Vanguard XL Three Phase Tower UPS (208V)

User Manual

Preface

Manual Usage

This manual introduces the main characteristics, performance, and working principles of the new generation Rack intelligent UPS, and provides users with information on installation, use, operation, and maintenance.

Users

Technical Support Engineer

Service Engineer

Authorized Person

Note

Our company provides a full range of technical support and service. Customers can contact our local office or customer service center for help.

The manual will update irregularly, due to the product upgrading or other reasons.

Unless otherwise agreed, the manual is only used as guide for users and any statements or information contained in this manual make no warranty expressed or implied.

Contents

1 Safety Precautions

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

The Rack 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: 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 is requirement is ignored.

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

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

1.2 Warning Label

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

Labels	Description
 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 carefully 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 avoid injury. ■ During positioning, keep the UPS way from shock or vibration. ■ Install the UPS in proper environment, more detail in chapter 0.

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 “UL 1778:2014 R4.24 and CAN/CSA-C22.2 No. 107.3-14 + GI1 +GI2". 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, the battery terminal voltage will exceed 200Vdc 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 always followed strictly. 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 UPS Structure and Introduction

2.1 Product Introduction

The intelligent tower UPS series products adopt online double conversion design, based on DSP full digital control, to provide a stable and uninterrupted power supply for important loads, which can eliminate surges, instantaneous high voltage, instantaneous low voltage, and "Power pollution" such as wire noise and frequency offset, provide customers with high-efficiency and high-power-density power supply guarantees.

2.2 UPS Type and Configuration

2.2.1 UPS Type

The UPS types are shown in Table 2-1.

Table 2-1 UPS Type

Model	Type
10KVA	Standard backup time
15KVA	
20KVA	
30KVA	
40KVA	

2.2.2 UPS Configuration

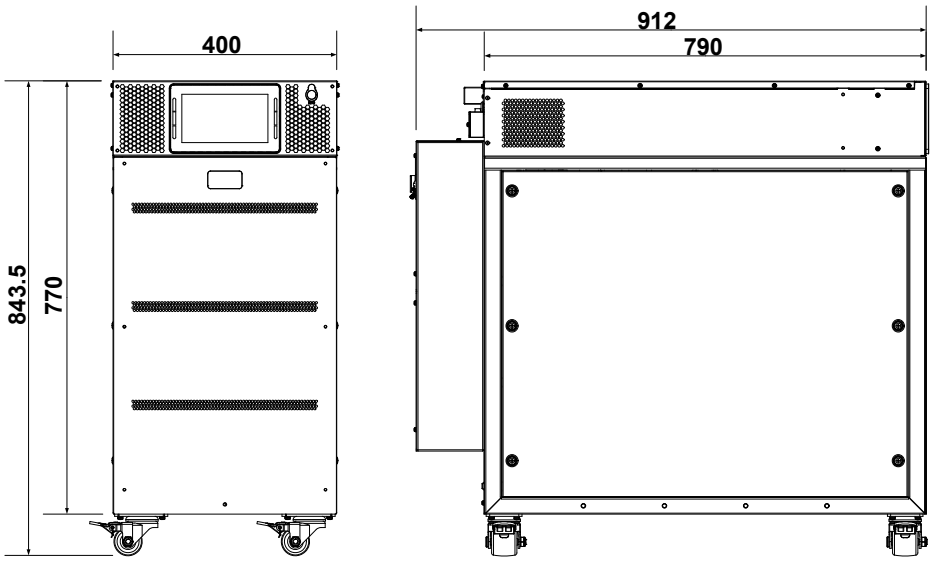
The UPS configurations are shown in Table 2-2.

Table 2-2 UPS Configuration

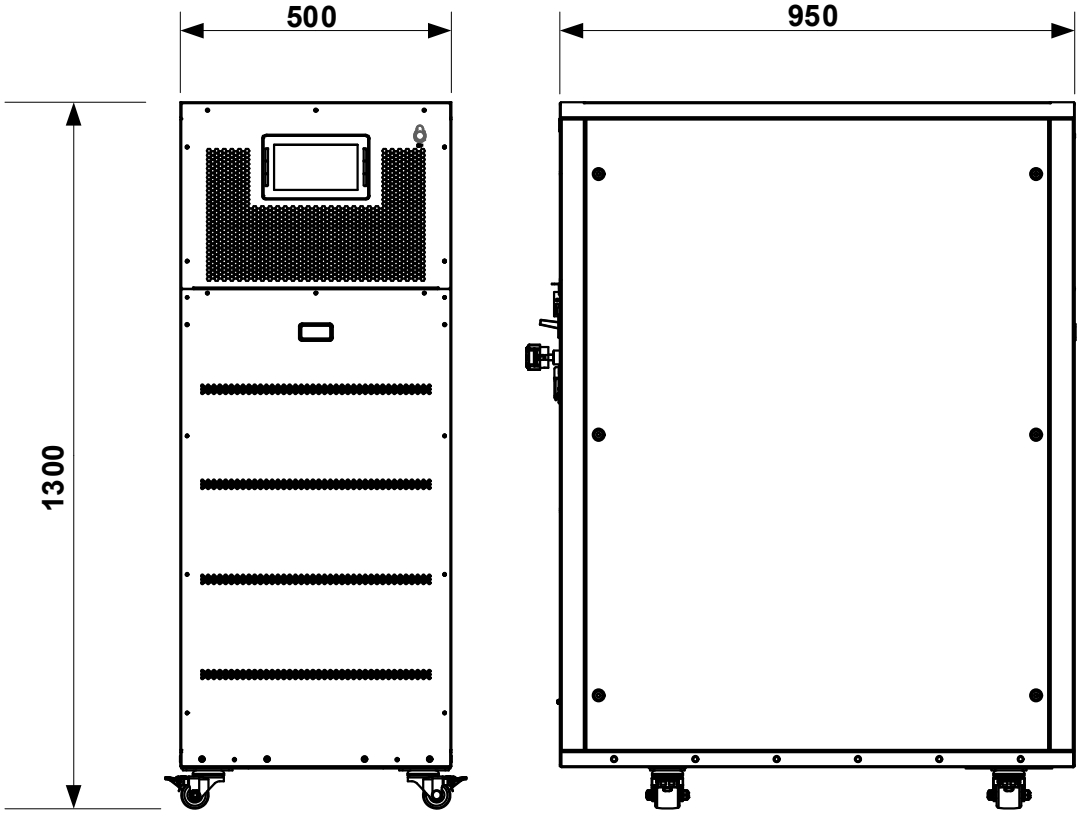
Item	Components	Quantity	Remark
10-20kVA	Circuit Breakers	5	Standard
30-40kVA	Circuit Breakers	4	Standard
	Battery Switch	1	Standard
ALL	Dual Input	1	Standard
	Dry Contact	1	Standard
	Dry Contact Card	1	Standard
	RS232, 485, USB	1	Standard
	Battery cold start	1	Standard
	Dust-proof net	1	Standard
	SNMP Card	1	Optional
	Parallel kit	1	Optional
	LBS	1	Optional

2.3 Appearance and Components

The UPS outlooks are shown as Figure 2-1.



(a) 10/15/20KVA (unit: mm)

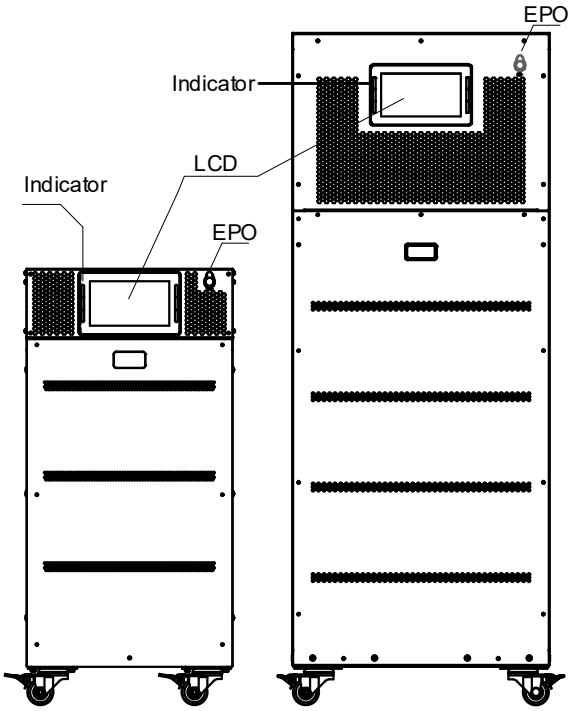


(b) 30/40KVA (unit: mm)

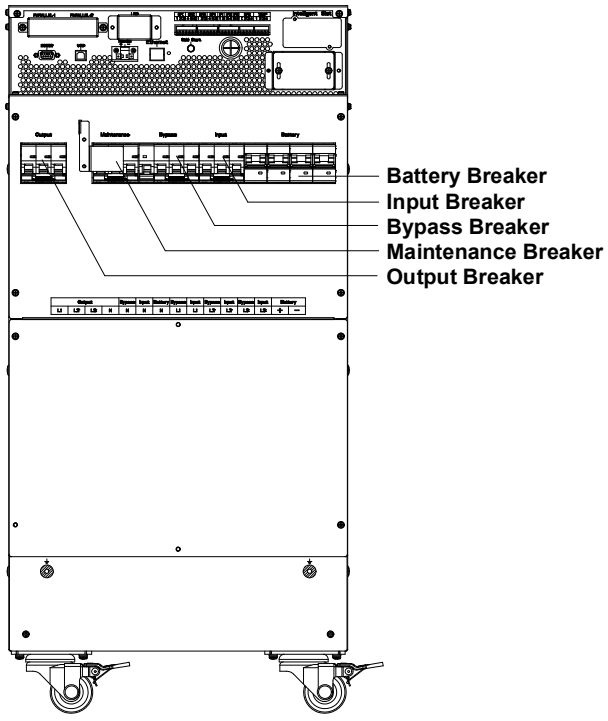
Figure 2-1 UPS Outlook

2.3.1 Details of UPS front and rear views

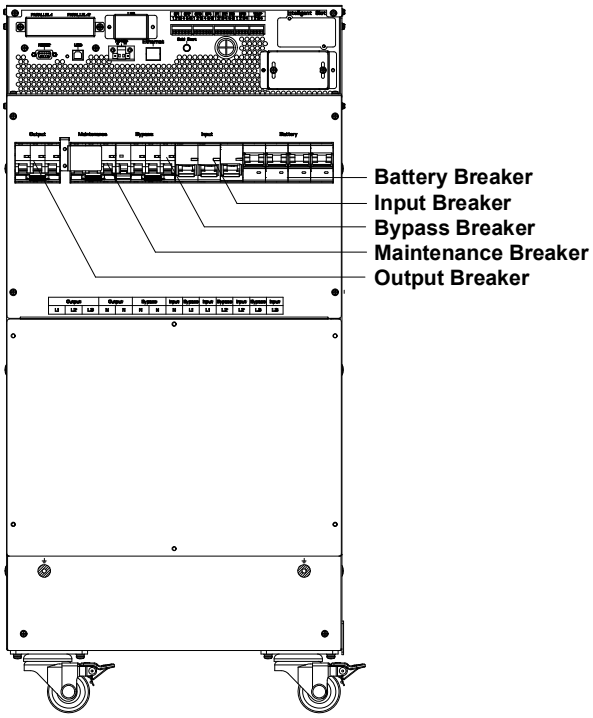
The UPS front and rear views are shown as Figure 2-2.



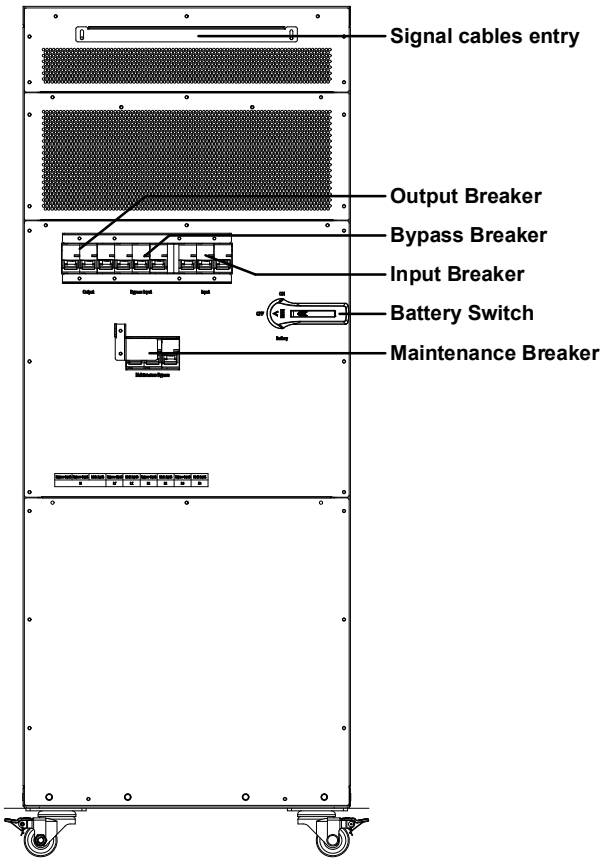
(a) 10-40KVA front views



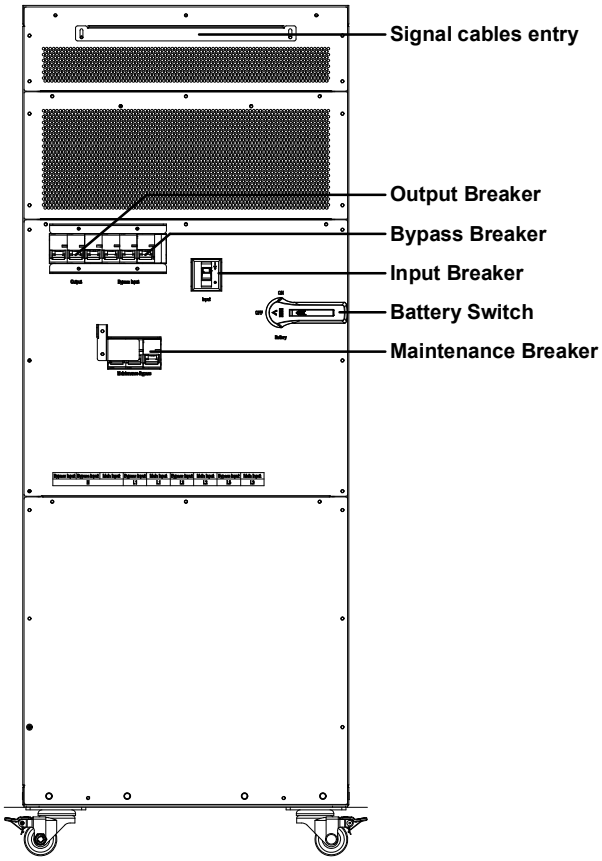
(b) 10KVA rear views



(c) 15/20KVA rear views



(d) 30KVA rear views



(e) 40KVA rear views

Figure 2-2 Details of UPS front and rear views

2.4 UPS System Description

The Rack UPS is configured by the following part: Rectifier, Charger, Inverter, Static bypass switch. One or several battery strings should be installed to provide backup energy once the utility fails. The UPS structures are shown in Figure 2-3.

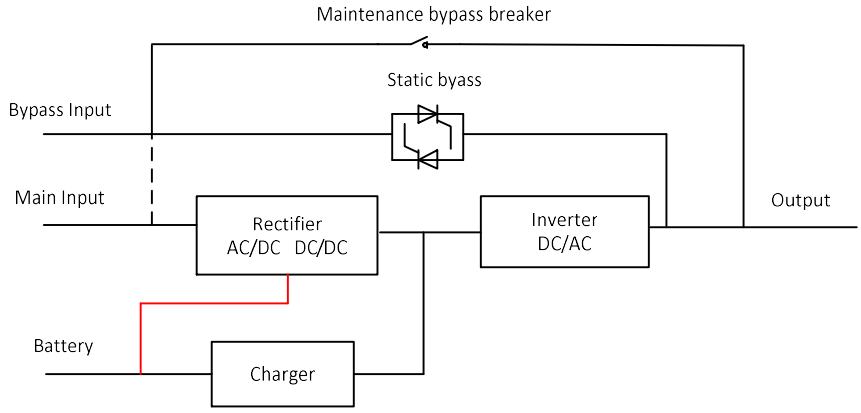


Figure 2-3 UPS schematic diagram

2.5 Operation Mode

The 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

2.5.1 Normal Mode

The UPS turns the AC input into DC voltage (AC / DC) through the rectifier, and the DC voltage boost to the BUS voltage. When the system is connected to the external battery, part of the charger charges the battery (DC / DC), and the other part changes the inverter to the DC output (DC / AC) to provide high quality AC power for the load. The working principle of the normal mode is shown in Figure 2-4.

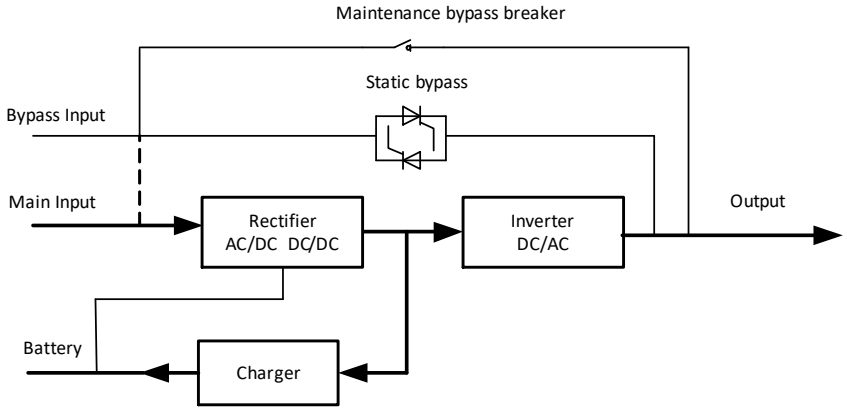


Figure 2-4 Normal mode schematic diagram

2.5.2 Battery Mode

Upon failure of the AC mains input power, the inverters will obtain power from the batteries, and supply AC power to the critical AC load. There is no interruption to the critical load. After restoration of the AC mains input power, UPS will transfer automatically to normal mode. Battery schematic diagram as shown below Figure 2-5.

