

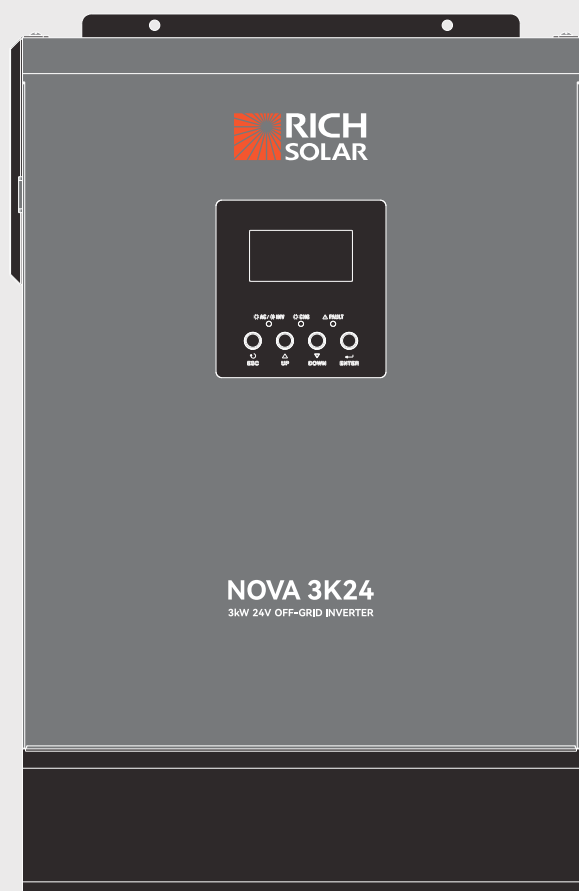


NOVATM Series

NOVA 3K24

3KW 24V OFF-GRID INVERTER

User Manual



MODEL: NOVA 3K24 (RS-H3024)

THIS MANUAL CONTAINS IMPORTANT SAFETY AND OPERATING INSTRUCTIONS FOR INVERTER. PLEASE READ THIS MANUAL AND FOLLOW THE INSTRUCTIONS EXACTLY.

Table Of Contents

ABOUT THIS MANUAL	1
Purpose.....	1
Scope.....	1
SAFETY INSTRUCTIONS.....	1
INTRODUCTION	2
Features.....	2
Basic System Architecture	2
Product Overview.....	3
INSTALLATION	4
Unpacking and Inspection.....	4
Preparation	4
Mounting the Unit.....	4
Battery Connection	5
AC Input/Output Connection	6
PV Connection	7
Final Assembly.....	8
Communication Connection.....	8
BMS Communication	8
OPERATION	9
Power ON/OFF	9
Operation and Display Panel	9
LCD Display Icons	10
LCD Setting.....	11
Display Setting	18
Operating Mode Description	21
Fault Reference Code.....	23
Warning Indicator	24
BATTERY EQUALIZATION	25
SPECIFICATIONS	27
Table 1 Line Mode Specifications	27
Table 2 Inverter Mode Specifications	28
Table 3 Charge Mode Specifications	29
TROUBLESHOOTING	30
Appendix I: Parallel Function.....	31
Appendix II: BMS Communication Installation	48
AppendixIII: The Wi-Fi Operation Guide	52

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. Fuse is 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

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 (option)

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.

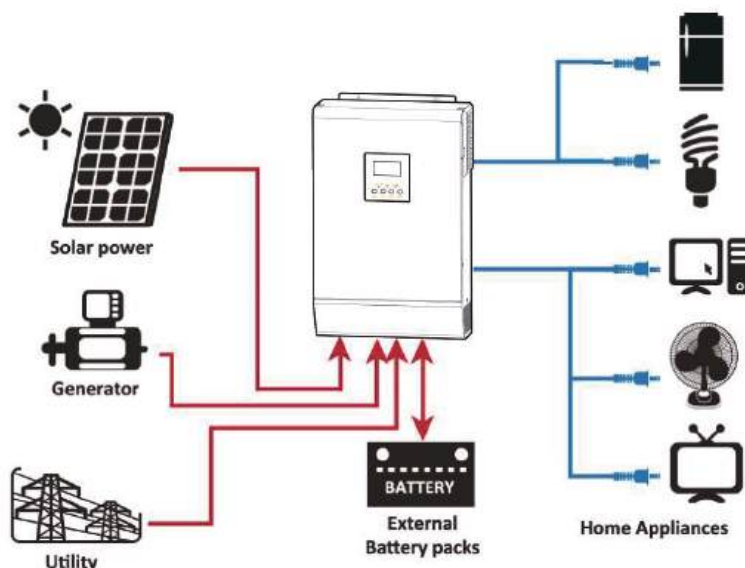
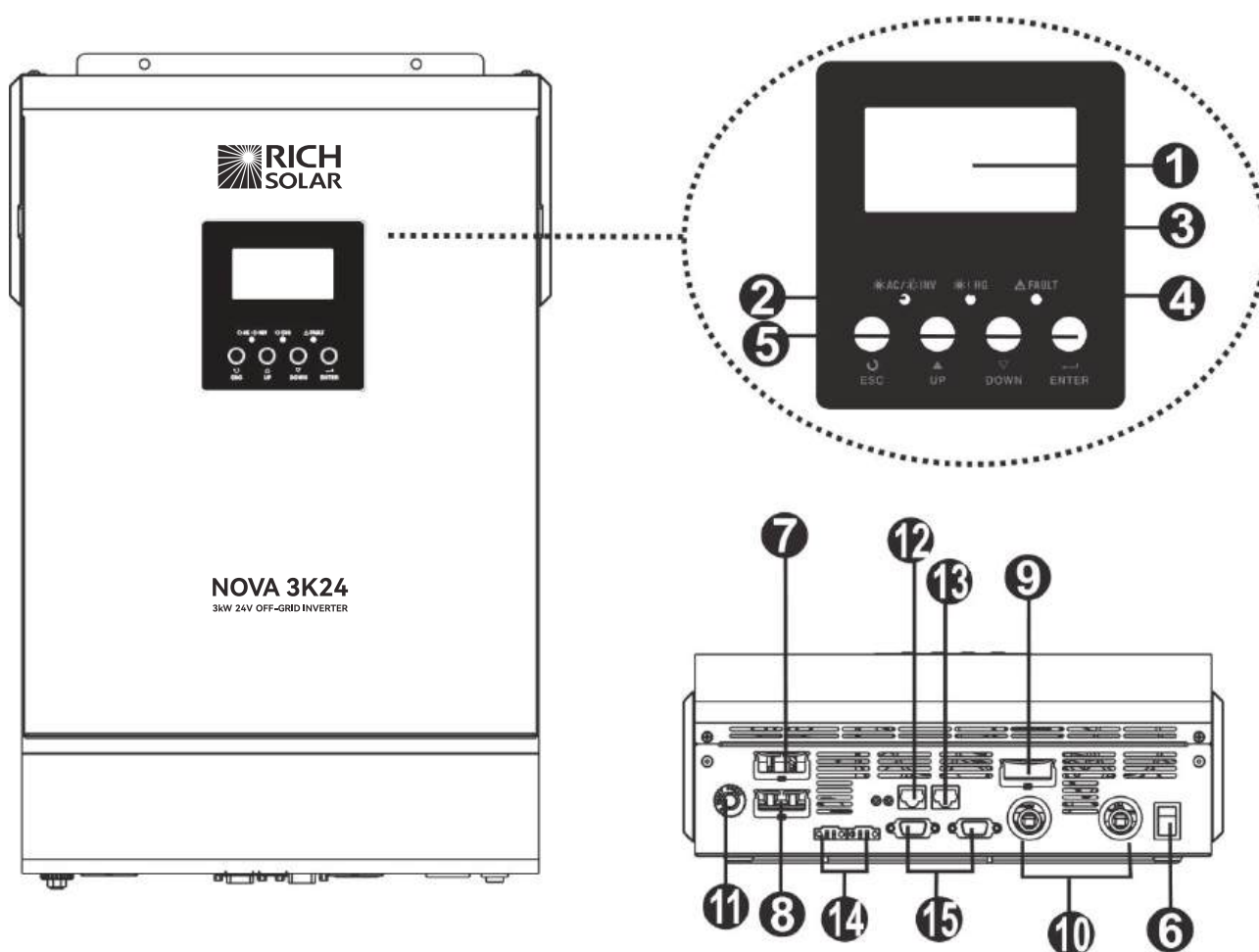


Figure 1 Off-Grid Power System

Product Overview



NOTE: For parallel installation and operation, please check the parallel installation guide for the details.

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 input
10. Battery input
11. Circuit breaker
12. BMS port
13. Communication port
14. Current sharing port (only for parallel model)
15. Parallel communication port (only for parallel model)

INSTALLATION

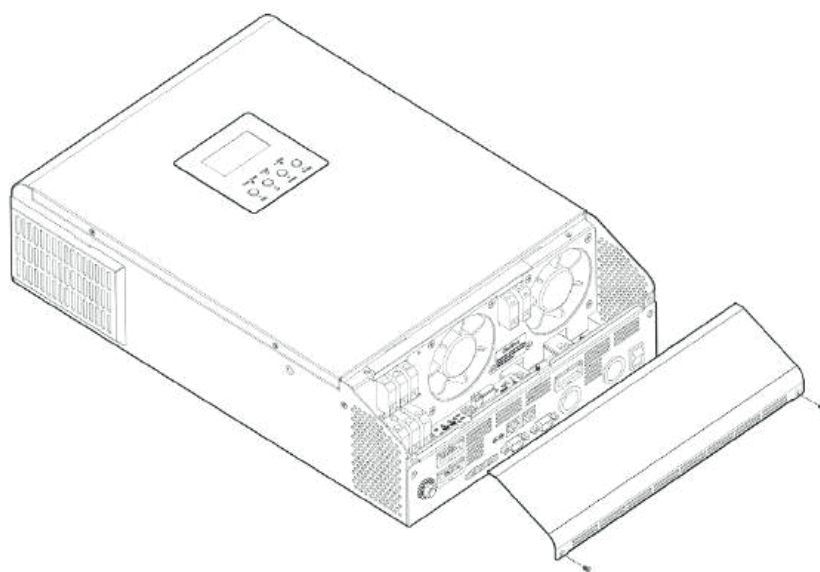
Unpacking and Inspection

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

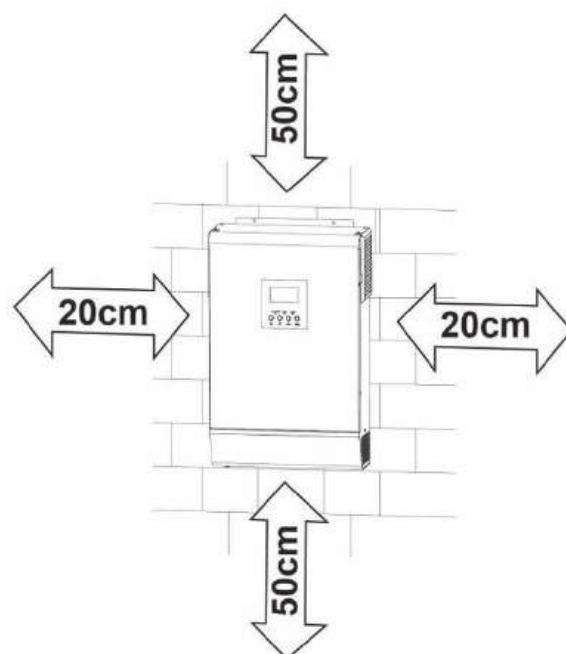
Before connecting all wirings, please take off bottom cover by removing two screws as shown below.



Mounting the Unit

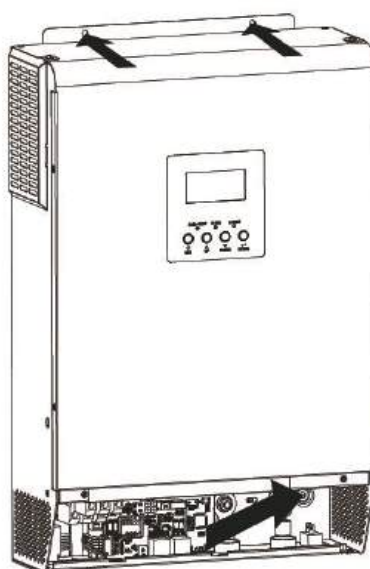
Consider the following points before selecting where to install:

- 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 32 °F and 131°F 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.



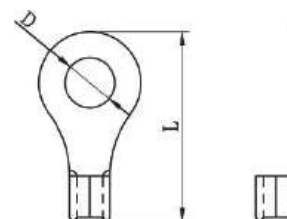
Battery Connection

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.

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.

Ring terminal:

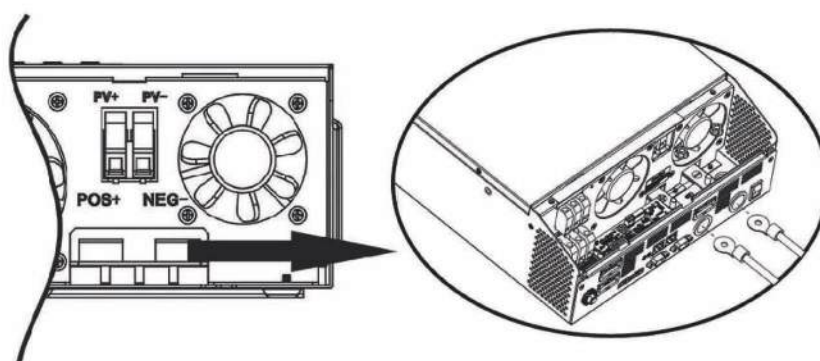


Recommended battery cable and terminal size:

Maximum Amperage	Battery Capacity	Cable Size	Ring Terminal			Torque
			Cable mm ²	Dimensions		
				D (mm)	L (mm)	
145A	200Ah	1/0 AWG	38	6.4	39.2	2~ 3 N·m

Please follow below steps to implement battery connection:

1. Assemble battery ring terminal based on recommended battery cable and terminal size.
2. Connect all battery packs as units requires. It's suggested to connect at least 200Ah capacity battery.
3. Insert the ring terminal of battery cable flatly into battery connector of inverter and make sure the bolts are tightened with torque of 2-3 N·m 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

Gauge	Torque
8 AWG	1.4~ 1.6 N·m

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

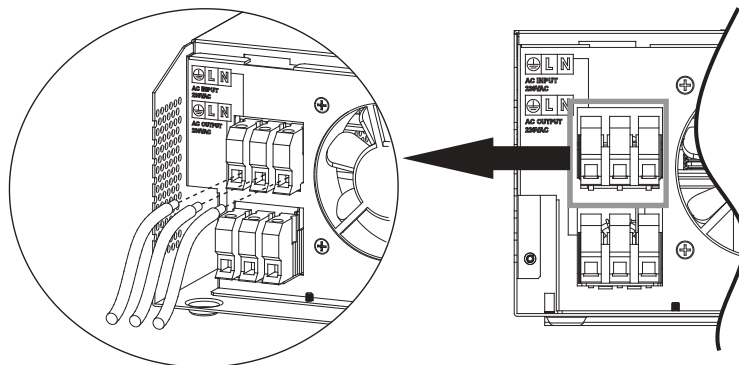
1. Before making AC input/output connection, be sure to open DC protector or disconnector first.
2. Remove insulation sleeve 10 mm for six conductors. And shorten phase L and neutral conductor N 3 mm.
3. Insert AC input wires according to polarities indicated on terminal block and tighten the terminal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



→ **Ground (yellow-green)**

L → **LINE (brown or black)**

N → **Neutral (blue)**

**WARNING:**

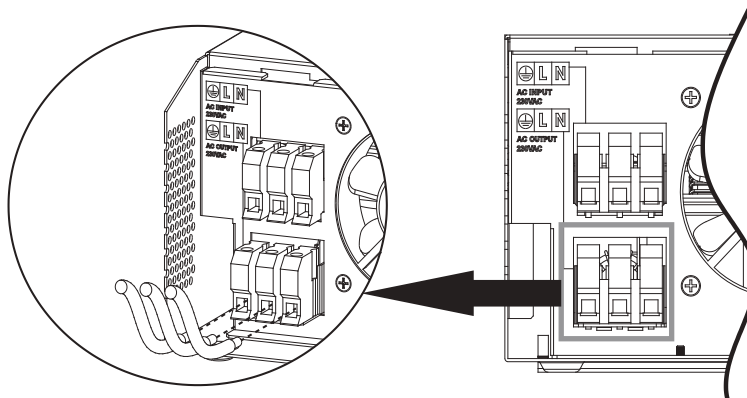
Be sure that AC power source is disconnected before attempting to hardwire it to the unit.

