Product Model
POW-HVM2.5KW-12V
POW-HVM3.5KW-24V



PowMr

SOLAR INVERTER CHARGER

User Manual

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ABOUT THIS MANUAL

Purpose

This manual introduces the assembly, installation, operation and troubleshooting of inverter. Please read this manual carefully before installation and operation.

Target Group

This manual is designed for professionals and end users. Operations that do not require any specific skills can also be handled by the end users themselves. Professionals must have the following skills:

- Understand how the inverter works and operates
- After training, someone knows that how to deal with crises and risks in the installation and use of electrical equipment and devices
- After training, someone knows that how to install and commission electrical equipment and fixtures
- Understand the applicable standards and directives
- Understand and abide by this manual and all safety knowledge

SAFETY REGULATIONS

Warning: This article contains important safety and operation instructions. Please read and save this manual for future reference.

1. Please choose the corresponding setting according to whether to use lead-acid battery or lithium battery. If it is not set properly, the system may not operate normally.
2. Before using the unit , please read all the instructions and cautionary on the unit and understand all battery models and relevant chapters in this manual.
3. Never short-circuit AC output and DC input. Never connect the mains when the DC input is short-circuited.
4. Never charge a non-rechargeable battery.
5. Do not disassemble the unit. When maintenance or repair is needed, please send it to the professional technical service center. Incorrect reassembly may lead to electric shock or fire.
6. To reduce the risk of electric shock, disconnect all wiring before attempting any maintenance or cleaning. Turning off the device will not reduce this risk.
7. Be extra careful when using metal tools on or around the battery. Some potential risks, such as short circuit of batteries or other electronic components caused by sparks caused by falling tools, may lead to explosion.
8. In order to realize the optimal operation of this off grid solar inverter, please select the appropriate cable size according to the instruction. It is very important to operate the off grid solar inverter correctly.
9. When disconnecting AC or DC terminals, please strictly follow the installation procedure. For more details, please refer to "Installation" in this manual.
10. Grounding instruction this off grid solar inverter shall be connected to the permanent grounding wiring system. Be sure to comply with local requirements and regulations to install this inverter.
11. Provide a fuse that meets certain specifications for battery power supply as overcurrent protection.
12. **Warning! !** Only professional service personnel can repair this equipment. If there are still errors after troubleshooting, please send this off line solar inverter back to the local dealer or service center for maintenance.

INTRODUCTION

This is a multifunctional off grid solar inverter, which integrates MPPT solar charging controller, high-frequency pure sine wave inverter and UPS function module, and is very suitable for off-grid backup power supply and spontaneous self-use system. The design of high-frequency transformer enables the machine to provide reliable power conversion in a small size.

The whole system also needs other equipment to achieve complete operation, such as photovoltaic modules, generator or utility grid. According to your requirements, please consult your system integrator to obtain other possible system components. WiFi module is a plug-and-play monitoring device installed on the inverter. With this device, users can monitor the running status of solar system anytime and anywhere through mobile phones or websites.

Features

- Pure sine wave output inverter
- According to the requirements of load (household appliances/personal computers), the input voltage range of utility grid can be selected
- According to the battery requirements, the charging current can be set through LCD
- Solar energy and utility grid can power loads at the same time
- AC intput is compatible with mains and generator
- Automatic restart function when mains power is restored
- Overload/ Over temperature/ short circuit protection
- The intelligent charging design of battery makes the battery more fully utilized
- RS485 port Used for communication with BMS
- Cold start function
- Intelligent fan speed adjustment, which adjusts the fan speed according to temperature, load and charging current
- Built-in MPPT, operating voltage range 55V~430V, open circuit voltage 450Voc
- WIFI remote monitoring (optional)

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 mains electricity
- Solar module (optional)

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 a ir conditioner.