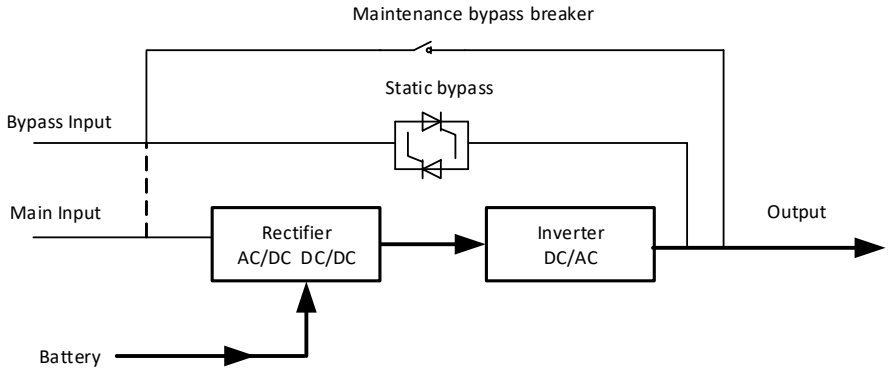


Figure 2-5 Battery mode schematic diagram

Note: With the function of "Battery Cold Start", the UPS could start without utility. *See more detail in chapter 5.1.2.*

2.5.3 Bypass Mode

After the system is powered on, when the inverter is not turned on or the inverter is artificially turned

off, the load is powered by the bypass. In the normal mode, if the UPS monitoring unit detects the system over temperature, overload or other shutdown failure of the inverter, the system will automatically switch to the bypass. In this condition, the mains directly supply power to the load through the bypass static switch. In the bypass mode, the load power supply quality is not protected by UPS, and it is susceptible to power failure, voltage waveform or abnormal frequency conditions. Bypass mode schematic diagram is shown in Figure 2-6.

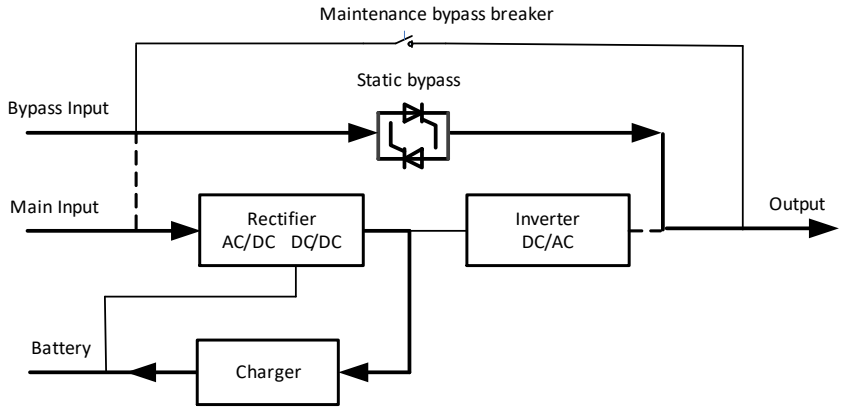


Figure 2-6 Bypass mode schematic diagram

2.5.4 Maintenance Mode (Manual Bypass)

When repairing the UPS system and battery or repairing the equipment failure, manually close the manual bypass switch, and the load is directly supplied by the mains power through the manual bypass to realize the emergency power supply to the load. Manual bypass mode schematic diagram is shown in Figure 2-7.

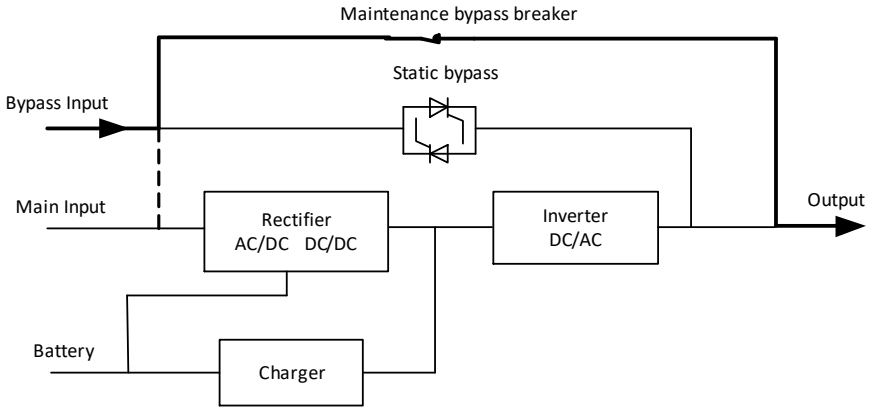


Figure 2-7 Maintenance mode schematic diagram

DANGER

During Maintenance mode, dangerous voltages are present on the terminal of input, output and neutral.

2.5.5 ECO Mode

To improve system efficiency, UPS system works in Bypass Mode at normal time, and the inverter is standby, when the utility from the bypass fails, the UPS will transfer to Battery Mode and the inverter powers the load. ECO mode schematic diagram is show as Figure 2-8.

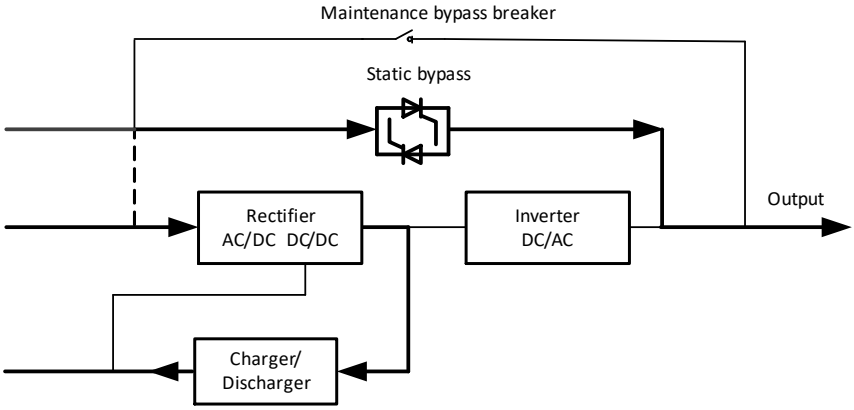


Figure 2-8 ECO mode schematic diagram

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

2.5.6 Auto-restart Mode

UPS provides automatic power-on function, that is, the mains power outage time is too long, the battery discharge to the EOD voltage causes the inverter to shut down. If the mains power recovery, UPS will automatically start UPS. The mode and the delay time are programmed by the commissioning engineer.

2.5.7 Frequency Converter Mode

By setting the UPS to "Frequency Converter Mode"， the UPS could present a stable output of fixed frequency (50 or 60HZ), and the bypass static switch is not available. The input frequency range ranged from 40 Hz to 70 Hz. In this mode, the static bypass is invalid and the battery is optional, as to determine whether to choose the battery according to whether to operate in battery mode.

3 Installation

This chapter introduces UPS installation, including unpacking and inspection, main cabinet installation, cables connection.

3.1 Location

As each site has itself requirements, the installation instructions in this chapter are as a guide for the general procedures and practices that should be observed by the installing engineer.

3.1.1 Installation Environment

The UPS is intended for indoor installation and uses forced convection cooling by internal fans. Please make sure there is enough space for the UPS ventilation and cooling.

Keep the UPS far away from water, heat and inflammable and explosive corrosive material. Avoid installing the UPS in the environment with direct sunlight, dust, volatile gases, corrosive material and high salinity.

Avoid installing the UPS in the environment with conductive dirt.

The operating environment temperature for batteries is 20℃-25℃. Operating above 25℃ will reduce the battery life, and operation below 20℃ will reduce the battery capacity.

The battery will generate a little amount of hydrogen and oxygen at the end of charging; ensure the fresh air volume of the battery installation environment must meet EN50272-2001 requirements.

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

3.1.2 Site Selection

Ensure the ground or installation platform can bear the weight of the UPS cabinet, batteries and battery racks.

No vibration and a horizontally inclination of less than 5 degree.

The equipment should be stored in a room to protect it against excessive humidity and heat sources.

The battery needs to be stored in dry and cool place with good ventilation. The most suitable storage temperature is 20℃ to 25℃.

3.1.3 Size and Weight

The dimension and weigh for the UPS cabinet is shown in Table 3-1

Table 3-1 Weight for the cabinet

Configuration	Dimension(W*D*H) mm
10/15/20KVA	400*912*843.5
30/40KVA	500*950*1300

3.2 Unpacking and Inspection

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, contact to the carrier)

(2) Transport the equipment to the designated site by forklift.

(3) Unpack the package as shown in Figure 3-1.

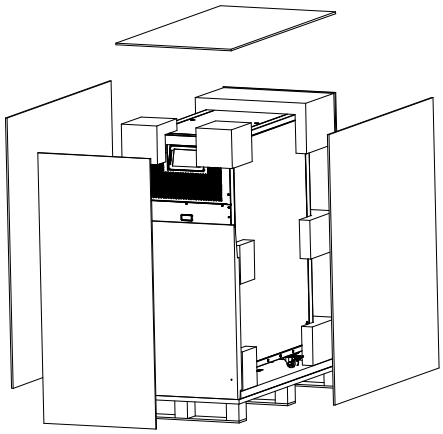


Figure 3-1 Disassemble the case

(4) Place the ramp on the ground. as shown in Figure 3-2.

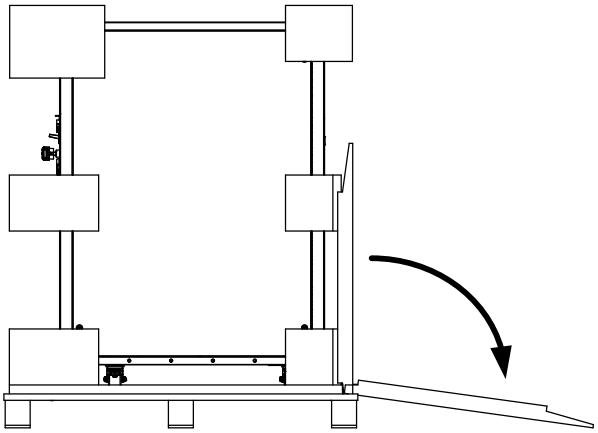


Figure 3-2 Place the ramp on the ground

(5) Remove the protective foam around the cabinet as shown in Figure 3-3.

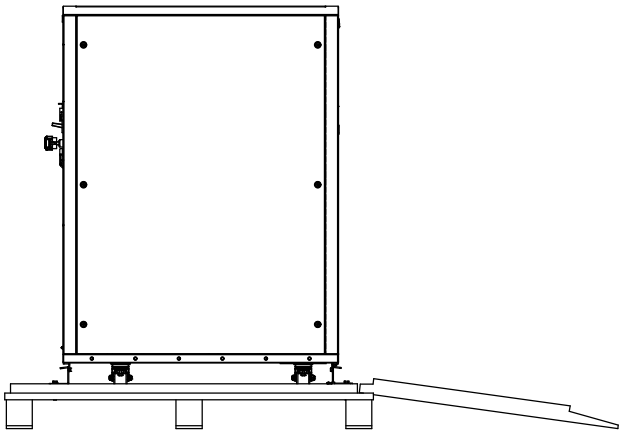


Figure 3-3 Remove the protective foam

(6) Remove the bracket that fasten the UPS to the pallet, and place them at the bottom of the ramp for supporting the ramp, as shown in Figure 3-4.

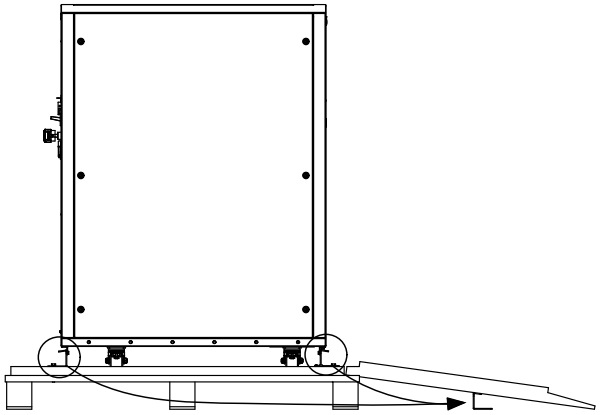


Figure 3-4 Remove the brackets to support the ramp

(7) Roll the UPS down from the pallet as shown in Figure 3-5.

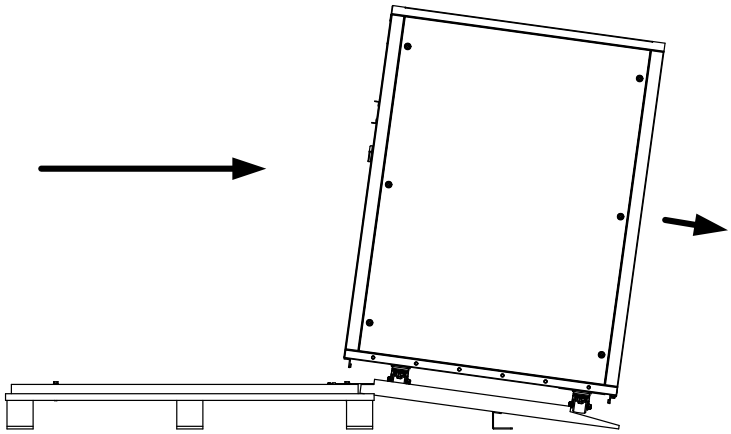


Figure 3-5 Roll the UPS down

(8) Check the UPS:

(a) Visually examine if there are any damages to UPS during transportation. If any, contact to the carrier.

(b) Check the UPS with the list of the goods. If any items are not included in the list, contact to our company or the local office.

(9) Move the cabinet to the installation position.

⚠CAUTION

Be careful while removing to avoid scratching the equipment.

If the UPS does not use an internal battery, the bracket should be retained for the installation and fixation of the UPS.

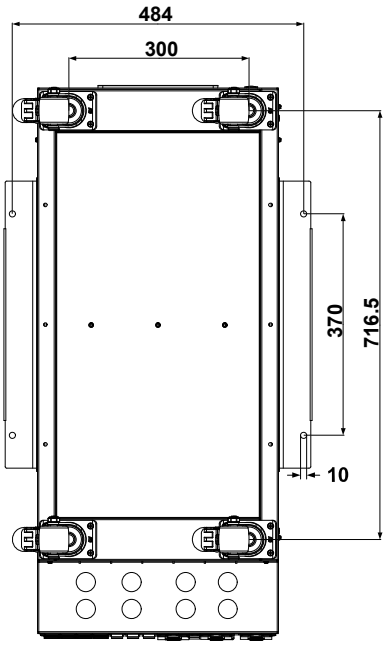
⚠CAUTION

The waste materials of unpacking should be disposed to meet the demand for environmental protection.

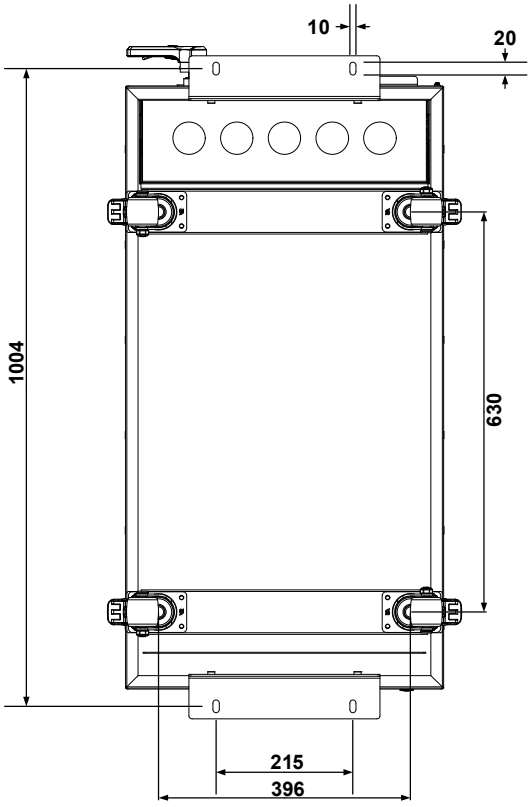
3.3 Positioning

3.3.1 Positioning Cabinet

The bottom view of the UPS is shown in Figure 3-6.



(a) 10-20KVA (Bottom, unit: mm)



(b) 30-40KVA (Bottom, unit: mm)

Figure 3-6 Supporting structure (Bottom View)

For the UPS with internal battery, the UPS cabinet supports itself by the four wheels at the bottom.

The steps to secure the cabinet via its wheels are as follows:

(1) Ensure the supporting structure is in good condition and the mounting floor is smooth and strong.

(2) Adjust the cabinet to the right position by the supporting wheels.

(3) Press the fixed position of the brake assembly as shown in Figure 3-7.

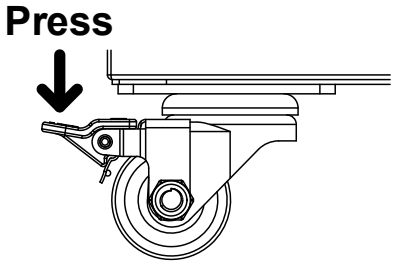


Figure 3-7 Press the fixed position

CAUTION

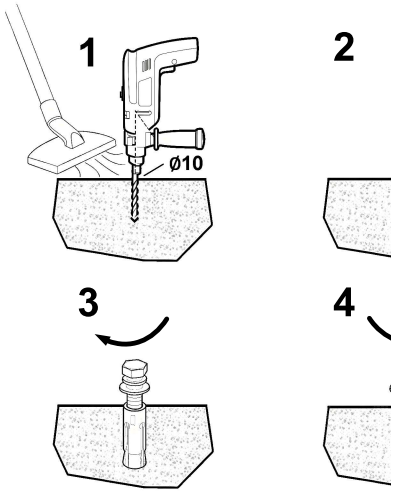
Auxiliary equipment is needed when the mounting floor is not solid enough to support the cabinet, which helps distribute the weight over a larger area. For instance, cover the floor with iron plate or increase the supporting area of the anchor bolts.

