



TEOS+ 300 SERIES

10-15-20-30 kVA

3 Phase In - 3 Phase Out

USER MANUAL

Preface

Usage

The manual contains information on installing, using, operation and maintenance of the Tower UPS. Please carefully read this manual prior to installation.

Users

Technical Support Engineer
Maintenance Engineer

Note

Our company is providing a full range of technical support and services. Customer 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.

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1.Important Safety Precautions

General Information

- Please read the "safety precautions" carefully before installing and using this product to ensure correct and safe installation and use. Please keep this manual properly.
- UPS must be installed, tested and maintained by an engineer authorized by the manufacturer or its agent, otherwise it is possible to endanger personal safety and cause equipment failure. The damage to UPS caused thereon is excluded from the warranty.
- Under no circumstances shall equipment structure or components be dismantled or changed without the manufacturer's permission, otherwise the damage to UPS caused thereby shall not be covered by the warranty.
- Local regulations and laws shall be followed when using equipment. The safety precautions in the manual only supplement the local safety regulations.
- Due to product version upgrade or other reasons, the content of this document will be updated from time to time. Unless otherwise agreed, this document is used only as a guide, and all statements, information and recommendations in this document do not constitute any warranty, express or implied.

UPS Safety

- Before installing the equipment, wear insulating protective clothing, use insulating appliances, and remove conductive objects such as jewelry and watches to avoid electric shock or burns.
- The operating environment has a certain impact on the service life and reliability of UPS. The environmental requirements set in the manual must be followed when using and storing the equipment.
- Avoid using the equipment in direct sunlight, rain, or in environments with electrified dust.
- When placing UPS, maintain a safe distance around it to ensure ventilation. During operation of the system, do not block the vent.
- Do not allow liquids or other foreign objects to enter into the UPS cabinet or cabinet.
- Before using UPS, check whether the local distribution characteristics are consistent with the information of the product nameplate.
- As UPS is a large leakage current device, it is not recommended to install breakers with leakage protection function.
- Before connecting UPS, please further confirm whether the switch connecting the power supply of the UPS mains input/bypass power supply and the mains power are disconnected.
- When it is required to move or rewire UPS, make sure to disconnect AC input power supply, battery and other inputs, and UPS is fully powered down (more than 5min) before carrying out the corresponding operation, otherwise there may still be power in the port and inside of the equipment, and it is possible to cause a risk of electric shock.
- Before powering on, please confirm the correct grounding, and check wire

connection and battery polarity to ensure correct connection. In order to ensure personal safety and the normal use of UPS, UPS shall be reliably grounded before use.

- UPS can be used for resistive and capacitive (such as computers), resistive and micro inductive load, not for pure capacitive and inductive load (such as motors, air conditioners and copiers) and half wave rectifier load.
- When cleaning the machine, please wipe it with a dry object. Under no circumstances shall water be used to clean electrical parts inside or outside the cabinet.
- After completion of maintenance operations, check immediately to ensure that no tools or other items are left in the cabinet.
- In case of fire, please use dry powder extinguisher correctly for extinguishment. There is a danger of electric shock if liquid fire extinguishers are used.
- Do not close the breaker before the UPS installation is completed. Do not power on UPS without the permission of a qualified electrician.





Battery Safety

- Battery installation and maintenance shall only be performed by personnel with battery expertise.
- There is danger of electric shock and short circuit current in the battery. In order to avoid safety accidents, when installing or replacing the battery, please pay attention to the following matters: do not wear jewelry and watches and other conductive objects; use special insulation tools; use facial protection; wear protective insulating clothing; do not turn the battery upside down or tilt it; disconnect the input breaker of the battery.
- The installation environment of the battery must be far away from the hot area, and it is not allowed to use or keep the battery near the fire source. The battery or battery strings cannot be processed by fire, otherwise it is possible cause personal injury due to explosion.
- Environmental factors impact battery life. Elevated ambient temperatures, poor quality utility power, and frequent short duration discharges will shorten battery life.
- The batteries should be regularly replaced to ensure the normal operation of UPS and sufficient backup time.
- Do not use a battery that is not approved by the supplier, as it may adversely affect the operation of the system. Use of a non supplier approved battery will void the manufacturer warranty.
- Check the screws of the connecting parts of the battery regularly to make sure they are tight and not loose. If the screws become loose parts, they must be tightened immediately.
- Please do not short the positive and negative terminals of the battery, Otherwise it is possible to cause electric shock or fire.
- Do not touch the wiring terminal of the battery. The battery circuit is not isolated from the input voltage circuit, and there will be a high voltage hazard between the battery terminal and the ground.
- Do not open or damage the battery, otherwise it is possible to cause short circuit and battery leakage and the electrolyte in the battery may cause damage to the

skin and eyes. In case of exposure into the electrolyte, wash immediately with plenty of water and go to the hospital for examination.

Description of Symbols

The following symbols used herein have the following meaning.

| Symbols | Description |
|--|--|
|  DANGER | It is used to warn of emergency and dangerous situations which may lead to death or serious bodily injury if not avoided. |
|  WARNING | It is used to warn of potential dangerous situations which will lead to a certain degree of personal injury if not avoided. |
|  CAUTION | It is used to transmit the safety warning information of equipment or environmental, which may lead to equipment damage, data loss, equipment performance degradation or other unpredictable results if not avoided. |
|  NOTICE | It is used for further detailed description of the things, highlighting important/critical information, etc. |

2. Product Introduction

2.1 Introduction

The UPS supplies stable and uninterrupted power for the important load. It can eliminate the power supply surge, instantaneous high/low voltage, harmonic and frequency offset pollution, to provide high quality electrical energy to customers.

2.2 System Configuration

The Tower UPS is configured by the following part: Rectifier, Charger, Inverter, Static Switch and Manual Bypass Switch. One or several battery strings should be installed to provide backup energy once the utility fails. The UPS structure is shown in Fig. 2-1.

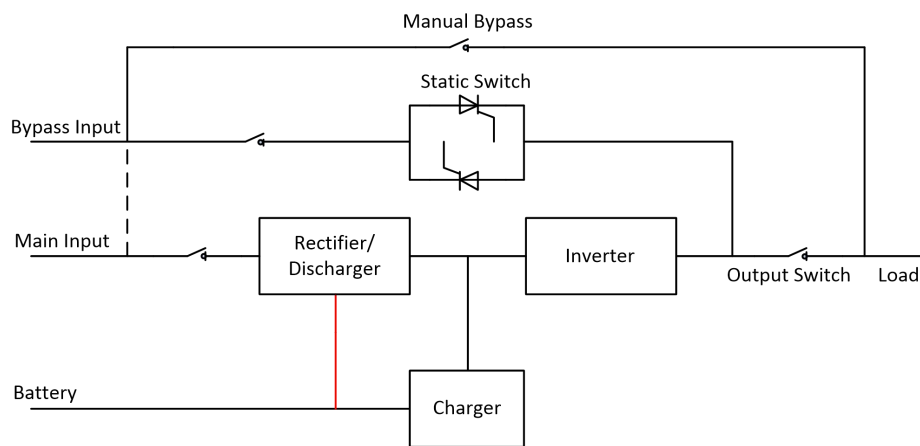


Fig. 2-1 UPS Configuration

2.3 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
- Self Aging Mode

2.3.1 Normal Mode

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

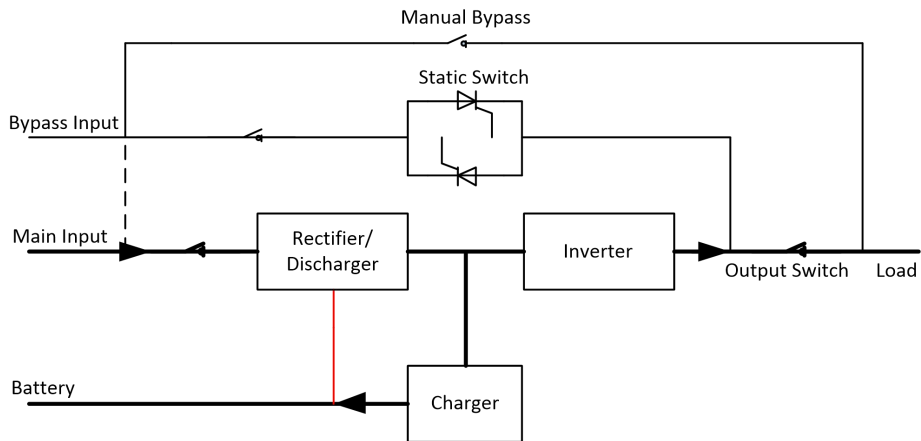


Fig 2-2 Normal mode operation diagram

2.3.2 Battery Mode

Upon failure of the AC mains input power, the inverter of power modules, which obtain power from the battery, supply the critical AC load. There is no interruption in power to the critical load upon failure. After restoration of the AC mains input power, the “Normal mode” operation will continue automatically without the necessity of user intervention.

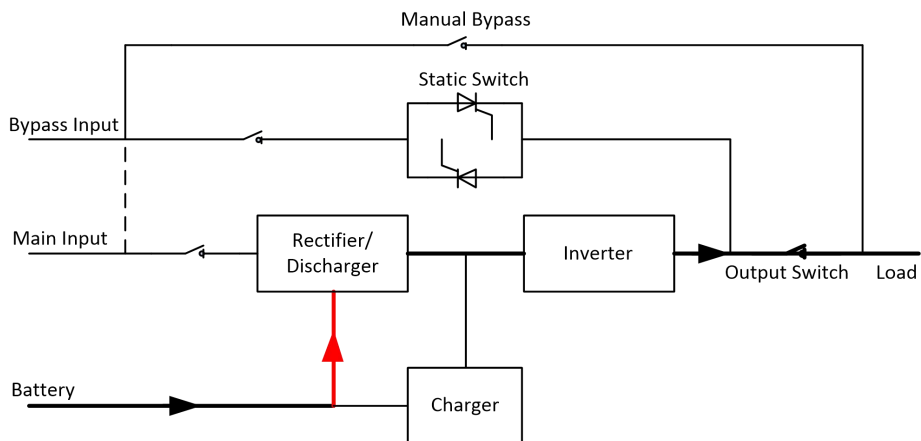


Fig 2-3 Battery mode operation diagram

Note

With the function of Battery cold start, the UPS may start without utility. See more detail in section 5.1.2.

2.3.3 Bypass Mode

If the inverter overload capacity is exceeded under Normal mode, or if the inverter becomes unavailable for any reason, the static transfer switch will perform a transfer of the load from the inverter to the bypass source, with no interruption in power to the critical AC load. Should the inverter be asynchronous with the bypass, the static switch will perform a transfer of the load from the inverter to the bypass with power interruption to the load. This is to avoid large cross currents due to the paralleling of unsynchronized AC sources. This interruption is programmable but typically set to be less than 3/4 of an electrical cycle, e.g., less than 15ms (50Hz) or less than 12.5ms (60Hz). The action of transfer/re-transfer can also be done by the command through monitor.

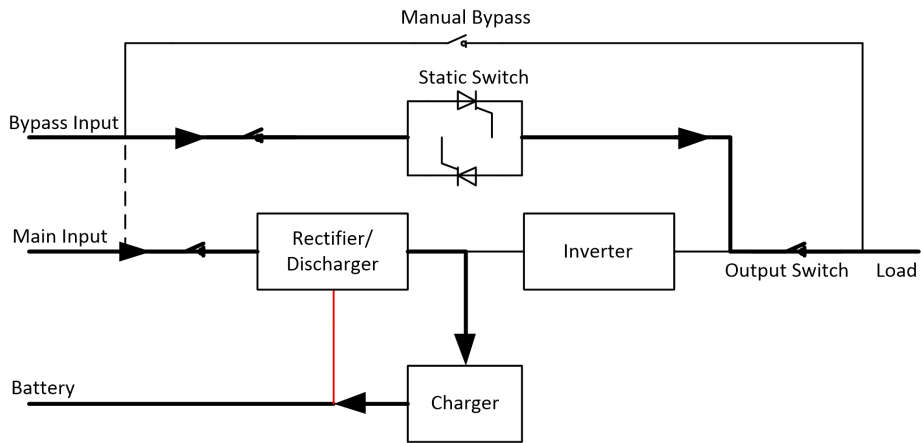


Fig. 2-4 Bypass mode operation diagram

2.3.4 Maintenance Mode (Manual Bypass)

A manual bypass switch is available to ensure continuity of supply to the critical load when the UPS becomes unavailable e.g. during a maintenance procedure. (See Fig.2-5).

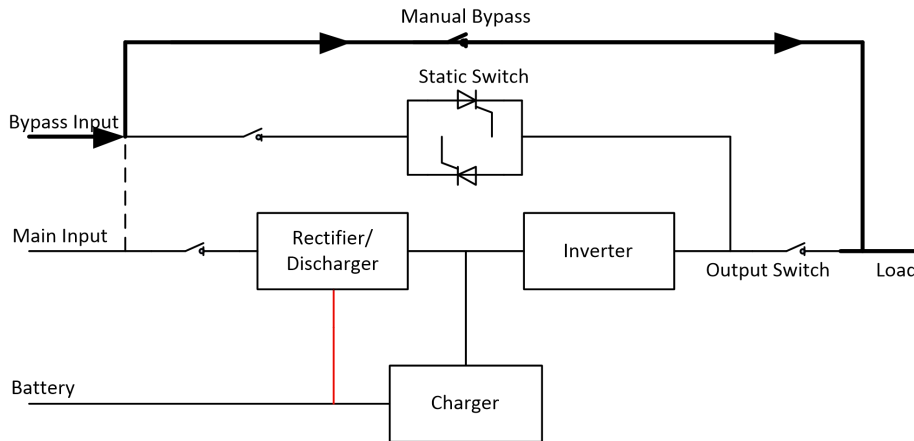


Fig. 2-5 Maintenance mode operation diagram



Danger

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

2.3.5 ECO Mode

To improve system efficiency, UPS rack system works in Bypass mode at normal time, and inverter is standby. When the utility fails, The UPS transfers to Battery Mode and the inverter powers the loads.

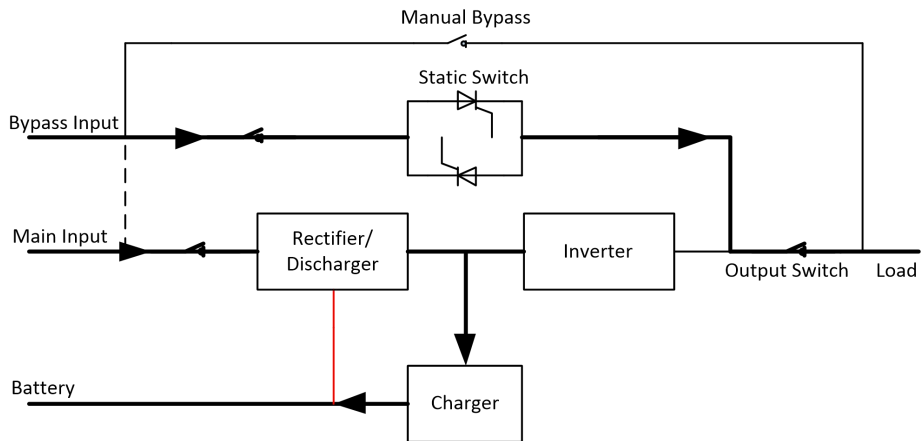


Fig.2-6 ECO Mode operation diagram



Note

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

2.3.6 Auto-restart Mode

The battery may become exhausted following an extended AC mains failure. The inverter shuts down when the battery reaches the End of Discharge Voltage (EOD). The UPS may be programmed to “System Auto Start Mode after EOD”. The system starts after a delay time when the AC mains input recovers. The mode and the delay time are programmed by the commissioning engineer.

2.3.7 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.

2.3.8 Self Aging Mode

If users want to burn in UPS without load, could set the UPS as Self Aging Mode, in this mode, the current flow through rectifier, inverter, and back to input through bypass. It needs only 5% loss to burn in UPS with 100% load.

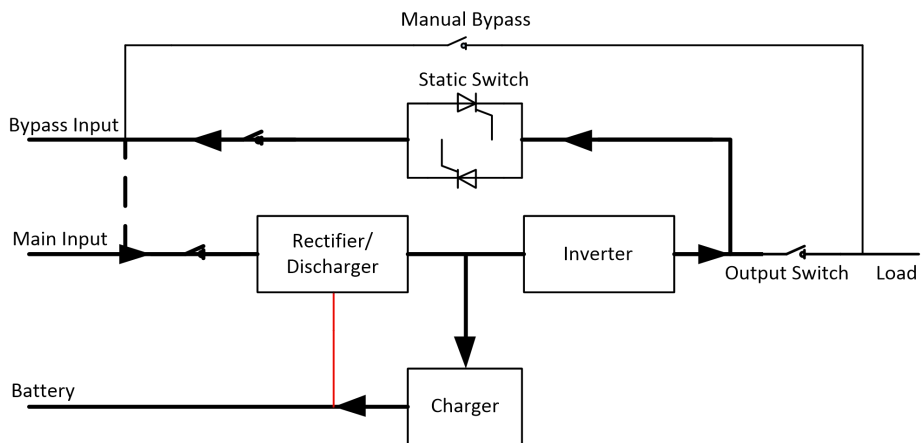


Fig.2-7 self aging operation diagram

2.4 UPS Structure

2.4.1 UPS Configuration

The UPS configuration is provided in Table 2.1

Table 2.1 UPS Configuration

| Item | Components | Quantity | Remark |
|-------------------------|------------------|----------|----------|
| Standard Backup Type(S) | Circuit Breakers | 5 | Standard |
| | Dual Input | 1 | Standard |
| | Parallel Card, | 1 | Optional |
| | Dry Contact Card | 1 | Optional |
| Long Backup Type(H) | Circuit Breakers | 4 | Standard |
| | Dual Input | 1 | Standard |
| | Parallel Card, | 1 | Optional |
| | Dry Contact Card | 1 | Optional |

2.4.2 UPS Outlook

The UPS outlook is shown as Fig.2-8 to Fig. 2-11.

