PREFACE

Note

The Manual contains instructions for installation, use and operation and so on of UPS. Please read this Manual carefully before installation. Do not operate UPS before reading all contents of safety and operating instructions. This Manual contains important information. Please strictly follow all warnings and operating instructions in the Manual and the machine. This Manual should be properly kept.

Safety

UPS must be grounded before using.

The battery must be replaced by qualified maintenance personnel. According to the laws and regulations, discarded battery is toxic waste. As a result, waste batteries should be classified for recycling according to Pollution Prevention Law.

Warning

This kind of product is sold only to partners who have a basic understanding of the product. It is necessary to know other installation requirements or measures to prevent accident.

TABLE OF CONTENTS

Chapter 1: Safety Instructions and Notes

⚠ **Note: please be sure to read all the contents of this Chapter before any operation to avoid personnel injury or equipment damage caused by faulty operation.**

1. **External battery switch is allowed to close only when the inverter is in normal operation, otherwise, internal devices of UPS and battery will be severely damaged, unless battery cold start option is connected between battery and UPS.**
2. **Output end of UPS is still charged even when the main power goes wrong. According to EN 50091-1, installer should examine and distinguish wire or plug powered by UPS and should inform the user.**
3. **The full range of UPS batteries is external. We recommend that the battery should be installed after UPS can charge it. It should be noted that if the battery is failed to charge within 2-3 months, irreparable damage will be caused to the battery.**
4. **UPS is provided forced cooling by the internal centrifugal fan. Cold-blast air enters UPS through the front air grid at the top of UPS cabinet; hot-blast air is discharged from the rear air grid at the top of UPS cabinet. Therefore, do not block the air vent (air grid).**
5. **Set the manual bypass as "On", and then close the output switch to exit the maintenance mode, in which case short circuit can be avoided to the two power supplies and damage to UPS can also be avoided.**
6. **People cannot touch the internal parts which are identified with yellow labels, otherwise they will get an electric shock.**
7. **The maintenance outlet may still be charged when the electricity for the machine is turned off, so please carefully examine whether the external power switch of UPS has been turned off to avoid the electric shock.**
8. **Data line which is given with the machine is cross line for RS232 communication and disk is the driver disk for RS232 communication and**

monitoring.

9. **Please disconnect the external switch for the battery in time when UPS is not used (especially when UPS is not used for a long time) to avoid the irreparable damage to battery caused by deep discharge of battery.**
10. **When fluctuation of bypass power supply is large, please carefully use the ECO mode of UPS to supply power to the load which is possible to power down (maximum power down time: 10ms).**
11. **The machine must be grounded before power on or any operation to this equipment to avoid any personal injury caused by leakage current.**
12. **Make sure that all power supplies are disconnected before installation and maintenance and operation in the UPS can be performed only after electrolytic capacitor is fully discharged.**
13. **Please pay special attention to the bold font with the symbol of "⚠", because they are safety tips and notes.**

Chapter 2: Introduction of Product

2.1 Brief Introduction

This series machine is full digital UPS with high performance by using DSP control technology, rectifier has function of power factor calibration, and its all performance indexes can reach the leading level in industry. This series UPS is connected between main power and major load to supply power supply with high quality for the load. It uses high-frequency double-conversion pulse-width modulation (PWM) and full digital control (DSP) technologies, and its output voltage cannot be affected by input voltage, frequency variation and interference.

As shown in figure 1, power supply of AC main power is inputted by RCB and then is ensured to charge for the battery at any time through BCB after transferred into DC power. At the same time, it can supply power for inverter which can transfer this DC power into pure AC power which cannot be interfered by main power. When main power is disconnected, the battery will supply back-by power to the load through inverter. When inverter is in fault or overloaded for exceeding time, it also can supply power for the load by input load switch SBCB and static bypass SB by outer AC bypass. In addition, if it needs to maintain or repair the UPS, the UPS can supply power for the load by inner manual control maintenance bypass load switch MBCB. When UPS is running normally, all switches shall be closed except maintenance bypass switch.

Note: BCB switch and battery are external equipments.

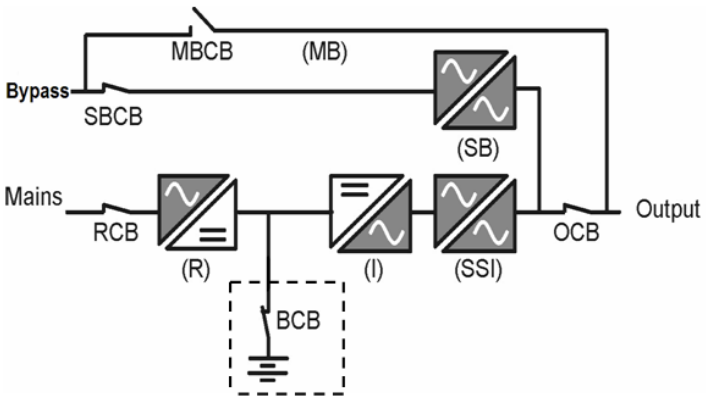


Figure 1: Schematic Diagram of Stand-along System

2.1.1 Separated bypass input

Figure 1 shows schematic diagram of UPS stand-alone system with “separated bypass power” (i.e. bypass uses input independent of main power). When allocating the separated bypass, static bypass and maintenance bypass share an independent bypass power which is connected with specialized bypass power by an independent power switch. If there is no independent bypass power, it shall connect the bypass with terminal of rectifier input power.

2.1.2 Rectifier

Rectifier of this series UPS uses IGBT three phases rectifier bridge with full digital control, and it can transfer the voltage of three phases of main power to continuous DC voltage. Design power is inverter with full load and supplies maximum charging current for battery.

Rectifier has the function of power factor calibration, which can reduce the harmonic distortion of main power to 5% and less. It can ensure that, no matter how is the load, the rectifier cannot cause voltage distortion of main power and can avoid overheat of cable caused by over-current of harmonic wave.

2.1.3 Inverter

Inverter of this series UPS uses matured three-phase half-bridge IGBG inverter technology which can transfer the current or continuous voltage from rectifier into alternating voltage with stable scope and frequency.

Inverter uses full digital control circuit and 16 bits microprocessor. Because of its superior processing capability, output sine wave produced by it is very good, which only cause minimum distortion even under condition of extremely high peak current for load.

2.1.4 Battery and charger

Battery pack is installed in external battery cabinet. Charging and discharging control of battery is fully integrated in main control panel. According to DIN41773 standard, after partial discharge or full discharge every time, the battery needs to be charged, and it shall float charge it after charging fully to compensate self discharge loss of the battery.

2.1.5 Static change-over switch

"Static switch" shown in figure 1 takes controllable silicon as converter to convert the load between power supply of inverter and power supply of main power. Under normal operation, inverter output and static bypass power must be synchronous fully, and then it can realize the uninterrupted conversion between inverter and static bypass power. Synchronization between inverter output and static bypass power supply is realized by controlling circuit through inverter. When static bypass power frequency is within allowed synchronization range, inverter control circuit always let the inverter output frequency trances static bypass power frequency

In addition, UPS also supplies manual control maintenance bypass. If it needs to close the UPS to take daily maintenance and repairing, UPS can supply power for major load by maintenance bypass.

2.1.6 Redundancy control power panel

UPS is equipped with two same control power panels with mutual stand-by. Both these two control panels can get input power from AC or DC power supply. If there is some fault for one power or one control power panel, UPS system still can operate normally. This function supplies higher reliability for the system.

2.2 Working mode

Full series UPS are online double-conversion UPS system, and its working modes are:

- Main power supply mode
- Battery mode
- Bypass mode
- Maintenance mode (manual bypass)
- Economic (ECO) mode
- Parallel redundancy mode

2.2.1 Main power supply mode

Supply AC power for rectifier of UP by main power, then supply DC power for inverter by rectifier, and then supply uninterrupted AC power for the load by

inverter. At the same time, the rectifier can supply even charging current and float charging voltage for battery.

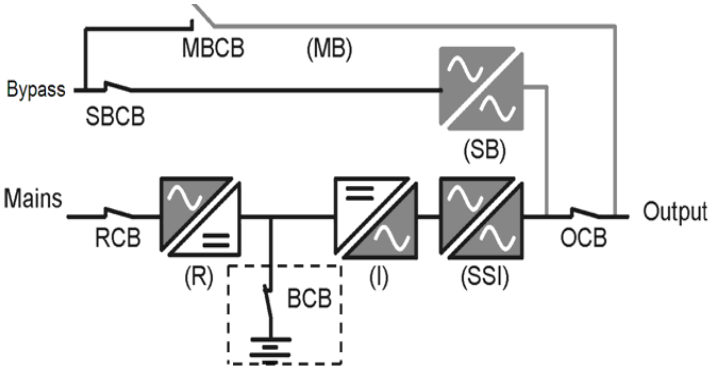


Figure 2: Main Power Supply Mode

2.2.2 Battery mode

The working mode that battery supplies back-by power supply for the load through inverter is called battery mode. When main power fault occurs, the system will convert to battery mode automatically and the battery supplies power continuously which shall be lasted to set back-by time. Power of load is supplied by inverter output through static switch and the power of load is uninterrupted. When main power recoveries, the system will switch to main power supply mode automatically without any manual operation and power supply for load is not interrupted. If the back-by time of battery is overdue but the main power still is not recovered, the system will switch to bypass mode automatically and uninterruptedly.

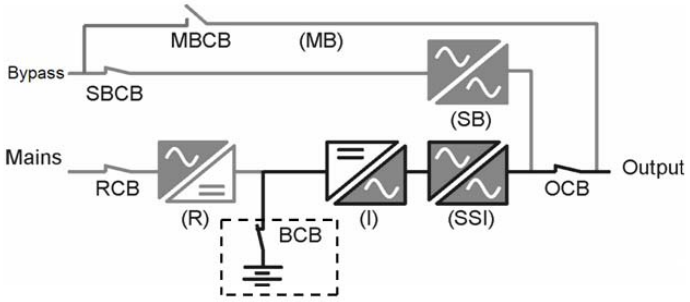


Figure 3: Battery Mode

2.2.3 Bypass Mode

Under inverter supply mode, if there is some fault for inverter or overload time of inverter is overdue or it needs to switch to manual bypass, the static switch will convert the load from inverter supply to static bypass power supply and the power

supply of load is not interrupted. If the inverter and bypass is not synchronous at that time, UPS will close the inverter static switch firstly, and then open the bypass static switch, and the power supply of load is not interrupted.

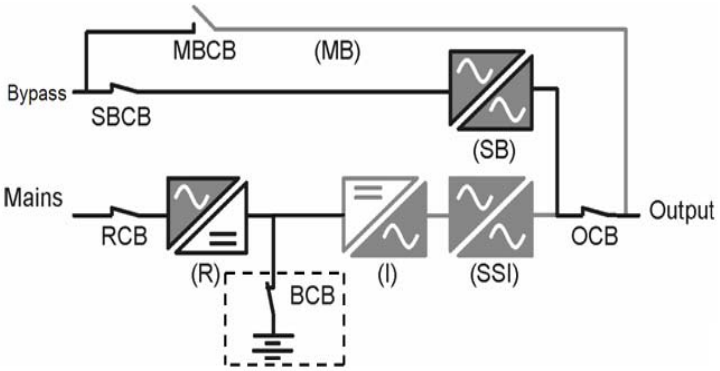


Figure 4: Bypass Mode

2.2.4 Maintenance mode (manual bypass)

If it needs to take daily maintenance or repairing for UPS, it can switch to maintenance mode by maintenance bypass switch and the power supply of load is not interrupted. Maintenance bypass switch locates inside of the UPS stand-alone, and its capacity can meet the requirement for stand-alone total load capacity.

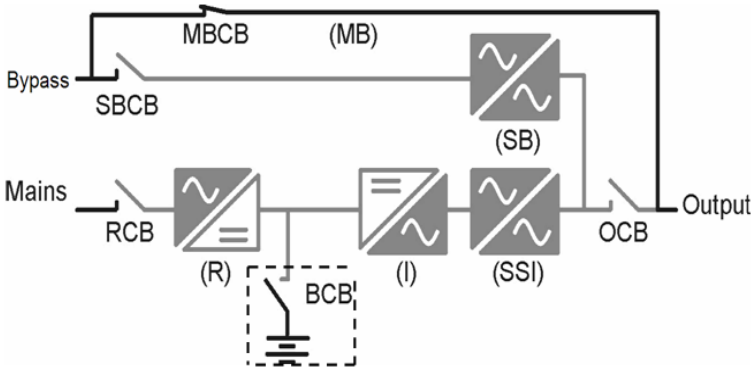


Figure 5: Maintenance Bypass Mode

2.2.5 Parallel redundancy mode (system expansion)

In order to improve the system capacity or reliability or not only improve the system capacity but also improve the system reliability, it can set several stand-alone UPS to be direct parallel, and parallel control logic in all UPS stand-alone can ensure the load can be taken evenly by all stand-alones automatically. Parallel system can be composed by three machines parallelly.

2.2.6 Economic (ECO) mode (only applicable for stand-alone system)

If the economic mode is selected, under most conditions, the power supply of load is supplied by bypass and double conversion UPS is in standby condition to achieve the purpose of energy-saving. When bypass power is within the working scope of ECO, power supply of the load is supplied by bypass; and if when it is out of the working scope of ECO, the system will switch to inverter output. However, it may occur disconnection of power supply of the load, minimum disconnection time is 5ms, and maximum disconnection time is 10ms.

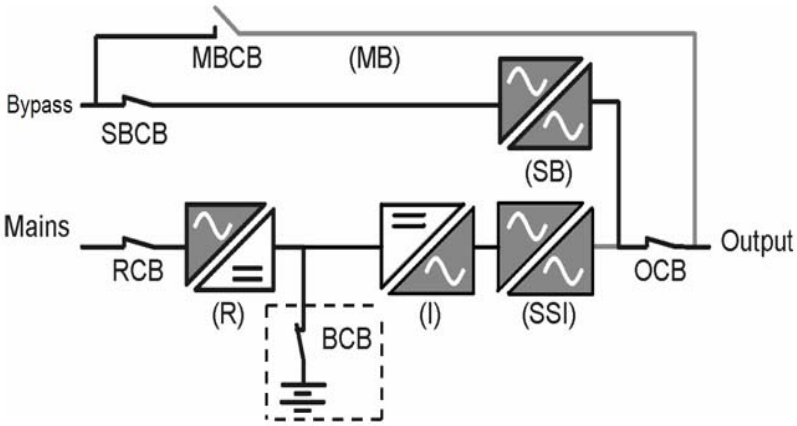


Figure 6: ECO Mode

2.3 Characteristics of products

2.3.1 Performance characteristics

- Three-inlet and three-outlet, support 380/400/415V, 50/60Hz grid system;
- Pure online double conversion type, provide optimal power quality;
- Strong capacity to take mixed load, have high overload capacity;
- Battery is connected with bus directly, output impact resistance is good;
- Unique ventilation design, overall structure is compact, and the volume is small;
- Output isolation transformer uses DZn winding, strong capacity to take unbalance load;
- Full isolation of input and output, no risk of DC serial-in for the load, safety is high;
- DSP full digital control, realize full digital of IGBG rectification and inverter converter;

- Newest IGBT rectification technology, input power factor is as high as 0.99, low harmonic current, environmental protection, effective and energy-saving;
- Function of self diagnosis, rich and complete fault protection function, inquired historical record can be more than 10,000;
- Full front maintenance, reliable wall-rely equipment installation, save room of the machine room;
- Modular design, convenient and fast site maintenance;
- Overlong mean time between failure (MTBF) (＞200,000h);
- Short mean time to repair (MTTR) (＜0.5 h);
- Huge LCD interface display, friend man-machine interface;
- Support two lining ways, lower wiring and side wiring;
- Option: Option: battery cold start, SNMP card, battery undervoltage release, synchronous controller, lightning protection device, power distribution cabinet (optional range: 160~300 KVA) and bypass maintenance switch cabinet (optional range: 400~600 KVA)

2.3.2 Performance parameter of product

Table 1: Performance parameters

The rated capacity (KVA)		160	200	250	300	400	500	600
Input of main circuit	Rated input voltage	Wire voltage 380V						
	Input mode	3Φ+PE						
	Power factor	>0.99						
	Range of voltage	Range for working: ±20%; range for starting-up: ±15%						
	Range of frequency	(50/60)±5Hz						
Bypass input	Rated input voltage	Phase voltage 220V						
	Range of voltage	±20%						
	Input mode	3Φ+N+PE						
	Range of frequency	(50/60)±5Hz						
ECO input	Rated input voltage	Phase voltage 220V						
	Range of voltage	± 10%						
	Range of frequency	(50/60)±2Hz						
Output	Rated output voltage	220V						
	Power factor	0.9						
	Frequency tracking range	(50/60)±3Hz						
	Normal switching time	Main power ←→battery: 0ms Bypass ←→inversion: 0ms						
	Overload capacity of inverter	102%< load ≤110%, switch to bypass to output 5 minutes later; 110%< load ≤ 125%, switch to bypass to output 1 minute later; 125%< load ≤ 150%, switch to bypass to output 30 seconds later; 150%< load ≤ 200%, switch to bypass to output 200 milliseconds later; 200%< load, inverter shuts down (turn off) 100ms later and switch to bypass to output;						

	Overload capacity of bypass		Load current ≤ 150% of rated current, overload can last for a long time; 150%< load current ≤200%, shut down 1 minute later; 200% of rated current < load current, shut down 100ms later;					
	Break period of ECO output		Under ECO mode, the longest break period of output is 10ms when the bypass goes wrong					
	Display		LCD+LED					
	EMI		IEC62040-2					
	EMS		IEC61000-4-2(ESD) IEC61000-4-3(RS) IEC6100-4-4(EFT) IEC6100-4-5(Surge)					
	Insulation resistance		>2MΩ(500VDC)					
	Insulating strength		2820Vdc, leak current is less than 1mA, without electric arcing for 1min					
	Surge protection		Meet the requirement of installation position of IV-class specified by IEC60664-1, which means that the ability to withstand hybrid wave of 1.2/50us+8/20us is not less than 6KV/3KA					
	Number of batteries		50 batteries of 12V					
	Mode of connection		Lower wiring and side wiring (upper wiring for power distribution cabinet)					
	Dimension: W×D×H (mm)		800×860×1700	1210×860×1950			2380×860×1950	
	Gross weight (kg)	Without battery	810	1200	1420	1420	2200	2480	2800
	Net weight (kg)		790	1135	1355	1355	2090	2300	2690
	Color		Black					
	Level of protection (IEC60529)		IP20					

2.3.3 Perfect fault protection and alarm

1. Fault protection

UPS will give sound and light alarm if any fault, and it can inquire the type and time of faults in menu of historical record.

Table 2: Fault Protection

Fault protection item	**UPS Motion Method**
Fault of low output voltage in phase R	Close rectifier, inverter, and inverter static switch, convert the output to bypass; after troubleshooting, press button “FAULT CLEAR” impanel to exit the UPS from fault mode, recover the normal working status, and the load will not power down again.
Fault of high output voltage in phase R	
Fault of low output voltage in phase S	
Fault of high output voltage in phase S	
Fault of low output voltage in phase T	
Fault of high output voltage in phase T	
Fault of high voltage of bus	
Fault of low voltage of bus	
Fault of over-temperature of radiator	
Fault of input SCR	
Fault of rectifier	
Fault of unbalance voltage of bus	
Fault of short circuit of bus	
Fault of insurance	
Fault of over-temperature of inverter	
Fault of inverter IGBT over-current	
Fault of rectification IGBT over-current	
Fault of inverter soft start	
Fault of inverter SCR	
Fault of charging	
Fault of bypass SCR	Power off (ECO mode, output to inverter)
Fault of bypass overload delay	Power off
Fault of output short circuit	Power off
Fault of main power	Forbid to start the rectifier
Fault of bypass power supply	Forbid to switch

2. Alarm information

UPS will give alarm information to remind the user in case of following cases listed in the table besides giving alarm information in case of fault.

Output overload	Effective of maintenance bypass	Pressing of EPO button	Open circuit of bypass
Failure of phase lock	Effective of manual bypass	Disconnection of battery	Disconnection of fan

2.3.4 Comprehensive monitoring

Monitoring content of this series UPS is very comprehensive, and it can take operational control for UPS, inquire all parameters of UPS, UPS and battery status, and event and alarm information by operation display panel.

