Flin Energy

FlinSlim MPPT Elite
Solar Inverter

USER MANUAL

Table of Contents

ABOUT THIS MANUAL

Purpose

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

Scope

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

SAFETY INSTRUCTIONS

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

1. Before using the unit, read all instructions and cautionary markings on the unit, the batteries and all appropriate sections of this manual.
2. **CAUTION** --To reduce risk of injury, charge only deep-cycle lead acid type rechargeable batteries. Other types of batteries may burst, causing personal injury and damage.
3. Do not disassemble the unit. Take it to a qualified service center when service or repair is required. Incorrect re-assembly may result in a risk of electric shock or fire.
4. To reduce risk of electric shock, disconnect all wirings before attempting any maintenance or cleaning. Turning off the unit will not reduce this risk.
5. **CAUTION** – Only qualified personnel can install this device with battery.
6. **NEVER** charge a frozen battery.
7. For optimum operation of this inverter/charger, please follow required spec to select appropriate cable size. It's very important to correctly operate this inverter/charger.
8. Be very cautious when working with metal tools on or around batteries. A potential risk exists to drop a tool to spark or short circuit batteries or other electrical parts and could cause an explosion.
9. Please strictly follow installation procedure when you want to disconnect AC or DC terminals. Please refer to INSTALLATION section of this manual for the details.
10. Fuses are provided as over-current protection for the battery supply.
11. GROUNDING INSTRUCTIONS -This inverter/charger should be connected to a permanent grounded wiring system. Be sure to comply with local requirements and regulation to install this inverter.
12. NEVER cause AC output and DC input short circuited. Do NOT connect to the mains when DC input short circuits.
13. **Warning!!** Only qualified service persons are able to service this device. If errors still persist after following troubleshooting table, please send this inverter/charger back to local dealer or service center for maintenance.
14. **WARNING:** Because this inverter is non-isolated, only three types of PV modules are acceptable: single crystalline, poly crystalline with class A-rated and CIGS modules. To avoid any malfunction, do not connect any PV modules with possible current leakage to the inverter. For example, grounded PV modules will cause current leakage to the inverter. When using CIGS modules, please be sure NO grounding.
15. **CAUTION:** It's requested to use PV junction box with surge protection. Otherwise, it will cause damage on inverter when lightning occurs on PV modules.

INTRODUCTION

This is a multi-function inverter, combining functions of inverter, solar charger and battery charger to offer uninterruptible power support in a single package. The comprehensive LCD display offers user-configurable and easy-accessible button operations such as battery charging current, AC or solar charging priority, and acceptable input voltage based on different applications.

Features

- Pure sine wave inverter
- Configurable color for the built-in RGB LED bar
- Built-in Wi-Fi for mobile monitoring (APP is required)
- Supports USB On-the-Go function
- Built-in anti-dusk kit
- Detachable LCD control module with multiple communication ports for BMS (RS485, CAN-BUS, RS232)
- Configurable input voltage ranges for home appliances and personal computers via LCD control panel
- Configurable AC/PV output usage timer and prioritization
- Configurable AC/Solar charger priority via LCD control panel
- Configurable battery charging current based on applications via LCD control panel
- Compatible to utility mains or generator power
- Auto restart while AC is recovering
- Overload / Over temperature / short circuit protection
- Smart battery charger design for optimized battery performance
- Cold start function

Basic System Architecture

The following illustration shows basic application for this unit. It also required the following devices to have a complete running system:
- Generator or Utility mains.
- PV modules

Consult with your system integrator for other possible system architectures depending on your requirements.

This inverter can power various appliances in home or office environment, including motor-type appliances such as tube light, fan, refrigerator and air conditioners.
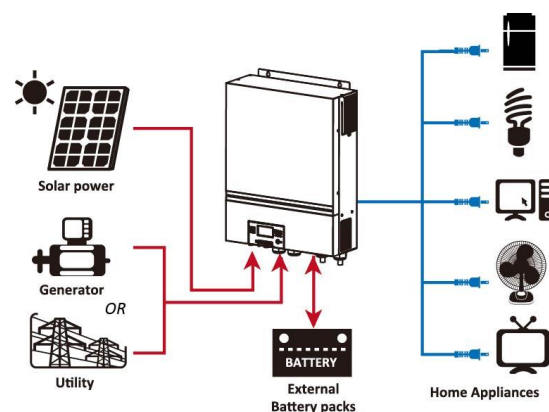

Figure 1 Basic hybrid PV System Overview

Depending on different power situations, this hybrid 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 Hybrid inverter. See Figure 1 for a simple diagram of a typical solar system with this hybrid inverter.

Product Overview

3.6KW   **7.2KW**
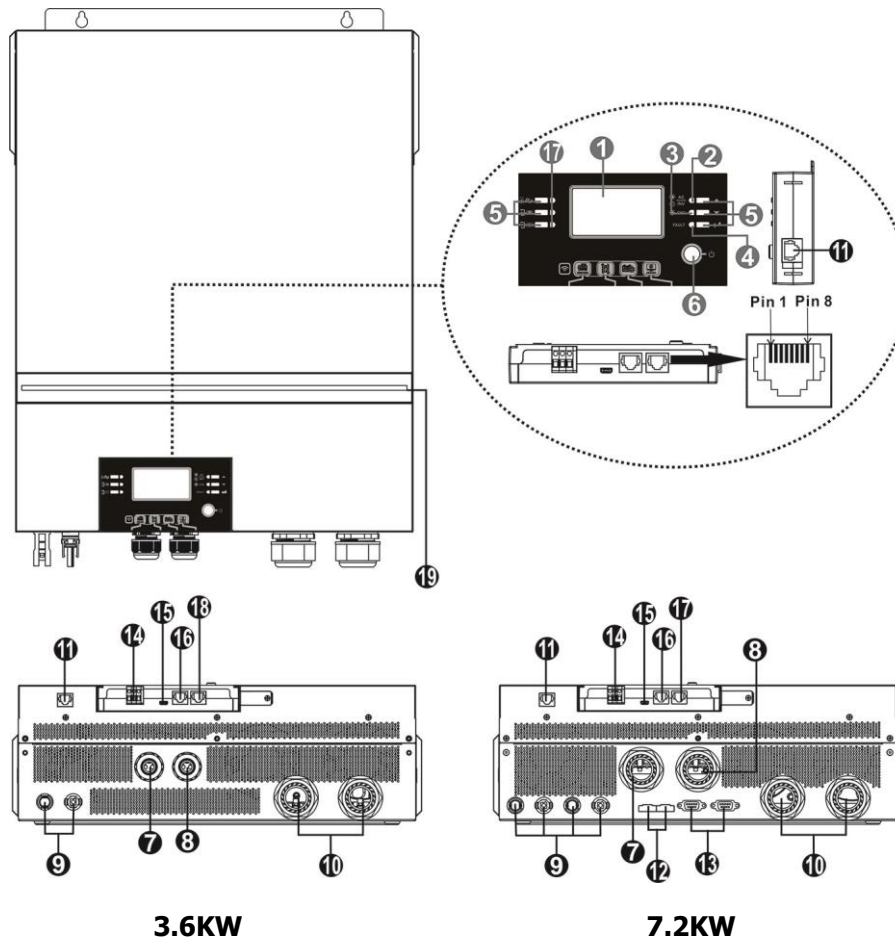
NOTE: For parallel model installation and operation, please check *Appendix I.*

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. Remote LCD module communication port
12. Parallel communication port
13. Current sharing port
14. Dry contact
15. USB port as USB communication port and USB function port

16. BMS communication port: CAN, RS-485 or RS-232
17. Output source indicators (refer to OPERATION/Operation and Display Panel section for details) and USB function setting reminder (refer to OPERATION/Function Setting for the details)
18. RS-232 communication port
19. RGB LED bar (refer to LCD Setting section for the details)

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:

| Inverter unit | Manual | RS-232 cable | Parallel communication cable | Current sharing cable |
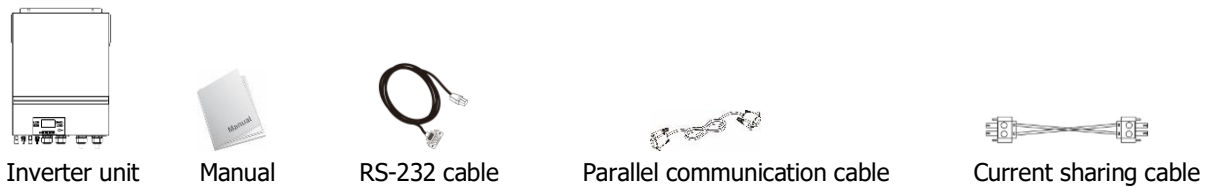
Preparation

Before connecting all wirings, please take off bottom cover by removing two screws. When removing the bottom cover, be carefully to remove three cables as shown below.
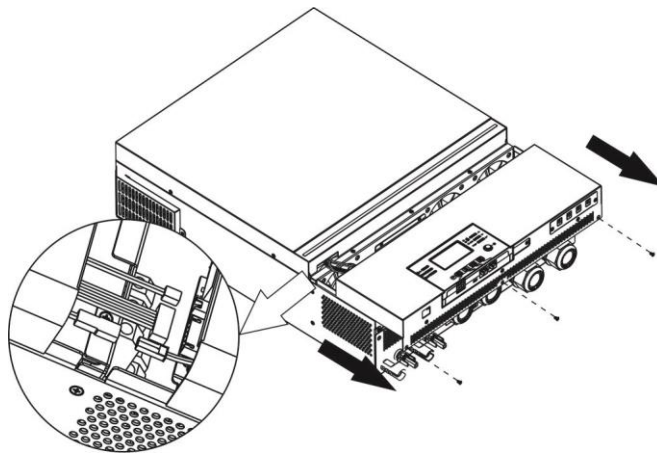
Mounting the Unit

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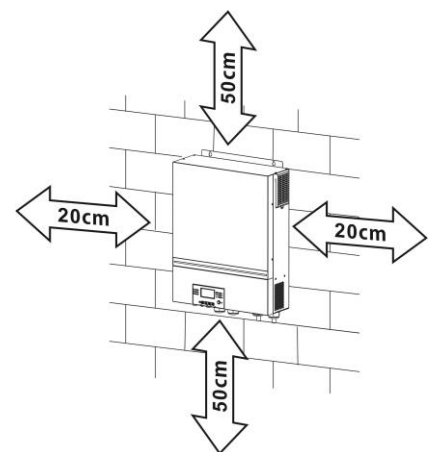
⚠ **SUITABLE FOR MOUNTING ON CONCRETE OR OTHER NON-COMBUSTIBLE SURFACE ONLY.**

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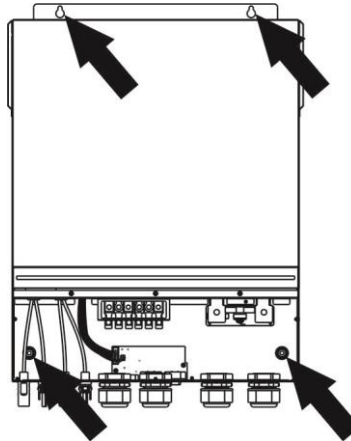
Battery Connection

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

Ring terminal:

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

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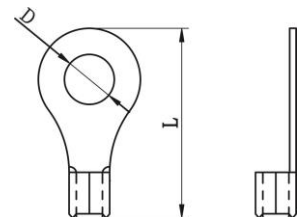
Recommended battery cable and terminal size:

Model	Typical Amperage	Battery capacity	Wire Size	Cable mm²	Ring Terminal Dimensions		Torque value
					D (mm)	L (mm)	
3.6KW	167A	250AH	1*1/0AWG	60	8.4	39.2	5 Nm
7.2KW	167A		1*1/0AWG	60	8.4	39.2	

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 5 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.
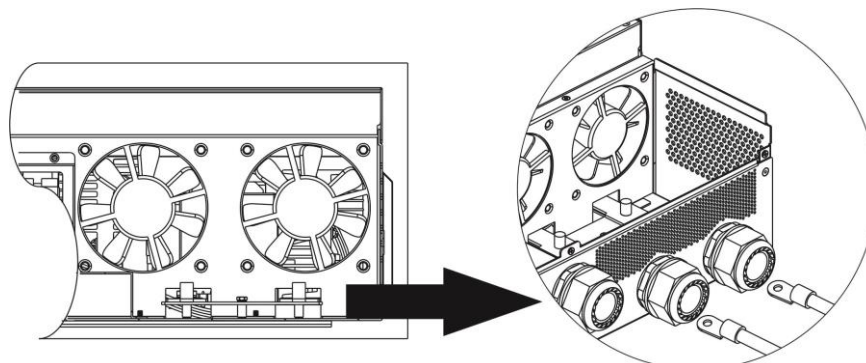
⚠	**WARNING: Shock Hazard**
	Installation must be performed with care due to high battery voltage in series.

⚠️ **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. Please do NOT mis-connect input and output connectors.

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

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

Suggested cable requirement for AC wires

Model	Gauge	Torque Value
3.6KW	12AWG	1.2~ 1.6Nm
7.2KW	8 AWG	1.4~ 1.6Nm

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

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

   ⏚→**Ground (yellow-green)**
   L→**LINE (brown or black)**
   N→**Neutral (blue)**
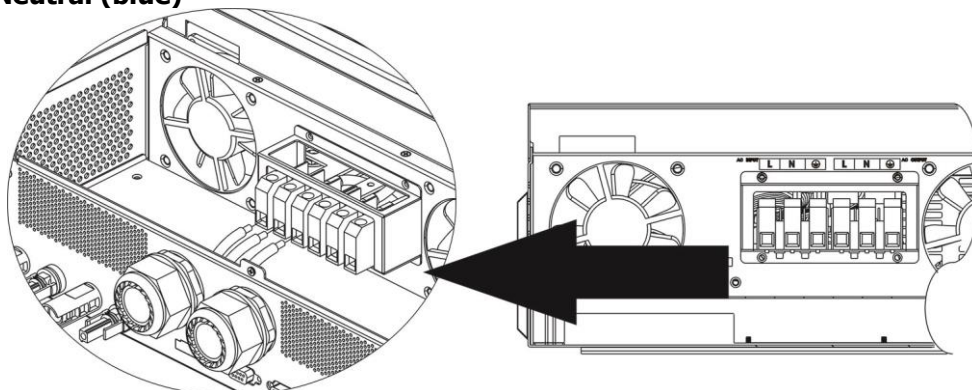
⚠️ **WARNING:**
Be sure that AC power source is disconnected before attempting to hardwire it to the unit.

4. Then, insert AC output wires according to polarities indicated on terminal block and tighten terminal screws. Be sure to connect PE protective conductor (⏚) first.

