User Manual for Double-Conversion Online UPS

VD-Series

5kVA – 8kVA, 3-Phase Models

Version 1

December 2023

CHATSWORTH PRODUCTS

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Table of Contents

1 Safety

1.1 Important Safety Instructions

This UPS contains LETHAL VOLTAGES. All repairs and service must be performed by AUTHORIZED SERVICE PERSONNEL ONLY. There are NO USER SERVICEABLE PARTS inside the UPS.

WARNING:

- The UPS designed for commercial and industrial purpose, it is forbidden to apply for any life sustainment and support.
- The UPS system contains its own energy source. The output terminals may carry live voltage even when UPS is disconnected to an AC source.
- To reduce the risk of fire or electrical shock, UPS installation has to be in a controlled room where temperature and humidity are monitored. Ambient temperature must not exceed 40°C. The system is only for indoor use.
- Ensure all power is disconnected before installation or service.
- Service and maintenance should be performed by qualified personnel only.

Before working on this circuit

- Isolate Uninterruptible Power System (UPS).
- Then check for Hazardous Voltage between all terminals including the protective earth.

Risk of Voltage Back feed

The isolation device must be able to carry the UPS input current.

1.2 EMC

WARNING:
This is a product for commercial and industrial application in the second environment - installation restrictions or additional measures may be needed to prevent disturbances.

1.3 Installation Information

WARNING:

- Installation must be performed by qualified personnel only.
- The cabinets must be installed on a level floor suitable for computer or electronic equipment.
- The UPS cabinet is heavy. If unloading instructions are not closely followed, cabinet may cause serious injury.
- Do not tilt the cabinets more than 10 degree.
- Before applying electrical power to the UPS, make sure the Ground conductor is properly installed.
- Installation and Wiring must be performed in accordance with the local electrical laws and regulations.
- The disconnection device should be chosen based on the input current.

1.4 Maintenance

- Only qualified service personnel should perform the battery installation.
- The following PRECAUTIONS should be observed:
    1. Remove watches, rings, or other metal objects. Use tools with insulated handles.
    2. Wear rubber gloves and boots.
    3. Do not lay tools or metal parts on top of batteries or battery cabinet
    4. Disconnect the charging source prior to connecting or disconnecting terminal.
    5. Check if the battery is inadvertently grounded. If it is, remove the source of grounding. Contacting with any part of the ground might result in electrical shock. The likelihood of such shock can be prevented if such grounds are removed during installation and maintenance.
- UPS is designed to supply power even when disconnected from the utility power. After disconnect the utility and DC power, authorized service personnel should attempt internal access to the UPS.
- Do not disconnect the batteries while the UPS is in Battery mode.
- Disconnect the charging source prior to connecting or disconnecting terminals.
- Batteries can result in a risk of electrical shock or burn from high short circuit current.
- When replacing batteries, use the same number of sealed, lead-acid batteries.
- Do not open or mutilate the battery. Release electrolyte is harmful to the skin and eyes, and may be toxic.

1.5 Recycling the Used Battery

- Do not dispose of the battery in a fire. Battery may explode. Proper disposal of battery is required. Refer to your local codes for disposal requirements.
- Do not open or mutilate the battery. Released electrolyte is harmful to the skin and eyes. It may be toxic.
- Do not discard the UPS or the UPS batteries in the trash. This product contains sealed, lead-acid batteries and must be disposed properly. For more information, contact your local recycling/reuse or hazardous waste center.
- Do not discard waste electrical or electronic equipment (WEEE) in the trash. For proper disposal, contact your local recycling/reuse or hazardous waste center.

2 Installation

2.1 Initial Inspection

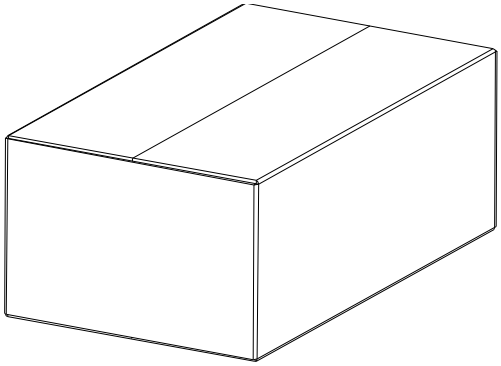
1. Visually examine if there is any damage inside and outside of packages in the process of the transportation. If any damage, report it to the carrier immediately.
2. Verify the product label and confirm the consistency of the equipment.
3. If the equipment needs to be returned, carefully repack the equipment by using the original packing material that came with.

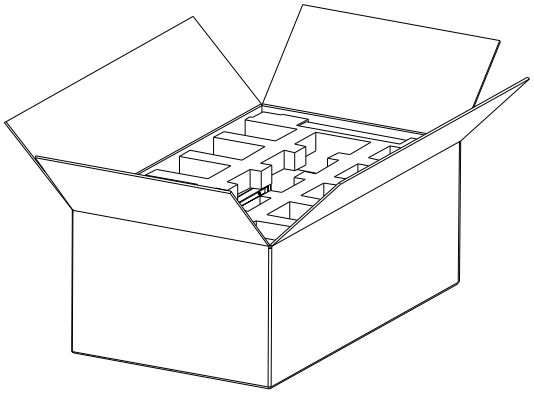
2.2 Installation Environment

1. The UPS is designed for indoor use only and should be located in a clean environment with adequate ventilation to keep the environmental parameters within the required specification.
2. Make sure that transportation routes (e.g. corridor, door gate, elevator, etc.) and installation area can accommodate and bear the weight of the UPS, the external battery cabinet and handling equipment.
3. The UPS uses forced convection cooling by internal fans. Cooling air enters the module through ventilation grills located at the front of the cabinet and exhausted through grills located in the rear part of the cabinet. Please do not block the ventilation holes.
4. Ensure that the installation area is spacious for maintenance and ventilation.
5. Keep the temperature of installation area around 30°C and humidity within 90%. The highest operating altitude is 5,200 ft above sea level.
6. If necessary, install a system of room extractor fans to avoid formation of room temperature. Air filters are necessary if the UPS is operated in a dusty environment.
7. It is recommended that you parallel the external battery cabinets to the UPS. The following instructions of clearances are suggested:
   - Keep a clearance of 40” from the top of the UPS for maintenance, wiring and ventilation.
   - Keep a clearance of 36" back clearance, or install flex-conduit to allow for moving of cabinet to access switches. When pushed toward wall, leave 6" of clearance for ventilation.
   - Front clearance should be per local and NEC code.
8. For safety concerns, we suggest that you shall:
   - Equip with CO2 or dry powder fire extinguishers near the installation area.
   - Install the UPS in an area where the walls, floors and ceilings were constructed of fireproof materials.
9. Do not allow unauthorized personnel to enter the installation area. Assign specific personnel to keep the UPS key.

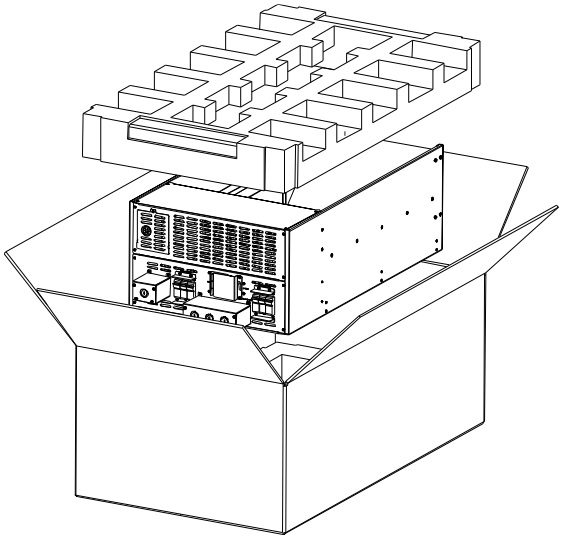
2.3 Unpacking

1. Unload the box to installed area, remove the tape and open box;

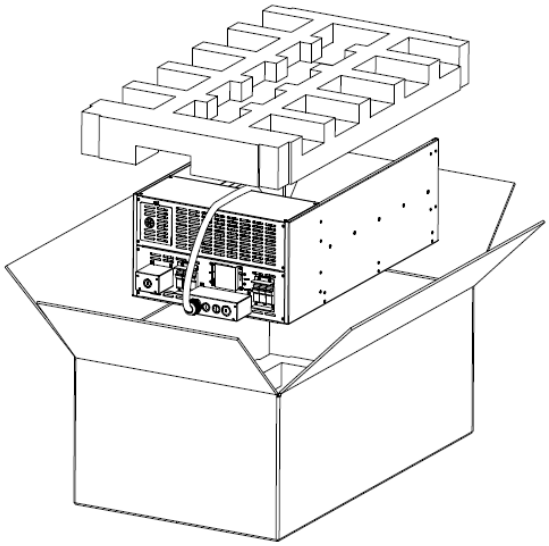




3. Take out the enclosure after removal of the cushion packing material;

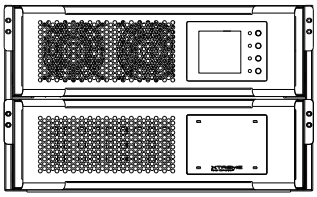


Terminal Block for AC input



L21-20P or L21-30P for AC input

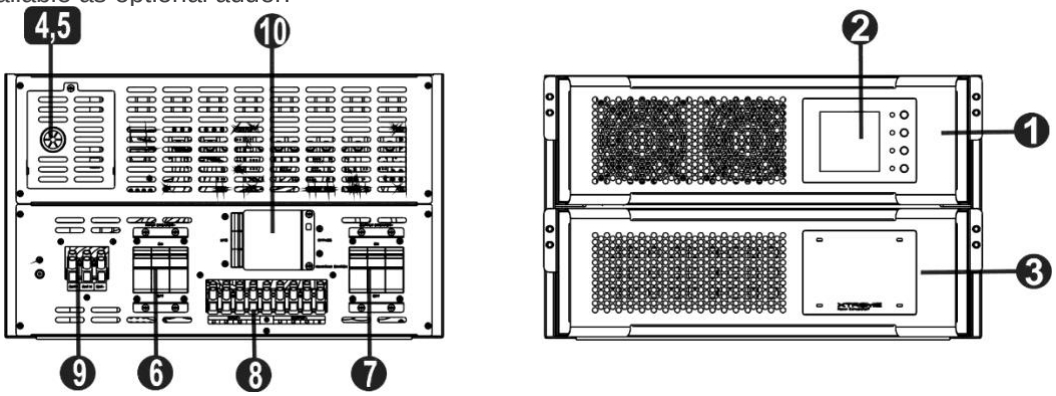
2.4 Model Configuration

Photo	
UPS Module	Max of 1 (Slot 1 ONLY)
Battery Module #	Max of 1
Cabinet Height	10.5” (6U)

2.5 Exterior

In the front of the UPS, Power Module slots and Battery Module slots. A wiring terminal blocks, circuit breakers, communication ports are located at the back of cabinet. The side panels are locked by screws. The casters at the bottom of the UPS cabinet can be used to move the UPS for short distances.

NOTE: The two slot chassis is intended to mount in a rack and doesn’t have casters or leveling feet.
Caster kit available as optional adder.



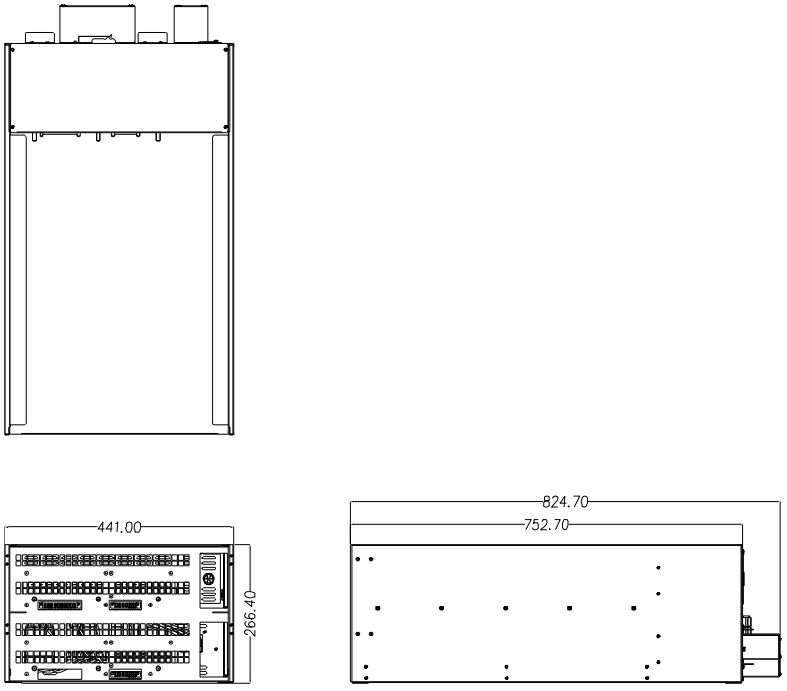
2 Slot M90C

1. Power module
2. LCD display on Power module
3. Battery module
4. Intelligent slot
5. Emergency power off port
6. AC input breaker
7. AC output breaker
8. AC terminal
9. External battery terminal
10. Maintenance bypass switch

2.5.1 Mechanical Data

Dimension			
UPS cabinet	**Width**	**Depth**	**Height**
2 Slot	17.4”	30.6”	10.5”

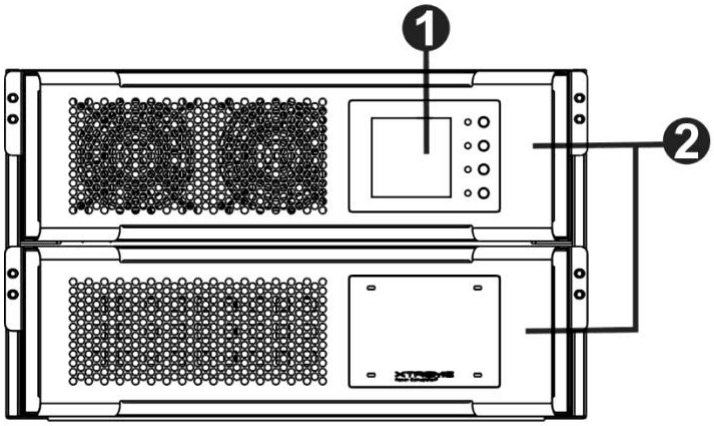
6U Rack



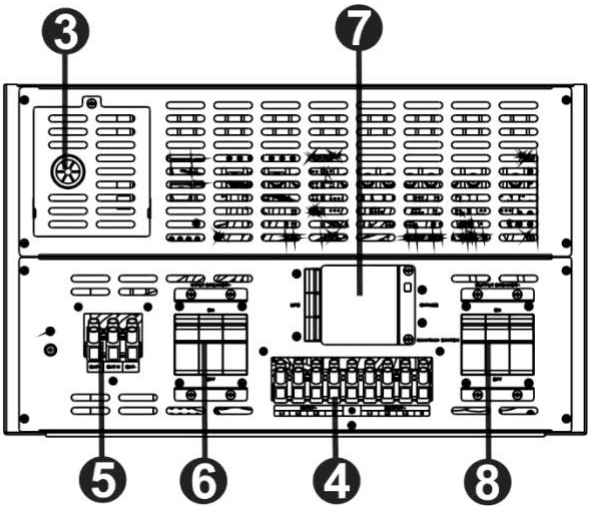
2 Slot Chassis

2.5.2 Front / Rear Open View

Front open view: After removing panel covers, you will see the empty module slots and control panel.
Rear open view: You will see the breakers, terminal blocks, receptacle panels, and communication ports installed on the cabinet.



Front View



Rear View

1. Control panel
2. Power/battery module slots
3. Communication port
4. AC terminals
5. DC terminals
6. AC input breakers
7. MBS behind display. See section 4.5
8. AC output breakers

2.6 Internal Mechanisms

2.6.1 Breakers

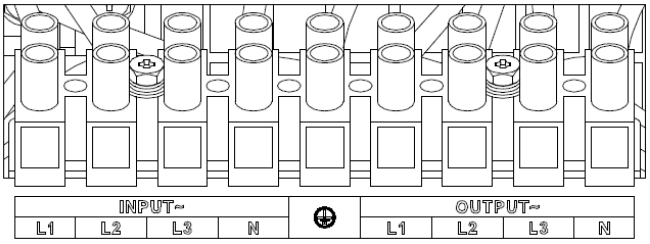
At the rear panel of the cabinet, you can see AC Input/Output breakers as 2.5.2 show.

