User Manual

OPTI-Solar

Solar Hybrid Inverter
SP6000 Handy II

Version: 1.2

Table Of Contents

ABOUT THIS MANUAL 1

Purpose 1
Scope 1

SAFETY INSTRUCTIONS 1

INTRODUCTION 2

Features 2
Basic System Architecture 2
Product Overview 3

INSTALLATION 4

Unpacking and Inspection 4
Preparation 4
Mounting the Unit 4
Battery Connection 5
AC Input/Output Connection 6
PV Connection 8
Final Assembly 10
Communication Connection 11

OPERATION 12

Power ON/OFF 12
Operation and Display Panel 12
LCD Display Icons 13
LCD Setting 15
Battery Equalization Description 27
Fault Reference Code 28
Warning Indicator 29

CLEARANCE AND MAINTENANCE FOR ANTI-DUST KIT 30

Overview 30
Clearance and Maintenance 30

SPECIFICATIONS 31

Table 1 Line Mode Specifications 31
Table 2 Inverter Mode Specifications 32
Table 3 Charge Mode Specifications 33
Table 4 General Specifications 33

TROUBLE SHOOTING 34

Appendix I: Parallel Operation 35

Appendix II: BMS Communication Installation 37

Appendix III: Wi-Fi Operation Guide 42

Appendix IV: The CT Operation Guide 51

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: All safety instructions in this document must be read, understood and followed. Failure to follow these instructions will result in death or serious injury.

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, please follow required spec to select appropriate cable size. It's very important to correctly operate this inverter.
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. One piece of 150A fuse is provided as over-current protection for the battery supply.
11. GROUNDING INSTRUCTIONS -This inverter 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 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
15. 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.
16. **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 dual AC input and output
- Configurable input voltage ranges for home appliances and personal computers via LCD control panel
- Configurable battery charging current based on applications via LCD control panel
- Configurable AC/Solar Charger priority via LCD control panel
- Compatible to utility mains or generator power
- Auto restart while AC is recovering
- Overload, over temperature and short circuit protection
- Battery reverse polarity protection
- PV reverse polarity detection
- Smart battery charger design for optimized battery performance
- Built-in Wi-Fi module
- Built-in BMS communication port
- Easy 1+1 parallel output power

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.

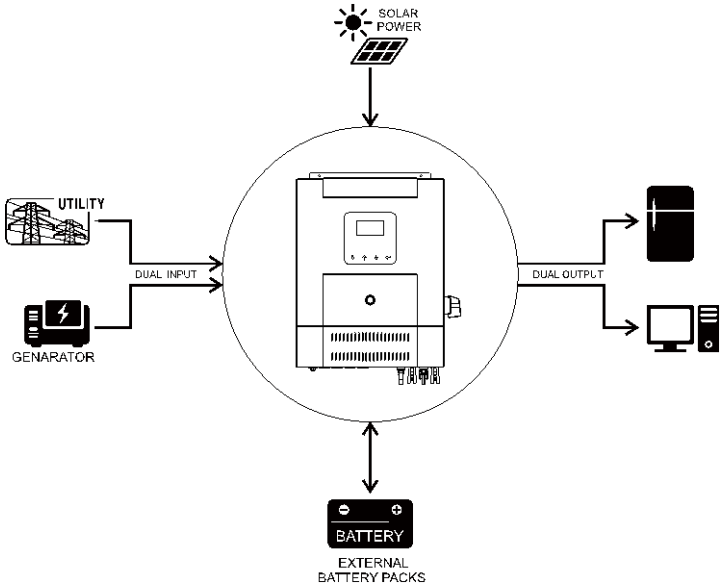
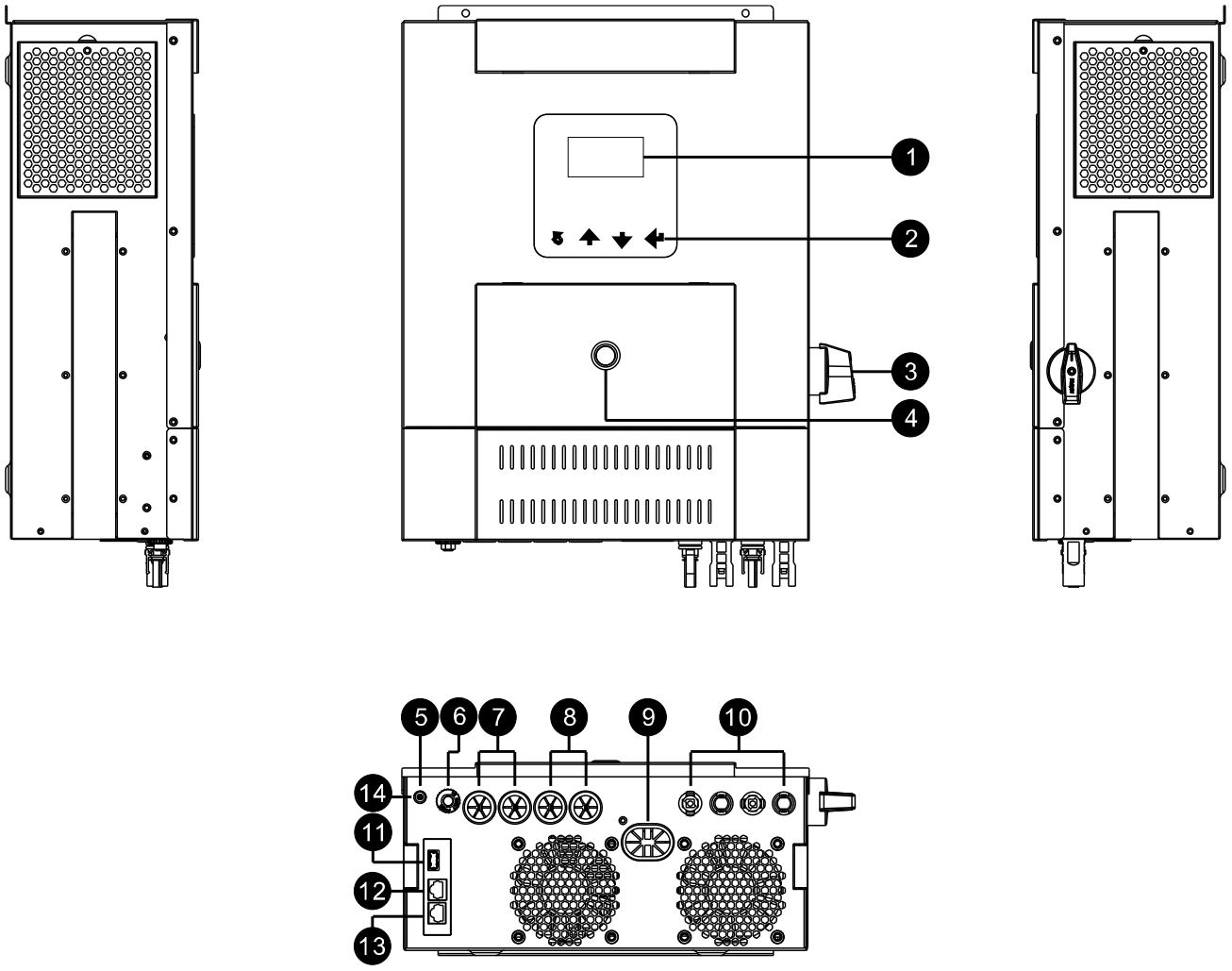


Figure 1 Solar Power System

Product Overview



1. LCD display
2. Function buttons with status indication
3. PV switch
4. Power on/off switch
5. External CT
6. AC input circuit breaker
7. AC input ports
8. AC output ports
9. Battery input ports
10. PV input ports
11. Wi-Fi module
12. Communication (RS485, RS232, BMS) port
13. Parallel port
14. Neutral to Ground bonding

INSTALLATION

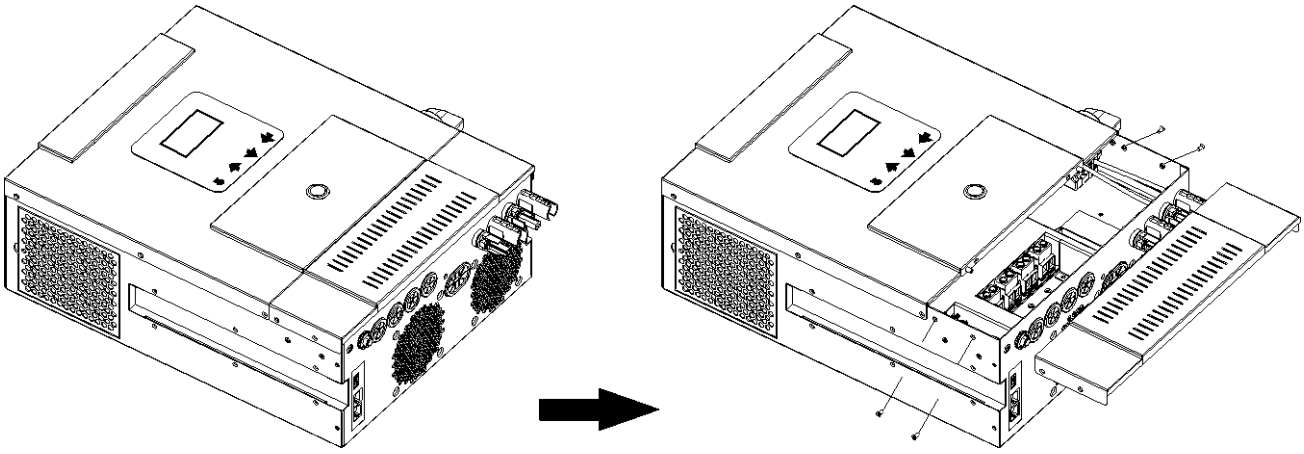
Unpacking and Inspection

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

- Inverter x 1
- User manual x 1
- RS232 Communication cable x 1
- Parallel cable x 1
- PV connectors x 2 set
- Current Transformer x 1

Preparation

Before connecting all wirings, please take off terminal cover first by removing one screw and bottom cover by removing four screws as shown below.

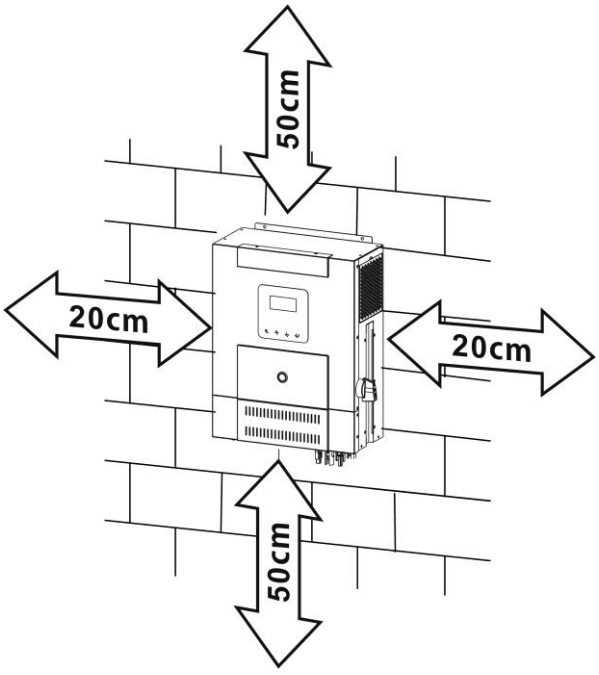


Mounting the Unit

Consider the followings before selecting your placements:

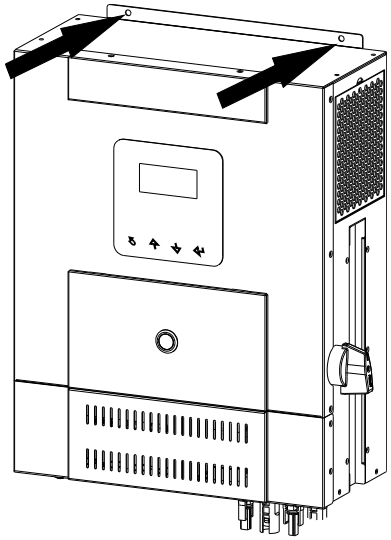
- Do not mount the inverter on flammable construction materials.
- Mount on a solid surface
- Install the inverter at eye level in order to allow easy LCD display readout.
- For proper air circulation and heat dissipation, allow a clearance of approx. 20 cm to the side and approx. 50 cm above and below the unit.
- The ambient temperature should be between 0°C and 55°C to ensure optimal operation.
- The recommended orientation is to adhered to the wall vertically.

  Be sure to keep other objects and surfaces as shown in the diagram to guarantee sufficient heat dissipation and to have enough space for wirings.



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

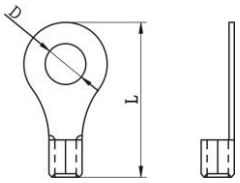
Install the unit by screwing two screws. It's recommended to use M4 or M5 screws.



Battery Connection

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

Ring terminal:



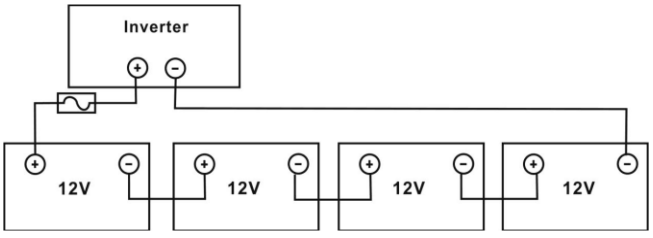
WARNING! All wiring must be performed by a qualified electrical technician.
WARNING! It's very important for system safety and efficient operation to use appropriate cables for battery connection. To reduce risk of injury, please use the proper recommended cable in the table below.

Recommended battery cable size:

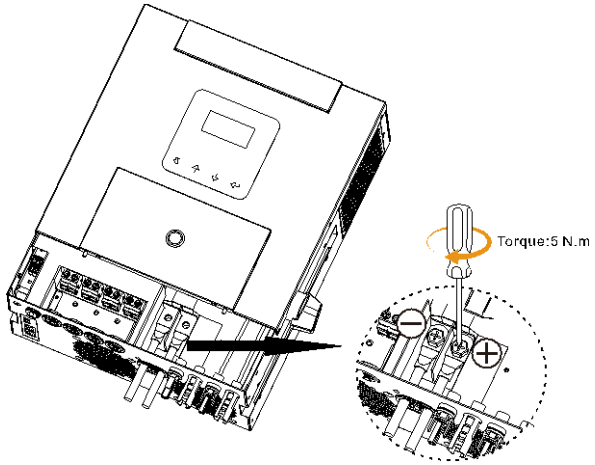
Typical Amperage	Wire Size	Cable mm² (each)	Ring Terminal Dimensions		Torque Value
			D (mm)	L (mm)	
138.8A	1*2AWG	38	8.4	39.2	5 Nm

Please follow below steps to implement battery connection:

1. This model supports 48VDC system. Connect all battery packs as below chart. It is recommend to connect minimum of 200Ah capacity battery.



2. Prepare two battery wires and apply ring terminals to your battery wires. Secure it to the battery terminal block with the bolts properly tightened. Refer to battery cable size for torque value. Make sure polarity at both of the battery and the inverter is correctly connected and ring terminals are secured to the battery terminals.



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

AC Input/Output Connection

CAUTION!! Before connecting to AC input power source, please install a **separate** AC breaker between the inverter and the AC input power source. This will ensure that the inverter can be safely disconnected during maintenance and fully protected from over-current. The recommended spec of AC breaker is 32A

CAUTION!! There are four power terminal blocks with "IN" (Input) and "OUT" (Output) markings. DO NOT mistakenly connect to the wrong connectors.

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

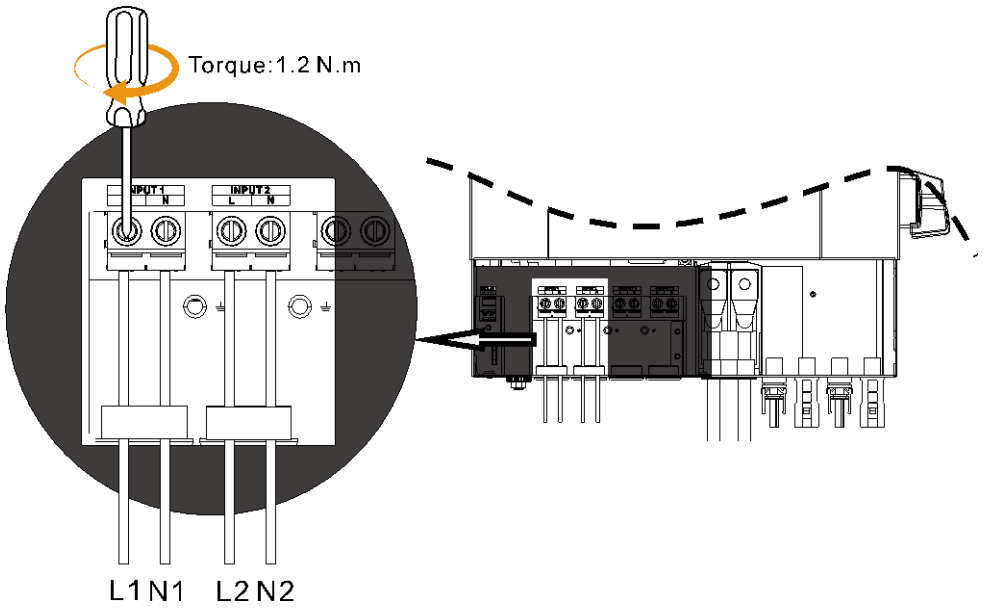
WARNING! It's very important for system safety and efficient operation to use appropriate cable size for AC input connection. To reduce risk of injury, please use the proper recommended cable size as below.

