

Uninterruptible Power Systems

CASTLE SERIES

C6K(e) / C6KS(e) / C10K(e) / C10KS(e)

USER MANUAL

 **SANTAK**

Please comply with all warnings and operating instructions in this manual and on the unit strictly. Keep this manual properly for future reference. Do not operate this unit until reading through all safety information and operating instructions carefully.

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1. Brief introduction

1.1 System and model description

This Online Series is an uninterruptible power system incorporating double-conversion technology. It provides perfect protection specifically for computer equipment, Communication Systems and computerized instruments.

Its true online double-conversion design eliminates all mains power disturbances. A rectifier converts the alternating current from the utility power to direct current. This direct current charges the batteries and powers the inverter. On the basis of this DC voltage, the inverter generates a pure sinusoidal AC voltage, which is constantly powering the loads. Computers and Peripherals connected to the UPS thus entirely power-protected. In the event of mains failure, the maintenance-free batteries power the inverter.

This manual is applicable to the following models:

- 1) The C6K(e) is a standard model with inbuilt battery;
- 2) The C6KS(e) is a long backup time model, which is able to connect with the external battery bank;
- 3) The C10K(e) is a standard model with inbuilt battery;
- 4) The C10KS(e) is a long backup time model, which is able to connect with the external battery bank;

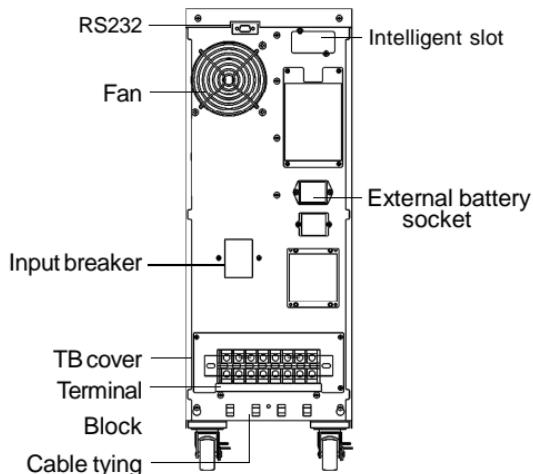
1.2 Description of commonly used symbols

The following symbols will be used in this manual and may appear during the course of your practical applications. Therefore, all users should be familiar with them and understand their meanings.

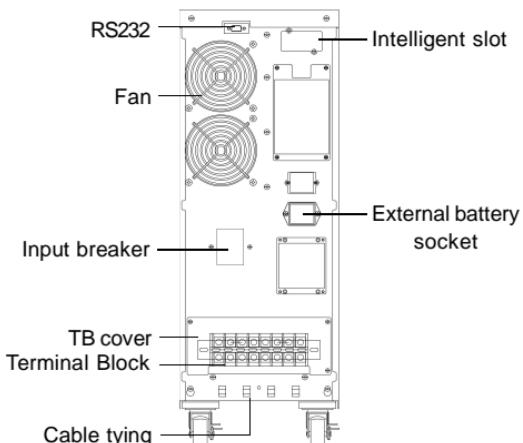
Notation and Explanation			
Notation	Explanation	Notation	Explanation
	Alert you to pay special attention		Protective ground
	Caution of high voltage		Alarm silence
	Turn on the UPS		Overload indication
	Turn off the UPS		Battery check
	Idle or shut down the UPS		Recyclable
	Alternating current source (AC)		Do not dispose with ordinary trash
	Direct current source (DC)		

1. Brief introduction

1.3 Appearance



BACK VIEW of C6K(e)/C6KS(e)



BACK VIEW of C10K(e)/C10KS(e)

