 set as USB (utility first)	Battery voltage < Low DC warning voltage	Open	Close
			Battery voltage > Setting value in Program 13 or battery charging reaches floating stage	Close	Open
		Program 01 is set as SBU (SBU priority) or SUB (solar first)	Battery voltage < Setting value in Program 12	Open	Close
			Battery voltage > Setting value in Program 13 or battery charging reaches floating stage	Close	Open

BMS Communication

If connecting to lithium battery, it's requested to buy a special communication cable. For the detailed BMS communication and installation, please check Appendix B – BMS Communication Installation.

OPERATION

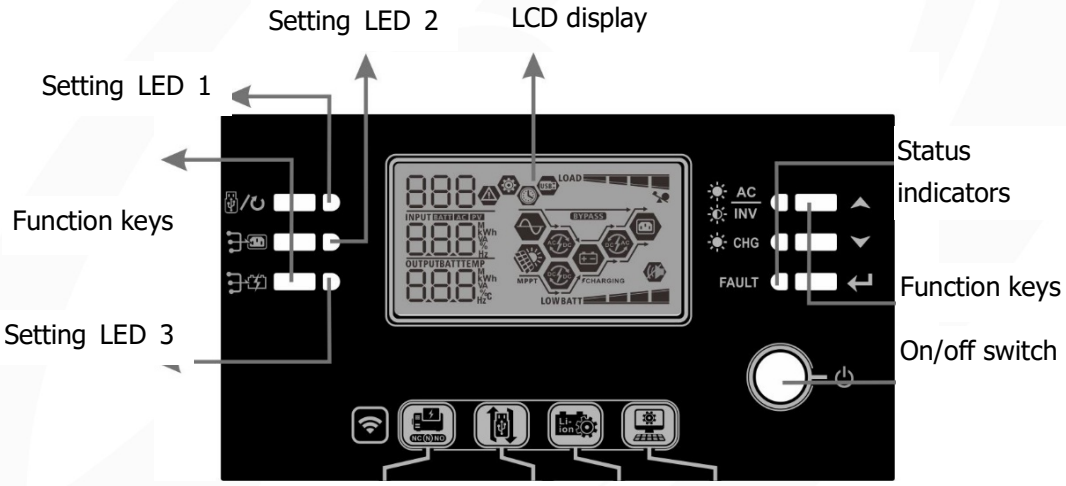
Power ON/OFF



Once the unit has been properly installed and the batteries are connected well, simply press On/Off switch to turn on the unit.

Operation and Display Panel

The operation and display panel, shown in below chart, is on the front panel of the inverter. It includes three indicators, four function keys and a LCD display, indicating the operating status and input/output power information.



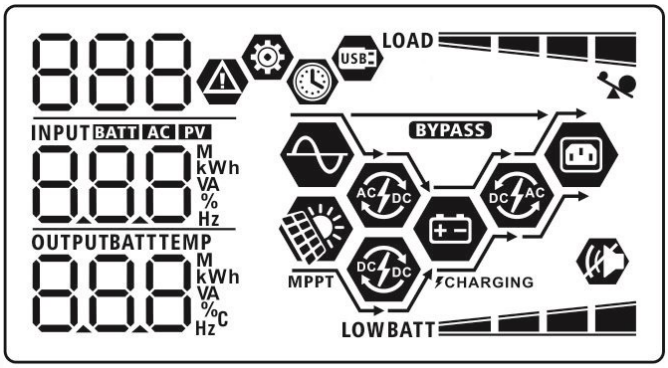
LED Indicators

LED Indicator				Messages
Setting LED1		Green	Solid On	Output powered by utility
Setting LED2		Green	Solid On	Output powered by PV
Setting LED3		Green	Solid On	Output powered by battery
Status Indicator	**AC INV**	Green	Solid On	Output is available in bypass mode
			Flashing	Output is powered by battery or AC in inverter mode
	CHG	Green	Solid On	Battery is fully charged
			Flashing	Battery is charging.
	FAULT	Red	Solid On	Fault mode
			Flashing	Warning mode

Function Keys

Function Key		Description
/↻	ESC	Exit setting mode
	USB function setting	Select USB OTG functions
▲	Up	To last selection
▼	Down	To next selection
↵	Enter	To confirm the selection in setting mode or enter setting mode

LCD Display Icons



Icon	Function description
Input Source Information	
AC	Indicates the AC input.
PV	Indicates the PV input
INPUT BATT AC PV 888 M kWh VA % Hz	Indicate input voltage, input frequency, PV voltage, charger current, charger power, battery voltage.
Configuration Program and Fault Information	
888 ⚙	Indicates the setting programs.
888 ⚠	Indicates the warning and fault codes. Warning: 88 ⚠ flashing with warning code. Fault: F88 lighting with fault code
Output Information	
OUTPUT BATT TEMP 888 M kWh VA % °C Hz	Indicate output voltage, output frequency, load percent, load in VA, load in Watt and discharging current.
Battery Information	
BATT	Indicates battery level by 0-24%, 25-49%, 50-74% and 75-100% in battery mode and charging status in line mode.

In AC mode, it will present battery charging status.

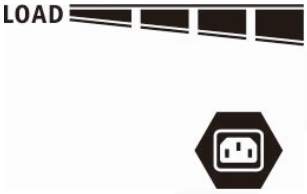
Status	Battery voltage	LCD Display
Constant Current mode / Constant Voltage mode	<2V/cell	4 bars will flash in turns.
	2 ~ 2.083V/cell	Bottom bar will be on and the other three bars will flash in turns.
	2.083 ~ 2.167V/cell	Bottom two bars will be on and the other two bars will flash in turns.
	> 2.167 V/cell	Bottom three bars will be on and the top bar

		will flash.
Floating mode. Batteries are fully charged.		4 bars will be on.

In battery mode, it will present battery capacity.

Load Percentage	Battery Voltage	LCD Display
Load >50%	< 1.85V/cell	
	1.85V/cell ~ 1.933V/cell	
	1.933V/cell ~ 2.017V/cell	
	> 2.017V/cell	
Load < 50%	< 1.892V/cell	
	1.892V/cell ~ 1.975V/cell	
	1.975V/cell ~ 2.058V/cell	
	> 2.058V/cell	

Load Information

	Indicates overload.	
	Indicates the load level by 0-24%, 25-49%, 50-74% and 75-100%.	
	0%~24%	25%~49%
		
	50%~74%	75%~100%
		

Mode Operation Information

	Indicates unit connects to the mains.
	Indicates unit connects to the PV panel.
	Indicates load is supplied by utility power.
	Indicates the utility charger circuit is working.
	Indicates the solar charger circuit is working.
	Indicates the DC/AC inverter circuit is working.
	Indicates unit alarm is disabled.
	Indicates USB disk is connected.
	Indicates timer setting or time display

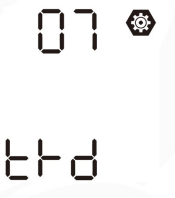
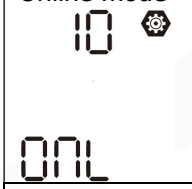
LCD Setting

After pressing and holding "↵" button for 3 seconds, the unit will enter setting mode. Press "▲" or "▼" button to select setting programs. And then, press "↵" button to confirm the selection or "⏻/↻" button to exit.

Setting Programs:

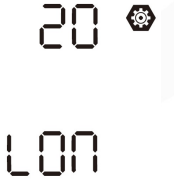
Program	Description	Selectable option	
00	Exit setting mode	Escape  	
01	Output source priority: To configure load power source priority	USB : Utility first (default)  	Utility will provide power to the loads as first priority. If Utility energy is unavailable, solar energy and battery provides power the loads.
		SUB: Solar first  	Solar energy provides power to the loads as first priority. If solar energy is not sufficient to power all connected loads, utility energy will supply power to the loads at the same time. Battery provides power to the loads only when solar and utility is not sufficient.
		SBU priority  	Solar energy provides power to the loads as first priority. If solar energy is not sufficient to power all connected loads, battery energy will supply power to the loads at the same time. Utility provides power to the loads only when battery voltage drops to either low-level warning voltage or the setting point in program 12 or solar and battery is not sufficient.

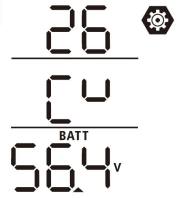
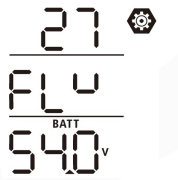
02	Maximum charging current: To configure total charging current for solar and utility chargers. (Max. charging current = utility charging current + solar charging current)	60A (default) 	5KW model setting range is from 10A to 100A and increment of each click is 10A. 6KW model setting range is from 10A to 120A and increment of each click is 10A.
05	Battery type	AGM (default) 	Flooded 
		User-Defined 	If "User-Defined" is selected, battery charge voltage and low DC cut-off voltage can be set up in program 26, 27 and 29.
		Pylontech battery 	If selected, programs of 02, 26, 27 and 29 will be automatically set up. No need for further setting.
		WECO battery 	If selected, programs of 02, 12, 26, 27 and 29 will be auto-configured per battery supplier recommended. No need for further adjustment.
		Soltaro battery 	If selected, programs of 02, 26, 27 and 29 will be automatically set up. No need for further setting.
		LIb-protocol compatible battery 	Select " LIb" if using Lithium battery compatible to Lib protocol. If selected, programs of 02, 26, 27 and 29 will be automatically set up. No need for further setting.

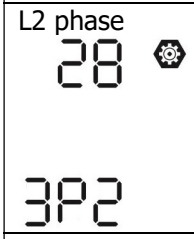
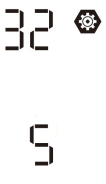
05	Battery type	3rd party Lithium battery  	If selected, programs of 02, 26, 27 and 29 will be automatically set up. No need for further setting. Please contact the battery supplier for installation procedure.
06	Auto restart when overload occurs	Restart disable (default)  	Restart enable 
07	Auto restart when over temperature occurs	Restart disable (default)  	Restart enable 
09	Output frequency	50Hz (default)  	60Hz 
10	Operation Logic	Automatically (default)  	If selected and utility is available, inverter will work in line mode. Once utility frequency is unstable, inverter will work in bypass mode if bypass function is not forbidden in program 23.
		Online mode  	If selected, inverter will work in line mode when utility is available.
		ECO Mode  	If selected and bypass is not forbidden in program 23, inverter will work in ECO mode when utility is available.

<table>
<tr><td rowspan="2">11</td><td rowspan="2">Maximum utility charging current

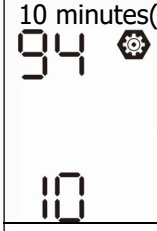
Note: If setting value in program 02 is smaller than that in program in 11, the inverter will apply charging current from program 02 for utility charger.</td><td>30A (default for 5KW)
  </td><td rowspan="2">For 5KW model, default setting is 30A and setting range is 1A, then from 10A to 100A.
For 6KW model, default setting is 60A and setting range is 1A, then from 10A to 120A.
Increment of each click is 10A.</td></tr>
<tr><td>Default setting: 46.0V
  </td></tr>
<tr><td>12</td><td>Setting voltage point back to utility source when selecting “SBU” (SBU priority) in program 01</td><td></td><td>Setting range is from 44.0V to 57.0V and increment of each click is 1.0V.</td></tr>
<tr><td rowspan="2">13</td><td rowspan="2">Setting voltage point back to battery mode when selecting “SBU” (SBU priority) in program 01</td><td colspan="2">The setting range is from 48.0V to 64.0V and increment of each click is 1.0V.</td></tr>
<tr><td>Battery fully charged
  </td><td>54.0V (default)
  </td></tr>
<tr><td rowspan="2">16</td><td rowspan="2">Solar energy priority:
To configure solar energy priority for battery and load</td><td>SbL: Solar energy for battery first
UCB: Allow utility to charge battery (Default)
  </td><td>Solar energy charges battery first and allow the utility to charge battery.</td></tr>
<tr><td>SbL: Solar energy for battery first
UdC: Disallow utility to charge battery
  </td><td>Solar energy charge battery first and disallow the utility to charge battery.</td></tr>
</table>

		SLb: Solar energy for load first UCb: Allow utility to charge battery 	Solar energy provides power to the load first and also allow the utility to charge battery.
		SLb: Solar energy for load first UdC: Disallow utility to charge battery 	Solar energy provides power to the load first and disallow the utility to charge battery.
18	Alarm control	Alarm on (default) 	Alarm off 
19	Auto return to default display screen	Return to default display screen (default) 	If selected, no matter how users switch display screen, it will automatically return to default display screen (Input voltage /output voltage) after no button is pressed for 1 minute.
		Stay at latest screen 	If selected, the display screen will stay at latest screen user finally switches.
20	Backlight control	Backlight on (default) 	Backlight off 
22	Beeps while primary source is interrupted	Alarm on (default) 	Alarm off 

23	Bypass function:	Bypass Forbidden 	If selected, inverter won't work in bypass/ECO modes.
		Bypass disable 	If selected and power ON button is pressed on, inverter can work in bypass/ECO mode only if utility is available.
		Bypass enable (default) 	If selected and no matter power ON button is pressed on or not, inverter can work in bypass mode if utility is available.
25	Record Fault code	Record enable 	Record disable (default) 
26	Bulk charging voltage (C.V voltage)	default setting: 56.4V 	If self-defined is selected in program 5, this program can be set up. Setting range is from 48.0V to 64.0V. Increment of each click is 0.1V.
27	Floating charging voltage	Default setting: 54.0V 	If self-defined is selected in program 5, this program can be set up. Setting range is from 48.0V to 64.0V. Increment of each click is 0.1V.
28	AC output mode *This setting is able to set up only when the inverter is in standby mode, Be sure that on/off Switch is in "OFF" status.	Single 	When the unit is operated alone, please select "SIG" in program 28.
		Parallel 	When the units are used in parallel for single phase application, please select "PAL" in program 28. Please refer to 5-1 for detailed information.

		L1 phase  L2 phase  L3 phase 	When the units are operated in 3-phase application, please choose "3PX" to define each inverter. It is required to have at least 3 inverters or maximum 9 inverters to support three-phase equipment. It's required to have at least one inverter in each phase or it's up to four inverters in one phase. Please refers to 5-2 for detailed information. Please select "3P1" in program 28 for the inverters connected to L1 phase, "3P2" in program 28 for the inverters connected to L2 phase and "3P3" in program 28 for the inverters connected to L3 phase. Be sure to connect share current cable to units which are on the same phase. Do NOT connect share current cable between units on different phases.
29	Low DC cut-off voltage: ● If battery power is only power source available, inverter will shut down. ● If PV energy and battery power are available, inverter will charge battery without AC output. ● If PV energy, battery power and utility are all available, inverter will transfer to line mode and provide output power to loads.	Default setting: 42.0V 	If self-defined is selected in program 5, this program can be set up. Setting range is from 40.0V to 54.0V. Increment of each click is 0.1V. Low DC cut-off voltage will be fixed to setting value no matter what percentage of load is connected.
32	Bulk charging time	auto-charging time (default) 	5min 
		If "User-Defined" is selected in program 05, this program can be set up. Setting range is from 5min to 900min. Increment of each click is 5min. Otherwise, Keeping auto-charging time.	

33	Battery equalization	Battery equalization enable 	Battery equalization disable (default) 
		If "Flooded" or "User-Defined" is selected in program 05, this program can be set up.	
34	Battery equalization voltage	Default setting: 58.4V 	Setting range is from 48.0V to 64.0V. Increment of each click is 0.1V.
35	Battery equalized time	 60min (default) 	Setting range is from 5min to 900min. Increment of each click is 5min.
36	Battery equalized timeout	120min (default) 	Setting range is from 5min to 900 min. Increment of each click is 5 min.
37	Equalization interval	30days (default) 	Setting range is from 0 to 90 days. Increment of each click is 1 day
39	Equalization activated immediately	Disable (default) 	Enable 
		If equalization function is enabled in program 33, this program can be set up. If "Enable" is selected in this program, it's to activate battery equalization immediately and LCD main page will shows "E9". If "Disable" is selected, it will cancel equalization function until next activated equalization time arrives based on program 37 setting. At this time, "E9" will not be shown in LCD main page.	

40	Reset all stored data for PV generated power and output load energy	Not reset(Default) 	Reset 
93	Erase all data log	Not reset(Default) 	Reset 
94	Data log recorded interval *The maximum data log number is 1440. If it's over 1440, it will re-write the first log.	3 minutes 	5 minutes 
		10 minutes(default) 	20 minutes 
		30 minutes 	60 minutes 
95	Time setting – Minute		For minute setting, the range is from 00 to 59.
96	Time setting – Hour		For hour setting, the range is from 00 to 23.
97	Time setting– Day		For day setting, the range is from 00 to 31.

98	Time setting– Month		For month setting, the range is from 01 to 12.
99	Time setting – Year		For year setting, the range is from 17 to 99.

USB Function Setting

Please insert USB disk into USB port ( ). Press and hold "/" button for 3 seconds to enter USB function setting mode. These functions include to upgrade inverter firmware, export data log and re-write internal parameters from USB disk.

Procedure	LCD Screen
Step 1: Press and hold "/" button for 3 seconds to enter USB function setting mode.	
Step 2: Press "/", "" or "" button to enter the selectable setting programs.	

Step 3: Please select setting program by following the procedure.

Program#	**Operation Procedure**	**LCD Screen**
/: Upgrade firmware	This function is to upgrade inverter firmware. If firmware upgrade is needed, please check with your dealer or installer for detail instructions.	
: Re-write internal parameters	This function is to over-write all parameter settings (TEXT file) with settings in the On-The-Go USB disk from a previous setup or to duplicate inverter settings. Please check with your dealer or installer for detail instructions.	
: Export data log	Press "" button to export data log from the inverter to USB disk. If the selected function is ready, LCD will display "tdy". Press "/" button to confirm the selection again.	
	• Press "" button to select "Yes", LED 1 will flash once every second during the process. It will only display LOG and all LEDs will be on after this action is complete. Then, press "/" button to return to main screen. • Or press "" button to select "No" to return to main screen.	

If no button is pressed for 1 minute, it will automatically return to main screen.

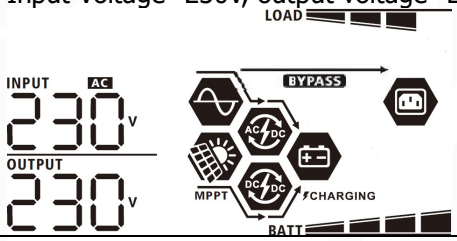
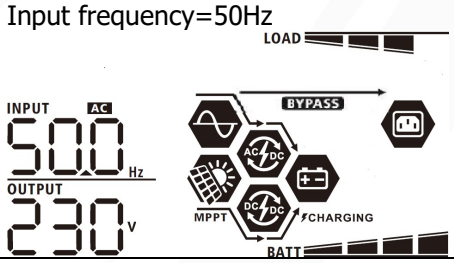
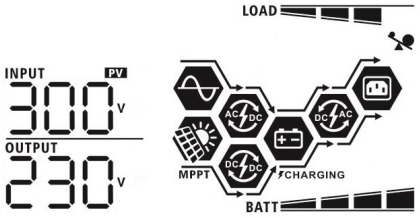
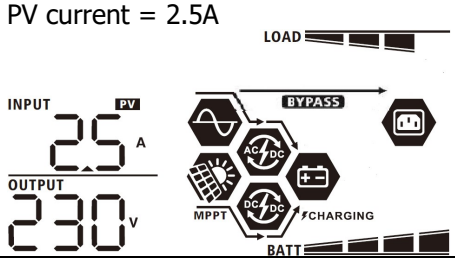
Error message for USB On-the-Go functions:

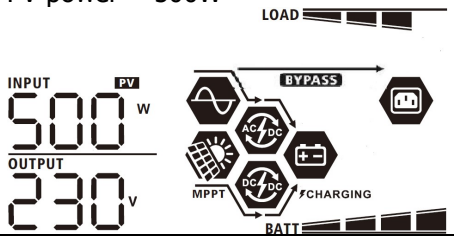
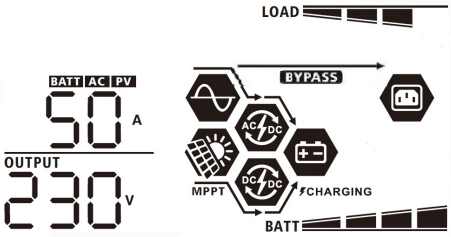
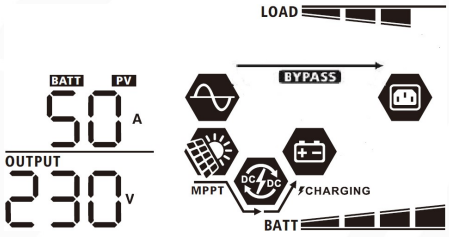
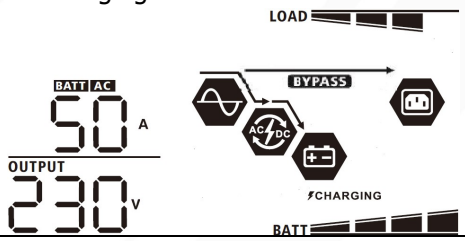
Error Code	Messages
	No USB disk is detected.
	USB disk is protected from copy.
	Document inside the USB disk with wrong format.

