



GTM Series  
50-600kVA Modular UPS  
User Manual

## Safety Precautions

This manual contains information concerning the installation and operation of modular UPS. Please carefully read this manual prior to installation.

The modular UPS cannot be put into operation until it is commissioned by engineers approved by the manufacturer (or its agent). Not doing so could result in personnel safety risk, equipment malfunction and invalidation of warranty.

### Safety Information Definition

**Danger:** Serious human injury or even death may be caused, if this requirement is ignored.

**Warning:** Human injury or equipment damage may be caused, if this requirement is ignored.

**Caution:** Equipment damage, loss of data or poor performance may be caused, if this requirement is ignored.

**Commissioning Engineer:** The engineer who installs or operates the equipment should be well trained in electricity and safety, and familiar with the operation, debug, and maintenance of the equipment.

### Warning Label

The warning label indicates the possibility of human injury or equipment damage, and advised the proper step to avoid the danger. In this manual, there are three types of warning labels as below.

Labels	Description
 <b>DANGER</b>	<b>Serious human injury or even death may be caused, if this requirement is ignored.</b>
 <b>WARNING</b>	<b>Human injury or equipment damage may be caused, if this requirement is ignored.</b>
 <b>CAUTION</b>	<b>Equipment damage, loss of data or poor performance may be caused, if this requirement is ignored.</b>

### Safety Instruction

 <b>DANGER</b>	<ul style="list-style-type: none"><li>■ Performed only by commissioning engineers.</li><li>■ This UPS is designed for commercial and industrial applications only, and is not intended for any use in life-support devices or system.</li></ul>
 <b>WARNING</b>	<ul style="list-style-type: none"><li>■ Read all the warning labels carefully before operation, and follow the instructions.</li></ul>
	<ul style="list-style-type: none"><li>■ ESD sensitive components inside the UPS, anti-ESD measure should be taken before handling.</li></ul>

## Move & Installation

 <b>DANGER</b>	<ul style="list-style-type: none"><li>■ Keep the equipment away from heat source or air outlets.</li><li>■ In case of fire, use dry powder extinguisher only, any liquid extinguisher can result in electric shock.</li></ul>
 <b>WARNING</b>	<ul style="list-style-type: none"><li>■ Don't start the system if any damage or abnormal parts founded.</li><li>■ Contacting the UPS with wet material or hands may be subject to electric shock.</li></ul>
 <b>CAUTION</b>	<ul style="list-style-type: none"><li>■ Use proper facilities to handle and install the UPS. Shielding shoes, protective clothes and other protective facilities are necessary to avoid injury.</li><li>■ During positioning, keep the UPS way from shock or vibration.</li><li>■ Install the UPS in proper environment</li></ul>

## Debug & Operate

 <b>DANGER</b>	<ul style="list-style-type: none"><li>■ Make sure the grounding cable is well connected before connecting the power cables, the grounding cable and neutral cable must be in accordance with the local and national codes practice.</li><li>■ Before moving or re-connecting the cables, make sure to cut off all the input power sources, and wait for at least 10 minutes for internal discharge. Use a multi-meter to measure the voltage on terminals and ensure the voltage is lower than 36V before operation.</li></ul>
 <b>WARNING</b>	<ul style="list-style-type: none"><li>■ The earth leakage current of load will be carried by RCCB OR RCD.</li><li>■ Initial check and inspection should be performed after long time storing of UPS.</li></ul>

## Maintenance & Replacement

 <b>DANGER</b>	<ul style="list-style-type: none"><li>■ All the equipment maintenance and servicing procedures involving internal access need special tools and should be carried out only by trained personnel. The components that can be accessed by opening the protective cover with tools cannot be maintenance by user.</li><li>■ This UPS full complies with "IEC62040-1-1-General and safety requirements for use in operator access area UPS". Dangerous voltages are present within the battery box.</li></ul> <p>However, the risk of contact with these high voltages is minimized for non-service personnel. Since the component with dangerous voltage can only be touched by opening the protective cover with a tool, the possibility of touching high voltage component is minimized. No risk exists to any personnel</p>
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when operating the equipment in the normal manner, following the recommended operating procedures in this manual.

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## Battery Safety



### DANGER

- All the battery maintenance and servicing procedures involving internal access need special tools or keys and should be carried out only by trained personnel.
  - When connected together, the battery terminal voltage will exceed 400Vdc and is potentially lethal.
  - Battery manufacturers supply details of the necessary precautions to be observed when working on, or in the vicinity of a large bank of battery cells. These precautions should be followed implicitly at all times. Particular attention should be paid to the recommendations concerning local environmental conditions and the provision of protective clothing, first aid and fire-fighting facilities.
  - Ambient temperature is a major factor in determining the battery capacity and life. The nominal operating temperature of battery is 20 °C. Operating above this temperature will reduce the battery life. Periodically change the battery according to the battery user manuals to ensure the back-up time of UPS.
  - Replace the batteries only with the same type and the same number, or it may cause explosion or poor performance.
  - When connecting the battery, follow the precautions for high-voltage operation before accepting and using the battery, check the appearance of the batteries. If the package is damaged, or the battery terminal is dirty, corroded or rusted or the shell is broken, deformed or has leakage, replace it with new product. Otherwise, battery capacity reduction, electric leakage or fire may be caused.
  - Before operating the battery, remove the finger ring, watch, necklace, bracelet and any other metal jewelry.
  - Wear rubber gloves.
  - Eye protection should be worn to prevent injury from accidental electrical arcs.
  - Only use tools (e.g. wrench) with insulated handles.
  - The batteries are very heavy. Please handle and lift the battery with proper method to prevent any human injury or damage to the battery terminal.
  - Don't decompose, modify or damage the battery. Otherwise, battery short circuit, leakage or even human injury may be caused.
  - The battery contains sulfuric acid. In normal operation, all the sulfuric acid is attached to the separation board and plate in the battery. However, when the battery

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case is broken, the acid will leak from the battery. Therefore, be sure to wear a pair of protective glasses, rubber gloves and skirt when operating the battery. Otherwise, you may become blind if acid enters your eyes and your skin may be damaged by the acid.

■ At the end of battery life, the battery may have internal short circuit, drain of electrolytic and erosion of positive/negative plates. If this condition continues, the battery may have temperature out of control, swell or leak. Be sure to replace the battery before these phenomena happen.

■ If a battery leaks electrolyte, or is otherwise physically damaged, it must be replaced, stored in a container resistant to sulfuric acid and disposed of in accordance with local regulations.

■ If electrolyte comes into contact with the skin, the affected area should be washed immediately with water.

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## Disposal



### WARNING

- Dispose of used battery according to the local instructions.

## Note



- Represents a supplementary explanation or emphasis to the main text.

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# 1 Installation

## 1.1 Introduction

This chapter introduces the relevant requirements for positioning and cabling of the UPS and related equipment.



### **WARNING: installation can only be done by authorized engineers**

**Do not apply electrical power to the UPS equipment before the commissioning engineer arrives at installation site.**

**The UPS should be installed by a qualified engineer in accordance with the information contained in this chapter. All the equipment not referred to in this manual is shipped with details of its own mechanical and electrical installation information.**



### **Note: 3-Phase 4-Wire Input Power is required**

**The standard UPS system can be connected to TN, TT AC distribution system (IEC60364-3) of 3-phase 4-wire, and a 3-wire to 4-wire conversion transformer is provided as an optional part.**



### **WARNING: battery hazards**

**SPECIAL CARE SHOULD BE TAKEN WHEN WORKING WITH THE BATTERIES ASSOCIATED WITH THIS EQUIPMENT.**

**When connecting the battery, the battery terminal voltage will exceed 400Vdc and is potentially lethal.**

- Eye protection should be worn to prevent injury from accidental electrical arcs.
- Remove rings, watches and all metal objects.
- Only use tools with insulated handles.
- Wear rubber gloves.
- If a battery leaks electrolyte, or is otherwise physically damaged, it must be replaced, stored in a container resistant to sulfuric acid and disposed of in accordance with local regulations.
- If electrolyte comes into contact with the skin, the affected area should be washed immediately with water.

## 1.2 Initial Inspections

Perform the following checking operations prior to the UPS installation.

1. While the cabinets are still on the truck, inspect the equipment and shipping container for any signs of damage or mishandling. Do not attempt to install the system if damage is apparent. If any damage is noted, file a damage claim with the shipping agency immediately and contact your supplier to inform them of the damage claim and the condition of the equipment.
2. Verify the product label and confirm the correctness of the equipment. The UPS model, capacity and main parameters are marked on the label.
3. Compare the contents of the shipment with the bill of lading. Report any missing items to the carrier.

## 1.3 Location

### 1.3.1 UPS Location

The UPS is intended for indoor installation and should be located in a cool, dry and clean environment with adequate ventilation to keep the environmental parameters within the specified operating range (see *Table 8-2*). The Modular series UPS uses forced convection cooling by internal fans. Cooling air enters the module through ventilation grills located at the front part of the cabinet and exhausted through grills located in the rear part of the cabinet. Please do not block the ventilation holes.

Note: The UPS should be installed on a cement surface or other surface that is not combustible.

### 1.3.2 External Battery Room

The battery will generate some amount of hydrogen and oxygen at the end of charging, so the fresh air volume of the battery installation environment must meet EN50272-2001 requirements.

The ambient temperature of the battery must be stable. Ambient temperature is a major factor in determining the battery capacity and life. The nominal operating temperature of battery is 20°C. Operating above this temperature will reduce the battery life, and operation below this temperature will reduce the battery capacity. If the average operating temperature of battery is increased from 20°C to 30°C, then the service life of the battery will be reduced by 50%. If the operating temperature of the battery is above 40°C, then the battery service life will be decreased in exponent rate. In a normal installation, the battery temperature is maintained between 15°C and 25°C. Keep batteries away from heat sources or air outlets.

If external batteries are to be used, the battery circuit breakers (or fuses) must be mounted as close as possible to the batteries, and the connecting cables should be as short as possible.

### 1.3.3 Storage

If the system will not be installed immediately, it must be stored indoors in a clean, dry and cool location (see Table 8.1 on page 63). If the UPS includes batteries, either internally or in a battery cabinet, the batteries' requirements will dictate the storage conditions. Batteries should be unpacked, installed and charged as soon as possible after delivery.



#### WARNING

**Risk of failure to properly charge batteries. It can cause permanent damage to the batteries and void the warranty. Batteries will self discharge during storage. Batteries must be recharged as recommended by the battery manufacturer. A notice of Charge Before Date is affixed to each unit that has batteries inside. The Charge Before Date is calculated based on the batteries being stored at 77 °F (25 °C). Storage at a higher temperature will increase the rate of self discharge, requiring earlier recharge. Consult the battery manufacturer on how to determine when the batteries need to be recharged.**

## 1.4 Positioning

Choose a location for the UPS that offers:

- Easy connection to inputs, outputs and auxiliary equipment.
- Enough space to service the UPS.
- Air circulation sufficient to expel the heat produced by the UPS.
- Protection against moisture and excessive humidity.
- Protection against dust and other particulate matter.

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- Compliance with the fire prevention regulations and practices.
- Operating environment temperature of 74 °F-80 °F (23 °C-27 °C) for maximum battery life.

#### 1.4.1 System Cabinet

A UPS system comprises an UPS rack system, external battery cabinet, depending on the specific system requirement.

All the UPS system cabinets used in the same installation site are of the same height and should be positioned side-by-side to achieve an aesthetically appealing effect. Refer to Chapter 7 Installation Drawing for the positioning of UPS cabinet.

#### 1.4.2 Moving the Cabinets



**Ensure that any lifting equipment used in moving the UPS cabinet has sufficient lifting capacity. The UPS is fitted with castors – take care to prevent movement when unbolting the equipment from its shipping pallet. Ensure adequate personnel and lifting aids are available when removing the shipping pallet.**

Ensure that the UPS weight is within the weight loading capacity range of any hoisting equipment. See *Table. 8-3* for UPS weight.

UPS and optional cabinets can be handled by means of a fork lift or similar equipment. The UPS cabinet can also be moved by its castors when moving in a short distance.



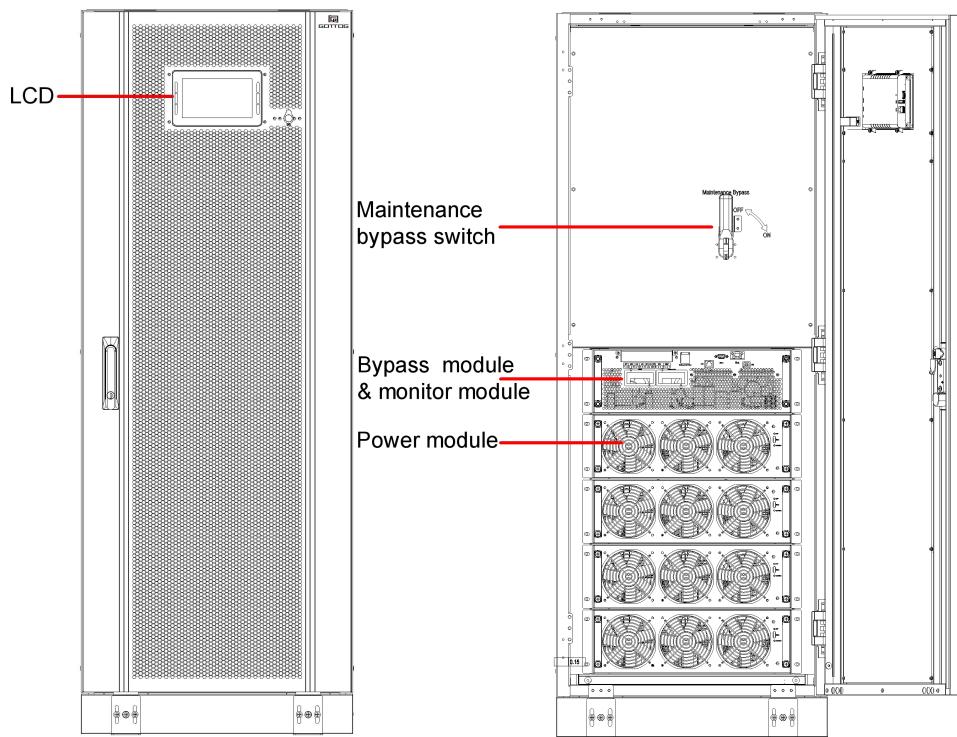
**Note:** Care must be taken when handling units fitted with batteries. Keep such moves to a minimum.

#### 1.4.3 Installation of Adjustable Feet

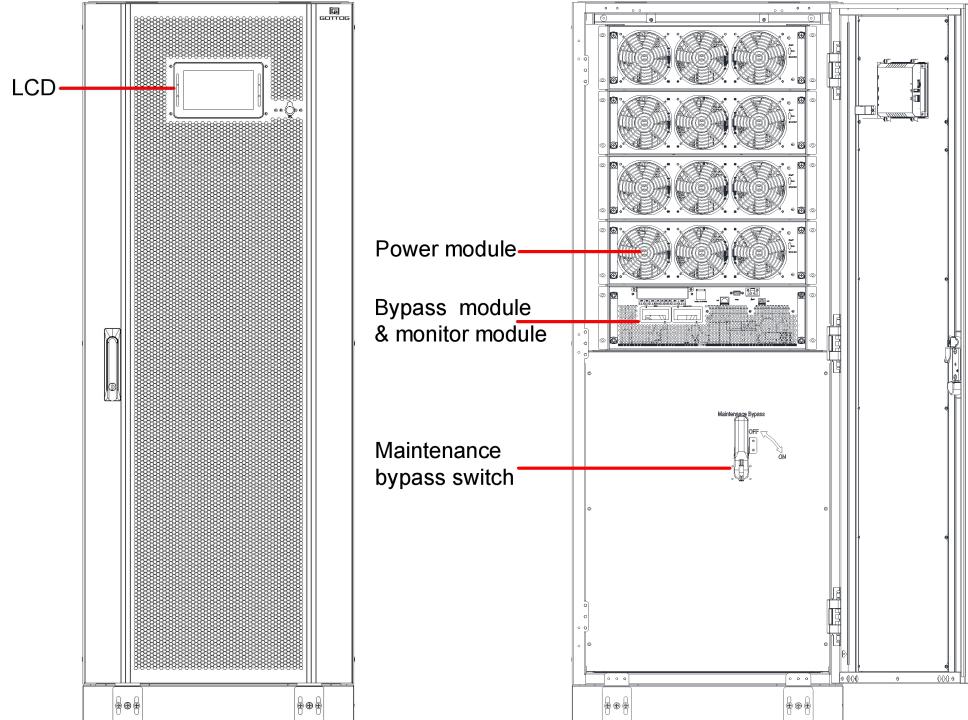
Installation diagrams in Chapter 4 of this manual identify the location of the holes in the base plate through which the equipment can be bolted to the floor. If the UPS is to be located on a raised floor, it should be mounted on a pedestal suitably designed to accept the UPS point loading (more than 150 kg).

#### 1.4.4 UPS Composition

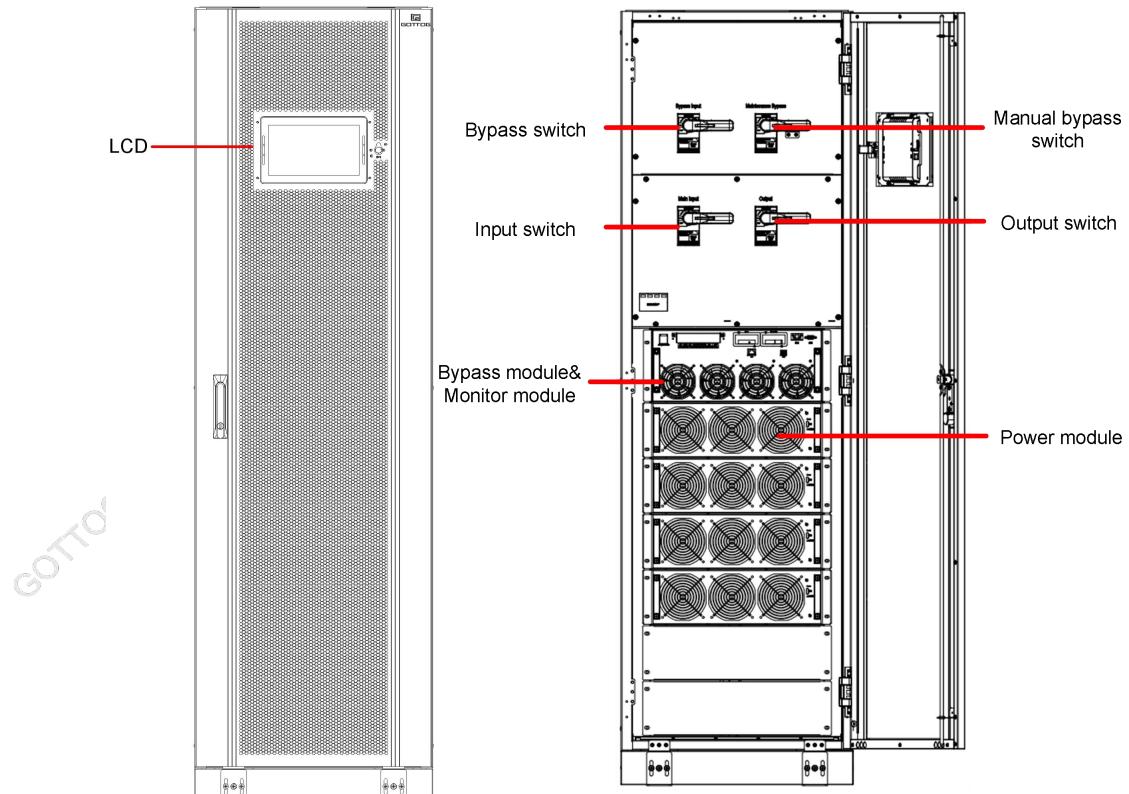
The UPS structure is shown in *Fig. 1-1*. The UPS configuration is provided in *Table. 1-1*



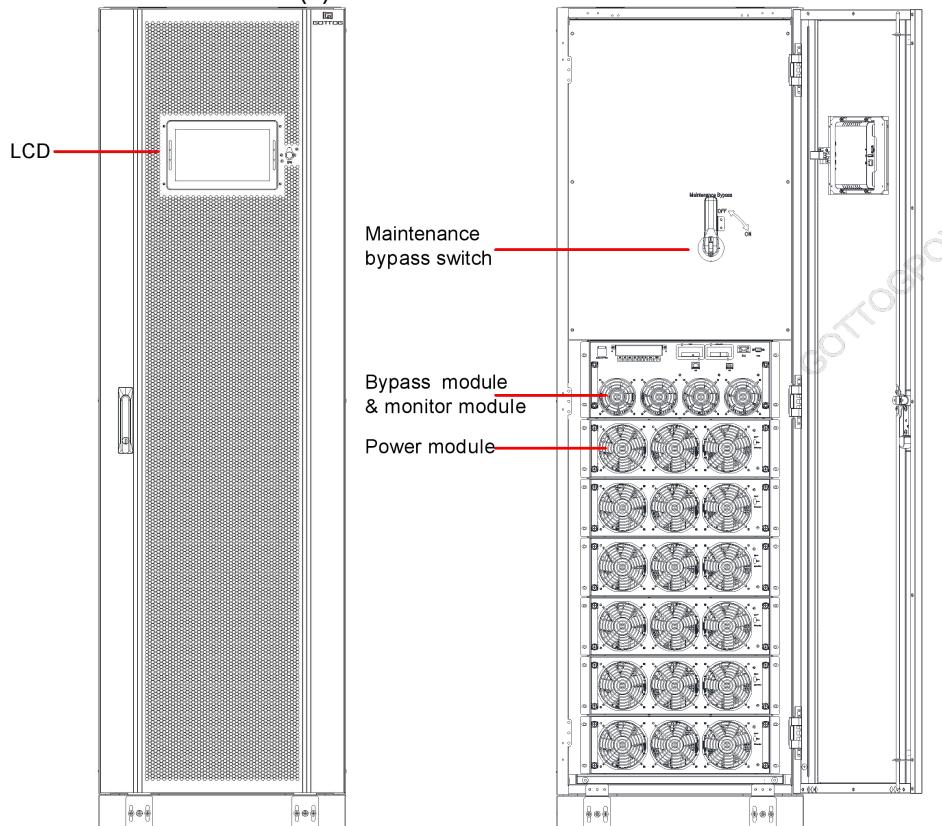
(a) 4 modules cabinet-front top entry



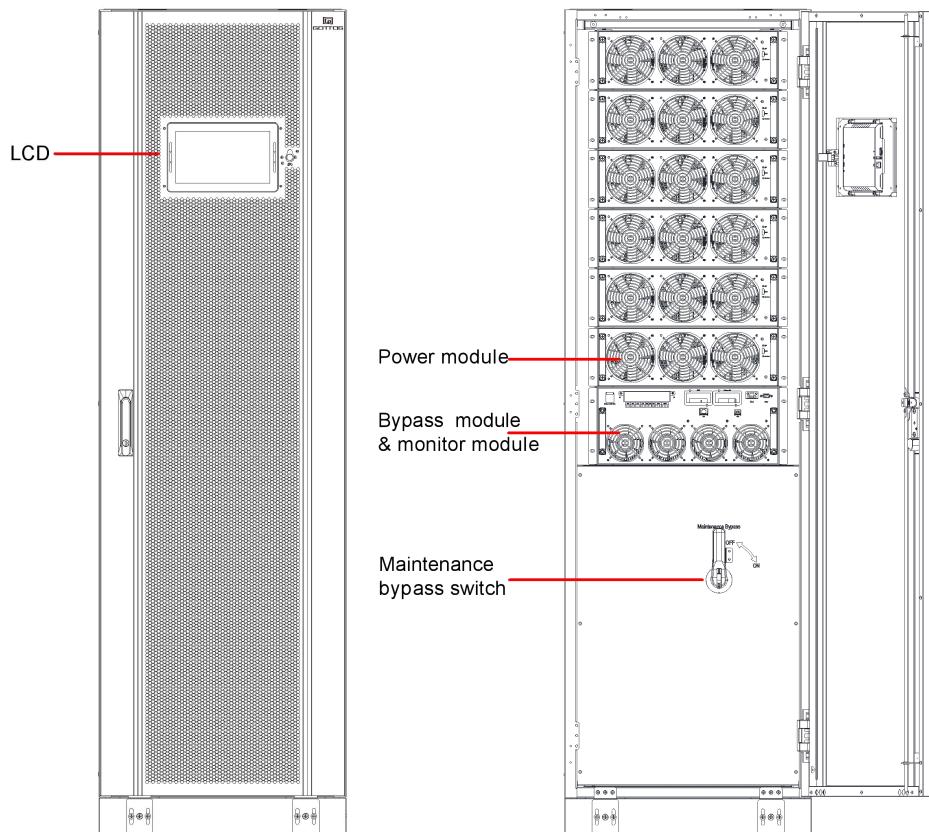
(b) 4 modules cabinet-front bottom entry



