Operation Manual

On-Line UPS

6KVA / 10KVA (1:1)

10KVA / 15KVA / 20KVA / 30KVA (3:1)

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1 Safety Information

⚠ CAUTION
Non-qualified electricians are forbidden to open the case due to hazard of electrical shock.
Consulting the dealer is required before using for below equipment. Its application, configuration, management and maintenance must be specially considered and designed. • Medical equipment which is directly related to patients' life • Elevator and other equipment which may endanger personal safety • Equipment which is similar to the above-mentioned ones

1.1 Symbol instructions

The following symbols are used in this manual, and might also appear in the application process. Therefore, each user is advisable to not only be familiar with the symbols, but also know their significations.

Symbols and Significations			
Symbol	Significations	Symbol	Significations
	Caution		Protective grounding
	Danger! High Voltage!		Disable/mute audible alarm
ON	Turn on		Overload
OFF	Turn off		Battery inspection
	Standby or Shutdown		Repeat
	AC		Display screen cycle button
	DC		Battery

⚠ Safety and General Information

- UPS is generally connected with the batteries. Even if UPS is disconnected with the AC mains power, the voltage still might exist on its output end.
- If it is necessary to replace the charging cable or power cord, please purchase raw materials from the service stations or dealers of our company, so as to avoid causing heat generation, ignition, or fires due to insufficient capacity.
- Please use a dry power extinguisher if there is a fire around. There will be a risk of electric shock if using liquid extinguishers.
- Do not use fire to dispose the batteries or battery packs. Otherwise, it will cause explosive damage.

- Do not open or destroy the batteries, the strong toxicity of the overflowing electrolyte will do harm to human bodies.
- Please avoid the short circuit of battery anodes and cathodes. Otherwise, it will cause electric shocks or ignition.
- Please do not open the UPS housing by yourself. Otherwise, there will be a risk of electric shock
- Do not open the batteries, the electrolyte will do harm to skins and eyes. If coming into contact with the electrolyte by accident, use plenty of clean water to wash immediately, and then go to the hospital for examination.
- Do not touch the battery terminals. If the battery circuit is not isolated from the input voltage circuit, hazardous high voltage may exist between battery terminals and ground.

Symbol	Instructions
 **Warning**	➢ The large leakage current must be grounded before turning on the power (including AC mains power and batteries). The equipment grounding must comply with local electrical codes.
 **Caution**	➢ UPS has high voltage inside. If there are any questions, please consult the qualified electricians, so as not to endanger personal safety. Do not try to maintain UPS. UPS does not have any components that might be maintained by users. Furthermore, this UPS has potential hazardous voltage. The maintenance can only be done by qualified maintenance personnel trained by the manufacturer. If users maintain or modify UPS by themselves, no warranty will be given.

2 Product Overview

2.1 Product description

This series on-line UPS is a high-performance and full-digital uninterruptible power supply using the DSP control technology. The system uses online double-conversion topology design. The DC/AC converter adopts SPWM technology, IGBT power module, and output isolation transformer. Therefore, This series UPS is a kind of pure sine wave power supply with stable frequency stable voltage (SFSV) output and without being affected by grid interference. This series UPS has wide mains input voltage range, superior generator compatibility, strong load capacity, good load compatibility, no switching time needed during the output, and other characteristics, which can greatly meet the demands of various application environments.

- Power range: 6-30KVA
- Operating mode: intelligent power frequency online mode
- Power supply mode: 1-phase in/1-phase out, and 3-phase in/1-phase out
- Applications: finance, telecommunications, securities, tax administration, transportation, insurances, governments, enterprises, etc.

2.2 Product features

- Strong environmental adaptability
  - Strong grid adaptability: the input voltage of the 1-phase in/1-phase out UPS is within the range of 165VAC to 275VAC; while that of the 3-phase in/1-phase out UPS is within the range of 285VAC to 475VAC. The input frequency is within the range of 40Hz to 70Hz, which can adapt to severe grid environment and various kinds of fuel generators.
  - Strong load capacity: this series UPS is compatible with mixed load along with strong overload capacity.
  - Adjustable output voltage/frequency: according to the user needs, the output voltage and the frequency can be respectively set at 220V/230V/240Vand 50/60Hz.
- Double DSP control with high reliability
  - Independent bypass power supply: the bypass DSP automatically detects the state of the main DSP. When there are abnormities on the main power panel or the main DSP, switch the UPS to the bypass mode for output, and give an alarm at the same time, so as to ensure the uninterruptible power supply for loads.
- Strong charging capability
  - The charging current 2A, 4A, 6A, 8A, 10A and 12A can be easily set by DIP switch. This series UPS (10Kand above) supports dual parallel charging panels. The maximum charging current is 24A.
- Support dual input, series hot standby, and parallel operation
  - It is easy to realize dual input, series hot standby, and parallel operation. Furthermore, it is simple to operate, which can further improve the system reliability.
- Input high voltage protection function
  - Monitor the input voltage of the rectifier. Disconnect the rectifier during the high voltage input, so as to protect the safety of the inverter.

- ◆ Diversified communication modes
- ➢ RS232 and USB communication for standard configuration; RS485, SNMP, and dry contact for options.
- ◆ Battery cold start
- ◆ Manual maintenance

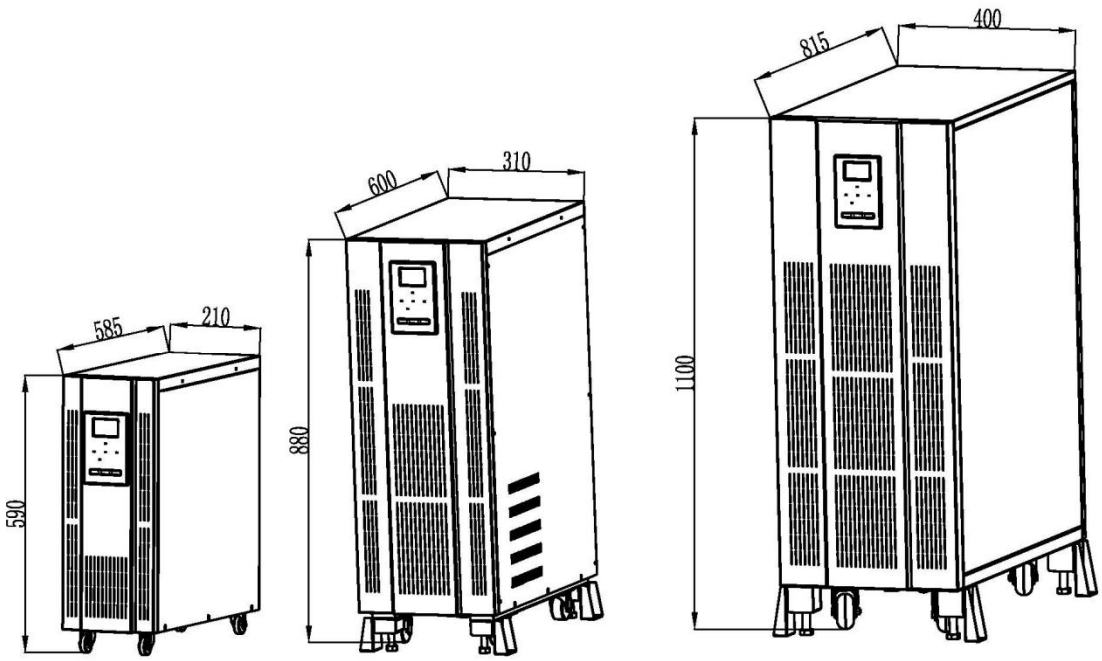
2.3 Specifications

Model		6KVA	10KVA	10KVA	15KVA	20KVA	30KVA
Operating Mode & Principle		Online power supply, static bypass switch (uninterruptible switchover), and double-conversion digital technology					
Main Input	Rated Voltage	220/230/240VAC		380/400/415VAC			
	Standard	Single-phase two-wire +PE		Three-phase four-wire +PE			
	Voltage Range	165 ~ 275VAC		285 ~ 475VAC			
	Rated Frequency	50Hz/60Hz					
	Frequency Range	40 ~ 70Hz					
	Frequency Tracking Range	±5%Hz					
Bypass Input	Rated Voltage	220/230/240VAC					
	Standard	Single-phase two-wire +PE					
	Overload Capacity	Load current<150% rated current: long time working 150%≤ load current <200%: 1min 200% rated current ≤ load current: 200ms					
Charging	Charging Voltage	220VDC					
	Final Discharging Voltage	Vmin = 168VDC					
	Charging Current	8A as default (adjustable to 2A/4A/6A/8A/10A/12A)					
	Protection	Input and output overvoltage protection, short-circuit protection, overtemperature protection etc.					
Battery	Type	Maintenance-free lead-acid battery					
	Battery Quantity	16pcs12V batteries in series					
	Nominal Battery Voltage	192VDC					
AC Output	Rated Voltage	220/230/240VAC					
	Standard	Single-phase two-wire +PE					
	Power Factor	0.8					
	Output Waveform	Pure sine wave					
	Rated Frequency	50Hz/60Hz(settable)					
	Frequency Accuracy	<±0.1Hz (battery inverter)					
	Frequency Tracking Rate	0.5Hz ~ 2Hz/S					
	Voltage Accuracy	<±1% (steady state)					
	Dynamic Voltage Transient Range	±5% (0 ~ 100%load varies)					

