



Liebert<sup>®</sup> EXS

## **Installer/User Guide**

**30-kVA, 60-Hz, 208/220-V, Three-phase UPS**

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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 Information

**IMPORTANT!** This manual contains important safety instructions that must be followed during the installation and maintenance of the UPS and batteries. Read this manual thoroughly and the safety and regulatory information, available at <https://www.vertiv.com/ComplianceRegulatoryInfo>, before attempting to install, connect to supply, or operate this UPS.

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## 2 Product Description

The Vertiv™ Liebert® EXS uninterruptible power system (UPS) is an intelligent, online UPS with sine wave output. The UPS offers reliable, high-quality AC power to small-scale computer centers, networks, communication systems, automatic control systems, and similar sensitive electronic equipment.

### 2.1 Features

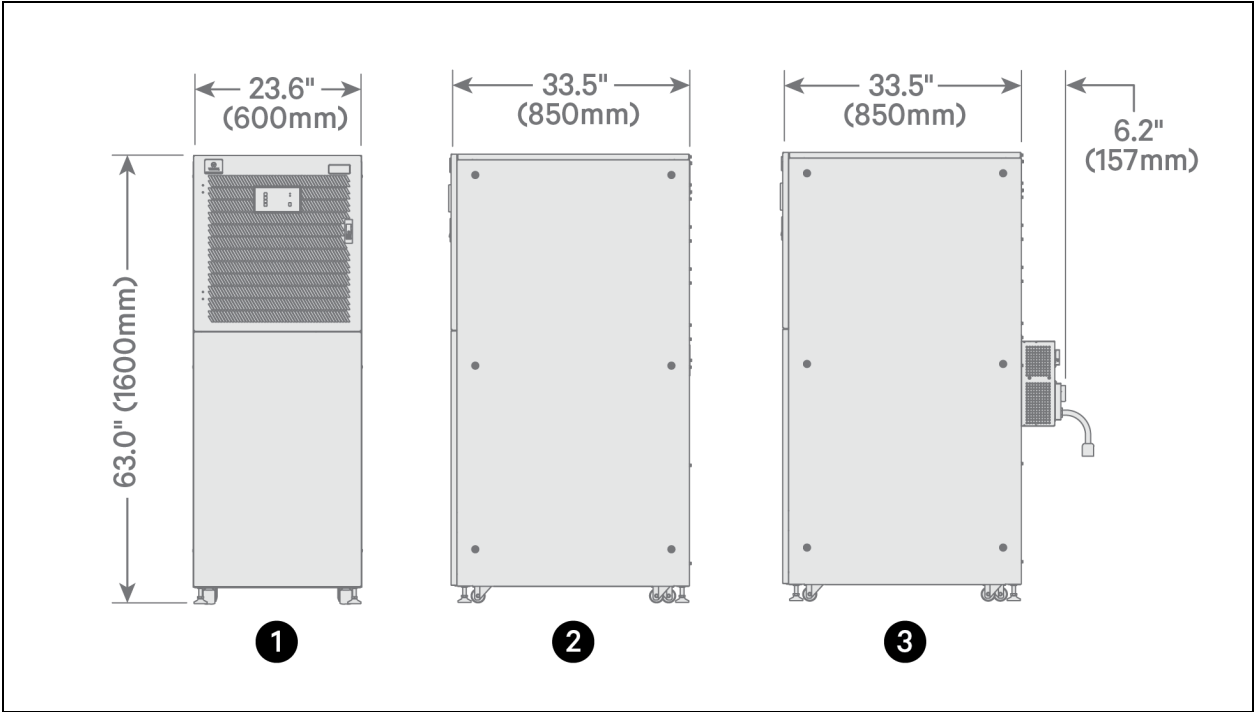
The Liebert® EXS includes:

- On-line, double-conversion efficiency up to 93.4% and Eco Mode efficiency up to 99%
- Output power factor—1.0 (Unity)
- Tower installation
- High-frequency, double-conversion topology with high input power factor, wide input voltage range
- Operation and display panel with color LCD for easy, intuitive operation
- Capable of Eco Mode, energy-saving operation

### 2.2 Front-panel Components

The outside front panel of the UPS provides ventilation holes and an operation/display panel with LED indicators and function keys. See [Operation and Display Panel](#) on page 31, for details about using the display panel.

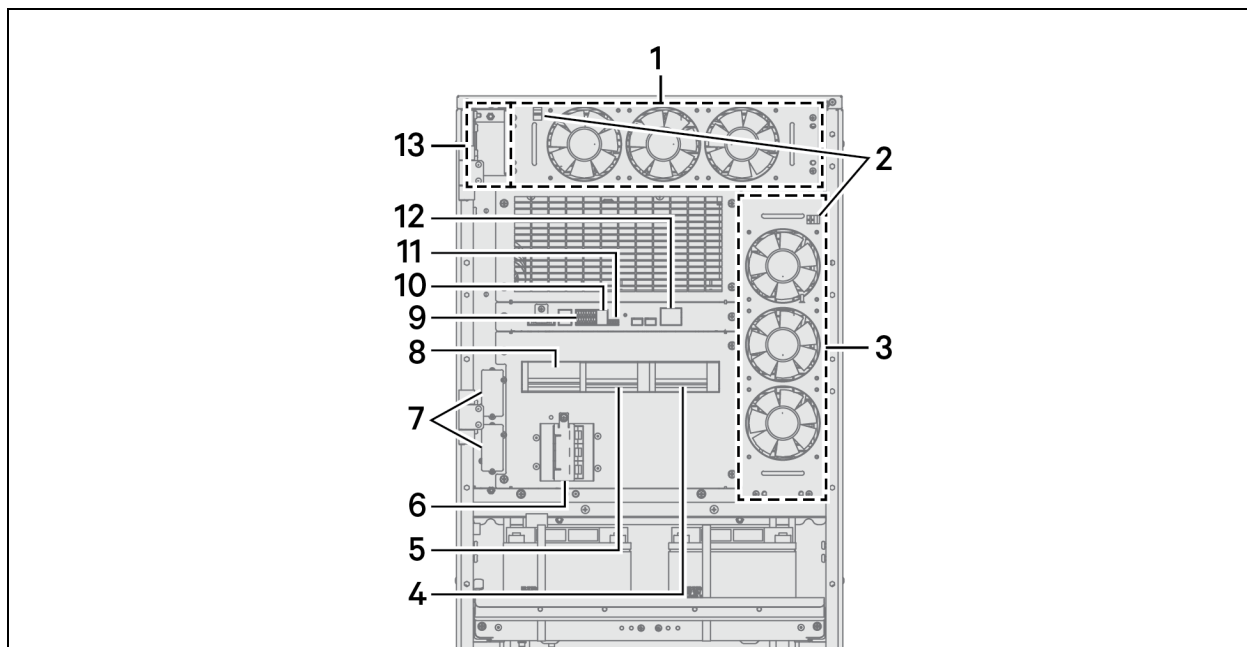
Figure 2.1 UPS Front and Side View



Item	Description
1	Front view
2	Right-side view
3	Right-side view with optional POD

## 2.3 Inside Front-panel Components

Figure 2.2 Components and Ports inside the Front Door

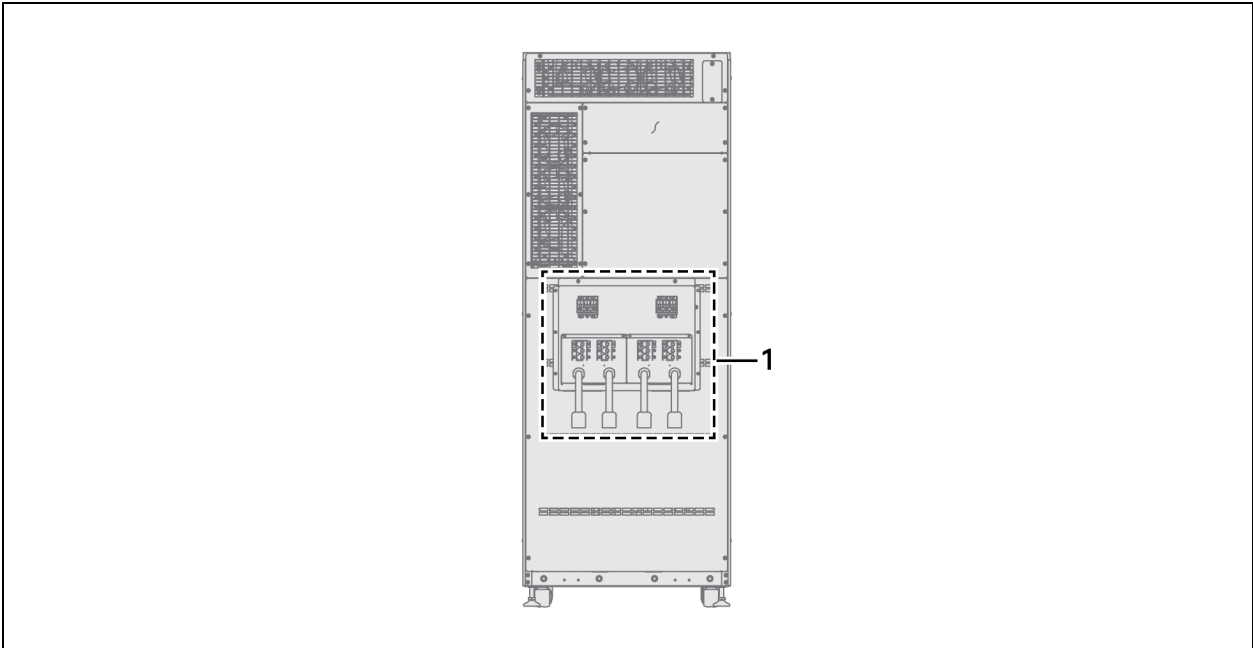


Item	Description
1	Power module 1
2	Battery start button
3	Power module 2
4	Rectifier-input breaker (RIB)
5	Bypass-input breaker (BIB)
6	Maintenance-bypass breaker (MBB)
7	Liebert® IntelliSlot ports
8	Maintenance-input breaker (MIB)
9	Dry-contact inputs
10	REPO port
11	Dry-contact outputs
12	Parallel/LBS ports
13	Wiring pass-through

## 2.4 Rear-panel Components

Your Vertiv™ Liebert® EXS may include an optional power-output distribution (POD) unit.

Figure 2.3 Optional POD on Rear of UPS



Item	Description
1	POD

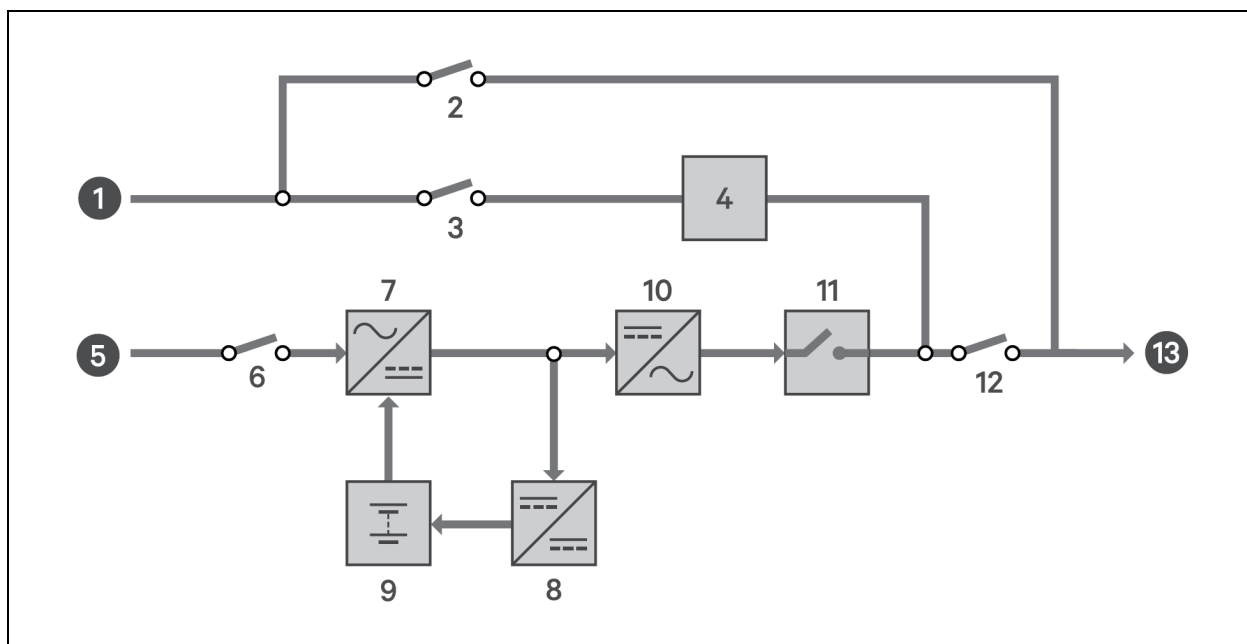
## 2.5 Major Internal Components and Operating Principle

The UPS is composed the components described in **Figure 2.4** on the next page. **Table 2.1** below, describes the operation of various circuits through the components.

**Table 2.1 Major Component Operation**

Component	Operation/Function
Transient Voltage Surge Suppression (TVSS) and EMI/RFI Filters	Provide surge protection. Filter electromagnetic interference (EMI) and radio frequency interference (RFI). Minimize any surges or interference present in the utility line and protect the sensitive equipment even when on internal bypass power.
Rectifier/Power Factor Correction (PFC) Circuit	In normal operation, converts utility AC power to regulated DC power for use by the inverter while ensuring that the wave shape of the input current used by the UPS is near ideal. Extracting this sine-wave input current ensures efficient use of utility power and reduces distortion reflected on the utility making cleaner power available to devices that are not protected by the UPS.
Inverter	In normal operation, inverts the DC output of the power-factor-correction circuit into precise, regulated sine-wave AC power. When utility power fails, the inverter receives energy from the batteries through the rectifier. In both Normal mode and Bypass mode, the UPS inverter remains on-line, generating clean, precise, regulated AC-output power.
DC-DC Charger	When the UPS is connected to utility power and the rectifier is operating, the battery charger regulates energy output from the rectifier/PFC to continuously recharge the batteries.
Static Bypass Switch	In the event of an output overload, over-temperature condition, or other failure, the switch automatically transfers connected equipment to bypass power.
Batteries	Up to 4 strings of long-life, valve-regulated, non-spillable, lead-acid batteries depending on back-up run-time requirements. See <b>Table 7.3</b> on page 51, for approximate run times.  <b>NOTE: To maintain battery design life, operate the UPS in an ambient temperature of 68°F to 77°F (20°C to 25°C).</b>
Maintenance Bypass	Breaker electrically isolates the UPS and internal batteries for maintenance.

Figure 2.4 UPS Operating-principle



Item	Description
1	Bypass input
2	Maintenance-bypass breaker (MBB)
3	Bypass-input breaker (BIB)
4	Static switch
5	Rectifier input
6	Rectifier-input breaker (RIB)
7	Rectifier
8	Battery charger
9	Battery
10	Inverter
11	Automatic inverter switch
12	Maintenance-isolation breaker (MIB)
13	UPS output

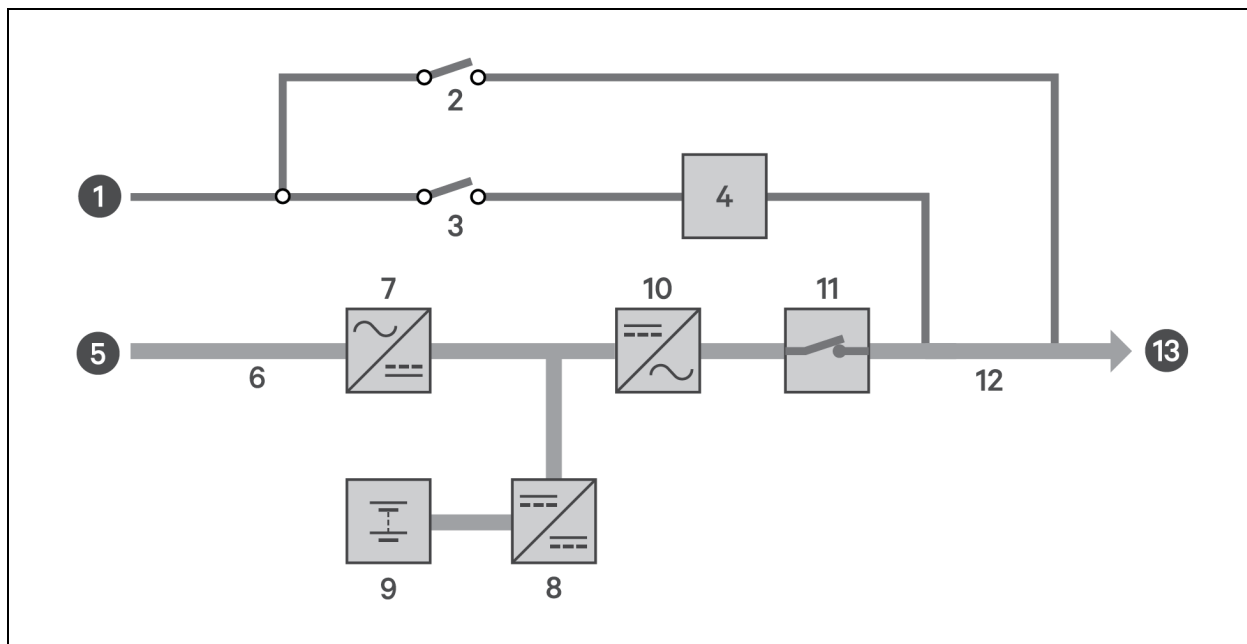
## 2.6 UPS States and Operating Modes

**NOTE:** See **Table 4.2** on page 32 , for description of the run-indicator and alarm-indicator LEDs mentioned in this section.