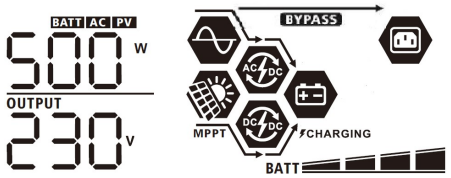
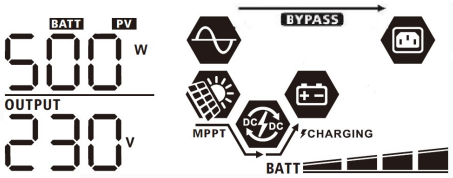
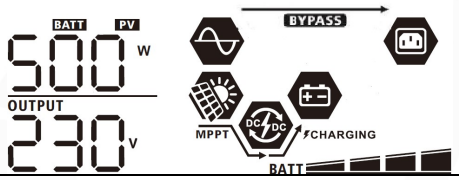
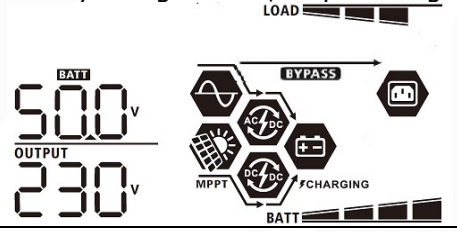
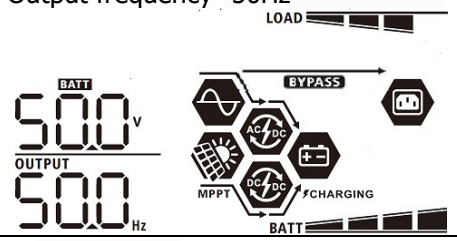
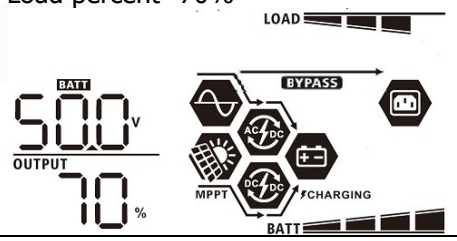
If any error occurs, error code will only show 5 seconds. After 5 seconds, it will automatically return to display screen.

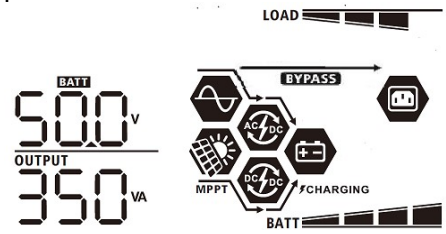
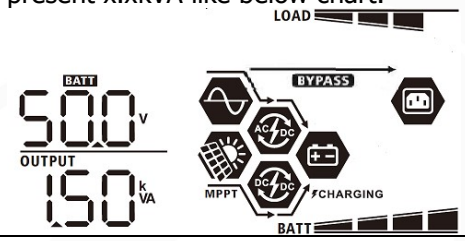
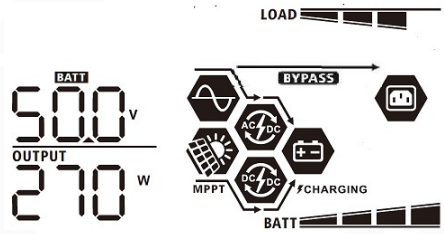
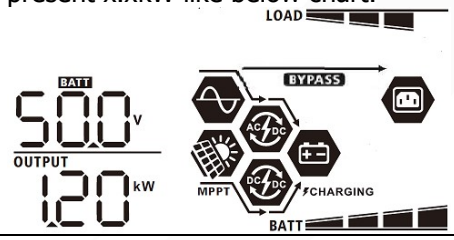
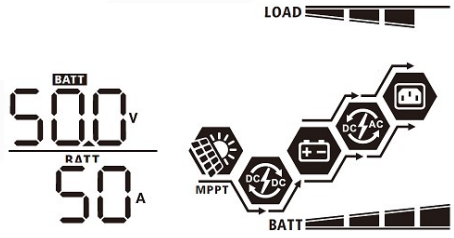
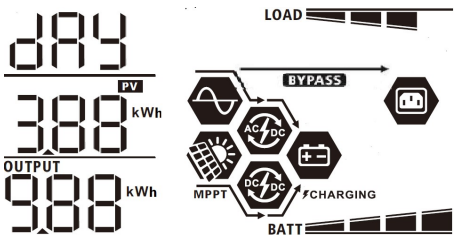
Display Setting

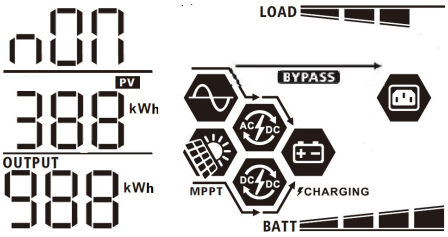
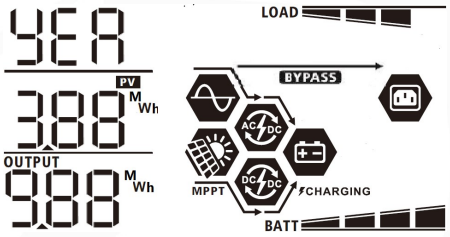
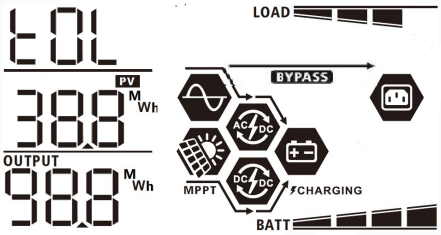
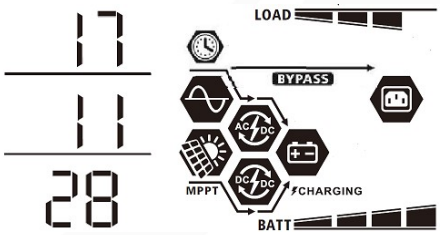
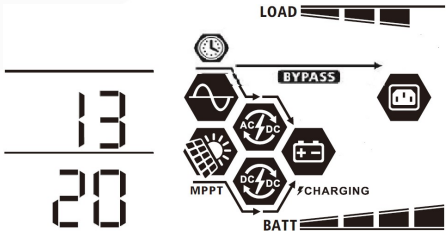
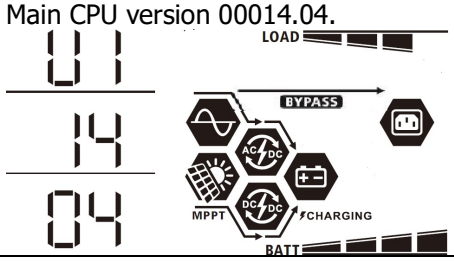
The LCD display information will be switched in turn by pressing the "UP" or "DOWN" button. The selective information will be switched as per the following orders:

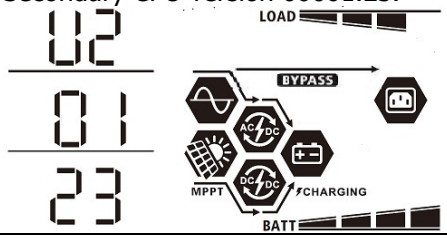
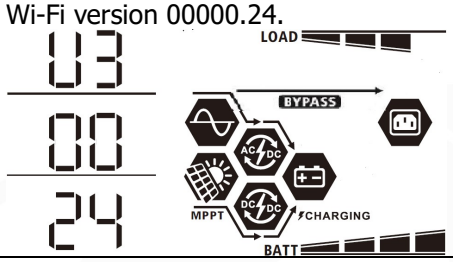
Selectable information	LCD display
Input voltage/Output voltage (Default Display Screen)	Input Voltage=230V, output voltage=230V 
Input frequency	Input frequency=50Hz 
PV voltage	PV voltage=300V 
PV current	PV current = 2.5A 

PV power	PV power = 500W 
Charging current	AC and PV charging current=50A  PV charging current=50A  AC charging current=50A 

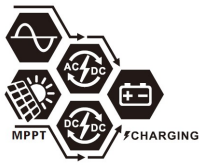
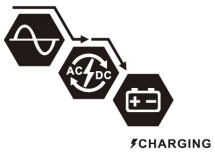
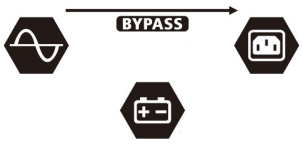
Charging power	AC and PV charging power=500W  PV charging power=500W  AC charging power=500W 
Battery voltage and output voltage	Battery voltage=50.0V, output voltage=230V 
Output frequency	Output frequency=50Hz 
Load percentage	Load percent=70% 

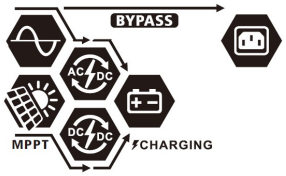
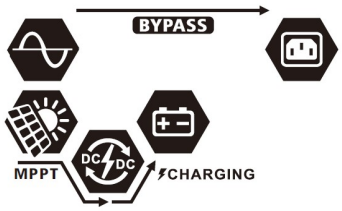
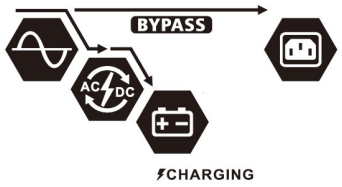
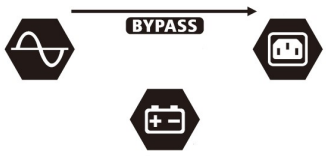
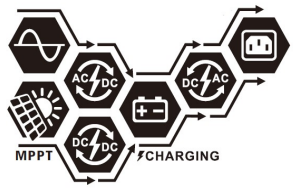
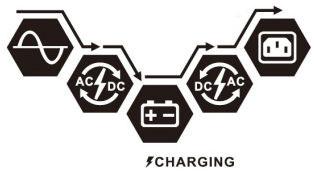
Load in VA	When connected load is lower than 1kVA, load in VA will present xxxVA like below chart.  When load is larger than 1kVA (≧1KVA), load in VA will present x.xkVA like below chart. 
Load in Watt	When load is lower than 1kW, load in W will present xxxW like below chart.  When load is larger than 1kW (≧1KW), load in W will present x.xkW like below chart. 
Battery voltage/DC discharging current	Battery voltage=50.0V, discharging current=50A 
PV energy generated today and Load output energy today	PV energy generated Today = 3.88kWh, Load output energy Today = 9.88kWh. 

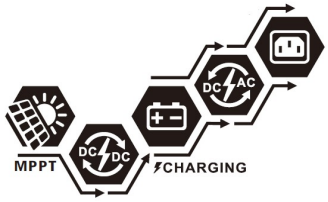
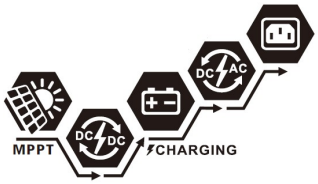
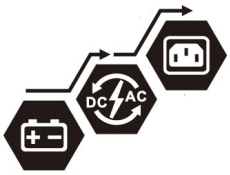
PV energy generated this month and Load output energy this month.	This PV month energy = 388kWh, Load month energy= 988kWh. 
PV energy generated this year and Load output energy this year.	This PV year energy = 3.88MWh, Load year energy = 9.88MWh. 
PV energy generated totally and Load output total energy.	PV Total energy = 38.8MWh, Load Output Total energy = 98.8MWh. 
Real date.	Real date Nov 28, 2017. 
Real time.	Real time 13:20. 
Main CPU version checking.	Main CPU version 00014.04. 

Secondary CPU version checking.	Secondary CPU version 00001.23. 
Wi-Fi version checking.	Wi-Fi version 00000.24. 

Operating Mode Description

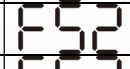
Operation mode	Description	LCD display
Standby mode **Note:** *Standby mode: The inverter is not turned on yet but at this time, the inverter can charge battery without AC output.	No output is supplied by the unit but it still can charge batteries.	Charging by utility and PV energy. 
		Charging by utility. 
		Charging by PV energy. 
		No charging. 
Fault mode Note: *Fault mode: Errors are caused by inside circuit error or external reasons such as over temperature, output short	Utility can bypass.	No charging and Bypass 

<table>
<tr><td>circuited and so on.</td><td></td><td>No charging
  </td></tr>
<tr><td rowspan="2">Bypass/ECO Mode</td><td rowspan="2">The unit will provide output power from the utility. PV energy and utility can charge batteries.</td><td>Charging by utility and PV energy.
  </td></tr>
<tr><td>Charging by PV
  </td></tr>
<tr><td rowspan="2">Bypass/ECO Mode</td><td rowspan="2">The unit will provide output power from the utility. PV energy and utility can charge batteries.</td><td>Charging by utility
  </td></tr>
<tr><td>No charging
  </td></tr>
<tr><td rowspan="3">Line Mode</td><td rowspan="3">The unit will provide output power from the mains. It will also charge the battery at line mode.</td><td>Charging by utility and PV energy.
  </td></tr>
<tr><td>Charging by utility.
  </td></tr>
<tr><td>Power from utility and PV energy</td></tr>
</table>

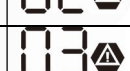
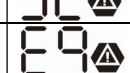
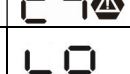
		
Line Mode	The unit will provide output power from the mains. It will also charge the battery at line mode.	Power from utility only 
Battery Mode	The unit will provide output power from battery and PV power.	Power from battery and PV energy. 
		PV energy will supply power to the loads and charge battery at the same time. 
		Power from battery only. 
		Power from PV only 

Fault Reference Code

Fault Code	Fault Event	Icon on
01	Fan is locked when inverter is off.	
02	Over temperature	
03	Battery voltage is too high	

04	Battery voltage is too low	
05	Output short circuited or over temperature is detected by internal converter components.	
06	Output voltage is too high.	
07	Overload time out	
08	Bus voltage is too high	
09	Bus soft start failed	
50	PFC over current	
51	OP over current	
52	Bus voltage is too low	
53	Inverter soft start failed	
55	Over DC voltage in AC output	
57	Current sensor failed	
58	Output voltage is too low	

Warning Indicator

Warning Code	Warning Event	Audible Alarm	Icon flashing
01	Fan is locked when inverter is on.	Beep three times every second	
02	Over temperature	None	
03	Battery is over-charged	Beep once every second	
04	Low battery	Beep once every second	
07	Overload	Beep once every 0.5 second	
10	Output power derating	Beep twice every 3 seconds	
32	Communication interrupted	None	
E9	Battery equalization	None	
bP	Battery open	Beep once every second	

Battery Equalization

Equalization function is added into charge controller. It reverses the buildup of negative chemical effects like stratification, a condition where acid concentration is greater at the bottom of the battery than at the top. Equalization also helps to remove sulfate crystals that might have built up on the plates. If left unchecked, this condition, called sulfation, will reduce the overall capacity of the battery. Therefore, it's recommended to equalize battery periodically.

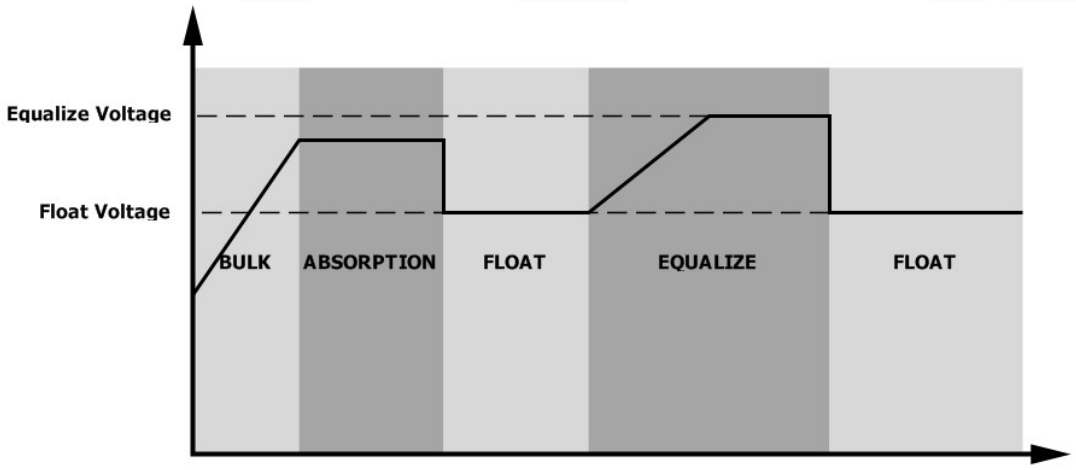
- **How to Apply Equalization Function**

You must enable battery equalization function in monitoring LCD setting program 33 first. Then, you may apply this function in device by either one of following methods:

1. Setting equalization interval in program 37.
2. Active equalization immediately in program 39.

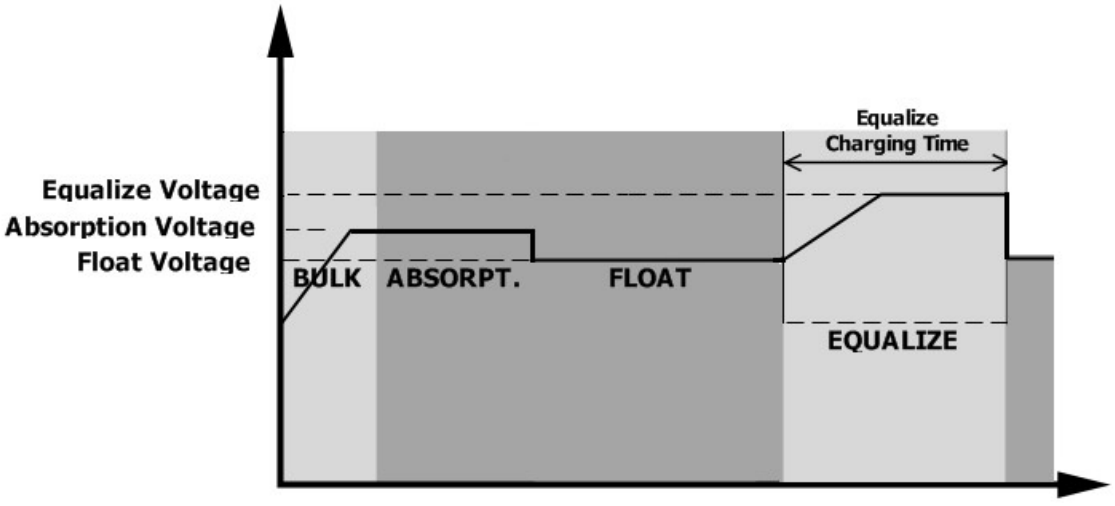
- **When to Equalize**

In float stage, when the setting equalization interval (battery equalization cycle) is arrived, or equalization is active immediately, the controller will start to enter Equalize stage.

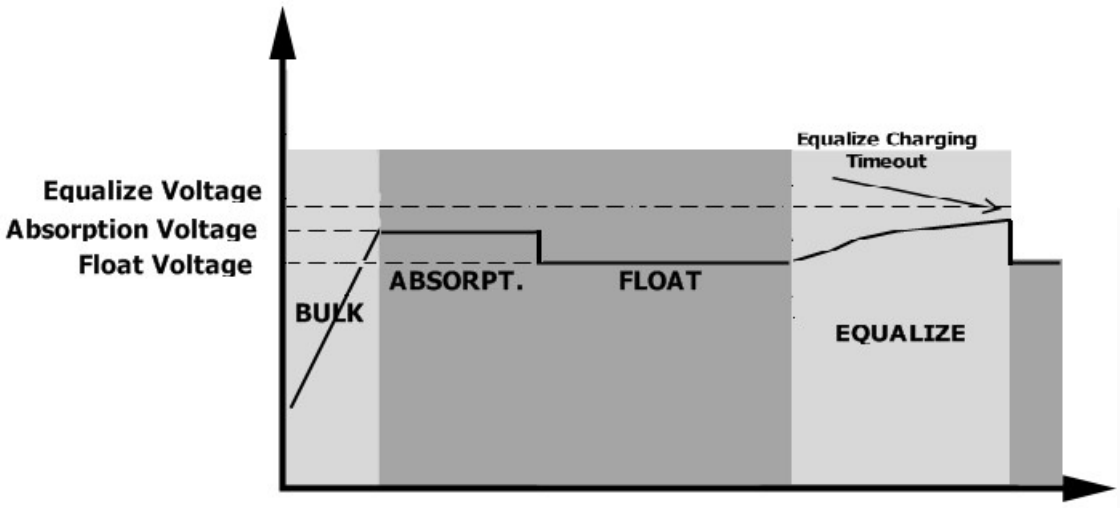


- **Equalize charging time and timeout**

In Equalize stage, the controller will supply power to charge battery as much as possible until battery voltage raises to battery equalization voltage. Then, constant-voltage regulation is applied to maintain battery voltage at the battery equalization voltage. The battery will remain in the Equalize stage until setting battery equalized time is arrived.



However, in Equalize stage, when battery equalized time is expired and battery voltage doesn't rise to battery equalization voltage point, the charge controller will extend the battery equalized time until battery voltage achieves battery equalization voltage. If battery voltage is still lower than battery equalization voltage when battery equalized timeout setting is over, the charge controller will stop equalization and return to float stage.