If the UPS does not use an internal battery, it needs to be fixed to the ground via brackets.

The steps to secure the cabinet via its brackets are as follows:

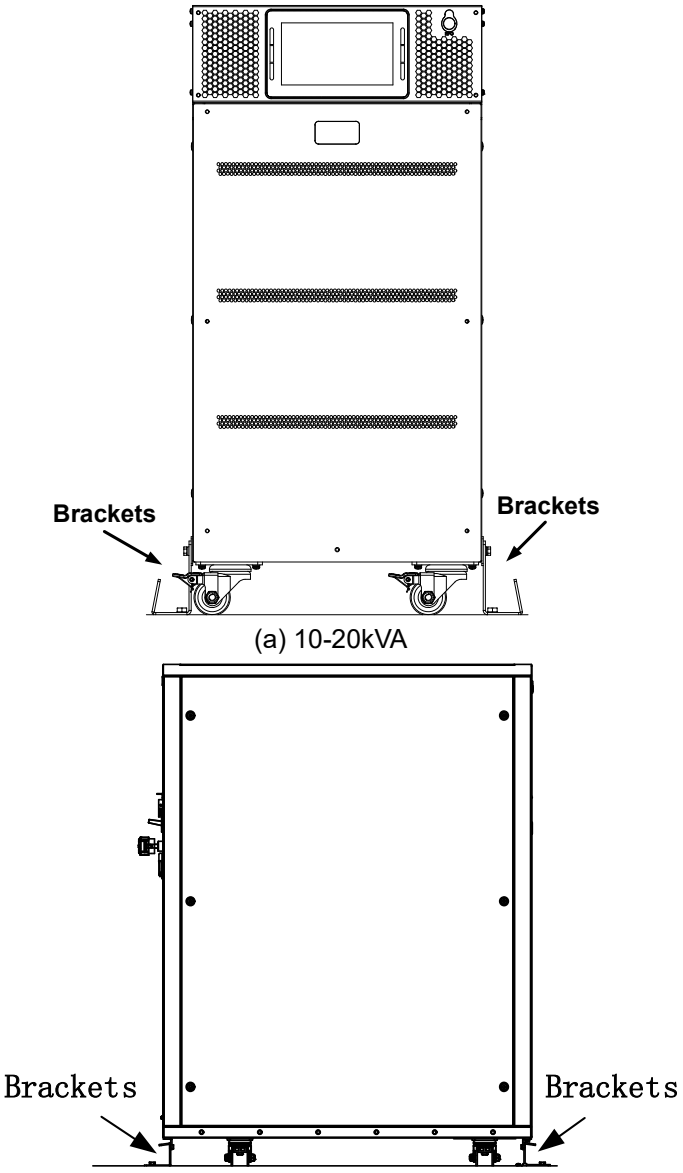
(1) Determine the cabinet installation position. Based on the hole dimension of the bracket in Figure 3-6, mark the installation holes on the mounting surface.

(2) Use a hammer drill to drill holes at the installation positions for the expansion bolts, with a drill hole diameter of 10mm. Fully drive 4 M8 expansion bolts into the installation holes. Tighten the bolts to fully expand the expansion bolts, then unscrew the bolts.



(3) Push the UPS to the designated installation position.

(4) Install the brackets of the UPS, as shown in Figure 3-8.



(a) 10-20kVA

(b) 30-40kVA

Figure 3-8 The brackets of the UPS

(5) Use bolts to fix the UPS brackets to the expansion bolt installation holes on the ground, and tighten the bolts.

CAUTION

The depth to drive the expansion bolts shall be based on the requirement that the expansion sleeves are fully inserted into the holes. The expansion sleeves must not protrude above the ground, so as not to affect the subsequent cabinet installation.

3.4 External battery

Three terminals (positive, neutral, negative) are drawn from the battery group, first connected to a 3-pole DC breaker, and then connected to the UPS system. The neutral line is draw from the middle of the batteries in series as shown in Figure 3-9.

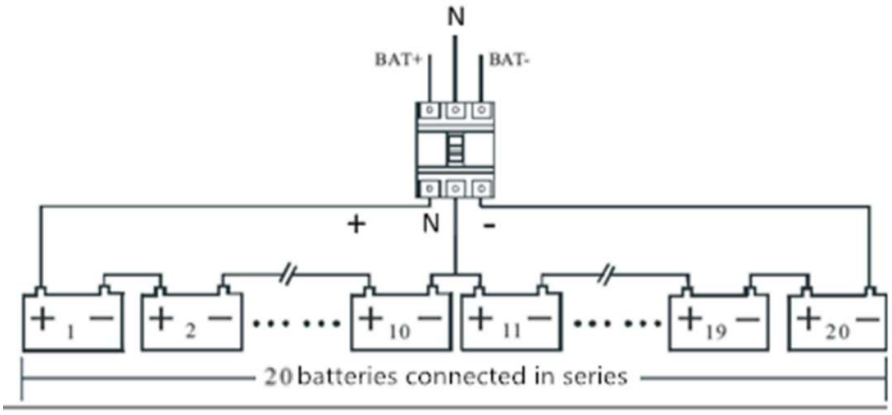


Figure 3-9 Battery string wiring diagram

DANGER

The battery terminal voltage is of more than 200Vdc, please follow the safety instructions to avoid electric shock hazard.

Ensure the positive, negative, neutral electrodes are correctly connected from the battery unit terminals to the breaker and from the breaker to the UPS system, and the selection of the external battery breaker complies with requirements (Refer to chapter 3.6.1).

3.5 Installation of internal batteries

For 10/15/20kVA UPS, 80 pieces of 7AH/9AH batteries can be installed.

For 30/40kVA UPS, 160 pieces of 7AH/9AH batteries can be installed.

Each strings have 2 battery strips. The interconnection among strings is via cable with Anderson Socket.

(1) Connect the all-battery strips internal cables as shown in Figure 3-10. All battery strips are connected the same, shown as a set of battery strip.

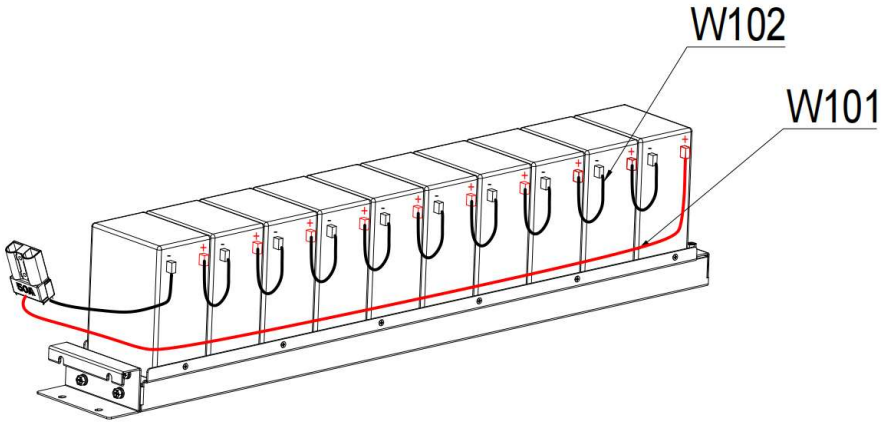
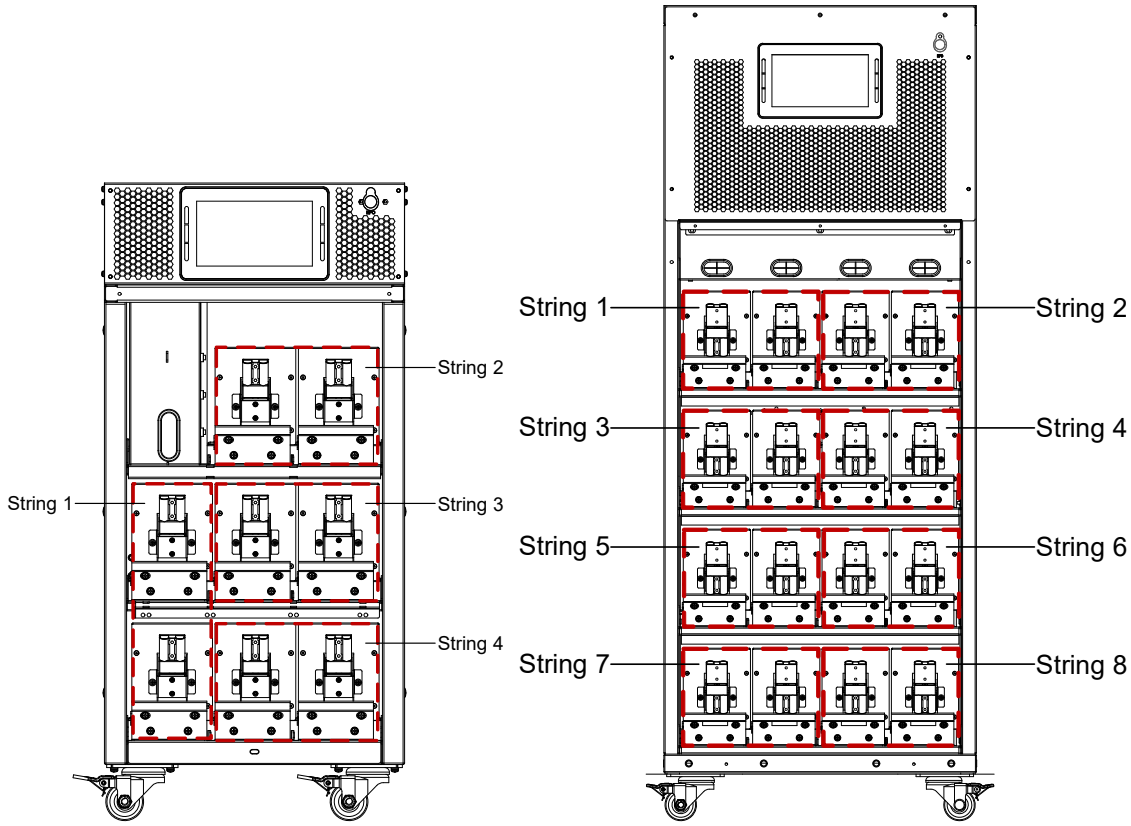


Figure 3-10 battery strip

(2) Remove the plate in front of the battery shelves.

(3) Holding the handle, install the battery strip one string at a time from the bottom and up, as shown in Figure 3-11.



(a) 10-20kVA (b) 30-40kVA

Figure 3-11 Battery Strings Diagram

(4) Fasten the battery strip with a screw in front of the battery strip.

(5) connect the power terminals to the batteries.

(6) Reinstall the plate in front of the battery shelves.

WARNING

Make sure the polarity of the battery is correct according to the diagrams above.

Test and confirm the battery voltage before connecting to the main circuit.

3.6 External protective device

A circuit breaker must be installed at the external AC power input of the UPS. This section provides general guidance for qualified installation engineers. qualified installation engineers shall be familiar with the local wiring regulations for the equipment to be installed as well as other relevant

knowledge of such installation.

3.6.1 Circuit Breaker

The external circuit breakers (CB) for the system are recommended in Table 3-2.

Table 3-2 Recommended CB

Installed position	10KVA	15KVA	20KVA	30KVA	40KVA
Input CB	63A/4P	63A/4P	80A/4P	125A/4P	225A/4P
Bypass input CB	63A/4P	63A/4P	80A/4P	125A/4P	225A/4P
Output CB	63A/4P	63A/4P	80A/4P	125A/4P	225A/4P
Maintenance CB	63A/3P	63A/4P	80A/3P	125A/3P	225A/3P
Battery CB	100A/3P 250VDC	100A/3P 250VDC	125A/3P 250VDC	200A/3P 250VDC	250A/3P 250VDC

 CAUTION

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

3.6.2 Main Bypass Circuit Backfeed Protection

The entire product series comes standard with bypass backfeed protection, when using the main circuit backfeed protection function, the user's main circuit input AC input mains circuit breaker must be equipped with a protective device with a tripping function, and the trip device control signal must be connected to the system's dry contact interface, refer to chapter 3.8.1.

3.7 Power Cables

3.7.1 Cables Specifications

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

Table 3-3 Recommended cables for power cables

Contents	10KVA	15KVA	20KVA	30KVA	40KVA

Main Input	Main Input Current(A)		33A	50A	66A	108A	142A
	CableSection (AWG)	L1	8	6	4	1	2/0
		L2					
		L3					
		N					
Main Output	Main Output Current(A)		27A	41A	56A	83A	111A
	CableSection (AWG)	L1	8	6	4	3	1
		L2					
		L3					
		N					
Bypass Input	Bypass Input Current(A)		29A	42A	57A	86A	113A
	CableSection (AWG)	L1	8	6	4	2	1
		L2					
		L3					
		N					
External battery Input	Battery Input current(A)		47A	71A	96A	140A	190A
	CableSection (AWG)	+	6	3	2	2/0	4/0
		-					
		N					
PE	CableSection (AWG)	PE	10	8	8	6	6

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

- Ambient temperature：30℃.
- AC loss less than 3%，DC loss less than1%，The length of the AC power cables are no longer than 50 m and the length of the external DC power cables are no longer than 30 m.
- For 90°C copper conductor flexible cables, when the external conditions change, please refer to National Electrical Code (NEC) and relevant local codes for verification.
- The cross-section of neutral lines needs to be increased to 1.5~1.73 times of the value listed above when the main loads are non-linear load.

3.7.2 Specifications for Power Cables Terminal

Specifications for power cables connector are listed as Table 3-4.

Table 3-4 Requirements for power terminal

UPS rating		10kVA	15 kVA	20 kVA	30 kVA	40 kVA
Mains input	Bolt	M6	M6	M6	M8	M10

	Torque	4.9 Nm	4.9 Nm	4.9 Nm	12 Nm	20 Nm
Bypass Input	Bolt	M6	M6	M6	M8	M10
	Torque	4.9 Nm	4.9 Nm	4.9 Nm	12 Nm	20 Nm
Battery Input	Bolt	M6	M8	M8	M10	M10
	Torque	4.9 Nm	12 Nm	12 Nm	20 Nm	20 Nm
Output	Bolt	M6	M6	M6	M8	M10
	Torque	4.9 Nm	4.9 Nm	4.9 Nm	12 Nm	20 Nm
PE	Bolt	M6	M6	M6	M8	M8
	Torque	4.9 Nm	4.9 Nm	4.9 Nm	12 Nm	12 Nm

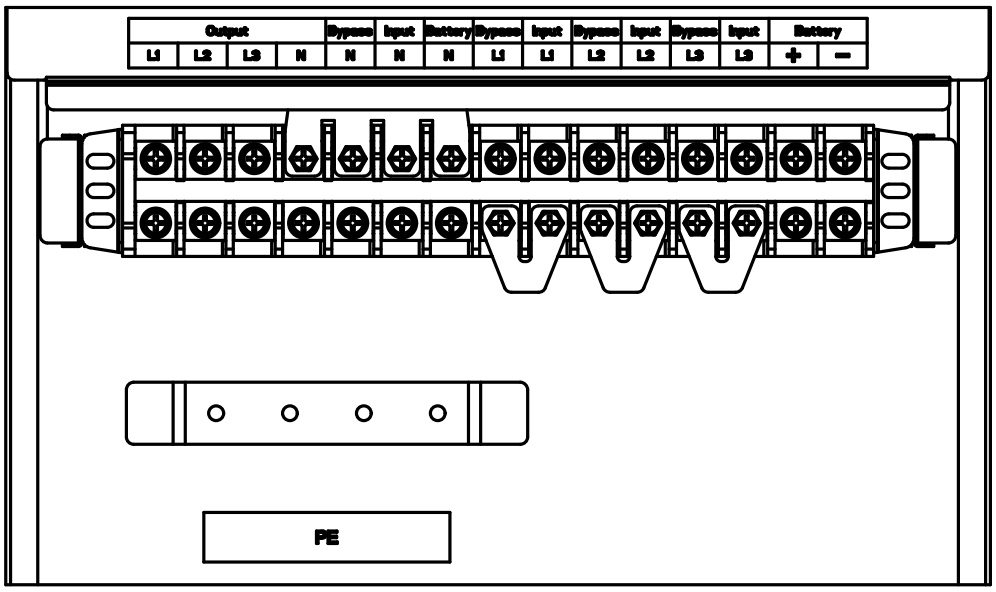
3.7.3 Connecting Power Cables

(1) Ensure that all breakers or switches are in the OFF (open) position.
(2) Remove the conduit box cover.
(3) In dual mains systems, remove the three single mains shorting bus bar.
(4) Remove the knockout from the bottom cover. Install the conduit (if applicable).
(5) Route the power cables through the bottom of the conduit box.
(6) Connect the equipment grounding conductor.
(7) Connect the N-cables to the N-terminals.