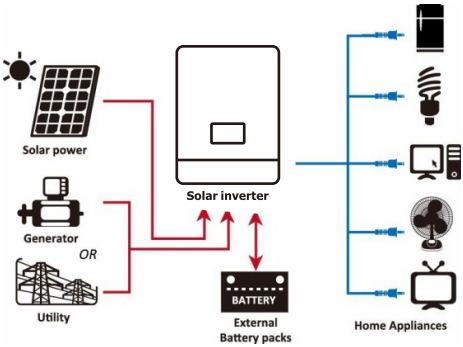
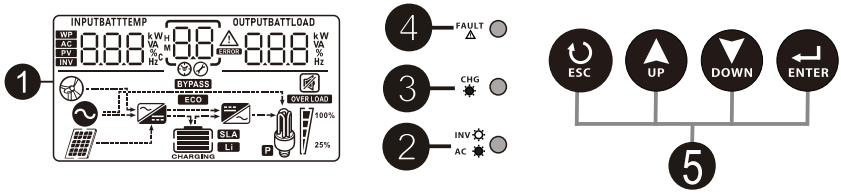
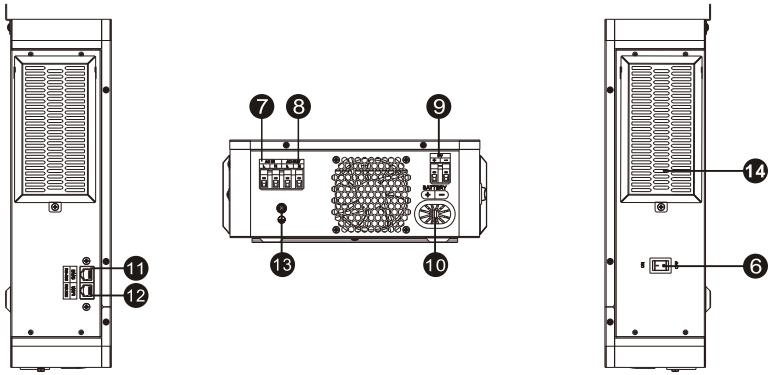


Figure 1 Hybrid Power System

Product Overview





1.LCD screen
2.Status indicator
3.Charging indicator
4.Fault indicator
5.Function keys
6.Power on/off
7.AC input
8.AC output
9.PV input
10.Bttery input
11.Battery communication/RS-485 port
12.WIFI communication/RS-232 port
13.Ground wire terminal
14.Anti dust kit

INSTALLATION

Unpacking And Inspection

Unpack the inverter and make sure there are no damaged objects in the package. You should have received the following items inside of package:

- Machine x 1
- User manual x 1

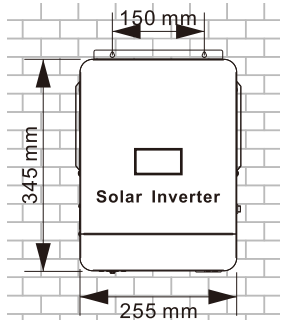
Preparation Before Installation

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

Installation

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 dissipat heat,allow a clearance of approx. 20 cm on both sides and above the equipment, 50 cm 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 .
- ⌘ Make sure that other objects and surfaces are left with enough space from the machine to ensure adequate heat dissipation and that there is enough room to remove the wires.



SUITABLE FOR INSTALLATION ON CONCRETE OR OTHER NON-COMBUSTIBLE SURFACE ONLY

Tighten the screws and fix the installation. Machine fixing screws: M4 or M5 screws are recommended.

Battery Connection

Lead-Acid Battery Connection

WARNING: In order to operate safely and comply with laws and regulations, it is required to install an independent DC overcurrent protector or disconnect device between the battery and the inverter.

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 as below.

Recommended battery cable specifications:

Model	Wire specification		Torque value
2.5KVA-12V	1 * 4 AWG	22mm2	2-3 Nm
3.5KVA-24V	1 * 6 AWG	13mm2	2-3 Nm

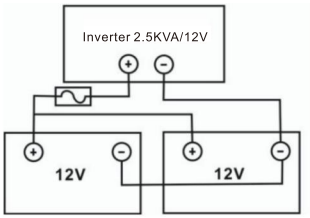
Note: The recommended charging current of lead-acid battery is 0.2C (C is battery capacity).

