USER MANUAL

3/3 ON LINE UPS

20KVA

Uninterruptible Power Supply

Version: 1.0

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1. Introduction

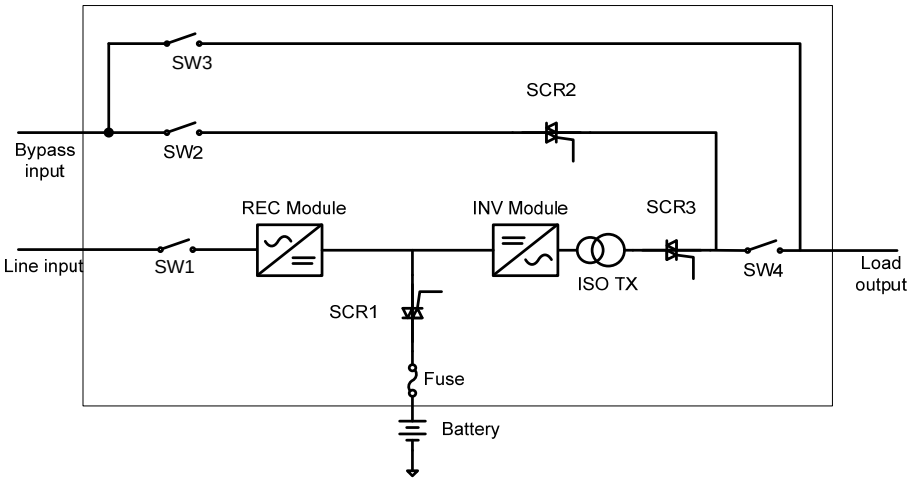
1.1 Overview

This UPS series is a double conversion system with sinewave output. It supplies continuous, stable, clean power for commercial and industrial environments. When the utility is lost accidentally, the UPS system will use the power from battery to output without interruption.

This system is applied an advanced digital controller to control the double conversion system, and with an isolated transformer at the output to protect the load and the UPS itself. The UPS is also built-in user-friendly LCD interface and multiple communications including Modbus, RS-232 and intelligent slot. With free download software, this UPS provides complete power solution of monitoring and controlling remotely.

1.2 Basic structure

The whole system consists of REC module, INV module, static bypass, maintain bypass and battery controller. The output of the UPS are switched over to either line input or bypass input with two SCRs operated in parallel. The basic structure is shown as below:

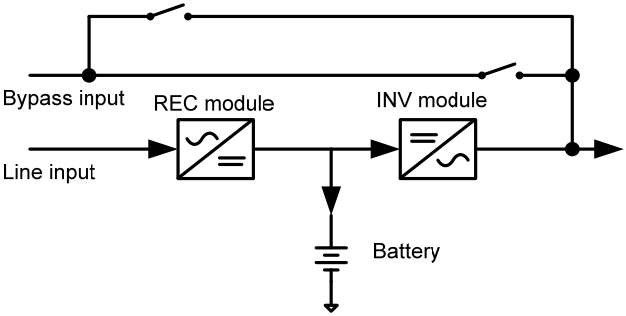


1.3 Working mode

This part will introduce the working mode of the UPS system.

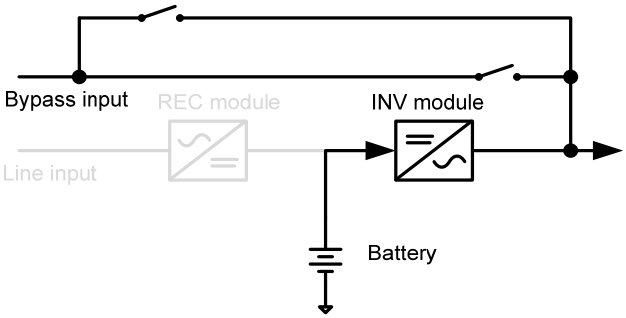
1.3.1 Line mode

When the UPS is working in line mode, the AC input will be rectified by REC module, and then be converted to the output via INV module. Meanwhile, the battery is being charged. At this time, static bypass is in standby.



1.3.2 Battery mode

When the utility fails, the UPS will transfer to battery mode without interruption. The UPS converts the power from battery to output. At this time, static bypass is still in standby. If the utility is recovered, the UPS will transfer back to line mode again.

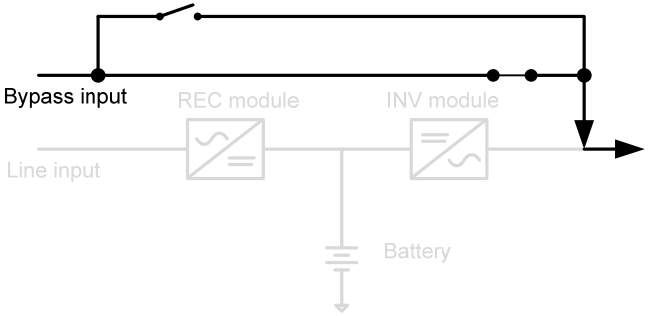


1.3.3 Static bypass mode

Bypass mode can be enabled or disabled by user setting. The default setting is enabled. The UPS system will work in bypass mode when the following conditions occur.

- The UPS system doesn't turn on.
- The UPS is overload in line mode.
- The rectifier or inverter module is abnormal.
- The utility fails and the battery is discharged to low level.

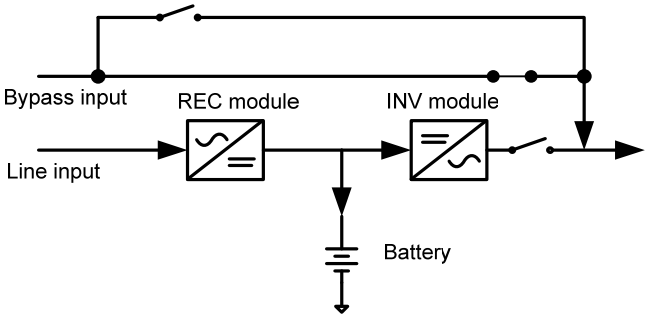
When above mentioned situation is eliminated, the UPS will transfer back to line mode or battery mode.



1.3.4 ECO MODE

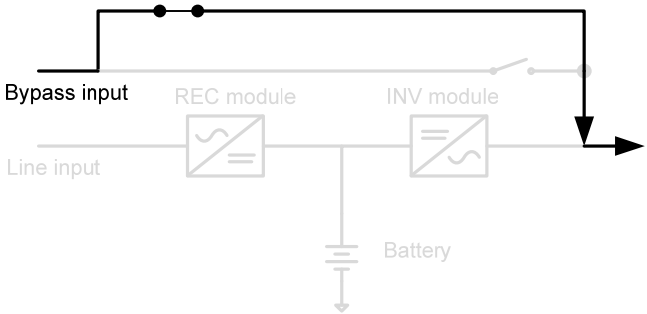
ECO mode can be enabled or disabled by user setting. The default setting is disabled. If it's required to have high efficiency performance instead of the high power quality, it's better to enable "ECO mode".

In this mode, load will be supported via Bypass input when utility quality is OK. And the Line input will still be operated to charge battery and INV module is in standby status with switch opened. When Bypass input is lost, the system will transfer to line mode or battery mode and the transfer time is less than 10ms. When Bypass input is restored, the system transfers back to bypass mode again. This ECO mode operation greatly improves system efficiency.



1.3.5 Maintain bypass mode

When the UPS needs maintenance and load needs uninterruptible power, the users can firstly transfer the inverter to bypass mode, and then switch on maintain bypass breaker. After that, switch off all other breakers and switches. In this condition, the utility can still power the load and users can maintain the UPS.



1.3.6 Other modes

Except mentioned modes above, there are standby mode, power-off mode and fault mode.

There is no output in standby mode, but the utility will charge battery. If the UPS stays in standby mode for a while without utility and load connection, the UPS will transfer to power-off mode. At this time, the UPS can't be turned on by pressing ON button. Please kindly wait for 5 minutes to allow UPS completely off itself. After 5 minutes, UPS can be restarted by pressing ON button.

The UPS will transfer to fault mode if a fault occurs in the UPS. When some minor faults occur, the UPS still can transfer to bypass mode if bypass input is available. When some severe faults occur, it won't be eliminated until the users restart the UPS. Now, it's not necessary to turn off and restart the UPS to clear fault code. Simply follow section "6.3.3" to exit fault mode through LCD operation.

1.3.7 Dual input source

The line input and bypass input are separated routes in this UPS. Users can apply different power sources into these two input routes and set up a dual-input system. Users also can connect the same power source to these two inputs. Once the utility fails, no Line input and bypass input is available at the same time. Then, it will transfer to battery mode.

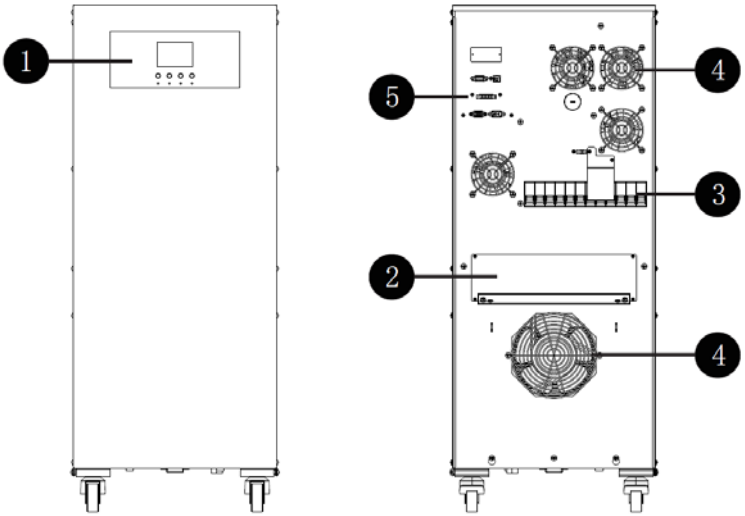
1.3.8 Reverse phase sequence operation

When the phase sequence of the line input is reversed, the UPS can still work in the line mode with "Line phase error" warning. If the bypass input connects to the line input with the same AC source, it will alarm with " Bps.phase error" warning and can't turn into bypass mode.