1. Brief introduction

1.4 Product specification and performance

General specification

Model	C6K(e)	C6KS(e)	C10K(e)	C10KS(e)
Power Rating	6kVA/4.2kW	6kVA/4.2kW	10kVA/7kW	10kVA/7kW
Frequency (Hz)	50	50	50	50
Input	Voltage	(176-276)VAC	(176-276)VAC	(176-276)VAC
	Current	31A max.	31A max.	50A max.
	Frequency	46Hz~54Hz	46Hz~54Hz	46Hz~54Hz
	Power Factor	>0.98(Full load)	>0.98(Full load)	>0.98(Full load)
Battery	Voltage	240VDC	240VDC	240VDC
	Current	24A max.	24A max.	40A max.
Output	Voltage	220VAC	220VAC	220VAC
	Current	27A	27A	45A
	Voltage regulation	± 1%		
	Power Factor	0.7 lag		
	Frequency tolerance	Synchronized 46-54Hz in Line mode(AC mode) ± 0.1% of normal frequency in Battery mode		
	Distortion	THD<2% Full load (Linear load)		
	Overload capacity	105%-130% load transfers to bypass mode after 10 minutes >130% load transfers to bypass mode after 1 second and shutdown the output after 1 minute		
	Current crest ratio	3:1 maximum		

Operating environment

Temperature	Humidity	Altitude	Storage temperature
0 ~40	<95%	<1000m	0 ~-40

Note: If the UPS is installed or used in a place where the altitude is above than 1000m, the output power must be derated in use, please refer to the following:

Altitude (M)	1000	1500	2000	2500	3000	3500	4000	4500	5000
Derating power	100%	95%	91%	86%	82%	78%	74%	70%	67%

2. Installation

2.1 Unpacking and inspection

- 1) Unpack the packaging and check the package contents. The shipping package contains:
 - A UPS
 - A user manual
 - A communication cable
 - A battery cable (for C6KS(e)/C10KS(e))
- 2) Inspect the appearance of the UPS to see if there is any damage during transportation. Do not turn on the unit and notify the carrier and dealer immediately if there is any damage or lacking of some parts.

2.2 Input and output power wiring and protective earth ground installation

1. Notes for installation

- 1) The UPS must be installed in a location with good ventilation, far away from water, inflammable gas and corrosive agents.
- 2) Ensure the air vents on the front and rear of the UPS are not blocked. Allow at least 0.5m of space on each side.
- 3) Condensation to water drops may occur if the UPS is unpacked in a very low temperature environment. In this case it is necessary to wait until the UPS is fully dried inside out before proceeding installation and use. Otherwise there are hazards of electric shock.

2. Installation

Installation and wiring must be performed in accordance with the local electric code and the following instructions by professional personnel.

For safety, please cut off the mains power breaker before installation. The battery breaker also needs to be cut off if it is a long backup time model ("S" model).

- 1) Open the terminal block cover located on the rear panel of the UPS, please refer to the appearance diagram.
- 2) For C6K(e)/C6KS(e) UPS, it is recommended to select the UL1015 10AWG(6mm²) wire or other insulated wire which complies with AWG Standard for the UPS input and output wirings.

2. Installation

- 3) For C10K(e)/C10KS(e) UPS, it is recommended to select the UL1015 8AWG(10mm²) wire or other insulated wire which complies with AWG Standard for the UPS input and output wirings.

Note: Do not use the wall receptacle as the input power source for the UPS, as its rated current is less than the UPS's maximum input current. Otherwise the receptacle may be burned and destroyed.

- 4) Connect the input and output wires to the corresponding input and output terminals according to the following diagram.

Note: you must make sure that the input and output wires and the input and output terminals are connected tightly.

- 5) The protective earth ground wire refers to the wire connection between the equipment which consumes electro-equipment and the ground wire. The wire diameter of protective earth ground wire should be at least as above mentioned for each model and green wire or green wire with yellow ribbon wire is used.

- 6) After having completed the installation, make sure the wiring is correct.

- 7) Please install the leak current protective breaker at the output power distribution panel of the UPS if necessary.

