

User Manual

PowerWalker SOLAR INVERTER ZRO (5000VA) OFF-Grid Charger

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	9
Remote Display Panel Installation	9
Communication Connection.....	11
Dry Contact Signal	11
BMS Communication	11
OPERATION.....	12
Power ON/OFF	12
Operation and Display Panel	12
LCD Display Icons	13
LCD Setting.....	15
Display Setting	25
Operating Mode Description	29
Fault Reference Code.....	32
Warning Indicator	32
Battery Equalization	33
SPECIFICATIONS.....	35
Table 1 Line Mode Specifications	35
Table 2 Battery Mode Specifications.....	36
Table 3 Charge Mode Specifications.....	37
Table 4 ECO/Bypass Mode Specifications.....	38
TROUBLE SHOOTING	39
PARALLEL FUNCTION	Fehler! Textmarke nicht definiert.
Appendix A: Approximate Back-up Time Table	Fehler! Textmarke nicht definiert.
Appendix B: BMS Communication Installation	Fehler! Textmarke nicht definiert.
Appendix C: The Wi-Fi Operation Guide in Remote Panel.....	Fehler! Textmarke nicht definiert.

ABOUT THIS MANUAL

Purpose

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

Scope

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

SAFETY INSTRUCTIONS



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

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

INTRODUCTION

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

Features

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

Basic System Architecture

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

- Generator or Utility.
- PV modules

Consult with your system integrator for other possible system architectures depending on your requirements. This inverter can power all kinds of appliances in home or office environment, including motor-type appliances such as tube light, fan, refrigerator and air conditioner.

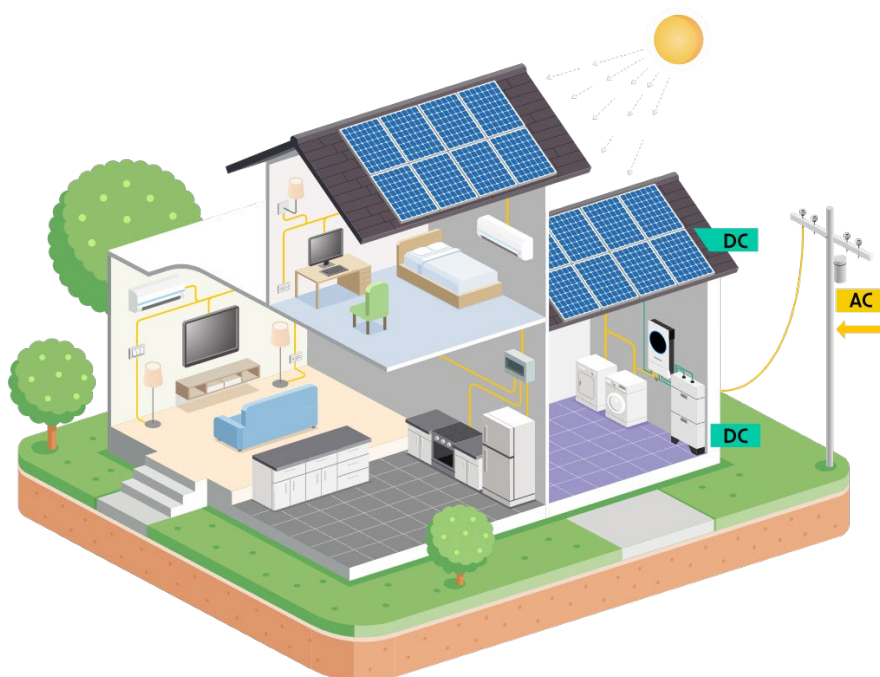
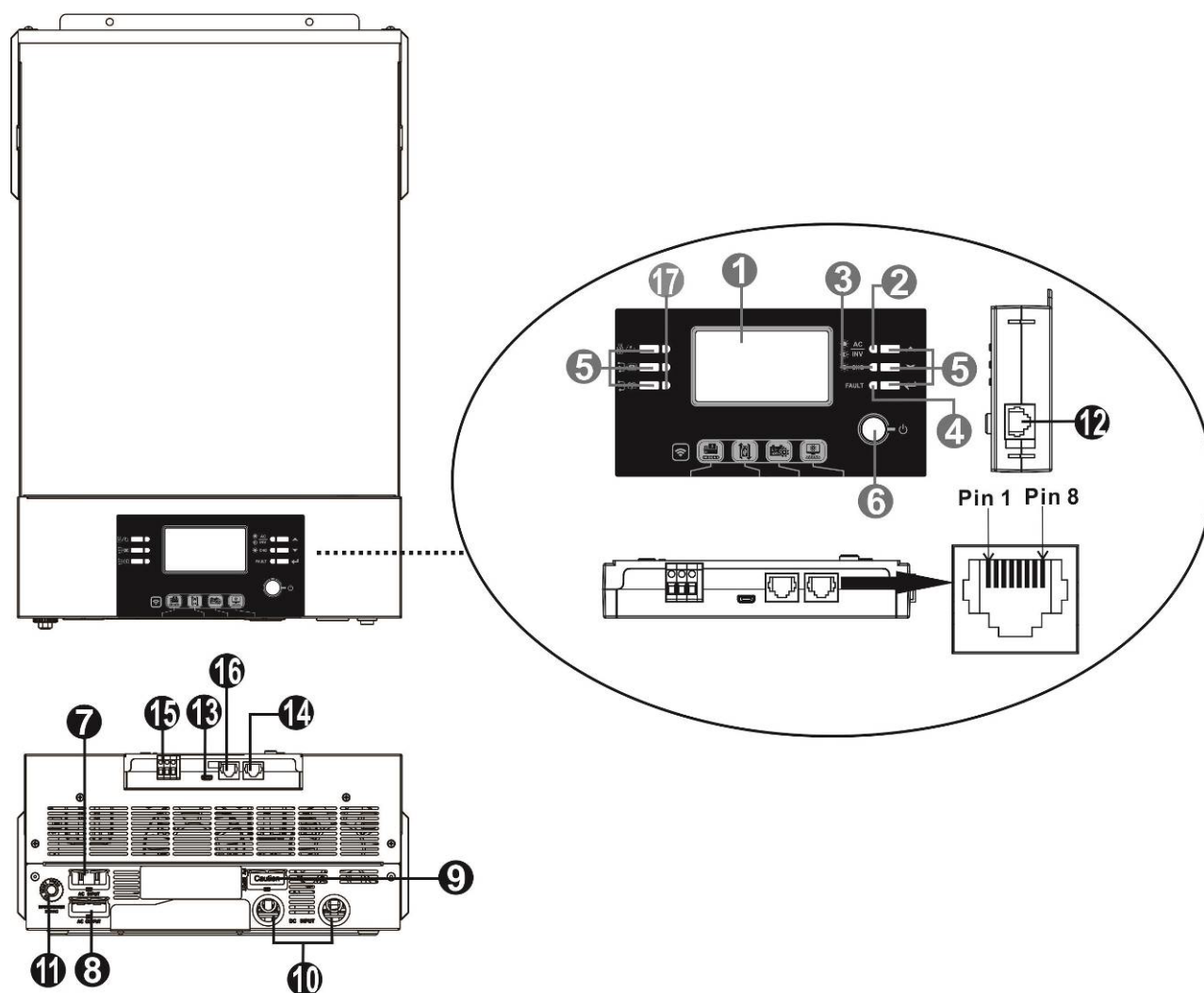


Figure 1 PV System Overview

Product Overview



1. LCD display
2. Status indicator
3. Charging indicator
4. Fault indicator
5. Function buttons
6. Power on/off switch
7. AC input
8. AC output
9. PV connectors
10. Battery input
11. Circuit breaker
12. Remote LCD panel communication port
13. USB port: for communication port and USB function port
14. RS-232 communication port
15. Dry contact
16. BMS communication port: CAN and RS232 or RS485
17. LED indicator for USB function settings