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: 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.

CAUTION: Please install surge protection device between inverter and PV modules and the recommended voltage is 500V.

WARNING! Do switch off the inverter before connecting to PV modules. Otherwise, it will cause inverter damage.

WARNING! Do NOT connect negative and positive terminal of PV modules to the ground.

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 PV module connection. To reduce risk of injury, please use the proper recommended cable size as below.

Typical Amperage	Cable Size	Torque
22A	12 AWG	1.4~1.6 N·m

PV Module Selection:

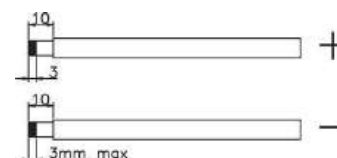
When selecting proper PV modules, please be sure to consider below parameters:

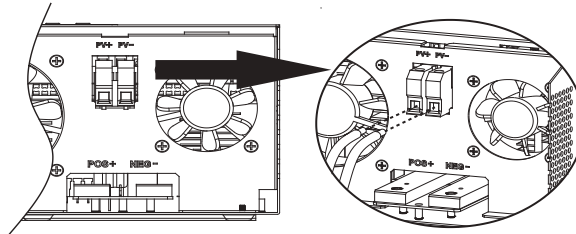
1. Open circuit Voltage (Voc) of PV modules not exceeds max. PV array open circuit voltage of inverter.
2. Open circuit Voltage (Voc) of PV modules should be higher than min. battery voltage.

Solar Charging Mode	
Max. PV Array Open Circuit Voltage	250V
PV Array MPPT Voltage Range	90Vdc~230Vdc

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.

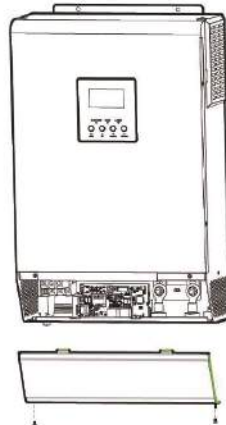




3. Make sure the wires are securely connected.

Final Assembly

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



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 "WatchPower" APP from the Apple® Store or "WatchPower Wi-Fi" in Google® Play Store. All data loggers and parameters are saved in iCloud. For quick installation and operation, please check Appendix III.

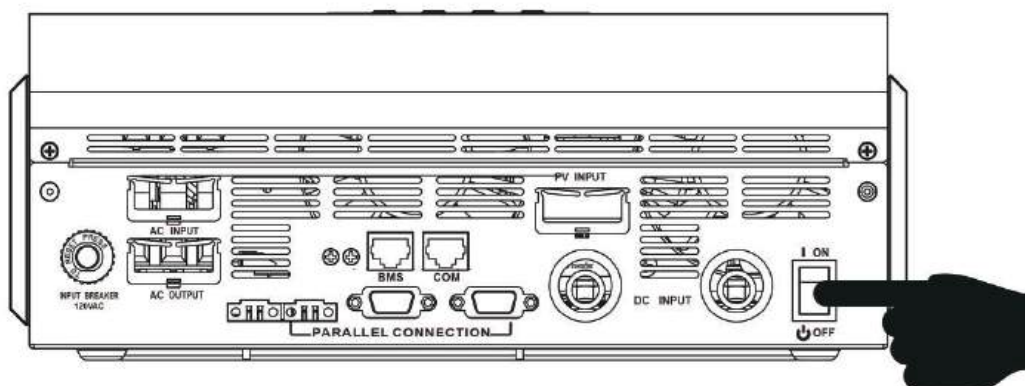


BMS Communication

It is recommended to purchase a special communication cable if you are connecting to Lithium-Ion battery banks. Please refer to Appendix II- BMS Communication Installation for details.

OPERATION

Power ON/OFF



Once the unit has been properly installed and the batteries are connected well, simply press On/Off switch (located on the button of the case) 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.



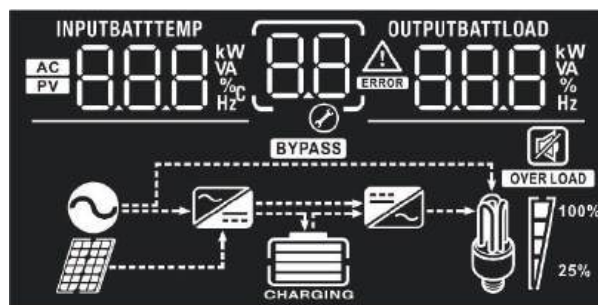
LED Indicator

LED Indicator			Messages
	Green	Solid On	Output is powered by utility in line mode.
		Flashing	Output is powered by battery or PV in battery mode.
	Green	Solid On	Battery is fully charged.
		Flashing	Battery is charging.
	Red	Solid On	Fault occurs in the inverter.
		Flashing	Warning condition occurs in the inverter.

Function Keys

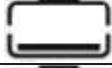
Function Key	Description
ESC	To exit setting mode
UP	To go to previous selection
DOWN	To go to next selection
ENTER	To confirm the selection in setting mode or enter setting mode

LCD Display Icons



Icon	Function description	
Input Source Information		
	Indicates the AC input.	
	Indicates the PV input	
	Indicate input voltage, input frequency, PV voltage, battery voltage and charger current.	
Configuration Program and Fault Information		
	Indicates the setting programs.	
	Indicates the warning and fault codes. Warning:  flashing with warning code. Fault:  lighting with fault code.	
Output Information		
	Indicate output voltage, output frequency, load percent, load in VA, load in Watt and discharging current.	
Battery Information		
	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.
	> 2.167V/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%	< 1.717V/cell	
	1.717 ~ 1.8V/cell	
	1.8 ~ 1.883V/cell	
	> 1.883V/cell	
50% > Load > 20%	< 1.817V/cell	
	1.817 ~ 1.9V/cell	
	1.9 ~ 1.983V/cell	
	> 1.983V/cell	
Load < 20%	< 1.867V/cell	
	1.867 ~ 1.95V/cell	
	1.95 ~ 2.033V/cell	
	> 2.033V/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 DC/AC inverter circuit is working.

Mute Operation

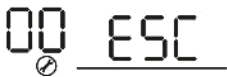
	Indicates unit alarm is disabled.
---	-----------------------------------

LCD Setting

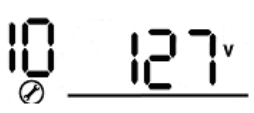
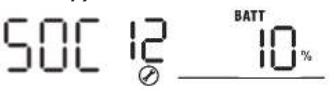
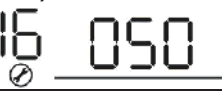
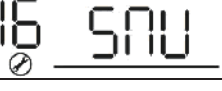
After pressing and holding ENTER button for 3 seconds, the unit will enter setting mode. Press "UP" or "DOWN"

button to select setting programs. And then, press "ENTER" button to confirm the selection or ESC button to exit.

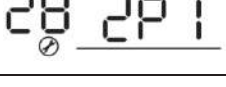
Setting Programs:

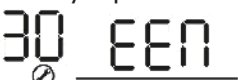
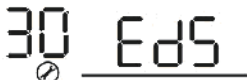
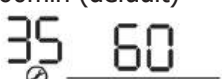
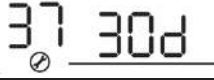
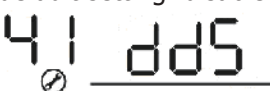
Program	Description	Selectable option	
00	Exit setting mode	Escape 	
01	Output source priority: To configure load power source priority	Utility first (default) 	Utility will provide power to the loads as first priority. Solar and battery energy will provide power to the loads only when utility power is not available.
		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.
		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.
02	Maximum charging current: To configure total charging current for solar and utility chargers. (Max. charging current = utility charging current + solar charging current)	80A (default) 	Setting range is from 10A to 80A. Increment of each click is 10A.
03	AC input voltage range	Appliances (default) 	If selected, acceptable AC input voltage range will be within 80-140Vac.
		UPS 	If selected, acceptable AC input voltage range will be within 90-140Vac.

05	Battery type	AGM (default) 05 AGM	Flooded 05 FLD
		User-Defined 05 USE	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 05 PYL	If selected, programs of 02, 26, 27 and 29 will be automatically set up. No need for further setting.
		BYD battery 05 BYD	If selected, programs of 02, 26, 27 and 29 will be automatically set up. No need for further setting.
		LIA-protocol compatible battery 05 LIA	Select "LIA" if using Lithium battery compatible to CAN protocol. If selected, programs of 02, 26, 27 and 29 will be automatically set up. No need for further setting.
		Lib-protocol compatible battery 05 LIB	Select "Lib" if using Lithium battery compatible to RS485 protocol. If selected, programs of 02, 26, 27 and 29 will be automatically set up. No need for further setting.
		3 rd party Lithium battery 05 LIC	Select "LIC" if using Lithium battery not listed above. 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) 06 LTD	Restart enable 06 LTE
07	Auto restart when over temperature occurs	Restart disable (default) 07 LTD	Restart enable 07 LTE
09	Output frequency	50Hz 09 50 Hz	60Hz (default) 09 60 Hz
10	Output voltage	110V 10 110 V	120V (default) 10 120 V

		127V 	
11	Maximum utility charging current Note: If setting value in program 02 is smaller than that in program 11, the inverter will apply charging current from program 02 for utility charger.	30A (default) 	Setting range is 2A, then from 10A to 80A. Increment of each click is 10A.
12	Setting voltage point or SOC back to utility source when selecting "SBU priority" in program 01.	23V (default)  SOC 10% (default for Lithium battery) 	Setting range is from 22V to 25.5V. Increment of each click is 0.5V. If any types of lithium battery is selected in program 05, setting value will change to SOC automatically. Adjustable range is from 5% to 95%. Increment of each click is 5%.
13	Setting voltage point or SOC back to battery mode when selecting "SBU priority" in program 01.	Battery fully charged  SOC 80% (default for Lithium battery) 	27V (default)  Setting range is from 24V to 29V. Increment of each click is 0.5V. If any types of lithium battery is selected in program 05, setting value will change to SOC automatically. Adjustable range is from 10% to 100%. Increment of each click is 5%.
16	Charger source priority: To configure charger source priority	If this inverter/charger is working in Line, Standby or Fault mode, charger source can be programmed as below: Solar first  Only Solar  Solar and Utility (default) 	Solar energy will charge battery as first priority. Utility will charge battery only when solar energy is not available. Solar energy will be the only charger source no matter utility is available or not. Solar energy and utility will charge battery at the same time.

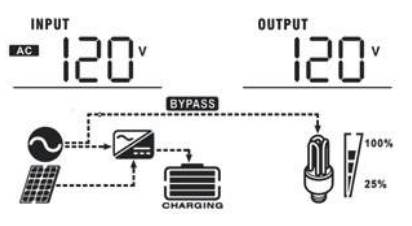
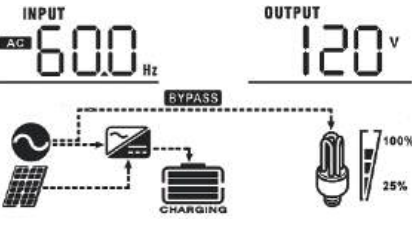
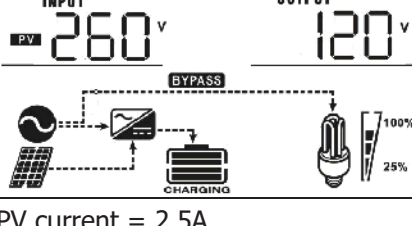
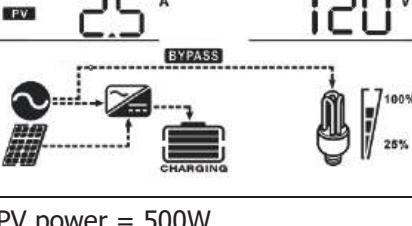
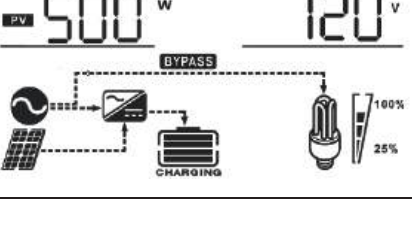
		If this inverter/charger is working in Battery mode or Power saving mode, only solar energy can charge battery. Solar energy will charge battery if it's available and sufficient.	
18	Alarm control	Alarm on (default) 18 bOn	Alarm off 18 bOf
19	Auto return to default display screen	Return to default display screen (default) 19 ESP	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 19 LEP	If selected, the display screen will stay at latest screen user finally switches.
20	Backlight control	Backlight on (default) 20 LOn	Backlight off 20 LOF
22	Beeps while primary source is interrupted	Alarm on (default) 22 AOn	Alarm off 22 AOf
23	Overload bypass: When enabled, the unit will transfer to line mode if overload occurs in battery mode.	Bypass disable (default) 23 bYd	Bypass enable 23 bYE
25	Record Fault code	Record enable 25 FEn	Record disable (default) 25 FdS
26	Bulk charging voltage (C.V voltage)	default setting: 28.8V CU 26 28.8 ^{BATT} v	
		If self-defined is selected in program 5, this program can be set up. Setting range is from 25.0V to 31.5V. Increment of each click is 0.1V.	
27	Floating charging voltage	default setting: 27.6V FLU 27 27.6 ^{BATT} v	
		If self-defined is selected in program 5, this program can be set up. Setting range is from 25.0V to 31.5V. Increment of each click is 0.1V.	
28	AC output mode *This setting is only available when the inverter is in standby mode (Switch off).	Single: 28 ^{OUTPUT} Si G	When the units are used in parallel with single phase, please select "PAL" in program 28. It is required to have at least 3 inverters or maximum 6 inverters to support three-phase equipment. It's required to have at least one inverter in each
		Parallel: 28 ^{OUTPUT} PAL	

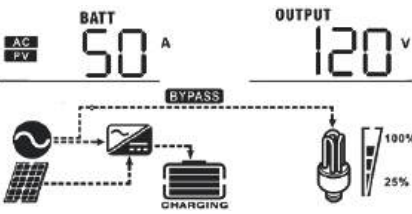
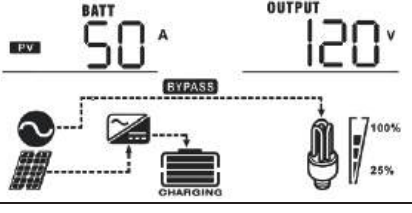
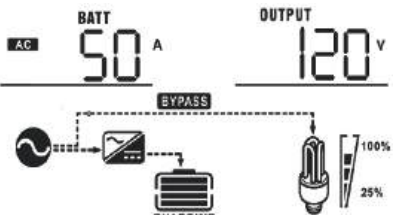
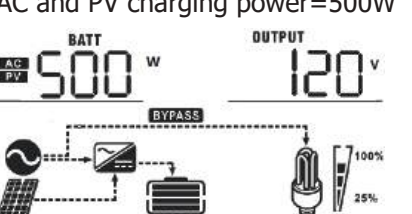
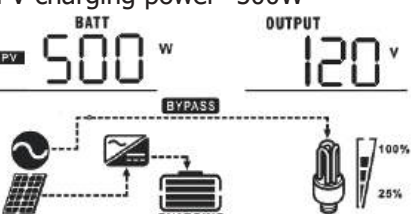
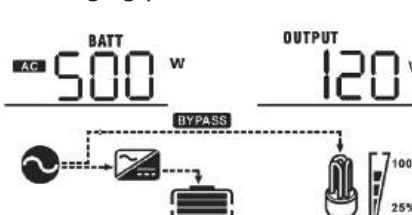
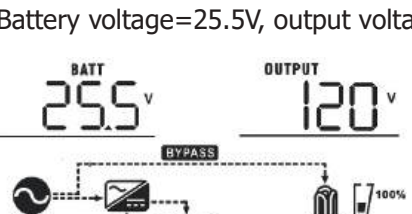
		L1 phase: 	phase or it's up to four inverters in one phase. Please refers to 5-2 for detailed information. Please select "3P1" in program 28 for the inverters connected to L1 phase, "3P2" in program 28 for the inverters connected to L2 phase and "3P3" in program 28 for the inverters connected to L3 phase. It is required to have at least 2 inverters or maximum 6 inverters to support split-phase equipment. It's required to have at least one inverter in each phase or it's up to three inverters in one phase. Please refer to 5-2 for detailed information. Please select "2P1" in program 28 for the inverters connected to L1 phase, "2P2" in program 28 for the inverters connected to L2 phase. And it can choose 120° or 180° phase difference for "2P2". 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: 	
		L1 for split-phase: 	
		L2 for split-phase: 	
		L2 for split-phase: 	
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.	default setting: 22.0V 	If self-defined is selected in program 5, this program can be set up. Setting range is from 18.8V to 27.0V. 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.
		SOC 0% (default for Lithium) 	If any types of Lithium battery is selected in program 05, setting value will change to SOC automatically. Adjustable range is 0% to 90%. Increment of each click is 5%.
30	Low DC cut-off re-discharge voltage	default setting: 27.1V 	If self-defined is selected in program 5, this program can be set up. Setting range is from 20.9V to 31.5V. Increment of each click is 0.1V. Low DC cut-off re-discharge voltage cannot higher than floating charging voltage – 0.5V and cannot lower than low DC cut-off voltage + 4V.