1.3.9 No neutral operation

When the line input disconnects from the neutral, the UPS can still work in the line mode.

1.4 Overview



1) Interface
2) Terminals
3) Breaker and switch
4) Fans
5) Communications

2. Important Safety Warning

2.1 Conventions and used symbols

Conventions used:

WARNING! Warnings identify conditions or practices that could result in personal injury;

CAUTION! Caution identify conditions or practices that could result in damaged to the unit or other equipment connected.

	Warning, risk of electric shock
	Warning, risk of danger
	Warning, risk of electric shock, energy storage timed discharge
	Refer to the operating instructions
	Warning, danger of the possible fall down of the equipment
	Warning, Danger of fan's rotation.
	Warning, hot surface
	Protective conductor terminal
	Earth (ground) terminal
	Direct current
	Alternating current
	Both direct and alternating current
	Three-phase alternating current
	Three-phase alternating current with neutral conductor
	Preservation of the environment: the users can contact with their provider or with the pertinent local authorities to be informed on how and where they can take the product to be recycled and/or disposed correctly.

2.2 Safety instructions



WARNING! Before installing and using this equipment, read all instructions and cautionary markings on the UPS and this manual. Store the manual where it can be accessed easily.



WARNING! This manual is for qualified personnel. The tasks described in this manual may be performed by qualified personnel only.



WARNING! This equipment must be installed by qualified person.



WARNING! An earth cable whose cross section should be the same as or greater than the power supply cable has to be connected to the protective earth connection.



WARNING! Make sure the UPS is isolated and protective earth correctly connected at installing and before operating the UPS.



CAUTION! This UPS should use for an IT distribution system.



CAUTION! The UPS's output neutral is same as the input neutral(Non isolate type). For the correct operation of the UPS, the input neutral cable should be connected. It may cause power loss without input neutral.



CAUTION! Please transport the UPS with packaged from factory.



WARNING! Pay attention to the slope of the ground and surface to avoid fall down when moving the equipment.



WARNING! This equipment is heavy. Do not lift too heavy without help.



CAUTION! The UPS can only working on dry condition. Shut down the UPS if any liquid flows into the UPS and dry it with absorbent cloth. Please use dry cloth when clean the UPS.



CAUTION! Please charge the battery first if using the UPS for first time or no using the UPS for a long period of time (6 months maximum).



WARNING! Never manipulate the equipment with wet hands.



CAUTION! To avoid a risk of fire and electric shock, make sure that existing wiring is in good condition and that the wire is not undersized. Do not operate the Inverter with damaged or substandard wiring.



WARNING! When the UPS shut down the power supply to the load because of EPO signal trigger, the equipment has power supply yet. To shut down the equipment's power, please turn off all the input power.



WARNING! Authorized service personnel should reduce the risk of electrical shock by disconnecting both the AC and DC power from the UPS before attempting any maintenance or cleaning or working on any circuits connected to the inverter. Turning off controls will not reduce this risk. Internal capacitors can remain charged after disconnecting all sources of power.



CAUTION! Do not open, disassemble or modify the equipment yourself. It contains no user-serviceable parts. Attempt to service this equipment yourself may cause a risk of electrical shock or fire and will void the warranty from the manufacturer.



CAUTION! Shut down the UPS If any smoke or gas exhausts from the UPS.



WARNING! Battery circuit is not isolated; it is dangerous to touch any part of the batteries.



CAUTION! When batteries are replaced, the complete battery set has to be replaced and do not reuse faulty batteries.



CAUTION! Do not expose the batteries in a fire or to high temperatures. Batteries may explode.



CAUTION! Batteries involve a serious risk for health and environment. Their disposal should be done in accordance with the existing regulations.



WARNING! Under high temperature environment, the case of this equipment could be hot enough to cause skin burns if accidentally touched. Ensure that this inverter is away from normal traffic areas.



CAUTION! Use only recommended accessories from installer. Otherwise, not-qualified tools may cause a risk of fire, electric shock, or injury to persons.



CAUTION! To reduce risk of fire hazard, do not cover or obstruct the equipment.

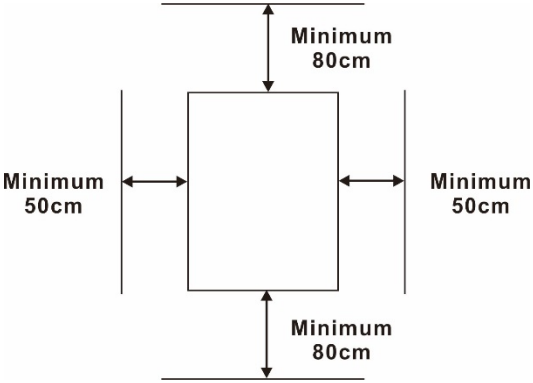
3. Installation

3.1 Basic requirement

- Ambient temperature: 0°C~+55°C
- Storage temperature: -15ºC ~ 60ºC
- Relative humidity: 5% ~ 95%
- Altitude: If the UPS is installed within 1000m, the UPS power will not be derated. When the height is over 1000m, the output power will be derated by following the table.

Altitude(m)	1000	1500	2000	2500	3000	3500	4000	4500	5000
Coefficient	100%	95%	91%	86%	82%	78%	74%	70%	67%

- Vertical: No vibration and the degree of deviation from vertical shouldn't be more than 5°.
- Space: It's requested to have a clearance of approx. 80 cm to the front and back of the unit and approx. 50 cm to the side.



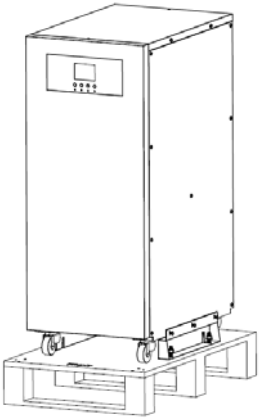
The UPS should be installed in the environment with free ventilation, less dust, optimum ambient temperature and humidity.

The recommended ambient temperature is 20°C~25°C with 50% humidity.

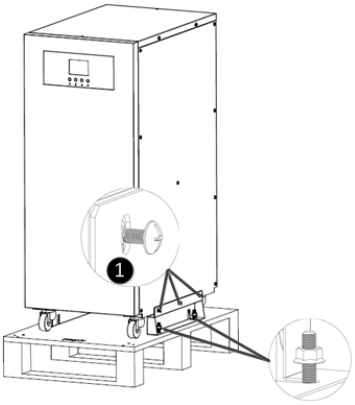
Caution! It's NOT allow to have flammable, explosive or corrosive gas or liquid in installation environment. It is forbidden to install in a metal conductive dust environment.

3.2 Disassembling and moving

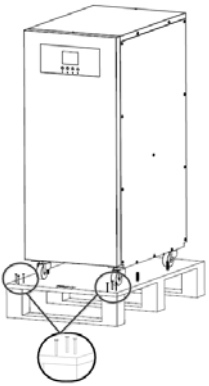
- Please check if any damage on the carton before open.
- Then follow below steps to remove UPS from the carton and the pallet.



Step 1: Remove the carton and foams.



Step 2: Remove fixing plates on the two sides of the UPS as shown in the chart. After removing fixing plates, please put screws ❶ back to UPS.



Step 3: Take off front foot of the pallet by removing screws as shown in chart.



Step 4: Then, lean the pallet to remove the UPS from the pallet.

➢ After the UPS is removed from pallet, please inspect the unit and package contents. Be sure that nothing inside the package is damaged. You should have received the following items inside of package:



CD



User manual



USB cable



RS-232 cable

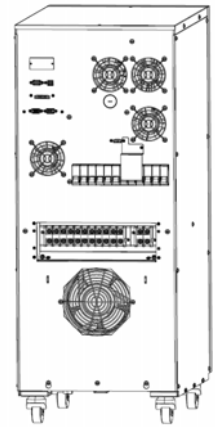


Parallel communication cable

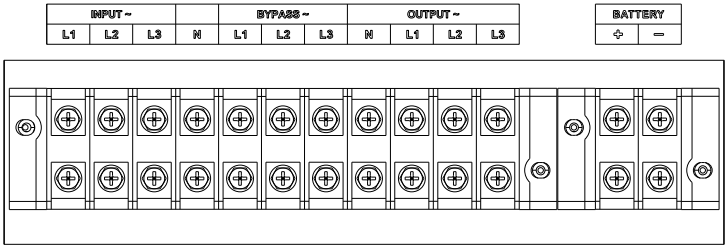
4. Electrical connection

4.1 Power connection

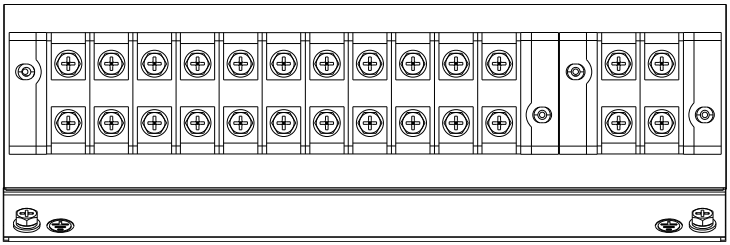
All the connectors are accessible by front panel of the UPS. Simply open the front door for wire connection. Refer below diagrams for inside panel for whole series.



