

USER'S MANUAL
ENERGY STORAGE INVERTER

USER'S MANUAL

PV Solar Inverter ON/OFF

Grid PNI GreenHouse SB4000

4KW MPPT 48



Appliances



PC



TV



Air-
conditioning



Fridge



Washing
machine



Grid

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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. The manual and other documents must be stored in a convenient place and be available at all times. Before using the unit, read all instructions and cautionary markings on the unit the batteries and all appropriate sections of this manual. We assume no liability for any damage caused by failure to observe these instructions.
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 energy storage inverter, please follow required spec to select appropriate cable size. It's very important to correctly operate this energy storage inverter.
8. Be very cautious when working with metal tools on or around batteries. A potential risk exists to drop a tool to spark or short circuit batteries or other electrical parts and could cause an explosion.
9. Please strictly follow installation procedure when you want to disconnect AC or DC terminals. Please refer to INSTALLATION section of this manual for the details.
10. Fuses (4 pieces of 40A,58VDC for 2KW, 5 pieces of 40A,58VDC for 2KW Plus and 3KW, 6 pieces of 40A, 58VDC for 4KW,) areprovided as over-current protection for the battery supply.
11. GROUNDING INSTRUCTIONS -This energy storage inverter should be connected to a permanent grounded wiring system. Be sure to comply with local requirements and regulation to install this inverter.
12. NEVER cause AC output and DC input short circuited. Do NOT connect to the mains when DC input short circuits.
13. **Warning!!** Only qualified service persons are able to service this device. If errors still persist after following troubleshooting table, please send this energy storage inverter back to local dealer or service center for maintenance.
14. Caution - We will not be responsible for any breakdown or damage caused by transportation, movement or negligence after purchase.
15. Caution - We are not responsible for failures caused by the use of the power supply conditions or the site environment not specified in the electrical specifications of the inverter.

Appendix: Approximate Back-up Time Table

Model	Load(W)	Back Time@48Vdc 100Ah(min)	Back Time@48Vdc 200Ah(min)
2KW/ 2KW Plus	200	1270	2541
	400	603	1270
	600	393	847
	800	270	610
	1000	208	488
	1200	158	360
	1400	154	308
	1600	111	270
	1800	98	228
	2000	82	203
3KW	300	847	1694
	600	393	847
	900	240	536
	1200	158	393
	1500	123	315
	1800	98	240
	2100	84	205
	2400	74	169
	2700	56	141
	3000	50	123
4KW	400	614	1281
	800	270	608
	1200	153	405
	1600	112	272
	2000	89	205
	2400	74	170
	2800	64	137
	3200	48	112
	3600	42	99
	4000	38	89

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.

TROUBLE SHOOTING

Problem	LCD/LED	Explanation / Possible cause	What to do
Unit shuts down automatically during startup process.	Fault code 04	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. (Appliance → Wide)
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.
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. 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 160°C.	
	Fault code 03	Battery is over-charged.	Return to repair center.
		The battery voltage is too high.	Check if spec and quantity of batteries are meet requirements.
	Fault code 01	Fan fault	Replace the fan.
	Fault code 06/58	Output abnormal (Inverter voltage below than 202 Vac or is higher than 253 Vac)	1. Reduce the connected load. 2. Return to repair center
	Fault code 08/09/57	Internal components failed.	Return to repair center.
	Fault code 51	Over current or surge.	Restart the unit, if the error happens again, please return to repair center.
	Fault code 52	Bus voltage is too low.	
	Fault code 55	Output voltage is unbalanced.	
	Fault code 56	Battery is not connected well or fuse is burnt.	If the battery is connected well, please return to repair center.

INTRODUCTION

This is a multi-function Energy Storage Inverter, combining functions of inverter, MPPT solar charger and battery charger to offer uninterruptible power support with portable size, and this inverter is able to generate power to feed the grid. 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
- On-Grid Inverter with Energy Storage
- Selectable input voltage range for home appliances and personal computers LCD setting
- Selectable battery charging current based on applications via LCD setting
- Selectable Multiple application Load priority mode, Match load mode, Sell mode, Backup UPS mode and Off grid priority mode
- Parallel operation (max 3 units)
- Auto restart while AC is recovering
- Smart battery charger design for optimized battery performance
- Multiple communication for RS-485 and CAN bus
- Overload and short circuit protection
- Multiple operations: Grid tie, Off grid, and grid-tie with backup
- Unique structure design to ensure good heat dissipation, greatly improved product lifespan
- In addition it is compatible with PV module types of mono crystalline and poly crystalline, but also connect thin-film panels.

Basic System Architecture

This energy storage inverter can provide power to connected loads by utilizing PV power, grid power and battery power.

