User Manual

LOW Voltage Stackable Lithium Energy Storage System

Version: 1.3

Contents

1. Introduction

The energy storage battery system can provide electricity for the connected load, and store energy from photovoltaic solar modules, fuel generators, or wind energy generators for backup power. When the sun goes down, energy demand is high, or there is a power outage, you can use the energy stored in the battery to meet your energy needs at no additional cost. In addition, the energy storage system can help you achieve energy self-consumption and ultimately achieve the goal of energy independence.

According to different power conditions, the energy storage system can output power during peak power consumption, and can also store energy during low power consumption. The simple diagram of a typical energy storage system as following:
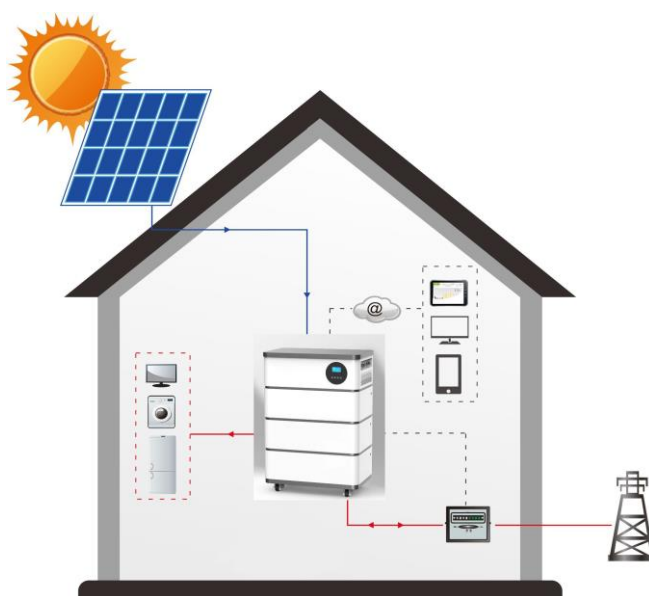

Figure 1 Energy storage System Overview

It is very important and necessary to read the user manual carefully before installing or using the battery. Failure to follow any of the instructions or warnings in this document may result in warranty lost or serious injury or death, or battery damage etc.

● If the battery is stored for a long time, it is requirement that they are charged every three to six months, and the SOC should be no less than 80%, after fully discharging, the battery needs to be recharged within 12 hours.
● Do not expose cable outside. Do not use cleaning solvents to clean the battery.
● All battery terminals must be disconnected before maintenance.

2. Important Safety Warning

● Do not expose the battery to flammable or harsh chemicals or vapors.
● Do not paint any part of the battery, include any internal or external components.
● Do not connect battery with PV solar wiring directly.
● Any object is prohibited to be inserted into any part of the battery.
● Our company will not bear any warranty claims for direct or indirect damage caused by violation of the above items.

2.1 Before Connecting

● After unpacking, please check the battery and pack list first, if the battery is damaged or spare parts are missing. Please contact the dealer.
● Before installation, be sure to cut off the grid power and make sure the battery is in the turned-off mode;
● Wiring must be correct, do not mix-connect the positive and negative cables, and ensure no short circuit with the external device;
● It is prohibited to connect the battery with AC power directly;
● The BMS in the battery is designed for below 100VDC system, DO NOT connect battery in series;
● It is prohibited to connect the battery with different type of battery;
● Please ensure the electrical parameters of battery system are compatible to inverter;
● Keep the battery away from fire or water.

Necessary installation Tools

Multimeter + Current clamp	Screw Driver Set	Lifting strap + mechanical lifter

Personal protective equipment.

Insulated gloves	Safety goggles	Safety shoes	Helmet

2.2 During operation

● If the battery system needs to be moved or repaired, the power must be cut off first and the battery is completely shut down;

● It is prohibited to connect the battery with different type of battery;

● It is prohibited to put the batteries working with faulty or incompatible inverter;

● In case of fire, only dry powder fire extinguisher can be used, liquid fire extinguishers are prohibited;

● Please do not open, repair or disassemble the battery. We do not undertake any consequences or related responsibility due to violation of safety operation or violating of design, production and equipment safety standards.

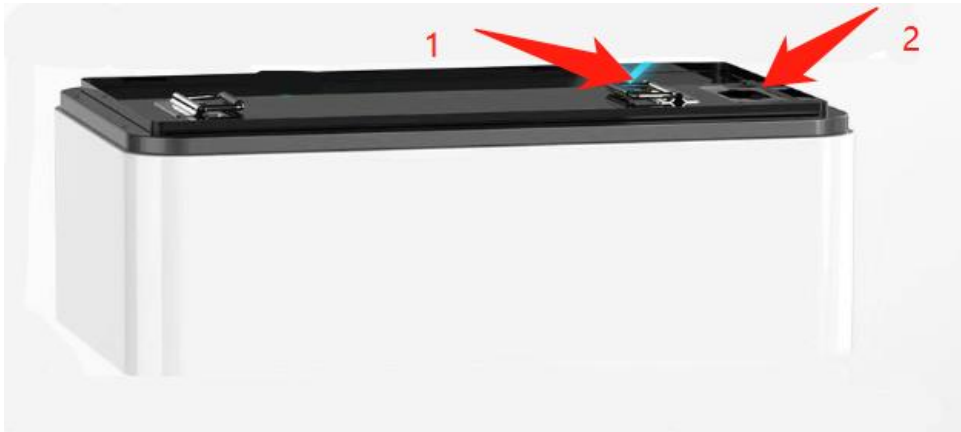# 3. Unpacking & Overview

3.1 Packing List

You will receive the following parts (Not a standard set), sample as follow picture. For customized requirements, please contact the manufacturer.
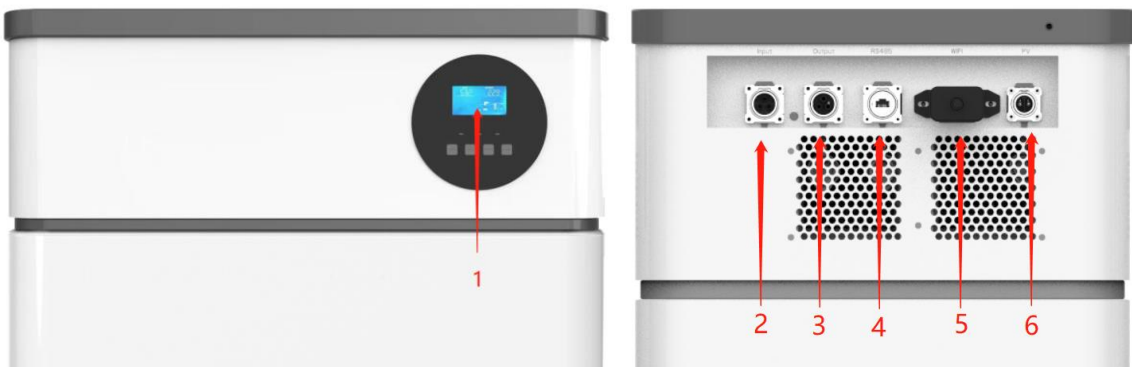
Battery pack	INVERTER box	PV connectors
base*1	Manual *1	AC connector

3.2 Product Overview

Battery module

No.	Description
1	Handle
2	Pack Output terminal

Inverter box

No.	Description	Silk-screen
1	LCD	INTVERTER LCD
2	Input terminal	GRID　INPUT
3	Output terminal	GRID　OUTPUT
4	RS485	BATTER RS485
5	Wifi	WIFI
6	PV terminal	PV terminal

4. Installation

4.1 Selecting Mounting Location

Consider the following points to install the energy storage system:
- The energy storage system needs to be installed on a solid surface;
- It is recommended to place the energy storage system horizontally.
- To ensure air circulation and heat dissipation, please leave a gap about 200mm away from the side of the device.
- The ambient temperature should be between 0°C and 40°C, and the relative humidity should be between 25% and 85% to ensure optimal operation.
- Install the battery module in a dry, protected, dust-free area with sufficient air circulation. Do not operate in locations where the temperature and humidity are outside the specified range.