INSTALLATION

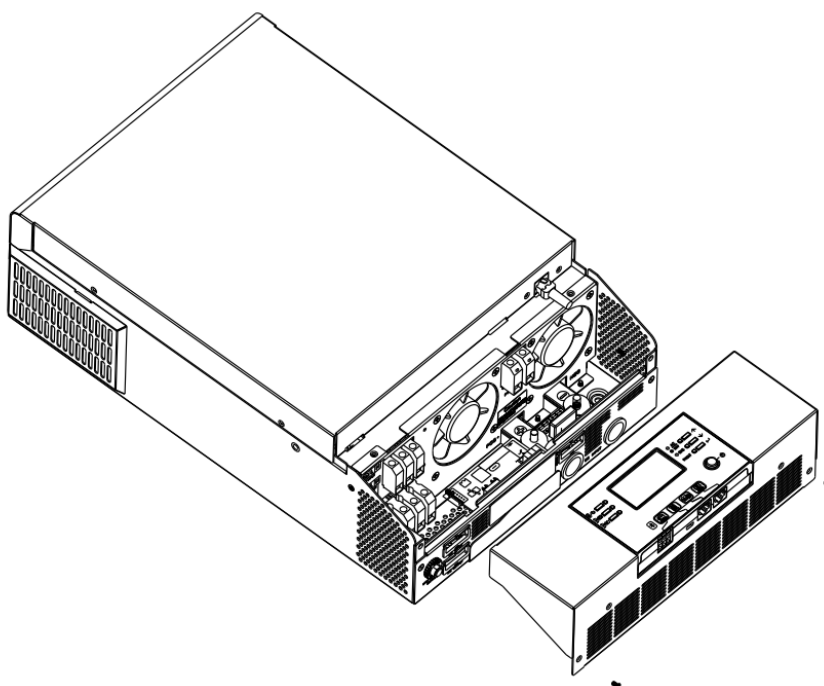
Unpacking and Inspection

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

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

Preparation

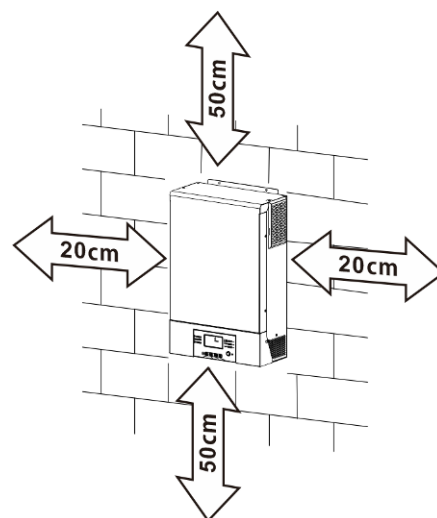
Before connecting all wirings, please take off bottom cover by removing two screws as shown below.



Mounting the Unit

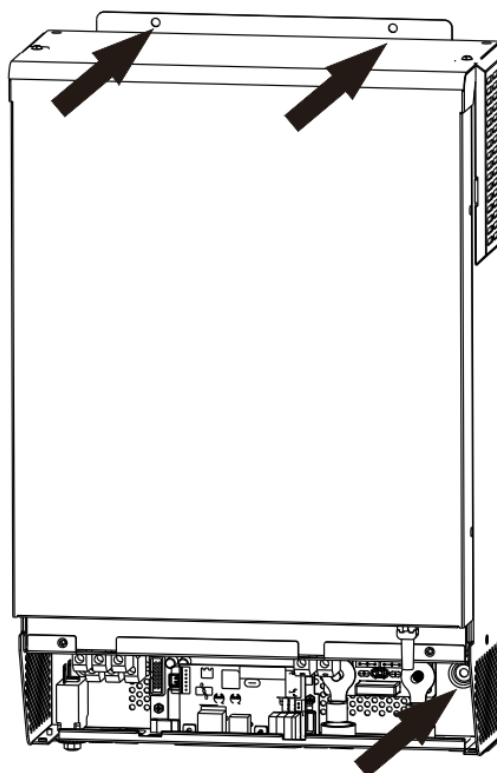
Consider the following points before selecting where to install:

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



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

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



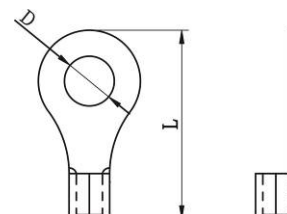
Battery Connection

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

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

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

Ring terminal:

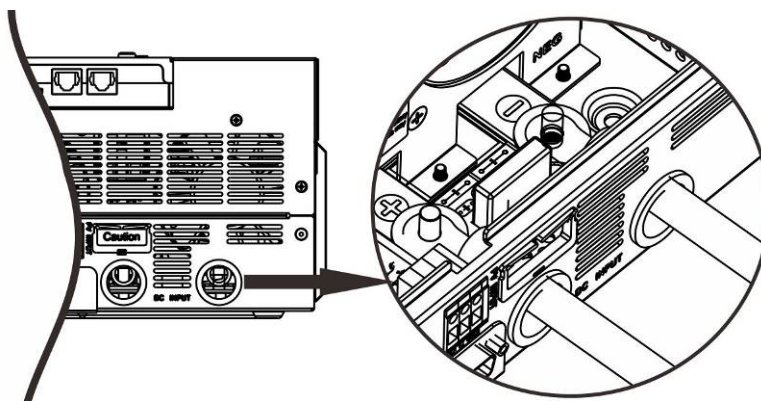


Recommended battery cable and terminal size:

Model	Typical Amperage	Battery Capacity	Wire Size	Ring Terminal			Torque Value
				Cable mm²	Dimensions		
					D (mm)	L (mm)	
5KW/6KW	125A/150A	200AH	1*1/0AWG	60	6.4	49.7	2~3 Nm
			2*4AWG	44	6.4	49.7	

Please follow below steps to implement battery connection:

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



WARNING: Shock Hazard

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



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

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

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

AC Input/Output Connection

CAUTION!! Before connecting to AC input power source, please install a **separate** AC breaker between inverter and AC input power source. This will ensure the inverter can be securely disconnected during maintenance and fully protected from over current of AC input. The recommended spec of AC breaker is 50A.

CAUTION!! There are two terminal blocks with "IN" and "OUT" markings. Please do NOT mis-connect input and output connectors.

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

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

Suggested cable requirement for AC wires

Model	Gauge	Torque Value
5KW/6KW	8 AWG	1.4~ 1.6Nm

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

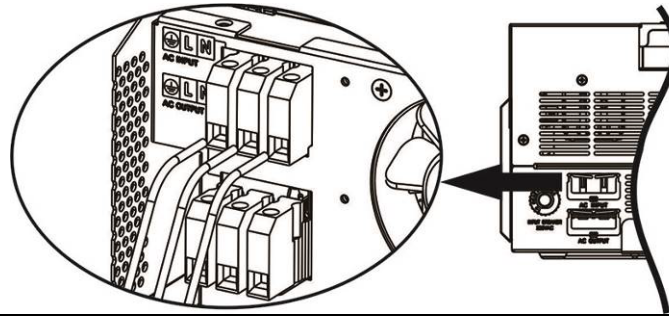
1. Before making AC input/output connection, be sure to open DC protector or disconnector first.
2. Remove insulation sleeve 10mm for six conductors. And shorten phase L and neutral conductor N 3 mm.
3. Insert AC input wires according to polarities indicated on terminal block and tighten the terminal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



→ **Ground (yellow-green)**

L→ **LINE (brown or black)**

N→ **Neutral (blue)**



WARNING:

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

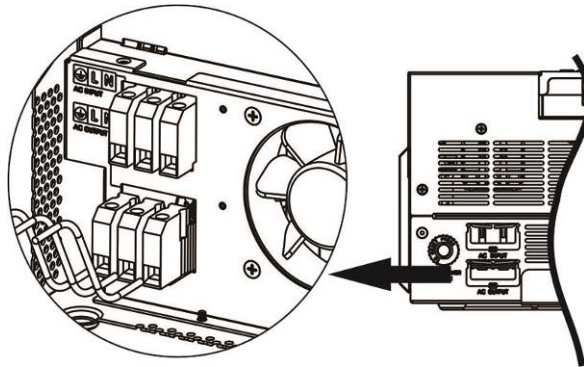
4. Then, insert AC output wires according to polarities indicated on terminal block and tighten terminal screws. Be sure to connect PE protective conductor (⊕) first.



→ **Ground (yellow-green)**

L → **LINE (brown or black)**

N → **Neutral (blue)**



5. Make sure the wires are securely connected.

CAUTION: Important

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

CAUTION: Important

When input source is the generator, it's suggested to choose the generator by following parameters:

- The recommend generator rating should be at least 2X of inverter capacity.
- Generator output: Pure Sine Wave
- Generator output voltage rms range: 180 ~ 270Vac
- Generator output frequency range: 45Hz ~ 63Hz

It's recommended to test the generator with the inverter before the installation. Few generators complied above parameters may still not be accepted by the inverter as the input source.

CAUTION: Appliances such as air conditioner are required at least 2~3 minutes to restart because it's required to have enough time to balance refrigerant gas inside of circuits. If a power shortage occurs and recovers in a short time, it will cause damage to your connected appliances. To prevent this kind of damage, please check manufacturer of air conditioner if it's equipped with time-delay function before installation. Otherwise, this inverter/charger will trig overload fault and cut off output to protect your appliance but sometimes it still causes internal damage to the air conditioner.

PV Connection

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

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

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

WARNING! Never connect the positive and negative terminals of the solar panel to the ground.

