

Buzzer beeps continuously and red LED is on.	Fault code 01	Fan fault	Replace the fan.
	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 04	The battery voltage is too low.	Connect with PV or utility power to charger, the problem will be solved.
	Fault code 05	Output short circuited.	Check if wiring is connected well and remove abnormal load.
	Fault code 06	Output voltage too high	Return to repair center.
Fault code 07	Overload error. The inverter is overload 110% and time is up.	Reduce the connected load by switching off some equipment.	

If any unlisted abnormal situations occur, please call the service people for professional examination.

7. Specifications

MODEL	1200VA	2400VA
CAPACITY	720W	1440 W
INPUT		
Voltage	230 VAC	
Voltage Range	170-280 VAC (UPS mode) 90-280 VAC (INV. Mode)	
OUTPUT		
Voltage Regulation (Battery Mode)	+/-10%	
Transfer Time	20 ms typical	
Waveform	Simulated Sine Wave	
BATTERY		
Battery Voltage	12 VDC	24 VDC
Floating Charge Voltage	13.5 VDC ±0.25 VDC	27.0 VDC ±0.5 VDC
Maximum Charge Current	10A or 20A	
SOLAR CHARGER		
Charging Current	50 A	
System Voltage	12 VDC	24 VDC
Operating Voltage Range	15~18 VDC	30~32 VDC
Max. PV Array Open Circuit Voltage	45 VDC	55 VDC
PHYSICAL		
Dimension(mm)	290 X 235 X 88	
Net Weight (kg)	2.6	2.8

User Manual

Off Grid Solar Inverter 1200VA / 2400VA

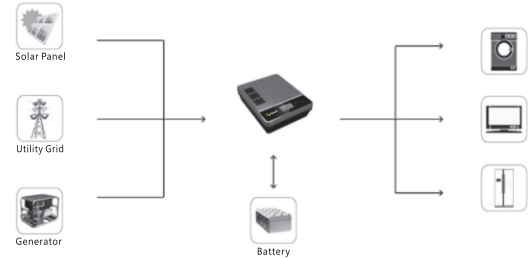


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1. Introduction

Thank you for purchasing the solar inverter. This solar inverter is designed to power your home appliances or precious 3C electronics. With built-in solar charger, it can convert solar power to battery power and provide continuous power to connected equipment during night time.



2. Important Safety Warning (SAVE THESE INSTRUCTIONS)

Before using the inverter, please read all instructions and cautionary markings on the unit, this manual and the batteries.

General Precaution-

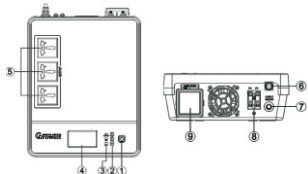
CAUTION! The unit is designed for indoor use. Do not expose this unit to rain, snow or liquids of any type.
CAUTION! To reduce risk of injury, only use qualified batteries from qualified distributors or manufacturers. Any unqualified batteries may cause damage and injury. Do NOT use old or overdue batteries. Please check the battery type and date code before installation to avoid damage and injury.
WARNING! It's very important for system safety and efficient operation to use appropriate external battery cable. To reduce risk of injury, external battery cables should be UL certified and rated for 75°C or higher. And do not use copper cables less than 8AWG.

CAUTION! Do not disassemble the inverter. Contact with the qualified service center when service is needed.
WARNING! Provide ventilation to outdoors from the battery compartment. The battery enclosure should be designed to prevent accumulation and concentration of hydrogen gas at the top of the compartment.
CAUTION! Use insulated tools to reduce the chance of short-circuit when installing or working with the inverter, the batteries, or other equipment attached to this unit.
CAUTION! For battery installation and maintenance, read the battery manufacturer's installation and maintenance instructions prior to operating.