(1) Liquid crystal display

Figure 7: Liquid Crystal Panel

- General information of UPS
- Name of UPS
- Model of UPS
- Current time and date
- Parallel system and No. of UPS

- Alarm information of UPS
- Real-time data

All parameters listed below shall be displayed in liquid crystal screen. All displayed electric quantity shall be updated once 500ms. Difference between displayed value and actual value is less than 2%.

- Input of main circuit

Line voltage of main circuit inputs of three phases

Current of main circuit inputs of three phases

Frequency of main circuit inputs of three phases

Three phases input power factor

- Bypass input

Phase voltage of bypass inputs of three phases

Bypass input frequency

- Output of UPS

Phase voltage of three phases output

Output currents of three phases

Power factors of three phases

Output frequencies of three phases

- Load information

Load percent of three phases

Active power, apparent power, and reactive power of output for three phases

Load power factor

- Battery

Battery voltage

Battery current

- Parallel load

Total apparent power of three phases

Total active power of three phases

Total reactive power of three phases

- Records of historical events

It needs to update the records of historical events at once if ay fault.

It can record 10,000 historical events at most.

- Menu language

Support two languages: Chinese and English

- Settable information

Date format

Date and time

Mailing address

Communication mode

Com1 baud rate

Com2 baud rate

Com3 baud rate

Contact phone

(2) LED display

Power flow of the system is displayed by 5 bicolor LED.

- Rectifier
- Battery
- Bypass
- Inverter
- Load

When LED is green, it means that related circuit is in normal working condition. When it is red, it means that related circuit is in abnormal working condition. When LED is off, it means related circuit is closed. When LED is flashing, it means that related circuit is in starting condition or ready mode. Red LED is used for fault alarm.

(3) Button

There are 9 buttons in the panel, including 4 menu buttons (F1, F2, F3 and F4), button of power on (ON), button of power off (OFF), emergent power off (EPO), button of mute off (SILENCE ON/OFF), button of fault clear (FAULT CLEAR).

4 menu buttons can be used to select the menu screens displayed by LED.

Button of ON/OFF is used to turn on or turn off the system.

Button of EPO is used to turn on the machine under emergent condition. After pressing EPO, the system can exit the emergent power off status only when UPS powers down.

Button of fault clear is used to clear the fault lock status.

Button of mute off is used to turn off the alarm sound of buzzer.

2.3.5 Modular design and overall frontage maintenance

It considers operability of site maintenance for structure design, it uses advanced front maintenance design concept, realize modular design by functions for internal of UPS, and it is convenient for installation and maintenance.

(1) 160 KVA model

DC bus module, output AC capacitor module, static switch module, and rectifier and inverter module

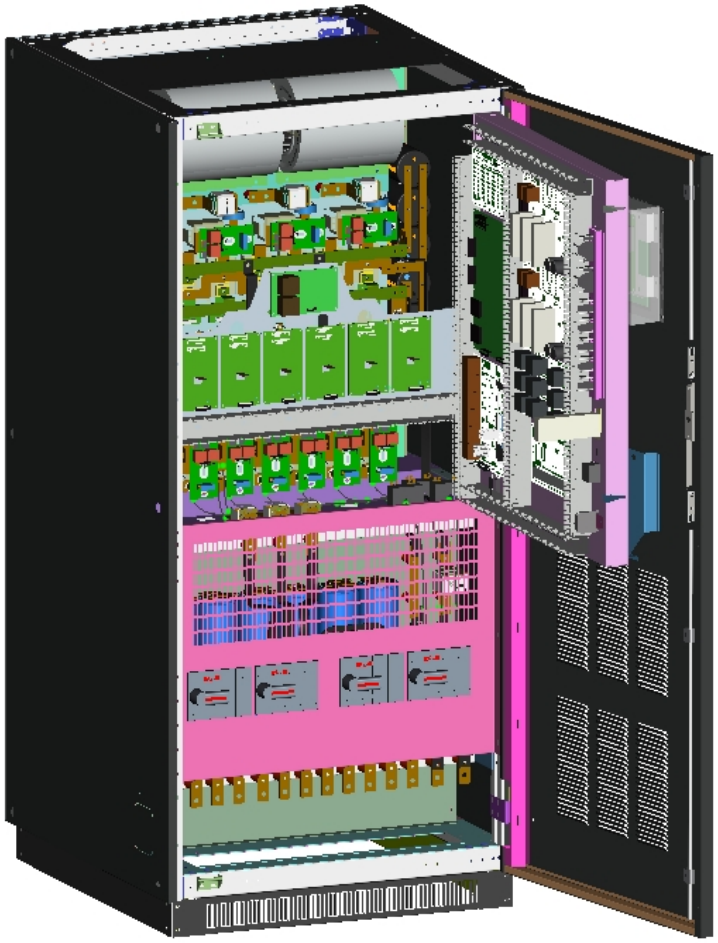


Figure 8: 160 KVA model

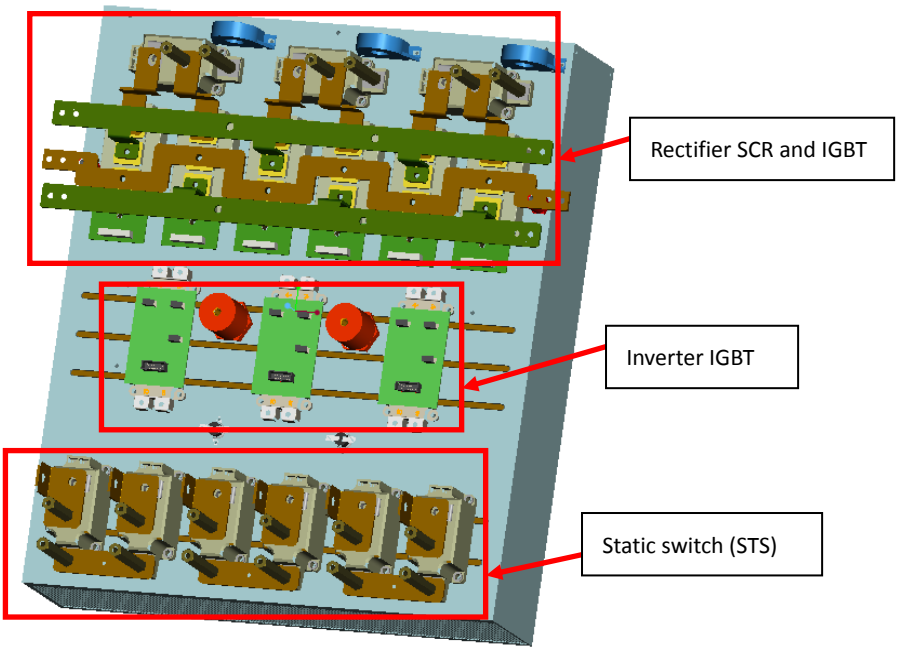


Figure 9: 160 KVA rectifier, inverter and STS module

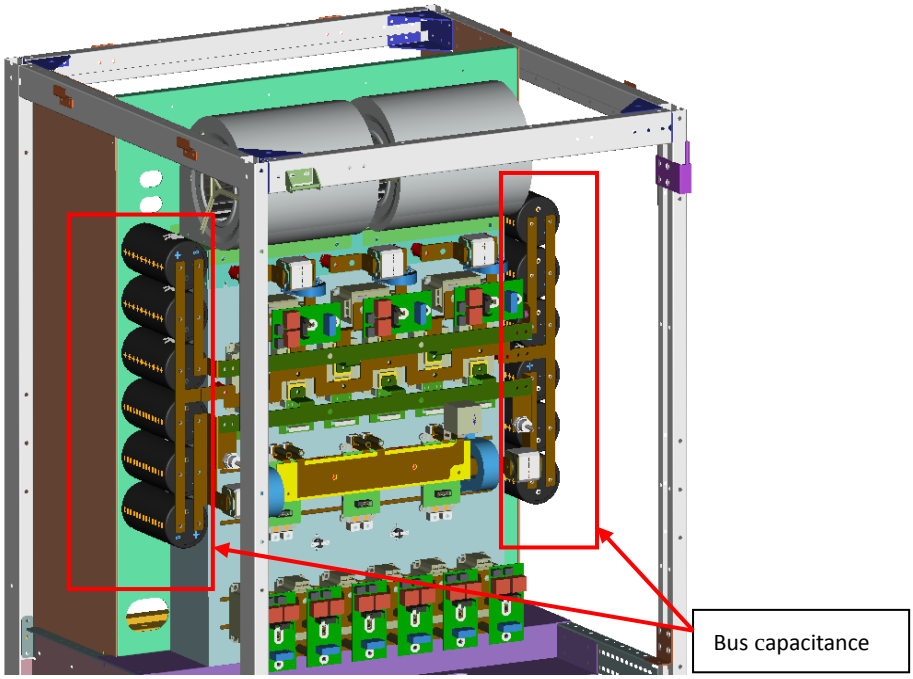


Figure 10: Bus capacitance

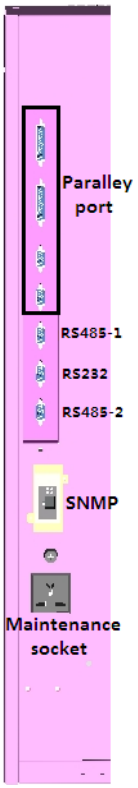


Figure 11: 160 KVA communication interface module

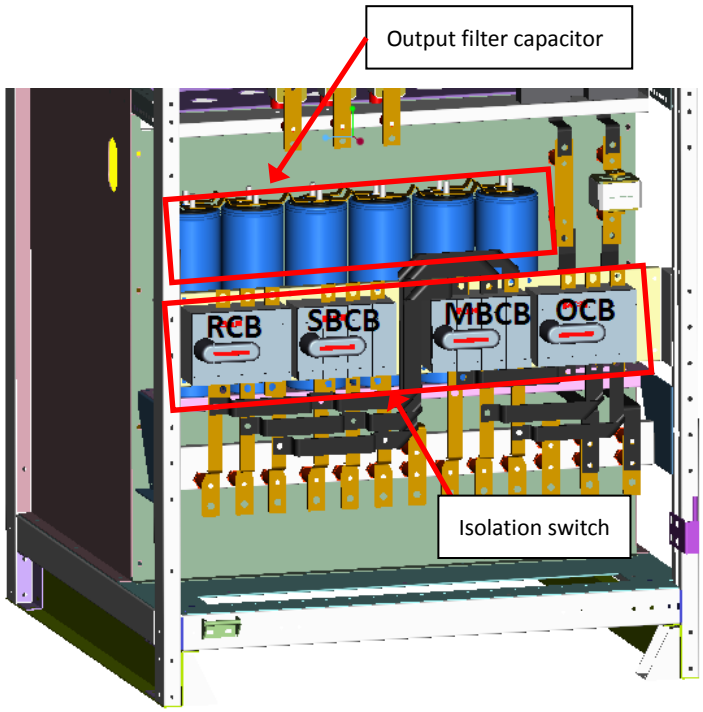


Figure 12: 160 KVA output filter capacitor and disconnecting switch

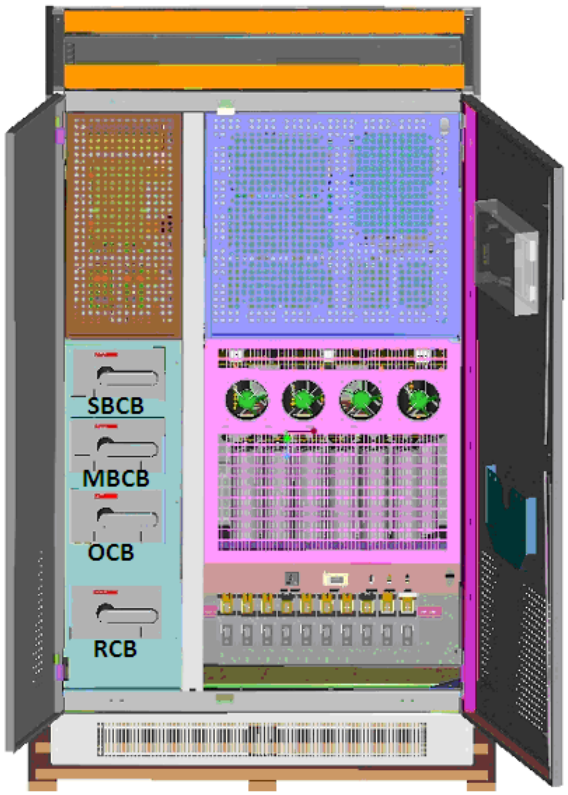


Figure 13: physical model of interior door of 200~300 KVA

Figure 14: 200~300 KVA communication port module

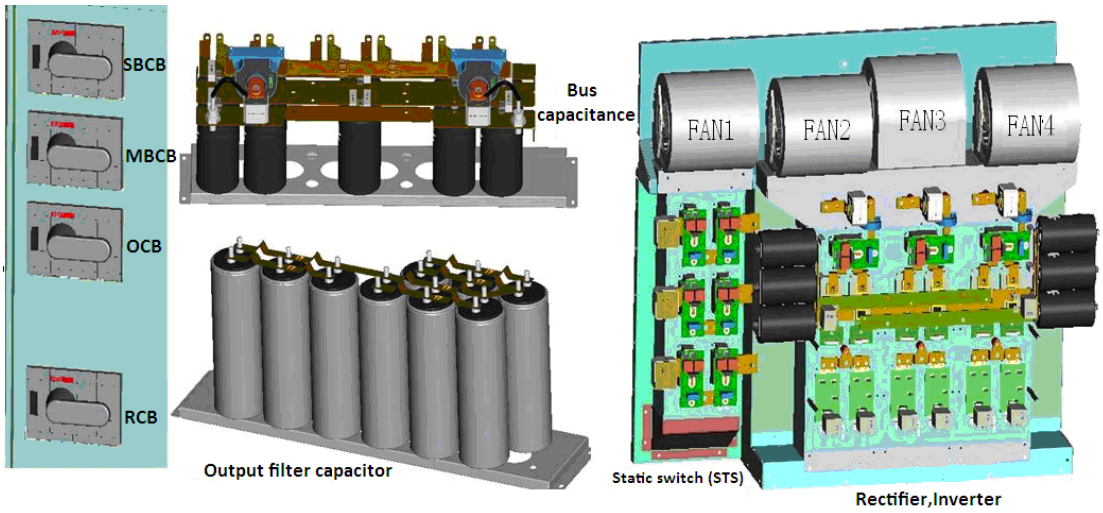


Figure 15: 200~300 KVA internal module design

(3) 400~600 KVA physical model

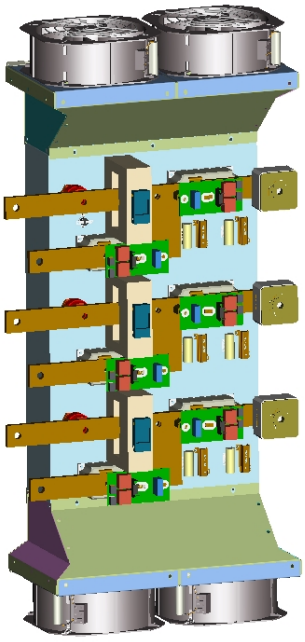


Figure 16: 400 KVA static switch module

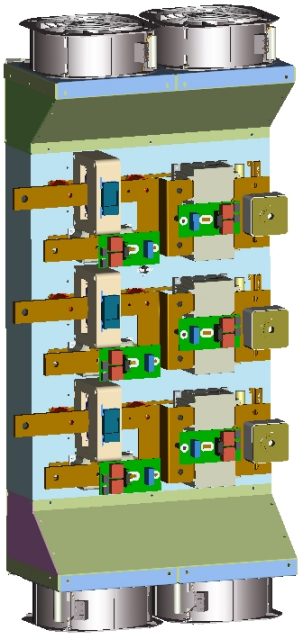


Figure 17: 500~600 KVA static switch module

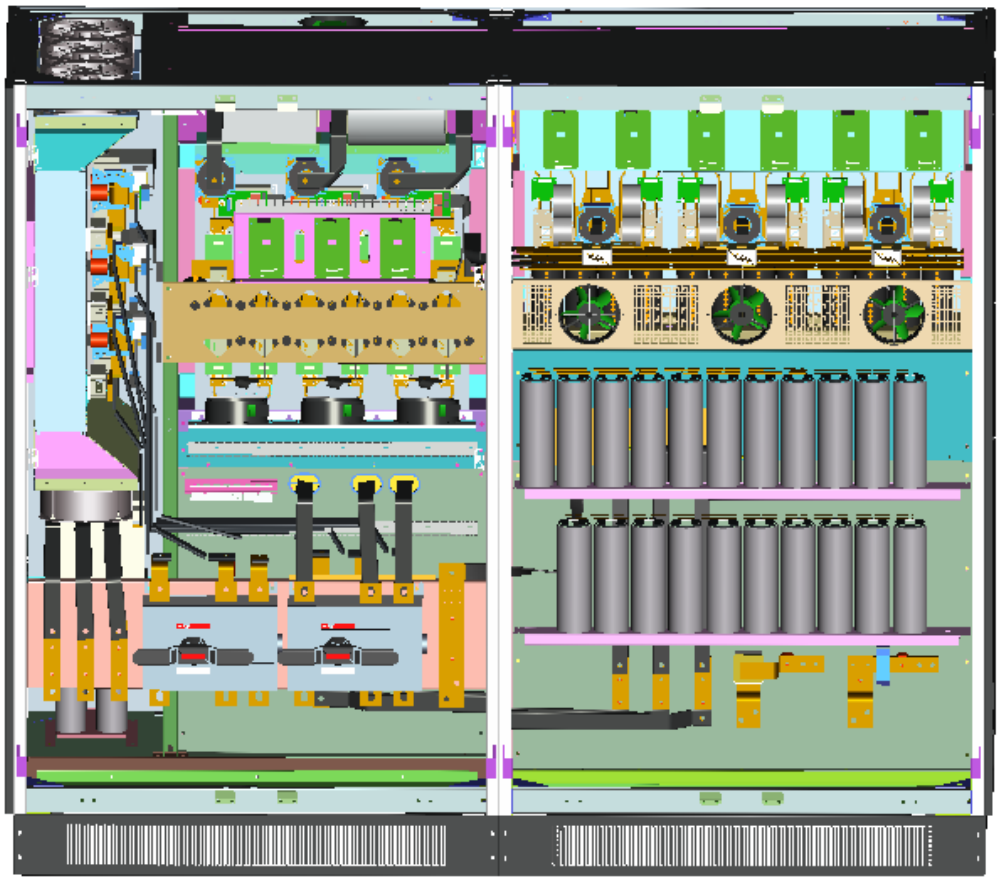


Figure 18: 400~600 KVA UPS model

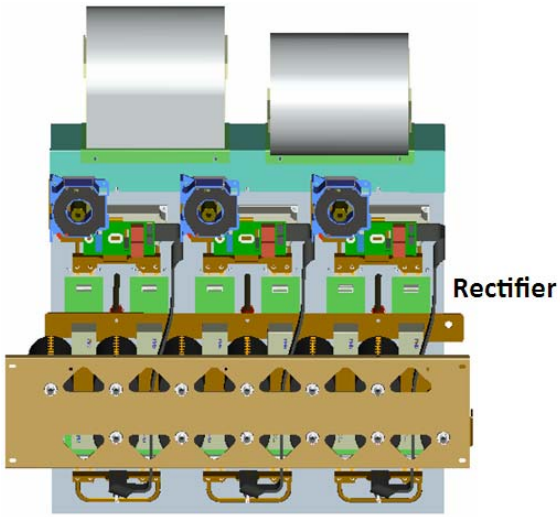


Figure 19: 400~600 KVA rectifier module

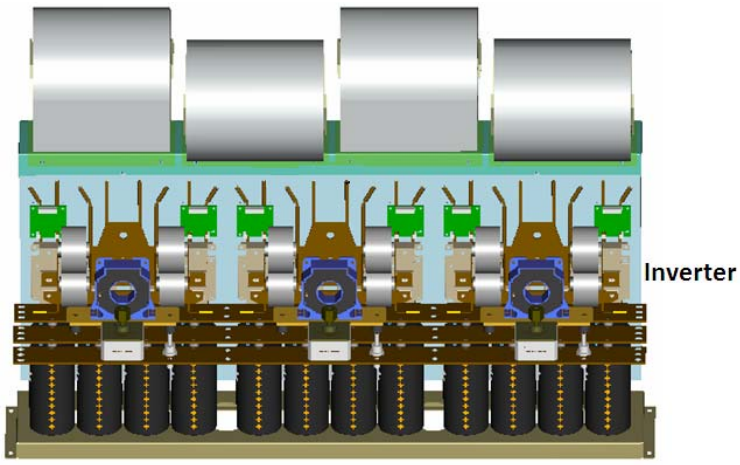


Figure 20: 400~600 KVA inverter module

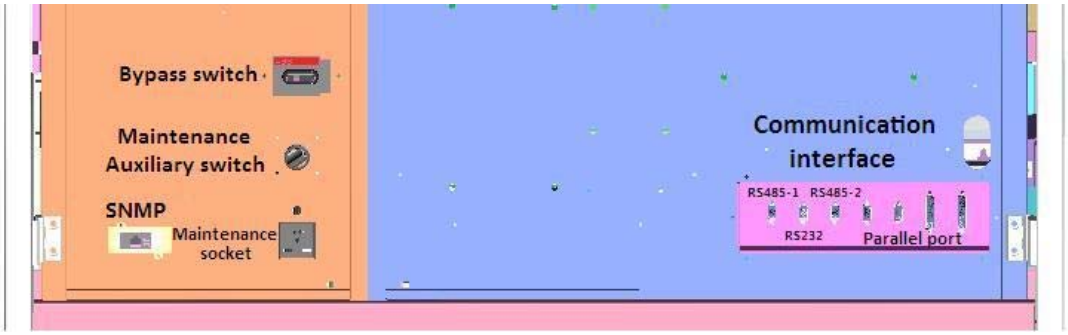


Figure 21: 400~600 KVA auxiliary switch and communication port

2.3.6 Option

(1) Battery cold boot option.