Model	Typical Amperage	Cable Size	Torque
5KW/6KW	27A	10 AWG	1.2~1.6 Nm

PV Module Selection:

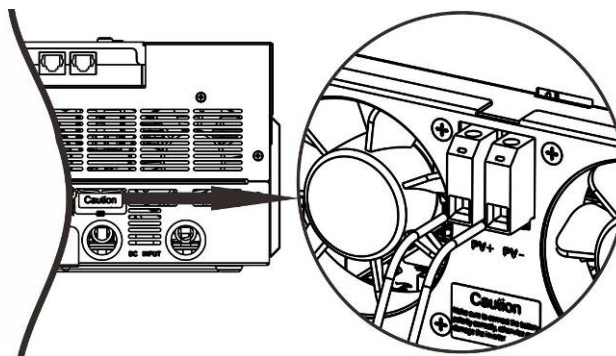
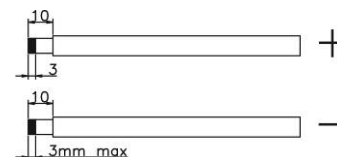
When selecting proper PV modules, please be sure to consider below parameters:

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

Solar Charging Mode	
INVERTER MODEL	5KW/6KW
Max. PV Array Open Circuit Voltage	500Vdc
PV Array MPPT Voltage Range	120~430Vdc

Please follow below steps to implement PV module connection:

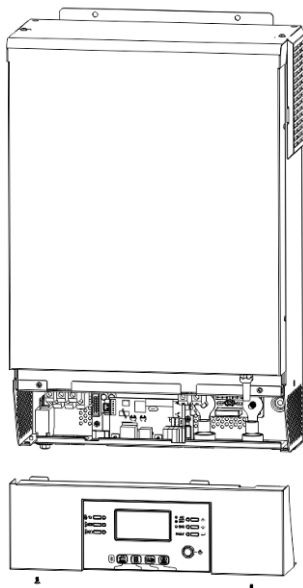
1. Remove insulation sleeve 10 mm for positive and negative conductors.
2. Check correct polarity of connection cable from PV modules and PV input connectors. Then, connect positive pole (+) of connection cable to positive pole (+) of PV input connector. Connect negative pole (-) of connection cable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



3. Make sure the wires are securely connected.

Final Assembly

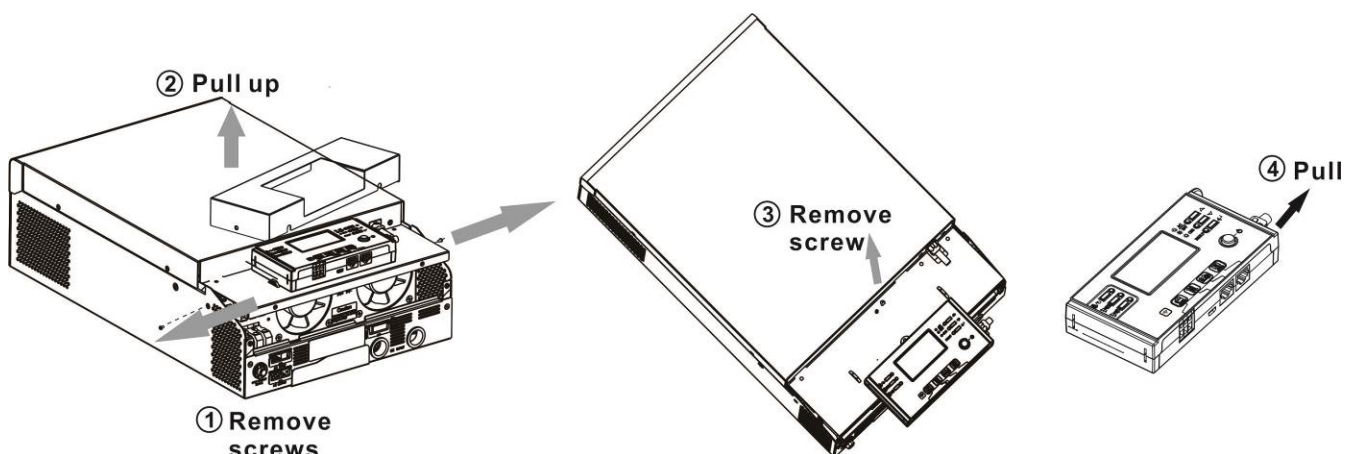
After connecting all wirings, please put bottom cover back by screwing two screws as shown on the below chart.



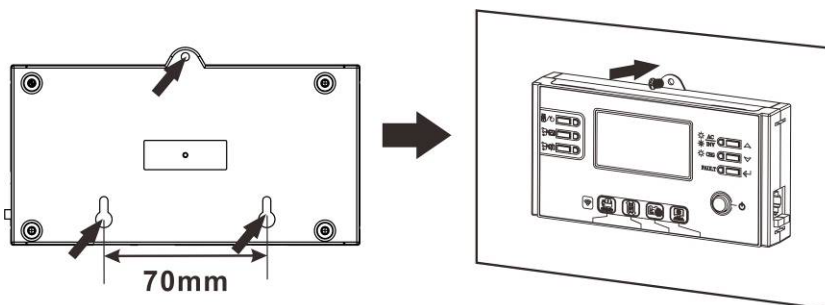
Remote Display Panel Installation

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

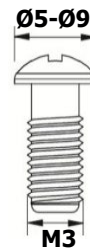
Step 1. Loosen the screw on the two sides of bottom case and push up the case cover. Then, remove screw on the top of the display panel. Now, the display can be removed from the bottom case. Then, pull out the cable from the remote communication port.



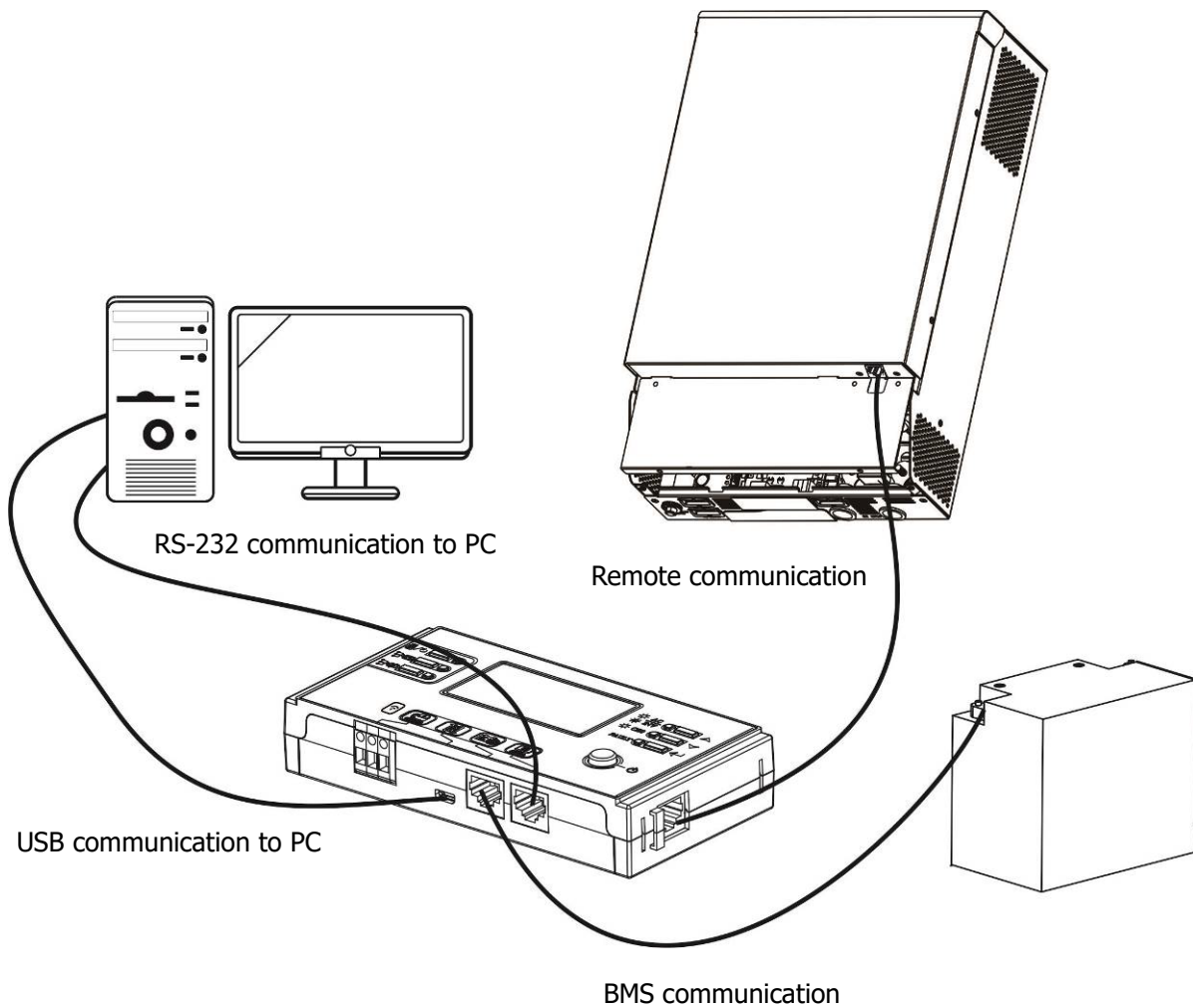
Step 2. Drill two holes in the marked locations with two screws as shown below chart. Place the panel on the surface and align the mounting holes with the two screws. Then, use one more screw on the top to fix the panel to the wall and check if the remote panel is firmly secured.