Personnel Precaution -

CAUTION! Careful to reduce the risk or dropping a metal tool on the batteries. It could spark or short circuit the batteries and could cause an explosion.
CAUTION! Remove personal metal items such as rings, bracelets, necklaces, and watches when working with batteries. Batteries can produce a short circuit current high enough to make metal melt, and could cause severe burns.
CAUTION! Avoid touching eyes while working near batteries.
CAUTION! Have plenty of fresh water and soap nearby in case battery acid contacts skin, clothing, or eyes.
CAUTION! NEVER smoke or allow a spark or flame in vicinity of a battery.
CAUTION! If a remote or automatic generator start system is used, disable the automatic starting circuit or disconnect the generator to prevent accident during servicing.

3. Product Overview



1. Power switch
2. Function buttons
3. Status indicators (please see the Operation section for the details)
4. LCD display
5. Output receptacles
6. AC input
7. Input circuit breaker
8. Solar panel connectors
9. Battery connectors

4. Installation

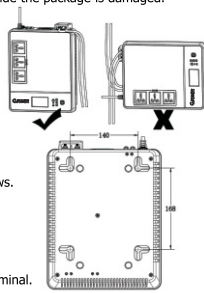
NOTE: Before installation, please inspect the unit. Be sure that nothing inside the package is damaged.

4.1 Mounting the unit

The unit **ONLY** can be mounted vertically to a wall surface.

Please follow below steps:

1. Turn off the unit before mounting.
2. Select an appropriate mounting location. Use a horizontal line and the length of the line must be 140mm and mark the two ends on the wall. (see right chart)
3. Drill two marks by screws.
4. Mount the unit by positioning the key-hole slots over the mounting screws.



4.2 Connect External Battery

Step 1- Take away the cover of external battery terminal.

Step 2- Following battery polarity guide printed near the battery terminal!

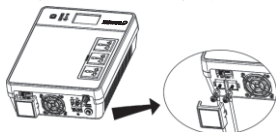
Place the external battery cable ring terminal over the battery terminal.

RED cable to the positive terminal (+);

BLACK cable to the negative terminal (-).

WARNING! Please use the appropriate battery cable. Please refer to **Important Safety Warnings Section** for the details.

Step 3- Tight the battery cables with the M5 nuts. Do NOT place anything between the flat part of battery terminal and the battery cable ring terminal, or overheating may occur.



Step 4- Install a DC Breaker in a positive battery line. The rating of the DC Breaker must be according to the inverter's battery current (75 Amp). Keep the DC breaker off.

Step 5- Connect battery cables to the external batteries. Note: For the user operation safety, we strongly recommend that you should use tapes to isolate the battery terminals before you start to operate the unit.

1) Single battery connection: When using a single battery, its voltage must be equal to the Nominal DC Voltage of the unit.

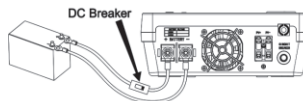
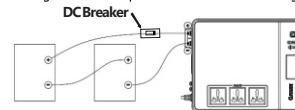


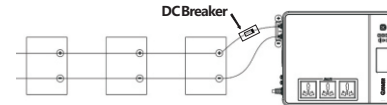
Table 1

Model	Nominal Battery DC Voltage
1200VA	12 VDC
2400VA	24 VDC

2) Multiple batteries in series connection: All batteries must be equal in voltage and amp hour capacity. The sum of their voltages must be equal to the nominal DC Voltage of the unit.



3) Multiple batteries in parallel connection: Each battery's voltage must be equal to the Nominal DC Voltage of the unit.



Step 6- Make sure to connect the polarity of battery side and the unit correctly.
Positive pole (Red) of battery to the positive terminal (+) of the unit.
Negative pole (Black) of battery to the negative terminal (-) of the unit.

Step 7- Put the covers back to the external battery terminals.

Step 8- Take the DC breaker on.

4.2 Connect to Solar Panel

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

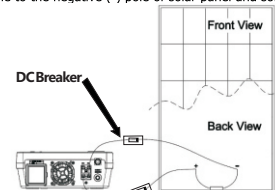
WARNING! All wiring must be performed by a qualified personnel.

