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# Sunfine PV Inverter SMÜ Series User's Manual

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# Sunfine PV Inverter SMÙ Series

## User's Manual

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## 1. Safety instruction

Safety use of equipment covers electric mounting, equipment running, maintenance and so on, as follows:

- ◊ Read the manual carefully before installation, any defect caused by the incorrect installation will not be covered by the manufacturer's warranty.
- ◊ The whole installation procedure must be measured up to the local electric mounting standards.
- ◊ When mounting, don't touch any parts inside except terminal blocks.



Please contact our local installation and maintenance worker when the product is needed to be maintained. It is forbidden for unauthorized person to repair it.

## 2. Before installation

### 2.1 Ready to install

Check whether all delivered accessories are complete or not:

- ◊ One Sunfine SMÙ PV inverter;
- ◊ One Warranty Card;
- ◊ One Users' Manual;
- ◊ One Test Report;
- ◊ One monitor software named SFENGINEER and one RS232 communication link;(option)
- ◊ One or two pairs of DC wires named sDCCon depending on your power grade and one AC wires named sACCon;
- ◊ Mounting accessories such as pattern sheet, metal expansion bolts, etc.

### 2.2 Get to know Sunfine PVI SMÙ

#### External dimension

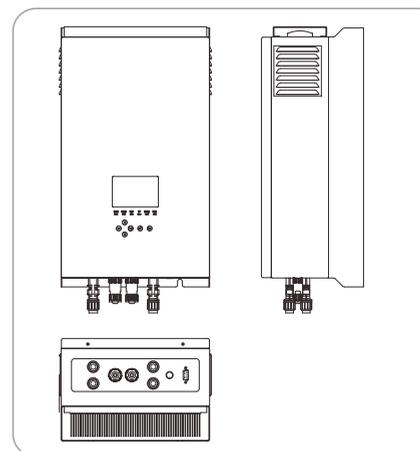


Fig.1 Outside drawing of PV inverter SMÙ series

#### External ports

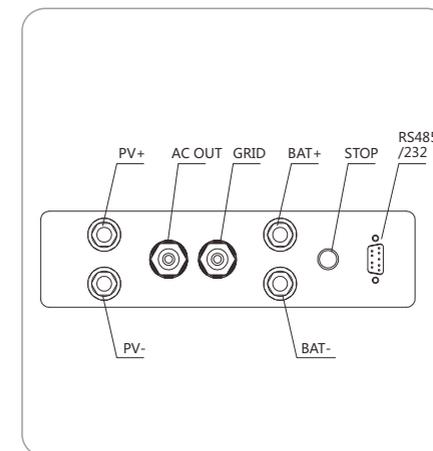


Fig.2 Terminals figure for PV inverter SMÙ series

Table 1 Ports and buttons at the bottom of machine

Ports	Pin number	Description
PV+ PV-	1~2 pairs	According to the needed PV power, connect 1~2 PV groups to the inverter. PV+ : anode pole of DC input, using red wiring; PV- : cathode pole of DC input, using black wiring
BAT+ BAT-	1-2 pairs	Determine the quantity of series battery according to the stand by time and the max. battery input current. BAT+ : anode pole of DC input, using red wiring; BAT- : cathode pole of DC input, using black wiring.
AC OUT	Single phase (L, N, PE)	AC OUT will be used as connection port of load end during off-grid output. Single phase: L-line, red wiring; N-line, blue wiring; PE, yellow and green
GRID	Single phase (L, N, PE)	The port is only configured in machines with batteries which used in public grid standby circumstance. Single phase: L-line, red wiring; N-line, blue wiring; PE, yellow and green.
STOP	Button	Button to STOP or restart the system
RS485/232	COM port	Remote monitor of single or several machines