The machine can boot by using battery directly without input of AC.

(2) SNMP card

Remote management of UPS through network can be realized.

(3) Undervoltage release of battery （ABB Tmax）

Cut the circuit of battery off when the machine goes wrong or does not work to avoid the irreparable damage to battery caused by deep discharge of battery. Battery switch is only allowed to close after inverter is working normally if it contains undervoltage release, otherwise, battery switch will be damaged if it is forced to close.

(4) LBS synchronous controller

It can ensure that two independent UPS systems output synchronously, which is most suitable for power distribution system with double bus.

(5) Lightning protection device

It is used to control overvoltage caused by lightning surge in power distribution to protect UPS or rear-end load.

(6) Power distribution cabinet (optional range: 160~300KVA)

Provide upper wiring and cold start option of battery.

(7) Bypass maintenance switch cabinet (optional range: 400~600KVA)

It contains maintenance switch and battery switch and has upper wiring function.

Chapter 3: Installation of UPS System

This chapter introduces the UPS requirements which are necessary for UPS site selection and wiring.

Since every site has its particularity, this chapter will not introduce detailed installation steps, only provides directive general installation steps and methods for qualified installation personals, and it should be carried out by installation personals according to detail condition of the site. ⚠ Note:

For electric connection, earth wire of UPS should be well connected; and ensure that all switches should be disconnected before finishing UPS installation.

Installation of UPS should be taken by qualified engineer according to description in this chapter and local standards. For other equipments not mentioned in this manual, their detailed mechanical and electric installation materials should be attached when delivery.

Installation of battery should be very careful. Voltage in battery terminal will be more than 600Vdc when the battery is connected, which has fatal danger。 Please wear eye shield to avoid eye injury caused by accidental electric arc. Take off ring, watch and other metal objects. Use tool with insulated handle. Wear rubber gloves. If the electrolyte leaks or battery is damaged, this battery is must be replaced. Put it into container which can resist corrosion of sulfuric acid, and take disablement process according to local stipulations. Rinse the skin immediately if it touches the electrolyte.

3.1 Position selecting

3.1.1 UPS room

Pay attention to the following requirements when you choose UPS room:

UPS must be installed in a clean and dry room with flat floor (relative humidity: 5%~90%). It would be best if there is no dust and UPS is away from contaminant and combustibles.

Suitable room temperature: UPS can operate under 0~40 ℃ indoor environment, but the temperature should be more than 0℃ when starting, and optimal operating temperature is 25℃. User should ensure enough ventilation in the room so that the equipment can take heat dissipation fully; if necessary, indoor exhaust fan should be installed to avoid too high room temperature. Or it can select the accurate air-condition for machine room. This equipment cannot be used outdoors.

Altitude: lower than 1,000m. Please use it by derating if it is higher.

Suitable space and weight capacity are as follows.

Table 4: external dimension of the whole machine 160~600 KVA

Rated capacity (KVA)	160	200	250	300	400	500	600
W – mm	800	1210			2380		
D – mm	860	860			860		
H – mm	1700	1950			1950		

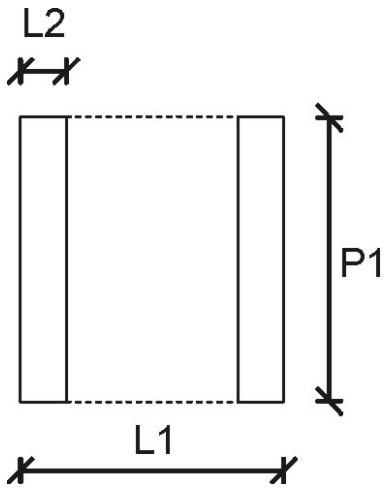


Figure 22: Bottom surface of 160~600 KVA stand-alone cabinet

Table 5: bottom surface dimension of 160~600KVA stand-alone cabinet and weight of the whole machine

Rated capacity (KVA)	**160**	**200**	**250**	**300**	**400**	**500**	**600**
L1 – mm	800	1170			1170		
P1 – mm	860	810			810		
L2 – mm	100	120			120		
Net weight of the whole machine / KG (without battery)	790	1135	1355	1355	2090	2300	2690

160~300KVA UPS is integrated in one cabinet. 400~600KVA UPS is composed of rectifier cabinet and inverter cabinet. Rectifier cabinet and inverter cabinet have the same size and dimension, as shown in Figure 23. Each cabinet must be carried separately and then be spliced together again.

Figure 23: External view of 400~600KVA UPS

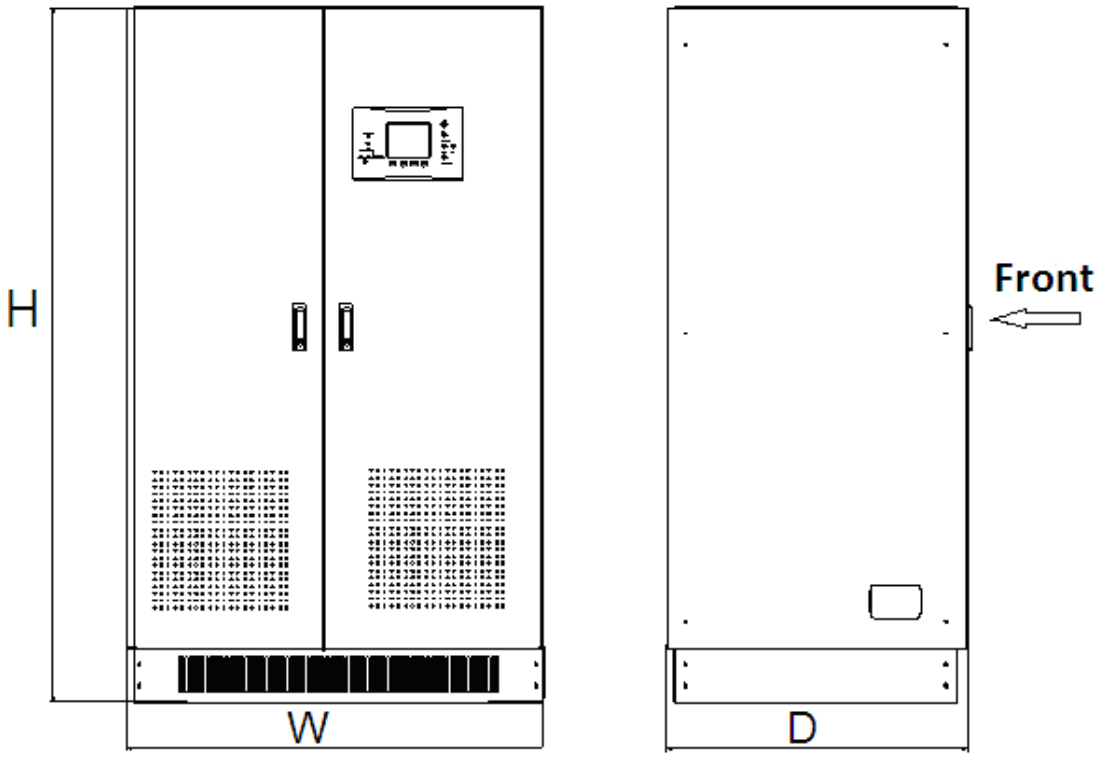


Figure 24: External view of 200~300KVA cabinet

3.1.2 External battery room

Ambient temperature of the battery should be constant, and it is the major factor affecting the capacity and service life of battery. Standard working temperature of battery is 20℃～25℃, it will shorten the service life of battery if it is used in condition that ambient temperature is higher than it, and it will reduce the battery capacity if it is used in condition that ambient temperature is lower than it. In general condition, ambient temperature range of battery is 15℃～25℃. The battery should be far away from heat resource and take reasonable ventilation (EN50091-1 annex N) to avoid forming of mixed gas of hydrogen and oxygen which is explosive. Battery switch should be installed near the battery, and wiring distance from battery to UPS should be as short as possible.

3.1.3 Storage

If it is not installed at once, please put the UPS vertically according to instruction shown in package. It should be stored in dry and shade room together with its package to avoid dust and high temperature.

Cover UPS with packing-case to prevent dust or other impurities from entering UPS, which will influence reliability of UPS, when the room or place where it is stored need to decorate or UPS is not used for a long time.

3.2 Initial inspection and unpacking of UPS

The equipment cabinet will be fixed on the wooden pallet with screw and be protected by packing materials during the transportation.

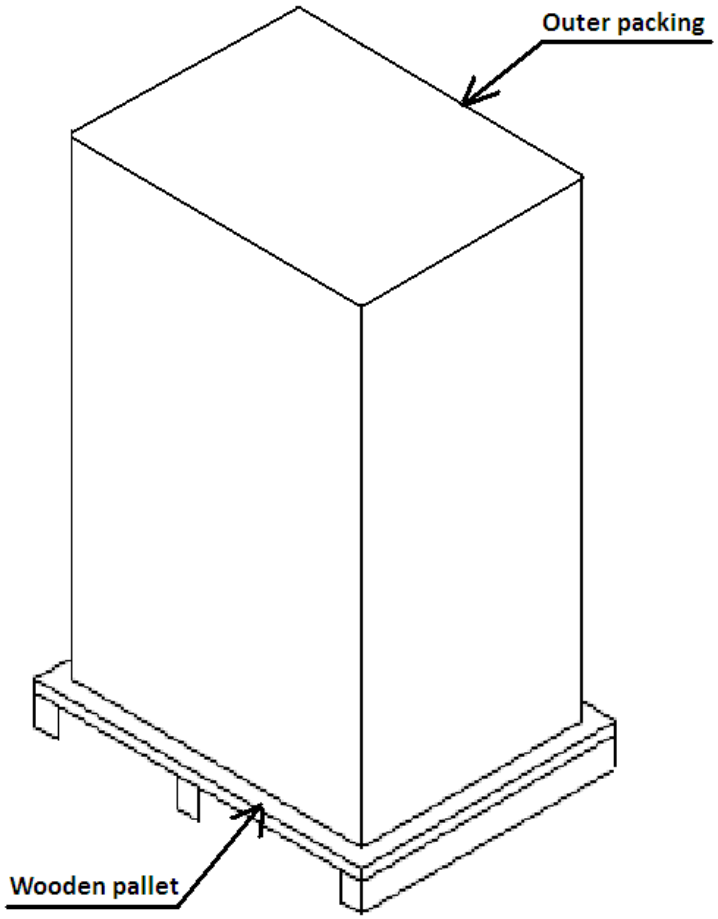


Figure 25: Outer packing and wooden pallet of UPS

Before installing UPS, the following should be carried out:

1. Carefully check the outer packing to confirm that no damage has been caused during the moving. After unpacking the packing-case, take a look at UPS and battery to check if damage has been caused during the

transportation. Please immediately inform the common carrier and contact customer service staff as soon as possible if you find they are damaged;

2. Open the packing-case and remove the protective foam;
3. Check up the technical data list to verify that it is the right equipment. Technical data list of UPS locates at label inside the front door, indicating the mode, capacity and main parameters of UPS;
4. Remove the fixed screw before unloading the equipment cabinet from the wooden pallet. Remove the front and the back shield at the bottom of UPS cabinet, and then you will see the screw that fix the cabinet and the wooden pallet, as shown in Figure 26 and 27;
5. Unload UPS cabinet from the wooden pallet and then move it with forklift to the installation position.

⚠ **Note: because UPS cabinet is heavy, please keep it vertical to the ground during removing or transportation, otherwise casualties and property losses will be caused if the UPS cabinet topples.**

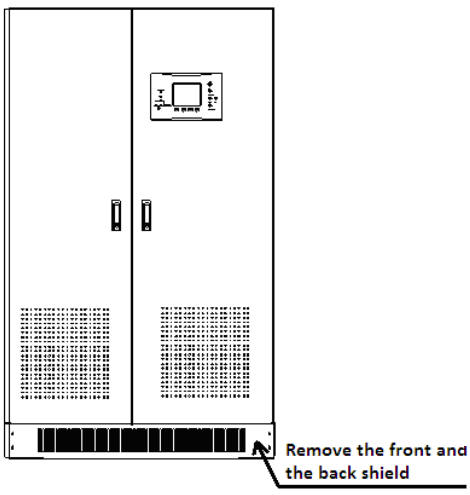


Figure 26: Position schematic diagram of shield

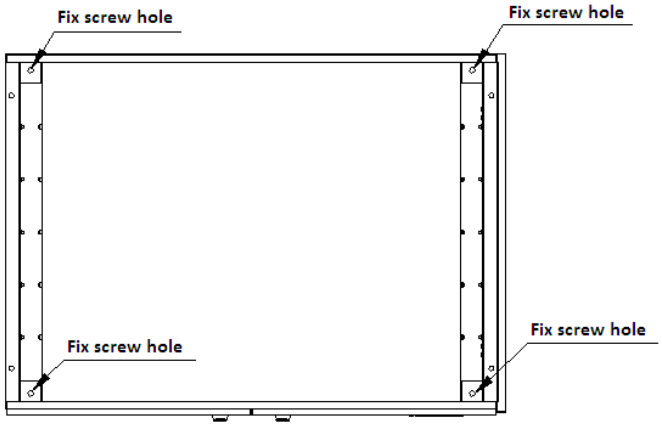


Figure 27: position of fixed bolt hole in 160~600KVA UPS cabinet and pallet

3.3 Positioning and installation

Element arrangement of UPS brings convenience for maintenance, diagnosis and repairing of UPS from front, so it reduces room requirement for side and back. After

opening the front door of UPS, you can see the power terminal, auxiliary terminal, and power operating switch.

Selection of location for UPS should ensure:

- Convenient wiring;
- Enough operating space;
- Good ventilation to meet thermal dissipation requirement;
- No corrosive gas around;
- Away from combustibles;
- No over-wet and high-temperature resource;
- Not environment with much dust;
- Meet fire control requirements;
- Optimal ambient temperature for working: +20℃~+25℃, temperature range for maximum efficiency of battery.

3.3.1 Operating space

There is no air grid in side and back of this series UPS. For 160~300KVA UPS, it has no special space requirement to the side and the back. However, for, 400~600KVA UPS, at least 500mm should be kept behind the cabinet for the convenience of connection of the machines. However, for convenience of daily maintenance, besides meeting local stipulations, it should keep enough space in front of UPS so that human can walk freely after full open of front door of UPS. 700mm should be kept at least between top of UPS and ceiling to ensure unblocking of ventilation in above space of it.

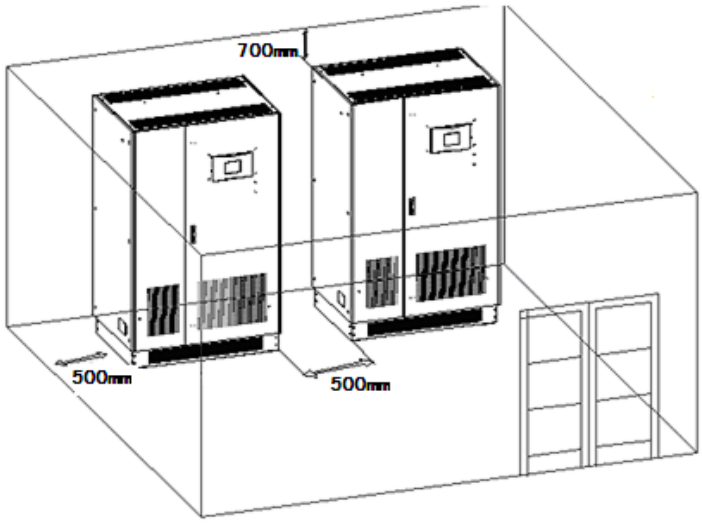


Figure 28: installation space diagram of 160~300KVA UPS (unit: mm)

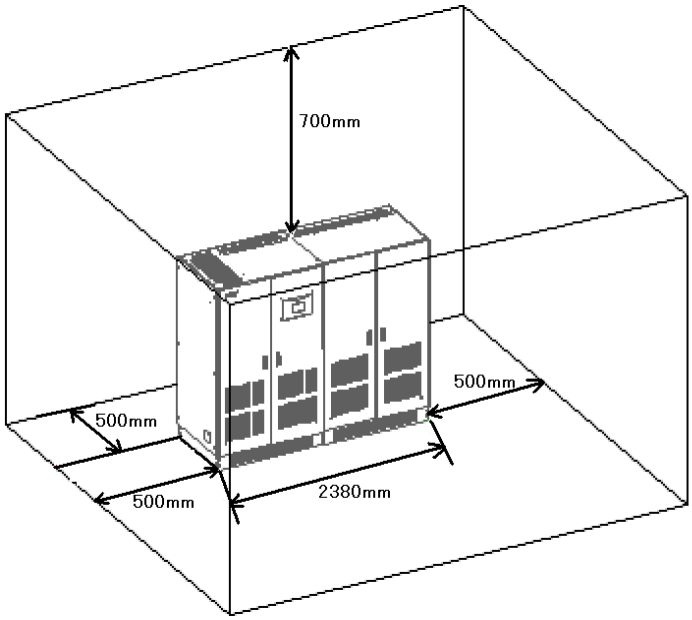


Figure 29: installation space diagram of 400~600KVA UPS (unit: mm)

3.3.2 Handling of cabinet

Lifting equipment used to carry UPS cabinet must have sufficient lifting capacity (See table 5 for the total weight of UPS). The rectifier cabinet and inverter cabinet of 400~600KVA UPS should be carried separately. Before the machine is put in the final location, pallet truck or forklift can be used to lift or carry UPS; only when the front lower baffle is removed, can the forklift be used.

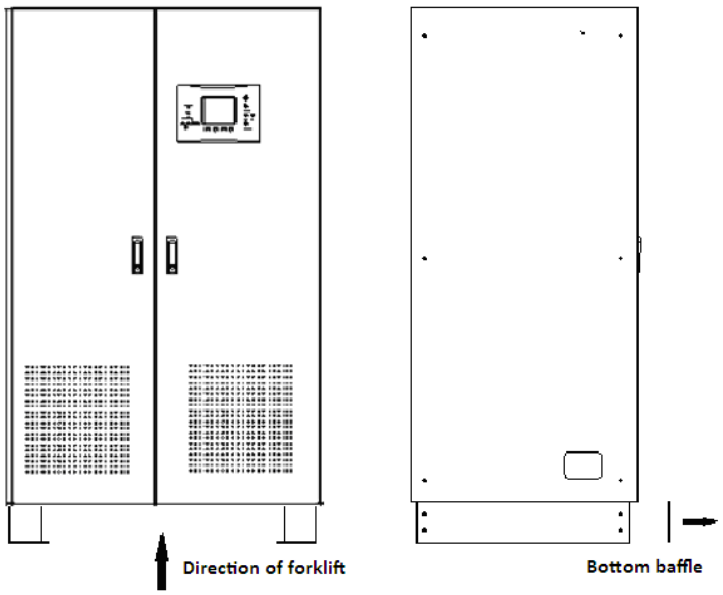


Figure 30: Carrying of 160~600KVA stand-alone cabinet

3.3.3 Parallel installation steps of cabinet

The two cabinets of 400~600KVA UPS can be installed in parallel as follows:

1. Side-by-side placement: place the rectifier cabinet and inverter cabinet side by side as shown in Figure 31. Don't leave any gap between the two cabinets which should be placed in the same level.