4.2 Mounting the PACK

⚠️ **WARNING!!** Remember that this Pack is heavy so please be careful when removing it from the package, or install it .

Step 1: When receiving the product, firstly check if all parts are complete as the packing list, if not, please report to the Dealer .

Step 2: Take out the battery pack and base from the box, lay the base flat, and then lift the battery pack up and place it in a fixed position. (Note: The battery pack with a fixed base is different from other modules, with no connectors at the bottom) as shown in the figure:

Step 3: Align the connector, place the second battery module on top of the first battery module and press it tightly; Install the third battery module. Finally, install the battery control box. The installation is complete, as shown in the following figure:

Step 4: Start the system, press the power lock switch, and push the circuit breaker switch up to start the system.

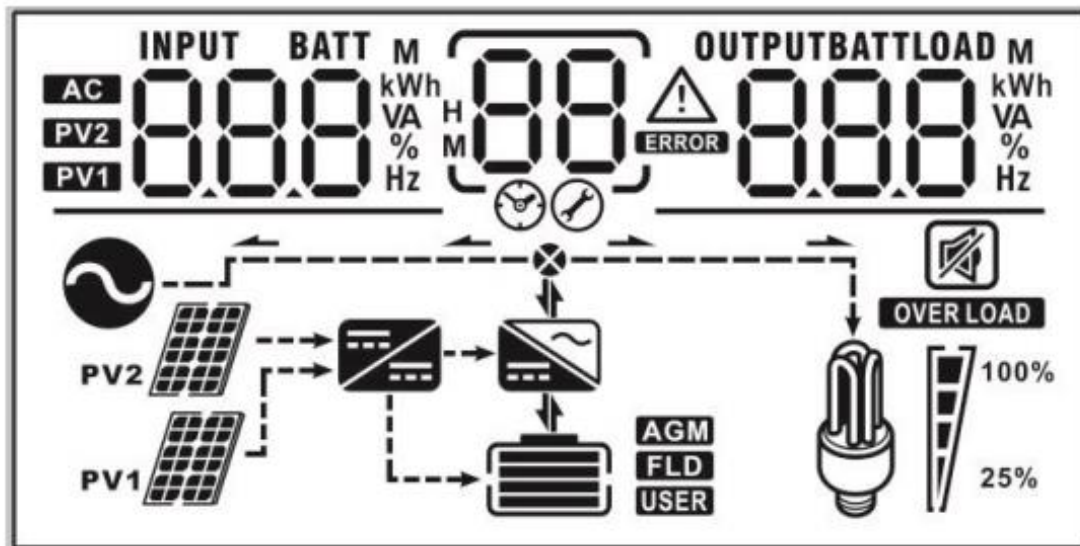## 4.3 Operation And Display Panel

The operation LCD panel, shown in the chart below, includes one RGB LED ring, four touchable function keys and a LCD display to indicate the operating status and input/output power information.
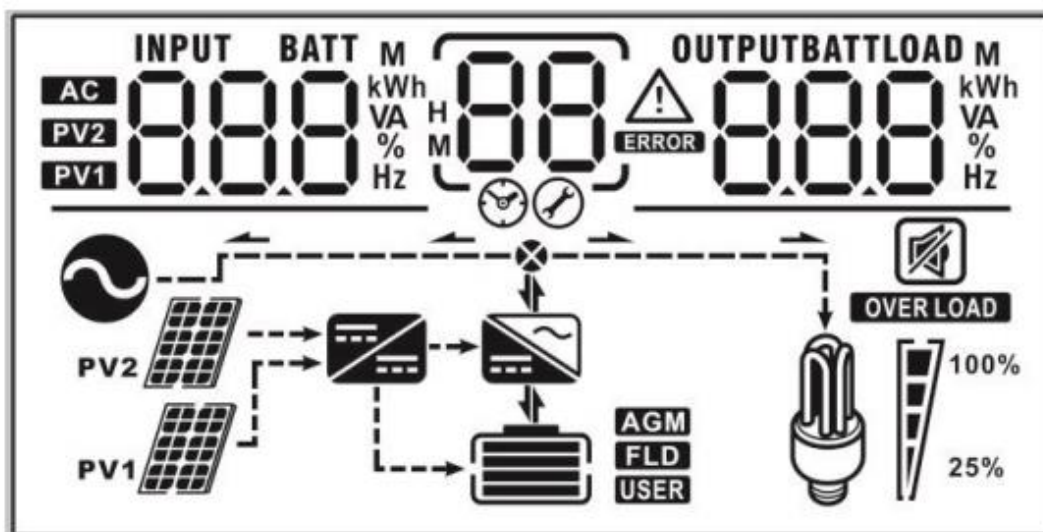
Touchable Function Keys

Function Key		Description
↻	ESC	To exit the setting
▲	Up	To last selection
▼	Down	To next selection
↵	Enter	To confirm/enter the selection in setting mode

