

T series online inverter LED/LCD 1-3KL



User's manual

Introduction

Thanks for selecting our power supply products! T series is an online sine wave telecom inverter, which is designed by DSP digital technology and high frequency PWM technology. It is specialized in protecting computer equipment, communication equipment, and medical equipment from destruction or loss of data when power off or interruption.

This manual will introduce functions and features, specifications, appearance, system theory and operating method of T series inverter. It also provides installation introduction, operation, maintenance and transportation information.

Please read this manual carefully and thoroughly before operation the inverter. The manual is offered when you purchase our product.

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1. Safety Introduction

This chapter introduces safety symbols and safety notes. Please read this chapter carefully and thoroughly before operation to avoid incorrect operation bringing harmful to personnel and equipment.

1.1. Description of the symbols

All of the symbols as listed in the below table may be used in this manual .These symbols are used for reminding users of safety notes for installation, operation and maintenance.

Symbol & description	
Symbol	Description
	Caution, danger
	Danger electric shock
	Alternating current(AC)
	Direct current(DC)
	Protective ground
	Recycle
	Do not dispose with ordinary trash

1.2. Safety notes

High temperature and voltage exist inside inverter. Please observe the rules before equipment installation, operation and maintenance or it may cause danger to personnel and equipment. Our company will assume none responsibility for violation of operation.

In the event of fire occurring vicinity, please use dry powder fire extinguishers only. The using of liquid fire extinguishing agents will cause electric shock.

1. Read this manual carefully and thoroughly before operation the Inverter and save this manual properly for future reference.

2. Do not tear up or shatter the alarm table on the inverter and pay attention to it.

3. Please do not overload the inverter beyond its designed capacity.

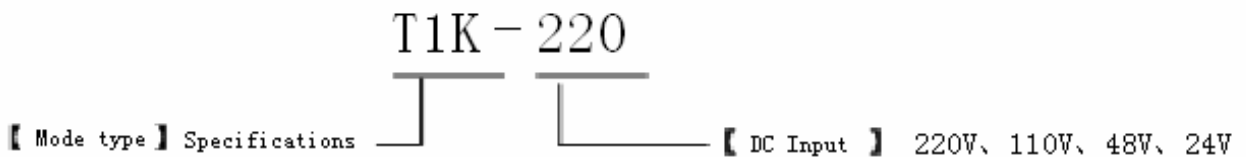
4. The inverter contains large capacity batteries. The case of the inverter must not be opened by untrained personnel. Otherwise, it may cause electric shock.

5. Do not let battery or batteries get close to any heating sources, they may explode.
6. Do not open or mutilate the battery or batteries, released electrolyte is highly poisonous and harmful to the skin and eyes.
7. Do not short the positive and negative of the battery electrode. Otherwise, it may cause electric shock or fire.

2. Product introduction

This chapter introduces the equipment model, function, features and specifications

2.1. Mode type



There are two types of inverter according to the battery configuration: standard type and long backup time type, each available in the following ratings: 1KVA, 2KVA and 3KVA inverter; according to the operation, there are LED indication and LCD numeric type.

2.2. Specifications

Specifications and parameters		Model	T1KL	T2KL	T3KL
Rated power			1000VA/800W	2000VA/1600W	3000VA/2400W
AC input	Input system		Single phrase & earth ground		
	Ranged voltage		220VAC		
	Frequency		50Hz		
	Voltage range		115~300VAC		
	Frequency range		45~55Hz		
	Voltage range of bypass		80VAC~285VAC		
DC input	DC nominal voltage		24VDC/48VDC/110VDC/220VDC		
	24V	Nominal current	40.0A	78.4A	117.6A
		Voltage range	20-29VDC		
		Input low voltage/protection	20/21VDC		
		Input high voltage/protection	29/29VDC		
	48V	Nominal current	19.6A	39.2A	58.8A
		Voltage range	40-58VDC		

