

User Manual

INVERTER/CHARGER 5KVA with MPPT solar charger

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ABOUT THIS MANUAL

Purpose

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

Scope

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

SAFETY INSTRUCTIONS



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

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

INTRODUCTION

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

Features

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

Basic System Architecture

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

- Generator or Utility.
- PV modules

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

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

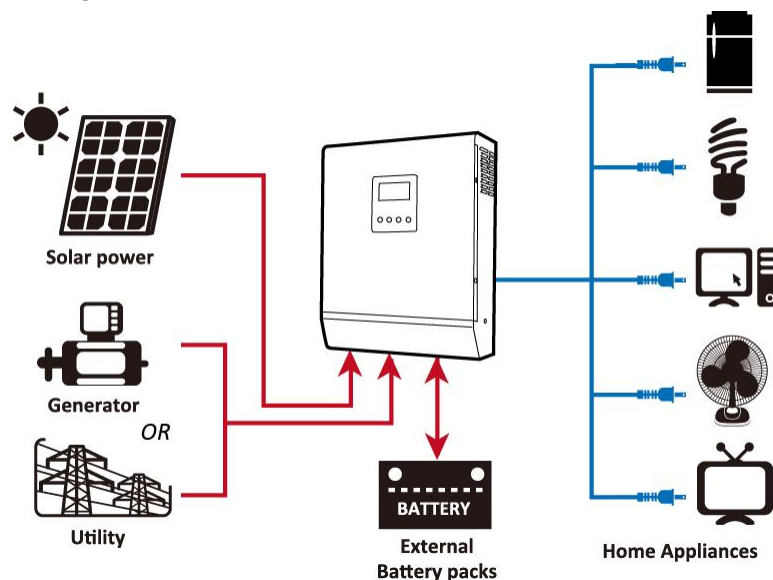
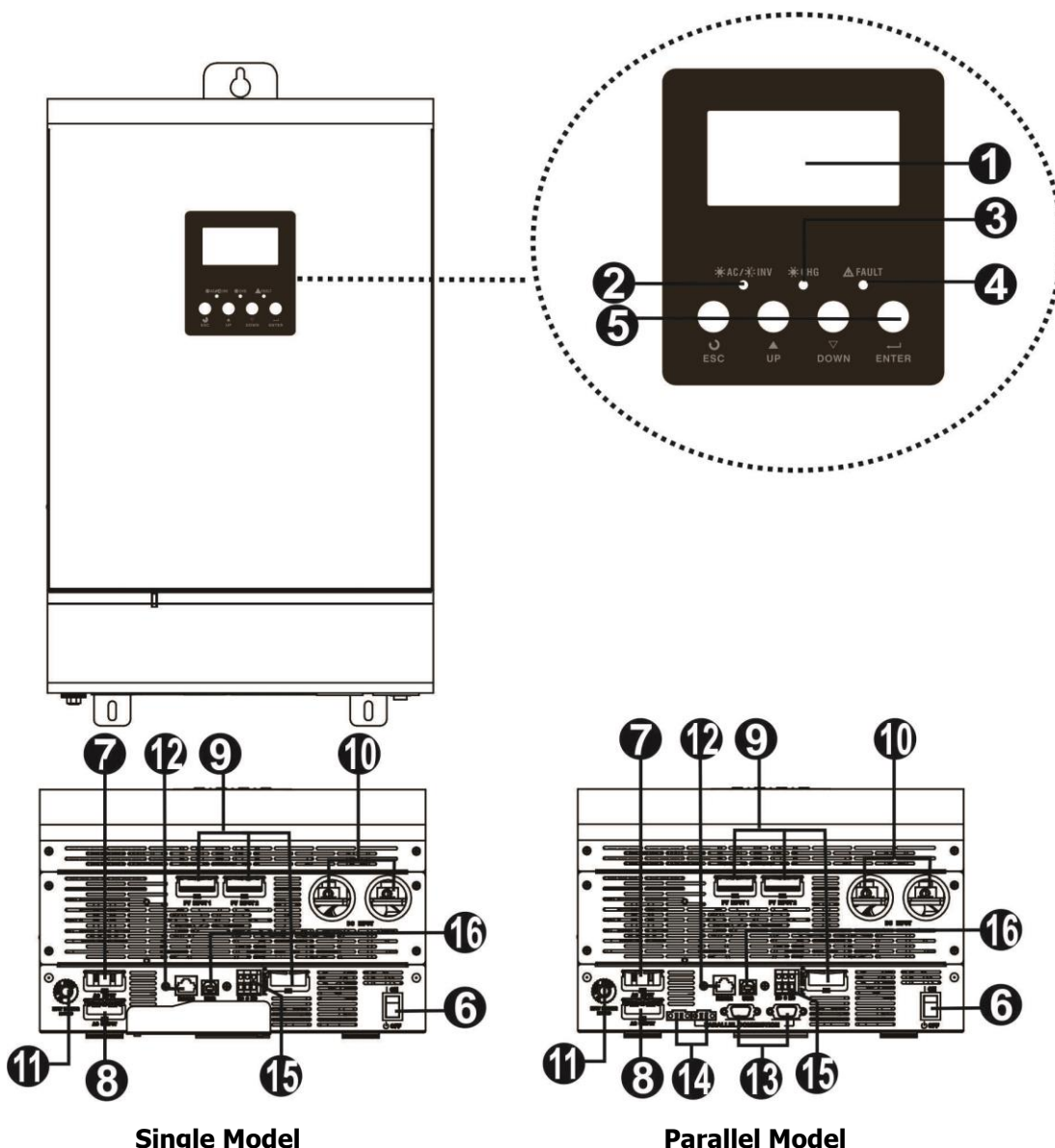


Figure 1 Hybrid Power System

Product Overview



- 1. LCD display
- 2. Status indicator
- 3. Charging indicator
- 4. Fault indicator
- 5. Function buttons
- 6. Power on/off switch
- 7. AC input
- 8. AC output
- 9. PV input (Please check model no for detailed PV input numbers)
- 10. Battery input
- 11. Circuit breaker
- 12. RS232 communication port
- 13. Parallel communication cable (only for parallel model)
- 14. Current sharing cable (only for parallel model)
- 15. Dry contact
- 16. USB communication port

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

INSTALLATION

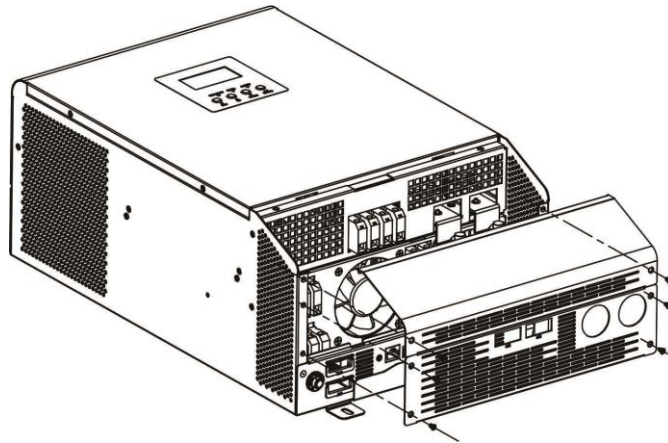
Unpacking and Inspection

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:

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

Preparation

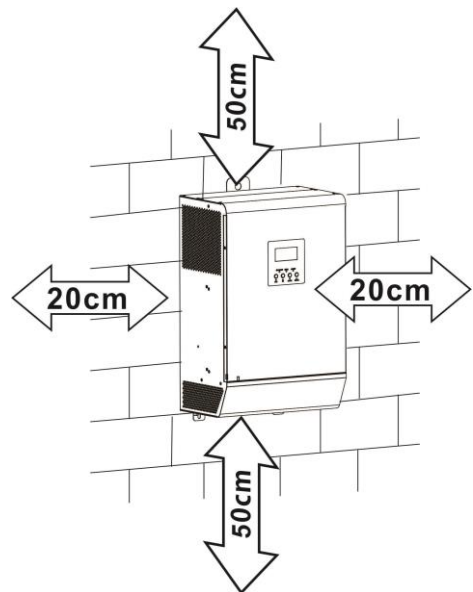
Before connecting all wirings, please take off bottom cover by removing two screws as shown below.



Mounting the Unit

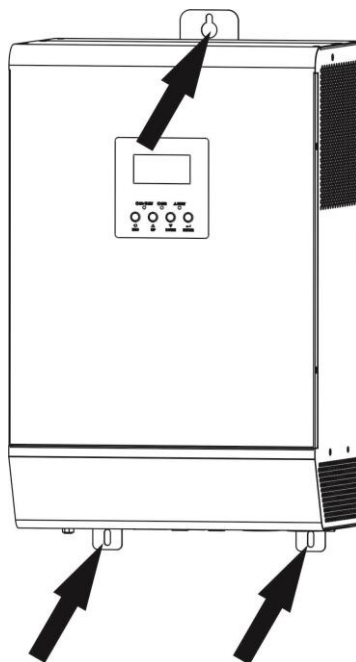
Consider the following points before selecting where to install:

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



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

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



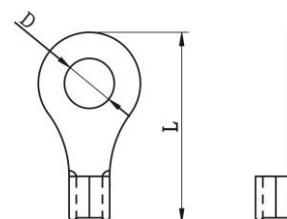
Battery Connection

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

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

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

Ring terminal:

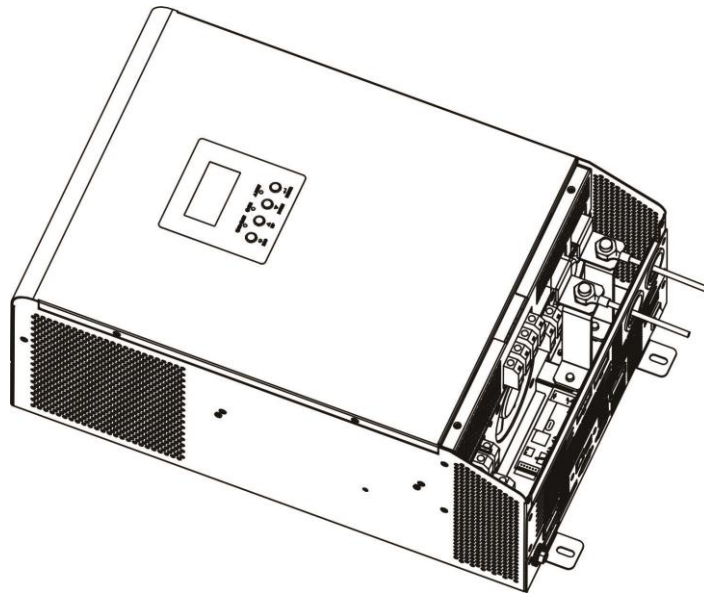



Recommended battery breaker, cable and terminal size:


Model	Breaker Size	Wire Size		Ring Terminal Dimensions		Torque Value
		AWG	mm ²	D (mm)	L (mm)	
5KVA with 2 MPPTs	200A/60VDC	2 * 4AWG	44	10.5	50	10~ 12 Nm
5KVA with 3 MPPTs	250A/60VDC	2 * 2AWG	72	10.5	55	

Please follow below steps to implement battery connection:

1. Assemble battery ring terminal based on recommended battery cable and terminal size.
2. Connect all battery packs as the unit requires. It's suggested to connect at least 600Ah capacity battery.
3. Insert the ring terminal of battery cable flatly into battery connector of inverter and make sure the bolts are tightened with torque of 10-12 Nm. Make sure polarity at both the battery and the inverter/charge is correctly connected and ring terminals are tightly screwed to the battery terminals.



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

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

AC Input/Output Connection

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

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

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

Suggested cable requirement for AC wires

Model	Wire Size		Torque Value
	AWG	mm ²	
5KVA	1 * 8 AWG	8.4	1.4~ 1.6Nm

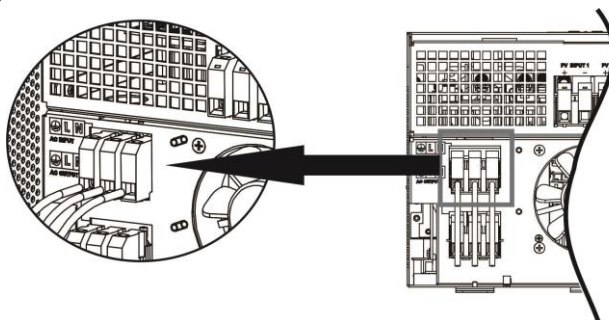
Please follow below steps to implement AC input/output connection:

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:

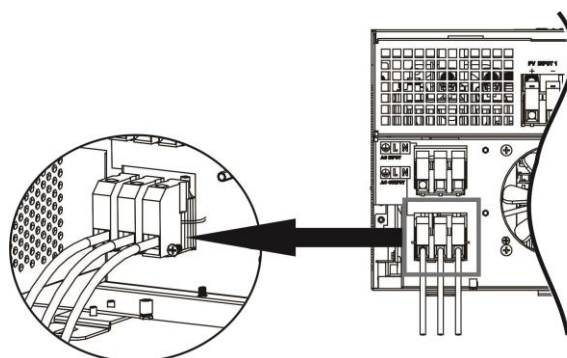
Be sure that AC power source is disconnected before attempting to hardwire it to the unit.

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 sometimes it still causes internal damage to the air conditioner.

PV Connection

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

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

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

Note! Each PV input connection is independent. Please connect to PV modules separately.

Note! If users only use one PV input, please choose one from PV1 or PV2 input.