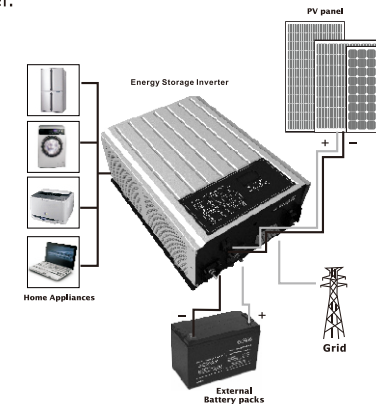
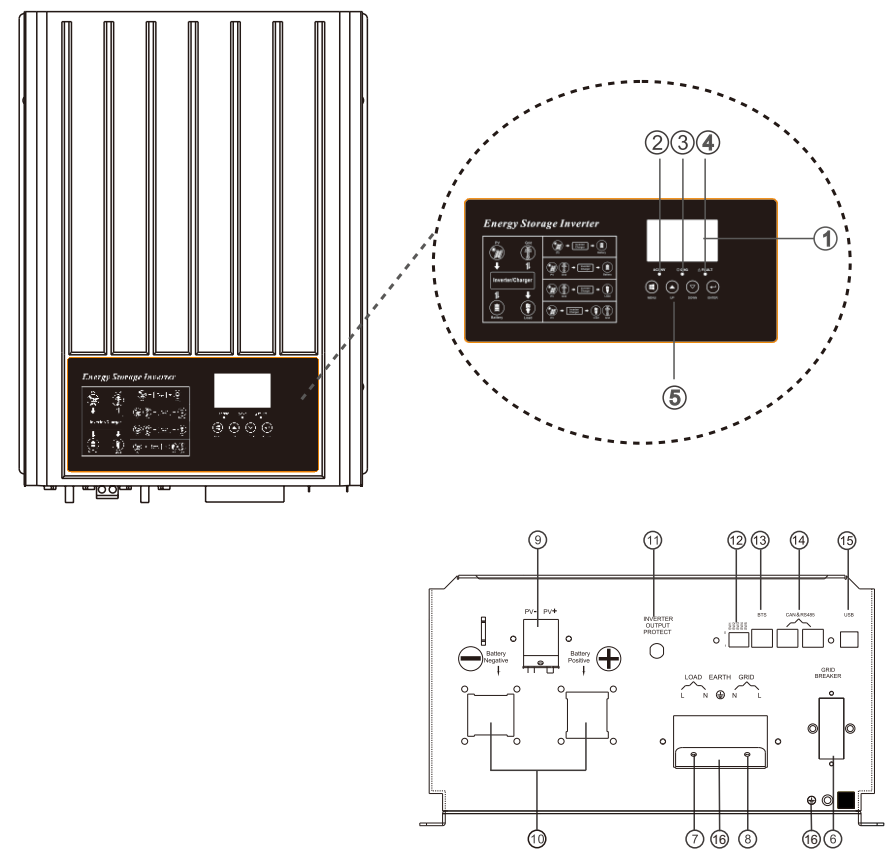


Figure 1 Basic energy storage system overview

Depending on different power situations, this energy storage inverter is designed to generate continuous power from PV solar modules (solar panels), battery, and the grid. When MPPT input voltage of PV modules is within acceptable range (see specification for the details), this inverter is able to generate power to feed the grid and charge battery. See Figure 1 for a simple diagram of a typical solar system with this energy storage inverter.

Product Overview



- 1. LCD display
- 2. Status indicator
- 3. Charging indicator
- 4. Fault indicator
- 5. Function keys
- 6. Grid breaker
- 7. Load
- 8. Grid
- 9. PV input
- 10. Battery input
- 11. Inverter output protect
- 12. Switch
- 13. BTS
- 14. CAN&RS485 communication port
- 15. USB communication port
- 16. Earth

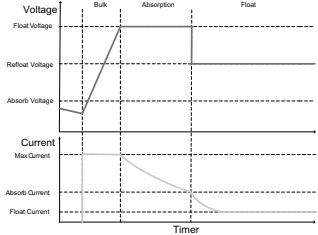
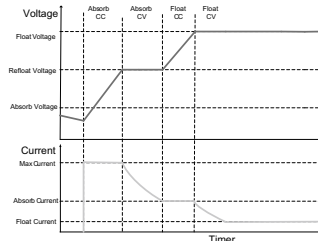
Goint Grid and Solar Charging				
INVERTER MODEL	2KW	2KW Plus	3KW	4KW
Max Charging Current	80A	80A	120A	140A
Default Grid Charging Current	40A	40A	60A	80A
Default Solar Charging Current	40A	60A	60A	60A

Table 4 General Specifications

INVERTER MODEL	2KW	2KW Plus	3KW	4KW
Safety Certification	CE			
Dimension(W*H*D),mm	337*462*183		337*462*183	370*462*183
Net Weight,kg	27.5		29.5	35
Operating Temperature Range	0℃ to +55℃			
Storage temperature	-15℃ to +60℃			
Ambient humidity	0 to 90% relative humidity(non-condensing)			
Environmental Protection Rating	IP20			
Altitude	<2000m			

Table 3 Charge Mode Specifications

Grid Charging Mode				
INVERTER MODEL		2KW	2KW Plus	3KW 4KW
Charging Current(UPS)		40A		60A 80A
Absorption Voltage	Pb	50.0V		
	Li	52.8V		
Refloat Voltage	Pb	54.8V		
	Li	53.6V		
Float Voltage	Pb	57.2V		
	Li	54.0V		

