Liebert® MTP Online UPS

Installer/User Guide

60kVA/100kVA/120kVA/160kVA/200kVA

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Technical Support Site

If you encounter any installation or operational issues with your product, check the pertinent section of this manual to see if the issue can be resolved by following outlined procedures.

Visit https://www.vertiv.com/en-us/support/ for additional assistance.

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1 Important Safety Instructions

WARNING! Risk of electric shock. Can cause serious injury or death. Lethal voltages are present in this UPS. All the repairs and services must be performed by authorized and qualified service personnel only. In the UPS, there are no user serviceable parts.

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

WARNING! Risk of voltage backfeed. Before working on this circuit, isolate uninterruptible power supply (UPS) then check for hazardous voltage between all terminals including the protective earth.

- When service and maintenance want to check the inside of the UPS, should follow Service on page 107 .

1.1 EMC

CAUTION: This product is designed for commercial and industrial applications in the second environment. Installation restrictions or additional measures may be required to prevent disturbances.

1.2 Installation

- Installation must be performed by authorized and qualified service personnel only.
- The cabinets must be installed on a level floor that can accommodate computer or electronic equipment.
- The UPS cabinet is heavy and can cause serious injury if the unloading instructions are not followed carefully.
- The cabinets should not be tilted more than 10 degrees.
- Ensure the ground conductor is properly installed according to the instructions before switching ON the UPS.
- Installation and wiring must be performed in accordance with the local electrical laws and regulations.

IMPORTANT! The disconnection device must be selected based on the input current and should be capable of breaking both line and neutral conductors—4 poles for 3 phases.

Table 1.1 Power Rating and Current (A)

Power rating	60kVA	100kVA	120kVA	160kVA	200kVA
Current (A)	125	250	250	400	400

- The short circuit capacity of the upstream protective devices must be equal to or larger than the capacity of the UPS's input protective devices.

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- The battery disconnection device should be chosen based on the DC input current and should break Battery +, Battery and neutral conductors three poles for three phases.

Table 1.2 Power Rating and Current (A)

Power rating	60kVA	100kVA	120kVA	160kVA	200kVA
Current (A)	200	350	400	550	700

For safety, it is necessary to install circuit breakers or fused isolators in the input AC supply and external battery system. Given that every installation has its own characteristics, this section provides guidelines for qualified installation personnel with knowledge of operating practices, regulatory standards and the equipment to be installed. External overcurrent protection must be provided. See equipment specification in the UPS manual for overload capacity.

An external battery protection device shall be installed to ensure adequate protection in case of short circuit fault: fuses or circuit breakers suitable for DC applications. The external battery protection device shall be sized in accordance to the available battery short circuit current and the battery string voltage.

WARNING! In case of missing or incorrect battery protection extensive damage to the batteries, the UPS, and ancillary equipment can occur.

1.3 Maintenance

- Battery installation must be performed by authorized and qualified service personnel only. While performing the battery installation, follow the below precautions:
  - Remove watches, rings, or other metal objects.
  - Use tools with insulated handles.
  - Wear rubber gloves and boots.
  - Do not lay tools or metal parts on top of batteries or battery cabinets.
  - Disconnect the charging source prior to connecting or disconnecting terminal.
  - Check the battery has been accidentally grounded. Remove the source of grounding if this is the case. Contacting with any part of the ground might result in electrical shock. If such grounds are removed during installation and maintenance, the risk of electric shock can be reduced.
- This UPS is designed to supply power even when it is disconnected from the utility power. Internal access to the UPS should be attempted by authorized and qualified service personnel only after disconnecting the utility and DC power.
- Do not disconnect the batteries while the UPS is in battery mode.
- Before connecting or disconnecting the terminals, disconnect the charging source.
- High short circuit current in batteries can cause electrical shock or burn.
- When replacing batteries, use the same number of sealed, lead acid batteries.
- Do not open or mutilate the battery. The electrolyte that is released might be toxic and potentially hazardous and is harmful for the skin and eyes.

WARNING! Risk of electrical shock and hazardous voltage. Can cause damage to the equipment, injury or death to personnel. Extreme caution is required when performing maintenance/repair. Be constantly aware that the UPS system operates with hazardous voltages.

CAUTION: Risk of hazardous voltage. Can cause equipment damage, injury or death to personnel. Extreme precaution is required when working with the UPS system as it is connected to the neutral main connector even after the UPS system input breakers are disconnected.
System doesn't have any breaker or switch on neutral terminal.

WARNING! Risk of electric shock and hazardous voltage. Can cause equipment damage, injury or death to personnel. Disconnect the neutral bar as in **Figure 7.2** on page 109 to **Figure 7.5** on page 111 in Transfer the UPS to Maintain Bypass Mode on page 108 , before conducting any kind of service or maintenance and verify that no voltage between terminals and the ground is present.

WARNING! Risk of electric shock and hazardous voltage. Can cause equipment damage, injury or death to personnel. Servicing of UPS should be performed or supervised by personnel experienced with the UPS and with the required precautions. Keep unauthorized personnel away.

WARNING! Risk of electric shock and high short-circuit current. It can cause damage to the property and injury or death to personnel. Remove wristwatches, rings, and other metal objects before installation and maintenance or repair. Use tools with insulated handles. Wear rubber gloves and boots during installation and maintenance or repair.

CAUTION: Risk of fire and damage to the equipment. Replace the fuse only if it is the same type and amperage.

NOTE: Do not disassemble the UPS system.

1.4 Recycling the Used Battery

- Do not dispose of the battery in a fire as it may explode. The battery must be disposed of properly. Refer to the local codes for battery disposal.
- Do not open or mutilate the battery. The electrolyte that is released might be toxic and potentially hazardous and is harmful for the skin and eyes.
- Do not discard the UPS or the UPS batteries in the trash. This product contains sealed, lead acid batteries and must be disposed properly. Contact your local recycling/reuse or hazardous waste center for proper disposal.
- Do not discard waste electrical or electronic equipment in the trash. Contact your local recycling/reuse or hazardous waste center for proper disposal.

CAUTION: Risk of explosion. May cause injury or death if the battery is replaced by an incorrect type. Dispose of the used batteries according to the instructions. Refer to the local codes for battery disposal.

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1.5 Connection Warnings

This UPS should be connected with TN grounding/earthing system. The power input for this unit must be 3-phase rated in accordance with the equipment nameplate. It also must be suitably grounded.

Figure 1.1 Warning Label



Use of this equipment in medical instrument of any life-sustaining equipment where failure of this equipment can reasonably be expected to cause the failure of the life-sustaining equipment or to significantly affect its safety or effectiveness is not recommended. Do not use this equipment in the presence of a flammable mixture with air, oxygen, or nitrous oxide.

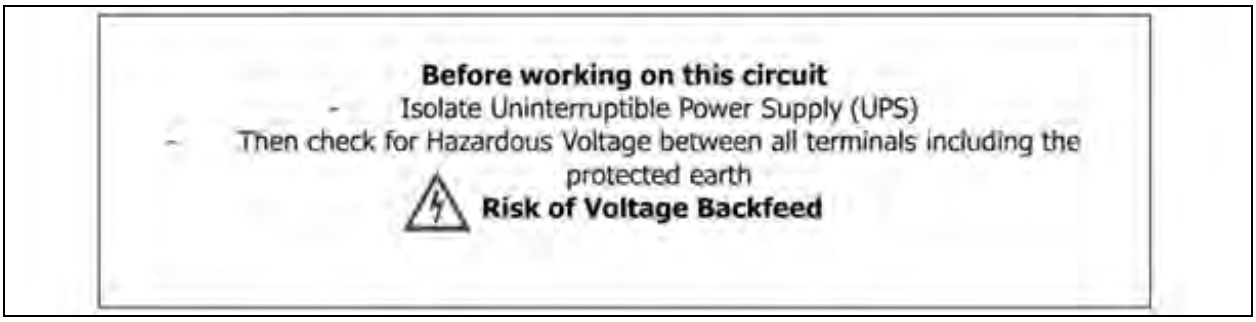
Connect grounding terminal of UPS to a grounding electrode conductor.

In accordance with safety standard EN-IEC 62040-1, installation has to be provided with a Back feed Protection system, as for example a contactor, which will prevent the appearance of voltage or dangerous energy in the input mains during a mains fault (respect the wiring diagram of Back feed Protection depending if the equipment is with signal or three-phase input).

NOTE: There can be no derivation in the line that goes from the Back feed Protection to the UPS, as the standard safety would be infringed.

Warning labels should be placed on all primary power switches installed in places away from the unit to alert the electrical maintenance personnel of the presence of a UPS in the circuit. The label will bear the following or an equivalent text:

Figure 1.2 Warning Label



Back feed protection can also be implemented by means of coil-based system controlled by UPS itself through output dry contact triggered in case of back feed. Default output dry contact port assigned to Back feed is number five. Output dry contacts are configurable, for more information refer to Dry contact output in section Product introduction on page 101 .



WARNING! High earth leakage current: Earth connection is critical before connecting the input supply (including both mains supply and battery). This equipment is installed with an EMC filter. Earth leakage current is less than 3000 mA. Transient and steady state earth leakage currents, which m ay occur when the equipment is started, should be taken in to account in the selection of instantaneous RCCBs or RCD devices. RCCB which is sensitive to unidirectional DC pulse (class A) and insensitive to transient state current pulse must be selected. Note also that the earth leakage currents of the load will be carried by the RCCBs or RCDs. The equipment must be earthed in accordance with the local electrical code of practice.



WARNING! The selection of the upstream distribution protection equipment of the UPS shall be selected in accordance with the details and shall comply with the local electrical regulations.



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

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2 Installation

2.1 Initial Inspection

1. Inspect the inside and outside of package for any damage that may have occurred during shipping. Immediately report any damage detected after delivery to the carrier and obtain a concealed damage inspection report upon their inspection of the shipment.
2. Verify the product label and confirm the consistency of the equipment.
3. If the equipment needs to be returned, repack it carefully using the original packing material.

2.2 Installation Environment

1. This UPS is designed for indoor usage only and should be kept in a clean environment with adequate ventilation to maintain the environmental parameters within the required specification.
2. Ensure that the transportation routes (such as corridor, door gate, elevator, and so on) can accommodate and the installation area can sustain the weight of the UPS, the external battery cabinet, and handling equipment.
3. Internal fans provide forced convection cooling for the UPS. Cooling air enters the module through ventilation grills located at the front of the cabinet and is exhausted through the grills located at the rear of the cabinet.

NOTE: Do not obstruct the ventilation holes.

4. Ensure that there is enough room for maintenance and ventilation in the installation area.
5. Maintain a temperature of less than 40°C and humidity within 90% in the installation area. The highest operating altitude is 1000m above sea level.
6. To avoid the formation of room temperature, install a system of room extractor fans if necessary. Air filters are necessary if the UPS is operated in a dusty environment.
7. It is recommended that the external battery cabinets should be connected in parallel to the UPS. The following clearance instructions are recommended:
    - Maintain a clearance of 100cm from the top of the UPS for maintenance, wiring, and ventilation.
    - Maintain a clearance of 100cm from the back of the UPS and the external battery cabinets for ventilation and servicing.
    - Maintain a clearance of 150cm from the front of the UPS and the external battery cabinets formaintenance and ventilation.
8. For safety concerns, it is recommended that:
    - The installation area must be equipped with CO_2 or dry powder fire extinguishers.
    - The UPS must be installed in a location where the walls, floors, and ceilings are made of fireproof materials.
9. Entry to unauthorized personnel in the installation area should be restricted. The UPS key should be given to authorized personnel only.

2.3 Unpacking

1. Use a forklift to move the product to the installation area. Ensure that the forklift has adequate load carrying capacity.

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2. To remove the carton and foams, see Figure 2.2 below .

Figure 2.1 Forklift to Move the Product

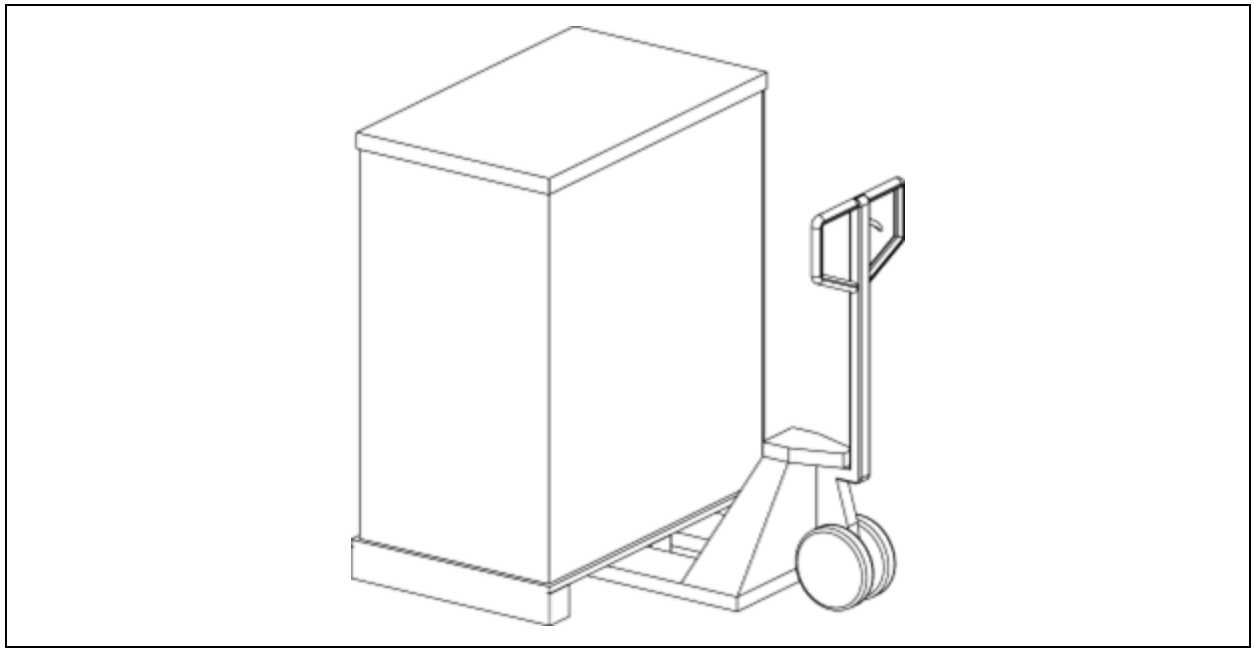
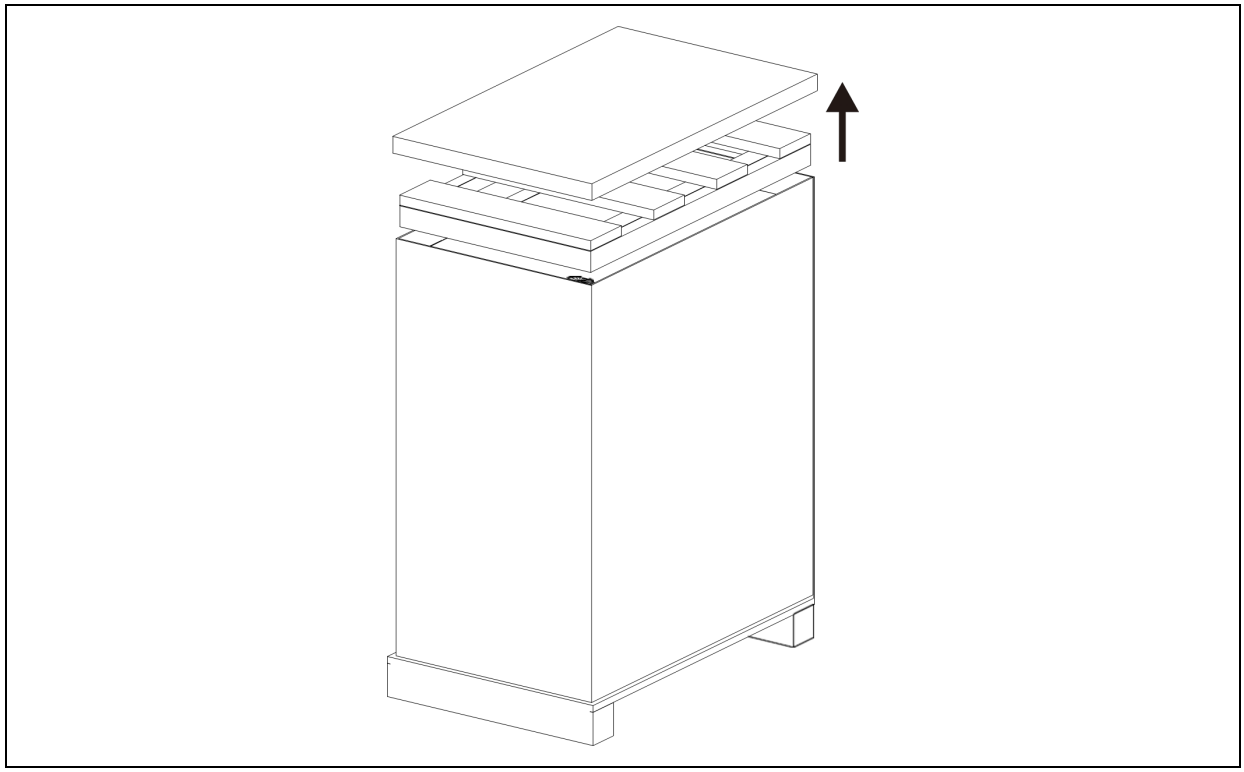
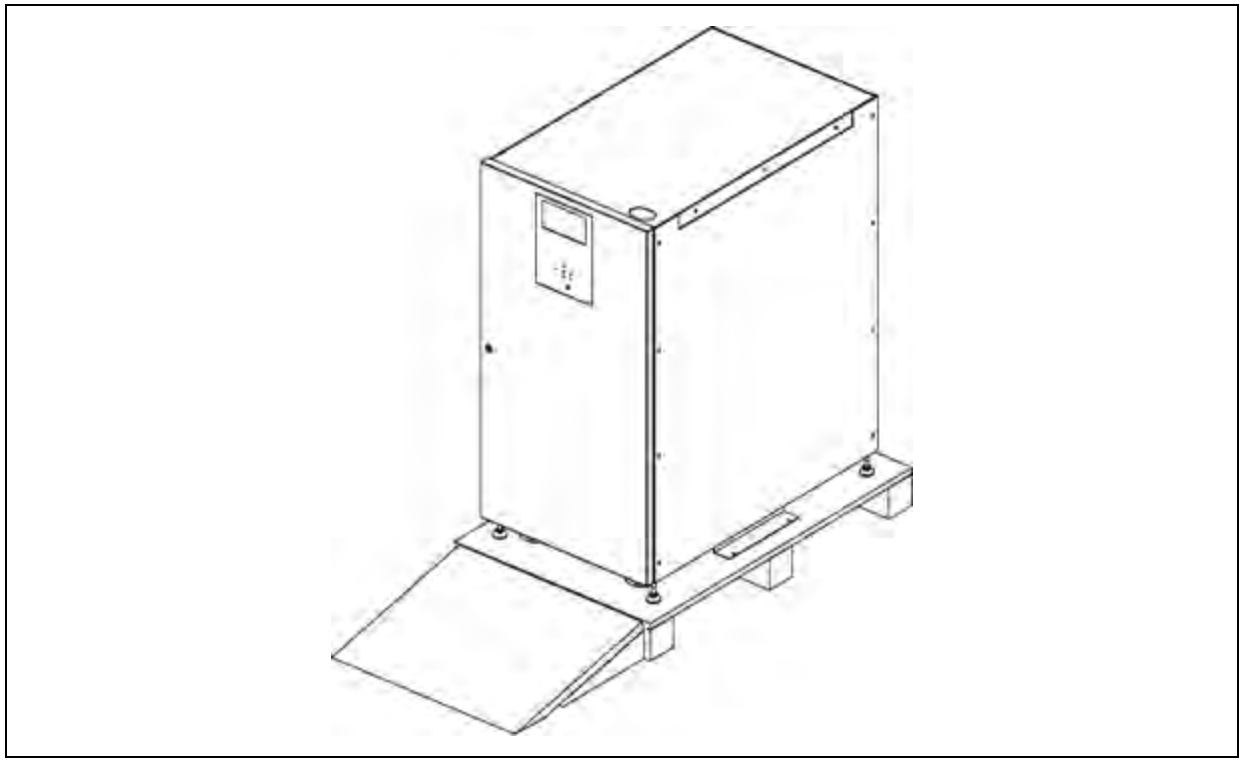


Figure 2.2 Remove Carton and Foams



3. Place a ramp in front of the cabinet.

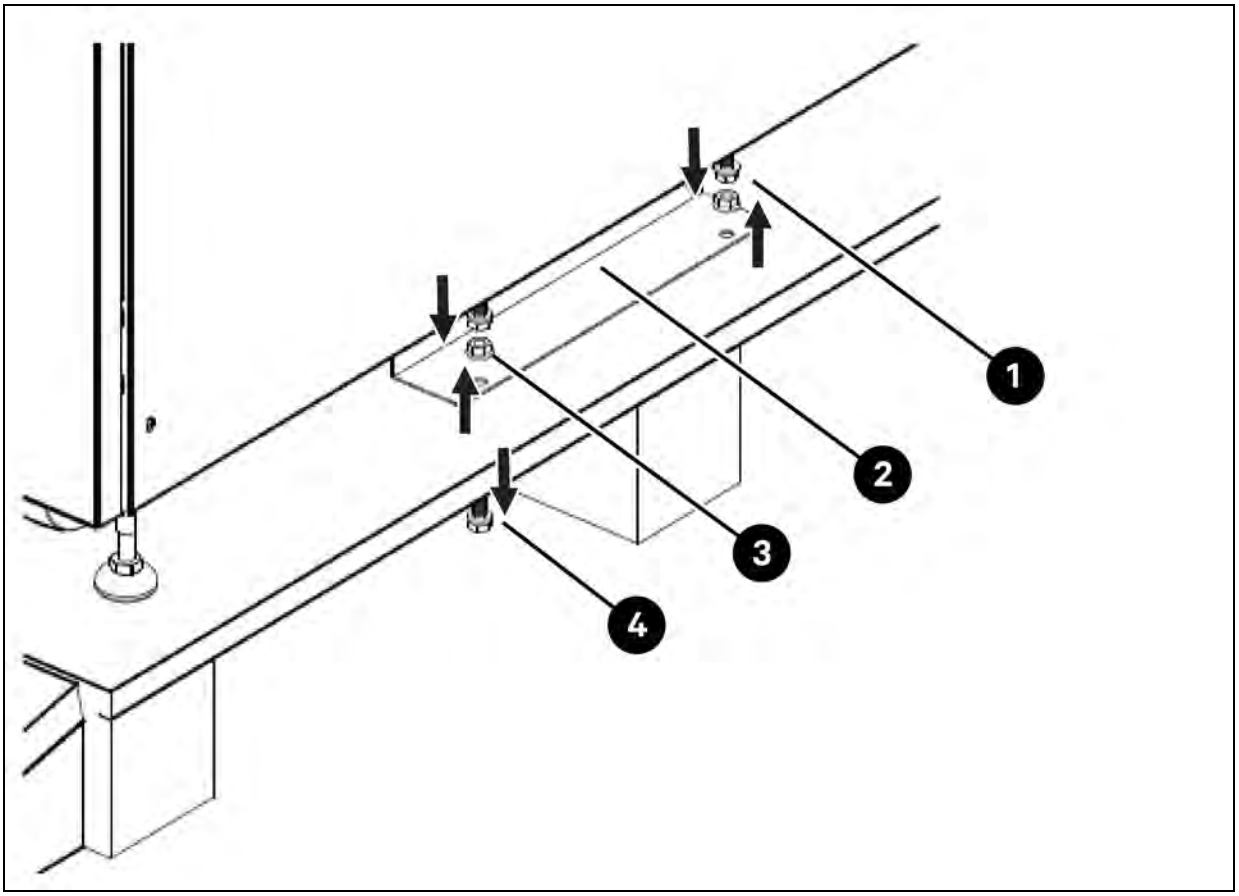
Figure 2.3 Ramp



4. Remove the 2 fixing cabinet plates and loosen the leveling feet by rotating them counterclockwise. Then remove the cabinet from the pallet.
5. To secure the cabinet in position, simply rotate leveling feet clockwise and secure the cabinet plates.

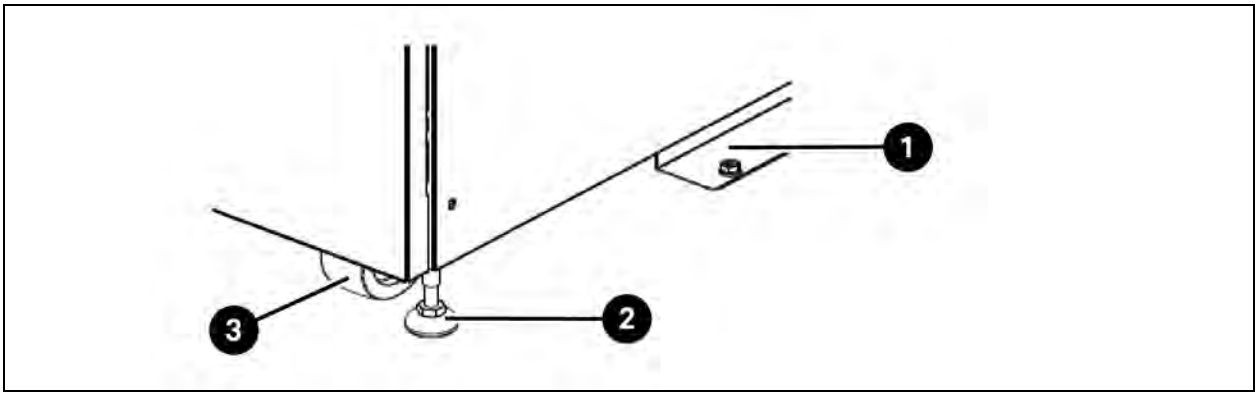
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Figure 2.4 Move the Cabinet from the Pallet



Item	Description	Quantity
1	Screw	4
2	Fixing cabinet plate	1
3	Screw nut	4
4	Screw	4

Figure 2.5 Fix the Cabinet



Item	Description
1	Fixing cabinet plate
2	Leveling foot
3	Caster

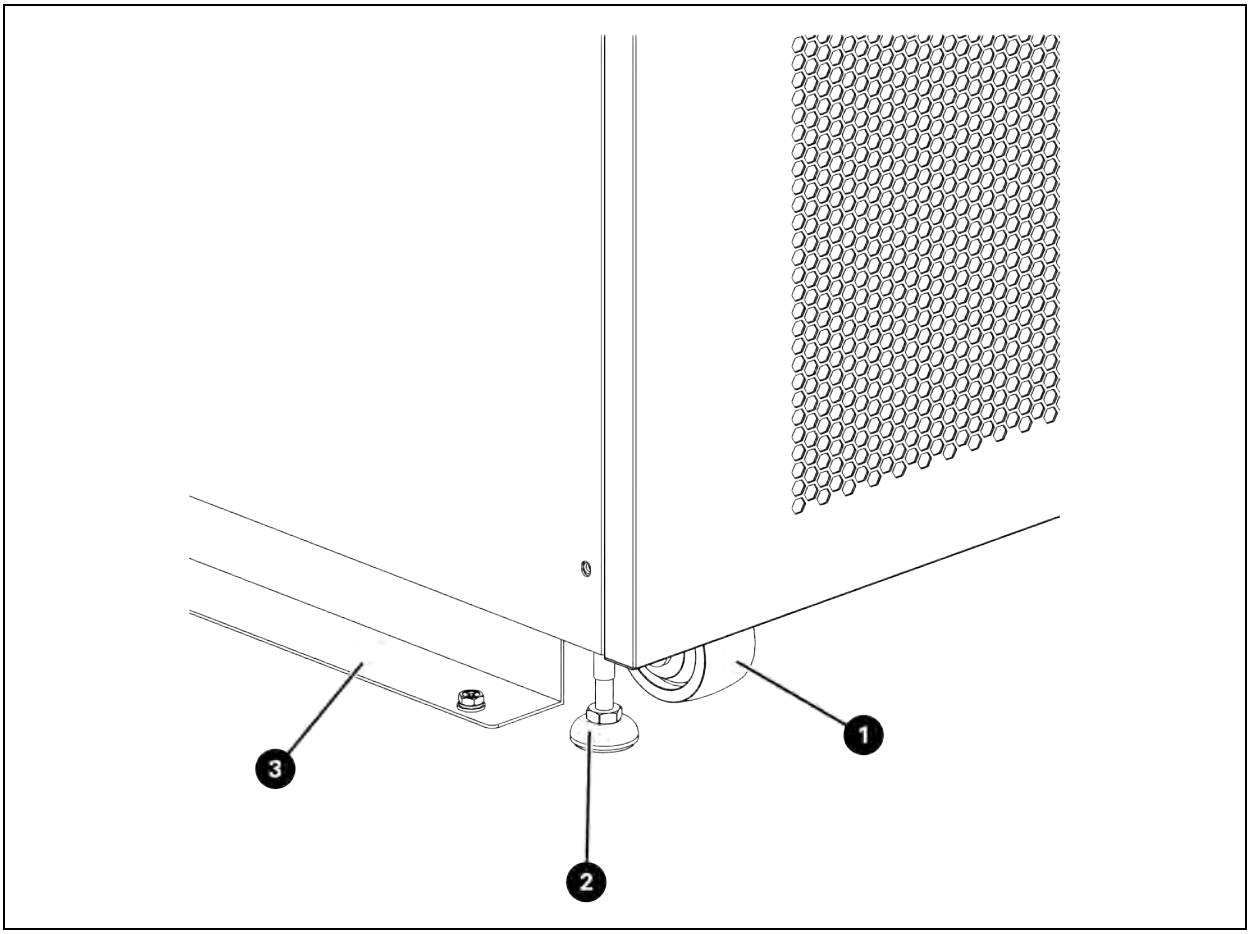
2.4 Moving the Cabinet

WARNING! Risk of injury. The UPS is secured on the pallet with 2 fixing cabinet plates. To avoid accidents, pay attention to the movement of the casters while removing it. Only forward and backward movement of the cabinet is possible. Sideward movement of the cabinet is not allowed. Pay attention while moving the cabinet to avoid overturning because the gravity center is high.

1. If the UPS needs to be moved over a long distance, use a forklift. Do not use the UPS casters to move the UPS over a long distance.
2. After the UPS has been removed from the pallet to the ground, we recommend that at least three people move the UPS to the installation area. One person holds one lateral side of the UPS with hands, another person holds the other lateral side of the UPS with hands, and the third person pushes the UPS to the installation area from the front or back, avoiding tipping the UPS.
3. The casters are designed to move on level ground. Do not move the UPS on an uneven surface as this might cause damage to the casters. Toppling the UPS could also damage the unit.
4. Ensure that the weight of the UPS does not exceed the specified load carrying capacity of any handling equipment.
5. The 4 casters at the bottom of the UPS assist in moving the UPS to a designated area. Before moving the UPS, turn the 4 leveling feet counterclockwise to lift them off the ground. This protects the leveling feet from damage when moving the UPS.
6. Screw the attaching cabinet plate to secure the cabinet firmly to the ground. See Figure 2.5 above .

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Figure 2.6 Moving the Cabinet



Item	Description
1	Caster
2	Leveling
3	Fixing cabinet

2.5 Types of UPS Cabinets

The battery module compartments are not present in the cabinets. The battery must be connected externally. While installing, the external battery space and wiring gauge must be considered.

Table 2.1 Types of UPS Cabinets

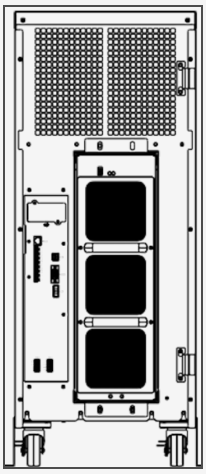
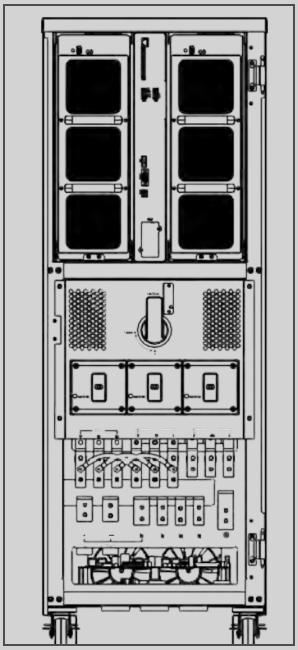
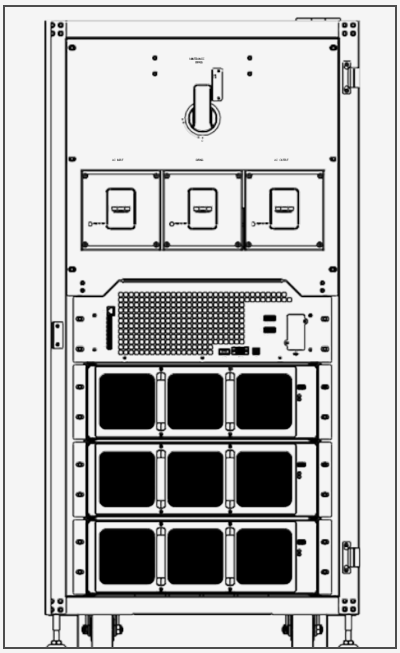
Model	Graphic	Dimension D x W x H (mm)	Number of Switches	Max Power
Vertiv™ Liebert® MTP 60kVA		1000x320x800	4	60kVA
Vertiv™ Liebert® MTP 100/120kVA		1000x430x1200	4	100/120kVA

Table 2.1 Types of UPS Cabinets (continued)

Model	Graphic	Dimension D x W x H (mm)	Number of Switches	Max Power
Vertiv™ Liebert® MTP 160/200kVA		1000x600x1200	4	160/200kVA

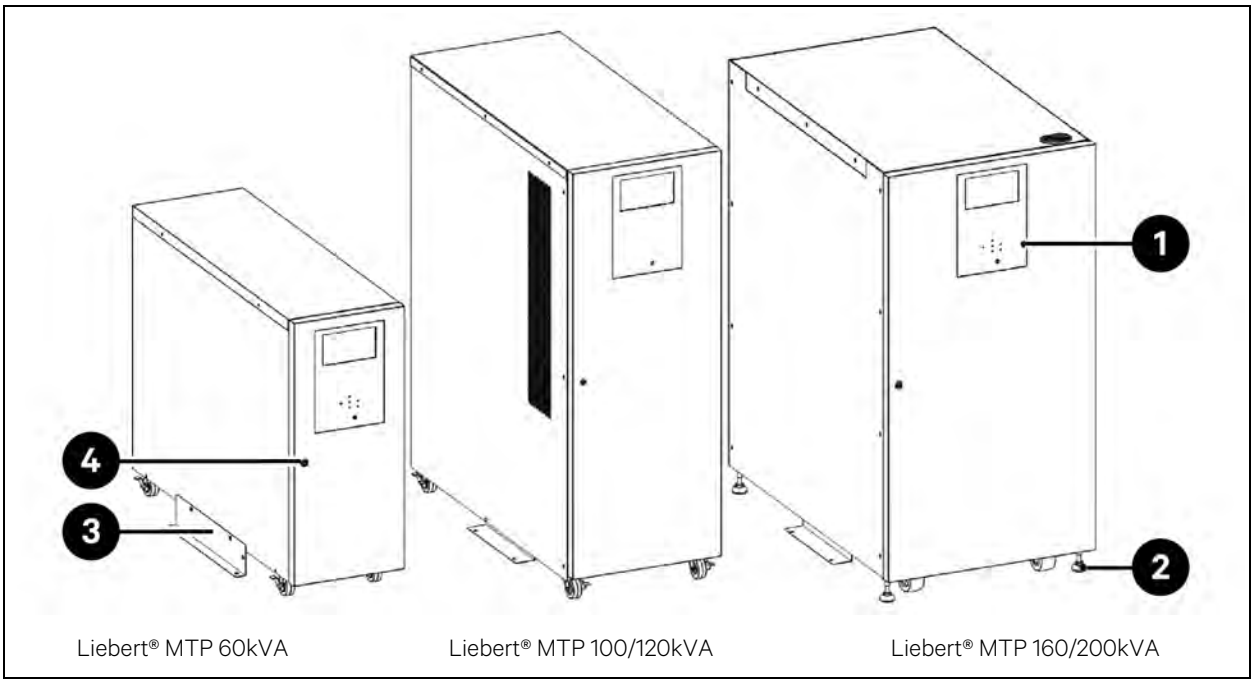
2.6 Exterior

The control interface (LCD panel) and door lock are located on the front of the UPS.

The side panels can be locked or unlocked. The casters at the bottom of the UPS cabinet can be used to move the unit over short distances. The UPS cabinet is secured and stabilized on the ground with 4 leveling feet at the bottom. See Figure 2.7 on the facing page .

Inside the cabinet, there are breakers, STS and power module slots. For 120K, wiring terminal blocks are located in the front of cabinet. For 60K and 200K, wiring terminal block are located in the back of cabinet.

