



Liebert[®] EXS

Installer/User Guide

15-40 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 Instructions

IMPORTANT! This manual contains important safety instructions that must be followed during the installation and maintenance of the Vertiv™ Liebert® EXS 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.

This product must be installed and commissioned by professional engineers of the manufacturer or its authorized agent. Failure to observe this could result in product malfunction or personal safety risk.

Read this product manual and the safety precaution thoroughly before installing and commissioning this product. Failure to observe this could result in product malfunction or personal safety risk.

NOTE: This product is not intended for life support equipment application.



WARNING! Never dispose of the internal or external battery of this product in a fire.

1.1 Product Safety

1. If this product is stored or remain de-energized for a long period, it must be placed in a dry and clean environment within specified temperature range.
2. This product should be used in an appropriate operating environment. For details, refer to the section on the environmental requirement in this manual. See **Table 8.1** on page 59.
3. This product is designed for application in the following conditions:
 - Where the temperature and relative humidity are not in specified range given in the [Specifications](#) on page 59.
 - Is not subjected to vibrations or shocks.
 - Where conductive dusts, corrosive gases, salts, or flammable gases are not present.
 - Away from heat sources or strong electromagnetic interferences.

1.2 Disclaimer

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

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

1.3 Safety Precaution

Always observe the following safety symbols.



WARNING! Used to alert the user to the risk of death or severe injury, if the unit is used improperly.



CAUTION: Used to alert the user to the risk of injury or equipment damage if the unit is used improperly.

IMPORTANT! Used to advise the user to carefully read and follow the instructions to avoid the damage.

This manual contains information concerning the installation and operation of the Vertiv™ Liebert® EXS 15-40 kVA UPS. To reduce the chance of accident, please read the safety precautions very carefully before operation. The caution, note, and warning in this user manual and on the product do not represent all the safety points to be observed, and are only supplement to various safety points. Therefore, the installation and operation personnel must receive strict training and master the correct operations and all the safety points before operation.

When operating Vertiv products, the operation personnel must observe the safety rules in the industry, the general safety points and special safety instructions provided by Vertiv.

1.3.1 Conformity and standards

The UPS complies with 2014/35/EU (LVD), 2014/30/EU (EMC), 2011/65/EU (Rohs) and the following standards:

- IEC/EN 62040-1, General and safety requirements for UPS.
- FCC Part 15, EMC requirement.
- ANSI C62.41, Surge immunity requirement.
- IEC/EN 62040-3: Performance requirements and test methods.



WARNING! Before moving or rewiring the UPS, disconnect mains input power and the battery. Make sure that the UPS is completely shutdown. Otherwise, the output terminal may carry live voltage, presenting an electric shock hazard.



WARNING! Liquid or other irrelevant external objects are prohibited inside the UPS.



WARNING! In case of a fire, a dry chemical fire extinguisher is essential. Using a foam fire extinguisher will cause electric shock.



CAUTION: To prevent the radio frequency of output cables from disturbing other electric equipment, it is recommended to use the UPS output cable of less than 10 m.



WARNING! Backfeeding protection

This UPS is fitted with a dry contact closure signal for use with an external automatic disconnect device (supplied independently) to protect against backfeeding voltage into the incoming terminal through the rectifier or bypass static switch circuit. The airgap of the disconnect device should be minimum 1.6 mm. A label must be added to 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 meaning: Risk of voltage backfeed! Isolate the UPS, then check for hazardous voltage between all terminals including the protective earth before working on this circuit.

User serviceable components (for service personnel)

- All equipment maintenance and servicing procedures involving internal access requires the use of a tool and should be carried out only by trained personnel. There are no user serviceable parts behind covers requiring a tool/key for removal.
- The UPS meets the safety requirements completely in operator access area. Only service personnel can contact the hazardous voltage inside the UPS. However, the risk of contacting these voltages is minimized because the components with hazardous voltage have protective covers, which must be removed/installed using proper safety tools. No risk will exist if you follow the general norms and in accordance with the procedures recommended in this manual on equipment operation.

Battery voltage exceeds 240 VDC (for service personnel)

- All physical battery maintenance and servicing procedures requires the use of a tool and should be carried out only by trained personnel.
- Operation on the battery can result in electric shock and high short-circuit current, therefore, before operating the battery, the following precautions should be observed:
 - Remove the watches, rings, and other metal objects.
 - Use the tools with insulation handle.
 - Wear rubber gloves and shoes.
 - Try not to place the tools and metal objects on the battery surface.
 - Cut off the charge power supply before connecting or disconnecting the battery terminals.
 - Check whether the battery is earthed accidentally, if yes, disconnect the earthing. Contacting with earth battery parts will result in electric shock. Therefore, make sure that the battery is not earthed during installation and maintenance.
- Battery manufacturers provide the details of the precautions to be observed when working on, or in the vicinity of the batteries. These precautions should be followed implicitly at all times. Attention should be paid to the recommendations concerning local environmental conditions and the provision of protective clothing, first aid, and fire fighting facilities.
- If the flame retardancy rating of the battery case is HB, the UPS is not intended for computer room.



WARNING! When selecting the UPS system upstream distribution protection equipment, ensure that it complies with the local electric regulations. The specified upstream breakers are required to obtain the conditional short circuit current rating, I_{cc} at 30 kA symmetrical rms. The specified upstream breakers should comply with a UL248 series standard.



WARNING! When the internal fuse of the UPS is damaged, it must be replaced with fuse of the same electric parameters from the designated manufacturer, and operated by qualified personnel.

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

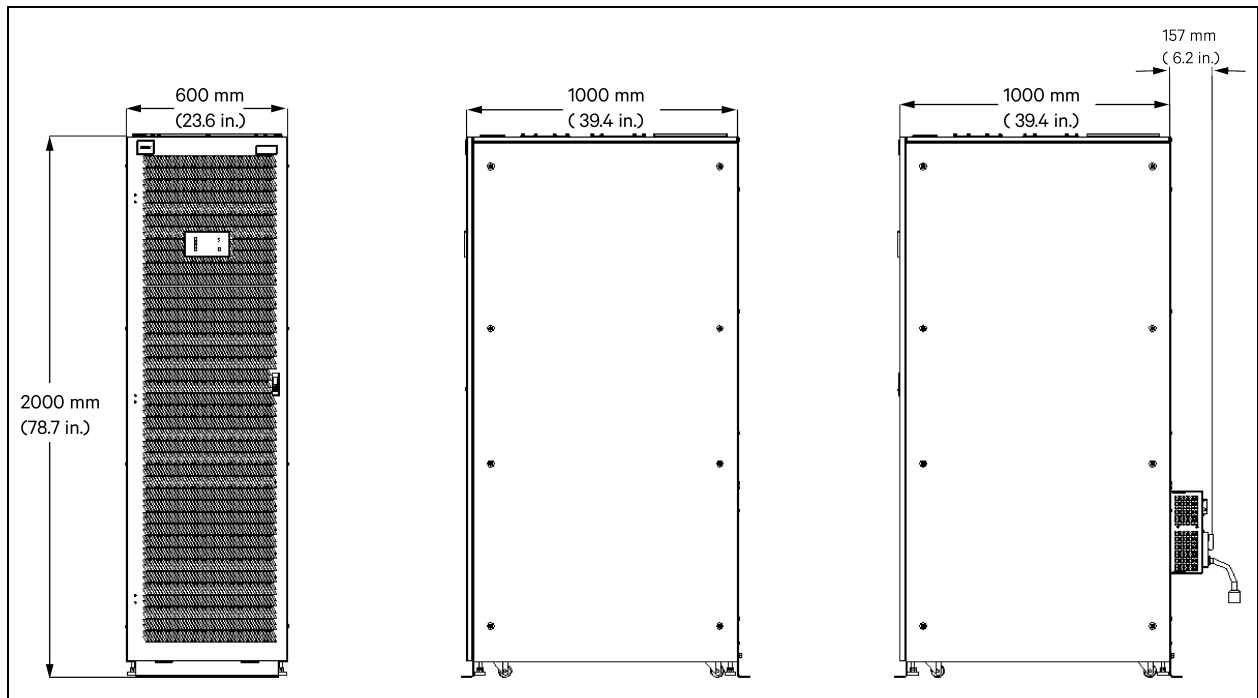
The Liebert® EXS includes:

- Online, double conversion efficiency up to 93.4% and Eco Mode efficiency up to 98.7%.
- Output power factor—1.0 (Unity).
- Tower installation.
- High frequency, double conversion topology with high input power factor, and wide input voltage range.
- Operation and display panel with color LCD for easy, and intuitive operation.
- Capable of eco mode, and 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.

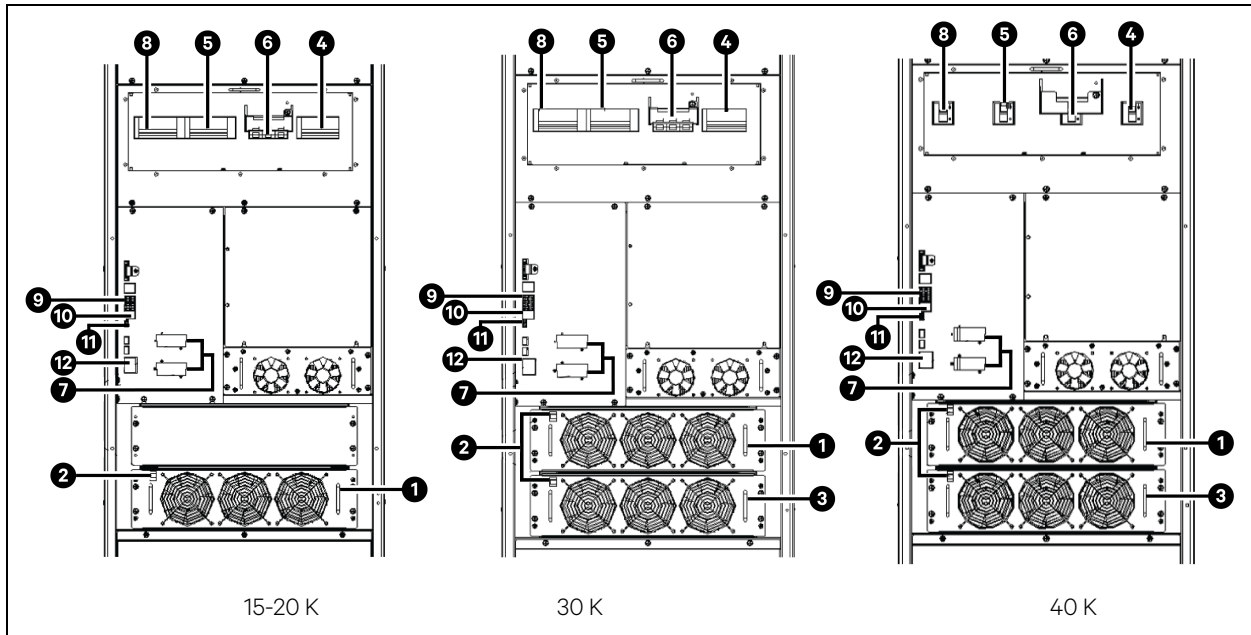
Figure 2.1 UPS Front and Side View



Item	Description
1	Front view
2	Right side view
3	Right side view with optional power output distribution (POD)

2.3 Inside Front Panel Components

Figure 2.2 Components and Ports Inside the Front Door

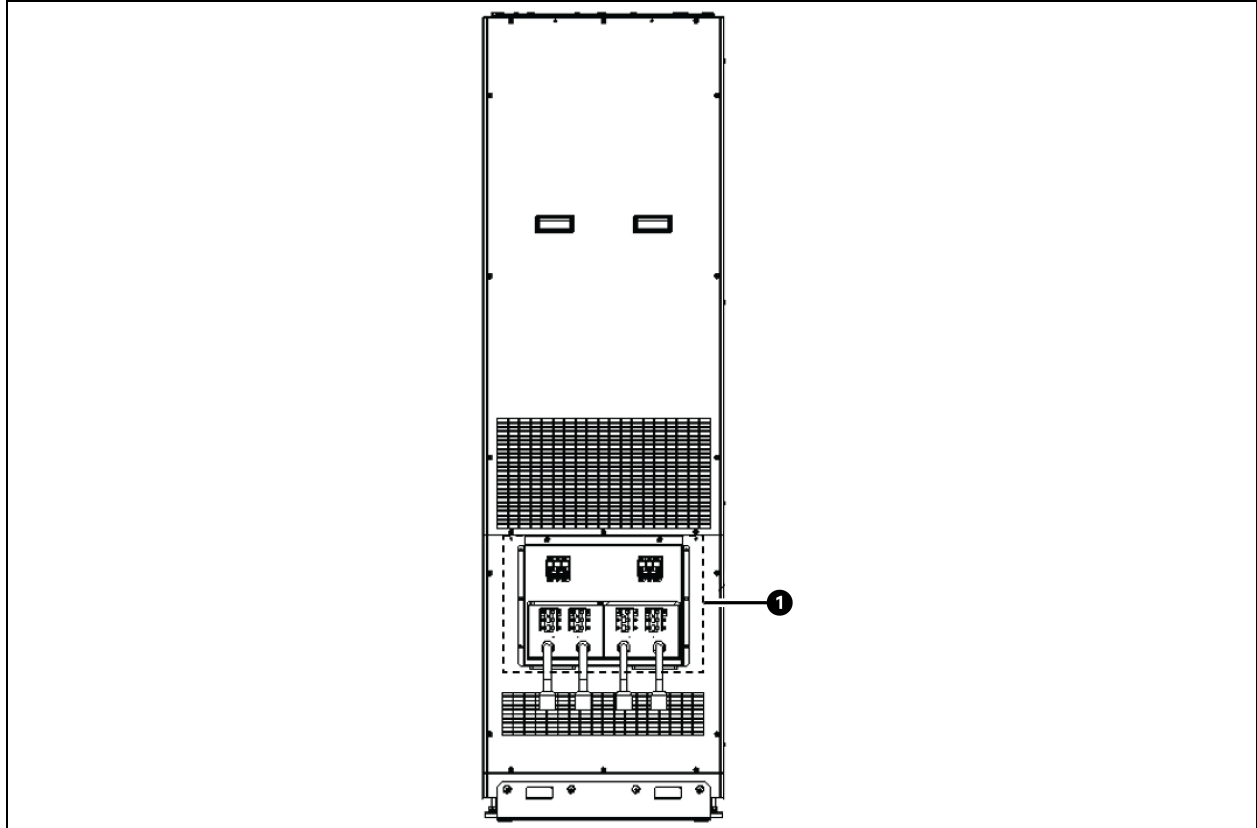


Item	Description
1	Power module 1
2	Battery start button
3	Power module 2
4	Maintenance isolation breaker (MIB)
5	Bypass input breaker (BIB)
6	Maintenance bypass breaker (MBB)
7	Vertiv™ Liebert® IntelliSlot™ ports
8	Rectifier input breaker (RIB)
9	Dry contact inputs
10	Remote emergency power off (REPO) port
11	Dry contact outputs
12	Parallel/LBS ports

