LARSON MAGNETICS

MT-UPS-3P 50-600KVA Modular UPS

User Manual

Preface

Manual Usage

This manual introduces the key features, performance, and working principles of the next-generation modular intelligent UPS, and provides users with essential information on installation, operation, and maintenance.

Users

Technical Support Engineer
Service Engineer
Authorized Person

Note

Larson Magnetics offers comprehensive technical support and services. Customers can contact our local office or customer service representatives for assistance.

This manual will be updated periodically due to product upgrades or other reasons. Unless otherwise specified, the manual is intended as a guide for users, and no warranties, either expressed or implied, are made regarding any statements or information contained in it.

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1 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.

1.1 Safety Information Definition

Danger: Ignoring this requirement may result in serious injury or even death.

Warning: Ignoring this requirement may result in injury or equipment damage.

Caution: Ignoring this requirement may cause equipment damage, data loss, or reduced performance.

Commissioning Engineer: The engineer responsible for installing or operating the equipment should be properly trained in electrical safety and well-versed in the operation, debugging, and maintenance of the equipment.

1.2 Warning Label

The warning labels indicate potential risks of injury or equipment damage and provide the necessary steps to avoid these dangers. This manual includes three types of warning labels, as described below.

Labels	Description
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.

1.3 Safety Instruction

DANGER	■ Performed only by commissioning engineers. ■ This UPS is designed for commercial and industrial applications only, and is not intended for any use in life-support devices or system.

WARNING	■ Read all the warning labels carafully before operation, and follow the instructions.
	■ When the system is running , do not touch the surface with this label, to avoid any hurt of scald.
	■ ESD sensitive components inside the UPS, anti-ESD measure should be taken before handling.

1.4 Move & Installation

DANGER	■ Keep the equipment away from heat source or air outlets. ■ In case of fire, use dry powder extinguisher only, any liquid extinguisher can result in electric shock.
WARNING	■ Don't start the system if any damage or abnormal parts founded. ■ Contacting the UPS with wet material or hands may be subject to electric shock.
CAUTION	■ Use proper facilities to handle and install the UPS. Shielding shoes, protective clothes and other protective facilities are necessary to aviod injury. ■ During positioning, keep the UPS way from shock or vibration. ■ Install the UPS in proper environment, more detail in section 2.3.

1.5 Debug & Operate

DANGER	■ 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. ■ 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.
WARNING	■ The earth leakage current of load will be carried by RCCB OR RCD. ■ Initial check and inspection should be performed after long time storing of UPS.

1.6 Maintenance & Replacement

DANGER	■ 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. ■ 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. 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 when operating the equipment in the normal manner, following the recommended operating procedures in this manual.

1.7 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℃. 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 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.

1.8 Disposal

WARNING	■ Dispose of used battery according to the local instructions.

1.9 Note

Note	■ Represents a supplementary explanation or emphasis to the main text.

2 Overview

2.1 Product Introduction

The intelligent modular UPS series uses an online double-conversion design based on DSP full digital control, providing a stable and uninterrupted power supply. It can eliminate mains surges, instantaneous high voltage, low voltage fluctuations, line noise, and frequency deviations, effectively addressing 'power pollution' to ensure high efficiency and high power density for reliable power supply.

2.2 UPS System Description

The intelligent modular UPS consists primarily of the conversion main circuit, bypass static switch, external battery pack, and cabinets with 4 or 6 modules, which include a manual bypass switch. The UPS system is shown in Figure 2-1.

The conversion main circuit is formed by multiple UPS power modules connected in parallel, consisting mainly of an AC-DC-AC structure, which includes the rectifier (REC) and inverter (INV). The bypass static switch is made of reverse-parallel SCRs, allowing the mains power to supply the load directly through the bypass switch. The manual bypass switch is an isolation switch that ensures uninterrupted load power supply during UPS maintenance. The external battery pack provides power to the load through the inverter when the mains power is interrupted.

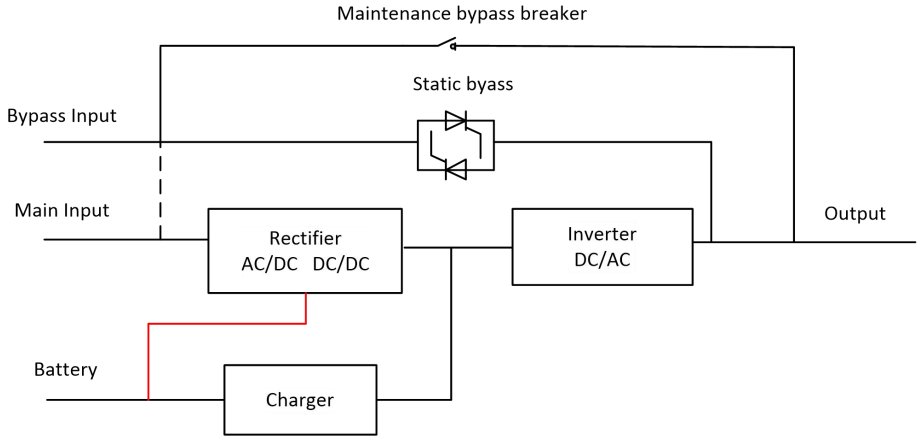


Figure 2-1 UPS schematic diagram

2.3 Power Module Description

The power module structure is shown as Figure 2-2.The power module contains a rectifier, an inverter, and one DC charger.

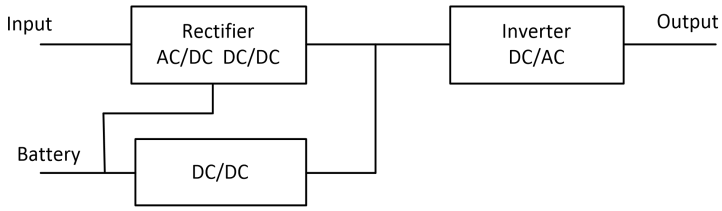


Figure 2-2 Power module schematic diagram

2.4 Operation Mode

The modular UPS is an on-line, double-conversion UPS that permits operation in the following modes:

- Normal mode
- Battery mode
- Bypass mode
- Maintenance mode(manual bypass)
- ECO mode
- Auto-restart Mode
- Frequency Converter mode

2.4.1 Normal Mode

The UPS converts the AC input into DC voltage (AC/DC) through the rectifier, then boosts the DC voltage to the BUS voltage. When the system is connected to the external battery, part of the charger charges the battery (DC/DC), while the other part feeds the inverter, which converts the DC to AC output (DC/AC) to provide high-quality AC power to the load. The working principle in normal mode is shown in Figure 2-3.

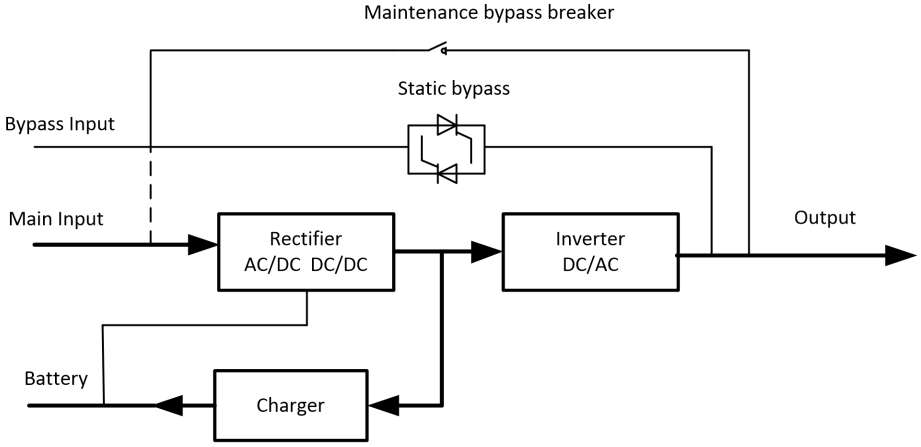


Figure 2-3 Normal mode schematic diagram

2.4.2 Battery Mode

Upon failure of the AC mains input power, the inverters of the power modules will draw power from the batteries and supply AC power to the critical load, ensuring there is no interruption. Once the AC mains input power is restored, the UPS will automatically return to normal mode. The battery schematic diagram is shown in Figure 2-4 below.

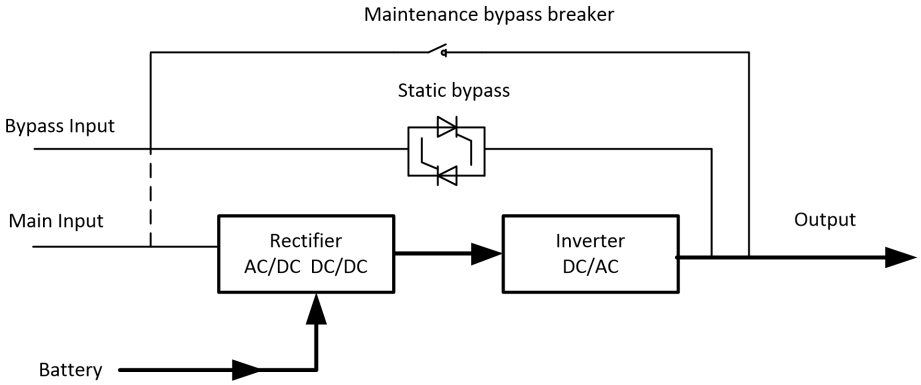


Figure 2-4 Battery mode schematic diagram

Note: With the function of "Battery Cold Start"， the UPS could start without utility.

2.4.3 Bypass Mode

After the system is powered on, if the inverter is not turned on or is manually turned off, the load will be powered by the bypass. In normal mode, if the UPS monitoring unit detects conditions such as over-temperature, overload, or other inverter failures, the system will automatically switch to bypass mode. In this case, the mains will directly supply power to the load through the bypass static switch. In bypass mode, the UPS does not protect the quality of the load power supply, and the load becomes susceptible to power failures, voltage waveform issues, or abnormal frequency conditions. The bypass mode schematic diagram is shown in Figure 2-5.

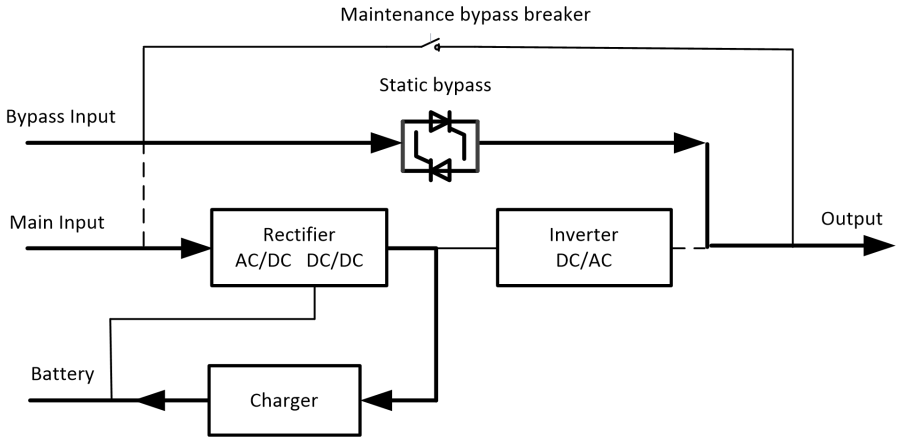


Figure 2-5 Bypass mode schematic diagram

2.4.4 Maintenance Mode (Manual Bypass)

During UPS system or battery maintenance, or when repairing equipment failures, manually close the manual bypass switch. This allows the load to be directly powered by the mains through the manual bypass, ensuring emergency power supply to the load. The manual bypass mode schematic diagram is shown in Figure 2-6.

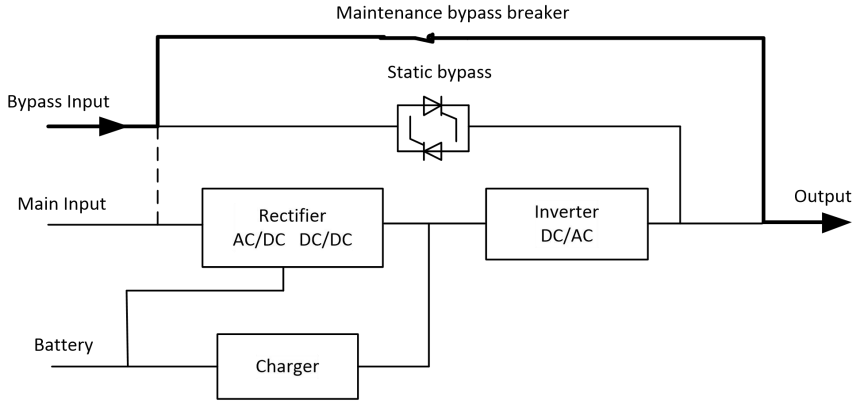


Figure 2-6 Maintenance mode schematic diagram

DANGER

During Maintenance mode, dangerous voltages are present on the terminal of input, output and neutral, even with all the modules and the LCD turned off.

2.4.5 ECO Mode

To enhance system efficiency, the UPS operates in Bypass Mode during normal operation, with the inverter in standby. If the utility power from the bypass fails, the UPS will automatically switch to Battery Mode, and the inverter will supply power to the load. The schematic diagram for ECO mode is shown in Figure 2-7.

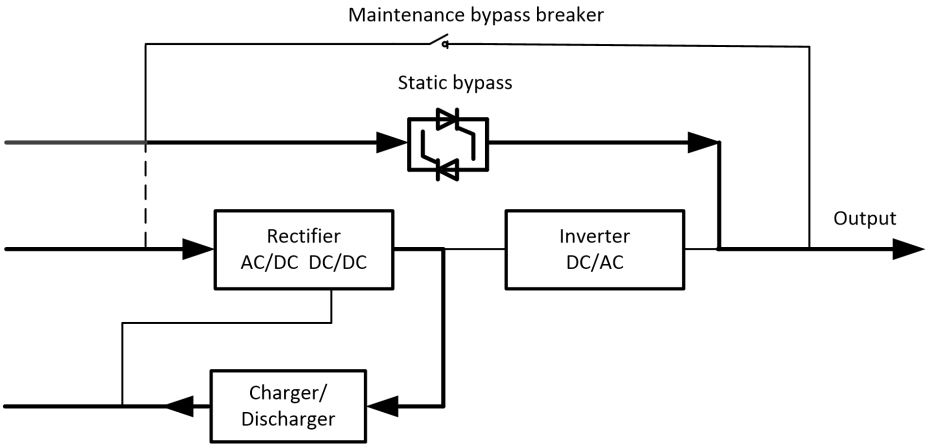


Figure 2-7 ECO mode schematic diagram

Note

There is a brief interruption (less than 10ms) when switching from ECO mode to Battery Mode. It is essential to ensure that this interruption has no impact on the load.

2.4.6 Auto-restart Mode

The UPS features an automatic power-on function. If the mains power is out for an extended period and the battery discharges to the EOD (End of Discharge) voltage, causing the inverter to shut down, the UPS will automatically restart once the mains power is restored. **The mode and delay time are programmed by the commissioning engineer.**

2.4.7 Frequency Converter Mode

By setting the UPS to 'Frequency Converter Mode,' the UPS provides a stable output with a fixed frequency (50 or 60 Hz), and the bypass static switch is disabled. The input frequency range is from 40 Hz to 70 Hz. In this mode, the static bypass is inactive, and the use of the battery is optional, depending on whether the system operates in battery mode.

2.5 UPS Structure

2.5.1 UPS Configuration

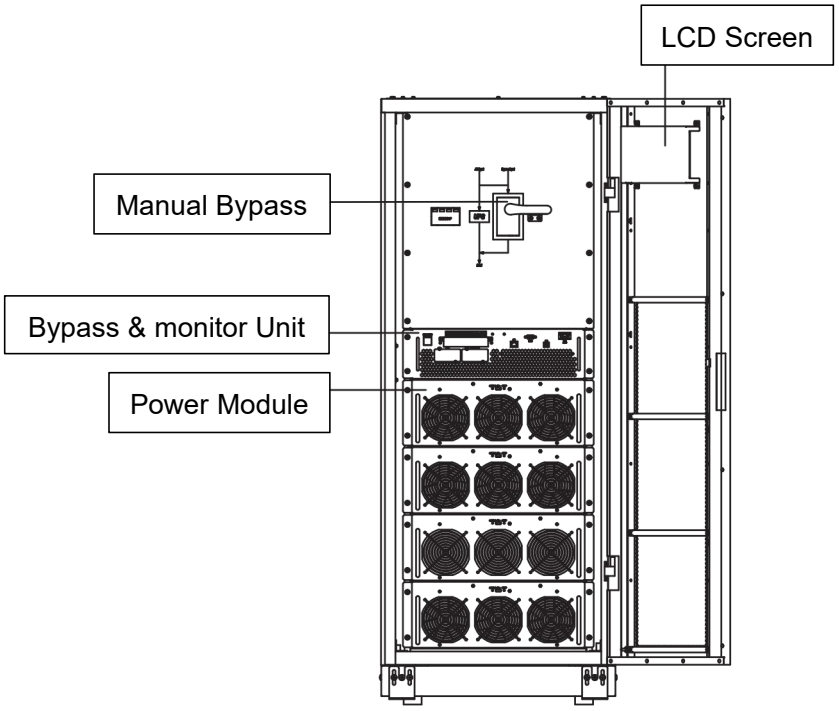
The UPS configurations are provided in Table 2-1.