2.6.2 Wiring Terminal Blocks

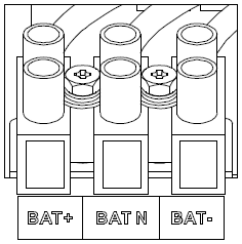
Remove all panel covers and you will see the wiring terminal block for the UPS input/output wiring, please check below chart and table.

Terminal Block Descriptions

	Item	Function	Description
AC Terminal	Output Block (O/P-L1, O/P-L2, O/P-L3, O/P-N)	Connects the Critical loads	Includes L1, L2, L3 and Neutral terminals.
	AC Input Block (I/P-L1, I/P-L2, I/P-	Connects main AC source	Includes L1, L2, L3 and Neutral terminals.
	For UPS Grounding (PE)	For UPS grounding	Includes one grounding terminal - PE.
DC Terminal	DC Terminal Block (BAT+, BAT-N, BAT-)	Connects an external battery pack	Includes Positive (+), Negative (-) and Neutral (N) terminals.



AC Terminal



DC Terminal

2.7 Power Cable

⚠ Warning

Please follow the local wiring regulations. Follow environmental conditions and refer to IEC60950-1.

2.7.1 AC input and output maximum current, recommended OCPD, and power cable configuration.

AC Input

Model	5kVA	8kVA
Current (A)	15	24
Recommended OCPD	20	30
Torque force (lb-in)	20	20

AC Output

Model	5kVA	8kVA
Current (A)	14	22
Recommended OCPD	20	30
Torque force (lb-in)	20	20

2.7.2 DC input maximum current and power cable configuration.

Model	5kVA	8kVA
Current (A)	30	46
Recommended OCPD	40	60
Torque force (lb-in)	20	20

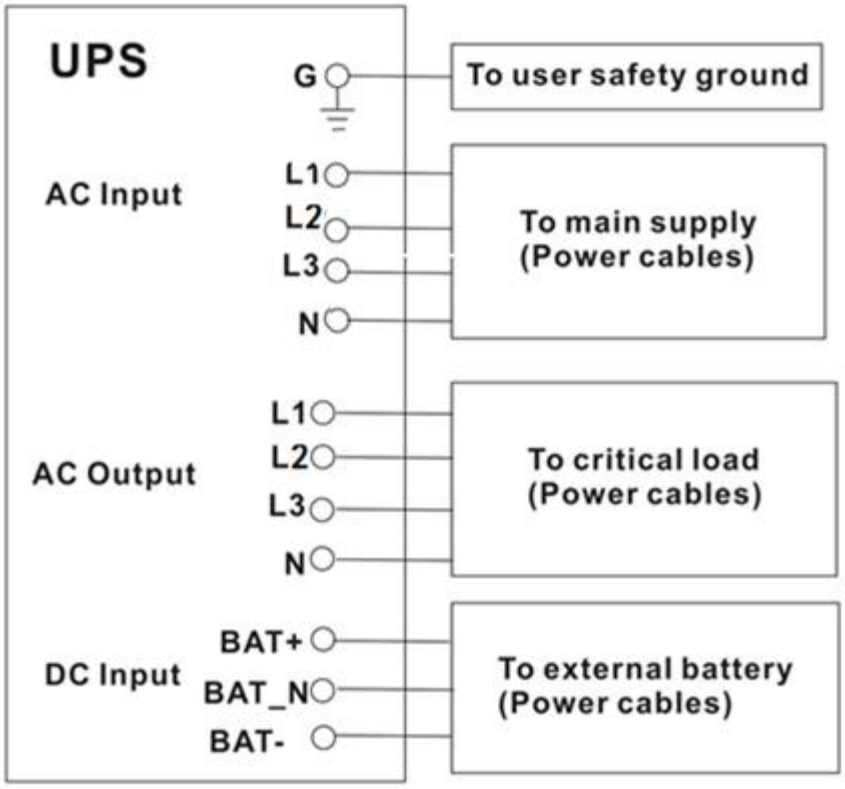
Warning:

1. One standard battery module contains 16 pcs of 12V 10Ah batteries (8 pcs Pos+/8pcs Neg-). You must install at least one battery module per power modules.

2.8 Wiring

- **WARNING:**
- Before wiring, make sure the AC input and battery power are completely cut off.
- Make sure the breakers, including AC input breaker, AC output breaker and DC breaker, are all in the OFF position
- If installing two slot chassis please ensure chassis is installed in rack before wiring is installed. (Refer to section 2.10).

2.8.1 Installation Drawing



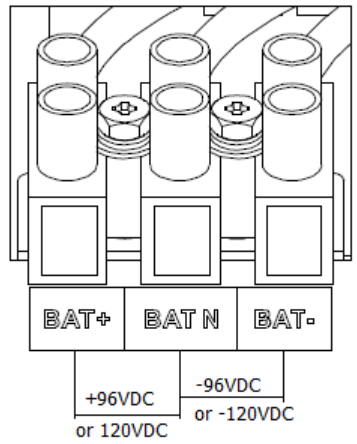
UPS Chassis Wiring

2.8.2 AC source connection

Connect AC input to the AC power source. Please refer to Installation Drawing for UPS wiring.
Polarity of three-phase is critical. A-B-C rotation needs to be used. The wrong polarity will cause an alarm for UPS system when the UPS is powered.

The Neutral wire must be connected properly. A warning message will be indicated if the Neutral wire is not connected properly. The UPS will show warning message as “Warning! Bypass Input N Error”. Then the UPS will transfer to battery mode if battery pack is connected or transfer to standby mode and no output if no battery pack is connected.

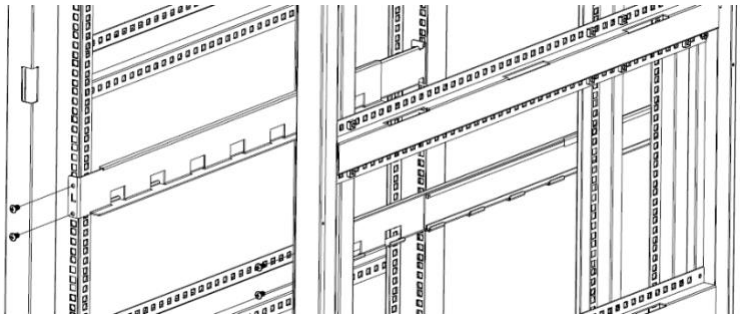
2.8.3 External Battery Pack Connection



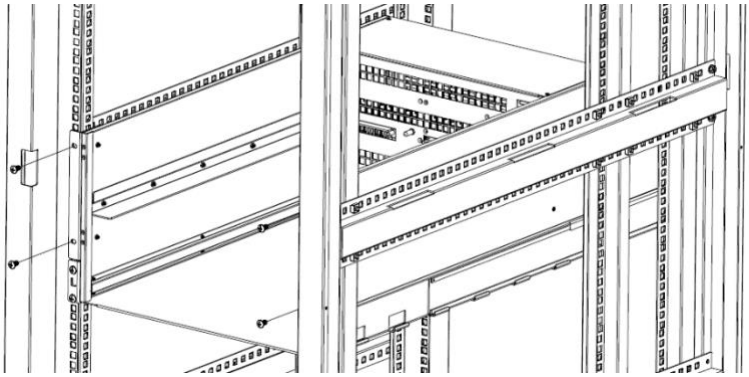
After the battery pack is completely installed, be sure to set up nominal battery voltage, battery capacity and maximum charging current in LCD setting. Otherwise, if battery setting is different from actual installation, the UPS will keep alarming. Please refer to section 5.1.2 battery setting list for details.

2.9 2 Slot Rackmount Chassis Installation

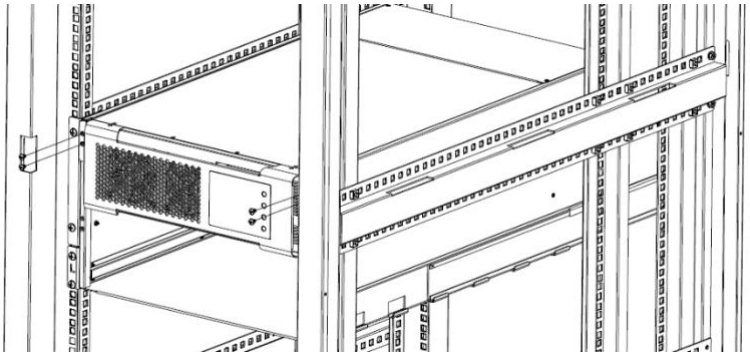
Step 1: Install included rail kits into user supplied rack.



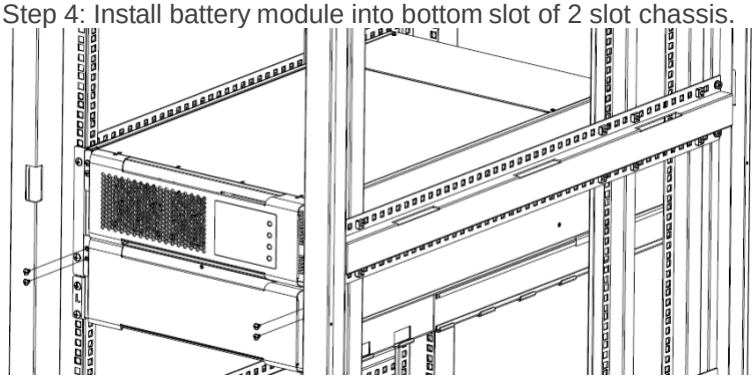
Step 2: Install 2 slot chassis on top of installed rail kit in rack. Secure two slot chassis with included brackets and screws.



Step 3: Install power module into top slot of 2 slot chassis.



Step 4: Install battery module into bottom slot of 2 slot chassis.



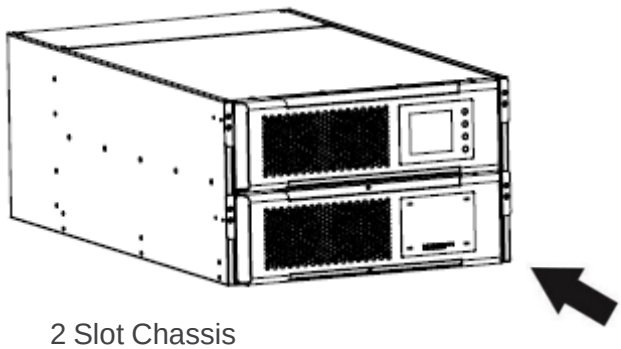
Step 5: Connect input and output electrical wiring to terminal block on rear of 2 slot chassis. (Refer to section 2.6.2)

2.10 Power Module/Battery Pack Installation

2.10.1 Install the UPS module

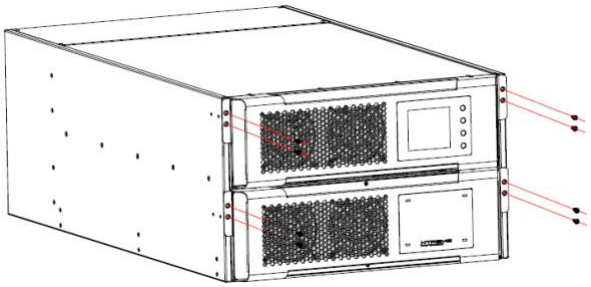
Warning: The power modules installed in the same cabinet must be at the same rating.
1. Insert the power module into an unoccupied slot by two persons.
NOTE: The power module must be inserted into a universal slot.

Universal Slots	
2 Slot	Upper Slot



2 Slot Chassis

2. Secure the UPS module to the cabinet by fixing the screws at the front panel of the UPS module.



2.10.2 Remove the UPS Module

Warning:

Before removing any power module, make sure the remaining power modules can support the critical loads.

At least one power module MUST stay in the UPS cabinet in case the UPS system is operating in Maintenance Bypass Mode. (1.)

(1.) Use a screwdriver to remove the four screws from fixing holes.

(2.) Two people pull out together and remove the UPS module from its slot.

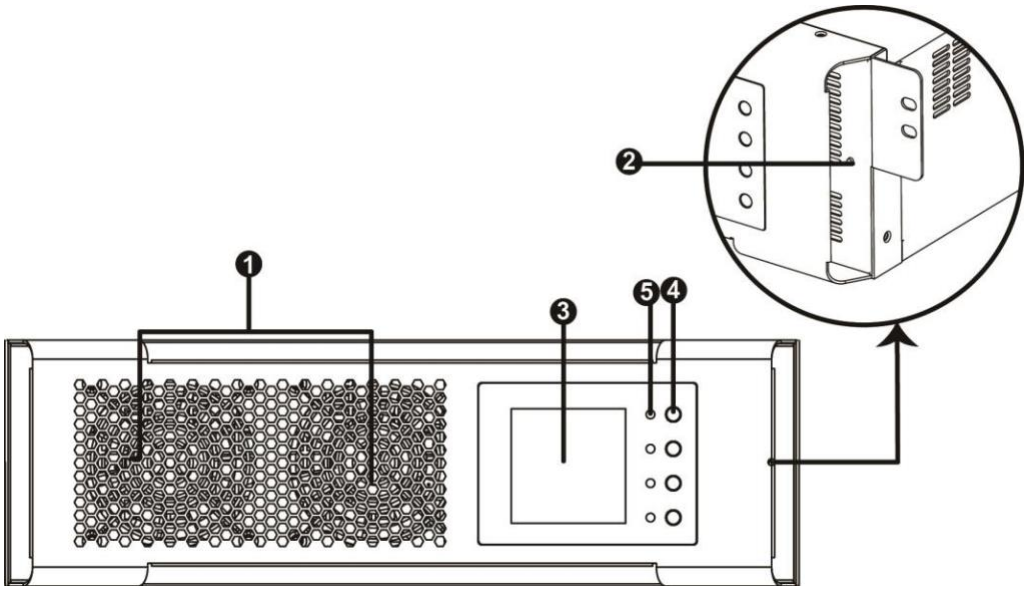
2.10.3 Battery Module Installation/Removal

Please follow power module installation/removal steps to install and remove battery packs.
NOTE: Battery modules can be installed in the lower slots.

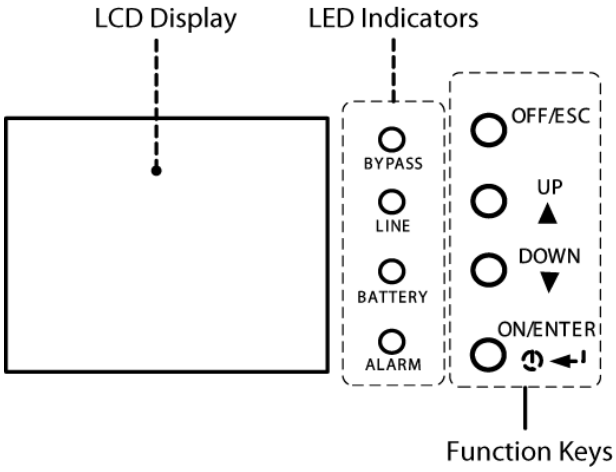
3. Power Module LCD Descriptions

3.1. Power module

Each power module is shipped with its own package. It has to be installed during the whole system installation. The capacity of each power module is 5kVA/5kW or 8KVA/8KW. It includes a power factor correction rectifier, a battery charger, an inverter, a static bypass circuit and control circuit.



No.	Item	Description
1	Fan	The Power Module uses forced convection cooling by these fans. Cooling air enters the module through ventilation grills at the front of the module and exhalation exhausts through grills located at the rear of the module. Please do not block the ventilation area.
2	Battery Start Button	When AC input is not existing, use this button to start battery power for UPS.
3	LCD display	There is LCD display on the UPS module. It can show the UPS information and the slave UPS information when operating in parallel.
4	Function Keys	There are four function keys in the UPS module. They can control and monitor the single UPS module. Please refer to function key table for the details.
5	LED indicators	There are four LED indicators to show UPS working status. Please refer to LED indicator table for the details.