Specifications and parameters		Model	T1KL	T2KL	T3KL
		Input low voltage/protection	40/42V		
		Input high voltage alarm/protection	58/58V		
	110V	Nominal current	8.6A	17.2A	25.8A
		Voltage range	90-130V		
		Input low voltage/protection	90/95V		
		Input high voltage/protection	130/130V		
	220V	Nominal current	4.3A	8.6A	12.9A
		Voltage range	180-260V		
		Input low voltage/protection	180/190V		
		Input high voltage/protection	260/260V		
	AC Output	Output system	Single phrase & earth ground		
		Output voltage	220VAC±3%(inverter output)		
Output frequency		50±5Hz(normal), 50Hz±1%(abnormal)			
Dynamic voltage transient range		<5%			
Dynamic transient restore		< 60ms			
Waveform		Sine wave THD<3% (linear load), sine wave THD<8% (nonlinear load)			
Output power factor		0.8			
Overload capability		105~125%≥ 60s, 126~150%≥30s, the recover point is 90%			
Input current peak coefficient		3:1			
Transfer time		0ms			
Panel indicator system		LED screen + LCD indicator, show the status of inverter and operation parameter			
Communications		RS232(turn to 485), stem node			
Alarm function		AC/DC input under abnormal, overload condition and inverter problems			
Protection function		AC input or output above or below the range of voltage Overload, over temperature and short circuit protection			
Conduction		Satisfy YD/T983-1998A			
Radiation		Satisfy YD/T983-1998A			
Noise immunity		Satisfy YD/T983-1998A			
Insulating resistance		>2MΩ(500VDC)			
Insulating strength		2121VDC(AC input, output to ground, DC input to AC output, without flashover in one minute)			
Cooling system		Wind cooling			
Frequency		<55dB(1M)			

Specifications and parameters		Model	T1KL	T2KL	T3KL
		Working environment	Temperature	-10℃~+40℃	
	Humidity	0~95%, no condensation			
	Altitude	≤1500M, satisfy GB3859.2-93			
Storage environment	Inverter temperature	-40℃~+65℃			
	Humidity	0~95%, no condensation			
Dimensions(W×D×H)(mm)		438×380×83			

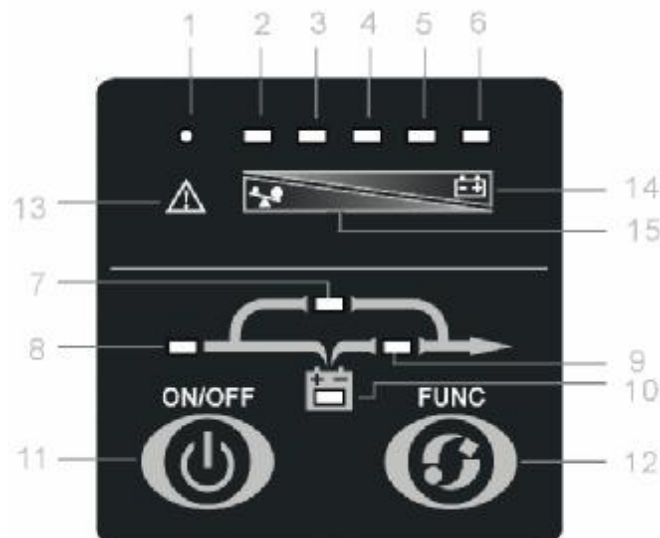
3. Appearance and operating principle

This chapter introduces the appearance of inverter and the outside interface.