   ⏚→**Ground (yellow-green)**

L→LINE (brown or black)
N→Neutral (blue)
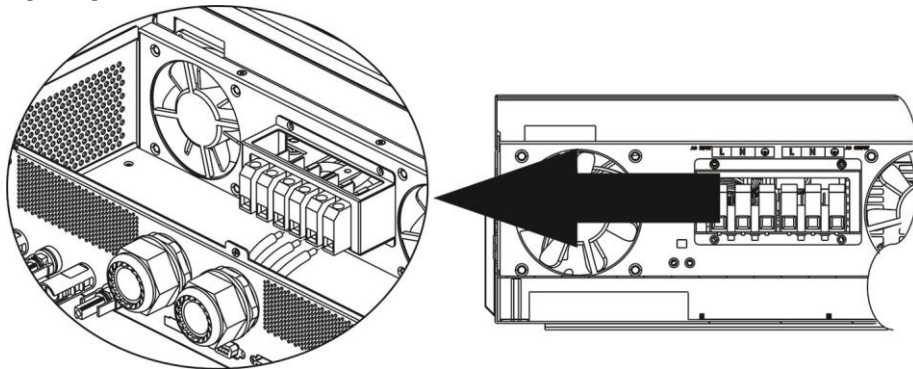
5. Make sure the wires are securely connected.

CAUTION: Important

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

CAUTION: 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

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PV Connection

CAUTION: Before connecting to PV modules, please install **separately** DC circuit breakers between inverter and PV modules.
NOTE1: Please use 600VDC/30A circuit breaker.
NOTE2: The overvoltage category of the PV input is II.
Please follow the steps below to implement PV module connection:

WARNING: Because this inverter is non-isolated, only three types of PV modules are acceptable: single crystalline and poly crystalline with class A-rated and CIGS modules.
To avoid any malfunction, do not connect any PV modules with possible current leakage to the inverter. For example, grounded PV modules will cause current leakage to the inverter. When using CIGS modules, please be sure NO grounding.
CAUTION: It's requested to use PV junction box with surge protection. Otherwise, it will cause damage on inverter when lightning occurs on PV modules.

Step 1: Check the input voltage of PV array modules. This system is applied with two strings of PV array. Please make sure that the maximum current load of each PV input connector is 18A.

CAUTION: Exceeding the maximum input voltage can destroy the unit!! Check the system before wire connection.

Step 2: Disconnect the circuit breaker and switch off the DC switch.

Step 3: Assemble provided PV connectors with PV modules by the following steps.

Components for PV connectors and Tools:

Female connector housing	
Female terminal	
Male connector housing	
Male terminal	
Crimping tool and spanner	

Prepare the cable and follow the connector assembly process:

Strip one cable 8 mm on both end sides and be careful NOT to nick conductors.
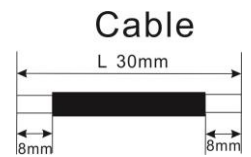
Insert striped cable into female terminal and crimp female terminal as shown below.

Insert assembled cable into female connector housing as shown below.

Insert striped cable into male terminal and crimp male terminal as shown below.

Insert assembled cable into male connector housing as shown below.

Then, use spanner to screw pressure dome tightly to female connector and male connector as shown below.

Step 4: 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.
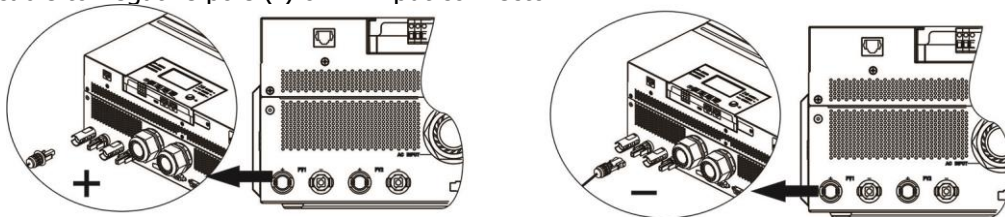
WARNING! For safety and efficiency, it's very important to use appropriate cables for PV module connection. To reduce risk of injury, please use the proper cable size as recommended below.

Conductor cross-section (mm^2)	AWG no.
4~6	10~12

CAUTION: Never directly touch the terminals of inverter. It might cause lethal electric shock.

Recommended Panel Configuration

When selecting proper PV modules, please be sure to consider the following parameters:
1. Open circuit Voltage (Voc) of PV modules not to exceeds maximum PV array open circuit voltage of the inverter.
2. Open circuit Voltage (Voc) of PV modules should be higher than the start-up voltage.

INVERTER MODEL	3.6KW	7.2KW
Max. PV Array Power	4000W	8000W
Max. PV Array Open Circuit Voltage	500Vdc	
PV Array MPPT Voltage Range	90Vdc~450Vdc	
Start-up Voltage (Voc)	120Vdc	

Solar Panel Spec. (reference) - 250Wp - Vmp: 30.7Vdc - Imp: 8.3A - Voc: 37.7Vdc - Isc: 8.4A - Cells: 60	SOLAR INPUT 1	SOLAR INPUT 2	Q'ty of panels	Total Input Power
	Min in serial: 4pcs, per input			
	Max. in serial: 12pcs, per input			
	4pcs in serial	x	4pcs	1000W
	x	4pcs in serial	4pcs	1000W
	12pcs in serial	x	12pcs	3000W
	x	12pcs in serial	12pcs	3000W
	6pcs in serial	6pcs in serial	12pcs	3000W
	6pcs in serial, 2 strings	x	12pcs	3000W
	x	6pcs in serial, 2 strings	12pcs	3000W
	8pcs in serial, 2 strings	x	16pcs	4000W
	x	8pcs in serial, 2 strings	16pcs	4000W
	9pcs in serial, 1 string	9pcs in serial, 1 string	18pcs	4500W
	10pcs in serial, 1 string	10pcs in serial, 1 string	20pcs	5000W
	12pcs in serial, 1 string	12pcs in serial, 1 string	24pcs	6000W
	6pcs in serial, 2 strings	6pcs in serial, 2 strings	24pcs	6000W
	7pcs in serial, 2 strings	7pcs in serial, 2 strings	28pcs	7000W
	8pcs in serial, 2 strings	8pcs in serial, 2 strings	32pcs	8000W

Final Assembly

After connecting all wirings, re-connect three cables and then put bottom cover back by screwing two screws as shown below.
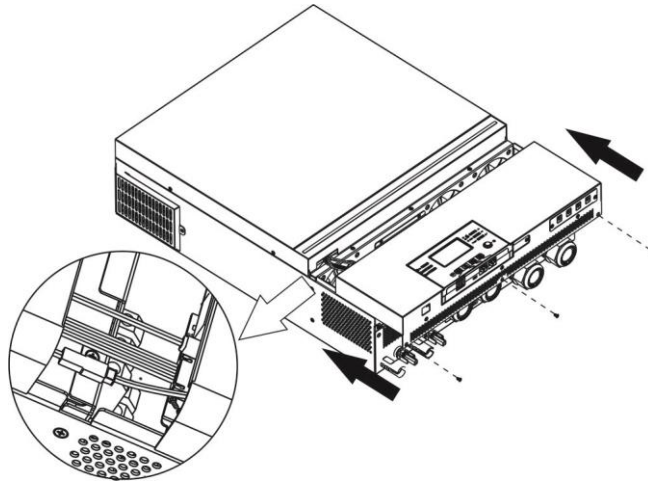
Remote Display Panel Installation

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

Step 1. Remove the screw on the bottom of LCD module and pull down the module from the case.   Detach the cable from the original communication port. Be sure to replace the retention plate back to the inverter.
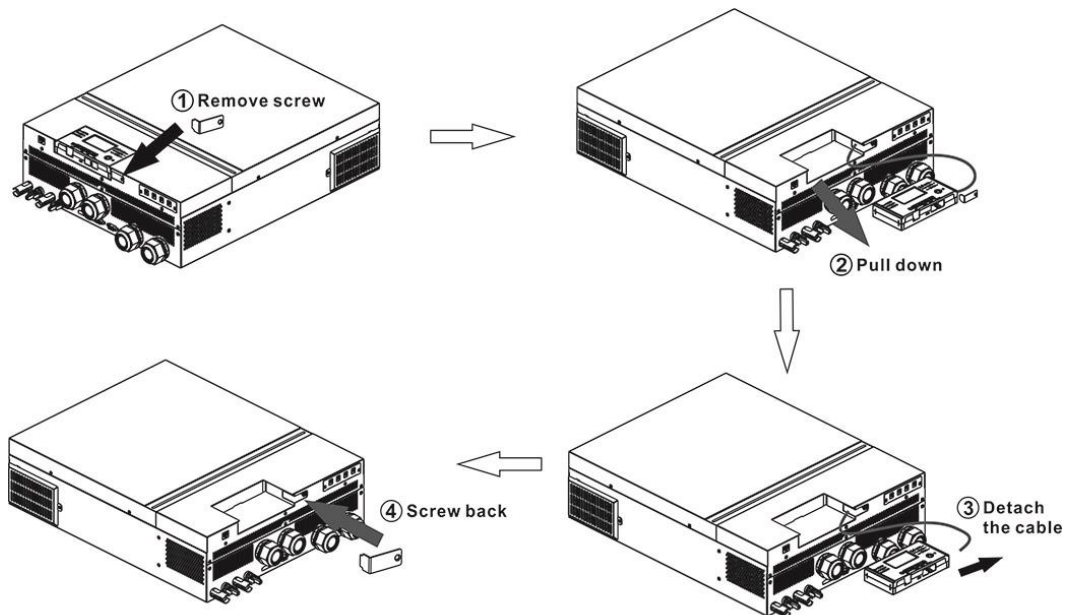
Step 2. Prepare your mounting holes in the marked locations as shown in the illustration below.   The LCD module then can be securely mounted to your desired location.
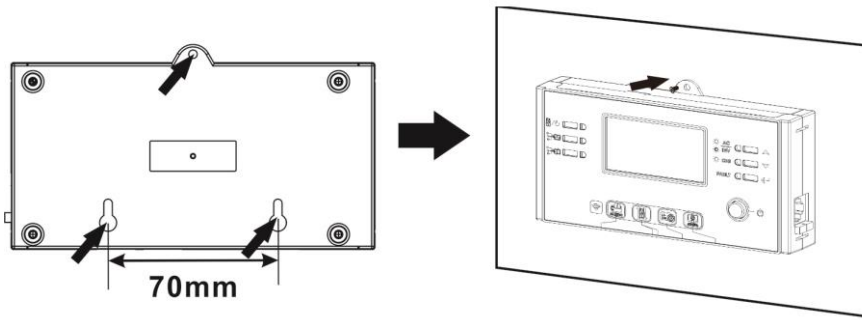
Note: Wall installation should be implemented with the proper screws to the right.

Step 3. After LCD module is installed, connect LCD module to the inverter with an optional RJ45 communication cable as shown below.
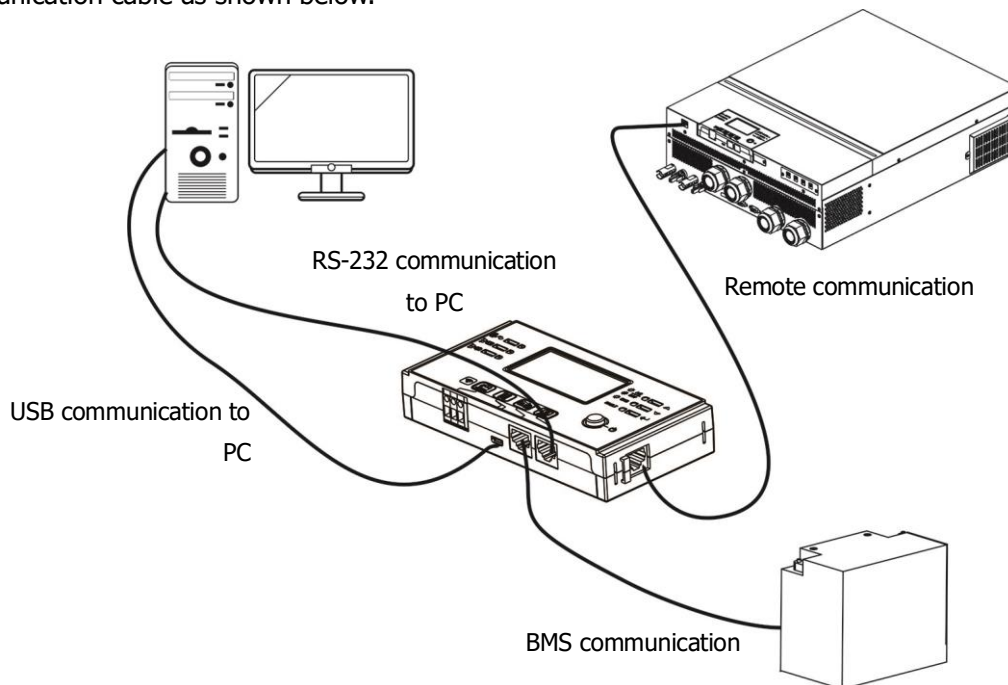
Communication Connection

Serial Connection
Please use the supplied serial cable to connect between the inverter and your PC.   Install the monitoring software from the bundled CD and follow the on-screen instructions to complete your installation. For detailed software operation, refer to the software user manual on the bundled CD.
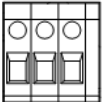
Wi-Fi Connection

This unit is equipped with a Wi-Fi transmitter. Download and install "WatchPower WiFi" APP, then refer to the Wi-Fi Operation Guide for the detail information
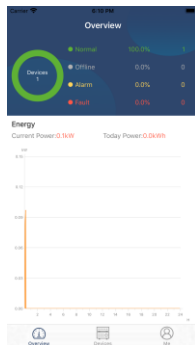
Dry Contact Signal

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

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

BMS Communication

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

OPERATION

Power ON/OFF

Once the unit has been properly installed and the batteries are connected well, simply press On/Off switch (located on the display panel) to turn on the unit.
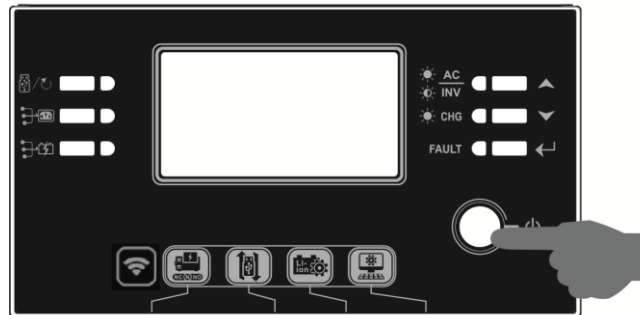
Inverter Turn-on

After this inverter is turned on, WELCOME light show will be started with RGB LED BAR. It will slowly cycle through entire spectrum of nine colors (Green, Sky blue, Royal blue, Violet, Pink, Red, Honey, Yellow, Lime yellow) about 10-15 seconds. After initialization, it will light up with default color.

RGB LED BAR can light up in different color and light effects based on the setting of energy priority to display the operation mode, energy source, battery capacity and load level. These parameters such as color, effects, brightness, speed and so on can be configured through the LCD panel. Please refer to LCD settings for the details.