Power Module Interface Display

3.1.2 Power Module Function Key Descriptions

Control key	Press this button to turn on the UPS. Or press it to confirm the selection in the menu.
Off/ENTER	Press this button to turn on the UPS. Or press it to confirm the selection in the menu.
OFF/ESC	Press this button to turn off the UPS. Or press it to return to the last menu.
UP	Press this button to select the previous item in the menu. Or press this button to jump to previous page in the screen. Or press this button to increase the number in the setting.
DOWN	Press this button to select the next item in the menu. Or press this button to jump to next page in the screen. Or press this button to decrease the number in the setting.

3.1.2 LED indicators for Power module

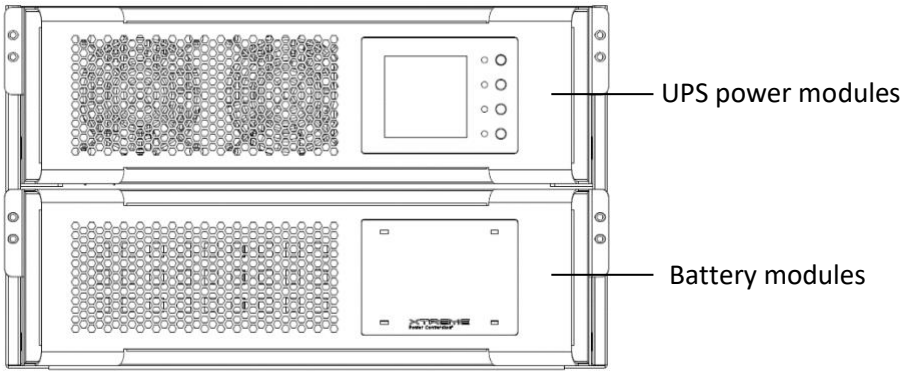
LED / Mode	BYPASS	LINE	BATTERY	ALARM
UPS Power On	●	●	●	●
Standby mode	○	○	○	○
Bypass mode	●	○	○	○

Line mode / Converter mode	○	●	○	○
Battery mode	○	○	●	○
Fault mode	○	○	○	●
Battery Test mode	○	●	●	○
ECO mode	●	●	○	○

Note: ● means LED is lighting, and ○ means LED is faded

3.2 UPS System Functional Description

The modular and hot-swappable design of power modules makes it a highly convenient replacement solution to meet your power requirement.



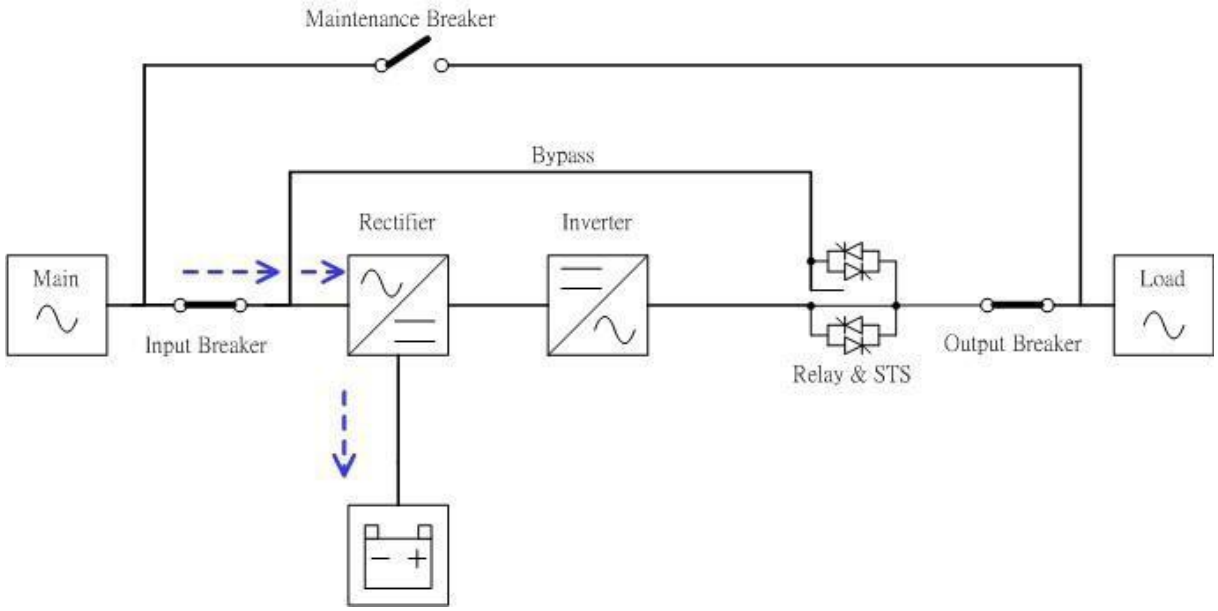
3.2.1 Operation Mode

This modular UPS is three-phase, three-wire plus Neutral + ground on-line, double-conversion and reverse-transfer UPS that permits operation in the following modes:

- Standby Mode
- Line Mode
- Battery Mode
- Bypass Mode
- ECO Mode
- Shutdown Mode

3.2.2 Standby Mode

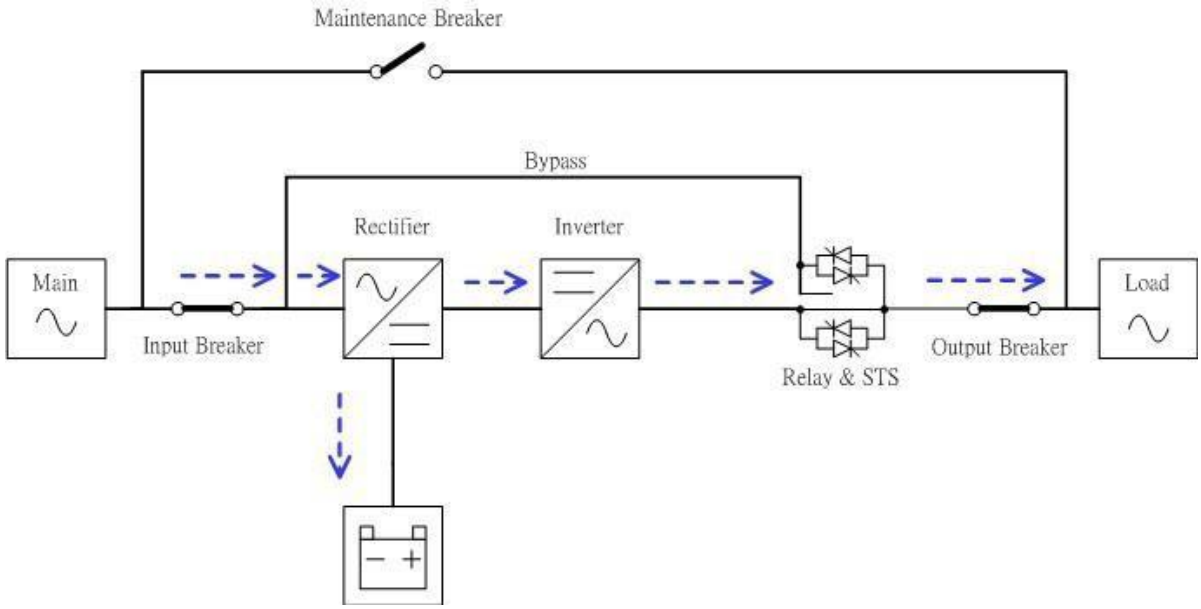
Upon connecting to utility input power, the UPS is in Standby mode before UPS is turned on (if BYPASS enable setting is Disabled), and charger function will be active when the battery is present.



Standby Mode Diagram

3.2.3 Line Mode

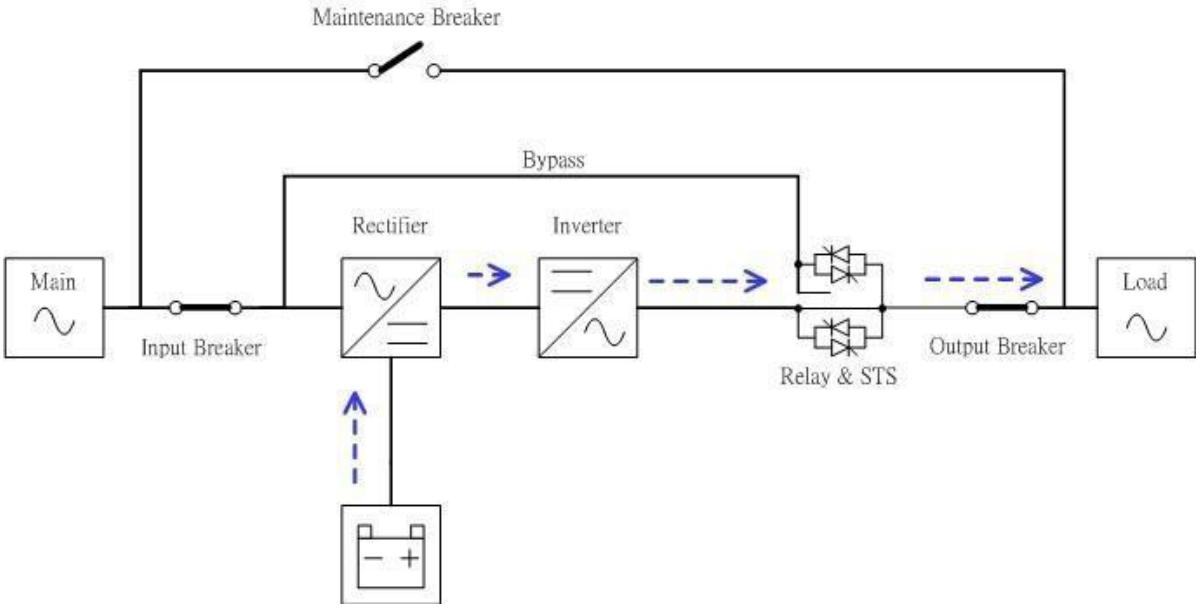
In Line Mode, the rectifier derives power from the utility power and supplies DC power to the inverter and the charger charges the battery. The inverter filters the DC power and converts it into pure and stable AC power to the load.



Line Mode Diagram

3.2.4 Battery Mode

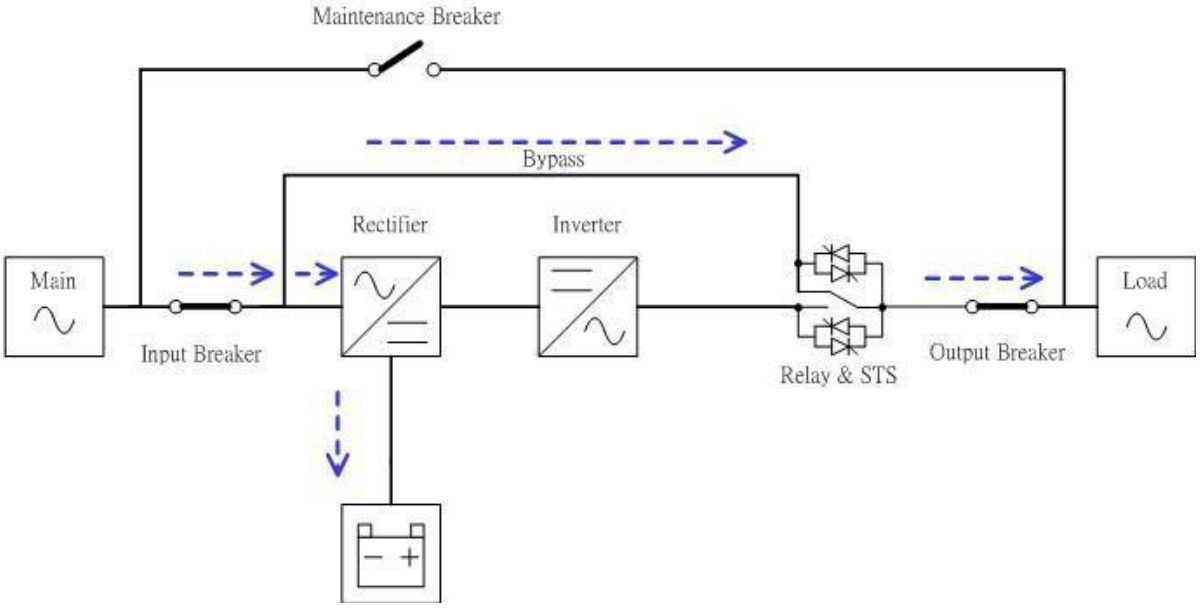
The UPS automatically transfers to Battery mode if the utility power fails. There is no interruption in power to the critical load upon failure. In battery mode, the inverter filters the DC power from battery and converts it into pure and stable AC power to the load.



Battery Mode Diagram

3.2.5 Bypass Mode

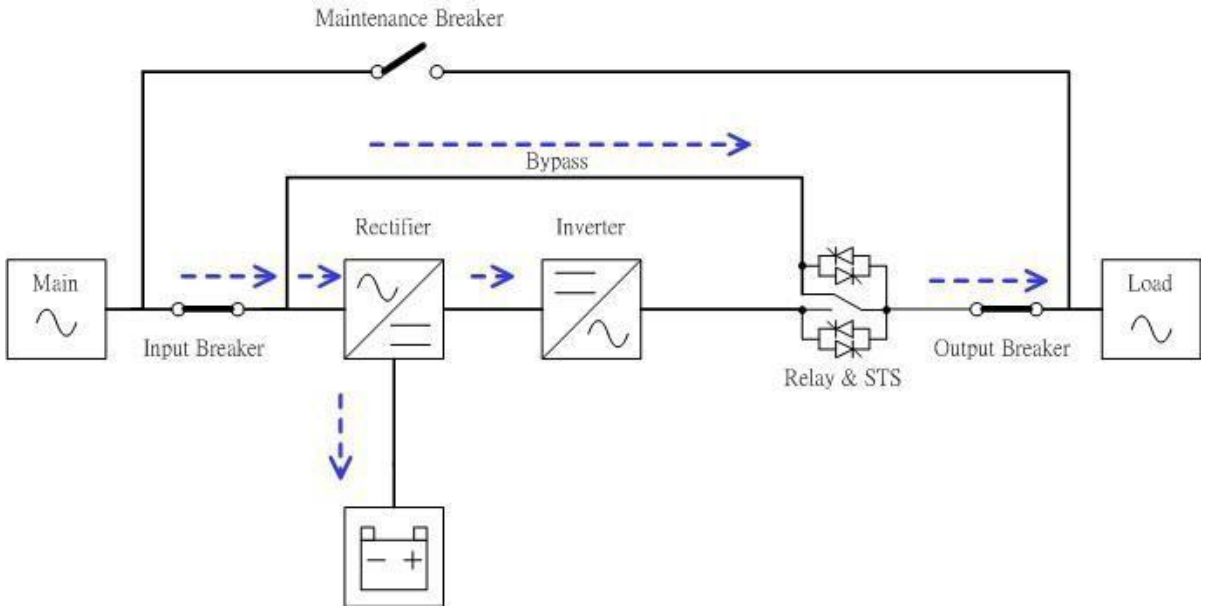
Upon connecting to utility input power, the UPS is in Bypass mode before UPS is turned on (if BYPASS enable setting is Enabled), and charger function will be active when battery is present. After UPS has been turned on, if the UPS encounters abnormal situations (over-temperature, overload …, etc.), the static transfer switch will perform as a transference of the load from the inverter to the bypass source with no interruption. If the transference is caused by a recoverable reason, the UPS will turn back to line mode when abnormal situation is solved.