The wire terminals of each model are shown as below:



The ground terminal is shown as below:



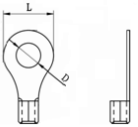
The specifications of internal breaker, fuse and switch are shown as below:

UPS Model	Input Breaker			Battery Fuse	Output	
	LINE INPUT	BYPASS	M-BYPASS		Breaker	Switch
20K	63A/3P	63A/3P	63A/3P	100A	63A/3P	N/A

The recommended sizes of the cables are listed as below:

UPS Model	Line Input and Ground		BYPASS/OUTPUT		BATTERY	
	Size (AWG)	Cross section (mm^2)	Size (AWG)	Cross section (mm^2)	Size (AWG)	Cross section (mm^2)
20K	≤ 8	≥ 8	≤ 8	≥ 8	≤ 6	≥ 10

The recommended sizes of the ring terminals are listed as below:



Items	20K
	AC INPUT/ BYPASS/ OUTPUT/ BATTERY
D (mm)	5.3
L (mm)	12
Torque (Nm)	2

Recommended battery pack spec:

Battery Voltage	12V
Battery capacity	100 Ah
Battery numbers	32 pcs

Note 1: Please set up suitable charging current and battery numbers based on specifications. Wrong configuration will shorten lifecycle of battery.

Note 2: The bypass input of the UPS is default connected to AC input wire from factory. Therefore, if this UPS is used as dual-inputs, please cut this connection.

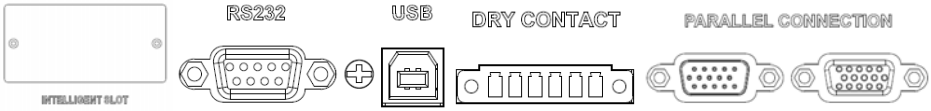
Note 3: If there is no neutral connection in bypass, the load with neutral connection may be out of power when UPS is in bypass mode.

After connecting all the cables, please double check the issues as below:

- Check the phase sequence of LINE INPUT, BYPASS and OUTPUT.
- Check the polarity of the battery cables.
- Make sure all the connected cables are screwed tightly.

4.2 Communication

The UPS provides a variety of communications. The details are listed as below:

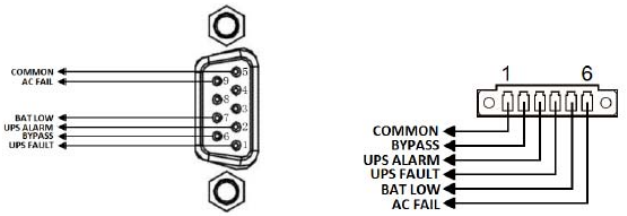


4.2.1 Intelligent slot

The intelligent slot can provide SNMP solution for remote monitor. Please request the supplier for detail information.

4.2.2 Dry contact

There are 5 output dry contacts. The detailed functions are listed as below.

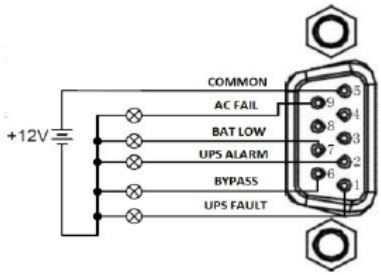


DB9 type TB type

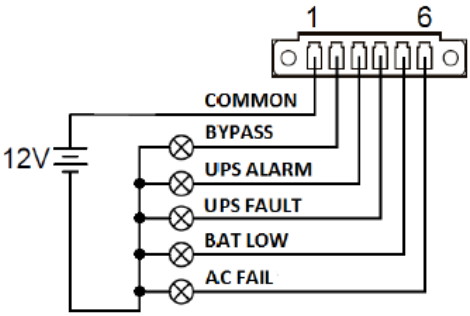
The output dry contacts only provide two passive statuses: short and open. It's necessary to connect external power source to trigger this function. The detailed electrical parameters of contacts are listed as below:

Parameters	Typical	Maximum	Unit
Relay dc voltage	12	30	V
Relay dc current	0.5	1	A

Application:



DB9 type



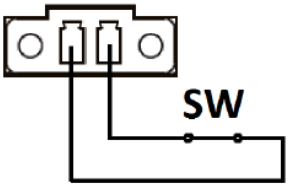
Terminal type

Function descriptions of output contacts:

Output contacts	Description	Status
AC fault	Line voltage and frequency is under normal range.	Open (Default)
	Line voltage and frequency exceeds normal range.	Short
Battery low	Battery voltage is normal.	Open (Default)
	Battery voltage drops to low alarm point.	Short
UPS Alarm	UPS works normally.	Open (Default)
	UPS is in standby, bypass, fault, line loss or low battery.	Short
Bypass mode	UPS isn't in bypass mode.	Open (Default)
	UPS is in bypass mode.	Short
UPS Fault	UPS works normally.	Open (Default)
	UPS works fault.	Short

4.2.3 EPO

Emergency Power Off (EPO) is the capability to shut down a system. It contains two pins of terminal strip. When it's in open circuit, it will activate shutdown of the system and cut off output. Otherwise, it's in close status for UPS normal operation.



When SW is closed, UPS works normally.

When SW is open, UPS cut off the output.

4.2.4 USB/RS232

To allow for unattended UPS shutdown/start-up and status monitoring, connect the bundled USB communication cable one end to the USB port and the other to the communication port of your PC. If using RS-232 communication, please use RS-232 cable to connect UPS and your PC. With the monitoring software installed, you can schedule UPS shutdown/start-up and monitor UPS status through PC.

Note: USB port and RS-232 port cannot work at the same time.

5. Commissioning

5.1 Startup procedure

Please follow the below steps to turn on the UPS.

- Before turning on the UPS, please be sure input and output wiring connection is complete. Please refer to section 4-1 for wiring connection.
- Switch on line input, bypass input and battery switch. UPS will start up automatically.
- Waiting for the UPS self-checking.
- Press "ON/ENTER" for 5 seconds.
- When UPS turns on successfully, green LED lights up. At this time, switch on output switch.

Cold start procedures:

When line input is lost, users can follow below steps to start up the UPS:

- Switch on battery breaker and press "ON/ENTER" for 2 seconds.
- Wait for LCD lighting and then follow startup procedure to turn on the UPS.

Caution! When bypass mode is enabled, the UPS will transfer to bypass mode automatically if bypass input is OK. The UPS won't transfer to line mode until entering LCD main menu to turn on the UPS.

5.2 Shutdown procedure

- Press "OFF/ESC" for 5 seconds, it will turn off.
- If bypass mode is enabled and bypass input is OK, the UPS will transfer to bypass mode. Otherwise, the UPS will stay in standby mode. When line input is lost, the UPS will transfer to power off mode and shut down after a while.
- After the UPS shuts down completely, switch off line input breaker and battery switch.
- Switch off bypass input breaker and load switch.

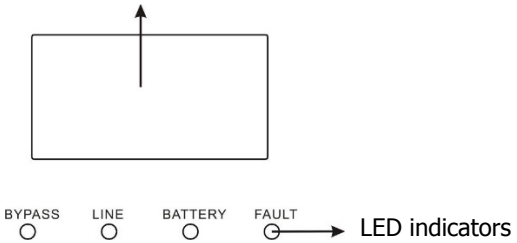
5.3 Maintenance bypass operation

- Turn off the UPS and keep the UPS working in bypass mode.
- Remove the metal cover of maintain bypass breaker and then switch on maintain bypass breaker.
- Switch off line input breaker and battery switch.
- Switch off bypass input breaker. Until now, the UPS works in maintain bypass mode. At this time, the load should be working without interruption.

After the maintenance is completed, switch on battery switch, AC input breaker and bypass input breaker in order. Then switch off maintain bypass breaker. Don't forget to put the cover back.

6. Interface

6.1 LED information



6.1.1 LED indicators

LED / MODE	Bypass	Line	Battery	Fault
UPS start	●	●	●	●
Bypass mode	●	○	○	○
Line mode	○	●	○	○
Battery mode	○	○	●	○
Fault (without output)	○	○	○	●
Fault (with bypass output)	●	○	○	●
Line ECO mode	●	●	○	○
Battery ECO mode	●	○	●	○

Note: ○ means LED is faded; ● means LED is lit.