Model	Breaker size	Wire Size		Torque
		AWG	mm ²	
5KVA	60A/150VDC	1 * 8 AWG	8.4	1.4~1.6 Nm

PV Module Selection:

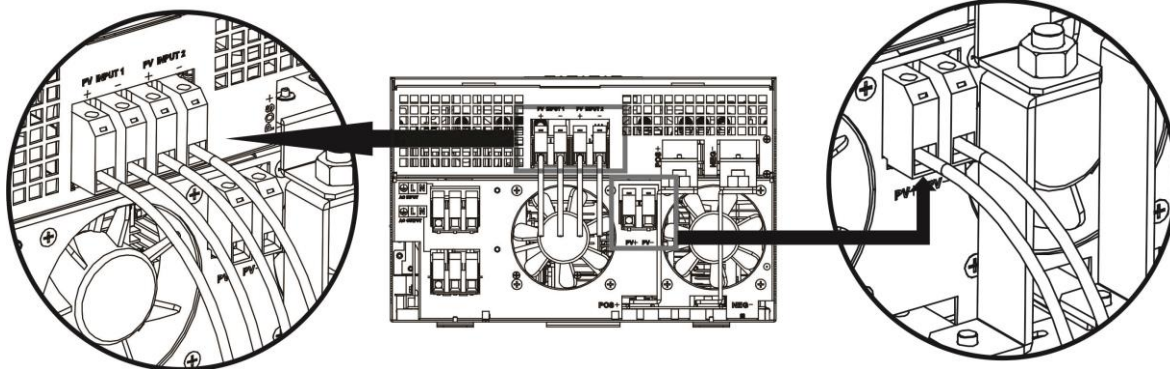
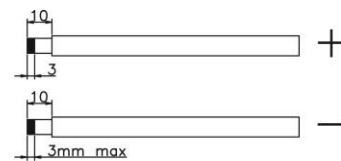
When selecting proper PV modules, please be sure to consider below parameters:

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

Solar Charging Mode	
INVERTER MODEL	5KVA
Max. PV Array Open Circuit Voltage	145Vdc
PV Array MPPT Voltage Range	60~115Vdc
Min. battery voltage for PV charge	34Vdc

Please follow below steps to implement PV module connection:

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

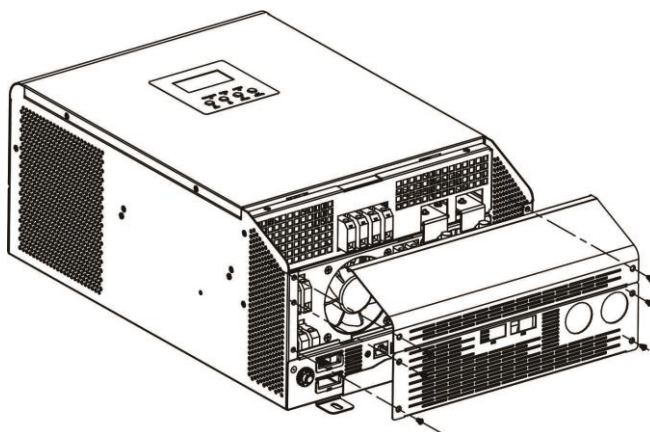


Only for the model with 3 MPPTs

3. Make sure the wires are securely connected.

Final Assembly

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




Communication Connection

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

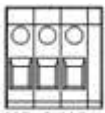
Dry Contact Signal

There is one dry contact (3A/250VAC) available on the rear panel. When program 38 is set as "disable", it could be used to deliver signal to external device when battery voltage reaches warning level. When program 38 is set as "enable" and the unit is working in battery mode, it could be used to trigger the grounding box to connect neutral and grounding of AC output together.

When program 38 is set as "disable" (default setting):

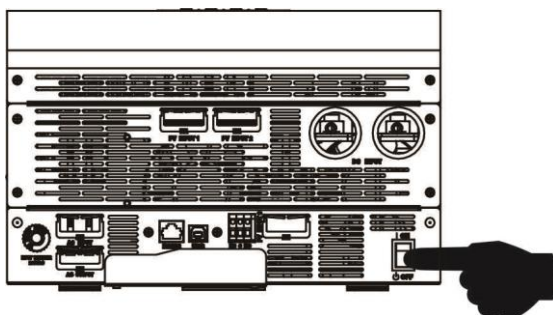
Unit Status	Condition		Dry contact port: 		
			NC & C	NO & C	
Power Off	Unit is off and no output is powered.		Close	Open	
Power On	Output is powered from Utility.		Close	Open	
	Output is powered from Battery or Solar.	Program 01 set as Utility	Battery voltage < Low DC warning voltage	Open	Close
			Battery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

When program 38 is set as "enable":

Unit Status	Condition		Dry contact port: 	
			NC & C	NO & C
Power Off	Unit is off and no output is powered.		Close	Open
Power On	Unit works in standby mode, line mode or fault mode.		Close	Open
	Unit works in battery mode or power saving mode.		Open	Close

OPERATION

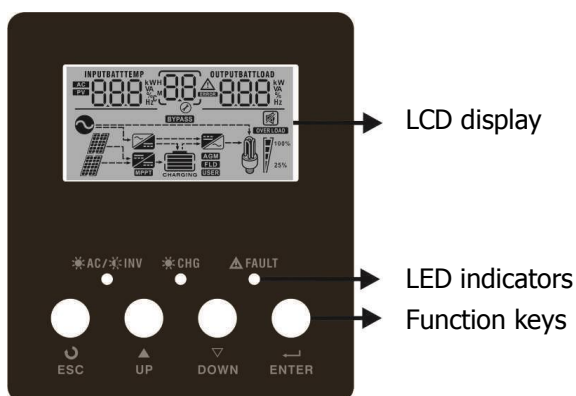
Power ON/OFF



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

Operation and Display Panel

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



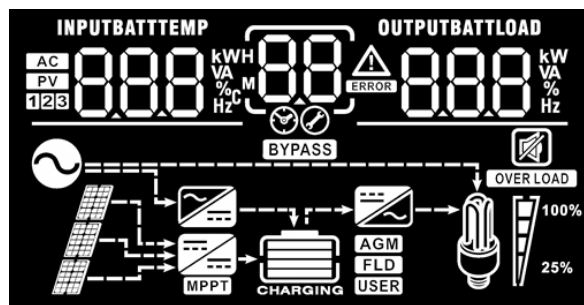
LED Indicator

LED Indicator		Messages	
☀️ AC / 🌙 INV	Green	Solid On	Output is powered by utility in Line mode.
		Flashing	Output is powered by battery or PV in battery mode.
☀️ CHG	Green	Solid On	Battery is fully charged.
		Flashing	Battery is charging.
⚠️ FAULT	Red	Solid On	Fault occurs in the inverter.
		Flashing	Warning condition occurs in the inverter.

Function Keys

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

LCD Display Icons



Icon	Function description	
Input Source Information		
	Indicates the AC input.	
	Indicates the PV1 input	
	Indicates the PV2 input	
	Indicates the PV3 input	
	Indicate input voltage, input frequency, PV voltage, battery voltage and charger current.	
Configuration Program and Fault Information		
	Indicates the setting programs.	
	Indicates the warning and fault codes. Warning: flashing with warning code. Fault: lighting with fault code	
Output Information		
	Indicate output voltage, output frequency, load percent, load in VA, load in Watt and discharging current.	
Battery Information		
	Indicates battery level by 0-24%, 25-49%, 50-74% and 75-100% in battery mode and charging status in line mode.	
In AC mode, it will present battery charging status.		
Status	Battery voltage	LCD Display
Constant Current mode / Constant Voltage mode	<2V/cell	4 bars will flash in turns.
	2 ~ 2.083V/cell	Bottom bar will be on and the other three bars will flash in turns.
	2.083 ~ 2.167V/cell	Bottom two bars will be on and the other two bars will flash in turns.
	> 2.167 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%	< 1.717V/cell	
	1.717V/cell ~ 1.8V/cell	
	1.8 ~ 1.883V/cell	
	> 1.883 V/cell	
50% > Load > 20%	< 1.817V/cell	
	1.817V/cell ~ 1.9V/cell	
	1.9 ~ 1.983V/cell	
	> 1.983	
Load < 20%	< 1.867V/cell	
	1.867V/cell ~ 1.95V/cell	
	1.95 ~ 2.033V/cell	
	> 2.033	

Load Information

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

Mode Operation Information

	Indicates unit connects to the mains.
	Indicates unit connects to the PV panel.
	Indicates load is supplied by utility power.
	Indicates the utility charger circuit is working.
	Indicates the DC/AC inverter circuit is working.

Mute Operation

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

LCD Setting












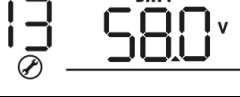


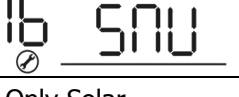
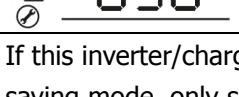


After pressing and holding ENTER button for 3 seconds, the unit will enter setting mode. Press "UP" or "DOWN" button to select setting programs. And then, press "ENTER" button to confirm the selection or ESC button to exit.

Setting Programs:

Program	Description	Selectable option
00	Exit setting mode	Escape 00 ESC
01	Output source priority: To configure load power source priority	Solar first 01 SOL
		Utility first (default) 01 UTI
		SBU priority 01 SBU
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
		90A 02 90 ^A	100A 02 100 ^A
		110A 02 110 ^A	120A 02 120 ^A
		130A 02 130 ^A	140A 02 140 ^A
		150A 02 150 ^A	160A 02 160 ^A
		170A 02 170 ^A	180A 02 180 ^A
		190A 02 190 ^A	200A 02 200 ^A
		210A 02 210 ^A	220A 02 220 ^A
		230A 02 230 ^A	240A 02 240 ^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.
04	Power saving mode enable/disable	Saving mode disable (default) 04 SDS	If disabled, no matter connected load is low or high, the on/off status of inverter output will not be effected.
		Saving mode enable 04 SEN	If enabled, the output of inverter will be off when connected load is pretty low or not detected.
05	Battery type	AGM (default) 05 AGM	Flooded 05 FLD
		User-Defined 05 USE	If "User-Defined" is selected, battery charge voltage and low DC cut-off voltage can be set up in program 26, 27 and 29.

06	Auto restart when overload occurs	Restart disable (default) 06 Lfd	Restart enable 06 LFE
07	Auto restart when over temperature occurs	Restart disable (default) 07 Lfd	Restart enable 07 LFE
08	Output voltage	220V 08 220 ^v	230V (default) 08 230 ^v
		240V 08 240 ^v	
09	Output frequency	50Hz (default) 09 50 ^{Hz}	60Hz 09 60 ^{Hz}
11	Maximum utility charging current	2A 11 2A	10A 11 10A
		20A 11 20A	30A (default) 11 30A
		40A 11 40A	50A 11 50A
		60A 11 60A	
12	Setting voltage point back to utility source when selecting "SBU priority" or "Solar first" in program 01.	44V 12 BATT 44 ^v	45V 12 BATT 45 ^v
		46V (default) 12 BATT 46 ^v	47V 12 BATT 47 ^v
		48V 12 BATT 48 ^v	49V 12 BATT 49 ^v
		50V 12 BATT 50 ^v	51V 12 BATT 51 ^v

13	Setting voltage point back to battery mode when selecting "SBU priority" or "Solar first" in program 01.	Battery fully charged	48V
			
		49V	50V
			
		51V	52V
			
		53V	54V (default)
			
55V	56V		
			
57V	58V		
			
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 	Solar energy will charge battery as first priority. Utility will charge battery only when solar energy is not available.
		Utility first 	Utility will charge battery as first priority. Solar energy will charge battery only when utility power is not available.
		Solar and Utility 	Solar energy and utility will charge battery at the same time.
		Only Solar 	Solar energy will be the only charger source no matter utility is available or not.
		If this inverter/charger is working in Battery mode or Power saving mode, only solar energy can charge battery. Solar energy will charge battery if it's available and sufficient.	
18	Alarm control	Alarm on (default) 	Alarm off 

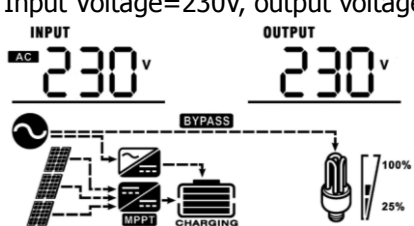
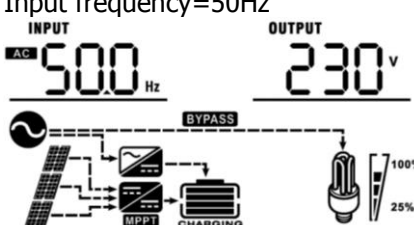
19	Auto return to default display screen	Return to default display screen (default) 19 ESP	If selected, no matter how users switch display screen, it will automatically return to default display screen (Input voltage /output voltage) after no button is pressed for 1 minute.
		Stay at latest screen 19 LEP	If selected, the display screen will stay at latest screen user finally switches.
20	Backlight control	Backlight on (default) 20 LON	Backlight off 20 LOF
22	Beeps while primary source is interrupted	Alarm on (default) 22 AON	Alarm off 22 AOF
23	Overload bypass: When enabled, the unit will transfer to line mode if overload occurs in battery mode.	Bypass disable (default) 23 byd	Bypass enable 23 byE
25	Record Fault code	Record enable 25 FEN	Record disable (default) 25 FdS
26	Bulk charging voltage (C.V voltage)	56.4V (default) CU 26 56.4 ^{BATT} v	If self-defined is selected in program 5, this program can be set up. Setting range is from 48.0V to 58.4V. Increment of each click is 0.1V.
27	Floating charging voltage	54.0V (default) FLU 27 54.0 ^{BATT} v	If self-defined is selected in program 5, this program can be set up. Setting range is from 48.0V to 58.4V. Increment of each click is 0.1V.
29	Low DC cut-off voltage	42.0V (default) COU 29 42.0 ^{BATT} v	If self-defined is selected in program 5, this program can be set up. Setting range is from 40.0V to 48.0V. Increment of each click is 0.1V. Low DC cut-off voltage will be fixed to setting value no matter what percentage of load is connected.