Suggested cable requirement for AC wires

Gauge	Cable (mm^2)	Torque Value
10 AWG	6	1.2 Nm

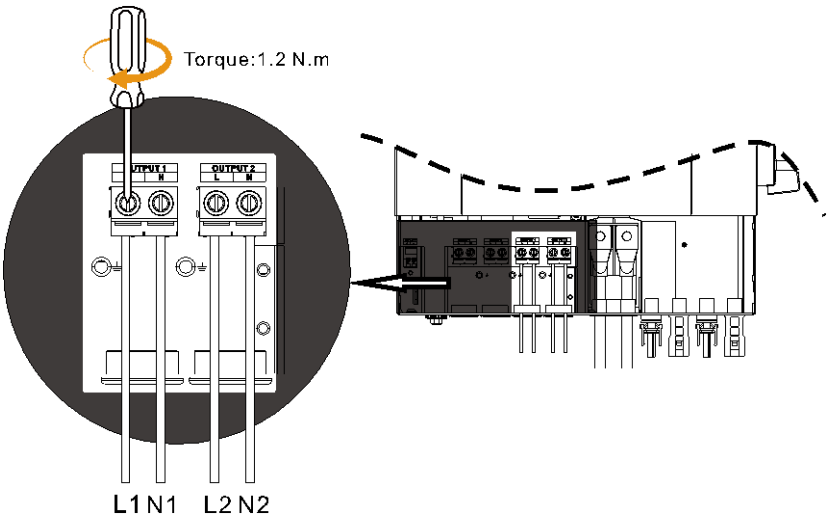
Please follow these steps to implement AC input/output connection:

1. Before making AC input/output connection, be sure to enable DC protector or disconnector first.
2. Loosen screws for the terminals.
3. Insert all AC input wires through terminal cover and connect to terminals according to polarities indicated on terminal block. Tighten the terminal screws. Be sure to connect the grounding wire (⏚) first.
   ⏚→**Ground (yellow-green)**
   L1→ Input 1 LINE (brown or black) …recommend connect to Generator
   N1→ Neutral (blue)
   L2→ Input 2 LINE (brown or black) …recommend connect to Grid
   N2→ Neutral (blue)



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

4. This inverter is equipped with dual-output. There are four terminals (L1/N1, L2/N2) available on output port. It's to set up through LCD program or monitoring software to turn on and off the second output. Refer to "LCD setting" section for the details.
   Insert AC output wires through terminal cover and connect to terminals according to polarities indicated on terminal block. Tighten terminal screws. Be sure to connect PE protective conductor (⏚) first.
   ⏚**→Ground (yellow-green)**
   L1→ Output LINE 1 (brown or black) : recommend Master or critical load
   N1→ Neutral (blue)
   L2→ Output LINE 2 (brown or black) : recommend connect to lower priority load
   N2→ Neutral (blue)



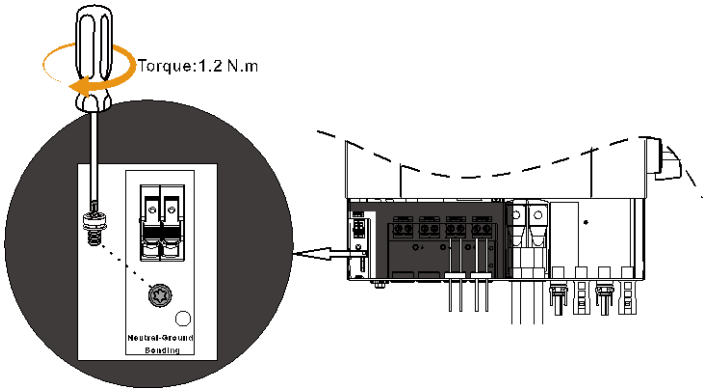
5. Make sure the wires are securely connected.

CAUTION: Appliances such as air conditioner required at least 2~3 minutes to spool up because it needs to have enough time to balance refrigerant gas inside of circuits. If a power shortage occurs and recovers in a short period of time, it may cause damage to your connected appliances. To prevent this from happening, please check with manufacturer of air conditioner if it has time-delay function before installation. Otherwise, this inverter will trigger overload fault and cut off output to protect your appliance but sometimes it may still causes damage to the air conditioner.

6. Bond the Neutral and the Ground.
   To ensure a correct operation of Ground Fault Circuit Interrupters (GFCIs), the AC output Neutral (N) is connected to the Safety Ground (PE) when the AC input of the inverter is disconnected from an external AC source. This default setting of the grounding system works well in most situations. However, depending on national or local regulations, neutral to ground bonding may not be allowed. In that case, this automatic switching feature must be disabled.

   The selection of enabling/disabling automatic neutral to ground bonding in inverter mode is done by positioning the M3x8 screw.

   Screw installed: Enabled (Default)
   Screw removed: Disabled



(Default Setting: Enabled)

PV Connection

CAUTION: Before connecting to PV modules, please install **separately** DC circuit breakers between inverter and PV modules.
NOTE1: Please use 1500VDC/32A 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 required 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.

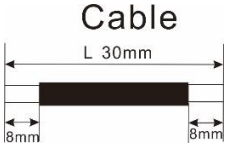
> **CAUTION:** Exceeding the maximum input voltage can destroy the unit!! Check the system before wire connection.

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	

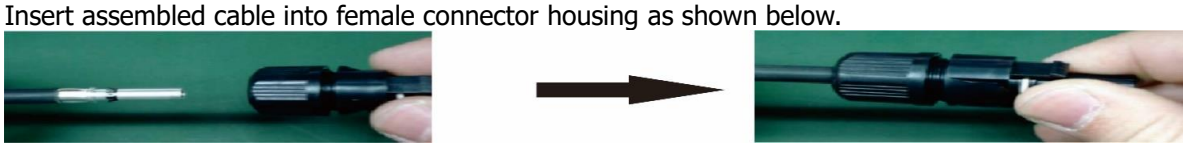
Prepare the cable and follow the connector assembly process:

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.

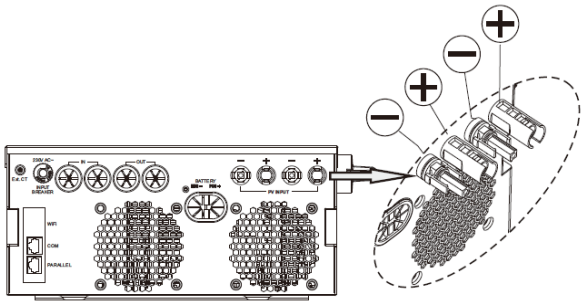


Insert striped cable into male terminal and crimp male terminal as shown below.

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. If there are two string PV array configured, it's recommend to separate them on the four ports.



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.

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. start-up voltage.

Max. PV Array Power	10000W
Max. PV Array Open Circuit Voltage	500Vdc
PV Array MPPT Voltage Range	60Vdc~450Vdc
Start-up Voltage	60Vdc +/- 10Vdc
Max. PV Current	27A

Take 400Wp PV module as an example. After considering above two parameters, the recommended module configurations are listed as below table.

Solar Panel Spec. (reference) - 400Wp - Vmp: 34.39Vdc - Imp: 11.64A - Voc: 41.3Vdc - Isc: 12.34A - Cells: 120	SOLAR INPUT Min in series: 2 pcs, max. in series: 12 pcs.	Q'ty of panels	Total input power
	4 pcs in series	4 pcs	1600W
	6 pcs in series	6 pcs	2400W
	10 pcs in series	10 pcs	4000W
	8 pieces in series, 2 sets in parallel	16 pcs	6400W
	10 pieces in series, 2 sets in parallel	20 pcs	8000W
	12 pieces in series, 2 sets in parallel	24 pcs	9600W

Take 555Wp PV module as an example. After considering above two parameters, the recommended module configurations are listed as below table.

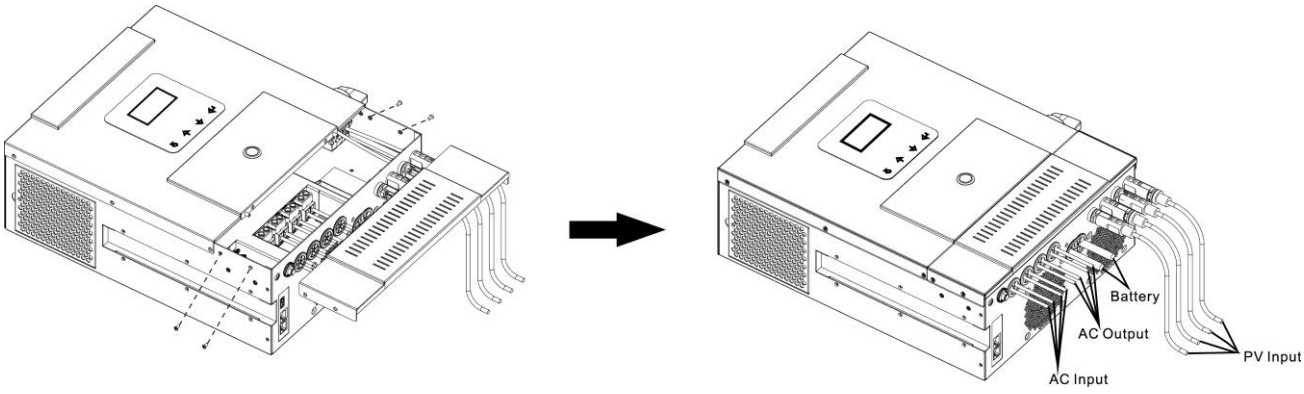
Solar Panel Spec. (reference) -500Wp -Vmp: 42.8V -Imp: 11.69A -Voc: 51.7Vdc -Isc: 12.28A -Cells: 150	SOLAR INPUT Min in series: 2 pcs, max. in series: 9 pcs.	Q'ty of panels	Total input power
	4pcs in series	4 pcs	2000W
	6 pcs in series	6 pcs	3000W
	9 pcs in series	9 pcs	4500W
	6 pcs in series, 2 sets in parallel	12 pcs	6000W
	8 pieces in series, 2 sets in parallel	16 pcs	8000W
	9 pieces in series, 2 sets in parallel	18 pcs	9000W

Take 620Wp PV module as an example. After considering above two parameters, the recommended module configurations are listed as below table.

Solar Panel Spec. (reference) -620Wp -Vmp: 35.7V -Imp: 17.37A -Voc: 42.9Vdc -Isc: 18.31A -Cells: 120	SOLAR INPUT Min in series: 2 pcs, max. in series: 11 pcs.	Q'ty of panels	Total input power
	4pcs in series	4 pcs	2480W
	6 pcs in series	6 pcs	3720W
	9 pcs in series	9 pcs	5580W
	6 pcs in series, 2 sets in parallel	12 pcs	7440W
	8 pieces in series, 2 sets in parallel	16 pcs	9920W
	9 pieces in series, 2 sets in parallel	18 pcs	11160W

Final Assembly

After connecting all wirings, put the bottom cover back by fixing four screws and install terminal cover back to original position as shown below.



Communication Connection

Serial Connection

Please use supplied communication cable to connect to inverter and PC.

Wi-Fi Connection

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

BMS Communication

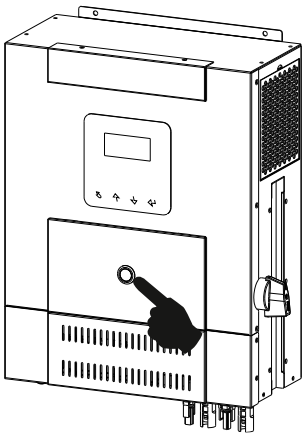
It is recommended to purchase a special communication cable if you are connecting to Lithium-Ion battery banks. Please refer to Appendix II- BMS Communication Installation for details.

Parallel Communication

This unit supports parallel function. Before making units in parallel, please connect parallel cable correctly. Please refer to Appendix I – Parallel Operation for detailed information.

OPERATION

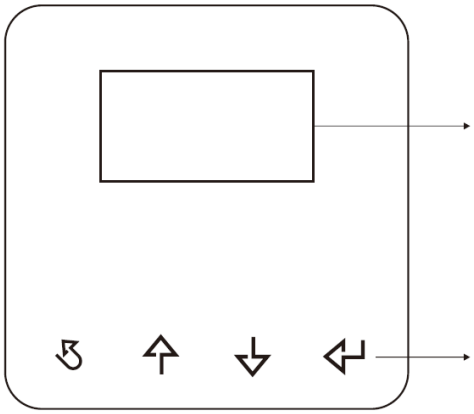
Power ON/OFF



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

Operation and Display Panel

The operation and the LCD module, shown in the chart below, includes four touchable buttons with status indication and a LCD display, indicating the operating status and input/output power information.

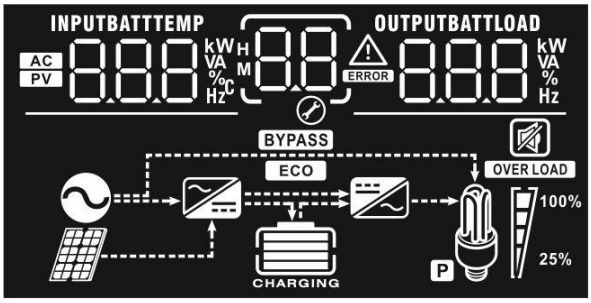


Touchable buttons with indication

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

LED Indicator	Color	Solid/Flashing	Messages
	Green	Solid On	Unit is working normally (without any warning or fault codes and charging).
	Green/Yellow	Alternatively flashing	Battery is charging.
	Yellow	Solid On	Warning code appears.
	Red	Solid On	Fault mode.

LCD Display Icons

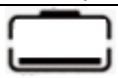


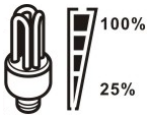
Icon	Function description
Input Source Information	
AC	Indicates the AC input.
PV	Indicates the PV input
INPUTBATT 888 kW VA %C Hz	Indicate input voltage, input frequency, PV voltage, charger current, charger power, battery voltage.
Configuration Program and Fault Information	
88	Indicates the setting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

In AC mode, it will present battery charging status.

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

In battery mode, it will present battery capacity.

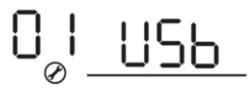
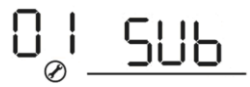
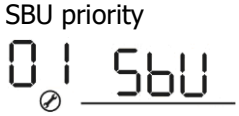
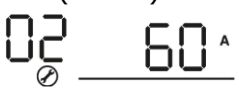
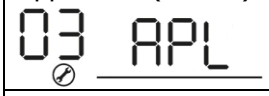
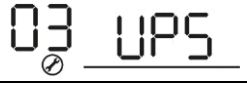
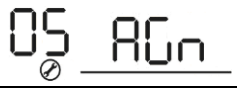
Load Percentage	Battery Voltage	LCD Display
Load >50%	< 1.85V/cell	
	1.85V/cell ~ 1.933V/cell	
	1.933V/cell ~ 2.017V/cell	
	> 2.017V/cell	
Load < 50%	< 1.892V/cell	
	1.892V/cell ~ 1.975V/cell	
	1.975V/cell ~ 2.058V/cell	
	> 2.058V/cell	

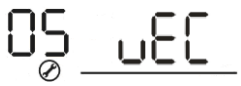
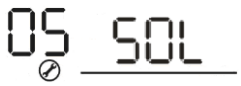
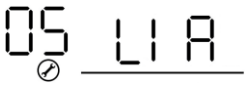
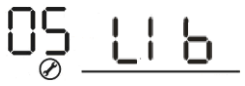
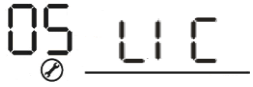
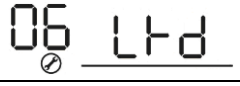
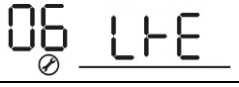
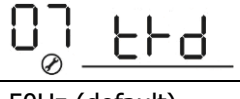
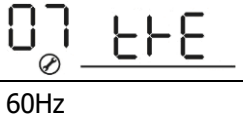
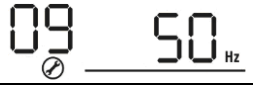
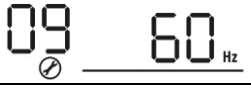
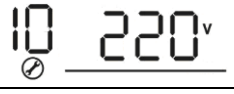
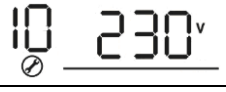
Load Information				
OVER LOAD	Indicates overload.			
	Indicates the load level by 0-24%, 25-49%, 50-74% and 75-100%.			
	0%~24%	25%~49%	50%~74%	75%~100%
				
Mode Operation Information				
	Indicates unit connects to the mains.			
	Indicates unit connects to the PV panel.			
BYPASS	Indicates load is supplied by utility power.			
	Indicates the utility charger circuit is working.			
	Indicates the DC/AC inverter circuit is working.			
P	Indicates second output is working.			
Mute Operation				
	Indicates unit alarm is disabled.			