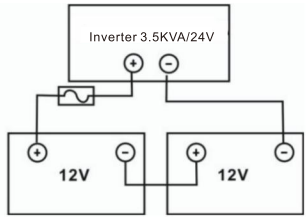
Please follow below steps to implement battery connection:

1. Connect the battery according to the recommended battery cable specifications.
2. Connect all battery packs as needed.
3. Insert the ring terminal of the battery cable into the battery connector of the inverter flatly, and ensure that the bolts are tightened with a torque of 2-3 Nm. Make sure that the polarities of the battery and inverter are connected correctly, and tighten the ring terminal with the battery terminal.

	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,It may cause short circuit or overheating.
	CAUTION! ! Do not apply antioxidant to the terminal before it is tightly connected.
	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(-).

4. Connect all battery packs in the following table.





Lithium Battery Connection

1. Wi-Fi cloud communication (option):

Please use supplied communication cable to connect to inverter and Wi-Fi module. Download APP and installed from APP store, and Refer to "Wi-Fi Plug Quick Installation Guideline" to set up network and registering. The inverter status would be shown by mobile phone APP or webpage of computer.

2. GPRS cloud communication (option):

Please use supplied communication cable to connect to inverter and GPRS module, and then applied external power to GPRS module. Download APP and installed from APP store, and Refer to "GPRS RTU Quick Installation Guideline" to set up network and registering. The inverter status would be shown by mobile phone APP or webpage of computer.

3. Battery communication

The communication between the battery and the inverter can be realized through the battery commun-ication interface, so that the inverter and the lithium battery can exchange information(Baud rate:9600).

4. Lithium battery and inverter connection:

If choosing lithium battery for the inverter, only lithium batteries that have been matched with BMS communication protocol are allowed.

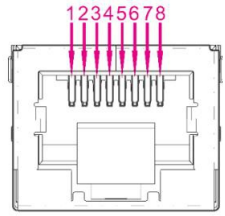
1. Connect the battery according to the recommended battery cable specifications.
2. Insert the ring terminal of the battery cable into the battery connector of the inverter flatly, and ensure that the bolts are tightened with a torque of 2-3 Nm.Make sure that the polarities of the battery and inverter are connected correctly,and that the ring terminal is tightened with the battery terminal.
3. Connect one side of RJ45 cable to the BMS communication port of inverter.
4. Insert the other side of RJ45 cable into RS485 communication port on lithium battery.

NOTE: If you choose a lithium battery.please make sure to connect the battery and inverter with BMS communication cable, and select the battery type as " LIB-485" mode.

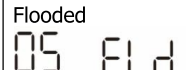
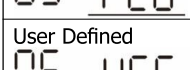
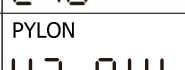
Communication And Setting Of Lithium Battery

1. Connect the RJ45 communication cable between inverter and battery. Please confirm that the lithium battery BMS port's PIN is correspond with the inverter BMS communication port. The inverter BMS port'PIN definition as below:

Pin number	Port definitions
1	RS485B
2	RS485A
3	NG
4	NG
5	NG
6	NG
7	RS485A
8	RS485B

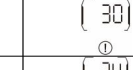


In order to communicate with the lithium battery BMS,you should press the "ENTER" button for a long time,and set the battery type as "LIB-485" in program 05. Then selectthe matching battery protocol in Program 43.

05	Battery type	AGM (default) 
		Flooded 
		User Defined 
		Lithium battery mode 
		Lithium battery communication mode 
43	Lithium battery protocol	PYLON 
		PACE 

CAUTION: When the battery type is set to "LIB-485",the setting items 12,13 and 29 are displayed in percentage.

Battery Alarm Code

Alarm code	Alarm event	Icon flashing
21	Battery Cell Over Voltage	
22	Battery Cell Under Voltage	
23	Battery Pack Over Voltage	
24	Battery Pack Under Voltage	
25	Charging Over Current	
26	Discharging Over Current	
27	Charging Cell Over Temperature	
28	Discharging Cell Over Temperature	
29	Charging Cell Under Temperature	
30	Discharging Cell Under Temperature	
34	Battery capacity is too low	
44	Battery Cell Voltage Imbalance	
45	Battery Cell Temperature Imbalance	
46	Internal Communication Alarm	