Operation and Display Panel

The operation and the LCD module, shown in the chart below, includes six indicators, six function keys, on/off switch and a LCD display to indicate the operating status and input/output power information.
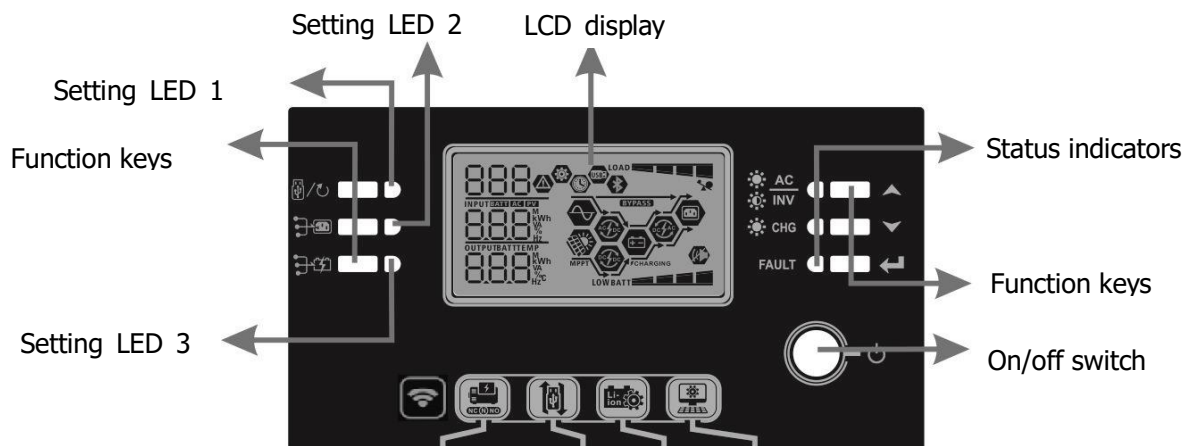
Indicators

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	☀ AC / ☀ INV	Green	Solid On	Output is available in line mode
			Flashing	Output is powered by battery in battery mode
	☀ CHG	Green	Solid On	Battery is fully charged
			Flashing	Battery is charging.
	FAULT	Red	Solid On	Fault mode
			Flashing	Warning mode

Function Keys

Function Key		Description
🖳/↻	ESC	Exit the setting
	USB function setting	Select USB OTG functions
⇥📼	Timer setting for the Output source priority	Setup the timer for prioritizing the output source
⇥⚡	Timer setting for the Charger source priority	Setup the timer for prioritizing the charger source
⇥📼 + ⇥⚡		Press these two keys at the time to switch RGB LED bar for output source priority and battery discharge/charge status
▲	Up	To last selection
▼	Down	To next selection
↵	Enter	To confirm/enter the selection in setting mode

LCD Display Icons
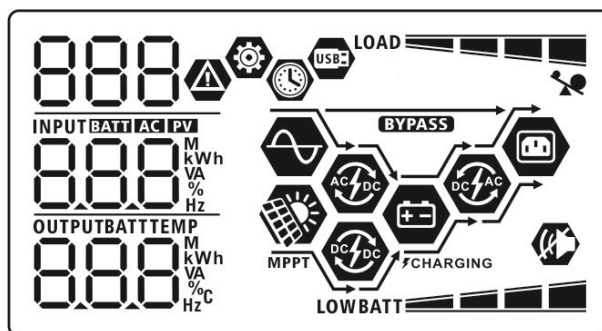
Icon	Function description
Input Source Information	
AC	Indicates the AC input.
PV	Indicates the PV input
INPUT BATT AC PV 888 M kWh VA % Hz	Indicate input voltage, input frequency, PV voltage, charger current, charger power, battery voltage.
Configuration Program and Fault Information	
⚙ 888	Indicates the setting programs.
888⚠	Indicates the warning and fault codes. Warning: 88⚠ flashing with warning code.

	Fault: lighting with fault code

Output Information

OUTPUT BATT TEMP (display)	Indicate output voltage, output frequency, load percent, load in VA, load in Watt and discharging current.

Battery Information

BATT (bars display)	Indicates battery level by 0-24%, 25-49%, 50-74% and 75-100% in battery mode and charging status in line mode.

When battery is charging, 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	LOW BATT
	1.85V/cell ~ 1.933V/cell	BATT
	1.933V/cell ~ 2.017V/cell	BATT
	> 2.017V/cell	BATT
Load < 50%	< 1.892V/cell	LOW BATT
	1.892V/cell ~ 1.975V/cell	BATT
	1.975V/cell ~ 2.058V/cell	BATT
	> 2.058V/cell	BATT

Load Information

(overload icon)	Indicates overload.

LOAD (bars display)	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

(mains icon)	Indicates unit connects to the mains.
(PV panel icon) MPPT	Indicates unit connects to the PV panel.
BYPASS	Indicates load is supplied by utility power.
AC/DC	Indicates the utility charger circuit is working.
DC/DC	Indicates the solar charger circuit is working.

	Indicates the DC/AC inverter circuit is working.
	Indicates unit alarm is disabled.
	Indicates USB disk is connected.
	Indicates timer setting or time display

LCD Setting

General Setting

After pressing and holding "⏎" button for 3 seconds, the unit will enter the Setup Mode. Press "▲" or "▼"

button to select setting programs. Press "⏎" button to confirm you 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 energy will supply power to the loads at the same time.

		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)	10A 02 ⚙ 10 ᴬ	20A 02 ⚙ 20 ᴬ
		30A 02 ⚙ 30 ᴬ	40A 02 ⚙ 40 ᴬ
		50A 02 ⚙ 50 ᴬ	60A (default) 02 ⚙ 60 ᴬ
		70A 02 ⚙ 70 ᴬ	80A 02 ⚙ 80 ᴬ
03	AC input voltage range	Appliances (default) 03 ⚙ APL	If selected, acceptable AC input voltage range will be within 90-280VAC.
		UPS 03 ⚙ UPS	If selected, acceptable AC input voltage range will be within 170-280VAC.

05	Battery type	AGM (default) 05 ⚙ AGn	Flooded 05 ⚙ FLd
		User-Defined 05 ⚙ USE	If "User-Defined" is selected, battery charge voltage and low DC cut-off voltage can be set up in program 26, 27 and 29.
		Pylontech battery 05 ⚙ PYL	If selected, programs of 02, 26, 27 and 29 will be automatically set up. No need for further setting.
06	Auto restart when overload occurs	Restart disable (default) 06 ⚙ Lrd	Restart enable 06 ⚙ LrE
07	Auto restart when over temperature occurs	Restart disable (default) 07 ⚙ trd	Restart enable 07 ⚙ trE
09	Output frequency	50Hz (default) 09 ⚙ 50ₕ	60Hz 09 ⚙ 60ₕ
10	Output voltage	220V 10 ⚙ 220ᵥ	230V (default) 10 ⚙ 230ᵥ
		240V 10 ⚙ 240ᵥ	

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 ⚙ Utl 2 A	10A 11 ⚙ Utl 10 A
		20A 11 ⚙ Utl 20 A	30A (default) 11 ⚙ Utl 30 A
		40A 11 ⚙ Utl 40 A	50A 11 ⚙ Utl 50 A
		60A 11 ⚙ Utl 60 A	70A 11 ⚙ Utl 70 A
		80A 11 ⚙ Utl 80 A	
12	Setting voltage point back to utility source when selecting "SBU" (SBU priority) in program 01.	24V model:	
		22.0V 12 ⚙ BATT 220 V	22.5V 12 ⚙ BATT 225 V
		23.0V (default) 12 ⚙ BATT 230 V	23.5V 12 ⚙ BATT 235 V

		24.0V `I2` ⚙ BATT `240`v	24.5V `I2` ⚙ BATT `245`v
		25.0V `I2` ⚙ BATT `250`v	25.5V `I2` ⚙ BATT `255`v
		48V model:	
		44V `I2` ⚙ BATT `44`v	45V `I2` ⚙ BATT `45`v
		46V (default) `I2` ⚙ BATT `46`v	47V `I2` ⚙ BATT `47`v
		48V `I2` ⚙ BATT `48`v	49V `I2` ⚙ BATT `49`v
		50V `I2` ⚙ BATT `50`v	51V `I2` ⚙ BATT `5 l`v
13	Setting voltage point back to battery mode when selecting "SBU" (SBU priority) in program 01.	24V model:	
		Battery fully charged `I3` ⚙ BATT `FUL`v	24V `I3` ⚙ BATT `240`v

		24.5V **13** ⚙ **BATT** **24.5**v	25V **13** ⚙ **BATT** **25.0**v
		25.5V **13** ⚙ **BATT** **25.5**v	26V **13** ⚙ **BATT** **26.0**v
		26.5V **13** ⚙ **BATT** **26.5**v	27V (default) **13** ⚙ **BATT** **27.0**v
		27.5V **13** ⚙ **BATT** **27.5**v	28V **13** ⚙ **BATT** **28.0**v
13	Setting voltage point back to battery mode when selecting "SBU" (SBU priority) in program 01.	28.5V **13** ⚙ **BATT** **28.5**v	29V **13** ⚙ **BATT** **29.0**v
		29.5V **13** ⚙ **BATT** **29.5**v	30V **13** ⚙ **BATT** **30.0**v
		30.5V **13** ⚙ **BATT** **30.5**v	31V **13** ⚙ **BATT** **31.0**v
		48V model:	

		Battery fully charged	48V
		13 ⚙	13 ⚙
		BATT FUL v	**BATT** 48 v
		49V	50V
		13 ⚙	13 ⚙
		BATT 49 v	**BATT** 50 v
		51V	52V
		13 ⚙	13 ⚙
		BATT 51 v	**BATT** 52 v
		53V	54V (default)
		13 ⚙	13 ⚙
		BATT 53 v	**BATT** 54 v

13	Setting voltage point back to battery mode when selecting "SBU" (SBU priority) in program 01.	55V `13` ⚙ **BATT** `55`ᵥ	56V `13` ⚙ **BATT** `56`ᵥ
		57V `13` ⚙ **BATT** `57`ᵥ	58V `13` ⚙ **BATT** `58`ᵥ
		59V `13` ⚙ **BATT** `59`ᵥ	60V `13` ⚙ **BATT** `60`ᵥ
		61V `13` ⚙ **BATT** `61`ᵥ	62V `13` ⚙ **BATT** `62`ᵥ
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 `16` ⚙ `CSO`	Solar energy will charge battery as first priority. Utility will charge battery only when solar energy 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, only solar energy can charge battery. Solar energy will charge battery if it's available and sufficient.	
18	Alarm control	Alarm on (default) 18 ⚙ bON	Alarm off 18 ⚙ bOF
19	Auto return to default display screen	Return to default display screen (default) 19 ⚙ ESP	If selected, no matter how users switch display screen, it will automatically return to default display screen (Input voltage /output voltage) after no button is pressed for 1 minute.
		Stay at latest screen 19 ⚙ HEP	If selected, the display screen will stay at latest screen user finally switches.
20	Backlight control	Backlight on (default) 20 ⚙ LON	Backlight off 20 ⚙ LOF
22	Beeps while primary source is interrupted	Alarm on (default) 22 ⚙ AON	Alarm off 22 ⚙ AOF
23	Overload bypass: When enabled, the unit will transfer to line mode if overload occurs in battery mode.	Bypass disable (default) 23 ⚙ bYd	Bypass enable 23 ⚙ bYE

25	Record Fault code	Record enable (default) 25 ⚙ FEN	Record disable 25 ⚙ FdS
26	Bulk charging voltage (C.V voltage)	24V model default: 28.2V 26 ⚙ CV 28.2 BATT V	48V model default: 56.4V 26 ⚙ CV 56.4 BATT V
		If self-defined is selected in program 5, this program can be set up. Setting range is from 25.0V to 31.0V for 24V model and 48.0V to 62.0V for 48V model. Increment of each click is 0.1V.	
27	Floating charging voltage	24V model default: 27.0V 27 ⚙ FLV 27.0 BATT V	48V model default: 54.0V 27 ⚙ FLV 54.0 BATT V
		If self-defined is selected in program 5, this program can be set up. Setting range is from 25.0V to 31.0V for 24V model and 48.0V to 62.0V for 48V model. Increment of each click is 0.1V.	
28	AC output mode *This setting is only available when the inverter is in standby mode (Switch off).	Single: This inverter is used in single phase application. 28 ⚙ SIG	Parallel: This inverter is operated in parallel system. 28 ⚙ PAL
		L1 phase: 28 ⚙ 3P1	L2 phase: 28 ⚙ 3P2
		L3 phase: 28 ⚙ 3P3	

29	Low DC cut-off voltage: - If battery power is only power source available, inverter will shut down. - If PV energy and battery power are available, inverter will charge battery without AC output. - If PV energy, battery power and utility are all available, inverter will transfer to line mode and provide output power to loads.	24V model default: 22.0V 29 C0U 22.0v BATT	48V model default: 44.0V 29 C0U 44.0v BATT
		If self-defined is selected in program 5, this program can be set up. Setting range is from 21.0V to 24.0V for 24V model and 42.0V to 48.0V for 48V model. 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.	
30	Battery equalization	Battery equalization 30 EEN	Battery equalization disable (default) 30 EdS
		If "Flooded" or "User-Defined" is selected in program 05, this program can be set up.	
31	Battery equalization voltage	24V model default: 29.2V 31 EU 29.2v BATT	48V model default: 58.4V 31 EU 58.4v BATT
		Setting range is from 25.0V to 31.0V for 24V model and 48.0V to 62.0V for 48V model. Increment of each click is 0.1V.	
33	Battery equalized time	60min (default) 33 60	Setting range is from 5min to 900min. Increment of each click is 5min.
34	Battery equalized timeout	120min (default) 34 120	Setting range is from 5min to 900 min. Increment of each click is 5 min.
35	Equalization interval	30days (default) 35 30d	Setting range is from 0 to 90 days. Increment of each click is 1 day

36	Equalization activated immediately	Enable 36 ⚙ AEN	Disable (default) 36 ⚙ AdS
		If equalization function is enabled in program 30, this program can be set up. If "Enable" is selected in this program, it's to activate battery equalization immediately and LCD main page will shows "Eq". If "Disable" is selected, it will cancel equalization function until next activated equalization time arrives based on program 35 setting. At this time, "Eq" will not be shown in LCD main page.	
37	Reset all stored data for PV generated power and output load energy	Not reset(Default) 37 ⚙ nrt	Reset 37 ⚙ rSt
41	Maximum discharging current (only for Parallel model)	Disable (Default) 41 ⚙ ddS	If selected, the maximum discharge current limits protection is disabled. It will be protected by overload.
		30A 41 ⚙ 30	The setting range is from 30 A to 150 A. Increment of each click is 10A. Setting to limit maximum discharge current. If more current is required, the inverter will by-pass (like overload by-pass) or if no AC source is available then shut down for 5 minutes.
		150A 41 ⚙ 150	
51	On/Off control for RGB LED *It's necessary to enable this setting to activate RGB LED lighting function.	Enabled (default) 51 ⚙ LEN	Disable 51 ⚙ LdS

52	Brightness of RGB LED	Low 52 ⚙ LO	Normal (default) 52 ⚙ NOR
		High 52 ⚙ HI	
53	Lighting speed of RGB LED	Low 53 ⚙ LO	Normal (default) 53 ⚙ NOR
		High 53 ⚙ HI	
54	RGB LED effects	Scrolling 54 ⚙ SCR	Breathing 54 ⚙ bAE
		Solid on (Default) 54 ⚙ SOL	

| 55	Color combination of RGB LED to show energy source and battery charge/discharge status: • Grid-PV-Battery • Battery charge/discharge status	C01: (Default) • Violet-White-Sky blue • Pink-Honey 55 ⚙ C01	C02: • White-Yellow-Green • Royal blue-Lime yellow 55 ⚙ C02
93	Erase all data log	Not reset (Default) 93 ⚙ ∩rt	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 minutes 94 ⚙ 3 10 minutes (default) 94 ⚙ 10 30 minutes 94 ⚙ 30	5 minutes 94 ⚙ 5 20 minutes 94 ⚙ 20 60 minutes 94 ⚙ 60
95	Time setting – Minute	For minute setting, the range is from 0 to 59. 95 ⚙🕐 ∩I∩ 0	
96	Time setting – Hour	For hour setting, the range is from 0 to 23. 96 ⚙🕐 HOU 0	

97	Time setting– Day	For day setting, the range is from 1 to 31. 97 ⚙🕐 dAY 1
98	Time setting– Month	For month setting, the range is from 1 to 12. 98 ⚙🕐 nOn 1
99	Time setting – Year	For year setting, the range is from 17 to 99. 99 ⚙🕐 YEA 19

Function Setting

There are three function keys on the display panel to implement special functions such as USB OTG, Timer setting for output source priority and timer setting for charger source priority.