6.1.2 Buzzer

Description	**Buzzer status**	**Muted**
UPS status		
Standby mode	Beeping once every 2 seconds	Yes
Bypass mode	Beeping once every 2 minutes	
Battery mode	Beeping once every 4 seconds	
Fault mode	Beeping continuously	
Warning		
Overload	Beeping twice every second	Yes
Low battery	Beeping once every second	
Battery unconnected		
Over charge		
EPO enable		
Fan failure/Over temperature		
Charger failure		
Overload 3 times in 30min		
Fault		
Bus start failure	Beeping continuously	Yes
Bus over		
Bus under		

Inverter soft start failure		
High Inverter voltage		
Low Inverter voltage		
Inverter output short circuited		
Battery SCR short circuited		
Over temperature		
Overload		

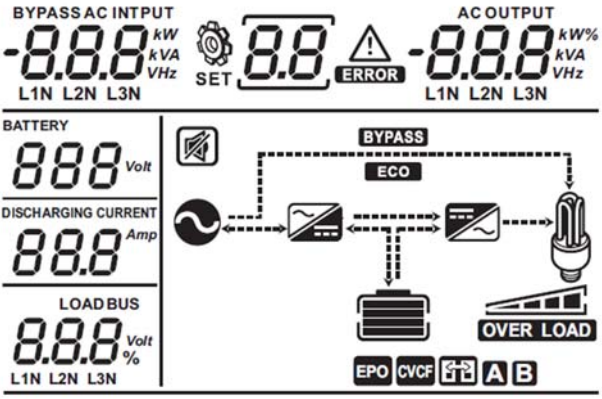
6.1.3 Button

Button	Function
ON/Enter Button	➢ Cold start: Press and hold the button more than 1 second to power on the UPS. ➢ Turn on the UPS: Press and hold the button more than 5 seconds to turn on the UPS. ➢ Enter setting mode: Press this button to enter setting mode in the main screen. ➢ Enter Key: Press this button to confirm the selection in setting menu.
OFF/ESC Button	➢ Turn off the UPS: Press and hold the button more than 5s to turn off the UPS. ➢ Esc key: Press this button to return to last menu in setting menu.
Test/Up Button	➢ Battery test: Press and hold the button more than 5 seconds to test the battery while in AC mode, or CVCF mode. ➢ UP key: Press this button to display next selection in setting menu.
MUTE/Down Button	➢ Mute: Press and hold the button more than 3 seconds to mute buzzer. ➢ Down key: Press this button to display previous selection in setting menu.

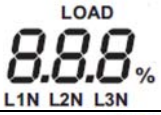
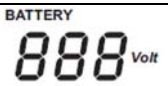
* CVCF mode means converter mode.

6.2 LCD information

6.2.1 LCD Panel



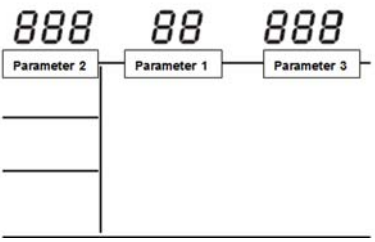
Display	Function
Fault information	
	Indicates that the warning occurs. The data represents the wrong code number
	Indicates that the fault occurs. The data represents the wrong code number
Mute operation	
	Indicates that the UPS alarm is disabled.
AC input & Bypass AC input voltage information	
	Indicates the input voltage, frequency or available power or total power. V: input voltage, Hz: frequency, kW: available power , kVA: total power
AC Output voltage information	
	Indicates the output voltage, frequency or available power or total power or load percentage. V: output voltage, Hz: frequency, kW: available power , kVA: total power , %: load percentage
Load information & Bus information	
	Indicates the load level by 0-25%, 26-50%, 51-75%, and 76-100%.
OVER LOAD	Indicates overload.

	Indicates the Percentage of total load.
	Indicates the Bus voltage.
Mode operation information	
	Indicates the UPS connects to the mains.
	Indicates the battery is working.
	Indicates machine start.
	Indicates the Inverter circuit is working.
	Indicates the rectifier circuit is working.
	Indicates the bypass circuit is working.
	Indicates the ECO is working.
	Indicates the CVCF is working.
Battery information	
	Indicates the Battery capacity by 0-25% and 26-50% and 51-75%and 76-100%.
	Indicating charging current
	Indicated discharge current
	Indicating battery voltage
Other	
	In parallel mode, it indicate master model
	In parallel mode, it indicates slave model
	Indicates EPO open
	Indicates that the machine is in parallel state

6.2.2 Abbreviation Meaning in LCD Display

Abbreviation	Display content	Meaning
ENA	EnA	Enable
DIS	di S	Disable
ATO	Ato	Auto
NCF	nCF	Normal mode (not CVCF mode)
CF	CF	CVCF mode
ON	on	On
OFF	oFF	Off
FBD	Fbd	Not allowed
OPN	oPn	Allow
RES	rES	Reserve
BON	bon	Buzzer allowed
BFF	bFF	Buzzer not allowed
PON	Pon	Parallel allowed
PFF	PFF	Parallel not allowed
FLO	FLo	CC to float time
TES	tES	Battery test time
BAT	bAt	Auto-restart with battery
NBT	nbt	Auto-restart without battery

6.3 LCD Setting



There are three parameters to set up the UPS. In main screen, simply press "Enter" button to enter setting mode.

Parameter 1: It's for program alternatives. Refer to below table for the details.

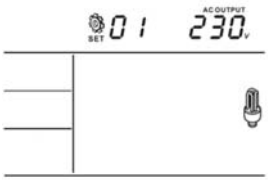
Parameter 2 and parameter 3 are the setting options or values for each program.
Note: Please select "**Up**" or "**Down**" button to change the programs or parameter value.

Program list for parameter 1:

Code	Description	Bypass	AC	CVCF	Battery	ECO
01	Output voltage	Y	--	--	--	--
02	Output frequency	Y	--	--	--	--
03	Voltage range for bypass	Y	Y	Y	Y	Y
04	Frequency range for bypass	Y	Y	Y	Y	Y
05	Acceptable input voltage range	Y	Y	Y	Y	Y
06	Frequency range for main input	Y	Y	Y	Y	Y
07	Voltage range for ECO mode	Y	Y	Y	Y	Y
08	Frequency range for ECO mode	Y	Y	Y	Y	Y
09	Bypass mode setting	Y	Y	Y	Y	Y
10	ECO mode setting	Y	Y	Y	Y	Y
11	Reserved	--	--	--	--	--
12	Battery charging voltage setting	Y	Y	Y	Y	Y
13	Maximum charging current setting	Y	Y	Y	Y	Y
14	Battery capacity and groups setting	Y	Y	Y	Y	Y
15	Battery number setting	Y	Y	Y	Y	Y
16	Buzzer setting	Y	Y	Y	Y	Y
17	Parallel setting	Y				
18	Constant voltage time setting	Y	Y	Y	Y	Y
19	Battery test time setting	Y	Y	Y	Y	Y
20	Auto-restart with battery setting	Y	Y	Y	Y	Y
21	Auto-restart without battery setting	Y	Y	Y	Y	Y

*Y means that this program can be set in this mode.

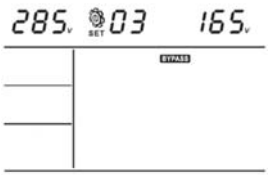
- **01: Output voltage**

Interface	Setting
	**Parameter 3: Output voltage** Setting the output voltage , The default setting is 220Vac.You may choose the following output voltage in parameter 3: **220:** Presents output voltage is 220Vac **230:** Presents output voltage is 230Vac **240:** Presents output voltage is 240Vac

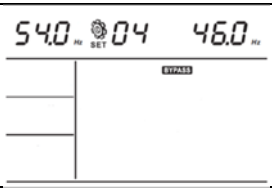
- **02: Output frequency**

Interface	Setting
50 Hz, CVCF mode  **50 Hz, Normal mode**  **ATO**  	**Parameter 2: Output Frequency** Setting the output frequency. You may choose following three options in parameter 2: **50.0Hz:** The output frequency is setting for 50.0Hz. **60.0Hz:** The output frequency is setting for 60.0Hz. **ATO:** If selected, output frequency will be decided according to the latest normal utility frequency. If it is from 45Hz to 55Hz, the output frequency will be 50.0Hz. If it is from 56Hz to 64Hz, the output frequency will be 60.0Hz. ATO is default setting. **Parameter 3: Frequency mode** Setting output frequency at CVCF mode or non-CVCF mode. You may choose following two options in parameter 3: **CF:** Setting UPS to CVCF mode. If selected, output frequency will be fixed at 50Hz or 60Hz according to setting in parameter 2. The acceptable input frequency range will be set up in Program 06. **NCF:** Setting UPS to normal mode (non-CVCF mode). If selected, UPS will enter battery mode when input frequency is not within setting range in Program 06. *If Parameter 2 is ATO, the Parameter 3 will show the current frequency.

- **03: Voltage range for bypass**

Interface	Setting
 	**Parameter 2:** Set the acceptable high voltage for bypass. Setting range is from 235V to 285V and the default value is 264V. **Parameter 3:** Set the acceptable low voltage for bypass. Setting range is from 165V to 225V and the default value is 176V.

- **04: Frequency range for bypass**

Interface	Setting
 	**Parameter 2:** Set the acceptable high frequency point for bypass mode. The default value is 54.0Hz/64.0Hz. 50 Hz system: Setting range is from 51.0Hz to 56.0Hz. 60 Hz system: Setting range is from 61.0Hz to

	66.0Hz. **Parameter3:** Set the acceptable low frequency for bypass. The default value is 46.0Hz/56.0Hz. 50 Hz: Setting range is from 45.0Hz to 49.0 Hz. 60 Hz: Setting range is from 55.0Hz to 59.0Hz.

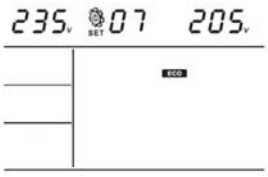
- **05: Acceptable input voltage setting**

Interface	Setting
	**Parameter 2:** Set the acceptable high input voltage point. Setting range is from235V to 285V and the default value is 280V. **Parameter 3:** Set the acceptable low input voltage point. Setting range is from 165V to 225V and the default value is 165V.

- **06: Acceptable input frequency setting**

Interface	Setting
	**Parameter 2:** Set the acceptable high input frequency point. Setting range is from the setting value of parameter 3 to 70 Hz. The default value is 54Hz. **Parameter3:** Set the acceptable input low frequency point. Setting range is from 40Hz to the setting value of parameter 2. The default value is 46.0Hz.