Table 2-1 UPS Configuration

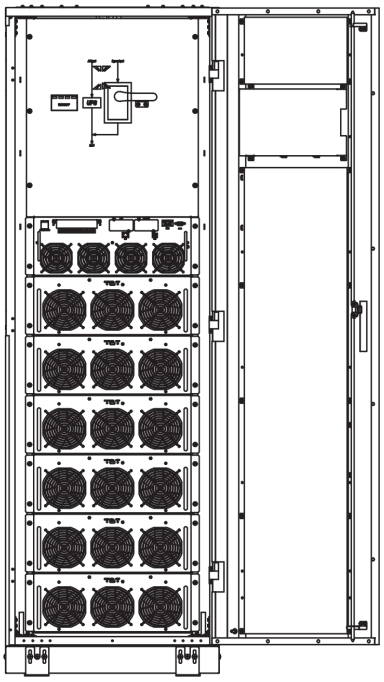
Item	Component	Quantity/PCS	Remark
4-solt cabinet	Manual Bypass breaker	1	standard
6-solt cabinet	Bypass & Monitoring unit	1	standard
60KVA power module	Power module	1~6	/
50KVA power module	Power module	1~6	/
10&12-solt cabinet	Main input breaker	1	standard
	Bypass input breaker	1	standard
	Maintenance bypass breaker	1	standard
	Output breaker	1	standard
	Bypass unit	1	standard
	Monitoring unit	1	standard
50/60KVA power module	Power module	1~12	/

2.5.2 UPS System Outlook

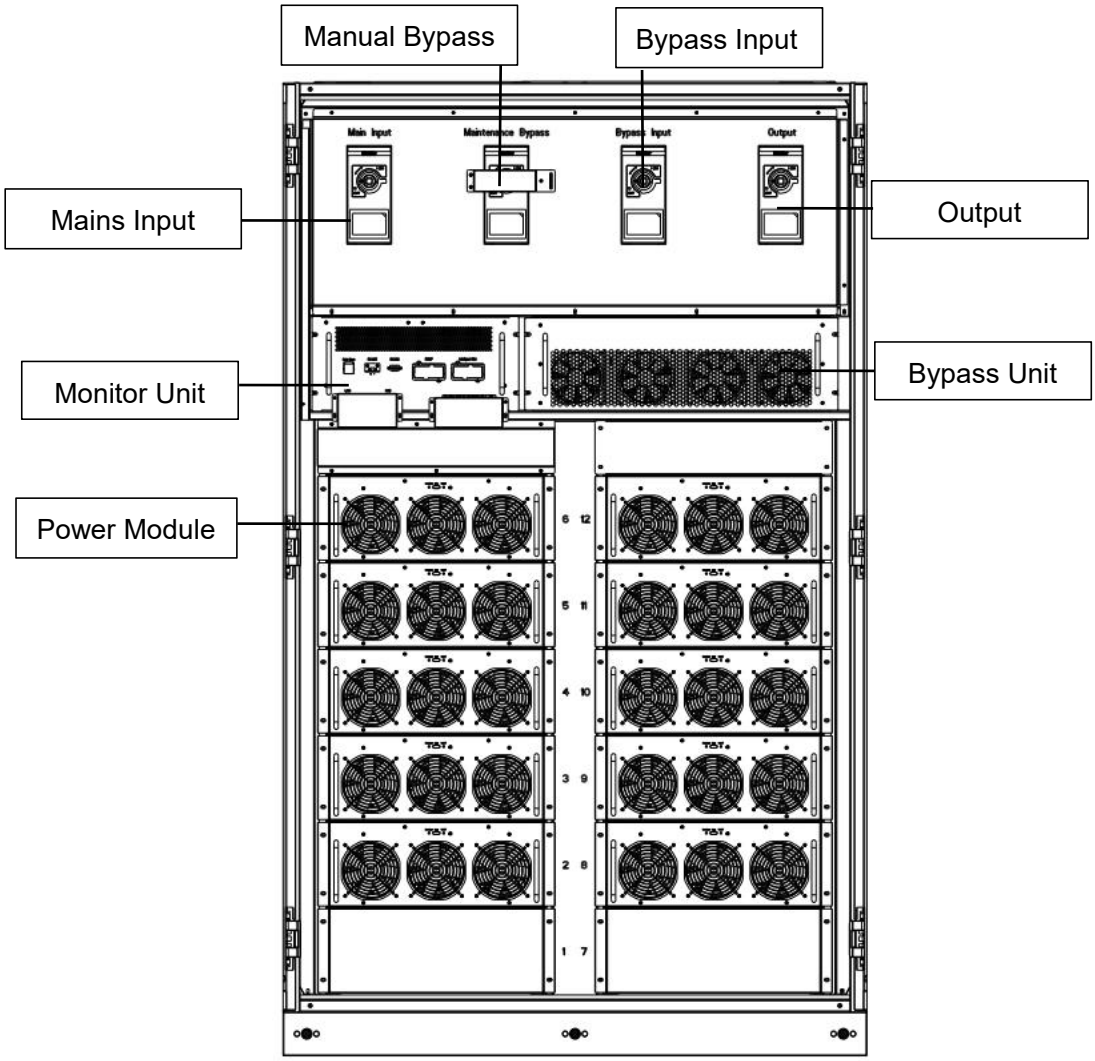
The UPS front outlooks are shown as figure 2-8.



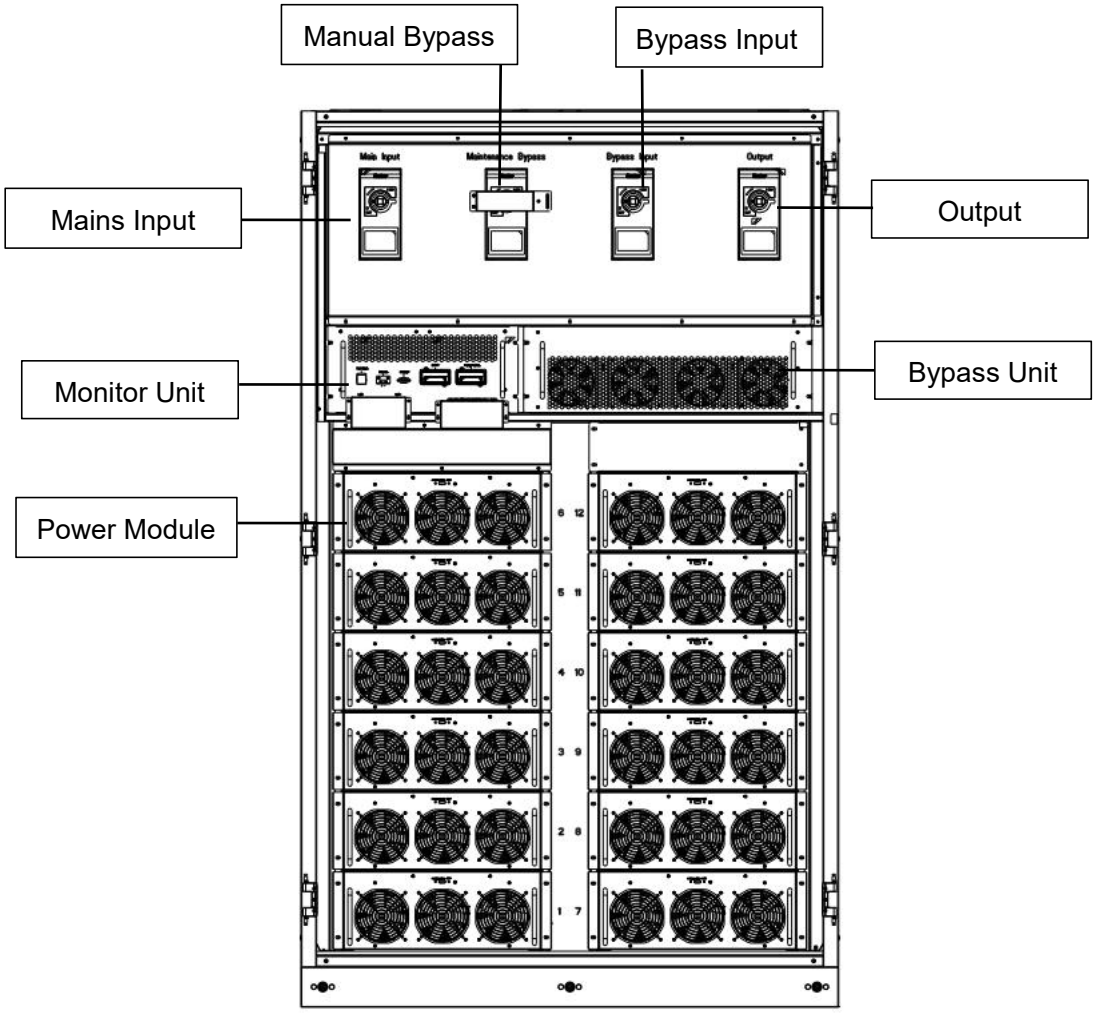
(a)The front view of 4-slot cabinet



(b)The front view of 6-slot cabinet



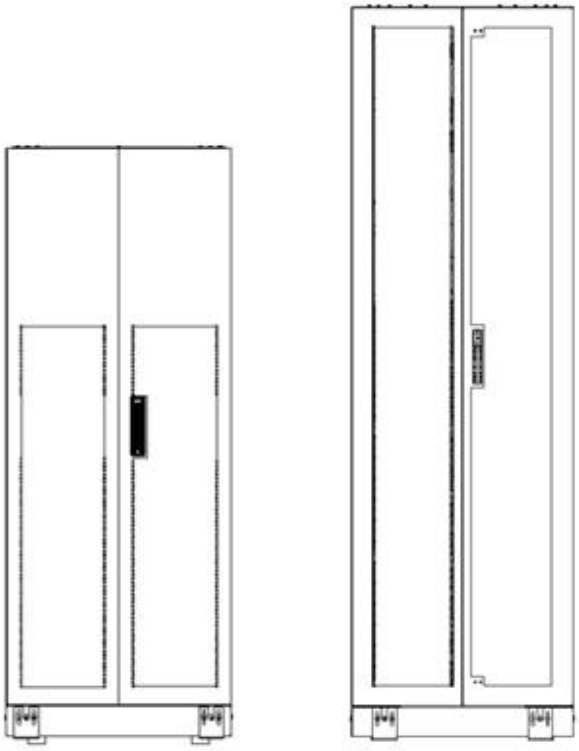
(c)The front view of 10-slot cabinet



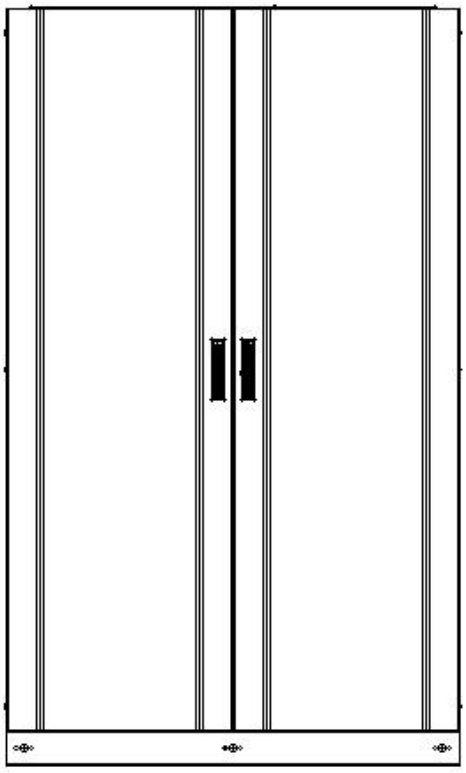
(d)The front view of 12-slot cabinet

Figure 2-8 System Front view

The UPS back outlooks are shown as figure 2-9.



(a) The back view of 4-slot & 6-slotcabinet



(b) The back view of 10-slot cabinet

Figure 2-9 System back view

3 Installation

3.1 Location

Since each site has its own specific requirements, the installation instructions in this section serve as a guide for the general procedures and practices that should be followed by the installing engineer.

3.1.1 Installation Environment

The UPS is designed for indoor installation and uses forced convection cooling with internal fans. Ensure that there is sufficient space around the UPS for proper ventilation and cooling. Keep the UPS away from water, heat sources, and flammable or corrosive materials. Avoid installing the UPS in environments with direct sunlight, dust, volatile gases, corrosive substances, or high salinity.
Avoid installing the UPS in environments with conductive dirt.

The optimal operating temperature for the batteries is between 20°C and 25°C. Operating above 25°C will shorten battery life, while operating below 20°C will reduce battery capacity. At the end of charging, the battery will generate small amounts of hydrogen and oxygen; ensure that the ventilation in the battery installation area meets the EN50272-2001 requirements.

When using external batteries, the battery circuit breakers (or fuses) should be installed as close as possible to the batteries, and the connecting cables should be kept as short as possible.

3.1.2 Site Selection

Ensure that the ground or installation platform can support the weight of the UPS cabinet, batteries, and battery racks. The platform should be free from vibration and have a horizontal inclination of less than 5 degrees.

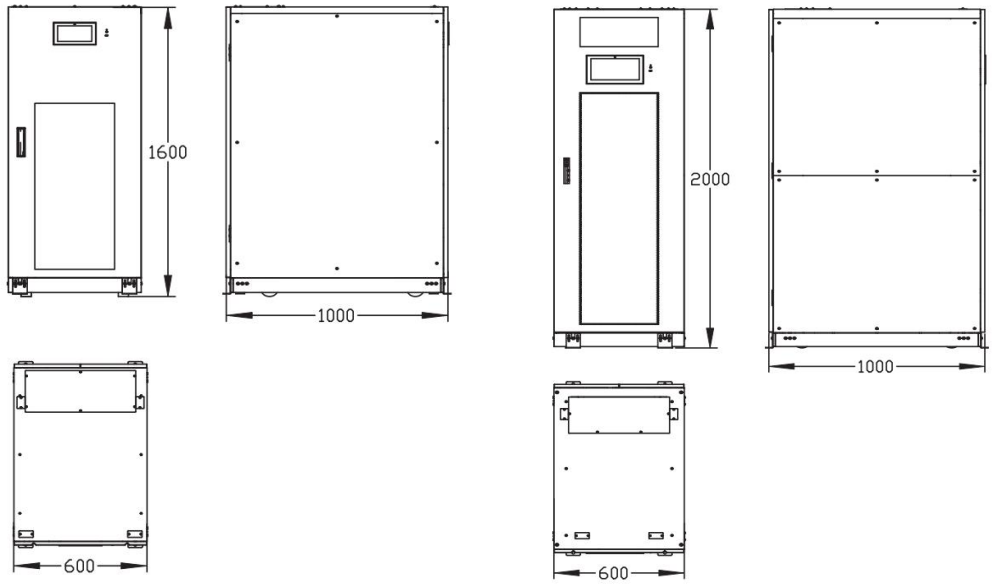
The equipment should be stored in a room to protect it from excessive humidity and heat sources. Batteries should be stored in a dry, cool place with good ventilation, and the ideal storage temperature is between 20°C and 25°C.

3.1.3 Size and Weight

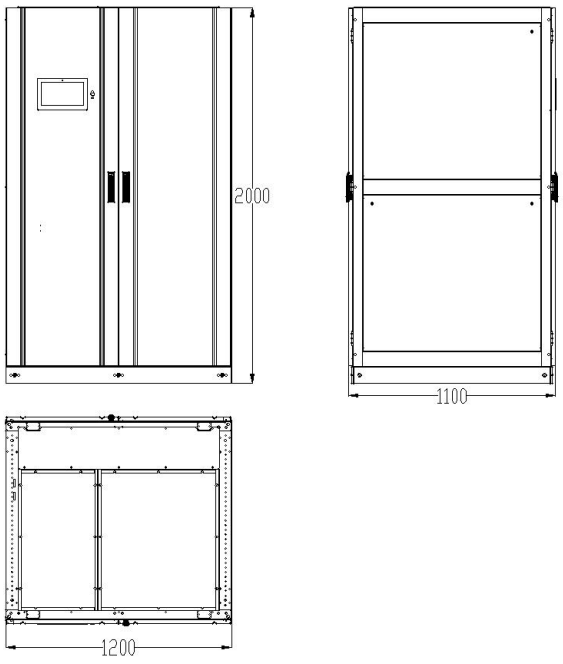
Ensure there is adequate space for the placement of the UPS. The recommended room dimensions for the UPS cabinet are shown in Figure 3-1.

DANGER

Ensure the following space margins: at least 0.8m in front of the cabinet door for easy maintenance of the power module with the door fully open; at least 0.5m behind the cabinet for ventilation and cooling; and at least 0.5m from the top of the cabinet. The recommended space for the cabinet is shown in Figure 3-2.



(a)The size diagram of the 4-slot & 6-slot cabinet (Unit:mm)



(b)The size diagram of the 10&12-slot cabinet (Unit:mm)

Figure 3-1 cabinet size diagram (Unit:mm)

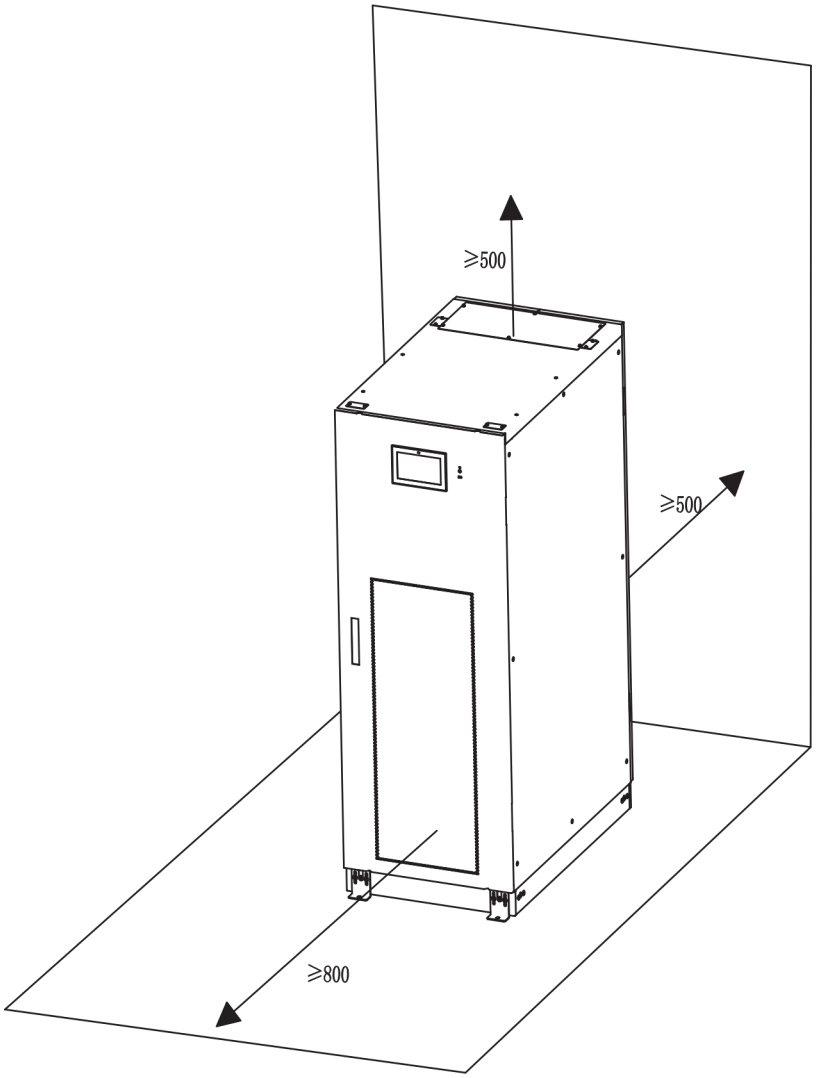


Figure 3-2 Space reserved for the cabinet (Unit: mm)

Ensure that the ground or installation platform can support the weight of the UPS cabinets, batteries, and battery racks. The weight of the batteries and battery racks is calculated based on actual usage, while the weight of the UPS is listed in Table 3-1.

Configuration	Weight(kg)
4-slot Cabinet	170
6-slot Cabinet	220
10&12-slot Cabinet	450
60KVA power module	45
50KVA power module	44

Table 3-1: Dimensions and Weight for the Cabinet

3.2 Unloading and Unpacking

3.2.1 Moving and Unpacking of the Cabinet

The steps to move and unpack the cabinet are as follows:

1) Check if any damages to the packing. (If any, please contact the carrier)

2) Transport the equipment to the designated site by forklift, as shown in Figure 3-3.

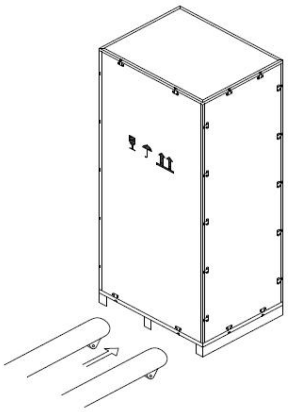


Figure 3-3 Transport to the designated site

3) Use an awl and hammer to open the top plate of the crate, followed by the side boards (see Figure 3-4)..

