

Liebert S600 Single and Parallel System 10kVA- 20kVA

User Manual

Version: V1.1

Revision date: September 27, 2018

BOM: 50490209008

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Special Declaration

Personnel Safety

1. This product must be installed and commissioned by professional engineers of the manufacturer or its authorized agent. Failure to observe this could result in product malfunction or personnel safety risk.
2. Take the time to read this product manual and the safety precaution thoroughly before installing and commissioning this product. Failure to observe this could result in product malfunction or personnel safety risk.
3. This product is not intended for life support equipment application.
4. Never dispose of the internal or external battery of this product in a fire, as it may explode and jeopardize personnel safety when exposed to flame.

Product Safety

1. If this product will be stored or remain de-energized for a long period, it must be placed in a dry and clean environment within specified temperature range.
2. This product should be used in an appropriate operating environment. For details, refer to the section on the environmental requirement in this manual.
3. This product is not designed for application in an environment:
 - Where the temperature and relative humidity are outside the specifications
 - Subject to vibrations or shocks
 - Where conductive dusts, corrosive gases, salts, or flammable gases are present
 - Near heat sources or strong electromagnetic interferences

Disclaimer

Vertiv disclaims any and all responsibility or liability for the defects or malfunction caused by:

- Application range or operating environment outside the specifications
- Unauthorized modification, improper installation or operation
- Force majeure
- Other actions not in compliance with the instructions in this manual

Application Note:

S600 UPS is suitable for IT load applications such as computers, servers, routers, CCTV, banking automation equipments, scientific equipments, projector, POS, etc. The UPS is suitable for industrial customer for above load and UPS should be installed in AC environment. The UPS is not suitable for industrial load such as motors, drives, lift, PLC, DCS, SCADA, etc.

Safety Precaution

Always observe the following safety symbols!

Safety symbol	Explanation
 Warning	Used for instructions intended to alert the user to the risk of death or severe injury should the unit be used improperly
 Note  Caution	Used for instructions intended to alert the user to the risk of injury or equipment damage should the unit be used improperly
 Important	Used for instructions intended to notify the user to carefully read and observe this unit though it may not cause damage

This manual contains information concerning the installation and operation of the Liebert eXM UPS single UPS module and parallel system 80kVA ~ 200kVA.

Read this manual thoroughly before installing, using and servicing the UPS.

Important

The UPS with standard configuration is a category C3 product for commercial and industrial application in the second environment. Installation restrictions or additional measures may be needed to prevent disturbances.

Important

The UPS adding C2 EMC option based on the standard configuration is a category C2 product. In a residential environment, this product may cause radio interference, in which case the user may be required to take additional measures.

Conformity and standards

This product complies with CE 2006/95/EC (low voltage safety) and 2004/108/EC (EMC), EMC standards of Australia and New Zealand (C-Tick), and the following UPS product standards:

- * IEC62040-1 General safety requirements for UPS
- * IEC62040-2-EMC
- * IEC62040-3 Performance requirements and test methods

For details, refer to *Chapter 11 Specifications*.

Continued compliance requires installation in accordance with these instructions and the use of manufacturer approved accessories only.

Warning

The selection of the upstream distribution protection equipment of the UPS shall be selected in accordance with the details in *3.1.4 Selection Of UPS I/O Switch* and shall comply with the local

electrical regulations.

 **Warning: high earth leakage current**

Earth connection is critical before connecting the input supply (including both mains supply and battery).

This equipment is installed with an EMC filter.

Earth leakage current is less than 3000mA.

Transient and steady state earth leakage currents, which may occur when the equipment is started, should be taken into account in the selection of instantaneous RCCBs or RCD devices.

RCCB which is sensitive to unidirectional DC pulse (class A) and insensitive to transient state current pulse must be selected.

Note also that the earth leakage currents of the load will be carried by the RCCBs or RCDs.

The equipment must be earthed in accordance with the local electrical code of practice.

 **Warning: backfeeding protection**

This UPS is fitted with a dry contact closure signal for use with an external automatic disconnect device (supplied by others) to protect against backfeeding voltage into the incoming terminal through the rectifier or bypass static switch circuit. A label must be added at all external incoming primary supply disconnect device to warn service personnel that the circuit is connected to a UPS. The text of the label has the following meaning: Risk of voltage backfeed! Isolate the UPS, then check for hazardous voltage between all terminals including the protective earth before working on this circuit.

 **User serviceable components (For service personnel)**

All equipment maintenance and servicing procedures involving internal access requires the use of a tool and should be carried out only by trained personnel. There are no user-serviceable parts behind covers requiring a tool/key for removal.

 **Battery voltage exceeds 400Vdc (For service personnel)**

All physical battery maintenance and servicing procedures requires the use of a tool/key and should be carried out only by trained personnel.

Take special care when working with the batteries associated with this UPS. When connected together, the battery terminal voltage will exceed 400Vdc and is potentially lethal.

Battery manufacturers supply details of the necessary precautions to be observed in working on, or in the vicinity of, a large bank of battery cells. These precautions should be followed implicitly at all times. Particular attention should be paid to the recommendations concerning local environmental conditions and the provision of protective clothing, first aid and fire-fighting facilities.

 **General safety (For users)**

Like other types of large power equipment, the UPS and battery circuit breaker box/battery cabinet

have high voltage inside. Because the components with high voltage can be accessed only when the front door is opened, the risk of contacting high voltage has been minimized. This equipment meets the IP20 standard, and other safety shields are provided inside the equipment.

There will not be any risk when operating this equipment according to the general instructions and the steps recommended in this manual.



Multiple power inputs (For users)

This UPS system receives power from more than one source. Disconnection of all AC source and the DC source is required before servicing.

This UPS has several circuits that are energized with high AC as well as DC voltages. Check for voltage with both AC and DC voltmeters before working within the UPS.



Warning

When the internal fuse of the UPS is damaged, it must be replaced with fuse of the same electric parameters by qualified personnel.



Important

Beside the communication board is a static sensitive area, an ESD-proof action is critical before contacting with this area.

Revision Information

V1.0 (August 21, 2018)

Initial release.

V1.1 (September 27, 2018)

Revision 1

V1.2 (October 11, 2018)

Revision 2

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Chapter 1 Product Information

S600 10~ 20kVA UPS is an intelligent online UPS system with sine wave output developed by Vertiv Co. The UPS offers reliable and high-quality AC power to the precision instrument.

This chapter introduces the features, model configurations, appearance and components, operating principle, UPS state and operation mode, and specifications of the UPS.

1.1 Features

The UPS features include:

- Output power factor is 1, which enhances the UPS load capacity.
- On-line double conversion efficiency up to 91% and ECO efficiency up to 94%, which provide more efficient products for the customer.
- Product volume decreased by 30% compared with the previous generation; little space occupied, simple handling and assembly.
- Capable of parallel connection to achieve up to 3 + 1 parallel redundant power
- High-frequency double conversion topology structure, with high input power factor, wide input voltage range, and output immune to grid interference, thus adaptable to areas with unstable mains supply
- Full digital control platform and hardware design platform, which can adapt worse unstable mains supply and load impact
- Support 12, 16, 20-block batteries (10kVA); 24, 32, 40-block batteries (20kVA). The long back-up model has a built-in large power charger with 13A charging capacity to provide fast charging
- Provide programmable terminals with cascade protection, to protect the key devices for the customer when the load is heavy
- Innovative design of the layout and the whole process greatly promote the reliability of the product; pass high temperature humidity durability experiment test of 1000 hours
- Operation and display panel with colorful LCD to help you learn about the UPS operation state and operating parameters. The LCD display will change according to the layout of the model
- Integrate Ethernet port, support HTTP protocol, and use the web browser to achieve the remote monitoring, no extra monitoring software required
- Full configuration can achieve the functions such as Interlock, external temperature & humidity sensor, and battery module automatic identification
- Capable of ECO power supply mode and smart sleep mode, which help you save energy to the maximum extent

1.2 Model Configuration

Table 1-1 Model Configurations

Model	Input	Output	Remark
10kVA	Three-Phase	Single phase	Common input configuration, split bypass configuration
20kVA	Three-Phase	Single Phase	Common input configuration (default), split bypass configuration

1.3 Appearance and Components

1.3.1 Appearance

The UPS appearance is shown in Figure 1-1.

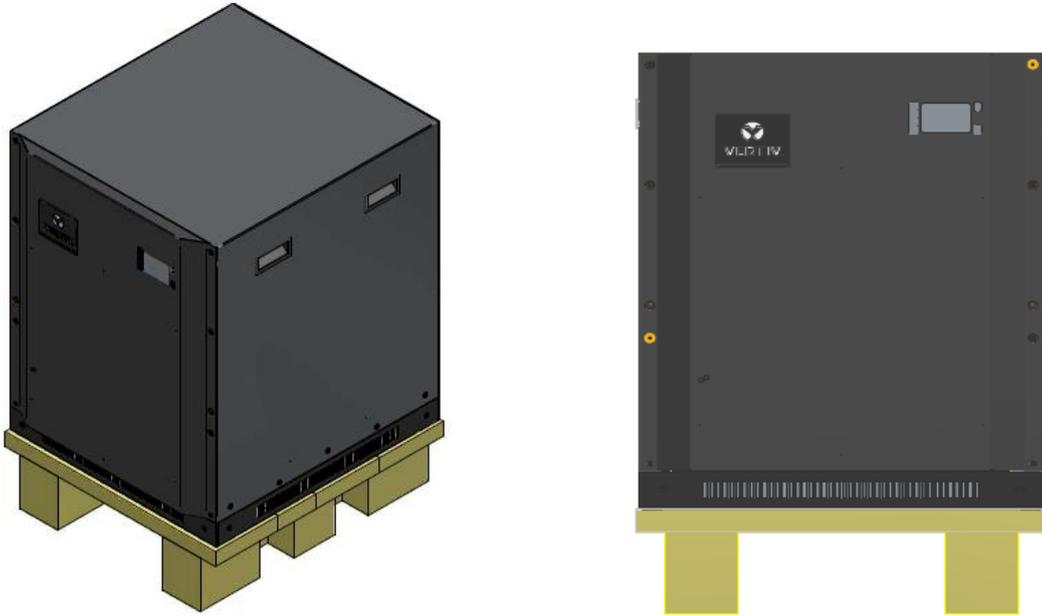


Figure 1-1 UPS Appearance in isometric view and front view respectively)

1.3.2 Components

Front Panel

As shown in Figure 1-2, the UPS front panel provides ventilation holes, operation and display panel, LED indicators and functional keys.

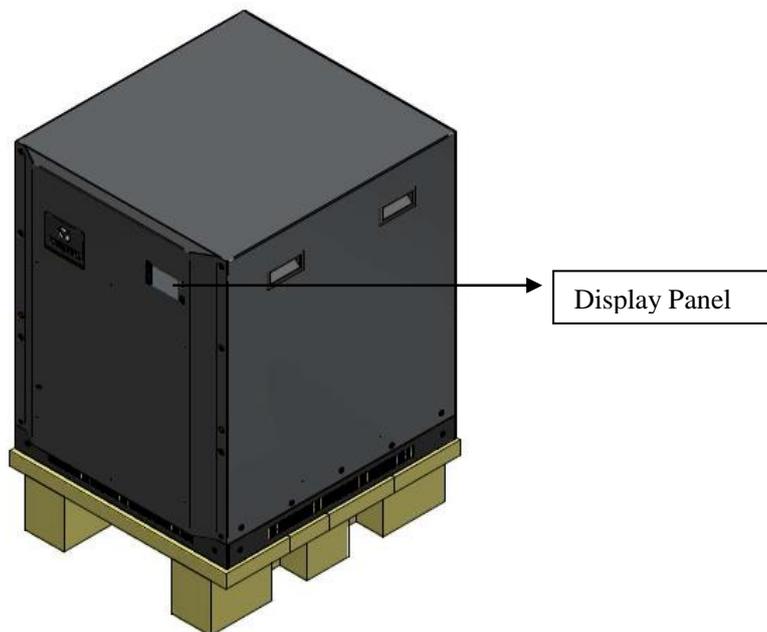


Figure 1-2 UPS front Panel

Rear Panel

As shown in Figure 1-3, the UPS rear panel provides input, output, bypass, maintenance bypass and battery MCBs. The figure also shows UPS power module, output transformer and a contactor. Transformer primary and secondary are connected to the contactor through cables.

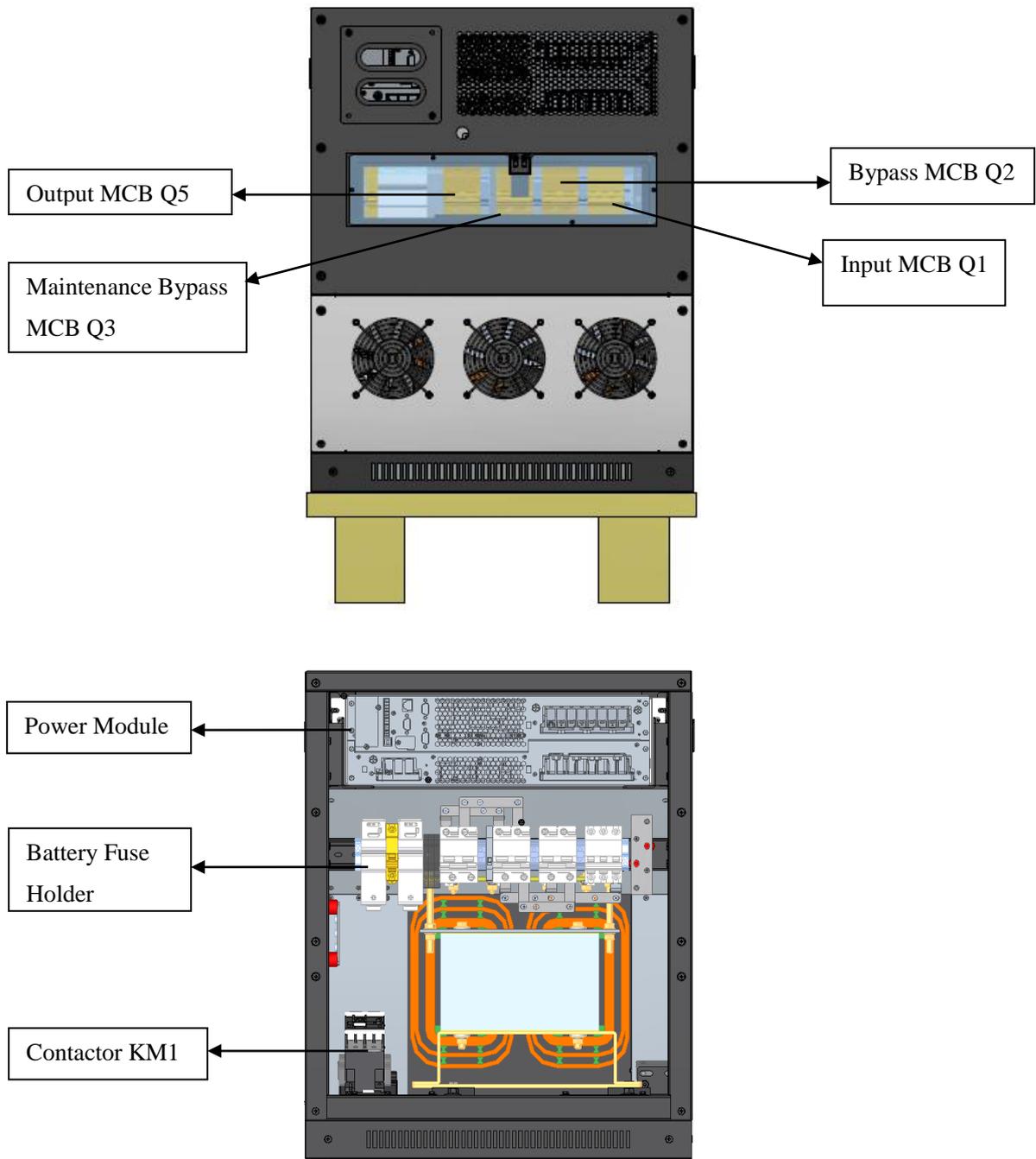


Figure 1-3 UPS Rear side

1.4 Operating Principle

The operating principle of the UPS is shown in the figure 1-4.

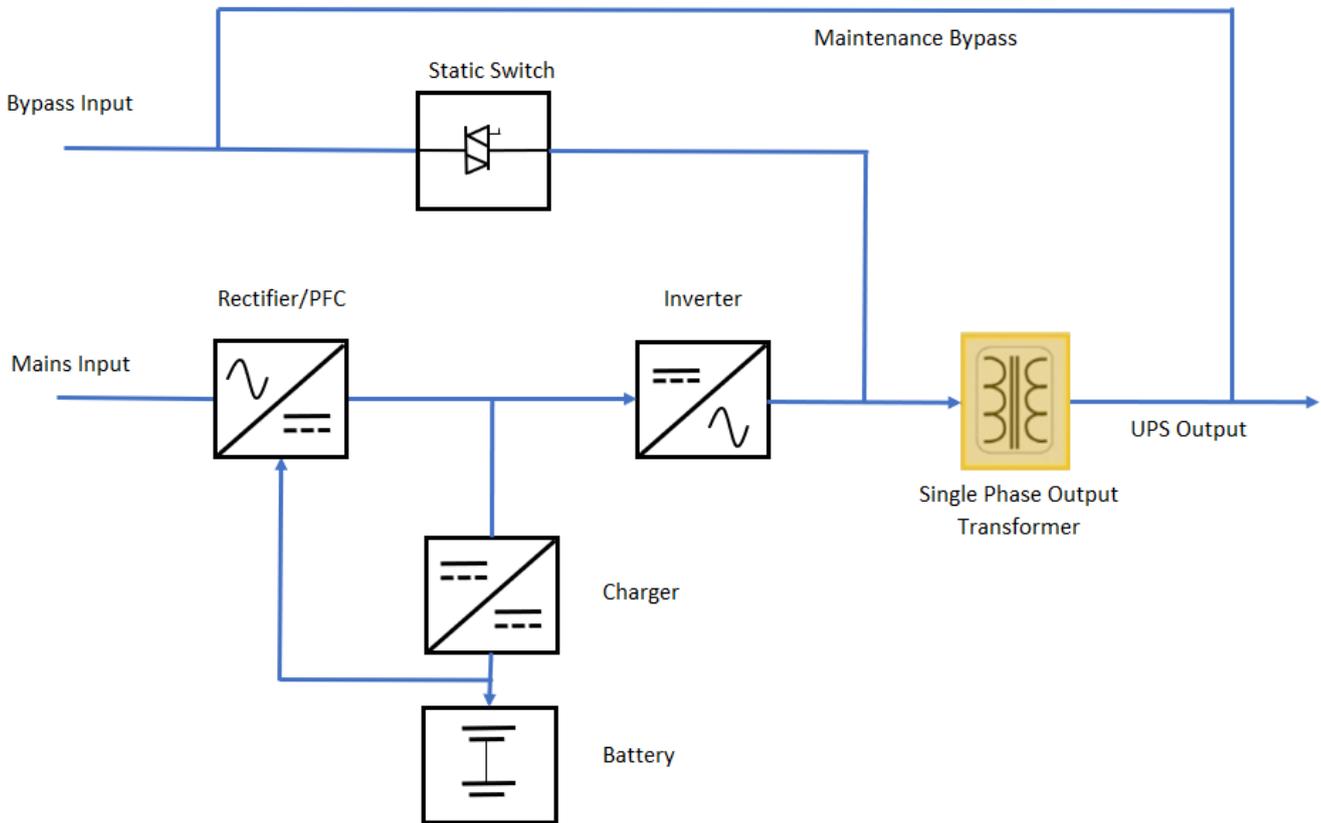


Figure 1-4 UPS Operating Principle

1. The UPS is composed of mains input (main and bypass), rectifier/PFC, charger, inverter, bypass, battery, DSP controller, single phase transformer, contactor and final output.
2. When the mains is normal, the rectifier will start, and the charger will charge the battery string. Before turning on the UPS, the output voltage is bypass voltage, and the mains supplies power to the load through the bypass. After turning on the UPS, the electronic transfer switch connects the inverter output to the load, and the mains supplies DC power to the inverter through the rectifier/PFC circuit. The inverter then converts DC power into pure sine wave AC power and supplies the AC power to the transformer connected to contactor. Final output is supplied to load from transformer secondary through electronic transfer switch. Refer figure 1-3 for the position of contactor and transformer.
3. When the mains is abnormal, the rectifier/PFC circuit boosts the battery voltage and supplies it to the inverter. The inverter then converts it into pure sine wave AC power and supplies the AC power to the load through the electronic transfer switch.
4. After the mains returns to normal state, the UPS will automatically transfer from Battery mode to Normal mode, the mains supply DC power to the inverter through the rectifier/PFC circuit, and then the electronic transfer switch supplies AC power to the load.

1.5 UPS State and Operation Modes

The UPS state and operation mode include: Normal mode, Bypass mode, Battery Mode, ECO mode, Fault State mode and Maintenance Bypass mode. The operation schematic diagrams of Normal mode, Bypass mode, Battery Mode and Maintenance bypass mode are shown in Figure

1.5.1 Normal Mode

When the mains input is normal, the load is supplied with voltage-stabilizing and frequency-stabilizing power by the mains after processing of the rectifier and the inverter, and meanwhile, the charger is charging the battery. The operation mode is Normal mode.

