ECO VOLT

UPS (SOLAR series)

USER MANUAL

MODEL: SOLAR 1012, SOLAR 1024, SOLAR 2012, SOLAR 2024, SOLAR 3012, SOLAR 3024, SOLAR 3048

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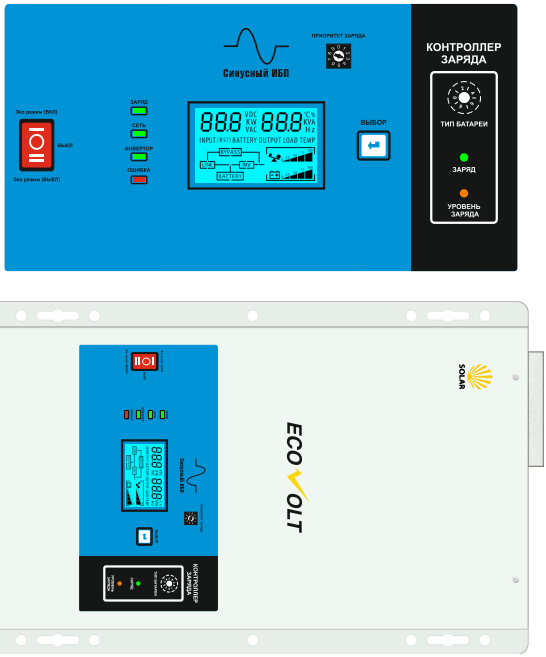
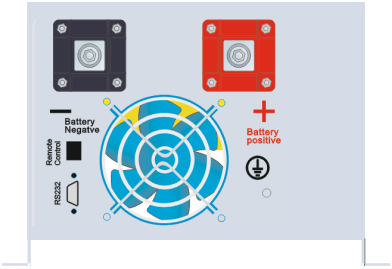


Figure 1 top view



(RS232,Remote control & Optional)

Figure 3 DC side

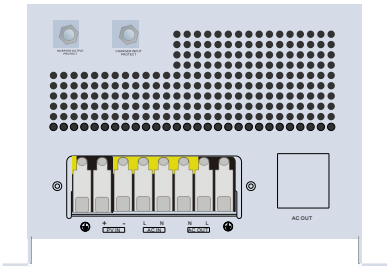
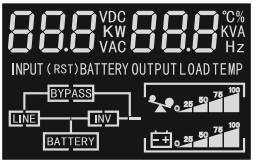


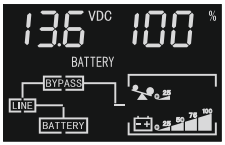
Figure 4 AC side

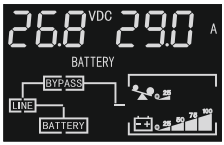
LCD Display



1) Charge Mode

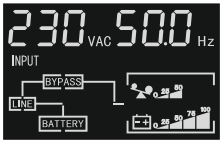
When utility is on, LCD indicate charge current:





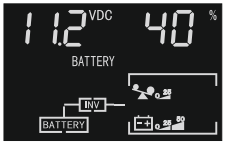
2) Utility Mode

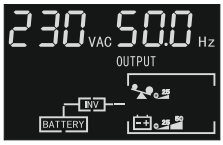
On utility mode, the indication and displays are as following figures:

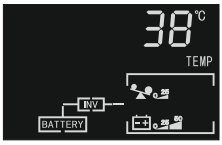


3) Battery Mode

On battery mode, LCD indicate battery capacity:



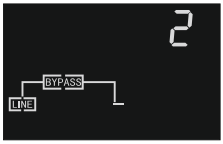




4) Fault Mode

When inverter fault, the indication and displays are as following figures:

1: fan jam
2: overload
3/6/7: output short circuit
4: over temperature
8/9: battery overvoltage.