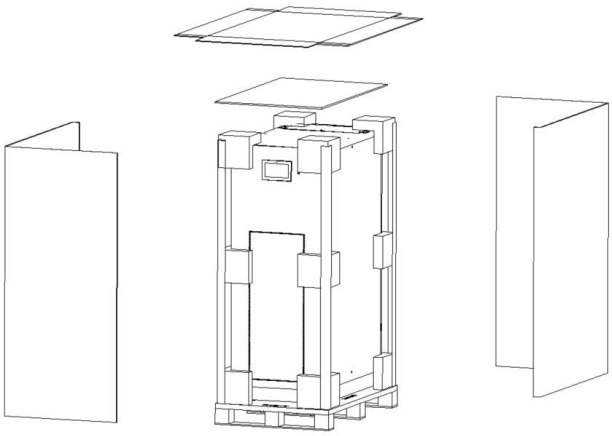


Figure 3-4 disassemble the case

4) Remove the protective foam around the cabinet. As show below Figure 3-5.

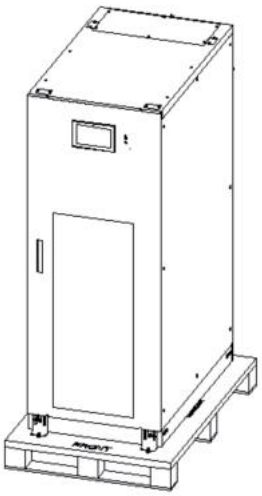


Figure 3-5 remove the protective foam

5) Inspect the UPS for any visible damage that may have occurred during transportation. If any damage is found, please contact the carrier. Verify the UPS against the list of goods. If any items are missing, please contact our company or the local office.

6) Remove the bolts connecting the cabinet to the wooden pallet after disassembly.

7) Move the cabinet to the designated installation location.

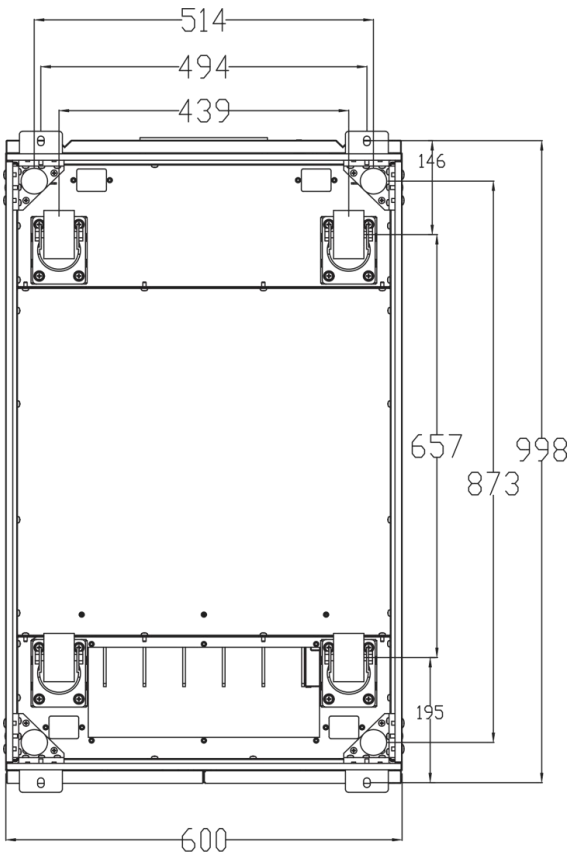
CAUTION

Be careful while moving to avoid damaging the equipment.

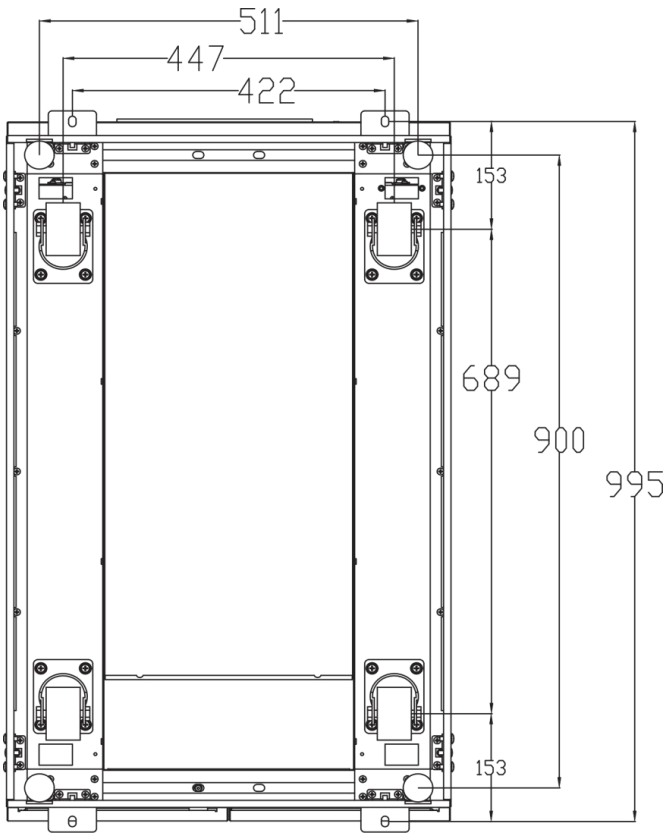
3.3 Positioning

3.3.1 Positioning Cabinet

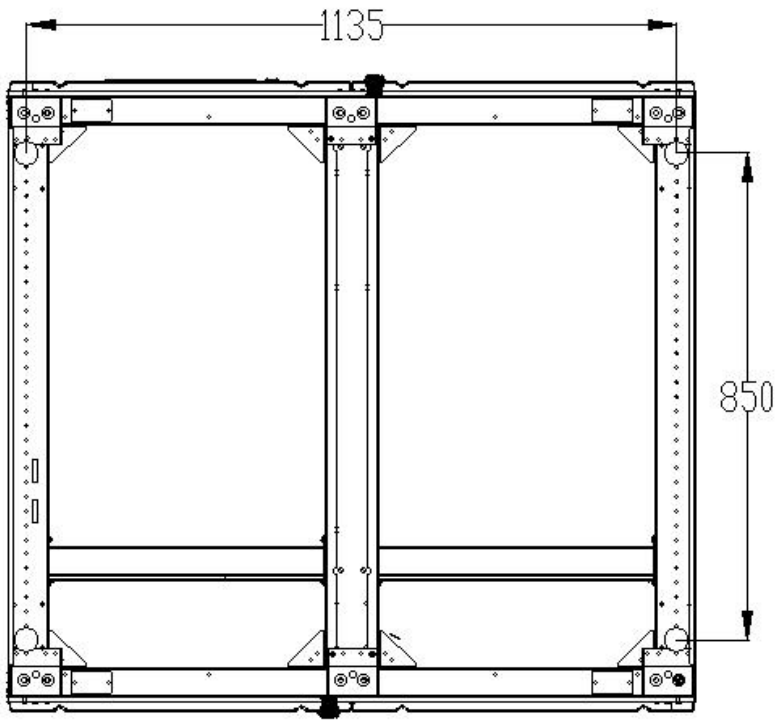
The UPS cabinet has two methods of support: One is temporary support using the four wheels at the bottom, allowing easy adjustment of the cabinet's position. The other is permanent support using anchor bolts after the cabinet's position has been adjusted. The supporting structure is shown in Figure 3-6.



(a) 4-slot cabinet UPS (Bottom View, unit: mm)



(b) 6-slot cabinet UPS (Bottom View, unit: mm)



(c) 10&12-slot cabinet UPS (Bottom View, unit: mm)

Figure 3-6 Supporting structure (Bottom View)

The steps of positioning the cabinet are as follows:

1) Ensure that the supporting structure is in good condition and that the mounting floor is smooth and strong.
2) Retract the anchor bolts by turning them counterclockwise with a wrench, so the cabinet is supported by the four wheels.
3) Adjust the cabinet to the correct position using the supporting wheels.
4) Secure the anchor bolts by turning them clockwise with a wrench, so the cabinet is supported by the four anchor bolts.
5) Ensure that the four anchor bolts are at the same height and that the cabinet is fixed and immovable.

CAUTION

Auxiliary equipment is required when the mounting floor is not solid enough to support the cabinet, as it helps distribute the weight over a larger area. For example, you can cover the floor with an iron plate or increase the supporting area of the anchor bolts.

3.4 Battery

Three terminals (positive, neutral, and negative) are drawn from the battery group and connected to the UPS system. The neutral line is taken from the center of the batteries connected in series (see Figure 3-7).

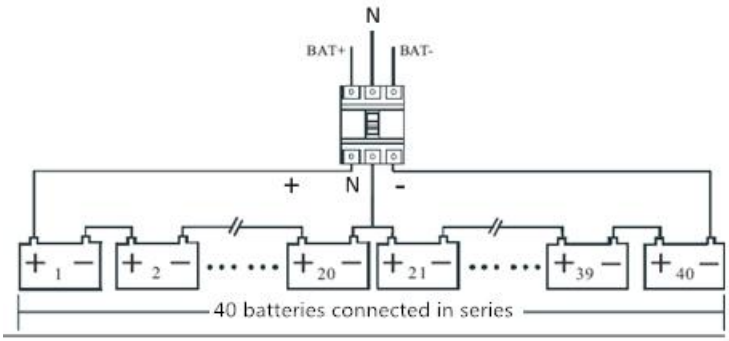


Figure 3-7 Battery string wiring diagram

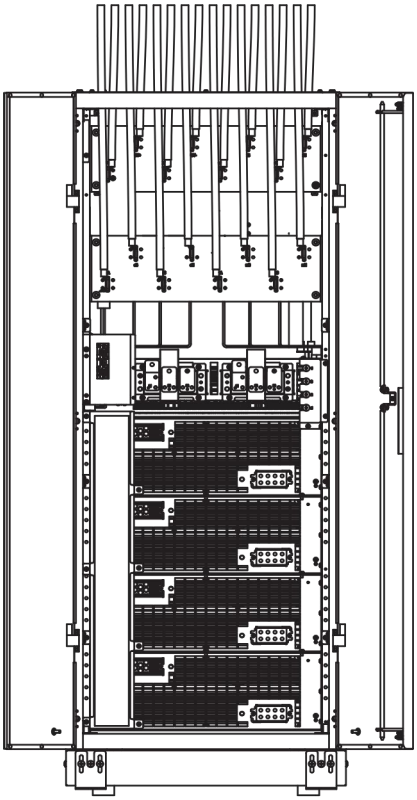
DANGER

The battery terminal voltage is more than 400VDC. Please follow all safety instructions to avoid the risk of electric shock.

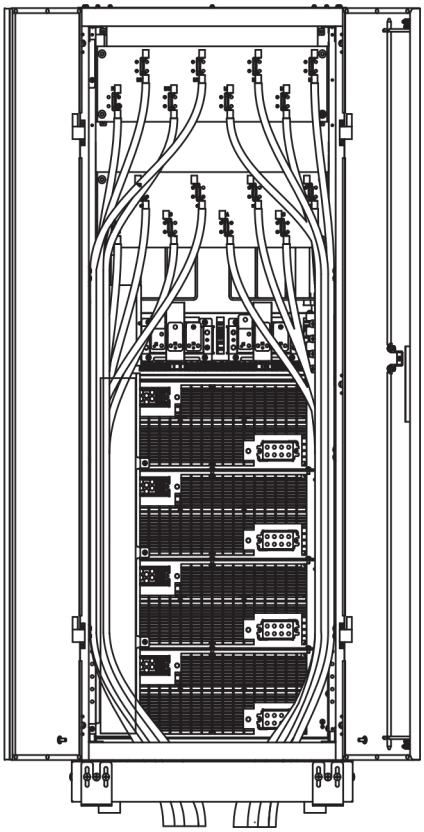
Ensure that the positive, negative, and neutral electrodes are correctly connected from the battery unit terminals to the breaker, and from the breaker to the UPS system.

3.5 Cable Entry

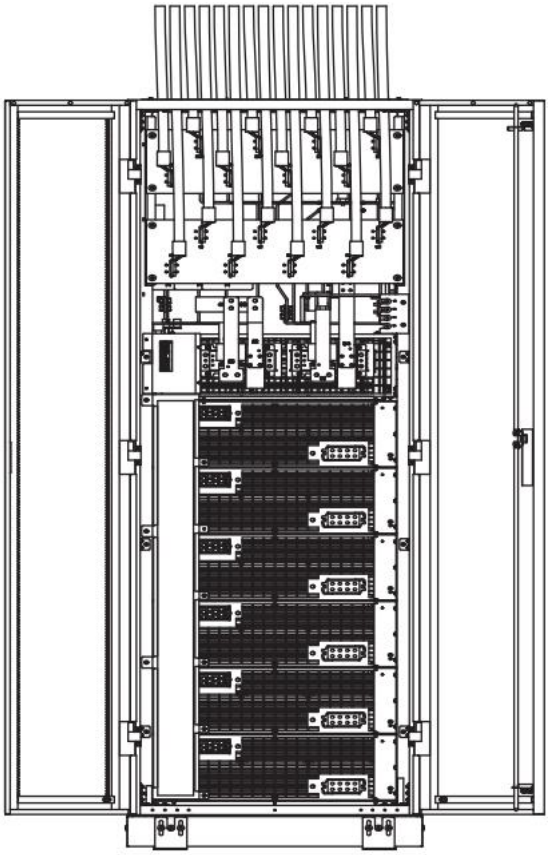
The product supports both top and bottom cable entry. The cable entry configuration is shown in Figure 3-8.



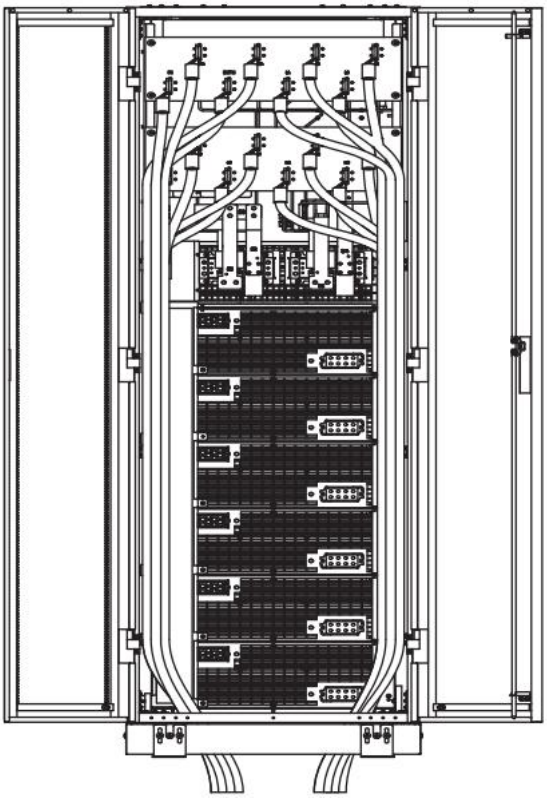
(a)4-slot cabinet top cables entry diagram



(b)4-slot cabinet bottom cables entry diagram

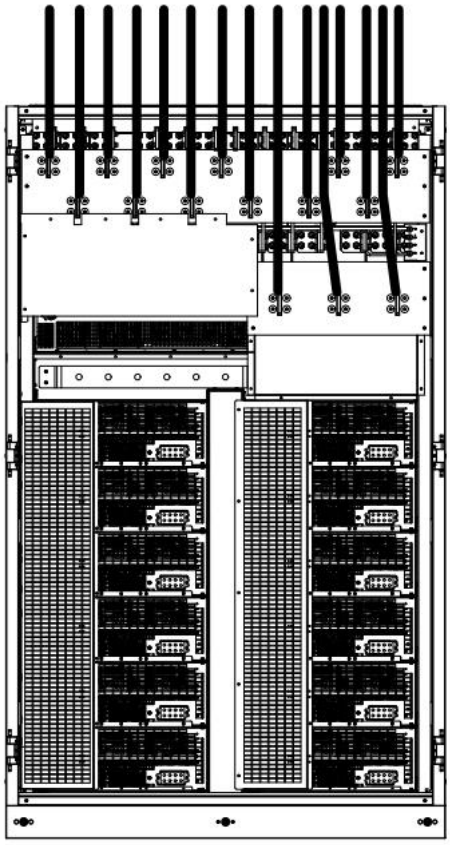


(c)6-slot cabinet top cables entry diagram

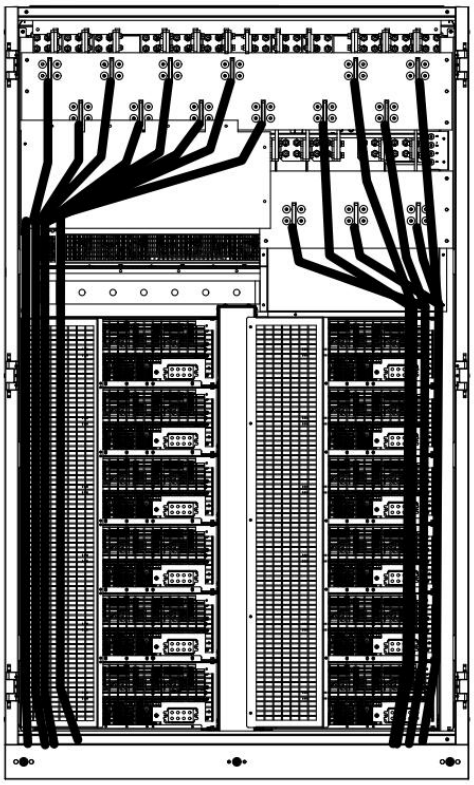


(d)6-slot cabinet bottom cables entry diagram

Figure 3-8 cables entry diagram



(e) 10&12-slot cabinet top cables entry diagram



(f) 10&12-slot cabinet bottom cables entry diagram

3.6 Power Cables

3.6.1 Specifications

The UPS power cables are recommended in Table 3-2.

Table 3-2 Recommended sizes for power cables

Contents			200K	240K	300K	360K	600K
Main Input	Main Input Current(A)		380	456	570	684	1140
	CableSection（mm²）	A	2*95	2*120	2*150	2*185	2*240
		B	2*95	2*120	2*150	2*185	2*240
		C	2*95	2*120	2*150	2*185	2*240
		N	2*95	2*120	2*150	2*185	2*240
Main Output	Main Output Current(A)		304	365	456	547	912
	CableSection（mm²）	A	2*95	2*120	2*150	2*185	2*240
		B	2*95	2*120	2*150	2*185	2*240
		C	2*95	2*120	2*150	2*185	2*240
		N	2*95	2*120	2*150	2*185	2*240
Bypass Input	Bypass Input Current(A)		304	365	456	547	912
	CableSection（mm²）	A	2*95	2*120	2*150	2*185	2*240
		B	2*95	2*120	2*150	2*185	2*240
		C	2*95	2*120	2*150	2*185	2*240
		N	2*95	2*120	2*150	2*185	2*240
Battery Input	Battery Input current(A) (40pcs EOD 1.75V/cell)		476	571	714	857	1428
	CableSection（mm²）	+	2*120	2*120	2*150	2*150	2*240
		-	2*120	2*120	2*150	2*150	2*240
		N	2*120	2*120	2*150	2*150	2*240
PE	CableSection（mm²）	PE	95	120	150	240	2*185

Note

The recommended cable section for power cables are only for the situations described below:

- Ambient temperature: +30℃.
- AC loss is less than 3%, DC loss is less than 1%, the length of the AC power cables should be no longer than 50 meters and the length of the DC power cables should be no longer than 30 meters.
- Currents listed in the table are based on the 380V system (line to line voltage). For 400V system, the current is 0.95 times and for the 415V system the current is 0.92 times.
- The size of neutral lines should be 1.5-1.7 times the value listed above when the predominant load is non-linear.