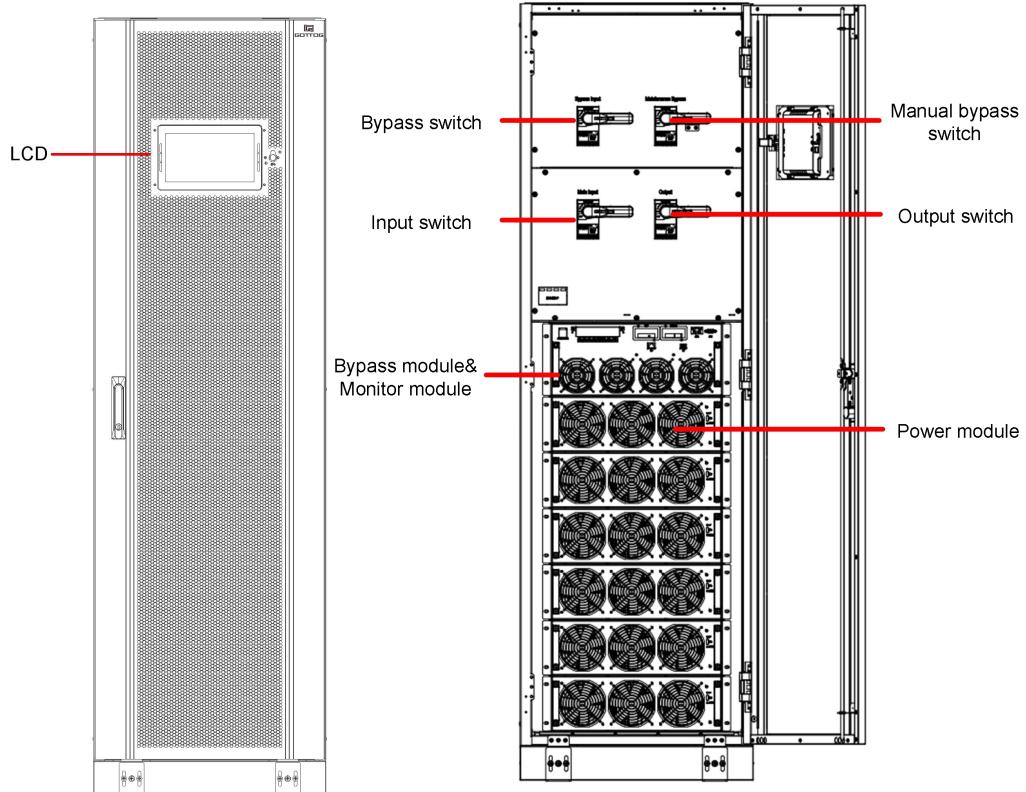
(c) 4 modules cabinet with 4 switches



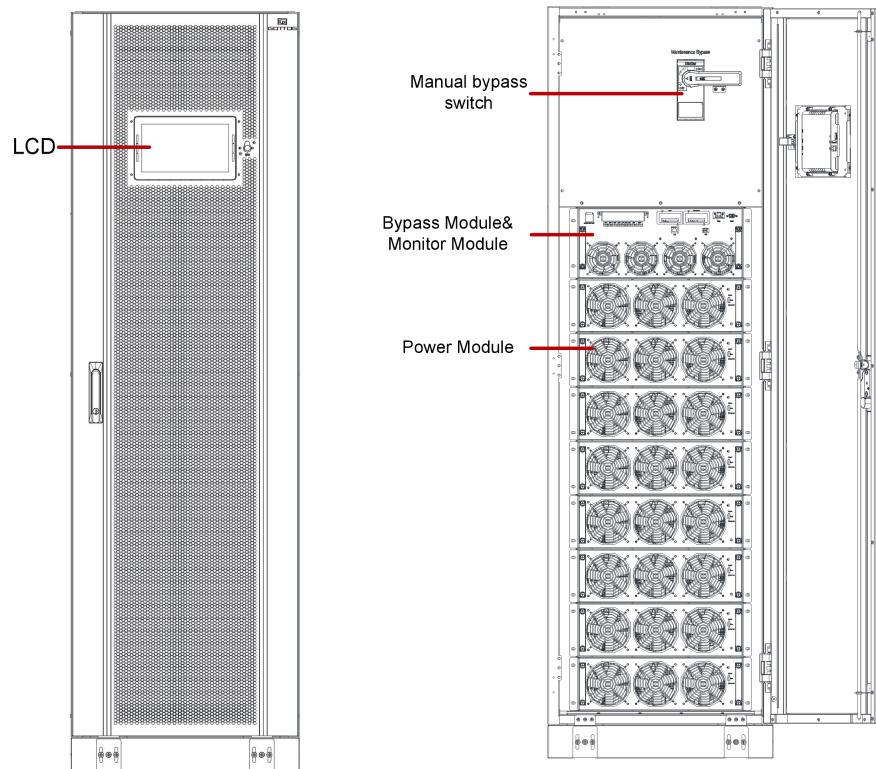
(d) 6 modules cabinet-front top entry



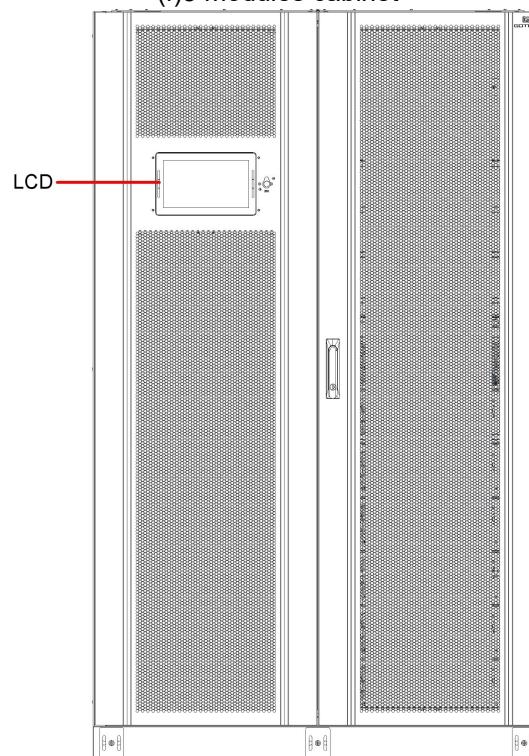
(e) 6 modules cabinet-front bottom entry

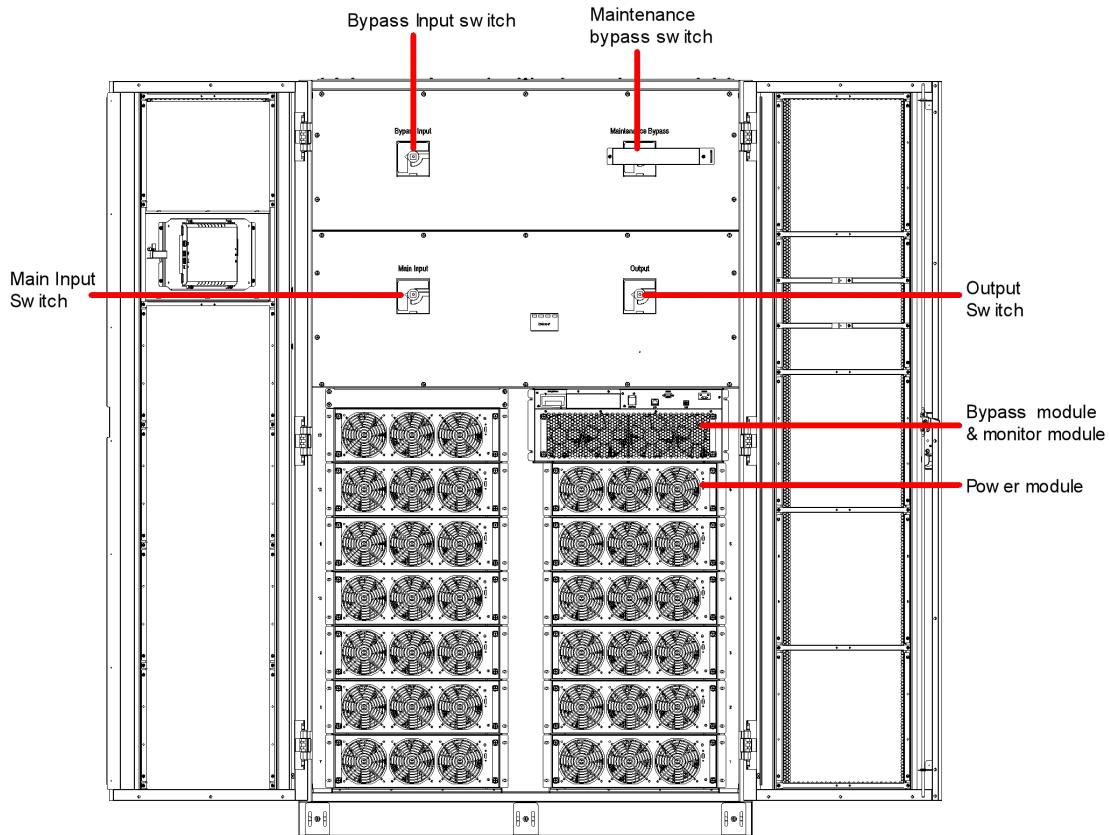


(e) 6 modules cabinet with 4 switches



(f)8 modules cabinet





(g)10 & 12 modules cabinet

Fig.1- 1: UPS Structure

Table.1- 1: UPS Configuration List

Item	Component	Quantity/PCS	Remark
4 module cabinet	Manual Bypass Switch	1	standard
6 module cabinet	Bypass & Monitoring module	1	standard
8 module cabinet			
50kVA power module	Power module	1~8	/
4&6(with 4 switches)&10&12 module cabinet	Main input Switch	1	standard
	Bypass input Switch	1	standard
	Maintenance bypass Switch	1	standard
	Output Switch	1	standard
	Bypass & Monitoring module	1	standard
50kVA power module	Power module	1~13	max 12 running +1 redundancy

#### 1.4.8 Installing Power Modules

The number and possible installation positions of the Power Modules may vary according to the chosen factory configuration.

When installing power modules always work from the lower available space upwards to prevent from raising the center of gravity. The default setting from the bottom space upwards is NO.1 to NO.4 (4 modules cabinet), NO.1 to NO.6 (6 modules cabinet), NO.1 to NO.8 (8 modules cabinet), NO.1 to NO.10 (10 modules cabinet), NO.1 to NO.12 (12 modules cabinet).



#### Note

If installed as standalone unit, it's recommended that install power modules from upper available space downwards to prevent from corrosion of the bottom module.

- Remove reserved covers according to number of power modules.
- Insert the module in the installation position, and push it into the cabinet.
- Fasten the module to the cabinet through the fixing holes on both sides of the front panel of the module.



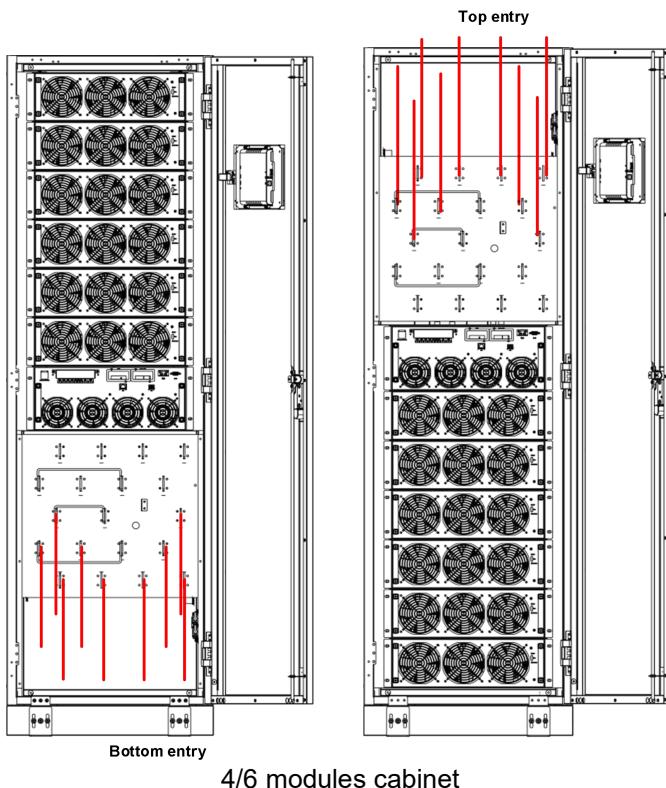
#### WARNING

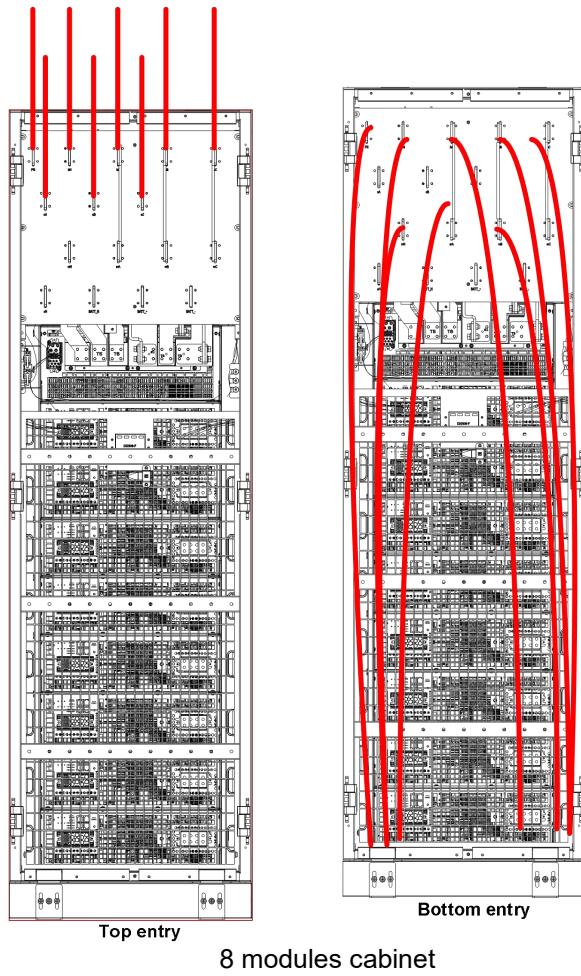
Service rack enclosure within side doors should be chosen to cover side panel of UPS cabinet, otherwise the connector for power modules might be touched with tools like screwdriver.

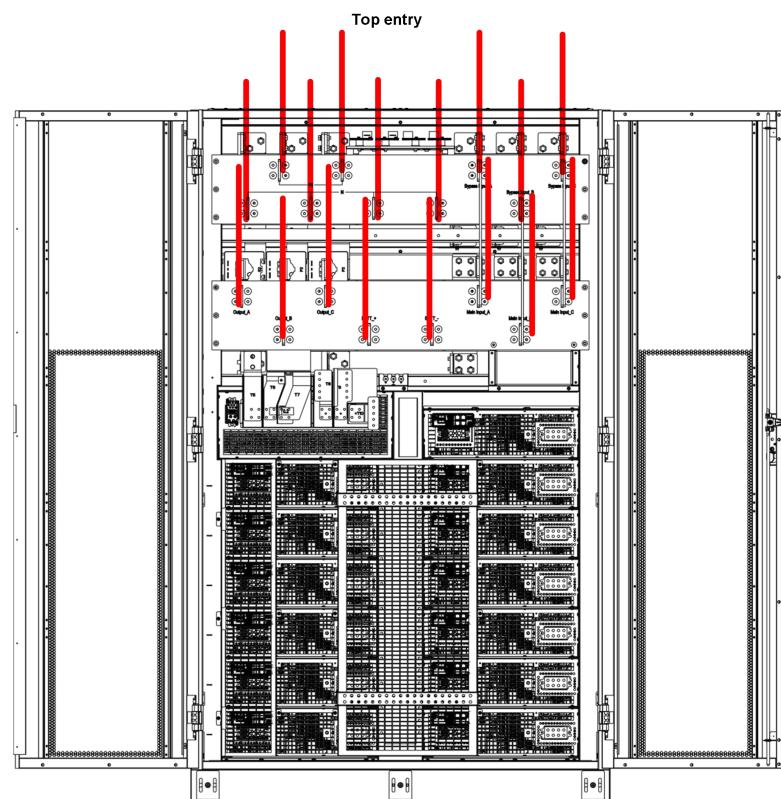
#### 1.4.9 Cable Entry

There are two types of cabinets for 4/6 module UPS, one with front top cable entry and one with front bottom cable entry. The 4&6 (with 4 switches)&10&12 module UPS have back top & bottom cable entry. The recommended installation practice is to connect cables through ellipse hole or circular cable protector on the removable plates to prevent foreign material or vermin entering the cabinet. If connect cables through bottom entry, remove the cover and install a rubber cable protector in the bottom entry hole firstly.

Cable entry is followed as fig. 1-2.







10/12 modules cabinet

Fig.1- 2: power cable entry



#### Note

Cables connection should be followed as diagram on rear panel or **appendix B**.

Fix cables in 6-module cabinet as Fig.1-2 to make sure best ventilation.

Enter through reserved entry cover if ellipse holes are not big enough, and block the remained space to protect UPS from rats.

## 1.5 External Protective Devices

For safety concerns, it is necessary to install external circuit breakers or other protective devices for the input AC supply of the UPS system. This section provides generic practical information for qualified installation engineers. The installation engineers should have the knowledge of the regulatory wiring standards, and of the equipment to be installed.

To reduce the risk of fire, connect only to a circuit provided with branch circuit overcurrent protection in accordance with the NEC ANSI/NFPA70.

### 1.5.1 Input Supply of the UPS

#### Over currents

Install suitable protective devices in the distribution unit of the incoming mains supply, considering the power cable current-carrying capacity and overload capacity of the system (see Tab. 8-7). Generally, the magnetic circuit breaker with IEC60947-2 tripping curve C (normal) at the 125% of the current listed in Tab. 8-7 is recommended.

**Split bypass:** In case a split bypass is used, separate protective devices should be installed for the rectifier input and bypass input in the incoming mains distribution panel.



**Note:** The rectifier input and bypass input must use the same neutral line.

#### Earth Leakage, RCD devices:

Any Residual Current Detector (RCD) installed upstream of the input supply:

- Must be sensitive to DC unidirectional pulses (class A) in the network
- Must be insensitive to transient current pulses
- Must have an average sensitivity, adjustable between 0.3A and 1A.

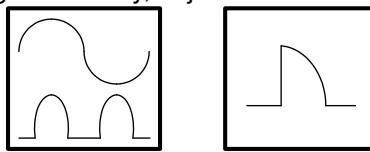


Fig.1- 3: The Symbols of RCCB

To avoid false alarms, the earth leakage monitoring devices (when used in the systems with the split bypass input or when used in parallel UPS configurations) must be located upstream of the common neutral sinking point. Alternatively, the device must monitor the combined four-wire rectifier and the split bypass input currents.

### 1.5.2 UPS Output

In the eventuality that an external distribution panel is used for load distribution, the selection of protective devices must provide discrimination with those that are used at the input to the UPS (see Tab. 8-7).

## 1.6 Power Cables

### 1.6.1 Power Cables

The selection of UPS system power cables should meet the requirements of Table 3B in IEC60950-1, and appropriate cables should be selected based on actual engineering applications. The maximum operating current of the UPS and the recommended cable diameter are shown in Table 1.2



**DANGER**  
FAILURE TO FOLLOW ADEQUATE EARTHING PROCEDURES CAN RESULT IN EMI, ELECTRIC SHOCK HAZARD, OR RISK OF FIRE, SHOULD AN EARTH FAULT OCCUR.

Modular power		50kVA				
UPS power		200kVA	300kVA	400kVA	500kVA	600kVA
Input	Current(A)	420	630	1050	1050	1250
	A	150	2*120	3*120	3*120	4*120
	B	150	2*120	3*120	3*120	4*120
	C	150	2*120	3*120	3*120	4*120
	N	150	2*120	3*120	3*120	4*120
Output	Current(A)	380	570	950	950	1150
	A	120	2*95	3*120	3*120	4*120
	B	120	2*95	3*120	3*120	4*120
	C	120	2*95	3*120	3*120	4*120
	N	120	2*95	3*120	3*120	4*120
Bypass	Current(A)	380	570	950	950	1150
	A	120	2*95	3*120	3*120	4*120
	B	120	2*95	3*120	3*120	4*120
	C	120	2*95	3*120	3*120	4*120
	N	120	2*95	3*120	3*120	4*120
Battery	Current(A)	500	750	1250	1250	1500
	wire diameter (mm <sup>2</sup> )	+	2*70	2*120	4*120	4*120
		-	2*70	2*120	4*120	4*120
		N	2*70	2*120	4*120	4*120
Ground wire	wire diameter (mm <sup>2</sup> )	PE	70	120	200	200

Table 1-2 Recommended wire diameter of power cables



**Note:**

The cables recommended in Table 1-2 are only applicable to the following conditions:

1. Ambient temperature: 30°C.

2. AC voltage loss is less than 3%, DC voltage loss is less than 1%. The AC cable length of various

UPS models in the table is no more than 50 meters, and the DC cable length is no more than 30 meters. If it exceeds, the cable specifications should be increased.

3.90°C copper conductor soft cable When external conditions change, it is necessary to refer to IEC60364-5-52 and local relevant specifications for verification. The current value in the table is for the data when the rated line voltage is 380V. For 400V rated voltage, the current value needs to be multiplied by 0.95; for 415V rated voltage, the current value needs to be multiplied by 0.92.

4. When the main load is non-linear load, the N line section needs to be increased to 1.5 times to 1.7 times.

5. In three-input/single-input mode, the current of the AC N line is three times that of the normal three-input/three-output mode. Pay attention to the power cable configuration. For wiring, see Section 1.6.4

### 1.6.2 Specifications for Power Cables Terminal

Cable terminal requirements are shown in Table 1-3 below.

Model	Terminal	Connection	Bolt specifications	Torque
200kVA	Mains input	OT terminal	M10	15Nm
	Bypass input		M10	15Nm
	Battery input		M10	15Nm
	Output		M10	15Nm
	PE		M10	15Nm
300kVA	Mains input	OT terminal	M12	28Nm
	Bypass input		M12	28Nm
	Battery input		M12	28Nm
	Output		M12	28Nm
	PE		M12	28Nm
400kVA	Mains input	OT terminal	M12	28Nm
	Bypass input		M12	28Nm
	Battery input		M12	28Nm
	Output		M12	28Nm
	PE		M12	28Nm
500kVA/600kVA	Mains input	OT terminal	M16	96Nm
	Bypass input		M16	96Nm
	Battery input		M16	96Nm
	Output		M16	96Nm
	PE		M16	96Nm

Table 1-3 Cable terminal requirements

### 1.6.3 Circuit Breaker

The UPS system needs to be equipped with external distribution circuit breakers, including main input circuit breaker, bypass input circuit breaker (configured when dual input is configured), output circuit breaker, maintenance bypass circuit breaker and battery output circuit breaker. The

recommended circuit breaker specifications are shown in Table 1-4.