2.4 Rear Panel Components

The 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

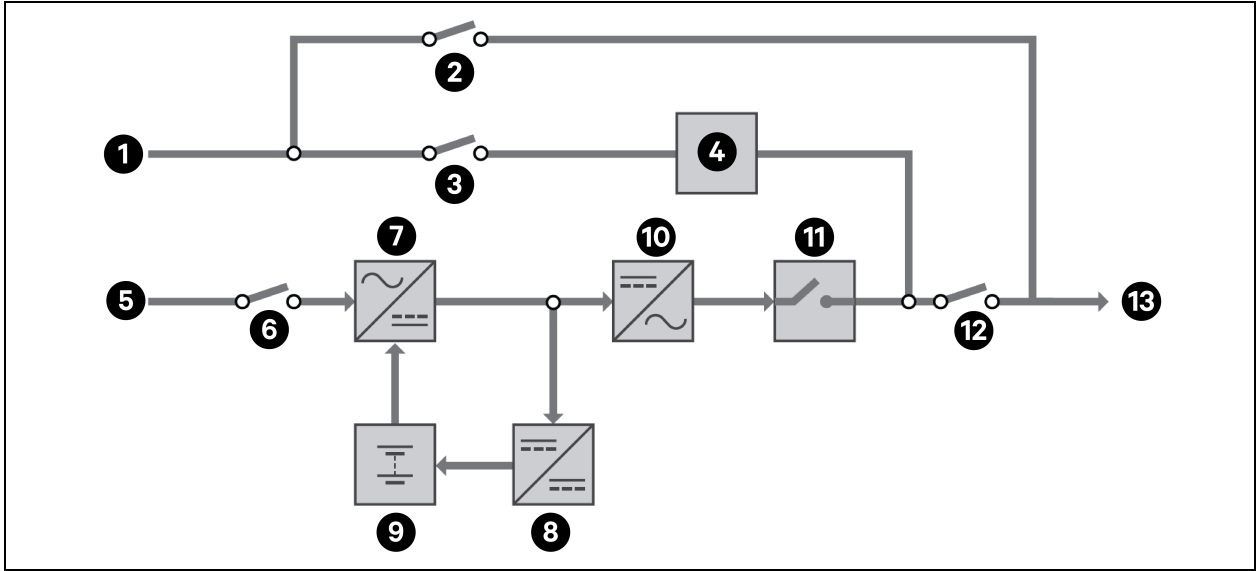
2.5 Major Internal Components and Operating Principle

The UPS is composed the components described in **Figure 2.4** on the next page. The **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 online, generating clean, precise, and regulated AC output power.
DC to 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 3 strings of long life, valve regulated, non-spillable, lead-acid batteries depending on back up run time requirements. See Specifications on page 59, for approximate run times. NOTE: To maintain battery design life, operate the UPS in an ambient temperature of 68 °F to 77 °F (20 °C to 25 °C).
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

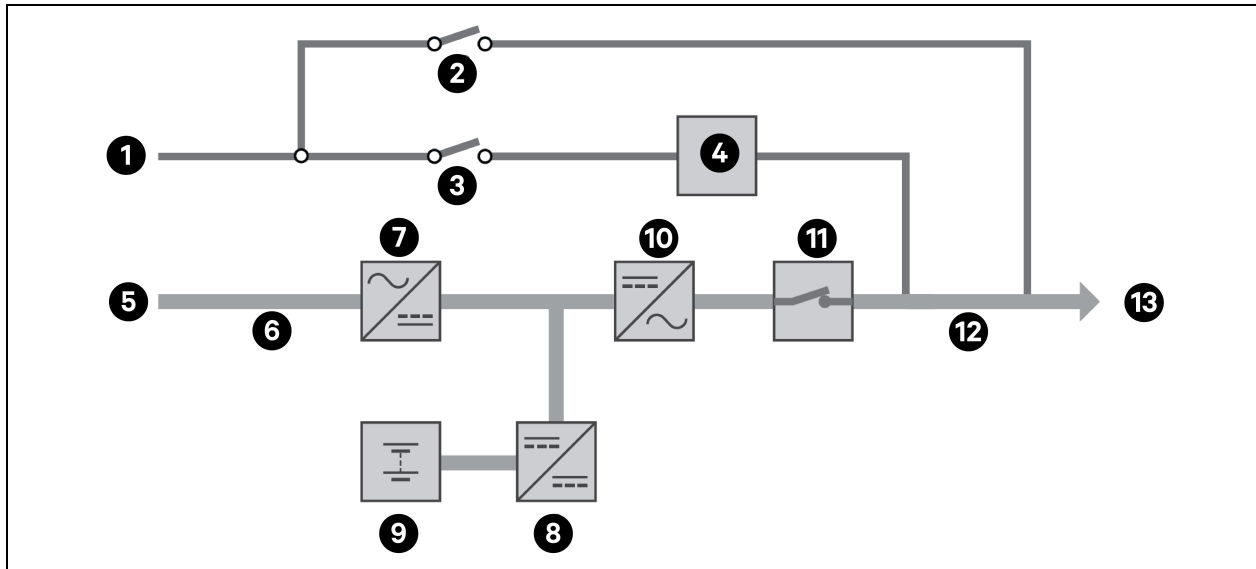
2.6 UPS States and Operating Modes

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, and 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

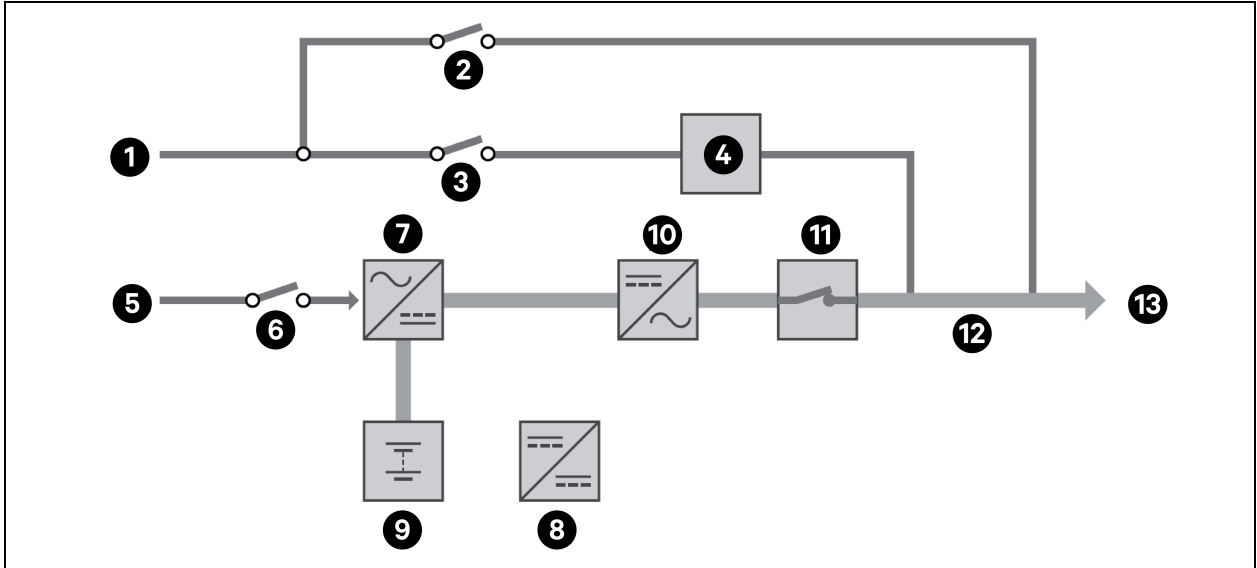


Item	Description
1	Bypass input
2	Maintenance byass breaker (MBB)
3	Bypass input breaker (BIB)
4	Static switch
5	Rectifier input
6	Rectifier input breaker (RIB)
7	Rectifier
8	Battery charger
9	Battery
10	Inverter
11	Automatic inverter switch
12	Maintenance isolation breaker (MIB)
13	UPS output

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

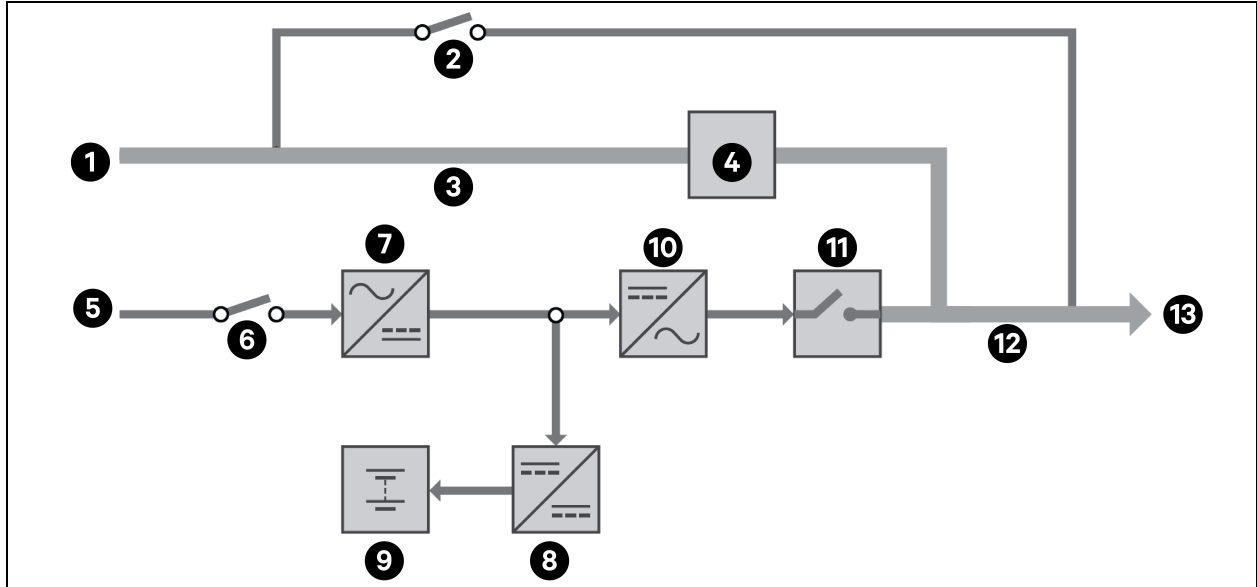


Item	Description
1	Bypass input
2	Maintenance bypass breaker (MBB)
3	Bypass input breaker (BIB)
4	Static switch
5	Rectifier input
6	Rectifier input breaker (RIB)
7	Rectifier
8	Battery charger
9	Battery
10	Inverter
11	Automatic inverter switch
12	Maintenance isolation breaker (MIB)
13	UPS output

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 byass 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

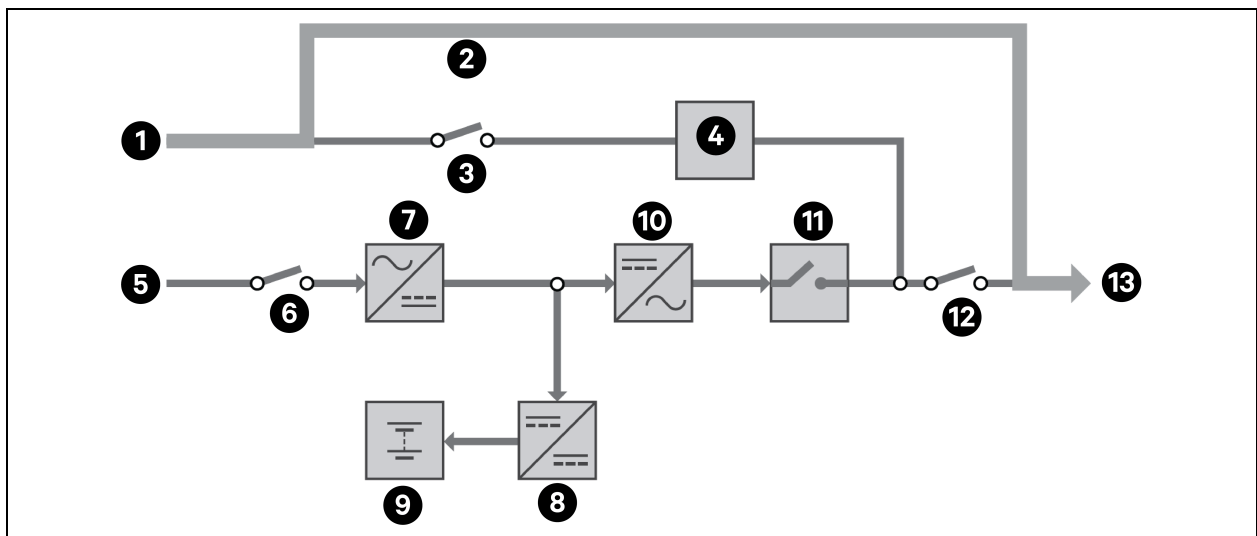
2.6.4 Maintenance bypass mode

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.

! WARNING! 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 shutdown 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 byass 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

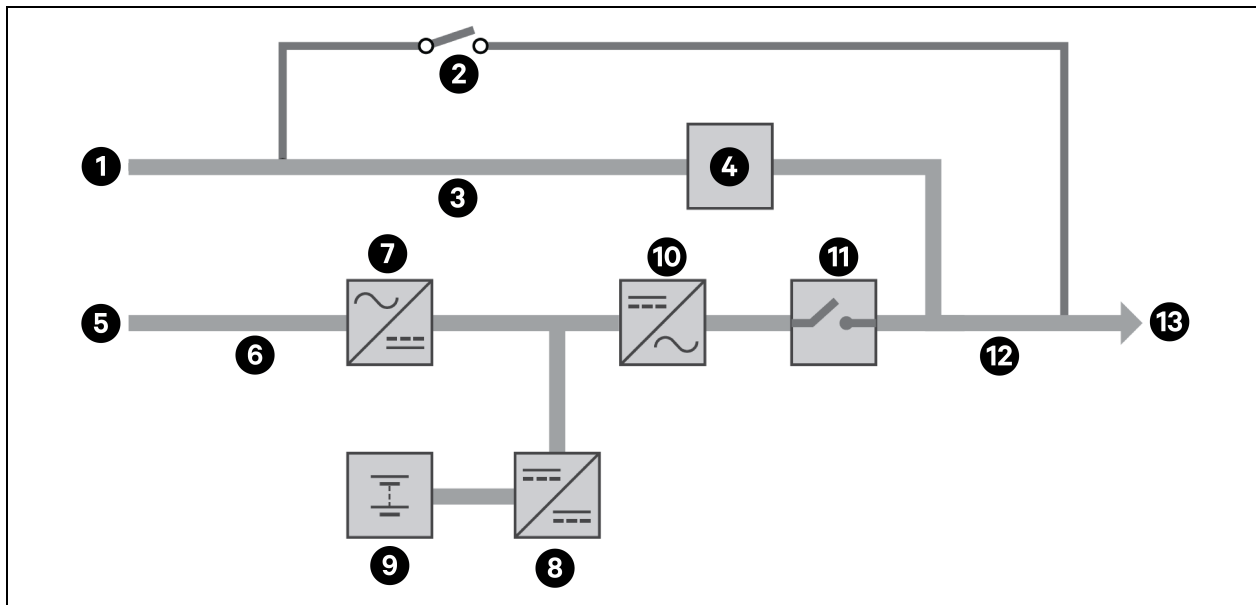
When enabled, which is the default setting, auto restart mode automatically restarts the UPS after a shutdown that resulted from depleted batteries after an extended power outage. A built-in 10 seconds delay after utility power is restored allows other equipment to start first and stabilize before the 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 98.7% 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 shutdown the bypass.