In Normal mode, the run indicator (green) is on, the alarm indicator is off, and the buzzer is silent.

1.5.2 Bypass Mode

If the overload overtime, inverter or rectifier failure appears during the UPS operation in Normal mode, the UPS will transfer to Bypass mode, that is, the load is powered by the bypass source, which comes directly from the mains input. If the rectifier is normal, the internal charger will charge the battery.

In Bypass mode, the run indicator (green) is on, alarm indicator (yellow) is on, and the buzzer beeps every second. The 'Current' page in LCD will display 'On Bypass'.

1.5.3 Battery Mode

Upon mains failure or voltage out of range, the rectifier and internal charger will stop running, and the battery will supply power to the load through the inverter. In Battery mode, the run indicator (green) is on, alarm indicator (yellow) is on, and the buzzer beeps every second. The 'Current' page in LCD will display 'On Battery'.



Note

1. The battery has been fully charged before delivery. However, transportation and storage will inevitably cause some capacity loss. Therefore, it is required to charge the battery for eight hours before putting the UPS into operation for the first time, to ensure the adequate backup time for battery.
2. The battery cold start can also be used to start the UPS from the Battery (charged) mode upon mains failure. Therefore, the battery power can be used independently for improving the system availability to some extent.

1.5.4 ECO Mode (For Single UPS with External Battery Only)

In ECO Mode, the load is powered by bypass when the bypass voltage is normal, and the load is powered by inverter when the bypass voltage is abnormal. ECO mode is an energy-saving operation mode. For power equipment insensitive to power grid quality, you can use the ECO mode for power supply through bypass to reduce the power loss.



Note

1. In ECO mode, if the bypass failure or abnormal bypass voltage appears when the output is not overloaded, the UPS will transfer to Normal mode. However, if the bypass failure or abnormal bypass voltage appears when the output is overloaded, the UPS will not transfer to Normal mode, but shut down the bypass.
2. In ECO mode, the efficiency of the UPS is up to 94%.

1.5.5 Fault State

In the normal mode, the UPS will transfer the load to Bypass mode in case of inverter failure or UPS over-temperature. In Battery mode (with no bypass mains), the UPS will shut down and stop the output if the inverter failure or UPS overtemperature appears. In UPS Fault State, the alarm indicator (red) will be solid on, the buzzer will keep beeping, and the corresponding fault information will be displayed on LCD.

1.5.6 Maintenance Bypass Mode

If maintenance and repair for UPS are needed, you can switch the load to the Maintenance Bypass through maintenance bypass MCB, and the power to the load is not interrupted. The maintenance bypass MCB is located at the back of the UPS cabinet, and the capacity meets the requirements of total load capacities.



Note

When the UPS has malfunctions, and can not working normally, please get in touch with the nearest Vertiv branch office or local service center. It is prohibited to repair the UPS by yourself, otherwise the personnel injury and damage to the equipment will occur.

1.6 Specifications

Table 1-2 Specifications

Item		Specifications	
		10kVA (3-in 1-out)	20kVA (3-in 1-out)
Input	Rated voltage	400vac 3-phase,4 wire	400Vac 3-Phase,4 wire
	Volatge Range	176 -288VAC at 100% load; 100VAC - 288VAC at 50% load	
	Rated Frequency	50Hz/60Hz	
	Frequency Range	40Hz ~ 70Hz	
	Power factor	≥ 0.95 at full load	
	Input Phase Reversal	Yes	NO
Output	Rated power	10KVA/10kW	20KVA/20kW
	Voltage	220Vac/230Vac/240Vac (Single phase output)	
	Frequency synchronization range	Rated frequency±3Hz. Configurable range: ±0.5Hz ~ ±5Hz	
	Rated Power Factor	Unity	
	Crest Factor	3 : 1	
	Voltage harmonic distortion	< 2% (linear load)	
	Voltage Regulation	± 2%	
	Dynamic response recovery time	60ms	40ms
	Isolation transformer	Inbuilt at UPS Output	
	Inverter Overload Capability the utility mode	At 25°C: 105% ~ 125%- 5min; 125% ~ 150%-1min; 150%- more than 200ms	
	Inverter Overload Capability the battery mode	At 25°C :105% ~125%-60~ 30 s; >125%- more than 200ms	

Item		Specifications	
		10kVA (3-in 1-out)	20kVA (3-in 1-out)
Bypass	Bypass Voltage range	Upper limit: +10%, +15% or +20%; default: +20%	
		Lower limit: -10%, -20%, -30% or -40%; default: -40%	
	Separate Bypass	Yes	
	Manual Bypass	Inbuilt	
Efficiency	ECO Mode	> 94%	> 94%
	Mains efficiency (RL)	> 91%	> 91%
	Inverter Efficiency(DC-AC)	88%	88%
Battery	Type	Sealed, lead-acid, Tubular,LI-ION	
	No's of Batteries	12 ⁽¹⁾ , 16, 20; 16 by default	24 ⁽¹⁾ , 32, 40; 32 by default
	Rated Voltage	144Vdc ~ 240Vdc	288Vdc ~ 480Vdc
	Battery Fuse Disconnecter	Inbuilt	
	Battery charging capacity	8A	13A
Transfer Time	Mains - Battery	0ms	
	Inverter- Bypass	Synchronous transfer: ≤0ms	
		Asynchronous transfer (default): ≤20ms	
UPS Parallel Numbers		4	
Noise		< 65dB	
Panel display mode		Graphical LCD display	
Ambient Conditions	Operating temperature	0°C ~ 50°C ⁽²⁾	
	Storage temperature	-40°C ~ +70°C (battery excluded); -25°C ~ +55°C (battery included)	
	Relative humidity	5%RH ~ 95%RH, non-condensing	
	Altitude	≤3000m; derating when higher than 3000m	
Mechanical Parameters	W*D*H (mm)	550 X 620 X 700	550 X 620 X700
	Weight (Kg)	138	158
	Ventilation	Forced -air cooled	
	Ingress protection	IP21	
	Color	Powder coated Black Texture finish	
	Cable entry	Bottom	

Note: (1) UPS power will derate to 70% of the total capacity

(2) UPS power will derate to 80% at 40 deg and 70% at 50 deg

Chapter 2 Installation and Commissioning

This chapter briefly introduces the mechanical installation of the UPS, cable connection and commissioning of the single UPS.

Each site has its peculiarity, so this chapter provides the guidance with general installation procedures and methods for the installation engineer who should conduct the installation according to the actual conditions.



- 1. The UPS should be installed by a qualified engineer according to the information contained in this chapter. If any problem is found, please get in touch with Vertiv local service center immediately.*
- 2. The UPS shall not be powered on without approval of the commissioning engineer.*
- 3. For other equipment which is not introduced in this manual, the detailed information about mechanical installation and electrical installation are delivered with the equipment.*

2.1 Unpacking and Inspection

The UPS adopts the carton box. Open carton box as shown in the figure 2-1. Visually inspect the UPS appearance for transportation damage. If any problem is found, please notify the carrier immediately. Check the accessories and models against the delivery list. If any problem is found, please notify the dealer immediately.

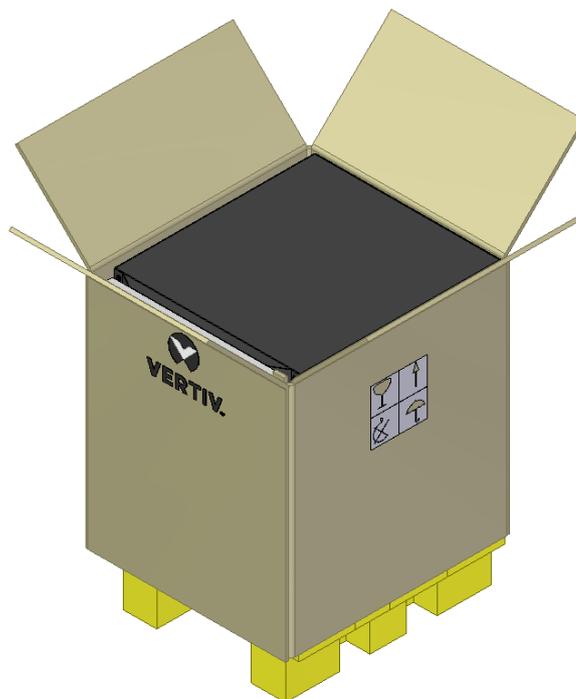


Figure 2-1 Unpacking the UPS

2.2 Equipment's Accessories

This section describes the parts, which are supplied along with the UPS. These parts must be examined on receipt of the system.

2.2.1 UPS

The UPS is mounted on a wooden base palette and fixed on to the same. The unit is wrapped in polythene sheets and enclosed in a corrugated box. The UPS cabinet can be moved by human, or forklift or other similar lifting equipment.

2.3 Installation Preparation

2.3.1 Location

To extend the UPS life, the chosen place must offer:

- Convenient wiring
- Adequate operator access area
- Good ventilation to meet the heat dissipation requirements
- No corrosive gas, such as sulfur dioxide and so on
- No excessive moisture or heat source
- No excessive dust
- Compliance with fire-fighting requirements
- Operating temperature compliant with the specifications, see Table 1-2 for details

2.3.2 Environmental Requirement

UPS room The UPS is designed for indoor installation, which should be installed in a clean and well-ventilated environment, to keep the ambient temperature within the specifications.

The internal fans provide forced air cooling for the UPS. Cooling air enters the UPS through the ventilation holes on the front panel and exhausts the hot air through the back-ventilation holes. Therefore, do not obstruct the ventilation holes. Maintain at least 200mm clearances between the front, rear of the UPS and the wall or adjacent equipment (see Figure 2-2), to avoid obstructing the UPS ventilation and heat dissipation. Otherwise, the UPS internal temperature will rise, which will shorten the UPS life.

If necessary, an indoor exhaust fan should be installed to keep the indoor temperature from rising. An air filter should be used in a dusty environment where the UPS is to be operated.

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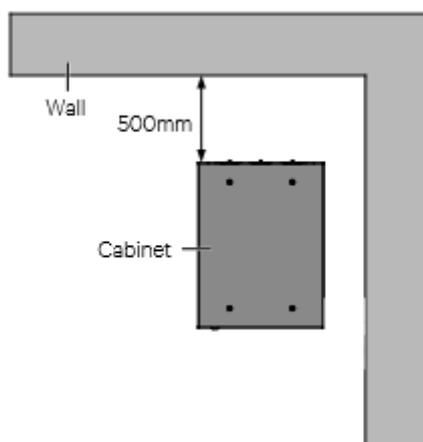


Figure 2-2 Installation Clearances (Top view of rack installation)



Note

1. The UPS should be installed only on the concrete surface or other non-flammable surfaces.
2. As shown in Figure 2-5, the demonstration of the clearance between the rear panel of the cabinet and the wall is 500mm. The clearance should not be less than 200mm, it needs to be considered according to the actual situation for the sake of maintenance convenience.

Battery Room

A small amount of hydrogen and oxygen will be generated at the end of battery charging; therefore, you must ensure that the fresh air ventilation of battery installation environment meets the EN50272-2001 requirements.

The battery ambient temperature should keep constant, for the ambient temperature is the main factor to affect the battery capacity and life. The battery standard operating temperature is 20°C, operation above this temperature will shorten the battery life, and operation below this temperature will reduce the battery capacity. If the battery average temperature in operation rises from 20°C to 30°C, the battery life will be reduced by 50%; if the battery temperature in operation exceeds 40°C, the battery life will be decreased exponentially. In general, the allowed ambient temperature of the battery is 15°C ~ 25°C. The battery should be kept away from heat and ventilation holes.

When the UPS uses an external battery, you must install a battery protective device (such as fuse or circuit breaker) in areas near the battery and use the shortest wiring distance for the connection between the protective device and the battery.

Storage Environment

When the UPS does not need to be installed immediately, the UPS must be stored indoors to be protected from the excessive moisture or over-temperature environment. The battery requires dry and low temperature, well-ventilated environment for storage, and the most suitable storage temperature is 20°C ~ 25°C.



Battery Hazards

During the battery storage, the battery must be periodically charged according to the battery instructions. When charging the battery, you can connect the UPS to the mains temporarily to charge and activate the battery.

2.4 Selecting Power Cables

I/O cables and battery cables are required for connection. When connecting the cables, you should follow the local wiring regulations, take the environment situation into account, and refer to Table 3B of IEC60950-1.

The max. current in different operating modes is listed in Table 2-1, the recommended min. cable CSA is listed in Table 2-2. Select the appropriate cables according to Table 2-1 and Table 2-2.

Table 2-1 Max steady state AC and DC current

UPS Power(kVA)	Rated Current						
	Max Input Phase Current			Max Output Phase Current			Max.battery discharging current (A)
	220V	230V	240V	220V	230V	240V	
10(3-in 1-out)	20	20	20	46	44	42	58
20(3-in 1-out)	44	43	42	91	88	85	58



Note

When the battery cables are selected, the maximum allowable voltage drop is 4Vdc according to the current value shown in this table. Do not ring the cables to avoid increasing the electromagnetic interference (EMI).

1: The input mains current of the rectifier and the bypass.

2: Non-linear load (switch mode power) affects the neutral cable design of the output and the bypass. The neutral cable current may exceed the rated phase current, up to 1.732 times as large as the rated current.

Table 2-2 Single UPS cable CSA (unit: mm², ambient temperature: 25 deg C)

Model	Input	Output	Bypass	Neutral Cable	PE	Battery	Battery PE
10(3-in 1-out)	10	10	10	10	10	10	10
20(3-in 1-out)	10	10	10	10	10	10	10

The recommended I/O MCB capability of the UPS is listed in Table 2-4; select the MCBs according to your requirements.



Note

1. The UPS is high leakage current equipment, it is not recommended to use the MCB with leakage current protection.
2. The specified upstream breakers below are required to obtain the conditional short-circuit current rating, I_{cc} at 10kA symmetrical rms. The specified upstream breakers should comply with an IEC 60947 series Standard.

Table 2-3 UPS I/O MCB Selection

MODEL	Recommended capability of external MCB input	Battery Fuse/MCB Selection	Recommended capability of output external MCB	Recommended capability of Maintenance bypass external MCB
10(3-in 1-out)	32A (mains) 63A (bypass)	63A	63A	63 A
20(3-in 1-out)	63A (mains) 125A (bypass)	63A	125A	125A



Note

1. The 3-in 3-out bypass MCB (125A) is used to connect the bypass input upon split-bypass configuration. The main MCB can be used only upon common input configuration.
2. The battery CB should use the 250Vdc or above.

2.5 Connecting Battery Cables

1. Before connecting the battery cables, confirm that the actual battery cell number and capacity are consistent with the parameter settings on the LCD menus.
2. It is prohibited to reverse the polarity of the battery cables.
3. Before replacing the battery module and connecting the battery cables, disconnect the DC battery MCB, power off the UPS completely, and conduct isolation protection on the terminals.
4. It is recommended that the battery cable should not be longer than three meters. Otherwise, the UPS cannot operate normally.

2.6 Single UPS Commissioning

2.6.1 Start-up Interface

If the system is first start-up, only mains input mode can be used, and the LCD screen will display the start-up interface, see figure 2-3.

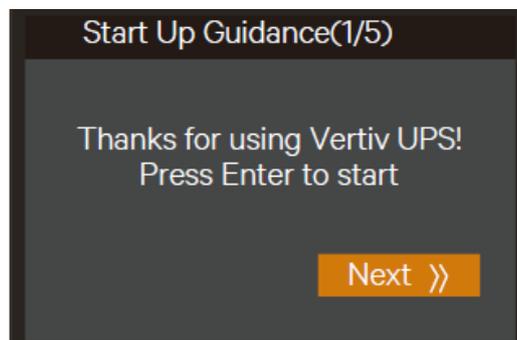


Figure 2-3 Start up interface

2.6.2 Normal Mode Start-Up

1. Close the external output MCB and input MCB of the UPS one by one.
2. The rectifier runs in normal state for about 30 seconds, the start-up of the rectifier is finished.
3. Finish and check the parameter settings of the single UPS.
 - a) At main menu screen, press the  or  key to select 'Settings', and press the key to enter the interface shown in Figure 2-4.

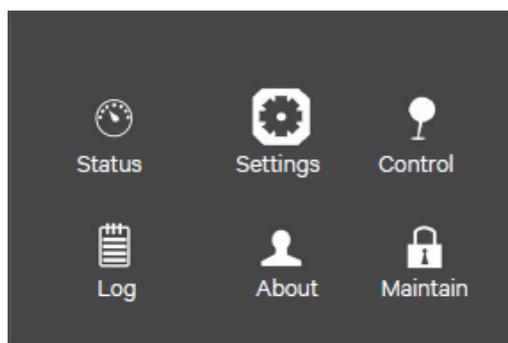


Figure 2-4 Main menu screen

b) Press the  or  key to select and set corresponding parameters (taking 'Output' as an example). As shown in Figure 2-5.

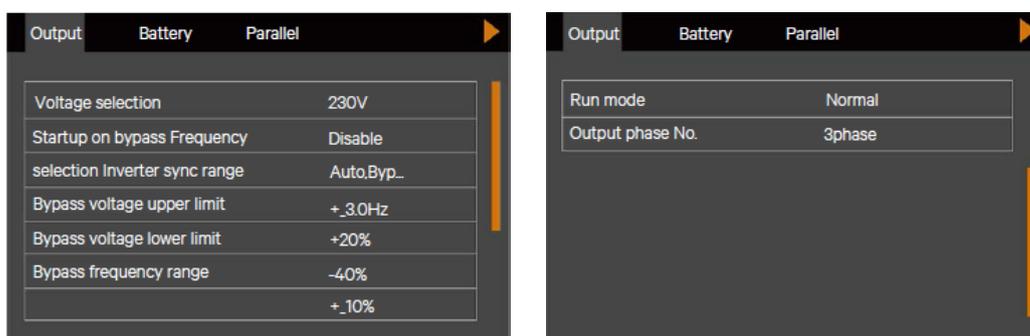


Figure 2-5 Output interface screen

4. After setting corresponding parameters, press the power button for two seconds, and the LCD prompts a dialogue box shown in Figure 2-6.

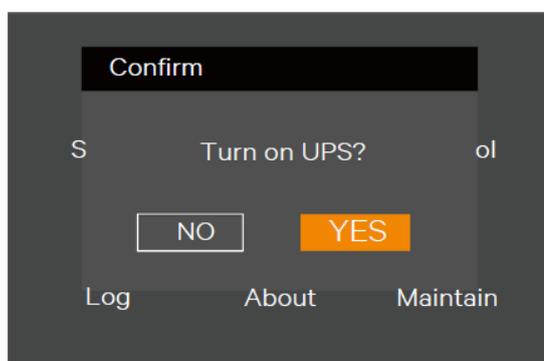


Figure 2-6 Turning on UPS

After selecting 'YES', the run indicator (green) blinks, the inverter starts, and the run indicator turns on.

5. Measure whether the inverter output voltage is normal.

6. If the battery is not connected, the alarm indicator is yellow. If the battery is connected, the alarm indicator turns off.

2.6.3 Battery Mode Start-Up

1. Close the battery MCB and press the power button on the UPS front panel for two seconds, the LCD displays the startup screen. The alarm indicator will be yellow, and the buzzer will beep continuously after the rectifier finishes the startup.

2. Press the power button for two seconds, the LCD prompts a dialogue box shown in Figure 2-7.

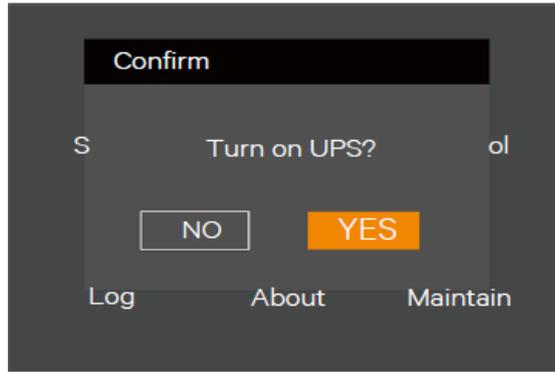


Figure 2-7 Turning on UPS

After selecting 'YES', the inverter starts, and the run indicator (green) is on.

Chapter 3 Parallel UPS Installation and Commissioning

This chapter introduces the features, requirements, installation and commissioning of the parallel system.

The UPS parallel system provides the user with $N + X$ ($2 \leq N + X \leq 4$, $X=0$ or 1) parallel configuration, N stands for the basic parallel sets, X stands for the redundant sets.

3.1 Features

1. The software and the hardware of each UPS in parallel system are the same as those of the single UPS. The basic parameters of the parallel system can be set through the LCD (Refer to 3.5.2 Parallel System Parameters Setting for details), and the detailed parameters can be set through the background software (For service engineers only).
2. The parallel cables form a ring connection (Refer to 3.4.2 Connecting Parallel Cables for details) to provide reliability and redundancy for the system. The intelligent parallel logic provides the user with maximum flexibility. For example, each UPS in the parallel system can be switched off or on in random order; seamless transfer can be achieved between Normal mode and Bypass mode, and the transfer is automatically recoverable: that is, after the overload is removed, the system will return to the original operation mode automatically.
3. The total load of the parallel system can be queried through the LCD of each UPS.