3.6.2 Specifications for Power Cables Terminal

Specifications for power cables connector are listed as Table 3-3.

Table 3-3 Requirements for power terminal

Type	Port	Connection	Bolt	Torque
4-slot cabinet	Mains input	Cables crimped OT terminal	M10	15Nm
	Bypass Input	Cables crimped OT terminal	M10	15Nm
	Battery Input	Cables crimped OT terminal	M10	15Nm
	Output	Cables crimped OT terminal	M10	15Nm
	PE	Cables crimped OT terminal	M10	15Nm
6-slot cabinet	Mains input	Cables crimped OT terminal	M12	28Nm
	Bypass Input	Cables crimped OT terminal	M12	28Nm
	Battery Input	Cables crimped OT terminal	M12	28Nm
	Output	Cables crimped OT terminal	M12	28Nm
	PE	Cables crimped OT terminal	M12	28Nm
10&12-slot cabinet	Mains input	Cables crimped OT terminal	M16	96Nm
	Bypass Input	Cables crimped OT terminal	M16	96Nm
	Battery Input	Cables crimped OT terminal	M16	96Nm
	Output	Cables crimped OT terminal	M16	96Nm
	PE	Cables crimped OT terminal	M16	96Nm

3.6.3 Circuit Breaker

The external circuit breakers (CB) for the system are recommended in Table 3-4.

Table 3-4 Recommended CB

Installed position	200k	240k	300k	360k	600k
Main input CB	400A/3P	630A/3P	630A/3P	800A/3P	1250A/3P
Bypass input CB	400A/3P	630A/3P	630A/3P	630A/3P	1000A/3P
Output CB	400A/3P	630A/3P	630A/3P	630A/3P	1000A/3P
Manual Bypass CB	400A/3P	630A/3P	630A/3P	630A/3P	1000A/3P

CAUTION

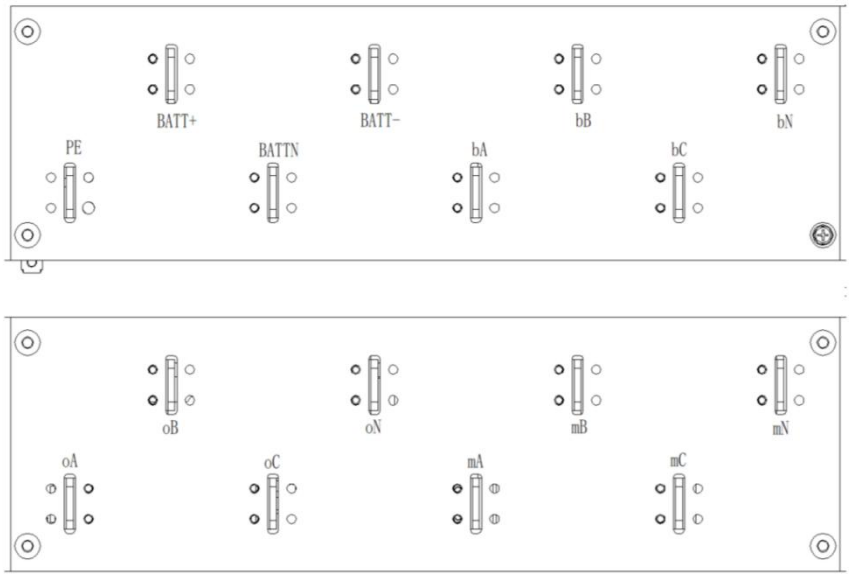
The CB with RCD (Residual Current Device) is not suggested for the system.

3.6.4 Connecting Power Cables

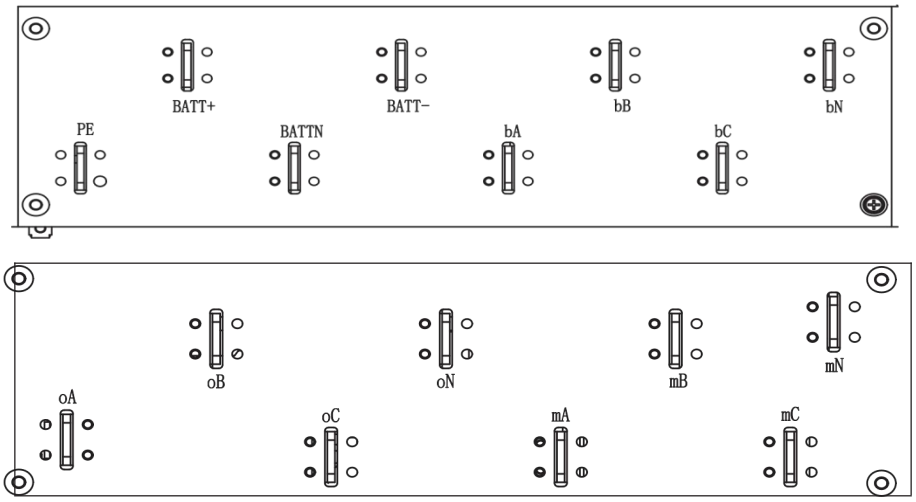
The steps of connecting power cables are as follows:

1) Verify that all the external input distribution switches of the UPS are completely open and the UPS internal maintenance bypass switch is open, Attach necessary warning signs to these switches to prevent unauthorized operation.

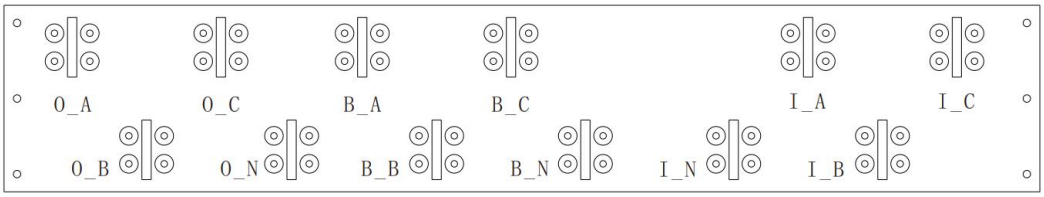
2) Open the back door of the cabinet, remove the metal or plastic cover. The input and output terminal, battery terminal and protective earth terminal are shown in Figure 3-9.

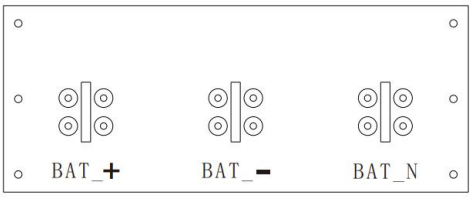


(a) 4-slot cabinet connection terminals diagram



(b) 6-slot cabinet connection terminals diagram





(c) 10&12-slot cabinet connection terminals diagram

Figure 3-9 Connection terminals layout diagram

3) Connect the protective earth wire to protective earth terminal (PE).

4) Connect the AC input supply cables to the main input terminal and AC output supply cables to the output terminal.

5) Connect the battery cables to the battery terminal.

6) Check to ensure there is no mistake and re-install all the protective covers.

CAUTION

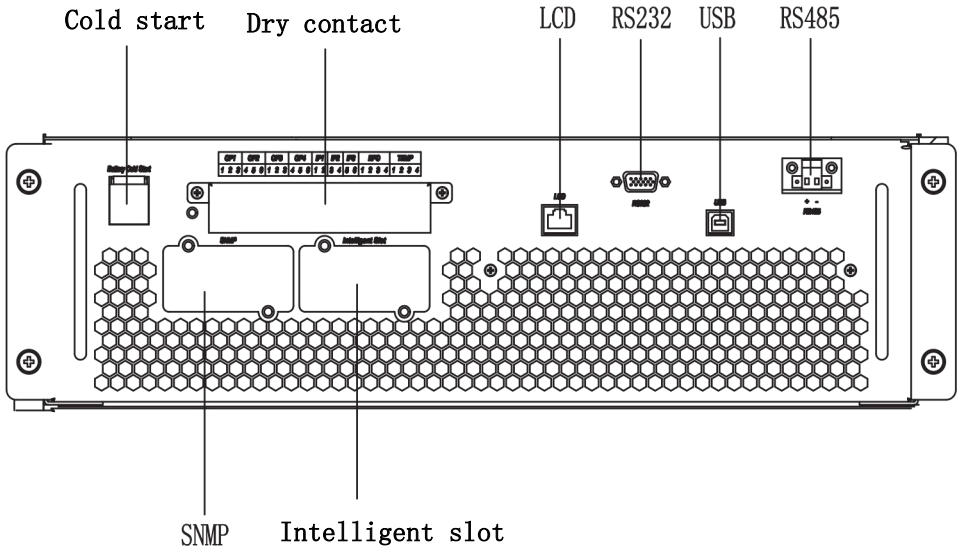
The operations described in this section must be performed by authorized electricians or qualified technical personnel. If you have any difficulty, please contact the manufacturer or the agency.

WARNING

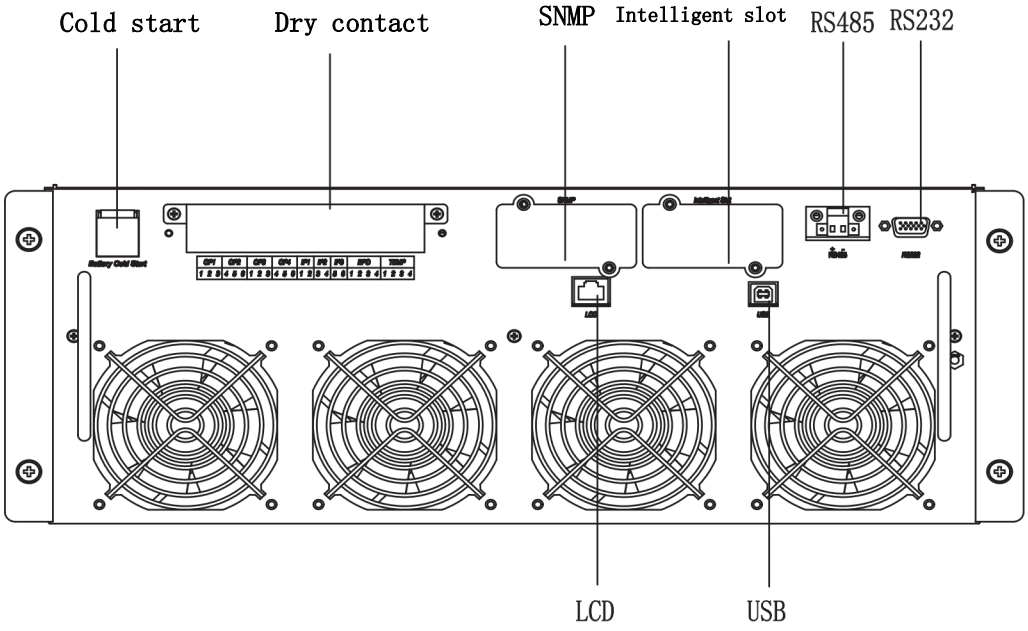
- Tighten the connections terminals to enough torque moment, refer to Table 2-3 and please ensure correct phase rotation.
- Before making the connection, ensure that the input switch and power supply are turned off. Attach warning labels to prevent unauthorized operation.
- The grounding cable and neutral cable must be connected in accordance with local and national codes.

3.7 Control and Communication Cables

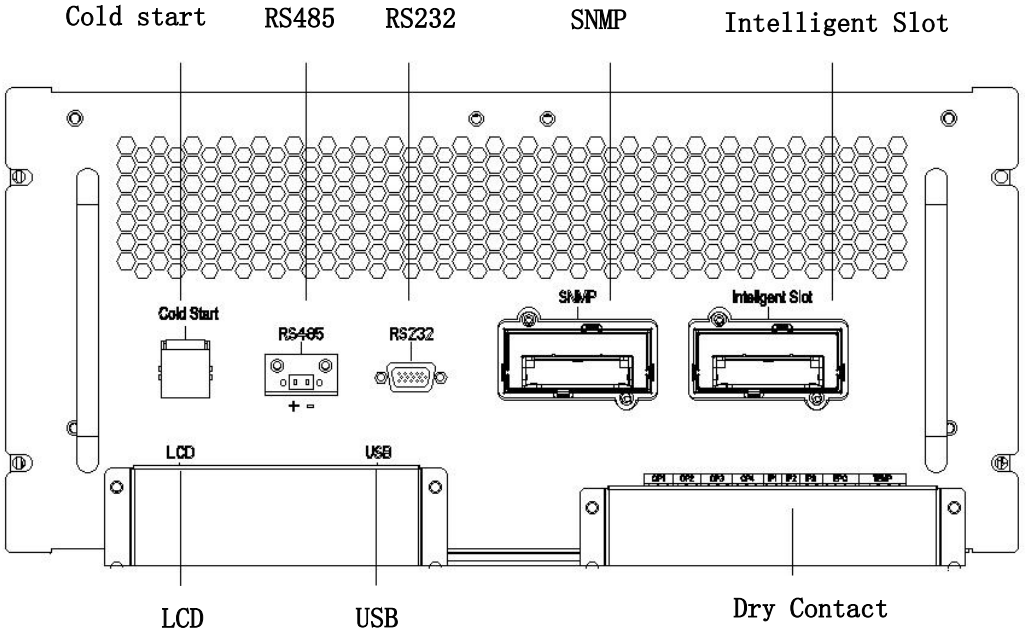
The front panel of the bypass module provides dry contact interface and communication interface (RS232, RS485, SNMP, Intelligent card interface and USB port), as is shown in Figure 3-10.



(a)Communication interface for 4-slot cabinet UPS



(b) Communication interface for 6-slot cabinet UPS



(c)Communication interface for 10&12-slot cabinet UPS

Figure 3-10 Communication interface diagram

The UPS can accept and send dry contact signals through the Phoenix terminal ports. The cables connected to the dry contact terminals must be kept separate from power cables. Additionally, these cables should be double-insulated, with a typical cross-sectional area of 0.5 to 1.5mm², and a maximum connection length of 25 to 50 meters.

3.7.1 Dry Contact Interface

Dry contact always includes 5 sets of interfaces, and the default definitions of these ports are shown in Table 3-5.

Table 3-5 Default Functions of the ports

Port	Name	Function
EPO-1	REMOTE_EPO_NO	Trigger EPO when short- circuited with EPO-2
EPO-2	+24V_DRY	+24V
EPO-3	+24V_DRY	+24V
EPO-4	REMOTE_EPO_NC	Trigger EPO when disconnected with EPO-3
TEMP-1	ENV_TEMP	Detection of environmental temperature
TEMP-2	TEMP_COM	Common terminal for temperature detection
TEMP-3	TEMP_COM	Common terminal for temperature detection
TEMP-4	TEMP_BAT	Detection of battery temperature
IP1-1	BCB_Status	Input dry contact, the function is settable. Default: BCB Status & BCB Online available (when BCB Status is invalid, the alarm make no battery)
IP1-2	GND_DRY	Ground for +24V
IP2-3	BCB_Online	Input dry contact, the function is settable.
IP2-4	GND_DRY	Ground for +24V
IP3-5	GEN_CONNECTED	Input dry contact, the function is settable. Default: Generator input
IP3-6	+24V_DRY	+24V
OP1-1	BAT_LOW_ALARM_NC	Output dry contact(Normally Closed), the function is settable. Default: Battery voltage low.
OP1-2	BAT_LOW_ALARM_NO	Output dry contact(Normally open), the function is settable. Default: Battery voltage low.
OP1-3	BAT_LOW_ALARM_GND	OP1-1 and OP1-2 Common
OP2-4	GENERAL_ALARM_NC	Output dry contact(Normally Closed), the function is settable. Default: General alarm
OP2-5	GENERAL_ALARM_NO	Output dry contact(Normally open), the function is settable. Default: General alarm
OP2-6	GENERAL_ALARM_GND	OP2-4 and OP2-5 Common

OP3-1	UTILITY_FAIL_NC	Output dry contact(Normally Closed), the function is settable. Default: Utility abnormal
OP3-2	UTILITY_FAIL_NO	Output dry contact(Normally open), the function is settable. Default: Utility abnormal
OP3-3	UTILITY_FAIL_GND	OP3-1 and OP3-2 Common
OP4-4	BCB Drive	Output dry contact, the function is settable. Default：Battery BCB (In the EOD or EPO available)
OP4-5	GND_DRY	Ground for +24V
OP4-6	+24V_DRY	+24V

Note

The dry contact ports can be programmed through our background monitor software.

Remote EPO Input Port

EPO1-4 is the input port for remote EPO. It requires connecting NC (EPO-4) and +24V (EPO-3) and disconnecting NO (EPO-1) and +24V (EPO-2) during normal operations, and EPO is triggered when disconnecting NC (EPO-4) and +24V (EPO-3), or connecting NO (EPO-1) and +24V (EPO-2). The port diagram is shown in Figure 3-11, and the port description is shown in Table 3-6.

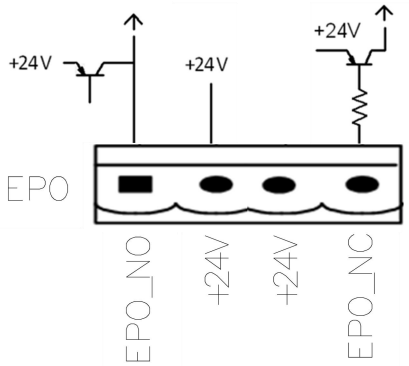


Figure 3-11 Diagram of input port for remote EPO

Table 3-6 Description of input port for remote EPO

Port	Name	Function
EPO-1	REMOTE_EPO_NO	Trigger EPO when connect with EPO-2
EPO-2	+24V_DRY	+24V
EPO-3	+24V_DRY	+24V
EPO-4	REMOTE_EPO_NC	Trigger EPO when disconnect with EPO-3

Note

EPO-1 and EPO-2 must be disconnected in normal operations.

Interface of Battery and Environmental Temperature Detection

The input dry contact can detect the temperature of the batteries and the environment separately, and can be used for environmental monitoring and battery temperature compensation. The interface diagram for TEMP_1-4 is shown in Figure 3-12, with the interface description provided in Table 3-7.

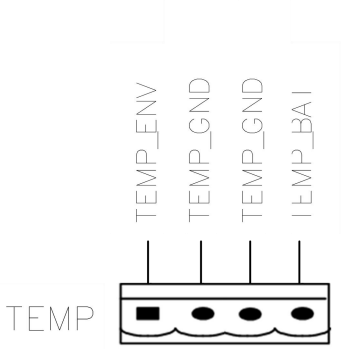


Figure 3-12 TEMP 1-4 for temperature detecting

Table 3-7 Description of TEMP 1-4

Port	Name	Function
TEMP-1	ENV_TEMP	Detection of battery temperature
TEMP-2	TEMP_COM	common terminal
TEMP-3	TEMP_COM	common terminal
TEMP-4	TEMP_BAT	Detection of environmental temperature

Note

A specified temperature sensor is required for temperature detection. This is optional, so please confirm with the manufacturer or local agency before placing the order.

Generator Input Dry Contact

The default function of IP3 5-6 is the interface for generator input, when connecting IP3-5 with +24V (IP3-6), the UPS judges the generator has been connected in the system. The port diagram is shown in Figure 3-13, the port description is shown in Table 3-8.

