

**WELCOME TO USE UPS**

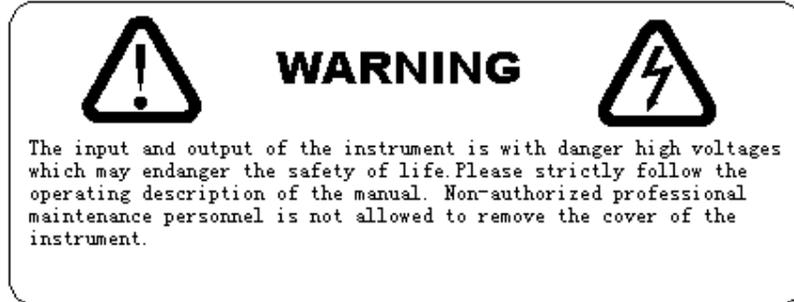
**FR-UK T Series UPS**

**(20-50KVA)**

**User's Manual**

## 【Note】

Please carefully read the user's manual before operation for the sake of understanding correct operation of the equipment. Please keep the manual handy for reference.



1. Please connect protective earth before power supply cables.
2. The input & output voltage of the UPS is dangerous which will endanger the safety.
3. Dangerous voltages are present inside the unit. Please do not open the cover of the UPS.
4. Please turn off the mains input switch and the battery switch for any urgency.
5. There are many kinds of power sources in the equipment, the line bank or the socket may still have dangerous voltage even if the main power is disconnected.
6. Please remove the cable between the battery & UPS before repairing. It's necessary to wait for another 5 minutes for discharging, because of the dangerous voltages.
7. The wires should be fastened to the terminals. It is prohibited to short the anode and cathode of battery. It's prohibited to touch any two of wire connectors or bare end of connecting wires. Otherwise, it may lead to damage of battery or personal injury.
8. Please keep the battery away from the fire and all the equipment that may cause spark to prevent the danger and damage.
9. Please do not open or shatter the battery, the overflow electrolyte is with causticity that may be harmful to life.
10. Please contact the professional personnel of the local dealer or the special maintenance station for any trouble-shooting. Random disposal of the trouble is not allowed.
11. This is an A-grade product with electromagnetic compatibility.
12. This equipment must be installed and serviced by qualified personnel.

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# 1. System Overview

## 1.1 Introduction

The UPS is the professional manufacturer of uninterruptible power supply and the telecommunication power products. The company is famous with its high quality and superior performance.

## 1.2 Explanation on Model Number

The model number explanation of FR-UK T Series UPS (20~50KVA) is showed as Figure 1-1.

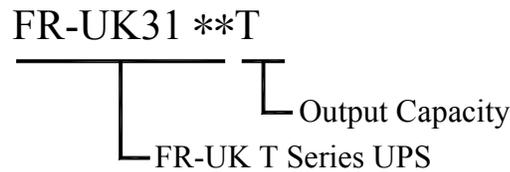


Figure 1-1 Explanations on the Meanings of FR-UK T Series UPS (20~50KVA)

As showed in Figure 1-1, “FR-UK T \*\*” is the FR-UK T Series on-line UPS; “\*\*” means the output power, when it is “30” , it means that the output power is 30KVA.

## 1.3 Brief Introduction of Product

### 1.3.1 Products Features

**FR-UK T Series UPS** is online sine wave UPS mainly designed for major equipment used in large-scaled data center (such as measurement equipment, industrial automation equipment, etc.) with high performance. Its high reliability provide necessary protection on load for the user from finance, communication, traffic, tax, forces, security, power source, education, government and enterprise etc.

**FR-UK T Series UPS** is true double conversion on-line UPS. With IGBT power units, SPWM inverter, intellectual multi modes battery management technique etc advanced tech and power management software, owning well cost/performance rate and wide basic subscribers.

#### **FR-UK T Series UPS main features:**

##### 🔧 **True on line double conversion UPS**

Output is fully isolated by transformer, with IGBT power units used to solve such problems of electric system as lightning strike.

##### 🔧 **Reliable EMC**

All products have got through EMC test in authentic facility and company. Testing items includes conducting disturbance, radiant disturbance, conducting anti-disturbance, radiant anti-disturbance, power fault, mass pulse, surge, ESD etc. Excellent EMC features donate FR-UK T Series to be capable for high

frequency communication and video & audio broadcasting system.

### ❖ **Cold start function**

Append a special current limiting circuit on UPS, user can start UPS directly with battery bank source for emergent need in no mains status. UPS owns more powerful cold starting ability and is able to run on full load.

### ❖ **Full functions LCD Display**

All FR-UK T Series UPS products power over 20KVA is equipped with large LCD and daily maintenance. **Display** and patented appearance can beautify user workroom. They are also very facility for user's operation on real time surveillance on UPS running parameters and status.

### ❖ **Perfect protection measures:**

Protection for over output voltage and current, low battery, quick current limit and short-circuit can avoid the stoppage caused by user's wrong operation. Making sure stable running for devices in all status.

### ❖ **Intellectual battery management technology and charging power capacity extension redundancy**

Equipped with patented intellectual battery management technique. With professional management design on battery charging or discharging, user can get high battery reliability and running life. At the same time intellectual charging module can select right charging power according to different battery configure to make sure rapid power compensation on backup battery bank.

### ❖ **Flexible network supervising**

Flexible network supervising ability can realize intellectual monitoring over UPS. Including close point-to-point communication supervising, middle range communication supervising, and remote net management. Base on these, there are many UPS functions as real time supervising over running status and features, automatic call, sending E-mail, cell phone message, vocal function, remote on/off UPS etc.

### ❖ **None-Principle-subordinate self-adaptive current equalization control technique (Only applicable to the parallel UPS)**

Adapt none-principle-subordinate self-adaptive current equalization control technique, realize N units parallel dilatancy or N+1 redundant parallel connection, digitized current equalization control, the ability of self-adaption is powerful, reliability and redundancy of the system is higher than traditional parallel system, field installation and debugging is simple. UPS unit can be launched or quit on line for free, as realizing hot maintenance on line of paralleled system.

### 1.3.2 Technical Specification

Table 1-1 FR-UK T Series (20~50KVA) Technical Specification

Specification		Model			
		FR-UK 3120T	FR-UK 3130T	FR-UK 3140T	FR-UK 3150T
Input	Voltage range (Vac)	400 (-30%~+20%)			
	Frequency range (Hz)	50 ± 6%			
	Phase	Three phases , five wires			
	Battery voltage (VDC)	29 × 12 = 348			
Output	Rated power (KVA/KW)	20/16	30/24	40/32	50/40
	Voltage range (Vac)	230 ± 2%			
	Frequency (Hz)	50 ± 1% (battery mode)			
	Wave form	THD ≤ 4% (linear load)			
	Switch time (ms)	0			
	Battery efficiency	≥ 90% (100% linear load)			
	Overload capacity	105% of rated load last for 10 minutes , 125% of rated load last for 1minute			
	Output connector	Terminal			
	Parallel equal current	≤ 5% (only applicable to the parallel models)			
Other Features	Maintenance bypass switch	Available(cancel in parallel models)			
	Backup time	Any configuration			
	Parallel function	random extending or N+1 redundancy parallel connection (only applicable to the parallel models)			
	LCD display	Input voltage, Frequency, Output voltage, Battery voltage, Load, DC current etc.			
	LED display	Operation status			
	Alarm function	Overload, AC input abnormal, Low battery, Failure, Over-temperature			
	Communication function	RS232/RS485, dry connection communication signal			
	Protection function	Low battery, Overload, Overheat, Output short circuit, Output over voltage			
	Lighting arrester (optional)	Imported 3 phases lighting arrester applied to IEC1312 protection grade			
	Electromagnetic compatibility	According with EN50091			
	Noise (dB)	< 65 (1 meter away from the front of the machine)			
	Cooling	Fans			
	Operating Temperature (°C)	0 ~ 40			
	Relative Humidity	0 ~ 95%, No condensation			
	Dimension (W×D×H)(mm)	800 × 400 × 1180			
Weight (Kg)	280	300	380	400	

◆ Specification are subject to change without prior notice.

## 2. Basic Principles and Structures

### 2.1 Working Principles of Single Unit

#### 2.1.1 Working Principle Drawing

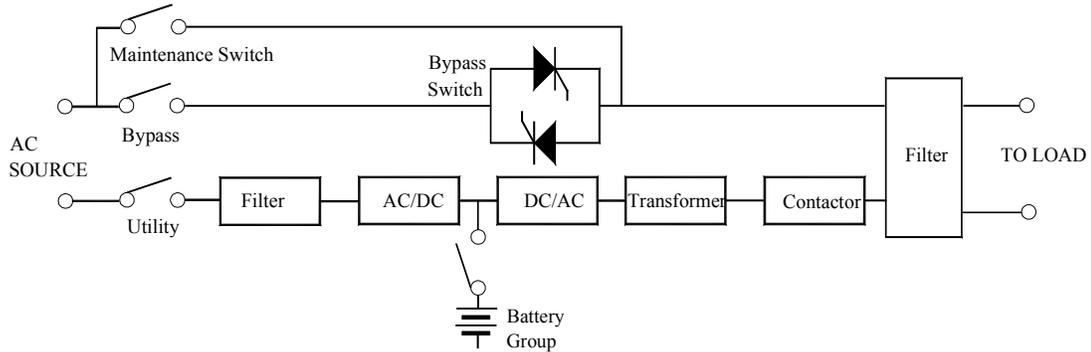


Figure 2-1 Working Principles Block Diagram of FR-UK T Series UPS

#### 2.1.2 Working Principles

This UPS includes: Input Breaker, Input Filter & Protection Network, Rectifier, Inverter, Static Switch, Bypass Breaker, Isolation Transformer, Output Filter & Battery group etc. as showed in Figure 2-1. This system is whole digital DSP controlled on-line UPS. When the utility is normal, AC power goes through filter and rectifier then change to DC power to inverter for charging the battery, which can be supply pure power to load at no transfer time.

UPS is invented to protect load equipment. The power is much more reliability than utility. If the UPS is inferior, the power may be much more unstable than utility. So you must choose a UPS that has high efficiency and high reliability, and good service.

This system has four operation modes: utility mode, battery mode, bypass mode and maintenance bypass mode, showed as following:

##### Utility Mode:

As showed in Figure 2-2, at the status of the utility normal, the rectifier changes the AC power to DC power to inverter and charging the battery. Through the process of AC power changed to DC power, the inverter can supply more reliability and pure power to load, as the rectifier can dispel the problems of the portent, noise, unstable frequency and so on.

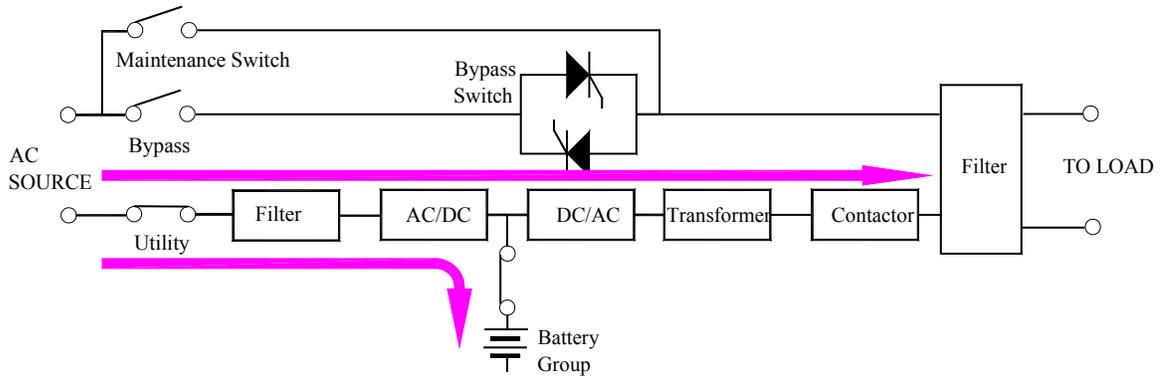


Figure 2-2 Utility mode

**Battery Mode:**

As showed in Figure 2-3, when the utility is abnormality, the battery connected to DC BUS will supply power to inverter, to protecting load from AC power interrupting.

