

User Manual

5KW with MPPT Solar Charger Inverter/Charger

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

INTRODUCTION

This off-grid PV inverter can provide power to connected loads by utilizing PV power, utility power and battery power.

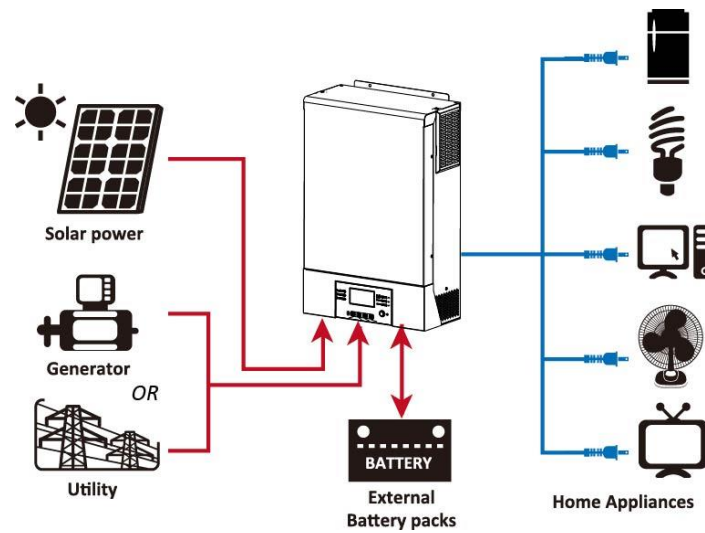
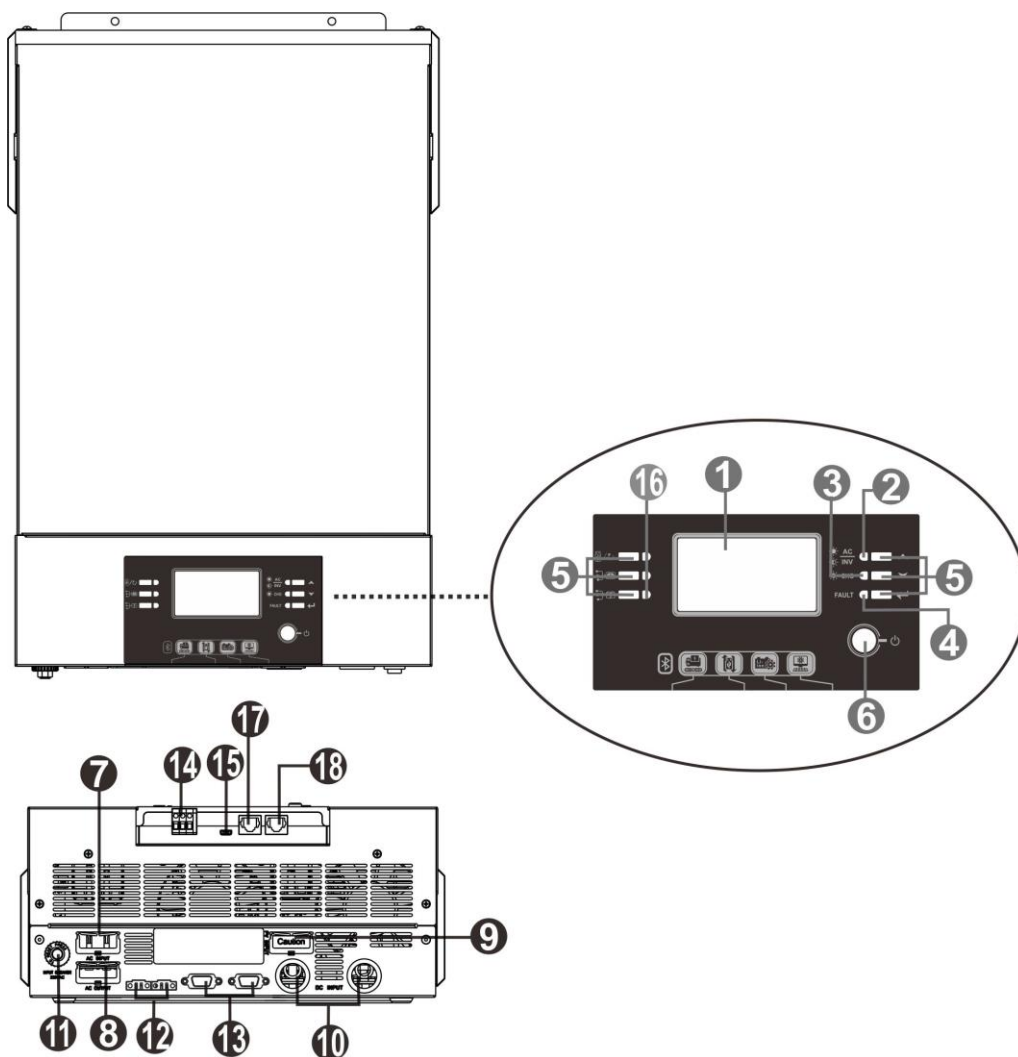


Figure 1 Basic PV System Overview

Depending on different power situations, this inverter is designed to generate continuous power from PV solar modules (solar panels), battery, and the utility. When MPP input voltage of PV modules is within acceptable range (see specification for the details), this inverter is able to generate power to feed the grid (utility) and charge battery. Galvanic isolation designed between PV/DC and AC output, so that user could connect any type of PV array to this inverter. See Figure 1 for a simple diagram of a typical solar system with this inverter.

Product Overview



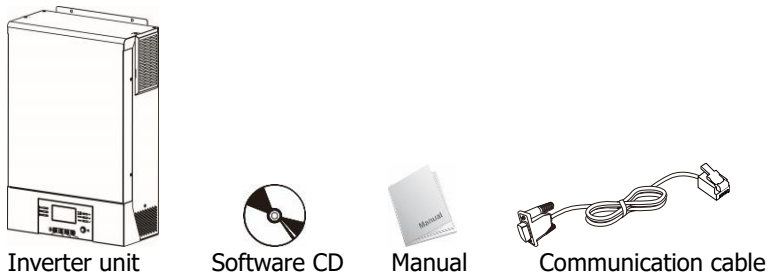
NOTE: For parallel model installation and operation, please check separate parallel installation guide for the details.

1. LCD display
2. Status indicator
3. Charging indicator
4. Fault indicator
5. Function buttons
6. Power on/off switch
7. AC input connectors
8. AC output connectors (Load connection)
9. PV connectors
10. Battery connectors
11. Circuit breaker
12. Current sharing port
13. Parallel communication port
14. Dry contact
15. USB port: for communication port and USB function port
16. LED indicators for USB function setting
17. BMS communication port: CAN, RS-485 or RS-232
18. RS-232 communication port

INSTALLATION

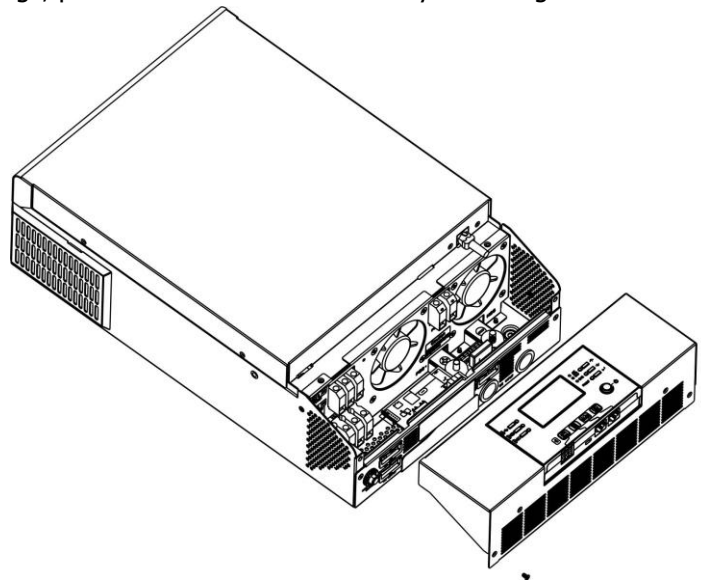
Unpacking and Inspection

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:



Preparation

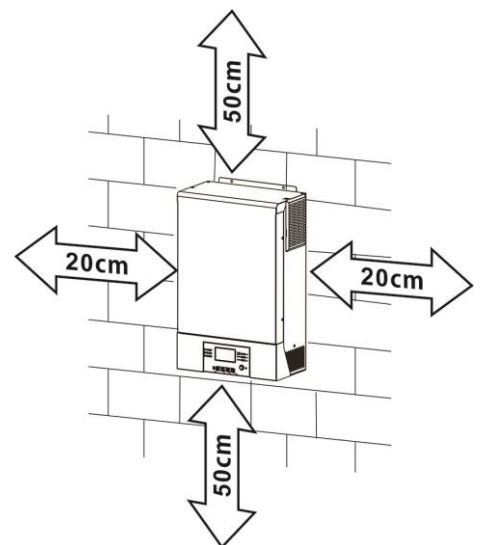
Before connecting all wirings, please take off bottom cover by removing two screws as shown below.



Mounting the Unit

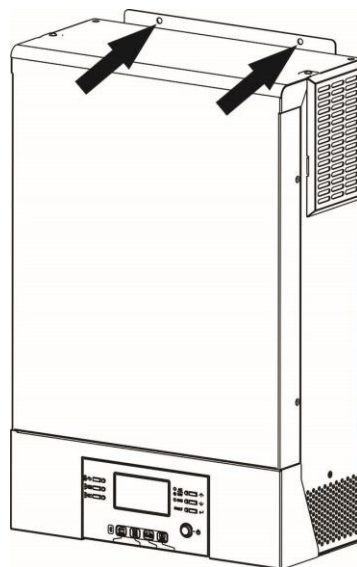
Consider the following points before selecting where to install:

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



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

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



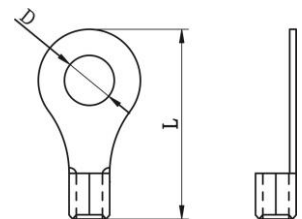
Battery Connection

CAUTION: For safety operation and regulation compliance, it's requested to install a separate DC over-current protector or disconnect device between battery and inverter. It may not be required to have a disconnect device in some applications, however, it's still required 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:

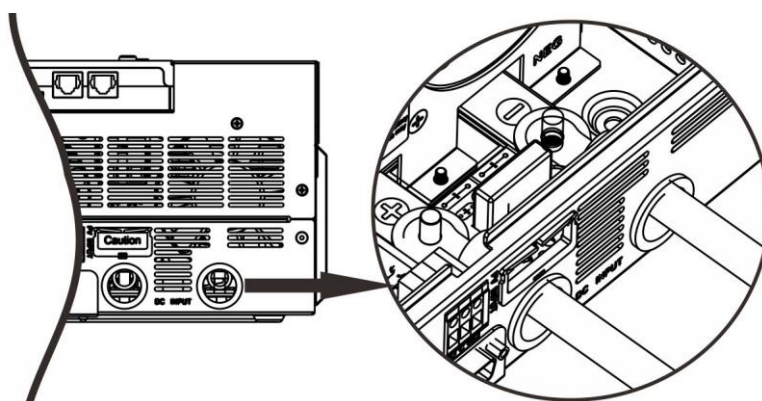


Recommended battery cable and terminal size:

| Model | Typical Amperage | Battery Capacity | Wire Size | Ring Terminal | | | Torque Value |
|-------|------------------|------------------|-----------|-----------------------|------------|--------|--------------|
| | | | | Cable mm ² | Dimensions | | |
| | | | | | D (mm) | L (mm) | |
| 5KW | 135A | 200AH | 2*4AWG | 44 | 6.4 | 49.7 | 2~3 Nm |

Please follow below steps to implement battery connection:

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



**WARNING: Shock Hazard**

Installation must be performed with care due to high battery voltage in series.



CAUTION!! Do not place anything between the flat part of the inverter terminal and the ring terminal. Otherwise, overheating may occur.

CAUTION!! Do not apply anti-oxidant substance on the terminals before terminals are connected tightly.

CAUTION!! Before making the final DC connection or closing DC breaker/disconnector, be sure positive (+) must be connected to positive (+) and negative (-) must be connected to negative (-).

AC Input/Output Connection

CAUTION!! Before connecting to AC input power source, please install a **separate** AC breaker between inverter and AC input power source. This will ensure the inverter can be securely disconnected during maintenance and fully protected from over current of AC input.

CAUTION!! There are two terminal blocks with "IN" and "OUT" markings. ENSURE that utility AC input is connected to IN and load AC to OUT and not the wrong way round and also that Line and Neutrals are connected correctly.

WARNING! All wiring must be performed by a qualified personnel.

WARNING! It's very important for system safety and efficient operation to use appropriate cable for AC input connection. To reduce risk of injury, please use the proper recommended cable size as below.

Suggested cable requirement for AC wires

| Model | Gauge | Torque Value |
|-------|--------|--------------|
| 5KW | 10 AWG | 1.2~ 1.6 Nm |

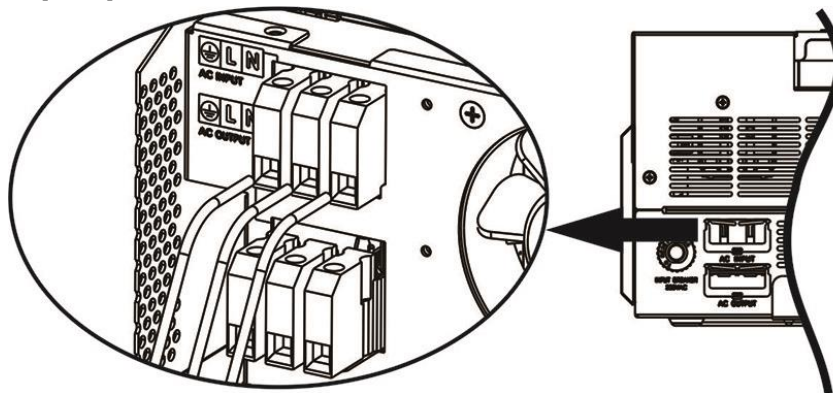
Please follow below steps to implement AC input/output connection:

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

⊕ → **Ground (yellow-green)**

L → **LINE (brown or black)**

N → **Neutral (blue)**

**WARNING:**

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

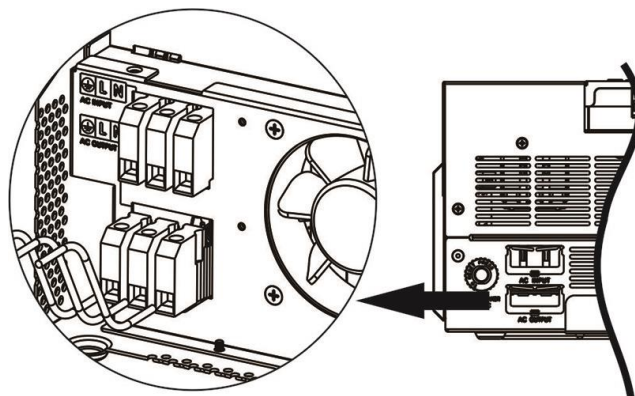
4. Then, insert AC output wires according to polarities indicated on terminal block and tighten terminal screws.

Be sure to connect PE protective conductor (⊕) first.

⊕ → **Ground (yellow-green)**

L → **LINE (brown or black)**

N → **Neutral (blue)**



5. Make sure the wires are securely connected.

CAUTION: Important

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

CAUTION: 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 a 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.

| Model | Typical Amperage | Cable Size | Torque |
|-------|------------------|------------|-----------|
| 5KW | 18A | 12AWG | 1.2~1.6Nm |

PV Module Selection:

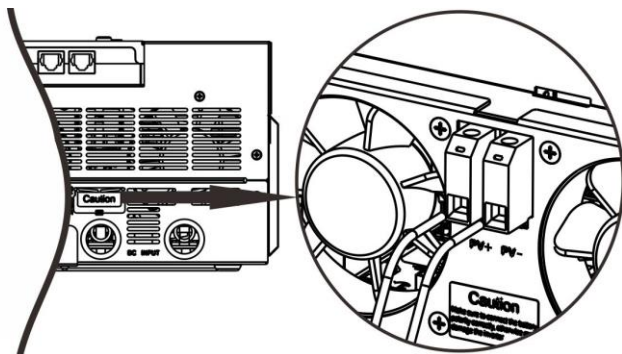
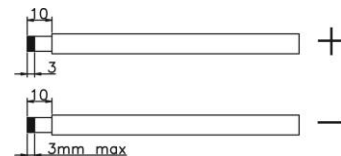
When selecting proper PV modules, please be sure to consider below parameters:

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

| Solar Charging Mode | |
|------------------------------------|------------|
| INVERTER MODEL | 5KW |
| Max. PV Array Open Circuit Voltage | 450 Vdc |
| PV Array MPPT Voltage Range | 120~430Vdc |
| MPP Number | 1 |

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.

