



PowerUPS 9000 1250 kVA Modular UPS (CE)

User Manual

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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.

TABLE OF CONTENTS

1 Important Safety Instructions	1
1.1 Personnel Safety	1
1.2 Product Safety	1
1.3 Disclaimer	1
1.4 Safety Precaution	2
1.5 Conformity and Standards	2
2 Overview	5
2.1 Features	5
2.2 Design Concept	5
2.2.1 System Design	5
2.2.2 Bypass	7
2.2.3 System Control Principle	7
2.2.4 UPS Power Supply Switch Configuration	8
2.2.5 Battery Circuit Breaker	10
2.3 Parallel System	11
2.3.1 Parallel System Features	11
2.3.2 Parallel System Requirements	11
2.4 Operation Modes	11
2.5 Battery Management System	17
2.5.1 Normal Function	17
2.5.2 Advanced Function	17
2.5.3 Battery Temperature Compensation	18
2.6 Battery Protection	18
2.6.1 Battery low pre-warning	18
2.6.2 End of Discharge Protection	18
2.6.3 Battery Circuit Breaker	18
3 Mechanical Installation	19
3.1 Precautions	19
3.2 Transportation	19
3.3 Tools	20
3.4 Unpacking	22
3.5 Pre-installation Inspection	24
3.6 Environmental Requirement	24
3.6.1 UPS Location Selection	24
3.6.2 Battery Location Selection	24
3.6.3 Storage	25
3.7 Mechanical Requirement	25
3.7.1 Composition	25

3.7.2	Moving the Cabinet	25
3.7.3	Clearance	26
3.7.4	Cable Access Mode	26
3.8	Installation Drawings	27
4	Electrical Installation	29
4.1	Power Cable Wiring	29
4.1.1	System Configuration	29
4.1.2	Maximum Steady State AC and DC Currents	29
4.1.3	Recommended Cross-sectional Area of UPS Cable	30
4.1.4	Selection of UPS I/O Switch and Battery Switch	30
4.1.5	Distance between the UPS Connection Point and Floor	30
4.1.6	General Information	30
4.1.7	Power Cable Connecting Terminal	31
4.1.8	Protective Ground	31
4.1.9	External Protective Devices	31
4.1.10	Power Cable Connection Steps	32
4.2	Wiring of Signal Cable	37
4.2.1	Overview	37
4.2.2	Dry Contact Port X6 J3	38
4.2.3	Dry Contact Port X6 J22	41
4.2.4	Output Dry Contact X7 J1 (Option)	41
4.2.5	Output Dry Contact X7 J2 (Option)	43
4.2.6	Output Dry Contact X7 J3 (Option)	45
4.2.7	Remote Emergency Power Off Port	46
4.2.8	X6 RS-485 Communication Port	47
4.2.9	Parallel and Load Bus Synchronization Communication Ports	47
4.2.10	Vertiv™ IntelliSlot™ Port	47
4.2.11	Signal Cable Connection Steps	48
5	Operator Control and Display Panel	51
5.1	Introduction	51
5.2	Navigating through the Vertiv™ PowerUPS 9000 1250 kVA Modular UPS CE Touchscreen Control Panel	51
5.2.1	UPS Touchscreen Control Panel Components	51
5.3	Operation	54
5.3.1	Login to the Touchscreen Control Panel	54
5.3.2	Operator Controls	55
5.4	Viewing UPS Status	61
5.4.1	Status Bar Components	61
5.4.2	Viewing UPS Data with the Status	62
5.4.3	Viewing UPS Data with the Status Panel	63
5.4.4	Logs Alarms and Events	66

6 Single UPS Operation	69
6.1 Introduction	69
6.1.1 Precautions	69
6.1.2 Power Switch	69
6.2 UPS Startup Procedures	70
6.2.1 Startup Procedures in Normal Mode	71
6.2.2 Startup Procedures in ECO Mode	73
6.2.3 Startup Procedures in Battery Mode (Battery Cold Start)	74
6.3 Procedures for Transfer Between Operation Modes	75
6.3.1 Transfer from Normal Mode to Battery Mode	75
6.3.2 Transfer from Normal Mode to Bypass Mode	75
6.3.3 Transfer from Bypass Mode to Normal Mode	76
6.4 Battery Test Procedures	77
6.5 UPS Shutdown Procedures	79
6.5.1 Procedures to Completely Power Down the UPS	79
6.6 Emergency Power Off Procedures	80
6.7 UPS Reset Procedures after Emergency Power Off	80
6.8 Automatic Restart	80
6.9 Selecting Language	81
6.10 Changing Current Date and Time	82
6.11 Changing Password	83
7 Battery	85
7.1 Introduction	85
7.2 Safety	85
7.2.1 Hazardous Battery Voltage Present Behind Covers	85
7.3 UPS Battery	88
7.4 Installation Design	89
7.5 Battery Installation Environment and Number of Batteries	89
7.5.1 Installation Environment	89
7.5.2 Number of Batteries	90
7.6 Battery Protection	90
7.7 Battery Installation and Connection	91
7.8 Design of Battery Room	91
7.9 Common Battery String	92
7.10 Battery Maintenance	93
7.11 Disposal of Used Battery	93
7.12 Battery Ground Fault (Optional)	94
7.13 Battery Circuit Breaker Reference Current and Connection	95
8 Parallel System and Load Bus Synchronization System	97
8.1 General	97

- 8.2 System Installation Procedures 97
 - 8.2.1 Preliminary Checks 97
 - 8.2.2 Cabinet Installation 97
 - 8.2.3 External Protective Device 98
 - 8.2.4 Power Cable 98
 - 8.2.5 Parallel Cable 99
 - 8.2.6 Remote Emergency Power Off 100
- 8.3 Operation Procedures for Parallel System 102
 - 8.3.1 Startup Procedures in Normal Mode 102
 - 8.3.2 Procedures for Isolating One UPS Module from Parallel System 102
 - 8.3.3 Procedures for Inserting One Isolated UPS Module in Parallel System 103
 - 8.3.4 Procedures for Completely Powering Down UPS 103
- 8.4 Load Bus Synchronization System 104
 - 8.4.1 Cabinet Installation 104
 - 8.4.2 External Protective Device 105
 - 8.4.3 Power Cable 106
 - 8.4.4 Load Bus Synchronization Cable 106
- 9 Options 109**
- 9.1 Options List 109
- 9.2 Options Introduction 109
 - 9.2.1 Battery Temperature Sensor Kit 109
 - 9.2.2 Battery Ground Fault Kit 113
 - 9.2.3 Seismic Anchor Kit 113
 - 9.2.4 SIC Card 116
 - 9.2.5 IS-Relay Card 118
 - 9.2.6 UF-RS-485 Card 119
 - 9.2.7 RDU120 Card 120
 - 9.2.8 Parallel Cable 121
 - 9.2.9 Load Bus Synchronization Cable 121
 - 9.2.10 Shorting Copper Bar Kit 121
 - 9.2.11 Load Bus Synchronization Adapter 122
 - 9.2.12 Bypass Backfeed Cabinet (Optional) 123
- 10 Communication 125**
- 10.1 SNMP Protocol Communication 125
- 10.2 Modbus Protocol Communication 125
- 10.3 Dry Contact Communication 126
 - 10.3.1 Communication through IS-Relay Card 126
 - 10.3.2 Communication through Dry Contact Port of Central Control Module 126
- 11 Service and Maintenance 127**
- 11.1 Safety for Service and Maintenance 127

- 11.2 Service Procedures of Power Module and Bypass Power Module 127
 - 11.2.1 Service Procedures of Bypass Power Module 127
 - 11.2.2 Replacement Procedures of Bypass Power Module 128
- 11.3 Key Components and Service Life of UPS 128
 - 11.3.1 Life Parameters and the Recommended Replacement Time of Key Components 129
 - 11.3.2 Replacement of Air Filter 129
- 11.4 Maintenance of UPS and Options 130
- 12 Specifications 131**
- 12.1 Conformance and Standards 131
- 12.2 Environmental Characteristics 131
- 12.3 Mechanical Characteristics 132
- 12.4 Electrical Characteristics (Input Rectifier) 132
- 12.5 Electrical Characteristics (Battery Bus) 133
- 12.6 Electrical Characteristics (Inverter Output) 133
- 12.7 Electrical Characteristics (Bypass Input) 134
- 12.8 Efficiency and Loss 134
- Appendices 135**
- Appendix A: Technical Support and Contacts 135
- Appendix B: Hazardous Substances and Content 136
- Appendix C: Glossary 137

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1 Important Safety Instructions

1.1 Personnel Safety

This manual contains information about the installation and operation of the Vertiv™ PowerUPS 9000 1250 kVA Modular UPS CE single module and parallel system.

A Vertiv authorized engineer must install and commission the uninterruptible power supply (UPS). Failure to do so can cause product malfunction or personal safety risk.

Read the UPS manual and safety precaution carefully, failure to do so can cause product malfunction or personal safety risk.



WARNING! Never dispose of the internal or external battery of the UPS in a fire. Doing so can lead to explosions and threaten lives and property.

NOTE: The PowerUPS 9000 1250 kVA Modular UPS CE is not manufactured to support the life-saving equipment.

1.2 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. The environmental requirements must be fulfilled while operating the UPS. For details, see [Environmental Requirement](#) on page 24.
3. This product is not designed for application in an environment:
 - Where the temperature and relative humidity are outside the specifications.
 - Subject to vibrations or shocks.
 - Where conductive dusts, corrosive gases, salts, or flammable gases are present.
 - Near heat sources or strong electromagnetic interferences.



WARNING! If an environment contains conductive dusts, corrosive gases, salts or flammable gases, the UPS should not be used. Installation restrictions or additional measures may be needed to prevent disturbances.

1.3 Disclaimer

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

- Any use or operation outside of the product [Specifications](#) on page 131, including application ranges or operating environments.
- Any unauthorized product operations, modifications, or improper installation.
- Any forceful measures used when operating the product.
- Any other product related actions not in compliance with the instructions in this document.

1.4 Safety Precaution

This manual contains information about the installation and operation of the Vertiv™ PowerUPS 9000 1250 kVA Modular UPS CE and parallel system. Read this manual thoroughly before installing, operating, and servicing the UPS.

1.5 Conformity and Standards



WARNING! High earth leakage current.

- Earth connection is critical before connecting the input supply (including both mains supply and battery).
- This equipment is installed with an EMC filter. Earth leakage current is less than 3000 mA.
- Transient and steady state earth leakage currents, which may occur when the equipment is started, should be considered in the selection of instantaneous residual current circuit breaker (RCCB) or residual current detectors (RCD) devices.
- RCCB which is sensitive to unidirectional DC pulse (class A) and insensitive to transient state current pulse must be selected.
- The earth leakage currents of the load will be carried by the RCCB or RCD.
- The equipment must be earthed in accordance with the local electrical code of practice.

This device complies with CE 2006/95/EU (Low Voltage Safety), 2004/108/EU (EMC), Australia, and New Zealand EMC standard (C-Tick), as well as the following UPS product standards:

- IEC62040-1 General safety requirements for UPS.
- IEC62040-2-EMC.
- IEC62040-3 Performance requirements and test methods.

For details, see [Specifications](#) on page 131.

Continued compliance requires installation in accordance with these instructions and the use of manufacturer approved accessories only.



WARNING! Risk of voltage backfeed. Isolate the UPS, then check for hazardous voltage between all terminals including the protective earth before working on this circuit.

- The UPS is fitted with a dry contact closure signal for use with an external automatic disconnect device (supplied by others) to protect against backfeeding voltage into the incoming terminal through the rectifier or bypass static switch circuit. A label must be added at all external incoming primary supply disconnect device to warn service personnel that the circuit is connected to a UPS.

IMPORTANT! The upstream distribution protection equipment of the UPS shall be selected in accordance with the local electrical regulations.



WARNING! Battery voltage exceeds 400 VDC is a tip for service personnel to ensure safety.

- All physical battery maintenance and servicing procedures requires the use of a tool/key and should be carried out only by trained personnel.
- Take special care when working with the batteries associated with this UPS. When connected, the battery terminal voltage will exceed 400 VDC and is potentially lethal.

- Battery manufacturers supply details of the necessary precautions to be observed in working on, or in the vicinity of, a large bank of battery cells. These precautions should be followed implicitly. Particular attention should be paid to the recommendations concerning local environmental conditions and the provision of protective clothing, first aid and fire-fighting facilities.



CAUTION: General safety (for users).

- Like other types of large power equipment, the UPS and battery circuit breaker (BCB) box/battery cabinet have high voltage inside. As the components with high voltage can be accessed only when the front door is opened, the risk of contacting high voltage has been minimized. This equipment meets the IP20 standard, and the other safety shields are provided inside the equipment.
- There is no risk when operating this equipment according to the general instructions and the steps recommended in this manual.



CAUTION: Multiple power inputs (for users).

- This UPS system receives power from more than one source. Disconnection of all AC source and the DC source is required before servicing.
- This UPS has several circuits that are energized with high AC as well as DC voltages. Check for voltage with both AC and DC voltmeters before working within the UPS.



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

IMPORTANT! The communication board is sensitive to electrostatic discharge, implement ESD prevention measures when managing any communication board.



WARNING! Select an appropriate molded case circuit breaker (MCCB) to protect against short circuit and overload for the battery. It is recommended to use the Vertiv BCB box to provide a better solution.



WARNING! The power cables must be routed through the metal cable trough in order to avoid cable damage and reduce the electromagnetic radiation.

NOTE: The UPS meets the standard requirement of short time withstand current: (Icw) of 150 kA for 1250 kVA.

Table 1.1 UPS Models

Product	Model
1250 kVA	Vertiv™ PowerUPS 9000 1250k

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2 Overview

This chapter describes the features, design concept, parallel system, operation mode, battery management, and battery protection of the Vertiv™ PowerUPS 9000 1250 kVA Modular UPS CE.

2.1 Features

The UPS is connected between a critical load, such as a computer and mains power to provide high quality power for the loads.

The UPS has the following advantages:

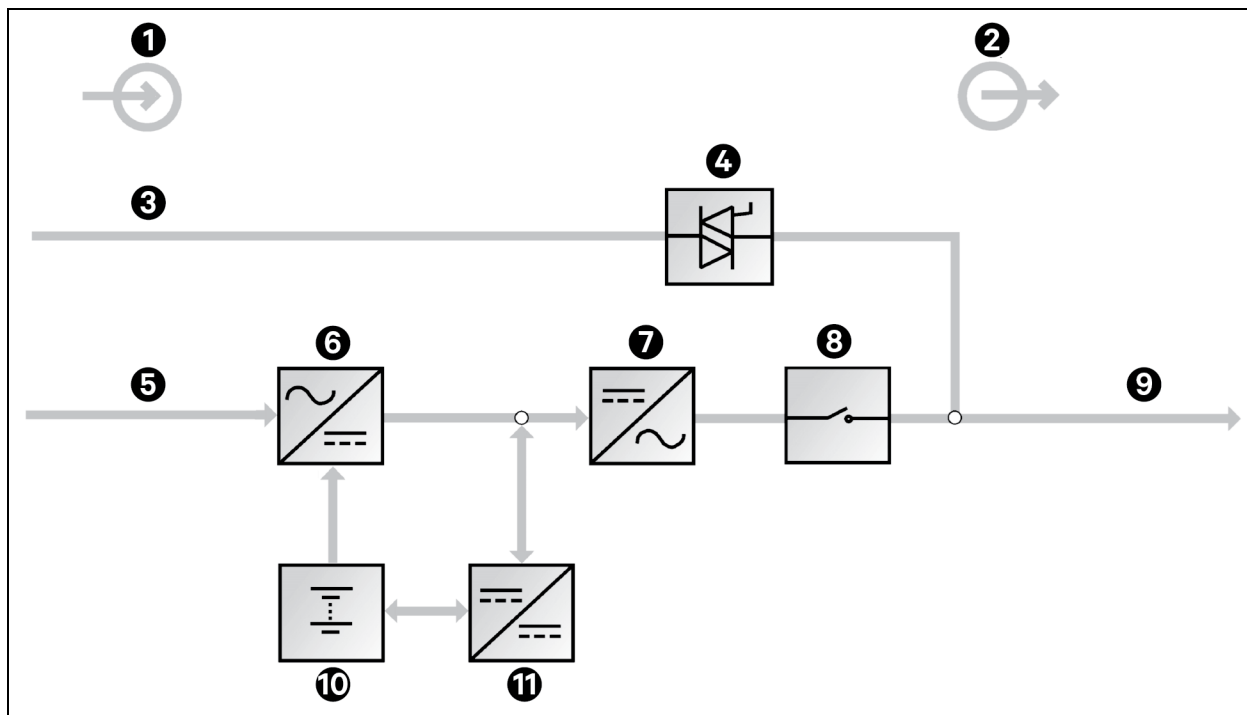
- Improves the input power quality.
- The UPS protects its output against the input power changes through the intelligent controller.
- Provides protection for mains failures in the event of a mains direct power source failure.
- If the input power fails, the UPS switches to battery mode and the power supply to the loads will not be interrupted.

2.2 Design Concept

2.2.1 System Design

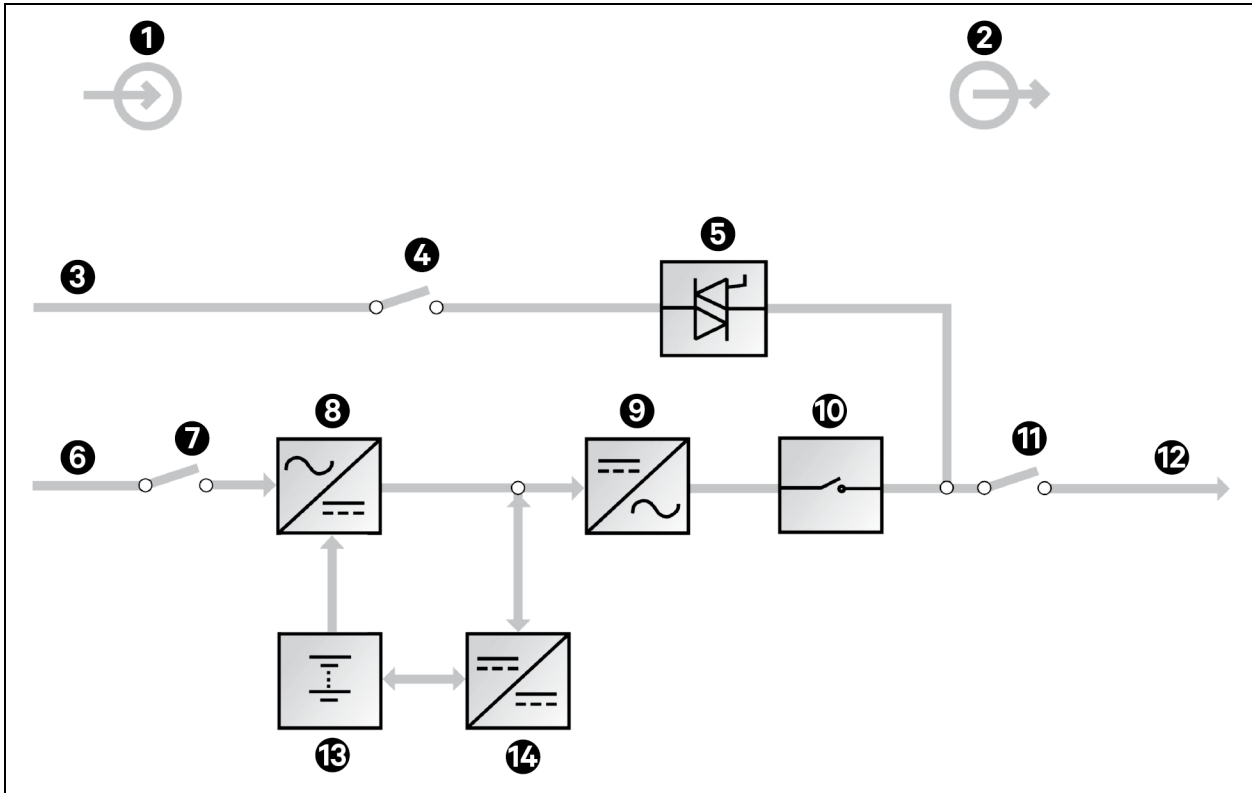
This section describes the working principle of a single UPS. The UPS uses an AC-DC-AC converter, as shown in **Figure 2.1** below and **Figure 2.2** on the next page. The first stage (AC-DC) conversion uses three-phase high frequency rectifier to convert the three-phase input voltage into a stable DC bus voltage.

Figure 2.1 Block Diagram for Working Principle of Single UPS without Switch



Item	Description	Item	Description
1	Input	7	Inverter
2	Output	8	Automatic inverter switch
3	Bypass input	9	Output Switch
4	Static switch	10	Battery
5	Mains input	11	Battery charger/discharger
6	Rectifier		

Figure 2.2 Block Diagram for Working Principle of Single UPS with Three Switches



Item	Description	Item	Description
1	Input	8	Rectifier
2	Output	9	Inverter
3	Bypass input	10	Automatic inverter switch
4	Bypass input switch	11	Output Switch
5	Static switch	12	UPS output
6	Main input	13	Battery
7	Rectifier input switch	14	Battery charger/discharger

The UPS has its own battery charger and adopts advanced temperature compensation technology to effectively improve the battery service life. The inverter adopts three level T-type IGBT topologies and uses advanced SPWM control technology to derive the stable AC voltage from the DC bus voltage.

When the mains is normal, the rectifier and inverter work together to supply the power to the load and charge the battery.

When the mains is abnormal, the rectifier stops working and the battery supplies power to the loads through the inverter. If the battery voltage falls to end of discharge (EOD) voltage and the mains still has not been recovered, the UPS will shut down (if the system uses split bypass configuration and the bypass is normal, the system will transfer to bypass). The battery EOD voltage is preset. When the mains is abnormal, the battery maintains the UPS operation till the battery voltage is reduced to EOD voltage and the UPS shuts down, this time is called backup time. The duration of backup time depends on the battery capacity and the loads.

2.2.2 Bypass

Through the intelligent control of the Static Switch module as shown in **Figure 2.1** on page 5 and **Figure 2.2** on the previous page containing the controllable electronic switch, the loads can be supplied by the inverter or the bypass. In normal situation, the loads are supplied by the inverter, in which case the automatic inverter switch at inverter side is closed. In the case of overload (the overload delay time expires) or inverter failure, the automatic inverter switch is opened, and the Static Switch module with UPS logic control will automatically transfer the loads to the bypass.

In normal operating state, to get the uninterrupted transfer between inverter and bypass, the inverter output must be synchronized with the bypass.

Therefore, when the bypass frequency is within the synchronization range, the inverter control circuit will synchronize the inverter output frequency and phase with the bypass frequency and phase.

NOTE: When the bypass maintenance mode supplies power to the load, the quality of the power supply may get affected.

2.2.3 System Control Principle

Normal operation

Normal mode: The UPS has normal input mains, the rectifier and inverter operate normally, the load is supplied by the inverter, the BCB is closed, and the battery is in stable floating charge state.

For a parallel system, as the UPS single module outputs are connected in parallel, the system checks that the inverter control circuits are perfectly synchronized with one another and with the bypass in terms of both frequency and phase, and that they have the same output voltages. Current supplied to the load is automatically divided among UPSs. A warning message appears while synchronization is in progress.

Mains abnormal

When the mains fails or exhibiting abnormal behavior, the rectifier stops working automatically and the system will transfer to battery output (through inverter). The length of the operation time in battery mode depends on the load and the battery capacity. In case that the mains fails or exhibiting abnormal behavior, if the battery voltage falls to the EOD voltage. If the mains has still not been recovered, the inverter will stop automatically, and the UPS touch screen will display alarm messages. If the system uses split bypass configuration and the bypass is normal, the system transfers to bypass.

Mains recovery

When the main power supply resumes normal within allowable time, the rectifier starts automatically and supplies the load and charges the battery again. Therefore, the power supply to the load is not interrupted.

Disconnect battery

To disconnect the external battery from the UPS system for maintenance, use the external isolating switch. When the battery is disconnected, back up function upon mains failure and other functions as well as the steady state performance of the UPS is not affected.

UPS unit failure

In case of inverter failure and output fuse blowout, the load automatically transfers to the bypass and the output power supply will not be interrupted. In this situation, contact the local Vertiv technical support.

If a single UPS has a failure in parallel system, then the single UPS will automatically exit from the parallel system. If the system is still capable of providing the required load, the remaining modules continue to supply the load with no interruption. If the remaining modules are no longer capable of fulfilling the power requirements, the load automatically transfers to the bypass.

Overload

If the inverter is overloaded or the inverter remains outside the specified time, the load automatically transfers to the bypass without interruption. For specified time see [Specifications](#) on page 131 and **Table 12.6** on page 134. If both the overload and the current are reduced to a level within the specified range, then the load is transferred back to the inverter. In case of output short circuit, the load is transferred to the bypass and the inverter will shut down. Five minutes later, the inverter starts up automatically. If the short circuit is removed at this point, the load is transferred back to the inverter. The transfer is determined by the features of the protective device of the system.

In the above two situations, the UPS screen displays alarm messages.

For a parallel system, the control logic system constantly monitors load requirements and controls the power supplied by each UPS unit. If an overload condition is sustained for greater than a preset time, the load will transfer to the bypass, when the number of active modules is unable to satisfy load requirements. The load returns to the inverter if the power is reduced to a value that can be sustained by the number of active modules in the system.

2.2.4 UPS Power Supply Switch Configuration

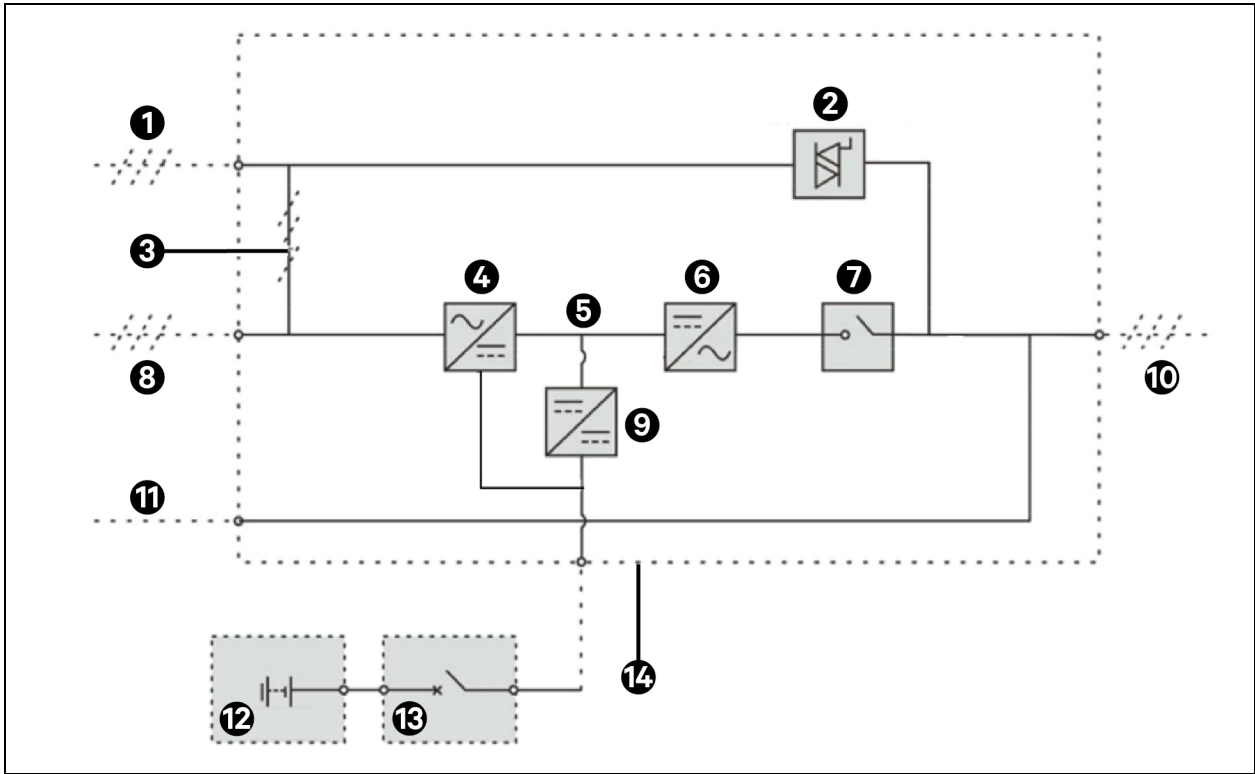
The UPS equipped with three switches:

- Rectifier input switch Q1.
- Bypass input switch Q2.
- Output switch Q5.

The block diagram of the UPS module are shown in **Figure 2.3** on the facing page and **Figure 2.4** on page 10. The UPS has a split bypass configuration (the bypass adopts independent mains input) and a common input configuration. In split bypass configuration, the static bypass and maintenance bypass share the same independent bypass power supply. Where a separate power source is not available, the input supply connections of the bypass input switch Q2 and rectifier input switch Q1 are linked together to make the bypass input and rectifier input use mains power of the same route.

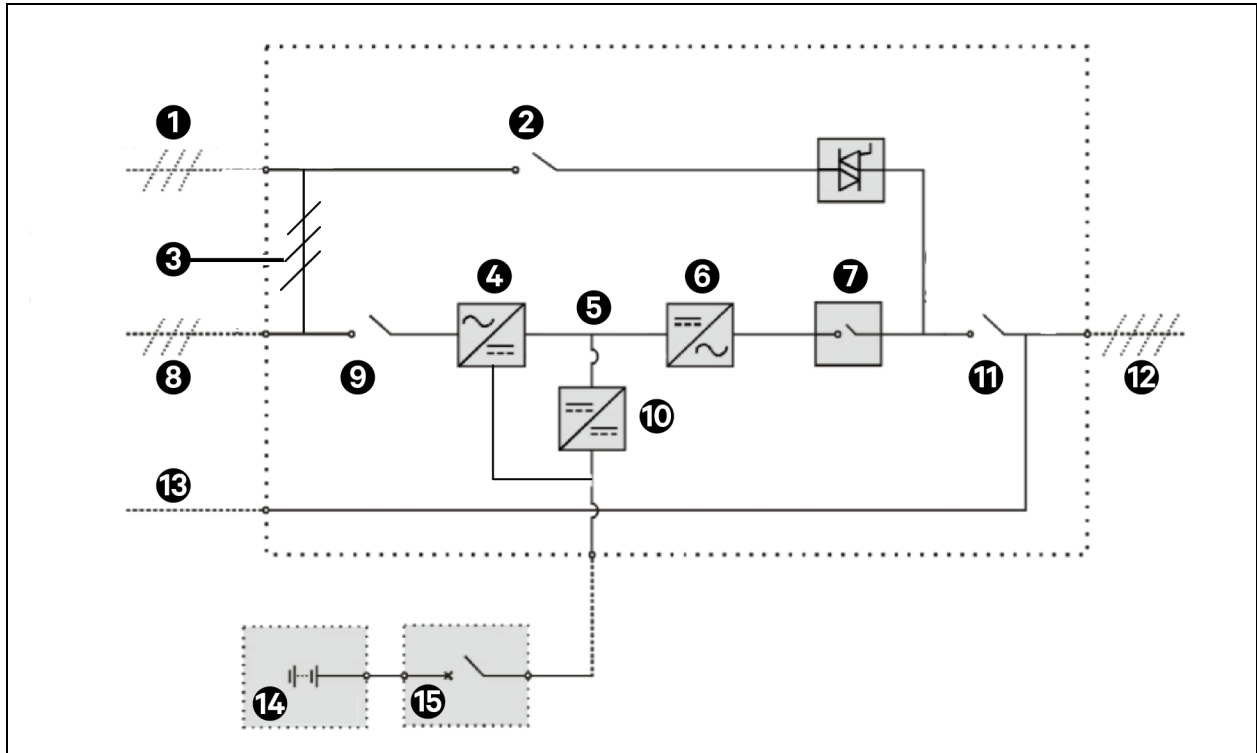
During the normal operation of the UPS, all switches shall be closed.