3.1. Appearance



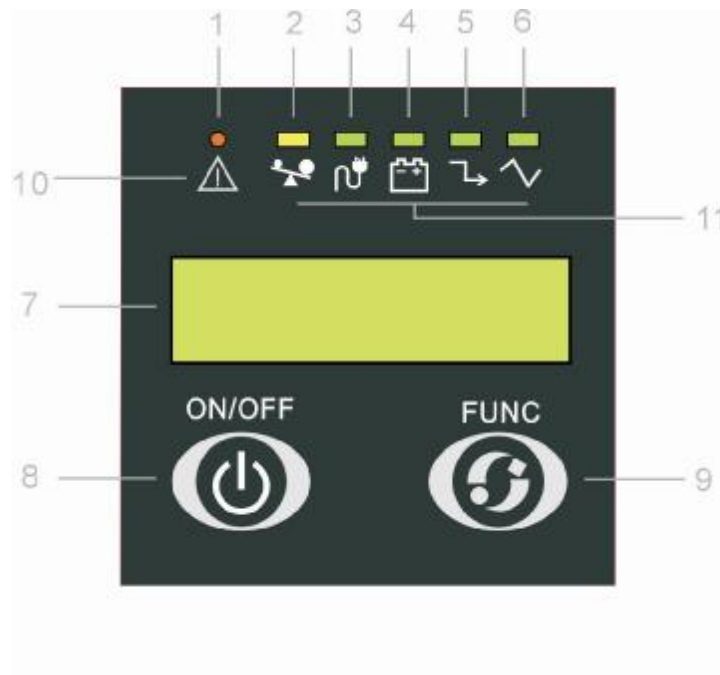
3.1.1. LED panel



No.	Indicator	Specification	Description
1	Fault indicator	Red	When the indicator on, it shows the inverter in abnormal condition, inverter output power off.
2	Alarm indicator	Yellow	When the indicator alarm, it show the inverter in abnormal condition, inverter output without interruption.
3	Load/battery capacity indicator	Green	In normal mode, the percentage of load capacity is 75~100%; the battery capacity level is 0~25%.
4	Load/battery capacity indicator	Green	In normal mode, the percentage of load capacity is 50~75%; the battery capacity level is 25~50%.
5	Load/battery capacity indicator	Green	In normal mode, the percentage of load capacity is 50~75%; the battery capacity level is 25~50%.
6	Load/battery capacity indicator	Green	In normal mode, the percentage of load capacity is 0~25%; the battery capacity level is 75~100%.
7	By pass indicator	Yellow	When the indicator on, it shows the inverter output in bypass.
8	Utility power indicator	Green	When the indicator on, it shows that the utility power is normal. When the indicator blink, it shows the utility power is abnormal. When the indicator off, the utility is off.
9	Inverter indicator	Green	When the indicator on, it shows the inverter in output.
10	Battery indicator	Yellow	When the indicator on, it shows the battery in normal condition, or the battery in abnormal condition.
11	ON/OFF button	-	Turn on: by pressing the ON/OFF button more than one second, the inverter system is turned on. Turn off: by pressing this button more than 1 second turning off the inverter system whenever the inverter runs under the Normal mode/battery mode.

12	Function button		<p>Battery self-test: when the inverter runs in normal mode, pressing the button for more than 2 seconds can start the battery self-test.</p> <p>Silence function in battery mode: in battery mode, when the buzzer beeps, pressing and holding the function button for 2 seconds can silence the buzzer. Pressing the button for more than 2 seconds again to resume the alarm function.</p> <p>Note: the alarm silencing function of the function button is valid only in battery mode, and invalid for any other inverter alarm.</p>
13	Fault indicator mark	-	-
14	Battery capacity indicator mark	-	-
15	Load capacity indicator Mark	-	-

3.1.2. LCD panel



No.	Indicator	Specification	Description
1	Fault LED indicator	Red	When the indicator on, it shows the inverter in abnormal condition, the inverter output power off.