Solar Charging Mode				
INVERTER MODEL	2KW	2KW Plus	3KW	4KW
Rated Power	2000W	3000W		
Efficiency	98.0% max			
Max.PV Array Open Circuit Voltage	145Vdc			
PV Array MPPT Voltage Range	64Vdc-130Vdc			
Min Battery Voltage For PV Charge	34Vdc			
Battery Voltage Accuracy	+/-0.3%			
PV Voltage Accuracy	+/-2V			
Charging Algorithm	Pb:3-Step;Li:4-Step			
Temperature Compensation Coefficient	-3mv/°C/cell(25°C ref)			
Charging algorithm for lead acid battery				
Charging algorithm for Lithium battery				

INSTALLATION

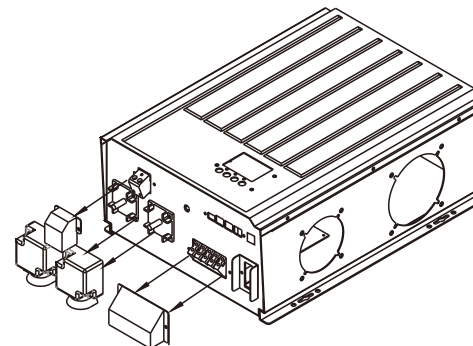
Unpacking and Inspection

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
- BTS cable x 1
- Communication cable (USB) x 1
- User manual x 1
- Software CD x 1
- Battery cable x 2(optional)

Preparation

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



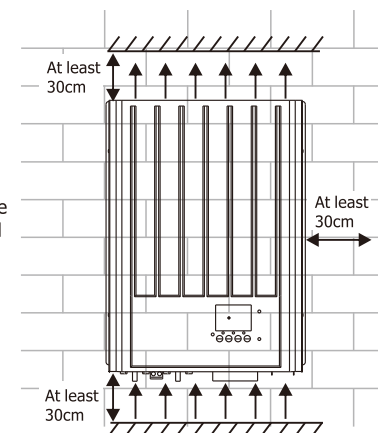
Mounting the Unit

Consider the following points before selecting where to install:

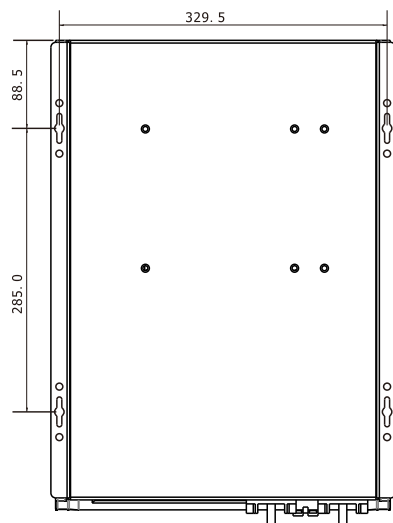
- Do not mount the inverter on flammable construction materials.
- Mount on a solid surface.
- Install this inverter at eye level in order to allow the LCD display to be read at all times.
- For proper air circulation to dissipate heat, allow a clearance of approx. 30 cm to the side and approx. 30 cm 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.



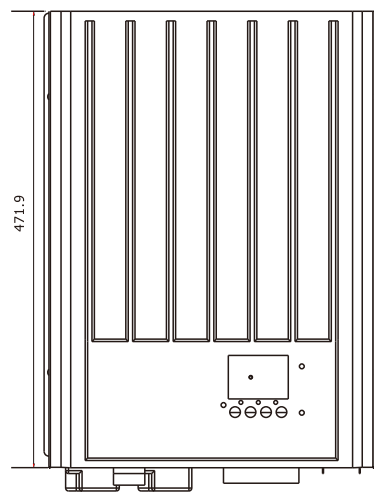
SUITABLE FOR MOUNTING ON CONCRETE OR OTHER NON-COMBUSTIBLE SURFACE ONLY.



Install the unit by screwing four screws



BACK



FRONT

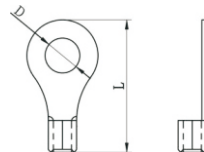
Battery Connection

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. Please use 60VDC/100A circuit breaker for 2KW/2KW Plus/3KW and 60VDC/150A for 4KW.

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:

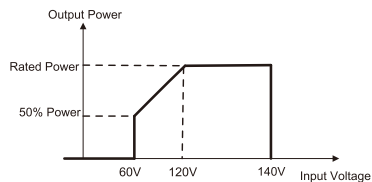
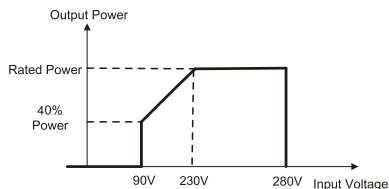
Model	Typical Amperage	Battery Capacity	Wire Size	Ring Terminal			Torque Value
				cable (mm ²)	Dimensions		
					D(mm)	L(mm)	
2KW	40A	100AH	1*8AWG	8	8.4	28	2~ 3 Nm
2KW Plus /3KW	60A	200AH	1*6AWG	14	8.4	29.8	2~ 3 Nm
			2*8AWG	14	8.4	28	2~ 3 Nm
4KW	80A	200AH	1*4AWG	22	8.4	32.8	2~ 3 Nm
			2*6AWG	26	8.4	29.8	2~ 3 Nm