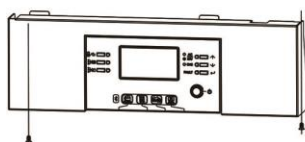
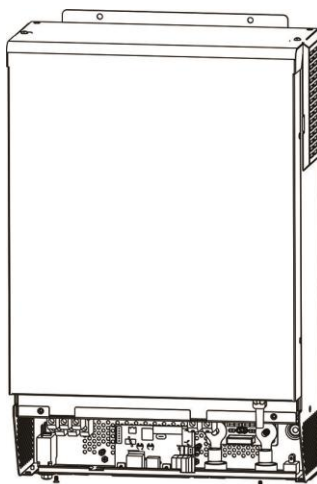


Recommended PV module Configuration

| PV Module Spec. (reference) | Total solar input power | Solar input | Q'ty of modules |
|--|-------------------------|--|-----------------|
| - 250Wp - Vmp: 30.7Vdc - Imp: 8.15A - Voc: 37.4Vdc - Isc: 8.63A - Cells: 60 | 1500W | 6 pieces in series | 6 pcs |
| | 2000W | 8 pieces in series | 8 pcs |
| | 2750W | 11 pieces in series | 11 pcs |
| | 3000W | 6 pieces in series 2 strings in parallel | 12 pcs |
| | 4000W | 8 pieces in series 2 strings in parallel | 16 pcs |
| | 5000W | 10 pieces in series 2 strings in parallel | 20 pcs |

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.


Bluetooth Connection

This unit is equipped with a Bluetooth transmitter. Download "WatchPower" APP from Google Play or Google Store. Once the APP is download, you may connect "WatchPower" APP to your inverter with the password "123456". The communication distance is roughly 6 ~ 7 meters.



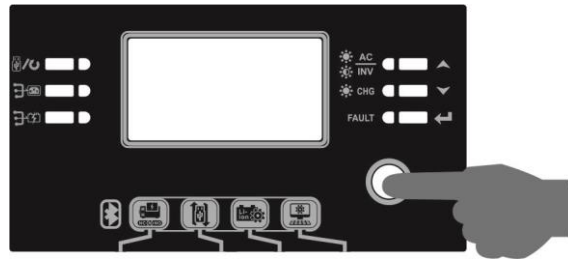
Dry Contact Signal

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

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

OPERATION

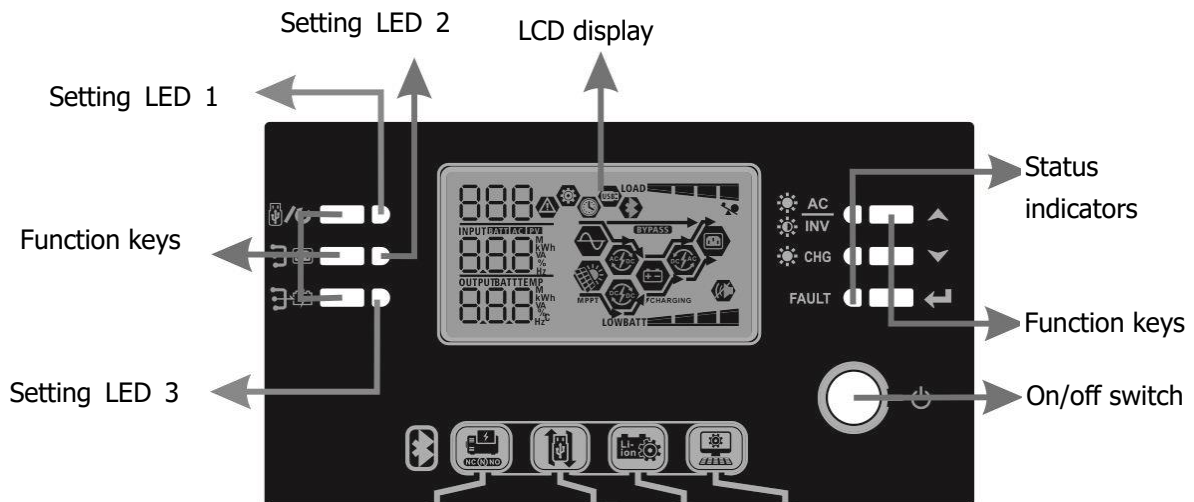
Power ON/OFF



Once the unit has been properly installed and the batteries are connected well, simply press On/Off switch (located on the display panel) 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 six indicators, six function keys, on/off switch and a LCD display, indicating the operating status and input/output power information.



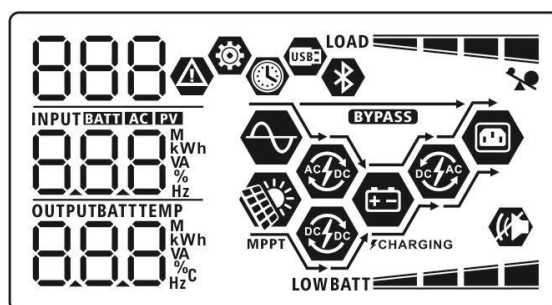
Indicators










| LED Indicator | Color | Solid/Flashing | Messages |
|--------------------------|-------|----------------|---|
| Setting LED 1 | Green | Solid On | Output powered by utility |
| Setting LED 2 | Green | Solid On | Output powered by PV |
| Setting LED 3 | Green | Solid On | Output powered by battery |
| Status indicators | | Solid On | Output is available in bypass mode |
| | | Flashing | Output is powered by battery in inverter mode |
| | | Solid On | Battery is fully charged |
| | | Flashing | Battery is charging. |
| FAULT | Red | Solid On | Fault mode |
| | | Flashing | Warning mode |

Function Keys

| Function Key | Description | |
|---|----------------------|--|
|  | ESC | Exit setting mode |
| | USB function setting | Select USB OTG functions |
|  | Up | To last selection |
|  | Down | To next selection |
|  | Enter | To confirm the selection in setting mode or enter setting mode |

LCD Display Icons



| Icon | Function description | |
|---|---|--|
| Input Source Information | | |
|  | Indicates the AC input. | |
|  | Indicates the PV input | |
|  | Indicate input voltage, input frequency, PV voltage, charger current, charger power, battery voltage. | |
| 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. |
| | > 2.167 V/cell | Bottom three bars will be on and the top bar will flash. |
| Floating mode. Batteries are fully charged. | | 4 bars will be on. |






| In battery mode, it will present battery capacity. | | |
|--|--|----------------|
| Load Percentage | Battery Voltage | LCD Display |
| Load > 50% | < 1.85V/cell | LOWBATT |
| | 1.85V/cell ~ 1.933V/cell | BATT |
| | 1.933V/cell ~ 2.017V/cell | BATT |
| | > 2.017V/cell | BATT |
| Load < 50% | < 1.892V/cell | LOWBATT |
| | 1.892V/cell ~ 1.975V/cell | BATT |
| | 1.975V/cell ~ 2.058V/cell | BATT |
| | > 2.058V/cell | BATT |
| Load Information | | |
| | Indicates overload. | |
| | Indicates the load level by 0-24%, 25-49%, 50-74% and 75-100%. | |
| | 0%~24% | 25%~49% |
| | LOAD | LOAD |
| | 50%~74% | 75%~100% |
| LOAD | LOAD | |
| Mode Operation Information | | |
| | Indicates unit connects to the mains. | |
| | Indicates unit connects to the PV panel. | |
| BYPASS | Indicates load is supplied by utility power. | |
| | Indicates the utility charger circuit is working. | |
| | Indicates the solar charger circuit is working. | |
| | Indicates the DC/AC inverter circuit is working. | |
| | Indicates unit alarm is disabled. | |
| | Indicates Bluetooth is connected. | |
| | Indicates USB disk is connected. | |
| | Indicates timer setting or time display | |










LCD Setting












General Setting














After pressing and holding “←” button for 3 seconds, the unit will enter setting mode. Press “▲” or “▼” button to select setting programs. And then, press “←” button to confirm the selection or “☰/↺” button to exit.








Setting Programs:









| Program | Description | Selectable option | |
|---------|--|--|---|
| 00 | Exit setting mode | Escape 00  ESC | |
| 01 | Output source priority: To configure load power source priority | Utility first (Default) 01  USb | 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 01  SUB | Solar energy provides power to the loads as first priority. If solar energy is not sufficient to power all connected loads, utility power will supply power the loads with solar at the same time. Battery energy provides power to the loads only when solar energy and utility power are not available. |
| | | SBU priority 01  SbU | 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) | 60A (Default) 02  60 ^A | Setting range is from 10A to 100A and increment of each click is 10A. |













| | | | |
|----|----------------------------------|---|--|
| 03 | AC input voltage range | Appliances (Default) 03  | If selected, acceptable AC input voltage range will be within 90-280VAC. |
| | | APL | |
| 04 | Power saving mode enable/disable | UPS 03  | If selected, acceptable AC input voltage range will be within 170-280VAC. |
| | | UPS | |
| 04 | Power saving mode enable/disable | Saving mode disable (default) 04  | If disabled, no matter connected load is low or high, the on/off status of inverter output will not be effected. |
| | | SdS | |
| 04 | Power saving mode enable/disable | Saving mode enable 04  | If enabled, the output of inverter will be off when connected load is pretty low or not detected. |
| | | SEN | |
| 05 | Battery type | AGM (Default) 05  | Flooded 05  |
| | | AGn | FLd |
| | | User-Defined 05  | If "User-Defined" is selected, battery charge voltage and low DC cut-off voltage can be set up in program 26, 27 and 29. |
| | | USE | |
| 05 | Battery type | Pylontech battery 05  | If selected, programs of 02, 26, 27 and 29 will be automatically set up. No need for further setting. |
| | | PYL | |
| 05 | Battery type | WECO battery 05  | If selected, programs of 02, 12, 26, 27 and 29 will be auto-configured per battery supplier recommended. No need for further adjustment. |
| | | WEC | |









| | | | |
|----|---|---|--|
| 5 | Battery type | Soltaro battery 05  SOL | If selected, programs of 02, 26, 27 and 29 will be automatically set up. No need for further setting. |
| | | BAK battery 05  BAK | 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 Lib 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 | 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  LFD | Restart enable 06  LFE |
| 07 | Auto restart when over temperature occurs | Restart disable (Default) 07  tFd | Restart enable 07  tFE |
| 08 | Output voltage | 220V 08  220 _v | 230V (default) 08  230 _v |
| | | 240V 08  240 _v | |

| | | | |
|----|---|--|--|
| 09 | Output frequency | 50Hz (Default) 09  50 _{Hz} | 60Hz 09  60 _{Hz} |
| 11 | Maximum utility charging current Note: If setting value in program 02 is smaller than that in program in 11, the inverter will apply charging current from program 02 for utility charger. | 2A 11  2 ^A | 10A 11  10 ^A |
| | | 20A 11  20 ^A | 30A (Default) 11  30 ^A |
| | | 40A 11  40 ^A | 50A 11  50 ^A |
| | | 60A 11  60 ^A | 70A 11  70 ^A |
| | | 80A 11  80 ^A | 90A 11  90 ^A |
| | | 100A 11  100 ^A | |










| | | | |
|----|--|--|--|
| 12 | Setting voltage point back to utility source when selecting "SBU" (SBU priority) or "SUB" (solar first) in program 01. | default setting: 46V  | Setting range is from 44V to 57V and increment of each click is 1V. |
| | | 5% (default)  | If "WECO battery" is selected in program 05, the setting value will be fixed at 5% of connected battery capacity. |
| 13 | Setting voltage point back to battery mode when selecting "SBU" (SBU priority) or "SUB" (solar first) in program 01. | Battery fully charged  | The setting range is from 48V to 64V and increment of each click is 1V. |
| | | default setting: 54V  | |
| | | 10% (default)  | |
| 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  Utility first  | Solar energy will charge battery as first priority. Utility will charge battery only when solar energy is not available. Utility will charge battery as first priority. Solar energy will charge battery only when utility power is not available. |

| | | | |
|----|---------------------------------------|--|---|
| | | Solar and Utility (Default) 16  SNU | Solar energy and utility will charge battery at the same time. |
| | | Only Solar 16  OSO | Solar energy will be the only charger source no matter utility is available or not. |
| | | 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  60N | Alarm off 18  60F |
| 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  A0n | Alarm off 22  A0F |
| 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: 56.4V 26  CV BATT 56.4 _v | If self-defined is selected in program 5, this program can be set up. Setting range is from 48.0V to 64.0V. Increment of each click is 0.1V. |
| 27 | Floating charging voltage | default setting: 54.0V 27  FLV BATT 54.0 _v | If self-defined is selected in program 5, this program can be set up. Setting range is from 48.0V to 64.0V. Increment of each click is 0.1V. |
| 28 | AC output mode *This setting is able to set up only when the inverter is in standby mode, Be sure that on/off Switch is in "OFF" status. | Single: This inverter is used in single phase application. 28  S10 | Parallel: This inverter is operated in parallel system. 28  PAR |
| | | L1 phase: 28  3P1 | L2 phase: 28  3P2 |



| | | | |
|----|--------------------------------|--|--|
| | | L3 phase: 28  3P3 | |
| 29 | Low DC cut-off voltage | default setting: 42.0V 29  CO4 BATT 42.0V | If self-defined is selected in program 5, this program can be set up. Setting range is from 40.0V to 54.0V. Increment of each click is 0.1V. Low DC cut-off voltage will be fixed to setting value no matter what percentage of load is connected. |
| 32 | Bulk charging time (C.V stage) | Automatically (Default): 32  AUT | If selected, inverter will judge this charging time automatically. |
| | | 5 min 32  5 | The setting range is from 5 min to 900 min. Increment of each click is 5 min. |
| | | 900 min 32  900 | |
| 33 | Battery equalization | Battery equalization 33  EEN | Battery equalization disable (Default) 33  Ed5 |
| | | If "Flooded" or "User-Defined" is selected in program 05, this program can be set up. | |
| 34 | Battery equalization voltage | Default setting is 58.4V. 34  EV BATT 58.4V | Setting range is from 48V ~ 64V. Increment of each click is 0.1V. |



| | | | |
|---|--|-------------------------------------|--|
| 35 | Battery equalized time | 60min (Default) 35 ⚙️ 60 | Setting range is from 5min to 900min. Increment of each click is 5min. |
| 36 | Battery equalized timeout | 120min (Default) 36 ⚙️ 120 | Setting range is from 5min to 900 min. Increment of each click is 5 min. |
| 37 | Equalization interval | 30days (Default) 37 ⚙️ 30d | Setting range is from 0 to 90 days. Increment of each click is 1 day |
| 39 | Equalization activated immediately | Enable 39 ⚙️ AEN | Disable (Default) 39 ⚙️ ADS |
| <p>If equalization function is enabled in program 33, this program can be set up. If "Enable" is selected in this program, it's to activate battery equalization immediately and LCD main page will shows "E9". If "Disable" is selected, it will cancel equalization function until next activated equalization time arrives based on program 37 setting. At this time, "E9" will not be shown in LCD main page.</p> | | | |
| 40 | Reset all stored data for PV generated power and output load energy | Not reset (Default) 40 ⚙️ Nrt | Reset 40 ⚙️ rst |
| 93 | Erase all data log | Not reset(Default) 93 ⚙️ Nrt | Reset 93 ⚙️ rst |
| 94 | Data log recorded interval *The maximum data log number is 1440. If it's over 1440, it will re-write the first log. | 3 days 94 ⚙️ 3 | 5 days 94 ⚙️ 5 |

| | | | |
|----|-----------------------|---|---|
| | | 10 days (Default) 94  10 | 20 days 94  20 |
| | | 30 days 94  30 | 60 days 94  60 |
| 95 | Time setting – Minute | 95  mi n 0 | For minute setting, the range is from 00 to 59. |
| 96 | Time setting – Hour | 96  HOU 0 | For hour setting, the range is from 00 to 23. |
| 97 | Time setting– Day | 97  DAY 1 | For day setting, the range is from 00 to 31. |
| 98 | Time setting– Month | 98  MON 1 | For month setting, the range is from 01 to 12. |
| 99 | Time setting – Year | 99  YEA 19 | For year setting, the range is from 17 to 99. |





USB Functional Setting

There are three function keys on the display panel to implement USB OTG setting.