Figure 2.7 Vertiv™ Liebert® MTP 60kVA, 120kVA, and 200kVA



Item	Description
1	Control panel
2	Leveling feet
3	Fixing cabinet plate
4	Door lock

2.6.1 Mechanical data

Table 2.2 Mechanical Data

UPS Model	Dimensions		
	Width (mm)	Depth (mm)	Height (mm)
Liebert® MTP 60kVA	320	1000	800
Liebert® MTP 100/120kVA	430	1000	1200
Liebert® MTP 160/200kVA	600	1000	1200

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Figure 2.8 Dimensions of Vertiv™ Liebert® MTP 60kVA

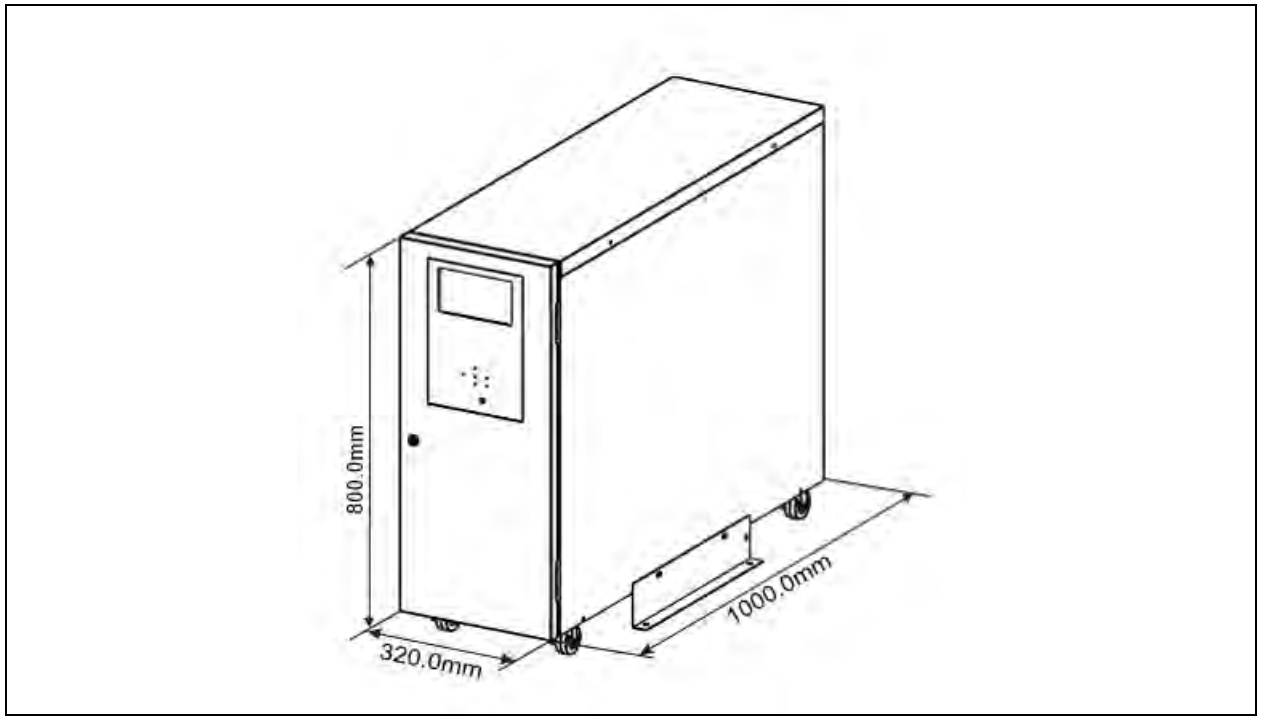


Figure 2.9 Dimensions of Vertiv™ Liebert® MTP 100/120kVA

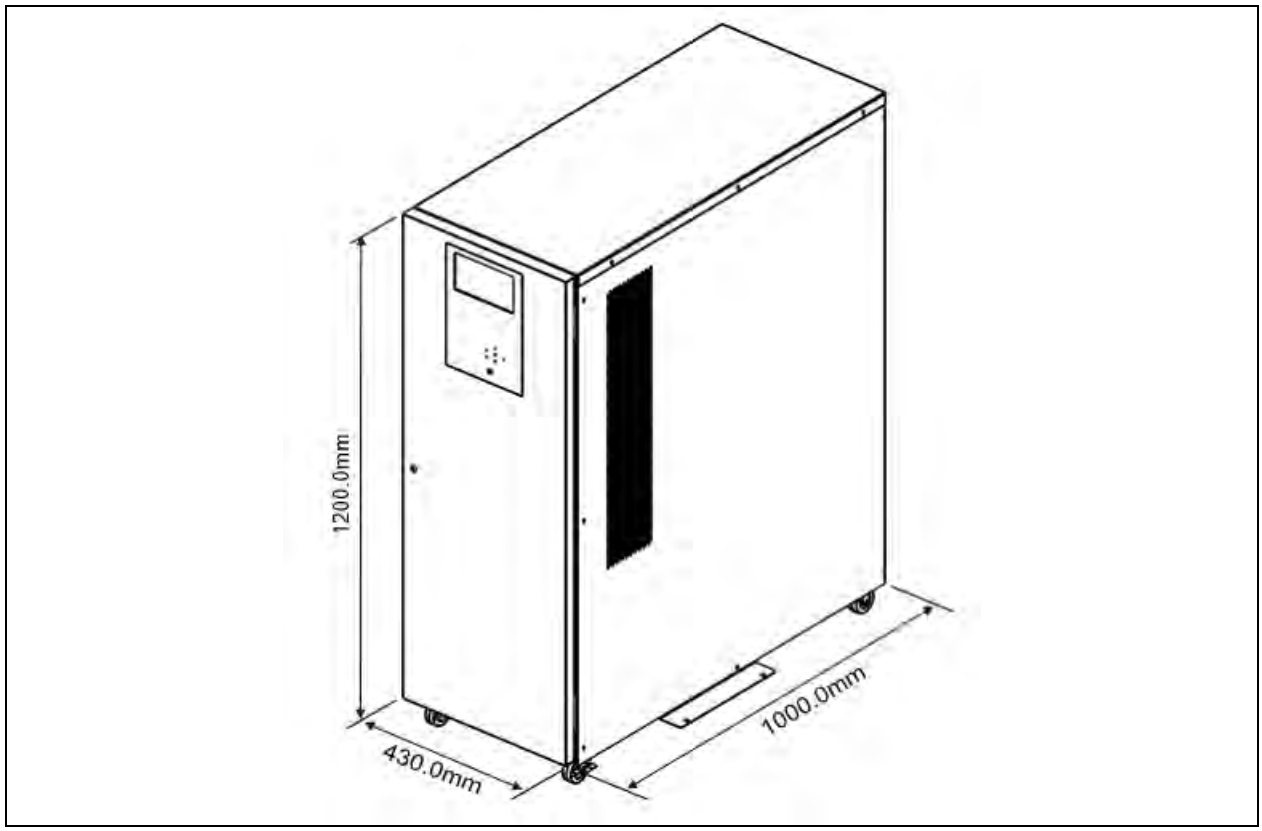
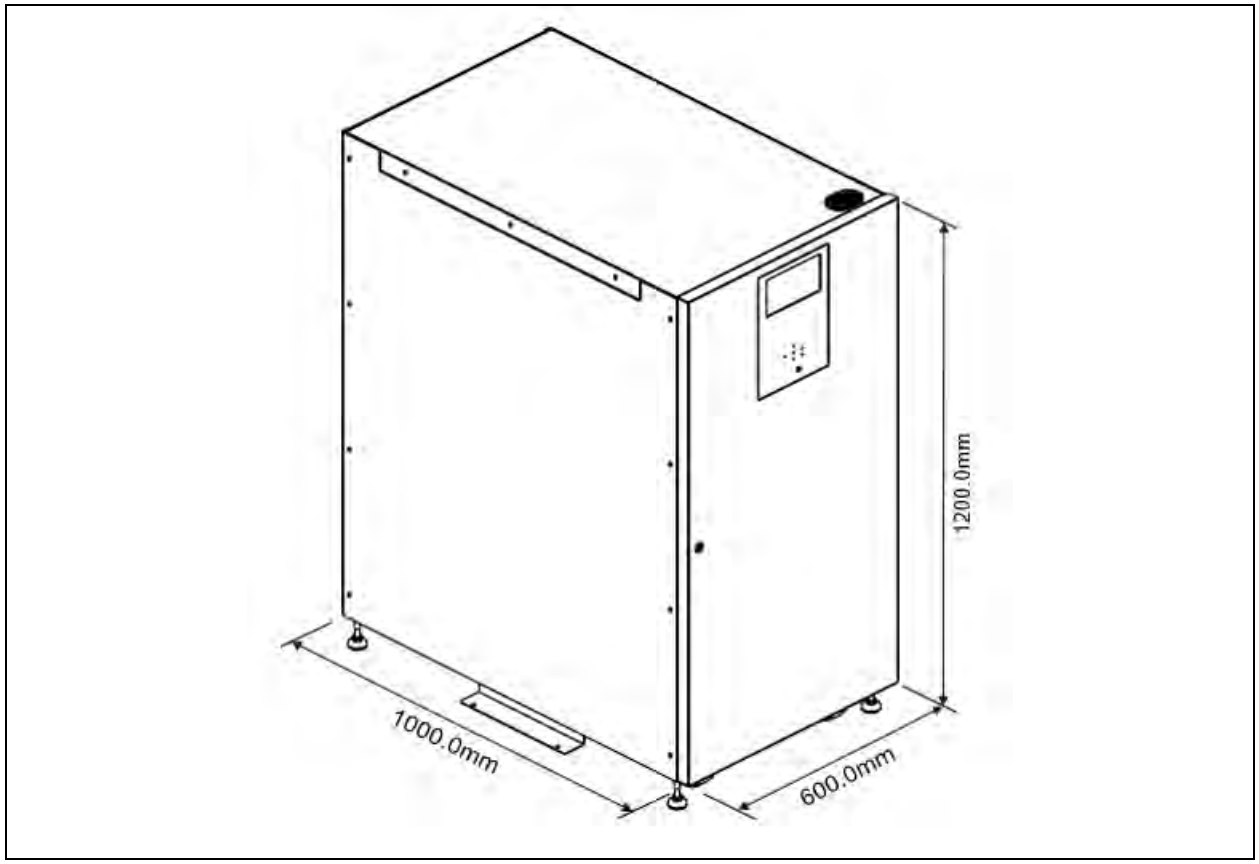


Figure 2.10 Dimensions of Vertiv™ Liebert® MTP 160/200kVA

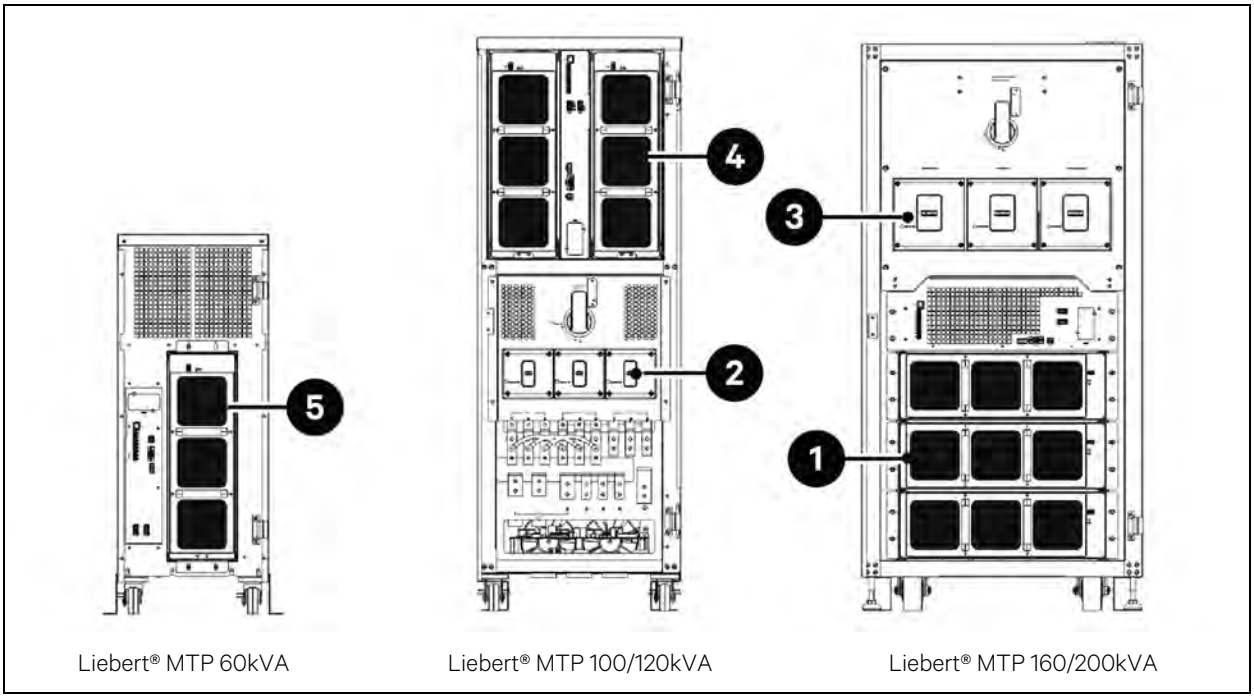


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2.6.2 Front view

The Rectifier input breaker, bypass input breaker, maintenance bypass breaker, output breaker, and power module slots are accessible when the front door is unlocked and opened.

Figure 2.11 Front View



Liebert® MTP 60kVA Liebert® MTP 100/120kVA Liebert® MTP 160/200kVA

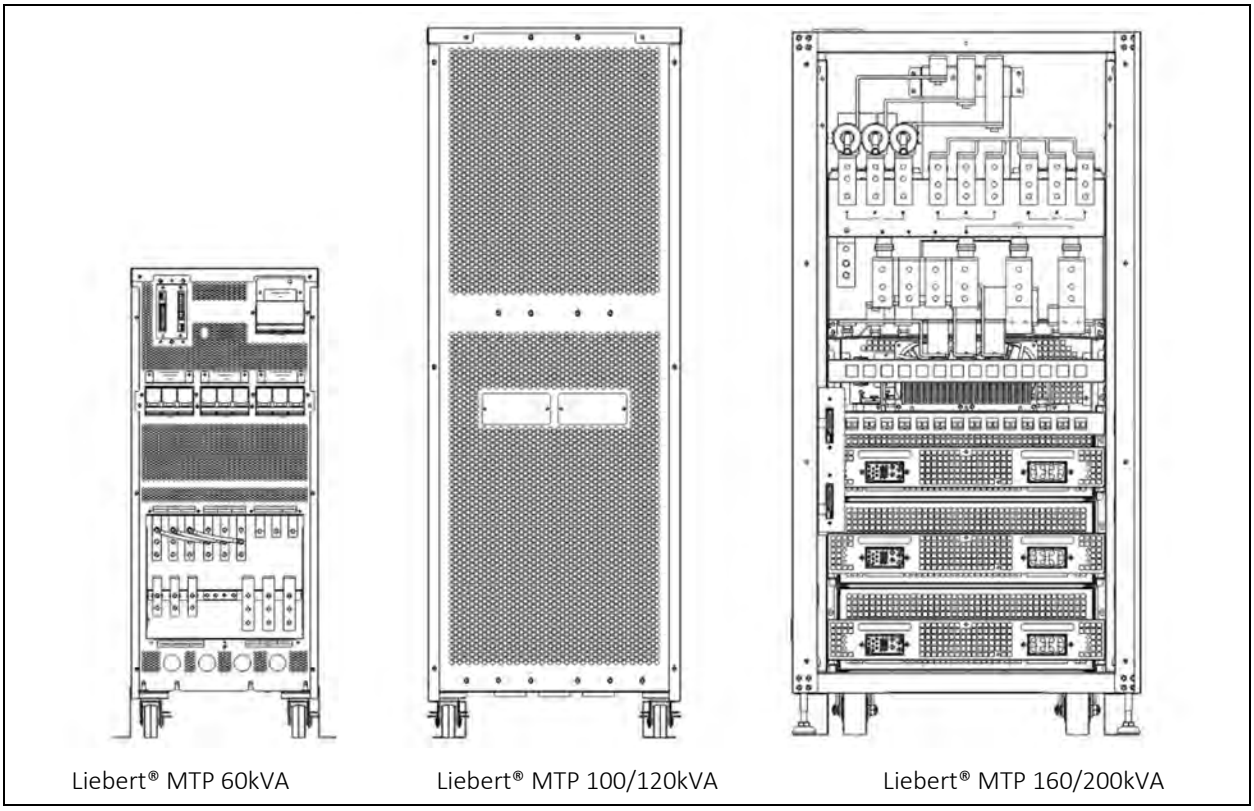
Item	Description
1	Power module
2	Switch unit
3	Switch unit
4	Power module
5	Power module

2.6.3 Rear view

The rear panel of UPS is accessible when the rear door is unlocked and opened. The rear door can only be opened for 160K/200K. (Vertiv™ Liebert® MTP 60kVA Rectifier input breaker, bypass input breaker, maintenance bypass input breaker and output breaker are in the rear door.)

Open the rear panel and you will see the live bars of UPS. Only Liebert® MTP 100/120K can not open the rear panel.

Figure 2.12 Rear View



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2.7 Internal Mechanisms

2.7.1 Breakers

The 4 circuit breakers, Rectifier input breaker, bypass input breaker, maintenance bypass breaker, and output breaker are accessible when the front door is opened.

Figure 2.13 Vertiv™ Liebert® MTP 60kVA Switch (Rear View)

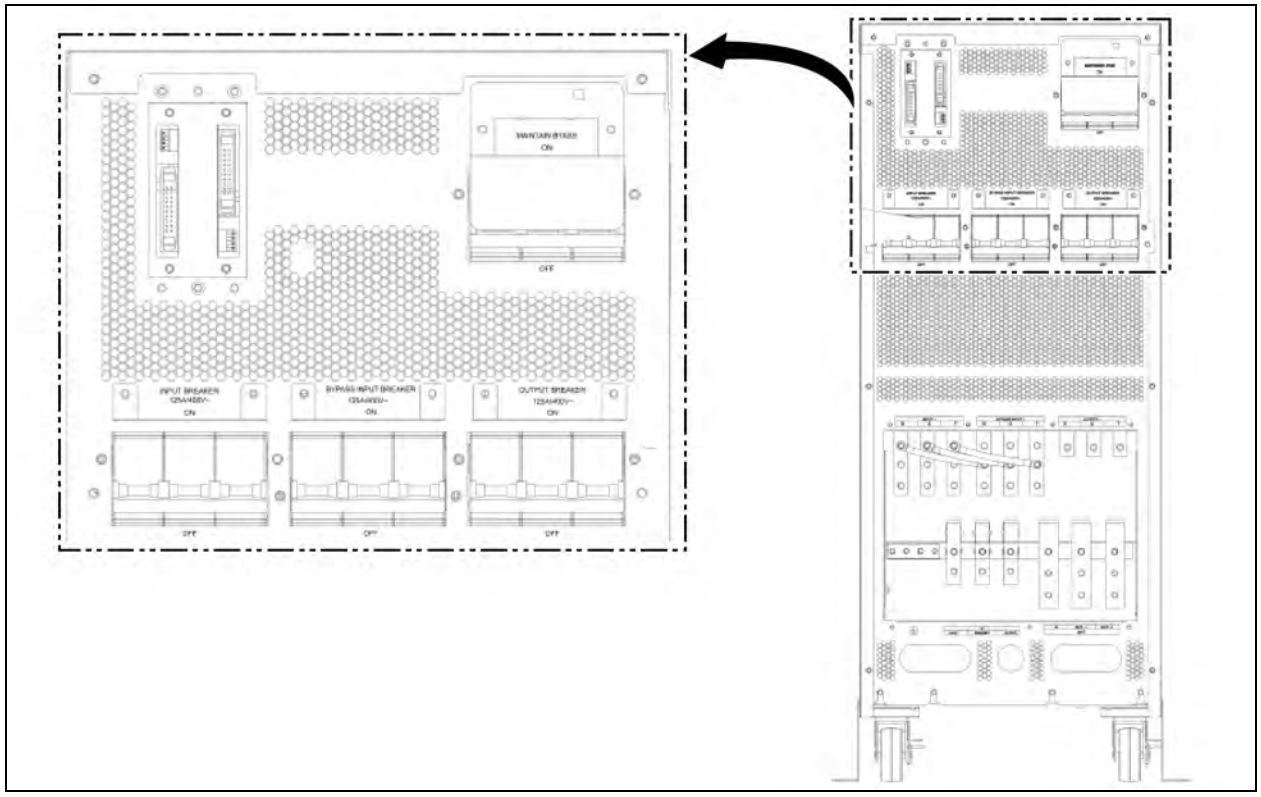
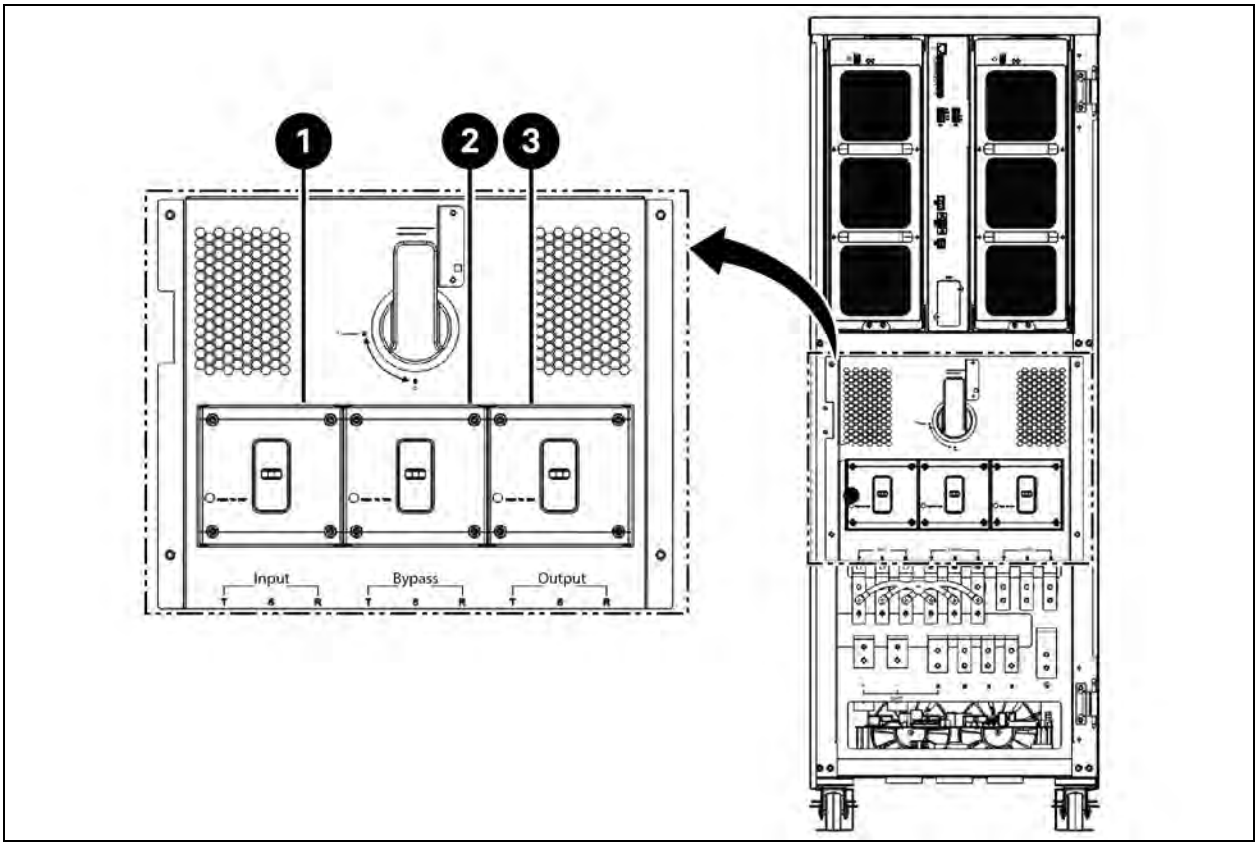


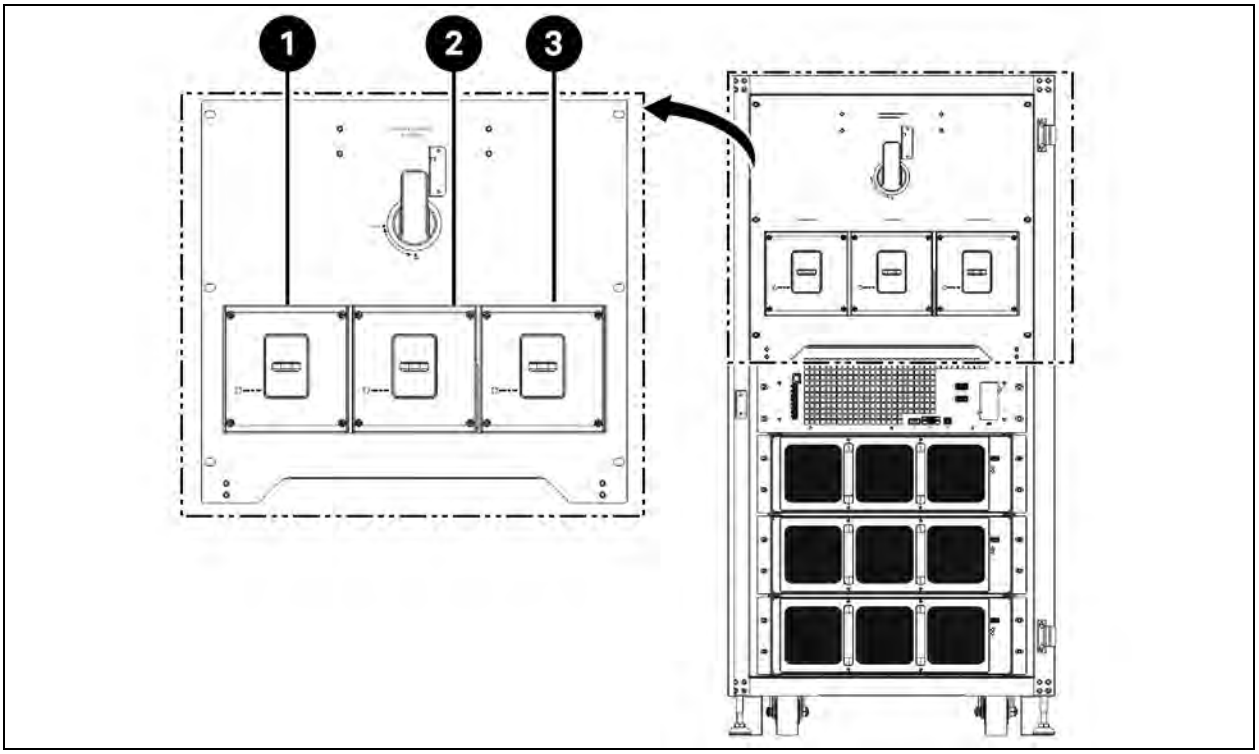
Figure 2.14 Vertiv™ Liebert® MTP 100/120kVA Switch (Front View)



Item	Description
1	AC input
2	Bypass
3	AC output

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Figure 2.15 Vertiv™ Liebert® MTP 160/200kVA Switch (Front View)



Item	Description
1	AC input
2	Bypass
3	AC output

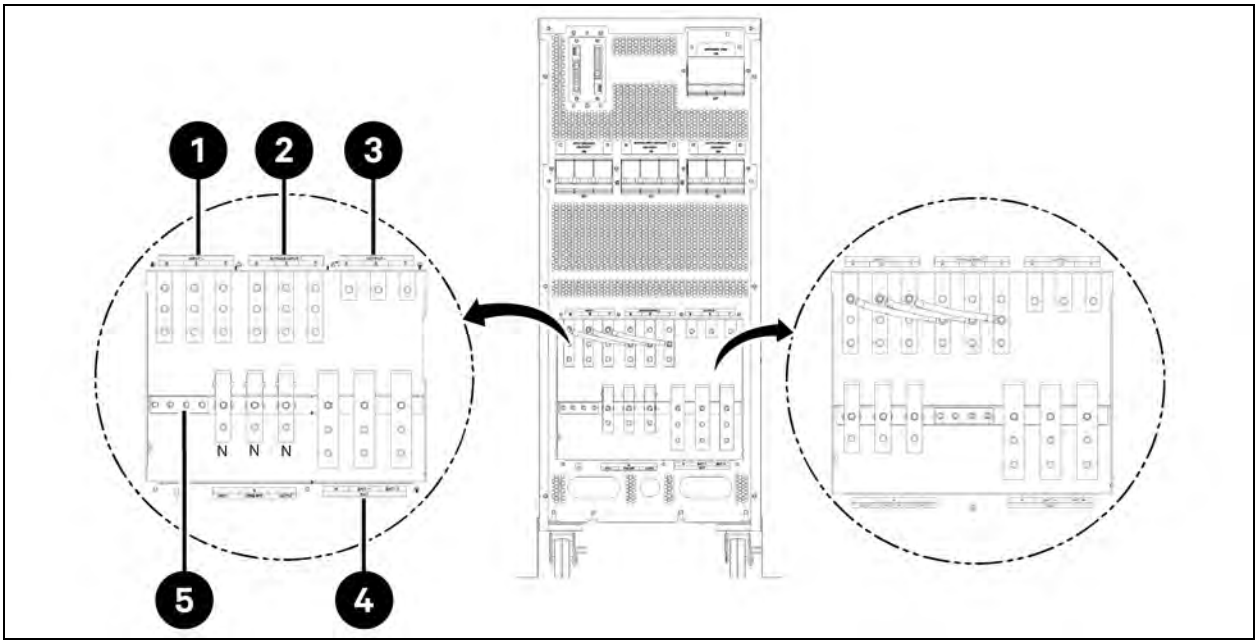
2.7.2 Wiring terminal blocks

See Figure 2.18 on page 25 for UPS cabinet wiring.

Table 2.3 Wiring Terminal Blocks

Sr. No.	Item	Function	Description
1	Output Block	Connects the critical loads	Includes R, S, T and neutral terminals.
2	Bypass Input Block	Connects bypass AC source	Includes R, S, T and neutral terminals.
3	Main Input Block	Connects main AC source	Includes R, S, T and neutral terminals.
4	For UPS Grounding	For UPS grounding	Includes one grounding terminal.
5	Battery Input Block	Connects an external battery cabinet	Includes positive (+), negative (-) and neutral (N) terminals.

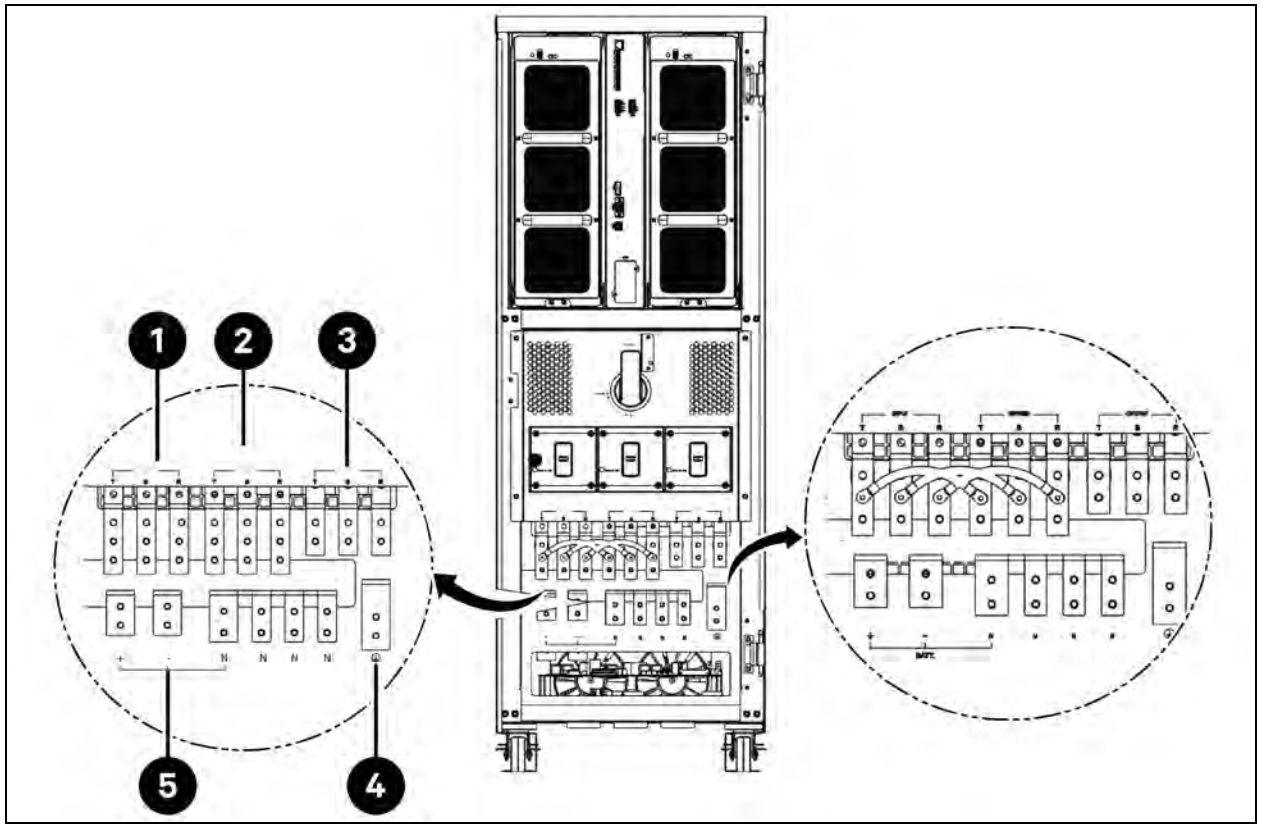
Figure 2.16 Terminal Block Vertiv™ Liebert® MTP 60kVA



Item	Description
1	Main input block
2	Bypass input block
3	Output block
4	Battery input block
5	For UPS grounding

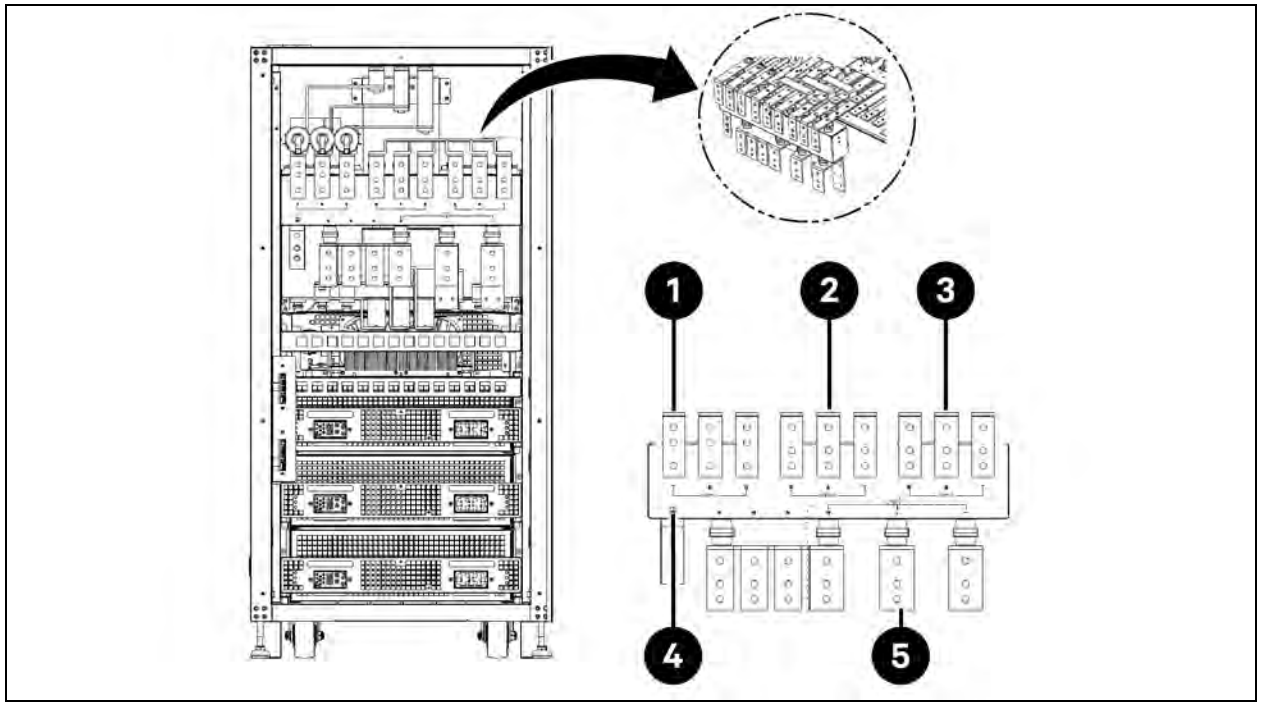
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Figure 2.17 Terminal Block Vertiv™ Liebert® MTP 100/120kVA



Item	Description
1	Main input block
2	Bypass input block
3	Output block
4	For UPS grounding
5	Battery input block

Figure 2.18 Terminal Block Vertiv™ Liebert® MTP 160/200kVA



Item	Description
1	Output block
2	Bypass input block
3	Main input block
4	For UPS grounding
5	Battery input block

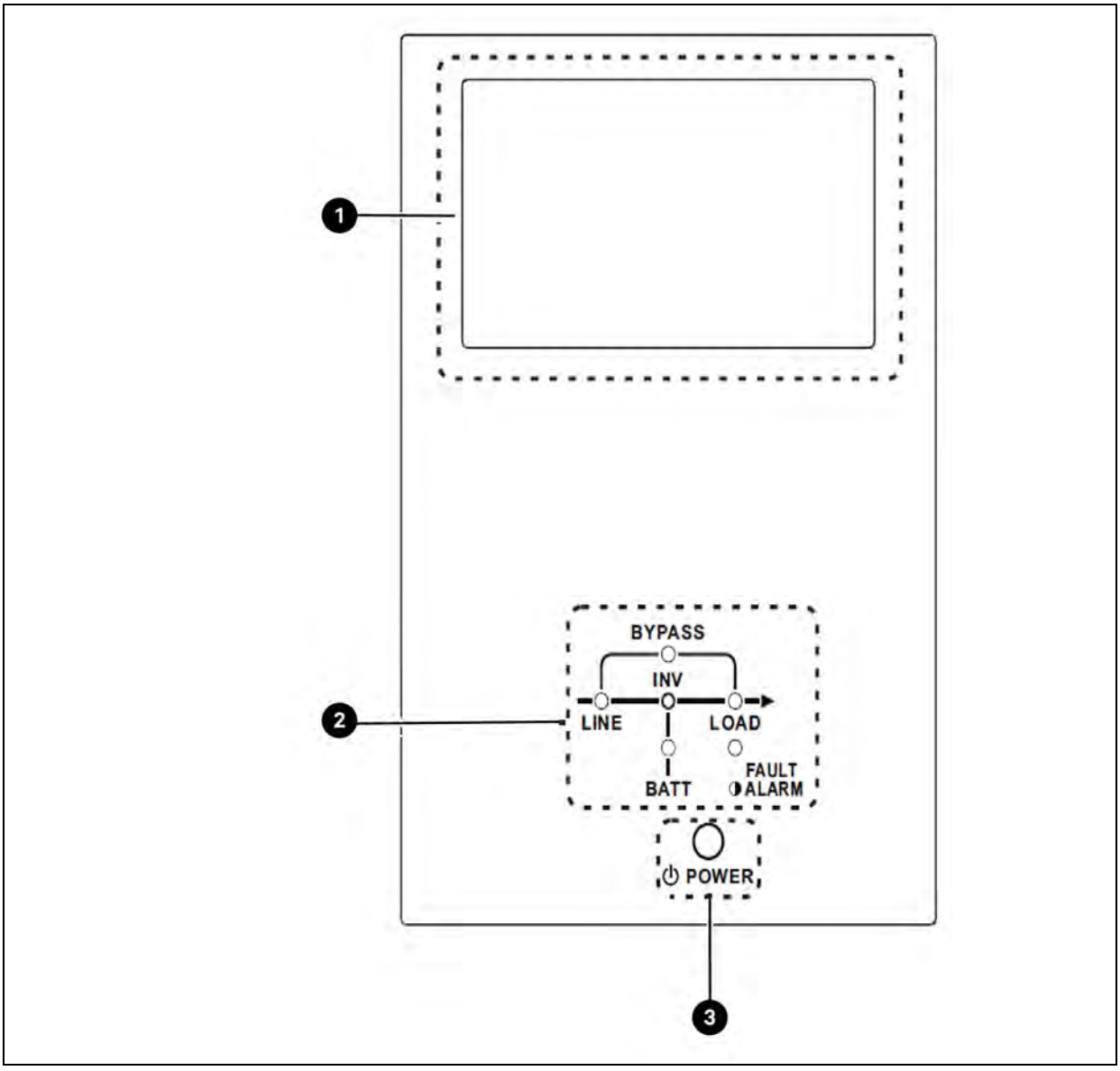
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2.8 Control Panel

2.8.1 LCD display

The user can easily understand the UPS operation mode with the touch LCD display. In addition, the user friendly interface allows the user to browse the measurement, parameters, firmware versions, and warnings. For detailed information, see Control Panel and Display Description on page 55 .