Installation location	200kVA	300kVA	400kVA	500kVA	600kVA
Input switch	500A/3P	630A/3P	1000A/3P	1250A/3P	1250/3P
Bypass switch	400A/3P	500A/3P	630A/3P	1000A/3P	1000A/3P
Output switch	400A/3P	500A/3P	630A/3P	1000A/3P	1000A/3P
Maintenance switch	400A/3P	500A/3P	630A/3P	1000A/3P	1000A/3P
Battery switch	630A	800A	1250A	1600A	1600A

Table 1-4 Recommended circuit breaker specifications



**Note:**

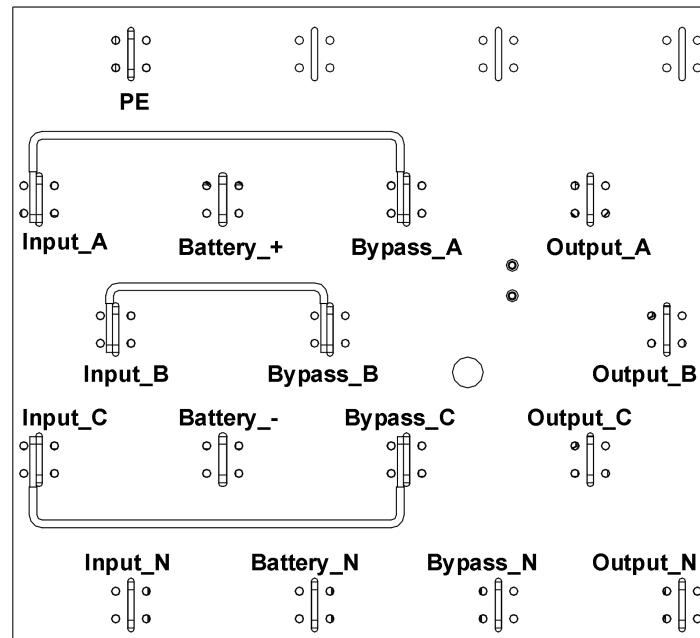
It is not recommended to configure a circuit breaker with leakage protection function.

#### 1.6.4 Cable Connections

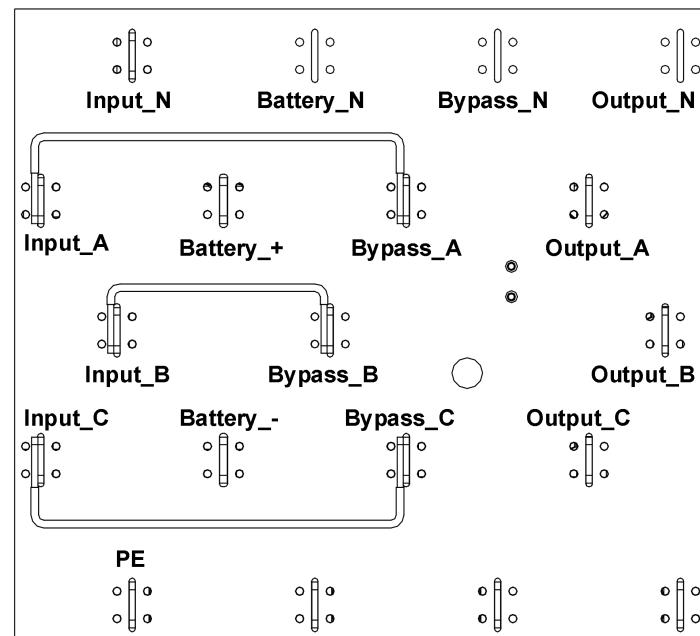
The specific connection process is carried out as follows.

Step 1 Confirm that all input power distribution switches are completely turned off, and all power switches inside the cabinet are turned off. Put warning signs on these switches to prevent others from operating them;

Step 2 Remove the rear protective cover to reveal the input and output terminals, battery terminals and grounding terminals. The wiring terminal layout is shown in Fig.1-4;



1-4-1 4&6 slots cabinet-Top entry power connection



1-4-2 4&6 slots cabinet-Bottom entry power connection

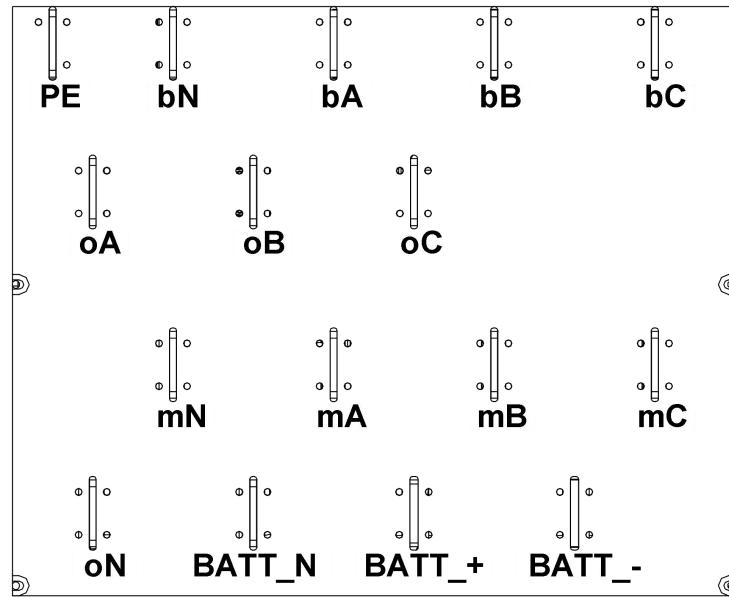


Figure 1-4-3 8 slots cabinet power connection

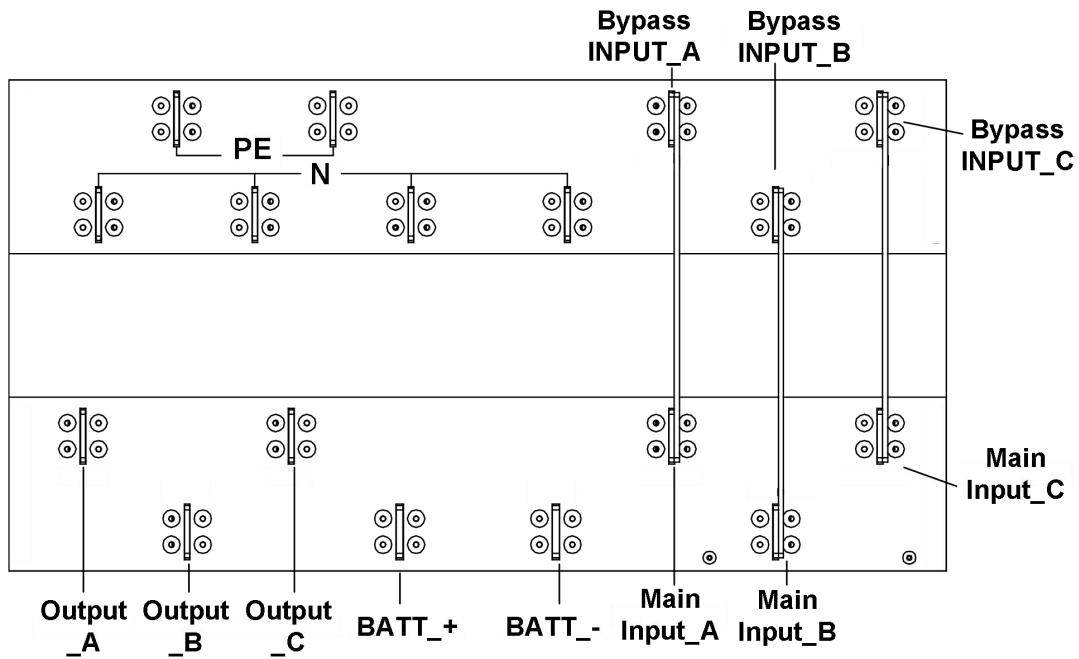


Figure 1-4-4 10&12 slots cabinet power connection

Step 3 Connect the input ground wire to the input ground terminal. Note that the ground wire connection must comply with local and national regulations;

Step 4: Connect the AC input cable to the UPS input terminal (Main Input) in sequence ; connect the output load cable to the UPS output terminal (Output);

---

Step 5 Connect the battery wiring to the battery terminal (Battery) of the UPS; the external battery must have a switch

Step 6: After checking that the wiring is correct, install the protective cover back and the wiring is completed.



**Note:**

1)When connecting power cables, follow the torque torque given in Table 1.3 to ensure the tightness of the terminals and avoid potential safety hazards.

2)Before wiring the UPS, make sure you know the position and status of the switch connecting the UPS input to the mains power distribution. Make sure the switch is off and attach a warning sign to prevent others from operating the switch.

---

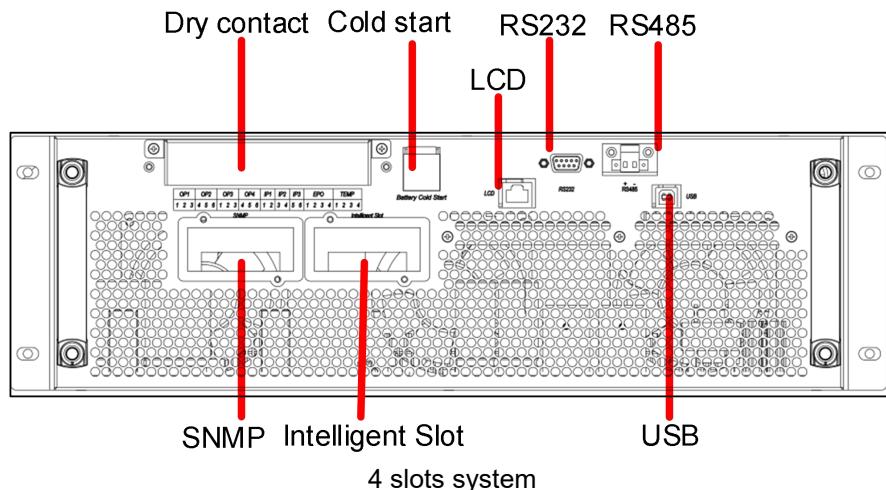
## 1.7 Control Cabling and Communication

### 1.7.1 Monitoring Board Features

Based on your site's specific needs, the UPS may require auxiliary connections to manage the battery system (the external battery circuit breaker, the battery temperature sensor), communicate with a personal computer or provide alarm signaling to the external devices or for the Remote Emergency Power Off (REPO). Terminations for these functions are located at the front of the static bypass assembly. The main features are:

- EPO
- Environment and battery temperature input interface
- Generator input dry contactor interface
- Battery warning output dry contactor interface
- Battery circuit breaker interface
- Mains failure warning output dry contactor interface
- Intelligent slots intelligent card interface
- User communication interface (RS232, RS485, USB)
- Parallel ports (optional)

The UPS dry contactor board provides input dry contactors and output dry contactors.



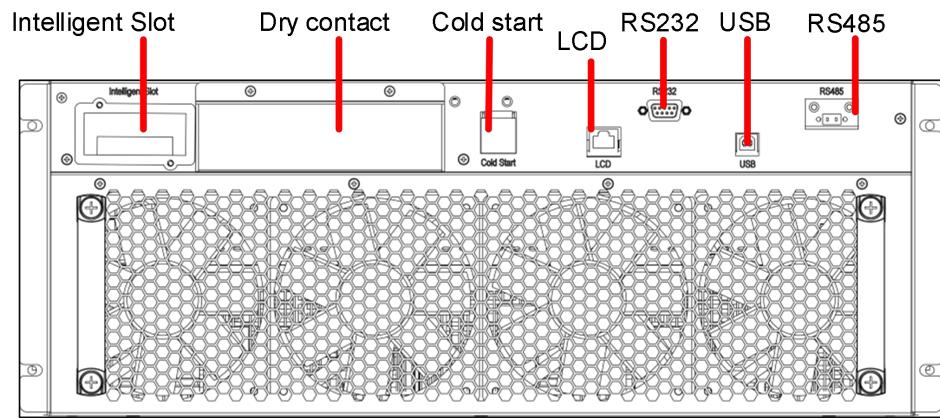
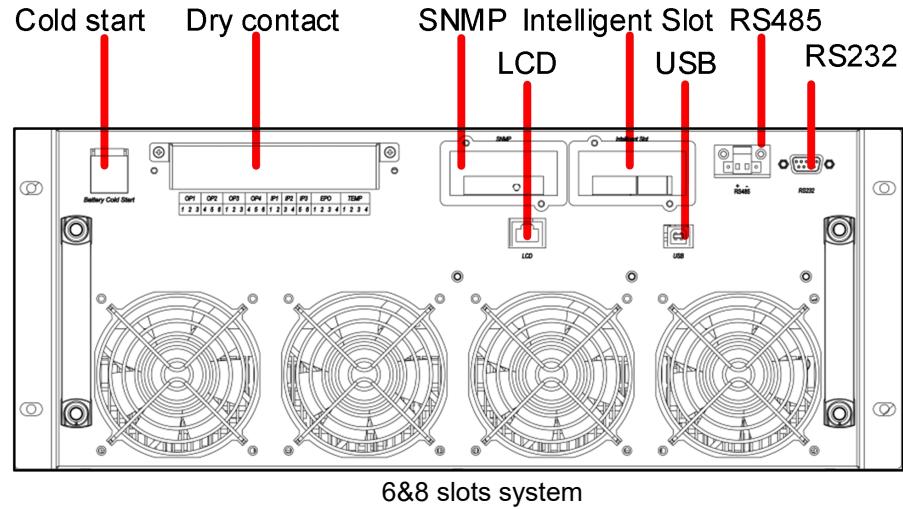


Fig.1- 5: Static Bypass Assembly Features

### 1.7.2 Dry Contactor

The dry contact port includes 5 groups of interfaces, and their interface functions are shown in Table 1-5.

Interface location	Type	Function
EPO-1	REMOTE_EPO_NO	Trigger EPO when shorted to EPO-2
EPO-2	+24V_DRY	+24V
EPO-3	+24V_DRY	+24V
EPO-4	REMOTE_EPO_NC	EPO triggered when disconnected from EPO-3
TEMP-1	ENV_TEMP	Ambient temperature detection
TEMP-2	TEMP_COM	Temperature detection common terminal
TEMP-3	TEMP_COM	Temperature detection common terminal
TEMP-4	TEMP_BAT	Battery temperature detection
IP1-1	BCB_Status	Built-in input dry contact, function can be set. Default function: BCB Status and BCB Online are valid (when BCB Status is invalid, it will report that the battery is empty)

IP1-2	GND_DRY	+24V ground
IP2-3	BCB_Online	Built-in input dry contact, function can be set. Default function: BCB Status and BCB Online are valid (when BCB Status is invalid, it will report that the battery is empty)
IP2-4	GND_DRY	+24V ground
IP3-5	GEN_CONNECTED	Built-in input dry contact, function can be set. Default function: engine access port
IP3-6	+24V_DRY	+24V
OP1-1	BAT_LOW_ALARM_NC	Built-in output dry contact (normally closed), function can be set. Default setting: low battery voltage alarm.
OP1-2	BAT_LOW_ALARM_NO	Built-in output dry contact (normally open), function can be set. Default setting: low battery voltage alarm
OP1-3	BAT_LOW_ALARM_GND	OP1-1 and OP1-2 common terminal
OP2-4	GENERAL_ALARM_NC	Built-in output dry contact (normally closed), function can be set. Default setting: Comprehensive alarm.
OP2-5	GENERAL_ALARM_NO	Built-in output dry contact (normally open), function can be set. Default setting: Comprehensive alarm
OP2-6	GENERAL_ALARM_GND	OP2-4 and OP2-5 common terminal
OP3-1	UTILITY_FAIL_NC	Built-in output dry contact (normally closed), function can be set. Default setting: Mains power abnormality alarm.
OP3-2	UTILITY_FAIL_NO	Built-in output dry contact (normally open), function can be set. Default setting: Mains power abnormality alarm
OP3-3	UTILITY_FAIL_GND	OP3-1 and OP3-2 common terminal
OP4-4	BCB Drive	Built-in output dry contact, function can be set. Default function: Battery CB trip signal (valid under EOD or EPO)
OP4-5	GND_DRY	+24V ground
OP4-6	+24V_DRY	+24V

Table 1-5 Dry contact interface definition



**Note:**

The settable functions of dry contacts can be set through the background monitoring software.

The default functions of each dry contact are described below.

**Remote EPO Input Port**

EPO is the remote EPO input interface. During normal operation, EPO\_NC needs to be short-circuited to +24V. When EPO needs to be triggered, EPO\_NC needs to be disconnected from +24V. The interface schematic diagram is as follows, the interface schematic diagram is shown in Figure 1-8, and the interface description is shown in Table 1-6.

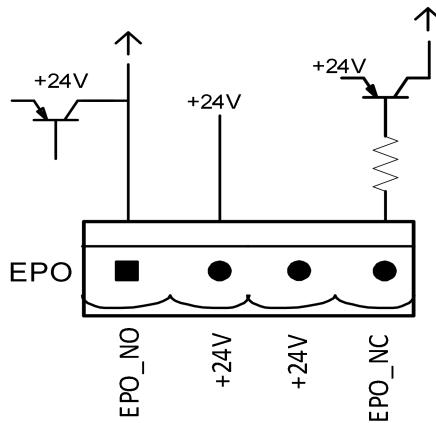


Figure 1-6 Schematic diagram of remote EPO input interface

Location	Type	Function
EPO-1	REMOTE_EPO_NC	EPO triggered when disconnected from EPO-2
EPO-2	+24V_DRY	+24V
EPO-3	+24V_DRY	+24V
EPO-4	REMOTE_EPO_NO	EPO is triggered when shorted to EPO-3

Table 1-6 Remote EPO input interface description

During normal operation of the UPS system, pins EPO-3 and EPO-4 need to be short-circuited and pins EPO-1 and EPO-2 disconnected. If EPO-3 and pins EPO-4 are disconnected or pins EPO-1 and EPO-2 are short-circuited, an emergency shutdown will be triggered.

### Battery & ambient temperature detection dry contact

The temperature dry contact detects battery temperature and ambient temperature and is used for environmental monitoring and battery temperature compensation. The schematic diagram of the temperature detection interface is shown in Figure 1-9, and the interface description is shown in Table 1-7.

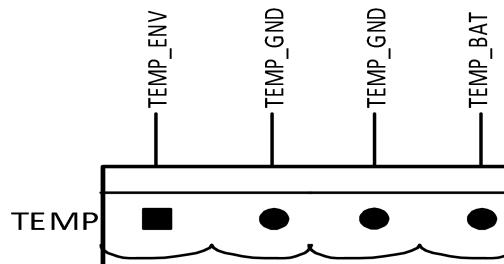


Figure 1-7 Temperature detection dry contact interface

Location	Type	Function
TEMP-1	TEMP_ENV	Ambient temperature detection
TEMP-2	TEMP_COM	Temperature detection common terminal
TEMP-3	TEMP_COM	Temperature detection common terminal
TEMP-4	ENV_TEMP	Battery temperature detection

Table 1-7 Description of input dry contact interfaces J2 and J3

**Note:**

Temperature detection requires the use of a specific temperature sensor (R<sub>25</sub>=5Kohm, B<sub>25/50</sub>=3275). Please confirm with the manufacturer when ordering, or contact the office.

**Generator Input Dry Contact**

IP3 5-6 pins are the generator connection status interface. Connect pin 5 of IP3 to the +24V power supply, indicating that the generator has been connected to the system. The interface diagram is shown in Figure 1-10, and the interface description is shown in Table 1-8.

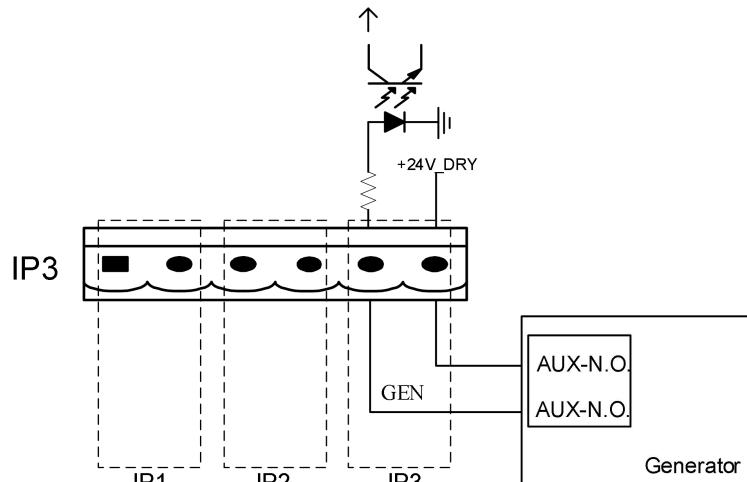


Figure 1-8 Generator access status interface and connection diagram

Location	Type	Function
IP3-5	GEN_CONNECTED	Built-in input dry contact, function can be set. Default function: generator access status port
IP3-6	+24V_DRY	+24V power supply

Table 1-8 Generator access status interface description

**BCB Interface**

IP1 and IP2 are battery switch (BCB) interfaces, and OP4 pins 4-6 are BCB breakout signal outputs. The interface diagram is shown in Figure 1-11, and the interface description is shown in Table 1-9.

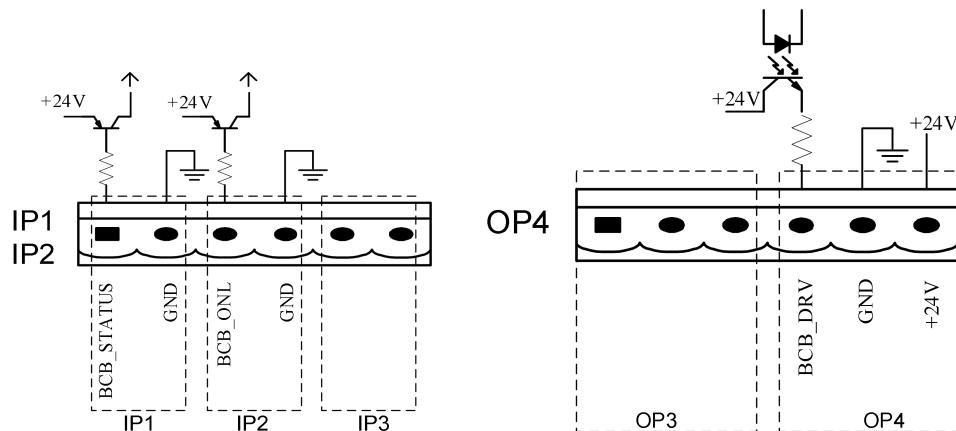


Figure 1-9 BCB interface

Location	Type	Function
IP1-1	BCB_Status	BCB contact status, connect to the normally open signal of BCB
IP1-2	GND_DRY	+24V ground
IP2-3	BCB_Online	BCB contact status, connected to the normally open signal of BCB
IP2-4	GND_DRY	+24V ground
OP4-4	BCB_DRV	BCB trip signal output, 24V level, maximum support 100mA
OP4-5	GND_DRY	+24V ground
OP4-6	+24V_DRY	+24V

Table 1-9 BCB interface description

### Battery Voltage Low Alarm Output Dry Contact Interface

OP1 is the output dry contact interface, and OP1 1-3 pins are the output battery voltage alarm signal. When the battery voltage is lower than the set value, an auxiliary dry contact signal isolated by a relay will be provided. The interface diagram is shown in Figure 1-12, and the interface description is shown in Table 1-10.