Figure 2.3 UPS Power Supply Switch Configuration without Switch



Item	Description	Item	Description
1	Bypass input	8	Mains input
2	Static switch	9	Charger/discharger
3	Shorting copper bar of input configuration	10	UPS output
4	Rectifier	11	Neutral line input
5	DC bus	12	Battery
6	Inverter	13	BCB
7	Inverter switch	14	UPS

Figure 2.4 UPS Power Supply Switch Configuration with Three Switches



Item	Description	Item	Description
1	Bypass input	9	Rectifier input switch Q1
2	Bypass input switch Q2	10	Charger/discharger
3	Shorting copper bar of input configuration	11	Output switch Q5
4	Rectifier	12	UPS output
5	DC bus	13	Neutral line input
6	Inverter	14	Battery
7	Inverter switch	15	BCB
8	Mains input		

NOTE: The mains input and bypass input are connected to the same neutral line.

2.2.5 Battery Circuit Breaker

The external battery is connected to the UPS through the BCB. The BCB cabinet is optional, and is installed near the battery. The BCB is closed manually. The BCB has a shunt tripping coil. When the system is faulty and BCB needs to be disconnected, the UPS control circuit sends a signal to the shunt tripping coil to trip BCB. It also has a magnetic trip facility for overload protection and short circuit protection.

2.3 Parallel System

Up to four UPS units can be parallel connected to form a parallel system to increase the system capacity and reliability. The load is equally shared between the paralleled UPS modules.

Two UPS units or a parallel system can comprise a dual bus system. Each parallel system has an independent output. Output synchronization is achieved through the load bus synchronization (LBS) cable or LBS adapter, enabling seamless load transfer between the two parallel systems or single units through the STS device.

2.3.1 Parallel System Features

1. The hardware and software of parallel system are completely the same as those of the single UPS. The parallel system configuration is achieved through settings in configuration software.
2. Parallel cables are connected in a ring, providing both system reliability and redundancy.
3. The total load of the parallel system is identified from the touchscreen of each UPS module.

2.3.2 Parallel System Requirements

A group of parallel modules operate as one large UPS with higher reliability. To ensure that all units are equally utilized and to comply with relevant wiring rules, make sure that the following requirements are met.

1. All UPS units must be in the same model, and connect to the same bypass source.
2. The bypass and rectifier input sources must be connected to the same neutral line input terminal.
3. Any RCD, if installed, must be of an appropriate setting and located upstream of the common neutral line input terminal. Alternatively, the device must monitor the protective earth current of the system.



WARNING! High earth leakage current. Earth connection is essential before connecting input power (including power supply and battery).

2.4 Operation Modes

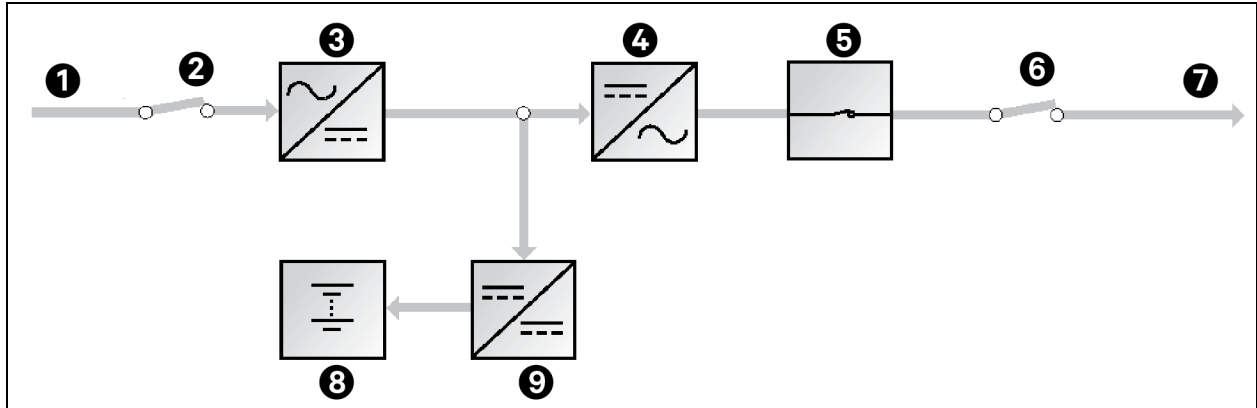
The UPS has the following operation modes:

- Normal mode
- Battery mode
- Automatic restart mode
- Bypass mode
- Maintenance mode
- ECO Mode
- Parallel redundancy mode
- Frequency converter mode
- LBS mode
- Dynamic online mode

Normal mode

As shown in **Figure 2.5** below, the mains is rectified by the UPS rectifier and inverted by the inverter to supply uninterrupted AC power to the loads. At the same time, the charger charges the battery.

Figure 2.5 Schematic Diagram of Normal Mode

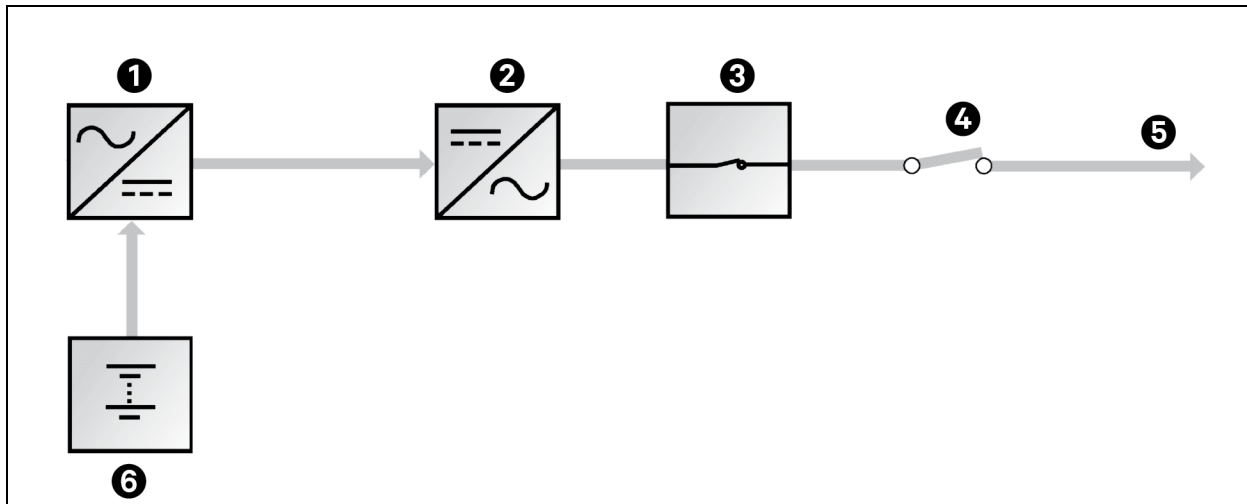


Item	Description	Item	Description
1	Mains input	6	Output switch
2	Rectifier input switch	7	UPS output
3	Rectifier	8	Battery
4	Inverter	9	Battery charger/discharger
5	Automatic inverter switch		

Battery mode

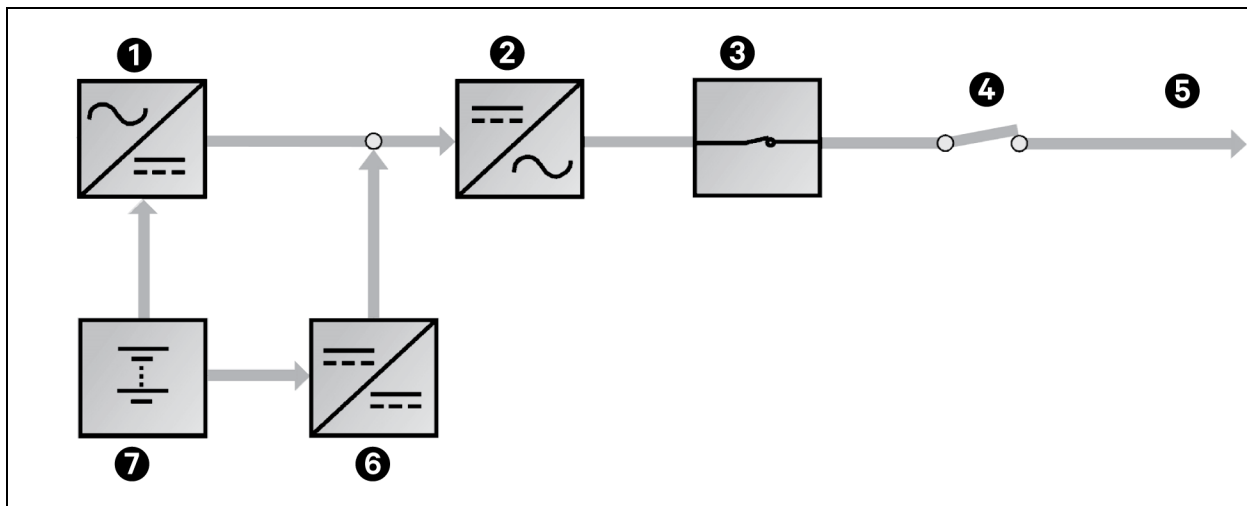
As shown in **Figure 2.6** on the facing page, the operation mode in which the battery provides backup power supply to the loads through the rectifier and inverter is called battery mode. When the load factor exceeds the limit value, the auxiliary discharger will be turned on. The battery provides backup power to the load through the rectifier and auxiliary discharger and inverter. Upon mains failure, the system automatically transfers to the battery mode with no load power interruption. When the mains is recovered, the system automatically transfers back to the normal mode without any manual intervention, and the power to the load will not be interrupted.

Figure 2.6 Schematic Diagram of Battery Mode



Item	Description	Item	Description
1	Rectifier	4	Output switch
2	Inverter	5	UPS output
3	Automatic inverter switch	6	Battery

Figure 2.7 Schematic Diagram of Battery Mode with Discharger



Item	Description	Item	Description
1	Rectifier	5	UPS output
2	Inverter	6	Discharger
3	Automatic inverter switch	7	Battery
4	Output switch		

NOTE: Battery cold start function is available for switching the UPS On from the battery (charged) mode directly a during mains failure. The battery power supply is used independently to improve the availability of the UPS.

Automatic restart mode

The UPS has automatic restart function. If the mains is recovered when the inverter shuts down because of a mains failure and the battery is discharged to EOD voltage, the UPS automatically restarts after a time delay.

NOTE: These two functions must be set by a Vertiv authorized service engineer.

Automatic restart helps to delay the shut down process and the UPS will charge the battery to protect against the power Off risk of the load device caused by mains power failure.

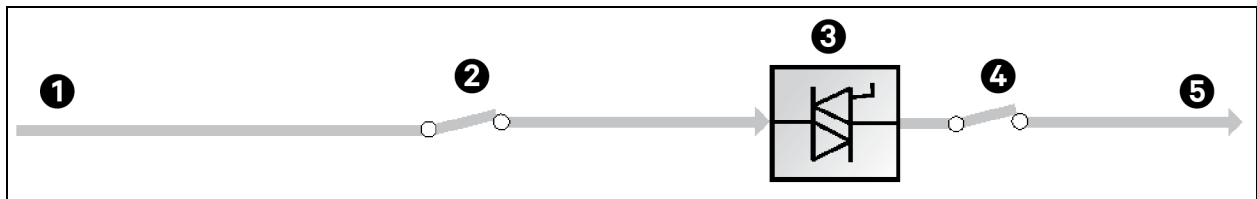
NOTE: The user can manually start the UPS through reset fault function, If the automatic restart function has not set.

Bypass mode

When the UPS is in bypass mode and the inverter fails, or the inverter gets overloaded, or the inverter is shutdown manually, the static switch will transfer the load from the inverter to bypass without interrupting the power to the load. See **Figure 2.8** below for more information.

NOTE: While transferring the load from the inverter to the bypass, if both are not synchronized, the power supply to the load has transitory interruptions with a time of less than 20 milliseconds.

Figure 2.8 Schematic Diagram of Bypass Mode

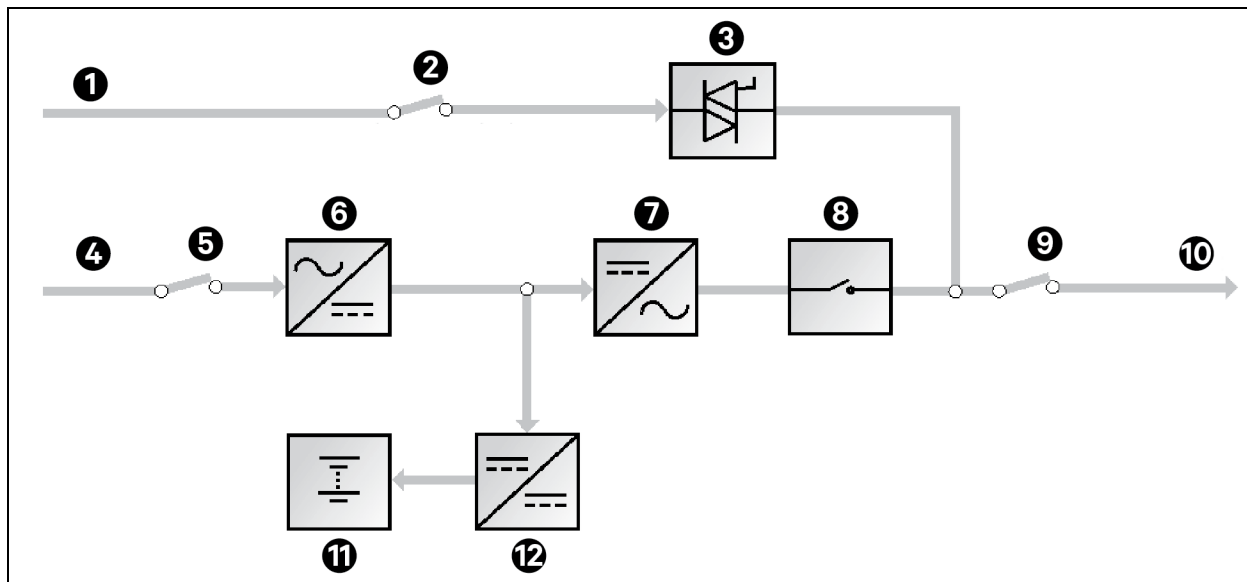


Item	Description	Item	Description
1	Bypass input	4	Output switch
2	Bypass input switch	5	UPS output
3	Static switch		

ECO mode

As shown in **Figure 2.9** on the facing page, if mode is selected, all power switches and the battery switches are closed except the maintenance bypass switch, and the system puts the load on the bypass mode, for energy saving. When the bypass supply is within the range of normal frequency and normal voltage (adjustable), the load is powered by the bypass, with the inverter on stand by; when the voltage and/or frequency of the bypass supply are beyond the pre defined and adjustable limits, the system will transfer to the inverter output. and the transfer time for switching from bypass to inverter is less than 2 milliseconds (uninterrupted) and less than 5 milliseconds (interrupted). In this mode, the system can normally charge the battery.

Figure 2.9 Schematic Diagram of ECO Mode



Item	Description	Item	Description
1	Bypass input	7	Inverter
2	Bypass input switch	8	Automatic inverter switch
3	Static switch	9	Output switch
4	Mains input	10	UPS output
5	Rectifier input switch	11	Battery
6	Rectifier	12	Battery charger

NOTE: If ECO mode is required, adjust the parameters through the touch screen.

The operation method of ECO mode is the same as described in [Single UPS Operation](#) on page 69. In normal mode, the load is powered by the bypass, the touchscreen displays Bypass mode.

NOTE: In ECO mode, the load is not protected against mains distortion.

Parallel redundancy mode (system expansion)

For higher capacity or higher reliability, the outputs of multiple UPS units can be programmed for directly paralleling. The built in parallel controller in each UPS module ensures automatic load sharing. A parallel system can include up to four UPS modules. For the operation principle diagram of the parallel redundancy mode, see [Figure 8.1](#) on page 98.

Frequency converter mode

The UPS can be programmed into frequency converter mode for either 50 Hz or 60 Hz stable output frequency. The input frequency may vary from 40 Hz to 70 Hz. In this mode, open the maintenance bypass switch and disable the static bypass operation, and the battery becomes optional depending on any requirement to operate in battery mode. The frequency converter mode is set by the service engineer through the setting software.

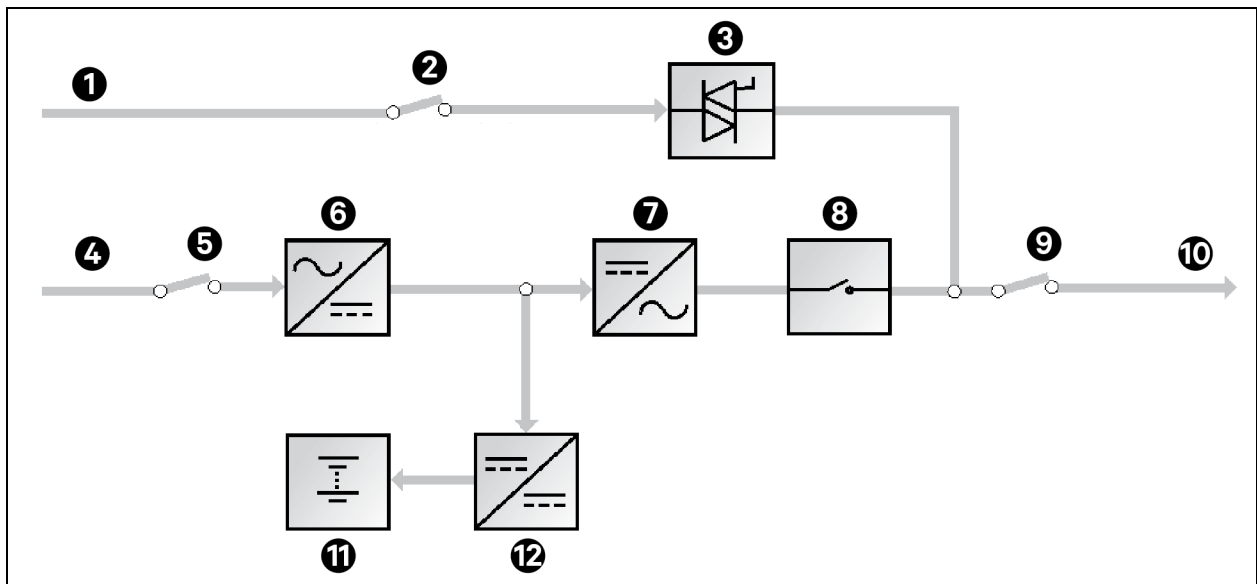
LBS mode

A dual bus system consists of 2 independent UPS systems, each containing one or more parallel UPS modules. The dual bus system has high reliability and is applicable to the load with multiple inputs. For a single input load, an STS can be installed to power the load. For the operation principle diagram of the LBS mode, see **Figure 8.5** on page 104 and **Figure 8.6** on page 105.

Dynamic online mode

As shown in **Figure 2.10** below, when the UPS is in dynamic online mode, except the maintenance bypass switch, all other power switches and battery switches are turned On. The load power is preferentially supplied by bypass to save energy. When the load power supply is provided by bypass, the inverter is in the mode of quality compensation for the bypass voltage. When the bypass voltage exceeds the normal range, the system will switch to the inverter output. In this mode, the battery can still be charged through the charger normally.

Figure 2.10 Dynamic Online Mode



Item	Description	Item	Description
1	Bypass input	7	Inverter
2	Bypass input switch	8	Automatic Inverter switch
3	Static switch	9	UPS switch
4	Mains input	10	Output output
5	Rectifier input switch	11	Battery
6	Rectifier	12	Battery charger/discharger

2.5 Battery Management System

Battery management system (BMS) functions are set by the Vertiv service engineer through the setting software.

2.5.1 Normal Function

- **Constant current boost charge**: Adopt the constant current (within battery charging limit) to charge the battery. The function is for fast recovery of battery capacity. The charge current can be set.
- **Constant voltage boost charge**: Adopt the constant voltage to charge battery. The function is for fast recovery of battery capacity. For valve regulated lead acid (VRLA) batteries, the maximum boost charge voltage must not exceed 2.4 V/cell.
- **Float charge**: The charging method is for keeping battery in full capacity. The function can balance the capacity loss due to battery self-discharge, and is used for battery capacity recovery. For VRLA batteries, the float charge voltage must be between 2.2 V/cell and 2.3 V/cell.
- **Automatic transfer to float charge**: When the charge current is less than threshold of equalize charge or for valve-controlled lead-acid batteries less than 0.5 A, the charger will automatically transfer from boost charge to float charge. When boost charge time exceeds the equalize charge protect time limit, the charger will transfer to float charge to protect the battery.
- **Float charge temperature compensation (optional)**: This function must be used with the battery temperature detection device. The Vertiv battery temperature sensor is a standard option for the selection.
- **EOD protection**: When the battery voltage drops to the EOD voltage, the battery converter shuts down automatically and the battery is inhibited to avoid further battery discharge. The EOD voltage is settable from 1.60 V/cell to 1.90 V/cell (VRLA).
- **Battery low pre-warning time**: The battery low pre-warning time is adjustable between 3 minutes and 60 minutes. The default setting is 5 minutes.
- **Maximum battery discharge time**: When the battery has a small current discharge over a long time, the battery is over discharged and has unrecoverable damage. Setting a battery discharge time to protect the battery is essential. The time limit setting must be configured by service engineer through the Vertiv setting software.
- **Maximum boost charge protection time**: To protect against the battery overcharge damage caused by long time boost charge, a protect time setting is essential. The limit of time setting shall be configured by service engineer through the Vertiv setting software.

2.5.2 Advanced Function

The UPS provides battery maintenance test function. At periodic intervals, 20% of the rated capacity of the battery will be discharged automatically, and the actual three-phase load must exceed 20% of the nominal UPS capacity. If the load is less than 20%, the automatic discharge cannot be executed. The periodic interval can be set from 30 to 360 days. The battery maintenance test function can be disabled through the Vertiv setting software.

The lead-acid battery should be charged for at least 5 hours. The manual discharge load should be in the range of 0 to 100%, and the automatic discharge maintenance load should be in the range of 20% to 100%.

Trigger can be done automatically or manually through the touchscreen battery maintenance command. Charge Interval is 30 to 360 days, with a default of 60 days.

The UPS also provides periodic battery capacity self-testing. To periodically test battery activity and battery residual capacity, judge the battery quality, and then provide corresponding measures. The capacity self-test is started by touching the screen. During the capacity self-test, the battery continuously discharges to the battery undervoltage shutdown threshold. After the self-test is finished, the system will update the battery curve table. The capacity self-test command is valid only one time, without any memory. During the capacity self-test, if the battery maintenance requirement is satisfied, the system will generate audible/visual alarm and give corresponding records.

If system load rate within 20% to 100%, the battery float charge at least 5 hours. If the generator is not connected, the battery is in floating charge state.

Trigger: Start up through the touch screen.

NOTE: The battery continuously discharges to the battery under voltage shutdown threshold. The battery then transfers to the charging state. When the capacity self-test is finished, the system updates the battery curve table.

NOTE: The capacity self-test can be stopped using the touchscreen.

2.5.3 Battery Temperature Compensation

The UPS system has battery charge temperature compensation function. When the ambient temperature is increased, the DC bus voltage (which charges the battery) is reduced correspondingly to provide optimal charging voltage for the battery, prolonging the battery service lifetime.

This function must be used with the Vertiv battery temperature detection device (a standard option).

2.6 Battery Protection



WARNING! The user must select an appropriate MCCB to protect against short circuit and overload for the battery. It is recommended to use the Vertiv BCB box to provide a better solution.

The following battery protection functions are set by the service engineer through the Vertiv setting software.

2.6.1 Battery low pre-warning

The battery low pre-warning occurs before the EOD. After this pre-warning, the battery should have the capacity of 3 minutes discharging with full load. The time can be configured from 3 to 60 minutes.

2.6.2 End of Discharge Protection

When the battery voltage drops to the EOD voltage, the battery shut down automatically. For VRLA batteries, the EOD voltage is adjustable from 1.60 V/cell to 1.90 V/cell (VRLA).

2.6.3 Battery Circuit Breaker

The BCB alarm occurs when the external BCB opens, if the Vertiv BCB (optional) is selected.

The external battery connects to the UPS through the BCB. The BCB is manually closed and tripped by the UPS control circuit.

3 Mechanical Installation

This chapter provides instructions for mechanical installation of the Vertiv™ PowerUPS 9000 1250 kVA Modular UPS CE, including environmental requirements, mechanical requirements, and mechanical considerations that necessary when planning the positioning and the cabling of the UPS equipment.

3.1 Precautions

Detailed installation steps are not provided in this section due to unique characteristic of each installation site. This section is a guide to general procedures and practices that are to be observed by the installation engineer, so that they can properly handle the specific situation of the site.

NOTE: Professional installation required. Do not disassemble the package without permission of authorized service engineer. The UPS should be installed by an authorized engineer in accordance with the information provided in this chapter.

NOTE: The UPS can be connected to IT, TN and TT AC distribution systems (IEC60364-3), and must be of three-phase, five-wire (A, B, C, N, PE) system.



WARNING! Risk of electric shock. It can cause damage to the property, serious injury or death. When connecting batteries, the battery terminal voltage will reach 320 VDC. Take special care when installing batteries.

The following safety precautions must be followed while working on the batteries.

- Always wear protective equipment including eye wear and rubber gloves.
- Remove all the metal tools and jewelry, including finger rings, wristwatch, and so on.
- Use tools with an insulated handle.
- If the battery has electrolyte leakage or the battery is damaged, it must be replaced. Place the battery into a container that can withstand sulfuric acid and dispose of it according to a local regulations.
- If you come in contact with the battery's electrolyte, wash and flush the area with water immediately. If it comes in contact with your eyes, flush them with water and get medical aid immediately.

3.2 Transportation

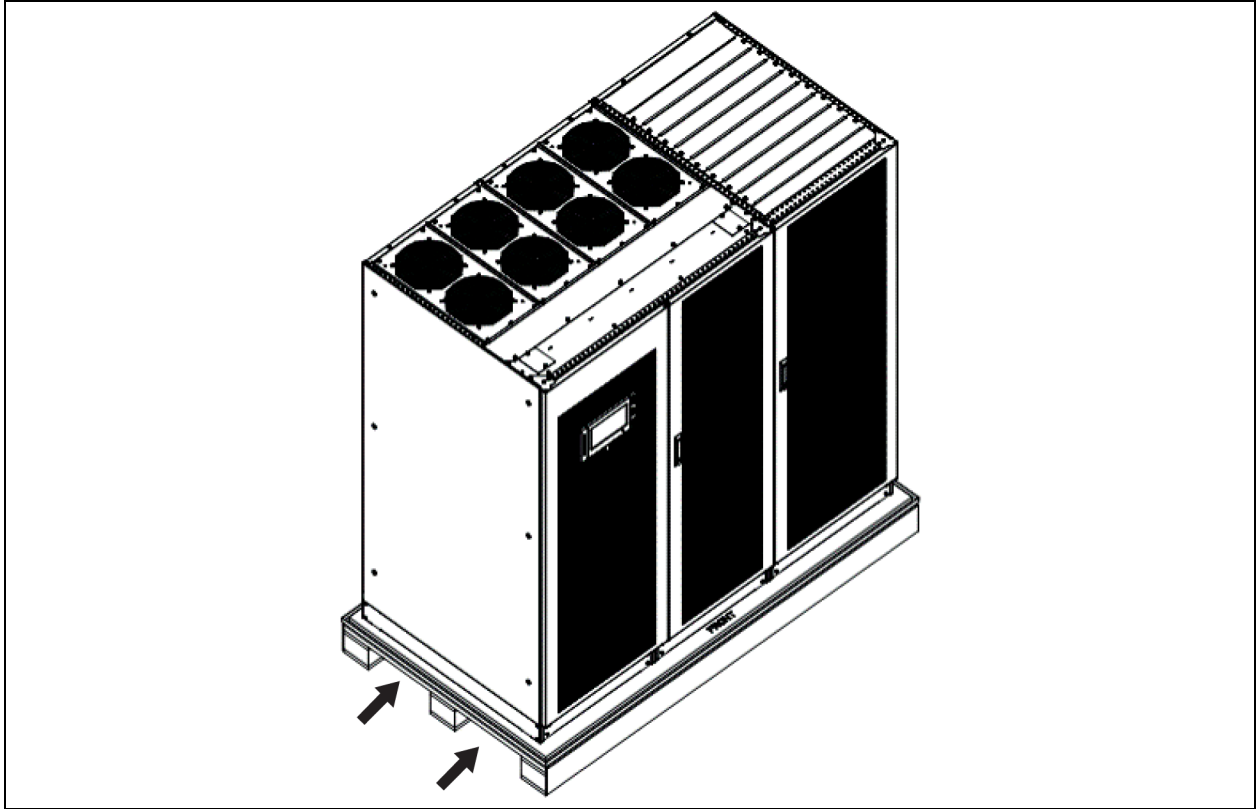
The recommended mode of transportation is railroad transportation and shipping. If truck transportation is necessary, choose smoother roads to protect the equipment.



WARNING! Risk of moving heavy unit and tipping over while moving. Can cause equipment damage, personnel injury, or death. The UPS cabinet is heavy. See Table 12.3 on page 132 weight of the cabinet. Make sure that any equipment that will be used to move the UPS cabinet has sufficient lifting capacity. The UPS cabinet presents a tipping hazard. Do not tilt the cabinet more than 15 degrees from vertical while transportation.

It is recommended to use mechanical equipment like an electric forklift to unload and transport the cabinet to the installation site. If an electric forklift is used, insert the tines of the forklift below the bottom pallet to prevent the cabinet from falling over. See Figure 3.1 on the next page.

Figure 3.1 Moving the Cabinet (Cabinet Front)

























3.3 Tools



WARNING! Risk of electric shock and hazardous voltage. Can cause personal injury or death. The Installation tools under live operation must be insulated. The tools listed in **Table 3.1** on the facing page are for reference only. For on-site installation and connection, use the actual required tools.