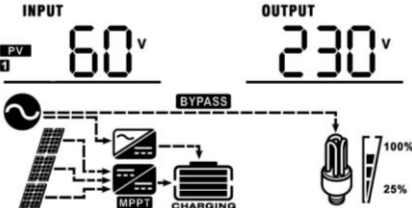
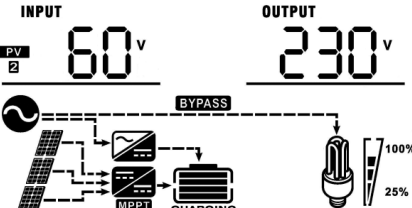
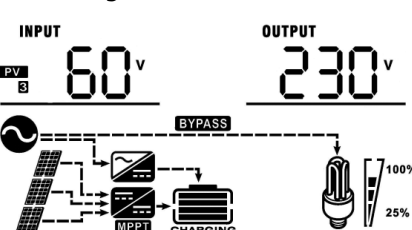
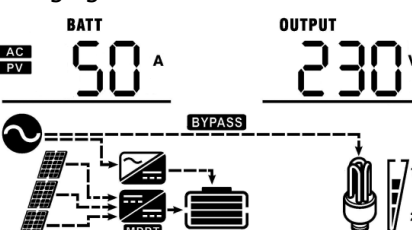
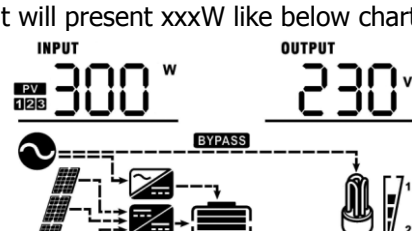
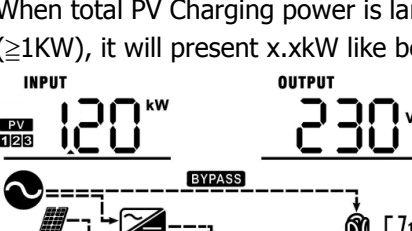
31	Solar power balance: When enabled, solar input power will be automatically adjusted according to connected load power.	Solar power balance enable (Default): 31 56E	If selected, solar input power will be automatically adjusted according to the following formula: Max. input solar power = Max. battery charging power + Connected load power.
		Solar power balance disable: 31 56d	If selected, the solar input power will be the same to max. battery charging power no matter how much loads are connected. The max. battery charging power will be based on the setting current in program 02. (Max. solar power = Max. battery charging power)
32	Bulk charging time (C.V stage)	Automatically (Default): AUT 32	If selected, inverter will judge this charging time automatically.
		5 min 5 32	The setting range is from 5 min to 900 min. Increment of each click is 5 min.
		900 min 900 32	
		If "USE" is selected in program 05, this program can be set up.	
33	Battery equalization	Battery equalization EEN 33	Battery equalization disable (default)
		EdS 33	
		If "Flooded" or "User-Defined" is selected in program 05, this program can be set up.	
34	Battery equalization voltage	3KVA default setting: 29.2V. Setting range is from 24V ~ 29.2V. Increment of each click is 0.1V. 29.2 ^{VDC} 34	
		5KVA Default setting: 58.4V. Setting range is from 48V ~ 58.4V. Increment of each click is 0.1V. 58.4 ^{VDC} 34	
35	Battery equalized time	60min (default) 60 35	Setting range is from 5min to 900min. Increment of each click is 5min.
36	Battery equalized timeout	120min (default) 120 36	Setting range is from 5min to 900 min. Increment of each click is 5 min.
37	Equalization interval	30days (default) 30d 37	Setting range is from 0 to 90 days. Increment of each click is 1 day

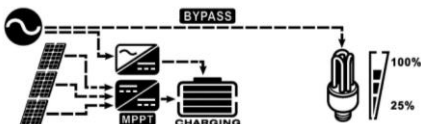
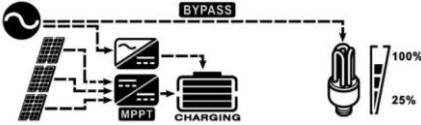
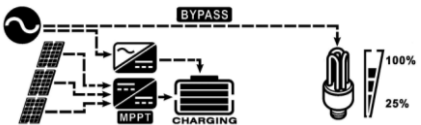
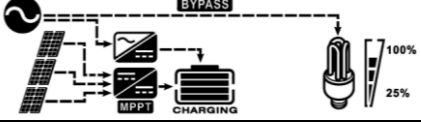
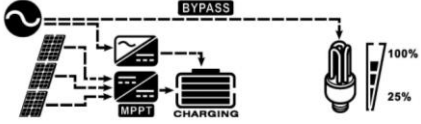
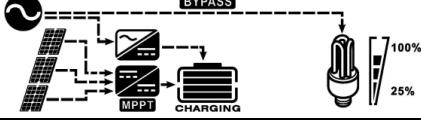
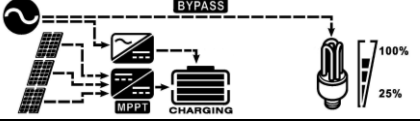
38	Allow neutral and grounding of AC output is connected together: When enabled, inverter can deliver signal to trigger grounding box to short neutral and grounding	Disable: Neutral and grounding of AC output is disconnected. (Default)	
			
		Enable: Neutral and grounding of AC output is connected.	
			
This function is only available when the inverter is working with external grounding box. Only when the inverter is working in battery mode, it will trigger grounding box to connect neutral and grounding of AC output.			
39	Equalization activated immediately	Enable	Disable (default)
			
If equalization function is enabled in program 33, this program can be set up. If "Enable" is selected in this program, it's to activate battery equalization immediately and LCD main page will shows "E9". If "Disable" is selected, it will cancel equalization function until next activated equalization time arrives based on program 37 setting. At this time, "E9" will not be shown in LCD main page.			

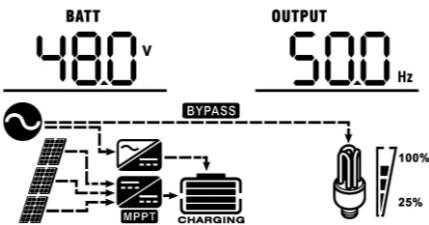
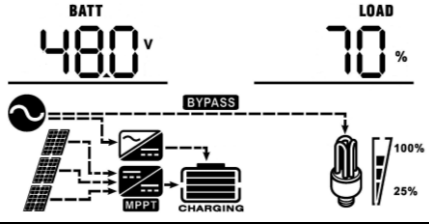
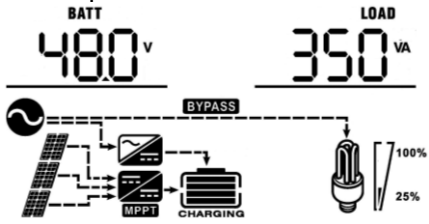
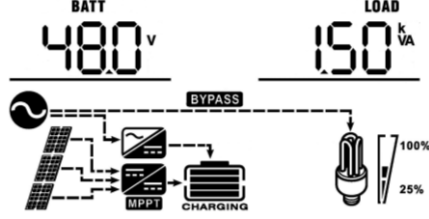
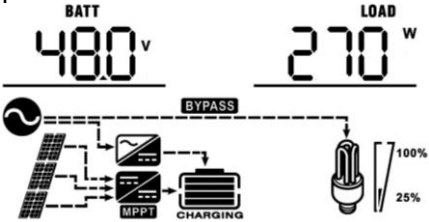
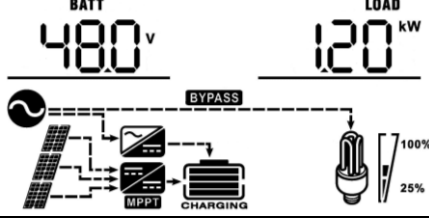
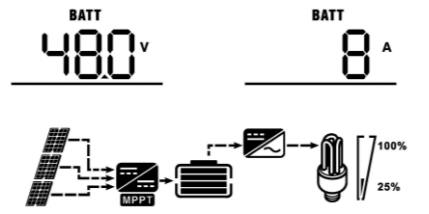
Display Setting





The LCD display information will be switched in turns by pressing "UP" or "DOWN" key. The selectable information is switched as below order: input voltage, input frequency, PV1 voltage, PV2 voltage, PV3 voltage, charging current, total PV charging power, PV1 charging power, PV2 charging power, PV3 charging power, battery voltage, output voltage, output frequency, load percentage, load in VA, load in Watt, DC discharging current, main CPU Version, second CPU Version, third CPU version and fourth CPU version.

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

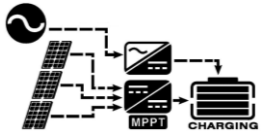

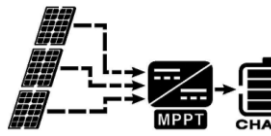

<p>PV1 voltage</p>	<p>PV1 voltage=60V</p> <p>INPUT 60V OUTPUT 230V</p> 
<p>PV2 voltage</p>	<p>PV2 voltage=60V</p> <p>INPUT 60V OUTPUT 230V</p> 
<p>PV3 voltage</p>	<p>PV3 voltage=60V</p> <p>INPUT 60V OUTPUT 230V</p> 
<p>Charging current</p>	<p>Charging current =50A</p> <p>BATT 50A OUTPUT 230V</p> 
<p>Total PV charging power</p>	<p>When total PV charging power is lower than 1kW, it will present xxxW like below chart.</p> <p>INPUT 300W OUTPUT 230V</p>  <p>When total PV Charging power is larger than 1kW ($\geq 1kW$), it will present x.xkW like below chart.</p> <p>INPUT 120kW OUTPUT 230V</p> 

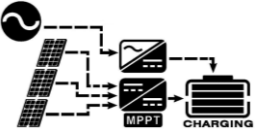

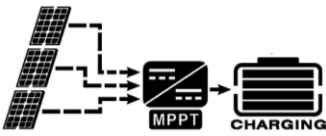

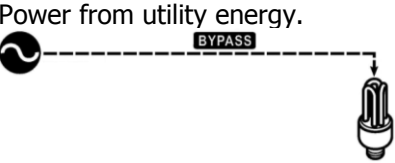
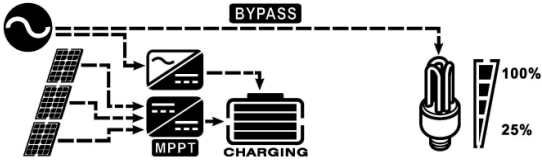
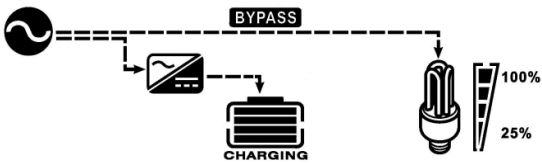
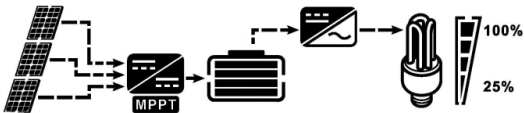
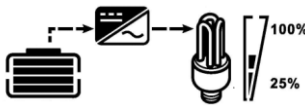
<p>PV1 charging power</p>	<p>When PV1 charging power is lower than 1kW, it will present xxxW like below chart.</p> <p>INPUT OUTPUT PV 1 300 W 230 v</p>  <p>When PV1 Charging power is larger than 1kW (\geq 1KW), it will present x.xkW like below chart.</p> <p>INPUT OUTPUT PV 1 120 kW 230 v</p> 
<p>PV2 charging power</p>	<p>When PV2 Charging power is lower than 1kW, it will present xxxW like below chart.</p> <p>INPUT OUTPUT PV 2 300 W 230 v</p>  <p>When PV2 Charging power is larger than 1kW (\geq 1KW), it will present x.xkW like below chart.</p> <p>INPUT OUTPUT PV 2 120 kW 230 v</p> 
<p>PV3 charging power</p>	<p>When PV3 Charging power is lower than 1kW, it will present xxxW like below chart.</p> <p>INPUT OUTPUT PV 3 300 W 230 v</p>  <p>When PV3 charging power is larger than 1kW (\geq 1KW), it will present x.xkW like below chart.</p> <p>INPUT OUTPUT PV 3 120 kW 230 v</p> 
<p>Battery voltage</p>	<p>Battery voltage=48.0V</p> <p>BATT OUTPUT BATT 48.0 v 230 v</p> 

Output frequency	<p>Output frequency=50Hz</p> 
Load percentage	<p>Load percent=70%</p> 
Load in VA	<p>When connected load is lower than 1kVA, load in VA will present xxxVA like below chart.</p>  <p>When load is larger than 1kVA ($\geq 1\text{kVA}$), load in VA will present x.xkVA like below chart.</p> 
Load in Watt	<p>When load is lower than 1kW, load in W will present xxxW like below chart.</p>  <p>When load is larger than 1kW ($\geq 1\text{kW}$), load in W will present x.xkW like below chart.</p> 
DC discharging current	<p>DC discharging current=8A</p> 


















Main CPU version checking	Main CPU version 00072.40 
The second CPU version checking	The second CPU version 00001.01 
The third CPU version checking	The third CPU version 00001.02 
The fourth CPU version checking	The fourth CPU version 00001.03 

Operating Mode Description











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

<p>Fault mode</p> <p>Note:</p> <p>*Fault mode: Errors are caused by inside circuit error or external reasons such as over temperature, output short circuited and so on.</p>	<p>PV energy and utility can charge batteries.</p>	<p>Charging by utility and PV energy.</p> 
<p>Fault mode</p> <p>Note:</p> <p>*Fault mode: Errors are caused by inside circuit error or external reasons such as over temperature, output short circuited and so on.</p>	<p>PV energy and utility can charge batteries.</p>	<p>Charging by utility energy.</p> 
<p>Line Mode</p>	<p>Utility can power loads when the unit starts up without battery. (Only available in single model)</p>	<p>Charging by PV energy.</p> 
<p>Battery Mode</p>	<p>The unit will provide output power from the mains. It will also charge the battery at line mode.</p>	<p>No charging.</p> 
<p>Battery Mode</p>	<p>The unit will provide output power from battery and PV power.</p>	<p>Power from utility energy.</p> 
<p>Battery Mode</p>	<p>The unit will provide output power from battery and PV power.</p>	<p>Charging by PV energy.</p> 
<p>Battery Mode</p>	<p>The unit will provide output power from battery and PV power.</p>	<p>Charging by utility energy.</p> 
<p>Battery Mode</p>	<p>The unit will provide output power from battery and PV power.</p>	<p>Power from battery and PV energy.</p> 
<p>Battery Mode</p>	<p>The unit will provide output power from battery and PV power.</p>	<p>Power from battery energy only.</p> 

Fault Reference Code

Fault Code	Fault Event	Icon on
01	Fan is locked when inverter is off.	
02	Over temperature	
03	Battery voltage is too high	
04	Battery voltage is too low	
05	Output short circuited or over temperature is detected by internal converter components.	
06	Output voltage is too high.	
07	Overload time out	
08	Bus voltage is too high	
09	Bus soft start failed	
11	Main relay failed	
51	Over current or surge	
52	Bus voltage is too low	
53	Inverter soft start failed	
55	Over DC voltage in AC output	
56	Battery connection is open	
57	Current sensor failed	
58	Output voltage is too low	

Warning Indicator

Warning Code	Warning Event	Audible Alarm	Icon flashing
01	Fan is locked when inverter is on.	Beep three times every second	
03	Battery is over-charged	Beep once every second	
04	Low battery	Beep once every second	
07	Overload	Beep once every 0.5 second	 
10	Output power derating	Beep twice every 3 seconds	
12	Battery voltage is too low to be charged by PV charger.	Beep once every second	
13	High loss on PV charger voltage	Beep once every second	
14	PV charger stops due to overload.	Beep once every 0.5 second	
E9	Battery equalization	None	

BATTERY EQUALIZATION DESCRIPTION

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.

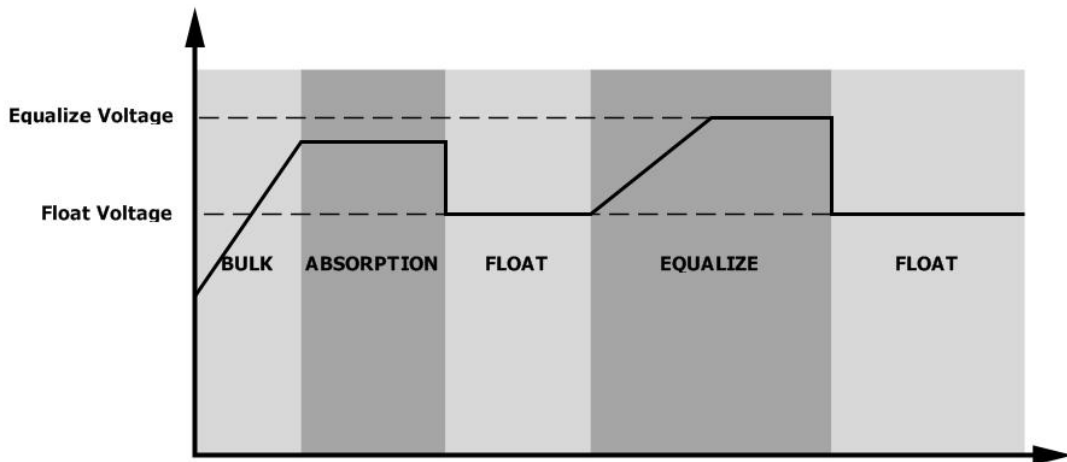
- **How to Apply Equalization Function**

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.

