

# **User Manual**

## **1.2KW-2.5KW MPPT SOLAR INVERTER**

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# ABOUT THIS MANUAL

## Purpose

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

## Scope

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

# SAFETY INSTRUCTIONS



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

1. Before using the unit, read all instructions and cautionary markings on the unit, the batteries and all appropriate sections of this manual.
2. **CAUTION** --To reduce risk of injury, charge only deep-cycle lead acid type rechargeable batteries. Other types of batteries may burst, causing personal injury and damage.
3. Do not disassemble the unit. Take it to a qualified service center when service or repair is required. Incorrect re-assembly may result in a risk of electric shock or fire.
4. To reduce risk of electric shock, disconnect all wirings before attempting any maintenance or cleaning. Turning off the unit will not reduce this risk.
5. **CAUTION** – Only qualified personnel can install this device with battery.
6. **NEVER** charge a frozen battery.
7. For optimum operation of this inverter/charger, please follow required spec to select appropriate cable size. It's very important to correctly operate this inverter/charger.
8. Be very cautious when working with metal tools on or around batteries. A potential risk exists to drop a tool to spark or short circuit batteries or other electrical parts and could cause an explosion.
9. Please strictly follow installation procedure when you want to disconnect AC or DC terminals. Please refer to INSTALLATION section of this manual for the details.
10. One piece of 150A fuse is 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, 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
- 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
- New human interface with upgraded LCD display, RGB LED and Touch pad design

## Basic System Architecture

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

- Generator or Utility.
- PV modules

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

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

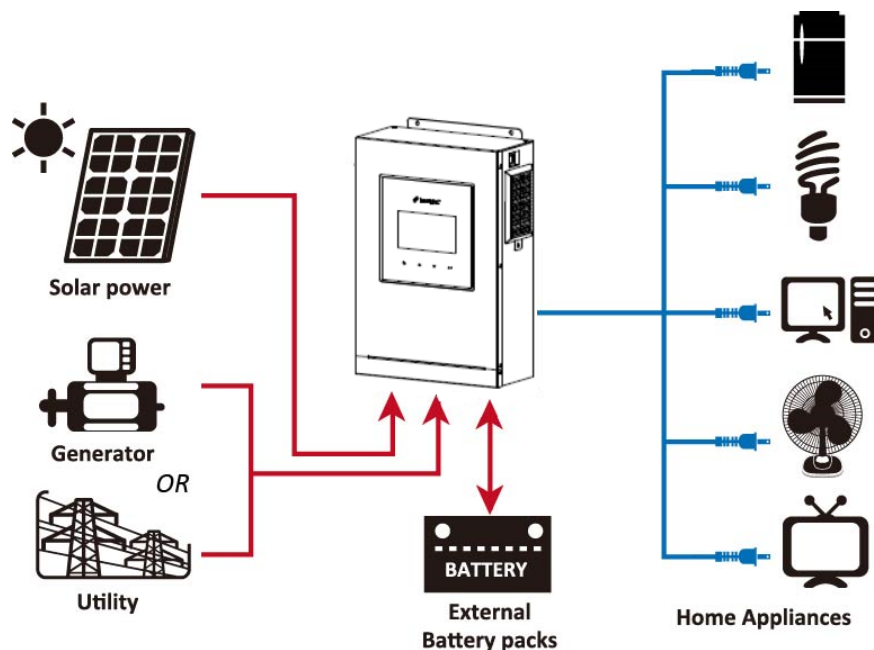
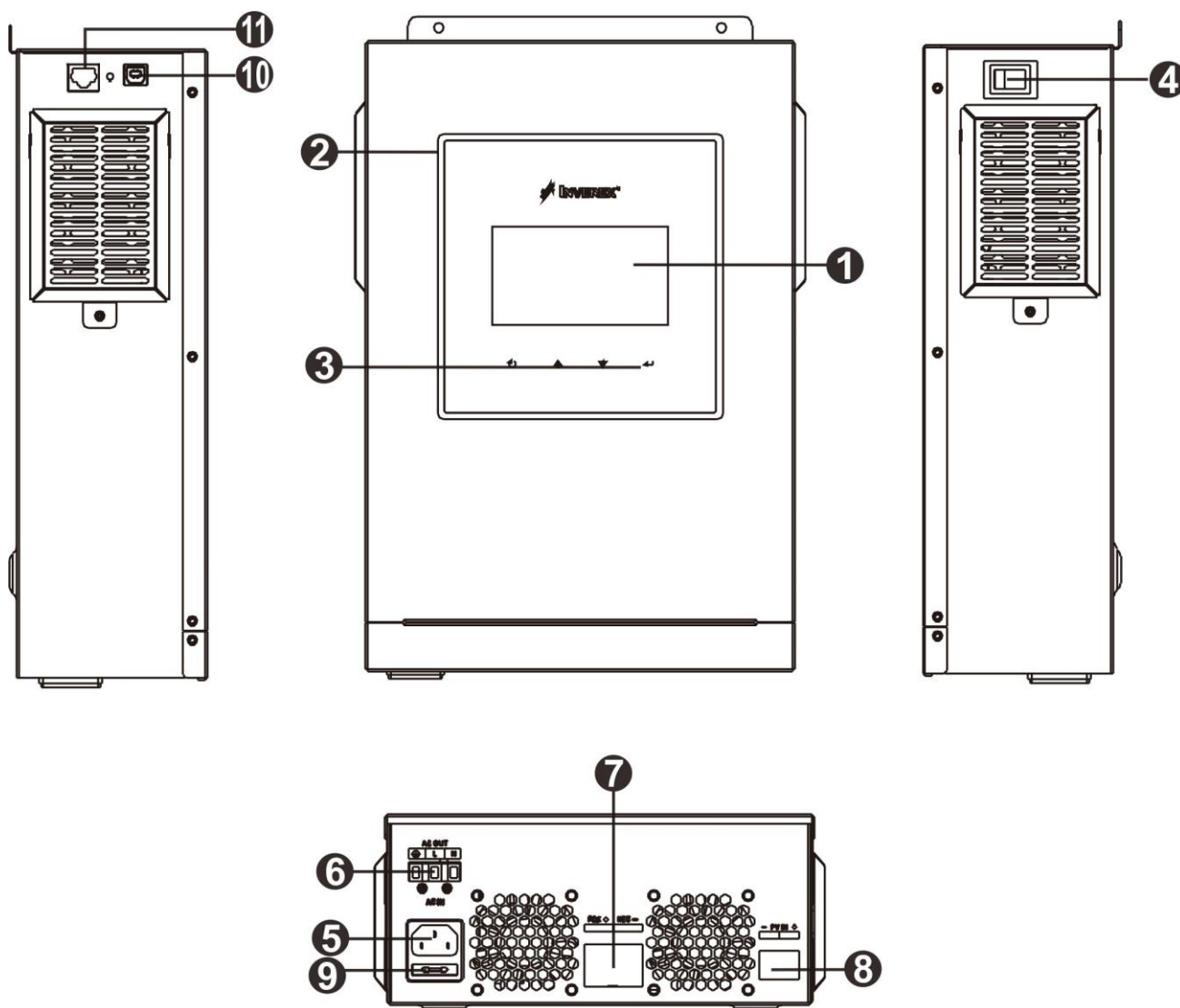


Figure 1 Hybrid Power System

## Product Overview



1. LCD display
2. RGB LED Bar (refer to LCD Setting section for the details)
3. Touchable function keys
4. Power on/off switch
5. AC input
6. AC output
7. Battery input
8. PV input
9. Fuse
10. USB communication port
11. RS-232 communication port

# INSTALLATION

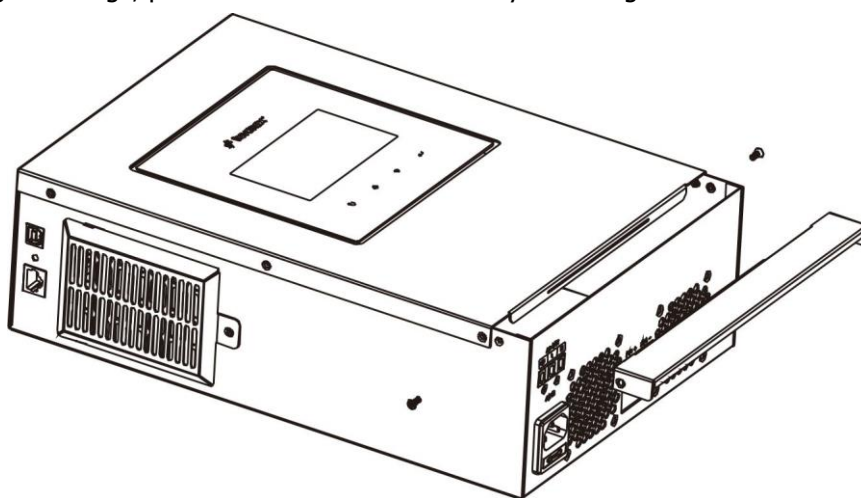
## Unpacking and Inspection

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

- The unit x 1
- User manual x 1
- Communication cable x 2
- Software CD x 1
- Battery cable x 1
- Power cord x 1

## Preparation

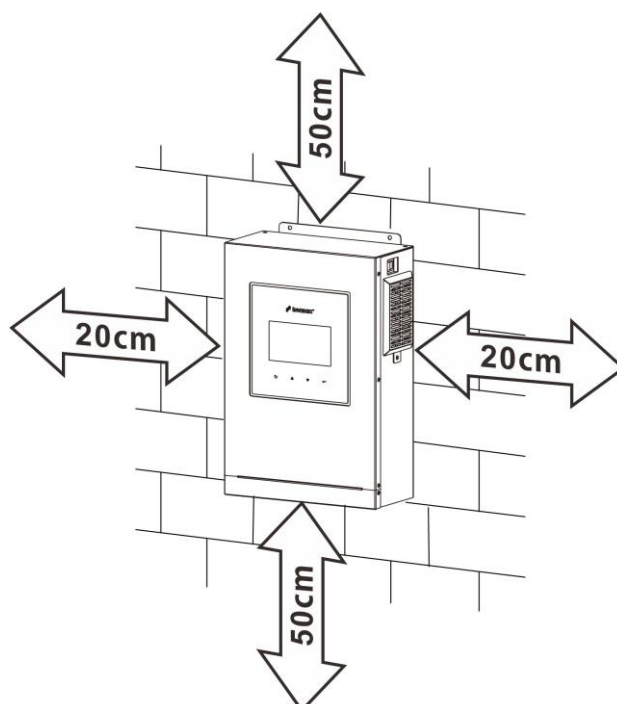
Before connecting all wirings, please take off bottom cover by removing two screws as shown below.