	Voltage Transient Recovery Time	<20ms					
	Output Current Peak Ratio	3: 1					
	Waveform Distortion	<3% (linear load); <6% (non-linear load)					
	Switching Time	Mains power mode to battery mode: 0ms; Bypass mode to inverter mode: 0ms					
	Overload Capacity	Load ≤105%: long time working; 105%< load ≤125%: transfer to bypass output in 10min; 125%< load ≤150%: transfer to bypass output in 1min; 150%< load ≤ 200%: transfer to bypass output in 200ms; Load >200%: transfer to bypass output in 100ms.					
Alarm	Mains Power Failure	2 beeps/s: manual silence					
	Battery Under Voltage	4 beeps/s: manual silence					
	Overload Alarm	2 beeps/s: manual silence					
	Fault Alarm	Long beep					
System	Display	LED+LCD					
	Operation	Press the button					
	Protective Function	Output short-circuit, overload, output overvoltage / undervoltage, battery low voltage, and overtemperature protection					
	Communication Port	RS232/USB (standard configuration); RS485/SNMP card/dry contacts (options)					
	Operating Temperature	0~40℃					
	Storage Temperature	-40~70℃(without batteries); -20~55℃(with batteries)					
	Relative Humidity	0~95% (non-condensing)					
	Operating Altitude	The altitude shall not exceed 1000m. Derating for above 1000m according to GB/T 3859.2 standard.					
	Noise	<60 dB (1m)					
	Input / Output Connection Mode	Terminal block					
Others	MTTF	MTTF>200,000 h					
	MTTR	MTTR<0.5 h					
	Insulation Resistance	>2MΩ(500VDC)					
	Insulating Strength	2820Vdc, leakage current is less than1mA, 1minno arcing					
Physical	Structure	Tower					
	IP Rating	IP20					
	Dimensions W×D×H (mm)	210×585×590	310×600×880		400×815×1100		
	Net Weight (kg)	54	96	130	201	230	277
	Color	Dark grey					

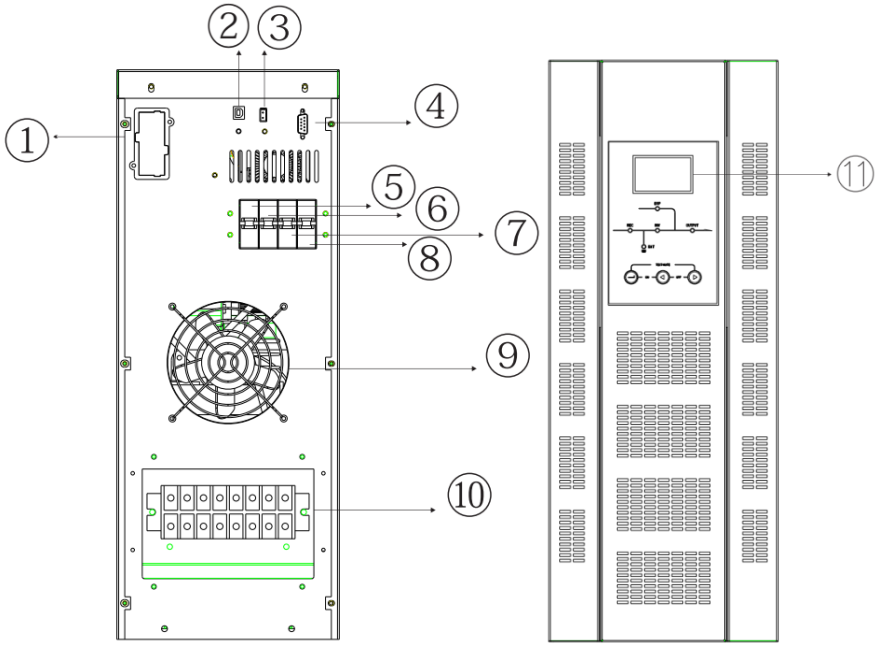
2.4 Front view of the UPS

UPS net dimensions (mm)



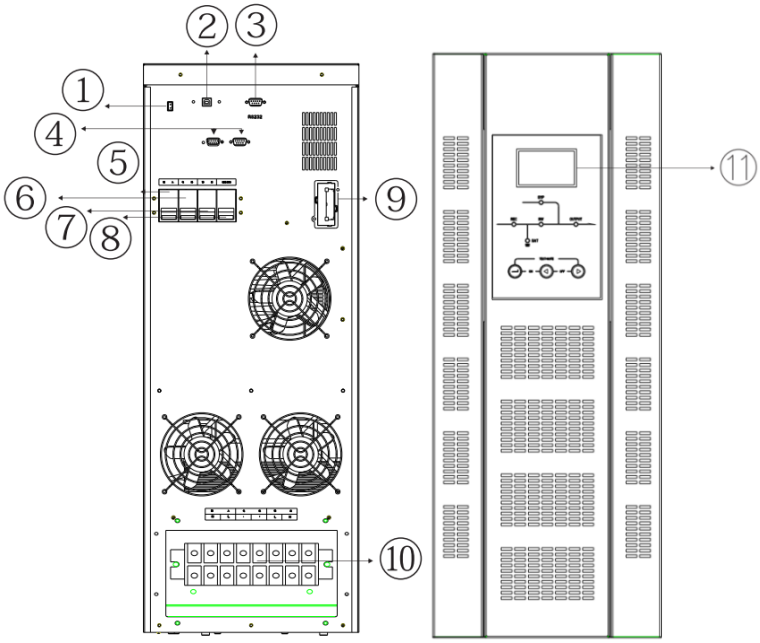
6KVA 10KVA 30KVA

Front panel and rear panel features



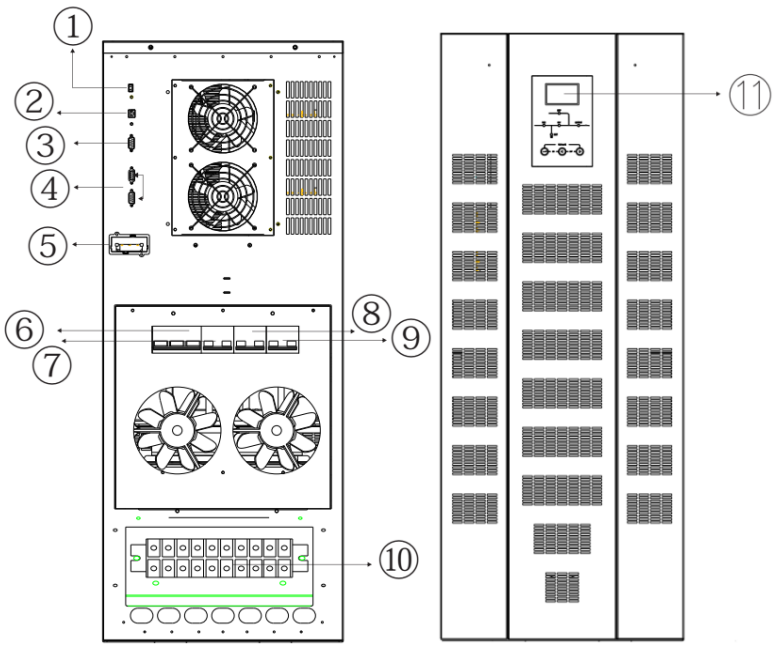
6KVA front and rear panel

① SNMP port	⑤Mains input breaker	⑨Fan
②USB port	⑥Bypass input breaker	⑩Terminal block
③ EPO port	⑦Output breaker	⑪Display panel
④RS232 port	⑧Maintenance bypass breaker	



10KVA (1/1) front and rear panel

①EPO port	⑤Mains input breaker	⑨ SNMP port
②USB port	⑥Bypass input breaker	⑩Terminal block
③ RS232 port	⑦Output breaker	⑪Display panel
④Parallel port	⑧Maintenance bypass breaker	



30KVA (3/3) front and rear Panel

①EPO port	⑤ SNMP port	⑨Maintenance bypass breaker
②USB port	⑥Mains input breaker	⑩Terminal block
③ RS232 port	⑦Bypass input breaker	⑪Display panel
④Parallel port	⑧Output breaker	

3 Installation

3.1 Transportation or movement

Considering the outermost shell of this product being shield, the protective cover cannot be used as the force bearing parts for transportation. It is necessary to pay attention to the following points, so as to ensure the safety:

- The batteries, battery cables, and other load cables can be placed separately during the transportation or movement.
- Prevent severe shock and impact, and handle gently.
- Avoid placing the UPS upside down.

3.2 Unpacking inspection

- Open the UPS package and inspect the contents upon receipt. The accessories attached to the UPS contain an operation manual, an RS232 communication cable, a USB cable, and a CD.
- Check if the unit is damaged during transport. Do not power on and notify the carrier and dealer if find damaged or parts missing.
- Verify this unit is the model you want to buy. Check the model name showed both on the front panel and rear panel.

Note: Keep the packaging box and packaging materials for reuse. The equipment is heavy. Always handle it with care.

3.3 Installation

Due to the particularity of each site, this section only provides the qualified installation personnel with the general installation steps and methods for guidance, instead of introducing detailed installation steps. The installation personnel shall handle according to the specific situation of the site.

⚠ **Caution**

- The UPS ground wire shall be connected well during the electrical connection. Furthermore, make sure to disconnect all switches before the completion of UPS installation.
- The UPS installation shall be conducted by qualified engineers according to the instructions of this chapter and local standards.
- It is necessary to be extremely careful during the battery installation. If the voltage on both ends of the battery exceeds 192VDC during the battery connection, it is in deadly danger. Please wear an eye shield, so as to prevent arcs from hurting your eyes by accident. Remove rings, wrist watches, and all metal objects. Use the tools with insulated handles. Wear rubber gloves. If there is any battery electrolyte leakage or battery damage, replace the battery, place it in the container which is resistant to sulfuric acid corrosion, and dispose it according to local regulations. If the skin contacts with the electrolyte, rinse with water

immediately.

- The altitude shall not exceed 1,000m. Derating for above 1,000m according to GB/T 3859.2 standard.

3.3.1 Installation environment and location

- The UPS placement area shall have good ventilation, and shall be away from water, flammable gas, and corrosives.
- Make sure that the ground or installation platform can bear the weight of UPS, batteries, and battery racks. The weight of batteries and battery racks shall be calculated according to the actual usage.
- Keep the air inlet holes on the front panels, the air outlet holes of the fans on the rear cover plates, and the air inlet holes on the sides of the boxes unobstructed.
- Keep the UPS ambient temperature between 0℃ to 40℃.
- If dismounting the UPS at low temperature for application, there might be condensed water droplets. The UPS can only be installed for application after becoming completely dry on the inside and outside. Otherwise, there will be a risk of electric shock.