Table 3.1 Tools

Name	Drawing	Name	Drawing
Electric hand drill		Adjustable wrench	
Slotted screwdriver		Cross head screwdriver	
Stepladder		Forklift	
Drill		Wire cutting plier	
Claw hammer		Diagonal cutting plier	
Insulating shoes		Antistatic gloves	
Electrician knife		Cable tie	
Insulating tape		Insulating gloves	
Crimping plier		Heat shrinkable tube	
Insulated torque wrench		Torque screwdriver	
Multimeter		Clip-on ammeter	

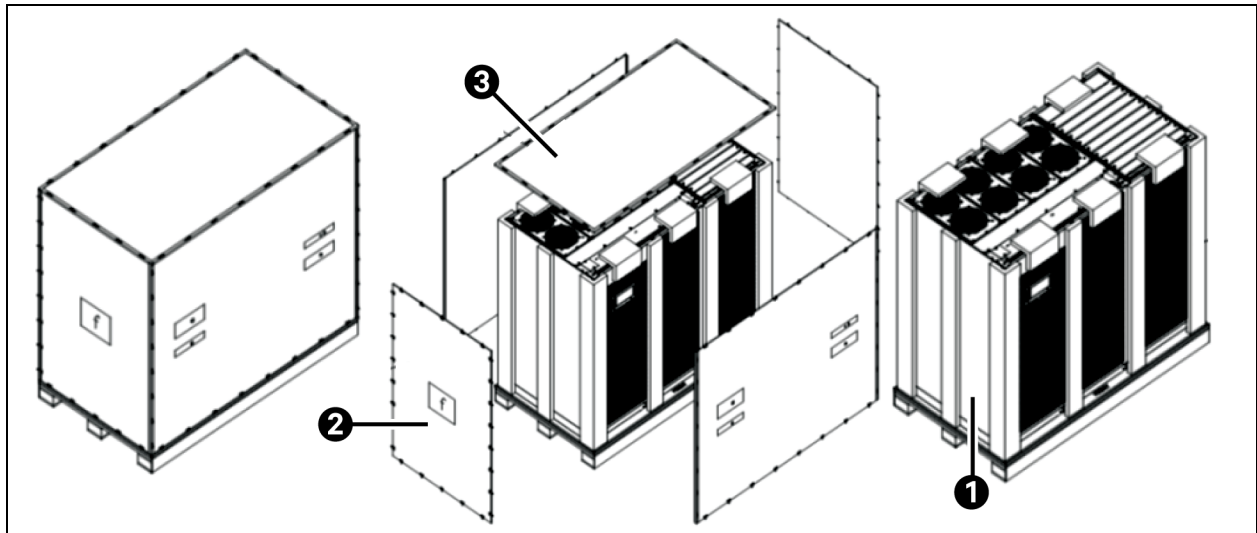
3.4 Unpacking

Before unpacking the UPS and battery, inspect for any visual damage or signs of mishandling under the guidance of authorized service engineer.

Follow the steps below to unpack the UPS and battery packages, as shown in **Figure 3.2** below.

1. Remove the package.
2. Remove the cover and honeycomb boards.
3. Remove the plastic film on the cabinet surface.

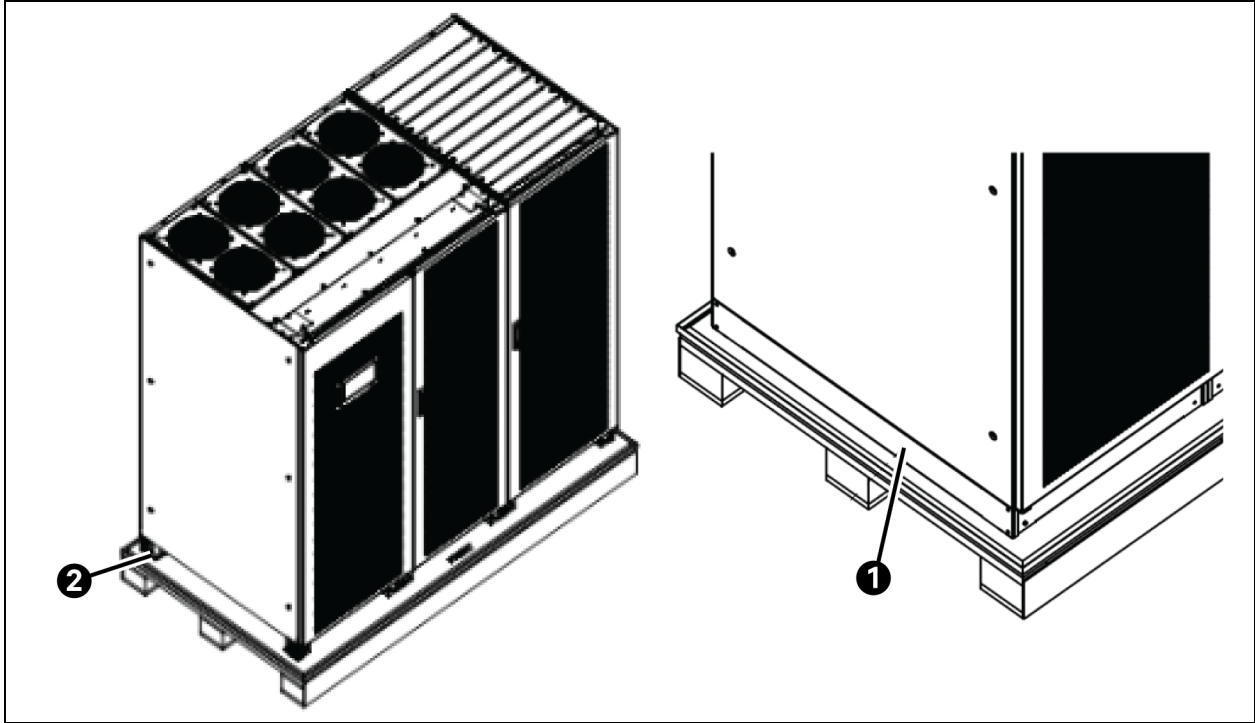
Figure 3.2 Removing the Package, Cover, and Honeycomb Boards



Item	Description
1	Honeycomb board
2	Package
3	Cover

4. Remove the bottom rat guards, see **Figure 3.3** on the facing page. When the UPS is in position, reinstall the rat guards.
5. Remove the fixing bolts at bottom of the cabinet as shown in **Figure 3.3** on the facing page.

Figure 3.3 Removing Bottom Fixing Bolts



Item	Description
1	Rat guard
2	Fixing bolt

- 6. Move the cabinet to the installation location using the forklift. See [Transportation](#) on page 19 for more details. Secure cabinet to the ground as shown in **Figure 9.3** on page 114.
- 7. Make sure to reinstall the rat guards, after the Vertiv™ PowerUPS 9000 1250 kVA Modular UPS CE is installed.

3.5 Pre-installation Inspection

Before installing the UPS, carry out the following inspections:

1. Ensure that the UPS equipment room's environment complies with the environmental requirement specified in the [Environmental Characteristics](#) on page 131, especially the ambient temperature, ventilation conditions, and the dust situations.
2. Visually inspect the UPS and battery for any sign of transportation damage or mishandling. Do not attempt to install the system, if damage is apparent. Report it to the carrier or Vertiv representative immediately. Unpack the UPS and battery under the guidance of authorized service engineer.
3. Check the UPS label on the back of the door and confirm the contents match the UPS model, capacity and main parameters that were ordered.

3.6 Environmental Requirement

3.6.1 UPS Location Selection

Before installing Vertiv™ PowerUPS 9000 1250 kVA Modular UPS CE, verify that the environment of the room where the UPS is to be installed complies with the environmental requirements as specified in relevant international standard and specifications and within operating ranges given in **Table 12.2** on page 131. Pay special attention to the ambient temperature and the air exchange system. Install the UPS in a cool, dry, clean air indoor environment with adequate ventilation and on concrete or other nonflammable, flat surfaces. The ambient environment should be free of conductive powder (such as, metallic powder, sulfide, sulfur dioxide, graphite, carbon fiber, and conductive fiber) and acid mist or other conductive media (strongly ionized substances).

The PowerUPS 9000 1250 kVA Modular UPS CE is cooled by internal fans. Cooling air enters the UPS through the ventilation grilles at the front of the cabinet and is exhausted out through the ventilation grilles at the back of the cabinet. To permit proper air flow and prevent overheating, do not block or cover the ventilation openings (ventilation grille) or blow air down onto the unit. The UPS requires at least 24.1 in. (610 mm) ventilation clearance at the top side of the unit to avoid blocking the UPS heat dissipation, thus reducing the UPS internal temperature, and improving the UPS life.

If necessary, install indoor extractor fans to aid cooling air flow to avoid increase in the room temperature. Air filters (optional) should be used when the UPS is to operate in a dirty environment.

NOTE: When installing the UPS, use M12 expansion bolts to fix the base of the cabinet on the floor to prevent the cabinet from falling due to uneven ground.

NOTE: When the battery cabinet is installed near the UPS, the maximum allowable ambient temperature is dependent on the battery rather than the UPS.

NOTE: If the UPS is working in ECO mode, the power consumption will be less than that in Normal mode. Proper air conditioning system shall be selected according to the normal operating mode.

3.6.2 Battery Location Selection

Batteries generate some hydrogen and oxygen at the end of a charge, so the fresh air volume of the battery installation environment must meet the EN50272-2001 requirements.

The ambient temperature is the main factor that affects the battery capacity and life. The normal operating temperature of the battery is 68 °F (20 °C). If the ambient temperature is higher than 68 °F (20 °C), the battery life is reduced. If it is lower than 68 °F (20 °C), the battery capacity is reduced. In normal situations, the allowable ambient temperature for the battery is 59 °F (15 °C) to 77 °F (25 °C). The ambient temperature of the battery is to be maintained constant, and the battery is to be kept away from heat source and air outlet.

The battery can be installed inside a specialized battery cabinet that must be close to the UPS. If the battery is placed on a raised floor, a bracket must be installed under the floor, just as for the UPS. If the battery adopts rack mounting or is mounted far from the UPS with another installation mode, the BCB must be installed near the battery and the cabling distance must be minimized.

3.6.3 Storage

If the UPS will not be installed immediately, it must be stored in the original packaging indoors in a clean, dry, and cool location protected from excessive humidity and heat sources, as shown in **Table 12.2** on page 131. The battery needs to be stored in a dry and cool place with good ventilation. The most suitable storage temperature range is 68 °F (25 °C) to 77 °F (25 °C).



WARNING! During battery storage, periodically charge the battery according to the battery manufacturer instructions. In the charging process, temporarily connect the UPS to the mains and activate the battery by recharging the battery.

3.7 Mechanical Requirement

3.7.1 Composition

For Vertiv™ PowerUPS 9000 1250 kVA Modular UPS CE, the UPS without switch contains the cabinet of 78.8 in. (2000 mm) width. The UPS with three switches contains the cabinet of 78.8 in. (2000 mm) width, which provides the rectifier input switch Q1, bypass input switch Q2, and output switch Q5.

3.7.2 Moving the Cabinet



CAUTION: Risk of improper handling. Can cause equipment damage, injury, or death. Use only lifting equipment that is rated for the unit weight by an OSHA-certified rating organization. The center of gravity of the UPS cabinet is high; avoid falling over during the cabinet movement. Vertical hanging of cabinet is prohibited.

Ensure that the UPS weight is within the designated surface weight loading of any lifting equipment. See **Table 12.3** on page 132 for weight of the UPS.

The PowerUPS 9000 1250 kVA Modular UPS CE cabinet can be moved by forklift or other similar lifting equipment.

3.7.3 Clearance

The UPS has no ventilation grilles at either side or at the rear. Leave a distance of 24 in. (610 mm) between the top of the UPS and any overhead obstacles for service and adequate circulation of air from the unit. Clearance around the front of the equipment should be sufficient to enable free passage of personnel with the doors fully opened, about 50 in. (1270 mm). In the rare instance of module replacement, 50 in. (1270 mm) of clearance is required for the Service team to perform module replacement. 50 in. (1270 mm) allows adequate clearance for both the module and the heavy-duty lift to remove and replace the modules. Ensure that there is a minimum of 36 in. (910 mm) in front of all circuit breakers to perform maintenance.

3.7.4 Cable Access Mode

The Vertiv™ PowerUPS 9000 1250 kVA Modular UPS CE uses the top cable and bottom cable access method. See [Power Cable Connection Steps](#) on page 32 and [Signal Cable Connection Steps](#) on page 48 for more information.

3.8 Installation Drawings

Figure 3.4 Schematic Diagram of Installing 1250 kVA UPS without Switch

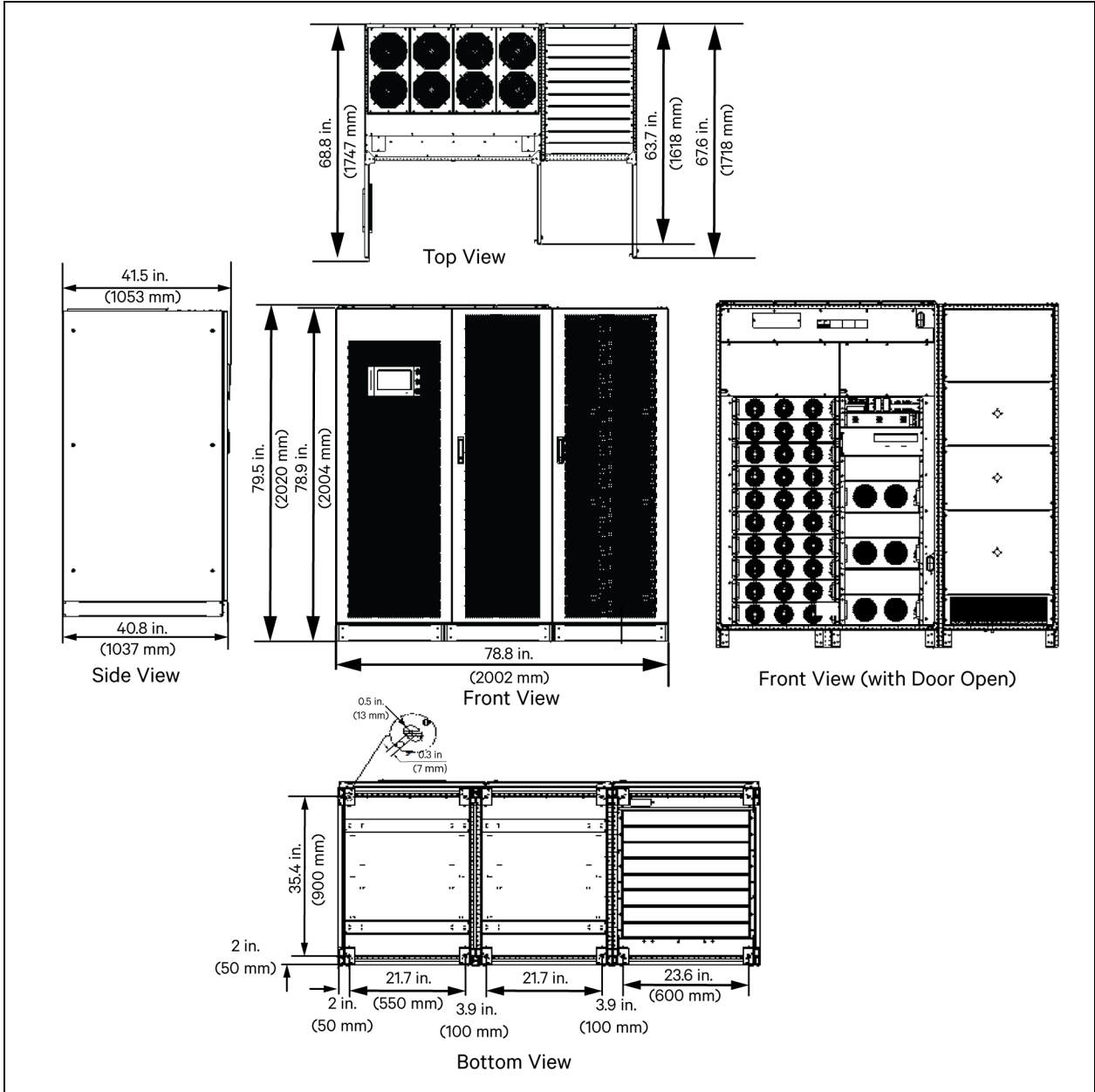
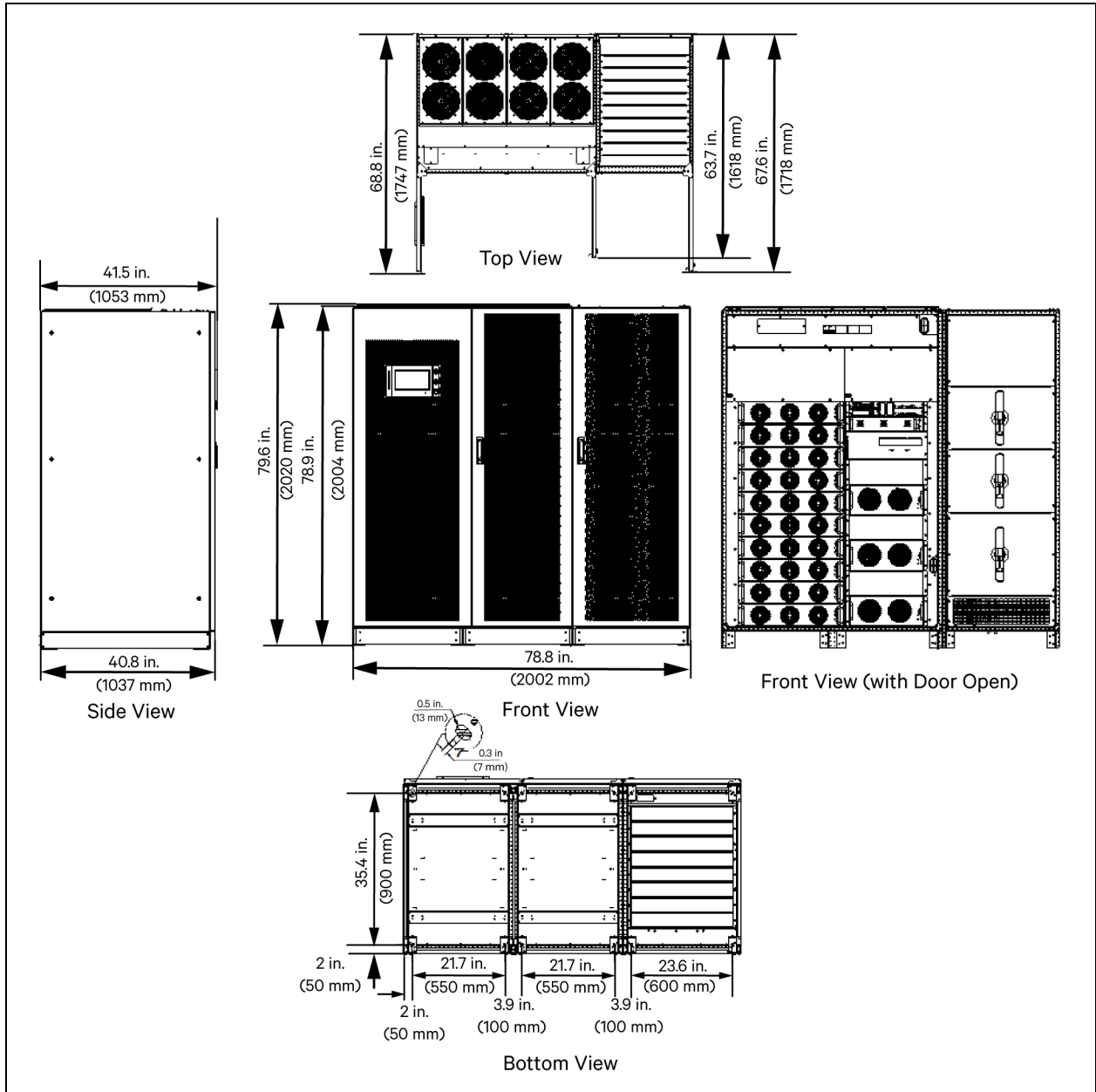


Figure 3.5 Schematic Diagram of Installing 1250 kVA UPS with Three Switch



4 Electrical Installation

This chapter describes the electrical installation of the Vertiv™ PowerUPS 9000 1250 kVA Modular UPS CE.

After completing the mechanical installation of the UPS, it is necessary to connect the power cable and signal cable of the UPS.

All the signal cables, whether shielded or not, should be kept away and routed separately from the power cables.



WARNING! Risk of electric shock and hazardous voltage. Can cause equipment, personal injury, or death. Do not turn on power to the UPS before the authorized service engineer arrives. Only an authorized engineer can route the PowerUPS 9000 1250 kVA Modular UPS CE cables in accordance with the information given in this chapter.

4.1 Power Cable Wiring

4.1.1 System Configuration

The power cables of the system must be sized as follows. See **Table 4.1** below for more details.

- **UPS input cables:** The UPS input cables must be sized for the maximum input current, including the maximum battery charge current.
- **UPS bypass and output cables:** The UPS bypass and output cables must be sized for the nominal output or bypass current.
- **Battery cables:** Each UPS connects to its battery through the two cables connecting to the positive and negative poles. The cable size of the battery cable differs with the UPS power ratings, provided that it meets the battery discharge current requirement when the battery discharges to near EOD voltage.

4.1.2 Maximum Steady State AC and DC Currents

The power cables must be selected in accordance with current and voltage values as given in **Table 4.1** below as well as local wiring regulations and environmental conditions (temperature and physical media). Refer Table 3B in IEC 60950-1 for more information on size of the cables.

Table 4.1 Maximum Steady State AC and DC Currents

UPS Power (kVA)	Rated Current (A)				Bus Stud Bolt/Nut Specification		
	Maximum Input Current ^{1,2}	Output/Bypass Current ² at Full Load			Battery Discharge ³ Current (+, -, N) at Lowest Battery Voltage	Input/Battery/Output/Bypass/PE Cable	Recommended Torque (Nm)
		380 V	400 V	415 V			
1250 kVA	2453	1899	1804	1739	3328	M16	90±10%

1. Maximum input current is calculated according to the low voltage input of 176 V and 100% load percentage.
2. Maximum output/bypass current is calculated according to the rated voltage and 100% load percentage.
3. The battery discharge current is calculated according to the battery cell number of 40, EOD voltage of 1.63 V and 100% load percentage.

4.1.3 Recommended Cross-sectional Area of UPS Cable

The recommended Cross-sectional Area (CSA) of the UPS cable is given in **Table 4.2** below.

Table 4.2 Recommended CSA of the UPS Single Module Cable (Unit: mm², Ambient Temperature: 77 °F (25 °C))

Model	Input	Output	Bypass	Neutral Line	Earth Cable	Battery
1250 kVA	6 x 240	6 x 240	6 x 240	18 x 240	4 x 240	See Table 7.3 on page 95

For maximum wiring capability of single UPS cable, see **Table 4.3** below.

Table 4.3 Maximum Wiring Capability of Single UPS Cable

Model	Input	Output	Bypass	N line	PE line	Battery
1250 kVA	8 x 240 or 6 x 300	8 x 240 or 6 x 300	8 x 240 or 6 x 300	24 x 240 or 18 x 300	12 x 300	8 x 300

4.1.4 Selection of UPS I/O Switch and Battery Switch

See **Table 4.1** on the previous page for the values of I/O current and battery current. The user can select the switch according to the actual configuration on site.

4.1.5 Distance between the UPS Connection Point and Floor

Table 4.4 Minimum Distance Between UPS Connection Point and Floor

UPS Connection Point	Minimum Distance 1250 kVA in. (mm)
Rectifier input	49 (1244)
Bypass input	34.3 (870)
AC output	19.5 (493)
Battery supply +/-	65.5 (1662)
N	14.7 (373)
PE terminal	64 (1624)

4.1.6 General Information

The following points are for general guidance only. If there are relevant local regulations, then follow the local regulations.

1. The protective earth cables must be selected in accordance with the AC power failure level, cable length, and protection type. The shortest connection route must be used for the grounding wire connection.
2. The parallel connection of small cables can be used to make easier installation for cables which are carrying large current.
3. The battery cable size must be selected in accordance with the current value given in **Table 4.1** on the previous page and a maximum allowed voltage drop is 4 VDC.
4. Avoid creating the coils to reduce the generation of electromagnetic interference (EMI).
5. Make sure to leave sufficient wiring space before wiring.
6. The wiring space of the input and output cables must meet the requirements of 4.11.8.4 in IEC 62040-1, and the bending space of the cables must meet the requirements of 4.11.8.4 in standard.

4.1.7 Power Cable Connecting Terminal

The rectifier input, bypass input, output, and battery power cables are connected to the respective terminals as specified in the **Figure 4.2** on page 33 and **Figure 4.3** on page 34.

4.1.8 Protective Ground

The protective earth cable is securely connected to the PE input terminal through the fixing bolt. See **Figure 4.2** on page 33 and **Figure 4.3** on page 34 for more details. All the cabinets and cable conduits shall be grounded according to the local regulations. The grounding wires must be securely fastened to prevent the loosening of the grounding wire tightening screws when the grounding wires are pulled.



WARNING! Failure to ground as required may cause EMI, electric shock, or fire risk.

4.1.9 External Protective Devices

This device is equipped with manual switches intended only for service bypass and internal service operations. Customers install external protection devices at the installation site. These must be installed near the unit and labelled as the line power separation device for the UPS. See IEC/EN/BS 62040-1:2019/A11:2021.

NOTE: This applies when no switch configuration is available with the model.

For safety concerns, it is necessary to install the external circuit breakers or other protective devices for the input and battery of the UPS system. This section provides generic practical information for the qualified installation engineers due to the different specific installations. The qualified installation engineers must be knowledgeable about local regulatory wiring standards on the equipment to be installed.

Rectifier and bypass input supply of the UPS:

1. Input overcurrent and short circuit protection

Install suitable protective devices in the distribution line of the incoming mains supply, considering the power cable current carrying capacity, system overload capacity. See **Table 12.6** on page 134 and **Table 12.7** on page 134 and the short circuit capability of the upstream power distribution. The protective devices should provide functions such as the overcurrent protection, short circuit protection, isolation protection and tripping upon backfeed.

2. Split bypass configuration

If the UPS uses split bypass configuration, a separate protective device should be installed respectively on the rectifier input and bypass input in the distribution lines.

NOTE: The rectifier input and bypass input must use the same neutral line.

NOTE: For IT grid system, four-pole protective components must be installed for the UPS external input power distribution.

3. Ground fault protection

If the upstream input power supply has a RCD, the transient state and steady state ground leakage current upon the startup of the UPS shall be considered.

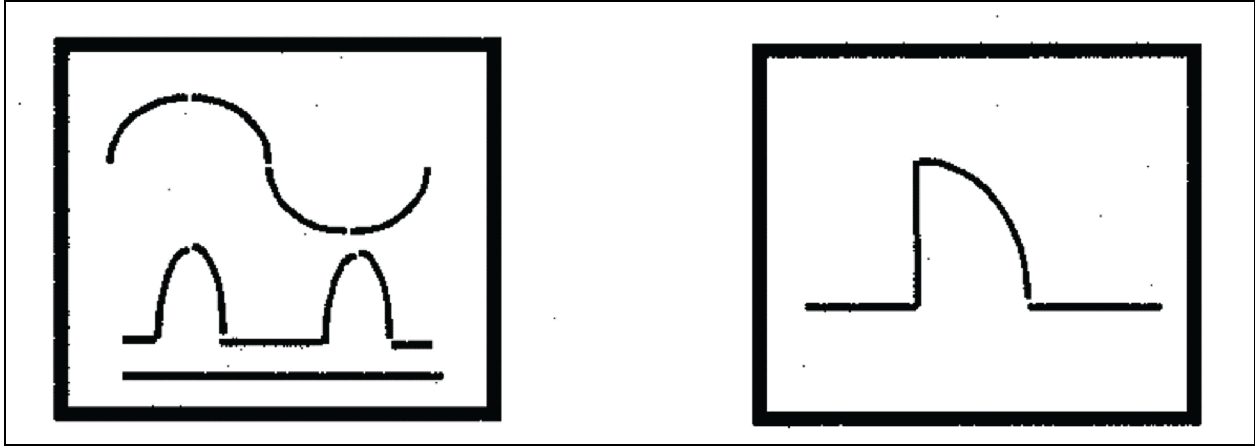
RCCB shall meet the following requirements:

- Must be sensitive to the DC unidirectional pulse (class A) of the whole distribution network.

- Must be insensitive to transient state current pulse.
- Must have an average sensitivity, adjustable between 1 A to 3 A.

The RCCB symbols are shown in **Figure 4.1** below.

Figure 4.1 RCCB Symbols



The UPS consist of an internal EMC filter; therefore the protective earth cable’s leakage current is less than 3000 mA. It is recommended to verify the RCD sensitivity of the upstream input distribution and the downstream distribution (to the load).

External battery

The battery switch box is mandatory and must be installed to protect the external battery. The UPS consist of an optional battery switch box cabinet to provide overcurrent protection, short circuit protection and automatic tripping functions for the external battery.

This battery switch box is important for the battery maintenance and is generally installed near the battery.

System output

The UPS output distribution must be configured with a protective device. The protective device must be different from the input distribution protection switch and able to provide overload protection. See **Table 12.6** on page 134 and **Table 12.7** on page 134 for more details.

NOTE: An IT grid system, four-pole protective components must be installed for the UPS external input power distribution.