Note: Installation to the wall should be implemented with the proper screws. Refer chart for recommended spec of screws.



Step 3. Connect LCD panel to the inverter with an optional RJ45 communication cable as below chart.



Communication Connection

Serial Connection

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

Wi-Fi Connection

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



Dry Contact Signal

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

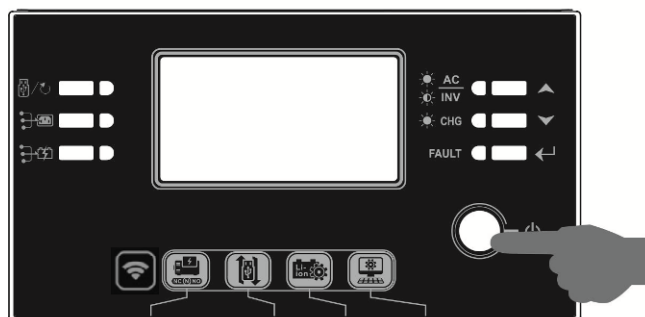
Unit Status	Condition			Dry contact port: 	
				NC & C	NO & C
Power Off	Unit is off and no output is powered.			Close	Open
Power On	Output is powered from Utility.			Close	Open
	Output is powered from Battery power or Solar energy.	Program 01 set as USB (utility first)	Battery voltage < Low DC warning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

BMS Communication

If connecting to lithium battery, it's requested to buy a special communication cable. For the detailed BMS communication and installation, please check Appendix B – BMS Communication Installation.

OPERATION

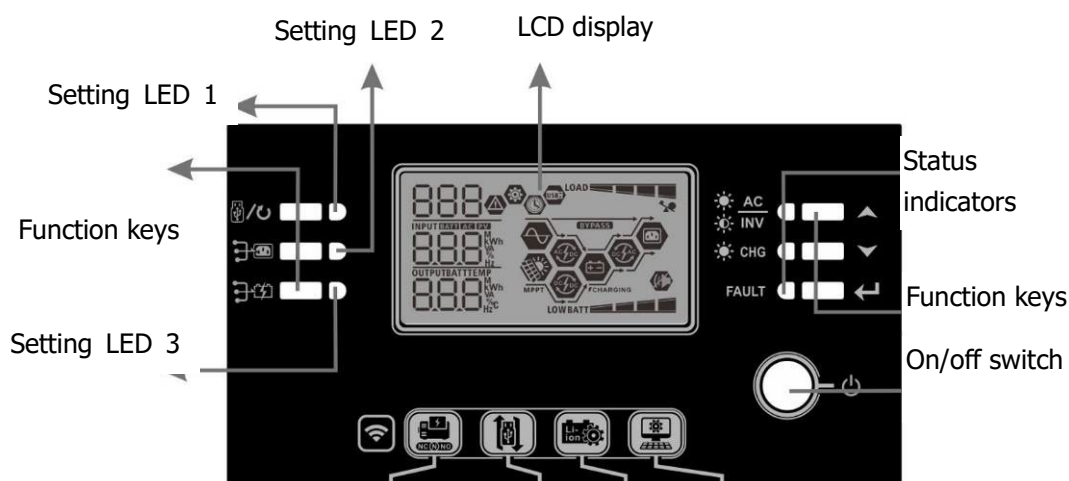
Power ON/OFF



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



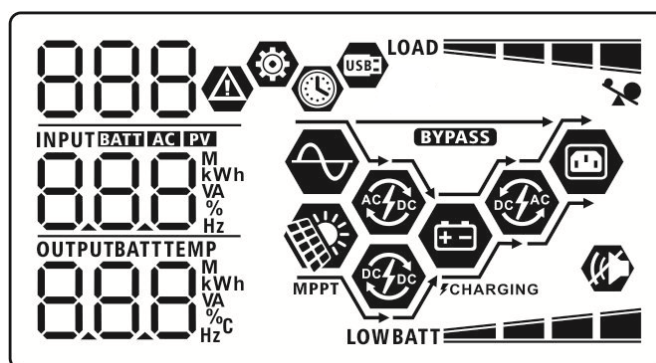
LED Indicators

LED Indicator				Messages
Setting LED1		Green	Solid On	Output powered by utility
Setting LED2		Green	Solid On	Output powered by PV
Setting LED3		Green	Solid On	Output powered by battery
Status Indicator		Green	Solid On	Output is available in bypass mode
			Flashing	Output is powered by battery or AC in inverter mode
		Green	Solid On	Battery is fully charged
			Flashing	Battery is charging.
	FAULT	Red	Solid On	Fault mode
			Flashing	Warning mode

Function Keys

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

LCD Display Icons



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

In battery mode, it will present battery capacity.

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

Load Information

	Indicates overload.	
LOAD  	Indicates the load level by 0-24%, 25-49%, 50-74% and 75-100%.	
	0%~24%	25%~49%
	LOAD 	LOAD 
	50%~74%	75%~100%
	LOAD 	LOAD 

Mode Operation Information

	Indicates unit connects to the mains.
 MPPT	Indicates unit connects to the PV panel.
BYPASS	Indicates load is supplied by utility power.
	Indicates the utility charger circuit is working.
	Indicates the solar charger circuit is working.
	Indicates the DC/AC inverter circuit is working.
	Indicates unit alarm is disabled.
	Indicates USB disk is connected.
	Indicates timer setting or time display

LCD Setting

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

Setting Programs:

Program	Description	Selectable option	
00	Exit setting mode	Escape 00  ESC	
01	Output source priority: To configure load power source priority	USB : Utility first (default) 01  USB	Utility will provide power to the loads as first priority. If Utility energy is unavailable, solar energy and battery provides power the loads.
		SUB: Solar first 01  SUB	Solar energy provides power to the loads as first priority. If solar energy is not sufficient to power all connected loads, utility energy will supply power to the loads at the same time. Battery provides power to the loads only when solar and utility is not sufficient.
		SBU priority 01  SBU	Solar energy provides power to the loads as first priority. If solar energy is not sufficient to power all connected loads, battery energy will supply power to the loads at the same time. Utility provides power to the loads only when battery voltage drops to either low-level warning voltage or the setting point in program 12 or solar and battery is not sufficient.

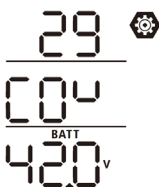
02	Maximum charging current: To configure total charging current for solar and utility chargers. (Max. charging current = utility charging current + solar charging current)	60A (default) 02  60 ^A	5KW model setting range is from 10A to 100A and increment of each click is 10A. 6KW model setting range is from 10A to 120A and increment of each click is 10A.
05	Battery type	AGM (default) 05  AGM	Flooded 05  FLD
		User-Defined 05  USE	If "User-Defined" is selected, battery charge voltage and low DC cut-off voltage can be set up in program 26, 27 and 29.
		Pylontech battery 05  PYL	If selected, programs of 02, 26, 27 and 29 will be automatically set up. No need for further setting.
		WECO battery 05  WEC	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 05  SOL	If selected, programs of 02, 26, 27 and 29 will be automatically set up. No need for further setting.
		LIb-protocol compatible battery 05  LIb	Select " LIb" if using Lithium battery compatible to Lib protocol. If selected, programs of 02, 26, 27 and 29 will be automatically set up. No need for further setting.