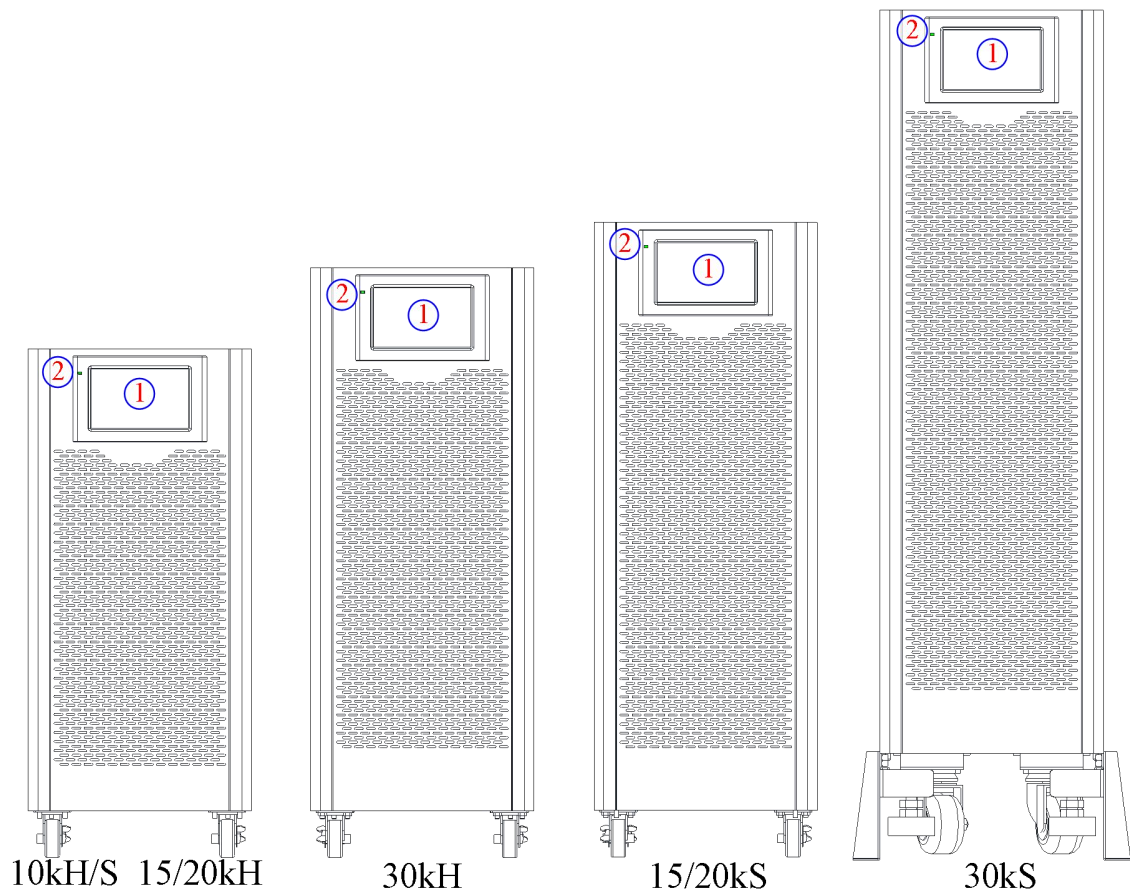


Fig. 2-8 10-30kVA front appearance

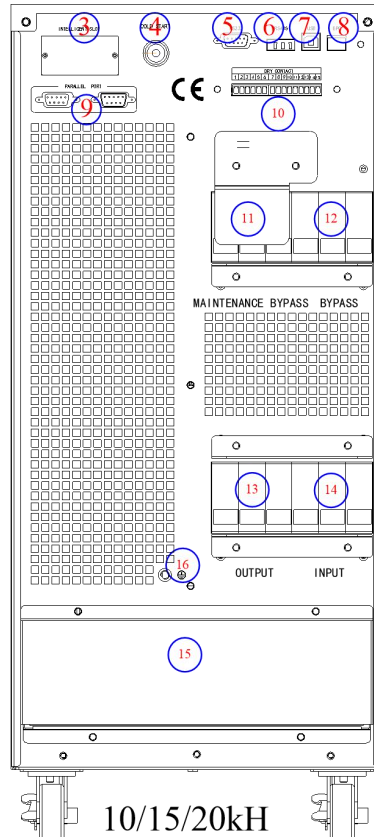


Fig. 2-9 10/15 kVA back appearance (Long backup type)

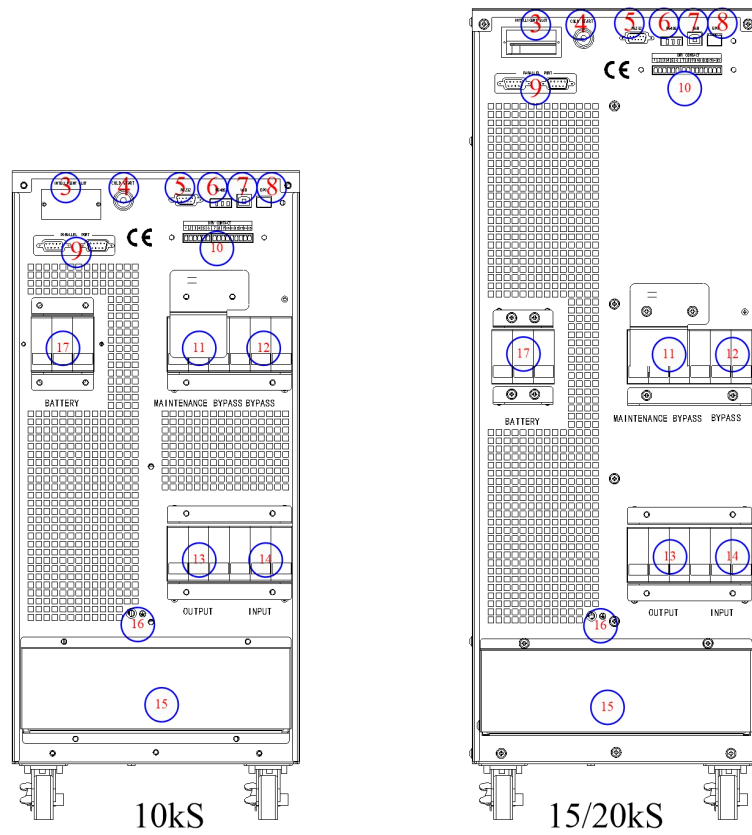


Fig. 2-10 10-20kVA back appearance (Standard backup type)

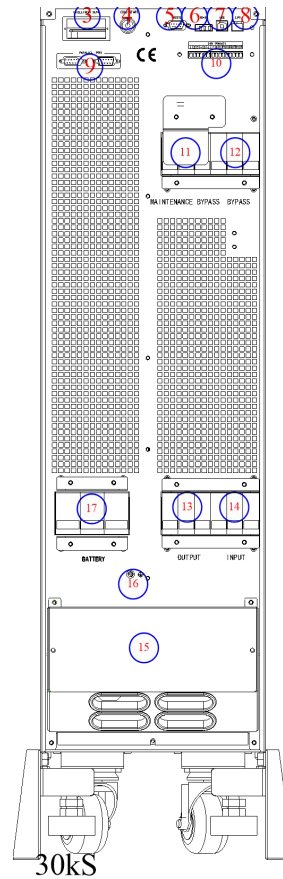
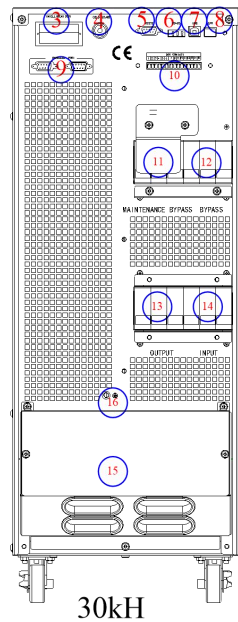


Fig. 2-11 30kVA back appearance



Note

The Standard product is configured with single input; the dual-input option is available, with an additional breaker for the main input.

Table2.2 UPS Configuration

| Item | Description |
|------|---|
| 1 | The touch screen LCD |
| 2 | LED |
| 3 | Intelligent slot :SNMP |
| 4 | Cold start button, used to light up the LCD in battery mode |
| 5 | RS232 ,used to connect monitoring software |
| 6 | RS485, used to connect monitoring software |
| 7 | USB: B type, used to connect monitoring software |
| 8 | EPO |
| 9 | Parallel port: option |
| 10 | Dry contact: option |
| 11 | Maintenance bypass : surge protection |
| 12 | Bypass breaker: surge protection |
| 13 | Output breaker: surge protection |
| 14 | Input breaker: surge protection |
| 15 | Connection terminals and protective cover |
| 16 | GND |
| 17 | Battery breaker: surge protection |

3. Installation Instruction

3.1 Location

As each site has its requirements, the installation instructions in this section are to act 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 battery is 20 °C -25 °C . Operating above 25 °C will reduce the battery life, and operation below 20 °C 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.

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

3.1.2 Site Selection

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

No vibration and less than 5 degree inclination horizontally.

The equipment should be stored in a room so as 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 °C to 25°C.

3.1.3 Size and Weight

The size of three dimensions and weight for the UPS cabinet is shown in Table 3.1.



Attention

Ensure there is at least 0.8m before the front of the cabinet so as to easily maintain the power module and at least 0.5m behind for ventilation and cooling.

Table 3.1 Size and Weight for the cabinet

| Configuration | Size(W*D*H) | Weight |
|----------------------------|---------------|-------------------------------------|
| 10kVA Long Backup Type | 250*680*560mm | 31kg |
| 10kVA Standard Backup Type | 250*680*560mm | 82kg(20pcs 9AH Batteries Included) |
| 15kVA Long Backup Type | 250*760*700mm | 33kg |
| 15kVA Standard Backup Type | 250*680*560mm | 131kg(40PCS 7AH Batteries Included) |

| | | |
|----------------------------|---------------|--------------------------------------|
| 20kVA Long Backup Type | 250*760*700mm | 33kg |
| 20kVA Standard Backup Type | 250*680*560mm | 145kg(40PCS 9AH Batteries Included) |
| 30kVA Long Backup Type | 250*800*650mm | 42kg |
| 30kVA Standard Backup Type | 250*800*930mm | 215kg(60PCS 9AH Batteries Included) |

3.1.4 Installation Tools

| | |
|---|---|
|  | DANGER |
| | To ensure safety, installation tools for live operation shall be insulated. |

Installation tools which may be used in installation process are shown in Table 3-2 and used as needed.

Table 3-2 Installation tools

| Tool name | Main function | Tool name | Main function |
|-------------------------|---|-----------------------------|--------------------------------------|
| Forklift | Handling | Nail hammer | Knock, install and remove components |
| Herringbone ladder | High-place operation | Rubber hammer | Knock and install components |
| Clip-on ammeter | Detect current | Percussion drill, drill bit | Drill |
| Multimeter | Check electrical connection and electrical parameters | Insulating tape | Electrical insulation |
| Cross screwdriver | Fasten screw | Heat-shrinkable tubing | Electrical insulation |
| Leveling instrument | Leveling | Heat gun | Heat heat-shrinkable tubing |
| Insulated monkey wrench | Tighten and loosen bolts | Electrician's knife | Wire stripping |
| Insulated torque wrench | Tighten and loosen bolts | Cable tie | Bundle |
| Crimping pliers | Cc cold-pressed terminal | Leather working gloves | Protect operator's hands |
| Hydraulic clamp | Clamp OT terminal | Antistatic gloves | Anti-static |
| Diagonal pliers | Shear cables | Insulating gloves | Insulation |
| Wire stripper | Wire stripping | Insulated protective shoes | Protect operator |

3.2 Unloading and Unpacking

3.2.1 Moving and Unpacking of the Cabinet

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

1. Check if any damages to the packing. (If any, contact to the carrier)
2. Transport the equipment to the designated site by forklift.
3. Unpack the package.
4. Remove the protective foam around the cabinet.
5. 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.
6. Dismantle the bolt that connects the cabinet and wooden pallet after disassembly.

7. Move the cabinet to the installation position.



Attention

Be careful while removing to avoid scratching the equipment.



Attention

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

3.3 Positioning

3.3.1 Positioning Cabinet

The UPS cabinet has two way of supporting itself: One is to support itself temporarily by the four wheels at the bottom, making it convenient to adjust the position of the cabinet ; The other is by anchor bolts to support the cabinet permanently after adjusting the position of the cabinet. The supporting structure is shown in Fig. 3-1.



Fig.3-1 Supporting structure (Bottom view)

The steps to position the cabinet are as follows:

1. Ensure the supporting structure is in good condition and the mounting floor is smooth and strong.
2. Retract the anchor bolts by turning them counterclockwise using wrench, the cabinet is then supported by the four wheels.
3. Adjust the cabinet to the right position by the supporting wheels.
4. Put down the anchor bolts by turning them clockwise using wrench, the cabinet is then supported by the four anchor bolts.
5. Ensure the four anchor bolts are in the same height and the cabinet is fixed and immovable.
6. Positioning done.



Attention

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.

3.4 Battery

Three terminals (positive, neutral, negative) are drawn from the battery unit and connected to UPS system. The neutral line is drawn from the middle of the batteries in series (See Fig.3-2).

Select total number of batteries from 30 to 44 (even number), and the number of positive and negative battery strings must be consistent. 10kVA could select the total number 20pcs.

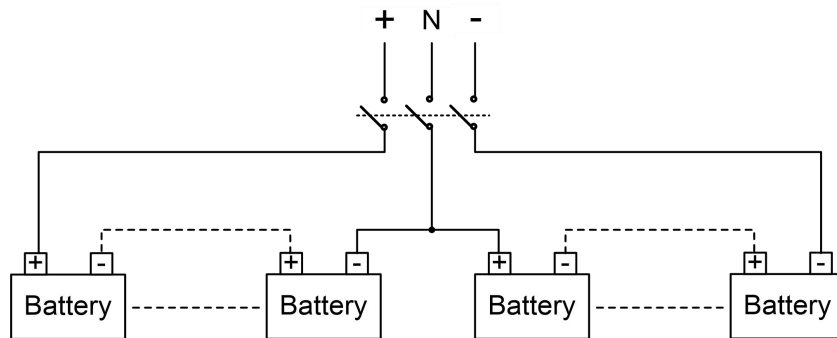


Fig 3-2 Battery string wiring diagram



Danger

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

Positive and negative battery strings must be equipped with a 3-channel battery breaker with limited current protection.

Ensure the positive, negative, neutral electrode is correctly connected from the battery unit terminals to the breaker and from the breaker to the UPS system.

3.5 Cable Entry

Cables can enter the UPS cabinet from the bottom. Cable entry is made possible through a blanking plate fitted at the bottom of the equipment. The cable entry is shown in Fig.3-3.

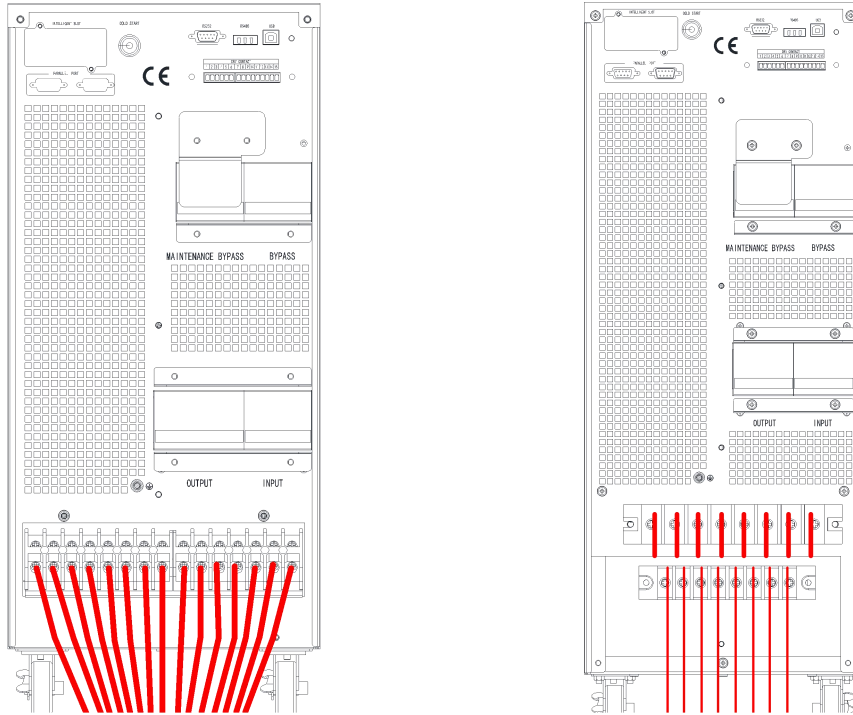


Fig.3-3 Cable entry

3.6 Power Cables

3.6.1 Specifications

The UPS power cables are recommended in Table 3.3.

Table 3.3 Recommended cables for power cables

| Contents | | 10kVA | 15kVA | 20kVA | 30kVA | |
|-------------------------|----------------------------------|-------|-------|-------|-------|----|
| Main Input | Main Input Current(A) | 20A | 29A | 39A | 58A | |
| | Cable Section (mm ²) | A | 6 | 6 | 10 | 16 |
| | | B | 6 | 6 | 10 | 16 |
| | | C | 6 | 6 | 10 | 16 |
| | | N | 6 | 6 | 10 | 16 |
| Main Output | Main Output Current(A) | 15A | 23A | 30A | 45A | |
| | Cable Section (mm ²) | A | 6 | 6 | 10 | 16 |
| | | B | 6 | 6 | 10 | 16 |
| | | C | 6 | 6 | 10 | 16 |
| | | N | 6 | 6 | 10 | 16 |
| Bypass Input (Optional) | Bypass Input Current(A) | 15A | 23A | 30A | 45A | |
| | Cable Section (mm ²) | A | 6 | 6 | 10 | 16 |
| | | B | 6 | 6 | 10 | 16 |
| | | C | 6 | 6 | 10 | 16 |

| | | | | | | |
|---------------|----------------------------------|----|-----|-----|-----|------|
| | | N | 6 | 6 | 10 | 16 |
| Battery Input | Battery Input current(A) | | 53A | 50A | 66A | 106A |
| | Cable Section (mm ²) | + | 10 | 10 | 16 | 25 |
| | | - | 10 | 10 | 16 | 25 |
| | | N | 10 | 10 | 16 | 25 |
| PE | Cable Section (mm ²) | PE | 6 | 6 | 10 | 16 |



Note

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

- Ambient temperature: 30°C.
- AC loss less than 3%, DC loss less than 1%, The length of the AC power cables are no longer than 50 m and the length of the DC power cables are no longer than 30 m.
- Currents listed in the table are based on the 208V system (Line-to-line voltage).
- The size of neutral lines should be 1.5~1.7 times the value listed above when the predominant load is non-linear.

3.6.2 Specifications for Power Cables Terminal

Specifications for power cables connector are listed as Table 3.4.

Table 3.4 Requirements for power module terminal

| Port | Connection | Bolt | Bolt Aperture | Torque Moment |
|---------------|-------------------------------|------|---------------|---------------|
| Mains input | Cables crimped OT terminal | M5 | 5.8mm | 3Nm |
| | | M6 | 7mm | 4.9Nm |
| Bypass Input | Cables crimped OT terminal | M5 | 5.8mm | 3Nm |
| | | M6 | 7mm | 4.9Nm |
| Battery Input | Cables crimped OT terminal | M5 | 5.8mm | 3Nm |
| | | M6 | 7mm | 4.9Nm |
| Output | Cables crimped OT terminal | M5 | 5.8mm | 3Nm |
| | | M6 | 7mm | 4.9Nm |
| PE | Cables crimped OT terminal | M5 | 5.8mm | 3Nm |
| | | M6 | 7mm | 4.9Nm |

3.6.3 Circuit Breaker

The circuit breakers (CB) for the system are recommended in Table 3.5.

Table 3.5 Recommended CB

| Installed position | 10kVA | 15kVA | 20kVA | 30kVA |
|--------------------|------------|------------|------------|-------------|
| Battery CB | 63A,250Vdc | 63A,250Vdc | 63A,250Vdc | 100A,250Vdc |



Attention

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

3.6.4 Connecting Power Cables

The steps of connecting power cables are as follows:

1. Verify that all the switches of the UPS are completely open and the UPS internal maintenance bypass switch is open. Attach necessary warning signs to these switches to prevent unauthorized operation.
2. Open the back door of the cabinet, remove the plastic cover. The input and output terminal, battery terminal and protective earth terminal are shown in Fig.3-4 & Fig. 3-5.