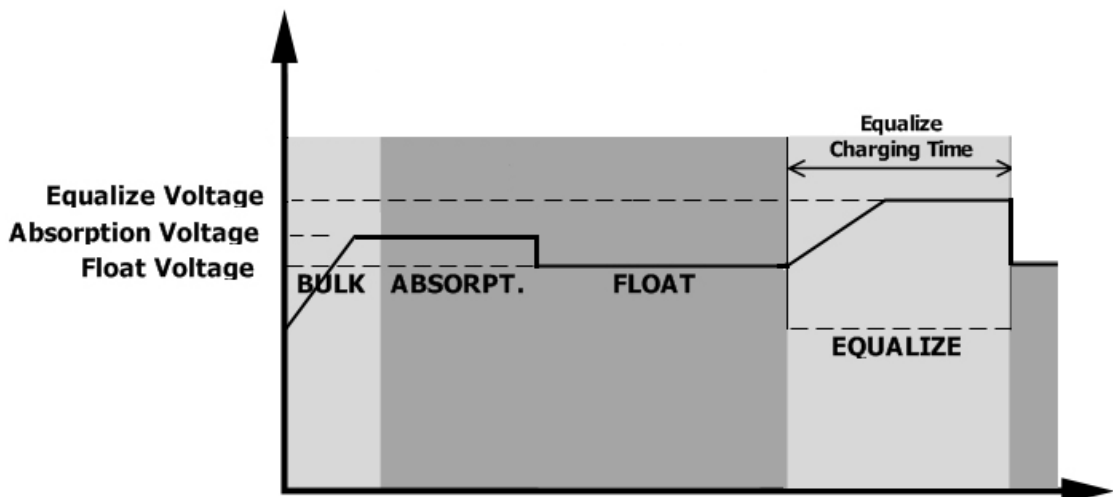
- **When to Equalize**

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.

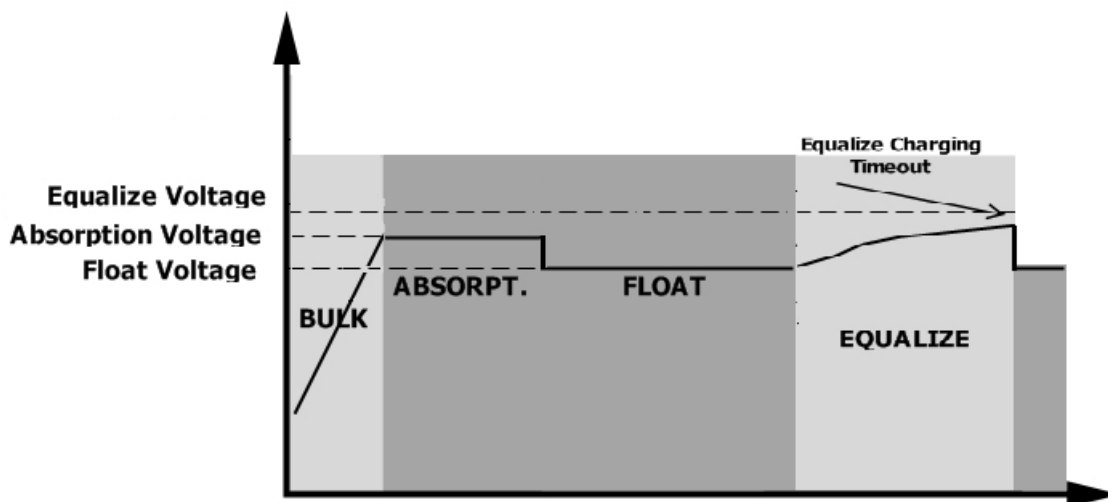


- **Equalize charging time and timeout**

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

Line Mode (Utility Bypass Mode)		
Model	5KVA with 2 MPPTs	5KVA with 3 MPPTs
Input Voltage Waveform	Sinusoidal (utility or generator)	
Nominal Input Voltage	230Vac	
Maximum input current	40A	
Maximum input inrush current	65A peak 100ms	
Low Loss Voltage	170Vac±7V(UPS); 90Vac±7V(Appliances)	
Low Loss Return Voltage	180Vac±7V(UPS); 100Vac±7V (Appliances)	
High Loss Voltage	280Vac±7V	
High Loss Return Voltage	270Vac±7V	
Max AC Input Voltage	300Vac	
Nominal Input Frequency	50Hz / 60Hz (Auto detection, 55Hz as boundary)	
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	>95% (Rated R load, battery full charged)	
Transfer Time	10ms typical, 12ms maximum @50Hz (UPS); 20ms typical, 25ms maximum @50Hz (Appliances)	
Power Limitation	<p>The graph plots Output Power on the vertical axis against Input Voltage on the horizontal axis. The horizontal axis has markers at 90V, 170V, and 280V. The vertical axis has markers for 50% Power and Rated Power. The power curve starts at 0 for input voltages below 90V. At 90V, the power jumps to 50% of the rated power. From 90V to 170V, the power increases linearly to reach the Rated Power level. From 170V to 280V, the power remains constant at the Rated Power level. At 280V, the power drops sharply to 0.</p>	

Table 2 Inverter Mode Specifications

Inverter Mode		
Model	5KVA with 2 MPPTs	5KVA with 3 MPPTs
Rated Output Power	5000VA/5000W	
Output Voltage Waveform	Pure Sine Wave	
Output Voltage Regulation	230Vac±5%	
Maximum output current	21.7A	
Maximum output inrush current	65 peak for 100ms	
Output Frequency	50Hz	
Power factor range	0.8 lag ~ 0.8 lead	
Max Output Fault Current	65 peak for 100ms	
Max Output overcurrent protection	65A	
Peak Efficiency	90%	
Overload Protection	5s@≥150% load; 10s@110%~150% load	
Surge Capacity	2 x rated power for 5sec	
Nominal DC Voltage	48Vdc	
Maximum DC current	93A	
Cold Start Voltage	46.0Vdc	
Low DC Warning Voltage		
@ load < 20%	44.0Vdc	
@ 20% ≤ load < 50%	42.8Vdc	
@ load ≥ 50%	40.4Vdc	
Low DC Warning Recovery Voltage		
@ load < 20%	46.0Vdc	
@ 20% ≤ load < 50%	44.8Vdc	
@ load ≥ 50%	42.4Vdc	
Low DC Cut-off Voltage		
@ load < 20%	42.0Vdc	
@ 20% ≤ load < 50%	40.8Vdc	
@ load ≥ 50%	38.4Vdc	
High DC Recovery Voltage	58Vdc	
High DC Cut-off Voltage	60Vdc	
DC Voltage Accuracy	+/-0.3%V@ no load	
THDV	<3% for linear load, <5% for non-linear load @ nominal voltage	
DC Offset	≤100mV	
No Load Power Consumption	<50W	
Saving Mode Power Consumption	<15W	
Enter Saving Mode level	<50W	
Leave Saving Mode level	>100W	

Table 3 Charge Mode Specifications

Utility Charging Mode		
Model	5KVA with 2 MPPTs	5KVA with 3 MPPTs
Charging Current (UPS) @ Nominal Input Voltage	2A/10A/20A/30A/40A/50A/60A	
Bulk Charging Voltage	Flooded Battery	58.4
	AGM / Gel Battery	56.4
Floating Charging Voltage	54Vdc	
Charging Algorithm	3-Step	
Charging Curve		

Solar Charging Mode		
Model	5KVA with 2 MPPTs	5KVA with 3 MPPTs
MPP tracker numbers	2	3
Charging Current	2 x 60 Amp	3 x 60 Amp
Max. PV Array Open Circuit Voltage	145Vdc	
PV Array Voltage High Loss	145Vdc	
PV Array Voltage High Comeback	140Vdc	
PV Array Voltage Low Loss	Battery voltage + 1V	
PV Array Voltage Low Back	Battery voltage + 2V	
PV Array MPPT Voltage Range	60~115Vdc	
Min. PV Voltage	34Vdc	
System Voltage	48Vdc	
Maximum operating PV input current	50A	
Isc PV	60A	
Max. inverter backfeed current to array	0A	
Standby Power Consumption	2W	
DC Voltage Accuracy	+/-0.3%	
PV Voltage Accuracy	+/-2V	
Charging Algorithm	3-Step	
DC Reverse Polarity Protection	Yes	

Over-temperature Protection	Yes
Overload, DC short-circuit Protection	Yes
Prevents reserve current from battery at night	Yes

Joint Utility and Solar Charging		
Model	5KVA with 2 MPPTs	5KVA with 3 MPPTs
Max Charging Current	180 Amp	240 Amp
Default Charging Current	60 Amp	

Table 4 General Specifications

Model	5KVA with 2 MPPTs	5KVA with 3 MPPTs
Safety Certification	CE	
Protective class	II	
Ingress protection	IP21	
Operating Temperature Range	0°C to 55°C	
Storage temperature	-15°C~ 60°C	
Humidity	5% to 95% Relative Humidity (Non-condensing)	
Dimension (D*W*H), mm	507.6 x 295 x 186.2	
Net Weight, kg	15	16

TROUBLE SHOOTING

Problem	LCD/LED/Buzzer	Explanation / Possible cause	What to do
Unit shuts down automatically during startup process.	LCD/LEDs and buzzer will be active for 3 seconds and then complete off.	The battery voltage is too low (<1.91V/Cell)	1. Re-charge battery. 2. Replace battery.
No response after power on.	No indication.	1. The battery voltage is far too low. (<1.4V/Cell) 2. Battery polarity is connected reversed.	1. Check if batteries and the wiring are connected well. 2. Re-charge battery. 3. Replace battery.
Mains exist but the unit works in battery mode.	Input voltage is displayed as 0 on the LCD and green LED is flashing.	Input protector is tripped	Check if AC breaker is tripped and AC wiring is connected well.
	Green LED is flashing.	Insufficient quality of AC power. (Shore or Generator)	1. Check if AC wires are too thin and/or too long. 2. Check if generator (if applied) is working well or if input voltage range setting is correct. (UPS→Appliance)
	Green LED is flashing.	Set "Solar First" as the priority of output source.	Change output source priority to Utility first.
When the unit is turned on, internal relay is switched on and off repeatedly.	LCD display and LEDs are flashing	Battery is disconnected.	Check if battery wires are connected well.
Buzzer beeps continuously and red LED is on.	Fault code 07	Overload error. The inverter is overload 110% and time is up.	Reduce the connected load by switching off some equipment.
	Fault code 05	Output 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: Approximate Back-up Time Table

Model	Load (VA)	Backup Time @ 48Vdc 600Ah (min)	Backup Time @ 48Vdc 1200Ah (min)
5KVA	500	3678	7728
	1000	1608	3678
	1500	948	2412
	2000	666	1626
	2500	540	1290
	3000	456	1092
	3500	390	846
	4000	300	672
	4500	264	600
	5000	240	540

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

Appendix II: Parallel function (Only for parallel model)

1. Introduction

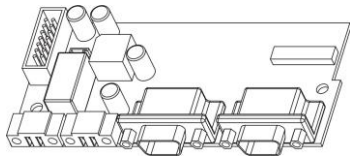
This inverter can be used in parallel with two different operation modes.

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

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

2. Package Contents

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



Parallel board



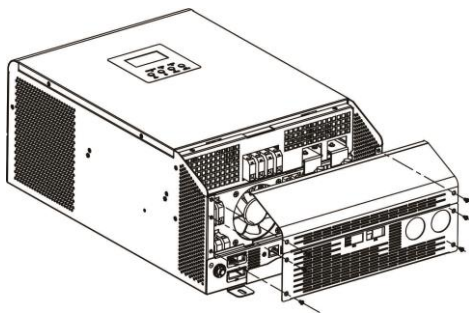
Parallel communication cable



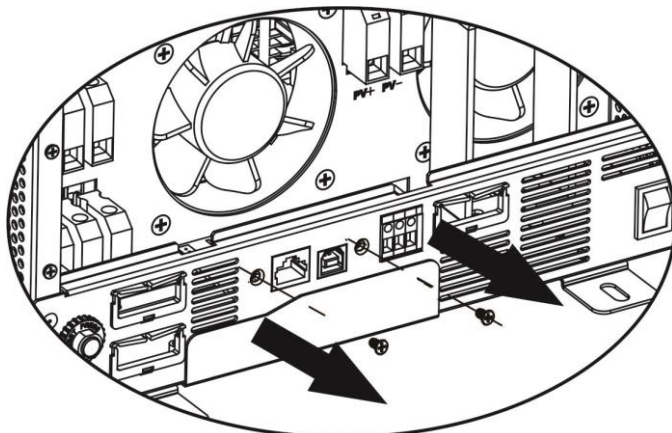
Current sharing cable

3. Parallel board installation

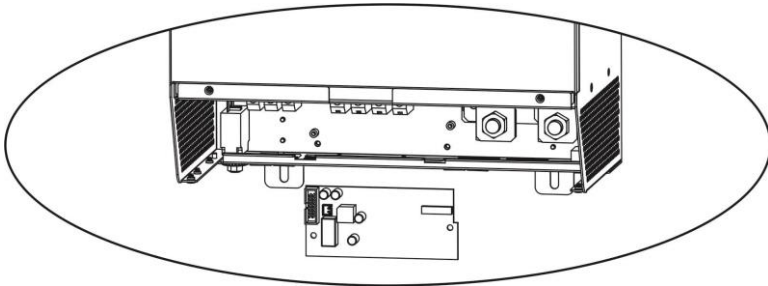
Step 1: Remove wire cover by unscrewing all screws.



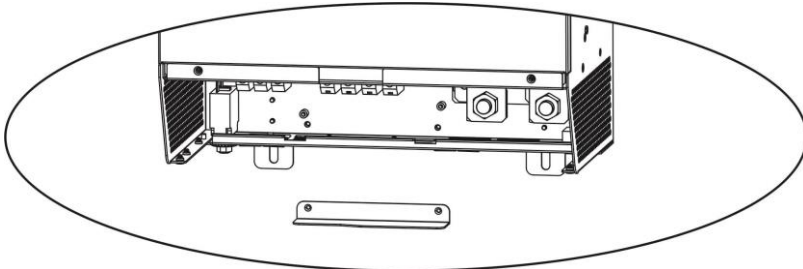
Step 2: Remove communication board by unscrewing two screws as below chart.