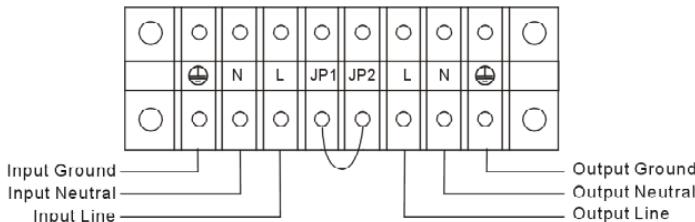
- 8) To connect the load with the UPS, please turn off all the loads first, then perform the connection and finally turn on the loads one by one.

- 9) No matter the UPS is connected to the utility power or not, the output of the UPS may have electricity. The parts inside the unit may still have hazardous voltage after turning off the UPS. To make the UPS have no output, power off the UPS, and then disconnect the utility power supply.

- 10) Suggest charging the batteries for 8 hours before use. After connection, turn the input breaker in the "ON" position, the UPS will charge the batteries automatically. You can also use the UPS immediately without charging the batteries first, but the backup time may be less than the standard value.

- 11) If it is necessary to connect the inductance load such as a monitor or a laser printer to the UPS, the start-up power should be used for calculating the capacity of the UPS, as its start-up power consumption is too big when it is started.

2. Installation



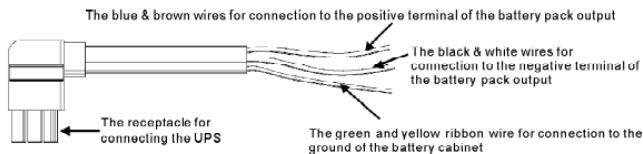
Input and Output Terminal Block wiring
diagram of C6K(e)/C6KS(e)/C10K(e)/C10KS(e)

2.3 Operating procedure for connecting the long backup time model UPS with the external battery

1. The nominal DC voltage of external battery pack is 240VDC. Each battery pack consists of 20 pieces of 12V maintenance free batteries in series. To achieve longer backup time, it is possible to connect multi-battery packs, but the principle of "same voltage, same type" should be strictly followed.
2. The connector of the external battery cable is used to plug into the external battery socket of the UPS, the other end of the external battery cable is made of three open wires with ring terminals to connect with the external battery pack(s). The procedure of installatiating battery bank should be complied with strictly. Otherwise you may encounter the hazardous of electric shock.
 - 1) A DC breaker must be connected between the battery pack and the UPS. The capacity of breaker must be not less than the data specified in the general specification.
 - 2) Set the battery pack breaker in "OFF" position and connect the 20 pieces of batteries in series.
 - 3) You must connect the external battery cable to the battery first, if you connect the cable to the UPS first, you may encounter the hazardous of electric shock. The positive pole of the battery is connected to the C10KS(e) in parallel with blue and brown wires; the negative pole of the battery is connected to the C10KS(e) in parallel with black and white wires; the green and yellow ribbon wire is connected to the ground of the battery cabinet.

2. Installation

3. To complete the connection by plugging the connector of the external battery cable into the external battery socket of the UPS. Do not attempt to connect any loads to the UPS now. You should connect the input power wire to the right position first. And then set the breaker of the battery pack in the "ON" position. After that set the input breaker in the "ON" position. The UPS begins to charge the battery packs at the time.



The external battery cable diagram for C6KS(e)/C10KS(e)
(The cable may vary from different "S" models)

3. Operation and Operating mode

It is easy to operate the equipment, with no previous training. You just need to read through this manual and operate according to the instructions in it. The meaning of the LED indicators, please refer to the appendix 1 "Display panel".