Figure 2.9 Eco Mode Operation



Item	Description
1	Bypass input
2	Maintenance byass breaker (MBB)
3	Bypass input breaker (BIB)

Item	Description
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.

3 Installation and Commissioning

Installation must be performed by properly trained and qualified personnel. Do not start the UPS until 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 8.2** on page 61, 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. Forklift 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 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

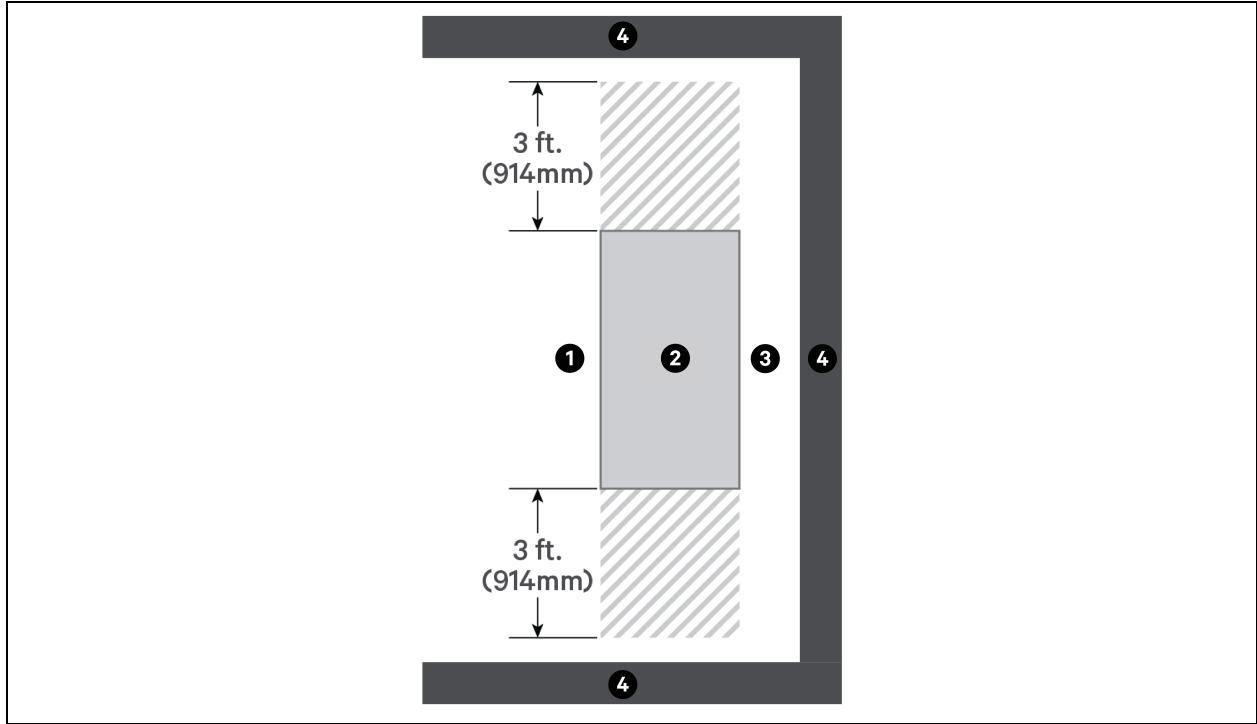
Install the UPS in a clean, well ventilated environment with the ambient temperature within the specifications listed in **Table 8.1** on page 59.

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.

- According to 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** below. 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.
- If a top fan is installed and there is no POD, rear clearance is not 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 to 77 °F (20 °C to 25 °C) and do not remove the package to prevent dust and metal dust from entering.



WARNING! Risk of battery failure. Improper charging of the batteries can cause damage 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 °F to 77 °F (20 °C to 25 °C): charge after 6 months in storage.

At 78 °F to 86 °F (26 °C to 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.

Rectifier and bypass input protection

Overcurrent protection

Install an appropriate overcurrent protective device 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. Refer **Table 3.1** on page 22 and **Table 3.2** on page 22.

Dual input system protection

In a dual input system, install separate protective devices for the utility and bypass at the utility input power distribution.

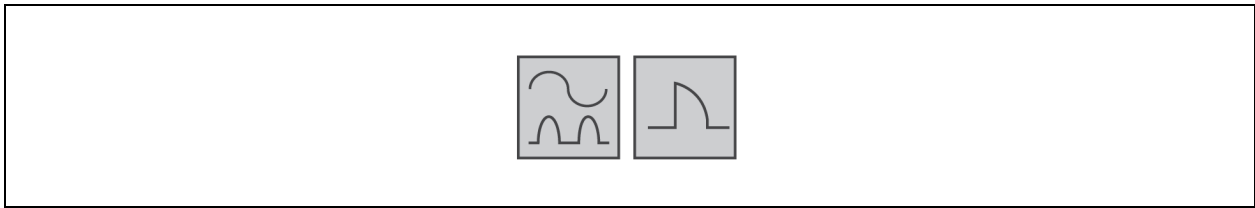
Earth leakage current

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: 0.3 A to 1 A.

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 661 lb (300 kg) and 1543 lb (700 kg) depending upon the number of battery strings in the system. See [Physical Specifications](#) on page 61, 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. Forklift 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 or has noticeable damage, please notate this on the proof of delivery and 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 palleted 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 uneven 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 damage, please document and photograph the damages and notify your local Vertiv representative.
- 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 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

Rating	Maximum Current, Amps	Recommended OPD, Amp Trip	167 °F (75 °C) THW		
			Copper Wire (phase) Number of Cables per Phase: 1	Copper Wire (neutral) Number of Cables: 1-2	Copper Wire (Ground) Number of Cables: 1
15	59	80	3	3	3
20	75	100	2	2	2
30	117	150	3/0	3/0	3/0
40	149	200	4/0	4/0	4/0

Table 3.2 AC Currents and Wire Size—UPS Bypass Input and Output⁴

Rating	Maximum Current, Amps	Recommended OPD, Amp Trip	167 °F (75 °C) THW		
			Copper Wire (phase) Number of Cables per Phase: 1	Copper Wire (neutral) Number of Cables: 1-2	Copper Wire (Ground) Number of Cables: 1
15	42	80	4	4	4
20	56	100	2	2	2
30	84	125	1/0	1/0	1/0
40	112	150	3/0	3/0	3/0

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

AWG (mm ²)			
	2 AWG (32.6 mm ²)	3 AWG (26.1 mm ²)	4 AWG (20.6 mm ²)
Manufacturer Part#	Thomas and Betts: 256-30695-257	Thomas and Betts: 256-30695-257	Thomas and Betts: 256-30695-255
Recommended Torque	177 lb-in./14.7 lb-ft./20 Nm		

Table 3.4 Recommended Wire Lug for Phase, Neutral, and Ground Conductors

AWG (mm ²)			
	0 AWG (53.5 mm ²)	3/0 AWG (85.3 mm ²)	4/0 AWG (108.6 mm ²)
Manufacturer Part#	Thomas and Betts: 54209	Thomas and Betts: 54211	Thomas and Betts: 54212
Recommended Torque	177 lb-in./14.7 lb-ft./20 Nm		

Table 3.5 Recommended Wire Lug for Phase, Neutral, and Ground Conductors

AWG (mm ²)		
	6 AWG (13.3 mm ²)	8 AWG (8.2 mm ²)
Manufacturer Part#	Thomas and Betts: 54136	Thomas and Betts: 54132
Recommended Torque	177 lb-in /14.7 lb-ft./20 Nm	

Table 3.6 Recommended Wire Lug for External Battery Conductors

AWG (mm ²)			
	4/0 AWG (108.6 mm ²)	2/0 AWG (69.8 mm ²)	4 AWG (20.6 mm ²)
Manufacturer Part#	Thomas and Betts: 54212	Thomas and Betts: 54210	Thomas and Betts: 256-30695-255
Recommended Torque	177 lb-in./ 14.7 lb-ft./20 Nm		

Table 3.7 Conduct Size and Knockout

Rating	Maximum Current, Amps	Recommended Conduct Size	Recommended Knockout (mm)
15	42	1 + 1/2	50
20	56	1 + 1/2	50
30	84	2 + 1/2	76.2
40	112	2 + 1/2	76.2

3.3.1 Connecting I/O cables



WARNING! Risk of electrical shock. Can cause equipment damage, injury and death.

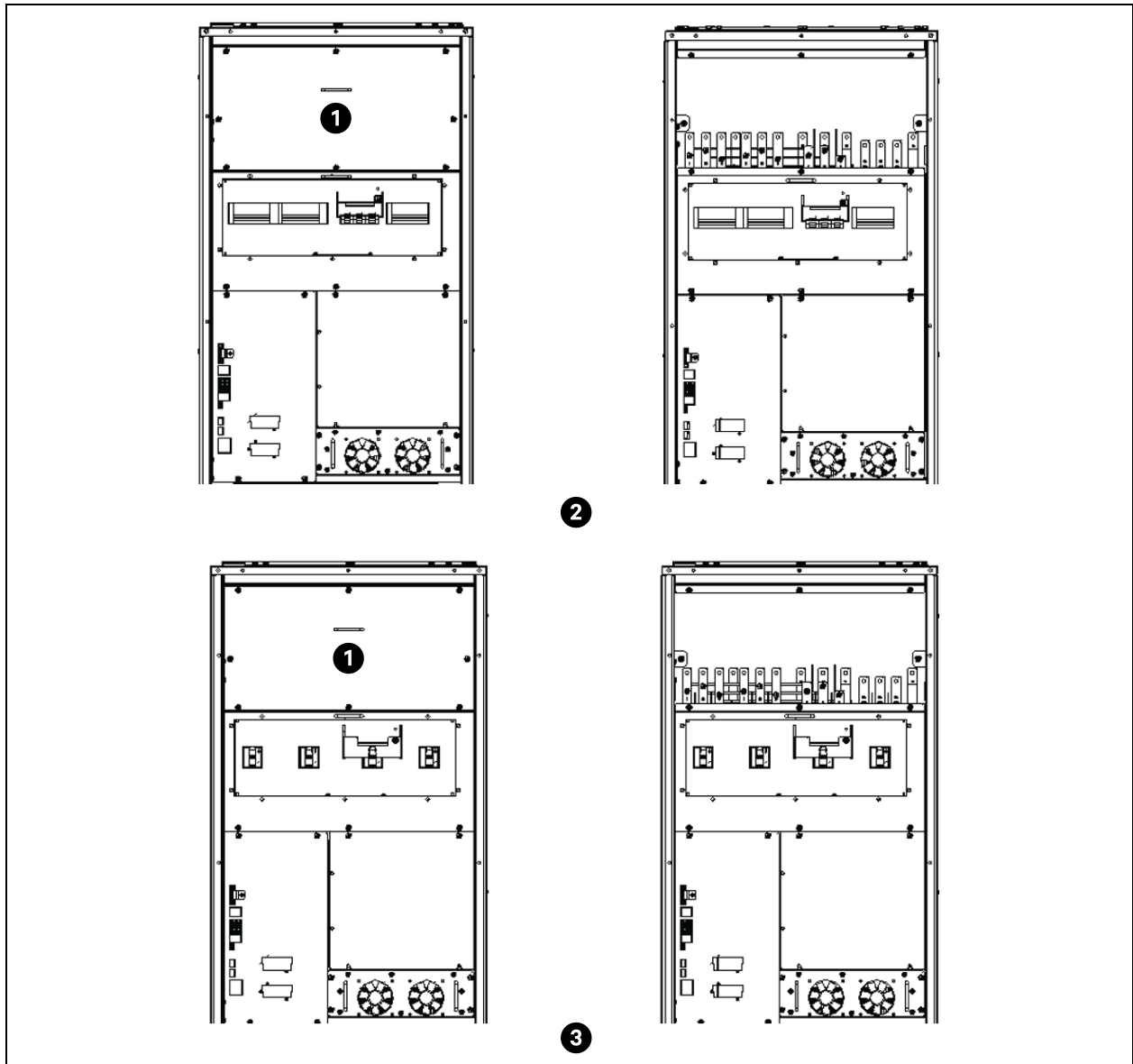
Before beginning installation, verify that all external overcurrent protection devices are open (Off), and that they are locked out and tagged appropriately to prevent activation during the installation. After the power cables are connected, the terminal block's protective cover must be reinstalled to remove the electric shock hazard.

1. Prepare to connect the UPS power cables to the bus bar on the UPS top panel, see **Figure 3.3** on page 25:
 - Remove the upper conduit/cable entry panel to punch holes for the conduit size, and attach the conduits to the top 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 bus bar.

NOTE: The Vertiv™ Liebert® EXS unit ships as a factory configured single input system.

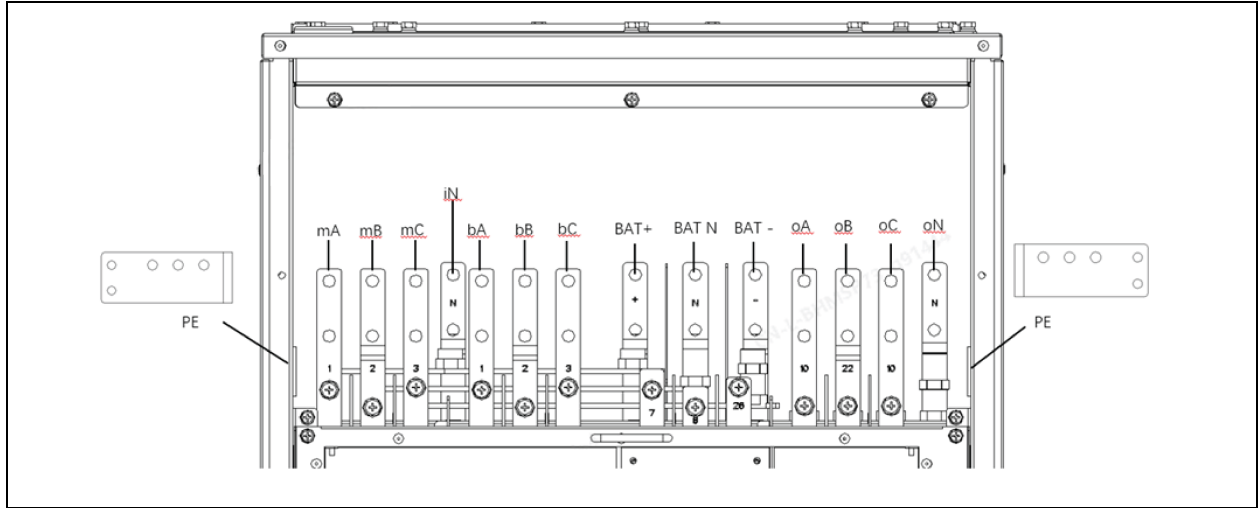
2. For a single input configuration, leave the factory installed jumpers on the input bus bar, and make the following input connections from the upstream feeder panel to the input bus bar. See **Figure 3.4** on page 26:
 - Phase A to rA
 - Phase B to rB
 - Phase C to rC
 - Neutral to iN
 - Ground cable to PE
3. To convert to a dual input configuration, remove the factory installed jumpers from bus bar:
 - rA – bA
 - rB – bB
 - rC – bC
4. For dual input, make the following connections from the upstream feeder panel to the main/rectifier input bus bar:
 - 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 bus bar:
 - 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 bus bar 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 EBC connection . The quick installation guide is included with your battery cabinet and is available on the Vertiv™ Liebert® EXS product page at www.Vertiv.com.
8. Torque all customer side connections per recommendations in **Table 3.3** on page 22, and **Table 3.6** on the previous page.
9. Replace and secure the cover panel.