**Notice:**  
The dimensions and parameters are subject to change without notice.

### Circuit structure

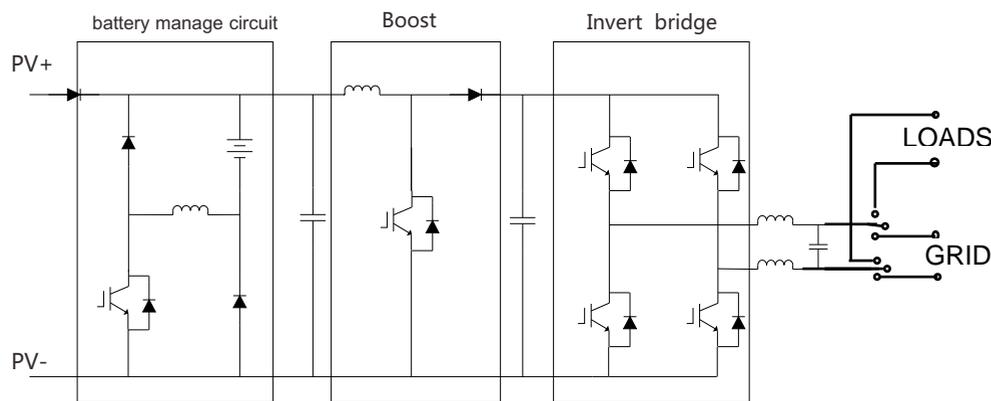


Fig. 3 the main circuit structure diagram of PVI SMB series

The main circuit structure diagram of PVI SMS series is as shown as Fig 3 . The PV charges the battery for energy storage via battery manage circuit, when the produce energy of PV is in abundance, the DC OUT of PV will be raised to proper value so as to invert to stable AC supply for load. Once the produce energy of PV is short of supply and also national grid is abnormal, the DC OUT of battery will output stable AC supply for load.

### 2.3 Choose installation site

In order to ensure the machine work normally, choose installation site where:

- ◇ The protecting grade of the Sunfine SMS is IP65, it can be installed outdoors;
- ◇ The ambient temperature for Sunfine SMS should be between  $-25^{\circ}\text{C} \sim +60^{\circ}\text{C}$ ; leave enough space around the Sunfine SMS to ensure better heat dissipation;
- ◇ Install the Sunfine SMS upon secure wall but not plastic sheet or thin wooden board to avoid noise interrupting your rest when installing the machine in residential area;
- ◇ Install the machine in low-temperature, dry and draughty places, and keep away from inflammables or explosives;
- ◇ Dont install the machine at the place where may be touched unconsciously and frequently, for example, the place where the children play around;

### 2.4 Fixed installation

Install the inverter according to the procedures as follows:

- ◇ Use the pattern sheet as a hole drilling template and mark the hole location on the wall;
- ◇ Drill 4 holes in the wall with a M8 drilling tool. The depth of the hole shall be between 6 and 7cm.
- ◇ Put the screw into the expansion bolt, and set in the hole;
- ◇ Mount the SMB inverter through hanging up on the bolt with its screw hole aligned to the bolt;
- ◇ Set gasket and fix all bolts firmly.

### 2.5 Electric wiring

#### DC wiring

Sunfine SMS can be connected with 1~2 groups of PV cells. You can connect 1~2 groups of PV cells which are parallel connected inside the inverter. Our Sunfine SMS is equipped with special PV connector named sDCCon. Not our designated PV connector is prohibited.

Connect the DC IN according to the procedures as follows:

- ◇ Switch off the breaker in PV(or BAT)line, make sure that the wiring of PV cells(or battery) is currentless;
- ◇ Check the polarity of PV cell(or battery) and wire the anode and cathode correctly.
- ◇ Measure the open-circuit voltage of PV groups with multimeter and make sure that the open-circuit voltage not exceeding 360V (DC);
- ◇ Connect the anode and cathode polarity of PV cell (or battery) correctly.

#### AC wiring

AC wiring of Sunfine SMB includes connections to AC load and public grid. Our Sunfine SMS adopts dedicated AC connectors named sACCon. Not our designated PV cell connector is prohibited.

Connect to AC loads or power grid according to the procedures as follows:

- ◇ Choose the breakers with enough capacity according to the parameters of PV inverter, connect them close to AC OUT port and GRID port respectively.
- ◇ Switch off the breakers;
- ◇ Connect the AC OUT or GRID port with AC connectors named sACCon, and tighten up.



#### Caution:

Use AC connecting wire as short as possible, to ensure the line loss under one percent of rated power.  
Only when the wiring is finished that the breaker can be switched on to connect machine to AC loads or public grid.

### Wiring of communication wires

SUNFINE PV inverter owns two communication modes named RS232 and RS485. You can monitor single or several Sunfine SMB remotely with PC just by connecting the PC's serial port to machines'.