3.1 Operation

1. Turn on the UPS with utility power supplied (in Line mode/AC mode)

- 1) After you make sure that the power supply connection is correct, set the input breaker in the "ON" position first. At this time the fan rotates and the UPS supplies power to the load via the bypass. The UPS operates in Bypass mode.
- 2) To power on the UPS by simply pressing the "ON" button continuously for more than 1 second.
- 3) When being powered on, the UPS will perform self-diagnosis, with the load/battery level LEDs turned on and then off one after another in ascending order. A few seconds later, the INV LED is turned on, the UPS is already running in Utility Power mode. If the utility power is abnormal, the UPS will operate in battery mode without output interruption of the UPS.

2. Turn on the UPS with no utility power supplied (in Battery mode)

- 1) Press the "ON" button continuously for more than 1 second to power on the UPS. For long back up time model ("S" model), please make sure that the battery breaker is in "ON" position.
- 2) During the course of starting up, the UPS has the same action as if it is connected to utility power except that the utility power LED is not turned on and the battery LED is turned on instead.

3. Turn off the UPS with utility power supplied (in Line mode/AC mode)

- 1) Press the "OFF" button continuously for more than 1 second to turn off the inverter of the UPS immediately.
- 2) When being powered off, the UPS will perform self-diagnosis, the Load/Battery level LEDs will be turned on and then off one after another in ascending order, then the INV LED will be turned off and Bypass LED will be turned on. The UPS is working in Bypass mode.
- 3) Upon completion of the above to turn it off, output of electric current of the UPS is still present. In order to cut off the output

3. Operation and Operating mode

from the UPS, simply cut off the utility power supply and the UPS will perform self-diagnosis, finally not any display is shown on the display panel and no voltage output is available from the UPS output.

4. Turn off the UPS with no utility power supplied (in Battery mode)

- 1) Press the "OFF" button continuously for more than 1 second to power off the UPS.
- 2) When being powered off, the UPS will perform self-diagnosis, the Load/Battery level LEDs will be turned on and then off one after another in ascending order. Finally not any display is shown on the display panel and no voltage is available from the UPS output.

Suggestions: Please turn off the connected loads before turning on the UPS and turn on the loads one by one after the UPS is working in INV mode. Turn off all of the connected loads before turning off the UPS.

3.2 Operating mode

1. Utility power mode

The display panel in utility power mode is shown in the following diagram. The utility power LED and the INV LED are turned on. The load level LEDs will be turned on in accordance with the load capacity connected.

- 1) If the battery LED is turned on and the utility power LED flashes, it indicates the voltage or frequency of the utility power has exceeded the normal range, the UPS operates in battery mode.

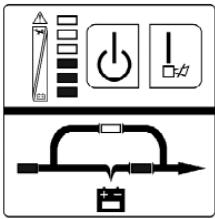


Fig 3-1 The utility power mode

- 2) If output overloaded, the load level LEDs will be turned on and alarm will keep twice every second. You should get rid of some unnecessary loads one by one to decrease the loads connected to the UPS less than 90% of its nominal power capacity.

3. Operation and Operating mode

Note: Please follow the following steps to connect the generator:

- Activate the generator and wait until the operation is stable before supplying power of the generator to the UPS (be sure that the UPS is in idle mode). Then turn on the UPS according to the start-up procedure. After the UPS is turned on, then the loads can be connected to the UPS one by one.
- The power capacity of the AC generator should be at least twice of the UPS capacity.

2. Battery mode

The display panel in battery mode is shown in the following diagram Fig.3-2. The battery LED and the INV LED are turned on. The displayed number of the battery level LEDs will be turned on in accordance with the battery capacity. Note that the load level LEDs in utility power mode will indicate the level of the battery capacity in battery mode instead.

- 1) When the UPS is running in battery mode, the buzzer beeps once every 4 seconds. If the "ON" button on the front panel is pressed for more than 1 second again, the buzzer will stop beeping (in silence mode). Press the "ON" button once again for more than 1 second to resume the alarm function.