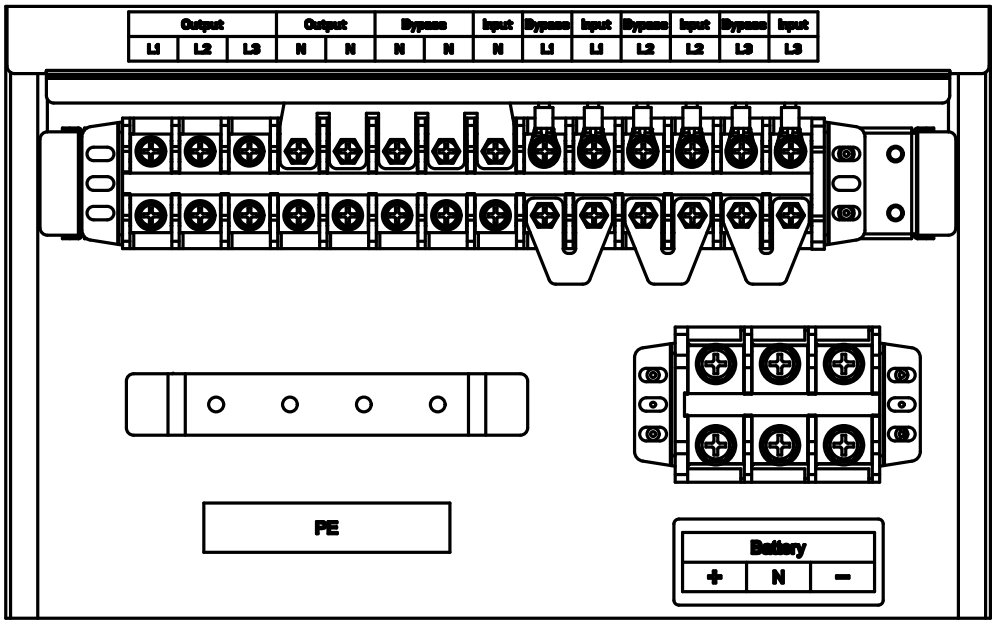
(8) Connect the external DC cables to the DC terminals (if applicable).

(9) Connect the input cables, output cables, and bypass cables (if applicable).

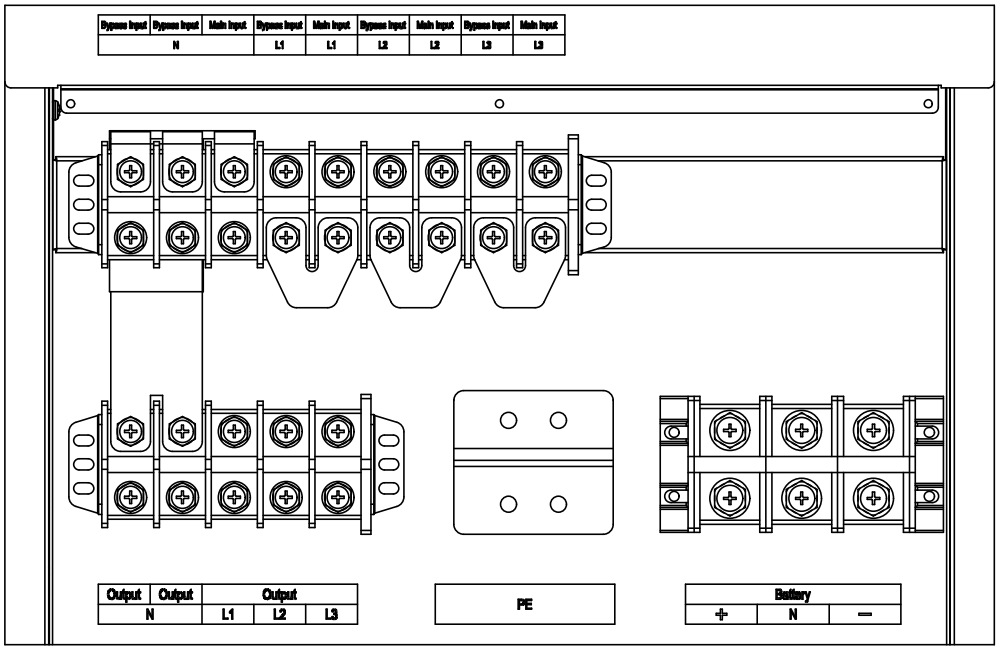
The terminals are shown in Figure 3-12.



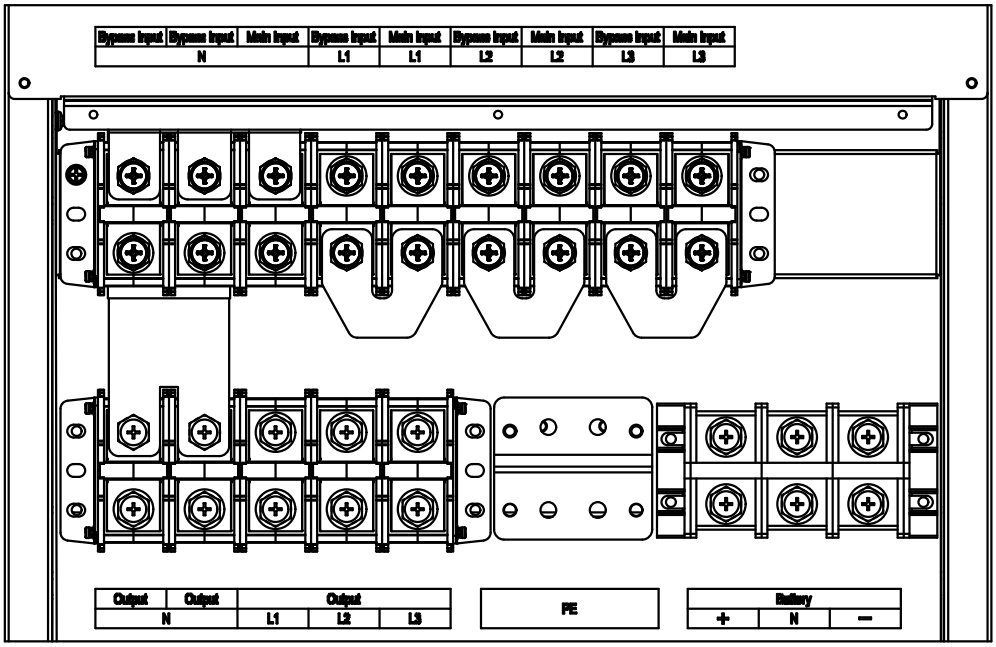
(a) 10kVA



(b) 15/20kVA



(c) 30kVA



(d) 40kVA

Figure 3-12 Connection terminals

(6) Check to ensure there is no mistake and reinstall the conduit box covers.

CAUTION

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

WARNING

When connecting power cables, follow the torque listed in Table 3-4 to ensure the tightness of the wiring terminals and avoid potential safety hazards.

Before wiring the UPS, confirm the position and status of the UPS input switch and the mains power distribution switch. Make sure that the switch is in the off state and attach a warning sign to prevent others from operating the switch.

3.8 Control and Communication Cables

The rear panel of the cabinet provides dry contact interface and communication interface (RS232, RS485, SNMP, Parallel card interface and USB port), as it is shown in Figure 3-13.

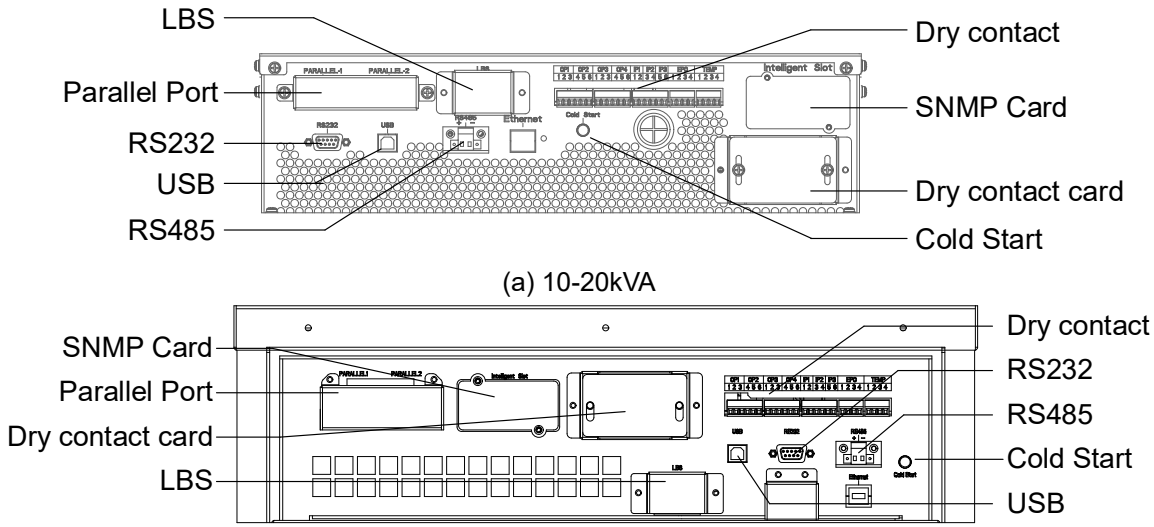


Figure 3-13 communication interface

3.8.1 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_COMM	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_COMM	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_COMM	OP3-1 and OP3-2 Common
OP4-4	BYP Backfeed	Output dry contact, the function is fixed.
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.

(1) 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) and connecting NO (EPO-1) and +24V (EPO-2). The port diagram is shown in Figure 3-14, and the definition is shown in Table 3-6.

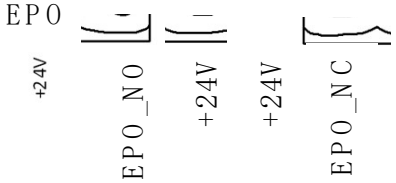


Figure 3-14 Diagram of input port for remote EPO

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.

(2) Interface of Battery and Environmental Temperature Detection

The input dry contact can detect the temperature of batteries and environment respectively, which can be used in environment monitoring and battery temperature compensation. Interfaces diagram for TEMP_1-4 are shown in Figure 3-13, the description of the interface is in Table 3-7.

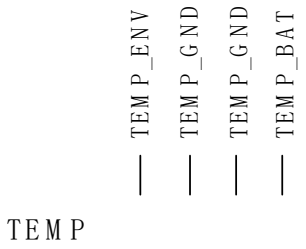


Figure 3-15 TEMP 1-4 for temperature detecting

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, and it's optional, please confirm with the manufacturer or the local agency before the order.

(3) 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 3-16, the port description is shown in Table 3-8.

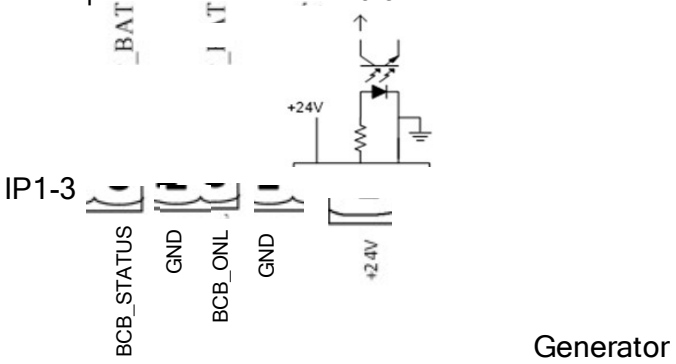


Figure 3-16 Diagram of input port for generator input

Table 3-8 Description of input port for generator input

Port	Name	Function
IP3-5	GEN_CONNECTED	Default: Generator input dry contact.

Port	Name	Function
IP3-6	+24V_DRY	+24V

(4) BCB Input Port

The UPS would detect the BCB status, when BCB is closed, it indicates batteries are connected, when open, it alarms batteries not connected. The port diagram is shown in Figure 3-17, and the description is shown in Table 3-9.

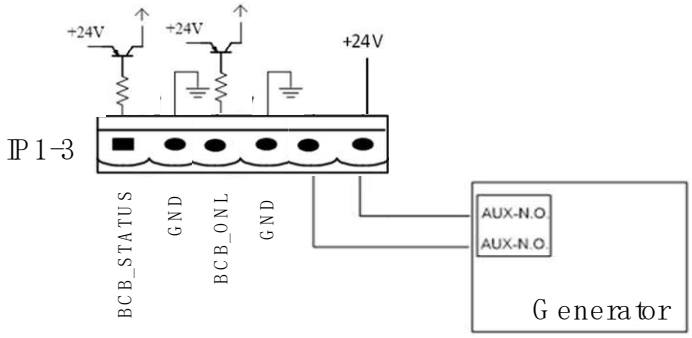


Figure 3-17 Diagram of input port for BCB Input

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

(5) Battery Warning Output Dry Contact Interface

The default function of OP1 1-3 is the output dry contact interface for battery voltage low alarm, when the battery voltage is lower than the setting value, an auxiliary dry contact signal will be activated via the relay, before UPS alarms "Battery voltage low", OP1-1 and OP1-3 are connected by the relay, OP1-2 and OP1-3 are disconnected, when UPS alarms "battery voltage low", OP1-1 and OP1-3 are disconnected by the relay, OP1-2 and OP1-3 are connected.

The port diagram is shown in Figure 3-18, and the description is shown in Table 3-10.

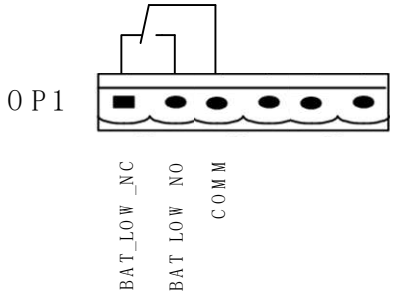


Figure 3-18 Battery warning output dry contact interface diagram

Table 3-10 Battery warning output dry contact interface description

Port	Name	Function

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_COMM	Common terminal

(6) General Alarm Output Dry Contact Interface

The default function of OP2 is the general alarm output dry contact dry interface. When one and more warnings are trigger, an auxiliary dry contact signal will be active via the isolation of a relay. The port diagram is shown in Figure 3-19, and the description is shown in Table 3-11.

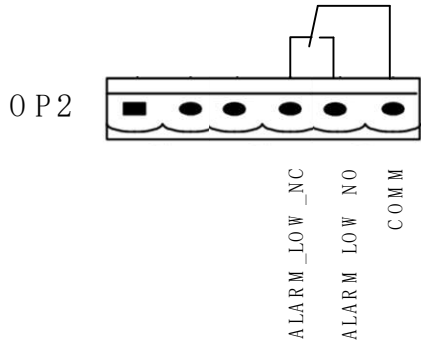


Figure 3-19 General alarm dry contact interface diagram

Table 3-11 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_COMM	Common terminal

(7) 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 information, and provide an auxiliary dry contact signal via the isolation of a relay. The interface diagram is shown in Figure 3-20, and the description is shown in Table 3-12.

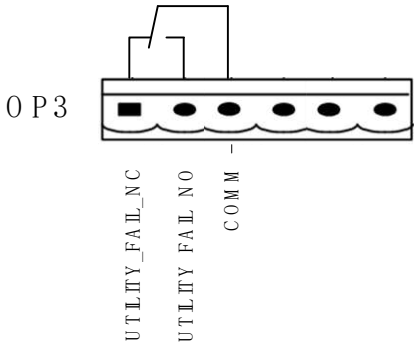


Figure 3-20 Utility failure warning dry contact interface diagram

Table 3-12 Utility failure warning dry contact interface description

Port	Name	Function

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_COMM	Common terminal

When the function of the output dry contact is set to Mainbackfeed and this output dry contact port is connected to the external main input break shunt trip, the output dry contact port can provide a driver signal to trip the external main input breaker When the UPS detects the occurrence of main circuit backfeed happen.

When the function of the output dry contact is set to BCB_trip and this output dry contact port is connected to the external battery break shunt trip, the output dry contact port can provide a driver signal to trip the external battery breaker when EPO is triggered or EOD (end of discharge) happen.

The output dry contact relay rating: 30Vdc/5A.

Connection diagram output dry contact to external break shunt trip, take OP3 as an example, as shown in Figure 3-21.

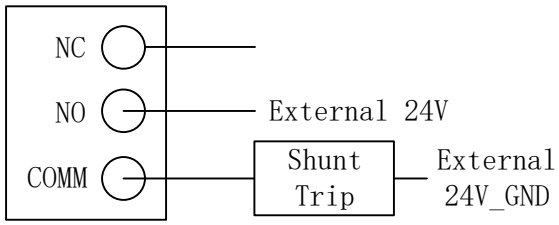


Figure 3-21 Output dry contact to external break shunt trip

3.8.2 Dry contact Card

The dry contact rating is as follows:

Max output current for them is 1A.

NC: normally close / NO: normally open

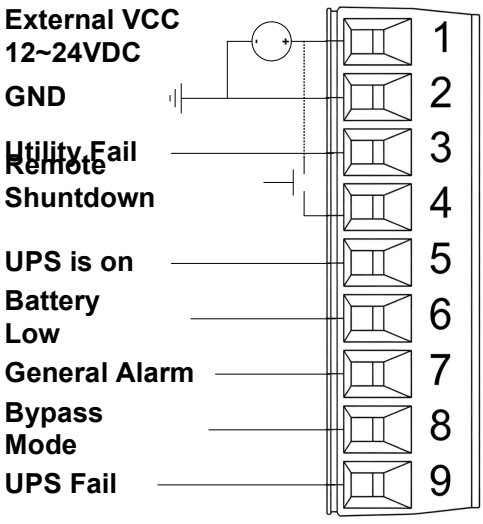


Figure 3-22 Description of Phoenix port

Table 3-13 Dry contact Card description

Function	Port PIN	Description
VCC	1	External power supply. 12VDC~24VDC, Common connection.
GND	2	External power supply GND
Utility fail	3	Pin3 to pin1 is open if utility is failure. If not, NC.
Remote shutdown	4	1.UPS shutdowns rectifier and inverter if utility is normal. 2.UPS shutdowns completely if in battery mode. 3.Remote shut down if in high level
Normal mode	5	Pin5 to pin1 is NC if UPS works in normal mode.
Battery low	6	Pin6 to pin1 is open if battery voltage is low. If not, NC.
General alarm	7	Pin7 to pin1 is open if something is abnormal. If not, NC.
Bypass mode	8	Pin8 to pin1 is close if UPS works in bypass mode. If not, NO.
UPS fail	9	Pin9 to pin1 is open if something is failure in UPS. If not, NC.

DANGER!

The dry contact card circuit are operated at hazardous voltage.

Do not remove the protection cover when the equipment is operating.