SPECIFICATIONS

Table 1 Line Mode Specifications

INVERTER MODEL	5KW
Input Voltage Waveform	Sinusoidal
Nominal Input Voltage	230Vac
Low Loss Voltage	110Vac±7V
Low Loss Return Voltage	120Vac±7V
High Loss Voltage	280Vac±7V
High Loss Return Voltage	270Vac±7V
Max AC Input Voltage	300Vac
Nominal Input Frequency	50Hz / 60Hz (Auto detection)
Low Loss Frequency	46(56)±1Hz
Low Loss Return Frequency	46.5(57)±1Hz
High Loss Frequency	54(64)±1Hz
High Loss Return Frequency	53(63)±1Hz
Power Factor	>0.98
Output Short Circuit Protection	Line mode: Circuit Breaker Battery mode: Electronic Circuits
Efficiency (Line Mode)	93% (Peak Efficiency)
Transfer Time	Line mode←→Battery mode 0ms Inverter←→Bypass 4ms

Table 2 Battery Mode Specifications

INVERTER MODEL	5KW
Rated Output Power	5KVA/5KW
Output Voltage Waveform	Pure Sine Wave
Output Voltage Regulation	230Vac±5%
Output Frequency	50Hz or 60Hz
Peak Efficiency	92%
Overload Protection	5s@≥150% load; 10s@110%~150% load; 100ms @ ≥200% load
Surge Capacity	2* rated power for 5 seconds
Nominal DC Input Voltage	48Vdc
Operating Range	40Vdc -66Vdc
Cold Start Voltage	46Vdc
Low DC Warning Voltage @ load < 50% @ load ≥ 50%	 45.0Vdc 44.0Vdc
Low DC Warning Return Voltage @ load < 50% @ load ≥ 50%	 47.0Vdc 46.0Vdc
Low DC Cut-off Voltage @ load < 50% @ load ≥ 50%	 43.0Vdc 42.0Vdc
High DC Recovery Voltage	64Vdc
High DC Cut-off Voltage	66Vdc
No Load Power Consumption	<75W

Table 3 Charge Mode Specifications

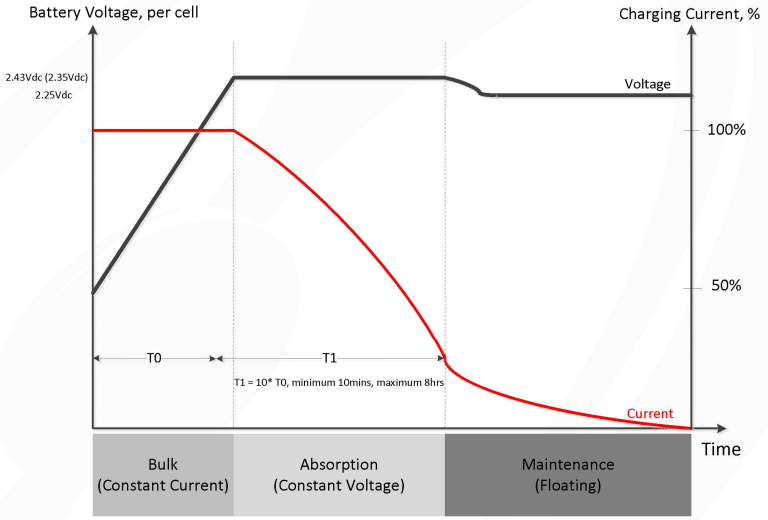
Charging Mode		
INVERTER MODEL		**5KW**
Charging Current @ Nominal Input Voltage		Default: 30A, max: 100A
Bulk Charging Voltage	**Flooded Battery**	58.4Vdc
	AGM / Gel Battery	56.4Vdc
Floating Charging Voltage		54Vdc
Overcharge Protection		66Vdc
Charging Algorithm		3-Step
Charging Curve		

Table 4 Solar Specifications

Solar Input (MPPT type)	
INVERTER MODEL	**5KW**
Rated Power	6000W
Max. PV Array Open Circuit Voltage	500Vdc
PV Array MPPT Voltage Range	120~430V
Maximum solar input current	27A

Table 4 ECO/Bypass Mode Specifications

Bypass Mode	
INVERTER MODEL	**5KW**
Input Voltage Waveform	Sinusoidal
Low Loss Voltage	176Vac±7V
Low Loss Return Voltage	186Vac±7V
High Loss Voltage	280Vac±7V
High Loss Return Voltage	270Vac±7V
Nominal Input Frequency	50Hz / 60Hz (Auto detection)
Low Loss Frequency	46(56)±1Hz
Low Loss Return Frequency	46.5(57)±1Hz
High Loss Frequency	54(64)±1Hz
High Loss Return Frequency	53(63)±1Hz

Table 5 General Specifications

INVERTER MODEL	**5KW**
SCC type	**MPPT**
Parallel-able	YES
Communication	RS232 and Wi-Fi
Safety Certification	CE
Operating Temperature Range	-10°C to 50°C
Storage temperature	-15°C~ 60°C
Humidity	5% to 95% Relative Humidity (Non-condensing)
Dimension (D*W*H), mm	140 x 295 x 468
Net Weight, kg	12

TROUBLE SHOOTING

Problem	LCD/LED/Buzzer	Explanation / Possible cause	What to do
Unit shuts down automatically during startup process.	LCD/LEDs and buzzer will be active for 3 seconds and then complete off.	The battery voltage is too low (<1.91V/Cell)	1. Re-charge battery. 2. Replace battery.
No response after power on.	No indication.	1. The battery voltage is far too low. (<1.4V/Cell) 2. Battery polarity is connected reversed.	1. Check if batteries and the wiring are connected well. 2. Re-charge battery. 3. Replace battery.
Mains exist but the unit works in battery mode.	Input voltage is displayed as 0 on the LCD and green LED is flashing.	Input protector is tripped	Check if AC breaker is tripped and AC wiring is connected well.
	Green LED is flashing.	Insufficient quality of AC power. (Shore or Generator)	1. Check if AC wires are too thin and/or too long. 2. Check if generator (if applied) is working well or if input voltage range setting is correct. (UPS→Appliance)
When the unit is turned on, internal relay is switched on and off repeatedly.	LCD display and LEDs are flashing	Battery is disconnected.	Check if battery wires are connected well.
Buzzer beeps continuously and red LED is on.	Fault code 07	Overload error. The inverter is overload 110% and time is up.	Reduce the connected load by switching off some equipment.
	Fault code 05	Output short circuited.	Check if wiring is connected well and remove abnormal load.
	Fault code 02	Internal temperature of inverter component is over 100°C.	Check whether the air flow of the unit is blocked or whether the ambient temperature is too high.
	Fault code 03	Battery is over-charged.	Return to repair center.
		The battery voltage is too high.	Check if spec and quantity of batteries are meet requirements.
	Fault code 01	Fan fault	Replace the fan.
	Fault code 06/58	Output abnormal (Inverter voltage below than 190Vac or is higher than 260Vac)	1. Reduce the connected load. 2. Return to repair center
	Fault code 08/09/53/57	Internal components failed.	Return to repair center.
	Fault code 50	PFC over current or surge.	Restart the unit, if the error happens again, please return to repair center.
	Fault code 51	OP over current or surge.	
	Fault code 52	Bus voltage is too low.	
	Fault code 55	Output voltage is unbalanced.	
	Fault code 56	Battery is not connected well or fuse is burnt.	If the battery is connected well, please return to repair center.

PARALLEL FUNCTION

1. Introduction

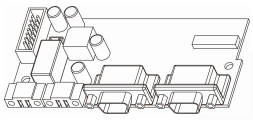
This inverter can be used in parallel for two applications.

1. Parallel operation in single phase with up to 9 units. For 5KW model, the supported maximum output power is 45KW/45KVA. For 6KW model, the supported maximum output power is 54KW/54KVA.
2. Maximum 9 units work together to support three-phase equipment. Seven units support one phase maximum. For 5KW model, the supported maximum output power is 45KW/45KVA and one phase can be up to 35KW/35KVA. For 6KW model, the supported maximum output power is 54KW/54KVA and one phase can be up to 42KW/42KVA.

NOTE: If this unit is bundled with share current cable and parallel cable, this inverter is default supported parallel operation. You may skip section 3. If not, please purchase parallel kit and install this unit by following instruction from professional technical personnel in local dealer.

2. Package Contents

In parallel kit, you will find the following items in the package:



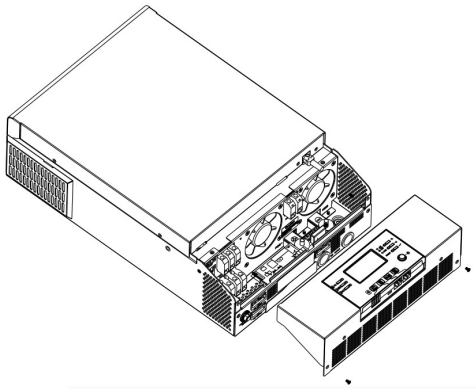
Parallel board

Parallel communication cable

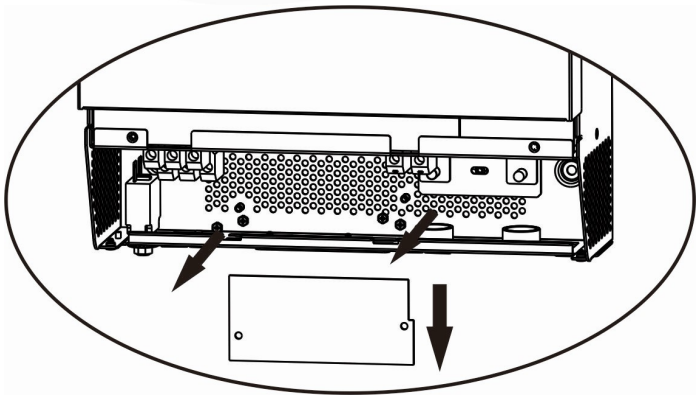
Current sharing cable

3. Parallel board installation

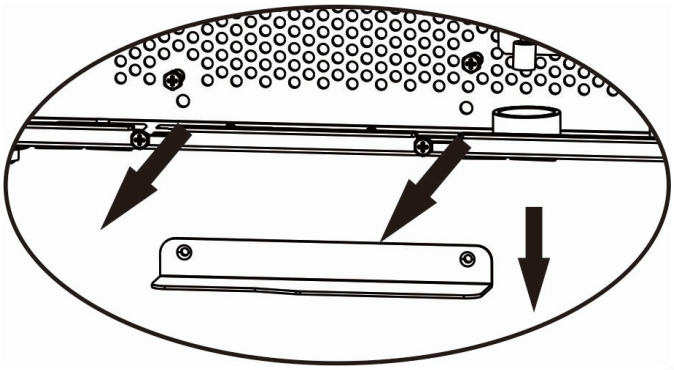
Step 1: Remove bottom case by unscrewing all screws as shown below.



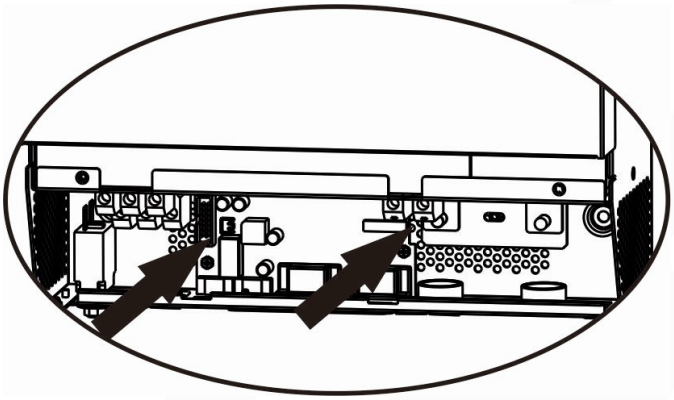
Step 2: Remove two screws as below chart and remove 2-pin and 14-pin cables.



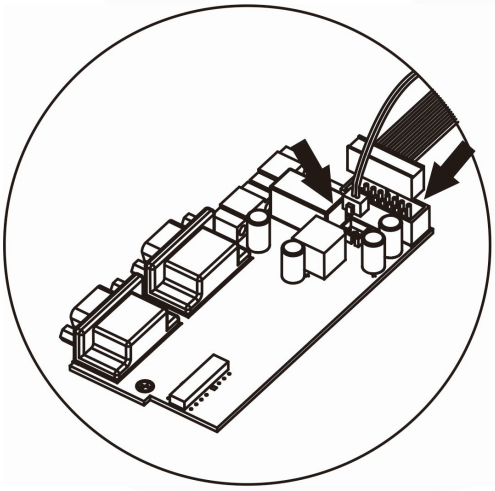
Step 3: Remove two screws as below chart to take out cover of parallel communication.



Step 4: Install new parallel board with 2 screws tightly.



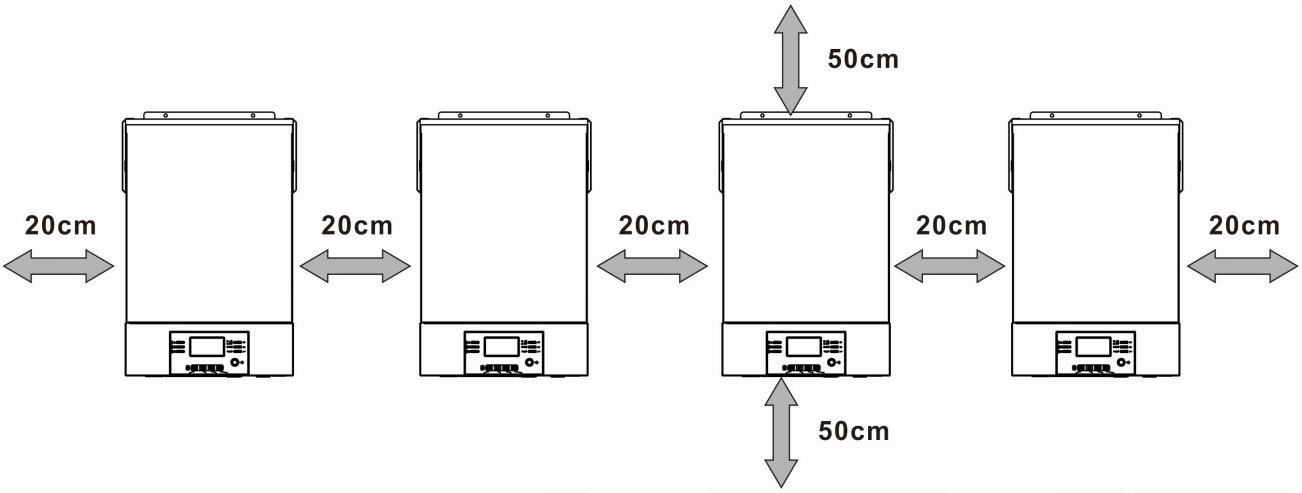
Step 5: Re-connect 2-pin and 14-pin to original position on parallel board as shown below chart.



Step 6: Put wire cover back to the unit. Now the inverter is providing parallel operation function.

4. Mounting the Unit

When installing multiple units, please follow below chart.



NOTE: For proper air circulation to dissipate heat, allow a clearance of approx. 20 cm to the side and approx. 50 cm above and below the unit. Be sure to install each unit in the same level.

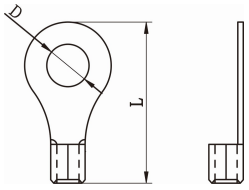
5. Wiring Connection

The cable size of each inverter is shown as below:

Recommended battery cable and terminal size for each inverter:

Model	Wire Size	Ring Terminal			Torque value
		Cable mm²	Dimensions		
			D (mm)	L (mm)	
5KW/6KW	1*1/0AWG	60	6.4	49.7	2~ 3 Nm
	2 * 4AWG	44	6.4	49.7	

Ring terminal:



WARNING: Be sure the length of all battery cables is the same. Otherwise, there will be voltage difference between inverter and battery to cause parallel inverters not working.

Recommended AC input and output cable size for each inverter:

Model	AWG no.	Torque
5KW/6KW	8 AWG	1.4~1.6Nm

You need to connect the cables of each inverter together. Take the battery cables for example: You need to use a connector or bus-bar as a joint to connect the battery cables together, and then connect to the battery terminal. The cable size used from joint to battery should be X times cable size in the tables above. "X" indicates the number of inverters connected in parallel.

Regarding AC input and output, please also follow the same principle.

CAUTION!! Please install the breaker at the battery and AC input side. This will ensure the inverter can be securely disconnected during maintenance and fully protected from over current of battery or AC input. The recommended mounted location of the breakers is shown in the figures in 5-1 and 5-2.

Recommended breaker specification of battery for each inverter:

Model	1 unit*
5KW	125A/80VDC

*If you want to use only one breaker at the battery side for the whole system, the rating of the breaker should be X times current of 1 unit. "X" indicates the number of inverters connected in parallel.

Recommended breaker specification of AC input:

Model	2 units	3 units	4 units	5 units	6 units	7 units	8 units	9 units
5KW/6KW	100A	150A	200A	250A	300A	350A	400A	450A

Note1: Also, you can use 40A for only 1 unit and install one breaker at its AC input in each inverter.

Note2: Regarding three-phase system, you can use 4-pole breaker directly and the rating of the breaker should be compatible with the phase current limitation from the phase with maximum units

Recommended battery capacity

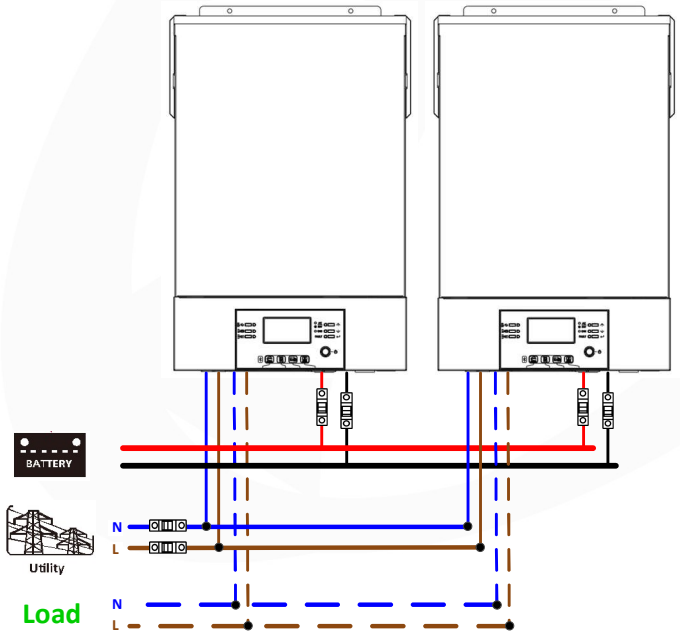
Inverter parallel numbers	2	3	4	5	6	7	8	9
Battery Capacity	800AH	1200AH	1600AH	2000AH	2400AH	2800AH	3200AH	3600AH

WARNING! Be sure that all inverters will share the same battery bank. Otherwise, the inverters will transfer to fault mode.

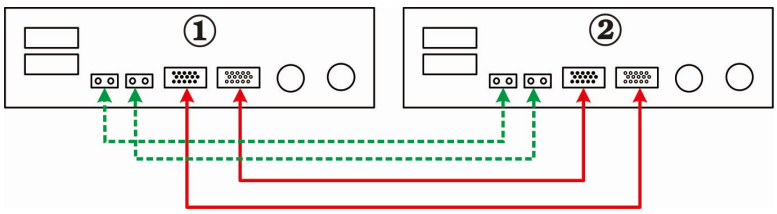
5-1. Parallel Operation in Single phase

Two inverters in parallel:

Power Connection

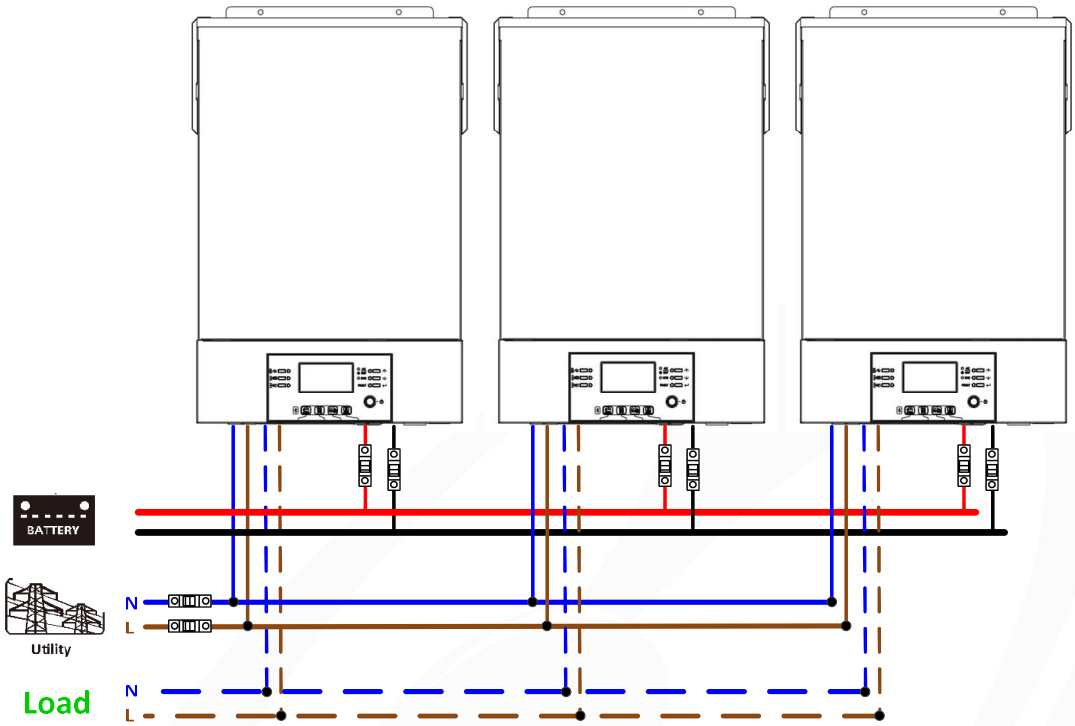


Communication Connection

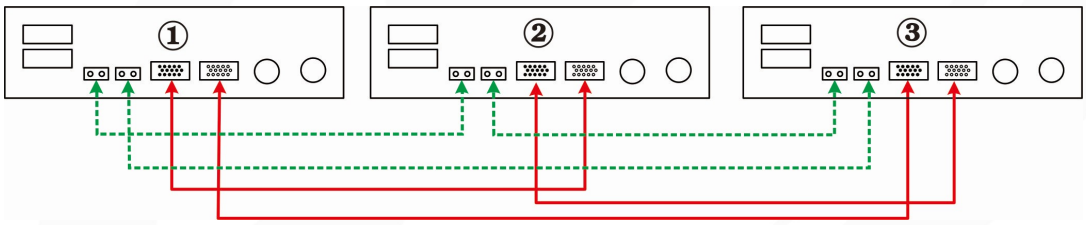


Three inverters in parallel:

Power Connection

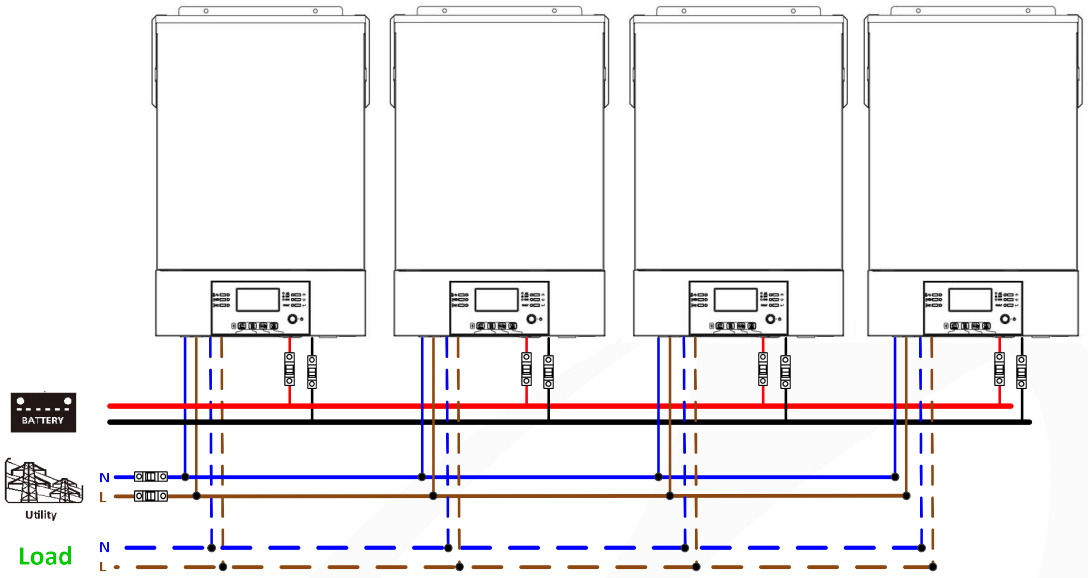


Communication Connection

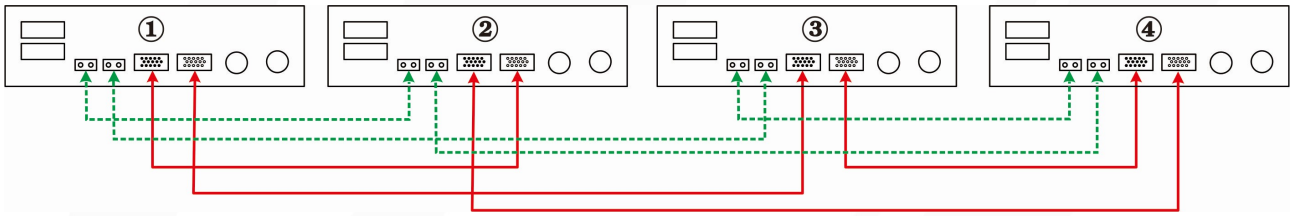


Four inverters in parallel:

Power Connection

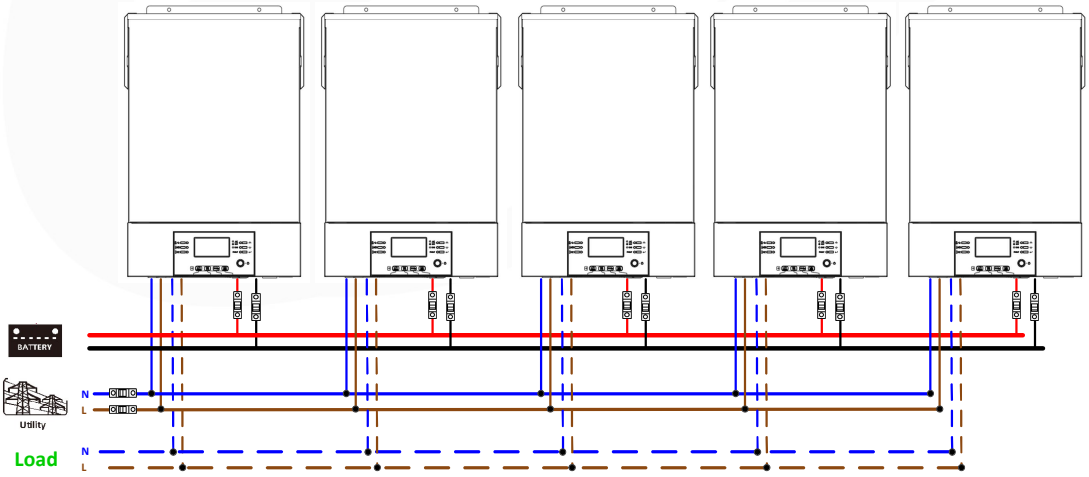


Communication Connection

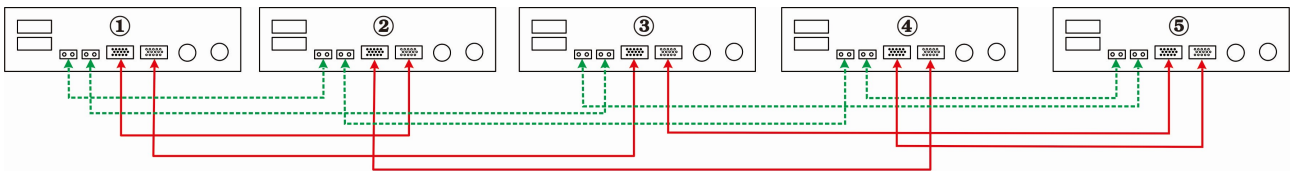


Five inverters in parallel:

Power Connection

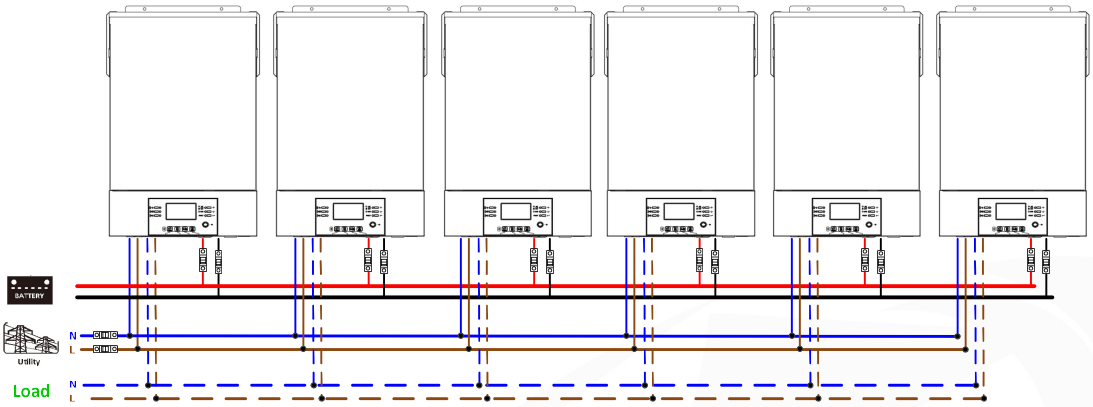


Communication Connection

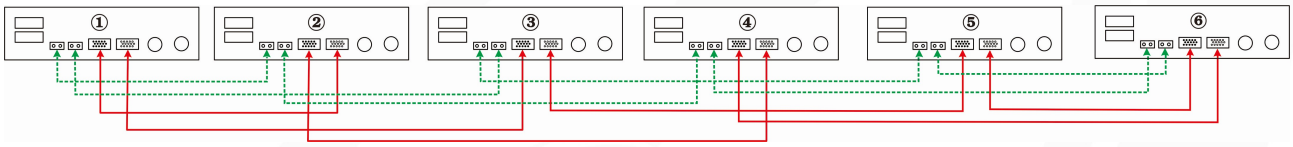


Six inverters in parallel:

Power Connection

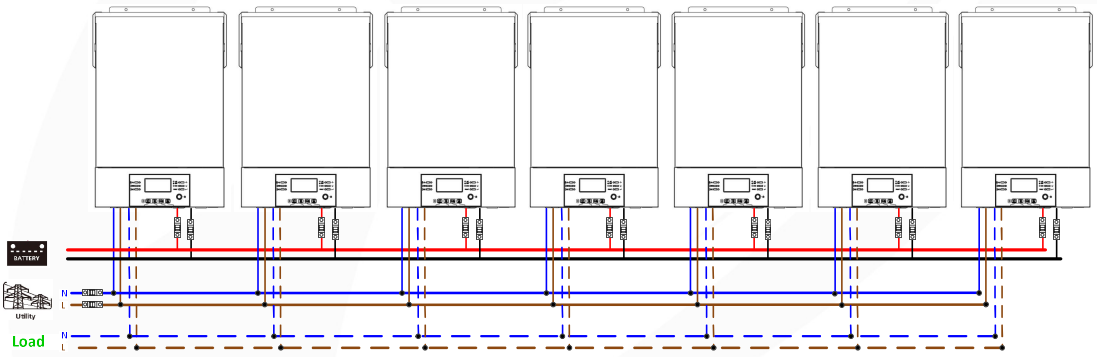


Communication Connection

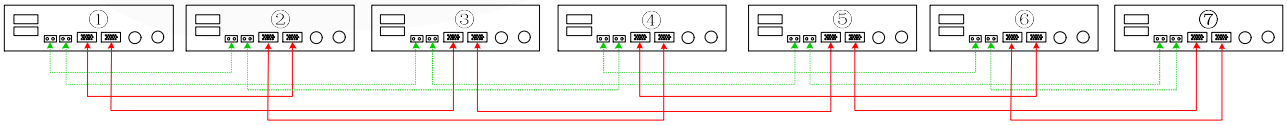


Seven inverters in parallel:

Power Connection

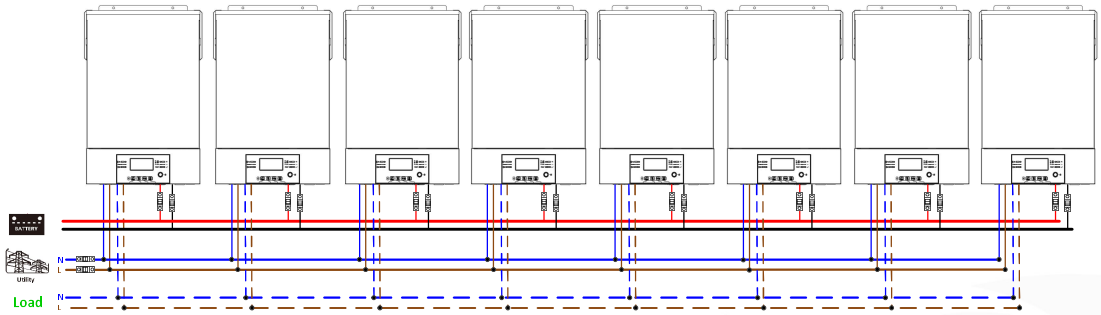


Communication Connection

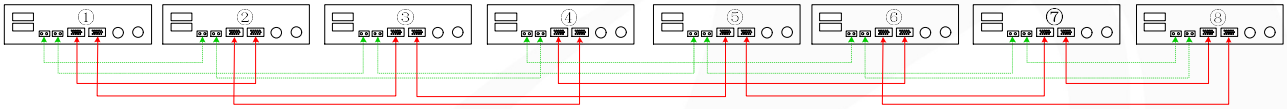


Eight inverters in parallel:

Power Connection

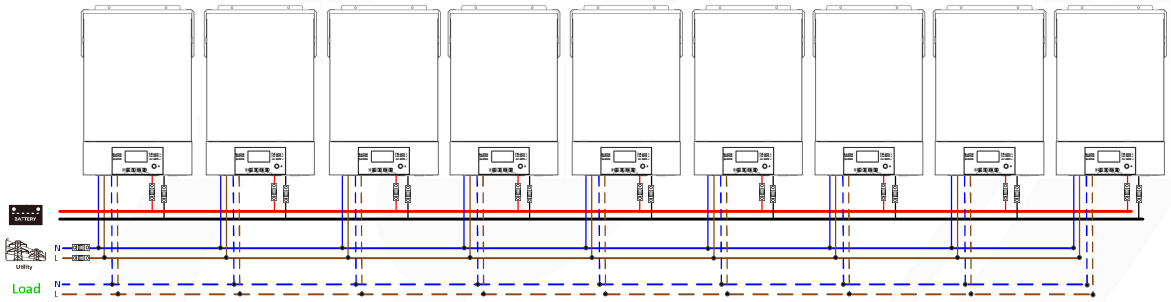


Communication Connection

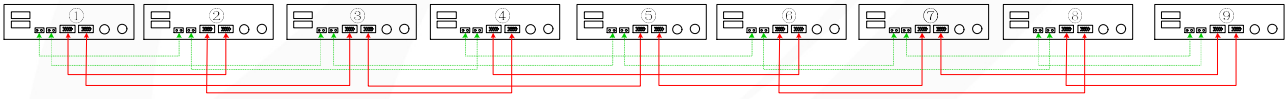


Nine inverters in parallel:

Power Connection



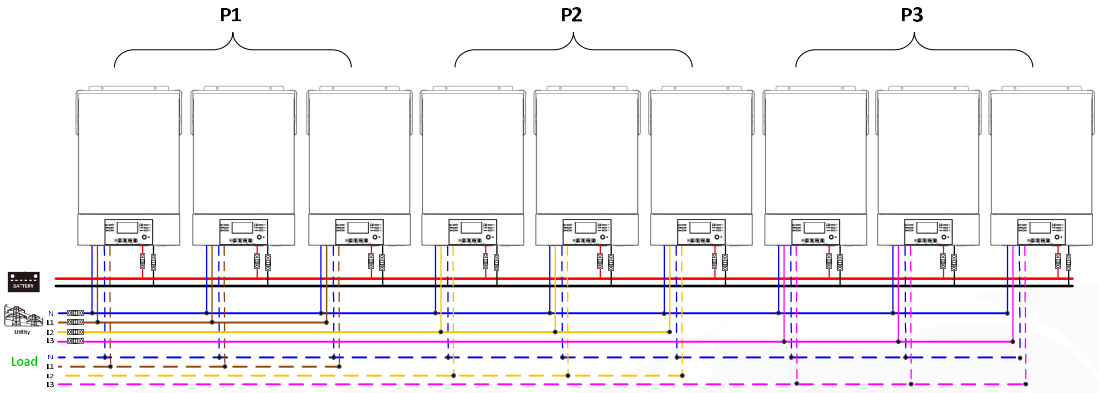
Communication Connection



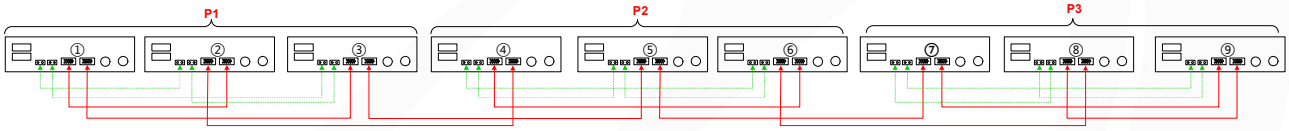
5-2. Support 3-phase equipment

Three inverters in each phase:

Power Connection

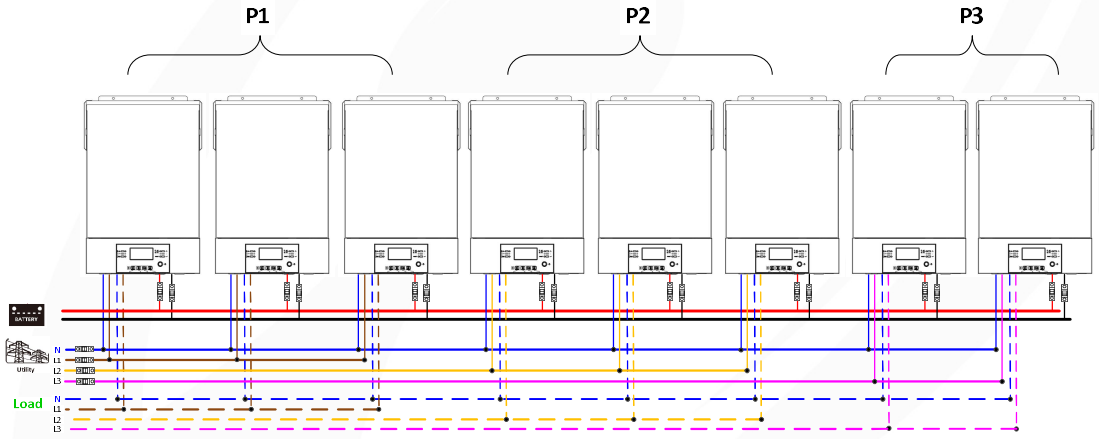


Communication Connection

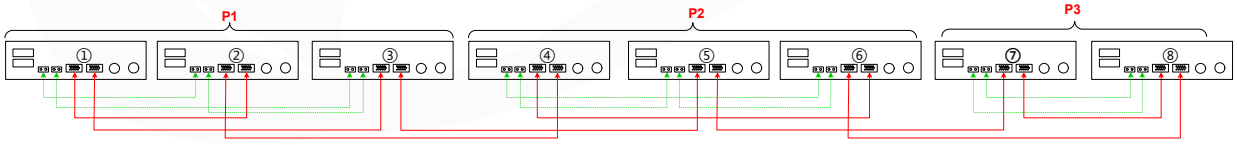


Three inverters in one phase, three inverters in second phase and two inverter for the third phase:

Power Connection

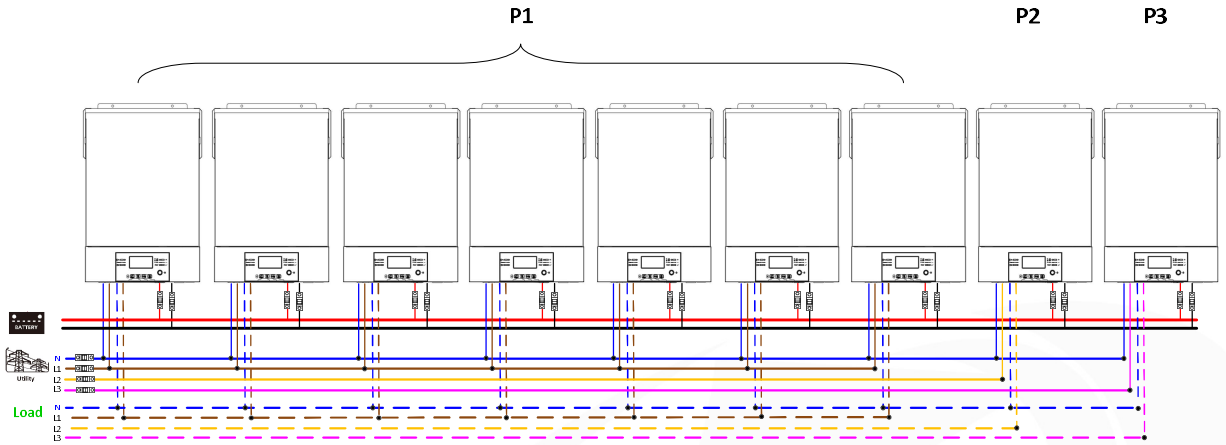


Communication Connection



Seven inverters in one phase and one inverter for the other two phases:

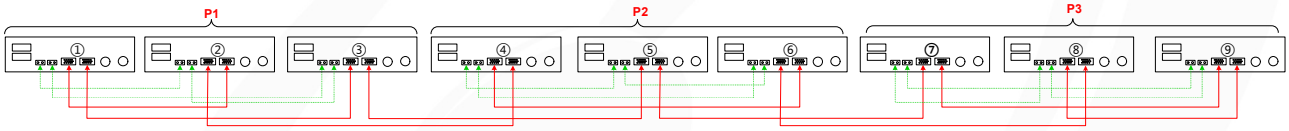
Power Connection



Note: It's up to customer's demand to pick 7 inverters on any phase.

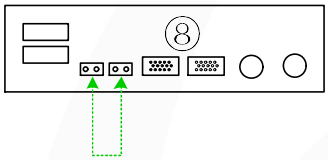
P1: L1-phase, P2: L2-phase, P3: L3-phase.

Communication Connection



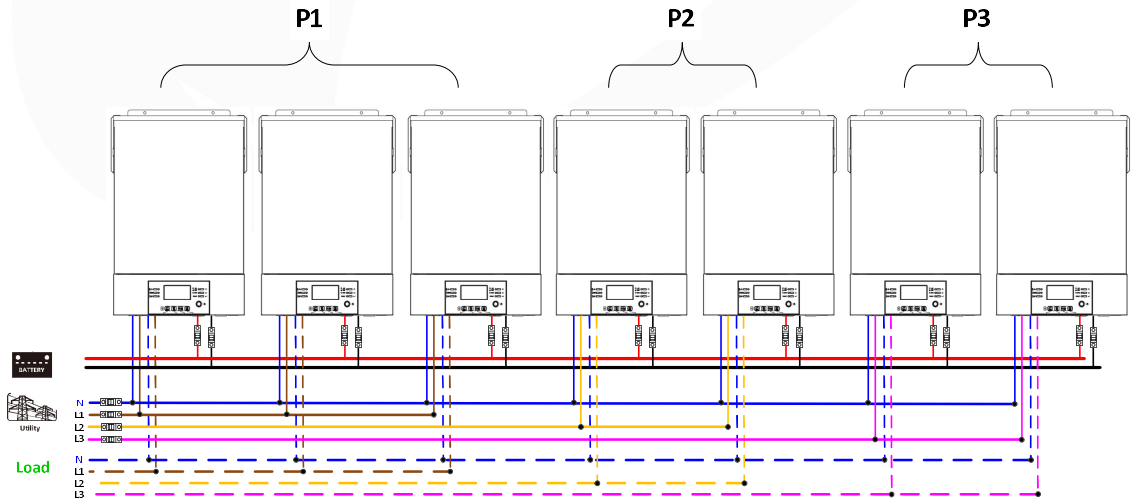
Note: If there is only one unit in one phase, this unit doesn't need to connect the current sharing cable.