Figure 2.19 Control Panel



Item	Description
1	LCD display
2	LED indicators
3	Control key

2.8.2 LED indicators

LED	Color	Status	Definition
LINE	Green	ON	Input source is normal.
		Flashing	Input source is abnormal.
		OFF	No input source.
BYPASS	Yellow	ON	Load on bypass.
		Flashing	Input source is abnormal.
		OFF	Bypass circuit is not operating.
LOAD	Green	ON	There is power output for the load.
		OFF	There is no power output for the load.
INV	Green	ON	Load on inverters.
		OFF	Inverter circuit is not operating.
BATTERY	Red	ON	Output power from battery.
		Flashing	Low battery.
		OFF	Battery converter is normal, and battery is charged.
FAULT/ ALARM	Red	ON	UPS fault.
		Flashing	UPS alarm.
		OFF	Normal.

2.8.3 Control key

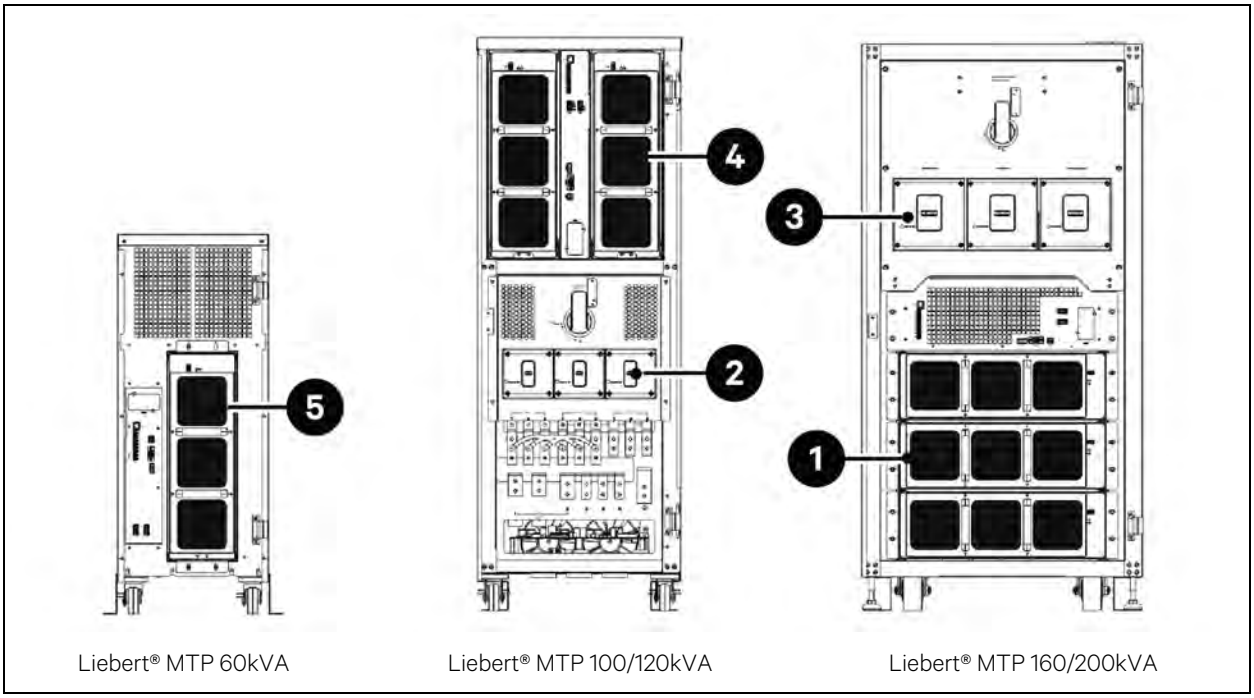
Turn ON or turn OFF the inverter.

2.9 Introduction of Modules

The design of power module allows for quick and easy maintenance and replacement. The modular and hot swappable design of power module makes it a highly cost effective solution to meet the power requirements. These UPSs have a modular design but they are Monolithic and not hot swappable.

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Figure 2.20 Front View



Liebert® MTP 60kVA Liebert® MTP 100/120kVA Liebert® MTP 160/200kVA

Item	Description
1	Power module
2	Switch unit
3	Switch unit
4	Power module
5	Power module

2.9.1 Communication interfaces

Refer to Interface and Communication on page 99 for detailed information.

2.9.2 Power module

Each power module includes a power factor correction rectifier, a battery charger, an inverter, and control circuit.

Figure 2.21 Power Module

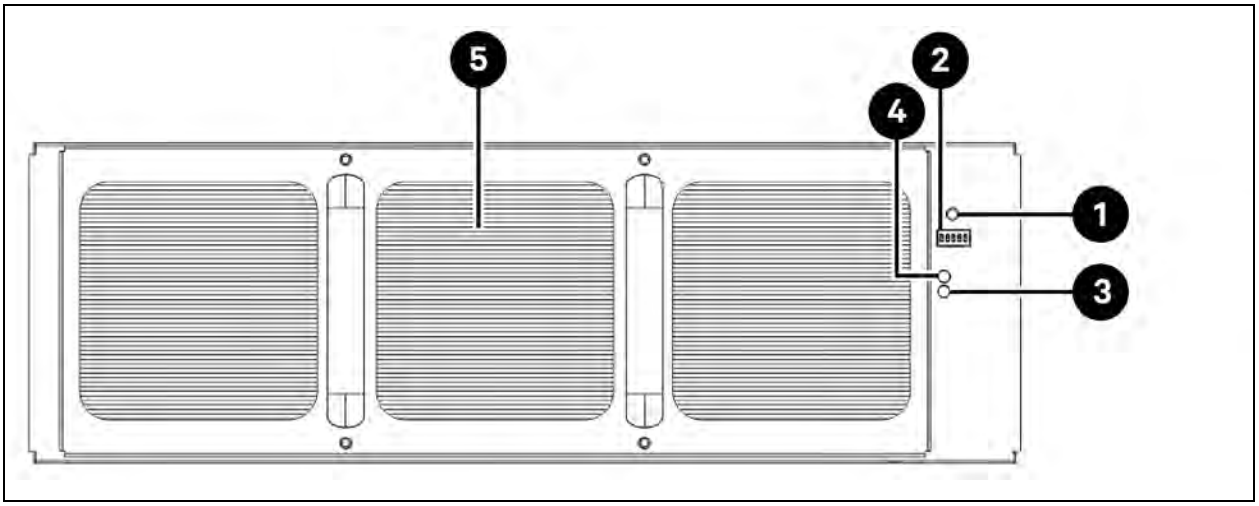


Table 2.4 Power Module

Sr. No.	Item	Description	
1	Battery Start Button	Use this button to start UPS battery power when there is no AC input.	
2	DIP Switches	The power module address is set using the 4 DIP switches. In the same cabinet, each power module ID must be unique. The setting method is shown in Table 2.5 on the next page .	
3	RUN LED	ON	The power module normally works as a secondary module.
		ON/OFF 0.5 sec	The power module normally works as a primary module.
		ON/OFF 0.15 sec	CAN bus communication failure.
4	FAULT LED	ON	The power module is in fault condition, or the ready switch is unlocked.
		ON/OFF 0.5 sec	The power module IDs conflict.
		ON/OFF 0.15 sec	The STS module is not found.
5	Fan	These fans provide forced convection cooling for the power module. Cooling air enters the module through the ventilation grills and is exhausted through grills located at the rear of the module. **NOTE: Do not obstruct the ventilation holes.**	

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Table 2.5 DIP Switch Setting and Module Address

Module Address	DIP Switch	Module Address	DIP Switch
Cabinet A		Cabinet C	
1		21	
2		22	
3		23	
4		24	
5		25	
6		26	
7		27	
8		28	
Cabinet B		Cabinet D	
11		31	
12		32	
13		33	
14		34	

Table 2.5 DIP Switch Setting and Module Address (continued)

Module Address	DIP Switch	Module Address	DIP Switch
15		35	
16		36	
17		37	

Power module ID assignment

Table 2.5 on the previous page shows the ID of the power module. The DIP switches are mounted on the front panel as shown in Figure 2.21 on page 29 .The DIP switch position is set before leaving factory. For a single UPS system application, there is no need to update it. However, for parallel UPS system application, follow the instructions in UPS Installation for Parallel Cabinet System on page 117

2.10 Power Cable

NOTE: Follow local wiring regulations. Follow environmental conditions and refer to IEC60950-1.

2.10.1 AC input and output current and power cable configuration

Power Rating	60kVA	100kVA	120kVA	160kVA	200kVA
Current (A)	110	175	215	286	354
Power cable (mm^2)	35	95	95	95x2	95x2
Fixation torque force (lb-in)	60	60	60	60	60

2.10.2 DC input current and power cable configuration

Power Rating	60kVA	100kVA	120kVA	160kVA	200kVA
Current (A)	166	277	332	498	554
Power cable (mm^2)	95	150	185	120x2	150x2
Fixation torque force (lb-in)	60	60	60	60	60

2.11 Wiring

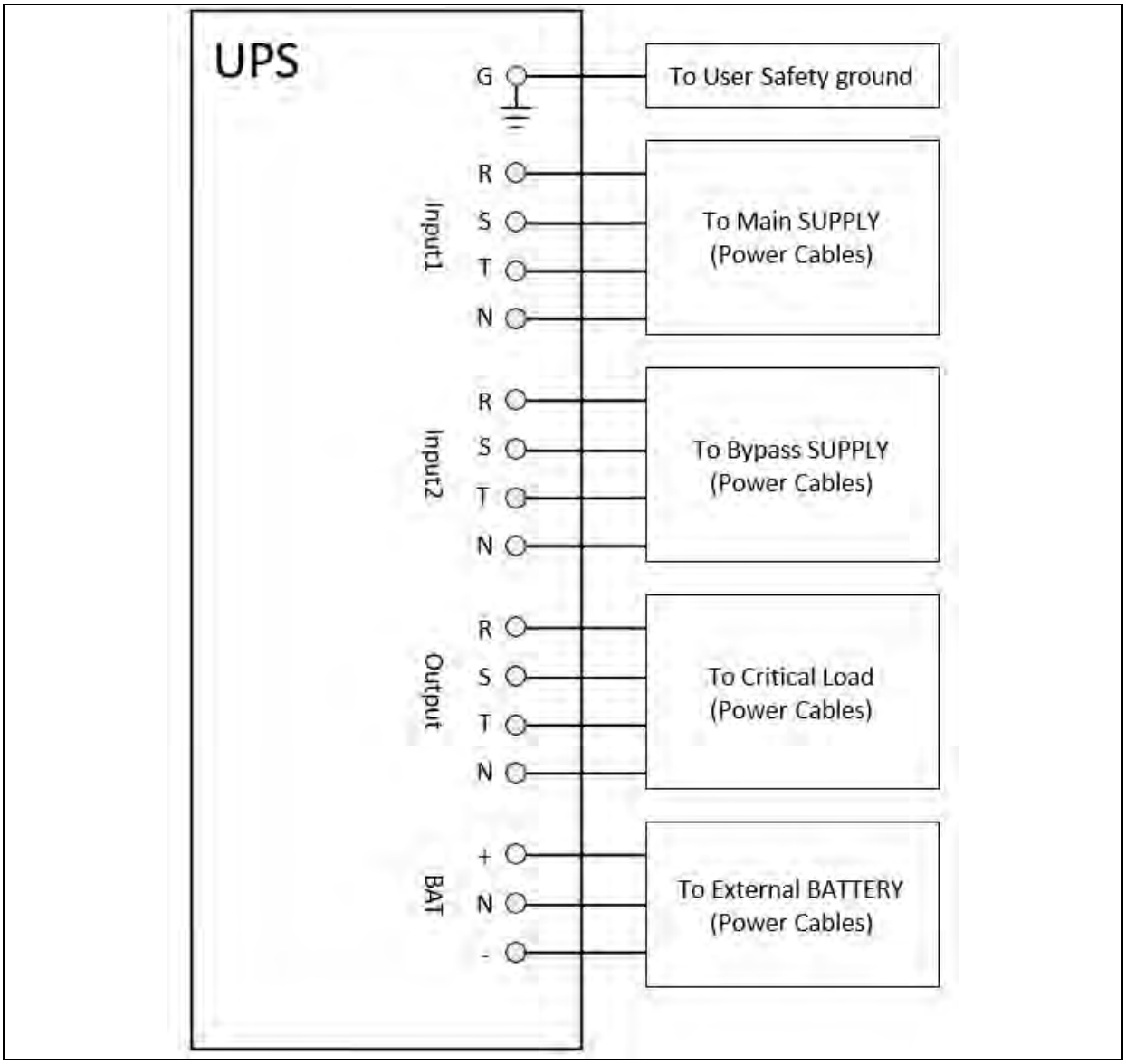
- Ensure that the AC input and battery power is completely cut OFF, before connecting any wire.
- Ensure that the breakers, main breaker, bypass breaker, maintenance breaker, output breaker, and battery breaker are all in the OFF position.

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- Ensure that the maintenance bypass switch is set to UPS position. The power cables must enter the cabinet from the outside to provide adequate heat dissipation. Alternatively, the cables may obstruct cooling ventilation, resulting in an overheating failure.

2.11.1 Installation drawing

Figure 2.22 UPS Cabinet Wiring



2.11.2 AC source connection

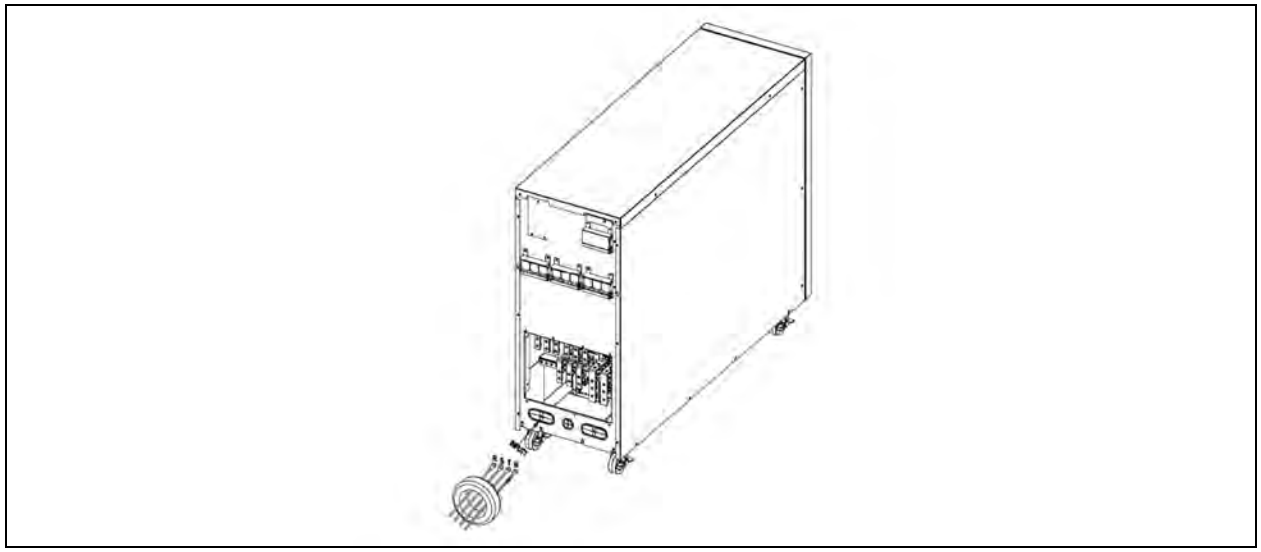
For single input application, connect Input1 to the AC power source and use 3 short wires to connect Input1 and Input2.

For dual input application, connect Input1 to the main AC power source and connect Input2 to the bypass power source.

The sequence of 3-phase, R, S, and T must be connected accordingly. When the UPS is turned ON, a warning alarm will occur if the sequence is incorrect. The N must be securely connected. If the N is not properly connected, a warning message will be displayed.

NOTE: For a 60K UPS, install the core in the accessory on the input1 wires as shown in the Figure 2.23 below .

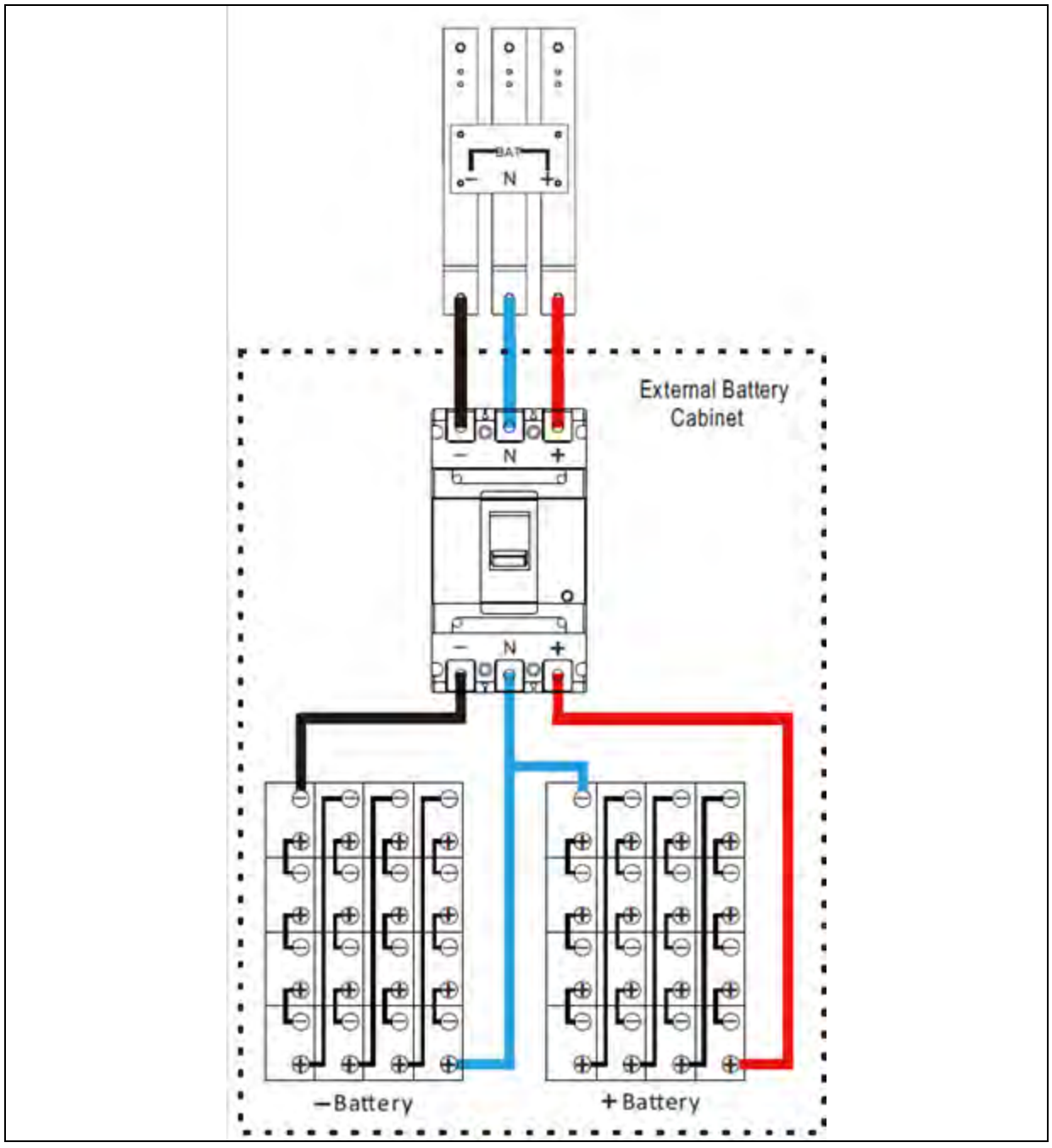
Figure 2.23 Install the Core on the Input1



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2.11.3 External battery cabinet connection

Figure 2.24 External Battery Cabinet Wiring

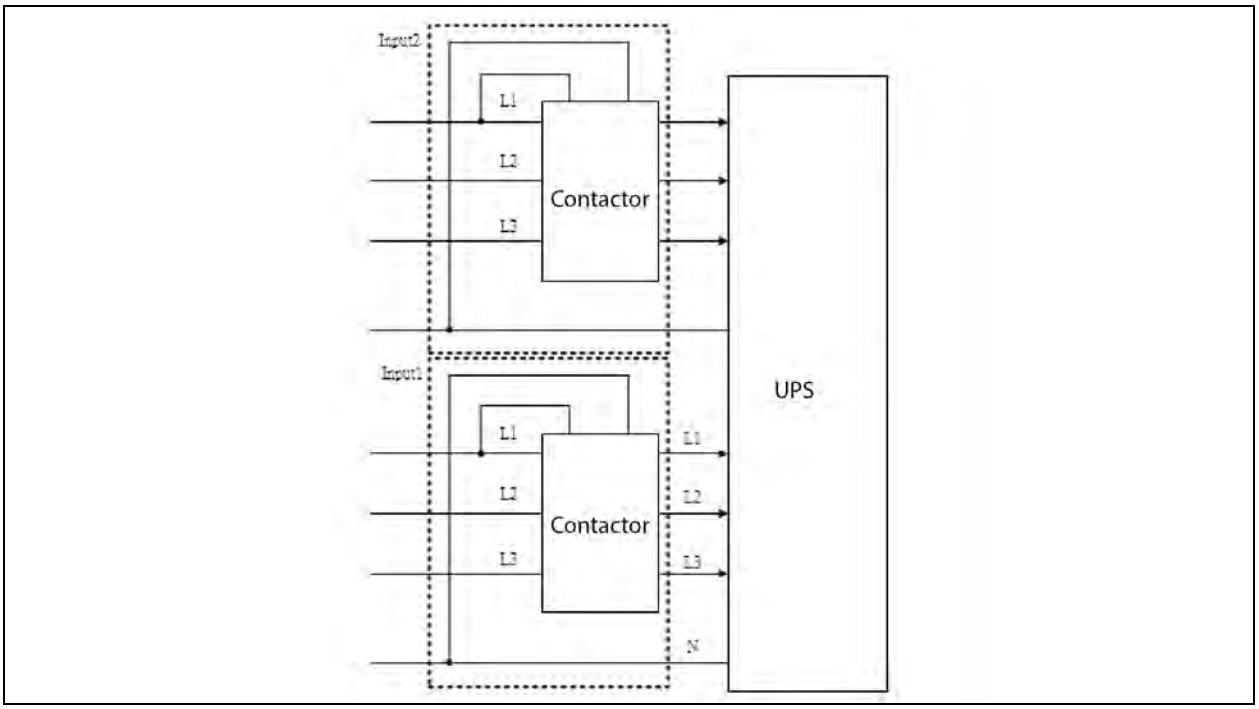


Once the battery is completely installed, make sure that the nominal battery voltage, battery capacity, and maximum charging current are all set in the LCD settings. If the battery setting is different from actual installation, the UPS will continue warning.

2.12 Backfeed Protection

Backfeed protection device shields the bypass line from static switch failure. The UPS has no backfeed device inside. It should be installed externally by following methods.

- An external disconnect device, coil is energized by input voltage. When input AC Loss, it will open the contactor.



- An external disconnect device, coil is controlled by the UPS interface. when input AC Loss, it will open the contact controlled by the UPS . Refer to Product introduction on page 101 .

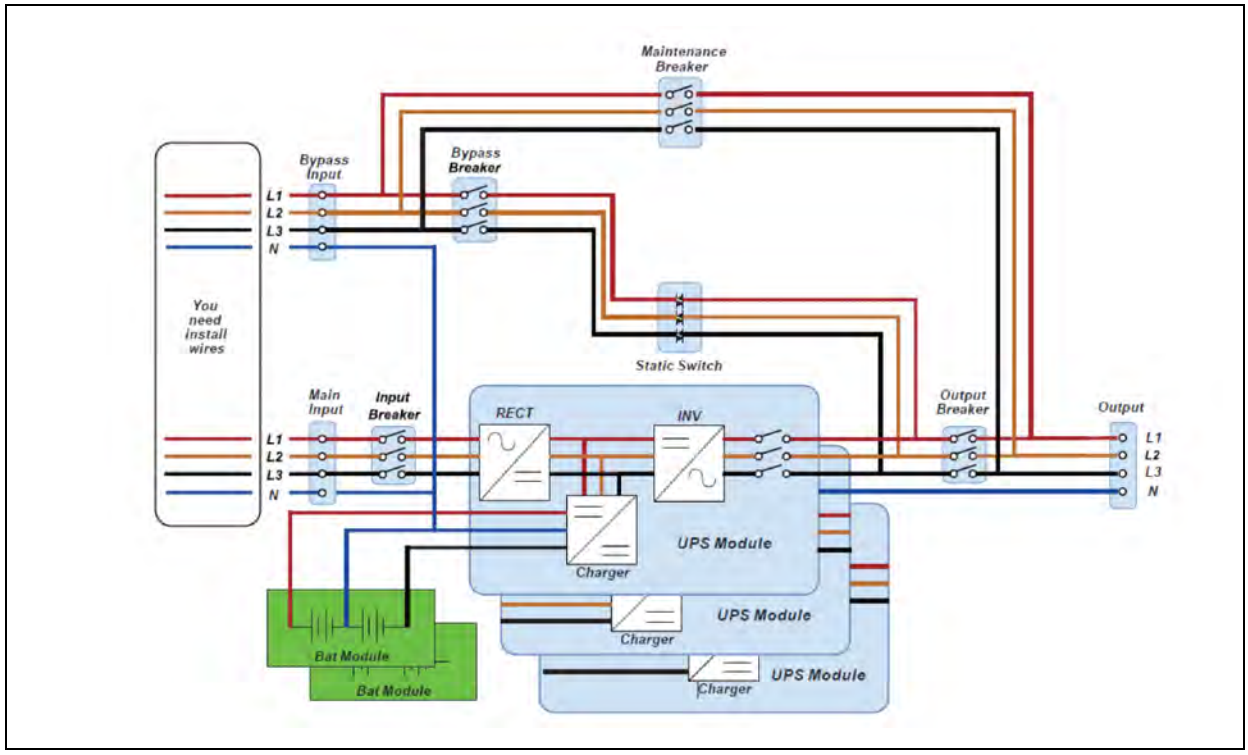
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3 Operation Mode and UPS Operation

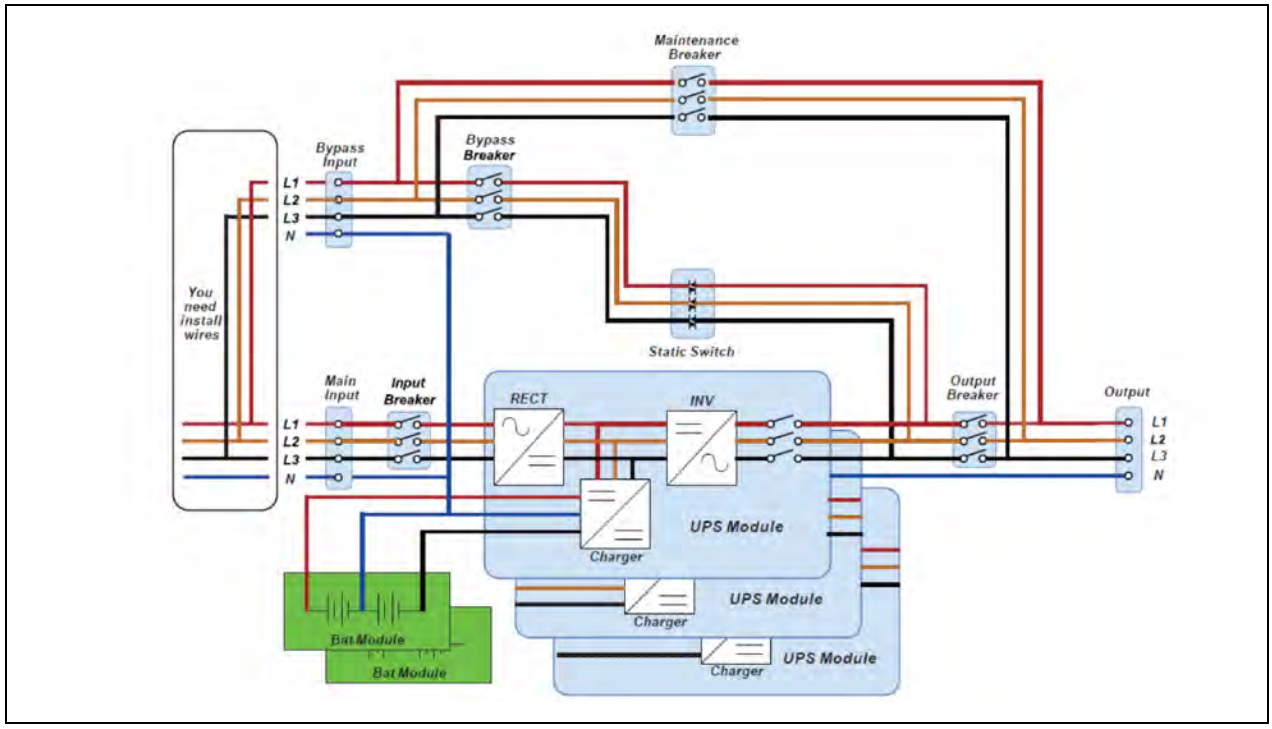
3.1 Block Diagram of UPS

Figure 3.1 Wiring Diagram for Dual Inputs



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Figure 3.2 Wiring Diagram for Single Input



3.2 Operation Mode

This UPS is a 3-phase, 4 wire on-line, double conversion UPS that permits operation in the following modes:

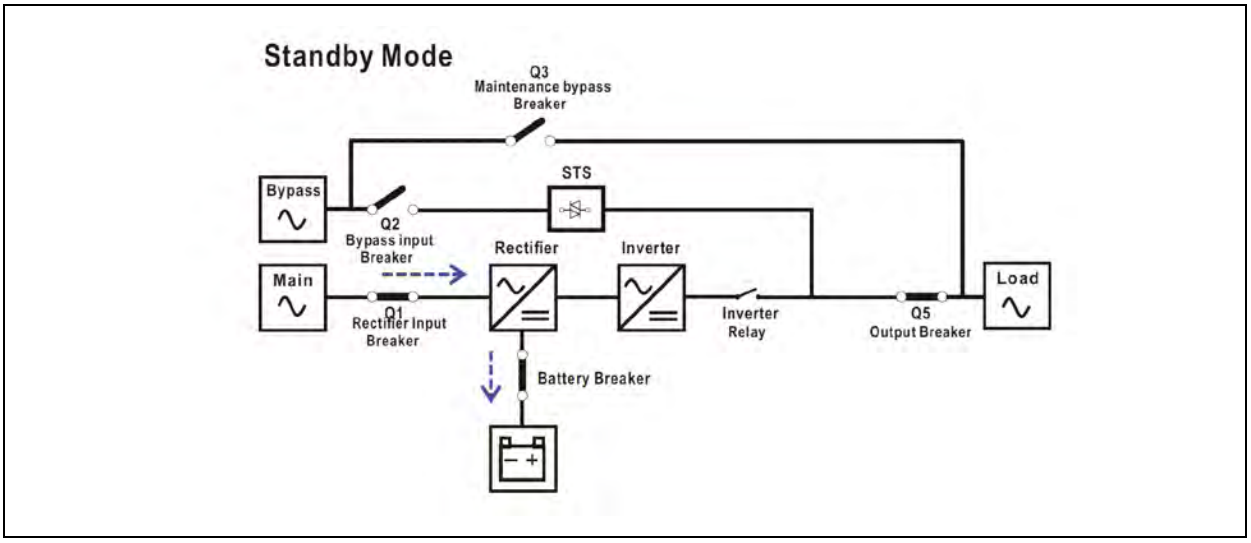
- Standby Mode
- Line Mode
- Battery Mode
- Bypass Mode
- ECO Mode
- Shutdown Mode
- Maintenance Bypass Mode (Manual Bypass)

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3.2.1 Standby mode

When the UPS is connected to the utility input power and the BYPASS enable setting is disabled, the UPS will be in standby mode until it is turned ON. The charger function will be activated when the battery is available. The load is not powered in this mode.

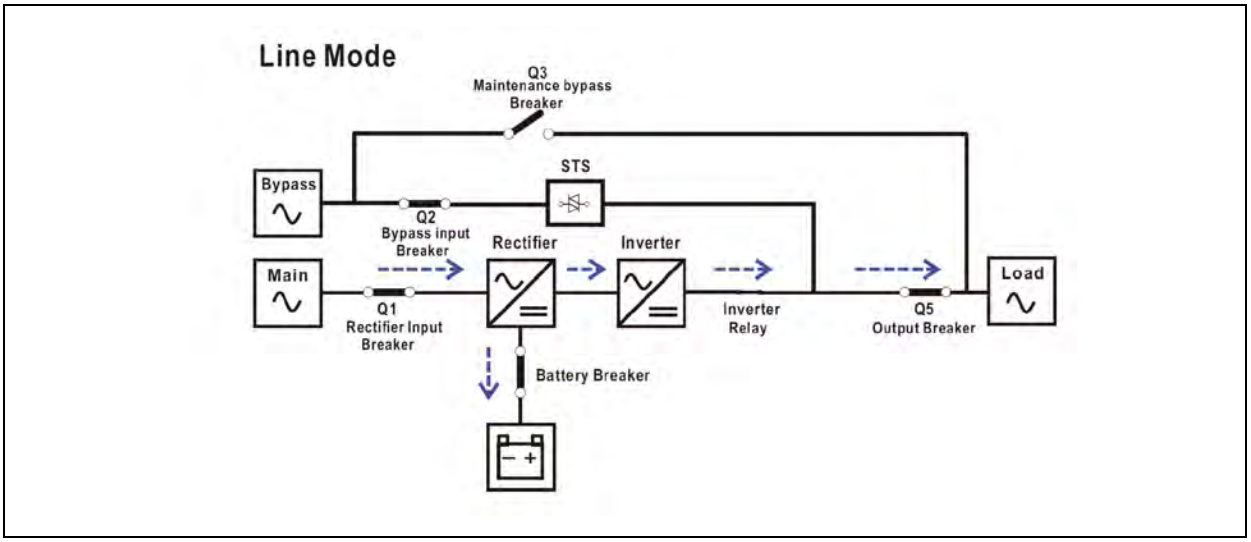
Figure 3.3 Standby Mode Diagram



3.2.2 Line mode

In line mode, the rectifier obtains power from the utility and supplies DC power to the inverter while the charger charges the battery. The inverter filters the DC power before converting it to clean and stable AC power to the load.

Figure 3.4 Line Mode Diagram



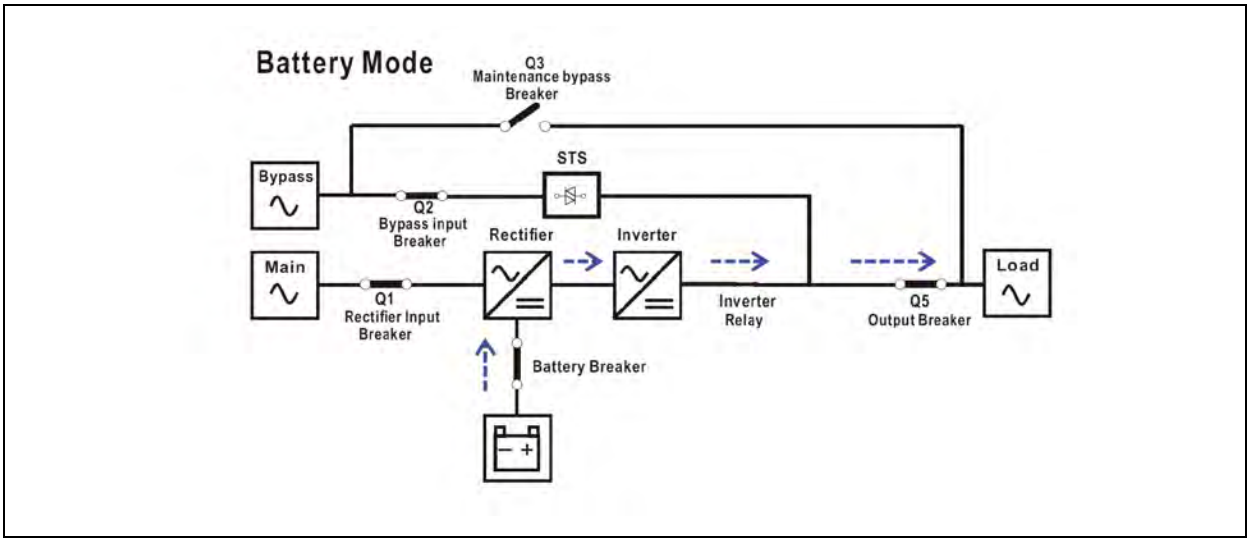
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3.2.3 Battery mode

When the utility power fails, the UPS automatically switches to the battery mode in order to avoid interruption in power to the critical load in the event of power failure.

In battery mode, the rectifier obtains power from the battery and supplies DC power to the inverter. The inverter then filters the DC power before converting it to clean and stable AC power to the load.

Figure 3.5 Battery Mode Diagram



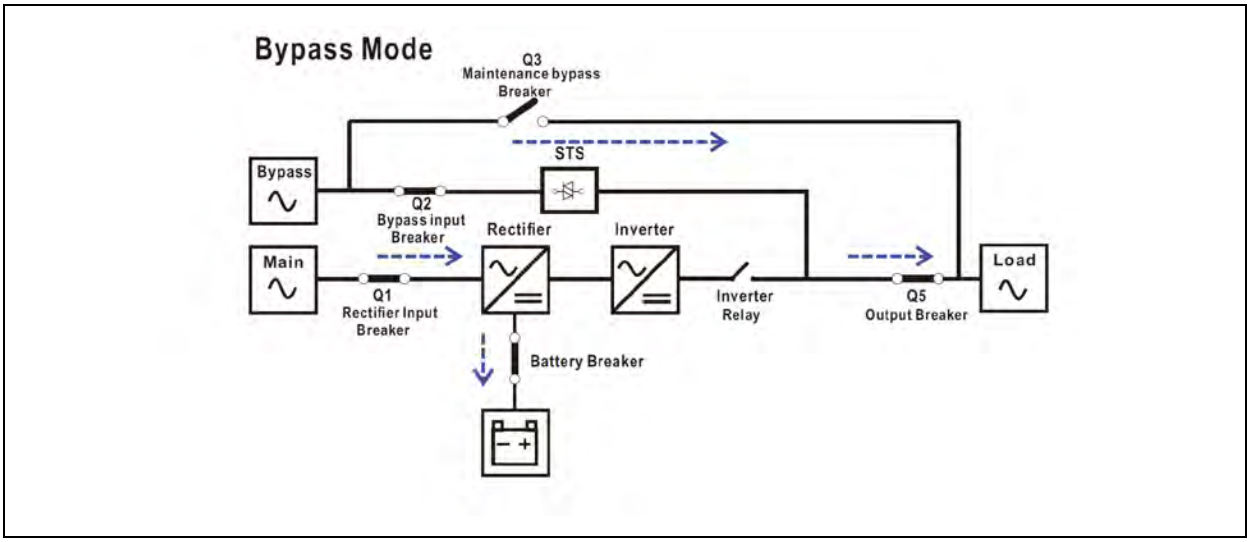
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3.2.4 Bypass mode

When the UPS is connected to the utility input power and the BYPASS enable setting is enabled, the UPS will be in bypass mode until it is turned ON, and the charger function will be activated when the battery is available.