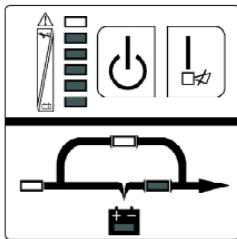


Fig 3-2 Battery mode diagram

- 2) When the battery capacity decreases, the number of the battery capacity LEDs turned on will be reduced. If the battery voltage descends to the alarm level, the buzzer will beep once every second to remind users of insufficient battery capacity and the UPS is soon going to shut down automatically. Then the load operations should be carried out promptly and the loads should be eliminated one by one.

3. Operation and Operating mode

3. Bypass mode

The display panel in bypass mode is shown in the following diagram Fig.3-3. The utility power LED and the bypass LED are lit. The displayed number of the load LEDs will be turned on in accordance with the load capacity connected. The UPS will beep once every 2 minutes in bypass mode.

- 1) The utility power LED flashes, it shows that the voltage or frequency of the utility power has exceeded the normal range of the UPS.

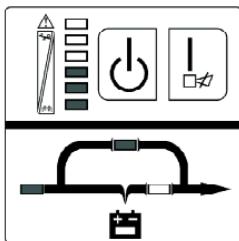


Fig 3-3 UPS bypass mode diagram

- 2) Other indications on the display panel are the same in utility mode.
- 3) The UPS does not have the backup function when it is in bypass mode. The power used by the load is supplied from the utility power via internal filter.

4. Abnormality mode

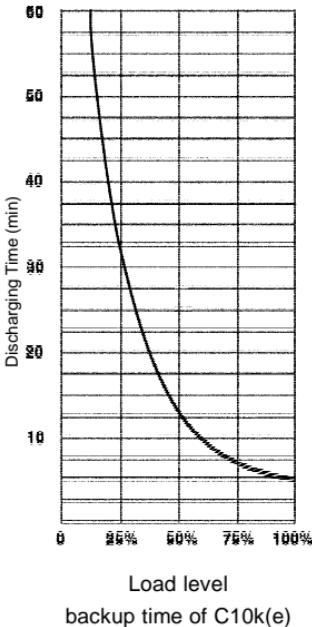
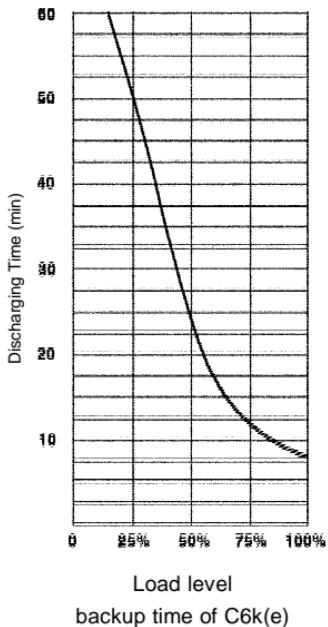
In case the fault LED is turned on when the UPS is in use, it shows that the UPS is operating in abnormal mode. Please refer to the troubleshooting in section 6 for details.

3. Operation and Operating mode

5. Backup time for the standard model

The backup time of the long backup time model is dependent on the external battery pack capacity and the load level as well as other factors.

The backup time of standard model may vary from different models and load level. Please refer to the following:



3. Operation and Operating mode

6. Communication Interface

Intelligent slot

This series is equipped with an intelligent slot for Webpower (optional accessory) or other optional card to achieve remote management of the UPS through internet / intranet. Please contact your local distributor for further information.

RS232 interface

1) The following are the descriptions and pin assignment of RS232 DB-9 port:

Baud rate: 2400bps

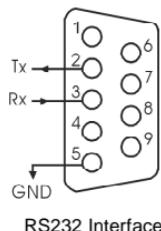
Data bit: 8 bit

Ending bit: 1bit

Parity bit: None

DB-9 pin assignment:

pin number	Function description	I/O
3	Rx	Input
2	Tx	Output
5	Ground	Ground



Optional AS400 interface

This optional AS400 card provides dry contact closure signal "OPEN" or "CLOSE". Following are the pin assignment and the descriptions of AS400 card:

PIN1: UPS failure (normally open, active close)

PIN2: summary alarm

PIN3: ground

PIN4: Remote shutdown

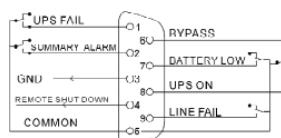
PIN5: Common

PIN6: Bypass active (relay close)

PIN7: Battery low

PIN8: UPS On (relay close)

PIN9: Utility Power failure (normally open, active close)



4. Battery maintenance

- This series UPS only requires minimal maintenance. The battery used for standard models are valve regulated sealed lead-acid maintenance free battery. These models require minimal repairs. The only requirement is to charge the UPS regularly in order to maximize the expected life of the battery. When being connected to the utility power, whether the UPS is turned on or not, the UPS keeps charging the batteries and also offers the protective function of overcharging and overdischarging.
- The UPS should be charged once every 4 to 6 months if it has not been used for a long time.
- In the regions of hot climates, the battery should be charged and discharged every 2 months. The standard charging time should be at least 12 hours.
- Under normal conditions, the battery life lasts 3 to 5 years. In case if the battery is found not in good condition, earlier replacement should be made. Battery replacement should be performed by qualified personnel.
- Replace batteries with the same number and same type of batteries.
- Do not replace the battery individually. All the batteries should be replaced at the same time following the instructions of the battery supplier.
- Normally, the batteries should be charged and discharged once every 4 to 6 months. Charging should begin after the UPS shuts down automatically in the course of discharging, the standard charging time for the standard UPS should be at least 12 hours.

5. Notes for battery disposal and battery replacement

- 1) Before disposing of batteries, remove conductive jewelry such as necklace, wrist watches and rings.
- 2) If it is necessary to replace any connection cables, please purchase the original materials from the authorized distributors or service centers, so as to avoid overheat or spark resulting in fire due to insufficient capacity.
- 3) Do not dispose of batteries or battery packs in a fire, they may explode.
- 4) Do not open or mutilate batteries, released electrolyte is highly poisonous and harmful to the skin and eyes.
- 5) Do not short the positive and negative of the battery electrode, otherwise, it may result in electric shock or fire.
- 6) Make sure that there is no voltage before touching the batteries. The battery circuit is not isolated from the input potential circuit. There may be hazardous voltage between the battery terminals and the ground.
- 7) Even though the input breaker is disconnected, the components inside the UPS are still connected with the batteries, and there are potential hazardous voltages. Therefore, before any maintenance and repairs work is carried out, switch off the breaker of the battery pack or disconnect the jumper wire of connecting between the batteries.
- 8) Batteries contain hazardous voltage and current. Battery maintenance such as the battery replacement must be carried out by qualified personnel who are knowledgeable about batteries. No other persons should handle the batteries.

6.Troubleshooting

Problem	Possible cause	Solution
The #1 Fault LED and the #6 LED are turned on, the buzzer beeps continuously	The UPS shutdown due to internal overheat	Make sure the UPS is not overloaded; the air vents are not blocked and the ambient temperature is not too high. Wait for 10 minutes for the UPS to cool down before turning on again. If failed, please contact the distributor or service center.
The #1 Fault LED and the #2 and #5 LED are turned on, and the buzzer beeps continuously	The UPS output is short circuited.	Turn off the UPS. Remove all the loads. Ensure that the load is not failed or the UPS has no internal faults before turning it on again. If failed, please contact the distributor or service center.
The #1 Fault LED and the #4 LED are turned on, the UPS beeps continuously	The UPS shuts down due to its internal fault.	Please contact the distributor or service center.
The #1 Fault LED and the #5 LED are turned on, the UPS beeps continuously	The UPS shuts down due to its internal fault.	Please contact the distributor or service center.
The utility power LED flashes	The voltage or frequency of the utility power is out of the input range of the UPS.	The UPS is running in battery mode. To save your data and close the application program. Make sure the utility power is within the input voltage or frequency range permitted by the UPS.
The #1 Fault LED and the #2 LED are turned on, the UPS beeps continuously	The UPS is overloaded or the load equipment is faulty	Check the loads and remove all non-critical equipment. Recalculate the load power and reduce the number of loads connected to the UPS. Check that the loads are not failed.
The #1 Fault LED and the battery LED are turned on, the buzzer beeps every second	The charger of the UPS is defective.	Please contact the distributor or service center.