Or you connect it like as below:

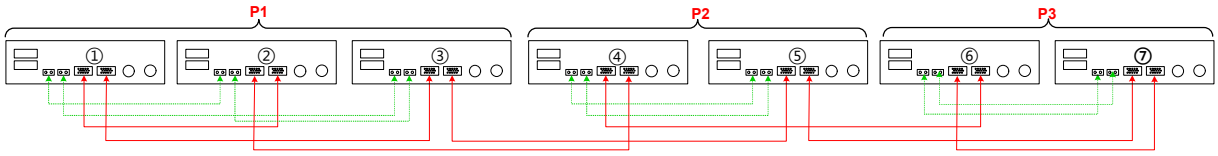


Three inverters in one phase, two inverters in second phase and two inverters for the third phase:

Power Connection

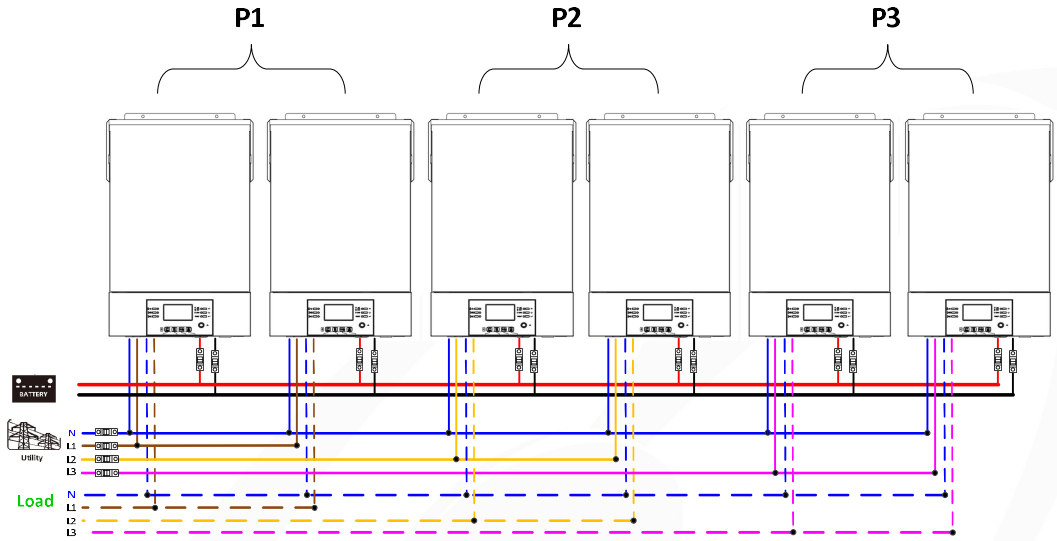


Communication Connection

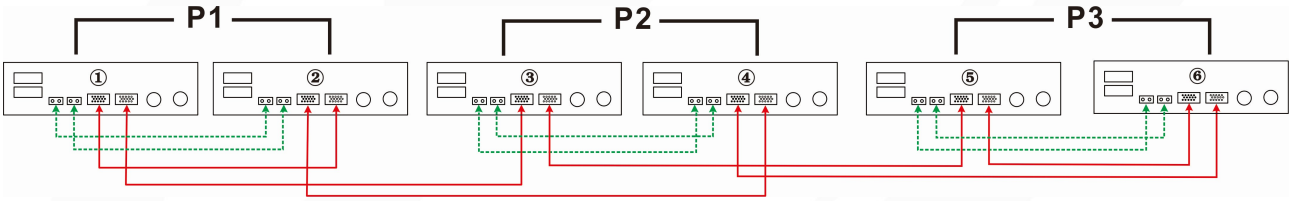


Two inverters in each phase:

Power Connection

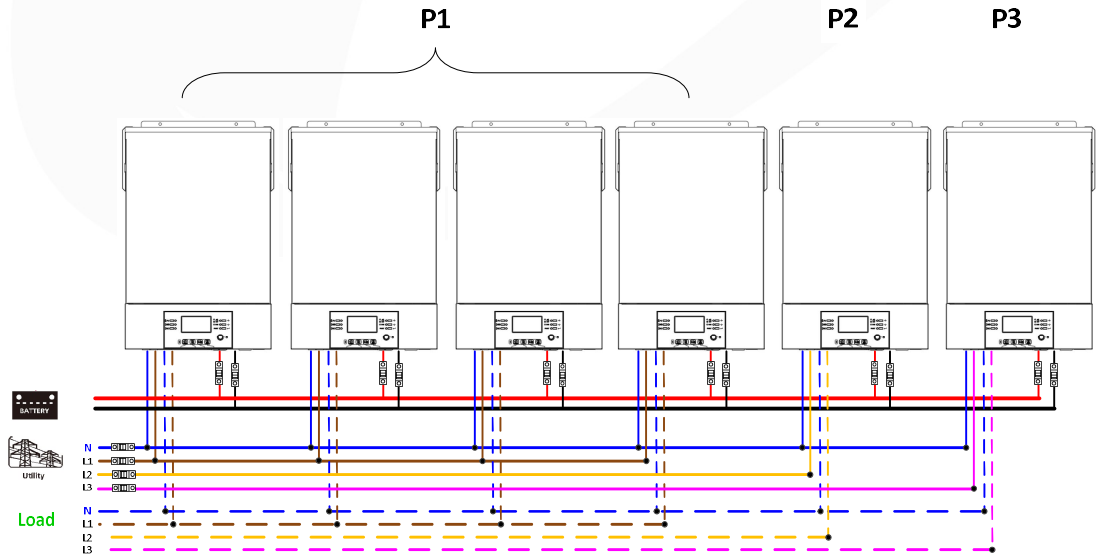


Communication Connection

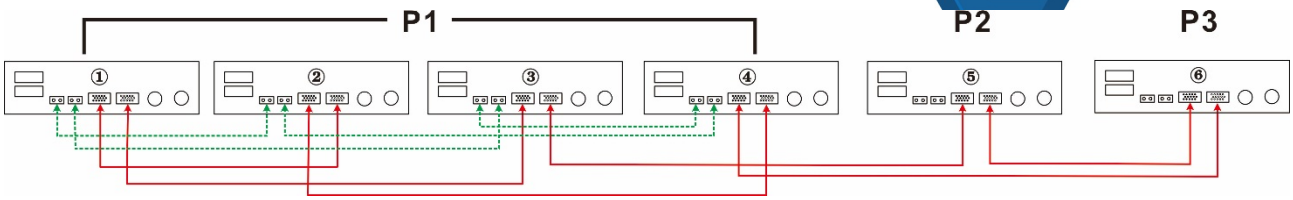


Four inverters in one phase and one inverter for the other two phases:

Power Connection

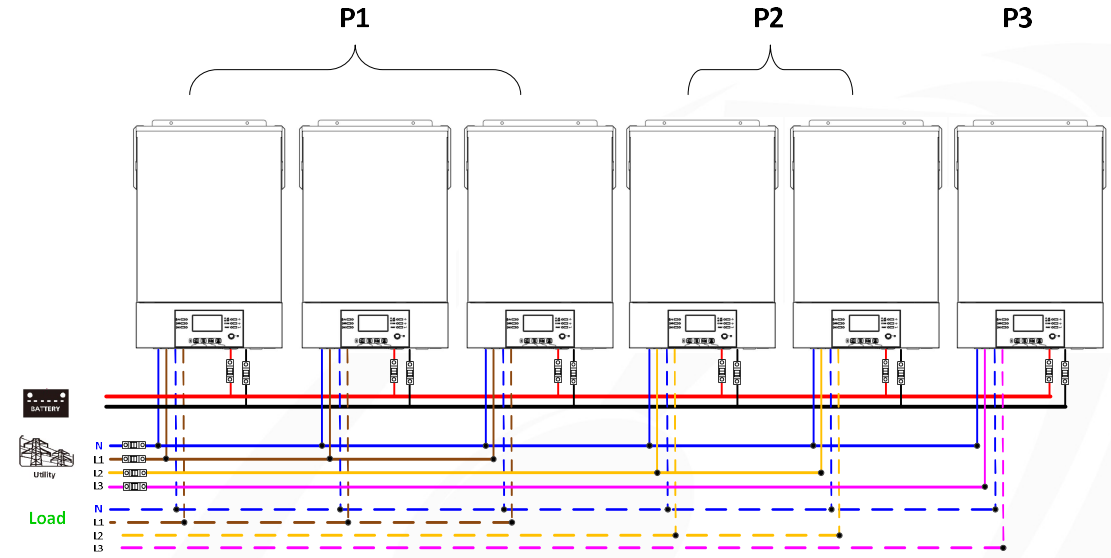


Communication Connection

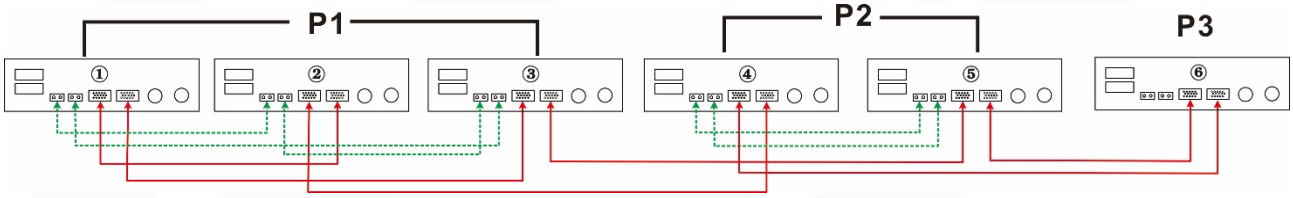


Three inverters in one phase, two inverters in second phase and one inverter for the third phase:

Power Connection

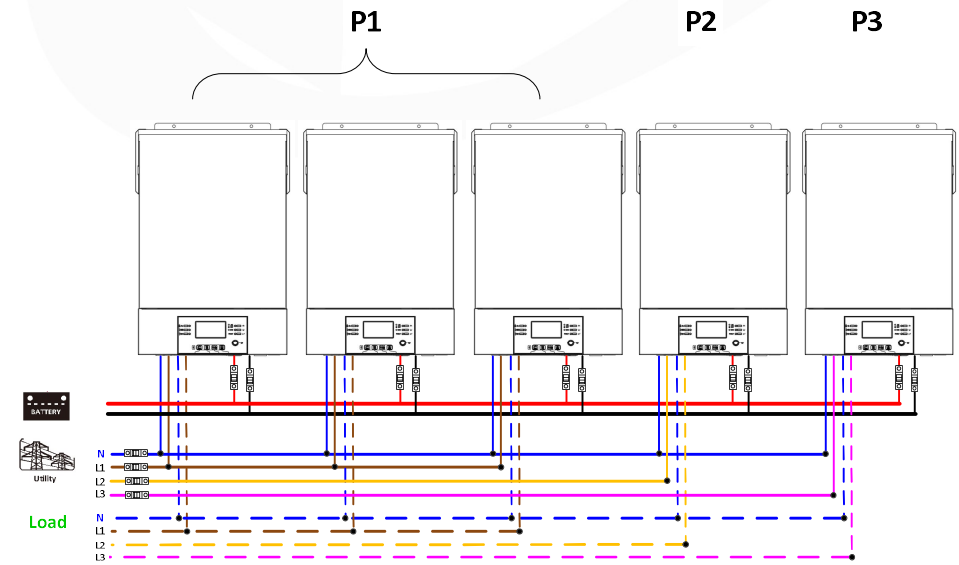


Communication Connection

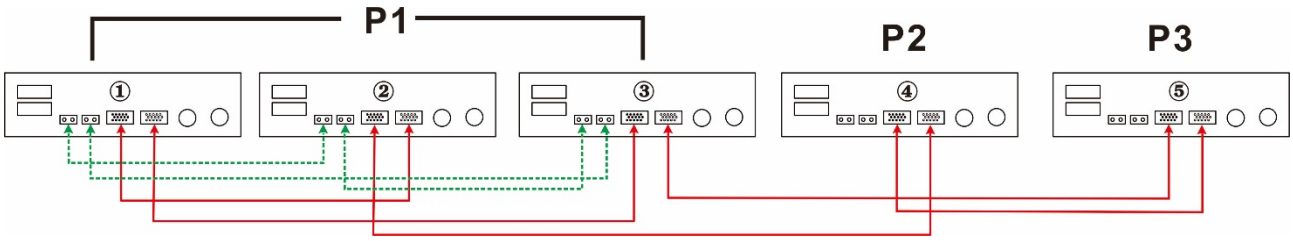


Three inverters in one phase and only one inverter for the remaining two phases:

Power Connection

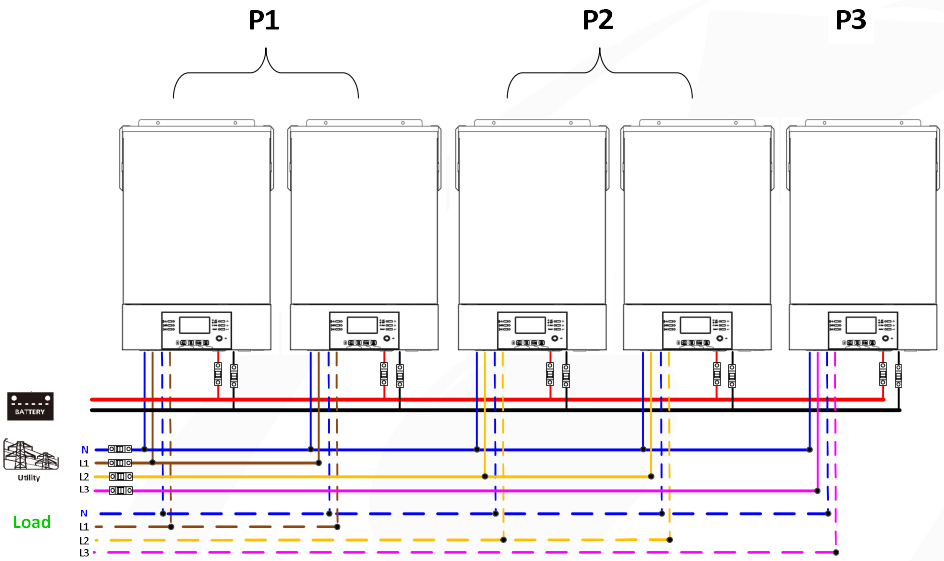


Communication Connection

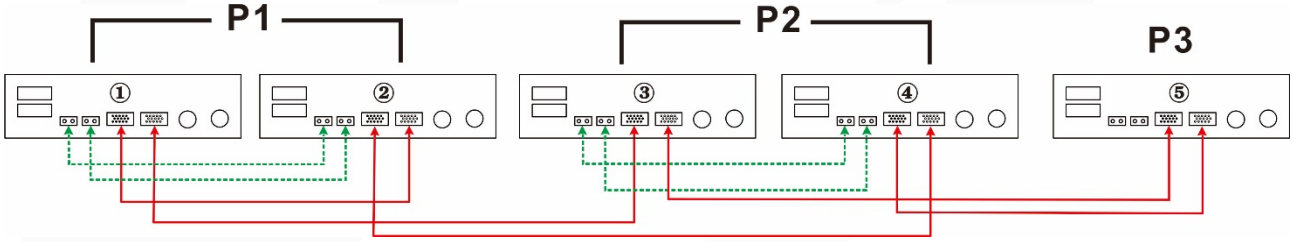


Two inverters in two phases and only one inverter for the remaining phase:

Power Connection

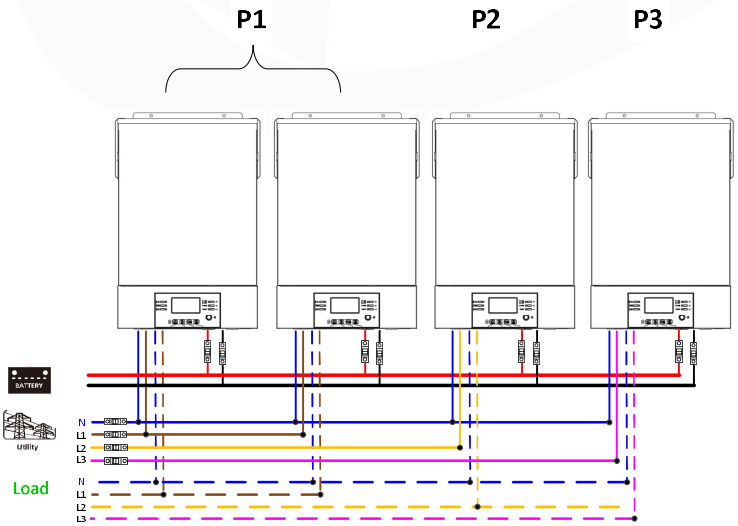


Communication Connection

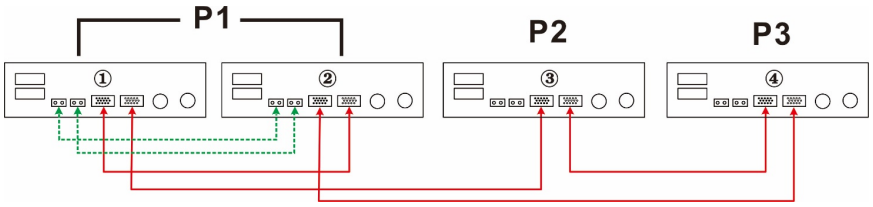


Two inverters in one phase and only one inverter for the remaining phases:

Power Connection

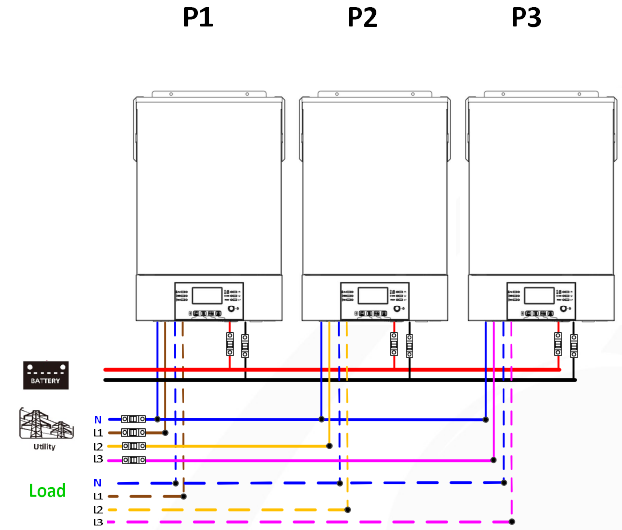


Communication Connection

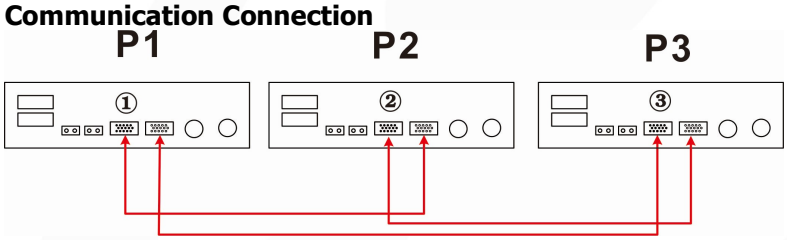


One inverter in each phase:

Power Connection



Communication Connection



WARNING: Do not connect the current sharing cable between the inverters which are in different phases. Otherwise, it may damage the inverters.

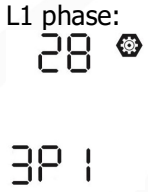
6. PV Connection

Please refer to user manual of single unit for PV Connection.

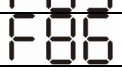
CAUTION: Each inverter should connect to PV modules separately.

7. LCD Setting and Display

Setting Program:

Program	Description	Selectable option	
28	AC output mode *This setting is able to set up only when the inverter is in standby mode. Be sure that on/off switch is in "OFF" status.	Single 	When the unit is operated alone, please select "SIG" in program 28.
		Parallel 	When the units are used in parallel for single phase application, please select "PAL" in program 28. Please refer to 5-1 for detailed information.
		L1 phase: 	When the units are operated in 3-phase application, please choose "3PX" to define each inverter. It is required to have at least 3 inverters or maximum 9 inverters to support three-phase equipment. It's required to have at least one inverter in each phase or it's up to four inverters in one phase. Please refers to 5-2 for detailed information. Please select "3P1" in program 28 for the inverters connected to L1 phase, "3P2" in program 28 for the inverters connected to L2 phase and "3P3" in program 28 for the inverters connected to L3 phase. Be sure to connect share current cable to units which are on the same phase. Do NOT connect share current cable between units on different phases.
		L2 phase: 	
		L3 phase: 	

Fault code display:

Fault Code	Fault Event	Icon on
60	Power feedback protection	
71	Firmware version inconsistent	
72	Current sharing fault	
80	CAN fault	
81	Host loss	
82	Synchronization loss	
83	Battery voltage detected different	
84	AC input voltage and frequency detected different	
85	AC output current unbalance	
86	AC output mode setting is different	

8. Commissioning

Parallel in single phase

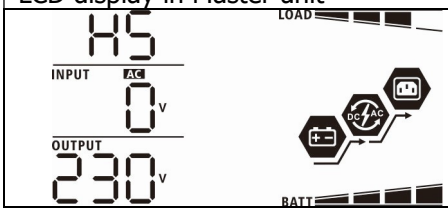
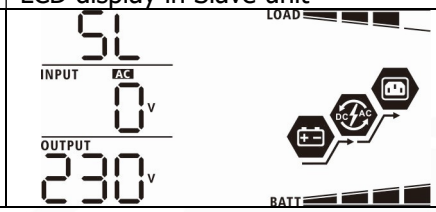
Step 1: Check the following requirements before commissioning:

- Correct wire connection
- Ensure all breakers in Line wires of load side are open and each Neutral wires of each unit are connected together.

Step 2: Turn on each unit and set "PAL" in LCD setting program 28 of each unit. And then shut down all units.

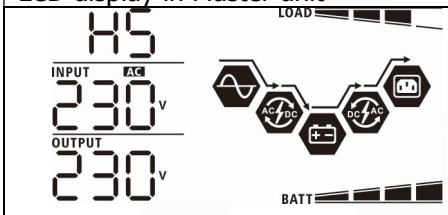
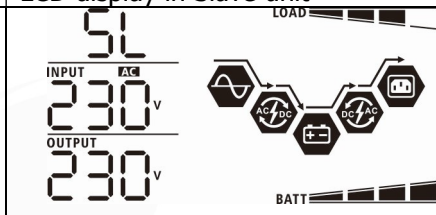
NOET: It's necessary to turn off switch when setting LCD program. Otherwise, the setting can not be programmed.

Step 3: Turn on each unit.

LCD display in Master unit	LCD display in Slave unit
	

NOTE: Master and slave units are randomly defined.

Step 4: Switch on all AC breakers of Line wires in AC input. It's better to have all inverters connect to utility at the same time. If detecting AC connection, they will work normally.

LCD display in Master unit	LCD display in Slave unit
	

Step 5: If there is no more fault alarm, the parallel system is completely installed.

Step 6: Please switch on all breakers of Line wires in load side. This system will start to provide power to the load.