4.1.10 Power Cable Connection Steps

Connection terminal

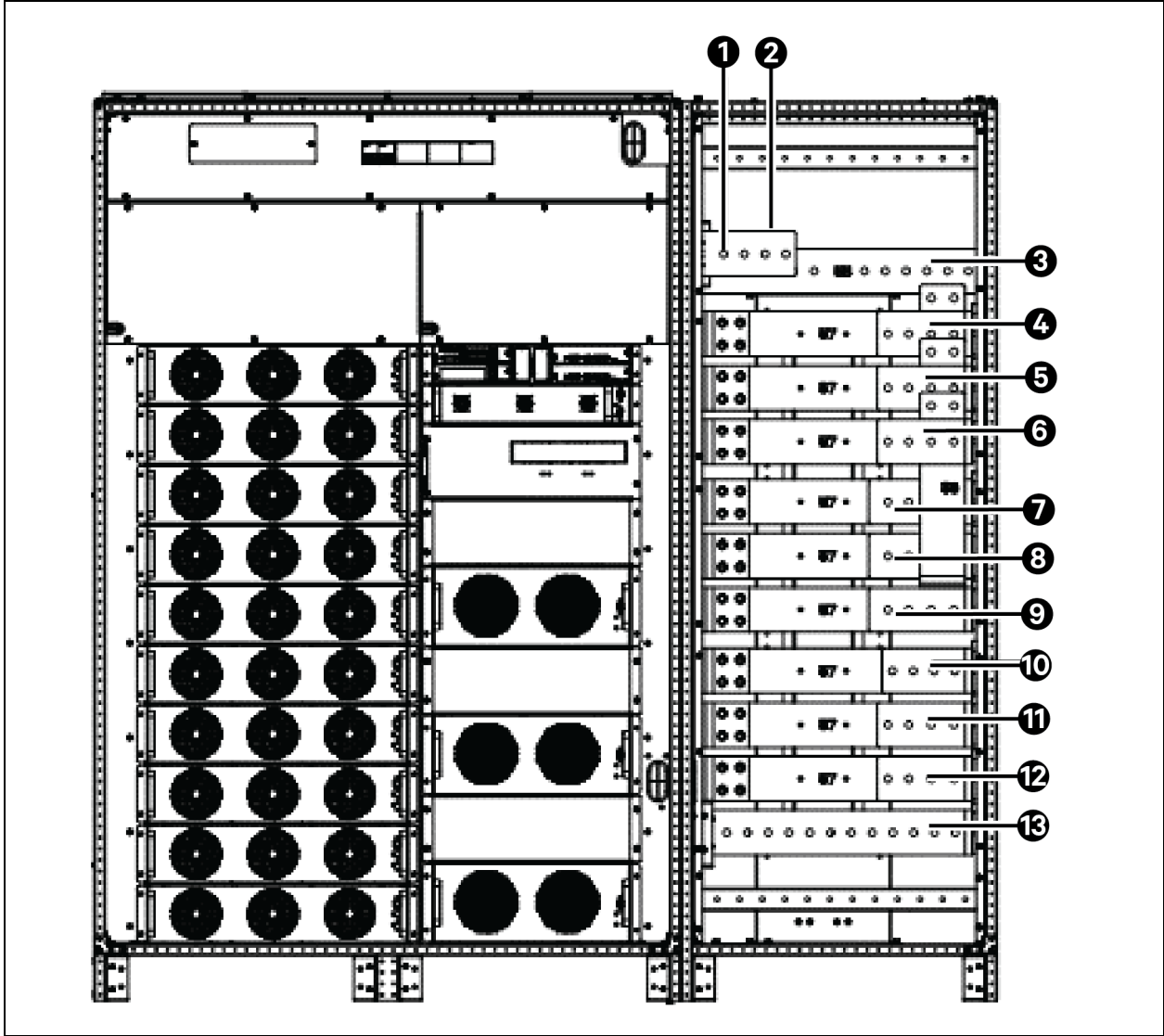
Figure 4.2 on the facing page and **Figure 4.3** on page 34 shows the connection terminals of the UPS power cable.

Figure 4.4 on page 35 and **Figure 4.5** on page 36 shows the power cable entry and routing methods. See [Cabling method](#) on page 35 to route cables and then connect them to corresponding terminals.

NOTE: The power cables should be routed through tunnels or cable conduits to prevent cable damage due to mechanical stress. After that reduce the EMI to the surrounding environment.

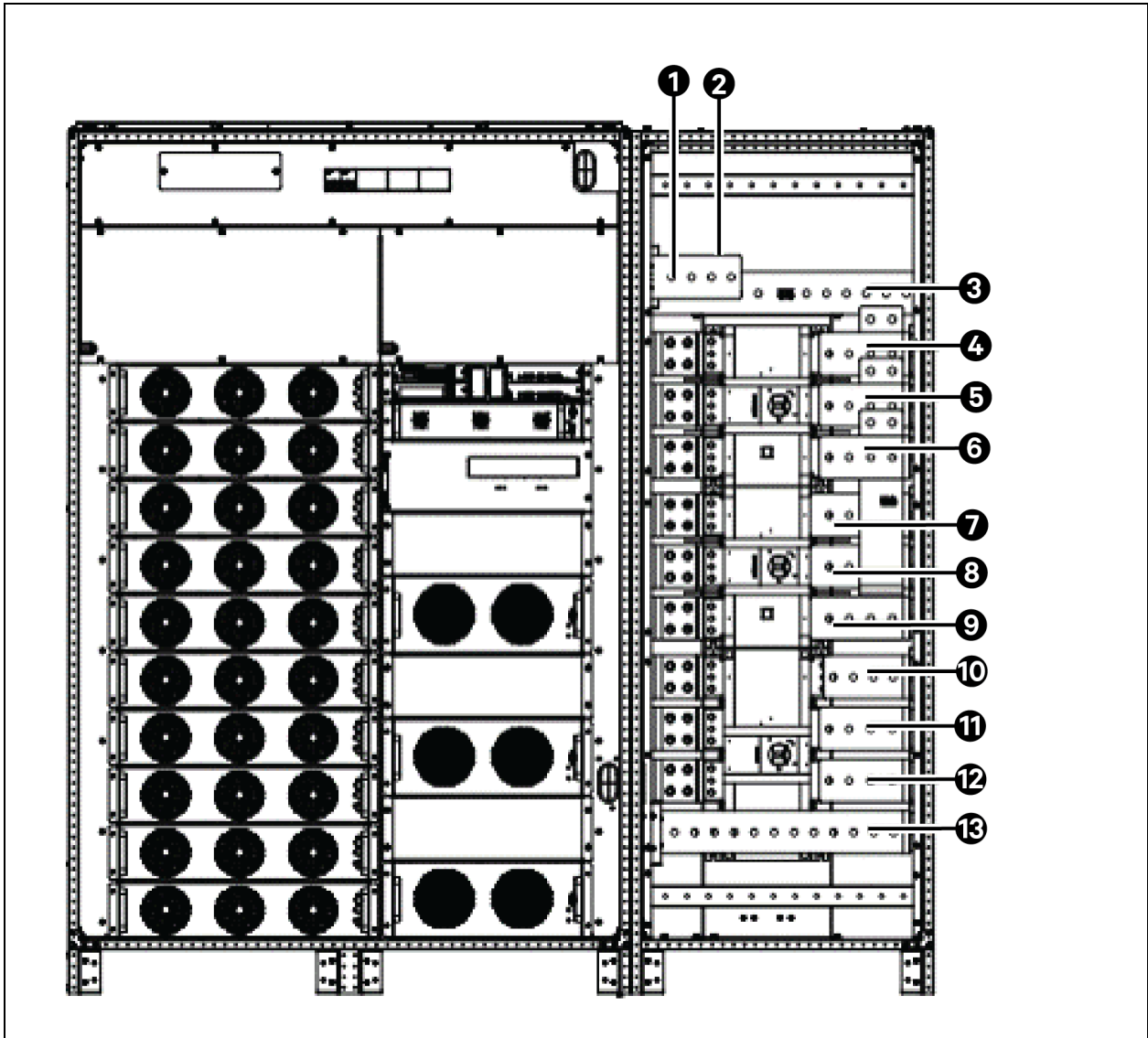
NOTE: It is necessary to tie and fix the cables when routing the cables inside the cabinets to prevent cable damage because of mechanical stress.

Figure 4.2 Power Cable Connection Terminals 1250 kVA without Switch



Item	Description	Item	Description
1	BAT+	8	bB
2	BAT-	9	bC
3	PE	10	oA
4	mA	11	oB
5	mB	12	oC
6	mC	13	mN, bN, oN
7	bA		

Figure 4.3 Power Cable Connection Terminals 1250 kVA with Three Switches

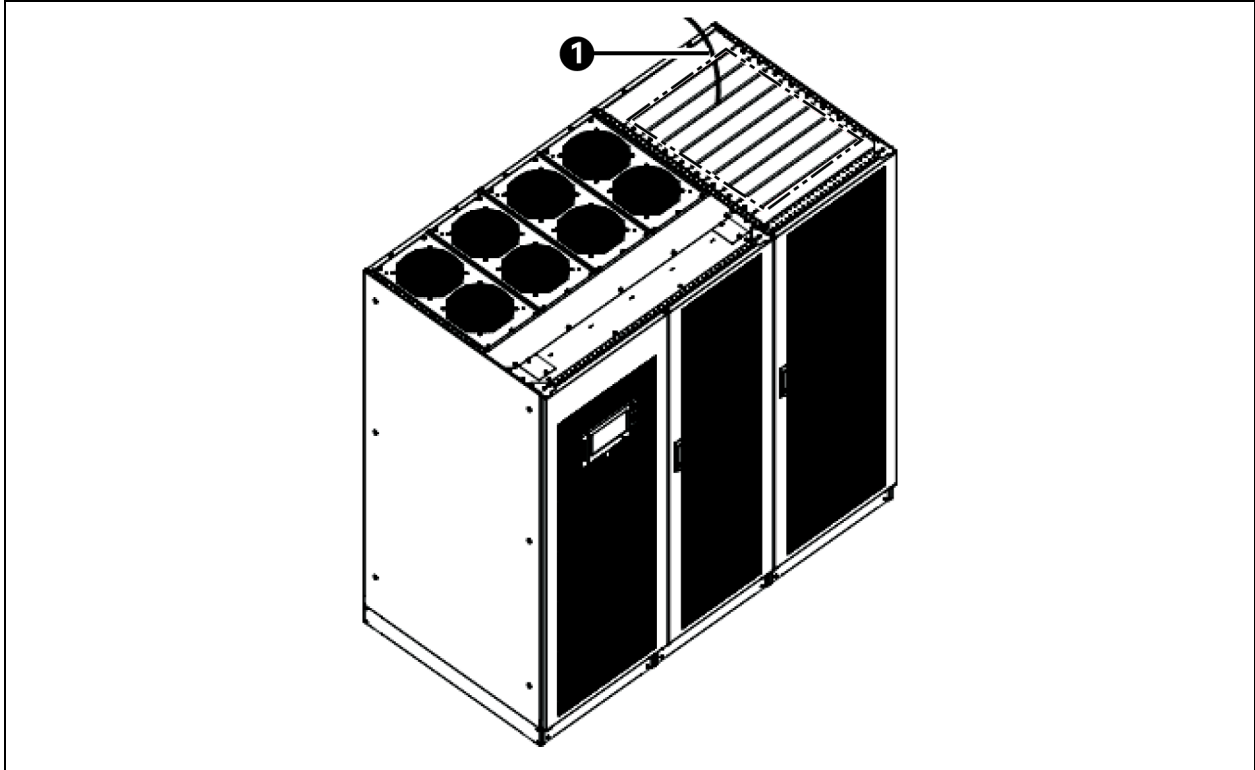


Item	Description	Item	Description
1	BAT+	8	bB
2	BAT-	9	bC
3	PE	10	oA
4	mA	11	oB
5	mB	12	oC
6	mC	13	mN, bN, oN
7	bA		

Cabling method

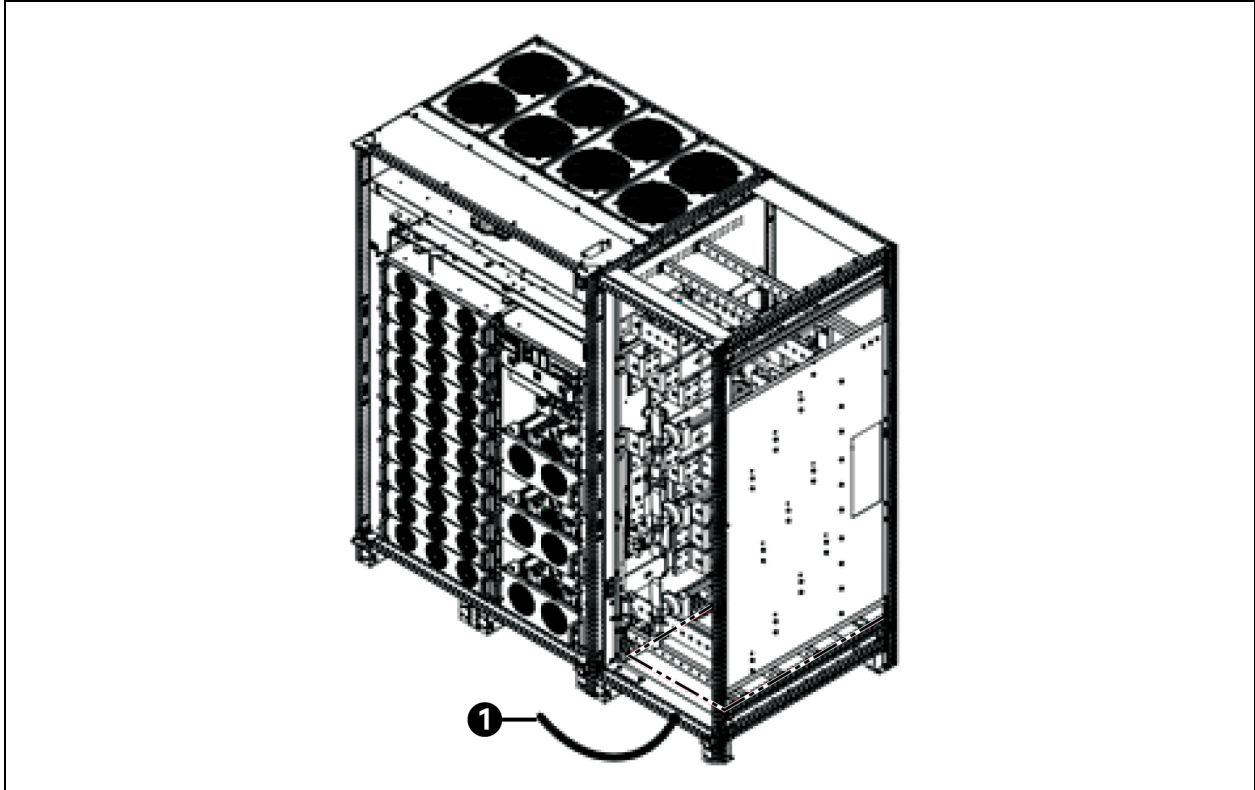
The 1250 kVA UPS supports both top and bottom cable access. See **Figure 4.4** below for details.

Figure 4.4 Power Cables Wiring Route 1250 kVA (Top Cable Access)



Item	Description
1	Power cable through top cabinet hole

Figure 4.5 Power Cables Wiring Route 1250 kVA (Bottom Cable Access)



Item	Description
1	Power cable through the bottom cabinet hole

! WARNING! Before cables connection, make sure that all external and internal power switches of the UPS are off, and post necessary warning signs to prevent inadvertent operation of the switches. Meanwhile, measure the voltages between the UPS terminals and the voltages between the terminals and the earth.

Open the front door of the UPS, and remove the protective cover to reveal the power cable connection terminals shown in Figure 4.2 on page 33 to Figure 4.5 above. Connect the protective earth cable to the PE input terminal in the cabinet. Connecting terminal are shown in Figure 4.2 on page 33 and Figure 4.3 on page 34.

! WARNING! Risk of electric shock or fire. Can cause equipment damage, personnel injury or death. The earth grounding cable and neutral line connection must comply with the national electrical code and all the applicable local code.

The cabinet space is limited and it is recommended to connect power cables in the following sequence. The top and bottom parts of the cabinet are provided with beams for securing the cables. See Table 4.5 below and Table 4.6 on the facing page.

Table 4.5 Recommended Wiring Sequence for Top Cable Access

Number	1	2	3	4	5	6	7	8	9	10	11	12
Terminal	mA	bA	oA	mB	bB	oB	mC	bC	oC	N	BAT	GND

Table 4.6 Recommended Wiring Sequence for Bottom Cable Access

Number	1	2	3	4	5	6	7	8	9	10	11	12
Terminal	oA	bA	mA	oB	bB	mB	oC	bC	mC	N	BAT	GND

Connecting system input

1. Common input configuration

Install the shorting copper bars, as shown in **Figure 4.2** on page 33 and **Figure 4.3** on page 34. Connect the AC input cables to the mains input terminals (mA-mB-mC) in the cabinet. Connect the input neutral line to the neutral terminal N in the cabinet. Ensure correct phase rotation.

2. Split bypass configuration

Remove the shorting copper bars, as shown in **Figure 4.2** on page 33 and **Figure 4.3** on page 34, connect the rectifier input cables to the rectifier input terminals (mA-mB-mC) in the cabinet, and connect the bypass input cables to the bypass input terminals (bA-bB-bC) in the cabinet. Connect the rectifier input neutral line and bypass neutral line to the neutral terminal N in the cabinet. Ensure correct phase rotation.

Connecting system output

Connect the system output cables between the output terminals (oA-oB-oC-N) in the cabinet and the load and tighten the connection. See **Table 4.1** on page 29 for the torque value. Ensure correct phase rotation.



WARNING! Risk of electric shock and arc flash. Can cause equipment damage, property damage, personnel injury or death. Make sure that the system output cables are safely isolated at their end if a power supply is not required for the load equipment before arrival of the service engineer.

Connecting batteries

Ensure correct polarity of the connections from the battery string terminals to the battery switch box and from the battery switch box to the battery input terminals (BAT+, BAT-) in the UPS cabinet, that is, (BAT+) to (+) and (BAT-) to (-). Do not reconnect these links and do not close the battery switch box before authorized to do so by the service engineer.

NOTE: When connecting the cables between battery terminals and BCB, the connection should begin from the battery switch box terminal.

Now the connection is finished.

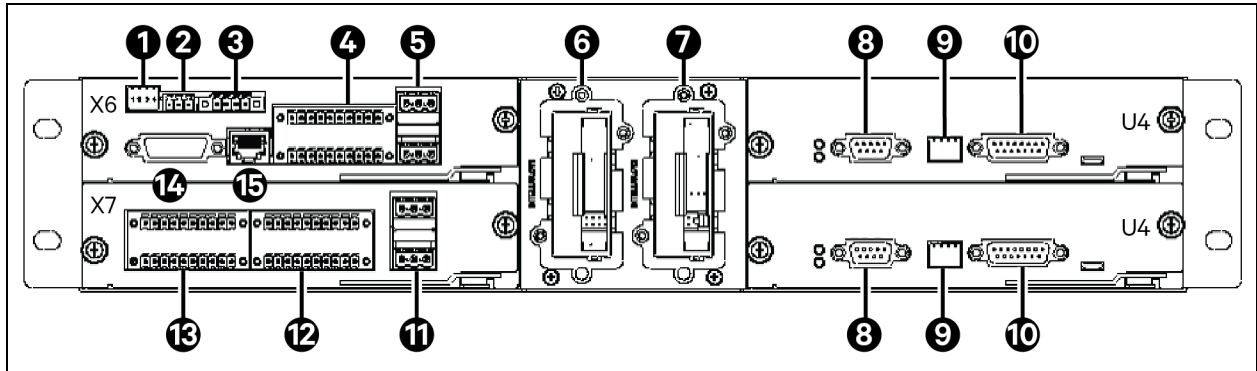
NOTE: After connection, make sure to seal the cable entry hole on the cabinet.

4.2 Wiring of Signal Cable

4.2.1 Overview

Based on the site's specific requirements, the Vertiv™ PowerUPS 9000 1250 kVA Modular UPS CE can require an auxiliary connection to manage the BMS (including the external battery switch), communicate with a personal computer, provide alarm signal to the external devices, for the remote emergency power off (REPO) or provide bypass back feed circuit breaker signal and parallel communication. These functions are performed through the communication box in the PowerUPS 9000 1250 kVA Modular UPS CE cabinet. The communication box provides the ports as shown in **Figure 4.6** on the next page.

Figure 4.6 Overview of Communication Ports



Item	Description	Item	Description
1	X6 SW1 for the terminating resistors	9	U4 SW parallel CAN for the terminating resistors
2	X6 RS-485	10	U4 parallel communication port
3	X6 REPO port	11	X7 J3: Other programmable output dry contact port
4	X6 J3: BCB and I/O dry contact ports	12	X7 J2: I/O dry contact ports
5	X6 J22: Backfeed port	13	X7 J1: BCB and I/O dry contact ports
6	Vertiv™ Liebert® Intellislot™ 1	14	X6 HMI port
7	Liebert® Intellislot™ 2	15	X6 BATT: Battery temperature or BMS communication port
8	U4 LBS sync signal port		

NOTE: The screws should be tightened after each board is inserted, as shown in Figure 4.6 above to maintain proper grounding.

4.2.2 Dry Contact Port X6 J3

The schematic diagram of dry contact port J3 is shown in Figure 4.7 on the facing page and the ports are described in Table 4.7 on page 40. The input dry contacts of this series provide 24 V/10 mA signals, and the output dry contacts are relay contacts that can accept 24 V/500 mA signals. The BCB drive signal can provide 12 V/10 mA signal.

Figure 4.7 Dry Contact Port J3

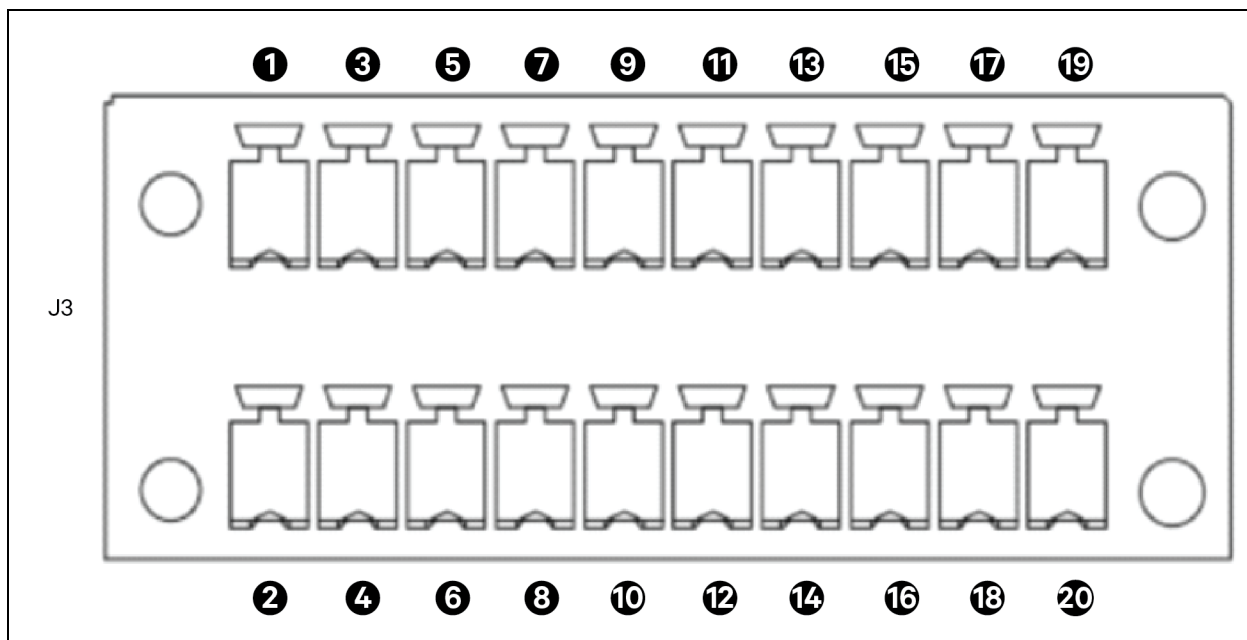


Table 4.7 Description of Dry Contact Port J3

Pin	Name	Meanings
1	Dry in	Input dry contact can be defined, the default setting is BIB1 on.
3	GND	
5	Dry in	Input dry contact can be defined, the default setting is BIB2 on.
7	GND	
9	NO	Output dry contact can be defined, the default setting is BIB1 trip.
11	Com1	
13	NC	
15	NO	Output dry contact can be defined, the default setting is BIB2 trip.
17	Com1	
19	NC	
2	BCB_Drive1	Reserved
4	Dry in	The input dry contact can be defined, and the default setting is BCB1 status feedback, NO contact.
6	GND	
8	Dry in	The input dry contact can be defined, and the default setting is BCB5 status feedback, NO contact.
10	GND	
12	Dry in	Input dry contact can be defined, default setting is battery grounding signal.
14	GND	

Table 4.7 Description of Dry Contact Port J3 (continued)

Pin	Name	Meanings
16	PE	Shielding to PE.
18	CAN+	CAN bus (reserved), set the matching resistor to PIN2 of SW1.
20	CAN-	

NOTE: The BCB drive signal and external battery temperature signal must be carried through shielded cables, and both sides of the shielding coat must be securely connected to the enclosure.

The list of definable input dry contact described in **Table 4.8** below.

Table 4.8 Input Dry Contact Functions

No.	Function Description
1	External switch status (optional mains input/bypass input/external output/external maintenance bypass/load switch)
2	Turn off the inverter
3	BCB enabled (8-group set table)
4	BCB feedback status (8-group set table)
5	Fault clear
6	Battery system abnormal
7	Battery system fault
8	Battery low voltage
9	Battery room overtemperature
10	BCB tripping required
11	Charger off
12	Start battery manual test
13	Stop battery manual test
14	Generator mode
15	ECO mode paused
16	Battery grounding fault (8-group set table)

The list of definable output dry contact functions are described in **Table 4.9** below.

Table 4.9 Output Dry Contact Functions

Number	Function Description	Number	Function Description
1	UPS alarm	5	On bypass
2	UPS fault	6	On maintenance bypass
3	On inverter	7	Input voltage abnormal
4	On battery	8	Battery low voltage

4.2.3 Dry Contact Port X6 J22

The schematic diagram of dry contact port J22 is shown in **Figure 4.8** below and described in **Table 4.10** below. The dry contact voltage is 24 VDC/250 VAC, and the current is 5 A.

Figure 4.8 Dry Contact Port J22

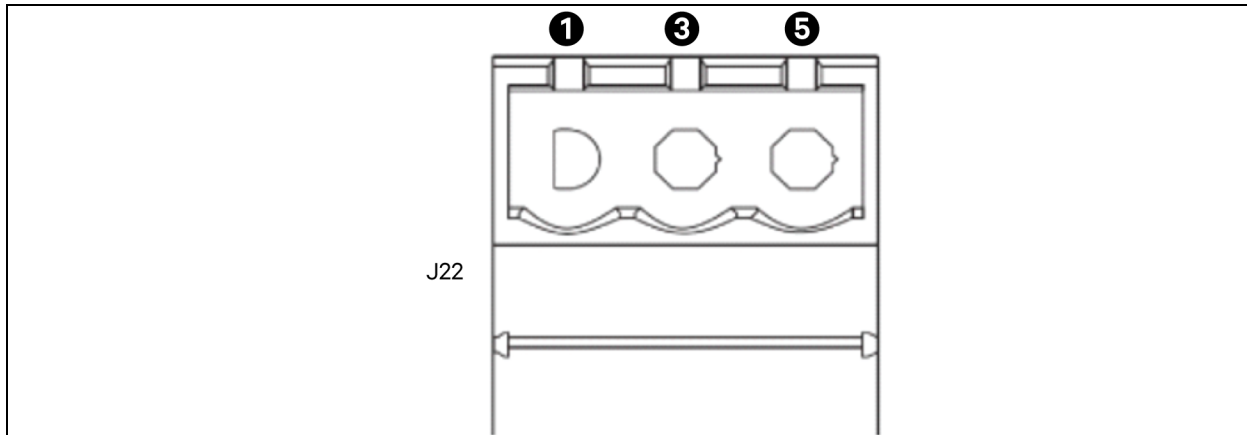


Table 4.10 Description of Dry Contact Port J22

Port	Pin	Name	Meanings
Bypass Backfeed	J22-1	BFP_O	Normally open. Closed when bypass has backfeed
	J22-3	BFP_S	Bypass backfeed protection relay common
	J22-5	BFP_C	Normally closed. Open when bypass has backfeed

4.2.4 Output Dry Contact X7 J1 (Option)

The schematic diagram of output dry contact port J1 is shown in **Figure 4.9** on the next page and described in **Table 4.11** on page 43. The input dry contacts of this series provide 24 V/10 mA signals, and the output dry contacts are relay contacts that can accept 24 V/500 mA signals. The BCB drive signal can provide 12 V/10 mA signal.

Figure 4.9 Dry Contact Port J1

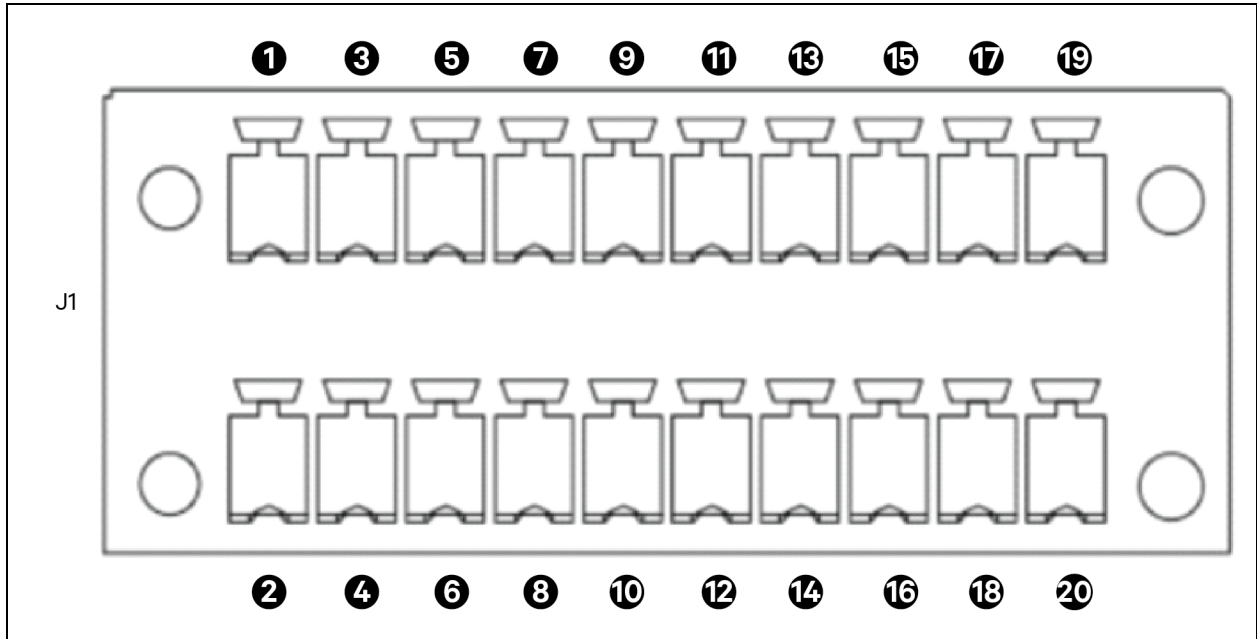


Table 4.11 Description of Dry Contact Port J1

Pin	Name	Meanings
1	BCB_Drive2	Reserved.
3	GND	
5	Dry in	Input dry contact can be defined, the default setting is BCB2 status feedback, NO contact.
7	GND	
9	Dry in	The input dry contact can be defined, and the default setting is BCB6 status feedback, NO contact.
11	GND	
13	Dry in	The input dry contact can be defined, and the default setting is to turn off the inverter.
15	GND	
17	Dry in	The input dry contact can be defined, and the default setting is the maintenance switch MBB/QBP state.
19	GND	
2	BCB_Drive3	Reserved.
4	GND	
6	Dry in	The input dry contact can be defined, and the default setting is BCB3 status feedback, NO contact.
8	GND	
10	Dry in	The input dry contact can be defined, and the default setting is BCB7 status feedback, NO contact.
12	GND	
14	Dry in	The input dry contact can be defined, and the default setting is the state of the external output switch MOB/QE.