2	Alarm LED indicator	Yellow	When the indicator on, it shows the inverter working in abnormal, the inverter output without interruption.
3	Utility LED indication	Green	In normal mode, when the indicator on, it shows the utility in normal condition; when the indicator blink, it shows the utility in abnormal condition.
4	Battery LED indicator	Yellow	When the indicator on, it shows that the utility power is normal. When the indicator blink, it shows the utility power is abnormal. When the indicator off, the utility power break off.
5	Bypass LED indicator	Yellow	When the indicator on, the inverter output is in bypass.
6	Inverter LED indicator	Green	When the indicator on, the inverter is in output.
7	LED display screen	-	Shows the inverter operating parameters
8	ON/OFF button	-	Turn on: by pressing the ON/OFF button more than 1second, the inverter system is turned on Turn off: pressing this button more than 1 second to turn off the inverter system whenever the inverter running under the normal mode/battery mode.
9	Function button	-	Battery self-test: when the inverter run in normal mode, pressing the function button for 2 seconds can start the battery self-test. Silence function in battery mode: when the buzzer beeps, pressing and holding the function button for 2 seconds can silence the beeps. Press again for more than 2 seconds can resume the alarm. Note: the alarm silencing function of the Function button are valid only in battery mode, invalid for any other inverter alarm.
10	Fault LED indicator	-	-
11	Definition of LED	-	Refer to the text

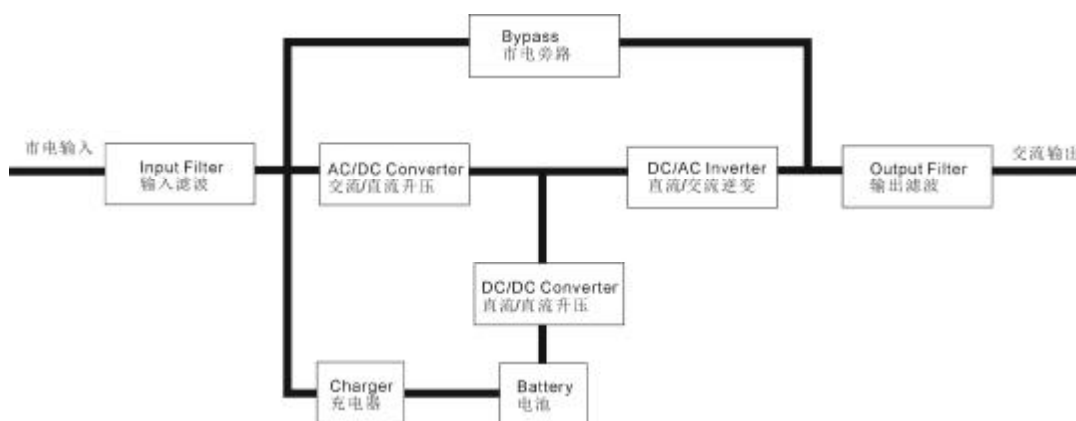
3.1.3. Rear panel

No.	Parts	Specification
1	Computer interface	Standard RS232 interface, external computer monitoring
2	Intelligent slot	All kinds of monitoring conditions by expanding monitoring function
3	Surge protection	Telephone line socket, lightning proof function
4	Output	External overload, the most current is 10A

5	Breaker	Input over current protection
6	Input	Input wire connector
7	Ground wire	Reserve grounding wire protection
8	External battery	Long backup time model for external battery connection
9	Terminal block	It is used only for 3K inverter by single output more than 10A

3.2. Operation principles

The inverter incorporates AC filter, AC converter, inverter equipment, bypass, DSP digital control, display panel and monitoring. The operating elementary diagram is as below,



Input filter: perform a filter for input. It provides clean AC power to inverter.

AC/DC converter: in normal mode, it converts the AC input power to regulator DC power.

DC/DC converter: in normal mode, it utilizes DC output of AC/DC converter and converts it into precise, regulated sine wave AC power. In Battery mode, it receives energy from the battery through DC/AC converter.

DC/AC converter: in normal mode, it converts DC power to regular AC power. Bypassing the event of an inverter fault that will not lead to inverter shut down, load will be automatically transferred to the Bypass. Meanwhile, LED indicators will indicate fault type, and fault information will be reported through communication ports.