05	Battery type	3 rd party Lithium battery 05 LIC	If selected, programs of 02, 26, 27 and 29 will be automatically set up. No need for further setting. Please contact the battery supplier for installation procedure.
06	Auto restart when overload occurs	Restart disable (default) 06 LId	Restart enable 06 LIE
07	Auto restart when over temperature occurs	Restart disable (default) 07 tId	Restart enable 07 tIE
09	Output frequency	50Hz (default) 09 50 _{Hz}	60Hz 09 60 _{Hz}
10	Operation Logic	Automatically (default) 10 AUT	If selected and utility is available, inverter will work in line mode. Once utility frequency is unstable, inverter will work in bypass mode if bypass function is not forbidden in program 23.
		Online mode 10 ONL	If selected, inverter will work in line mode when utility is available.
		ECO Mode 10 ECO	If selected and bypass is not forbidden in program 23, inverter will work in ECO mode when utility is available.
11	Maximum utility charging current Note: If setting value in program 02 is smaller than that in program in 11, the inverter will apply charging current from program 02 for utility charger.	30A (default for 5KW) 11 30 ^A	For 5KW model, default setting is 30A and setting range is 1A, then from 10A to 100A. For 6KW model, default setting is 60A and setting range is 1A, then from 10A to 120A. Increment of each click is 10A.

12	Setting voltage point back to utility source when selecting "SBU" (SBU priority) in program 01	Default setting: 46.0V 	Setting range is from 44.0V to 57.0V and increment of each click is 1.0V.
13	Setting voltage point back to battery mode when selecting "SBU" (SBU priority) in program 01	The setting range is from 48.0V to 64.0V and increment of each click is 1.0V. Battery fully charged 	54.0V (default) 
16	Solar energy priority: To configure solar energy priority for battery and load	SbL: Solar energy for battery first UCB: Allow utility to charge battery (Default) 	Solar energy charges battery first and allow the utility to charge battery.
		SbL: Solar energy for battery first UdC: Disallow utility to charge battery 	Solar energy charge battery first and disallow the utility to charge battery.
		SLb: Solar energy for load first UCb: Allow utility to charge battery 	Solar energy provides power to the load first and also allow the utility to charge battery.
		SLb: Solar energy for load first UdC: Disallow utility to charge battery 	Solar energy provides power to the load first and disallow the utility to charge battery.

18	Alarm control	Alarm on (default) 18  60n	Alarm off 18  60f
19	Auto return to default display screen	Return to default display screen (default) 19  ESP	If selected, no matter how users switch display screen, it will automatically return to default display screen (Input voltage /output voltage) after no button is pressed for 1 minute.
		Stay at latest screen 19  1EP	If selected, the display screen will stay at latest screen user finally switches.
20	Backlight control	Backlight on (default) 20  L0n	Backlight off 20  L0f
22	Beeps while primary source is interrupted	Alarm on (default) 22  A0n	Alarm off 22  A0f
23	Bypass function:	Bypass Forbidden 23  byf	If selected, inverter won't work in bypass/ECO modes.
		Bypass disable 23  byd	If selected and power ON button is pressed on, inverter can work in bypass/ECO mode only if utility is available.
		Bypass enable (default) 23  bye	If selected and no matter power ON button is pressed on or not, inverter can work in bypass mode if utility is available.

25	Record Fault code	Record enable 25  FEN	Record disable (default) 25  Fds
26	Bulk charging voltage (C.V voltage)	default setting: 56.4V 26  CU BATT 56.4 _v	If self-defined is selected in program 5, this program can be set up. Setting range is from 48.0V to 64.0V. Increment of each click is 0.1V.
27	Floating charging voltage	Default setting: 54.0V 27  FLU BATT 54.0 _v	If self-defined is selected in program 5, this program can be set up. Setting range is from 48.0V to 64.0V. Increment of each click is 0.1V.
28	AC output mode *This setting is able to set up only when the inverter is in standby mode, Be sure that on/off Switch is in "OFF" status.	Single 28  SIG	When the unit is operated alone, please select "SIG" in program 28.
		Parallel 28  PAL	When the units are used in parallel for single phase application, please select "PAL" in program 28. Please refer to 5-1 for detailed information.
		L1 phase 28  3P1	When the units are operated in 3-phase application, please choose "3PX" to define each inverter. It is required to have at least 3 inverters or maximum 9 inverters to support three-phase equipment. It's required to have at least one inverter in each phase or it's up to four inverters in one phase. Please refers to 5-2 for detailed information. Please select "3P1" in program 28 for the inverters connected to L1 phase, "3P2" in program 28 for the inverters connected to L2 phase and "3P3" in program 28 for the inverters connected to L3 phase.
		L2 phase 28  3P2	
		L3 phase 28  3P3	
			Be sure to connect share current cable to units which are on the same phase. Do NOT connect share current cable between units on different phases.

29	Low DC cut-off voltage: • If battery power is only power source available, inverter will shut down. • If PV energy and battery power are available, inverter will charge battery without AC output. • If PV energy, battery power and utility are all available, inverter will transfer to line mode and provide output power to loads.	Default setting: 42.0V 	If self-defined is selected in program 5, this program can be set up. Setting range is from 40.0V to 54.0V. Increment of each click is 0.1V. Low DC cut-off voltage will be fixed to setting value no matter what percentage of load is connected.
32	Bulk charging time	auto-charging time (default)  	5min  
		If "User-Defined" is selected in program 05, this program can be set up. Setting range is from 5min to 900min. Increment of each click is 5min. Otherwise, Keeping auto-charging time.	
33	Battery equalization	Battery equalization enable  	Battery equalization disable (default)  
		If "Flooded" or "User-Defined" is selected in program 05, this program can be set up.	
34	Battery equalization voltage	Default setting: 58.4V  	Setting range is from 48.0V to 64.0V. Increment of each click is 0.1V.
35	Battery equalized time	60min (default)  	Setting range is from 5min to 900min. Increment of each click is 5min.

36	Battery equalized timeout	120min (default) 36  120	Setting range is from 5min to 900 min. Increment of each click is 5 min.
37	Equalization interval	30days (default) 37  30d	Setting range is from 0 to 90 days. Increment of each click is 1 day
39	Equalization activated immediately	Disable (default) 39  AdS	Enable 39  AeN
		If equalization function is enabled in program 33, this program can be set up. If "Enable" is selected in this program, it's to activate battery equalization immediately and LCD main page will shows "E9". If "Disable" is selected, it will cancel equalization function until next activated equalization time arrives based on program 37 setting. At this time, "E9" will not be shown in LCD main page.	
40	Reset all stored data for PV generated power and output load energy	Not reset(Default) 40  NrE	Reset 40  rSE
93	Erase all data log	Not reset(Default) 93  NrE	Reset 93  rSE
94	Data log recorded interval *The maximum data log number is 1440. If it's over 1440, it will re-write the first log.	3 minutes 94  3	5 minutes 94  5
		10 minutes(default) 94  10	20 minutes 94  20

		30 minutes 94	60 minutes 94
		30	60
95	Time setting – Minute	95 min 00	For minute setting, the range is from 00 to 59.
96	Time setting – Hour	96 HOU 00	For hour setting, the range is from 00 to 23.
97	Time setting– Day	97 day 01	For day setting, the range is from 00 to 31.
98	Time setting– Month	98 mon 01	For month setting, the range is from 01 to 12.
99	Time setting – Year	99 YEA 17	For year setting, the range is from 17 to 99.

USB Function Setting

Please insert USB disk into USB port () . Press and hold "/U" button for 3 seconds to enter USB function setting mode. These functions include to upgrade inverter firmware, export data log and re-write internal parameters from USB disk.

Procedure	LCD Screen
Step 1: Press and hold "  /U" button for 3 seconds to enter USB function setting mode.	   UPG SEt LOG
Step 2: Press "  /U", "  /D" or "  /F" button to enter the selectable setting programs.	

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

Program#	Operation Procedure	LCD Screen
 : Upgrade firmware	This function is to upgrade inverter firmware. If firmware upgrade is needed, please check with your dealer or installer for detail instructions.	
 : Re-write internal parameters	This function is to over-write all parameter settings (TEXT file) with settings in the On-The-Go USB disk from a previous setup or to duplicate inverter settings. Please check with your dealer or installer for detail instructions.	
 : Export data log	Press "  " button to export data log from the inverter to USB disk. If the selected function is ready, LCD will display "LOG". Press "  " button to confirm the selection again.	LOG   LOG
	- Press "" button to select "Yes", LED 1 will flash once every second during the process. It will only display LOG and all LEDs will be on after this action is complete. Then, press "" button to return to main screen. - Or press "" button to select "No" to return to main screen.	LOG   YES NO