3.3.2 Wiring

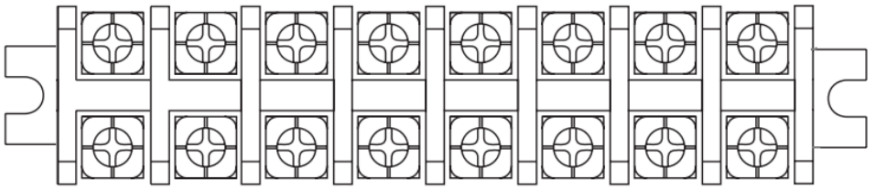
When designing the external connection cables, it is essential to consider the requirements for the current capacity of power cables and the overload capacity of the system, the ambient temperature, and the physical media support. The installation engineers shall refer to local relevant regulations and standards as well as the actual situation of users for comprehensive selection. The connection cables are generally 2-50m in length. Since the overlong cables will cause low voltage, the dimension of the cable cross-sectional area shall be increased accordingly.

Use the terminal block mode as the connection mode for UPS input and output. The basic requirements for wiring are as follows:

Model	Wire Dimension (mm²)					Screw Dimension	
	Mains Input	Bypass Input	Battery Input	Output	Ground Wire	Screw	Screw Hole
6KVA (1: 1)	6	6	6	6	6	M6	6
10KVA (1: 1)	10	10	10	10	6	M6	6
10KVA (3: 1)	6	10	10	10	6	M6	6
15KVA (3: 1)	8	12	12	12	10	M6	6
20KVA (3: 1)	8	16	16	16	16	M6	6
30KVA (3: 1)	10	25	25	25	16	M8	8

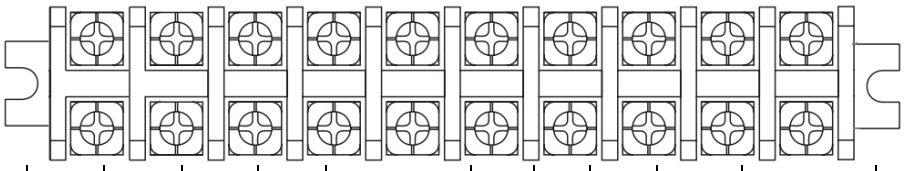
Note: During the wiring, make sure to respectively connect the input and output cables with the input and output terminals firmly. There must be no poor contact. It is suggested that the ground wire diameter should be close to the diameter of the input and output cables.

Wiring schematic diagram for 1-phase in/1-phase out UPS:



L	N	L	+	-	L	N	E
Input		Bypass	Battery		Output		Ground wire
INPUT		BYPASS	BATTERY		OUTPUT		PE

Wiring schematic diagram for 3-phase in/1-phase out UPS:



A	B	C	N	L	+	-	L	N	E
Input				Bypass	Battery		Output		Ground wire
INPUT				BYPASS	BATTERY		OUTPUT		PE

3.3.3 Single wiring

After fully positioning the equipment, connect the power cord according to the following steps:

- Make sure that all the input power distribution switches and internal power switches of UPS have been completely disconnected. Stick warning labels on these switches, so as to prevent others from conducting incorrect operations to the switches.
- Remove the cover plate of the terminal block below the UPS rear panel, so as to expose the terminal block connected with the power cable.
- Ground connection:

Connect the protective grounding cable and other necessary grounding cables to the ground terminal of the UPS terminal block. All the UPS cabinets must be connected with the user grounding cable.

- Mains and bypass input wiring:
  - During the assembly, the bypass input cable L and the mains input cable L (1-phase in/1-phase out UPS), or the mains input cable C (3-phase in/1-phase out UPS) have been short-circuited on the terminal block.
  - When the bypass and the mains power use the same mains input, the AC input cable shall be connected with the UPS mains input terminal. Make sure that the bypass input cable L and the mains input cable L (1-phase in/1-phase out UPS), or the mains input cable C (3-phase in/1-phase out UPS) are short-circuited. Furthermore, make sure that the live wire and the neutral wire are properly connected according to the label of terminal block.

- The bypass refers to the short-circuit wire that shall be used for disconnecting the mains power and bypass on the terminal block when the mains power uses duplex mains input, which is the short-circuit wire of the bypass input cable L and the mains input cable L (1-phase in/1-phase out UPS), or the mains input cable C (3-phase in/1-phase out UPS). The bypass input cable N and the mains input cable N shall be short-circuited before connecting with the mains terminal N of the terminal block. The bypass live wire and the mains live wire shall be connected according to the label of the terminal block.

◆ Output cable connection:

Connect output cables between UPS output terminals and important loads.

If loads are not ready to receive the power supply when commissioning engineers arrive at the scene, please properly handle the safety insulation on the end of the system output cable.

◆ External battery connection:

Please refer to the Chapter 4.5 in the EN50091-1 standard for battery connection.

The battery cabinets must have separate ground connection.

Connect battery cables between the (battery input +/-) battery terminals and the battery switches of UPS. When connecting the cables between battery terminals and battery switches, connect from the switch end first. Pay attention to the polarity of battery cables.

◆ Reinstall all the protective cover plates.

3.4 Parallel UPS units

3.4.1 Redundancy introduction

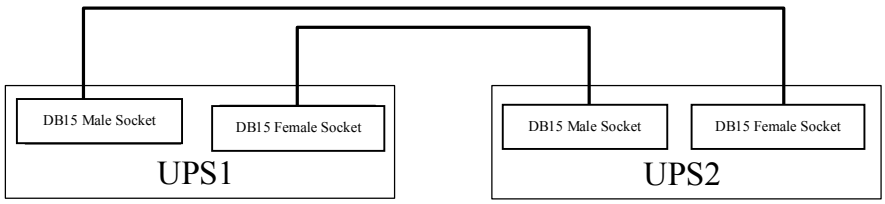
N+X parallel redundancy is the most reliable power supply structure at present. N stands for the minimum number of UPS required for total load. X stands for the number of redundant UPS, which is the number of UPS failure that the system can bear all at once. The larger the X is, the more reliable the system will be. N+X parallel redundancy is the best mode for the applications requiring extremely high reliability.

3.4.2 Parallel units installation

The function of parallel operation is an optional function of UPS. Users can purchase the components with the function of parallel operation (including parallel cards and parallel cables) by themselves, and then contact customer service staff to install the components on the UPS.

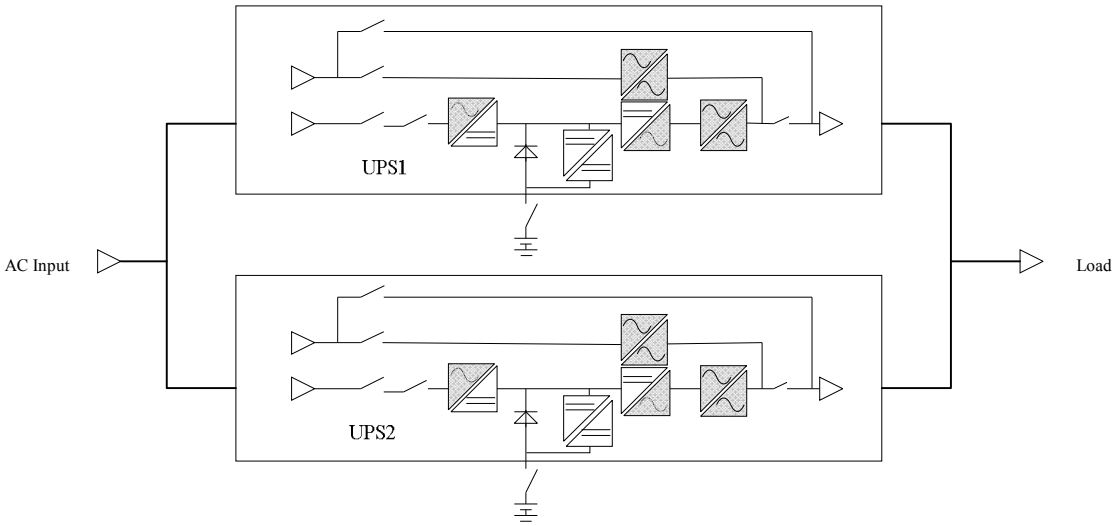
Connect signal cables for parallel UPS units

Each UPS has 2 parallel cable ports (one is DB15male socket, and the other is DB15 female socket) used for connecting two parallel cables. Two parallel cables play the role of redundancy. Keep the cable paralleled as far as possible, so as to reduce the external interference on the parallel cables. Take two parallel UPS units as an example. The wiring schematic diagram is shown as follows.



Connect power cables for parallel UPS units

After fully positioning the equipment, use the input and output cable of the parallel system to respectively connect the input ends of each UPS together, and the output ends of each UPS together. The wiring schematic diagram is shown as follows.



If using separate bypass connection, disconnect the short-circuit wire of the bypass input cable L and the mains input cable L (1-phase in/1-phase out UPS), or the mains input cable C (3-phase in/1-phase out UPS) inside the terminal block of each UPS. Furthermore, respectively connect the mains input ends of each UPS together, and the bypass input ends of each UPS together. Pay attention to confirm whether the live wire and the neutral wire are connected in a correct way.

The cable connection of the battery is the same as that of the single unit. Each UPS has independent battery pack. UPS cannot share battery packs.