Figure 3.3 Connection Terminal Access and Locations



Item	Description
1	Wiring access cover plate
2	15-30 K
3	40 K

Figure 3.4 Terminal Detail



3.4 Communication Connections

The communication ports, shown in **Figure 2.2** on page 7, 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 7, for the location of the pass through.

If included, the cards are factory installed in the ports. **Table 3.8** below, describes the cards available. The instructions for configuring and using the cards are available at www.Vertiv.com.

Table 3.8 Liebert® 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 upto 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.

Table 3.8 Liebert® IntelliSlot™ Communication Cards (continued)

Card	Description
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.

3.4.2 REPO connection

The **Table 3.9** below, describes the pin out of the REPO port, J14, used for N.O. or N.C. connection.

Table 3.9 REPO Port (J14) Pin Descriptions

J14 Pin No.	Pin Name	Description
2	REPO Coil N.C.	Normally Closed circuit, EPO is activated when Pin 2–Pin 4 is opened.
4	+12 VDC	REPO power supply, 12 VDC, 100 mA.
6	+12 VDC	REPO power supply, 12 VDC, 100 mA.
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 shutdown 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.

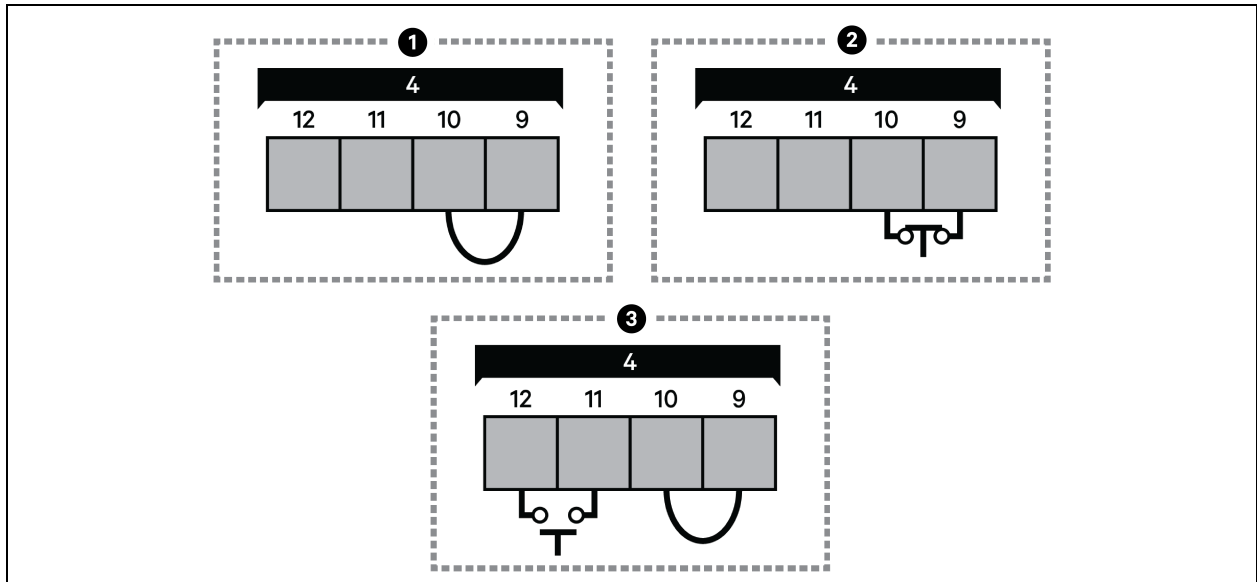
The **Figure 2.2** on page 7, shows the location of the REPO connection inside the UPS front panel. **Figure 3.5** on the next page, shows the connection details.

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 to 22 AWG (0.82 mm² to 0.33 mm²), and we recommend using 18 AWG copper, shielded, and 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 7, 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 Table 3.9 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's 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 7, shows the dry contact location inside the front panel, and **Figure 3.6** on the facing page, shows the connection details. **Table 3.10** on the facing page, and **Table 3.11** on the facing page, describe the pin out designations, allowable configuration selections, and factory details.

NOTE: The terminal block wire range is 18 AWG to 22 AWG (0.82 mm² to 0.33 mm²), and we recommend using 18 AWG copper, shielded, and 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 in order to trigger the alarm/action.

NOTE: We recommend that you route the cables for the dry contacts from the rear of the UPS through the built-in wiring channel to the dry contact port connections. See **Figure 2.2 on page 7, for the location of the pass through.**

Figure 3.6 Dry Contact Connections

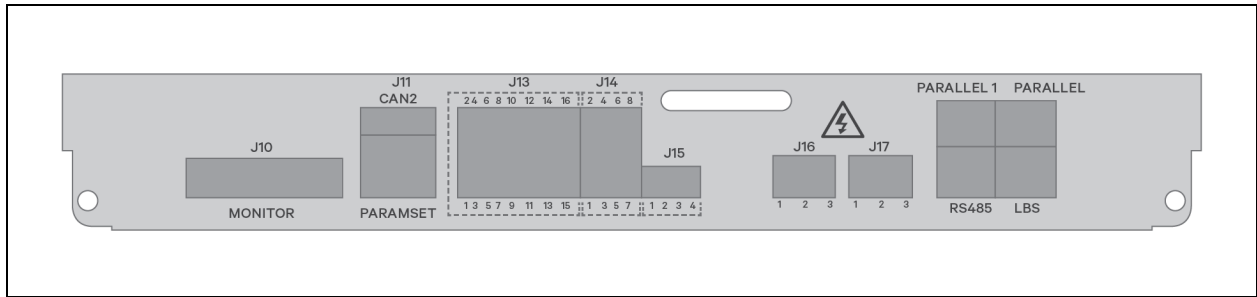


Table 3.10 Input Dry Contact Details

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"> On Generator Transfer to Inverter Inhibit External MIB Status External MBB Status Module Output Breaker Status Battery Ground Fault Detected Charger Shutdown ECO Mode Inhibit Start Battery Maintenance Self Test Stop Battery Maintenance Self Test Alarm Cleared 	External MIB Status
	3	Input #1 Gnd		Module Output Breaker Status
	5	Input #2 N.O.		External MBB Status
	7	Input #2 Gnd		External MBB Status
	9	Input #3 N.O.		External MBB Status
	11	Input #3 Gnd		External MBB Status
	13	Input #4 N.O.		On Generator
	15	Input #4 Gnd		On Generator
	2	Input #5 N.O.		Transfer to Inverter Inhibit
	4	Input #5 Gnd		Transfer to Inverter Inhibit
	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 3.11 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"> System Alarm (Summary) On Battery Low Battery UPS Fault, On Bypass On UPS REPO Main Input Abnormal On Maintenance Bypass Load Shed Signal 1 Load Shed Signal 2 Internal MBB Closed 	On Battery
	3	Output #1 Gnd		On Battery
	5	Output #2 N.O.		Summary Alarm
	7	Output #2 Gnd		Summary Alarm

Table 3.12 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.

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 Table 4.1 below.
2	LCD panel
3	Run indicator LED. See LED Indicators on the next page.
4	Alarm indicator LED. See LED Indicators on the next page.
5	Power button. See Table 4.1 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, and move left.
▼	Down	Move to next page, decrease value, and move right.
Esc	Escape	Go back.
⏻	Power	Power on the UPS, power off the UPS, and 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 2 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 and 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, refer [Silencing the Audible Alarm](#) on page 41.

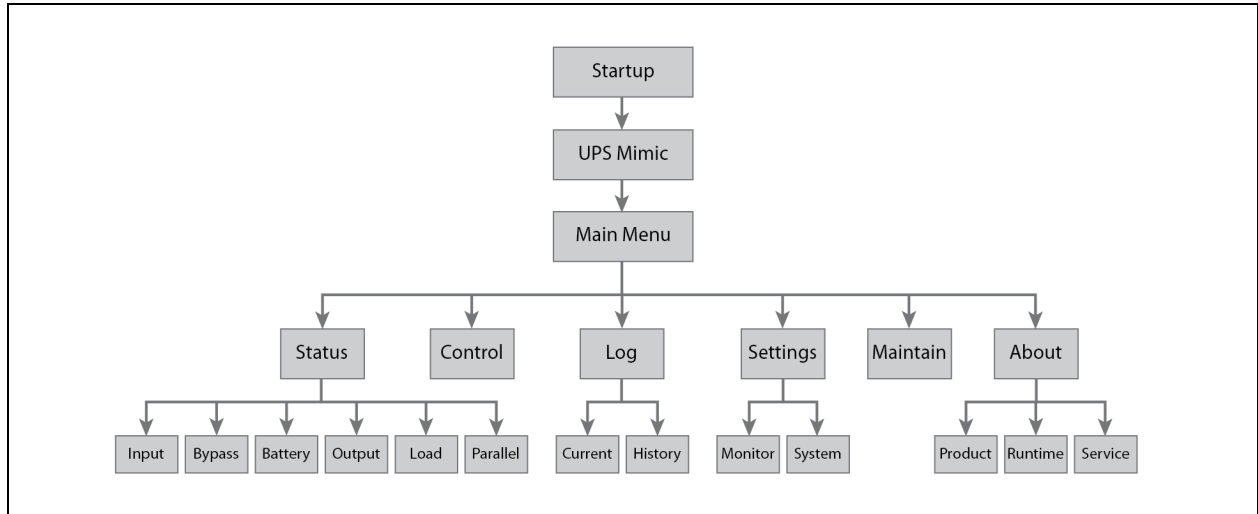
Table 4.3 Audible Alarm Descriptions

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.

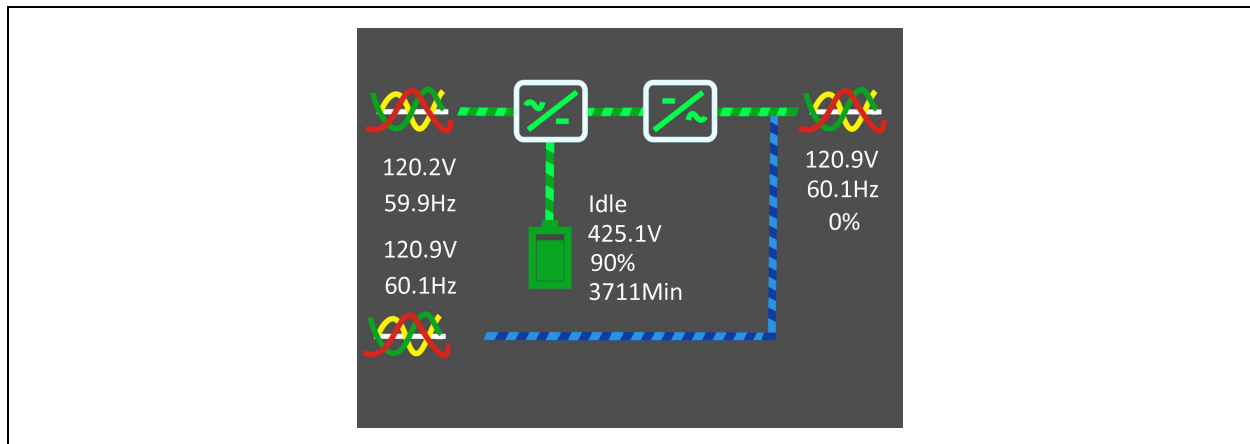
Figure 4.3 LCD Menu Structure



4.3.1 Startup and UPS mimic screens

At startup, the UPS executes a system test and displays the Vertiv logo screen for 10 to 15 seconds as 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



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

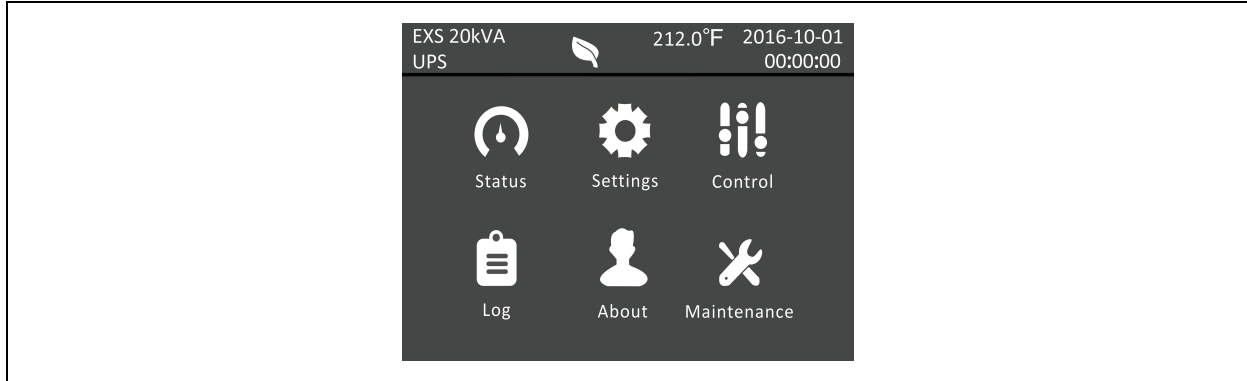


Table 4.4 Menu Options

Submenu	Description
Status	Voltage, current, frequency, and parameters for UPS components. See Status screen below.
Settings	Display and system parameter settings. See Settings submenu on the facing page.
Control	UPS controls. See Control screen on page 36.
Log	Current alarms and event history. See Log screen on page 36.
About	Product and network information. See About page on page 37.
Maintain	Service only, proprietary password protected page for use only by Vertiv service representatives.