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

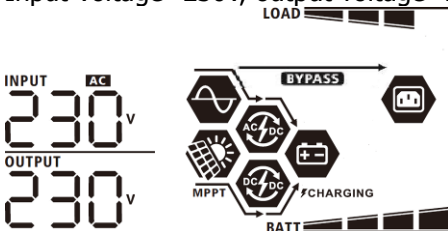
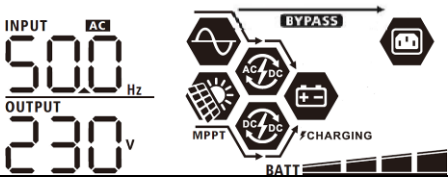
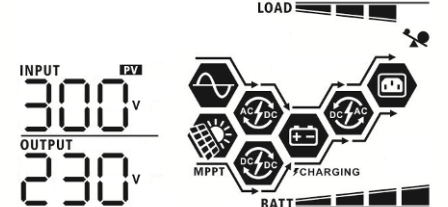
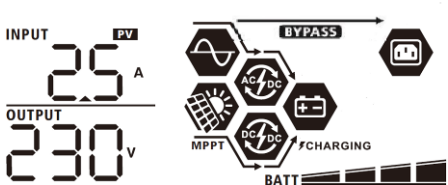
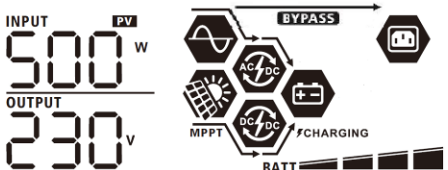
Error message for USB On-the-Go functions:

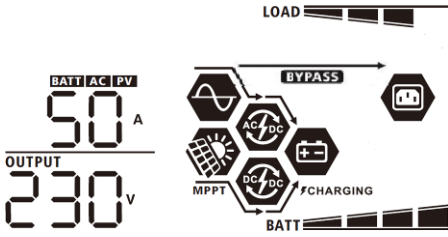
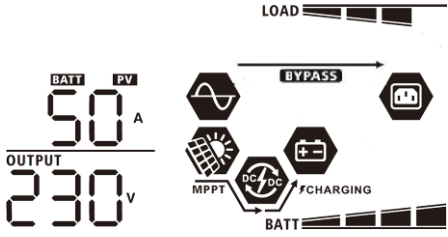
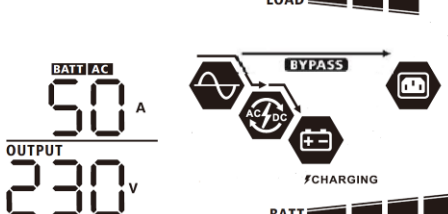
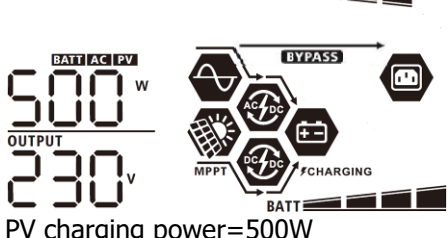
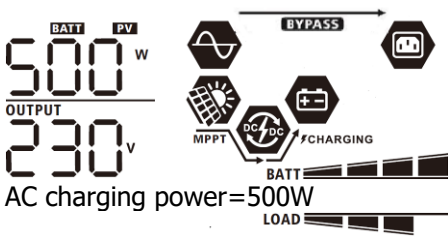
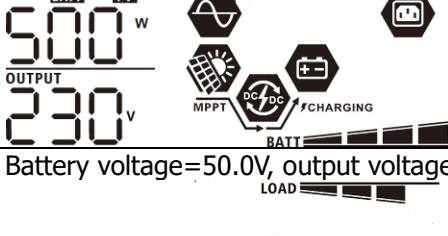
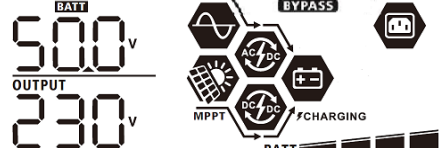
Error Code	Messages
U01	No USB disk is detected.
U02	USB disk is protected from copy.
U03	Document inside the USB disk with wrong format.

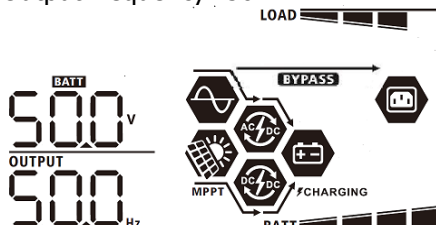
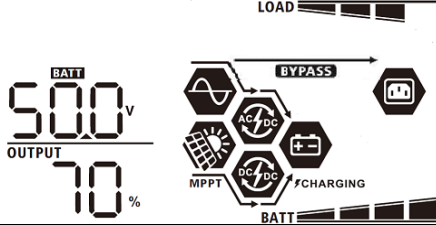
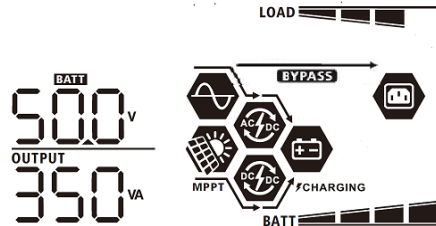
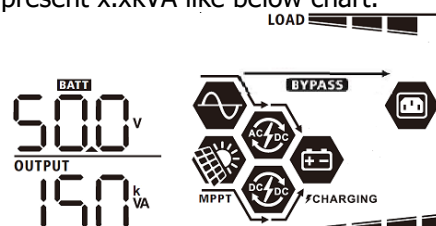
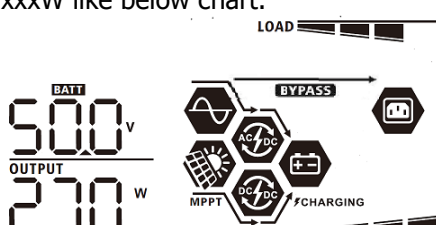
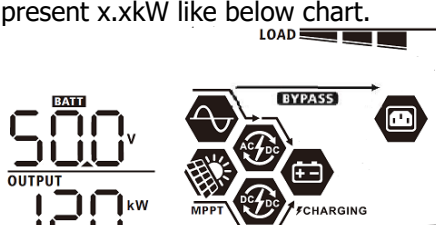
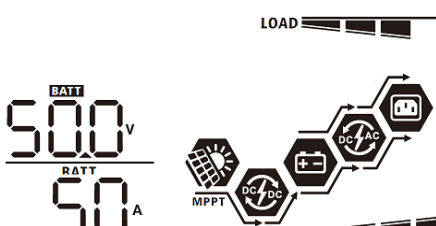
If any error occurs, error code will only show 5 seconds. After 5 seconds, it will automatically return to display screen.

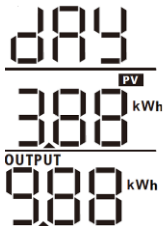
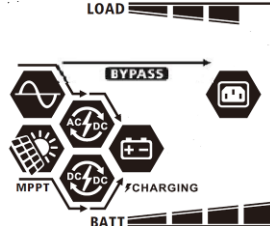
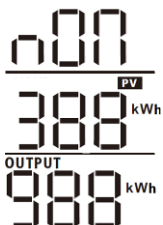
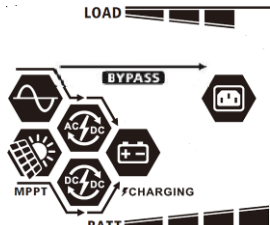
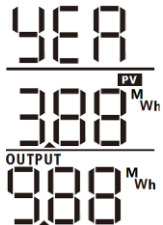
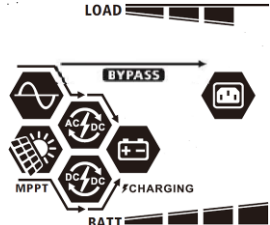
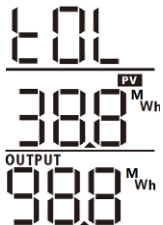
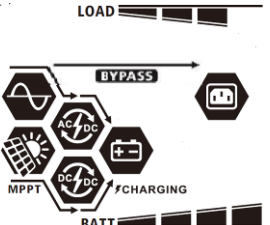
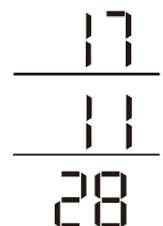
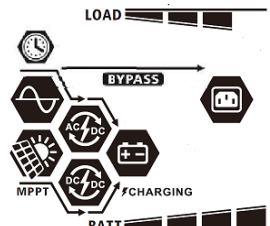
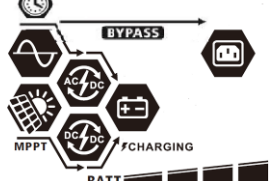
Display Setting