3.2 Requirements

A UPS system composed of multiple parallel-connected UPSs is equivalent to a large UPS system. Nevertheless, it provides increased system reliability. To ensure equal utilization of all UPSs and compliance with relevant wiring regulations, the following requirements must be met:

1. All single UPSs must have the same capacity. The 10kVA//20kVA UPS must be connected to the same bypass source.
2. The bypass input power (10kVA/20kVA only) and the rectifier input power must be connected to the same neutral line input terminal.
3. If a residual current detector (RCD) is required, it must be set correctly and installed before the same neutral line input terminal, or it must monitor the protective earth current of the system. Refer to 'Warning: high leakage current' of Safety Precautions before Contents.
4. The outputs of all single UPSs must be connected to the same output bus.
5. Because the UPS parallel system is not fitted with any auxiliary contact detection devices for the output MCB of the UPS, removing the single UPS from the parallel system before maintenance and adding the single UPS into the parallel system after maintenance must be conducted strictly following the procedures provided in 5.2 Transfer Procedures Between Operation Modes. Failure to observe this may affect the reliability of the load power supply.

3.3 Connecting Power Cables

Each single UPS of the parallel system needs to configure the MCB and cables respectively, refer to 2.4 Connecting Power Cables for the specification. The recommended configurations of the total power cables are listed in Table 3-1 and Table 3-2 for the parallel system.

3.3.1 Connecting Power Cables

The power cables of the UPS are connected to the I/O terminal block of the rear panel of the UPS, the layout of the I/O terminal block is shown in 2.6.1 Connecting I/O Cables.

Table 3-1 Input & Output cable CSA for 10 kVA parallel system (unit:mm², ambient temperature: 25 deg C)

Parallel UPS number	3-in 1-out			
	Total input Phase line for parallel system	Total input neutral line for parallel system	Total output cable for parallel system	Total grounding cable for parallel system
2 Units	10	35	25	35
3 Units	10	70	50	70
4 Units	16	120	70	120

Table 3-2 Input & Output cable CSA for 20 kVA parallel system (unit:mm², ambient temperature: 25 deg C)

Parallel UPS number	3-in 3-out				3-in 1-out		
	Single Input cable for parallel system	Single output cable for parallel system	Total neutral line for parallel system	Grounding cable for parallel system	Total output cable for parallel system	Total neutral line for parallel system	Grounding cable for parallel system
2 Units	25	25	25	25	50	50	50
3 Units	35	35	35	35	70	70	70
4 Units	50	50	50	50	95	95	95

3.3.2 Connecting Parallel Cables

The parallel system provides parallel cable option. The parallel cables form a ring connection through the parallel ports on the rear panel of the UPS. Taking 20kVA model for example, the cable connection schematic diagram of 3 + 1 parallel system is shown in Figure 3-1.

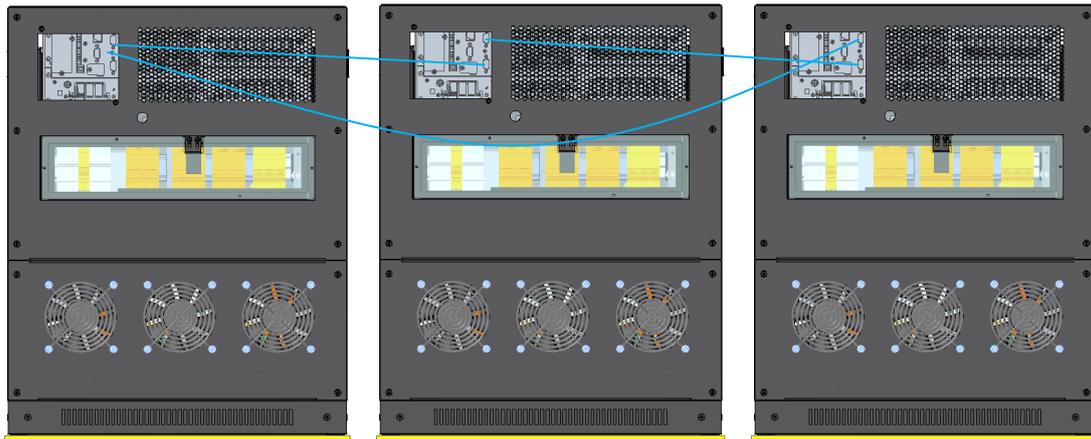


Figure 3-1 Cable Connection schematic diagram of 2 + 1 parallel system (20kVA)



Note

1. The Vertiv parallel cables must be used for the parallel system.
2. If the parallel communication fault occurs during the parallel commissioning or operation just shut off the system and check whether the connection of the parallel cables is correct.
3. During parallel system operation, do not unplug the parallel cables to avoid system damage risk.

3.3.3 Connecting Battery Cables

In the parallel system, the 20kVA UPS can either share the battery strings or use the battery strings independently. The 10kVA UPS can only use the battery strings independently.

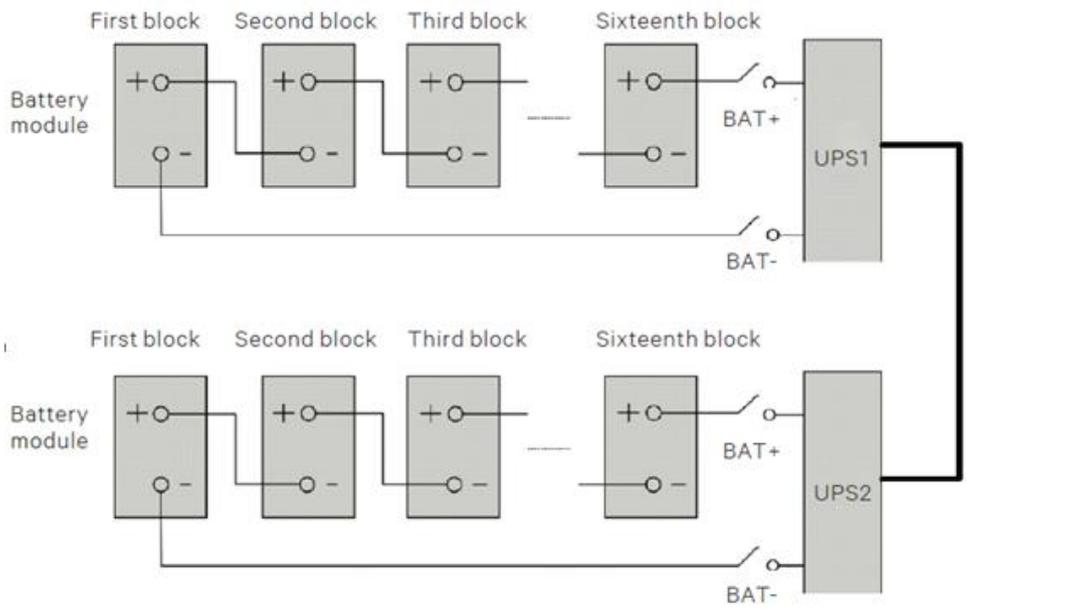
Using battery string independently

When each UPS of the parallel system uses the battery string independently, the battery cables connection of each UPS in the parallel system is the same with that of the single UPS, refer to 2.5 Connecting Battery Cables for the installation method. The schematic diagram of battery strings in 1 + 1 parallel system with independent battery strings is shown in Figure 3-2 (a) and (b). Refer to 2.4 Connecting Power Cables to configure an MCB.

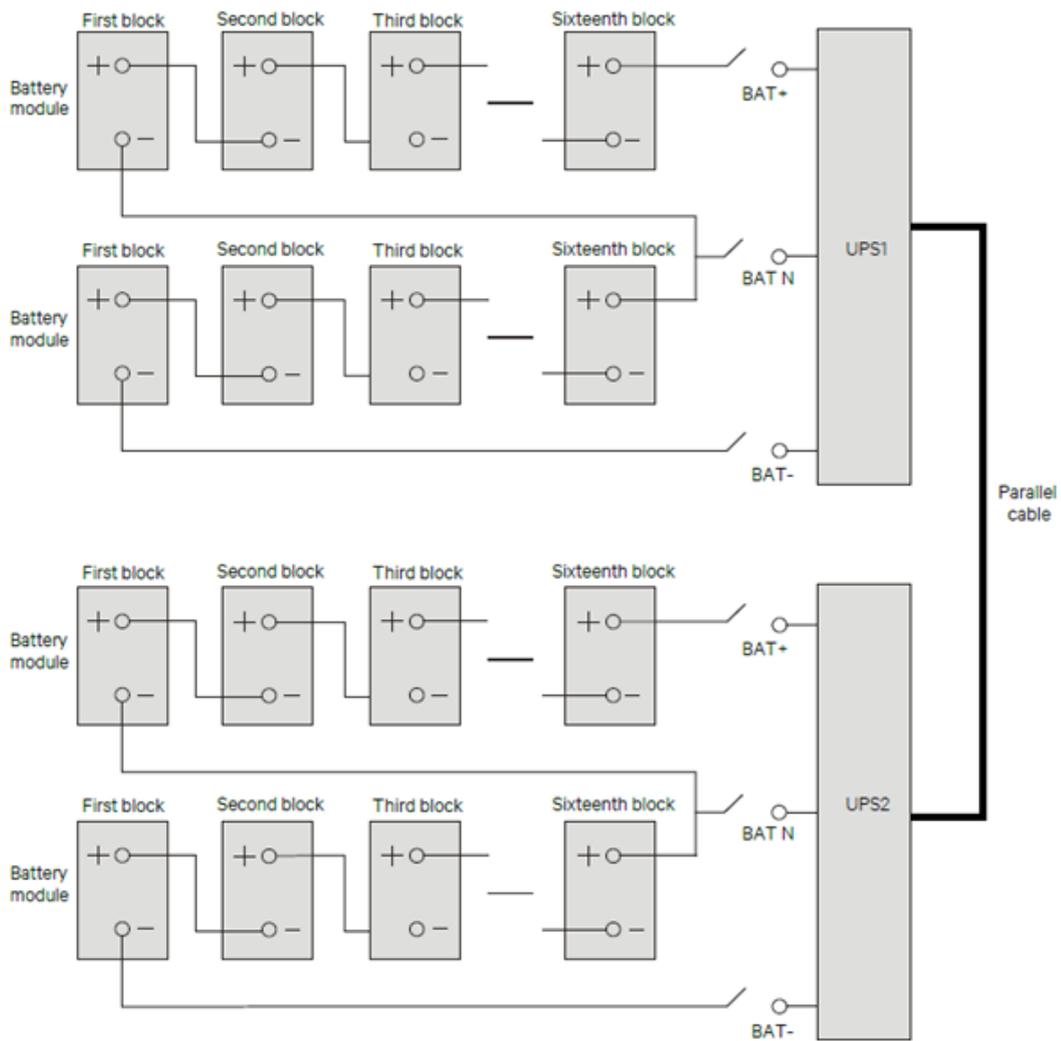


Note

Make sure that the LCD settings are correct when using the battery strings independently for the parallel system, refer to 3.5.2 Parallel System Parameters Settings for details.



(a)



(b)

Figure 3-2 Connection Principle Diagram upon using battery string independently in (a) 10kVA and (b) 20kVA respectively

Sharing battery strings (20kVA only)

Using the shared battery strings in the parallel system can save investment in equipment for the users.

Note

1. If the battery strings (four standard battery modules, option) are shared in parallel system, the backup time of the battery module ranges from two minutes to three minutes at full load.
2. To ensure the abundant backup time of the battery, it is recommended to use the external battery cabinet with big capacity.

Wiring

Power off the parallel system completely, disconnect the battery MCBs of all single UPSs, and then use battery cables to connect '+' , 'N' , '-' and 'PE' terminals of the battery strings respectively to 'BAT+', 'BAT-', 'BAT N' and 'PE' terminals of the corresponding I/O terminal block of the UPS in the parallel system through each battery MCB, as shown in Figure 3-3.

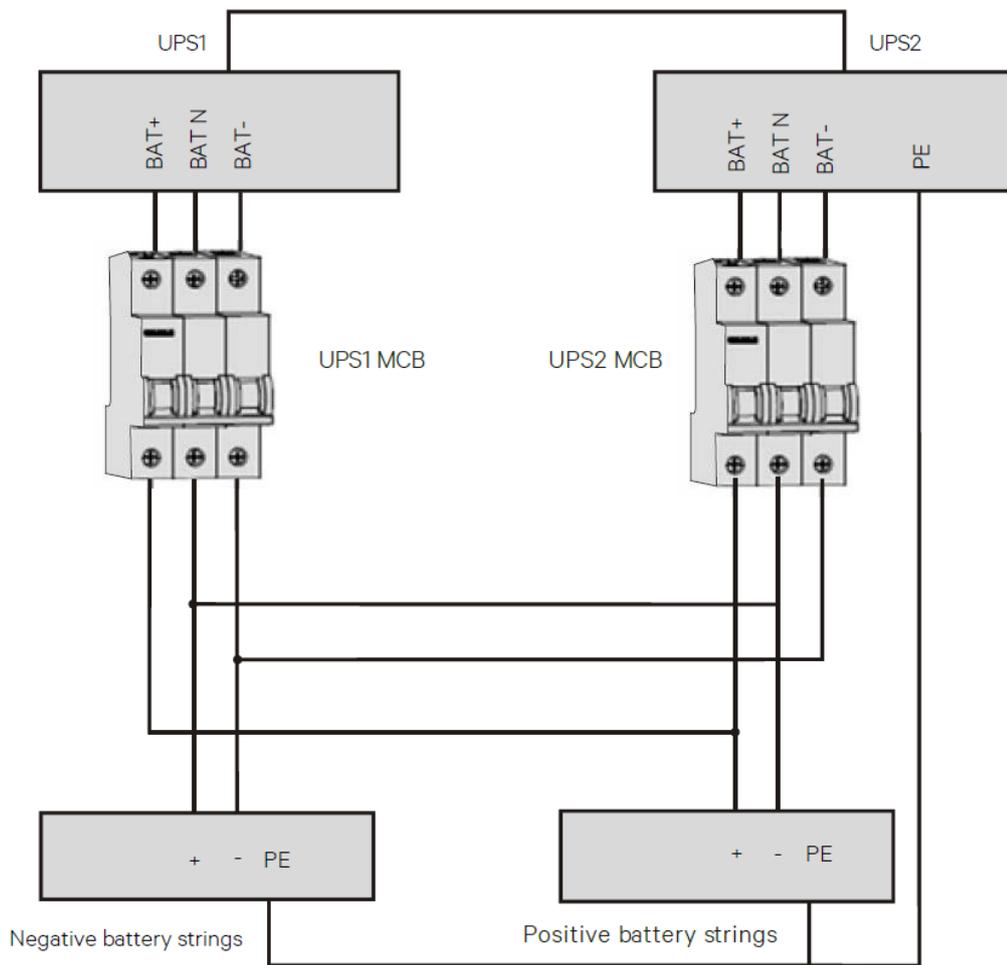


Figure 3-3 Connection diagram for shared battery string in 1+1 parallel system

Refer to Figure 3-4 to configure the positive battery string and negative battery string.

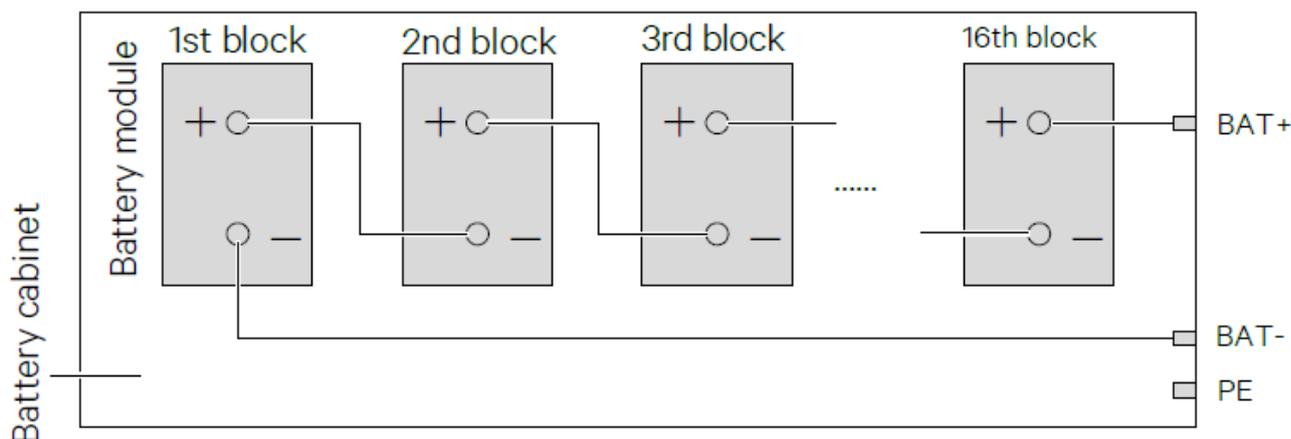


Figure 3-4 Internal connection diagram for positive battery string and negative battery string

Close the battery MCB of each UPS.

3.4 Commissioning of Parallel Cables

3.4.1 Check Before Start-Up

1. Check and confirm that power distribution mode of the is correct; that connections of the power cables and the signal cables are correct and there is no short circuit.
2. Check that the battery installation and cable connection is correct and there is no short circuit, and that the positive pole and negative pole of the battery are correct. Especially when each UPS of the 20kVA parallel system shares the battery strings, check these items carefully.
3. Check all the working status of the parallel system, ensure that the phase sequence of the main, bypass (10kVA/20kVA) and output of each UPS is correct and consistent, that the connection of the parallel cable is reliable, and that the user load is not connected during power-on.
4. Measure and confirm that the mains voltage and frequency are normal.
5. The output terminals of the UPS is energized upon the start-up. If the load is connected with the output terminals, make sure that the power to the load is safe.



Note

The output terminals of the UPS will be live upon start-up. When bypass of the single UPS in the parallel system is not consistent, the system fault may occur, check and confirm the bypass before power-on.

3.4.2 Parallel System Parameters Setting

The parallel parameters for all the UPSs in the parallel system should be set. As shown in Figure 3-5.

Output	Battery	Parallel
Voltage selection	230V	
Frequency selection	Auto,Bypa_	
Run mode	Normal	
Redundant	YES	
System parallel num	1	
Output phase No.	3phase	
Sync parallel parameters		

Figure 3-5 Setting for parallel parameters

The user can change these settings according to actual needs, for instance two units are connected in parallel then in the settings System parallel num will be 2; refer to Appendix 1 LCD Parameters Setting for details. After the change, press the last item 'Sync parallel parameters' to validate the setting.

3.4.3 Power-On Commissioning for Parallel System

1. Set the parallel parameters of each UPS in the parallel system, then commission the inverter. The specific commissioning procedures are as follows:

a) Make sure that the output MCBs of all UPSs in the parallel system are open, and then close the external input MCB of each UPS in the parallel system, the UPS is powered on at the same time.

b) The LCD displays the self check screen, and the alarm indicator (red) and run indicator (green) are on at the same time for about five seconds.

c) After the rectifier has been in normal operation state for about 30 seconds, the rectifier start-up is finished.

d) Refer to 3.5.2 Parallel System Parameters Setting for the parallel parameters setting for each UPS. Note whether there is an alarm of 'Parallel comm. Fail', if yes, clear the fault according to Table 4-5. Carry out the following procedures if the UPS is running normally.

e) Press the power button of one UPS for 2 seconds, then press the Enter key to start the UPS. The run indicator (green) will blink, after 20 seconds, the inverter will start, and the run indicator will turn on.

f) If the battery is not connected, the alarm indicator will be solid on, and the buzzer will beep every second. If the battery is connected, the alarm indicator will turn off.

g) If the UPS is working normally, press the power button for two seconds to turn off the inverter.

h) Repeat the preceding step a) ~ step g) to power on and commission the inverter of other UPSs respectively.



Note

1. Carry out the parallel commissioning after each UPS is working normally.

2. After confirming that the inverter of each UPS is normal, commission the parallel system, the specific procedures are as follows:

a) Close the external output MCB and input MCB of each UPS, and all UPSs are powered on at the same time. After the start of the rectifier is finished, press the power button of one UPS for two seconds, the run indicator (green) will be on. Measure whether the inverter output voltage is normal.

b) Start the inverter of the second UPS, check whether there is an alarm on the LCD, and confirm that the UPS parallel works normally.

c) Follow the methods to start the inverter of the third or the fourth UPS to connect the UPS into the parallel system.

3. If the user needs to add one UPS in the parallel system, follow the commissioning procedures below:

a) Check and confirm that the power distribution mode, each power cable and signal cable of the added UPS are well connected without short circuit. Check that the battery installation and cables connection are correct without short circuit, and that the positive and negative are correct.

b) Repeat steps a) to h) in Part 1 to complete the single unit commissioning of the added UPS. Then completely power off the UPS.

c) Ensure that the connection of power cable and signal cable is reliable.

d) For any online UPS, enter the interface shown in Figure 3-7. Set the system parallel No. from 'N' to 'N+1', then click the 'Sync parallel parameters'.

e) Close the external I/O switches of the added UPS, normally start the inverter after the rectifier start-up. Then check that the LCD has no alarm, and that the UPS parallel system works normally.



Note

1. For 1+1 parallel system, when one UPS is faulty and needs to be replaced on line, the above operation steps are available too. The difference is no need to change parallel No., just click the 'Sync parallel parameters' for the online UPS.

2. Clicking the 'Sync parallel parameters' to achieve the synchronization of the items in parallel settings interface, and the parameters will affect the parallel system. The user should manually set other parameters according to actual needs.

3. When adding a single unit in the parallel system, first ensure the parallel cables connection is correct, then power on the single unit.