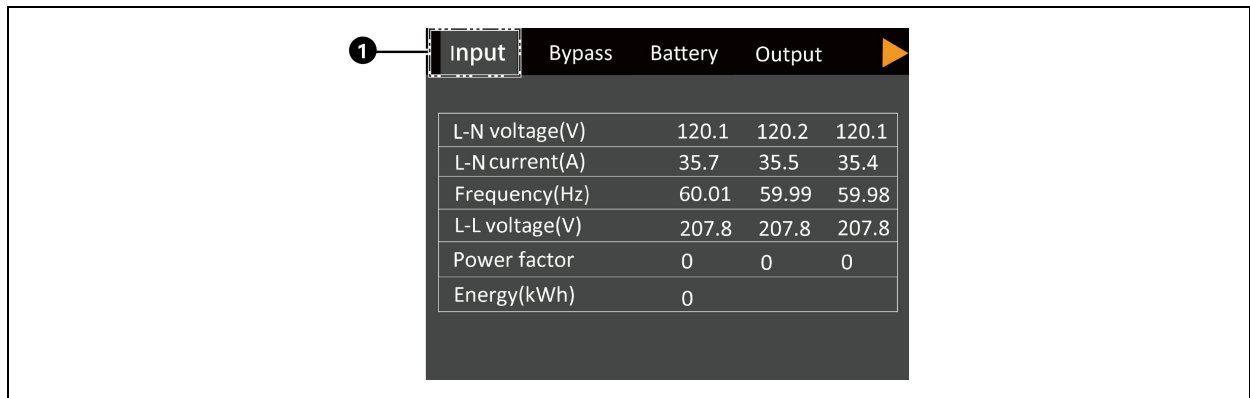
Status screen

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



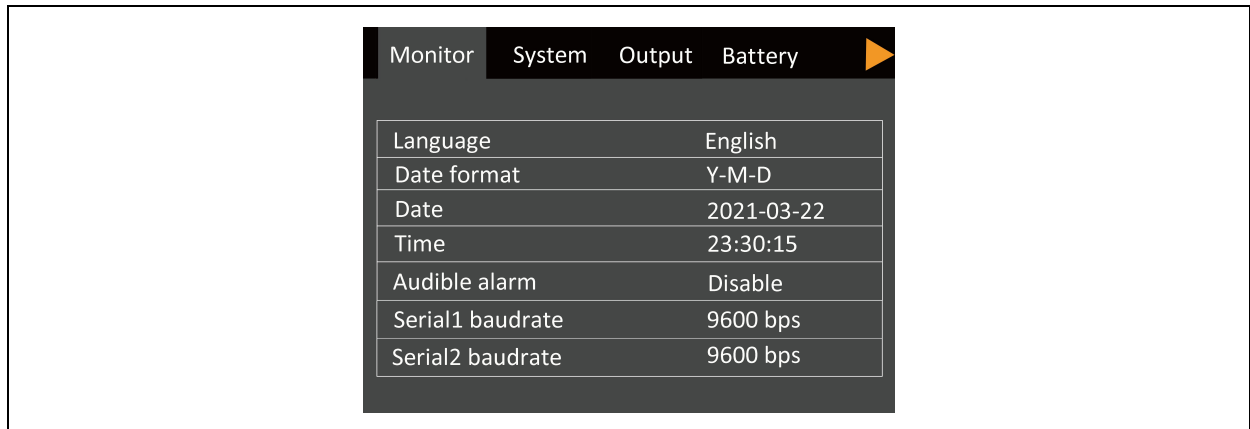
Item	Description
1	Screen tabs with Input tab selected.

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 38, for details on entering the password and editing the setting parameters.

Figure 4.7 Monitor and System Tabs on the Settings Submenu



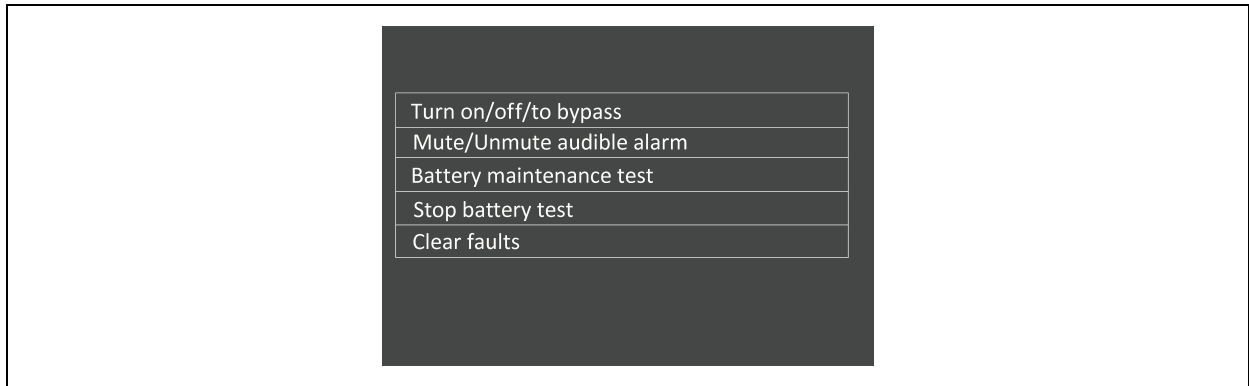
Control screen

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 select the control.

Figure 4.8 Control Screen



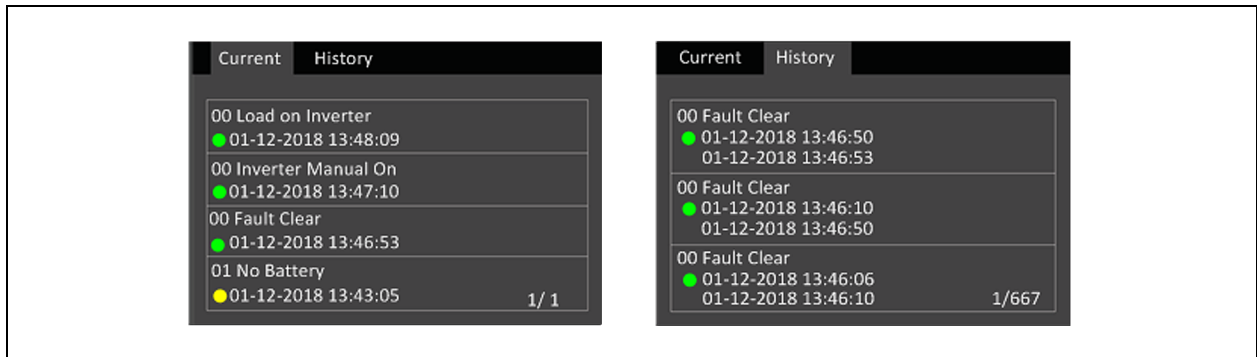
Log screen

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



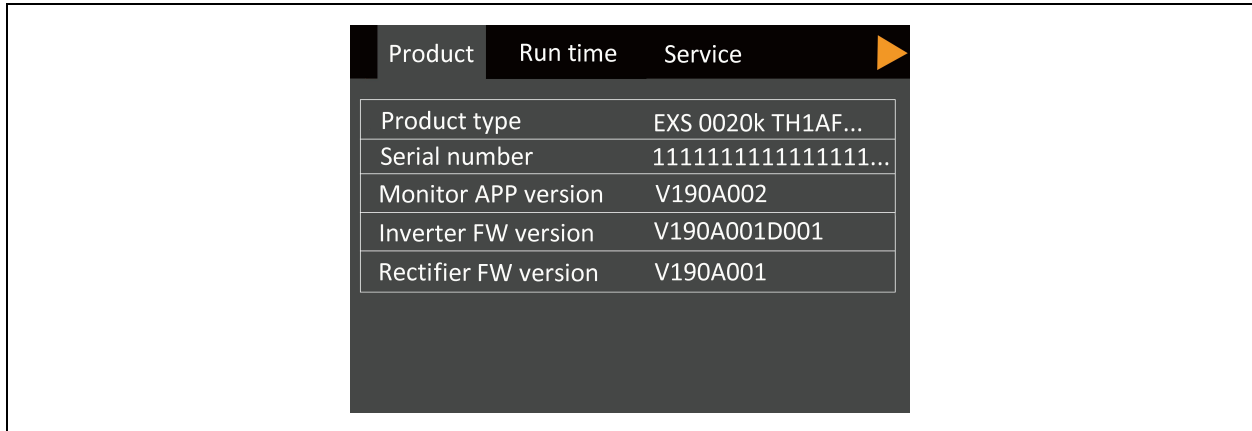
About page

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** below, describes the settings. The display and operation settings are password protected. 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 facing 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

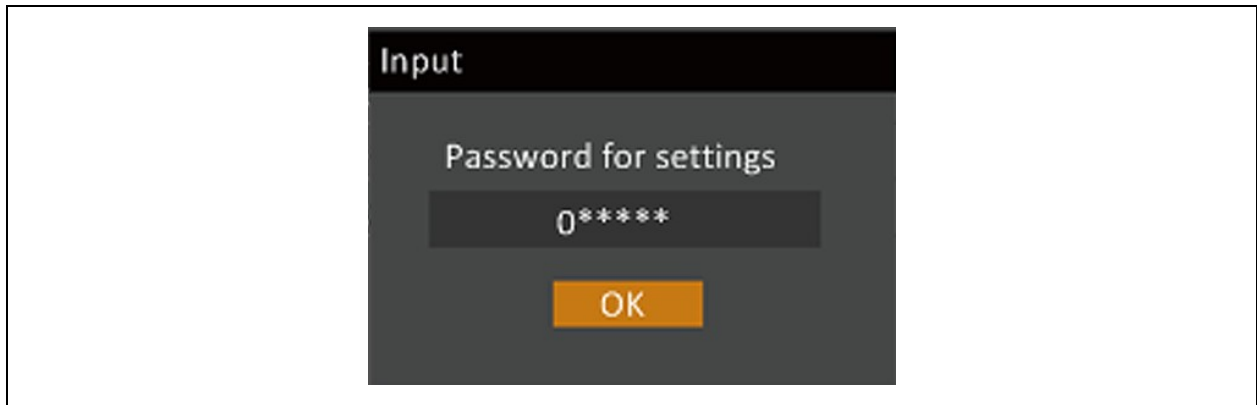


Table 4.5 Settings Available at the Display Panel

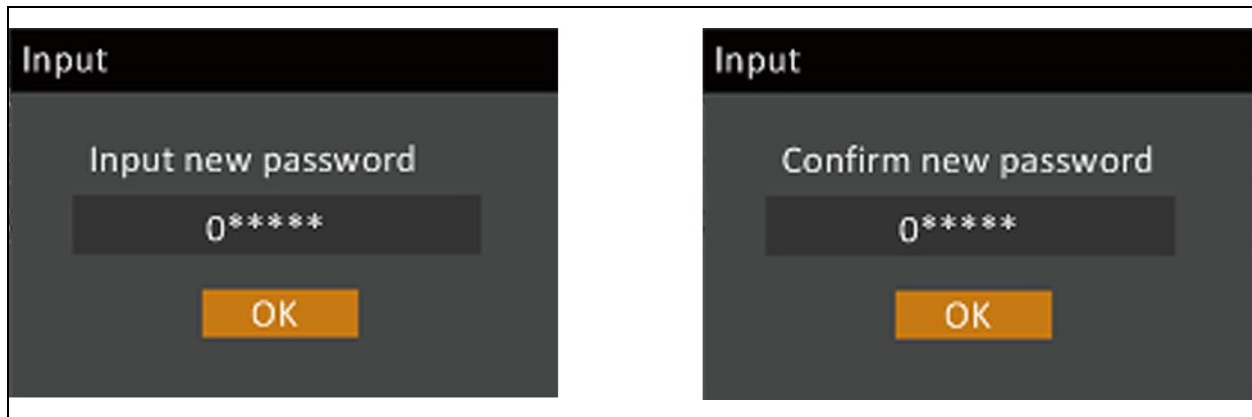
Tab	Settings	Parameter Range	Default Setting
System	Battery Auto Equalize	Disable, Enable	Disable
	ECO Mode	Disable, Enable	Disable
Monitor	Language	English, French, Portuguese, Spanish, Chinese, Czech, Dutch, German, Italian, Polish, Russian, Swedish, and Turkish	English
	Date	YY/MM/DD, MM/DD/YY, DD/MM/YY	Y-M-D
	Time	HH:MM:SS	00:00:00
	Audible Alarm	Disable, Enable	Enable
	Serial 1 baudrate	1200 bps, 2400 bps, 4800 bps, 9600 bps, 19200 bps	9600 bps
	Serial 2 baudrate	1200 bps, 2400 bps, 4800 bps, 9600 bps, 19200 bps	9600 bps
	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.

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.

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 Startup

Perform startup 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 startup procedure starts the UPS in normal mode providing clean and protected AC power to the connected equipment.

To start the UPS:

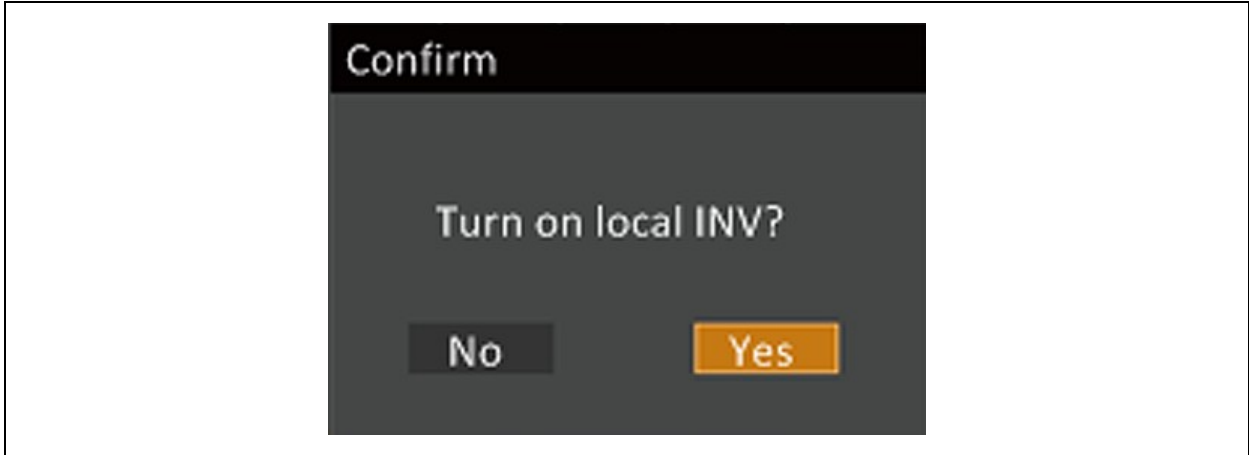
1. Close the upstream feeder breakers for the UPS rectifier and bypass (if wired as dual input).
2. Close all downstream breakers including distribution panel main breaker and/or branch circuit breakers.
3. If external battery cabinets are installed, close the EBC breaker.
4. If optional PODs are installed, verify that all distribution breakers on the PODs are closed.
5. Ensure that the UPS 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 RIB, BIB, and 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 startup process and the boot up system checks, which take approximately 20-30 seconds.

7. Before continuing to step 9, make any changes/customization to the UPS operating parameters for the installation or application. See [Editing Display and Operation Settings](#) on page 38.
8. Can be set to startup on bypass, then the UPS will first output on bypass when starting up.
9. After the system checks are 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** on the next page.