## Mounting the Unit

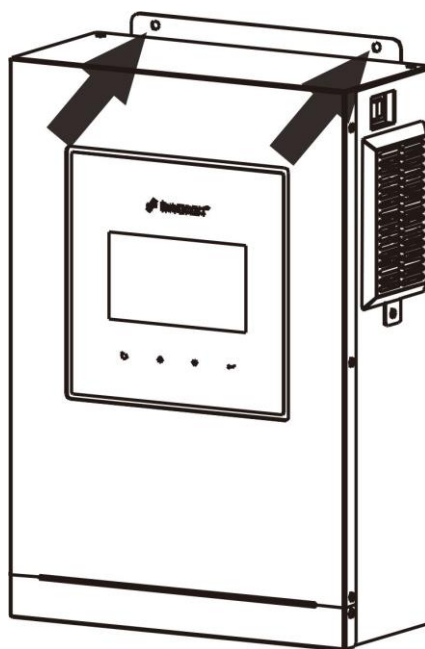
Consider the following points before selecting where to install:

- 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.
- 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.
- 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 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 two screws. It's recommended to use M4 or M5 screws.



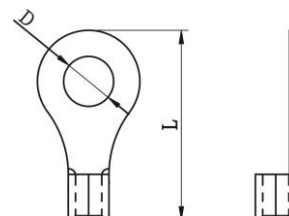
## Battery Connection

**CAUTION:** For safety operation and regulation compliance, it's requested to install a separate DC over-current protector or 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 as below.

**Ring terminal:**



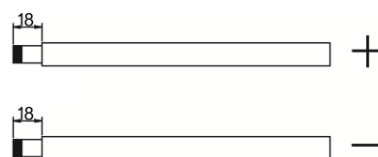
**Recommended battery cable size:**

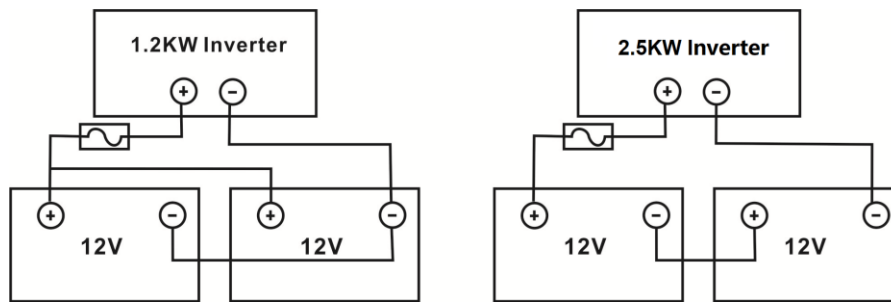
Model	Typical Amperage	Wire Size	Terminal			Torque Value
			Cable mm <sup>2</sup>	Dimensions		
				D (mm)	L (mm)	
1.2KW	114A	1 x 4AWG	25	/	/	2~ 3 Nm
2.5KW	104A					

### Battery connection:

Please follow below steps to implement battery connection:

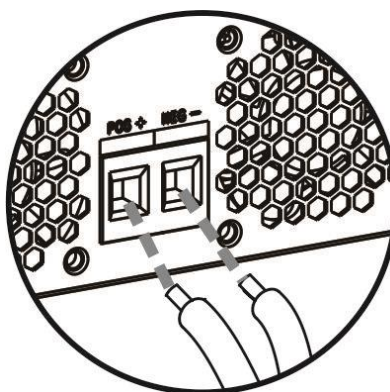
1. Remove insulation sleeve 18 mm for positive and negative conductors.
2. Suggest to put bootlace ferrules on the end of positive and negative wires with a proper crimping tool.
3. 1.2KW model supports 12VDC system and 2.5KW model supports 24VDC system. Connect all battery packs as below chart. It's suggested to connect at least 100Ah capacity battery.





4. Insert the battery wires flatly into battery connectors of inverter and make sure the bolts are tightened with torque of 2 Nm in clockwise direction. Make sure polarity at both the battery and the inverter/charge is correctly connected and conductors are tightly screwed into the battery terminals.

Recommended tool: #2 Pozi Screwdriver



**WARNING: Shock Hazard**

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



**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 10A for 1.2KW, 20A for 2.5KW.

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

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

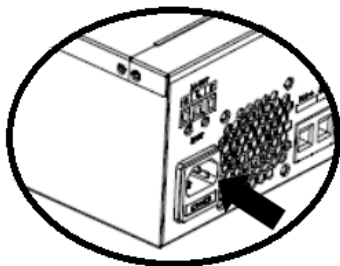
**WARNING!** It's very important for system safety and efficient operation to use appropriate cable for AC input connection. To reduce risk of injury, please use the proper recommended cable size as below.

**Suggested cable requirement for AC wires**

Model	Gauge	Cable (mm <sup>2</sup> )	Torque Value
1.2KW	16 AWG	1.5	0.6 Nm
2.5KW	14 AWG	2.5	0.6 Nm

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

1. Simply connect AC utility to AC input of the inverter with a plug.



**WARNING:**

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

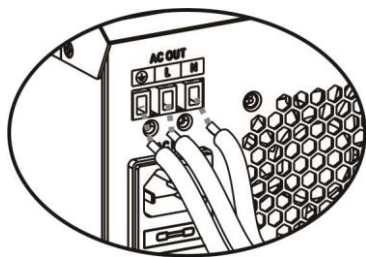
2. Then, insert AC output wires according to polarities indicated on terminal block and tighten terminal screws.  
Be sure to connect PE protective conductor (⏏) first.



→ **Ground (yellow-green)**

**L** → **LINE (brown or black)**

**N** → **Neutral (blue)**



3. Make sure the wires are securely connected.

**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!** 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.

Wire Size	Cable (mm <sup>2</sup> )	Torque value ( max )
1 x 8AWG	10	1.6 Nm

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.

INVERTER MODEL	1.2KW	2.5KW
Max. PV Array Open Circuit Voltage	102Vdc	
PV Array MPPT Voltage Range	15Vdc~80Vdc	30~80Vdc

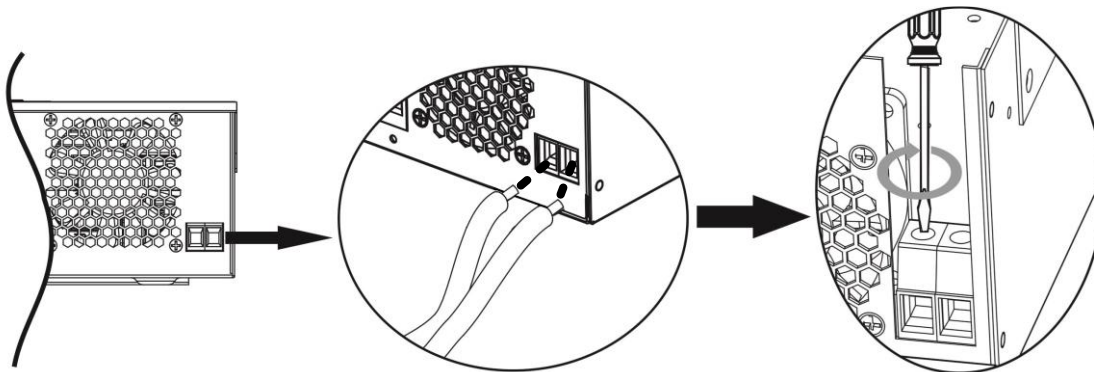
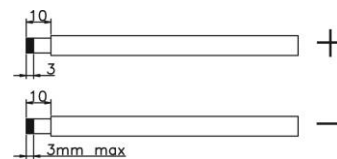
Take 555Wp PV module as an example. After considering above two parameters, the recommended module configurations listed as below table.

Maximum Power (Pmax)	555W	For 1.2KW: 2 sets in parallel For 2.5KW: 2 pieces in serial and 2 sets in parallel
Max. Power Voltage Vmpp(V)	32.06V	
Max. Power Current Impp(A)	17.32A	
Open Circuit Voltage Voc(V)	38.46V	
Short Circuit Current Isc(A)	18.33A	

### PV Module Wire Connection

Please follow below steps to implement PV module connection:

1. Remove insulation sleeve 10 mm for positive and negative conductors.
2. Suggest to put bootlace ferrules on the end of positive and negative wires with a proper crimping tool.
3. Check correct polarity of wire connection from PV modules and PV input connectors. Then, connect positive pole (+) of connection wire to positive pole (+) of PV input connector. Connect negative pole (-) of connection wire to negative pole (-) of PV input connector. Screw two wires tightly in clockwise direction.  
Recommended tool: 4mm blade screwdriver