3.5 Installation and Commissioning for a Dual Bus System (for 20kVA system only)

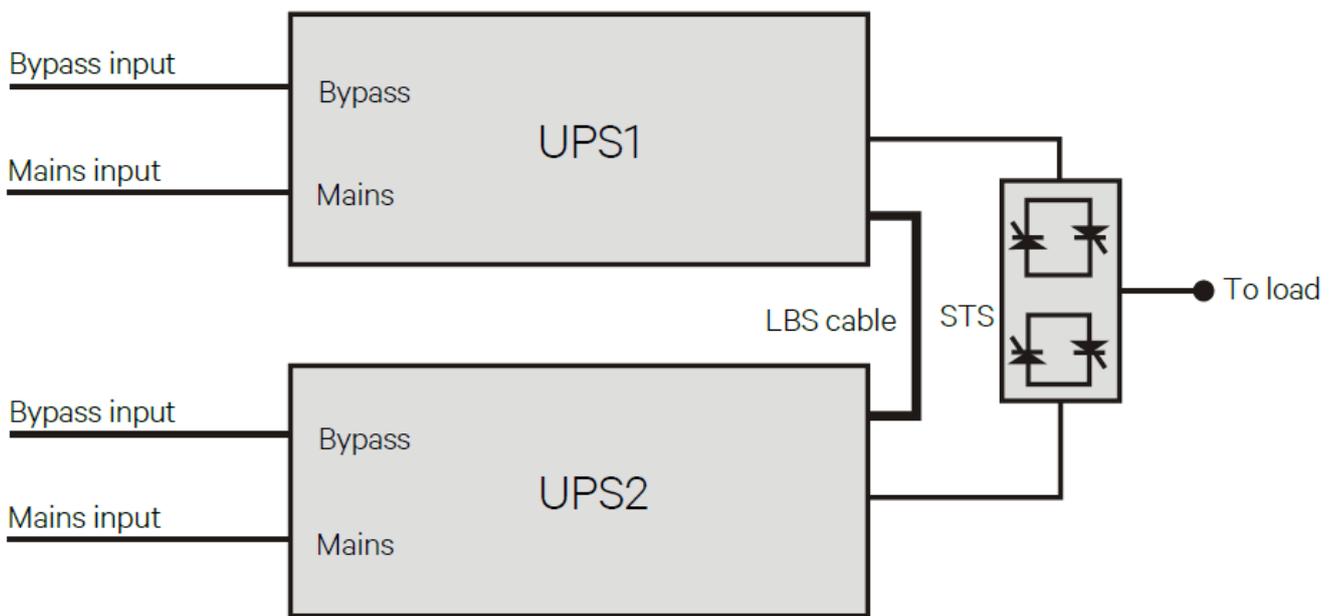
3.5.1 Introduction

The dual bus system consists of two independent UPS systems; each UPS system consists of one or two parallel-connected single UPSs, or more parallel-connected single UPSs.

The dual bus system has high reliability, which is suitable for the load with many input terminals. For single UPS input load, you can add a static trigger switch (STS, optional) to start the standard Load Bus Synchronization (LBS) system.

Place the UPSs side by side, and connect the UPSs as follows:

The dual bus system adopts the LBS system to realize the output synchronization of the two independent (or parallel) UPS systems. One is the master system, and the other is the slave system. The operation mode of the dual bus system contains master system and/or slave system running in Normal mode or Bypass mode. The schematic diagram of the LBS system built by two UPSs is shown in Figure 3-6.



Note: UPS1 is master system while UPS2 is slave system.

Figure 3-6 LBS System Schematic Diagram

3.5.2 Connecting LBS Cable

The appearance of the LBS port is the same as the parallel port. For the dual bus system formed by the parallel UPS, it is recommended to prepare two LBS cables used to connect any two parallel/LBS ports of the two-parallel system, which is used for reliable connection. LBS connection is applicable for only 20kVA.

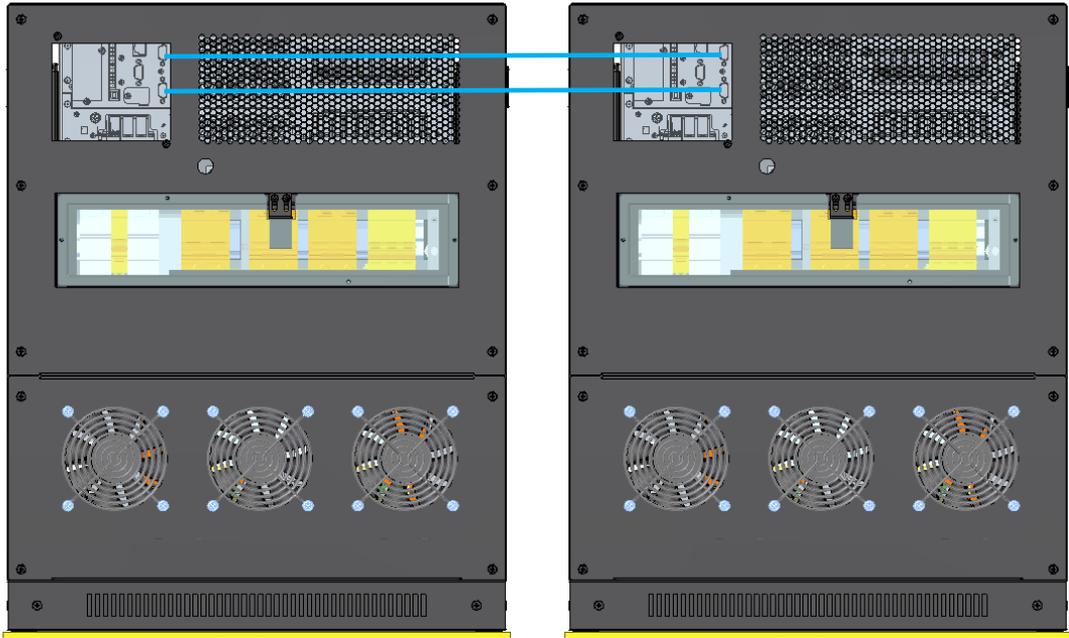


Figure 3-7 LBS Cable Connection (20kVA)

3.5.3 Setting Parameters Of LBS

The LBS parameters setting interface is shown in Figure 3-8.

Procedures for setting LBS parameters:

Through the 'Settings' -> 'System' -> 'LBS', you can set the LBS according to actual needs.

There are three items of LBS for selection: Disable, Slave, Master.

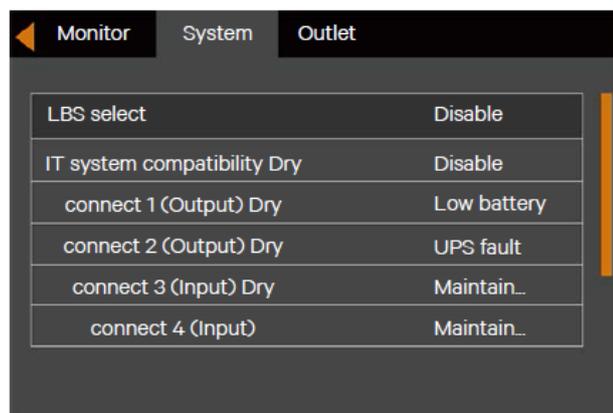


Figure 3-8 LBS Parameter Setting Interface

The LBS is the load synchronous system, which is used to implement the output voltage phase synchronization of the two sets of UPS system. Two sets of UPS system can be two single UPS or two sets of UPS parallel system.

You can manually set the 'Master' and 'Slave' through the LCD.

The UPS which is set to LBS master can send synchronization signal to LBS slave according to the own inverter voltage phase. After the slave receives the synchronization signal sent by the master, the slave will adjust its inverter voltage phase to realize the inverter voltage phase is synchronized with the master.

Through the above to realize the inverter voltage phase synchronization of two sets of UPS system and realize the reliable transfer between the two sets of UPS output voltage and STS, then provide the reliable uninterrupted power supply to the load.

Chapter 4 Operation and Display Panel

This chapter introduces the function and use of the components of the UPS operation and display panel, and provides LCD display options information, including LCD screen types, detailed menu messages, prompt windows message and UPS alarm list.

4.1 Introduction

The operation and display panel is located on the front panel of the UPS. Through the operation and display panel, you can conduct the operation and control on the UPS and query all the UPS parameters, UPS and battery states, and alarm message.

As shown in Figure 4-1, the operation and display panel provide LCD, menu keys, LED indicators (run indicator and alarm indicator).



Figure 4-1 LCD Screen

**Note**

1. The device has a gravity sensor function; thus, the LCD display direction will be changed according to the device layout mode.

4.1.1 LED Indicator

The LED indicators are composed of run indicator and alarm indicator. Table 4-1 gives the indicator description.

Table 4-1 Definition of Indicators

Indicator	Colour	State	Description
Run indicator	Green	On	UPS has Output
		Blinking	Inverter is Starting
		Off	UPS has no output, Inverter is starting
Alarm indicator	Yellow	On	Alarm Occurs
	Red	On	Fault Occurs
	/	Off	No Alarm, No Fault

4.1.2 Audible Alarm (Buzzer)

UPS activity is accompanied by the two kinds of sound listed in Table 4-2.

Table 4-2 Description of audible alarm

Alarm sound	Meaning
One beep every 0.5 second	Sound is generated when the UPS critical alarm appears, such as Inverter overload
One beep every second	Sound is generated when the UPS critical alarm appears, such as battery low voltage
One beep every 3.3 second	Sound is generated when the UPS general alarm appears
Continuous beep	Sound is generated when the UPS fault appears, such as fuse or hardware failure.

4.1.3 LCD and Functional Keys

The operator control and display panel provides five control keys, as described in Table 4-3.

Table 4-3 Description of Control Keys

Control key	Silkscreen	Description
Confirm		Used to confirm or enter
Up		Used to page up, turn left or add value, etc.

Down		Used to page down, turn right or reduce value, etc.
Escape		Used to back, escape, cancel or forbid operation Power
Power		Used to power on, power off or transfer to Bypass mode



Note

It is required to hold and press the preceding keys for 2s to initiate the key function.

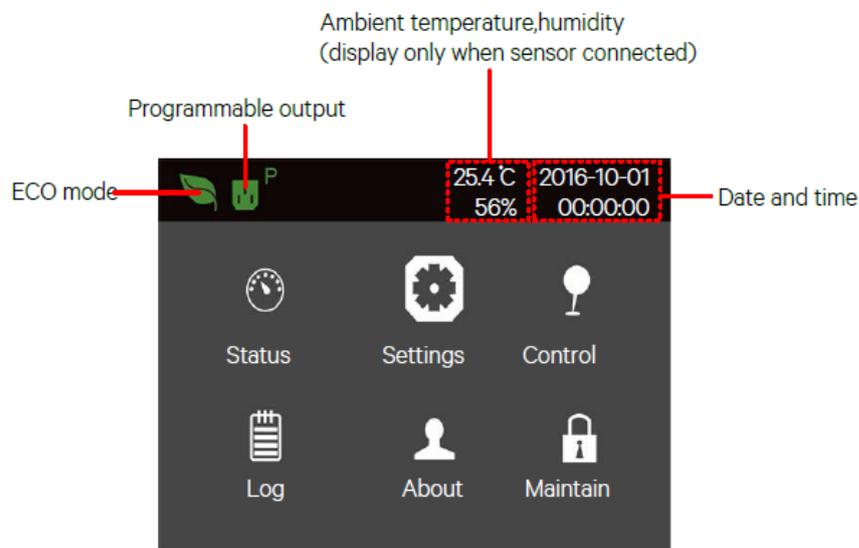


Figure 4-2 LCD Screen

LCD provides you with the user-friendly interface and the 320 × 240 dot matrix image display. The user-friendly and menu-driven LCD allows you to easily browse through the UPS input, output, parameters of the load and the battery, learn about the current UPS status and alarm message, perform functional settings and control operation. The LCD also stores historical alarm records that can be retrieved for reference and diagnosis.

4.2 Initial Start-Up Guidance

When the UPS is the initial start-up, the interface shown in Figure 4-3 will appear to guide the user to set basic parameters of the UPS.

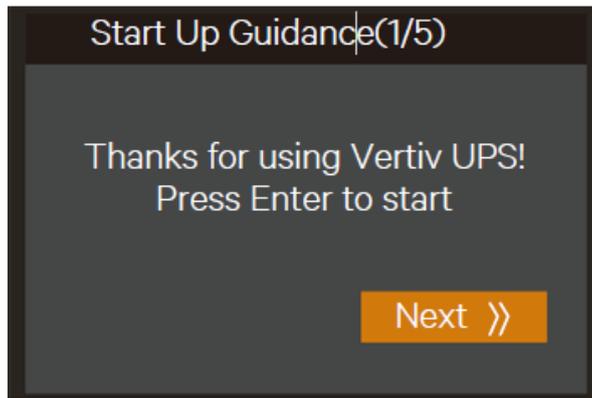


Figure 4-3 Initial start-up guidance (1)

Initial start-up guidance (1)

Welcome page

Click Next to start the guidance.

Language, date and time page

At this page, you can set the language, date and time you need.

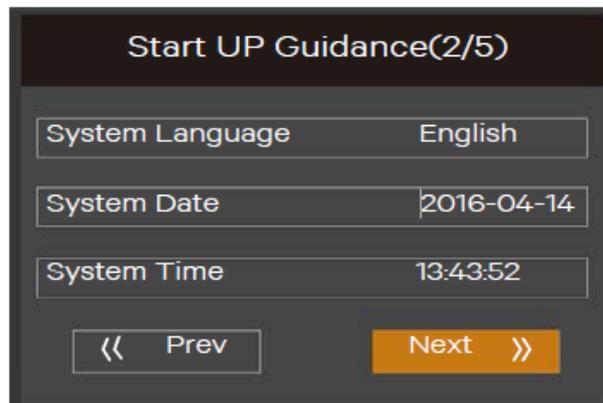


Figure 4-4 Initial start-up guidance (2)

Battery parameter page

At this page, you can set the battery cell number and total Ah.

For 10kVA model, the 'Battery series' are 12, 16, and 20 selectable. See left diagram in Figure 4-5.

For 20kVA model, the 'Battery series' are 24, 32, and 40 selectable. See right diagram in Figure 4-5.

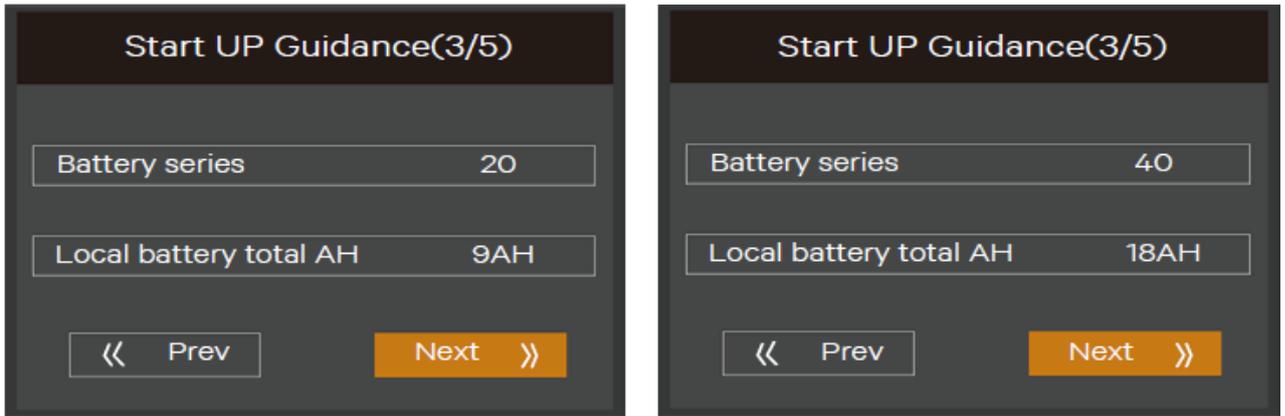


Figure 4-5 Initial start-up guidance (3)

If there is an external battery module, the 'Local battery total Ah' will not appear, see Figure 4-6.

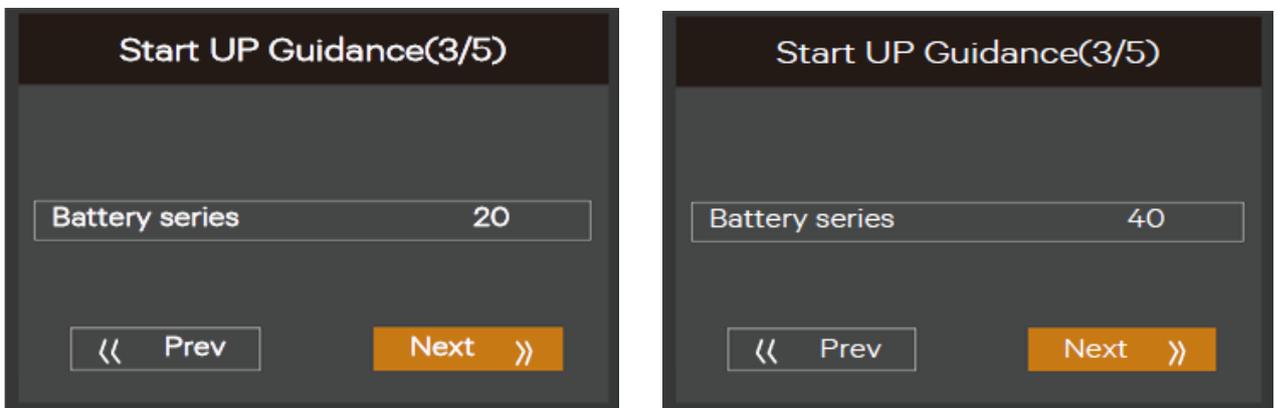


Figure 4-6 Initial start-up guidance (3)

Output page

As shown in Figure 4-8, you can set output voltage, output frequency, and output phase.

For 10kVA model, the 'Output phase No.' cannot be set, because the model only has single phase output. See left diagram in Figure 4-7.

For 20kVA model, the 'Output phase No.' can be set to 'single' or '3 phases'. See right diagram in Figure 4-7.



Figure 4-7 Initial start-up guidance (4)



Note

For output page, all the settings must unplug the REPO terminal (forcible output shutdown), otherwise the interface shown in Figure 4-8 will appear

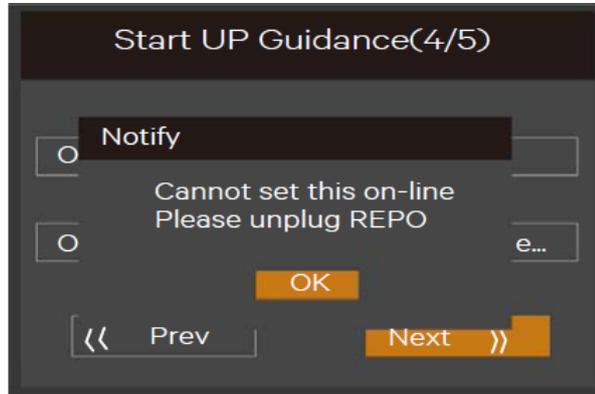


Figure 4-8 Prompt of removing REPO terminal

Finish page

For 10kVA model, the interface shown in Figure 4-9 will appear. Click Finish to enter the Flow page, then the user can operate the UPS normally.

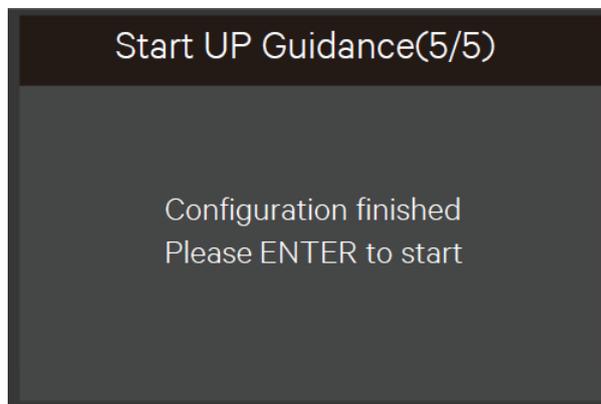


Figure 4-9 Initial start-up guidance (5)

For 20kVA model, the interface shown in Figure 4-10 will appear. It means that the functional keys and LCD are invalid; the user cannot continue the operation. Please power off the UPS based on the prompt shown in Figure 4-10, confirm that the actual wiring method of the output terminal is the same as that of the setting method, then power on the UPS again.