Insert an OTG USB disk into the USB port (). Press and hold "/U" button for 3 seconds to enter USB Setting Mode. These functions including inverter firmware upgrade, data log export and internal parameters re-write from the USB disk.

| | |
|---|---|
| Procedure | LCD Screen |
| Step 1: Press and hold "⏏/U" button for 3 seconds to enter USB function setting mode. | UPG   |
| Step 2: Press "⏏/U", "↔" or "↔" button to enter the selectable setting programs (detail descriptions in Step 3). | SET LOG |

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

| Program # | Operation Procedure | LCD Screen |
|------------------------------------|---|--|
| ⏏/U: Upgrade firmware | This function is to upgrade inverter firmware. If firmware upgrade is needed, please check with your dealer or installer for detail instructions. | |
| ↔: Re-write internal parameters | This function is to over-write all parameter settings (TEXT file) with settings in the On-The-Go USB disk from a previous setup or to duplicate inverter settings. Please check with your dealer or installer for detail instructions. | |
| ↔: Export data log | Press "↔" button to export data log from the inverter to USB disk. If the selected function is ready, LCD will display "t dY". Press "⏏/U" button to confirm the selection again. | LOG   t dY |
| | <ul style="list-style-type: none"> Press "↔" button to select "Yes", LED 1 will flash once every second during the process. It will only display LOG and all LEDs will be on after this action is complete. Then, press "⏏/U" button to return to main screen. Or press "↔" button to select "No" to return to main screen. | LOG   YES NO |

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

Error message for USB On-The-Go functions:

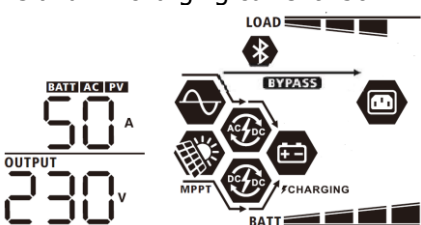
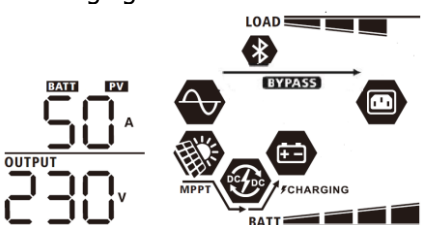
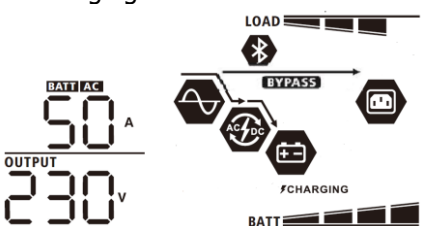
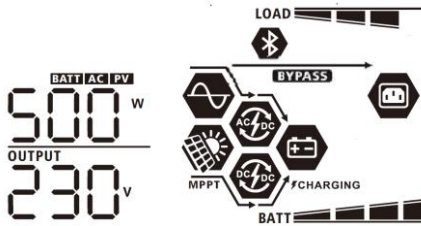
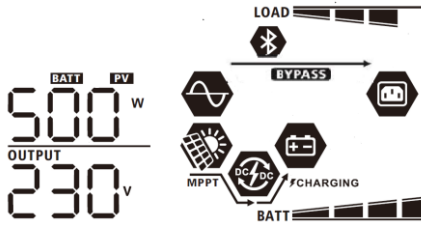
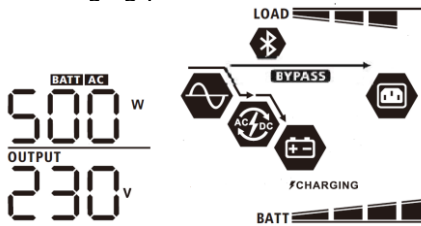
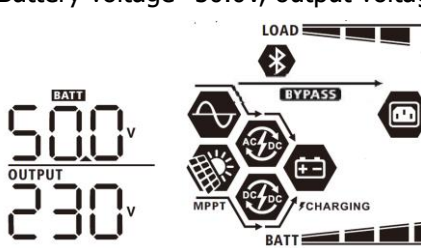
| Error Code | Messages |
|------------|---|
| U01 | No USB disk is detected. |
| U02 | USB disk is protected from copying. |
| U03 | Document inside the USB disk contains the wrong format. |

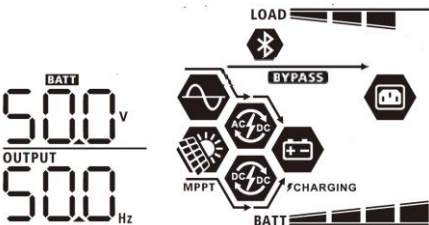
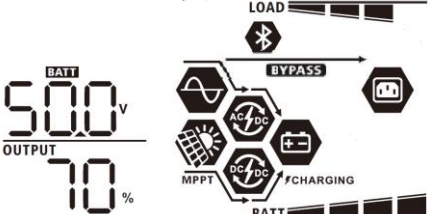
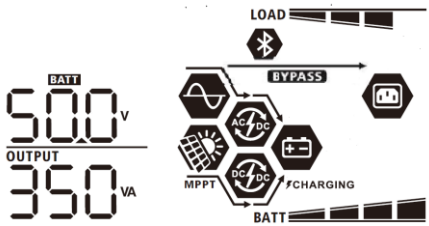
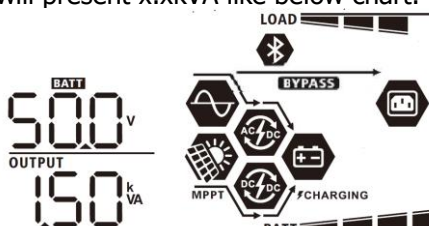
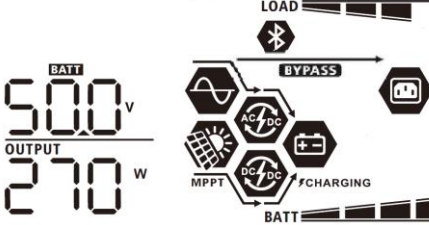
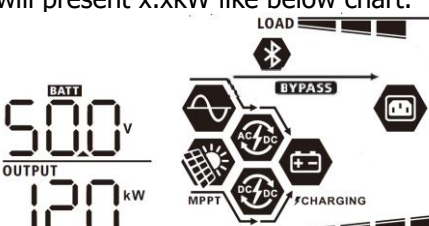
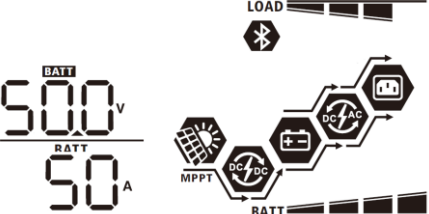
If any error occurs, error code will only show for 3 seconds. After 3 seconds, it will automatically return to the main screen.

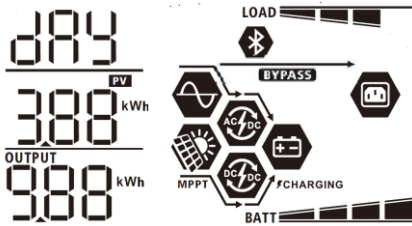
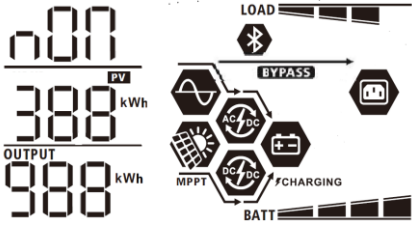
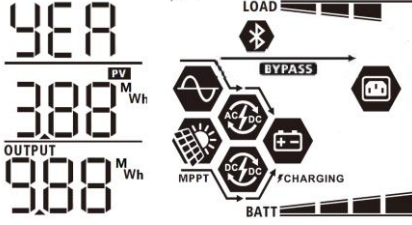
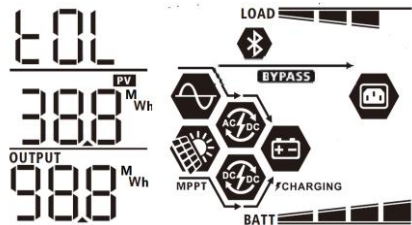
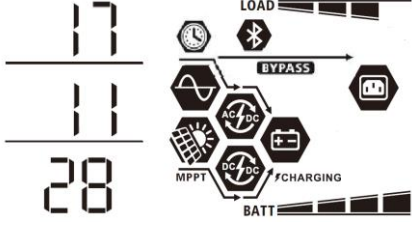
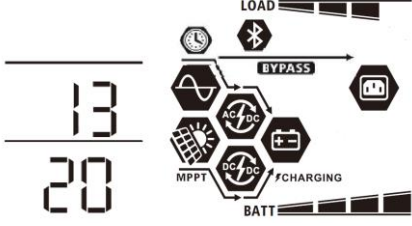
Display Setting

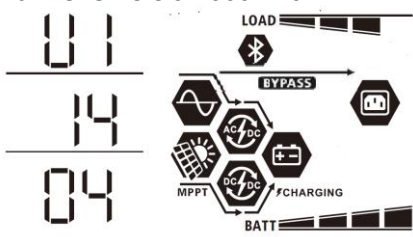
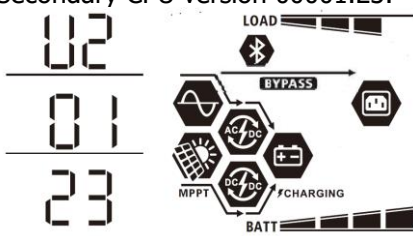
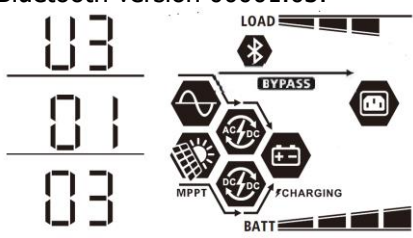
The LCD display information will be switched in turns by pressing “▲” or “▼” key. The selectable information is switched as the following table in order.

| Selectable information | LCD display |
|--|--|
| Input voltage/Output voltage (Default Display Screen) | <p>Input Voltage=230V, output voltage=230V</p> |
| Input frequency | <p>Input frequency=50Hz</p> |
| PV voltage | <p>PV voltage=260V</p> |
| PV current | <p>PV current = 2.5A</p> |
| PV power | <p>PV power = 500W</p> |

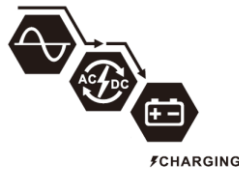

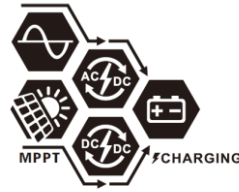

| | |
|---|--|
| <p>Charging current</p> | <p>AC and PV charging current=50A</p>  <p>PV charging current=50A</p>  <p>AC charging current=50A</p>  |
| <p>Charging power</p> | <p>AC and PV charging power=500W</p>  <p>PV charging power=500W</p>  <p>AC charging power=500W</p>  |
| <p>Battery voltage and output voltage</p> | <p>Battery voltage=50.0V, output voltage=230V</p>  |

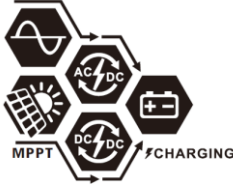



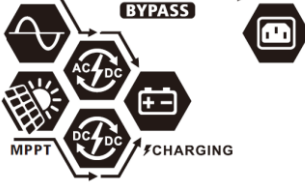
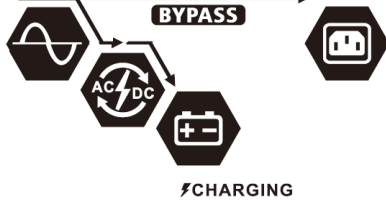
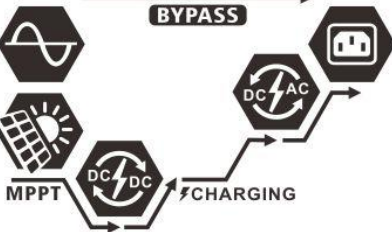

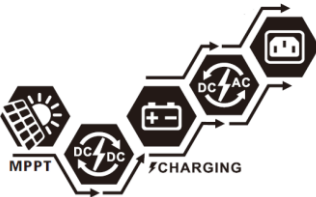
| | |
|--|---|
| Output frequency | <p>Output frequency=50Hz</p>  |
| Load percentage | <p>Load percent=70%</p>  |
| Load in VA | <p>When connected load is lower than 1kVA, load in VA will present xxxVA like below chart.</p>  <p>When load is larger than 1kVA ($\geq 1\text{kVA}$), load in VA will present x.xkVA like below chart.</p>  |
| Load in Watt | <p>When load is lower than 1kW, load in W will present xxxW like below chart.</p>  <p>When load is larger than 1kW ($\geq 1\text{kW}$), load in W will present x.xkW like below chart.</p>  |
| Battery voltage/DC discharging current | <p>Battery voltage=50.0V, discharging current=50A</p>  |

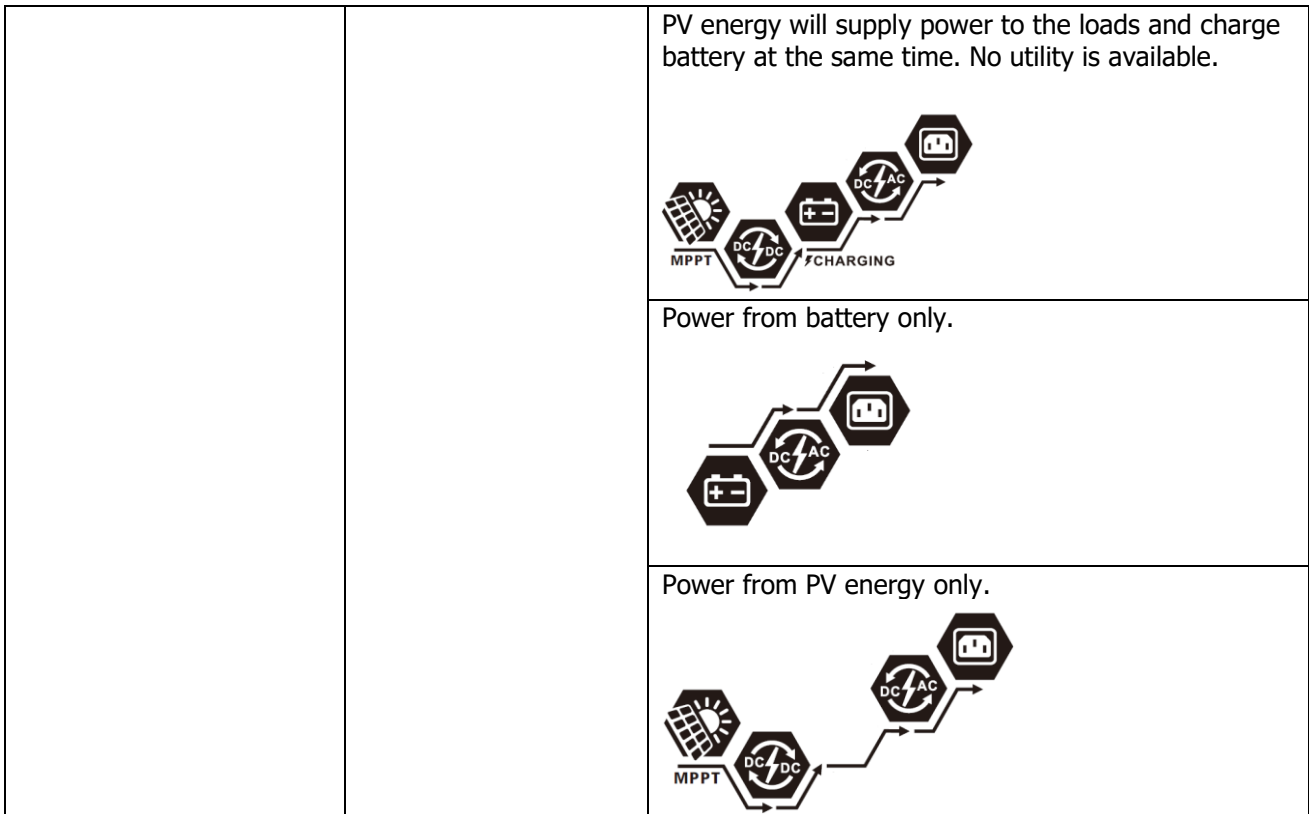
| | |
|--|---|
| <p>PV energy generated today and Load output energy today</p> | <p>PV energy generated Today = 3.88kWh, Load output energy Today = 9.88kWh.</p>  |
| <p>PV energy generated this month and Load output energy this month.</p> | <p>PV energy generated this month = 388kWh, Load output energy this month = 988kWh.</p>  |
| <p>PV energy generated this year and Load output energy this year.</p> | <p>PV energy generated this year energy =3.88MWh, Load output energy this year = 9.88MWh.</p>  |
| <p>PV energy generated totally and Load output total energy.</p> | <p>Total PV energy until now= 38.8MWh, Total load output energy until now= 98.8MWh.</p>  |
| <p>Real date.</p> | <p>Real date Nov 28, 2017.</p>  |
| <p>Real time.</p> | <p>Real time 13:20.</p>  |

| | |
|---------------------------------|---|
| Main CPU version checking. | Main CPU version 00014.04.  |
| Secondary CPU version checking. | Secondary CPU version 00001.23.  |
| Bluetooth version checking. | Bluetooth version 00001.03.  |

Operating Mode Description

| Operating mode | Behaviors | LCD display |
|--|--|--|
| Standby mode / Power saving mode Note: *Standby mode: The inverter is not turned on yet but at this time, the inverter can charge battery without AC output. *Power saving mode: If enabled, the output of inverter will be off when connected load is pretty low or not detected. | No output is supplied by the unit but it still can charge batteries. | Battery is charged by utility.  |
| | | Battery is charged by PV energy.  |
| | | Battery is charged by utility and PV energy.  |
| | | No charging.  |

| | | |
|--|---|--|
| <p>Fault mode</p> <p>Note:</p> <p>*Fault mode: Errors are caused by inside circuit error or external reasons such as over temperature, output short circuited and so on.</p> | <p>PV energy and utility can charge batteries.</p> | <p>Charging by utility and PV energy.</p>  <p>Charging by utility.</p>  <p>Charging by PV energy.</p>  <p>No charging.</p>  |
| <p>Line mode</p> | <p>Output power from utility. Charger is available.</p> | <p>Charging by utility and PV energy.</p>  <p>Charging by utility.</p>  <p>Battery is not connected, solar energy and the utility will provide the loads.</p>  |
| | <p>Output power from utility. Charger is available.</p> | <p>Power from utility.</p>  |
| <p>Battery mode</p> | <p>Output power from battery or PV</p> | <p>Power from battery and PV energy.</p>  |