**Recommended PV module Configuration for 1.2KW**

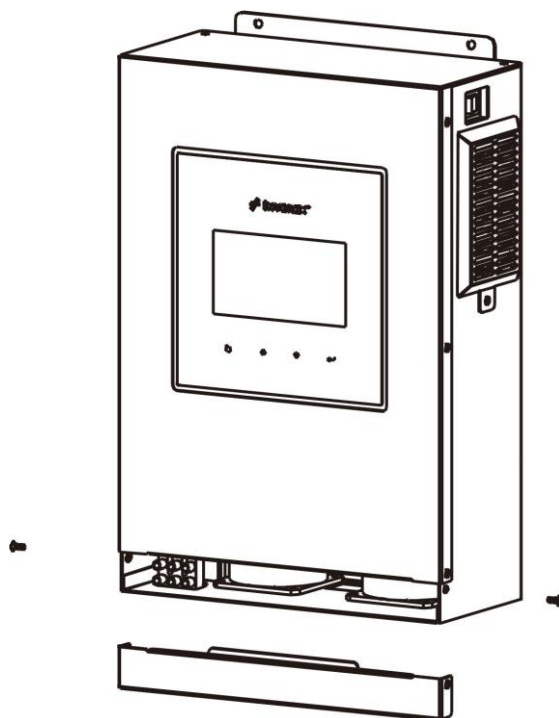
Solar Panel Spec. (reference)	SOLAR INPUT	Q'ty of panels	Total Input Power
	((Battery Voltage+5V)≤Voc* Number of modules in series≤102V(Max. PV Array Open Circuit Voltage))		(700(Max. PV Array Power)>= Q'ty of modules*Wp)
- 555Wp - Vmp: 32.06Vdc - Imp: 17.32A - Voc: 38.46Vdc - Isc: 18.33A - Cells: 110	Min in parallel: 1pcs, per input		
	Max. in series: 2pcs, per input		
	1pcs used	1	555W
	2pcs in parallel	2	700W
	2pcs in series	2	700W
	3pcs in parallel	3	700W
Solar Panel Spec. (reference)	SOLAR INPUT	Q'ty of panels	Total Input Power
	((Battery Voltage+5V)≤Voc* Number of modules in series≤102V(Max. PV Array Open Circuit Voltage))		(700(Max. PV Array Power)>= Q'ty of modules*Wp)
- 580Wp - Vmp: 44.78Vdc - Imp: 12.96A - Voc: 53.3Vdc - Isc: 13.82A - Cells: 156	Min in parallel: 1pcs, per input		
	Max. in series: 2pcs, per input		
	1pcs used	1	580W
	2pcs in parallel	2	700W
	3pcs in parallel	3	700W

**Recommended PV module Configuration for 2.5KW:**

Solar Panel Spec. (reference)	SOLAR INPUT	Q'ty of panels	Total Input Power
	((Battery Voltage+5V)≤Voc* Number of modules in series≤102V(Max. PV Array Open Circuit Voltage))		(1440(Max. PV Array Power)>= Q'ty of modules*Wp)
- 555Wp - Vmp: 32.06Vdc - Imp: 17.32A - Voc: 38.46Vdc - Isc: 18.33A - Cells: 110	Min in parallel: 2pcs, per input		
	Max. in series: 2pcs, per input		
	2pcs in parallel	2	1110W
	2pcs in series	2	1110W
	3pcs in parallel	3	1440W
	2pcs in parallel, 2pcs in series	4	1440W
Solar Panel Spec. (reference)	SOLAR INPUT	Q'ty of panels	Total Input Power
	((Battery Voltage+5V)≤Voc* Number of modules in series≤102V(Max. PV Array Open Circuit Voltage))		(1440(Max. PV Array Power)>= Q'ty of modules*Wp)
- 580Wp - Vmp: 44.78Vdc - Imp: 12.96A - Voc: 53.3Vdc - Isc: 13.82A - Cells: 156	Min in parallel: 2pcs, per input		
	Max. in series: 2pcs, per input		
	2pcs in parallel	2	1160W
	3pcs in parallel	3	1440W

## Final Assembly

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



## Communication Connection

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

## OPERATION

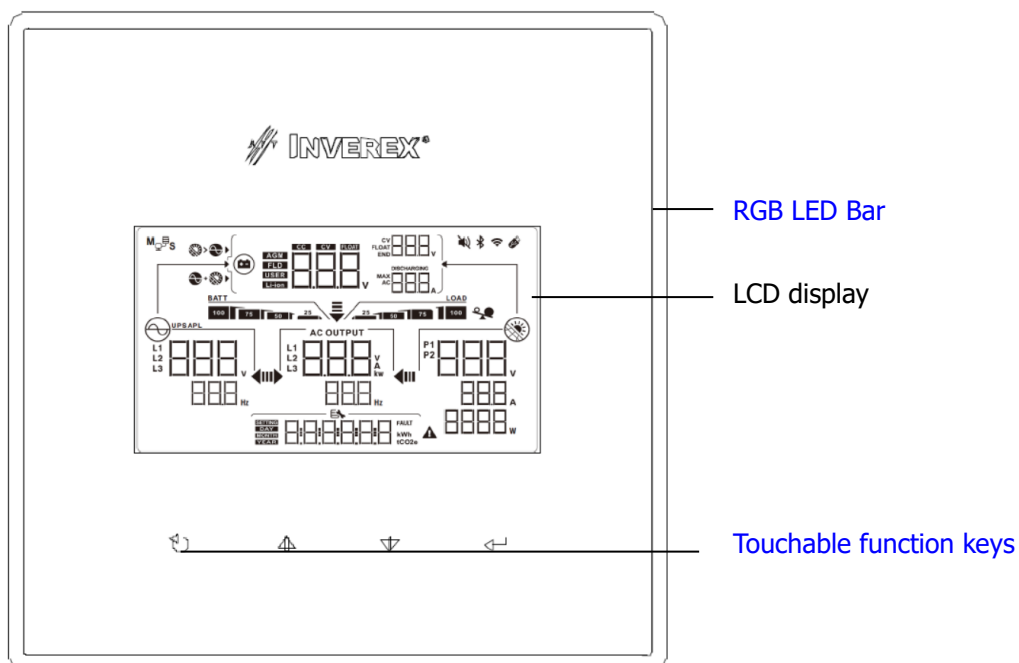
### Power ON/OFF

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



### Operation and Display Panel

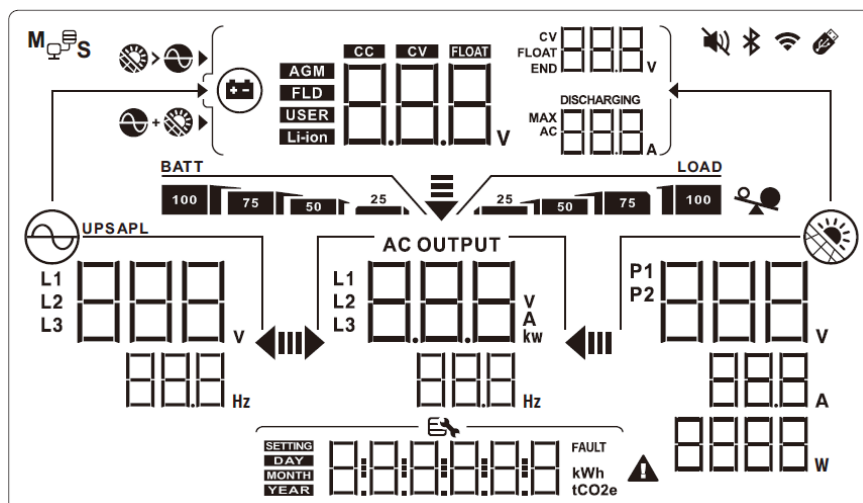
The operation and display panel, shown in below chart, is on the front panel of the inverter. It includes a LCD display, four touchable function keys and RGB LED Bar, indicating the operating status and input/output power information.



#### Touchable Function Keys

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

## LCD Display Icons

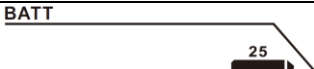



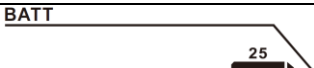


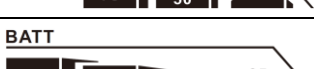


Icon	Function description
<b>Input Source Information</b>	
	Indicates the AC input.
	Indicates the PV input.
	Indicate AC input range, input voltage, <a href="#">input current</a> and input frequency.
	Indicate PV voltage, PV input current and PV input power.
<b>Output Information</b>	
	Indicate output voltage, output frequency, load in VA, load in Watt.
<b>Battery Information</b>	
	Indicate battery voltage, charger voltage, charging current, discharging current and charging stage.
	Indicates battery level by 0-24%, 25-49%, 50-74% and 75-100% in battery mode and charging status in line mode.





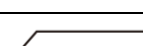
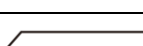
In AC mode, it will present battery charging status.

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

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






### Charger Source Priority Setting Display

	Indicates setting program 16 "Charger source priority" is selected as "Utility first".
	Indicates setting program 16 "Charger source priority" is selected as "Solar first".
	Indicates setting program 16 "Charger source priority" is selected as "Solar and Utility".
	Indicates setting program 16 "Charger source priority" is selected as "Solar only".