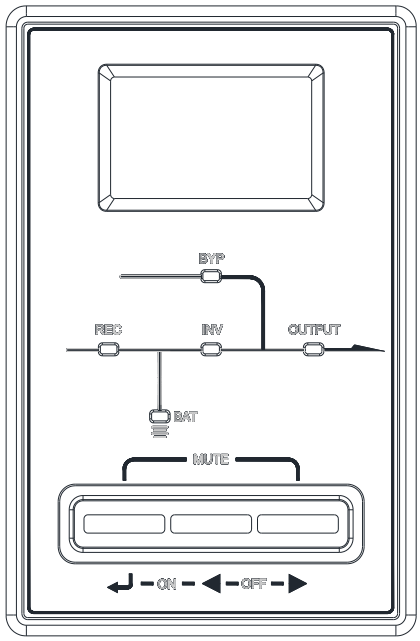
⚠ Caution

All of the UPS bypass shall be connected in the same way for power distribution in the parallel system. The power line between the input end and the AC distribution connecting point of each UPS shall be as long as that between the output end and the load connecting point. Make sure that the input and output impedance of each UPS is consistent with each other, so as to achieve the current-sharing effect of the paralleled UPS.

4 Operation Instructions

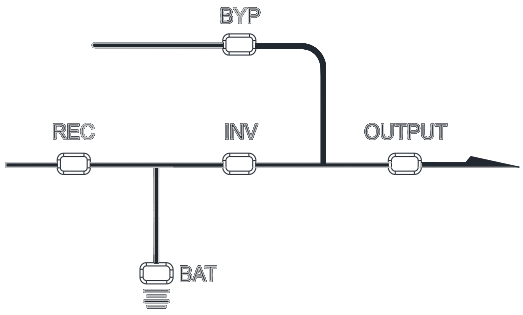
4.1 Panel instructions

4.1.1 Display panel



Keys	Descriptions
↵ + ◄	ON
◄ + ►	OFF
↵ + ►	MUTE

4.1.2 LED indicators

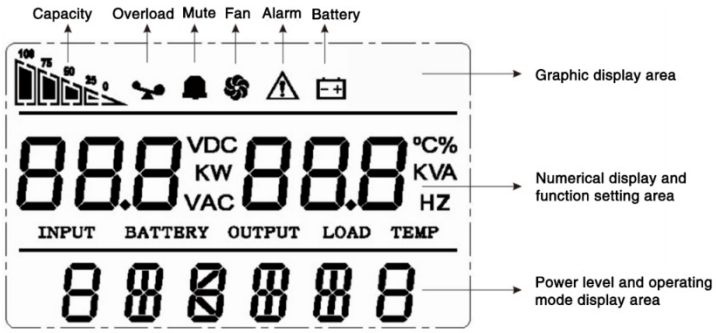


REC: Rectification Indicator	INV: Inverter Indicator	OUTPUT: Output Indicator
BYP: Bypass Indicator	BAT: Battery Indicator	

The indicator status description is shown in the table below.

Indicator No.	Function	Description
①	Rectification Indicator (green)	Light on: The rectifier is running. Light off: The rectifier is out of operation.
②	Inverter Indicator (green)	Light on: The inverter is turned on. Light off: The inverter is out of operation. Blink: The inverter is in standby mode.
③	Output Indicator (green)	Light on: UPS has bypass/inverter output. Light off: UPS has no output.
④	Bypass Indicator (yellow)	Light on: UPS is powered by the bypass. Light off: UPS is not powered by the bypass.
⑤	Battery Indicator (yellow)	Light on: UPS is working in battery mode. Light off: UPS is working in non-battery mode. Blink: The battery voltage is low.

4.1.3 LCD screen



LCD panel view

The LCD display can be divided into 3 areas from top to bottom, which are “graphic display area”, “numerical display and function setting area”, and “power level and operating mode display area”.

- Graphic display area:
  - The load figures represent the load capacity. Each square represents the capacity of 25%.
  - The fan icon will present rotating status without any corresponding meaning; the overload icon will show up without any corresponding meaning.
  - If pressing the mute button in battery mode or in fault and alarm mode, the buzzer icon will blink. This icon will not show up under other circumstances.
  - The fault icon will be lit up and blink in fault or alarm mode. This icon will not show up under other circumstances.
- Numerical display and function setting area:
  - The output information shows up. If operating left and right buttons, the input, battery, output, load, alarm and fault codes will display successively (the fault codes are on the left, while the alarm codes are on the right, please refer to the Chapter 5 “5.5 Fault Mode” for the specific fault and alarm information).

- Press the setting button in standby mode, so as to enter the function setting status for manual bypass setting, output voltage setting, output frequency setting, physical address setting, UPS self-inspection function (p) setting (fault elimination function), etc.

◆ Power level and operating mode display area:

- This display area mainly displays the power level of the UPS within 10s after startup;
- This display area mainly displays the operating mode of the UPS 10s after startup. For instance, STdby (standby mode), BYPS (bypass mode), LINE (mains mode), BAT (battery mode), and FAULT (fault mode).

4.1.4 Keys

It is hereby explained that the UPS key operation is divided into two types, so as to prevent incorrect operations: ①"LONG PRESS", only be effective after pressing for 2s and above; ②"SHORT PRESS", only be effective after pressing for 0.5s and above.

◆ Startup Key Combination (↵ + ◄)

If pressing the startup key combination for 0.5s and above, UPS will turn on.

◆ Shutdown Key Combination (◄ + ►)

If pressing the shutdown key combination for 0.5s and above, UPS will turn off.

◆ System Mute Key Combination (↵ + ►)

If long pressing for 2s and above in battery mode or fault and alarm modes, UPS will be mute.

◆ Setting Key (↵)

Press ↵ to enter the function setting status.

◆ Left Page-turning Key (◄)

Execute the left page-turning operation by short pressing the ◄ key in the main interface and the setting interface.

◆ Right Page-turning Key (►)

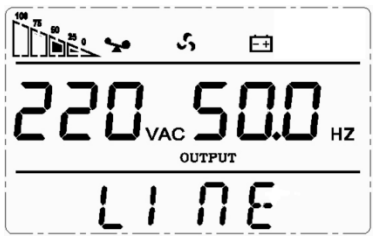
Execute the right page-turning operation by short pressing the ► key in the main interface and the setting interface.

4.2 Panel operation

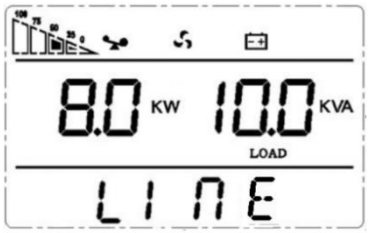
4.2.1 Panel parameter query

Successively query input, battery, output, load, alarm, and fault codes by short pressing the left key ◄ or right key ►.

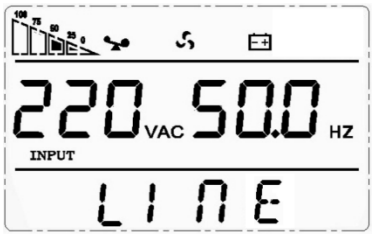
◆ Output: Display UPS output voltage and output frequency. As shown in the figure below, the output voltage is 220V, and the output frequency is 50.0Hz.



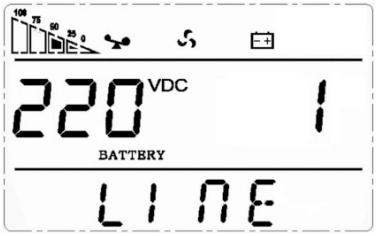
- Load: Display the values of “active power” and “apparent power” at this moment. As shown in the figure below, the load capacity is 8.0kW/10.0kVA.



- Input: Display input voltage and input frequency. As shown in the figure below, the input voltage is 220V, and the input frequency is 50.0Hz.



- Battery: Display battery voltage as well as parallel master and slave unit. As shown in the figure below, the battery voltage is displayed on the left, while the master and slave unit are displayed on the right (1 represents the master unit, while 2 represents the slave unit).



4.2.2 Function settings

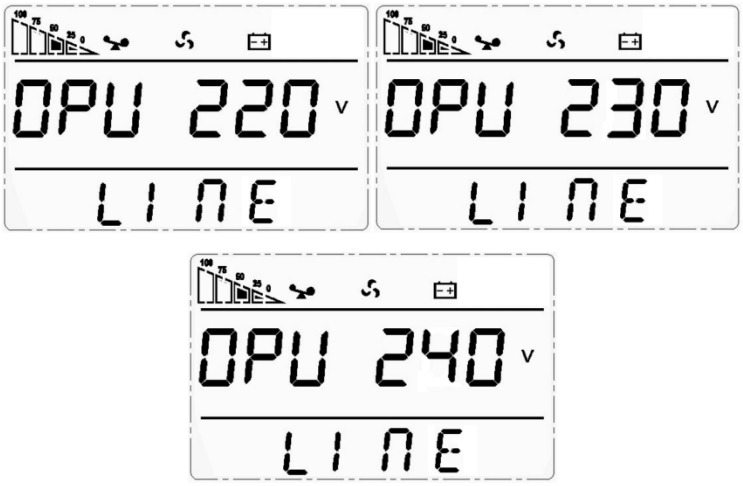
Note:

- The function setting interface provides the setting and query functions of UPS parameters and status. UPS output parameters or operating mode might be affected after setting. Please operate carefully!
- Set Data or Status Query: When entering the setting interface, the data or status showing up for the first time stands for the current setting. Take the output voltage setting and query as an example. When entering the OPU setting interface, if “220V” shows up on the right side, it indicates that the output voltage is set at 220V at present; if setting the output voltage at 230V, “230V” will show up on the right side when entering the OPU setting interface again.
- UPS parameter (output voltage, frequency, and address) setting needs to be conducted in standby mode. After the setting, the set parameters can only come into effect under normal shutdown.