## 2.6.1 Normal Mode

Normal operation supplies clean, conditioned, sine-wave power to connected equipment from normal utility input. The battery charger charges the batteries. On the front-panel display, the run-indicator (green) is On, the alarm indicator is OFF, and the buzzer is silent.

**Figure 2.5 Normal-mode Operation**

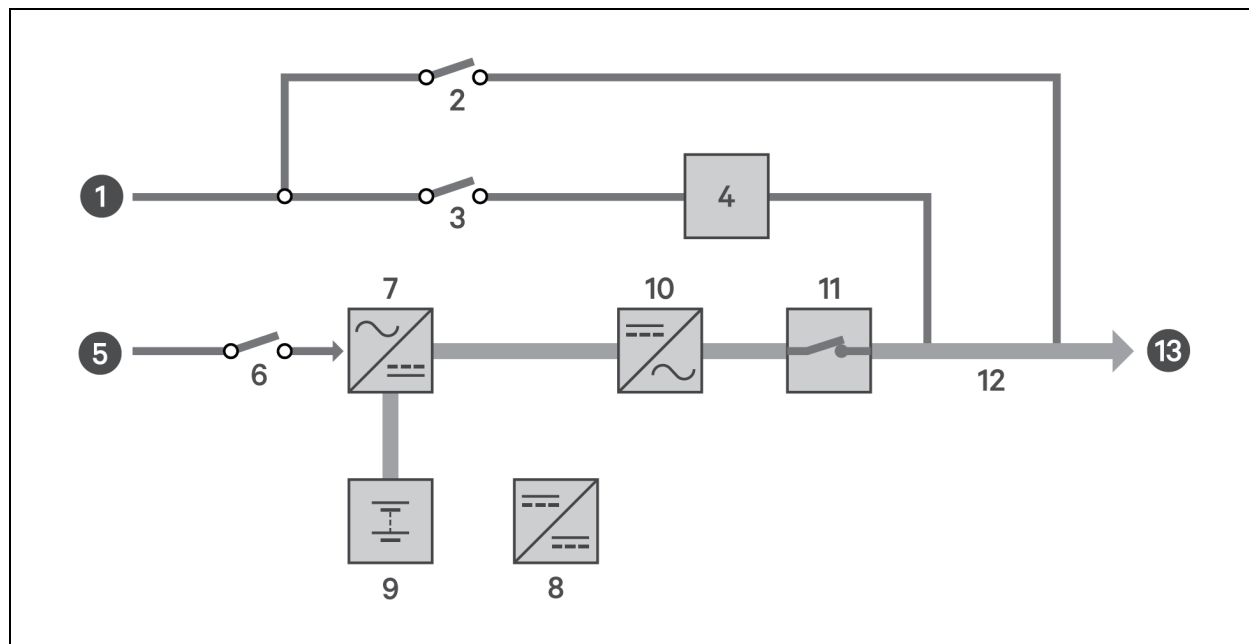


Item	Description
1	Bypass input
2	Maintenance-bypass breaker (MBB)
3	Bypass-input breaker (BIB)
4	Static switch
5	Rectifier input
6	Rectifier-input breaker (RIB)
7	Rectifier
8	Battery charger
9	Battery
10	Inverter
11	Automatic inverter switch
12	Maintenance-isolation breaker (MIB)
13	UPS output

## 2.6.2 Battery Mode

Battery mode supplies battery power to the load if utility power fails or if the utility voltage goes outside of the permissible range. On the front-panel display, the run indicator (green) is On, the alarm indicator (yellow) is On, and the buzzer beeps once each second. The LCD "Current" screen displays "On Battery."

**Figure 2.6 Battery-mode Operation**

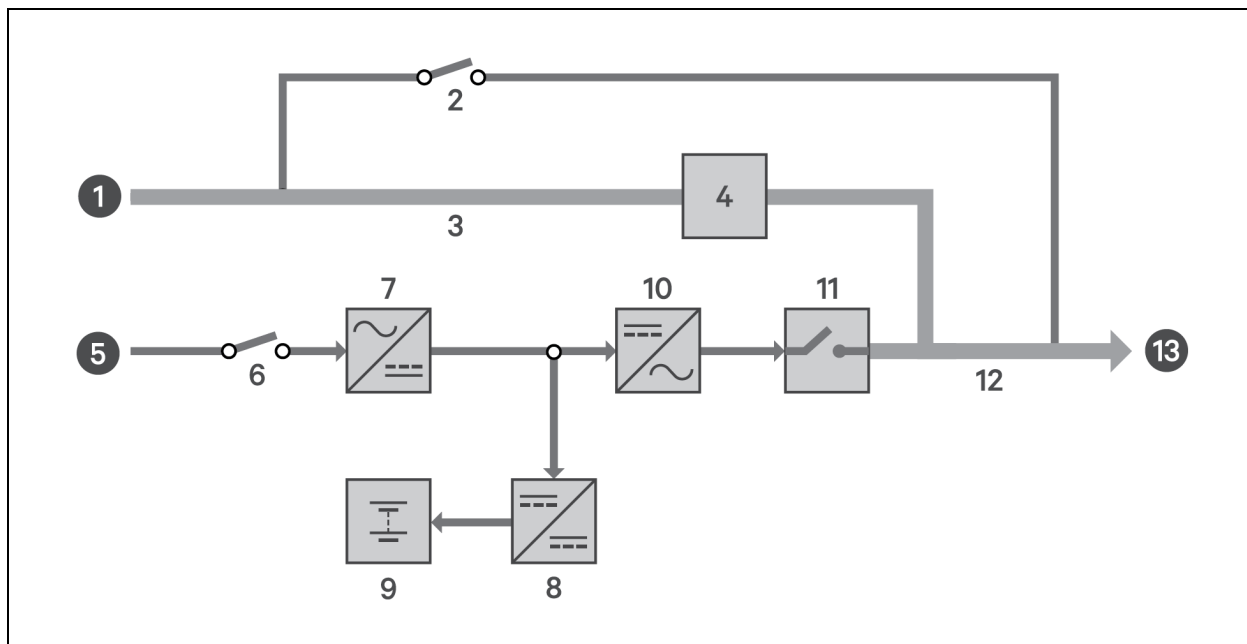


Item	Description
1	Bypass input
2	Maintenance-bypass breaker (MBB)
3	Bypass-input breaker (BIB)
4	Static switch
5	Rectifier input
6	Rectifier-input breaker (RIB)
7	Rectifier
8	Battery charger
9	Battery
10	Inverter
11	Automatic inverter switch
12	Maintenance-isolation breaker (MIB)
13	UPS output

### 2.6.3 Bypass Mode

Bypass mode supplies power to the load from the bypass source if an overload or fault occurs during normal operation. On the front-panel display, the run indicator (green) is On, the alarm indicator (yellow) is On, and the buzzer beeps once each second. The LCD "Current" screen displays "On Bypass."

**Figure 2.7 Bypass-mode Operation**



Item	Description
1	Bypass input
2	Maintenance-bypass breaker (MBB)
3	Bypass-input breaker (BIB)
4	Static switch
5	Rectifier input
6	Rectifier-input breaker (RIB)
7	Rectifier
8	Battery charger
9	Battery
10	Inverter
11	Automatic inverter switch
12	Maintenance-isolation breaker (MIB)
13	UPS output

## 2.6.4 Maintenance Bypass Mode

Used when the UPS requires maintenance or repair, Maintenance-bypass-mode operation powers the connected equipment with utility power while electrically isolating the internal UPS components.

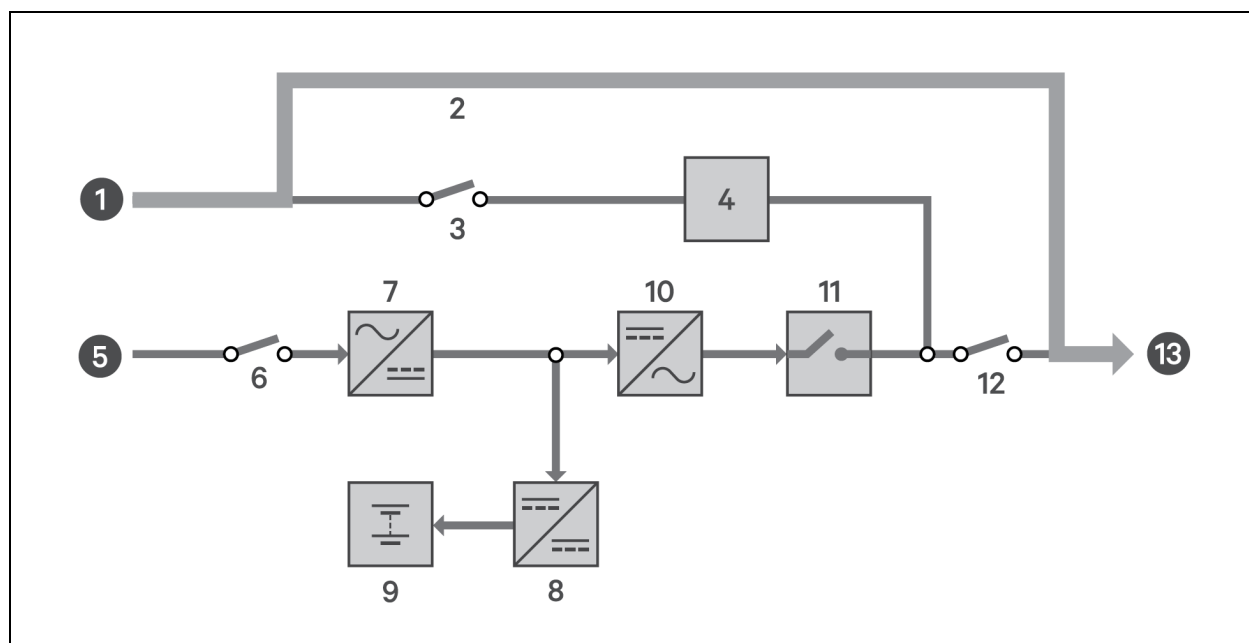
### NOTICE

Risk of power interruption. Can damage the connected equipment.

If utility power fails or if its quality is out of range while the UPS is in Maintenance Bypass Mode, the UPS may shut down without notice and shut-off output power to the load.

**NOTE:** The UPS has no user-serviceable parts. If the UPS malfunctions and requires service, visit <http://www.Vertiv.com/en-us/support/> or contact your local Vertiv™ representative.

**Figure 2.8 Maintenance-bypass Operation**



Item	Description
1	Bypass input
2	Maintenance-bypass breaker (MBB)
3	Bypass-input breaker (BIB)
4	Static switch
5	Rectifier input
6	Rectifier-input breaker (RIB)
7	Rectifier
8	Battery charger
9	Battery
10	Inverter

Item	Description
11	Automatic inverter switch
12	Maintenance-isolation breaker (MIB)
13	UPS output

### 2.6.5 Auto Restart Mode

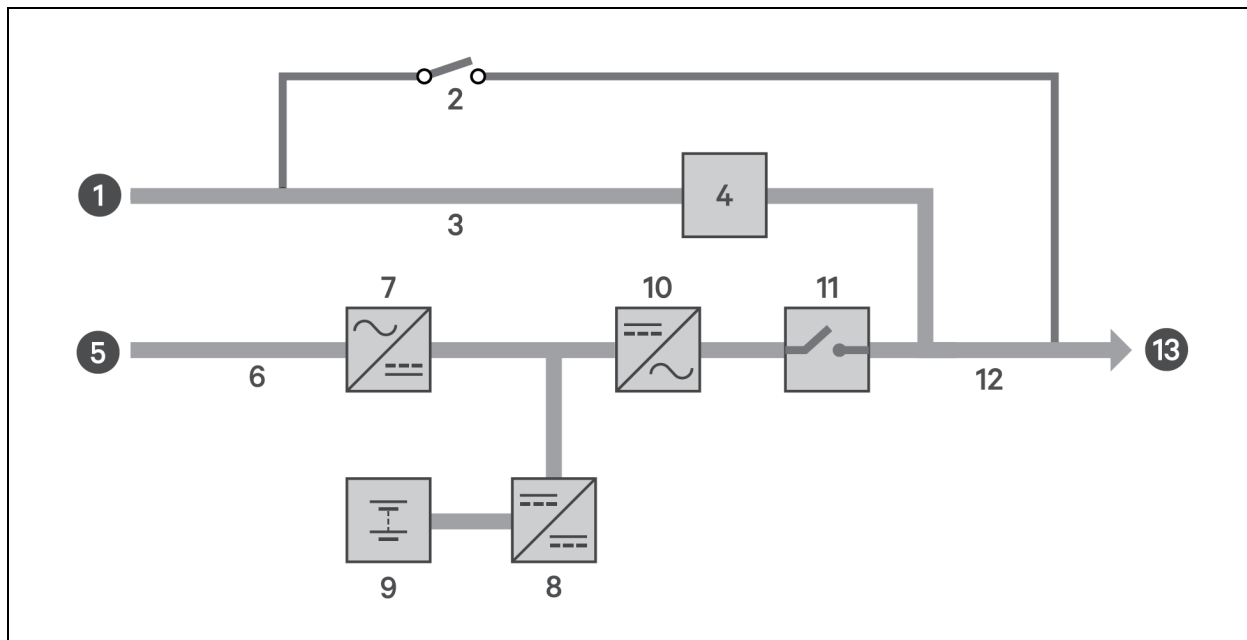
When enabled, which is the default setting, Auto Restart mode automatically re-starts the UPS after a shut-down that resulted from depleted batteries after an extended power outage. A built-in 10-second delay after utility power is restored allows other equipment to start first and stabilize before the UPS restarts.

## 2.6.6 Eco Mode—Single UPS

The UPS ships in Eco mode as the factory-default setting. Eco mode reduces power consumption and provides UPS efficiency approaching 99% by powering the load via bypass if the bypass voltage is normal or by powering the load via the inverter when the bypass voltage is outside the specified range.

**NOTE:** During Eco mode, if a bypass-failure or abnormal-bypass-voltage notification appears when the output is not overloaded, the UPS will transfer to Normal Mode. However, if a notification showing bypass failure or abnormal bypass voltage appears when the output is overloaded, the UPS will shut down the bypass.

Figure 2.9 Eco-mode Operation



Item	Description
1	Bypass input
2	Maintenance-bypass breaker (MBB)
3	Bypass-input breaker (BIB)
4	Static switch
5	Rectifier input
6	Rectifier-input breaker (RIB)
7	Rectifier
8	Battery charger
9	Battery
10	Inverter
11	Automatic inverter switch
12	Maintenance-isolation breaker (MIB)
13	UPS output

## 2.6.7 Fault State

When the UPS is in Normal mode and the inverter fails or UPS over-temperature occurs, operation transfers to Bypass mode. When the UPS is in Battery mode (with no bypass utility), and the inverter fails or over-temperature occurs, the UPS shuts down and stops output power. During a Fault state, the front-panel display alarm indicator (red) is On, the buzzer beeps continuously, and fault information displays on the LCD screen.

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## 3 Installation and Commissioning

Installation must be performed by properly-trained and qualified personnel. Do not start the UPS until after the installation is finished, and the system is commissioned by an authorized engineer.