### 2.6 Trial run

Make sure that the followings have been done before starting up the Sunfine SMS:

- ◇ AC wires have been connected correctly;
- ◇ All DC IN such as PV and BATTERY have been connected to inverter correctly, left the unused DC connectors covered with sealed cap.
- ◇ Switch on the breakers in PV IN, BAT IN, GRID and AC OUT lines.
- ◇ According to the fault LCD, working state LCD, and the six indicator lamps on control panel to check if Sunfine SMS runs well. If the FAULT lamp and the fault LCD indicate that the system runs without fault, it means the machine starts successfully.

### 2.7 The sequence of switch on and shut down

When switch on, you should switch on the circuit breaker in AC OUT line firstly, and switch on the circuit breaker in PV and BAT line, then, the device are to be launched.

If you are in need of emergency shutdown, you should shut down the circuit breaker by the side of PV array.



Caution :

When repair, you can open the cover three minutes after power off, to prevent remaining capacity on components inside the device causing electric shock. When open the case, you should carry about three centimeters off the case, and gently push the cover approximately 10 cm forward. Disassemble the FFC cable between LCD on cover and Mainboard before removing the cover.

## 3.Operation

### 3.1 Working mode

**Auto run:** The PV cells charges the storage battery through Sunfine SMS, when the energy produced by PV cells is sufficient, the direct current output from the PV cells will be converted into stable alternating current through Sunfine SMS for loads; and once the produced energy is short of supply, the grid will supply power to the loads; when the produced energy is short of supply and also national grid is abnormal, the storage battery will output electricity to loads.

**Emergency stop:** Set [EMERGENCY STOP], shut down the power module of inverter, leaving the mainboard under the state of monitoring. The machine enters into the state of non-locking emergency stop. You can remove the state by pressing STOP button.

**Maintain:** Once the inverter works abnormally, set [MAINTAIN], leaving mainboard working for repairment. Then, the system will not react to the control of system restarting by STOP button.

**Shut down:** Set [SHUT DOWN], shut down the mains supply of the inverter.

### 3.2 LCD menu operation

#### 3.2.1 LCD display and control panel

Normally, the LCD display and control panel of Sunfine SMB can be divided into text/menu/graphic display space, fault LCD, working state LCD, and date/time 4 function areas, as shown as following diagram.

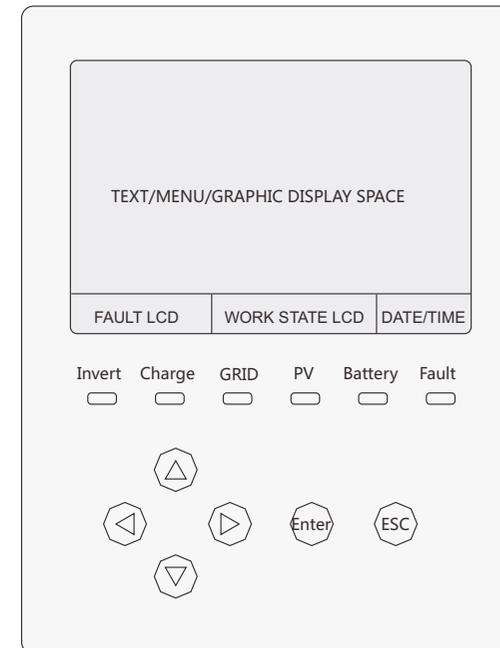


Fig.4 LCD display and control panel

**Text /menu/graphic display space:** Normally, this area shows realtime graphic monitoring dynamic information figure. When you operate the LCD display and control panel, text/menu/graphic display space shows corresponding LCD menu. You can read features, data, run log and settings of PV inverter through LCD menu.

**Fault LCD:** Normally, this area shows “Sunfine Off grid Gen”. Once the checking system finds out internal fault, the fault LCD will indicate the fault information of PV inverter.

**Working state LCD:** this area shows the current working state of PV inverter.

**Date/time:** this area shows the current date and current time.

**Invert:** invert indicator lamp, it lights while inverting, otherwise, it goes out.

**Charge:** charge indicator lamp, it lights while charging, otherwise, it goes out.

**GRID:** mains supply indicator lamp, it lights while the mains' voltage and frequency are in accord with the grid condition, otherwise, it goes out.