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:

1. 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 shutdown output displays. See **Figure 5.3** on the facing page.
 - 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

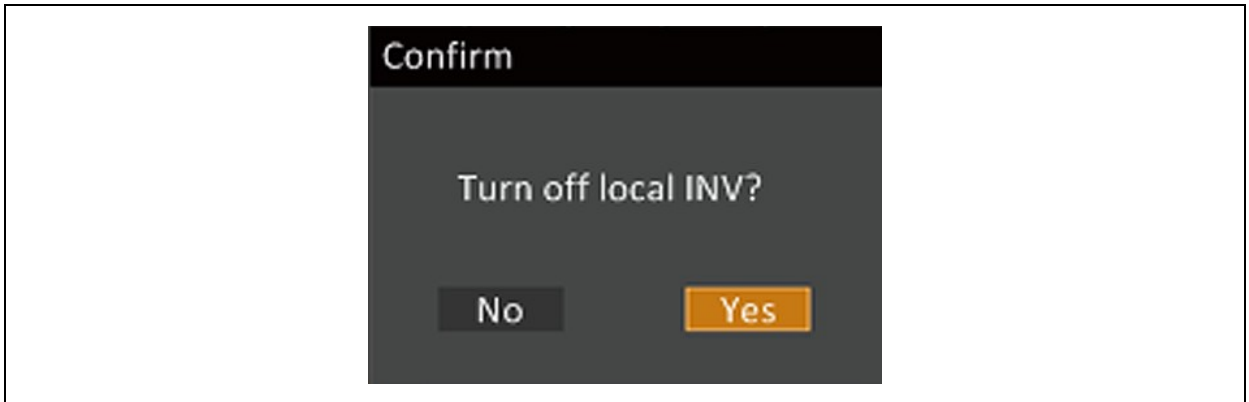
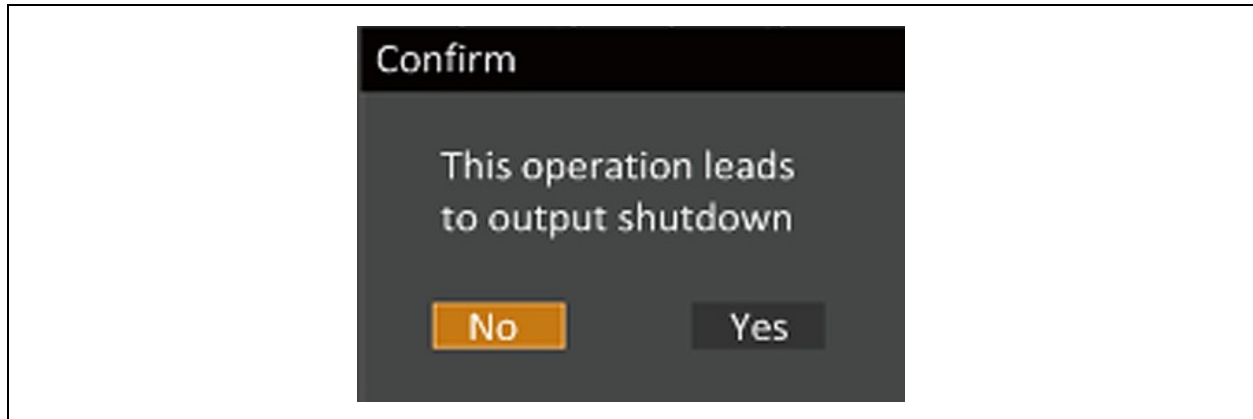


Figure 5.3 Output Shutdown—Bypass Power Outside Normal Range



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** on the next page.
 - 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

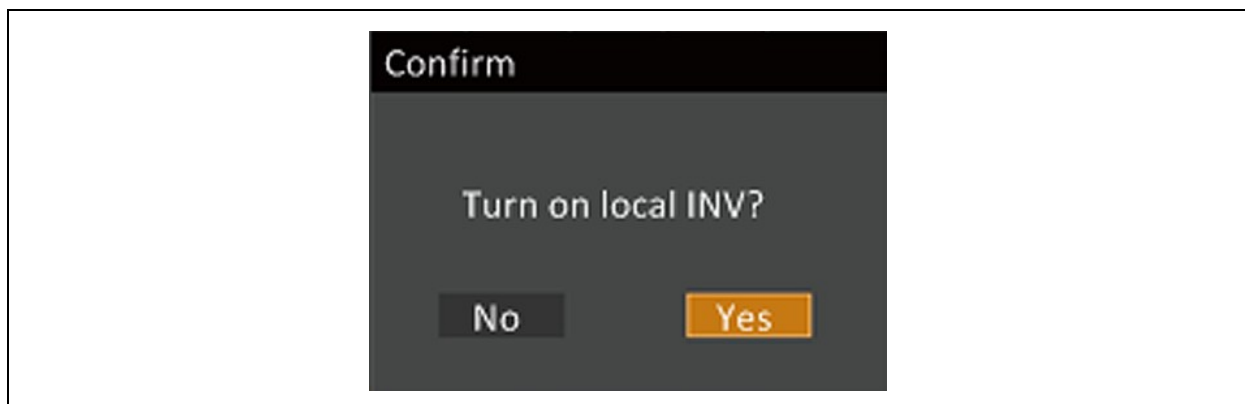
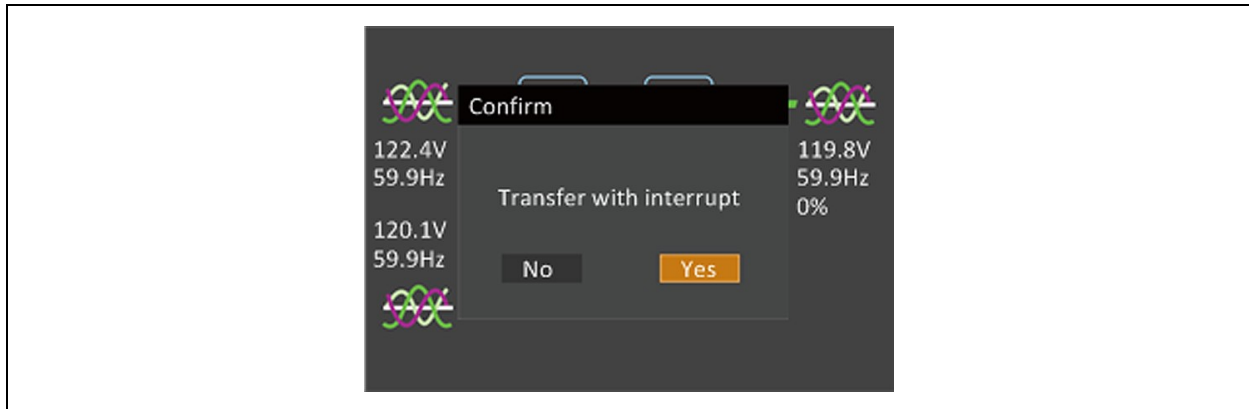


Figure 5.5 Transfer with Interrupt



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 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 RIB, BIB, and MIB. If external battery cabinets are installed, open the EBC breakers.

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 cabinets are installed, close the EBC breaker.
3. On the front of the UPS, close RIB, BIB, and MIB.

NOTE: The UPS performs startup 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.



WARNING! 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 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 REPO

The UPS is equipped with a REPO connector for N.O. or N.C. systems. See [REPO connection](#) on page 27, 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 Parallel System and LBS System

This chapter gives details on the installation of parallel system and LBS system.

6.1 General

The UPS parallel system consists of up to two single UPS of the same model. The parallel system does not require a centralized bypass. Instead, each UPS bypass shares the load when the system is transferred to the mains bypass supply.

From a power viewpoint, each module is internally identical to the single module configuration. A parallel system requires inter module control signals to manage the load sharing, synchronizing and bypass switching. The control signals are connected through the parallel cables, which are multi way ribbon cables connected between the units of the system to form a ring.

When two modules are to be connected in parallel, it is recommended that inductor should be inserted in the bypass line. This can be installed internal to the UPS as an option.

6.2 Requirements

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

- All single UPSs must have the same capacity.
- The bypass input power and the rectifier input power must be connected to the same neutral line input terminal.
- If a residual current detector (RCD) is required, it must be set correctly and installed before the same neutral line input terminal, or it must monitor the protective earth current of the system. Refer to 'Warning: high leakage current of Safety Precautions before Contents.
- The outputs of all single UPSs must be connected to the same output bus.

6.3 System Installation Procedures

The basic installation procedure of a parallel system comprising two or more UPS modules is the same as that of single module system. This section only introduces the installation procedures specific to the parallel system. The installation of a parallel UPS should follow the installation procedure for a single UPS module with the additional requirements detailed in this section.



WARNING! To achieve normal operation of the parallel system, Vertiv service personnel must execute the CAN resistance operation. Failure to do so could result in system fault.

6.3.1 Preliminary checks

Ensure that correct parallel cable option has been selected, and that the module ratings, model, and software and hardware releases are consistent.

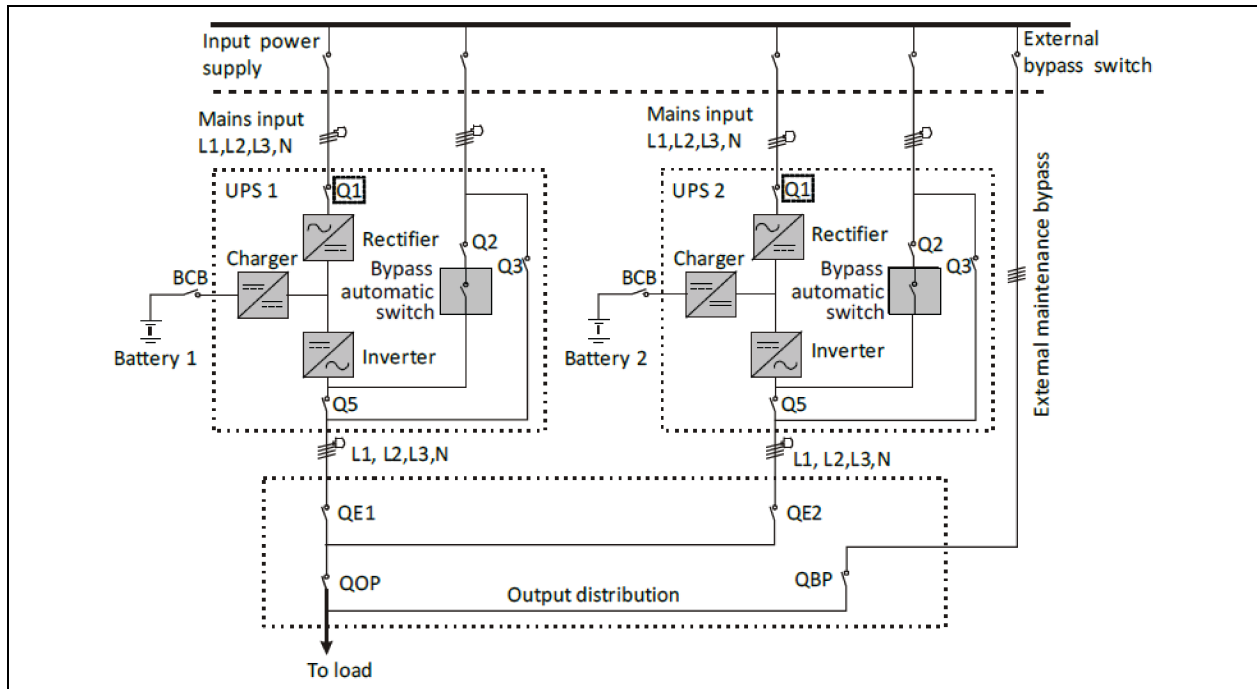


WARNING! To achieve coordinated operation of the modules in the parallel system, it is required to configure each module separately using Vertiv setting software. This must be done by Vertiv service personnel.

6.3.2 Cabinet installation

Place the UPS modules side by side and interconnect as shown in **Figure 6.1** below. The output distribution mode (QE1 and QE2 must be configured) shown in **Figure 6.1** below is recommended to facilitate maintenance and system testing.

Figure 6.1 Typical Parallel System (with Common Input, Separate Batteries and Output)



6.3.3 Power cables

The power cable wiring is similar to that of the UPS module.

The bypass and rectifier input supplies must use the same neutral line input terminal. If the input has a current leakage protective device, the current leakage protective device must be fitted upstream of the neutral line input terminal.

NOTE: The power cables of each UPS module (including the bypass input cables and UPS output cables) should be of the same length and specifications to facilitate load sharing.

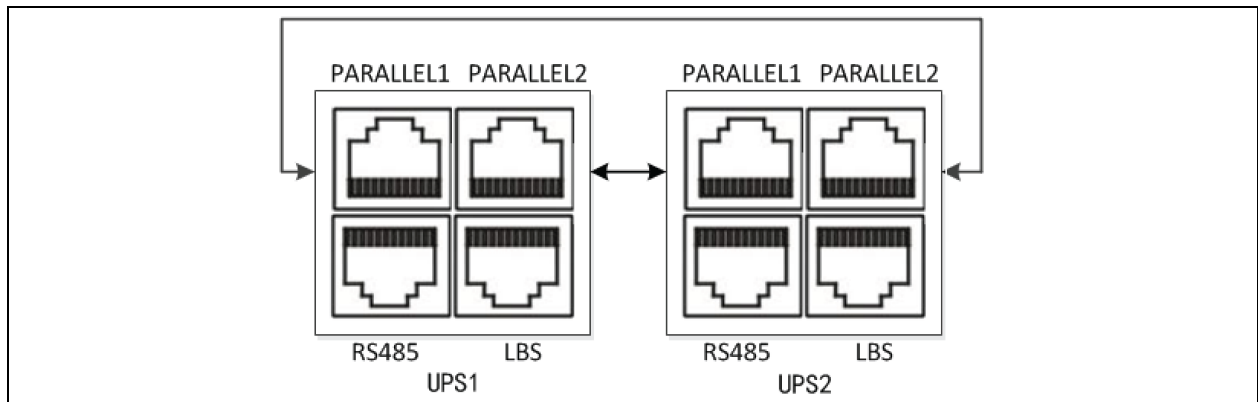
NOTE: The UPS adopts common input configuration and split bypass configuration. If the mains input and bypass input come from two different transformers, then these two transformers should share one grounding grid.

6.3.4 Parallel cables

Shielded and double insulated parallel cables available in lengths of 5 m, 10 m, and 15 m must be interconnected between the UPS modules in a ring configuration, as shown in **Figure 6.2** on the facing page. Connect a single module parallel cable from its PARALLEL1 port to the PARALLEL2 port of another module. Repeat this step for all the other parallel cables.

The ring connection ensures the reliability of the control of the parallel system. Make sure that the cables are securely connected before starting the system.