Support three-phase equipment

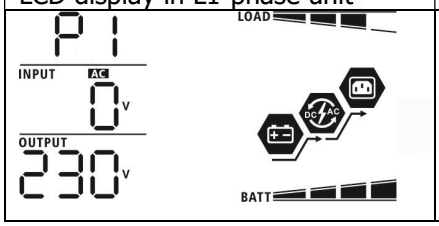
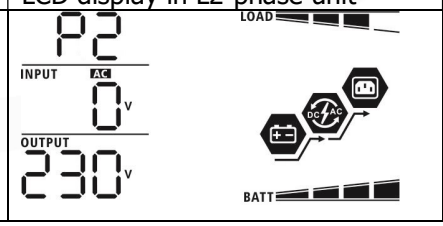
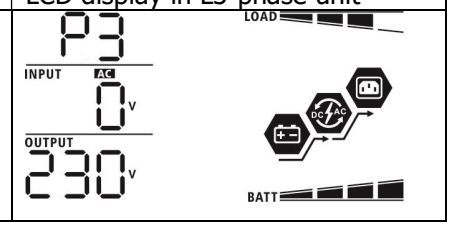
Step 1: Check the following requirements before commissioning:

- Correct wire connection
- Ensure all breakers in Line wires of load side are open and each Neutral wires of each unit are connected together.

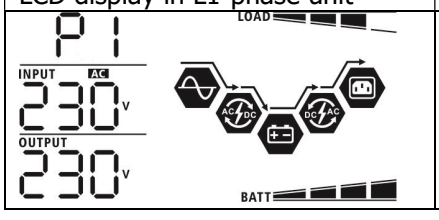
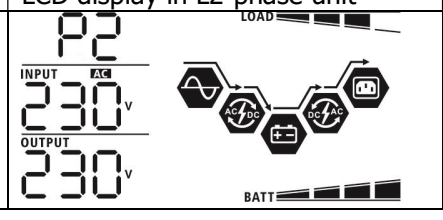
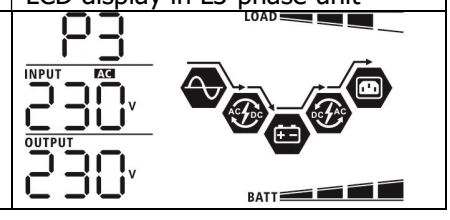
Step 2: Turn on all units and configure LCD program 28 as P1, P2 and P3 sequentially. And then shut down all units.

NOET: It's necessary to turn off switch when setting LCD program. Otherwise, the setting can not be programmed.

Step 3: Turn on all units sequentially.

LCD display in L1-phase unit	LCD display in L2-phase unit	LCD display in L3-phase unit
		

Step 4: Switch on all AC breakers of Line wires in AC input. If AC connection is detected and three phases are matched with unit setting, they will work normally. Otherwise, the AC icon will flash and they will not work in line mode.

LCD display in L1-phase unit	LCD display in L2-phase unit	LCD display in L3-phase unit
		

Step 5: If there is no more fault alarm, the system to support 3-phase equipment is completely installed.
Step 6: Please switch on all breakers of Line wires in load side. This system will start to provide power to the load.

Note 1: To avoid overload occurring, before turning on breakers in load side, it's better to have whole system in operation first.
Note 2: Transfer time for this operation exists. Power interruption may happen to critical devices, which cannot bear transfer time.

9. Trouble shooting

Situation		Solution
Fault Code	Fault Event Description	
60	Current feedback into the inverter is detected.	1. Restart the inverter. 2. Check if L/N cables are not connected reversely in all inverters. 3. For parallel system in single phase, make sure the sharing are connected in all inverters. For supporting three-phase system, make sure the sharing cables are connected in the inverters in the same phase, and disconnected in the inverters in different phases. 4. If the problem remains, please contact your installer.
71	The firmware version of each inverter is not the same.	1. Update all inverter firmware to the same version. 2. Check the version of each inverter via LCD setting and make sure the CPU versions are same. If not, please contact your installer to provide the firmware to update. 3. After updating, if the problem still remains, please contact your installer.
72	The output current of each inverter is different.	1. Check if sharing cables are connected well and restart the inverter. 2. If the problem remains, please contact your installer.
80	CAN data loss	1. Check if communication cables are connected well and restart the inverter. 2. If the problem remains, please contact your installer.
81	Host data loss	
82	Synchronization data loss	
83	The battery voltage of each inverter is not the same.	1. Make sure all inverters share same groups of batteries together. 2. Remove all loads and disconnect AC input and PV input. Then, check battery voltage of all inverters. If the values from all inverters are close, please check if all battery cables are the same length and same material type. Otherwise, please contact your installer to provide SOP to calibrate battery voltage of each inverter. 3. If the problem still remains, please contact your installer.
84	AC input voltage and frequency are detected different.	1. Check the utility wiring conncetion and restart the inverter. 2. Make sure utility starts up at same time. If there are breakers installed between utility and inverters, please be sure all breakers can be turned on AC input at same time. 3. If the problem remains, please contact your installer.
85	AC output current unbalance	1. Restart the inverter. 2. Remove some excessive loads and re-check load information from LCD of inverters. If the values are different, please check if AC input and output cables are in the same length and material type. 3. If the problem remains, please contact your installer.
86	AC output mode setting is different.	1. Switch off the inverter and check LCD setting #28. 2. For parallel system in single phase, make sure no 3P1, 3P2 or 3P3 is set on #28. For upporting three-phase system, make sure no "PAL" is set on #28. 3. If the problem remains, please contact your installer.

Appendix A: Approximate Back-up Time Table

Lead-Acid based Batteries:

Model	Load (VA)	Backup Time @ 48Vdc 200Ah (min)	Backup Time @ 48Vdc 400Ah (min)
5KW	500	1226	2576
	1000	536	1226
	1500	316	804
	2000	222	542
	2500	180	430
	3000	152	364
	3500	130	282
	4000	100	224
	4500	88	200
	5000	80	180

Note: Backup time depends on the quality of the battery, age of battery and type of battery. Specifications of batteries may vary depending on different manufacturers.

Lithium-Ion based Batteries:

Model	Load (VA)	Backup Time @ 48Vdc 200Ah (min)	Backup Time @ 48Vdc 400Ah (min)
5KW	500	1080	2160
	1000	540	1080
	1500	360	720
	2000	270	540
	2500	216	432
	3000	180	320
	3500	154	308
	4000	135	270
	4500	120	240
	5000	108	216

Note: Backup time depends on the quality of the battery, age of battery and type of battery. Specifications of batteries may vary depending on different manufacturers.

Appendix B: BMS Communication Installation

1. Introduction

If connecting to lithium battery, it is recommended to purchase a custom-made RJ45 communication cable. Please check with your dealer or integrator for details.

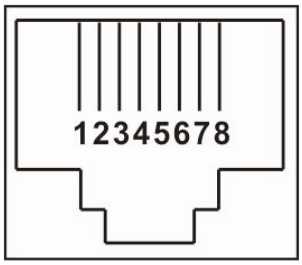
This custom-made RJ45 communication cable delivers information and signal between lithium battery and the inverter. These information are listed below:

- Re-configure charging voltage, charging current and battery discharge cut-off voltage according to the lithium battery parameters.
- Have the inverter start or stop charging according to the status of lithium battery.

2. Pin Assignment for BMS Communication Port

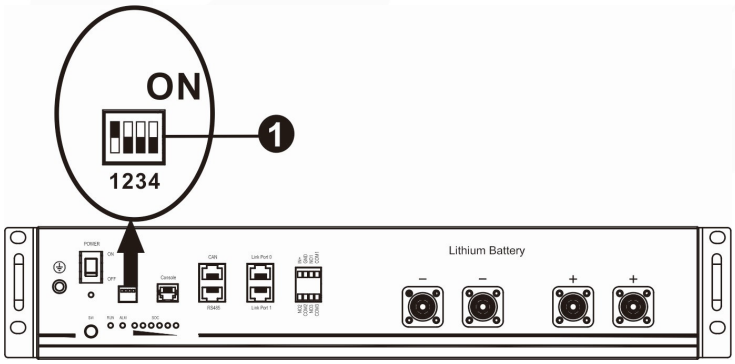
*Pin 3 and Pin 5 are used for BMS communication

	Definition
PIN 1	RS232TX
PIN 2	RS232RX
PIN 3	**RS485B**
PIN 4	12V
PIN 5	**RS485A**
PIN 6	CANH
PIN 7	CANL
PIN 8	GND



3. Lithium Battery Communication Configuration

PYLONTECH



□ ADD Switch: There are 4 ADD switches are to define different baud rate and battery group address. If switch position is turned to bottom for "OFF" position, it means "0". If switch position is turned to upper for "ON" position, it means "1".

Dip 1 is "ON" to represent the baud rate 9600.

Dip 2, 3 and 4 are to set up battery group address.

Dip switch 2, 3 and 4 on master battery (first battery) are to set up or change the group address.

NOTE: "1" is upper position and "0" is bottom position.

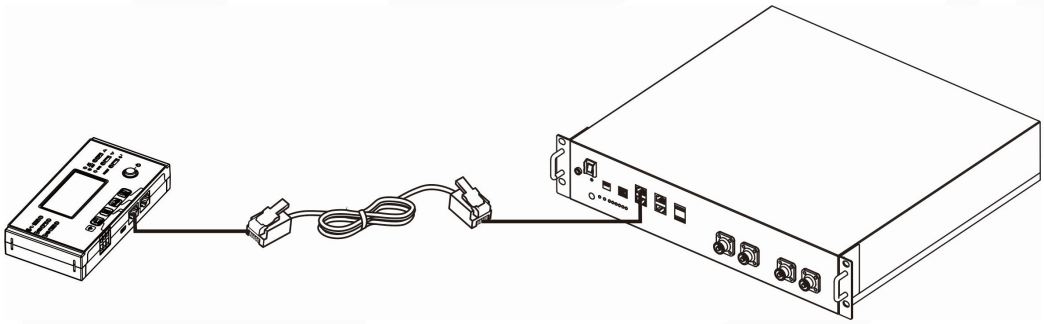
Dip 1	Dip 2	Dip 3	Dip 4	Group address
1: RS485 baud rate=9600 Restart to take effect.	0	0	0	Single group only. It's required to set up master battery with this setting and slave batteries are unrestricted.
	1	0	0	Multiple group condition. It's required to set up master battery on the first group with this setting and slave batteries are unrestricted.
	0	1	0	Multiple group condition. It's required to set up master battery on the second group with this setting and slave batteries are unrestricted.
	1	1	0	Multiple group condition. It's required to set up master battery on the third group with this setting and slave batteries are unrestricted.
	0	0	1	Multiple group condition. It's required to set up master battery on the fourth group with this setting and slave batteries are unrestricted.
	1	0	1	Multiple group condition. It's required to set up master battery on the fifth group with this setting and slave batteries are unrestricted.

NOTE: The maximum groups of lithium battery is 5 and for maximum number for each group, please check with battery manufacturer.

4. Installation and Operation

After configuration, please install LCD panel with inverter and Lithium battery with the following steps.

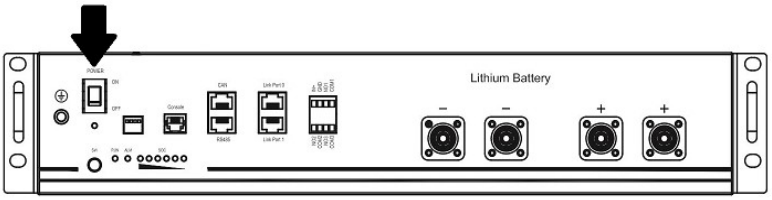
Step 1. Use custom-made RJ45 cable to connect inverter and Lithium battery.



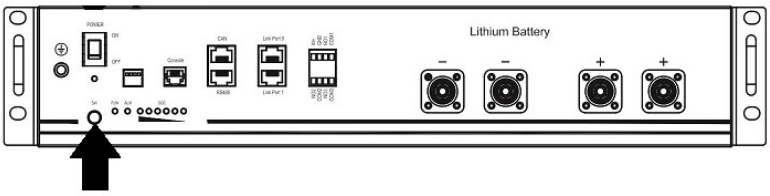
Please take notice for parallel system:

1. Only support common battery installation.
2. Use one custom-made RJ45 cable to connect any inverter (no need to connect to a specific inverter) and Lithium battery. Simply set battery type of this inverter to "PYL" in LCD program 5. The remaining inverters are set as "USE".

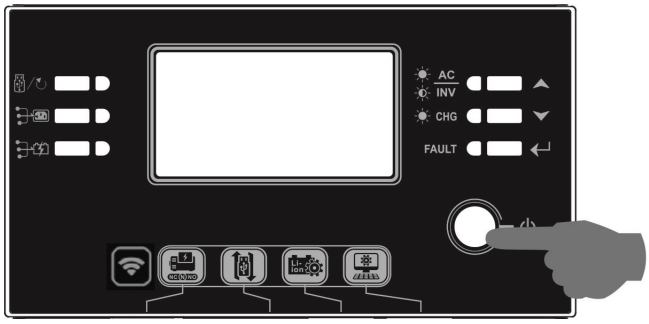
Step 2. Switch on Lithium battery.



Step 3. Press more than three seconds to start Lithium battery. Output power is ready.



Step 4. Turn on the inverter.

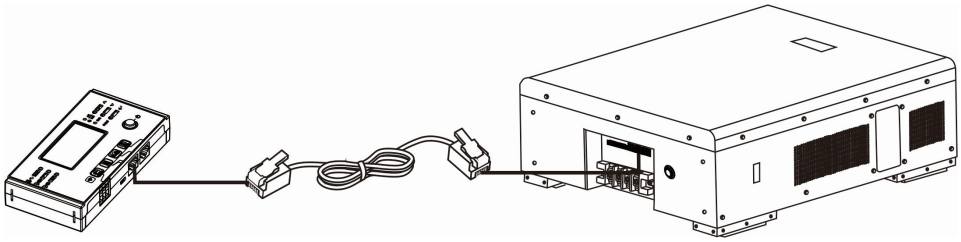


Step 5. Be sure to select battery type as "PYL" in LCD program 5.

If communication between the inverter and battery is successful, the battery icon  on LCD display will flash. Generally speaking, it will take longer than 1 minute to establish communication.

WECO

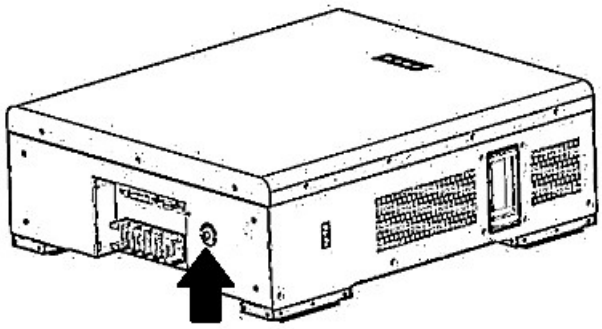
Step 1. Use a custom-made RJ45 cable to connect inverter and Lithium battery.



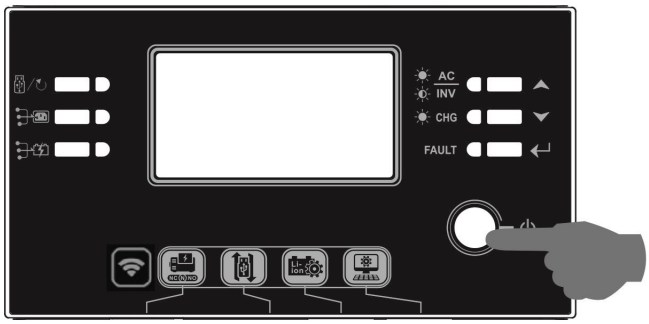
Please take notice for parallel system:

3. Only support common battery installation.
4. Use one custom-made RJ45 cable to connect any inverter (no need to connect to a specific inverter) and Lithium battery. Simply set battery type of this inverter to "WEC" in LCD program 5. The remaining inverters are set as "USE".

Step 2. Switch on Lithium battery.



Step 3. Turn on the inverter.

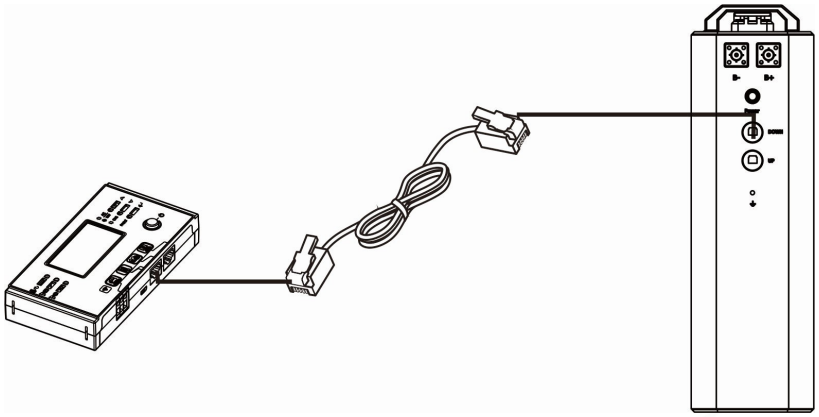


Step 4. Be sure to select battery type as "WEC" in LCD program 5.

If communication between the inverter and battery is successful, the battery icon  on LCD display will "flash". Generally speaking, it will take longer than 1 minute to establish communication.

SOLTARO

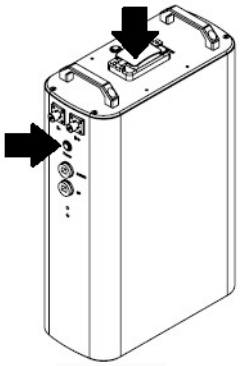
Step 1. Use a custom-made RJ45 cable to connect inverter and Lithium battery.



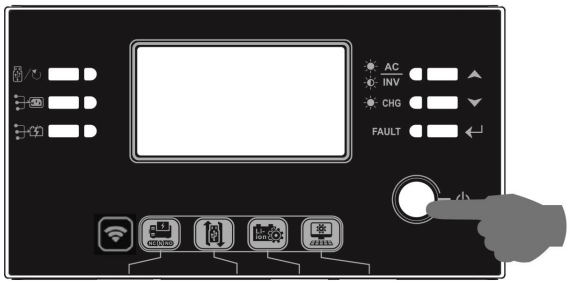
Please take notice for parallel system:

1. Only support common battery installation.
2. Use one custom-made RJ45 cable to connect any inverter (no need to connect to a specific inverter) and Lithium battery. Simply set battery type of this inverter to "SOL" in LCD program 5. The remaining inverters are set as "USE".

Step 2. Open DC isolator and switch on Lithium battery.



Step 3. Turn on the inverter.

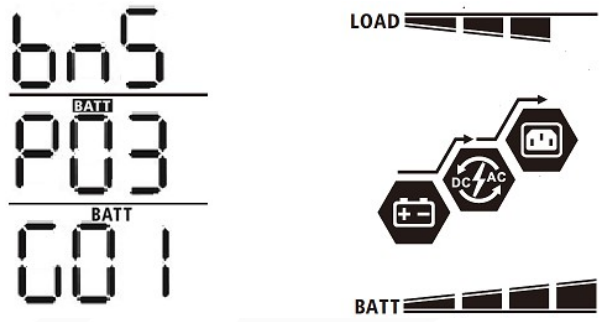


Step 4. Be sure to select battery type as "SOL" in LCD program 5.

If communication between the inverter and battery is successful, the battery icon  on LCD display will "flash". Generally speaking, it will take longer than 1 minute to establish communication.

5. LCD Display Information

Press "UP" or "DOWN" key to switch LCD display information. It will show battery pack and battery group number before "Main CPU version checking" as below screen.

Selectable information	LCD display
Battery pack numbers & Battery group numbers	Battery pack numbers = 3, battery group numbers = 1 

5. Code Reference

Related information code will be displayed on LCD screen. Please check inverter LCD screen for the operation.

Code	Description
	If battery status is not allowed to charge and discharge after the communication between the inverter and battery is successful, it will show code 60 to stop charging and discharging battery.
	Communication lost (only available when the battery type is setting as "Pylontech Battery".) ● After battery is connected, communication signal is not detected for 3 minutes, buzzer will beep. After 10 minutes, inverter will stop charging and discharging to lithium battery. ● Communication lost occurs after the inverter and battery is connected successfully, buzzer beeps immediately.
	If battery status is not allowed to charge after the communication between the inverter and battery is successful, it will show code 69 to stop charging battery.
	If battery status must to charge after the communication between the inverter and battery is successful, it will show code 70 to charge battery.
	If battery status is not allowed to discharge after the communication between the inverter and battery is successful, it will show code 71 to stop discharging battery.

Appendix C: Energy-Mate App Setting Guide

1. Introduction

Energy-Mate is a new inverter monitoring APP, available for both iOS and Android based device. It allows users to have complete and remote monitoring and controlling experience for solar inverters. All data loggers and parameters are saved in Cloud.

The major functions of this APP:

- Delivers device status during normal operation.
- Allows to configure device setting after installation.
- Notifies users when a warning or alarm occurs.
- Allows users to query inverter history data.

Energy-Mate App

2-1. Download and install APP

Operating system requirement for your smart phone:

iOS system supports iOS 9.0 and above

Android system supports Android 5.0 and above

Please scan the following QR code with your smart phone and download Energy- mate App.

Android system

iOS system

Or you may find “Energy-mate” app from the Apple® Store and Google® Play Store.

2.2 Initial Setup

Step 1: Registration at first time

After the installation, please open the shortcut icon to access this Energy-Mate on your mobile screen. For the first time, tap “Register” to access “User Registration” page as shown in below chart. Enter the account registration interface to access registered page as shown in the Figure 2. Fill in all required information and scan the remote box PN by tapping icon. Or you can simply enter PN directly, as shown in Figure 3. The PN number is 14 digits, which can be obtained from the bottom side of the inverter. Refer to the Figure 4. Then, tap “Sign up now” button.