4.4 LCD Display Icons
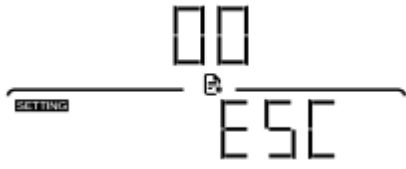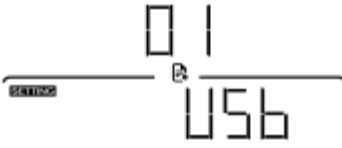
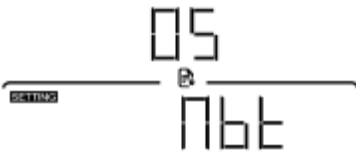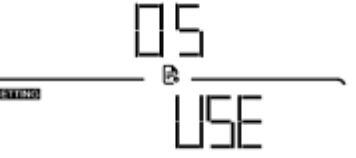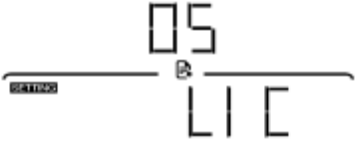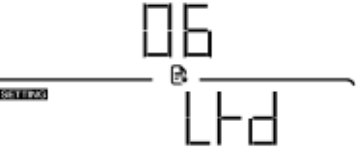| Icon	Function
Input source information	
AC	Indicates the AC input
PV1	Indicates the PV1 panel input
Left digital display information	
INPUT BATT M kWh VA % Hz (AC PV2 PV1) 888	Indicate input voltage, input frequency, battery voltage, PV voltage, charger current
Middle digital display information	
88	Indicates the setting programs.
88 ERROR	Indicates the warning and fault codes. Warning: Flashing 88⚠ with warning code Fault: display 88 ERROR with fault code
Right digital display information	
OUTPUTBATTLOAD M kWh VA % Hz 888	Indicate the output voltage, output frequency, load percent, load VA, load W, PV charger power, DC discharging current.
Battery information	
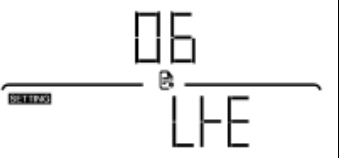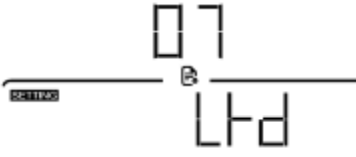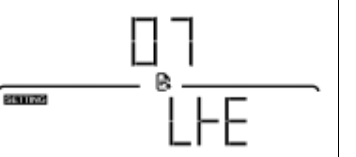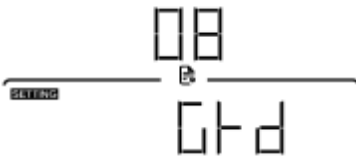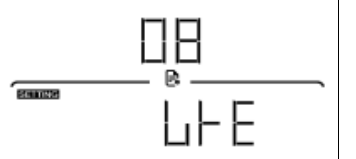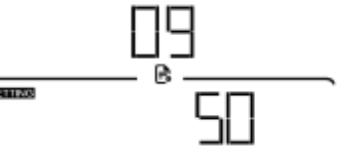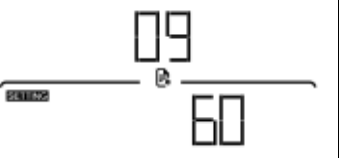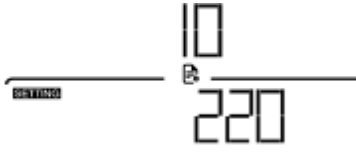
4.5 LCD Setting
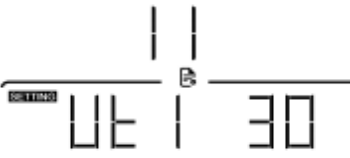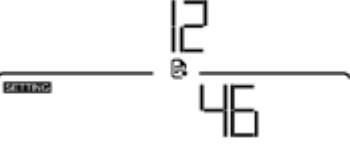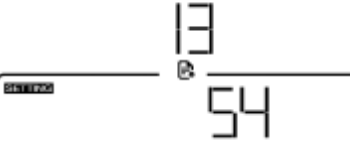
After pressing and holding ENTER button for 3 seconds, the unit will enter setting mode. Press "UP" or "DOWN" button to select setting programs. And then, press "ENTER" button to confirm the selection or ESC button to exit.
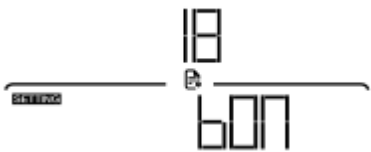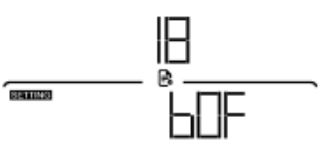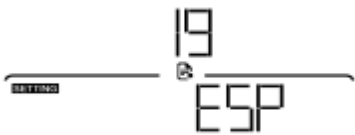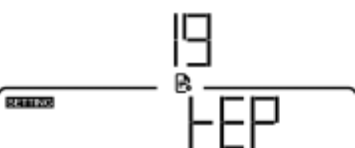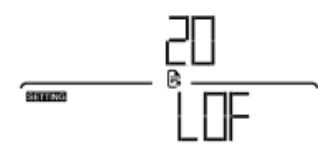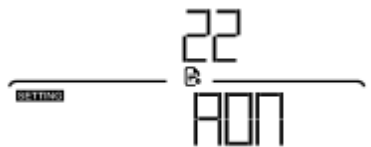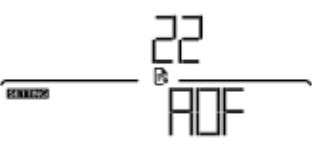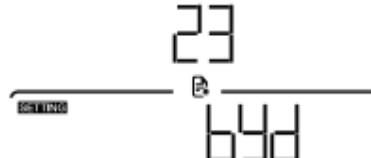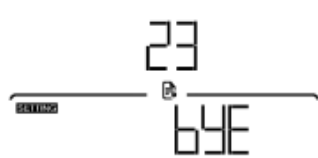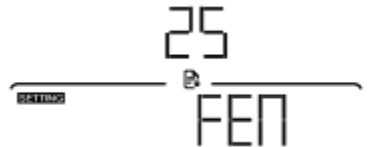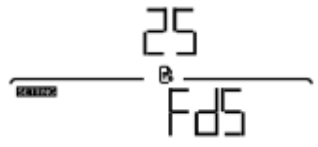
Note: All settings must be modified in battery mode and must be rebooted to be valid.
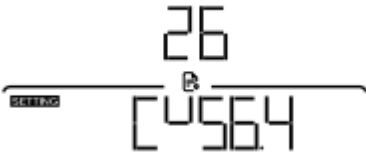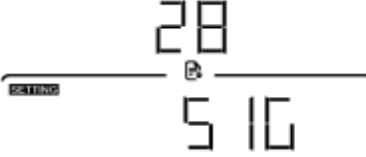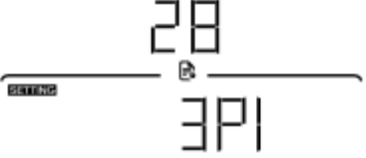
Program	Description	Selectable option	
00	Exit setting mode	Escape 00 SETTING ESC	
01	Output source priority : To configure load power source priority	Utility First (default) 01 SETTING USb	Utility will provide power to the loads as first priority. solar and battery energy will provide power to the loads only when utility power is not available
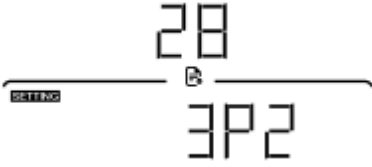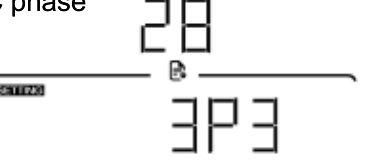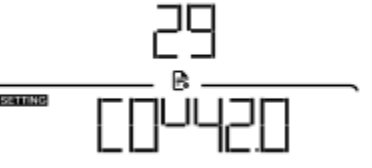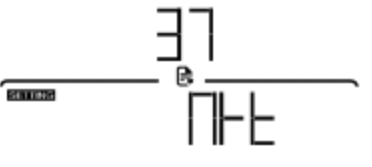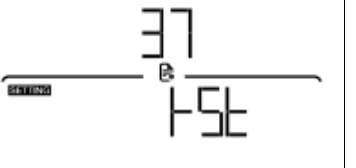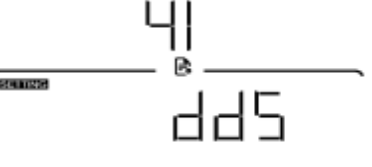
		Solar first	Solar energy provides power to the loads as first priority. if solar energy is not sufficient to power all connected loads, Utility energy will supply power to the loads at the same time.
		☐¹ SUb	
		Battery priority	Solar energy provides power to the loads as first priority.if solar energy 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.
		☐¹ SbU	
02	Maximum charging current: (Max. charging current = utility charging current + solar charging current)	60A (default) 02 60	Setting range is from 10A to 100A. Increment of each click is 10A.
03	AC input voltage range	Appliances (default) 03 APL	If selected, acceptable AC input voltage range will be within 90-280VAC.
		UPS 03 UPS	If selected, acceptable AC input voltage range will be within 170-280VAC.
05	Battery type	AGM (default) 05 AGN	Flooded 05 FLd