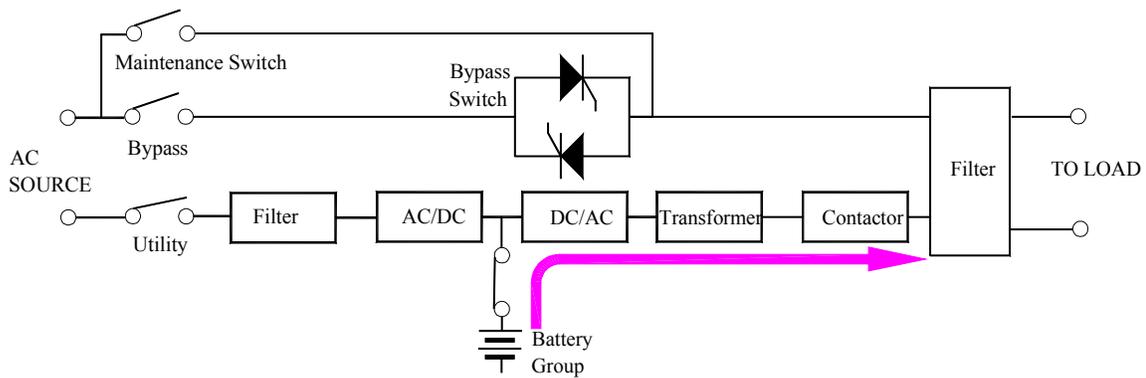


Figure 2-3 Battery mode

**Bypass Mode:**

As showed in Figure 2-4, when the inverter is failure (such as over-temperature, short circuit, output voltage abnormality, overload and so on), the inverter should shut off automatically. If the utility is normal at this moment, the switch will switch to bypass power to supply power to load.

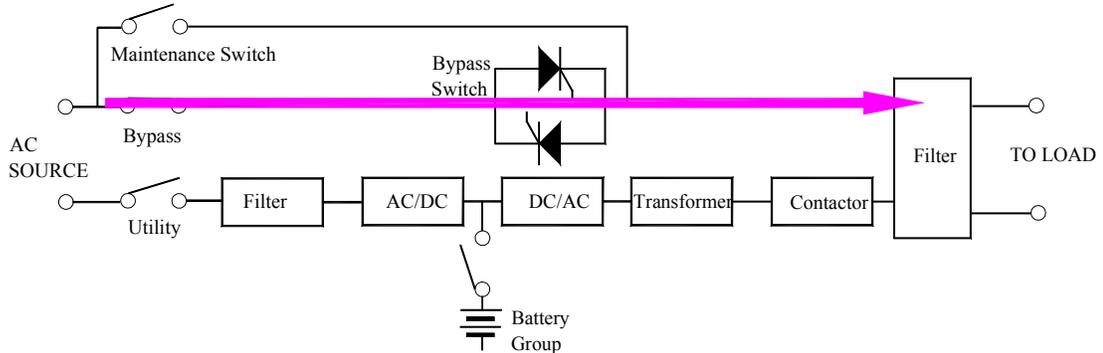


Figure2-4 Bypass mode

**Maintenance bypass mode**

As showed in Figure 2-5, when you are maintaining or changing the battery, and the power must not be interrupted, you can shut off the inverter, and turn on the maintenance switch, then turn off the rectifier and bypass breaker. At this mode, AC power goes through maintenance switch to supply power to load. And at this time, there may be no any electricity in the UPS inside, and the maintenance personnel can work without any angst.

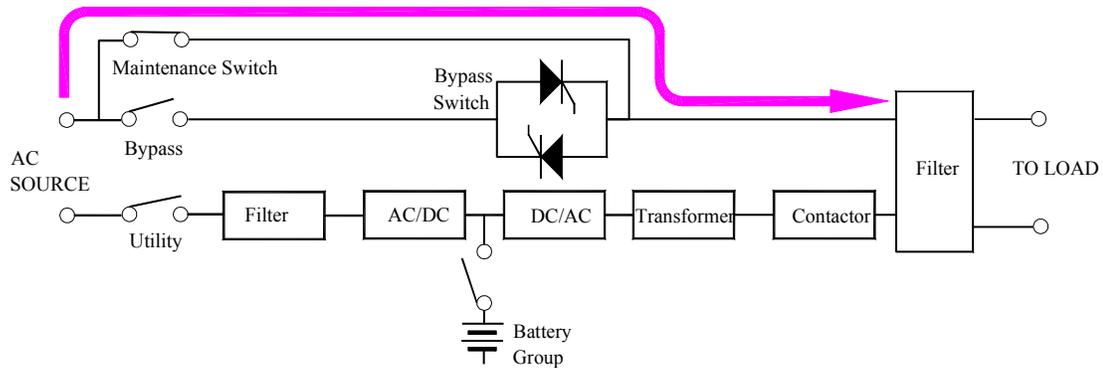


Figure 2-5 Maintenance bypass mode

### 2.1.3 Working Process

In Case of proper external power supply, there is DC voltage in the DC main circuit from DC/AC inverter to output steady 230Vac. And external power supply will charge the battery at the same time. In case of low voltage or sudden failure of external power supply, the battery supplies will power to the DC circuit. There is no switching time from main supply to battery power supply. When battery is nearly out of power, UPS will give out light and sound alarm; restrict the inverter's operation and give out long sound alarms while the battery is discharging electricity. UPS also has over-load protection function. In case of overload (125% rated load), the UPS will switch to bypass status, and come back when the load is normal. In case of severe overload ( $\geq 150\%$  of rated load), the UPS will stop immediately inverter output and switch to bypass status while the UPS breaker may also switch off automatically. When fault is eliminated, switch on UPS and resume operation.

When UPS is abnormal, it will give out sound and light alarm, the UPS have alarm and protection function.

Table 2-1 Abnormal status and alarm protection function

UPS status	Buzzer	Panel lights	Protection/Alarm
Normal	Silent	Inverter light on, line light on, bypass light off, fault light off	None
Overload $\geq$ 105%	Beeping every 1 second	Inverter light on, bypass light off, fault light off	Protection after ten minutes
Overload $\geq$ 125%	Long Beeping	Bypass light on, inverter light off after 1 minute, fault light on	Protection after one minute
Battery voltage under alarm point and above protection point	Beeping every 1 seconds	Inverter light on, line light off, bypass light off, fault light off	Alarm
Battery voltage under protection point	Long Beeping	Inverter light off, line light off, bypass light on, fault light on	Protection
Utility input abnormal	Beeping every 5 seconds	Line light off, inverter light on, bypass light off, fault light off	Alarm
Over temperature (Inverter)	Long Beeping	Inverter light off, line light on, bypass light on, fault light on	Protection
Over temperature (Rectifier)	Long Beeping	Inverter light on, line light on	Alarm

The UPS will start up and charge the battery when the utility come back after low battery protection.

## 2.2 Working Principles of Series Connection Hot Standby System

### 2.2.1 Working Principles and Drawing

Connect the main UPS's bypass input to standby UPS output, instead of external power supply input

In case of main UPS failure, the main UPS is switched to bypass status and standby UPS supplies power to the load, the load is in UPS inverter protection, so the equipment can run safely. If the main UPS is in bypass status and the standby UPS failure, the utility supplies power to the load.

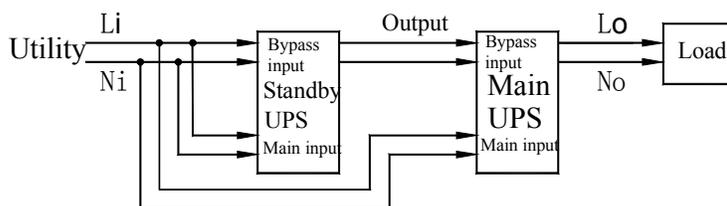


Figure 2-6 Principle Diagram of Hot Standby System

## 2.2.2 Working Process

While working properly, main UPS supplies power to the load and standby UPS idly runs hot standby system. As showed in Figure 2-7, thick lines refer to the power passage of hot standby system.

- Note: 1.** The two units of UPS by hot standby connection mode shall not share one battery pack, instead, they shall have separate battery packs.
- 2.** The AC input(L1,L2,L3,N) of main UPS, the bypass input of standby UPS (L,N) and the AC input (L1,L2,L3,N) of standby UPS should be from the same utility (L1,L2,L3,N), at the same time, the order of phase must be consistent. The bypass input (L,N) should be connected to utility(L2,N).

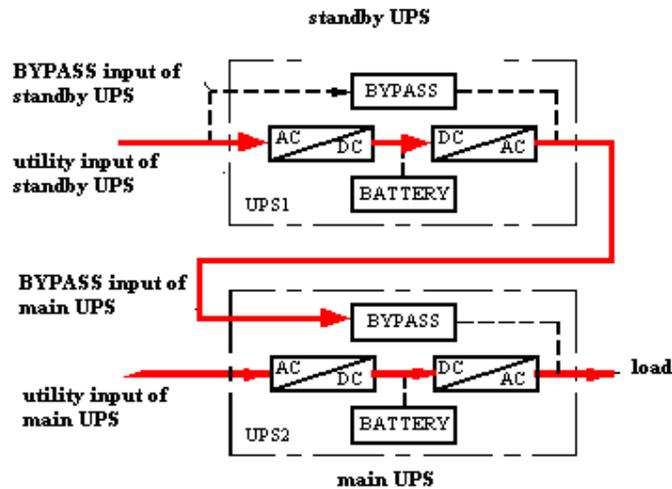


Figure 2-7 Power Flow Chart of UPS Hot Standby in Normal Condition

In case of main UPS failure, the main UPS is switched to bypass status and standby UPS supplies power to the load. As showed in Figure2-8, the thick lines refer to the power passage of hot standby system in case of main UPS failure.

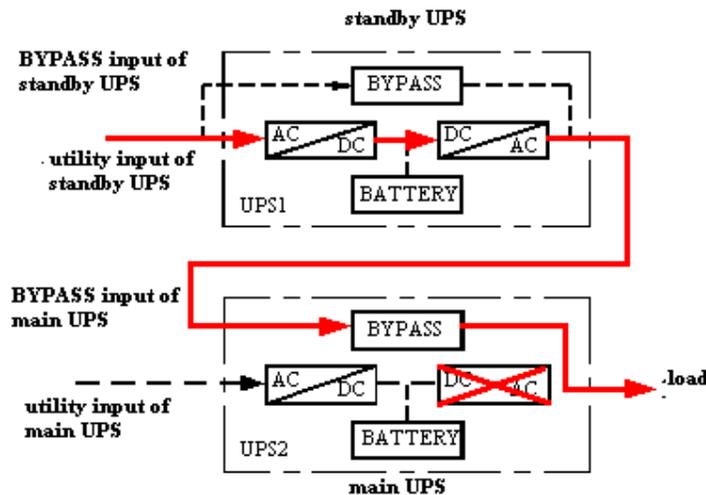


Figure 2-8 Power Flow Chart of Hot Standby System in case of Main UPS Failure

## 2.3 Working Principles of Parallel System

### 2.3.1 Working Principle

The realization of AC power supply's parallel current equalization is through the rapid regulation of the single unit's AC output wave, amplitude and phase to make them in strict conformity to one another and for the purpose of current equalization. Any voltage amplitude or phase contrast will create very big circulating current that in serious case may cause overload or damage to the inverter. Due to the relatively high possibility of interference to the power of high-power UPS, the parallel system must have relatively high anti-interference characteristic to ensure the reliable running of system.

### 2.3.2 Working Mode

Figure 2-9 shows block diagram of the parallel system.

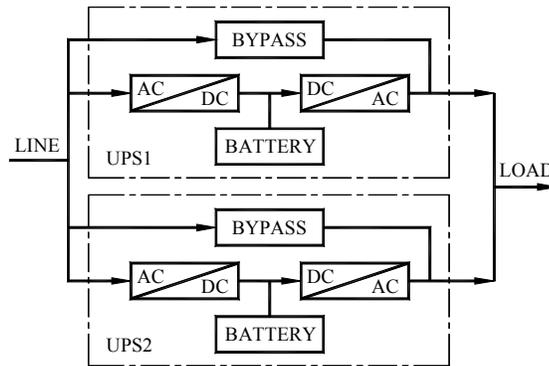


Figure 2-9 Block Diagram of the Parallel System

The parallel unit has a separate bypass. Two UPS's can be paralleled directly without parallel control cabinet and other additional public bypass input, which may facilitate installation and maintenance.