		SOC 50% (default for Lithium) 	If any types of Lithium battery is selected in program 05, setting value will change to SOC automatically. Adjustable range is 10% to 100%. Increment of each click is 5%.
33	Battery equalization	Battery equalization 	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: 29.2V 	Setting range is from 25.0V to 31.5V. 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 900min. Increment of each click is 5min.
37	Equalization interval	30days (default) 	Setting range is from 0 to 90 days. Increment of each click is 1 day
39	Equalization activated immediately	Enable 	Disable (default) 
		If equalization function is enabled in program 30, 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 35 setting. At this time, "E9" will not be shown in LCD main page.	
41	Maximum discharging current	default setting: disable 	The setting range is from 30A to 150A. Increment of each click is 10A. Setting to limit maximum discharge current. If more current is required, the inverter will by-pass (like overload by-pass) or if no AC source is available then shut down for 5 minutes.

Display Setting

The LCD display information will be switched in turns by pressing "UP" or "DOWN" key. The selectable information is switched as below order: input voltage, input frequency, PV voltage, MPPT charging current, MPPT charging power, charging current, charging power, battery voltage, output voltage, output frequency, load percentage, load in VA, load in Watt, DC discharging current, main CPU Version and second CPU Version.

Selectable information	LCD display
Input voltage/Output voltage (Default Display Screen)	Input voltage=120V, output voltage=120V 
Input frequency	Input frequency=60Hz 
PV voltage	PV voltage=260V 
PV current	PV current = 2.5A 
PV power	PV power = 500W 

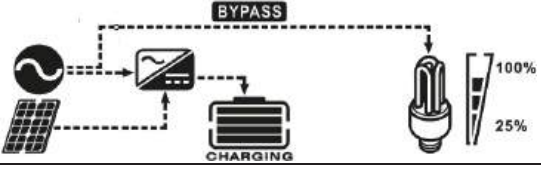
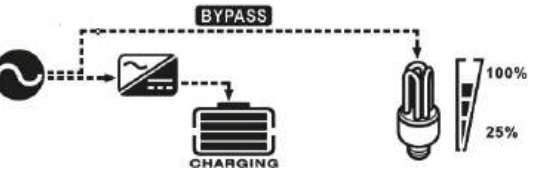
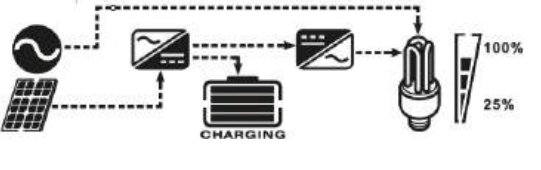
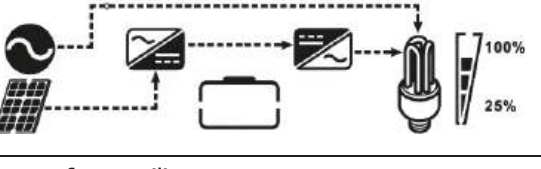
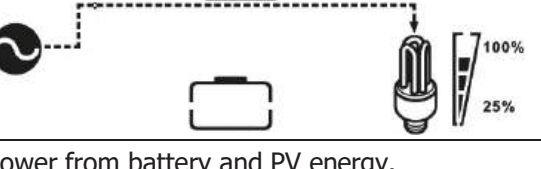
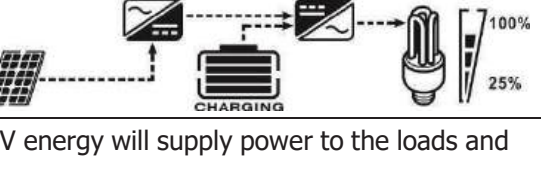
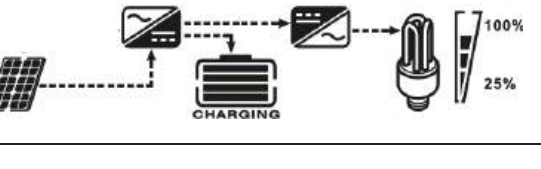
Charging current	AC and PV charging current=50A  PV charging current=50A 
Charging current	AC charging current=50A 
Charging power	AC and PV charging power=500W  PV charging power=500W  AC charging power=500W 
Battery voltage and output voltage	Battery voltage=25.5V, output voltage=230V 

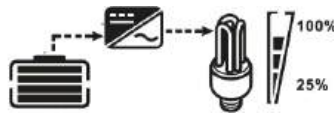
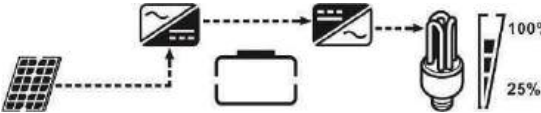
Output frequency	Output frequency=50Hz
Load percentage	Load percent=70%
Load in VA	When connected load is lower than 1kVA, load in VA will present xxxVA like below chart. When load is larger than 1kVA ($\geq 1\text{kVA}$), load in VA will present x.xkVA like below chart.
Load in Watt	When load is lower than 1kW, load in W will present xxxW like below chart. When load is larger than 1kW ($\geq 1\text{kW}$), load in W will present x.xkW like below chart.

Battery voltage/DC discharging current	Battery voltage=25.5V, discharging current=1A
Main CPU version checking	Main CPU version 00014.04
Secondary CPU version checking	Secondary CPU version 00001.00

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	PV energy and utility can	Charging by utility and PV energy.
		Charging by utility.

caused by inside circuit error or external reasons such as over temperature, output short circuited and so on.	charge batteries.	Charging by PV energy.  No charging. 
Line mode	The unit will provide output power from the mains. It will also charge the battery at line mode.	Charging by utility and PV energy.  Charging by utility.  If "solar first" is selected as output source priority and solar energy is not sufficient to provide the load, solar energy and the utility will provide the loads and charge the battery at the same time.  If "solar first" is selected as output source priority and battery is not connected, solar energy and the utility will provide the loads.  Power from utility. 
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. 
Battery mode	The unit will provide output power from battery and PV power.	Power from PV energy 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	
06	Output voltage is too high	
07	Overload time out	
08	Bus voltage is too high	
09	Bus soft start failed	
10	PV over current	
11	PV over voltage	
12	DCDC over current	
13	Battery discharge over current	
51	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	
15	PV energy is low	Beep twice every 3 seconds	
32	Communication failure between inverter and communication board	None	
E9	Battery equalization	None	
bP	Battery is not connected	None	

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.

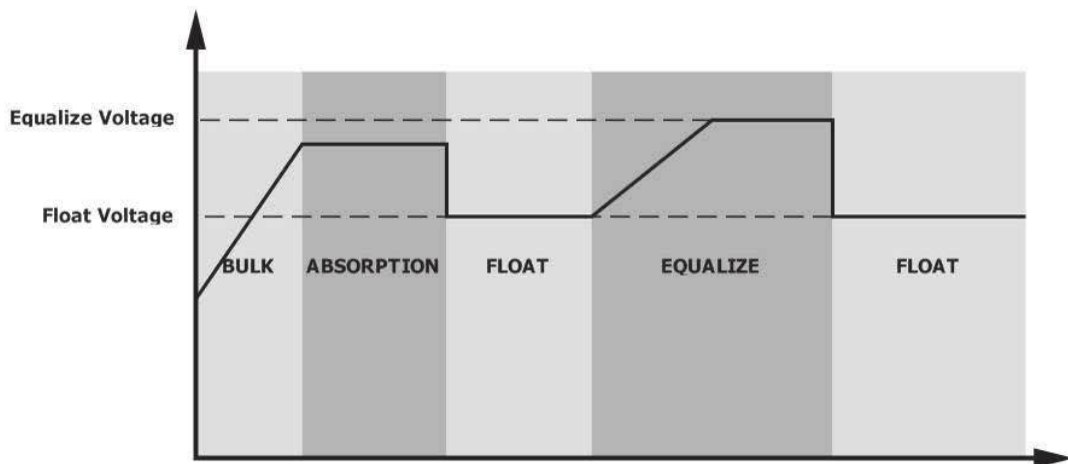
● How to Apply Equalization Function

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.

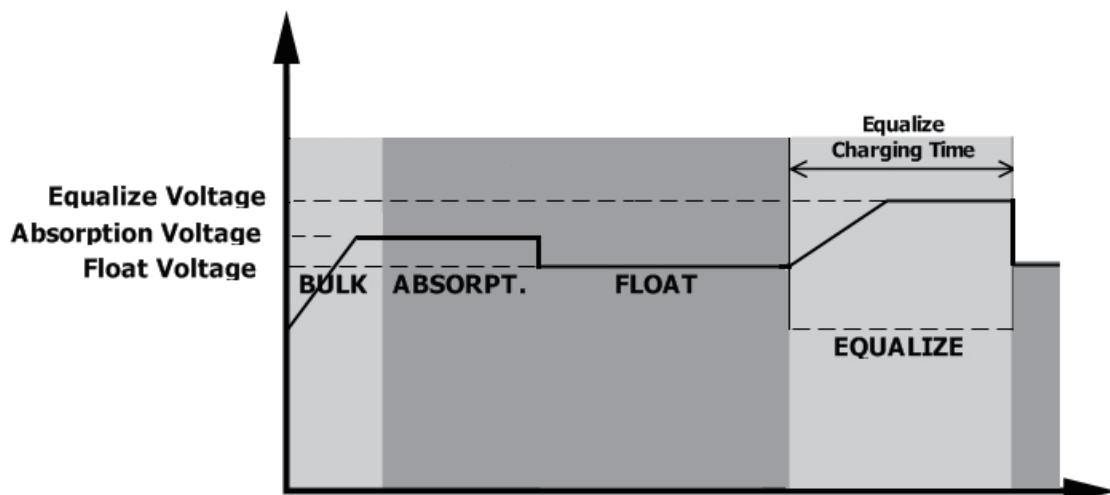
● When to Equalize

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.

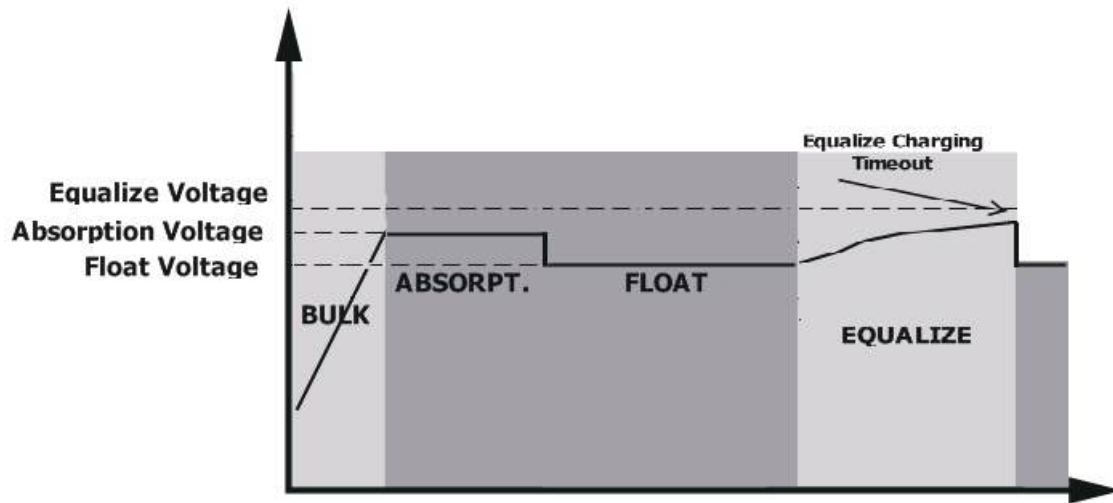


● Equalize Charging Time and Timeout

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

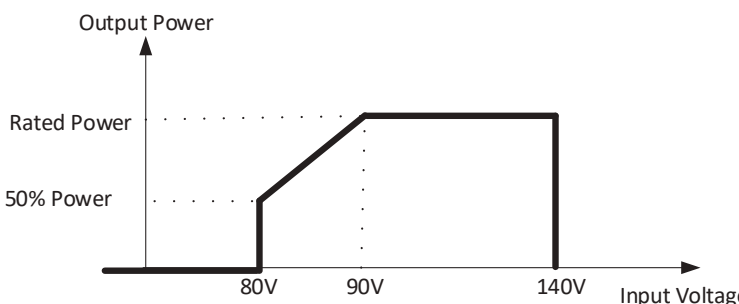
MODEL	NOVA 3K24
Input Voltage Waveform	Sinusoidal (utility or generator)
Nominal Input Voltage	120Vac
Low Loss Voltage	90Vac $\pm$ 7V (UPS) 80Vac $\pm$ 7V (Appliances)
Low Loss Return Voltage	100Vac $\pm$ 7V (UPS); 90Vac $\pm$ 7V (Appliances)
High Loss Voltage	140Vac $\pm$ 7V
High Loss Return Voltage	135Vac $\pm$ 7V
Max AC Input Voltage	150Vac
Nominal Input Frequency	50Hz / 60Hz (Auto detection)
Low Loss Frequency	40 $\pm$ 1Hz
Low Loss Return Frequency	42 $\pm$ 1Hz
High Loss Frequency	65 $\pm$ 1Hz
High Loss Return Frequency	63 $\pm$ 1Hz
Output Short Circuit Protection	Line mode: Circuit Breaker Battery mode: Electronic Circuits
Efficiency (Line Mode)	>95% (Rated R load, battery full charged)
Transfer Time	10ms typical (UPS); 20ms typical (Appliances)
Output Power Derating	 The graph illustrates the output power derating characteristics of the device. The vertical axis represents Output Power, with markers for 50% Power and Rated Power. The horizontal axis represents Input Voltage, with markers at 80V, 90V, and 140V. The power remains at 0% until 80V, then rises linearly to reach the Rated Power at 90V. It remains constant at Rated Power until 140V, after which it drops to 0%.

Table 2 Inverter Mode Specifications

MODEL	NOVA 3K24
Rated Output Power	3kVA/3kW
Output Voltage Waveform	Pure Sine Wave
Output Voltage Regulation	120Vac±5%
Output Frequency	60Hz or 50Hz
Peak Efficiency	91%
Overload Protection	100ms@≥205% load;5s@≥150% load; 10s@110%~150% load
Surge Capacity	2* rated power for 5 seconds
Nominal DC Input Voltage	24Vdc
Cold Start Voltage	23.0Vdc
Low DC Warning Voltage @ load < 20% @ 20% ≤ load < 50% @ load ≥ 50%	23.0Vdc 21.4Vdc 20.2Vdc
Low DC Warning Return Voltage @ load < 20% @ 20% ≤ load < 50% @ load ≥ 50%	24.0Vdc 22.4Vdc 21.2Vdc
Low DC Cut-off Voltage @ load < 20% @ 20% ≤ load < 50% @ load ≥ 50%	22.0Vdc 20.4Vdc 19.2Vdc
High DC Recovery Voltage	32Vdc
High DC Cut-off Voltage	33Vdc
DC Voltage Accuracy	+/-0.3%V@ no load
THDV	<5% for linear load,<10% for non-linear load @ nominal voltage
DC Offset	≤100mV
Power Limitation If the output load is high than de-rate power. The AC output voltage will be decrease until the output power reduce to de-rate power. The lower limit of AC output voltage is 95V.	The graph illustrates the power limitation of the inverter. The vertical axis represents the Output Load, with specific markers for 'Rated Power' and 'Rated Power-600'. The horizontal axis represents the Battery Voltage, with markers at 18.8Vdc and 25Vdc. The curve shows that at battery voltages below 18.8Vdc, the output load is constant at the de-rated power level (Rated Power-600). Between 18.8Vdc and 25Vdc, the output load increases linearly from the de-rated power level to the full rated power. Above 25Vdc, the output load remains constant at the rated power level.