Battery fault code

Fault code	Fault event	The icon is long and bright
21	Battery Cell Over Voltage	
22	Battery Cell Under Voltage	
23	Battery Pack Over Voltage	
24	Battery Pack Under Voltage	
25	Charging Over Current	
26	DischargingOver Current	
27	Charging Cell Over Temperature	
28	DischargingCell Over Temperature	
29	Charging Cell Under Temperature	
30	Discharging Cell Under Temperature	
31	Ambient Over Temperature	
32	Ambient Under Temperature	
33	MOS Over Temperature	
35	Battery Short Circuit	
36	Charge Overvoltage	
37	System Failure	
39	Charging MOS Fault	
40	Discharge MOS Fault	
41	Temperature Sensor Fault	
42	Battery Cell Fault	
43	Sampling CommunicationFailure	
61	CommunicationFailure	

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.

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

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

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

Suitable cable specifications for AC wires

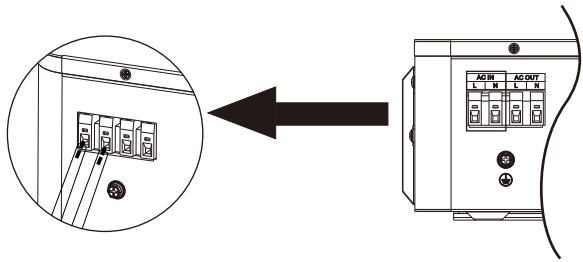
Model	Wire Gauge	Torque Value
2.5KVA-12V	1 * 12 AWG	1.2-1.6 Nm
3.5KVA-24V	1 * 10 AWG	1.2-1.6 Nm

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

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

   L→ LINE (brown or black)

   N→ Neutral (blue)

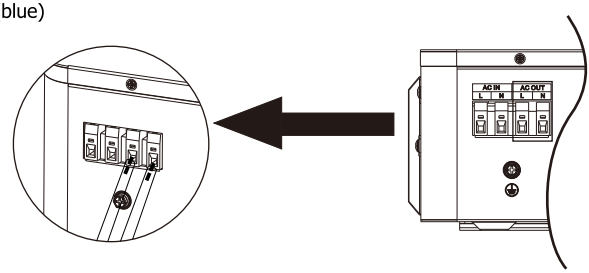


⚠	**WARNING:** **Be sure that AC power source is disconnected before attempting to hardwire it to the unit.**

4. Then, insert the AC output conductor according to the polarity identification at the terminal, and tighten the screw.

L→ LINE (brown or black)

N→ Neutral (blue)



5. Make sure the wires are firmly connected.

⚠	**CAUTION:** Please ensure that all AC cables are connected correctly according to the corresponding polarity.
⚠	**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 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 the PV module, please install separately a DC circuit breaker between the inverter and PV module.

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	Wire Gauge	Torque Value
2.5KVA-12V	1 * 14 AWG	1.2-1.6 Nm
3.5KVA-24V	1 * 12 AWG	1.2-1.6 Nm

PV Module Selection:
When selecting proper PV modules, please be sure to consider below parameters:
1. Open circuit Voltage (Voc) of PV modules not exceeds max. PV array open circuit voltage of inverter.
2. Open circuit Voltage (Voc) of PV modules should be higher than min. battery voltage.

INVERTER MODEL	2.5KVA-12V	3.5KVA-24V
Max. PV Array Open Circuit Voltage	500Vdc	
PV Array MPPT Voltage Range	55Vdc~450Vdc	
IMax.PV	13A	18A
Max. PV Array Power	3000W	4000W

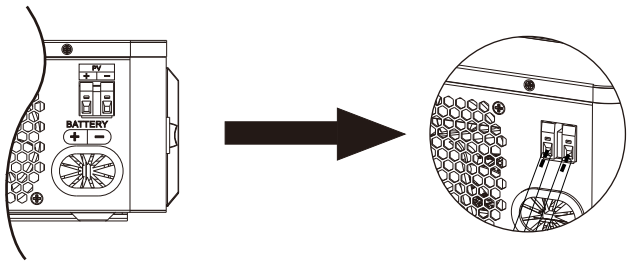
Take 250Wp PV module as an example. After considering above two parameters, the recommended module configurations are listed as below table:

Solar panel parameters -250Wp -Vmp: 30.1Vdc -Imp: 8.3A -Voc: 37.7Vdc -Isc: 8.4A -Cells: 60	Solar Input Range (Min in serial: 6 pcs, max in serial: 11 pcs)	Q'ty of panels	Total Input
	3 pcs in serial	3	750W
	4 pcs in serial	4	1000W
	5 pcs in serial	5	1250W
	6 pcs in serial	6	1500W
	8 pcs in serial	8	2000W
	11 pcs in serial	11	2750W

3. Equipment Assembly

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.