The parallel system has the following four working modes

1. Working mode in case of proper external power supply (real lines refer to UPS's power passage), refer to figure 2-10

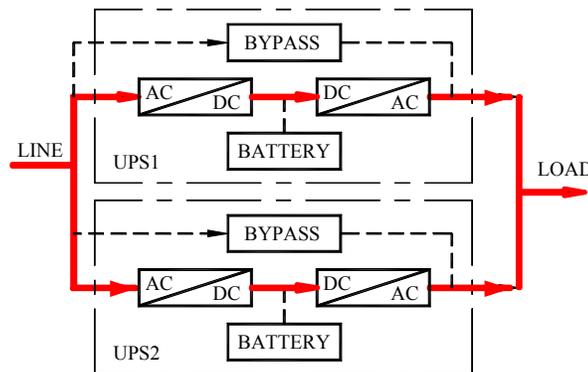


Figure 2-10 Working Mode in case of Proper External Power Supply

2. Working mode in case of improper external power supply (real lines refer to UPS's power passage), refer to figure 2-11

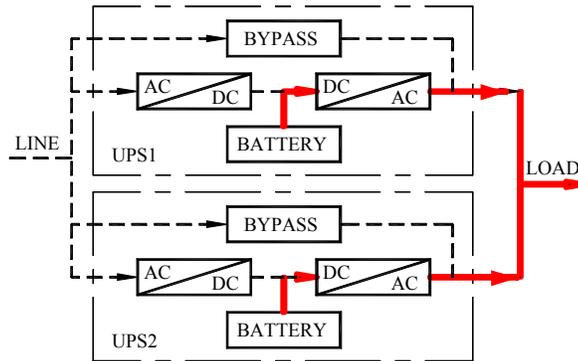


Figure 2-11 Working Mode in case of Improper External Power Supply

3. Working mode in case of system overload (real lines refer to UPS's power passage), refer to figure 2-12

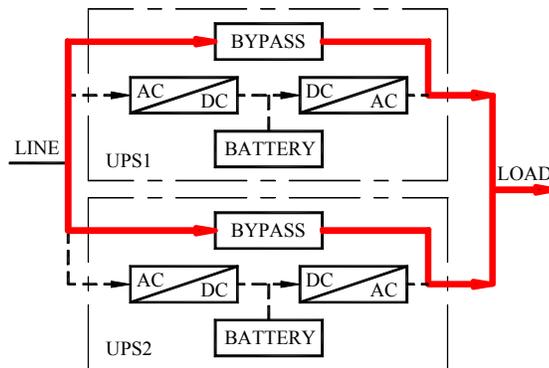


Figure 2-12 Working Mode in case of System Overload

4. Working mode in case of one machine of the system is abnormal (real lines refer to UPS's power passage), referred to figure 2-13. The abnormal machine has no output, while the normal one supply the power.

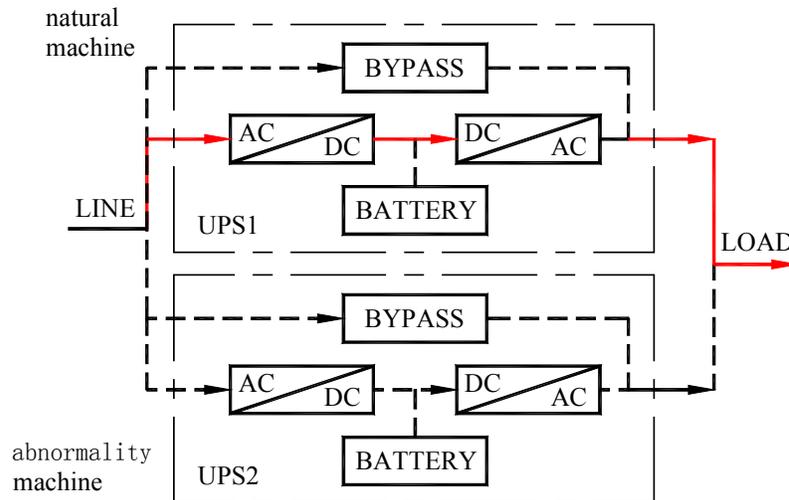


Figure 2-13 Working Mode in case of one machine abnormality

## 2.4 How to Choose the Parallel System or Series Connection System

It is suggested to choose series connection system or parallel system, when the capacity of user's need is smaller, and need to advance the system reliability.

It is commonly suggested to choose paralleled system, when the capacity of user's need is larger. Paralleled system can be used for free as N piece parallel dilatancy or N+1 piece redundant parallel connection, in this way the system reliability can be greatly enhanced. And single unit also can be launched or quit on line for free, as realizing hot maintenance on line of paralleled system.

It should be put forward when order if the user needs the parallel system.

## 2.5 Shape and Structure

### 2.5.1 Display Panel Structure of FR-UK T Series UPS (20~50KVA)

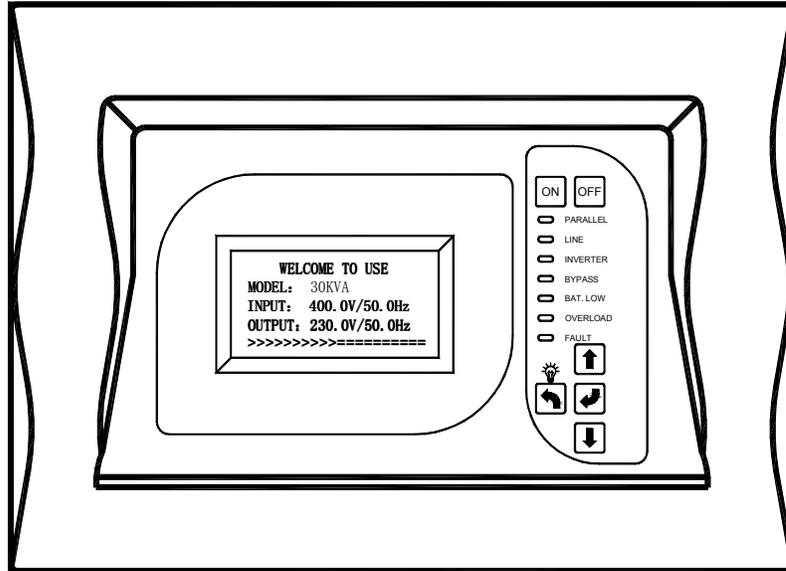


Figure 2-14 Display panel structure of FR-UK T Series UPS (20~50KVA)

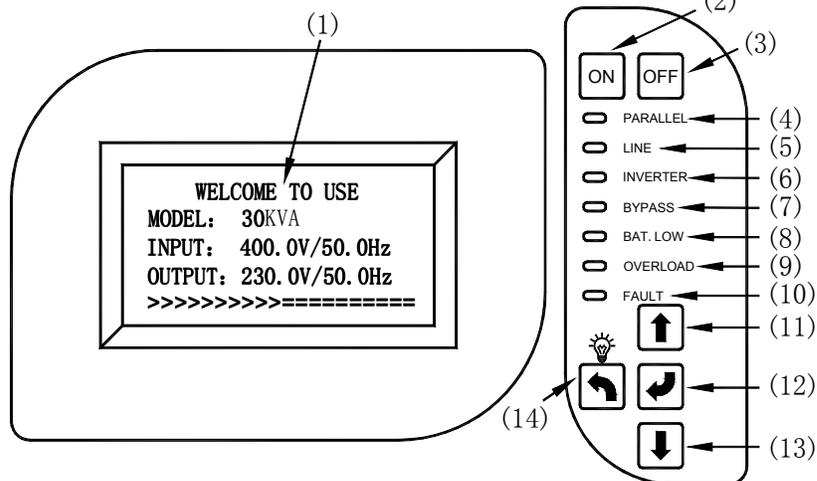


Figure 2-15 Display interface of FR-UK T Series UPS (20~50KVA)

Explanation:

(1) LCD display panel	(9) Load indicator light
(2) ON button	(10) Fault indicator light
(3) OFF button	(11) Page up: for looking over the display content
(4) Parallel light	(12) Enter: for looking over the display content
(5) Utility indicator light	(13) Page down: for looking over the display content
(6) Inverter indicator light	(14) Turn back: for looking over the display content
(7) Bypass indicator light	and Push to Light the LCD
(8) Battery indicator light	<b>NOTE: Parallel light is cancel in single unit</b>

## 2.5.2 Shape and Structure of FR-UK T Series UPS (20~50KVA)

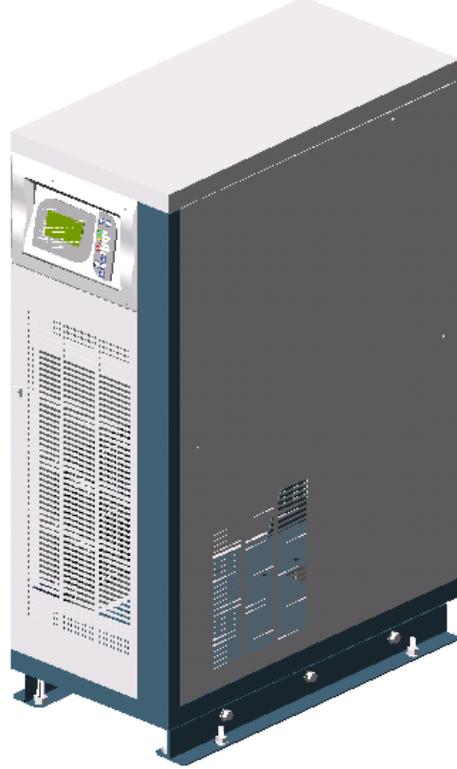


Figure 2-16 Shape and structure of FR-UK T Series UPS (20~50KVA)

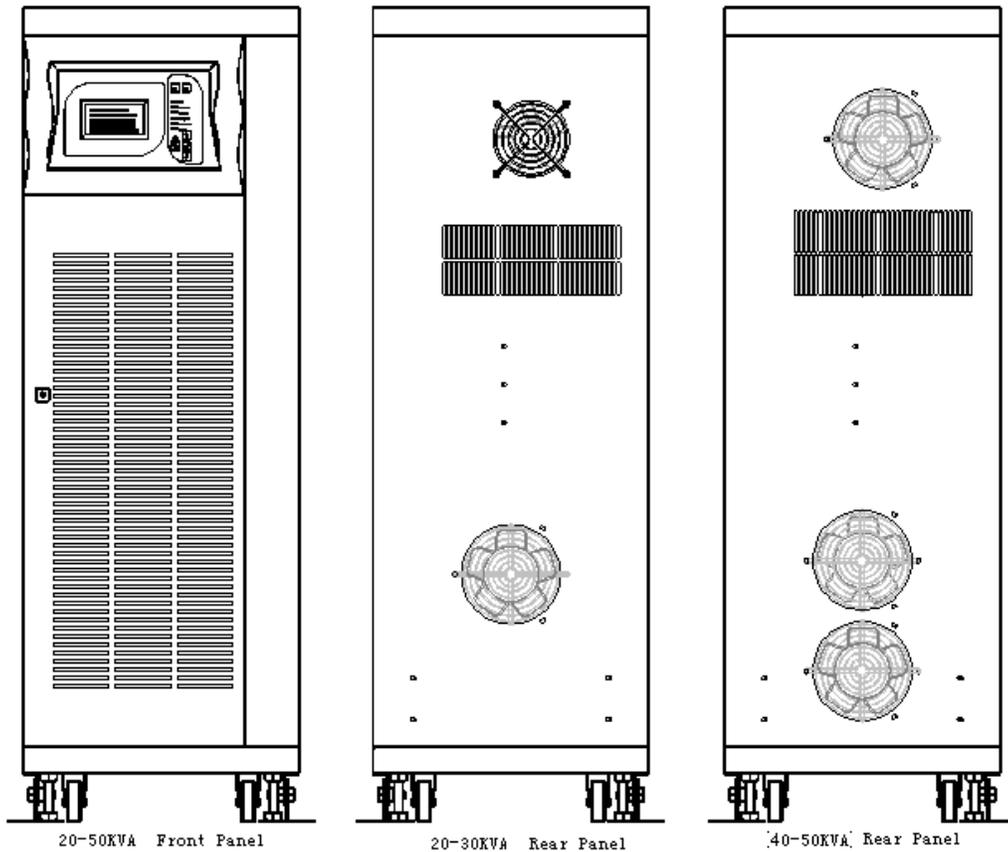


Figure 2-17 The front and rear panel of FR-UK T Series UPS (20~50KVA)