Table 2 Inverter Mode Specifications

INVERTER MODEL	2KW	2KW Plus	3KW	4KW
Rated output power	2000W		3000W	4000W
Output Voltage Waveform	Pure Sine Wave			
Output Voltage Regulation	230Vac±1%			
Output Frequency	60Hz or 50Hz			
Peak Efficiency	≥92%		≥93%	
Overload Protection	5 seconds@Short circuit; 10 seconds@load > 150%; 30 seconds@125%<load ≤ 150%; 60 seconds@110%<load ≤ 125%; 30 minutes@100%<load ≤ 110%			
Surge Capacity	2* rated power for 5 seconds			
Nominal DC Input Voltage	48Vdc			
Cold Start Voltage	46.0Vdc			
Low DC Warning Voltage @ load < 20%	44.0Vdc			
@ 20% ≤ load < 50%	42.8Vdc			
@ load ≥ 50%	40.4Vdc			
Low DC Warning Return Voltage @ load < 20%	46.0Vdc			
@ 20% ≤ load < 50%	44.8Vdc			
@ load ≥ 50%	42.4Vdc			
Low DC Cut-off Voltage @ load < 20%	42.0Vdc			
@ 20% ≤ load < 50%	40.8Vdc			
@ load ≥ 50%	38.4Vdc			
High DC Recovery Voltage	58Vdc			
High DC Cut-off Voltage	60Vdc			
Rated output current	8.7A		13A	17.4A
Dynamic response speed (0↔100%)	20ms			
Rate of wave distortion (THD) (Linearity loads)	Off grid≤2%;Grid discharge ≤3%;Grid charge ≤3%			
Power factor	Grid discharge 99.9% & Grid charge 99.9%			
Saving Mode Power Consumption	<15W		<15W	<15W

SPECIFICATIONS

Table 1 Line Mode Specifications

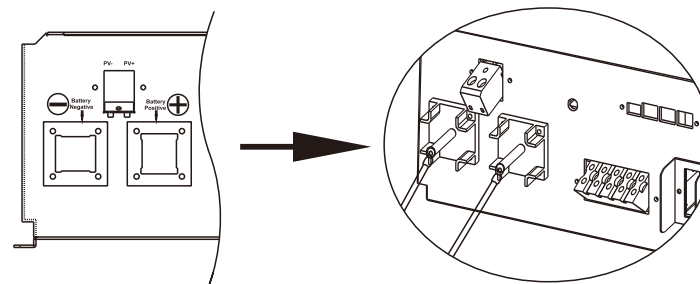
INVERTER MODEL	2KW	2KW Plus	3KW	4KW
Input Voltage Waveform	Sinusoidal(grid or generator)			
Nominal Input Voltage	120Vac or 230Vac			
Low Loss Voltage	65Vac±7V or 95 Vac±7V(SLO) 95Vac±7V or 174Vac±7V(FST) 95Vac±7V or 186Vac±7V(APL)			
Low Loss Return Voltage	70Vac±7V or 105Vac±7V(SLO) 100Vac±7V or 184Vac±7V(FST) 100Vac±7V or 196Vac±7V(APL)			
High Loss Voltage	140Vac±7V or 272Vac±7V(SLO,FST) 140Vac±7V or 253Vac±7V(APL)			
High Loss Return Voltage	135Vac±7V or 265Vac±7V(SLO,FST) 135Vac±7V or 250Vac±7V(APL)			
Max AC Input Voltage	150Vac or 300Vac			
Nominal Input Frequency	50Hz / 60Hz			
Low Loss Frequency	40±1Hz(SLO or FST)/47.5±0.05Hz(APL)			
Low Loss Return Frequency	42±1Hz(SLO or FST)/47.5±0.05Hz(APL)			
High Loss Frequency	65±1Hz(SLO or FST)/51.5±0.05Hz(APL)			
High Loss Return Frequency	63±1Hz(SLO or FST)/50.05±0.01Hz(APL)			
Output Short Circuit Protection	Line mode:Circuit Breaker Battery mode:Electronic Circuits			
Transfer Time	< 10ms			
Output power derating: When AC input voltage drops to 120V or 230V depending on models,the output power will be derated	120Vac model:  230Vac model: 			

Please follow below steps to implement battery connection:

1. Assemble battery ring terminal based on recommended battery cable and terminal size.
2. Connect all battery packs as units requires. It's suggested to connect at least 100Ah capacity battery for 2KW/2KW Plus model and at least 200Ah capacity battery for 3KW/4KW.

NOTE: Please only use sealed lead acid battery or sealed GEL/AGM lead-acid battery.

3. Insert the ring terminal of battery cable flatly into battery connector of inverter and make sure the bolts are tightened with torque of 2-3 Nm. Make sure polarity at both the battery and the energy storage inverter 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 (-).

Grid/Load Connection

Preparation

CAUTION!! Before connecting to Grid , please install a separate AC breaker between inverter and Grid. This will ensure the inverter can be securely disconnected during maintenance and fully protected from over current of Grid . The recommended spec of AC breaker is 32A for 2KW and 2KW Plus, 40A for 3KW, 63A for 4KW.