**PV:** PV cell indicator lamp, it lights while the PV cells are normal, otherwise, it goes out.

**Battery:** battery indicator lamp, it lights while the battery pack is normal, otherwise, it goes out.

**Fault:** fault indicator lamp, it lights when the checking system finds out internal fault.

Table 2 Function description of keys

Keys	Function
[CANCEL]	Return
[ENTER]	Enter
↑	Move up the control menu focus/increase value
↓	Move down the control menu focus/decrease value
→	Move the control menu focus right
←	Move the control menu focus left

3.2.2 Edit mode

Set the state and parameters in edit mode. Press [ENTER] and enter into the menu edit mode, press “←” “→” to move the focus to the needed editing place, such as “units”, “tens”, “hundreds”... and “hour”, “minute”, “second”. Press “↑” “↓” to increase or decrease the value of parameters needed editing.

Press [ENTER] to confirm the setting or change and return, press [ESC] to cancel the setting or change and return.

3.2.3 Menu structure

Main structure of the LCD menu is shown as following diagram:

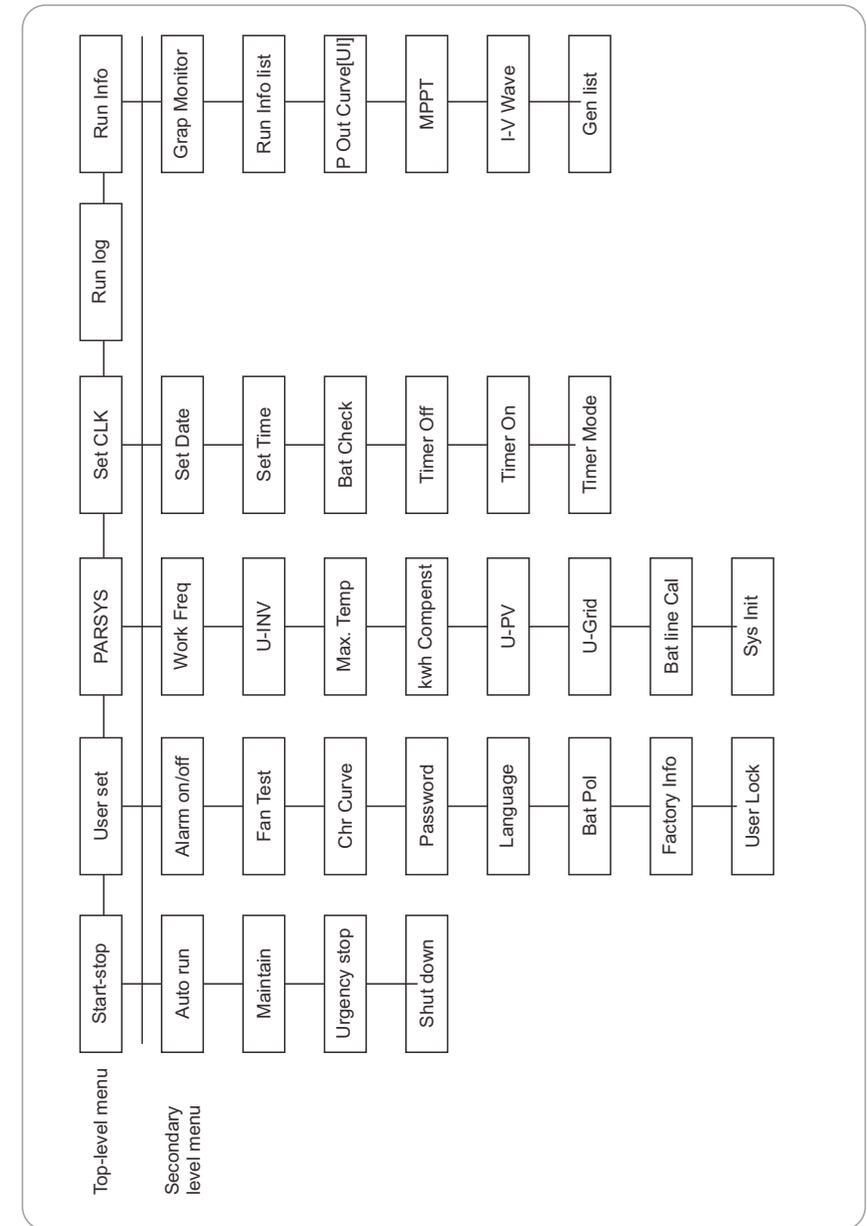


Fig.5 Menu structure

Table 3 Top-level menu items of LCD

Top-level menu	Description
Start-stop	You can switch the working mode through [Start-stop].
User set	You can read features and settings of PV inverter through [User set].
PARSYS	You can modify the run parameters of PV inverter through [PARSYS].
Set CLK	You can modify the timer parameters through [Set CLK].
Run log	It records manual operation and running log of the PV inverter.
Run Info	It records realtime data of the PV inverter.