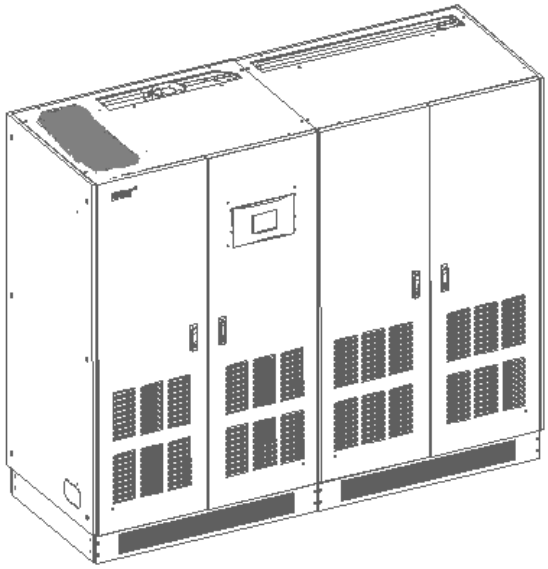


Figure 31: Side-by-side placement of 400~600KVA UPS rectifier cabinet and inverter cabinet

2. Fixed installation: disassembly the back board of cabinets placed side by side. Fix the two cabinets together with screw rod at the "fixing holes for parallel connection of the two cabinets" (as shown in figure 32), and then fit on the back board.

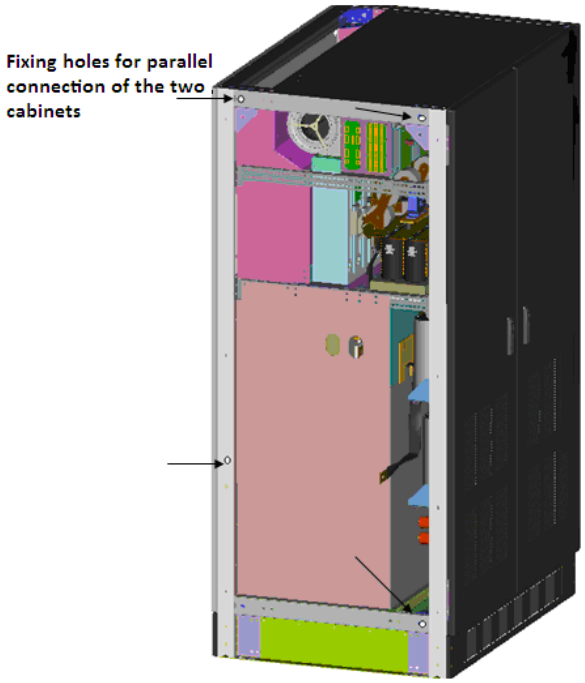


Figure 32: Schematic diagram of fixing holes for parallel connection of 400~600KVA UPS rectifier cabinet and inverter cabinet

3. Bus connection: connect the bus of rectifier cabinet with soft copper bar (as shown in Figure 33) and then correspondingly connect it to the copper bars for the bus of inverter cabinet (as shown in Figure 34).

⚠ **Note: +BUS, N and -BUS must be connected correspondingly.**

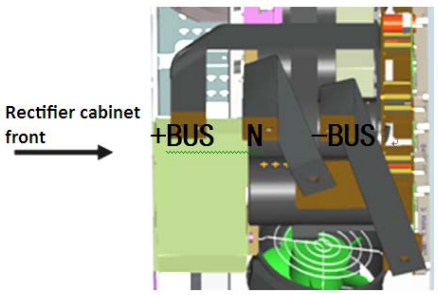


Figure 33: Soft copper bars for the bus of rectifier cabinet

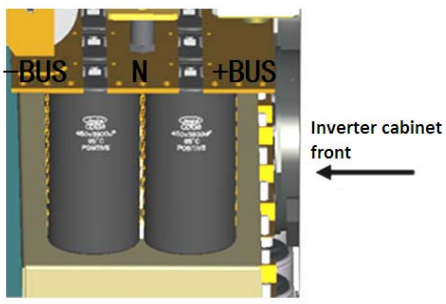


Figure 34: Copper bars for bus of inverter cabinet

4. Inverter connection: connect the "invertion switch terminal" of rectifier cabinet with the "invertion output" terminal of inverter cabinet with the given soft copper bars. In connection, the phase sequence should maintain corresponding connection (for example: "Phase A of invertion switch terminal" should be connected with "phase A of invertion output terminal" correspondingly) and the invertion connection is as shown in Figure 35.

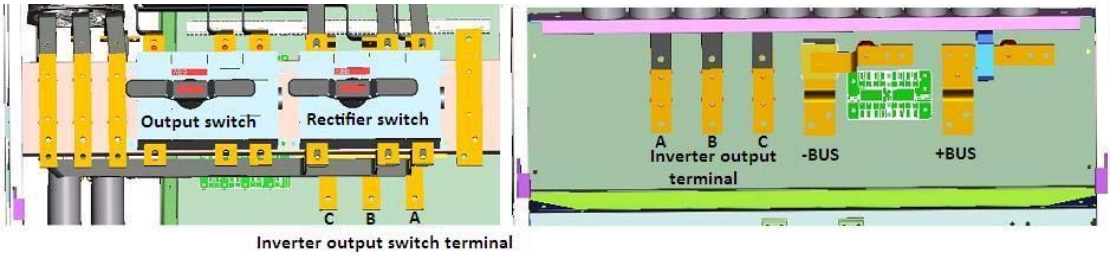


Figure 35: Diagram for inversion connection of 400~600KVA UPS

5. Connection of signal lines: connect a bunch of unconnected signal lines on the top right of rectifier cabinet to the switch board on the top left of inverter cabinet correspondingly (as shown in Figure 36) and the connection between signal line mark and corresponding terminal is as shown in table 6.

Table 6: Corresponding connection of terminals

Switch board 1	Switch board 2
Line J4 is connected to switch board J4	Line J4A is connected to switch board J4A
Line J5 is connected to switch board J5	Line J3B is connected to switch board J3B
Line J8 is connected to switch board J8	Line J2B is connected to switch board J2B
	Line J1B is connected to switch board J1B

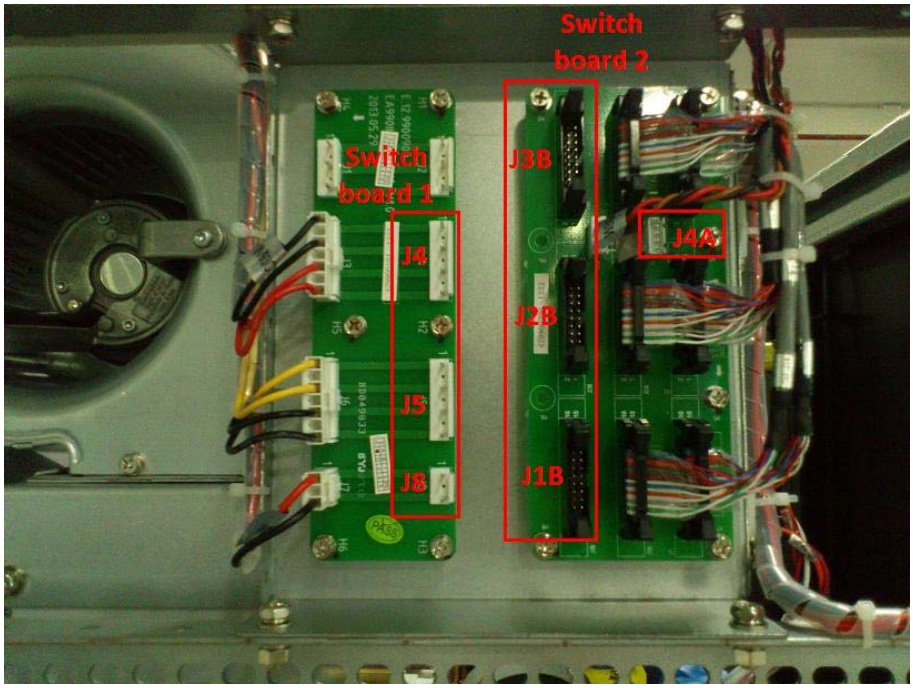


Figure 36: Signal line connection of 400~600KVA UPS

6. Connection of dry contacts: the wiring terminal of dry contacts is located below the interior door of rectifier cabinet. Dry contacts are as shown in Figure 37. Dry contacts "1" and "2" are the wiring terminal for cold start of battery **(note: the terminal carries strong current during the operation of UPS. "1" refers to live wire and "2" refers to neutral wire);** dry contacts "4" and "5" are wiring terminals of auxiliary contacts in maintenance bypass (option).

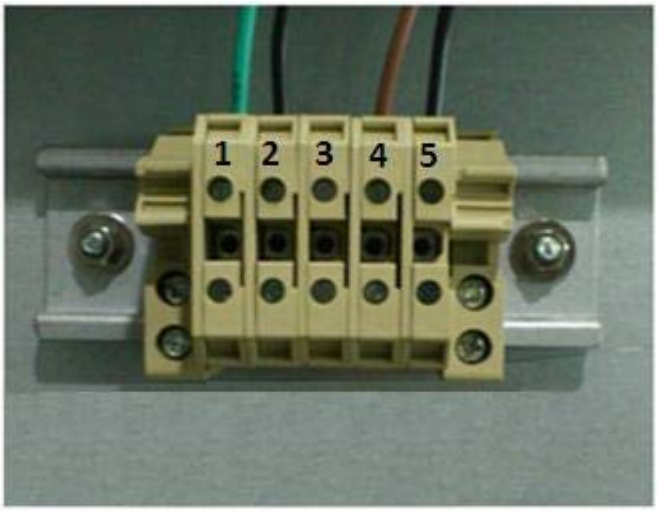


Figure 37: Dry contacts of 400~600KVA UPS

3.3.4 Wiring way

Full series UPS and battery cabinet can use lower wiring and side wiring. When lower wiring is used, the wiring channel can be seen when the front door of UPS is opened and the baffle below the wiring terminal is removed. When side wiring is used, the side wiring channel can be seen when the baffle on the left or right of cabinet is removed.

When upper wiring is required, please select power distribution cabinet (for 200~300KVA UPS) or maintenance bypass switch cabinet (for 400~600KVA UPS)

Figure 38: Diagram for installation of UPS and power distribution cabinet

3.4 Introduction of optional parts

3.4.1 Power distribution cabinet and maintenance bypass switch cabinet

200~300KVA UPS can select power distribution cabinet and 400~600KVA UPS can select maintenance bypass switch cabinet.

Power distribution cabinet and maintenance bypass switch cabinet can realize the upper and lower wiring as shown in Figure 39 and 40.

Copper bars for wiring (the upper terminal is for customer use and the lower terminal is connected with machine), battery switch

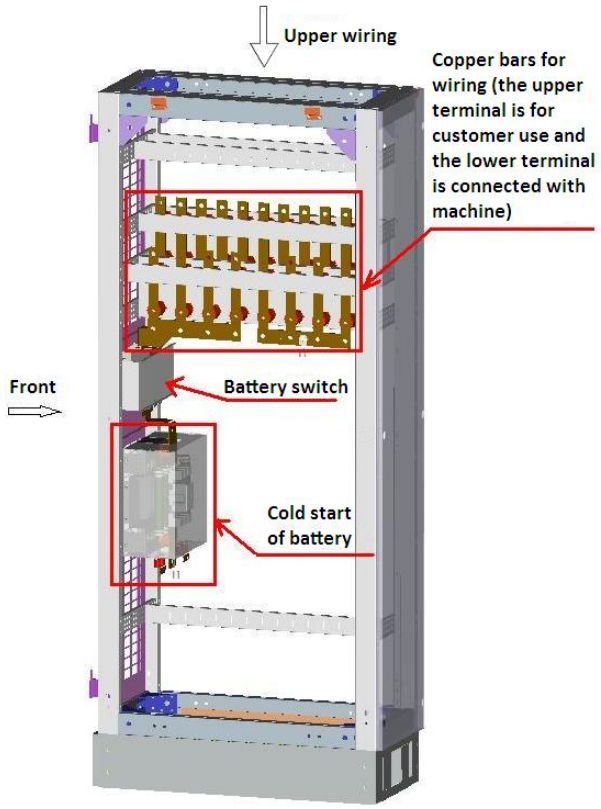


Figure 39: Power distribution cabinet of 200~300KVA UPS

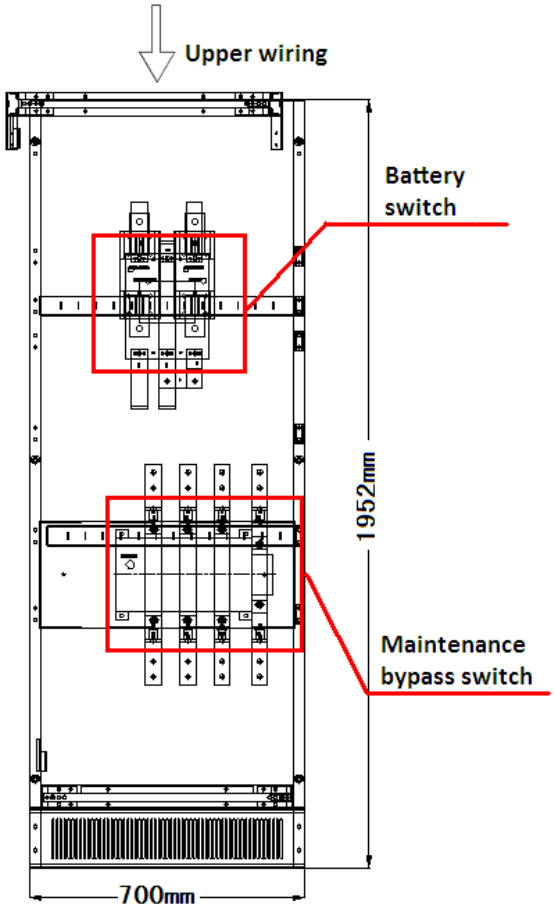


Figure 40: Maintenance bypass switch cabinet of 400~600KVA UPS

3.4.2 Cold start of battery

Cold start of battery can start the machine directly, as shown in Figure 41.

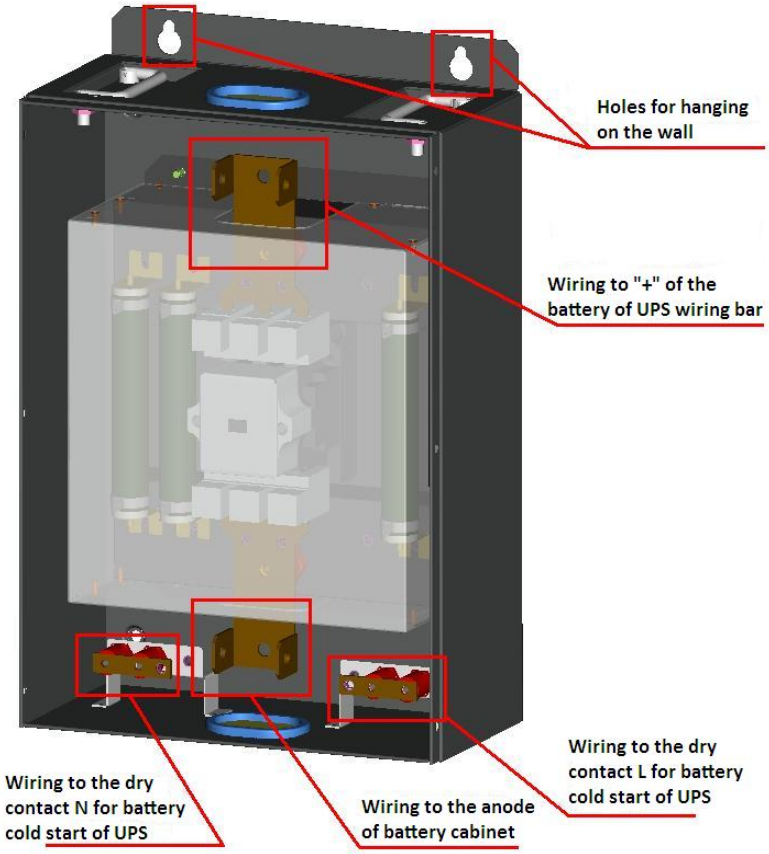


Figure 41: Parts for cold start of battery

⚠ **Note: dry contacts for cold battery start of 200~300KVA UPS is located on the right of UPS power wiring bar, which can be seen when the front door of UPS is opened; the dry contact for the cold battery start of 400~600KVA UPS is located on the bottom right corner of the right interior door of circuit board, which can be seen when the right interior door of UPS is opened.**

3.4.3 Synchronous controller(LBS)

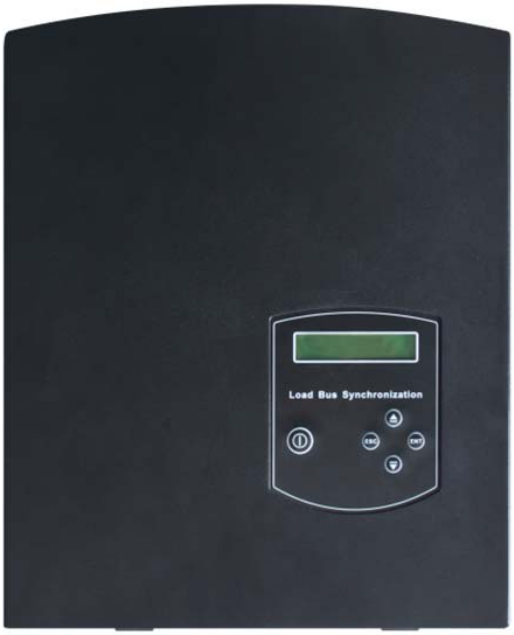


Figure 42: Physical Figure of synchronous controller(LBS)

Dual bus system is composed of two independent UPS systems and each UPS system can be composed of one or more parallel stand-alone UPS. Dual bus system with high reliability is applicable to load with multiple input terminals. For single input load, one optional static transfer switch (STS) can be added for load power supply.