- **07: Voltage range for ECO mode**

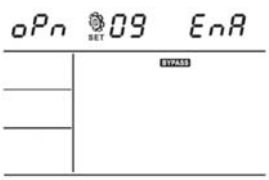
Interface	Setting
	**Parameter 2:** Set the acceptable high voltage for ECO mode. Setting range is from 235V to 285V and the default value is 235V. **Parameter 3:** Set the acceptable low voltage for ECO mode. Setting range is from 165V to 225V and the default value is 205V. **Note:** If the ECO voltage range is beyond the bypass voltage range, the setting range will become the same as bypass voltage range.

- **08: Frequency range for ECO mode**

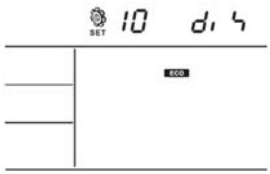
Interface	Setting
	**Parameter 2:** Set the acceptable high frequency for bypass. The default value is 52.0Hz/62.0Hz. 50Hz system: Setting range is from 51.0Hz to 56.0Hz. 60Hz system: Setting range is from 61.0Hz to 66.0Hz. **Parameter3:** Set the acceptable low frequency

	for bypass. The default value is 48.0Hz/58.0Hz. 50Hz system: Setting range is from 45.0Hz to 49.0 Hz. 60Hz system: Setting range is from 55.0Hz to 59.0Hz. **Note:** If the frequency range for ECO mode is beyond the setting range for bypass mode, the setting range will become the same as bypass frequency range.

- **09: Bypass mode setting**

Interface	Setting
	**Parameter 2:** **OPN**: Bypass allowed. When selected, UPS will run at Bypass mode depending on bypass enabled/disabled setting. **FBD**: Bypass not allowed. When selected, it's not allowed for running in Bypass mode under any situations. **Parameter 3:** **ENA**: Bypass enabled. When selected, Bypass mode is activated. **DIS**: Bypass disabled. When selected, automatic bypass is acceptable, but manual bypass is not allowed. Manual bypass means users manually operate UPS for Bypass mode. For example, pressing OFF button in AC mode to turn into Bypass mode.

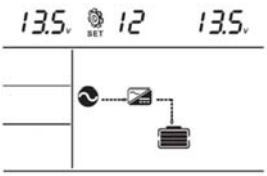
- **10: ECO mode setting**

Interface	Setting
	**Parameter 3:** **ENA**: ECO allowed. **DIS**: ECO not allowed.

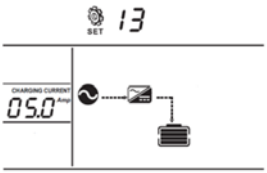
- **11: Reserved**

Interface	Setting
	**reserved**

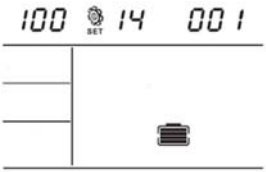
- **12: Battery charging voltage setting**

Interface	Setting
	**Parameter 2:** Setting absorption floating voltage. The setting range is from the setting value of parameter 3 to 15.0V. The default setting value is 13.5V. **Parameter 3:** Setting floating voltage. The setting range is from 9.0V to the setting value of parameter 2. The default setting value is 13.5V. **Note:** when the setting values for absorption floating and floating setting are the same, it will become two-stage charge.

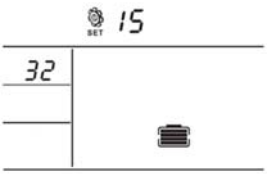
- **13: Maximum charging current setting**

Interface	Setting
	**Parameter 3:** The maximum charging current could be adjusted. The setting range is from 1A to 20A. The default setting value is 10A. When the setting value is 0A, it will show DIS and the UPS won't charge anytime.

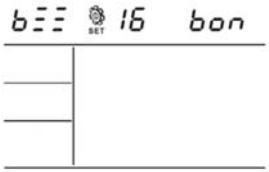
- **14: Battery capacity and group setting**

Interface	Setting
	**Parameter 2:** Single battery capacity setting. Setting range is from 50 to 600 and the default value is 100. **Parameter 3:** Battery group setting. Setting range is from 1 to 6 and the default value is 1. **Note:** Maximum charging current = (Parameter 2 x Parameter 3 x 0.2) A.

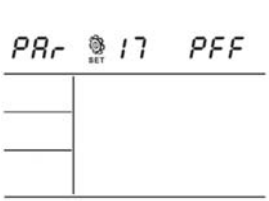
- **15: Battery number setting**

Interface	Setting
	**Parameter 3:** Setting total battery numbers in series. There are four options: 29, 30, 31 and 32. The default setting is 32.

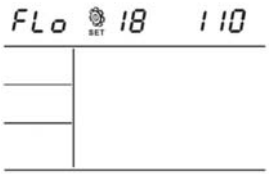
- **16: Buzzer setting**

Interface	Setting
	**Parameter 3:** **BON**: buzzer allowed. **BFF**: buzzer not allowed.

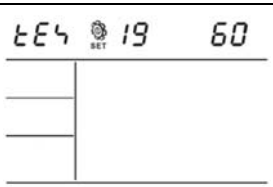
- **17: Parallel setting**

Interface	Setting
	**Parameter 3:** **PON**: Parallel system is allowed. **PFF**: Parallel system is not allowed.

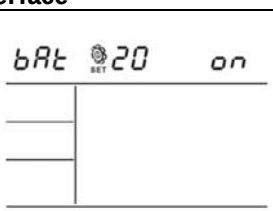
- **18: Constant voltage time setting**

Interface	Setting
	**Parameter** 3: Setting the duration for constant voltage charging. **dis**: When selected, it will automatically transfer to float charging stage. (Default) **1-900**: When setting value, it will proceed constant voltage stage based on setting time. The setting range is from 1 to 900 minutes.

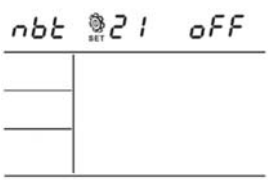
- **19: Battery test time setting**

Interface	Setting
	**Parameter 3:** Setting the battery test duration. **dis**: When selected, there is no battery test function available. **1-900**: It sets up battery test duration. The setting range is from 1 to 900 minutes. The default setting is 60 minutes.

- **20: Auto-restart with battery setting**

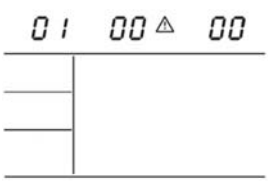
Interface	Setting
	**Parameter 3:** **ON**: Auto-restart with battery is allowed. **OFF**: Auto-restart with battery is not allowed.

- **21: Auto-restart without battery setting**

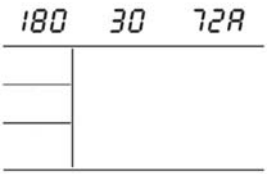
Interface	Setting
	**Parameter 3:** **ON**: Auto-restart without battery is allowed. **OFF**: Auto-restart without battery is not allowed.

In setting mode, only three data information can be queried, data log, software version and hardware version.

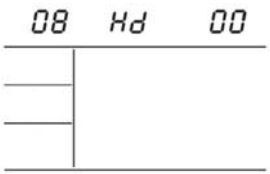
- **Data Log**

Interface	Enquiry procedure
	Press "Down" key for 3 seconds in setting mode to enter data log screen. In this screen, it will show warning code. Refer to section 8.1 for warning code list. It will show maximum three warning codes.

- **Software version**

Interface	Enquiry procedure
	After entering data log screen, short press "Down" key to access software version query. In this screen, it will show software version.

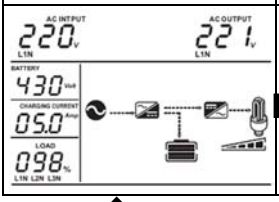
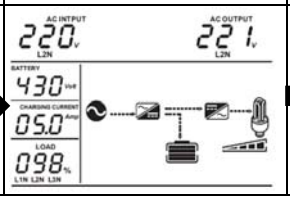
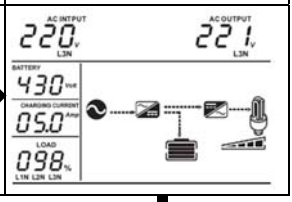
- **Hardware version**

Interface	Setting
	After entering software version screen, short press "Down" key to access hardware version query. In this screen, it will show hardware version.

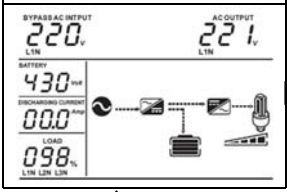
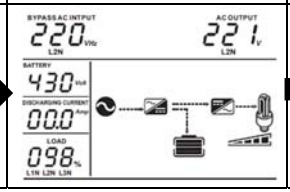
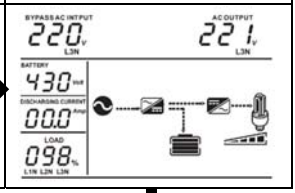
6.4 LCD Display Information

The LCD will display the relevant data of the corresponding unit in turns. The maximum displayed data is categorized into 10 groups, depending on the combination of input sources and display units. Press "UP" or "DOWN" key to switch displayed data group. If the latest data is the first group, press "DOWN" to jump to the 10th group of all displayed information. If the latest page is 10th group, press "UP" to jump to first group. Each group will respectively indicate UPS data in L1N, L2N and L3N phase in a loop.