To avoid wrong operation and improve the safety of the product, you can only be permitted to enter into secondary and the following submenu after password authorization.



The setting of the product state and parameter can only be authorized to persons who are specially trained.

Choose top-level menu of LCD and press [ENTER], the text/menu/graphic display space is shown as Fig.5. Initial password of the system is 666666, please enter into [Password] under the [User set] to modify the password.

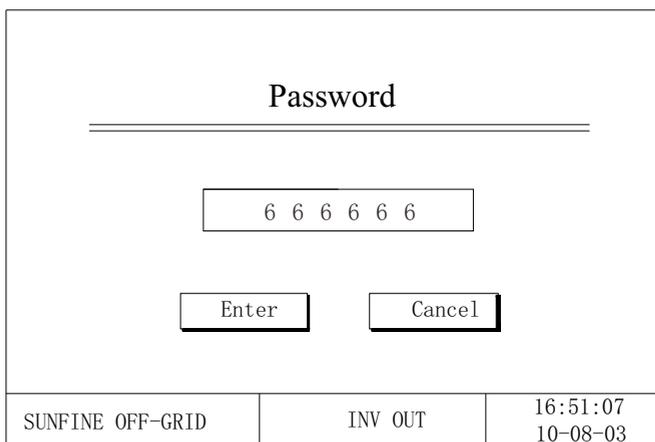
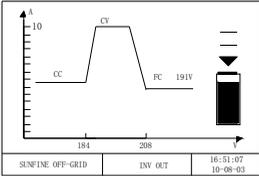
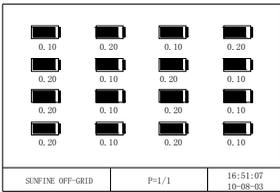
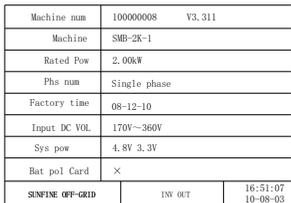


Fig. 6. Password authorization window

User set

Table 4 Setting items and description of user set

Function	Factory preset	Users' option	Description
Alarm on/off	On	On(off)	Start or shut down the system buzzer
Fan test	Off	On(off)	To test whether the system fan could work normally or not
Chr Curve		Null	The system charges batteries adopting three-segment curve charging way
Password	666666	Six decimal	Set password for users' authorization
Language	English	English or Chinese	Bilingual choice
Bat pol		Null	The text/menu/graphic display space shows the batteries' realtime monitoring picture and corresponding battery voltage, press [ENTER], label below will switch to battery-NO.; The working state LCD shows pagination, press [DOWN], the pagination point to next page.
Factory Info		Null	Electronic nameplate
User lock	Off	On or off	Key lock. Need to authenticate the password again before operating LCD menu