Table 4.11 Description of Dry Contact Port J1 (continued)

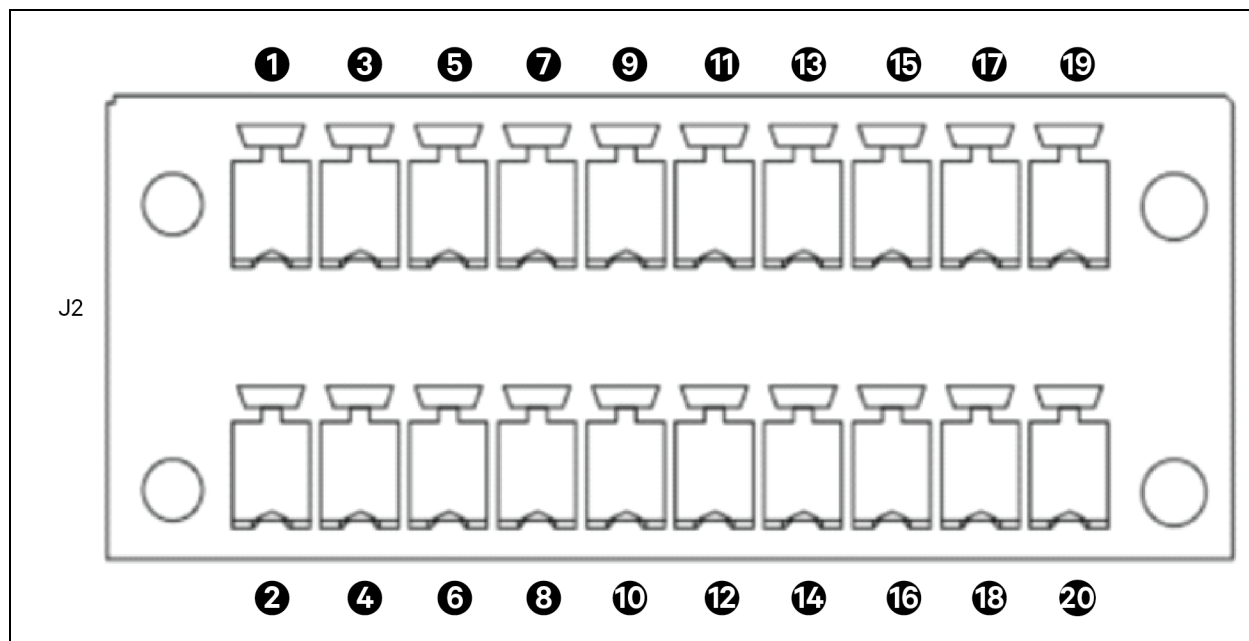
Pin	Name	Meanings
16	GND	
18	Dry in	The input dry contact can be defined, and the default setting is the state of the system total output switch MIB/QOP.
20	GND	

NOTE: The programmable dry contacts must be set in Paramset.

When using a parallel system, if you want to use the dry contact function of the external maintenance isolation circuit breaker, the auxiliary contact signal must be connected to the respective dry contacts on all single racks in the parallel system at the same time.

4.2.5 Output Dry Contact X7 J2 (Option)

The schematic diagram of the output dry contact port J2 is shown in **Figure 4.10** below and described in **Table 4.12** on the next page. The input dry contacts of this series provide 24 V/10 mA signals, and the output dry contacts are relay contacts that can accept 24 V/500 mA signals. The BCB drive signal can provide 12 V/10 mA signal.

Figure 4.10 Dry Contact Port J2**Table 4.12 Description of Dry Contact Port J2**

Pin	Name	Meanings
1	Dry in	The input dry contact can be defined, and the default setting is the load test switch LLBB state.
3	GND	
5	Dry in	The input dry contact can be defined, and the default setting is the state of the main input switch RIB/Q1.
7	GND	

Table 4.12 Description of Dry Contact Port J2 (continued)

Pin	Name	Meanings
9	NO	The output dry contact can be defined, and the default setting is bypass power supply.
11	COM	
13	NC	
15	NO	The output dry contact can be defined, and the default setting is battery mode.
17	COM	
19	NC	
2	BCB_Drive4	Reserved.
4	GND	
6	Dry in	The input dry contact can be defined, and the default setting is BCB4 status feedback, NO contact.
8	GND	
10	Dry in	The input dry contact can be defined, and the default setting is BCB8 status feedback, NO contact.
12	GND	
14	Dry in	The input dry contact can be defined, and the default setting is the state of the bypass input switch BIB/Q2.
16	GND	
18	NA	NA
20	GND	

NOTE: The programmable dry contacts must be set in Paramset.

When using parallel system, if you want to use the dry contact function of the external maintenance isolation circuit breaker, the auxiliary contact signal must be connected to the respective dry contacts on all single racks in the parallel system at the same time.

4.2.6 Output Dry Contact X7 J3 (Option)

The schematic diagram of output dry contact interface J3 is shown in **Figure 4.11** below and described in **Table 4.13** below. The dry contact voltage is 24 VDC/250 VAC, and the current is 5 A.

Figure 4.11 Dry Contact Port J3

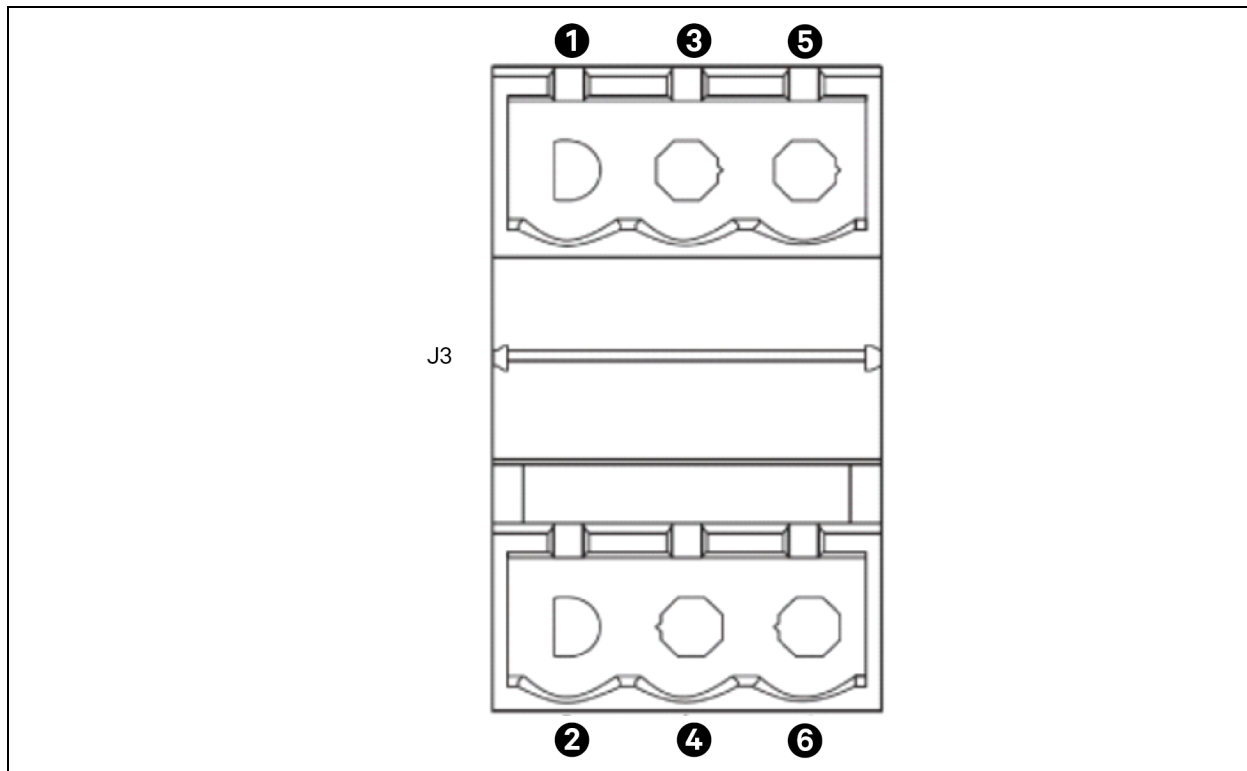


Table 4.13 Description of Dry Contact Port J3

Port	Pin	Name	Default Signal
MBB and MIB interlock signal	J3-1	NO	Normally open. External maintenance bypass MBB and system inverter main switch MIB interlock signal
	J3-3	COM	Common contact
	J3-5	NC	Normally closed
ATS transfer enable signal	J3-2	NO	Normally open. Provide remote dry contact signal to enable upstream ATS switching
	J3-4	COM	Common contact
	J3-6	NC	Normally closed

4.2.7 Remote Emergency Power Off Port

The UPS has an emergency power off (EPO) function that operates by an EPO button on the touch screen of the UPS or by a remote contact provided by the user. The REPO button has a protective cover.

The schematic diagram of the REPO port is shown in **Figure 4.12** below and described in **Table 4.14** below.

Figure 4.12 REPO Port

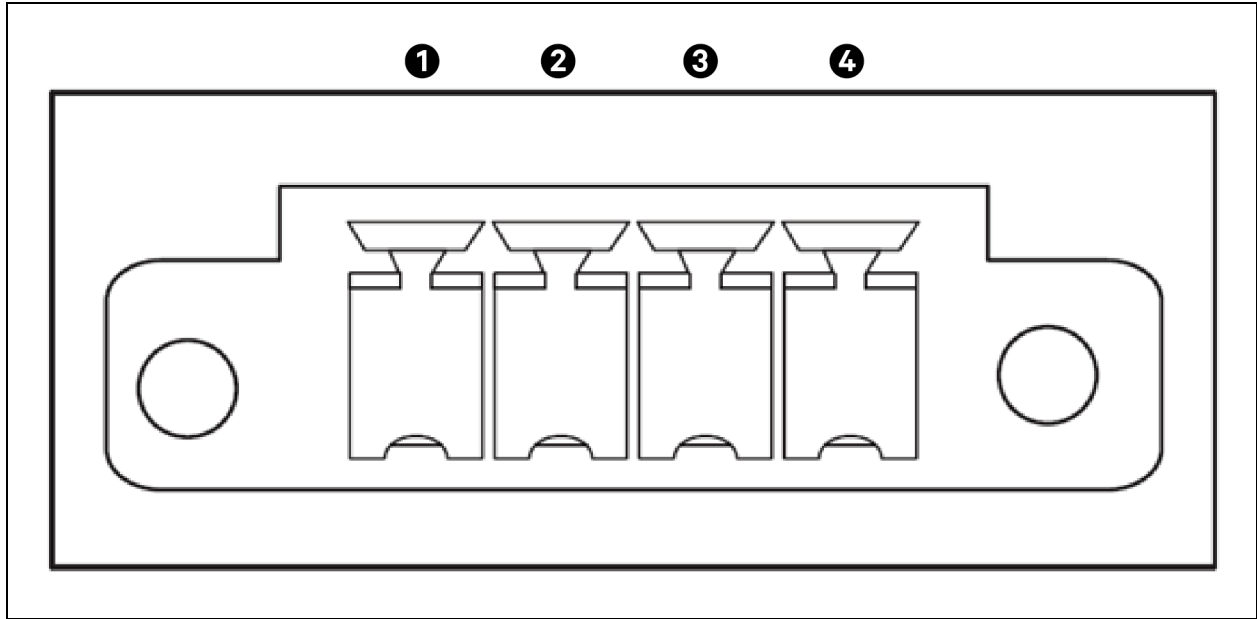


Table 4.14 REPO Port Pins

Pin	Name	Meanings
1	EPO-NC	EPO activated when opened to Pin 2
2	+ 12 V	EPO activated when opened to Pin 1
3	+ 12 V	EPO activated when shorted to Pin 4
4	EPO-NO	EPO activated when shorted to Pin 3

The EPO is triggered when the pins 3 and 4 are shorted or the pins 2 and 1 are opened.

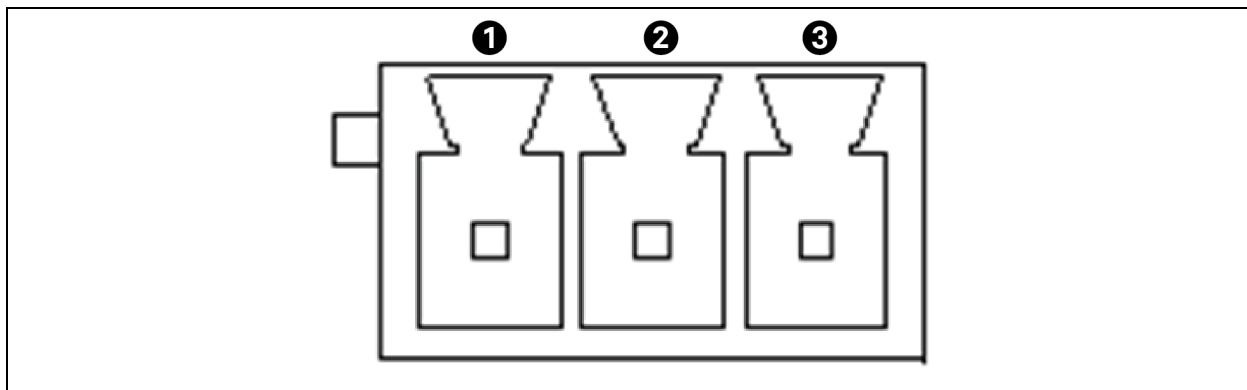
If an external EPO function is required, pins 1 and 2 or 3 and 4 are reserved for this function. The external EPO facility is also connected to the normally open or normally closed remote EPO switch between these two terminals using shielded cable. If this function is not required, pins 3 and 4 must be opened and pins 1 and the 2 must be closed.

NOTE: The EPO action of the UPS shuts down the rectifier, the inverter and the static bypass, but it does not internally disconnect the mains input power supply. To disconnect all power to the UPS, open the external power switch, bypass input switch, output switch and BCB after the EPO is activated.

4.2.8 X6 RS-485 Communication Port

The X6 RS-485 communication port is used for the host monitoring.

Figure 4.13 RS-485 X6 Port



RS-485: 1+, 2-. Set the port resistance to pin1 of SW1.

NOTE: This function is designed for internal use only.

4.2.9 Parallel and Load Bus Synchronization Communication Ports

See Figure 4.6 on page 38 for the positions of the parallel and LBS communication port.

4.2.10 Vertiv™ IntelliSlot™ Port

The Vertiv™ PowerUPS 9000 1250 kVA Modular UPS CE consist of IntelliSlot™ ports which allows field installation of the optional communication cards, including RDU120 card, IS-Relay card, SIC card 2.0, and 485 card. **Table 4.15** below describes the models and installation positions of the optional cards. For the detailed installation of the optional cards, see the respective contents in the [Options](#) on page 109.

Table 4.15 Models and Installation Positions of Optional Cards

Optional Card	Model	Installation Position
SIC card 2.0	UFSNC10	Intellislot™ ports 1 to 2 (port 1 recommended)
IS-Relay card	IS-RELAY	Intellislot™ ports 1 to 2
UF-RS-485 card	UF-RS-485	Intellislot™ port 1
RDU120 card	RDU120	Intellislot™ ports 1 to 2

NOTE: When using a SIC card or RS-485 card, it is necessary to set the IS RS-485 bus protocol to YDN23 on the HMI interface.

NOTE: When using the RDU120 card, it is necessary to set the IS RS485 Bus protocol to Velocity on the HMI interface.

NOTE: The RDU120 card can be inserted in either Intellislot™ port 1 or 2, or both. If you use the card simultaneously, you need to reset the node code of the second card. When using, it is necessary to set the protocol of IS RS-485 bus to Velocity.

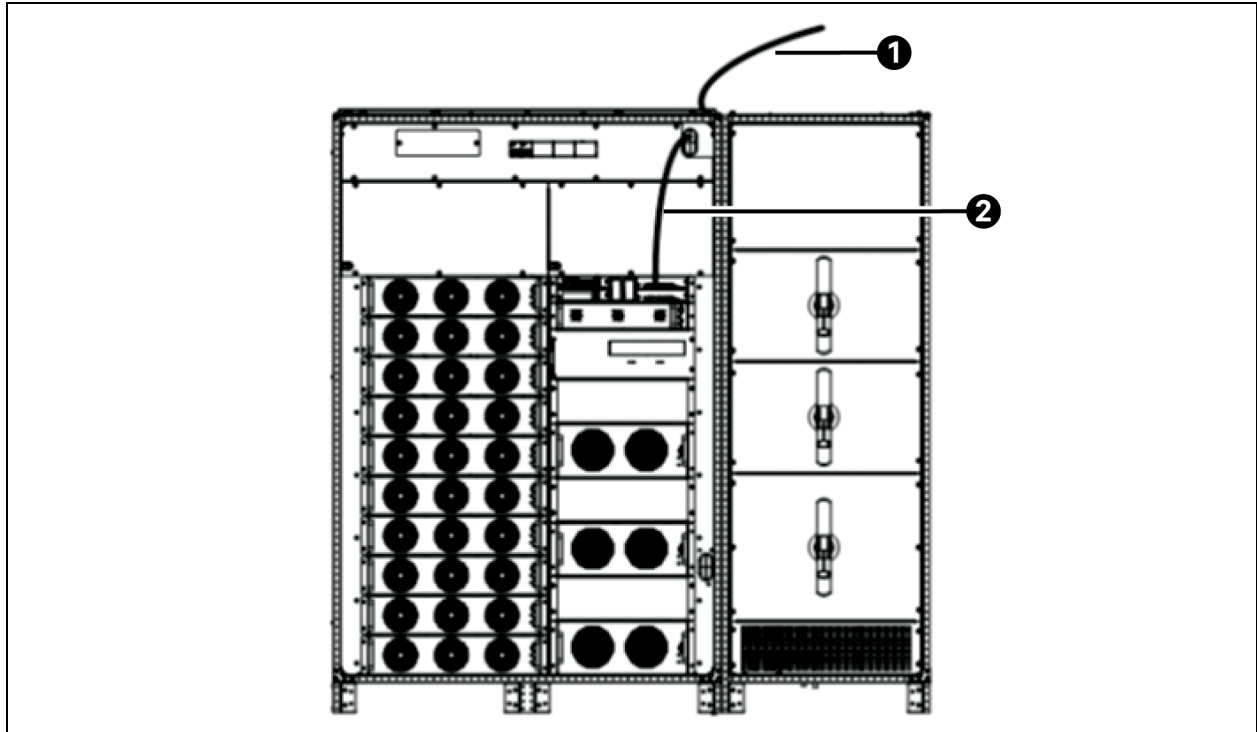
NOTE: SIC card and RS-485 card cannot be used with RDU120 card at the same time.

4.2.11 Signal Cable Connection Steps

NOTE: The power cables and signal cables should be routed respectively. The shielding coat of signal cable must be reliably earthed.

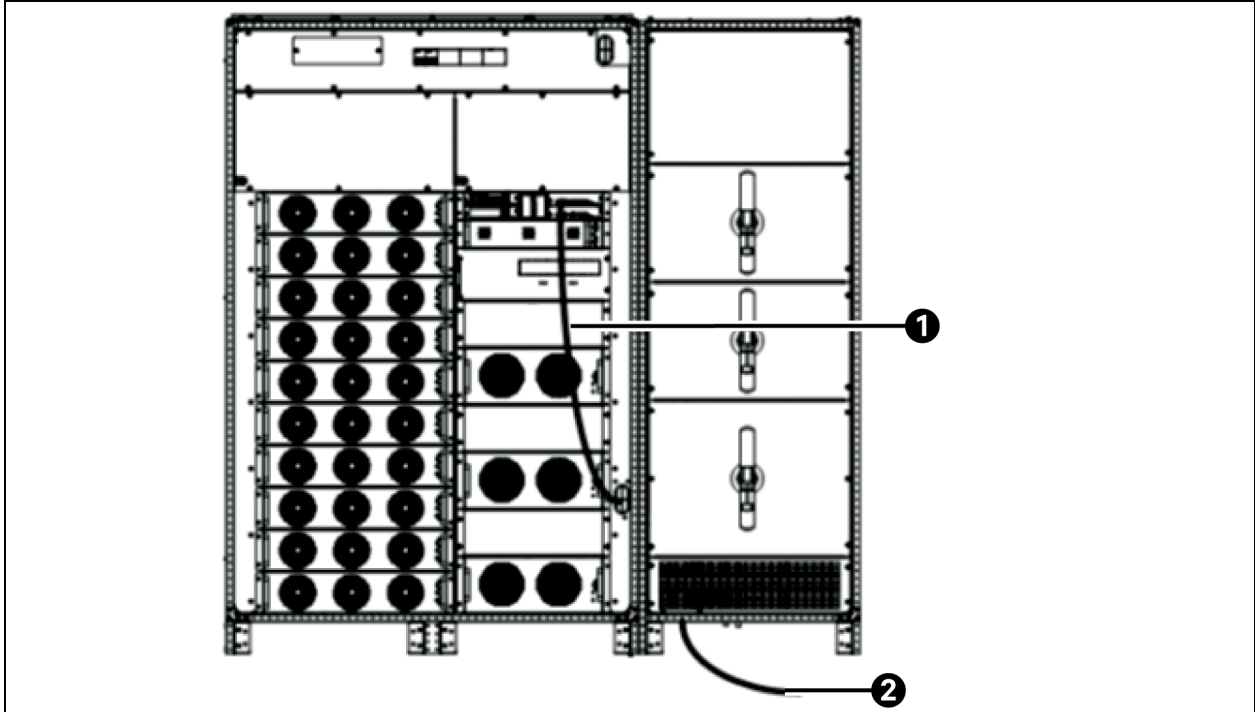
See **Figure 4.14** below and **Figure 4.15** on the facing page for cable routing of 1250 kVA UPS. See **Figure 4.6** on page 38 for communication port for connecting signal cables to respective ports.

Figure 4.14 Signal Cables Wiring Route of 1250 kVA (Top Cable Access)



Item	Description
1	Lead cable into the cabinet through the holes
2	Connect them to the corresponding terminals

Figure 4.15 Signal Cables Wiring Route of 1250 kVA (Bottom Cable Access)



Item	Description
1	Lead cable into the cabinet through the holes
2	Connect to the corresponding terminals

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5 Operator Control and Display Panel

5.1 Introduction

The integrated display of touchscreen control panel of the Vertiv™ PowerUPS 9000 1250 kVA Modular UPS CE simplifies monitoring and managing single or multiple UPS units. The control collects information about the health of the modules and presents it in a standardized format. This simple, dynamic display speeds operator response to changing power input and demand. Most of the settings depend on the UPS type and features. Other settings will be made during the UPS setup by Vertiv Tech service personnel. The PowerUPS 9000 1250 kVA Modular UPS CE touchscreen control panel display shows data either graphically or as text. The status scroll bar at the top of the touchscreen shows the system conditions. The bar changes color to indicate status and includes an icon matched to the status. The Status Gauge displays details as power demand from the connected load, input power quality, output and bypass on each phase and battery capacity.

5.2 Navigating through the Vertiv™ PowerUPS 9000 1250 kVA Modular UPS CE Touchscreen Control Panel

The PowerUPS 9000 1250 kVA Modular UPS CE touchscreen control panel is active when the UPS has input power. The Touchscreen on the front of the UPS permits:

- Login. See [Login to the Touchscreen Control Panel](#) on page 54.
- Silencing alarms. See [Silence an alarm](#) on page 56.
- Turning the UPS On. See [Inverter On](#) on page 57.
- Turning the UPS Off. See [Inverter Off](#) on page 58.
- Resetting faults. See [Reset Fault](#) on page 59.
- Enabling Energy Saving Mode. See [Energy Saving Mode Activation](#) on page 59.
- The ability to check the status of the UPS and its external batteries, including all measured parameters, events and alarms, see [Viewing UPS Status](#) on page 61.

The display of the touchscreen control panel has two panes. These are line graphic screen and Unit Status. The appearance can be changed to multiple panes that show other data.

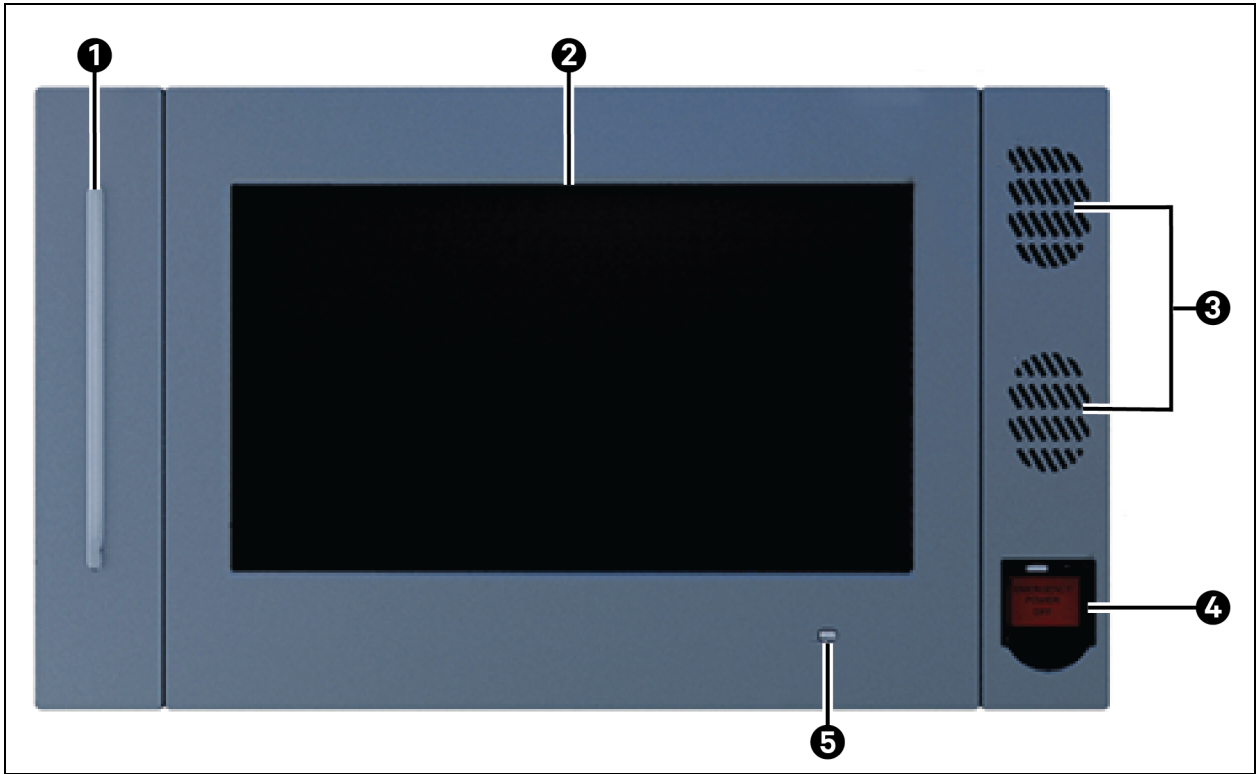


CAUTION: Risk of unauthorized changes to operational settings. Can cause equipment damage. The default PIN numbers should be changed immediately to prevent unauthorized personnel from changing UPS operation or even shutting down the UPS. The PINs for Operator and Administrator may be changed by logging in with either Administrator or Service level access.

5.2.1 UPS Touchscreen Control Panel Components

The main areas of the touchscreen control panel are shown in **Figure 5.1** on the next page and **Figure 5.2** on page 53. The display arrangement and the information displayed can be changed. At login for all access levels, the touchscreen control panel opens to the Status screen in graphic display. The Status screen will show the graphic screen and system status readings at each login level. The appearance differs only in the function menus displayed in **Figure 5.3** on page 53.

Figure 5.1 PowerUPS 9000 1250 kVA Modular UPS CE Touchscreen Control Panel Components



Item	Description	Item	Description
1	UPS Status LED	4	EPO Switch
2	Touchscreen LCD	5	UPS Status LED
3	Speakers (not used)		

Figure 5.2 Interface Overview — Status Screen Graphic Display

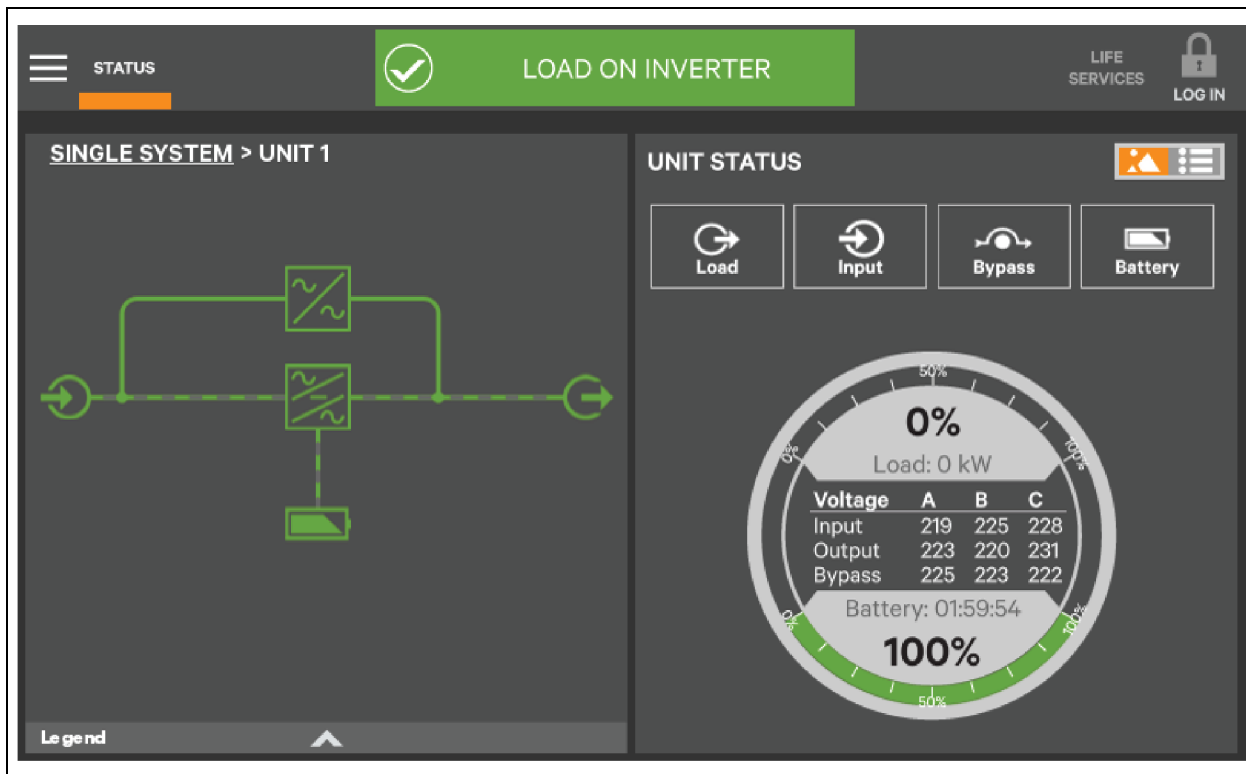
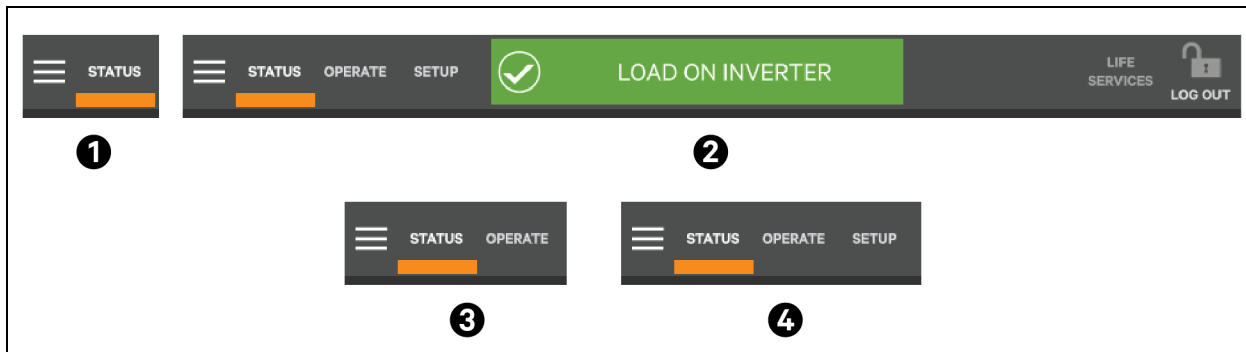


Figure 5.3 Control Display by Access Level



Item	Description
1	Observe level (or no login)
2	Service level
3	Operator level
4	Administrator level

Information and control are different under each Function Menu. The Function Menus displayed are specific to the access level.