CAUTION!! There are two terminal blocks with "LOAD" and "GRID" markings. Please do NOT-misconnect load and grid 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 Grid 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
2KW/2KW Plus	12AWG	1.2~1.6Nm
3KW	10AWG	1.4~1.6Nm
4KW	8AWG	1.4~1.6Nm

Connecting to the Grid/Load

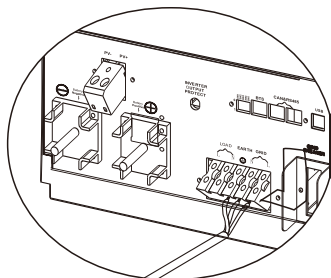
Please follow below steps to implement Load/Grid connection:

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

⊕ → **Earth (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.

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

⊕ → **Earth (yellow-green)**

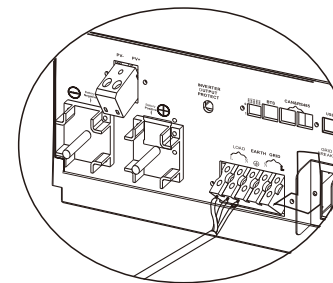
L → **LINE (brown or black)**

N → **Neutral (blue)**

Warning Indicator

Warning Code	Warning Event	Icon flashing
61	Fan is locked when inverter is on.	[61]
62	Fan2 is locked when inverter is on.	[62]
63	Battery is over-charged.	[63]
64	Low battery	[64]
67	Overload	[67]
70	Output power derating	[70]
72	Solar charger stops due to low battery.	[72]
73	Solar charger stops due to high PV voltage.	[73]
74	Solar charger stops due to over load.	[74]
75	Solar charger over temperature	[75]
76	PV charger communication error	[76]
77	Parameter error	[77]

26	Inverter grid over current error	[26] 
27	Inverter radiator over temperature	[27] 
31	Solar charger battery voltage class error	[31] 
32	Solar charger current sensor error	[32] 
33	Solar charger current is uncontrollable	[33] 
41	Inverter grid voltage is low	[41] 
42	Inverter grid voltage is high	[42] 
43	Inverter grid under frequency	[43] 
44	Inverter grid over frequency	[44] 
51	Inverter over current protection error	[51] 
52	Inverter bus voltage is too low	[52] 
53	Inverter soft start failed	[53] 
55	Over DC voltage in AC output	[55] 
56	Battery connection is open	[56] 
57	Inverter control current sensor error	[57] 
58	Inverter output voltage is too low	[58] 



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 grid short-circuited when these inverters are worked in parallel operation.

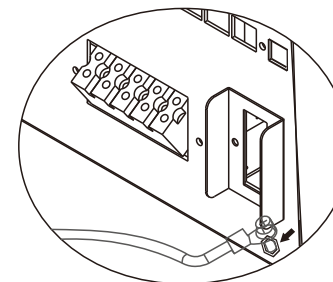
CAUTION: Appliances such as air conditioner are required at least 2~3 minutes to restart because it's required to have enough time to balance refrigerant gas inside of circuits. If a power shortage occurs and recovers in a short time, it will cause damage to your connected appliances. To prevent this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

Connecting to the Earth

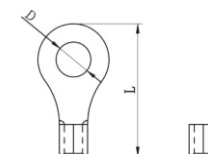
For safe operation, please use one more wire with ring terminal to connect the earth.

Wire Size	Ring Terminal		Torque value
	Cable mm2	Dimensions D (mm) L (mm)	
10 AWG	6	5.3 23.8	1.2~ 2 Nm

CAUTION: To prevent risk of electric shock, ensure the earth wire is properly earthed before operating this hybrid inverter no matter the grid is connected or not.



Ring terminal:



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.

Model	Typical Amperage	Cable Size	Torque
2KW/2KW Plus	40A	1*8 AWG	1.4~ 1.6 Nm
3KW	60A	1*6 AWG	1.6~ 1.8 Nm
4KW	60A	1*6 AWG	1.6~ 1.8 Nm

PV Module Selection:

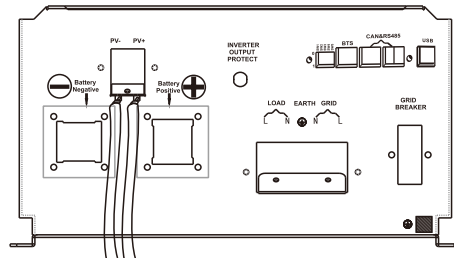
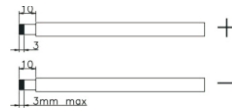
When selecting proper PV modules, please be sure to consider below parameters:

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	2KW/ 2KW Plus	3KW	4KW
Max.PV Array Open Circuit Voltage	145Vdc		
PV Array MPPT Voltage Range	64Vdc-130Vdc		
Min Battery Voltage For PV Charge	34Vdc		

Please follow below steps to implement PV module connection:

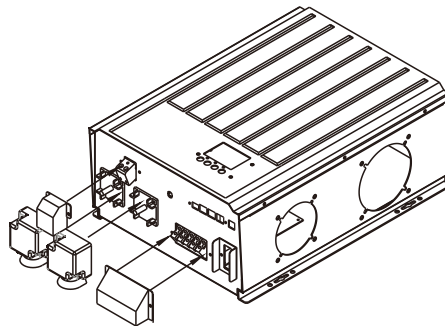
1. Remove insulation sleeve 10 mm for positive and negative conductors.
2. Check correct polarity of connection cable from PV modules and PV input connectors. Then, connect positive pole (+) of connection cable to positive pole (+) of PV input connector. Connect negative pole (-) of connection cable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