Dual bus system uses LBS cable option to realize the synchronous output of two independent (or parallel) UPS system. One of the systems is master system and the other one is slave system. The operation mode of dual bus system includes the operation of master / slave system in inversion or bypass mode. The wiring diagram between synchronous controller and stand-alone or parallel system is as shown in Figure 43 and 44;

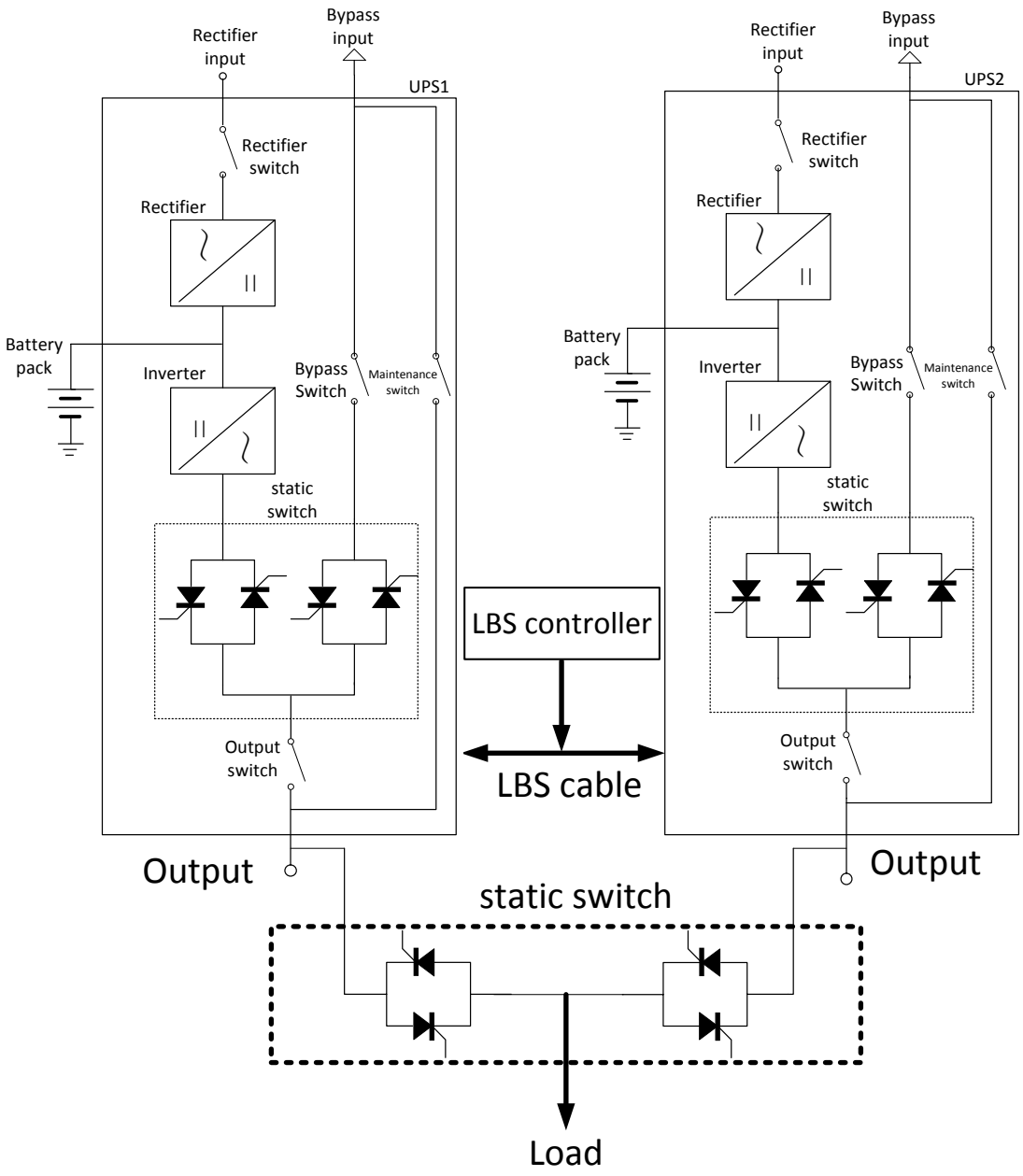


Figure 43: Typical stand-alone dual bus system (STS and LBS cables are used)

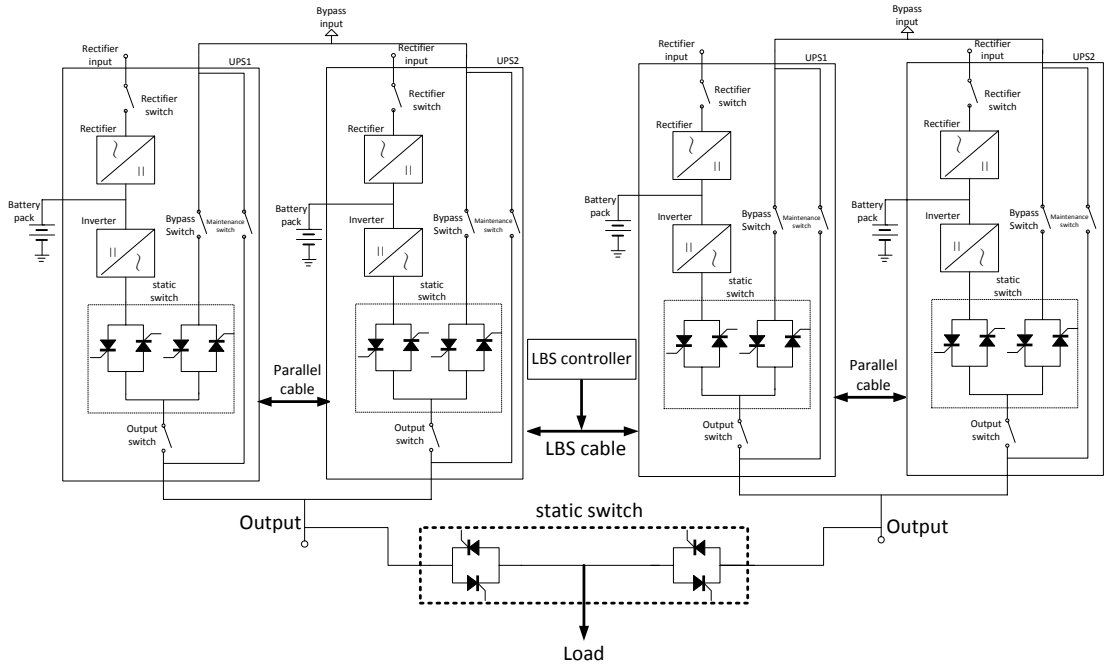


Figure 44: Typical parallel dual bus system (STS and LBS cables are used)

3.5 External protective devices

Breaker or other protective devices must be installed at the external power location of UPS system. This chapter only provides general direction for installation engineer who should know related stipulations on local wiring of equipment to be installed.

Before connecting the rectifier and bypass input with main power, proper over-current protective device must be installed between main power and UPS. According to EN50091-1 and in consideration of leakage current of UPS, leakage protective device with adjustable threshold can be used. While external battery should be equipped with DC compatible breaker to provide over-current protection for UPS and its battery.

⚠ **Note: if leakage protective device is used to supply power for UPS, it may be started wrongly due to the greatly high leakage current caused by FRI filtering.**

3.6 Power cable

In the design of external wiring cable, the requirements on current capacity of power cable and the overload capacity of the system, as well as ambient temperature and physical support media, should be considered. Installation engineer should make selection according to related local standards and actual situation of users. Length of connecting cable should be 2-50m generally. If the cable is too long, low voltage will be caused and corresponding cable section area should be increased.

Table 7: Wiring terminal and wiring method of UPS

Terminal	Rectifier input	Bypass input	Output	Battery (50 pieces)
Wiring method	3Φ+PE	3Φ+N+PE	3Φ+N+PE	Anode + cathode + PE

Table 8: Rated current of UPS

Rated Capacity (KVA)	**Rated Current (A)**						
	Input current in full load and full charging			**Output current of full load (PF=0.9)**			**Discharging current for the lowest battery voltage (495V)**
	R	**S**	**T**	**U**	**V**	**W**	
160	267	267	267	243	243	243	310
200	334	334	334	304	304	304	387
250	418	418	418	380	380	380	484
300	501	501	501	456	456	456	580
400	669	669	669	608	608	608	774
500	836	836	836	760	760	760	967
600	1003	1003	1003	912	912	912	1161

⚠ **Note:**

- Please refer to national or local electrical specification on the connection of external wiring cable.
- In rated battery current, the wiring between battery and UPS shouldn't have a voltage drop greater than 1% of the nominal DC voltage.

3.7 Wiring terminal

Open the front door of UPS, remove the lower protective baffle, then you can see the copper bars connecting the power cable.

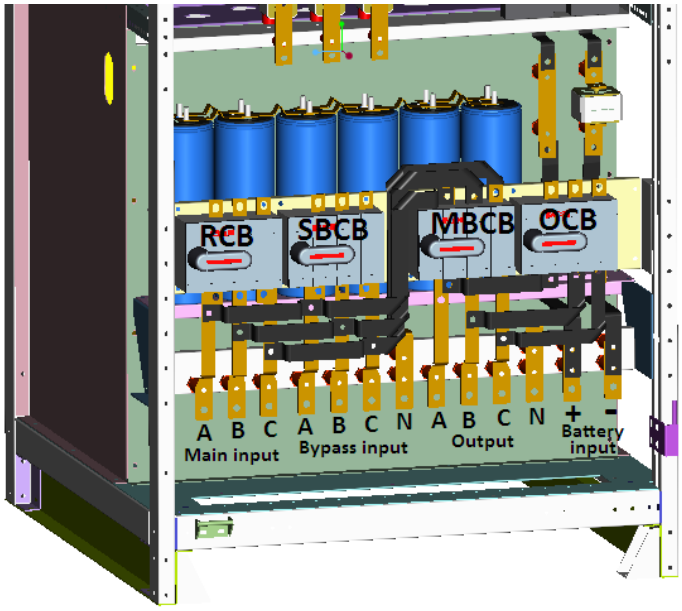


Figure 45: Wiring terminals of 160KVA UPS

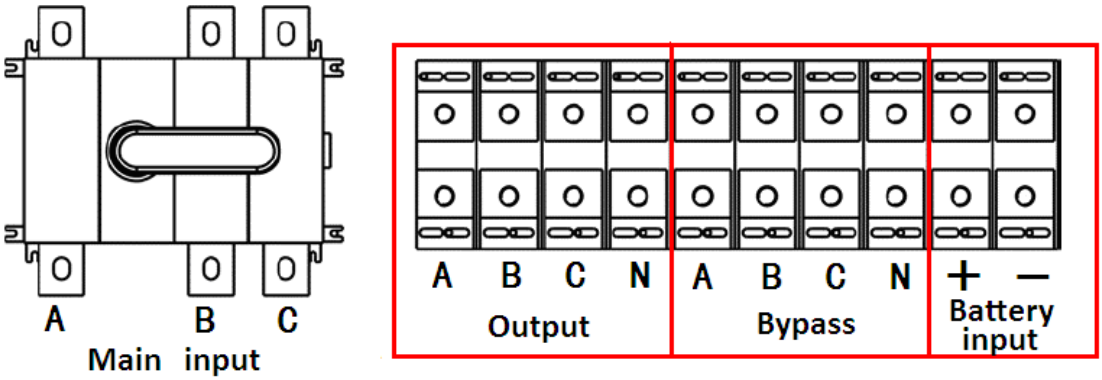


Figure 46: Wiring terminals of 200 ~300KVA UPS

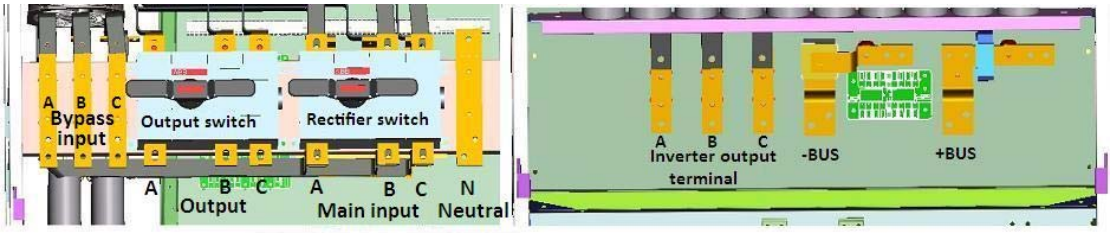


Figure 47: Wiring terminals of 400 ~600KVA UPS

3.8 Wiring

3.8.1 Wiring of stand-alone system

After the equipment is positioned completely, connect power lines according to the following steps:

1. Confirm that all power distribution switches and internal power switches of UPS are cut off. Paste warning identification at the location of switches to prevent faulty operation of others.

2. The terminal connecting power cable can be seen when the front door of UPS is opened, but for 200~300KVA machine, the rectifier input terminal can only be seen when the protective cover in front of isolated switch is removed.

⚠ Note: When 200~300KVA machine is connected with rectifier input line, the minimum distance between the fixed screw rod and protective cover should be 3cm to prevent accidents caused by sparking or short connection of cabinet due to the insufficient distance of safety regulation.

3. Connect the protective earth and other necessary earth cables with earth studs at the power equipment base of UPS. All UPS cabinets should be connected with the grounding system of users.

Select one of following two steps (separated bypass or public input) according to installation mode to mark and connect input cables:

Separated bypass connection

4. When two-circuit main power input is used for bypass and rectifier, 200~300 KVA UPS should connect the rectifier input cable with rectifier input terminal (MAIN INPUT:R/S/T) and connect the power supply input cable of bypass with bypass input terminal (BYPASS INPUT:R/S/T/N); while 160 KVA and 400~600 KVA UPS should dismantle the shortly connected soft copper bars of rectifier input and bypass input first and then connect the input cable. Pay attention to the correct phase sequence in wiring.

Public input connection

5. If bypass and rectifier share the same main power input, 160 KVA and 400~600 KVA UPS should connect the AC input cable with UPS bypass input terminal (BYPASS INPUT:R/S/T/N), and confirm that the rectifier input terminal and bypass input terminal have been shortly connected; while 200~300 KVA UPS needs to add shortly connected cable that given with the machine between bypass and rectifier input, and then connect cables. Pay attention to the correct phase sequence in wiring.

System output connection

6. Connect the output cable between UPS output terminal (OUTPUT: R/S/T/N) and major load.

When debugging engineer comes to the site, please deal with safety insulation at the end of output cable of the system properly if the load is not ready to receive power supply.

External battery connection

Refer to chapter 4.5 in EN50091-1 for battery connection.

Battery cabinet must be connected with protective earth alone.

7. Connect the battery cable between the (+B\-B) battery terminal and battery switch of UPS. The connection of cable between battery terminal and battery switch should start from switch end. Pay attention to the polarity of battery cable.

8. Inspect wiring and fasten bolt again for wire locking. Recover all protective covers after confirmation.

3.8.2 Wiring of parallel system

Wiring of parallel signal line

Each machine has 4 parallel wiring ports (two are DB25 and another two are DB9). Closed loop should be formed in the wiring of DB25 in parallel system, so should DB9. Two parallel wiring in the same circuit should be closed and parallel as far as possible and kept away from power cable to the greatest extent so as to

reduce outside interference to parallel wires. Schematic diagram of wiring is as shown in Figure 48.

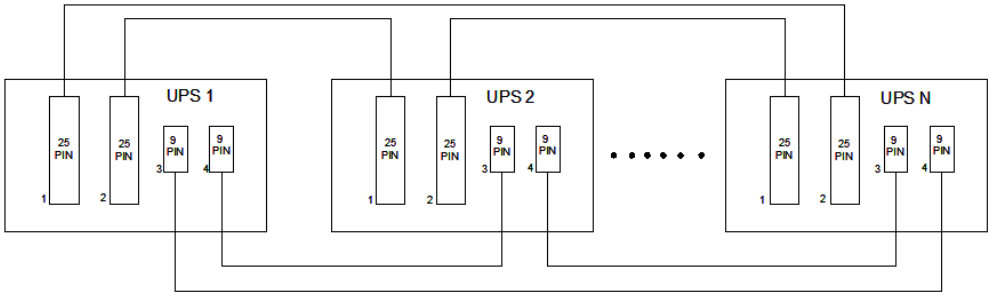


Figure 48: Schematic diagram for connection of parallel signal line

Connection of parallel power line

If there is only one circuit with power supply, connect each machine with "public input connection" first, and then separately connect the input and output terminals of each machine. Schematic diagram of wiring is as shown in Figure 49.

If separated bypass connection is used, it is necessary to remove the copper bars with short connected the internal main pass and bypass, and then separately connect the rectifier input terminals and bypass input terminals of each machine; the connection of phase sequence should be correct.

Battery cable is connected in the same way as stand-alone machine and the battery pack can't be shared.

⚠ Note: in the configuration design of parallel system, for better uniform flow to be obtained by parallel UPS, the input and output cables of each UPS must be same in specifications, the length of power line from the input terminal to the AC power distribution connection point of each UPS is same as that from output terminal to load connection point, and the input and output impedance of each UPS should be consistent.

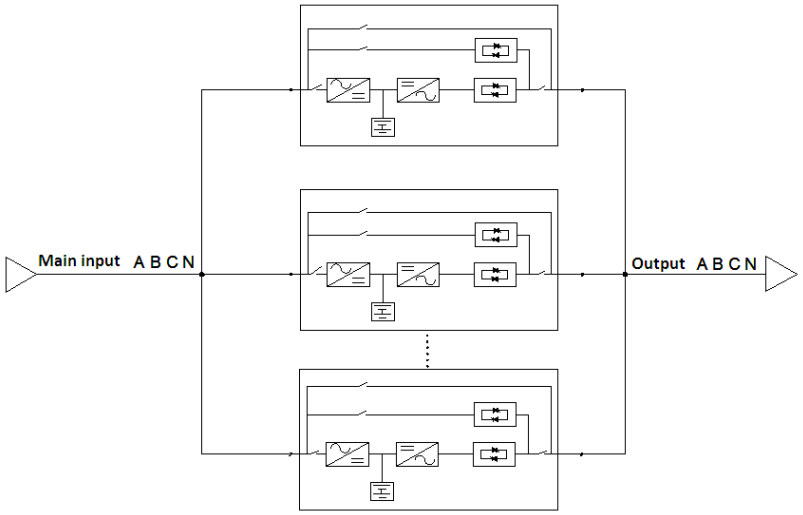


Figure 49: Schematic diagram for connection of parallel power cable

3.9 Control cable and communication

3.9.1 Communication port

According to detail requirements on site, auxiliary connection may be needed for UPS to realize management of battery system (battery temperature sensor), communication with personal computers, provision of alarming signals to external devices or remote emergency power off, etc. These functions are realized by monitoring panel locating at the back of the front door of UPS and communication port module. The monitoring panel can provide the following ports:

1. Control of emergency power off (EPO)

2. Detection port of battery temperature (BAT)

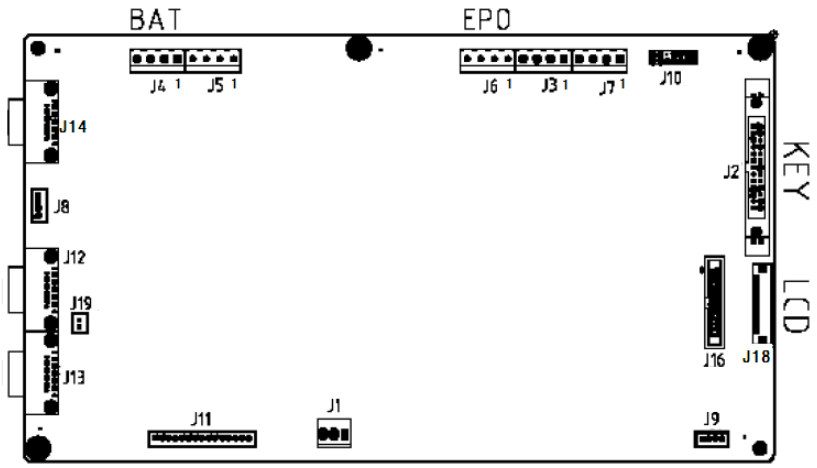


Figure 50: Schematic Diagram for Ports of Monitoring Panel

Communication port module can provide the following ports

3. User communication port RS232 and RS485-1 (used for background monitoring of users)

4. Parameter setting and debugging port RS485-2 (used for debugging and maintenance by maintainer)

5. SNMP port (used for remote control of UPS through network)

6. Parallel port (used for communication port of parallel system)

7. Maintenance socket (used for providing convenient power to the test instrument of maintainer in UPS fault)

8. Auxiliary switch for maintenance and communication port

The following three Figures are diagrams for communication port module of 160~600 KVA UPS

Figure 51: 200~300 KVA communication port

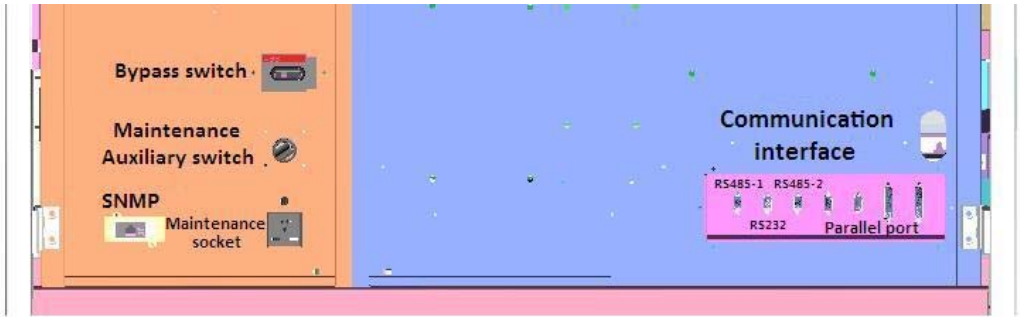


Figure 52: 400~600 KVA communication port

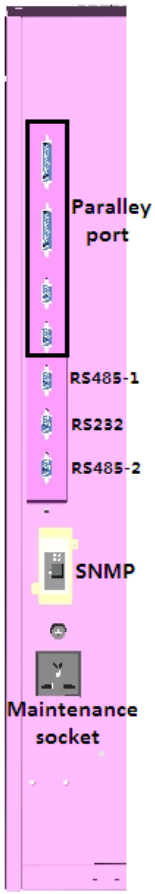


Figure 53: 160 KVA communication port

⚠ Pay attention to the following in the wiring of auxiliary cable:

Conduits for wiring of communication cable and power cord should be used separately.

The wiring of remote EPO switch should conform to local regulations.

Auxiliary cables must be double-insulated twisted cables, and the section area should be 0.5～1.5mm² when the wiring distance is 25~50m.

3.9.2 Input port for emergency power off (EPO)

UPS has the function of emergency power off (EPO). It is realized through EPO button on control panel of UPS or remote contact provided by users. EPO button is protected by the plastic cover with hinge.

⚠ Note: in emergency power off (EPO), UPS will cut off the power supply of load (output is cutoff). Only when UPS output is confirmed to be cut off, can EPO be used.