Figure 6.2 Parallel Cables Connection



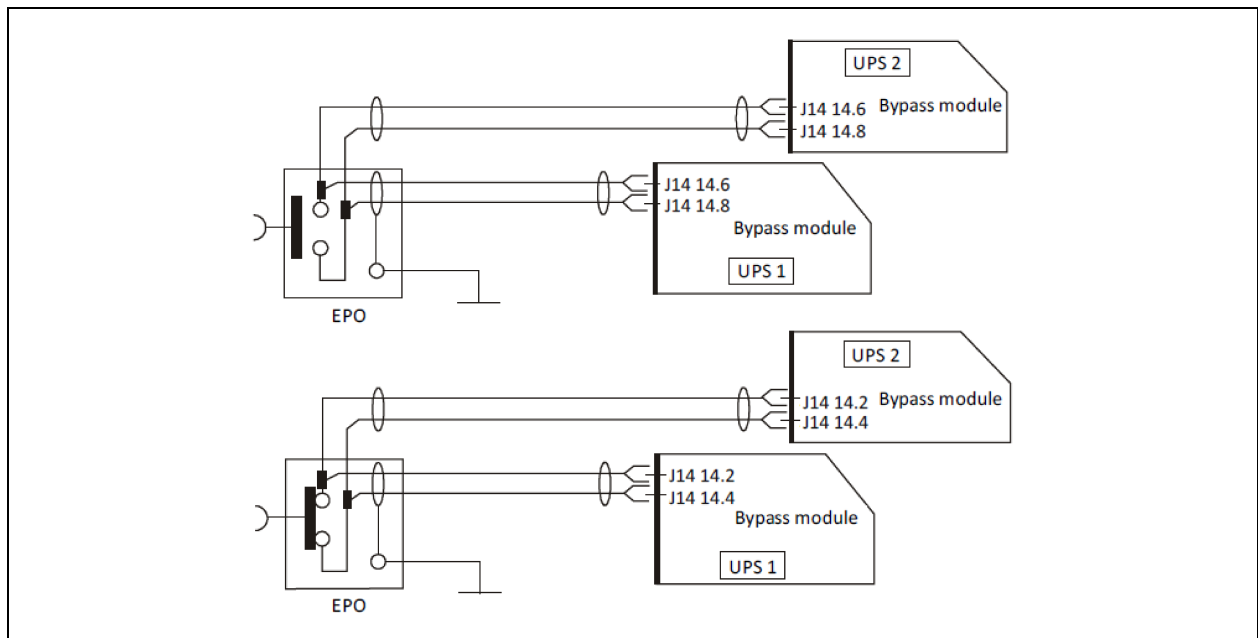
6.3.5 REPO

In addition to the EPO terminal provided by each UPS module to control the EPO of each module respectively, the parallel system also provides remote EPO function for controlling all UPS modules to shutdown simultaneously from a remote terminal, as shown in **Figure 6.3** below.

NOTE: The remote EPO switch must provide dry contact signal, which is normally open or normally closed.

NOTE: The external EPO device can be composed of another control system which can disconnect UPS mains supply or bypass input.

Figure 6.3 EPO Circuit Diagram



NOTE: In **Figure 6.3** above, the upper one is normally open type, and the lower one is normally closed type.

6.4 Operation Procedures for Parallel System

6.4.1 Before startup



WARNING! These procedures result in mains voltage being applied to the UPS output terminals.



WARNING! If any load equipment is connected to the UPS output terminals, check with the user that it is safe to apply power. If the load is not ready to receive power, disconnect the downstream load switch, and paste a warning label on the connection point of the load.

1. Check and confirm that the UPS power distribution mode is correct, that the power cables and signal cables are correctly connected, and there are no short circuits.
2. Check that the batteries are properly installed, the cables are correctly connected, and the positive and negative battery poles are correct.
3. Check all the operating status of the parallel system, ensure that the phase sequence of the main, bypass and output of each UPS is correct and consistent, that the connection of the parallel cable is reliable, and that the user load is not connected during power on.
4. Measure the mains voltage and frequency and verify that they are correct.
5. When the UPS is switched on, the UPS output terminals are energized. If the load has already been connected to the output terminals, make sure that it is safe to apply power to it.

6.4.2 Parallel system parameters setting

NOTE: The parameters of parallel system must be set by Vertiv engineer through Vertiv setting software.

6.4.3 Power on procedures for parallel system



WARNING! During the parallel power on, confirm that the external output MCB of each UPS has been closed, and that all the inverter output of the UPSs is connected parallelly.



WARNING! During the parallel power on, confirm that the system is working normally, and then feed power to the load, to void load power failure.



WARNING! To avoid misreporting as faults, all operations relating to disconnection or connection must follow the following steps.

1. Set the parallel parameter of each UPS in the parallel system, then commission the inverter. The specific commissioning procedures are as follows:
 - a. Ensure that the total external maintenance bypass switches are open in the parallel system. Open the front door of each UPS, ensure that the internal maintenance bypass switch Q3 is off, and that the input cables and PE terminals are securely connected.
 - b. Close the total bypass input switch Q2.

- c. Close the output switch Q5, bypass input switch Q2, main input switch Q1 and all the external output isolating switches (if any) in turn. Now, the system is powered on, and LCD screen is activated.
- d. The UPS internal cooling fan starts, and the rectifier executes self check and starts to run. The rectifier runs in normal state for about 30 seconds, after which the rectifier startup phase is complete. Confirm that the LCD displays bypass and main input normally, and that the current log window generates an alarm of PowerCAN Comms. Abnormal or Discrete Bus Comms. Abnormal, otherwise you should check that the switch Q2 and switch Q1 have been closed, and that parallel cables of each UPS have been well connected. The alarm indicators (red) are always off till all the UPSs in parallel system are rectified.
- e. Refer to [Parallel system parameters setting](#) on the previous page for the parallel parameters setting for each UPS. Carry out the following procedures if the UPS is running normally.
- f. Press the *power* button of one UPS and press the *Enter* key to start the UPS. The run (green) indicator blinks, and the inverter will start, then the run indicator comes on. If the battery is not connected, the alarm indicator will be solid on, and the buzzer will beep every second. If the battery is connected, the alarm indicator will turn off.
- g. If the UPS is working normally, press the *power* button of this UPS for 2 seconds to turn off the inverter.
- h. Repeat steps a to g to power on and commission the inverter of other UPSs respectively.

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

2. After confirming that the inverter of each UPS is normal, commission the parallel system, the specific procedures are as follows:
 - a. Close the external and internal I/O switch of each UPS, and all UPSs are powered on at the same time. After the start of the rectifier is finished, press the *power* button of one UPS to start the inverter, and then the run indicator (green) comes on.
 - b. Start the inverter of the second UPS, check whether there is an alarm on the LCD, and confirm that the UPS parallel works normally.

6.4.4 Maintenance bypass procedures

If the UPS system consists of more than 2 parallel UPS modules, and the load capacity exceeds that of the single module capacity, do not use the internal maintenance bypass switch.

This operation will make the load transfer from UPS power supply protection state to direct connection with AC input bypass state.



WARNING! Power supply interruption danger of the load.

Before performing this procedure, check the LCD information first, and ensure that the bypass is normal, and inverter synchronized. Otherwise, it may result in the load power interruption for a while.



WARNING! If the maintenance is required, wait 10 minutes for the internal DC bus capacitance discharging.



WARNING! The parts of UPS circuits also have hazardous voltage, though the rectifier input switch, bypass input switch and battery switch are disconnected. Therefore, the UPS maintenance is applicable to qualified personnel only.

1. Press the *power* button of each UPS to shutdown the inverter, till all the UPSs in parallel system transfer to bypass mode.
2. Close the UPS external total maintenance bypass switches, and do not close the internal maintenance bypass switch Q3 of each UPS.
3. At this moment, the external total maintenance bypass should be parallelly connected with each UPSs bypass.
4. At this moment, the LCD of each UPS displays maint. switch closed.



WARNING! When the UPS is in maintenance mode, the load does not have the mains abnormal protection.

5. Press the *remote EPO* button of each UPS for 2 seconds (if any) or unplug the EPO terminal of each UPS to stop the operation of rectifier, inverter, bypass, and battery, but this action will not affect the maintenance bypass power the load normally.

NOTE: In maintenance mode, the load is directly fed by the mains power instead of the pure AC power from the inverter.

6. Disconnect the main input switch Q1, bypass input switch Q2, and output switch Q5 of each UPS in turn.

At present, all the internal power supply is off, and the LCD no longer displays.

7. If the UPS is equipped with internal batteries, ensure that they have been isolated from the UPS before carrying out maintenance work on it. If the UPS is equipped with an external battery, set the corresponding external battery switch to off.

6.4.5 Isolating one UPS module from parallel system



WARNING! These procedures shall only be carried out by service personnel of Vertiv or under their guidance.



WARNING! Before operation, confirm that the system capacity has redundancy to avoid system shutdown due to overload.

The following procedures apply when one UPS module must be isolated from the parallel system for repair due to serious fault:

1. Unplugging the EPO terminal stops the operation of rectifier, inverter, bypass, and battery, but this action will not affect other UPSs in parallel system to normally power the load.
2. Disconnect the main input switch Q1, bypass input switch Q2, and output switch Q5 of the UPS. At present, all the internal power supply is off, and the LCD no longer displays.
3. If the UPS is equipped with internal batteries, make ensure that they have been isolated from the UPS before carrying out maintenance work on it. If the UPS is equipped with an external battery, set the corresponding external battery switch to off.



WARNING! Post a label at the AC input distribution (generally far away from the UPS) to alert that the UPS maintenance is being operated.



WARNING! Wait 10 minutes for the internal DC bus capacitance discharging. Then the UPS is completely shutdown.

6.4.6 Inserting one isolated UPS module in parallel system



WARNING! These procedures shall only be carried out by service personnel of Vertiv or under their guidance.

The following procedures are used to reintegrate a UPS module that has been previously isolated from the parallel system:

1. If the UPS is equipped with internal batteries, ensure that the external battery terminals are well connected. Close the output switch Q5, bypass input switch Q2, and main input switch Q1 in turn. At present, the system is powered on, and LCD screen is activated.
2. The UPS internal cooling fan starts, and the rectifier executes self check and starts to run. The rectifier runs in normal state for about 30 seconds, after which the rectifier startup phase is complete. Confirm that the LCD displays bypass and main input normally, and that the current log window generates an alarm of PowerCAN Comms. Abnormal or Discrete Bus Comms. Abnormal, otherwise you should check that the switch Q2 and switch Q1 have been closed, and that parallel cables of each UPS have been well connected.
3. Refer to [Parallel system parameters setting](#) on page 50 for the parallel parameters setting for each UPS. Carry out the following procedures if the UPS is running normally.
4. Press the *power* button of one UPS and press the *Enter* key to start the UPS. Then the run indicator comes on.
5. After this UPS runs in Inverter mode, close the external output switch (if any), and connect this UPS to the parallel system.

6.4.7 Completely powering down the UPS

Complete UPS shutdown and load power off should follow this procedure. All power switches, isolating switches, and breakers are disconnected, and then UPS no longer supplies power to the load.



WARNING! The following procedures will cut off the load power, making the load completely power off.

1. Press the *remote EPO* button of each UPS for 2 seconds (if any) or unplug the EPO terminal of each UPS to stop the operation of all the rectifiers, inverters, bypasses, and batteries.
2. If the UPS is equipped with internal batteries, ensure that they have been isolated from the UPS before carrying out maintenance work on it. If the UPS is equipped with an external battery, set the corresponding external battery switch to off.
3. Disconnect the main input switch Q1, bypass input switch Q2, and output switch Q5 of each UPS. At present, all the internal power supply is closed and the LCD no longer displays.



**WARNING! Hazardous battery voltage.
The battery terminals still have hazardous voltage after the UPS complete shutdown.**

6.4.8 Procedures for complete UPS shutdown while maintaining power to load

The procedures are applicable for completely powering down the UPS and still keeping the power supply to the load. Refer to the procedures in [Maintenance bypass procedures](#) on page 51.

6.5 LBS System

6.5.1 Overview

An LBS system consists of two independent UPS systems, each containing one or more parallel UPS modules. The LBS system is highly reliable and is applicable to the load with multiple inputs. For single input load, an STS can be installed to feed power to the load.

6.5.2 Cabinet installation

The system uses the LBS cables to synchronize the output of the two independent (or parallel) UPS systems. One system is designated as the master, the other is designated as the slave. The operation modes of the parallel system comprise master and/or slave operation in normal or bypass mode. Refer to **Figure 6.4** below and **Figure 6.5** on the facing page for details.

Figure 6.4 LBS System (UPS Module)

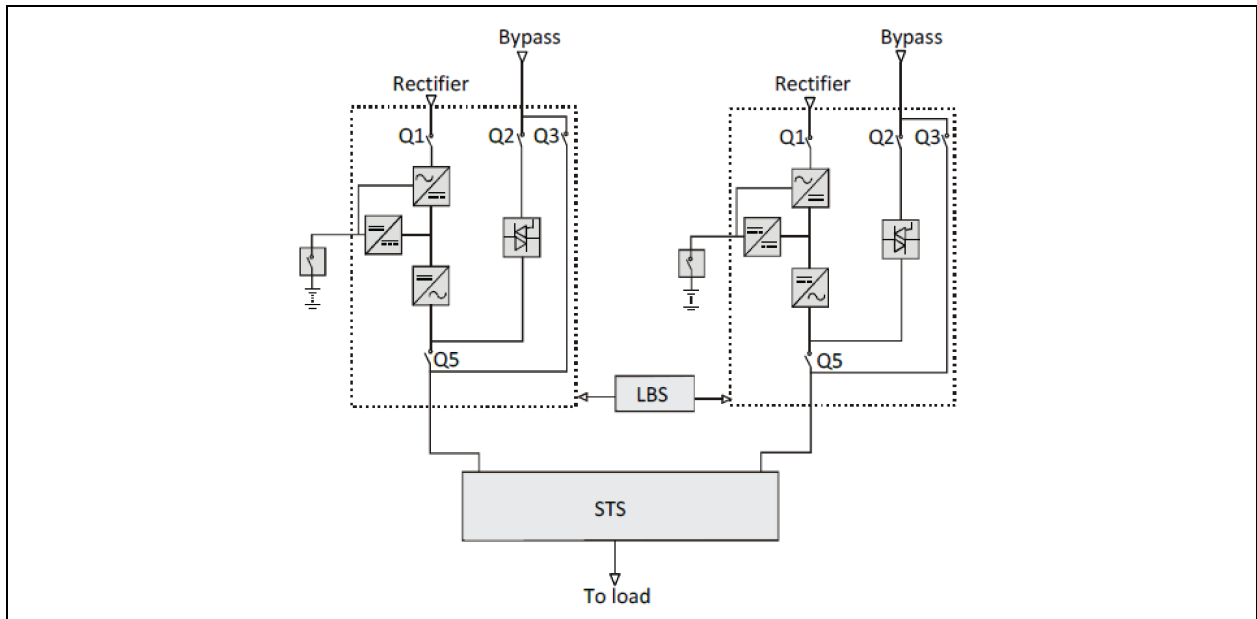
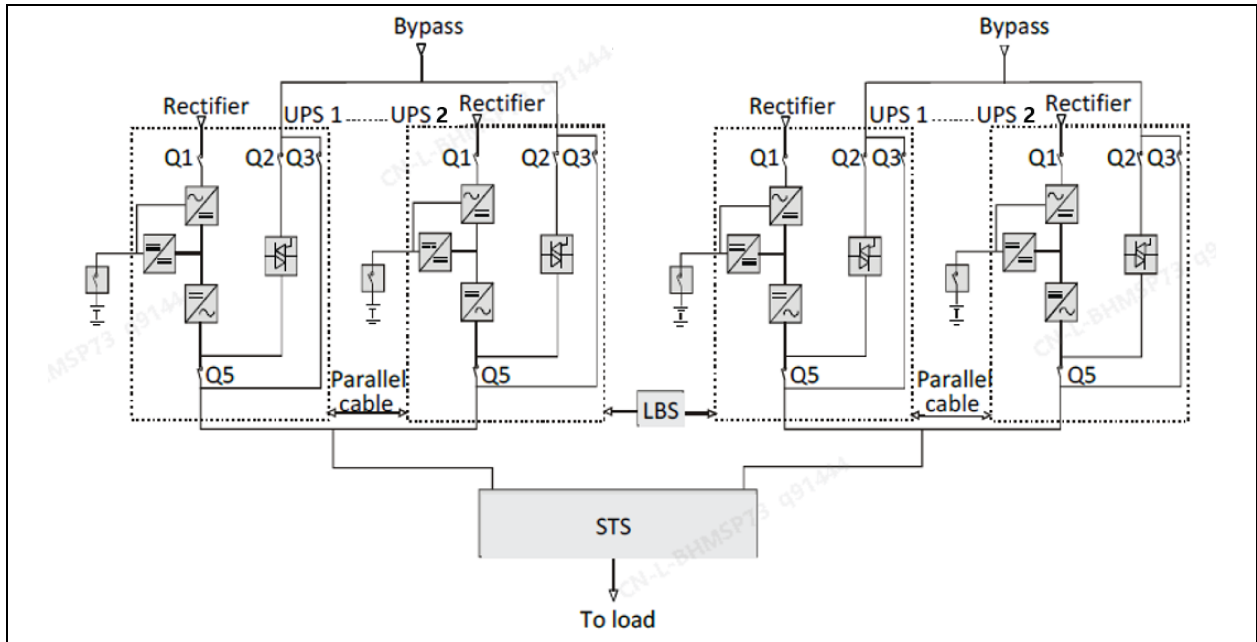


Figure 6.5 LBS System (Parallel System)



NOTE: In a dual bus system, the two UPS systems must have the same power rating, voltage and frequency, and the load should not exceed the power rating of a UPS module system.