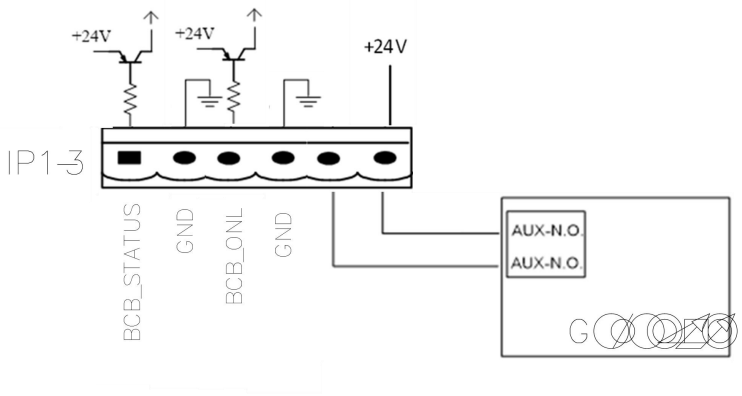


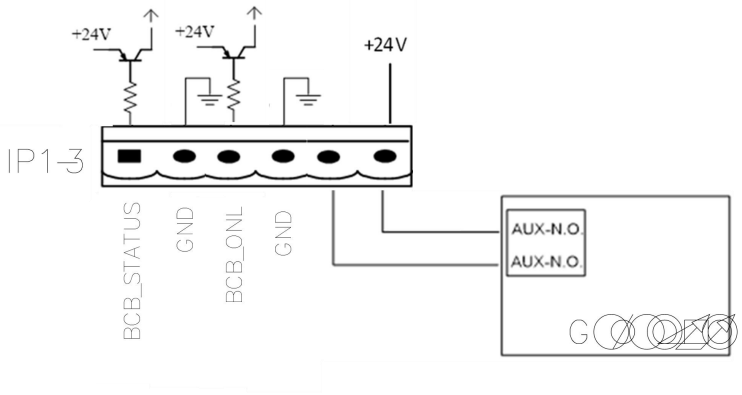
Figure 3-13 Diagram of input port for generator input

Table 3-8 Description of input port for generator input

Port	Name	Function
IP3-5	GEN_CONNECTED	Default: Generator input dry contact.
IP3-6	+24V_DRY	+24V

BCB Input Port

The default functions of OP4-4 and OP4-6 are for BCB tripping and BCB status monitoring. Connect OP4-4 and OP4-6 to the BCB tripper. OP4-4 can provide a driver signal (+24VDC, 100mA) to trip the battery circuit breaker (BCB) when the EPO is triggered or the EOD (end of discharge) occurs. The UPS detects the BCB status: when the BCB is closed, it indicates the batteries are connected; when open, it triggers an alarm for disconnected batteries. The port diagram is shown in Figure 3-14, and the description is provided in Table 3-9.



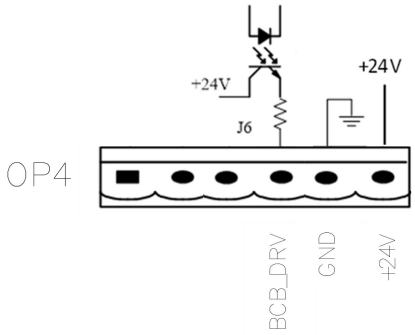


Figure 3-14 BCB Port

Table 3-9 Description of BCB port

Port	Name	Function
IP1-1	BCB_Status	BCB contact status, connect with the normally open signal of BCB
IP1-2	GND_DRY	Ground for +24V
IP2-3	BCB_Online	BCB contact status, connect with the normally open signal of BCB
IP2-4	GND_DRY	Ground for +24
OP4-4	BCB_Drive	BCB trip signal output, +24V, maximum support of 100mA
OP4-5	GND_DRY	Ground for +24V
OP4-6	+24V_DRY	+24V

Battery Warning Output Dry Contact Interface

The default function of OP1-1, OP1-2, and OP1-3 is the output dry contact interface for the battery voltage low alarm. When the battery voltage drops below the set threshold, an auxiliary dry contact signal is activated via the relay. Before the UPS triggers the 'Battery Voltage Low' alarm, OP1-1 and OP1-3 are connected by the relay, while OP1-2 and OP1-3 are disconnected. When the UPS alarms 'Battery Voltage Low,' OP1-1 and OP1-3 are disconnected by the relay, and OP1-2 and OP1-3 are connected.
The port diagram is shown in Figure 3-15, and the description is shown in Table 3-10.

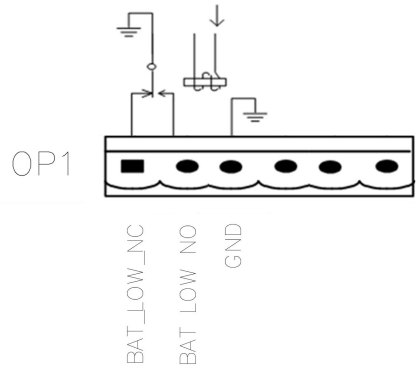


Figure 3-15 Battery warning output dry contact interface diagram

Table 3-7 Battery warning output dry contact interface description

Port	Name	Function
OP1-1	BAT_LOW_ALARM_NC	Battery warning relay (normally closed) will be open during warning
OP1-2	BAT_LOW_ALARM_NO	Battery warning relay (normally open) will be closed during warning
OP1-3	BAT_LOW_ALARM_GND	Common terminal

General Alarm Output Dry Contact Interface

The default function of OP2 is the general alarm output dry contact interface. When one or more warnings are triggered, an auxiliary dry contact signal is activated via the relay isolation. The port diagram is shown in Figure 3-16, and the description is provided in Table 3-19.

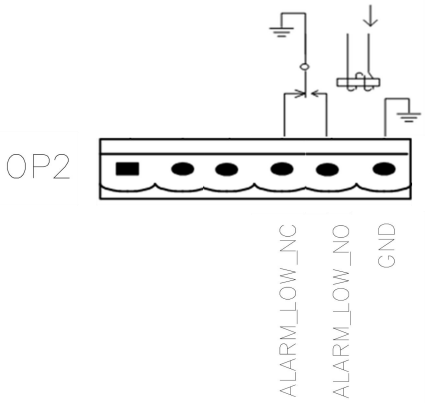


Figure 3-16 General alarm dry contact interface diagram

Table 3-8 General alarm dry contact interface description

Port	Name	Function
OP2-4	GENERAL_ALARM_NC	Integrated warning relay (normally closed) will be open during warning
OP2-5	GENERAL_ALARM_NO	Integrated warning relay (normally open) will be closed during warning
OP2-6	GENERAL_ALARM_GND	Common terminal

Utility Fail Warning Output Dry Contact Interface

The default function of OP3 is the output dry contact interface for utility failure warning. When the utility fails, the system will send a utility failure warning and provide an auxiliary dry contact signal via the relay isolation. The interface diagram is shown in Figure 3-17, and the description is provided in Table 3-9.

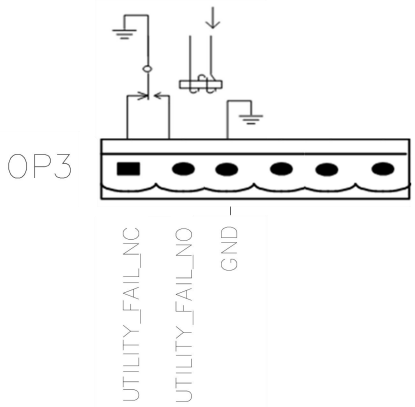


Figure 3-17 Utility failure warning dry contact interface diagram

Table 3-9 Utility failure warning dry contact interface description

Port	Name	Function
OP3-1	UTILITY_FAIL_NC	Mains failure warning relay(normally closed) will be open during warning
OP3-2	UTILITY_FAIL_NO	Mains failure warning relay (normally open) will be closed during warning
OP3-3	UTILITY_FAIL_GND	Common terminal

3.7.2 Communication Interface

RS232, RS485, and USB ports provide serial data, which can be used for commissioning and maintenance by authorized engineers, or for networking and integration with the monitoring system in the service room.

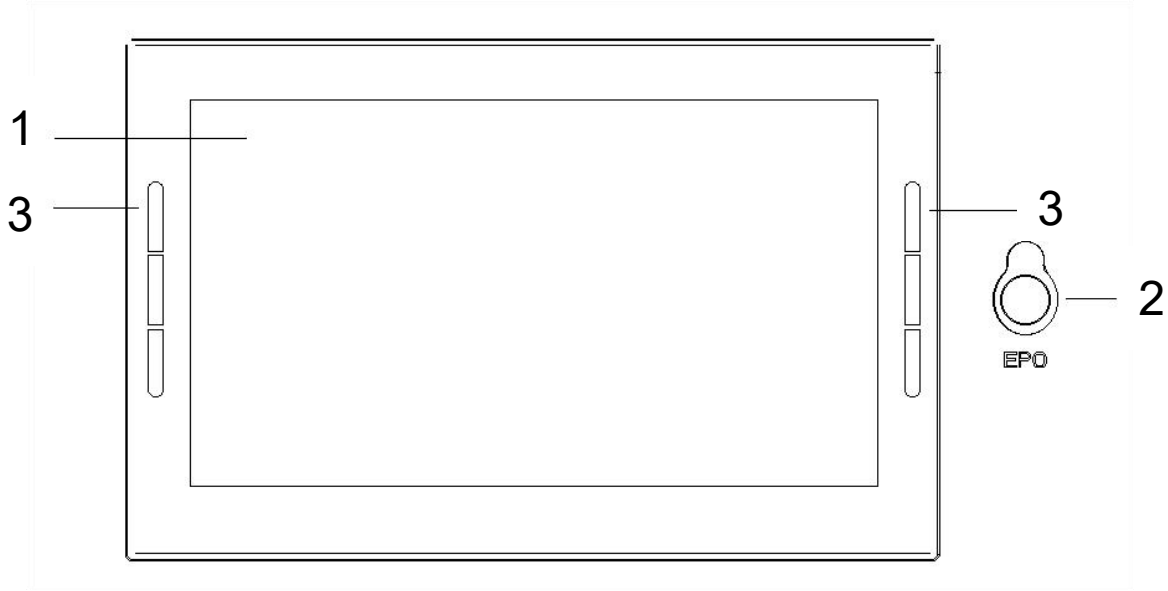
SNMP card: Used on-site for communication (optional).

Intelligent card: Used to extend the dry contact interface (optional).

4 UPS Control LCD Panel

4.1 UPS LCD Panel

The LCD panel of the cabinet is divided into three functional areas: the LED indicator, control and operation keys, and the LCD touch screen.
The structure of operator control and display panel for cabinet is shown in Figure 4-1.



1: LCD touch screen 2: EPO switch 3: Status indicator

Figure 4-1 Control and display panel for cabinet

4.1.1 LED Indicator

There LED on the panel to indicate the operating status and fault. The description of indicators is shown in Table 4-1.

Table 4-1 Status description of indicator

Indicator	State	Description
Status indicator	Green	Normal operation
	Red	Fault alarm
	Yellow	Warning alarm

There are two different types of audible alarm during UPS operation, as shown in Table 4-2.

Table 4-2 Description of audible alarm

Alarm	Description
Two short alarm with a long one	when system has general alarm (for example: AC fault),

Continuous alarm	When system has serious faults (for example: fuse blown or hardware failure)

4.1.2 Control and Operation Keys

Control and operation keys mainly include emergency power off (EPO). The function description is shown in Table 4-3.

Table 4-3 Functions of control and operation keys

Function Key	Description
EPO	Long press， cut off the load power (shut down the rectifier, inverter, static bypass and battery)

CAUTION

When bypass frequency is over track, there is interruption time(less than 10ms) for transferring from bypass to inverter.

4.1.3 LCD Touch Screen

Users can easily browse information, control the UPS, and set parameters through the LCD touch screen, providing a user-friendly experience.

After the monitoring system completes the self-test, the system will enter the home page, following the welcome window. The home page is shown in Figure 4-2.

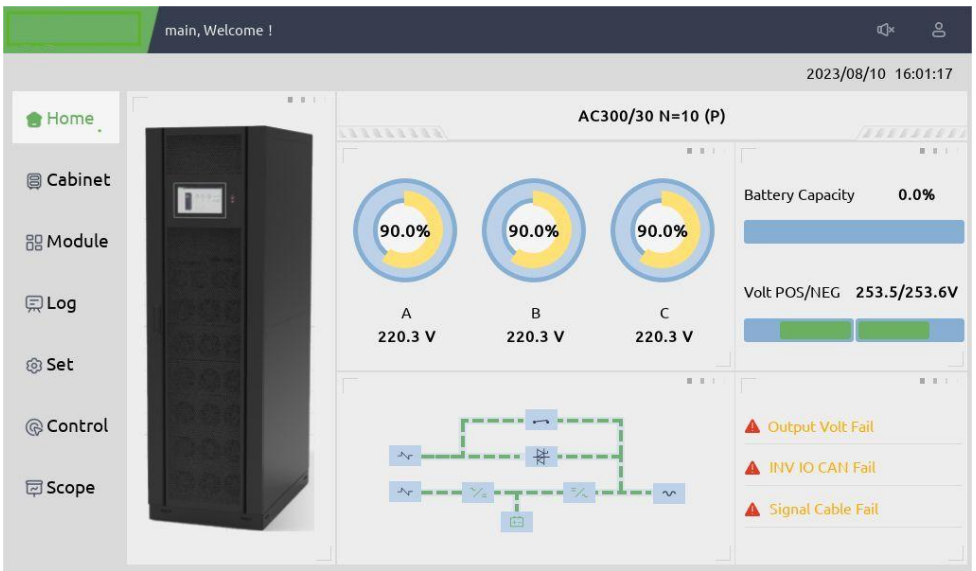


Figure 4-2 Home page

Home page consists of Status bar, Information display, warning information, and main menu.

- Status Bar

The status bar contains the product, capacity, operational mode, and the number of the power module and the time of the system.

- Warning Information

Display the warning information of the cabinet. The red indicates a serious alarm, while orange indicates a general alarm.

- Information Display

Users can check the information of the cabinet in this area.

The bypass voltage, main input voltage, battery voltage, and output voltages are presented in the form of gauge. The energy flow mimics the flow of the power.

- Main Menu

The main menu includes Cabinet, Module, Setting, Log, Control and Scope. Users can operate and control the UPS, and browse all measured parameters through main menu.

The structure of the main menu tree is shown in Figure 4-3.

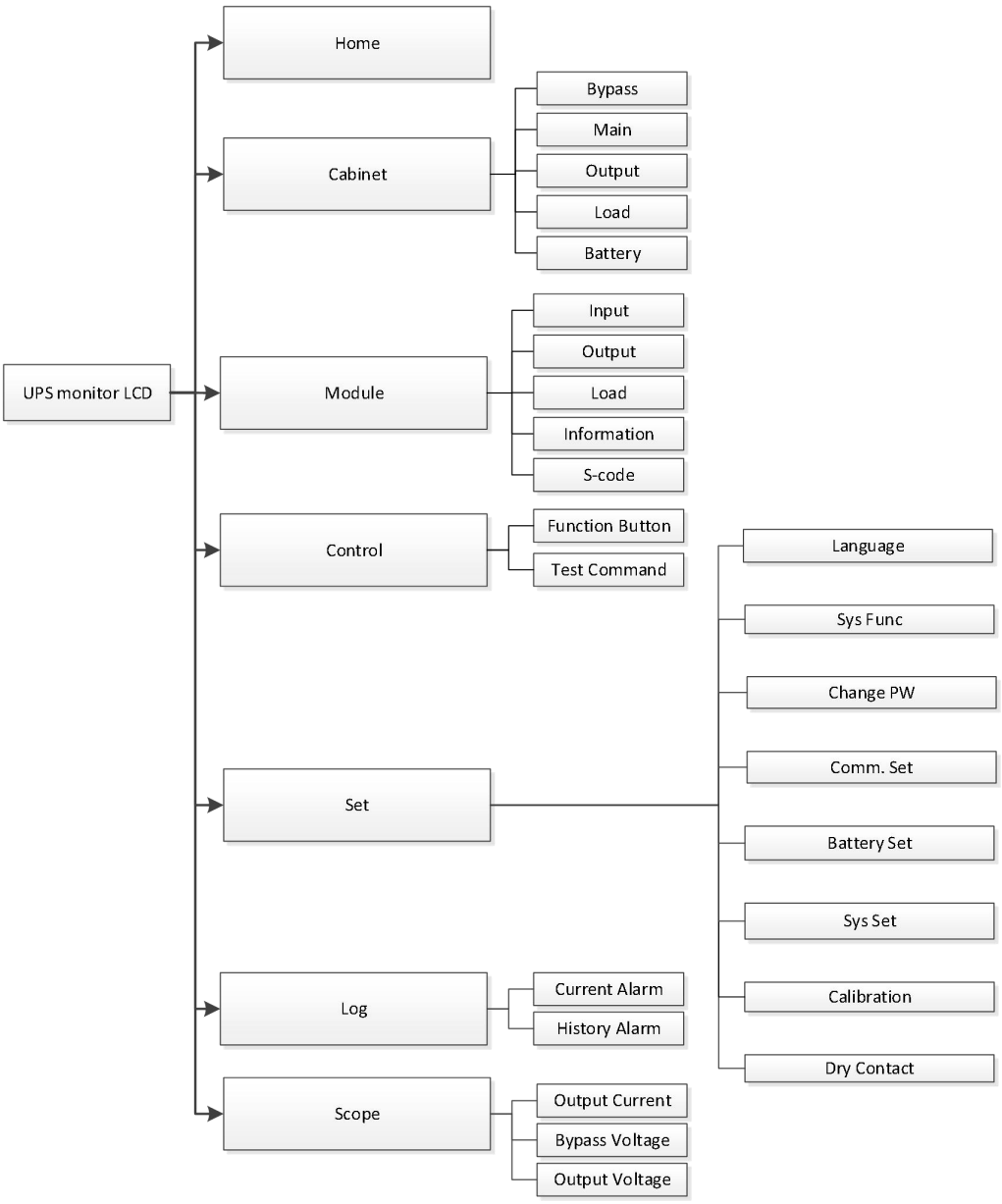


Figure 4-3 Structure of menu diagram

4.2 Main Menu

The main menu includes Cabinet, Module, Setting, Log, Control and Scope, and it is described in details below.

4.2.1 User Login

Click on the icon in the upper right corner of the homepage to enter the user login interface, as shown in Figure 4-4. Enter the authorized account and password to log in to the system and perform corresponding permission operations.