1. USB Function Setting

Insert an OTG USB disk into the USB port (🔌). Press and hold "🔌/⏻" button for 3 seconds to enter USB Setup 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 "🔌/⏻" button for 3 seconds to enter USB function setting mode.	UPG ⚙ 💾 SEt LOG
Step 2: Press "🔌/⏻", "⏻📷" or "⏻⚡" button to enter the selectable setting programs (detail descriptions in Step 3)..	

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

| Program#	Operation Procedure	LCD Screen
🔌/⏻: Upgrade firmware	This function is to upgrade inverter firmware. If firmware upgrade is needed, please check with your dealer or installer for detail instructions.	
⏻📷: Re-write internal parameters	This function is to over-write all parameter settings (TEXT file) with settings in the On-The-Go USB disk from a previous setup or to duplicate inverter settings. Please check with your dealer or installer for detail instructions.	

	By pressing "⚡" button to export data log from USB disk to the inverter. If the selected function is ready, LCD will display "Ⱶd�". Press "/button to confirm the selection again.	LOG ⚙ ⬡ ⱵdY
⚡: Export data log	● Press "" button to select "Yes", LED 1 will flash once every second during the process. It will only display LOG and all LEDs will be on after this action is complete. Then, press "/button to return to main screen. ● Or press "⚡" button to select "No" to return to main screen.	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 copy.
U03	Document inside the USB disk with wrong format.

If any error occurs, error code will only show 3 seconds. After three seconds, it will automatically return to display screen.

2. Timer Setting for Output Source Priority

This timer setting is to set up the output source priority per day.

Procedure	LCD Screen
Step 1: Press and hold "" button for 3 seconds to enter Timer Setup Mode for output source priority.	USb ⚙ SUb SbU
Step 2: Press "/", "" or "⚡" button to enter the selectable programs (detail descriptions in Step 3).	

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

Program#	Operation Procedure	LCD Screen
/⏻	Press "/" button to set up Utility First Timer. Press "" button to select staring time. Press "▲" or "▼" button to adjust values and press "↵" to confirm. Press "⚡" button to select end time. Press "▲" or "▼" button to adjust values, press "↵" button to confirm. The setting values are from 00 to 23, with 1-hour increment.	USb ⚙ 00 23

⊟▣	Press "⊟▣" button to set up Solar First Timer. Press "⊟▣" button to select staring time. Press "▲" or "▼" button to adjust values and press "←" to confirm. Press "⊟⚡" button to select end time. Press "▲" or "▼" button to adjust values, press "←" button to confirm. The setting values are from 00 to 23, with 1-hour increment.	**SUb** ⚙ **00** **23**
⊟⚡	Press "⊟⚡" button to set up SBU Priority Timer. Press "⊟▣" button to select staring time. Press "▲" or "▼" button to adjust values and press "←" to confirm. Press "⊟⚡" button to select end time. Press "▲" or "▼" button to adjust values, press "←" button to confirm. The setting values are from 00 to 23, with 1-hour increment.	**SbU** ⚙ **00** **23**

Press "▣/⏻" button to exit the Setup Mode.

3. Timer Setting for the Charger Source Priority

This timer setting is to set up the charger source priority per day.

Procedure	LCD Screen
Step 1: Press and hold "⊟⚡" button for 3 seconds to enter Timer Setup Mode for charging source priority.	**CSO** ⚙ **SNU** **OSO**
Step 2: Press "▣/⏻", "⊟▣" or "⊟⚡" button to enter the selectable programs (detail descriptions in Step 3).	

Step 3: Please select setting program by following each procedure.
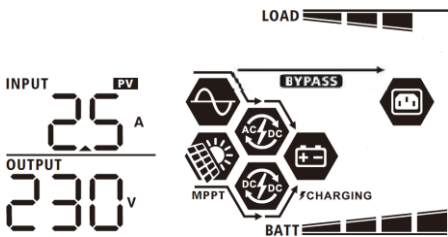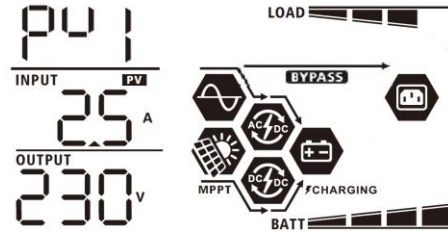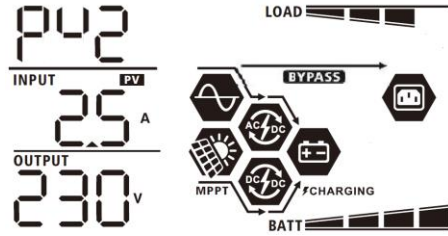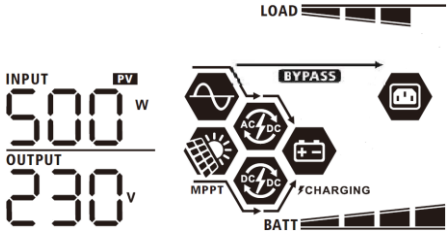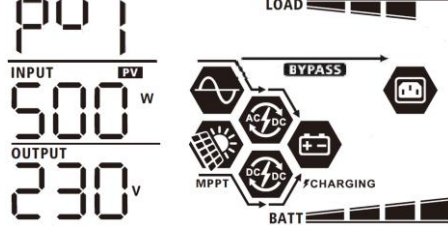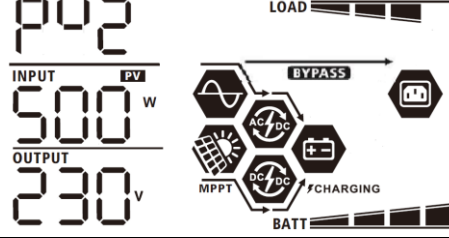
Program#	Operation Procedure	LCD Screen
▣/⏻	Press "▣/⏻" button to set up Solar First Timer. Press "⊟▣" button to select staring time. Press "▲" or "▼" button to adjust values and press "←" to confirm. Press "⊟⚡" button to select end time. Press "▲" or "▼" button to adjust values, press "←" button to confirm. The setting values are from 00 to 23, with 1-hour increment.	**CSO** ⚙ **00** **23**
⊟▣	Press "⊟▣" button to set up Solar & Utility Timer. Press "⊟▣" button to select staring time. Press "▲" or "▼" button to adjust values and press "←" to confirm. Press "⊟⚡" button to select end time. Press "▲" or "▼" button to adjust values, press "←" button to confirm. The setting values are from 00 to 23, with 1-hour increment.	**SNU** ⚙ **00** **23**
⊟⚡	Press "⊟⚡" button to set up Solar Only Timer. Press "⊟▣" button to select staring time. Press "▲" or "▼" button to adjust values and press "←" to confirm. Press "⊟⚡" button to select end time. Press "▲" or "▼" button to adjust values, press "←" button to confirm. The setting values are from 00 to 23, with 1-hour increment.	**OSO** ⚙ **00** **23**
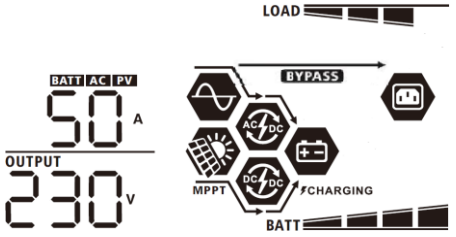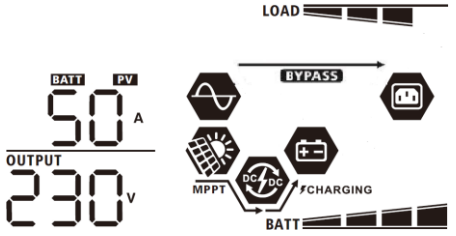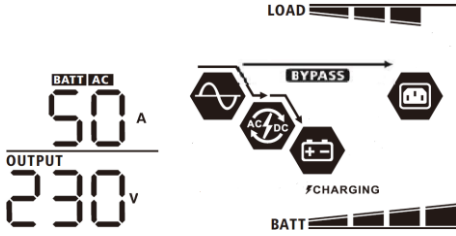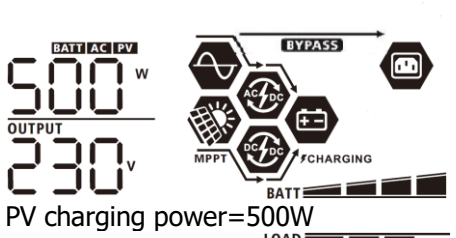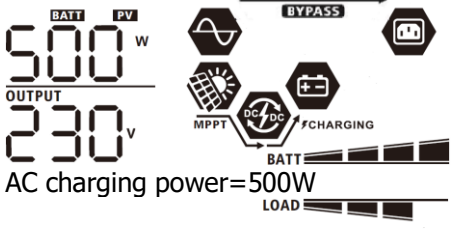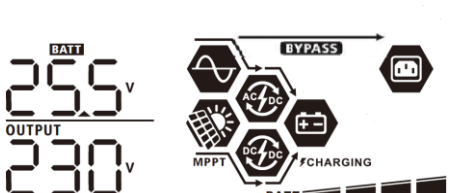
Press "▣/⏻" button to exit the Setup Mode.
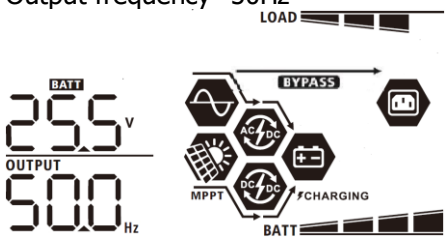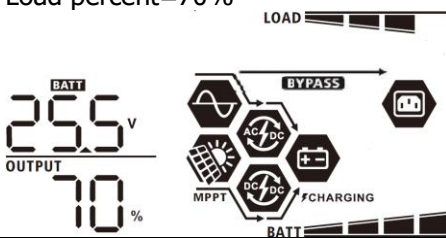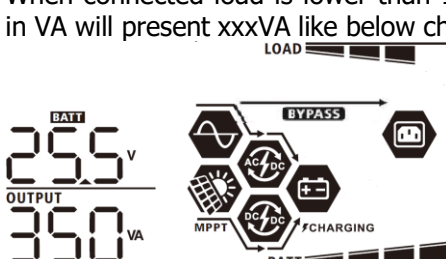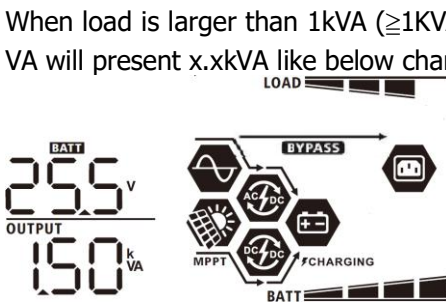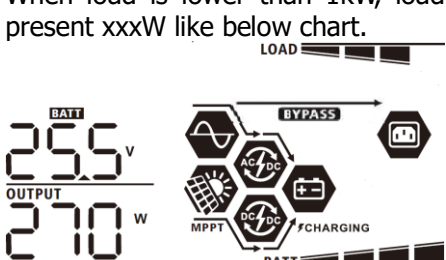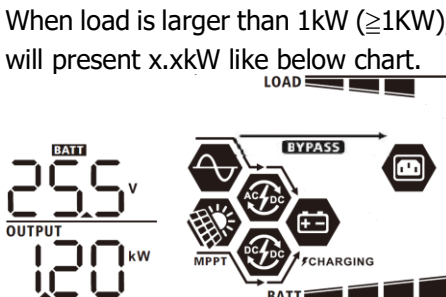
LCD Display
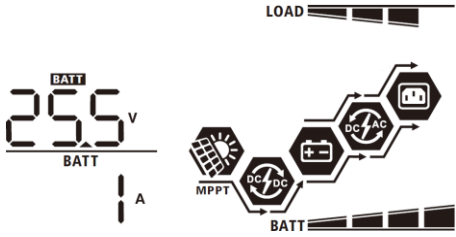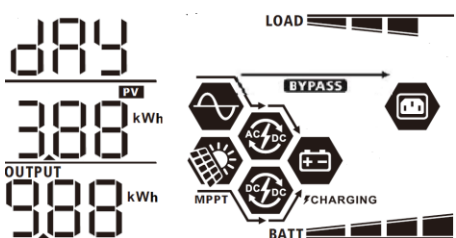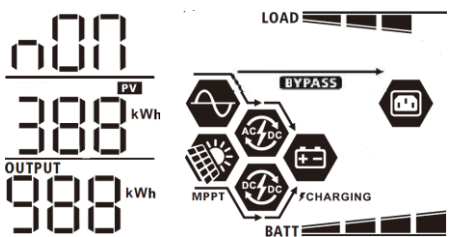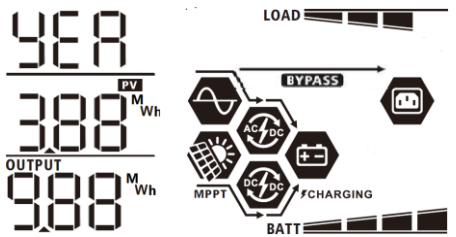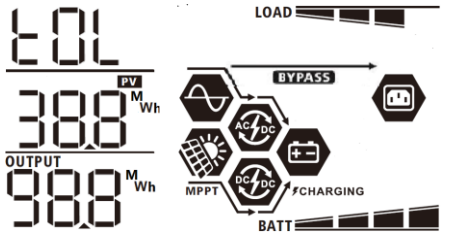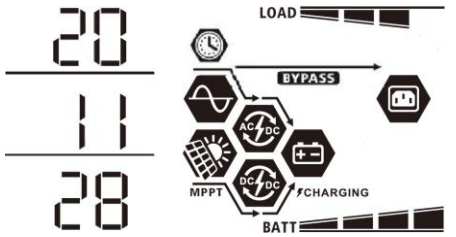
The LCD display information will be switched in turn by pressing the "UP" or "DOWN" button. The selectable information is switched as the following table in order.
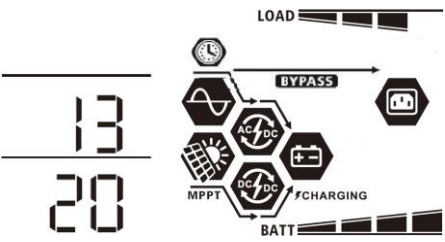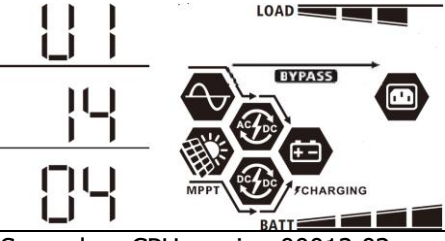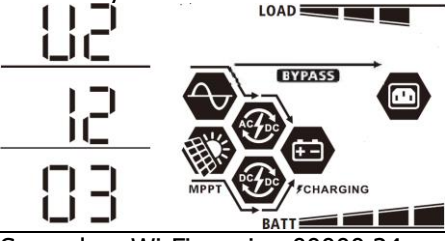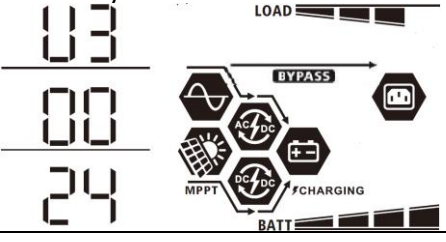
Selectable information	LCD display
Input voltage/Output voltage (Default Display Screen)	Input Voltage=230V, output voltage=230V
Input frequency	Input frequency=50Hz
PV voltage	PV voltage=260V PV1 voltage=260V (dual input model) PV2 voltage=260V (dual input model)