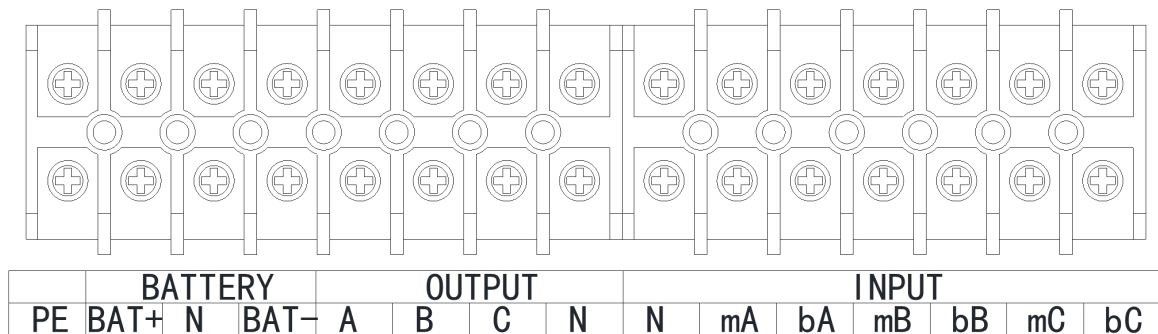


Fig.3-4 connections terminals for 10/15/20kVA

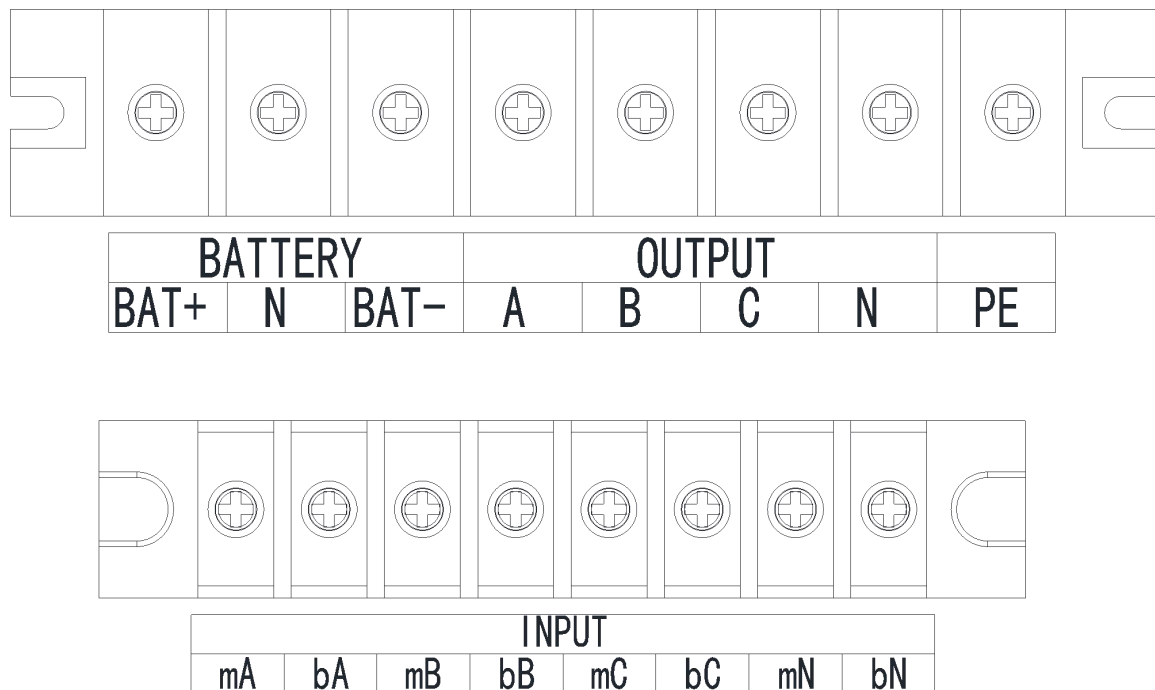


Fig.3-5 connections terminals for 30kVA

3. Connect the protective earth wire to protective earth terminal (PE).
4. Connect the AC input supply cables to the Input terminal and AC output supply cables to the Output terminal.
5. Connect the Battery cables to the Battery terminal.
6. Check to make sure there is no mistake and re-install all the protective covers.

Note: mA, mB, mC standard for Main input phase A,B and C; bA, bB, bC standard for Bypass Input phase A,B and C.

 **Attention**

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

 **Warning**

- Tighten the connections terminals to enough torque moment, refer to Table 3.3, and please ensure correct phase rotation.
 - The grounding cable and neutral cable must be connected in accordance with local and national codes.
 - When the cable holes does not goes through by cables, it should be filled by the hole stopper
-

3.7 Control and Communication Cables

The rear panel of the UPS provides dry contact interface and communication interface (RS232, RS485, SNMP, Intelligent card interface and USB port), as it is shown in Fig.3-6.

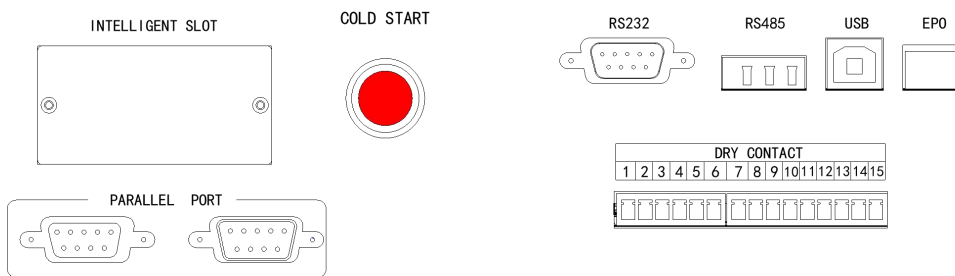


Fig.3-6 Dry contact & communication interface

3.7.1 Dry Contact Interface

Dry contact interface includes port J1-J18 and the functions of the dry contact are shown in Table 3.6.

Table 3.6 Functions of the port

| Port | Name | Function |
|------|------------|--|
| 1 | IN_DRY1_NC | Input dry contact-1,1-2, (Normally closed)function is settable , Default: none |
| 2 | Vcc_GJ | VCC |
| 3 | IN_DRY2_NO | Input dry contact-2,3-4, (Normally open) function is settable , Default: None |
| 4 | GND | Ground for Vcc |
| 5 | IN_DRY3_NO | Input dry contact-3,5-6, (Normally open) function is settable , |

| | | |
|----|--------------|---|
| | | Default: None |
| 6 | GND | Ground for Vcc |
| 7 | OUT_DRY1_NO | Output dry contact-1, 7-9(Normally open) function is settable. Default: None If used for BCB_DRV,6-7, provide +15V voltage, 20mA drive signal |
| 8 | OUT_DRY1_NC | Output dry contact-1, 8-9(Normally closed) function is settable. Default: None |
| 9 | OUT_DRY1_GND | Common terminal for 7 and 8 |
| 10 | OUT_DRY2_NO | Output dry contact-2, 10-12(Normally open), function is settable. Default: None |
| 11 | OUT_DRY2_NC | Output dry contact-2, 11-12(Normally closed), function is settable. Default: None |
| 12 | OUT_DRY2_GND | Common terminal for 10and 11, |
| 13 | OUT_DRY3_NO | Output dry contact-3, 13-15(Normally open), function is settable. Default: None |
| 14 | OUT_DRY3_NC | Output dry contact-3, 14-15 (Normally closed), function is settable. Default: None |
| 15 | OUT_DRY3_GND | Common terminal for 13 and 14 |



Note

The settable functions for each port can be set by the monitor software or touch screen.

Specified temperature sensor is required for temperature detection (R25=5Kohm, B25/50=3275), please confirm with the manufacturer, or contact the local maintenance engineers when placing an order.

The output dry contact interface: An auxiliary dry contact signal will be activated via the isolation of a relay.

3.7.2 Communication Interface

RS232 、 RS485 and USB port : Provide serial 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.

Optional smart cards: SNMP card, GPRS card and Wi-Fi card etc.

The smart cards are installed in the optional card slot of UPS, which support hot-plug and feature convenient installation. Proceed as follows:

- Step 1: first remove the cover plate from the intelligent slot;
- Step 2: insert the required smart card into the slot;
- Step 3: lock the smart card with previously removed screws.

SNMP card is compatible with today's popular Internet software and firmware and network operating system and provide direct the direct Internet access function for UPS to provide instant UPS data and power supply information, and achieve communication and management by communication network management systems,

the network communication of UPSs and convenient centralized monitoring and management of each UPS. Please refer to supporting operation instruction for details.

4G card allows UPS to connect the Internet through 4G data (local SIM card is required), and the server for data communication, and UPS may be monitored online through computer or mobile phone. Please refer to supporting operation instruction for details.

GPRS card allows UPS to connect the Internet through GPRS data (local SIM card is required), and the server for data communication, and UPS may be monitored online through computer or mobile phone. Please refer to supporting operation instruction for details.

Wi-Fi card allows UPS to connect the Internet through Wi-Fi and the server for data communication, and UPS may be monitored online through computer or mobile phone. Please refer to supporting operation instruction for details.

4. LCD Panel

4.1 Introduction

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

4.2 LCD panel for Cabinet

The structure of operator control and display panel for cabinet is shown in Fig.4-1. The operation control panel of UPS is located on the front panel of the case. By operating the LCD, the ups can be operated, controlled, and checked for all its parameters, operating status, and alarm information.



Fig.4-1 Control and display panel

The LCD panel for cabinet is divided into two functional areas: LED indicator, LCD touch screen.

4.2.1 LED Indicator

There are 2 LEDs on the panel to indicate the operating status and fault. (See Fig.4-1).The description of indicators is shown in Table 4.1

Table 4.1 Status description of indicators

| Indicators | State | Description |
|------------|--------------|---|
| red | Steady red | UPS fault |
| | Flashing red | UPS alarming |
| green | Steady green | Power supply mode (mains mode, bypass mode, ECO mode, etc.) |
| No | None | Standby status or no starting |

4.2.1 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 |
|--------------------|--|
| Intermittent alarm | when system has general alarm (for example: AC fault), |
| Continuous alarm | When system has serious faults (for example: hardware fault) |



Attention

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

4.2.2 LCD Menu structure

The menu structure of the monitoring display interface is shown in Fig. 4-2.

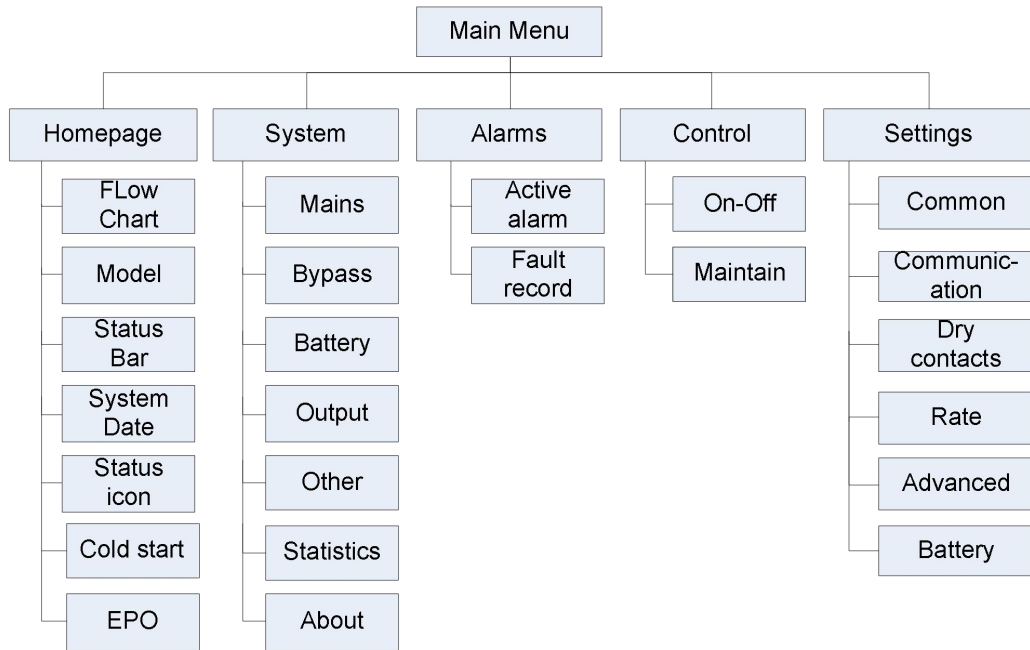


Fig. 4-2 Menu

4.2.3 Home page

After the monitoring system starts self-test, the system enters the home page, following the welcome window. The home page is divided into three parts, including main menu, energy flow diagram, status bar. The home page is shown in Fig. 4-3:

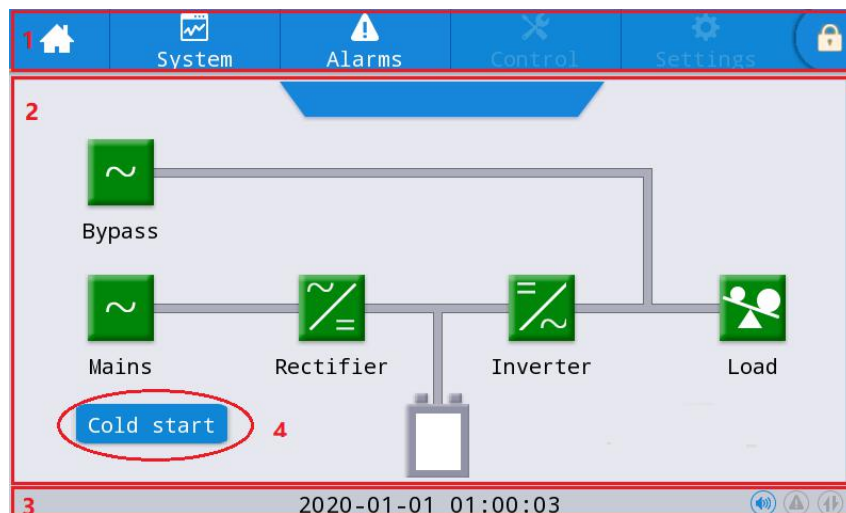


Fig. 4-3 Home page

Table 4-3 Function description of interface area

| No. | Area | Function description |
|-----|---------------------|---|
| 1 | Main menu | Level 1 menu, including home page, system, alarm, control, settings, password login. The control and the settings are displayed in gray before login by password. |
| 2 | Energy flow diagram | Display the energy flow state of the cabinet. Click the corresponding work interface to view the status information. |
| 3 | Status bar | Display operation status, system time, buzzer status, alarm status, HMI and monitoring communication status, USB status of the cabinet. |
| 4 | Cold start | Start the UPS in battery mode. The icon will be hidden after two minutes. |

Table 4-4 Description of icons in status bar




| Icon | Function description |
|--|---|
|  | Buzzer status, which becomes lit to indicate the buzzer enabled, and off to indicate the buzzer disabled |
|  | Alarm status, which becomes lit to indicate an alarm, and off to indicate no alarm |
|  | Password login/logout key. After clicking, enter user password or advanced password by the keyboard. The screen will be locked automatically. |

Table 4-5 Description of password permissions

| Password permissions | Default | Function description |
|----------------------|------------|--|
| User password | 123456 | Unlock On and OFF control right and the right of common settings and communication settings. It can be changed in "settings - common settings - user password". |
| Advanced password | Not opened | Unlock all control and setting rights. It can be used by qualified electricians only. |

4.2.4 System

In the "System" information interface, the "Mains ", "Bypass ", "Battery ", "Output", "Other", "Statistics" and "About " information of the system can be inquired in the secondary menu at the left side.

Mains

The menu interface of the mains input is shown in Fig. 4-5, and displays information on three phases ABC from left to right. The interface description is shown in Table 4-6.

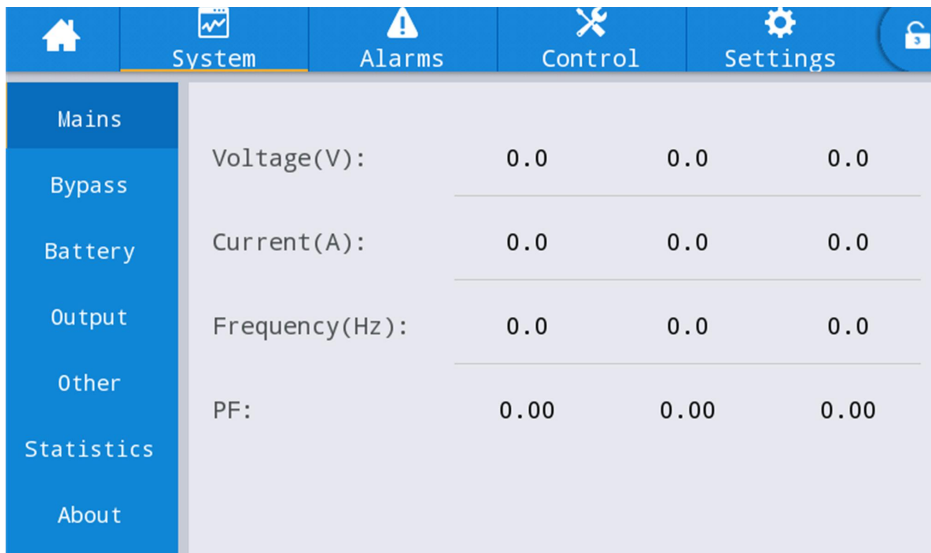


Fig. 4-4 Input interface

Table 4-6 Description of input interface

| Display item | Description |
|----------------|---------------------------|
| Voltage (V) | Mains input phase voltage |
| Current (A) | Mains input phase current |
| Frequency (Hz) | Mains input frequency |
| PF | Mains input Power factor |

Bypass

The menu interface of the bypass input is shown in Fig. 4-5, and the interface description is shown in Table 4-7.

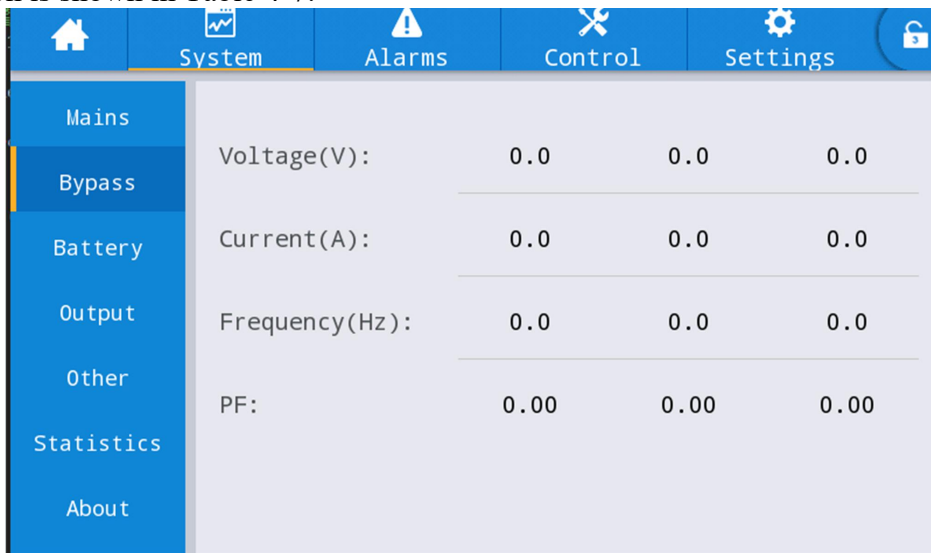


Fig. 4-5 Bypass interface

Table 4-7 Description of bypass interface

| Display item | Description |
|--------------|----------------------------|
| Voltage (V) | Bypass input phase voltage |
| Current (A) | Bypass input phase current |

| Display item | Description |
|----------------|---------------------------|
| Frequency (Hz) | Bypass input frequency |
| PF | Bypass input Power factor |

Battery

The interface menu of battery input is shown in Fig. 4-6, and the interface description is shown in Table 4-8.