If the UPS encounters any unusual condition such as over temperature or overload. After it has been turned ON, the static transfer switch will act as a transference and will transfer the load from the inverter to the bypass source without any interruption. When the abnormal situation is resolved, the UPS will return to line mode if the transference was caused by a recoverable reason.

Figure 3.6 Bypass Mode Diagram

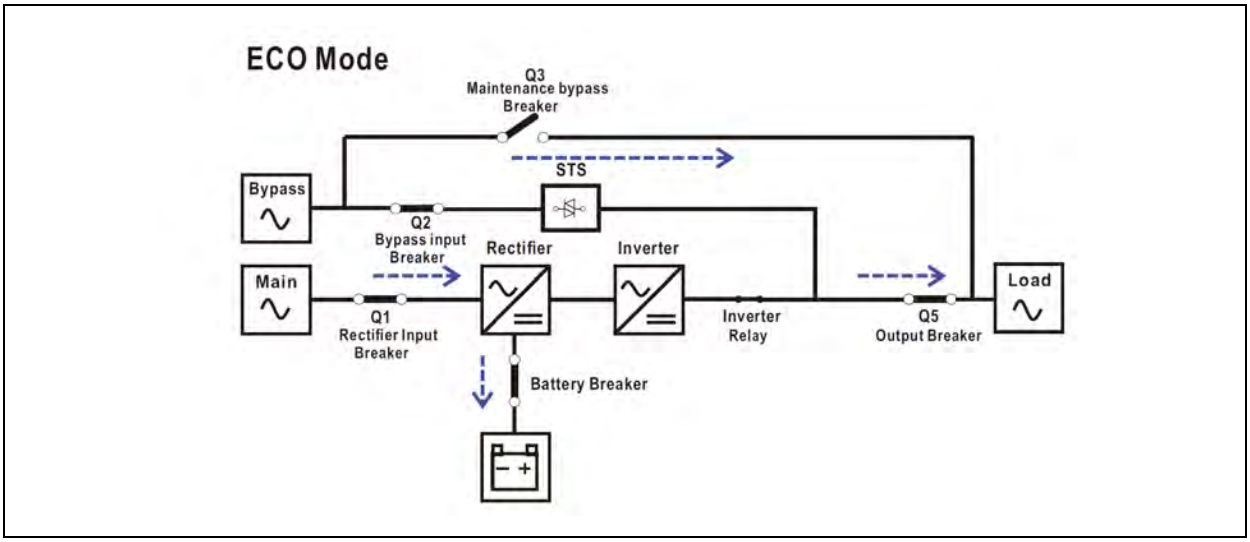


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3.2.5 ECO mode

The ECO mode can be enabled through the settings menu of LCD panel. When the bypass voltage and frequency are within acceptable range, the load is powered by bypass in ECO mode. The UPS will transfer the power source of load from bypass to inverter if the bypass is out of range. When the UPS is in ECO mode, the rectifier and inverter are turned on to reduce the transfer time.

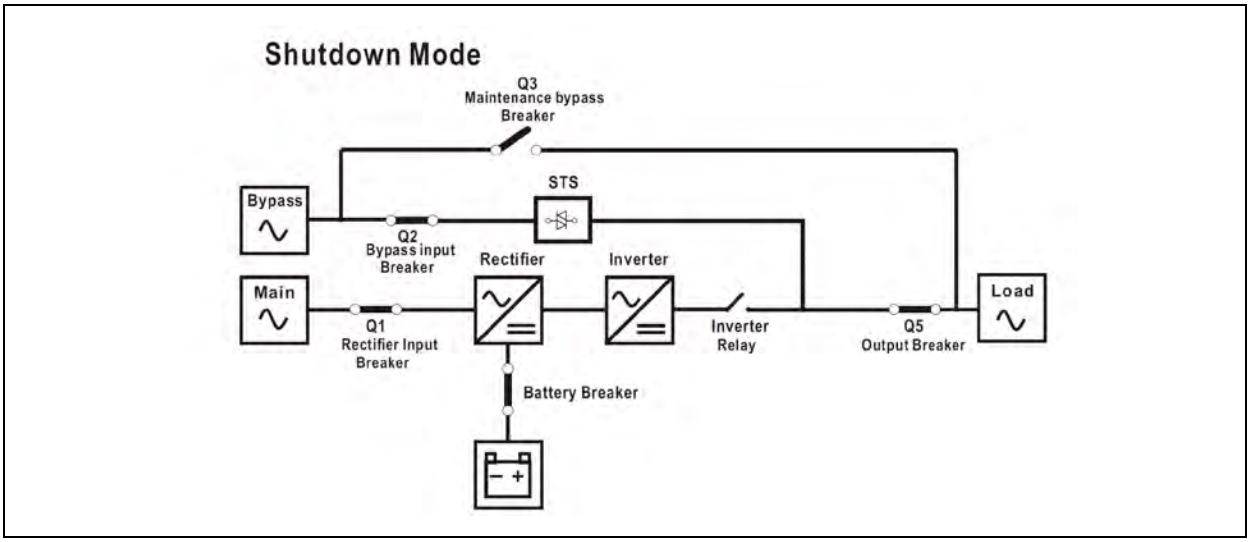
Figure 3.7 ECO Mode Diagram



3.2.6 Shutdown mode

When the UPS is in the OFF state and the utility power source is not available, the UPS will enter into shutdown mode. Alternatively, the UPS will enter into shutdown mode once the battery has been discharged to the cut off level. The UPS will turn OFF the control power when it enters this mode. The rectifier, charger, and inverter are all in the OFF state.

Figure 3.8 Shutdown Mode Diagram

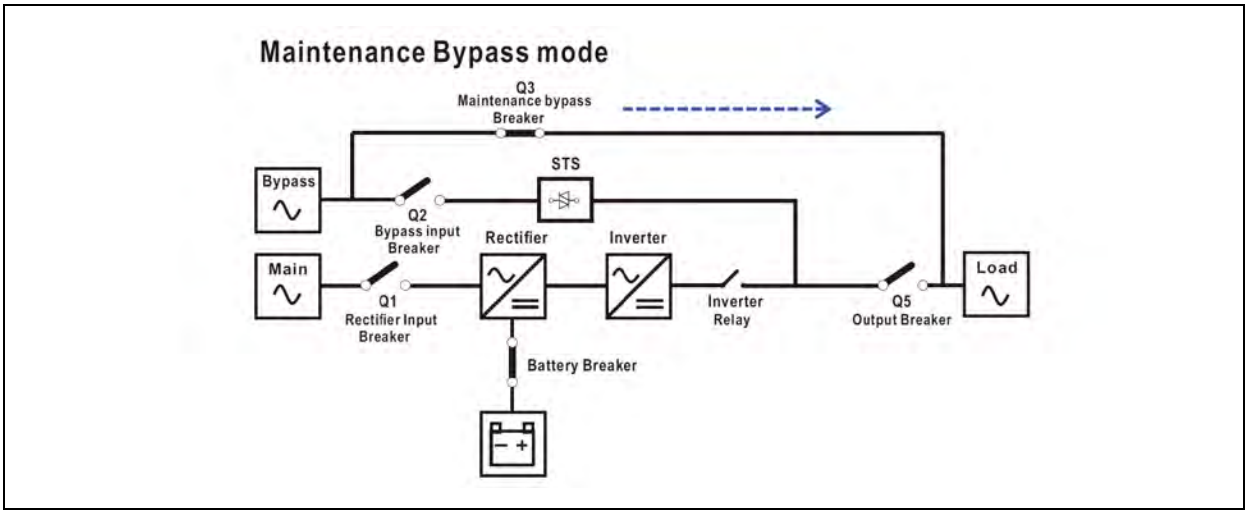


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3.2.7 Maintenance bypass mode

When the UPS is unable to supply power during the maintenance process, a manual bypass switch is available to ensure continuous supply of power to the critical load. Ensure that the bypass power source is normal, before enabling the maintenance bypass mode.

Figure 3.9 Maintenance Bypass Mode Diagram



3.3 UPS Operation

- Do not start the UPS until the installation is completed.
- Make sure that the wiring is correct, and the power cables are securely attached.
- Make sure that the address of power module is configured. Refer to Power Module on page 29 .
- Make sure that all the breakers are switched OFF.

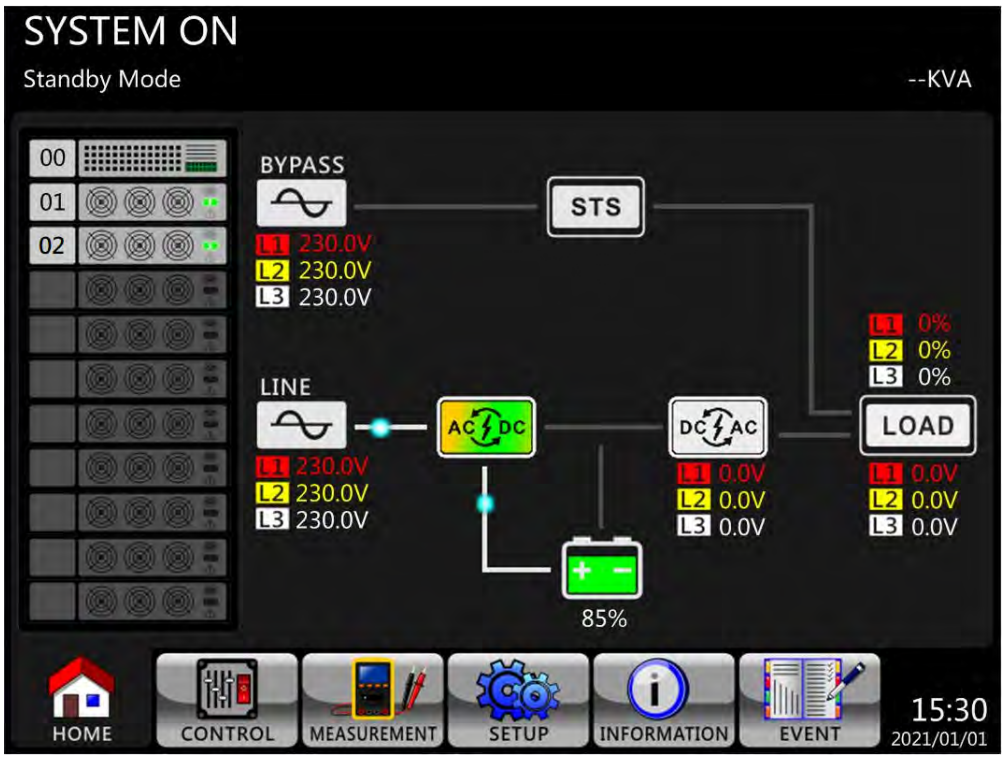
3.3.1 AC startup (line mode)

When turning ON the UPS from a fully powered down condition, ensure to follow the operating procedure given below:

1. Refer to Installation on page 7 to connect the power cables and install the battery required for the UPS system.
2. Turn the battery breaker ON.
3. To start the UPS, turn ON the external power switch in distribution panel.
4. Turn the Input and the Bypass breakers ON.

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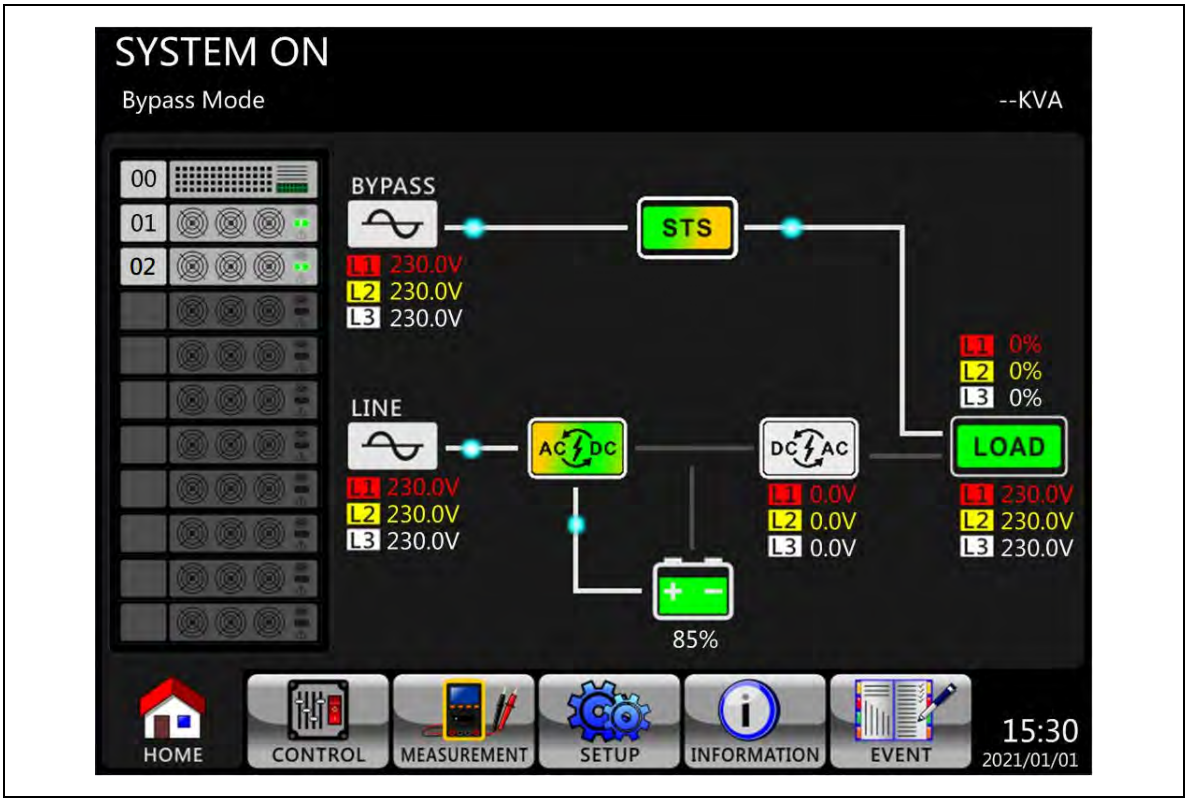
Figure 3.10 System ON Standby Mode



Alternatively, the UPS will enter into bypass mode, if the Bypass Mode setting is enabled.

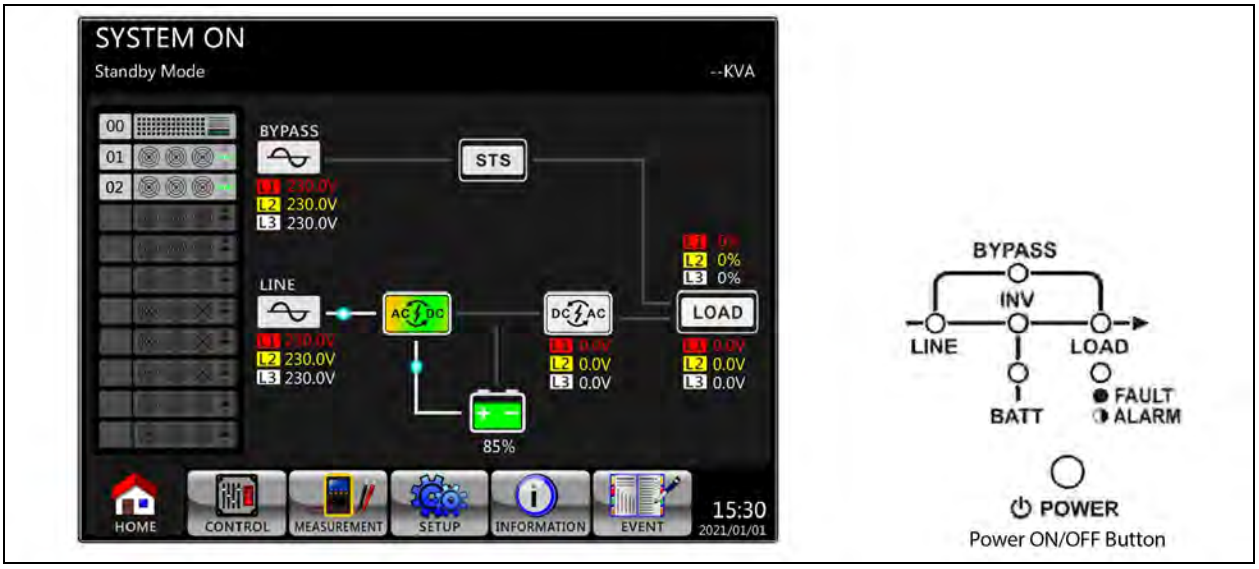
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Figure 3.11 System ON-Bypass Mode



5. Make sure that no warning or fault event occurs. If a warning or fault occurs, refer to Troubleshooting on page 105 to resolve it.
6. Press and hold the *Power* button for 2 seconds to enter into Line Mode, as shown in **Figure 3.12** below .

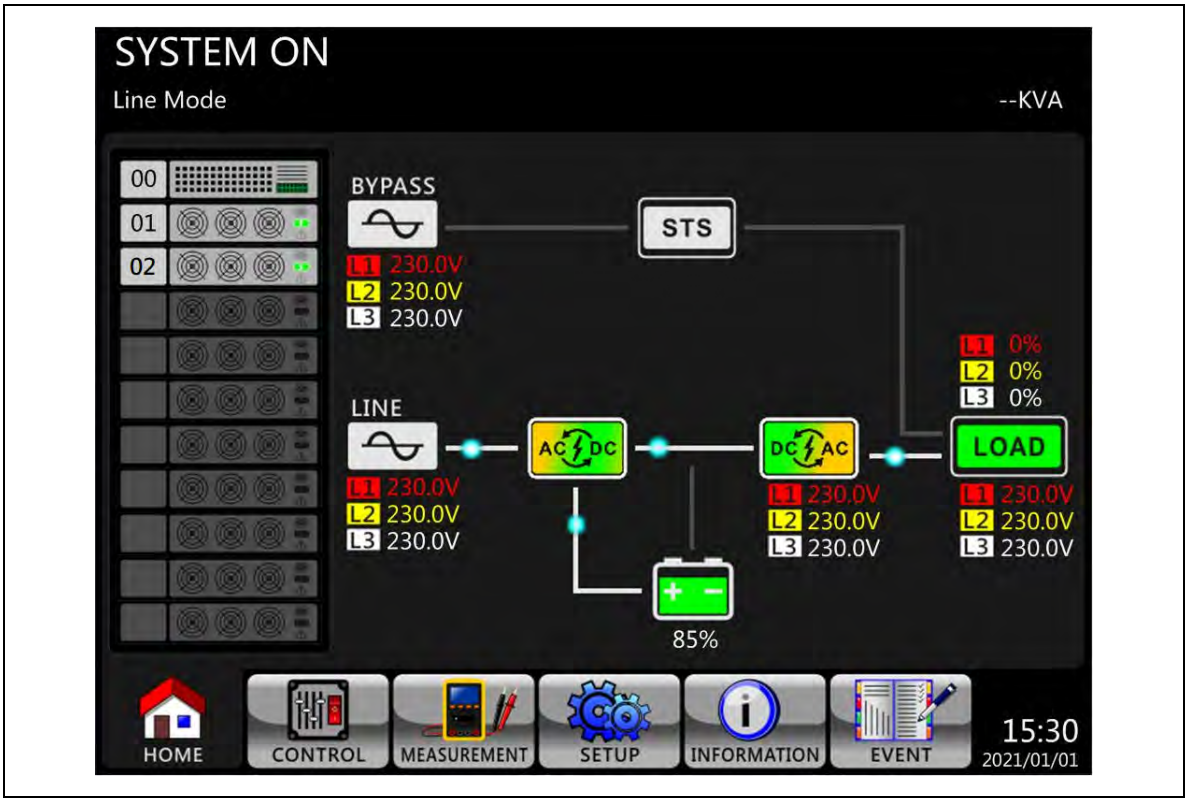
Figure 3.12 Entering into Line Mode



When the UPS is turned ON, it will perform a self-test and start up the inverter. UPS will be switched to Line Mode when all power modules are ready.

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Figure 3.13 System on Line Mode

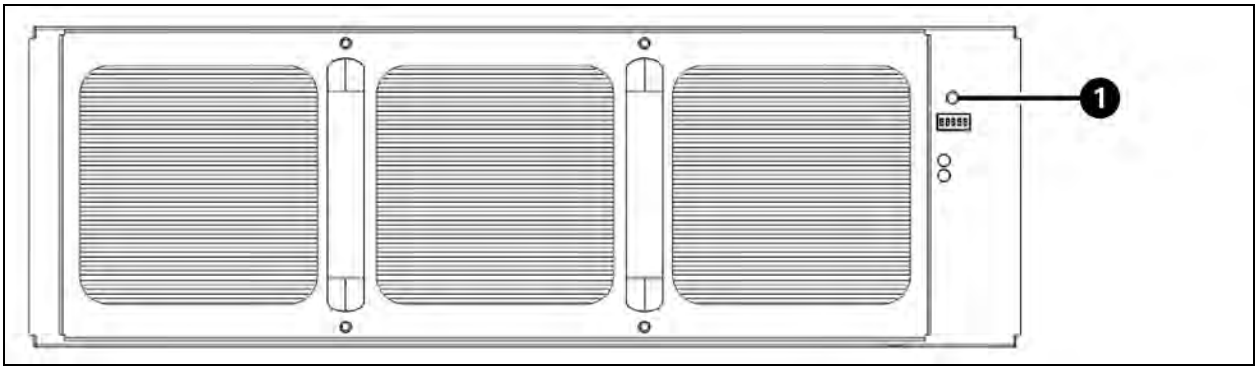


7. Turn the output breaker ON. AC startup procedure is complete.

3.3.2 Cold start startup

1. Turn the battery breaker ON.
2. Press the *Battery Start* button on any one of power modules to start up the control power as shown in **Figure 3.14** below

Figure 3.14 Battery Start

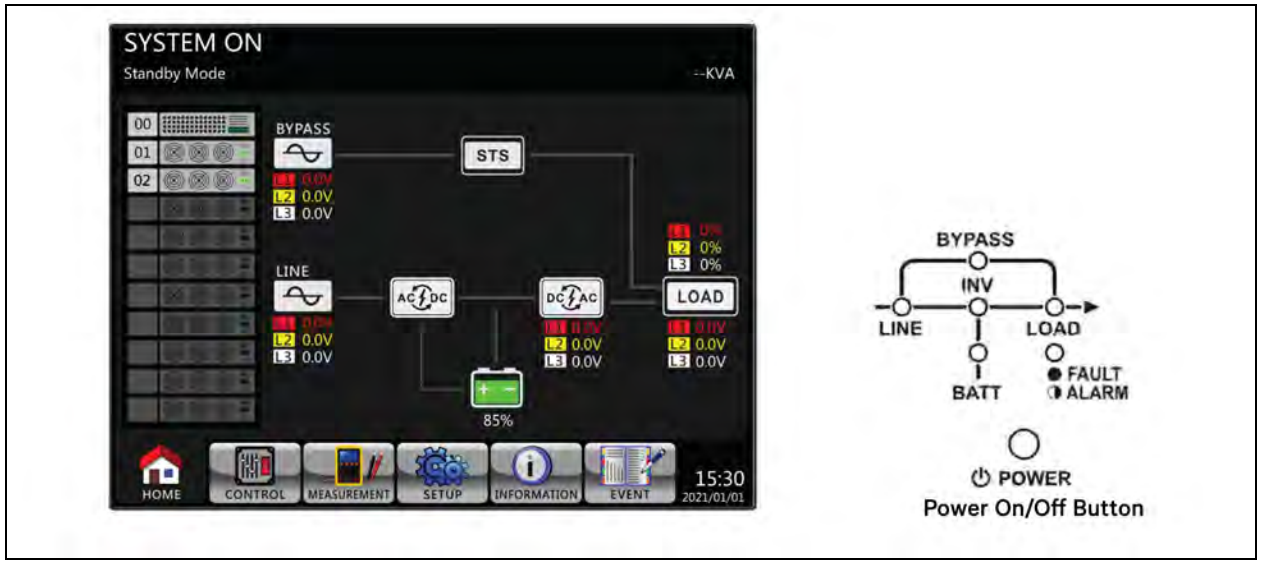


Item	Description
1	Battery start button

3. UPS will enter Standby Mode after pressing the *Battery Start* button. Refer to the diagram below for LCD display.

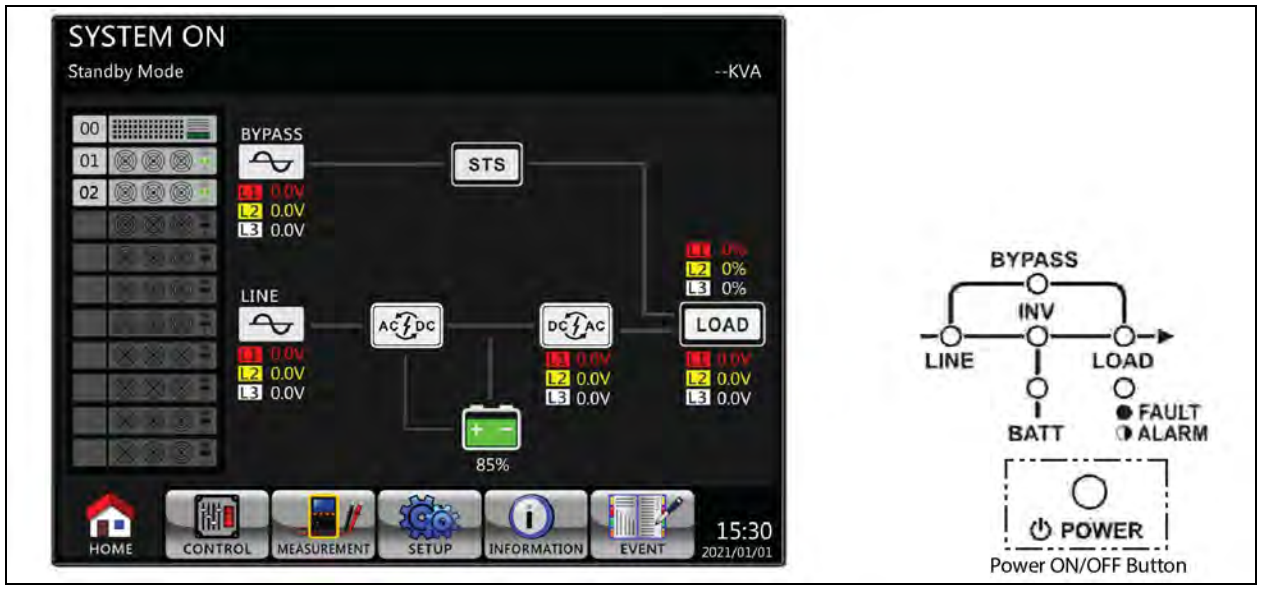
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Figure 3.15 UPS in Standby Mode



4. Before the UPS enters shutdown mode, press and hold *Power* button for 2 seconds immediately as shown in Figure 3.16 below .

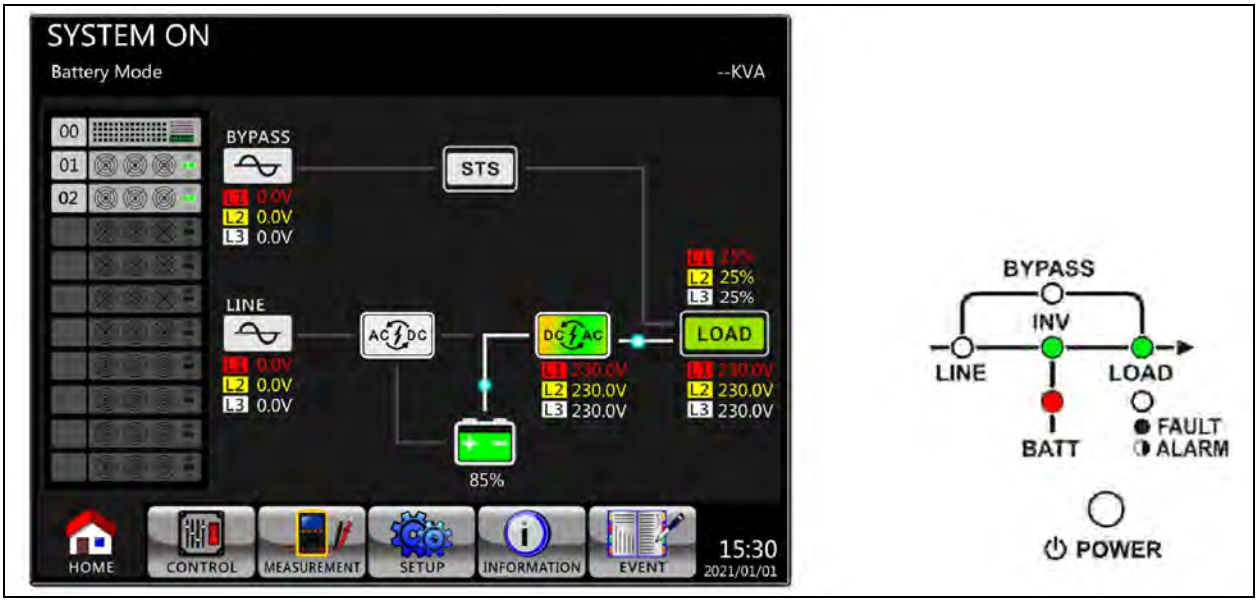
Figure 3.16 Entering into Battery Mode



5. As shown in the Figure 3.16 above , the UPS will then enter into Battery Mode.

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Figure 3.17 UPS in Battery Mode



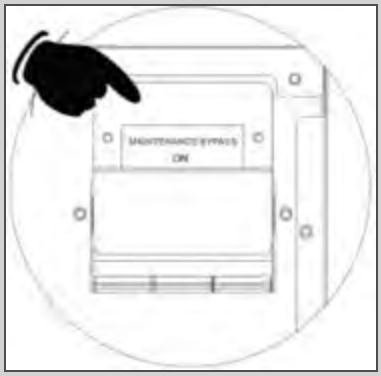
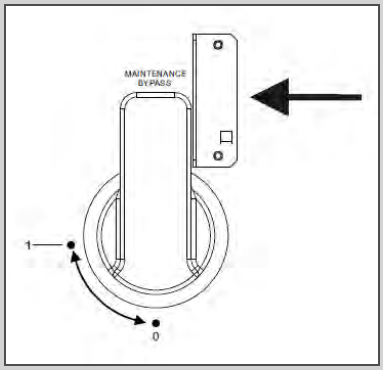
6. Turn the output breaker ON. Cold start startup procedure is complete.

3.3.3 Maintenance bypass operation

To switch from Line Mode to Maintenance bypass mode and back, follow instructions below.

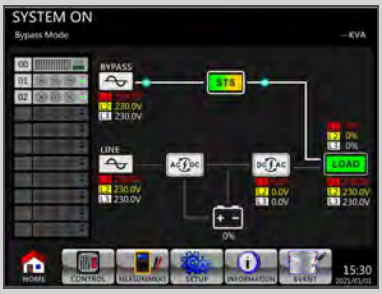
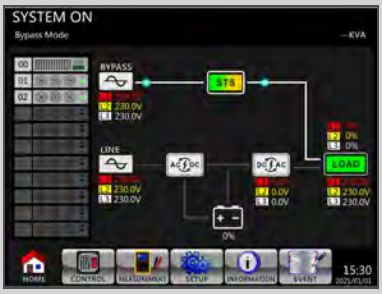
Transfer from Line Mode to Maintenance Bypass Mode

1. Remove the mechanical lock plate of maintenance bypass breaker.

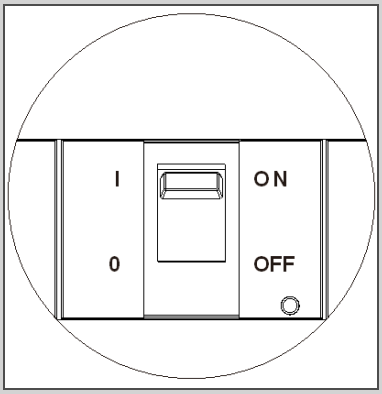
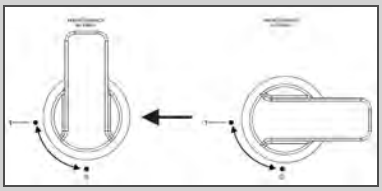
60kVA	120kVA~200kVA
	

2. Ensure that the UPS is operating in Bypass Mode.

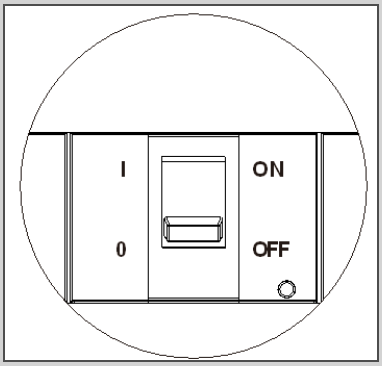
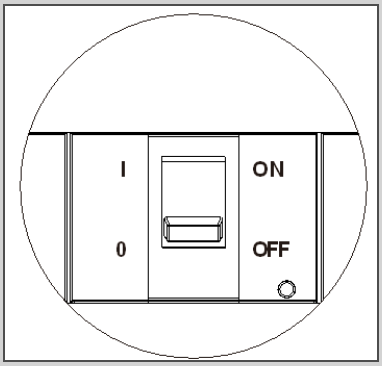
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60kVA	120kVA~200kVA
	

3. Turn the maintenance bypass breaker ON.

60kVA	120kVA~200kVA
	

4. Turn the AC input breaker OFF.

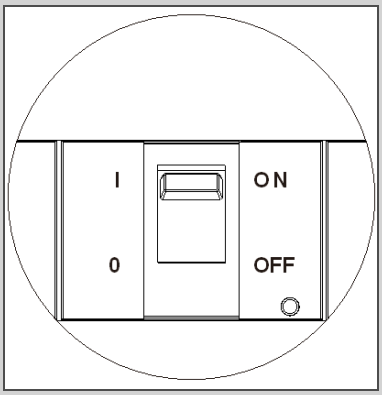
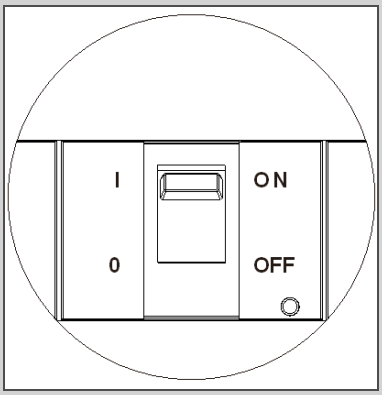
60kVA	120kVA~200kVA
	

5. Change the power module, if required.

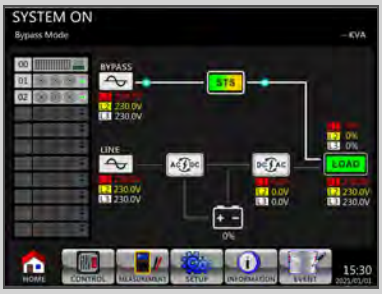
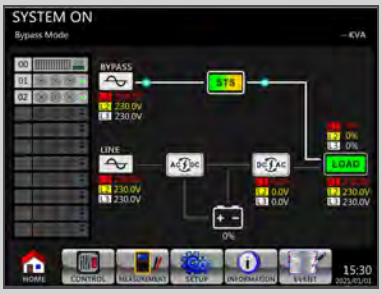
Transfer from Maintenance bypass mode to Line Mode

1. Make sure that the maintenance is complete. The power modules are correctly installed .
2. Turn the AC input breaker and the Bypass inbut breaker ON.

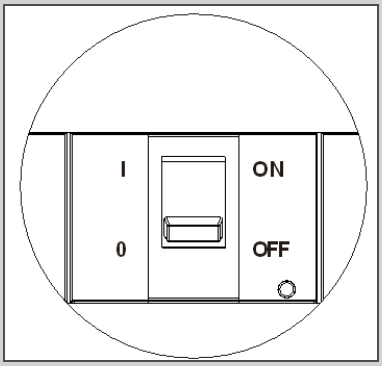
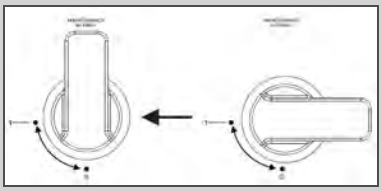
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60kVA	120kVA~200kVA
	

3. To ensure that the Bypass Mode is enabled, enter LCD SETUP MENU and choose SYSTEM. If the Bypass Mode is disabled, it must be set to enabled. Exit the SETUP menu and check if the UPS operates in Bypass Mode.

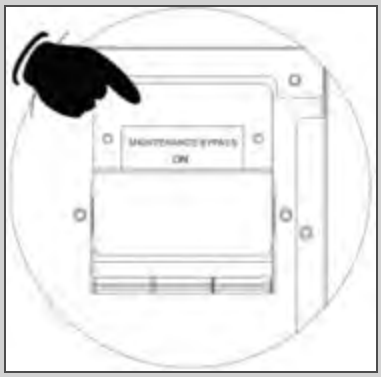
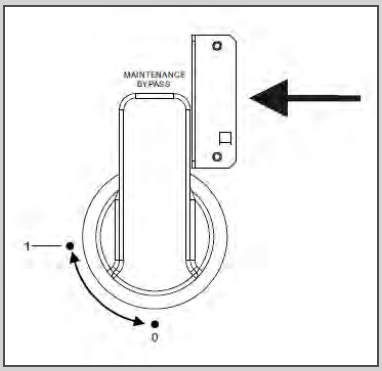
60kVA	120kVA~200kVA
	

4. Turn the Maintenance Bypass Breaker OFF.

60kVA	120kVA 200kVA
	

5. Lock the mechanical lock plate.

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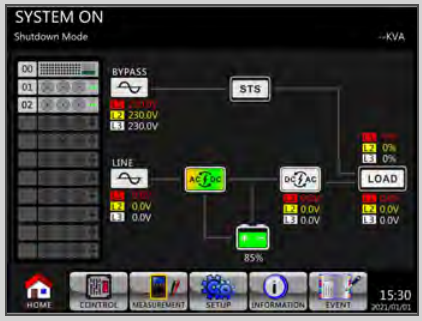
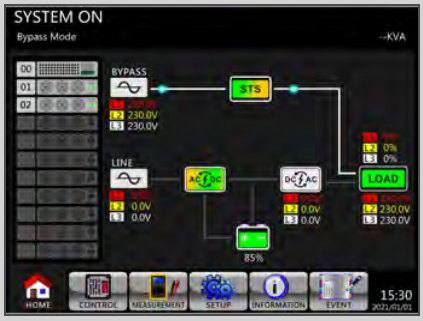
60kVA	120kVA~200kVA
	

3.3.4 Turn OFF operation

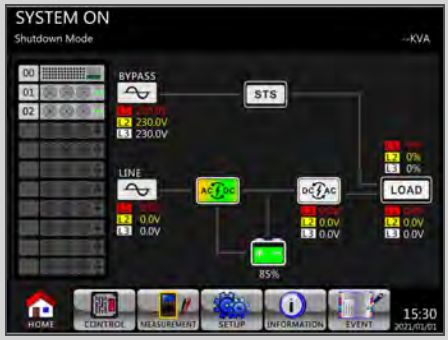
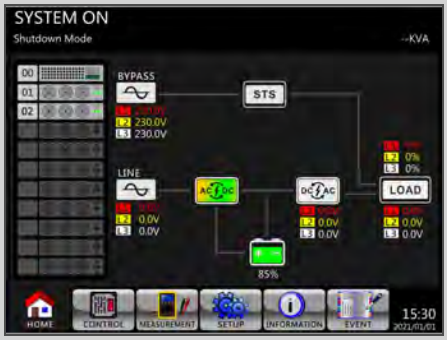
Turn OFF operation in Bypass Mode/Standby Mode

The UPS operates in Standby Mode or Bypass Mode when it is neither turned ON or OFF. It depends on the Bypass Mode setting.