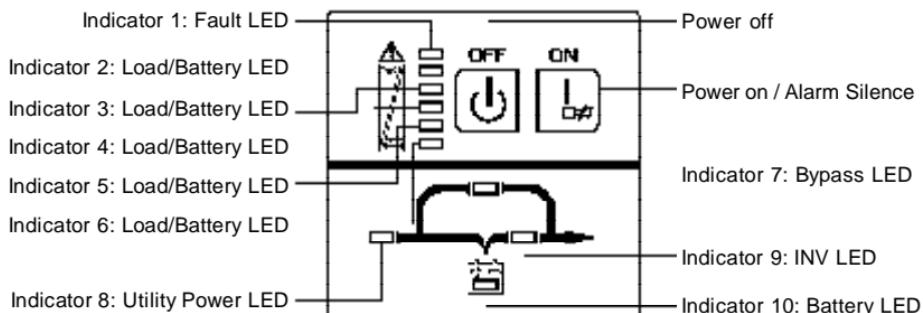
6.Troubleshooting

Problem	Possible cause	Solution
Battery LED flashes	Battery low or battery not connected	Check the battery. If the battery is damaged, replace the battery immediately and ensure that the battery breaker is in "ON" position.
The utility power is normal, but the UPS can not turn in line mode	AC input breaker in "OFF" position	Set the input breaker in "ON" position.
Battery discharging time diminishes	Battery not yet been fully charged	Keep UPS connected to utility power persistently for more than 10 hours to recharge the batteries again.
	UPS overloaded	Check the loads and remove the non-critical equipment.
	Battery aged	Replace the batteries. Please contact the distributor to obtain the parts and replacement service.
The UPS cannot power on after pressing the "ON" button	The "ON" button is pressed too briefly	Press the "ON" button for more than 1 second.
	The UPS is not connected to the battery or the battery pack voltage is too low.	Check the battery or recharge the battery.
	UPS fault	Please contact the distributor or service center.

When you contact the service center, please provide the following information:

- Model No. and the serial No. of the UPS;
- The date when the problem arose;
- Complete description of the problem, including the LED display, alarm warning, and power condition and load capacity. If your UPS is a long backup time model, you may also provide the battery information.

Appendix 1. Display panel



- Power ON/OFF: To turn on the UPS simply by pressing the “ON” button on the front panel continuously for 1 second. Press the “OFF” button on the front panel continuously for 1 second to turn off the UPS.
- Bypass LED (orange LED): Whenever the bypass LED is turned on, it shows that the loading current is supplied directly from the utility power.
- Utility power LED (green LED): Whenever the utility power LED is turned on, it shows that the utility power is normal.
- INV LED (green LED): Whenever the INV LED is turned on, it shows that the loading current is supplied from utility power or battery via the inverter.
- Battery LED (orange LED): Whenever the battery LED is turned on, it shows that the loading current is supplied from battery via the inverter.
- Fault LED (red LED): Whenever the fault LED is turned on, it shows that the UPS is in abnormal condition.
- #2-#6 LEDs (the #2 LED is orange and the #3-#6 LEDs are green): These LEDs indicate the percentage of the load capacity in utility power mode or battery capacity level in battery mode.