**System parameters setting**

Table 5 Setting items and description of system parameters

Function	Factory preset	Users' option	Description
Work Freq	SYS(Hz)= USE(Hz)=50Hz	49.3≤USE(Hz) ≤50.5	It means the system frequency before system' s protection action or anti-island failure. You can set [Work Freq] in range from SYS(Hz)-negative frequency drift to SYS(Hz)+positive frequency drift. SYS: normal value; USE: correctable.
U-INV	SYS(V)= USE(V)=220	165≤USE(V) ≤265	Before system' s protection action, You can set USE(V) in range from Min. invert voltage to Max. invert voltage. SYS: normal value; USE: correctable.
Max. Temp	ENV(°C)=60 IPM(°C) =90	ENV(°C) ≤60 IPM(°C) ≤90	It means the maximum temperate limit of the environment and module before system' s protection action. ENV (°C): temperature of environment; IPM (°C): temperature of module
KWH Compenst	Null	Absolute compensate range:±0~99KWh Relative compensate range: ±0~99KWh	The [kwh Compenst] is used to compensate the different part between generation measurement on LCD and actual KWH meter. It includes two kinds of compensation, absolute compensation (±) and relative compensation (%). The absolute compensation is for total generation measurement, and the relative compensation is for the [Gen list] under [Run Info].
U-PV		Min(V)=170≤U ≤Max(V)=360	It means the voltage on two ends of PV cell before system' s protection action. You can set [U-PV] in range from Min. PV-IN off voltage to Max. PV-IN on voltage
U-Grid	220	Min(V)=165≤U ≤Max(V)=265	It means mains AC voltage of allowed grid. You can set [U-Grid] in range from min. grid voltage to max. grid voltage
Bat line Cal	Null	Null	Let the output value of system sampling circuit be linear with batteries' voltage through conic compensation.
Sys Init	No	Yes or no	Recover factory information

**Timer setting**

Table 6 Setting items and description of timer

Function	Factory preset	Users' option	Description
Set date	Null	YY-MM-DD	Current date calibration, year-month-date
Set time	Null	HH-MM-SS	Current time calibration, hour-minute-second
Bat check	30 days 85%	DAYS: 0~999 days ; %. C: 00~99%	Discharge the batteries regularly for self-checking, in which DAYS : self check cycle; %.C : discharge depth
Timer off	Null	HH-MM-SS	Timer off
Timer on	Null	HH-MM-SS	Timer on
Timer mode	Null	Y: turn on the mode of timing start and timing shut down today N: turn off the mode of timing start and timing shut down today	Set the mode of timing start and timing shut down everyday to run the machine per week cycle.

**Run log**

Press [UP], [DOWN] to page up and down to check the running log. Press [ENTER], switch from [DATE] to [TIME]. The log records manual operation and running log.

**Running information**

**Realtime graphic monitoring**

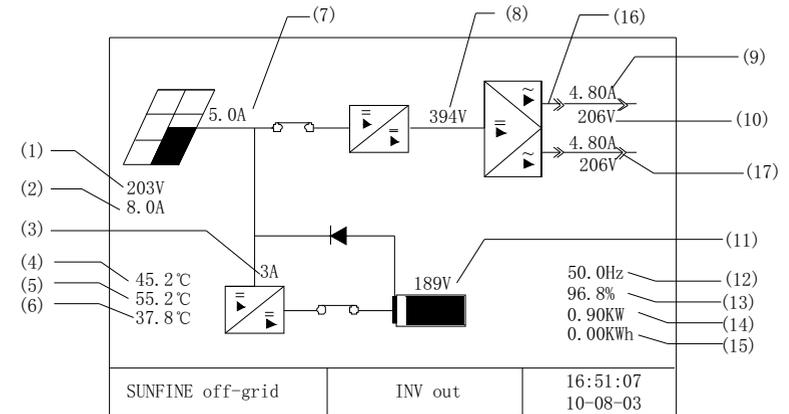


Fig.10 Realtime graphic monitoring

Table 7 Realtime graphic monitoring interface data

No.	Parameter name	Definition	Unit
1	U-PV	Voltage on two ends of PV cell	V
2	I-PV	Output current of PV cell	A
3	I charge[U3]	Charging current to lead acid battery	A
4	Env Temp	Environment temperature	°C
5	Tran Temp	Inductance temperature	°C
6	T-Module	Module temperature	°C
7	I [U4]dischr	Discharge current of lead acid battery or absorbed current by system converter from PV, and its value equals to the [I-PV] minus the [I charge[U3]]	A
8	U-Bus	The voltage of the output end of DC converter inside the system	V
9	I-load	It means the current flows through load when off-grid generation	A
10	U-INV or U-Grid	It means the output voltage of inverter when off-grid generation.	V
11	U-bat	Voltage of two ends of lead acid batteries	V
12	Grid Freq	The grid frequency which used to be criteria of whether to start the anti-island action or not	Hz
13	Eff out	The ratio of PV inverter output power to PV cell output	%
14	P out	The system output power which under the rated power on nameplate.	KW
15	Total KWH	Total generation	KWh
16	Phs Number	Single phase	Null
17	Work mode	——>>——× : off-grid generation mode	Null