### 2.5.3 Terminal and Air Breaker of FR-UK T Series UPS (20~30KVA)

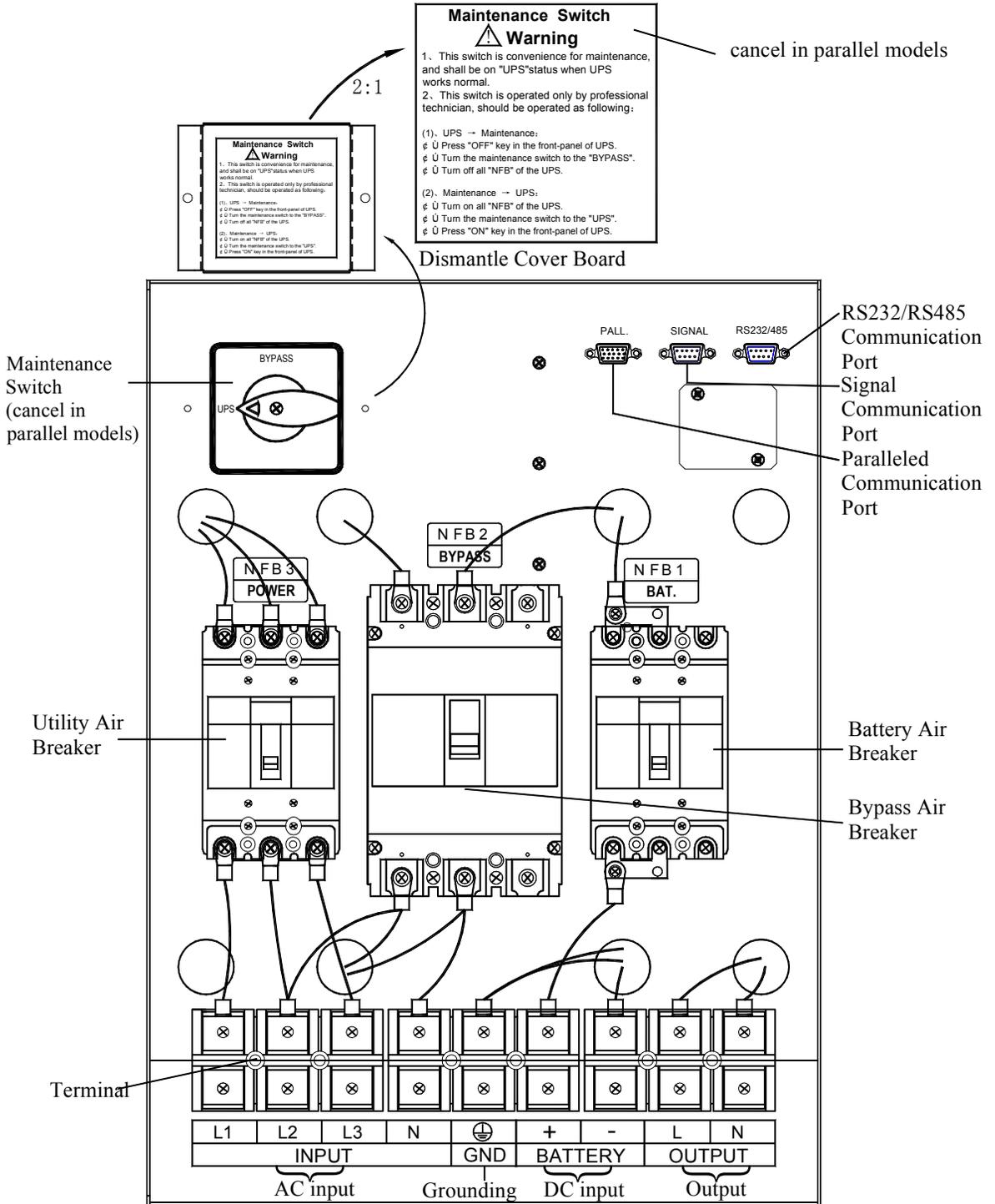


Figure 2-18 Terminal and air breaker FR-UK T Series UPS (20~30KVA)

## 2.5.4 Terminal and Air Breaker of FR-UK T Series UPS (40~50KVA)

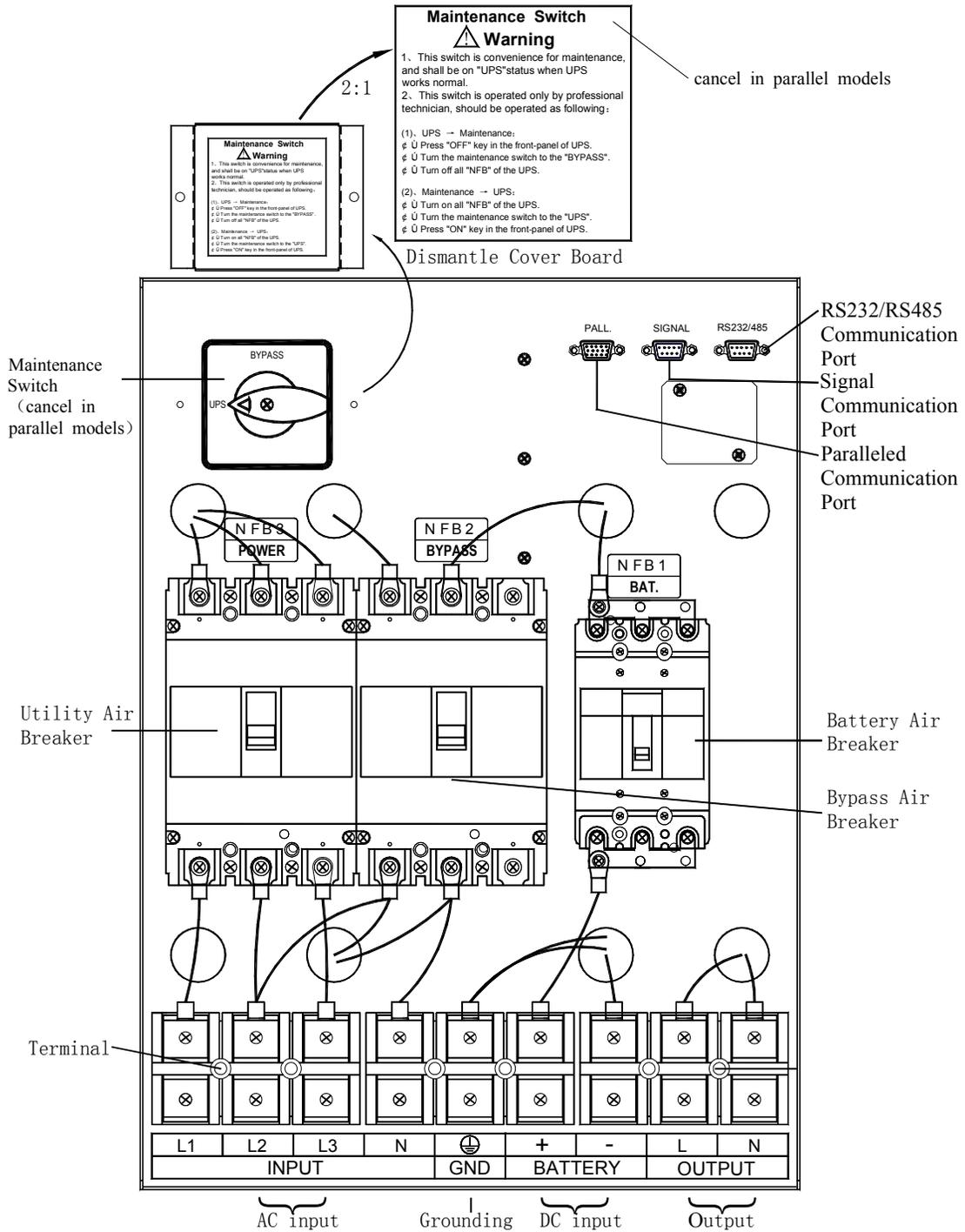


Figure 2-19 Terminal and air breaker of FR-UK T Series UPS (40~50KVA)

## **3. Transportation and Storage**

### **3.1 Transportation**

It should strictly conform to the care signs during transportation, and place the UPS according to the care signs, to avoid the shake to the UPS. It can't put the equipment on the open vehicle and cabin, and should be put together with flammable articles. It is prohibited to put the equipment in the open air in the midway, and should avoid the drench of the rain, snow or other wet goods, also machinery damage.

### **3.2 Storage**

Place the equipment according to the care signs. It should part from ground for 20cm, part from wall, hot source, cold source, windows or air entrance for 50cm.

Environment temperature for storage is 0~40°C, relative humidity is 20%~80%, the stock should not have any baleful gas, flammable and corrosive chemistry, have not strong shake, strike and magnetic field. The storage period in this condition is for six months, over six months, the equipment should be checked, and charged the battery every three months.

## 4. Installation

### 4.1 Precautions During Installation

1. Before installation, check whether the circuitry is smooth, including every connection point, electrical outlet, to avoid open circuit or short circuit.
2. For input single phase three wires, it should well grounded, ensure the voltage between neutral and ground wire should be lower than 5V, if it is not well grounded, the voltage may be reach 100V. If the users have the strict requirement on the voltage, pay attention to the well ground, to avoid any unnecessary loss.
3. When install UPS, it is prohibited to connect the input and output neutral wires, line wires, and ground wires wrongly, to avoid short circuit. In the meantime check the input voltage is normal.
4. Please follow the provided instructions and sequences while installing the battery. The wires should be fastened to the terminals. It is prohibited to short the anode and cathode of battery. It is prohibited to touch any two of wire connectors or bare end of connecting wires. All the misconducts may lead to damage of battery or personal injury. Before connect the battery packs to the UPS, check whether the battery voltage conforms to the UPS specification.
5. UPS installation requirement:
  - ◆ UPS must be evenly placed on the floor (avoid slanting or uneven ground);
  - ◆ Do not place articles on the top of UPS, No one is allowed to sit on top of UPS.
  - ◆ Avoid placing UPS in direct sunlight, rain or humid grounds.
  - ◆ Do not place the UPS in any place with erosive gases.

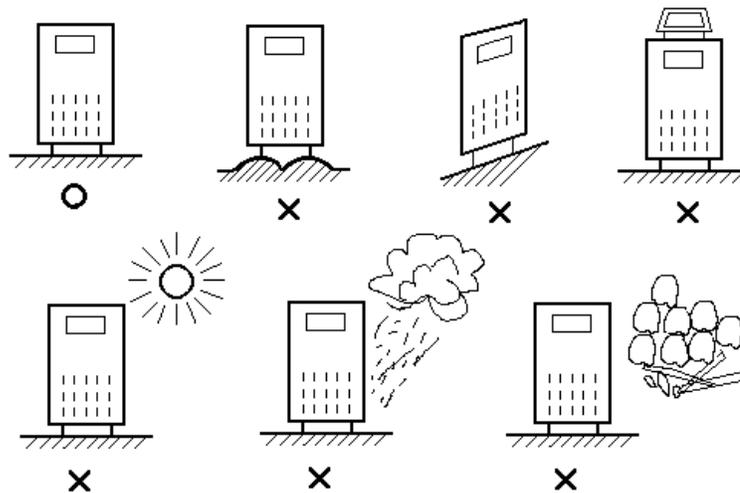


Figure 4-1 UPS Placement

## 4.2 Location and Environment Requirement

### 4.2.1 Location Requirement

#### 1、 Clearance

There should be no garbage or sundries around UPS because the liquid or metal improperly deposited or suddenly fall down from other place may cause UPS short-circuit endanger power system and operator. The dust or sundries on the vent can clumber air circulation influence fan's work or may shut down the power system.

#### 2、 Fireproofing

To lessen the possibility of on fire and reduce the expense to the least, UPS room's wall, ceiling, floor should be made of fireproofing material and equip fire fighting equipment (such as Portable CO<sub>2</sub> fire extinguisher).

#### 3、 Air circulation and heat elimination

To easily operator, maintenance Inverter and eliminate Inverter inner heat, there should be at least 50-70 cm room around UPS frame and 50 cm room above it. Also electronic fan should be installed near the battery to keep the house in good air circulation. Only operate in the normal temperature (20°C), battery life will be the longest.

### 4.2.2 Environment Requirement

Environment temperature: 0°C~+40°C;

Relative humidity: 0%RH~95%RH, no condensation;

Cooling: Air-cooled;

Altitude: Meet international standard;

Uprightness: There shall be no shock and the inclination shall no be over 5°;

Pollution grade: II;

UPS must be installed in an environment that has enough wind, cool, not high humidity and clean air.