3.8.3 LBS (Load bus synchronization)

A typical dual-bus system consists of two independent UPS (Uninterruptible Power Supply) systems, each composed of one or more parallel-connected UPS units. One of the two UPS systems serves as the main system, and the other as the standby system. The dual-bus system features high reliability and is suitable for loads with multiple input terminals. Its operating modes include the main system and standby system running in inverter mode or bypass mode.

When a UPS is used in a dual-bus system, an STS (Static Transfer Switch) and an optional LBS (Load Bus Synchronization) controller need to be incorporated, with the LBS controller connected to the LBS interface of the UPS.

DANGER!

The LBS terminal are operated at hazardous voltage.

Do not remove the protection cover when the equipment is operating.

3.8.4 Communication Interface

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

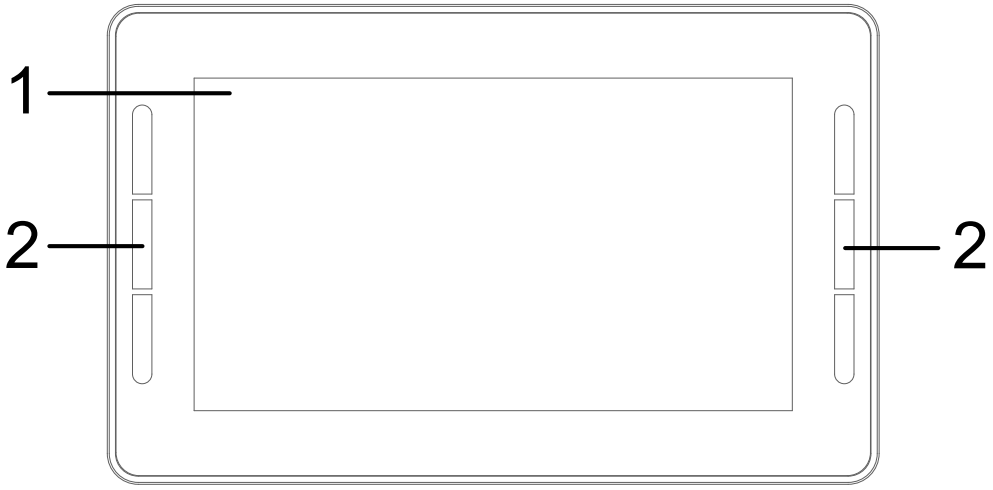
SNMP card: It is used on site for communication (Optional).

4 UPS Control LCD Panel

4.1 UPS LCD Panel

The LCD panel for cabinet is divided into three functional areas: LED indicator, control and operation keys and LCD touch screen.

The structure of operator control and display panel for cabinet is shown in Figure 4-1.



1: LCD touch screen 2: 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 alarms 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)

CAUTION

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

4.1.2 LCD Touch Screen

User can easily browse the information, operate the UPS, and set the parameters through the LCD

touch screen, which is friendly for users.

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

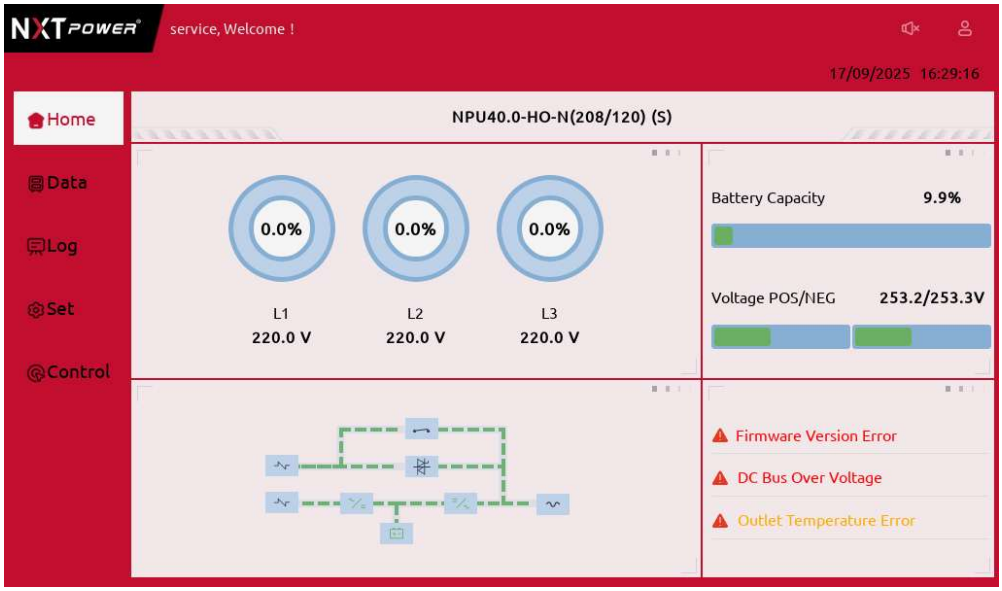


Figure 4-2 Home page

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 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 Data, Setting, Log, Control. 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.

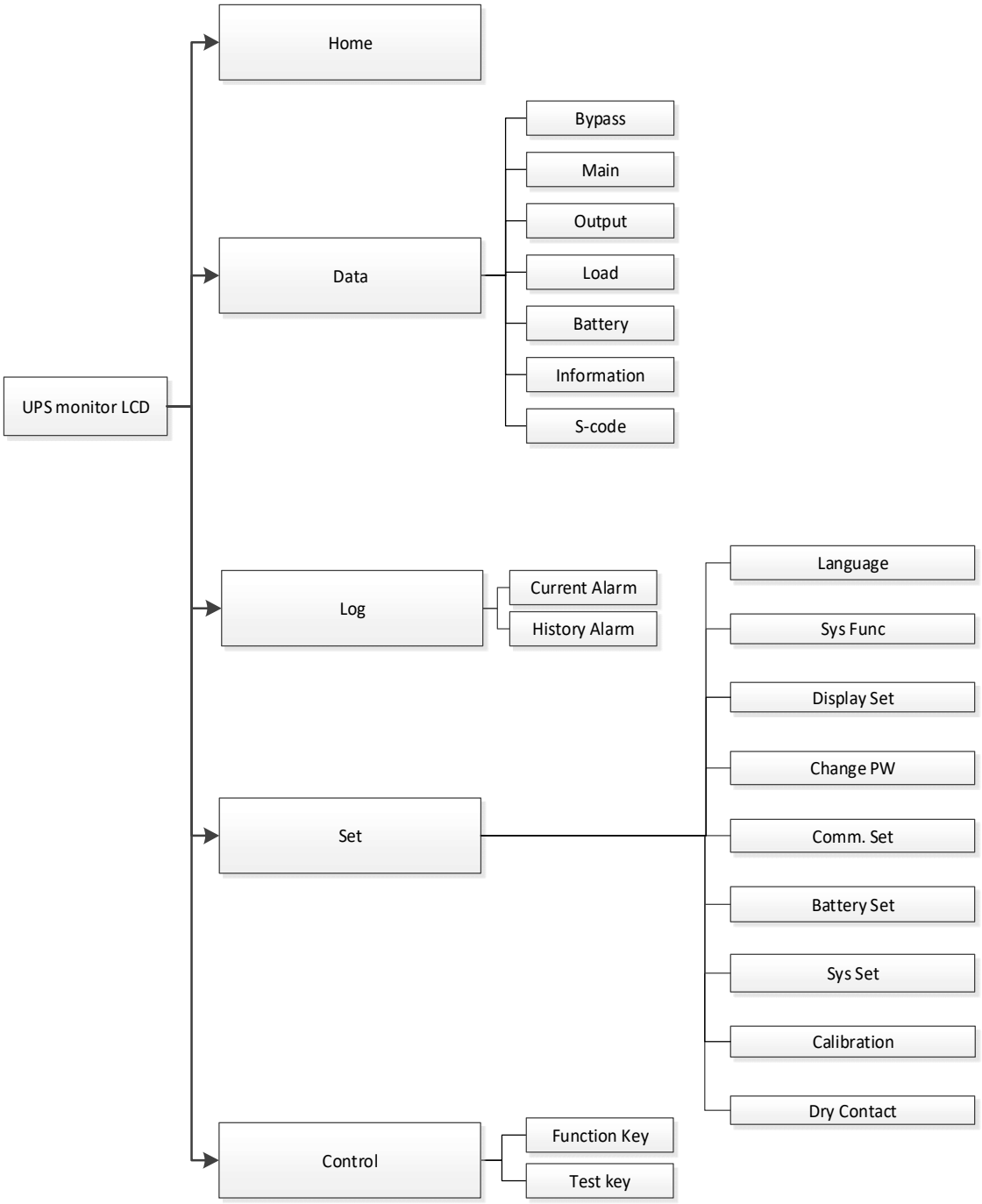


Figure 4-3 Structure of menu diagram

4.2 Main menu

The main menu includes Home page, Data, Setting, Log, Control, 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.

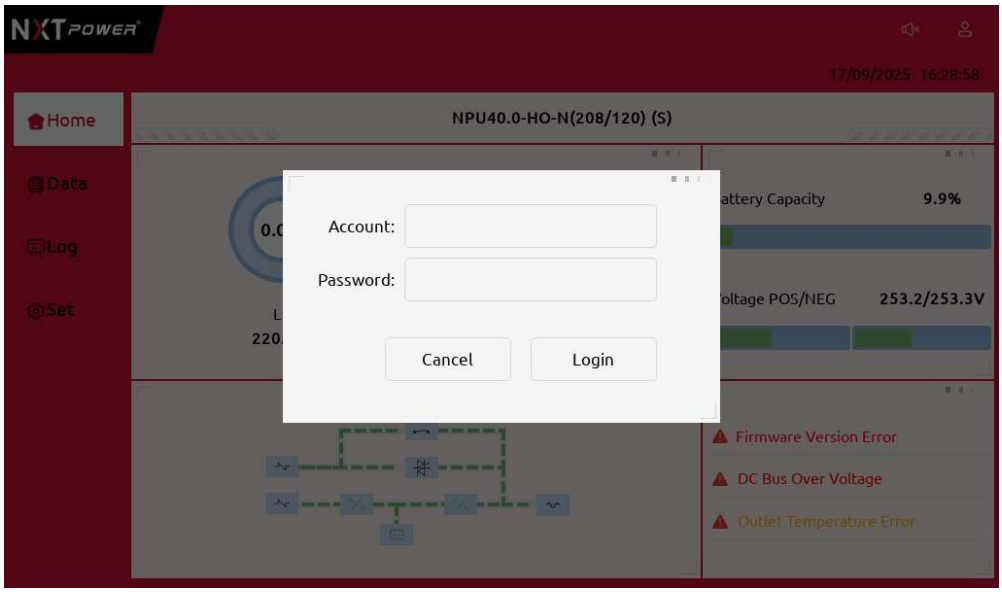


Figure 4-4 Login page

4.2.2 Data Menu

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

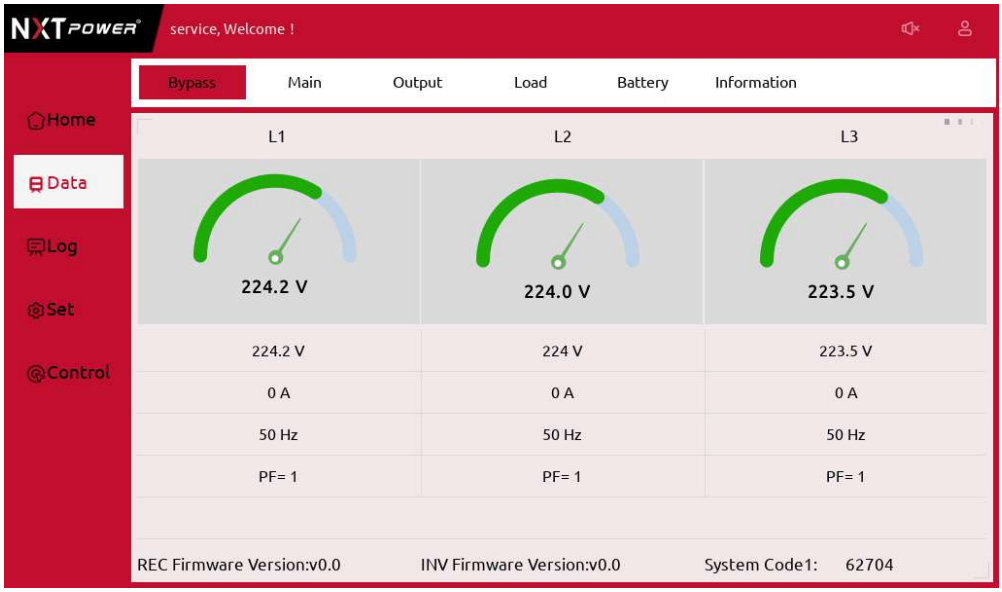


Figure 4-5 Cabinet menu

The cabinet menu interface mainly consists of sub menus for bypass, main input, output, load, and battery. Each sub-menu displays detection information for each part of the cabinet. The sub-menu of Cabinet is described in details below in Table 4-3.

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

Table 4-3 Description of each sub-menu of Data

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 capacity
	Remain Time（Min）	Remaining battery backup time
	Battery Temp.(℃)	Battery temperature
	Ambient Temp.(℃)	Environmental temperature
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 L1/L2/L3 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 L1/L2/L3
	INV IGBT Temp.(°C)	INV IGBRT temperature of the phase L1/L2/L3
Scode	Fault Code	For the maintenance personnel

4.2.3 Set Menu

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

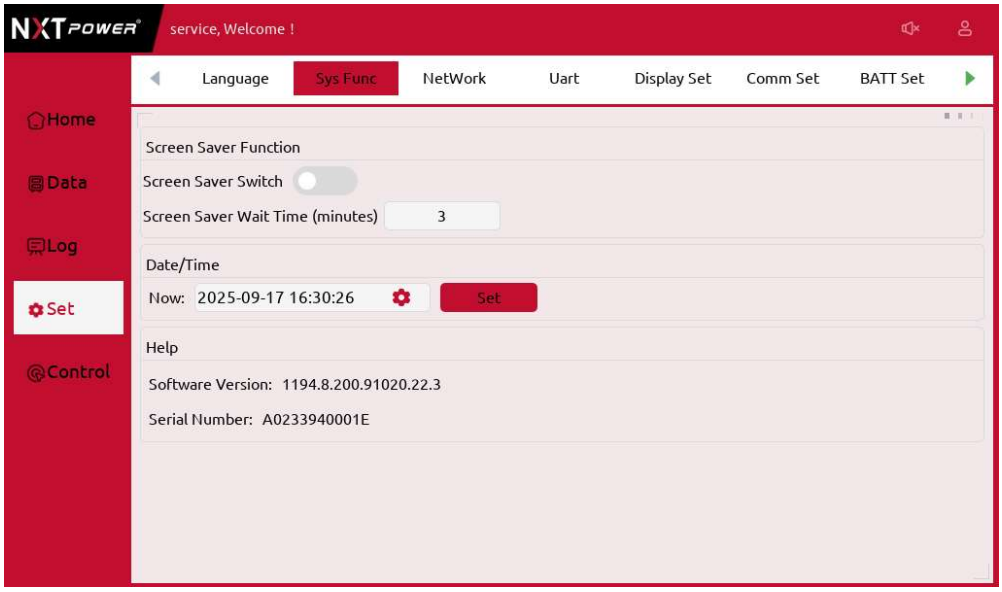


Figure 4-6 Setting menu

Under the setting menu, there are the following grading sub-menus, which are language setting, system function, network setting, general setting, communication setting, user setting, battery setting, system setting, rating setting, system code setting, calibration function and dry contact setting.

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

Table 4-4 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
Display Set	Display Setting	Homepage UPS model, screen horizontal and vertical display
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 Set	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)
	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. For example, lithium battery settings, please contact the manufacturer

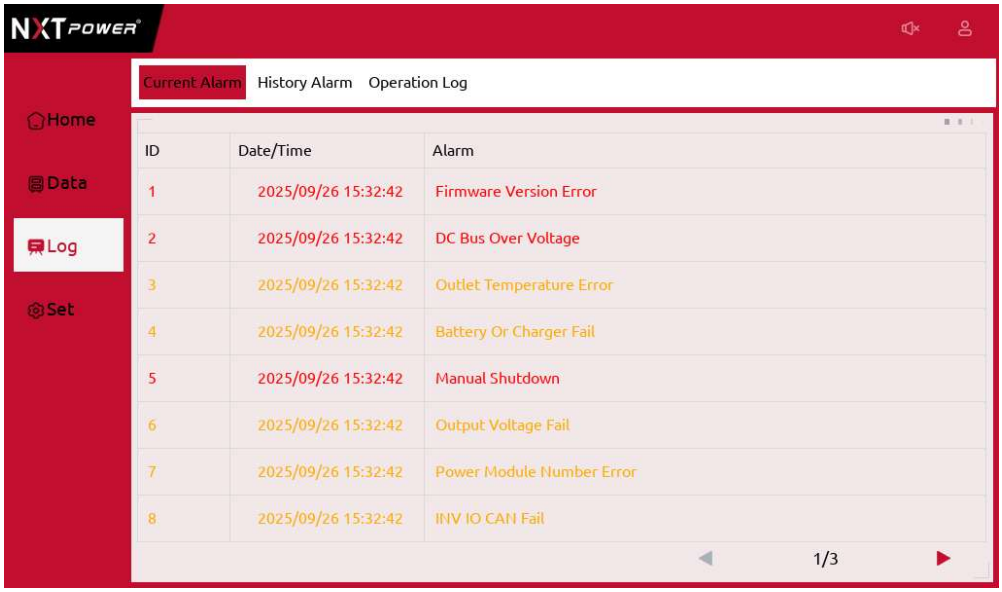
WARNING

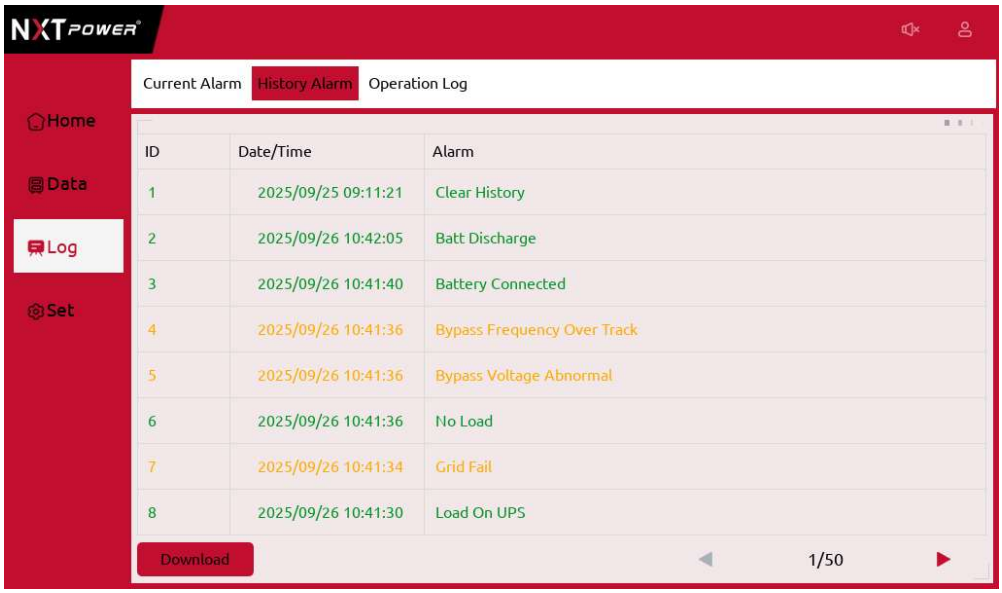
Ensure the number of the battery, set via the menu or the monitoring software, is completely equal to the real installed number. Otherwise, it may cause serious damage to the batteries or the equipment.