### Output Source Priority Setting Display


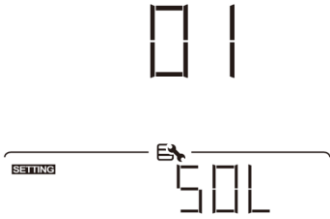



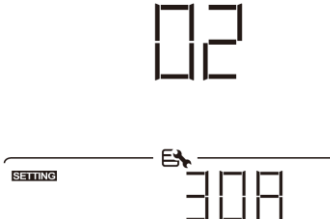

	<p>Indicates setting program 01 "Output source priority" is selected as "Utility first".</p>
	<p>Indicates setting program 01 "Output source priority" is selected as "Solar first".</p>
	<p>Indicates setting program 01 "Output source priority" is selected as "SBU".</p>
<b>Mute Operation</b>	
	<p>Indicates unit alarm is disabled.</p>
<b>Configuration Program and Fault Information</b>	
	<p>Indicates the setting programs.</p>
	<p>Indicates the warning and fault codes.</p> <p>Warning: 02  flashing with warning code.</p> <p>Fault: 02  lighting with fault code</p>



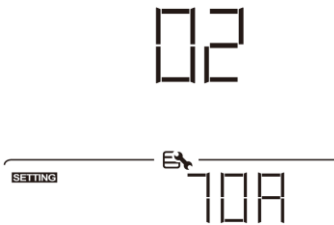

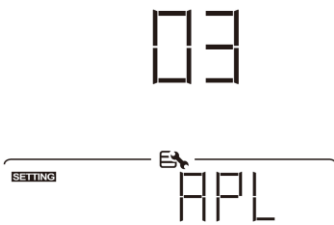

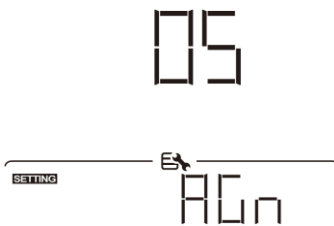
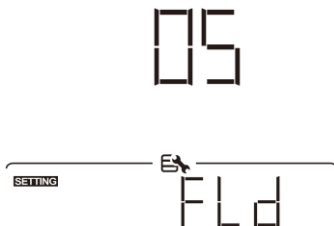
## LCD Setting

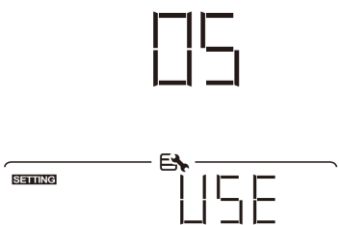
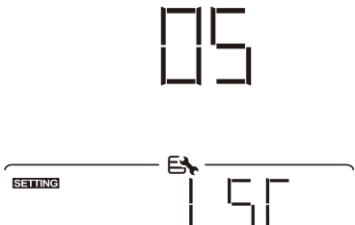
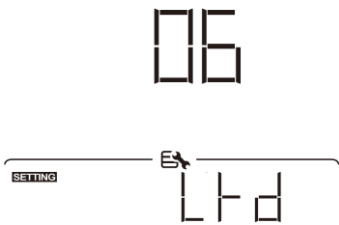
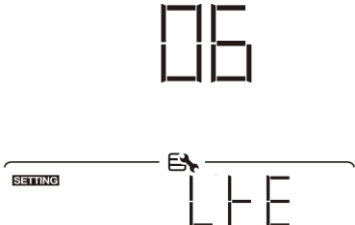
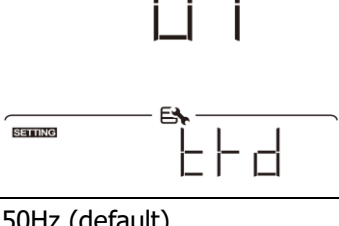
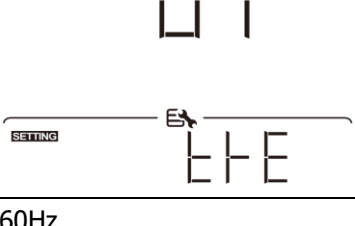
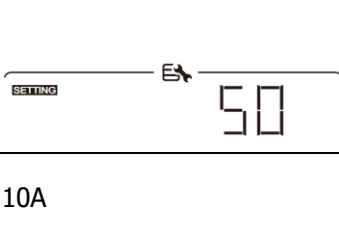
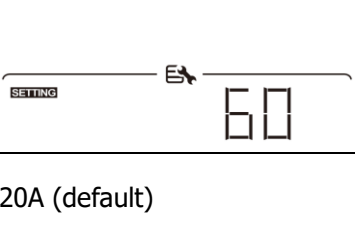
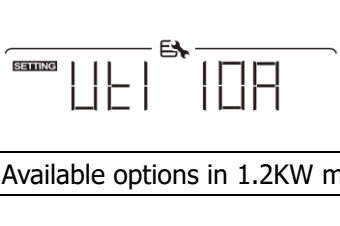

After pressing and holding "" button for 3 seconds, the unit will enter setting mode. Press "" or "" button to select setting programs. And then, press "" button to confirm the selection or "" button to exit.

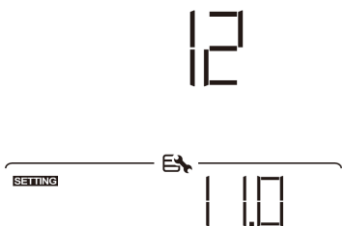

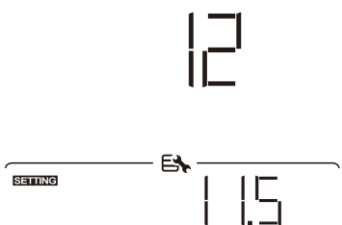
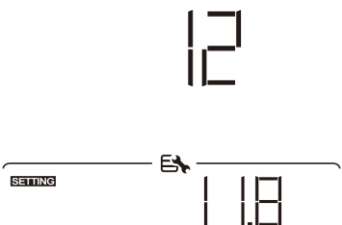
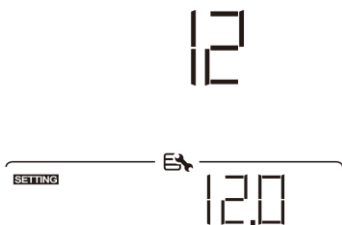
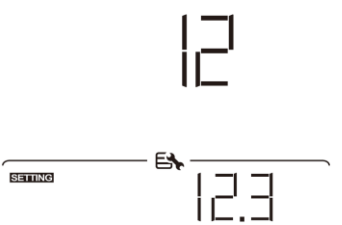
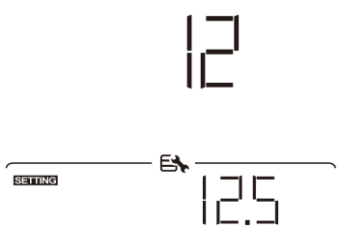
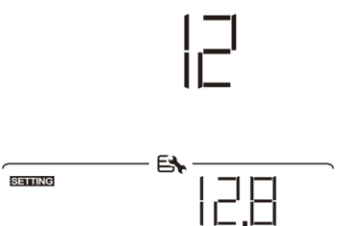
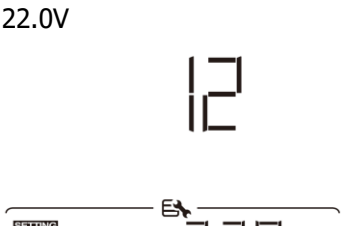
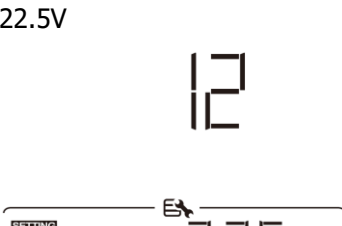
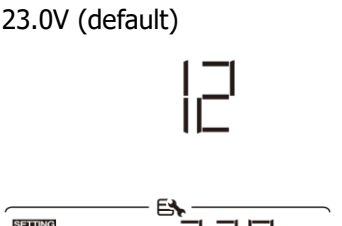
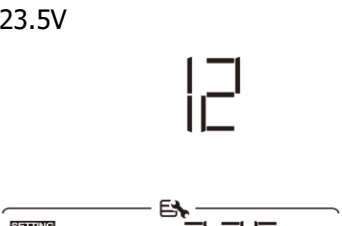
### Setting Programs:

Program	Description	Selectable option
00	Exit setting mode	<p>Escape</p>  

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, battery energy will supply power the loads at the same time. Utility provides power to the loads only when any one condition happens: - Solar energy is not available - Battery voltage drops to low-level warning voltage or the setting point in program 12.
		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)	10A 	20A 
		30A 	40A 

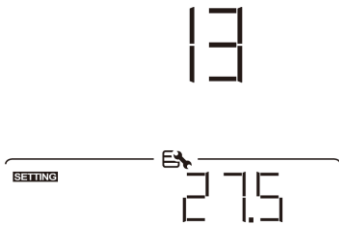
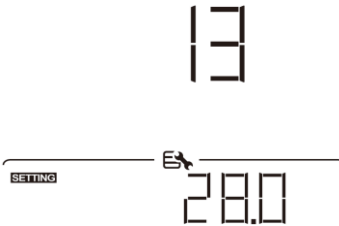
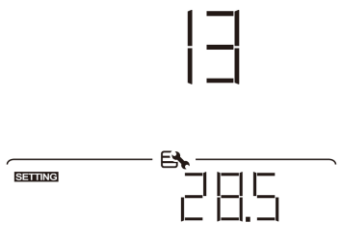
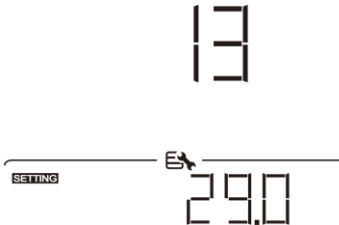
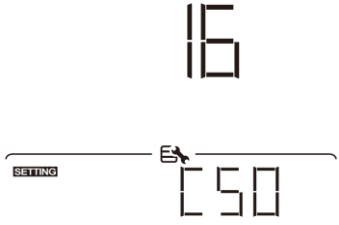

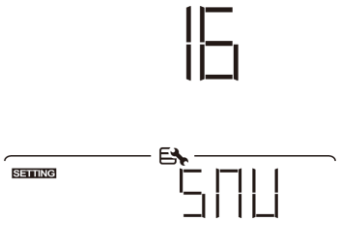
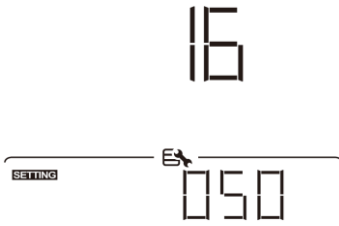
		50A (default, for 1.2KW) 	60A 
		70A (only available and default for 2.5KW) 	80A (only available for 2.5KW) 
03	AC input voltage range	Appliances (default) 	If selected, acceptable AC input voltage range will be within 90-280VAC.
		UPS 	If selected, acceptable AC input voltage range will be within 170-280VAC.
05	Battery type	AGM (default) 	If 'AGM' is selected, program 26 =14.1V, program 27 =13.5V.
		Flooded 	If 'FLD' is selected, program 26 =14.6V, program 27 =13.5V.