- **Status:** Condition of the UPS components and data affecting operation and performance. Visible to all access levels.

- **Operate:** UPS operation controls, such as inverter on, inverter off, energy saving status. Visible to Operator, Administrator and Service.
- **Setup:** Manage permissions through PINs. Visible to Administrator and Service.
- **Service:** Input wiring and breaker configuration, protocol used and battery charging method. Visible to Service.

5.3 Operation

5.3.1 Login to the Touchscreen Control Panel

The PowerUPS 9000 1250 kVA Modular UPS CE touchscreen control panel provides security by limiting the user access to change how the UPS operates. There are 4 access levels.

- **Observer:** Viewing permission only; can choose graphic or text display. No PIN is required.
- **Operator:** Permission to start the UPS, shut the system down, reset faults and enable or disable ECO Mode operation. PIN is required.
- **Administrator:** All functions of Operator plus permission to change PINs for Operator and Administrator level. PIN is required.
- **Service:** All functions of Administrator plus permission to alter system configuration, choose serial communication protocol, enable equalize battery charging and change Service PIN. PIN is required.

Vertiv Tech Services provide PINs when setting up the UPS. These default PINs may be changed by those with Administrator or Service access.

Default PINs are:

- **Operator:** 1234



CAUTION: Risk of unauthorized changes to operational settings. Can cause equipment damage. The default PIN numbers should be changed immediately to prevent unauthorized personnel from changing UPS operation or even shutting down the UPS. The PINs for Operator and Administrator may be changed by logging in with either Administrator or Service level access.

The Vertiv™ PowerUPS 9000 1250 kVA Modular UPS CE touchscreen control panel is On when the UPS has control power. It is inactive and appears dark, depending on its settings. Touch the touchscreen to turn it On.

To log in to the PowerUPS 9000 1250 kVA Modular UPS CE touchscreen control panel:

1. Touch the log In icon at the top right of the screen. The lock and background change color a prompt, PIN Required screen, is displayed.
2. Enter a PIN at the prompt using the keypad on the touchscreen.
3. Touch Enter.

NOTE: If you enter an incorrect PIN, a prompt stating the PIN is invalid is displayed.

Figure 5.4 Log In Screen



5.3.2 Operator Controls

The Operator login enables control of UPS functions:

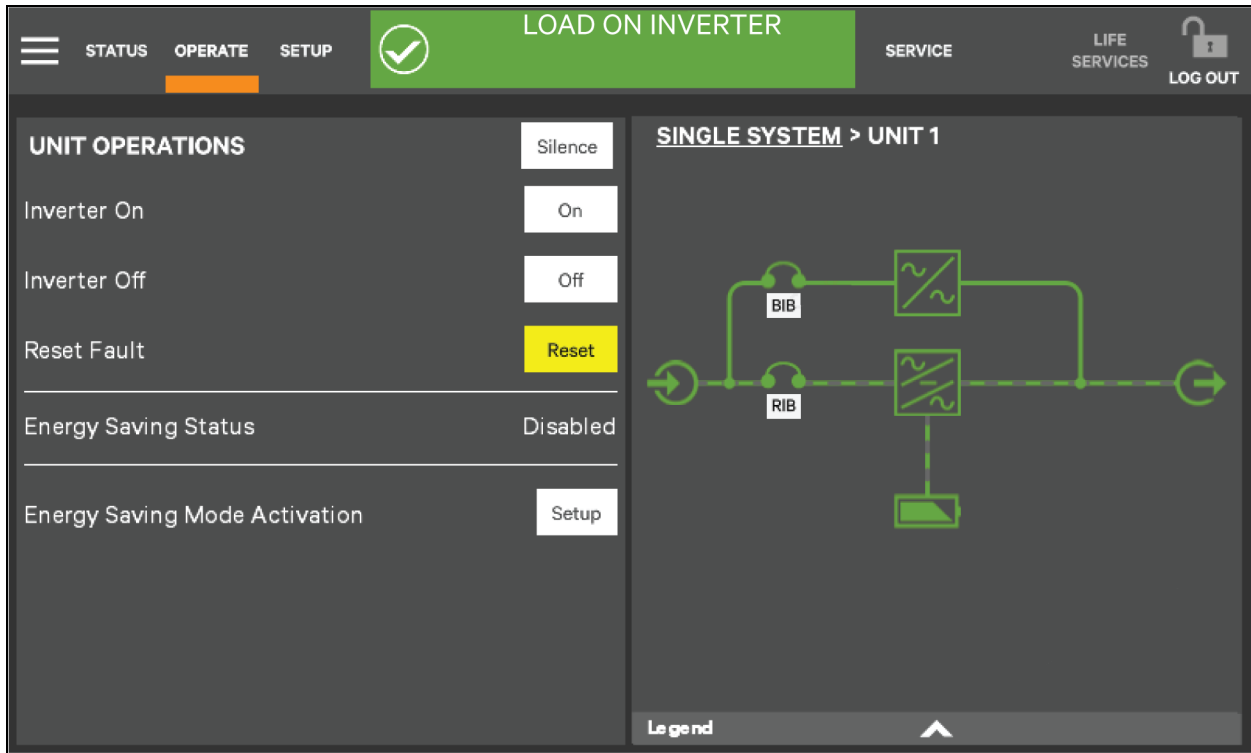
- Silence (Alarm)
- Inverter On
- Inverter Off
- Reset Fault
- Energy Saving Mode Activation
- Battery Operations

Each command is available under the Operate menu. The Operate menu may be used by logging in with Operator, Administrator, and Service access.

Operate menu commands

All Operator commands are available from the Operate menu. The menu is available when the UPS has input power. The UPS need not be supplying power to the load for the menu to be available. The graphic screen is not linked to data in this view touching a component will not cause it to display data.

Figure 5.5 Operate Menu



! **CAUTION:** Risk of improper operation. Can cause load drop resulting in equipment damage. The Inverter On, Inverter Off, Reset Fault and Energy Saving Mode Activation commands will be available whenever the UPS is operating. Before executing any command, verify that the UPS status is suitable for the command to be performed.

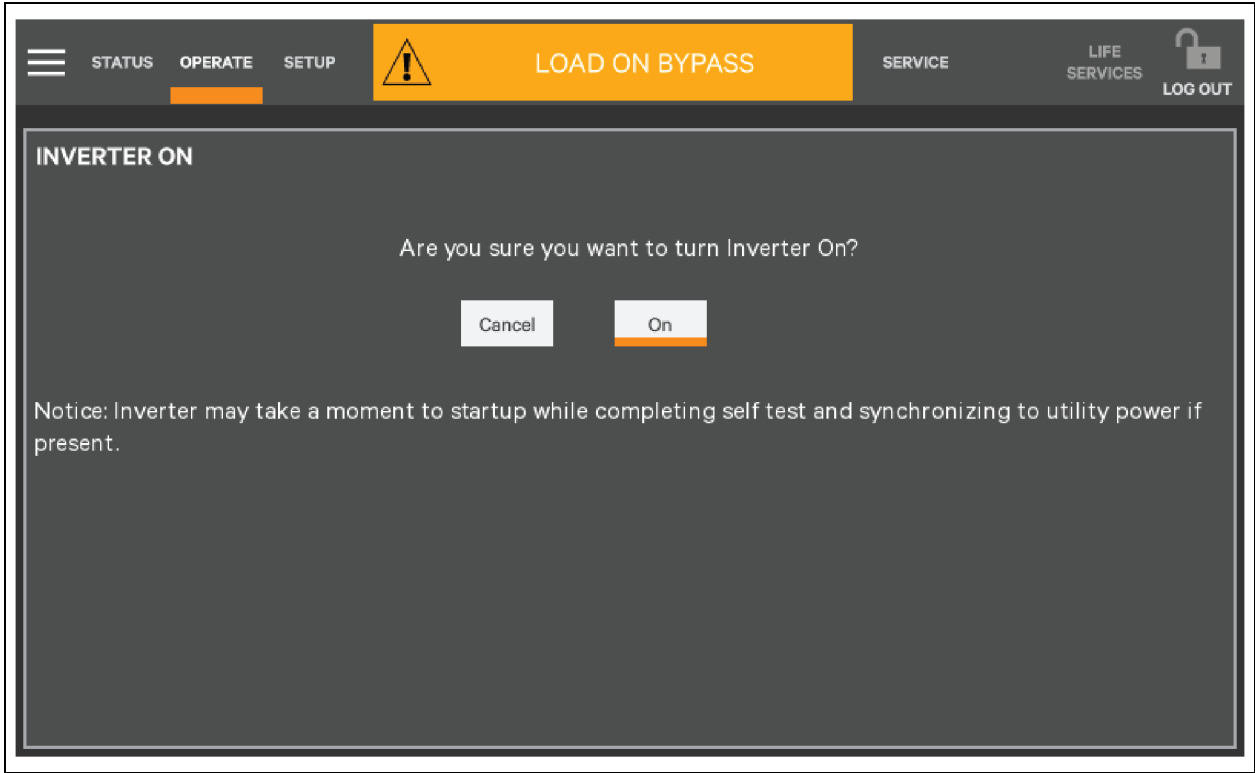
Silence an alarm

To silence an alarm, touch the Silence radio button at the top of the panel. The time the alarm will remain silenced varies, depending on the UPS type, type of alarm, and configuration.

Inverter On

The Inverter On menu item is available when the UPS has input power and the inverter is off. Before executing the command, verify that the UPS is prepared for the inverter to start. When the operator access is shown, commands are the same for all access levels. The Vertiv™ PowerUPS 9000 1250 kVA Modular UPS CE touchscreen control panel displays a message asking for confirmation. Touch On to confirm, see **Figure 5.6** below. The control then displays a progress window while the inverter starts.

Figure 5.6 Inverter On Screen



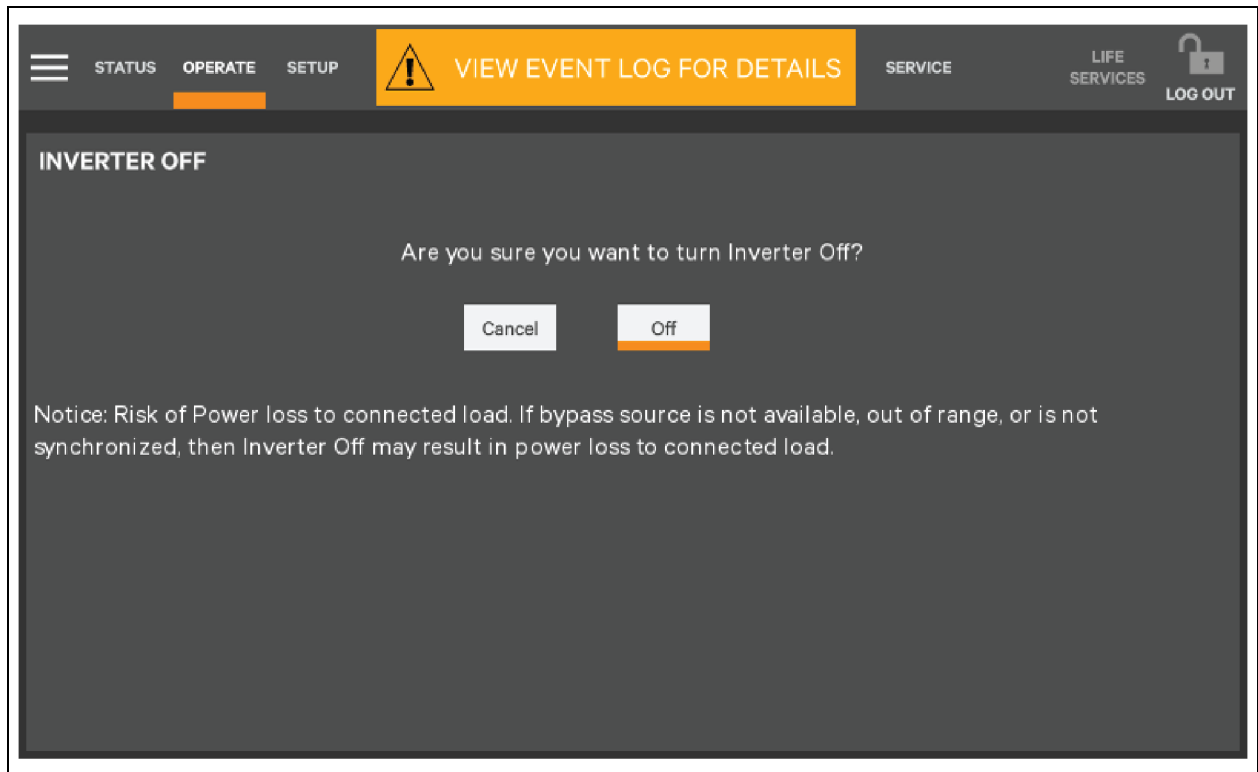
Inverter Off

The Inverter Off menu item is available whenever the UPS has input power and the inverter is off. Before executing the command, verify that the UPS and connected load are prepared for the inverter to be shut down. Touch Off to turn the inverter off.



CAUTION: Risk of improper operation. Can cause load drop resulting in equipment damage. The Inverter Off will shut off power to the connected load unless bypass power is available. Before executing this command, verify that the connected load is either shut off or that input power to the load will be supplied by another source, such as bypass.

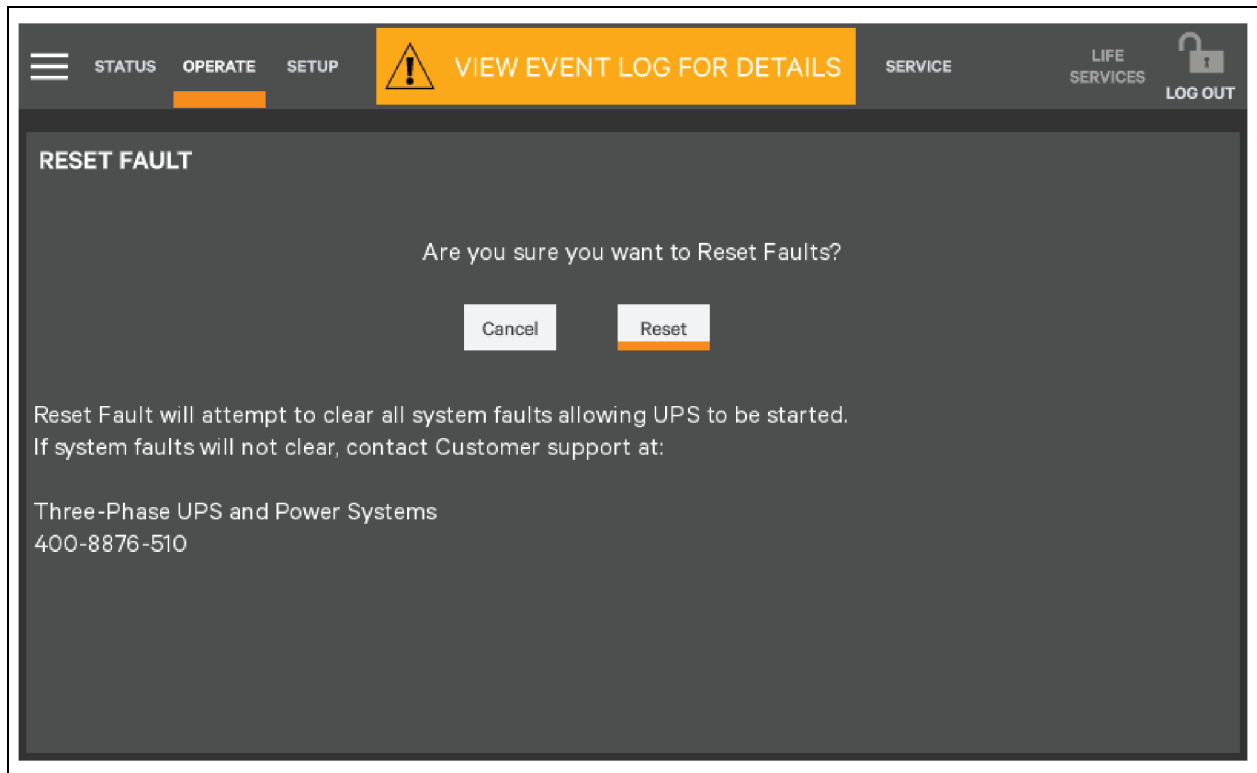
Figure 5.7 Inverter Off Screen



Reset Fault

Reset faults by touching the Reset button.

Figure 5.8 Reset Fault Screen



Energy Saving Mode Activation

NOTE: Read this manual carefully before activating energy saving mode. Only an Operator enable or disable Energy Saving Mode. The available modes vary according to the UPS type and system configuration. The types available must be set up by either Administrator or Service personnel.

Energy Saving Mode may be activated or deactivated through the Operate menu screen. Two modes are available as ECO Mode and Intelligent Parallel Mode.

ECO Mode permits the UPS to reduce power consumption by powering the load through bypass power when utility supplied power is within acceptable ranges. The inverter will remain in a state that will permit it to resume supplying power if the utility power goes outside acceptable ranges.

Intelligent paralleling puts units in sleep mode until required.

To activate or deactivate Energy Saving Mode:

1. Touch the Setup button for Energy Saving Mode Activation.
2. Enable or disable Energy Saving Mode.

3. Touch the Save button. The Save button is inactive until the activation state is changed.

Figure 5.9 Activating Energy Saving Mode

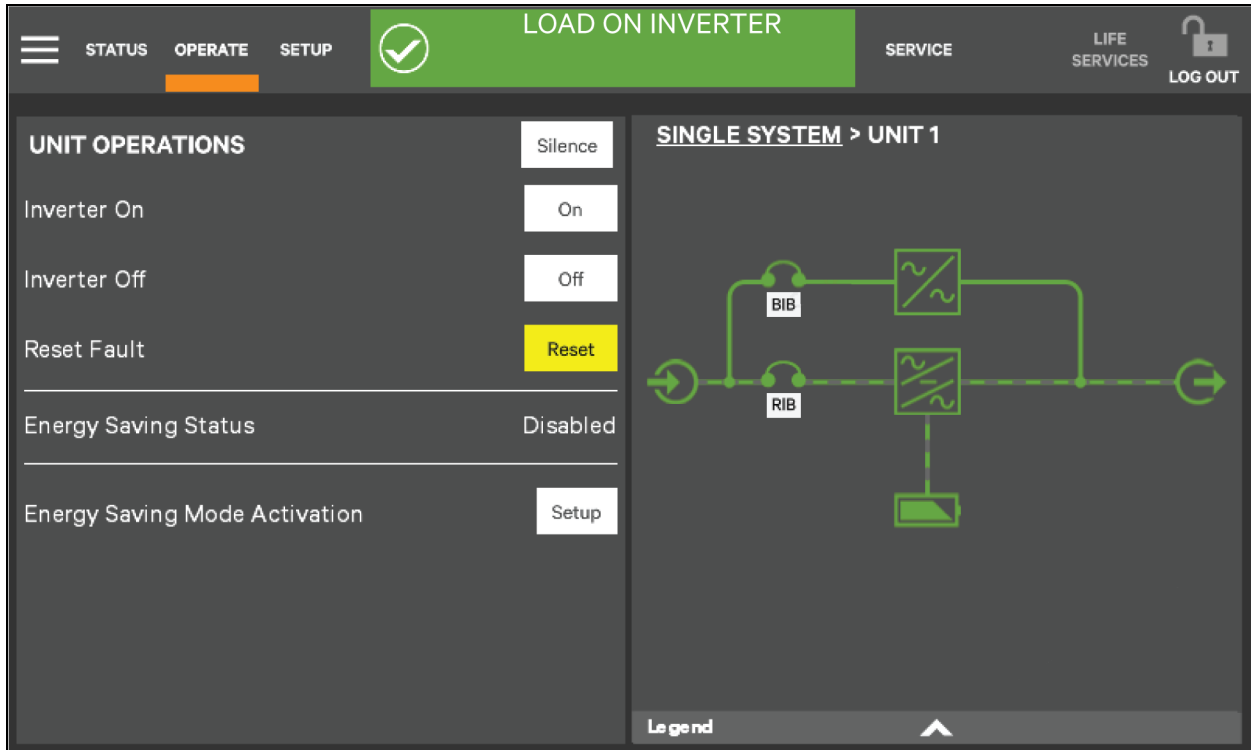
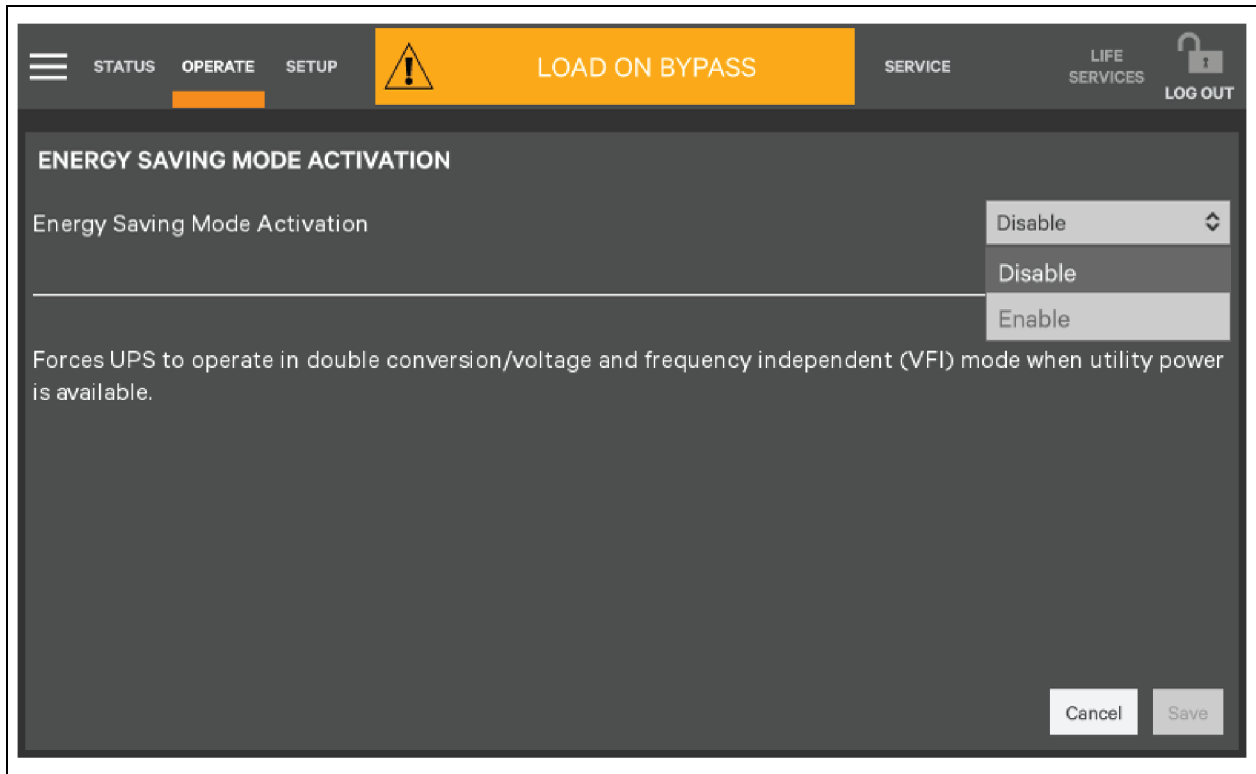


Figure 5.10 Energy Saving Mode Activation



5.4 Viewing UPS Status

The Vertiv™ PowerUPS 9000 1250 kVA Modular UPS CE Touchscreen display reports UPS status in multiple ways. The graphic views and text views will show the same readings.

5.4.1 Status Bar Components

The status bar indicates UPS status by:

- Changing color. Color indicators are green for normal, yellow for warning, and red for alarm.
- Showing an icon inside the bar, shown in **Figure 5.11** on the next page.

Figure 5.11 Status Bar Messages



Up to three messages may scroll through the status bar to the right of the status icon. Each message will have a duration of 4 seconds, except they change immediately if the system’s status changes.

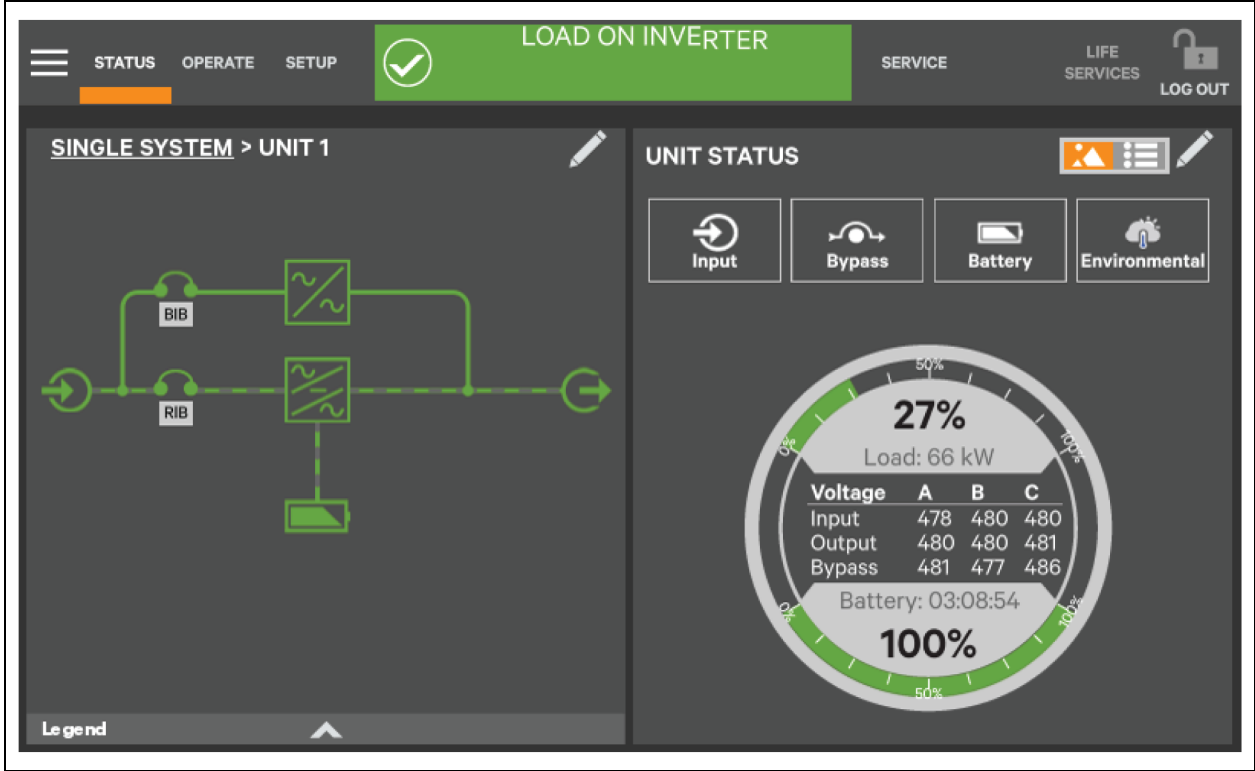
Alarms and certain events trigger audible alarms and the LED on the bezel, the light bar and the status header change color. (Audible alarms do not sound unless enabled.) The scrolling information bar at the top of the interface summarizes information about the UPS status. The Status Gauge on the Unit Status pane gives additional details about the UPS status.

5.4.2 Viewing UPS Data with the Status

The Status Gauge offers a quick summary of the UPS status. The information shown depends on the type of UPS and its configuration and upon the choices made in the gauge setup. The data can be chosen by someone with Administrator or Service access.

The additional data will not replace the information shown in the center of the Status Gauge. Touching the center of the Status Gauge multiple times on to cycle through the data.

Figure 5.12 Default Status Gauge View



5.4.3 Viewing UPS Data with the Status Panel

More detailed information about the UPS status is readily available through the Status panel. Touching a component in the graphic screen display brings up data about the component on another pane. Touching a parameter icon on the Unit Status pane shows details about that parameter.

The same data can be viewed by switching to the text view. The length of the lists and order of the details may require scrolling to find the desired data.

NOTE: A parameter must be visible on the graphic view of the Unit Status screen for details to be viewed, even in the text view.