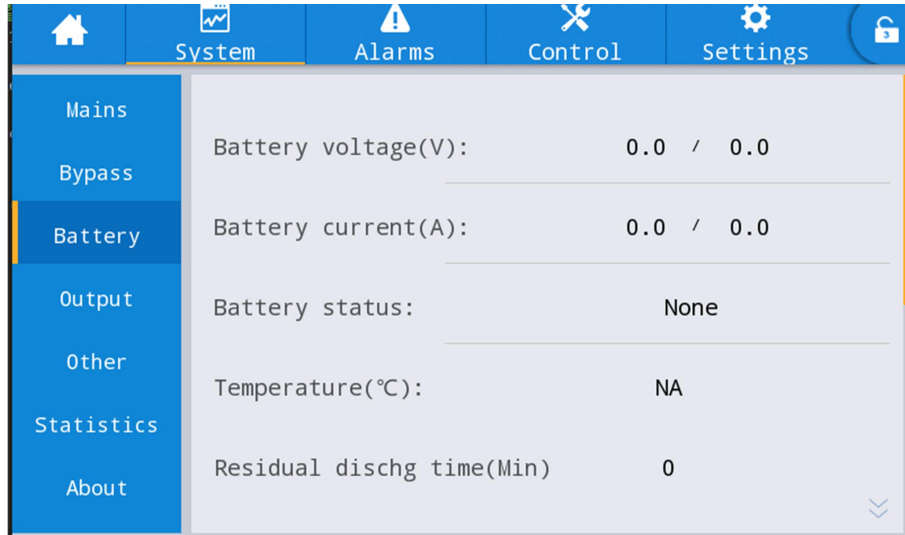


Fig. 4-6 Battery interface

Table 4-8 Description of battery interface

| Display item | Description |
|---------------------|---|
| Battery voltage (V) | Battery voltage |
| Battery Current (A) | Battery current |
| Battery status | Current battery status: idle, discharge, boost charge, floating charge, None |
| Temperature (°C) | Current operating temperature of battery (optional battery temperature sensor, display "NA" if not connected) |
| Backup time (min) | Estimated discharge time of the battery at the current load |
| Remaining cap. (%) | Current remaining capacity of battery |

Output

The interface of output menu is shown in Fig. 4-7, and the interface description is shown in Table 4-9.



Fig. 4-7 Output interface

Table 4-9 Description of output interface

| Display item | Description |
|---------------------|--|
| Voltage (V) | AC output phase voltage. |
| Current (A) | AC output phase current. |
| Frequency (Hz) | AC output frequency. |
| Load ratio (%) | Load rate of each phase of the machine, i.e. the ratio of actual power to rated power. |
| Active power (kW) | Output active power of each phase of the UPS unit |
| Appa. pow. (kVA) | Output apparent power of each phase of the UPS unit |
| Reactive power(kVA) | Output reactive power of each phase of the UPS unit |
| PF | Output power factor of each phase of the UPS unit |

Other

The interface of other menu is shown in Fig. 4-8, and the interface description is shown in Table 4-10.



Fig. 4-8 Other interface

Table 4-10 Description of other interface

| Display item | Description |
|---------------------------|---|
| PFC temperature | Rectifier temperature |
| INV temperature | Inverter temperature |
| Environmental temperature | Environmental temperature(optional battery temperature sensor, display "NA" if not connected) |

Statistics

The interface of statistics menu is shown in Fig. 4-9, and the interface description is shown in Table 4-11.

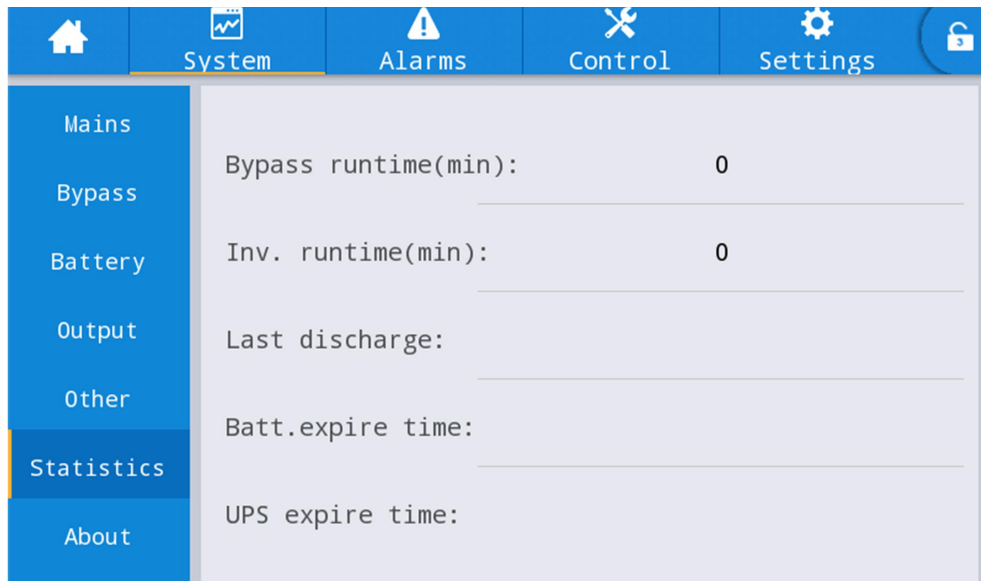


Fig. 4-9 Statistics interface

Table 4-11 Description of statistics interface

| Display item | Description |
|----------------------|--|
| Bypass runtime (min) | Accumulative operation time of UPS in bypass output status |
| Inv. Runtime (min) | Accumulative operation time of UPS in inverter output status |
| Last discharge | Date of previous discharge status of UPS |
| Batt. expire time | When the system time exceeds the warranty period, the status bar will prompt the warranty information of battery. |
| UPS expire time | When the system time exceeds the warranty period, the status bar will prompt the warranty information of main machine. |

About

The interface of “About” menu is shown in Fig. 4-10, and the interface description is shown in Table 4-12.

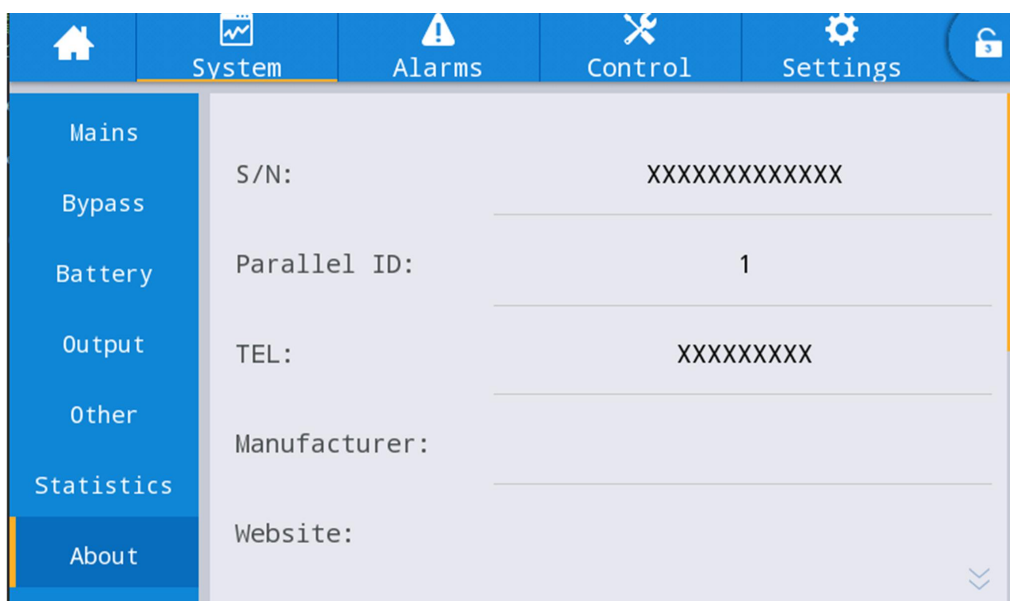


Fig. 4-10 About interface

Table 4-12 Description of Interface

| Display item | Description |
|---------------|---|
| S/N | Production serial number of this machine. |
| TEL | Contact information of after-sales service providers. |
| Manufacturer | Manufacturer of this machine. |
| Website | Website of manufacturer of this unit. |
| HMI version | Program version of HMI display system. |
| PFC1 version | Program version of power rectifier system |
| Inv.1 version | Program version of power inverter system |

4.2.5 Alarm

In the "Alarms" information interface, you can view "Active alarm" and "Fault record" from the secondary menu in the lower left corner. Click to select the type of alarm you want to view. The interface of alarm menu is shown in Fig. 4-11

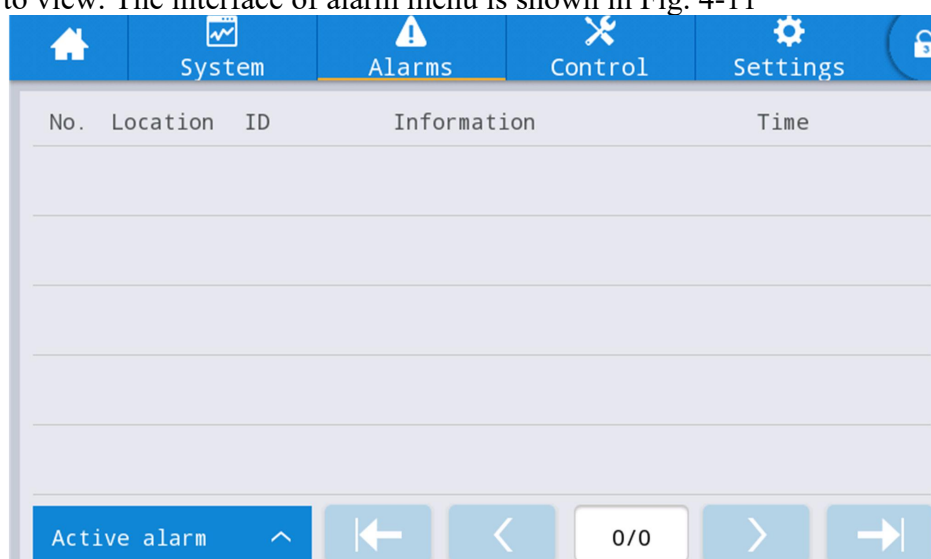


Fig. 4-11 Alarm menu interface

Active alarm

The active alarm interface displays the relevant information of the current warning of UPS system, The interface description is shown in Table 4-13.

Table 4-13 Description of active alarm interface

| Display item | Description |
|--------------|---|
| No. | Alarm number |
| Location | Display the cabinet number and module number of the current alarm source. |
| ID | Alarm code for program analysis. |
| Information | Current alarm name |
| Time | The current alarm is the current alarm information without time display. |

History records

The "history record" is divided into "Fault record", "Status record" and "Operating record". Take "Fault record" as an example, The interface description is shown in Table 4-14.

Table 4-14 Description of history record interface

| Display item | Description |
|--------------|--|
| No. | Record number, which is listed in reverse order, that is to say the latest record is in the front. |
| Location | Displays the module number of the current record source. |
| ID | List code of fault, status or operation information for program analysis |
| Information | Current record name and record state (occurrence, disappearance). |
| Time | Record the time of occurrence or disappearance. |

4.2.6 Control

In the "Control" information interface, you can select relevant operation from the left secondary menu, which contains "On-Off" and "Maintain".

On-Off

The interface of the On-Off menu is shown in Fig. 4-12, and the interface description is shown in Table 4-15.

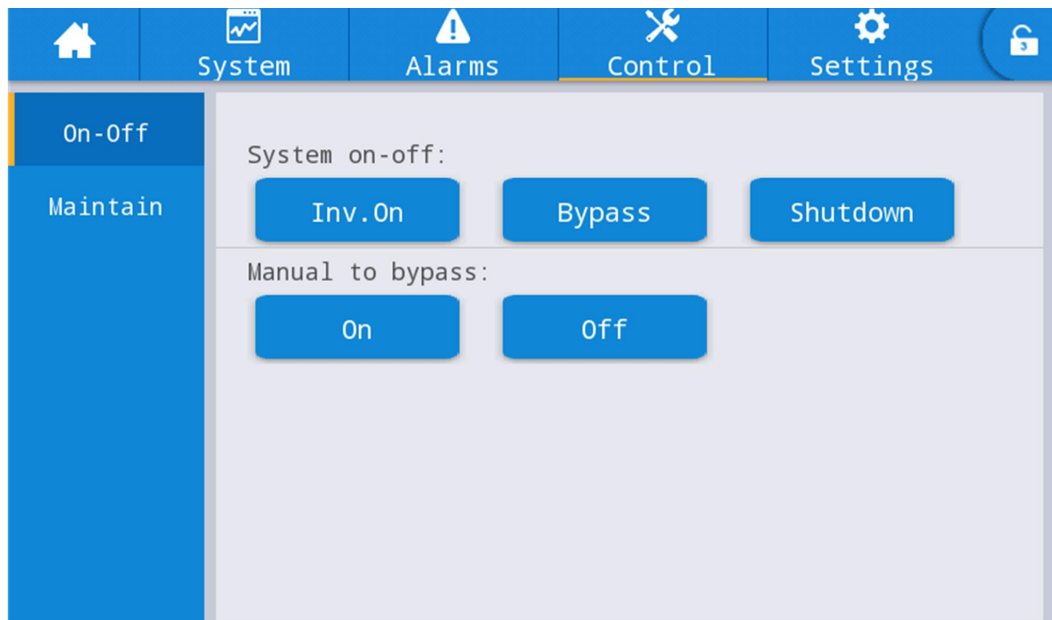


Fig. 4-12 On-Off interface

Table 4-15 Description of On-Off interface

| Control item | Description |
|------------------|--|
| System on-off | Including "Inv.On", "Shut to bypass" and "Shutdown". It is gray when clicking is invalid. |
| Manual to bypass | Including "On" and "Off". It is gray when clicking is invalid. If the bypass is abnormal, switching to bypass fails. |

Maintenance

The interface of maintenance menu is shown in Fig. 4-13, and the interface description is shown in Table 4-16.

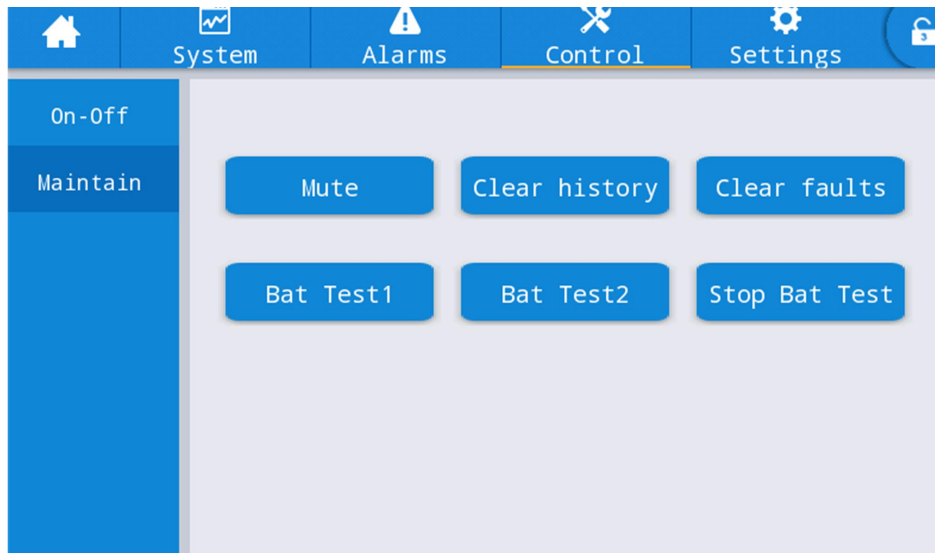


Fig. 4-13 Maintenance interface

Table 4-16 Description of maintenance interface

| Control item | Description |
|---------------|--|
| Mute | Mute the buzzer |
| Clear history | Clear history |
| Faults Clear | Clear the fault |
| Bat Test1 | UPS transfer to battery discharge mode to test if the battery is normal. Bypass must be in normal condition, the battery capacity should be above 25%. |
| Bat Test2 | This test will lead to the battery being partly discharged to activate battery until battery voltage is low. Bypass must be in normal condition, the battery capacity should be above 25%. |
| Stop Bat Test | Manually Stop the test including maintenance test, capacity test |

4.2.7 Settings

Common settings

The interface of common settings menu is shown in Fig. 4-14, and the interface description is shown in Table 4-17.

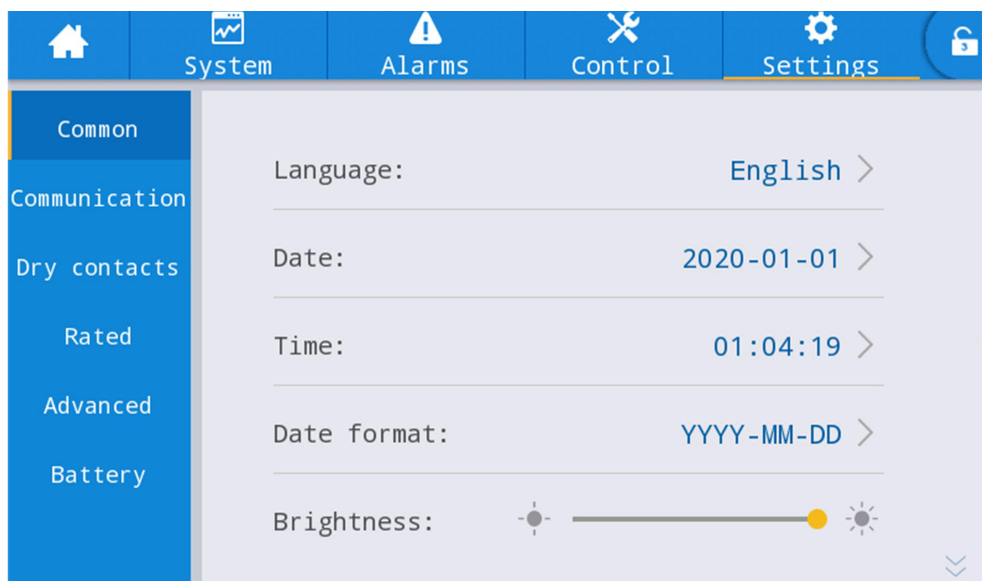


Fig. 4-14 Common setting interface

Table 4-17 Description of common setting interface

| Setting item | Default | Options | Description |
|---------------|------------|-----------------------|---|
| Language | English | English | Display in English. |
| YYYY-MM-DD | 2016-01-01 | 2000-01-01~2099-12-31 | Set the current date. |
| Time | 00:00:00 | 00:00:00~23:59:59 | Set the current time. |
| Date format | Y-M-D | Y-M-D, M-D-Y, D-M-Y | Support 3 formats: Y-M-D, M-D-Y, D-M-Y. |
| Brightness | 100% | 0% ~ 100% | Adjust backlight brightness by moving the slider. |
| Auto-lock | 5 min | 0 ~ 30 min | Set screen time out. 0 is set to keep the screen on. |
| User password | 123456 | 0 ~ 99999999 | The user can change the password, which can be set to 1-8 digits. |

Communication settings

The interface of the communication setting menu is shown in Fig. 4-15, and the interface description is shown in Table 4-18.