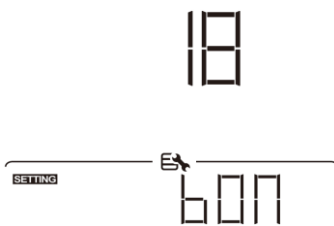
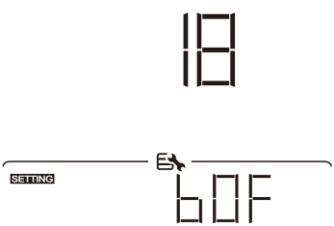
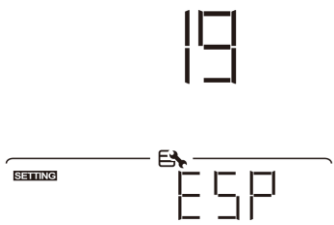
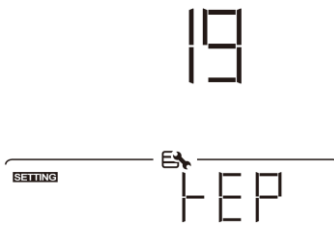
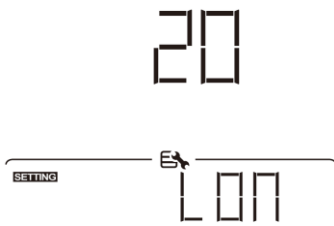
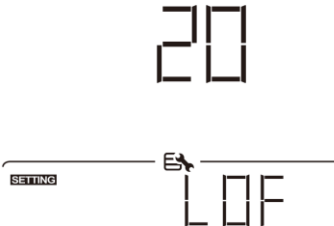

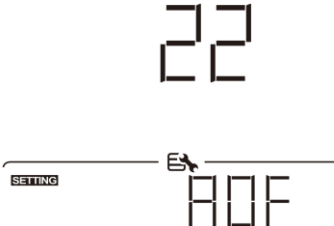
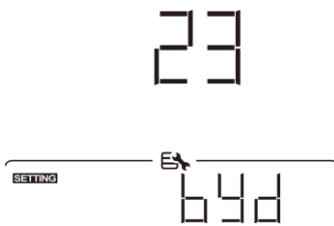
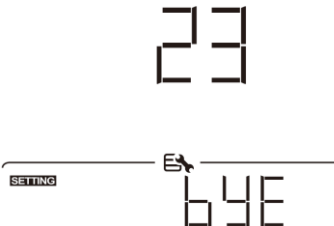
		User-Defined 	If "User-Defined" is selected, battery charge voltage and low DC cut-off voltage can be set up in program 26, 27 and 29.
		ISC 	For 1.2KW, if 'ISC' is selected, program 26 is 14.2V, program 27 is 13.8V and program 29 is 10.5V. For 2.5KW, if 'ISC' is selected, program 26 is 28V, program 27 is 27V and program 29 is 21V.
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 
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.	10A 	20A (default) 
12	Setting voltage point	Available options in 1.2KW model:	

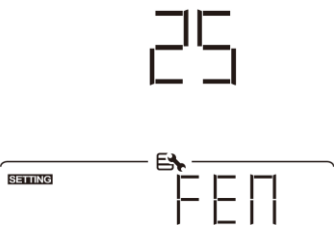
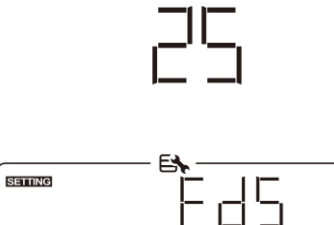




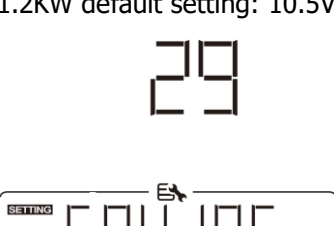
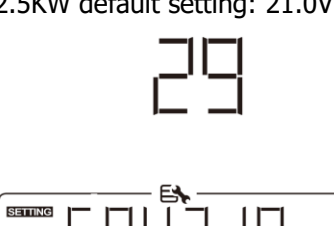
	back to utility source when selecting "SBU priority" or "Solar first" in program 01.	11.0V		11.3V	
		11.5V (default)		11.8V	
		12.0V		12.3V	
		12.5V		12.8V	
		Available options in 2.5KW model:			
		22.0V		22.5V	
		23.0V (default)		23.5V	
12	Setting voltage point back to utility source when selecting "SBU priority" or "Solar first" in program 01.				


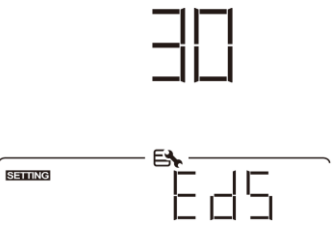


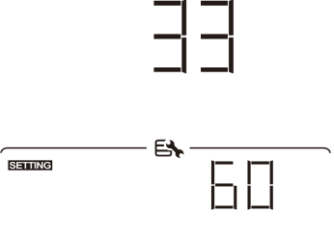
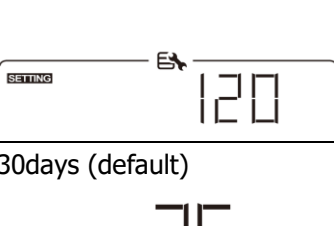
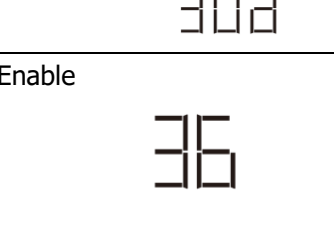
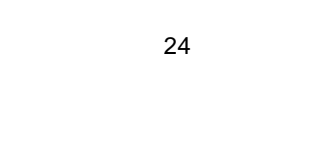

13	Setting voltage point back to battery mode when selecting "SBU priority" or "Solar first" in program 01.	24.0V	<div>12</div> <div>SETTING → 24.0</div>	24.5V	<div>12</div> <div>SETTING → 24.5</div>
		25.0V	<div>12</div> <div>SETTING → 25.0</div>	25.5V	<div>12</div> <div>SETTING → 25.5</div>
		Available options in 1.2KW model:			
		Battery fully charged	<div>13</div> <div>SETTING → FUL</div>	12.0V	<div>13</div> <div>SETTING → 12.0</div>
		12.3V	<div>13</div> <div>SETTING → 12.3</div>	12.5V	<div>13</div> <div>SETTING → 12.5</div>
		12.8V	<div>13</div> <div>SETTING → 12.8</div>	13.0V	<div>13</div> <div>SETTING → 13.0</div>
		13.3V	<div>13</div> <div>SETTING → 13.3</div>	13.5V (default)	<div>13</div> <div>SETTING → 13.5</div>

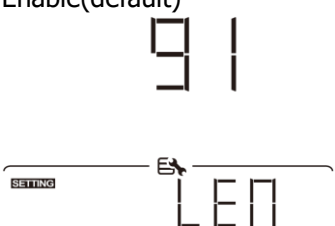
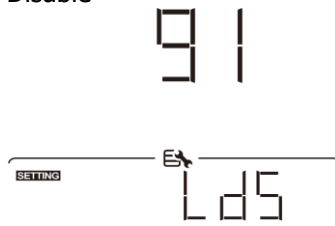
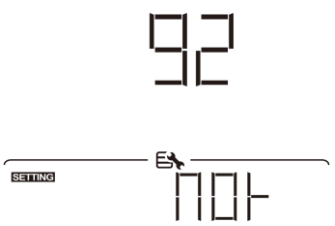
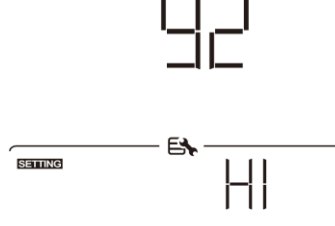

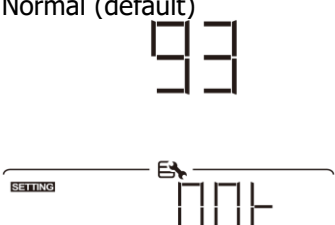
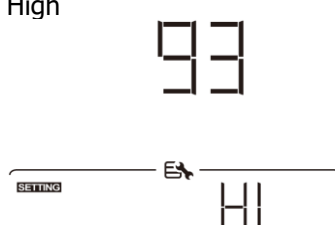
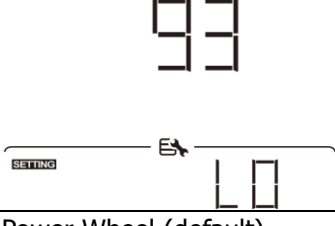
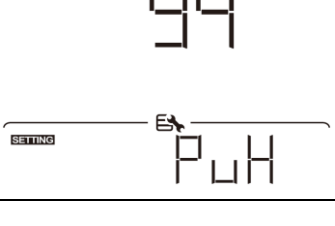

13	Setting voltage point back to battery mode when selecting "SBU priority" or "Solar first" in program 01.	13.8V 13 SETTING 13.8	14.0V 13 SETTING 14.0
		14.3V 13 SETTING 14.3	14.5V 13 SETTING 14.5
		Available options in 2.5W model:	
		Battery fully charged 13 SETTING FUL	24V 13 SETTING 24.0
		24.5V 13 SETTING 24.5	25V 13 SETTING 25.0
		25.5V 13 SETTING 25.5	26V 13 SETTING 26.0
		26.5V 13 SETTING 26.5	27V (default) 13 SETTING 27.0




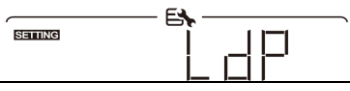
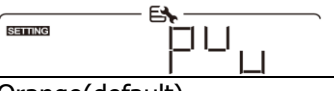

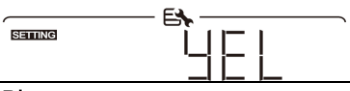


13	Setting voltage point back to battery mode when selecting "SBU priority" or "Solar first" in program 01.	27.5V 	28V 
		28.5V 	29V 
16	Charger source priority: To configure charger source priority	If this inverter/charger is working in Line, Standby or Fault mode, charger source can be programmed as below:	
		Solar first 	Solar energy will charge battery as first priority. Utility will charge battery only when solar energy is not available.
		Utility first 	Utility will charge battery as first priority. Solar energy will charge battery only when utility power is not available.
		Solar and Utility (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.