**[P out curve]**

[P out curve] includes four kinds of curve, i.e. curves M/Y, D/M, H/D and M/H, corresponding to output power curve of some months in a certain year, some days in a certain month, some hours in a certain day or some minutes in a certain hour, respectively. Right top corners of the four curves show the specific time coordinate of the output power curves, and their basic form is: year- month-date: hour. Press [LEFT] or [RIGHT], the text/menu/graphic display space on LCD will switch to M/Y, D/M, H/D or M/H curve, press [UP] or [DOWN], you can orient to M/Y curve in a certain year, D/M curve in a certain month, H/D curve in a certain day or M/H curve in a certain minute on the text/menu/graphic display space on LCD.

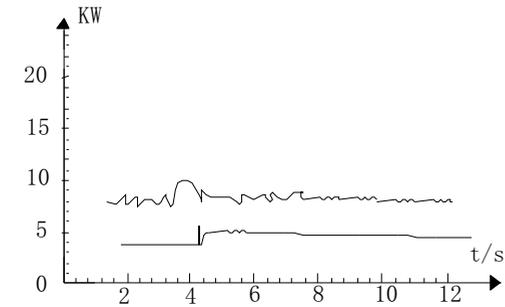
**MPPT**

Fig.11 MPPT

**I-V Wave**

The meaning of [I-V Wave] lies in convenience of reading the waveform drawing of phase load current and phase inverting voltage when off-grid. Press [LEFT] or [RIGHT], switch to waveform of voltage, current or both of them. Press [UP] or [DOWN], switch to the [I-V wave] of phase A, B, or C.

**Gen List**

[Gen List] includes generation statistics in recent 5 years, showing by items of day, month subtotal and year total. You can read specific year, month, day of generation statistics. Press [LEFT] or [RIGHT], and shift the focus of cursor position to specific time digit numbers. Press [UP] or [DOWN], increase or descend value of focused digit number to set the specific time coordinates. The parameters of [Gen List] includes [p-out], [Gen Time], [Gen Times], [Chr Times], [KWH], and [Drop CO2].

**4. Sounding hint**

The running log sounding hint of Sunfine SMB is comprised of four hexadecimal characters, like Ox ABCD, in which "A" refers to sounding groups, containing "B", "C" and "D", "B" refers to the "ON" time in min. unit cycle, "C" refers to the time of min. unit cycle, "D" refers to interval numbers. Such as Ox28F2, the meaning is shown as following diagram.

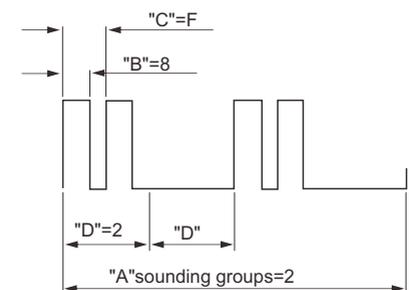


Fig.12 Waveform for sounding hint

The system will sound when the Sunfine SMS system go wrong or finish some running event. You can read fault information from fault LCD, working state LCD at the bottom of the LCD and indicator lamps, and take corresponding actions.

**Table 8 List of sounding hints**

No.	Hints content	Code	Description
1	High U-PV	2FF6	Six times of continuous sounding for two groups
2	Low U-PV	28F2	Two times of discontinuous sounding for two groups
3	U-PV Norm	3FF2	Two times of continuous sounding for two groups
4	High U-bat	3886	Six times of continuous sounding for three groups
5	Low U-bat	3484	Four times of discontinuous sounding for three groups
6	U-bat Norm	3882	Two times of continuous sounding for three groups
7	Grid freq err	1F3F	Fifteen times of continuous sounding for one group
8	Phs Sequ Err	146F	Fifteen times of discontinuous sounding for one group
9	High U-Grid	2666	Six times of continuous sounding for two groups
10	Low U-Grid	2362	Two times of discontinuous sounding for two groups
11	U-Grid Norm	4662	Two times of continuous sounding for four groups
12	High T-Env	2624	Four times of continuous sounding for two groups
13	High T-Module	2F16	Six times of continuous sounding for two groups
14	High T-Tran	2CC8	Eight times of continuous sounding for two groups
15	High U-Bus	8E41	One times of continuous sounding for eight groups
16	Low U-Bus	2E82	Two times of continuous sounding for two groups
17	PV Out Over	482A	Ten times of continuous sounding for four groups
18	High I-load	33C2	Two times of discontinuous sounding for three groups
19	High I charge	4A34	Four times of continuous sounding for four groups
20	High U-Inv	3EE2	Two times of continuous sounding for three groups
21	Low U-Inv	37E2	Two times of discontinuous sounding for three groups
22	120% over of I-load	FF1F	Fifteen times of continuous sounding for fifteen groups
23	INV Err	292F	Fifteen times of continuous sounding for two groups