11

		No battery 05 SETTING Πbt	
		User- Defined 05 SETTING USE	If "User-Defined" is selected, battery charge voltage and low DC cut-off voltage can be set up in program 26, 27 and 29.
		3rd　Party Lithium Battery 05 SETTING LIC	If selected "LIC – LI5", programs of 02, 26, 27 and 29 will be automatically set up. No need for further setting. Please contact the battery supplier for installation procedure.
06	Auto restart when overload occurs	Restart disable (default) 06 SETTING Ltd	Restart enable 06 SETTING LtE
07	Auto restart when over temperature occurs	Restart disable (default) 07 SETTING Ltd	Restart enable 07 SETTING LtE
08	Feed back into the grid	Disable (default) 08 SETTING Gtd	Enable 08 SETTING LtE
09	Output frequency	50Hz (default) 09 SETTING 50	60Hz 09 SETTING 60
10	Output voltage	220V 10 SETTING 220	230V (default) 10 SETTING 230
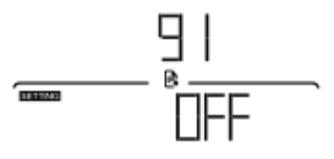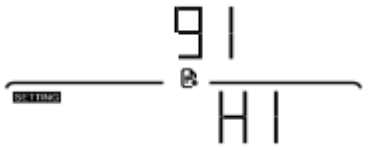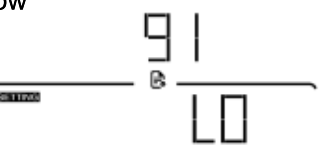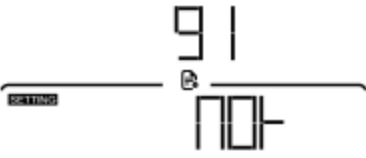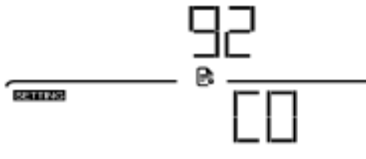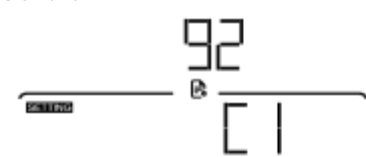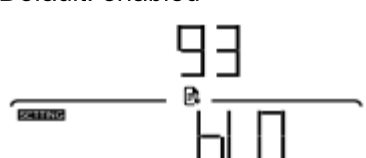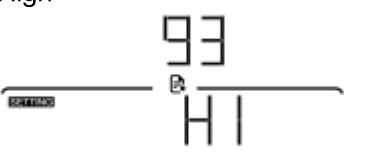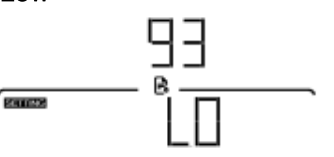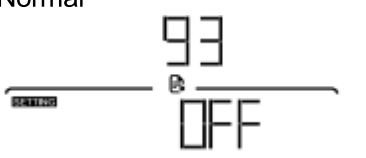
		240V	
		10 ⚙ **240**	
11	Maximum utility charging current Note: If setting value in program 02 is smaller than that in program in 11, the inverter will apply charging current from program 02 for utility charger.	30A (default) **11** ⚙ **UtI 30** model	Setting range is 2A, then from 10A to 80A. Increment of each click is 10A.
12	Setting voltage point back to utility source when selecting "SBU" (SBU priority) in program 01.program 01	46V model(default) **12** ⚙ **46**	Setting range is from 44V to 51V. Increment of each click is 1V.
13	Setting voltage point back to battery mode when selecting "SBU" (SBU priority) in program 01.	Battery fully charged **13** ⚙ **FUL**	
13	Setting voltage point back to battery mode when selecting "SBU" (SBU priority) in program 01.	48V model **13** ⚙ **54**	54V (default) Setting range is from 48V to 58V. Increment of each click is 1V.
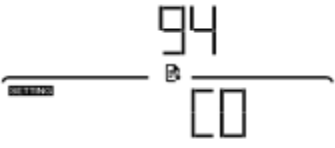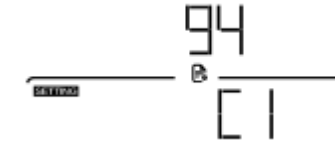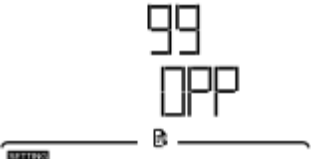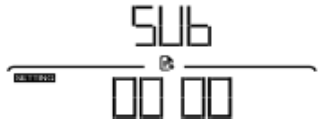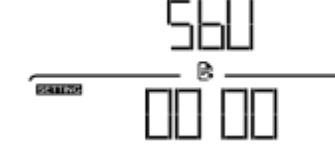
18	Alarm control	Alarm on (default) 18 bON	Alarm off 18 bOF
19	Auto return to default display screen	Return to default display screen (default) 19 ESP	If selected, no matter how users switch display screen, it will automatically return to default display screen after no button is pressed for 1 minute.
		Stay at latest screen 19 HEP	If selected, the display screen will stay at latest screen user finally switches.
20	Backlight control	Backlight on(default) 20 LON	Backlight off 20 LOF
22	Beeps while primary source is interrupted	Alarm on (default) 22 AON	Alarm off 22 AOF
23	Overload bypass: When enabled, the unit will transfer to line mode if overload occurs in battery mode.	Bypass disable (default) 23 byd	Bypass enable 23 byE
25	Record Fault code	Record enable (default) 25 FEN	Record disable 25 FdS

26	Bulk charging voltage (C.V voltage)	Available options for 48V model: 56.4V (default) 26 SETTING CU56.4	If user defined is selected in program 5, this program can be set up. Setting range is from 48.0V to 61.0V. Increment of each click is 0. 1V.
27	Floating charging voltage	Available options for 48V model: 54.0V (default) 27 SETTING FL U54.0	If user defined is selected in program 5, this program can be set up. Setting range is from 48.0V to 61.0V. Increment of each click is 0. 1V.
28	Single and Parallel setting	Default 28 SETTING SIG	Single: enable
		Single-phase parallel 28 SETTING PAL	Single-phase parallel enable
28	Single and Parallel setting	A phase 28 SETTING 3PI	A-phase parallel enable
		B phase	B-phase parallel enable

		3P2	
		C phase **3P3**	C-phase parallel enable
		Please note: 1. when three-phase parallel, make sure that A-phase is the host; 2. after the parallel parameters are modified, the device must be restarted to be effective. 3. All inverters must share the same battery pack when paralleling 4. This setting is only available when the inverter is in standby mode (Switch off).	
29	Low DC cut-off voltage	Available options for 48V model: 42V (default) **CV420**	If use-defined is selected in program 5, this program can be set up. Setting range is from 42.0V 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.
37	Reset all stored data for PV generated power and output load energy	Not reset(Default) **nrt**	Reset **rSt**
41	Discharge limited current	**ddS**	Discharge current limited disable

		41 10	Setting range :10A to 200A setting increase or decrease of 10A. NOTE:1. if you work in "SUB mode" or "SBU mode", when the loads is greater than the current limiting point, it will automatically switch to utility mode. 2.if it only works in battery mode, when the load is greater than the current limiting point ,the inverter will shut down immediately.
85	Time setting – Minute	85 n In 0	For minute setting, the range from 0 to 59
86	Time setting – Hour	86 HOU 0	For hour setting, the range is from 0 to 23.
87	Time setting– Day	87 1	For day setting, the range is from 1 to 31.
88	Time setting– Month	88 1	For month setting, the range is from 1 to 12.
89	Time setting – Year	89 22	For year setting, the range is from 17 to 99.
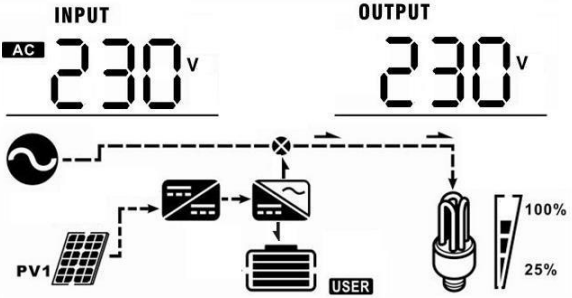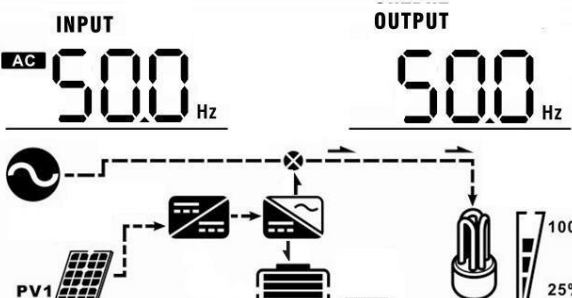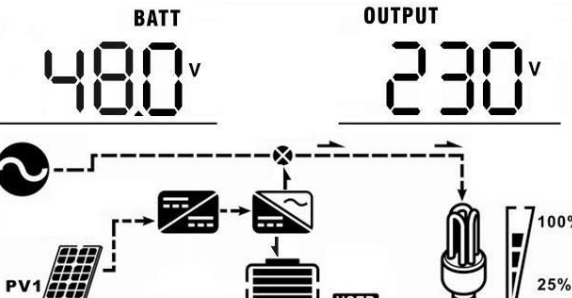
91	On/Off control for surround RGB LED	Enabled (default) 91 bLП	Disable 91 OFF
		It's necessary to enable this setting to activate RGB LED lighting function.	
	Surround RGB brightness	Brightness of RGB LED: high 91 HI	Brightness of RGB LED: low 91 LO
		Brightness of RGB LED: normal 91 ПOt	
92	Surround RGB LED effect	Default: Cycling 92 CO	The cycle of seven kinds of color.
		Solid on 92 C1	" [1 " to " [7 " can be used in one of the colors
93	On/Off control for LOGO RGB LED	Default: enabled 93 bLП	Disabled 93 OFF
	LOGO RGB brightness	High 93 HI	Low 93 LO
		Normal 93 OFF	