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)	1.2KW default setting: 14.1V 	2.5KW default setting: 28.2V 
		If self-defined is selected in program 5, this program can be set up. Setting range is from 12.5V to 15.0V for 1.2KW model, 25.0V to 30.0V for 2.5KW model. Increment of each click is 0.1V.	
27	Floating charging voltage	1.2KW default setting: 13.5V 	2.5KW default setting: 27.0V 
		If self-defined is selected in program 5, this program can be set up. Setting range is from 12.5V to 15.0V for 1.2KW model, 25.0V to 30.0V for 2.5KW model. Increment of each click is 0.1V.	
29	Low DC cut-off voltage	1.2KW default setting: 10.5V 	2.5KW default setting: 21.0V 
		If self-defined or 'ISC' is selected in program 5, this program can be set up. If 'ISC' is selected, setting range is from 10.5V to 14.2V for 1.2KW model, 21.0V to 28.4V for 2.5KW model, otherwise, setting range is from 10.5V to 12.0V for 1.2KW model, 21.0V to 24.0V for 2.5KW model. Increment of each click is 0.1V. Low DC cut-off voltage will be fixed to setting value no matter what percentage of load is connected.	

30	Battery equalization	Enable 	Disable (default) 
		If "Flooded" or "User-Defined" is selected in program 05, this program can be set up.	
31	Battery equalization voltage	1.2KW default setting: 14.6V 	2.5KW default setting: 29.2V 
		Setting range is from 12.5V to 15.0V for 1.2KW model, 25.0V to 30.0V for 2.5KW model. Increment of each click is 0.1V.	
33	Battery equalized time	60min (default) 	Setting range is from 5min to 900min. Increment of each click is 5min.
34	Battery equalized timeout	120min (default) 	Setting range is from 5min to 900 min. Increment of each click is 5 min.
35	Equalization interval	30days (default) 	Setting range is from 0 to 90 days. Increment of each click is 1 day
36	Equalization activated immediately	Enable 	Disable (default) 

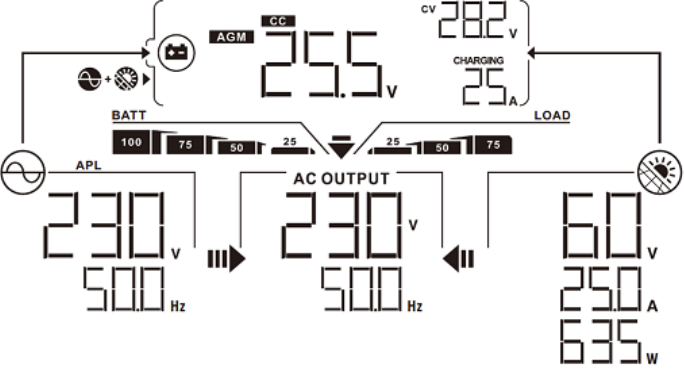


		<p>If equalization function is enabled in program 30, this program can be set up. If "Enable" is selected in this program, it's to activate battery equalization immediately and LCD main page will shows "E9". If "Disable" is selected, it will cancel equalization function until next activated equalization time arrives based on program 35 setting. At this time, "E9" will not be shown in LCD main page.</p>	
91	On/Off control for RGB LED	Enable(default) 	Disable 
92	Brightness of RGB LED	Normal (default) 	High 
		Low 	
93	Lighting speed of RGB LED	Normal (default) 	High 
		Low 	
94	RGB LED effects	Power Wheel (default) 	Power Chasing 

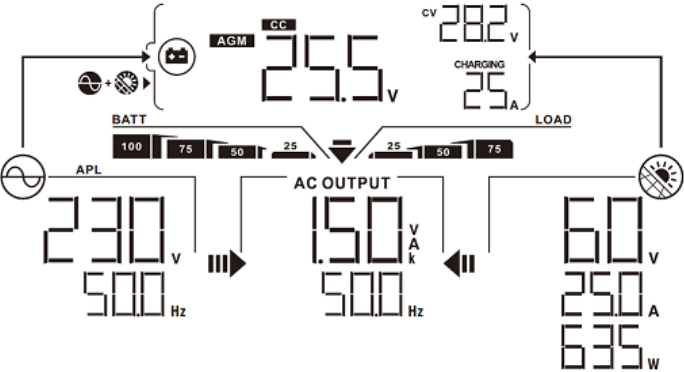
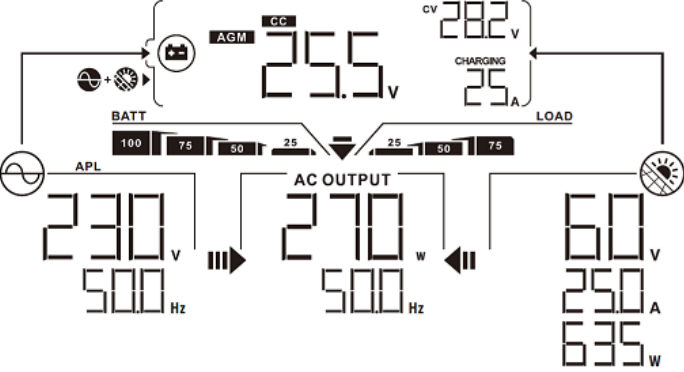
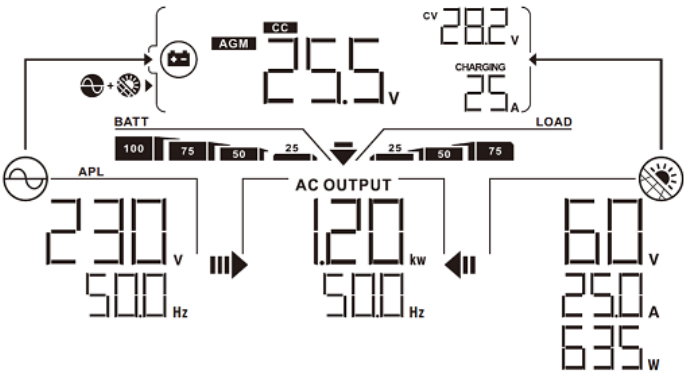

		Power Cycling 94 	Power Solid on 94 
95	Data Presentation of data color	Battery capacity (default) 95 	Load percentage 95 
		Solar input power in watt 95 	
96	Background color of RGB LED	Orange(default) 96 	Yellow 96 
		Green 96 	Blue 96 

96	Background color of RGB LED	Sky Blue 96 SETTING 56L	Purple 96 SETTING PUF
		Other 96 SETTING 0EH	Pink 96 SETTING PIN
97	Data Color for RGB LED	Purple(default) 97 SETTING PUF	Other 97 SETTING 0EH
		Pink 97 SETTING PIN	Orange 97 SETTING 0FA
		Yellow 97 SETTING YEL	Green 97 SETTING GFE
		Blue 97 SETTING BLU	Sky Blue 97 SETTING 56L

## Display Setting

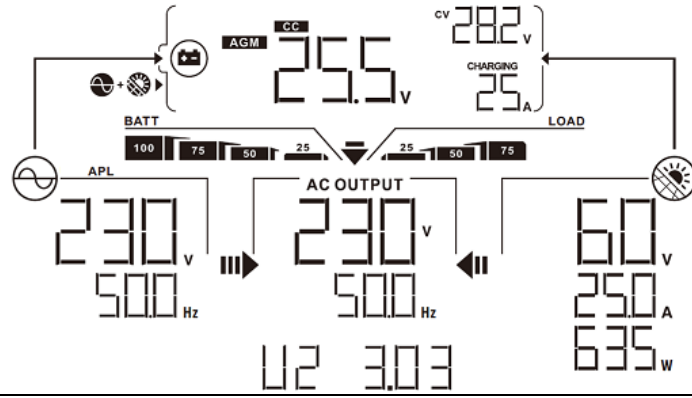
The LCD display information will be switched in turns by pressing “▲” “▼” button. The selectable information is switched as the following table in order.

Selectable information	LCD display
Battery voltage/ Charging stage/ Charger voltage/ Charging current, Battery capacity/ Load percentage, Input voltage/ Input frequency, Output voltage/ Output frequency, PV voltage/PV input current/PV input power, (Default Display Screen)	Input Voltage=230V, output voltage=230V 
Battery voltage/ Charging stage/ Charger voltage/ Charging current, Battery capacity/ Load percentage, Input voltage/ Input current, Output voltage/ Output frequency, PV voltage/PV input current/PV input power, (Default Display Screen)	
Battery voltage/ Charging stage/ Charger voltage/ Charging current, Battery capacity/ Load percentage, Input voltage/ Input frequency, Load in VA / Output frequency, PV voltage/PV input current/PV input power,	When connected load is lower than 1kVA, load in VA will present xxxVA like below chart. 