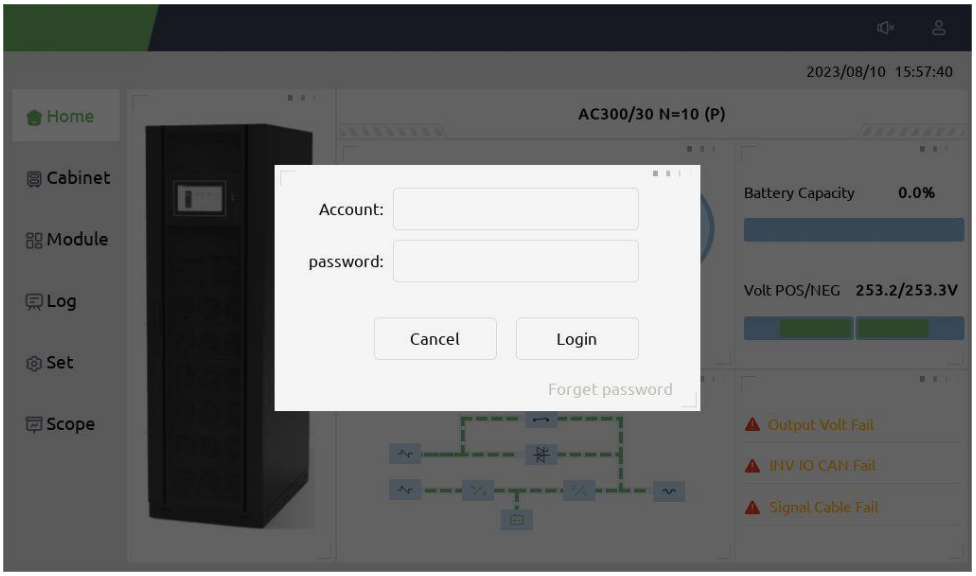


Figure 4-4 Login page

4.2.2 Cabinet Menu

Touch the icon Cabinet (at the left of the screen), and the system enters the page of the cabinet menu, as it is shown in Figure 4-5.

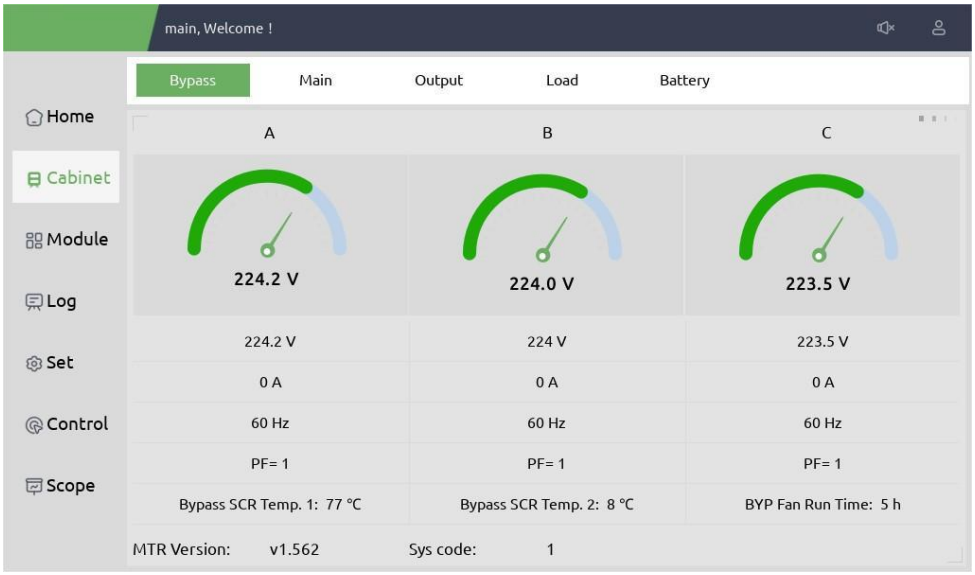


Figure 4-5 Cabinet menu

The cabinet menu interface primarily consists of submenus for bypass, main input, output, load, and battery. Each submenu displays detection information for the respective component of the cabinet. The details of the cabinet submenus are provided in Table 4-4 below.

Menu information can be displayed on the next page through the flip icon 1/2 in the bottom right corner.

Table 4-4 Description of each sub-menu 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 group
	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
	Remain Time（Min）	Remaining battery backup time

Sub-menu	Contents	Meaning
	Battery Temp.(℃)	Battery temperature
	Ambient Temp.(℃)	Environmental temperature

4.2.3 Module Menu

Touch the icon Module (At the left of the screen), and the system enters the page of the Module menu, as is shown in Figure 4-6.

Figure 4-6 Module menu

The power module mainly menu interface includes Input, Output, Load, INFO and S-CODE etc sub-menu.

- **Power module information**

(1) Power module number, automatically displaying the power module code based on different cabinet settings;

(2) Whether the power module is inserted and selected;

(3) The operating status of the power module is as follows:

(a) The green box indicates the current module being selected for viewing.

(b) The black box indicates that the power module has been connected to the system and displays the current status.

(c) If no module is displayed in the corresponding box, it means that no module has been detected in the slot.

(d) The status indicator lights on the right side of the module indicate the status of the input, output, and battery, with green indicating normal and red indicating abnormal.

- **Version Information**

Display the version information of rectifier and inverter for the selected module.

The sub-menus of Module are described below in details in Table 4-5.

Table 4-5 Description of each sub-menu of Module

Sub-menu Name	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
	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 IGBRT temperature of the phase A/B/C
S-code	Fault Code	For the maintenance personnel

4.2.4 Set Menu

Touch the icon

(At the left of the screen), and the system enters the page of the Setting, as is shown in Figure 4-7.

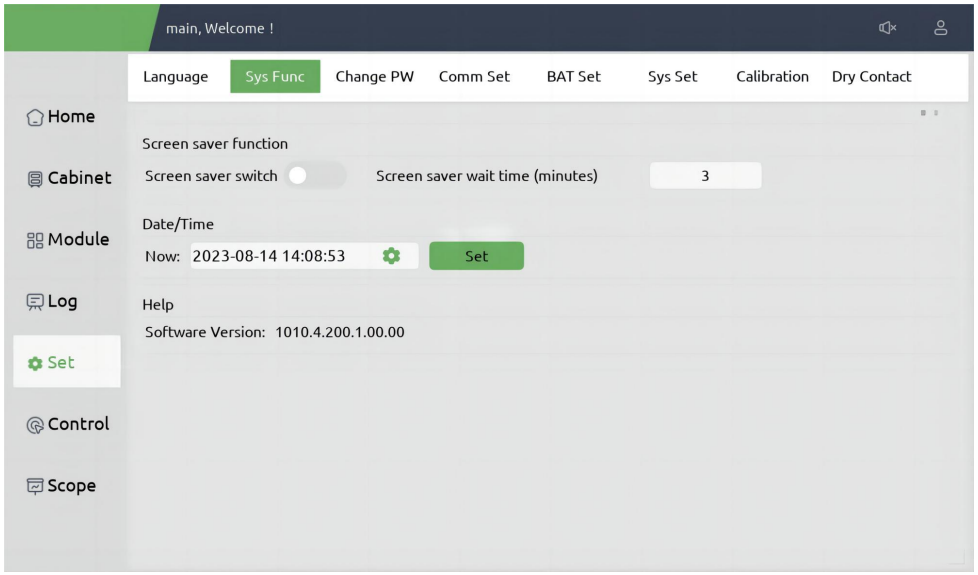


Figure 4-7 Setting menu

Under the setting menu, there are the following grading sub-menus, which are language setting, system function, change password, communication setting, battery setting, system setting, calibration function and dry contact setting.

The setup subordinate sub-menu is shown in Table 4-6.

Table 4-6 Description of each sub-menu of Setting Menu

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
Change PW	Change password	Change the user login password
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 Number	Setting the number of the battery（12V）
	Battery Capacity	Setting of the AH of the battery
	Float Charge Voltage/Cell	Setting the floating Voltage for battery cell (2V)

Battery Set	Boost Charge Voltage/Cell	Setting the boost Voltage for battery cell (2V)
	EOD Voltage（0.6C）	EOD voltage for cell battery,@0.6C current
	EOD Voltage（0.15C）	EOD voltage for cell battery,@0.15C current
	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
	United 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

1. Improper parameter settings may affect product performance, please ensure that operators receive appropriate training and authorization.
2. The C set for the battery is the ampere hour of the battery. If it is a 100AH battery, then C=100A.
3. Setting up projects may vary depending on different user permissions. If you have any questions, please contact the manufacturer.

WARNING

Ensure that the number of batteries, as set via the menu or monitoring software, exactly matches the actual number installed. Any discrepancy may result in serious damage to the batteries or equipment.

4.2.5 Log Menu

Click the icon on the left side of the LCD screen to access the Log menu, where events are recorded by time. It displays various events and alarm information that have occurred in the system, along with the time they were set and cleared. The logging menu is divided into two sections: current alarms and historical alarms.
The Home screen is shown in Figure 4-8 below.

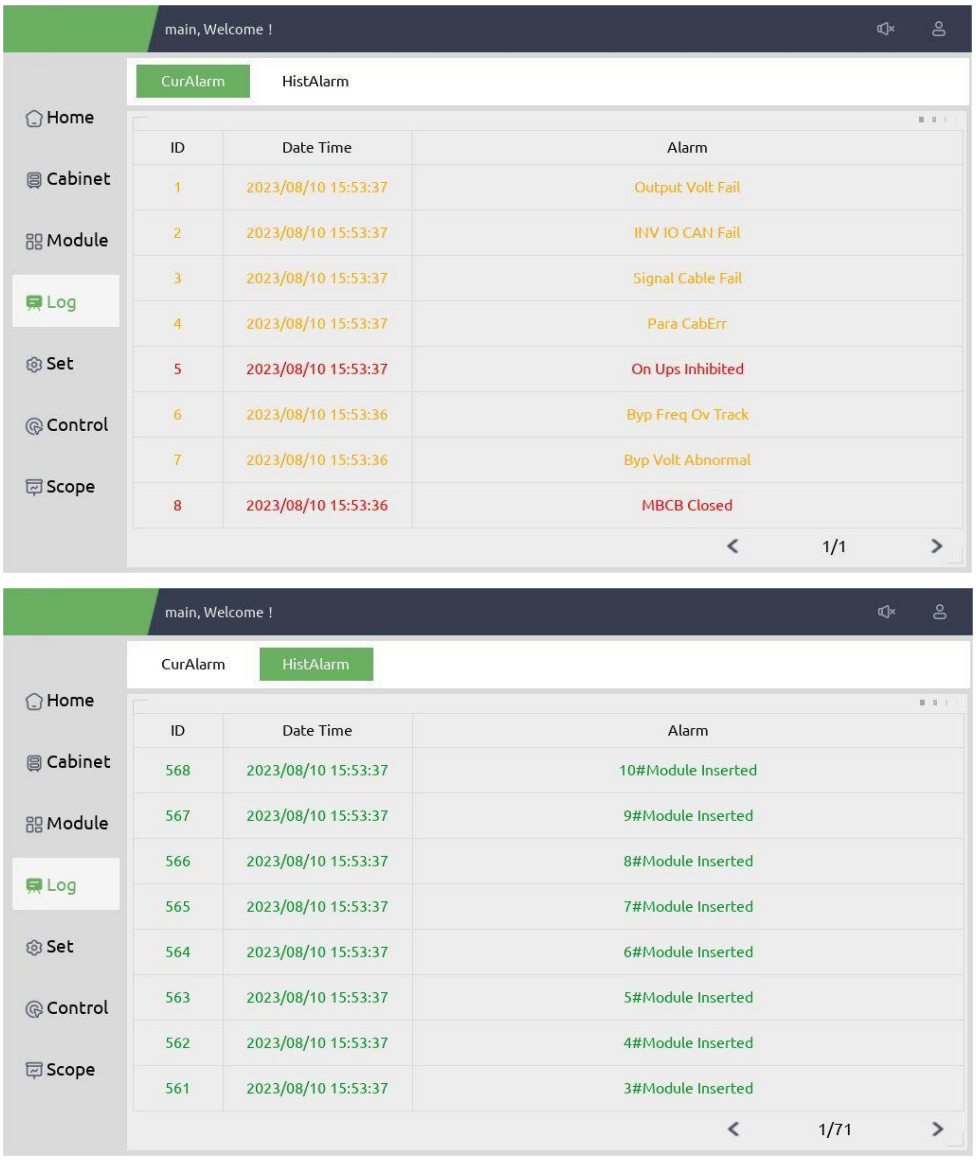


Figure 4-8 Log menu

The Table 4-7 below displays all the events and gives a brief explanation

Table 4-7 the list for events

Event	Describe
Load On UPS	The system is in a normal inverter power supply state

Event	Describe
Load On Bypass	The system is in a bypass power state
UPS no output	The system has no output
Battery Boost	The battery is in Boost charging state
Battery Float	The battery is in Floating charging state
Battery Discharge	The system operates in a battery discharge state
Battery Connected	Battery connect to the UPS
Battery Not Connected	The battery is not connected
Maintenance CB Closed	Maintenance breaker is turn on
Maintenance CB Open	Maintenance breaker is turn off
EPO	Emergency power off
EPO -Disappear	Emergency power off release
Generator Input	External generator access
Generator Input -Disappear	Disconnect the external generator
Utility Abnormal	The input mains power supply is abnormal
Utility Abnormal -Disappear	Mains power returned to normal
Bypass Sequence Error	The bypass phase sequence connect error
Bypass Sequence Error -Disappear	The bypass phase sequence connect returns to normal
Bypass Volt Abnormal	The bypass voltage is abnormal
Bypass Volt Abnormal -Disappear	The bypass voltage returns to normal
Bypass Module Fail	The bypass fails
Bypass Module Fail -Disappear	The bypass returns to normal
Bypass Overload	The bypass output is overloaded
Bypass Overload -Disappear	The bypass output returns to normal
Bypass Over Load Tout	The bypass overload status continues and the overload times out.
Bypass Over Load Tout -Disappear	The bypass overload status -Disappears
Byp Freq Over Track	The bypass frequency is out of tracking range

Event	Describe
Byp Freq Over Track -Disappear	The bypass frequency return to the tracking range
Exceed Tx Times Lmt	More than 5 switching times between bypass and inverter in the last hour
Exceed Tx Times Lmt -Disappear	-Disappear the number of switchovers
Output Short Circuit	The system output is short-circuited
Output Short Circuit -Disappear	The system output short circuit -Disappears
Battery EOD	The battery voltage reaches the battery shutdown point
Battery EOD -Disappear	The battery voltage returns above the battery shutdown point
Battery Test	The system enters battery self-test mode
Battery Test OK	The system self-test battery is normal
Battery Test failed	The system self-detects a problem with the battery
Battery Maintenance	The system is in battery maintenance state
Battery Maintenance OK	Battery maintenance status complete
Battery Maintenance failed	The battery maintenance process did not complete properly
Stop Test	The battery self-test or battery maintenance status stops
Fault Clear	-Disappears the failure
Log Clear	Delete all history
N#Module inserted	The N# module joins the system
N#Module Exit	The N# module exits the system
N#Rectifier Fail	The N# module rectifier has failed
N#Rectifier Fail -Disappear	N# module rectifier fault dispear
N#Inverter Fail	The N# module inverter has failed
N#Inverter Fail -Disappear	N# module inverter fault -Disappear
N#Rectifier Over Temp	N# The module rectifier is over-temperature
N#Rectifier Over Temp	N# module rectifier over-temperature

Event	Describe
-Disappear	
N#Fan Fail	The N# module fan is faulty, not connected or stalled
N#Fan Fail -Disappear	The N# fan returns to normal
N#Output Over load	The N# module output is overloaded
N#Output Over load -Disappear	N# module output overload dispear
N#Inverter Overload Tout	The N# module output is overloaded with a timeout
N#Inverter Overload Tout -Disappear	The N# module output overloaded timeout dispear
N#Inverter Over Temp	The inverter of the N# module is overheated
N#Inverter Over Temp -Disappear	The over temperature of the N# module inverter -Disappears
On UPS Inhibited	The inverter prohibits power supply
On UPS Inhibited -Disappear	The inverter forbidden -Disappear
Manual Transfer Byp	Manually transfer the system to the bypass
Esc Manual Transfer Byp	Manually transfer the system to the normal
Battery Volt Low	The battery voltage low
Battery Volt Low -Disappear	The battery voltage returns to normal
Battery Wiring Error	The battery cables connect reverse
Battery Wiring Error -Disappear	The battery cables connect normal
N#Inverter Protect	The N# module has inverter protection
N#Inverter Protect -Disappear	The N# module has inverter protection -Disappear
Input Neutral Lost	Input N line disconnect
Bypass Fan Fail	The bypass module fan fault
Bypass Fan Fail -Disappear	The bypass module fan fault -Disappear
N#Manual Shutdown	The N# module shuts down manually
Manual Boost Charge	Manually adjust to the boost charging
Manual Float Charge	Manually adjust to the floating charge

Event	Describe
UPS Locked	UPS lock shutdown occurs
Parallel Cable Error	The parallel cable connect fail
Parallel Cable Error -Disappear	The parallel cable connect normal
N#Battery or Charger Fail	The N# module has battery or charger fail
N#Battery or Charger Fail -Disappear	The N# module has battery or charger fail -Disappear
N+X Redundant Lost	The cabinet lost N+X redundant function
N+X Redundant Lost -Disappear	The cabinet recover N+X redundant function
EOD System Inhibited	
EOD System Inhibited -Disappear	
Signal Cable Fail	The signal cables connect fail
Signal Cable Fail -Disappear	The signal cables connect returns to normal
Ambient Over Temp.	The battery ambient temperature over setting range
Ambient Over Temp. -Disappear	The battery ambient temperature less setting range
REC CAN Fail	The monitor unit rectifier CAN signal abnormal
REC CAN Fail -Disappear	The monitor unit rectifier CAN signal returns to normal
INV IO CAN Fail	The monitor unit inverter CAN signal abnormal
INV IO CAN Fail -Disappear	The monitor unit inverter CAN signal returns to normal
INV DATA CAN Fail	The monitor unit inverter CAN data abnormal
INV DATA CAN Fail -Disappear	The monitor unit inverter CAN data returns to normal
N#Power Share Fail	The difference of two or more power modules' output current in system is over limitation
N#Power Share Fail -Disappear	Output current difference returns to normal
Sync Pulse Fail	The synchronization signal of each module is abnormal

Event	Describe
Sync Pulse Fail -Disappear	The synchronization signal of each module returns to normal
N#Input Volt Detect Fail	The N# module input voltage value is abnormal
N#Input Volt Detect Fail -Disappear	The N# module input voltage value returns to normal
N#Battery Volt Detect Fail	The N# module battery voltage value is abnormal
N#Battery Volt Detect Fail -Disappear	The N#module battery voltage was detected to return to normal
N#Output Volt Detect Fail	The N# module output voltage value is abnormal
N#Output Volt Detect Fail -Disappear	The N# module input voltage value returns to normal
N#Bypass Volt Detect Fail	The N# module bypass voltage value is abnormal
N#Bypass Volt Detect Fail -Disappear	The N# module bypass voltage value returns to normal
N#INV Bridge Fail	The N# module inverter is faulty
N#INV Bridge Fail -Disappear	The N# module inverter faulty -Disappears
N#Outlet Temp. Error	The N# module outlet temperature is not within the set range
N#Outlet Temp. Error -Disappear	The N# module outlet temperature returns to the normal range
N#Input Curr Unbalance	There is a difference in the three-phase input current of the N# module
N#Input Curr Unbalance -Disappear	The N# module input current returns to normal
N#DC Bus Over Volt	The N# module bus voltage is overvoltage
N#DC Bus Over Volt -Disappear	The N# module bus voltage returns to normal
N#REC Soft Start Fail	The N# module rectifier could not be started
N#REC Soft Start Fail -Disappear	The N# module rectifier returned to normal