94	LOGO RGB LED effect	Default: Cycling	The cycle of seven kinds of color.
		Solid on	" [|] " to " [⌐] " can be used in one of the colors
99	Timer Setting for Output source Priority	Once access this program, it will show "OPP" in LCD. Press " ↵ " button to select timer setting for output source priority. There are three timers to set up. Press " ▲ " or " ▼ " button to select specific timer option. Then, press " ↵ " to confirm timer option. Press " ▲ " or " ▼ " button to adjust starting time first and the setting range is from 00 to 23. Increment of each click is one hour. Press " ↵ " to confirm starting time setting. Next, the cursor will jump to right column to set up end time. Once end time is set completely, press " ↵ " to confirm all setting.	
		Utility USb 00 00	Solar SUb 00 00
		SBU priority timer SbU 00 00	

Setting Programs:

4.6 LCD Display

The LCD display information will be switched in turns by pressing " ▲ " or " ▼ " 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 board firmware version and SCC firmware version.

Select item	LCD display
Input voltage and output voltage (Default Display Screen)	Input Voltage=230V, output voltage=230V
Input frequency and output frequency	Input frequency=50.0Hz, output frequency=50.0Hz
Battery voltage and output voltage	Battery Voltage=48.0V, output voltage=230V

Battery voltage and load percentage	Battery Voltage=48.0V, load percentage = 68%
Battery voltage and load in VA	Battery Voltage=48.0V, load in VA=1.08kVA
Battery voltage and load in Watt	Battery Voltage=48.0V, load in Watt=1.88kW
PV1 voltage and PV1 charger power	PV1 Voltage=360V, charging power=1.58kW