The LCD diagrams are shown figure below:

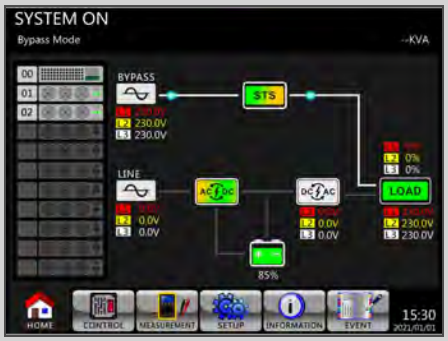
Bypass Mode setting is disabled	Bypass Mode setting is enabled
	

1. Turn the Input breaker OFF. The LCD diagrams are shown below.

Bypass Mode setting is disabled	
	

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Bypass Mode setting is enabled

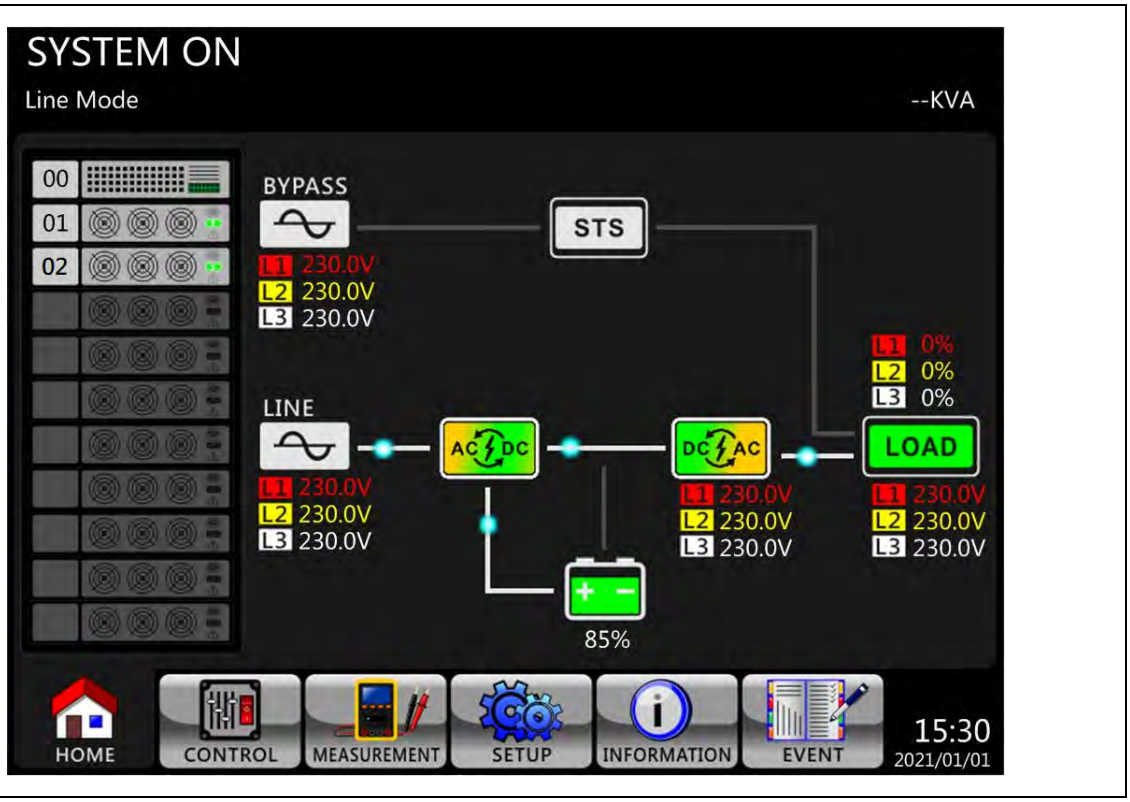


2. To disconnect the UPS from the AC power supply, turn OFF the external power switch. Wait until the LCD is completely turned OFF.
3. If the UPS will be disconnected from AC power for a long period of time, turn OFF the battery breaker.

Turn OFF operation in Line Mode

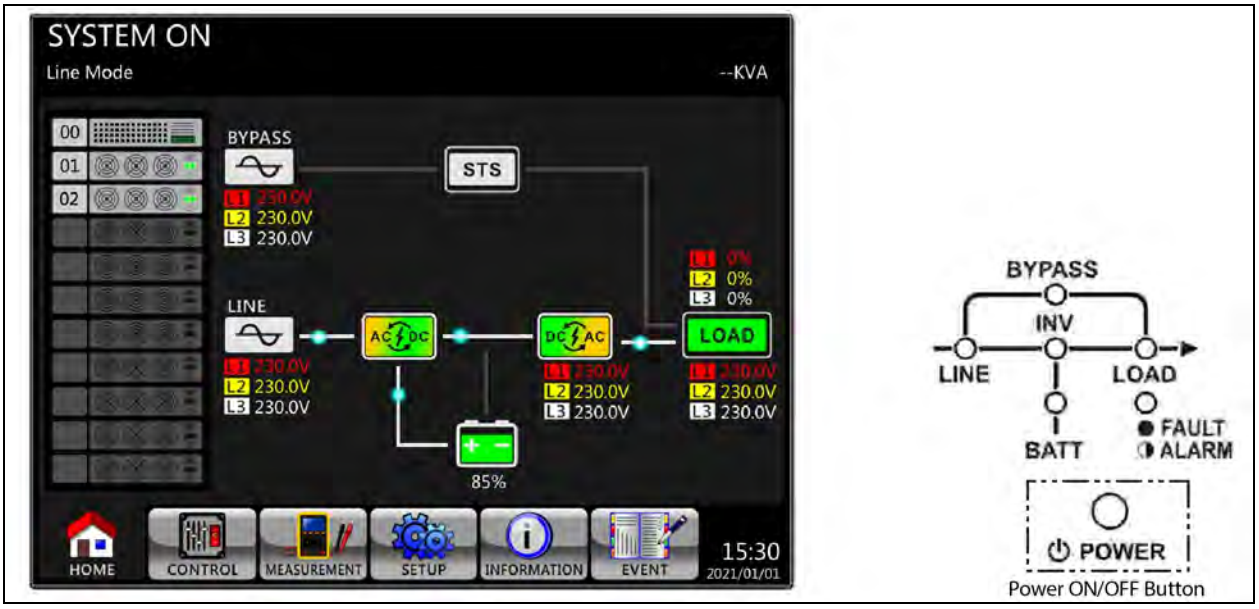
The LCD diagrams are shown below when the UPS operates in the Line Mode.

Figure 3.18 Turn OFF in Line Mode



1. Press and hold the *Power* button for 2 seconds to turn OFF the Inverter. Alternatively, use the LCD operation (Control ➔ Turn OFF) to turn OFF the UPS.

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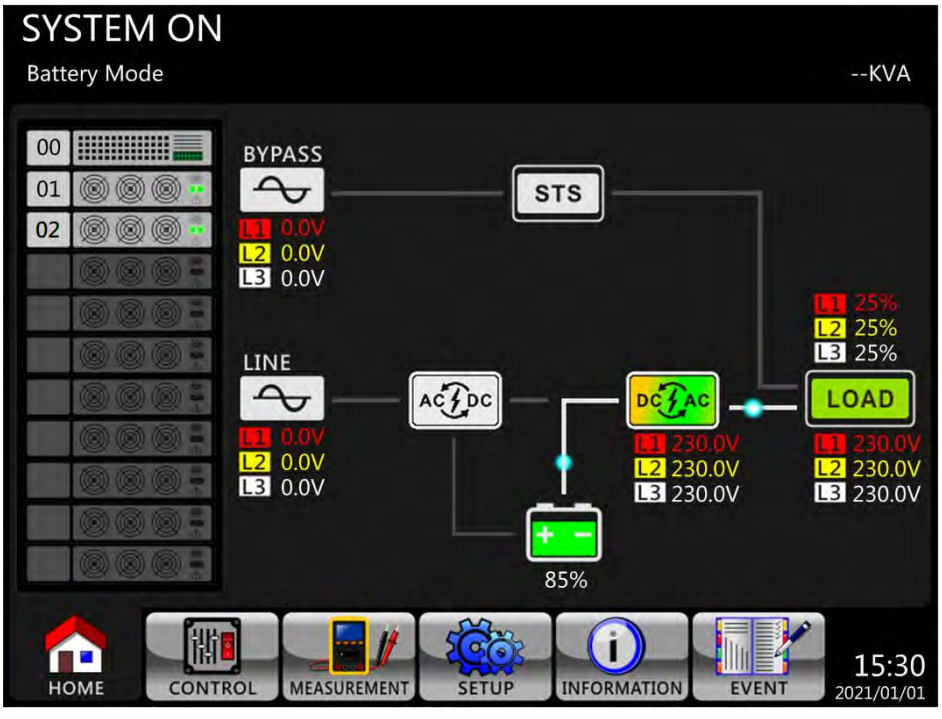


2. Depending on the Bypass Mode setting, the UPS will switch to Standby Mode or Bypass Mode once it is turned OFF. Then follow the procedure for Turn OFF Operation in Bypass Mode/Standby Mode.

Turn OFF operation in battery mode

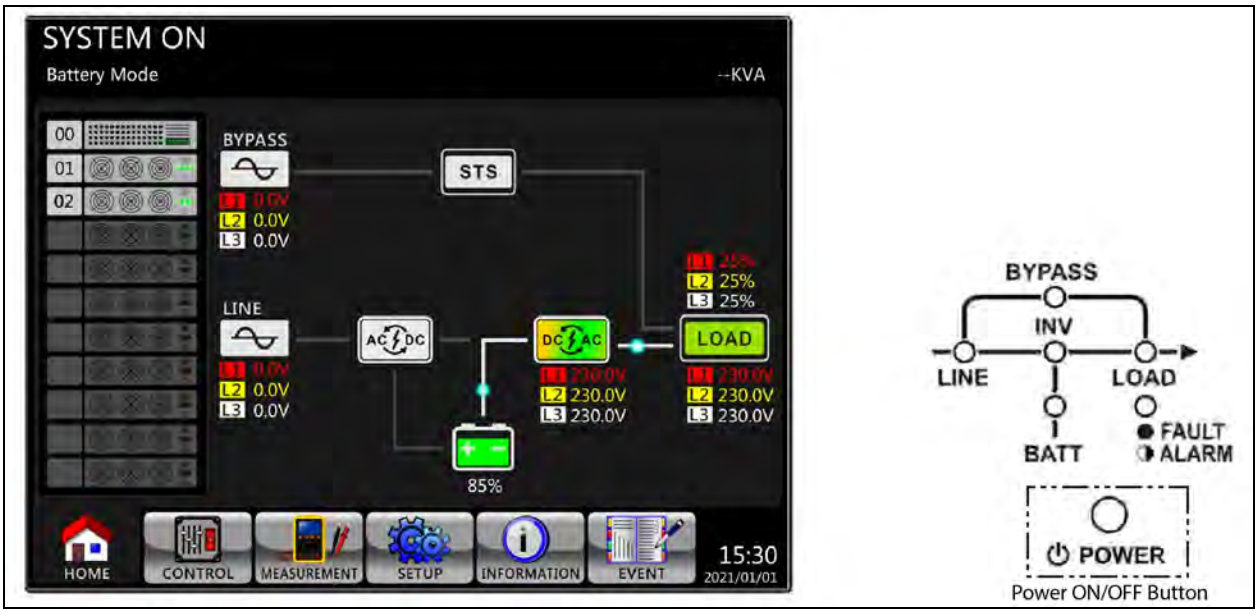
The LCD screen is shown in Figure 3.19 below when the UPS operates in the Battery Mode.

Figure 3.19 Operating in Battery Mode



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1. Press and hold the *POWER* button for 2 seconds to turn OFF the inverter. Alternatively, use the LCD operation (Control ➔ Turn OFF) to turn OFF the inverter.



2. The UPS will switch to Standby Mode once it is turned OFF. Follow the procedure for Turn OFF Operation in Bypass Mode/ Standby Mode.

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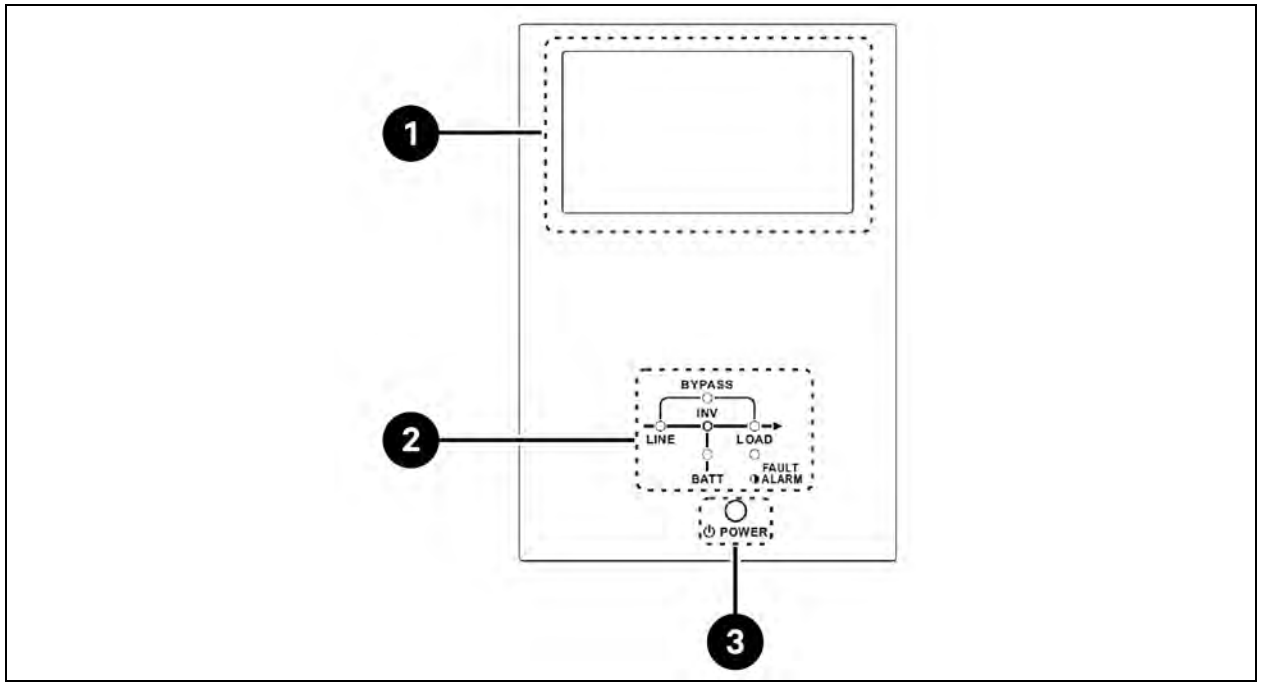
4 Control Panel and Display Description

4.1 Introduction

The control panel and display description are located on the front door of the UPS cabinet. It is the User control, monitoring of all measured parameters, as well as UPS and battery status and alarms. As shown in Figure 4.1 below the control panel is divided into three functional areas:

1. LCD Display: Graphic display for real time UPS status and all measured parameters.
2. LED Indications: Refer Table 4.1 on the next page .
3. Control Key: Refer Table 4.2 on the next page
4. Audio Alarm: Refer Table 4.3 on the next page .

Figure 4.1 Control Panel



Item	Description
1	LCD display
2	LED indicators
3	Power

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Table 4.1 LED Indications

LED	Color	Status	Definition
LINE	Green	ON	Input source is normal.
		Flashing	Input source is abnormal.
		OFF	No input source.
BYPASS	Yellow	ON	Load on Bypass.
		Flashing	Input source is abnormal.
		OFF	Bypass circuit is not operating.
LOAD	Green	ON	There is power output for the load.
		Off	There is no power output for the load.
INV	Green	ON	Load on inverters.
		OFF	Inverter circuit is not operating.
BATTERY	Red	On	Output power from Battery.
		Flashing	Low battery .
		OFF	Battery converter is normal, and battery is charged.
FAULT/ ALARM	Red	ON	UPS fault.
		Flashing	UPS alarm.
		OFF	Normal.

Table 4.2 Control Key Table

Control Key	Description
POWER	Turn ON UPS or turn OFF UPS. (hold for 2 seconds)

Table 4.3 Audible Alarm

Audio Type	Description
Power ON/OFF	Buzzer sounds for 2 seconds.
Battery mode	Buzzer sounds every 2 seconds.
Low battery	Buzzer sounds every half second.
UPS alarm	Buzzer sounds every 1 second.
UPS fault	Buzzer continuously sounds.

NOTE: Panel and Display are powered by bypass or battery.

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4.2 Screens

4.2.1 Start screen

The UPS performs a self-test upon startup. The initial screen displays and remains still for approximately 5 seconds as shown in Figure 4.2 below .

Figure 4.2 Initial Screen

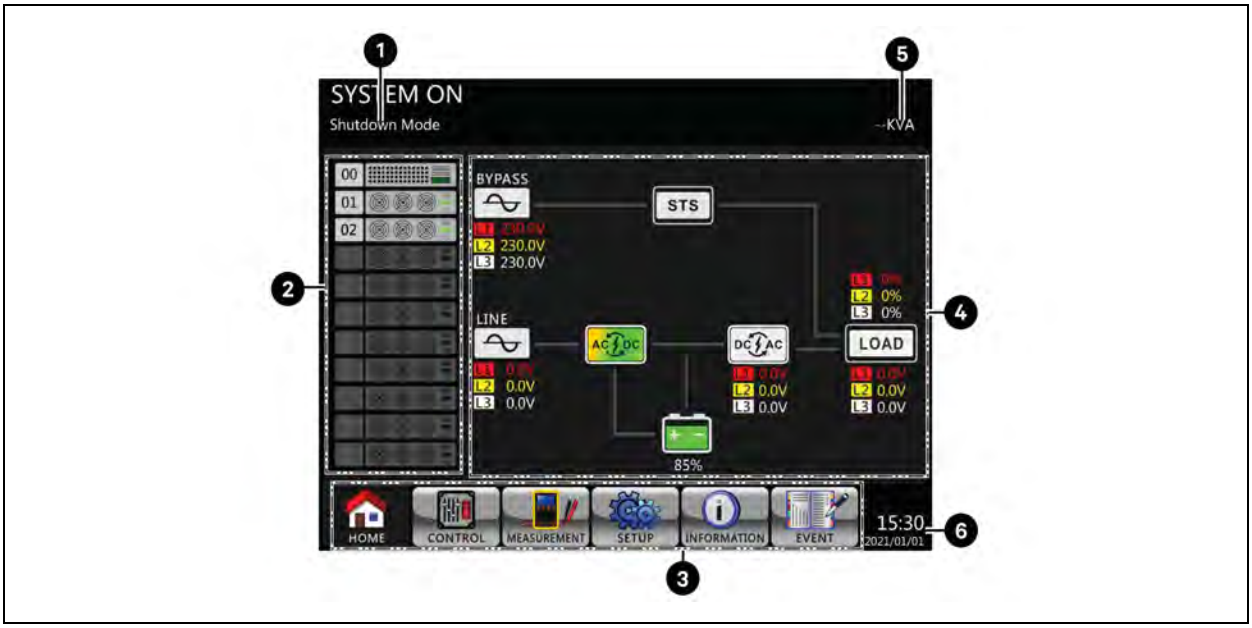


4.2.2 Main screen

The Main screen will be displayed after initialization as shown in Figure 4.3 on the next page . The Main screen is split into 6 sections.

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Figure 4.3 Main Screen



Item	Description
1	UPS Mode: Current operation mode.
2	Module status: It will display the active module number. Touch each module icon to enter measurement screen. The meanings of each icon are listed in **Table 4.4** below .
3	Main menu: Touch icon to enter sub screen.
4	UPS flowchart: Current flow chart and measurement data.
5	UPS power rating.
6	Date and time.

Table 4.4 Module Status

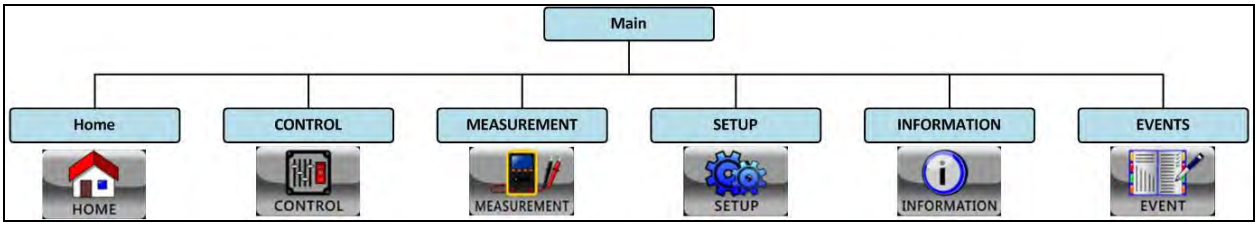
Module Icon	Explanation
	STS icon with ID number
	Power module icon with ID number
	No power module
	Power module output ON

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Table 4.4 Module Status (continued)

Module Icon	Explanation
	Power module output OFF
	Power module charger ON
	Power module charger OFF
	Power module fault
	Power module is operated normally

Figure 4.4 Main Menu



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4.2.3 Control screen

1. Touch the Control icon to enter the Control submenu. It will display the list of Control menu options as shown in Figure 4.5 below .

Figure 4.5 Control Screen Page



2. In the Control submenu, touch any control option from the list. The Confirmation screen will appear next as shown in Figure 4.6 on the facing page .
3. Touch Yes to confirm the command or touch No to cancel the command as shown in Figure 4.6 on the facing page .

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Figure 4.6 Confirmation Screen



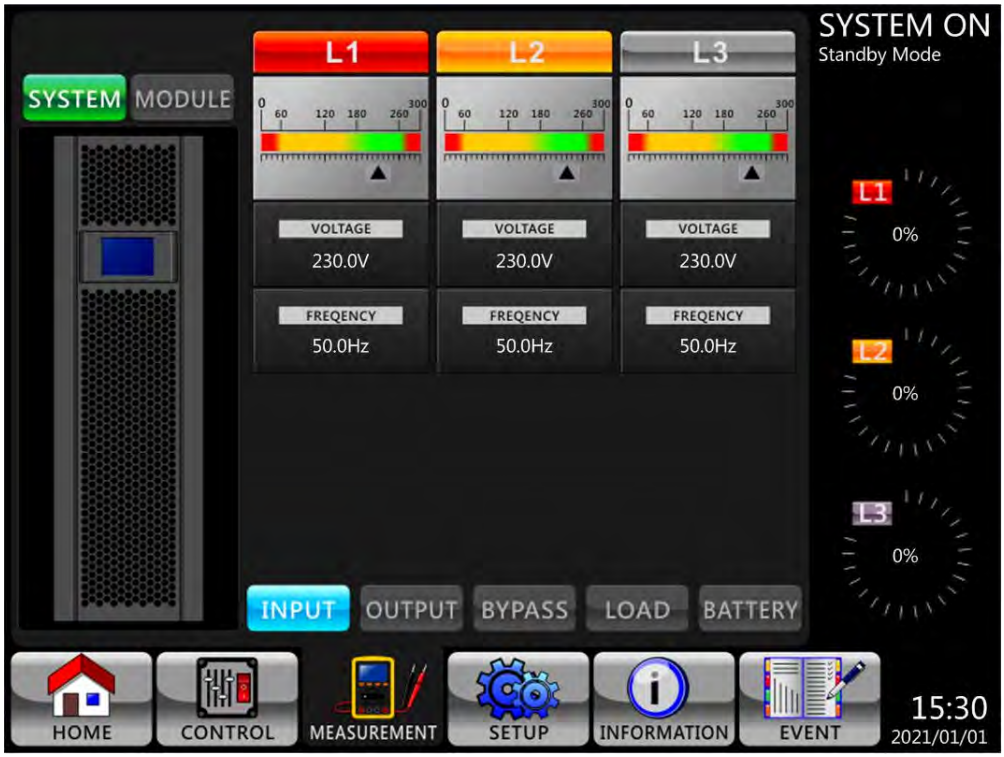
4.2.4 Measurement screen

1. Touch the Measurement icon to enter the Measurement submenu. In the Measurement submenu, there are 2 submenus, System Measurement, and Module Measurement.
2. Touch System to monitor system measurement value or touch Module to monitor module measurement value.
3. Under the System or Module directory, select the Input, Output, Bypass, Load, or Battery, to monitor the detailed status.
4. Refer Figure 4.7 on the next page for System Measurement Screens and Figure 4.12 on page 65 for Module Measurement Screens. All detailed measurement items are listed in Table 4.5 on page 68 .

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5. To monitor the system measurement value, touch System.

Figure 4.7 System Measurement Screen-Input

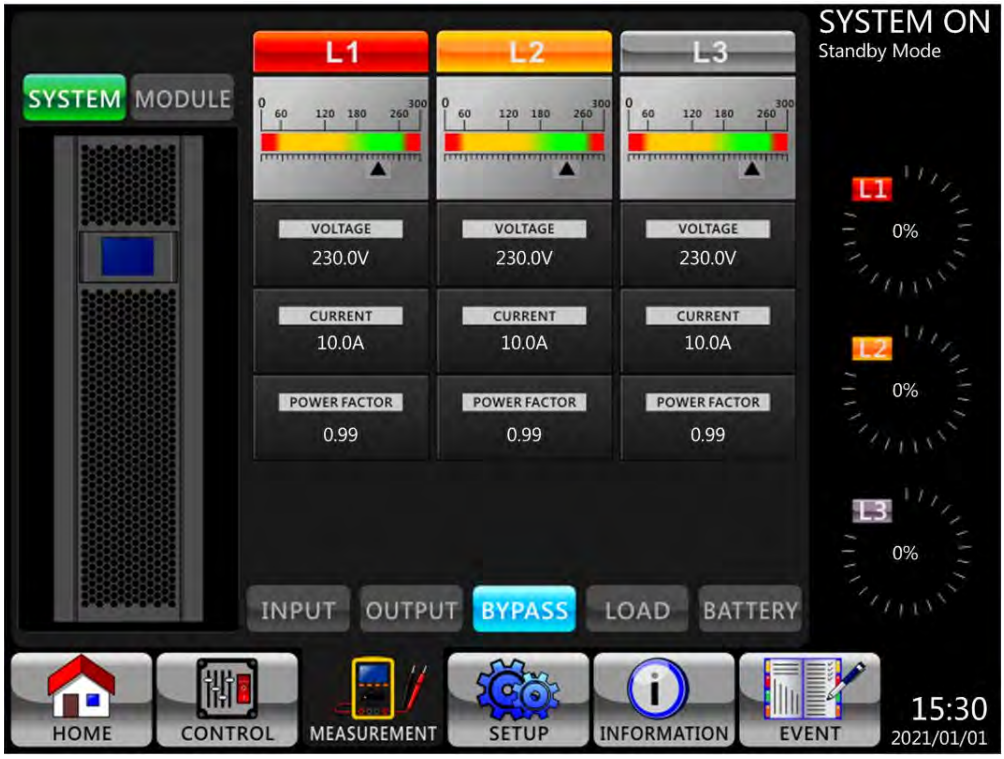


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Figure 4.8 System Measurement Screen-Output



Figure 4.9 System Measurement Screen-Bypass

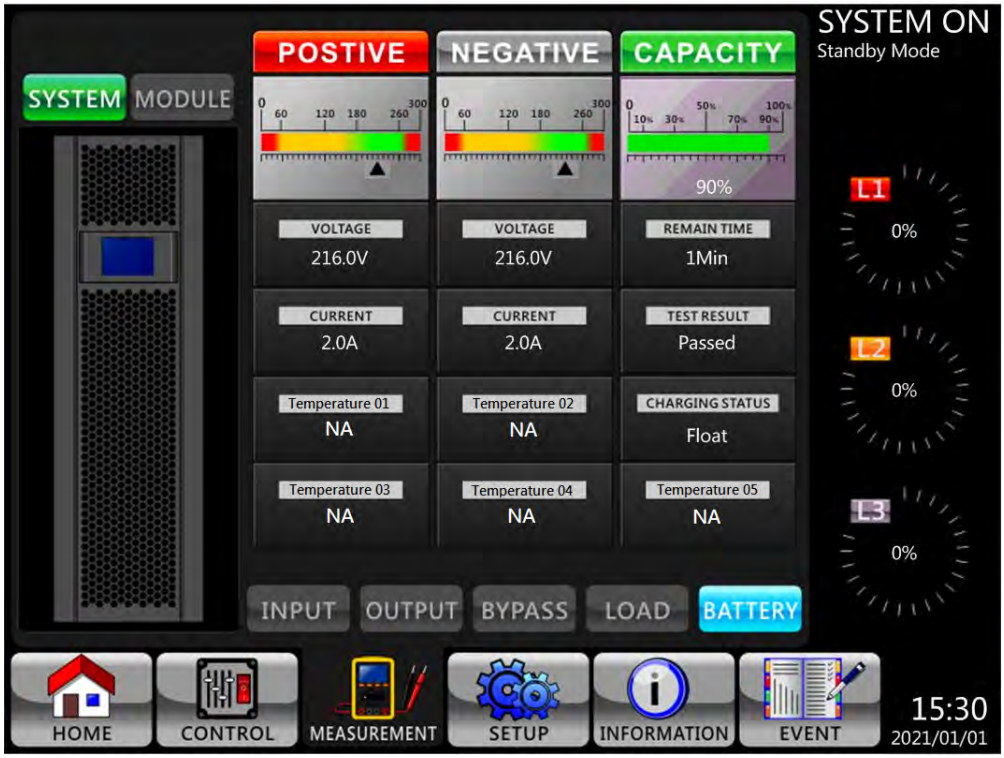


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Figure 4.10 System Measurement Screen-Load



Figure 4.11 System Measurement Screen-Battery



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6. To monitor the module measurement value, touch the MODULE icon.

Figure 4.12 Module Measurement Screen-Input



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Figure 4.13 Module Measurement Screen-Output

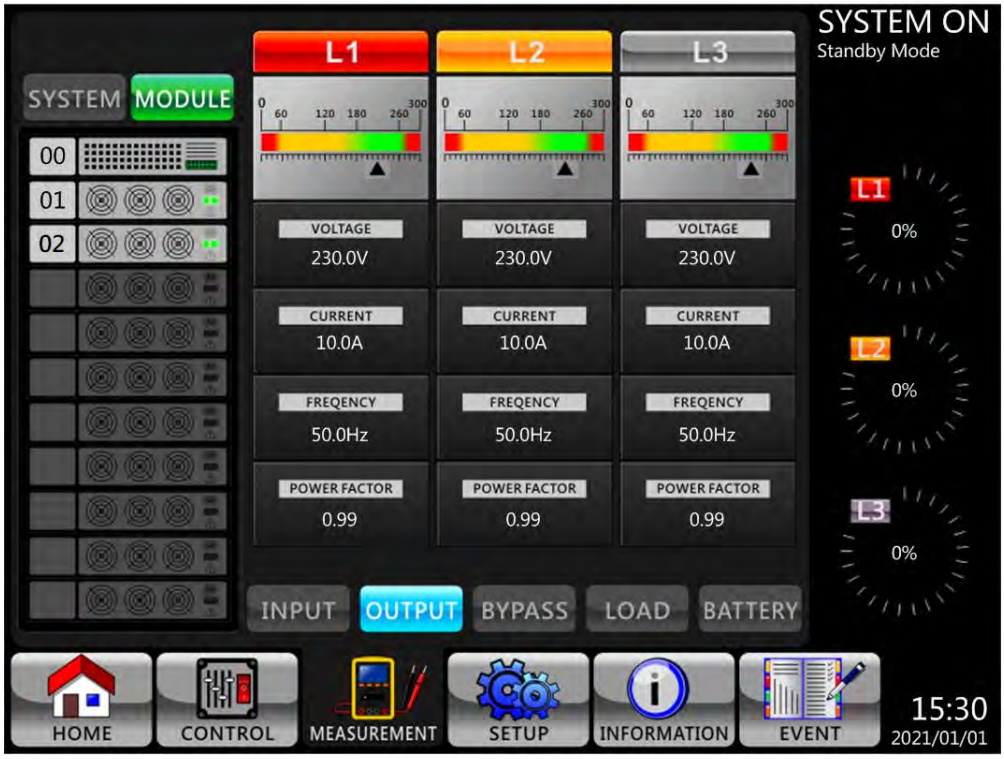


Figure 4.14 Module Measurement Screen-Bypass



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Figure 4.15 Module Measurement Screen-Load

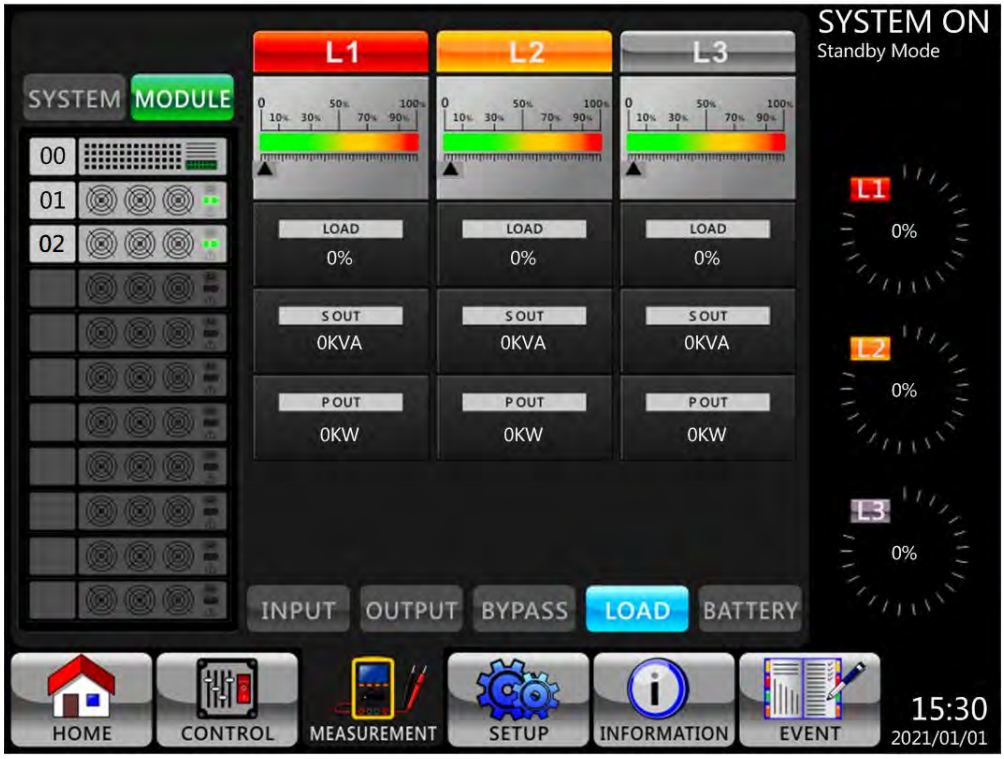
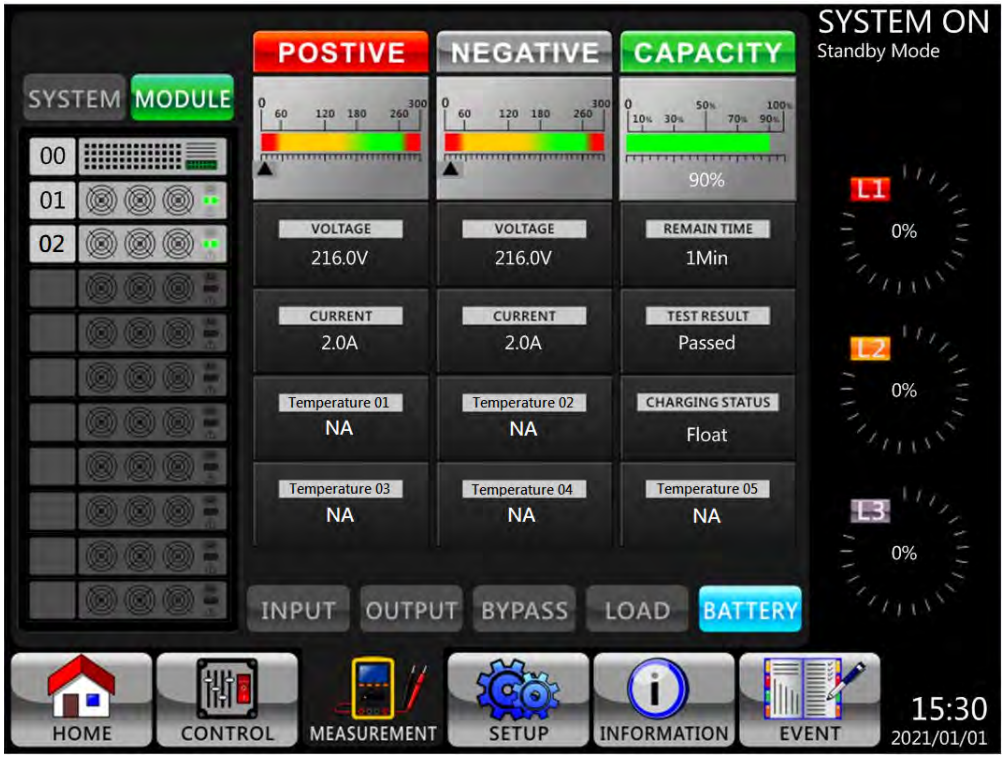


Figure 4.16 Module Measurement Screen-Battery



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The detailed measurement items are listed in Table 4.5 below .