After the start-up, the user can operate the UPS normally,

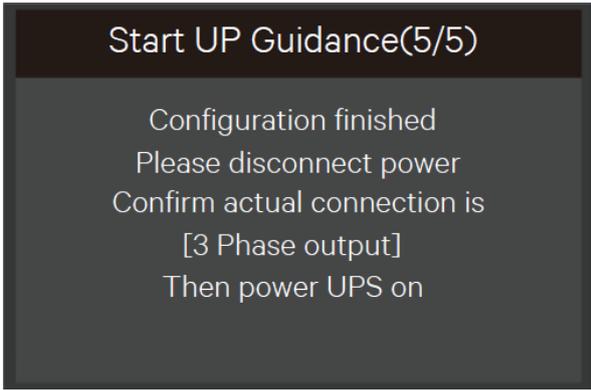


Figure 4-10 Initial start-up guidance (5)

4.3 LCD Menu Structure

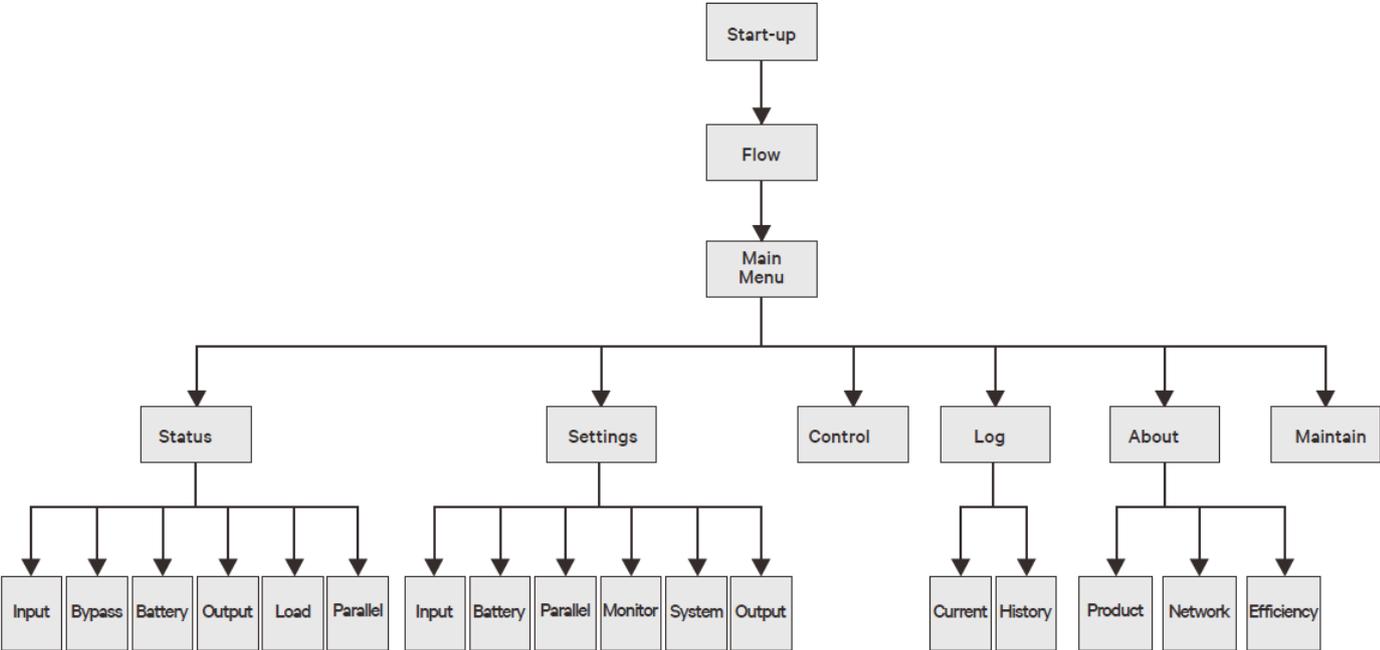


Figure 4-11 LCD Menu Structure

4.4 LCD Screen Types

4.4.1 Start Screen

Upon UPS start-up, the UPS executes the system self-test, and the start screen will appear and remain for about 10 seconds, as shown in Figure 4-12.



Figure 4-12 Start Screen

4.4.2 Flow Screen

After the self-test of the UPS, the flow screen shown in Figure 4-13 will appear.

The flow screen is the total status view of the UPS, includes input, bypass, rectifier, battery, inverter and output, etc. The working modes with color display while the invalid modes with gray display.

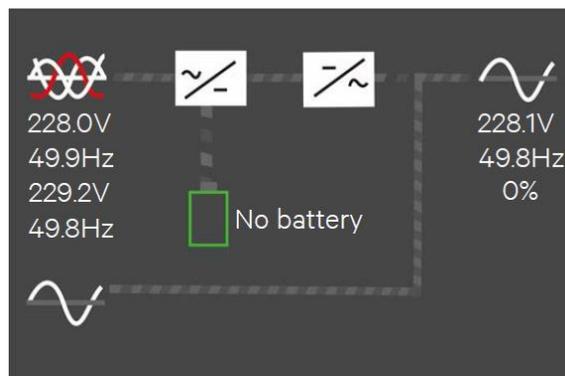


Figure 4-13 Flow Screen

4.4.3 Main Menu Screen

The main menu screen is composed of six icons: Status, Settings, Control, Log, About, Maintain. As shown in Figure 4-14.

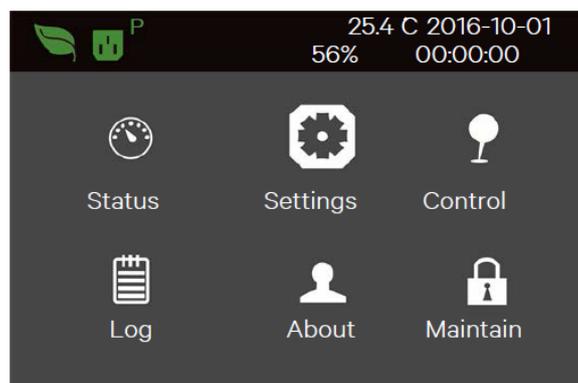


Figure 4-14 Main Menu Screen

At main menu screen, press the  key to back to the flow screen. Press the  or  key to switch the cursor to select the submenu you need, then press the  key to confirm it.

4.4.4 Submenu Screen

The submenu screen contains the UPS parameters and item settings. After entering the submenu screen, if there is a tab control, just move the cursor to the tab. Now, you can press the  or  key to switch the tab. Press the  key to move the cursor to a certain item.

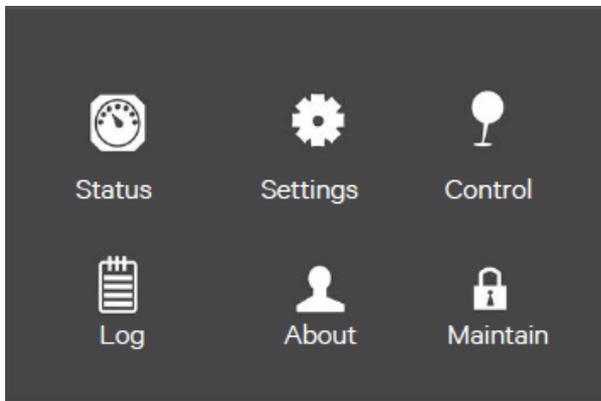
After entering the submenu screen, if there is no tab control, then the cursor will stop at a certain Item.

Press the  key to back to the previous screen.

For details about the submenu screen, see following pages.

Status page

The Status page contains the Input, Bypass, Battery, Output and Load. See below



Input	Bypass	Battery	Output
L-N voltage(V)	230	230	230
L-N current(A)	0.59	0.31	0.96
Frequency(Hz)	48.98	48.98	48.98
L-L voltage(V)	380	380	380
Power factor	0.27	0.00	0.22
Energy(kWh)	2.768		

Input	Bypass	Battery	Output
L-N voltage(V)	230		
Frequency(Hz)	48.98		

Input	Bypass	Battery	Output
Battery status	Battery	NoBatt	NoBatt
voltage(V)	Battery	0.00	0.00
current(A)	Backup	0.00	0.00
time(Minut... Remaining	0.0		
capacit... External	0		
battery c...	0		

Input	Bypass	Battery	Output
L-N voltage(V)			230
L-N current(A)			0.00
Frequency(Hz)			0.00

Load	
Sout(kVA)	0.00
Pout(kW)	0.00
Power factor	0.00
Load percent(%)	0

Settings page

The Settings page contains the Output, Battery, Parallel, Monitor, System, and Outlet. For details about the parameters setting, refer to Appendix 1 LCD Parameters Setting. See below:

Output	Battery	Parallel
Voltage selection		230V
Startup on bypass Frequency		Disable
selection Inverter sync range		Auto,By...
Bypass voltage upper limit		+..3.0Hz
Bypass voltage lower limit		+20%
Bypass frequency range		-40%
		+..10%

Output	Battery	Parallel
Run mode		Normal
Output phase No.		3phase

Output	Battery	Parallel
Shared battery		Disable
Local battery total AH		9 AH
External battery cabin... Low		AutoTest
battery time		2 min
Battery replaced time Battery		2016-10-0...
test interval Battery test		Disable
weekday		Wednesday

Output	Battery	Parallel
Battery test time	00:00:00	
Battery series Dischg	20	
proctct time Equal	4320min	
charge enable Temp	No	
compensation Replace	Disable	
battery		

Output	Battery	Parallel
Voltage selection	230V	
Frequency selection	Auto,Bypa...	
Run mode	Normal	
Redundant	YES	
System parallel num	1	
Output phase No.	3phase	
Sync parallel parameters		

Monitor	System	Outlet
Language	English	
Date	2016-10-01	
Time	00:00:00	
Display orientation	Auto- rota_	
Audible alarm Control	Enable	
port protocol Modbus	Sensor	
address	1	

Monitor	System	Outlet
IPv4 address	192.168.1.10	
Subnet mask	255.255.255.0	
Gateway address Bluetooth	192.168.1.1	
reset		
Change settings password		

Monitor	System	Outlet
Auto restart	Enable	
Auto restart delay	10 sec	
Guaranteed shutdown	Disable	
Remote control Remote	Enable	
power on delay Remote	0 sec	
shutdown delay	0 sec	
Redundant	YES	

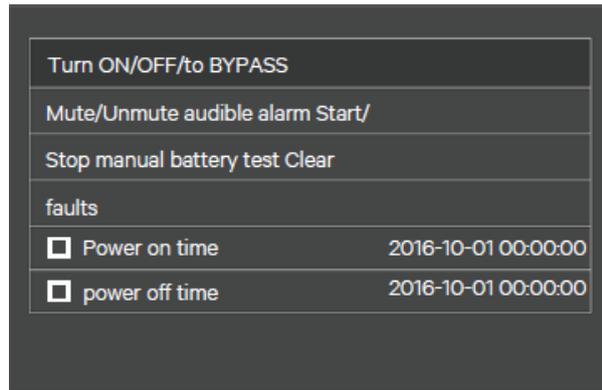
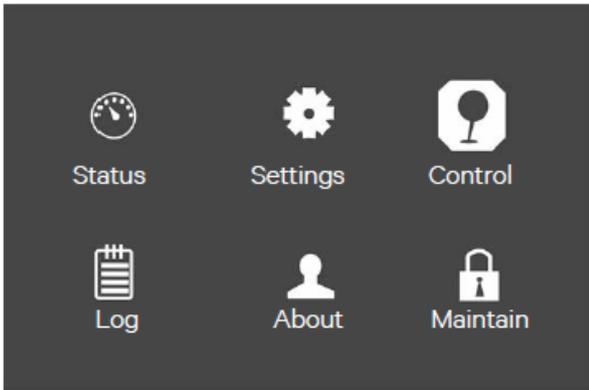
Monitor	System	Outlet
LBS select	Disable	
IT system compatibility Dry	Disable	
connect 1 (Output) Dry	Low battery	
connect 2 (Output) Dry	UPS fault	
connect 3 (Input) Dry	Maintain...	
connect 4 (Input)	Maintain...	

Monitor	System	Outlet
Turn off		
Reboot		
Turn off when UPS over_	No	
<input type="checkbox"/> Turn off when UPS on...	2min	
<input type="checkbox"/> Turn off when backup...	0min	
<input type="checkbox"/> Turn off when batter...	30%	
<input type="checkbox"/> Turn on when powerr...	0min	

Control Page

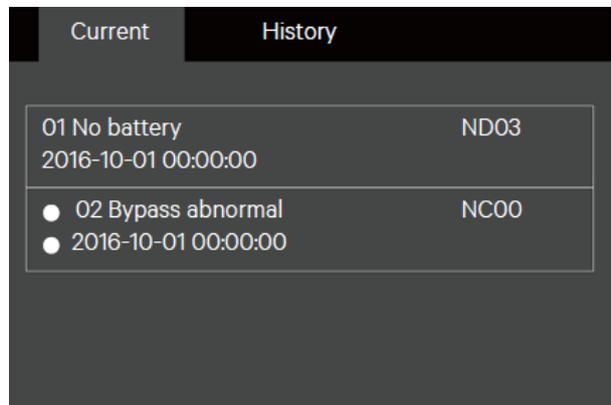
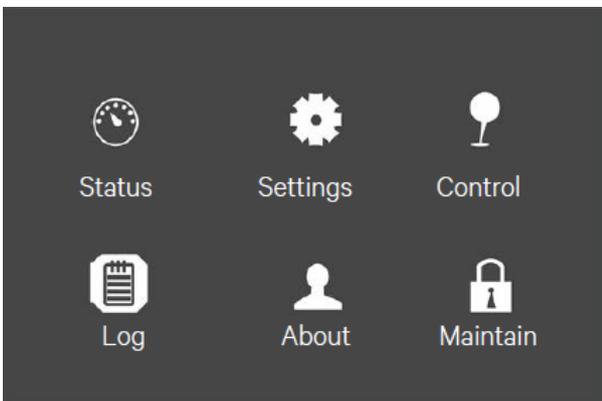
The Control page contains the Turn ON/OFF/to BYPASS, and Manual battery test, etc.

See below:



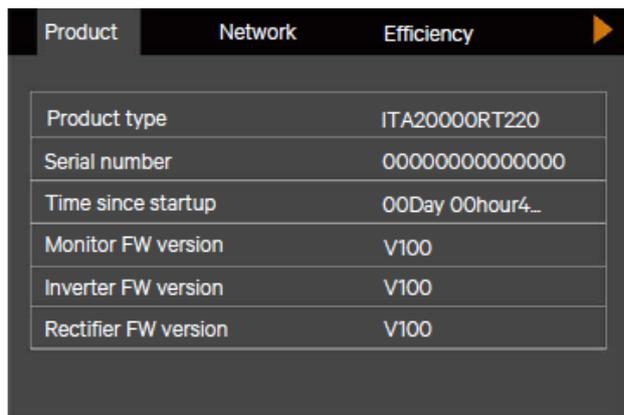
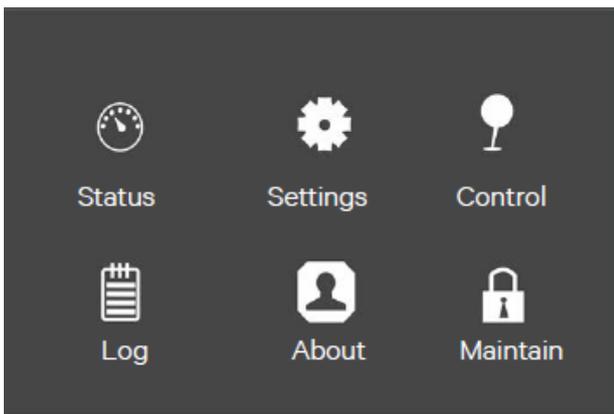
Log page

The Log page contains the Current and History. See below:

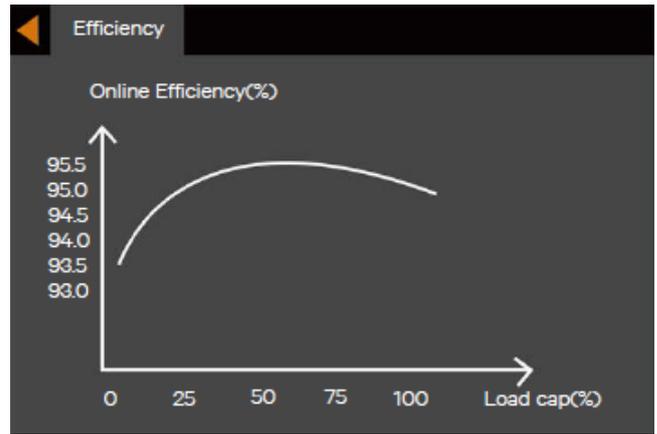


About page

The About page contains the Product, Network, and Efficiency. See below:



Product	Network	Efficiency
Connection status	Disconnected	
IPv4 address	192.168.1.10	
Subnet mask	255.255.255.0	
Gateway address	192.168.1.1	
MAC address	01:23:45:67:89:AB	

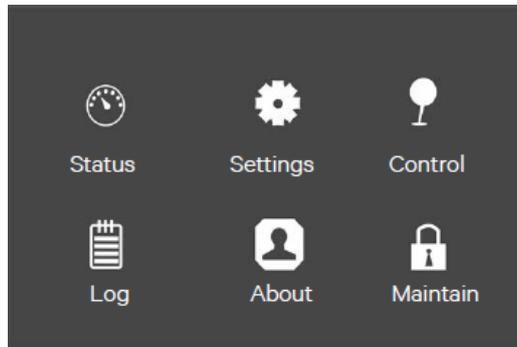


Maintain page



Note

The Maintain page needs correct password and for Vertiv service engineer operation only.



4.4.5 Default Screen

During the UPS operation, if there is no alarm within two minutes, the default screen shown in Figure 4-15 will appear. At the default screen, if there is an alarm or a fault, or the user press any key, the Flow screen will appear again.

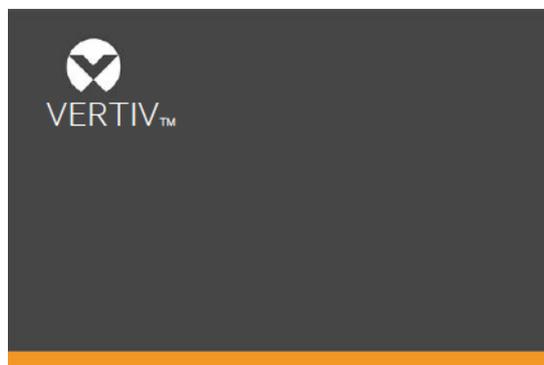


Figure 4-15 Default Screen

4.5 Prompt Window

A prompt window is displayed during the operation of the system to alert you to certain conditions and/or to require your confirmation of a command or other operation. Table 4-4 lists the prompts and meanings.

Table 4-4 Prompts and meaning

Prompt	Meaning
System setting is different, please check	When the parallel parameters are different, the prompt will appear
Cannot set this online, please shut down output	If the user wants to change some important settings under condition of output (output voltage, output frequency, output phase No.), the prompt will appear
Incorrect password, please input again	The prompt will appear when the user incorrectly input the Settings password
Operation failed, condition is not met	The prompt will appear when the user wants to execute a certain operation but the condition is not met
Password changed OK	The prompt will appear when the user successfully changes the Settings password
Fail to change password, please try again	The prompt will appear when the user tries to change the Settings password but input two different new passwords
The time cannot be earlier than system time	The prompt will appear when the user set the time of 'Turn on delay' or 'Turn off delay' is earlier than the current system time
Turn on failed, condition is not met	When users press the power button (or execute the command of 'Turn on/Turn off/to Bypass' under 'Control' page), the prompt will appear
Cannot set this on line, please unplug REPO	If the user wants to change output phase No. under condition of output, the prompt will appear
Please disconnect power, check output: 1 phase, 3 phase, then power UPS on	The prompt will appear when the output phase is changed. The system requires the user to power off and check the cables connection, then power on the UPS again to guarantee the safety

4.6 UPS Alarm Message List

Table 4-5 gives all UPS alarm messages based on the 'Current' and 'History' menus.