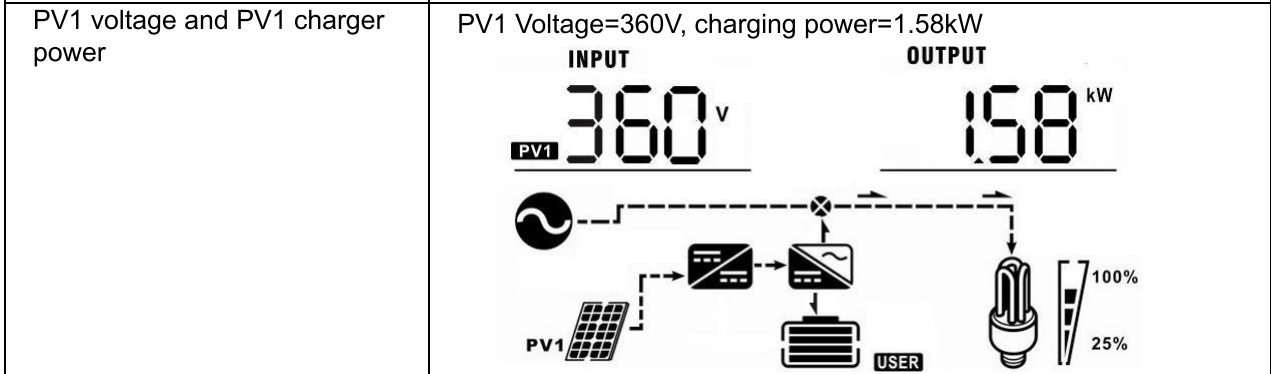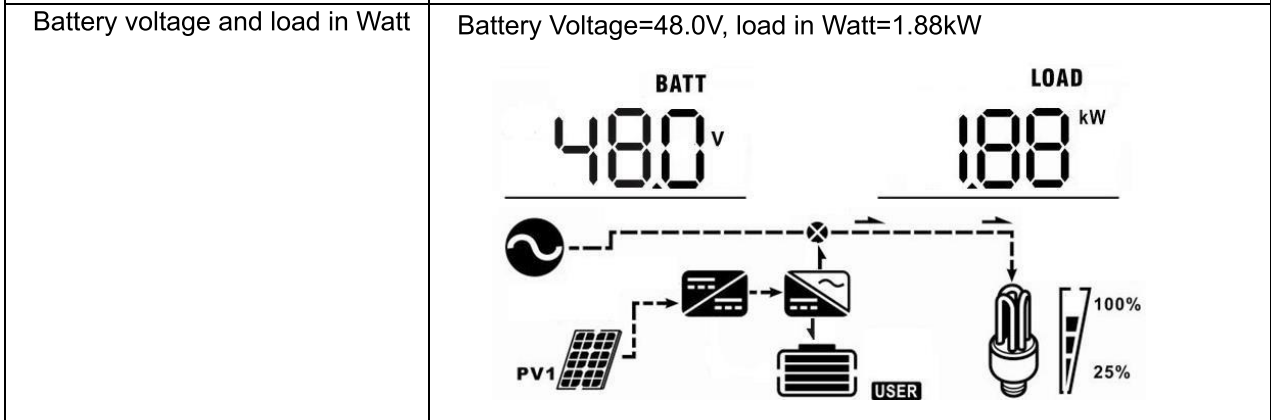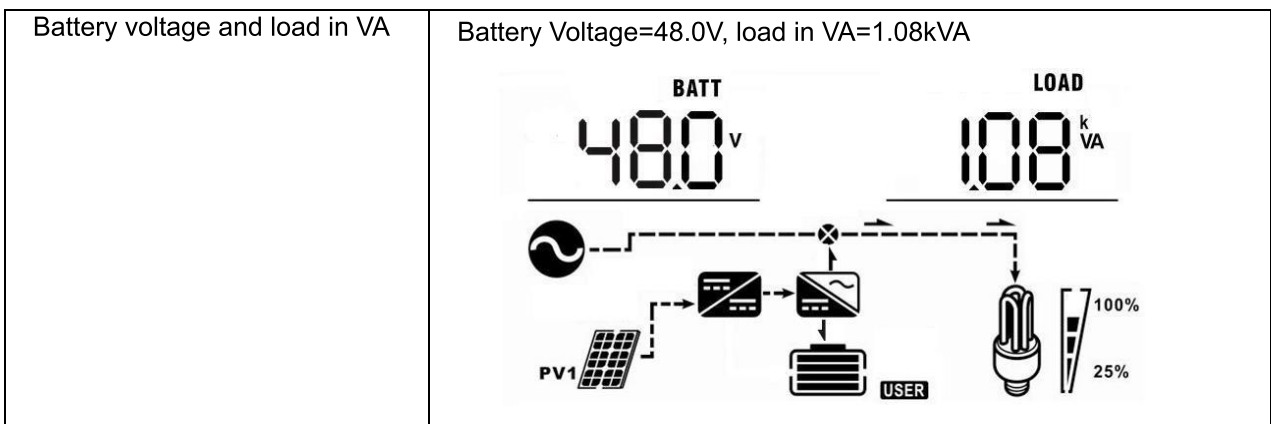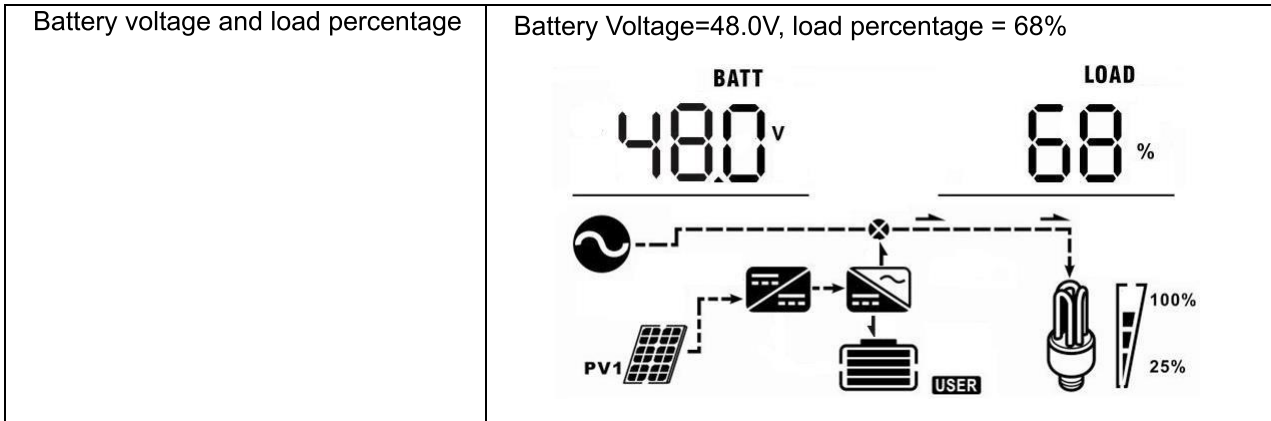
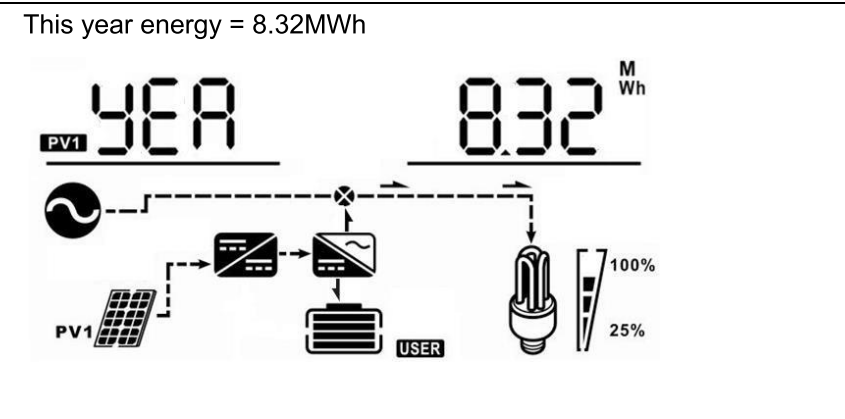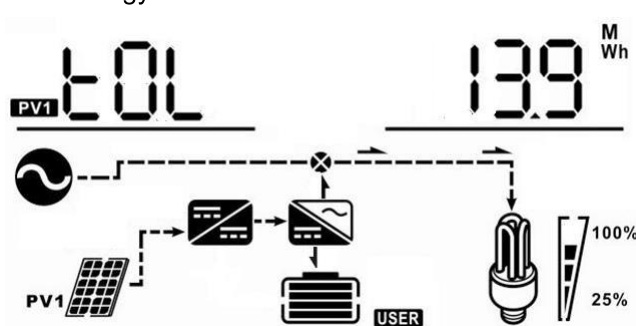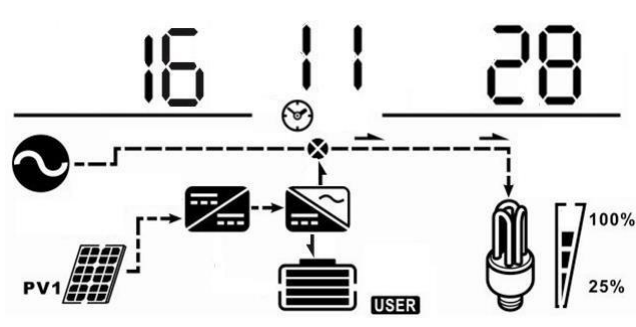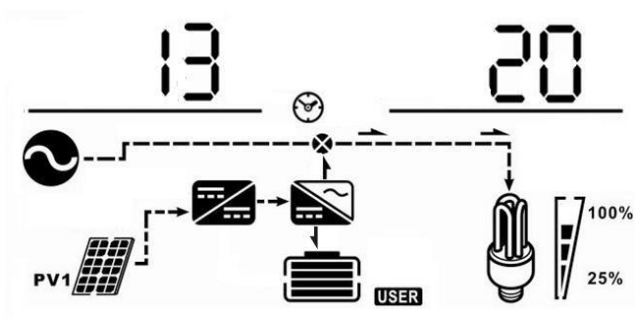| Charger current and DC discharging current	Charging current=30A, discharging current=0A INPUT BATT OUTPUTBATT **30** A **0** A PV1 PV1 USER 100% 25%
PV energy generated today	Today energy = 6.3kWh **dAY** **6.3** kWh PV1 PV1 USER 100% 25%
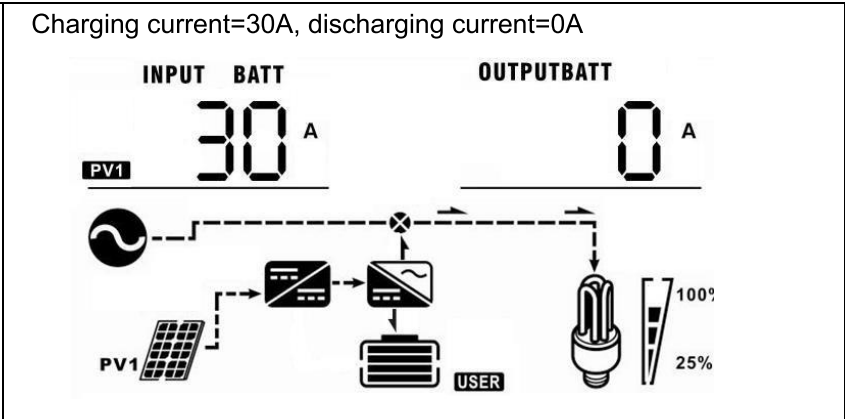
PV energy generated this month	This month energy = 358kWh. **nOn** **358** kWh PV1 PV1 USER 100% 25%
PV energy generated this year	This year energy = 8.32MWh **YEA** **8.32** MWh PV1 PV1 USER 100% 25%
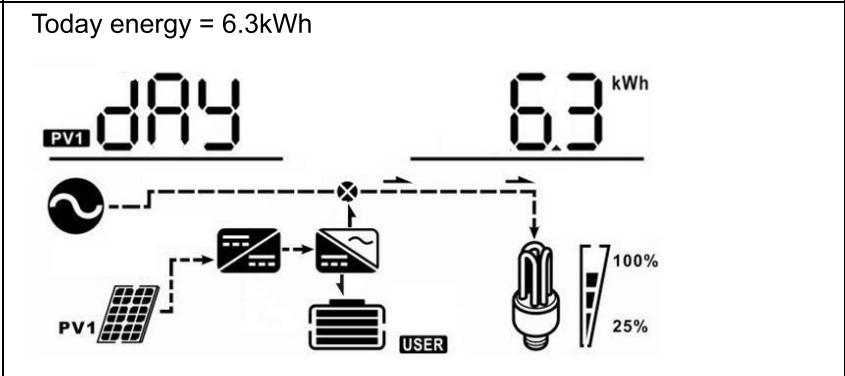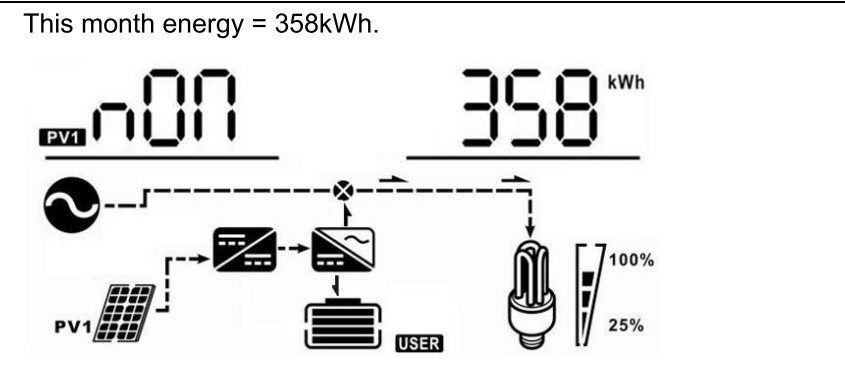
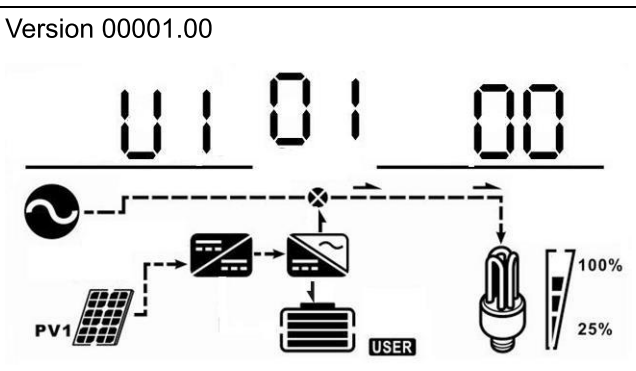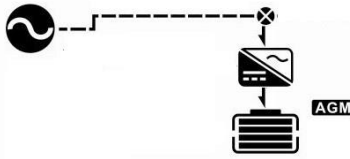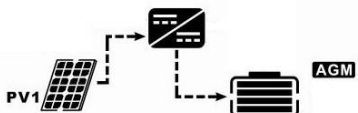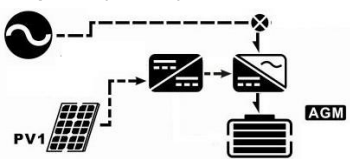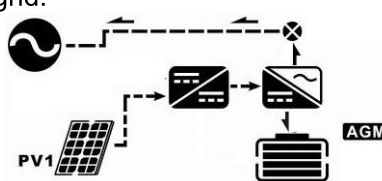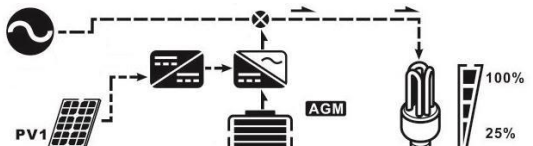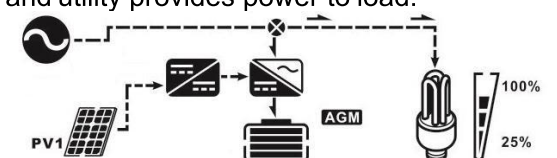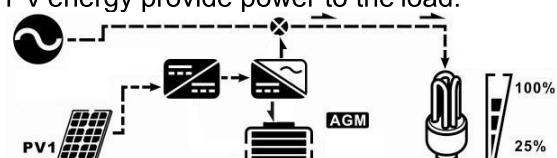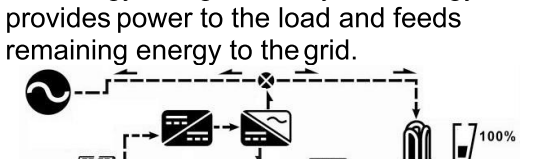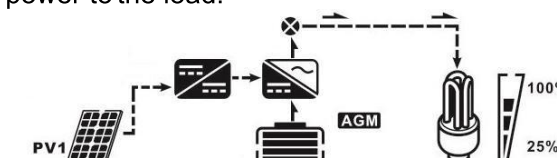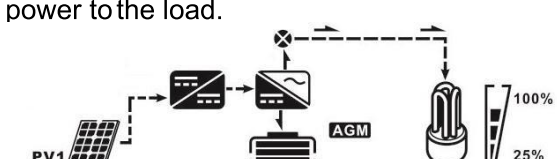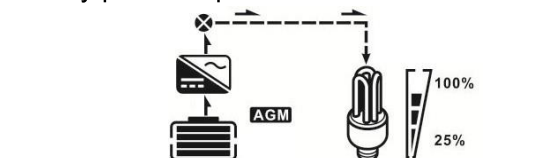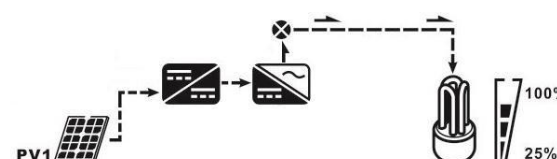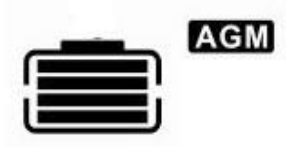|	
PV energy generated totally	Total energy = 13.9MWh tOL 139 M Wh PV1 PV1 USER 100% 25%
Real date	Real date Nov 28, 2016. 16 11 28 PV1 USER 100% 25%
Real time	Real time 13:20. 13 20 PV1 USER 100% 25%