Bypass Mode Diagram

3.2.6 ECO Mode

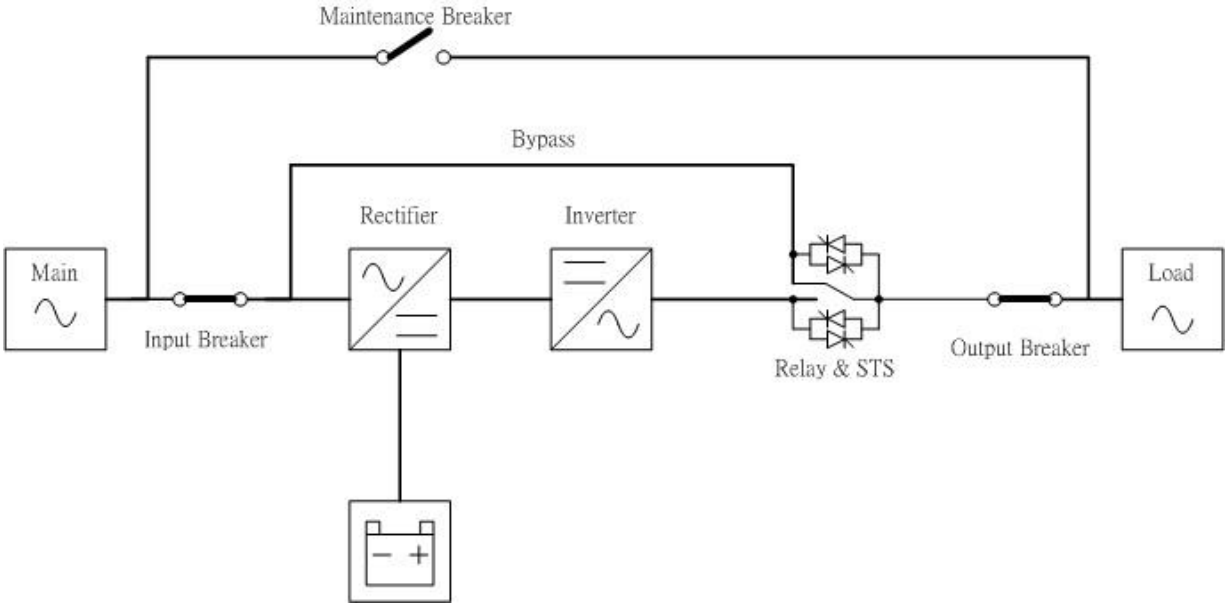
The ECO Mode is enabled through the LCD setting menu. In ECO mode, the load is powered by bypass when the bypass voltage and frequency are within the acceptable ranges. If the bypass is out of range, the UPS will transfer the power source of load from bypass to inverter. In order to shorten the transfer time, the rectifier and inverter are working when the UPS is in ECO mode.



ECO Mode Diagram

3.2.7 Shutdown Mode

When the UPS is in the off state and the utility power source is absent, the UPS will enter shutdown mode. Or when the UPS has discharged the battery to the cut-off level, the UPS will enter shutdown mode as well. When the UPS enters this mode, it is going to shut off the control power of UPS. The rectifier, charger and inverter are all in off state.



Shutdown Mode Diagram

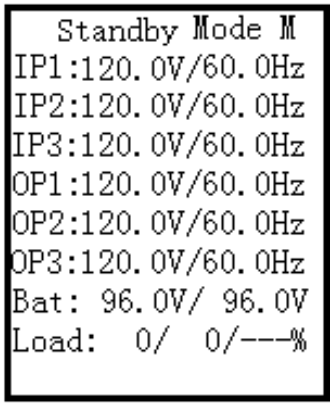
4. Operation (See section 5.2 for screen shots during these operations)

- Do not start the UPS until the installation is completed.
- Make sure the wiring is correct and the power cables are properly connected.
- Make sure all the breakers are switched OFF.

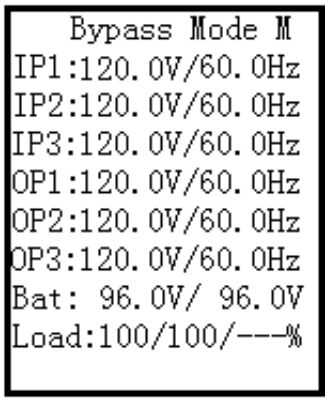
4.1 AC Startup

Ensure to follow this procedure when turning on the UPS from a fully powered-down condition.

The operating procedures are as follows:
Step 1: Refer to the “Installation Section” to connect the power cables and install the Power Modules and the battery required for the UPS system.
Step 2: Switch ON the battery breaker on the External Battery Pack if installed.
Step 3: Switch ON the external power switch to power the UPS.
Step 4: Switch ON the input breaker. The UPS will enter Standby Mode, if the setting of Bypass mode is disabled (default).

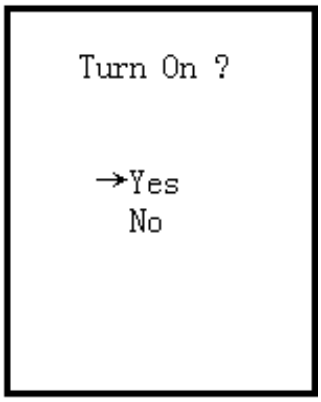


Or the UPS will enter Bypass Mode, if the setting of Bypass mode is enabled.

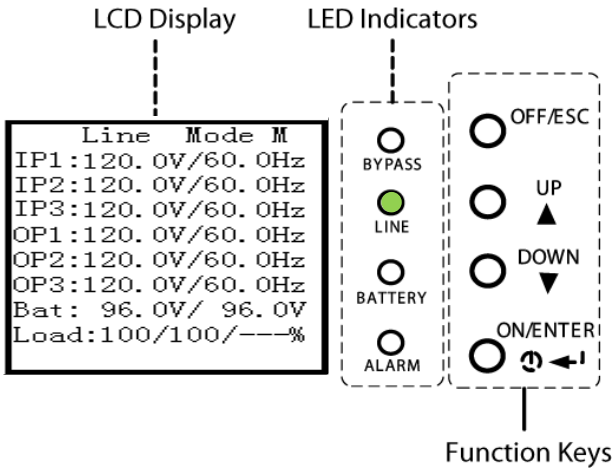


Step 5: Make sure there is no warning or fault event happening. If there is, please refer to Chapter 6: Troubleshooting to solve it.

Step 6: Press Power ON/Enter button for two seconds to enter Line Mode as shown below.



After turned on, UPS will do self-test and start Inverter up. UPS will be transferred to Line mode when all power modules are ready.

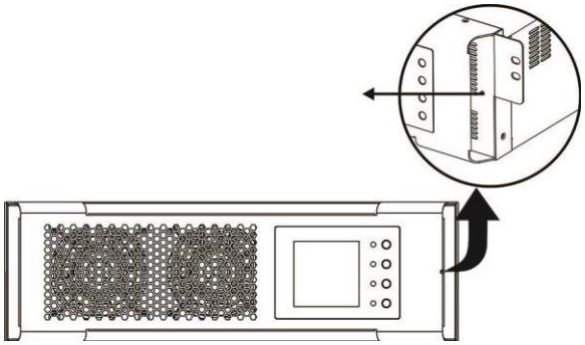


Step 7: Switch ON the output breaker. AC startup procedure is complete.

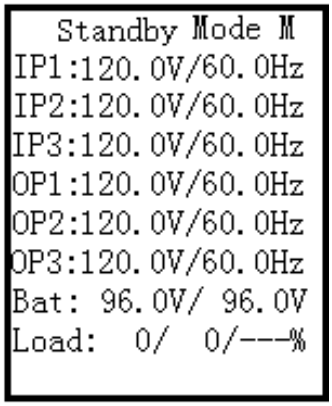
4.2 Cold Start Startup (Start up with no AC Power present)

Step 1: Insert battery pack into M90-2S rack system.

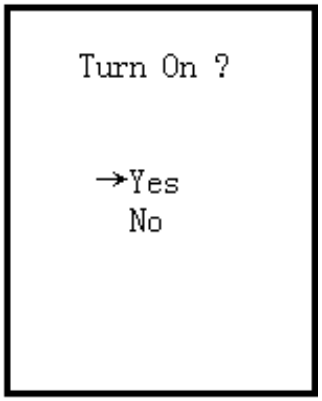
Step 2: Press the “Battery Start” button on power module to start up the control power as shown below.



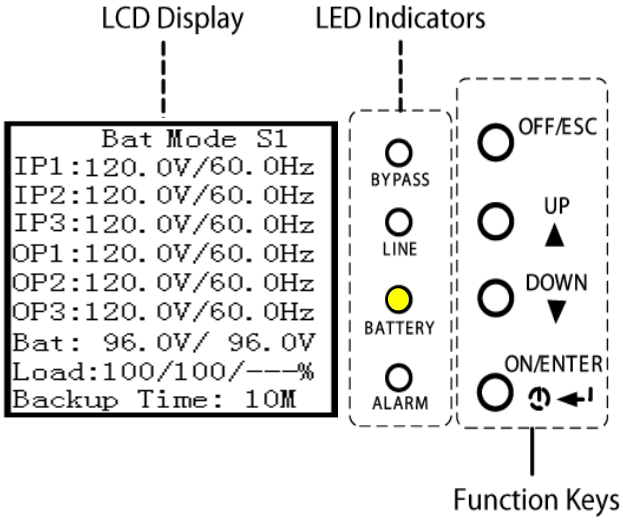
Step 3: After pressing the “Battery Start” button, UPS will enter Standby mode. Refer to the diagram below for LCD display.



Step 4: Before UPS enters shutdown mode, please press “Power On/Enter” button or use the Menu-Control-System as shown in the diagram below



Step 5: UPS will enter Battery Mode as shown in the diagram below.

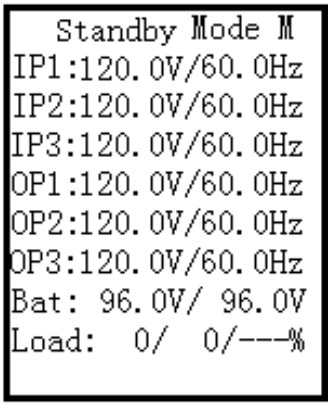
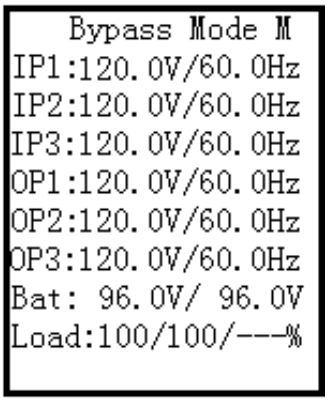


Step 6: Switch ON the output breaker. Cold start startup procedure is complete.
Follow the instruction to transfer to Maintenance Bypass and UPS protection as below.

4.3 Turn off Operation

4.3.1 Bypass Mode/ Standby Mode Turn Off Operation

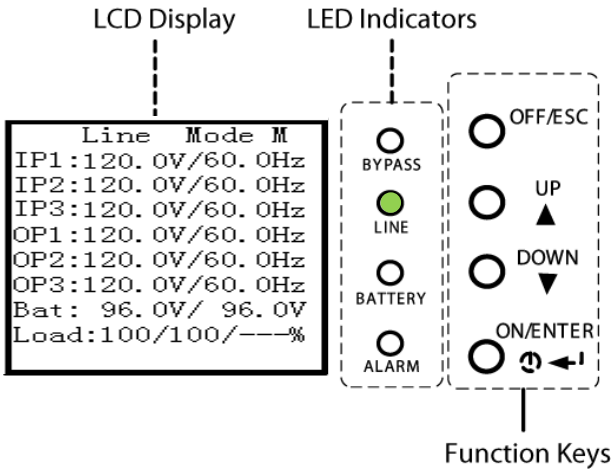
The UPS operates in the Standby Mode or Bypass Mode depending on the “Bypass Mode” Setting. The LCD Diagrams are shown below.

Bypass Mode Setting is Disabled	Bypass Mode Setting is Enabled
	

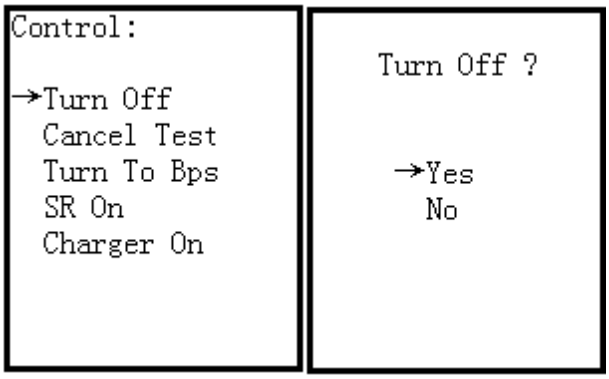
Switch OFF the AC input breaker. The LCD will OFF if no battery.

4.3.2 Line Mode Turn Off Operation

The LCD diagrams are shown below when the UPS operates in the Line Mode.



Press “Power OFF/ESC” button or use the Menu-Control-System Turn Off to turn off the UPS.

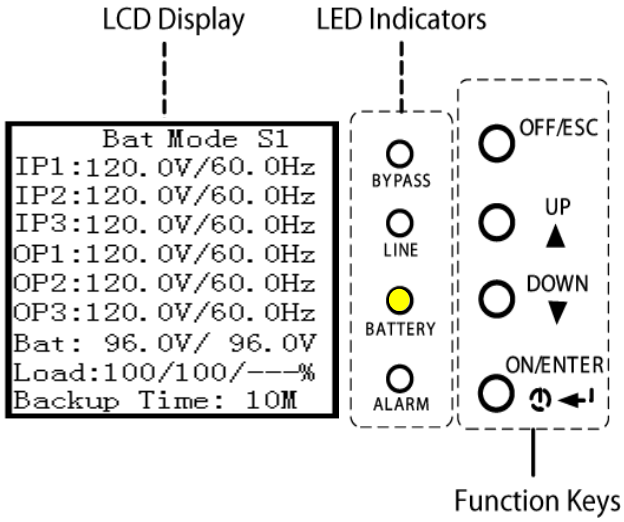


After turning off, the UPS will transfer to Standby Mode or Bypass Mode depending on the “Bypass Mode” Setting.

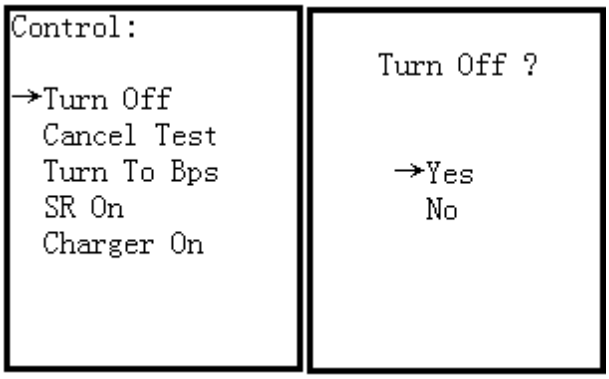
Next, follow the Bypass Mode/ Standby Mode Turn Off Operation procedure.

4.4 Battery Mode Turn Off Operation

The LCD diagram is shown below when the UPS operates in the Battery Mode.



Press “Power OFF/ESC” button or use the Menu-Control-System Turn Off to turn off the UPS.

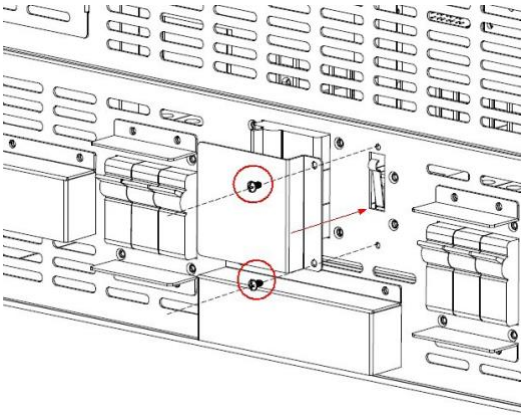


After turning off, the UPS will tranfer to Standby Mode.
Next, follow the Bypass Mode/ Standby Mode Turn Off Operation procedure.