Operation temperature for recommended is 20~25°C, and humidity is about 50%.

#### Note:

**It is prohibited to be installed in an environment that has metal electric dust.**

## 4.3 Unpacking

Both UPS and its fittings (battery) are packaged in wooden cases or cartons, so when unpack the UPS, the operator should be careful and see if there is any damage. Before clear away the package material, make sure all the fittings have been found.

If the equipment and its fittings have damaged during the transportation or are not fit with the goods listed in the contract, please note on spot and contact with the representative of our local office.

If the UPS is found machinery damage, or the external damage, further inspection will be needed.

## 4.4 Check the External Power Supply

Check the load capacity of the power net, to ensure it can meet the equipment's requirement, and to make sure it conforms to the voltage and frequency on the equipment's nameplate. Check whether the load capacity decline because of the aging of the wire. If any doubt, please consult with the local electricity department.

## 4.5 Installation of UPS

### 4.5.1 Installation Steps of FR-UK T Series UPS (20~50KVA)

Move the UPS to the ground from the wooden pallet. The FR-UK T Series UPS (20~50KVA) can be installed as following:

1. Unpack the FR-UK T Series UPS (20~50KVA) , the shape and structure is below:



Figure4-2 Installation step 1

2. Release four pieces of M16×65 bolts and six pieces of M12×40 bolts where the feet joins the wooden pallet, let the wheels contact the floor.



Figure 4-3 installation step 2

3. Remove the anchor frame away.

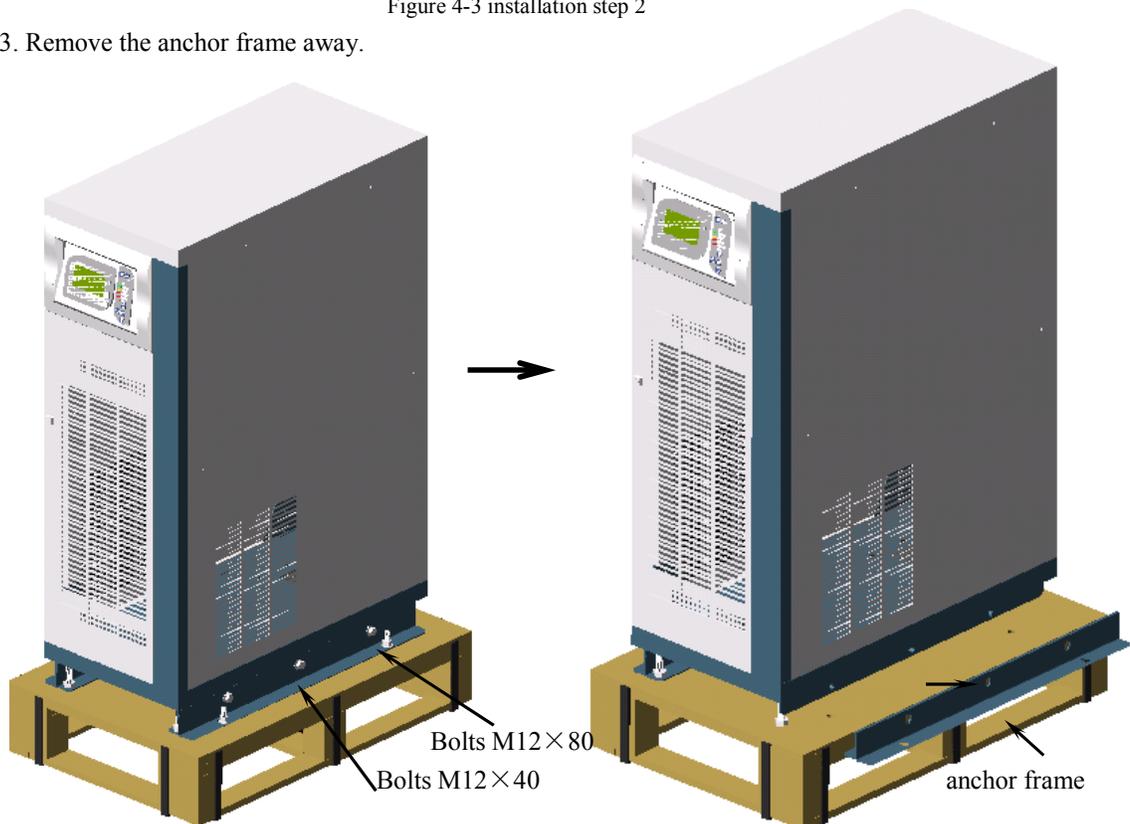


Figure 4-4 Installation step 3

4. Push the UPS from wooden pallet to the floor by using the slope.

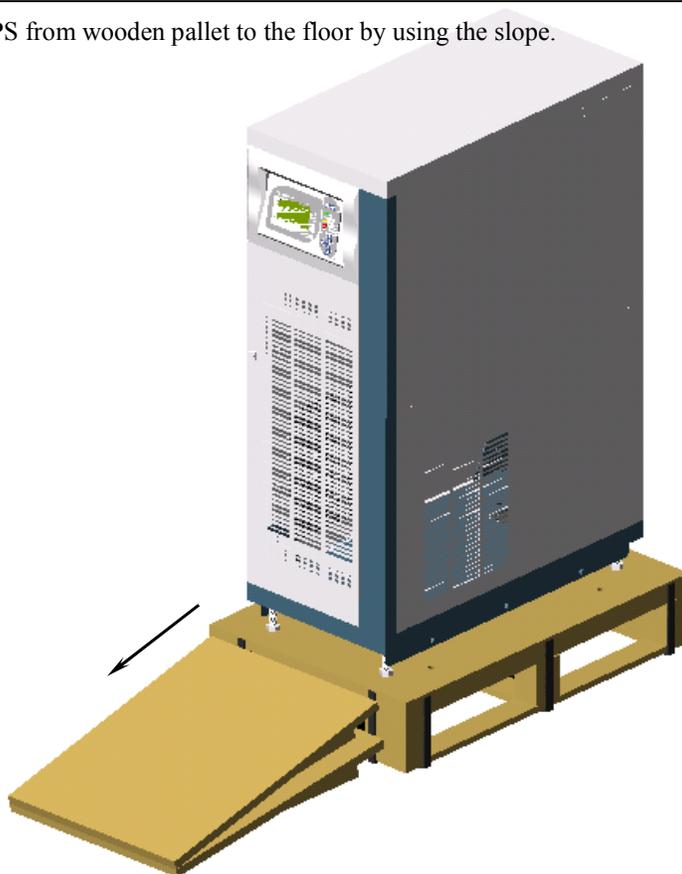


Figure 4-5 Installation step 4

5. Select and arrange the installation location, drive 4 M10 expansion bolts into the ground, space between is  $410\text{mm} \times 525\text{mm}$ , the revealed height should be within 50mm:

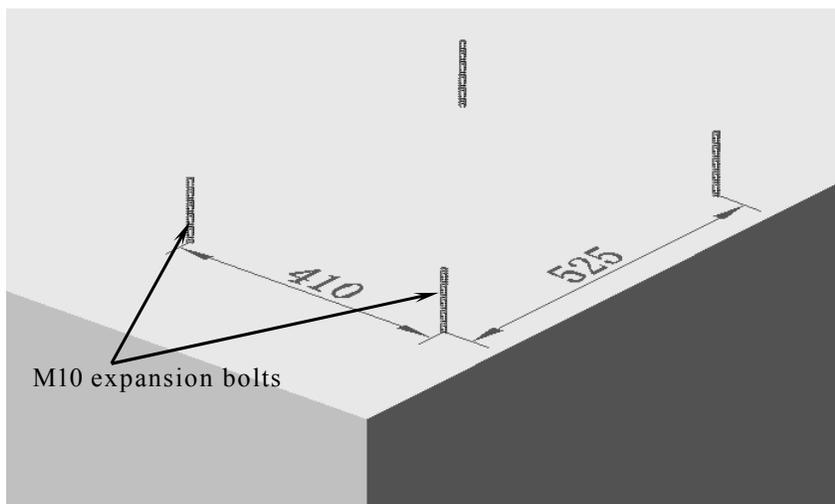


Figure 4-6 Installation step 5

6. Mount the T type anchor frame, fix the gasket  $\Phi 10$ , spring gasket  $\Phi 10$  and nut M10, fasten as following:

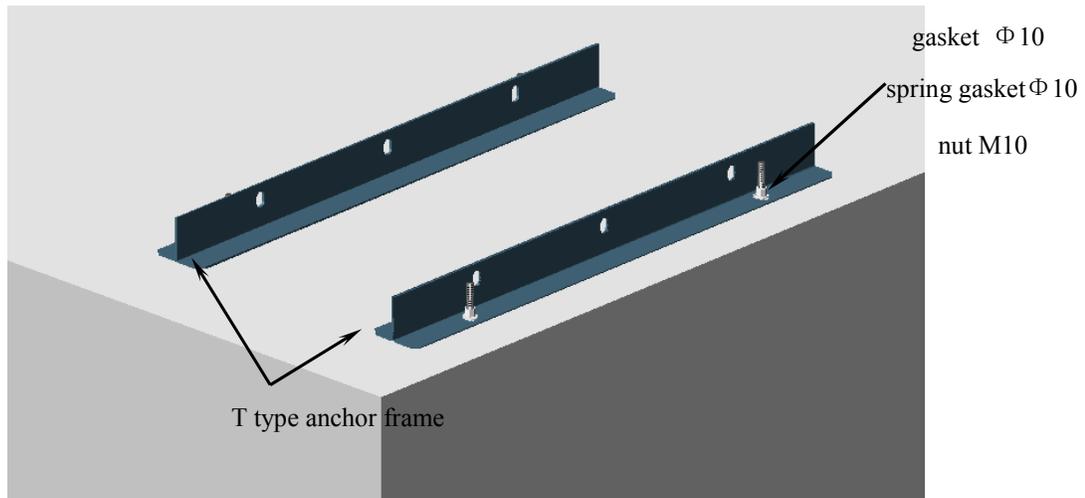


Figure 4-7 Installation step 6

7. Move the UPS into anchor frame, prop up it again by the 4 pieces M16 $\times$ 65 bolts, and then fix the main UPS with anchor frame with 6 pieces of M12 $\times$ 40, as following:

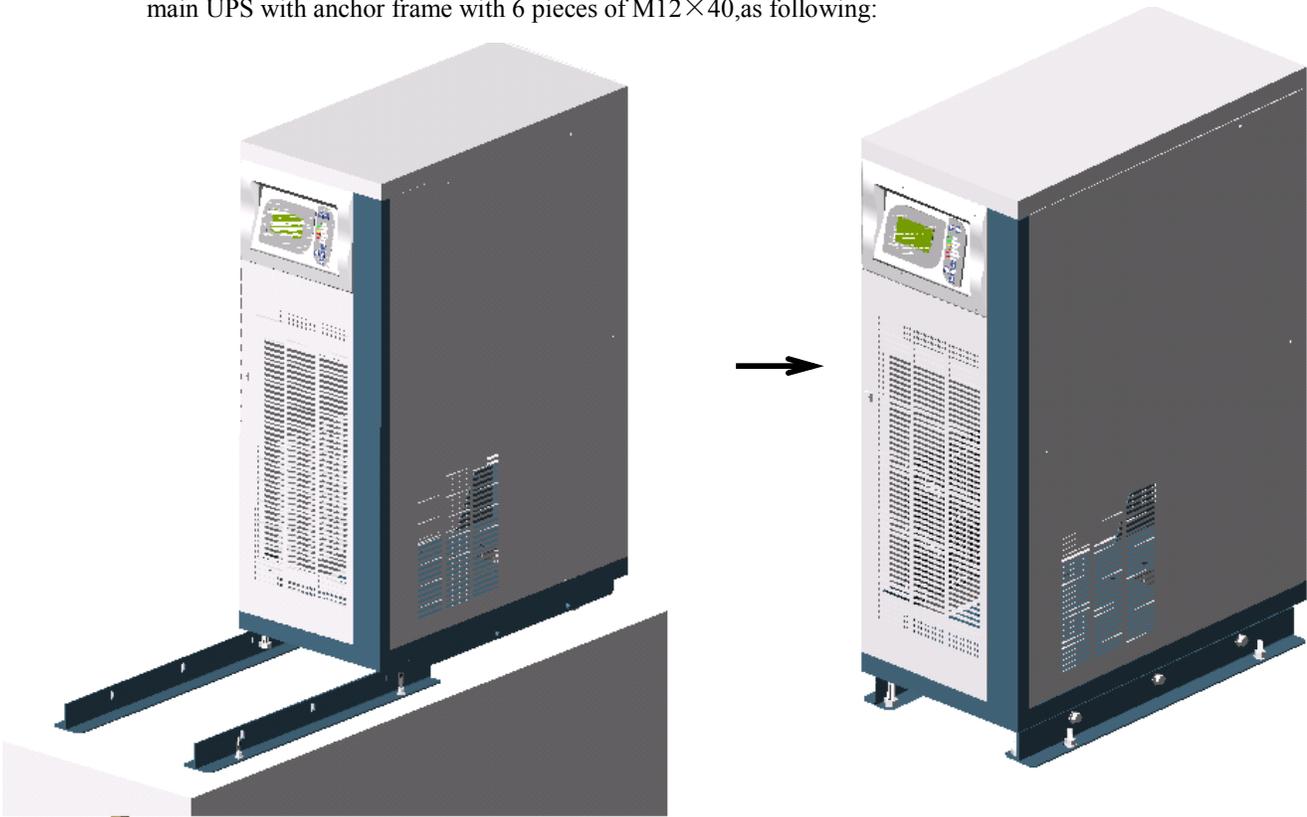


Figure 4-8 Installation step 7

## 4.6 Installation of Battery Cabinet

FR-UK T Series UPS would be matched battery and battery cabinet except the main unit.