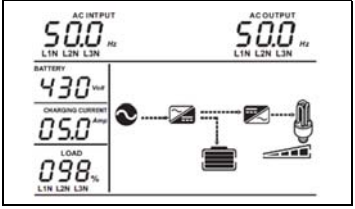
1. **First group: Line input voltage /output voltage**

AC input voltage in L1N = 220V AC output voltage in L1N = 221V	AC input voltage in L2N = 220V AC output voltage in L2N = 221V	AC input voltage in L3N = 220V AC output voltage in L3N = 221V
		

2. **2nd group: Bypass input voltage / output voltage**

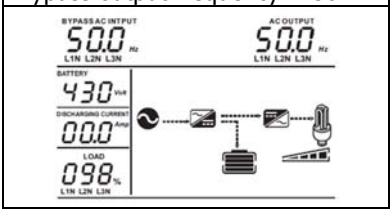
Bypass input voltage in L1N = 220V Bypass output voltage in L1N = 221V	Bypass input voltage in L2N = 220V Bypass output voltage in L2N = 221V	Bypass input voltage in L3N = 220V Bypass output voltage in L3N = 221V
		

3. **3rd group: Line input frequency / output frequency**

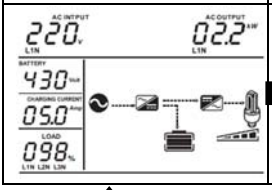
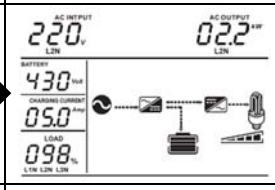
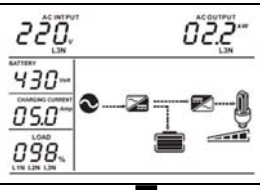
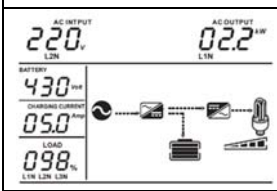
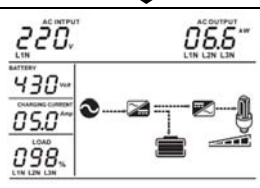
AC input frequency = 50Hz AC output frequency = 50Hz


4. 4th group: Bypass input frequency / output frequency

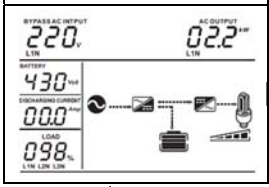
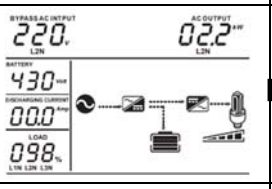
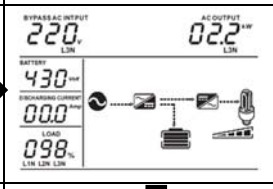
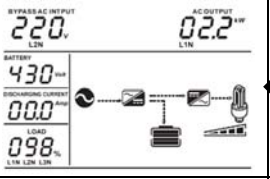
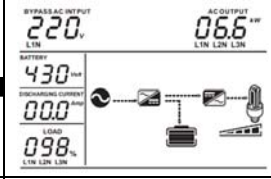
Bypass input frequency = 50Hz
Bypass output frequency = 50Hz



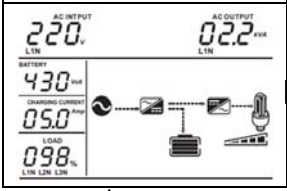
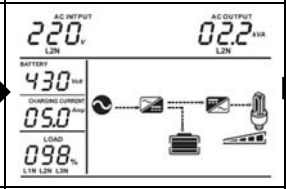
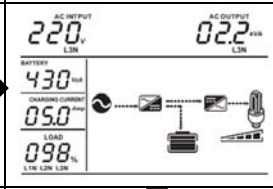
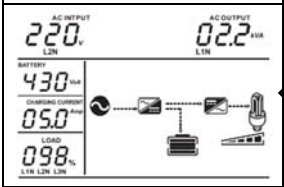
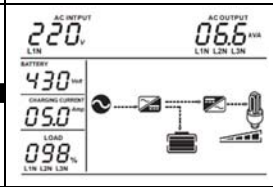
5. 5th group: Line input voltage / Line output power in watts

AC input voltage in L1N = 220V AC output power in L1N = 2.2KW		AC input voltage in L2N = 220V AC output power in L2N = 2.2KW		AC input voltage in L3N = 220V AC output power in L3N = 2.2KW
	→		→	
				↓
	←		←	
AC input voltage in L2N = 220V AC output power in L1N = 2.2KW				AC input voltage in L1N = 220V Total AC output power = 6.6KW

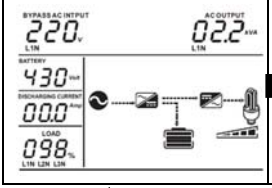
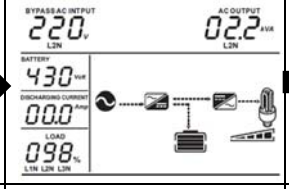
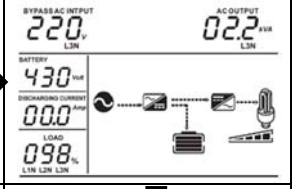
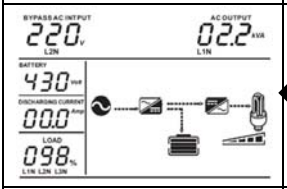
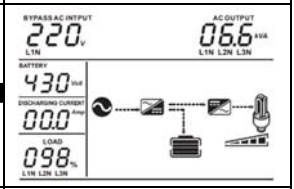
6. 6th group:

Bypass input voltage in L1N = 220V AC output power in L1N = 2.2KW	Bypass input voltage in L2N = 220V AC output power in L2N = 2.2KW	Bypass input voltage in L3N = 220V AC output power in L3N = 2.2KW
		
Bypass input voltage in L2N = 220V AC output power in L1N = 2.2KW		Bypass input voltage in L1N = 220V Total AC output power = 6.6KW
		

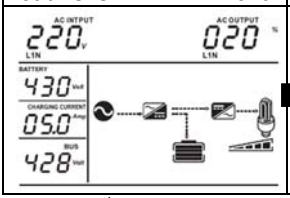
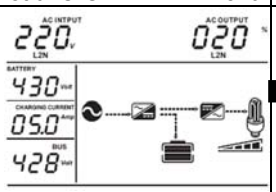
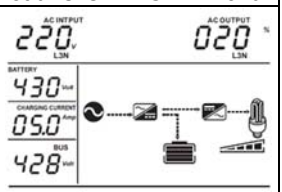
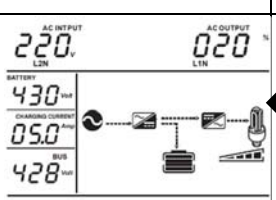
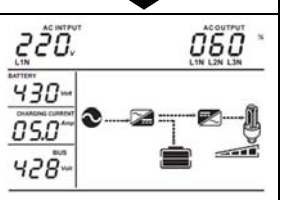
7. 7th group: AC input voltage / Output power in VA

AC input voltage in L1N = 220V AC output power in L1N = 2.2KVA	AC input voltage in L2N = 220V AC output power in L2N = 2.2KVA	AC input voltage in L3N = 220V AC output power in L3N = 2.2KVA
		
AC input voltage in L2N = 220V AC output power in L1N = 2.2KVA		AC input voltage in L1N = 220V Total AC output power = 6.6KVA
		

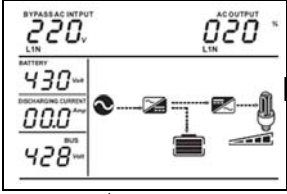
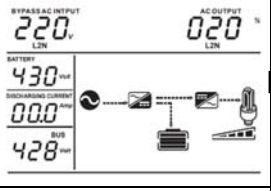
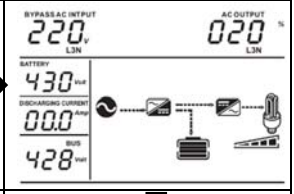
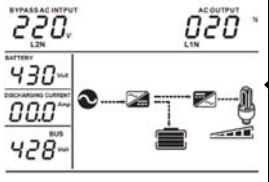
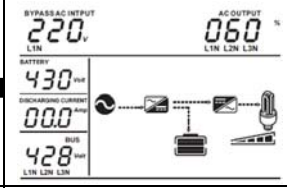
8. 8th group: Bypass input voltage / output power in VA

Bypass input voltage in L1N = 220V AC output power in L1N = 2.2KVA		Bypass input voltage in L2N = 220V AC output power in L2N = 2.2KVA		Bypass input voltage in L3N = 220V AC output power in L3N = 2.2KVA
	→		→	
↑				↓
Bypass input voltage in L2N = 220V AC output power in L1N = 2.2KVA			←	 Bypass input voltage in L1N = 220V Total AC output power = 6.6KVA

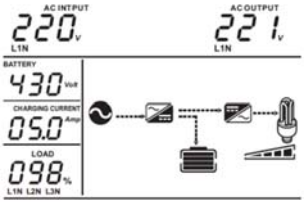
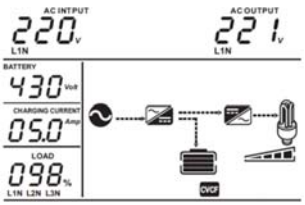
9. 9th group: AC input voltage / Load level