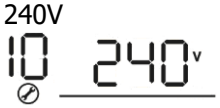
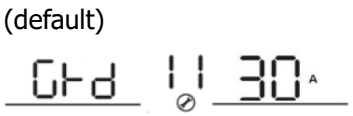
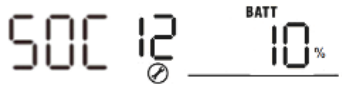
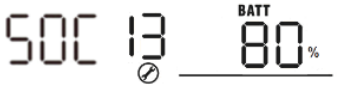
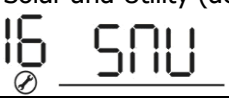
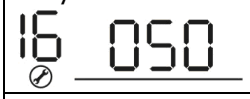
LCD Setting

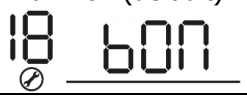
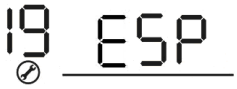
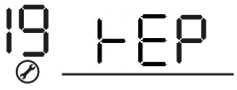
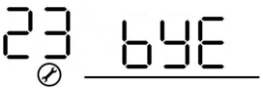
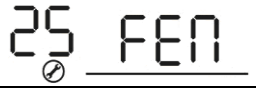
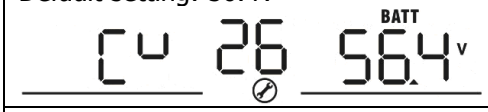
After pressing and holding ENTER button for 3 seconds, the unit will enter setting mode. Press "UP" or "DOWN" button to select setting programs. And then, press "ENTER" button to confirm the selection or ESC button to exit.

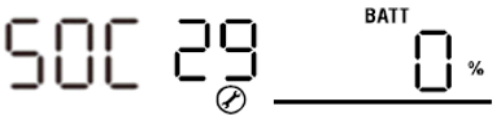
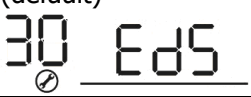
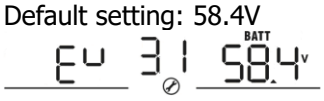
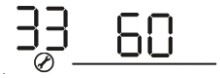
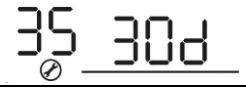
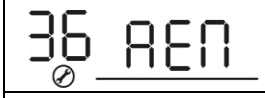
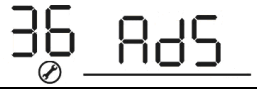
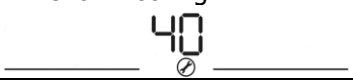
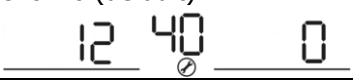
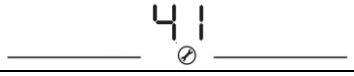
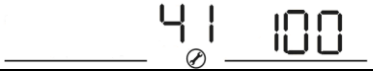
Setting Programs:

Program	Description	Selectable option	
00	Exit setting mode	Escape 	
01	Output source priority: To configure load power source priority	Utility first (default) 	Utility will provide power to the loads as first priority. Solar and battery energy will provide power to the loads only when utility power is not available.
		Solar first 	Solar energy provides power to the loads as first priority. If solar energy is not sufficient to power all connected loads, Utility energy will supply power to the loads at the same time.
		SBU priority 	Solar energy provides power to the loads as first priority. If solar energy is not sufficient to power all connected loads, battery energy will supply power to the loads at the same time. Utility provides power to the loads only when battery voltage drops to either low-level warning voltage or the setting point in program 12.
02	Maximum charging current: To configure total charging current for solar and utility chargers. (Max. charging current = utility charging current + solar charging current)	60A (default) 	Setting range is from 10A to 120A. Increment of each click is 10A.
03	AC input voltage range	Appliances (default) 	If selected, acceptable AC input voltage range will be within 90-280VAC.
		UPS 	If selected, acceptable AC input voltage range will be within 170-280VAC.
05	Battery type	AGM (default) 	Flooded 

05	Battery type	User-Defined 	If "User-Defined" is selected, battery charge voltage and low DC cut-off voltage can be set up in program 26, 27 and 29.
		Pylontech battery 	If selected, programs of 02, 26, 27 and 29 will be automatically set up. No need for further setting.
		WECO battery 	If selected, programs of 02, 12, 26, 27 and 29 will be auto-configured per battery supplier recommended. No need for further adjustment.
		Soltaro battery 	If selected, programs of 02, 26, 27 and 29 will be automatically set up. No need for further setting.
		LIA-protocol compatible battery 	Select "LIA" if using Lithium battery compatible to CAN protocol. If selected, programs of 02, 26, 27 and 29 will be automatically set up. No need for further setting.
		LIb-protocol compatible battery 	Select "LIb" if using Lithium battery compatible to RS485 protocol. If selected, programs of 02, 26, 27 and 29 will be automatically set up. No need for further setting.
		3rd party Lithium battery 	Select "LIC" if using Lithium battery not listed above. If selected, programs of 02, 26, 27 and 29 will be automatically set up. No need for further setting. Please contact the battery supplier for installation procedure.
06	Auto restart when overload occurs	Restart disable (default) 	Restart enable 
07	Auto restart when over temperature occurs	Restart disable (default) 	Restart enable 
09	Output frequency	50Hz (default) 	60Hz 
10	Output voltage	220V 	230V (default) 

10	Output voltage	240V 	
11	Maximum 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 charger.	Input2 charging current: 30A (default) 	Input1 charging current: 30A (default) 
		Setting range is 2A, then from 10A to 100A. Increment of each click is 10A.	
12	Setting voltage point or SOC back to utility source when selecting "SBU priority" in program 01.	46V (default) 	Setting range is from 44V to 51V. Increment of each click is 1V.
		SOC 10% (default for Lithium battery) 	If any types of lithium battery is selected in program 05, setting value will change to SOC automatically. Adjustable range is from 5% to 95%. Increment of each click is 5%.
13	Setting voltage point or SOC back to battery mode when selecting "SBU priority" in program 01.	Setting range is from 48V to 58V. Increment of each click is 1V.	
		Battery fully charged 	54V (default) 
		SOC 80% (default for Lithium battery) 	If any types of lithium battery is selected in program 05, setting value will change to SOC automatically. Adjustable range is from 10% to 100%. Increment of each click is 5%.
16	Charger source priority: To configure charger source priority	If this inverter 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.
		Solar and Utility (default) 	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 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) 	Alarm off 
19	Auto return to default display screen	Return to default display screen (default) 	If selected, no matter how users switch display screen, it will automatically return to default display screen (Input voltage /output voltage) after no button is pressed for 1 minute.
		Stay at latest screen 	If selected, the display screen will stay at latest screen user finally switches.
20	Backlight control	Backlight on (default) 	Backlight off 
22	Beeps while primary source is interrupted	Alarm on (default) 	Alarm off 
23	Overload bypass: When enabled, the unit will transfer to line mode if overload occurs in battery mode.	Bypass disable (default) 	Bypass enable 
25	Record Fault code	Record enable (default) 	Record disable 
26	Bulk charging voltage (C.V voltage)	Default setting: 56.4V 	
		If self-defined is selected in program 05, this program can be set up. Setting range is from 48.0V to 61.0V. Increment of each click is 0.1V.	
27	Floating charging voltage	Default setting: 54.0V 	
		If self-defined is selected in program 05, this program can be set up. Setting range is from 48.0V to 61.0V. Increment of each click is 0.1V.	
29	Low DC cut-off voltage or SOC: ● 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 self-defined is selected in program 05, this program can be set up. Setting range is from 42.0V 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.	
		Default setting: 42.0V 	

<table>
<tr><td rowspan="2">29</td><td rowspan="2">Low DC cut-off voltage or SOC:
● 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.</td><td colspan="2">If any type of lithium battery is selected in program 05, setting value will change to SOC automatically. Adjustable range is from 0% to 90%. Increment of each click is 5%.</td></tr>
<tr><td colspan="2">SOC 0% (default for lithium battery)
  </td></tr>
<tr><td rowspan="2">30</td><td rowspan="2">Battery equalization</td><td>Battery equalization
  </td><td>Battery equalization disable (default)
  </td></tr>
<tr><td colspan="2">If “Flooded” or “User-Defined” is selected in program 05, this program can be set up.</td></tr>
<tr><td>31</td><td>Battery equalization voltage</td><td>Default setting: 58.4V
  </td><td>Setting range is from 48.0V to 61.0V. Increment of each click is 0.1V.</td></tr>
<tr><td>33</td><td>Battery equalized time</td><td>60min (default)
  </td><td>Setting range is from 5min to 900min. Increment of each click is 5min.</td></tr>
<tr><td>34</td><td>Battery equalized timeout</td><td>120min (default)
  </td><td>Setting range is from 5min to 900 min. Increment of each click is 5 min.</td></tr>
<tr><td>35</td><td>Equalization interval</td><td>30days (default)
  </td><td>Setting range is from 0 to 90 days. Increment of each click is 1 day</td></tr>
<tr><td rowspan="2">36</td><td rowspan="2">Equalization activated immediately</td><td>Enable
  </td><td>Disable (default)
  </td></tr>
<tr><td colspan="2">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 “  ”. If “Disable” is selected, it will cancel equalization function until next activated equalization time arrives based on program 35 setting. At this time, “  ” will not be shown in LCD main page.</td></tr>
<tr><td rowspan="2">40</td><td rowspan="2">Adjustment parameter for EARTH LED</td><td colspan="2">If EARTH LED of meter is on, it can be off by adjusting the parameter. If the unit is in Line mode, this program can be set up. Setting range is from -30 to 30. Increment of each click is 1. The condition of program changed automatically.</td></tr>
<tr><td>If unit is not in Line mode, it will show nothing.
  </td><td>If unit is in Line mode, it will show 0 (default).
  </td></tr>
<tr><td rowspan="2">41</td><td rowspan="2">Adjustment parameter for REVERSE LED</td><td colspan="2">If REVERSE LED of meter is on, it can be off by adjusting the parameter. If the unit is in Line mode, this program can be set up. Setting range is from 0 to 300. Increment of each click is 10.</td></tr>
<tr><td>If unit is not in Line mode, it will show nothing.
  </td><td>If unit is in Line mode, it will show 100 (default).
  </td></tr>
</table>

60	Low DC cut-off voltage or SOC threshold to turn off the second output (L2) in battery mode.	default setting: 42.0V 	If "User-defined" is selected in program 05, this setting range is from 42.0V to 60.0V. Increment of each click is 0.1V.
		SOC 0%(default for lithium battery) 	If any type of lithium battery is selected in program 05, setting value will change to SOC automatically. The selectable options are 0%, 5%, and from 10% to 95%.
61	Setting discharge time to turn off the second output in battery mode.	Disable (Default) 	Setting range is disable and then from 0 min to 990 min. Increment of each click is 5 min. *If the battery discharge time achieves the setting time in program 61 and the program 60 function is not triggered, the second output will be turned off.
63	Setting voltage point or SOC to restart on the second output (L2) when the battery is in charging status.	default setting: 46.0V 	If "User-defined" is selected in program 05, this setting range is from 43.0V to 61.0V. Increment of each click is 0.1V. *If second output is cut off due to setting in program 60, second output (L2) will restart according to setting in program 63.
		SOC 20% (default for lithium battery) 	If any type of lithium battery is selected in program 05, setting value will change to SOC automatically. The selectable options are 0%, 5%, and from 10% to 95%.
64	Setting waiting time to turn on the second output (L2) when the battery is in charging status.	0 (Default) 	Setting range is from 0 min to 990 min and disable. If "disable (dds) is selected, the second output will turn on immediately when inverter is working in Line mode. Increment of each click is 5 min. *If second output is cut off due to setting in program 61, second output (L2) will restart according to setting in program 64.
65	Setting VA threshold to turn off the second output (L2) in battery mode.	Disable (Default) 	Setting range is from Disable, 500VA to 6000VA. When output VA is higher than threshold value, the second output will be turned off. When 'dds' is selected, second output (L2) is normally on.

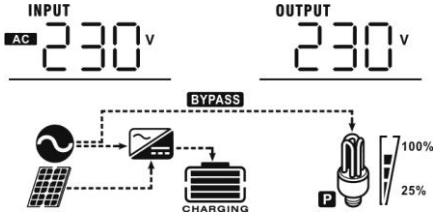
66	Setting waiting time to turn on the second output (L2) when the battery is in charging status.	0 min (Default) 	Setting range is from 0 min to 990 min. Increment of each click is 5 min. *If second output is cut off due to setting in program 65, second output (L2) will restart according to setting in program 66.
67	External CT	Enable 	Disable (default) 

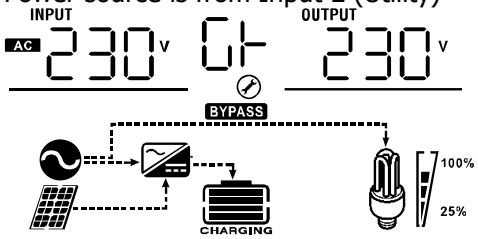
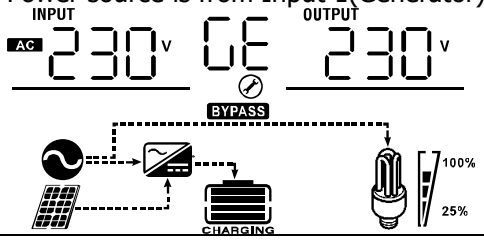
Note: #60~#66 functions are only for standalone unit. When unit is operated in parallel, the second output is always on

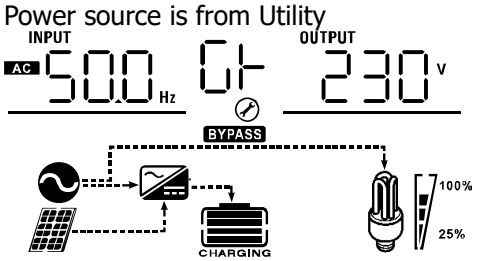
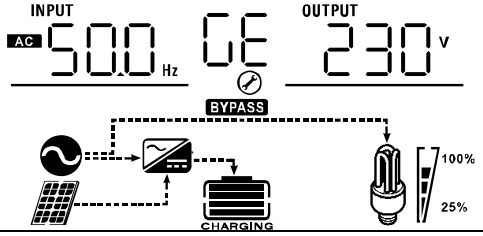
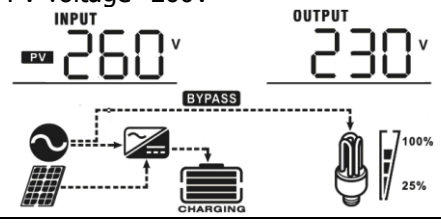
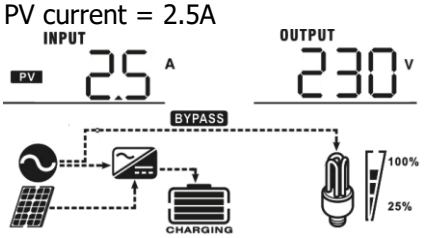
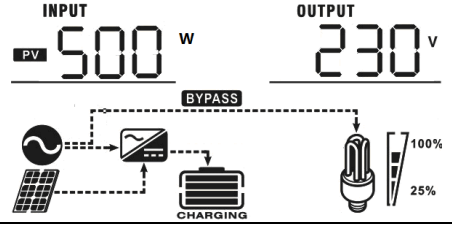
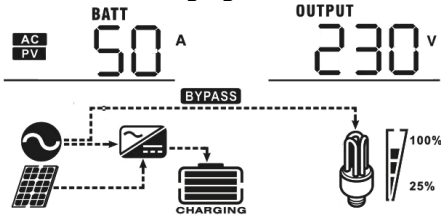
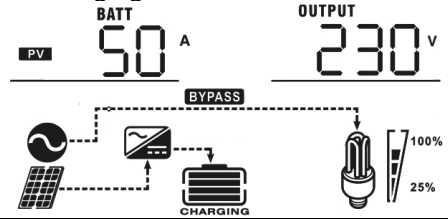
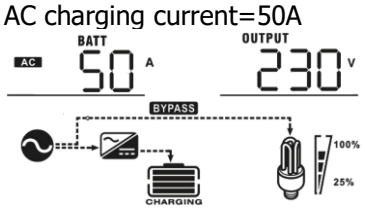
Display information