Battery: sealed maintenance-free lead-acid battery can be used as the DC source of the inverter.

Output filter: performing a filter for output, it can provide clean power for load.

4. Operation

This chapter introduces inverter operation management, maintenance guidance, safety precautions, and maintenance steps.

4.1. Operation

4.1.1. Turn on inverter

1. Turning on with utility power

Connecting the mains input to inverter, pressing and holding the ON/OFF button for more one second until buzzer beeps, at this point, inverter begins to conduct self-test, with load/battery capacity indicators on the front panel turning on and then off one after the other. Seconds later, the inverter indicator, the utility power indicator will turn on, meanwhile, inverter begins to operate under the normal mode. If the utility power is abnormal, inverter will work in battery mode.

2. Turning on without utility power

With no mains input to feed inverter, pressing and holding the ON/OFF for more than one second, buzzer will beep. In the power on process, inverter has the same operation as if it is connected to the utility power that the utility power indicator will not on instead of the battery indicator on.

4.1.2. Turn off inverter

The operation of powering down contains: Power down under Normal mode, power down under Battery mode.

1. Turn down inverter under the normal mode.

Press and hold the ON/OFF button persistently for more than one second to power off inverter. If it is set up to work in bypass mode with monitoring software, the bypass indicator will turn on to indicate that inverter is working in bypass mode. In order to cut off the output from inverter, simply cut off the utility power. Finally, not any display is shown on the front panel and no output is available from the inverter outlets.

2. Turn down inverter under the battery mode

Press and hold the "ON/OFF" for more than one second to power down inverter. At this point, inverter will start self-test and all load /battery capacity indicators will be turned on and off one after the other. Meanwhile, no display is shown on the front panel and no voltage output is available from the inverter.

4.1.3. Battery self-test

In inverter operation, user can manually initiate battery self-test to check battery condition. There are two methods to initiate battery self-test.

1. Through the function button

In normal mode, press the function button for more than 2 seconds until buzzer beeps. At this point, the 7#~10# indicators blink circularly, indicating that inverter has been transferred to battery mode and batteries have started self-test. The battery self-testing will last for 10 seconds (it can also be set up by monitoring software) in the event of battery fault, inverter will transfer to normal mode automatically.

2. Through the background monitoring software

User can start battery self-test through background monitoring software inverter

4.1.4. Silencing operation

When inverter is on battery or bypass mode, it will warn with warning tone (battery mode four seconds one tone; bypass mode two minutes). These warning tone are set on or off manually.

Notes: In battery mode, only the four seconds tone could be disabled.

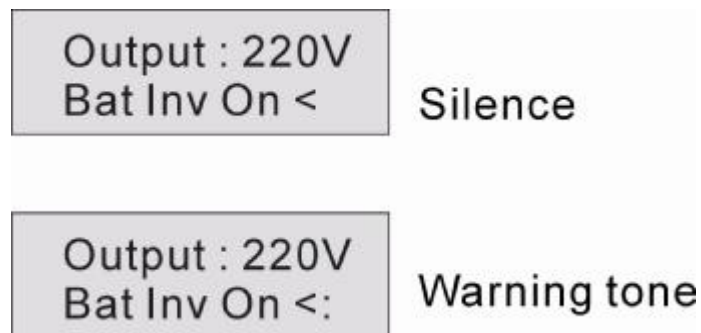
There are two ways to realize this function.

1. By function key

In battery and bypass mode, push function key above 2 seconds until you hear a tone.

2. Through the software

The user can use software to realize this function



4.2. Inverter running mode

4.2.1. Line mode

Turn on the inverter, if the Normal mode is normal, it will work in Normal mode and the indicator on the panel will be turned on.

1. If load capacity over 100%, the buzzer beeps continuously, inverter must be reduced load until its capacity is less than 100%.

2. If the battery blinks circularly, it shows inverter without batteries or volts of batteries is too low. Please check if batteries are connected well.