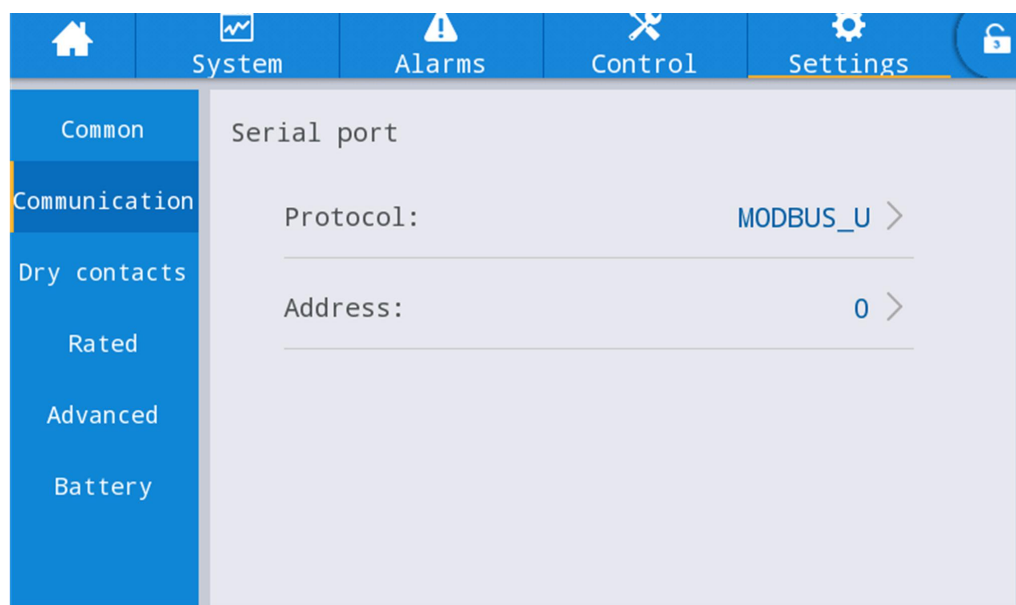


Fig. 4-15 Communication settings interface

Table 4-18 Description of communication settings interface

| Setting item | Default | Options | Description |
|--------------|----------|--------------------------------|--|
| Protocol | MODBUS_U | MODBUS_U, R&D, MODBUS, MEGATEC | Settings such as Protocol, Address and Parity are set for serial ports, including USB interface, RS232 interface and RS485 interface. Users can make the corresponding settings according to the setting requirements of the monitoring software used, but ensure that the setting value in the monitoring software must be consistent with the value in the UPS communication settings. |
| Address | 0 | 0~ 247 | |

Dry contact settings

The interface of dry contact setting menu is shown in Fig. 4-16, and the interface description is shown in Table 4-19.

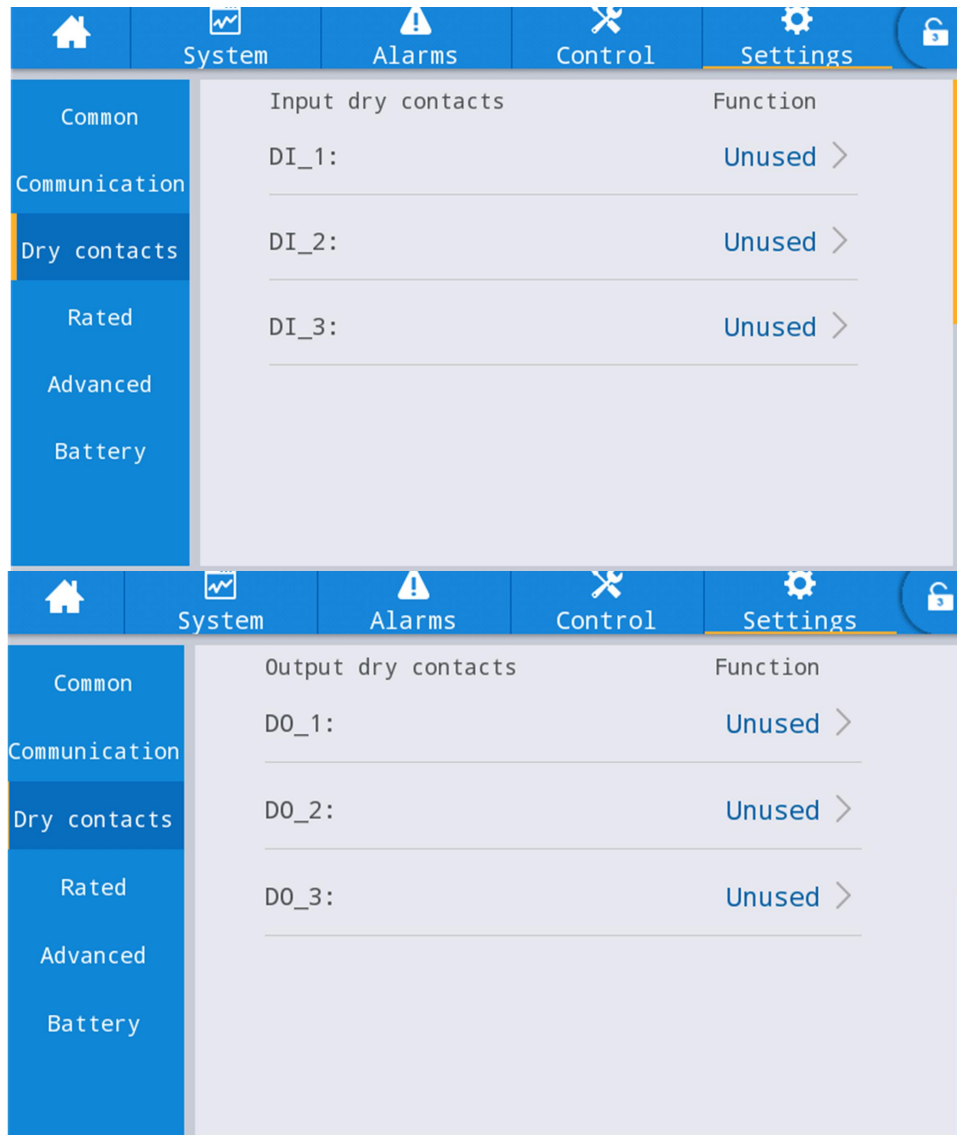


Fig. 4-16 Dry contact setting interface

Table 4-19 Description of dry contact setting interface

| INTERFACE | Name | Function |
|----------------------------------|------------------|--|
| Input Dry Contact DI_1 ~ DI_3 | D.G.mode | Connection status of generator, Select IN_DRY1_NC |
| | EPO | EPO , Select IN_DRY1_NC |
| | BCB online | BCB on-line input (normally open), Select IN_DRY2/3_NO |
| | BCB status | BCB contact status, connect with the normally open signal of BCB. Select IN_DRY2/3_NO. |
| | INV | Transfer from the bypass to inverter |
| | Bypass | Transfer from the inverter to bypass |
| | Fault clear | Fault clear |
| | Batt over charge | The battery is over charging, the ups will shutdown the charger |
| | Low batt.volt. | The battery voltage is low, the ups will get ready to shutdown or recharge |

| INTERFACE | Name | Function |
|---------------------------------|------------------|---|
| Output Dry Contact DO_1~DO_3 | Grid Fault | Grid Fault warning |
| | Low.Bat.vol | The battery voltage is low |
| | Load on bypass | The UPS is in bypass mode |
| | Load on INV | The UPS is in INV mode |
| | Battery Mode | The UPS is in battery mode |
| | General Alarm | General Alarm |
| | Output over load | Output over load |
| | BCB drive | BCB contact drive, need +15V voltage, 20mA drive signal |

Rate parameters

The interface of the rate parameters menu is shown in Fig. 4-17, and the interface description is shown in Table 4-20.

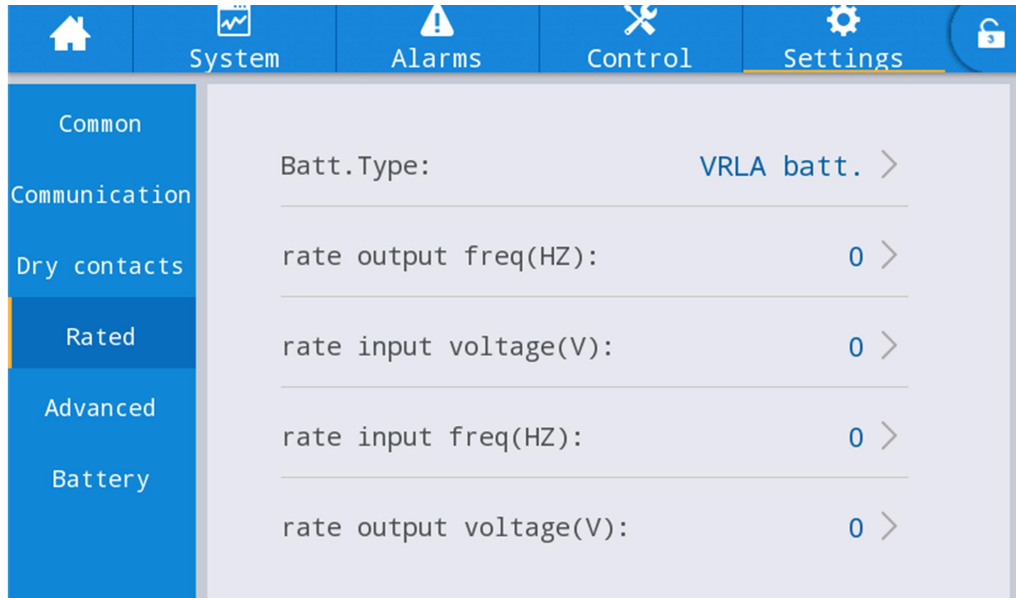


Fig. 4-17 Bypass parameters interface

Table 4-20 Description of bypass parameters interface

| Setting item | Default | Options | Description |
|---------------------|---------|-----------------|---|
| Batt.Type | VRLA | Lithium/VRLA | Battery type: VRLA battery and Lithium battery, The supported lithium battery type is 3.2 V lithium iron phosphate battery. |
| Rate output freq | 50 | 50/60 | Rate output frequency |
| Rate output voltage | 220 | 208/220/230/240 | Rate output voltage |
| Rate input freq | 50 | 50/60 | Rate input frequency |
| Rate input voltage | 220 | 208/220/230/240 | Rate input voltage |

Advanced parameters

The interface of advanced parameters menu is shown in Fig. 4-18, and the interface description is shown in Table 4-21.

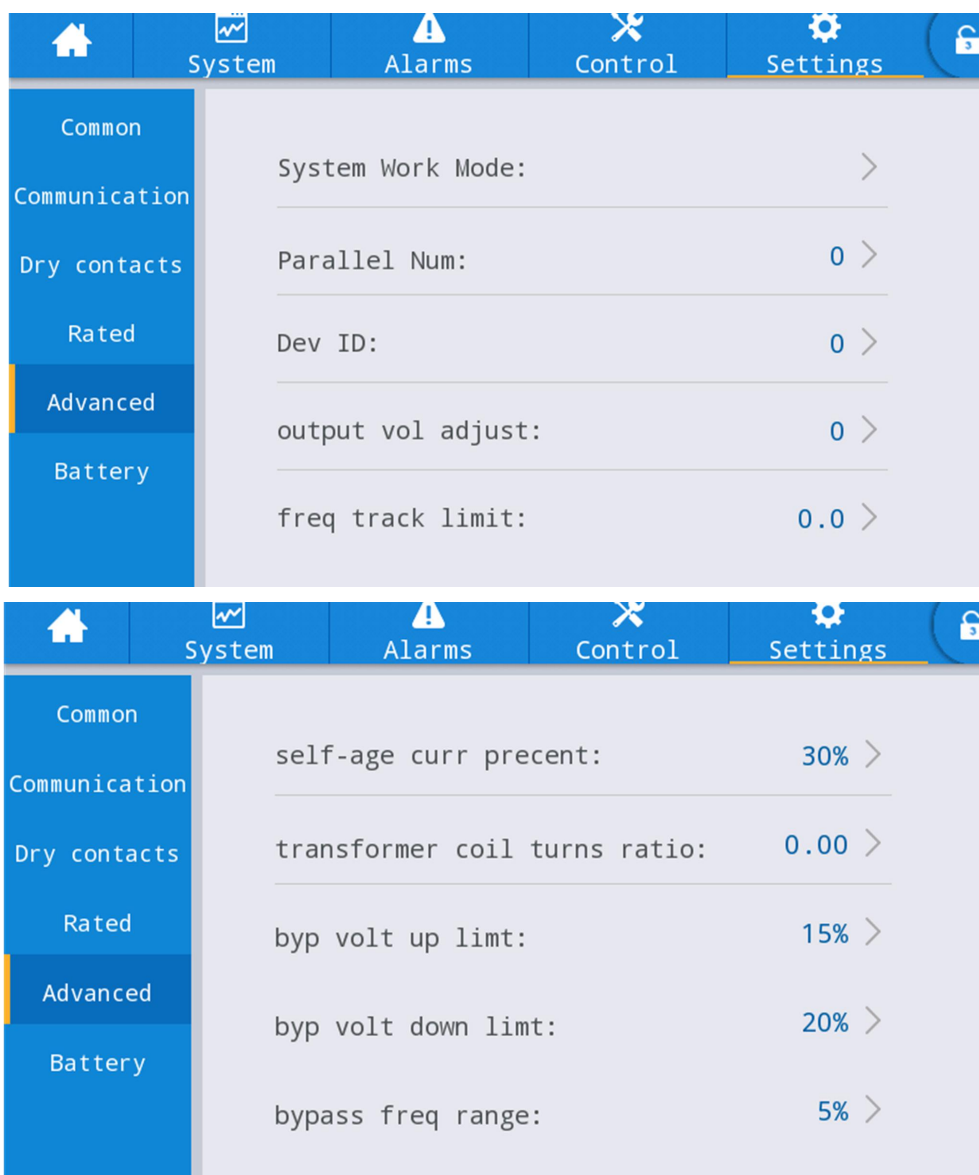


Fig. 4-18 Advanced parameters interface

Table 4-21 Description of advanced parameters interface

| Setting item | Default | Options | Description |
|---------------------------|------------------|--|--|
| Working mode | Normal | Normal/ECO/Self-age/ Parallel mode | Select the corresponding working mode according to user needs. It is normal working mode in general. |
| Parallel Number | 1 | 1 ~ 4 | Set according to the actual frame numbers of the UPS system installed by the user. |
| Dev ID | 1 | 1 ~ 16 | Set device parallel ID |
| Output voltage adjust | 0 | -5.0 ~ 5.0 | Fine tune the output voltage according to the customer's field power distribution. |
| Freq track limit | $\pm 3\text{Hz}$ | $\pm 0.5\text{Hz} \sim \pm 5\text{Hz}$ | Settable, $\pm 0.5\text{Hz} \sim \pm 5\text{Hz}$, default $\pm 3\text{Hz}$ |
| Self-age curr precent (%) | 80 | 30 ~ 100 | It is percentage of output current in rated output current in self-aging mode. |

| Setting item | Default | Options | Description |
|------------------------------|---------|-------------------------------|---|
| Transformer coil turns ratio | 1 | settable | Set the output transformer coil turns ratio. |
| Byb volt up limit | +15% | +10%, +15%, +20%, +25% | Upper limit: +10%, +15%, +20%, +25% |
| Byb volt down limit | -20% | -10%, -15%, -20%, -30%, -40% | Lower limit: -10%, -15%, -20%, -30%, -40% |
| bypass frq range | ±5.0 | ±1.0/±2.0/±3.0/±4.0/±5.0/±6.0 | Note that the bypass frequency range cannot be less than the ECO frequency range. |

Battery parameters

The interface of battery parameters menu is shown in Fig. 4-19, and the interface description is shown in Table 4-22.