Main board firmware version	Version 00001.00 U1 01 00 PV1 USER 100% 25%

Operating Mode Description

Operating mode	Behaviors	LCD display
Standby mode **Note:** *Standby mode: The inverter is not turned on yet but at this time, the inverter can charge battery without AC output. *Power saving mode: If enabled, the output of inverter will be off when connected load is pretty low or not detected.	No output power, solar or utility charger available	Battery is charged by utility. Battery is charged by PV energy. Battery is charged by utility and PV energy. Battery is charged by PV energy and feed PV energy to grid. No charging.
Line mode	Output power from utility. Charger available	Utility charges battery and provides power to Utility and battery power provide power to load.
Line mode	Output power from utility. Charger available	PV energy, battery power and utility provide power to load.
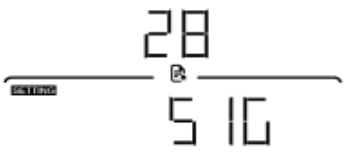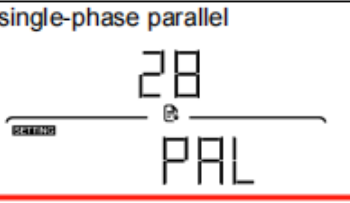
		PV energy and utility charge battery, and utility provides power to load.
		PV energy charges battery, utility and PV energy provide power to the load.
		PV energy charges battery, PV energy provides power to the load and feeds remaining energy to the grid.
Battery mode	Output power from battery or PV	PV energy and battery energy supply power to the load.
		PV energy charges battery and provides power to the load.
		Battery provides power to the load.
Only PV mode	Output power from PV	PV provides power to the load.

Fault mode **Note:** *Fault mode: Errors are caused by inside circuit error or external reasons such as over temperature, output short circuited and so on.	No output, No Charging.	No charging. AGM

5. Parallel Installation Guide

5.1 Matters Needing Attention In Single-phase Parallel Operation

1. Parallel operation in single phase with up to 3 units.
2. WARNING: It is forbidden for inverter to share the same solar panel group.
3. Set the parameters of each inverter separately (working mode, single - phase parallel function).

| 28 | Single and Parallel setting | default
28
SIG | Single enable |
| | | single-phase parallel
28
PAL | single-phase parallel enable |

Warning: When working in parallel, the working mode of each inverter must be the same working mode,

output frequency.

After setting the parameters, turn on each inverter in turn.