Faults Reference Code

| Fault Code | Fault Event | Icon on |
|------------|--|---------|
| 01 | Fan is locked when inverter is off. | F01 |
| 02 | Over temperature | F02 |
| 03 | Battery voltage is too high | F03 |
| 04 | Battery voltage is too low | F04 |
| 05 | Output short circuited or over temperature is detected by internal converter components. | F05 |
| 06 | Output voltage is too high. | F06 |
| 07 | Overload time out | F07 |
| 08 | Bus voltage is too high | F08 |
| 09 | Bus soft start failed | F09 |
| 10 | PV over current | F10 |
| 11 | PV over voltage | F11 |
| 12 | DCDC over current | F12 |
| 51 | Over current or surge | F51 |
| 52 | Bus voltage is too low | F52 |
| 53 | Inverter soft start failed | F53 |
| 55 | Over DC voltage in AC output | F55 |
| 57 | Battery connection is open | F57 |
| 58 | Current sensor failed | F58 |

Warning Indicator

| Warning Code | Warning Event | Audible Alarm | Icon flashing |
|--------------|------------------------------------|-------------------------------|---------------|
| 01 | Fan is locked when inverter is on. | Beep three times every second | 01 |
| 02 | Over temperature | None | 02 |
| 03 | Battery is over-charged | Beep once every second | 03 |
| 04 | Low battery | Beep once every second | 04 |
| 07 | Overload | Beep once every 0.5 second | 07 |
| 10 | Output power derating | Beep twice every 3 seconds | 10 |
| 32 | Communication interrupted | None | 32 |
| Eq | Battery equalization | None | Eq |
| bP | Battery is not connected | None | bP |

BATTERY EQUALIZATION

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

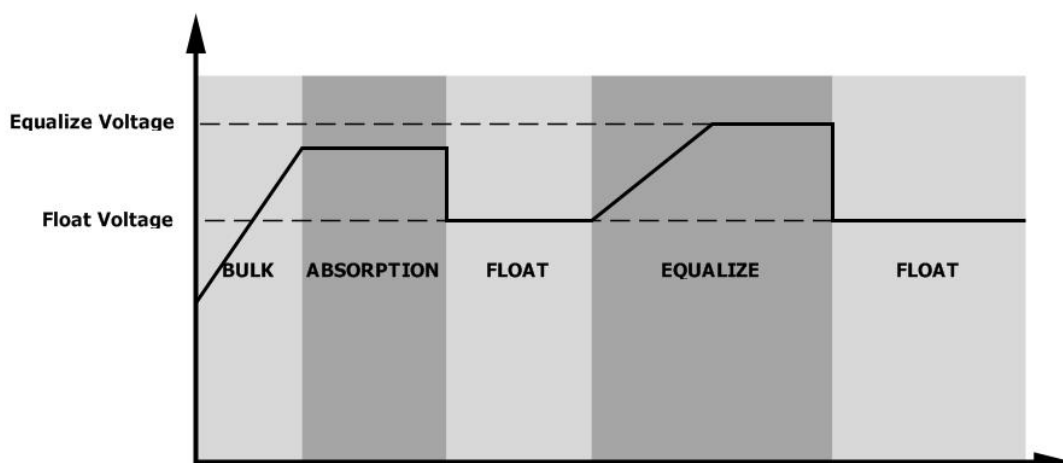
● How to Apply Equalization Function

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

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

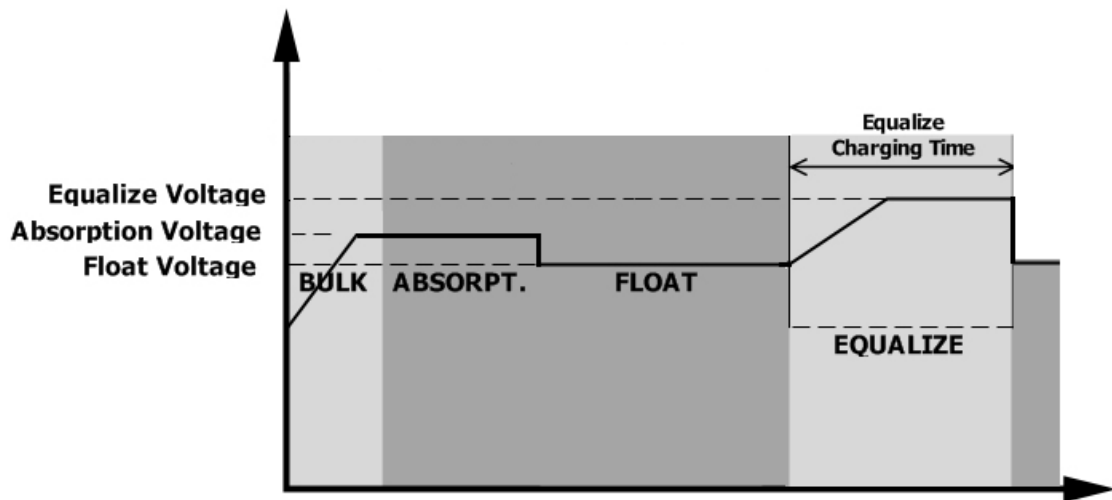
● When to Equalize

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

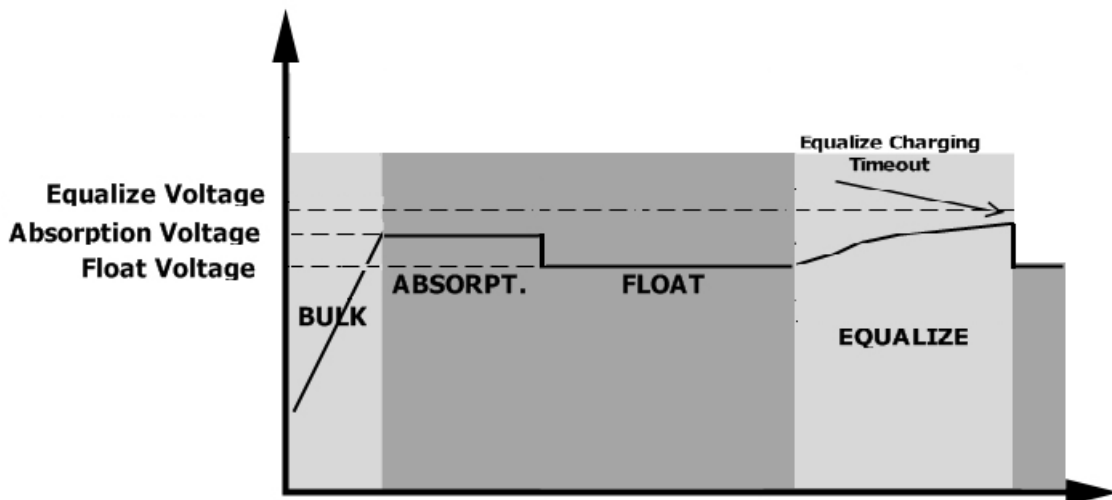


- **Equalize charging time and timeout**

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



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



SPECIFICATIONS

Table 1 Line Mode Specifications

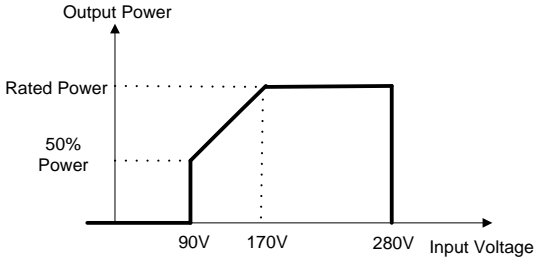
| INVERTER MODEL | 5KW |
|--|---|
| Input Voltage Waveform | Sinusoidal (utility or generator) |
| Nominal Input Voltage | 230Vac |
| Low Loss Voltage | 170Vac±7V (UPS) 90Vac±7V (Appliances) |
| Low Loss Return Voltage | 180Vac±7V (UPS); 100Vac±7V (Appliances) |
| High Loss Voltage | 280Vac±7V |
| High Loss Return Voltage | 270Vac±7V |
| Max AC Input Voltage | 300Vac |
| Nominal Input Frequency | 50Hz / 60Hz (Auto detection) |
| Low Loss Frequency | 40±1Hz |
| Low Loss Return Frequency | 42±1Hz |
| High Loss Frequency | 65±1Hz |
| High Loss Return Frequency | 63±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) |
| <p>Output power derating: When AC input voltage drops to 95V or 170V depending on models, the output power will be derated.</p> |  <p>The graph illustrates the output power derating characteristics. The vertical axis represents Output Power, with a horizontal line for Rated Power and a lower horizontal line for 50% Power. The horizontal axis represents Input Voltage, with markers at 90V, 170V, and 280V. The power output is 50% at 90V, rises linearly to the Rated Power level at 170V, remains constant at the Rated Power level until 280V, and then drops back to 50% power at 170V.</p> |

Table 2 Inverter Mode Specifications

| INVERTER MODEL | 5KW |
|--|-----------------------------------|
| Rated Output Power | 5KVA/5KW |
| Output Voltage Waveform | Pure Sine Wave |
| Output Voltage Regulation | 230Vac±5% |
| Output Frequency | 60Hz or 50Hz |
| Peak Efficiency | 90% |
| Overload Protection | 5s@≥150% load; 10s@110%~150% load |
| Surge Capacity | 2* rated power for 5 seconds |
| Nominal DC Input Voltage | 48Vdc |
| Cold Start Voltage | 46.0Vdc |
| Low DC Warning Voltage @ load < 20% @ 20% ≤ load < 50% @ load ≥ 50% | 44.0Vdc 42.8Vdc 40.4Vdc |
| Low DC Warning Return Voltage @ load < 20% @ 20% ≤ load < 50% @ load ≥ 50% | 46.0Vdc 44.8Vdc 42.4Vdc |
| Low DC Cut-off Voltage @ load < 20% @ 20% ≤ load < 50% @ load ≥ 50% | 42.0Vdc 40.8Vdc 38.4Vdc |
| High DC Recovery Voltage | 64Vdc |
| High DC Cut-off Voltage | 66Vdc |

Table 3 Charge Mode Specifications

| Utility Charging Mode | | |
|--|--------------------------|--|
| INVERTER MODEL | | 5KW |
| Charging Current (UPS) @ Nominal Input Voltage | | 100A |
| Bulk Charging Voltage | Flooded Battery | 58.4 |
| | AGM / Gel Battery | 56.4 |
| Floating Charging Voltage | | 54Vdc |
| Overcharge Protection | | 66Vdc |
| Charging Algorithm | | 3-Step |
| Charging Curve | | <p>The graph plots Battery Voltage (per cell) on the left y-axis and Charging Current (%) on the right y-axis against Time on the x-axis. The voltage curve (black) starts at 2.25Vdc, rises linearly to 2.43Vdc (2.35Vdc), remains constant during the Absorption phase, and then drops to a floating voltage. The current curve (red) starts at 100% and decreases as the battery charges, reaching a low level in the Maintenance phase. The Bulk phase duration is T0, and the Absorption phase duration is T1, with a note that T1 = 10 * T0, minimum 10mins, maximum 8hrs.</p> |
| Solar Input | | |
| INVERTER MODEL | | 5KW |
| Rated Power | | 5000W |
| Max. PV Array Open Circuit Voltage | | 450Vdc |
| PV Array MPPT Voltage Range | | 120Vdc~430Vdc |
| Max. Input Current | | 18A |

Table 4 General Specifications

| | |
|------------------------------------|--|
| INVERTER MODEL | 5 KW |
| Safety Certification | CE |
| Operating Temperature Range | -10°C to 50°C |
| Storage temperature | -15°C~ 60°C |
| Humidity | 5% to 95% Relative Humidity (Non-condensing) |
| Dimension (D*W*H), mm | 140 x 295 x 468 |
| Net Weight, kg | 12 |

TROUBLE SHOOTING

| Problem | LCD/LED/Buzzer | Explanation / Possible cause | What to do |
|---|---|---|--|
| Unit shuts down automatically during startup process. | LCD/LEDs and buzzer will be active for 3 seconds and then complete off. | The battery voltage is too low (<1.91V/Cell) | 1. Re-charge battery. 2. Replace battery. |
| No response after power on. | No indication. | 1. The battery voltage is far too low. (<1.4V/Cell) 2. Battery polarity is connected reversed. | 1. Check if batteries and the wiring are connected well. 2. Re-charge battery. 3. Replace battery. |
| Mains exist but the unit works in battery mode. | Input voltage is displayed as 0 on the LCD and green LED is flashing. | Input protector is tripped | Check if AC breaker is tripped and AC wiring is connected well. |
| | Green LED is flashing. | Insufficient quality of AC power. (Shore or Generator) | 1. Check if AC wires are too thin and/or too long. 2. Check if generator (if applied) is working well or if input voltage range setting is correct. (UPS→Appliance) |
| | 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 is short circuited. | Check if wiring is connected well and remove abnormal load. |
| | | Temperature of internal converter component is over 120°C. (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 100°C. | |
| | 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. | | |

Appendix I: Parallel function

1. Introduction

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

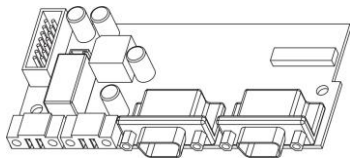
1. Parallel operation in single phase with up to 9 units. The supported maximum output power is 45KW/45KVA.
2. Maximum nine units work together to support three-phase equipment. Seven units support one phase maximum. The supported maximum output power is 45KW/45KVA and one phase can be up to 35KW/35KVA.

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.

WARNING! Please make sure all output N wires of each inverter must be always connected. Otherwise, it will cause inverter fault in error code # 72.

2. Package Contents

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



Parallel board



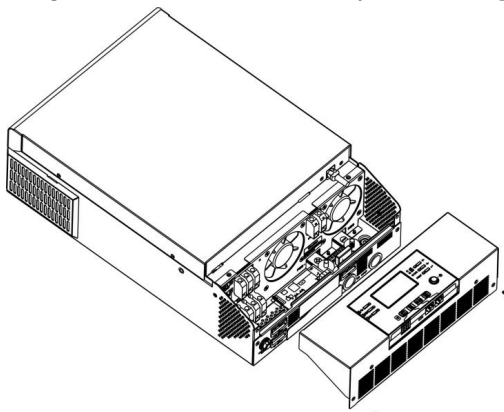
Parallel communication cable



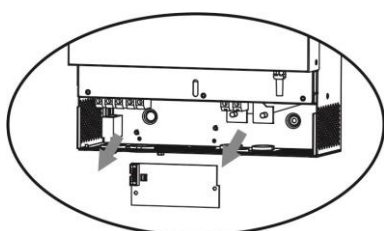
Current sharing cable

3. Parallel board installation

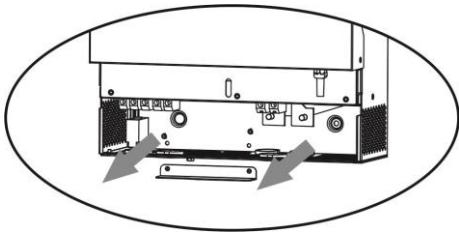
Step 1: Remove wire cover by unscrewing all screws.



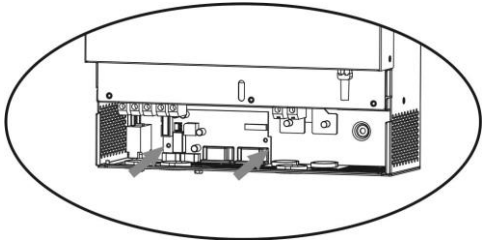
Step 2: Remove two screws as below chart and remove 2-pin and 14-pin cables. Take out the board under the communication board.



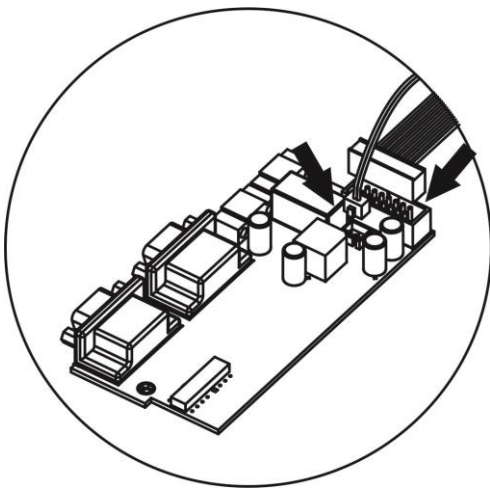
Step 3: Remove two screws as below chart to take out cover of parallel communication.