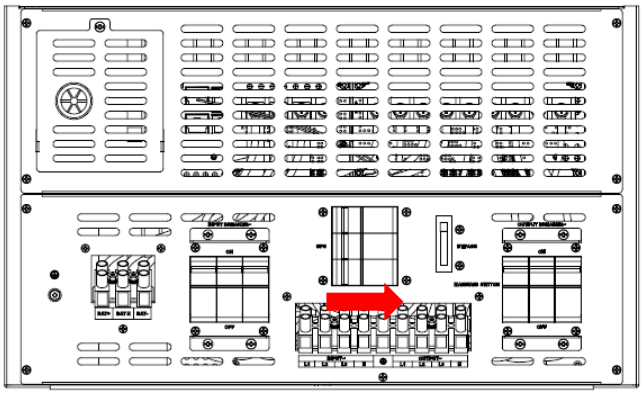
4.5 Maintenance Bypass Switch Operation

4.5.1 Transfer to Maintenance Bypass

Step 1: Remove the MBS small metal cover with 2 screws:



Step 2: Make sure the UPS is operating in static Bypass mode.
Step 3: Switch ON the Maintenance Bypass Breaker as shown below:

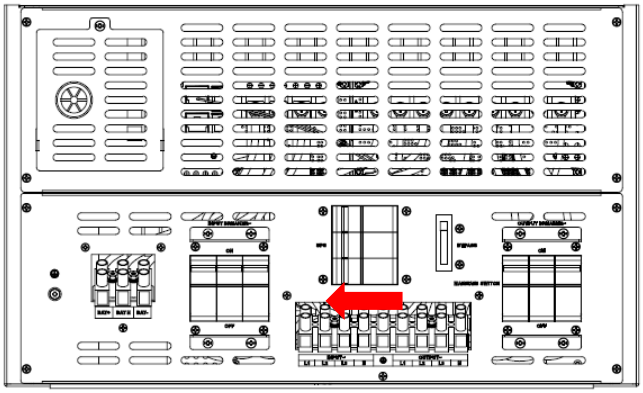


Now it is possible to perform maintenance on the UPS without affecting the load equipment.

4.5.2 Transfer from Maintenance Bypass

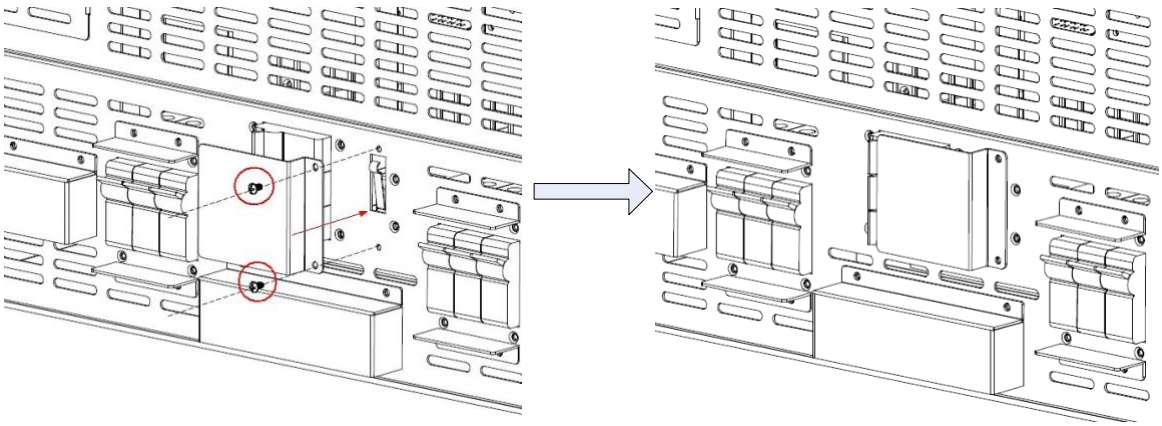
Step 1: After the maintenance is completed, make sure all Modules have been installed properly.
Step 2: Please enter LCD SETUP MENU then choose “SYSTEM” to ensure that the “Static Bypass mode” is enabled. If the “Static Bypass mode” is disabled, you have to enable it. Then, exit the SETUP menu and ensure that the UPS operates in static bypass mode.

Step 3: Switch OFF the Maintenance Bypass Breaker as shown below:



Step 4: Re-insert the 2 screws on the MBS breaker cover. For the six slot chassis re-install the LCD display panel housing.

2 Slot Chassis



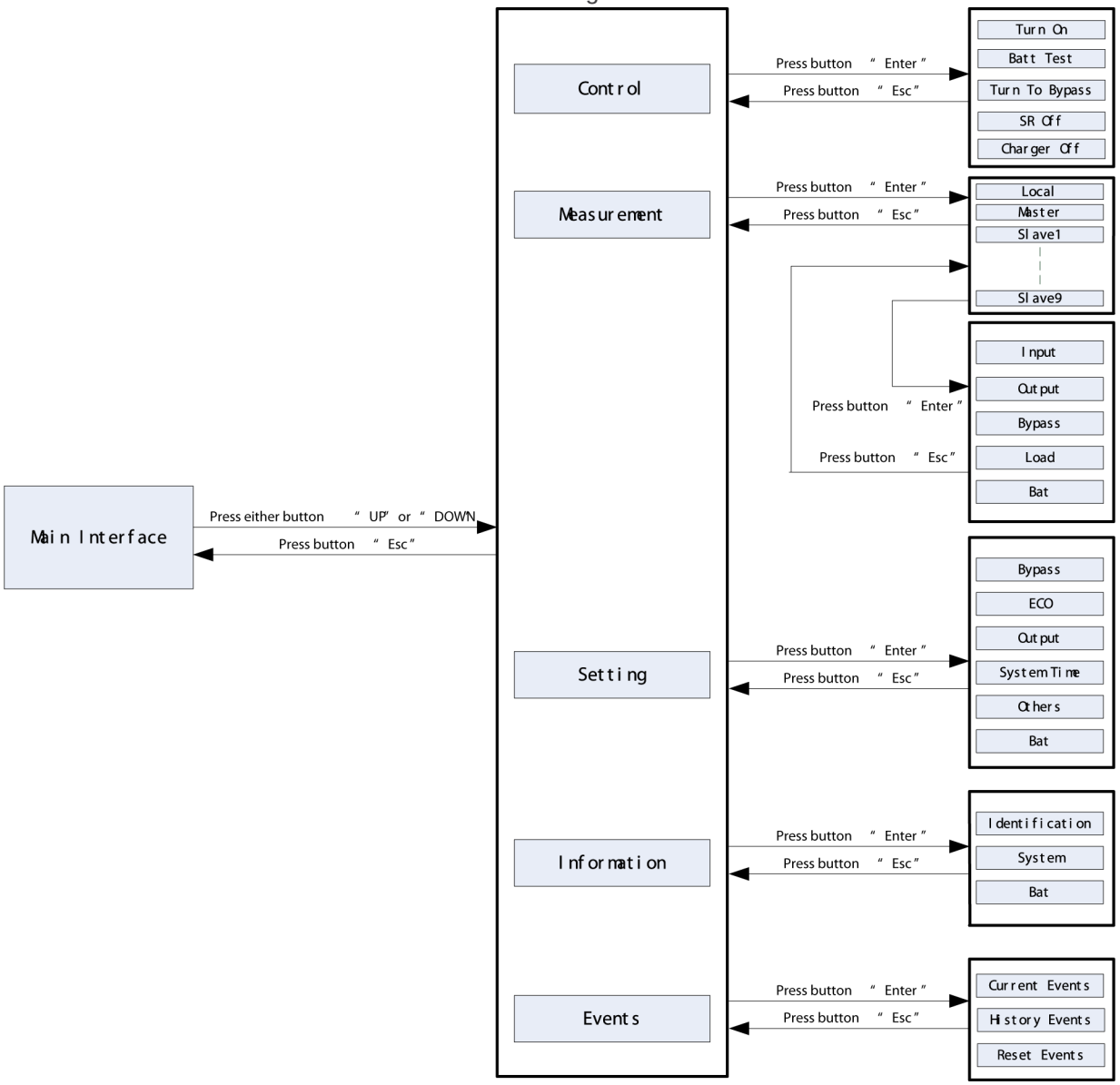
Step 5: Turn on the UPS inverter

5 Control Panel and Display Description

5.1 LCD Screen in UPS Module

5.1.1 LCD Structure

The entire LCD structure is demonstrated as below diagram.



LCD Structure

5.1.2 Main interface (Home Page)

1) UPS Mode: Current operation mode.

2) It will display the UPS running status mode and parallel information as below table.

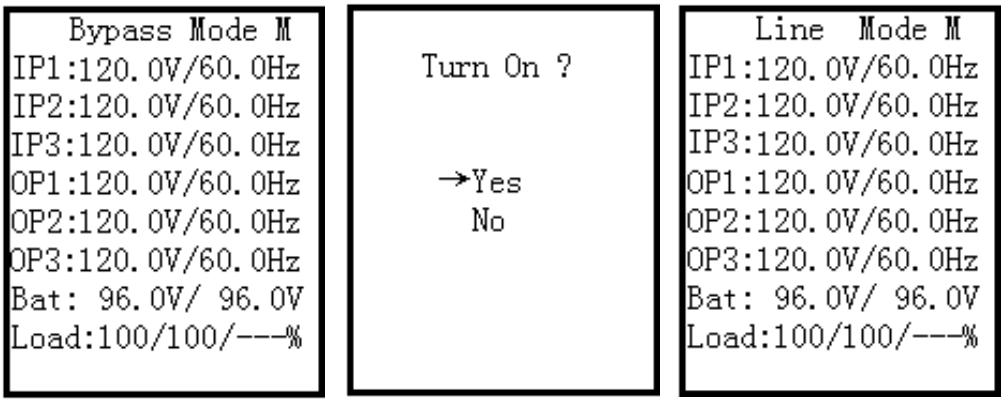
Short Description	Description
N	New adding module into parallel system.
M	Master
S<n>	Slave, <n> means the number of slave module.

3) Input and output information.

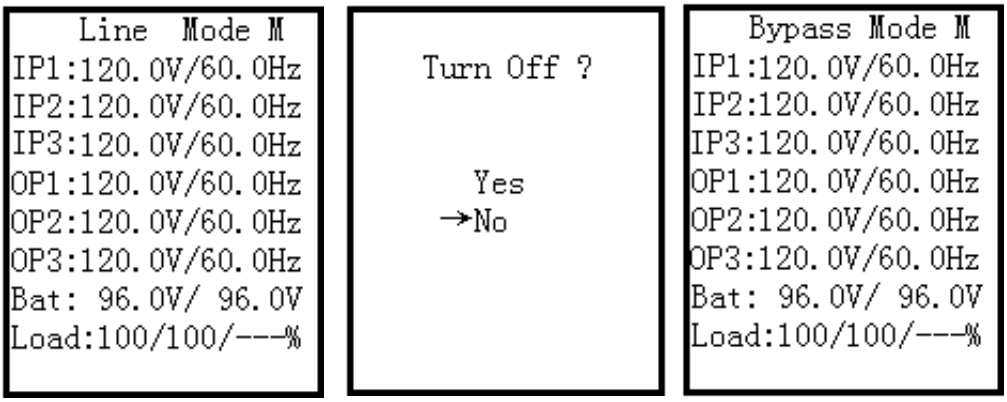
4) Battery capacity, load level and backup time/warning or fault codes. When alarms happen, the warning or fault information will display. When UPS is operated in Battery mode or Battery Test mode, the backup time will display.

When the front panel is not operated for 2 minutes, the display page will return back to home page.
Press the “UP” or “DOWN” button to enter the operation menu (Refer to 4.2.3).

When it displays home page in LCD, if UPS is in bypass or standby, you could press the “ON/ENTER” button to turn on the UPS to line / converter / ECO / battery mode according to the setting and input status.

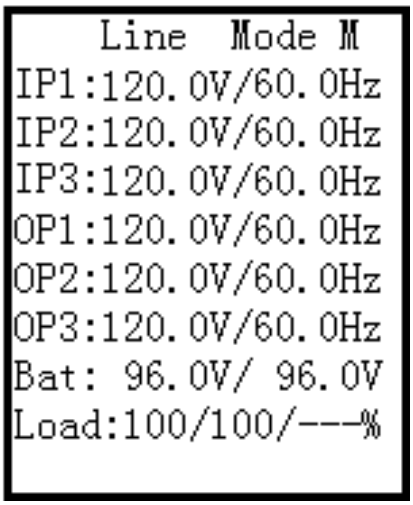


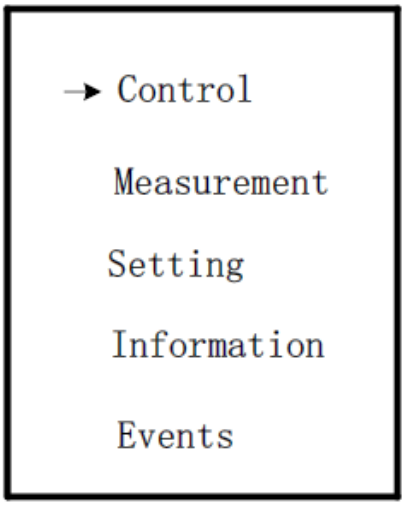
When UPS is turned on, you could press the “OFF/ESC” button to allow UPS to bypass mode or standby.



5.2 Operation

5.2.1 Main menu





Main screen(Home page) **Main menu**

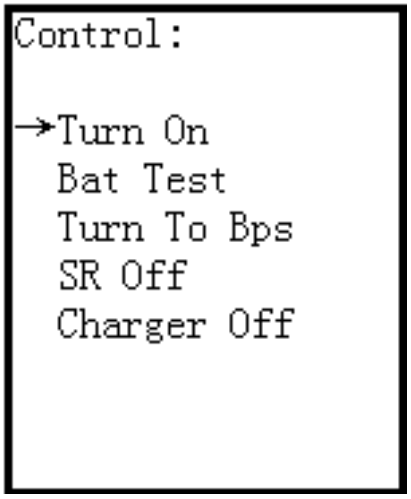
1) After pressing the “UP” or “DOWN” button on the main screen (Home page), it will display five items in operation menu: Control / Measurement / Setting / Information / Events.

2) Press “UP” or “DOWN” button to select item.

3) Press “ON/ENTER” button to confirm the selection.

4) Press “OFF/ESC” button to return back to main scree (Home page).

Control



In “Control” screen, it’s real-time command for UPS.

- “Turn On” will be displayed if UPS is not turned on. “Turn Off” will be displayed if UPS is turned on.
- “Bat Test” will be displayed if UPS is not in Battery Test Mode. “Cancel Test” will be displayed if UPS is in Battery Test Mode.
- “Turn to Bps” will be displayed all the time no matter what status UPS is. But this action is only

effective when the input power is available.

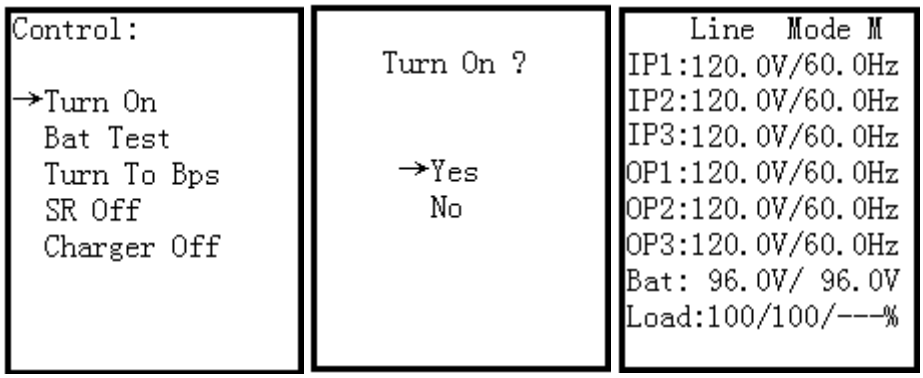
- "SR Off" will be displayed if UPS is not turned on. "SR On" will be displayed if UPS is turned on.
- "Charger Off" will be displayed if charger is working. "Charger On" will be displayed if charger is turn off.

Generally speaking, only one selection will be displayed in the screen and it depends on UPS status.