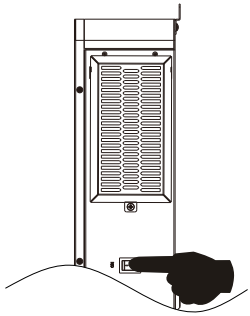
Final Assembly

After connecting all the wires, put the bottom cover back and screw the screws.

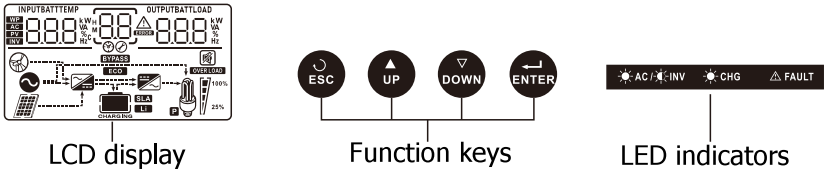
OPERATION

Power On/Off

After installing the machine correctly and connecting the battery correctly, just press the On/Off switch to turn on the machine.



Operation And Display



The operation and display panel is shown in the following figure, which is located on the front panel of the inverter. It includes four function keys and an LCD screen for indicating operationstatus and input/output power information.

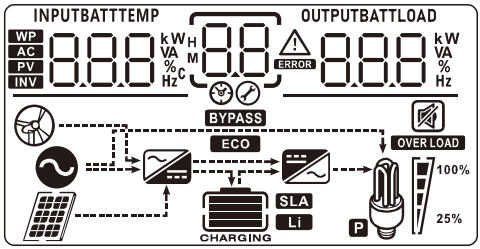
LED Indicator

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.

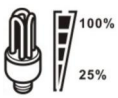
Function Keys

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

LCD Display Icons



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

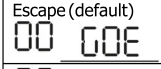
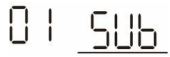
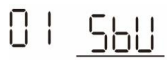
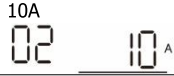
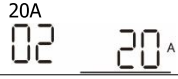
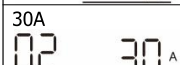
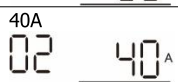
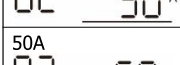
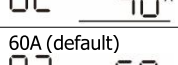
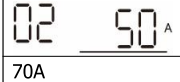
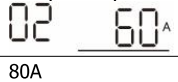
<table>
<tr><td colspan="3">In AC mode, it will present battery charging status.</td></tr>
<tr><td>Status</td><td>Battery voltage</td><td>LCD Display</td></tr>
<tr><td rowspan="4">Constant Current mode/
Constant Voltage mode</td><td><2V/cell</td><td>4 bars will flash in turns.</td></tr>
<tr><td>2 ~ 2.083V/cell</td><td>Bottom bar will be on and the other three bars will flash in turns.</td></tr>
<tr><td>2.083 ~ 2.167V/cell</td><td>Bottom two bars will be on and the other two bars will flash in turns.</td></tr>
<tr><td>> 2.167 V/cell</td><td>Bottom three bars will be on and the</td></tr>
<tr><td></td><td></td><td>top bar will flash.</td></tr>
<tr><td colspan="2">Floating mode. Batteries are fully charged.</td><td>4 bars will be on.</td></tr>
<tr><td colspan="3">In battery mode, it will present battery capacity.</td></tr>
<tr><td>Load Percentage</td><td>Battery Voltage</td><td>LCD Display</td></tr>
<tr><td rowspan="4">Load >50%</td><td>< 1.717V/cell</td><td></td></tr>
<tr><td>1.717V/cell ~
1.8V/cell</td><td></td></tr>
<tr><td>1.8 ~ 1.883V/cell</td><td></td></tr>
<tr><td>> 1.883 V/cell</td><td></td></tr>
<tr><td rowspan="4">50%> Load > 20%</td><td>< 1.817V/cell</td><td></td></tr>
<tr><td>1.817V/cell ~
1.9V/cell</td><td></td></tr>
<tr><td>1. 9 ~ 1. 983V/cell</td><td></td></tr>
<tr><td>> 1.983V/cell</td><td></td></tr>
<tr><td rowspan="4">Load< 20%</td><td>< 1.867V/cell</td><td></td></tr>
<tr><td>1.867V/cell ~
1.95V/cell</td><td></td></tr>
<tr><td>1.95 ~ 2.033V/cell</td><td></td></tr>
<tr><td>> 2.033 V/cell</td><td></td></tr>
<tr><td colspan="3">Load Information</td></tr>
<tr><td></td><td colspan="2">Indicates overload.</td></tr>
<tr><td rowspan="2"></td><td colspan="2">Indicates the load level by 0-24%, 25-50%, 50-74% and 75-100%.</td></tr>
<tr><td>0~24%
</td><td>25~50%
</td><td>50%~75%
</td><td>75%-100%
</td></tr>
</table>