Line Mode Specifications:

MODEL	Model					
	1012	1024	2012	2024	3012	3024
Input Voltage Waveform	Sinusoidal (utility or generator)					
Nominal Input Voltage	230Vac					
Low Line Disconnect	155Vac±2%					
Low Line Re-connect	164Vac ±2%					
High Line Disconnect	272Vac ± 2%					
High Line Re-connect	265Vac ± 2%					
Max AC Input Voltage	270Vrms					
Nominal Input Frequency	50Hz (Auto detection)					
Low Line Frequency Re-connect	44±0.3Hz for 50Hz;					
Low Line Frequency Disconnect	40±0.3Hz for 50Hz;					
High Line Frequency Re-connect	75±0.3Hz for 50Hz;					
High Line Frequency Disconnect	80±0.3Hz for 50Hz;					
Output Voltage Waveform	As same as Input Waveform					
Over-Load Protection (SMPS load)	Circuit breaker					
Output Short Circuit Protection	Circuit breaker					
Efficiency (Line Mode)	>95%					
Transfer Switch Rating	30A					
Transfer Time (Ac to Dc)	10ms (typical)					
Transfer Time (Dc to Ac)	10ms (typical)					
Pass through without Battery	Yes					
Max Bypass Overload Current	30A					

Inverter Mode Specifications:

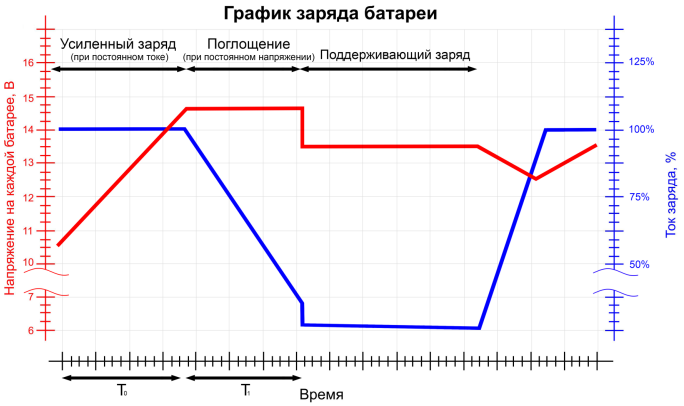
MODEL	Model					
	1012	1024	2012	2024	3012	3024
Output Voltage Waveform	Pure Sine wave					
Rated Output Power (VA)	1000		2000		3000	
Rated Output Power (W)	1000		2000		3000	
Power Factor	1.0					
Nominal Output Voltage (V)	230Vac ±10%					
Nominal Output Frequency (Hz)	50Hz ± 0.3Hz					
Auto tracking Main Frequency (Hz)	Yes (Following Main first connection) 50Hz @40-80Hz					
Output Voltage Regulation	±10% rms					
Nominal Efficiency	>80%					
Over-Load Protection (SMPS load)	(110%<load<125%) ±10%: Fault (shutdown output) after 15 minutes; (125%<load<150%) ±10%: Fault (shutdown output) after 60s; Load>150% ±10%: Fault (shutdown output) after 20s					
Surge rating	3000VA		6000VA		9000VA	
Capable of starting electric motor	1 HP		1 HP		2 HP	
Output Short Circuit Protection	Current limit (Fault after 10s)					
Inverter Breaker Size	10A		30A			
Nominal DC Input Voltage	12V	24V	12V	24V	12V	24V
Min DC start voltage	11V/22V/43V					
Low Battery Alarm	10.5Vdc ± 0.3Vdc for 12V battery 21.0Vdc ± 0.6Vdc for 24V battery					
Low DC input Shut-down	10.0Vdc ± 0.3Vdc for 12V battery 20.0vdc± 0.6Vdc for 24V battery					
High DC input Alarm & Fault	16Vdc ± 0.3Vdc for 12V battery 32Vdc ± 0.6Vdc for 24V battery					
High DC input Recovery	15.5Vdc ± 0.3Vdc for 12V battery 31.0Vdc ± 0.6Vdc for 24V battery					
Power saver	Load ≦25W					

Charge Mode Specifications:

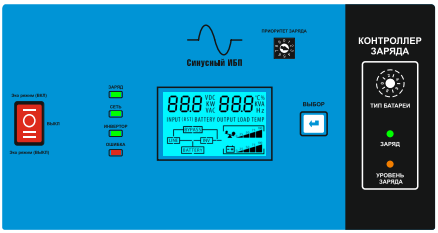
MODEL	Model					
	1012	1024	2012	2024	3012	3024
Nominal Input Voltage	230Vac					
Input Voltage Range	155~272Vac					
Nominal Output Voltage	Same as input voltage					
MAX Charge Current	35A	20A	65A	35A	75A	45A
Charge Current Regulation	Charge current adjustable: 25%, 50%, 75%, 100%. (Optional)					
Battery initial voltage	0-15.7Vdc/31.4Vdc (can operate with 0V battery)					
Charger Short Circuit Protection	Circuit breaker					
Breaker Size	30A					
Over Charge Protection	Bat. V ≥15.7Vdc / 31.4Vdc , beeps 0.5s every 1s & fault after 60s					
Charge Algorithm						
Algorithm	***Three stage:*** ***Boost CC*** (constant current stage) → Boost ***CV*** (constant voltage stage) → Float (constant voltage stage)					

Charge Stage Transition Definitions

- ***Boost CC Stage***：If A/C input is applied, the charger will run at full current in CC mode until the charger reaches the boost voltage.
- Software timer will measure the time from A/C start until the battery charger reaches 0.3V below the boost voltage, then take this time as T_0 and $T_0 \times 10 = T_1$.
- ***Boost CV Stage:*** Start a T_1 timer; the charger will keep the boost voltage in Boost CV mode until the T_1 timer has run out. Then drop the voltage down to the float voltage. The timer has a minimum time of 1 hour and a maximum time of 12 hours.
- ***Float Stage:*** In float mode, the voltage will stay at the float voltage.
- If the A/C is reconnected or the battery voltage drops below 12Vdc/24Vdc, the charger will reset the cycle above.
- If the charge maintains the float state for 10 days, the charger will reset the cycle.



Front Panel



Switch	**Эко режим (ВКЛ)**	Power on with saver mode (power saver ≦25W)
	ВЫКЛ	Power totally off (If there is AC power,inverter have charger function)
	Эко режим (ВЫКЛ)	Power on without saver mode
ЗАРЯД	controller line on	
УРОВЕНЬ ЗАРЯДА	controller charge battery (red: low, orange: normal, green: high)	
ЗАРЯД	AC charge on	
СЕТЬ	AC power on	
ИНВЕРТОР	inverter mode	
ОШИБКА	check inverter	

Audible Alarm

Battery Voltage Low	Inverter green LED Lighting, and the buzzer beep 0.5s every 5s.
Battery Voltage High	Inverter green LED Lighting, and the buzzer beep 0.5s every 1s, and Fault after 60s.
Inverter Mode Over-Load	110%< load<125%, no audible alarm in 14 minutes, beeps 0.5s every 1s in 15th minute, and Fault after 15 minutes. 125% <load<150%, beeps 0.5s every 1s, and Fault after 60s. Load>150%, beeps 0.5s every 1s, and Fault after 20s.
Over Temperature	Heat sink temp. ≥105ºC, Over temp red LED Lighting, beeps 0.5s every 1s;

Protection	
Over Temperature Protection	Heat sink temp. ≥105ºC, Fault (shutdown Output) after 30 seconds
Back-Feed Protection	Yes