Turn On/Turn Off

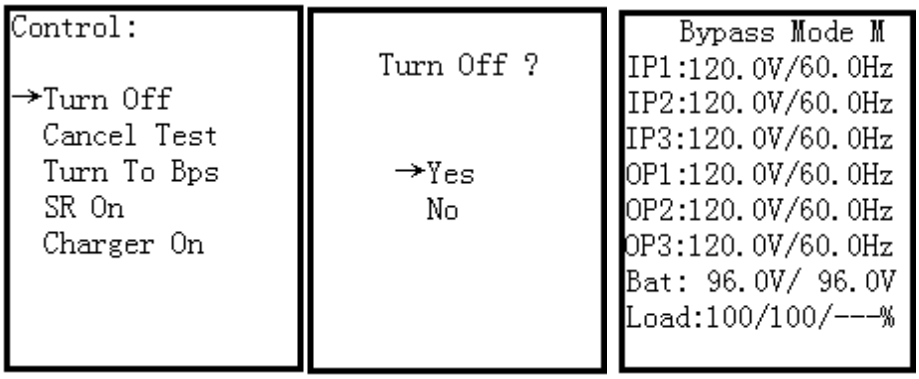
This item is for turning on/off the UPS.

a) On Bypass mode, it will display "Turn On" in control menu. If it is selected and confirmed, the UPS will transfer to line mode, converter mode, ECO mode, or battery mode according to the setting and input status.



NOTE: You may simply turn on UPS by pressing "ON/ENTER" button in main scree (Home page). It's not necessary to enter control menu to turn on the UPS.

b) On line mode, converter mode, ECO mode or battery mode, it will display "Turn Off" in control menu. If it is selected and confirmed, the UPS will transfer to bypass mode or shutdown mode.

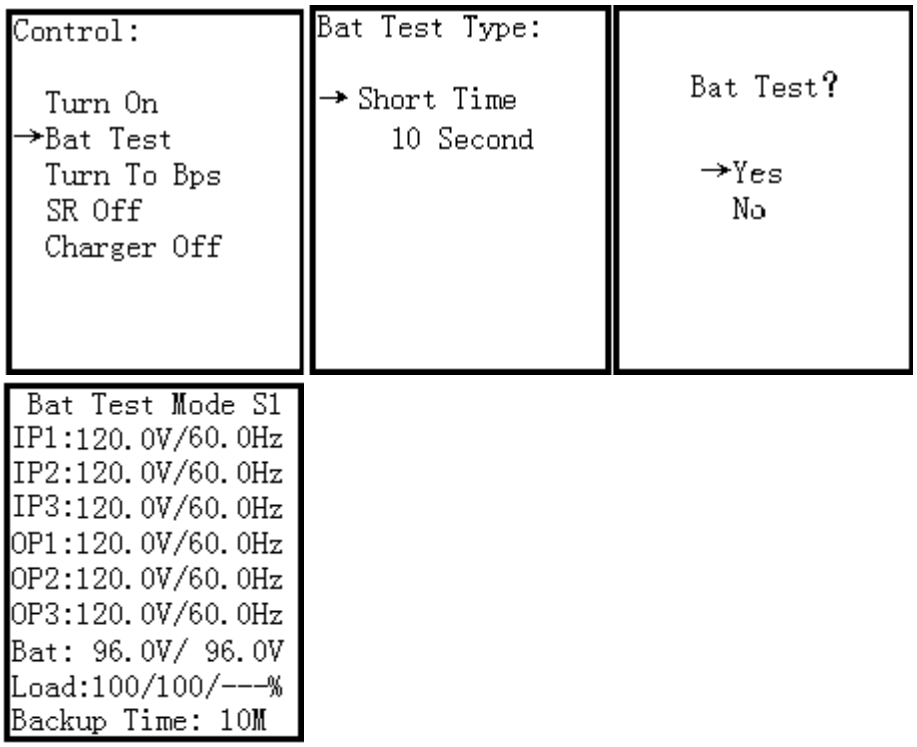


NOTE: You may simply turn off UPS by pressing "OFF/ESC" button in main scree (Home page). It's not necessary to enter control menu to turn off the UPS.

2) Battery Test / Cancel Test

a) It is to check if the UPS could work well in battery mode and test the battery performance.

Except UPS is in Battery Test mode, "Battery Test" selection will be displayed under all operation models

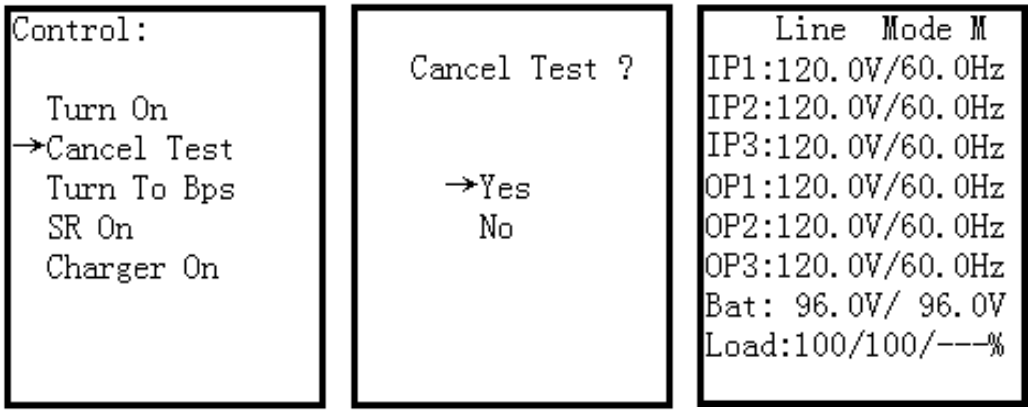


However, it could execute this test in Line/Converter mode and reminder will pop up in the screen. When “Yes” is selected, the screen will return back to home page with “Battery Test Mode” displayed on top. If the test is completed, the displayed status will change back to UPS current mode. There are four battery test types to select. Refer to Table 5-1.

Table 5-1: Battery Test Type

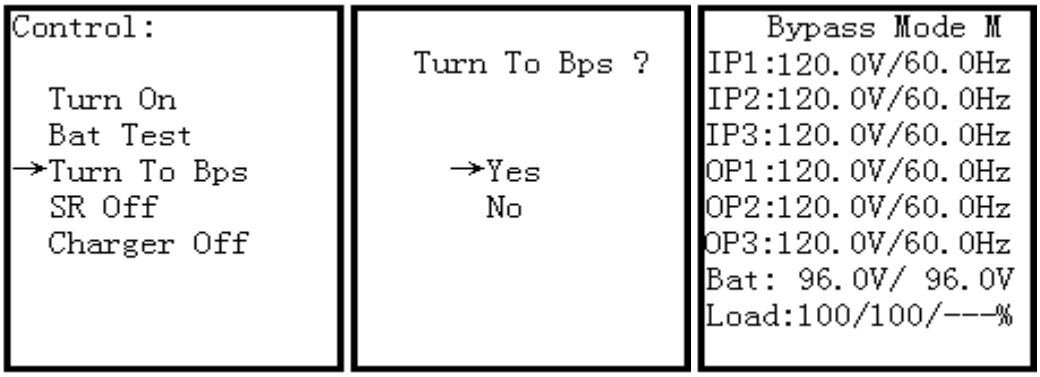
Setting Item	Sub Item	Explanation
Bat Test Type	Short Time	10-second test time.
	Long Time	When testing time is longer than 1 minute, please select “Long Time” and the duration is able to set up. (1~99min) -10 min (Default)
	Till to Bat Low	Test until the battery is low voltage.

b) On Battery Test mode, it will display “Cancel Test” in control menu. When “Cancel Test” is selected, the screen will change back to UPS current mode.



3) Turn to Bypass

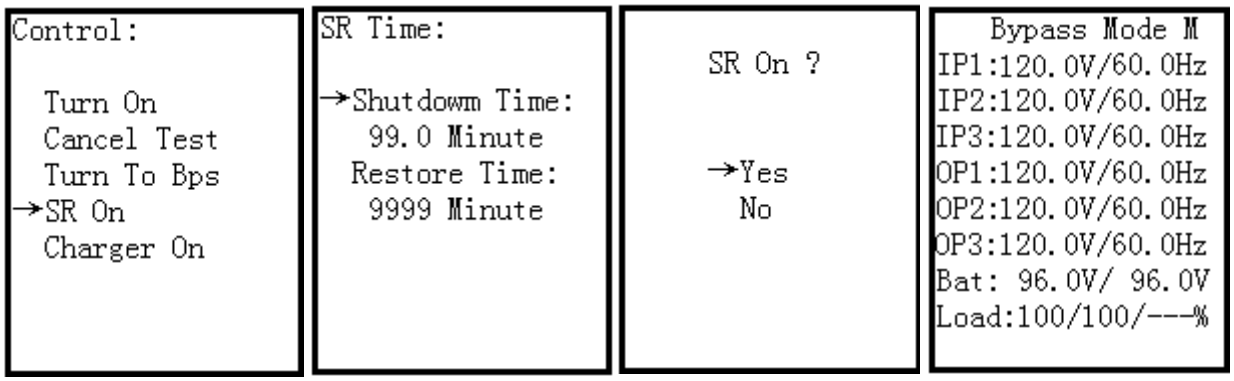
If it is selected and confirmed, the UPS will transfer from Line mode to Bypass mode.



4) SR On / SR Off

a) On Line/Battery/Battery Test/Converter/ECO mode, it will display “SR On” in control menu. If it is selected and confirmed, the screen will return back to home page. Shutdown and restore time can be selected as in Table 5-2.

When “Shutdown Time” countdown ends, the UPS will turn off. Then, the “Restore Time” will start to count. When countdown ends, the UPS will be turned on and back to current mode.



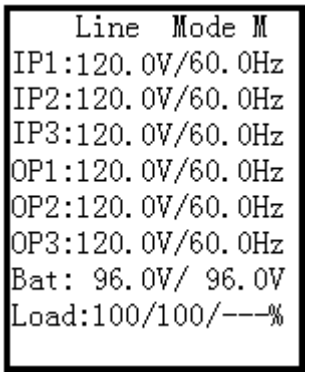
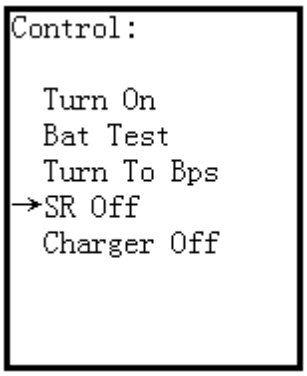


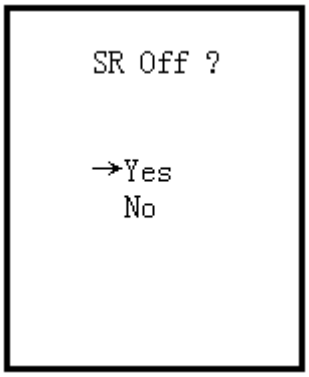
Table 5-2: Shutdown Restore Time

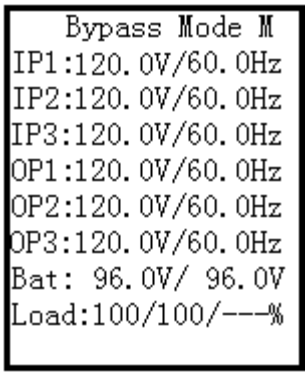
Setting Item	Sub Item	Explanation
SR On	Shutdown Time	Set system shutdown time (0.2~99min) -0.2 min (Default)
	Restore Time	Set system restore time (0~9999min)

b) On Standby/Bypass/Fault mode, it will display “SR Off” in control menu. If it is selected and confirmed, the screen will return back to home page and system will back to current mode.

If “SR On” is selected and confirmed, When UPS in Line/Battery/Battery Test/Converter/ECO mode, it will display “SR Off” in control menu. If it is selected and confirmed, the screen will return back to home page and system will cancel this function.

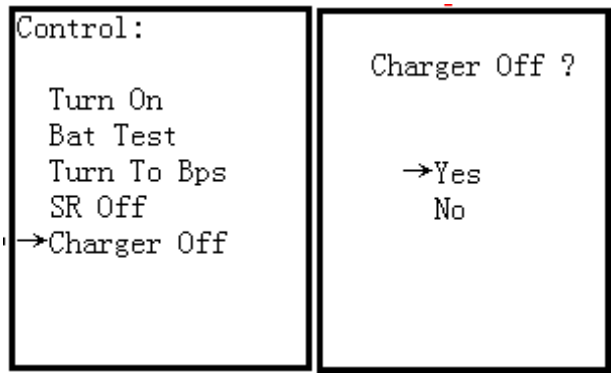




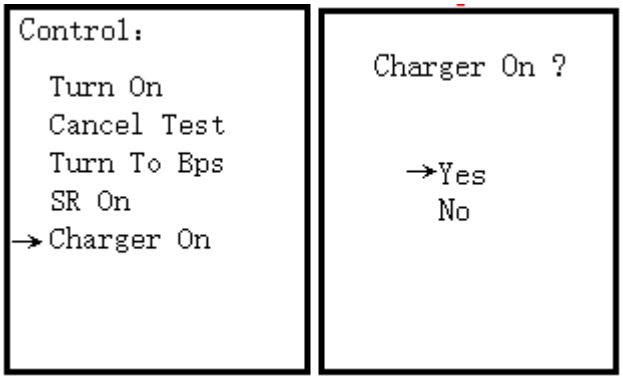


5) Charger Off / Charger On

a) “Charger Off” will be displayed under all operation modes when charger is working. If it is selected and confirmed, the screen will return back to home page. And charger will stop charging the battery.



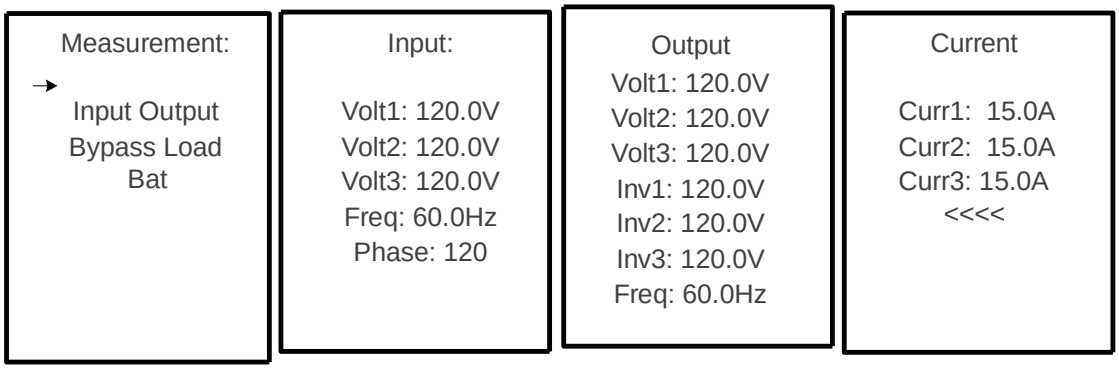
b) “Charge On” will be displayed under all operation modes when charger is turned off. If it is selected and confirmed, the screen will return back to home page. And charger will charge the battery.

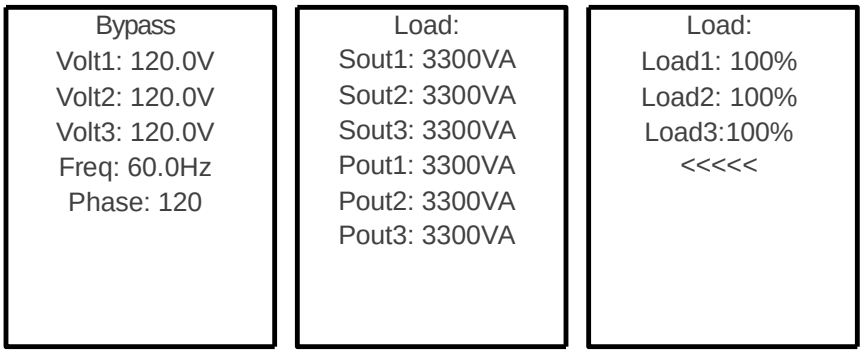


5.2.2 Measurement

Measurement displays the measurement value of the parameters such as voltage / current / frequency / power / capacity / time etc. Every UPS could display the measured value of the whole system. Press up or down button to explore the pages.