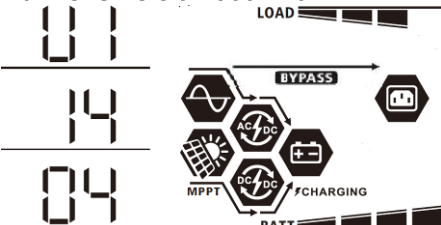
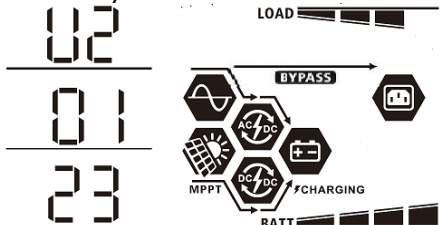
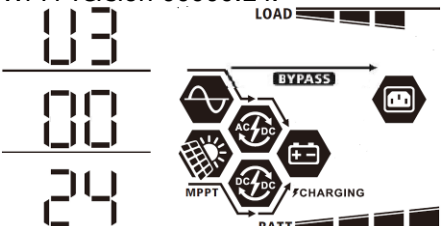
The LCD display information will be switched in turn by pressing the "UP" or "DOWN" button. The selective information will be switched as per the following orders:

Selectable information	LCD display
Input voltage/Output voltage (Default Display Screen)	Input Voltage=230V, output voltage=230V 
Input frequency	Input frequency=50Hz 
PV voltage	PV voltage=300V 
PV current	PV current = 2.5A 
PV power	PV power = 500W 

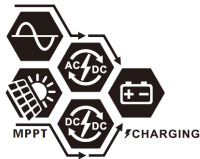
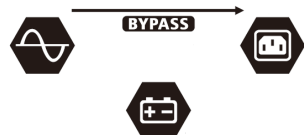
Charging current	AC and PV charging current=50A  PV charging current=50A  AC charging current=50A 
Charging power	AC and PV charging power=500W  PV charging power=500W  AC charging power=500W 
Battery voltage and output voltage	Battery voltage=50.0V, output voltage=230V 

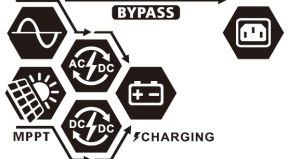
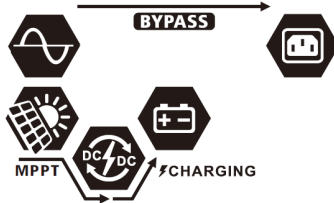
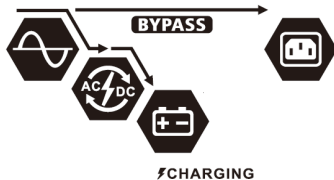
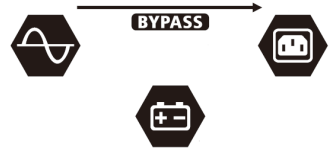
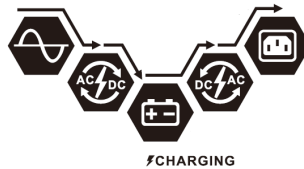
Output frequency	Output frequency=50Hz 
Load percentage	Load percent=70% 
Load in VA	When connected load is lower than 1kVA, load in VA will present xxxVA like below chart.  When load is larger than 1kVA ($\geq 1\text{kVA}$), load in VA will present x.xkVA like below chart. 
Load in Watt	When load is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

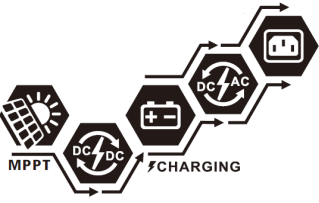
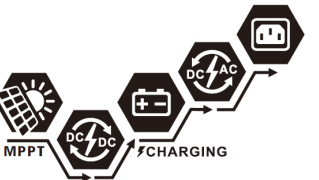
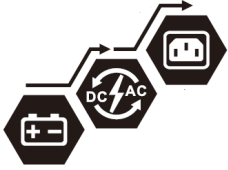
PV energy generated today and Load output energy today	PV energy generated Today = 3.88kWh, Load output energy Today = 9.88kWh.  
PV energy generated this month and Load output energy this month.	This PV month energy = 388kWh, Load month energy = 988kWh.  
PV energy generated this year and Load output energy this year.	This PV year energy = 3.88MWh, Load year energy = 9.88MWh.  
PV energy generated totally and Load output total energy.	PV Total energy = 38.8MWh, Load Output Total energy = 98.8MWh.  
Real date.	Real date Nov 28, 2017.  
Real time.	Real time 13:20.  

Main CPU version checking.	Main CPU version 00014.04. 
Secondary CPU version checking.	Secondary CPU version 00001.23. 
Wi-Fi version checking.	Wi-Fi version 00000.24. 

Operating Mode Description

Operation mode	Description	LCD display
Standby mode Note: *Standby mode: The inverter is not turned on yet but at this time, the inverter can charge battery without AC output.	No output is supplied by the unit but it still can charge batteries.	Charging by utility and PV energy. 
		Charging by utility. 
		Charging by PV energy. 
		No charging. 
Fault mode Note: *Fault mode: Errors are caused by inside circuit error or external reasons such as	Utility can bypass.	No charging and Bypass 
		No charging

	over temperature, output short circuited and so on.	
Bypass/ECO Mode	The unit will provide output power from the utility. PV energy and utility can charge batteries.	Charging by utility and PV energy. 
		Charging by PV 
Bypass/ECO Mode	The unit will provide output power from the utility. PV energy and utility can charge batteries.	Charging by utility 
		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. 
		Power from utility and PV energy 

Line Mode	The unit will provide output power from the mains. It will also charge the battery at line mode.	Power from utility only 
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 only 

Fault Reference Code

Fault Code	Fault Event	Icon on
01	Fan is locked when inverter is off.	F01
02	Over temperature	F02
03	Battery voltage is too high	F03
04	Battery voltage is too low	F04
05	Output short circuited or over temperature is detected by internal converter components.	F05
06	Output voltage is too high.	F06
07	Overload time out	F07
08	Bus voltage is too high	F08
09	Bus soft start failed	F09
50	PFC over current	F50
51	OP over current	F51
52	Bus voltage is too low	F52
53	Inverter soft start failed	F53
55	Over DC voltage in AC output	F55
57	Current sensor failed	F57
58	Output voltage is too low	F58

Warning Indicator

Warning Code	Warning Event	Audible Alarm	Icon flashing
01	Fan is locked when inverter is on.	Beep three times every second	01 
02	Over temperature	None	02 
03	Battery is over-charged	Beep once every second	03 
04	Low battery	Beep once every second	04 
07	Overload	Beep once every 0.5 second	07  
10	Output power derating	Beep twice every 3 seconds	10 
32	Communication interrupted	None	32 
E9	Battery equalization	None	E9 
bP	Battery open	Beep once every second	bP

Battery Equalization

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

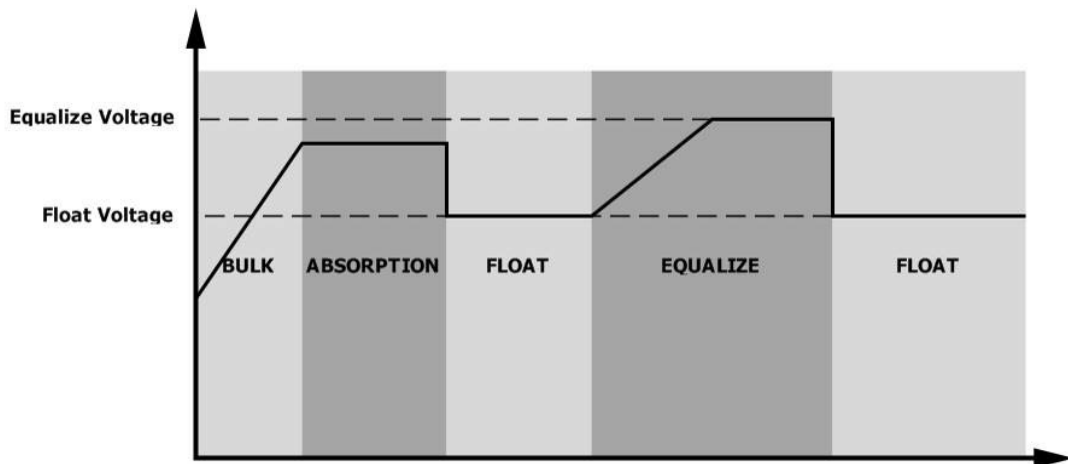
- **How to Apply Equalization Function**