**WARNING! Risk of electrical shock. Can cause property damage, injury, and death. The unit has several circuits that are energized with high DC and AC voltages. Check for voltage with both AC and DC voltmeters before making contact and before working within the UPS. Only properly trained and qualified personnel wearing appropriate, OSHA-approved personal protective equipment (PPE) should prepare for installation, install, and maintain the equipment. When performing maintenance with any part of the equipment under power, service personnel and test equipment must stand on rubber mats.**



**WARNING! Risk of electrical shock. Can cause equipment damage, injury and death. Before beginning installation, verify that all external overcurrent protection devices are open (Off), and that they are locked-out and tagged appropriately to prevent activation during the installation. After the power cables are connected, the terminal block's protective cover must be reinstalled to remove the electric shock hazard.**



**WARNING! Risk of heavy unit falling over. Improper handling can cause equipment damage, injury, and death. Exercise extreme care when handling unit cabinets and rack-mounted units to avoid equipment damage or injury to personnel. The UPS weighs between 1,041.1 lb (460 kg) and 1,388.9 lb (630 kg) depending upon the number of battery strings in the system. See **Table 7.2** on page 50, for the specific weights. Locate center-**



**of-gravity symbols and determine unit weight before handling. Test-lift and balance the cabinets before transporting. Maintain minimum tilt from vertical at all times. Slots at the base of the module cabinets are for forklift use. Fork-lift slots support the unit only if the forks are completely beneath the unit.**

**NOTE:** These are general installation procedures and methods. Because each site is different, consider the site conditions and requirements when planning and conducting the installation.

### 3.1 Pre-installation Preparation

Before beginning the installation, consider the environmental requirements, service clearances, and external protective devices when planning the final location of the UPS system.

#### 3.1.1 Environment of Installation Area

Install the UPS in a clean, well-ventilated environment with the ambient temperature within the specifications listed in **Table 7.1** on page 49.

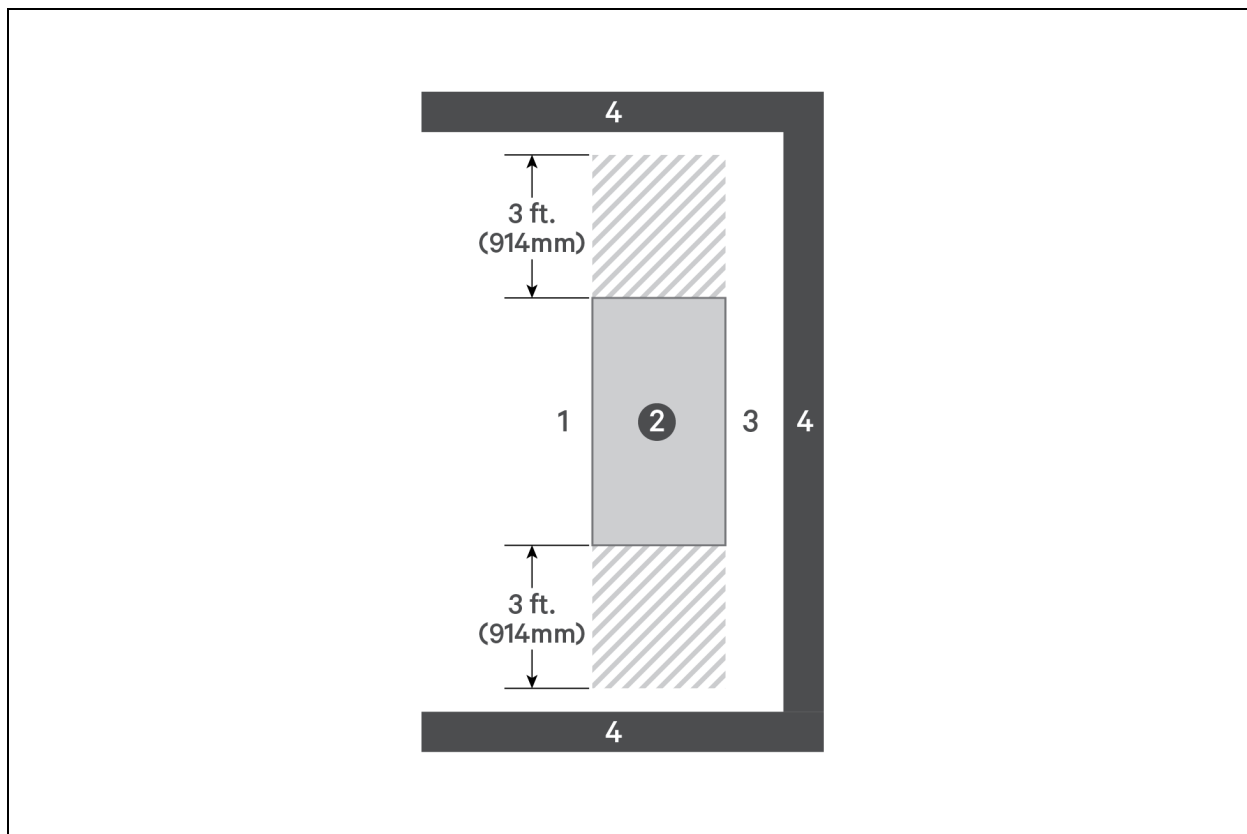
#### 3.1.2 Clearance Required for Installation, Maintenance and Operation

Internal fans provide forced-air cooling for the UPS. Cooling air enters through the front panel and hot air is exhausted through the back.

- Per National Electric Code, at least 3 ft. (914 mm) clearance in the front and rear of the UPS is required for installation and maintenance, see **Figure 3.1** on the next page. No side clearance is required.

- During operation, 8 in. (203 mm) rear clearance is required, unless the unit includes the optional POD, then 3 ft. (914 mm) rear clearance is required.

**Figure 3.1 Installation and Maintenance Clearances**



Item	Description
1	No side clearance required.
2	UPS (top view).
3	No side clearance required.
4	Wall or other solid surface.

### 3.1.3 Installation Tools

The following tools are required to properly install your UPS:

- Pallet jack / Forklift
- Utility Knife
- 18-mm (23/32-in.) open wrench or adjustable wrench (Crescent wrench)
- 16-mm (5/8-in.) wrench or socket
- 13-mm (1/2-in.) wrench or socket
- 10-mm (3/8-in.) wrench or socket
- #1, #2, and #3 Phillips-head screwdrivers
- Torque wrench

### 3.1.4 Storage

If you do not install the UPS immediately, you must store it indoors and protect it from excessive moisture, heat, and other harsh conditions. Store the batteries in a dry, well-ventilated environment with a temperature range of 68°F ~ 77°F (20°C ~ 25°C).

#### NOTICE

Risk of failure to properly charge batteries can damage the batteries and void the warranty.

Batteries will lose charge during storage. Batteries must be recharged as recommended by the battery manufacturer every 3 to 6 months, depending on storage temperature:

- At 68-77°F (20-25°C): charge after 6 months in storage
- At 78-86°F (26-30°C): charge after 3 months in storage
- At 87°F or higher (31°C or higher): charge after 1 month in storage.

### 3.1.5 External Protective Devices

Circuit breakers or other external protective devices must be installed on the UPS input. The following sections provide general guidance for installation by properly-trained and qualified personnel.

#### Rectifier and Bypass-input Protection

Overcurrent Protection—Install an appropriate overcurrent protective device should on the utility input power distribution. Consider the current capacity of power cables and the system-overload requirements in selection of the input protection and wiring, see **Table 3.1** on page 21, and **Table 3.2** on page 21.

Dual-Input System Protection—In a dual-input system, install separate protective devices for the utility and bypass at the utility input power distribution.

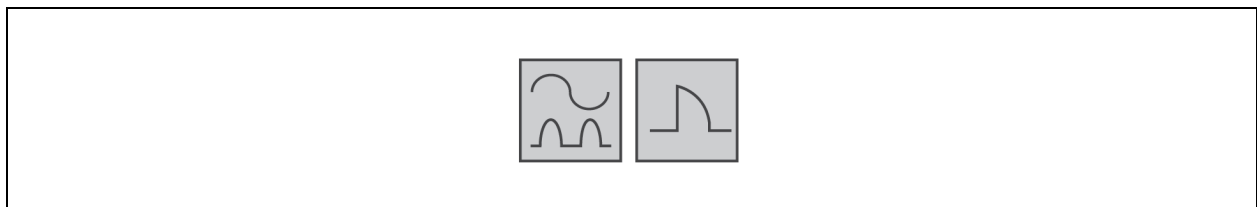
Utility/Bypass Back-Feed Protection—the UPS includes back-feed protection in the event of a fault.

Earth Leakage Current—the residual current detector (RCD) for the UPS upstream input power distribution should be:

- Sensitive to the DC unidirectional pulse (Level A) in the power distribution network
- Insensitive to the transient current pulse
- General sensitivity type, settable: 0.3A ~ 1A

The residual current circuit breaker (RCCB) must be sensitive to the DC unidirectional pulse (Level A) in the power distribution network, but insensitive to the transient current pulse, see **Figure 3.2** below.

**Figure 3.2** RCCB symbols



When using the earth RCD in a split-bypass system, the RCD should be installed at the upstream input power distribution end to prevent false alarms. The earth leakage current fed by the RFI filter in the UPS ranges from 3.5 mA to 100 mA. We recommend that you verify the sensitivity of each differential device of the upstream input power distribution and downstream power distribution (to load).

## Battery

The UPS includes an overcurrent-protection device for the internal battery.

## UPS Output

The UPS includes output overcurrent protection in all modes of operation. If the customer-provided output-distribution panel is not within sight of the UPS, the distribution panel must include a main breaker.

## 3.2 Equipment Handling and Unpacking



**WARNING! Risk of heavy unit falling over. Improper handling can cause equipment damage, injury, and death. Exercise extreme care when handling unit cabinets and rack-mounted units to avoid equipment damage or injury to personnel. The UPS weighs between 1,041.1 lb (460 kg) and 1,388.9 lb (630 kg) depending upon the number of battery strings in the system. See **Table 7.2** on page 50 , for the specific weights. Locate center-**



**of-gravity symbols and determine unit weight before handling. Test-lift and balance the cabinets before transporting. Maintain minimum tilt from vertical at all times. Slots at the base of the module cabinets are for forklift use. Fork-lift slots support the unit only if the forks are completely beneath the unit.**

Upon receipt, check the items received against the order and shipping manifest. If any parts are missing, contact your local Vertiv™ representative or visit <http://www.Vertiv.com/en-us/support/>.

The UPS ships on a pallet and is equipped with casters that permit two or more people to roll it off the pallet for installation. Move the palletted UPS as close as possible to the installation location before removing packing material or loosening shipping brackets.

### NOTICE

The casters on the UPS are for moving short distances. Move the pallet as close as possible to the installation site before taking the UPS off the pallet. Plan the unloading procedure and route to the final location to minimize the distance that the UPS must be rolled on casters and to avoid large cracks and un-even flooring. Major shocks while moving the UPS over large cracks can loosen internal connections and otherwise damage the unit.

During unpacking:

- Inspect the UPS for damage. If you find any problem, file a damage claim with the carrier immediately and send a copy to Vertiv™ at:  
  
Attn: Traffic Department  
  
Vertiv Corporation  
  
1050 Dearborn Drive  
  
P.O. Box 29186  
  
Columbus, Ohio 43085 USA
- Check the accessories and model numbers against the delivery list. If you find any problem, notify your local Vertiv™ representative immediately.

### 3.2.1 Removing the UPS from the Shipping Pallet

1. Using a forklift, pallet jack, or other lifting device, move the packaged unit as close as practical to the intended installation location.
2. Remove the protective packing.
3. Locate the included accessories in their packed location on top of the UPS, and set them aside.
4. Unbolt the shipping brackets from the pallet with a 16-mm (5/8-in.) wrench or socket:
  - Remove the front, lower panel from the UPS, and unbolt the front shipping bracket.
  - Unbolt the shipping bracket from the rear of the UPS.
  - Retain the brackets to secure the installed UPS to the floor, if required.
5. Raise the leveling feet so that they will not interfere when moving the UPS.
6. Place the ramp onto the pallet at the front of the UPS, and gently roll the UPS down the ramp to the floor then into the installation position.
7. Lower the leveling feet to fix the UPS in the location.

### 3.3 Connecting Power Cables



**WARNING! Risk of electrical shock. Can cause property damage, injury, and death. The unit has several circuits that are energized with high DC and AC voltages. Check for voltage with both AC and DC voltmeters before making contact and before working within the UPS. Only properly trained and qualified personnel wearing appropriate, OSHA-approved personal protective equipment (PPE) should prepare for installation, install, and maintain the equipment. When performing maintenance with any part of the equipment under power, service personnel and test equipment must stand on rubber mats.**



**WARNING! Risk of electrical shock. Can cause equipment damage, injury and death. Before beginning installation, verify that all external overcurrent protection devices are open (Off), and that they are locked-out and tagged appropriately to prevent activation during the installation. After the power cables are connected, the terminal block's protective cover must be reinstalled to remove the electric shock hazard.**

When connecting input and output cables, follow national and local wiring regulations, take the environment into account, and refer to NFPA 70, Table 310-16. The recommended minimum cables and overcurrent protection is listed in **Table 3.1** below, and **Table 3.2** below, are based upon an 86°F (30°C) ambient temperature.

**Table 3.1 Currents and Wire Size—UPS Rectifier Input**

Maximum Current, Amps	Recommended OPD, Amp Trip	75°C THW Copper Wire (phase) Number of Cables per Phase: 1	75°C THW Copper Wire (neutral) Number of Cables: 1-2	75°C THW Copper Wire (Ground) Number of Cables: 1
105	150	2/0	2/0	6 AWG

**Table 3.2 AC Currents and Wire Size—UPS Bypass Input\* and Output**

Maximum Current, Amps	Recommended OPD, Amp Trip	75°C THW Copper Wire (phase) Number of Cables per Phase: 1	75°C THW Copper Wire (neutral) Number of Cables: 1-2	75°C THW Copper Wire (Ground) Number of Cables: 1
83	125	1/0	1/0	6 AWG

\* Bypass input for dual input configurations only.

**Table 3.3 Recommended Wire Lug for Phase, Neutral, and Ground Conductors**

	AWG (mm <sup>2</sup> )		
	6 (13.3)	1/0 (53.5)	2/0 (67.4)
Manufacturer Part #	McMaster-Carr: 7113K366	Thomas & Betts: 54152NT	Thomas & Betts: 54157NT
	Thomas & Betts: RE6-14		
Recommended Torque	50 lb-in. / 4.2 lb-ft. / 5.6 Nm		

**Table 3.4 Recommended Wire Lug for External Battery Conductors**

	AWG (mm <sup>2</sup> )		
	6 (13.3)	1/0 (53.5)	2/0 (67.4)
Manufacturer Part #	Thomas & Betts: RE6-516	Thomas & Betts: 54153NT	Thomas & Betts: 54158NT
	Thomas & Betts: CTL6-516		
Recommended Torque	126 lb-in. / 10.5 lb-ft. / 14.2 Nm		

### 3.3.1 Connecting I/O Cables



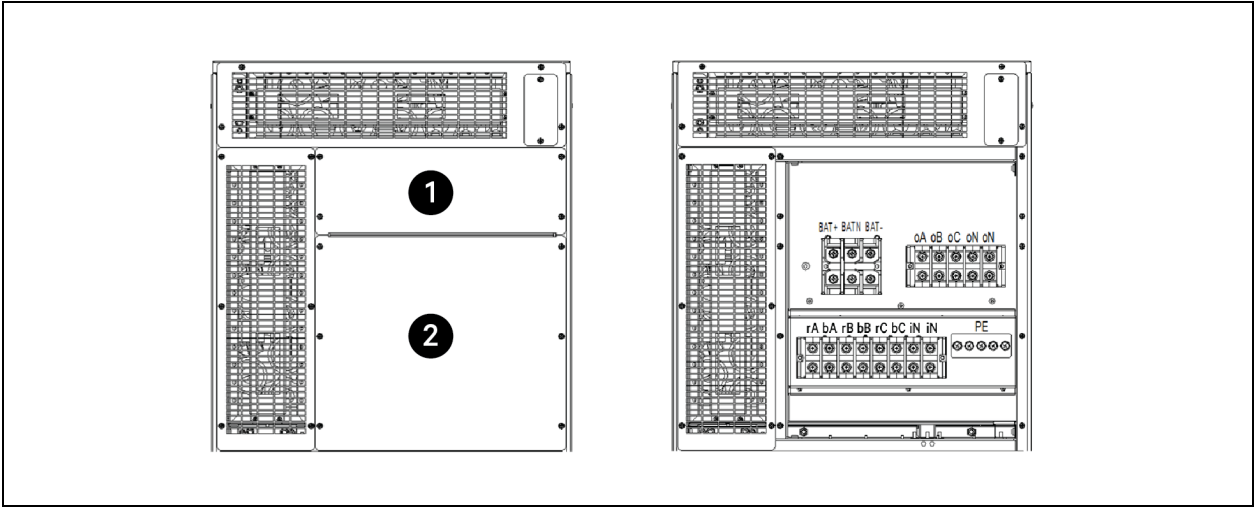
**WARNING! Risk of electrical shock. Can cause equipment damage, injury and death. Before beginning installation, verify that all external overcurrent protection devices are open (Off), and that they are locked-out and tagged appropriately to prevent activation during the installation. After the power cables are connected, the terminal block's protective cover must be reinstalled to remove the electric shock hazard.**

1. Prepare to connect the UPS power cables to the I/O terminal block on the UPS rear panel, see **Figure 3.3** on page 24 :
  - Remove the upper conduit/cable entry panel to punch holes for the conduit size, and attach the conduits to the rear of the conduit plate.
  - Reinstall the conduit/cable-entry panel on the UPS
  - Remove the wiring-access cover plate to gain access to the input and output terminal blocks.