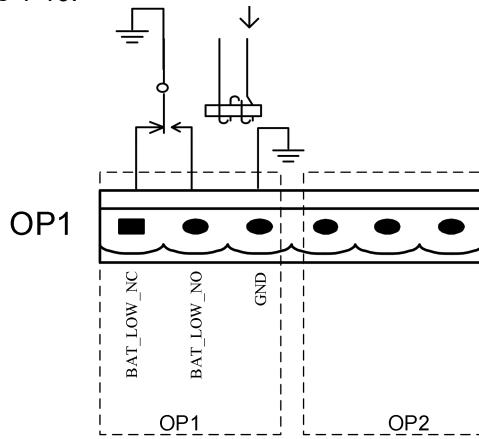


Figure 1-10 Schematic diagram of dry contact interface with similar battery voltage

Location	Type	Function
OP1-1	BAT_LOW_ALARM_NC	Battery voltage alarm relay (normally closed), disconnected when alarm occurs
OP1-2	BAT_LOW_ALARM_NO	Battery voltage alarm relay (normally open), closed when alarm occurs
OP1-3	BAT_LOW_ALARM_GND	OP1-1 and OP2-2 common terminal

Table 1-10 Battery voltage alarm dry contact interface description

### General Alarm Output Dry Contact Interface

OP2 is a general alarm output dry contact interface. When one or more preset alarms are triggered, the system will send out a general alarm message and provide an auxiliary dry contact signal isolated by a relay. The interface diagram is shown in Figure 1-13, and the interface description is shown in Table 1-11.

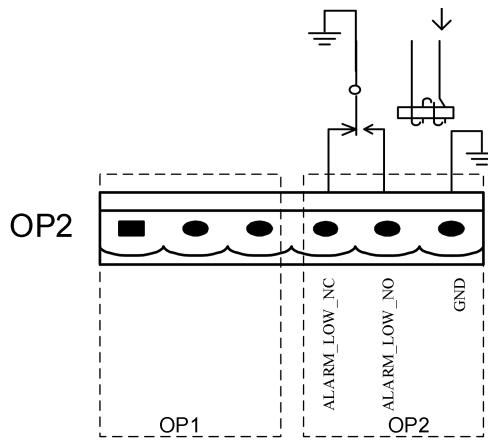


Figure 1-11 Schematic diagram of general alarm dry contact interface

Location	Type	Function
OP2-4	GENERAL_ALARM_NC	General alarm relay (normally closed), disconnected when alarm occurs
OP2-5	GENERAL_ALARM_NO	General alarm relay (normally open), closed when alarm occurs
OP2-6	GENERAL_ALARM_GND	OP2-4 and OP2-5 common terminal

Table 1-11 Comprehensive alarm dry contact interface description

#### Utility Fail Alarm Output Dry Contact Interface

J10 is the utility fault alarm output dry contact interface. When the utility fails, the system will send out a utility fault alarm message and provide an auxiliary dry contact signal isolated by a relay. The interface diagram is shown in Figure 1-14, and the interface description is shown in Table 1-12.

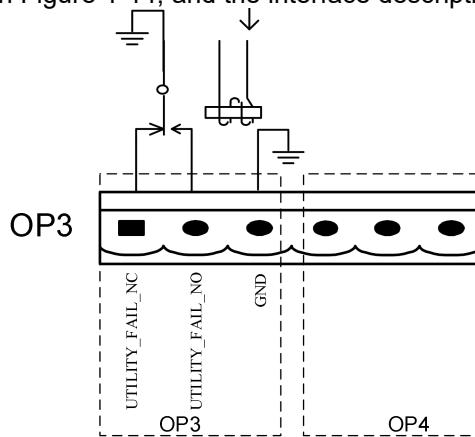


Figure 1-12 Mains fault alarm dry contact interface diagram

Location	Type	Function
OP3-1	UTILITY_FAIL_NC	Utility failure alarm relay (normally closed), disconnected when alarm occurs
OP3-2	UTILITY_FAIL_NO	Utility failure alarm relay (normally open), closed when alarm occurs
OP3-3	UTILITY_FAIL_GND	OP3-1 and OP3-2 common terminal

Table 1-12 Mains fault alarm dry contact interface description

## 2 Battery Installation and Maintenance

### 2.1 General Recommendations

Take special care when operating the batteries of the UPS system. When all the batteries are connected, the battery voltage can exceed 400Vdc, which is potentially lethal.



#### Note

The precautions for battery installation, use and maintenance are to be provided by the batteries manufacturers. The precautions in this section include the key issues that must be considered during the installation design, which may be adjusted according to the specific local situations.



#### WARNING

- The battery shall be installed and stored in a clean, cool and dry environment.
- Do not install the battery in a sealed battery chamber or sealed room. The battery room ventilation shall at least meet the requirement of EN50272-2001. Otherwise, battery bulging, fire and even human injury may be caused.
- The battery shall be installed far away from the heating source (e.g. transformer). Do not use or store the battery in the place near the heating source or burn the battery or place it into fire. Otherwise, battery leakage, bulging, fire or explosion may be caused.
- Batteries shall be placed in such a manner that two bare live parts with the potential difference of more than 150V shall not be connected at the same time. If it is unavoidable, insulated terminal cover and insulated cables shall be used for connection.
- If external batteries are to be used, the battery circuit breakers (or fuses) must be mounted as close as possible to the batteries, and the connecting cables should be as short as possible.



#### DANGER

When connecting the battery, follow the precautions for high-voltage operation

- Before accepting and using the battery, check the appearance the battery. If the package is damaged, or the battery terminal is dirty, corroded or rusted or the shell is broken, deformed or has leakage, replace it with new product. Otherwise, battery capacity reduction, electric leakage or fire may be caused.
  - Before operating the battery, remove the finger ring, watch, necklace, bracelet and any other metal jewelry
  - Wear rubber gloves.
  - Eye protection should be worn to prevent injury from accidental electrical arcs.
  - Only use tools (e.g. wrench) with insulated handles.
- The batteries are very heavy. Please handle and lift the battery with proper method to prevent any human injury or damage to the battery terminal.
  - Do not decompose, modify or damage the battery. Otherwise, battery short circuit, leakage or even human injury may be caused.
  - The battery contains sulfuric acid. In normal operation, all the sulfuric acid is attached to the separation board and plate in the battery. However, when the

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**battery case is broken, the acid will leak from the battery. Therefore, be sure to wear a pair of protective glasses, rubber gloves and skirt when operating the battery. Otherwise, you may become blind if acid enters your eyes and your skin may be damaged by the acid.**

- **At the end of battery life, the battery may have internal short circuit, drain of electrolytic and erosion of positive/negative plates. If this condition continues, the battery may have temperature out of control, swell or leak. Be sure to replace the battery before these phenomena happen.**
- **If a battery leaks electrolyte, or is otherwise physically damaged, it must be replaced, stored in a container resistant to sulfuric acid and disposed of in accordance with local regulations.**
- **If electrolyte comes into contact with the skin, the affected area should be washed immediately with water.**

---

## 2.2 Battery Typologies

According to the requested configuration UPS may need batteries consisting of one or more strings of battery blocks installed on shelves in a locked cabinet or dedicated battery room



### Note

**The Traditional external battery cabinet can make use of each even number of batteries per string between 36 and 44.**

**The default factory setting, if the unit is ordered w/o internal battery is 40.**

**The cabinet is only for valve regulated maintenance-free lead-acid battery.**

**CAUTION: The lead acid battery may cause chemistry hazard**

---

### 2.2.1 Traditional Battery Installation

Only the qualified engineers are allowed to install and maintain mounted in a traditional battery cabinet or shelf. To ensure safety, install the external battery in a locked cabinet or dedicated battery room accessible just to service qualified personnel.

Please note that number of cells set via software must be consistent with the actual number of cells.

A minimum space of 10mm must be reserved on all vertical sides of the battery block to permit free air movement around the cells.

A certain clearance should be reserved between the top of the cells and the underside of the shelf above as this is necessary for monitoring and servicing the cells.

When installing the batteries always work from the bottom shelf upwards to prevent raising the center of gravity.

Install the batteries reliably and avoid vibration and mechanical bumping.

The bending radius of cable should be more than 10D, where "D" is the outer diameter of cable.

When connecting the cable, do not cross the battery cables and do not bind the battery cables together. The battery connection must be firm and reliable. After the connection, all the connections between the wiring terminals and the batteries must be corrected to meet the torque requirement provided in the specifications and user manuals of the battery manufacturers.

Each battery terminal should be insulated after its connection has been made.

Check if the battery is unexpectedly grounded. If the battery is unexpectedly grounded, remove the earth power supply. Contacting any part of the grounded earth may be subject to electric shock.

Measure the battery voltage, and carry out battery voltage calibration after the UPS is started.

Diagram of batteries connection is shown as below:

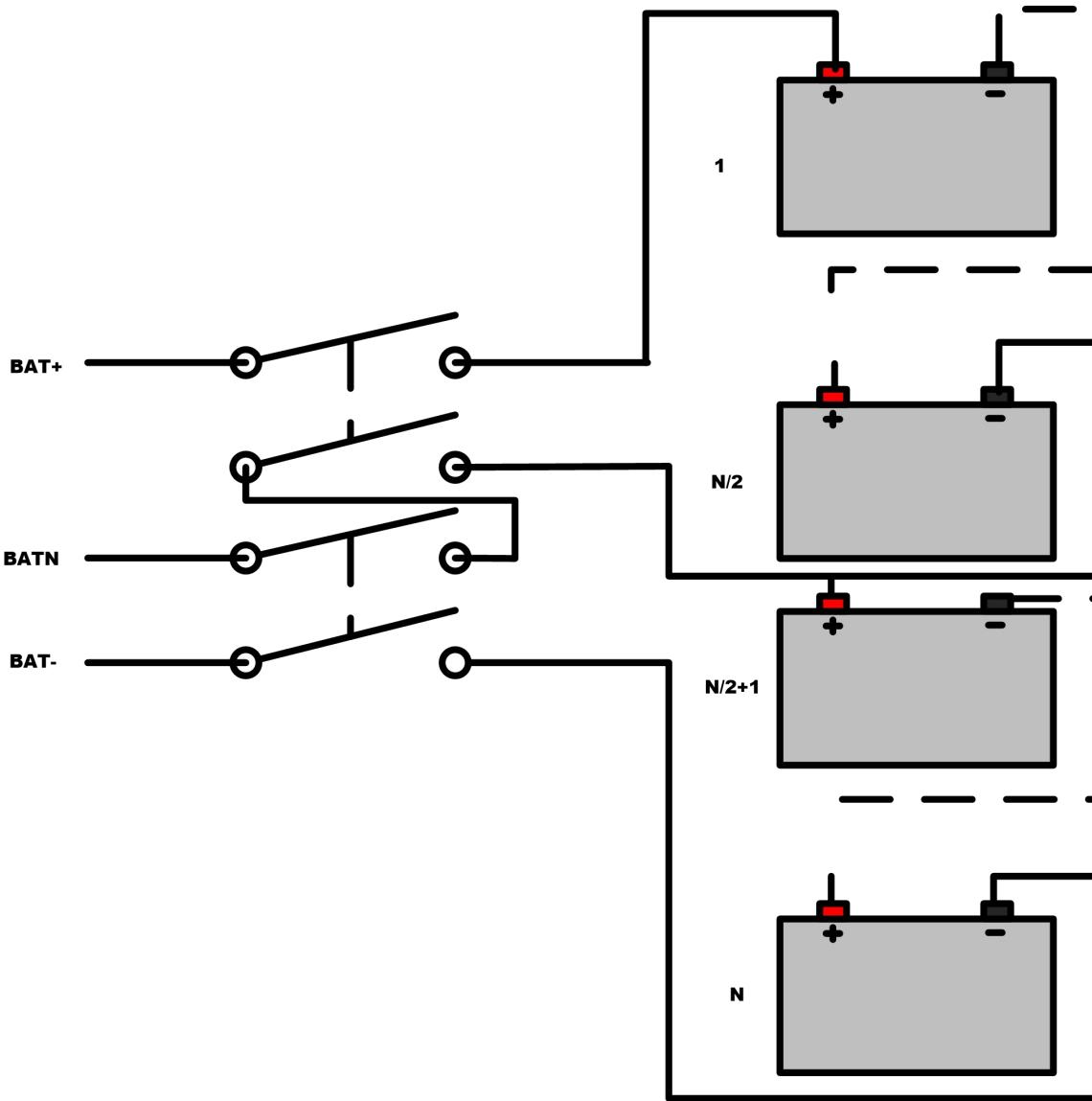


Fig.2- 1: Diagram of Batteries Connection



**WARNING**  
When using a traditional battery solution, always comply with the following precautions:

- Disconnect the charging power before connecting or disconnecting the cable of the battery terminals.
- Do not connect the cables between the UPS battery terminals and the batteries before getting the approval from the commissioning engineer.
- When connecting the cables between the battery terminals and the circuit breaker, always connect the circuit breaker end of the cable first.
- Be sure to connect the positive/negative terminals of the batteries to those of the circuit breakers and those of the circuit breakers to those of the UPS respectively with reference to the markings of positive/negative terminals. Reverse connection of battery polarities will result in explosion, fire accident, the damage of batteries and UPS, and human injury.

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- The battery connecting terminal shall not subject to any external force, such as the pulling force or twisting force of the cable. Otherwise, the internal connection of the battery may be damaged, and in severe case, the battery may catch fire.
- Do not connect power until the total voltage of the battery string is verified correct through measurement.
- Do not connect any conductor between the positive and negative terminals of the battery.
- Do not close the battery circuit breakers before getting the approval from the commissioning engineer.

---

## 2.3 Battery Maintenance

For the battery maintenance and precautions, please refer to IEEE-Std-1188-2005 and the relevant manuals provided by the battery manufacturers.



### WARNING

- Check to ensure that all the safety devices are in place and function normally. Check if the battery management parameter setting is normal particularly.
  - Measure and record the air temperature in the battery room.
  - Check if the battery terminals are damaged or have the symptom of heating, and if the shell or cover is damaged.
  - Please fasten every bolt on the terminal according to the fastening torque specified in the table below.
  - After 1-2 months of service, recheck to make sure that each screw has been fastened according to the specified torque. Otherwise there is risk of fire.
  - CAUTION: Use the battery with the same capacity and type, if battery is replaced by an incorrect type, it can cause explosion.
  - CAUTION: Dispose of used battery according to the local instructions

## 3 Installation of UPS Rack System

### 3.1 Overview

The single system should be installed according to the installation procedures of the UPS rack module system and the requirements in this Chapter.

For single UPS installation the EPO button on the front panel of the UPS rack controls the emergency stop of UPS modules and bypass static switch and also supports remote emergency power off function that can be used to shut down the UPS rack module remotely.



#### Note

- The remote EPO switch must provide normally open or normally closed dry contactor signals.
- The open circuit voltage is 24Vdc, and the current is less than 20mA.
- Normally closed EPO terminals: Pin 1 and pin 2 have been connected in factory and located on the dry contactor board.
- Set EPO function as available with monitoring software on PC before using remote EPO function.

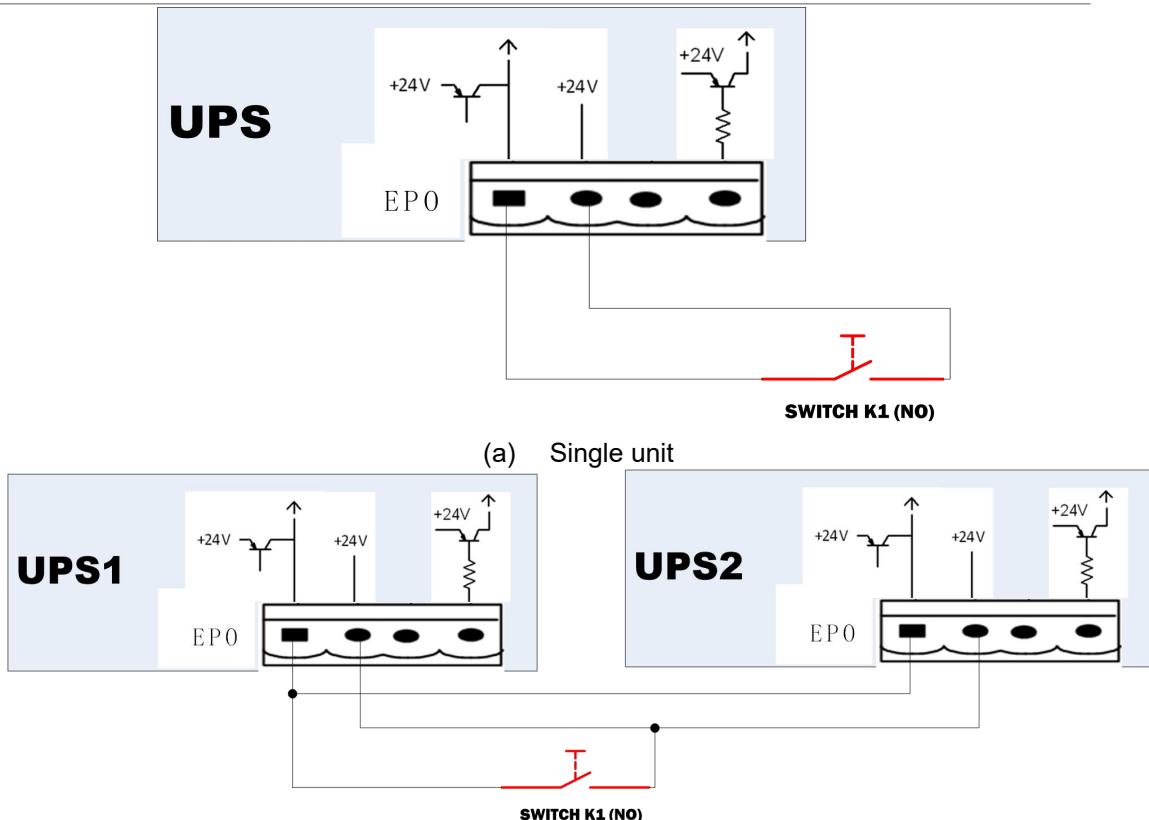


Fig.3- 1: Circuit diagram of EPO

## 3.2 UPS in Parallel System

The basic installation procedures of parallel system are the same with those of the UPS rack module system. In this section, only the installation procedures related to the parallel system are introduced.



### WARNING

**The operations described in this section must be performed by the authorized electricians or the qualified technical personnel. If you have any difficulties, contact your local representative or Services.**

#### 3.2.1 Installation of Cabinet

To make the maintenance and system test easier, an external maintenance bypass is recommended in the installation.

#### 3.2.2 External Protective Devices

Refer to Chapter 1 Installation

#### 3.2.3 Power Cables

The power cable connection of the parallel system is similar to that of the single UPS system. If the bypass input and rectifier input share the same neutral terminal and if an RCD protective device is installed at the input, then the RCD device must be installed before the input cables are connected to the neutral terminal. Refer to Chapter 1 Installation

**Note: The length and specification of the power cables of each UPS module should be the same, including the bypass input cables and UPS output cables, so that the load sharing effect can be achieved in bypass mode.**

#### 3.2.4 Parallel Board

##### Installation of parallel signal board

Location of parallel board is shown as **Fig.1-1: UPS Structure**. Shown as below:

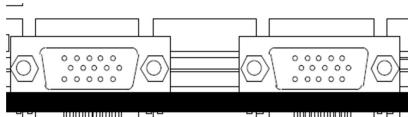


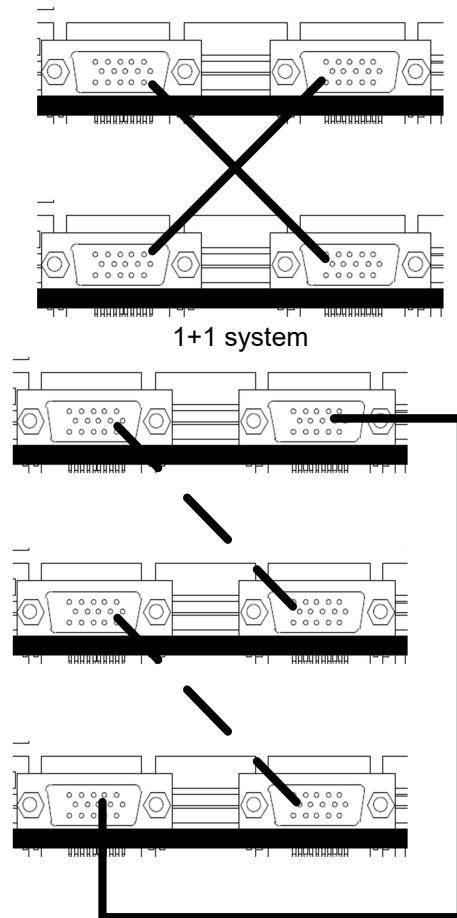
Fig.3- 2: Parallel Board

Note: The jumper pins on the parallel board need to be set according to the number of parallel cabinets and the number of cabinet slots. Please contact the manufacturer or refer to the manual.