Table 3 Charge Mode Specifications

Utility Charging Mode		
MODEL		NOVA 3K24
Charging Current (UPS) @ Nominal Input Voltage		80A
Bulk Charging Voltage	Flooded Battery	29.2
	AGM / Gel Battery	28.8
Floating Charging Voltage		27.6Vdc
Overcharge Protection		33Vdc
Charging Algorithm		3-Step
Charging Curve		The graph illustrates the 3-step charging algorithm. The left y-axis represents Battery Voltage per cell (2.25Vdc to 2.43Vdc), and the right y-axis represents Charging Current (%). The x-axis represents Time, divided into Bulk (Constant Current), Absorption (Constant Voltage), and Maintenance (Floating) stages. The voltage rises during Bulk and remains constant during Absorption. The current is constant during Bulk and drops to 0% during Absorption. The Maintenance stage shows a constant voltage of 2.76Vdc and a constant current of 0%.
Solar Input		
MODEL		NOVA 3K24
Rated Power		3000W
Max. PV Array Open Circuit Voltage		250Vdc
PV Array MPPT Voltage Range		90Vdc~230Vdc
Max. Input Current		22A
Start-up Voltage		80V +/- 5Vdc

Table 4 General Specifications

MODEL	NOVA 3K24
Operating Temperature Range	14°F to 104°F
Storage Temperature	5°F to 140°F
Humidity	5% to 95% Relative Humidity (Non-condensing)
Dimension (D*W*H), inch	5.61 x 12.12 x 18.80
Net Weight, lb	26.5

TROUBLESHOOTING

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)
	Green LED is flashing.	Set "Solar First" as the priority of output source.	Change output source priority to Utility first.
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.
		Temperature of internal converter component is over 248°F. (Only available for 1-3kVA models.)	Check whether the air flow of the unit is blocked or whether the ambient temperature is too high.
	Fault code 02	Internal temperature of inverter component is over 212°F.	
	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 51	Over current or surge.	Restart the unit, if the error happens again, please return to repair center.
	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.

Appendix I: Parallel Function

1. Introduction

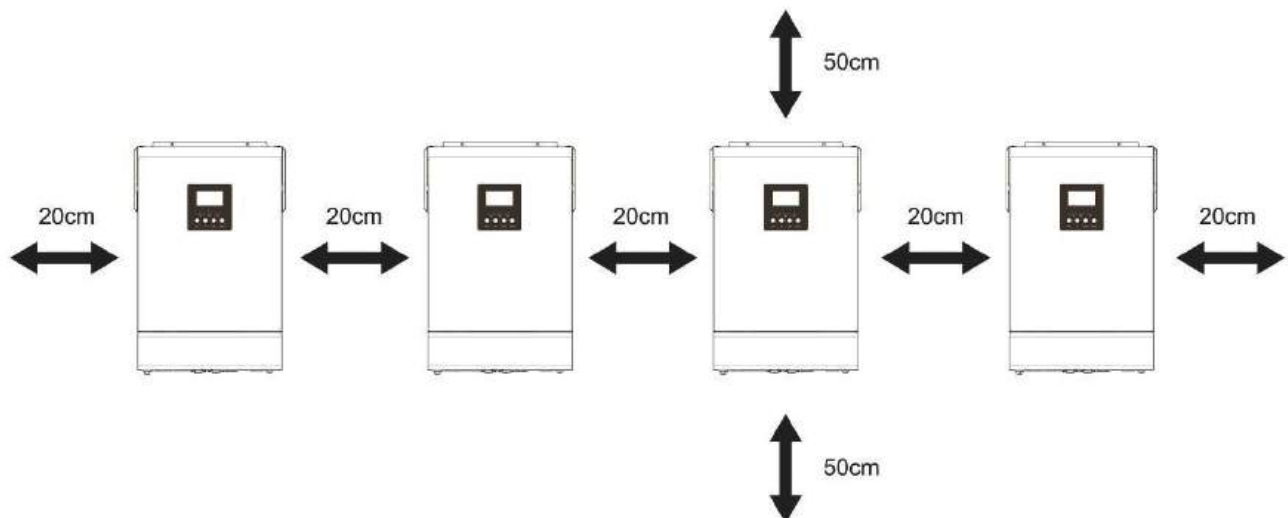
This inverter can be used in parallel with two different operation modes.

1. Parallel operation in single phase with up to 9 units. The supported maximum output power is 27kW/27kVA.
2. Maximum nine units work together to support three-phase equipment. Seven units support one phase maximum. The supported maximum output power is 27kW/27kVA and one phase can be up to 21kW/21kVA.
3. Maximum nine units work together to support split-phase equipment. Eight units support one phase maximum. The supported maximum output power is 27kW/27kVA and one phase can be up to 24kW/24kVA.

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.

The inverter can't turn on when PV source only.

2. Mounting the Unit



NOTE: For proper air circulation to dissipate heat, allow a clearance of approx. 20 cm (7.9 in) to the side and approx. 50 cm (19.7 in) above and below the unit. Be sure to install each unit in the same level.

3. Wiring Connection

The cable size of each inverter is shown as below:

Recommended battery cable and terminal size for each inverter:

Model	Cable Size	Ring Terminal			Torque
		Cable mm ²	Dimensions		
			D (mm)	L (mm)	
3kW	1/0 AWG	38	6.4	39.2	2~ 3 N·m

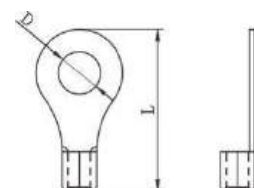
WARNING: Be sure the length of all battery cables is the same. Otherwise, there will be voltage difference between inverter and battery to cause parallel inverters not working.

Recommended AC input and output cable size for each inverter:

AWG no.	Torque
8 AWG	1.4~ 1.6 N·m

You need to connect the cables of each inverter together. Take the battery cables for example: You need to use

Ring terminal:



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:

1 unit*
150A/40Vdc

*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 with single phase:

Inverter parallel numbers	2 units	3 units	4 units	5 units	6 units	7 units	8 units	9 units
Breaker spec	90A/ 120Vac	120A/ 120Vac	150A/ 120Vac	180A/ 120Vac	210A/ 120Vac	240A/ 120Vac	270A/ 120Vac	300A/ 120Vac

Note1: Also, you can use 50A breaker 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

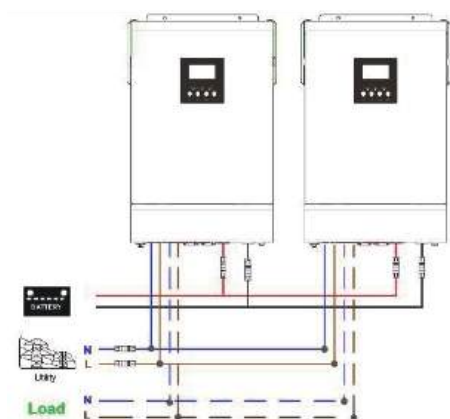
Inverter parallel numbers	2	3	4	5	6	7	8	9
Battery Capacity	200Ah	400Ah	400Ah	600Ah	600Ah	800Ah	800Ah	1000Ah

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

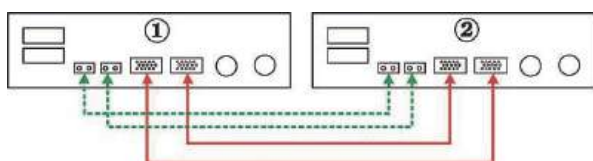
5-1. Parallel operation in single phase

Two inverters in parallel:

Power Connection

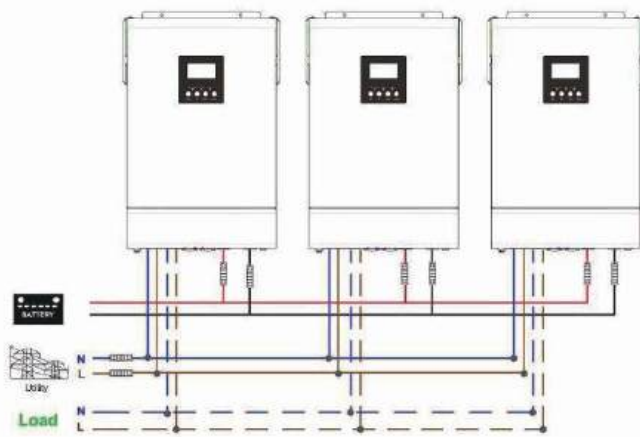


Communication Connection

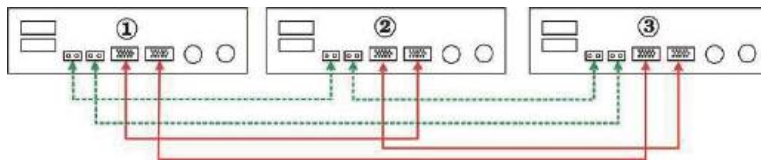


Three inverters in parallel:

Power Connection

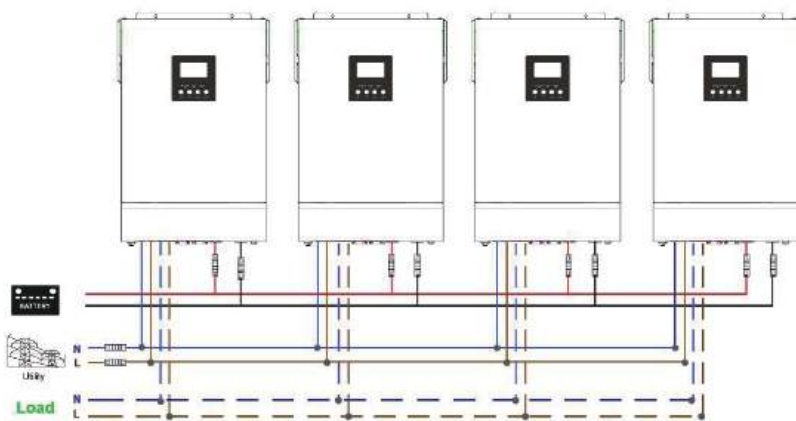


Communication Connection

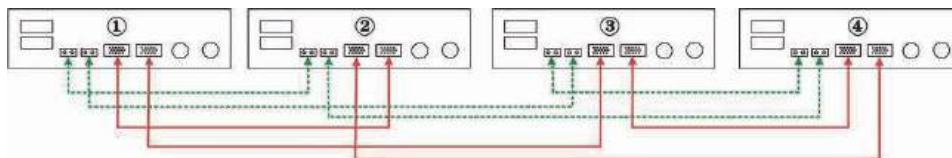


Four inverters in parallel:

Power Connection

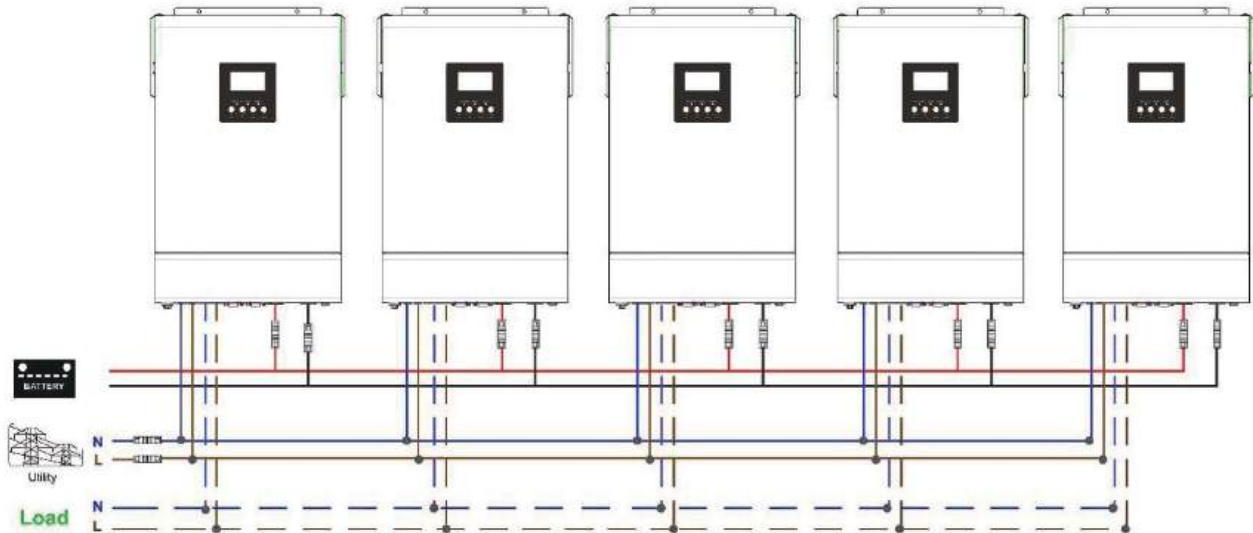


Communication Connection

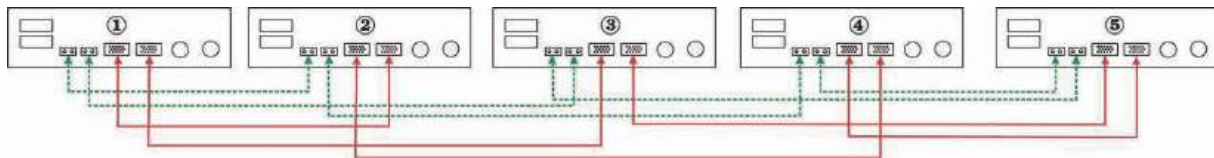


Five inverters in parallel:

Power Connection

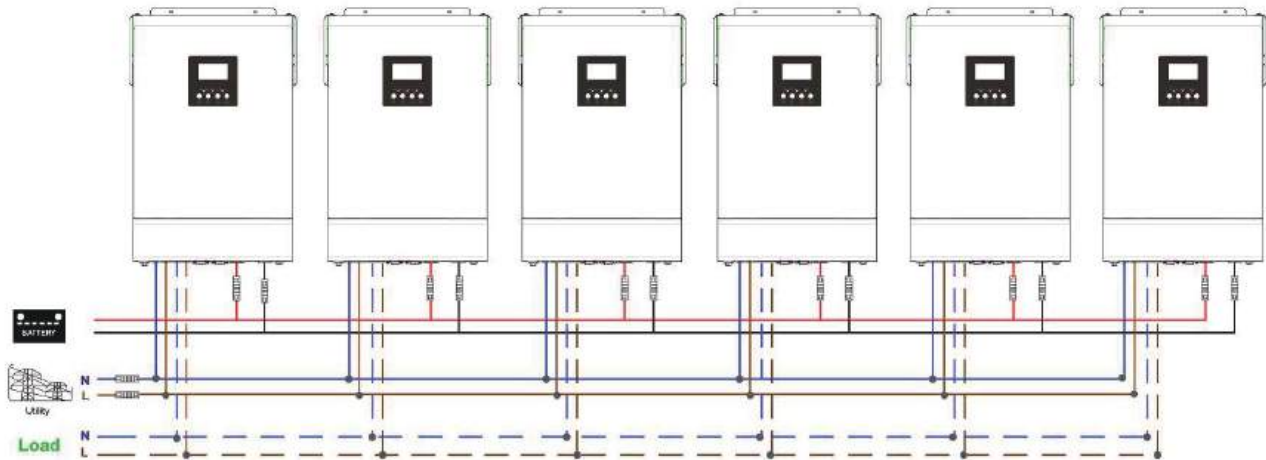


Communication Connection

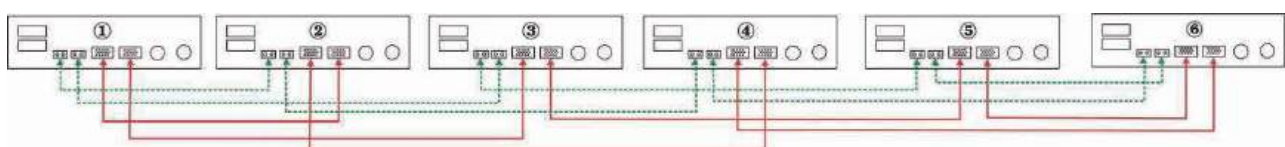


Six inverters in parallel:

Power Connection

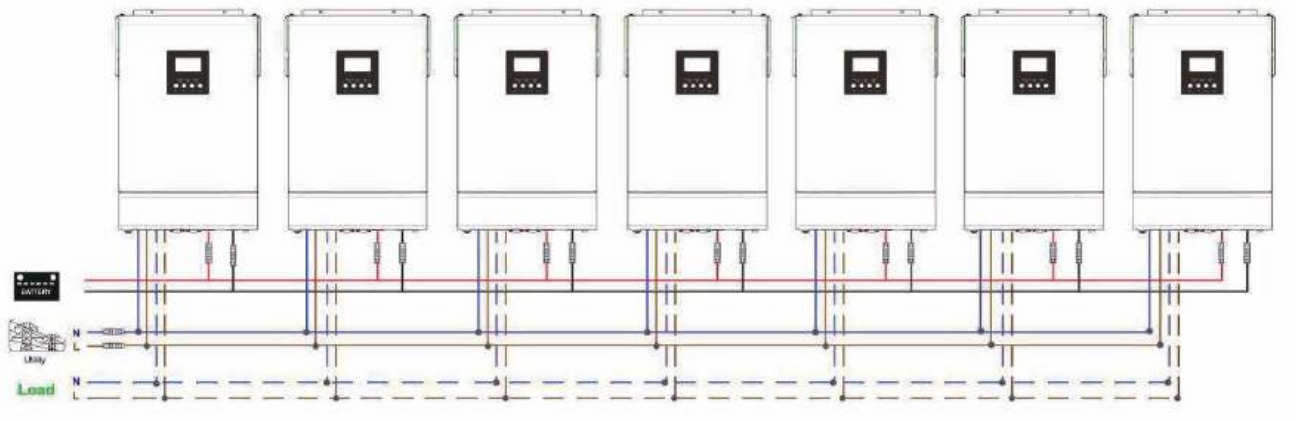


Communication Connection

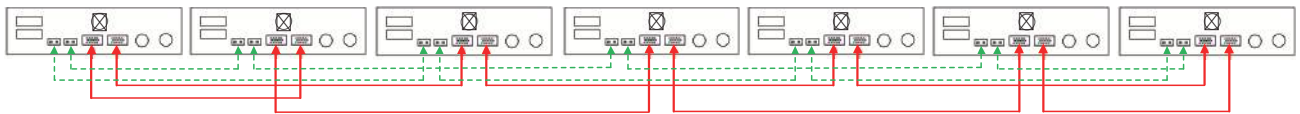


Seven inverters in parallel:

Power Connection

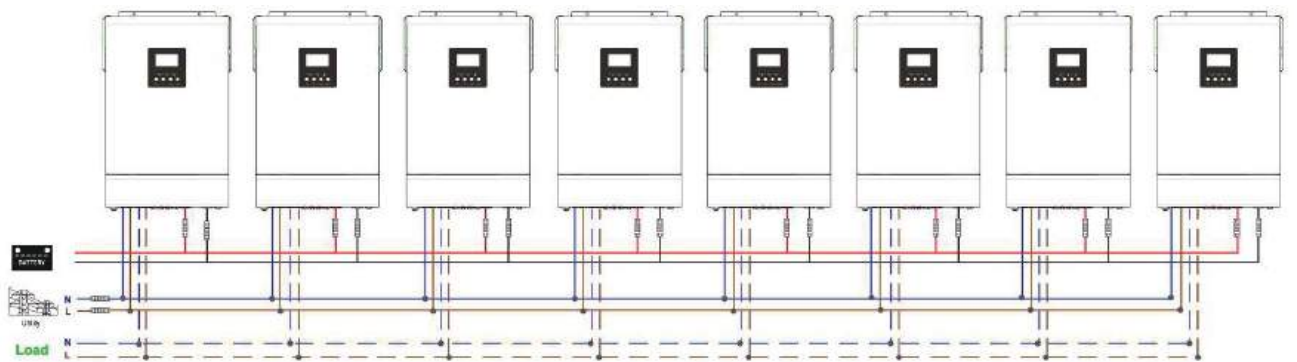


Communication Connection

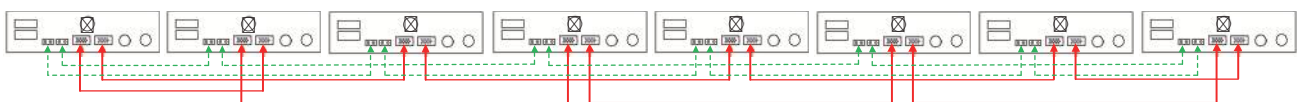


Eight inverters in parallel:

Power Connection

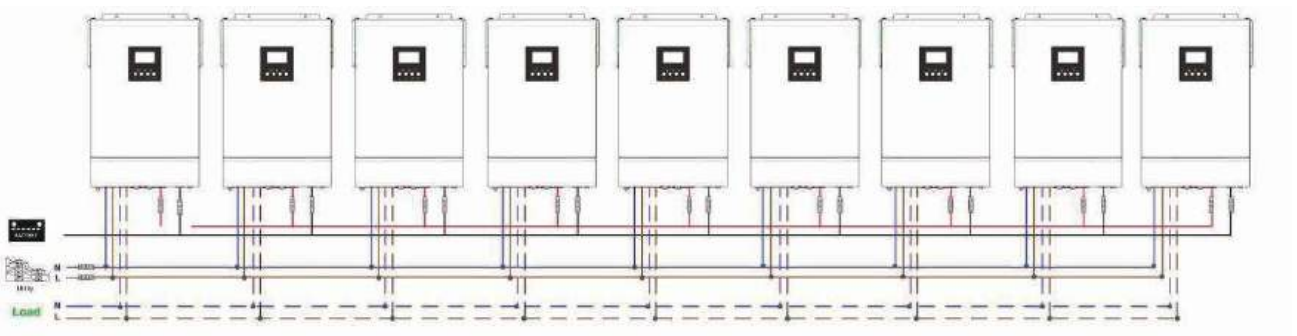


Communication Connection



Nine inverters in parallel:

Power Connection



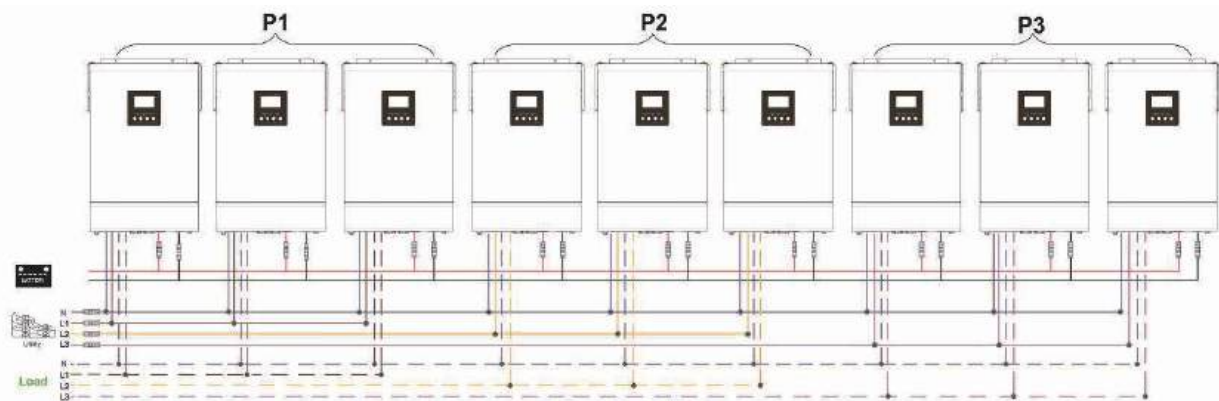
Communication Connection



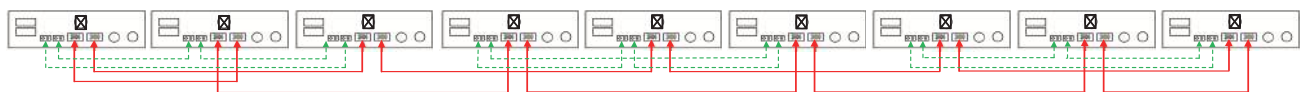
5-2. Support 3-phase equipment

Three inverters in each phase:

Power Connection



Communication Connection

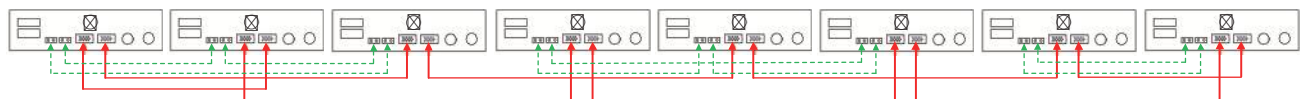


Three inverters in one phase, three inverters in second phase and two inverter for the third phase:

Power Connection

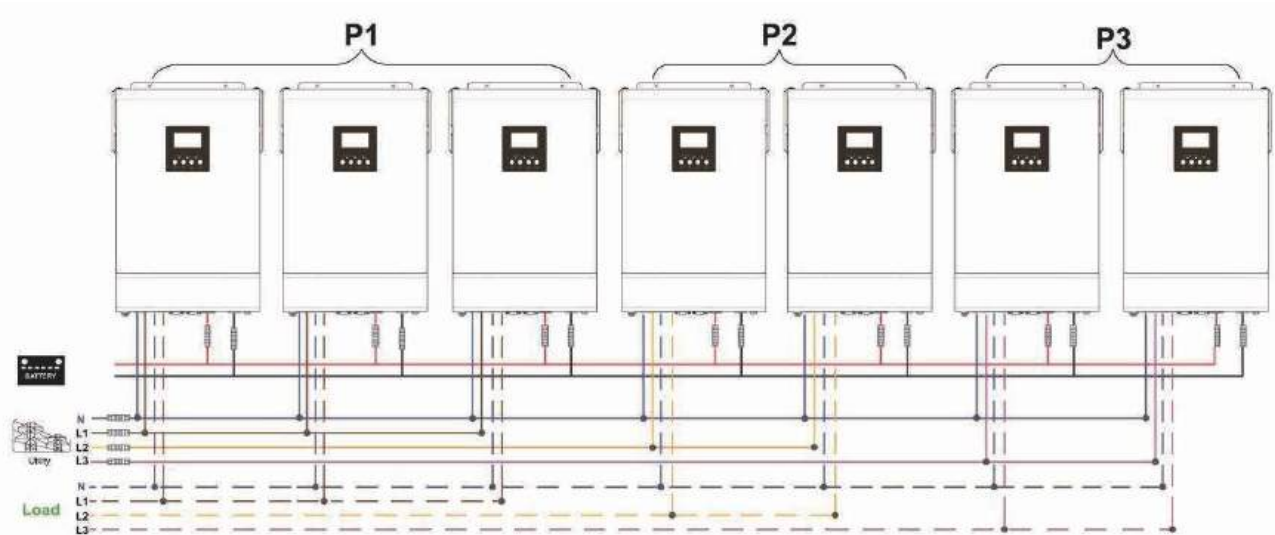


Communication Connection

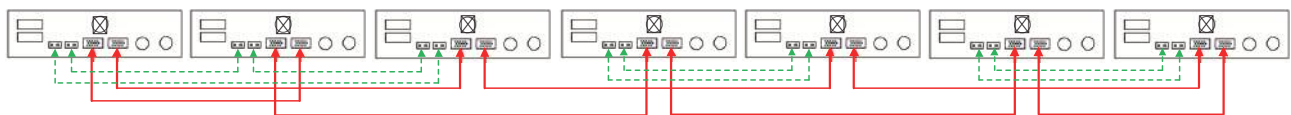


Three inverters in one phase, two inverters in second phase and two inverters for the third phase:

Power Connection



Communication Connection

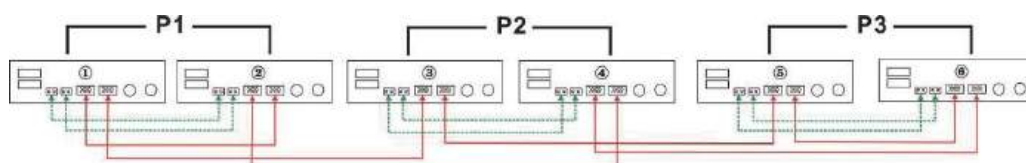


Two inverters in each phase:

Power Connection

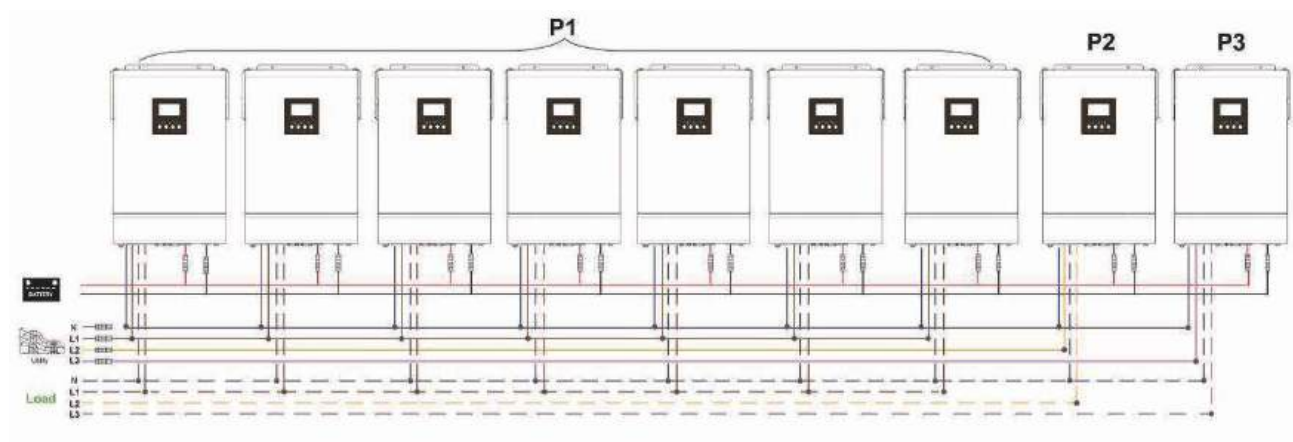


Communication Connection



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

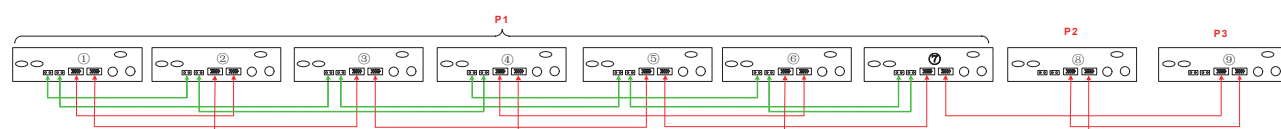
Power Connection



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

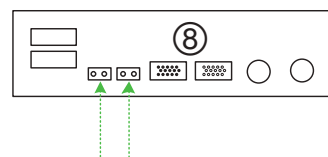
P1: L1-phase, P2: L2-phase, P3: L3-phase.

Communication Connection



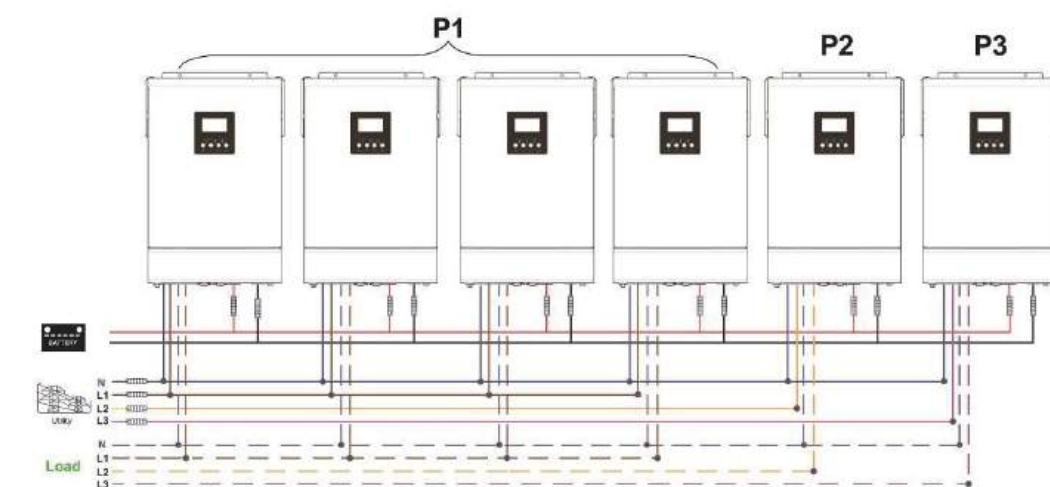
Note: If there is only one unit in one phase, this unit doesn't need to connect the current sharing cable.