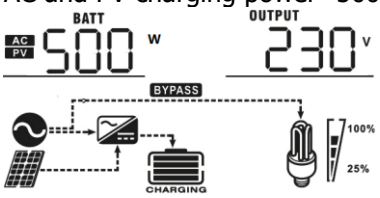
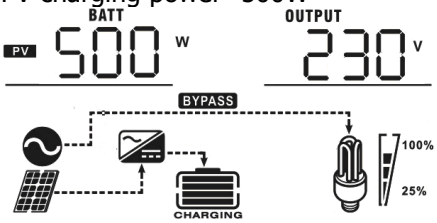
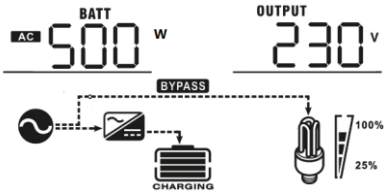
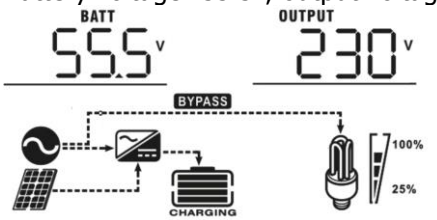
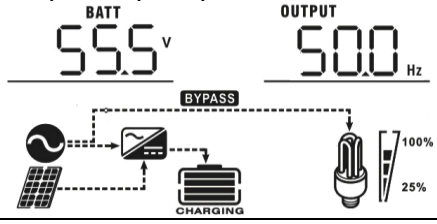
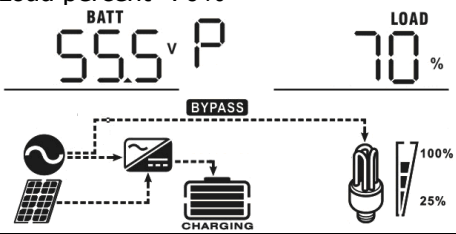
The LCD display information will be switched in turns by pressing "UP" or "DOWN" key. The selectable information is switched as below order: input voltage, input frequency, PV voltage, charging current, charging power, battery voltage, output voltage, output frequency, load percentage, load in Watt,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

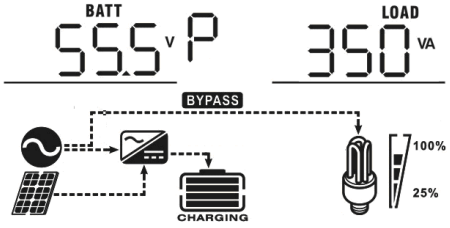
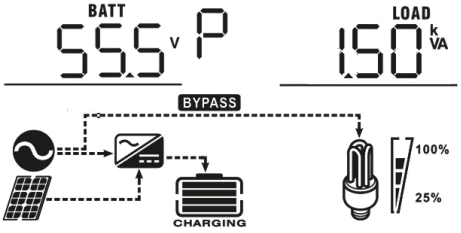
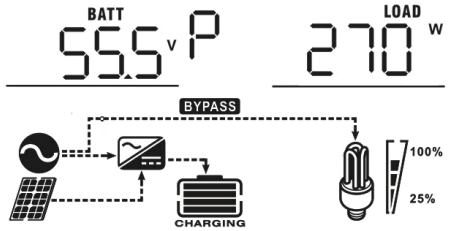
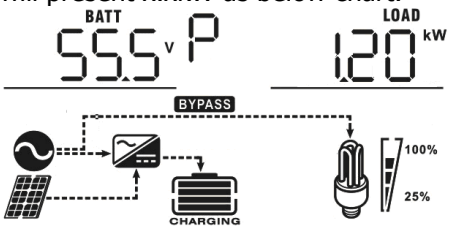
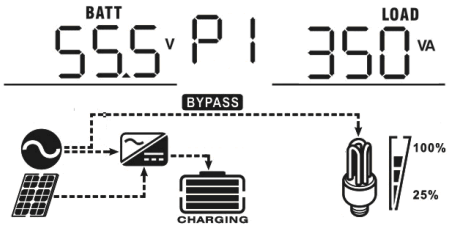
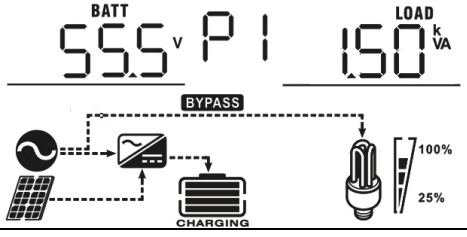
If second output is on, all screens will show "P" icon in the screen.

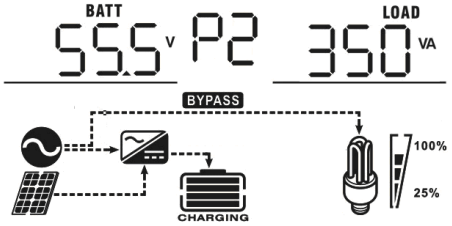
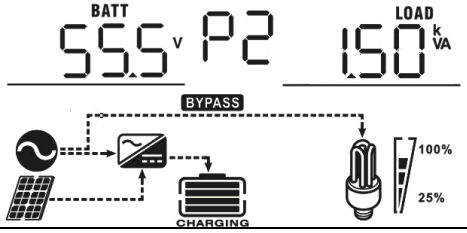
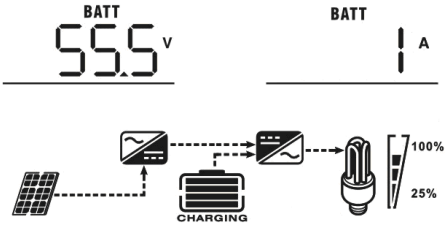
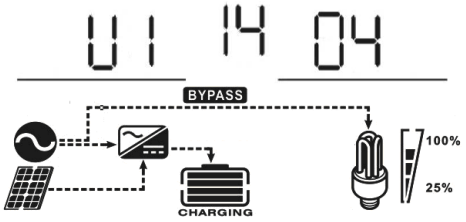
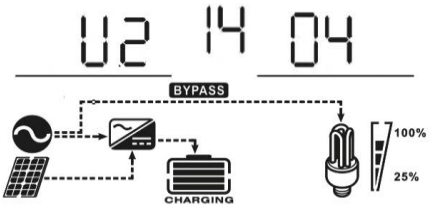
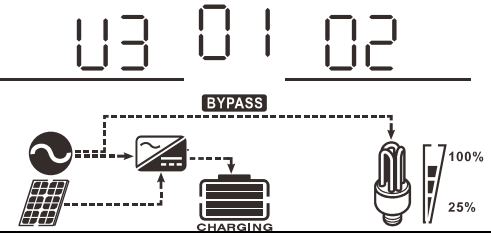


Selectable information	LCD display
Input voltage/Output voltage (Default Display Screen) **NOTE:** If any warning or fault occurs, it will show warning/fault code first.	Input Voltage=230V, output voltage=230V Power source is from Input 2 (Utility)  Input Voltage=230V, output voltage=230V Power source is from Input 1(Generator) 

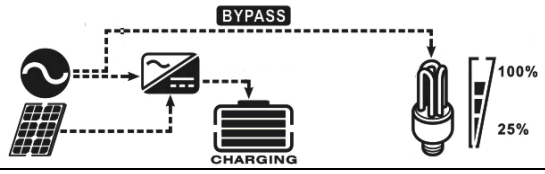
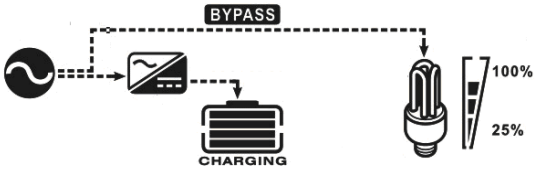
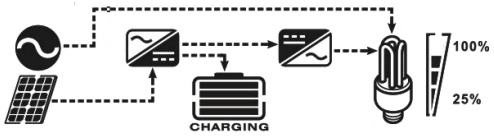
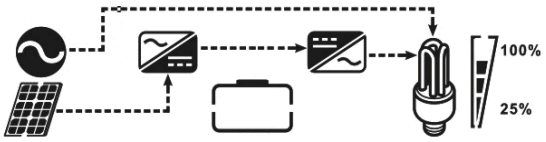
Input frequency **NOTE:** If any warning or fault occurs, it will show warning/fault code first.	Input frequency=50Hz Power source is from Utility  Input frequency=50Hz Power source is from Generator 
PV voltage	PV voltage=260V 
PV current	PV current = 2.5A 
PV power	PV power = 500W 
Charging Current	AC and PV charging current=50A  PV charging current=50A 
Charging current	AC charging current=50A 

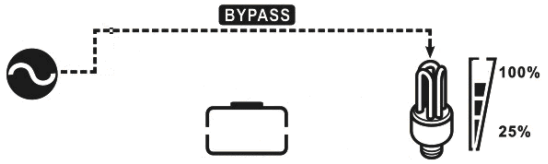
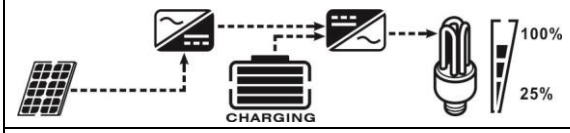
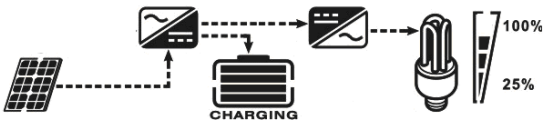
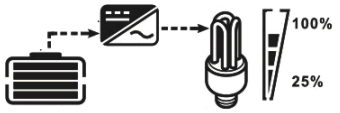
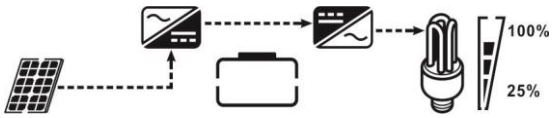
Charging power	AC and PV charging power=500W  PV charging power=500W 
Charging power	AC charging power=500W 
Battery voltage and output voltage	Battery voltage=55.5V, output voltage=230V 
Output frequency	Output frequency=50Hz 
Load percentage	Load percent=70% 

Total Load in VA	When connected load is lower than 1kVA, load in VA will present xxxVA as below chart.  When load is larger than 1kVA (≧1KVA), load in VA will present x.xkVA as below chart. 
Total Load in Watt	When load is lower than 1kW, load in W will present xxxW as below chart.  When load is larger than 1kW (≧1KW), load in W will present x.xkW as below chart. 
Output1 load in VA	When connected load is lower than 1kVA, load in VA will present xxxVA as below chart.  When load is larger than 1kVA (≧1KVA), load in VA will present x.xkVA as below chart. 

Output2 load in VA	When connected load is lower than 1kVA, load in VA will present xxxVA as below chart.  When load is larger than 1kVA (≧1KVA), load in VA will present x.xkVA as below chart. 
Battery voltage/DC discharging current	Battery voltage=55.5V, discharging current=1A 
Main CPU version checking	Main CPU version 00014.04 
Second CPU version checking	Second CPU version 00014.04 
Third CPU version checking	Third CPU version 00001.02 

Operating Mode Description

Operation mode	Description	LCD display
Standby mode **Note:** *Standby mode: The inverter is not turned on yet but at this time, the inverter can charge battery without AC output.	No output is supplied by the unit but it still can charge batteries.	Charging by utility and PV energy. 
		Charging by utility. 
		Charging by PV energy. 
		No charging. 
Fault mode Note: *Fault mode: Errors are caused by inside circuit error or external reasons such as over temperature, output short circuited and so on.	No charging.	No charging. 
Line Mode	The unit will provide output power from the mains. It will also charge the battery at line mode.	Charging by utility and PV energy. 
		Charging by utility. 
		If "solar first" is selected as output source priority and solar energy is not sufficient to provide the load, solar energy and the utility will provide the loads and charge the battery at the same time. 
		If "solar first" is selected as output source priority and battery is not connected, solar energy and the utility will provide the loads. 

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

Battery Equalization Description

Battery equalization function is built into the charge controller. It reverses the buildup of negative chemical effects such as 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 may 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 the battery periodically.

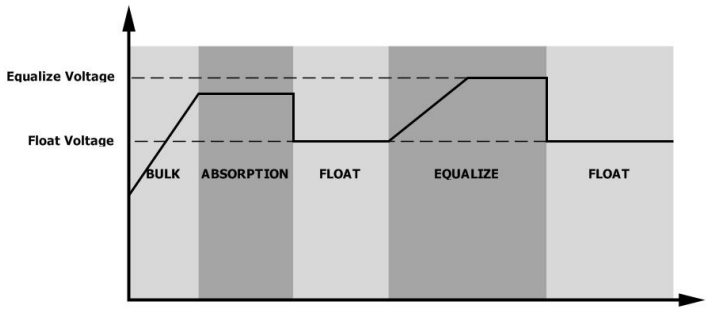
- **How to Activate Equalization Function**

You must enable battery equalization function in LCD setting Program 30 first. You can then apply this function by either one of the following methods:

1. Setting equalization interval in Program 35.
2. Activate equalization immediately in Program 36.

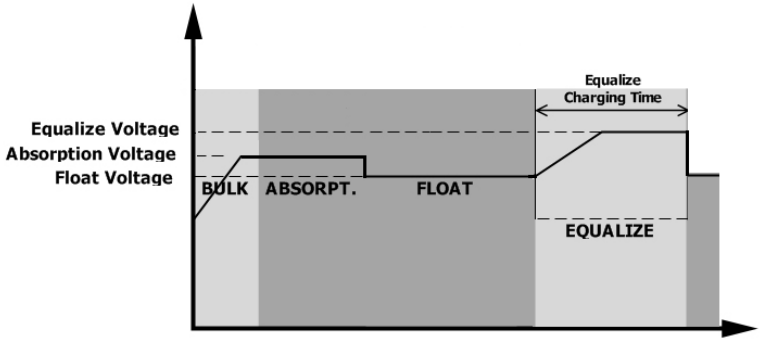
- **When to Equalize**

In floating charge stage, when setting the equalization interval (battery equalization cycle) is reached, or equalization is activated immediately, the controller will start to enter Equalize Mode.

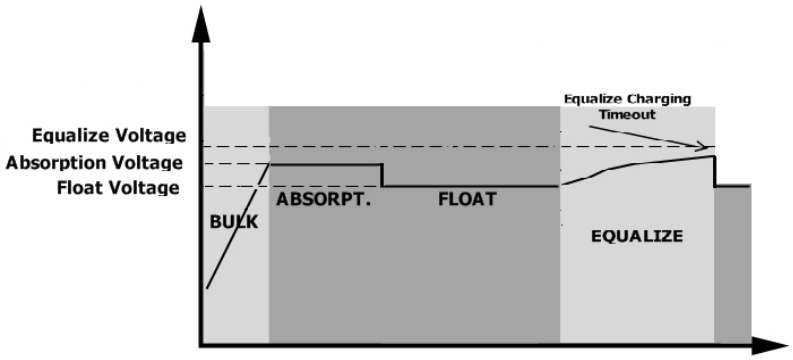


- **Equalize Charging and Timeout**

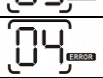
In Equalize Mode, the controller will supply power to charge battery as much as possible until battery voltage reach the equalization voltage. Then, constant-voltage regulation is applied to maintain battery voltage at the equalization level. The battery will remain in the Equalize Mode until the equalization timer runs out.



However, in Equalize Mode, if the battery equalization timer runs out and the battery voltage doesn't recover to the battery equalization voltage point, the charge controller will extend the battery equalized time until battery voltage achieves equalization voltage. If the battery voltage is still lower than equalization voltage when the extension runs out, the charge controller will stop equalization and return to the floating charging stage.