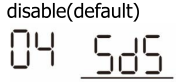
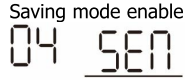
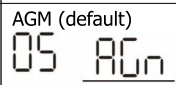
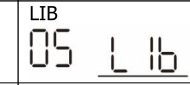
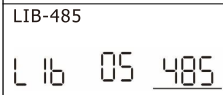
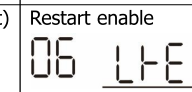
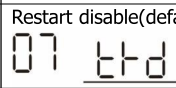
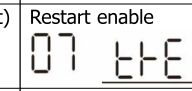
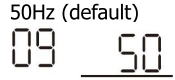
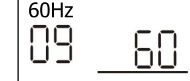
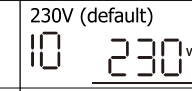
Mode Operation Information	
	Indicates unit connects to the mains.
	Indicates unit connects to the PV panel.
BYPASS	Indicates load is supplied by utility power.
	Indicates the utility charger circuit is working.
	Indicates the DC/AC inverter circuit is working.
	Indicates unit alarm is disabled.

LCD Setting

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

Setting Programs:

Option	Describe	Optional Item	
00	Exit setting mode	Escape (default) 	One-button restore setting options
			
01	Output source priority: To configure load power source priority	SUB priority (default) 	Solar energy gives priority to supplying power to the load. If solar energy can't effectively provide all connected loads, Utility will provide power to the loads at the same time.
		SBU priority 	Solar energy gives priority to supplying power to the load. If solar energy cannot effectively provide all connected loads, the battery 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.
		MKS priority 	Solar energy provides power to the loads as frist priority，if solar energy is not sufficient to power all connected loads，utility energy will supply power to the loads at the same time. The battery only supplies energy to the load as a backup power.
02	Maximum charging current: To configure total charging current for solar and utility chargers.	10A 	20A 
		30A 	40A 
		50A 	60A (default) 
		70A 	80A 
		90A 	100A 

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.
04	Power saving mode enable/disable	Saving mode disable(default) 	If disabled,no matter connected load is low or high,the on/off status of inverter output will not be effected.
		Saving mode enable 	If enabled, the output of inverter will be of when connected load is pretty low or not detected.
05	Battery type	AGM (default) 	Flooded 
		User-Defined 	LIB  When using lithium battery and not connected to BMS communication
		LIB-485 	If "User-Defined" is selected, battery charge voltage and low DC cut-off voltage can be set up in program 26, 27 and 29.
06	Auto restart when overload occurs	Restart disable(default) 	Restart enable 
07	Auto restartwhen over temperature occurs	Restart disable(default) 	Restart enable 
09	Output frequency	50Hz (default) 	60Hz 
10	Output voltage	220V 	230V (default) 
		240V 