The settable functional items of 6-30KVA UPS are shown in the table below:

Serial No.	Display	Function	Instructions	Remark
1	OPU	Output Voltage Setting	The output voltage can be set at220V/230V/240V	220V by default
2	OPF	Output Frequency Setting	The output frequency can be set at 50.0Hz/60.0Hz	50.0Hz by default
3	ID	Physical Address Setting	The UPS physical address can be set at 1/2/3/4	1 by default
4	nbp	Manual Bypass Setting	1. When nbp is OFF, cut off the bypass by force. 2. When nbp is ON, turn on the bypass by force.	OFF by default
5	P	UPS Self-inspection Function (p) Setting (Fault Elimination Function)	1. When p is OFF, the fault-free system automatically starts up after the self-inspection. 2. When p is ON, the system performs no operations.	OFF by default

4.2.2.1 Output voltage settings (OPU)

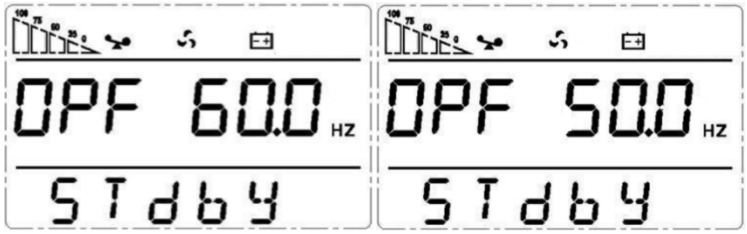


Different UPS output voltage

- Enter the setting interface by short pressing the setting key ↵. Select the options that need to be set (such as OPU, OPF, nbp, ID, etc.) by short pressing the left key ◄ or the right key ►.
- Enter the OPU output voltage setting interface by short pressing the setting key ↵ in the OPU interface. At this moment, the word “OPU” is always lit up, and the numerical value on the right side of the word “OPU” blinks at the same time. Select the output voltage value220V, 230V and 240Vby short pressing the left key ◄ or the right key ►. The output voltage is 220V.

- After selecting the numerical value, short press the function setting key ↵, so as to confirm the OPU setting. At this moment, the numerical value on the right side of the word “OPU” is always lit up without blinking.
- Exit the setting interface, and return back to the main interface by short pressing the function setting key ↵.

4.2.2.2 Output frequency settings (OPF)



Output frequency setting interface

- Enter the setting interface by short pressing the function setting key ↵. Select the function setting contents by short pressing the left key ◄ or the right key ► for 0.5s.
- Enter the OPF setting interface by short pressing the function setting key ↵. At this moment, the word “OPF” is always lit up, and“50Hz” or “60Hz” showing up on the right side of the word “OPF” blinks at the same time. Select “50Hz” or “60Hz”by short pressing the left key ◄ or the right key ►. OPF is 50Hz by default.
- After selecting “50Hz” or “60Hz”, short press the function setting key ↵, so as to accomplish the OPF setting. At this moment, the “50Hz” or “60Hz” on the right side of the word “OPF” is always lit up without blinking.
- Exit the setting interface, and return back to the main interface by short pressing the function setting key ↵.

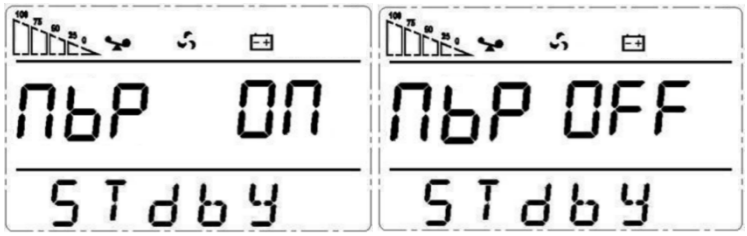
4.2.2.3 Physical address settings (ID)

Physical address setting interface

- Enter the setting interface by short pressing the function setting key ↵. Select the physical address setting interface by short pressing the left key ◄ or the right key ►.

- Enter the physical address ID setting interface by short pressing the function setting key ↵. At this moment, the word “ID” is always lit up, and the numerical value showing up on the right side of the word “ID” blinks at the same time. Select the numerical value corresponding to the ID function by short pressing the left key ◄ or the right key ►. 1/2/3/4 address are optional. The address is 1by default.
- After selecting the address, short press the function setting key ↵, so as to confirm the ID setting. At this moment, the numerical value on the right side of the word “ID” is always lit up without blinking.
- Exit the setting interface, and return back to the main interface by short pressing the function setting key ↵.

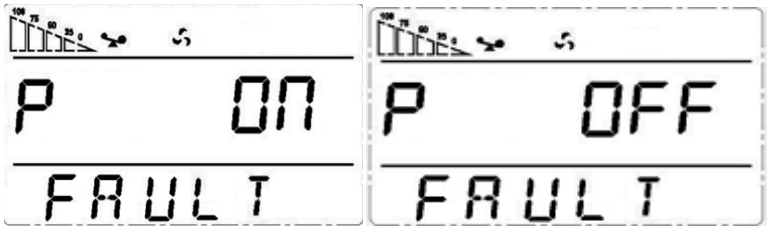
4.2.2.4 Manual bypass (nbp) settings



Manual bypass setting interface

- Enter the setting interface by short pressing the function setting key ↵. Select the function setting by short pressing the left key ◄ or the right key ►. Select the manual bypass setting interface, the word “nbp” blinks at this moment.
- Enter the nbp setting interface by short pressing the function setting key ↵. At this moment, the word “ID” is always lit up, and the “ON” or “OFF” showing up on the right side of the word “nbp” blinks at the same time. Select whether to start using the nbp function by short pressing the left key ◄ or the right key ►. Press “ON” to start using the nbp function. Press “OFF” for rejection.
- After selecting “ON” or “OFF”, short press the function setting key ↵, so as to confirm the nbp setting. At this moment, the “ON” or “OFF” on the right side of the word “nbp” is always lit up without blinking.
- Exit the setting interface, and return back to the main interface displaying the UPS output information by short pressing the function setting key ↵.
- After confirming the nbp as “ON”, the UPS has bypass output after connecting with the mains power without starting up or when the mains power is off. However, there is no backup function after the power goes off.

4.2.2.5 UPS self-inspection function (p) settings (Fault elimination function)



UPS Self-inspection functional interface

- Enter the setting interface by short pressing the function setting key ↵. Select the function setting by short pressing the left key ◄ or the right key ►. Select the UPS self-inspection setting interface, the word “P” blinks at this moment.
- Enter the P setting interface by short pressing the function setting key ↵. At this moment, the word “P” is always lit up, and the “ON” or “OFF” showing up on the right side of the word “P” blinks at the same time. Select whether to conduct system self-inspection by short pressing the left key ◄ or the right key ►. Select the corresponding word “OFF”. After pressing the ↵ key for confirmation, the fault-free UPS automatically starts up after the self-inspection. After selecting the corresponding word “ON”, the UPS performs no operations.
- After selecting “ON” or “OFF”, short press the function setting key ↵, so as to confirm the P setting. At this moment, the “ON” or “OFF” on the right side of the word “P” is always lit up without blinking.
- Exit the setting interface, and return back to the main interface displaying the UPS output information by short pressing the function setting key ↵.

4.3 Daily startup and shutdown

4.3.1 Startup procedures

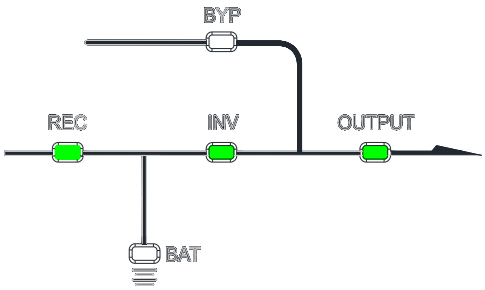
Before the UPS startup, make sure that the authorized maintenance engineers have installed the UPS, and make sure to check whether all the electrical connections are normal, so as to ensure the normal operation of the system.

⚠ Caution: Before implementing any operating steps described in this chapter, read the manual instruction carefully, so as to avoid the personal injuries or equipment damages caused by incorrect operations.

Warning:

- This operating step will generate mains voltage on the UPS output terminal.
- Disconnect the subordinate load connection if necessary. Please stick warning labels on the load connecting positions.

- Users cannot operate the components at the back of the protective cover plates, which can only be opened by using tools.
- Only qualified maintenance personnel can be allowed to open such protective cover plates.
  - Check the rear panel, so as to confirm that all the switches have been disconnected.
  - Close the mains and bypass switches. At this moment, the LCD display screen is lit up, and the UPS is powered by the bypass mode.
  - Check whether the fault/alarm code in the fault interface on the display screen is “000”. If not, refer to the fault code list and the alarm code list to eliminate the abnormalities. After first startup or maintenance, check the setting interface first before startup, so as to examine whether the set output voltage, output frequency, and other parameters meet the requirements of customers.
  - After confirming that the UPS is fault-free, keep pressing the startup key combination (↵ + ◄) for more than 0.5s so that the UPS performs startup operation. In the meanwhile, the rectifier and the inverter start running, and the inverter indicator (INV) blinks. Switch to UPS inverter output after about 10s. Confirm the LED display status. As shown in the figure below:



  - Close the output switch and the UPS external battery switch.

4.3.2 Manual bypass

When the UPS is under normal operation, manually switch the inverter power supply to the bypass power supply. The manual bypass can be set at any moment, and also has memory function (the manual bypass mode only needs to be set once, UPS will keep operating in manual bypass mode after the setting comes into effect, and thus the UPS will automatically start up).
Please refer to the “4.2.2.4 Manual Bypass (nbp) Setting” for operating steps.

⚠ **Caution:** When UPS operates in the bypass mode, if the voltage and frequency fluctuation occur, or the power goes off, the loads will not be protected by UPS.

4.3.3 Maintenance bypass

Note: Please read the warning information given in the Chapter 1 carefully, and conduct bypass maintenance with caution. Otherwise, it is likely to damage the UPS, or to cause load power failure, even endanger personal safety.

4.3.3.1 Entering the maintenance bypass mode (Single unit)

Follow the operating steps below, so as to switch the UPS power supply protection status to the status where the AC input bypass power supply is directly connected through the maintenance

switch.

- Enter the setting interface by pressing ↵ for 0.5s.
- Select the nbp interface by pressing ◄ or ► for 0.5s. Press ↵ key for confirmation.
- Select “nbp ON” by pressing ◄ or ► for 0.5s again. Press ↵ key for confirmation. UPS enters the forced bypass mode afterwards.
- After closing the maintenance switch, UPS provides power supply for the loads through bypass and maintenance bypass.
- Turn off the inverter by pressing ◄ + ► for 0.5s.
- After disconnecting the mains, bypass and output switches as well as the external battery switch, UPS provides power supply for the loads through maintenance bypass.