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.

Typical Amperage	Gauge	Torque Value
50A	8 AWG	1.4~1.6 Nm

Step 1- Connect one cable to the positive (+) pole of solar panel and solar charger positive (+) terminal.

Step 2- Connect the other cable to the negative (-) pole of solar panel and solar charger negative (-) terminal.



Solar Panel Connection

PV Module Selection:

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

- Open Circuit Voltage (Voc) of PV modules not exceeds max. PV array open circuit voltage of inverter.

INVERTER MODEL	1200VA	2400VA
Charging Current (PWM)	50Amp	
System DC Voltage	12Vdc	24Vdc
Operating Voltage Range	15~18Vdc	30~32Vdc
Max. PV Array Open Circuit Voltage	45Vdc	55Vdc

- Max. Power Voltage (Vmp) of PV modules should be close to best Vmp of inverter or within Vmp range to get best performance. If one PV module cannot meet this requirement, it's necessary to have several PV modules in series connection. Refer to below table.

Model	Best Vmp	Vmp Range
1200VA	15Vdc	15V~18V
2400VA	30Vdc	30V~32V

Note: * Vmp: panel max power point voltage.

The PV charging efficiency is maximized while PV system voltage is close to Best Vmp.

Maximum PV module numbers in Series: Vmp of PV module * X pcs \approx Best Vmp of Inverter or Vmp range

PV module numbers in Parallel: Max. charging current of inverter / Imp

Total PV module numbers = maximum PV module numbers in series * PV module numbers in parallel

Take 1200VA inverter as an example to select proper PV modules. After considering Voc of PV module not exceeds 45Vdc and max. Vmp of PV module close to 15Vdc or within 15Vdc ~ 18Vdc, we can choose PV module with below specification.

Maximum Power (Pmax)	85W	Max. PV module numbers in series
Max. Power Voltage Vmp(V)	17.6V	1 \times 17.6 x 1 \approx 15 ~ 18
Max. Power Current Imp(A)	4.83A	PV module numbers in parallel
Open Circuit Voltage Voc(V)	21.6V	10 \times 50 A / 4.83
Short Circuit Current Isc(A)	5.03A	Total PV module numbers
		1 x 10 = 10

Maximum PV module numbers in Series: 1

PV module numbers in Parallel: 10

Total PV module numbers: 1 x 10 = 10

Take 2400VA inverter as an example to select proper PV module. After considering Voc of PV module not exceed 55Vdc and max. Vmp of PV module close to 30Vdc or within 30Vdc ~ 32Vdc, we can choose PV module with below specification.

Maximum Power (Pmax)	260W	Max. PV module numbers in series
Max. Power Voltage Vmp(V)	30.9V	1 \times 30.9 x 1 \approx 30 ~ 32
Max. Power Current Imp(A)	8.42A	PV module numbers in parallel
Open Circuit Voltage Voc(V)	37.7V	6 \times 50 A / 8.42
Short Circuit Current Isc(A)	8.89A	Total PV module numbers
		1 x 6 = 6

Maximum PV module numbers in Series: 1

PV module numbers in Parallel: 6

Total PV module numbers: 1 x 6 = 6

4.3 Connect to Utility and Charge

CAUTION! Plug in the AC input cord to the wall outlet. The unit will automatically charge the connected external battery even though the unit is off.

5. Operation

5.1 Power On/Off

Once the inverter has been properly installed, press the power switch to turn on the unit. The unit will work automatically in line mode or inverter mode according to input utility power's status. When press the power switch again, the unit will be turned off.

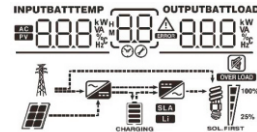
5.2 LED Indicators & Audible Alarms

There are three indicators (Green/Green/Red) in the front panel of the unit.