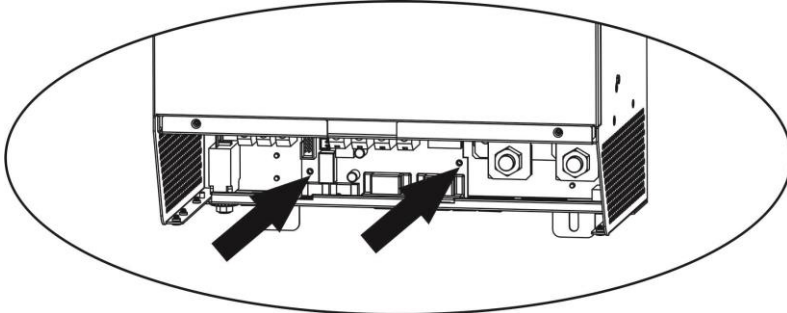
Step 3: Remove two screws as below chart and remove 2-pin and 14-pin cables. Take out the board under the communication board.



Step 4: Remove two screws as below chart to take out cover of parallel communication.

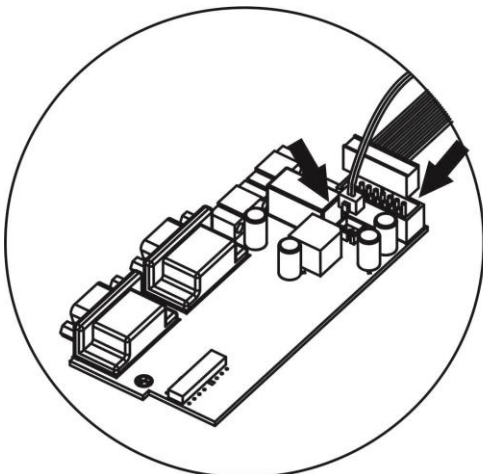


Step 5: Install new parallel board with 2 screws tightly.

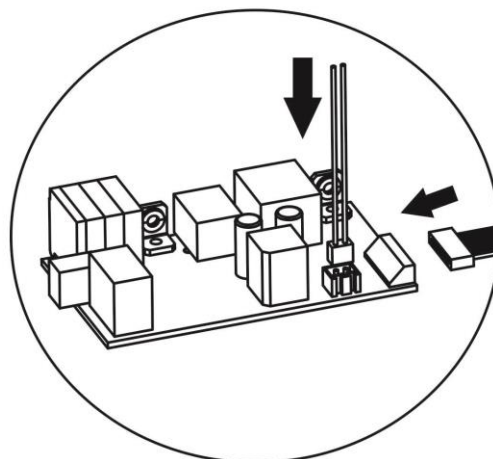


Step 6: Re-connect 2-pin and 14-pin to original position.

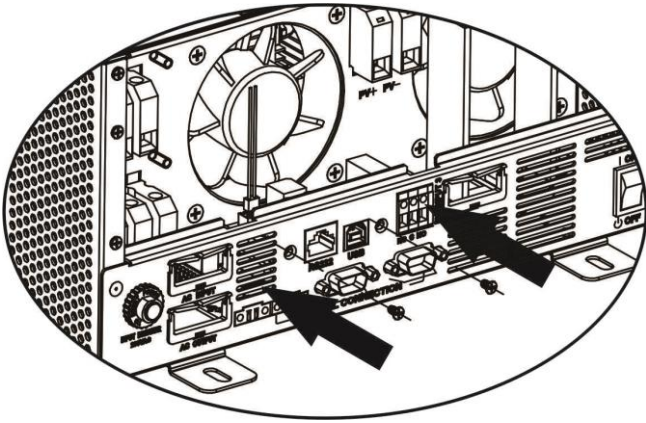
Parallel board



Communication board



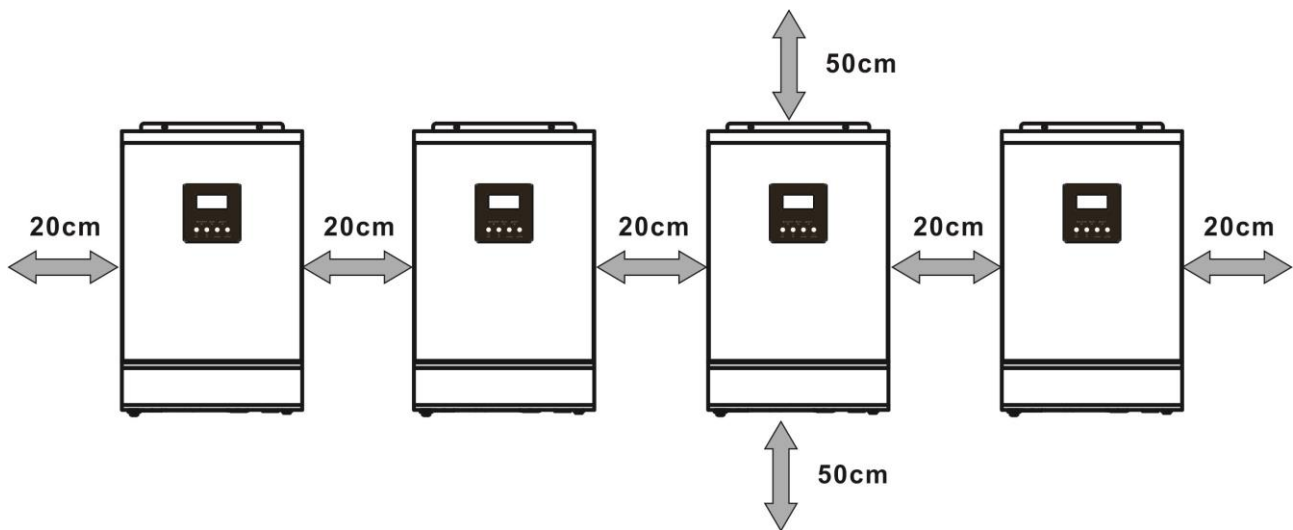
Step 7: Put communication board back to the unit.



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

4. Mounting the Unit

When installing multiple units, please follow below chart.



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

5. Wiring Connection

The cable size of each inverter is shown as below:

Recommended battery breaker, cable and terminal size for each inverter:

Model	Breaker Size	Wire Size		Ring Terminal Dimensions		Torque Value
		AWG	mm ²	D (mm)	L (mm)	
5KVA with 2 MPPTs	200A/60VDC	2 * 4AWG	44	10.5	50	10~ 12 Nm
5KVA with 3 MPPTs	250A/60VDC	2 * 2AWG	72	10.5	55	

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:

Wire Size		Torque Value
AWG	mm ²	
1 * 8 AWG	8.4	1.4~ 1.6Nm

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

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

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

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

Recommended breaker specification of AC input with single phase:

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

Note 1: Also, you can use 50A breaker for only 1 unit, and each inverter has a breaker at its AC input.

Note 2: Regarding three phase system, you can use 4 poles breaker, the rating is up to the current of the phase which has the maximum units. Or you can follow the suggestion of note 1.

Recommended battery capacity

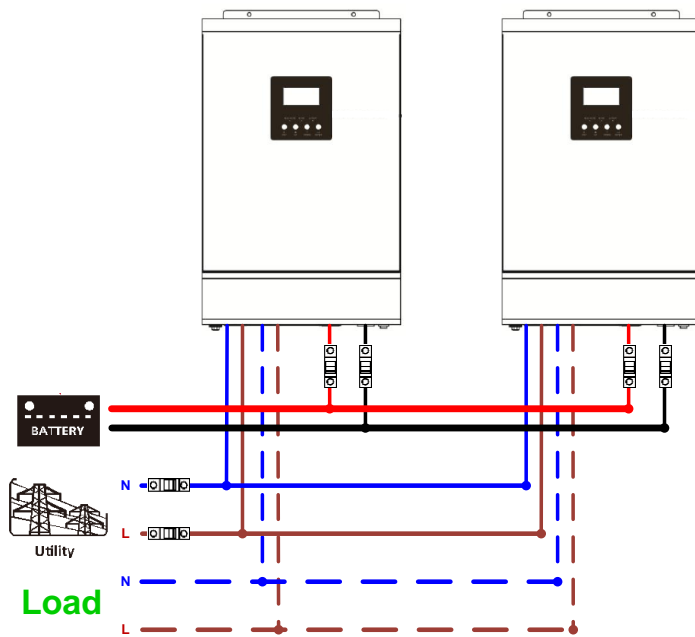
Inverter parallel numbers	2	3	4	5	6	7	8	9
Battery Capacity	1200AH	1800AH	2400AH	3000AH	3600AH	4200AH	4800AH	5400AH

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

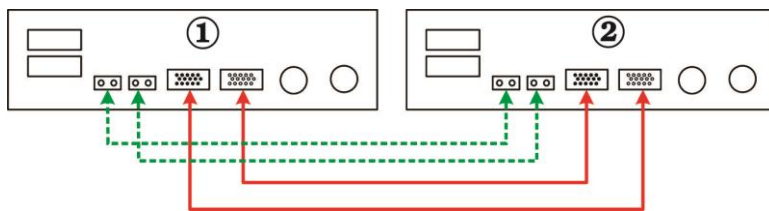
5-1. Parallel Operation in Single phase

Two inverters in parallel:

Power Connection

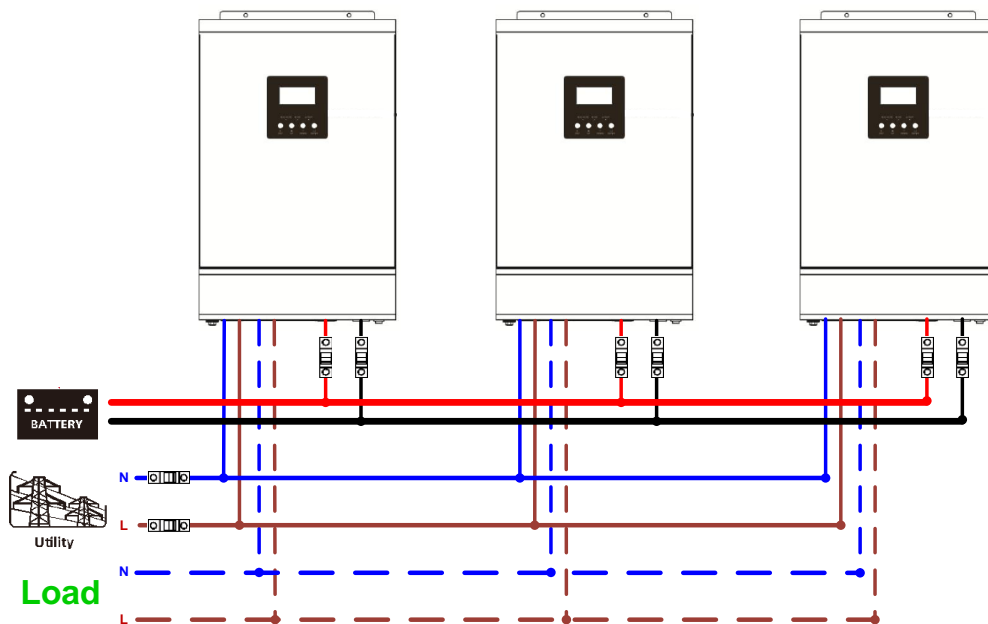


Communication Connection

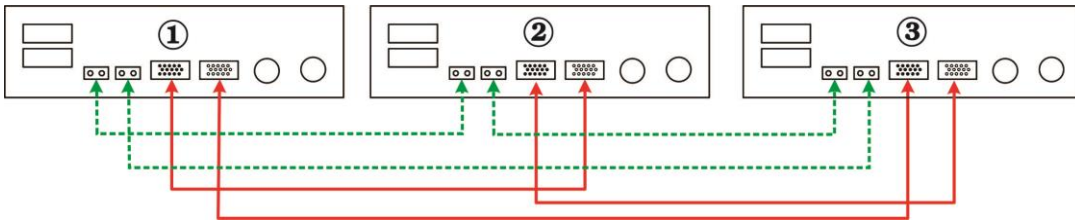


Three inverters in parallel:

Power Connection

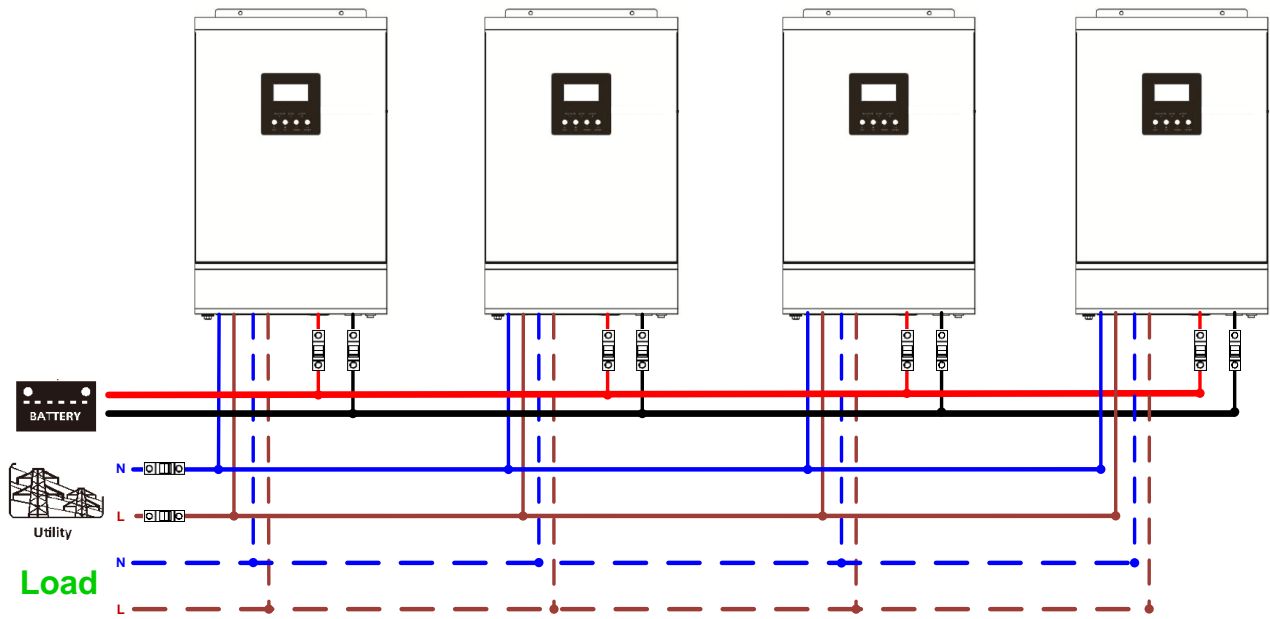


Communication Connection

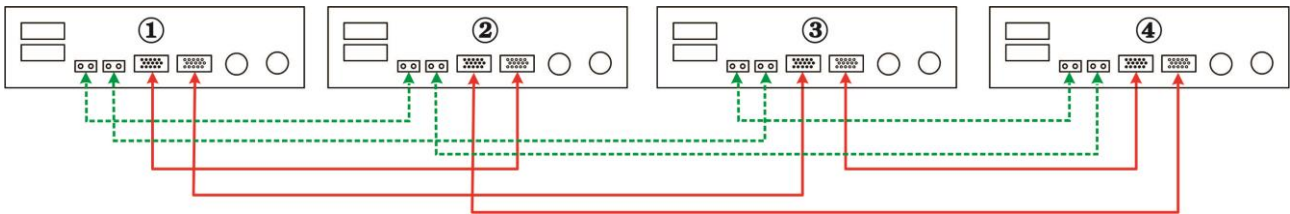


Four inverters in parallel:

Power Connection

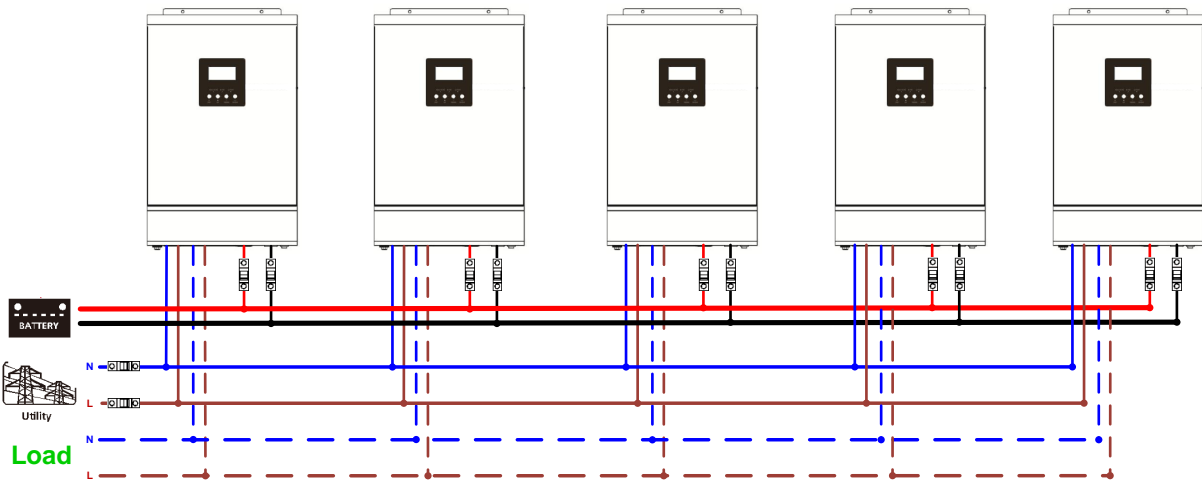


Communication Connection

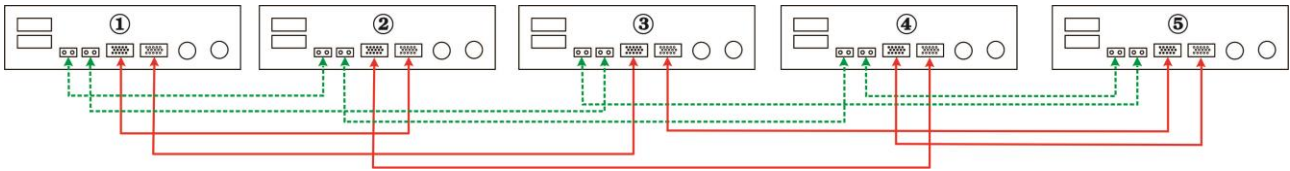


Five inverters in parallel:

Power Connection

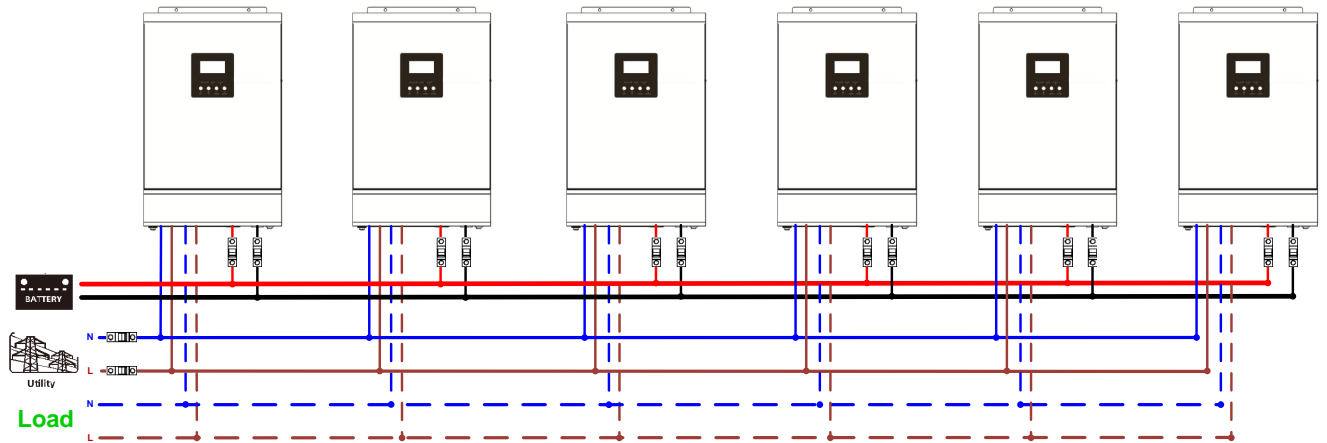


Communication Connection

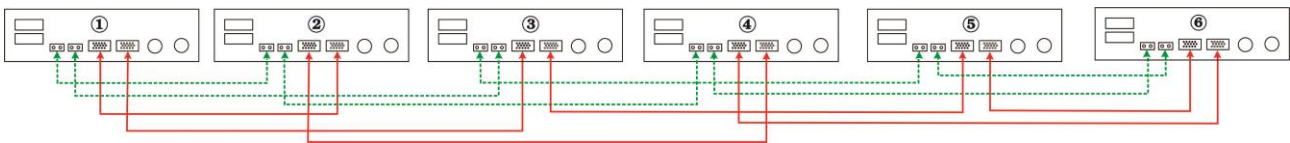


Six inverters in parallel:

Power Connection

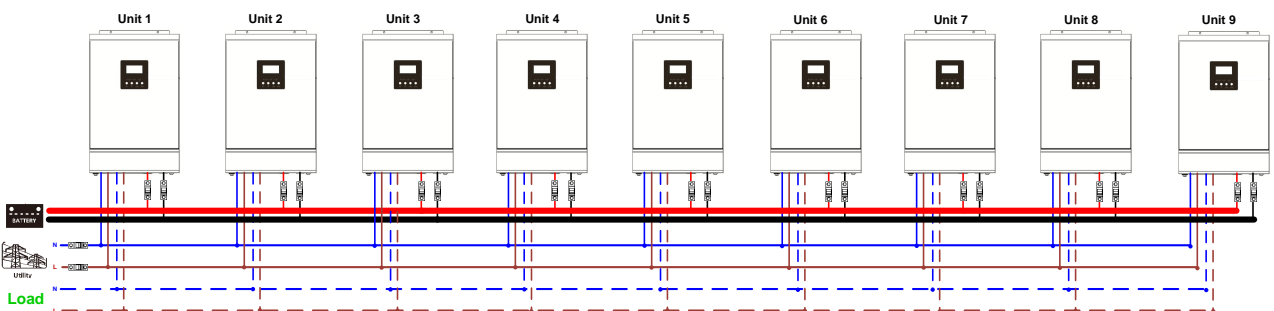


Communication Connection



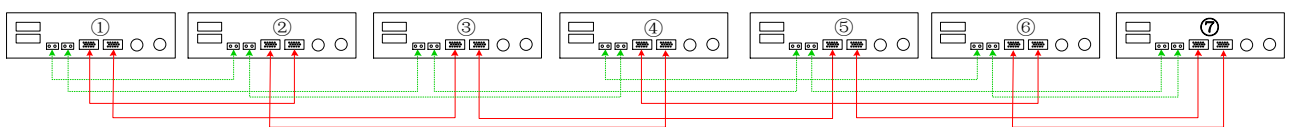
Seven to nine inverters in parallel:

Power Connection

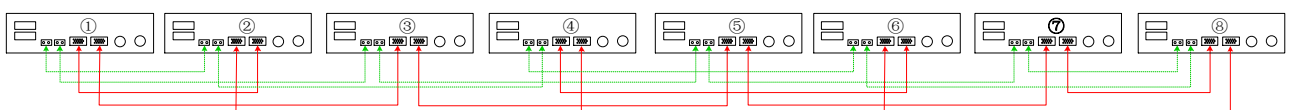


Communication Connection

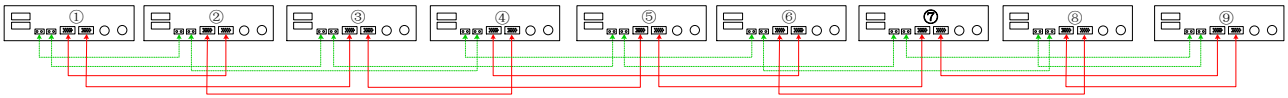
➤ Seven inverters in parallel



➤ Eight inverters in parallel



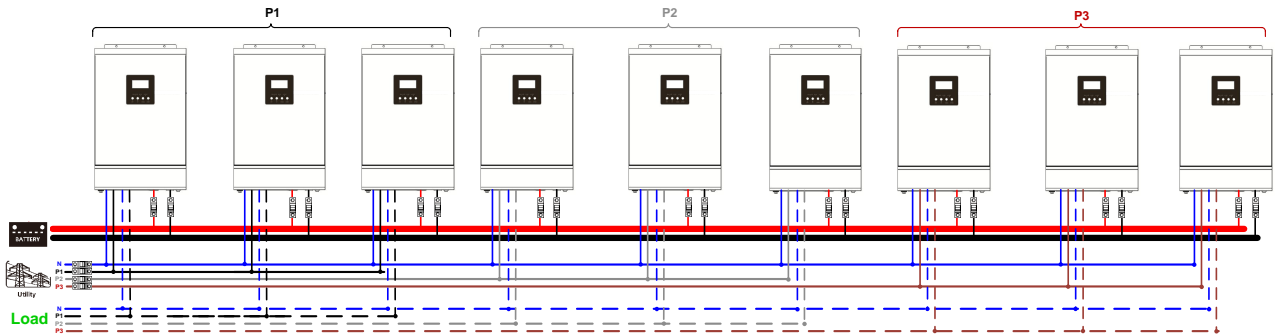
➤ Nine inverters in parallel



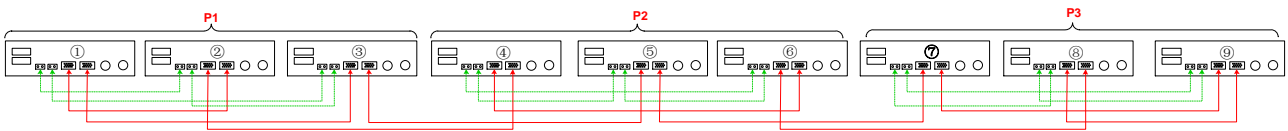
5-2. Support 3-phase equipment

Three inverters in each phase:

Power Connection



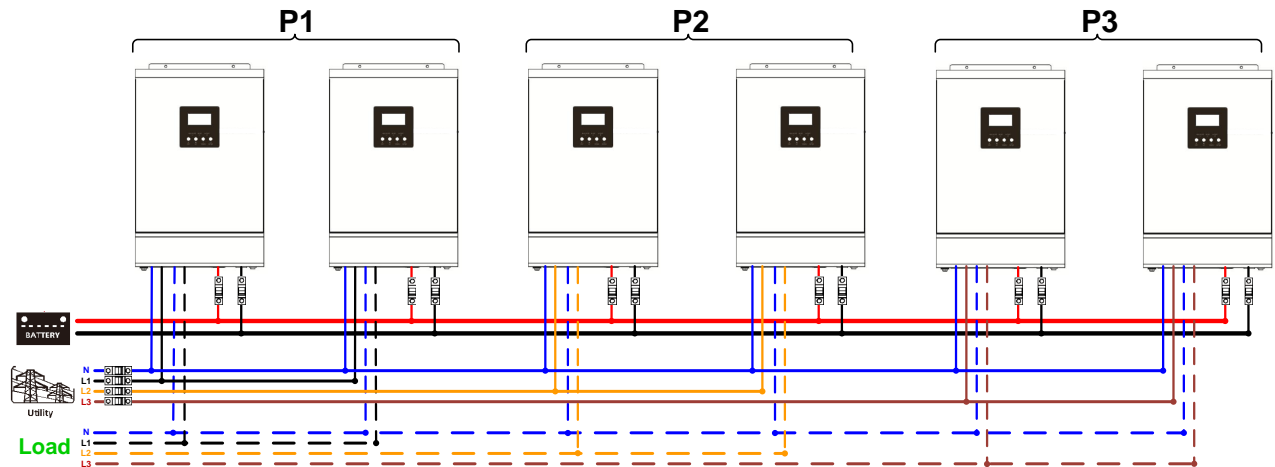
Communication Connection



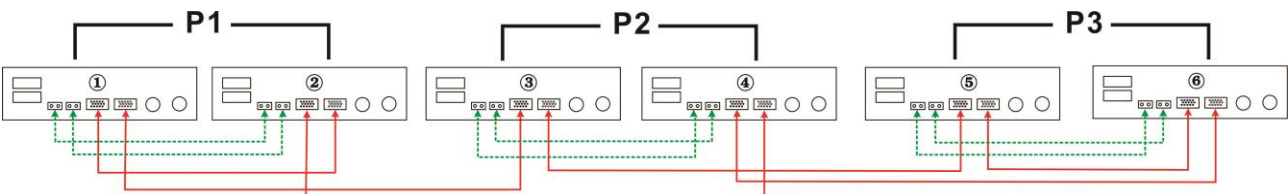
WARNING: Do not connect the current sharing cable between the inverters which are in different phases. Otherwise, it may damage the inverters.