	<p>When load is larger than 1kVA (<math>\geq 1\text{kVA}</math>), load in VA will present x.xkVA like below chart.</p> 
<p>Battery voltage/ Charging stage/ Charger voltage/ Charging current, Battery capacity/ Load percentage, Input voltage/ Input frequency, Load in Watt / Output frequency, PV voltage/PV input current/PV input power,</p>	<p>When load is lower than 1kW, load in W will present xxxW like below chart.</p>  <p>When load is larger than 1kW (<math>\geq 1\text{kW}</math>), load in W will present x.xkW like below chart.</p> 
<p>Main CPU version checking.</p>	<p>Main CPU version 00014.04.</p> 

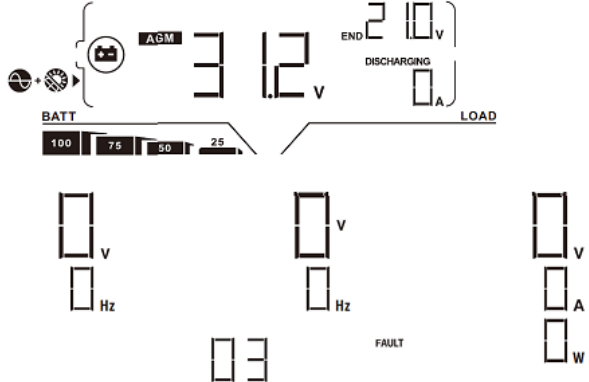
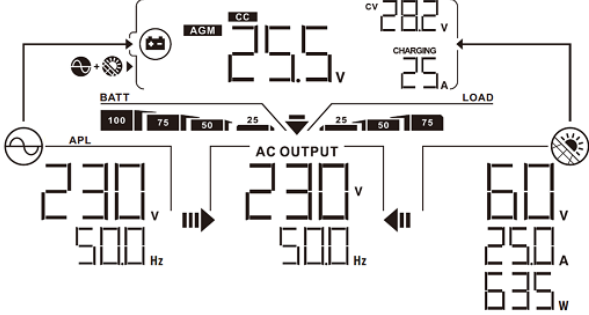
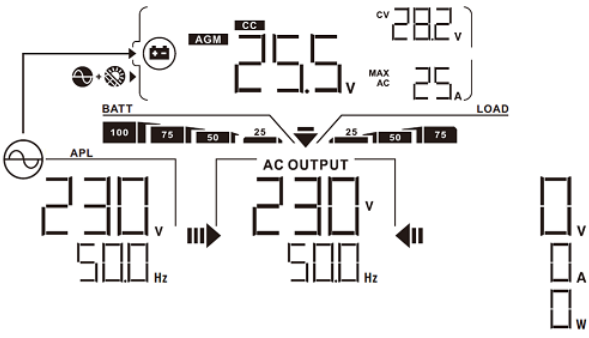
Secondary CPU version checking.

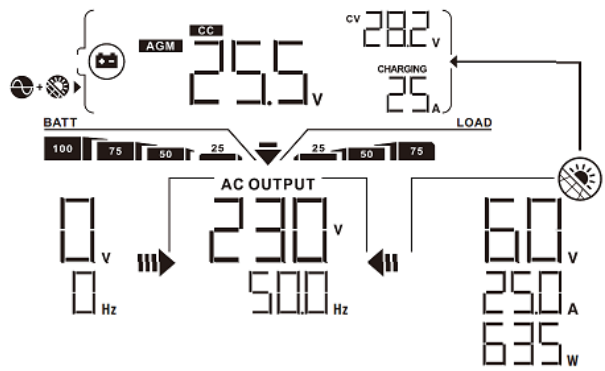
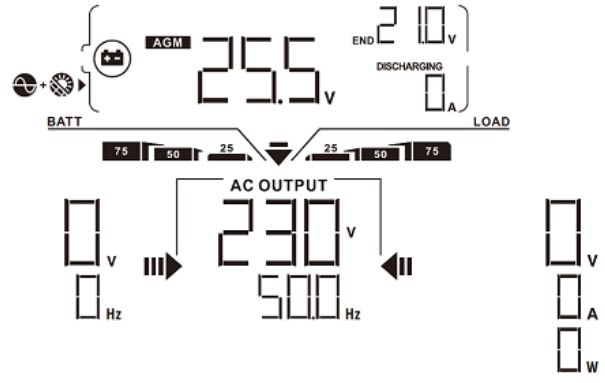
Secondary CPU version 00003.03.



## Operating Mode Description

Operation mode	Description	LCD display
Standby mode <b>Note:</b> *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. 

<p>Fault mode</p> <p>Note:</p> <p>*Fault mode: Errors are caused by inside circuit error or external reasons such as over temperature, output short circuited and so on.</p>	<p>No output is supplied by the unit and no charging.</p>	<p>Battery voltage is too high.</p> 
<p>Line Mode</p>	<p>The unit will provide output power from the mains. It will also charge the battery at line mode.</p>	<p>Charging by utility and PV energy.</p>  <p>Charging by utility.</p> 

Battery Mode	The unit will provide output power from battery and PV power.	<p>Power from battery and PV energy.</p>  <p>Power from battery only.</p> 
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## Battery Equalization Description

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

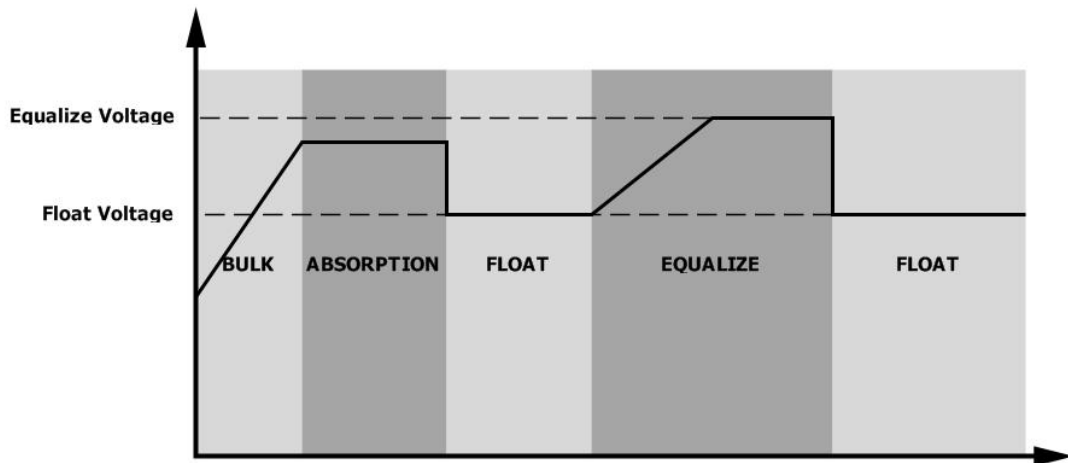
- **How to Apply Equalization Function**

You must enable battery equalization function in monitoring LCD setting program 30 first. Then, you may apply this function in device by either one of following methods:

1. Setting equalization interval in program 35.
2. Active equalization immediately in program 36.

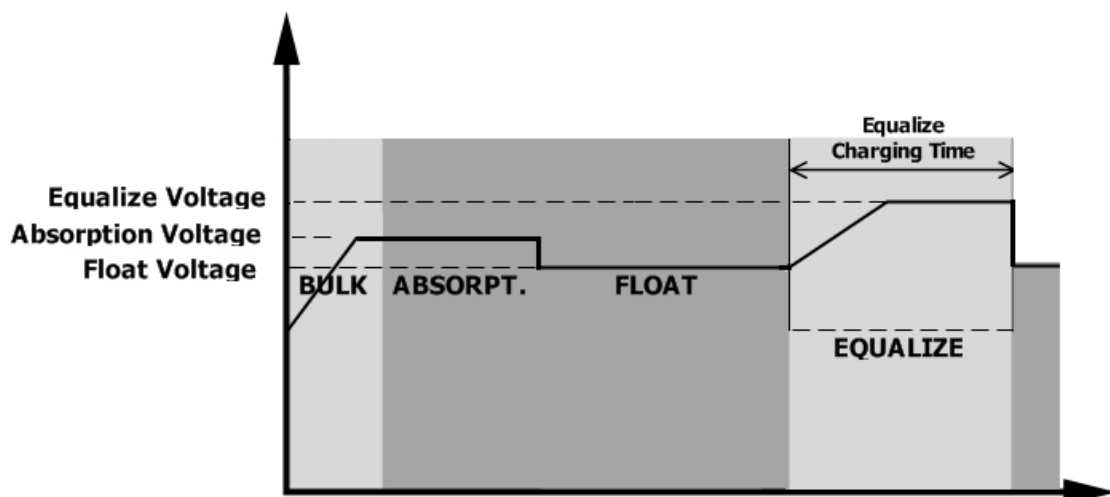
- **When to Equalize**

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.

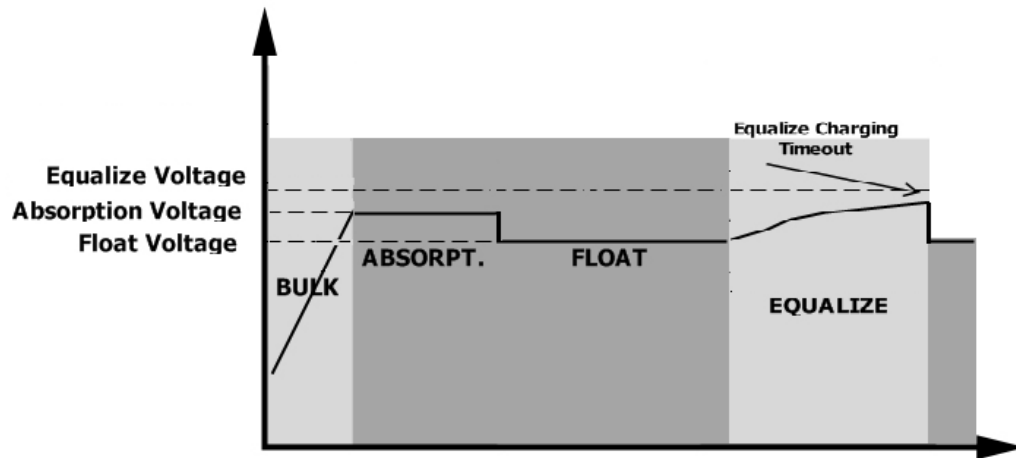


- **Equalize charging time and timeout**

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.