Table 2 Battery Type Selector Switch Settings

Switch Position	Description	12-volt Models		24-volt Models		Charge Function	
		Float voltage (V)	Bulk/ Equalize voltage (V)	Float voltage (V)	Bulk/ Equalize voltage (V)	Equalize charge rate	Equalize time
0	Equalize 1 - equalizes at a rate equal to the battery bank Capacity (in Amp hours) Divided by 40.	13.2	*15	26.4	*30	Battery Capacity Setting	6 hrs. Minimum 12 hrs. Maximum
1	Equalize 2 -charges at a rate set by the BATTERY CHARGER RATE control.	13.2	*15.5	26.4	*31	Battery Charger Rate Setting (manual)	6 hrs. minimum 12 hrs. maximum
2	Deep Cell Lead Acid 2	13.3	15	26.6	30	Provides an additional Float and Bulk settings for deep cycle, lead acid batteries. Refer to the battery manufacturer recommendation for Float and Bulk settings	
3	Not Specified	13.6	14.3	27.2	28.6	Provides an additional setting of Bulk and Float voltages.	
4	GelCel 2	13.7	14.4	27.4	28.8	Recommended for gel cell batteries that specify high float voltages.Check with the battery manufacturer.	
5	Gel Cell 1	13.5	14.1	27	28.2	Typical gel cell setting.	
6	PcCa-lead Calcium	13.2	14.3	26.4	28.6	Use this setting for sealed type car batteries.	
7	Deep Cycle Lead Acid 1 (Default Setting)	13.4	14.6	26.8	29.2	Factory setting for typical deep cycle lead acid batteries.	
8	NiCad 1	14	16	28	32	Use for NiCad battery systems	
9	NiCad 2	14.5	16	29	32	Recommended for use with nickel iron batteries	

Important:

1. Switch positions “0” and “1” are for monthly battery maintenance only. Return the switch to the appropriate position for the system's batteries when Equalize charging has completed. NEVER EQUALIZE GEL BATTERIES! Use together with BATTERYCHARGER RATE potentiometer (position1)or BATTERY CAPACITY potentiometer (position 0).
2. Equalize voltages are displayed in the table with an asterisk (*) Switch positions “0” and “1” only.
3. Switch position “7” is the default values as shipped from the factory.
4. Always refer to the battery manufacturer's specifications for equalization.

AC Priority (Position of priority selector: 0,1,2,3,4,5,6)

	Switch setting	Description	Boost		Float	
			Voltage		Voltage	
			12	24	12	24
Position of priority selector 	0		No charging			
	1	Gel USA	14.0	28.0	13.7	27.4
	2	AGM 1	14.1	28.2	13.4	26.8
	3	AGM 2	14.6	29.2	13.7	27.4
	4	Sealed lead acid	14.4	28.8	13.6	27.2
	5	Gel EURO	14.4	28.8	13.8	27.6
	6	Open lead acid	14.8	29.6	13.3	26.6

Battery Priority (Position of priority selector: 7,8,9)

	Switch setting	Description	Boost		Float	
			Voltage		Voltage	
			12	24	12	24
Position of priority selector 	7	Battery prefer mode (batt. voltage sets by bat.selector of solar controler)	deactivate battery mode at 11/22V and switch to AC and charge the battery from PV		charging stops at 14/28V	
	8		deactivate battery mode at 10.5/21V and switch to AC and charge the battery from PV		charging stops at 13.5/27V	
	9		deactivate battery mode at 10/20V and switch to AC and charge the battery from PV		charging stops at 13/26V	

Note: When priority selector has 1-6 position (AC priority), the invertor has charger function from AC. When the position is 0 (AC priority), the inverter has no charge function.

AC/Battery Priority:

Our inverter is designed AC priority by default. This means, when AC input is present, the battery will be charged first, For more information, please refer to Charge Stage Transition Definitions on page and the inverter will transfer the input AC to power the load.

When you choose battery priority (position of priority selector is 7-9), the inverter will invert from battery (the load is powered from the battery) despite the AC input. Only when the battery voltage reaches the low voltage alarm point, the inverter will transfer the load to AC input, charge battery from PV and switch back to the battery when the battery is fully charged. This function is mainly for wind/solar systems using utility power as back up.

<table>
<tr><td>Fault recovery</td><td>By restart the machine</td></tr>
<tr><td colspan="2">FAN Operation</td></tr>
<tr><td>Fan Operation</td><td>Variable speed fan operation is required in invert and charge mode. This is to be implemented in such a way as to ensure high reliability and safe unit and component operating temperatures in an operating ambient temperature up to 50°C.

Speed to be controlled in a smooth manner as a function of internal temperature and/or current.
Fan should not start/stop suddenly.
Fan should run at minimum speed needed to cool unit.
Fan noise level target <60db.