No.	Hints content	Code	Description
24	Boost err	24AF	Fifteen times of discontinuous sounding for two groups
25	Charge Err	22A6	Six times of discontinuous sounding for two groups
26	PV-Bat	3334	Four times of continuous sounding for three groups
27	Bat-PV	2848	Eight times of continuous sounding for two groups
28	Inv Start	14EE	Fourteen times of discontinuous sounding for one groups
29	Inv Stop	1E4E	Fourteen times of continuous sounding for one groups
30	Boost Start	14F8	Eight times of discontinuous sounding for one groups
31	Boost Stop	2F28	Eight times of continuous sounding for two groups
32	Charge Start	11EE	Fourteen times of discontinuous sounding for one groups
33	Charge stop	2EE1	One times of continuous sounding for two groups
34	Menu Autorun	2143	Three times of discontinuous sounding for two groups
35	Menu stop	4313	Three times of continuous sounding for four groups
36	Menu Maintain	8331	One times of continuous sounding for two groups
37	Run Timer on	5673	Three times of discontinuous sounding for five groups
38	Run Timer off	5637	Seven times of continuous sounding for five groups
39	Invert power protect	FF11	One times of continuous sounding for fifteen groups
40	Boost power protect	4416	Six times of continuous sounding for four groups
41	Alarm test	F1F1	One times of discontinuous sounding for fifteen groups
42	Unregistered alarm	F111	One times of continuous sounding for fifteen groups
43	Limited for wrong operation	4324	Four times of continuous sounding for four groups
44	Auxiliary supply err	12F8	Eight times of discontinuous sounding for eight groups
45	Bat pol Finished	61F2	Two times of discontinuous sounding for six groups
46	Buck power protect	F122	Two times of discontinuous sounding for fifteen groups

## 5. Quality warranty

We Zhejiang Sunfine Solar Technology Co., Ltd. will repair or change the damaged product for a new product within warranty period.

### evidence

Warranty service is not provided unless you show the purchase proof and purchasing date on it and also the logo on the product is clear to identify in warranty period.

### condition

- ◇ The defective inverter should be sent back to the closest Sunfine office;
- ◇ You would reserve reasonable time for us to repair the damaged product.

### responsibility exemption

Any defect caused by the following circumstances will not be covered by the manufacturer's warranty:

- ◇ The whole machine or accessories has been out-of- free-warranty;
- ◇ Transport damage;
- ◇ Improper installation, modification or usage;
- ◇ Run in terrible condition beyond the description in users' manual;
- ◇ Fault or damage caused by installation, repair, modify or dismantling by non Sunfine technician;
- ◇ Fault or damage caused by using nonstandard or not our designated accessories and software.
- ◇ The installation or using range relating to the product have not been followed to an acceptable standard;
- ◇ Damage caused by force majeure.

We can provide paid maintenance services after investigation by our service agency for damaged product caused by the cases above.

### software licensing

We won't be responsible for the damage caused by our software product named SFENGINEER which provided with machine, and:

- ◇ The usage of the part or whole data in the designed hardware or software product in any way for commercial purpose is prohibited.
- ◇ The operation of decompile, decoding or others which cause damage to initial program design to our designed software is prohibited.

To provide better service for you, we will keep our hotline open for you, please prepare following information if you have any question on Sunfine PV inverter or its technology.

Inverter type you purchased;

And the type of PV panels you purchased.

## Zhejiang Sunfine Solar Technology Co., Ltd.

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