Figure 5.13 Unit Status — Input Details

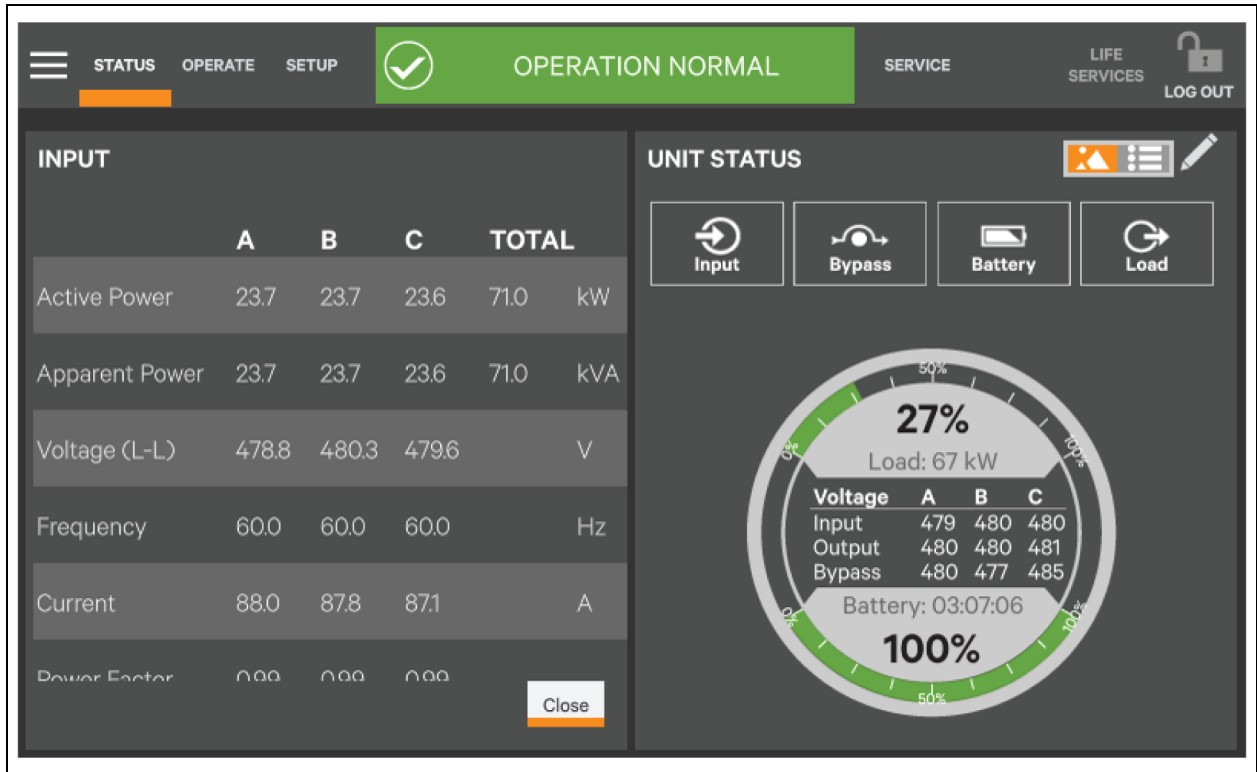


Figure 5.14 Unit Status — Bypass Details

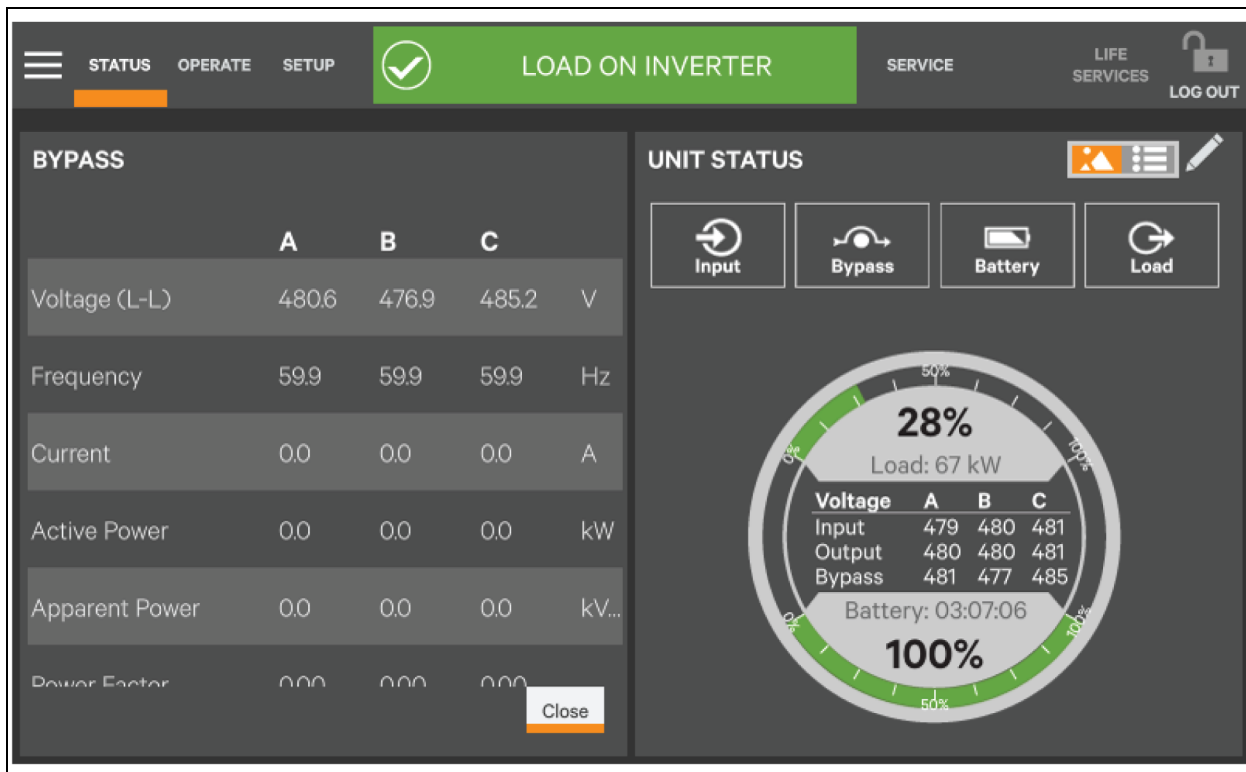


Figure 5.15 Unit Status — Battery Details

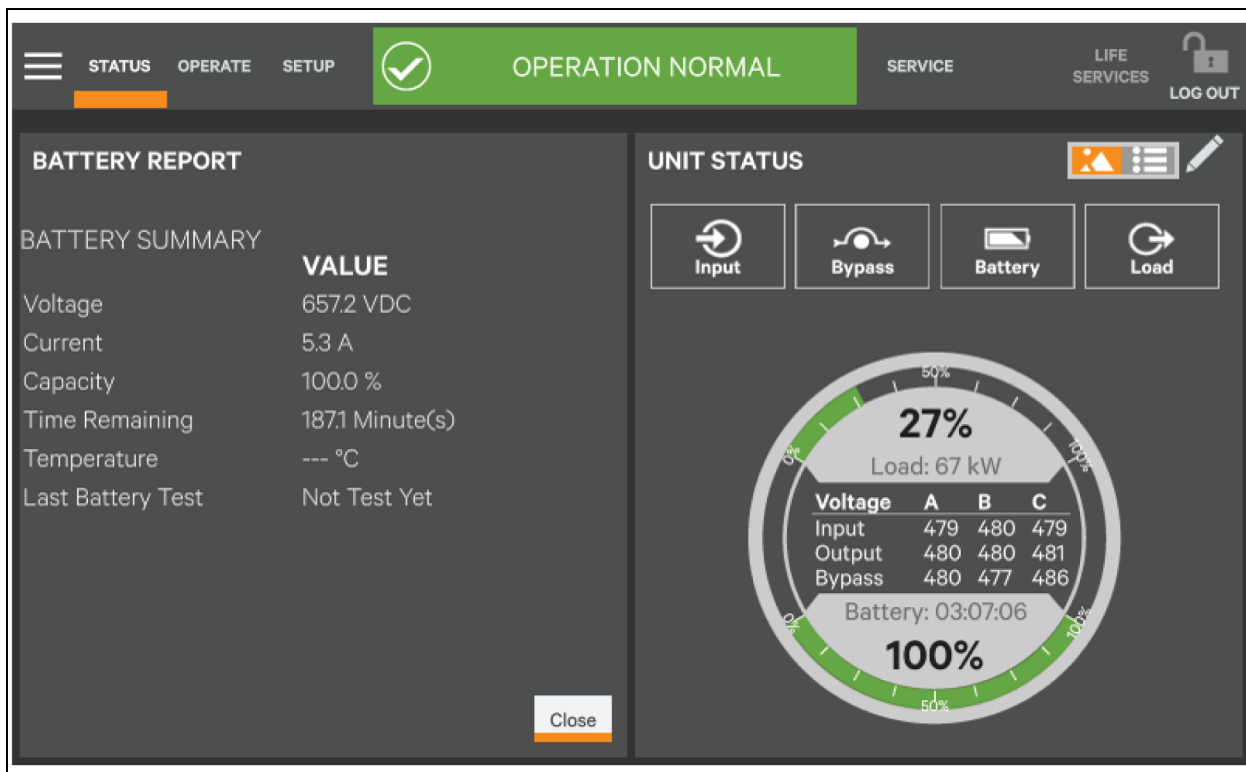
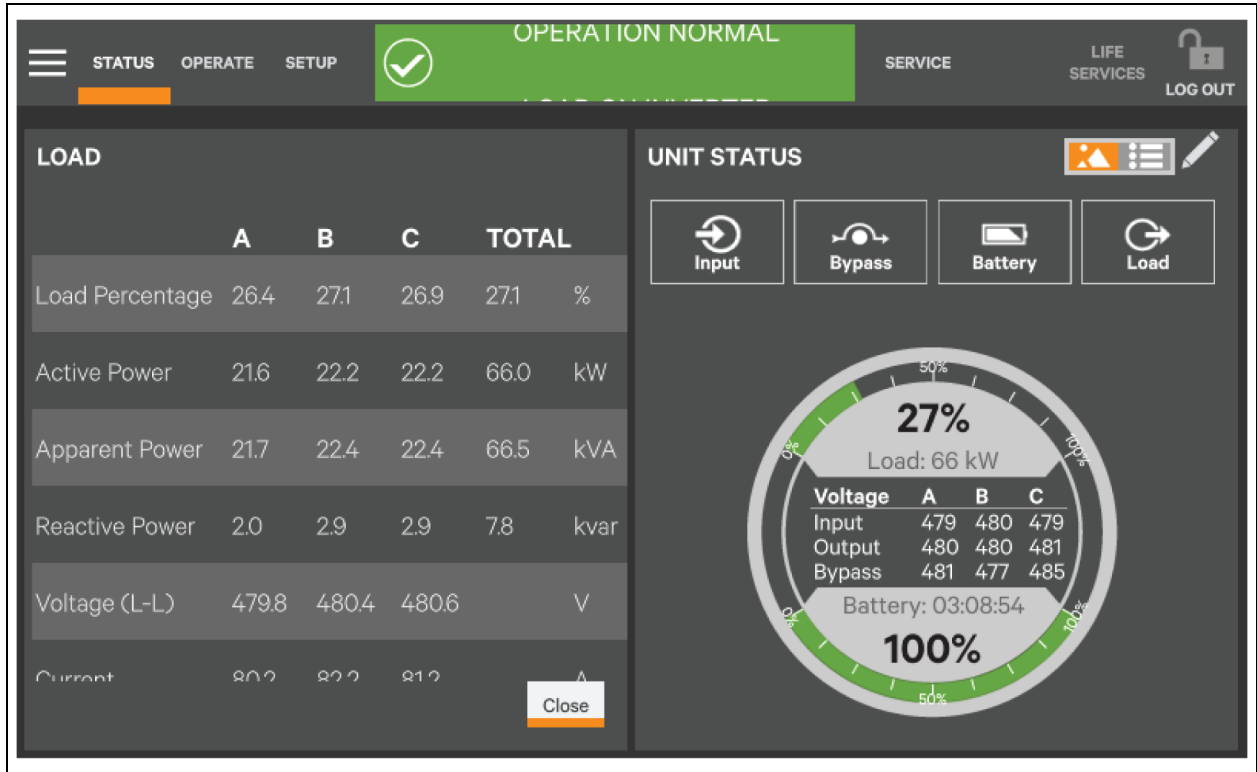


Figure 5.16 Unit Status — Load Details



5.4.4 Logs Alarms and Events

The Context Menu, when opened from the Status pane, permits viewing logs of alarms and events that have occurred on the UPS. Both logs include the date and time of occurrence, type, an ID, component affected and a description of the alarm or event. The information is available to Observers, those who are able to without a log in passcode.

To view the alarms or events:

1. Navigate to the Status pane, if required.
2. Touch the Context Menu.
3. Touch the log to view, alarms or events. See **Figure 5.17** on the facing page.

Touch the logs to see the UPS event log screen.

Touch Alarms to open a list of alarms.

Figure 5.17 View Alarms or Events

The screenshot shows the 'ALARM ACTIVE - WARNING' interface. At the top, there are navigation tabs: STATUS (selected), OPERATE, and SETUP. A yellow warning banner displays a warning icon and the text 'ALARM ACTIVE - WARNING'. On the right, there are links for 'LIFE SERVICES' and 'LOG OUT'. Below the banner, there are buttons for 'Reset Fault', 'Silence', and 'Filter'. The main area is titled 'EVENTS' and contains a table with the following data:

Date/Time	Type	ID	Com.	Description	Wave
23/2/2 PM2:56	✓	39F1	BYP	Module Comms. Normal	
23/2/2 PM2:57	⚠	3081	HMI	Load on Bypass	
23/2/2 PM2:56	✓	3011	HMI	Silence Active	
23/2/2 PM2:56	✓	39F1	MCM	Module Comms. Normal	
23/2/2 PM2:56	⚠	2021	PM1	No Battery	
23/2/2 PM2:56	✓	39F1	PM1	Module Comms. Normal	
23/2/2 PM2:56	⚠	2021	PM2	No Battery	
23/2/2 PM2:56	✓	39F1	PM2	Module Comms. Normal	

Figure 5.18 Event Logs of Alarms or Events

The screenshot shows the 'VIEW EVENT LOG FOR DETAILS' interface. At the top, there are navigation tabs: STATUS (selected), OPERATE, and SETUP. A yellow banner displays a warning icon and the text 'VIEW EVENT LOG FOR DETAILS'. On the right, there are links for 'LIFE SERVICES' and 'LOG OUT'. Below the banner, there are buttons for 'Export' and 'Filter'. The main area is titled 'EVENT LOG' and contains a table with the following data:

Date/Time	Type	ID	Status	Com.	Description	Wave
23/2/2 PM2:57	Warning	3081	Set	HMI	Load on Bypass	
23/2/2 PM2:57	Critical	30B1	Clr	HMI	Load Off	
23/2/2 PM2:57	Critical	30B1	Set	HMI	Load Off	
23/2/2 PM2:57	Critical	39A1	Clr	HMI	Power Hardware Mismatch	
23/2/2 PM2:57	Info	10B1	Clr	PM2	Inverter in Setting	
23/2/2 PM2:57	Info	10B1	Clr	PM1	Inverter in Setting	
23/2/2 PM2:57	Info	1881	Clr	BYP	Bypass in Setting	

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6 Single UPS Operation

This chapter briefly describes the operating precautions and routine operations for the Vertiv™ PowerUPS 9000 1250 kVA Modular UPS CE single module. For the operating precautions and routine operating methods of UPS parallel system, see [Parallel System and Load Bus Synchronization System](#) on page 97.

6.1 Introduction

6.1.1 Precautions

NOTE: The user can perform the next operation only after the authorized engineer completes the first power On and test of the UPS.



WARNING! Risk of electric shock and hazardous voltage of mains system and battery. The improper operation can cause equipment damage, personnel injury or death. The AC input and output terminals of the UPS have dangerous voltage. If the cabinet is equipped with an EMC filter, the filter may have dangerous voltage.

There are no operator serviceable parts are located behind the covers that require a specific tool for removal. Only a qualified service engineer can remove the covers.

1. For the detail operation procedure of the control keys and touch screen, see [Operator Control and Display Panel](#) on page 51.
2. The audible alarm sounds at various points during operation procedures. The alarm canceled at any time by pressing the Silence On/Off key.
3. When UPS uses traditional lead acid battery, the system provides boost charge optional function. If the lead acid battery is used, when the mains returns after an extended mains failure, the charging voltage of the battery will be higher than the normal charging voltage. This is normal, and the charging voltage of the battery will return to normal value after a few hours charging.

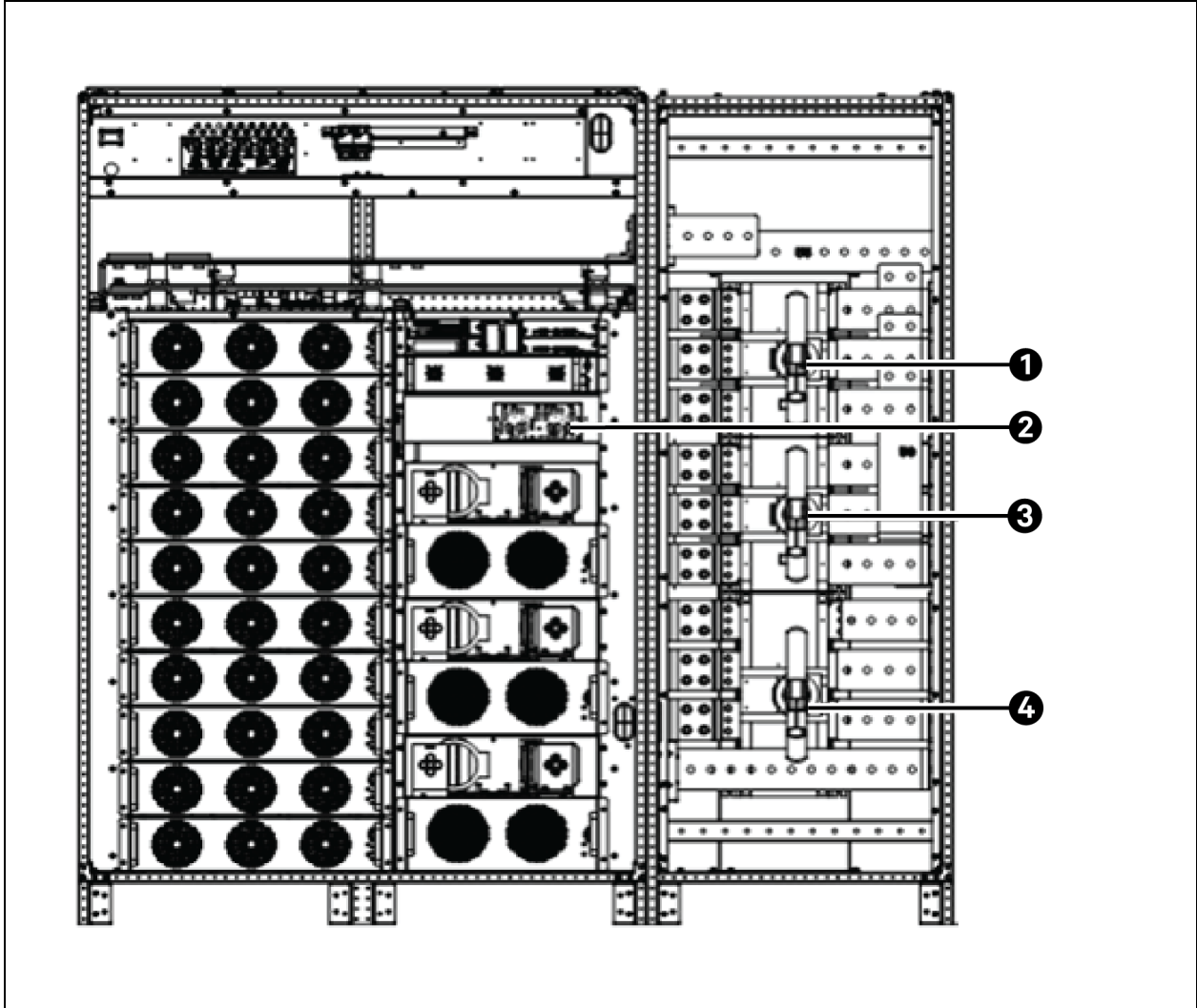
6.1.2 Power Switch

The power switches are inside the PowerUPS 9000 1250 kVA Modular UPS CE cabinet, that can be accessed by opening the front door of the UPS as shown in **Figure 6.1** on the next page, which includes the below switches:

- Q1 Rectifier input switch which connects the UPS to the main circuit power.
- Q2 Bypass input switch which connects UPS to the bypass.
- Q5 Output switch which connects UPS output to the load.

NOTE: If the UPS system consists of more than two parallel UPS modules, do not use the internal maintenance bypass switch.

Figure 6.1 UPS Power Switch Three Switches (1250 kVA)



Item	Description
1	Q1
2	Lightning arrester
3	Q2
4	Q5

6.2 UPS Startup Procedures

The Vertiv™ PowerUPS 9000 1250 kVA Modular UPS CE must be completely installed and commissioned before startup by an authorized engineer. The external power supply switch must be closed. After these conditions are met, the UPS can be started.

6.2.1 Startup Procedures in Normal Mode



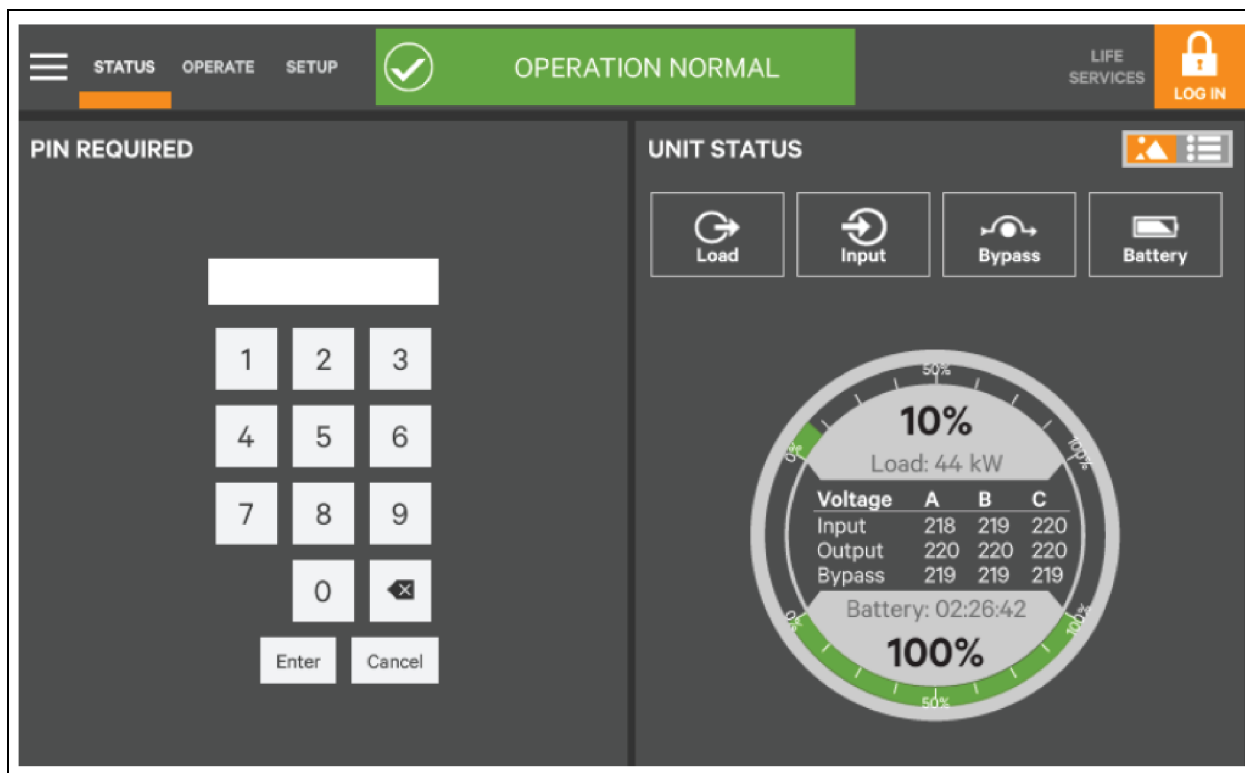
WARNING! If any load equipment is connected to the UPS output terminals, check with the user that it is safe to apply power. If the load is not ready to receive power, please disconnect the downstream load switch and stick a warning label on the connection point of the load. These procedures result in mains voltage being applied to the UPS output terminals.

To start the UPS from a fully powered down condition, follow the below procedure:

1. Open the front door of the UPS, ensure that the input cables and PE bars are reliably connected.
2. Close the external input switch, ensure that the UPS input voltage, frequency, and phase are normal.
3. Close the output switch Q5, bypass input switch Q2, rectifier input switch Q1, and all external output isolating switches (if any) of the UPS in turn. The system is powered On and the startup screen opens.

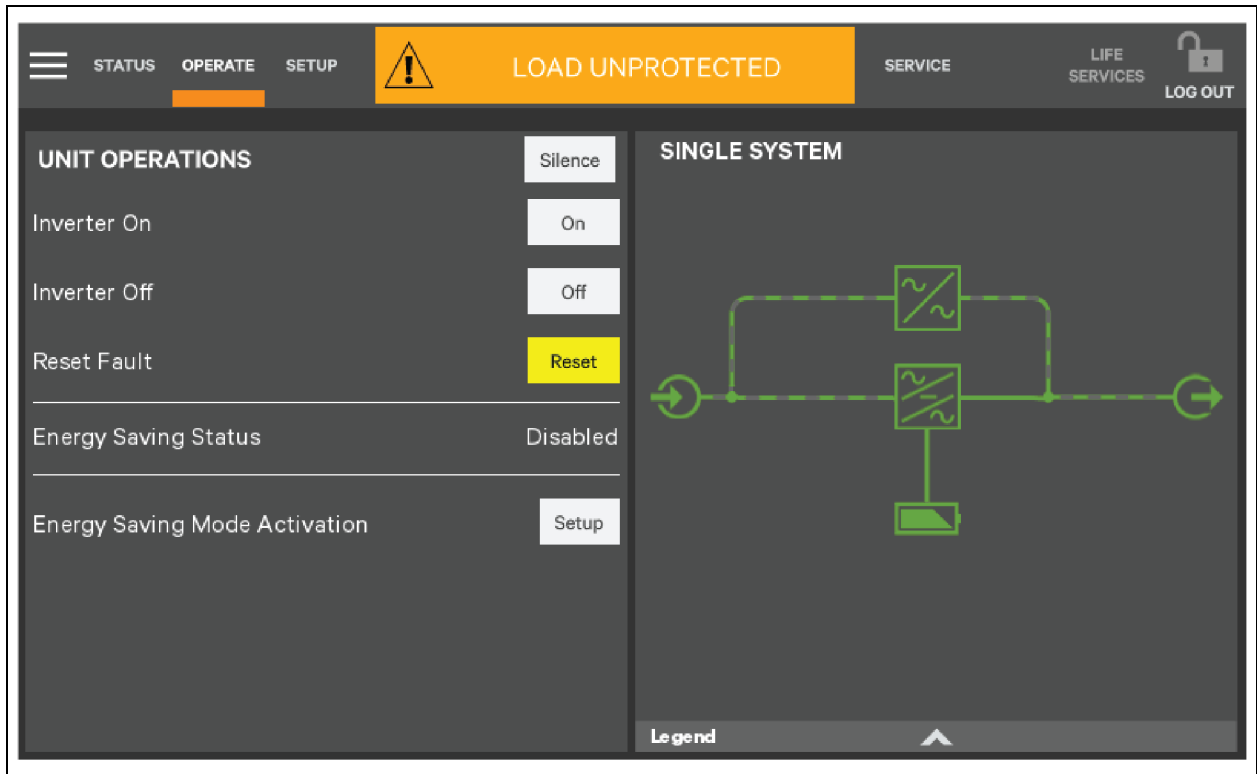
After the touchscreen start, touch Log in icon to enter the system by typing correct password.

Figure 6.2 Inputting Password



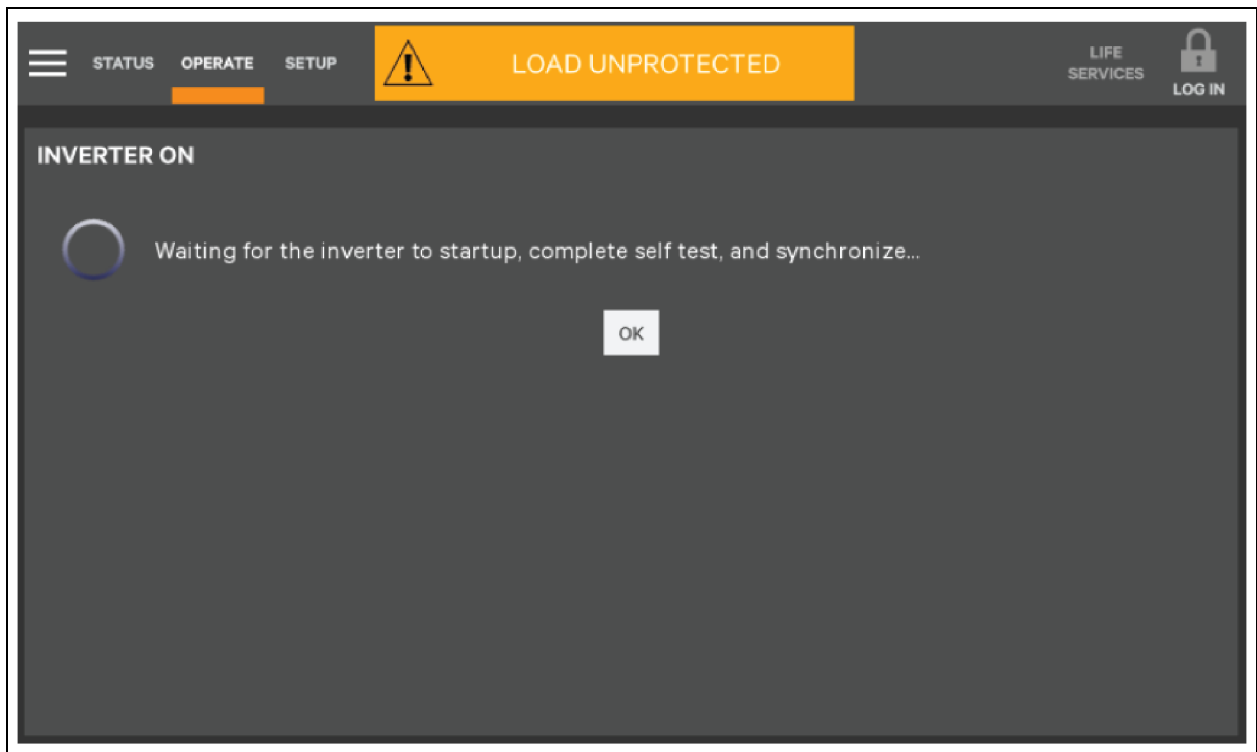
4. When the rectifier start process is finished, close BCB and the system runs in bypass mode. Power flow shown in [Figure 6.3](#) on the next page. Touch the On. See [Operator Controls](#) on page 55 for more information.