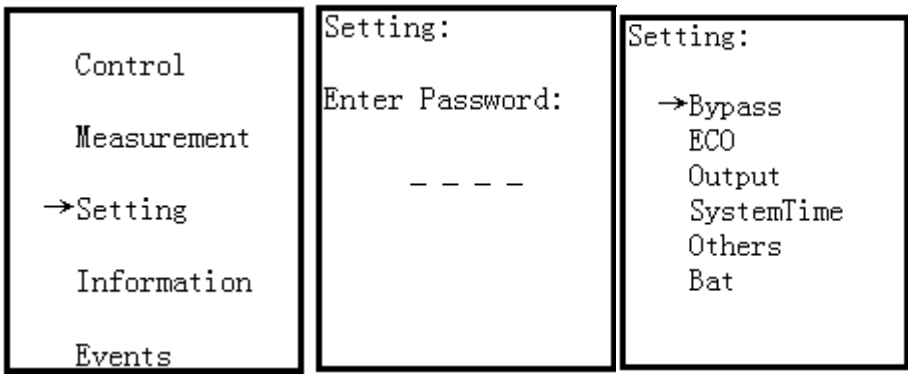
“Local” means the current UPS module. “System” means the whole M90C system. “Master” and “Slave<n>” means the other UPS module in this parallel system.





5.2.3 Setting

This page is used to configure the parameter settings. It's necessary to enter password to enter submenus. Some submenus require the Maintainer password. There are submenus under the Setting, including Bypass, ECO, Output, SystemTime, Others and Battery, as shown below.



NOTE: Some settings will be only available in some operation modes. If the setting is not available in current mode, the LCD will show prompt message with "Item can't be set in this mode". Press any button or just wait for several seconds until this message fades.

1) Bypass setting (only available or effective on bypass mode and standby mode)

Interface	Description
Bypass: Status: Open Disable High Loss V: 140V Low Loss V: 88V High Loss F: 64Hz Low Loss F: 56Hz	**1. Status** **1.1 Open/Forbid:** Open: Bypass allowed. When selected, UPS will run at Bypass mode depending On bypass enabled/disabled setting. Forbid: Bypass not allowed. When selected, it's not allowed for running in Bypass mode under any situations. The default setting is Open. **1.2 Enable/Disable** This option appears only when Bypass status is set to "Open". Enable: Bypass enabled. When selected, Bypass mode is activated. Disable: Bypass disabled. When selected, automatic bypass is acceptable, but "manual bypass" is not available. "Manual bypass" means users manually operate UPS to Bypass mode (for example, in AC mode turning off the UPS to Bypass mode). Then, the UPS will go to bypass mode but without output if it is turned off in AC mode. The default setting is Enable. NOTE: The following items are only available in bypass mode: **2. HighLoss V:** Set the acceptable high voltage for bypass. Setting range is from (Rated Output Volt +6V) to 155V and the default value is 140V. **3. LowLoss V:** Set the acceptable low voltage for bypass. Setting range is from 88V to (Rated Output Volt - 6V) and the default value is 88V. **4. HighLoss F:** Set the acceptable high frequency for bypass. 60 Hz system: Setting range is from 61Hz to 64Hz. The default value is 64.0Hz. **5. LowLoss F:** Set the acceptable low frequency for bypass. 60 Hz system: Setting range is from 56Hz to 59Hz. The default value is 56Hz.

2) ECO setting(only available or effective on bypass mode, standby mode, Line mode and ECO mode)

Interface	Description
ECO: Status: Disable High Loss V: 126V Low Loss V: 114V High Loss F: 62Hz Low Loss F: 58Hz	**1. Status** Enable: Enable ECO Function Disable: Disable ECO Function If ECO function is disabled, voltage range and frequency range for ECO mode still can be set, but it is meaningless unless the ECO function is enabled. The default setting is Disable. **2. HighLoss V:** High voltage point in ECO mode. The setting range is from (Rated Output Volt +6V) to (Rated Output Volt +12V) And the default setting is (Rated Output Volt +6V). **3. LowLoss V:** Low voltage point in ECO mode. The setting range is from (Rated Output Volt -12V) to (Rated Output Volt -6V) And the default setting is (Rated Output Volt -6V). **4. HighLoss F:** Set High frequency point for ECO mode. 60 Hz system: Setting range is from 62Hz to 64Hz. The default value is 62Hz. **5. LowLoss F:** Set Low frequency point for ECO mode. 60 Hz system: Setting range is from 56Hz to 58Hz. The default value is 58Hz.

3) Output setting (only available or effective on bypass mode and standby mode)

Interface	Description
Output: Volt: 120V Freq: 60Hz CVCF: Enable	**1. Volt:** 100: Presenting the rated output voltage with 100Vac 110: Presenting the rated output voltage with 110Vac 115: Presenting the rated output voltage with 115Vac 120: Presenting the rated output voltage with 120Vac 127: Presenting the rated output voltage with 127Vac The default value is 120Vac. **2. Freq:** 60Hz: The output frequency is setting for 60Hz. NOTE: CVCF should be enabled to modify this item. If CVCF is disabled, output frequency will be decided according to the latest normal utility frequency. If it is within 56Hz and 64Hz, the output frequency will be 60.0Hz. **3. CVCF:** Enable or disable converter mode. Enable: The output frequency will be fixed at 60Hz according to setting of "Freq". The input frequency could be from 56Hz to 64Hz. Disable: The output frequency will synchronize with the input frequency within 56~64 Hz for 60Hz system. NOTE: CVCF means Constant Voltage and Constant Frequency. It represents converter mode. The default setting is Disable.

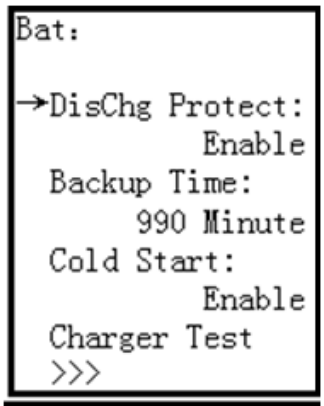
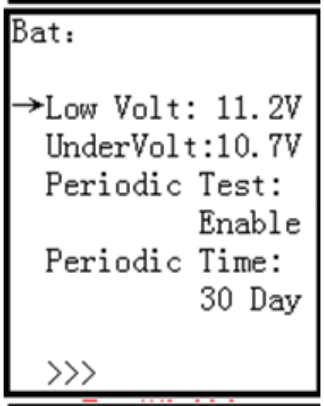
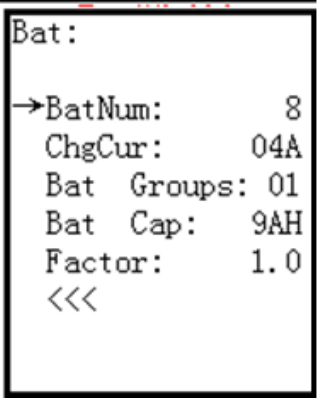
4) SystemTime setting (available or effective on all mode)

Interface	Description
SystemTime: 2023-06-09 11:10:26 Friday	**SystemTime:** Date, time and calendar date can be modified via this interface. Input the actual time, the unit will automatically adjust timer after " EN↵ button is pressed.

5) Others setting

Interface	Description
Others: Hot Standby: Disable Audible Mute: Disable Language: English >>> Others: Bat Mute: Disable Fault Mute: Disable Bypass Mute: Disable >>> Others: Redundancy: 00 Total Power: 02 Standard Mode: Enable Factory Reset <<<	**1. Hot standby(**only available or effective on bypass mode and standby mode): Enable: Hot standby function is enabled. It means that the current UPS is set to be host of hot standby system, and it will automatically restart after AC recovery even without battery connected. Disable: Hot standby function is disabled. The UPS is running at normal mode and can't restart without battery. The default setting is Disable. **2. Audible Mute**(available or effective for all modes): Enable: It is to mute the buzzer. Disable: It is to enable the buzzer when UPS have alarms or UPS is working in bypass mode or Battery mode. The default setting is Disable. **3. Language**(available or effective for all mode): English: All interface will show in English **4. Bat Mute**(available or effective on all modes): Enable: It is to mute the buzzer when UPS in Battery mode. Disable: It is to enable the buzzer in Battery mode. The default setting is Disable. **5. Fault Mute**(available or effective on all mode): Enable: It is to mute the buzzer when UPS in Fault mode. Disable: It is to enable the buzzer in Fault mode. The default setting is Disable. **6. Bypass Mute**(available or effective on all mode): Enable: It is to mute the buzzer when UPS in Bypass mode. Disable: It is to enable the buzzer in Bypass mode. The default setting is Disable. **7. Redundancy** (available or effective on all modes): The setting is quantity of redundant UPS module. The setting range is 0~9. The setting quantity must be less than the number of UPS modules in the system. The default value is 0. **8. Total Power** (available or effective on all mode): The parallel number we set in system. **9.Standard Mode(**only available or effective on bypass mode and standby mode): Enable: It is a compatible mode for Generator. Disable: It is a normal mode. The default setting is Enable. **10. Factory Reset** (only available or effective on bypass mode and standby mode): Restore to factory default setting.

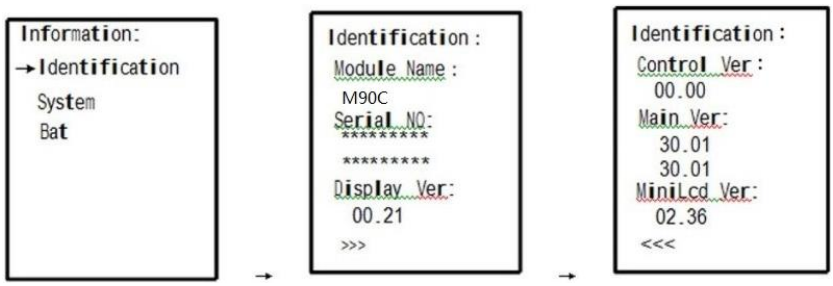
6) Battery

Interface	Description
  	1. Discharge Protect: Enable or disable battery discharge protection. Enable: Battery discharge protection function is enabled. When UPS have been continuously working in “battery/battery test mode”, the UPS will automatically shut down when the backup time set next is achieved. Disable: Battery discharge protection function is disabled. 2. Backup Time: When discharge protection is enabled, this setting time can Be counted. 1~990: The maximum discharge time can be set from 1 to 990 minutes. UPS will shut down to protect battery after backup time arrives when the “Discharge Protect” is enabled. If “Discharge protect” is disabled, then this setting does not make sense whatever the value is. The default value for this setting is 990 minutes. 3. Cold Start: Enable: UPS could be turned on without mains. Disable: UPS could not be turned on without mains. 4. Charger Test: Test the battery charger even without battery. After entering this item, it will Pop-up a screen showing “Yes” and “No”. If selecting “Yes”, the UPS will execute charger test. After test, the LCD screen will return to main scree (home page) and show battery voltages on BAT+ and BAT-. 5. Low Volt: Set battery low warning voltage. The setting range is from 10.5~11.5V per piece. The default value is 11.2V. 6. Under Volt: Set battery low cut off voltage. The setting range is from 9.6~10.7V per piece. The default value is 9.6V. 7. Periodic Test: Enable: UPS will test the battery periodically. Disable: UPS will not test the battery periodically. 8. Periodic Test: When periodic test is enabled, please set up battery test interval. The setting range is from 7 days to 99 days. The default value is 30-day. 9. BatNum: Set battery number in the system. The setting range is from 8 to 10 pieces. The default value is 8. 10. Chg Curr: Set maximum charge current. The setting range is from 0~40A. The default value is 4A. 11. Bat Groups: Set the number of battery group ranging from 1 to 10 The default value is 1 group; 12. Bat Cap : Set the battery capacity such as 5AH, 7AH, 9AH, 10AH, 12AH, 17AH, 26AH, 40AH, 65AH, 100AH and so on. The default value is 9AH. 13. Factor: Calibrate the displayed backup time by adjusting this multiplier factor. The formulation is listed below: Displayed backup time=Original calculated backup time × Multiplier factor The value of default factor is 1.0. The setting range is from 0.5 to 2. Item 10~12 are used for the battery backup time calculation.

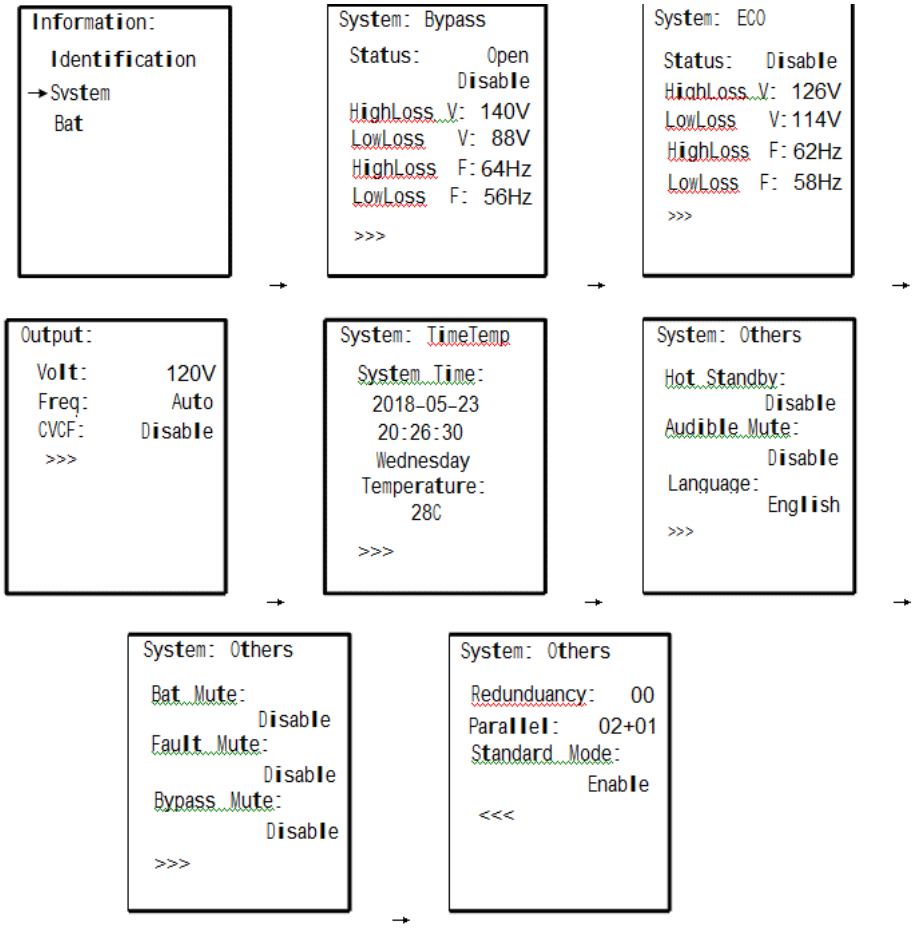
5.2.4 Information

In Information page, you can check the serial number, firmware version, system configuration and settings of the UPS. There are submenus under the Information, including Identification, System and Battery, as shown below. Information displays all parameter setting value and status.

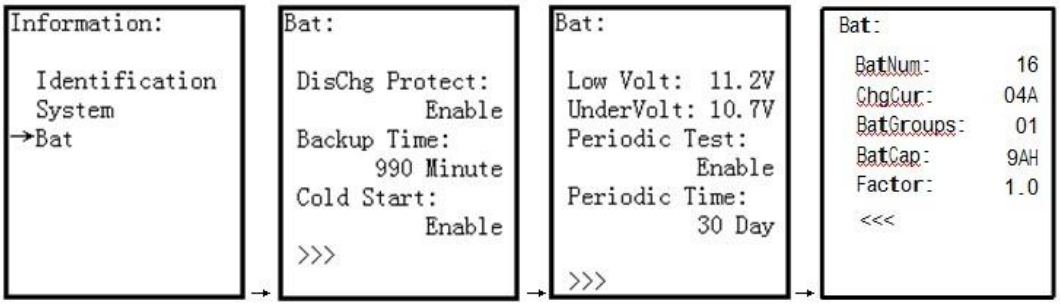
1) Identification shows the UPS Module name, serial no, UPS display version, controller module version, CPU version and system LCD version.