PV current	PV current = 2.5A
	PV1 current = 2.5A (dual input model)
	PV2 current = 2.5A (dual input model)
PV power	PV power = 500W
	PV1 power = 500W (dual input model)
	PV2 power = 500W (dual input model)
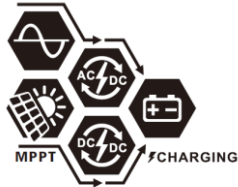
Charging current	AC and PV charging current=50A PV charging current=50A AC charging current=50A
Charging power	AC and PV charging power=500W PV charging power=500W AC charging power=500W
Battery voltage and output voltage	Battery voltage=25.5V, output voltage=230V
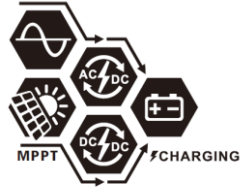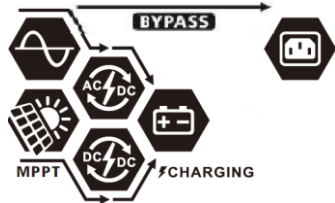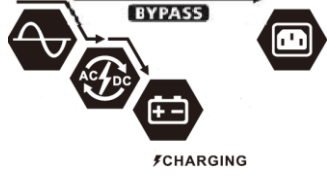
Output frequency	Output frequency=50Hz
Load percentage	Load percent=70%
Load in VA	When connected load is lower than 1kVA, load in VA will present xxxVA like below chart. When load is larger than 1kVA (≥1KVA), load in VA will present x.xkVA like below chart.
Load in Watt	When load is lower than 1kW, load in W will present xxxW like below chart. When load is larger than 1kW (≥1KW), load in W will present x.xkW like below chart.
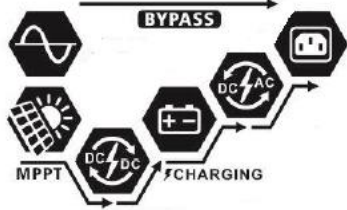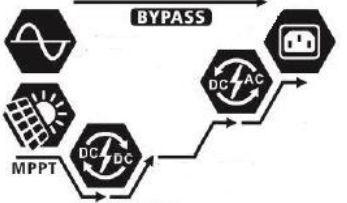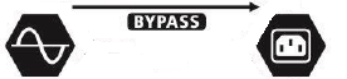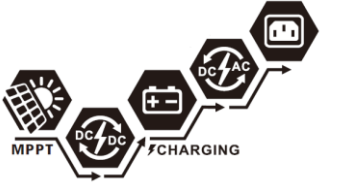
Battery voltage/DC discharging current	Battery voltage=25.5V, discharging current=1A 25.5V 1 A
PV energy generated today and Load output energy today	This PV Today energy = 3.88kWh, Load Today energy= 9.88kWh. dAY 388 kWh 988 kWh
PV energy generated this month and Load output energy this month.	This PV month energy = 388kWh, Load month energy= 988kWh. nON 388 kWh 988 kWh
PV energy generated this year and Load output energy this year.	This PV year energy = 3.88MWh, Load year energy = 9.88MWh. YER 388 MWh 988 MWh
PV energy generated totally and Load output total energy.	PV Total energy = 38.8MWh, Load Output Total energy = 98.8MWh. tOL 388 MWh 988 MWh
Real date.	Real date Nov 28, 2020. 20 11 28

Real time.	Real time 13:20.
Main CPU version checking.	Main CPU version 00014.04.
Secondary CPU version checking.	Secondary CPU version 00012.03.
Secondary Wi-Fi version checking.	Secondary Wi-Fi version 00000.24.

Operating Mode Description

Operation mode	Description	LCD display
Standby mode **Note:** *Standby mode: The inverter is not turned on yet but at this time, the inverter can charge battery without AC output.	No output is supplied by the unit but it still can charge batteries.	Charging by utility and PV energy.
		Charging by utility.
		Charging by PV energy.

| | | No charging. |
| | | Charging by utility and PV energy. |

Operation mode	Description	LCD display
		Charging by utility and PV energy.
Fault mode Note: *Fault mode: Errors are caused by inside circuit error or external reasons such as over temperature, output short circuited and so on.	PV energy and utility can charge batteries.	Charging by utility.
		Charging by PV energy.
		No charging.
Line Mode	The unit will provide output power from the mains. It will also charge the battery at line mode.	Charging by utility and PV energy.
		Charging by utility.
		If "SUB" (solar first) is selected as output source priority and solar energy is not sufficient to provide the load, solar energy and the utility will provide the loads and charge the battery at the same time.

peration mode	Description	LCD display
Line Mode	The unit will provide output power from the mains. It will also charge the battery at line mode.	If either "SUB" (solar first) or "SBU" is selected as output source priority and battery is not connected, solar energy and the utility will provide the loads.
		Power from utility.
Battery Mode	The unit will provide output power from battery and/or PV power.	Power from battery and PV energy.
		PV energy will supply power to the loads and charge battery at the same time. No utility is available.
		Power from battery only.
		Power from PV energy only.
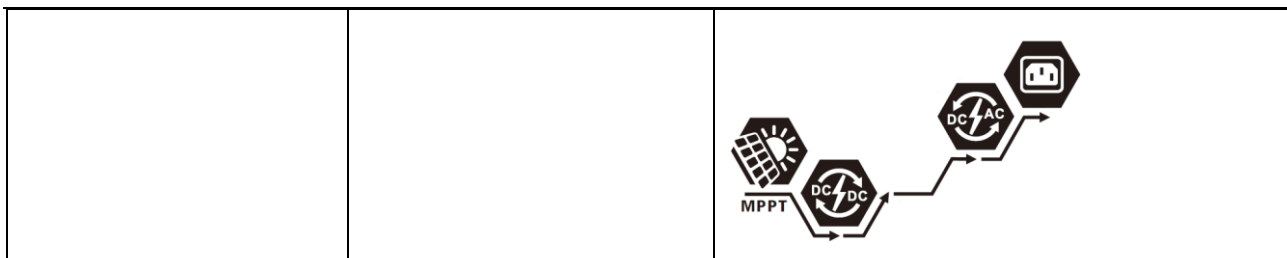
Faults Reference Code

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.	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
13	Battery discharge over current	F13
51	Over current	F51
52	Bus voltage is too low	F52
53	Inverter soft start failed	F53
55	Over DC voltage in AC output	F55
57	Current sensor failed	F57
58	Output voltage is too low	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 ⚠ LOAD
10	Output power derating	Beep twice every 3 seconds	10 ⚠
15	PV energy is low.	Beep twice every 3 seconds	15 ⚠
16	High AC input (>280VAC) during BUS soft start	None	16 ⚠
32	Communication failure between inverter and remote display panel	None	32 ⚠
E9	Battery equalization	None	E9 ⚠
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.
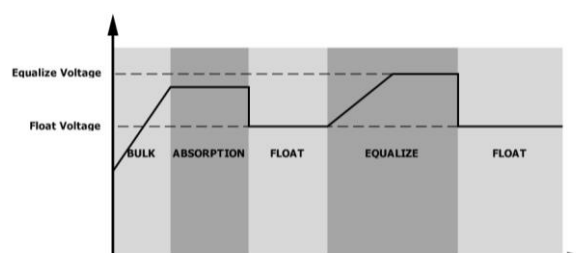
● **Equalize charging time and timeout**

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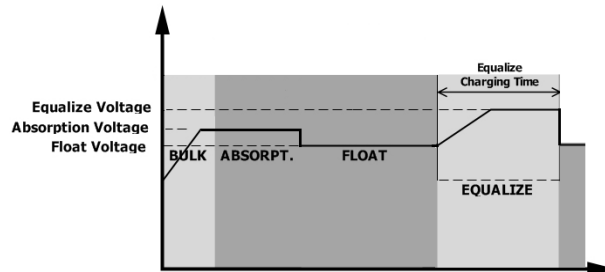
However, in Equalize stage, when battery equalized time is expired and battery voltage doesn't rise to battery equalization voltage point, the charge controller will extend the battery equalized time until battery voltage achieves battery equalization voltage. If battery voltage is still lower than battery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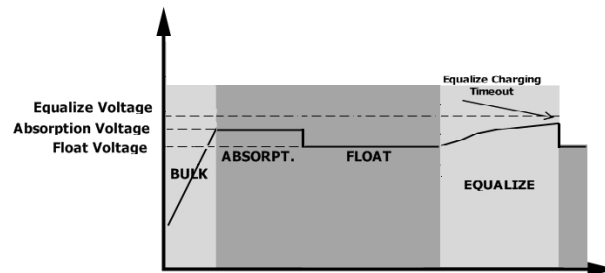
SPECIFICATIONS

Table 1 Line Mode Specifications

MODEL	3.6KW	7.2KW
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	
Max AC Input Current	40A	60A
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)
Output power de-rating: When AC input voltage under 170V the output power will be de-rated.	

Table 2 Inverter Mode Specifications

MODEL	3.6KW	7.2KW
Rated Output Power	3600W	7200W
Output Voltage Waveform	Pure Sine Wave	
Output Voltage Regulation	230Vac±5%	
Output Frequency	60Hz or 50Hz	
Peak Efficiency	91%	93%
Overload Protection	100ms@≥205% load;5s@≥150% load; 10s@110%~150% load	
Surge Capacity	2* rated power for 5 seconds	
Nominal DC Input Voltage	24Vdc	48Vdc
Cold Start Voltage	23.0Vdc	46.0Vdc
Low DC Warning Voltage @ load < 20% @ 20% ≤ load < 50% @ load ≥ 50%	23.0Vdc 21.4Vdc 20.2Vdc	46.0Vdc 42.8Vdc 40.4Vdc
Low DC Warning Return Voltage @ load < 20% @ 20% ≤ load < 50% @ load ≥ 50%	24.0Vdc 22.4Vdc 21.2Vdc	48.0Vdc 44.8Vdc 42.4Vdc
Low DC Cut-off Voltage @ load < 20% @ 20% ≤ load < 50% @ load ≥ 50%	22.0Vdc 20.4Vdc 19.2Vdc	44.0Vdc 40.8Vdc 38.4Vdc

High DC Recovery Voltage	32Vdc	64Vdc
High DC Cut-off Voltage	33Vdc	66Vdc
DC Voltage Accuracy	+/-0.3%V@ no load	
THDV	<5% for linear load,<10% for non-linear load @ nominal voltage	
DC Offset	≦100mV	

Table 3 Charge Mode Specifications

Utility Charging Mode			
MODEL		**3.6KW**	**7.2KW**
Charging Current (UPS) @ Nominal Input Voltage		80A	
Bulk Charging Voltage	**Flooded Battery**	29.2	58.4
	AGM / Gel Battery	28.8	57.6
Floating Charging Voltage		27.6Vdc	55.2Vdc
Overcharge Protection		33Vdc	66Vdc
Charging Algorithm		3-Step	
Charging Curve			

Solar Input		
MODEL	**3.6KW**	**7.2KW**
Rated Power	4000W	5000W
Max. PV Array Open Circuit Voltage	500Vdc	500Vdc
PV Array MPPT Voltage Range	90Vdc~450Vdc	90Vdc~450Vdc
Max. Input Current	18A	18A*2 (Max. 30A)
Start-up Voltage	80V +/- 5Vdc	80V +/- 5Vdc

Power Limitation	
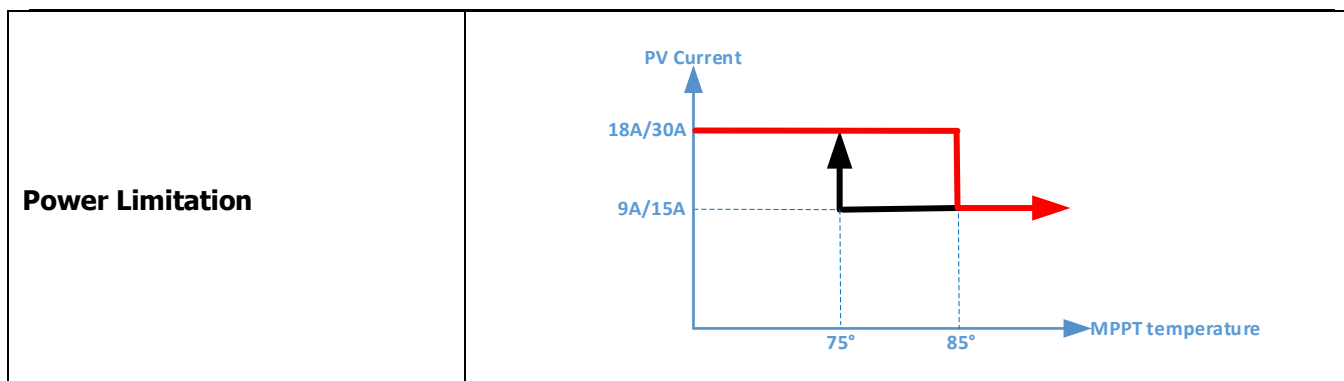
Table 4 General Specifications

MODEL	3.6KW	7.2KW
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	147.4x 432.5 x 553.6	
Net Weight, kg	14.1	18.4

Table 5 Parallel Specifications (Parallel model only)

Max parallel numbers	6
Circulation Current under No Load Condition	Max 2A
Power Unbalance Ratio	<5% @ 100% Load
Parallel communication	CAN
Transfer time in parallel mode	Max 50ms
Parallel Kit	YES

Note: Parallel feature will be disabled when only PV power is available

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.