**NOTE: The EXS unit ships as a factory-configured single-input system.**

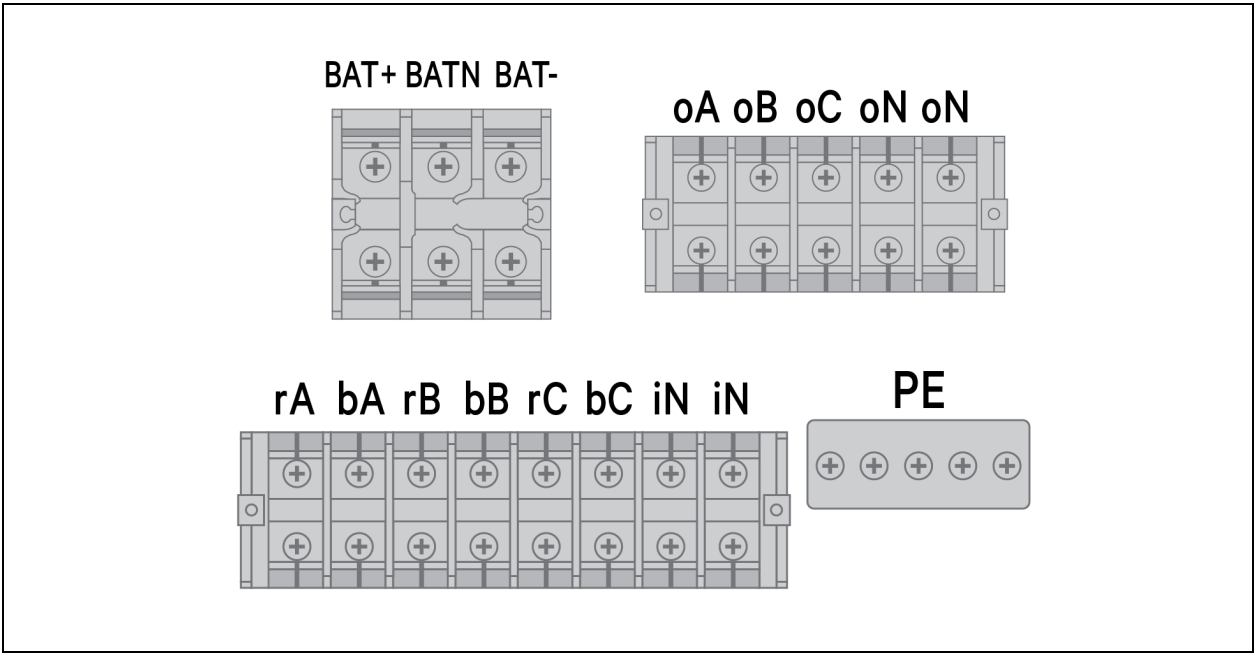
2. For a single-input configuration, leave the factory-installed jumpers on the input terminals, and make the following input connections from the upstream feeder panel to the input terminal. See **Figure 3.4** on the next page :
  - Phase A to rA
  - Phase B to rB
  - Phase C to rC
  - Neutral to iN
  - Ground cable to PE
3. To convert to a dual-input configuration, Remove the factory-installed jumpers from between terminals:
  - rA – bA
  - rB – bB
  - rC – bC
4. For dual input, make the following connections from the upstream feeder panel to the main/rectifier input terminal block:
  - Phase A to rA
  - Phase B to rB
  - Phase C to rC
  - Neutral to iN
  - Ground cable PE
5. For dual input, make the following connections from the upstream feeder panel to the bypass-input terminal block:
  - Phase A to bA
  - Phase B to bB
  - Phase C to bC
  - Neutral to iN
  - Ground cable to PE
6. For both configurations, make the following output connections from the UPS output terminal to the downstream distribution-panel main lug breaker:
  - oA to Phase A
  - oB to Phase B
  - oC to Phase C
  - oN to neutral bus
  - PE to ground bus
7. If you are using an external battery, refer to the quick-installation guide for the external battery cabinet for cable routing and connection the EBC. The quick-installation guide is included with your battery cabinet and is available on the EXS product page at [www.Vertiv.com](http://www.Vertiv.com).
8. Torque all customer-side connections per recommendations in **Table 3.3** on the previous page , and **Table 3.4** on the previous page
9. Replace and secure the cover panel.

Figure 3.3 Connection-terminal access and locations



Item	Description
1	Upper conduit/cable-entry panel
2	Wiring-access cover plate

Figure 3.4 Terminal Detail



## 3.4 Communication Connections

The communication ports, shown in **2.3** on page 5 , include:

- Two Vertiv™Liebert® IntelliSlot card ports
- I/O, programmable dry contacts
- REPO port
- USB port

### 3.4.1 Liebert® IntelliSlot Ports

The UPS has two IntelliSlot ports on the front of the unit. The IntelliSlot and USB ports may be used simultaneously.

We recommend that you route the communication cable for the IntelliSlot ports from the rear of the UPS through the built-in wiring pass-through to connect to the installed cards. See **Figure 2.2** on page 5 , for the location of the pass-through.

If included, the cards are factory-installed in the ports. **Table 3.5** below , describes the cards available. The instructions for configuring and using the cards are available at [www.Vertiv.com](http://www.Vertiv.com).

**Table 3.5 IntelliSlot Communication Cards**

Card	Description
Vertiv™ Liebert® IS-UNITY-LIFE™ Card	Communicates with Vertiv™ LIFE Services remote monitoring.
Vertiv™Liebert® IS-UNITY-SNMP™ Card	Communicates via SNMP protocol to Vertiv monitoring/shut-down applications or any third-party network management system.
Vertiv™ Liebert® IS-UNITY-DP™ Card	Communicates with up-to two third-party platforms including SNMP, Modbus, BACnet, and YDN-23 protocols to network-connected Vertiv monitoring/shut-down applications or third-party shut-down software.
Vertiv™ Liebert® IS-485EXI™ Card	Communicates with Vertiv™ SiteScan™ monitoring system.
Vertiv™ Liebert® IS-Relay Card	Provides dry-contact alarm information, including signals for: On Battery, On Bypass, Low Battery, Summary Alarm, UPS Fault and On UPS for communication to a remote-monitoring system or network-connected Vertiv or third-party shut-down software. The card also accepts input signals to shut-down the UPS during any operating mode.

### 3.4.2 REPO Connection

**Table 3.6** below, describes the pin-out of the REPO port, J14, used for N.O. or N.C. connection.

**Table 3.6 REPO port (J14) Pin Descriptions**

J14 Pin #	Pin Name	Description
2	REPO Coil N.C.	Normally Closed circuit, EPO is activated when Pin 2 – Pin 4 is opened
4	+12VDC	REPO Power Supply, 12 VDC, 100mA
6	+12VDC	REPO Power Supply, 12 VDC, 100mA
8	REPO Coil N.O.	Normally Open circuit, EPO is activated when Pin 6 – Pin 8 is closed



**WARNING! Risk of electrical shock. Can cause equipment damage, injury and death. The EPO action of the UPS will shut down the rectifier, inverter and static bypass, but it does not disconnect input power to the UPS. To electrically isolate the UPS, an interface with the external REPO circuit must be field-supplied to allow disconnecting the UPS input feeder breaker to remove all sources of power to the UPS and connected equipment to comply with national and local wiring codes and regulations.**

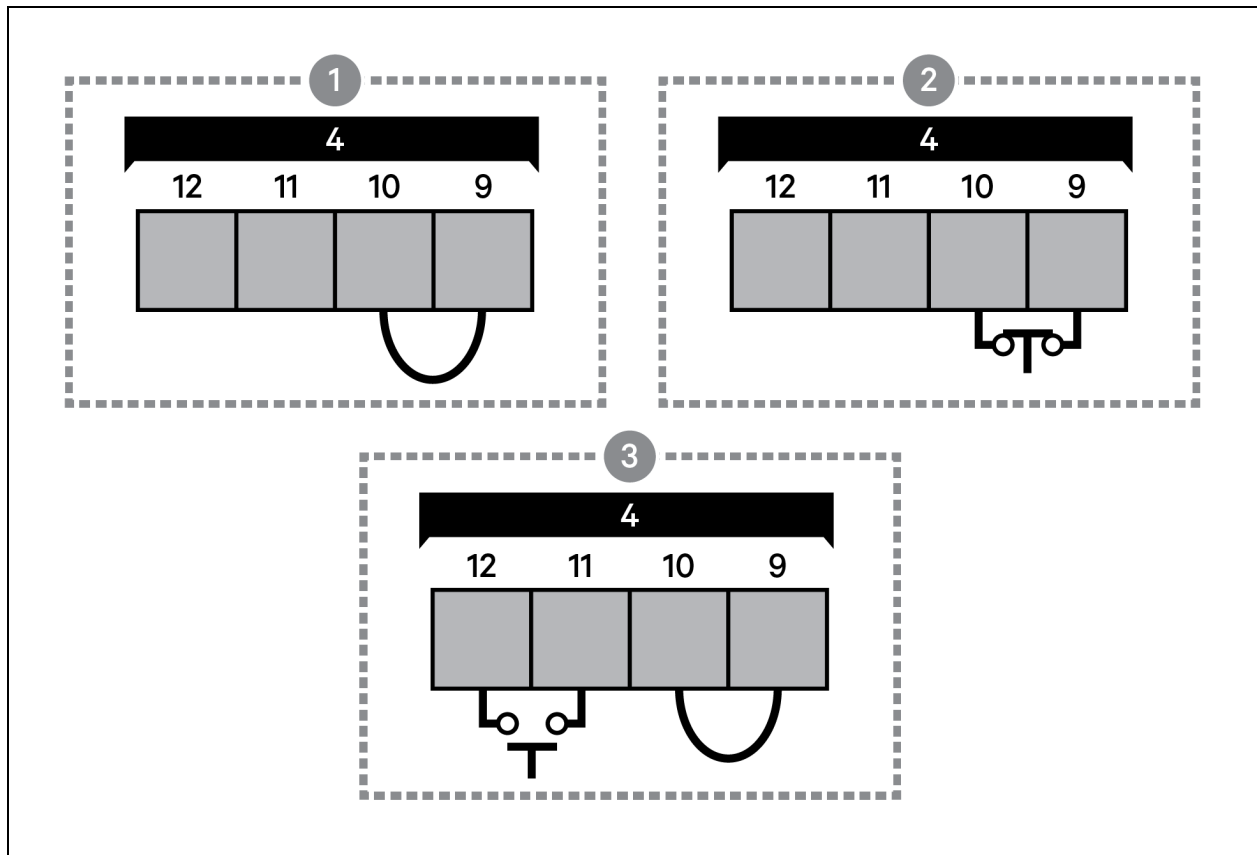
**Figure 2.2** on page 5, shows the location of the REPO connection inside the UPS front panel. **Figure 3.5** on the facing page, shows the connection details.

If a REPO connection is not required for the UPS, the factory-installed jumper between Pin 2 and Pin 4 must remain installed for the UPS to operate.

**NOTE:** The terminal-block wire range is 18 AWG ~ 22 AWG (0.82 mm<sup>2</sup> ~ 0.33 mm<sup>2</sup>), and we recommend using 18-AWG copper, shielded, signal cable. If the REPO will trip an external, electronically-controlled circuit breaker, you must reset the breaker before starting the UPS after the REPO is activated.

**NOTE:** We recommend that you route the wiring for the REPO connection from the rear of the UPS through the built-in wiring pass-through to connect to the REPO port. See **Figure 2.2** on page 5, for the location of the pass-through.

Figure 3.5 REPO-connection on J14



Item	Description
1	No REPO connection—factory-supplied jumper must remain installed.
2	Normally-closed (N.C.) connection—remove factory-supplied jumper and wire pins 2 and 4 to a remote switch.
3	Normally-open (N.O.) connection—factory-supplied jumper must remain installed.
4	Port J14. See <b>Table 3.6</b> on the previous page, for the pinout details.

### 3.4.3 Connecting USB Communication Cables

The UPS includes a standard, USB Type-A port is provided for service and troubleshooting by Vertiv™ service technicians.

### 3.4.4 Dry-contact Input and Output Connections

The UPS contains 5 sets of configurable input contacts and 2 sets of configurable output contacts. **Figure 2.2** on page 5, shows the dry-contact location inside the front panel, and **Figure 3.6** on the next page, shows the connection details. **Table 3.7** on the next page, and **Table 3.8** on page 29, describe the pin-out designations, allowable configuration selections, and factory details.

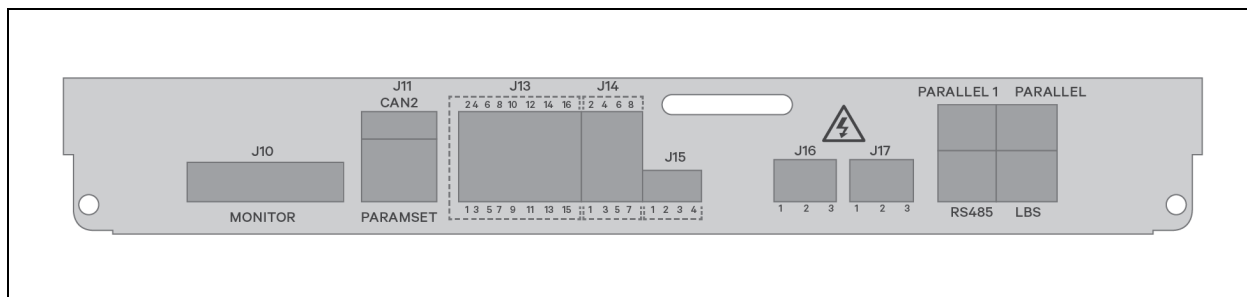
**NOTE:** The terminal-block wire range is 18 AWG ~ 22 AWG (0.82 mm<sup>2</sup> ~ 0.33 mm<sup>2</sup>), and we recommend using 18-AWG copper, shielded, signal cable.

All input dry-contact ratings are 12-VDC, 20-mA maximum. The output dry-contact rating is 24-VDC, 0.5-A maximum.

The inputs expect the external dry contact to be N.O. and to close in order to trigger the alarm/action. The output dry contacts are N.O. and close to trigger the alarm/action.

**NOTE:** We recommend that you route the cabling for the dry contacts from the rear of the UPS through the built-in wiring channel to connect to the dry-contact ports. See **Figure 2.2** on page 5, for the location of the pass-through.