Appendix 2. The corresponding form of the LED display

No.	Operating state	LED display										Alarm warning
		1#	2#	3#	4#	5#	6#	7#	8#	9#	10#	
1	Utility Power Mode	0~35% Load capacity					■		■	■		none
		36%~55% Load capacity				■	■		■	■		none
2	Battery Mode	56%~75% Load capacity			■	■	■		■	■		none
		76%~95% Load capacity		■	■	■	■		■	■		none
3	Battery Mode	96%~105% Load capacity	■	■	■	■	■		■	■		none
		0~20% Battery capacity	■						■	■		Beep once every sec.
4	Battery Mode	21%~40% Battery capacity	■	■					■	■		Beep once every 4 sec.
		41%~60% Battery capacity	■	■	■				■	■		Beep once every 4 sec.
5	Battery Mode	61%~80% Battery capacity	■	■	■	■			■	■		Beep once every 4 sec.
		81%~100% Battery capacity	■	■	■	■	■		■	■		Beep once every 4 sec.
11	Bypass mode		▲	▲	▲	▲	■	■	■	■		Beep once every 2 min.
12	overloaded in utility mode and UPS still in INV mode	■	■	■	■	■	■		■	■		Beep twice every sec.
13	overloaded in utility mode and UPS in bypass mode	■	■	■	■	■	■	■	■	■		Beep twice every sec.
14	Utility power abnormal		▲	▲	▲	▲	■	▲	■	▲		▲
15	Overloaded in battery mode, Early-warning		■	▲	▲	▲	▲		▲	■	■	Beep twice every sec.
16	Overloaded in battery mode, Cut off the output	■	■						▲			Continuously beep

Appendix 2. The corresponding form of the LED display

No.	Operating state	LED display										Alarm warning
		1#	2#	3#	4#	5#	6#	7#	8#	9#	10#	
17	Over temperature	■					■	▲	▲			Continuously beep
18	Inv abnormal	■				■		▲	▲			Continuously beep
19	Output short circuited	■	■			■			▲			Continuously beep
20	BUS voltage abnormal	■			■			▲	▲			Continuously beep
21	Charger and battery failed	■						▲	▲	▲	■	Beep once every sec
22	BAT SCR failed	■		■			■	▲	▲			Continuously beep
23	Fan abnormal	■	■				■	▲	▲	▲	▲	Beep once every sec
24	INV RLY failed	■			■		■	▲	▲			Continuously beep
25	Communication abnormal	■		■	■			▲	▲			Continuously beep
26	Parallel abnormal	■	■	■			■		▲			Continuously beep

■: Solid ON

■: Flash

▲: LED display and alarm warning are dependent on other conditions

Warranty

Santak Corp. offers the buyer and the client (hereinafter referred to as 'the Buyer') the following limited warranty for repair:

Starting from the initial date when the Buyer purchases the product from Santak or the distributor/the retailer of Santak, the Uninterruptible Power System and its components related to this 'User's Manual' will not be short of materials and services under normal use, service and maintenance within three years. The foregoing warranty card is the only acceptable warranty card unless other reasonable commercial agreements with specified purposes have been reached. In certain places where local laws have special provisions for the term of warranty, the foregoing term shall not be applicable. This warranty offers special legal rights. You are able to obtain other different rights pursuant to local laws. The Buyer is responsible for certain service and maintenance expenses. The following situation is not covered by the warranty: finished goods lost or serial number manipulated, loss or damage due to force majeure or external reasons, misuse, accident, negligence, unauthorized alteration or repair, overuse, violation of operation stipulations.

Warning: The warranty does not cover any loss caused by the over discharge of the battery. In order to prevent over discharge, when utility power supply is cut off, do not keep the UPS working in battery mode for more than two days without recharging of the battery. Moreover, the battery should be charged again at the interval of 4 to 6 months.

Within the warranty period of three years, in case if any damage of the machine is covered by the warranty, Santak shall offer repair or replacement according to its own means. In case of need for the warranty service, please contact your local Santak Service Center. The transportation charges shall be borne by the buyer.

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