The fan logic as below:
<table>
<tr><th>Condition</th><th>Enter condition</th><th>Leave condition</th><th>Speed</th></tr>
<tr><td rowspan="3">HEAT SINK TEMPERATURE</td><td>T ≤ 60℃</td><td>T > 65℃</td><td>OFF</td></tr>
<tr><td>65℃≤ T<85 ℃</td><td>T ≤ 60℃ or
T ≥ 85℃</td><td>50%</td></tr>
<tr><td>T > 85℃</td><td>T ≤ 80℃</td><td>100%</td></tr>
<tr><td rowspan="3">Charge Current</td><td>I ≤ 15%</td><td>I ≥ 20%</td><td>OFF</td></tr>
<tr><td>20%< I ≤ 50%Max</td><td>I≤ 15%or
I ≥ 50%Max</td><td>50%</td></tr>
<tr><td>I > 50%Max</td><td>I ≤ 40%Max</td><td>100%</td></tr>
<tr><td rowspan="3">Load%
(Invert mode)</td><td>Load < 30%</td><td>Load ≥ 30%</td><td>OFF</td></tr>
<tr><td>30% ≤ Load < 50%</td><td>Load ≤ 20% or
Load ≥ 50%</td><td>50%</td></tr>
<tr><td>Load ≥ 50%</td><td>Load ≤ 40%</td><td>100%</td></tr>
</table>
</td></tr>
</table>

General Specifications	
Safety Certification	CE(EN62040-1)
EMC Classification	EN62040-2, C2
Operating Temperature Range	0°C to 40°C
Storage temperature	-15ºC ～ 60ºC
Operation humidity	5% to 95%
Audible Noise	60dB max
Cooling	Forced air, variable speed fan
Size	1012/1024/2012/2024/2048/3012/3024 : 460x260x185MM

AC Input wiring:

Selecting the proper wire (cable) size is very important for performance and safety.The Internal wire resistance varies according to amperage and temperature.It is recommended to keep voltage drop in all circuit under 3%.**Below table shows specific cable lengths for the input circuit.**

Inverter Model Watts Rating	Nominal Operating DC Voltage	Nominal Operating AC Voltage	AC Breaker size Minimum Wire Size
1012	12Volts	230VAC	8 amps-12AWG
1024	24Volts	230VAC	8 amps-12AWG
2012	12Volts	230VAC	10 amps-12AWG
2024	24Volts	230VAC	10 amps-12AWG
3012	12Volts	230VAC	15 amps-12AWG
3024	24Volts	230VAC	15 amps-12AWG

Solar changer function

There is a solar charger built in, List below is the spec for solar charger

Table 1 Electrical specifications@(77 °F)

Rated Voltage	12/24V DC	
Rated charge current	40A	
Input voltage range	15-55V DC	
Max. PV open circuit array voltage	55V DC	
Typical idle consumption	At idle < 10mA	
Bulk charge	14.6V(default)	29.2V(default)
Floating charge	13.4V(default)	26.8V(default)
Equalization charge	14.0V(default)	28.0V(default)
Over charge disconnection	14.8V	29.6V
Over charge recovery	13.6V	27.2V
Over discharge disconnection	10.8 V (default)	21.6V(default)
Over discharge reconnection	12.3V	24.6V
Temperature compensation	-13.2mV/℃	-26.4mV/℃
Lead acid battery settings	Adjustable	
NiCad battery settings	Adjustable	
Load control mode	1.Low Voltage Reconnect (LVR): Adjustable 2.Low Voltage Disconnect (LVD): Automatic disconnection 3.Reconnection: Includes warning flash before disconnect and reconnection	
Low voltage reconnect	12.0-14.0 Vdc	24.0-28.0 Vdc
Low voltage disconnect	10.5-12.5 Vdc	21.0-25.0 Vdc
Ambient temperature	0-40 ℃ (full load) 40 — 60 ℃ (de-rating)	
Altitude	Operating5000 m, Non-Operating 16000m	
Protection class	IP21	
Terminal size(fine/single wire)	#8 AWG	

NOTE: The optional battery temperature sensor automatically adjusts the charging process of the controller according to the type of the battery is selected by user through battery type selector. With the battery temperature sensor installed, the controller will increase or decrease the battery charging voltage depending on the temperature of the battery to optimizethe charge to the battery and maintain optional performance of the battery.