Or you connect it like as below:

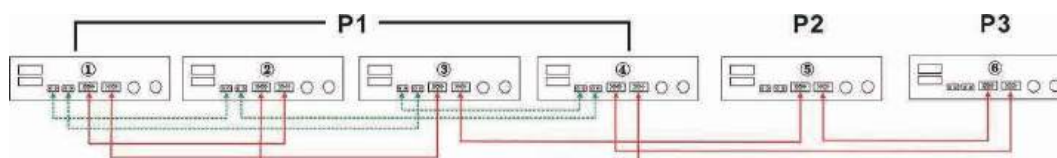


Four inverters in one phase and one inverter for the other two phases:

Power Connection

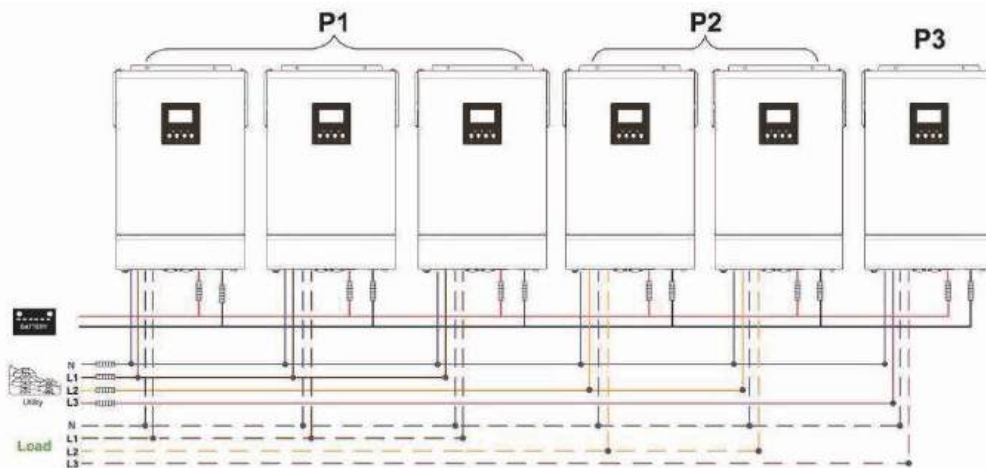


Communication Connection

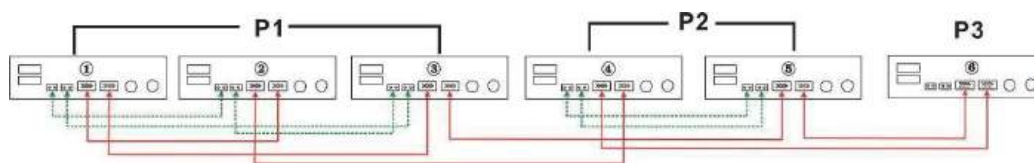


Three inverters in one phase, two inverters in second phase and one inverter for the third phase:

Power Connection

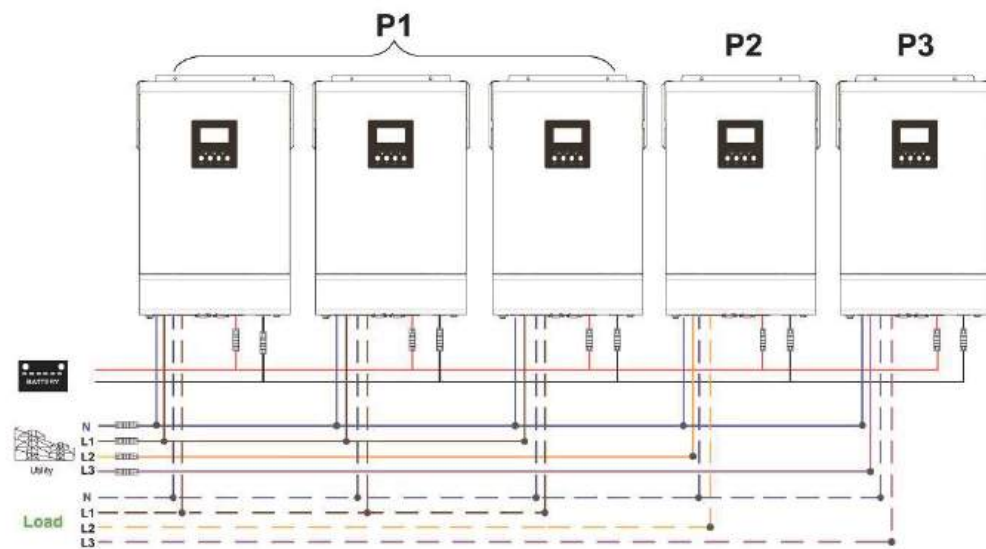


Communication Connection

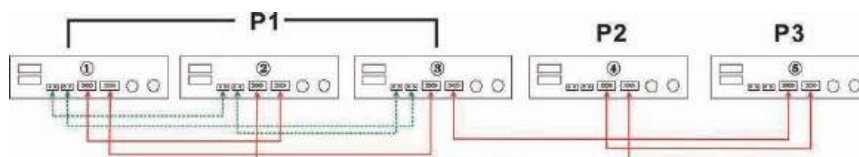


Three inverters in one phase and only one inverter for the remaining two phases:

Power Connection

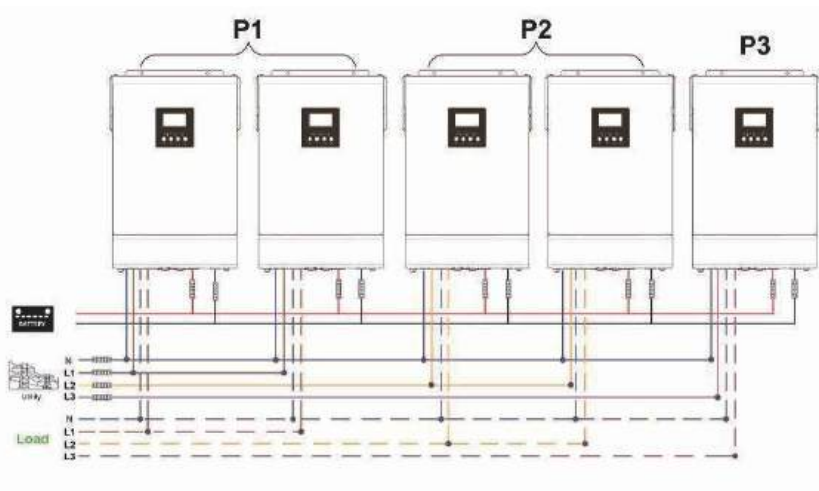


Communication Connection

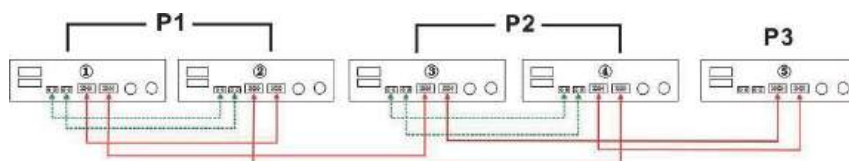


Two inverters in two phases and only one inverter for the remaining phase:

Power Connection

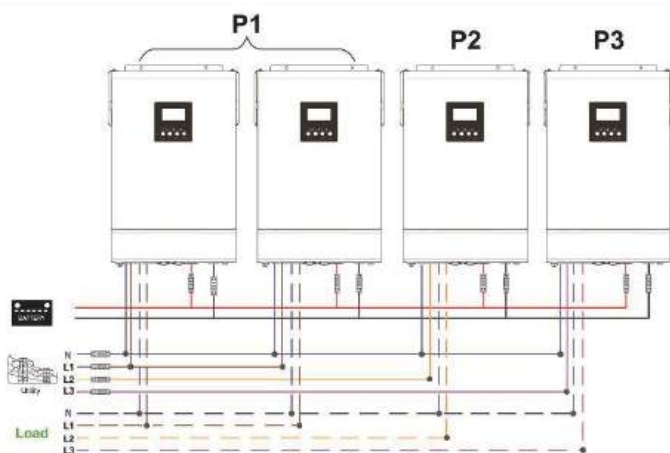


Communication Connection

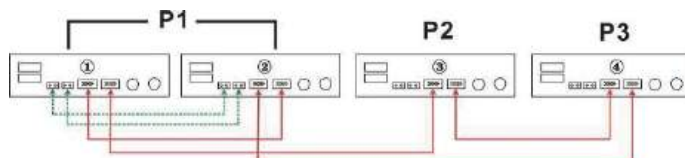


Two inverters in one phase and only one inverter for the remaining phases:

Power Connection

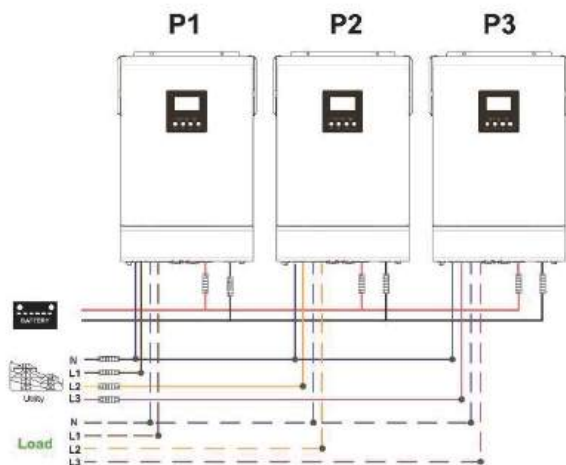


Communication Connection

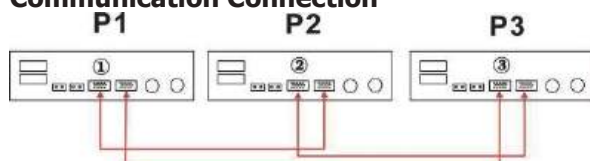


One inverter in each phase:

Power Connection



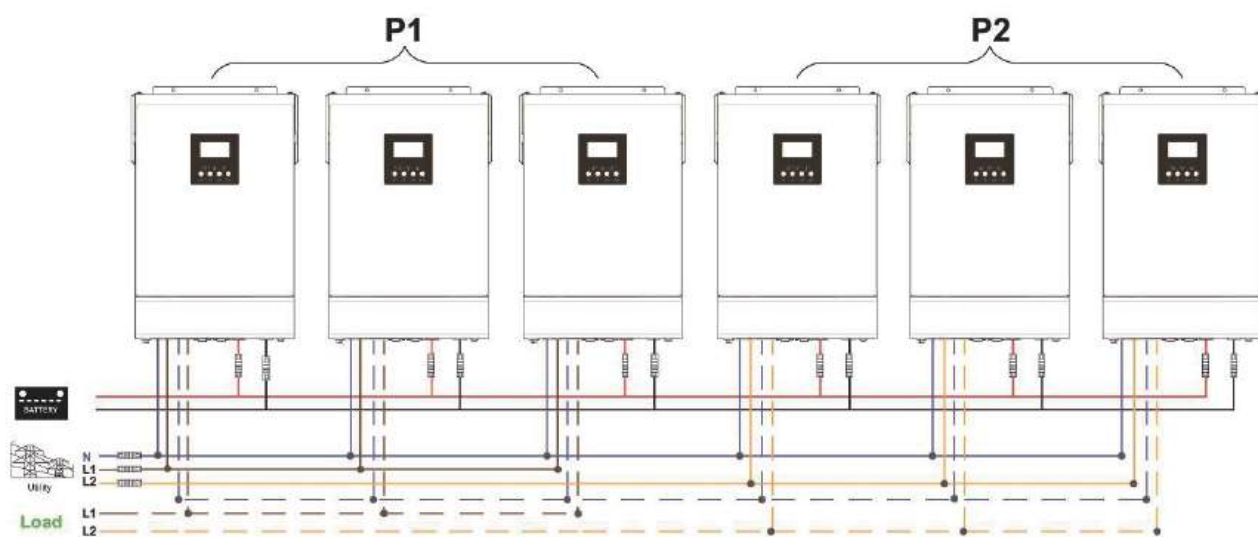
Communication Connection



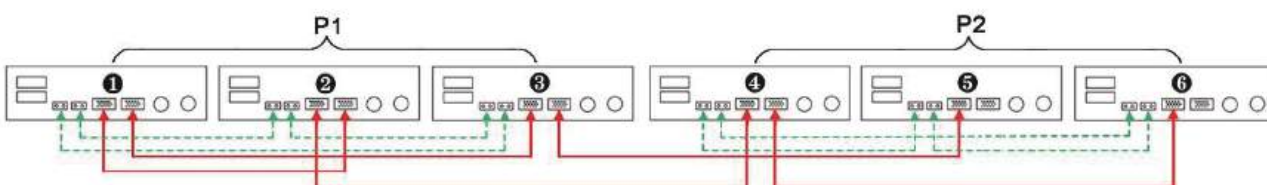
WARNING: Do not connect the current sharing cable between the inverters which are in different phases. Otherwise, it may damage the inverters.

5-3. Support split-phase equipment

Three inverters in each phase:

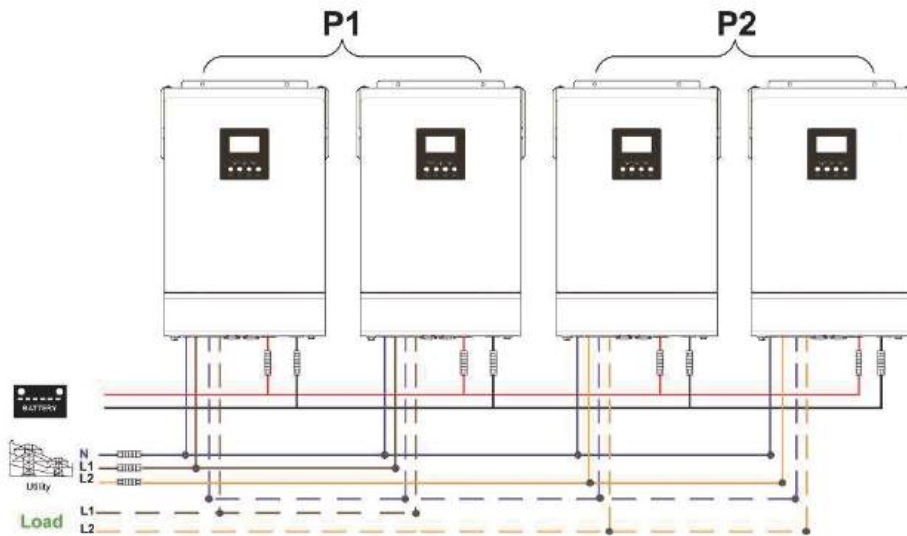


Communication Connection

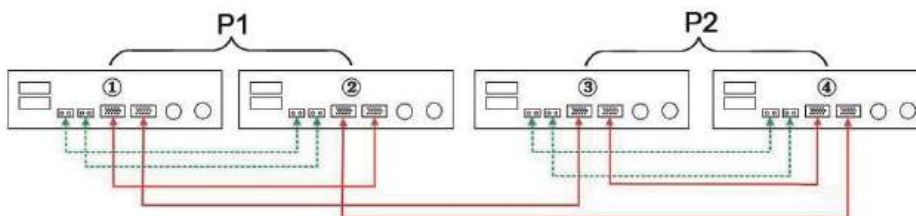


Two inverters in each phase:

Power Connection

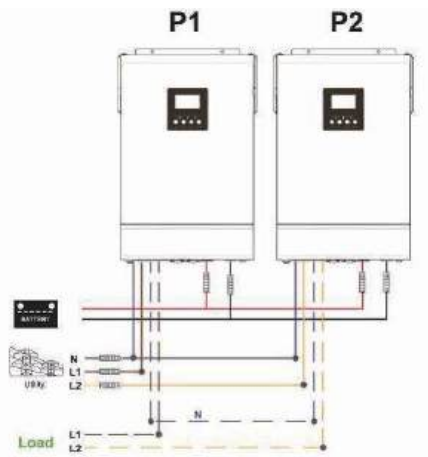


Communication Connection

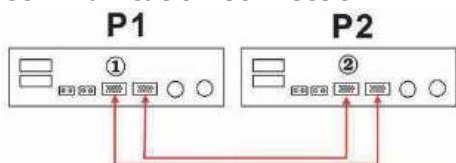


One inverter in each phase:

Power Connection



Communication Connection



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 only available when the inverter is in standby mode (Switch off).	Single: 28 OUTPUT S1 C	When the units are used in parallel with single phase, please select "PAL" in program 28.
		Parallel: 28 OUTPUT PAL	It is required to have at least 3 inverters or maximum 6 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 refer to 5-2 for detailed information.
		L1 phase: 28 OUTPUT 3P 1	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.
		L2 phase: 28 OUTPUT 3P2	
		L3 phase: 28 OUTPUT 3P3	It is required to have at least 2 inverters or maximum 6 inverters to support split-phase equipment. It's required to have at least one inverter in each phase or it's up to three inverters in one phase. Please refer to 5-2 for detailed information.
		L1 for split phase: 28 2P 1	Please select "2P1" in program 28 for the inverters connected to L1 phase, "2P2" in program 28 for the inverters connected to L2 phase.
		L2 for split phase: 120 28 2P2	And it can choose 120° or 180° phase difference for "2P2".
		L2 for split phase: 180 28 2P2	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.