4.2.4 Log Menu

Click on the icon on the left side of the LCD screen to enter the Log menu, where history is recorded by time.

Display various events and alarm information that have occurred in the system in sequence, and record the time of their set and clear. The recording menu is divided into three menus: current alarm, historical alarm, and Operation log. The Home screen is shown in Figure 4-7 below.





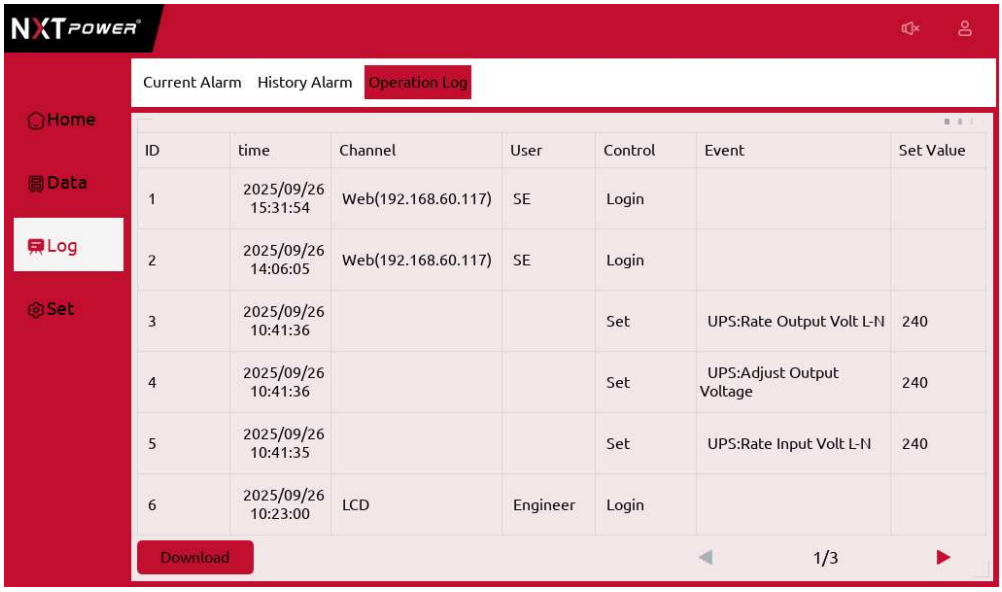


Figure 4-7 Log menu

The Table 4-5 below displays all the events and gives a brief explanation

Table 4-5 The list for events

UPS events	Description
Fault Clear	Manually clear fault
Log Clear	Manually clear History log
Load On UPS	Inverter feeds load
Load On Bypass	Bypass feeds load
No Load	No load
Battery Boost	Charger is working in boost charging mode
Battery Float	Charger is working in float charging mode
Battery Discharge	Battery is discharging
Battery Connected	Battery is connected
Battery Not Connected	Battery is not connected.
Maintenance CB Closed	Manual maintenance breaker is closed
Maintenance CB Open	Manual maintenance breaker is opened
EPO	Emergency Power Off
Module On Less	Available power module capacity is less than the load capacity. Please reduce the load capacity or add extra power module to make sure that the UPS capacity is big enough.
Generator Input	Generator is connected and a signal is sent to the UPS.
Utility Abnormal	Utility (Grid) is abnormal. Mains voltage or frequency exceeds the upper or lower limit and results in rectifier shutdown. Check the input phase voltage of rectifier.
Bypass Sequence Error	Bypass voltage Sequence is reverse. Check if input power cables are connected correctly.
Bypass Volt Abnormal	This alarm is triggered by an inverter software routine when the amplitude or frequency of bypass voltage exceeds the limit. The alarm will

	automatically reset if the bypass voltage becomes normal. First check if relevant alarm exists, such as “bypass circuit breaker open”, “Byp Sequence Err” and “Ip Neutral Lost”. If there is any relevant alarm, first clear this alarm. 1. Then check and confirm if the bypass voltage and frequency displayed on the LCD are within the setting range. Note that the rated voltage and frequency are respectively specified by “Output Voltage” and “Output Frequency”. 2. If the displayed voltage is abnormal, measure the actual bypass voltage and frequency. If the measurement is abnormal, check the external bypass power supply. If the alarm occurs frequently, use the configuration software to increase the bypass high limit set point according to the user’s suggestions
Bypass Module Fail	Bypass Module Fails. This fault is locked until power off. Or bypass fans fail.
Bypass Module Over Load	Bypass current is over the limitation. If bypass current is under 125% of the rated current. The UPS alarms but has no action.
Bypass Over Load Tout	The bypass overload status continues and the overload times out.
Byp Freq Over Track	This alarm is triggered by an inverter software routine when the frequency of bypass voltage exceeds the limit. The alarm will automatically reset if the bypass voltage becomes normal. First check if relevant alarm exists, such as “Byp Sequence Err” and “Input Neutral Lost”. If there is any relevant alarm, first clear this alarm. Then check and confirm if the bypass frequency displayed on the LCD are within the setting range. Note that the rated frequency is respectively specified by “Output Frequency”. If the displayed voltage is abnormal, measure the actual bypass frequency. If the measurement is abnormal, check the external bypass power supply. If the alarm occurs frequently, use the configuration software to increase the bypass high limit set point according to the user’s suggestions
Exceed Tx Times Lmt	The load is on bypass because the output overload transfer and re-transfer is fixed to the set times during the current hour. The system can recover automatically and will transfer back to the inverter with 1 hour
Output Short Circuit	Output shorted Circuit. Fist check and confirm if loads have something wrong. Then check and confirm if there is something wrong with terminals, sockets or some other power distribution unit. If the fault is solved, press “Fault Clear” to restart UPS.
Battery EOD	Inverter turned off due to low battery voltage. Check the mains power failure status and recover the mains power in time
Battery Test	System transfer to battery mode for 20 seconds to check if batteries are normal
Battery Test OK	Battery Test OK
Battery Maintenance	System transfer to battery mode until battery voltage is down to 1.1*EOD voltage to maintain battery string
Battery Maintenance OK	Battery maintenance succeed
Module inserted	Power Module is inserted in system.

Module Exit	Power Module is pulled out from system.
Rectifier Fail	The N# Power Module Rectifier Fail, The rectifier is fault and results in rectifier shutdown and battery discharging.
Inverter Fail	The N# Power Module Inverter Fail. The inverter output voltage is abnormal and the load transfers to bypass.
Rectifier Over Temp.	The N# Power Module Rectifier Over Temperature. The temperature of the rectifier IGBTs is too high to keep rectifier running. This alarm is triggered by the signal from the temperature monitoring device mounted in the rectifier IGBTs. The UPS recovers automatically after the over temperature signal disappears. If over temperature exists, check: 1. Whether the ambient temperature is too high. 2. Whether the ventilation channel is blocked. 3. Whether fan fault happens. 4. Whether the input voltage is too low.
Fan Fail	At least one fan fails in the N# power module.
Output Over load	The N# Power Module Output Over Load. This alarm appears when the load rises above 100% of nominal rating. The alarm automatically resets once the overload condition is removed. 1. Check which phase has overload through the load (%) displayed in LCD so as to confirm if this alarm is true. 2. If this alarm is true, measure the actual output current to confirm if the displayed value is correct. Disconnect non-critical load. In parallel system, this alarm will be triggered if the load is severely imbalanced.
Inverter Overload Tout	N# Power Module Inverter Over Load Timeout. The UPS overload status continues and the overload times out. Note: The highest loaded phase will indicate overload timing-out first. When the timer is active, then the alarm “unit over load” should also be active as the load is above nominal. When the time has expired, the inverter Switch is opened and the load transferred to bypass. If the load decreases to lower than 95%, after 2 minutes, the system will transfer back to inverter mode. Check the load (%) displayed in LCD to confirm if this alarm is true. If LCD displays that overload happens, then check the actual load and confirm if the UPS has over load before alarm happens.
Inverter Over Temp.	The N# Power Module Inverter Over Temperature. The temperature of the inverter heat sink is too high to keep inverter running. This alarm is triggered by the signal from the temperature monitoring device mounted in the inverter IGBTs. The UPS recovers automatically after the over temperature signal disappears. If over temperature exists, check: Whether the ambient temperature is too high. Whether the ventilation channel is blocked. Whether fan fault happens. Whether inverter overload time is out.

On UPS Inhibited	Inhibit system transfer from bypass to UPS (inverter). Check: Whether the power module's capacity is big enough for load. Whether the rectifier is ready. Whether the bypass voltage is normal.
Manual Transfer Byp	Transfer to bypass manually
Esc Manual Bypass	Escape from "transfer to bypass manually" command. If UPS has been transferred to bypass manually, this command enable UPS to transfer to inverter.
Battery Volt Low	Battery Voltage is Low. Before the end of discharging, battery voltage is low warning should occur. After this pre-warning, battery should have the capacity for 3 minutes discharging with full load.
Battery Reverse	Battery cables are connected not correctly.
Inverter Protect	The N# Power Module Inverter Protect. Check: Whether inverter voltage is abnormal Whether inverter voltage is much different from other modules, if yes, please adjust inverter voltage of the power module separately.
Input Neutral Lost	The mains neutral wire is lost or not detected. For 3 phases UPS, it's recommended that user use a 3-poles breaker or switch between input power and UPS.
Bypass Fan Fail	At least one of bypass module Fans Fails
Manual Shutdown	The N# Power Module is manually shutdown. The power module shuts down rectifier and inverter, and there's on inverter output.
Manual Boost Charge	Manually force the Charger work in boost charge mode.
Manual Float Charge	Manually force the charger work in float charge mode.
UPS Locked	Forbidden to shutdown UPS power module manually.
Parallel Cable Error	Parallel cables error. Check: If one or more parallel cables are disconnected or not connected correctly If parallel cable round is disconnected If parallel cable is OK
Lost N+X Redundant	Lost N+X Redundant. There is no X redundant powers module in system.
EOD Sys Inhibited	System is inhibited to supply after the battery is EOD (end of discharging)
Battery Test Fail	Battery Test Fail. Check if UPS is normal and battery voltage is over 90% of float voltage.
Battery Maintenance Fail	Check If UPS is normal and not any alarms If the battery voltage is over 90% of float voltage If load is over 25%
Ambient Over Temp	Ambient temperature is over the limit of UPS. Air conditioners are required to regulate ambient temperature.
REC CAN Fail	Rectifier CAN bus communication is abnormal. Please check if communication cables are not connected correctly.
INV IO CAN Fail	IO signal communication of inverter CAN bus is abnormal. Please check if communication cables are not connected correctly.
INV DATA CAN Fail	DATA communication of inverter CAN bus is abnormal. Please check if

	communication cables are not connected correctly.
Power Share Fail	The difference of two or more power modules' output current in system is over limitation. Please adjust output voltage of power modules and restart UPS.
Sync Pulse Fail	Synchronization signal between modules is abnormal. Please check if communication cables are not connected correctly.
Input Volt Detect Fail	Input voltage of N# power module is abnormal. Please check if the input cables are connected correctly. Please check if input fuses are broken. Please check if utility is normal.
Battery Volt Detect Fail	Battery voltage is abnormal. Please check if batteries are normal. Please check if battery fuses are broken on input power board.
Output Volt Fail	Output voltage is abnormal.
Bypass Volt Detect Fail	Bypass voltage is abnormal. Please check if bypass breaker is closed and is good. Please check if bypass cables are connected correctly.
INV Bridge Fail	Inverter IGBTs are broken and opened.
Outlet Temp Error	Outlet temperature of power module is over the limitation. Please check if fans are abnormal. Please check if PFC or inverter inductors are abnormal. Please check if air passage is blocked. Please check if ambient temperature is too high.
Input Curr Unbalance	The difference of input current between every two phases is over 40% of rated current. Please check if rectifier's fuses, diode, IGBT or PFC diodes are broken. Please check if input voltage is abnormal.
DC Bus Over Volt	Voltage of DC bus capacitors is over limitation. UPS shutdown rectifier and inverter.
REC Soft Start Fail	While soft start procedures are finished, DC bus voltage is lower than the limitation of calculation according utility voltage. Please check Whether rectifier diodes are broken Whether PFC IGBTs are broken Whether PFC diodes are broken Whether drivers of SCR or IGBT are abnormal Whether soft start resistors or relay are abnormal
Relay Connect Fail	Inverter relays are opened and cannot work or fuses are broken.
Relay Short Circuit	Inverter relays are shorted and cannot be released.
PWM Sync Fail	PWM synchronizing signal is abnormal
Intelligent Sleep	UPS works in intelligent sleep mode. In this mode, the power modules will be standby in turn. It will be more reliability and higher efficiency. It must be confirmed that remained power modules' capacity is big enough to feed load. It must be conformed that working modules' capacity is big enough if user add more load to UPS. It's recommended that sleeping power modules are waken up if the capacity of new added loads is not

	sure.
Manual Transfer to INV	Manually transfer UPS to inverter. It's used to transfer UPS to inverter when bypass is over tracking. The interrupt time could be over 20ms.
Input Over Curr Tout	Input over current timeout and UPS transfer to battery mode. Please check if input voltage is too low and output load is big. Please regulate input voltage to be higher if it's possible or disconnect some loads.
No Inlet Temp. Sensor	Inlet temperature sensor is not connected correctly.
No Outlet Temp. Sensor	Outlet temperature sensor is not connected correctly.
Inlet Over Temp.	Inlet air is over temperature. Make sure that the operation temperature of UPS is between 0-40°C.
Capacitor Time Reset	Reset timing of DC bus capacitors.
Fan Time Reset	Reset timing of fans.
Battery History Reset	Reset battery history data.
Byp Fan Time Reset	Reset timing of bypass fans.
Battery Over Temp.	Battery is over temperature. It's optional.
Bypass Fan Expired	Working life of bypass fans is expired, and it's recommended that the fans are replaced with new fans. It must be activated via software.
Capacitor Expired	Working life of capacitors is expired, and it's recommended that the capacitors are replaced with new capacitors. It must be activated via software.
Fan Expired	Working life of power modules' fans is expired, and it's recommended that the fans are replaced with new fans. It must be activated via software.
INV IGBT Driver Block	Inverter IGBTs are shutdown. Please check if power modules are inserted in cabinet correctly. Please check if fuses between rectifier and inverter are broken.
Battery Expired	Working life of batteries is expired, and it's recommended that the batteries are replaced with new batteries. It must be activated via software.
Bypass CAN Fail	The CAN bus between bypass module and cabinet is abnormal.
Dust Filter Expired	Dust filter needs to be clear or replaced with a new one
Stop Test	Manually stop battery test or battery maintenance, UPS transfer back to normal mode.
Wave Trigger	Waveform has been saved while UPS fail
Bypass CAN Fail	Bypass and cabinet communicate with each other via CAN bus. Check If connector or signal cable is abnormal. If monitoring board is abnormal.
Firmware Error	Manufacturer used only.
System Setting Error	Manufacturer used only.
Bypass Over Temp.	Bypass module is over temperature. Please check If bypass load is overload If ambient temperature is over 40°C If bypass SCRs are assembled correctly

	If bypass fans are normal
Module ID Duplicate	At least two modules are set as same ID on the power connector board, please set the ID as correct sequence

Note: Different colors of the words represent different level of events:

- Green, an event occurs or disappear.
- Yellow, warning occurs.
- Red, faults happen.

4.2.5 Control Menu

Touch the icon Control (at the left of the screen), and the system enters the page of the "Control", The control menu includes "Func Button" & "Test Command", as it is shown in Figure 4-8&Figure 4-9.