6.5.3 Connecting power cables

The power cable of dual bus system is identical to that of single system.

The bypass and rectifier input supplies must use the same neutral line input terminal. If the input has a current leakage protective device, the current leakage protective device must be fitted upstream of the neutral line input terminal.

6.5.4 Connecting LBS cables

Connect the shielded and double insulated LBS optional cables (5 m, 10 m, and 15 m) between the LBS port of the two UPS systems as shown in Figure 6.6 below and Figure 6.7 on the next page.

Figure 6.6 Connection of Typical LBS System (UPS Module)

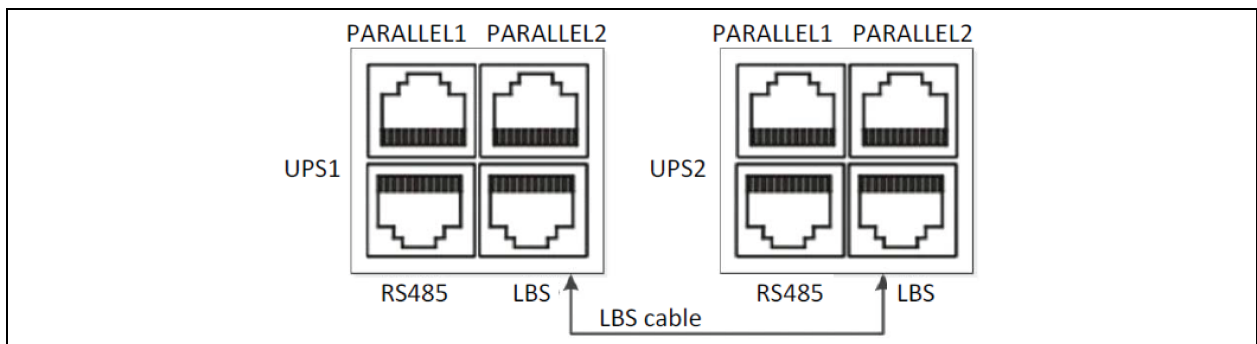
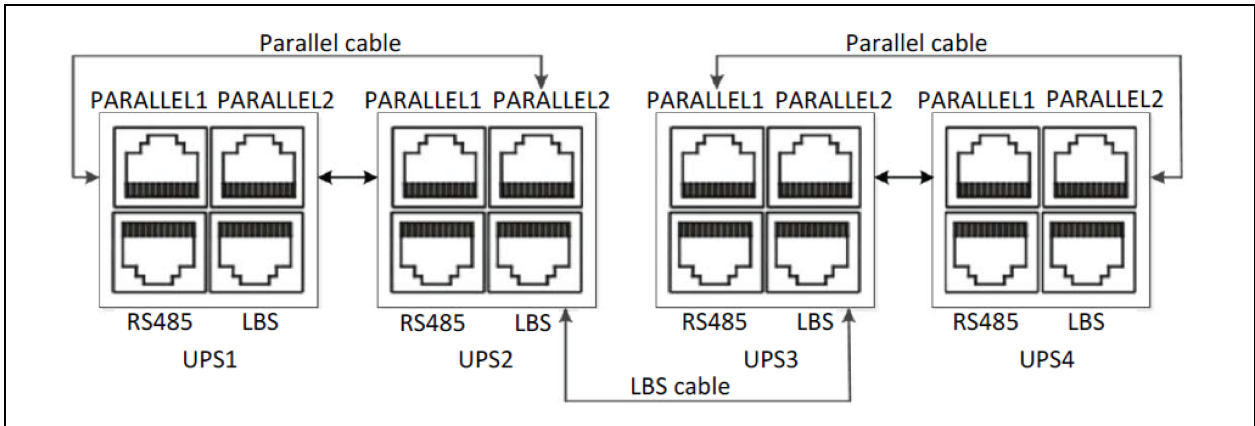


Figure 6.7 Connection of Typical LBS System (Parallel System)



6.5.5 LBS parameters setting

NOTE: The parameters of LBS parameters must be set by Vertiv engineer through Vertiv setting software.

6.5.6 LBS system commissioning

Refer to [Operation Procedures for Parallel System](#) on page 50 for details.

7 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 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 8.2** on page 61, 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. Forklift slots support the unit only if the forks are completely beneath the unit.

7.1 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.

7.2 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 Vertiv representative.

7.2.1 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.



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.



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.

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 is 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.

8 Specifications

Table 8.1 Specifications

Item	Description	Vertiv™ Liebert® EXS Model			
		15 kVA/15 kW	20 kVA/20 kW	30 kVA/30 kW	40 kVA/40 kW
Input	Rated Voltage	208/120 VAC or 220/127 VAC; 3 Phase, 4W+Gnd			
	Voltage Range	176-263 VAC (L-L); 102-152 VAC (L-N)			
	Rated Frequency	60 Hz			
	Frequency Range	40-70 Hz			
	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	15 kVA/15 kW	20 kVA/20 kW	30 kVA/30 kW	40 kVA/40 kW
	Voltage	208/120 VAC or 220/127 VAC; 3 Phase, 4W+Gnd			
	Frequency Synchronization Range	±0.5 Hz to ±10% 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	Up to 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 60 ms			
	INV 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% 200 ms then transfer to bypass			
	Bypass Overload Capabilities	≤ 110% Continuous 110% to 125% 10 Minutes 125% to 150% 1 Minutes >150% (impact load) No less than 200 ms 1000% 100 ms			
	AC-AC Efficiency	Up to 93.4% online mode, 98.7% ECO mode			

Table 8.1 Specifications (continued)

Item	Description	Vertiv™ Liebert® EXS Model			
		15 kVA/15 kW	20 kVA/20 kW	30 kVA/30 kW	40 kVA/40 kW
	Bypass Voltage Range	+15% / -20% default, ±10%, ±15%, ±20%, -30%, -40% user selectable			
	Transfer Time (utility to battery)	0 ms			
	Transfer Time (inverter to bypass)	<5 ms			
Battery	Standard Type	Sealed valve regulated lead-acid (VRLA)			
	Number Cells per string	120 default			
	Open Cell Voltage	240 VDC			
	Discharge Current (maximum at EOD)	83.1 A	110.8 A	166.2 A	221.6 A
	Charge Current (maximum)	8.6 A	9.65 A	17.2 A	19.3 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				
	Protection Level	IP20			
Safety	Agency	cULus (UL 1778 5th Edition, CSA No.222 107.3)			
EMC	EMC	FCC Part 15, Class A			
	Surge	ANSI C62.41, 6 kV/20 hms			
<p>NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in such case the user is required to correct the interference at his own expense.</p>					

Table 8.2 Physical Specifications

	15/20 K			30 K		40 K	
	W/O Internal battery	W internal battery CSB 12150	W internal battery CSB 12200	W/O Internal battery	W internal battery CSB 12200	W/O Internal battery	W internal battery CSB 12200
Dimensions, W x D x H, (mm)							
W/O Packaging	600×1000×2000						
W Packaging	722×1122×2170						
Weight, (kg)							
Unit	260	550	660	290	690	300	700
Shipping	290	580	690	320	720	330	730
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 to 30 lb (9 to 13 kg) to the unit weight.

NOTE: 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.

The **Table 8.3** below shows the actual backup time, but the maximum value displayed on the LCD is 249.9.

Table 8.3 Battery Run Time in Minutes—(37.5 Ah)

15 kVA Models Load Level										
Battery- string Qty.	100%	90%	80%	70%	60%	50%	40%	30%	20%	10%
	15 kW	13.5 kW	12 kW	11.25 kW	9 kW	7.5 kW	6 kW	4.5 kW	3.75 kW	1.5 kW
1	17.5	20.5	25.5	30	35.5	44	57	78.5	126	278.5
2	41.5	47.5	58	66	77	94.5	122	170	267	577
3	71.5	80.5	98	111.5	130	159	204	279.5	429.5	895

20 kVA Models Load Level										
Battery- string Qty.	100%	90%	80%	70%	60%	50%	40%	30%	20%	10%
	20 kW	18 kW	16 kW	15 kW	12 kW	10 kW	8 kW	6 kW	5 kW	2 kW
1	11.5	13.5	16	19.5	25.5	31.5	41	57	90.5	204.5
2	28	32.5	38	45.5	58	69.5	88	122	193.5	428.5
3	51.5	58	66.5	77	98	117.5	148.5	204	317.5	672.5

30 kVA Models Load Level										
Battery- string Qty.	100%	90%	80%	70%	60%	50%	40%	30%	20%	10%
	30 kW	27 kW	24 kW	22.5 kW	18 kW	15 kW	12 kW	9 kW	7.5 kW	3 kW
1	6	7	8.5	10.5	13	16.5	24.5	34	56	123.5
2	17	19.5	23	28	34.5	43.5	59.5	79	126	272.5
3	30	34.5	40	47.5	57	70	95	127.5	200	425.5

40 kVA Models Load Level										
Battery- string Qty.	100%	90%	80%	70%	60%	50%	40%	30%	20%	10%
	40 kW	36 kW	32 kW	30 kW	24 kW	20 kW	16 kW	12 kW	10 kW	4 kW
1	4	5	6	7	9	11.5	16	25.5	41	90.5
2	11.5	13.5	16	19.5	24.5	31	41.5	60.5	92.5	201.5
3	21	24.5	28.5	34	41.5	51.5	66.5	98	148.5	317.5

NOTE: 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.

The **Table 8.4** below shows the actual backup time, but the maximum value displayed on the LCD is 249.9.

Table 8.4 Battery Run Time in Minutes—(50 Ah)

15 kVA Models Load Level										
Battery- string Qty.	100%	90%	80%	70%	60%	50%	40%	30%	20%	10%
	15 kW	13.5 kW	12 kW	11.25 kW	9 kW	7.5 kW	6 kW	4.5 kW	3.75 kW	1.5 kW
1	18	21	26.5	31	37.5	48.5	65.5	94.5	151	342
2	59.5	67.5	81	92	107.5	133	171.5	235.5	369	782.5
3	100.5	114	136.5	155.5	180.5	221	282	382.5	583	1203

20 kVA Models Load Level										
Battery- string Qty.	100%	90%	80%	70%	60%	50%	40%	30%	20%	10%
	20 kW	18 kW	16 kW	15 kW	12 kW	10 kW	8 kW	6 kW	5 kW	2 kW
1	13	15.5	18.5	22	29	36.5	48.5	70.5	113	257.5
2	41.5	47.5	55	64.5	81	96.5	123.5	171.5	269	584.5
3	71.5	80.5	93	109	136.5	162.5	206	282	433	906.5

30 kVA Models Load Level										
Battery- string Qty.	100%	90%	80%	70%	60%	50%	40%	30%	20%	10%
	30 kW	27 kW	24 kW	22.5 kW	18 kW	15 kW	12 kW	9 kW	7.5 kW	3 kW
1	10	11.5	13.5	16.5	20.5	26.5	37.5	50.5	79.5	174.5
2	30.5	34.5	39.5	46.5	56	69	93	123.5	191	392
3	51	57.5	66	76.5	91.5	112.5	150.5	196	297.5	598.5

40 kVA Models Load Level										
Battery- string Qty.	100%	90%	80%	70%	60%	50%	40%	30%	20%	10%
	40 kW	36 kW	32 kW	30 kW	24 kW	20 kW	16 kW	12 kW	10 kW	4 kW
1	6.5	8	9.5	11.5	14	18.5	25	38	58	128.5
2	21.5	24.5	28.5	33	39.5	49	64	93	140	291.5
3	36	41	47	55	66	81	104.5	150.5	221.5	448.5

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

Appendix B: UPS Prompts and Alarms

B.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 9.1 UPS Prompts

Prompt	Description
Incorrect password, please input again	Appears when an incorrect settings password is 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.

B.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 9.2 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 breakers to ensure they are closed and/or orderly shutdown 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 startup 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 breakers 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 backfeed	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

Table 9.2 UPS Alarm and Warning Messages (continued)

Alarm/Warning	Description	Action
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.
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 shutdown	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 shutdown 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	The external maintenance bypass switch is closed.	The UPS is being serviced, the load is not protected.

Table 9.2 UPS Alarm and Warning Messages (continued)

Alarm/Warning	Description	Action
Closed		
External MBB Open	The external maintenance switch is opened.	None required
External MIB Open	The external maintenance isolating switch is opened.	Check the external breakers 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
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 backfeed	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 5 min.	
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 breakers 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 96 V to 102 V, 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 breakers 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

Table 9.2 UPS Alarm and Warning Messages (continued)

Alarm/Warning	Description	Action
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
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 shutdown, 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

Table 9.2 UPS Alarm and Warning Messages (continued)

Alarm/Warning	Description	Action
MMS Inv. Manual On	Power button is pressed on one UPS, and select the parallel system for unified startup.	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.
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. Overtemp.	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.

Table 9.2 UPS Alarm and Warning Messages (continued)

Alarm/Warning	Description	Action
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.
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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