Problem	LCD/LED/Buzzer	Explanation / Possible cause	What to do
Mains exist but the unit works in battery mode.	Input voltage is displayed as 0 on the LCD and green LED is flashing.	Input protector is tripped	Check if AC breaker is tripped and AC wiring is connected well.
	Green LED is flashing.	Insufficient quality of AC power. (Shore or Generator)	1. Check if AC wires are too thin and/or too long. 2. Check if generator (if applied) is working well or if input voltage range setting is correct. (UPS→Appliance)
	Green LED is flashing.	Set "Solar First" as the priority of output source.	Change output source priority to Utility first.
When the unit is turned on, internal relay is switched on and off repeatedly.	LCD display and LEDs are flashing	Battery is disconnected.	Check if battery wires are connected well.
Buzzer beeps continuously and red LED is on.	Fault code 07	Overload error. The inverter is overload 110% and time is up.	Reduce the connected load by switching off some equipment.
	Fault code 05	Output short circuited.	Check if wiring is connected well and remove abnormal load.
		Temperature of internal converter component is over 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.	
	Fault code 56	Battery is not connected well or fuse is burnt.	If the battery is connected well, please return to repair center.

Appendix I: Parallel function (Only for Parallel mode)

1. Introduction

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

1. Parallel operation in single phase is with up to 6 units. The supported maximum output power for 7.2KW model is 43.2KW/43.2KVA and for 3.6KW is 21.6KW/21.6KVA.

2. Maximum six units work together to support three-phase equipment. Maximum four units support one phase.

2. Mounting the Unit

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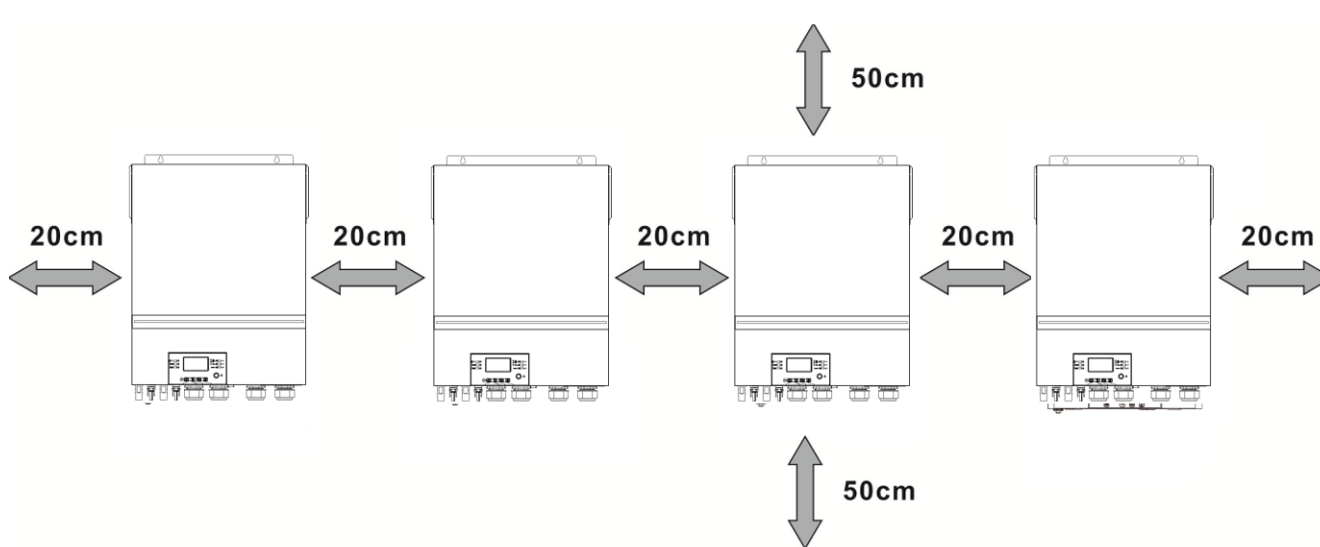
NOTE: For proper air circulation to dissipate heat, allow a clearance of approx. 20 cm to the side and approx. 50 cm above and below the unit. Be sure to install each unit in the same level.

3. Wiring Connection

The cable size of each inverter is shown as below:

Recommended battery cable and terminal size for each inverter:

Ring terminal:

Wire Size	Cable mm^2	Ring Terminal Dimensions		Torque value
		D (mm)	L (mm)	
1*1/0AWG	60	6.4	33.2	5 Nms
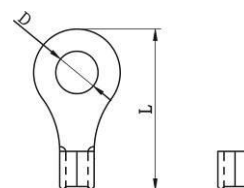
WARNING: Be sure the length of all battery cables is the same. Otherwise, there will be voltage difference between inverter and battery to cause parallel inverters not working.

Recommended AC input and output cable size for each inverter:

Model	AWG no.	Torque
3.6KW	12 AWG	1.2~ 1.6 Nm
7.2KW	8 AWG	1.4~ 1.6 Nm

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.

Recommended breaker specification of battery for each inverter:

Model	1 unit*
3.6KW	250A/40VDC
7.2KW	250A/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
3.6KW	60A/230VAC	90A/230VAC	120A/230VAC	150A/230VAC	180A/230VAC
7.2KW	160A/230VAC	240A/230VAC	320A/230VAC	400A/230VAC	480A/230VAC

Note1: Also, you can use 50A breaker for 3KW/5KW 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.

4-1. Parallel Operation in Single phase

Two inverters in parallel:
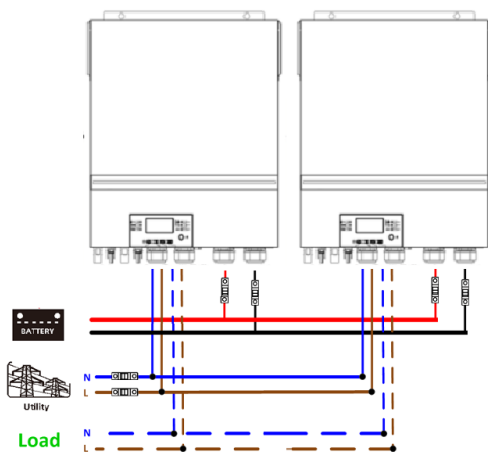
Power Connection

Communication Connection
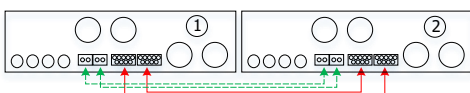
Three inverters in parallel:
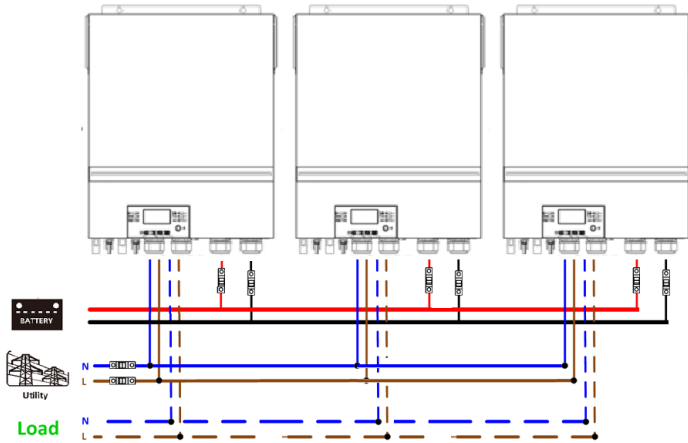
Power Connection

Communication Connection
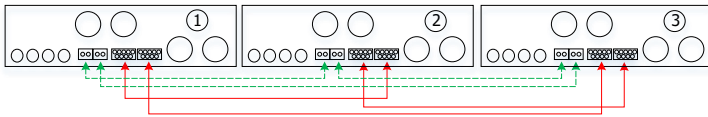
Four inverters in parallel:
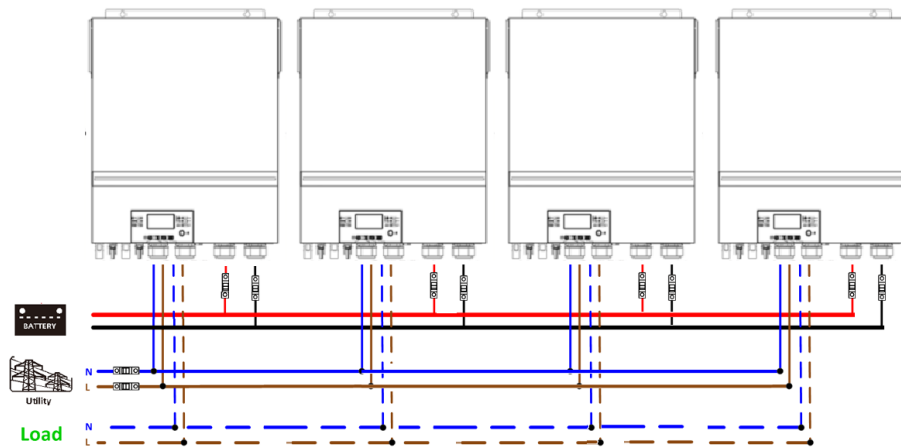
Power Connection

Communication Connection
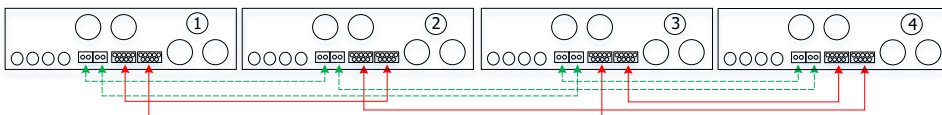
Five inverters in parallel:
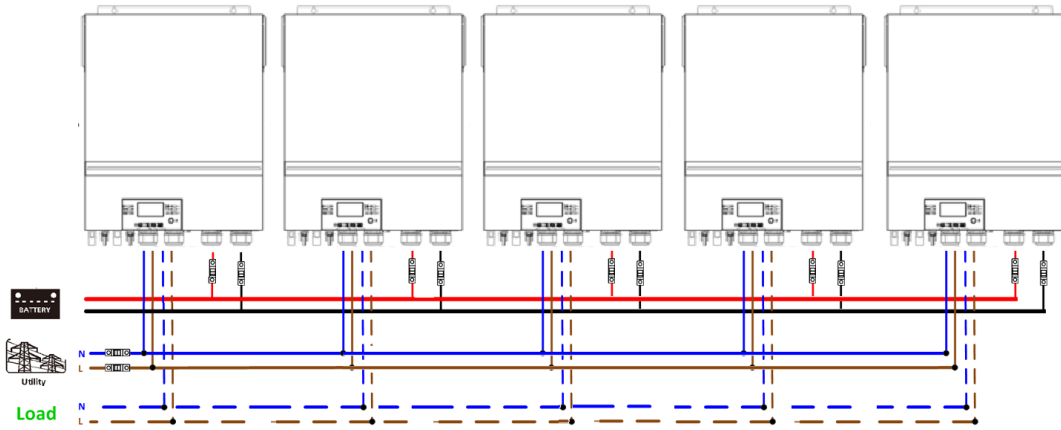
Power Connection

Communication Connection
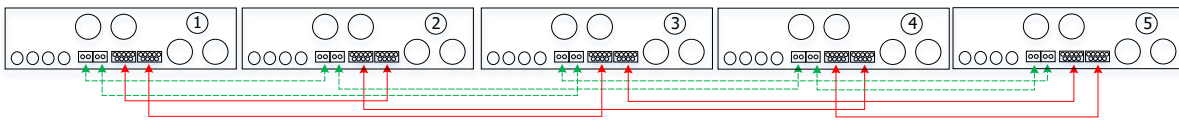
Six inverters in parallel:
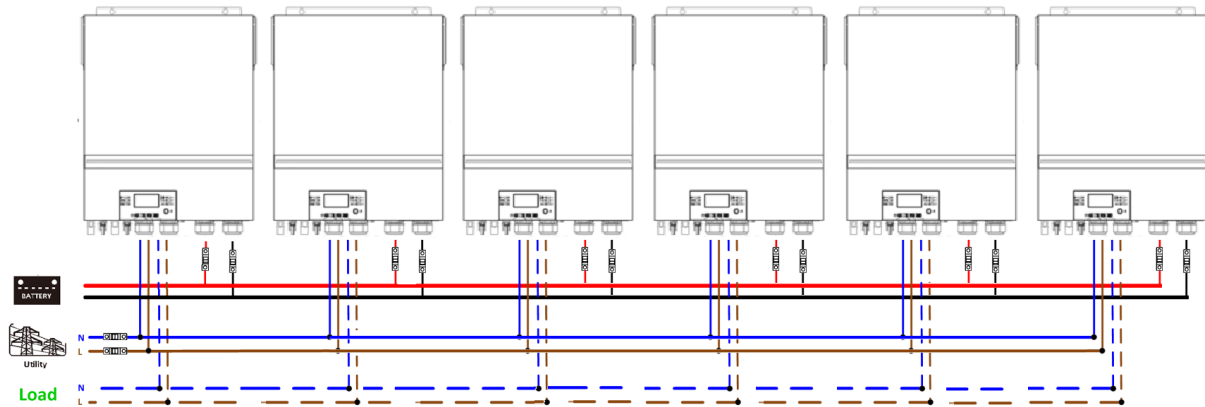
Power Connection

Communication Connection
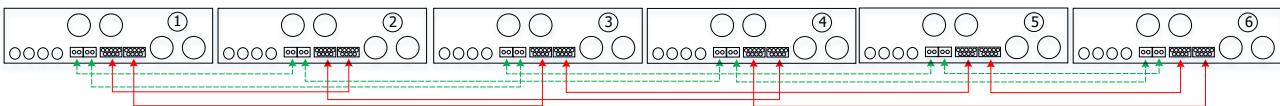
4-2. Support 3-phase equipment

Two inverters in each phase:

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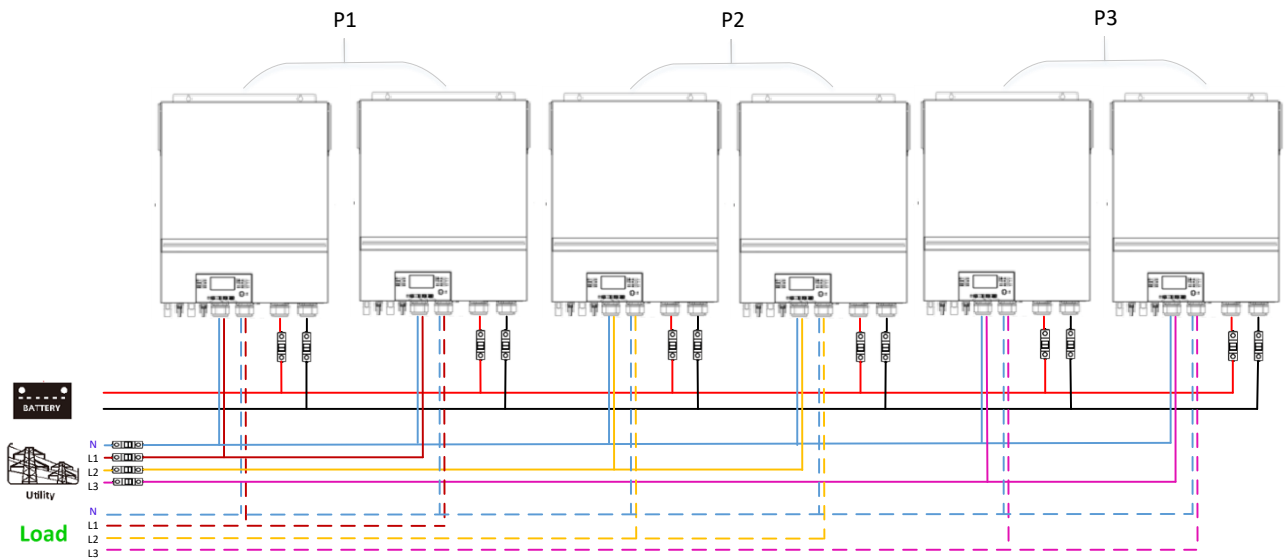
Communication Connection
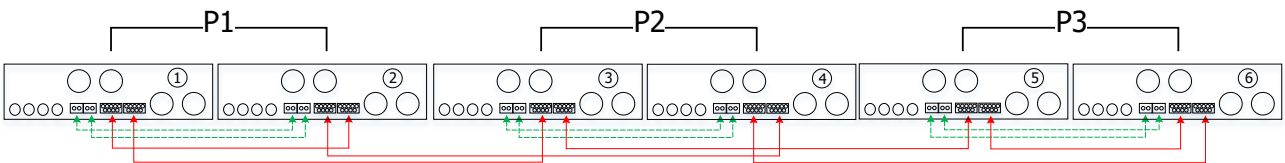
Four inverters in one phase and one inverter for the other two phases:

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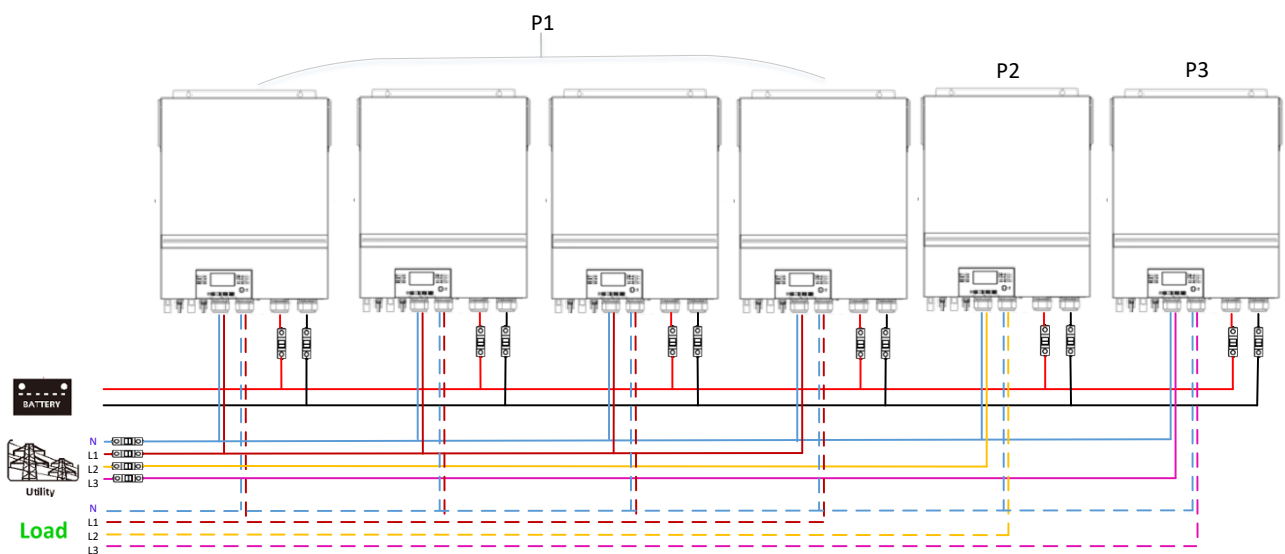
Communication Connection
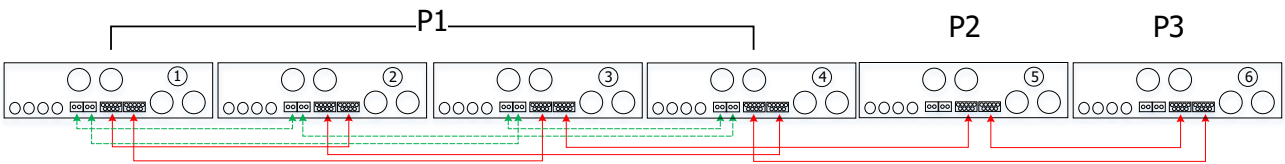
Three inverters in one phase, two inverters in second phase and one inverter for the third phase:

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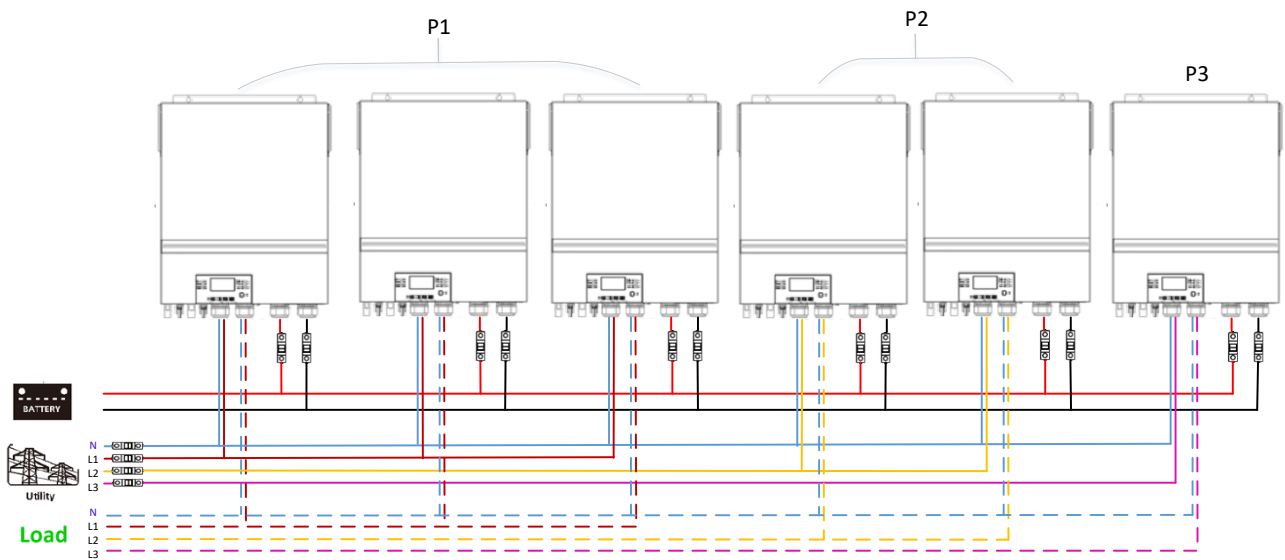
Communication Connection
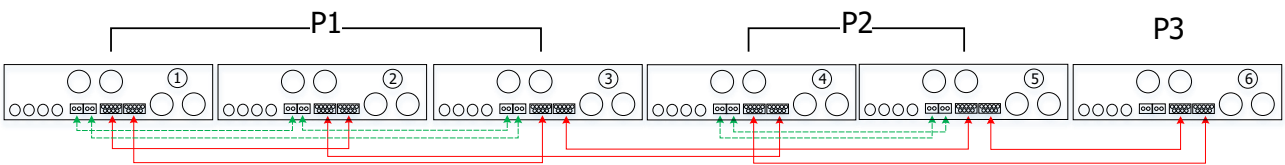
Three inverters in one phase and only one inverter for the remaining two phases:

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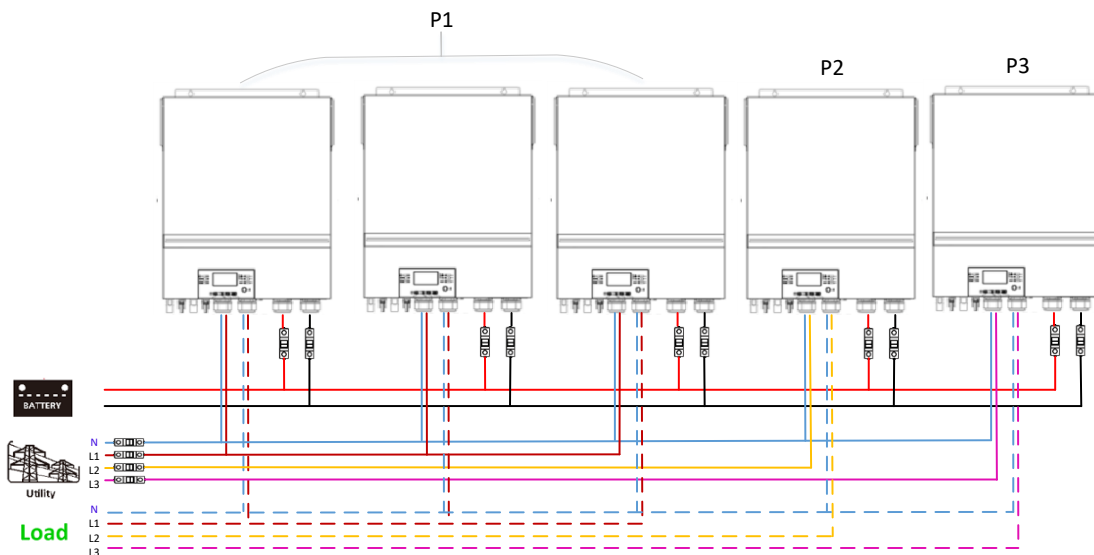
Communication Connection
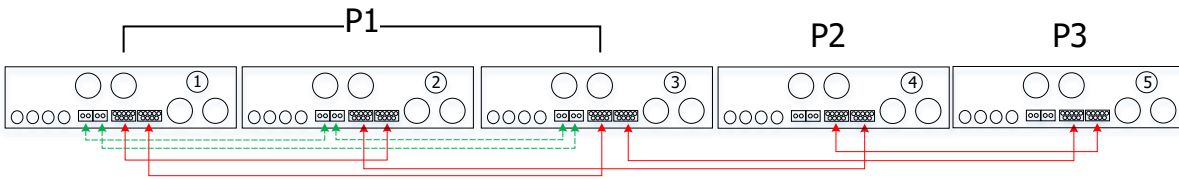
Two inverters in two phases and only one inverter for the remaining phase:

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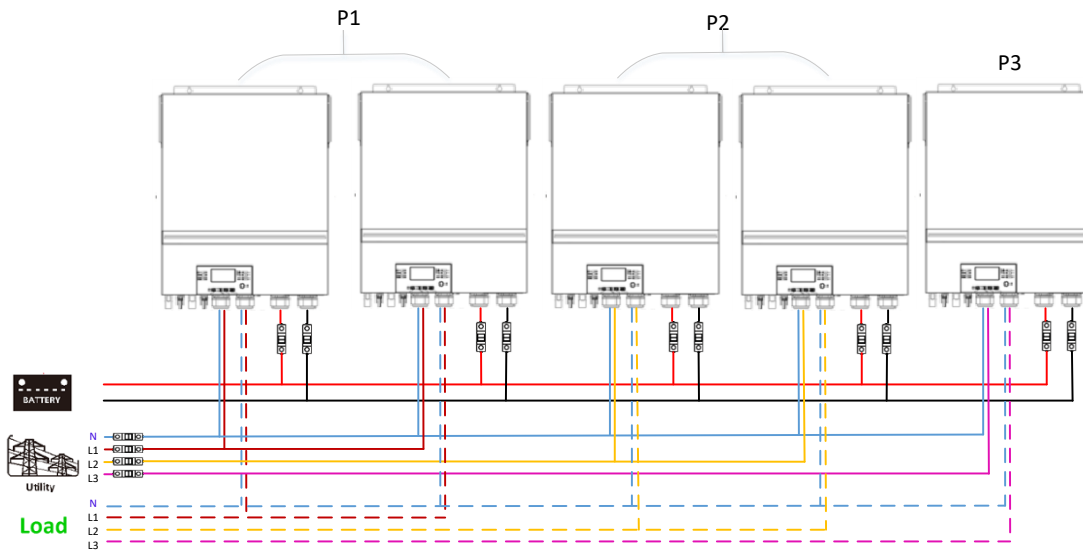
Communication Connection
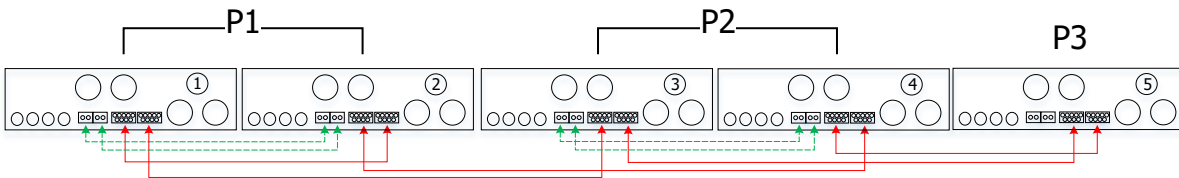
Two inverters in one phase and only one inverter for the remaining phases:

Power Connection

Communication Connection

P1 P2 P3
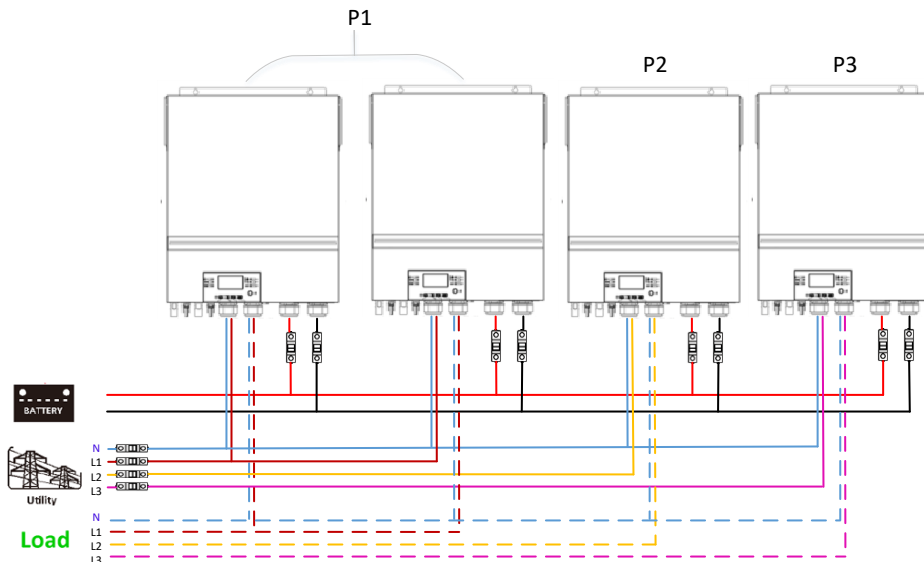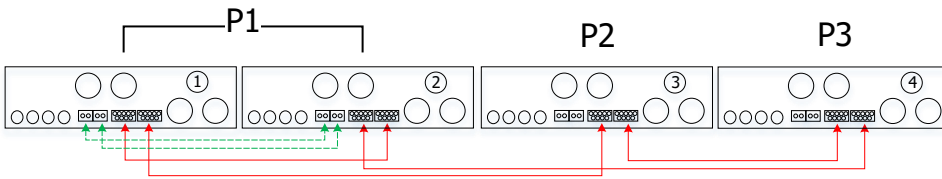
One inverter in each phase:

Power Connection

P1 P2 P3

Communication Connection

P1 P2 P3
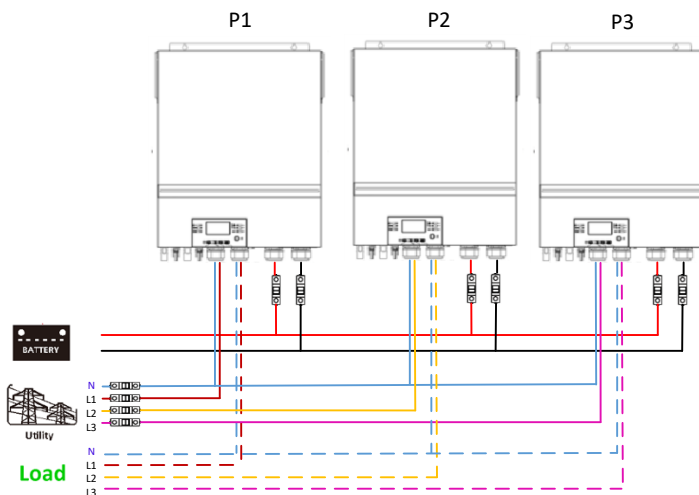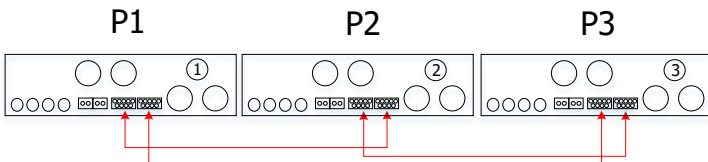
WARNING: Do not connect the current sharing cable between the inverters which are in different phases. Otherwise, it may damage the inverters.