Table 4-5 Alarms and meaning

Alarm	Explanation
Communication fail	Internal communication is abnormal, please check the communication cables are connected correctly or not
Rectifier fault	The rectifier is faulty and off
DC/DC fault	The discharger is faulty, because the bus voltage exceeds the setting range when discharger starts or soft starts
DC bus abnormal	The inverter is off when DC bus voltage is faulty. The load will transfer to bypass if the bypass is available
Charger fault	The charger output voltage is abnormal, and the charger is off
Aux. power fault	The auxiliary power output voltage exceeds the normal range
Input backfeed Battery mode.	The mains relay short circuit, and the difference between mains and battery voltage is less than the setting range
Inverter fault	The inverter is off when the inverter output voltage and current exceed the setting range. If bypass is available, the UPS will transfer to bypass mode, otherwise the system will power off
Output short	Check that the output cables are not shorted
Bypass backfeed battery mode.	The bypass relay is shorted or the SCR is damaged
Output off, voltage is not zero	When there is no output, the system detects that the output has a voltage
Inverter relay welded	The inverter relay is shorted
Parallel No. abnormal	The parallel online number is different from the setting number. Please check that the parallel number at 'Settings' page is the same as the actual online number, and that the parallel cables are normal
Parallel comm Fault	The local UPS and its online frequency configuration is different or the parallel address is conflicted. Please check that the parallel system parameter setting is the same as the local parameter setting
Parallel cable Connection abnormal	Detect the parallel cables are loosened
Input neutral lost	The AC input mains N line is not detected. Please check that the input N line is opened or loosened

Alarm	Explanation
Input ground lost	Check that the PE line is well connected, and the alarm can be cleared on line
Input phase Reversed	The mains AC input phase is reversed. Normally, phase B lags phase A of 120 degrees, and phase C lags phase B of 120 degrees. Check that the UPS mains input phase sequence is correct. If not, just modify it
Input abnormal	The rectifier and charger are off due to the mains voltage and frequency exceeding normal range. Check that the rectifier input phase voltage and frequency exceed the normal range or that the mains has power-off
Rectifier overload	The output power is larger than the rectifier overload point. Check that the input voltage meets the output load, mains input 176V ~ 100V, the load 100% ~ 50% linear derating
Battery reversed	The battery positive and negative are reversed. Please reconnect the battery and check the battery cables connection
Battery low pre-warning	This alarm occurs when the battery reaches the EOD. After the pre-warning, the battery capacity allows two minutes discharge at full load. The user can set the time ranging from 2min~30min, (2 min by default). Please shut down the load timely
Battery voltage Abnormal	When battery is connected, the system checks that the battery voltage exceeds the normal setting range. Check that the battery terminal voltage exceeds the normal range
No battery	Check the battery and battery cables connection
Battery series not Qualified	The actual connected battery cells are different from the setting cells. Please change to the same
Battery aged	The battery capacity is less than 25% of the initial capacity. Battery replacement is recommended
Battery test fail	The battery low voltage is detected when the battery has manual or periodic self-test. Battery replacement is recommended
Battery overtemp	Battery ambient temperature too high. Check that the battery ambient temperature is higher than setting value 40 ~ 60°C (default: 50°C)
Battery cabinet not connected	The battery cabinet is not connected to the system
Fan fault	At least one fan is faulty. Check that the fan is blocked or the cables connection is loosened
System overtemp	Internal heat sink temperature too high, and the inverter is off. Only each module heat sink temperature decreased to the setting value can you silence the alarm. The system can automatically start after overtemperature fault is solved. If overtemperature, please check: 1. Ambient temperature too high or not 2. Dust is blocked or not 3. Fan fault or not

Alarm	Explanation
Inverter overload	Inverter load capacity is larger than the rated value, overload delay time is up, inverter shuts down. If bypass is available, the system will transfer to the bypass mode, otherwise the output is failure. Check that the actual inverter load capacity, if overloaded, just reduce the load capacity, and the system will transfer to the inverter mode after five minutes with alarm cleared
Bypass phase Reversed	The bypass voltage phase sequence is reversed. Normally, phase B lags phase A of 120 degrees, and phase C lags phase B of 120 degrees. Check that the UPS bypass input phase sequence is correct. If not, just modify it
Bypass Overcurrent	The bypass current exceeds the rated value. Overload delay time is up, inverter shuts down
Parallel bypass cable connection abnormal	The bypass phase number is different from the output phase number under 'Monitor'. Please check that the bypass cables connection is the same as the configured phase number
Byapss abnormal	Maybe caused by bypass voltage and frequency outside of range, bypass power-off and incorrect bypass cables connection. 1. Check that the bypass voltage and frequency are within the setting range. 2. Check the bypass cables connection
Bypass abnormal in ECO mode	The ECO mode is available, and the bypass voltage and frequency are outside of the setting range. Check that the bypass input voltage and frequency are within the setting range
Output LPE short	The output and enclosure are shorted. Check whether the output cables connection and the enclosure are shorted or not
Output pending	Remote shutdown is enabled, and the system will be off
Output disabled	The system is in standby state, and the dry cntact shutdown is enabled. Check whether the shutdown dry contact is enabled or not
Version Incompatible	The version between monitoring board and DSP board is incompatible
Electric leak Alarm	Short circuit between bus and enclosure or between battery and enclosure. Check whether the bus and battery cables connection are shorted with the enclosure or not
On maintenance bypass	The dry contact in maintenance bypass state is activated
Battery mode	The UPS is on battery, and the inverter starts
Bypass mode	The UPS is on bypass
System overload	The parallel system load capacity is larger than the max. load capacity outputed by parallel sets. Confirm the parallel system load capacity, if overloaded, just reduce it
Loss of Redundancy	After the parallel redundancy is enabled, the system load capacity is larger than the rated load of (online set minus one)

Alarm	Explanation
Load sharing Abnormal	Load sharing is abnormal in parallel system
System parallel settings async	Check that parallel setting parameters of each unit are the same
Local parallel settings async	Check that the Settings page is the same between this local unit and other units
LBS abnormal	Check whether the LBS cables are normal, the system is in stand-by state, or system on bypass and the bypass unable to trace
REPO	Shutdown caused by the REPO terminal Normally Closed contact open
Bypass phase Reversed	During parallel connection, the bypass phase sequence is not the same. Check the parallel bypass cables connection
System battery low pre-warning	In parallel system, all the devices powered by the battery inverter have battery low voltage pre-warning
Battery test started	The battery periodical self-test and manual self-test started
Battery test Stopped	The battery periodical self-test or manual self-test finished
EOD turn off	The inverter is off due to EOD. Check the mains power-off state and recover the mains in time
Guaranteed Shutdown	Under forced EOD mode, the battery discharging finished, then system shuts down
Shutdown due to Overtemp	During the UPS operation, the system checks that the heat sink temperature exceeds the setting range. If overtemperature, please check: 1. Ambient temperature too high or not 2. Dust is blocked or not 3. Fan fault or not
Remote shutdown	Dry contact activated at any mode shutdown
Remote power-on	Remotely power on
Remote shut-off	Remotely power off
Load off due to shutdown on battery	Shutdown in battery mode
Output off due to bypass abnormal	The bypass is abnormal, and the bypass is in standby state from working state. Check that the bypass input is normal
Battery to	The UPS is powered by the mains instead of the battery

Alarm	Explanation
utility transition	
Manual power-on	Set power-on via LCD panel
Manual shutdown	Set shutdown via LCD panel
Operating inverter on	The UPS output state is on inverter
Battery series set to 12 (12~20)	The battery cells changed (10kVA)
Battery series set to 24 (24~40)	The battery cells changed (20kVA)
Restore factory defaults	Under UPS standby state, set 'Restore Factory Defaults' function via the Maintain page
Output phase No. set to 1	The output phase is changed from 3-phase to 1-phase
Output phase No. set to 3	The output phase is changed from 1-phase to 3-phase
UPS is out of service	The UPS is out of service
Turn on programmable outlet	The programmable outlet status is changed from Turn Off to Turn On
Turn off programmable outlet	The programmable outlet status is changed from Turn On to Turn Off
System parallel settings start sync	Manually set the 'Sync parallel parameters' command to activate the event
Local settings sync OK	Local parameters are successfully synchronized
System settings sync OK	All the parameters are successfully synchronized
Load off due to output short	The inverter short circuit or the bypass short circuit. Please check it
Output off due to overload & bypass abnormal	The output is off due to output overload and bypass abnormal. Please check it

Alarm	Explanation
Parallel No. Abnormal	The parallel online number and the configured number are different. Please check that the parallel number under Setting page is the same as the actual online number, and that the parallel cables are normal
Bypass disabled	In Settings->Output->Frequency selection, 'Auto, BypDisa; 50Hz, BypDisa; 60Hz, BypDisa' is set, the LCD will generate BypDisa alarm
On intelligent sleep mode	After the intelligent sleep mode is enabled, the system has N sets of inverter start-up. When the system meets the sleep requirement (Condition of entering sleep mode: Shared large battery string (If no large battery string, the sleep mode will cause the battery charging failure, host sleep enable, inverter side no fault or alarm, rectifier side no fault or alarm, with battery but large battery no charging need, rectifier not on battery mode, wait for 1h after exiting the former sleep, not master and the local unit ID number except sleep module has no start-up command within 5 minutes). When the N minus 2 units' rated load is larger than the existing system rated load capacity, the unit with the largest ID number starts to enter sleep mode (inverter off), at this time, the N minus 1 units are working in inverter mode. The N minus 3 units are larger than the current system rated load capacity, and the unit with the largest ID number keeps sleep mode
Battery cabinet Connect abnormal	The system detects the number of battery cabinet is over six, then reports the battery cabinet connection is abnormal
Battery cabinet not connected	The battery cabinet group number is specified, but the communication cables are not connected
Battery EOD	Battery end of discharge
Faults cleared	Press the 'Clear faults' button under 'Control', then the system will record this event
Manual shut off	After the user shuts the UPS output, then the system will record this event
System warning	In parallel system, the alarm occurs when UPS's self-adapting output frequency is inconsistent. Solution: Power on again
System fault	The alarm occurs when model identification is incorrect. Solution: Contact service manager



Note

If the alarm is caused through setting the software value by Vertiv authorized engineer, and when you wish to change the setting values, please get in touch with the Vertiv local customer service center.

Chapter 5 UPS Operation Instructions

This chapter gives a detailed description of the UPS operation procedures.

During the operation, the buzzer alarm may appear, at this point, you can press the  key for three seconds to silence the audible alarm.



Warning: *Hazardous mains and/or battery voltage exists behind the protective cover*

- 1. No user accessible parts are located behind the protective covers that require a tool for removal.*
- 2. Only qualified service personnel are authorized to remove such covers.*
- 3. If maintenance for rack is needed, notice that the neutral line is live.*

5.1 UPS Start-Up

The start-up procedures can be performed after the installation is finished, the system has been commissioned by authorized engineer and the external input MCBs are closed.



Important

This procedure results in mains voltage being applied to the UPS output terminals. Confirm that the load power is safe, if there is a load to be connected with the UPS output terminal. Ensure that the load is isolated with the UPS output terminal, if the load is not ready for accepting the power.

The start-up mode of the single UPS includes normal mode start-up and battery mode start-up; refer to 2.6.2 Normal Mode Start-Up and 2.6.3 Battery Mode Start-Up for details.

5.2 Transfer Procedures Between Operating Modes



Note

The Inverter operation mode includes Normal mode (mains inverter) and Battery module (battery inverter).

5.3 Transfer from Normal Mode to Battery Mode

In case of mains failure, the UPS will transfer to Battery mode. If you wish to transfer the UPS from Battery mode to Normal mode, wait few seconds for mains input recovery. Ten seconds later, the rectifier will restart automatically, and the inverter will restore the power.

5.4 Transfer from Inverter Mode to Bypass Mode

In standby mode, press and hold the power button. If the rectifier and inverter are normal, the interface shown in Figure 5-1 will appear, select 'YES' to turn on the UPS.

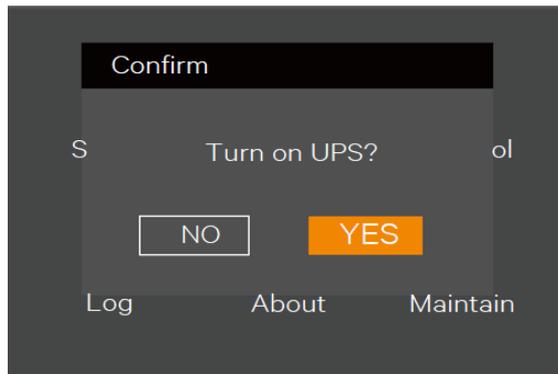


Figure 5-1 Turning on UPS

In Inverter mode, press and hold the power button. If the bypass is normal, the interface shown in Figure 5-2 will appear. Select 'To the Bypass' and click OK to transfer the UPS to Bypass mode; select 'Turn off UPS' and click OK to turn off the UPS.

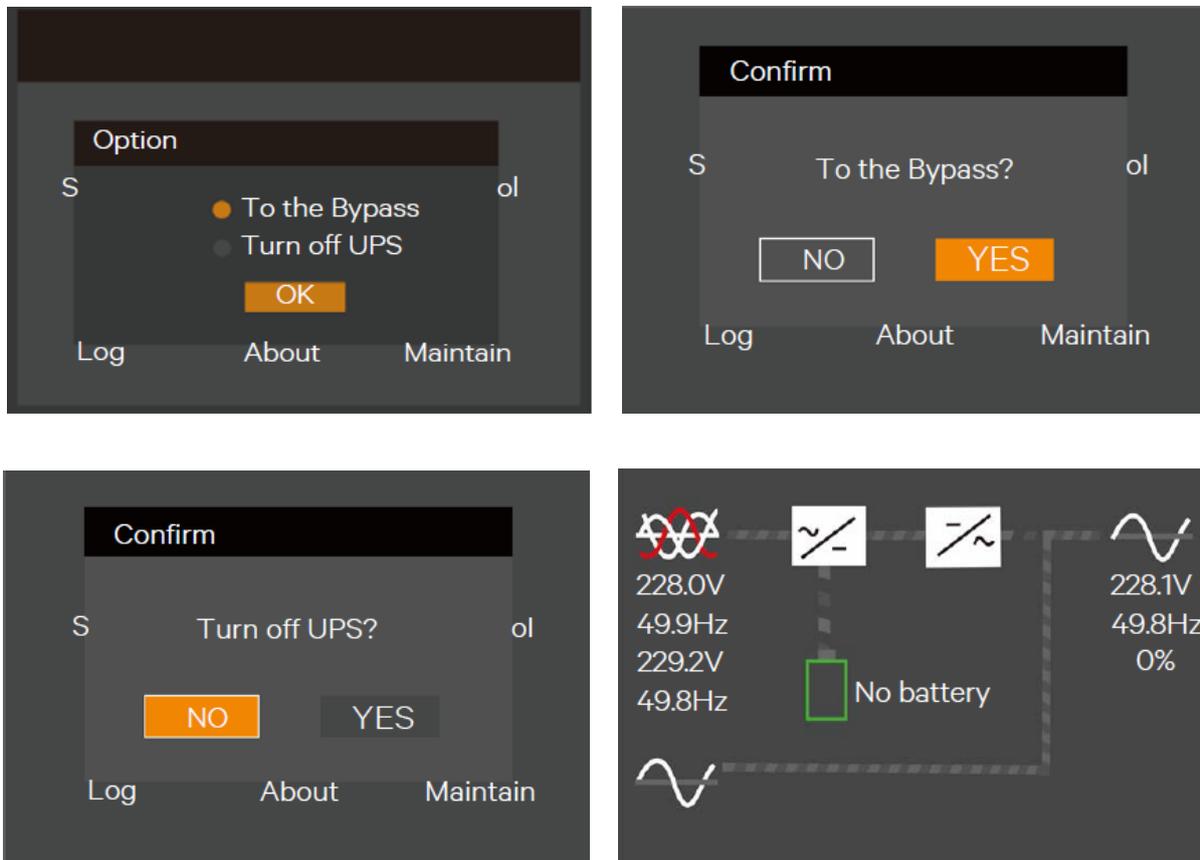


Figure 5-2 Bypass Normal Interface

In Inverter mode, press and hold the power button. If the bypass is abnormal, then the interface shown in Figure 5-3 will appear, select 'YES' to shut down the UPS output.

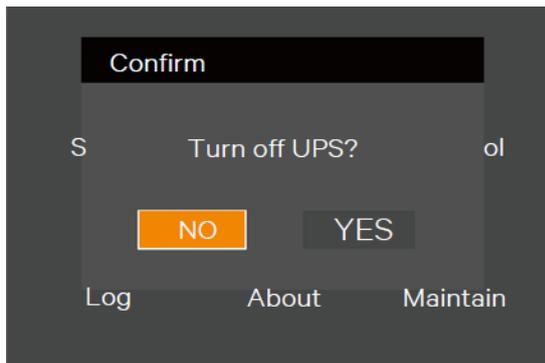


Figure 5-3 Bypass abnormal interface



Note

In Bypass mode, the load accepts the power not from the pure power outputted by the inverter, but from the mains power directly.

For the detailed information of the Normal mode, Bypass mode, Battery and Maintenance Bypass mode, please refer to section 1.5 UPS State and Operation Mode.

5.4.1 Transfer from Bypass Mode to Inverter Mode

In Bypass mode, press and hold the power button.

If the ECO mode is not turned on, the interface shown in Figure 5-4 will appear.

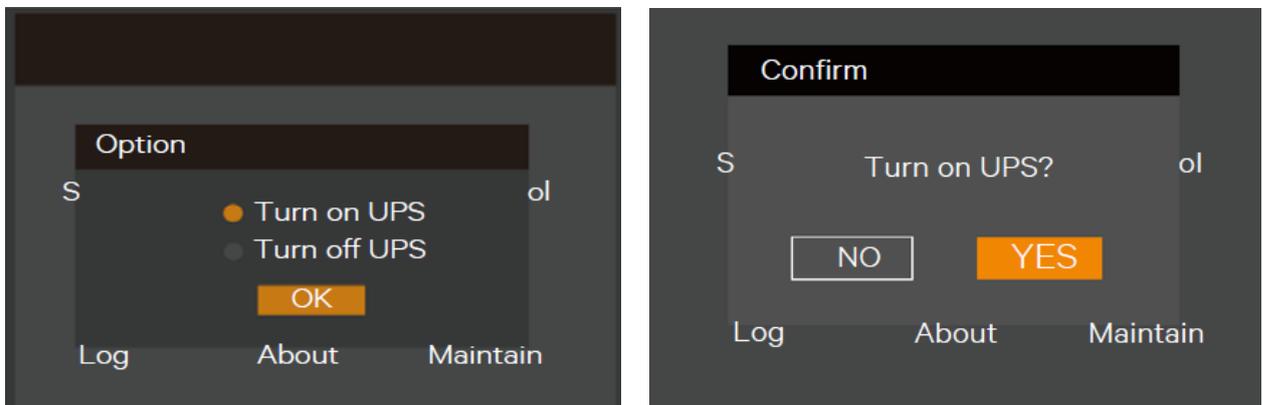


Figure 5-1 ECO Mode not turned on

Select 'Turn on UPS' and click OK to transfer to the Inverter mode, see Figure 5-5.

Select 'Turn off UPS' and click OK to shut down the UPS output.

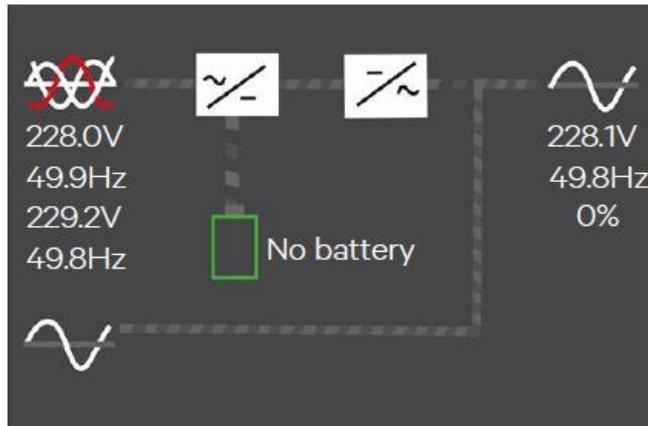


Figure 5-2 Bypass to inverter Mode

If the ECO turned on, the interface shown in Figure 5-6 will appear. Select 'YES' to shut down the UPS output.

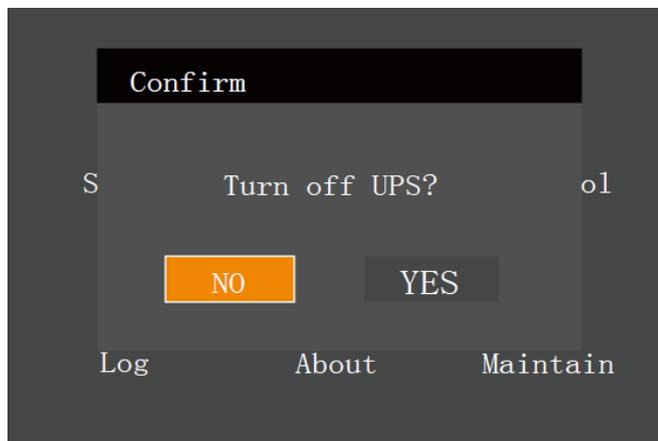


Figure 5-3 ECO turned on interface Mode

5.4.2 Transfer from Inverter Mode to Maintenance Bypass

When the UPS is running in Normal mode, you can use this procedure to make the load transfer from inverter output to maintenance bypass.



Important

1. Before performing this procedure, you should check the LCD information first, and make sure, the bypass is normal and synchronizes with the inverter. Otherwise, it may result in the load power interruption for a while.

1. Through the LCD settings page, change the Dry connect 3 to 'Maintain mode'. See Figure 5-7.

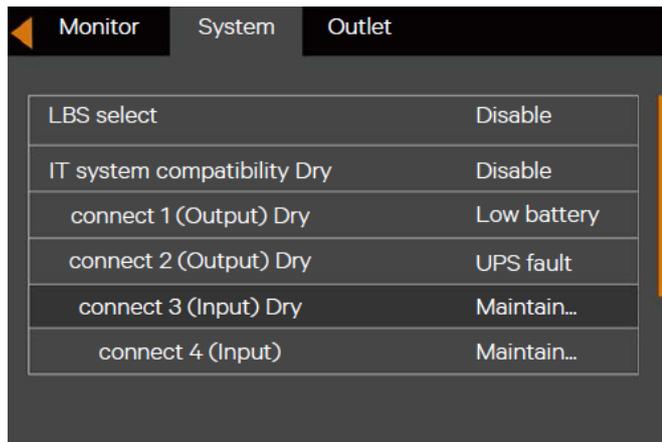


Figure 5-4 Changing dry contact 3 to “Maintain Mode”

2. Connect one end of the maintenance bypass signal cable to Dry Contact Port 3 of the UPS and the other end to the NO/NC Auxiliary contact.
3. Remove the screws securing the Bracket of the maintenance bypass switch.
4. Turn Off Inverter.
5. Confirm that the UPS has transferred to internal bypass mode.
6. After confirmation, close the maintenance bypass switch

Note: Dry contact port 4 can achieve the same function as dry contact port 3 via the steps mentioned above.

5.4.3 Transfer from Maintenance Bypass to Inverter Mode

After UPS maintenance, you can use this procedure to transfer the load from the maintenance bypass to the inverter.