**Figure 3.6 Dry-contact Connections**



**Table 3.7 Input Dry-contact Details**

Connector ID	Pin No.	Pin Name	Description	Default
J13	1	Input #1 N.O.	General-purpose inputs that may be configured for any of the following: <ul style="list-style-type: none"> <li>On Generator</li> <li>Transfer to Inverter Inhibit</li> <li>External MIB Status</li> <li>External MBB Status</li> <li>Module Output Breaker Status</li> <li>Battery Ground Fault Detected</li> <li>Charger Shutdown</li> <li>ECO Mode Inhibit</li> <li>Start Battery Maintenance Self-Test</li> <li>Stop Battery Maintenance Self-Test</li> <li>Alarm Cleared</li> </ul>	External MIB Status
	3	Input #1 Gnd		
	5	Input #2 N.O.		Module Output Breaker Status
	7	Input #2 Gnd		
	9	Input #3 N.O.		External MBB Status
	11	Input #3 Gnd		
	13	Input #4 N.O.		On Generator
	15	Input #4 Gnd		
	2	Input #5 N.O.		Transfer to Inverter Inhibit
	4	Input #5 Gnd		
	6-8-10	RESERVED		
	12	Internal Battery Temp Sensor	Internal battery temperature sensor inputs	N/A
	14			
	16	Temp Gnd	Internal battery temperature sensor gnd	

**Table 3.8 Output Dry-contact Details**

Connector ID	Pin No.	Pin Name	Description	Default
J14	1	Output #1 N.O.	General-purpose outputs that may be configured for any of the following: <ul style="list-style-type: none"> <li>• System Alarm (Summary)</li> <li>• On Battery</li> <li>• Low Battery</li> <li>• UPS Fault, On Bypass</li> <li>• On UPS</li> <li>• Remote EPO</li> <li>• Main Input Abnormal</li> <li>• On Maintenance Bypass</li> <li>• Load Shed Signal 1</li> <li>• Load Shed Signal 2</li> <li>• Internal MBB Closed</li> </ul>	On Battery
	3	Output #1 Gnd		
	5	Output #2 N.O.		Summary Alarm
	7	Output #2 Gnd		

**Table 3.9 External Battery-breaker Interface Details**

Connector ID	Pin No.	Pin Name	Description
J15	1	BCB Drive	Battery-breaker trip signal (12-V)
	2	BCB Status	Battery-breaker AUX contact status (12-V)
	3	GND SELV	Battery-breaker trip signal return
	4	BCB Online	Battery-breaker AUX contact return

### 3.4.5 External-device-interface Terminal Connection Ports

The UPS contains ports J16, and J17, to integrate external, overcurrent-protection devices.

Terminal J16 is reserved for optional wiring to the upstream, rectifier input breaker fitted with a shunt-trip coil for back-feed protection. However, the UPS includes all required back-feed protection circuitry to comply with safety-agency requirements. The capacity rating for J16 is 250-VAC, 5-A.

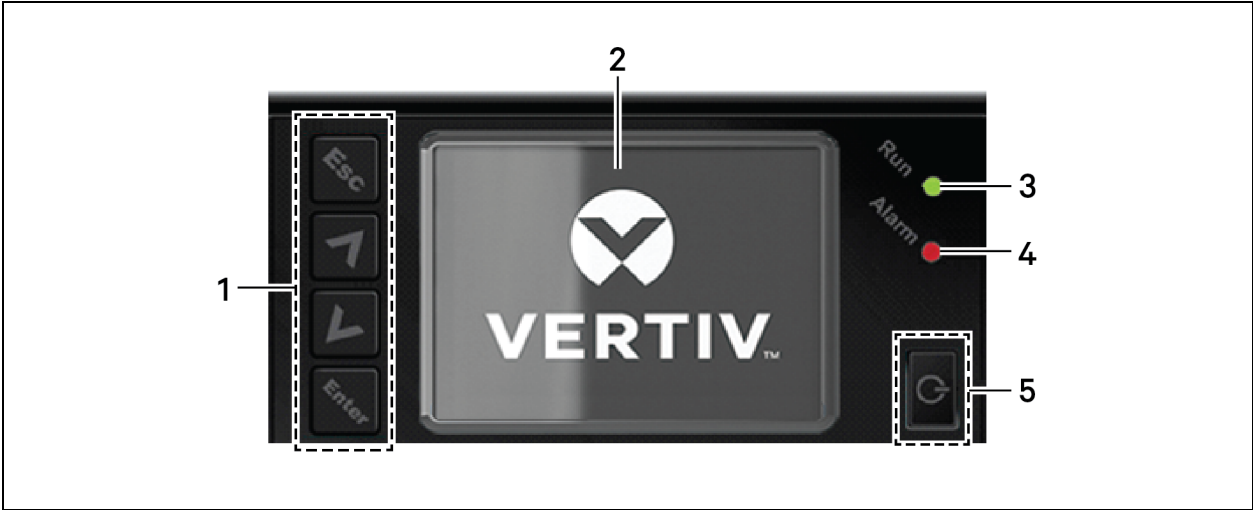
Terminal J17 is reserved for optional wiring to the upstream, bypass input breaker (for dual-input systems) fitted with a shunt-trip coil for back-feed protection. However, the UPS includes all required back-feed protection circuitry to comply with safety-agency requirements. The capacity rating for J17 is 250-VAC, 5-A.

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## 4 Operation and Display Panel

The operation/display panel includes LED indicators, function keys, and an LCD interface to configure and control UPS operation.

Figure 4.1 UPS Front-panel Display



Item	Description
1	Menu keys, see <b>Table 4.1</b> below .
2	LCD panel.
3	Run indicator LED, see <a href="#">LED Indicators</a> on the next page .
4	Alarm indicator LED, see <a href="#">LED Indicators</a> on the next page .
5	Power button, see <b>Table 4.1</b> below .

Table 4.1 Display-panel Button Functions and Descriptions

Button	Function	Description
Enter	Enter	Confirm or enter selection.
▲	Up	Move to previous page, increase value, move left.
▼	Down	Move to next page, decrease value, move right.
Esc	Escape	Go back.
G	Power	Power-on the UPS, power-off the UPS, transfer to Bypass Mode.

**NOTE:** While the UPS is operating, the LCD will dim and display a screen saver if there is no active alarm or user interaction for two minutes, see **Figure 4.2** below . If an alarm or fault occurs or if any button is pressed, the UPS-flow screen displays.

**Figure 4.2** LCD Screen Saver



## 4.1 LED Indicators

The LEDs on the front-panel display indicate operation and alarm statuses of the UPS.

**Table 4.2** LED Functions

Indicator	LED color	LED state	Indicates:
Run indicator	Green	On	UPS has output
		Blinking	Inverter is starting
		Off	UPS has no output
Alarm indicator	Yellow	On	Alarm occurs
	Red	On	Fault occurs
	N/A	Off	No alarm, no fault

## 4.2 Audible Alarm (Buzzer)

An audible alarm accompanies various events during UPS operations. **Table 4.3** below , describes the sounds and their meaning. To silence an alarm, see [Silencing the Audible Alarm](#) on page 41 .

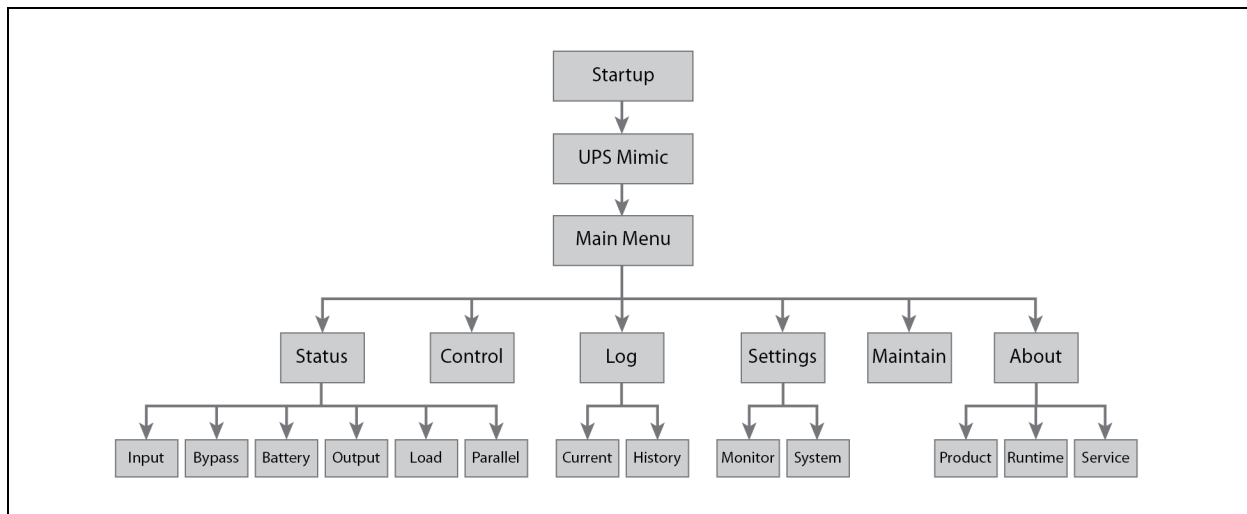
**Table 4.3** Audible-alarm Descriptions

Sound	Indicates:
Continuous beep	Generated when a UPS fault appears, such as a fuse or hardware failure.
One 0.5 second beep every 4 seconds	Generated when a UPS general alarm/warning appears, such as on battery.
One 0.5 second beep every 1.5 seconds	Generated when the UPS reaches low battery reserve.
One 0.5 second beep every 1 second	Generated when the UPS output is overloaded.

## 4.3 LCD Menu and Screens

The menu-driven LCD user interface lets you browse the UPS status, view operating parameters, customize settings, control operation, and view alarm/event history. Use the function keys to navigate through the menu, and view statuses or select settings in the screens.

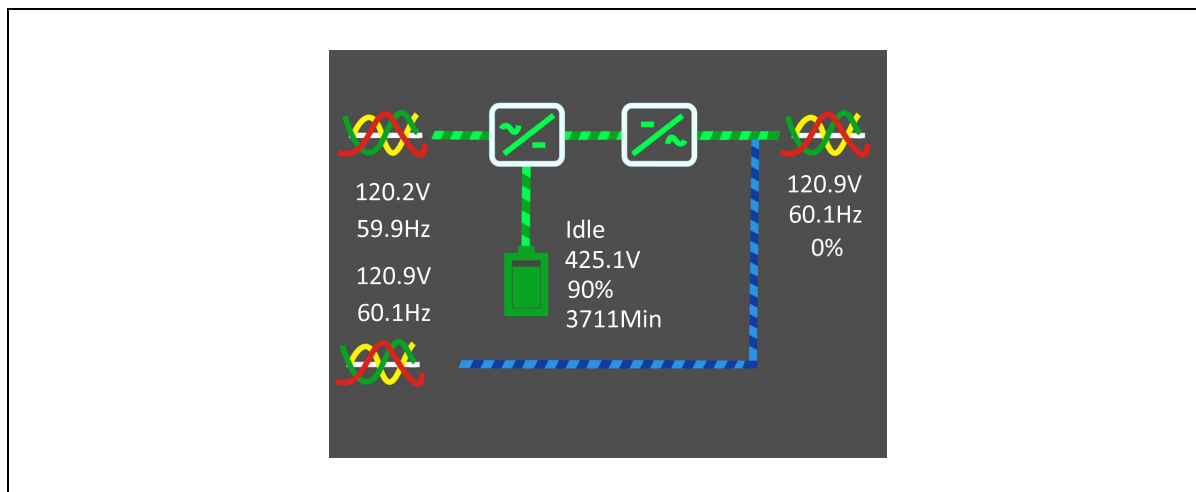
**Figure 4.3 LCD Menu Structure**



### 4.3.1 Start-up and UPS Mimic Screens

At start-up, the UPS executes a system test and displays the Vertiv™ logo screen for 10 to 15 seconds, shown in **Figure 4.1** on page 31. After the test completes, an overview screen shows status information, the active (green) power path, and the non-working power path (gray).

**Figure 4.4 UPS Mimic Screen**



### 4.3.2 Main Menu

To access the main menu, press **Enter** while at the UPS Mimic screen. Use the Up/Down buttons to select the submenu options, and press **Enter** to open the submenu. Press **ESC** to return to UPS Mimic.

Figure 4.5 Main Menu

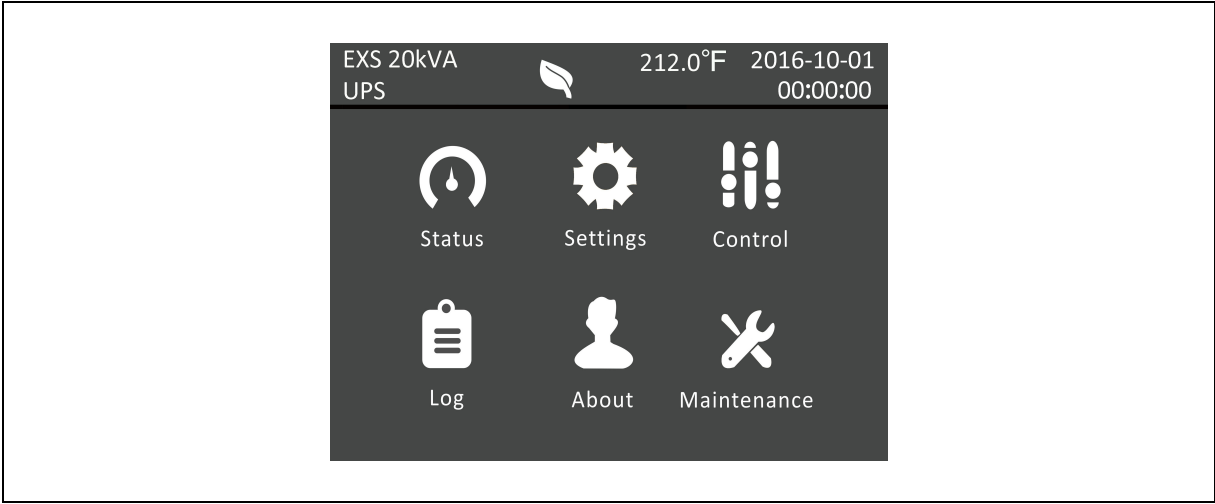


Table 4.4 Menu Options

Submenu	Description
Status	Voltage, current, frequency, and parameters for UPS components, see <a href="#">Status Screen</a> below .
Settings	Display and system parameter settings, see <a href="#">Settings Submenu</a> on the facing page .
Control	UPS controls, see <a href="#">Control Screen</a> on page 36 .
Log	Current alarms and event history, see <a href="#">Log Screen</a> on page 36 .
About	Product and network information, see <a href="#">About Page</a> on page 37 .
Maintain	Service-only, proprietary-password-protected page for use only by Vertiv™ service representatives.

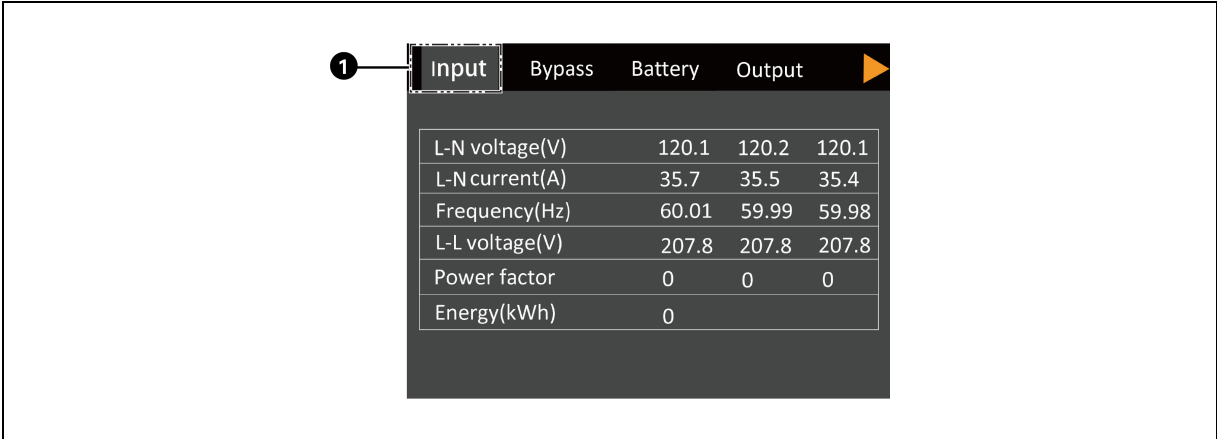
### Status Screen

The status screen displays voltages, currents, frequencies, and parameters on individual tabs for input, bypass, battery, output, and load status.

**To view the UPS status information:**

1. At the main menu, select the Status icon, and press **Enter**.
2. Use the arrow buttons to move the cursor left/right and select a tab, then press **Enter** to display the status information for the selected tab.