Table 4.5 Measurement Data

Menu	Item	Explanation
Input	L-N Voltage (V)	Input phase voltage (L1, L2, L3). Units 0.1V.
	Frequency (Hz)	Input frequency (L1, L2, L3). Units 0.1Hz.
Output	L-N Voltage (V)	Output phase voltage (L1, L2, L3). Units 0.1V.
	L-N Current (A)	Output phase current (L1, L2, L3). Units 0.1A.
	Frequency (Hz)	Output frequency (L1, L2, L3). Units 0.1Hz.
	Power Factor	Output power factor (L1, L2, L3).
Bypass	L-N Voltage (V)	Bypass phase voltage (L1, L2, L3). Units 0.1V.
	Frequency (Hz)	Bypass frequency (L1, L2, L3). Units 0.1Hz.
	Power Factor	Bypass power factor (L1, L2, L3).
Load	Sout (kVA)	Apparent power. Units 0.1kVA.
	Pout (KW)	Active power. Units 0.1KW.
	Load Level (%)	The percentage of the UPS rating load. Units 1%.
Battery	Positive Voltage (V)	Battery positive voltage. Units 0.1V.
	Negative Voltage (V)	Battery negative voltage. Units 0.1V.
	Positive Current (A)	Battery positive current. Units 0.1A.
	Negative Current (A)	Battery negative current. Units 0.1A.
	Remain Time (Sec)	Battery run time remaining. Units 1sec.
	Capacity (%)	The percentage of the capacity of the battery. Units 1%.
	Test Result	Battery test result
	Charging Status	Battery charging status
	Temperature1 (°C)	Battery cabinet temperature of STS module. Units 0.1 °C.

4.2.5 Setup screen

1. Touch the Setup icon to enter the Setup submenu. The Setup submenu is password protected. To access the General, System, Battery, Pre-Alarm, it is required to enter password.
2. Touch the grey field, a numbered keyboard will appear as shown in Figure 4.17 on the facing page .
3. To access the Setup submenu, enter the 4 digit password and click the Enter button. The LCD screen would prompt for a retry if the password entered is incorrect as shown in below Figure 4.18 on page 70 .

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Figure 4.17 Enter Password Screen





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Figure 4.18 Error, Wrong Password



NOTE: There are two levels of password protection, the user password and the maintainer password. The default user password is 0000. The user can change the default password.

NOTE: The maintainer password is owned by service personnel. Entering different levels of password allow access to different settings. The setting can be changed in different operation mode.

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Table 4.6 All Setting Items in Setup Menu

UPS Operation Mode		Standby Mode	Bypass Mode	Line Mode	Battery Mode	Battery Test Mode	Fault Mode	Converter Mode	ECO Mode	Authorization	
Setting Item										User	Maintainer
General	Model Name	Y	Y	Y	Y	Y	Y	Y	Y		Y
	Language	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	TIME	Y	Y	Y	Y	Y	Y	Y	Y		Y
	Change Password	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Baud Rate	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Audible Alarm	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Factory Reset	Y									Y
	EPO Function	Y									Y
	EEPROM Reset	Y									Y
	Save Setting	Y	Y							Y	Y
	Startup Screen	Y	Y	Y	Y	Y	Y	Y	Y		Y

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Table 4.6 All Setting Items in Setup Menu (continued)

UPS Operation Mode		Standby Mode	Bypass Mode	Line Mode	Battery Mode	Battery Test Mode	Fault Mode	Converter Mode	ECO Mode	Authorization	
Setting Item										User	Maintainer
System	Output Voltage	Y	Y								Y
	Bypass Voltage Range	Y	Y	Y	Y	Y	Y	Y	Y		Y
	Bypass Frequency Range	Y	Y								Y
	Converter Mode	Y									Y
	ECO Mode	Y	Y								Y
	Bypass Mode	Y	Y								Y
	Auto-Restart	Y	Y	Y	Y	Y	Y	Y	Y		Y
	Power Walk in	Y	Y	Y	Y	Y	Y	Y	Y		Y
	Battery Mode Delay Time	Y	Y	Y			Y	Y	Y		Y
	System Shutdown Time	Y	Y	Y	Y	Y	Y	Y	Y		Y
	System Restore Time	Y	Y	Y	Y	Y	Y	Y	Y		Y
	Redundancy	Y	Y	Y	Y	Y	Y	Y	Y		Y
	Power Rating Setting	Y	Y	Y	Y	Y	Y	Y	Y		Y

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Table 4.6 All Setting Items in Setup Menu (continued)

UPS Operation Mode		Standby Mode	Bypass Mode	Line Mode	Battery Mode	Battery Test Mode	Fault Mode	Converter Mode	ECO Mode	Authorization	
Setting Item										User	Maintainer
Battery	Nominal Battery Voltage	Y	Y								Y
	Battery Capacity in Ah	Y	Y	Y			Y	Y	Y		Y
	Maximum Charging Current	Y	Y								Y
	Battery Low/Shutdown Setting	Y	Y	Y			Y	Y	Y		Y
	Periodic Battery Test	Y	Y	Y	Y	Y	Y	Y	Y		Y
	Battery Test Interval	Y	Y	Y	Y	Y	Y	Y	Y		Y
	Stop by Time	Y	Y	Y	Y		Y	Y	Y		Y
	Stop by Battery Voltage	Y	Y	Y	Y		Y	Y	Y		Y
	Stop by Battery Capacity	Y	Y	Y	Y		Y	Y	Y		Y
	Battery Age Alert	Y	Y	Y	Y	Y	Y	Y	Y		Y
	Temperature Compensation	Y	Y	Y	Y	Y	Y	Y	Y		Y
	Charging Voltage	Y	Y								Y

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Table 4.6 All Setting Items in Setup Menu (continued)

UPS Operation Mode / Setting Item		Standby Mode	Bypass Mode	Line Mode	Battery Mode	Battery Test Mode	Fault Mode	Converter Mode	ECO Mode	Authorization	
										User	Maintainer
Pre-Alarm	Line Voltage Range	Y	Y	Y	Y	Y	Y	Y	Y		Y
	Line Frequency Range	Y	Y	Y	Y	Y	Y	Y	Y		Y
	Overload	Y	Y	Y	Y	Y	Y	Y	Y		Y
	Load Unbalance	Y	Y	Y	Y	Y	Y	Y	Y		Y

"Y"* means that the setting item can be set in this operation mode.

Setting procedure

1. Choose a setting item from General, System, Battery, Pre-Alarm, and Others.
2. Select the modified item, and the current value and setting will be displayed on screen. Select the current setting and it will list all alternatives. Select the modified setting.
3. Select Enter to confirm the setting change or select ESC icon to cancel the setting. See Figure 4.20 on the facing page .
4. Save the setting in General screen, after finishing the setting.

Figure 4.19 Setup Screen 1



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Figure 4.20 Setup Screen 2



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4.2.6 General setup screen

The General setting list is shown in Table 4.7 below . General settings can be set in any operating mode.

Figure 4.21 General Setup Screen

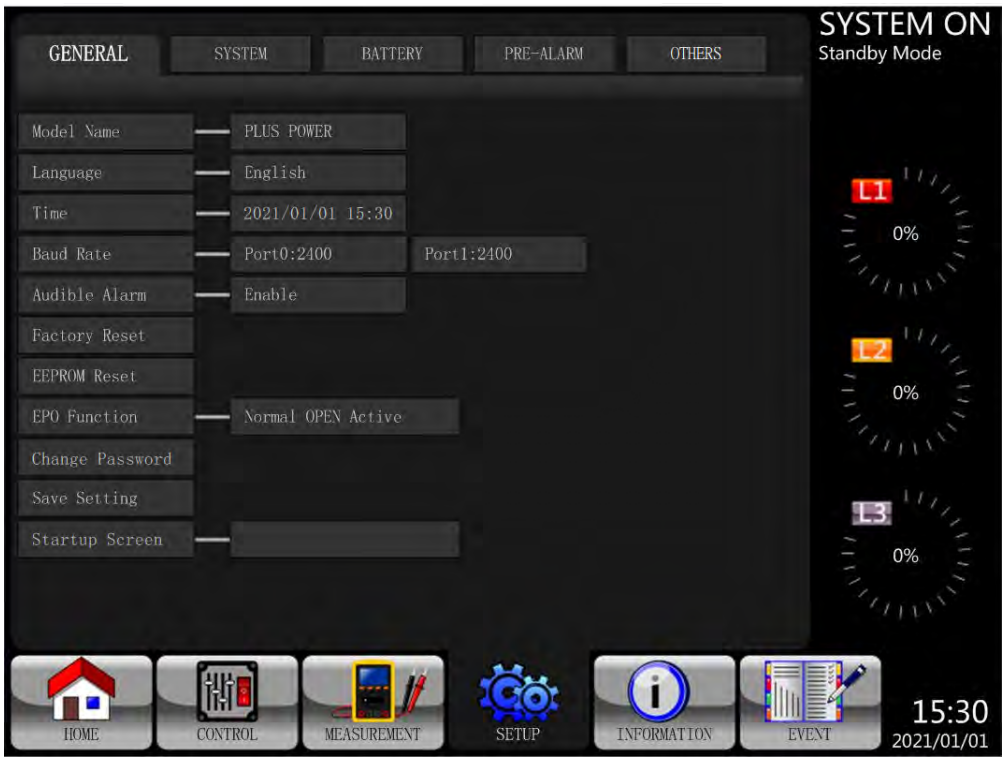


Table 4.7 Setup General Setting List

Setting Item	Sub Item	Explanation
Model Name		Set UPS Name. The maximum length is 10 characters.
Language	--	Select the languages from below: • English • Italian • French • Spanish • Portuguese • German • Turkish • Rusian • Polish
Time	Adjust Time	Set current date and time. yyyy/mm/dd hour:min:sec. **NOTE: Must be set after UPS installation.**

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Table 4.7 Setup General Setting List (continued)

Setting Item	Sub Item	Explanation
	System Installation Date	Set system installed date yyyy/mm/dd Default is 2015/01/01 **NOTE: Must be set after UPS installation.**
	System Last Maintainance Date	Set system latest maintenance date (yyyy/mm/ dd) **NOTE: Must be set after UPS installation.**
	Battery Installation Date	Set battery installed date (yyyy/mm/ dd) **NOTE: Must be set after UPS installation.**
	Battery Last Maintenance Date	Set battery latest maintenance date (yyyy/ mm/dd) **NOTE: Must be set after UPS installation.**
Baud Rate	--	Set COM Port0 Baud Rate: • 2400 (Default) • 4800 • 9600 Set COM Port1 Baud Rate: • 2400 (Default) • 4800 • 9600
Audible Alarm	--	Set Audible Alarm: • Disable • Enable (Default)
Factory Reset	--	Restore to factory default setting: Refer to **Table 4.8** on the next page
EPO Function		Set EPO function: • Normal open • Normal close
EEPROM Reset	--	Set EEPROM default: Refer to **Table 4.8** on the next page
Password	--	Set New Password: 0000 (Default)
Save Setting	--	Save EEPROM. **NOTE: Use this feature to save the settings.**

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Table 4.8 EEPROM Reset Category List

Setting Item		Factory Reset	EEPROM Reset
General	Model Name	Y	Y
	Language	Y	Y
	Adjust Time	Y	Y
	System Installed Date	Y	Y
	System Last Maintain Date	Y	Y
	Battery Installed Date	Y	Y
	Battery Last Maintain Date	Y	Y
	Change Password	Y	Y
	Baud Rate	Y	Y
	Audible Alarm	Y	Y
	Factory Reset	--	--
	EEPROM Reset	--	--
	EPO Function	Y	Y
	Save Setting	--	--
	Serial Number		Y
System	Output Voltage	Y	Y
	Bypass Voltage Range	Y	Y
	Bypass Frequency Range	Y	Y
	Converter Mode	Y	Y
	ECO Mode	Y	Y
	Bypass Mode	Y	Y
	Auto-Restart	Y	Y
	Battery Mode Delay Time	Y	Y
	System Shutdown Time	Y	Y
	System Restore Time	Y	Y
	Redundancy	Y	Y
	Power Rating Setting	Y	Y
	Charger Test	--	--
	Calibration Data		Y

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Table 4.8 EEPROM Reset Category List (continued)

Setting Item		Factory Reset	EEPROM Reset
Battery	Nominal Battery Voltage	Y	Y
	Battery Capacity in Ah	Y	Y
	Maximum Charging Current	Y	Y
	Battery Low/Shutdown Setting	Y	Y
	Periodic Battery Test	Y	Y
	Battery Test Interval	Y	Y
	Stop by Time	Y	Y
	Stop by Battery Voltage	Y	Y
	Stop by Battery Capacity	Y	Y
	Battery Age Alert	Y	Y
	Temperature Compensation	Y	Y
	Charging Voltage	Y	Y
	Auto-Restart Battery Voltage	Y	Y
Pre-Alarm		Y	Y

System Setup menu

Refer to Figure 4.22 on the next page for the System Setup screen and Table 4.9 on page 81 for Setting List. System settings can be set only when the UPS is operated in specific mode. Refer to Table 4.6 on page 71 to check setting item availability. If the UPS is not set up under specific mode, the Warning screen shown in Figure 4.23 on the next page will appear if it is not set up in specific mode.

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Figure 4.22 Setup System Screen

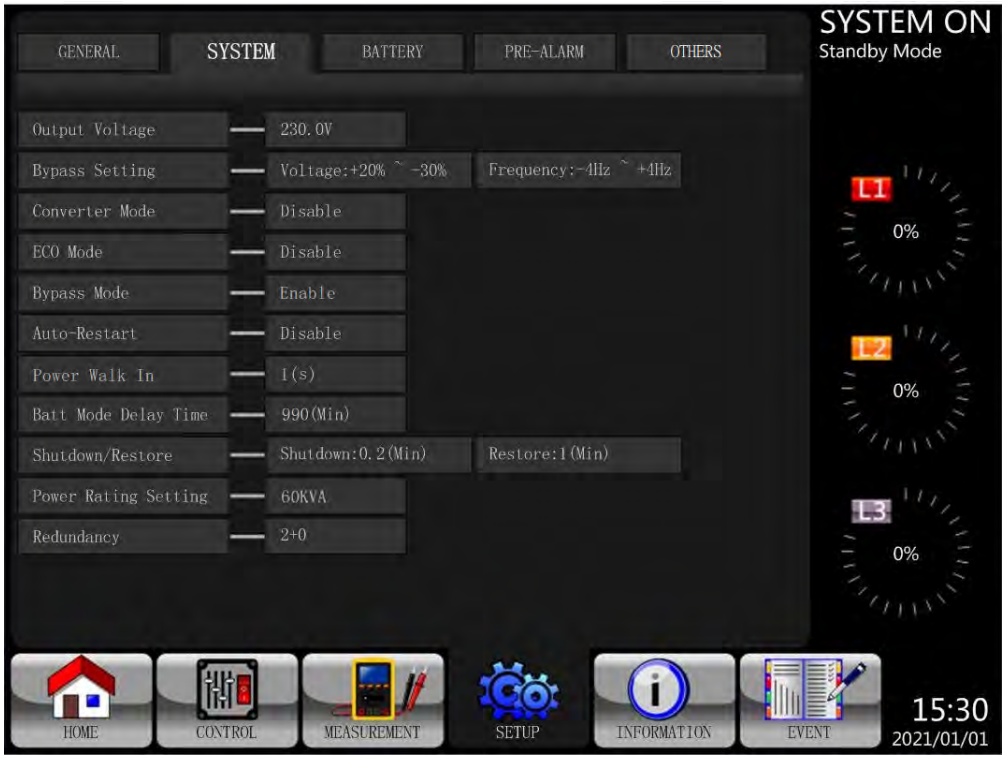


Figure 4.23 Warning Screen



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System setting list is shown in Table 4.7 on page 76

Table 4.9 System Setting List

Setting Item	Sub Item	Explanation
Output Voltage	--	Set output voltage • 220VAC • 230VAC (Default) • 240VAC **NOTE: Must be reviewed after UPS installation.**
Bypass Setting	Bypass Voltage Range	Set bypass voltage range Upper limit • +10% • +15% • +20% (Default) Lower limit • -10% • -20% • -30% (Default)
	Bypass Frequency Range	Set bypass Frequency range Upper/ Lower limit • +/- 1Hz • +/- 2Hz • +/- 4Hz (Default)
Converter Mode	--	Set converter mode • Disable (Default) • Enable • 50Hz • 60Hz • AUTO
ECO Mode	--	Set ECO mode • Disable (Default) • Enable
Bypass Mode	--	Set bypass mode • Disable • Enable (Default) **NOTE: Must be reviewed after UPS installation.** If required, enable the Bypass power when UPS is OFF.
Auto Restart	--	Set auto-restart • Disable • Enable (Default) Once Enable is set, the UPS will return to line mode if the UPS is shut down due to low battery and the utility is restored.

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Table 4.9 System Setting List (continued)

Setting Item	Sub Item	Explanation
Power Walk in		Set power walk in upper/lower limits: • +/- 1s time step (setting range: 1s to 10s)
Battery Mode Delay Time	--	Set system shutdown delay time in battery mode (0 to 990min). • 0: Disable (Default) • Not 0: Enable When this feature is enabled, UPS will turn off the output after a certain amount of time when it operates in battery mode.
Shutdown/Restore	System Shutdown Time	Set system shutdown time (0.2~99min) • 0.2 min (Default) This delay time will start counting when the CONTROL-Shutdown Restore command is executed.
	System Restore Time	Set system restore time (0 to 9999min) • 1 min (Default) This delay time will start counting after shutdown time is elapsed when the CONTROL-Shutdown Restore command is executed.
Power Rating Setting	--	Set power rating value per module: • 50kVA for MTP 100kVA • 60kVA for MTP 60kVA and MTP 120kVA • 53kVA for MTP 160kVA • 67kVA for MTP 200kVA
Redundancy	--	Set total power and redundancy. Redundancy: the QTY of redundant power module. **NOTE: Must be set after UPS installation or the QTY of Power Module is changed.**
CT Ratio Setting		Set the Bypass CT ratio • 60kVA • 120kVA • 200kVA **NOTE: To be set according to the cabinet type, not the actual power rating.**

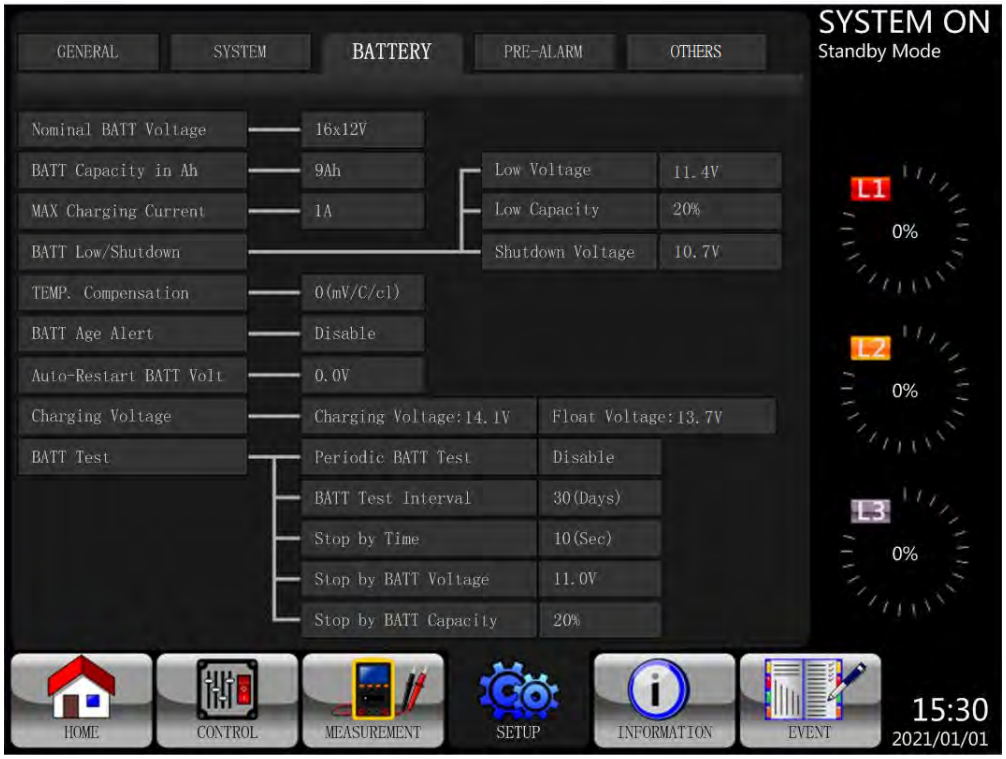
NOTE: Total number of modules=X+N where N is the number of Redundant UPSs.

Battery screen

Refer to Figure 4.30 on page 90 for Battery Screen and Table 4.10 on the facing page for the battery seting list. Battery setting can be set only when the UPS is operated in standby mode. If the UPS is not in Standby Mode, the Warning Screen will appear as shown in Figure 4.23 on page 80 .

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Figure 4.24 Battery Screen



Refer to Table 4.10 below for setup battery setting list.

Table 4.10 Battery Setting List

Setting Item	Sub Item	Explanation
Nominal Battery Voltage	--	Set battery nominal voltage: • 16x12V (Default) • 18x12V • 20x12V **NOTE: Must be set after UPS installation.** **NOTE: By setting the number of battery blocks of half string.**
Battery Capacity in Ah	--	Set battery capacity (0 to 999) • 9Ah (Default) **NOTE: Must be set after UPS installation or battery capacity is changed.**
Maximum Charging Current	--	Set battery maximum charging current (1 to 54A) 1A (Default) **NOTE: Must be set after UPS installation or battery capacity is changed.**
Battery Low/ Shutdown Setting	Low Voltage	Set battery low voltage (10.5 to 11.5V)x(battery number) • 11.4V x Battery number (Default)
	Low Capacity	Set battery low capacity (20 to 50%)

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Table 4.10 Battery Setting List (continued)

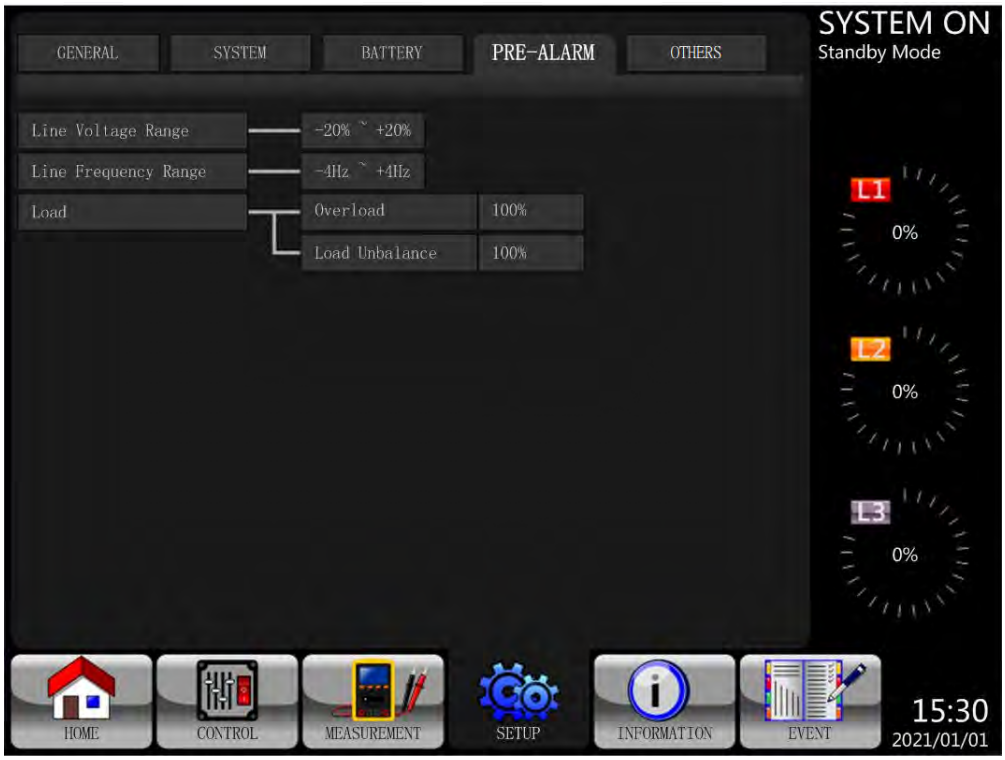
Setting Item	Sub Item	Explanation
		• 20% (Default)
	Shutdown Voltage	Set battery voltage point for system shutdown in battery mode (10.0 to 11V) x (battery number) • 10.7V x battery number (Default)
Battery Test	Periodic Battery Test	Set periodic battery test disable or enable • Disable (Default) • Enable
	Battery Test Interval	Set battery test interval (7 to 99 Days) • 30 Days (Default)
	Stop by Time	Set testing time for battery test (10 to 1000sec) • 10 sec (Default)
	Stop by Battery Voltage	Set stop battery voltage in battery test (11 to 12V) x (battery number) • 11V x battery number (Default)
	Stop by Battery Capacity	Set battery capacity to stop battery testing. (20to 50%) • 20% (Default)
Battery Age Alert	Battery Age Alert (Months)	Set battery age for replacement. (Disable,12 to 120Months) • Disable (Default) If this feature is enabled and the battery has been installed during this period of time, a “Battery Age Alert” warning will appear.
Temperature Compensation	--	Set battery temperature compensation. (0~-5 (mV/C/cl)) • 0(mV/C/cl) (Default)
Auto Restart BATT Volt	--	Set battery auto restart voltage • 0V (Default)
Charging Voltage	--	Set battery charging voltage. (14.1~14.4V) • 14.1V(Default) Set battery float voltage. (13.5~14.0V) • 13.7V(Default)

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Pre-Alarm screen

Refer to Figure 4.25 below to see the Pre-Alarm screen and Table 4.11 on the next page for Pre-Alarm setting list. Pre-Alarm settings can be set in any operation mode.

Figure 4.25 Pre-Alarm Screen



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Table 4.11 Pre-Alarm Setting List

Setting Item	Sub Item	Explanation
Line Voltage Range	--	Set line voltage range: Upper limit: • +5% • +10% • +15% • +20% (Default) Lower limit: • -5% • -10% • -15% • -20% (Default)
Line Frequency Range	--	Set line frequency range: Upper / Lower limit: • +/- 1Hz • +/- 2Hz • +/- 3Hz • +/- 4Hz (Default)
Load	--	Set UPS Overload percentage (40~100%) • 100% (Default) Set UPS load unbalance percentage (20~100%) • 100% (Default)

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Setup Others screen

To switch between the different submenus, use the Up and Down icons. To access the Others settings screen, press the *ENTER* key, as shown in Figure 4.26 below .

Figure 4.26 Setup Others Screen



Refer to Table 4.12 below for Dynamic Password Settings.

Table 4.12 Setup Dynamic Password Setting List

Setting Item	Sub Item	Description
Dynamic Password	--	Set Dynamic Password disable or enable • Disable (Default) • Enable
Customer ID	--	• The default customer code is 0000000

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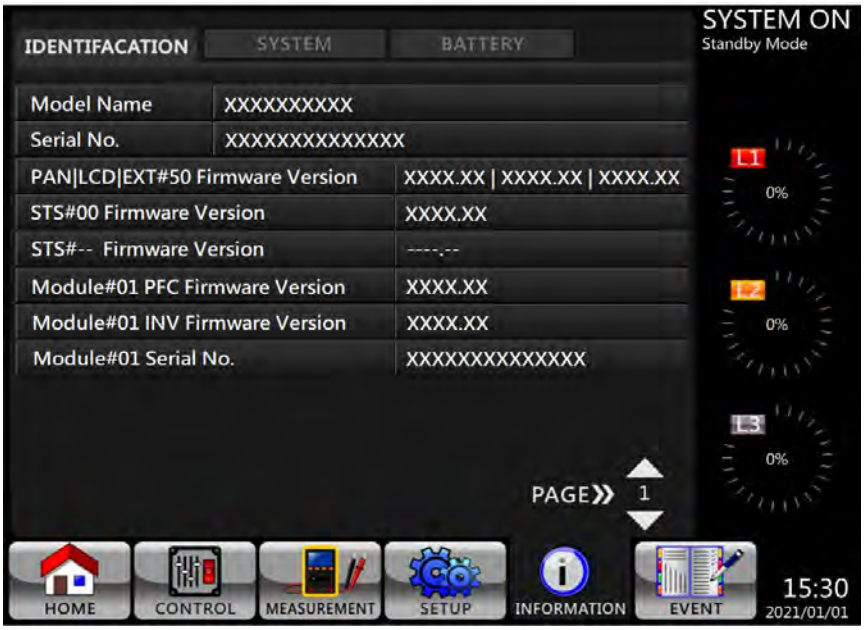
4.2.7 Information screen

Touch the Information icon to enter the Information submenu. In this Information screen, check the UPS configuration of the unit. There are three submenus, Identification, System and Battery. Refer to Figure 4.27 below .

Information-Identification screen

When Identification submenu is clicked, the model name, serial number and firmware version is displayed when the identification submenu is selected, as shown in Figure 4.27 below .

Figure 4.27 Screen



4.2.8 System screen

The system parameters system power, nominal voltage, nominal frequency, and so on, information will be displayed when system submenu is selected, as shown in Figure 4.28 on the facing page and Figure 4.29 on the facing page . To navigate between the different pages, use the Up and Down arrows.

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Figure 4.28 System Screen 1

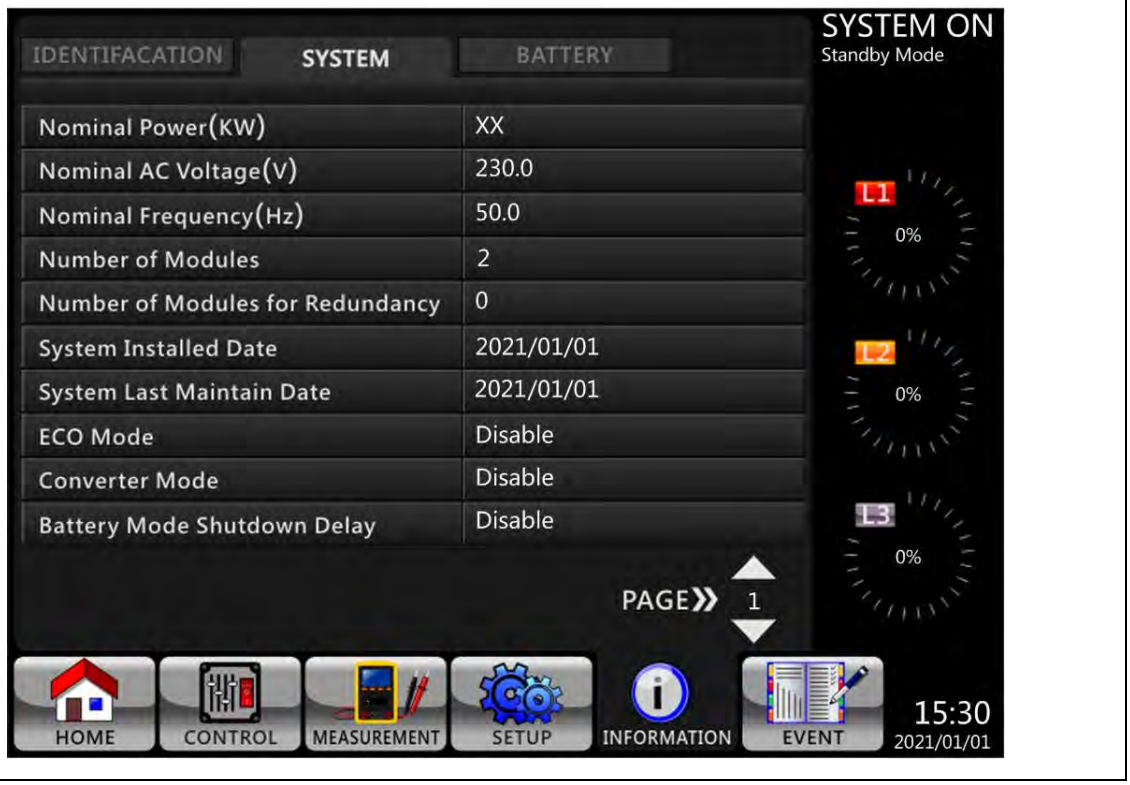
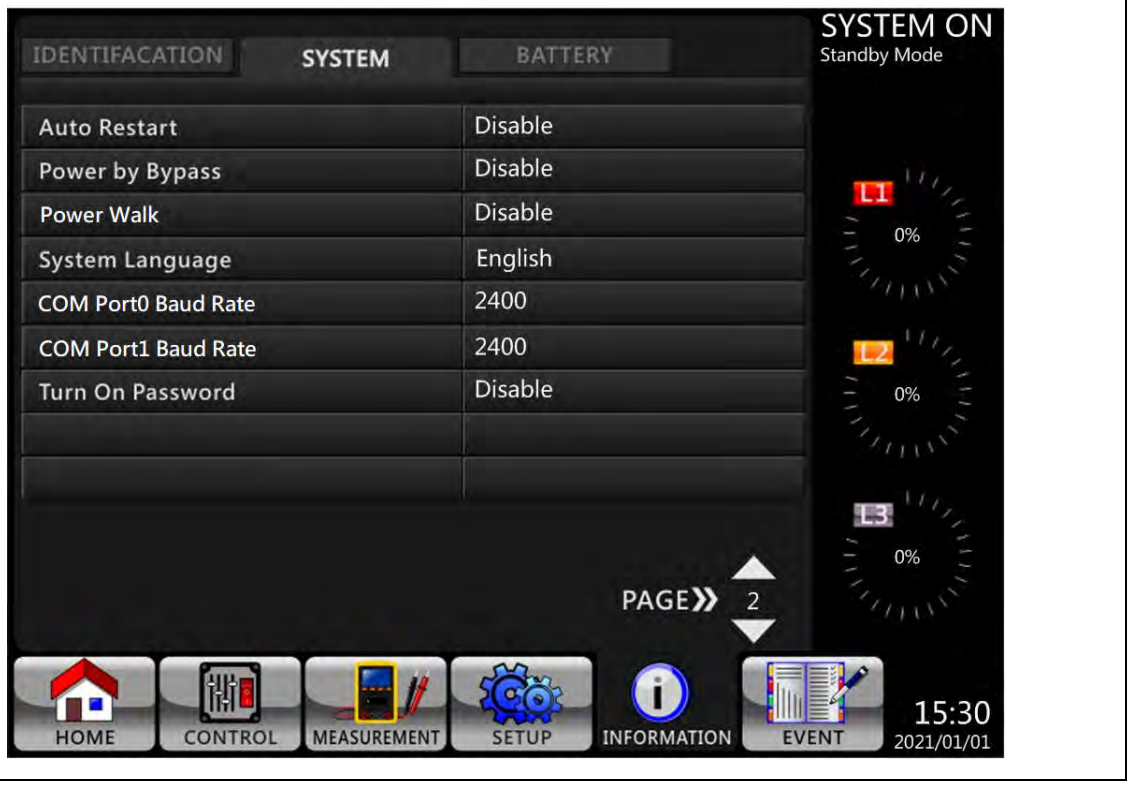


Figure 4.29 System Screen 2



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Battery screen

The battery parameters such as the battery nominal voltage, capacity, charging current, and so on. information will be displayed when the battery submenu is selected, as shown in Figure 4.30 below .

Figure 4.30 Battery Screen

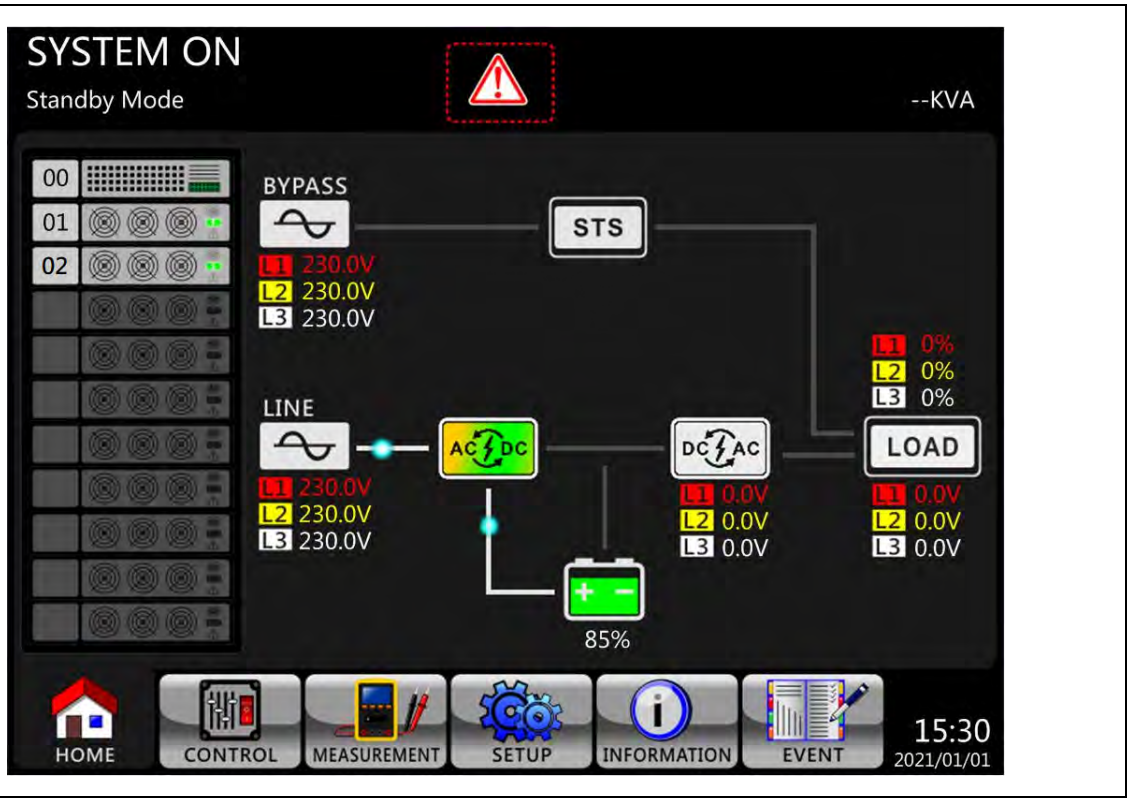


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4.2.9 Events screen

When an event occurs, the main screen will display a flashing icon. To check the latest event lists, history events, and to reset all events, select  icon, Refer to Figure 4.32 on the next page .