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

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

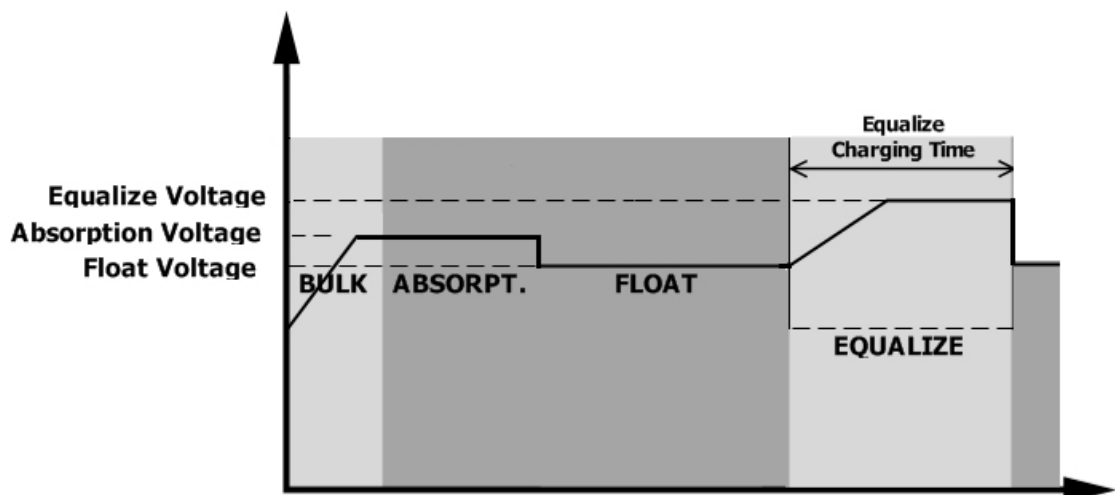
- **When to Equalize**

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

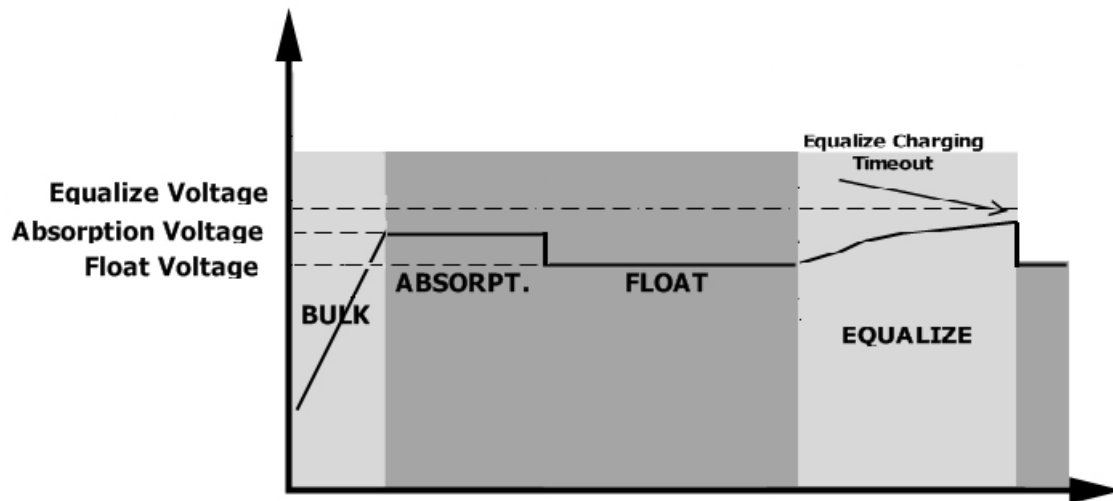


- **Equalize charging time and timeout**

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



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



SPECIFICATIONS

Table 1 Line Mode Specifications

INVERTER MODEL	5KW
Input Voltage Waveform	Sinusoidal
Nominal Input Voltage	230Vac
Low Loss Voltage	110Vac±7V
Low Loss Return Voltage	120Vac±7V
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	46(56)±1Hz
Low Loss Return Frequency	46.5(57)±1Hz
High Loss Frequency	54(64)±1Hz
High Loss Return Frequency	53(63)±1Hz
Power Factor	>0.98
Output Short Circuit Protection	Line mode: Circuit Breaker Battery mode: Electronic Circuits
Efficiency (Line Mode)	93% (Peak Efficiency)
Transfer Time	Line mode←→Battery mode 0ms Inverter←→Bypass 4ms

Table 2 Battery Mode Specifications

INVERTER MODEL	5KW
Rated Output Power	5KVA/5KW
Output Voltage Waveform	Pure Sine Wave
Output Voltage Regulation	230Vac±5%
Output Frequency	50Hz or 60Hz
Peak Efficiency	92%
Overload Protection	5s@≥150% load; 10s@110%~150% load; 100ms @ ≥200% load
Surge Capacity	2* rated power for 5 seconds
Nominal DC Input Voltage	48Vdc
Operating Range	40Vdc -66Vdc
Cold Start Voltage	46Vdc
Low DC Warning Voltage @ load < 50% @ load ≥ 50%	45.0Vdc 44.0Vdc
Low DC Warning Return Voltage @ load < 50% @ load ≥ 50%	47.0Vdc 46.0Vdc
Low DC Cut-off Voltage @ load < 50% @ load ≥ 50%	43.0Vdc 42.0Vdc
High DC Recovery Voltage	64Vdc
High DC Cut-off Voltage	66Vdc
No Load Power Consumption	<75W

Table 3 Charge Mode Specifications

Charging Mode		
INVERTER MODEL		5KW
Charging Current @ Nominal Input Voltage		Default: 30A, max: 100A
Bulk Charging Voltage	Flooded Battery	58.4Vdc
	AGM / Gel Battery	56.4Vdc
Floating Charging Voltage		54Vdc
Overcharge Protection		66Vdc
Charging Algorithm		3-Step
Charging Curve		Battery Voltage, per cell 2.43Vdc (2.35Vdc) 2.25Vdc Charging Current, % 100% 50% Time Bulk (Constant Current) Absorption (Constant Voltage) Maintenance (Floating) $T_1 = 10 * T_0$, minimum 10mins, maximum 8hrs

Table 4 Solar Specifications

Solar Input (MPPT type)	
INVERTER MODEL	5KW
Rated Power	6000W
Max. PV Array Open Circuit Voltage	500Vdc
PV Array MPPT Voltage Range	120~430V
Maximum solar input current	27A

Table 4 ECO/Bypass Mode Specifications

Bypass Mode	
INVERTER MODEL	5KW
Input Voltage Waveform	Sinusoidal
Low Loss Voltage	176Vac±7V
Low Loss Return Voltage	186Vac±7V
High Loss Voltage	280Vac±7V
High Loss Return Voltage	270Vac±7V
Nominal Input Frequency	50Hz / 60Hz (Auto detection)
Low Loss Frequency	46(56)±1Hz
Low Loss Return Frequency	46.5(57)±1Hz
High Loss Frequency	54(64)±1Hz
High Loss Return Frequency	53(63)±1Hz

Table 5 General Specifications

INVERTER MODEL	5KW
SCC type	MPPT
Parallel-able	YES
Communication	RS232 and Wi-Fi
Safety Certification	CE
Operating Temperature Range	-10°C to 50°C
Storage temperature	-15°C~ 60°C
Humidity	5% to 95% Relative Humidity (Non-condensing)
Dimension (D*W*H), mm	140 x 295 x 468
Net Weight, kg	12

TROUBLE SHOOTING

Problem	LCD/LED/Buzzer	Explanation / Possible cause	What to do
Unit shuts down automatically during startup process.	LCD/LEDs and buzzer will be active for 3 seconds and then complete off.	The battery voltage is too low (<1.91V/Cell)	1. Re-charge battery. 2. Replace battery.
No response after power on.	No indication.	1. The battery voltage is far too low. (<1.4V/Cell) 2. Battery polarity is connected reversed.	1. Check if batteries and the wiring are connected well. 2. Re-charge battery. 3. Replace battery.
Mains exist but the unit works in battery mode.	Input voltage is displayed as 0 on the LCD and green LED is flashing.	Input protector is tripped	Check if AC breaker is tripped and AC wiring is connected well.
	Green LED is flashing.	Insufficient quality of AC power. (Shore or Generator)	1. Check if AC wires are too thin and/or too long. 2. Check if generator (if applied) is working well or if input voltage range setting is correct. (UPS→Appliance)
When the unit is turned on, internal relay is switched on and off repeatedly.	LCD display and LEDs are flashing	Battery is disconnected.	Check if battery wires are connected well.
Buzzer beeps continuously and red LED is on.	Fault code 07	Overload error. The inverter is overload 110% and time is up.	Reduce the connected load by switching off some equipment.
	Fault code 05	Output short circuited.	Check if wiring is connected well and remove abnormal load.
	Fault code 02	Internal temperature of inverter component is over 100°C.	Check whether the air flow of the unit is blocked or whether the ambient temperature is too high.
	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 50	PFC over current or surge.	Restart the unit, if the error happens again, please return to repair center.
	Fault code 51	OP over current or surge.	
	Fault code 52	Bus voltage is too low.	
	Fault code 55	Output voltage is unbalanced.	If the battery is connected well, please return to repair center.
	Fault code 56	Battery is not connected well or fuse is burnt.	