3. Make sure the wires are securely connected.

Final Assembly

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



stop state	The inverter stop working if you turn off the inverter by the soft key or error has occurred in the condition of no grid.	
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Fault Reference Code

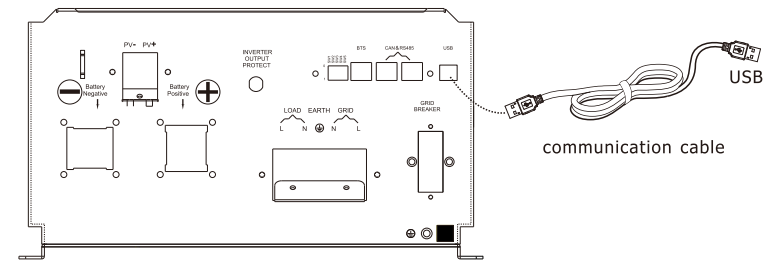
Fault Code	Fault Cause	LCD Indication
01	Fan is locked when inverter is off	[01]
02	Inverter transformer over temperature	[02]
03	battery voltage is too high	[03]
04	battery voltage is too low	[04]
05	Output short circuited	[05]
06	Inverter output voltage is high	[06]
07	Overload time out	[07]
08	Inverter bus voltage is too high	[08]
09	Bus soft start failed	[09]
11	Main relay failed	[11]
21	Inverter output voltage sensor error	[21]
22	Inverter grid voltage sensor error	[22]
23	Inverter output current sensor error	[23]
24	Inverter grid current sensor error	[24]
25	Inverter load current sensor error	[25]

Operating State Description

Operation state	Description	LCD display
Sell state Note: The system generates electricity when it has sufficient sunshine, supplying power to your home and sending any excess power back to the grid.	PV energy is sold back to grid.	PV energy power is larger than inverter power
		PV energy power is smaller than inverter power
Match load state Note: DC power produced from your solar array is converted by the inverter into AC power, which is then sent to your main electrical panel to be used by your household appliances. Any excess power generated is not sold back to the grid, but stored in battery.	PV energy is charging into the battery or converted by the inverter to the AC load.	PV energy power is larger than inverter power
		PV energy power is smaller than inverter power
		PV is off
Charge state	PV energy and grid can charge batteries.	
Bypass state	Errors are caused by inside circuit error or external reasons such as over temperature, output short circuited and so on	
Off-Grid state	The inverter will provide output power from battery and PV power.	Inverter power loads from PV energy.
		Inverter power loads r from battery and PV energy.
		Inverter power loads from battery only.

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.

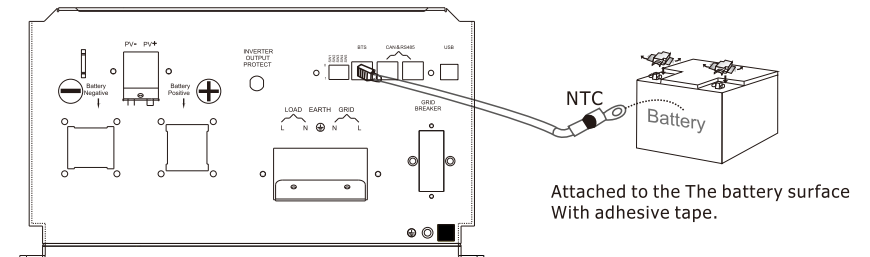


CAUTION

If the PC without additional RS485 communication port, you need to configure(optional or buying yourself) a USB to RS485 communication cable.

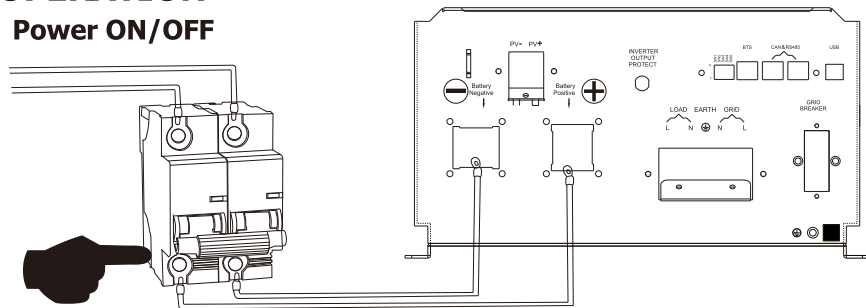
BTS Connection

An optional Battery Remote Temperature Sensor(BTS)is recommended for accurate battery recharging.The inverter will not perform temperature compensation for charging parameters if the BTS is not used. You should use the RJ45 cables to connect Negative Temperature Coefficient(NTC),as follows:



OPERATION

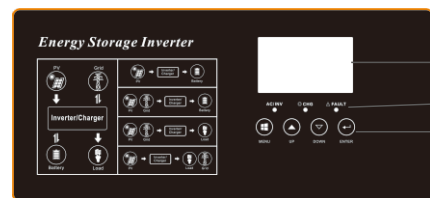
Power ON/OFF



As shown in illustration, the unit turned on or off via an external switch.