	<p>Important</p> <p><i>In Maintenance bypass mode, After UPS maintenance, the UPS must be manually transferred to bypass mode and the output switch must be closed. Failure in doing so may cause equipment damage.</i></p>
---	--

1. Close the mains input MCB and bypass input MCB on the rear panel of the UPS. The UPS will turn on and operate in Bypass mode.
2. Confirm that the UPS is in Bypass mode, then close the output MCB on the rear panel of the UPS.
3. Open the maintenance bypass MCB on the rear panel of the UPS.
4. Fix Bracket of the maintenance bypass switch to its original position, then fasten the fixing screws.
5. Press the power button, and the UPS transfers to Inverter mode.

5.5 REPO

Located at rear of the UPS, the REPO port is designed to switch off the UPS in emergency conditions (such as fire, flood). The system will turn off the rectifier, inverter and stop powering the load immediately (inverter and bypass output included), and the battery stops charging or discharging. Just unplug the terminal connecting to the REPO if you need emergency power-off.

If the mains input is present, the UPS control circuit will remain active; however, the output is closed. To remove all

mains power from the UPS, the external main input MCB should be disconnected.

5.6 Auto Restart

When the mains power failure, the UPS draws power from the battery to supply the load until the batteries are depleted, then the UPS will shut down.

The UPS will automatically restart and recover output power supply:

- After the mains power is restored.
- The UPS Auto Restart function is enabled.
- After the Auto Restart is delayed (default: 10s). During the Auto Restart delay, the UPS will charge the battery to provide a safety margin for equipment shutdown if input power fails again.

If the Auto Restart function is disabled, you can restart the UPS manually by pressing the power button.

5.7 Language Selection

The LCD menus are available in two languages: Chinese, English. Procedures for selecting the language:

1. At the main menu screen, press the  or  key to switch the cursor to select 'Settings', then press the  key to confirm it. See Figure 5-9.

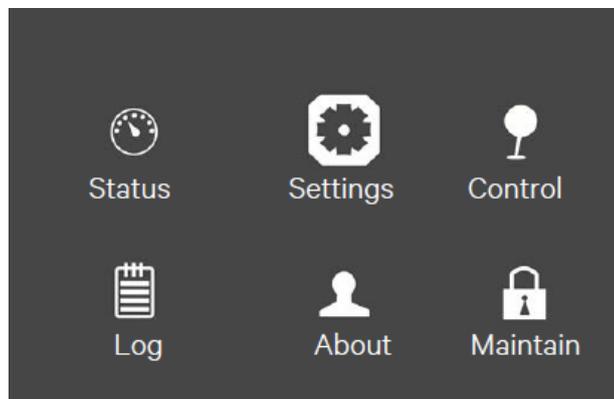


Figure 5-5 Main menu

2. Press the  key to move the cursor to 'Monitor', see Figure 5-10.

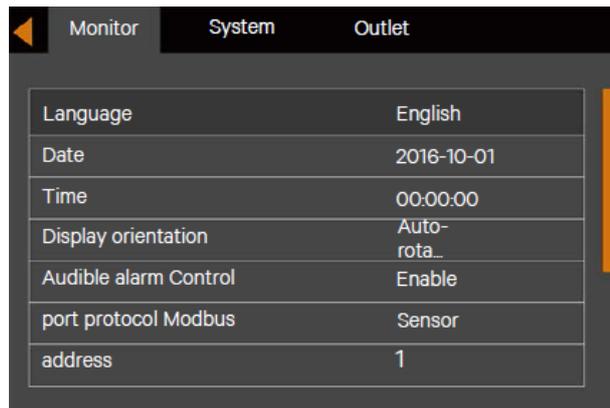


Figure 5-6 Monitor Interface

3. Press the  key to highlight the language, see Figure 5-11.

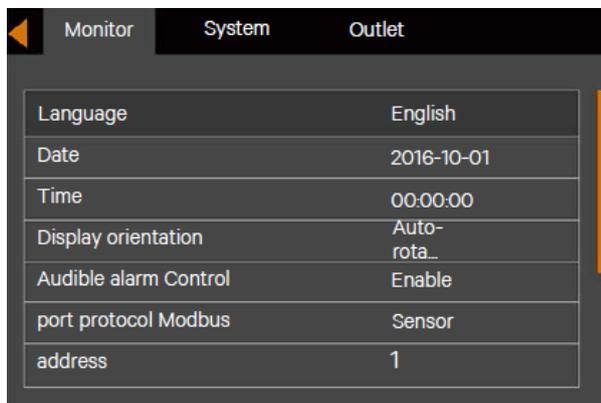


Figure 5-7 Language Selection

4. Press the  or  key to select the language you need, then press the  key to confirm it. At this time, the LCD contents will be the language selected by you. See Figure 5-12.

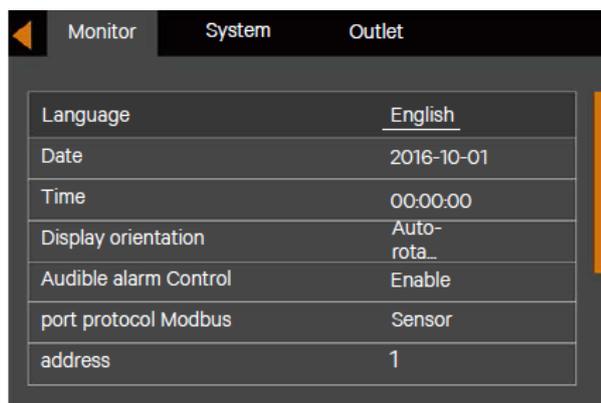


Figure 5-8 Changing Language

5. Press the  key for several times to back to the main menu screen.

5.8 Changing Current Date and Time

Procedures for changing the system date and time:

1. At the main menu screen, press the  or  key to switch the cursor to select 'Settings', then press the  key to confirm it. See Figure 5-13.

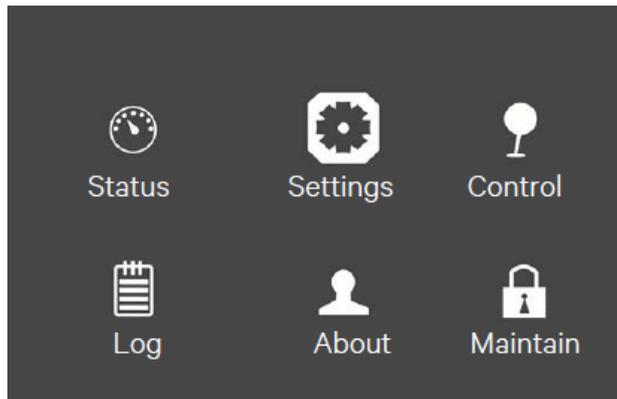


Figure 5-9 Main menu screen

2. Press the  key to move the cursor to 'Monitor', see Figure 5-14.

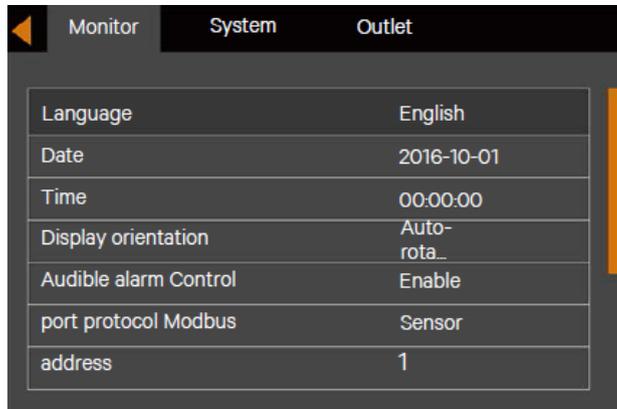


Figure 5-10 Monitor Interface

3. Press the key, and press the or key to highlight the date and time, see Figure 5-15.

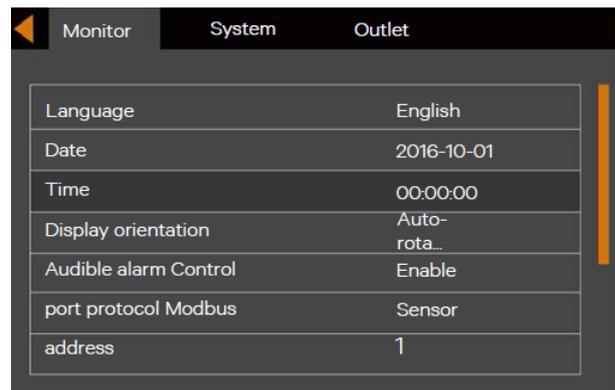
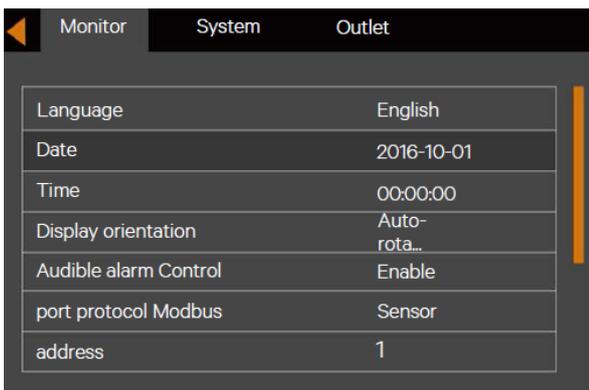


Figure 5-11 Selection of date and time

4. Press the  key, move the cursor and press the  or  key to change the date and time you need. See Figure 5-16.

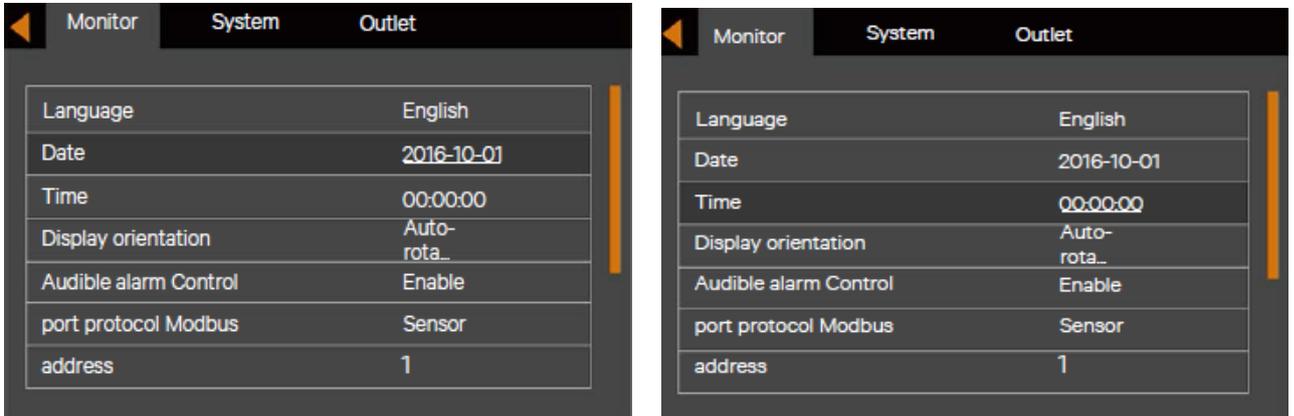


Figure 5-12 Changing date and time

5. Press the  key to confirm it, and then press the  key several times to back to the main menu screen.

5.9 Setting Password

1. After powering on the UPS, at the main menu screen, press the  or  key to move the cursor to select 'Settings'. See Figure 5-17.

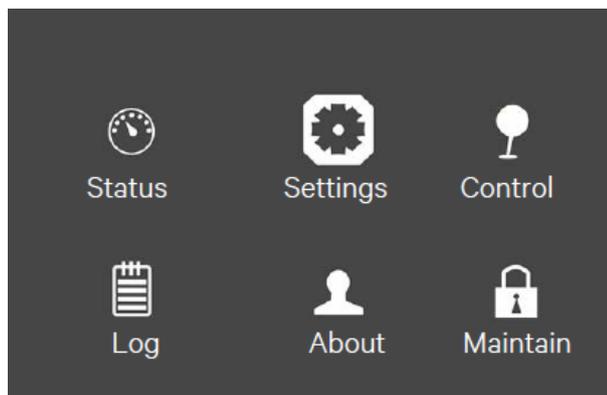


Figure 5-13 Main menu

2. Press the  key, the interface shown in Figure 5-18 will appear.

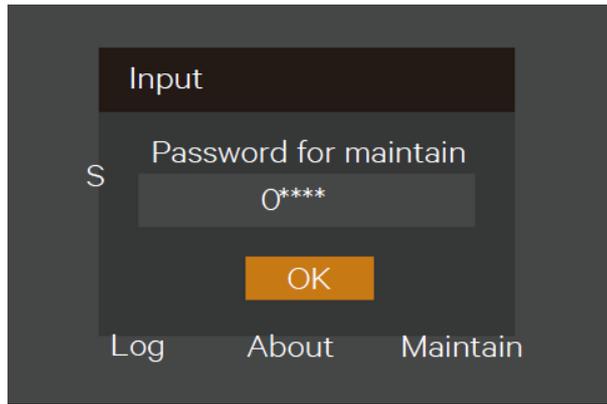


Figure 5-14 Inputting password

The user can observe the following procedures to change password:

1. Press the  key to move the cursor to the 'Monitor', see Figure 5-19.

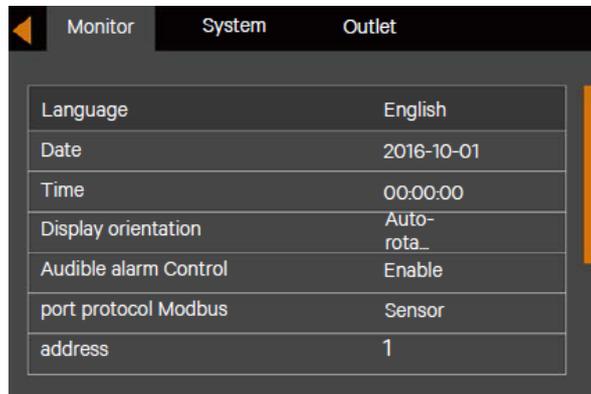


Figure 5-15 Monitor Interface

2. Press the key, then press the key to select the 'Change settings password', see Figure 5-20.

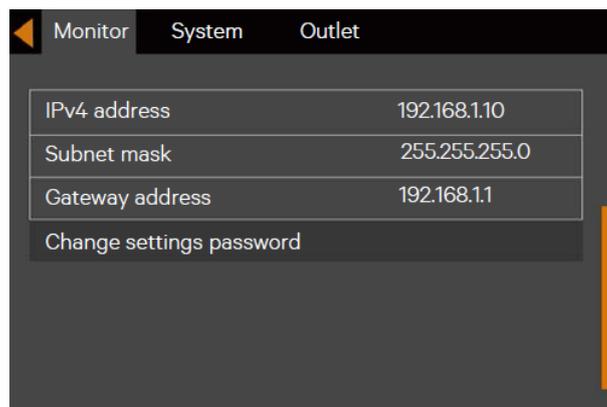


Figure 5-16 Changing setting password

3. Press the  key, the interface shown in Figure 5-21 will appear.

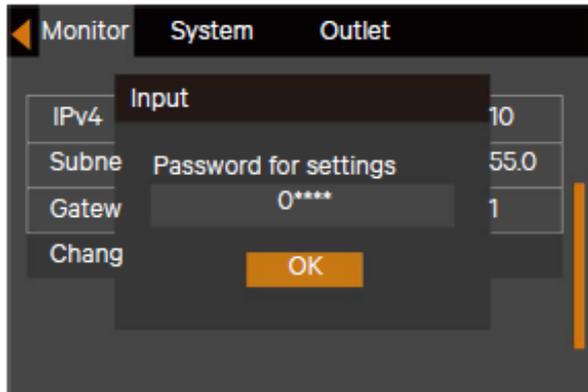


Figure 5-17 Password for settings

4. Input the existing password, press the  key to confirm it, then the system requires to input a new password. See Figure 5-22.

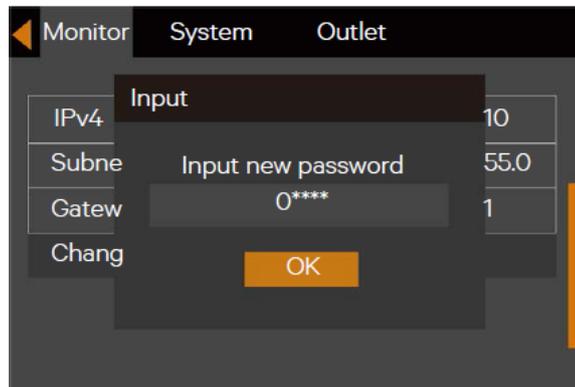


Figure 5-18 Inputting new password

5. After inputting the new password, press the  key to confirm it, then the system requires confirming the new password, see Figure 5-23.

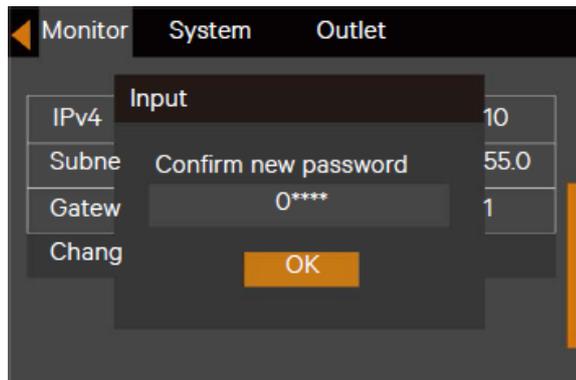


Figure 5-19 Confirming new password

6. After the confirmation, press the  key and the system prompts that the password changing is successful, see Figure 5-24.

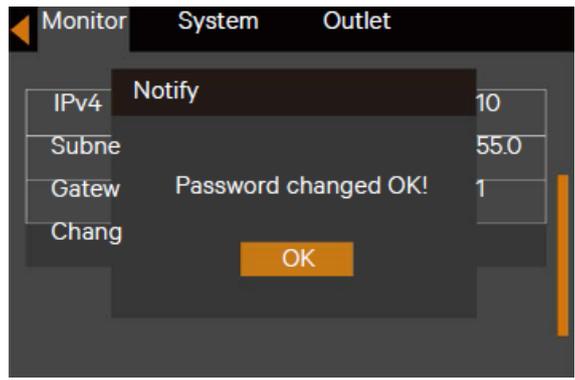


Figure 5-20 Password changed ok

 **Note**

Only through the correct password (default: 111111) verification can you conduct the parameters of the UPS.

Chapter 6 Communication

This chapter briefly introduces the UPS communication.

The communication ports include: intelligent card port, dry contact port, built-in port, 32 port, control port and USB port



It is recommended to make the signal cable length be less than 3m and keep away from the power cable.

6.1 Installing Intelligent Card

6.1.1 Intelligent Card Port

UPS provides an intelligent card port (see Figure 6-1, taking 20kVA model for example), which is used to install the communication device options, including SIC card and RDU-SIC card. The intelligent card port and USB port can be used at the same time.

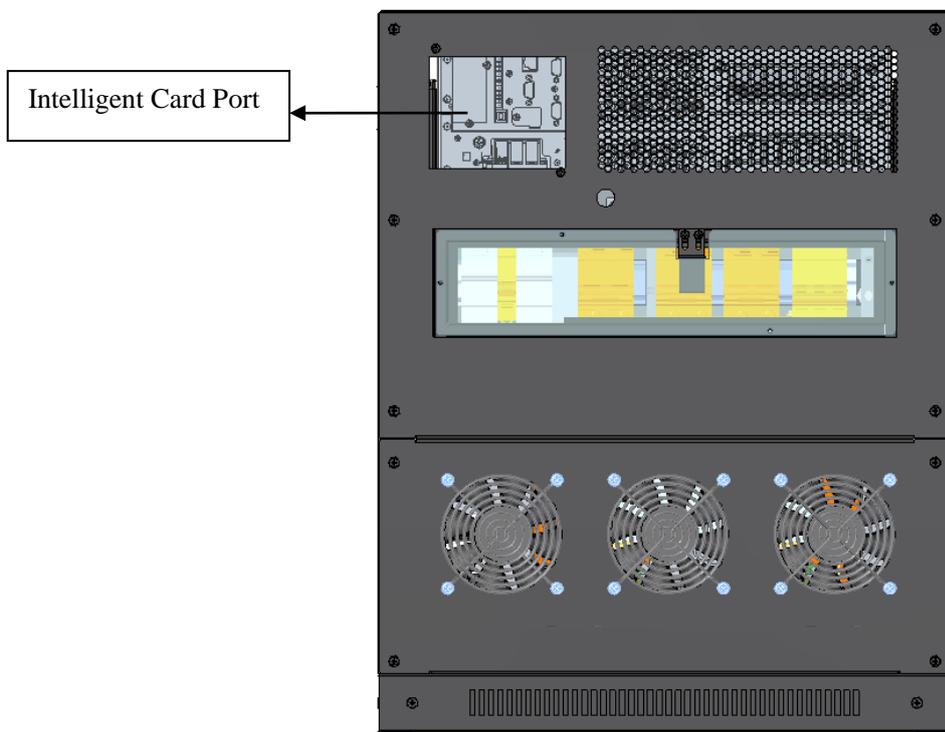


Figure 6-1 Intelligent card installation (20kVA, rear view)

6.1.2 Intelligent Card Option

SIC card

SIC card is a network management card, which makes the intelligent devices (such as UPS, air conditioner, static transfer system (STS), server power management system (SPM), and so on) produced by Vertiv have network communication capability. The SIC card can also be used with the Network Shutdown designed by Vertiv to provide safe automatic shutdown function for the computer, in which the Network Shutdown has been installed, to protect data and reduce loss.

Refer to the corresponding user manual for the installation and operation guide.