Figure 4.6 Status-screen tabs



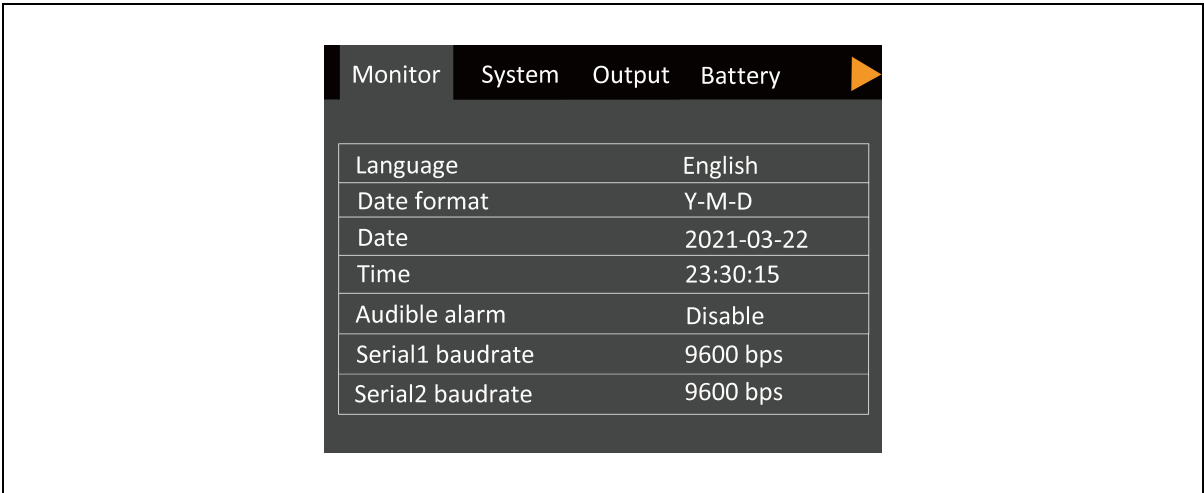
Item	Description
1	Screen tabs with Input tab selected.

Settings Submenu

The settings screen consists of tabs that list UPS settings described in **Table 4.5** on page 38 .

**NOTE:** To adjust the settings, you must enter a password. See [Editing Display and Operation Settings](#) on page 37 , for details on entering the password and editing the setting parameters.

Figure 4.7 Monitor and System tabs on the Settings Submenu



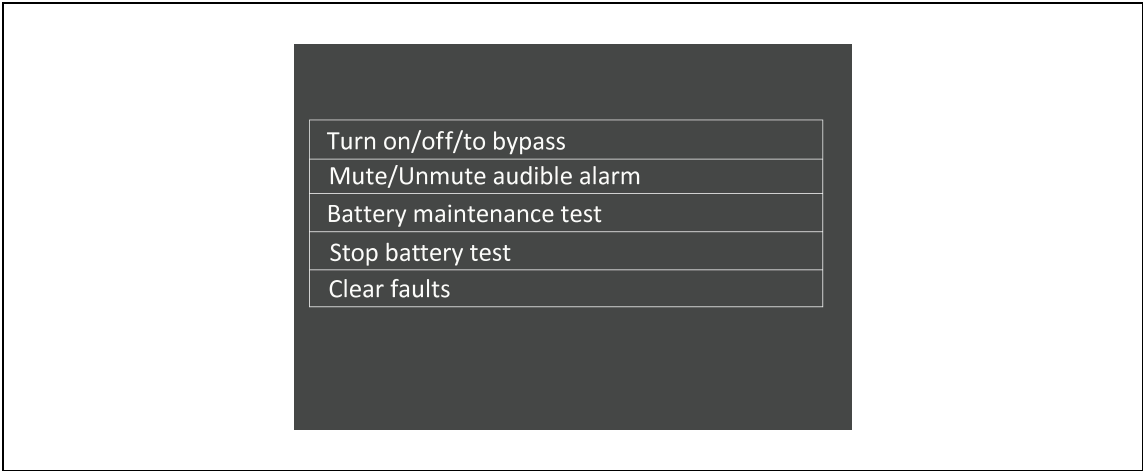
Control Screen

The Control screen offers UPS-control options.

To adjust the UPS controls:

- 1. At the main menu, select the Control icon, and press **Enter**.
- 2. Use the arrow buttons to move the cursor to the option, then press **Enter** to selected the control.

Figure 4.8 Control Screen



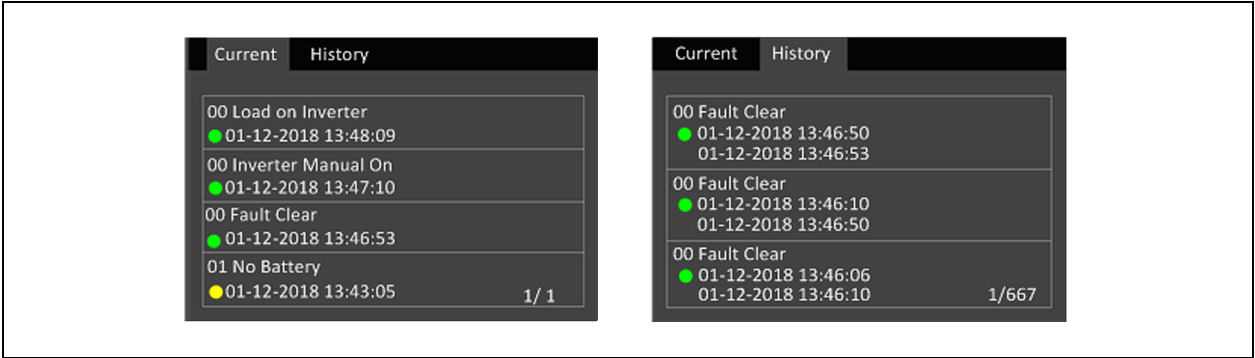
Log Screen

The Log Screen offers tabs that list the current alarms and the alarm/event history.

To view the logs:

- 1. At the main menu, select the Log icon, and press **Enter**.
- 2. Use the arrow buttons to move the cursor left/right and select a tab, then press **Enter** to display the log for the selected tab.

Figure 4.9 Current and History Log Tabs



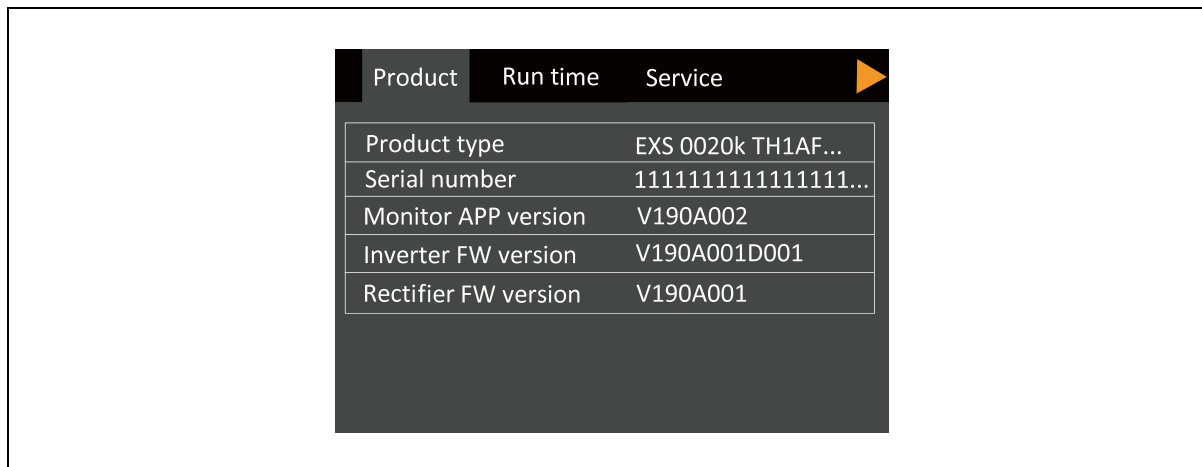
## About Page

The About screen offers tabs that list information about the product and the network.

**To view the product and network information:**

1. At the main menu, select the Settings icon, and press **Enter**.
2. Use the arrow buttons to move the cursor left/right and select a tab, then press **Enter** to display the information for the selected tab.

**Figure 4.10 About Screen Tabs**



## 4.4 Editing Display and Operation Settings

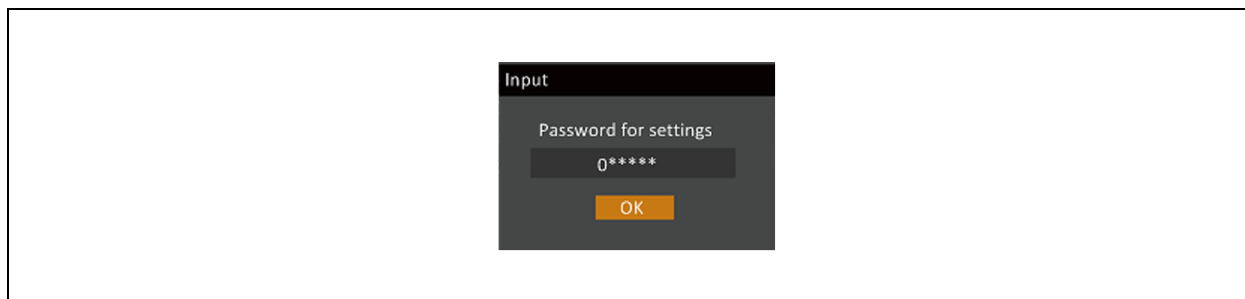
You may adjust the display settings and UPS configuration via the LCD. **Table 4.5** on the next page, describes the settings. The display and operation settings are password projected. The default password is 111111 (six ones).

**NOTE:** We recommend that you change the password to protect your system and equipment and record the new password and store it in an accessible location for later retrieval. See [Changing the Password](#) on the next page.

**To enter the password:**

1. Press the up-arrow button to change the digit, then press the down-arrow button to move to the next digit.
2. Repeat to select each digit, and press **Enter** to submit the password.

**Figure 4.11 Password Prompt**



**Table 4.5 Settings Available at the Display Panel**

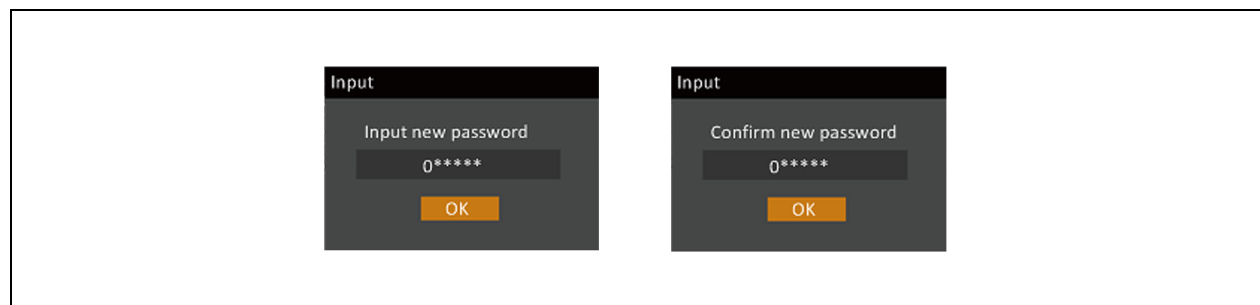
Tab	Settings	Parameter range	Default setting
System	Battery Auto Equalize	Disable, Enable	Disable
	ECO Mode	Disable, Enable	Disable
Monitor	Language	English, French, Portuguese, Spanish, Chinese, Czech, Dutch, German, Italian, Polish, Russian, Swedish, and Turkish	English
	Date	YY/MM/DD, MM/DD/YY, DD/MM/YY	Y-M-D
	Time	HH:MM:SS	00:00:00
	Audible Alarm	Disable, Enable	Enable
	Serial 1 baudrate	1200bps, 2400bps, 4800bps, 9600bps, 19200bps	9600bps
	Serial 2 baudrate	1200bps, 2400bps, 4800bps, 9600bps, 19200bps	9600bps
	UPS Comm Address	01	01
	Card Slot Protocol	YDN23, Velocity	Velocity
	Change Settings Password	0 – 9, must be six digits in length	111111

### 4.4.1 Changing the Password

The default password is 111111 (six ones). You must use the current password to change the password.

**NOTE:** We recommend that you change the password from the default to protect your system and equipment. Record the new password and store it in an accessible location for later retrieval.

1. At the main menu, select the Settings icon, and press **Enter**.
2. At the password prompt, use the up-arrow to select the first digit, press the down-arrow to move to the next digit, repeat for each digit, then press **Enter** to access the settings.
3. Use the arrow buttons to select the Monitor tab, then press **Enter**.
4. Use the down arrow to highlight *Change Settings Password*, press **Enter**, and re-enter the current password. The Input new password dialog opens, see Figure 4.12 below .
5. Enter the new password, then confirm the new password.  
A confirmation dialog opens to indicate a successful password change.
6. Press ESC to return to the settings or main menu.

**Figure 4.12 New and Confirm Password dialogs**

## 4.4.2 Selecting the Display Language

The LCD is multilingual. The available languages are English, French, Portuguese, Spanish, Chinese, Czech, Dutch, German, Italian, Polish, Russian, Swedish, and Turkish.

### To change the language:

1. At the main menu, select the Settings icon, and press **Enter**.
2. At the password prompt, use the up-arrow to select the first digit, press the down-arrow to move to the next digit, repeat for each digit, then press **Enter** to access the settings.
3. Use the arrow buttons to select the Monitor tab, then press **Enter**.
4. Use the down arrow to highlight *Language*, then press **Enter**.
5. Use the up/down arrows to select the language, then press **Enter**.  
All the LCD elements display in the selected language.

## 4.4.3 Setting the Date and Time

### To adjust the date and time:

1. At the main menu, select the Settings icon, and press **Enter**.
2. At the password prompt, use the up-arrow to select the first digit, press the down-arrow to move to the next digit, repeat for each digit, then press **Enter** to access the settings.
3. Use the arrow buttons to select the Monitor tab, then press **Enter**.
4. Use the down arrow to highlight *Date* or *Time*, then press **Enter**.
5. Use the up/down arrows to select the date/time, then press **Enter to confirm**.

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## 5 Operating the UPS

### 5.1 Silencing the Audible Alarm

If the audible alarm is enabled, it may sound during UPS operation. To silence the alarm, press and hold the ESC button for 3 seconds. The button is located on the front-panel display, see [Operation and Display Panel](#) on page 31.

### 5.2 UPS Start-up

Perform start-up only after the UPS installation is complete, all UPS wiring is complete, and all exterior access panels that were removed for installation are replaced on the UPS.

The start-up procedure starts the UPS in Normal Mode providing clean and protected AC power to the connected equipment.

#### To start the UPS:

1. Close the upstream feeder breakers for the UPS rectifier and bypass (if wired as dual input).
2. Close all downstream breakers including distribution-panel main breaker and/or branch circuit breakers.
3. If external battery cabinet(s) are installed, close the EBC breaker.
4. If optional PODs are installed, verify that all distribution breakers on the PODs are closed.
5. Ensure that the UPS maintenance bypass breaker (MBB) on the front of the UPS is OPEN and the mechanical interlock is secured in the lower position (near the breaker handle).
6. Close the rectifier-input breaker (RIB), bypass-input breaker (BIB), and maintenance-isolation breaker (MIB) on the front of the UPS.

**NOTE: The MIB is also the main output breaker of the UPS.**

When the RIB and BIB breakers are closed, the UPS automatically begins the start-up process and the boot-up system checks, which take approximately 20-30 seconds

7. Before continuing to step 8, make any changes/customization to the UPS operating parameters for the installation or application, see [Editing Display and Operation Settings](#) on page 37.
8. After the system checks complete and/or operating parameters are set, press the power button at the front-panel display, then use the up/down arrow buttons to confirm *Turn on local INV*, see **Figure 5.1** below.

**Figure 5.1 Turn on local INV**



## 5.3 Transferring from Normal (Inverter) to Bypass Mode

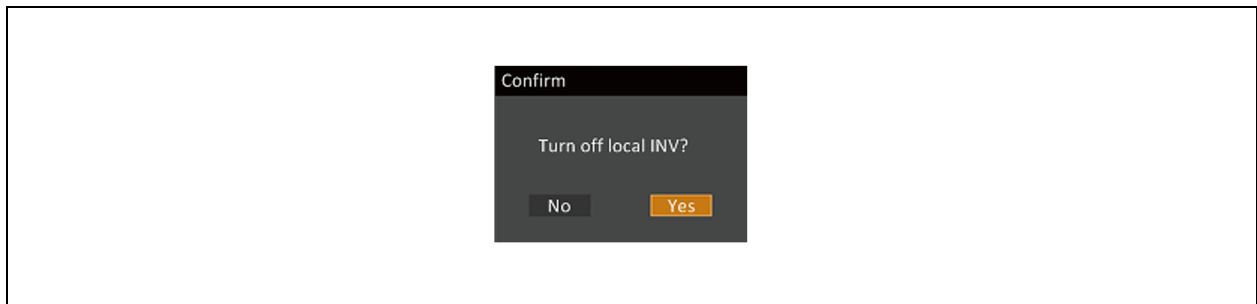
**NOTE:** When the UPS is in Bypass mode, the load is not protected. It is powered directly by utility power.