5.2 Single-phase Parallel Operation Cable Connection

5.2.1. Two inverters in parallel:
Power Connection:
NOTE: The following picture only for your reference. It is subject to actual goods to be received.
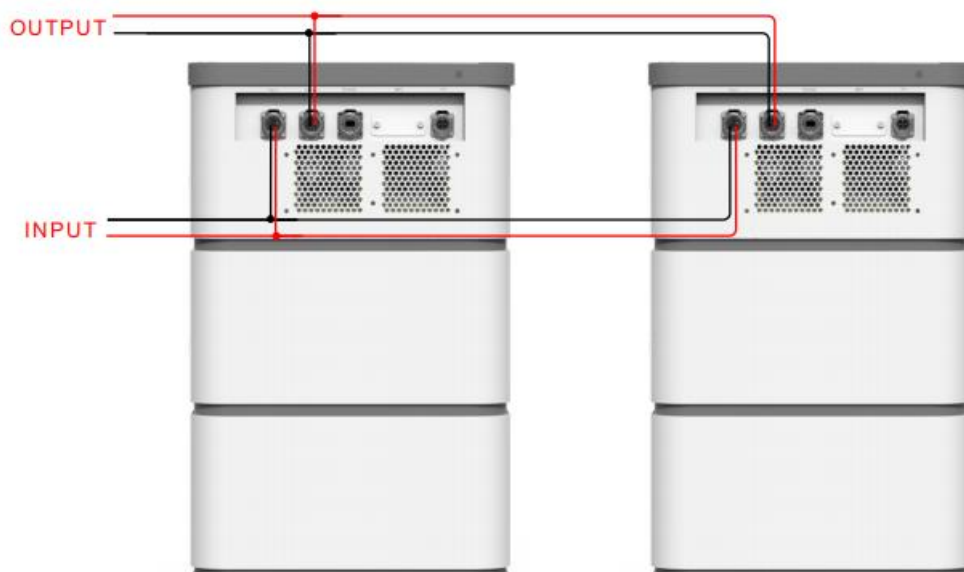
Communication Connection:

5.2.2. Three inverters in parallel：
Power Connection:
NOTE: The following picture only for your reference. It is subject to actual goods to be received.
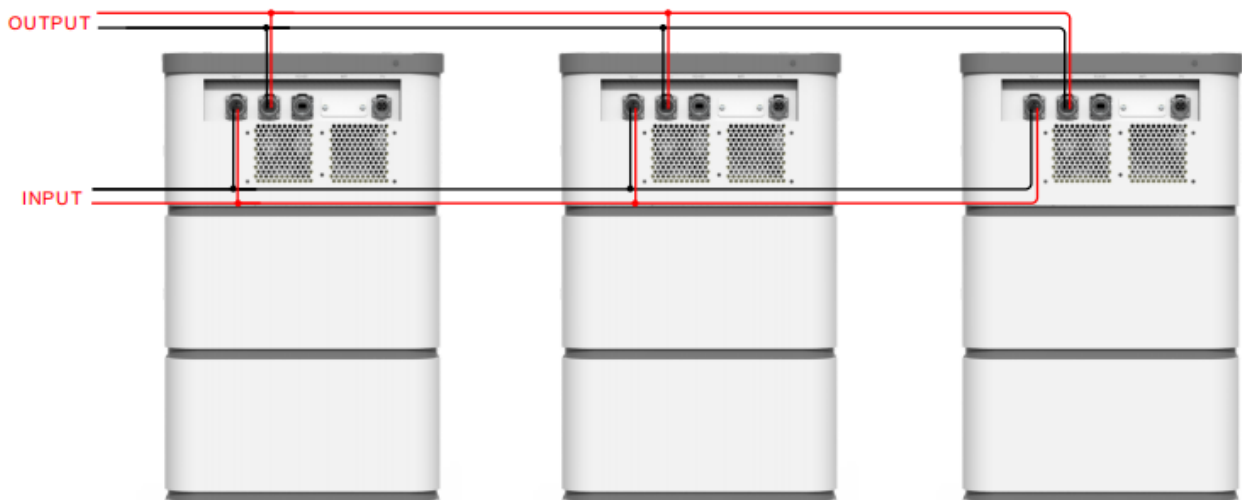
Communication Connection:
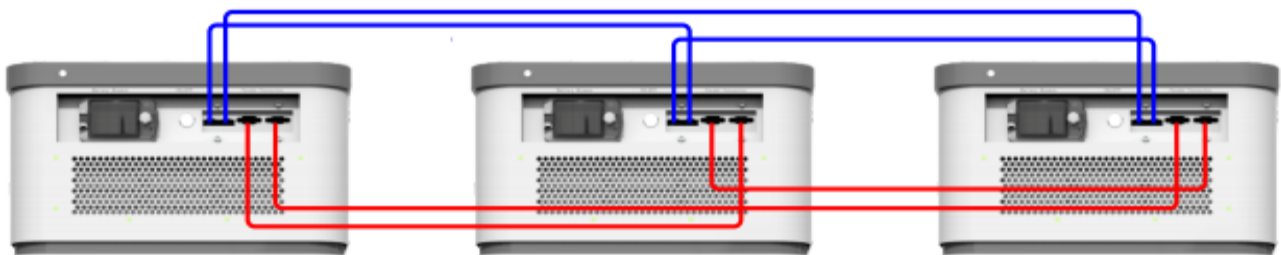
6．Faults Code

Fault Code	Fault Event
01	Fan is locked
02	Over temperature
03	Battery voltage is too high
04	Battery voltage is too low
05	Output short circuited
06	Output voltage is too high
07	Overload time out
08	Bus voltage is too high
09	Bus soft start failed
52	Bus voltage is too low
53	Inverter soft start failed
55	Over DC voltage in AC output
57	Current sensor failed
58	Output voltage is too low

7. Warning Code

Warning Code	Warning Event
01	Fan is locked
02	Over temperature
03	Battery is over-charged
04	Low battery
07	Overload
08	Discharged over current
10	Output power derating
15	PV energy is low
16	High AC input (>280VAC) during BUS soft start
21	PV low voltage

22	PV over voltage
24	PV over temperature

8．Specifications

Table 1 Line Mode Specifications

MODEL	5.6KW
Input Voltage Waveform	Sinusoidal (utility or generator)
Nominal Input Voltage	230Vac
Low Loss Voltage	170Vac±7V (narrow range); 90Vac±7V (wide range)
Low Loss Return Voltage	180Vac±7V (narrow range); 100Vac±7V (wide range)
High Loss Voltage	280Vac±7V
High Loss Return Voltage	270Vac±7V
Max AC Input Voltage	300Vac
Nominal Input Frequency	50Hz / 60Hz (Auto detection)
Low Loss Frequency	40±1Hz
Low Loss Return Frequency	42±1Hz
High Loss Frequency	65±1Hz
High Loss Return Frequency	63±1Hz
Output Short Circuit Protection	Circuit Breaker
Efficiency (Line Mode)	>95% (Rated R load, battery full charged)
Transfer Time	10ms typical (narrow range); 20ms typical (wide range)
Output power derating: When AC input voltage drops to 170V, the output power will be derated.	

Table 2 Inverter Mode Specifications

MODEL	5.6KW	
Rated Output Power	5600W	
Output Voltage Waveform	Pure Sine Wave	
Output Voltage Range	230Vac±5%	
Output Frequency	50Hz	
Peak Efficiency	93%	
Overload Protection	5s@≥130% load; 10s@105%~130% load	
Surge Capacity	2* rated power for 5 seconds	
Nominal DC Input Voltage	48Vdc	
Cold Start Voltage	46.0Vdc	
Low DC Warning Voltage @ load < 50%	46.0Vdc	
@ load ≥ 50%		44.0Vdc
Low DC Warning Return Voltage @ load < 50%		47.0Vdc
@ load ≥ 50%		46.0Vdc
Low DC Cut-off Voltage @ load < 50%		43.0Vdc
@ load ≥ 50%		42.0Vdc
High DC Recovery Voltage		62Vdc
High DC Cut-off Voltage		63Vdc
No Load Power Consumption		<55W

Table 3 Charge Mode Specifications

INVERTER MODEL	5.6KW	
Charging Algorithm	3-Step	
Utility Charging Mode		
AC Max. Charging Current	2/10/20/30/40/50/60/70A/80Amp (@VI/P =230Vac)	
Bulk Charging	Flooded Battery	58.4VDC

Voltage	AGM / Gel Battery	56.4VDC
Floating Charging Voltage		54.0VDC
Charging Curve		

Solar input

Model	5.6KW
PV Input Max. Power	5500W
Max. charging current (Solar+AC)	100A
Nominal PV Voltage	360Vdc
Start-up Voltage	150Vdc +/- 10Vdc
PV Array MPPT Voltage Range	120-450VDC
Max. PV Array Open Circuit Voltage	450Vdc
PV Max input current	18A