J6 port shown in Figure 50 is remote EPO input port. Emergency power off will be started when pin 3 and 4 of J6 are shortly connected or pin 2 and 1 of it are cut off. Pin 1 and 2 or pin 3 and 4 of J6 are reserved terminals for external emergency power off. External emergency power off device also needs to connect the normally open or closed remote power off switch between the two terminals with shielded cable to prevent faulty operation of EOP caused by interference and power down of load. If it is unnecessary to use this function, the pin 3 and 4 of J6 should be cut off and the pin 1 and 2 of J6 should be shortly connected.

Table 9: Description of remote EPO port

Location	Name	Meaning
J6-1	EPO_NC (normally closed)	Start EPO when disconnected with J6-2
J6-2	EPO_NC (normally closed)	Start EPO when disconnected with J6-1
J6-3	EPO_NO (normally open)	Start EPO when shortly connected with J6-4
J6-4	EPO_NO (normally open)	Start EPO when shortly connected with J6-3

⚠ Note: motion of UPS emergency power off will close the rectifier, inverter and static bypass, but will not cut off the input main power of UPS from inside. If power of UPS need to be completely disconnected, just cut off the superior input switch when EPO is started. When UPS is delivered, pin 1 and 2 at the normally closed contact J6 of EOP on monitoring panel have been shortly connected.

3.9.3 Temperature detection port of external battery

J4 port shown in Figure 50 is TMP-2 battery temperature sensor port. The battery temperature sensor is connected with external battery cabinet usually.

J4 pin 1: ＋12V (power supply of temperature sensor)

J4 pin 2: not used

J4 pin 3: BAT-T (battery temperature signal)

J4 pin 4: GND

3.9.4 Serial port communication

RS232 provides series data, and it can be used as the port of background monitoring software directly. Users only need to directly connect the communication port module with the data line equipped with the machine when they use it.

RS485-1 provides series data, and it can be used as port of background monitoring software directly. Users only need to directly connect the communication port module with a serial port data line (uncrossed) when they use it.

RS485-2 provides series data, and it can be used to authorize debugging and maintenance personals for port debugging and maintenance. This port has been connected with communication port module.

3.9.5 Port of SNMP card

Full series UPS provides SNMP card communication port which is used to install the communication option SNMP card at site to realize remote management of UPS. This port has been connected with communication port module.

3.9.6 Definition and use of dry contact port

Definitions of dry contact port are shown in Table 10

Table 10: definition of dry contact port

Name of port	Definition of signal	Action condition
OUT1	Voltage of battery is low	Battery voltage is less than 550V
OUT2	Boot	Boot (normal running)
OUT3	Fault alarm	Break down or alarm
OUT4	Draught fan breaks down	Draught fan breaks down
OUT5	Bypass mode	Bypass mode
OUT6	Battery mode	Battery mode
OUT7	Main power mode	Main power mode
OUT8	Output overload	Output overload
OUT9	EPO (Emergent power off)	EPO is effective
OUT10	Battery underoverload release	Inverter breaks down
OUT11	——	——
OUT12	Contactor	Pull-in contractor

Use of dry contact port

To output dry contact, including running mode and fault alarm (specific definition of port is shown in Table 10).

Each output dry contact port is equipped with a normally open contact and a normally close contact. Users can choose to use according to the specific situation. Ports are arranged as shown in Figure 55.

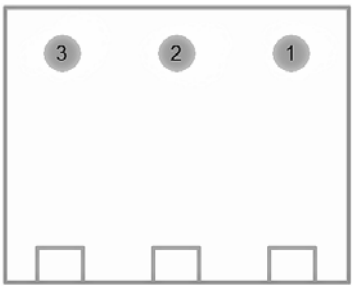


Figure 54: arrangement of pin of dry contact OUT 1—12 port

Pin of dry contact OUT 1—12 port is arranged as shown in Figure 54

Pin 1: normally close contact

Pin 2: common port

Pin 3: normally open contact

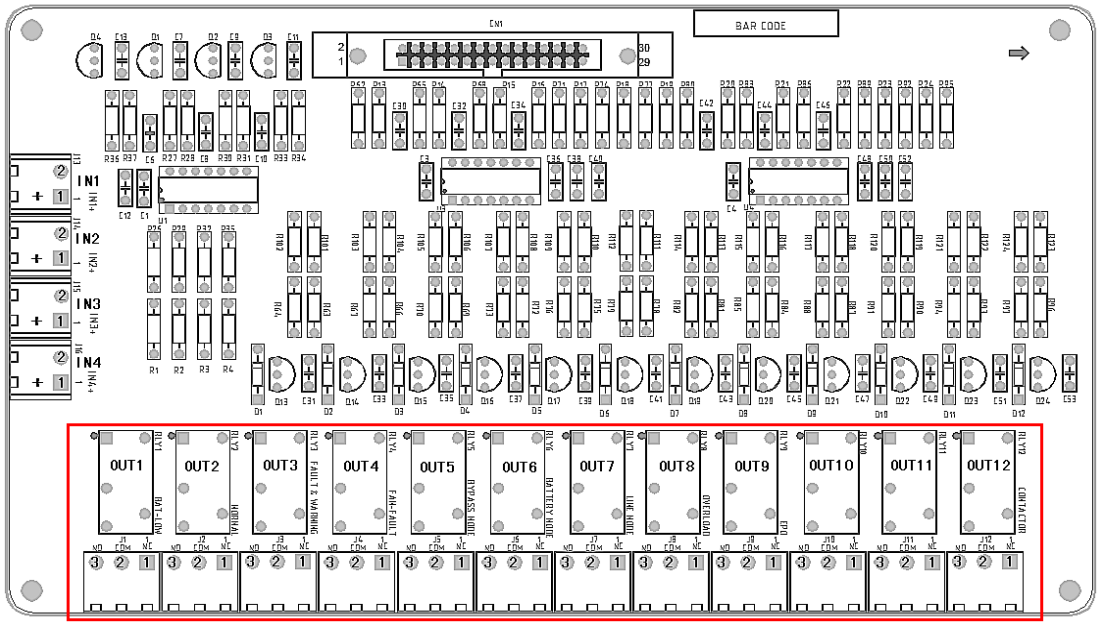


Figure 55: schematic diagram status detection plate

Chapter 4: Operation Manual

Before starting UPS, please ensure that UPS is installed by authorized maintenance engineer, and he/she should test whether all the electrical connections are correct to ensure the system can run normally. After UPS is started, it can operate in the working modes stated in chapter 1. This chapter describes all operating steps of operator under all working modes, including steps for UPS power on / power off, operating steps for switching the load to bypass, steps for entering and exiting maintenance bypass and steps for UPS power off.

⚠ Note 1: all user operational keys and LED display mentioned in operating steps can refer to chapter 5.

⚠ Before taking any operating step described in this chapter, please read the guidance carefully to avoid personal injury or equipment damage caused by faulty operation.

4.1 Steps for power on (entering to main power supply mode)

This step is used to power on the machine under condition that UPS losses all electricity fully, that is, before this, UPS fails to supply power to the load directly or supply power to the load through maintenance bypass switch. It is assumed that the UPS has been installed well and debugged by engineer, and external power switch has been closed.

Warning:

This operating step will cause UPS output terminal has main power voltage.

If necessary, please cut off subordinate load connection and paste warning identification in location of load connection.

Components behind the protective cover which only can be opened by tools are components which cannot be operated by user.

Only qualified maintenance personal can open this kind of protective cover.

Open front door of UPS, and confirm all switches are in close condition.

Close bypass switch of UPS. After normal display of LCD, press power on key “ON” in panel, and then the UPS will give a sound “tick”. At this time, the UPS is

started and fan of the machine starts to run. Status of LED indicating light can be seen in table 11:

Table 11

LED No.	REC	INV	OUTPUT	BAT	BYP	STATUS
Display status	Off	Off	Red	Red	Green	Red

3. Close the rectifier input switch. The rectifier starts soft start, indicating light of rectifier (REC) in panel is green and flashing. After about 10s, the rectifier starts to normally run, and indicating light of rectifier turns to green and on. Next, inverter starts soft start, indicating light of inverter (INV) in panel is green and flashing. After about 3s, inverter starts to run normally, UPS is converted to inverter power supply from static bypass power supply. Confirm the display status of LED, see table 12:

Table 12

LED No.	REC	INV	OUTPUT	BAT	BYP	STATUS
Display status	Green	Green	Red	Red	Off	Red

4. Close external battery switch. This switch locates inside the battery cabinet or near battery rack. After the UPS system detects the battery, the red indicating light of battery (BAT) in panel will be off. Find the battery data in liquid crystal display field to check whether the battery voltage (500V~680V) is correct or not.

5. Inspect and confirm that there is no warning information in left bottom of LCD display screen. UPS is running under main power mode. Close the output switch and confirm display status of LED as shown in Table 13:

Table 13

LED No.	REC	INV	OUTPUT	BAT	BYP	STATUS
Display status	Green	Green	Green	Off	Off	Green

4.2 On and off of ECO mode

ECO mode can be set at any time, and it has memory function (that is: it only needs to set the ECO mode once, and the UPS will keep ECO mode even if the machine starts automatically after it is effective).

4.2.1 Steps of turning on the ECO mode

Enter the menu of “function setting” in panel, and set the “ECO mode setting” as “ECO mode”. At this time, the setting “ECO mode” is effective, that is: UPS is running under ECO mode, bypass supplies the power, and inverter is stand-by. LED display status can be seen in table 14:

Table 14

LED No.	REC	INV	OUTPUT	BAT	BYP	STATUS
Display status	Green	Green light flashes	Green	Off	Green	Green

4.2.2 Steps of turning off the ECO mode

Enter the menu of “function setting” in panel, and then set the “ECO mode setting” as “UNECO mode”.

Then, the setting “UNECO mode” is effective, that is: UPS exits the ECO mode and runs under inverter power supply mode.

4.3 Manual bypass

When the machine is running normally, convert the invert power supply mode to bypass power supply mode manually. It is the same with ECO mode that manual bypass can be set at any time and has memory function (that is: it only needs to set the manual bypass mode once, and the UPS will keep the manual bypass mode even if the machine starts automatically after it is effective).

Operating steps are: enter the menu of “function setting” in panel, and then set the “manual bypass” as “ON”. At this time, the output is converted to bypass power supply, it will display “manual bypass close” in left bottom of LCD display screen. If it needs to turn off the manual bypass, please set it as “OFF”.

⚠ If voltage or frequency fluctuates or the power is cut when UPS is running under bypass mode, load is not protected by UPS.

4.4 Operating steps of maintenance bypass

Note: please read the warning information in chapter carefully and operate the maintenance bypass carefully, otherwise it may damage the UPS or cause power down of the load and even endanger personal safety.

4.4.1 Enter maintenance mode (stand-alone mode)

The following operating step can switch the load from status of UPS power supply protection to status that maintenance bypass switch is connected with AC input bypass power directly.

In menu of “function setting”, set the “manual bypass” as “ON”. At this time, UPS supplies power to the load through static bypass.

Manually close the maintenance switch. At this time, the maintenance bypass power supply and UPS static bypass power supply parallel supply power to the load.

Press the key “OFF” in panel for more than 3S; select "OFF" through left shift key F1 and right shift key F2 according to prompts in the panel, and press F4 to confirm the operation after the selecting is completed. In this operation, rectifier and inverter will be closed, status switch will be cut off and power supply for load is made by maintenance switch.

Manually disconnect rectifier switch, bypass input switch, battery switch and output switch.

By now, conversion of UPS output to maintenance bypass has been completed, power of the load is supplied by maintenance bypass, the fan stops, and UPS is powered off. Maintenance personal can take daily maintenance and repairing of UPS when busbar voltage is lower than 36V, but the load equipment has no AC power fault protection.

4.4.2 Exit maintenance mode (stand-alone mode)

After maintenance is completed, the load can be converted from status of no AC power fault protection to status of UPS power supply protection by the following operating steps.

1. Carefully confirm there is no object left inside the UPS cabinet and UPS internal wiring has been recovered to status before maintenance.

2. Close the rectifier switch, and then press the key “ON” until UPS gives a sound “tick” after normal liquid crystal display of panel. Carefully observe whether the rectifier and inverter of UPS can operate normally: if it is normal, it can perform

the following steps; if it is abnormal, please press the red key “EPO” in the panel, disconnect rectifier switch, and continue the maintenance.

3. After normal operation of rectifier and inverter of UPS, close the bypass switch.

4. Make sure that "Manual bypass" in the menu of "Function setting" is "ON". If it is not "ON", set it as "ON".

5. Close the output switch. At this time, the maintenance bypass power supply and UPS static bypass power supply parallel supply power to the load.

6. Disconnect the maintenance switch.

7. Close external battery switch, and set the “manual bypass” in panel as “OFF”. At this time, operations for exiting the maintenance status are completed, and the load is converted from status no AC power fault protection to status of UPS power supply protection.

4.5 Battery manual maintenance mode

To prolong service life of battery, it is suggested to take a manual maintenance every 2-3 months. Steps for entering the battery manual maintenance are as follows:

1. Enter the menu of “test order” from front panel LCD of UPS, and select “battery manual maintenance”.

2. According to prompts in the panel, input the control password (default password: 88888888) by “F1” and “F2”, and then press “F4” in left bottom of the panel to confirm the input. At this time, UPS turns off the rectifier, battery discharges, indicating light “REC” in panel is off, and indicating light “BAT” is green and flashes.

3. When UPS outputs is uninterruptedly converted to static bypass and left bottom in LCD panel displays “battery manual maintenance is success”, it means that the battery manual maintenance has been completed. After battery manual maintenance is completed, rectifier and inverter of UPS start normally, input is uninterruptedly converted to inverter output, and charging the battery.

In order to make sure power is not cut during the output, please perform battery manual maintenance when the bypass power supply is stable. If necessary,

maintenance personal only needs to select “stop test” in menu of “test order”, it can stop the manual maintenance of battery, UPS recovers normal working mode.

4.6 Steps for battery cold start (option)

If you need to start the machine through battery when there is no main power or bypass, battery cold start option is should be equipped. It is assumed that electrical connection of battery cold start option with UPS and battery cabinet is normal. The operating steps for power on are as follows:

1. Close external battery switch.

2. After normal display of LCD, press power on key “ON” in panel, and then the UPS will give a sound “tick”. STS of UPS inverter is on about 10S after soft start of UPS inverter is completed, and the fan starts to run. LED display status can be seen in table 14:

Table 14

LED No.	REC	INV	OUTPUT	BAT	BYP	STATUS
Display status	Off	Green	Green	Green	Red	Red

4.7 Steps for power off

Press the key “OFF” in panel for more than 3S; select "Switch to bypass" or "OFF" through left shift key F1 and right shift key F2 according to prompts in the panel, and press F4 to confirm the operation after the selecting is completed. Note: if "Switch to bypass" is selected, the machine will turn off rectifier and inverter, the output will be uninterruptedly converted to bypass power supply and will not power down. Disconnect rectifier switch, output switch and external battery switch. However, if "OFF" is selected, UPS will be closed and power for load will be cut, so please select it with careful thought. After the machine is shut down, please disconnect rectifier switch, output switch, bypass switch and external battery switch.

2. Confirm that the maintenance switch is in disconnection status.

⚠ Note: if you want to completely power off UPS, please disconnect all power switches, circuit breaker, and external distribution switch for main power and external output switch and then paste them with warning labels.

4.8 Steps for emergent power off (EPO)

⚠ Note: in emergency power off (EPO), UPS will cut off the power supply of load (output is cutoff). Only when UPS output is confirmed to be cut off, can EPO be used.

Press the red key "EPO" in lower panel to finish the steps of emergent power off. Emergent power off (EPO) switch is used to turn off the UPS under emergent condition (such as fire and flood). The system will turn off the rectifier and inverter, cut off the load power supply (including inverter and bypass output) rapidly, and stop charging or discharging of the battery.

If the UPS still has main power input, the control circuit of UPS has electricity and UPS output is turned off. If you need to cut off the main power of UPS thoroughly, you should disconnect the external main power input switch of UPS.

It must take full power down for UPS, that is, disconnect all input switches (including battery switch) by hand, only by this way, the UPS can exit the emergent power off status.

4.9 Operating steps for power on / power off of parallel system

4.9.1 Notes for operation in parallel

It is not allowed to unplug parallel wire in the normal running of parallel system.

In the parallel system, UPS output switch must be closed and output end must be connected together in parallel before the parallel system has load. It is not allowed to disconnect any output switch of UPS in the parallel system after it has load.

Before using maintenance bypass, "Manual bypass" in the menu of "Function setting" of all the machines in the parallel system should be set as "ON", and then maintenance switch can be closed.

Bypass switches of all the machines in the parallel system must in the same state in parallel operation.

4.9.2 Steps for power on of parallel system

1. Please make sure that wiring of all machines and parallel lines for parallel system are correctly connected;

2. Close bypass switch of all the machines in the parallel system;

3. Firstly, close output switch of UPS1, and then close rectifier switch of UPS1, press boot key "ON" to power on, the indicating light of REC flashes and the fan begins to work and then UPS1 begins to output by bypass. About 15S later, green light of BYP is off, green light of INV is on for a long time, the machine begins to output by inverter. Close battery switch of UPS1, indicating lights of REC, INV, OUT and STATUS are green, and indicating lights of BYP and BAT are off;

4. Power on UPS2, UPS3...UPS N in the parallel system according to the order in Step 3;

5. After all the machines are started, their indicating lights are the same as that of UPS1. All the machines in the parallel system are started now.

6. The parallel system is allowed to have load after all the machines in the parallel system are started. Please make sure output switches of all the machines in the parallel system are closed and output ends are connected together in parallel before it has load;

7. Please follow Step 2 in this section when a stand-lone machine is added to the parallel system.

4.9.3 Steps for power off of parallel system

1. Close all the loads;

2. Press and hold the key "OFF" in the panel of UPS1 for more than 3S and then press F4 to turn the machine off according to the prompts. Rectifier and inverter of the machine will be closed through this operation, status switch will be closed as well, and it cannot continue to supply power to load, so please carry out this operation with careful thought. After the machine is turned off, disconnect output switch, battery switch, rectifier switch and bypass switch of UPS1. Indicating lights of REC, INV, OUT, BYP AND BAT in the panel are off;

3. Turn off UPS2, UPS3 ... UPS N in the parallel system according to Step 2;

4. If a stand-alone UPS exits the parallel system, please follow Step 2.

4.9.4 Operating steps of maintenance mode in the parallel system

1. Set "Manual bypass" in the menu of "Function setting" of UPS1, UPS2, UPS3 ... UPS N as "On" one by one;

2. Close the maintenance switch of machine needs to be repaired: press and hold the key "OFF" for more than 3S and then press F4 to turn off the machine according to prompts. And then disconnect output switch, battery switch, rectifier switch and bypass switch of the machine;

3. Maintenance can be performed after the machine is completely power down and electrolytic capacitor is fully discharged.

4. After maintenance is completed, carefully confirm that there is no object left in UPS cabinet and internal connection line of UPS is recovered to status before maintenance. Close rectifier switch and bypass switch, press the key "ON" to power on and the fan begins to run. At this time, the machine is working under bypass mode. After about 15S, indicating light of INV is green and flashes and the machine is turned on now.

5. Firstly, make sure that all the machines in the parallel system are in bypass mode, and then close output switch of the machine has been repaired and disconnect the maintenance switch;

6. Close battery switch of the machine, and then set "Manual bypass" in the menu of "Function setting" of UPS1, UPS2, UPS3 ... UPS N as "OFF" one by one. Indicating lights of REC, INV, OUT and STATUS in the panels of all the machines are green, indicating lights of BYP and BAT are off, and all the machines in the parallel system are converted to main power mode.

4.10 Reset operations after fault alarming

When UPS is power off due to over-temperature of rectifier or inverter, over load power off, and excessive conversion times, after clearing all faults by measures according to tips in display screen, and take the following reset steps of UPS so that the UPS can recover the normal working status.

After user confirms that the faults have been cleared and there is no remote EPO signal, take the following steps:

1. Press key “FAULT CLEAR” in panel so that the UPS system can exit the fault mode.

Press key “ON” in right side of operation control panel for more than 2s, the rectifier, inverter and inverter static switch are started, and UPS enters normal working mode.

4.11 Auto start

When power failure of main power, UPS supplies power to the load through battery system until the battery is discharged to battery discharging final voltage 495V, UPS stops inverter output, and the output is converted to static bypass. When main power is recovered, UPS starts again automatically, inverter output power supply is recovered, and the battery is charged. Auto start function is also applicable for bypass mode.