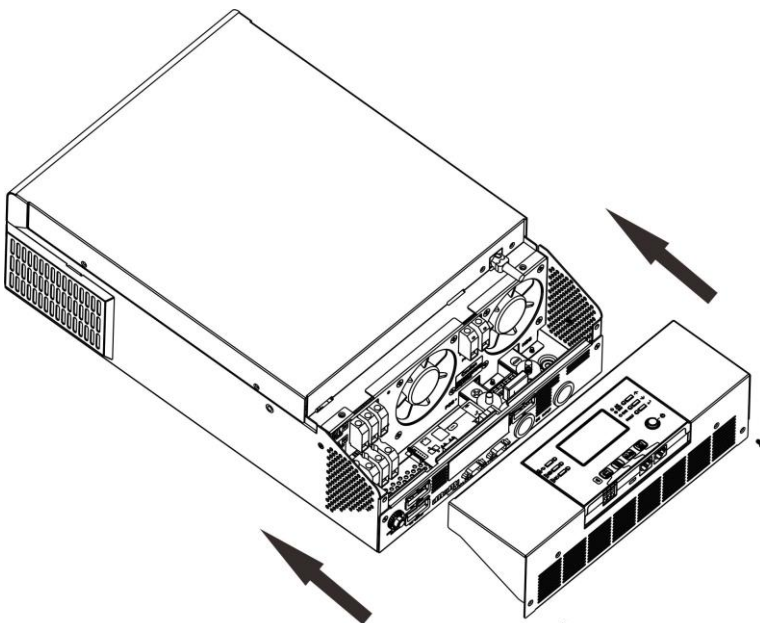
Step 4: Install new parallel board with 2 screws tightly.



Step 6: Connect 2-pin to original position.



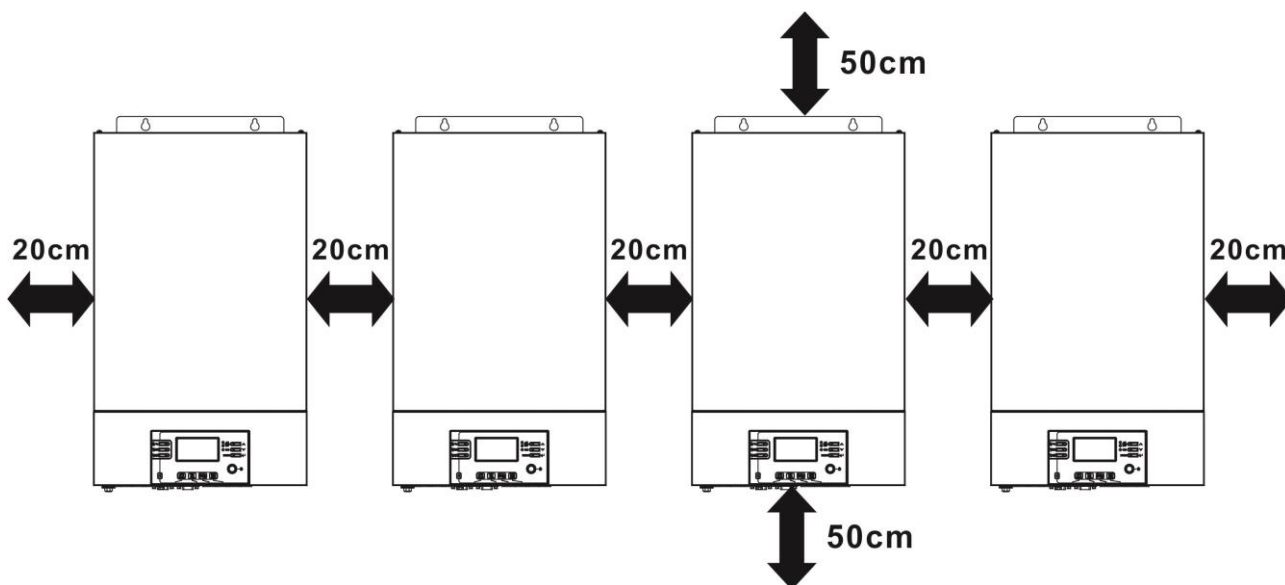
Step 7: Put communication board back to the unit.



Step 8: Put wire cover back to the unit. Now the inverter is providing parallel operation function.

4. Mounting the Unit

When installing multiple units, please follow below chart.



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

5. Wiring Connection

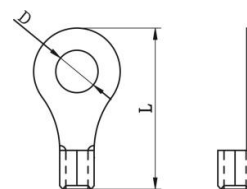
NOTICE: It's required to connect to battery for parallel operation.

The cable size of each inverter is shown as below:

Recommended battery cable and terminal size for each inverter:

| Model | Wire Size | Cable mm ² | Ring Terminal Dimensions | | Torque value |
|-------|-----------|-----------------------|--------------------------|--------|--------------|
| | | | D (mm) | L (mm) | |
| 5KW | 2*4 AWG | 44 | 6.4 | 49.7 | 2~3 |

Ring terminal:



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

Recommended AC input and output cable size for each inverter:

| Model | AWG no. | Torque |
|-------|---------|------------|
| 5KW | 10 AWG | 1.2~ 1.6Nm |

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

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

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

Recommended breaker specification of battery for each inverter:

| | |
|-------|------------|
| Model | 1 unit* |
| 5KW | 135A/70VDC |

*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:

| Model | 2 units | 3 units | 4 units | 5 units | 6 units | 7 units | 8 units | 9 units |
|-------|----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| 5KW | 80A/ 230VAC | 120A/ 230VAC | 160A/ 230VAC | 200A/ 230VAC | 240A/ 230VAC | 280A/ 230VAC | 320A/ 230VAC | 360A/ 230VAC |

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

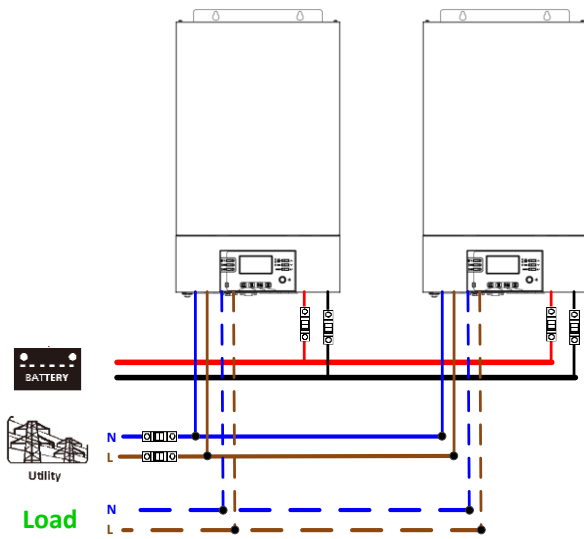
| Inverter parallel numbers | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---------------------------|-------|-------|-------|-------|-------|-------|-------|--------|
| Battery Capacity | 200AH | 400AH | 400AH | 600AH | 600AH | 800AH | 800AH | 1000AH |

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

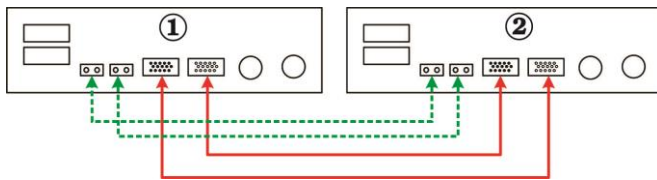
5-1. Parallel Operation in Single phase

Two inverters in parallel:

Power Connection

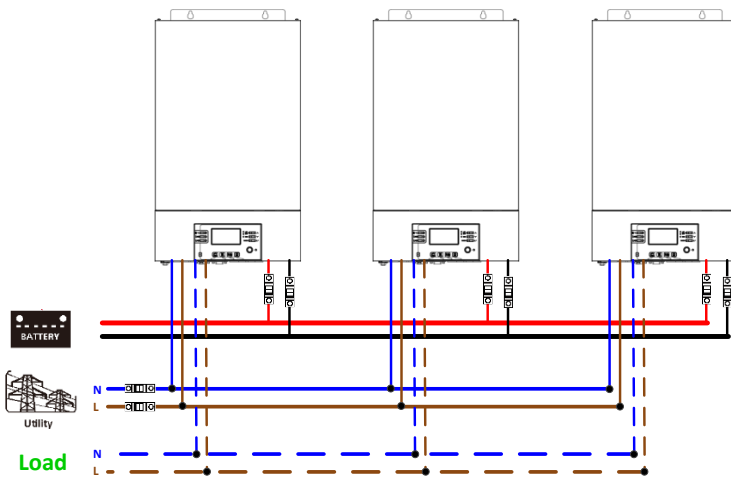


Communication Connection

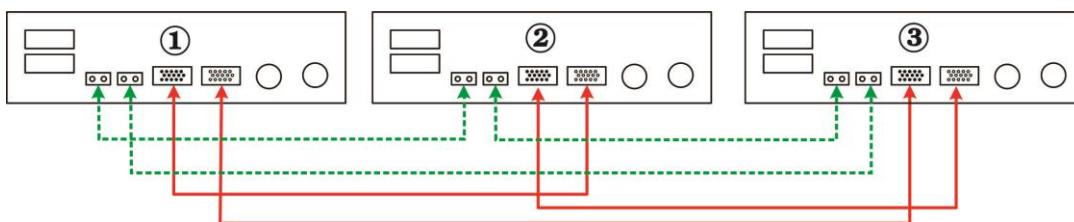


Three inverters in parallel:

Power Connection

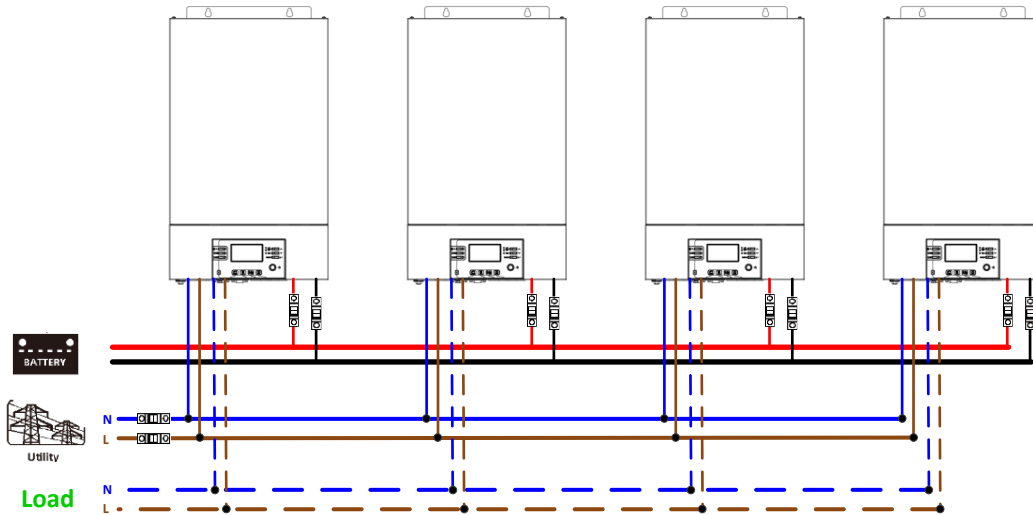


Communication Connection

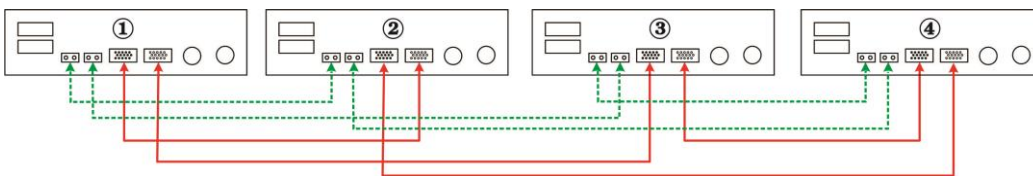


Four inverters in parallel:

Power Connection

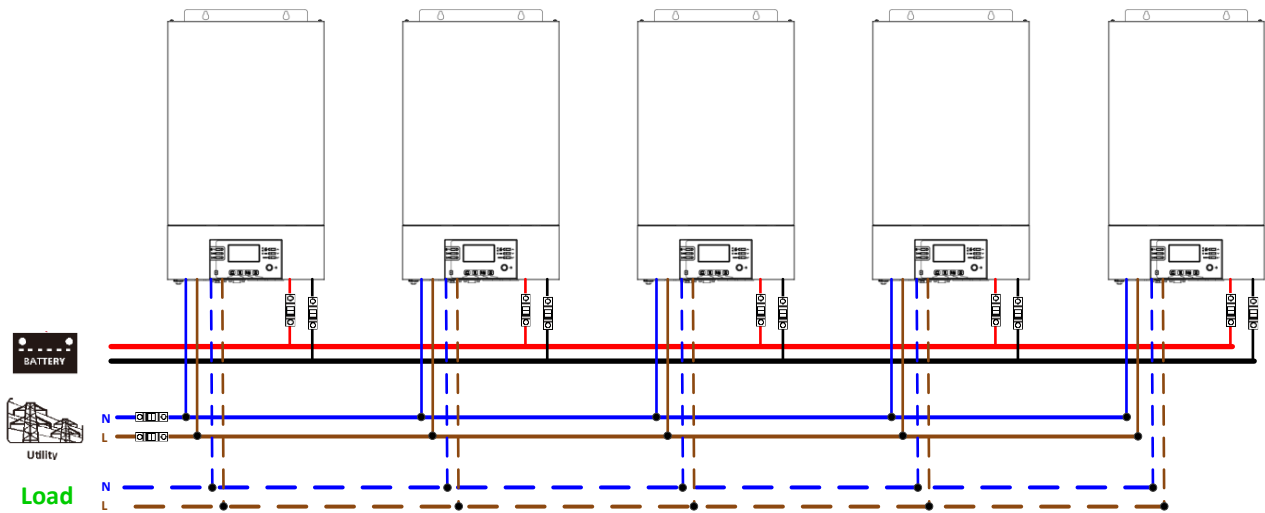


Communication Connection

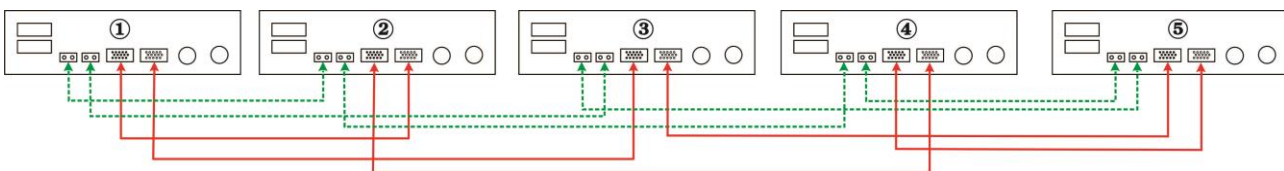


Five inverters in parallel:

Power Connection

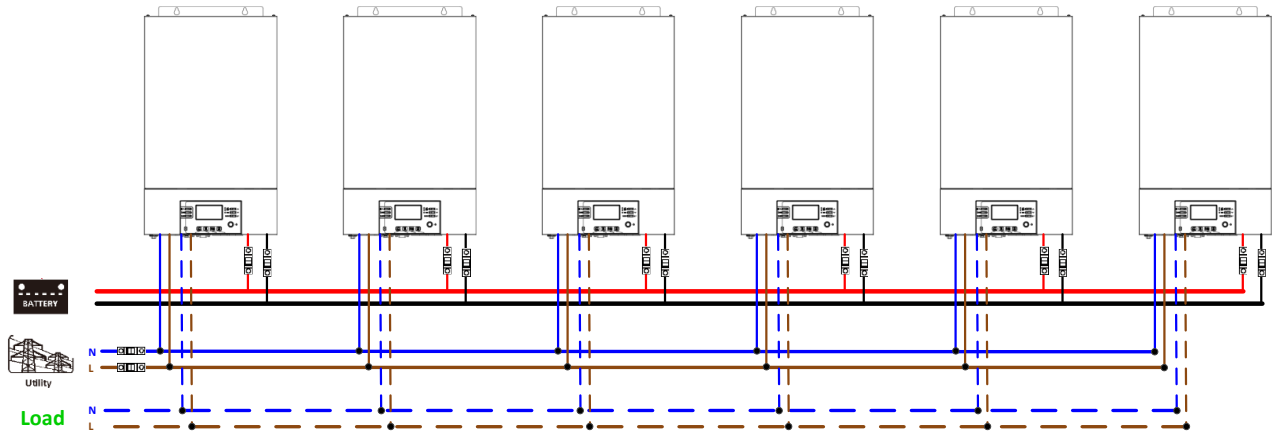


Communication Connection

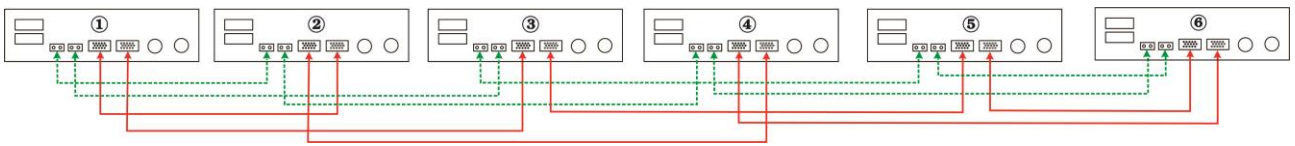


Six inverters in parallel:

Power Connection

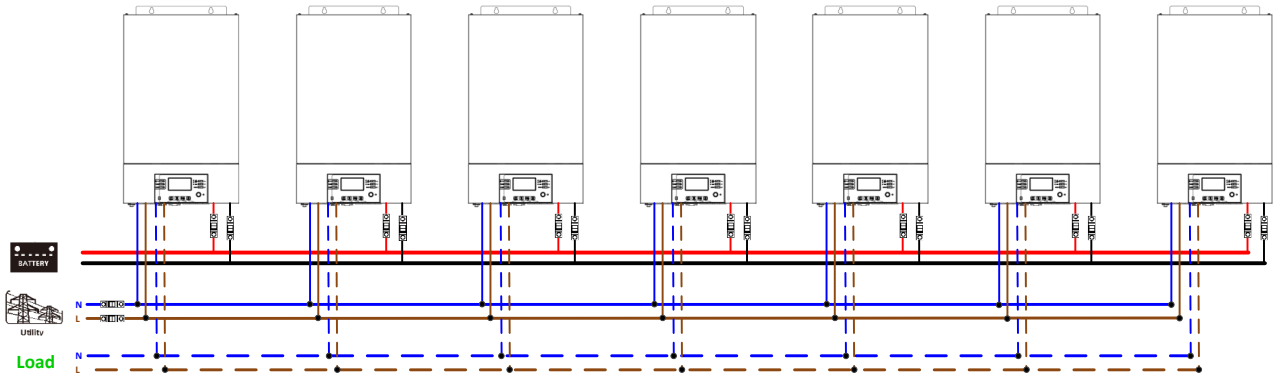


Communication Connection

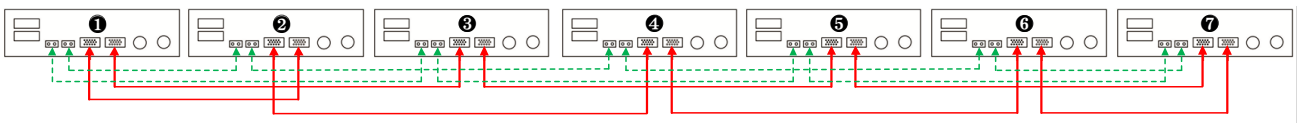


Seven inverters in parallel:

Power Connection

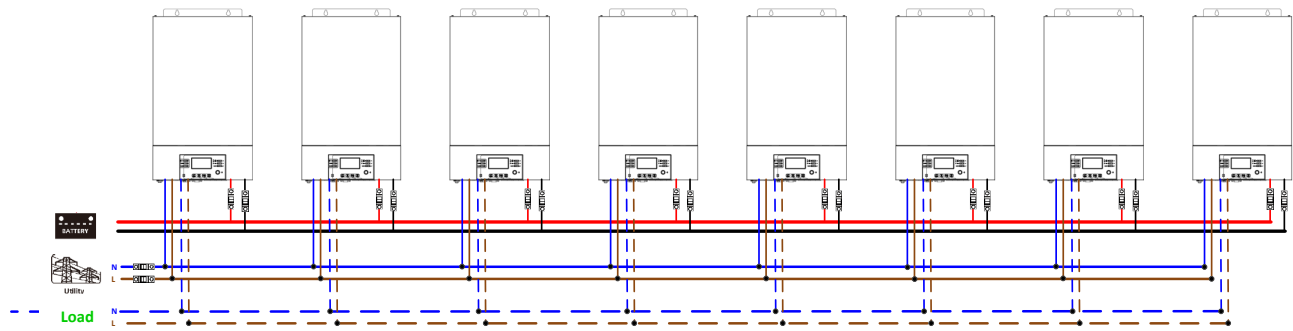


Communication Connection

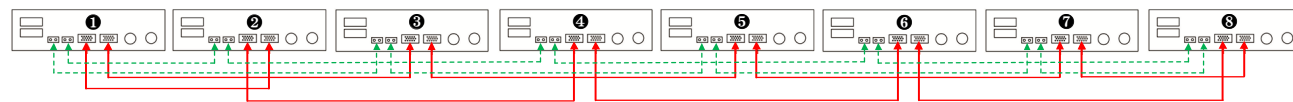


Eight inverters in parallel:

Power Connection

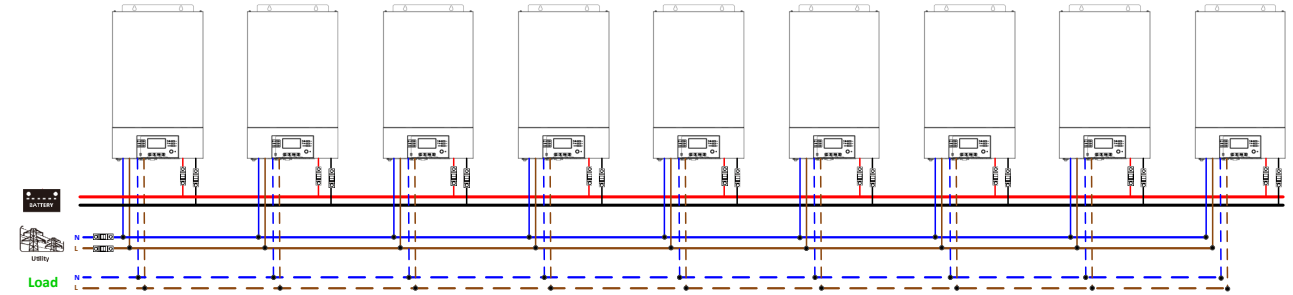


Communication Connection

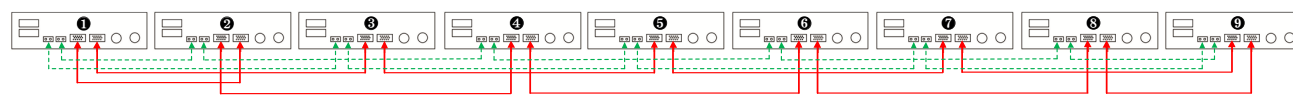


Nine inverters in parallel:

Power Connection



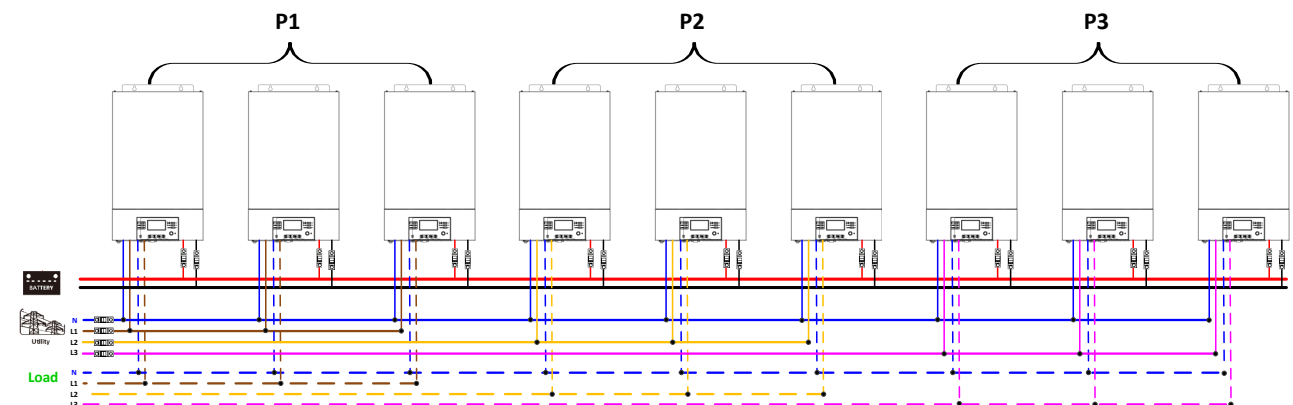
Communication Connection



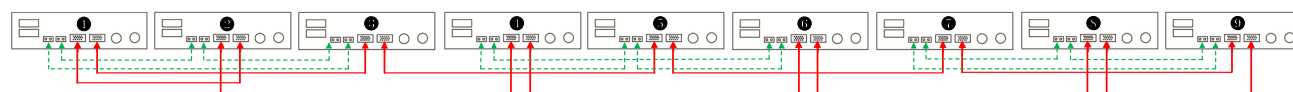
5-2. Support 3-phase equipment

Three inverters in each phase:

Power Connection

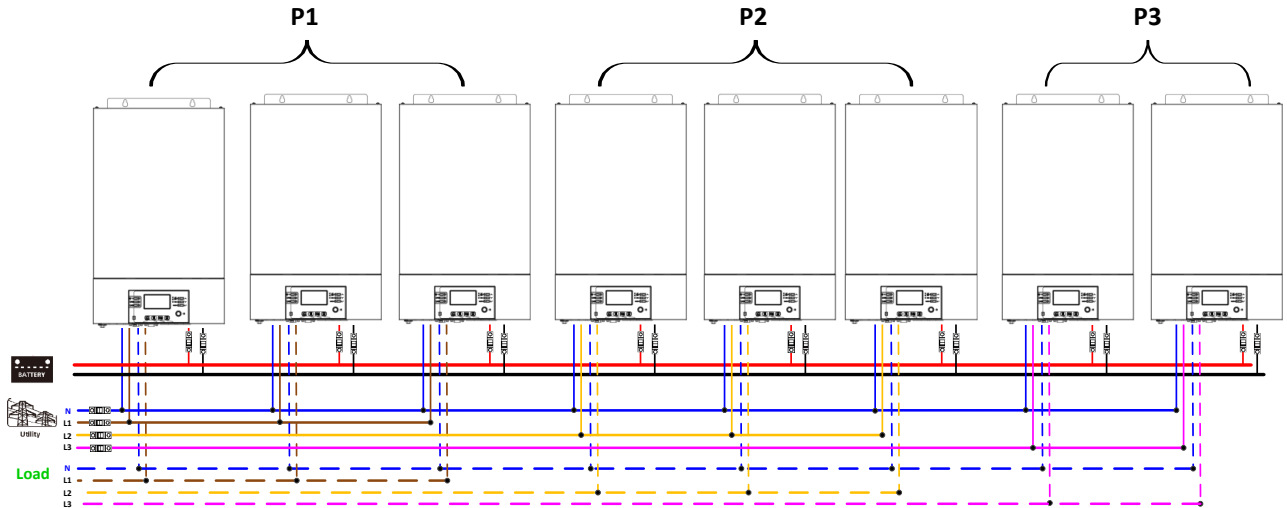


Communication Connection

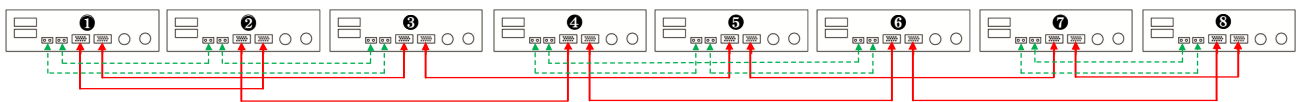


Three inverters in one phase, three inverters in second phase and two inverter for the third phase:

Power Connection

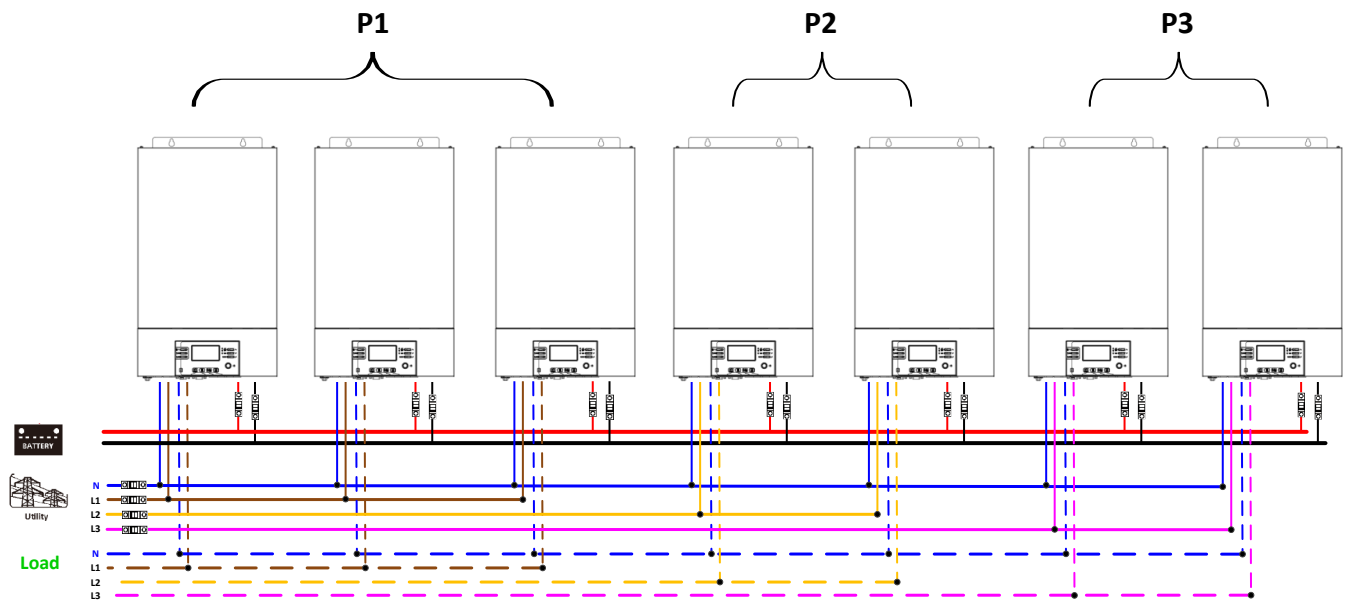


Communication Connection

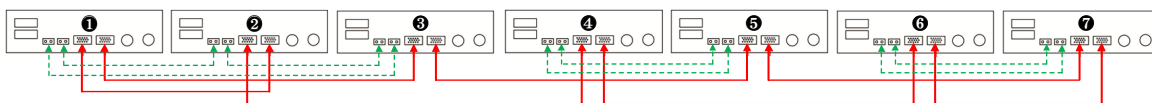


Three inverters in one phase, two inverters in second phase and two inverters for the third phase:

Power Connection

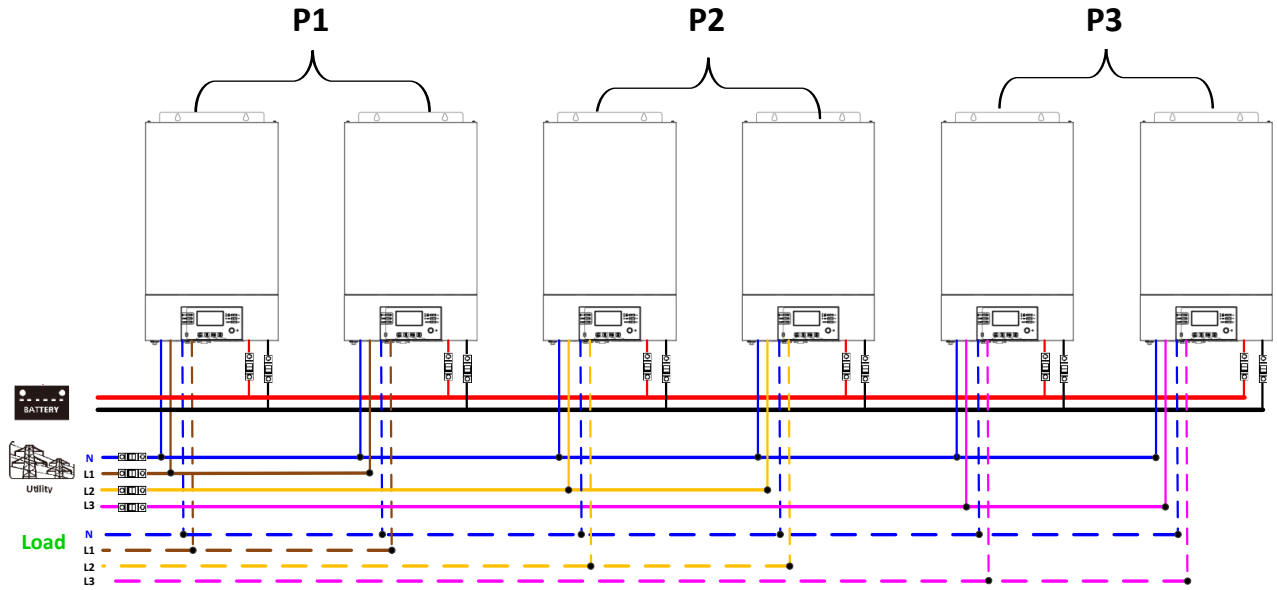


Communication Connection

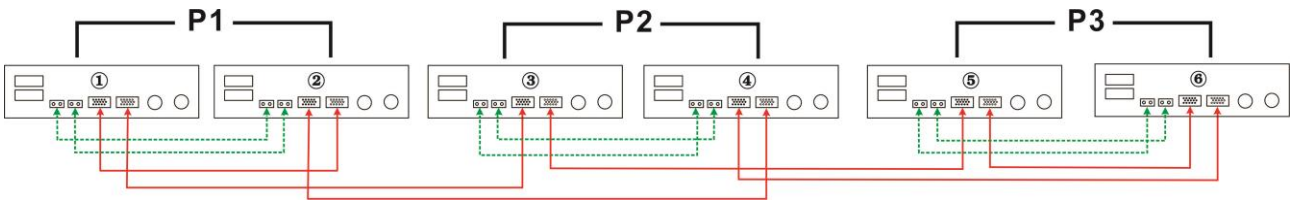


Two inverters in each phase:

Power Connection

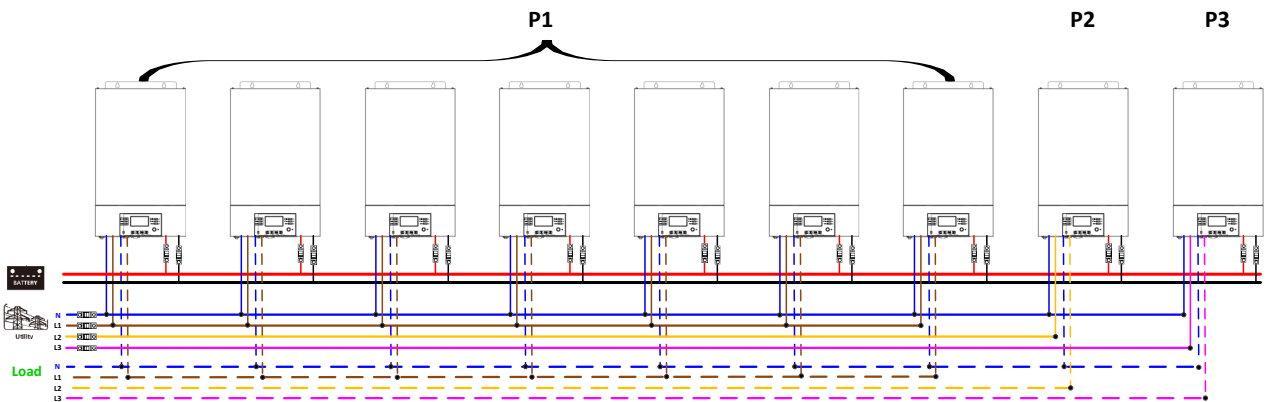


Communication Connection



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

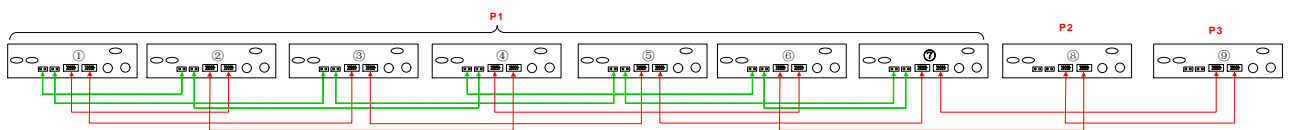
Power Connection



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

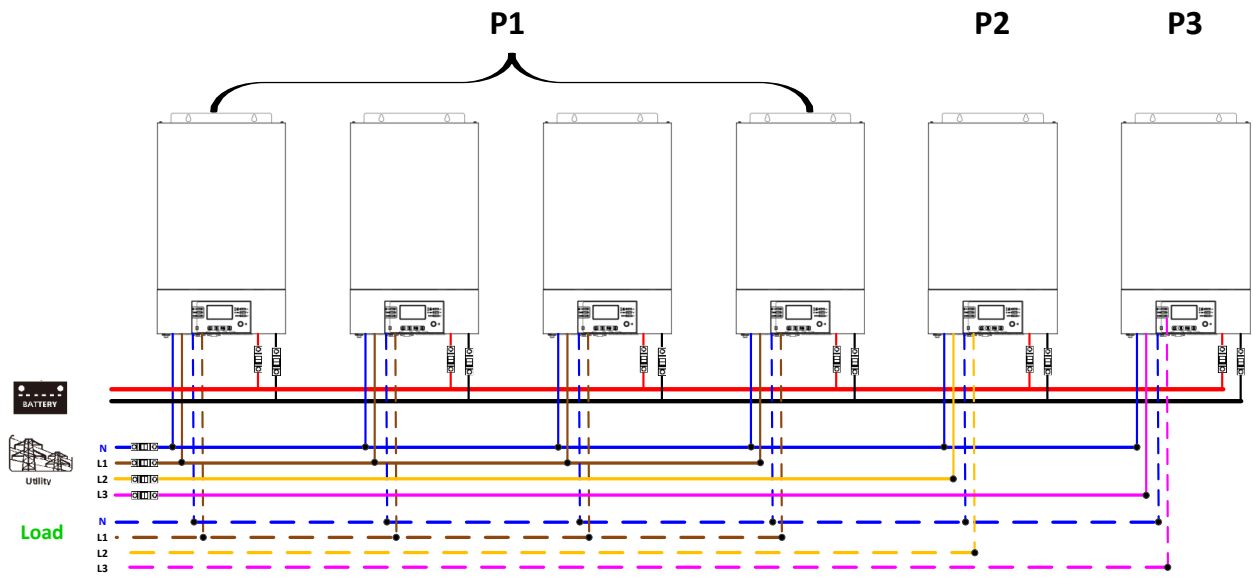


Note: If there is only one unit in one phase, this unit doesn't need to connect the current sharing cable.

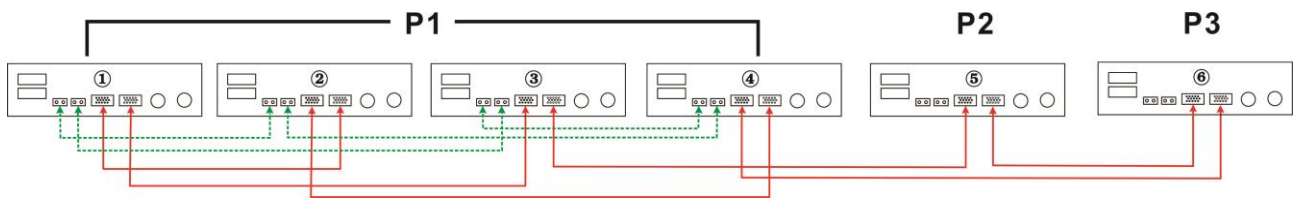
Or you connect it like as below:

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

Power Connection

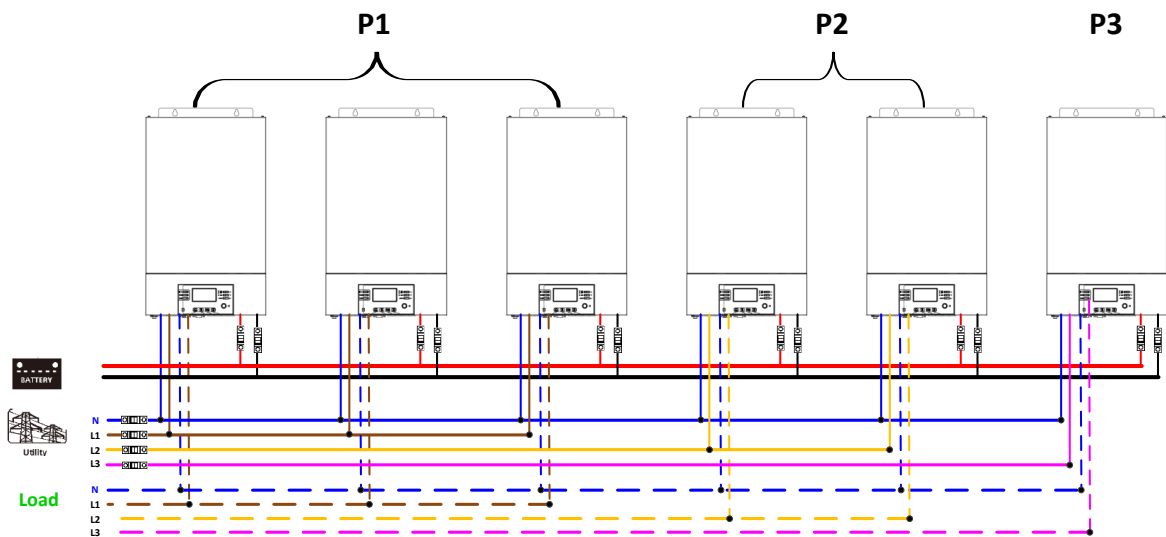


Communication Connection

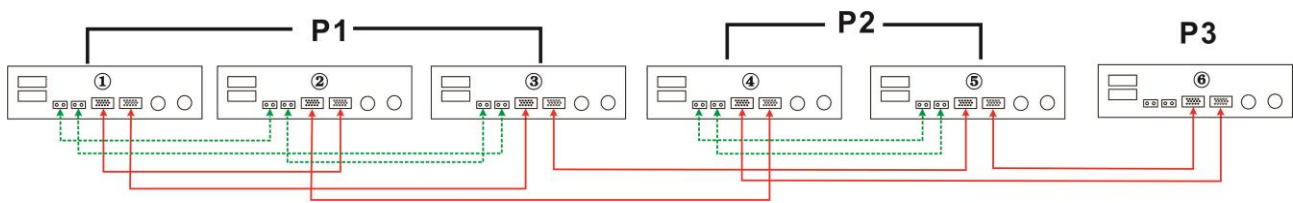


Three inverters in one phase, two inverters in second phase and one inverter for the third phase:

Power Connection

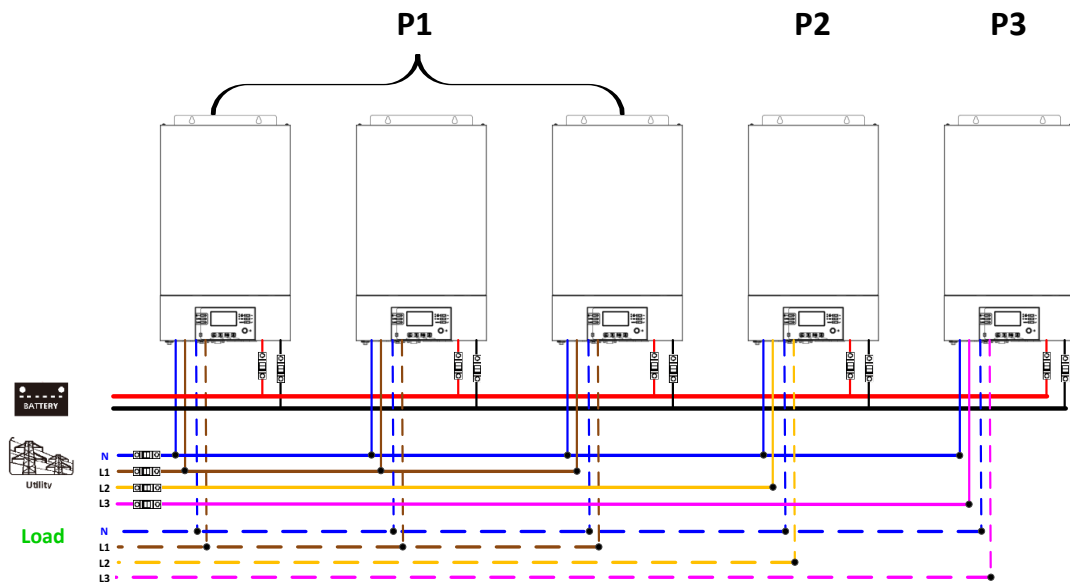


Communication Connection

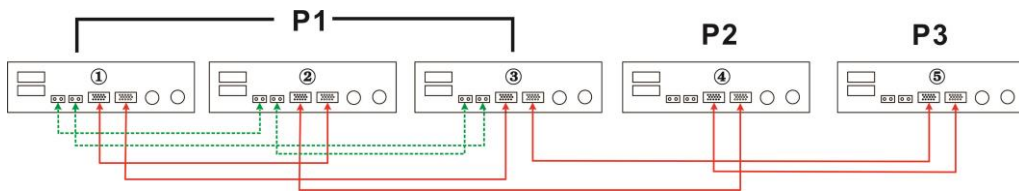


Three inverters in one phase and only one inverter for the remaining two phases:

Power Connection

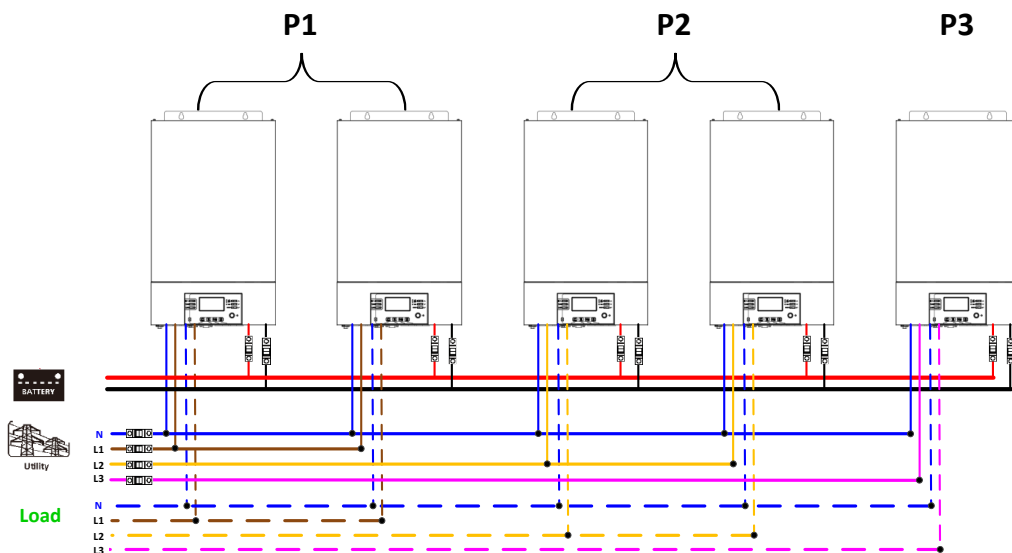


Communication Connection

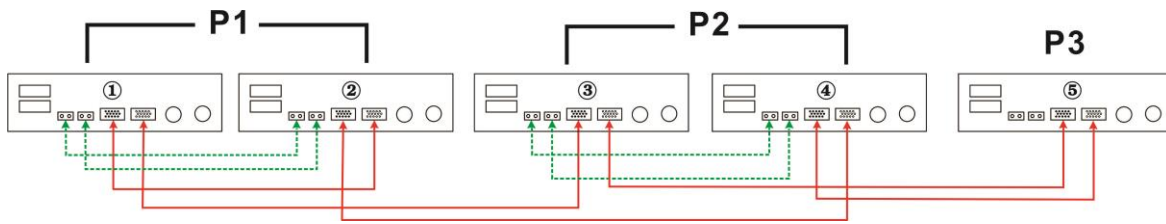


Two inverters in two phases and only one inverter for the remaining phase:

Power Connection

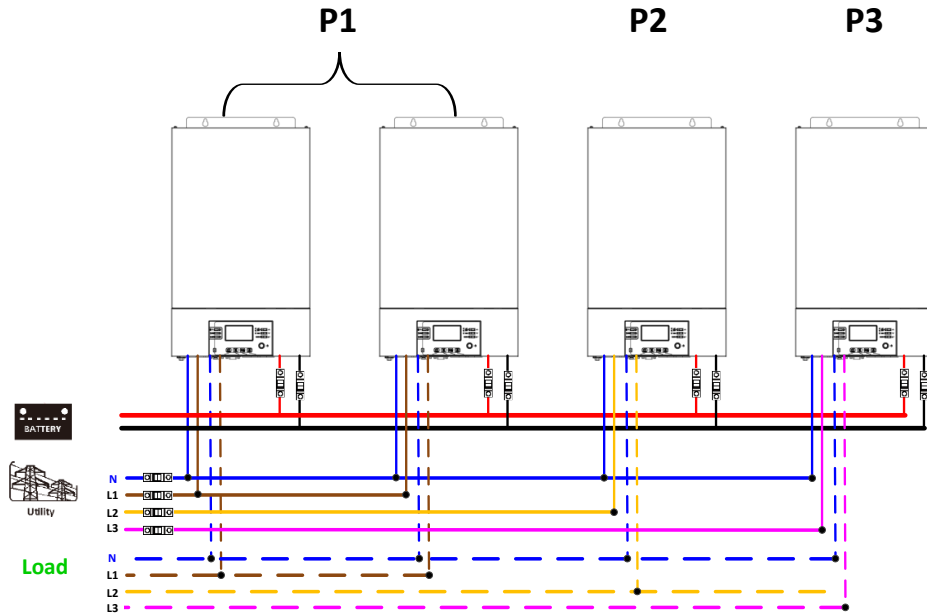


Communication Connection

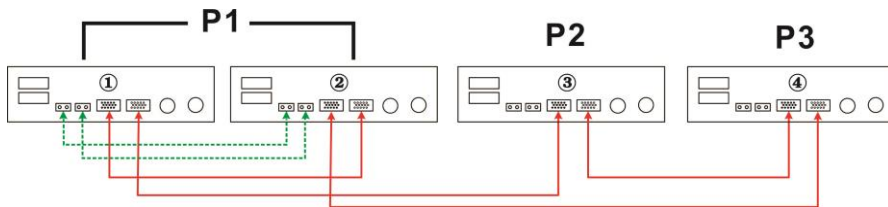


Two inverters in one phase and only one inverter for the remaining phases:

Power Connection

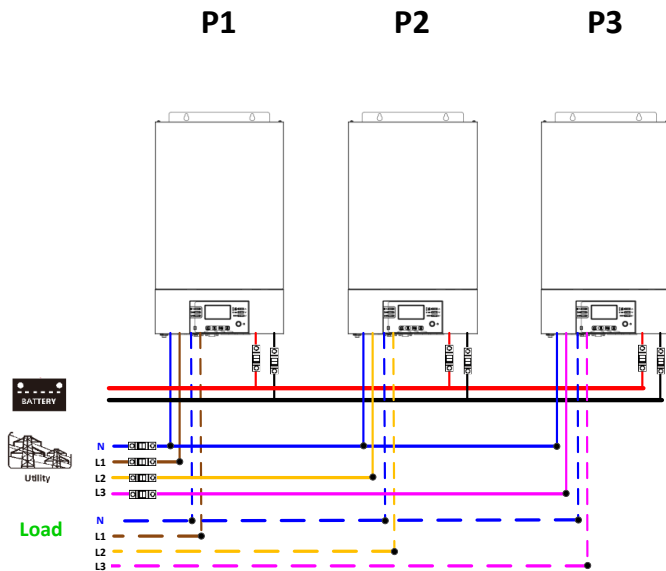


Communication Connection

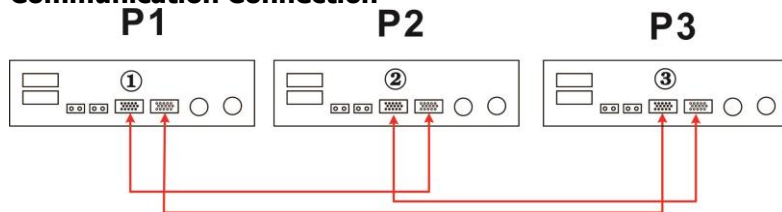


One inverter in each phase:

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.