4.2.2. Battery mode

When there is no utility power, inverter will run in battery mode.

1. In battery mode, inverter will beep once every 4s. The user can silence the beep by the function key. Please see the silence function.
2. If battery capacity is very low, inverter will beep once every 1s. It tells the user should take off load as soon as possible.
3. If line LED flickeringly, it means the utility power voltage or frequency is out of range or the L, N is reversed or the earth cable is not connected.
4. The user can test backup function through cutting off the utility power input.

4.2.3. Bypass mode

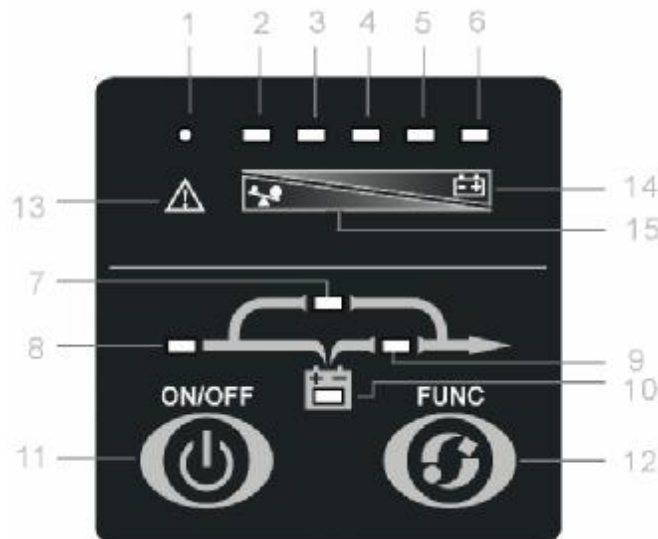
Through software we can set inverter working in bypass mode or not.

When the utility power is available and inverter is not turned on, inverter will work in bypass mode.

Note: when inverter running in bypass mode, inverter has no backup function, because load power is supplied by the utility power directly.

4.3. Relation panel and running status

4.3.1. LED panel display



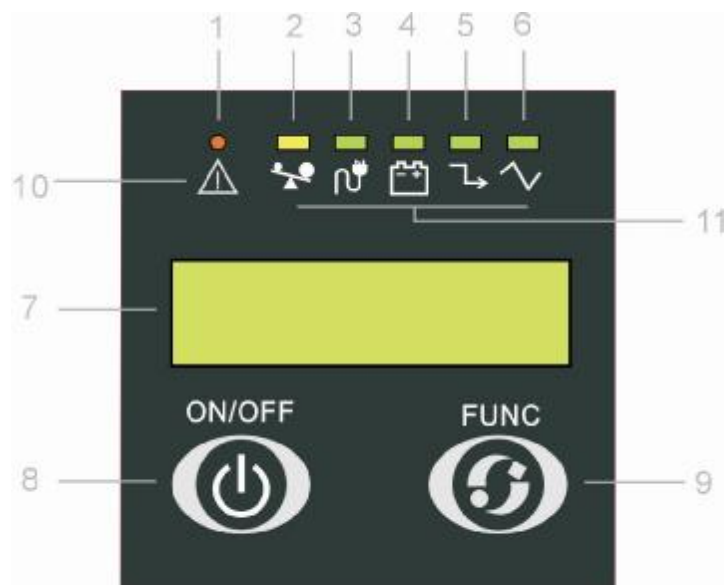
LED panel

Table: LED Panel display (●: means light ★: means ↑: means: defined by others)

Index	Inverter status	LED	Warning tone
-------	-----------------	-----	--------------