### 4.6.1 Important Safety Precautions

It is prohibited to prize up or break down the battery, because the electrolyte do harm to our skin and eyes. Please advert the following safe precautions when replacing the battery to avoid getting an electric shock and short circuit.

- 1) Don't gird the watch, ring or any other metal decorations.
- 2) Using the tools with insulated holds.
- 3) Don't put tools and metal articles on the battery.
- 4) Keep the fire source away from the battery, no smoking.

### 4.6.2 Installation Procedures

1. To ensure safe operation and avoid the damage to the equipment, it is required to install the battery by professional personnel, and implement the following procedures:
  - 1) Connect the external battery groups, don't join into the UPS battery input terminal.
  - 2) Connect the AC Wire into UPS, ensure the polar is correct and the voltage conforms to the UPS technical specification.
2. Turn on UPS when AC input normal and UPS empty load, check the DC voltage in battery input terminal.
3. Turn off UPS after checking the charging voltage is normal, join the battery packs, and ensure the polar is correct of UPS and battery cabinet.
4. Check everything is OK after mounting.

## 4.7 Installation of Parallel System

1. Assemble the single unit of parallel system separately according to the above installation procedure, then connect the single unit's AC output to the distribution box.

**Note:** the connection and phases of single unit AC input should be strictly consistent, and the bypass phases of the parallel system should be identical.

2. Connect all the parallel port with the communication wires, and fasten the RS232 with the bolts

## 4.8 Electrical Wire Connection

### 4.8.1 Selection of Input Breaker

To isolate with the utility, the breaker or distribution box with the adaptive power should be equipped before the equipment's input wire. The breaker should be 1.5~2 times of the UPS maximal input currency, and can't adopt the breaker with the creepage protection, to avoid the wrong operation. It is suggested to make

the distribution box by the professional company, please refer the selection of breaker to Table 4-1.

Table 4-1 choice of air breaker

	FR-UK T 20		FR-UK T 30	
	maximal currency (A)	recommended breaker (A)	maximal currency (A)	recommended breaker (A)
AC input	70	100	105	200
DC input	70	100	105	200
	FR-UK T 40		FR-UK T 50	
	maximal currency (A)	recommended breaker (A)	maximal currency (A)	recommended breaker (A)
AC input	140	200	165	200
DC input	140	200	165	200

## 4.8.2 Selection of the Input and Output Cables

The selection of UPS AC input cable, output cable and battery connecting cable, please refer to the recommended sections listed in Table 4-2.

Table 4-2 choice of cables area(mm<sup>2</sup>)

	FR-UK T 20	FR-UK T 30
AC input (line, neutral)	35	35
AC input (ground)	10	10
DC input (+, -)	25	25
AC output (line, neutral)	25	25
AC output (ground)	10	10
	FR-UK T 40	FR-UK T 50
AC input (line, neutral)	50	50
AC input (ground)	16	16
DC input (+, -)	35	35
AC output (line, neutral)	50	50
AC output (ground)	25	25

The above section is for the wire about 5m, if the wire is above 20m, the section should be increased accordingly.

## 4.8.3 Connection of Single Unit

Connect the provided cables into the corresponding terminal and fasten.

Note: Ensure the connection of input wire and output wire, input terminal and output terminal is fastened.

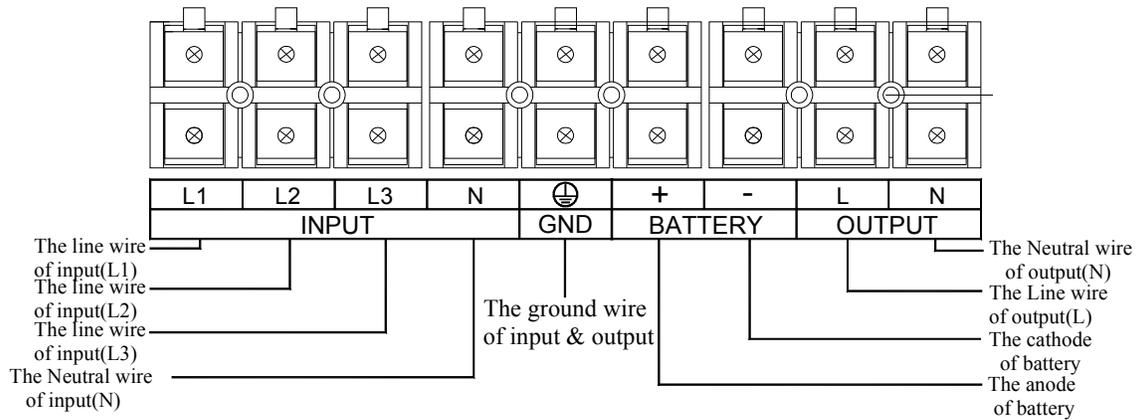


Figure 4-9 Connection of FR-UK T Series UPS (20~50KVA)

## 4.8.4 Connecting of Hot Standby System

### 4.8.4.1 Connecting steps

- 1 Dismantle the terminal's covering board of main UPS and standby UPS.
- 2 Remove the wires connection between "L" & "N" of "BYPASS" and "L2" & "N" of "INPUT" of the main UPS.
- 3 Connect the "L" of "BYPASS" in main UPS terminal to the "L" of "OUTPUT" in the standby UPS terminal by red wire; and connect "N" of "BYPASS" in main UPS terminal to the "N" of "OUTPUT" in standby UPS terminal by blue wire.  
**Note:** be sure not short to "L" and "N".
- 4 The remaining connecting is the same with the single unit.
- 5 Check the above steps and confirm everything is OK, lock up the terminal covering board on the main UPS and the standby UPS.