Figure 4.31 Alarm Warning Screen

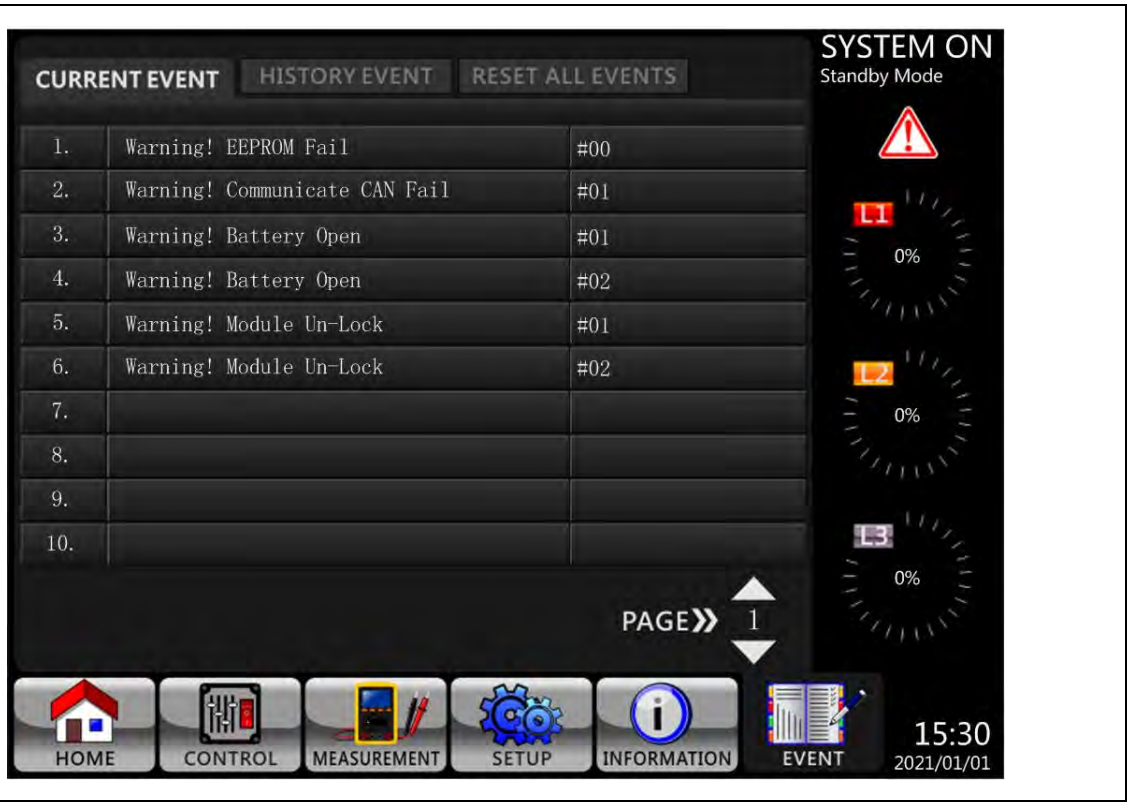


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4.2.10 Current events

When an event occurs, the Module ID and alarm code are displayed in the Current Events screen. It can save up to 50 events are saved. Only 10 events are listed per page. If there are more than 10 events, you can use the Up and Down arrow to page through the events. See Figure 4.32 below .

Figure 4.32 Current Events Screen



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4.2.11 History events

The History Event page provides detailed event information for up to 500 events. When a warning occurs, it will display alarm code, alarm time and Module ID. When a fault event occurs, it will display alarm details, alarm time and Module ID. Refer to Table 4.13 on page 95 .
In order to record more historical information about the UPS system, the important setting changed, refer to Table 4.14 on page 97 . UPS operation mode changes, refer to Table 4.14 on page 97 UPS mode change) and control action executes (refer to Table 4.6 on page 71 Control execution will be saved in History Events. Refer to Table 4.16 on page 98 for display screen.

Figure 4.33 History Events Screen



Reset All Events

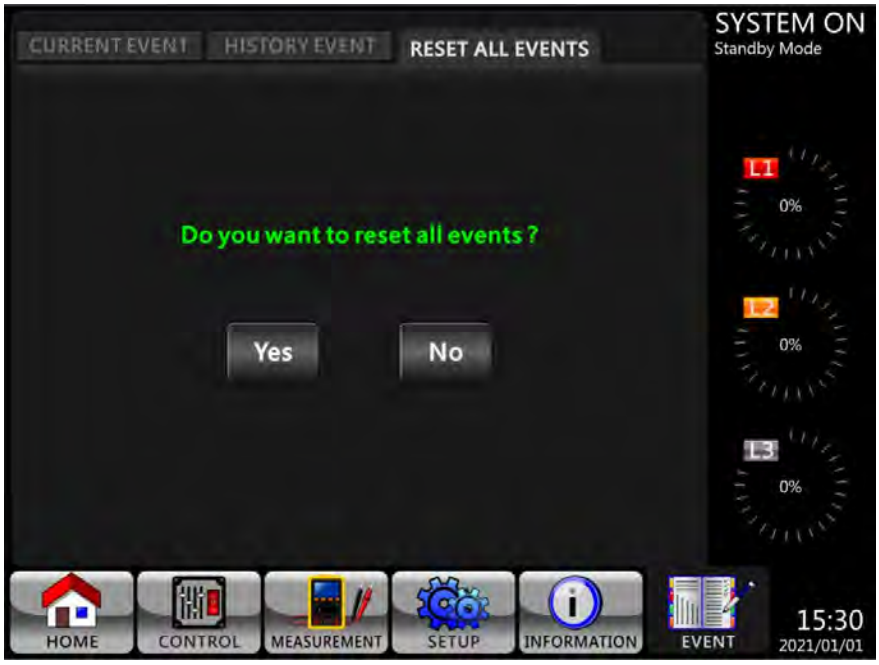
To access the Reset All Events screen, as shown in Figure 4.34 on the next page , the maintainer password is required. After entering correct password, it will display a reconfirmed screen. Then, touch Yes to reset all events or touch No to cancel this action. See Figure 4.35 on the next page .

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Figure 4.34 Reset All Events Screen



Figure 4.35 Reset All Events Confirmation Screen



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4.3 Alarm List

For the complete list of UPS alarm messages, refer to Table 4.13 below .

Table 4.13 Alarm List

Fault/Warning Message	Explanation
Fault! <01>Bus start fail	BUS soft start failed
Fault! <02>Bus over	BUS voltage high
Fault! <03>Bus under	BUS voltage low
Fault! <04>Bus unbalance	BUS voltage unbalanced
Fault! <05>Bus dec fast	BUS voltage drop too fast
Fault! <06>Input overload	Converter over current
Fault! <11>INV start fail	Inverter soft start failed
Fault! <12>High INV VOL	Inverter voltage high
Fault! <13>Low INV VOL	Inverter voltage low
Fault! <14>INV A out SC	Phase A (Line to Neutral) output short circuited
Fault! <15>INV B out SC	Phase B (Line to Neutral) output short circuited
Fault! <16>INV C out SC	Phase C (Line to Neutral) output short circuited
Fault! <17>INV AB out SC	Phase A-Phase B (Line to Line) output short circuited
Fault! <18>INV BC out SC	Phase B-Phase C (Line to Line) output short circuited
Fault! <19>INV AC out SC	Phase C-Phase A (Line to Line) output short circuited
Fault! <1A>INV A N-fault	Phase A output negative power fault
Fault! <1B>INV B N-fault	Phase B output negative power fault
Fault! <1C>INV C N-fault	Phase C output negative power fault
Fault! <28>BATT VOL low	BATT VOL low
Fault! <31>Par commu fail	Parallel communication failed
Fault! <36>Output Status Error	Output Error in Parallel
Fault! <41>Over temp	Over temperature
Fault! <42>DSP commu fail	DSP communication failed
Fault! <43>Overload	Heavy overload causes UPS fault
Fault! <45>Charger error	As stated.
Fault! <49>In&out phase incomp	Input and output phase error
Fault! <60>INV Over Current	Inverter over current
Fault! <61>BYP SCR SC	Bypass SCR short circuited
Fault! <62>BYP SCR open	Bypass SCR open circuited
Fault! <6C> Bus-VOL dec fast	BUS voltage drop too fast

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Table 4.13 Alarm List (continued)

Fault/Warning Message	Explanation
Fault! <6D> CUR detect err	Current detect err
Fault! <6E> SPS Power fault	SPS Power fault
Fault! <6F> BATT reversal	Battery polarity reverse
Fault! <71> R PFC IGBT fault	PFC IGBT over-current in R phase
Fault! <72> S PFC IGBT fault	PFC IGBT over-current in S phase
Fault! <73> T PFC IGBT fault	PFC IGBT over-current in T phase
Fault! <74> R INV IGBT fault	INV IGBT over-current in R phase
Fault! <75> S INV IGBT fault	INV IGBT over-current in S phase
Fault! <76> T INV IGBT fault	INV IGBT over-current in T phase
Fault! <77> ISO Over temp	Isolation transformer over temperature
Fault! <7A> Power Module Connect Fail	Power Module Connect Fail
Warning! <01> BATT open	Battery not connected
Warning! <02> IP N loss	Input N loss
Warning! <04> Line phase error	As stated.
Warning! <05> Bypass phase error	As stated.
Warning! <07> BATT over charge	Battery over charge
Warning! <08> BATT low	Battery voltage is too low
Warning! <09> Overload warning(W)	As stated.
Warning! <0A> Fan lock warning	As stated.
Warning! <0B> EPO active	As stated.
Warning! <0D> Over temperature	As stated.
Warning! <21> Line connect dif	Line connect different
Warning! <22> Bypass connect dif	Bypass connect different
Warning! <24> Par INV vol dif	Par INV vol dif
Warning! <34> AC input CURR unb	AC input CURR unbalance
Warning! <36> INV CURR unb	Inverter current unbalanced
Warning! <38> BATT replace	Battery need to be replaced
Warning! <3A> maintain is open	Maintain bypass cover is opened
Warning! <3C> Utility ext unb	Utility extremely unbalanced
Warning! <3D> Bypass unstable	As stated.
Warning! <3E> BATT VOL High	Battery voltage is too High
Warning! <3F> BATT VOL Unbalance	Battery voltage unbalanced

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Table 4.13 Alarm List (continued)

Fault/Warning Message	Explanation
Warning! <41> Bypass Loss	As stated.
Warning! <43> BUS soft Error	BUS soft start failure
Warning! <44> Redundancy Error	As stated.
Warning! <46> EEPROM Fail	EEPROM operation error
Warning! <49> BCB open	Battery Circuit Breaker open
Warning! <4A> Ext. maint. bps clsd	External Maintenance Bypass closed
Warning! <4B> Line Loss	Line Loss
Warning! <4C> Overload Warning (A)	Output Current Overload
Warning! <4D>Output Status Abnormal	Output Error in Parallel
Warning! <4E> Overload Warning (U)	Bus Under Overload
Warning! <4F> Overload Warning (V)	INV low Overload

4.4 History Record

Table 4.14 Important Setting Changed

Item No.	Description	Item No.	Description
1	Setup! Model Name	2	Setup! Turn On Password
3	Setup! Language	4	Setup! Change Turn On Password
5	Setup! Adjust Time	6	Setup! Nominal Power Display
7	Setup! System Installed Date	8	Setup! Output Voltage
9	Setup! System Last Maintain Date	10	Setup! Bypass Voltage Range
11	Setup! Battery Installed Date	12	Setup! Bypass Frequency Range
13	Setup! Battery Last Maintain Date	14	Setup! Converter Mode
15	Setup! Change Password	16	Setup! ECO Mode
17	Setup! Baud Rate	18	Setup! Bypass Mode
19	Setup! Audible Alarm	20	Setup! Auto-Restart
21	Setup! Factory Reset	22	Setup! Battery Mode Delay Time
23	Setup! EEPROM Reset	24	Setup! Shutdown Restore Time
25	Setup! EPO Function	26	Setup! Redundancy
27	Setup! Save Setting	28	Setup! Charger Test
29	Setup! Power Rating Setting	30	Setup! Battery Capacity in Ah
31	Setup! Nominal Battery Voltage	32	Setup! Battery Low Voltage
33	Setup! Maximum Charging Current	34	Setup! Battery Shutdown Voltage

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Table 4.14 Important Setting Changed (continued)

Item No.	Description	Item No.	Description
35	Setup! Battery Low Capacity	36	Setup! Stop By Time
37	Setup! Periodic Battery Test	38	Setup! Temperature Compensation
39	Setup! BATTERY Age Alert	40	Setup! PRE-ALARM
41	Setup! Charging Voltage	42	Setup! Independent Battery
43	Setup! UPS Parallel	44	Setup! Auto-Restart Battery Voltage

Table 4.15 UPS Mode Change

Item No.	Description	Item No.	Description
1	UPS Mode! Power On Mode	2	UPS Mode! Standby Mode
3	UPS Mode! Bypass Mode	4	UPS Mode! Line Mode
5	UPS Mode! Battery Mode	6	UPS Mode! Battery Test Mode
7	UPS Mode! Fault Mode	8	UPS Mode! Converter Mode
9	UPS Mode! ECO Mode	10	UPS Mode! Shutdown Mode
11	UPS Mode! Un-Connection		

Table 4.16 Control Execution

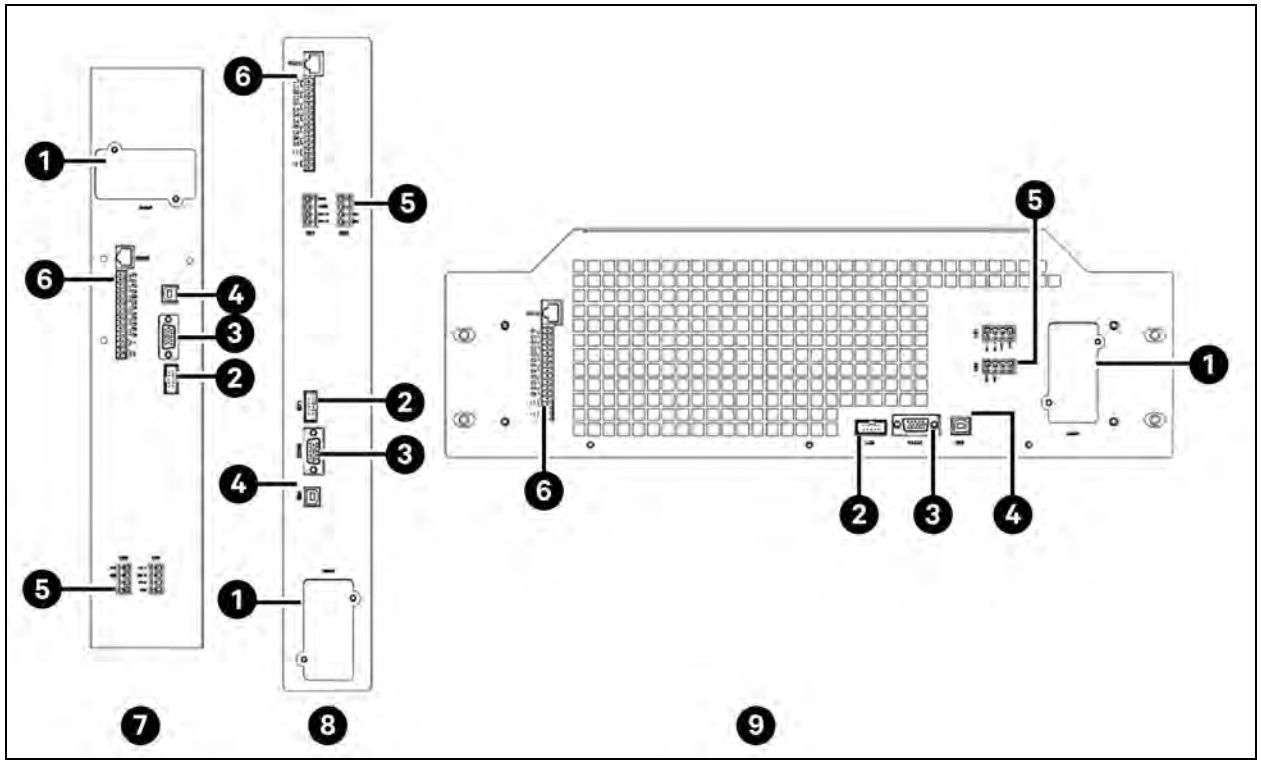
Item No.	Description	Item No.	Description
1	Control! System Turn On	2	Control! System Turn Off
3	Control! Manual Battery Test	4	Control! Cancel Battery Test
5	Control! Turn To Bypass	6	Control! Shutdown Restore
7	Control! Cancel Shutdown	8	Control! Charger Turn On
9	Control! Charger Turn Off		

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5 Interface and Communication

The UPS includes dry contact ports, SNMP slot, LCD connection port and serial communication ports (RS232 port, USB port) on the front panel, as shown in Figure 5.1 below .

Figure 5.1 Interface and Communication



Item	Description
1	SNMP slot
2	LCD port
3	RS232 port
5	USB port
6	Dry contact ports
7	Liebert® MTP 60kVA
8	Liebert® MTP 100/120kVA
9	Liebert® MTP 160/200kVA

Dry Contact No.	Function
X1	Remote EPO input port
X2	Battery Cabinet Temperature Detection Port)

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5.1 Dry Contact Port

5.1.1 X1 remote EPO input port

The emergency power off (EPO) function in UPS can be operated by an assigned remote contact. Logic N.C. turns off the UPS.

X1 is the remote EPO input port. The port is shown in Figure 5.2 below and described in Table 5.1 below .

Figure 5.2 Remote EPO Input Port

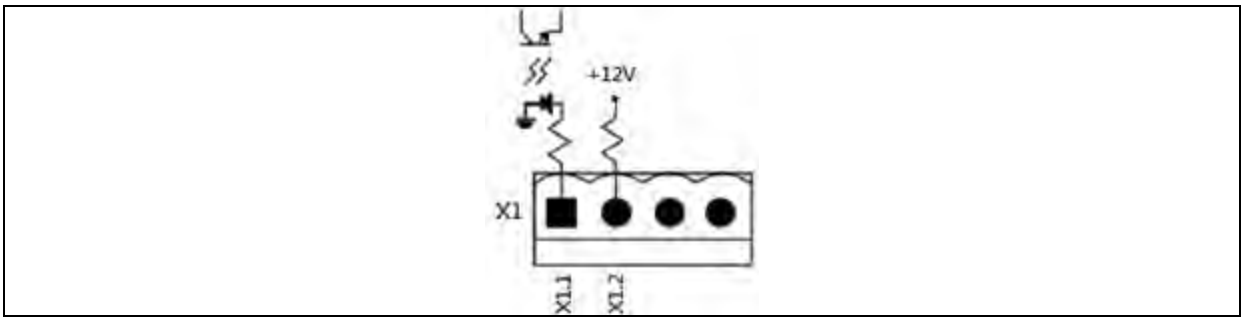


Table 5.1 Description of Remote EPO Port

EPO Logic Setting	Position	Description
Short	X1.1 & X1.2	EPO is not activated when X1.1 & X1.2 are shortened
Open	X1.1 & X1.2	EPO is activated when X1.1 & X1.2 are opened

The EPO Logic setting is set to normal closed. EPO is triggered when pins 1 and 2 of X1 are opened.

NOTE: The EPO function activates shutdown of the rectifiers, inverters, and static transfer switch. However, it does not internally disconnect the input power supply. EPO Logic can be set also as Normally Open.

5.1.2 X2 battery cabinet temperature detection port

The UPS has the battery cabinet temperature detection function. The external battery cabinet temperature detection sensor can detect the temperature of the battery cabinet. The I2C communication protocol was used to communicate between the UPS and battery temperature detection board. X6 is the battery cabinet temperature detection port. The port is shown in Figure 5.3 below and described in Table 5.2 on the facing page .

Figure 5.3 Battery Cabinet Temperature Detection Port

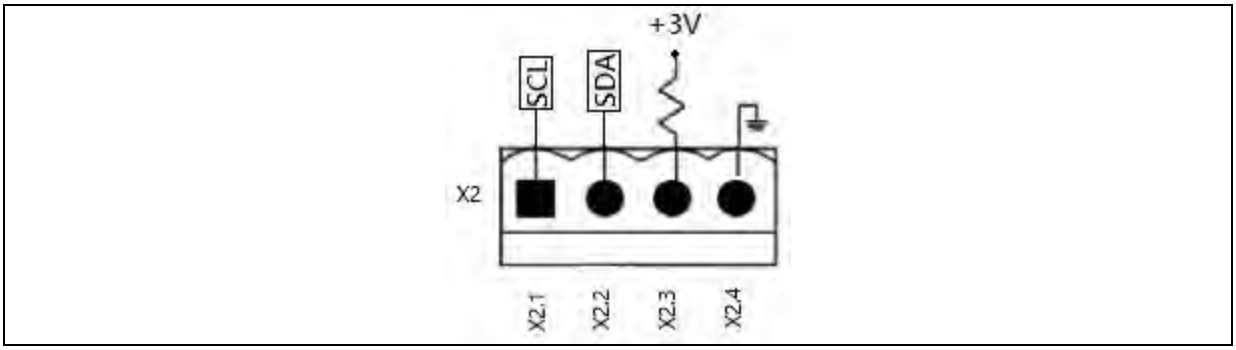


Table 5.2 Description of Battery Cabinet Temperature Detection Port

Name	Position	Description
SCL	X2.1	I²C communication SCL Signal
SDA	X2.2	I²C communication SDA Signal
+3.0V	X2.3	3V
Power GND	X2.4	GND

5.2 Local communication ports RS232 and USB

To connect a USB port or RS 232 port to the PC as local communication, use USB cable or RS232 cable.

NOTE: The RS232 and USB ports cannot be used at the same time.

5.3 SNMP slot

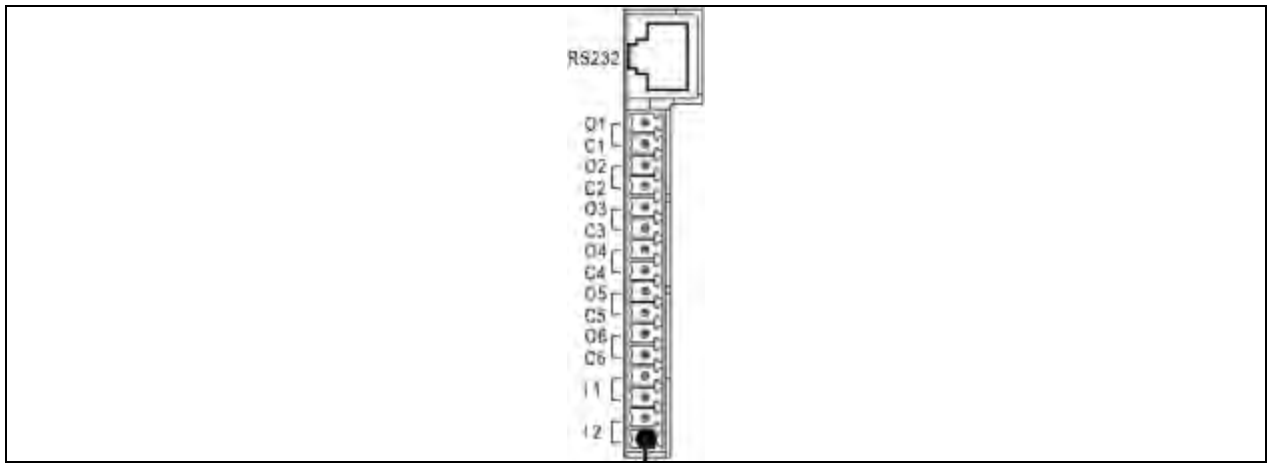
The SNMP, AS400 or Modbus card can be inserted into this slot to work with the UPS.

5.4 Extra comm

The extra comm card can enhance the communication capability of the UPS by providing an additional dry contact I/P and O/P signals.

5.4.1 Product outlook

Figure 5.4 Product Outlook



5.4.2 Product introduction

Extra communication card is a device with additional interface functionality. This device can provide a variety different applications for UPS. The communication interfaces of extra communication card are listed below:

- RS232 Port
- Dry Contact Output
- Dry Contact Input

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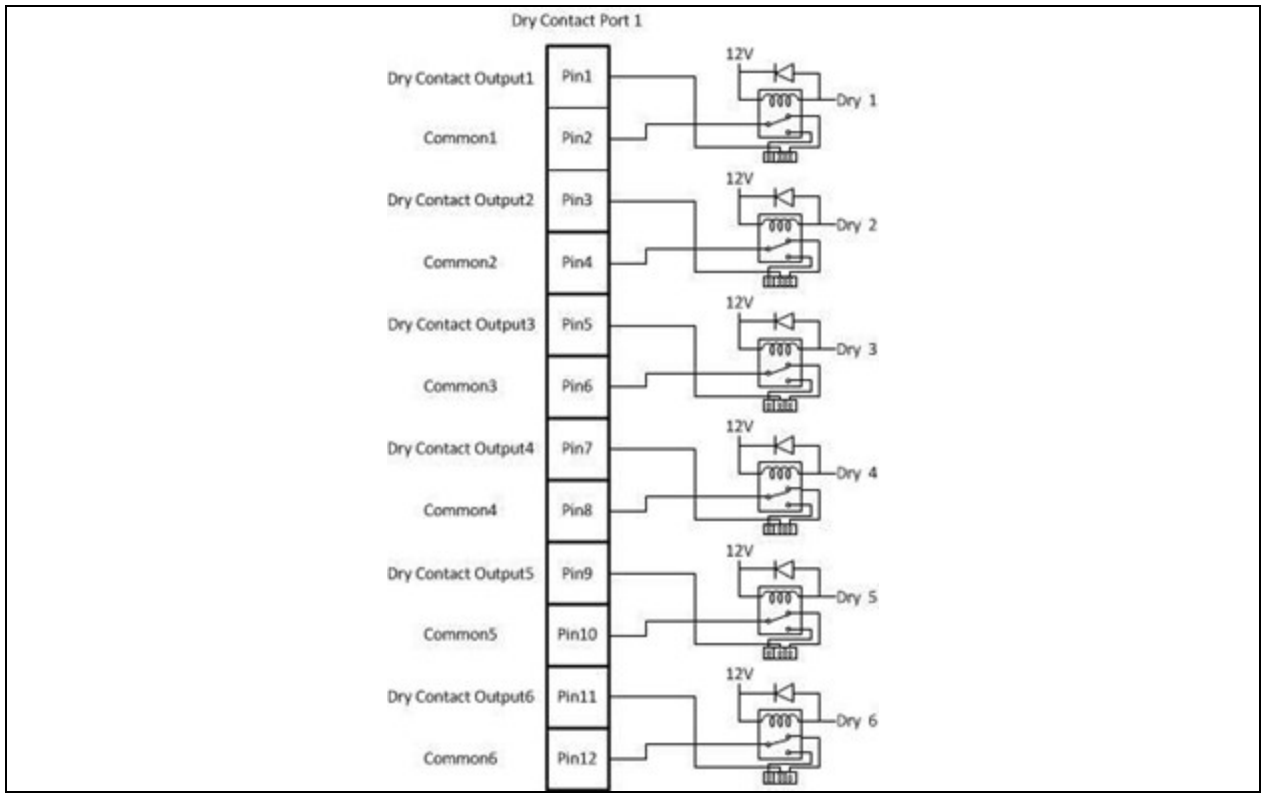
RS232 port

The RS232 port can set dry contact function.

Dry contact output

Six dry contact outputs are used to set different feature. These contacts are rated for max 24V DC and 1A.

Figure 5.5 Dry Contact Output



Liebert MTP dose not include internal back-feed protection, but provide a dry contact signal. This is safety feature and will prevent the UPS inverter from back-feeding the input source.

Configuration

There are six Output Dry Contacts on MTP 60-120-200kVA.

All of them have programmable function. The complete list of available functions is listed in Table 5.3 below .

Table 5.3 Configurable Functions

Function	Message	Description
1	Load on inverter	The UPS is working normally.
2	Load on bypass	The UPS is in Bypass mode.
3	Load on Battery	The UPS is in Battery mode.
4	Low battery	The battery voltage is low.

Table 5.3 Configurable Functions (continued)

Function	Message	Description
5	Bypass input abnormal	The bypass voltage or frequency is abnormal.
6	Battery test failure	Performs the battery test. The battery test fails.
7	Internal communication failure	DSP and MCU stop communication in power module.
8	External parallel communication failure	Communication error between power modules.
9	Output overload warning/shutdown	Connected load is over rated output of the UPS.
10	Power module fault shutdown	The module fails and the UPS shuts down.
11	Power module warning	The module has errors, but the UPS can still function normally.
12	EPO Active	Urgently power off the UPS.
13	Maintain Bypass	The UPS transfers to Maintain bypass mode.
14	Module over temperature warning/shutdown	The temperature is too high.
15	No defined	NC
16	Bypass over temperature warning/shutdown	Bypass “static transfer switch” is over temperature.
17	Bypass static switch fault (Backfeed)	The bypass “static transfer switch” is abnormal.(backfeed protection)
18	Line AC fail	Power failure
19	Bypass failure	Bypass source fails
20	Redundancy failure	Redundancy setting error.
21	Summary Alarm	bypass mode/battery mode/bat open/bypass loss/fault/warning/line fail

The default functions assigned to the output dry contacts are listed in Table 5.4 below :

Table 5.4 Default Setting List

Contact	Message	Description
1	Load on bypass	The UPS is in Bypass mode.
2	Load on Battery	The UPS is in Battery mode.
3	Low battery	The battery voltage is low.
4	EPO Active	Urgently power off the UPS.
5	Bypass static switch fault (Backfeed)	The bypass “static transfer switch” is abnormal.(backfeed protection)
6	SummaryAlarm	bypass mode/battery mode/bat open/bypass loss/fault/warning/line fail

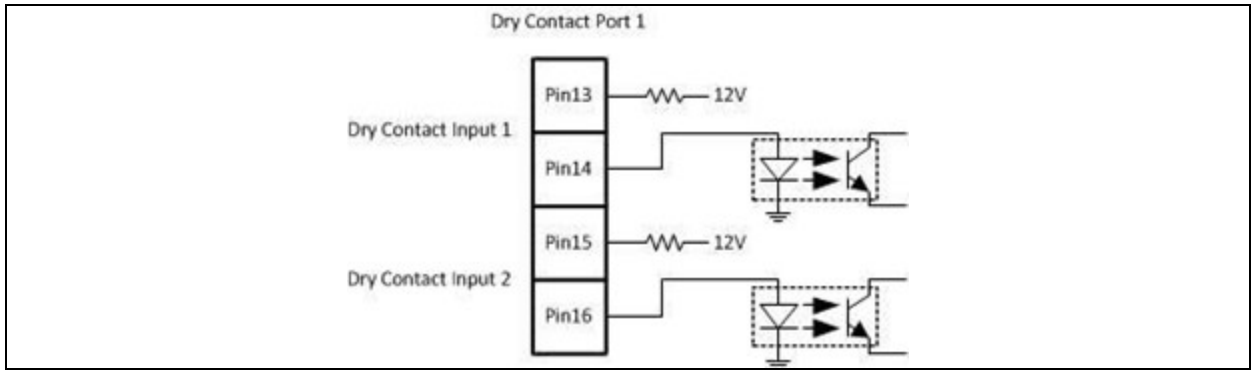
NOTE: If you want to change the setting, please contact Vertiv service personnel.

Dry contact input

There are two Input Contacts on MTP 60-120-200kVA (rated at 50mA max).

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Figure 5.6 Dry Contact Input



The functions assigned to the Input dry contacts are the following.

Table 5.5 Functions for Input Dry Contact

Port	Message	Description
1	"Warning! <49> BCB open"	Battery Circuit Breaker open
2	"Warning! <4A> Ext. maint. bps clsd"	External Maintenance Bypass closed

In order to activate these functions it is required to connect the two pins of the Input port.

6 Troubleshooting

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

LCD Message	Explanation	Solution
Fault! Bus Over Voltage	DC bus voltage is too high.	Contact service personnel.
Fault! Bus Under Voltage	DC bus voltage is too low.	Contact service personnel.
Fault! Bus Voltage Unbalance	DC bus voltage is not balanced.	Contact service personnel.
Fault! Bus Soft Start Time Out	The rectifiers could not start due to low DC bus voltage within specified duration.	Turn off the UPS and then restart it. If it fails again, contact service personnel.
Fault! Inverter Soft Start Time Out	Inverter voltage cannot reach desired voltage within specified duration.	Turn off the UPS and then restart it. If it fails again, contact service personnel.
Fault! Inverter Voltage High	Inverter Voltage is too high.	Contact service personnel.
Fault! Inverter Voltage Low	Inverter Voltage is too Low.	Contact service personnel.
Fault! R Inverter Voltage Short	R phase inverter Output is shorted.	Contact service personnel.
Fault! S Inverter Voltage Short	S phase inverter Output is shorted.	Contact service personnel.
Fault! T Inverter Voltage Short	T phase inverter Output is shorted.	Contact service personnel.
Fault! RS Inverter Voltage Short	R-S inverter Output is shorted.	Contact service personnel.
Fault! ST Inverter Voltage Short	S-T inverter Output is shorted.	Contact service personnel.
Fault! TR Inverter Voltage Short	T-R inverter Output is shorted.	Contact service personnel.
Fault! Inverter R Negative Power	R phase inverter Output Negative Power over range.	Contact service personnel.
Fault! Inverter S Negative Power	S phase inverter Output Negative Power over range.	Contact service personnel.
Fault! Inverter T Negative Power	T phase inverter Output Negative Power over range.	Contact service personnel.
Fault! Over Load Fault	Heavy overload causes UPS fault..	Reduce some load.
Fault! Over Temperature	Make sure adequate space is allowed for air vents and the fan is working.	Check if the ambient temperature is over the specified value. Alternatively, contact service personnel.

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LCD Message	Explanation	Solution
Fault! CAN Fault	CAN communication fault.	Contact service personnel.
Fault! DSP MCU Stop Communicate	As stated.	Contact service personnel.
Fault! Bypass SCR Fault	As stated.	Contact service personnel.
Warning! EPO Active	Check the EPO connector.	Check if the connector is loose when EPO acts abnormally.
Warning! Over Load Fail	The load devices are demanding more power than the UPS can supply. Line mode will transfer to Bypass mode.	Reduce some load and check output load capacity and specification.
Warning! Communicate CAN Fail	CAN communication error.	Contact service personnel.
Warning! Over Load	In Line mode, the load devices are demanding more power than the UPS can supply.	Reduce some load and check output load capacity and specification
Warning! Battery Open	Battery not connected.	1. Check battery breaker. 2. Check if the battery connection is well connected. 3. Check the setting of nominal battery voltage. 4. Contact service personnel if necessary
Warning! Battery voltage High	Battery voltage is too High.	Check the setting of nominal battery voltage and contact service personnel.
Warning! Charge Fail	As stated.	Contact service personnel.
Warning! EEPROM Fail	EEPROM operation error.	Contact service personnel.
Warning! Fan Lock	As stated.	Check if the fan is blocked or contact service personnel.
Warning! Line Phase Error	As stated.	Check if the mains phase sequence is correct and contact service personnel.
Warning! Bypass Phase Error	As stated.	Check if the bypass phase sequence is correct and contact service personnel.
Warning! N Loss	Neutral loss.	Check if the neutral connection is well and contact service personnel.
Warning! Redundancy Set Fail	As stated.	Check the redundancy setting is correct and contact service personnel.
Warning! Maintenance Bypass	Enter maintenance.	Check if the connector is loose when it acts abnormally.

7 Service

This chapter introduces the UPS service, including the service procedures of the power module, and the replacement of air filter.

- Only the customer service engineers can service the power modules.
- The static transfer switch (STS) is not hot pluggable. It should be replaced only when the UPS is in maintenance bypass mode or completely powered OFF. Also the Power Modules are not hot swappable. This UPS is, indeed, Monolithic.

7.1 Replacing the Power Module

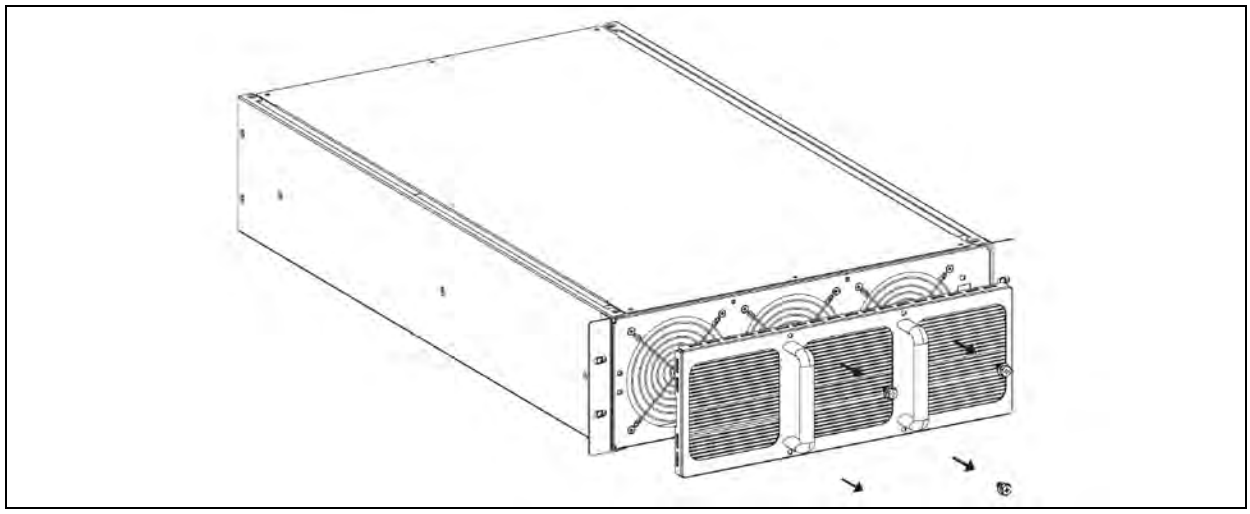
This is a Monolithic UPS, to replace the Power Module, transfer the UPS to Maintenance Bypass and then activate an EPO function.

1. The power module FAULT LED (red) indicator illuminates to indicate that the power module output is OFF and disconnected from the UPS system.
2. Remove the screws from the mounting holes with a screwdriver.
3. Two persons are required to pull out and remove the power module from its slot.
4. After servicing the module, ensure that the DIP switch of the module is set correctly. Push the module into the cabinet and tighten the screws on both sides.
5. Perform the procedure for transfer from Maintenance bypass mode to Line Mode.

7.2 Procedures of Clean Air Filter

The UPS air filters are on the front panel of the power module, see Figure 7.1 below . Each filter is secured by 4 screws.

Figure 7.1 To Replace Clean Air Filter



1. Loosen the 4 screws that secure the air filter.
2. Use a brush to remove dust from the air filter or replace it with a new spare part.
3. Tighten the 4 screws to install the air filter.

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7.3 Serviceability of Internal Parts

If any part needs a replacement other than the Power Module, follow the below procedure.

This is a Monolithic UPS, to replace internal parts, transfer the UPS to Maintenance Bypass and then activate an EPO function.

Even if system is in Maintenance bypass, internal parts are still supplied via Neutral connector.

CAUTION: Risk of hazardous voltage. Can cause equipment damage, injury or death to personnel.
Extreme precaution is required when working with the UPS system as it is connected to the neutral main connector even after the UPS system input breakers are disconnected.
System doesn't have any breaker or switch on neutral terminal.

WARNING! Risk of electric shock and hazardous voltage. Can cause equipment damage, injury or death to personnel. Disconnect the neutral bar as in Removing the Metal Part on the facing page , Figure 7.4 on page 110 , Figure 7.6 on page 111 , and Figure 7.8 on page 112 before conducting any kind of service or maintenance and verify that no voltage between terminals and the ground is present.
After neutral bar removal mains input terminal is still supplied and presents hazardous voltages.

WARNING! Risk of electric shock and hazardous voltage. Can cause equipment damage, injury or death to personnel. Servicing of UPS should be performed or supervised by personnel experienced with the UPS and with the required precautions. Keep unauthorized personnel away.