5. PV Connection

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

CAUTION: Each inverter should connect to PV modules separately.

6. LCD Setting and Display

Setting Program:

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

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

Code Reference:

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

7. Commissioning

Parallel in single phase

Step 1: Check the following requirements before commissioning:

● Correct wire connection

● Ensure all breakers in Line wires of load side are open and each Neutral wires of each unit are connected together.

Step 2: Turn on each unit and set "PAL" in LCD setting program 28 of each unit. And then shut down all units.
NOET: It's necessary to turn off switch when setting LCD program. Otherwise, the setting cannot be programmed.

Step 3: Turn on each unit.

LCD display in Master unit	LCD display in Slave unit
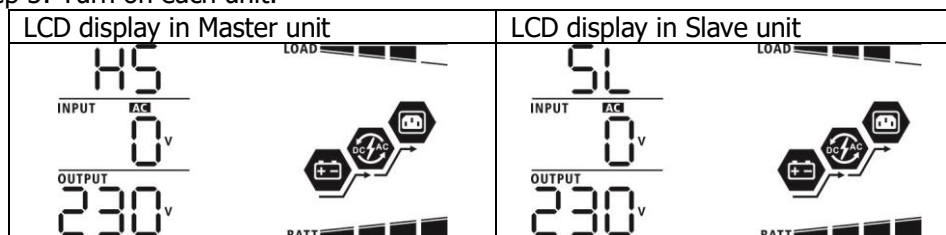
NOTE: Master and slave units are randomly defined.

Step 4: Switch on all AC breakers of Line wires in AC input. It's better to have all inverters connect to utility at the same time. If not, it will display fault 82 in following-order inverters. However, these inverters will automatically restart. If detecting AC connection, they will work normally.

LCD display in Master unit	LCD display in Slave unit
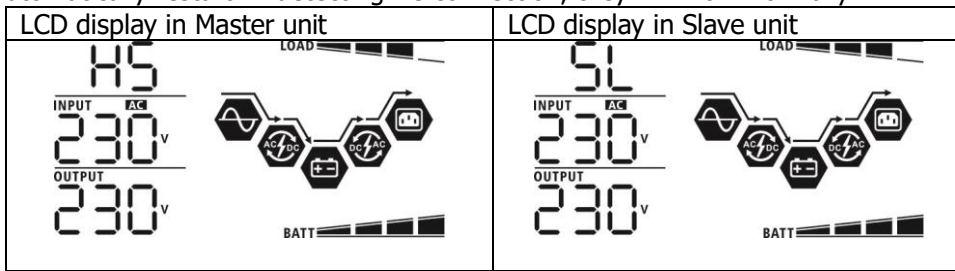
Step 5: If there is no more fault alarm, the parallel system is completely installed.

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

Support three-phase equipment
Step 1: Check the following requirements before commissioning:
● Correct wire connection
● Ensure all breakers in Line wires of load side are open and each Neutral wires of each unit are connected together.
Step 2: Turn on all units and configure LCD program 28 as 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 cannot be programmed.
Step 3: Turn on all units sequentially.

LCD display in L1-phase unit	LCD display in L2-phase unit	LCD display in L3-phase unit
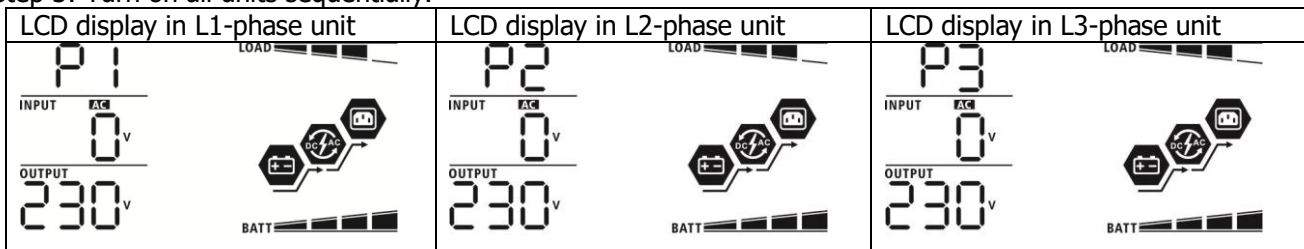
Step 4: Switch on all AC breakers of Line wires in AC input. If AC connection is detected and three phases are matched with unit setting, they will work normally. Otherwise, the AC icon ⚫ will flash and they will not work in line mode.

LCD display in L1-phase unit	LCD display in L2-phase unit	LCD display in L3-phase unit
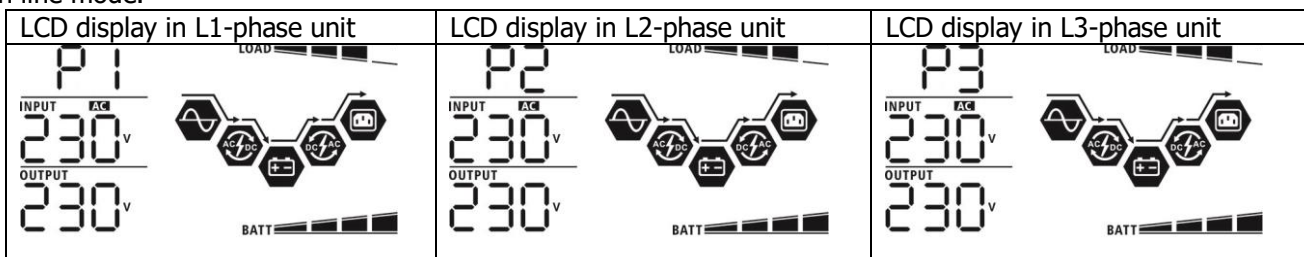
Step 5: If there is no more fault alarm, the system to support 3-phase equipment is completely installed.

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

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

8. Trouble shooting

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

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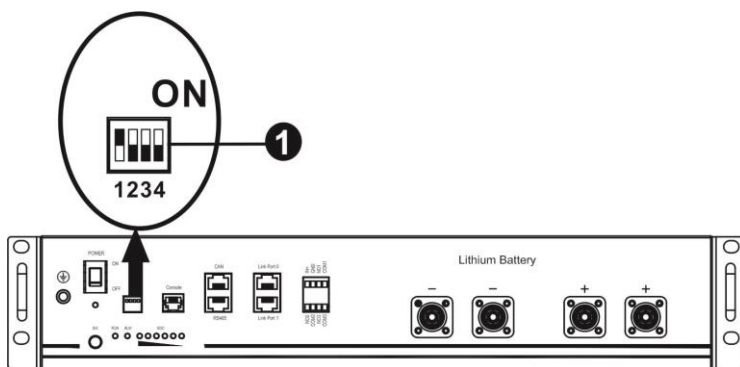
①Dip Switch: There are 4 Dip Switches that sets different baud rate and battery group address. If switch position is turned to the "OFF" position, it means "0". If switch position is turned to the "ON" position, it means "1".

Dip 1 is "ON" to represent the baud rate 9600.
Dip 2, 3 and 4 are reserved for battery group address.
Dip switch 2, 3 and 4 on master battery (first battery) are to set up or change the group address.

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

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

NOTE: The maximum groups of lithium battery is 2 and for maximum number for each group, please check with battery manufacturer.

3. Installation and Operation

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

Step 1. Use custom-made RJ45 cable to connect inverter and Lithium battery.
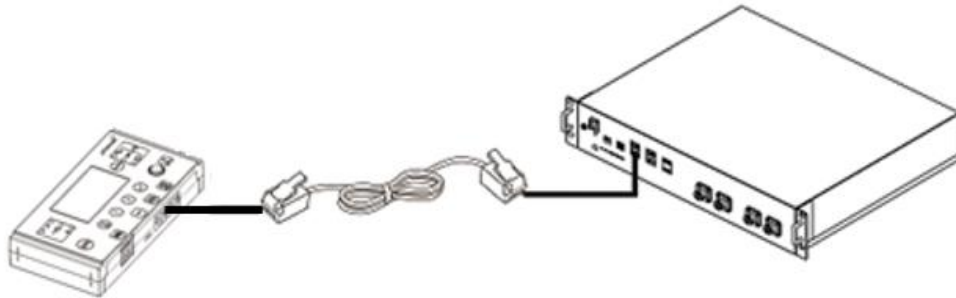
Note for parallel system:

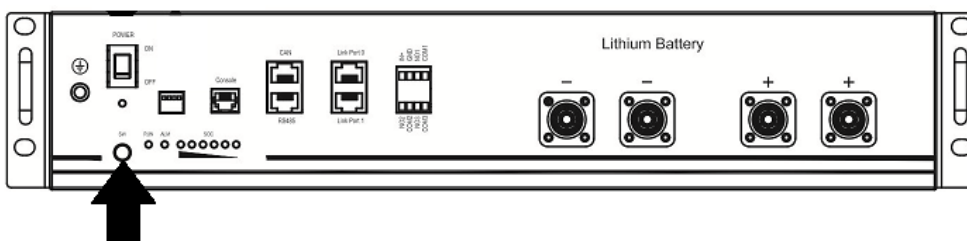1. Only support common battery installation.
2. Use custom-made RJ45 cable to connect any inverter (no need to connect to a specific inverter) and Lithium battery. Simply set this inverter battery type to "PYL" in LCD program 5. Others should be "USE".
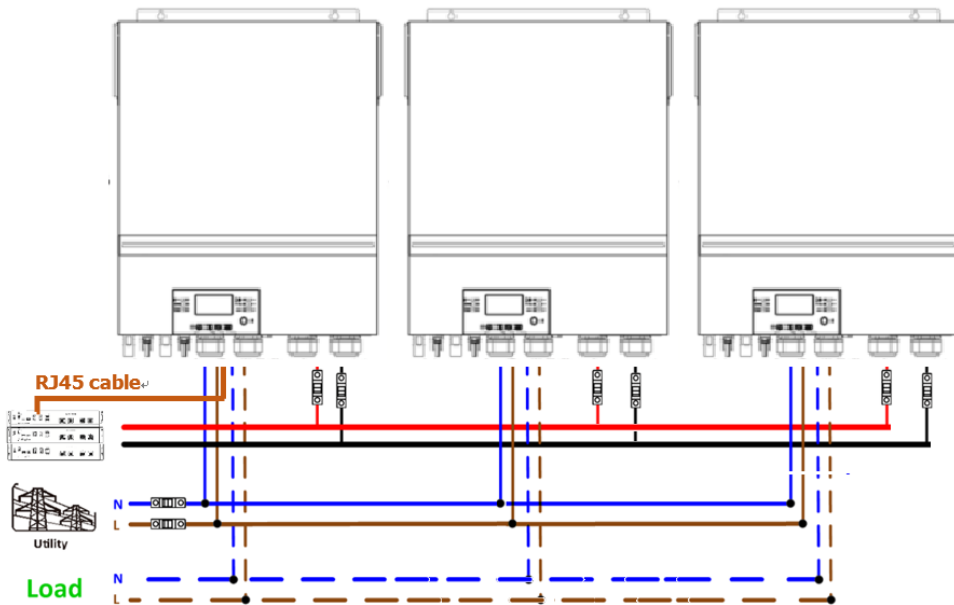
Step 2. Switch on Lithium battery.
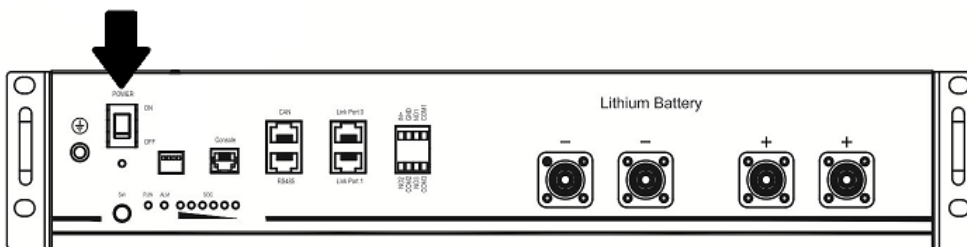
Step 3. Press more than three seconds to start Lithium battery, power output ready.

Step 4. Turn on the inverter.

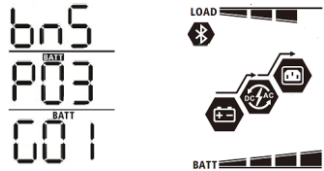Step 5. Be sure to select battery type as "PYL" in LCD program 5.

05 ⚙

PYL

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

Active Function

This function is to activate lithium battery automatically while commissioning. After battery wiring and commissioning is successfully, if battery is not detected, the inverter will automatically activate battery if the inverter is powered on.
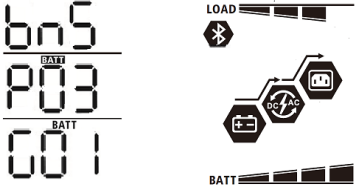
4. LCD Display Information

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

Selectable information	LCD display
Battery pack numbers & Battery group numbers	Battery pack numbers = 3, battery group numbers = 1 bn5 P03 G01

5. Code Reference

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

Code	Description	Action
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".) ● After battery is connected, communication signal is not detected for 3 minutes, buzzer will beep. After 10 minutes, inverter will stop charging and discharging to lithium battery.	

	● Communication lost occurs after the inverter and battery is connected successfully, buzzer beeps immediately.	
62⚠	Battery number is changed. It probably is because of communication lost between battery packs.	Press "UP" or "DOWN" key to switch LCD display until below screen shows. It will have battery number re-checked and 62 warning code will be clear.

For more information or general questions,
contact us at contact@flinenergy.com