2) System shows the UPS configuration.



3) Battery shows the battery configuration.

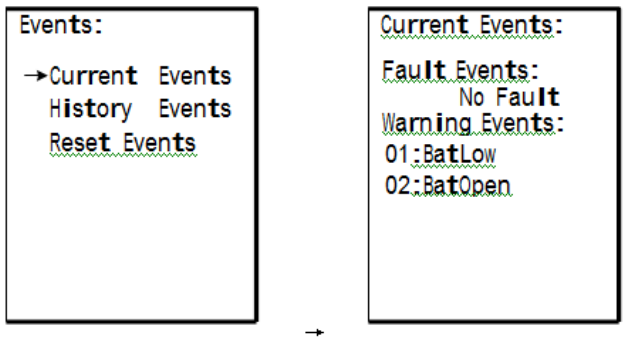


5.2.5 Events

In Event page, you can check the current events, history events and reset events.

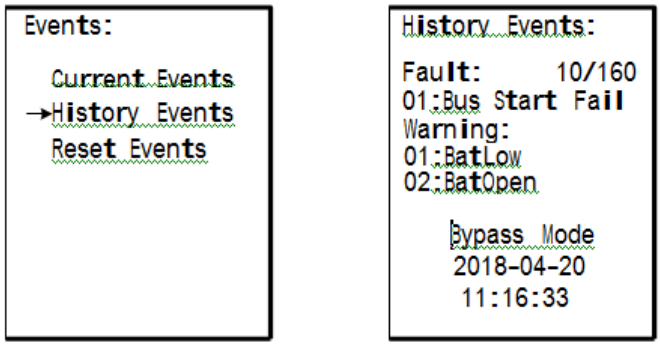
1) Current Events

When an event occurs, it will display alarm code in Current Events page. If events exceed more than one page, press "↑" or "↓" button to read other events.



2) History Events

The detailed event information is saved in history events. It can save up to 160 pages in history events. When a warning occurs, it will display alarm code, alarm time and UPS mode. When a fault event occurs, it will display fault code, alarm time/date and UPS operation mode. (Refer to Chapter 6 Troubleshooting)



3) Reset Events

It's necessary to enter password to enter Reset Events page as shown below. Then, press "↑" or "↓" button to choose "Yes" to clear all history events or "No" to cancel the reset action. Maintainer password required.

6 Troubleshooting

Most of the fault and warnings need to be resolved by authorized service personnel. Few of them can be solved by users themselves.

Fault 01: Bus Start Fail	The rectifiers could not start within specified time due to low DC-bus voltage.	Turn off UPS and then restart the UPS. If it fails again, contact service personnel.
Fault 02: Bus Over Volt	DC-bus voltage exceeds the maximum voltage.	Contact service personnel.
Fault 03: Bus Under Volt	DC-bus voltage is lower than the minimum value.	Contact service personnel.
Fault 04: Bus Unbalance	DC-bus voltage is not balanced	Contact service personnel.
Fault 05: Bus Volt Vary	DC-bus voltage changes too fast.	Contact service personnel.
Fault 06: PFC Over Curr	PFC current is higher than the maximum current.	Contact service personnel.
Fault 07: Over Temperature	The temperature in UPS is higher than 85°C. At this time, the UPS is off.	Check if the ambient temperature is over specification. Or contact service personnel.
Fault 08: Batt SCR Short	Battery SCR is short circuited.	Contact service personnel.
Fault 11: Inv Start Fail	Inverter voltage cannot reach desired voltage within specified time.	Turn off UPS and then restart it. If it fails again, contact service personnel.
Fault 12: Inv Volt High	Inverter voltage is too high.	Contact service personnel.
Fault 13: Inv Volt Low	Inverter voltage is too low.	Contact service personnel.
Fault 14: Inv Short R	R phase inverter output is short circuited	Contact service personnel.
Fault 15:Inv Short S	S phase inverter output is short circuited	Contact service personnel.
Fault 16: Inv Short T	T phase inverter output is short circuited	Contact service personnel.
Fault 17: Inv Short RS	R-S inverter output is short circuited	Contact service personnel.
Fault 18: Inv Short ST	S-T inverter output is short circuited	Contact service personnel.
Fault 19: Inv Short TR	T-R inverter output is short circuited	Contact service personnel.
Fault 1A: Nega Power R	R Phase inverter output negative power is beyond the range.	Contact service personnel.
Fault 1B: Nega Power S	S Phase inverter Output Negative Power is beyond the range.	Contact service personnel.
Fault 1C: Nega Power T		
Fault 21: Inv STS Open		
Fault 22: Inv STS Short		
Fault 23: Op STS Open		
Fault 24: Op STS Short		
Fault 25: Wiring Fail		
Fault 26: Bat Fuse Open		

Fault 1C: Nega Power T	T phase inverter Output Negative Power is beyond the range.	Contact service personnel.
Fault 21: Inv STS Open	Inverter relay or STS is open.	Contact service personnel.
Fault 22: Inv STS Short	Inverter relay or STS is short circuited.	Contact service personnel.
Fault 23: Op STS Open	Output relay or STS is open.	Contact service personnel.
Fault 24: Op STS Short	Output relay or STS is short circuited.	Contact service personnel.
Fault 25: Wiring Fail	The wiring is wrong.	Contact service personnel.
Fault 26: Bat Fuse Open	Battery fuse is broken.	Contact service personnel.
Fault 27: Charge Short	The battery is short circuited.	Contact service personnel.
Fault 31: Para Comm Fail	The communication between UPS modules is interrupted.	Contact service personnel.
Fault 32: Host Line Fail	The host line between UPS modules fails.	Contact service personnel.
Fault 33: OP Current Unbalanced	The load share line between UPS modules fails	Contact service personnel.
Fault 34: Ver Incompatible	The firmware version between UPS modules is incompatible.	Contact service personnel.
Fault 41: DSP Comm Fail	The internal communication in UPS module is interrupted.	Contact service personnel.
Fault 42: Over load	Heavy overload causes UPS fault.	Reduce some load.
Fault 43: Charger Fail	Battery polarity is connected reverse-ly or charger voltage is abnormal.	
Fault 44: Model Fault	UPS model is not able to identify.	Contact service personnel.
Fault 45: Mcu Comm Fail	As stated.	Contact service personnel.
Fault 46: CT Satiation	Load current sensor is abnormal.	Contact service personnel.
Fault 47: Fan Fault	The two fans are stuck or broken.	Make sure fans work well when UPS is working.
Warning 01: BatLow	Battery voltage is low.	Charge the battery when the mains is normal.
Warning 02: BatOpen	Battery is not connected.	1. Check battery breaker status. 2. Check if the battery connection is well connected. 3. Check the setting of Nominal Battery voltage. 4. Contact service personnel if necessary
Warning 03: BatPhaseLoss	The voltage between positive and negative battery is different.	Check the battery connection.
Warning 04: LineIpNLoss	Neutral loss	Check if the Neutral connection is well and contact service personnel.
Warning 05: LinePhaseError	As stated	Check if the Mains phase sequence is correct and contact service personnel.

Warning 06: LineVoltError	As stated.	Check if the input wiring is correct or contact service personnel
Warning 07: LinePhaseFail	As stated.	Contact service personnel
Warning 08: OverCharge	Battery voltage is too high.	Check the setting of Nominal Battery voltage and contact service personnel.
Warning 09: ChgFail	Battery voltage is detected as low level. However, the charge is able to work.	Contact service personnel.
Warning 0A: OverTemp	The temperature in UPS is higher than 75°C. At this time, the UPS is still running.	Check if the ambient temperature is over specification. Or contact service personnel.
Warning 0B: PFCCurUnbal	PFC current is unbalance.	Contact service personnel
Warning 0C: FanError	Fan error.	Check if the fan is blocked or contact service personnel.
Warning 0D: LineFuseOpen	Fuse is broken.	Turn off UPS and replace a good one with the broken one. If UPS fails again after you do this, contact the service personnel.
Warning 0E: IICEepromFail	EEPROM operation error	Contact service personnel.
Warning 11: BypassIpNLoss	Neutral loss.	Check if the Neutral connection is well and contact service personnel.
Warning 12: BpsPhaseError	Bypass phase error.	Check if the Bypass phase sequence is correct and contact service personnel.
Warning 13: BpsVoltError	Bypass voltage error.	Check the wiring or contact service personnel
Warning 14: BpsPhaseFail	As stated.	Contact service personnel
Warning 15: OverLoad	In line mode, the connected devices are demanding more power than the UPS can supply	Reduce some load and check output Load-Capacity in specification.
Warning 16: OverLoadLock	The connected devices are demanding more power than the UPS can supply. UPS will transfer to bypass mode from line mode.	Reduce some load and check output Load-Capacity in specification
Warning 17: EpoActive	Check the EPO connector.	Check if the connector is loose when EPO acts abnormally.
Warning 18: MaintainOpen	The UPS is in maintenance mode.	Check if EMBS port is not connected to 2-pin EPO port on the controller module when it acts abnormally.
Warning 19: LineDiff	Each module gets different line voltage when they are in parallel.	Contact service personnel.
Warning 1A: BypassDiff	Each module gets different bypass voltage when they are in parallel.	Contact service personnel.
Warning 1B: InvCurUnbal	As stated.	Contact service personnel.

Warning 1C: BpsUnstable	UPS switches between bypass mode and standby mode five times in 30 minutes due to abnormal utility.	Contact service personnel.
Warning 1D: RedundancyFail	As stated.	Check if redundancy setting is correct or not. Then, contact service personnel.
Warning! Battery Age Alert	Battery life is expired.	Check if the battery has been used over its service age. Or contact service personnel.
Warning! Dry Contact Input Alarm 1	As stated.	Remove the node
Warning! Dry Contact Input Alarm 2	As stated.	Remove the node
Warning! COMM Module SPS 1 Fault	As stated.	Contact service personnel.
Warning! COMM Module SPS 2 Fault	As stated.	Contact service personnel.

7 Specifications

MODEL NUMBER		VD5K3P/VD5K3P-1	VD5K8P/VD5K8P-1
CAPACITY	Power Rating	5kVA/5kW	8kVA/8kW
INPUT	Voltage/Frequency Nominal	Input Voltage/frequency line. 120/208V, 50/60Hz auto-sensing (3PH+N+G)	
	Voltage/Frequency Range	120/208V, 50/60Hz; (3PH+N)	
OUTPUT	Voltage & Frequency	150 - 269VAC (L-L); 40 - 70 Hz	
	THD (full load)	≤2% (Linear load); ≤3% (Non-linear load)	
	Efficiency	Up to 97% ECO mode, 93% online mode	
	Overload Capacity	100%-110% for 30min; 110%-130% for 5min; 131%-150% for 10s; >150% for 200ms	
BATTERY SYSTEM	Nominal Voltage	+/-96Vdc or +/-120Vdc (+/-96Vdc default)	
	Max charging (adjustable)	4A	
MODULE DIMENSION & WEIGHT	Power Module	16.3”W x 24”D x 5.2”H / 38 lbs	
	Battery Module	16.3”W x 24”D x 5.2”H / 107 lbs	
SYSTEM ENCLOSURE DIMENSIONS & WEIGHT	UPS enclosure rack	17.3”W x 31.5”D x 10.5”H (6U) / 34 lbs	
	Input connections	VD5K3P: Terminal Block VD5K3P-1: L21-20P	VD8K3P: Terminal Block VD5K8P-1: L21-30P
	Output Connections	VD5K3P/VD8K3P : Terminal Block VD5K3P-1: L21-20R w/ 20A breaker VD8K3P-1: L21-30 w/ 30A breaker	
ENVIRONMENT	Temperature	0–40°C (32–104°F)*	
	Altitude	5,200 ft above sea level*	
	Audible noise	< 58dBA at 1m	
APPROVALS		cTUVusa certified to UL-1778, FCC, RoHS	
WARRANTY		2 year battery (USA and Canada)	
COMMUNICATIONS INTERFACE		RS-232, USB, EPO, intelligent slot for optional cards (Web/SNMP, Relay, Modbus) ; Web/SNMP Card included with VD5K3P-1 & VD8K3P-1	
INCLUDED IN BOX		User manual, USB cable, RS-232, ViewPower Software	
AVAILABLE OPTIONS		L21-20P line cord (5kW), L21-30P line cord (8kW), caster base, 5 year extended warranty, 4-post rail kit and SNMP/Web card	

**Battery Life is reduced above 30°C, UPS Capacity derates above 30°C and 5,200 ft above sea level.*

8 Obtaining Service

If the UPS requires Service:

1. Use the TROUBLESHOOTING section in this manual to eliminate obvious causes.
2. Verify there are no circuit breakers tripped.
3. Call your dealer for assistance. If you cannot reach your dealer, or if they cannot resolve the problem, call CPI Technical Support at 800.834.4969. Technical support inquiries can also be made at techsupport@chatsworth.com. Please have the following information available BEFORE calling the Technical Support Department:
    - Your name and address.
    - The serial number of the unit.
    - Where and when the unit was purchased.
    - All of the model information about your UPS.
    - Any information on the failure, including LED's that may or may not be illuminated.
    - A description of the protected equipment, including model numbers if possible.
    - A technician will ask you for the above information and, if possible, help solve your problem over the phone. In the event that the unit requires factory service, the technician will issue you a Return Material Authorization number (RMA).

If you are returning the UPS to CPI for service, please follow these procedures:

1. Pack the UPS in its original packaging. If the original packaging is no longer available, ask the Technical Support Technician about obtaining a replacement set of packaging material. It is important to pack the UPS properly in order to avoid damage in transit. Never use Styrofoam beads for a packing material.
2. Include a letter with your name, address, daytime phone number, RMA number, a copy of your original sales receipt, and a brief description of the problem.
3. Mark the RMA number on the outside of all packages. Xtreme Power cannot accept any package without the RMA number marked on the outside of the boxes.
4. Return the UPS by insured, prepaid carrier to the address provided by the Technician.
5. Refer to the Warranty statements in this manual for additional details on what is covered.

9 Chatsworth Products (CPI) Limited Warranty

Chatsworth Products (CPI) warrants CPI equipment, when properly applied and operated within specified conditions, against faulty materials or workmanship for a period of **Two years for Three-Phase UPS products** from the date of purchase. CPI warrants **internal batteries for a period of two years** from the date of purchase. For equipment sites within the United States and Canada, this warranty covers repair or replacement, at the sole discretion of CPI. The customer is responsible for the costs of shipping the defective product to CPI. CPI will pay for ground shipment of the re- paired or replacement product. This warranty applies only to the original purchaser.

If equipment provided by CPI is found to be **Dead-on-Arrival (DOA)**, the customer must request and received a **Return Material Authorization (RMA)** number. DOA equipment is defined as equipment that does not properly function according to user documentation when initially received and connected in conjunction with proper procedures as shown in the user documentation or via support provided by CPI personnel or authorized agents.

This warranty shall be void if (a) the equipment is repaired or modified by anyone other than CPI or a CPI approved third party; (b) the equipment is damaged by the customer, is improperly used or stored, is subjected to an adverse operating environment, or is operated outside the limits of its electrical specifications; or (c) the equipment has been used or stored in a manner contrary to the equipment's operating manual, intended use or other written instructions. Any technical advice furnished by CPI or a CPI authorized representative before or after delivery with regard to the use or application of CPI equipment is furnished on the basis that it represents CPI best judgment under the situation and circumstances, but it is used at the recipient's sole risk.

EXCEPT AS STATED ABOVE, CPI DISCLAIMS ALL WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

EXCEPT AS STATED ABOVE, IN NO EVENT WILL CPI BE LIABLE FOR DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OF CPI EQUIPMENT, including but not limited to, any costs, lost profits or revenue, loss of equipment, loss of use of equipment, loss of software, loss of data, cost of substitutes, or claims by third parties. Purchaser's sole and exclusive remedy for breach of any warranty, expressed or implied, concerning CPI equipment, and the only obligation of CPI under this warranty, shall be the repair or replacement of defective equipment, components, or parts; or, at CPI's sole discretion, refund of the purchase price or substitution of an equivalent replacement product.