Event	Describe
N#Relay Connect Fail	The N# module inverter relay is open
N#Relay Connect Fail -Disappear	The N# module relay is closed
N#Relay Short Circuit	The N# module inverter switch is short-circuited
N#Relay Short Circuit -Disappear	The N# module inverter switch is short-circuited returns to normal
N#PWM Sync Fail	The rectifier and inverter PWM synchronization signals are abnormal
N#PWM Sync Fail -Disappear	The rectifier and inverter PWM synchronization signals return to normal
N#Intelligent Sleep	The N# module system enters Smart Sleep
N#Intelligent Sleep -Disappear	The N# module exit Smart Sleep
Manual Transfer to INV	Manually switch to inverter
N#Input current limit Tout	The N# module input current limit time is up
N#Input current limit Tout -Disappear	The N# module input current limit time -Disappears
N#No Inlet Temp. Sensor	The N# module air inlet temperature probe is not connected or disconnected
N#No Inlet Temp. Sensor -Disappear	The N# module inlet temperature probe returns to normal
N#No Outlet Temp. Sensor	The N# module outlet temperature probe is not connected or disconnected
N#No Outlet Temp. Sensor -Disappear	The N# module outlet temperature probe returned to normal
N#Inlet Over Temp.	The N# module air inlet temperature is too high
N#Inlet Over Temp -Disappear	The N# module air outlet temperature returned to normal
N#Capacitor Time Reset	The N# module clears the capacitor cumulative runtime record
N#Fan Time Reset	The N# module clears the fan cumulative runtime record
Battery History Reset	-Disappears battery history data
Battery Over Temp.	The battery is overheated

Event	Describe
Battery Over Temp. -Disappear	The battery overheat -Disappears
Bypass Fan Expired	Reached the bypass fan repair period
Bypass Fan Expired -Disappear	Reaching Bypass fan maintenance period alarm -Disappear
Capacitor Expired	Reached the bypass fan repair period
Capacitor Expired -Disappear	Reaching Bypass fan repair period -Disappears
Fan Expired	Module fan maintenance cycle time is up
Fan Expired -Disappear	Reaching Module fan maintenance cycle -Disappears
N#INV IGBT Driver Block	The N# module inverter driver signal block
N#INV IGBT Driver Block -Disappear	The N# module inverter driver signal block turns to normal
Dust Filter Expired	Dust filter maintenance time is up
Dust Filter Expired -Disappear	Dust filter maintenance time -Disappears
Battery Expired	Battery maintenance period is up
Battery Expired -Disappear	The battery maintenance period -Disappears
BMS RS485 Error	The BMS communication fail
BMS RS485 Error -Disappear	The BMS communication fail returns to normal
CAN Error	The monitor unit CAN signal fail
CAN Error -Disappear	The monitor unit CAN signal returns to normal
Cell Undervoltage	The single cell battery voltage low
Cell Undervoltage -Disappear	The single cell battery voltage returns to normal
Cell Overvoltage	The single cell battery voltage high
Cell Overvoltage -Disappear	The single cell battery voltage returns to normal
Cell Volt Difference Fail	Excessive voltage difference between single cell battery
Cell Volt Difference Fail -Disappear	The single cell battery voltage returns to normal
Batt Low Temperature	The battery ambient temperature too low
Batt Low Temperature	The battery ambient temperature returns to

Event	Describe
-Disappear	normal
Battery Over Temp.	The battery ambient temperature too high
Battery Over Temp. -Disappear	The battery ambient temperature returns to normal
BMS Charge Inhibited	The BMS system prohibits charging the battery
BMS Charge Inhibited -Disappear	The BMS system recover the charging function
BMS Discharge Inhibited	The BMS system prohibits discharging the battery
BMS Discharge Inhibited -Disappear	The BMS system recover the discharging function
Wave Trigger	Wave Trigger
Bypass CAN Fail	The monitor unit bypass CAN signal abnormal
Bypass CAN Fail -Disappear	The monitor unit bypass CAN signal returns to normal
Bypass Power Fuse Fail	The bypass power fuse disconnect
Bypass Power Fuse Fail -Disappear	The bypass power fuse normal
Firmware Error	Software version error
Firmware Error -Disappear	Software version update to normal version
System Setting Error	System setting error
Bypass Over Temp.	The bypass module over temperature
Bypass Over Temp. -Disappear	The bypass module temperature returns to normal
Module ID Duplicate	At least two modules are set as same ID
Module ID Duplicate -Disappear	The module setting correct ID returns to normal
Electrolyte Leakage	The battery electrolyte leakage alarm
Electrolyte Leakage -Disappear	The battery electrolyte leakage alarm -Disappear

Note

Different colors of the words represent different level of events:

(a)Green, an event occurs;

(b)Yellow, warning occurs；
(c) Red, faults happen.

4.2.6 Control Menu

Touch the icon

(at the left of the screen), and the system enters the page of the "Control". The control menu include "Func Button" & "Test Command"， as it is shown in Figure 4-9& Figure 4-10.

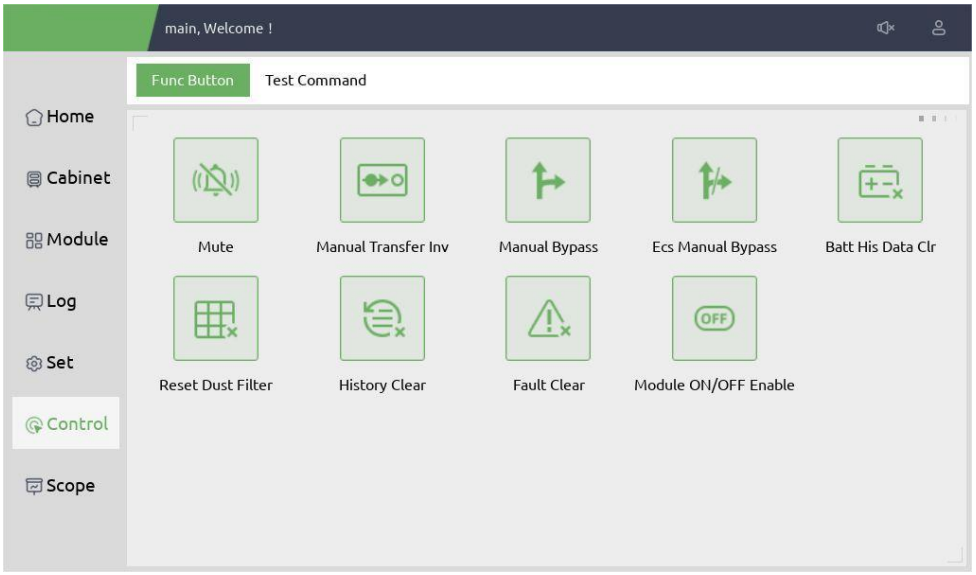


Figure 4-9 Operate-Function Button menu

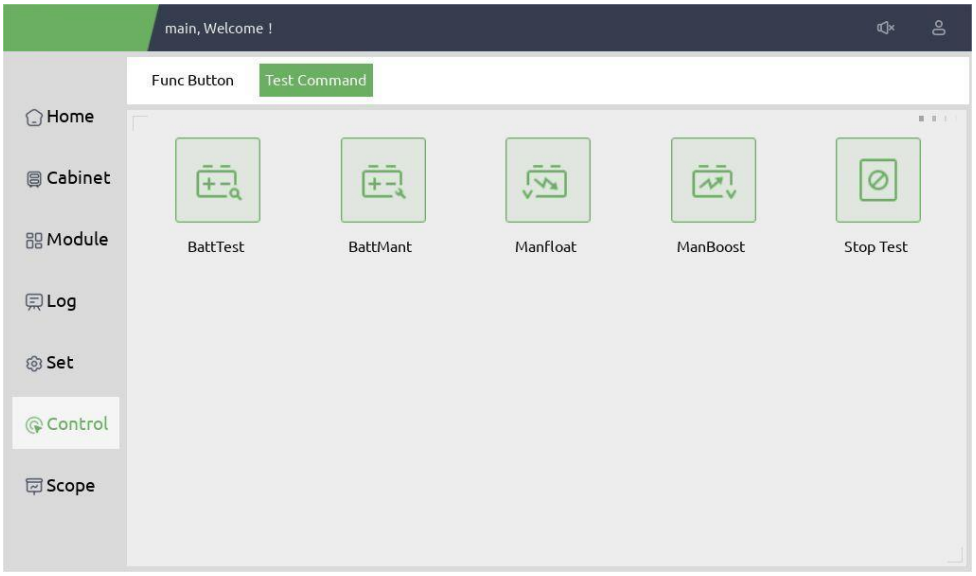


Figure 4-10 Control-Test Command menu

The "Control" menu includes "Func Button" and "Test Command". The contents are described in details below.

Function Button

Mute and Unmute

Mute or unmute alarm of the system by touching the icon

.

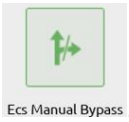
Fault Clear

Clear the faults by touching the icon

.

Manual Bypass and ESC Manual Bypass

Transfer to bypass mode or cancel this command by touching the icon

or 

.

Manual Transfer Inv

Transfer the bypass mode to Inverter Mode by touching the icon

.

Battery History Data Clear

Clear the battery history data by touching the icon

, the history data includes the times of discharge, days for running and hours of discharging.

Reset Dust Filter

Reset the time of dust filter using by touching the icon

, it includes the days of using and maintenance period.

Test Command

Battery Test

By touching the icon

, the system transfer to the battery mode to test the condition of the battery. Ensure the bypass is working normally and the capacity of the battery is no less than 25%.

Battery Maintenance

By touching the icon

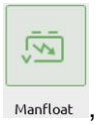
, the system transfer to the battery mode. This function is used for maintaining the battery, which requires the normality of the bypass and minimum capacity of 25% for the battery.

Battery Boost

By touching the icon

, the system starts boost charging.

Battery Float

By touching the icon 

, the system starts float charging.

Stop Test

By touching the icon

, the system stops battery test or battery maintenance.

4.2.7 Scope Menu

Click the icon

at the bottom of the LCD screen, enter the waveform menu, which mainly provides the output voltage, output current, bypass voltage waveforms, convenient for users to observe intuitively. As shown in Figure 4-11 below, click the upper menu option, and the display area will show the corresponding waveform, where the yellow, green and red will represent the corresponding ABC phase respectively.

Figure 4-11 Scope menu

5 Operations

5.1 UPS Start-up

5.1.1 Startup in Normal Mode

The UPS must be started up by commissioning engineer after the completeness of installation. The steps below must be followed:

1) Ensure all the circuit breakers are open.
2) For cabinet system, one by one to turn on the output breaker (Q4), input breaker (Q1), bypass input breaker (Q2), and then the system starts initializing. (For 4-slot and 6-slot cabinet systems, there is only one manual bypass breaker in the cabinet, please one by one to turn on the external input breaker, the external bypass input breaker, and then the system starts initializing.)
3) The LCD in front of the cabinet is lit up. The system enters the home page, as shown in Figure 4-2.
4) Notice the energy bar in the home page, the ups system rectifier is starting up. The power module LED indicators green.
5) After about 30 seconds, the "REC" indicator goes steady green; it means the finish of the rectifier startup. And at the same time the static bypass switch closes, and then the inverter is starting up. The inverter LED indicators green flashing.
6) After 90 seconds, the UPS transfer from the bypass to the inverter after the inverter goes normal. The "BYP" LED indicators off, the "INV" LED indicator and load LED indicator green.
7) The UPS is in normal mode. Close the external battery circuit breaker and the UPS starts charging batteries. The Battery LED indicators off.

8) The startup has finished, users can close the external main output breaker, and then close the branch breakers one by one.

Note

- When the system starts, the stored setting will be loaded.
- Users can browse all events during the process of the starting up by checking the menu Log.

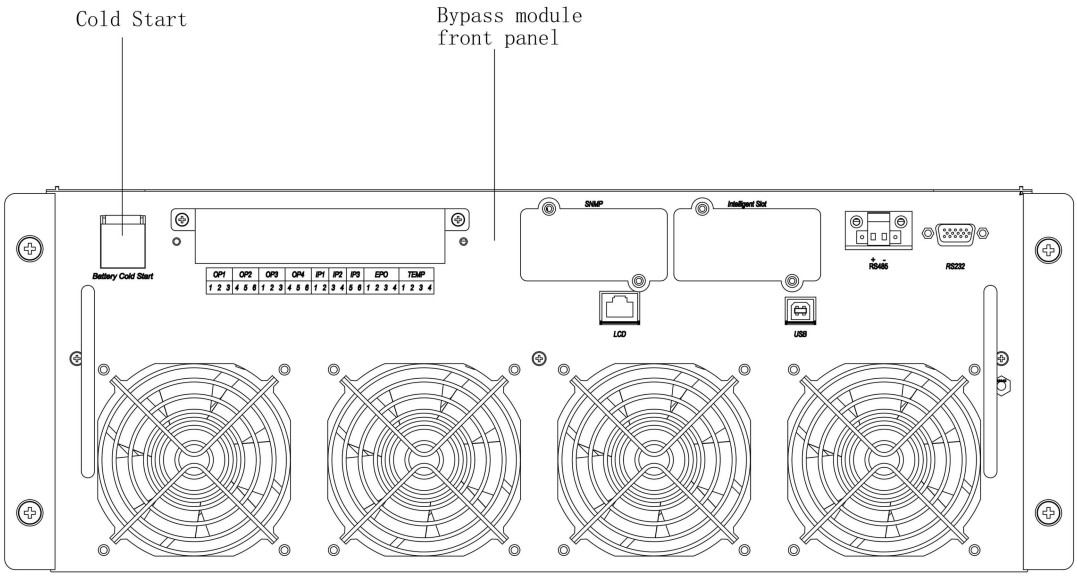
5.1.2 Start from Battery

The start from battery refers to the battery cold start. The steps of the start-up are as follow:

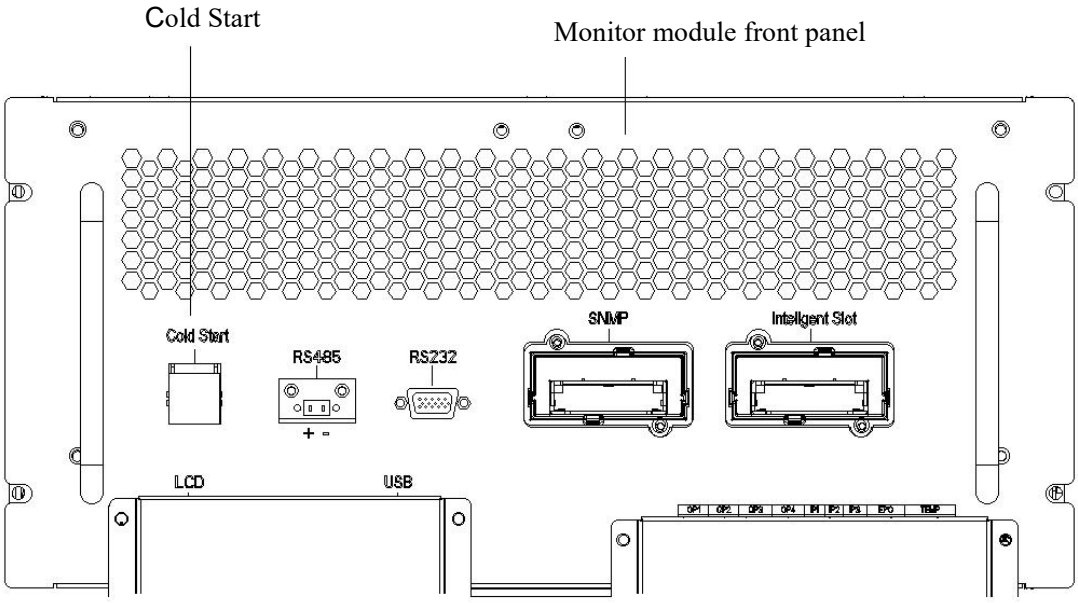
1) Confirm the batteries are correctly connected, and at least one power module is

installed into the cabinet, and then close the external battery circuit breakers.

2) Press the red battery start button for 3 seconds, as shown in Figure 5-1, when the monitoring module starts working.



(a) Battery cold start button for 4/6-slot cabinet UPS



(c)Battery cold start button for 10&12-slot cabinet UPS

Figure 5-1 Monitor module battery cold start button position

3) Next, press the cold start button on the module, as shown in Figure 5-2. The module will start working, and the system will proceed with the steps following step 3 in the normal mode startup. The system first starts the rectifier, then the inverter, completing the inverter output. The entire process takes about 60 seconds, and the system will operate in battery mode.

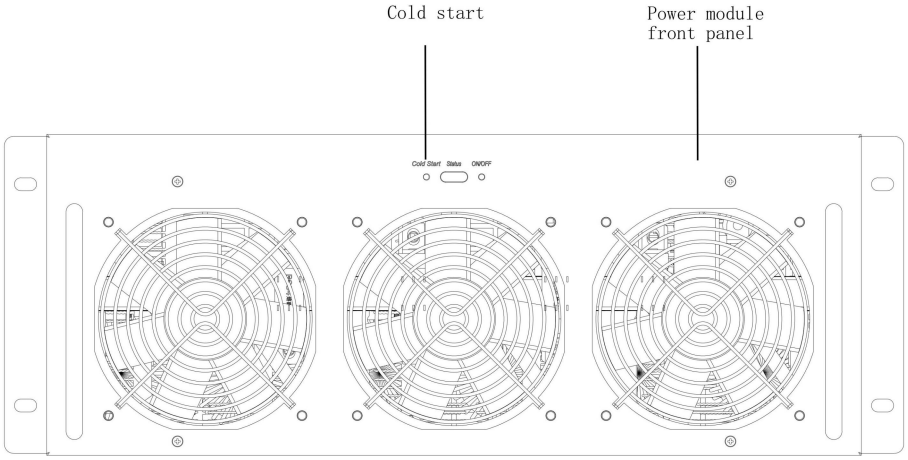


Figure 5-2 Power module battery cold start button position

4) Turn on the external output breaker to supply power to the load, and the system will operate in battery mode.

5.2 UPS Shut down

To shut down the UPS completely, first ensure that the load is properly shut down. Then, turn off the external battery breaker, the main input breaker (internal or external), and the bypass input breaker (internal or external, if applicable), one by one. The display screen will then turn off completely.

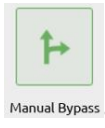
Note: If UPS in maintenance bypass mode, please also turn off the maintenance bypass breaker.

5.3 Procedure for Switching between Operation Modes

5.3.1 Switching the UPS from Normal Mode into Battery Mode

The UPS transfers to battery mode immediately after the utility (mains voltage) fails or drops down below the predefined limit.

5.3.2 Switching the UPS from Normal Mode into Bypass Mode

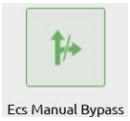
Enter the menu "Control"， touch the icon "Manual Bypass" 

and the system should transfer to bypass mode.

WARNING

Ensure the bypass is working normally before transferring to bypass mode. Or it may cause failure.

5.3.3 Switching the UPS into Normal Mode from Bypass Mode

Enter the menu "Control"， touch the icon "Ecs Manual Bypass" 

and the system should transfer to Normal mode.

Note

Normally, the system will automatically transfer to normal mode. This function is used when the bypass frequency is off-track, or when the system needs to be manually switched to normal mode.

5.3.4 Switching the UPS into Maintenance Bypass Mode from Normal Mode

These following procedures can transfer the load from the UPS inverter output to the maintenance bypass supply.