UPS output has been switched to maintenance bypass so far. The loads have been powered by maintenance bypass mode. The draught fan of the complete unit has stopped running. UPS has been completely shut down. Wait until the bus voltage is lower than 36V, the maintenance personnel can conduct routine maintenance to the UPS. However the load equipment does not have AC power supply fault protection.

4.3.3.2 Exiting the maintenance bypass mode (Single unit)

Perform the following operating steps after the maintenance, so as to switch the loads without AC power supply fault protection to the ones with UPS power supply protection.

- Carefully confirm that there are no objects left inside the UPS cabinet, and the UPS internal connecting wires are recovered to the status before the maintenance.
- Close the bypass switch. After the LCD display screen becomes normal, check the setting interface, and confirm that the manual bypass is turned on. At this moment, the loads are powered by bypass mode and maintenance bypass mode together.
- Close the mains switch. UPS starts up after pressing ↵ + ◄ for more than 0.5s. Carefully observe whether the UPS rectifier and inverter are under normal operation. If they are, keep performing the following steps; if they are not, please shut down the UPS, disconnect the mains and bypass switches, and continue the maintenance.
- Close the output switch after the inverter is under normal operation. UPS is powered by bypass mode and maintenance bypass mode together.
- After disconnecting the maintenance bypass switch, UPS is powered by the bypass mode.
- Close the external battery switch, and set the “manual bypass” on the panel at “OFF”. At this moment, the operation of exiting the maintenance mode has been accomplished, and the loads without AC power supply fault protection have been switched to the ones with UPS power supply protection.

4.3.4 Battery cold start

If it is necessary to use the battery for startup, the operating steps are as follows:

- Close the battery switch, and press ↵ to light up the display screen;
- After the LCD display screen becomes normal, press ↵ + ◄ for more than 0.5s to start up the UPS.

4.3.5 Shutdown procedures (Completely shutting down the UPS and loads)

Follow the steps below when completely shutting down the UPS and disconnecting the loads. Disconnect all the power switches and breakers. The loads are no longer powered by UPS.

- Disconnect all the UPS loads.
- Shut down the UPS after pressing ◄ + ► for more than 0.5s. UPS enters the bypass mode afterwards.
- After disconnecting the mains, bypass and output switches as well as the external battery switch, the display screen goes off.
- Make sure that the maintenance switch has been disconnected.
- The external mains distribution switch and the external output switch must be disconnected for the complete power failure of UPS. Stick the warning labels on the UPS as well.

4.3.6 Emergency power off (EPO)

After inserting the short circuit jumper of the EPO port on the rear panel, UPS enters the EPO mode. EPO switches are used for turning off the UPS in case of emergency (such as fires, floods, etc.). The system will turn off the rectifier and inverter, and will immediately cut off the load power supply (including inverter and bypass output). Furthermore, the battery will stop charging or discharging.

If the UPS mains input still exists, it indicates that the circuit controlled by the UPS is still electrified, while the UPS input is shut down. If it is necessary to cut off the UPS mains power supply, disconnect the UPS external mains input switch.

UPS must be completely powered off, which means to manually disconnect all the input switches (including battery switches), and thus UPS can exit the EPO mode.

⚠ **Caution:** When conducting EPO operations, the UPS system will cut off the load power supply (output cutoff). This function shall only be used after confirming the UPS output cutoff.

4.3.7 Parallel UPS operation

4.3.7.1 Startup parallel UPS

- Confirm all the power lines. Make sure that the parallel cables are properly connected.
- Close the UPS1 mains and bypass switches. Press the UPS1 shutdown key combination for shutdown. Confirm the UPS1 bypass output. Make sure that there is no automatic startup.
- Turn off other UPS in the parallel system successively by referring to the previous step.
- Check whether the fault/alarm interface on the display screen is normal. If it is abnormal, please refer to the fault/alarm list for abnormality elimination.
- Close the UPS1 output switch. Press the startup key combination to turn on the UPS1. After switching to the inverter output, make sure that UPS2, UPS3…UPSN are in standby mode.
- Turn on the UPS2, UPS3…UPSN successively by referring to the previous step.
- After switching all the UPS in the parallel system to inverter output, close the battery switches of UPS2, UPS3…UPSN successively.
- Refer to the Step 3when adding a single unit to the parallel system.

4.3.7.2 Shutdown parallel UPS

- Turn off all the loads.
- Press the shutdown key combination to turn off the UPS1, UPS2…UPSN.
- Single Exit: Turn off the UPS to be exited, and disconnect its mains, bypass and battery switches under the condition of system inverter output. Please check the capacity before single exit, so as to make sure that the parallel system will not overload after single exit.

4.3.7.3 Parallel UPS maintenance bypass

- Set one UPS at manual bypass mode. At this moment, other UPS in the parallel system are set at bypass mode with system bypass output.
- Close the maintenance switches of the UPS that need to be repaired, and then shut down the UPS.
- Disconnect the mains, bypass and output switches as well as the external battery switch. Conduct maintenance after the bus voltage has been reduced to the safety range.
- After the maintenance, carefully confirm that there are no objects left in the UPS cabinet, and the wires are properly connected.
- Make sure that all the UPS in the parallel system are in bypass operating mode. Close the mains and bypass switches. Check whether the fault/alarm interface is normal.
- Turn on the repaired UPS. The inverter shall be in standby mode after startup. Close the output switch. Disconnect the maintenance switch. Switch to bypass output mode.
- Conduct manual bypass elimination to one of the UPS in the parallel system. Make sure that the manual bypass of all the UPS has been eliminated together, and that UPS has been switched to inverter output mode.

⚠ **Caution:** If unplugging the parallel cables of the parallel system in maintenance mode, other UPS in the parallel system might suffer from power failure. If it is necessary to unplug the parallel cables during the maintenance, it is advisable to conduct the operation after shutting down other UPS in the parallel system.

4.3.8 Reset operation after the fault alarm

When UPS shuts down due to the rectifier abnormalities, bus overvoltage, etc., follow the UPS reset steps below to recover the normal operating mode of the UPS after taking measures to eliminate faults according to the fault/alarm information on the display screen.

After the users confirm that the faults have been eliminated, and there are no remote EPO signals, perform the following steps:

- The operation panel enters the fault/alarm interface.
- Refer to the “4.2.2.4 UPS Self-inspection Function (p) Setting (Fault Elimination Function)” in the Chapter 4 for fault elimination.

4.3.9 Automatic startup

During the mains power failure, UPS provides power supply for the loads through the battery system. When the battery discharges to 168V, UPS stops the inverter output, and switches to static bypass output. During the mains recovery, UPS automatically restarts, and recovers the inverter output power supply for battery charging. The automatic startup function also applies to the bypass mode.

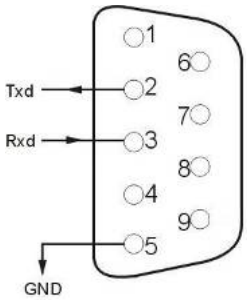
4.4 Communication interface

4.4.1 Computer interface

UPS and monitoring equipment (computer) can be connected with each other through standard RS232 port (standard configuration) and standard USB interface (standard configuration), so as to realize single UPS communication.

- ◆ Connect RS232 (USB) communication cable onto the serial port (USB interface) of the computer;
- ◆ Connect RS232 (USB) communication cable onto the serial port (USB interface) of the UPS.

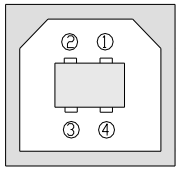
☆ The RS232 port description is as follows:



Pin	1	2	3	4	5
Definition	Null Pin	Transmit Data	Receive Data	Null Pin	Ground
Pin	**6**	**7**	**8**	**9**	
Definition	Null Pin	Null Pin	Null Pin	Null Pin	

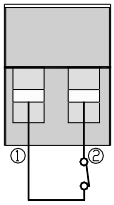
☆ The USB interface description is as follows:

Pin	1	2	3	4
Definition	Power Supply +5V	Data +	Data -	Ground



4.4.2 EPO port

EPO is short for Emergent Power Off. EPO ports refer to the green terminals located on the UPS rear panels. Users can shut down the UPS and cut off the power output through this port in case of emergency. The wiring mode is as follows:



Under normal circumstances, pin 1 and pin 2 are disconnected; close pin 1 and pin 2 during emergency shutdown.

4.4.3 Installation of intelligent cards (Optional)

Each UPS has one intelligent slot, which is adaptive to three kinds of intelligent cards, namely SNMP cards, dry contact cards, and RS485 cards.

The intelligent cards shall be installed in the intelligent slots on the UPS rear panels. There is no need to shut down UPS during the installation of intelligent cards. The installation steps are as follows:

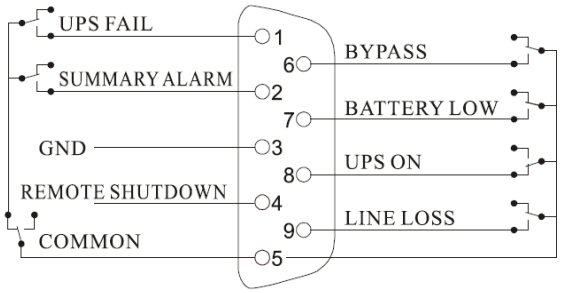
- Remove the cover plate on the intelligent slot first;
- Insert the required intelligent card in the slot;
- Use the screws removed before to fasten the intelligent card.

> SNMP card (Optional)

SNMP cards can be compatible with the software, hardware, and network operating systems that are popular on the Internet today. Therefore, UPS can directly access to the Internet, can provide real-time UPS and power supply information, and can realize communication and management through various kinds of network management systems. Since SNMP cards can realize network communication on multiple UPS, it is convenient to conduct centralized monitoring and management to each UPS.