⚠ Note: if you need to check or repair back end equipment of UPS when the main power is cut and battery of UPS is exhausted, please be sure to disconnect output switch and power supply and distribution switch of UPS to avoid personal casualties caused by sudden recover of the main power.

4.12 Language selection

LCD menu and data can be displayed in English or Chinese. It can be selected by “Language Lang” in panel.

4.13 Change current date and time

It can be set by menu of "Function setting" in the panel.

4.14 Control password

The system provides password protection to limit some control operations of operators, the default password is "88888888". You can only carry out the UPS and battery test operation only passing password confirmation.

Control password can be changed. However, the control password will be recovered to the default password after power down of main control panel.

Chapter 5: Operation Control and Display Panel

5.1 Brief introduction

Operation display panel of UPS locates at front panel. By operation display panel, it can take operation control to UPS and inquire all parameters of UPS, UPS and battery status, and event and alarming information. Operation display panel can be divided into three parts: simulation status diagram, LCD display and menu button, and control operation button.

Simulation status diagram LCD display and menu button Control operation button

Figure 18: UPS Operation Control and Display Panel

Table 12: Description of Components of UPS Display Panel

LED silk-screen	Function	Button	Function
REC	Indicating light of rectifier	EPO	Button of emergent power off
INV	Indicating light of inverter	ON	Button of ON
OUTPUT	Indicating light of load	OFF	Button of OFF
BAT	Indicating light of battery	FAULT CLEAR	Button of fault reset
BYP	Indicating light of bypass input	SILENCE ON/OFF	Button of mute off
STATUS	Indicating light of UPS status and alarm	F1,F2,F3,F4	Button of LCD and menu
ALARM	Sound alarm (buzzer)		

5.1.1 Simulation status diagram

Simulation status diagram provides LED indicating lights which can display all working paths of UPS and current working status of it.

Table 13: Description for Status of Indicating Light of Rectifier (REC)

Green and on	Rectifier is in normal working condition.
Green and flashing	Main power is normal, and rectifier is in soft start condition.
Red and on	Rectifier is in fault.
Off	Rectifier cannot work

Table 14: Description for Status of Indicating Light Battery (BAT)

Green and on	Battery discharges normally.
Green and flashing	Battery low voltage discharge or battery is taking self-inspection test
Red and on	Battery is in fault (fault of battery or no battery)
Off	Battery is being charged.

Table 15: Description for Status of Indicating Light Bypass (BYP)

Green and on	Power of load is supplied by bypass.
Red and on	Power of bypass is in fault or exceeds normal range or bypass static switch is in fault.
Off	Bypass is normal.

Table 16: Description for Status of Indicating Light Inverter (INV)

Green and on	Power of load is supplied by inverter.
Green and flashing	Inverter starts or is in stand-by status (ECO mode)
Red and on	Inverter is in fault.
Off	Inverter cannot work

Table 17: Description for Status of Indicating Light Load (OUTPUT)

Green and on	UPS has output and is normal.
Red and on	Output switch of UPS is disconnected or has output but overloaded.
Off	UPS has no output.

Table 18: Description for Operation Status (STATUS)

Green and on	Operation is normal.
Yellow and on	UPS gives alarm.
Red and on	UPS is in fault.

5.1.2 Sound alarm (buzzer)

There are two kinds of different sound alarms during running of UPS:

Table 19: Description of Sound Alarm of Buzzer

Short single sound alarm	Give this kind of sound alarm when pressing any functional operation key.
Continuous sound alarm	Give this kind of sound alarm when UPS is in fault.

5.1.3 Functional operation keys

Table 20

EPO	Used to cut off the load power supply and turn off rectifier, inverter and static switch
ON	Used to start the rectifier, inverter and static switch and supply power to the load
OFF	Used to cut off the load power supply and turn off rectifier, inverter and static switch as well as set ECO mode
FAULT CLEAR	Clear the fault
SILENCE ON/OFF	Cancel alarming sound by pressing this key when sound alarm is given, and restart the buzzer by pressing it again

5.1.4 Button of LCD and menu

LCD displays friendly interface and provides 320 x 240 raster graphic display. LCD can display the alarming information real-time, provide 1000 historical alarming records for inquiry of user, and provide reliable basis for fault diagnosis.

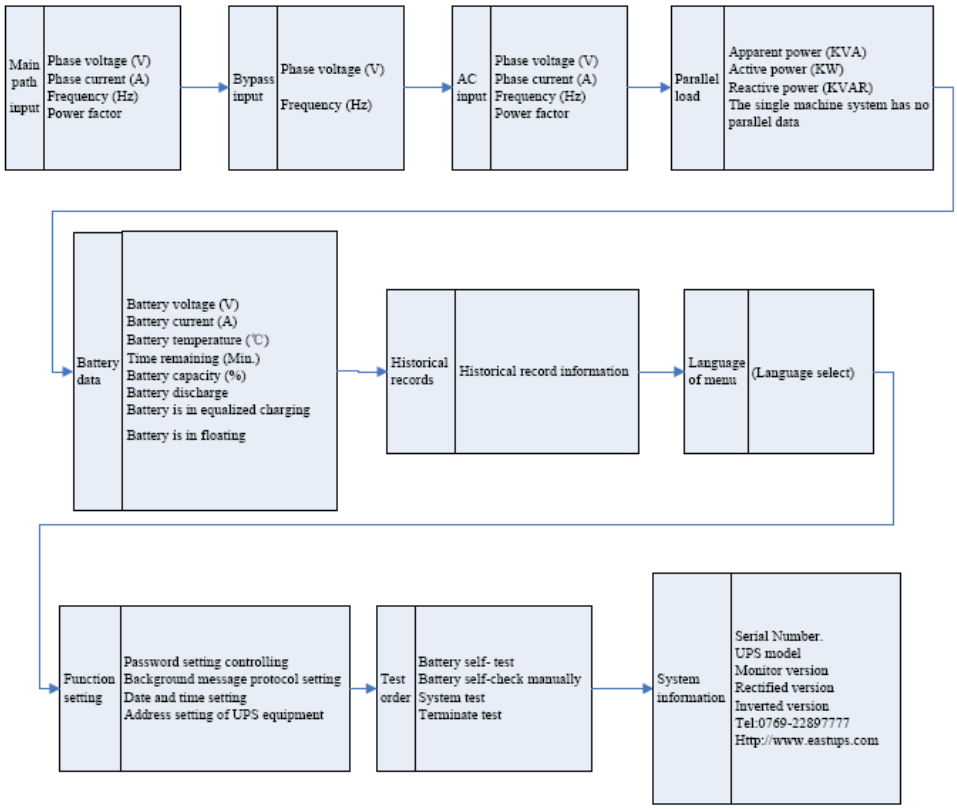
User can execute all operating command by LCD display interface, conveniently browse input, output, load and battery parameter, and timely obtain current status and alarming information of UPS. LCD also can display version information of control software and internal monitoring software.

There are five menu buttons, and descriptions of their functions are:

Table 21: Description of Meanings of Menu Icons

KEY	F1	F2	F3	F4
Function 1	Left	Right	Switch	Enter
Function 2	Up	Down	ESC Exit	

Tree structure chart of menu displayed by LCD is:



5.1.5 Description of detail menu

Information window of UPS system: display general information of UPS, including current time and date, and name, configuration and status of UPS. Information in this window does not needs operation of user, and the detailed explanation can be seen in table 22:

Table 22: Item Description of Information Window of UPS system

Display Content	Explanation
300KVA	Name of UPS series
(configure) stand-alone online, stand-alone ECO	Stand-alone online: double conversion stand-alone system Stand-alone ECO: this UPS set is stand-alone system, runs under economic mode.
2012-08-05	Current date (format: year-month-day)
15:26	Current time (format: 24h, hour: minute: second)

Use UP and DOWN to select the menu window and data window.

Table 23: UPS Menu Window and UPS Data Window

Menu Name	Menu Item	Explanation
Input of main circuit	Line voltage (V)	Line voltage
	Phase current (A)	Phase current
	Frequency (Hz)	Frequency
	Power factor	Power factor
Input of bypass	Phase voltage (V)	Phase voltage
	Frequency (Hz)	Frequency
AC output	Phase voltage (V)	Phase voltage
	Phase current (A)	Phase current
	Frequency (Hz)	Frequency
	Power factor	Power factor
Load of machine	Apparent power (KVA)	Sout: apparent power
	Active power (KW)	Pout: active power
	Reactive power (KVAR)	Qout: reactive power
	Percentage of load (%)	Load (percentage of UPS rated load)
Parallel load	Apparent power (KVA)	Sout: apparent power
	Active power (KW)	Pout: active power
	Reactive power (KVAR)	Qout: reactive power
	Stand-alone system without parallel data	UPS is set as only having load of machine and having no system load when it is stand-alone UPS
Battery data	Battery voltage (V)	Bus voltage of battery
	Battery current (A)	Charging and discharging current of battery
	Battery discharge	Battery is discharging
	Battery is in even charge	Battery is in status of even charge
	Battery is in float charge	Battery is in status of float charge
	Battery is not used	Battery is not used

Historical records	Historical record information	Display all historical records
Menu language	(Language option)	Provides 2 kinds of languages for option
Function set	Set of control password	User can change the control password
	Set of background communication protocol	Provides 2 kinds of background protocols for option
	Set of ECO mode	User can set the on or off of ECO mode
	Set of manual bypass	User can set the on or off of manual bypass
	Set of date and time	Set the date and time
	UPS equipment address	Applicable for RS485 communication way
Test command	Manual self-inspection of battery	
	Manual maintenance of battery	Manual maintenance of battery takes partial discharge for the battery to general data of battery capacity. Load must be within scope of 20％～80％
	System test	It is self-inspection test of UPS.
	Stop test	Stop the manual self-inspection of battery, manual maintenance of battery or system test by hand
System information	Model of UPS	Provide information of UPS’s model, for example: 220V-50Hz
	Version of monitoring software	Provide information for version of monitoring software

	Version of control software	Provide information for version of control software

Current record window:

This window records all events causing current working mode of UPS and doesn't record the short condition which has been settled.

Use F1, UP or DOWN to browse the events.

For complete historical record, please refer to historical record window of menu and data window.

List of display UPS events in UPS front panel can be seen in table 24.

5.2 List of display events of liquid crystal panel

Table 24: List of Display Events

UPS Event	Explanation
Occurrence of even charge for battery	Battery status (is even charging)
Occurrence of float charge for battery	Battery status (is float charging)
Occurrence of battery discharge	Battery status (is discharging)
Occurrence of normal working of rectifier	Rectifier is working normally
Occurrence of no battery	Inspect the battery and battery connection
Occurrence of close of output air switch	UPS output power supply switch is on.
Occurrence of disconnection of output air switch	UPS output power supply switch is off.
Occurrence of power supplied by bypass	Bypass can supply the power
Occurrence of power not supplied by bypass	Bypass cannot supply the power
Occurrence of free inverter	Inverter is free
Occurrence of soft start of inverter	Soft start of inverter
Occurrence of normal working of inverter	Inverter is working normally
Occurrence of power not supplied by inverter	Inverter cannot supply the power
Occurrence of no power supplied by inverter	Inverter doesn't supply the power.
Occurrence of power supplying of inverter	Inverter is supplying power

Occurrence of close of maintenance bypass air switch	Maintenance bypass air switch is on
Occurrence of disconnection of maintenance bypass air switch	Maintenance bypass air switch is off
Occurrence of emergent power off	Emergent power off: directly press button of EPO in panel or receive command of external emergent power off
Occurrence of close of inverter static switch	Inverter static switch is on
Occurrence of disconnection of inverter static switch	Inverter static switch is off
Occurrence of effectiveness of manual bypass	Manual bypass is effective
Occurrence of cancel of manual bypass	Manual bypass is ineffective
Occurrence of failure of phase lock	When phase angle between inverter and bypass phase voltage is more than 6°, the inverter software program will start this alarm. Set value of amplitude is rated value ±10％. When the alarm is cancelled, the alarm will recover automatically. 1. Inspect whether it has alarm of “bypass super-tracking” or “bypass super-protection”. If yes, cancel it. 2. Inspect whether the bypass voltage waveform is normal or not. If it is in severe distortion, request the user to confirm and find the solution.
Disappearance of failure of phase lock	Inverter is synchronous
Occurrence of fault of main power	Main power is in fault
Disappearance of fault of main power	Main power is normal

Occurrence of fault of rectifier	Rectifier is in fault
Disappearance of fault of rectifier	Rectifier is normal
Occurrence of fault of inverter	Output voltage of inverter exceeds the limitation, and load is converted to bypass
Disappearance of fault of inverter	Inverter is normal
Occurrence of fault of bypass	Bypass is in fault
Disappearance of fault of bypass	Bypass is normal
Occurrence of low output voltage of phase R	Output voltage of R is low
Occurrence of high output voltage of phase R	Output voltage of R is high
Disappearance of fault for output voltage of phase R	Output voltage of R is normal
Occurrence of low output voltage of phase S	Output voltage of S is low
Occurrence of high output voltage of phase S	Output voltage of S is high
Disappearance of fault for output voltage of phase S	Output voltage of S is normal
Occurrence of low output voltage of phase T	Output voltage of T is low
Occurrence of high output voltage of phase T	Output voltage of T is high
Disappearance of fault for output voltage of phase T	Output voltage of T is normal
Occurrence of fault for voltage of main power	Voltage of main power is abnormal
Disappearance of fault for voltage of main power	Voltage of main power is normal
Occurrence of fault for frequency of main power	Frequency of main power is abnormal
Disappearance of fault for frequency of main power	Frequency of main power is normal
Occurrence of opposite phase sequence of main circuit input	Phase sequence of main circuit input is opposite

Disappearance of opposite phase sequence of main circuit input	Phase sequence of main circuit input is normal
Occurrence of failure for input soft start	Rectifier cannot start due to low voltage of DC bus
Disappearance of failure for input soft start	Input soft start is normal
Occurrence of over-current of rectifier IGBT	Rectifier IGBT is over-current
Disappearance of over-current of rectifier IGBT	Rectifier IGBT is not over-current
Occurrence of over-voltage of bus	Extremely high voltage of DC bus results in close of rectifier and inverter: inspect whether it has any fault in side of rectifier;
Disappearance of over-voltage of bus	Voltage of bus is normal
Occurrence of low voltage of bus	Voltage of DC bus is low
Disappearance of low voltage of bus	Voltage of bus is normal
Occurrence of opposite phase sequence of bypass	Phase sequence of bypass voltage is opposite. In normal condition, phase S is later 120 than phase R, and phase T is later 120 than phase S. Inspect and confirm whether the phase sequence of UPS bypass power is correct or not. If wrong, correct it.
Disappearance of opposite phase sequence of bypass	Phase sequence of bypass in normal
Occurrence of fault for voltage of bypass	Voltage of bypass is abnormal
Disappearance of fault for voltage of bypass	Voltage of bypass is normal
Occurrence of fault for bypass thyristor	There is at least a static switch in side of bypass is disconnected or short circuit. This fault is locked until power down.

Disappearance of fault for bypass thyristor	Bypass thyristor is normal
Occurrence of fault for frequency of bypass	Frequency of bypass is abnormal
Disappearance of fault for frequency of bypass	Frequency of bypass is normal
Occurrence of overdue for overload of the machine	UPS is overloaded and exceeds the allowed overload time. Note 1: phase with max load displays overdue of overload; note 2: when load exceeds rated value, it shall report “output overload of machine”; note 3: when it exceeds the allowed overload time, inverter static switch disconnects and load is converted to bypass; inverter is in stand-by. If there is no power down for bypass after 10s, the load is converted to inverter, and this conversion only can be 5 times within 1h. Note 4: load factor of phase with max load reduces less than 90%, the system will convert to inverter mode. Confirm whether the alarm is true or not by checking the load percentage displayed by LCD panel.
Disappearance of overdue for overload of the machine	
Occurrence of limitation for conversion times within 1h	Overload conversion times in last 1h exceed the set value so that the load stays in bypass power supply mode. Within 1h, UPS can recover

	automatically and convert to inverter power supply mode.
Disappearance of limitation for conversion times within 1h	Limitation for conversion times within 1h
Occurrence of fault of fan	At least a fan is in fault
Disappearance of fault of fan	Fan is normal
Occurrence of fault of fuse	Input fuse or bus fuse is damaged
Disappearance of fault of fuse	Fuse is normal
Occurrence of over-temperature of inverter	Temperature of inverter is too high
Disappearance of over-temperature of inverter	Temperature of inverter is normal
Occurrence of over-current of inverter IGBT	Pulse width modulation module of inverter is over-current.
Disappearance of over-current of inverter IGBT	Current of inverter IGBT is normal
Occurrence of overload for output of the machine	This alarm is given when load exceeds 105% of rated value. The alarm will recover automatically after the overload status is clear. 1. Confirm the overloaded phase by checking load percentage displayed by LCD panel to confirm whether the alarm is true or not. 2. If it is true, measure the actual output current to confirm the correctness of display value. Disconnect the unimportant load. In parallel system, this alarm also will be given if the load is imbalance badly.
Disappearance of overload for output of the	Output of the machine is not

machine	over-loaded
Delay time of overload for bypass is overdue	Load current > 150%, 1min; load current > 200%, 200ms
Occurrence of fault for inverter thyristor	There is at least a static switch in side of inverter is disconnected or short circuit.
Disappearance of fault for inverter thyristor	Inverter thyristor is normal
Occurrence of short circuit for output	Output is short circuit
Disappearance of short circuit for output	
Occurrence of cancel of fault	Press button of FAULT CLEAR (fault reset) in panel
Occurrence of deletion of historical records	Delete historical records

Chapter 6: Daily Management and Maintenance

6.1 Machine room management

Machine room management includes environmental safety management of the room and equipment management.

1. Basic tasks of environmental safety management are: to ensure ambient humidity, relative humidity, cleanness, electrostatic interference, noise and electromagnetic interference of strong electricity and other factors in the machine room meet requirements; to ensure stable performance, reliable running and safe production of electrical power unit and the normal power supply of electric equipment.

2. Basic tasks of equipment management are: to ensure mechanical property of the machine is good, the electrical property meets requirement of the standard, the machine is running stably and reliably and related technical data and original records are complete.

6.2 Maintenance guide

Proper maintenance (including preventive maintenance and remedial maintenance) is the critical factor for optimal operation of UPS, and it ensures that the machine will have a longer service life. Preventive maintenance includes some procedures which are frequently performed and used to prevent system failure and get the maximum running efficiency. Remedial maintenance includes looking for fault of system so that effective maintenance can be performed.

6.3 Safety precaution

In order to maintain the system safely and successfully, please be sure to follow safety precautions, use necessary tools and test devices, have qualified maintenance personnel to participate and always pay attention to the following safety operation procedures:

1. You must keep in mind that there is dangerous voltage in UPS even if the UPS system is not running.

2. Make sure that operators and maintenance personnel of UPS are familiar with this equipment and the contents of this manual.

3. Do not wear ring, watch or other gold or silver ornaments when you operate UPS.

4. Do not operate UPS on assumptions. If you have any questions about the safe operating procedures, please consult personnel who are familiar with the machine.

5. Please keep in mind that there is dangerous voltage in UPS. Check UPS with voltmeter to ensure the power is shut and UPS is in a safe state before maintenance and adjustment.

6.4 Periodic preventive maintenance

Preventive maintenance steps are as follows. Operation efficiency and reliability of UPS system will be improved after all the following steps are performed.

1. Be careful about the environmental hygiene to avoid dust or chemical pollution to UPS.

2. Keep cleanliness of the surrounding area of UPS to ensure that the channel to it is unobstructed.

3. Check connecting terminals of input and output cable once every six months to carefully examine and measure if they are well connected.

4. Regularly check working condition of heat rejection fan to avoid air outlet is blocked. The fan should be replaced if there is any damage.

5. Regularly check battery voltage and working condition of UPS.

6.5 Using and maintenance of storage battery

6.5.1 Charging and discharging of storage battery

Storage battery pack is an important component to ensure uninterruptible power supply of UPS. Storage battery pack is hanged in storage battery shunt of UPS system. Float charge or equalizing charge of storage battery is performed when the main power is normal. Equipment is supplied by inverter through storage battery when there is a power failure.

6.5.2 Selection of storage battery

1. Selection of battery pack capacity is determined by two factors: current required for electrical equipment of power system and the expected discharge time of battery. For example, if discharge current of battery in the power system is 100A and battery is expected to supply power for 2h when there is a power failure, then battery capacity required by the system = discharge current of battery × duration time of power supply by battery when there is a power failure = 200Ah. After battery capacity is obtained, add an extra amount to it, then the actual demand battery capacity is obtained. The battery capacity can be a little higher but should be within 120% of capacity required by the electrical equipment. However, it is not allowed to be lower.