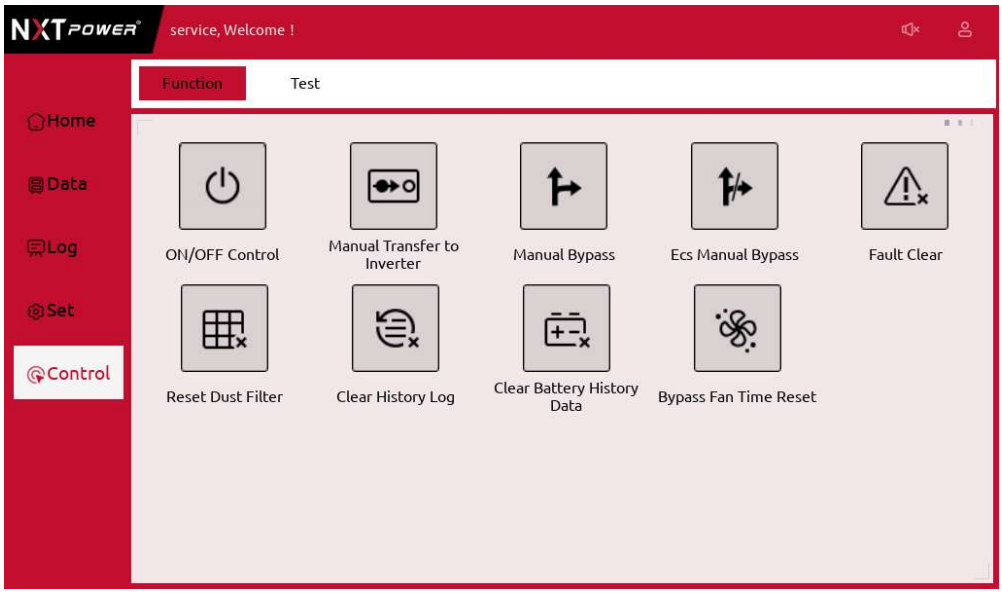


Figure 4-8 Control-Function Button menu

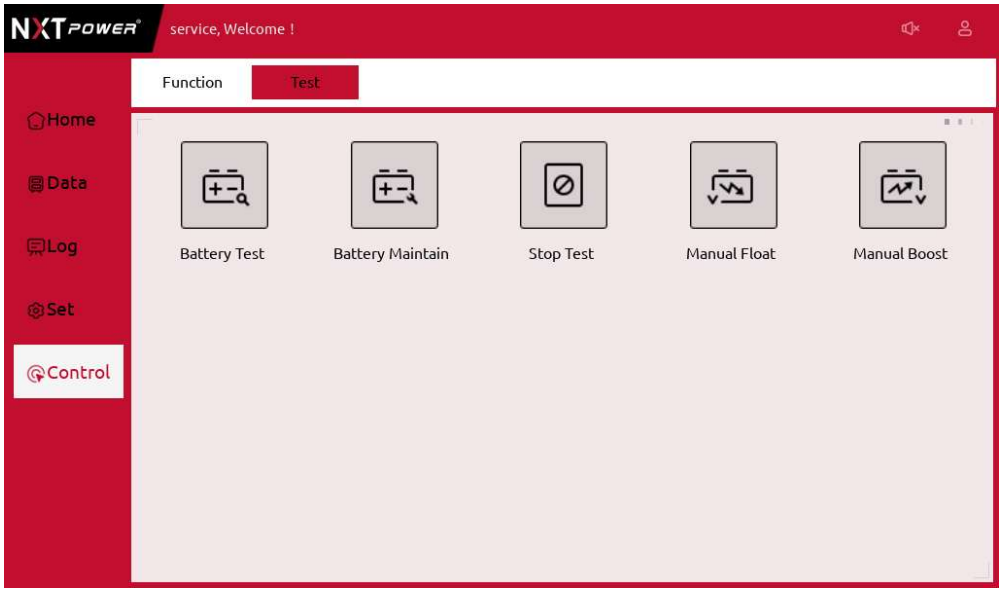


Figure 4-9 Control-Test Command menu

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

- Function Button
- Mute and Unmute

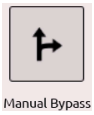
Mute or unmute alarm of the system by touching the icon .

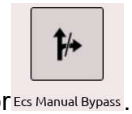
- Fault Clear

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 

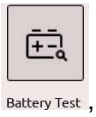
, the history data includes the times of discharge, days for running and hours of discharging.

- Reset Dust Filter

Reset the time of dust filter using by touching the icon 

, it includes the days of using and maintenance period.

- 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.

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) One by one to close the output breaker, input breaker, 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.

(4) Notice the energy flowing diagram，the rectifier start and indicator flashing.

(5) After about 30S, the rectifier start is completed, the bypass static switch is on, and the bypass indicator flashes.

(6) After the bypass static switch is on, the inverter starts and the inverter indicator flashes.

(7) After about 30S, when the inverter is running normally, the UPS switches from the bypass to the inverter, the bypass indicator is off, and the load indicator flashing.

(8) Users can close the external or internal battery breaker，the load indicator flashing. Then start charge the battery. The startup has finished.

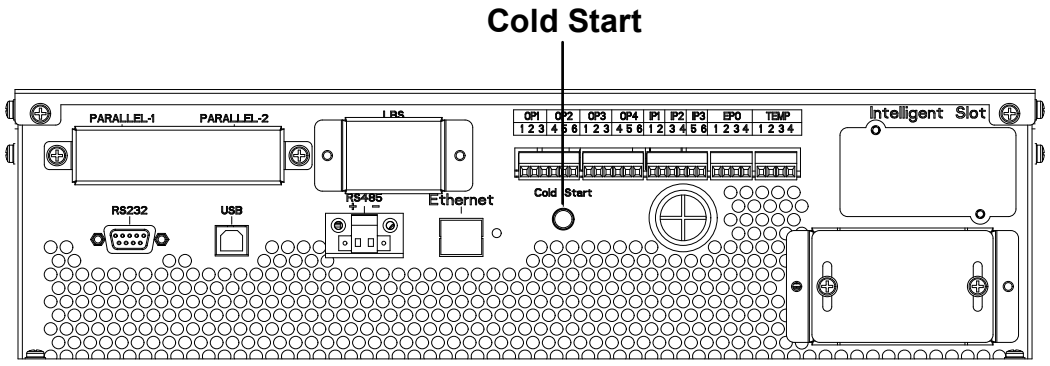
Note: You can set the parameters of language, date and time through sub-menu. When the system starts, the stored setting will be defaulted. If you have already set these parameters, system default existing settings. Users can browse all events during the process of the starting up by checking the menu Log.

5.1.2 Start from battery

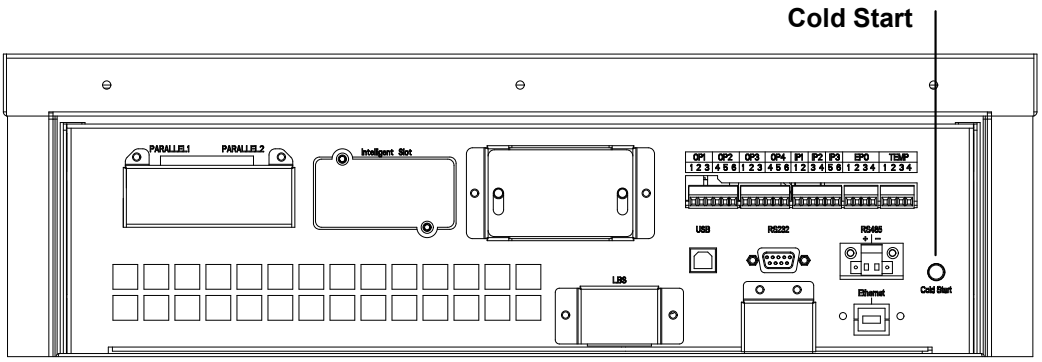
The start from battery refers to the battery cold start(optional). The steps of the start-up are as follow:

(1) Confirm the batteries are correctly connected, and then close the output circuit breaker and external or internal battery circuit breakers.

(2) Press and hold the red button of battery, as shown in Figure 5-1, battery supply power to UPS.



(a) 10-20kVA



(b) 30-40kVA

Figure 5-1 Position of the battery cold start button

(3) Then UPS starts up after step 3 normal mode, the rectifier completes the start, and the inverter begins to start, and after 60 seconds, the inverter complete the start, UPS run in battery mode.

(4) Close the external output power supply isolators to supply the loads, and the system is working in battery mode.

Note: Press battery cold start button after 1 minute of battery access.

5.2 UPS Shut down

If want to shut down UPS completely, please first ensure the load is shut down correctly, and then turn off the battery breaker (internal or external), the main input breaker (internal or external), the bypass input breaker (internal or external, if have) one by one, the display screen will be off completely.

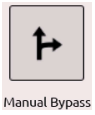
Note: If UPS in maintenance bypass mode, please also turn off the maintenance bypass breaker.

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

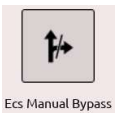
Enter the menu "Control", touch the icon "transfer to bypass" 

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: The system normally auto-switches to normal mode. This function applies when bypass frequency goes beyond the tracking range or manual transfer to normal mode is required.

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, which is used for maintaining the UPS.

(1) Transfer the UPS into Bypass mode as per the chapter 5.3.2.

(2) Remove the cover of maintenance bypass breaker as shown in

(3) Figure 5-2.

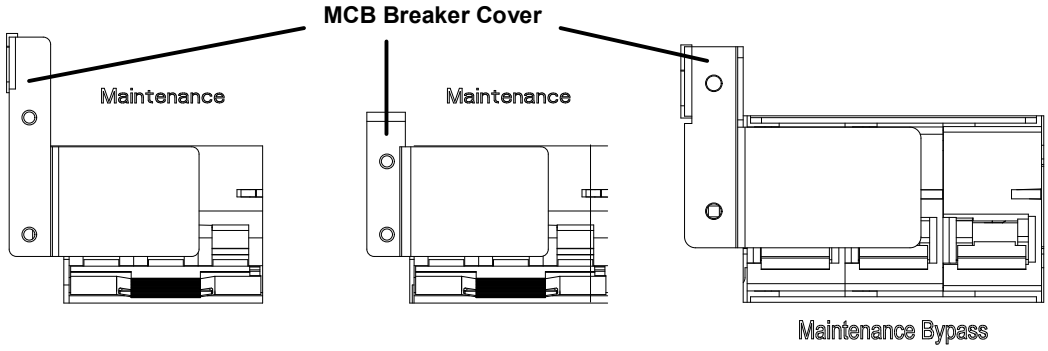


Figure 5-2 Remove the cover

(4) Turn on the maintenance bypass breaker. And the load is powered through maintenance bypass and static bypass.

(5) One by one to turn off the battery breaker, input breaker, bypass input breaker and output breaker.

(6) The load is powered through maintenance bypass.

Note:

- In manual bypass mode (The manual bypass supplies power to loads), dangerous voltages are present on terminal.
- The UPS need to use external circuit breakers (Includes external input breaker, external bypass input breaker, external output breaker and external maintenance bypass breaker).

WARNING

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

DANGER

Even with the LCD turned off, the terminals of input and output may be still energized.

Wait for 10 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 inverter output.

(1) After finish of maintenance. One by one to turn on the output breaker, the bypass input breaker, the input breaker and the external or internal battery breaker. After 30S, the bypass indicator LED flashes and the load is powered through maintenance bypass breaker and static bypass.

(2) Turn off the maintenance bypass breaker and fix the protection cover, and then the load is powered through static bypass. The rectifier starts after 30 seconds, inverter is starting. The inverter energy bar flashes and the inverter starts.

(3) After 60 seconds, the system transfers to 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 

.

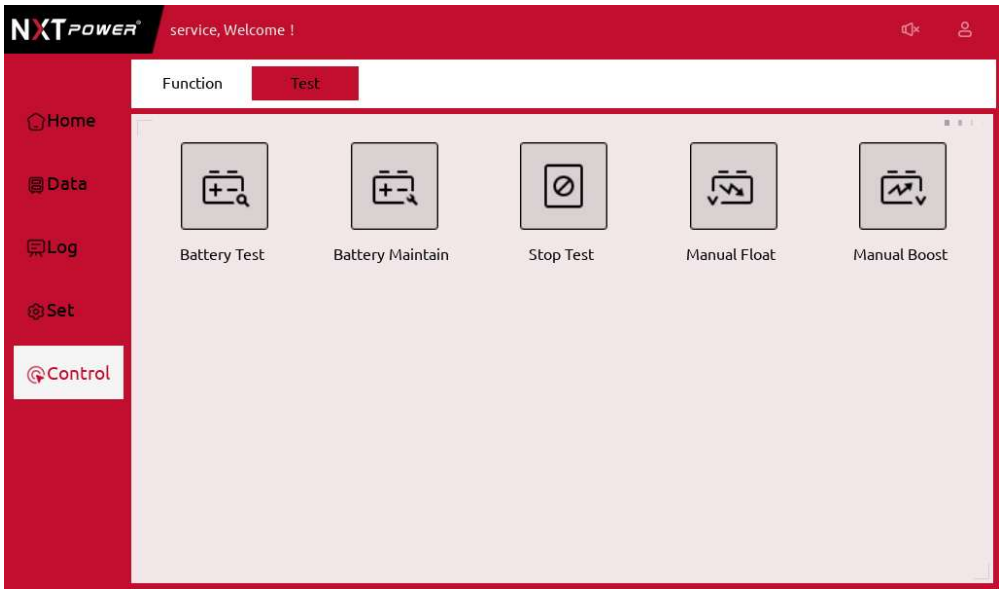


Figure 5-3 Battery maintenance

(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 Parallel UPS

5.5.1 Diagram of the parallel system

UPS can be scaled up to four times the stand-alone capacity by parallel 4 cabinets，The parallel structure diagram is shown in Figure 5-4.

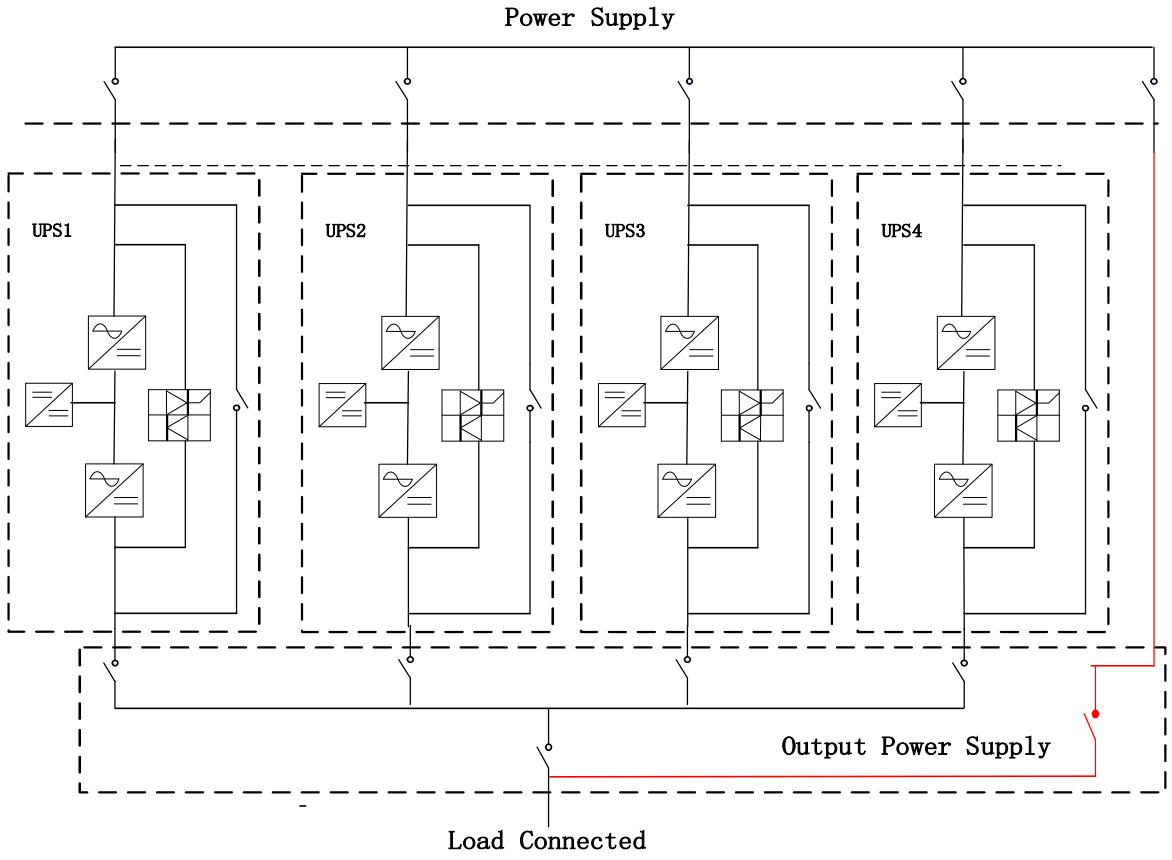


Figure 5-4 Parallel Structure

The system parallel board is located on the rear of the UPS cabinet，Its position is shown in Figure

3-13.

Open the cover of parallel Port, connect the terminals in order with cables, connected into a ring. The connection is shown in Figure 5-5.