## Fault Reference Code

Fault Code	Fault Event	Icon on
02	Over temperature	02 FAULT
03	Battery voltage is too high	03 FAULT
04	Battery voltage is too low	04 FAULT
05	Output short circuited or over temperature is detected by internal converter components.	05 FAULT
06	Output voltage is abnormal.	06 FAULT
07	Overload time out	07 FAULT
08	Bus voltage is too high	08 FAULT
09	Bus soft start failed	09 FAULT
12	NTC temperature sensor on the heatsink is failed	12 FAULT

## Warning Indicator

Warning Code	Warning Event	Audible Alarm	Icon flashing
02	Temperature of inverter inside is high	1. No beep when temperature is in high level. 2. Beep once every 0.5 second when temperature is increased to close to over-temperature protection.	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 
E9	Battery equalization	None	E9 
20	Communication error between MPPT SCC board and main board	None	20 
21	MPPT solar charger board cannot match with main board even communication is normal.	None	21 

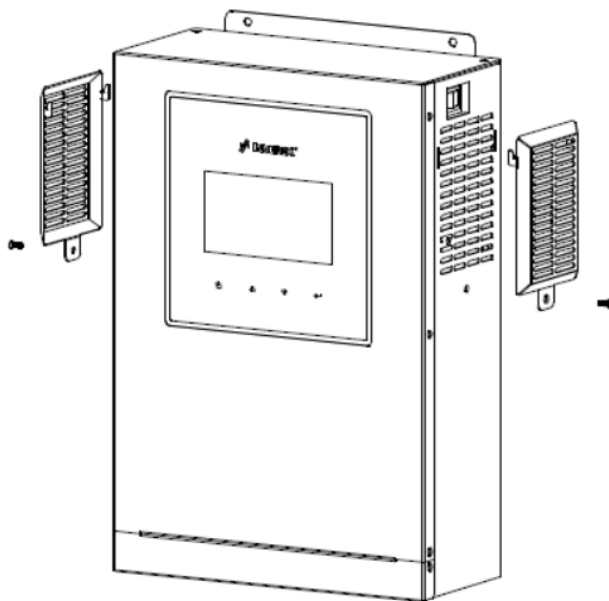
# CLEARANCE AND MAINTENANCE FOR ANTI-DUST KIT

## Overview

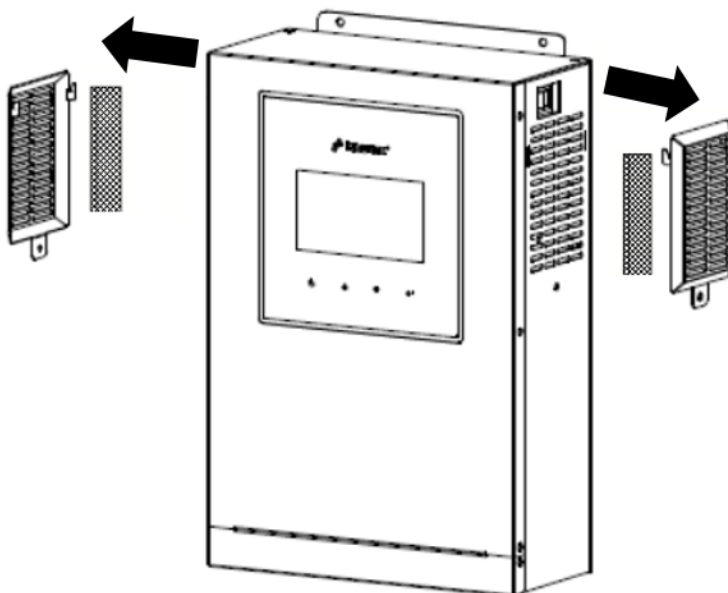
Every inverter is already installed with anti-dusk kit from factory. Inverter will automatically detect this kit and activate internal thermal sensor to adjust internal temperature. This kit also keeps dusk from your inverter and increases product reliability in harsh environment.

## Clearance and Maintenance

**Step 1:** Please loosen the screw in counterclockwise direction on both sides 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.

## SPECIFICATIONS

Table 1 Line Mode Specifications

INVERTER MODEL	1.2KW	2.5KW
<b>Input Voltage Waveform</b>	Sinusoidal (utility or generator)	
<b>Nominal Input Voltage</b>	230Vac	
<b>Low Loss Voltage</b>	170Vac±7V (UPS); 90Vac±7V (Appliances)	
<b>Low Loss Return Voltage</b>	180Vac±7V (UPS); 100Vac±7V (Appliances)	
<b>High Loss Voltage</b>	280Vac±7V	
<b>High Loss Return Voltage</b>	270Vac±7V	
<b>Max AC Input Voltage</b>	300Vac	
<b>Nominal Input Frequency</b>	50Hz / 60Hz (Auto detection)	
<b>Low Loss Frequency</b>	40±1Hz	
<b>Low Loss Return Frequency</b>	42±1Hz	
<b>High Loss Frequency</b>	65±1Hz	
<b>High Loss Return Frequency</b>	63±1Hz	
<b>Output Short Circuit Protection</b>	Circuit Breaker	
<b>Efficiency (Line Mode)</b>	>95% ( Rated R load, battery full charged )	
<b>Transfer Time</b>	10ms typical (UPS); 20ms typical (Appliances)	
<b>Output power derating:</b> When AC input voltage drops to 170V, the output power will be derated.		

Table 2 Inverter Mode Specifications

INVERTER MODEL	1.2KW	2.5KW
<b>Rated Output Power</b>	1.2KVA/1.2KW	2.5KVA/2.5KW
<b>Output Voltage Waveform</b>	Pure Sine Wave	
<b>Output Voltage Regulation</b>	230Vac±5%	
<b>Output Frequency</b>	50Hz	
<b>Peak Efficiency</b>	93%	
<b>Overload Protection</b>	5s@≥130% load; 10s@105%~130% load	
<b>Surge Capacity</b>	2* rated power for 5 seconds	
<b>Nominal DC Input Voltage</b>	12Vdc	24Vdc
<b>Cold Start Voltage</b>	11.5Vdc	23.0Vdc
<b>Low DC Warning Voltage</b> @ load < 50% @ load ≥ 50%	11.5Vdc 11.0Vdc	23.0Vdc 22.0Vdc
<b>Low DC Warning Return Voltage</b> @ load < 50% @ load ≥ 50%	11.7Vdc 11.5Vdc	23.5Vdc 23.0Vdc
<b>Low DC Cut-off Voltage</b> @ load < 50% @ load ≥ 50%	10.7Vdc 10.5Vdc	21.5Vdc 21.0Vdc
<b>High DC Recovery Voltage</b>	15Vdc	30Vdc
<b>High DC Cut-off Voltage</b>	16Vdc	31Vdc
<b>No Load Power Consumption</b>	<25W	<35W

Table 3 Charge Mode Specifications

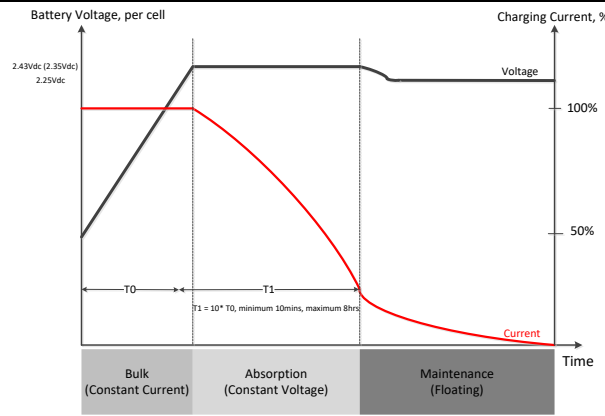
Utility Charging Mode			
INVERTER MODEL		1.2KW	2.5KW
Charging Algorithm		3-Step	
AC Charging Current (Max)		20Amp(@V <sub>I/P</sub> =230Vac)	
Bulk Charging Voltage	Flooded Battery	14.6	29.2
	AGM / Gel Battery	14.1	28.2
Floating Charging Voltage		13.5Vdc	27Vdc
Charging Curve		<div></div>	
MPPT Solar Charging Mode			
INVERTER MODEL		1.2KW	2.5KW
Max. PV Array Power		700W	1440W
Charging Current		50Amp	65Amp
PV Array MPPT Voltage Range		15Vdc~80Vdc	30~80Vdc
Max. PV Array Open Circuit Voltage		102Vdc	
Max Charging Current (AC charger plus solar charger)		50Amp	65Amp

Table 4 General Specifications

INVERTER MODEL	1.2KW	2.5KW
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	101 x 225 x 334	93 x 290 x 355
Net Weight, kg	5.4	7.2

## TROUBLE SHOOTING

Problem	LCD/LED/Buzzer	Explanation / Possible cause	What to do
Warning code 02 is displayed in the LCD.	No beep but it shows warning code 02 in the LCD.	Temperature of inverter inside is high.	1. Remove the loads. 2. Reduce the operation environment temperature.
	Beep once every 0.5 second and it shows warning code 02 in the LCD.		
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 and green LED is flashing.	Input protector is tripped	Check if AC breaker is tripped and AC wiring is connected well.
	Green LED is flashing.	Insufficient quality of AC power. (Shore or Generator)	1. Check if AC wires are too thin and/or too long. 2. Check if generator (if applied) is working well or if input voltage range setting is correct. (UPS→Appliance)
	Green LED is flashing.	Set "Solar First" as the priority of output source.	Change output source priority to Utility first.
When the unit is turned on, internal relay is switched on and off repeatedly.	LCD display and LEDs are flashing	Battery is disconnected.	Check if battery wires are connected well.
Buzzer beeps continuously and red LED is on.	Fault code 07	Overload error. The inverter is overload 105% 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 are 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 06	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	Internal components failed.	Return to repair center.

## Appendix: Approximate Back-up Time Table

Model	Load (VA)	Backup Time @ 12Vdc 100Ah (min)	Backup Time @ 12Vdc 200Ah (min)
1.2KW	100	618	1235
	200	259	594
	300	155	396
	400	109	271
	500	87	210
	600	65	177
	700	57	139
	800	49	109
	900	43	96
	1000	38	85
	1200	26	71

Model	Load (VA)	Backup Time @ 24Vdc 100Ah (min)	Backup Time @ 24Vdc 200Ah (min)
2.5KW	200	587	1235
	400	256	587
	600	155	393
	800	109	263
	1000	87	210
	1200	65	177
	1400	56	139
	1600	50	109
	1800	43	96
	2000	31	85
	2200	28	78
	2500	26	72

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