2. Batteries with different capacity cannot be used in series; batteries with different voltage cannot be used in parallel.

3. Battery packs with different capacity cannot be used in parallel (charging process cannot be completed at the same time because of different internal resistance and different current; battery pack will discharge to each other in the discharging process).

6.5.3 Notes for use and maintenance of battery

1. The total capacity of batteries is the sum of capacity of each battery pack when batteries are used in parallel.

2. Operating temperature for battery is 0~40℃. Life of battery is inversely proportional to temperature of battery, so cooling should be taken into account in the course of using to prevent temperature of battery from rising (life of battery will be shortened because corrosion of sulphuric acid to its counter is intensified with the increasing of temperature of battery). In order to prolong service life of battery, the machine room should be equipped with air conditioning.

3. After installation of power system is completed, charge the battery which is used for the first time or has not been used for a long time before using. Battery will lose a part of capacity because of self discharge during the storage, so charging is necessary.

4. Regularly check and fasten each joint part of battery pack and connecting wire of fastener to prevent accident.

Annex

1. Product Specification

Product design shall meet following standards:

European and international standards

Table 25

ITEM	STANDARD
GENERAL SAFETY REQUIREMENTS FOR OPERATIONAL AREA OF UPS	**EN 50091-1-1/IEC 62040-1-1/AS 62040-1-1**
UPS EMC REQUIREMENTS	**EN 50091-2/IEC 62040-2/AS 62040-2 (A CLASS)**
DETERMINATION METHOD AND TEST REQUIREMENTS OF UPS PERFORMANCE	**EN 50091-3/IEC 62040-3/AS 62040-3（VFI SS III）**

Environmental characteristics of product are as follows:

Table 26: Environmental Characteristics

Rated power, KVA	Unit	160	200	250	300	400	500	600
Noise within 1m	dB	65				70	75	75
Altitude	m	≤1,000m (1,000m above, lower the power for 1% for every increased 100m), maximum altitude is 4,000m						
Relate humidity	—	5%~95%, no condensation						
Working temperature	℃	0~40 ⚠ Note: service life of battery will be reduced for a half if temperature rises for 10℃ when it is higher than 20℃						
Storage and transportation temperature of UPS	℃	-20~70						

2. SNMP card product overview

iStars is a new kind of network monitoring product designed for the convenience of UPS management. Real-time network monitoring and management of UPS can be realized through this product. You can look over the real-time dynamic data and control UPS from remote distance by using this product, which facilitates the network management of UPS. You can monitor a stand-alone machine through this product. Integrated monitoring management can be realized as well by cooperating with the corresponding PC software.

iStars provides users with convenient installation program. You can search for or set the IP address after PC is installed with iSearch software. Log in homepage of iStars through web browser, and then operating status of UPS can be obtained: such as working voltage, current, frequency, temperature and humidity and so on of UPS. Parameters of equipment and system can be set in web interface: such as set to turn off or test UPS in a certain time; set user permission, user name and IP and so on.

iStars provides different operating systems with shutdown softwares which shut down the system to avoid abnormal shutdown of host caused by abnormal main power.

Main functions are as follows:

(1) Set different functions through the browser;

(2) Monitor the real-time status of UPS through the browser;

(3) Support TCP/IP, SNMP, FTP, NTP, HTTP, SMTP and other protocols;

(4) Provide software upgrading and configuration tool (iSearch software);

(5) Send daily statement by Email;

(6) Send related information to the administrator by SMS, SNMP, Email and so on when UPS goes wrong;

(7) SMS alarm can be realized by adding GPRS SMS module according to users' needs.

3. iStars hardware connection settings

3.1 Hardware port

Figure 58 Front view of iStars (external card)

Figure 59 Back view of iStars (external card)

Figure 60 Front view of iStars (internal card)

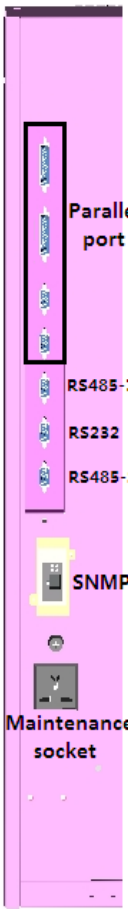


Figure 61: 200~300 KVA communication port module

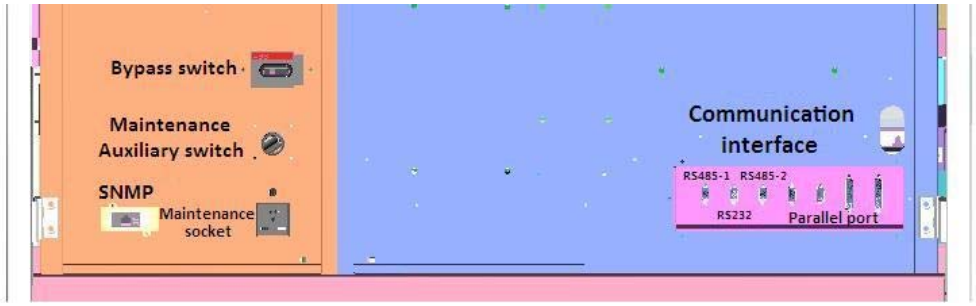


Figure 62: 400~ 600 KVA communication port module

Figure 63: 160 KVA communication port module

3.2 Description of ports at all parts of iStars and connection

NET port: 10/100M Ethernet network line port, connected to network line port of computer

UPS port: uses RS232 serial port line, connected to RS232 port of UPS (external DB9 port; internal golden finger port)

DC9V port: DC9V power port

GPRS port: GPRS SMS module port (DB9 port)

Y/G/R indicating light: LED three-color indicating light

3.3 Instructions of LED indicating light

Table 30: Instructions of LED indicating light

Instructions of LED indicating light		
Type	Indicating signal	Description
Red light	Fault indicating light	If communication with UPS is interrupted or other systems go wrong, the red light flashes.
Green light	Power indicating light	After the system is started and enters a normal operating status, the green light flashes, which means the system is running normally.
Yellow light	Communication indicating light	Yellow light flashes means that there is data communication with UPS. It means to send order when the light is on; it means that data is received when the light is off.

4. Operating instructions for Email and SMS platform of SNMP

4.1 Web page login

Before logging in the web page, enter "Function setting" option in the control panel of UPS and set the communication protocol as "EA protocol", and then the following operations can be carried out.

After hardware connection between iStars and network and settings are completed, enter the corresponding IP address obtained through iStars in the

browser to log in the monitoring web page of iStars to remotely monitor UPS or set the related information.

⚠ Please make sure the IP address setting and address of user's host are in the same network segment.

Open the browser and enter the IP address of iStars (such as 192.168.6.6).

Enter user name and password, click on "Enter" to enter the monitoring web page. The user name of default administrator account is admin and password is admin. Users can add or delete user account and permission in setting according to their actual need.

Figure 64: logging in interface of iStars web page

4.2 iStars web page operating

The current user name and the permission, function menu of system, information of system, status information and other information will be displayed on the front page after entering iStars web page.

Main functions of system menu includes: UPS information and status, setting and control, query log and miscellaneous function.

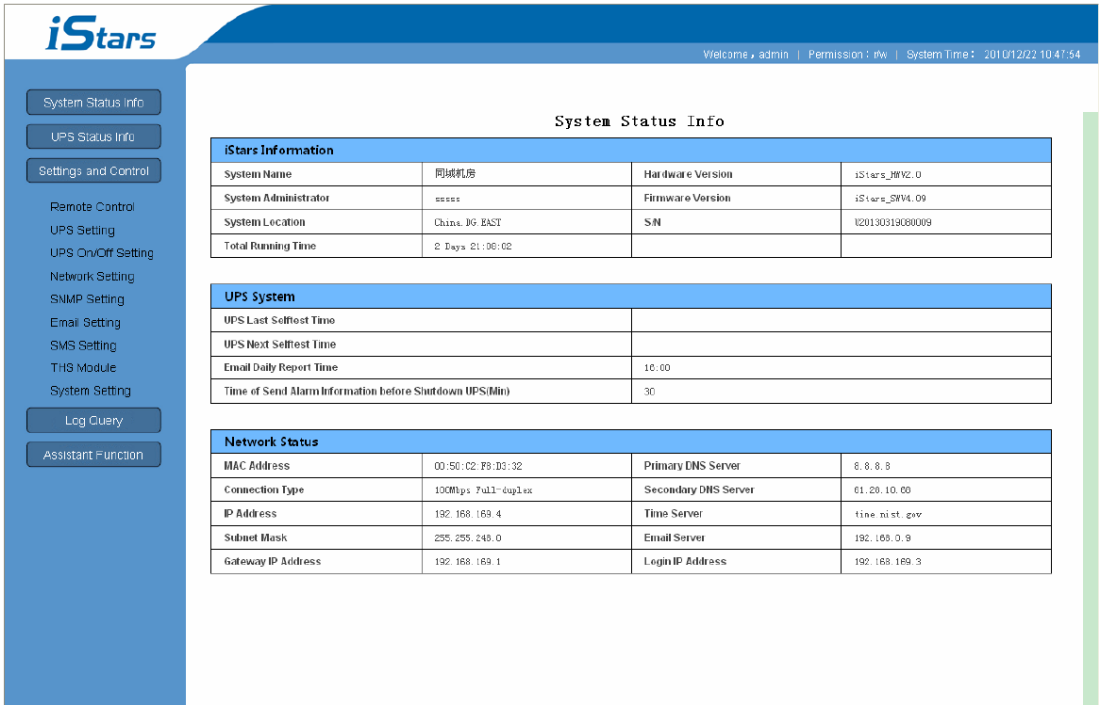


Figure 65: Home page of iStars

4.3 iStars Email settings

As for this function, events of equipment and daily statement are sent to user by Email.

Function setting: it can be set whether to send the information to an Email of user when iStars detects related data and event of UPS. Page setting includes: Email setting, Email address of recipient (used to receive log file of event), Email address of recipient (used to receive daily statement) and test setting. After settings are completed, click on "Apply" and the operation is completed.

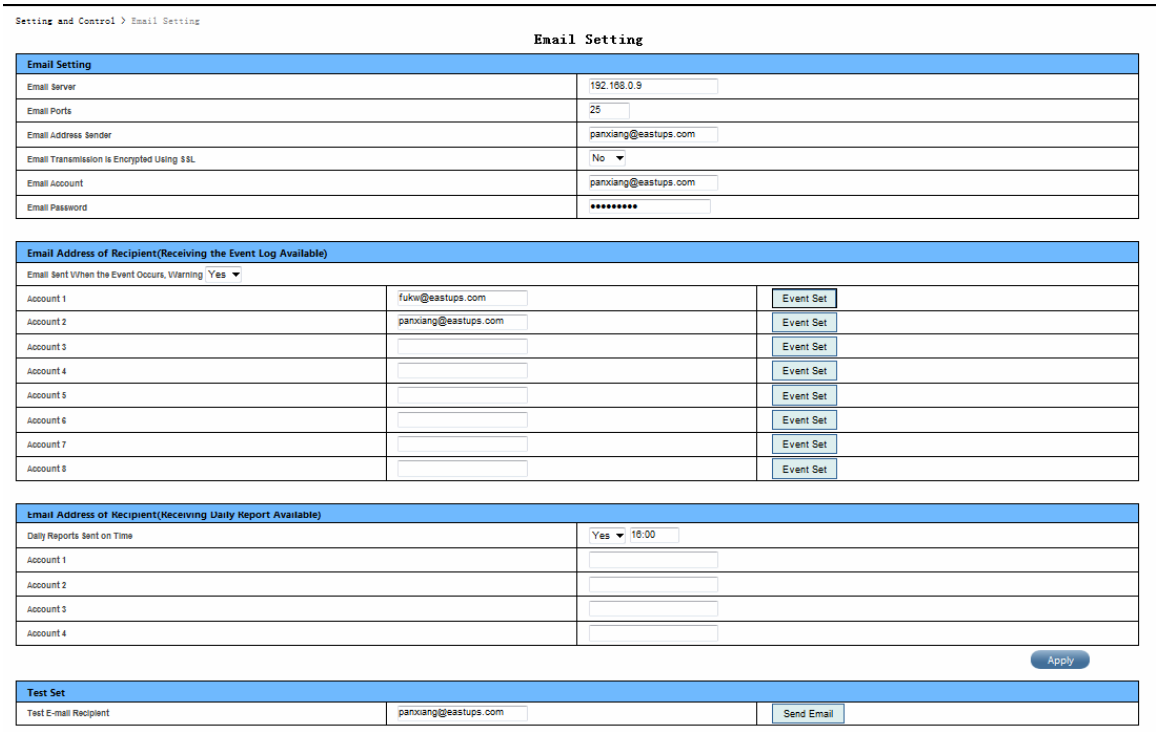


Figure 66: Email setting page

Email setting

Email server address

Set the receiver's server address of Email.

Email port

In general, receiving port of Email is 25.

Sender's Email address

Set sender's Email address.

Whether to send Email by SSL encryption transmission

Set whether to send Email by SSL encryption transmission.

Account

Set the sender's Email account, which is the same as the sender's Email address in general.

Password

Set password for the sender's Email account.

Receiver's Email address (used to receive and receive the event and record)

Send Email to warn when event occurs

Set whether to send event by Email when abnormal condition of UPS is detected.

Account 1~8

Account 1~8 is Email account of receiver when UPS goes wrong and it supports 8 accounts at most.

Select

This page selects to send part or all of the events detected by iStars to the corresponding Email account. Specific events are shown in Figure 67.

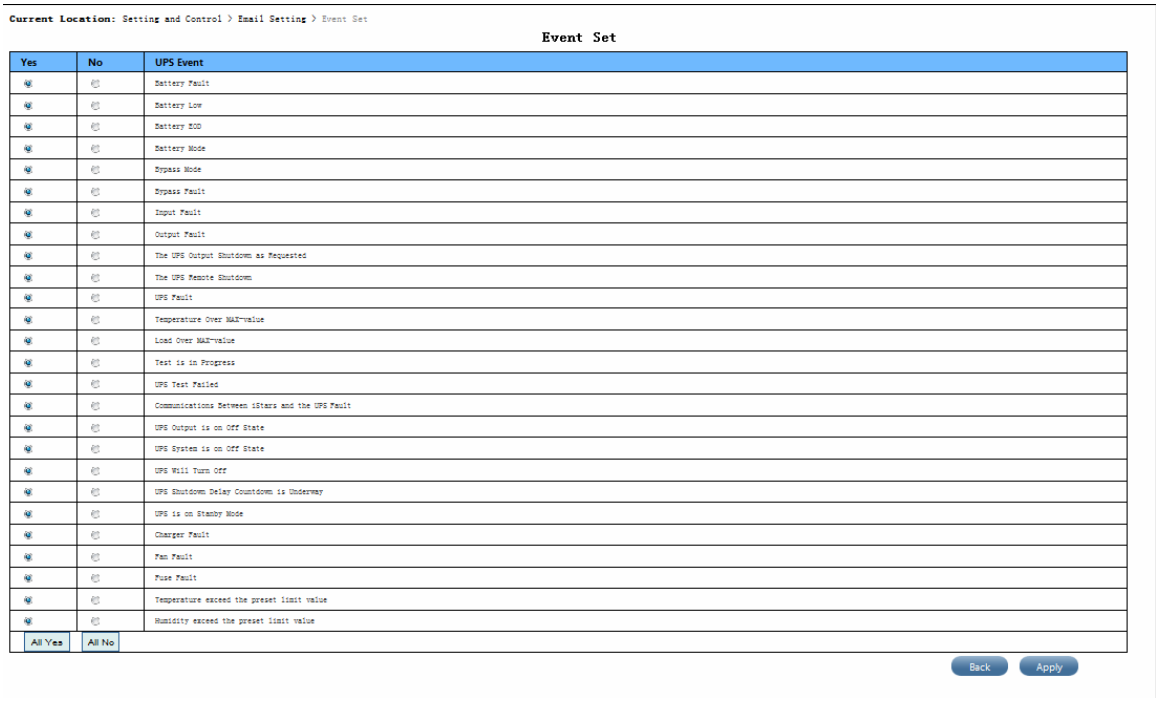


Figure 67: UPS event page

Receiver's Email address (used to receive daily statement)

Delivery time for daily statement each day

In this item, whether to send daily statement at the fixed time is set. Format of sending time is set as hour: minute (hh:mm). Hour and minute are tow integer respectively and separated by colon. The hour cannot be more than 23 and the minute cannot be more than 59, such as 12:00.

Account 1~4 :Set Email account used to receive daily statement and it supports 4 accounts at most.

Test setting

Test mail recipient

After setting Email address of recipient, and then click on "Send test Email" to test whether sending function of Email is normal or not. If function of Email is normal, Email recipient will receive a test Email.

4.4 iStars short message setting

For short message function, iStars should be connected to GPRS module. Related data and event of UPS that detected is sent in the form of short message. The setting interface includes short message communication status, test setting and mobile phone of recipient of short message (used to receive event notification). After settings are completed, click on "Apply" and the operation is completed.

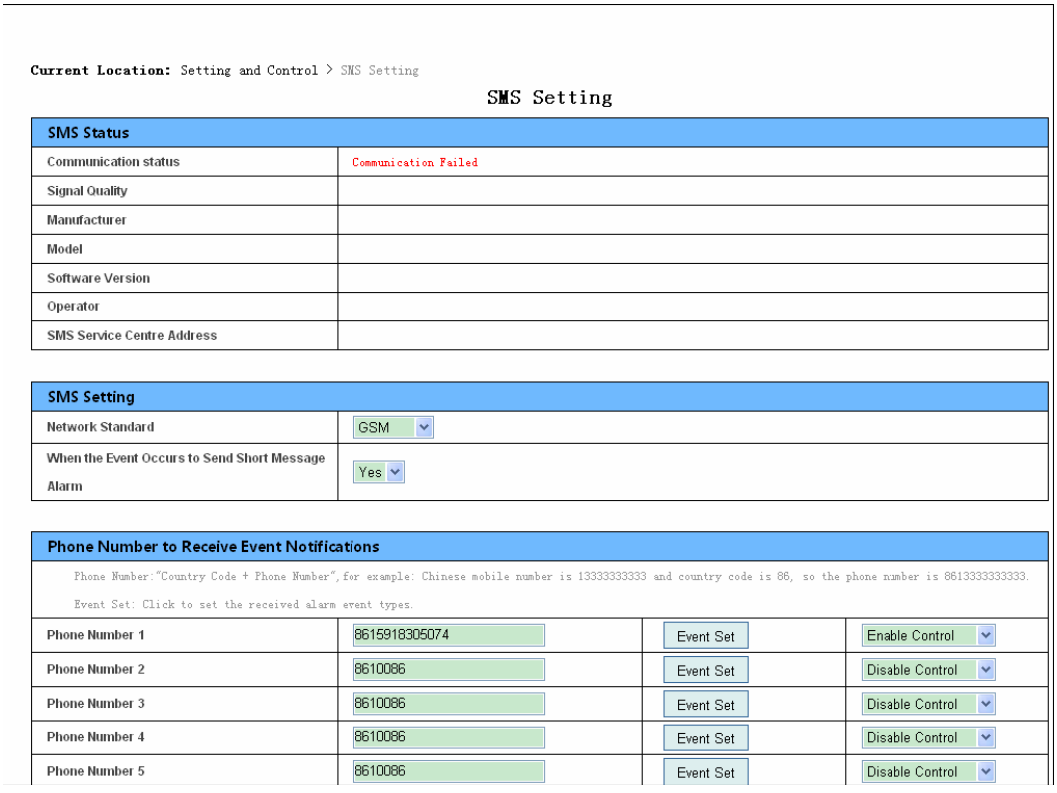


Figure 68: Short message setting page

Status of short message

To display communication status, signal quality, manufacture and other related information of external GPRS module of iStars.

Short message setting

Network type-setting and set whether to send the related event through short message when it detects abnormal stats of UPS.

Mobile phone number 1~8

Set receiver's mobile phone number and it supports 8 mobile phone numbers at most.

Select

The page selects the events detected by iStars and sends them, in whole or in part, to the corresponding mobile phone number. Specific events are shown in Figure 67.

Test setting

Test receiver's mobile phone number of short messages. Test whether functions of the page can be used and whether the receiver's mobile phone number can receive message. Click on "Test" and then the receiver will receive a test message.