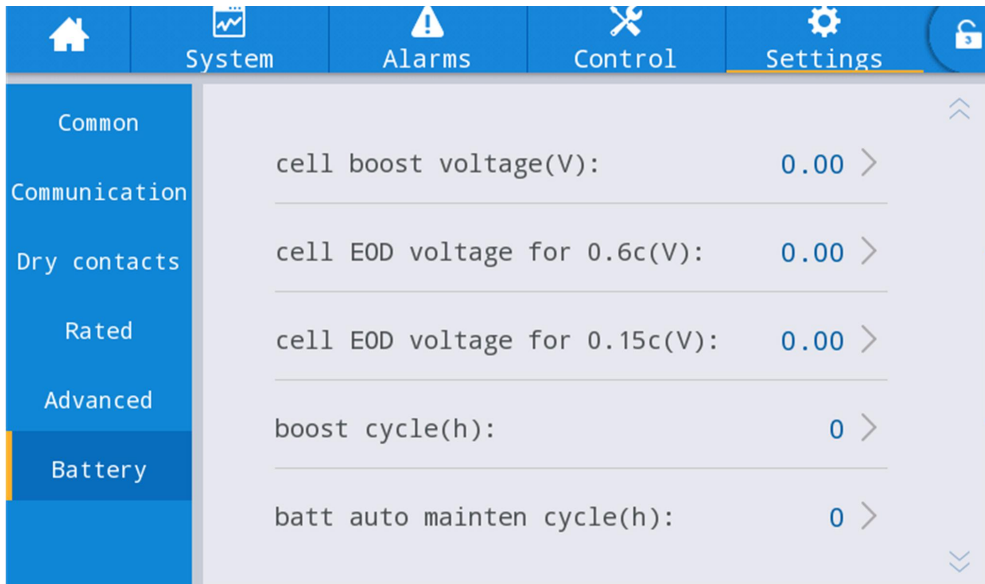


Fig. 4-19 Battery parameters interface

Table 4-22 Description of battery parameters interface

| Setting item | Default | Options | Description |
|-----------------------|---------|-------------|--|
| Battery number | 40 | settable | et according to the total number of battery cells connected to the UPS system, each conventional lead-acid battery has 6 battery cells, for example, 32 batteries × 6=192 battery cells. |
| Battery capacity (Ah) | 18 | settable | Single battery capacity connected to the UPS system. |
| Charge curr.limit(A) | 1 | 10 | Set according to the needs, 20% * UPS capacity limited. |
| Boost time limit | 2 | 1-48 | Set according to the needs. |
| Cell float voltage | 2.25 | 2.10 ~ 2.35 | Charging voltage of single cells under floating charge condition. |
| Cell boost voltage | 2.25 | 2.20~2.45 | Charging voltage of single cells under boost charge condition. |

| Setting item | Default | Options | Description |
|----------------------------|---------|-------------|--|
| Cell EOD voltage for 0.6C | 1.65 | 1.6~1.85 | Set according to the needs. |
| Cell EOD voltage for 0.15C | 1.75 | 1.65~1.9 | Set according to the needs. |
| Boost cycle | 1440 | 1~3000h | Set according to the needs. |
| Batt auto mainten cycle | 2880 | 720~3000 0h | This test will lead to the battery being partly discharged to activate battery until battery voltage is low. Bypass must be in normal condition, the battery capacity should be above 25%. |
| Batt volt low coefficient | 1.1 | 1.05~1.25 | Set according to the needs. |
| Batt mainten cycle | 3000 | 0-3000d | Set according to the actual battery replacement time for the users. |

4.3 Event List

The following Table4.7 gives events of UPS History Log

Table 4.7 List of History Log

| String Sequence | LCD Display | Explanation |
|-----------------|---|---|
| 230 | Battery voltage low (DOD) | Battery voltage is low |
| 231 | Battery end of discharge (EOD) | Battery End Of Discharge |
| 232 | Bypass fail | Bypass Fail |
| 233 | Fan fail | Fan fail |
| 245 | UPS maintenance breaker close | Maintenance CB is Closed |
| 336 | System board and inverter module CAN communication abnormal | System board and inverter module CAN communication abnormal |
| 337 | Same address of multiple inverter | address of multiple inverter is same |
| 352 | CAN communication abnormal between system board | CAN communication abnormal between system board |
| 366 | Frequency beyond tracing range | Bypass Frequency Over Track Range |
| 368 | Bypass phase over voltage | Bypass voltage abnormal |
| 369 | Bypass phase under voltage | Bypass voltage abnormal |
| 370 | Bypass over frequency | Bypass frequency abnormal |
| 371 | Bypass under frequency | Bypass frequency abnormal |
| 372 | Bypass phase sequence error | Bypass voltage Sequence is reverse |
| 373 | Bypass phase loss | Utility (Grid) Abnormal |
| 374 | Bypass phase volt imbalance | Bypass voltage is not balance |
| 375 | Bypass voltage rapid inspection abnormal | Bypass voltage Sequence is reverse |
| 376 | Bypass overcurrent | Bypass overcurrent |
| 377 | ECO bypass overvoltage | Byapss voltage abnormal in ECO model |

| | | |
|-----|---|--|
| 378 | ECO bypass undervoltage rapidly | Byapsss voltage abnormal in ECO model |
| 379 | ECO bypass overfrequency | Byapsss frequency abnormal in ECO model |
| 380 | ECO bypass underfrequency | Byapsss frequency abnormal in ECO model |
| 381 | ECO bypass undervoltage rapidly | Bypass undervoltage rapidly in ECO model |
| 382 | ECO bypass phase sequence error | Bypass phase sequence error in ECO model |
| 383 | ECO bypass neutra loss | Bypass neutra loss in ECO model |
| 396 | Bypass radiator overtemperature | Bypass radiator overtemperature |
| 418 | Battery maintenance reminder | Battery maintenance reminder |
| 419 | Battery discharging time ended | Battery discharging until time ended |
| 420 | Battery discharge voltage ended | Battery End Of Discharge |
| 421 | Battery over temperature | Battery over temperature |
| 422 | Battery under temperature | Battery under temperature |
| 423 | Battery self check fail | Battery Test fails |
| 451 | Bypass abnormal | Bypass voltage or frequency abnormal |
| 452 | Output abnormal | Output voltage or frequency abnormal |
| 464 | Input over voltage | Input voltage abnormal |
| 465 | Input under voltage | Input voltage abnormal |
| 466 | Input over frequency | Input frequency abnormal |
| 467 | Input under frequency | Input frequency abnormal |
| 468 | Input phase sequence error | Input phase sequence is reverse |
| 469 | Input phase loss | Input phase loss |
| 470 | Input voltage imbalance | Input voltage is not balance |
| 471 | input voltage rapid inspection abnormal | Output shorted Circuit |
| 472 | Input over current | Input over current |
| 473 | Input current imbalance | Input current is not balance |
| 474 | Input null wire loss | Input Grid Neutral Lost |
| 475 | Input fuse failure | Input fuse failure |
| 476 | Input power limited | Input power limited |
| 477 | Frequent switching between grid and battery | Transfer times (from grid to battery) in 1 hour exceed the limit. |
| 478 | Input overload | Input overload |
| 479 | Reserved | |
| 480 | Battery disconnect | Battery cables Disconnected. |
| 481 | Battery overtemperature | Battery overtemperature |
| 482 | Battery self check fail | Battery Test fails |
| 483 | Battrey overvoltage | Battrey overvoltage |
| 484 | Battery undervoltage DOD | Battery voltage is lower than "low voltage warning" point when discharging |
| 485 | Battery undervoltage EOD | Battery voltage is lower than "end of discharge" point when discharging |
| 486 | Battery over-charging | Battery over-charging |
| 487 | Battery temperature low | Battery temperature low |

| | | |
|-----|--|--|
| 488 | Battery hardware overvoltage failure | Battery hardware overvoltage failure |
| 489 | Battery charging overcurrent | Battery charging overcurrent |
| 490 | Battery discharging overcurrent | Battery discharging overcurrent |
| 491 | Open circuit of charger switch | Charger relay is open |
| 492 | Charger switch short circuit | Charger relay short circuit |
| 493 | Battery discharge overtime | Battery discharge overtime |
| 494 | Reverse battery connection | Battery pole (positive and negative)are reverse |
| 495 | battery neutral Lost | battery neutral Lost |
| 521 | PFC soft start fail | PFC soft start fail |
| 528 | Rectifier IGBT module over temperature | Rectifier over temperature |
| 529 | Rectifier E2PROM read-write failure | Rectifier E2PROM read-write failure |
| 546 | Charger soft start fail | Charger soft start fail |
| 547 | Charger over voltage | Charger fail |
| 548 | Charger hardware overvoltage failure | Charger fail |
| 549 | Charger under-voltage | Charger fail |
| 568 | Lithium battery charge primary protection | The charge primary protection of Lithium battery BMS system has been trigered |
| 569 | Lithium battery discharge primary protection | The discharge primary protection of Lithium battery BMS system has been trigered |
| 570 | Lithium battery charge secondary protection | The charge secondary protection of Lithium battery BMS system has been trigered |
| 571 | Lithium battery discharge secondary protection | The discharge secondary protection of Lithium battery BMS system has been trigered |
| 572 | Lithium battery charge tertiary protection | The charge tertiary protection of Lithium battery BMS system has been trigered |
| 573 | Lithium battery discharge tertiary protection | The discharge tertiary protection of Lithium battery BMS system has been trigered |
| 574 | Lithium battery charge warning | Lithium battery charge abnormal |
| 575 | Lithium battery discharge warning | Lithium battery discharge bnormal |
| 576 | Input abnormal | Input abnormal |
| 592 | Bus-bar short circuit | DC bus shorted Circuit |
| 593 | Bus-bar abnormal | Bus-bar abnormal |
| 594 | Bus-bar overvoltage | DC bus over Voltage |
| 595 | Bus-bar under voltage | DC bus under Voltage |
| 596 | Bus-bar voltage imbalance | DC bus voltage imbalance |
| 608 | Inverter overvoltage | Inverter overvoltage |
| 609 | Inverter under voltage | Inverter under voltage |
| 610 | Inverter voltage imbalance | Inverter voltage imbalance |
| 611 | DC component excessed | DC component excessed |

| | | |
|-----|--|--|
| 612 | Inverter module 105% overload | Inverter Over Load 105%Timeout |
| 613 | Inverter module 110% overload | Inverter Over Load 110%Timeout |
| 614 | Inverter module 125% overload | Inverter Over Load 125%Timeout |
| 615 | Inverter module 150% overload | Inverter Over Load 150%Timeout |
| 616 | Short circuit of inverter output | Output shorted Circuit |
| 617 | Inverter module overload alarm | Inverter Over load |
| 626 | BYP 125% overload | BYP Over Load 125%Timeout |
| 627 | BYP 135% overload | BYP Over Load 135%Timeout |
| 628 | BYP 150% overload | BYP Over Load 150%Timeout |
| 629 | BYP 200% overload | BYP Over Load 200%Timeout |
| 630 | Bypass overload alarm | Bypass Over load |
| 640 | Inverter soft start fail | Inverter soft start fail |
| 641 | Phase lock fail | Phase lock fail |
| 642 | Frequent switching between bypass and inverter | Transfer times (from inverter to bypass) in 1 hour exceed the limit. |
| 643 | Inverter soft start times reached | Inverter soft start times reached |
| 644 | Parallel operation current imbalance | Parallel operation current imbalance |
| 645 | Capture failure | Capture failure |
| 646 | Load strike | Load strike |
| 647 | Adjacent UPS request switching to bypass | Adjacent UPS request switching to bypass |
| 648 | Parallel operation wire abnormal | Parallel cable in error |
| 649 | Driver connection failure | Driver connection failure |
| 650 | Synchronous square wave abnormal | Synchronous square wave abnormal |
| 651 | Inverter self check failure | Inverter self check failure |
| 656 | Inverter radiator over temperature | Inverter Over Temperature |
| 657 | Inverter E2PROM operation failure | Inverter E2PROM operation failure |
| 658 | Inverter DSP and monitor communication failure | Inverter DSP and monitor communication failure |
| 663 | Emergency shutdown | EPO Emergency Power Off |
| 672 | Inverter relay open circuit | Inverter relay open circuit |
| 673 | Inverter relay short circuit | Inverter relay short circuit |
| 676 | SPI communication failure between rectifier and inverter | SPI communication failure between rectifier and inverter |
| 688 | Output overvoltage | Output overvoltage |
| 689 | Output undervoltage | Output undervoltage |
| 704 | inverter fast check fail | inverter fast check fail |
| 705 | inverter Negative power fault | inverter Negative power fault |

5. Operations

5.1 UPS Start-up

5.1.1 Start from 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 and the UPS output is not shorted..
2. Close the output circuit breaker (CB) and then the input CB and the system starts initializing. If the system has dual inputs, close both of the breakers.
3. The LCD in front of the cabinet is lit up. The system enters the home page, as shown in Fig.4-2.
4. Notice the energy bar in the home page, and pay attention to the LED indicators.
5. After 30S, Bypass static switch closes then the inverter is starting up.
6. The UPS transfers from the bypass to inverter after the inverter goes normal.
7. The UPS is in Normal Mode. Close the battery circuit breakers and the UPS starts charging the battery.
8. The starting up done.

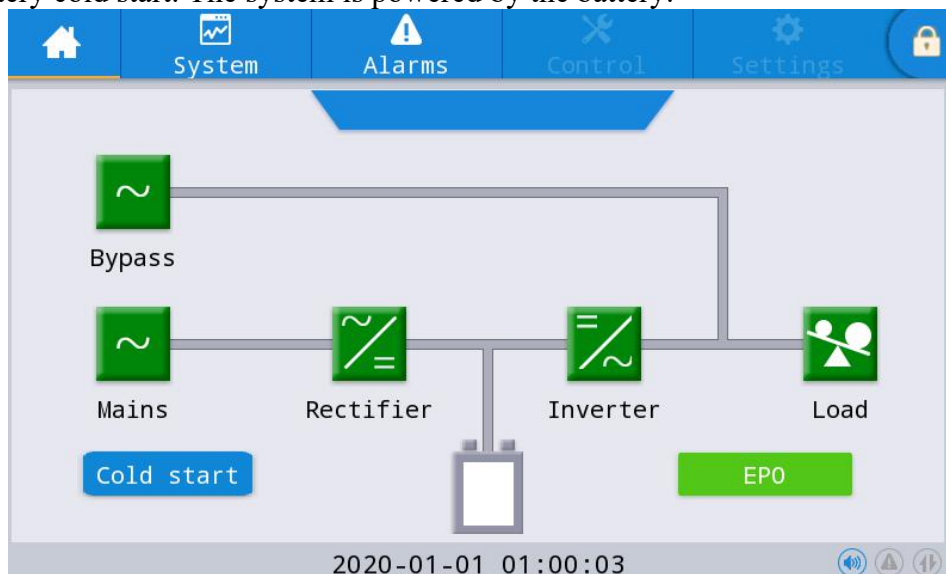
Note

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

5.1.2 Start from Battery

The start for battery model is referring to battery cold start. The steps for the start-up are as follows:

1. Confirm the battery is correctly connected; close the external battery circuit breakers.
2. After 60S, Press the red button located at the back of the UPS cabinet for the battery cold start. The system is powered by the battery.



3. After that, Press the button for **cold start** on the LCD, The system is starting up following steps 3 in section 5.1.1 and the system transfers to battery mode in 30S.
4. Close the external output power supply isolation to supply the load, and the system is working on battery model.

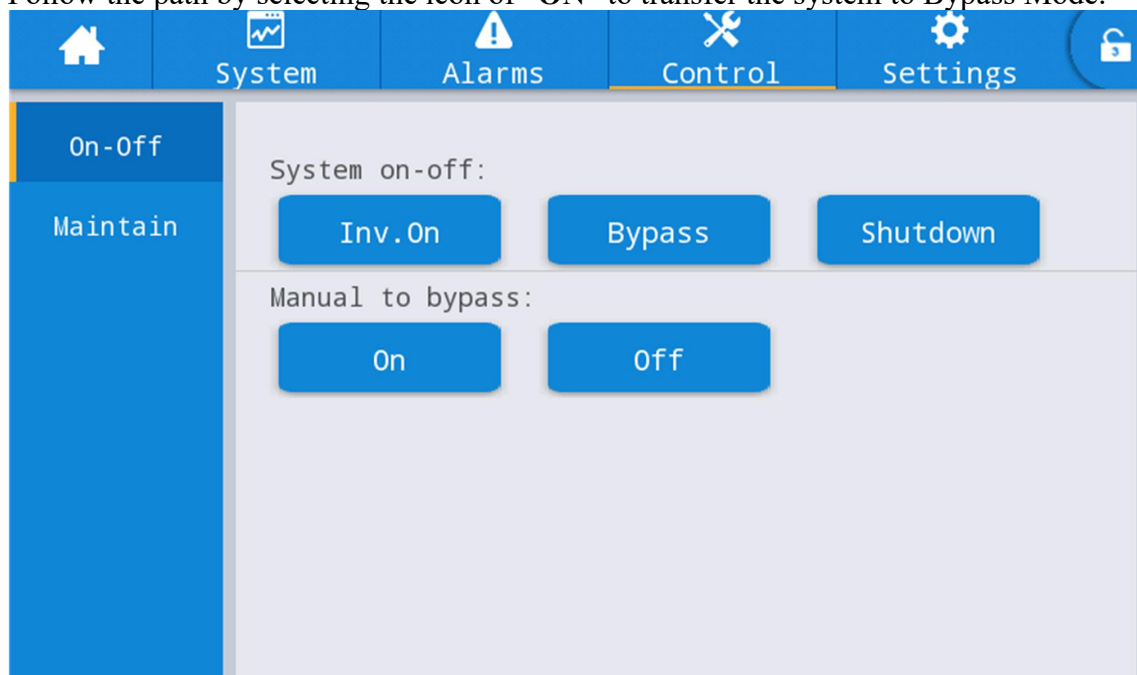
5.2 Procedure for Switching between Operation Modes

5.2.1 Switching the UPS into Battery Mode from Normal Mode

The UPS transfers to Battery mode immediately after input circuit breaker disconnects from the utility.

5.2.2 Switching the UPS into Bypass Mode from Normal Mode

Follow the path by selecting the icon of “ON” to transfer the system to Bypass Mode.



Warning

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

5.2.3 Switching the UPS into Normal Mode from Bypass Mode

Follow the path by selecting the icon of “Off”, the system transfer to Normal Mode

Note

Normally, the system will transfer to the Normal mode automatically. This function is used when the frequency of the bypass is over track and when the system needs to transfer to Normal mode by manual.

5.2.4 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 following section 5.2.2.
2. Open the battery breaker and close the maintenance bypass breaker. And the load is powered through maintenance bypass and static bypass.
3. The load is powered through maintenance bypass.

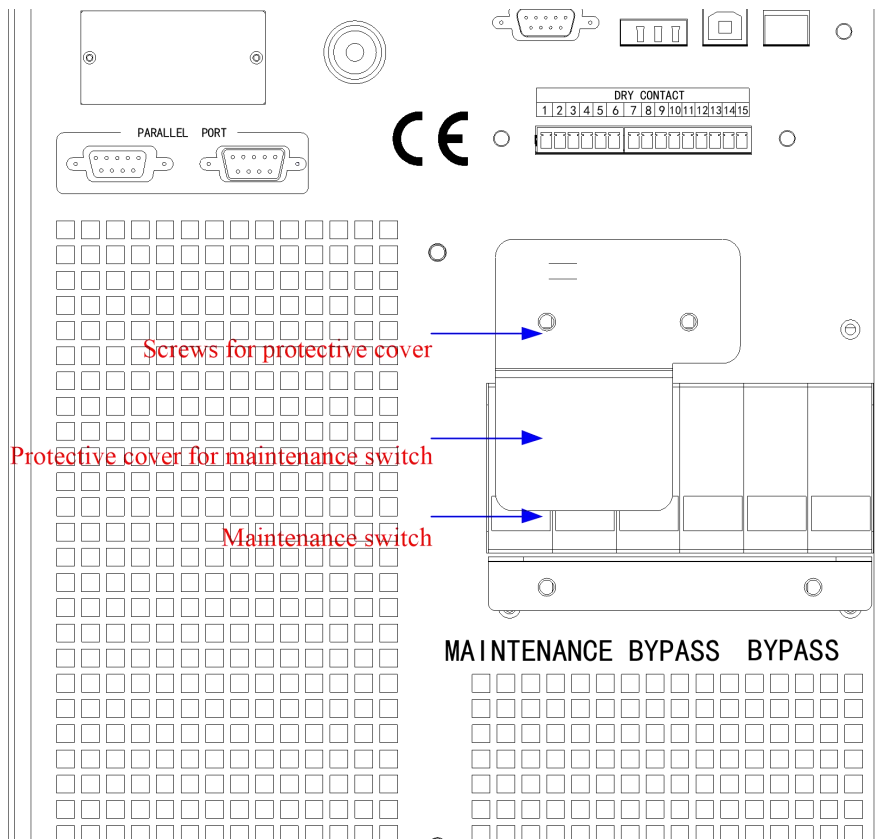


Fig.5-1 the cover of maintenance bypass breaker



Warning

Once the cover on the maintenance bypass breaker is removed, the system will transfer to bypass mode automatically.



Warning

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



Danger

Even with the LCD turned off, the terminals of input and output may be still energized .
If you need to maintain the power module, wait for 10 minutes to let the DC bus capacitor fully discharge before removing the cover.