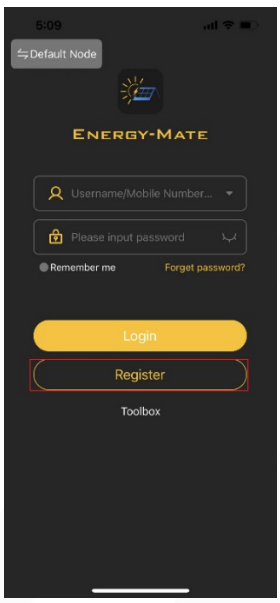


Figure 1

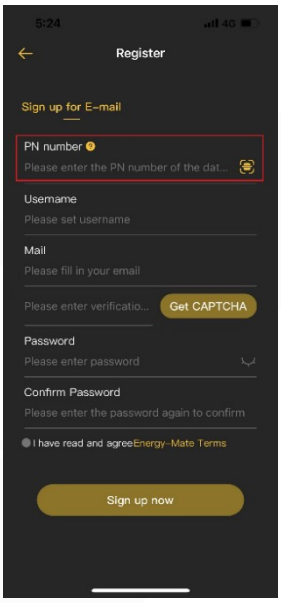


Figure 2

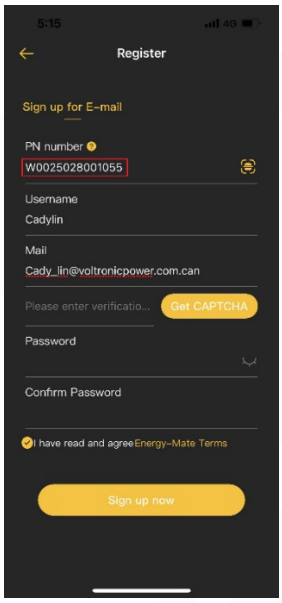


Figure 3

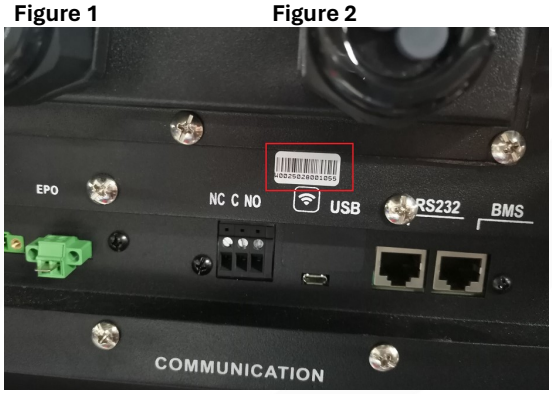


Figure 4

After successful registration, it automatically enters the access “device” page. the account login interface is shown in Figure 5. The registered device has not been configured for networking and is not online.

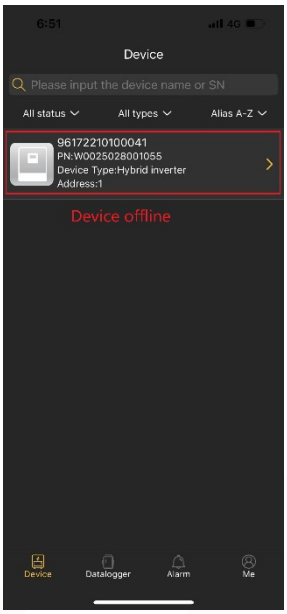


Figure 5

Step 2: Local Wi-Fi Configuration

Click bottom menu “Me” (Personal Center) to access Networking Configuration as shown in Figure 6.

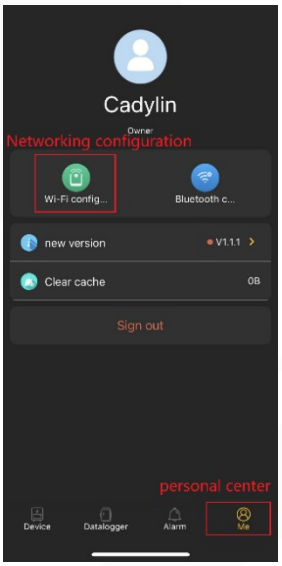


Figure 6

The networking configuration page is displayed as shown in Figure 7. The device networking configuration requires the device to be powered on and connected to the device hotspot using the mobile phone, as shown in Figure 8. The connected Wi-Fi name is the same to your Wi-Fi PN number. Enter default password “12345678”.

Figure 7

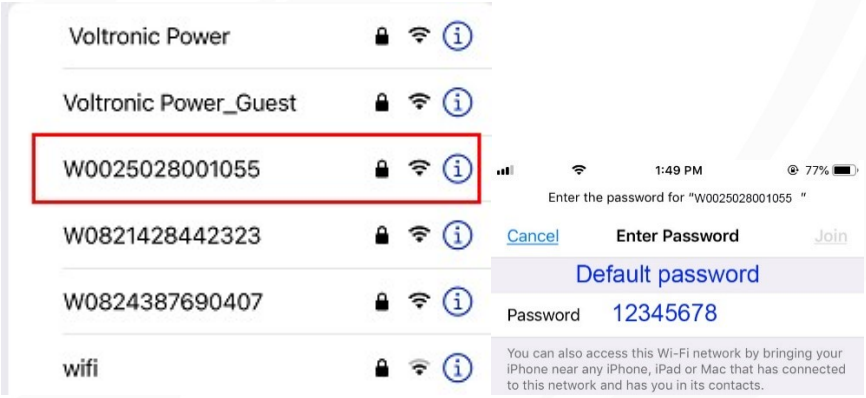


Figure 8

After connecting the device WiFi successfully, enter the network settings and select local WiFi name and enter the password as shown in Figure 9. and Figure 10. The setting is successful as shown in Figure 11.

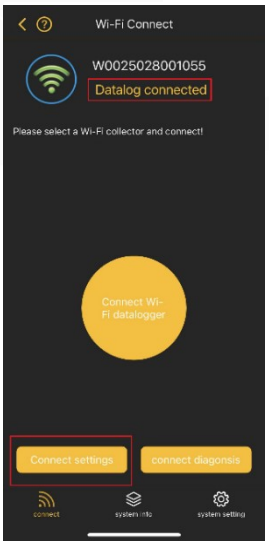


Figure 9

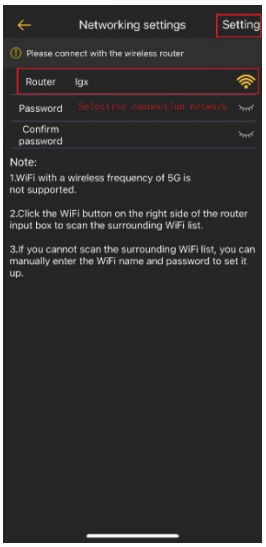


Figure 10

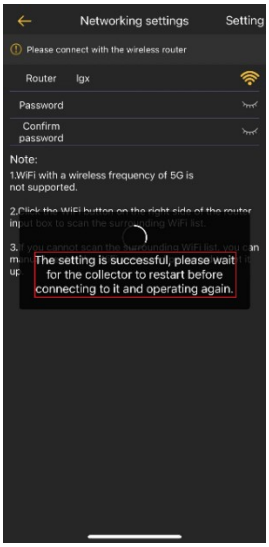


Figure 11

Tips:

1. Please ensure that the signal connected to the network is good and the network is unblocked.
2. Currently, routers in 5G band are not supported. Please use routers in 2.4G Band.
3. Make sure that the router password is correct.

Step 3: View the distribution results

Go back to the main interface of networking configuration and select networking diagnosis, as shown in Figure 12.

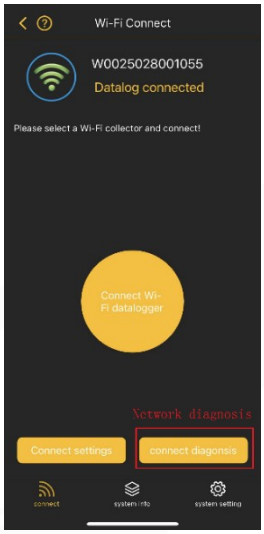


Figure 12

Network diagnosis is successfully as shown in Figure 13. If network diagnosis fails, it will show as in Figure 14. If the network connection fails, reconfigure the network or restart the device.

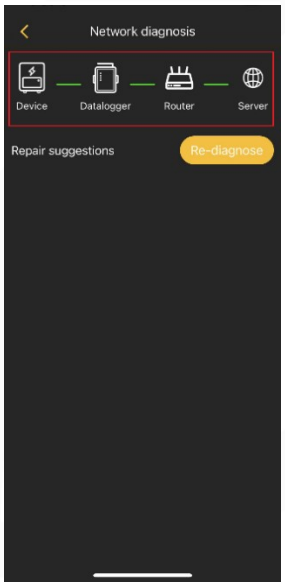


Figure 13

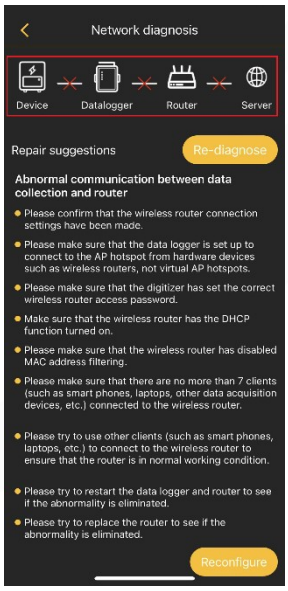


Figure 14

After network configuration is successfully, you can view the device status as shown in Figure 15.

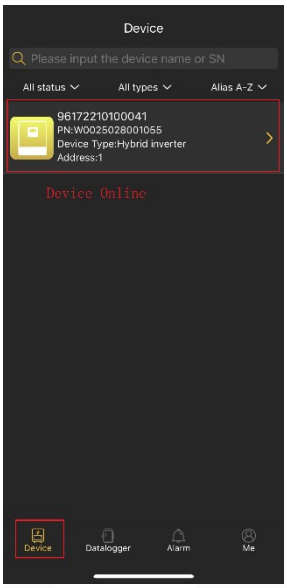


Figure 15

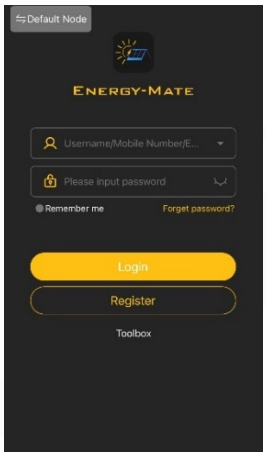
Tips:

1. If the network configuration fails, troubleshoot the problem according to the repair suggestions on the actual page.

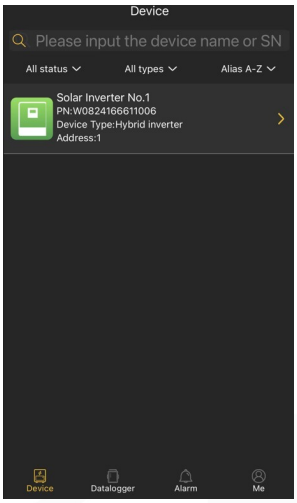
2-3. Login and APP Main Function

Login to the APP

After finishing the registration and local Wi-Fi configuration, enter registered name and password to login.
Tips: Tick “Remember me” for your login convenience afterwards.



After login is successfully, you can access “device” page to see device status in device list under this registered account.
Tips: Tap the input text box (located on the top) to enter the PN number on the device or scan the QR code to Search Device.



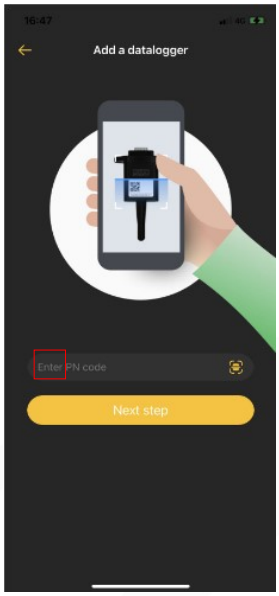
Delete device and Name Modification

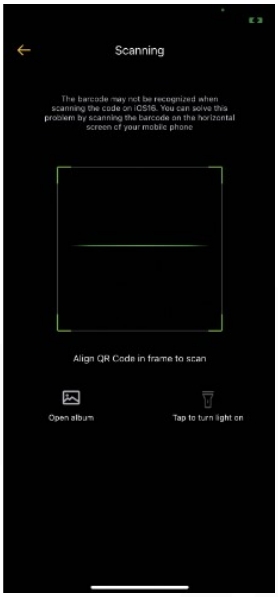
Click “device name” to access the main page of monitored device. After tapping the  icon on the top right corner, two options will pop up: edit name and delete device. When you click on the edit name, a blank input box will pop out. Then, you can edit the name for your device and tap “Confirm” to complete name modification. When you click to delete device, a dialog box will pop up asking if you really want to delete the device, and click “Delete” to complete it.

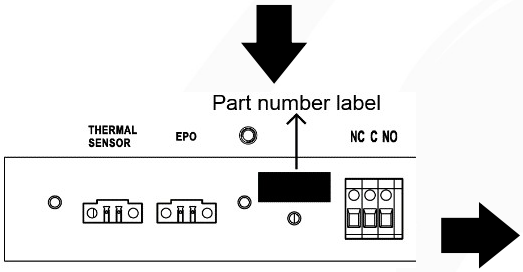
Add device

Tap the icon  (Datalogger located on the bottom) to enter Device List page. You can review all devices here by adding or deleting Wi-Fi Module in this page.

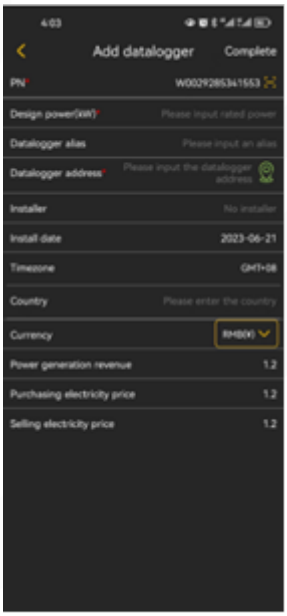
Tap  icon on the top right corner and manually enter part number to add device. This part number label is pasted on the bottom of inverter. After entering part number, tap “Confirm” to add this device in the Device list shown as below figures.







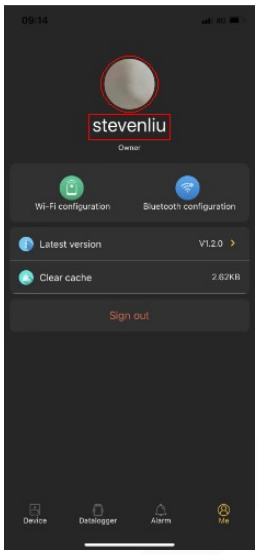
Part number label is pasted on the bottom of inverter.

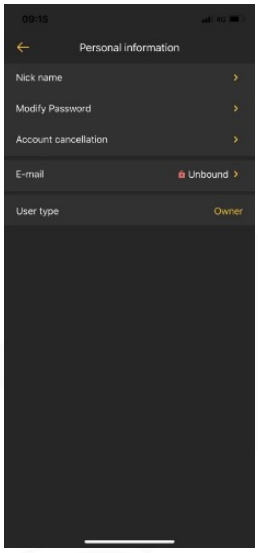


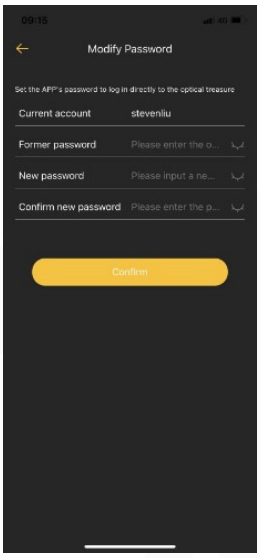
Tips: For more information about Device List, please refer to the section 2.4.

ME

In ME page, users can modify “My information”, including【Clear cache】, and【Log-out】. You can also update and upgrade the version of the APP, and perform network settings. Click on the profile picture to replace User’s Photo, and click on the nickname to modify your “personal information”, including 【Nick name】,【Modify password】, 【Account cancellation】, 【E-mail】, shown as below figures.



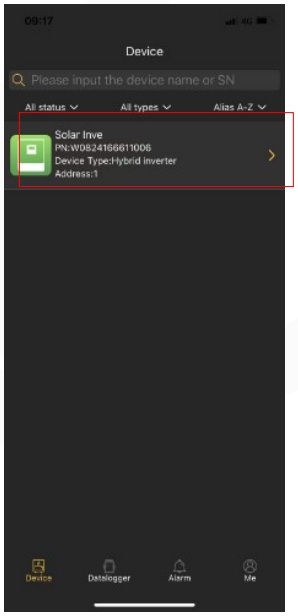


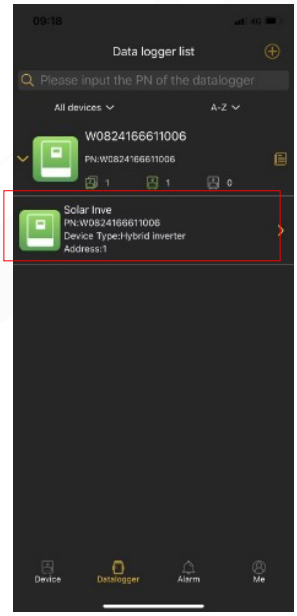


2-4. Device List

In Device list page, you can roll down to refresh the device information and then tap any device you want to check up for its real-time status and related information as well as to change parameter settings. Please refer to the parameter setting list.

Note: From both the device list and the data collector list, you can access to view device energy and related parameters





2-5. Device Management

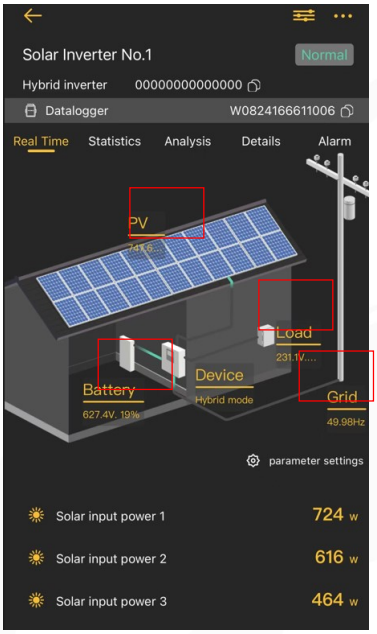
Device List

Displays all devices under the account, and displays the status and basic parameters of the devices.
Green icon indicates that the equipment is normal;
Gray icon indicates that the device is offline;
Red icon indicates equipment failure;
Yellow icon indicates device alerts;
Blue icon indicates the standby of the device.

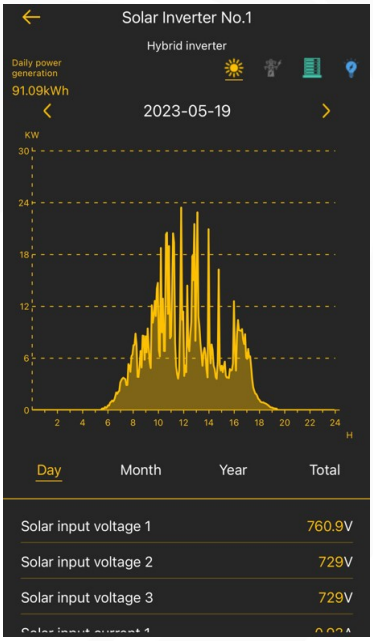
Device Details

1. Real-Time power flow

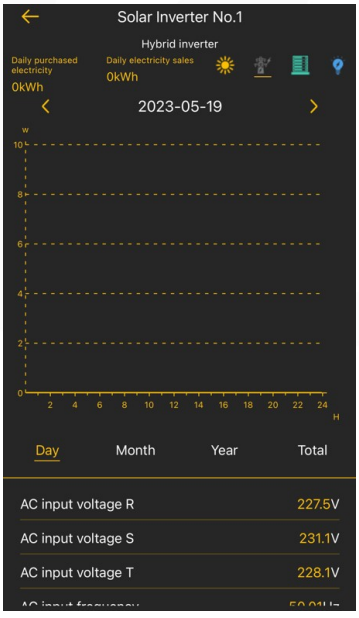
In this page, you can view dynamic power flow chart of monitored device. It contains five icons to present PV power, Device, load, Grid and battery. Click these icons to view the related parameters shown as below figures.



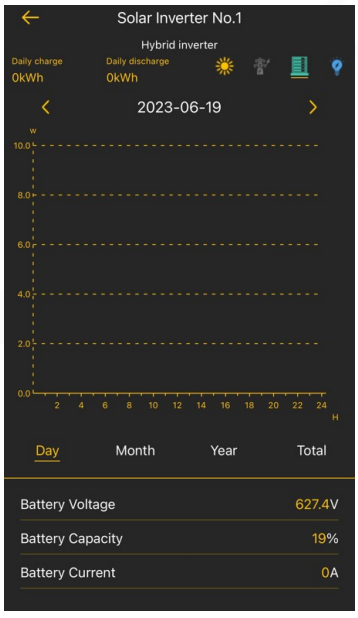
Power flow



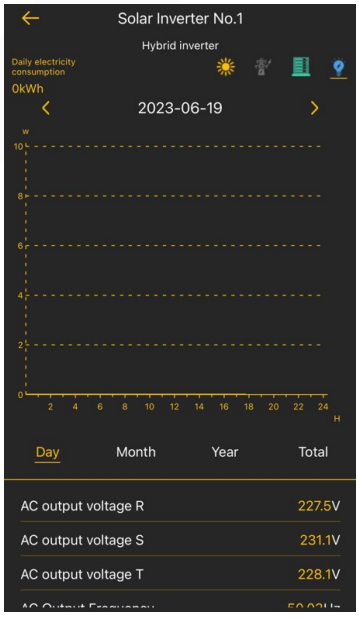
PV screen



Grid screen

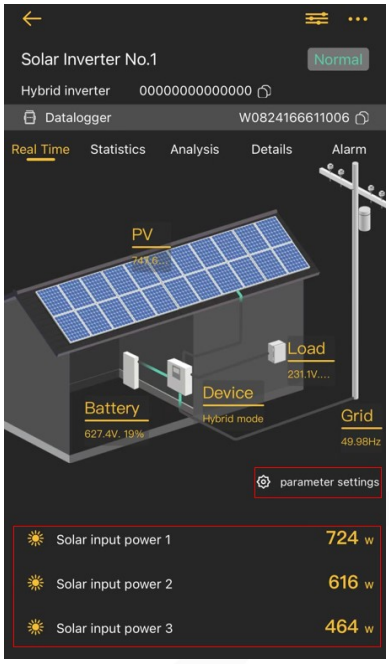


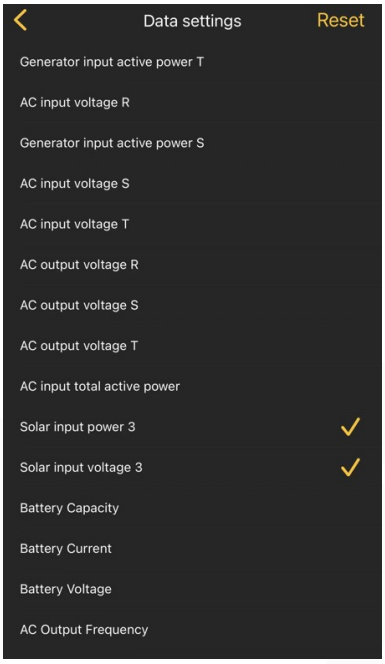
Battery screen



Load screen

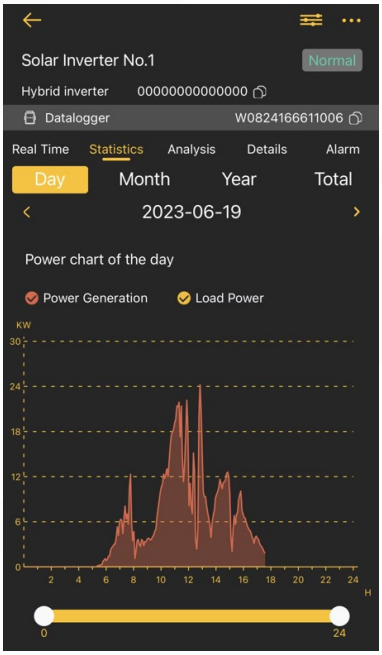
In this page, you also can modify the parameter settings according to your needs. Click the Parameter settings icon to enter the parameter setting page. After setting the parameters, the monitoring homepage will display the parameters you have set.