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.



LCD display

LED indicators

Function keys

LED Indicator

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

Function Keys

Function key	Description.
MENU	Enter or exit setting mode go to previous selection.
UP	Increase the setting data.
DOWN	Decrease the setting data.
ENTER	Confirm the selection in setting mode or go to next selection.

Display Setting

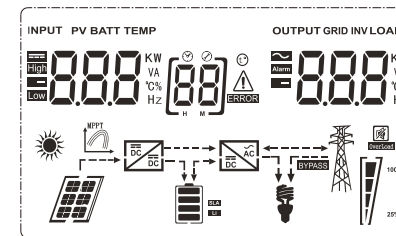
The LCD display information will be switched in turns by pressing "UP" or "DOWN" key. The selectable information is switched as below order: battery voltage, battery current , inverter output voltage, inverter current , grid voltage, grid current, load in Watt, load in VA, grid frequency, inverter frequency, PV voltage, MPPT charging power, MPPT charging output voltage, MPPT charging current.

Selectable information	LCD display	
Battery voltage/Battery current	BATT 52.0 V	58 A
Inverter output voltage/Inverter output current	229 V	13.0 A
Grid voltage/Grid current	229 V	GRID 8.0 A
Load in Watt/VA	100 KW	LOAD 120 KVA
Grid frequency/Inverter frequency	INPUT 50.0 Hz	INV 50.0 Hz
PV voltage and power	PV 120 V	200 KW
PV charger output voltage and current	PV 51.0 V	OUTPUT 40.0 A

Auto turn page	[64] PLE	If selected, the display screen will auto turn the display page.
	[64] PLd	If selected, the display screen will stay at latest screen until user turns keys on.
Backlight control	[67] LON	Backlight on.(default)
	[67] LOF	Backlight off.
Record Fault code	[68] FON	Record disable.(default)
	[68] FOF	Record enable.

- * 09 > 08 > 07 max voltage > balance voltage point > the min voltage point.
 * 11 > 10 DC recovery voltage > low DC cut-off voltage.
 * 46 > 45 > 44 solar charger float voltage > solar charger refloat voltage > solar charger absorb voltage.

LCD Display Icons



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

In battery mode, it will present battery capacity.					
Load Percentage		Battery Voltage		LCD Display	
Load >50%	< 1.717V/cell				
	1.717V/cell ~ 1.8V/cell				
	1.8 ~ 1.883V/cell				
	> 1.883 V/cell				
50%> Load > 20%	< 1.817V/cell				
	1.817V/cell ~ 1.9V/cell				
	1.9 ~ 1.983V/cell				
	> 1.983				
Load < 20%	< 1.867V/cell				
	1.867V/cell ~ 1.95V/cell				
	1.95 ~ 2.033V/cell				
	> 2.033				
Load Information					
		Indicates overload.			
		Indicates the load level by 0-25%, 25-50%, 50-75% and 75-100%.			
		0%~25%	25%~50%	50%~75%	75%~100%
					
Mode Operation Information					
		Indicates unit connects to the mains.			
		Indicates unit connects to the PV panel.			
		Indicates load is supplied by grid power.			
		Indicates the solar charger circuit is working.			
		Indicates the DC/AC inverter circuit is working.			
Mute Operation					
		Indicates unit alarm is disabled.			

Solar Charger absorb voltage	[44] 50.0 ^v	Set the Absorb voltage.(Refer to the Charging Curve)
Solar Charger refloat voltage	[45] 54.8 ^v	Set the Refloat voltage.(Refer to the Charging Curve)
Solar Charger Float voltage	[46] 57.2 ^v	Set the Float voltage.(Refer to the Charging Curve)
Solar Charger max current	[47] 60.0 ^A	Set the max output current of the Solar Charge Controller.(Refer to the Charging Curve)
Solar Charger absorb current	[48] 10.0 ^A	Set the absorb current of the Solar Charge Controller.(Refer to the Charging Curve)
Solar Charger low DC cut-off voltage	[49] 34.0 ^v	If the battery voltage is lower than the set point, the Solar Charge Controller will close the output.
Solar Charger high DC cut-off voltage	[50] 60.0 ^v	If the battery voltage is higher than the set point, the Solar Charge Controller will close the output.
Auto restart when overload occurs	[61] L-E	Restart enable, restart in 10 minutes(default).
	[61] L-d	Restart disable.
Auto restart when over temperature occurs	[62] t-E	Restart enable.(default)
	[62] t-d	Restart disable.
Overload bypass: When enabled, the unit will transfer to line mode if overload occurs in battery mode	[63] b-E	Bypass enable.(default)
	[63] b-d	Bypass disable.