5.2.5 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, close the bypass breaker and the bypass static switch will be turned on in 30S after the LCD touch screen goes on, the bypass energy bar is ok and the load is powered through maintenance bypass and static bypass.

-
2. Turn off the maintenance bypass switch and fix the protection cover, and then the load is powered through bypass. The rectifier starts followed by the inverter.
 3. After 60S, the system transfers to Normal mode.
-



Warning

The system will stay on bypass mode until the cover of maintenance bypass breaker is fixed.

5.3 Battery Maintenance

If the battery is not discharged for a long time, it is necessary to test the condition of the battery.

Enter the menu “maintain”, as is shown in Fig.5-2 and select the icon “Bat Test 2”, the system transfers into the Battery mode for discharging. The system will discharge the batteries until the alarm of “Battery low voltage” is given. Users can stop the discharging by the “Stop Bat Test” icon.

With the icon of “Bat Test 1”, batteries will be discharged for about 30 seconds, and then re-transfer to normal mode.

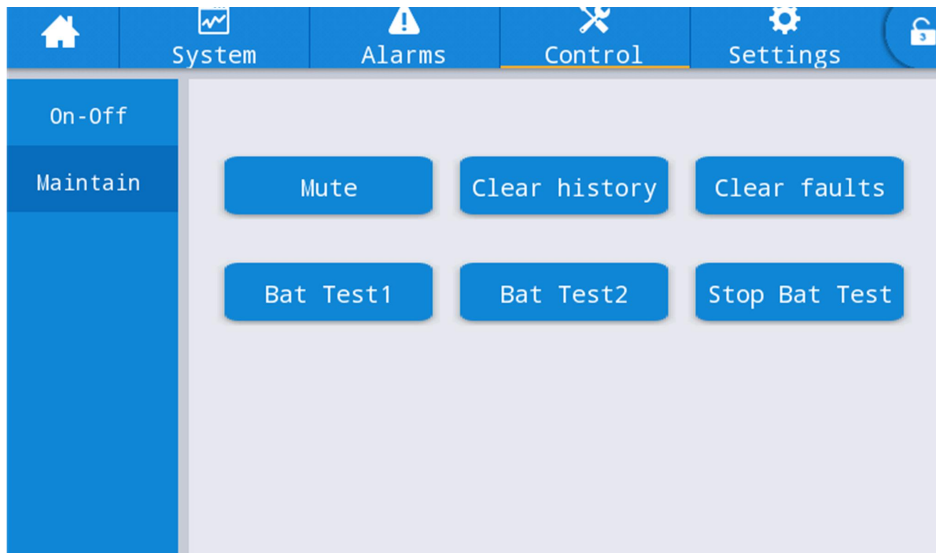


Fig.5-2 Battery maintenance

5.4 EPO

The EPO button located on the home page (see Fig.5-3) is designed to switch off the UPS in emergency conditions (e.g., fire, flood, etc.). To achieve this, just press the EPO button, and the system will turn off the rectifier, inverter and stop powering the load immediately (including the inverter and bypass output), and the battery stops charging or discharging.

If the input utility is present, the UPS control circuit will remain active; however, the output will be turned off. To completely isolate the UPS, users need to open the external mains input supply to the UPS



Warning

When the EPO is triggered, the load is not powered by the UPS. Be careful to use the EPO function.

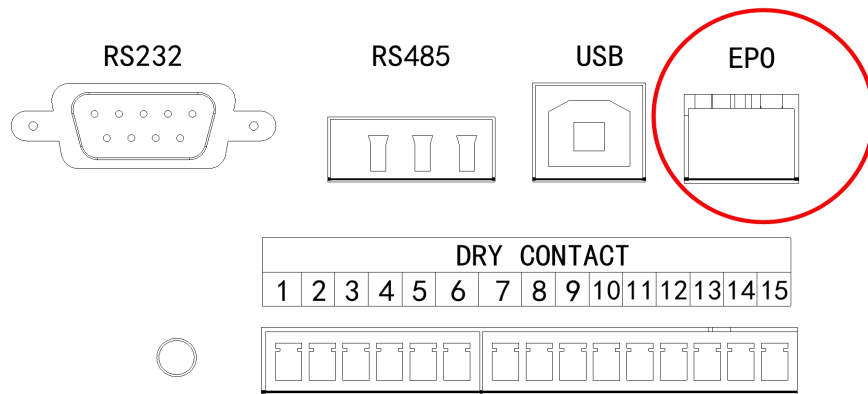


Fig .5-3 EPO Button

5.5 Installation of Parallel Operation System

5.5.1 Parallel system diagram

Up to four UPS could be paralleled, with a diagram as shown in Fig.5-4.

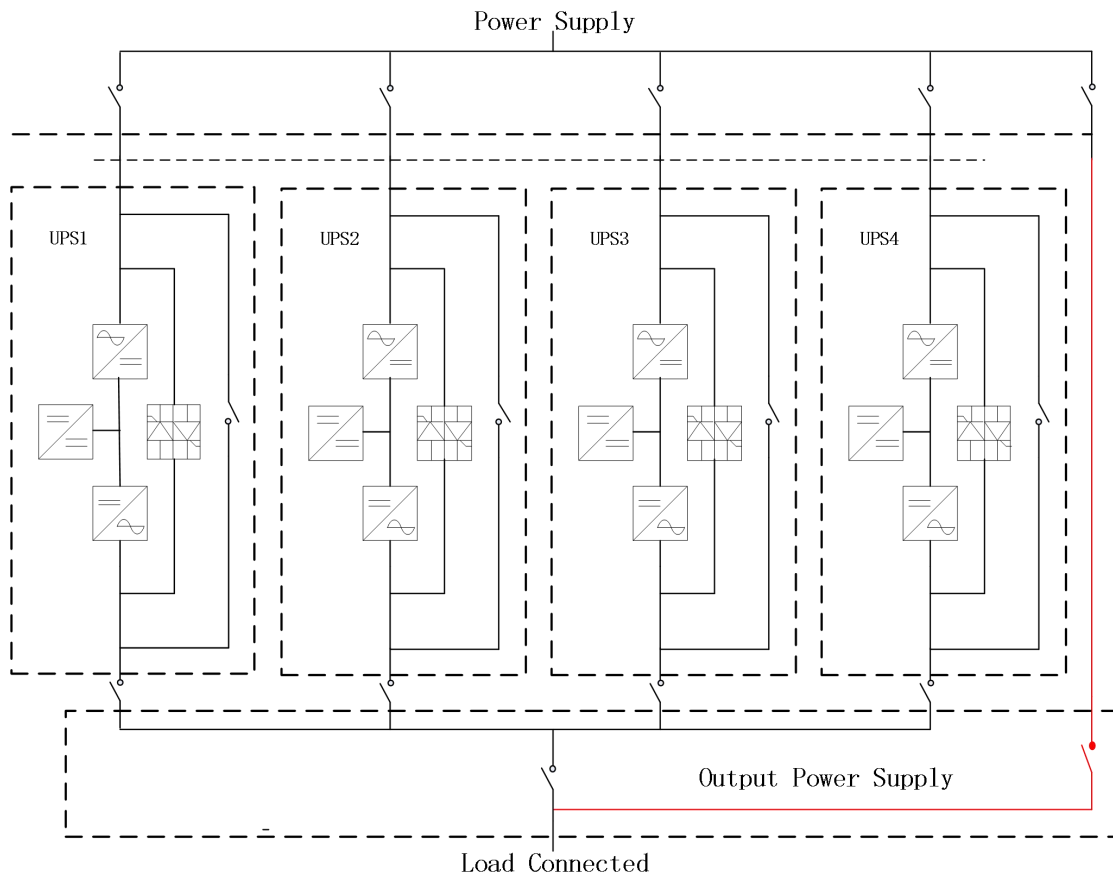


Fig. 5-4 Parallel diagram

The parallel board is located at the back of the UPS cabinet.

All the parallel cables are designed to be shielded and double insulated, and are connected between the UPS to form a loop as shown below in Fig.5-5.

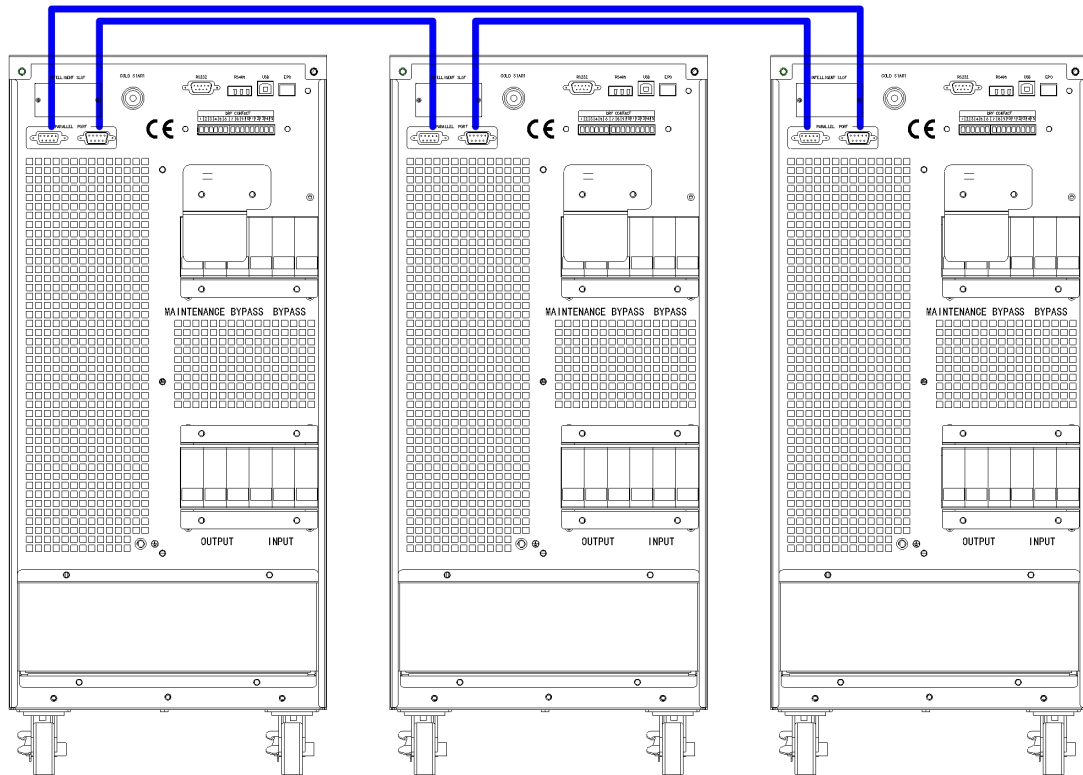


Fig.5-5 Parallel connection

5.5.2 Parallel system setting

Parallel system connection

For field installation, please connect the cables according to Fig.5-6 and Fig.5-8.

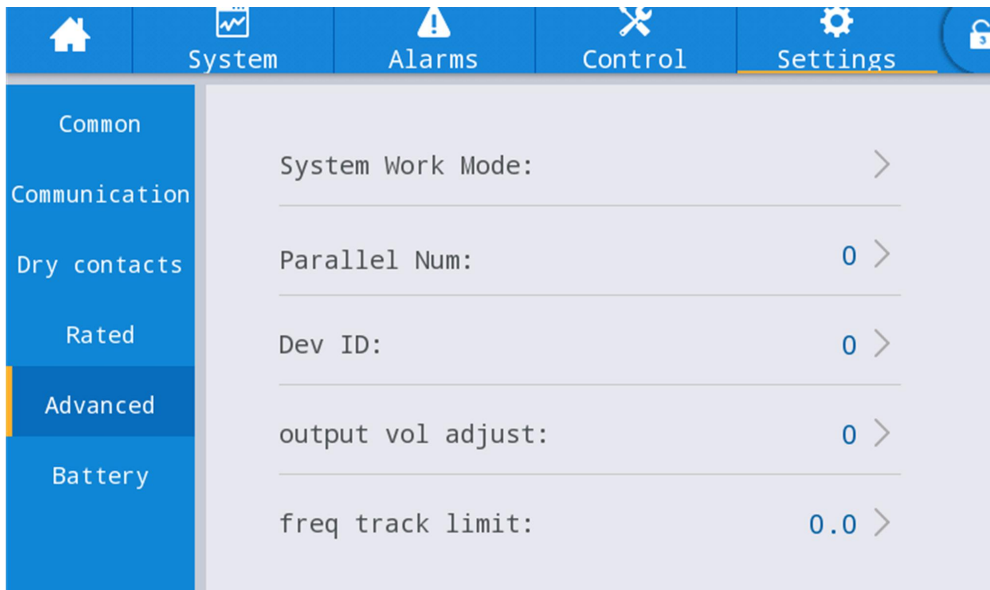
In order to assure that all units are equally utilized and to comply with relevant wiring rules, the following requirements apply:

1. All units shall be of the same rating and must be connected to the same bypass source.
2. The bypass and the main input sources must be referenced to the same neutral potential.
3. Any RCD (Residual Current detecting device), if installed, must be of an appropriate setting and located upstream of the common neutral bonding point. Alternatively, the device must monitor the protective earth currents of the system. Refer to the High Leakage Current Warning in the first part of this manual.
4. The outputs of all UPS must be connected to a common output bus.

Parallel system software setting

To change the parallel system setting, please follow the steps below.

1. With the monitoring software from manufacturer, select the page of “Settings” as below,



Set “**System Work Mode**” to “**Parallel mode**”, and set the “**Parallel Num**” to the number of units in parallel. For the setting of **device ID** with a system of 3 units in parallel, for example, set the number from 0 to 2 for these 3 units accordingly.

Restart the UPS when finish the setting. Here the setting is done. Ensure all the output parameters must be set the same.

When all the connection and settings are finished, follow the steps below for the operation of parallel system setup.

1. Close the output and input breaker of the first unit. Wait for the start up of bypass static switch and rectifier, about 90 seconds later; the system will transfer to normal mode. Check if there is any alarm on LCD and verify the output voltage is correct or not.
2. Turn on the second unit as the same operation with the first one; the unit will join the parallel system automatically.
3. Turn on the rest units one by one, and check the information on LCD.
4. Verify the load sharing with a certain load applied.

6. Maintenance

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

6.1 Precautions

1. Only certified engineers are authorized to maintain the UPS.
2. The components or PCBs should be disassembled from top to bottom, so as to prevent any inclination from high gravity centre of the cabinet.
3. To ensure the safety before maintaining, measure the voltage between operating parts and the earth with multimeter to ensure the voltage is lower than hazardous voltage, i.e. DC voltage is lower than 60Vdc, and AC maximum voltage is lower than 42.4Vac.
4. Wait 10 minutes before opening the cover of the power module or the bypass after pulling out from the Cabinet.

6.2 Instruction for Maintaining UPS

For the maintenance of the UPS, please refer to chapter 5.2.4 for the instruction to transfer to maintenance bypass mode. After maintenance, re-transfer to normal mode according to chapter 5.2.5.

6.3 Instruction for Maintaining Battery string

For the Lead-Acid maintenance free battery, when maintenance the battery according to requirements, battery life can be prolonged. The battery life is mainly determined by the following factors:

1. 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.
2. Temperature. The most suitable storage temperature is 20 °C to 25°C. The battery life will be shortened if the battery is used under high temperature or in deep discharging status. Refer to product manual for details.
3. Charging/discharging current. The best charging current for the lead-acid battery is 0.1C. The maximum current for the battery can be 0.3C. The suggested discharging current is 0.05C-3C.
4. 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.
5. Discharge depth. Avoid deep discharging; which will greatly reduces 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.
6. Check periodically. Observe if any abnormality of the battery, measure if the voltage of each battery are in balance. Discharge the battery periodically.



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 a 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 Specification

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

7.1 Applicable Standards

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

Table 7.1 Compliance with European and International Standards

| Item | Normative reference |
|---|--|
| General safety requirements for UPS used in operator access areas | EN50091-1-1/IEC62040-1-1/AS 62040-1-1 |
| Electromagnetic compatibility (EMC) requirements for UPS | EN50091-2/IEC62040-2/AS 62040-2 (C3) |
| Method of specifying the performance and test requirements of UPS | EN50091-3/IEC62040-3/AS 62040-3 (VFI SS 111) |



Note

The above mentioned product standards incorporate relevant compliance clauses with generic IEC and EN standards for safety (IEC/EN/AS60950), electromagnetic emission and immunity (IEC/EN/ AS61000 series) and construction (IEC/EN/AS60146 series and 60950).



Warning

This product conforms the EMC requirements for UPS in Category C3 and it is not suitable for medical equipments.