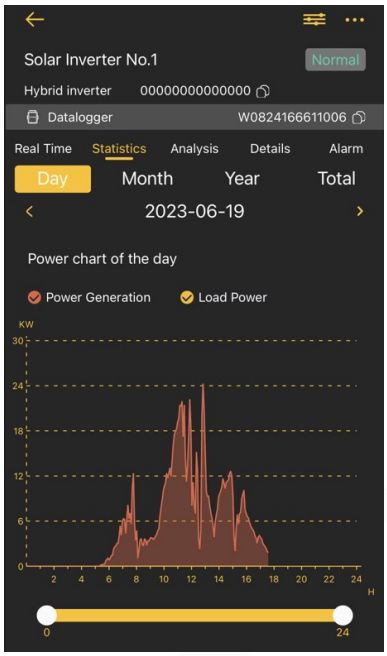


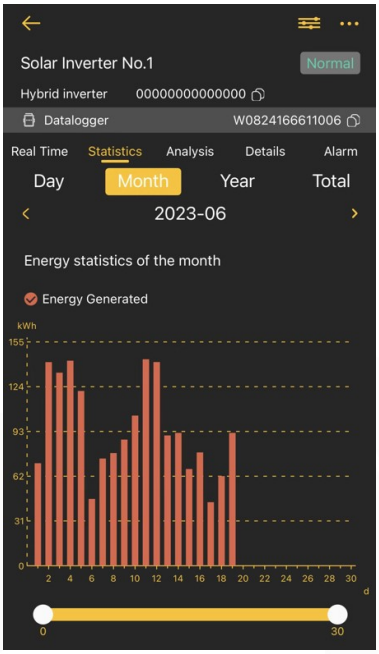


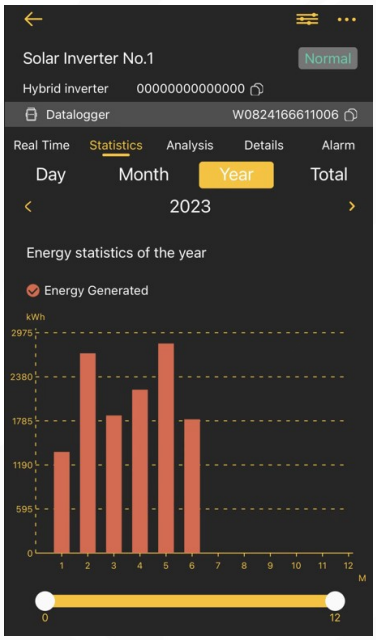
2. Statistics

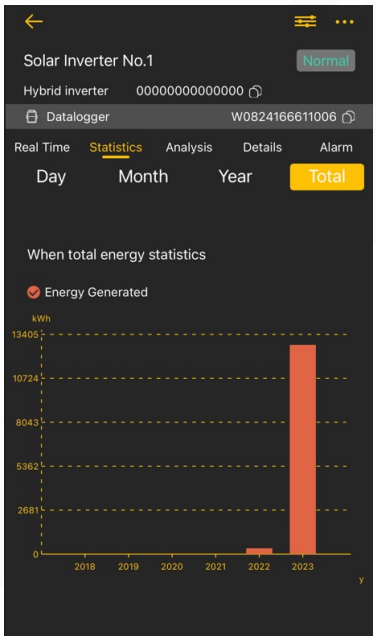
You can view graphic chart representing the power generation, grid electricity, battery capacity, load, as well as daily, monthly, annual, and total power generation, electricity consumption, power purchase, power sale, and charging/discharging.




Solar Inverter No.1
Normal
Hybrid inverter 00000000000000
Datalogger W0824166611006
Real Time Statistics Analysis Details Alarm
Day Month Year Total
2023-06-19
Power chart of the day
Power Generation
Load Power
KW
30
24
18
12
6
0
2 4 6 8 10 12 14 16 18 20 22 24
H
0
24


Solar Inverter No.1
Normal
Hybrid inverter 00000000000000
Datalogger W0824166611006
Real Time Statistics Analysis Details Alarm
Day Month Year Total
2023-06
Energy statistics of the month
Energy Generated
kWh
155
124
93
62
31
0
2 4 6 8 10 12 14 16 18 20 22 24 26 28 30
d
0
30

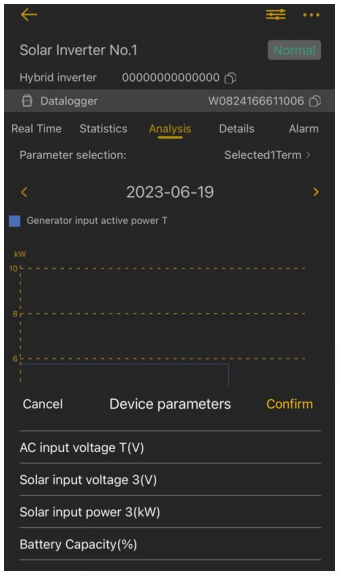

Solar Inverter No.1
Normal
Hybrid inverter 00000000000000
Datalogger W0824166611006
Real Time Statistics Analysis Details Alarm
Day Month Year Total
2023
Energy statistics of the year
Energy Generated
kWh
2975
2380
1785
1190
595
0
1 2 3 4 5 6 7 8 9 10 11 12
M
0
12

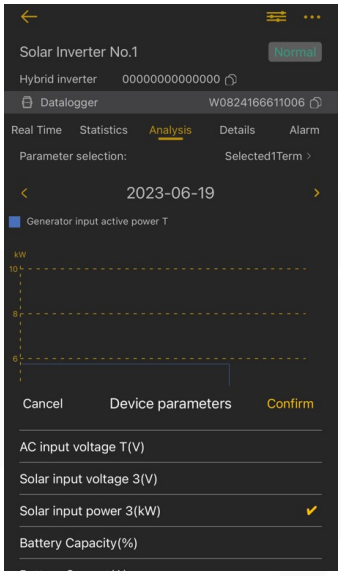

Solar Inverter No.1
Normal
Hybrid inverter 00000000000000
Datalogger W0824166611006
Real Time Statistics Analysis Details Alarm
Day Month Year Total
When total energy statistics
Energy Generated
kWh
13405
10724
8043
5362
2681
0
2018 2019 2020 2021 2022 2023
y

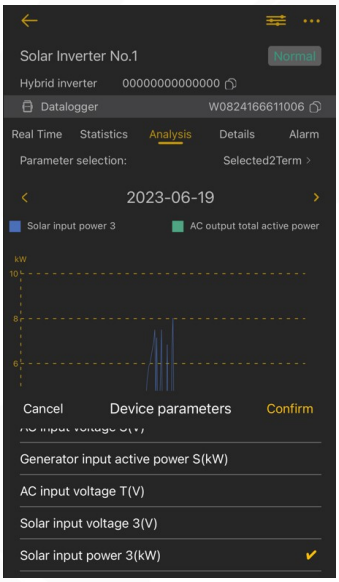
3. Analysis

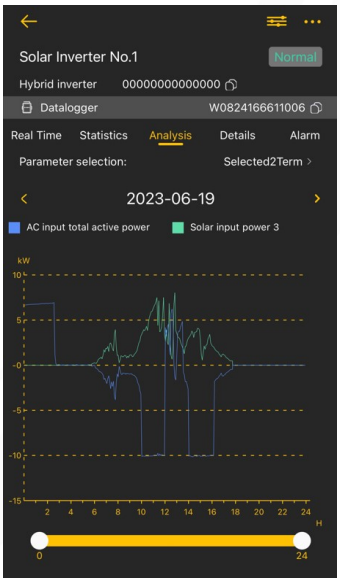
You can select one or more parameters of the device to view the power chart for analysis and comparison.

Tips: On the parameter analysis page, you can select one or more device parameters for analysis, shown as below figures.



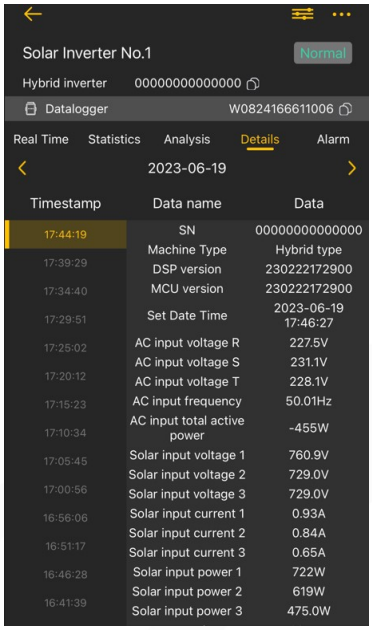






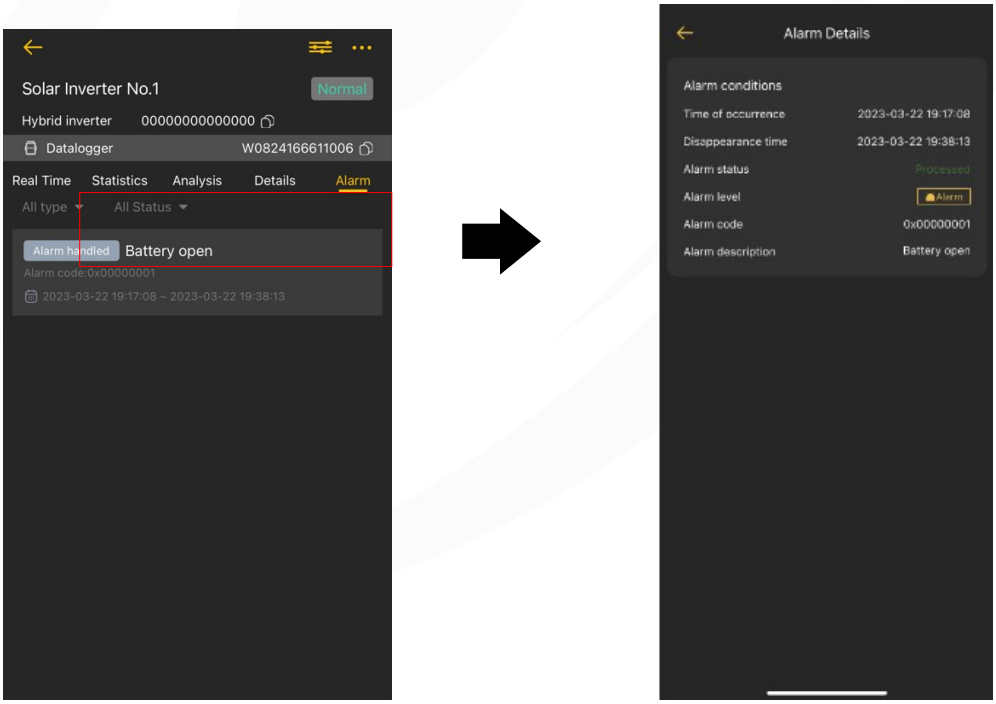
4. Details

You can view the data details recorded by the device every five minutes.



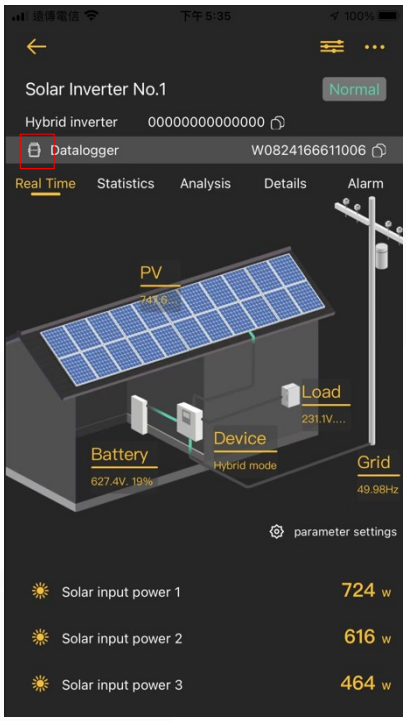
5. Alarm

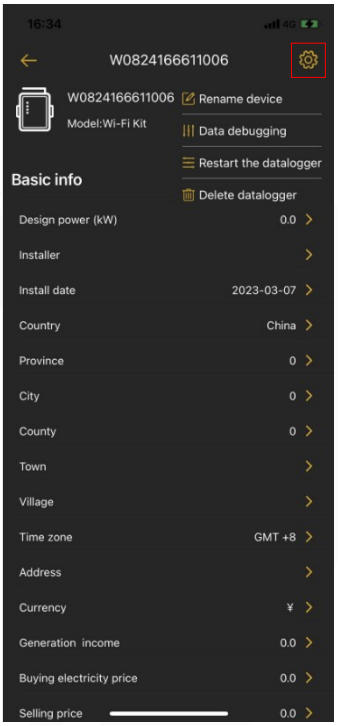
Tap the “Alarm” on the top to enter the device alarm page. You can view all alarms and alarm details generated by the device. Displays all alert information of an account, which can be filtered by time.



6. Device Information Data

Tap on device list or click Datalogger in device homage, you can view information about the digital collector and the digital collector connected to the device. Browse 【Basic Info】 and【Basic parameter】by swiping up and down. You can modify the basic information of the device on this page and restart, debug, and delete the data collector.





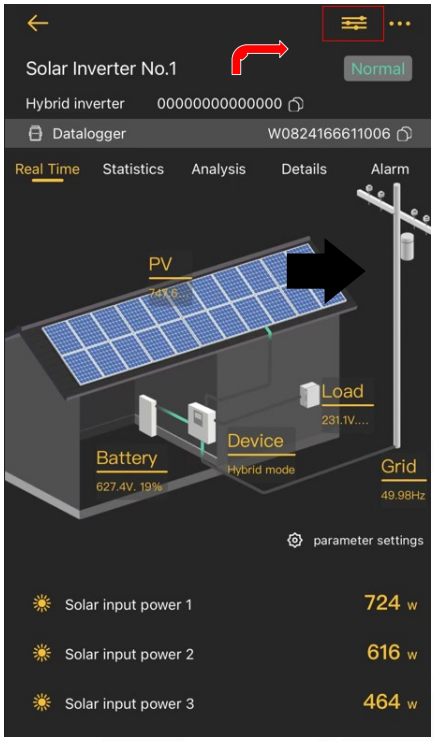
Tips: If you cannot view the real-time device data all the time, the possible reasons are as follows:

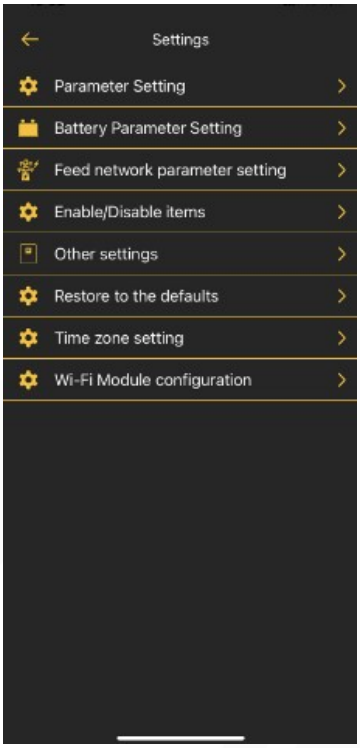
1. Incorrect device model selection: you can change the device model.
2. Incorrect device address: you can click to modify next to the device address to modify the device address;

【Basic Information】Displays basic information of the PV inverter: inverter power rating, installer information, installed date, country, installed address, time zone, currency setting, calculated generation income, buying electricity price and selling price.

【Basic parameter】 Displays information of datalogger model, datalogger PN, datalogger status, firmware version, device quantity, online device quantity.

7. Parameter Setting





This page is to activate some features and set up parameters for PV inverters. Please be noted that the listing in "Parameter Setting" page in below diagram may differ from the models of monitored inverter.
There are 8 submenus: 【Output setting】, 【Battery Parameter Setting】, 【Feed network parameter setting】, 【Enable/ Disable items】, 【Other Settings】, 【Restore to the defaults】, 【Time zone setting】, 【Wi-Fi Module configuration】 to illustrate.

There are two ways to modify setting.

a) Listed options to change values by tapping one of it.

b) Changing values by clicking arrows or entering the numbers directly in the column.

Each function setting is saved by clicking "Issued" button.

Please refer to below parameter setting list for an overall description and be noted that the available parameters may vary depending on different models. Please always see the original product manual for detailed setting instructions.

Parameter setting list:

Item		Description
Output setting	Machine working mode setting	Query working mode
	Solar Supply Priority	Solar energy distribution of priority
Battery parameter setting	Max pv input voltage	Solar input highest voltage
	Min pv input voltage	Solar input lowest voltage
	Set Solar input highest MPPT voltage	Solar input highest MPPT voltage
	Set Solar input lowest MPPT voltage	Solar input lowest MPPT voltage
	Maximum Charging Current	Battery maximum charge current
	Max. AC Charging Current	Max. AC charging current
	C.V voltage	Battery constant charge voltage(C.V.)
	Float charge voltage	Battery float charge voltage
	Battery Cut-off Voltage when grid is available	Battery weak voltage in hybrid mode
	Battery Cut-off back Voltage when grid is available	Battery weak back voltage in hybrid mode
	Battery Cut-off Voltage when grid is unavailable	Battery under voltage
	Battery Cut-off back Voltage when grid is unavailable	Battery under back voltage
	Max battery discharge current in hybrid mode	Battery discharge max current
	LCD screen-saver start time	LCD sleep wait time
	Battery under back SOC	Battery under back SOC
	Battery under SOC	Battery under S0C
	Battery weak back SOC in hybrid mode	Battery weak SOC in hybrid mode
	Battery weak SOC in hybrid mode	Battery weak back SOC in hybrid mode
Feed network Parameter Setting	Max grid-connected voltage	AC input highest voltage
	Min grid- connected voltage	AC input lowest voltage
	Max grid-connected Frequency	AC input highest frequency
	Min grid-connected Frequency	AC input lowest frequency
	Wait time before grid-connection	Wait time for feed power
	Set feed-in reactive power	Feed-in reactive power
	Max Grid-connected average Voltage	AC input long-time highest average voltage
	Max feed-in power	Max power of feeding grid
	feed-in power factor	Feed-in power factor
Enable/Disable Functions	Auto-adjust PF with powers	Auto-adjust PF with power
	Auto-adjust PF when power rate reaches	Start power percentage of auto-adjusting
	Min PF value when power is 100%	Minimum PF value when power percentage reach 100%

	Activate Li-Fe battery	Li-Fe battery self-test by charged at a time
	Reactive power Auto-control Enable	Reactive power Auto-control Enable
	Mute buzzer alarm	Mute buzzer beep
	Mute buzzer in the standby mode	Mute buzzer beep in standby mode
	Mute alarm in battery mode	Mute buzzer beep only on battery discharged status
	Output N-line grounding in battery mode	N/G relay close in battery mode
	Over voltage derating	De-rating power for Grid voltage
	Over frequency derating	De-rating power for Grid frequency
	Generator as AC input	Generator as AC input
	Wide AC input range	Wide AC input range
	Parallel for output	Parallel for output
	BMS Battery Connect	BMS battery connect
Other Settings	Charging source	Charging source
	Remote turn on/off machine load	Remote turn on/off machine load
	Load supply(PV is available)	Load supply(PV is available)
	Load supply(PV is unavailable)	Load supply(PV is unavailable)
	Allow to feed-in to the Grid	Allow to feed-in to the Grid
	Allow battery to be connected to the grid when PV is available	Allow battery to be connected to the grid when PV is available
	Allow battery to be connected to the grid when PV is unavailable	Allow battery to be connected to the grid when PV is unavailable
	Start Time For Enable AC Charge Working	Start Time For Enable AC Charge Working
	Ending Time For Enable AC Charge Working	Ending Time For Enable AC Charge Working
	Start Time For Enable AC Charge Working 2	Start Time For Enable AC Charge Working 2
	Ending Time For Enable AC Charge Working 2	Ending Time For Enable AC Charge Working 2
	Start Time For Enable AC supply the load	Start Time For Enable AC supply the load
	Ending Time For Enable AC supply the load	Ending Time For Enable AC supply the load
	Set Date Time	
Restore to the default	This function is to restore all settings back to default settings.	
Time zone setting	This function is used to modify the time zone	
Wi-Fi Module configuration	This function is used to reconfigure the network or change the connection router.	