#### 3.2.5 Parallel Cable Connections

##### Parallel Communication Cable

The parallel control cables are designed to be shielded and double insulated, DB15 terminals, and are connected between the UPS rack modules to form a loop as shown below. This close loop connection ensures the reliability of the parallel system control. Refer to *fig. 3-3*



N+1 system

Fig.3- 3: Connection of Parallel Cables of Parallel System

## 4 Installation Drawing

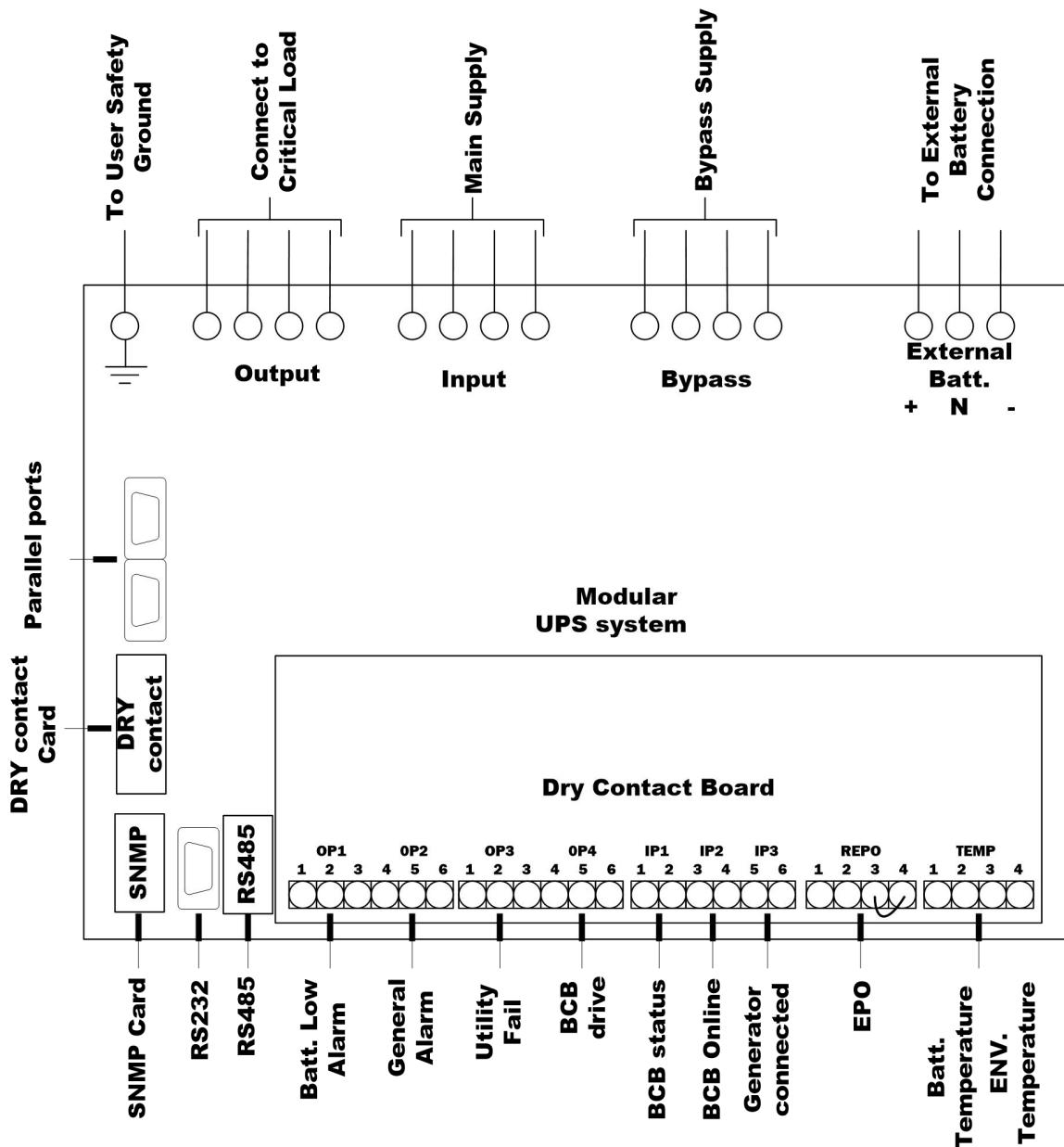


Fig.4- 1: Wiring Diagram

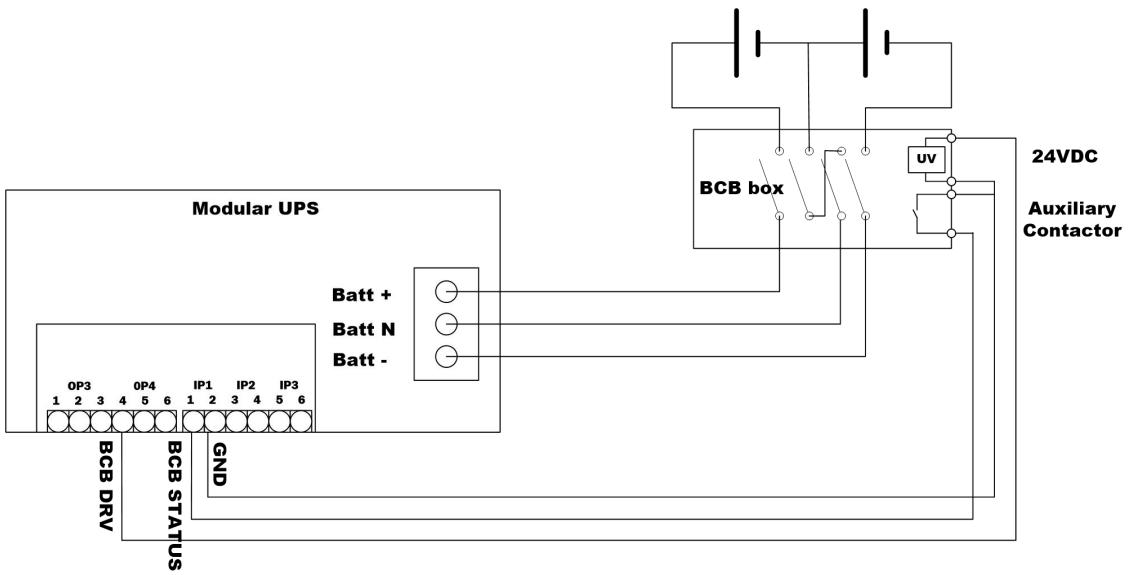


Fig.4- 2: External Battery Connection

External BCB interface:

BCB DRV (OP4-4): BCB drive signal

BCB STATUS (IP1-1): BCB contactor status, normally opened. Shorted to GND when activated

GND (IP1-2): common connection

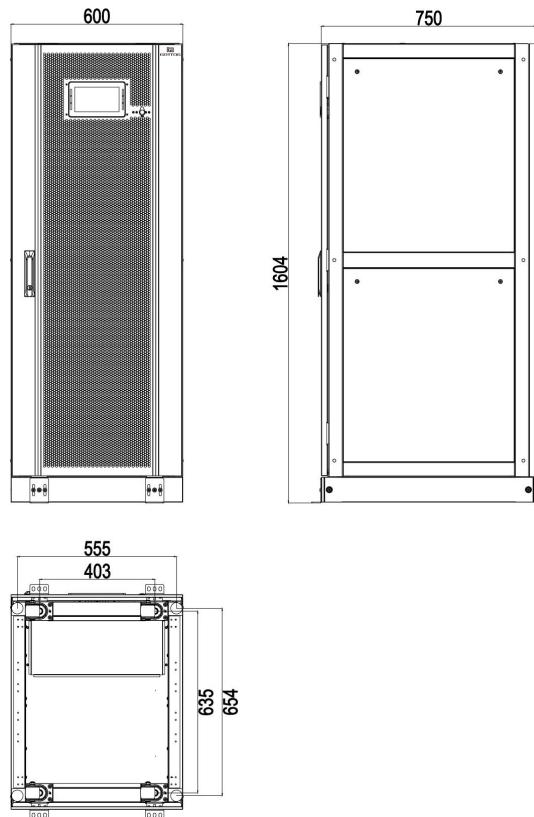


Fig.4- 3: 4 slots UPS Dimensions

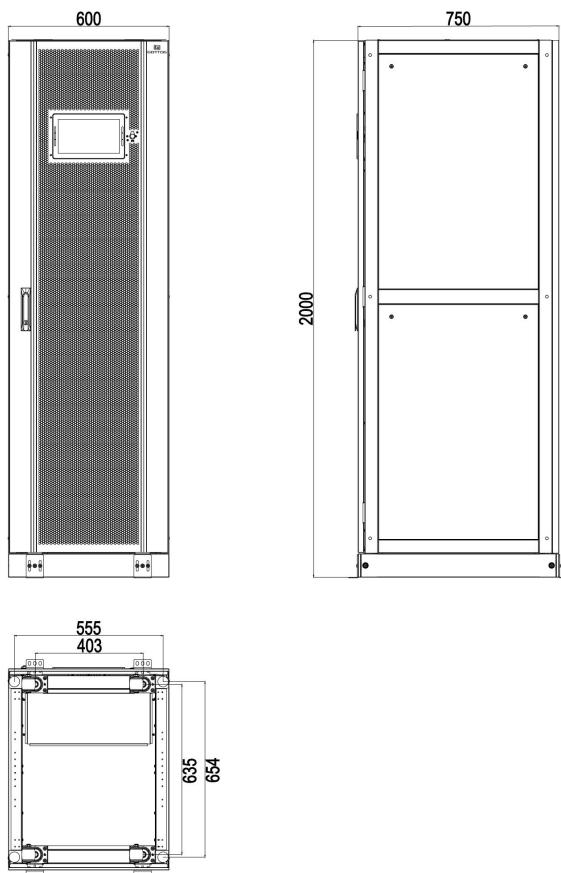


Fig.4- 4: 6 Slots UPS Dimensions

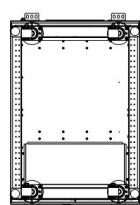
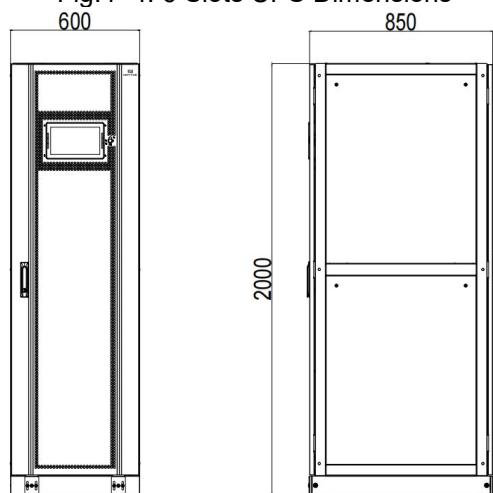


Fig.4- 5: 4&6 Slots(with 4 switches) UPS Dimensions

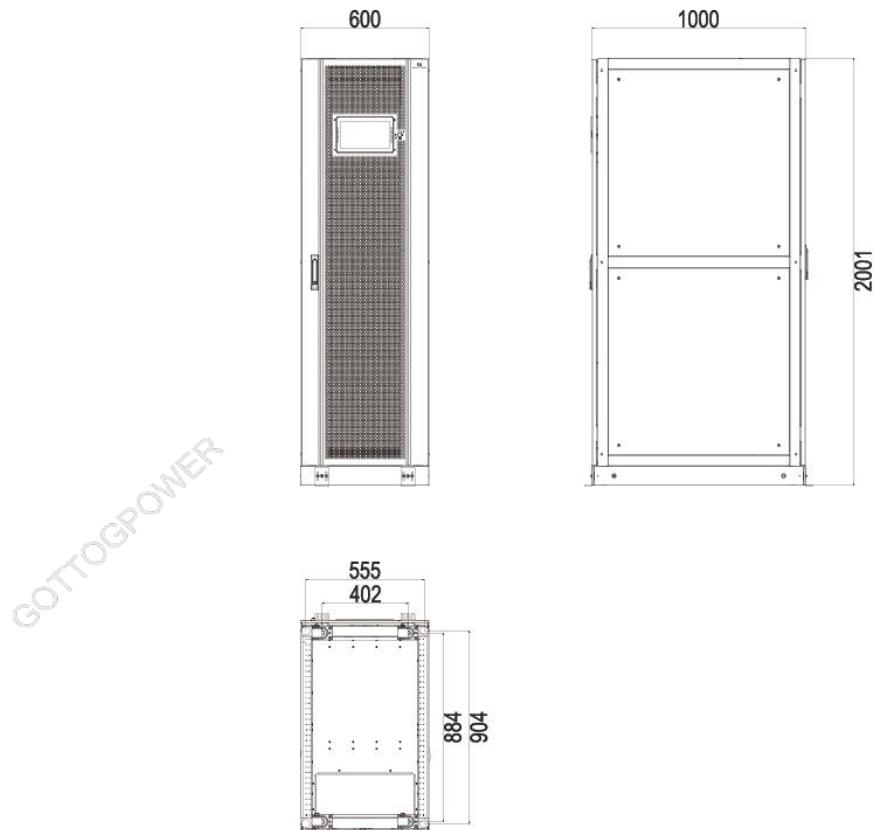


Fig.4- 6: 8 Slots UPS Dimensions

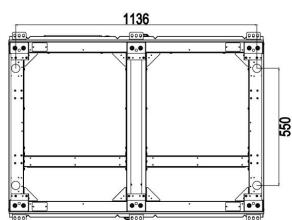
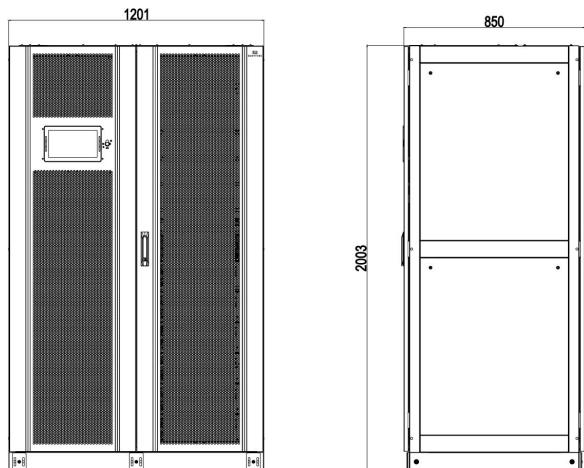
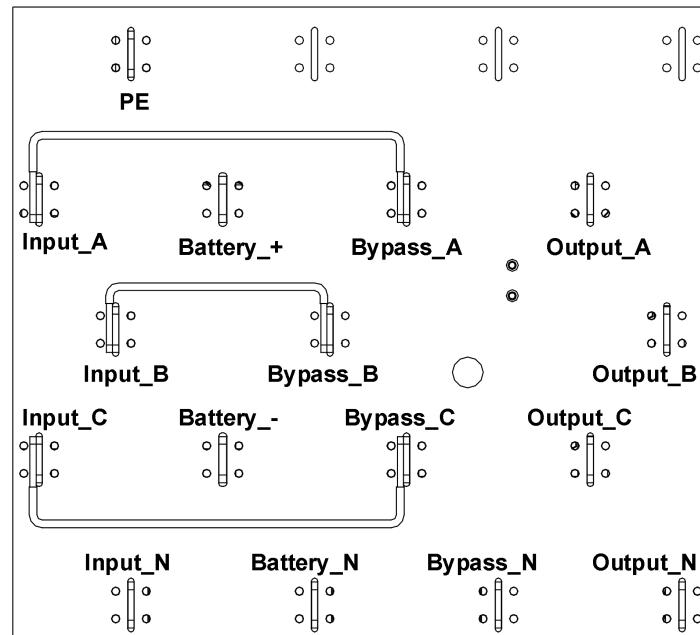
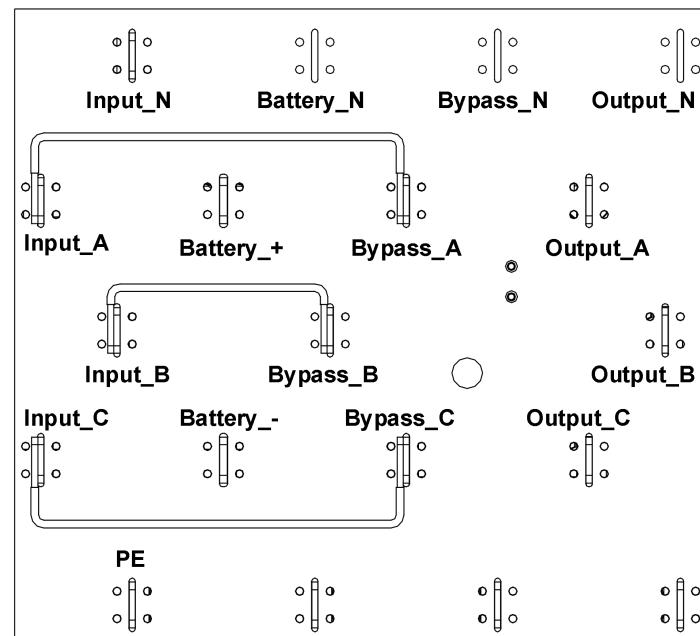


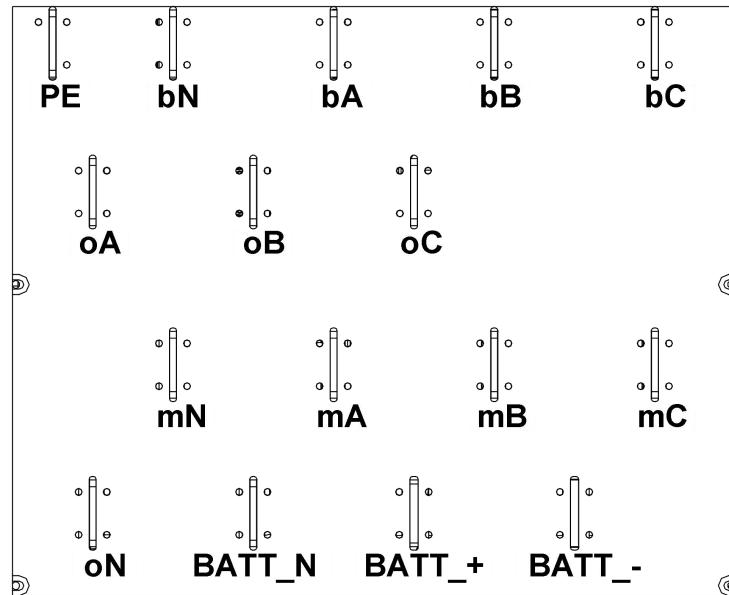
Fig.4- 6: 10 & 12 Slots UPS Dimensions



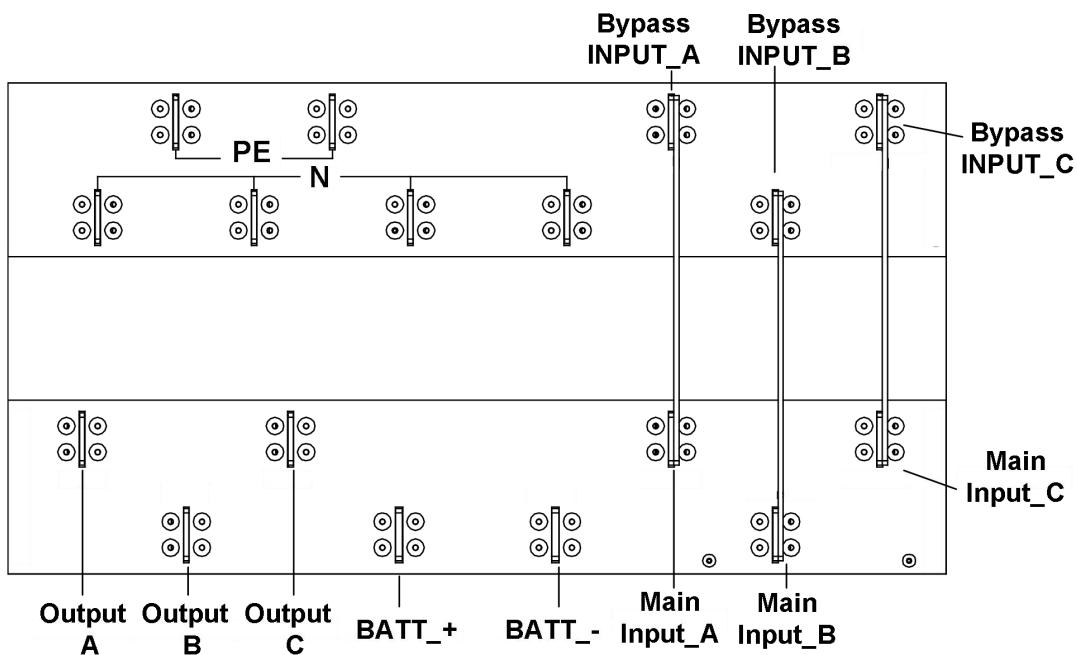
4 & 6 slots cabinet-Top entry power connection



4 & 6 slots cabinet-Bottom entry power connection



8 slots cabinet power connection



10 & 12 slots cabinet power connection

Fig.4-6: Power Connection of Module System UPS

Notes:

1. When installing the modules, install the modules from bottom to top. When removing the modules, remove the modules from top to bottom. The purpose is to maintain the stable center of gravity.
2. After inserting the module, tighten all the screws.
3. When removing the modules, turn off modules first, remove the screws and then remove the modules.

4. Wait for 5 minutes before inserting the removed modules.

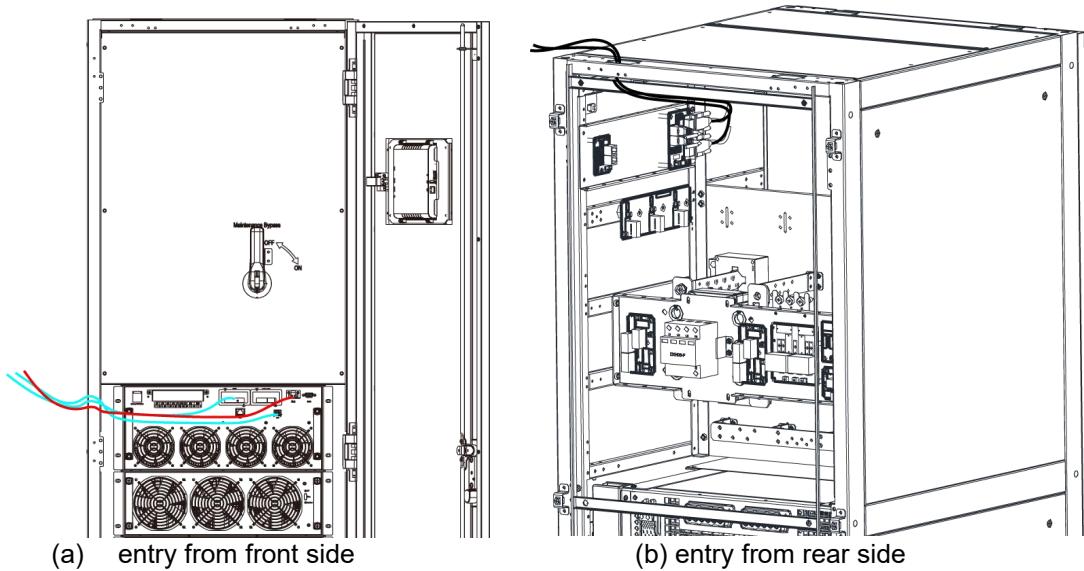


Fig.4- 7: Communication cables routing

1. Open the door lock on the front panel. If cables need to be connected from the rear, the rear panel can also be removed.
2. Connect cables and route as **Fig.4-7**
3. Cover front panel and rear panel.

## 5 Operations



**WARNING:** Hazardous mains voltage and/or battery voltage present(s) behind the protective cover

The components that can only be accessed by opening the protective cover with tools cannot be operated by user. Only qualified service personnel are authorized to remove such covers.

### 5.1 Introduction

The UPS can be configured as either a fixed capacity or as a scalable, transformer free, online uninterruptible power system with 400/230 V input and 400/230V output capability. The UPS can operate with either a 50 Hz or 60 Hz input and provide a matching output frequency conversion.

When configured for scalability, the capacity of the UPS can be increased in 50KVA increments. Based on the configuration, a power module can be set to a redundant operation mode.

The UPS provides continuous, high quality AC power to the business-critical equipment, such as telecommunications and data processing equipment. The UPS supplies power free of the disturbances and variations in voltage and frequency common to the utility power, which is subject to brownouts, blackouts, surges and sags.

The UPS utilizes the latest in high frequency, double conversion Pulse Width Modulation (PWM) technology and fully digital controls to enhance its reliability and increase the ease of use.

The UPS requires external batteries to support the load when the utility power is not present.

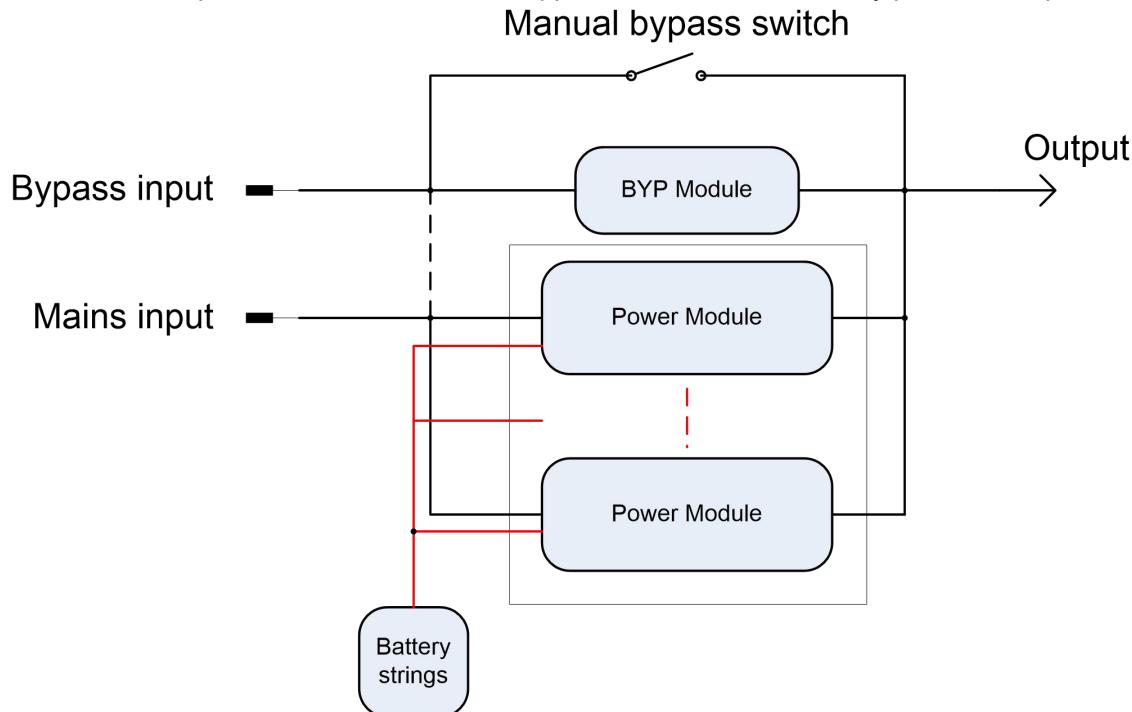


Fig.5- 1: Single Unit Block Diagram

### 5.1.1 Split-Bypass Input

Fig. 5-1 illustrates the Modular UPS in what is known as the split-bypass configuration (that is, the bypass uses a separated AC power). In this configuration, the static bypass and manual bypass share the same independent bypass power supply and connect to the power supply through a separate switch. Where a separated power source is not available, the bypass and rectifier input supply connections are linked.