7.2 Environmental Characteristics

Table 7.2 Environmental Characteristics

| Item | Unit | Requirements |
|---------------------------------|------|--|
| Acoustic noise level at 1 meter | dB | 58dB @ 100% load, 55dB @ 45% load |
| Altitude of Operation | m | ≤1000,load derated 1% per 100m from 1000m and 2000m |
| Relative Humidity | % | 0-95,non condensing |
| Operating Temperature | °C | 0-40,Battery life is halved for every 10°C increase above 20°C |
| UPS Storage Temperature | °C | -40-70 |

7.3 Mechanical Characteristic

Table 7.3 Mechanical Characteristics for Cabinet

| Model | Unit | 10kH/10kS | 15kH/15kS | 20kH/20kS | 30kH/30kS |
|---------------------------------|------|----------------|----------------------------|----------------------------|----------------------------|
| Dimension W×D×H | mm | 250*720*560 | 250*720*560 250*800*700 | 250*720*560 250*800*700 | 250*840*650 250*840*930 |
| Weight | kg | 31/82 | 33/131 | 33/145 | 42/215 |
| Color | N/A | BLACK,RAL 7021 | | | |
| Protection Level IEC (60529) | N/A | IP20 | | | |

7.4 Electrical Characteristics

Table 7.4 Electrical Characteristics

| Model | 10kH/10kS | 15kH/15kS | 20kH/20kS | 30kH/30kS |
|---|---|------------|------------|------------|
| Power Rating | 10kVA/10kW | 15kVA/15kW | 20kVA/20kW | 30kVA/30kW |
| Input Rectifier AC input Mains | | | | |
| Phase | 3 Phases + Neutral + Ground | | | |
| Rated Input Voltage | 380/400/415 (three-phase and sharing neutral with the bypass input) | | | |
| Rated Frequency | 50/60Hz | | | |
| Input Voltage Range | 304~478Vac (Line-Line),full load 228V~304Vac (Line-Line),load decrease linearly according to the min phase voltage | | | |
| Input Frequency Range | 40Hz ~ 70Hz | | | |
| Input Power Factor | >0.99 | | | |
| Input Current THDi | <5%(full non-linear load) | | | |
| Bypass Mains Input | | | | |
| Rated Bypass Voltage | 380/400/415Vac (Line-Line) | | | |
| Rated Frequency | 50/60Hz | | | |
| Bypass Voltage Range | Selectable, default -20% ~ +15% Up limited: +10%, +15%, +20%, +25% Down limited: -10%, -15%, -20%, -30%, -40% | | | |
| Bypass Frequency Range | Selectable, ±1Hz, ±3Hz, ±5Hz | | | |
| Bypass Overload | 125% long term operation 125%~130% 10min 130%~150% 1min 150%~400% 1s >400% , < 200ms | | | |
| Current rating of neutral cable | 1.7×In | | | |
| Switch time (between bypass and inverter) | Synchronized transfer: 0ms | | | |
| Inverter Output | | | | |
| Rated Inverter Voltage | 380/400/415Vac (Line-Line) | | | |
| Rated Frequency | 50/60Hz | | | |
| Output Power Factor | 1 | | | |

| | | | | |
|--|--|--------|------|------|
| Voltage precision | ±1%(Linear Load) | | | |
| Frequency precision | 0.1Hz | | | |
| Synchronized Range | Settable, ±0.5Hz ~ ±5Hz, default ±3Hz | | | |
| Synchronized Slew Rate | Settable, 0.5Hz/S ~ 3Hz/S, default 0.5Hz/S | | | |
| Transient Response | <5% for step load (20% - 80% -20%) | | | |
| Transient recovery | < 20ms for step load (20% - 100% -20%) | | | |
| Output Voltage THDu | <1% (full linear Load) <3% (full non-linear load according to IEC/EN62040-3) | | | |
| Inverter Overload | <110%, 60min; 110%~125%,10min; 125%~150%,1s; >150%,200ms | | | |
| Battery(Intermediate DC Lin) | | | | |
| Long run model battery voltage | Rated : ±240V default, ±120V ~ ±240V | | | |
| Standard model battery voltage | ±120 | ±240 | ±240 | ±180 |
| Float charge voltage | 2.25V/cell(selectable from 2.2V/cell ~ 2.35V/cell) Constant current and floated voltage charge mode | | | |
| Equalized charge voltage | 2.35V/cell(selectable from : 2.30V/cell~2.45V/cell) Floated current and constant voltage charge mode | | | |
| Temperature compensation | 3.0(selectable:0~5.0) mV/°C/cI | | | |
| Charger Voltage precision | ≤1% | | | |
| Ripple current | ≤5% | | | |
| Final discharging voltage EOD Voltage (Acid battery) | 1.65V/cell(selectable from: 1.60V/cell~1.75V/cell) @0.6C discharge current 1.75V/cell (selectable from: 1.65V/cell~1.8V/cell) @0.15C discharge current (EOD voltage changes linearly within the set range according to discharge current) | | | |
| Battery Charging Power Max Current | Selectable from : 1~10A (20% * UPS capacity limited) | | | |
| System | | | | |
| Display | LCD+LED(5 inch touch screen) | | | |
| Normal mode Efficiency (dual conversion) | >94.5% | >94.5% | >95% | >95% |
| Battery discharging efficiency (battery at nominal voltage 480Vdc and full-rated linear load) | >94.5% | >94.5% | >95% | >95% |
| Interface | Standard:RS232, RS485, USB Option: Programmable dry contact, SNMP, Parallel kit | | | |

Annex A Installation of internal battery

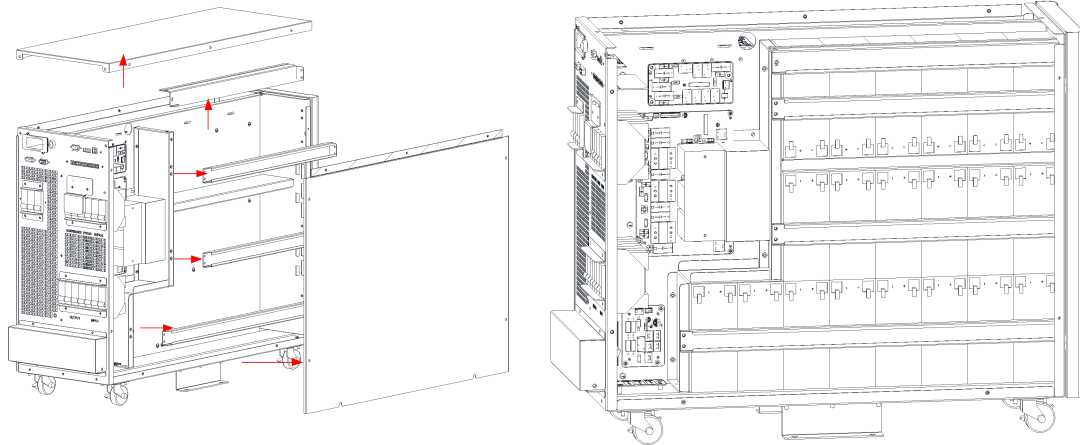
For 10kVA to 30kVA standard UPS, the internal batteries is not provided as standard; if required, please contact your local agency.

There are 20 batteries of 9AH to be installed for 10kVA.

There are 40 batteries of 7/9AH to be installed for 15/20kVA.

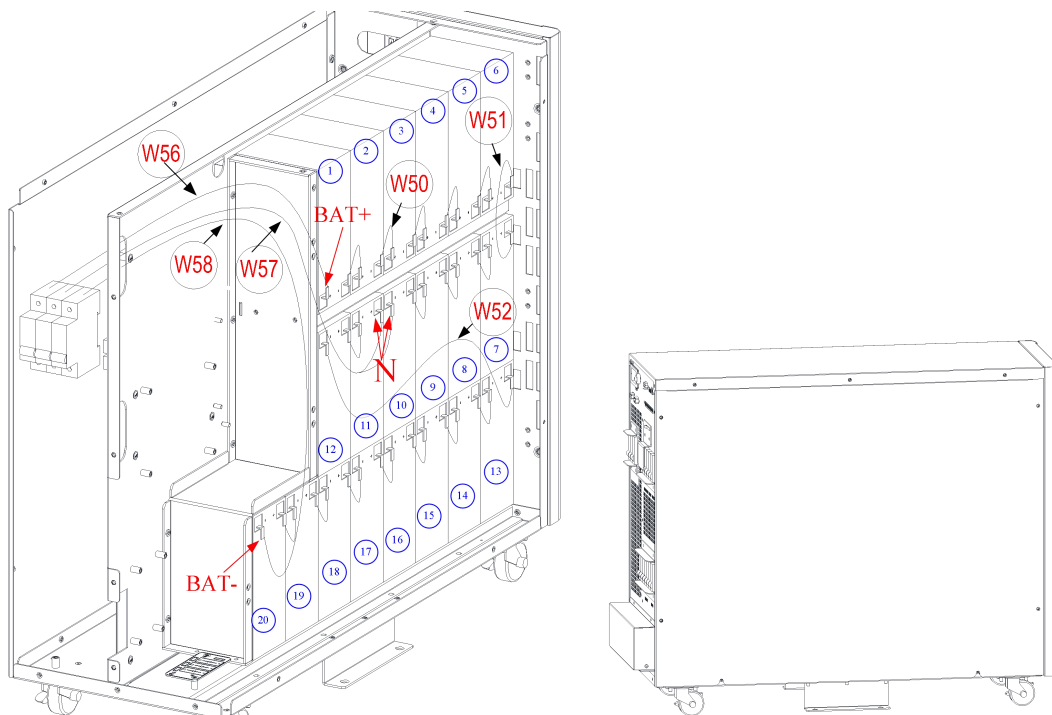
There are 60 batteries of 9AH to be installed for 30kVA.

Fig.6-1 is the installation of battery of the 10kVA standard UPS.



1. Dismantle the covers and crossbeams

2. Install battery and fix the crossbeams

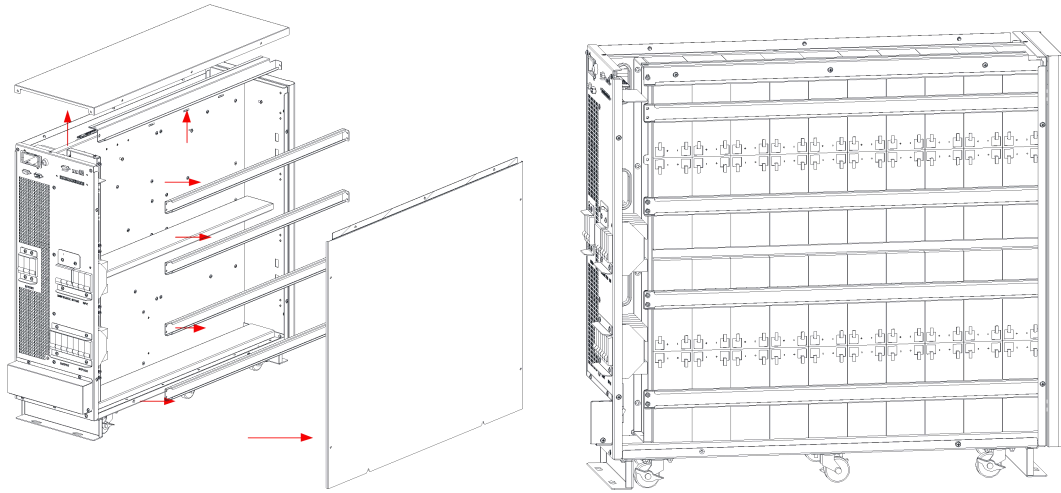


3. Connect the battery cable according to the series number,

4. Recover the cover

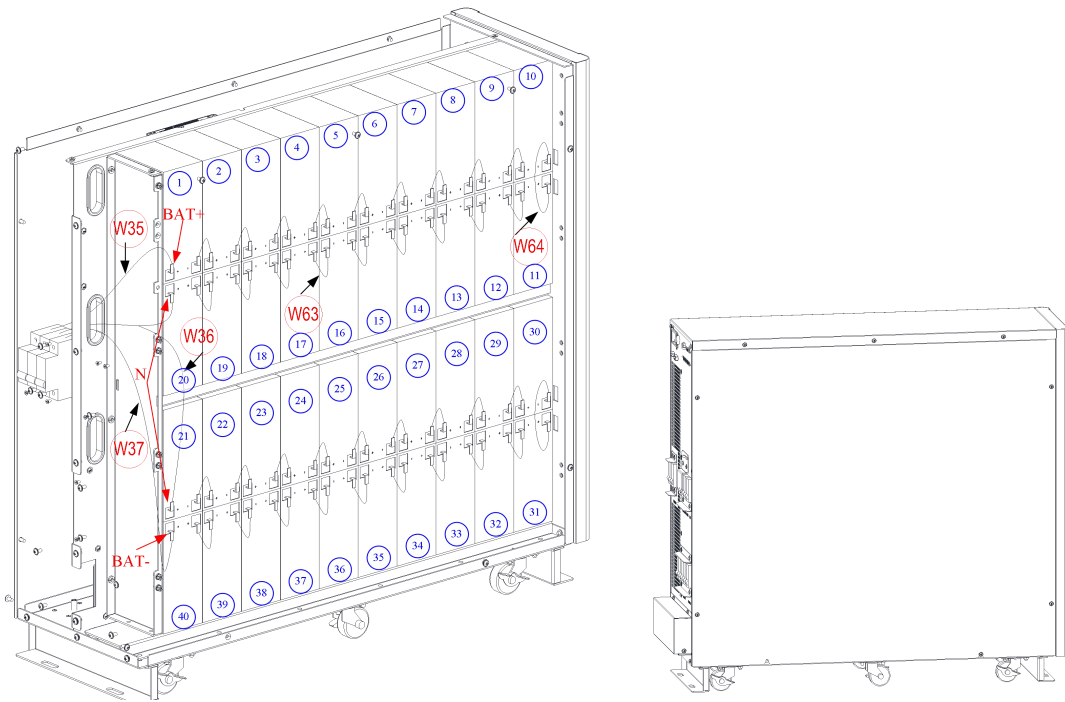
Fig.6-1 Installation of battery the 10kVA standard UPS

Fig.6-2 is the installation of battery of the 15-20kVA standard UPS.



1. Dismantle the covers and crossbeams

2. Install battery and fix the crossbeams

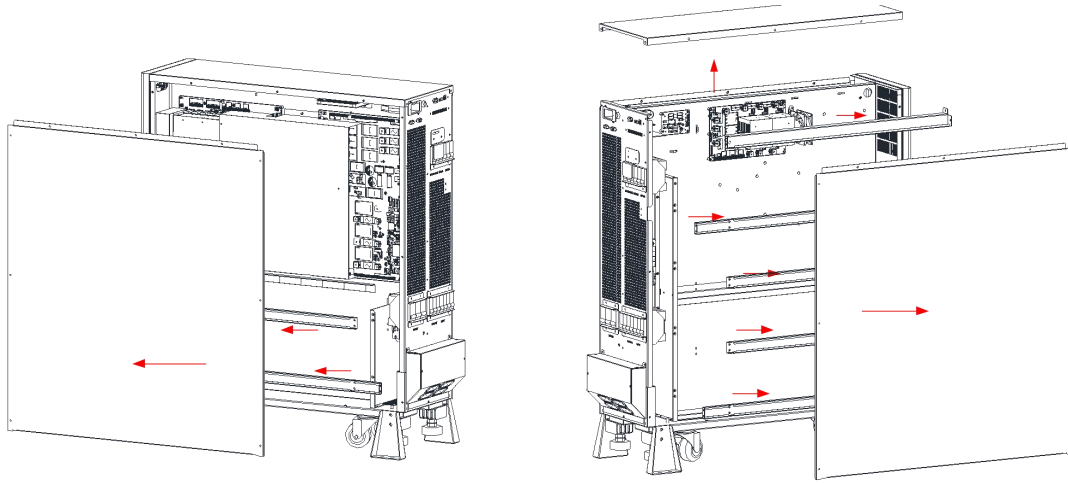


3. Connect the battery cable according to the series number

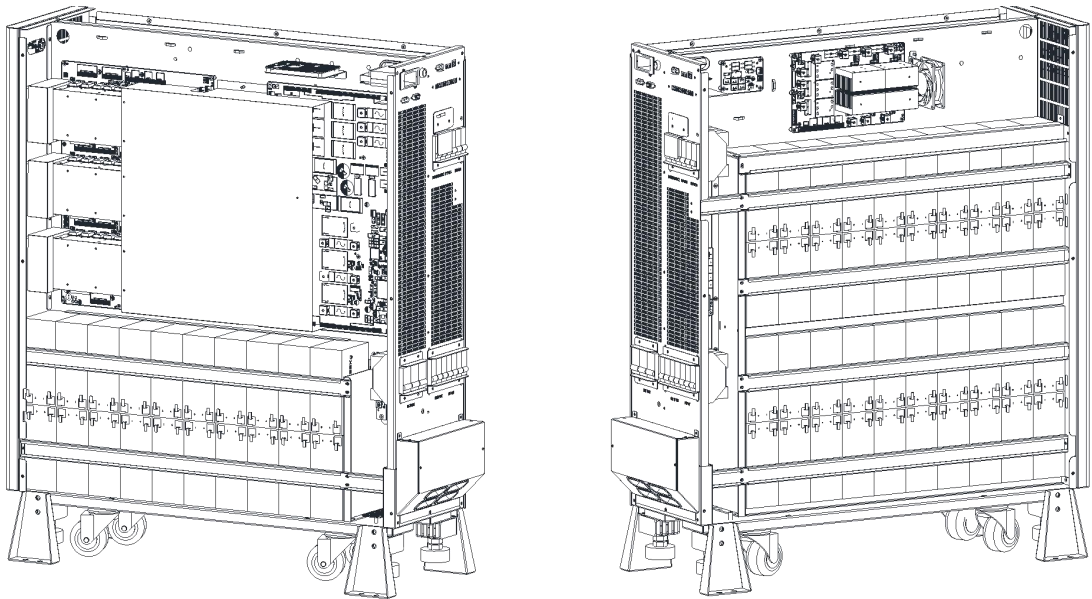
4. Recover the cover

Fig.6-2 Installation of battery the 15-20kVA standard UPS

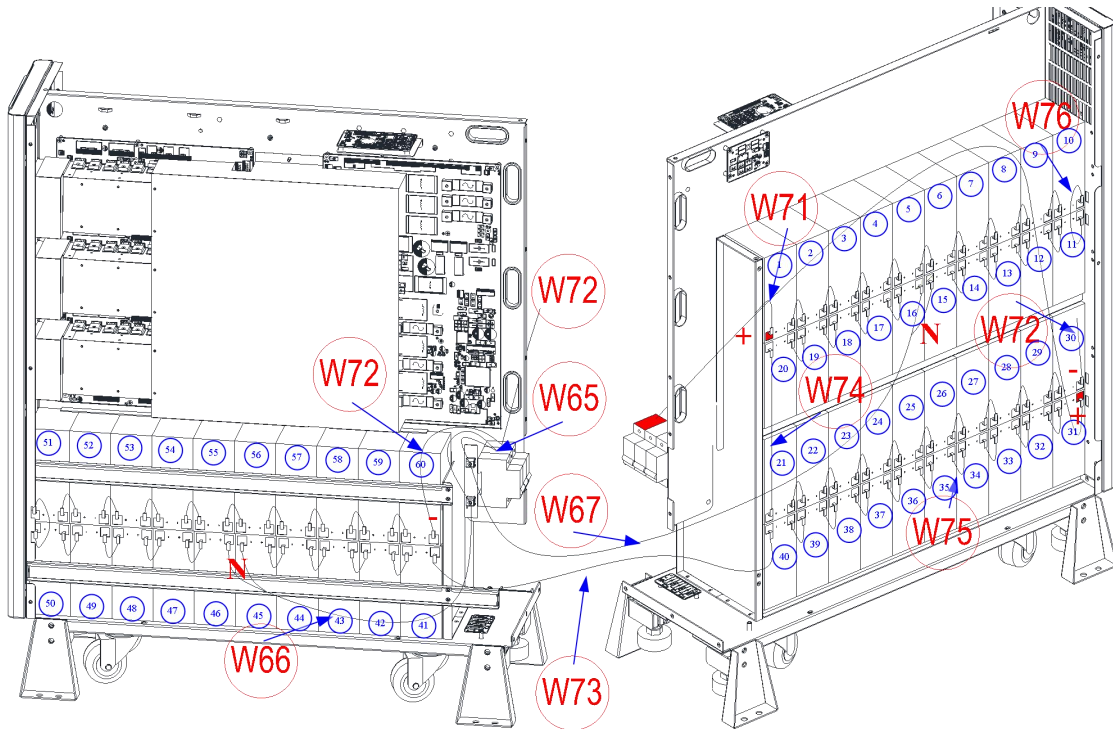
Fig.6-3 is the installation of battery of the 30kVA standard UPS.



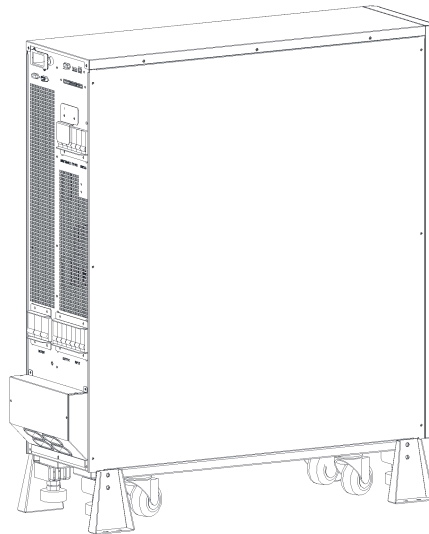
1. Dismantle the covers and crossbeams



2. Install battery and fix the crossbeams



3. Connect the battery cable according to the series number



4. Recover the cover

Fig.6-3 Installation of battery the 30kVA standard UPS



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.

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