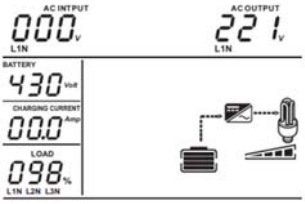
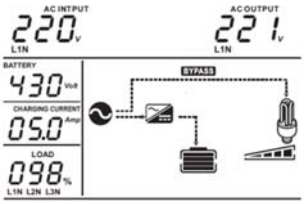
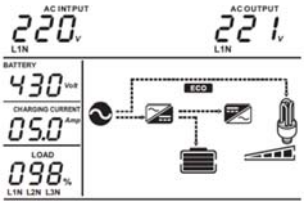
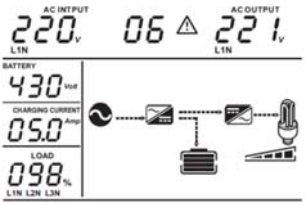
AC input voltage in L1N = 220V Load level in L1N = 20%		AC input voltage in L2N = 220V Load level in L2N = 20%		AC input voltage in L3N = 220V Load level in L3N = 20%
	→		→	
↑				↓
AC input voltage in L2N = 220V Load level in L1N = 20%			←	 AC input voltage in L1N = 220V Total load level = 60%

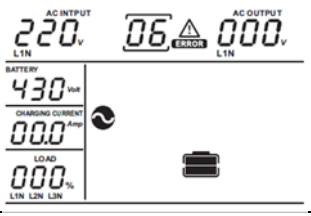
10. 10th group: Bypass input voltage / Load level

Bypass input voltage in L1N = 220V Load level in L1N = 20%	Bypass input voltage in L2N = 220V Load level in L2N = 20%	Bypass input voltage in L3N = 220V Load level in L3N = 20%
		
		
Bypass input voltage in L2N = 220V Load level in L1N = 20%		Bypass input voltage in L1N = 220V Total load level = 60%

6.5 Operating Mode/Status Description

Operating mode/status		
AC mode	Description	When the input voltage is within acceptable range, UPS will provide pure and stable AC power to output. The UPS will also charge the battery at AC mode.
	LCD display	
CVCF mode	Description	When input frequency is within 40 to 70Hz, the UPS can be set at a constant output frequency, 50 Hz or 60 Hz. The UPS will still charge battery under this mode.
	LCD display	

Battery mode	Description	When the input voltage is beyond the acceptable range or power failure, UPS will backup power from battery and alarm will beep every 4 seconds.
	LCD display	
Bypass mode	Description	When input voltage is within acceptable range and bypass is enabled, turn off the UPS and it will enter Bypass mode. Alarm beeps every two minutes.
	LCD display	
ECO mode	Description	When bypass voltage is within acceptable range and ECO is enabled, turn on the UPS and it will enter Bypass mode and INV module is in standby status.
	LCD display	
Warning status	Description	When a warning occurs in the UPS, it will show icon ⚠ in the LCD and warning codes in the LCD. At this time, it still can work normally. It will automatically show all warning codes one by one in the LCD screen. Please check section 8.1 for the detailed warning code list.
	LCD display	

Fault status	Description	When a fault occurs in the UPS, it will display fault codes in LCD panel. Only the latest fault code will be displayed. Please check section 8.2 for the detailed fault code list.
	LCD display	

7 Maintenance

Caution! Inside maintenance is only available for the engineer with qualified electrical knowledge.

**There is still possible high voltage inside of the unit even disconnect all connections.**

7.1 System maintenance

- Check if indicators and LCD function well and the buttons are functional.
- Make sure there is no abnormal noise inside of the unit.
- Make sure nothing blocks the ventilation of the unit.
- Please use dry towel to clean the surface of the unit when it is not working.
- Please check the outlook condition of all wires and connection situation periodically after disconnecting all power. The checking interval should be less than 2 years.

7.2 Battery maintenance

In order to prolong the lifecycle of the battery, please do the maintenance periodically.

- The lifecycle of the battery is based on ambient temperature and recharge cycles. Please make the battery working under the ambient temperature between 15°C ~25°C.
- Check the voltage of the battery pack weekly. Check the voltage of each battery monthly.
- Keep the environment of battery clean and tidy.
- Check the terminals of the batteries termly, make sure they are tightened.
- Please charge the battery once a month if the battery hasn't been used for a long time.
- If the discharging time is much less than normal situation, please check if it's time to replace them.

8 Trouble shooting

8.1 Warning code

Warning	Icon (flashing)	Warning Code
battery open	⚠ 🔋	01
input phase sequence errors	⚠	02
battery over charge	⚠ ▬	03
battery voltage low	⚠ ▬	04
Over load	⚠ OVER LOAD	05
EPO active	⚠	06
Inverter over temperature	⚠	07
The input frequency is unstable	⚠	08
IO expansion card communication failed	⚠	09
EEPEOM communication failed	⚠	10
Maintenance bypass opens	⚠	13
The bypasses are inconsistent	⚠	14

8.2 Fault code

Fault	Icon (flashing)	Fault Code
Firmware incompatibility	ERROR ⚠	01
NO Boot Loader	ERROR ⚠	02
Overload fault	ERROR ⚠ OVER LOAD	03
BUS Soft start timeout	ERROR ⚠	04
BUS voltage is too high	ERROR ⚠	05
BUS voltage is too low	ERROR ⚠	06
INV in L1 is short circuited	ERROR ⚠	07
INV in L2 is short circuited	ERROR ⚠	08
INV in L3 is short circuited	ERROR ⚠	09
INV voltage in L1 is too low	ERROR ⚠	10
INV voltage in L2 is too low	ERROR ⚠	11
INV voltage in L3 is too low	ERROR ⚠	12
INV voltage in L1 is too high	ERROR ⚠	13

INV voltage in L2 is too high	ERROR ⚠	14
INV voltage in L3 is too high	ERROR ⚠	15
INV voltage short circuited in L1 & L2	ERROR ⚠	16
INV voltage short circuited in L2 & L3	ERROR ⚠	17
INV voltage short circuited in L3 & L1	ERROR ⚠	18
Battery voltage is too high	ERROR ⚠	19
INV over current in L1	ERROR ⚠	20
INV over current in L2	ERROR ⚠	21
INV over current in L3	ERROR ⚠	22
IGBT over current	ERROR ⚠	23
INV soft start timeout	ERROR ⚠	24
IGBT over current in L1	ERROR ⚠	25
IGBT over current in L2	ERROR ⚠	26
IGBT over current in L3	ERROR ⚠	27
Zero offset of INV voltage is too High	ERROR ⚠	28
Zero offset of OP voltage is too High	ERROR ⚠	29
INV over temperature	ERROR ⚠	30
Transformer over temperature	ERROR ⚠	31
Input source short circuited in L1	ERROR ⚠	32
Input source short circuited in L2	ERROR ⚠	33
Input source short circuited in L3	ERROR ⚠	34
CAN Communication failure	ERROR ⚠	35
Output voltage differential fault	ERROR ⚠	36
Parallel host line loss	ERROR ⚠	37
Parallel synchronous line loss	ERROR ⚠	38
Parallel version differences	ERROR ⚠	39
OP over temperature	ERROR ⚠	40
Parallel Line Loss	ERROR ⚠	41
Switch Line Fault	ERROR ⚠	42
IO Card Read Fail	ERROR ⚠	50

9 Specification

Table1: Line input

Model	20K
Capacity	20KVA / 16KW
Rated voltage	3 x 380/400V (3Ph + N)
Rated frequency	50Hz/60Hz
Voltage range	165V~280V (Ph-N) / 285V~485V (Ph-Ph)
Frequency range	46Hz~54Hz @50Hz; 56Hz~64Hz @60Hz
Rated input current / per phase	38A

Table 2: Battery

Model	20K
Battery numbers	29/30/31/32 PCS (12V in series)
Rated voltage	348/360/372/384VDC(Default 384VDC)
Charging current	Default 10A, Maximum=Capacity(KW)/Battery(real-time) *The maximum current is never higher than 40A.
Floating voltage	13.5VDC /per unit (12V)
High cut off point	15.0VDC / per unit (12V)

Table 3: Inverter output

Model	20K
Waveform	Sinusoidal wave
Rated voltage	220/230/240VAC(Ph + N)
Tolerance	±1% (Balanced)
Rated frequency	50/60 Hz ±1 %
THDV	R load<2%; RCD load<5%
Overload capacity	110%~150% 10min~60s; >160% 200ms
Efficiency	>90%

Table 4: Bypass

Model	20K
Rated voltage	220/230/240VAC(Ph + N)
Rated frequency	50Hz/60Hz
Voltage range	176V~264V (Ph-N) / 304V~456V (Ph-Ph)
Frequency range	46Hz~54Hz @50Hz; 56Hz~64Hz @60Hz
Transfer time	Synchronization: 0ms
Overload capacity	150% ~ 180%: 1h~300s, >180%: 300s

Table 5: ECO Bypass (Default disable)

Model	20K
Rated voltage	220/230/240VAC(Ph + N)
Rated frequency	50Hz/60Hz
Voltage range	176V~264V (Ph-N) / 304V~456V (Ph-Ph)
Frequency range	48Hz~52Hz @50Hz; 58Hz~62Hz @60Hz
Transfer time	<10ms

Table 6: Environment

Model	20K
Working temperature range	0°C ~ 55°C
Storage temperature range	-15ºC ~ 60ºC
Altitude	0 ~ 1000m (Please refer to part 3.1 when over 1000m)
Humidity	5% ~ 95% no condensing
IP degree	IP21
Cooling	Forced air cooling
Communication	RS232, USB, intelligent slot(Modbus and SNMP port)

Table 7: Mechanics

Model	20K
Depth (mm)	560
Width (mm)	360
Height (mm)	900
Weight (kg)	180

10 Parallel Installation Guide

10.1 Introduction

- The UPS can be paralleled in 3+1 redundancy or 4 units as an expansion.
- **N+1 redundancy** is a form of resilience that ensures system availability in the event of one UPS failure. During normal operations, the load is shared equally across all UPSs, which behaves as if they were a single UPS device. If a single UPS fails or needs to be taken offline for service, the system will continue running without interruption. The UPS modules should be sized so that the total anticipated load can be carried by N units.