Two inverters in each phase:

Power Connection

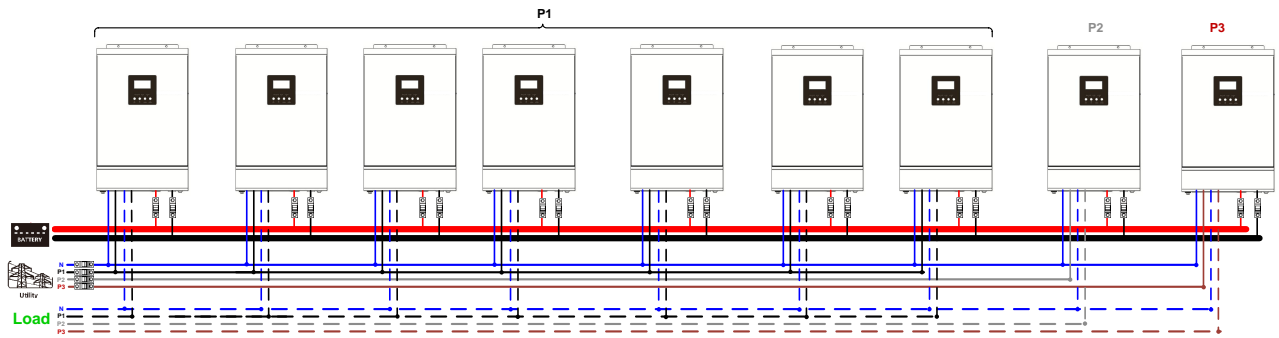


Communication Connection



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

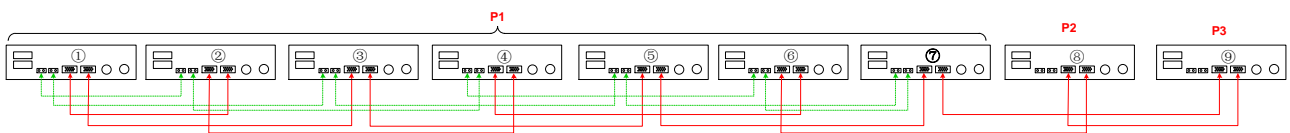
Power Connection



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

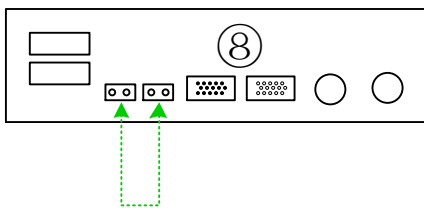
P1: L1-phase, P2: L2-phase, P3: L3-phase.

Communication Connection



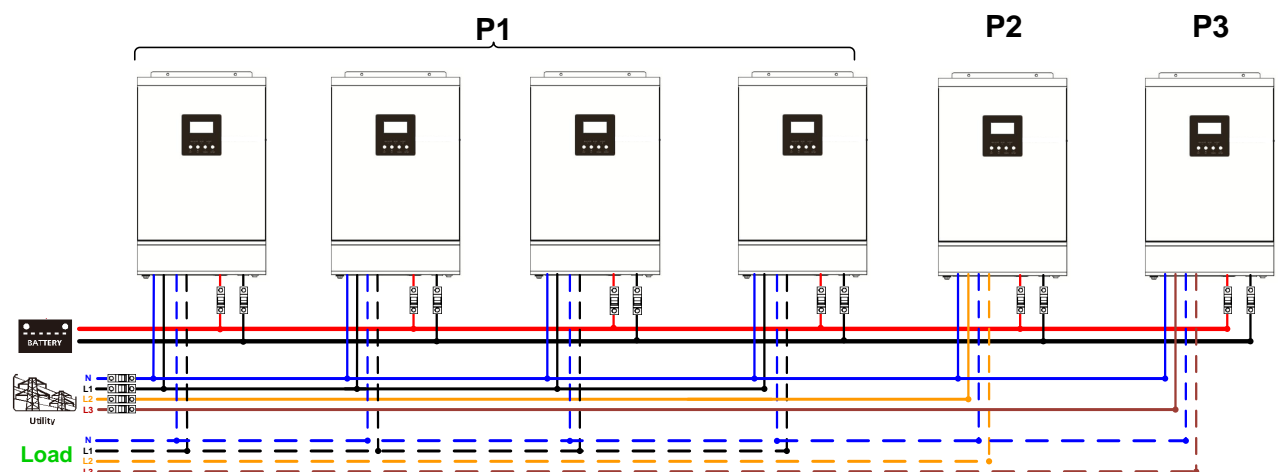
Note: If there is only one unit in one phase, this unit doesn't need to connect the current sharing cable.

Or you connect it like as below:



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

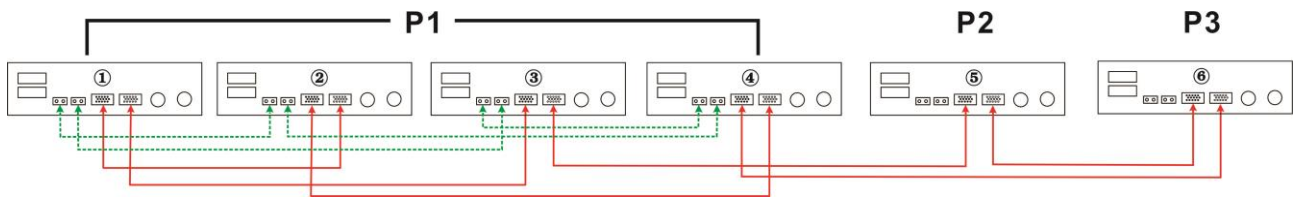
Power Connection



Note: It's up to customer's demand to pick 4 inverters on any phase.

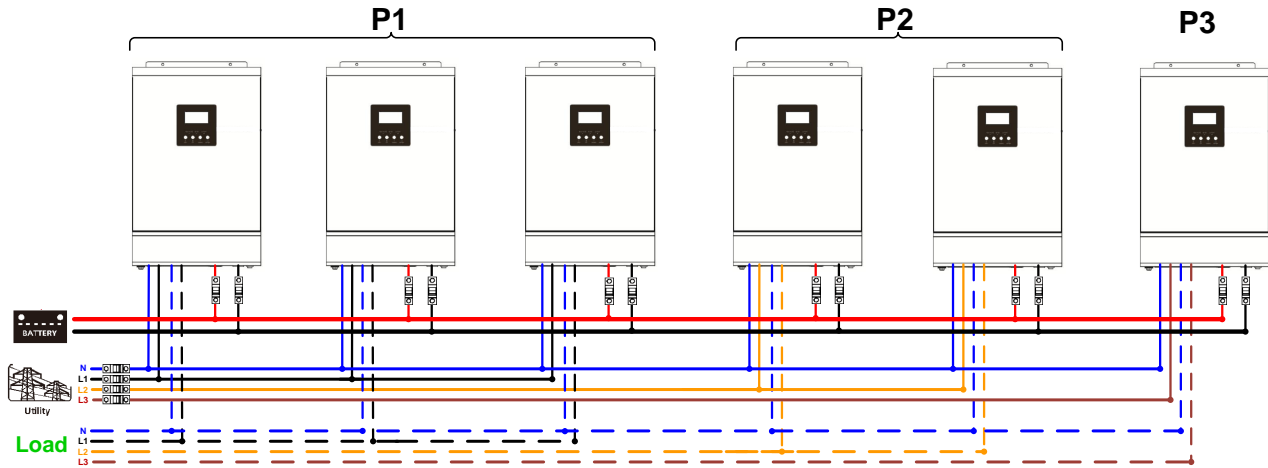
P1: L1-phase, P2: L2-phase, P3: L3-phase.

Communication Connection

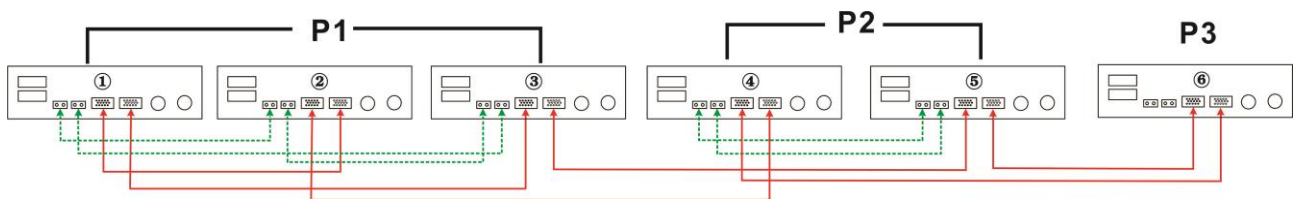


Three inverters in one phase, two inverters in second phase and one inverter for the third phase:

Power Connection

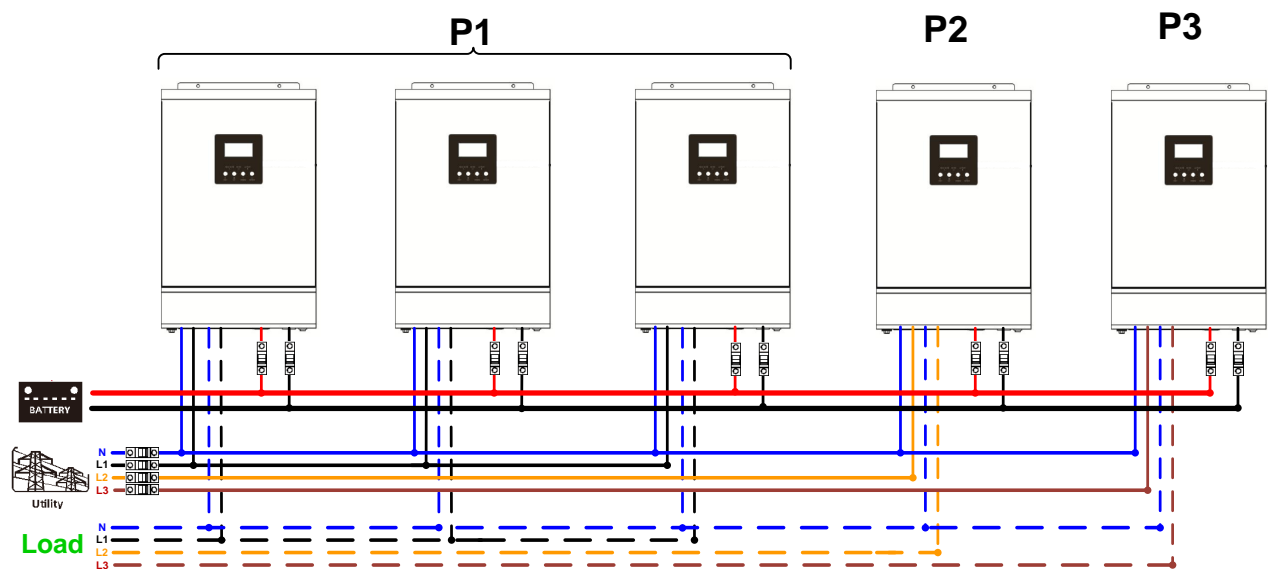


Communication Connection

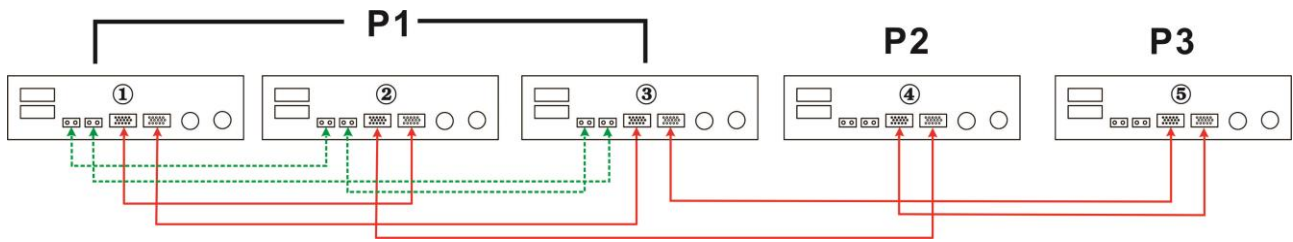


Three inverters in one phase and only one inverter for the remaining two phases:

Power Connection

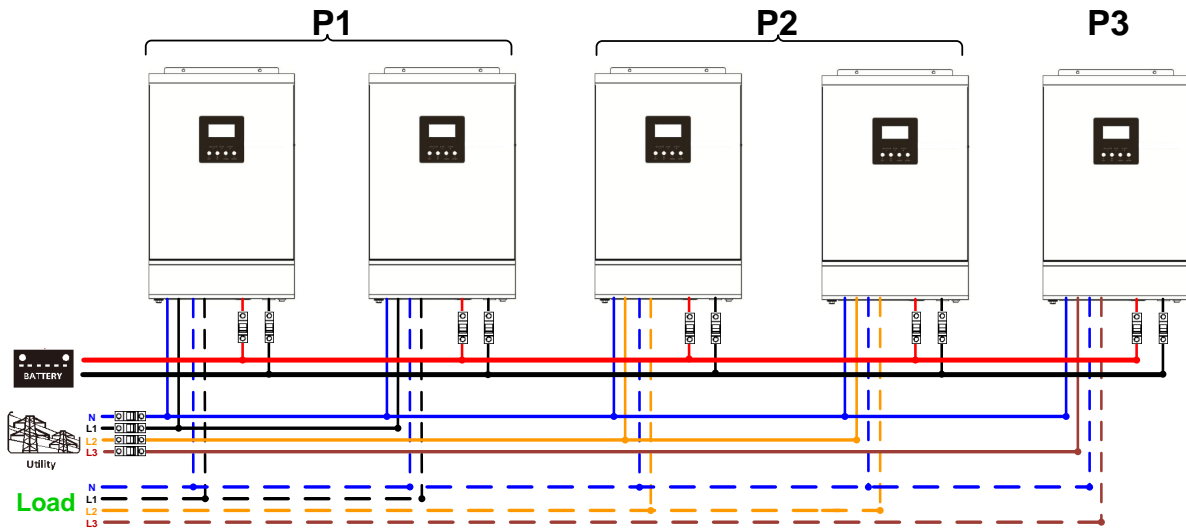


Communication Connection

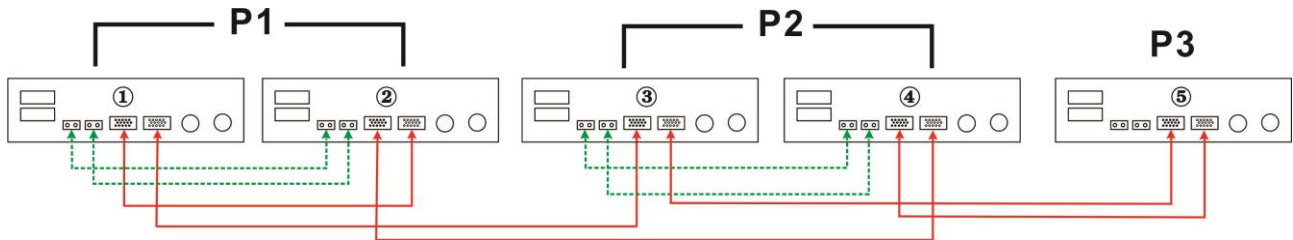


Two inverters in two phases and only one inverter for the remaining phase:

Power Connection

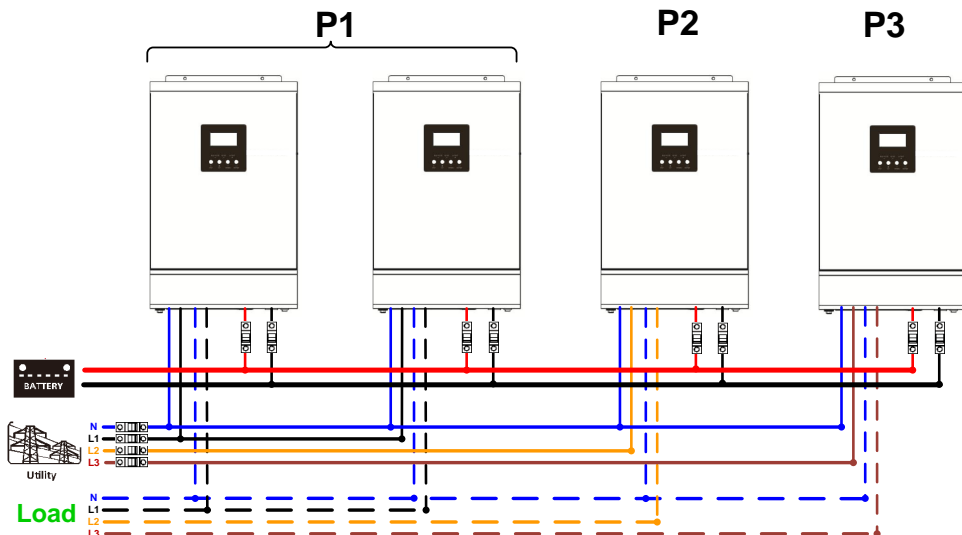


Communication Connection

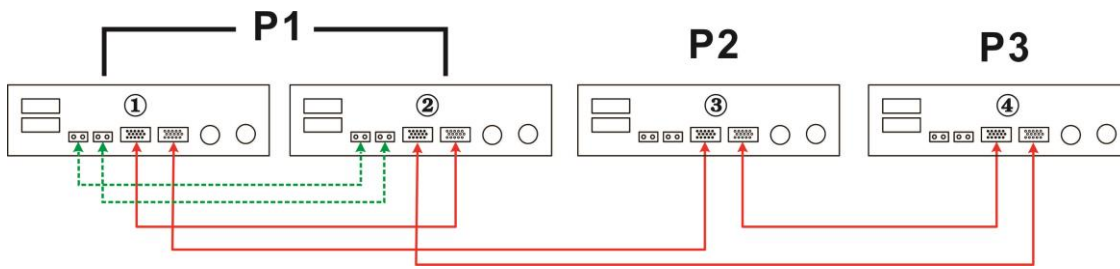


Two inverters in one phase and only one inverter for the remaining phases:

Power Connection

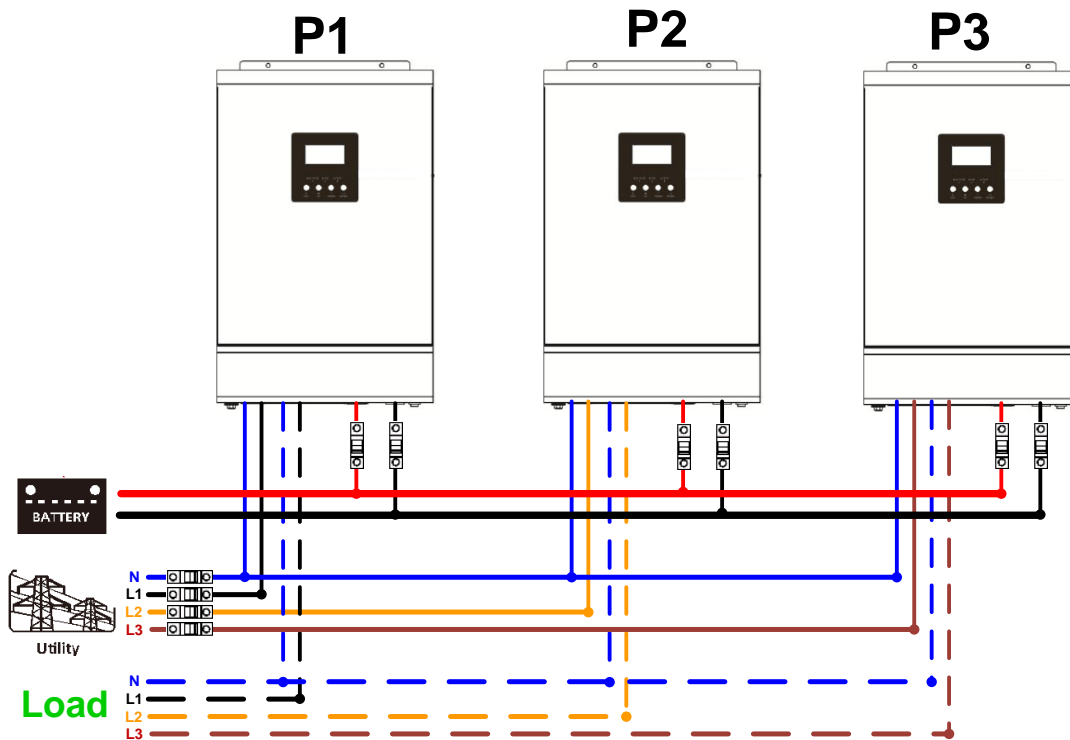


Communication Connection

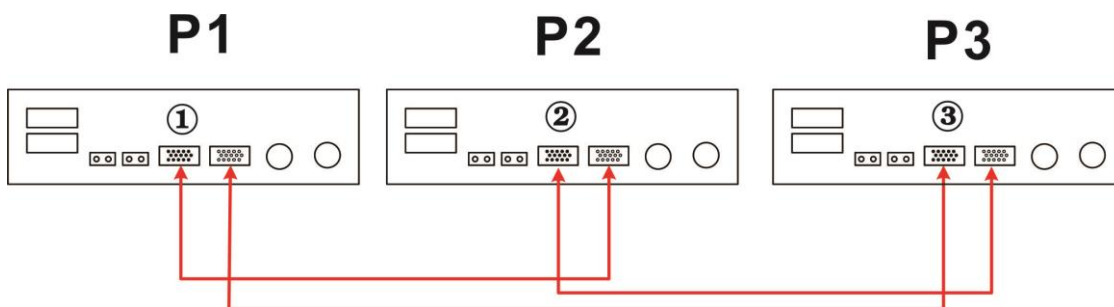


One inverter in each phase:

Power Connection



Communication Connection



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

6. PV Connection

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

CAUTION: Each inverter should connect to PV modules separately.

7. LCD Setting and Display

Setting Program:

Program	Description	Selectable option	
28	AC output mode *This setting is only available when the inverter is in standby mode (Switch off).	Single: 28 ^{OUTPUT} <u>SI G</u>	When the units are used in parallel with single phase, please select "PAL" in program 28.
		Parallel: 28 ^{OUTPUT} <u>PAL</u>	It is required to have at least 3 inverters or maximum 6 inverters to support three-phase equipment. It's required to have at least one inverter in each phase or it's up to four inverters in one phase. Please refers to 5-2 for detailed information. Please select "3P1" in program 28 for the inverters connected to L1 phase, "3P2" in program 28 for the inverters connected to L2 phase and "3P3" in program 28 for the inverters connected to L3 phase.
		L1 phase: 28 ^{OUTPUT} <u>3P 1</u>	
		L2 phase: 28 ^{OUTPUT} <u>3P 2</u>	
		L3 phase: 28 ^{OUTPUT} <u>3P 3</u>	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.
			Besides, power saving function will be automatically disabled.
30	PV judge condition (Only apply for setting "Solar first" in program 1: Output source priority)	One Inverter (Default): 30 <u>ONE</u>	When "ONE" is selected, as long as one of inverters has been connected to PV modules and PV input is normal, parallel or 3-phase system will continue working according to rule of "solar first" setting. For example, two units are connected in parallel and set "SOL" in output source priority. If one of two units has connected to PV modules and PV input is normal, the parallel system will provide power to loads from solar or battery power. If both of them are not sufficient, the system will provide power to loads from utility.
		All of Inverters: 30 <u>ALL</u>	When "ALL" is selected, parallel or 3-phase system will continue working according to rule of "solar first" setting only when all of inverters are connected to PV modules. For example, two units are connected in parallel and set "SOL" in output source priority. When selecting "ALL" in program 30, it's necessary to have all inverters connected to PV modules and PV input is normal to allow the system to provide power to loads from solar and battery power. Otherwise, the system will provide power to loads from utility.

Fault code display:

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

8. Commissioning

Parallel in single phase

Step 1: Check the following requirements before commissioning:

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

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

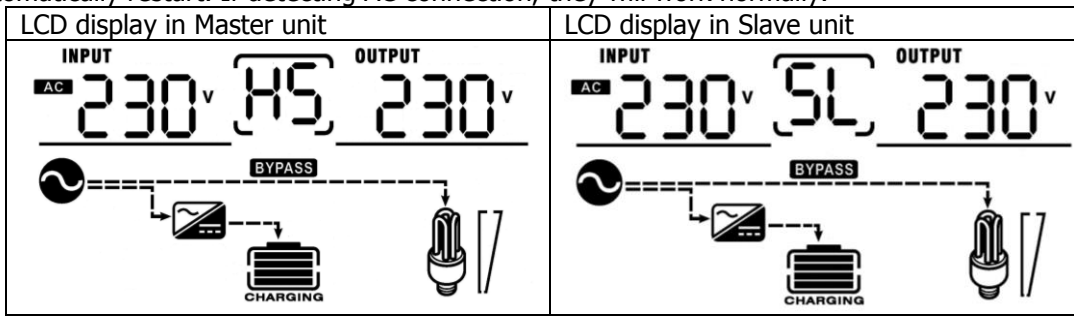
NOET: It's necessary to turn off switch when setting LCD program. Otherwise, the setting can not be programmed.

Step 3: Turn on each unit.

LCD display in Master unit	LCD display in Slave unit

NOTE: Master and slave units are randomly defined.

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



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

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

Support three-phase equipment

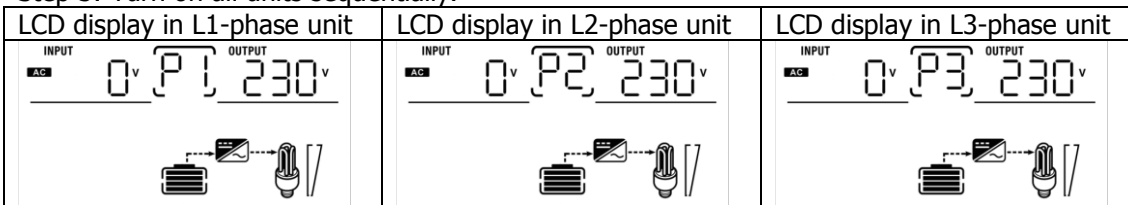
Step 1: Check the following requirements before commissioning:

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

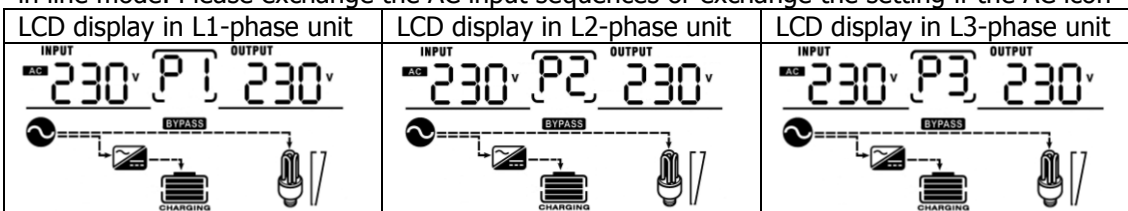
Step 2: Turn on all units and configure LCD program 28 as P1, P2 and P3 sequentially. And then shut down all units.

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

Step 3: Turn on all units sequentially.



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



Step 5: If there is no more fault alarm, the system to support 3-phase equipment is completely installed.

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

Note 1: To avoid overload occurring, before turning on breakers in load side, it's better to have whole system in operation first.

Note 2: Transfer time for this operation exists. Power interruption may happen to critical devices, which cannot bear transfer time.

9. Trouble shooting

Situation		Solution
Fault Code	Fault Event Description	
60	Current feedback into the inverter is detected.	<ol style="list-style-type: none"> Restart the inverter. Check if L/N cables are not connected reversely in all inverters. For parallel system in single phase, make sure the sharing are connected in all inverters. For supporting three-phase system, make sure the sharing cables are connected in the inverters in the same phase, and disconnected in the inverters in different phases. If the problem remains, please contact your installer.
71	The firmware version of each inverter is not the same.	<ol style="list-style-type: none"> Update all inverter firmware to the same version. Check the version of each inverter via LCD setting and make sure the CPU versions are same. If not, please contact your instraller to provide the firmware to update. After updating, if the problem still remains, please contact your installer.
72	The output current of each inverter is different.	<ol style="list-style-type: none"> Check if sharing cables are connected well and restart the inverter. If the problem remains, please contact your installer.
73	Output Voltage setting different fault	<ol style="list-style-type: none"> Check if the output voltages setting of all inverters are same. If setting is different, please set up to the same. After setting, please restart all inverters. If the problem remains, please contact your installer.
80	CAN data loss	<ol style="list-style-type: none"> Check if communication cables are connected well and restart the inverter. If the problem remains, please contact your installer.
81	Host data loss	
82	Synchronization data loss	
83	The battery voltage of each inverter is not the same.	<ol style="list-style-type: none"> Make sure all inverters share same groups of batteries together. Remove all loads and disconnect AC input and PV input. Then, check battery voltage of all inverters. If the values from all inverters are close, please check if all battery cables are the same length and same material type. Otherwise, please contact your installer to provide SOP to calibrate battery voltage of each inverter. If the problem still remains, please contact your installer.
84	AC input voltage and frequency are detected different.	<ol style="list-style-type: none"> Check the utility wiring connction and restart the inverter. Make sure utility starts up at same time. If there are breakers installed between utility and inverters, please be sure all breakers can be turned on AC input at same time. If the problem remains, please contact your installer.
85	AC output current unbalance	<ol style="list-style-type: none"> Restart the inverter. Remove some excessive loads and re-check load information from LCD of inverters. If the values are different, please check if AC input and output cables are in the same length and material type. If the problem remains, please contact your installer.
86	AC output mode setting is different.	<ol style="list-style-type: none"> Switch off the inverter and check LCD setting #28. For parallel system in single phase, make sure no 3P1, 3P2 or 3P3 is set on #28. For three-phase system, make sure no "PAL" is set on #28. If the problem remains, please contact your installer.