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	

Code reference:

Code	Description	Icon On
NE	Unidentified unit master or slave	
HS	Master unit	
SL	Slave unit	

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 cannot be programmed.

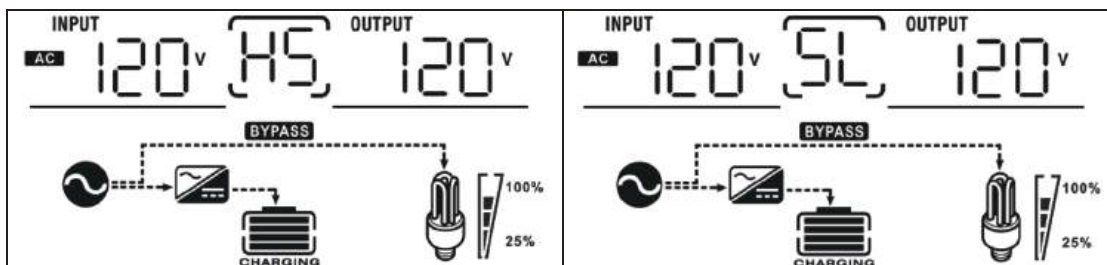
Step 3: Turn on each unit.

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 not, it will display fault 82 in following-order inverters. However, these inverters will automatically restart. 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

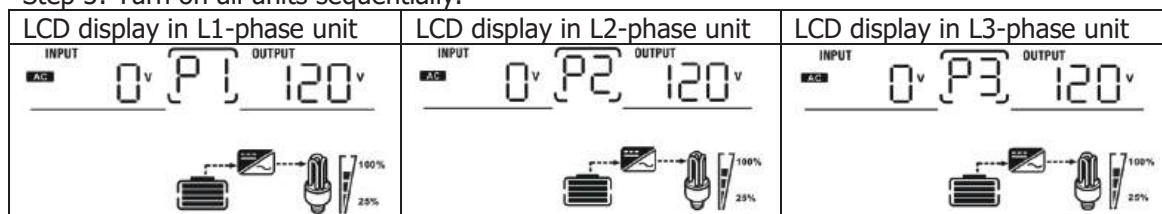
Step 1: Check the following requirements before commissioning:

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

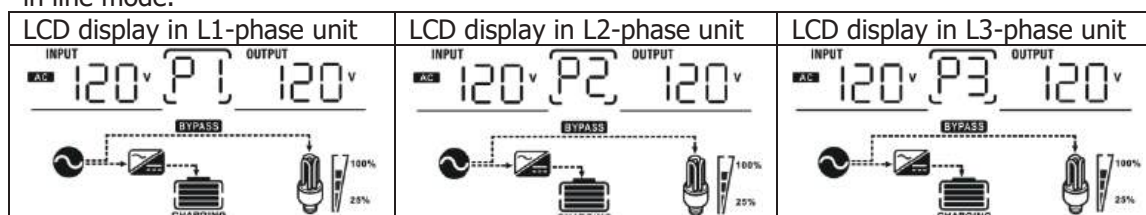
Step 2: Turn on all units and configure LCD program 28 as 3P1, 3P2 and 3P3 sequentially. And then shut down all units.

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.



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.



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.

Support split-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 2P1 and 2P2 sequentially. And then shut down all units.

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

Step 3: Turn on all units sequentially.

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

Step 4: Switch on all AC breakers of Line wires in AC input. If AC connection is detected and split-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

Step 5: If there is no more fault alarm, the system to split-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. Troubleshooting

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 or split-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 connection 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, 3P3, 2P1 or 2P2 is set on #28. For supporting three-phase system, make sure no "PAL" is set on #28. 3. If the problem remains, please contact your installer.

Appendix II: BMS Communication Installation

1. Introduction

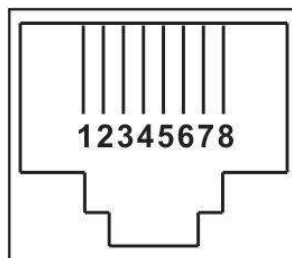
If connecting to Lithium battery, it is recommended to purchase a custom-made RJ45 communication cable. Please check with your dealer or integrator for details.

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.

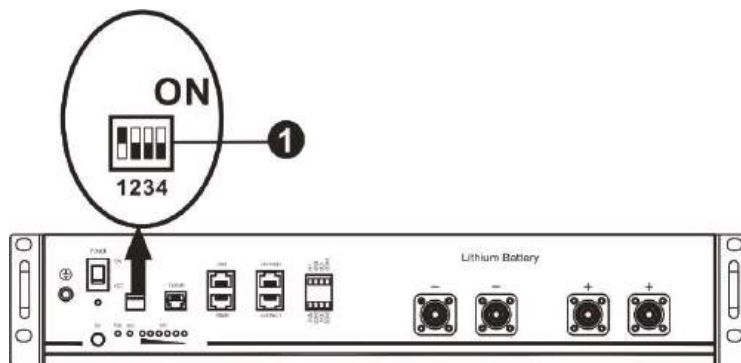
2. Pin Assignment for BMS Communication Port

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



3. Lithium Battery Communication Configuration

PYLONTECH



①Dip Switch: There are 4 Dip Switches that sets different baud rate and battery group address. If switch position is turned to the "OFF" position, it means "0". If switch position is turned to the "ON" position, it means "1".

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

Dip 2, 3 and 4 are reserved for 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	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.

Restart to take effect	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.

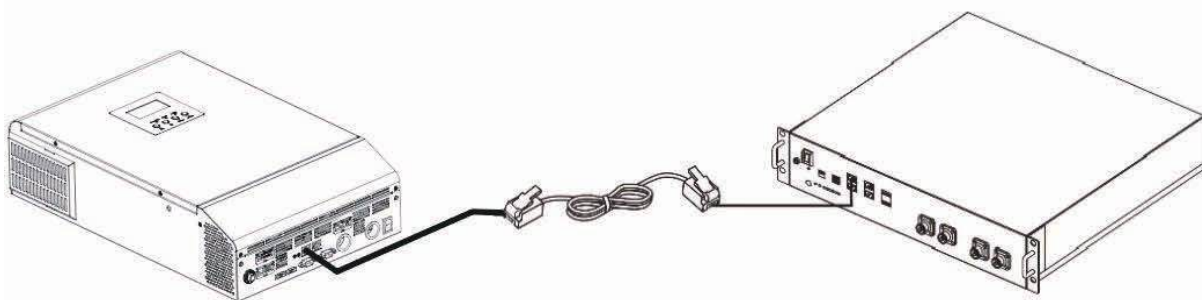
NOTE: The maximum groups of Lithium battery is 5 and for maximum number for each group, please check with battery manufacturer.

4. Installation and Operation

PYLONTECH

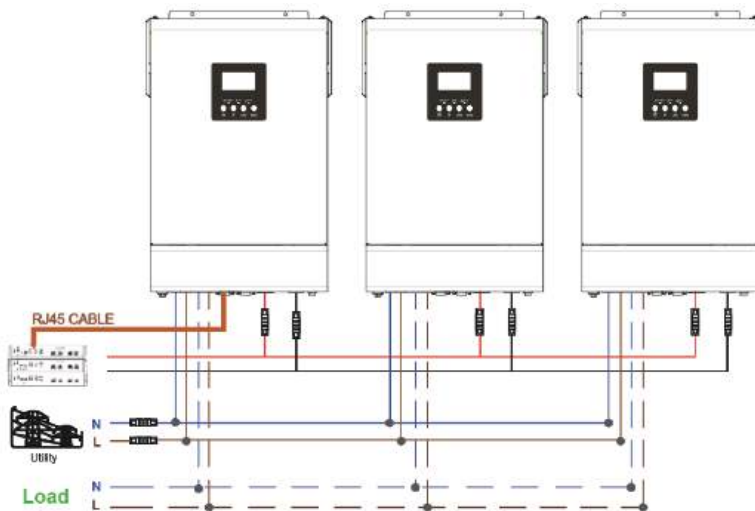
After configuration, please install LCD panel with inverter and Lithium battery with the following steps.

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

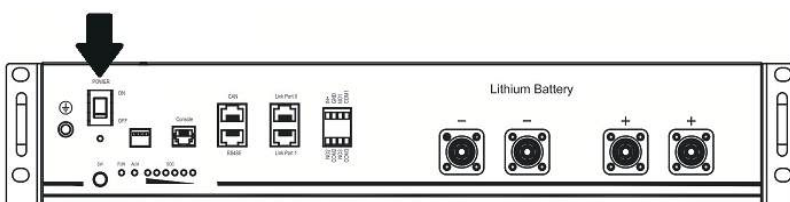


Note for parallel system:

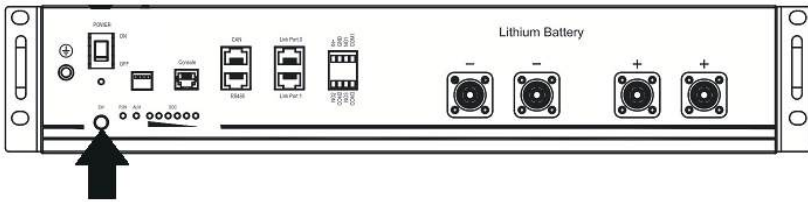
1. Only support common battery installation.
2. Use custom-made RJ45 cable to connect any inverter (no need to connect to a specific inverter) and Lithium battery. Simply set this inverter battery type to "PYL" in LCD program 5. Others should be "USE".



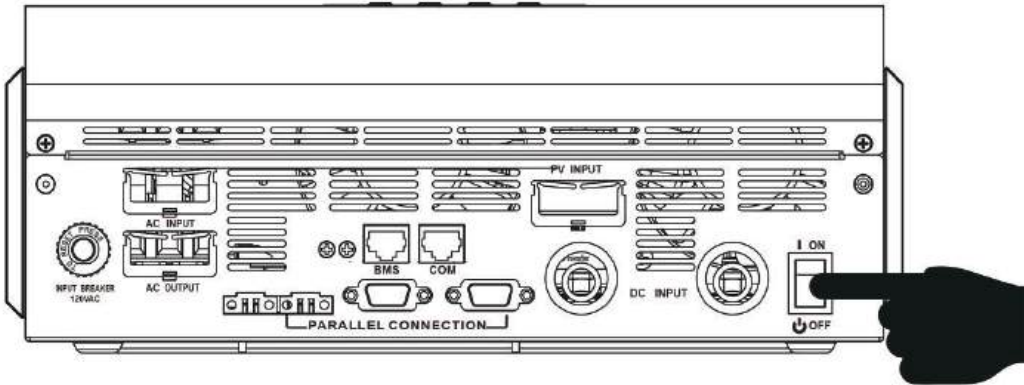
Step 2. Switch on Lithium battery.



Step 3. Press more than three seconds to start Lithium battery, power output ready.



Step 4. Turn on the inverter.



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

05 PYL

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.

Active Function

This function is to activate Lithium battery automatically while commissioning. After battery wiring and commissioning is successfully, if battery is not detected, the inverter will automatically activate battery if the inverter is powered on.

5. LCD Display Information

Press "▲" or "▼" button to switch LCD display information. It will show battery pack and battery group number before "Main CPU version checking" as shown below.

Selectable information	LCD display
Battery pack numbers & Battery group numbers	Battery pack numbers = 3, battery group numbers = 1 6n5 P3 001 

6. Code Reference

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

Code	Description	Action
	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 any type of Lithium-ion 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.	
	Battery number is changed. It probably is because of communication lost between battery packs.	Press "UP" or "DOWN" key to switch LCD display until below screen shows. It will have battery number re-checked and 62 warning code will be clear. 
	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 be charged 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 III: The Wi-Fi Operation Guide

1. Introduction

Wi-Fi module can enable wireless communication between off-grid inverters and monitoring platform. Users have complete and remote monitoring and controlling experience for inverters when combining Wi-Fi module with WatchPower APP, available for both iOS and Android based device. All data loggers and parameters are saved in iCloud.

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.



2. WatchPower APP

2-1. Download and install APP

Operating system requirement for your smartphone:

🍏 iOS system supports iOS 9.0 and above

🤖 Android system supports Android 5.0 and above

Please scan the following QR code with your smartphone and download WatchPower APP.



Android
system



iOS system

Or you may find "WatchPower" APP from the Apple® Store or "WatchPower Wi-Fi" in Google® Play Store.



2-2. Initial Setup

Step 1: Registration at first time

After the installation, please tap the shortcut icon  to access this APP on your mobile screen. In the screen, tap "Register" to access "User Registration" page. Fill in all required information and scan the Wi-Fi module PN by tapping  icon. Or you can simply enter PN directly. Then, tap "Register" button.

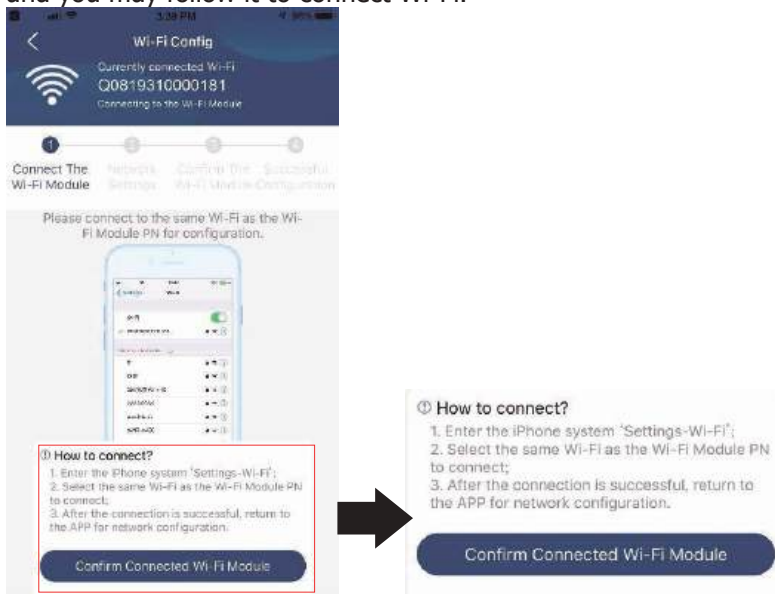


Then, a "Registration success" window will pop up. Tap "Go now" to continue setting local Wi-Fi network connection.



Step 2: Local Wi-Fi Module Configuration

Now, you are in "Wi-Fi Config" page. There are detailed setup procedure listed in "How to connect?" section and you may follow it to connect Wi-Fi.



Enter the "Settings→Wi-Fi" and select connected Wi-Fi name. The connected Wi-Fi name is the same to your Wi-Fi PN number and enter default password "12345678".



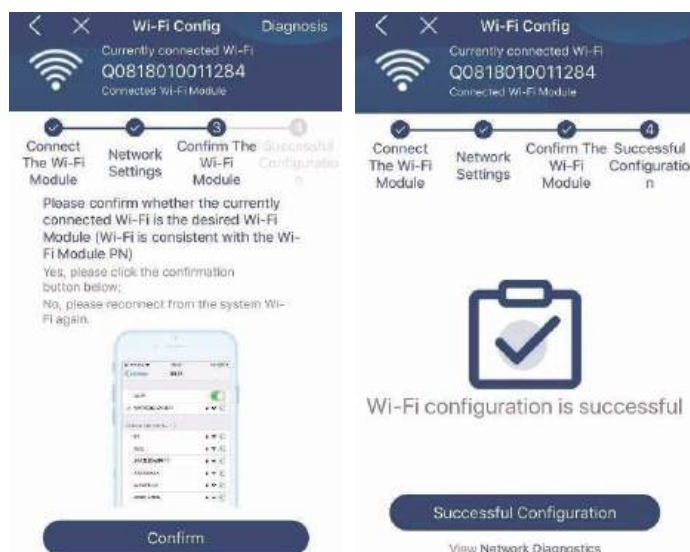
Then, return to WatchPower APP and tap "Confirm Connected Wi-Fi Module" button when Wi-Fi module is connected successfully.