Maximum Power Point Tracking (MPPT) function.

Maximum Power Point Tracking, frequently referred to as MPPT, is an electronic system that operates the Photovoltaic (PV) modules in a manner that allows the modules to produce all the power they are capable of. The Solarmate Charge controller is a microprocessor-based system designed to implement the MPPT. And it can increase charge current up to 30% or more compared to traditional charge controllers.
(See figure 1).

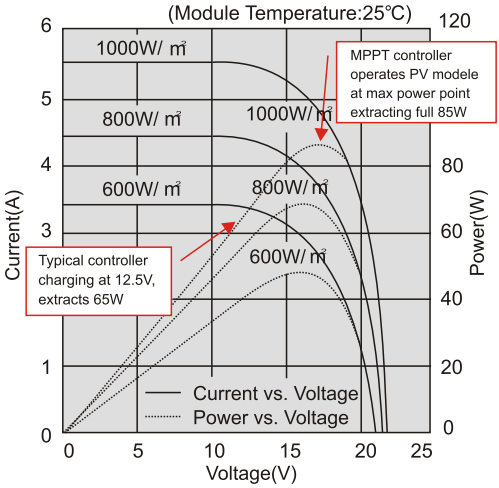
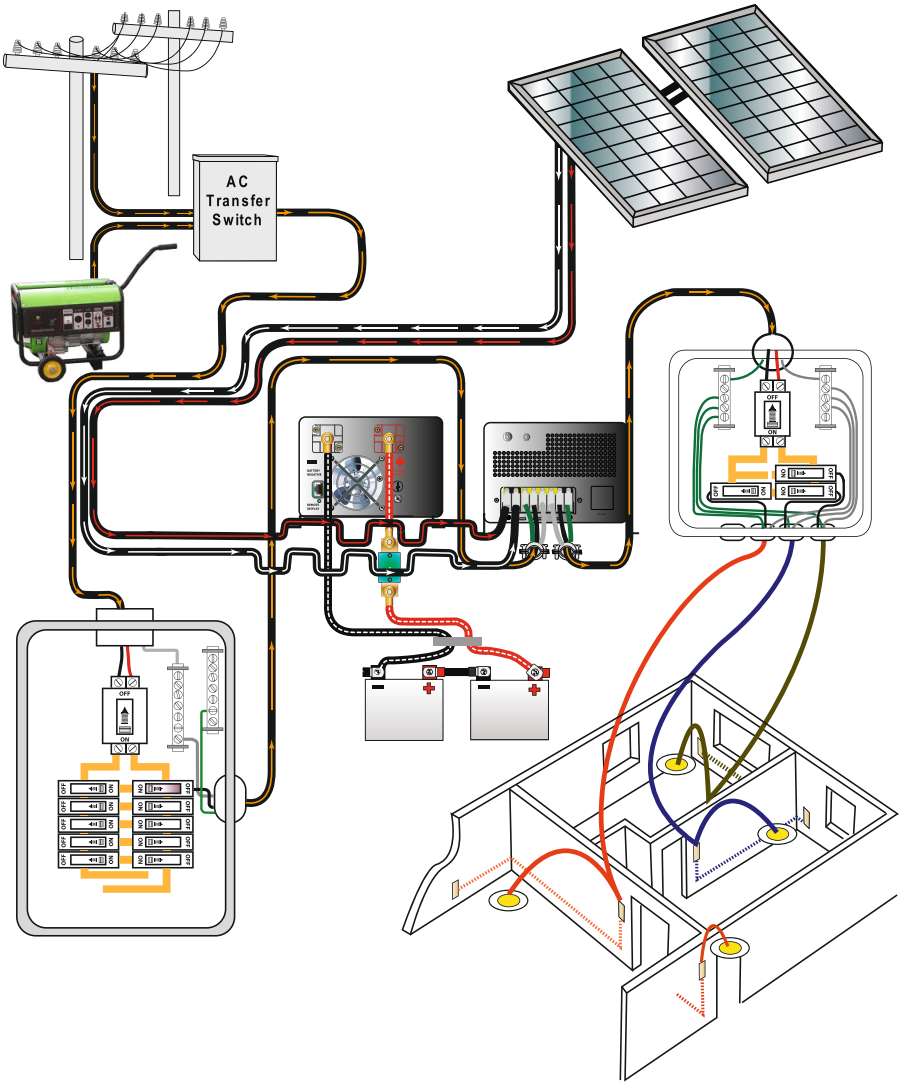