			1	2	3	4	5	6	7	8	9	10	
1	Line mode	0%--30% load						•		•	•		No
2		31%--50% load					•	•		•	•		No
3		51%--70% load				•	•	•		•	•		No
4		71%--95% load			•	•	•	•		•	•		No
5		96%--105% load		•	•	•	•	•		•	•		No
6	Battery mode	0%--25% load		•							•	•	Beep 1 every 1s
7		26%--50% load		•	•						•	•	Beep 1 every 4s
8		51%--75% load		•	•	•					•	•	Beep 1 every 4s
9		76%--100% load		•	•	•	•				•	•	Beep 1 every 4s
10		100% load		•	•	•	•	•			•	•	Beep 1 every 4s
11	Bypass mode			↑	↑	↑	↑	•	•	•			Beep 1 every 2M
12	Line mode overload to bypass		•	•	•	•	•	•	•	•			Beep
13	Line is abnormal			↑	↑	↑	↑	•	↑	★	↑	↑	↑
14	Battery mode overload, warning.		•	•							•	•	Beep 2 every 1A
15	Battery mode overload, turn off inverter		•	•									Beep
16	Over temperature		•	•				•	↑	↑			Beep
17	Inverter abnormal		•				•		↑	↑			Beep
18	Bypass abnormal		•			•			↑	↑			Beep
19	Battery is abnormal		↑	↑	↑	↑	↑	•				★	↑
20	L, N reversed or earth is not connected.			↑	↑	↑	↑	•	↑	★		↑	Beep 1 every 2M
21	Battery test			↑	↑	↑	↑	↑					Light circularly

4.3.2. LCD panel display



LCD panel

Table: LED panel display (●: means light ★: means ↑: means: defined by others)

Index	Inverter status	LED						Warning tone	Remarks
		1	2	3	4	5	6		
1	Line mode			●	↑		●	No	
2	Battery mode				●		●	Beep 1 every 4s; Very low, beep 1 every 1s	
3	Bypass mode			●	↑	●		Beep 1 every 2M	
4	Line mode overload		●	●			●	Beep 2 every 2s	Overload to bypass
5	Battery mode overload		●		●		●	Beep 2 every 2s	Overload to turnoff
6	Fault	●	↑	↑	↑	↑	↑	Beep	Detailed information refer to LCD
7	Line mode battery weak			●	★		●	↑	
8	L, N reversed or earth not connected.		↑	★	↑	↑	↑	Beep 1 every 2M	
9	Battery test	Light circularly							

LCD display example:



【Turn on display】



【Running display】

【Turn on display】: The first line shows equipment model. The second line shows welcome information.

【Running display】: The first line shows running data, such as utility power, DC voltage, and output voltage and so on, the user can switch these data by function key. The second line shows running statuses, here is list table of running statuses.

[Running status list for LCD panel]

Index	Running status	Group	Remarks
1	Bypass output	Normal	Bypass output
2	Battery invert on	Normal	Battery inverter output
3	Line invert on	Normal	Line inverter output
4	Testing...	Normal	Battery test
5	Standby...	Normal	Inverter standby for turn on
6	Overload to bps	Warning	Line mode overload to bypass
7	Overload to off	Warning	Battery mode overload to turn off
8	Overload!	Warning	Load over 100%
9	Battery low	Warning	Battery low
10	Line abnormal	Warning	Line L, N reversed or earth not connected or voltage and frequency our of range
11	Model wrong	Fault	Inverter model read fail
12	Load short	Fault	Load short
13	Over temp	Fault	Inverter inner temperature high
14	Inverter fail	Fault	Inner fail
15	Inverter Fault	Fault	Inverter fail
16	EPO fault	Fault	EPO interface fail
17	Battery high	Fault	Battery volts high
18	Fan fail	Fault	Fan stopped

5. Maintain and troubleshoot

This chapter introduces inverter maintenance methods and trouble shootings.

5.1. Maintain method

When we check inverter to make sure it works well, we should check as below.

1. Check running status of inverter

If the utility power is available, inverter should work in line mode or in battery mode. And there is no warning or fault indication.