Grid-use enable/disable	Grid-use enable [14] UEN	Enable the inverter to connect to an AC input source.
	Grid-use disable [14] Uds	Disable the inverter to connect to an AC input source.
Low battery voltage Protection mode	[15] UAL	If "Usually-Defined" is selected, low DC cut-off voltage and low DC Warning Return Voltage can be referred to the table 2 of the page 27 in this manual.
	User-Defined [15] USE	If "Usually-Defined" is selected, low DC cut-off voltage and low DC Warning Return Voltage can be set up by program 10 and 11 of the page 16 in this manual.
Output voltage	[16] 230 ^v	Set the output voltage amplitude.
Output frequency	[17] 50.0 ^{Hz}	50Hz.(default)
	[17] 60.0 ^{Hz}	60Hz.
Grid charge enable	[18] UCE	Enable grid charge.(default)
	[18] UCd	Disable grid charge.
Solar Charger working Switch	[4] ON	Open or close the Solar Charge Controller output .
	[4] OFF	
Battery type	[42] Pb	Select the battery type.(Lead acid or Lithium)
	[42] L	
Battery AH	[43] 200	Set the AH of the battery.

LCD Setting

After pressing and holding MENU button for 2 seconds, the unit will enter setting mode. Press "UP" or "DOWN" button to select setting programs. And then, press "ENTER" or "MUNE" button to confirm the selection and exit.

Setting Programs:

Program	Selectable option	Description
	[5] INV	Select the setting of inverter.
	[5] CHA	Select the setting of solar charger.
	[5] S4S	Select the setting of the system.
Power use mode	Load priority mode [0] PL	PL: 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. If the solar energy is larger than the load and the battery voltage is higher than the max voltage, the solar energy will sell to the grid.
	Match load mode [0] FL	FL: the energy will never sell to the grid and the solar energy will fully supply to the load.
	Sell mode [0] FS	FS: the solar energy will Sell to the grid ignore the load.
	Backup UPS mode [0] UPS	UPS: the converter will charger the battery to full voltage Combine with the Solar Charge Controller.
	Off grid priority mode [0] Po	PO: the inverter will turn to off grid state when the solar energy is enough.
Maximum charging current(DC)	[02] 120 ^A	To configure total charging current for solar and grid (Max. charging current = grid charging current + solar charging current)
Maximum Grid charging current(DC)	[03] 60 ^A	
Maximum discharging current (AC)	[04] 130 ^A	Maximum Discharging current: To configure Max Discharging current when the inverter is on Grid-tie mode.

AC input voltage range	Narrow 	If selected, acceptable AC input voltage range will be within 184-272VAC.
	Wide 	If selected, acceptable AC input voltage range will be within 105-272VAC.
	APP-VDE4105 	If selected, acceptable AC input voltage range will conform to VDE4105.
Power saving(Search) mode enable/disable	Saving mode disable(default) 	If disabled, no matter connect load is low or high, the on/off status of inverter output will not be effected.
	Saving mode enable 	If enable, the inverter begins search mode if the AC load connected is pretty low($\leq 50W$) or not detected. The inverter's "search" mode reduces stand-by energy consumption during no-load conditions.
Setting the min voltage point		PL: when the battery voltage is lower than the setting point, the inverter will start to recharge the battery.
		FL: when the battery voltage is lower than the setting point, the inverter will start to recharge the battery.
		FS: when the battery voltage is lower than the setting point, the inverter will start to recharge the battery.
		UPS: no use.
		PO: when the battery voltage is lower than the setting point, the inverter will start to recharge the battery.
Setting the balance voltage point		PL: when the battery voltage is higher than the setting point, the inverter will supply the power match the load, don't sell power back to grid.
		When the battery voltage is lower than the setting point, the inverter will stop discharging from battery.
		FL: when the battery voltage is higher than the setting point, the inverter will supply the power match the load, don't sell power back to grid.
		When the battery voltage is lower than the setting point, the inverter will stop discharging from battery.

		FS: when the battery voltage is higher than the setting point, the inverter will discharging with max current. When the battery voltage is lower than the setting point, the inverter will stop discharge from battery.
		UPS: when the battery voltage is lower than the setting point, the inverter will start to recharge the battery.
		PO: When the battery voltage is lower than the setting point, the inverter will back to the grid. When the battery voltage is higher than the setting point, the inverter will stop charging to battery.
Setting the max voltage point		PL: In this mode, when the battery voltage is higher than the setting point, the inverter will sell power to the grid. When the battery voltage falls to the setting voltage below, the inverter will discharge match the load.
		FL: In this mode when the battery voltage is higher than the setting point, the inverter will discharge match the load.
		FS: In this mode when the battery voltage is higher than the setting point, the inverter will start selling power to the grid.
		UPS: In this mode when the battery voltage is higher than the setting point, the inverter will stop charging to battery.
		PO: When the battery voltage is higher than the setting point, the inverter will back to the off grid state.
low DC cut-off voltage		48V model default setting: 42.0V Setting range is from 40.0V to 48.0V. Increment of each click is 0.1V. Low DC cut-off voltage will be fixed to setting value no matter what percentage of load is connected.
low DC recovery voltage		If the inverter is in the low voltage fault state of the battery, the battery voltage higher than the voltage, inverter will remove the battery low voltage fault.
High DC cut-off voltage		48V model default setting: 60.0V Setting range is from 58.0V to 60.0V. Increment of each click is 0.1V. High DC cut-off voltage will be fixed to setting value no matter what percentage of load is connected.
Off-Grid enable	On(default) 	Turn on the inverter output when the grid is off.
	Off 	Shut down the inverter output when the grid is off.