>Dry contact card (Optional)

Insert the dry contacts into the intelligent slot, so as to realize UPS monitoring and management. The pin description of the dry contact card is as follows:



Pin	Definition
PIN1	Breakover: UPS fault
PIN2	Breakover: alarm sound (system fault)
PIN3	Grounding (Ground)
PIN4	Remote shutdown
PIN5	Common port (Common)
PIN6	Breakover: bypass operation
PIN7	Breakover: low battery voltage
PIN8	Breakover: UPS operation; Non-breakover: bypass operation
PIN9	Breakover: mains power failure

> RS485 card (Optional)

This series of UPS specially designs a kind of supporting RS485 card for the intelligent slot. The words “A” and “B” on the right side of the port represent RS485 output. “A” represents positive pole, while “B” represents negative pole.

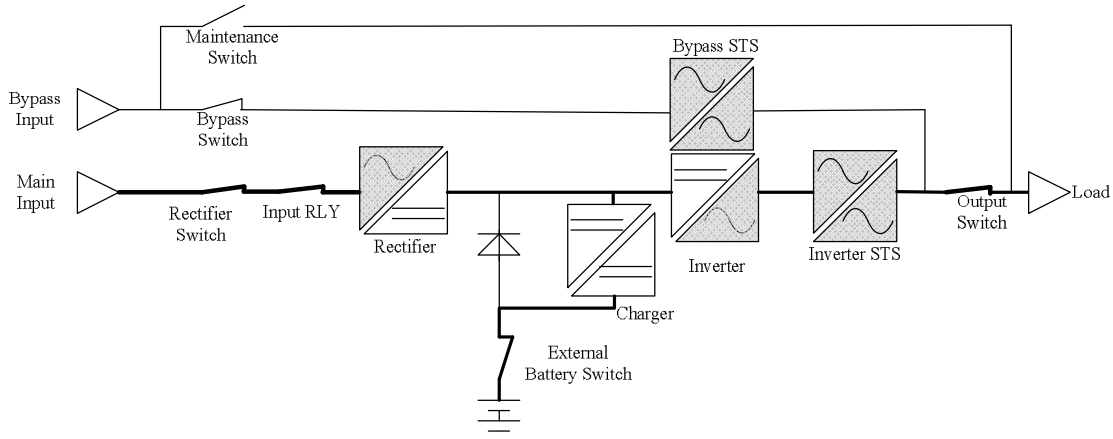
5 Operation Modes

This series UPS is online double-conversion UPS system, which can be operated in the following modes:

- Mains inverter mode
- Battery mode
- Bypass mode
- Maintenance mode (manual bypass)
- Parallel redundancy mode

5.1 Mains inverter mode

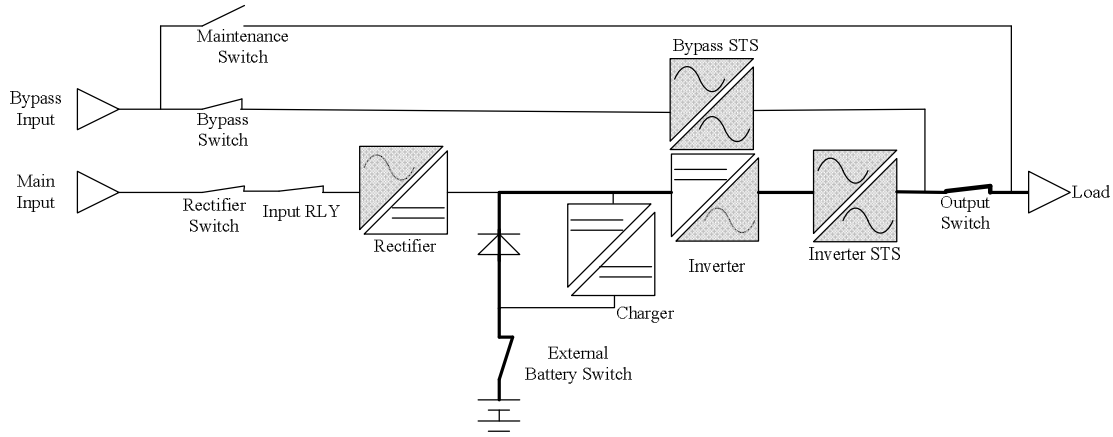
Mains power provides AC power supply for the UPS rectifier. The rectifier provides DC power supply for the inverter, and provides continuous uninterruptible AC power supply for the loads through the inverter. The charging panel is used for battery charging.



Mains inverter mode

5.2 Battery mode

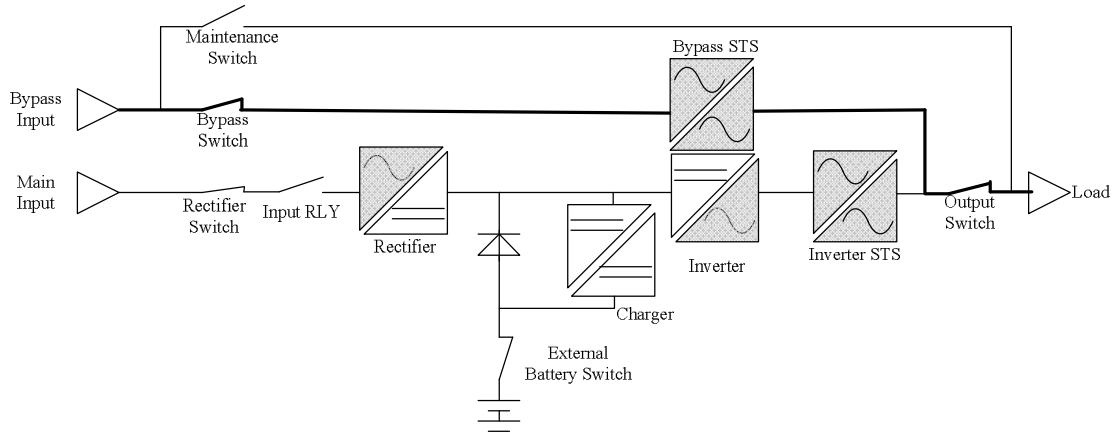
The battery mode refers to the operating mode where the batteries provide backup power supply for the loads through the inverters. During the mains power failure, the system automatically switches to the battery mode, and keeps on being powered by batteries until reaching the predetermined backup time. The batteries provide output power supply through inverters. The load power supply is uninterruptible. During the mains recovery, the system automatically switches to the mains inverter power supply mode without any manual intervention, and the load power supply is uninterruptible. If the mains power fails to be back to normal after reaching the battery backup time, the system will automatically switch to uninterruptible bypass mode.



Battery mode

5.3 Bypass mode

If UPS remains shutdown status after being electrified, and suffers from inverter fault in the inverter power supply mode, or is turned off, UPS will switch to bypass mode.

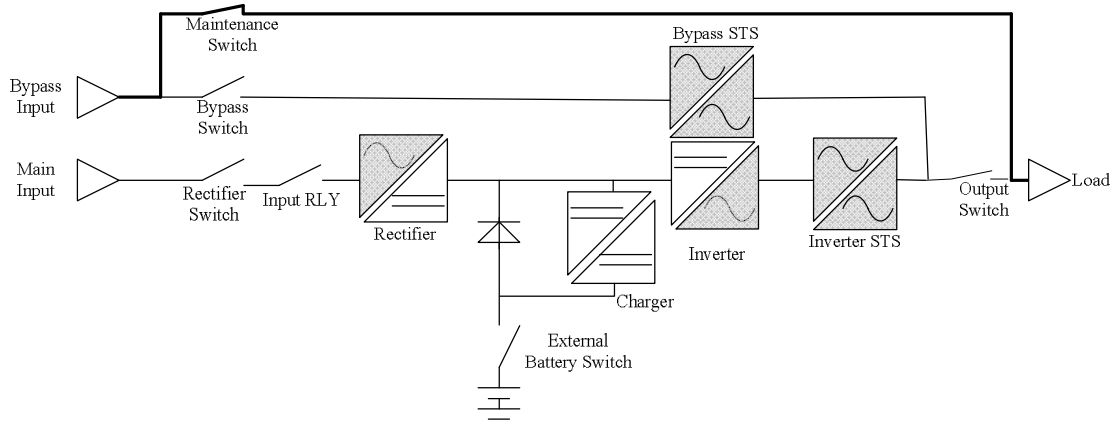


Bypass mode (the inverter has been shut down)

⚠ **Caution:** When UPS is in bypass mode, if voltage and frequency fluctuation occur, or UPS suffers from power failure, the loads will not be under the protection of UPS.

5.4 Maintenance mode

When it is necessary to conduct routine maintenance to the UPS, users can switch the loads to the maintenance bypass mode through maintenance bypass switch, and the load power supply is uninterruptible. The maintenance bypass switch is inside the UPS single unit. The capacity meets the requirements for the total load capacity of the single unit.



Maintenance mode

5.5 Fault mode

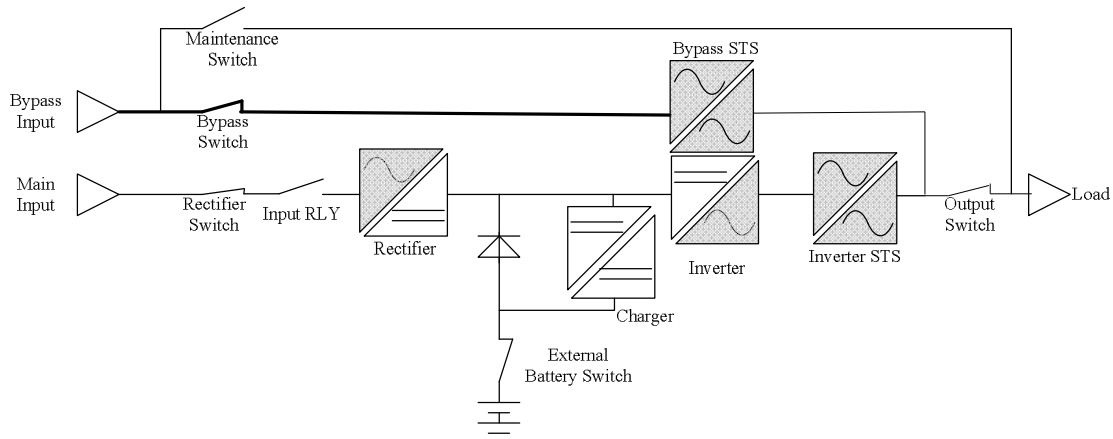
The LED indications during the operation in fault mode are shown in the figure below: All the LED indicators go out, and the fault icons and codes show up in the LCD display area at the same time. When UPS breaks down, the buzzer gives out long beep. According to the fault type, the fault mode is divided into breaker output fault and bypass output fault.