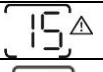
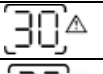
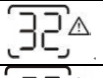
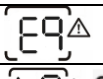


Fault Reference Code

Fault Code	Fault Event	Icon on
01	Fan is locked when inverter is off.	
02	Over temperature or NTC is not connected well.	
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	
17	PV opposite	
51	Over current or surge	
52	Bus voltage is too low	
53	Inverter soft start failed	
55	Over DC voltage in AC output	
57	Current sensor failed	
58	Output voltage is too low	
59	PV voltage is over limitation	
60	Negative Power protection	
80	Can communication fail	
81	Parallel Host Line loss	
82	Parallel Syn Line loss	
83	Battery voltage detected different	
84	Parallel line different	

Warning Indicator

Warning Code	Warning Event	Audible Alarm	Icon flashing
01	Fan is locked when inverter is on.	Beep three times every second	
02	Over temperature	None	
04	Low battery	Beep once every second	
07	Overload	Beep once every 0.5 second	
10	Output power derating	Beep twice every 3 seconds	
15	PV energy is low.	Beep twice every 3 seconds	
16	High AC input (>280VAC) during BUS soft start	None	
30	Internal communication lost	None	
32	Communication lost	None	
Eq	Battery equalization	None	
bP	Battery is not connected	None	

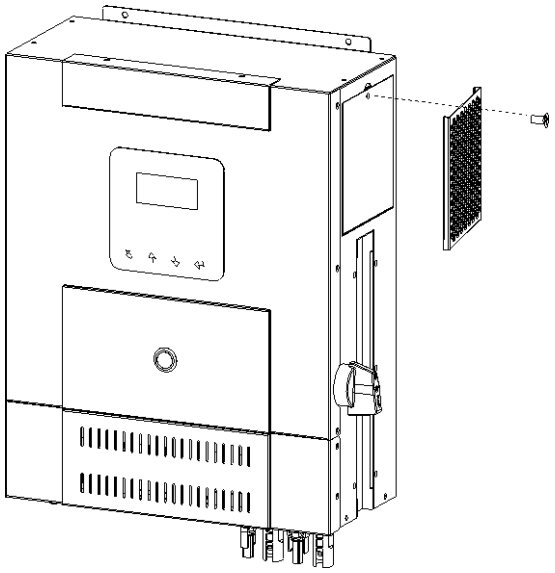
CLEARANCE AND MAINTENANCE FOR ANTI-DUST KIT

Overview

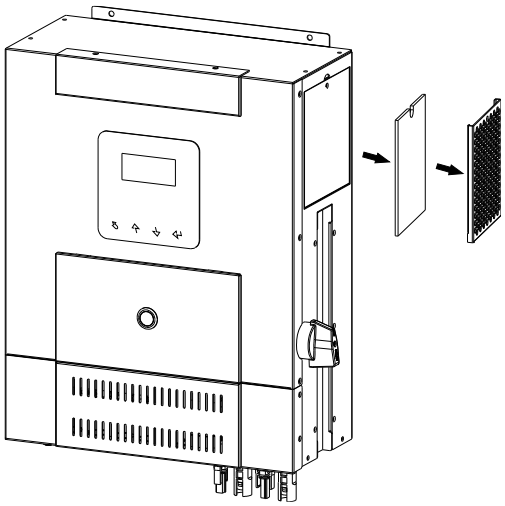
Every inverter is already installed with anti-dusk kit from factory. This kit keeps dusk from your inverter and increases product reliability in harsh environment.

Clearance and Maintenance

Step 1: Please loosen the screw on the side of the inverter.



Step 2: Then, dustproof case can be removed and take out air filter foam as shown in below chart.



Step 3: Clean air filter foam and dustproof case. After clearance, re-assemble the dust-kit back to the inverter.

NOTICE: The anti-dust kit should be cleaned from dust every one month.

SPECIFICATIONS

Table 1 Line Mode Specifications

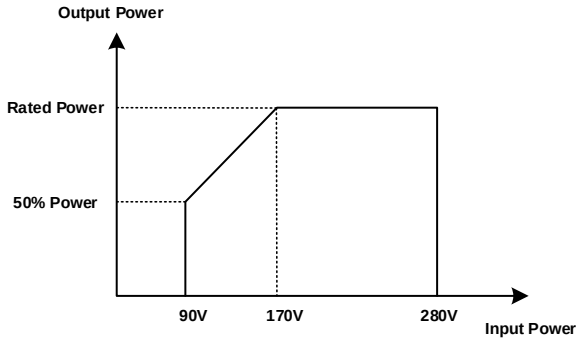
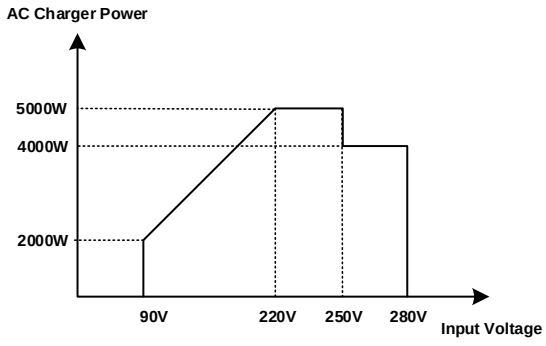
MODEL	SP6000 Handy II
Input Voltage Waveform	Sinusoidal (utility or generator)
Nominal Input Voltage	230Vac
Low Loss Voltage	170Vac±7V (UPS); 90Vac±7V (Appliances)
Low Loss Return Voltage	180Vac±7V (UPS); 100Vac±7V (Appliances)
High Loss Voltage	280Vac±7V
High Loss Return Voltage	270Vac±7V
Max AC Input Voltage	300Vac
Nominal Input Frequency	50Hz / 60Hz (Auto detection)
Low Loss Frequency	40±1Hz
Low Loss Return Frequency	42±1Hz
High Loss Frequency	65±1Hz
High Loss Return Frequency	63±1Hz
Output Short Circuit Protection	Circuit Breaker
Efficiency (Line Mode)	>95% (Rated R load, battery full charged)
Transfer Time	10ms typical (UPS); 20ms typical (Appliances)
Power Limitation	
AC Charger Power Limitation	

Table 2 Inverter Mode Specifications

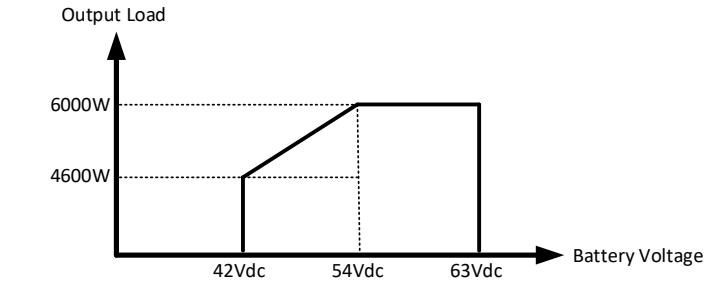
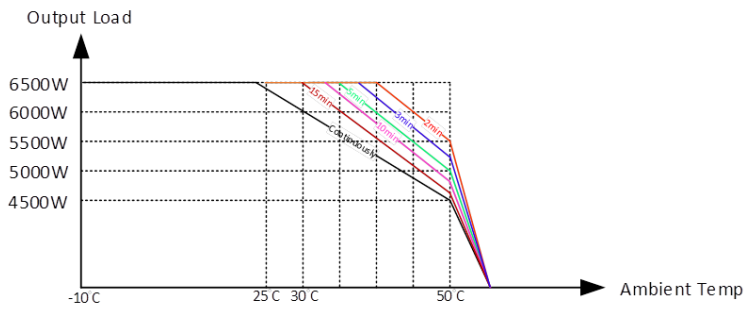
Rated Output Power	6KVA/6KW
Output Voltage Waveform	Pure Sine Wave
Output Voltage Regulation	230Vac±5%
Output Frequency	50Hz
Peak Efficiency	93%
Overload Protection	5s@≥130% load; 10s@110%~130% load
Surge Capacity	2* rated power for 5 seconds
Nominal DC Input Voltage	48Vdc
Cold Start Voltage	46.0Vdc
Low DC Warning Voltage	
@ load < 50%	46.0Vdc
@ load ≥ 50%	44.0Vdc
Low DC Warning Return Voltage	
@ load < 50%	47.0Vdc
@ load ≥ 50%	46.0Vdc
Low DC Cut-off Voltage	
@ load < 50%	43.0Vdc
@ load ≥ 50%	42.0Vdc
High DC Recovery Voltage	62Vdc
High DC Cut-off Voltage	63Vdc
No Load Power Consumption	<55W
Inrush Current (Battery input)	<2 rated
Reverse Polarity Protection	Yes
Power Limitation	 

Table 3 Charge Mode Specifications

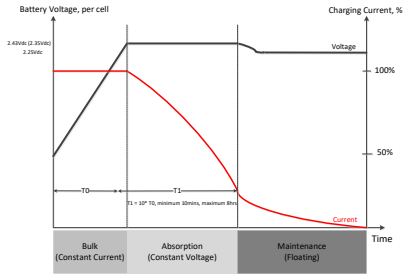
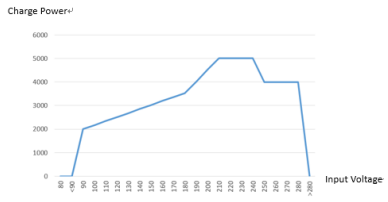
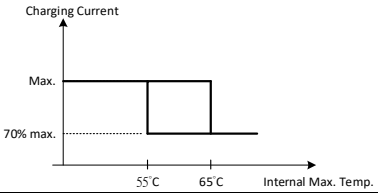
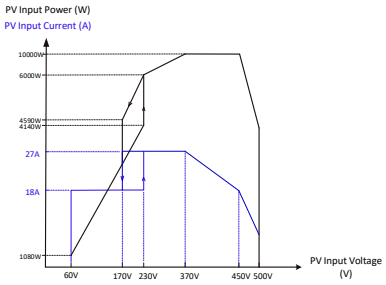
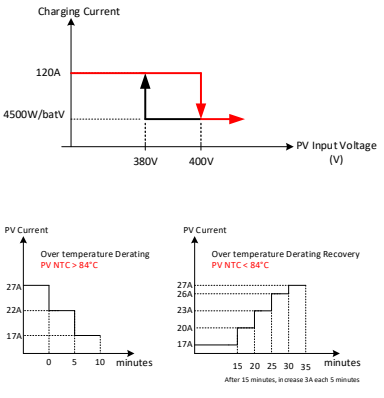
Utility Charging Mode		
Charging Current (UPS) @ Nominal Input Voltage		100Amp(@$V_{I/P}$=230Vac)
Bulk Charging Voltage	**Flooded Battery**	58.4Vdc
	AGM / Gel Battery	56.4Vdc
Floating Charging Voltage		54Vdc
Charging Algorithm		3-Step
Charging Curve		
Charging Current De-rating		 
Solar Input		
Max. PV Array Power		10000W
Max. PV Current		27A
Nominal PV Voltage		380Vdc
Start-up Voltage		60Vdc +/- 10Vdc
PV Array MPPT Voltage Range		60~450Vdc
Max. PV Array Open Circuit Voltage		500Vdc
Max Charging Current (AC charger plus solar charger)		120Amp
Reverse Polarity Detection		Yes
Power and Current De-rating		 

Table 4 General Specifications

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	144 x 348 x 446
Net Weight, kg	12.5

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. Internal fuse tripped.	1. Contact repair center for replacing the fuse. 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.	Input protector is tripped	Check if AC breaker is tripped and AC wiring is connected well.
	No indication.	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)
	No indication.	Set "SUB" (solar first) as the priority of output source.	Change output source priority to "USB" (utility first).
When the unit is turned on, internal relay is switched on and off repeatedly.	LCD display is 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.
		If PV input voltage is higher than specification, the output power will be derated. At this time, if connected loads is higher than derated output power, it will cause overload.	Reduce the number of PV modules in series or the connected load.
	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.	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 59	PV input voltage is beyond the specification.	Reduce the number of PV modules in series.

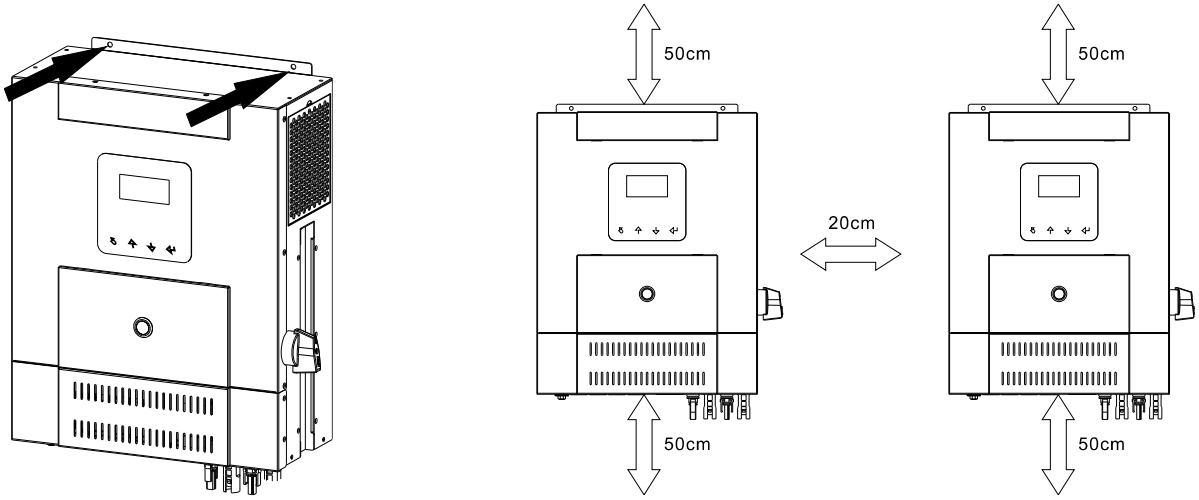
Appendix I: Parallel Operation

1. Introduction

In case the required load higher than the rated power 6KW, parallel operation could be an easy option. This unit support two units in parallel to double the output power to 12KW.

2. Mounting the Unit

When installing multiple units, please follow below chart.

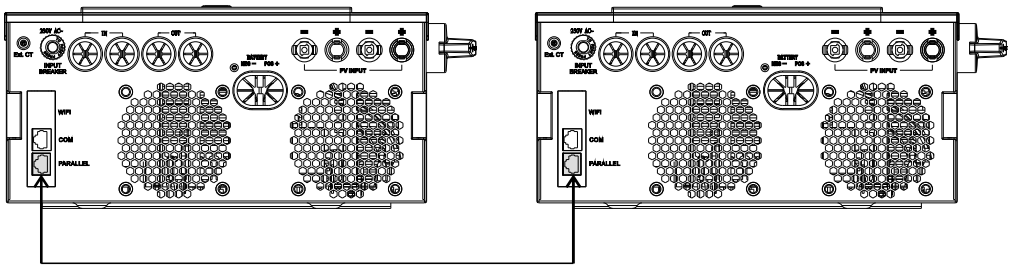


NOTE: For proper air circulation to dissipate heat, allow a clearance of approx. 20 cm to the side and approx. 50 cm above and below the unit. Be sure to install each unit in the same level.

3. Wiring Connection

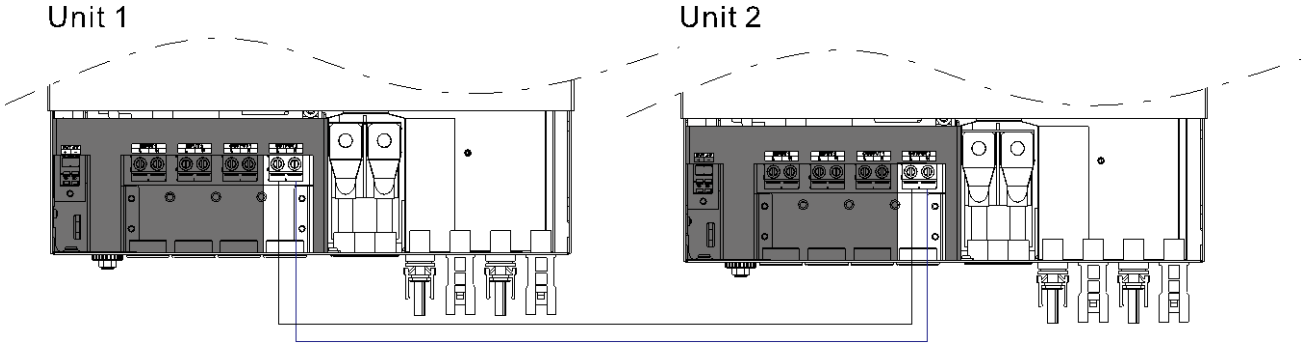
Step 1: Use the supplied parallel cable to establish the communication.