2. Check running mode switch of inverter

Cut off the line input to simulate the utility power interruption, inverter should transfer to battery mode, and connect the line input, inverter return to line mode again.

3. Check display of inverter

4. Check display of inverter if it is consistent with inverter running mode.

5.2. Battery maintain

Battery is a very important part in inverter system. Life of batteries is defined by environment temperature and discharge times, high temperature and deep discharging will decrease battery life.

- 1. Environment temperature should be between 15-25°C
- 2. If inverter is not used, it is proposed to charge batteries once every 3 months.
- 3. Normally, batteries should be discharged once every 4 to 6 months.
- 4. Batteries should not be replaced individually, please get advices from the supplier.

5.3. Trouble shoot

If any trouble, please refer to the below table at first. If the problem cannot be solved, please contact with us.

5.3.1. LED panel trouble shoot

Problem	Possible reason	How to solve
1# & 6# LED light with beep	Inverter over temperature	Make sure inverter is not overload; environment temperature is not high; intake is ok. Turn off inverter for 10 minutes and try to turn on again. If fail again, please contact with the seller.
1# & 5# LED light with beep	Inverter fail	Please contact with the seller.
1# & 4# LED light with beep	Inverter fail	Please contact with the seller.
8# LED flicker.	Line voltage or frequency is out of range.	Inverter is in battery mode, please save data and turn off inverter to check input voltage.

	L, N reversed or earth not connected.	Reconnect cables.
1# & 2# LED light, with beep	Battery mode inverter overload	Check loads and remove some loads to make sure inverter is not overloaded.
1# & 2# & 6# LED light with beep 1 every 1s	Fan not connected or fan fail	Contact with the seller
1# & 2#, 5# LED light with beep	Inverter output short	Turn off inverter, remove all loads. Make sure no short in the load, return on inverter, if fail again please contact with the seller.
10# LED flicker	Battery low or not connected.	Check batteries if connected ok or battery damaged.
Line is ok, but inverter doesn't work in line mode	Inverter input	Check the input MCB before the input cable
Battery discharge time short	Battery not full	Charge batteries.
	Inverter overload	Remove some loads
	Batteries are aged	Change batteries.
Inverter cannot be turned on	Not enough key holding time.	Holding to turn ON key at least 1 second.
	No batteries or batteries low.	Connect with the batteries, and turn on inverter without load.
	Inverter fail	Contact with the seller

5.3.2. LCD panel trouble shoots

Problem	Possible reason	How to solve
LCD display "Over temp" fault LED light and beep	Inverter over temperature	Make sure inverter is not overload; environment temperature is not high; intake is ok. Turn off inverter for 10 minutes and try to turn on again. If fail again, please contact
LCD display "inverter fail", fault LED light and beep	Inverter fail	Please contact with the seller.
LCD display "line abnormal" line LED flicker	Line voltage or frequency is out of range.	Inverter is in battery mode, please save data and turn off inverter to check input voltage.
	L, N reversed or earth not connected.	Reconnect cables.

LCD display "Overload! " Overload LED light and beep	Overload	Check loads and remove some loads to make sure inverter is not overload.
LCD display "fan fail", and beep 1 every 1s	Fan not connected or fan fail	Contact with the seller
LCD display "Output short", fault LED light and beep	Inverter output short	Turn off inverter, remove all loads. Make sure no short in the load, re turn on inverter, if fail again please contact with the seller.
LCD display "battery low" and battery LED	Battery low or not connected.	Check batteries if connected ok or batteries damaged.
Line is ok, but inverter doesn't work in line	Inverter input	Check the input MCB before the input cable.
Battery discharge time short	Battery is not full	Charge batteries.
	Inverter overload	Remove some loads
	Batteries are aged	Change batteries.
Inverter cannot be turned on	Not enough key holding time.	Hold turn ON key at least 1 second.
	No batteries or batteries low.	Connect with batteries, and turn on inverter without load.
	Inverter fail	Contact with the seller.