Figure 1 Current, Power vs. Voltage Characteristics



Remark:Used in utility power or solar system.

Troubleshooting Guide

Troubleshooting contains information about how to troubleshoot possible error conditions while using the Any Power Combi Inverter & Charger.

The following chart is designed to help you quickly pinpoint the most common inverter failures.

Indicator and Buzzer

Status	Item	Indicator on top cover				Buzzer
		LINE	INVERTER	CHARGE	FAULT	
Line Mode	CC	√	×	√	×	—
	CV	√	×	blink	×	—
	Float	√	×	blink	√	—
	Standby	√	×	×	×	—
Invert Mode	Inverter on (Power saver OFF)	×	√	×	×	—
	Power saver on	×	blink	×	×	—
Alarm Mode	Battery Low	×	√	×	×	beep 0.5s every 5s
	Battery High	×	√	×	×	beep 0.5s every 1s
	Overload on invert mode	×	√	×	×	Refer to "Audible alam"
	OverTemp on invert mode	×	√	×	×	beep 0.5s every 1s
	OverTemp on line mode	√	×	√	×	beep 0.5s every 1s
	Over charge	√	×	√	×	beep 0.5s every 1s
Fault Mode	Fan lock	×	×	×	√	beep continuous
	Battery High	×	×	×	√	beep continuous
	Inverter mode overload	×	×	×	√	beep continuous
	OverTemp	×	×	×	√	beep continuous
	Over charge	×	×	×	√	beep continuous
	Back Feed Short	×	×	×	√	beep continuous

Remark: √ shows the indicator on. × shows the indicator off. √, blink shows the indicator blinking about 0.5s on and 0.5s off.

Problem	Possible cause	Solution
battery lowvoltage	run out of battery	continue to charge battery full
	battery lower to 10v at machine off status, baterry damaged	change new battery
battery overvoltage	machine fault/battery connection fault	check machine, and check if battery connection correct.
overload	connected more loads	turned off inverter,remove some loads
	connected big motor load	start power of motor load is huge,3-4 times of load itself,pls choose the correct load
over tempterature	The surrounding environment space is small	keep environment unobstructed
		check Fan at normal working
	machine does not turn off but overload	remove some loads
over charge	machine fault/machine "select" switch at wrong position	set "selcet" switch at correct position
without output	red power button wrong,	check red power button at right place,
	machine inside wire connection not correct	check LED lights if normal to confirm inside wire connection
	machine components damaged	open machine case to check components
without charge	machine "select" switch at wrong position	set "selcet" switch at correct position
	machine inside wire connection not correct	check LED lights if normal to confirm inside wire connection
	machine does not at "AC mode"	set at "AC mode"
load light flashing	at power saver on, load less than 25w	add more loads over 25w , 50w is better until normal
Fan stops run	Fan blocked	check if somthing block fan, like insect, etc.
	Fan jam	open machine case, find a white probe cable (on cooling fin), let it at short-circuit condition, the small fan should be run (if not,the fan abnormal)
Output short circuit	Load at short circuit	Check load carefully
	Mosfet broken	Check machine inside
Remark:1kw to 3kw machine, the fan starts to run until temperature reaches 50~60 degree		
4kw to 6kw machine start machine, the big fan starts to run at the same time. the small fan starts to run until the temperature reaches 50~60 degree		

...Need any support,contact our customer servicer freely...