### 5.1.2 Static Bypass

The circuit blocks labeled “BYP Module” in *fig.5-1* contain electronically controlled transferring circuits that enable the critical load to be connected to either the inverter output or to a bypass power source via the static bypass line. During normal system operation the load is connected to the inverter; but in the event of a UPS overload or inverter failure, the load is automatically transferred to the static bypass line. To provide a clean (no-break) load transfer between the inverter output and static bypass line, the inverter output and bypass supply must be fully synchronized during normal operating conditions. This is achieved through the inverter control electronics, which makes the inverter frequency track that of the static bypass supply, provided that the bypass remains within an acceptable frequency window.

A manually controlled maintenance bypass supply is incorporated into the UPS design. It enables the critical load to be powered from the utility (bypass) supply while the UPS is shut down for routine maintenance.



#### Note

**When the UPS is operating in bypass mode or on maintenance bypass, the connected equipment is not protected from power failures or surges and sags.**

## 5.2 1+1 Parallel System

Several “single unit” UPS modules may constitute a “1+1” system, where up to two single units operate together for the purpose of providing additional power or reliability or both. The load is equally shared between any paralleled UPSs.

### 5.2.1 Features of Parallel System

1. The hardware and firmware of single module UPS units are completely compatible with the requirements of a parallel system. Parallel configuration can be achieved merely through settings in configuration software. The parameters settings for the modules in parallel system shall be consistent.
2. Parallel control cables are connected in a ring, providing both performance and redundancy. Dual-bus control cables are connected between any two UPS modules of each bus. The intelligent paralleling logic provides the user with maximum flexibility. For example, shutting down or starting up UPS modules in a parallel system can be done in any sequence. Transfers between Normal and Bypass modes of operation are synchronized and self-recovering e.g. following overloads and their clearance.
3. The total load of the parallel system can be queried from each unit’s LCD.

### 5.2.2 Parallel Requirements of UPS Modules

A group of paralleled modules behave as if it were one large UPS with the advantage of presenting higher reliability. In order to assure that all modules are equally utilized and to comply with relevant wiring rules, the following requirements apply:

1. All UPS modules shall be of the same rating and must be connected to the same bypass source.

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2. The bypass and the main input sources must be referenced to the same neutral potential.
3. Any RCD (Residual Current detecting device), if installed, must be of an appropriate setting and located upstream of the common neutral bonding point. Alternatively, the device must monitor the protective earth currents of the system. Refer to the High Leakage Current Warning in the first part of this manual.
4. The outputs of all UPS modules must be connected to a common output bus.
5. It is strongly recommended that each paralleled UPS install at least a redundant power module



**Note**

**Optional isolation transformers are available for applications where sources do not share the same neutral reference or where the neutral is not available.**

---

## 5.3 Operating Mode

The Modular UPS is an online, double-conversion, reverse-transfer UPS that permits operation in the following modes:

- Normal mode
- Battery Mode
- Auto-restart mode
- Bypass mode
- Maintenance mode (manual bypass)
- Parallel redundancy mode
- ECO Mode

### 5.3.1 Normal Mode

The UPS inverter power modules continuously supplies the critical AC load. The rectifier/charger derives power from the AC mains input source and supplies DC power to the inverter while simultaneously FLOAT or BOOST charging its associated backup battery.

### 5.3.2 Battery Mode

Upon failure of the AC mains input power; the inverter power modules, which obtains power from the battery, supplies the critical AC load. There is no interruption in power to the critical load upon failure. After restoration of the AC mains input power, the "Normal Mode" operation will continue automatically without the necessity of user intervention.

### 5.3.3 Auto-Restart Mode

The battery may become exhausted following an extended AC mains failure. The inverter shuts down when the battery reaches the End of Discharge voltage (EOD). The UPS may be programmed to "Auto Recovery after EOD" after a delay time if the AC mains recovers. This mode and any delay time are programmed by the commissioning engineer.

### 5.3.4 Bypass Mode

If the inverter overload capacity is exceeded under normal mode, or if the inverter becomes unavailable for any reason, the static transfer switch will perform a transfer of the load from the inverter to the bypass source, with no interruption in power to the critical AC load. Should the inverter be asynchronous with the bypass, the static switch will perform a transfer of the load from the inverter to the bypass with power interruption to the load. This is to avoid large cross currents due to the paralleling of unsynchronized AC sources. This interruption is programmable but typically set to be less than 3/4 of an electrical cycle, e.g., less than 15ms (50Hz) or less than

---

12.5ms (60Hz).

### 5.3.5 Maintenance Mode (Manual Bypass)

A manual bypass switch is available to ensure continuity of supply to the critical load when the UPS becomes unavailable e.g. during a maintenance procedure.

### 5.3.6 Parallel Redundancy Mode (System Expansion)

For higher capacity or higher reliability or both, the outputs of several UPS modules can be programmed for direct parallel while a built-in parallel controller in each UPS ensures automatic load sharing.

### 5.3.7 Eco Mode

To improve system efficiency, UPS rack system works in bypass mode at normal time, and inverter is standby. When utility fails, UPS transfer to battery mode, and inverter power the loads. The efficiency of ECO system can be up to 98%.



#### Note

**There is a short interruption time (lower than 10ms) when transfer from ECO mode to battery mode, it must be sure that the time has no effect on loads.**

---

## 5.4 Battery Management—Set During Commissioning

### 5.4.1 Normal Function

#### Constant Current Boost Charging

Current can be set up as 0%~20%, default setting is 10%.

#### Constant Voltage Boost Charging

Voltage of boost charging can be set as required by the type of battery.

For Valve Regulated Lead Acid (VRLA) batteries, maximum boost charge voltage should not exceed 2.4V / cell.

#### Float Charge

Voltage of float charging can be set as required by the type of battery.

For VRLA, float charge voltage should be between 2.2V to 2.3V, default setting is 2.25V.

#### Float Charge Temperature Compensation (optional)

A coefficient of temperature compensation can be set as required by the type of battery.

#### End of Discharge (EOD) Protection

If the battery voltage is lower than the EOD, the battery converter will shut down and the battery is isolated to avoid further battery discharge. EOD is adjustable from 1.6V to 1.75V per cell (VRLA).

### 5.4.2 Advanced Functions (Software Settings Performed by the Commissioning Engineer)

#### Battery self-test and self-service

At periodic intervals, 25% of the rated capacity of the battery will be discharged automatically, and the actual load must exceed 25% of the rated UPS (kVA) capacity. If the load is less than 25%, auto-discharge cannot be executed. The periodic interval can be set from 720 to 3000 hours.

**Conditions:** Battery at float charge for at least 5 hours, load equal to 25~100% of rated UPS capacity Trigger—Manually through the command of Battery Maintenance Test in LCD panel or automatically Battery self-test interval.

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## 5.5 Battery Protection (Settings by Commissioning Engineer)

### **Battery Low Pre-warning**

The battery undervoltage pre-warning occurs before the end of discharge. After this pre-warning, the battery should have the capacity for 3 remaining minutes discharging with full load. And the

### **End of discharge (EOD) protection**

If the battery voltage is lower than the EOD, the battery converter will be shut down. EOD is adjustable from 1.6V to 1.75V per cell (VRLA).

### **Battery Disconnect Devices Alarm**

The alarm occurs when the battery disconnect device disconnects. The external battery connects to the UPS through the external battery circuit breaker. The circuit breaker is manually closed and tripped by the UPS control circuit.

## 6 Operating Instructions



**DANGER:** Hazardous mains voltage and/or battery voltage present(s) behind the protective cover

The components that can only be accessed by opening the protective cover with tools cannot be operated by user. Only qualified service personnel are authorized to remove such covers.

### 6.1 Introduction

The Modular UPS operates in the following modes listed in *table.6-1*. This section describes various kinds of operating procedures under each operating mode, including transfer between operating modes, UPS setting and procedures for turning on/off inverter.

Tab.6-1: UPS Operating mode

Operating mode	Descriptions
Normal mode	UPS powers the load
Bypass mode	The load power supply is provided by the static bypass. This mode can be regarded as a temporary transition mode between the normal mode and maintenance bypass mode, or a temporary abnormal operating status
Battery mode	Mains input is abnormal, UPS transfer to battery mode and battery provide the power to load via PFC and inverter.
Maintenance mode	UPS Shuts down, the load is connected to the mains via Manual bypass. <b>NOTE:</b> <i>in this mode the load is not protected against abnormal mains</i>
ECO mode	The load power supply is provided by the static bypass while the inverter is standby. If mains input is abnormal, UPS transfer to inverter and inverter provide the power for load.
Hibernate mode	One or more power modules are sleeping in turn in this mode according to the load percent and setting.

**Note:**

1. Refer to *Chapter 7 Operator Control and Display Panel*, for all the user operating keys and LED displays.
2. The audible alarm may annunciate at various points in these procedures.
3. The UPS function can be set via maintenance software. However, the setting and commissioning must be done by maintenance engineers trained.

#### 6.1.1 Power Switches

The 4/6/8 slots cabinet UPS system has a manual bypass breaker, the 10/12 slots have four breaker, input, output, bypass, maintenance bypass breaker, and all the other transfers are processed automatically.

Customer must install an external mains input breaker, an external maintenance bypass breaker and an external output breaker. An external bypass breaker is needed if split-bypass is applied for.



**Note**

It's recommended that 4-poles breakers are used, and the rated current is higher than rated current of breakers in UPS.

## 6.2 UPS Startup

### 6.2.1 Start-Up Procedure

This procedure must be followed when turning on the UPS from a fully powered down condition.

The operating procedures are as follows:

1. Open the external power switch. Open the internal power switch. Connect the power supply cables and ensure the correct phase rotation.



#### WARNING

**During this procedure the UPS output terminals are live. If any load equipment are connected to the UPS output terminals please check with the load user that it is safe to apply power: If the load is not ready to receive power then ensure that it is safely isolated from the UPS output terminals.**

2. Close bypass breaker. Close external output circuit breaker. Close external mains input circuit breaker and connect the mains power. The LCD starts up at this time. The rectifier enters normal operation state. After initialization, the bypass static switch closes.
3. The inverter starts up automatically. After about 1 minute, the inverter is ready, the UPS transfers from bypass to inverter. The UPS is in normal mode.
4. Close external battery switch, a few minutes later, the battery will be charged by UPS.

### 6.2.2 Procedures for Switching Between Operation Modes

Switch from normal mode to bypass mode



Press “ Manual Bypass” menu in menu “Control”—“Func Button” to switch to bypass mode.



#### WARNING

**In bypass mode, the load is directly fed by the mains power instead of the pure AC power from the inverter.**

Switch from bypass mode to normal mode



Press “ Ecs Manual Bypass” menu in bypass mode. After the inverter is normal, the UPS transfers to normal mode.

### 6.2.3 Start up from battery

If mains input is not ready and need to start up UPS from battery, it's available to start up UPS directly from battery.

1. Make sure the battery string is connected already.
2. Press “Cold start” button behind LCD as **Fig.1-6** for about 1s. LCD turns on.
3. Press “Cold start” button on front panel of power module to start power module.
4. After about 2 minutes, the power module works in battery mode.
5. Start up the other power modules one by one.

## 6.3 Procedure for Switching the UPS between Maintenance Bypass and Normal Mode

### 6.3.1 Procedure for Switching from Normal Mode to Maintenance Bypass Mode

This procedure can transfer the load from the UPS inverter output to the maintenance bypass supply, but the precondition is that the UPS is in normal mode before the transfer.



#### WARNING

Before making this operation, read messages on display to be sure that bypass supply is regular and the inverter is synchronous with it, so as not to risk a short interruption in powering the load.



1. Press the “ Manual Bypass ” to transfer to bypass mode.

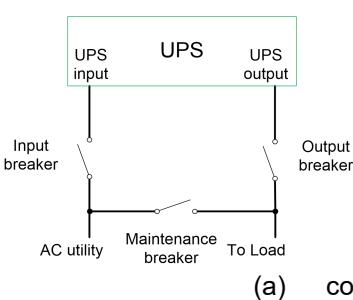


#### Note

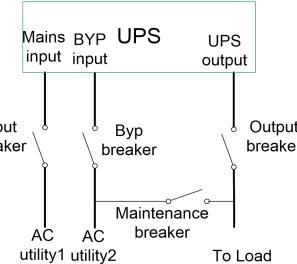


**Pressing the mute off button in “Control” menu to cancel the audible alarm but leaves the warning message displayed until the alarm condition is rectified.**

2. Close the manual bypass switch. The load power supply is provided by the manual bypass and static bypass together.
3. Press OFF on each power module shutdown all power modules. Open the external battery breaker and internal battery breaker (if built-in battery cabinet). Then power modules can be maintained.
4. If cabinet maintenance is needed, external maintenance bypass breaker is required. If external maintenance bypass breaker is available, close external maintenance bypass breaker, open the external input breaker and external output breaker, then UPS cabinet can be maintained. It's recommended that external maintenance breaker are installed as *fig.6-1*:



(a) common input



(b) split-bypass input

Fig.6- 1: External Maintenance Bypass



#### DANGER

If you need to maintain the module, wait for 10 minutes to let the DC bus capacitor fully discharge before removing corresponding module.

When the manual bypass switch is on position of ON, some part of the UPS circuit still has hazardous voltage. Therefore, only qualified person can maintain the UPS.



#### WARNING

When the UPS is in maintenance bypass or manual bypass mode, the load is not

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**protected against abnormal mains supply.**

---

### 6.3.2 Procedure for Switching from Maintenance Mode to Normal Mode

1. Close bypass breaker if available. Close manual bypass breaker. Close external output breaker. Close external mains input breaker. The LCD starts up at this time. The rectifier enters normal operation state after about 20s. After initialization, the bypass static switch closes.
2. Open the external maintenance breaker. Open manual bypass breaker.

---



**Before opening the maintenance breaker, make sure that static bypass switch is working according power flow displayed on LCD.**

---

3. After about 60s, UPS transfers to inverter. Close external battery breaker and internal battery breaker (for battery built-in cabinet).

### 6.3.3 Procedure for Switching from normal mode to manual bypass mode



1. Press the “ Manual Bypass.” menu on the LCD. The load transfers to static bypass accompanied with an audible alarm, and the inverter standby.
2. Close manual bypass switch to ON position. Open bypass breaker.
3. Press OFF on each power module shutdown all power modules. Open the battery circuit breaker or disconnect battery terminals.

---



**Make sure not to open external input breaker, otherwise, UPS output will be interrupted.**

---

### 6.3.4 Procedures for Switching from manual bypass mode to normal mode



1. Press “ Fault Clear” in function menu to clear EPO alarm.
2. Close bypass breaker and bypass turns on.
3. Switch manual bypass switch to OFF.



4. Press the “ Ecs Manual Bypass.” menu in bypass mode, UPS transfer to inverter after about 60s.
5. Close external battery circuit breaker or internal battery circuit breaker.

---



**Before opening the manual breaker, make sure that static bypass switch is working according power flow displayed on LCD.**

---

## 6.4 Procedure for Completely Powering Down a UPS

If you need to power down the UPS completely, follow the procedures as:

- Press EPO button on the front panel
- Open external battery breaker
- Open bypass breaker, external input breaker, external output breaker

If the mains and bypass are split, you need to open these two input breakers respectively.

## 6.5 EPO Procedure

The EPO button is designed to switch off the UPS in emergency conditions (e.g., fire, flood, etc.). To achieve this, just press the EPO button, and the system will turn off the rectifier, inverter and stop powering the load immediately (including the inverter and bypass), and the battery stops charging or discharging.

If the input utility is present, the UPS DSP will remain active; however, the output will be turned off. To completely isolate the UPS, you need to open the mains input breaker and battery breaker.

## 6.6 Auto Start

Commonly, the UPS is start up on static bypass. When the mains power fails, the UPS draws power from the batteries to supply the load until the battery voltage reaches the end of discharge (EOD) voltage, and the UPS will shut down.

The UPS will automatically restart and enable output power:

- After the mains power is restored
- If the Auto Recovery after EOD Enabling feature is enabled

## 6.7 UPS Reset Procedure

After using EPO to shut down the UPS, operates as following to restore UPS:

- Shutdown UPS completely
- Start UPS as section 6.2.1

After the UPS is shut down due to inverter over temperature, or overload, or over transfer times, UPS will reset the fault automatically when fault is cleared.



### Note

**The rectifier will be turned on automatically when the over temperature fault disappears after the disappearance of over temperature signals.**

After pressing the EPO button, if the UPS mains input has been disconnected, the UPS is completely power down. When the mains input is restored, the EPO condition will be cleared and the UPS system will enable static bypass mode to restore the output.



### WARNING

**If the manual bypass is switch to ON and the UPS has mains input, then the UPS output is energized.**

## 6.8 Operation Instruction for Power Module Maintenance

Only a trained operator can perform the following procedures

If the system is normal mode and the bypass is normal, the redundant number of power module is at least one:



1. Enter in function menu and press “Module OH/OFF Enable” to release shutdown power module function.
2. Press “off” button on the front panel of power module to manually power off power module.
3. Loose the screws of the power module, then pull out the module after 5 minutes.

If there are no redundant power modules:



1. Enter in function menu and press “Manual Bypass” to transfer to bypass mode.
2. Loose the screws of the power module, then pull out the module after 5 minutes.



### WARNING

**To ensure the safety, use a multi-meter to measure the DC bus capacitor voltage and ensure the voltage is below 60V before operation.**

3. After finishing the maintenance of the power module, insert the power modules one by one (the inserting interval for each module is longer than 10s), the power modules will automatically join the system operation, and then tighten the screws of the power modules.

Maintenance guidance for bypass power module



### WARNING

**The bypass power module cannot be maintained in battery mode.**

If the system is in normal mode and the bypass is normal:



1. Press “Manual Bypass” on LCD to transfers to bypass. Close the manual bypass switch to ON and the UPS transfer to manual bypass. Open the bypass breaker to shutdown bypass if available.
2. Press EPO button to ensure the battery current is 0. Open the battery circuit breaker or disconnect battery terminals.
3. Open LCD panel and disconnect RJ45 cable on back of LCD. Pull out the bypass power modules that need maintenance or repair, wait for 5 minutes and then maintain the bypass power modules. After finishing the maintenance of the bypass power modules, insert the module.
4. Transfer to normal mode as section 6.3.2.



### WARNING

**The terminal of bypass power module is big, and it need more power when inserting bypass module to make sure the connection is tighten enough.**

## 6.9 Language Selection

The LCD menus and data display are available in kinds of languages: Simple Chinese, English, Traditional Chinese, Russian, Spanish, Polish, Portuguese or else.

Perform the following procedure to select a language needed:



1. In main menu, press “Set” to enter in setting menu on the LCD screen.
2. Select LANGUAGE menu.
3. Select the language. At this time, all the words in the LCD will be displayed in the selected language.

---

## 6.10 Changing the Current Date and Time

To change system date and time:

1. In main menu, press “  ” to enter in function setting menu in the LCD screen.
2. Select DATE&TIME in SysFunc.
3. Enter new date and time, then enter to confirm it.

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## 7 Control and Display Panel

This chapter introduces the functions and operation instructions of the UPS operator control and display panel in detail, and provides LCD display information, including LCD display types, detailed menu information, UPS alarm list.

### 7.1 Introduction

The control and display panel is located on the front panel of the UPS. Through the LCD panel, the operator can operate and control the UPS, and check all measured parameters, UPS and battery status, event and history logs. The detailed description of control and display panel is shown in *table.7-1*.



Fig.7- 1: UPS operator control and display panel

Table.7- 1: Description of UPS Operator Control and Display Panel

Indicator	Description	Indicator	Description
Green	System is working normally	Yellow	System warns (utility fails, over load, etc)
Red	System fails or fault		

### 7.1.1 Audible Alarm (buzzer)

There are two different types of audible alarm during UPS operation as shown in *table.7-3*.

Table.7- 2: Description of Audible Alarm

Alarm	Purpose
Two short, one long	when system has general alarm (for example: main input abnormal), this audible alarm can be heard
Continuous alarm	When system has serious faults (for example: fuse or hardware fault), this audible alarm can be heard

### 7.1.2 EPO

Press EPO to shutdown UPS system (REC,INV, CHG, BYP) at the emergency situation.

## 7.2 LCD Display

Following the self-check of UPS LCD display, the main LCD display is shown as *fig.7-2*, which can be divided into 4 display windows: system information, power flow, current record and main menu.