1. Transfer the UPS into bypass mode following as per chapter 5.3.2.
2. The inverter indicator is off, the status indicator is off, and the buzzer is alarm. The load is switched to the static bypass, and the inverter is closed;
3. Turn off the battery breaker, turn on the manual bypass breaker, and the load is jointly supplied by the manual bypass breaker and the static bypass;
4. At this time, the bypass module can be pulled out, and the system supplies the load power through the manual bypass breaker.

Note

- 4-slot cabinet and 6-slot cabinet only have a manual bypass breaker. In manual bypass mode (The manual bypass supplies power to loads), dangerous voltages are present on terminal and internal Copper bar.
- 4-slot cabinet and 6-slot cabinet need to use external circuit breakers (Includes external input breaker, external bypass input breaker, external output breaker and external maintenance bypass breaker).

WARNING

Before performing this operation, please check the messages on the LCD display to ensure that the bypass supply is stable and that the inverter is synchronized with it, to avoid any risk of a short interruption in powering the load.

DANGER

If you need to maintain the power module, wait for 5 minutes to let the DC bus capacitor fully discharge before removing the cover.

5.3.5 Switching the UPS into Normal Mode from Maintenance Bypass Mode

These following procedures can transfer the load from the maintenance bypass mode to the inverter output.

1. After power-on, wait for about 30S, the static bypass breaker is turned on, the bypass indicator light becomes green, and the load is jointly supplied by static bypass and manual bypass;
2. Turn off the manual bypass breaker, and the load is powered by the static bypass;
3. After 30 seconds, the rectifier is started. The indicator light is green, and the inverter is started.

After one minute, switch to the inverter mode, and the system returns to the normal mode.

5.4 Battery Maintenance

If batteries are not in use for a long time, it is necessary to test the condition of the battery. Two methods are provided:

1) Manual discharging test. Enter the "Control" menu, as is shown in Figure 5-3 and touch the icon "Battery maintenance"

, the system transfers into battery mode for discharging. The system will stop discharging when batteries have 20% of capacity or in low voltage. Users can stop the discharging by touching the "Stop Test" icon

.

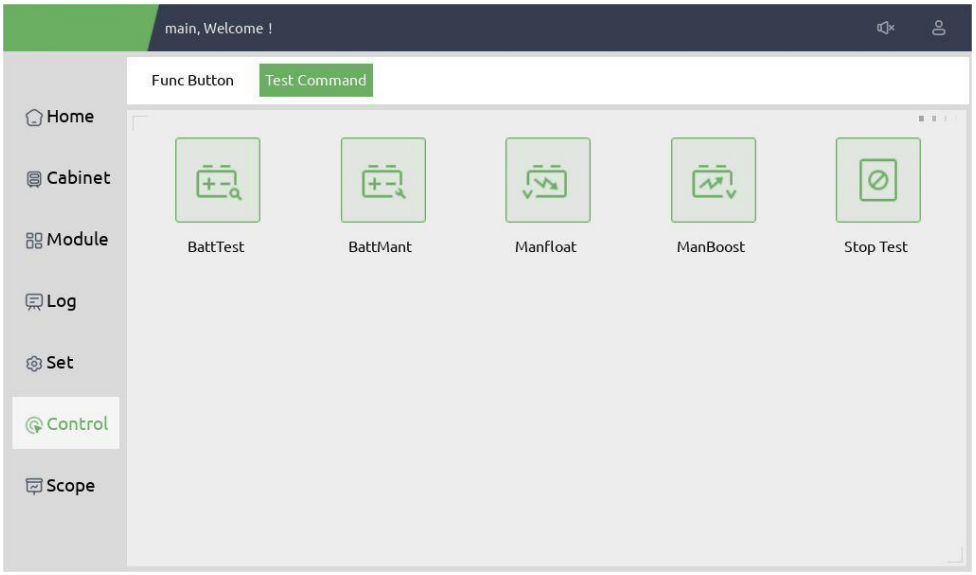


Figure 5-3 Battery maintenance

2) Auto discharging. The system can be set to discharge automatically per a certain time. The setting procedures are as follows.(this needs to be done by factory or connect the background monitor software operation).

a) Enable "battery auto discharge". Enter the "Set" page of the setting menu, tick "Battery Auto Discharge" and confirm.

b) Setting the period for "battery auto discharge". Enter the "Battery Set" page of the setting, set the period time in the item "Auto Maintenance Discharge Period" and confirm.

WARNING

The load for the auto maintenance discharge should be 20%—100%， if not, the system will not start the process automatically.

5.5 EPO

The EPO (Emergency Power Off) button, located on the operator control and display panel (with a cover to prevent accidental operation, see Figure 5-4), is designed to turn off the UPS in emergency situations (e.g., fire, flood, etc.). To activate it, simply press the EPO button, and the system will immediately shut off the rectifier, inverter, and stop powering the load (including both the inverter and bypass). The batteries will also stop charging or discharging.

If the input utility is present, the UPS control circuit will remain active; however, the output will be turned off. To fully isolate the UPS, users must switch off the external mains input supply to the UPS. The UPS can be restarted by powering it on again.

WARNING

When the EPO is triggered, the UPS will stop powering the load. Use the EPO function with caution.

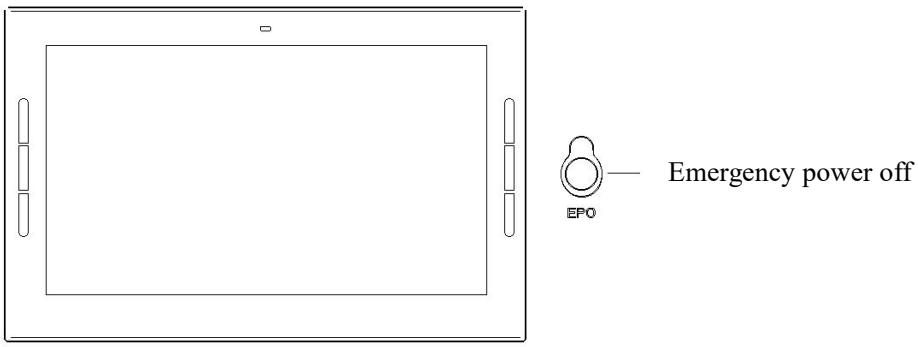


Figure 5-4 EPO Button

5.6 Installation of Parallel Operation System

For the UPS system, up to three cabinets can be paralleled. The parallel function is optional, so if users require this feature, please confirm the configuration with the supplier in advance. The parallel structure diagram is shown in Figure 5-3 below.

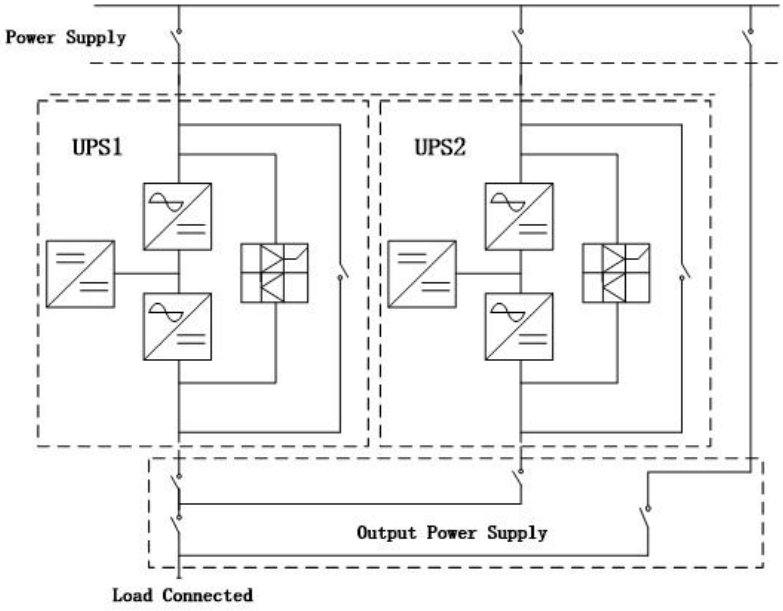


Figure 5-3 Parallel structure diagram

The position of the parallel board on the back of the cabinet door. The specific location is shown in Figures 5-4.

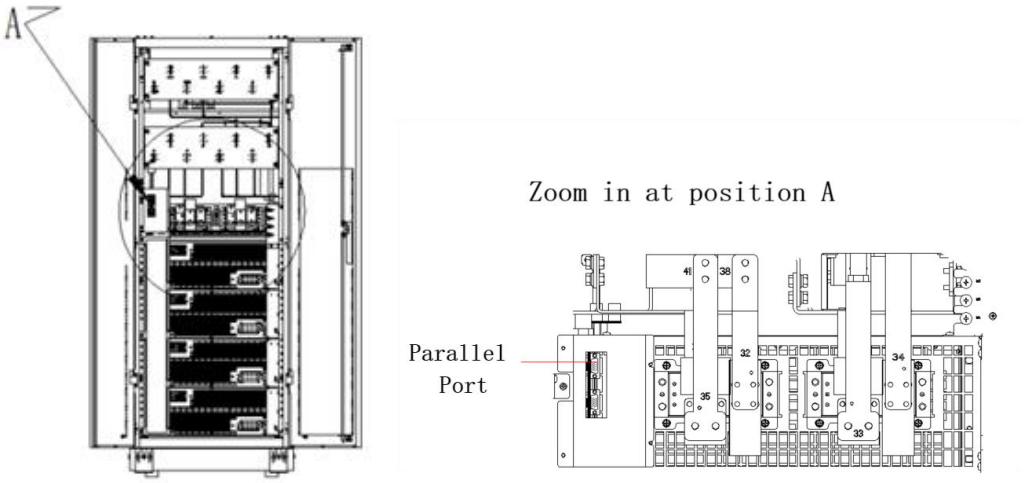


Figure 5-4 UPS parallel connect port position

The parallel cables need to be connected to a cycle, the connect way as show below figure 5-5.

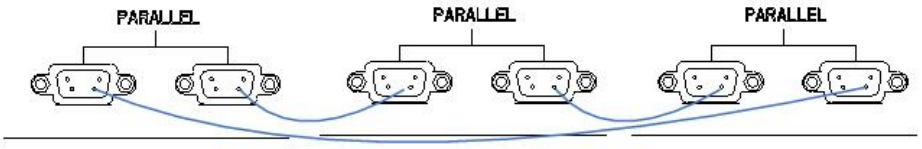


Figure 5-5 Parallel schematic diagram

For the detailed process of integration, refer to the Parallel Operation Manual.

6 Maintenance

This chapter introduces UPS maintenance, including the maintenance instructions of power module and monitoring bypass module and the replacement method of dust filter.

6.1 Precautions

Only maintaining engineers can maintain the power module and monitoring bypass module.

1) The power module should be disassembled from top to bottom to prevent any imbalance caused by the cabinet's high center of gravity.
2) To ensure safety before maintaining the power module and bypass module, use a multimeter to measure the voltage between the operating parts and the earth. Ensure the voltage is below hazardous levels, i.e., DC voltage is less than 36VDC, and AC voltage is below 30VAC.
3) Hot-swapping of the bypass module is not recommended. It can only be disassembled when the UPS is in Manual Bypass Mode or completely powered off.
4) Wait 10 minutes before opening the cover of the power module or bypass module after removing them from the cabinet.

6.2 Instruction for Maintaining Power Module

Before removing the power module that needs repair, confirm that the UPS is operating in normal mode and that the bypass is functioning properly.

1) Ensure the remaining power module will not be overloaded. If there is overload risk, manually transfer the UPS system to bypass mode (refer to section 5.3.2).

2) Power off the module.

a) Press LCD panel ＞Menu "Control"

＞Enable Module "ON/OFF" key

;

b) Press the "OFF" key for 3 seconds, the power module quits from the system.

3) After 10 minutes, remove the mounting screw on the two front side of the power module and pull out the module by two persons.

4) After completing the power module maintenance, push the power module into the cabinet (each power module is over 10s) and tighten the screws on both sides. The power module will automatically start and join the system.

5) If in the Step 1: manually transfer the UPS system to bypass mode. After the power module starts for 2 minutes, restore the UPS system to normal mode. Please refer to Section 5.3.3.

6.3 Instruction for Maintaining the Monitor & Bypass Unit

6.3.1 Maintaining the Monitor & Bypass Module for 4-slot, 6-slot Cabinet UPS

Confirm the UPS is operating in normal mode and the bypass is working normally.

1) Using the LCD screen, switch the system to maintenance bypass mode, so the load is powered by the maintenance bypass.
2) Turn on the maintenance bypass breaker.
3) Turn on the external maintenance bypass breaker.
4) Sequentially turn off the battery breaker, external main input breaker, external bypass input breaker, and external output breaker. The UPS will be powered through the external maintenance bypass.
5) Once the LCD screen goes dark, remove the monitor module for maintenance.
6) After completing the maintenance, insert the power module and tighten the screws on both sides.
7) Sequentially turn on the external output breaker, external bypass input breaker, external main input breaker, and battery breaker.
8) After 2 minutes, the "BYP" indicator on the LCD will light up, indicating that the bypass power supply is functioning normally.
9) Turn off the external maintenance bypass breaker.
10) Turn off the maintenance bypass breaker. The inverter will automatically start up, and after 60 seconds, the UPS will transfer to normal mode.

6.4 Battery Maintenance

For the maintenance-free lead-acid battery, proper maintenance can extend its lifespan. The battery life is primarily influenced by the following factors:

1) Installation: The battery should be placed in a dry, cool area with good ventilation. Avoid direct sunlight and keep it away from heat sources. During installation, ensure the batteries are correctly connected with the same specifications.
2) Temperature: The ideal storage temperature is between 20°C and 25°C.
3) Charging/Discharging Current: The optimal charging current for a lead-acid battery is 0.1C, with a maximum charging current of 0.2C. The discharging current should range from 0.05C to 3C.
4) Charging Voltage: The battery typically stays in a standby state. When the utility is normal, the system charges the battery in boost mode (constant voltage with a maximum limit) until full, then switches to float charge mode.
5) Depth of Discharge: Avoid deep discharges, as they can significantly shorten the battery's lifespan. Prolonged operation of the UPS in battery mode with light load or no load can lead to deep discharge.
6) Check periodically. Observe if any abnormality of the battery, measure if the voltage of each battery is in balance. Discharge the battery periodically.

WARNING

Daily inspection is crucial! Regularly check and confirm that the battery connections are tight, and ensure that no abnormal heat is generated by the battery.

WARNING

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

Waste lead-acid batteries are considered hazardous waste and are regulated by the government as major contaminants. Therefore, their storage, transportation, use, and disposal must comply with national or local regulations and laws regarding hazardous waste, waste batteries, or other relevant standards.

According to national laws, waste lead-acid batteries must be recycled and reused. Disposal of these batteries by any means other than recycling is prohibited. Improper disposal, such as throwing away waste lead-acid batteries, can cause significant environmental pollution, and the responsible individuals will bear the corresponding legal consequences.

6. Product Specifications

This chapter provides the product specifications, including environmental characteristics, mechanical characteristics, and electrical characteristics.

7.1 Applicable Standards

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

Table 7-1 Compliance with European and International Standards

Item	Normative
General safety requirements for UPS used in operator access areas	IEC62040-1-1
Electromagnetic compatibility (EMC) requirements for UPS	IEC62040-2
Method of specifying the performance and test requirements of UPS	IEC62040-3

Note

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/EN61000 series) and construction (IEC/EN60146 series and 60950).

7.2 Environmental Characteristics

Table 7-2 Environmental Characteristics

Item	Unit	Parameter
Acoustic noise level	dB	＜72dB @ 100% load, 69dB @ 45% load
Altitude of Operation	m	≤1000,load de-rated 1% per 100m from 1000m to
Relative Humidity	%	0-95, non-condensing
Operating Temperature	℃	0-40(for UPS only),Battery life is halved for every 10°C increase above 20°C
UPS Storage	℃	-40-70

7.3 Mechanical Characteristics

Table 7-3 Mechanical Characteristics for Cabinet

Model	Unit	4-slot	6-slot	10&12-slot
Mechanical Dimension (W*D*H)	mm	600*1000*1600	600*1000*2000	1200*1100*2000
Weight	kg	170	220	450
color	N/A	Black		
Protection	N/A	IP20		

Table 7-4 Mechanical Characteristics for Power Module

Item	Unit	50KVA Power Module	60KVA Power Module
Mechanical Dimension，W*D*H	mm	442*659*172	442*659*172
Weight	kg	44	45

7.4 Electrical Characteristics

7.4.1 Electrical Characteristics (Input Rectifier)

Table 7-5 Rectifier AC input Mains

Item	Unit	Parameter
Grid System	\	3 Phases + Neutral + PE
Rated AC Input Voltage	Vac	380/400/415(three-phase and sharing neutral with the bypass input)
Rated Frequency	Vac	50/60Hz
Input Frequency range	Hz	40~70
Input Power factor	PF	>0.99

7.4.2 Electrical Characteristics (Intermediate DC Link)

Table 7-6 Battery

Items	Unit	Parameters
Battery bus voltage	Vdc	Rated：±240V

Quantity of lead-acid cells	Nominal	40=[1 battery(12V)] ,240=[1 battery(2V)]
Float charge voltage	V/cell （VRLA）	2.25V/cell(selectable from 2.2V/cell～2.35V/cell) Constant current and constant voltage charge mode
Boost charge voltage	V/cell （VRLA）	2.3V/cell(selectable from : 2.30V/cell~2.45V/cell) Constant current and constant voltage charge mode
Temperature compensation	mV/℃/cl	3.0(selectable:0~-5.0)
Final 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)

Note

The default battery number is 40. When the actual battery in use is 32-44, ensure the actual number and the set number is the same, otherwise, batteries may be damaged.

7.4.3 Electrical Characteristics (Inverter Output)

Table 7-7 Inverter Output (To critical load)

Item	Unit	Parameter
Rated capacity	kVA	50~600
Rated AC voltage	Vac	380/400/415 (Line-Line)
Rated Frequency	Hz	50/60
Frequency Regulation	Hz	50/60Hz±0.1%

7.4.4 Electrical Characteristics (Bypass Mains Input)

Table 7-8 Bypass Mains Input

Item	Unit	4-slot Cabinet	6/10/12-slot Cabinet
Rated AC voltage	Vac	380/400/415 (three-phase four-wire and sharing neutral with the bypass)	
Rated Current	A	58~720	
Overload	%	125%, Long term operation 125%～130%, for 10 min 130%～150%, for 1min >150%,300ms	110%, Long term operation 110%～125%，for 5 min 125%～150%，for 1 min >150%,1S
Current rating of neutral cable	A	1.7×In	
Rated frequency	Hz	50/60	
Switch time (between bypass and inverter)	ms	Synchronized transfer: 0ms	
Bypass voltage range	%	Settable, default -20%~+15% Up limited: +10%, +15%, +20% Down limited: -10%, -15%, -20%, -30%, -40%	
Bypass frequency range	Hz	Settable, ±1Hz, ±3Hz, ±5Hz	

7.5 Efficiency

Table 7-9 Efficiency

System Efficiency		
Normal mode(dual conversion)	%	96 (max)
Battery discharging efficiency (battery at nominal voltage 480Vdc and full-rated linear load)		
battery mode	%	96 (max)

7.6 Display and Interface

Table 7-10 Display and Interface

Display	LED + LCD Color touch screen
Interface	Standard:RS232, RS485, USB, Dry Contact Option: SNMP,AS400

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