Step 3: Wi-Fi Network settings

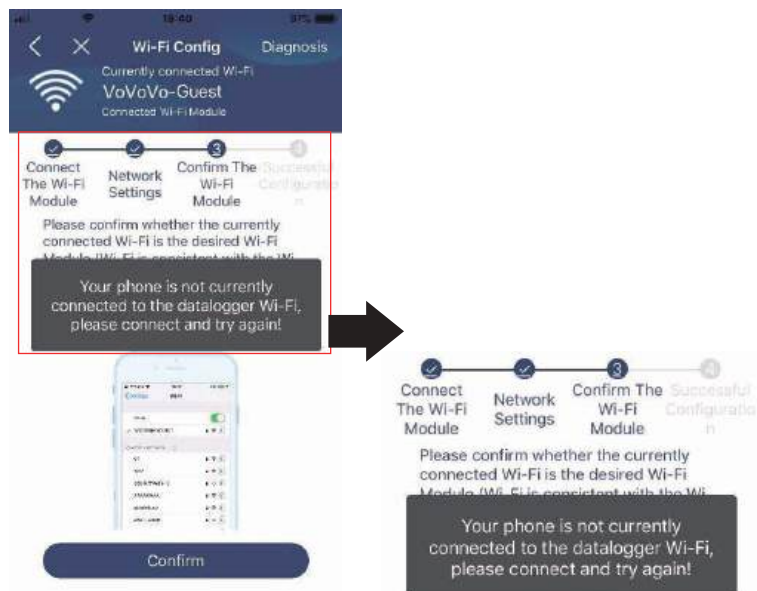
Tap  icon to select your local Wi-Fi router name (to access the internet) and enter password.



Step 4: Tap "Confirm" to complete the Wi-Fi configuration between the Wi-Fi module and the Internet.

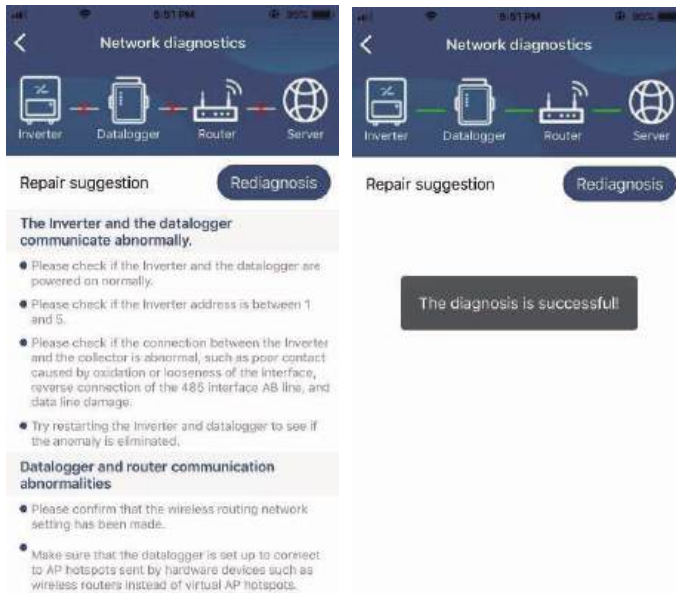


If the connection fails, please repeat Step 2 and 3.



Diagnose Function

If the module is not monitoring properly, please tap "Diagnosis" on the top right corner of the screen for further details. It will show repair suggestion. Please follow it to fix the problem. Then, repeat the steps in the chapter 4.2 to re-set network setting. After all setting, tap "Rediagnosis" to re-connect again.



2-3.Login and APP Main Function

After finishing the registration and local Wi-Fi configuration, enter registered name and password to login.
Note: Tick "Remember Me" for your login convenience afterwards.



Overview

After login is successfully, you can access "Overview" page to have overview of your monitoring devices, including overall operation situation and Energy information for Current power and Today power as below diagram.



Devices

Tap the  icon (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.

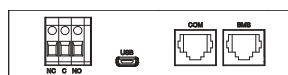
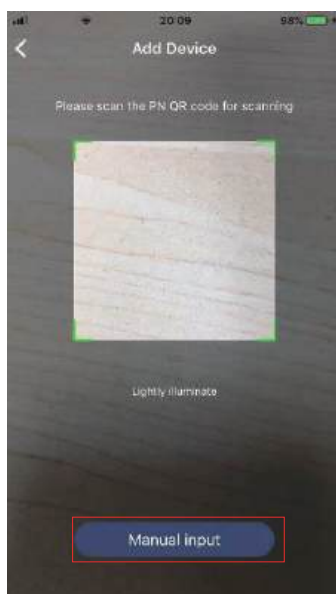
Add device



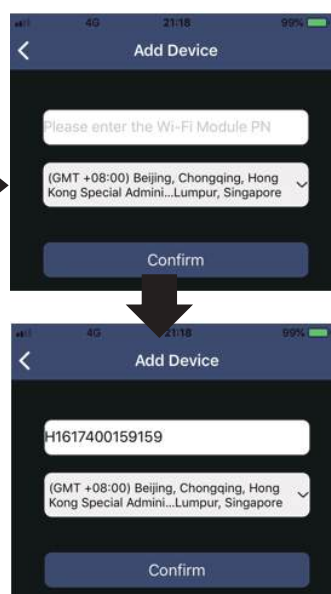
Delete device



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.



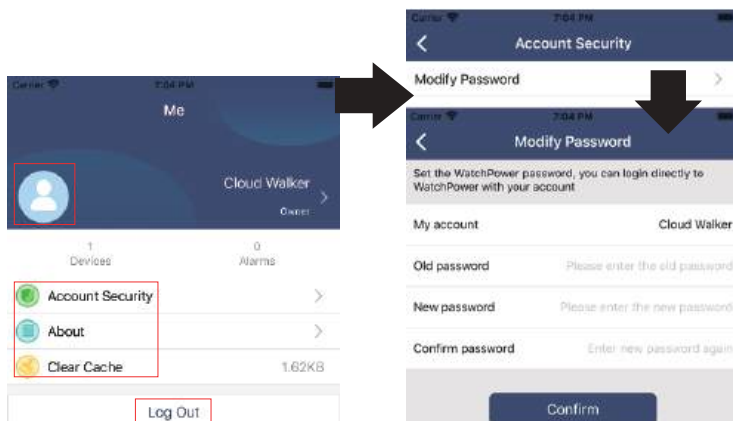
Part number label is pasted on the bottom of inverter.



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

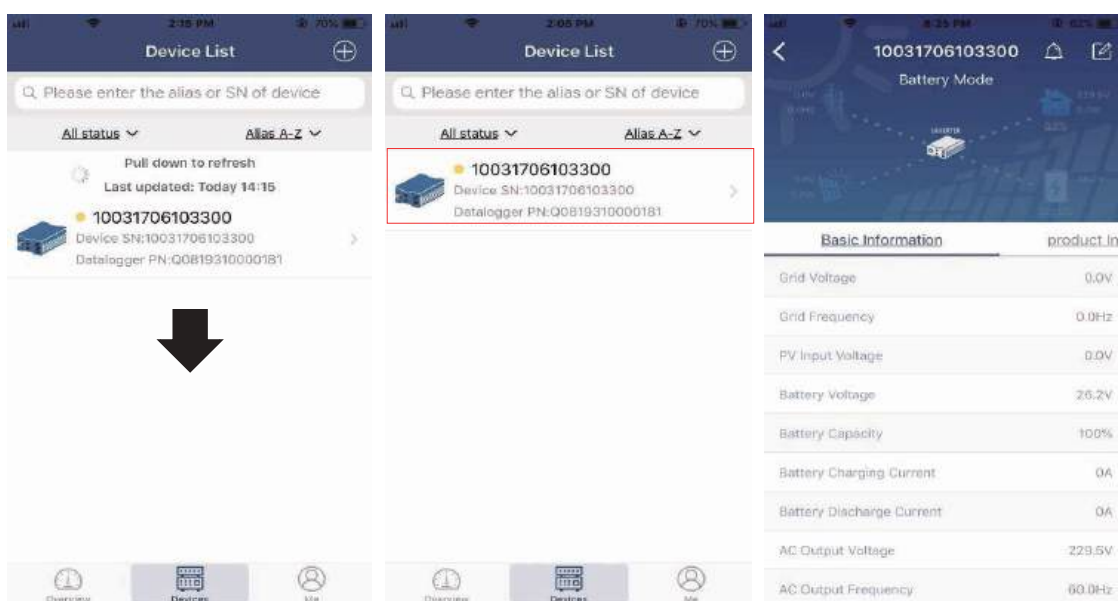
ME

In ME page, users can modify "My information", including **【User's Photo】** , **【Account security】** , **【Modify password】** , **【Clear cache】** , and **【Log-out】** , shown as below diagrams.



2-4. Device List

In Device List page, you can pull 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.



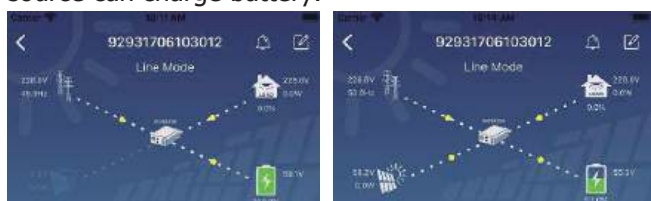
Device Mode

On the top of screen, there is a dynamic power flow chart to show live operation. It contains five icons to present PV power, inverter, load, utility and battery. Based on your inverter model status, there will be **【Standby Mode】** , **【Line Mode】** , **【Battery Mode】** .

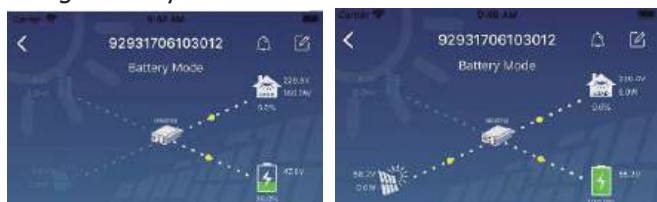
【Standby Mode】 Inverter will not power the load until "ON" switch is pressed. Qualified utility or PV source can charge battery in standby mode.



【Line Mode】 Inverter will power the load from the utility with or without PV charging. Qualified utility or PV source can charge battery.

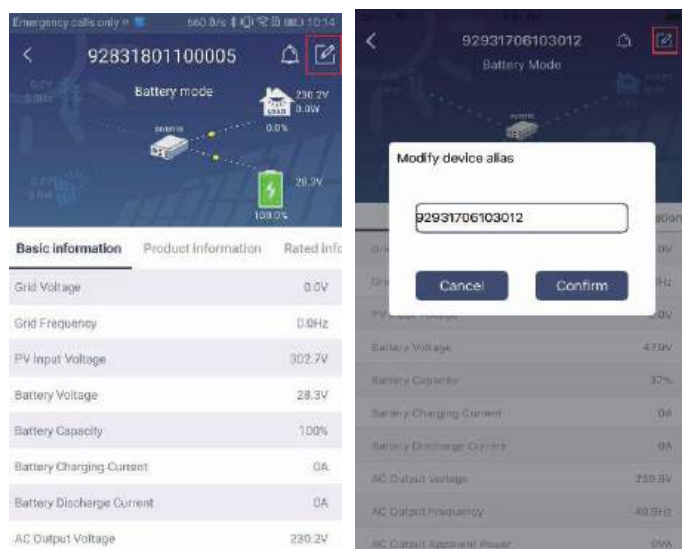


【Battery Mode】 Inverter will power the load from the battery with or without PV charging. Only PV source can charge battery.



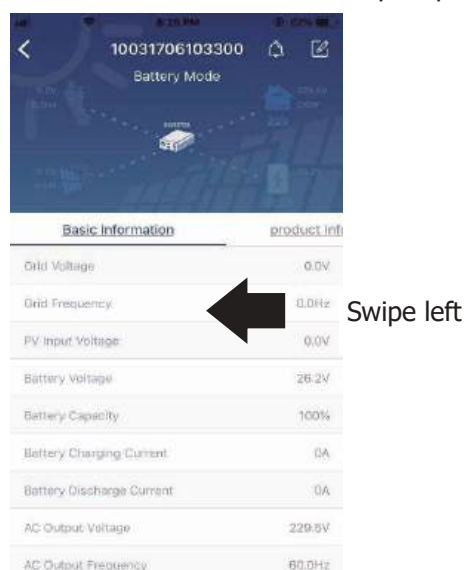
Device Alarm and Name Modification

In this page, tap the  icon on the top right corner to enter the device alarm page. Then, you can review alarm history and detailed information. Tap the  icon on the top right corner, a blank input box will pop out. Then, you can edit the name for your device and tap "Confirm" to complete name modification.



Device Information Data

Users can check up **【Basic Information】** , **【Product Information】** , **【Rated information】** , **【History】** , and **【Wi-Fi Module Information】** by swiping left.



【Basic Information】 displays basic information of the inverter, including AC voltage, AC frequency, PV input voltage, Battery voltage, Battery capacity, Charging current, Output voltage, Output frequency, Output apparent power, Output active power and Load percent. Please slide up to see more basic information.

【Production Information】 displays Model type (Inverter type), Main CPU version, Bluetooth CPU version and secondary CPU version.

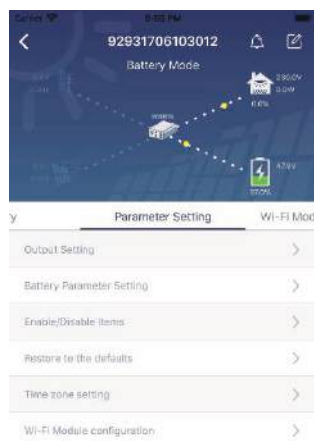
【Rated Information】 displays information of Nominal AC voltage, Nominal AC current, Rated battery voltage, Nominal output voltage, Nominal output frequency, Nominal output current, Nominal output apparent power and Nominal output active power. Please slide up to see more rated information.

【History】 displays the record of unit information and setting timely.

【Wi-Fi Module Information】 displays of Wi-Fi Module PN, status and firmware version.

Parameter Setting

This page is to activate some features and set up parameters for inverters. Please be noted that the listing in "Parameter Setting" page in below diagram may differ from the models of monitored inverter. Here will briefly highlight some of it, **【Output Setting】** , **【Battery Parameter Setting】** , **【Enable/ Disable items】** , **【Restore to the defaults】** to illustrate.



There are three ways to modify setting and they vary according to each parameter.

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

b) Activate/Shut down functions by clicking "Enable" or "Disable" button.

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

Each function setting is saved by clicking "Set" 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	Output source priority	To configure load power source priority.
	AC input Range	When selecting "UPS", it's allowed to connect personal computer. Please check product manual for details.
		When selecting "APPLIANCE", it's allowed to connect home appliances.
	Output Voltage	To set output voltage.
	Output Frequency	To set output frequency.
	AC Output mode	To set inverter to single, parallel, 3P1, 3P2, 3P3, 2P1, 2P2 Please see product manual on Appendix I: Parallel function
Battery Parameters Setting	Battery Type	To set connected battery type.
	Battery Cut-off Voltage/Capacity	To set the battery stop discharging voltage or SOC. Please see product manual for the recommended voltage or SOC range based on connected battery type.
	Battery Cut-off Return Voltage/Capacity	To set the battery re-start discharging voltage or SOC. Please see product manual for the recommended voltage or SOC range based on connected battery type.
	Bulk Charging Voltage	It's to set up battery charging parameters. The selectable values in different inverter model may vary. Please see product manual for the details.
	Float Charging Voltage	It's to set up battery charging parameters. The selectable values in different inverter model may vary. Please see product manual for the details.
	Max. Charging Current	
	Max. AC Charging Current	
	Maximum Battery Discharge Current	To set Maximum discharging current
	Charging Source Priority	To configure charger source priority.
	Battery Equalization	Enable or disable battery equalization function.
	Real-time Activate Battery Equalization	It's real-time action to activate battery equalization.
	Battery Equalization Time Out	To set up the duration time for battery equalization.
	Battery Equalization Time	To set up the extended time to continue battery equalization.
	Equalization Period	To set up the frequency for battery equalization.
	Equalization Voltage	To set up the battery equalization voltage.
	Back to Grid Voltage/ Capacity	When "SBU" is set as output source priority and battery voltage is lower than this setting voltage or SOC, unit will transfer to line mode and the grid will provide power to load.
	Back to Discharge Voltage/ Capacity	When "SBU" is set as output source priority and battery voltage is higher than this setting voltage or SOC, battery will be allowed to discharge.

Enable/Disable Functions	LCD Auto-return to Main screen	If enable, LCD screen will return to its main screen after one minute automatically.
	Fault Code Record	If enabled, fault code will be recorded in the inverter when any fault happens.
	Backlight	If disabled, LCD backlight will be off when panel button is not operated for 1 minute.
	Bypass Function	If enabled, unit will transfer to line mode when overload happened in battery mode.
	Beeps While Primary Source Interrupt	If enabled, buzzer will alarm when primary source is abnormal.
	Over Temperature Auto Restart	If disabled, the unit won't be restarted after over-temperature fault is solved.
	Overload Auto Restart	If disabled, the unit won't be restarted after overload occurs.
	Buzzer	If disabled, buzzer won't be on when alarm/fault occurred.
Restore to the default	This function is to restore all settings back to default settings.	

 1-800-831-9889

 support@richsolar.com

 www.richsolar.com

 1900 Mountain Ave, Norco, CA 92860