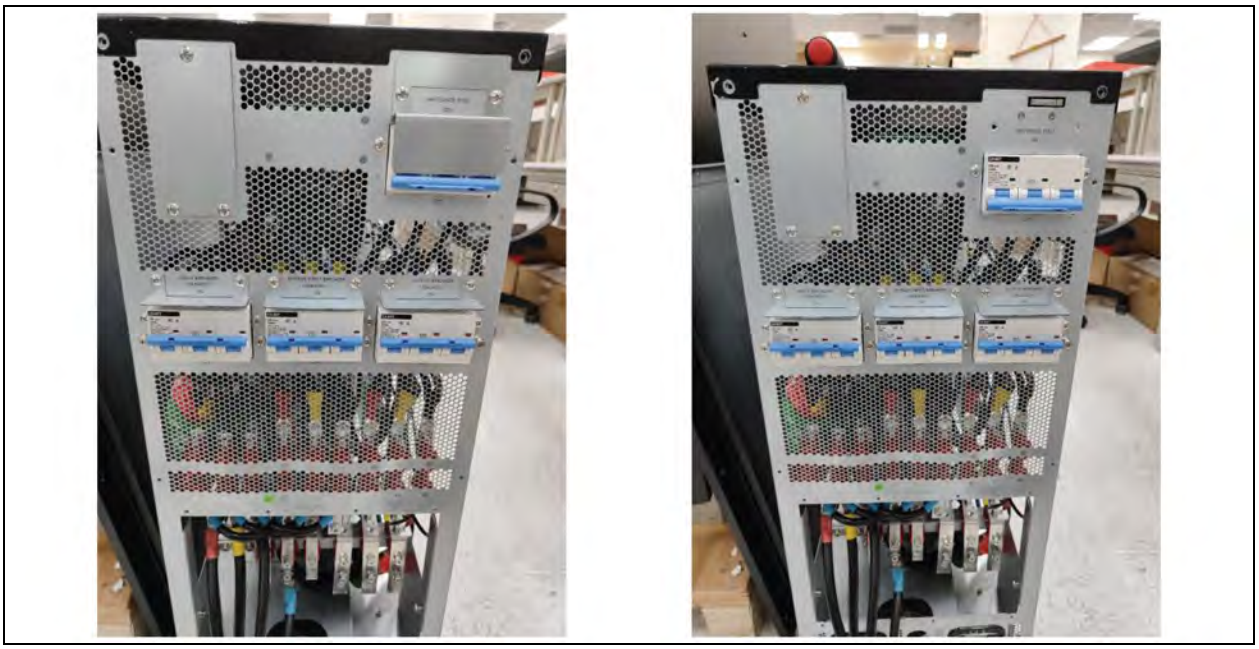
WARNING! Risk of electric shock and high short-circuit current. It can cause damage to the property and injury or death to personnel. Remove wristwatches, rings, and other metal objects before installation and maintenance or repair. Use tools with insulated handles. Wear rubber gloves and boots during installation and maintenance or repair.

7.4 Transfer the UPS to Maintain Bypass Mode

7.4.1 Vertiv™ Liebert® MTP 60kVA mode transfer to Maintain Bypass mode

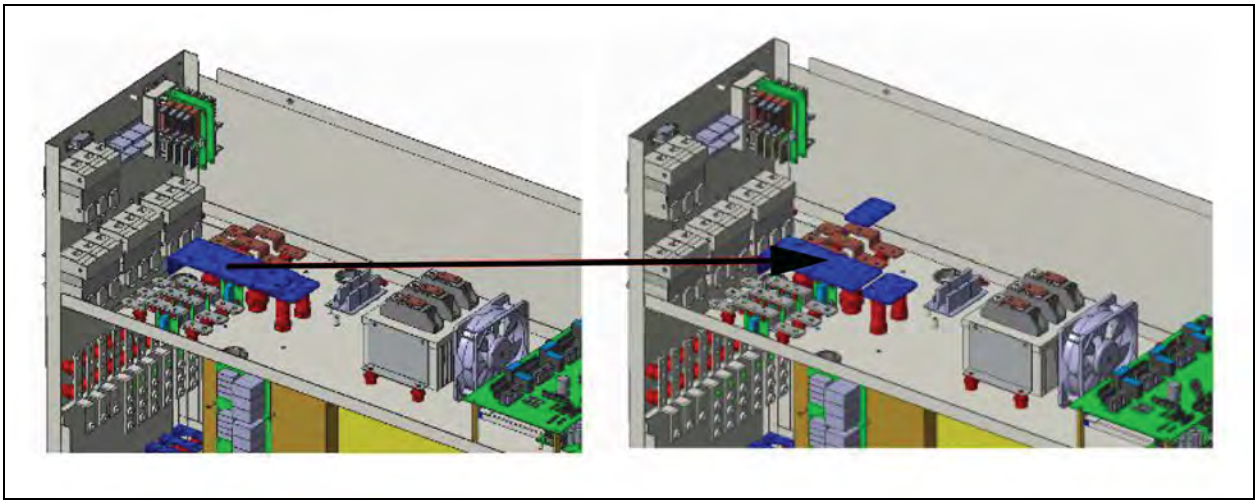
1. If the UPS work in online mode, turn off the UPS to bypass mode.
2. Remove the cover of the Maintain bypass as shown in the Figure 7.2 on the facing page , then the UPS will force transfer to bypass mode and the warning <3A> will alarm.

Figure 7.2 Removing the Cover



3. Close the maintain bypass switch.
4. Turn off the rectifier input, bypass input and output breaker. Proceed with the next steps only if it is needed to service internal components. Otherwise the procedure is completed.
5. Remove the metal part to divide the neutral bar as shown in the Figure 7.3 below .

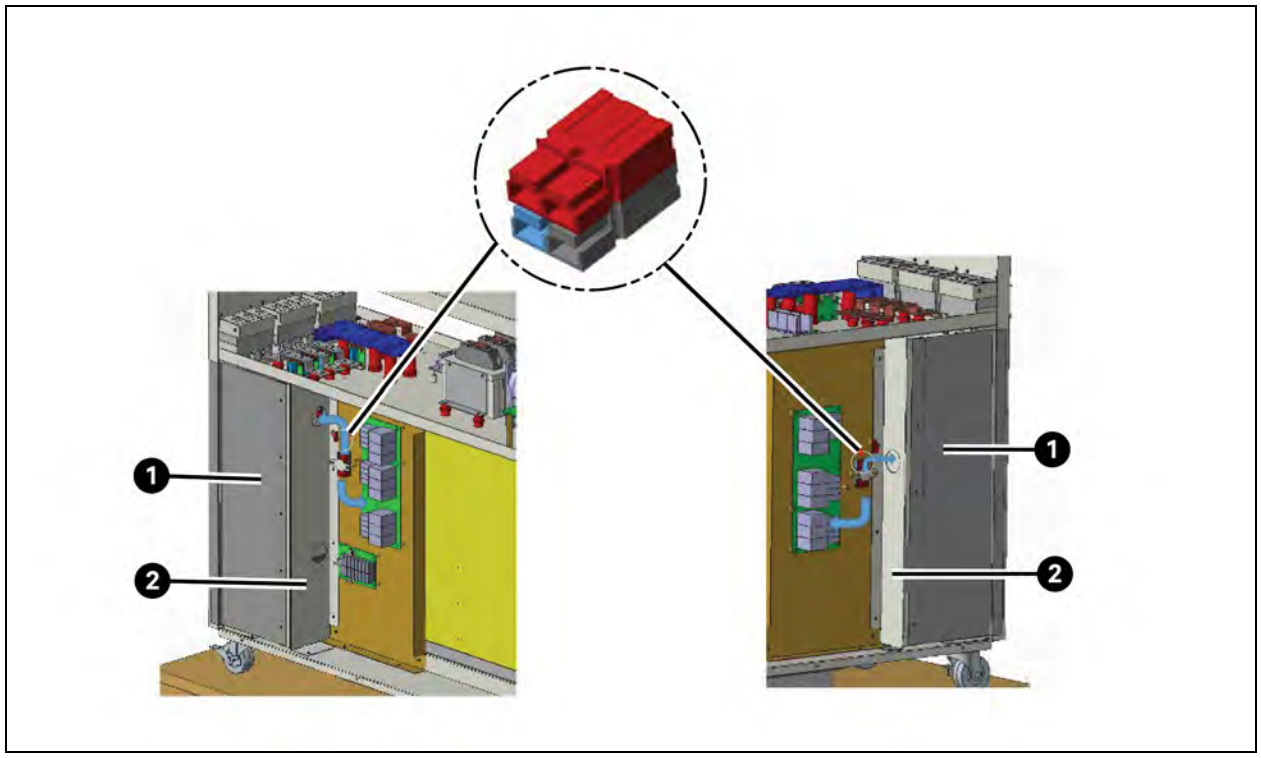
Figure 7.3 Removing the Metal Part



6. Disconnect the input/output EMI board by unpluging the quick connect terminal as shown in the Figure 7.4 on the next page .

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Figure 7.4 Disconnecting Input/Output EMI Board

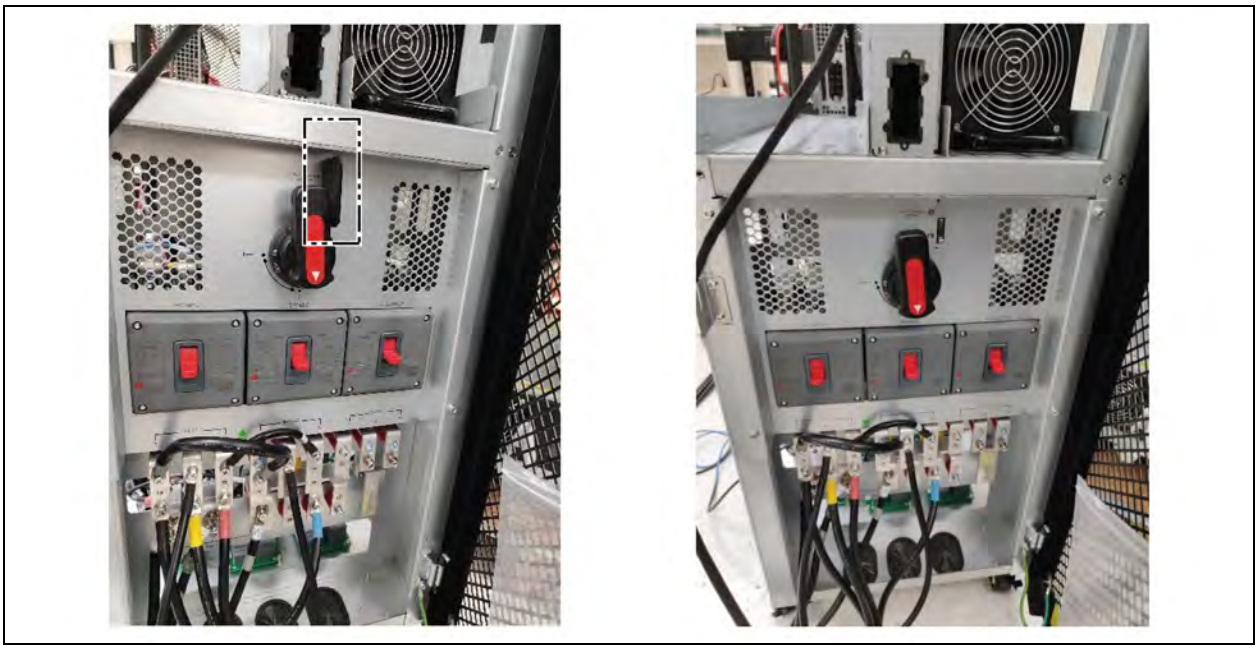


Item	Description
1	FORMEX
2	Sheet metal

7.4.2 Vertiv™ Liebert® MTP 120kVA mode transfer to Maintain Bypass mode

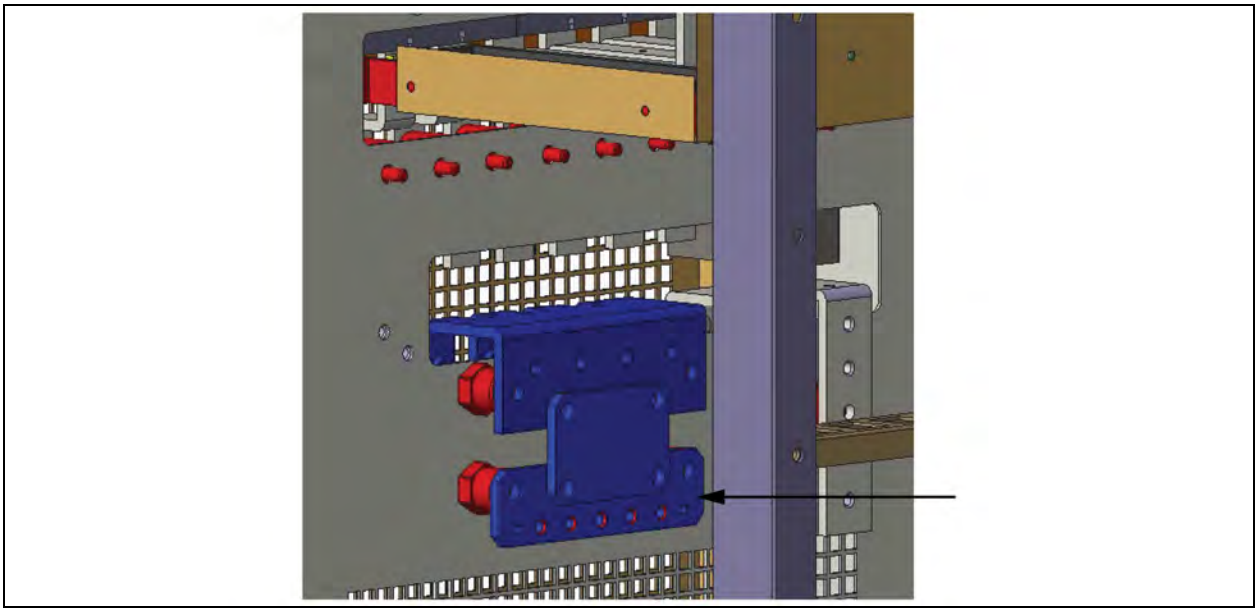
1. If the UPS work in online mode, turn off the UPS to bypass mode.
2. Remove the cover of the Maintain bypass as shown in the Figure 7.5 on the facing page , then the UPS will force transfer to bypass mode and the warning <3A> will alarm.

Figure 7.5 Removing the Cover



3. Close the maintain bypass switch.
4. Turn off the rectifier input, bypass input and output breaker. Proceed with the next steps only if it is needed to service internal components. Otherwise the procedure is completed.
5. Remove the metal part to divide the neutral bar as shown in the Figure 7.6 below .

Figure 7.6 Removing the Metal Part

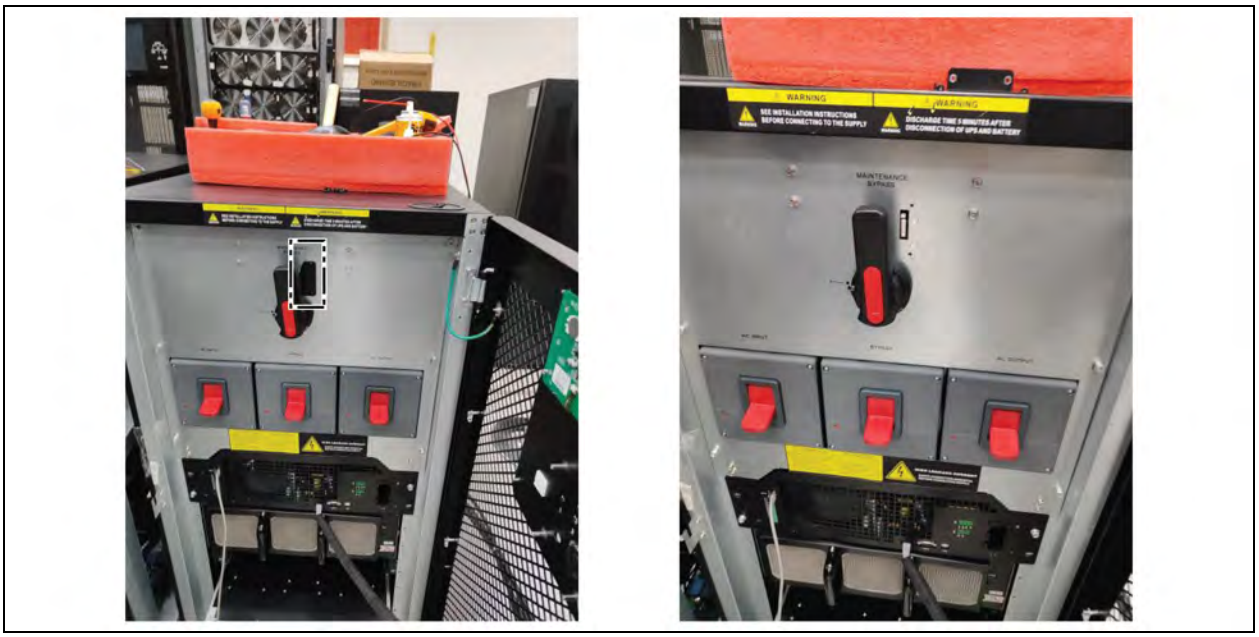


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7.4.3 Vertiv™ Liebert® MTP 200kVA mode transfer to Maintain Bypass mode

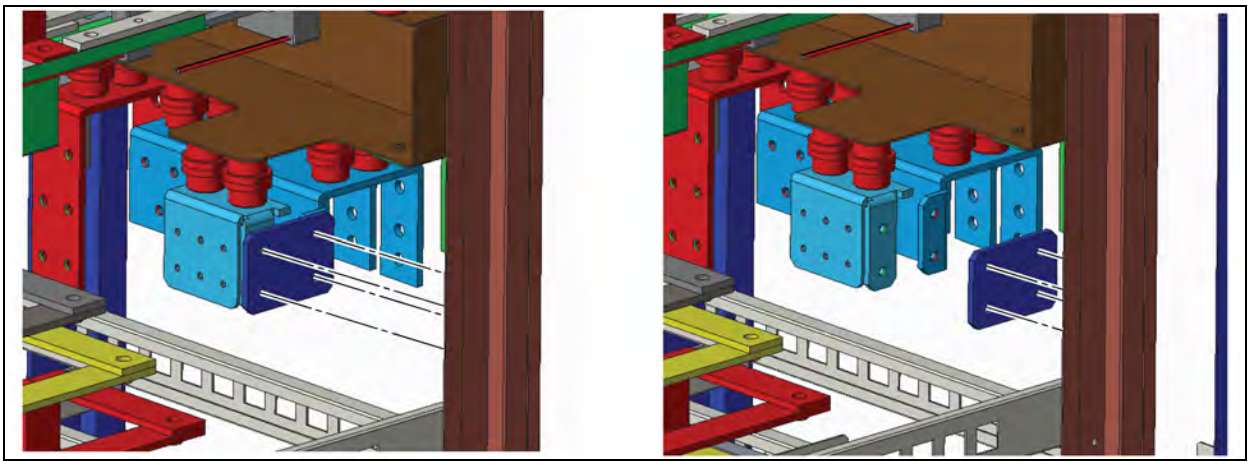
1. If the UPS work in online mode, turn off the UPS to bypass mode.
2. Remove the cover of the Maintain bypass as shown in the Figure 7.7 below , then the UPS will force transfer to bypass mode and the warning <3A> will alarm.

Figure 7.7 Removing the Cover



3. Close the maintain bypass switch.
4. Turn off the rectifier input, bypass input and output breaker. Proceed with the next steps only if it is needed to service internal components. Otherwise the procedure is completed.
5. Remove the metal part to divide the neutral bar as shown Figure 7.8 below .

Figure 7.8 Dividing Neutral Bar



8 Specifications

The UPS specifications are given in this chapter.

8.1 Conformity and Standards

This UPS is designed to European and international standards listed in Table 8.1 below .

Table 8.1 European and International Standards

Item	Normative Reference
Uninterruptible power systems (UPS) –Part 1: General and safety requirements for UPS	IEC/EN62040-1
Electromagnetic compatibility (EMC) requirements for UPS	IEC/EN62040-2
Method of specifying the performance and test requirements of UPS	IEC/EN62040-3
Notes:	
ESD	IEC/EN 61000-4-2 Level 3
RS	IEC/EN 61000-4-3 Level 3
EFT	IEC/EN 61000-4-4 Level 3
Surge	IEC/EN 61000-4-5 Level 3
CS	IEC/EN 61000-4-6 Level 3
Power-Frequency Magnetic Field	IEC/EN 61000-4-8 Level 4
Low Frequency Signals	IEC/EN 61000-2-2 Level 10V
Conduction	IEC/EN62040-2 Category C3
Radiation	IEC/EN62040-2 Category C3

8.2 Environmental Characteristics

Table 8.2 Environmental Characteristics

Item	Unit	Specifications
Noise within 1 m	dB	Max. 75
Altitude	m	≤1000, derate power by 1% per 100m
Relative humidity	% RH	0~95, non-condensing
Operating temperature	°C	0~ 40°C
Storage and transport temperature for UPS	°C	-15 ~60

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8.3 Mechanical Characteristics

Table 8.3 Mechanical Characteristics

Model	Unit	60K	100/120K	160/200K
Rated power	kVA	60	100/120	160/200
Dimensions, D x W x H	mm	1000 x 320 x 800	1000 x 430 x 1200	1000 x 600 x 1200
Weight	kg	88	169	249
Color	N/A	Black		

8.4 Electrical Characteristics (Input Rectifier)

Table 8.4 Rectifier AC input (Mains)

Rated Power (kVA)	Unit	60~200	
Rated AC input voltage	VAC	380/400/415 (3-phase and sharing neutral with the bypass input)	
Input voltage range	VAC	110~300Vac (full lo ad @ 184V ~276V)	
Frequency	Hz	50/60 (tolerance: 40Hz~70Hz)	
Power factor	kW/kVA	0.99 (0.97) full load (half load)	
Harmonic current distortion	THDI%	<4 (full load)	
Max. current/phase	A	60kVA/60kW	110
		100kVA/100kW	188
		120kVA/120kW	220
		160kVA/160kW	293
		200kVA/200kW	375
Icc	kA	≤ 10kA	
NOTE: 40Hz~70Hz by setting generator mode.			

8.5 Electrical Characteristics (Intermediate DC Circuit)

Table 8.5 Battery

Intermediate DC Circuit		
Battery		**External Battery**
Number of lead-acid cells	Nominal	216 (6 cells x 36 12V battery block)
	Maximum	240 (6 cells x 40 12V battery block)
	Minimum	192 (6 cells x 32 12V battery block)
Float voltage	V/cell	2.28V/cell
Temperature Compensation	mV/°C/cl	0~-5

Table 8.5 Battery (continued)

Intermediate DC Circuit		
Battery		**External Battery**
(option)		
Ripple voltage	% V float	≤1
Ripple current	% C10	≤5
Boost voltage	VRLA	2.35V/cell
EOD voltage	V/cell	1.67-1.83V/cell (adjustable)
Battery charge	V/cell	Constant current and constant voltage charge mode
Battery charging power1 max current	A	18A(adjustable) @ 60kVA Model 36A(adjustable) @ 100/120kVA Model 54A(adjustable) @ 160/200kVA Model
NOTE: At low input voltage, the UPS recharging capability increases and load decreases (up to the maximum capacity indicated).		

8.6 Electrical Characteristics (Inverter Output)

Table 8.6 Inverter Output (To Critical Load)

Rated Power (kVA)	Unit	60~200
Rated AC voltage1	Vac	380/400/415 (3-phase 4-wire, with neutral reference to the bypass neutral)
Frequency	Hz	50/60 Auto Selectable
Overload	%	100%~110% for 60min 110%~125% for 10min 126%~150% for 1min >150% for 200ms
Steady state voltage stability	%	±1 balanced load ±2 100% unbalanced load
Total harmonic voltage	%	<2 linear load <4 non-linear load
Synchronization window		+/- 1Hz +/- 2Hz +/- 4Hz default: 4Hz

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Table 8.6 Inverter Output (To Critical Load) (continued)

Rated Power (kVA)	Unit	60~200	
Output rated current (380/400/415V)	A	60kVA/60kW	91/86/83
		100kVA/100kW	151/145/138
		120kVA/120kW	182/173/167
		160kVA/160kW	242/231/222
		200kVA/200kW	304/290/278
NOTE: Factory setting is 400V, 380V or 415V is selectable by commissioning engineer.			

8.7 Electrical Characteristics (Bypass Mains Input)

Table 8.7 Bypass Mains Input

Rated Power (kVA)	Unit	60~200
Rated AC voltage1	Vac	380/400/415 (3-phase 4-wire, sharing neutral with the rectifier input and providing neutral reference to the output)
Overload	%	105%~110% for 60min 110%~125% for 10min 126%~150% for 1min >150% for 200ms
Upstream protection, bypass line	N/A	Circuit breaker, rated up to 100% of nominal output current.
Frequency	Hz	50/60 Auto Selectable
Transfer time (between bypass and inverter)	ms	Synchronous transfer: Line ßàBattery 0ms Inverter ßàBypass 0ms When phase lock fails, <4ms interruption occurs from inverter to bypass Inverter ßàECO ≤10ms
Bypass voltage tolerance	%Vac	Upper limit: • +10, +15 or +20 • default +15 Lower limit: • -10, -20, -30 • default -20
Frequency range	Hz	+/- 1Hz +/- 2Hz +/- 4Hz default: 4Hz
NOTE: Factory setting is 400V. 380V or 415V is selectable by commissioning engineer.		

9 UPS Installation for Parallel Cabinet System

The chapter gives information about the installation and setup of a single cabinet system to parallel cabinet system.

- In a parallel cabinet system, the input harmonic current distortion will be greater than 4%.
- This type of application requires the use of the parallel cable. The parallel cable is required for installation and operation.
- If the user wants to install a UPS to a parallel cabinet system, the installation must be performed under the supervision of authorized engineers or service personnel.
- The power capacity of the parallel rack will be 90% of the rated load.
- The parallel system must use the common battery.
- All UPSs with same model, power rating and Firmware version.
- Bypass and rectifier input with same neutral line.
- Current leakage protective device fitted upstream of the common neutral line input terminal.
- Same Bypass supply for all the UPSs in parallel

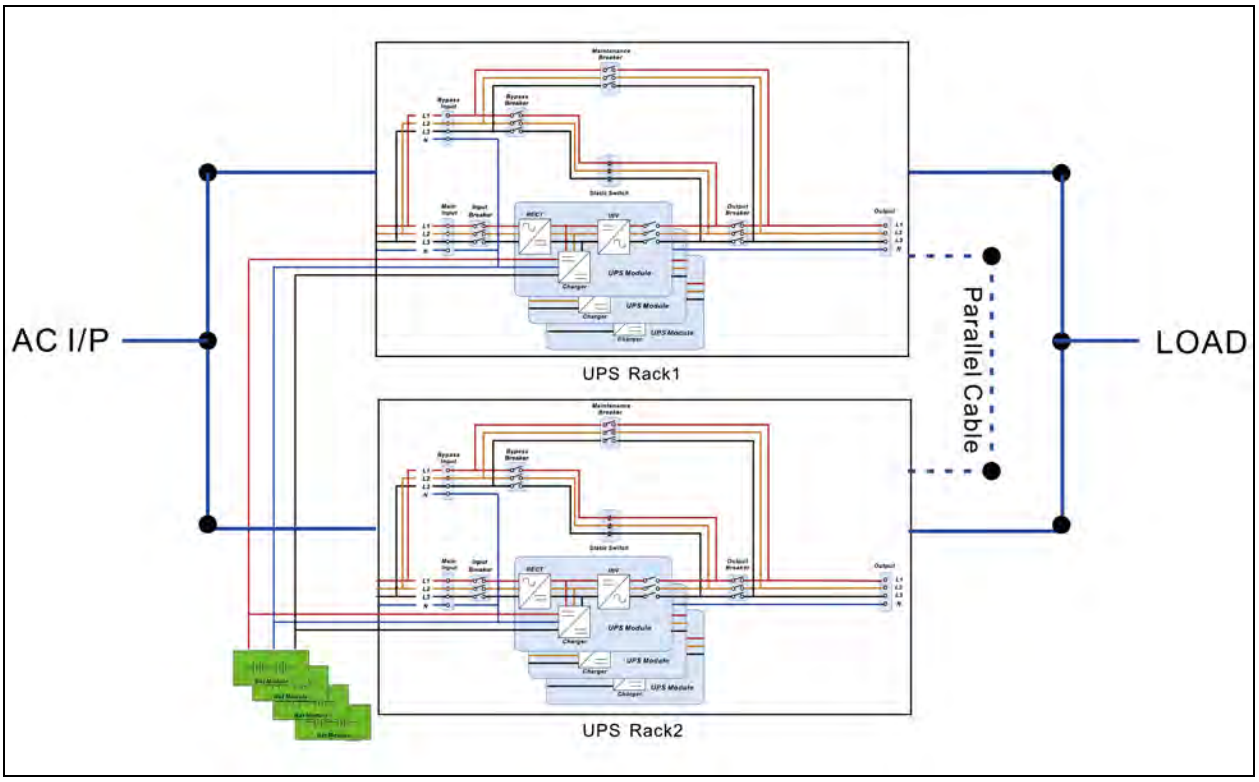
9.1 Input and Output Wiring

When installing the parallel cabinet system, the length of the input wires (R, S, T, N) of one cabinet must be equal to the length of the input wires of another cabinet. Similarly, the length of the output wires (R, S, T, N) of one cabinet must be equal to the length of the output wires of another cabinet. Two cabinets must have the same length input and output wires. Otherwise, it will cause the unbalance current of output load.

Refer to Installation on page 7 for the input and output wiring and battery wiring methods.

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Figure 9.1 Parallel System Wiring with Four Breakers



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9.2 Parallel Board Setting and Power Module Setting

9.2.1 Installing the power module of cabinet A

1. Refer to Table 2.5 on page 30 to set the module address.
2. Refer to Table 9.2 below and Table 9.2 below to set the cabinet address.

9.2.2 Installing the power module of cabinet B

1. Refer to Table 2.5 on page 30 to set the module address.
2. Refer to Table 9.2 below to set the cabinet address.

9.2.3 Installing the power module of cabinets C and D

1. Refer to Table 2.5 on page 30 , if there are more than 2 cabinets in parallel
2. Refer to Table 9.1 below and Table 9.2 below to set the address.

9.2.4 Parallel board information

The parallel board is located on the back of the cabinet. Refer to Table 9.2 below to set the parallel units. The parallel cables can be connected both in series or in Ring connection for higher reliability.

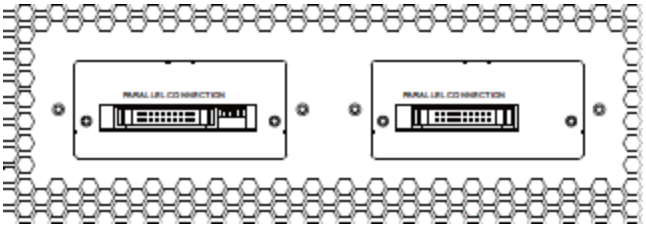


Table 9.1 Parallel Board Information

Switch View	DIP Switch	Description
	DIP SW 1	Terminal resistance
	DIP SW 2	Parallel set pin
	DIP SW 3	Parallel set pin
	DIP SW 4	NC

NOTE: DIP SW1 should be ON (down) only for the first and last UPSs in parallel system.

NOTE: For DIP SW 2 and 3 refer to Table 9.2 below .

Table 9.2 Parallel Board Cabinet Information

Cabinets	Switch Setting
Cabinet A	SW2 ON SW3 ON
Cabinet B	SW2 OFF SW3 ON
Cabinet C	SW2 ON SW3 OFF

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Table 9.2 Parallel Board Cabinet Information (continued)

Cabinets	Switch Setting
Cabinet D	SW2 OFF SW3 OFF

9.3 Parallel Function Setting

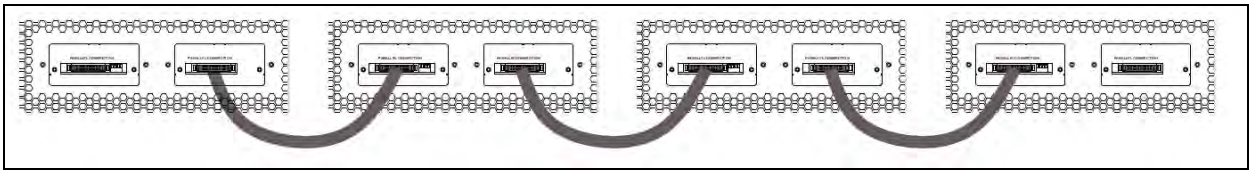
1. To prepare for the input and output wiring, refer to Input and Output Wiring on page 117 .
2. For the module address setting and cabinet setting, see Parallel Board Setting and Power Module Setting on the previous page .
3. Make sure that the ID settings of the module and the cabinet must be matched correctly, so that the normal operation of parallel connection is not affected. See Table 9.1 on the previous page .

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9.4 Parallel Cable Connection

Parallel cable is equipped with 20-pins connectors. Insert the 20-pins connector into the parallel board as shown in Figure 9.2 below . Both cabinets use the same way to connect the parallel cable.

Figure 9.2 Parallel Cable Connection Drawing



Set the terminal resistance (SW1) as shown in Figure 9.3 below , after connecting the parallel cable. If there are more than 2 cabinets, turn on SW1 on the first and last two cabinets, but keep SW1 off on other cabinets.

NOTE: The parallel connection can be realized by connecting the parallel cables in daisy chain Figure 9.2 above or in a closed loop configuration (for higher reliability).

Figure 9.3 Two Cabinets in Parallel

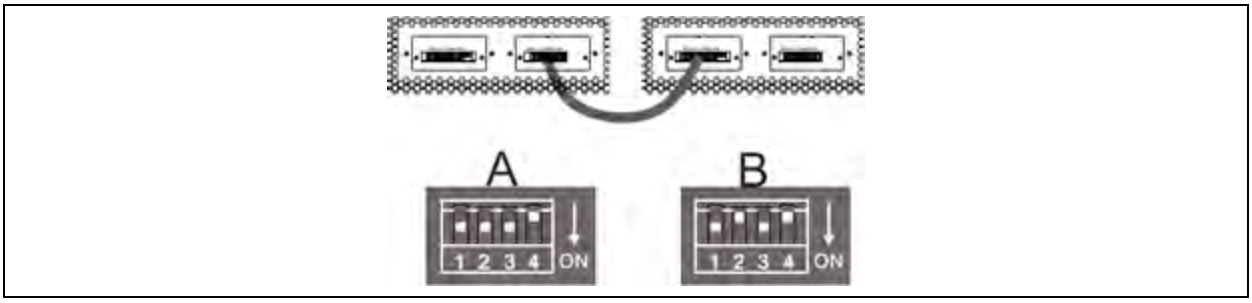


Figure 9.4 Three Cabinets in Parallel

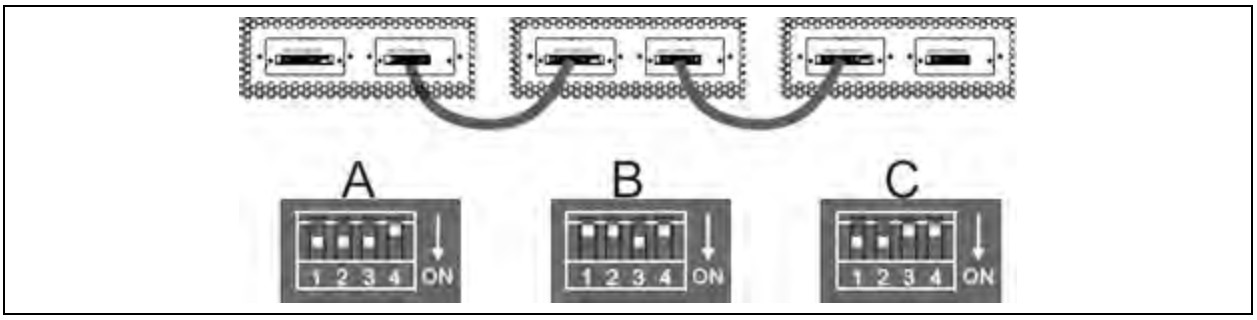
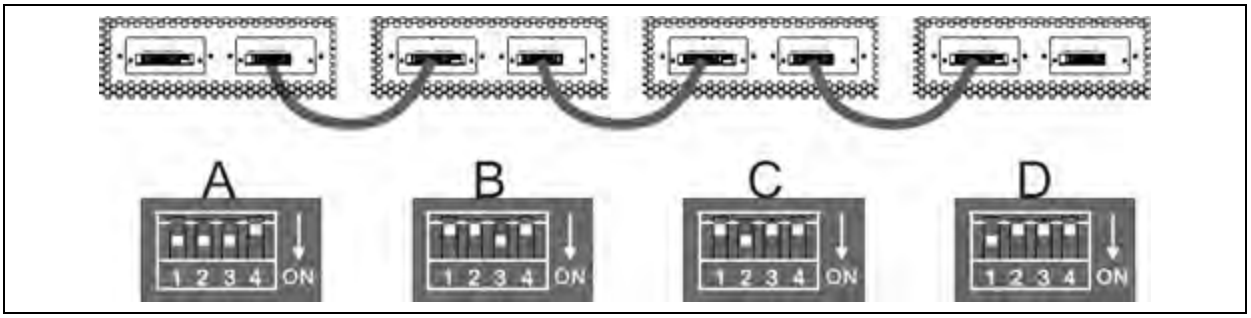


Figure 9.5 Four Cabinets in Parallel



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CAUTION: The parallel cable of each UPS must be connected correctly. Any incorrect connection will cause the UPS system to operate abnormally.

CAUTION: Make sure that the ID setting of the module and the cabinet must be matched correctly, so that the normal operation of parallel connection is not affected. Refer to Table 9.1 on page 119 .

9.5 Parallel System Turn on Procedure

1. Make sure that the sections Input and Output Wiring on page 117 to Parallel Cable Connection on the previous page are completed correctly.
2. Make sure that the input breakers and output breakers of each UPS have been turned ON.
3. Turn the battery breaker ON.
4. To connect the AC Input source to UPS, turn on the external AC source breaker.
5. Set the number of power modules of the complete parallel system on the Setting page of the Cabinet A. The total number of modules is set as N+X, where X is the number of redundant modules. Refer to Setup screen on page 68 .
6. Through the LCD display of each of the UPSs it is possible to check the Measurement data of all the UPSs of the system.
7. Make sure that the system is operating without any abnormal event on the panel display. Refer to Events screen on page 91 .
8. Use the ON switch or the control page of the panel of any of the UPSs to turn ON/OFF the complete parallel system.

NOTE: When all the settings of the parallel UPS are completed, all UPS are regarded as a system, and when one of the UPS is turned on or off, all the UPS will be synchronized. Including EPO is activated, all UPS are shut down at the same time.

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Appendices

Appendix A: Technical Support and Contacts

A.1 Technical Support/Service in the United States

Vertiv Group Corporation

24x7 dispatch of technicians for all products.

1-800-543-2378

Liebert® Thermal Management Products

1-800-543-2378

Liebert® Channel Products

1-800-222-5877

Liebert® AC and DC Power Products

1-800-543-2378

A.2 Locations

United States

Vertiv Headquarters

505 N Cleveland Ave

Westerville, OH 43082

Europe

Via Leonardo Da Vinci 8 Zona Industriale Tognana

35028 Piove Di Sacco (PD) Italy

Asia

7/F, Dah Sing Financial Centre

3108 Gloucester Road, Wanchai

Hong Kong

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