### 4.8.4.2 Connecting mode

1. The connecting mode of FR-UK T Series UPS (20~50KVA) hot standby as showed in Figure 4-10.

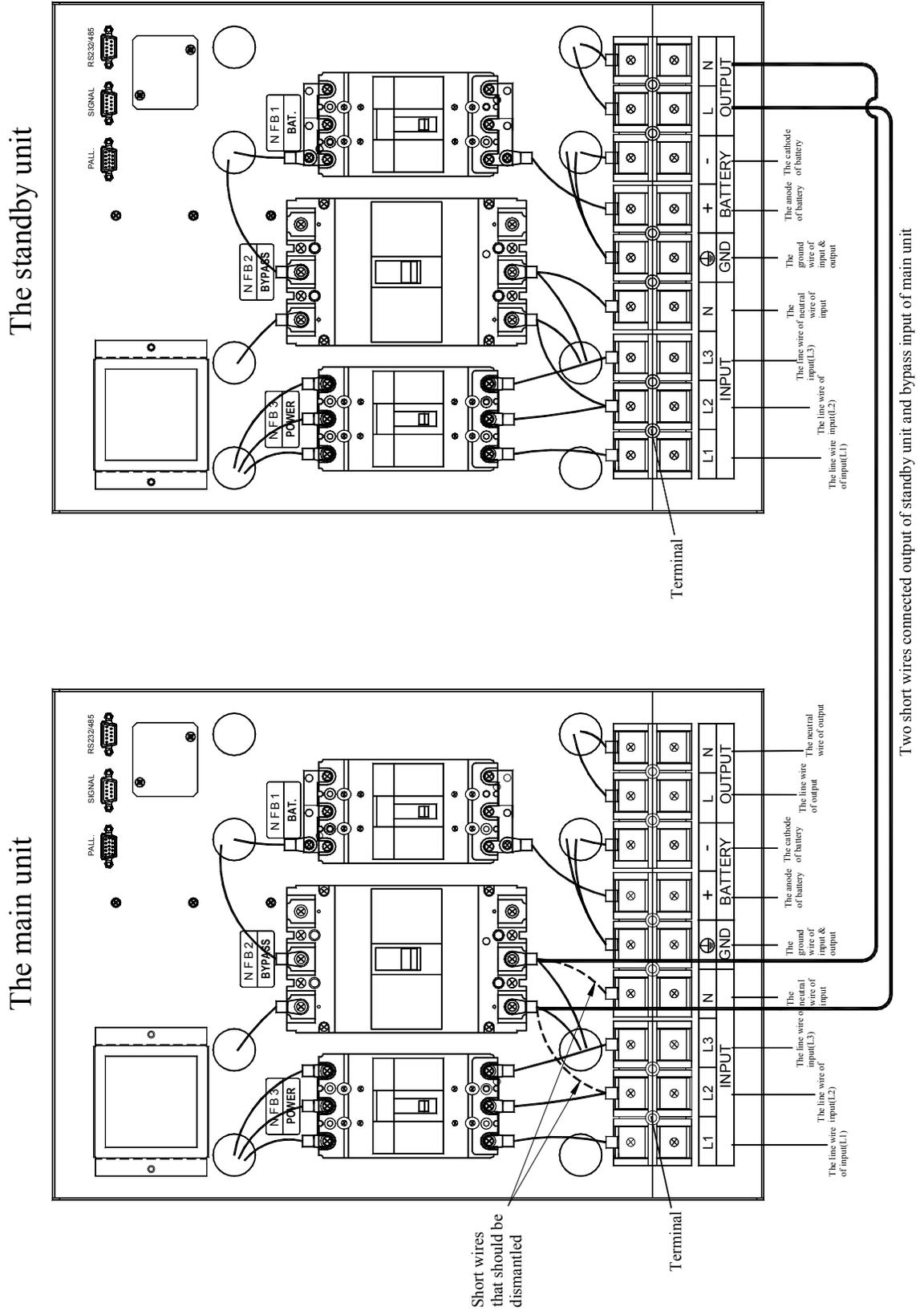


Figure 4-10 Connection of FR-UK T Series UPS (20~50KVA) hot standby system

## 4.8.5 The Connection of Parallel System

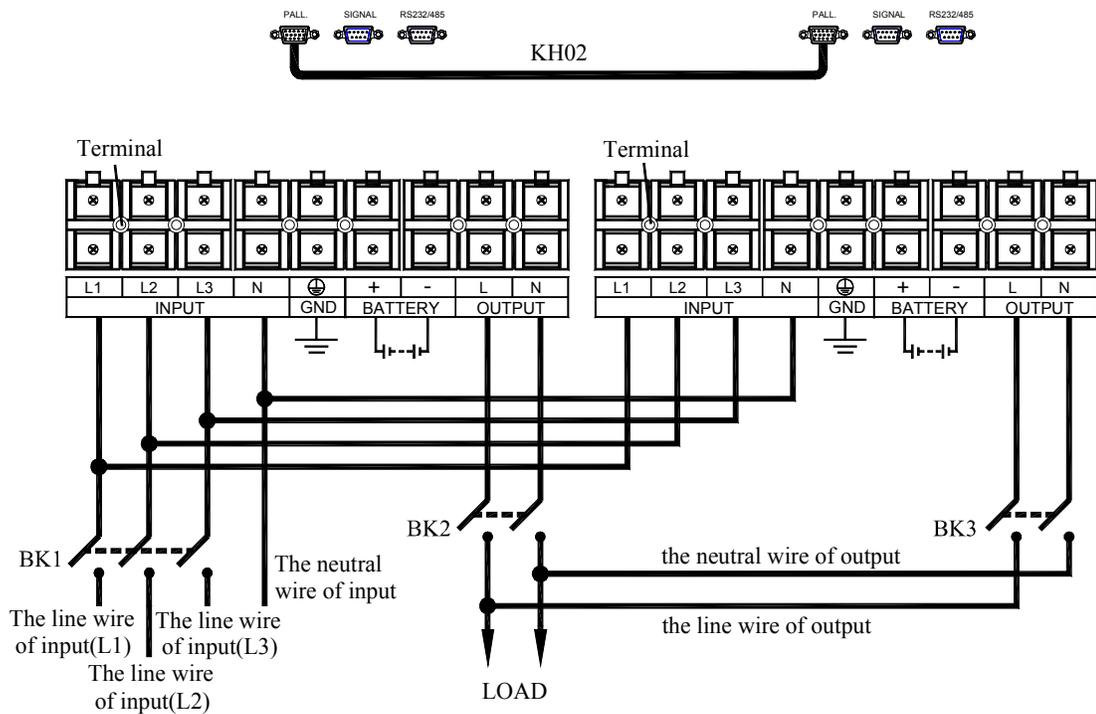


Fig.4-11 connection of FR-UK T Series UPS (20~50KVA) paralleled system

## 4.9 Checking and Testing of the System

### 4.9.1 Check the Electrical Wire Connection

1. Check the AC input wire: if AC input wire's colour system is standard, if the section of AC input wire is suitable, if connect with the external control switch, if the connection is correct and fasten.
2. Check AC output wire: if the AC output wire's colour system is standard, if the section of AC output wire is suitable, if the connection is correct and fasten.
3. Check the ground wire: if the ground wire connects with the ground wire terminal of the house, if the connection is fastening and safe.
4. Check the voltage between neutral wire and ground wire. It should be lower than 5Vac.
5. Check the connection of RS232 port if the UPS mount remote control monitor.
6. Check if the wiring is neat and tidy, if wire binding complies with technical standards.
7. Check if the installation and wiring is convenient for future modification, expansion and maintenance.

### 4.9.2 UPS Testing

Turn off the bypass input switch or AC input switch to simulate the situation of the utility fail, the "LINE" LED light will turn off and the buzzer will sound for every 5 seconds.

## 4.10 Connect with the Load

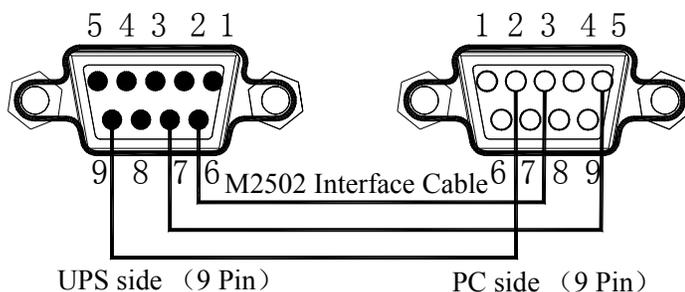
Connect with the load when the UPS starts to work normally, if it displays output power 100%, it means the UPS is full loaded, and should lessen some load.

## 4.11 Connection for Communication Port

### 4.11.1 RS232 Communication Pin Signal as Following :

UPS supply a standard RS232 communication port, FR-UK T Series UPS supervising software,SNMP card is optional for UPS communication ( no more than 10m generally) ; Realizing remote control over UPS input voltage, input frequency, output voltage, output frequency, load etc parameter and remote machine on/off. The definition on pin as following: UPS end supply standard DB9 port (RS232/RS485 in common adapter) .

1. Definition for UPS end (DB9) pin:
  - 6pins communication adapter (RXD)
  - 7pins communication land (GND)
  - 9pins communication sending (TXD)
2. PC end (DB9) pin follow RS232 definition.



3. data transmitting way:
  - Asynchronous transmitting in Series
  - Beginning at 1 digit
  - Data at 8 digits (low digit ahead)
  - 1 Stop digit
  - No verify

Speed for communication port data transiting 2400 bit/s.

### 4.11.2 RS485 Communication Pin Signal as Following :

Standard communication port on UPS also can support RS485 communication standard for remote communication. Realizing the remote control on UPS parameter for input voltage, frequency, output voltage, frequency, and load etc. Allowing remote on/off machine operation. By the connection between RS485 communication port and UPS concentrating supervising can realizes the monitoring on muti-UPS. The

definition of RS485 pins as following:

- 5-----RS485 data communication “ +” end
- 7-----RS485 data communication “ GND” end
- 8-----RS485 data communication “ -” end

### **4.11.3 Signal Communication Pin as Following :**

UPS supply signal communication with two isolations. It stands for low battery, utility abnormal, its status is as following:

Battery normal, 1-2P break; low battery , 1-2P connected;

Utility normal, 3-4P break; utility abnormal, 3-4Pconnected;

## 5. Operation

### 5.1 Precautions during Operation

1. Check the load before turning on, the user's load should not exceed the UPS rated power, otherwise, it will result in UPS overload protection or bypass working.
2. It is prohibited to use the UPS panel switch as the load power switch, turn on/off UPS as following: turn on UPS panel power switch, then turn on load power switch when starting up, turn off load power switch, then turn off UPS power switch when turning off. Don't start up UPS frequently.
3. Usually one should wait till the UPS is running smoothly before turning on the loaded equipment, first turning on the higher power equipment, then the lower power equipment. Some equipment requires very high starting currents (as some brands of monitors), and they might cause overload protection (as bypassing). Such equipment had better be turned on before other equipment.
4. If the UPS work with generator, turn on generator firstly, turn on UPS after generator work smoothly, otherwise it will damage to UPS or equipment. Also cut down the connection before turning off.

### 5.2 Before Turning on

#### 5.2.1 Calculate Loading Capacity

FR-UK T Series UPS calculates loading capacity based on 80% resistance loading of nominal rated power. Usually the largest loaded number N bearable with computer is calculated according to the following formulae:

$$\sum_{i=1}^n P_i \leq P$$

in the equation, P stands for UPS output capacity (VA),  $P_i$  is VA of No. i load.

✧ **Example:** a user has the computer equipment of the following nominal powers:

IBM PC: 230V/1.5A(345VA)

LQ1600K printer: 230V/1.0A(230VA)

14-inch color monitor: 70W

Total power: 345VA + 230VA + 70/0.6VA = 690VA

The selected UPS with nominal power of 30KVA will sustain 43~45 sets of above computer equipment.

#### 5.2.2 Do before Starting

In order that the UPS operates normally, make sure of the following before starting the machine:

1. Input and output are correctly installed;

2. The breaker on the front of UPS is in OFF position;
3. Input power supply end is connected with rated input power;
4. Output of UPS is not short-circuited and self-loaded capacity is not more than UPS capacity;
5. Make sure the computer or other equipments are turned off.

## **5.3 The Operation of Single Unit**

### **5.3.1 First-time Starting**

After making sure that the above items are all correct, please start up UPS by the following methods:

1. Turn on the switches by the following order:

Power →bypass→battery switches

2. Press UPS display panel ON key, then UPS will start up gradually, Conversion indicator will light up, after some delay, Bypass light will go out, UPS converts to inversion supplies, by now starting procedure is finished, UPS begins operation, then turn on the computer or other equipments.

3. Turn on the computer or other equipments to operate on.

### **5.3.2 Daily Turning on/off**

In daily routine uses, please follow the methods below for operation:

Press “ON” key on the display panel; after about 20 seconds, turn on the computer or other equipments.

Before turning off, please turn off the computer or other equipments firstly, then press the OFF on the display panel for two seconds to turn off.

Usually one should wait till the UPS is running smoothly before turning on the loaded equipment, first turning on the higher power equipment, then the lower power equipment. Some equipment requires very high starting currents (as some brands of monitors), and they might cause overload protection (as bypassing). Such equipment had better be turned on before other equipment.

## **5.4 Operating Sequence of Parallel System**

Do not start up load before the parallel system is not yet started. Make sure that each breaker of parallel output distribution box is off.

### **5.4.1 Start up**

- 1 After making sure of correct installation, start up each parallel unit separately as per single unit's startup sequence.
- 2 After each parallel unit has inverted output, measure each unit's inverter voltage and the difference

between highest and lowest voltages should not be over 5V, switch on the parallel unit's breaker on the distribution cabinet, the measured circulating current of parallel unit should not be fewer than 3A.

- 3 Switch on the general output breaker and each shunt output breaker, then start up load equipments one by one.

### 5.4.2 Switching-off of Parallel Systems

**Normally, it is not recommended to frequently switch on/off the parallel system.**

- 1 Switch off all loads
- 2 Switch off all parallel units one by one.
- 3 Switch off relevant breaker of each unit (it can remain on during normal switching on/off).

### 5.4.3 On-line Launching and Exit of Parallel Systems

1. In case of any parallel unit's faults, this unit will automatically exit the parallel system with sound and light alarms; the user can fully launch out this unit by switching off this unit on the panel, inputting external power into air switch and switching off this unit's air switch in the parallel distribution cabinet. On-line hot maintenance and replacement is realized.
2. In order to realize on-line launching of one or several units, what is needed is to finish the input and output connection of these units, switch on the relevant air switch on parallel distribution cabinet and then start these units on by one. These units will automatically launch themselves and work with balanced current.

Note: while the parallel system is working normally, do not launch out a unit without shutting down the parallel unit, or the equipment running might become abnormal..

### 5.4.4 Redundancy and Expansion of Parallel Systems

1. Redundancy

When N+1 standby redundancy design is adopted, the total output power shall not be bigger than N times single unit rated power. In case of fault of any single unit, this backup unit can be freely launched in/out without interfering with the system's running to improve the system's reliability. When output goes beyond the above load, the overloaded unit (over  $N/(N+1)$  times of single unit's rated power) will give out alarm. For example, regarding double backup system, overload alarm will be given when any single unit is over 50% overloaded.

2. Expansion

Unless in special cases, total output power is not to be increased by paralleling.

## 6. Panel LCD Display Operation Procedure

Panel LCD can display UPS all kinds of running parameter and status. It is operation interface to set some parameter for UPS and control UPS. Whole LCD display apparatus can display 5 lines characters. More than 5 lines character content can be displayed by up and down paging. Elegant operating buttons are facility for user operation.

### 6.1 Push Key Function Illustration

This Series UPS owns 4 functions keys, as following:



This key is “ display upward / parameter setting +” function repeat.  
Add parameter at parameter setting.



Push this key mean “ display downward / parameter set.  
For multi-lines character display, downward browsing.  
At parameter setting, reduce parameter.



Push this key to confirm the function.  
To confirm the option with “>” mark or parameter set.



Push this key to back to previous page.  
For back to upper level operation menu or parameter setting without input.  
Push to Light the LCD.

### 6.2 On/Off Operation

This Series UPS On/Off keys:



Power on: Push



Power off: Push



key about 2S.

### 6.3 Display and Related Operation

1. UPS bypass shut off and power on, panel LCD display:

```

WELCOME TO USE
MODEL: 30KVA
INPUT: 400.0V/50.0Hz
OUTPUT: 230.0V/50.0Hz
>>>>>>>>>=====
  
```

Around 10 seconds later turn into normal display.

This Series UPS defaults on output parameter to be normal display page. If no touching any key after power on or in 30S, LCD display will turn into output parameter display.

```

                UPS
    OUTPUT:    230.0V
    FREQUENCY: 50.0Hz
    UPS:       NORMAL
    2004/08/28 09:00:00
    
```

UPS information:

POWER OFF	NORMAL	OVERLOAD	LINE FAIL
RECT. FAIL	BAT. LOW	PHASE ERR.	INV. FAULT

In this page, Push  Key into function menu, other keys are negative.

2. Function menu:

This page supply all UPS functions display in menu list, ">" mark your present selected function.

```

> RECTIFIER DATA  ↑
  BYPASS DATA
  OUTPUT DATA
  BATTERY DATA
  WORKING STATUS   ↓
    
```

By the way, there are these options as following:

BUZZER CONTROL  
 BATTERY TEST  
 LANGUAGE SETTING  
 DATA&TIME SETTING  
 HISTORICAL EVENT

Push   keys to move ">" mark to the selection in menu.