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





Buzzer Audible Alarm	Messages
Inverter Mode (Low-battery Voltage)	Buzzing every 1 seconds
110% overload warning	Buzzing every 0.5 second
Overcharge	Buzzing continuously
Fault mode	Buzzing continuously for 1 minute, unit shutdown (BAT-MODE) Buzzing continuously (Line mode)



5.3 LCD Display








Display	Function
Input source information	
AC	Indicates the AC input
PV	Indicates the PV input
INPUTBATTTEMP 8888 V 8888 Hz 8888 W	Indicates input voltage, input frequency, PV voltage, charging current, battery voltage, main board firmware version
Configuration Program and Fault Information	
88	Indicates the setting programs.
88	Indicates the warning and fault codes.
88	Warning: 88 Δ Flashing with warning code
88	Fault: 88 Δ Lighting with fault code
Output Information	
OUTPUTBATTLOAD 8888 V 8888 Hz 8888 %	Indicates the output voltage, output frequency, load percent, load in VA, load in Watt, main board firmware version

Battery Information		
	Indicates the Battery level by 0-24%, 25-49%, 50-74% and 75-100% in battery mode, 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	< 11Vdc/pcs	4 bars will flash in turns. Bottom bar will be on and the other three bars will flash in turns.
	11Vdc ~ 11.5Vdc/pcs	Bottom two bars will be on and the other two bars will flash in turns.
	11.5Vdc ~ 12.5Vdc/pcs	Bottom two bars will be on and the other two bars will flash in turns.
Floating mode. Batteries are fully charged.	> 12.5Vdc/pcs	Bottom three bars will be on and the top bar will flash.
		4 bars will be on.

In battery mode, it will present battery capacity.	
Battery Voltage	LCD Display
< 11Vdc/pcs	
11.0Vdc ~ 11.5Vdc/pcs	
11.5Vdc ~ 12.5Vdc/pcs	
> 12.5Vdc/pcs	





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%

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

5.4 LCD Setting

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

Setting Programs:

Program	Description	Setting Option
01	Output source priority: To configure load power source priority	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 to 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 either low-level warning voltage or the setting point in program 12.
		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.
		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)	 24V model: default 50A, 10A~70A Settable 12V model: default 50A, 10A~70A Settable

03	AC input voltage range	03 APL Appliance (default)	If selected, acceptable AC input voltage range will be within 90~280VAC
		03 UPS UPS	If selected, acceptable AC input voltage range will be within 170~280VAC
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 19, 20 and 21.
06	Auto restart when overload occurs	Restart disable (default) 06 Lfd	Restart enable 06 LfE
09	Output frequency	50Hz (default) 09 50 _{Hz}	60Hz 09 60 _{Hz}
11	Maximum utility charging current	11 20 ^A 24V model: default 20A, 10A~20A Settable 12V model: default 20A, 10A~20A Settable	
12	Setting voltage point back to utility source when selecting "SBU priority" or "Solar first" in program 01	12 11.5 ^V Default 11.5V, 11.0V~12.8V Settable (This is unit voltage for 12V battery. For 24V system, total voltage*2)	
13	Setting voltage point back to battery mode when selecting "SBU priority" or "Solar first" in program 01	13 13.5 ^V Default 13.5V, 12.0V~14.0V Settable (This is unit voltage for 12V battery. For 24V system, total voltage*2)	