To transfer to the internal bypass/turn-off when the UPS is in Normal mode:

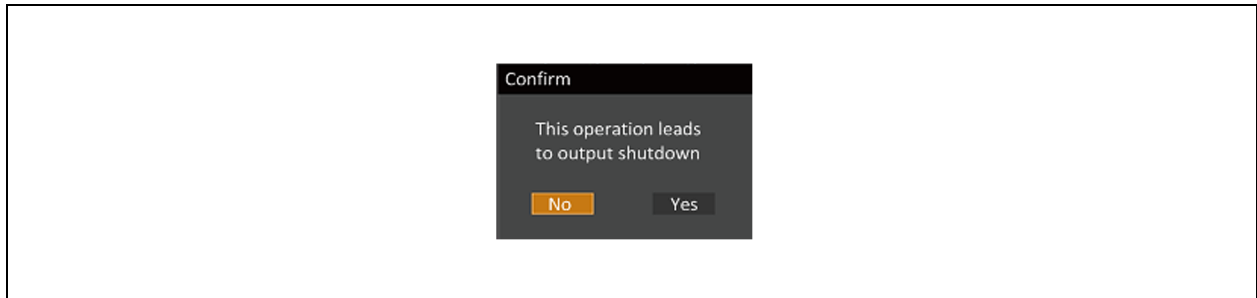
Press and hold the power button for 2 seconds.

- If the bypass power is within normal operating range, the option to turn-off the local inverter displays, see **Figure 5.2** below . Confirming this selection initiates a transfer to internal bypass operation.
  - a. Use the up/down arrows to select no or yes, or press the **ESC** to cancel.
  - b. Press **Enter** to confirm the action.
  - c. Press **Enter** again.
- If the bypass power is outside normal operating range, the option to shut-down output displays, see **Figure 5.3** below .
  - a. Use the up/down arrows to select no or yes, or press the **ESC** to cancel.
  - b. Press **Enter** to confirm the action.

**Figure 5.2** Turn off inv—Bypass power in normal range



**Figure 5.3** Output shutdown—Bypass power outside normal range



## 5.4 Transferring from Bypass to Normal (Inverter) Mode

To transfer to the inverter (normal operation) or turn on the UPS when the UPS is on internal bypass mode:

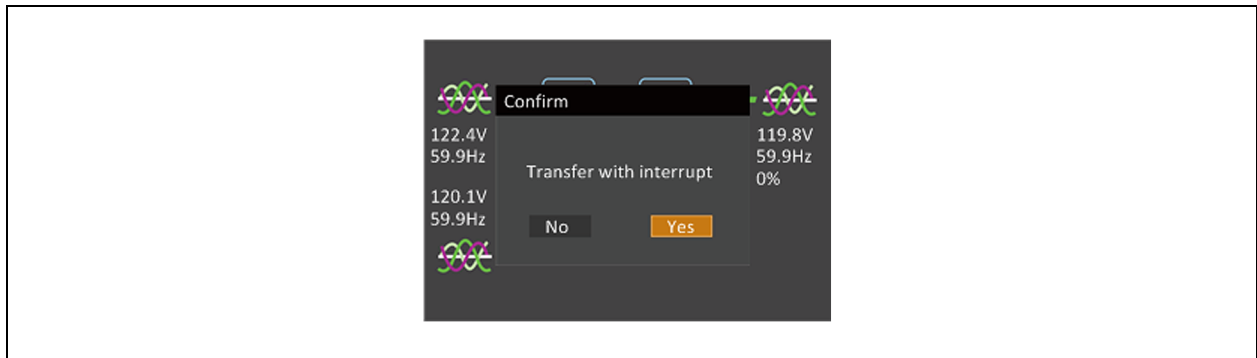
Press and hold the power button for 2 seconds.

- If the UPS is configured for normal operation, the option to turn-on the local inverter displays, see **Figure 5.4** below .
  - a. Use the up/down arrows to select no or yes, or press the **ESC** to cancel.
  - b. Press **Enter** to confirm the action.
  - c. Press **Enter** again.
- If the "Bypass unable to trace" alarm occurs, the option to transfer with interrupt displays, see **Figure 5.5** below .
  - a. Use the up/down arrows to select no or yes, or press the **ESC** to cancel.
  - b. Press **Enter** to confirm the action.

**Figure 5.4 Turn on local INV**



**Figure 5.5 Transfer with interrupt**



## 5.5 Transferring to Maintenance-bypass Mode

The transfer procedure puts the UPS in maintenance-bypass mode for safe servicing by a Vertiv™ service technician.

### To transfer from normal operation to maintenance-bypass mode:

1. Press and hold the power button for 2 seconds.
  - If the bypass power is within normal operating range, the option to go to bypass displays.
    - a. Select *Turn off local INV.*
    - b. Press **Enter** to confirm the action.
    - c. Press **Enter** again.
  - If the bypass power is outside normal operating range, the only option is to turn-off the UPS .
2. Open the front door of the unit to gain access to the Maintenance Bypass Breaker (MBB).
3. Loosen the thumb screw on the mechanical interlock on the MBB.
4. Slide the interlock to the left and tighten the thumb screw to secure the interlock in place.
5. Close the MBB.
6. Press and hold the power button for 2 seconds.
7. Electrically isolate the UPS module from AC-power Input by opening the Rectifier Input Breaker (RIB), Bypass Isolation Breaker (BIB), and Maintenance Isolation Breaker (MIB). If external battery cabinets are installed, open the EBC breaker(s).

## 5.6 Transferring from Maintenance-bypass to Normal Mode

### To transfer from maintenance bypass to normal operations:

1. Ensure that the mechanical interlock is still secured in the unlocked position.
2. If external battery cabinet(s) are installed, close the EBC breaker.
3. On the front of the UPS, close the rectifier input breaker (RIB), bypass input breaker (BIB), and maintenance isolation breaker (MIB).  
The UPS performs start-up checks and begins operating in internal bypass mode.
4. Verify that the UPS is operating in internal bypass mode before proceeding.
  - If the unit is not in Bypass mode, see [Transferring from Normal \(Inverter\) to Bypass Mode](#) on page 42 , for the steps.

### NOTICE

Risk of improper operation. Failure to have the UPS operating on internal bypass and performing the next step will result in loss of all output power to the connected equipment.

5. On the front of the UPS, open the maintenance bypass breaker (MBB)
6. Loosen the thumb screw on the mechanical interlock on the MBB
7. Slide the interlock to the right and tighten the thumb screw to secure the interlock in place.
8. Close and latch the front door of the UPS.
9. Press and hold the “POWER” button for 2 seconds.
10. Select the operation Turn on UPS
  - a. Select *Turn on UPS.*
  - b. Press **Enter** to confirm the action.
  - c. Press **Enter** again.

## 5.7 Remote Emergency Power-off (REPO)

The UPS is equipped with a remote emergency power-off (REPO) connector for normally-open (N.O.) or normally-closed (N.C.) systems. See [REPO Connection](#) on page 26 , for connection details.

Consult national and local wiring codes to determine if additional REPO is required for the external UPS rectifier and bypass feeds.

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## 6 Maintenance



**WARNING!** Risk of electrical shock. Can cause property damage, injury, and death. The unit has several circuits that are energized with high DC and AC voltages. Check for voltage with both AC and DC voltmeters before making contact and before working within the UPS. Only properly trained and qualified personnel wearing appropriate, OSHA-approved personal protective equipment (PPE) should prepare for installation, install, and maintain the equipment. When performing maintenance with any part of the equipment under power, service personnel and test equipment must stand on rubber mats.



**WARNING!** Risk of electrical shock. Can cause equipment damage, injury and death. Before beginning installation, verify that all external overcurrent protection devices are open (Off), and that they are locked-out and tagged appropriately to prevent activation during the installation. After the power cables are connected, the terminal block's protective cover must be reinstalled to remove the electric shock hazard.



**WARNING!** Risk of heavy unit falling over. Improper handling can cause equipment damage, injury, and death. Exercise extreme care when handling unit cabinets and rack-mounted units to avoid equipment damage or injury to personnel. The UPS weighs between 1,041.1 lb (460 kg) and 1,388.9 lb (630 kg) depending upon the number of battery strings in the system. See **Table 7.2** on page 50 , for the specific weights. Locate center-



of-gravity symbols and determine unit weight before handling. Test-lift and balance the cabinets before transporting. Maintain minimum tilt from vertical at all times. Slots at the base of the module cabinets are for forklift use. Fork-lift slots support the unit only if the forks are completely beneath the unit.

### 6.1 Cleaning the UPS

Clean the UPS periodically, especially the ventilation holes, to ensure free air flow inside the UPS. If necessary, clean the UPS with a vacuum cleaner or wipe with a dry cloth. Confirm that the ventilation holes are unobstructed.

### 6.2 Routine Maintenance

There are no user serviceable parts in the UPS. Attempting to service the unit yourself can void the warranty.

Any routine maintenance other than cleaning, must be performed by a Vertiv™ service technician. Visit <http://www.Vertiv.com/en-us/support/>, or contact your Vertiv™ representative.

## Battery Safety

If the battery kit is damaged in any way or shows signs of leakage, contact Vertiv™ technical support immediately. Handle, transport, and recycle batteries in accordance with local regulations.



**WARNING! Risk of electrical shock. Can cause personal injury and death. When connected together, battery-terminal voltage is potentially lethal. Be constantly aware that the battery system contains high DC and AC voltages. Check for the presence of voltage using DC and AC voltmeters before making contact with terminals.**



**CAUTION: Do not dispose of the battery in a fire. The battery may explode. Do not open or damage the battery. Released electrolyte is harmful to skin and eyes. If electrolyte comes into contact with the skin, wash the affected area immediately with plenty of clean water and get medical attention.**

A battery can present a risk of electrical shock and high short-circuit current. The following precautions should be observed when working on batteries:

- Remove watches, rings and other metal objects.
- Use tools with insulated handles.
- Wear rubber gloves and boots.
- Do not lay tools or metal parts on top of batteries.
- Disconnect charging source prior to connecting or disconnecting battery terminals.
- Determine if the battery is inadvertently grounded. If it is inadvertently grounded, remove the source of the ground. Contact with any part of a grounded battery can result in electrical shock. The likelihood of such shock will be reduced if grounds are removed during installation and maintenance (applicable to a UPS and a remote battery supply not having a grounded supply circuit).

The UPS is equipped with long-life, sealed, valve-regulated lead-acid batteries (VRLA), also known as “maintenance-free” batteries. The battery life depends upon the operating ambient temperature of the UPS system. To prolong battery life:

- Keep the ambient temperature between 68°F and 77°F (20°C and 25°C)
- Prevent long low current discharges
- Charge the battery for at least 8 hours if the battery hasn't been charged for three months when it has been stored at the specified ambient temperature, or two months when it has been stored at high ambient temperature

The waste lead-acid battery is dangerous waste material. Its storage, transportation, usage, and disposal must follow national and local laws and other criteria about dangerous waste material and waste battery pollution prevention.

Per the related regulations, recycle the waste lead-acid battery. Other disposal methods are prohibited. Disposing of the waste lead-acid battery in a landfill or other waste dump can result in serious environment pollution and violates national and local laws.

Vertiv™ has a service network and recycle system to assist in complying with laws governing waste battery disposal. Visit <http://www.Vertiv.com/en-us/support/> for information about recycling the waste battery.

## 7 Specifications

**Table 7.1 Specifications**

Item	Description	Liebert® EXS Model
		30 kVA/30 kW
Input	Rated Voltage	208/120VAC or 220/127VAC; 3 Phase, 4W+Gnd
	Voltage Range	176-263VAC (L-L); 102-152VAC (L-N)
	Rated Frequency	60 Hz
	Frequency Range	40-70Hz
	Power Factor	≥0.99 at full load; ≥0.98 at half load
	Current Distortion THDi	≤3% linear load, ≤5% non-linear load
Output	Rated Power	30 kVA / 30 kW
	Voltage	208/120 VAC or 220/127 VAC; 3 Phase, 4W+Gnd
	Frequency Synchronization Range	Rated Frequency ±3 Hz; Selectable range ±0.5 Hz to ±5 Hz
	Slew Rate	0.6 Hz/s default; Selectable 0.1 Hz/s to 3.0 Hz/s
	Rated Power Factor	1.0 (Unity)
	Load Power Factor Range	0.5 lagging to 0.8 leading
	Load Crest Factor	3:1
	Voltage Regulation	≤1% balanced loading; ≤4% unbalanced loading
	Voltage Distortion THDv	≤2% linear load; ≤5% non-linear load
	Transient Voltage Response	±5% for 0%-100%-0% load steps
	Transient Recovery Time	To within ±1% of nominal in 60ms
	Overload Capabilities	100%-105% continuous 105%-110% 60 minutes then transfer to bypass 110%-125% 10 minutes then transfer to bypass 125%-150% 1 minute then transfer to bypass >150% 200ms then transfer to bypass
	AC-AC Efficiency	Up to 93.4% online mode, 99% ECO mode
	Bypass Voltage Range	+15% / -20% default, ±10%, ±15%, ±20%, -30%, -40% user selectable
	Transfer Time (utility to battery)	0ms
	Transfer Time (inverter to bypass)	Synchronous transfers: 0ms Asynchronous transfers: ≤20 ms (default); 40/60/80/100/200 ms user-selectable

**Table 7.1 Specifications (continued)**

Item	Description	Liebert® EXS Model
		30 kVA/30 kW
Battery	Standard Type	Sealed Valve Regulated Lead Acid (VRLA)
	Number Cells per string	120 default
	Open Cell Voltage	240 VDC
	Discharge Current (maximum @ EOD)	167 A
	Charge Current (maximum)	17.7 A
Environmental	Operating Temperature	32°F to 104°F (0°C to 40°C); 68°F to 77°F (20°C to 25°C) for optimum battery life
	Storage Temperature	5°F to 131°F (-25°C to 55°C)
	Relative Humidity	5-95% non-condensing
	Operating Altitude	Sea level to 4,921 ft (1,500 m) without derating {Derate output power by 1% per 328 ft (100 m) up to 10,000 ft (3000 m)}
	Audible Noise	<60 dBA maximum measured at 39 in. (1 m)
	Protection Level	IP20
	Agency	cULus (UL 1778 5th Edition, CSA No.22.2 107.3);
Safety	EMC	FCC Part 15, Class A; IEC/EN62040-2 Class A
	Harmonic	IEC/EN62040-2
	Surge	ANSI C62.41, 6kV/20hms; IEC/EN-61000-4-5, Level 4 (4 kV) (line to earth), Level 3 (2 kV) (line to line)

**Table 7.2 Physical Specifications**

UPS with 1 battery string		UPS with 2 battery strings		External Battery Cabinet with 2 battery strings
Dimensions, W x D x H, in. (mm)				
Unit	23.6 x 33.5 x 63 (600 x 850 x 1600)			
Shipping	36 x 48 x 72 (914.4 x 1219.2 x 1828.8)			
Weight, lb (kg)				
Unit	1,132 (513.5)	1,650 (748.4)	1,352 (613.3)	
Shipping	1,280 (580.6)	1,795 (814.2)	1,495 (678.1)	
Color	Black-Gray (RAL 7021)			

**NOTE:** For units fitted with the integral distribution POD, add 6.2 in. (157 mm) to the unit depth and add 20 – 30 lb (9 – 13 kg) to the unit weight.

**Table 7.3 Battery Run Time in Minutes—30-kVA Models**

Battery- string Qty.	Load Level											
	100%	90%	80%	75%	70%	60%	50%	40%	30%	25%	20%	10%
	30 kW	27 kW	24 kW	22.5 kW	21 kW	18 kW	15 kW	12 kW	9 kW	7.5 kW	6 kW	3 kW
1	5	7	9	10	11	14	18	23	36	45	60	129
2	18	21	25	26	30	36	45	61	81	102	130	252
3	31	36	40	45	49	61	74	96	131	152	190	384
4	45	51	61	66	71	81	102	131	163	202	254	480

Run times shown are approximate. They are based on new, fully-charged batteries at a temperature of 77°F (25°C) with 100% resistive UPS loading. Different loading will change the actual run times. Run times listed may vary by ±5% due to manufacturing variances of the batteries.