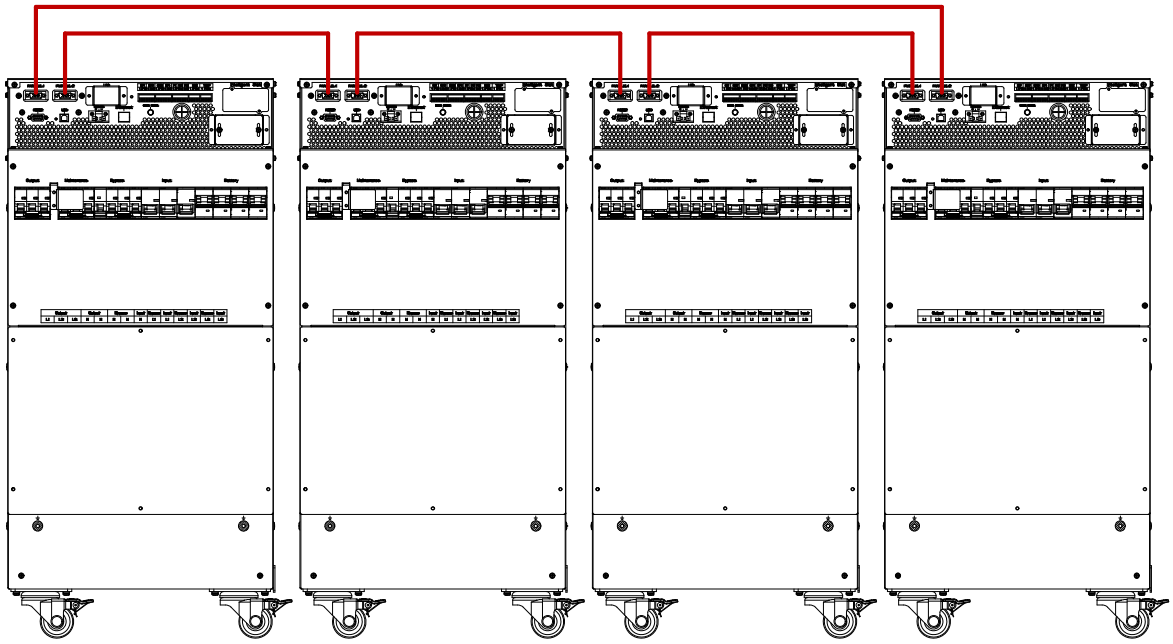


Figure 5-5 Parallel connection

5.5.2 Parallel operation process

Short-circuit the main and bypass inputs of each UPS in the system (If the main side of different sources, then short circuit the main road, bypass and other UPS in the system of the main road, bypass together). Taking into account the bypass current sharing problem of the parallel system, the specifications and length of the input and output power lines of each UPS in the parallel system should be consistent。

If the customer needs to set the parallel parameters according to actual needs, please follow the steps below:

(1) Set each UPS in the machine system one by one: In LCD screen or background software click "Set" "System Set", set to "Parallel" and select "United Number" and "Cabinet ID"， In principle, the Cabinet ID starts from "0" and is continuous and must not be repeated. For example: a three-parallel system, the ID of one UPS is set to "0", and the other two are set to "1" and "2" in turn. The UPS and the code correspond freely, and no special requirement. All UPS output parameters must be consistent, otherwise they can’t be paralleled.

All settings take effect after the UPS restarts. Background parallel parameter settings are shown in Figure 5-6.

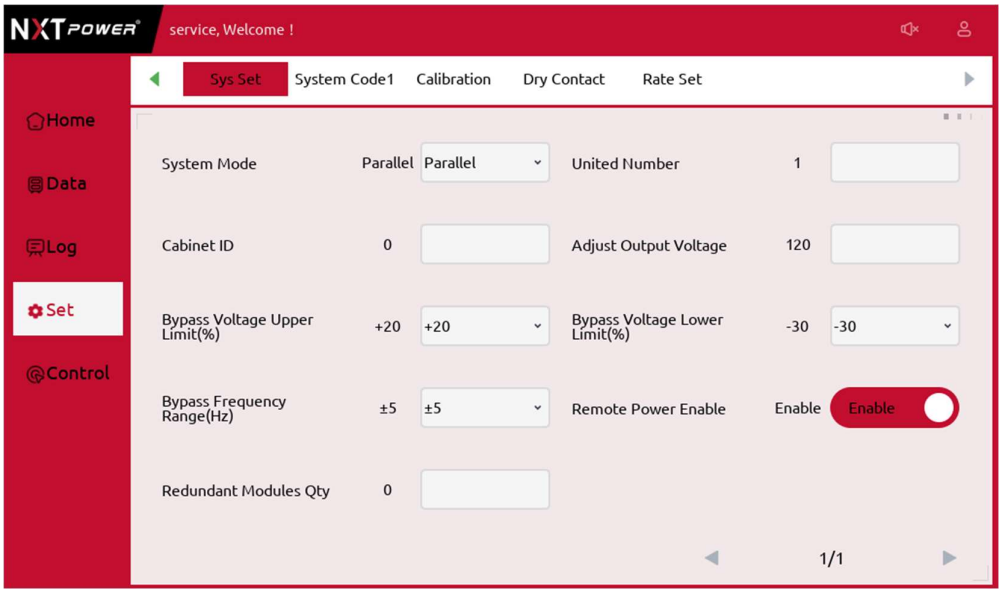


Figure 5-6 Parallel setting

(2) Depending on the number of parallel machines, and the corresponding short pin status on the board is different:

● Single UPS: J16-J20 needs to be short through short circuit blocks, as show in Figure 5-7.

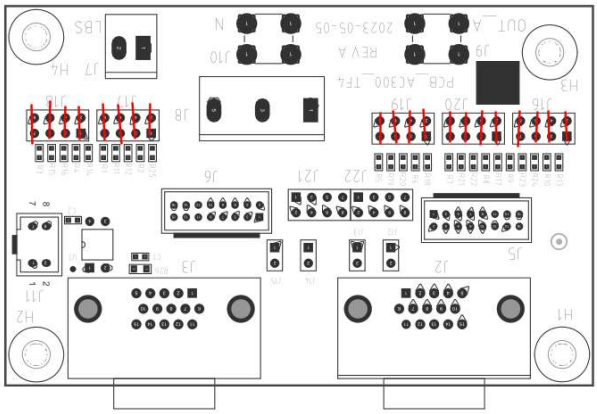


Figure 5-7 Single UPS

● Two UPS parallel: J12-J15, J21, J22 needs to be short through short circuit blocks, J16-J20 only needs to short circuit 2 of them, as shown in Figure 5-8.

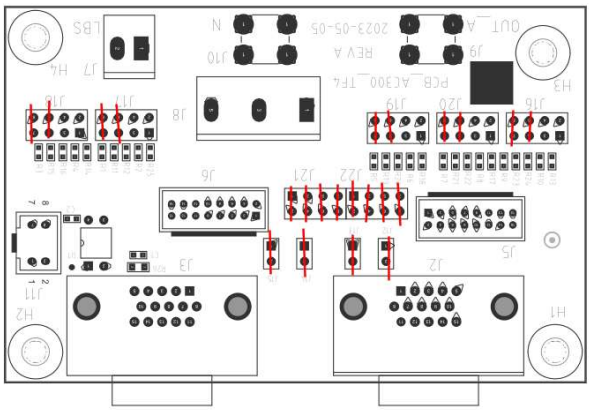


Figure 5-8 Two UPS parallel

● Three or four UPS parallel: J12-J15, J21, J22 needs to be short through short circuit blocks, as shown in Figure 5-9.

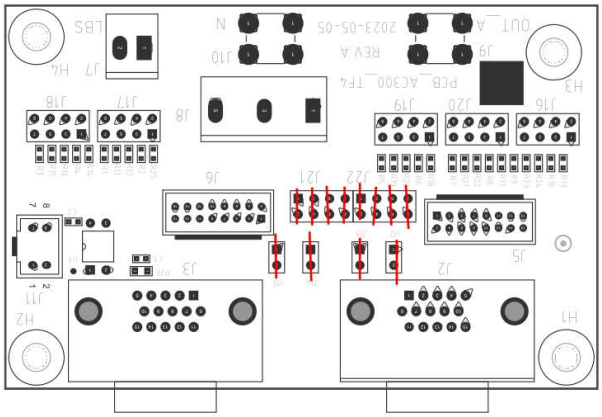


Figure 5-9 Three or four UPS parallel

Note: Pin skippers his article is not covered are operating nothing.

After confirming that each single UPS is properly commissioned, debug the parallel system, the specific steps are as follows:

(1) Close the input and output breakers of one of the UPSs, and the UPS will power on and enter the bypass for power supply，The rectifier and inverter are turned on one after another and switched to the inverter power supply mode, test whether the output is normal.

(2) Close the input and output breaker of the second UPS, follow the above start-up operation steps, and the UPS will automatically enter the system，Check the LCD display UPS without warning and make sure that the UPS is working normally.

(3) And so on, continue to put the third or fourth UPS into the parallel system after turning on the inverter.

(4) With a certain load, each UPS should be able to share the load equally.

WARNING

During the power-on process of the parallel system, make sure that the external output of each UPS is closed, and that all UPS inverter outputs are parallel.

6 Maintenance

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

6.1 Precautions

(1) Only maintaining engineers can maintain the power parts.

(2) The power parts should be disassembled from top to bottom, to prevent any inclination from high gravity center of the cabinet.

(3) To ensure the safety before maintaining power parts and bypass parts, use a multi-meter to measure the voltage between operating parts and the earth to ensure the voltage is lower than hazardous voltage, i.e. DC voltage is lower than 60Vdc, and AC maximum voltage is lower than 42.4 Vac, the voltage on the DC bus capacitor is less than 60Vdc.

(4) Wait 5 minutes before opening the cover of the power parts or the bypass after pulling out from the cabinet.

6.1 Instruction for maintaining UPS

Please refer to chapter 5.3.2 to transfer to maintenance bypass mode，remove the UPS　panel and the damaged parts. After the maintenance is complete, the components and the panels are returned to the cabinet. Refer to chapter 5.3.5 to transfer UPS to normal module from maintenance bypass mode.

6.2 Instruction for Maintaining Battery String

For the Lead-Acid maintenance free battery, when maintaining the battery according to requirements, battery life can be prolonged. The battery life is mainly determined by the following factors: installation, temperature, charging/discharging current, charging voltage, discharge depth, long-time discharge.

● Installation. The battery should be placed in dry and cool place with good ventilation. Avoid direct sunlight and keep away from heat source. When installing, ensure the correct connection to the batteries with same specification.

● Temperature. The most suitable storage temperature is about 25℃.

● Charging/discharging current. The best charging current for the lead-acid battery is 0.1C. The maximum charging current for the battery can be 0.2C. The discharging current should be 0.05C-3C.

● Charging voltage. In most of the time, the battery is in standby state. When the utility is normal, the system will charge the battery in boost mode (constant voltage with maximum limited) to full and then transfers to the state of float charge to prolong the battery life. Discharge only without power. Float charging voltage of each cell is about 13.7V. If the charging voltage is too high, the battery will be overcharged, if the charging voltage is too low, the battery will be lack of power.

● Discharge depth. Avoiding deep discharge, which will greatly reduce the life time of the battery. When the UPS runs in battery mode with light load or no load for a long time, it will cause the battery to deep discharge.

● Check periodically. The battery should be checked regularly after a certain amount of time Observe if any abnormality of the battery, measure if the voltage of each battery is in balance. Discharge the battery periodically. The battery remains charged for a long time, which will make the battery less active, so even without power outages, UPS will need to conduct regular discharge tests to keep the battery active.

 WARNING

Daily inspection is very important!

Check and confirm the battery connection is tightened regularly, and make sure there is no abnormal heat generated from the battery.

 WARNING

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

The waste lead-acid battery is a kind of hazardous waste and is one of the major contaminants controlled by government.

Therefore, its storage, transportation, use and disposal must comply with the national or local regulations and laws about the disposal of hazardous waste and waste batteries or other standards.

According to the national laws, the waste lead-acid battery should be recycled and reused, and it is prohibited to dispose of the batteries in other ways except recycling. Throwing away the waste lead-acid batteries at will or other improper disposal methods will cause severe environment pollution, and the person who does this will bear the corresponding legal responsibilities.

7 Product Specifications

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

7.1 Applicable Standards

The UPS has been designed to conform to the following European and international standards, as shown in Table 7-1.

Table 7-1 Compliance with European and International Standards

Item	Normative reference
General safety requirements for UPS used in operator access areas	UL 1778:2014 R4.24/CAN/CSA-C22.2 No. 107.3-14 + GI1 +GI2
Electromagnetic compatibility (EMC) requirements for UPS	FCC CFR Title 47, Part 15, Subpart B-Section 15.107 and 15.109
Method of specifying the performance and test requirements of UPS	EN50091-3/IEC62040-3/AS 62040-3（VFI SS 111）

7.2 Environmental Characteristics

Table 7-2 Environmental Characteristics

Item	Unit	Parameter
Acoustic noise level at 1 meter	dB	65dB @ 100% load, 62dB @ 45% load
Altitude of Operation	m	≤1000, load de-rated 1% per 100m from 1000m to 2000m
Relative Humidity	%RH	0-95, non-condensing
Operating Temperature	°C	0-40(for UPS only), Battery life is halved for every 10°C increase above 20°C
UPS Storage Temperature	°C	-40-70

7.3 Mechanical Characteristics

The main mechanical characteristics of the cabinet are shown below for Table 7-3.

Table 7-3 Mechanical characteristics of the cabinet

Cabinet model	Unit	10/15/20KVA	30/40KVA
Dimension (W×D×H)	mm	400*912*843.5	500*950*1300
Color	N/A	Black	
Protection Level	N/A	IP20	

7.4 Electrical Characteristics

7.4.1 Electrical Characteristics (Input Rectifier)

The main electrical characteristics of the rectifier are shown in Table 7-4 below.

Table 7-4 Rectifier AC input Mains

Item	Unit	Parameter
Grid System	/	3 Lines + Neutral + Ground
Rated AC Input Voltage	Vac	208 (three-phase and sharing neutral with the bypass input)
Rated Frequency	Vac	50/60Hz
Input voltage range	Vac	166V~261Vac (Line-Line), full load 125V~166Vac (Line-Line), load decrease linearly from 100% to 75%
Input Frequency range	Hz	40～70
Input Power factor	kW/KVA	>0.99 @ full load
THDI	THDI%	<3%,100% Resistance load

7.4.2 Electrical Characteristics (Intermediate DC Link)

Table 7-5 Battery parameter

Items	Unit	Parameters
Battery bus voltage	Vdc	Rated: ±120V
Lead-acid cell quantity	Nominal	20 = [1 battery (12V)] ,120 = [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
Temperature compensation	mV/℃/cl	-3.0 (selectable:0 ~ -5.0)
Ripple voltage	% V float	≤1
Ripple current	% C_{10}	≤5
Boost Voltage	VRLA	2.4V/cell (selectable from: 2.30V/cell~2.45V/cell) Constant current and constant voltage charge mode
End Of Discharge Voltage	V/cell (VRLA)	1.65V/cell (selectable from: 1.60V/cell~1.750V/cell) @0.6C discharge current 1.75V/cell (selectable from: 1.65V/cell~1.8V/cell) @0.15C discharge current EOD voltage changes linearly within the set range according to discharge current.
Battery Charge	V/cell	2.4V/cell (selectable from: 2.3V/cell~2.45V/cell) Constant current and constant voltage charging mode
Battery Charging Power	%	10%* UPS capacity (selectable from: 1~20%* UPS capacity)

Note: The default battery number is 20. When the actual battery in use is 16-22, ensure the actual number and the set number is the same, otherwise, batteries may be damaged. To set the number of battery packs, please contact the manufacturer's customer service phone.

7.4.3 Electrical Characteristics (Inverter Output)

Table 7-6 Inverter Output (To critical load)

Items	Unit	Parameters

Items	Unit	Parameters
Rated AC voltage	Vac	208 (Three-phase four-line, with the bypass common middle line)
Rated Frequency	Hz	50/60
Frequency Regulation	Hz	50/60Hz±0.1%
Voltage precision	%	±1 (0-100% Linear load)
Overload	%	110%, 60min; 125%,10min; 150%,1min; >150%,200ms
Synchronized Range	Hz	Settable, ±0.5Hz ~±5Hz, default ±3Hz
Synchronized Slew Rate	Hz	Settable, 0.5Hz/S ~ 3Hz/S, default 0.5Hz/S
Output Power Factor		1
Transient Response		<5% (20% - 80% -20% step load)
Transient recovery		< 30ms (0% - 100% -0% step load)
Output Voltage THDu		<1%, 0-100%，linear load <6%, non-linear load
Output short circuit current (Irms)	A	2.5 times rated current
Output short circuit (Ipeak)	A	3 times rated current

7.4.4 Electrical Characteristics (Bypass Mains Input)

Table 7-7 Bypass Mains Input

Item	Unit	Value
Rated AC voltage	Vac	208 (three-phase four-wire and sharing neutral with the bypass)
Rated current	A	29-113
Overload	%	125% Long term operation; 125%~130% for 10min; 130%~150% for 1min; 150%~400% for 1s; >400%, less than 200ms
Current rating of neutral cable	A	1.73×In
Frequency	Hz	50/60
Switch time (between bypass and inverter)	mS	Synchronized transfer: 0ms
Bypass voltage range	%	Settable: Upper limit: +10, +15, +20, default +15 Lower limit: -10, -15, -30, -40, default -20

Bypass frequency range	%	Settable, ±1Hz, ±3Hz, ±5Hz
Synchronized Range	Hz	Default: ±2Hz (Settable：±0.5Hz～±5Hz)

7.5 Efficiency

Table 7-8 Efficiency

Items	Unit	Parameters
Normal mode (dual conversion)	%	Up to 93
ECO mode	%	>99
Battery mode	%	Up to 93

7.6 Display and Interface

The system display and interface are shown in the following table 7.9

Table 7-9 System display and interface

Display	LCD
Interface	Standard: RS232, RS485, Dry Contact, Dry contact Card, USB Option: SNMP, Parallel

Vanguard Series Three Phase 10 – 40 kVA Products

Vanguard Series Three Phase 10 – 40 kVA products (hereafter referred to as “Product”) are warranted to be free from defects in material and workmanship for **twenty four (24) months** from date of shipment from NXT POWER, on the chassis & electronic components and **twenty four (24) months** from date of shipment from NXT POWER on the batteries. This warranty will include, at NXT POWER’s sole discretion, On-site Repair Service or NXT POWER Depot Exchange Service. For locations other than those specified herein, this warranty is limited to NXT POWER Depot Exchange Service. Start-up services directed by NXT Power are required on this product within 3 months of shipping from NXT Power. See the Limitations of Warranty section for additional limitations & exclusions.

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