  If the total power of system is more than N units, the system will continue running but with warning coming out.
- **Expansion** is activated when the total power of system is more than N units. In this case, the system continues running but with warning ringing out.

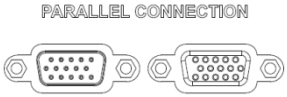
  Under this situation, if a single UPS fails or needs to be taken offline for service, the system will shut down for overload.
- **Host and slaves** are generated randomly. Usually the first one who starts up will be the host.

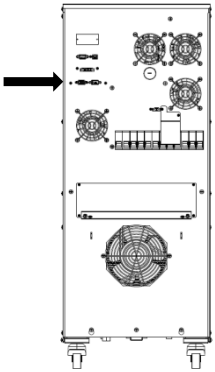
  If one slave device fails or needs to be taken offline, the host and other slaves keep running. If the host fails or needs to be taken offline, the new host will come out from slaves by competing with each other.

10.2 Parallel Kit Overview

10.2.1 Package Contents

If you purchase a parallel UPS, you should find the following items.





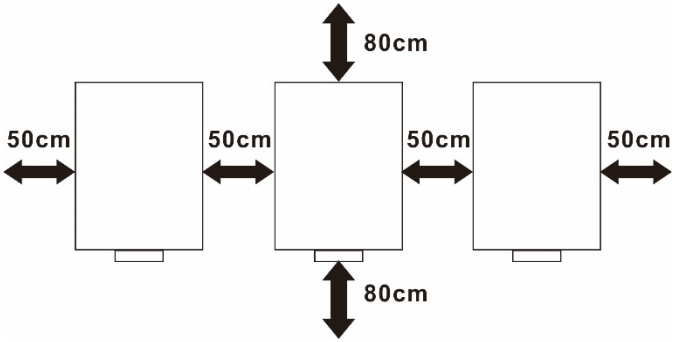
Please make sure parallel communication port is already installed in the UPS as shown in the chart.



Parallel communication cable

10.2.2 Installation

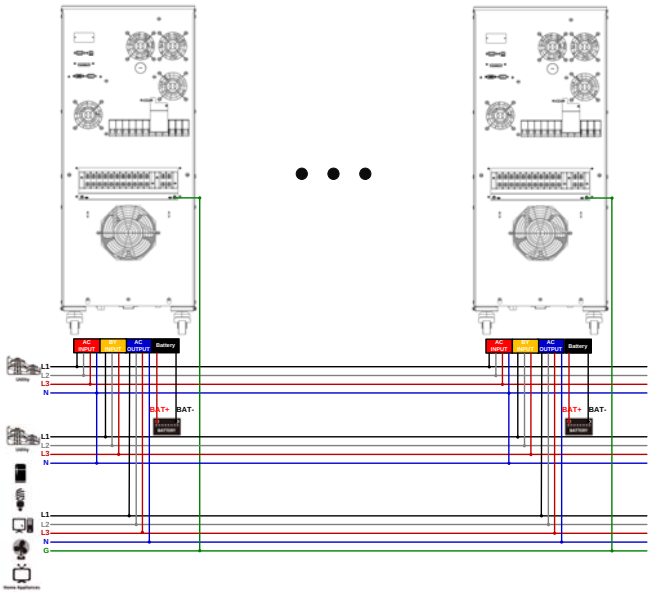
When installing multiple units, please follow below chart.



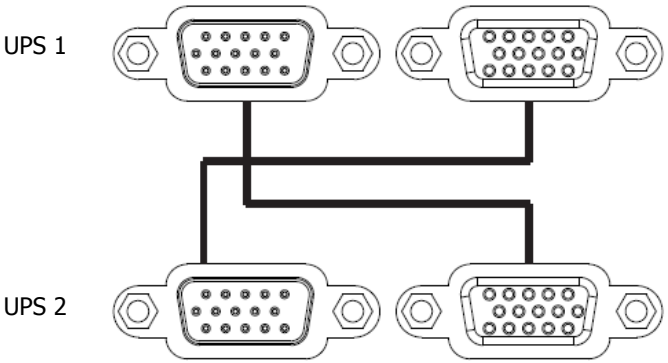
NOTE: For proper air circulation to dissipate heat, allow a clearance of approx. 20 cm to the side and approx. 80 cm front and back the unit.

10.2.3 Wiring Connection

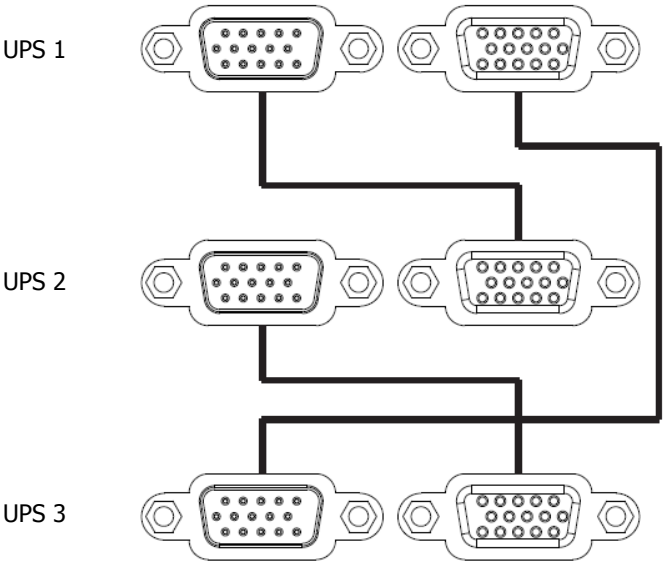
Two UPSs in parallel:

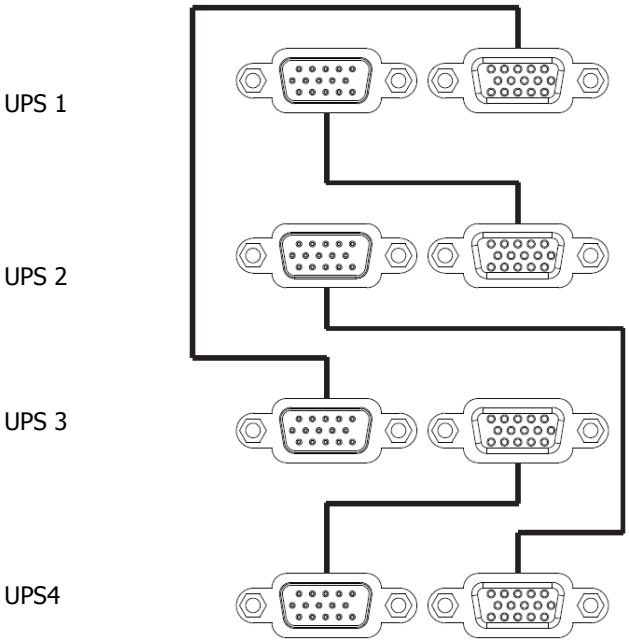


Communication Connection



Communication Connection





Recommended specification of battery breaker for each UPS:

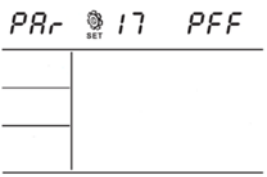
Model	One unit
20KVA	80A/500VDC

Note 1: Please be sure **NOT** to share the same battery pack in parallel system.

Note 2: It's recommended to use the same specification for all connected batteries.

10.3 Setting and LCD display

This UPS is default set up as single operation from factory. However, it's able to configure as parallel model by setting LCD program. You may find parallel or single model of the UPS from LCD screen as below:

Interface	Setting
	**Parameter 3:** **PON**: Parallel system is allowed. **PFF**: Parallel system is not allowed. Be sure that this UPS is selected as "PON".

10.4 Specification

Model	20K
Power range	20KVA / 16KW
Max parallel number	4
Output Power for Parallel System	
VA	80K
W	64K
Circulation Current under No Load	<3A
Power Unbalance Ratio	<5% @ 100% Load
Parallel communication	CAN
Transfer time in parallel mode	0ms

10.5 Trouble shooting

10.5.1 Warning code

Code	Event	How to do
14	Bypass inputs in parallel UPSs are not consistent.	Check if the Bypass phase sequence and voltage is correct or not in all parallel UPSs. **WARNING:** If bypass inputs are not consistent in all parallel UPSs and when fault occurs, it will cause power interruption in whole system.

10.5.2 Fault code

Code	Event	How to do
35	CAN comm. fault	1. Update all UPS firmware to the same version. 2. After updating, if the problem still remains, please contact your local dealer.
37	Host line loss	
41	Parallel line loss	
42	Switch line fault	
36	Output voltage difference	Restart the UPS. If the problem still remains, please contact your local dealer.
38	SYNC line Loss	1. Check if communication cables are connected well and restart the UPS. 2. If the problem remains, please contact your local dealer.
39	Parallel version difference	1. Update all UPS firmware to the same version. 2. After updating, if the problem still remains, please contact your local dealer.

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