Please connect the cable on the parallel port of the unit.



Step 2: Use power cables to connect AC output.

Please connect the terminal "OUTPUT 2" together for both units. The recommended AC cable size is 10 AWG, with 1.2 Nm torque.



Step 3: Use power cables to connect AC, Battery and PV inputs

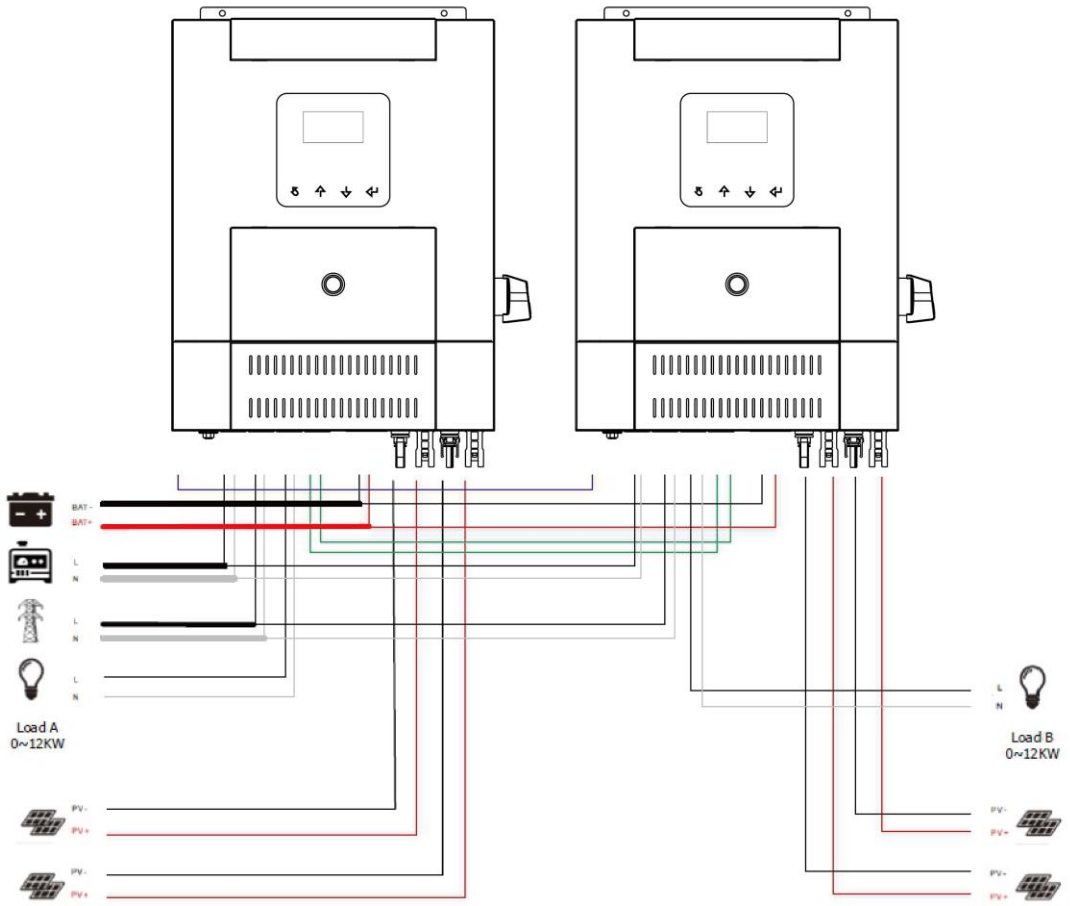
Please utilize the same AC input and battery for the paralleled units. The recommended AC cable size is 10 AWG, with 1.2 Nm torque; battery cable size is 2 AWG, with 5 Nm torque. Take the battery cables for example: You need to use a connector or bus-bar as a joint to connect the battery cables together, and then connect to the battery terminal. The cable size used from joint to battery or AC source should be 2 times than the rated.

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 of battery and AC for each inverter is 150A/70VDC and 40A/230VAC.

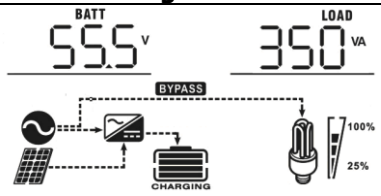
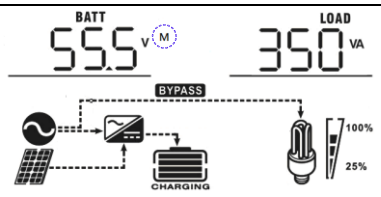
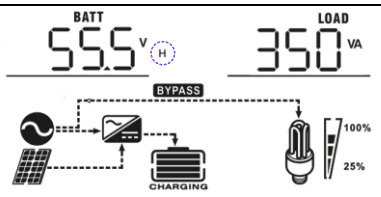
4. Parallel Operation

While paralleling inverters, the load can be either connected totally on the master or slave side, as showed 'Load A' and 'Load B' in the following figure. The maximum capacity of Load A and Load B is 12KW.

Note: Please check if there is only PV source available. If only PV source is available, parallel system is not working. Try to connect Grid or Battery together with PV. The unit could supply load correctly.



Display on the units

Single unit	Master unit	Slave unit
		

Appendix II: BMS Communication Installation

1. Introduction

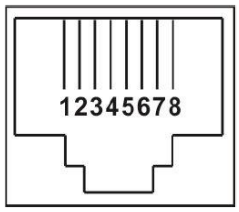
If connecting to lithium battery, it is recommended to purchase a custom-made RJ45 communication cable. Please check with your dealer or integrator for details.

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

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

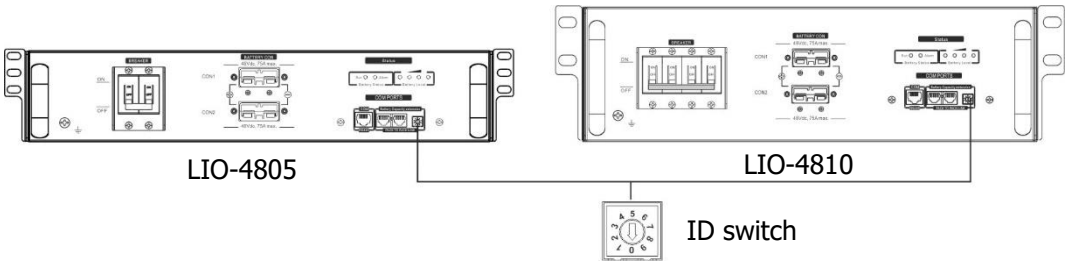
2. Pin Assignment for BMS Communication Port

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

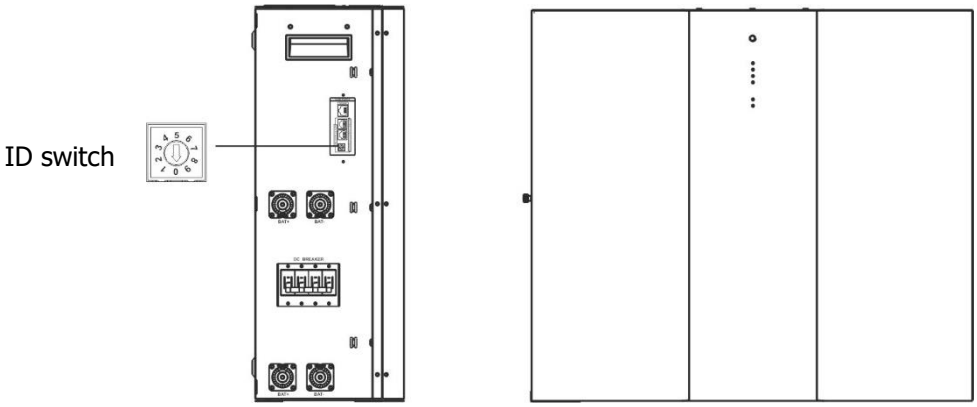


3. Lithium Battery Communication Configuration

LIO-4805/LIO-4810/LIO II-4810E

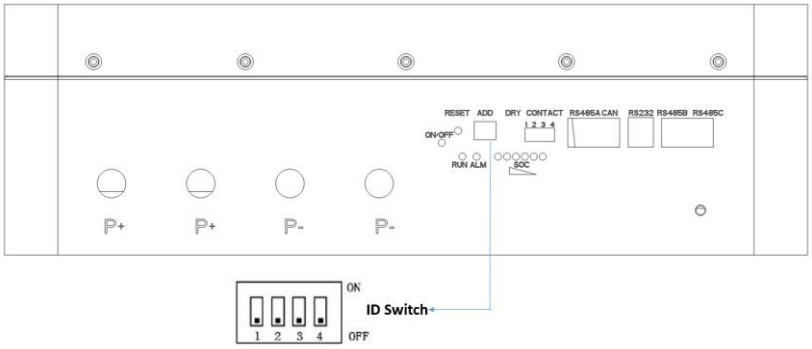


LIO II-4810



ID Switch indicates the unique ID code for each battery module. It's required to assign an identical ID to each battery module for normal operation. We can set up the ID code for each battery module by rotating the PIN number on the ID switch. From number 0 to 9, the number can be random; no particular order. Maximum 10 battery modules can be operated in parallel.

LIO II-4810E



ADD: In parallel, band switch using four dip switch to address set cell system.The explanation of its dial switch as shown in below table.

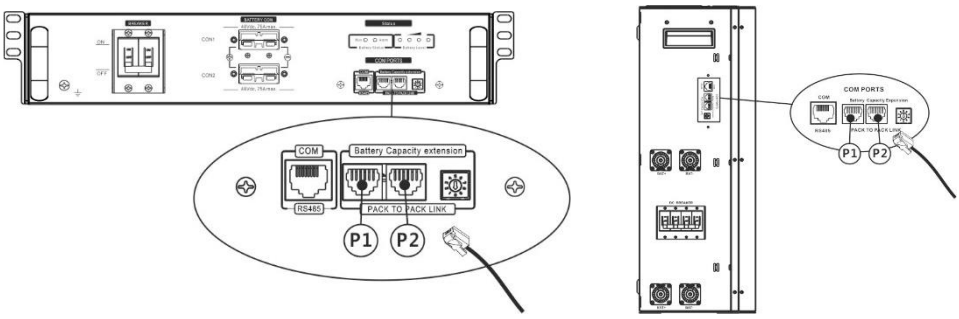
Address Code				ADD	PACK Definition	Address Code				ADD	PACK Definition
1	2	3	4			1	2	3	4		
ON	OFF	OFF	OFF	1	PACK1	ON	OFF	OFF	ON	9	PACK9
OFF	ON	OFF	OFF	2	PACK2	OFF	ON	OFF	ON	10	PACK10
ON	ON	OFF	OFF	3	PACK3	ON	ON	OFF	ON	11	PACK11
OFF	OFF	ON	OFF	4	PACK4	OFF	OFF	ON	ON	12	PACK12
ON	OFF	ON	OFF	5	PACK5	ON	OFF	ON	ON	13	PACK13
OFF	ON	ON	OFF	6	PACK6	OFF	ON	ON	ON	14	PACK14
ON	ON	ON	OFF	7	PACK7	ON	ON	ON	ON	15	PACK15
OFF	OFF	OFF	ON	8	PACK8						

4. Installation and Operation

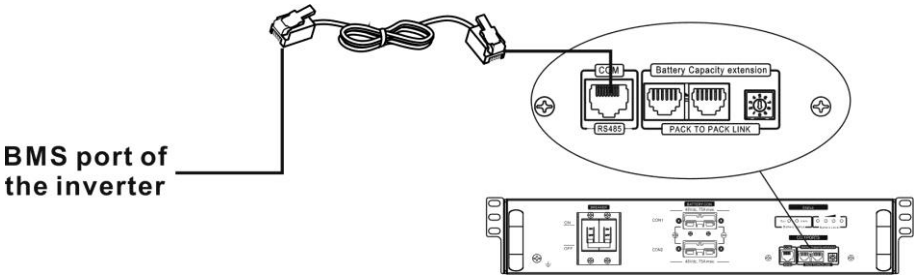
LIO-4805/LIO-4810/ESS LIO II-4810

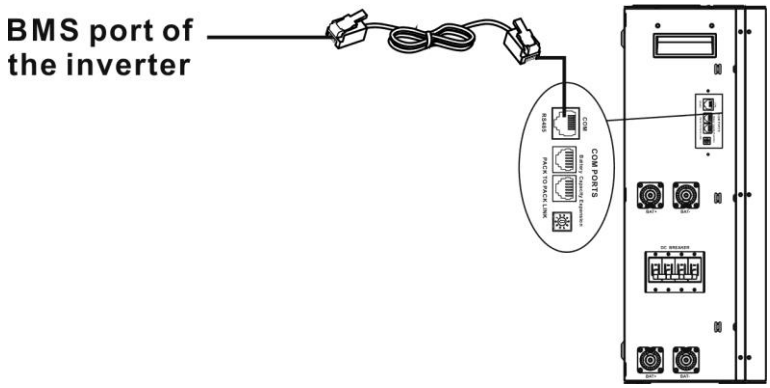
After ID no. is assigned for each battery module, please set up LCD panel in inverter and install the wiring connection as following steps.

Step 1: Use supplied RJ11 signal cable to connect into the extension port (P1 or P2).



Step 2: Use supplied RJ45 cable (from battery module package) to connect inverter and Lithium battery.

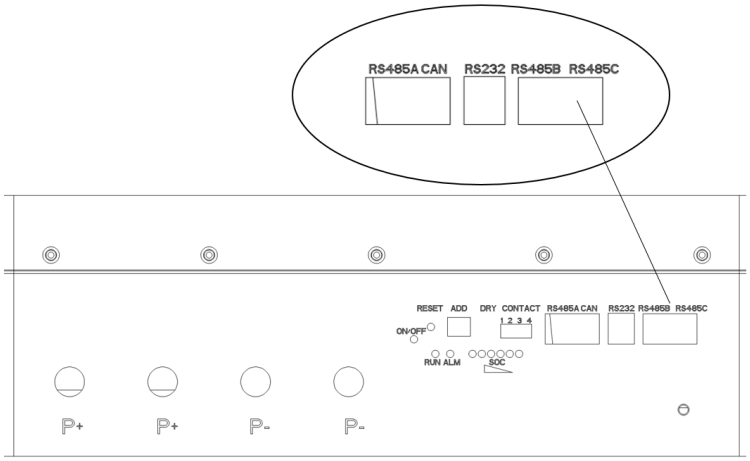




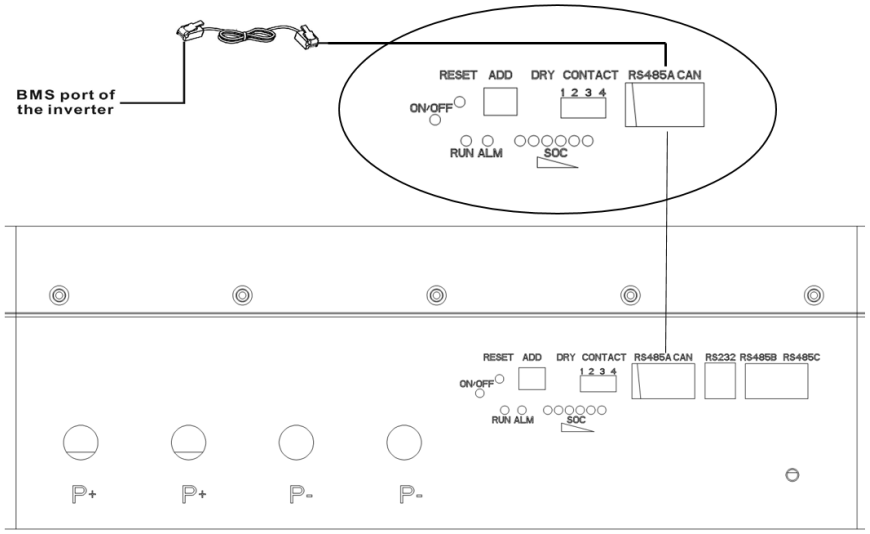
LIO II-4810E

After ID no. is assigned for each battery module, please set up LCD panel in inverter and install the wiring connection as following steps.

Step 1: Use supplied RJ11 signal cable to connect into the extension port (RS485B or RS485C).



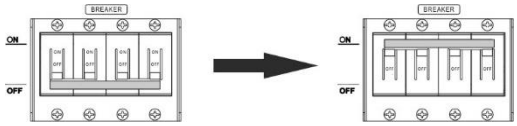
Step 2: Use supplied RJ45 cable (from battery module package) to connect inverter and Lithium battery.



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 "LIB" in LCD program 05. Others should be "USE".