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# Appendices

## Appendix A: UPS Prompts and Alarms

### A.1 Prompt Window

A prompt window is displayed during the operation of the system to alert you to certain conditions and/or to require confirmation of a command or other operation.

**Table A.1 UPS Prompts**

Prompt	Description
Incorrect password, please input again	Appears when an incorrect settings password was entered
Turn on failed, condition is not met	Appears when the power button is pressed or Turn-on/Turn-off/to-Bypass is selected while on the "Control" page
Turn on more UPS to carry current load	Appears when a parallel system load exceeds the total rating of the number of active UPS units in the parallel system
The load is too high to be transferred with interrupt	Appears when the load exceeds the capacity of a single UPS rating in a parallel system to perform an interrupted transfer from bypass to inverter (normal mode)
Turn ON local INV? OK or Cancel	Appears when the power button is pressed when the inverter is OFF. Confirm or Cancel the action
Turn OFF local INV? OK or Cancel	Appears when the power button is pressed when the inverter is ON. Confirm or Cancel the action
New alarms present, Show log? OK or Cancel	Appears when a new alarm generated. Confirm to view the alarm log or cancel it
Clear faults? OK or Cancel	Appears when the command to clear the active fault is selected. Confirm or Cancel the action
Transfer with interrupt? OK or Cancel	Appears when attempting to transfer to or from bypass when the UPS inverter is not synchronized with the bypass source
This operation leads to output shutdown, OK or Cancel	Appears when no alternative source (bypass) is available and turning OFF the inverter command is issued. This will cause the load to be de-energized and shutdown
This operation leads to inverter overload, OK or Cancel	Appears when attempting to turn off a UPS inverter in a parallel system that does not include a redundant UPS module
Turn ON local INV Turn ON PARA INV	Appears when the power button is pressed on a unit in a parallel system. Select one option to confirm operation
Turn OFF local INV Turn OFF PARA INV	Appears when the power button is pressed on a unit in a parallel system. Select one option to confirm operation

### A.2 Alarms, Faults, and Warnings

A warning or alarm or fault can be displayed during the operation of the system to alert you to certain conditions and/or to require action or other operation.

**Table A.2 UPS Alarm and Warning Messages**

Alarm/Warning	Description	Action
Ambient Overtemperature	Ambient overtemperature detection	Verify the ventilation openings are not block or Contact Vertiv™ Technical Support
Automatic Battery Test	The battery is under automatic periodic battery maintenance discharge test (20% capacity discharge)	None required
Autostart	After UPS shutdown at EOD, the UPS automatically starts upon restoration of input power	None required
Battery End of Discharge	Inverter turned off due to battery EOD	None required
Battery Equalize Charge	The battery is forced to be in boost charge state	None required
Battery Ground Fault	A battery short circuit to ground has been detected	Contact Vertiv™ Technical Support
Battery low pre-warning	This alarm occurs when the battery reaches the low battery setting and is near the end of battery power	Check the upstream input breaker(s) to ensure they are closed and/or orderly shut down connected equipment
Battery Maintain	Start the battery maintenance discharge test	
Battery Reset	The battery state restores to a new one	None required
Battery reversed	The battery polarity is reversed	Call a qualified electrician to verify the battery wiring or Contact Vertiv™ Technical Support
Battery terminal abnormal	A short circuit or arc has been detected in the battery wiring, battery connectors or battery fuse	Contact Vertiv™ Technical Support
Battery test fail	The battery capacity dropped below the threshold for the battery test	Replace battery
Battery Voltage High	Upon start up or auto restart the system measures that the battery voltage and it exceeds high voltage range.	Contact Vertiv™ Technical Support
BCB Closed	BCB state (closed)	None required
BCB Open	BCB is opened	If the battery is being serviced, this is normal. If not being serviced Contact Vertiv™ Technical Support
BCB Status Abnormal	Logic conflict between BCB drive signal and feedback signal	Contact Vertiv™ Technical Support
Bypass abnormal	The bypass input voltage or frequency exceeds normal operating range	Check the upstream bypass input breaker(s) to ensure they are closed
Bypass abnormal shutdown	While operating on bypass power, the bypass input voltage or frequency exceeds normal operating range; the output is off and load will no longer have power	
Bypass back-feed	A bypass short circuit has been detected while in battery mode	Contact Vertiv™ Technical Support
Bypass Input Breaker Open	The bypass switch is opened	None required
Bypass Not Available	Bypass output disabled under generator mode	This alarm resets automatically once the condition is no longer true
Bypass Overcurrent	The bypass current is outside the rated current of 1.1 times	Check output loading or Contact Vertiv™ Technical Support
Bypass Overcurrent Timeout	Bypass overload delay timeout, and the bypass shuts down	Check output loading or Contact Vertiv™ Technical Support

**Table A.2 UPS Alarm and Warning Messages (continued)**

Alarm/Warning	Description	Action
Bypass phase reversed	The AC bypass input phase rotation is reversed in a single module system system.	Call a qualified electrician to verify the input phase rotation or Contact Vertiv™ Technical Support
Bypass STS fail	At least one of the bypass SCRs has failed and the output is off and load will no longer have power	Contact Vertiv™ Technical Support
Bypass Unable to Trace	The bypass voltage and/or frequency is outside specifications	This alarm resets automatically once the condition is no longer true
Charger Fault	Battery charger failure occurred	Contact Vertiv™ Technical Support
Charger Overtemperature	The power tube of charger inside the module has overtemperature	Contact Vertiv™ Technical Support
Charger Shutdown	Dry contact signal. When the dry contact gives a command of charger shutdown, then the charger will shut down	None required
Control Power Fail	The auxiliary power failure or power-off	Contact Vertiv™ Technical Support
DC Bus Abnormal	The DC bus voltage is outside of limits and the load will transfer to bypass power if available	Contact Vertiv™ Technical Support
DC Bus Overvoltage	The DC bus voltage is outside of limits and the load will transfer to bypass power if available	Contact Vertiv™ Technical Support
Discharge Current Limit	Discharge current is over limit	Contact Vertiv™ Technical Support
Discharge Fault	DC bus voltage too high or too low during discharge	Contact Vertiv™ Technical Support
Discrete Bus Comms. Abnormal	Communication failure between discrete bus inside the rack. It is recommended to confirm that the rear communication cables connection inside the rack is reliable	Contact Vertiv™ Technical Support
ECO Mode Active	ECO mode activated	None required
ECO Mode Enabled	ECO mode enabled	None required
EPO	UPS has shut down due to activation of the REPO circuit	Check REPO circuit to reset it and manually restart the UPS
Equalize Charge Timeout	The actual float charging time exceeds the time set by the setting software	
Excess Auto Retransfers	The UPS remains on bypass power due to exceeding the preset number of overload transfers to bypass within a 1 hour period. The connected equipment is not protected.	Check output loading or Contact Vertiv™ Technical Support
Excess ECO Auto Transfers	The UPS remains on inverter power due to exceeding the preset number of transfers within a 1 hour period while in ECO mode operation.	Check input power or Contact Vertiv™ Technical Support
External MBB Closed	The external maintenance bypass switch is closed	The UPS is being serviced, the load is not protected
External MBB Open	The external maintenance switch is opened	None required
External MIB Open	The external maintenance isolating switch is opened	Check the external breaker(s) to ensure they are closed if the UPS is not being serviced
Fan Abnormal	At least one cooling fan has failed or is not operating with proper air flow	Contact Vertiv™ Technical Support
Fault Clear	Select the command of 'Clear faults' via the Control page	None required

**Table A.2 UPS Alarm and Warning Messages (continued)**

Alarm/Warning	Description	Action
Flash Operate Fail	Historical record not saved	None required
Freq. Converter Mode Active	Frequency converter mode activated	None required
Freq. Converter Mode Enabled	Frequency converter mode enabled	None required
HMI Unauthorized	The UPS does not work due to incompatible display	Contact Vertiv™ Technical Support
Input back-feed	A rectifier short circuit has been detected while in battery mode	Contact Vertiv™ Technical Support
Input Current Abnormal	Battery load sharing imbalance or mains battery frequent transfer more than 5 times within 5min	
Input Current Limit	Input current over limit	
Input frequency abnormal	The rectifier and charger are OFF due to input frequency exceeding normal operating range	Check the upstream input breaker(s) to ensure they are closed or UPS is operating from a genset
Input neutral missing	The UPS has detected that the input neutral conductor is missing or has been disconnected	Call a qualified electrician to verify the input neutral connection or Contact Vertiv™ Technical Support
Input phase reversed	The AC rectifier input phase rotation is reversed.	Call a qualified electrician to verify the input phase rotation or Contact Vertiv™ Technical Support
Input Transf. Overtemp.	The optional input transformer temperature has exceeded pre-set limits	Contact Vertiv™ Technical Support
Input Undervoltage	At least one phase main input voltage to neutral is within 96V ~ 102V, thus the load should be derated	
Input voltage abnormal	The rectifier and charger are OFF due to input voltage exceeding normal operating range	Check the upstream input breaker(s) to ensure they are closed
Intell. ECO Mode Active	Intelligent ECO mode activated	None required
Intell. ECO Mode Demo Active	Intelligent ECO demo mode activated	None required
Intell. ECO Mode Demo Enabled	Intelligent ECO demo mode enabled	None required
Intell. ECO Mode Enabled	Intelligent ECO mode enabled	None required
Internal MBB Closed	The maintenance bypass switch is closed	The UPS is being serviced, the load is not protected
Internal MBB Open	The maintenance switch is opened	None required
Inverter Asynchronous	The UPS output voltage and/or frequency and bypass voltage and/or frequency are not synchronized	This alarm resets automatically once the condition is no longer true
Inverter DSP SW Error	Inverter DSP software being updated.	Contact Vertiv™ Technical Support
Inverter fault	A fault in the UPS inverter has occurred and the load will transfer to bypass power if available	Contact Vertiv™ Technical Support
Inverter FPGA SW Error	Inverter FPGA being updated	Contact Vertiv™ Technical Support
Inverter in Setting	The inverter starts up and is in synchronization with the monitoring	None required

**Table A.2 UPS Alarm and Warning Messages (continued)**

Alarm/Warning	Description	Action
Inverter Manual Off	Power button on the operator control and display panel pressed to manually turn off the inverter	None required
Inverter Manual On	Power button on the operator control and display panel pressed to manually turn on the inverter	None required
Inverter relay fail	At least one of the inverter output relays has failed and the load will transfer to bypass power if available	Contact Vertiv™ Technical Support
IP Mode Active	Intelligent parallel mode activated, that is sleep mode	None required
IP Mode Demo Active	Intelligent parallel demo mode activated, that is sleep demo mode	None required
IP Mode Demo Enabled	Intelligent parallel demo mode enabled, that is sleep demo mode	None required
IP Mode Enabled	Intelligent parallel mode enabled, that is sleep mode	None required
LBS Active	LBS is enabled	None required
Load Impact Transfer	A transfer to bypass occurred due to a large step load	This alarm resets automatically once the condition is no longer true
Load Off	UPS shut down, both bypass and inverter have no output	None required
Load on Battery	UPS is in battery mode	None required
Load on Bypass	UPS is in bypass mode	None required
Load on Inverter	UPS is in normal mode	None required
Load Shed Signal 1 Active	During the battery discharge, if the back-up time or remaining capacity is insufficient, the load shed signal 1 will be activated	Signal to external device to shed load is sent
Load Shed Signal 2 Active	During the battery discharge, if the back-up time or remaining capacity is insufficient, the load shed signal 2 will be activated	Signal to external device to shed load is sent
Maint Isolation Breaker Open	The internal maintenance isolating switch is opened	The UPS is being serviced, the load is not protected
Manual Battery Test	The user initiates a maintenance test (20% capacity discharge)	None required
MMS Capacity Exceeded	The parallel system load exceeds the parallel system rating and system settings	Verify the parallel system settings, remove unauthorized loads, or Contact Vertiv™ Technical Support
MMS Inv. Manual Off	Power button is pressed on one UPS, and select the parallel system for unified shutdown	None required
MMS Inv. Manual On	Power button is pressed on one UPS, and select the parallel system for unified start-up	None required
Module Comms. Normal	Communication between the module and monitoring is normal	None required
Module in Sleeping	The module is in sleep mode and the module does not work. Only the UPS configured with intelligent ECO demo mode can present this state	None required
Module Output Breaker Open	The external output breaker switch is opened	The UPS is being serviced, the load is not protected
Module Overtemperature	The power tubes of rectifier and inverter inside the module have overtemperature	Contact Vertiv™ Technical Support

**Table A.2 UPS Alarm and Warning Messages (continued)**

Alarm/Warning	Description	Action
MonCAN Comms. Abnormal	Monitor software being updated	Contact Vertiv™ Technical Support
No battery	Either no battery is connected or the battery connections have become loose or disconnected	Call a qualified electrician to verify the battery wiring or Contact Vertiv™ Technical Support
On Generator	Dry contact signal. The system is in generator mode	None required
Operation Invalid	Maintenance bypass switch and output switch are closed when the inverter is on	
Other Bypass STS fail	One unit in the parallel system had at least one of the bypass SCRs has failed	Contact Vertiv™ Technical Support
Other Module Transfer	One unit in the parallel system transferred to bypass and this message appears on all other units in the parallel system	Contact Vertiv™ Technical Support
Output Disabled	EOD event happened. Check the battery voltage	
Output Fuse fail	At least one of the inverter output fuses has opened and the load will transfer to bypass power if available	Contact Vertiv™ Technical Support
Output overload	The connected equipment has exceeded the inverter ratings. The load will transfer to bypass power if available, otherwise it will shutdown	Verify the connected load and disconnect any unauthorized equipment or check if load is properly balanced
Output Overload Timeout	The UPS inverter overload timer has expired; the load automatically transfers to the bypass	Verify the connected load and disconnect any unauthorized equipment. This alarm resets automatically once the condition is no longer true
Output Transf. Overtmp.	The optional output transformer temperature has exceeded pre-set limits	Contact Vertiv™ Technical Support
Output Voltage Abnormal	At least one output phase voltage is outside of specified limits	Contact Vertiv™ Technical Support
Overvoltage N-GND	The Neutral to Ground voltage exceeds present limits	Call a qualified electrician to verify the input wiring and neutral-ground bond connections
Parameter Config. Fail	EEPROM operation failed during DSP configuration, or DSP parameter issued by MON failed	Contact Vertiv™ Technical Support
Power Hardware Mismatch	The model information set at the host is inconsistent with the actual situation	Contact Vertiv™ Technical Support
PowerCAN Comms. Abnormal	Internal communication among the inverter, rectifier and bypass gets a failure	Contact Vertiv™ Technical Support
Pwr. Conditioner Mode Active	Power conditioner mode activated	None required
Pwr. Conditioner Mode Enabled	Power conditioner mode enabled	None required
Rectifier DSP SW Error	Rectifier DSP program incorrect, may burn the inverter or bypass DSP	Contact Vertiv™ Technical Support
Rectifier fault	A fault in the UPS rectifier has occurred and the load will transfer to bypass power if available	Contact Vertiv™ Technical Support
Rectifier in Setting	The rectifier starts up and is in synchronization	None required
Rectifier soft start fail	Low DC bus voltage	Contact Vertiv™ Technical Support

**Table A.2 UPS Alarm and Warning Messages (continued)**

Alarm/Warning	Description	Action
Regen. Mode Active	Self-aging mode activated	None required
Regen. Mode Enabled	Self-aging mode enabled	None required
RIB Open	The input switch is opened	None required
Silence Active	Select the command of 'Mute/Unmute audible alarm' via the Control page	None required
Silence Inactive	Under conditioner of buzzer silence, select the command of 'Mute/Unmute audible alarm' via the Control page	None required
System Interrupt Transfer	Execute the interval transfer under conditions of bypass unable to trace and inverter phase not locked	None required
Testing Mode Active	Testing mode activated	None required
Testing Mode Enabled	Testing mode enabled	None required
Turn On Fail	The inverter failed to turn on when the Inverter Manual On is pressed.	Check event log for reason Contact Vertiv™ Technical Support

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SL-70329\_REV1\_06-21