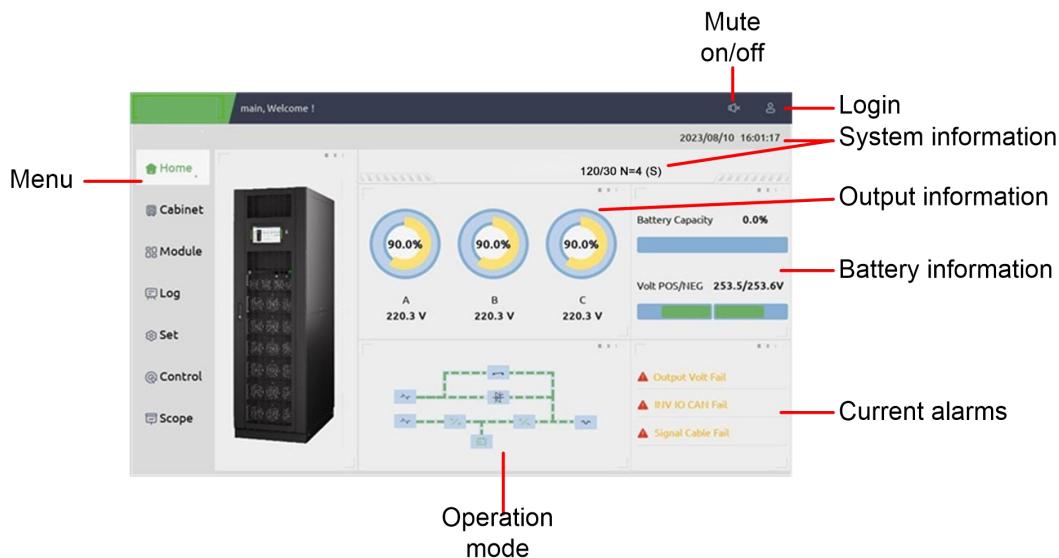


Fig.7- 2: Main LCD Display

Items	Description
Menu	Main menu: Home, Cabinet, Module, Log, Set, Control, Scope
Mute on/off	Touch it if alarms to mute off. Touch again to mute on.
Login	Touch to enter in login window to log in or log out.
System information	2023/08/10 16:01:17--- System Date and Time 120/30 N=4(S) ---120: cabinet capacity, 30: power module capacity, N=4: 4 power modules in system, (S): single mode, (P1): parallel mode, 1# unit
Output information	Output voltage and output load percent
Current alarms	Current alarms
Operation mode	Power flow of current system operation

The description of main Menu is shown in *table.7-5*:

Table.7- 3: Description of Menu

Menu	Description
Home	Return to main menu page
 Cabinet	Bypass, main, output, Load, battery information
 Module	Information of power module(input, output, load, Scode, information)
 Set	Language, Sys Func, Change PW, BAT set, Sys Set, Calibration, Dry Contact
 Log	History LOG, Current Alarm
 Control	Mute ON/OFF, Fault clear, Manual bypass, Manual transfer to inverter, Esc Manual bypass, Module "on/off" enable, clear battery history data, reset dust filter using time, battery test, battery maintenance, battery boost, battery float, stop test
 Scope	Scope of output voltage, output current, bypass voltage

The LCD menu tree is shown as below. Please refer to *table. 7-7: Item Description of UPS Menu*

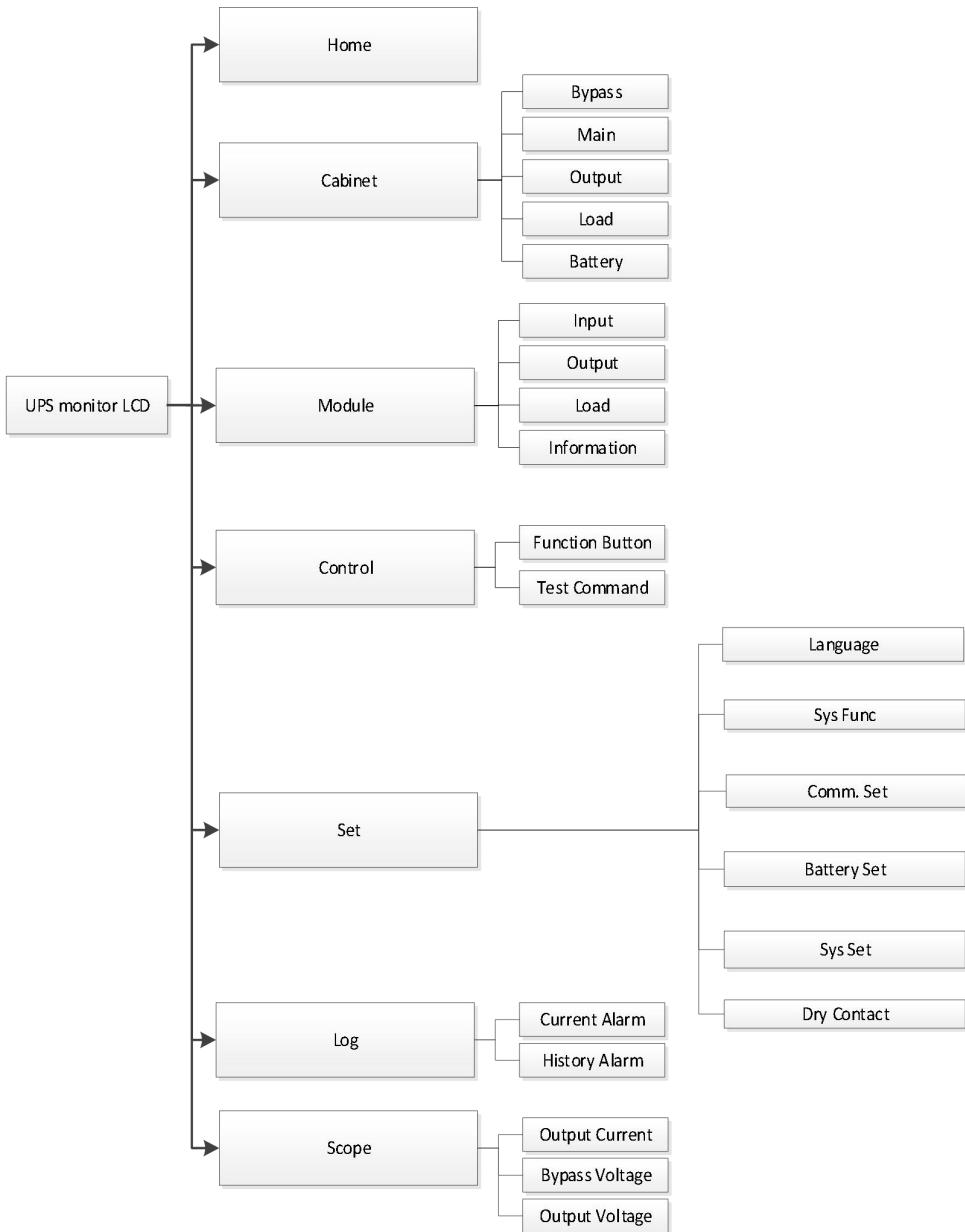


Fig.7- 3: Menu Structure

### 7.3 Detailed Description of Menu Items

The LCD main display shown in *fig.7-4* is described in details below.

**UPS information window**

UPS information window: unit model, module numbers, unit mode, current date and time are displayed. The information of the window is not for the user to operate. Main menu window

Details of UPS menu is shown in Table.7-6.

Enter in  to enter in the page of cabinet menu.

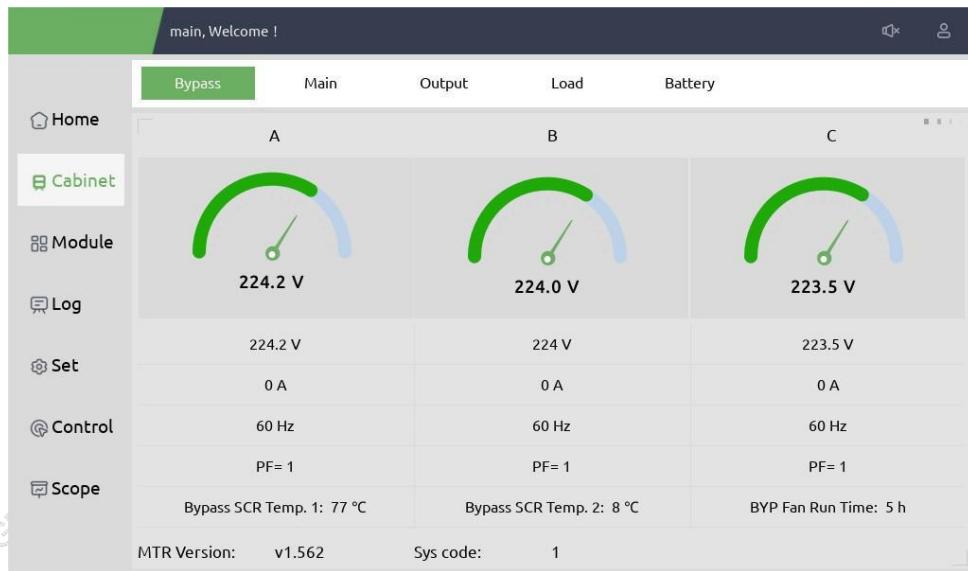


Fig.7- 4: cabinet menu

#### Submenu BYPASS, MAIN, OUTPUT, LOAD, BATTERY

The information of submenu is shown as below:

Table.7- 6: Submenu of Cabinet

Sub-menu	Contents	Meaning
Bypass	V	Phase voltage
	A	Phase current
	Hz	Input frequency
	PF	Power factor
Main	V	Phase voltage
	A	Phase current
	Hz	Bypass frequency
	PF	Power factor
Output	V	Phase voltage
	A	Phase current
	Hz	Output frequency
	PF	Power factor
Load	kVA	Sout: Apparent Power
	kW	Pout: Active Power
	kVar	Qout: Reactive power
	%	Load (The percentage of the UPS load)
Battery	Battery Number	Total number of battery connections per
	Battery Status	Battery boost/float charging status
	Run time	Total battery run time
	V	Battery positive/negative Voltage
	A	Battery positive/negative Current
	Battery Capacity (%)	The percentage compared with new battery capacity
	Remain Time (Min)	Remaining battery backup time
	Battery Temp.(°C)	Battery temperature
	Ambient Temp.(°C)	Environmental temperature

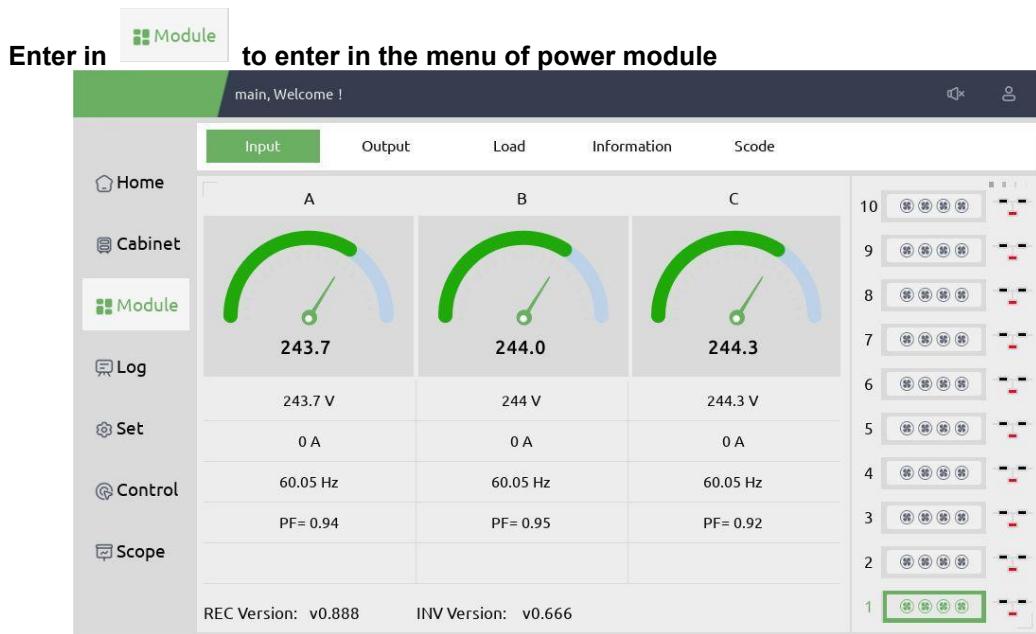


Fig.7- 5: power module information

Module information menu includes submenu: Input, Output, Load, Information, Scode, software version.

The information of submenu is shown as below:

Table.7- 7: Submenu of Module

Sub-menu	Contents	Meaning
Input	V	Input phase voltage of selected module
	A	Input phase current of selected module
	Hz	Input frequency of selected module
	PF	Input power factor of selected module
Output	V	Output phase voltage of selected module
	A	Output phase current of selected module
	Hz	Output frequency of selected module
	PF	Output power factor of selected module
Load	kVA	Sout: Apparent Power
	kW	Pout: Active Power
	kVar	Qout: Reactive power
	%	Load (The percentage of the UPS load)
Information	DC BUS +/- (V)	Bus voltage(positive & negative)
	Battery +/- (V)	Battery voltage (positive & negative)
	Charger(V)	Charger voltage(positive & negative)
	Charger(A)	Charger current(positive & negative)
	Discharger(A)	Discharger current(positive & negative)
	INV Voltage(V)	Inverter phase A/B/C voltage
	Fan Run Time(H)	Total fan's running time

Sub-menu	Contents	Meaning
	Capacitor Run Time(H)	Total capacitor running time
	Air Inlet Temp.(°C)	Air inlet temperature
	Air Outlet Temp.(°C)	Air outlet temperature
	REC IGBT Temp.(°C)	REC IGBT temperature of the phase A/B/C
	INV IGBT Temp.(°C)	INV IGBT temperature of the phase A/B/C

**Enter in  Set to set UPS system**  
 It includes SysFunc, Language, Comm Set, BATT Set, CHANGE PW, Calibration, Dry contact.  
 And submenu BATT Set, Calibration, Comm Set, Dry contact are only available for service engineer or manufacturer.

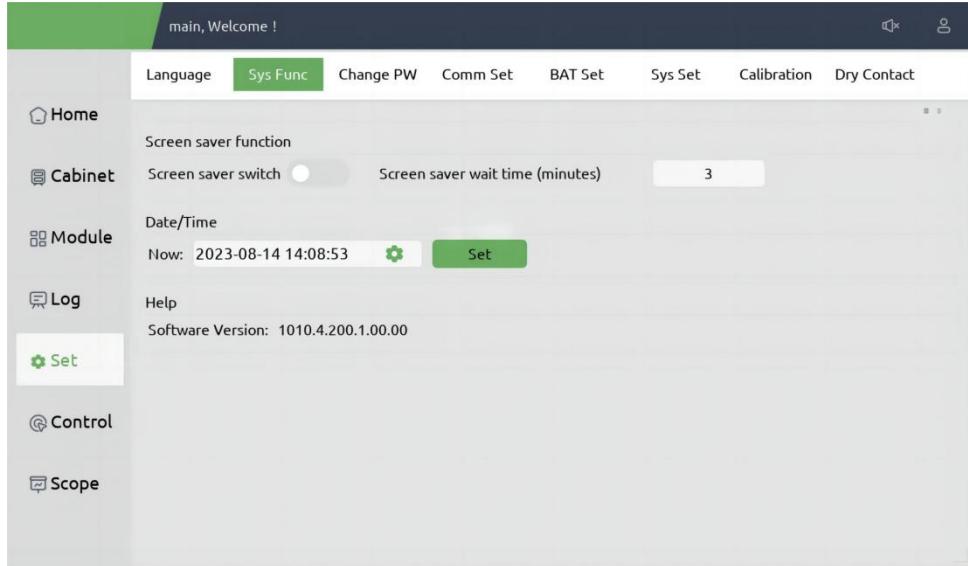


Fig.7-6: Setting Menu

Table.7- 4: Description of details of submenu in Set

Sub-menu	Contents	Description
Language	Current language	Displays the currently selected language
	Optional language	Simplified Chinese, English and other languages for choice
Sys Func	System function setting	Setting screensaver, system time, check memory and software version
Comm Set	Comm. interface	Include RS232,RS485,USB
	Protocol	Include MEGA protocol、ModBus_ASCII protocol、ModBus_RTU protocol
	Baud-rate	Setting the baud-rate
	Device Address	Setting the Device address
Battery Set	Battery Type	Setting the battery type: VRLA or Lithium
	Battery Number	VRLA 12V 32-40 pcs Lithium 3.2V 128-160 pcs
	Battery Capacity	Setting of the AH of the battery VRLA Capacity=Battery(12V) Ah* N groups Lithium Capacity=Battery(3.2V) Ah* N groups
	Float Charge Voltage/Cell*	Setting the floating Voltage for battery cell VRLA (Cell/2V)<2.5V;Lithium (Cell/3.2V)>3V

	Boost Charge Voltage/Cell*	Setting the boost Voltage for battery cell VRLA (Cell/2V)<2.5V;Lithium (Cell/3.2V)>3V
	EOD Voltage(0.6C)*	EOD voltage for cell battery,@0.6C current VRLA (Cell/2V)<2V;Lithium (Cell/3.2V)>2V
	EOD Voltage(0.15C)*	EOD voltage for cell battery,@0.15C current VRLA (Cell/2V)<2V;Lithium (Cell/3.2V)>2V
	Charge Current Percent Limit	Charge current (percentage of the rated current)
	Battery Temperature Compensate	Coefficient for battery temperature
Sys Set	System Mode	Setting the system mode: Single , parallel, Single ECO, parallel ECO,LBS, parallel LBS
	Unit Number	Set the number of UPS in parallel system
	Cabinet ID	For parallel system, the ID starts from 0
	Output Voltage Adjustment	Setting the Output Voltage
Calibration	Calibration product parameters	Calibration the UPS output voltage
Dry contact	Configuration the dry contact	Configuration the dry contact



#### Note

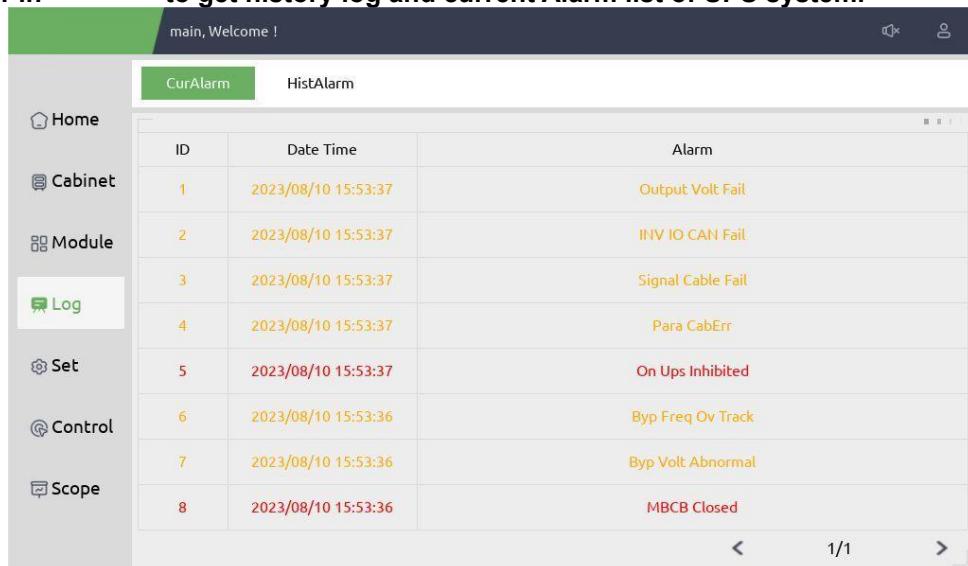
(\*) : Please set according to the recommended values of the battery manufacturer.



#### WARNING

Ensure the number of the battery, set via the menu or the monitoring software, is completely equal to the real installed number. Otherwise it may cause serious damage to the batteries or the equipment.

Enter in  to get history log and current Alarm list of UPS system.



ID	Date Time	Alarm
1	2023/08/10 15:53:37	Output Volt Fail
2	2023/08/10 15:53:37	INV IO CAN Fail
3	2023/08/10 15:53:37	Signal Cable Fail
4	2023/08/10 15:53:37	Para CabErr
5	2023/08/10 15:53:37	On Ups Inhibited
6	2023/08/10 15:53:36	Byp Freq Ov Track
7	2023/08/10 15:53:36	Byp Volt Abnormal
8	2023/08/10 15:53:36	MBCB Closed

main, Welcome !

CurAlarm HistAlarm

Home Cabinet Module Log Set Control Scope

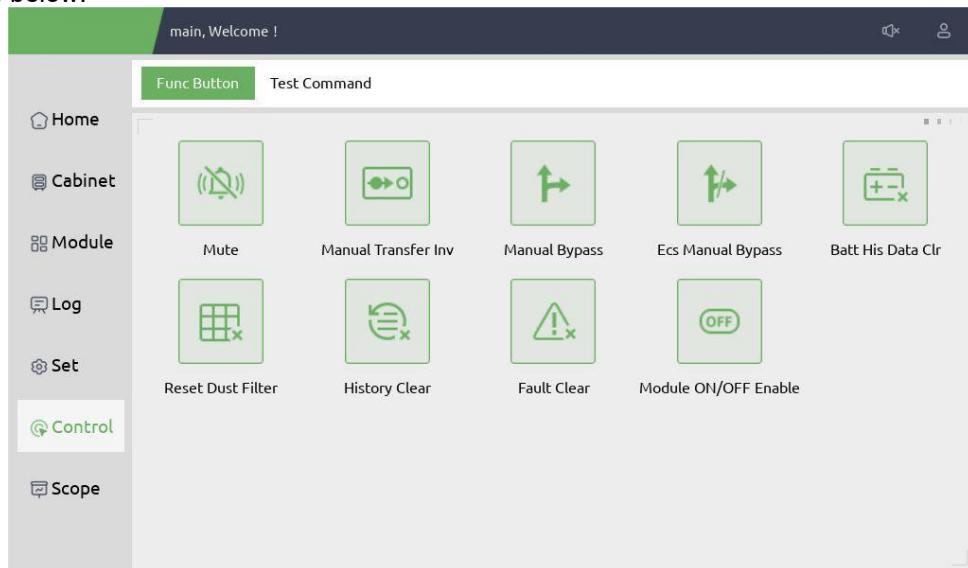
ID Date Time Alarm

568	2023/08/10 15:53:37	10#Module Inserted
567	2023/08/10 15:53:37	9#Module Inserted
566	2023/08/10 15:53:37	8#Module Inserted
565	2023/08/10 15:53:37	7#Module Inserted
564	2023/08/10 15:53:37	6#Module Inserted
563	2023/08/10 15:53:37	5#Module Inserted
562	2023/08/10 15:53:37	4#Module Inserted
561	2023/08/10 15:53:37	3#Module Inserted

Fig.7-7: History log and current Alarm

The details of all the events are shown as **Chapter 7-4**.

Enter in to enter in UPS command menu. The function and test command are shown as below:



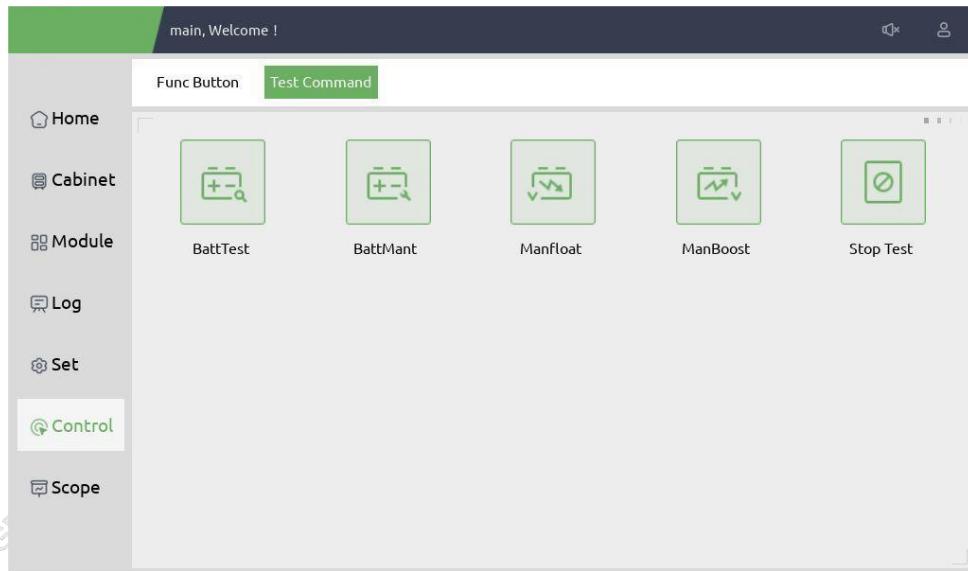


Fig.7- 8: Function and test command

Menu of Operate includes:

**Function**



Mute off or mute on



Fault clear manually

Fault Clear



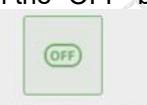
Manually transfer to bypass or escape from bypass mode

Manual Bypass Ecs Manual Bypass



Manual Transfer Inv

Transfer to inverter mode manually. The output could be interrupted.  
Enable the "OFF" button on the front panel of power module. Then the "OFF" button is



Module ON/OFF Enable

available, user can press the button to shutdown the power module.

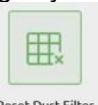
Reset battery history data including discharge dates and hours, discharge times. Normally



Batt His Data Clr

reset battery history data after replacing new batteries.

Reset dust filter data including days and maintenance period. Normally reset filter data after



Reset Dust Filter

replacing new filter or washing.

**Command**



Battery test command **BattTest**. UPS transfer to battery mode to test the condition of battery. If battery voltage is low or battery is failure, UPS will alarm and transfer back to normal mode or transfer to bypass mode. Make sure there is not any warns or alarm, make sure that battery voltage is higher than 90% of float voltage. If battery is normal, UPS will transfer back to battery mode after 20 seconds. If battery test is failure, UPS alarms.



Battery maintenance command **BattMant**. UPS transfer to battery mode. Make sure that there is not any warns or alarm, make sure that battery voltage is higher than 90% of float voltage. If battery is normal, UPS will transfer back to battery mode until battery voltage is down to 105% of EOD voltage and then transfer back to normal mode.



Manually enable charger enter in boost charge to charge the batteries more quickly.



Manually enable charger enter in float charge mode.



Stop battery test or battery maintenance.



**Enter in main menu** **Scope** **to check the waveform of output voltage, current and bypass voltage.**



Fig.7-9: output and bypass waveform

## 7.4 UPS Event Log

The follow *table.7-8* gives the complete list of all the UPS events displayed by history record

window and current record window.