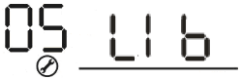
Step 3: Turn the breaker switch "ON" on battery module. Now, the battery module is ready for DC output.



Step 4: Press Power on/off button on battery module for 5 secs. The battery module will start up.
*If the manual button cannot be approached, just simply turn on the inverter module. The battery module will be automatically turned on.

Step 5. Turn on the inverter.

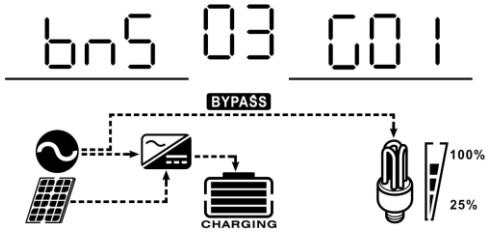
Step 6. Be sure to select battery type as "LIB" in LCD program 05.



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

5. LCD Display Information

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

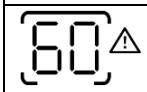
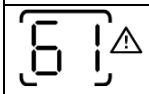
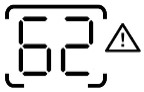
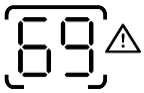
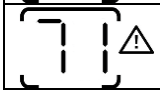
Selectable information	LCD display
Battery pack numbers & Battery group numbers	Battery pack numbers = 3, battery group numbers = 1 

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.

6. Code Reference

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

Code	Description
	If battery status is not allowed to charge and discharge after the communication between the inverter and battery is successful, it will show code 60 to stop charging and discharging battery.
	Communication lost (only available when the battery type is setting as any type of lithium-ion battery.) ● After battery is connected, communication signal is not detected for 3 minutes, buzzer will beep. After 10 minutes, inverter will stop charging and discharging to lithium battery. ● Communication lost occurs after the inverter and battery is connected successfully, buzzer beeps immediately.
	Battery number is changed. It probably is because of communication lost between battery packs. Please check the cables between the batteries.
	If battery status is not allowed to charge after the communication between the inverter and battery is successful, it will show code 69 to stop charging battery.
	If battery status must be charged after the communication between the inverter and battery is successful, it will show code 70 to charge battery.
	If battery status is not allowed to discharge after the communication between the inverter and battery is successful, it will show code 71 to stop discharging battery.

Appendix III: Wi-Fi Operation Guide

1. Introduction

Wi-Fi module can enable wireless communication between inverter and monitoring platform. Users can remote monitoring and controlling inverter easily by using the i.Solar APP.

The major functions of this i.Solar APP:

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

1. i.Solar App

Operating system requirement for your smart phone:
iOS system supports iOS 12.0 and above
Android system supports Android 10.0 and above

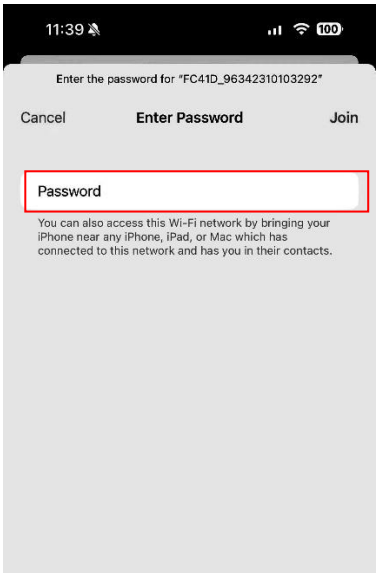
2-1. Download and install APP

Please find "i.Solar" app from Apple® store or Google® Play Store. Install this app in your mobile phone.

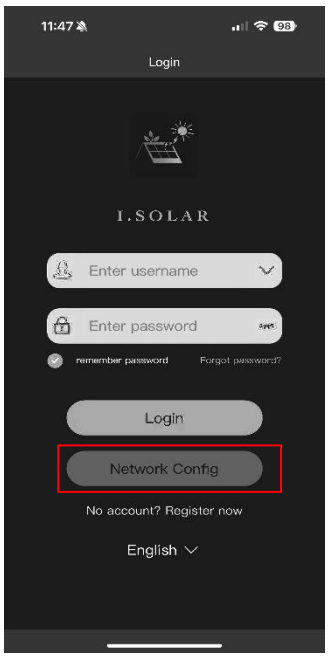
iOS	Android

2-2. WiFi Model Setting

- Turn on the unit.
- Open the Wi-Fi settings from your smart phone.
- Connect your smart phone to the Wi-Fi module. The Wi-Fi named starts with "FC41D_ serial number ".
- Default password for the Wi-Fi module is: 12345678



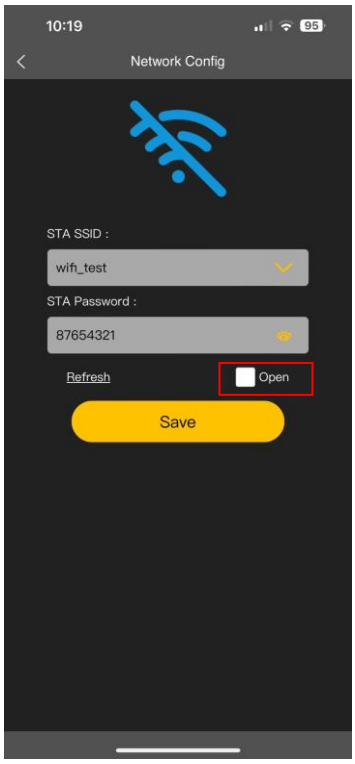
- Once the Wi-Fi connection is successful, click the i.Solar App installed on the phone to enter the login page. Then, click the “Network Config” button to enter the Wi-Fi configuration page.



- Enter your router name (STA SSID) and router password (STA Password), then click the "Save" button to complete the setting.

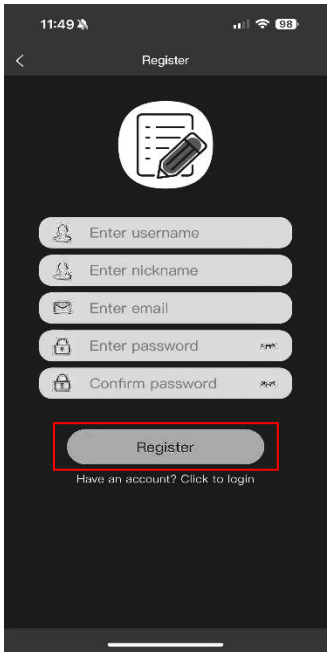
  If you check the “Open” box marked in red, you only need to enter the router name (STA SSID) and don’t need to enter the router password. Click the "Save" button to complete the setting.
  The Wi-Fi module only could connect the router at 2.4GHz.

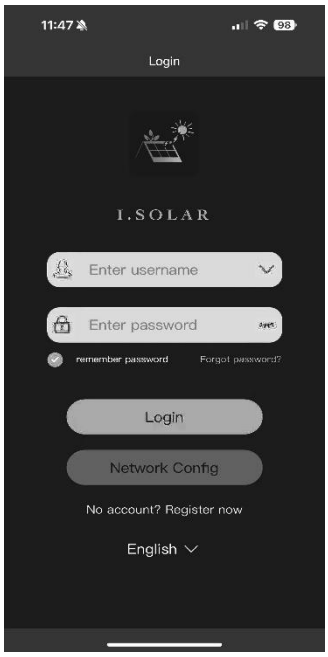
  After configuration, please forget the Wi-Fi module on the mobile to avoid automatic connection and unable to access the internet.



2-3. Login

- After opening the app, enter the login page shown below. After filling in all required information (user name and password), click the "Register" button to complete the user registration. Once registration is complete, click "Login" or return to the previous page. Swipe left or click the left arrow to return to the login page. Enter the user name and password to log in.

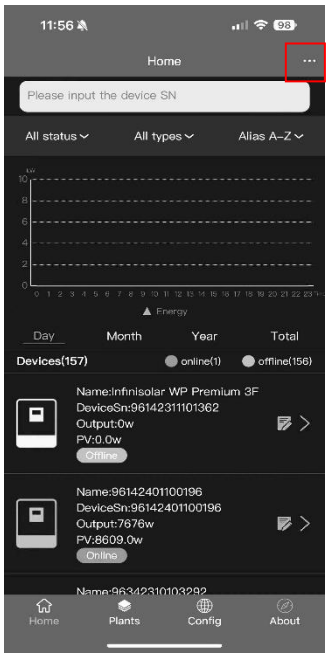




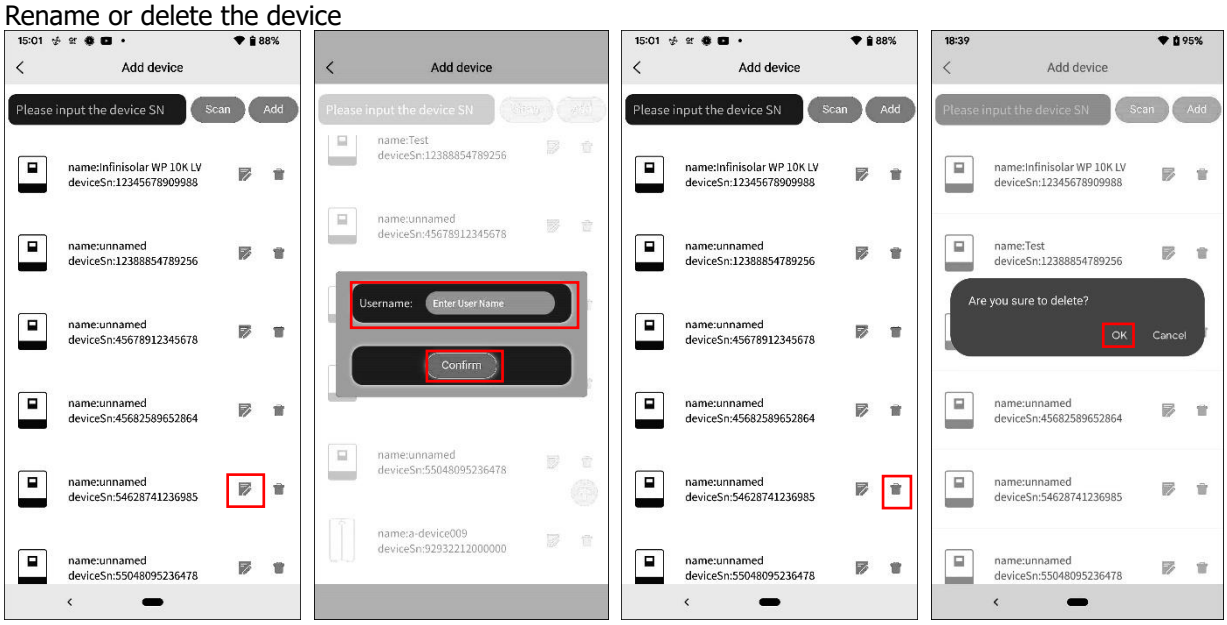
2-4. Home Page

- Log in to enter the App. The default Home page will appear where you can view the charts (left screenshot). Click the tabs 'Day', 'Month', and 'Year' to query the power generation data. Click 'Total' to query the annual power generation data.

  Tap the icon (located on the top right corner) to enter the page to add, delete or rename the device. Enter the device serial number to add the device.

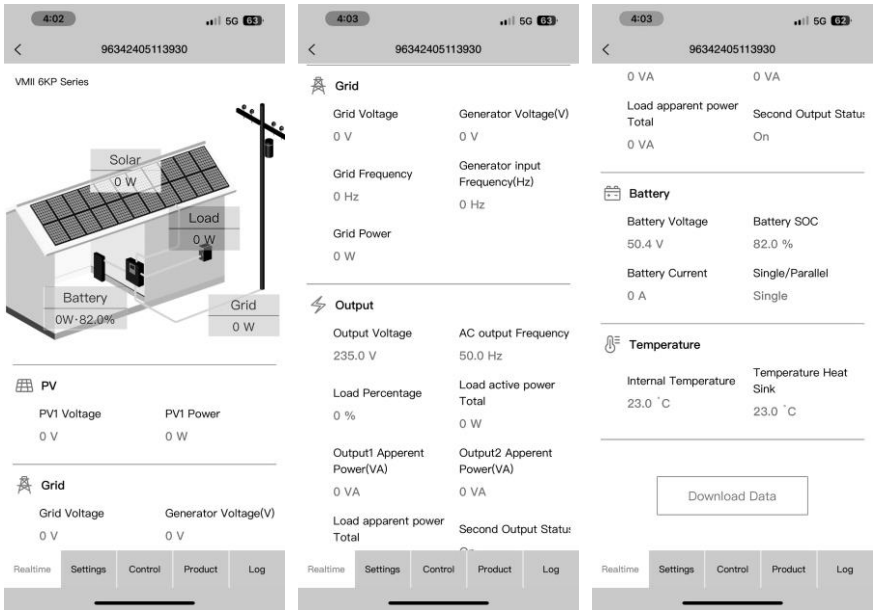


Rename or delete the device



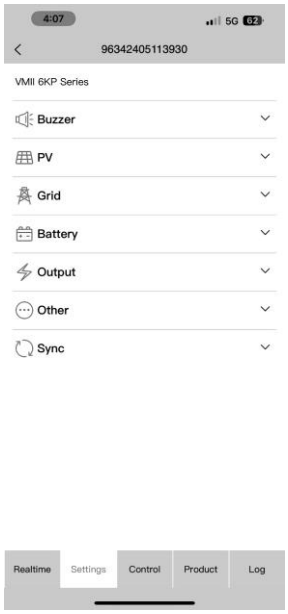
2-5. Real-time data

- Energy: displays battery power, grid power, solar power, and load consumption.

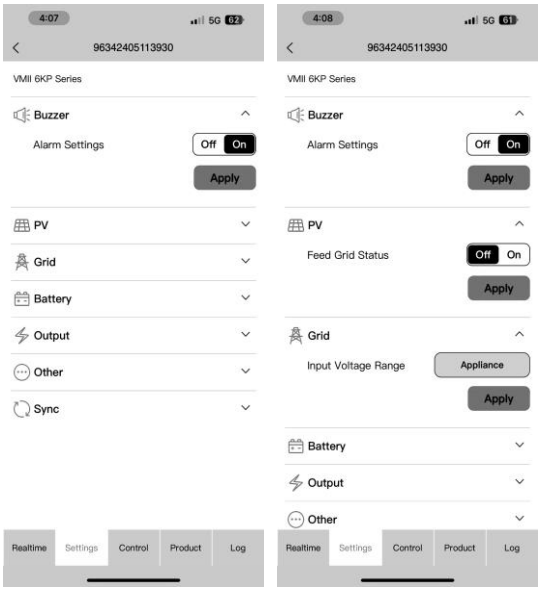


2-6. Settings

Displays the setting items. Different models, the setting items on the parameter page will be different.



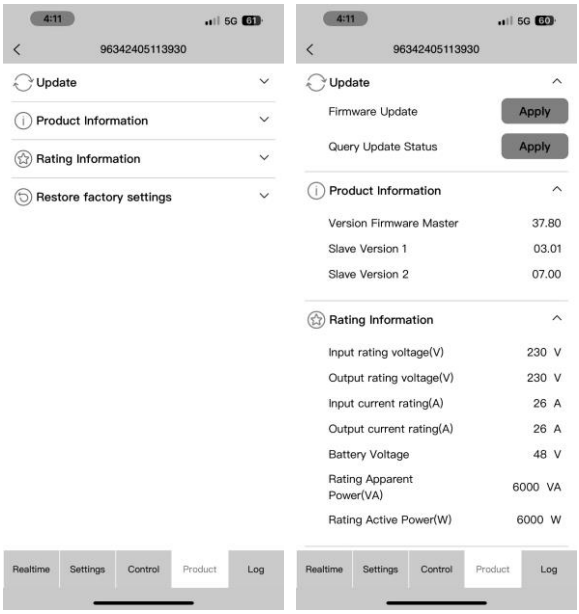
Tap the icon, select the setting and click the "Apply" button to change the setting.



2-7. Control: Select time zone.

2-8. Product

Firmware upgrade, displays product information, rating information and restore factory settings.