14	Charger source priority: To configure charger source priority	If this off grid solar inverter is working in Line, Standby or Fault mode, charger source can be programmed as below:	
		Solar first 14 C50	Solar energy will charge battery as first priority. Utility will charge battery only when solar energy is not available.
		Utility first 14 C0t	Utility will charge battery as first priority. Solar energy will charge battery only when utility power is not available.
		Solar and Utility 14 SNU	Solar energy and utility will both charge battery.
		Only Solar 14 050	Solar energy will be the only charger source no matter utility is available or not.
If this off grid solar inverter is working in Battery mode, only solar energy can charge battery. Solar energy will charge battery if it's available and sufficient.			
15	Alarm control	Alarm on (default) 15 60N	Alarm off 15 60F
16	Backlight control	Backlight on (default) 16 L0N	Backlight off 16 L0F
17	Beeps while primary source is interrupted	Alarm on (default) 17 A0N	Alarm off 17 A0F
19	Bulk charging voltage (C.V voltage). If self-defined is selected in program 5, this program can be set up	19 14.1 ^V Default 14.1V, 12.0V~14.6V Settable (This is unit voltage for 12V battery. For 24V system, total voltage*2)	
20	Floating charging voltage. If self-defined is selected in program 5, this program can be set up	20 13.5 ^V Default 13.5V, 12.0V~14.6V Settable (This is unit voltage for 12V battery. For 24V system, total voltage*2)	
21	Low DC cut-off voltage. If self-defined is selected in program 5, this program can be set up	21 9.9 ^V Default 9.9V, 10V~12V Settable (This is unit voltage for 12V battery. For 24V system, total voltage*2)	

5.5 Display Setting

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

Setting Information	LCD display
Input voltage/Output voltage (Default Display Screen)	<p>Input Voltage=230V, output voltage=230V</p>
Input frequency	<p>Input frequency=50Hz</p>
PV voltage	<p>PV voltage=30V</p>
Charging current (if PV normal)	<p>Current = 50A</p>
PWM charging power	<p>PWM charging power=500W</p>
Battery voltage/ Output voltage	<p>Battery voltage=25.5V, Output voltage=230V</p>

Output frequency	<p>Output frequency=50Hz</p>
Load percentage	<p>Load percent=70%</p>
Load in VA	<p>When connected load is lower than 1kVA, load in VA will present xxx VA like below chart.</p> <p>When load is larger than 1kVA (≥ 1kVA), load in VA will present x.x kVA like below chart.</p>
Load in Watt	<p>When load is lower than 1kW, load in W will present xxx W like below chart.</p> <p>When load is larger than 1kW (≥ 1KW), load in W will present x.x kW like below chart.</p>

Battery voltage/ DC discharging current	<p>Battery voltage=25.5V, DC discharging current=0A</p>
Main CPU version checking	<p>Main CPU version UI-01-04</p>

5.6 Operating Mode Description

Operation Mode	Description	LCD Display
Line Mode	The unit will provide output power from the mains. It will also charge the battery at line mode.	<p>Charging by utility and PV energy.</p>
		<p>Charging by 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>

5.7 Fault Reference Code

Fault Code	Fault Event	Icon On
01	Fan is locked when inverter is off.	
02	Over temperature	
03	Battery voltage is too high	
04	Battery voltage is too low	
05	Output short circuited or over temperature is detected by internal converter components.	
06	Output voltage is abnormal.	
07	Overload time out	

5.8 Warning Indicator

Warning Code	Warning Event	Icon Flashing
10	Low Battery	
11	Overload	
12	PV temperature too high	
54	Solar charger stops due to high PV voltage	
58	Output voltage is too low	

6. Trouble Shooting

Use the table below to solve minor problems.

Problem	LCD/LED/Buzzer	Explanation / Possible cause	What to do
When power fails, the backup time is shorten.	Battery low alarm issue quickly.	Battery voltage is too low.	Charge the unit at least 8 hours.
		Battery capacity is not full even after charge the unit for at least 8 hours.	Check the date code of the battery. If the batteries are too old, replace the batteries.
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.
		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)
		Set "Solar First" as the priority of output source.	Change output source priority to Utility first.
No LED display on the front panel when the utility power is normal.	No LED display.	Battery is not connected well.	Check the external battery cable and terminal. Make sure all the battery connections to the unit are all correct.
		Battery defect.	Replace the batteries.