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  S10 Parallel: 28  PAL L1 phase: 28  3P1 L2 phase: 28  3P2 L3 phase: 28  3P3 |

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 phase or it's up to four inverters in one phase. Please refers to 5-2 for detailed information. Please select "3P1" in program 28 for the inverters connected to L1 phase, "3P2" in program 28 for the inverters connected to L2 phase and "3P3" in program 28 for the inverters connected to L3 phase.

Be sure to connect share current cable to units which are on the same phase. Do NOT connect share current cable between units on different phases.

Fault code display:

| Fault Code | Fault Event | Icon on |
|------------|---|---------|
| 60 | Power feedback protection | F60 |
| 71 | Firmware version inconsistent | F71 |
| 72 | Current sharing fault | F72 |
| 80 | CAN fault | F80 |
| 81 | Host loss | F81 |
| 82 | Synchronization loss | F82 |
| 83 | Battery voltage detected different | F83 |
| 84 | AC input voltage and frequency detected different | F84 |
| 85 | AC output current unbalance | F85 |
| 86 | AC output mode setting is different | F86 |

8. Commissioning

Parallel in single phase

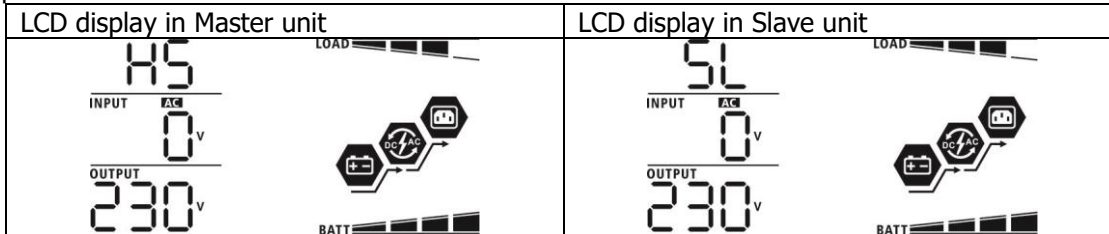
Step 1: Check the following requirements before commissioning:

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

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

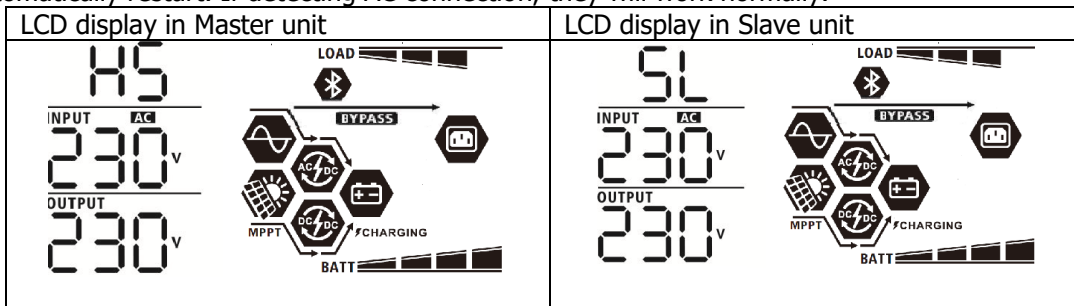
NOET: It's necessary to turn off switch when setting LCD program. Otherwise, the setting can not be programmed.

Step 3: Turn on each unit.



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.



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

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

Support three-phase equipment

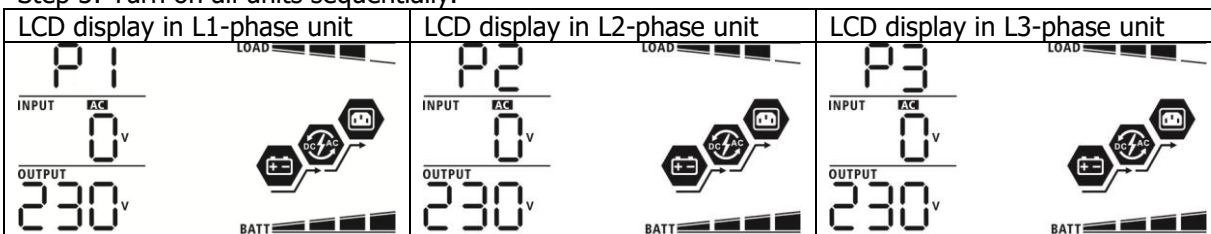
Step 1: Check the following requirements before commissioning:

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

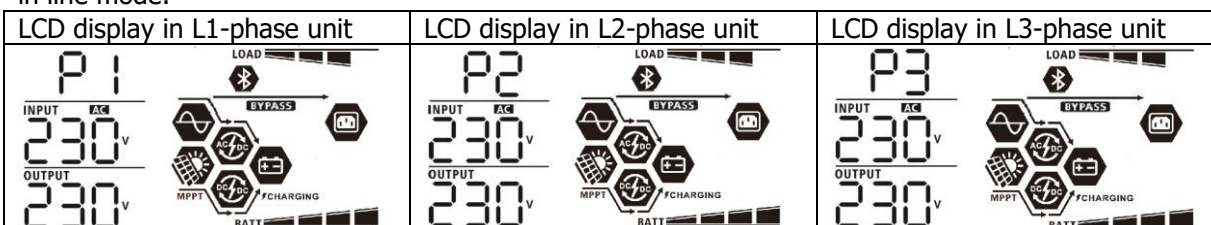
Step 2: Turn on all units and configure LCD program 28 as P1, P2 and P3 sequentially. And then shut down all units.

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

Step 3: Turn on all units sequentially.



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.

9. Trouble shooting

| Situation | | Solution |
|------------|--|--|
| Fault Code | Fault Event Description | |
| 60 | Current feedback into the inverter is detected. | <ol style="list-style-type: none"> Restart the inverter. Check if L/N cables are not connected reversely in all inverters. For parallel system in single phase, make sure the sharing are connected in all inverters. For supporting three-phase system, make sure the sharing cables are connected in the inverters in the same phase, and disconnected in the inverters in different phases. If the problem remains, please contact your installer. |
| 71 | The firmware version of each inverter is not the same. | <ol style="list-style-type: none"> Update all inverter firmware to the same version. 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. After updating, if the problem still remains, please contact your installer. |
| 72 | The output current of each inverter is different. | <ol style="list-style-type: none"> Check if sharing cables are connected well and restart the inverter. If the problem remains, please contact your installer. |
| 80 | CAN data loss | <ol style="list-style-type: none"> Check if communication cables are connected well and restart the inverter. 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. | <ol style="list-style-type: none"> Make sure all inverters share same groups of batteries together. 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. If the problem still remains, please contact your installer. |
| 84 | AC input voltage and frequency are detected different. | <ol style="list-style-type: none"> Check the utility wiring connection and restart the inverter. 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. If the problem remains, please contact your installer. |
| 85 | AC output current unbalance | <ol style="list-style-type: none"> Restart the inverter. 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. If the problem remains, please contact your installer. |
| 86 | AC output mode setting is different. | <ol style="list-style-type: none"> Switch off the inverter and check LCD setting #28. For parallel system in single phase, make sure no 3P1, 3P2 or 3P3 is set on #28. For supporting three-phase system, make sure no "PAL" is set on #28. If the problem remains, please contact your installer. |

Appendix II: BMS Communication Installation

1. Introduction

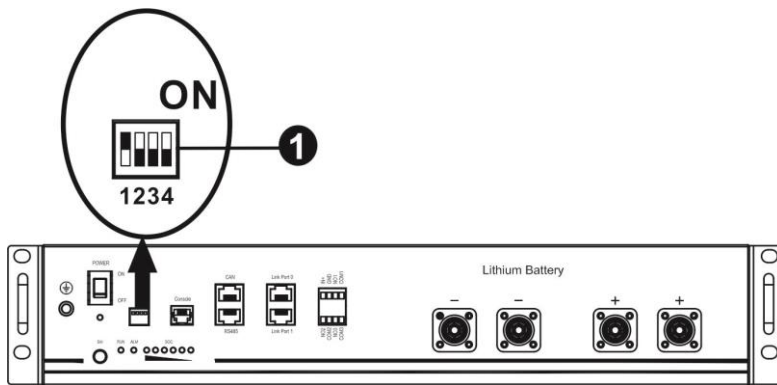
If connecting to lithium battery, it is recommended to purchase a custom-made RJ45 communication cable. Please check with your dealer or integrator for details.

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. Lithium Battery Communication Configuration

PYLONTECH



Dip 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 to set up battery group address.

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

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

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

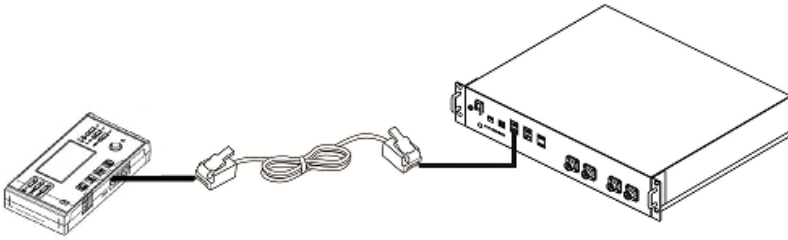
NOTE: The maximum groups of lithium battery is 5 and for maximum number for each group, please check with battery manufacturer.

3. Installation and Operation

PYLONTECH

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

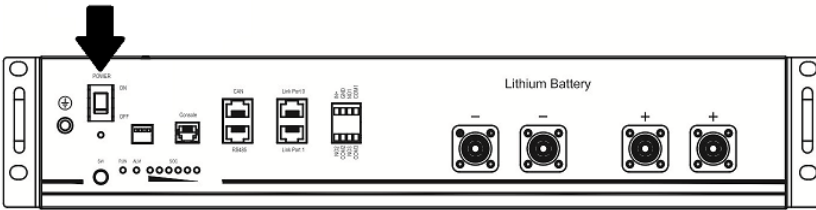
Step 1. Use a custom-made RJ45 cable to connect inverter and Lithium battery.



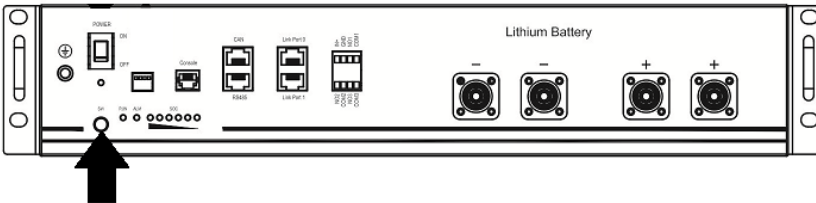
Please take notice for parallel system:

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

Step 2. Switch on Lithium battery.




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



Step 4. Turn on the inverter.



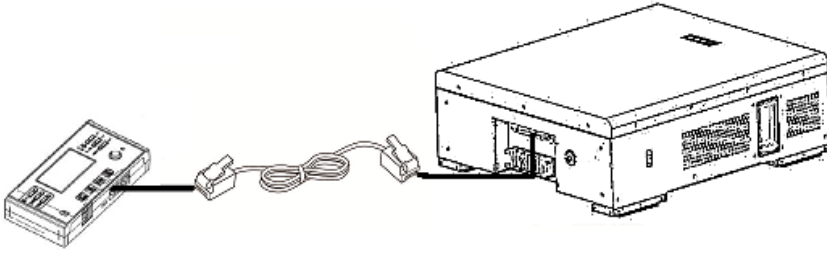
Step 5. Be sure to select battery type as "PYL" in LCD program 5.

05 

PYL

WECO

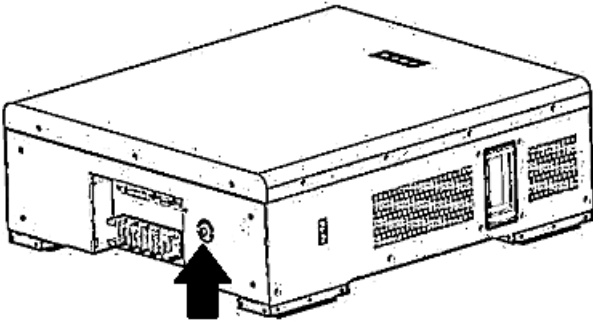
Step 1. Use a custom-made RJ45 cable to connect inverter and Lithium battery.



Please take notice for parallel system:

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

Step 2. Switch on Lithium battery.




Step 3. Turn on the inverter.



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

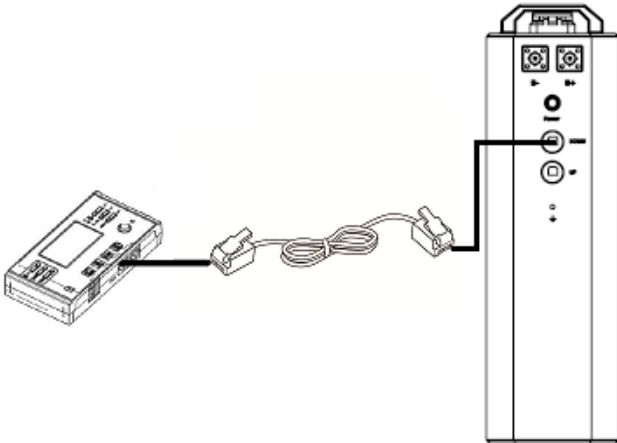
05 

WEC

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

SOLTARO

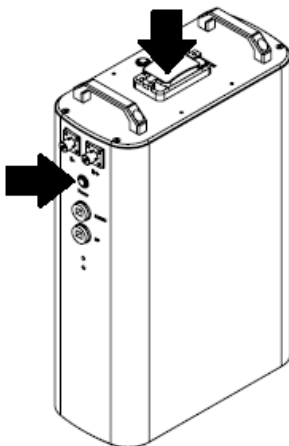
Step 1. Use a custom-made RJ45 cable to connect inverter and Lithium battery.



Please take notice for parallel system:

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

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




Step 3. Turn on the inverter.



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

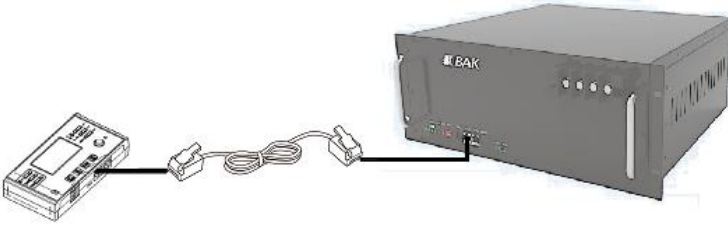
05 ⚙️

SOL

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.

BAK

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



Please take notice for parallel system:

1. Only support common battery installation.
2. Use one custom-made RJ45 cable to connect any inverter (no need to connect to a specific inverter) and Lithium battery. Simply set battery type of this inverter to "BAK" in LCD program 5. The remaining inverters are set as "USE".
3. Set the DIP address switches to "ON OFF OFF OFF" if it is a single battery. If multiple batteries in parallel, connect the RJ45 to the master unit's RS485 connector.

Step 2. Press more than three seconds to start Lithium battery, power output ready.




Step 3. Turn on the inverter.



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

05 

bat

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.

4. LCD Display Information

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

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

5. Code Reference

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

| Code | Description |
|------|--|
| 60 | 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. |
| 61 | Communication lost (only available when the battery type is setting as "Pylontech Battery", "WECO Battery", "Soltaro Battery" or "BAK Battery".) <ul style="list-style-type: none"> After battery is connected and 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. Then, buzzer beeps immediately. |
| 69 | 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. |
| 70 | 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. |
| 71 | 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: Approximate Back-up Time Table

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

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