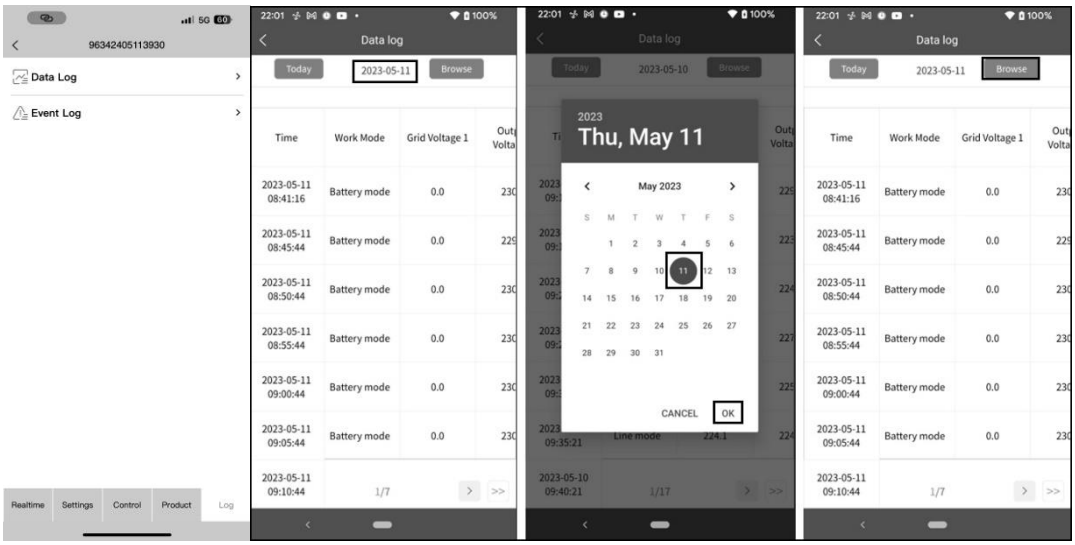


2-9. Log

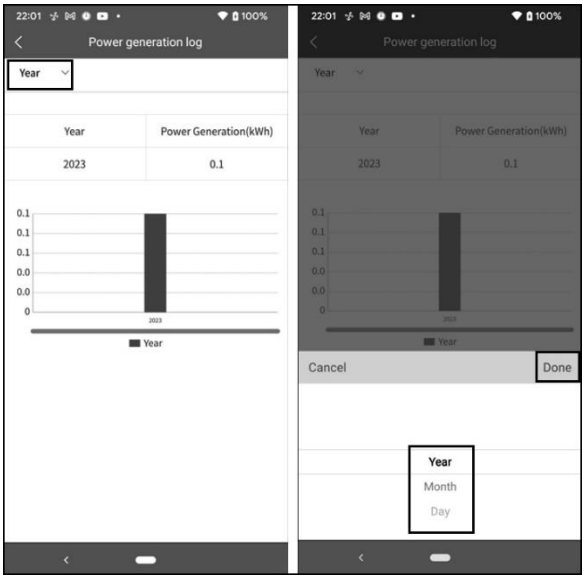
Change password, remove account and change language

- Log: displays data log, solar power generation log, load consumption log and event.

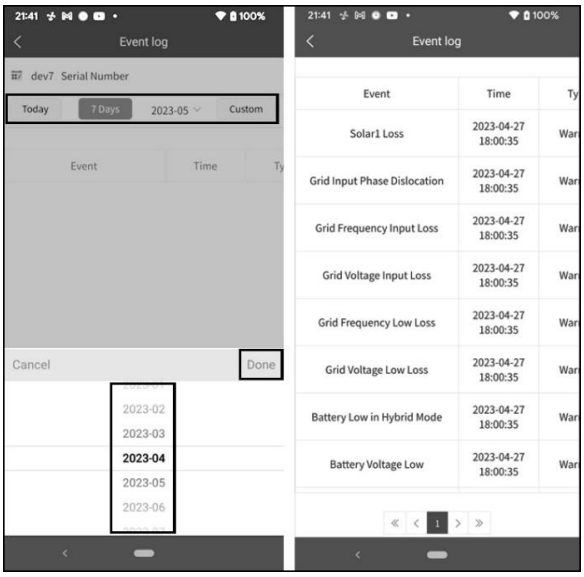
Data log: Tap the time, select the date and click the "Browse" button to update log.



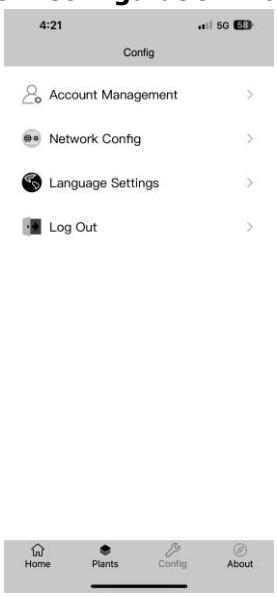
Power Generation Log: Select the day, month or year, and click the "Done" button to update log.

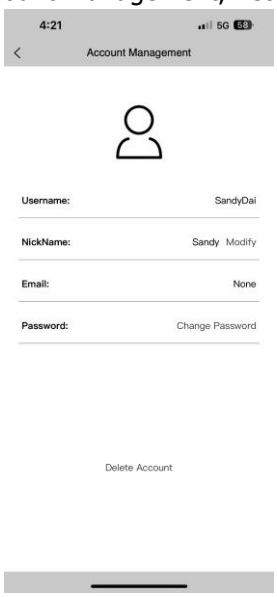


Event log: Choose the time or certain date, and click the "Done" button to retrieve log.



2-10. **Configuration:** Account management, network configuration and language settings.





2-11. About

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

Parameter setting list:

Item		Description
Buzzer	Buzzer Status	If disabled, buzzer won't be on when alarm/fault occurred.
Grid	Input Voltage Range	When selecting "UPS", it's allowed to connect personal computer. Please check product manual for details.
		When selecting "Appliance", it's allowed to connect home appliances.
Battery	Battery Equalization	Set Battery Equalization
	Battery Equalization Now	It's real-time action to activate battery equalization.
	Battery Type	To set connected battery type.
	Max Charge Current Grid (A)	It's to set up battery charging parameters. The selectable values in different inverter model may vary. Please see product manual for the details.
	Max Charge Current (A)	
	Generator Max Charge Current	
	Battery cut-off discharging voltage when grid is available	When "SBU" is set as output source priority and battery voltage is lower than this setting voltage or SOC, unit will transfer to line mode and the grid will provide power to load.
	Battery re-discharging voltage when grid is available	When "SBU" is set as output source priority and battery voltage is higher than this setting voltage or SOC, battery will be allowed to discharge.
	Charge Voltage Max(V)	It's to set up battery charging parameters. The selectable values in different inverter model may vary. Please see product manual for the details.
	Battery Voltage Float (V)	
	Battery cut-off discharging voltage when grid is unavailable(V)	To set the battery stop discharging voltage or SOC. Please see product manual for the recommended voltage or SOC range based on connected battery type.
	Equalization Voltage	To set up the battery equalization voltage.
	Equalization Time	To set up the extended time to continue battery equalization.
	Equalization Time Out	To set up the duration time for battery equalization.
	Equalization Interval	To set up the frequency for battery equalization.
Output	Overload Restart	If disabled, the unit won't be restarted after overload occurs.
	Overload Bypass	If enabled, unit will transfer to line mode when overload happened in battery mode.
	Grid Frequency Output Rating(Hz)	To set output frequency.
	Grid Voltage Output Rating(V)	To set output voltage.

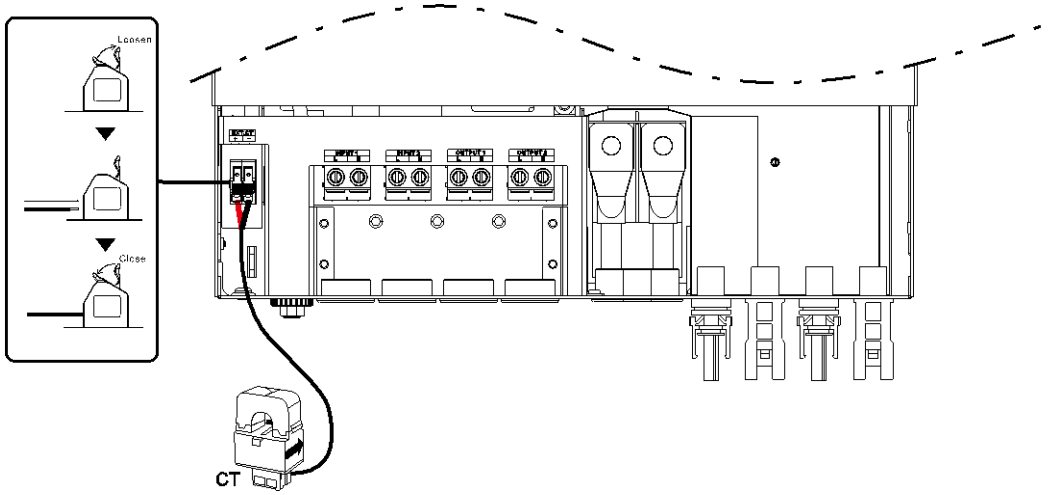
	Output Priority	To configure load power source priority.
	Battery Voltage to Turn Off Load 2(V/SOC)	To set the battery stop discharging voltage or SOC on second (L2) output.
	Discharge Time to Turn Off Load 2(m)	To set time interval to turn off second (L2) output.
	Battery Voltage to Turn On Load 2(V/SOC)	To set voltage point or SOC percentage to re-start on second (L2) output.
	Discharge Time to Turn On Load 2(m)	To set time interval to turn on second (L2) output.
	Output over VA to Turn Off Load 2(VA)	To set over VA to turn off second (L2) output
	Timer out(VA) to turn on Load(m)	To set time to turn on second (L2) output due to over VA turn off.
Other	Over Temperature Restart	If disabled, the unit won't be restarted after over-temperature fault is solved.
	Backlight	If disabled, LCD backlight will be off when panel button is not operated for 1 minute.
	Alarm When Primary Source Change	If enabled, buzzer will alarm when primary source is abnormal.
	Fault Code Record	If enabled, fault code will be recorded in the inverter when any fault happens.
	Default LCD Display	If enable, LCD screen will return to its main screen after one minute automatically.
	External CT	To enable/disable external CT function
	Charge Priority	To configure charger source priority.
	Sync Rating and Parameter	Update Rating and Parameter

Appendix IV: The CT Operation Guide

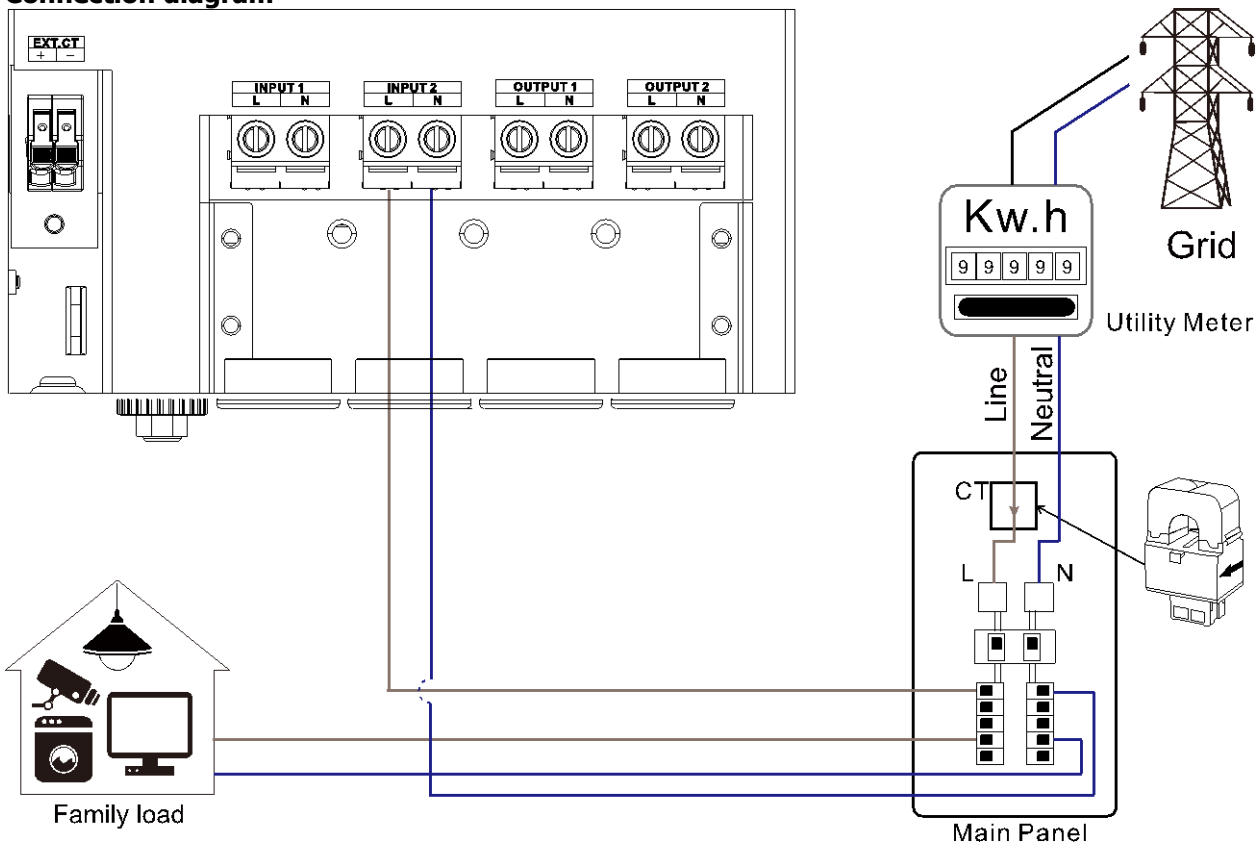
With External CT connected, solar inverter can be easily integrated into the existing household system. It's to arrange self-consumption via CT to control power generation and battery charging of the inverter.

1. CT Connection

Step 1. Power off the inverter and connect the external CT install on the spring terminal block. Be noted the mark of current flow direction on the CT should point to the Inverter and the polarity on connecting CT wires on the terminal block should be followed as "L+" vs red wire and "L-" vs white wire.
The CT could either string on the LINE of AC input 1(if the AC source is not a generator) or AC input 2.



1-1 Connection diagram



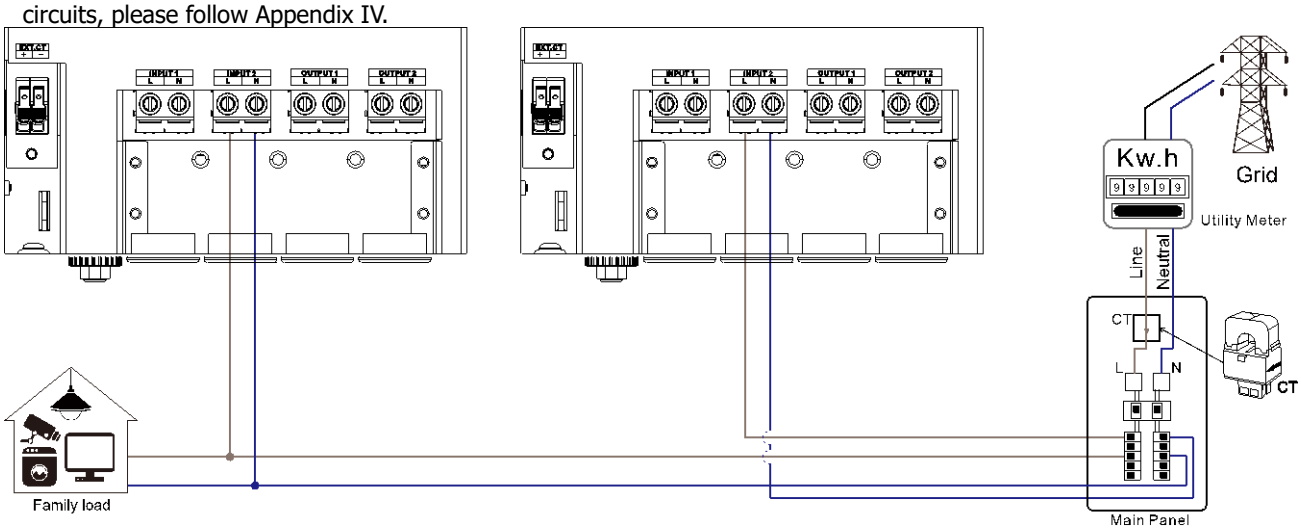
Step 2: Power on the inverter.

Step 3: Enter LCD setting on the inverter with CT sensor connected and set CT function program #67 to "enable".

External CT function	Disable (default) 	Enable 

2. Parallel commissioning

Step 1. Power off the inverter and connect the CT sensor according to the wiring diagram below. For other parallel circuits, please follow Appendix IV.



Step 2: Power on each inverter.

Step 3: Enter LCD setting on the inverter with CT sensor connected and set CT function to "enable". Same as single phase setting

IMPORTANT ATTENTION:

If applying CT function during parallel operation, it only needs one inverter from the parallel system connected to CT sensor. Be sure to enable LCD program #67 external CT function on the one inverter with CT connected and set up "Disable" on the remaining inverters. Otherwise, it will cause CT function not working during parallel operation.