The mark on right up or down of screen stands there is still some matter for up or down rolling.

Push  key into the menu with ">" mark.

Push  key to turn in output parameter normal display page.

### 3. Rectifier parameter page:

This page displays UPS rectifier 3 phases input voltage, frequency and rectifier DC output voltage.

RECTIFIER DATA	
R-N:	230.0Vac
S-N:	230.0Vac
T-N:	230.0Vac
DC VOLTAGE:	403.0V

Push  key to back upper menu. Other keys are negative.

### 4. Bypass parameter page:

This page displays UPS bypass voltage and frequency.

BYPASS DATA	
BYPASS:	230.0Vac
FREQUENCY:	50.0Hz

Push  key to back upper menu. Other keys are negative.

### 5. Output parameter page:

This page displays UPS 3 phases output voltage and percentage for each phase.

OUTPUT DATA	
OUTPUT:	230.0Vac
FREQUENCY:	50.0Hz
LOAD:	100%

Push  key to back upper menu. Other keys are negative.

### 6. Battery parameter page:

This page displays UPS battery voltage and charging/discharging current. When UPS in normal status, displaying charging current; When UPS in inverting status, displaying discharging current.

Push  key to back upper menu. Other keys are negative.

BATTERY DATA	
VOLTAGE:	403.0V
CHARGE:	5.0A

## 7. Working status:

This page displays all UPS running status.

PHASE:	NORMAL
RECTIFIER:	NORMAL
BATTERY:	NORMAL
INVERTER:	NORMAL
BYPASS:	NORMAL

By the way, there are three lines in this page. Displayed by the mark at right down of screen.

OUTPUT: ON INV.

LOAD STATUS: NORMAL

TEMPERATURE: 26.0 (C)

Push   keys to browse by scroll.

Push  key to back upper menu. Other keys are negative.

## 8. Buzzer silence control page:

This Series offer UPS silence control ability, When UPS stay in no utility input status, user can buzz off intermission beeping. But if abnormal status initiated, buzzer will start alarming automatically without shield control.

BUZZER CONTROL STATUS: OFF >BUZZER ON BUZZER OFF
---

Push   keys to select on/off.

Push  key to confirm your selection.

Push  key to back upper menu. Other keys are negative.

## 9. Battery test control page:

This Series supply UPS battery test function, the principle for it is lower DC input voltage for inverter to give UPS battery a instant discharging to test battery validity under long term utility status.

```

BATTERY TEST
STATUS: OFF
>ABORT TEST
GENERAL TEST
DEEP TEST

```

By the way, another line in this page, can be displayed in the mark at right down of screen.

DEEP TEST

- Push   keys to control mark,
- Push  key to confirm your selection.
- Push  key to back upper menu. Other keys are negative.

#### 10. Language selection presetting page:

This page can select screen information in Chinese or English.

```

LANGUAGE
>中文
ENGLISH

```

- Push   keys to select on/off.
- Push  key to confirm your selection.
- Push  key to back upper menu. Other keys are negative.

#### 11. UPS internal time adjusting:

This Series UPS equipped with timer chip. It can offer present time. By this page, user can adjust time for UPS timer chip.

```

DATE&TIME SETTING
DATE: 2004/01/01

TIME: 09: 00: 00
      ▲▲

```

- Push  key to select year, month, date, hour, minute, second.

Push   Keys to add or reduce time meters.

Push  key to confirm adjusted time parameter and input UPS internal time chip, then back to upper menu.

## 12. Version message:

This page can supply the information of UPS type name, version and device ID address.

ID address supply UPS address code information of communication data at adopting RS485 multi-machines supervising. A Series dial switch in UPS can preset it. Generally it is not supported to change these parameters.

```
MODEL: 30KVA
VERSION: 1.00
ID: 01
```

Push  key to back upper menu. Other keys are negative.

## 13. History page:

This page can supply subscriber display and record of some important history parameter and time for UPS. They are the basic information for analysis on local power network and abnormal situation.

```
AC FAIL CNT: 0
BAT LOW CNT: 0
OVERLOAD CNT: 0
AC HIGH CNT: 0
```

Push   keys to do rolling browsing.

Push  key to back upper menu. Other keys is negative.

Push  +  keys for 10 seconds to clean the history record in UPS memory. But account on the analysis for fault later ,so recommended to keep the history data record.

## 7. Maintenance

### 7.1 Maintenance of Battery

#### 7.1.1 Daily Maintenance of Battery

1. Charge the battery for 4 hours every three months if it is not used for a long time.
2. Charging the UPS for 4 hours before using, the UPS can be used while charging, but if the utility fail at that time, the backup time may be less than the standard value.
3. The battery should charge and discharge every four or six months when normally using. The standard models should charge after overload protection, and the charging time should be less than 4 hours.
4. In high temperature district, the battery should charge and discharge every two months, the standard models' charging time should be less than 4 hours.
5. It is prohibited to mix use different capacity, different type and different manufacturer's battery.
6. Use the dishcloth with clean water to clean the battery crust, it is not allowed to use oil or organic chemistry such as gasoline or thinner.
7. Keep the battery or battery pack away from fire source, to avoid any unnecessary losses.
8. Check the charger regularly, to avoid the situation of over-charge or not complete charge. Don't over discharge the battery, full charge the battery after discharge (no more than 24 hours), it is not allowed to discharge the battery when it is not full charge, otherwise it will reduce the battery capacity, even damage the battery.
9. Turn off the switch after stop using the UPS, to avoid over discharge after power cut.

#### 7.1.2 Replace the Battery

1. Don't throw the battery into water.
2. Don't open up or break down the battery, the electrolyte will do harm to skin and eyes.
3. Take back the batteries according to the relative explain.
4. Replace the battery with the same type and same grade battery.
5. Replace the whole battery pack, don't use the new battery with the worn battery.
6. Please note the following items when replace the battery:

Dangerous voltage exist between battery terminal and ground, please test before touch.

### 7.2 Maintenance Instructions

Correct maintenance, including preventive and remedy maintenance, is key to optimal operation of UPS and will prolong the equipment's life span. Preventive maintenance includes some frequently executed procedures which are for the prevention of system faults and maximization of system efficiency; remedy maintenance includes trouble-shooting of the system for effective maintenance.

## 7.2.1 Safety Precautions

In order to carry out system maintenance safely and successfully, the relevant safety precautions must be carried out. Essential tools and testing equipment shall be used and qualified maintenance staff shall participate. The following safe operation procedures shall be observed at any time:

1. Bear in mind that there is dangerous voltage in UPS even if it is not running.
2. Make sure that the operation and maintenance staff of UPS is familiar with the equipment and this manual.
3. Do not wear gold or silver ornaments like rings and watches, etc during operation of UPS.
4. Do not take for granted the safe operation procedures. If you have any questions, please consult those who are familiar with the equipment.
5. Look out for the dangerous voltage in UPS. Before maintenance and adjustment, use a voltage meter to ensure that the power supply is switched off and it is safe for operation.

## 7.2.2 Regular Preventive Maintenance

The following is the steps of preventive maintenance which after execution will increase the efficiency and reliability of UPS system.

1. Maintain a clean environment to avoid dust or chemical pollution to the UPS.
2. Wiring.  
Check once half a year if the input and output terminals have good contact.
3. Check regularly the operation of draught fans to prevent choking of draught. They shall be replaced in case of damage.
4. Check regularly battery voltage and UPS working status.

## 7.2.3 Analysis and Solution to Common Problems

In case of improper operation after UPS startup, do not diagnose it to be UPS fault, do the following to see if it works.

### **Phenomenon 1**

External power supply is all right, UPS outputs AC 230V after startup, battery is in inverter status and buzzer gives off intermittent alarms.

Possible cause: Intermittent AC input due to bad contact between all terminals and sockets, etc.

### **Phenomenon 2**

After installation of UPS, fusing or tripping will occur when power supply is switched on or UPS “On” button is pressed.

Possible cause: the five input phase wires are wrongly connected, e.g. null wires or line wires are connected to UPS grounding wires (machine casing), or the three output wires are wrongly connected.

**Phenomenon 3**

UPS outputs AC 230V after startup, but it works in bypass status (“Bypass” indicator light is on)

Possible cause: load is bigger than UPS rated power. It is necessary to reduce load or choose UPS of bigger power capacity. It is still normal operation if bypass status is actuated by startup of load and disabled automatically.

**Phenomenon 4**

UPS display and output are proper after startup, but output stops immediately after load is connected.

Possible cause:

- (1) UPS is seriously overloaded or output has short circuit. It is necessary to reduce load to applicable value and find out the cause of short circuit. It is most commonly due to output transfer socket short circuit or input short circuit due to equipment damage.
- (2) The startup sequence from equipment of bigger power to smaller power is not followed. UPS shall be restarted. After UPS is in normal operation, start the equipment in the above sequence.

**Phenomenon 5**

UPS has been in proper operation for some time before it shuts down automatically.

Possible cause: Battery unit is not charged in time and it is working and discharging (when external power supply fails or is not connected). In the end UPS battery under voltage protection is actuated.

Warning: in case of UPS battery under-voltage protection, all switches shall be switched off. Restart UPS and recharge battery pack when external power supply resumes. Long-term low voltage may affect battery's life span.

**Phenomenon 6**

UPS has been in operation for some time and input display has been all right before the buzzer alarms intermittently and battery under-voltage is displayed.

Possible cause: Caused by too low power supply voltage. UPS is working in battery supply status then trigger battery under-voltage protection.

**Phenomenon 7**

When external power supply is cut, UPS has no output.

Possible cause: Battery unit is not connected with main unit or battery unit is low voltage or seriously damaged.

## 7.3 Trouble-shooting

### 7.3.1 General Description

In case of any fault, look for the evident damage and try to find out if the fault is caused by the system itself or external environment (like temperature, humidity and load). All these external factors shall always be checked before coming to the conclusion that it is due to UPS system damage.

### 7.3.2 Trouble-shooting

This part only contains some simple ways for trouble-shooting. If the diagnosis is not quite sure or the acquired information is not sufficient for solving the problem, please contact local representative office or distributors.

1. Buzzer gives off long alarms and fault indicator light is on, UPS is in bypass status and inverter is not working properly.

Possible cause: (1) Overload or short circuit, UPS is shut down automatically for protection

- (2) Drive or power tube fault
- (3) Main control panel fault
- (4) DC fuse broken

2. UPS is working properly but can not work in case of external power failure.

Possible cause: (1) Battery fault

- (2) Battery charger fault and can't charge the battery
- (3) Battery wires are not connected or wiring terminals have bad contact.
- (4) UPS is not working and it is normally in bypass output status
- (5) UPS battery control switch is off

3. UPS input is all right while buzzer still gives out intermittent alarms

Possible cause: Bypass input air switch is not on so that system can detect input signals from external power supply; input voltage is abnormal which exceeds UPS's permitted input voltage range.

4. UPS is in normal operation with computer load. However, after electricity cut-off, UPS is still working normally while computer is down.

Possible cause: it has bad grounding. It is due to the high floating voltage between null wires and grounding wires.

5. No indicator lights on the panel.

Possible cause: bad contact or fault of display control board.

6. UPS is in normal operation without load. However, when the load is start, UPS is failure and work in bypass status.

Possible cause: the one drive signal of IGBT is lost.

### 7.3.3 Emergency Measures

1. Emergency Measures for single unit

Press the "OFF" button on the panel to shut off the UPS when the single UPS is failure. If it is necessary, disconnect the load and turn off the input/output breaker for more to protect the UPS.

2. Emergency Measures for hot standby system when the main unit is failure or the standby unit is failure.

Press the "OFF" button on the panel of main unit to shut off the UPS when the main unit is failure. And turn off its the utility breaker and battery breaker. Then ask authorized professional maintenance personnel for help.

Press the "OFF" button on the panel of standby unit to shut off the UPS when the main unit is failure. And turn off its the utility breaker and battery breaker. Then ask authorized professional maintenance personnel for help.

3. Emergency Measures for paralleled system that single unit single unit is failure.

Press the "OFF" button on the panel of standby unit to shut off the UPS when the single unit of paralleled system is failure. Then turn off its the input breaker, output breaker and battery breaker. And ask authorized professional maintenance personnel for help.

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