RDU-SIC card

The RDU-SIC card is a network management card. It can make the intelligent equipment (such as UPS, PDU and so on) developed by Vertiv have the capacity of network communication. The SIC card can also connect to the environment monitoring equipment, including IRM series or 1-Wire series temperature sensor, temperature & humidity sensor or dry contact signal input & detecting sensors. In case of an intelligent equipment alarm, it notifies the user by multiple ways: recording, sending a Trap message, sending an E-Mail or sending an SMS.

The RDU-SIC card provides four approaches to monitor the intelligent equipment and equipment room environment:

- Web browser. Monitor your intelligent equipment and equipment room environment through the Web server function provided by the SIC card
- Network management system (NMS). Monitor your intelligent equipment and equipment room environment through the SNMP agent function provided by the SIC card
- RDU-Manager. RDU-Manager is a piece of management software for equipment room. You can use RDU-Manager to monitor your intelligent equipment and equipment room environment through the TCP/IP interface provided by the SIC card
- Centralized management software (Nform). Monitor your intelligent equipment through the Velocity Server service function provided by the SIC card

The SIC card can also work with the Network Shutdown computer safe shutdown program developed by Vertiv to provide automatic safe shutdown function for your computer installed with Network Shutdown, so as to prevent data loss.

Refer to the corresponding user manual for the installation and operation guide

RS485 card

RS485 card should be used together with S600 Model provided by Vertiv to realize the signal transform from RS232 to RS485.

Refer to the corresponding user manual for the installation and operation guide.

RS232 card

The RS232 card should be used together with the Liebert® S600 series UPS of Vertiv. It only supports RS232 protocol communication, and the maximum length of the communication cable cannot exceed 15 meters.

6.2 Connection Cables for Dry Contact Port

The UPS provides five dry contact ports. The silkprints of the five dry contact ports are 1 ~ 12. The pin layout of each dry contact port is shown in Figure 6-2, and the port description is shown in Table 6-1.

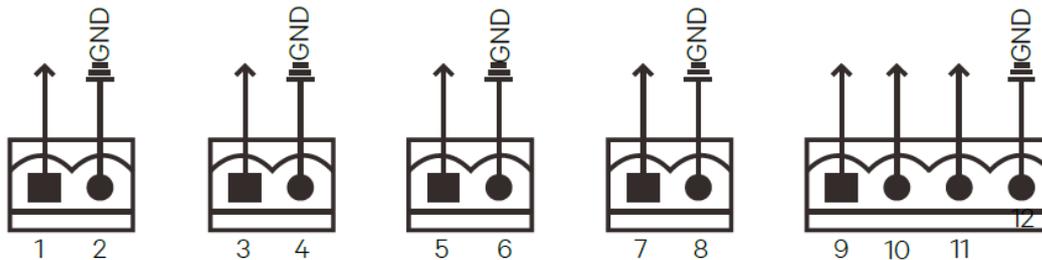


Figure 6-2 Pin layout of dry contact ports

Table 6-1 Description of the dry contact ports

SilkPrint	Port Name	Pin No	Pin Name	Meaning
1	Output port1	1	LOW-BATTERY/ ON_BATTERY / ON_BYPASS/UPS_FAULT	Default: LOW-BATTERY can be set via the LCD settings page. When the system has as alarm, short Pin 1 and Pin 2
		2	GND	GND
2	Output Port2	3	LOW-BATTERY/ ON_BATTERY / ON_BYPASS/UPS_FAULT	Default: UPS_FAULT, can be set via the LCD settings page. When the system has as alarm, short Pin 3 and Pin 4
		4	GND	GND
3	Input port 1	5	Battery mode shutdown/Any mode shutdown (Remote Comms Shutdown)/maintain mode	Default: Maintain mode, can be set via the LCD settings page. When Pin 5 and Pin 6 are shorted, the function is valid
		6	GND	GND
4	Input port 2	7	Battery mode shutdown/Any mode shutdown (Remote Comms Shutdown)/ Maintain mode	Default: Maintain mode, can be set via the LCD settings page. When Pin 7 and Pin 8 are shorted, the function is valid
		8	GND	GND
5	REPO input port*	9	+5V	REPO power supply, 5Vdc 100mA
		10	REPO Coil -NC	NC, ECO activated when Pin 9 and Pin 10 opened
		11	REPO Coil -NO	Trigger REPO when Pin 11 and Pin 12 closed
		12	GND	REPO Ground



Note

The I/O dry contact port capacity: 125Vdc, 0.5A; 30Vdc, 1A. Pin11 and Pin12 reserves the corresponding terminals for configuring the REPO function. The REPO device also needs the shielded cable to connect to the Normally Open remote REPO switch between the two terminals. If not necessary, you should disconnect Pin9 and Pin10. Pin9 and Pin10 have been shorted before delivery.



Note

The EPO action of the UPS will close the rectifier, inverter and static bypass, but it cannot disconnect the UPS mains input inside. If you want to disconnect the UPS completely, just disconnect the upstream input MCB when generating the EPO.

In emergency conditions, close the REPO switch (prepared by users) to shut down the rectifier and inverter, and the UPS is powered off. In normal condition, the REPO switch cannot cut off the UPS input power. If a switch of electronic control tripping function is adopted at the UPS input, the REPO switch can help the switch trip and thus cut off the UPS input power. The position of the REPO switch is shown in Figure 1-3, and the REPO cable connection is shown in Figure 6-3.

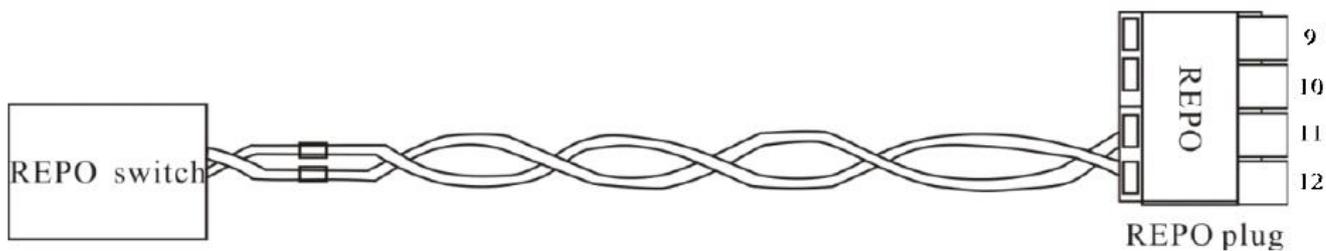


Figure 6-3 Repo cable connection

The cable connection procedures are as follows:

1. Loosen the '11' and '12' connection terminals of the REPO port.
2. Insert the two ends of the copper core cables with the insulation leather peeled into the '11' and '12' connection terminals of the REPO port and press down the terminals. The REPO cable is complete. Ensure that the REPO cable is firmly connected to avoid no action or wrong action of the REPO caused by accidental dropping or infirm contact.
3. For parallel UPSs, when connecting the REPO cable, users should parallel connect '11' of the REPO port with one end of the electronic switch, and parallel connect '12' with the other end of the electronic switch.

When the REPO switch at the user end closes, the UPS will generate an alarm and cut off the output immediately, and the UPS will not return to the normal operation state automatically. At this point, you must change the REPO switch state, and power on the UPS manually.



Note

1. It is recommended to use 0.82mm² ~ 0.33mm² (signal cable of 18AWG ~ 33AWG) copper core cable.
2. If the switch you have configured is of electronic control tripping function, when the REPO signal takes action, you need to close the switch before restart the UPS.

6.3 Connecting USB

The methods to connect the USB communication cable are as follows:

Insert one end of the USB communication cable to the USB port (see Figure 1-3) on the rear panel of the UPS and connect the other end to the USB port of the computer. After the connection, you need to install the USB drive program in the installation disk.

6.4 Connecting Serial Port Communication Cables

The methods to connect the serial port communication cable are as follows:

Insert one end of the DB9 serial port communication cable to the DB9 serial port (see port 5 in Figure 1-3) on the rear panel of the UPS, and connect the other end to the DB9 port of the computer.

The pin function of DB9 is listed below:

Pin No	Function
2	Send Data
3	Receive Data
5	Common Terminal

6.5 Connecting Control Port

The control port adopts the standard RJ45 port, which supports the Modbus/Jbus port and connects the Vertiv temperature/temperature & humidity sensor.

The user can select Modbus/Jbus protocol function or sensor function via the 'Settings' on the LCD.

6.6 Connecting Built-In Ethernet Port

The built-in Ethernet port supports the HTTP protocol. The user can connect one end of the net cable to the Ethernet port of the UPS and connect the other end to the built-in Ethernet port of the computer. The user can remotely access the UPS via the IE, Chrome and Firefox, so as to monitor the UPS in real time.

Connect net cables: Connect one end of the net cable to the Ethernet port of the UPS and connect the other end to the built-in Ethernet port (or the switch port, Router port) of the computer.

Set network parameters: The user should change the parameters (IP address, subnet mask, gateway address) of the computer or the UPS, so as to make the computer communicate the UPS well.

To change the network parameters of the UPS, operate them via the 'Settings'->'Monitor', as shown in Figure 6-4.

Webpage monitoring function

Open the browser (like IE), input the IPv4 address at the address bar to the login interface.

After inputting the correct user name and password (default name: user, password: 111111), you can monitor the UPS working status.

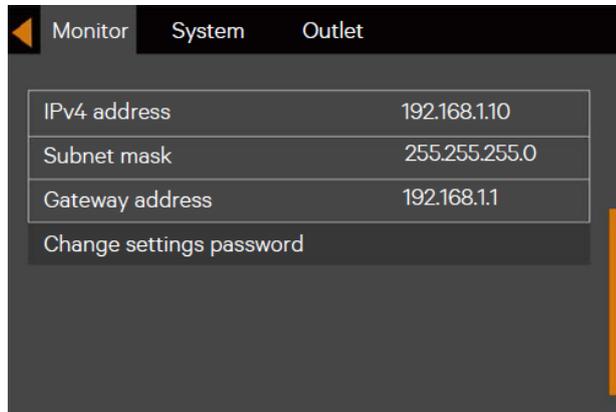


Figure 6-4 Changing UPS Network Parameters

Browser support

To obtain the best user experience, it is recommended to use the Internet Explorer (IE9 or above), or the Chrome, FireFox (latest version required)

Screen resolution

The display with resolution of 1024*768 or above is recommended.

Chapter 7 Maintenance

This chapter focuses on the UPS maintenance, including the fan maintenance, battery maintenance, UPS cleaning, UPS state check, UPS function check



Never maintain the UPS on line. Ensure that the UPS has been completely powered off when performing the UPS Internal maintenance.

7.1 Fan Maintenance



Before the fan is completely stopped, do not insert your fingers or some tools into the fan so as to avoid device damage or personal injury.

The UPS fans are expected to run for 20000 hours ~ 40000 hours continuously. The higher the ambient temperature, the shorter the fan life is.

During the UPS operation, please verify the fan status once every half year by confirming that air blows out from the ventilation holes on the rear panel.

7.2 Battery Maintenance



- 1. Never reverse-connect the battery, otherwise the fire will occur.*
- 2. Never open the battery to prevent physical injury because of the electrolyte. If you accidentally touch the electrolyte, wash the area immediately with plenty of clean water and go to hospital.*

The internal battery module of the UPS is sealed, lead-acid, maintenance-free battery. The battery life depends on the ambient temperature, charge and discharge times. High ambient temperature and deep discharge shortens the battery life.

To ensure the battery life, it is required to:

- Keep the ambient temperature ranging from 15°C to 25°C
- Prevent small current discharge. Continuous battery operation time exceeding 24 hours is strictly prohibited
- Charge the battery for at least 12 hours, if the battery hasn't been charged for three months at specified ambient temperature, or two months at high ambient temperature



1. Check regularly the screws at the battery connection parts, fasten it immediately if not tight.
2. Make sure that the safety equipment is complete and that the function is normal, especially that the settings of the battery management parameters are normal.
3. Measure and record the internal temperature of the battery room.
4. Check whether the battery ports are damaged or hot, and whether the chassis and the covers are damaged

If liquid leakage and damage to the battery are found, place the battery in the anti-vitriol tank, and deal with it according to the local regulations.

The waste lead-acid battery is dangerous waste material. It is one of the national emphases to control the waste battery pollution. Its storage, transportation, usage and disposal must follow the national and local law and other criterions about the dangerous waste material and the waste battery pollution prevention.

According to the related regulations, recycle the waste lead-aid battery, and other disposal methods are prohibited. Throwing away randomly the waste lead-aid battery and other improper disposal methods can result in serious environment pollution, which will be investigated the legal responsibility.

As the provider of the lead-acid battery, Vertiv has built perfect service network and recycle system for the waste battery to assist users to deal with the waste battery by law. Contact Vertiv or the nearest service center for the detailed information of the recycle system about the waste battery.

Vertiv is not liable for the environment results caused by failure to comply with the notices in this section or to use the waste battery recycle system provided by Vertiv.

7.3 Cleaning UPS

Clean the UPS periodically, especially the ventilation holes, to ensure free airflow inside the UPS. If necessary, clean the UPS with a vacuum cleaner. Confirm that the ventilation holes are unobstructed.

7.4 Checking UPS Status



UPS functions check procedures may cause power interruption to load!

It is recommended to check the UPS operation status once every half year.

Check the following items:

1. Check if the UPS is faulty: Is the alarm indicator on? Is the UPS giving any alarm?
2. Check if the UPS is operating in Bypass mode. Normally, the UPS operates in Normal mode; if it is operating in Bypass mode, you should find out the reason, such as operator intervention, overload, internal fault, and so on.

3. Check if the battery is discharging: When AC mains is normal, the battery should not discharge; if the UPS operates in Battery mode, you should find out the reason, such as mains failure, battery test, operator intervention, and so on.

7.5 Checking UPS Function

It is recommended to check the UPS functions once every half year. Backup the load data before conducting the UPS functions check. Procedures are as follows:

1. Press the power button to check if the buzzer beeps, indicators are on and the LCD display is normal.
2. Press the ESC key to check again if the indicators are on, the LCD display is normal and the UPS has been transferred to the inverter mode.

Chapter 8 Options

The Chapter introduces the options of the UPS.

8.1 Option List

Table 8-1 Option list

No.	Option name	Remark	Model
1	Parallel Cables	Available in two lengths. 1M parallel cable.	324922020702
2		3M parallel cable	324922020703
3	LBS Cable	2M LBS cable	324922020704
4	SNMP		931602351817
5	MODBUS		000002354066

8.2 Communication Cables

Communication cable is compulsory in parallel system. See Table 8-5 for cable description. Refer to 3.4.2 Connecting Parallel Cables for the methods to connect the parallel cables.

Type	Name	Description	Appearance
324922020702	Parallel communication cable	For N + 1 parallel system, N + 1 communication cables (1m) are needed. For example, two communication cables are needed in 1 + 1 parallel system; three communication cables are needed in 2 + 1 parallel system; four communication cables are needed in 3 + 1 parallel system	
324922020703	Parallel communication cable	For N + 1 parallel system, N + 1 communication cables (3m) are needed. For example, two communication cables are needed in 1 + 1 parallel system; three communication cables are needed in 2 + 1 parallel system; four communication cables are needed in 3 + 1 parallel system	

Dual Bus Ports

The LBS cables are compulsory in dual bus system. See Table 8-7 for the dual bus parts.

Type	Name	Description	Appearance
324922020704	LBS Cable	Be used to form LBS system. Two LBS cables are recommended	

Appendix 1 LCD Parameter Settings

Menu	Item	Setting Range	Default Setting
System	Auto restart	Disable, Enable	Enable
	Auto restart delay	0~999 seconds	10; Single unit only
	Guaranteed shutdown	Disable, Enable	Disable
	Remote control	Disable, Enable	Enable
	Remote power on delay	0~999 seconds	0
	Remote shutdown delay	0~999 seconds	0
	Redundant	NO, YES	YES
	LBS select	Disable, Master, Slave	Disable; /20kVA only
	IT system compatibility	Disable, Enable	Disable
	Dry contact 1 (Output)	Low battery, On bypass, On battery, UPS fault	Low battery
	Dry contact 2 (Output)	Low battery, On bypass, On battery, UPS fault	UPS Fault
	Dry contact 3 (Input)	Battery mode shutdown, Any mode shutdown, Maintain mode	Maintain mode
	Dry contact 4 (Input)	Battery mode shutdown, Any mode shutdown, Maintain mode	Maintain mode
Output	Voltage selection	220V, 230V, 240V	220V
	Startup on bypass	Disable, Enable	Disable
	Frequency Selection	Auto, BypEna; Auto, BypDisa; 50Hz, BypDisa; 60Hz, BypDisa	Auto, BypEna
	Inverter sync range	±0.5Hz, ±1.0Hz, ±2.0Hz, ±3.0Hz, ±4.0Hz, ±5.0Hz	±3.0Hz
	Bypass voltage upper limit	+10%, +15%, +20%	+20%
	Bypass voltage lower limit	-10%, -20%, -30%, -40%	-40%
	Bypass frequency range	±5Hz, ±10Hz	±10Hz
	Run mode	Normal, ECO mode	Normal
Menu	Item	Setting Range	Default Setting
Output	ECO voltage range	±5%, ±10%, ±15%	±10%
	ECO frequency range	±1Hz, ±2Hz, ±3Hz	±3Hz
	ECO	requalification time 5, 15, 30 (min)	30
	Output phase No.	1 phase, 3 phases	3 phases (/20kVA)
Parallel	Voltage selection	220V, 230V, 240V	220V
	Frequency selection	Auto, BypEna; Auto, BypDisa; 50Hz, BypDisa; 60Hz, BypDisa	Auto, BypEna
	Run mode	Normal, ECO mode	Normal
	Redundant	NO, YES	YES
	System parallel No.	1~4	1
	Output phase No.	1 phase, 3 phases	3 phases (/20kVA)
	Sync parallel parameters	Button	Button
	Shared battery	Disable, Enable	Disable; /20kVA only
	Local/Parallel battery	7~3000Ah	9Ah (5/6/10kVA)

Battery	total Ah		18Ah (16/20kVA)
	External battery cabinet vgroup No.	Auto test, 0~10	Auto test
	Low battery time	2~30 (min)	2
	Battery replaced time	YYYY-MM-DD HH:MM:SS	2000-01-01 0:00:00
	Battery test interval	Disable, 8 weeks, 12 weeks, 16 weeks, 20 weeks, 26 weeks	Disable
	Battery test weekday	Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday	Wednesday
	Battery test time	HH:MM:SS	0:00:00
	Battery series	10kVA: 12, 16, 20 20kVA: 24, 32, 40	16 (10kVA), 32 (20kVA)
	Discharge protect time	1~4320 (min)	4320
	Equal charge enable	NO, YES	NO
	Temperature Compensation	Disable, Enable	Disable
	Replace battery	Button	Button
Menu	Item	Setting Range	Default Setting
Outlet	Turn on outlet		Appear only when outlet off
	Turn off outlet		Appear only when outlet off
	Reboot outlet		Appear only when outlet off
	Turn off when UPS overload on battery	YES, NO	NO
	Turn off when UPS on battery for	0~4320 (min)	2
	Turn off when backup time less than	0~4320 (min)	0
	Turn off when battery capacity less than	20~80%	30%
	Turn on when power returns for	0~4320 (min)	
MONITOR	Language	English, Chinese	English
	Date	YYYY-MM-DD	2016-10-0
	Time	HH:MM:SS	00:00:00
	Display orientation	Auto-rotate, horizontal, Vertical	Auto-rotate
	Audible Alarm	Disable, Enable	Enable
	Control port protocol	Modbus, Sensor	Sensor
	Modbus address	1~128	1
	IPv4 address		192.168.1.10
	Subnet mask	ddd.ddd.ddd.ddd ('d' is a decimal number)	255.255.255.0
	Gateway address		192.168.1.1
	Change settings password	The password is numeric only and can be set from 0 to 9. The password length is 6	111111

Appendix 2 Glossary

AC	Alternating current
CB	Circuit breaker
CSA	Cross sectional area
DC	Direct current
DIP	Dual-in-line Package
DSP	Digital Signal Processor
EMC	Electromagnetic compatibility
EMI	Electromagnetic interference
EOD	End-of-discharge
EPO	Emergency power off
I/O	Input/output
IGBT	Integrated gate bipolar transistor
LBS	Load bus synchronizer
LCD	Liquid crystal display
LED	Light-emitting diode
MCB	Master Circuit Breaker
NMS	Network Management System
PE	Protective Earth
RCCB	Residual current circuit breaker
RCD	Residual current detector
REPO	Remote emergency power off
SCR	Silicon-controlled rectifier
SNMP	Simple network monitoring protocol
STS	Static transfer switch
UPS	Uninterruptible power system

Appendix 3 Hazardous Substances or Elements Announcement

Parts	Hazardous substances or elements					
	Plumbum	Hydrargyru	Cadmium	Chrome6+	PBB	PBDE
	Pb	Hg	Cd	Cr6+	PBB	PBDE
Cables	×	○	○	○	○	○
<p>This table is made following the regulation of SJ/T 11364.</p> <p>○: Means the content of the hazardous substances in all the average quality materials of the parts is within the limits specified in GB/T 26572</p> <p>×: Means the content of the hazardous substances in at least one of the average quality materials of the parts is outside the limits specified in GB/T 26572</p>						
Applicable scope: Liebert® S600 10kVA ~ 20kVA UPS						