Output cutoff fault under the following circumstances:

- Output short circuit fault;
- 150% overload in bypass mode, lasting for 1min; or 200% overload in bypass mode, lasting for 200ms;
- Set as EPO breaker output fault;
- Bypass SCR fault in bypass mode.

For the faults not included in the above circumstances, keep providing power supply for the loads through bypass.

After UPS enters the fault mode, users can press the mute button for noise reduction (mute setting automatically cancels after one day). Furthermore, contact the after-sales personnel for fault elimination, and make further treatment to the scene under the guidance of after-sales personnel.



Operating diagram for the fault mode of bypass output

When the UPS fails, the LCD displays “FAULT”, the alarm Icon flashes, and the fault alarm interface displays fault / alarm information code, at the same time the buzzer gives out alarm sound.

Alarm messages

Definition	Code	Alarm Sound	Description	UPS Action
Parallel lock phase abnormality	001	2 beeps/s	When the system is set to be paralleled, lock phase abnormality is detected on this unit.	Give an alarm
Frequency beyond tracking range	002	2 beeps/s	Bypass sampling frequency is beyond inverter frequency tracking bypass frequency range	Give an alarm, UPS inverter self-oscillation
Switching times	003	2 beeps/s	Caculate the switching times from bypass to inverter within 1 hour. It will give an alarm for 5 times	Give an alarm, bypass isn't switched to inverter
Mains power abnormality	004	2 beeps/s	Virtual value of sampling by mains power or frequency is beyond normal working range	Give an alarm, switch to battery mode
Unclosed output breaker	005	2 beeps/s	The output breaker presents open circuit status	Give an alarm
Low battery voltage	006	4 beeps/s	The battery voltage is lower than the configured low voltage point	Give an alarm
High battery voltage	007	2 beeps/s	The battery voltage is higher than the configured high voltage point	Give an alarm, shut down and switch to bypass
Bypass abnormality	008	2 beeps/s	Virtual value of sampling by bypass or frequency is beyond normal working range	Give an alarm
Overload alarm	009	2 beeps/s	The load capacity is more than 105% in inverter / bypass mode	Give an alarm, inverter overload until switching to bypass, bypass overload until shutdown
Battery disconnected	010	2 beeps/s	Detect that the battery voltage is less than 9V/cell	Give an alarm, shut off the charger
Charger fault	011	2 beeps/s	The charger board is abnormal	Give an alarm
DSP fault	012	2 beeps/s	Bypass DSP is abnormal	Give an alarm
Over-temperature alarm	013	2 beeps/s	Temperature is beyond UPS safe operating temperature	Give an alarm, switch to bypass, inverter is standby
Manual bypass	014	2 beeps/s	Configure manual bypass open by panel settings	Give an alarm, switch to bypass, inverter is standby
EPO alarm	015	2 beeps/s	Detect that EPO access	Give an alarm and shut down the UPS
CAN communication abnormality	016	2 beeps/s	Detect that CAN communication signal is abnormal	Give an alarm
Parallel redundancyabnormality	017	2 beeps/s	When the UPS is paralleled, the load capacity is more than 50%	Give an alarm
Parallel setting abnormality	018	2 beeps/s	The actual status of single and parallel unit doesn't match the settings	Give an alarm

Alarm messages

Definition	Code	Alarm Sound	Description	UPS Action
Low-voltage inverter fault	004	Long Beep	The inverter voltage is lower than the configured fault alarm point	Shut down and switch to bypass
High-voltage inverter fault	005	Long Beep	The inverter voltage is higher than the configured fault alarm point	Shut down and switch to bypass
Power supply boardfault	015	Long Beep	Detect that the output voltage of power supply board is beyond operating range	Shut down and switch to bypass
Bus High-voltage fault	016	Long Beep	Detect that BUS voltage is higher than BUS high-voltage alarm point	Shut down and switch to bypass
Bypassphase order error	022	Long Beep	In the state of parallel, detect that the phase order of bypass voltage of master and slave unit is inconsistent	Shut down
Rectifier soft start fault	023	Long Beep	Bus voltage is lower than its setting value within the configured soft start time	Shut down and switch to bypass
Rectifier fault	024	Long Beep	Bus voltage is lower than the battery shutdown point voltage in inverter mode	Shut down and switch to bypass
Bypass SCR fault	025	Long Beep	The difference value of bypass input and output is more than its setting value in bypass mode	Shut down and switch to bypass
Inverter output fault	027	Long Beep	Inverter output voltage is overrun	Shut down and switch to bypass
Inverter overcurrent fault	032	Long Beep	Overcurrent signal is detected on the inverter IGBT module	Shut down and switch to bypass
Inverter soft start fault	034	Long Beep	During the inverter soft start, the inverter voltage value is abnormal	Shut down and switch to bypass
Output short-circuit fault	035	Long Beep	The output current is more than its setting value, the voltage is less than its setting value	Shut down
Bypass overload fault	037	Long Beep	Detect that the bypass output current is more than its setting value	Shut down
Inverter fault	038	Long Beep	Detect that the inverter is overcurrent or overvoltage	Shut down and switch to bypass
Model detection fault	042	Long Beep	The adapter model setting doesn't match the settings of upper computer	Shut down and switch to bypass
Parallel ID conflict	044	Long Beep	Two UPS set same ID address in parallel mode	Shut down and switch to bypass
Parallel voltage setting Abnormality	050	Long Beep	Two UPS set different voltage in parallel mode	Shut down and switch to bypass
Parallel frequency setting abnormality	051	Long Beep	Two UPS set different frequency in parallel mode	Shut down and switch to bypass

Note: The fault codes display on the left side of the fault/alarm interface, while the alarm codes display on the right side. "000" represents normality.

6 Routine Maintenance

6.1 Application and maintenance of storage batteries

Battery safety description:

- The battery life will be shortened along with the rise of ambient temperature. Battery shall be periodically replaced to guarantee the normal operation of UPS, and enough backup time shall be guaranteed.
- If UPS is not used for a long time, the battery shall be charged once every 4 to 6 months. In high temperature zone, the battery shall be charged and discharged every two months, and the charging time for each time shall not be less than 12h.
- The maintenance of storage batteries can only be conducted by the professionals in the field of storage battery.
- The storage batteries may suffer from the danger of electric shock and short circuit. To avoid personal injury caused by electric shock, please pay attention to the following precautions during the battery replacement.
  - Do not wear wristwatches, rings, and other metal objects;
  - Use insulating tools;
  - Wear rubber shoes and gloves;
  - Do not place metal tools or metal components on the batteries;
  - Before dismantling the battery terminals, disconnect the loads connected on the batteries first.
- Do not use fire to dispose the batteries or battery packs. Otherwise, it will cause explosive damage.
- The storage batteries shall not be disassembled or damaged by nonprofessionals, because the electrolyte inside the batteries contains strong acid that may cause damage to skins and eyes. If coming into contact with the electrolyte by accident, use plenty of clean water to wash immediately, and then go to the hospital for examination.
- Please do not short-circuit the battery cathodes and anodes. Otherwise, it will cause electric shock or fires.
- Please do not touch the battery terminals. If the battery circuit is not isolated from the input voltage circuit, the hazardous high voltage might generate between battery terminals and ground.
- Battery Maintenance of the UPS with Long Time Delay (conduct good maintenance to the batteries, so as to prevent the precision equipment from being damaged during the power failure, which is of great importance):

- Clean up the dust and dirt on the batteries.
- Check whether all the internal connecting wires of batteries are loose or corroded. Conduct replacement and maintenance if necessary.
- Make sure that the batteries and the battery terminals are fastened.

6.2 UPS maintenance

This series of UPS only needs to be maintained for a few times. The standard UPS use valve regulated low-maintenance batteries. This kind of batteries often needs to be charged for expected life. After starting up the mains mode, UPS charges the batteries, and also provides overcharging and over-discharging protection.

- If UPS is not used for a long time, the batteries shall be charged once every 4 to 6 months.
- Under the circumstance that the service environment is dusty, it is advisable to clean the UPS once every 4 to 6 months.
- Conduct troubleshooting as soon as possible after discovering fault or alarm information, so as to recover the normal operation of UPS.
- The service environment and storage methods will have certain impact on the service life and reliability of this product. Therefore, please do not use this product in the following work environment:
  - High/low-temperature and moist places, which are beyond the specified technical indicators(temperature: 0℃-40℃; relative humidity: 20%-90%);
  - The places with vibration, which are vulnerable to the impact;
  - The places with metal dust, corrosive substances, salt, and combustible gas;
- If UPS is not used for a long time, UPS (without batteries) must be stored in the dry environment. Storage temperature range: -25℃~+55℃. Before UPS startup, the ambient temperature must be heated to 0℃ and above, and the temperature shall be maintained for above 2h

6.3 Safety measures for maintenance

- Turn off the UPS and disconnect the mains power before the battery replacement.
- Remove rings, wristwatches, and other metal objects.
- Use the screwdrivers with insulated handles. Do not put tools or other metal objects on the batteries.
- When the battery cable is connected, it is normal to generate small sparks at the connector, and no harm will be caused to personal safety and UPS.
- Do not short-circuit or connect the battery anodes and cathodes in reverse direction.