Table.7- 5: UPS Event List

UPS events	Description
<b>Fault Clear</b>	Manually clear fault
<b>Log Clear</b>	Manually clear History log
<b>Load On UPS</b>	Inverter feeds load
<b>Load On Bypass</b>	Bypass feeds load
<b>No Load</b>	No load
<b>Battery Boost</b>	Charger is working in boost charging mode
<b>Battery Float</b>	Charger is working in float charging mode
<b>Battery Discharge</b>	Battery is discharging
<b>Battery Connected</b>	Battery is connected
<b>Battery Not Connected</b>	Battery is not connected.
<b>Maintenance CB Closed</b>	Manual maintenance breaker is closed
<b>Maintenance CB Open</b>	Manual maintenance breaker is opened
<b>EPO</b>	Emergency Power Off
<b>Module On Less</b>	Available power module capacity is less then the load capacity. Please reduce the load capacity or add extra power module to make sure that the UPS capacity is big enough.
<b>Generator Input</b>	Generator is connected and a signal is sent to the UPS.
<b>Utility Abnormal</b>	Utility (Grid) is abnormal. Mains voltage or frequency exceeds the upper or lower limit and results in rectifier shutdown. Check the input phase voltage of rectifier.
<b>Bypass Sequence Error</b>	Bypass voltage Sequence is reverse. Check if input power cables are connected correctly.
<b>Bypass Volt Abnormal</b>	<p>This alarm is triggered by an inverter software routine when the amplitude or frequency of bypass voltage exceeds the limit. The alarm will automatically reset if the bypass voltage becomes normal.</p> <p>First check if relevant alarm exists, such as "bypass circuit breaker open", "Byp Sequence Err" and "Ip Neutral Lost". If there is any relevant alarm, first clear this alarm.</p> <p>1. Then check and confirm if the bypass voltage and frequency displayed on the LCD are within the setting range. Note that the rated voltage and frequency are respectively specified by "Output Voltage" and "Output Frequency".</p> <p>2. If the displayed voltage is abnormal, measure the actual bypass voltage and frequency. If the measurement is abnormal, check the external bypass power supply. If the alarm occurs frequently, use the configuration software to increase the bypass high limit set point according to the user's suggestions</p>
<b>Bypass Module Fail</b>	Bypass Module Fails. This fault is locked until power off. Or bypass fans fail.
<b>Bypass Module Over Load</b>	Bypass current is over the limitation. If bypass current is under 125% of the rated current. The UPS alarms but has no action.
<b>Bypass Over Load Tout</b>	The bypass overload status continues and the overload times out.

<b>Byp Freq Over Track</b>	<p>This alarm is triggered by an inverter software routine when the frequency of bypass voltage exceeds the limit. The alarm will automatically reset if the bypass voltage becomes normal.</p> <p>First check if relevant alarm exists, such as “Byp Sequence Err” and “Input Neutral Lost”. If there is any relevant alarm, first clear this alarm.</p> <p>Then check and confirm if the bypass frequency displayed on the LCD are within the setting range. Note that the rated frequency are respectively specified by “Output Frequency”.</p> <p>If the displayed voltage is abnormal, measure the actual bypass frequency. If the measurement is abnormal, check the external bypass power supply. If the alarm occurs frequently, use the configuration software to increase the bypass high limit set point according to the user’s suggestions</p>
<b>Exceed Tx Times Lmt</b>	The load is on bypass because the output overload transfer and re-transfer is fixed to the set times during the current hour. The system can recover automatically and will transfer back to the inverter with 1 hour
<b>Output Short Circuit</b>	<p>Output shorted Circuit.</p> <p>Fist check and confirm if loads have something wrong.</p> <p>Then check and confirm if there is something wrong with terminals, sockets or some other power distribution unit.</p> <p>If the fault is solved, press “Fault Clear” to restart UPS.</p>
<b>Battery EOD</b>	Inverter turned off due to low battery voltage. Check the mains power failure status and recover the mains power in time
<b>Battery Test</b>	System transfer to battery mode for 20 seconds to check if batteries are normal
<b>Battery Test OK</b>	Battery Test OK
<b>Battery Maintenance</b>	System transfer to battery mode until battery voltage is down to 1.1*EOD voltage to maintain battery string
<b>Battery Maintenance OK</b>	Battery maintenance succeed
<b>Module inserted</b>	Power Module is inserted in system.
<b>Module Exit</b>	Power Module is pulled out from system.
<b>Rectifier Fail</b>	The N# Power Module Rectifier Fail, The rectifier is fault and results in rectifier shutdown and battery discharging.
<b>Inverter Fail</b>	The N# Power Module Inverter Fail. The inverter output voltage is abnormal and the load transfers to bypass.
<b>Rectifier Over Temp.</b>	<p>The N# Power Module Rectifier Over Temperature. The temperature of the rectifier IGBTs is too high to keep rectifier running. This alarm is triggered by the signal from the temperature monitoring device mounted in the rectifier IGBTs. The UPS recovers automatically after the over temperature signal disappears.</p> <p>If over temperature exists, check:</p> <ol style="list-style-type: none"> <li>1. Whether the ambient temperature is too high.</li> <li>2. Whether the ventilation channel is blocked.</li> <li>3. Whether fan fault happens.</li> <li>4. Whether the input voltage is too low.</li> </ol>
<b>Fan Fail</b>	At least one fan fails in the N# power module.
<b>Output Over load</b>	The N# Power Module Output Over Load. This alarm appears when the load rises above 100% of nominal rating. The alarm automatically resets once the overload condition is removed.

	<p>1. Check which phase has overload through the load (%) displayed in LCD so as to confirm if this alarm is true.</p> <p>2. If this alarm is true, measure the actual output current to confirm if the displayed value is correct.</p> <p>Disconnect non-critical load. In parallel system, this alarm will be triggered if the load is severely imbalanced.</p>
<b>Inverter Overload Tout</b>	<p>N# Power Module Inverter Over Load Timeout. The UPS overload status continues and the overload times out.</p> <p><b>Note:</b> The highest loaded phase will indicate overload timing-out first.</p> <p>When the timer is active, then the alarm “unit over load” should also be active as the load is above nominal.</p> <p>When the time has expired, the inverter Switch is opened and the load transferred to bypass.</p> <p>If the load decreases to lower than 95%, after 2 minutes, the system will transfer back to inverter mode. Check the load (%) displayed in LCD so as to confirm if this alarm is true. If LCD displays that overload happens, then check the actual load and confirm if the UPS has over load before alarm happens.</p>
<b>Inverter Over Temp.</b>	<p>The N# Power Module Inverter Over Temperature.</p> <p>The temperature of the inverter heat sink is too high to keep inverter running. This alarm is triggered by the signal from the temperature monitoring device mounted in the inverter IGBTs. The UPS recovers automatically after the over temperature signal disappears.</p> <p>If over temperature exists, check:</p> <ul style="list-style-type: none"> <li>Whether the ambient temperature is too high.</li> <li>Whether the ventilation channel is blocked.</li> <li>Whether fan fault happens.</li> <li>Whether inverter overload time is out.</li> </ul>
<b>On UPS Inhibited</b>	<p>Inhibit system transfer from bypass to UPS (inverter). Check:</p> <ul style="list-style-type: none"> <li>Whether the power module's capacity is big enough for load.</li> <li>Whether the rectifier is ready.</li> <li>Whether the bypass voltage is normal.</li> </ul>
<b>Manual Transfer Byp</b>	Transfer to bypass manually
<b>Esc Manual Bypass</b>	Escape from “transfer to bypass manually” command. If UPS has been transferred to bypass manually, this command enable UPS to transfer to inverter.
<b>Battery Volt Low</b>	Battery Voltage is Low. Before the end of discharging, battery voltage is low warning should occur. After this pre-warning, battery should have the capacity for 3 minutes discharging with full load.
<b>Battery Reverse</b>	Battery cables are connected not correctly.
<b>Inverter Protect</b>	<p>The N# Power Module Inverter Protect. Check:</p> <ul style="list-style-type: none"> <li>Whether inverter voltage is abnormal</li> <li>Whether inverter voltage is much different from other modules, if yes, please adjust inverter voltage of the power module separately.</li> </ul>
<b>Input Neutral Lost</b>	The mains neutral wire is lost or not detected. For 3 phases UPS, it's recommended that user use a 3-poles breaker or switch between input power and UPS.
<b>Bypass Fan Fail</b>	At least one of bypass module Fans Fails
<b>Manual</b>	The N# Power Module is manually shutdown. The power module

<b>Shutdown</b>	shuts down rectifier and inverter, and there's on inverter output.
<b>Manual Boost Charge</b>	Manually force the Charger work in boost charge mode.
<b>Manual Float Charge</b>	Manually force the charger work in float charge mode.
<b>UPS Locked</b>	Forbidden to shutdown UPS power module manually.
<b>Parallel Cable Error</b>	<p>Parallel cables error. Check:</p> <ul style="list-style-type: none"> <li>If one or more parallel cables are disconnected or not connected correctly</li> <li>If parallel cable round is disconnected</li> <li>If parallel cable is OK</li> </ul>
<b>Lost N+X Redundant</b>	Lost N+X Redundant. There is no X redundant powers module in system.
<b>EOD Sys Inhibited</b>	System is inhibited to supply after the battery is EOD (end of discharging)
<b>Battery Test Fail</b>	Battery Test Fail. Check if UPS is normal and battery voltage is over 90% of float voltage.
<b>Battery Maintenance Fail</b>	<p>Check</p> <ul style="list-style-type: none"> <li>If UPS is normal and not any alarms</li> <li>If the battery voltage is over 90% of float voltage</li> <li>If load is over 25%</li> </ul>
<b>Ambient Over Temp</b>	Ambient temperature is over the limit of UPS. Air conditioners are required to regulate ambient temperature.
<b>REC CAN Fail</b>	Rectifier CAN bus communication is abnormal. Please check if communication cables are not connected correctly.
<b>INV IO CAN Fail</b>	IO signal communication of inverter CAN bus is abnormal. Please check if communication cables are not connected correctly.
<b>INV DATA CAN Fail</b>	DATA communication of inverter CAN bus is abnormal. Please check if communication cables are not connected correctly.
<b>Power Share Fail</b>	The difference of two or more power modules' output current in system is over limitation. Please adjust output voltage of power modules and restart UPS.
<b>Sync Pulse Fail</b>	Synchronization signal between modules is abnormal. Please check if communication cables are not connected correctly.
<b>Input Volt Detect Fail</b>	<p>Input voltage of N# power module is abnormal.</p> <ul style="list-style-type: none"> <li>Please check if the input cables are connected correctly.</li> <li>Please check if input fuses are broken.</li> <li>Please check if utility is normal.</li> </ul>
<b>Battery Volt Detect Fail</b>	<p>Battery voltage is abnormal.</p> <ul style="list-style-type: none"> <li>Please check if batteries are normal.</li> <li>Please check if battery fuses are broken on input power board.</li> </ul>
<b>Output Volt Fail</b>	Output voltage is abnormal.
<b>Bypass Volt Detect Fail</b>	<p>Bypass voltage is abnormal.</p> <ul style="list-style-type: none"> <li>Please check if bypass breaker is closed and is good.</li> <li>Please check if bypass cables are connected correctly.</li> </ul>
<b>INV Bridge Fail</b>	Inverter IGBTs are broken and opened.
<b>Outlet Temp Error</b>	<p>Outlet temperature of power module is over the limitation.</p> <ul style="list-style-type: none"> <li>Please check if fans are abnormal.</li> <li>Please check if PFC or inverter inductors are abnormal.</li> <li>Please check if air passage is blocked.</li> <li>Please check if ambient temperature is too high.</li> </ul>
<b>Input Curr</b>	The difference of input current between every two phases is

POWER

<b>Unbalance</b>	over 40% of rated current. Please check if rectifier's fuses, diode, IGBT or PFC diodes are broken. Please check if input voltage is abnormal.
<b>DC Bus Over Volt</b>	Voltage of DC bus capacitors is over limitation. UPS shutdown rectifier and inverter.
<b>REC Soft Start Fail</b>	While soft start procedures are finished, DC bus voltage is lower than the limitation of calculation according utility voltage. Please check <ol style="list-style-type: none"> <li>1. Whether rectifier diodes are broken</li> <li>2. Whether PFC IGBTs are broken</li> <li>3. Whether PFC diodes are broken</li> <li>4. Whether drivers of SCR or IGBT are abnormal</li> <li>5. Whether soft start resistors or relay are abnormal</li> </ol>
<b>Relay Connect Fail</b>	Inverter relays are opened and cannot work or fuses are broken.
<b>Relay Short Circuit</b>	Inverter relays are shorted and cannot be released.
<b>PWM Sync Fail</b>	PWM synchronizing signal is abnormal
<b>Intelligent Sleep</b>	UPS works in intelligent sleep mode. In this mode, the power modules will be standby in turn. It will be more reliability and higher efficiency. It must be confirmed that remained power modules' capacity is big enough to feed load. It must be conformed that working modules' capacity is big enough if user add more load to UPS. It's recommended that sleeping power modules are waken up if the capacity of new added loads is not sure.
<b>Manual Transfer to INV</b>	Manually transfer UPS to inverter. It's used to transfer UPS to inverter when bypass is over tracking. The interrupt time could be over 20ms.
<b>Input Over Curr Tout</b>	Input over current timeout and UPS transfer to battery mode. Please check if input voltage is too low and output load is big. Please regulate input voltage to be higher if it's possible or disconnect some loads.
<b>No Inlet Temp. Sensor</b>	Inlet temperature sensor is not connected correctly.
<b>No Outlet Temp. Sensor</b>	Outlet temperature sensor is not connected correctly.
<b>Inlet Over Temp.</b>	Inlet air is over temperature. Make sure that the operation temperature of UPS is between 0-40°C.
<b>Capacitor Time Reset</b>	Reset timing of DC bus capacitors.
<b>Fan Time Reset</b>	Reset timing of fans.
<b>Battery History Reset</b>	Reset battery history data.
<b>Byp Fan Time Reset</b>	Reset timing of bypass fans.
<b>Battery Over Temp.</b>	Battery is over temperature. It's optional.
<b>Bypass Fan Expired</b>	Working life of bypass fans is expired, and it's recommended that the fans are replaced with new fans. It must be activated via software.
<b>Capacitor Expired</b>	Working life of capacitors is expired, and it's recommended that the capacitors are replaced with new capacitors. It must be activated via software.

<b>Fan Expired</b>	Working life of power modules' fans is expired, and it's recommended that the fans are replaced with new fans. It must be activated via software.
<b>INV IGBT Driver Block</b>	<p>Inverter IGBTs are shutdown.</p> <p>Please check if power modules are inserted in cabinet correctly.</p> <p>Please check if fuses between rectifier and inverter are broken.</p>
<b>Battery Expired</b>	Working life of batteries is expired, and it's recommended that the batteries are replaced with new batteries. It must be activated via software.
<b>Bypass CAN Fail</b>	The CAN bus between bypass module and cabinet is abnormal.
<b>Dust Filter Expired</b>	Dust filter need to be clear or replaced with a new one
<b>Stop Test</b>	Manually stop battery test or battery maintenance, UPS transfer back to normal mode.
<b>Wave Trigger</b>	Waveform has been saved while UPS fail
<b>Bypass CAN Fail</b>	<p>Bypass and cabinet communicate with each other via CAN bus. Check</p> <p>If connector or signal cable is abnormal.</p> <p>If monitoring board is abnormal.</p>
<b>Firmware Error</b>	Manufacturer used only.
<b>System Setting Error</b>	Manufacturer used only.
<b>Bypass Over Temp.</b>	<p>Bypass module is over temperature. Please check</p> <p>If bypass load is overload</p> <p>If ambient temperature is over 40°C</p> <p>If bypass SCRs are assembled correctly</p> <p>If bypass fans are normal</p>
<b>Module ID Duplicate</b>	At least two modules are set as same ID on the power connector board, please set the ID as correct sequence

## 8 Product Specification

This chapter provides UPS product specification.

### 8.1 Applicable Standards

The UPS has been designed to conform to the following European and international standards:

Table.8- 1: Compliance with European and International Standards

Item	Normative reference
General safety requirements for UPS used in operator access areas	EN50091-1-1/IEC62040-1-1/AS 62040-1-1
Electromagnetic compatibility (EMC) requirements for UPS	EN50091-2/IEC62040-2/AS 62040-2(C3)
Method of specifying the performance and test requirements of UPS	EN50091-3/IEC62040-3/AS 62040-3(VFI SS 111)
<b>Note:</b> The above mentioned product standards incorporate relevant compliance clauses with generic IEC and EN standards for safety (IEC/EN/AS60950), electromagnetic emission and immunity (IEC/EN/ AS61000 series) and construction (IEC/EN/AS60146 series and 60950).	

### 8.2 Environmental Characteristics

Table.8- 2: Environmental Properties

Items	Unit	Requirements
Acoustic noise level at 1 meter	dB	61.0(power module)
Altitude of Operation	m	≤3000m above sea level, derate power by 2% per 100m between 3000m and 4000m
Relative Humidity	%RH	0 to 95%, non condensation
Operating Temperature	°C	0 to 40 deg , Battery life is halved for every 5°C increase above 25°C
UPS Storage-Transport Temperature	°C	-20~70
Recommended Battery Storage Temperature	°C	0~25 (20°C for optimum battery storage)

### 8.3 Mechanical Characteristics

Table.8- 3: Mechanical Properties

Cabinet Specification	Unit	4-slots	6-slots	4&6-slots with 4 switches	8-slots	10/12 slots
Mechanical Dimension, WxDxH	mm	600*750*1600	600*750*2000	600*850*2000	600*1000*2000	1200*850*2000
Weight	kg	170	220	300	320	450

Color	N/A	Black
Protection Level, IEC(60529)	N/A	IP20
Module type	Unit	50KVA
Mechanical Dimension, W×D×H	mm	440×475×140
Net Weight	kg	23
Color	N/A	Black(front)



#### Note

**Wheels or holders of cabinets are not included in dimension. Please refer to Chapter 4 to get detailed dimension.**

## 8.4 Input Characteristics

Table.8- 4: Mains input

Items	Unit	Parameter
Rated AC Input Voltage	Vac	380/400/415(three-phase and sharing neutral with the bypass input)
Input voltage range	Vac	-40%~+25%
Frequency	Hz	50/60(range: 40Hz~70Hz)
Power factor	kW/kVA, full load	0.99
THD	THDI%	2

## 8.5 Battery Characteristics

Table.8- 5: Battery Information

Items	Unit	Parameters
Battery bus voltage	Vdc	Nominal: ±192-240V
Quantity of lead-acid cells	Nominal	480V=40*6cell(12V)
Float charge voltage	V/cell (VRLA)	2.25V/cell(selectable from 2.2V/cell~2.35V/cell) Constant current and constant voltage charge mode
Temperature compensation	mV/°C /cl	-3.0(selectable from : 0~-5.0, 25°C or 30°C, or inhibit)
Ripple voltage	%V float	≤1
Ripple current	%C10	≤5
Boost charge voltage	V/cell (VRLA)	2.4V/cell(selectable from : 2.30V/cell~2.45V/cell) Constant current and constant voltage charge mode
End of discharging voltage	V/cell (VRLA)	1.65V/cell(selectable from : 1.60V/cell~1.750V/cell) @0.6C discharge current 1.75V/cell (selectable from : 1.65V/cell~1.8V/cell) @0.15C discharge current (EOD voltage changes linearly within the set range according to discharge current)
Battery Charging Power	kW	10%* UPS capacity (selectable from : 1~20%* UPS capacity)

## 8.6 Output Characteristics

Table.8- 6: Inverter Output (to Critical Load)

Rated capacity (kVA)	Unit	50~600
Rated AC voltage	Vac	380/400/415(three-phase four-wire and sharing neutral with the bypass)
Frequency	Hz	50/60
overload	%	110% load, 1 hour 125% load, 10min 150% load, 1min >150% load, 200ms
Fault current	%	300% short current limitation for 200ms
Non linear load Capability	%	100%
Neutral current capability	%	170%
Steady state voltage stability	%	±1(balanced load) ±1.5(100% unbalance load)
Transient voltage response	%	±5
THD	%	<1(linear load) , <3(non linear load)
Synchronization Window	-	Rated frequency ±2Hz(selectable: ±1~±5Hz)
Max change rate of synch frequency	Hz/s	1: selectable: 0.1~5
Inverter voltage range	%V(ac)	±5

## 8.7 Bypass Characteristics

Table.8- 7: Bypass Input

Rated capacity(kVA)	Unit	200	300	400	500	600				
Rated AC Voltage	Vac	380/400/415								
		three-phase four-wire, sharing neutral with the rectifier input and providing neutral reference for the output								
Rated current	380	A	304	456	608	761				
	400		289	434	577	723				
	415		279	418	556	696				
Overload		%	<110%, long term							
			<125%, 10 mins							
			<150%, 1min							
Superior protection bypass line	N/A	Thermal-magnetic breaker, the capacity is 125% of rated current output. IEC60947-2 curve C								
Current rating of neutral cable	A	1.7×In								
Frequency	Hz	50/60								

Switch time (between bypass and inverter)	ms	Synchronized switch: 0ms
Bypass voltage tolerance	% Vac	Upper limit: +10,+15,+20, +25, default: +15
		Lower limit: -10, -20, -30 or -40, default:-20
		(acceptable stable bypass voltage delay: 10s)
Bypass frequency tolerance	%	±2.5, ±5, ±10 or ±20, default: ±10
Synchronization -Window	Hz	Rated frequency±2Hz (selectable from ±0.5Hz~±5Hz)

## 8.8 Efficiency

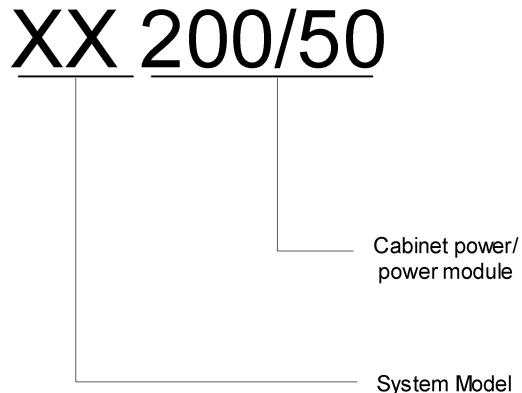
Table.8- 8: Efficiency

Rated Efficiency (kVA)	Unit	50~600kVA
<b>Efficiency</b>		
Normal mode(dual conversion)	%	96 max
ECO mode	%	99
Battery discharging efficiency (DC/AC) (battery at nominal voltage 480Vdc and full-rated linear load)		
Battery mode	%	96

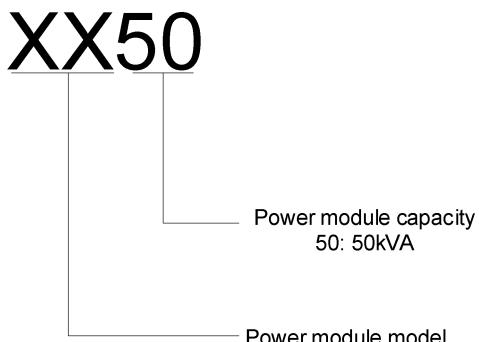
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## Annex A Guide for Ordering and Selection of UPS System

The UPS system includes two parts: cabinet and power modules. The model of cabinet is shown as following:



The model of power module is shown as following:



## Annex B. Parallel Setting

If finish connecting all parallel cables and connection, set each unit in parallel system via software:

Enter in “ Set”

→SysSet” to set “**system Mode**” as **parallel**.

Set “**Unit Number**” according to actual system.

Set “**Cabinet ID**” as “0 or 1, 2...8”, make sure that all unit ID are different. For example, 4 units are in parallel system, set the ID as 0, 1, 2, 3.

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## Operational Summary & Support

The GT Series 10~30kVA Online Tower UPS delivers stable, continuous power for servers, network devices, and data center infrastructure.

Follow the installation, operation, and maintenance procedures to ensure reliable performance, extend equipment life, and maintain long-term efficiency.

Perform regular inspections and battery checks, keep ventilation paths clear, and avoid unauthorized internal repairs. Always comply with applicable electrical safety regulations.

For technical assistance or after-sales support, contact our service team. Our engineers are committed to maintaining reliable operation of your critical power systems.

## About Gotogpower

Gotogpower provides UPS systems and integrated power solutions for data centers and industrial applications worldwide.

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