Figure 6.3 Selecting Inverter On Key



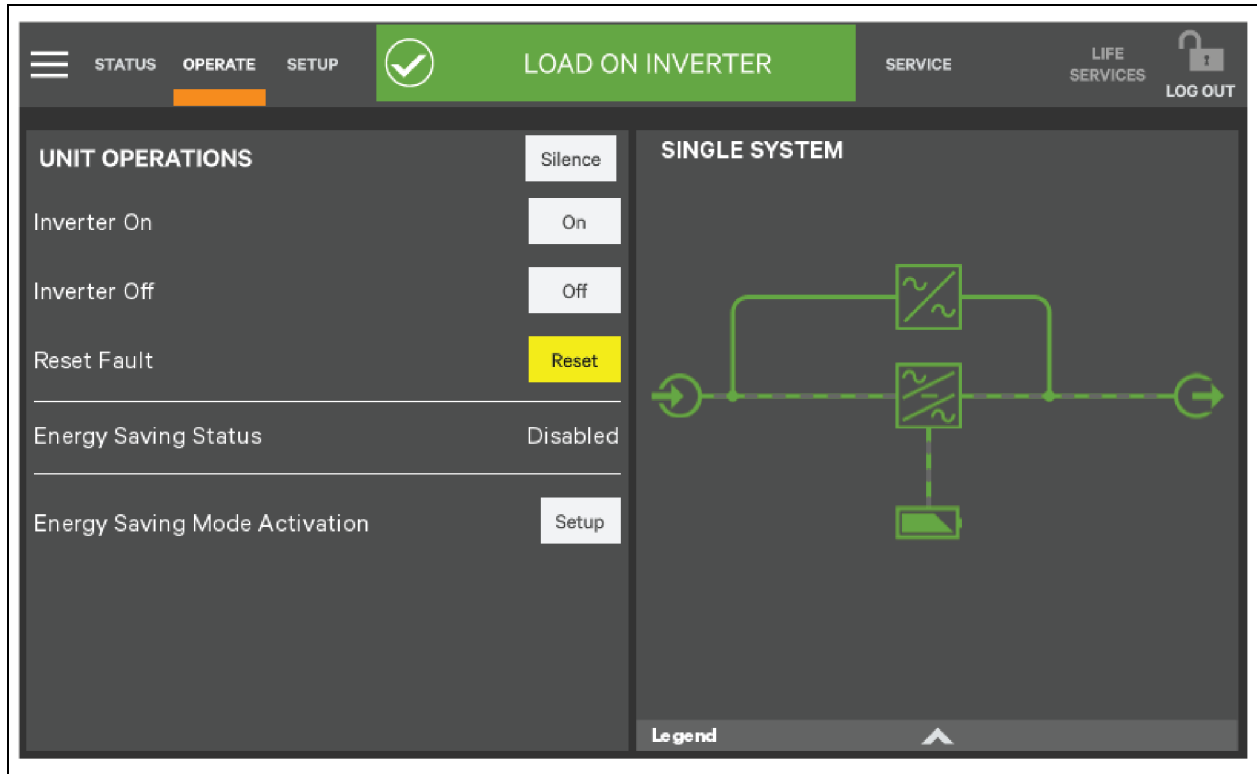
- 5. The inverter starts a self-test and synchronize.

Figure 6.4 Inverter Self-Test and Synchronize



- Startup is finished.

Figure 6.5 Start Up Finished



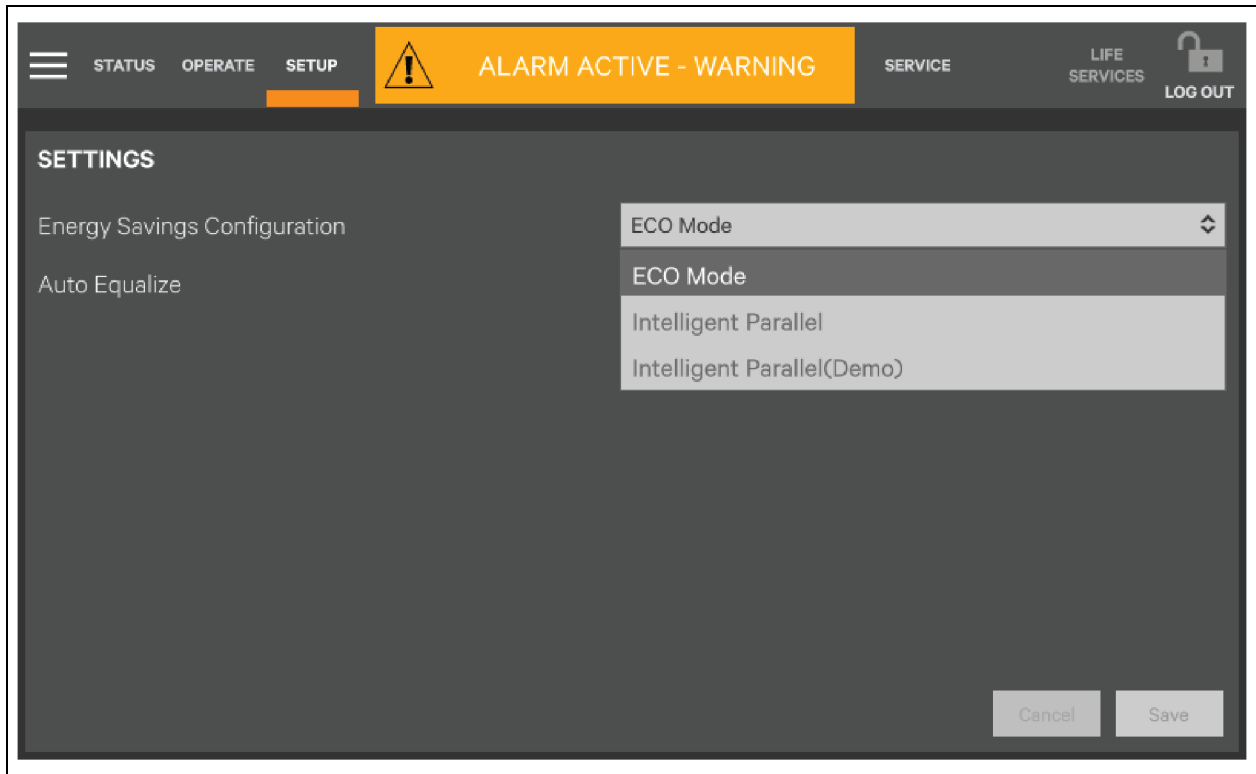
6.2.2 Startup Procedures in ECO Mode

- Open the front door of the UPS, ensure that the input cables and copper bars are reliably connected.
- Close the output switch Q5, bypass input switch Q2, rectifier input switch Q1, and all external output isolating switches (if any) of the UPS in turn.

The system is powered on and the startup screen activates.

- If ECO mode is required, contact a Vertiv service engineer to set it through the setting software. If you wish to set it by yourself, you can enable it through the sub-menu under setup on Touchscreen. For details, see [Operator Controls](#) on page 55.
- Touch Setup next to the Energy Saving Mode Activation.
- In the drop-down menu, touch ECO Mode.
- Touch Save.

Figure 6.6 Setting ECO Mode



7. When the rectifier is started, start the system according to [Startup Procedures in Normal Mode](#) on page 71.

After the inverter is running normally and if the bypass voltage is within the range of ECO power supply, then the system works in ECO mode; otherwise the system will transfer to inverter. The system will automatically work in ECO mode after the bypass voltage is within the range of ECO power supply and lasts for five minutes.

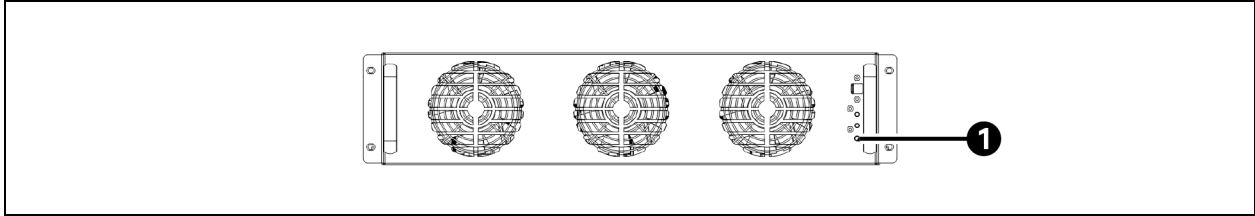
6.2.3 Startup Procedures in Battery Mode (Battery Cold Start)

1. Verify that the battery has been connected, close the battery loop switch, and the battery voltage is transferred to the input terminal of the battery.
2. Wait for 30 seconds after the battery path switch is closed.
3. Press the battery cold start button. See **Figure 6.7** on the facing page for its position of any power module.
4. When the rectifier starts, start the system according to steps 4 to 6 in Section [Startup Procedures in Normal Mode](#) on page 71.



WARNING! Start the UPS strictly following the above procedures. Press and hold the battery cold start button for 1 second to perform the above procedures. Do not press the battery cold start button before switching on the BCB.

Figure 6.7 Battery Cold Start Button



Item	Description
1	Battery cold start button

6.3 Procedures for Transfer Between Operation Modes

6.3.1 Transfer from Normal Mode to Battery Mode

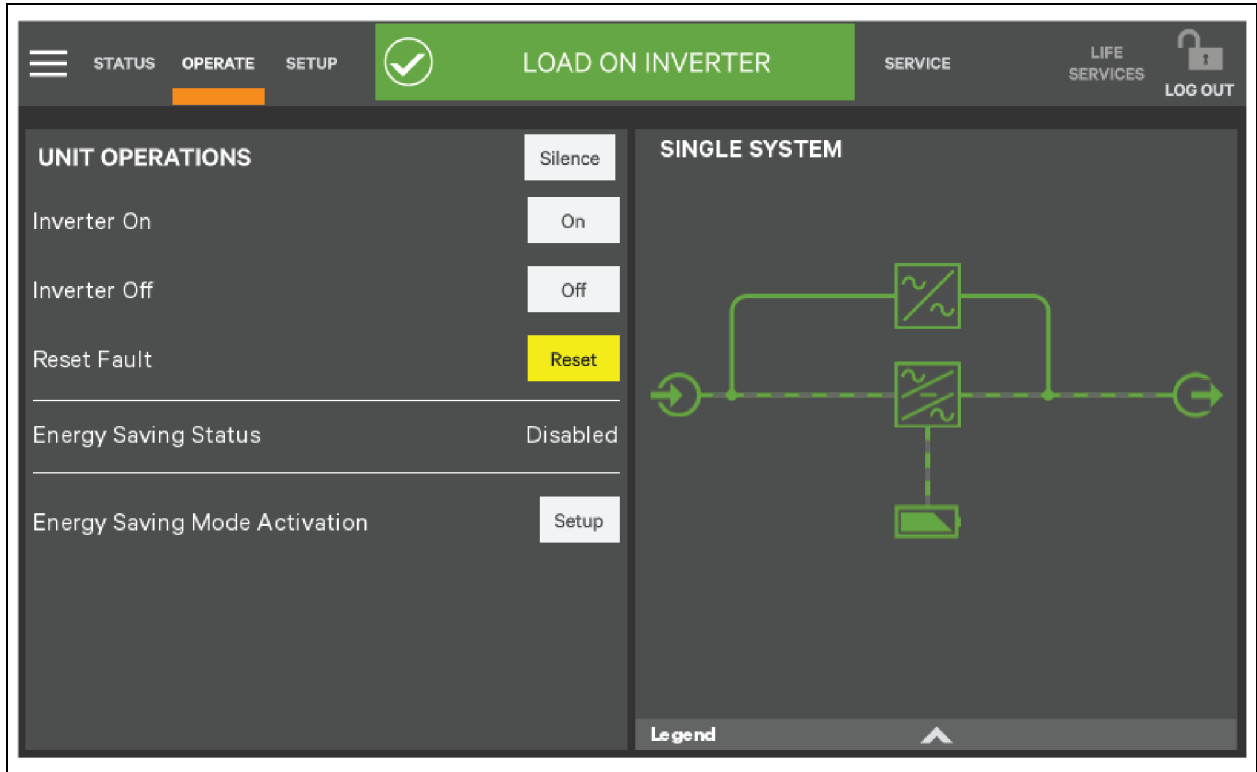
Open the external power switch to isolate the mains power and initiate the UPS on battery mode. To transfer the UPS back to normal mode, close the external power switch to reconnect the mains power to the UPS. The power modules start one by one according to the interval set in the UPS background, and the UPS recovers to normal mode.

6.3.2 Transfer from Normal Mode to Bypass Mode

Procedure to transfer the load from the normal mode to the bypass mode.

1. Activate the system and log in to the system.
2. Touch the Operate tab.
3. Touch the Off button next to the Inverter Off. The UPS transfers to bypass mode, see **Figure 6.8** on the next page for more information.

Figure 6.8 Transfer UPS to Bypass Mode



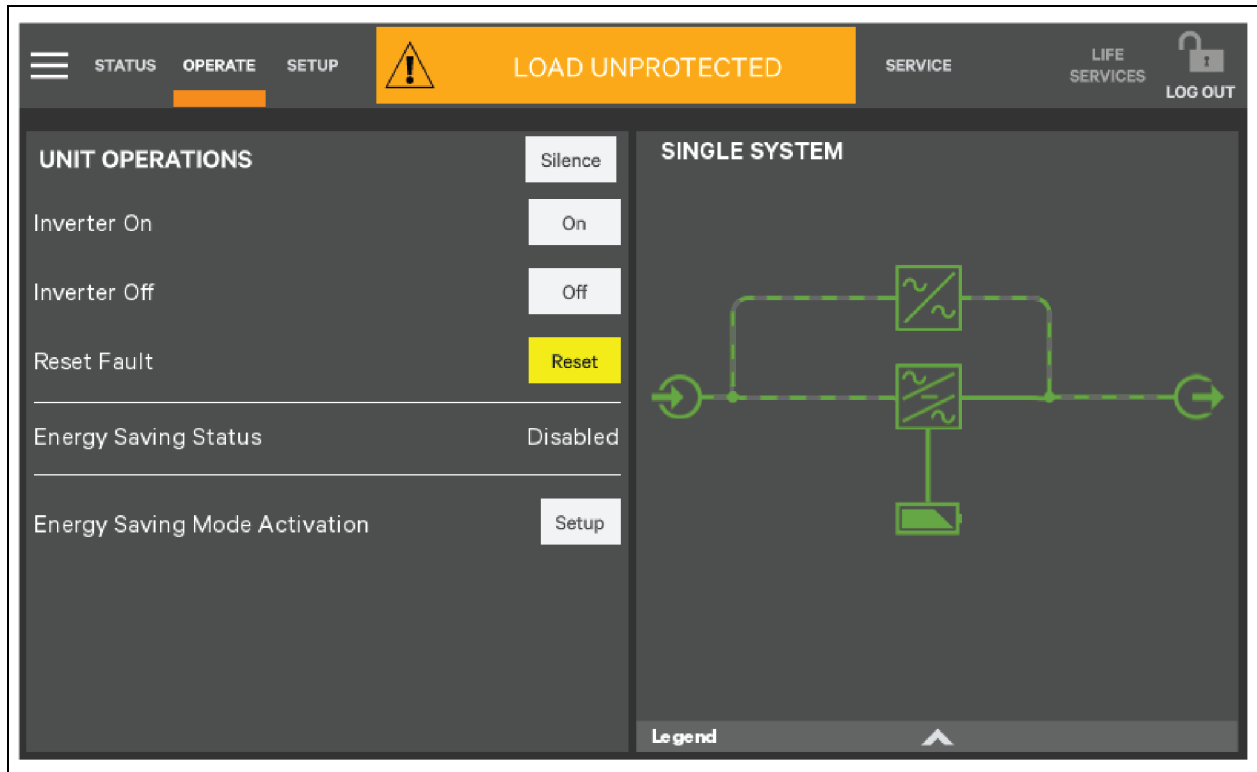
NOTE: In bypass mode, the load is directly supplied by the mains power instead of the pure AC power from the inverter.

6.3.3 Transfer from Bypass Mode to Normal Mode

Follow the procedure below to transfer the load from the bypass mode to the normal mode.

1. Activate the system and login to the system.
2. Verify that the Vertiv™ PowerUPS 9000 1250 kVA Modular UPS CE is in bypass mode.
3. Touch the Operate tab.
4. Touch the On button next to the Inverter On. The UPS transfers to normal mode from the bypass mode, see **Figure 6.9** on the facing page.

Figure 6.9 Transfer UPS to Normal Mode



6.4 Battery Test Procedures

The battery test function is disabled by default. If you need this function, contact Vertiv's customer service.

The battery self-test includes periodical self-test and manual maintenance self-test.

- When the load factor is 0 to 20%, the system only supports manual maintenance self-test.
- When the load factor is 20% to 100%, the system supports periodical self-test and manual maintenance self-test.

The battery discharges 20% of total battery energy.

Periodical self-test is to test the battery activity. The periodical self-test is regular and the self-test period can be configured via the Vertiv setting software. During the periodical self-test, if the battery maintenance requirement is met, the system generates audible/visual alarm and corresponding records. The periodical self-test does not update the battery curve table.

The mode of the manual maintenance self-test is similar to that of the periodical self-test, except for the maintenance self-test mode is started manually, and this operation is valid only one time, that is the system will not automatically start up the self-test once you exit. When the load factor is 20% to 100% and the battery maintenance requirement is satisfied during the maintenance self test, the system will generate audible/visual alarm and corresponding records. The maintenance self-test does not update the battery curve table.

NOTE: After the self-test is successful, the system will fully clear the self-test interval counter. If the self-test fails, self-test exists and the self-test is re-entered when self-test conditions are satisfied.

How to do a test

1. **Manual maintenance self-test:** Via the Touchscreen.

2. **Periodical self-test:** A self-test period can be configured via the Vertiv setting software. The range of battery self-test period is 30 days to 360 days. The default is 60 days.

Self-test startup conditions

1. System load rate is within 0 to 100% (manual maintenance) or 20% to 100% (periodical self-test), stable output.
2. Battery in fully charged state, battery float charge at least 5 hours and generator not connected.
3. Current system is in float charge state.

Self-test exit conditions

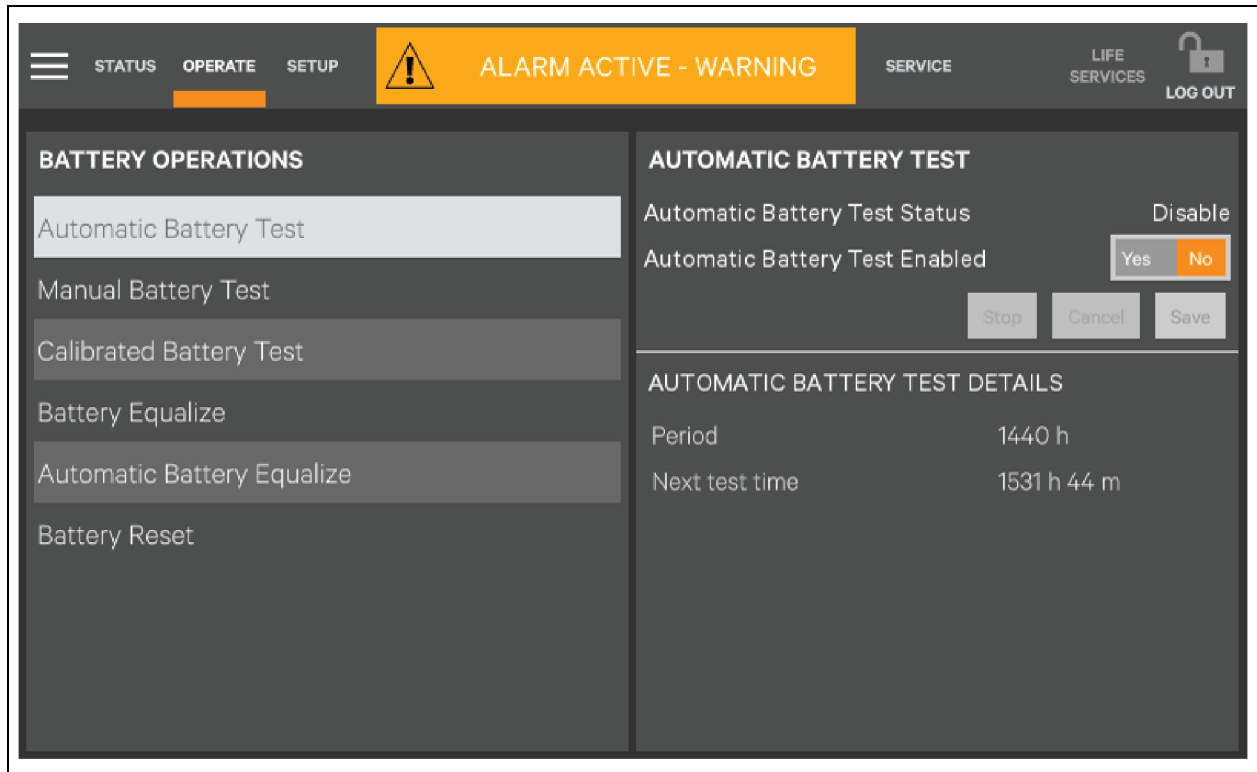
1. Confirm that the system is not in self-test state for at least 10 seconds and battery mode or rectifier is closed. The system shifts to battery supply state.
2. During the self-test, the system will shift to float charge state if the load fluctuation, UPS module overload or no battery occurs.
3. During the self-test, if the battery voltage is lower than the calculated pre-alarm voltage, or the battery discharge exceeds the protection time, then the system will shift to float charge state.
4. The user can manually stop the maintenance test via the touchscreen.
5. During the manual maintenance self-test, when the load rate ranges from 0 to 20%, the system will shift to float charge state after the battery discharge for 5 minutes.

NOTE: After the self-test is successful, the system will fully clear the self-test interval counter. If the test fails a second time and exits the system it will enter self-test again when self-test conditions are satisfied.

Procedures for battery self-test

1. Enter the level of **Operate**.
2. Touch Operate icon.
3. Touch Menu icon on the upper left corner.
4. Touch *Battery Operations* to display the interface shown in **Figure 6.10** on the facing page.

Figure 6.10 Battery Management Interface



5. Respectively touch *Automatic Battery Test*, *Manual Battery Test*, *Calibrated Battery Test* and *Battery Equalize*, then you can execute corresponding settings and operation.

6.5 UPS Shutdown Procedures

6.5.1 Procedures to Completely Power Down the UPS

Follow the below procedure to completely shutdown the UPS and load power off. All power switches, isolating switches, and breakers are disconnected, and then UPS no longer supplies power to load.

NOTE: The following procedures cuts off the load power completely.

1. Touch the Inverter Off key to stop the operation of the inverter. See [Operator Controls](#) on page 55, then press the EPO button to stop the operation of the rectifier, static switch, and battery.
2. Disconnect the external battery switch.
3. Disconnect the rectifier input switch Q1, bypass input switch Q2, output switch Q5. Now, all the internal power supply is off, and the touchscreen does not display any more.



WARNING! Place a notice at the AC input distribution (generally far away from the UPS) to alert that UPS maintenance is being performed.



WARNING! Hazardous battery voltage. The battery terminals still have hazardous voltage after the UPS is completely shut down.

IMPORTANT! Wait 10 minutes for the internal DC bus capacitance to complete discharging. Then the UPS completely shuts down.

6.6 Emergency Power Off Procedures

The EPO is designed to switch off the UPS in emergency conditions (such as fire or flood). To carry out EPO, press the EPO button, then the system turns off the rectifier, and inverter. Power to the load is stopped immediately (including the inverter and bypass) and the battery stops charging or discharging.

After EPO, if the input mains is present, the UPS control circuit remains active; however, the output will be turned off. To remove all power from the UPS, first disconnect the external power switch of the UPS.

6.7 UPS Reset Procedures after Emergency Power Off

After shutting down the UPS through EPO or the UPS fault condition, clear the fault according to the alarm message appearing on the touchscreen.

After confirming the fault has been cleared and no remote EPO signal is received, follow these procedures:

1. Touch the *Reset Fault* button. See [Operator Controls](#) on page 55, the system will exit the EPO/abnormal Off state, and the alarm indicator flashes in red.
2. After the rectifier start up is finished, normally start the UPS according to [Transfer from Bypass Mode to Normal Mode](#) on page 76.

NOTE: The rectifier starts automatically when the overtemperature fault disappears five minutes after the disappearance of the overtemperature signal.

3. After the EPO button is pressed, if the mains input is switched off, the UPS shuts down completely. When the mains input is restored, the UPS enables the bypass. Restore the power at the output terminal of the UPS.

6.8 Automatic Restart

The UPS uses the battery system to supply power to the load equipment in the event of mains failure until the batteries are discharged. When the UPS reaches its EOD threshold, it will shut down.

The UPS will automatically restart and enable output power only when the following conditions are met:

1. If Auto Recovery after EOD Enabling is enabled.
2. After the Auto Recovery after EOD Delay Time expires (the default delay is 10 minutes), the UPS restarts bypass, then inverter. During the automatic recovery delay, the UPS will charge its batteries to provide a safety margin for equipment shutdown if input power fails again.

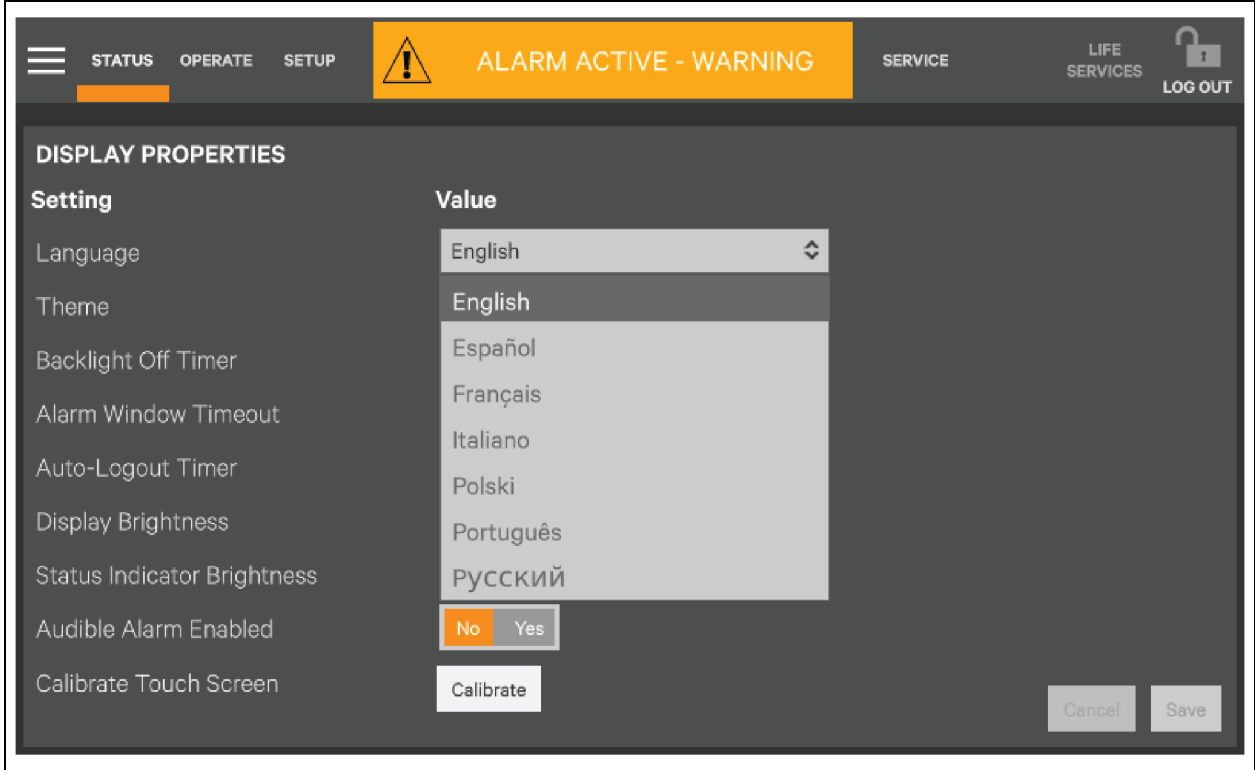
NOTE: During the automatic restart process, manual startup is disabled. Automatic restart must be set by Vertiv's authorized service engineer through Vertiv setting software.

6.9 Selecting Language

Use the following procedures to select the language:

- 1. Touch Status.
- 2. Touch the Hamburger icon.
- 3. Touch **Display Properties**.
- 4. Touch to select **Language**. See **Figure 6.11** below.

Figure 6.11 Setting Language

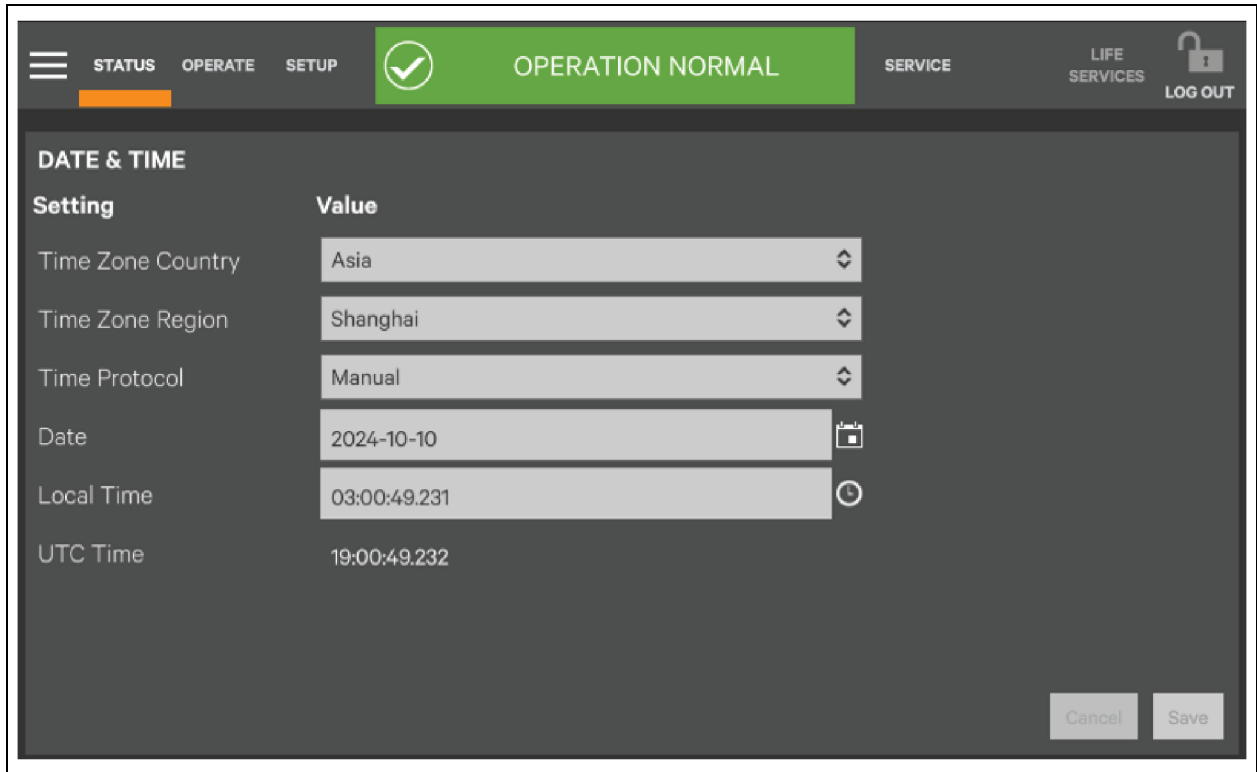


6.10 Changing Current Date and Time

To change the system date and time, follow the below procedure:

1. Touch Status.
2. Touch the Hamburger icon.
3. Touch **Date and Time** to update each. See **Figure 6.12** below.
4. Touch Save.

Figure 6.12 Setting Date and Time

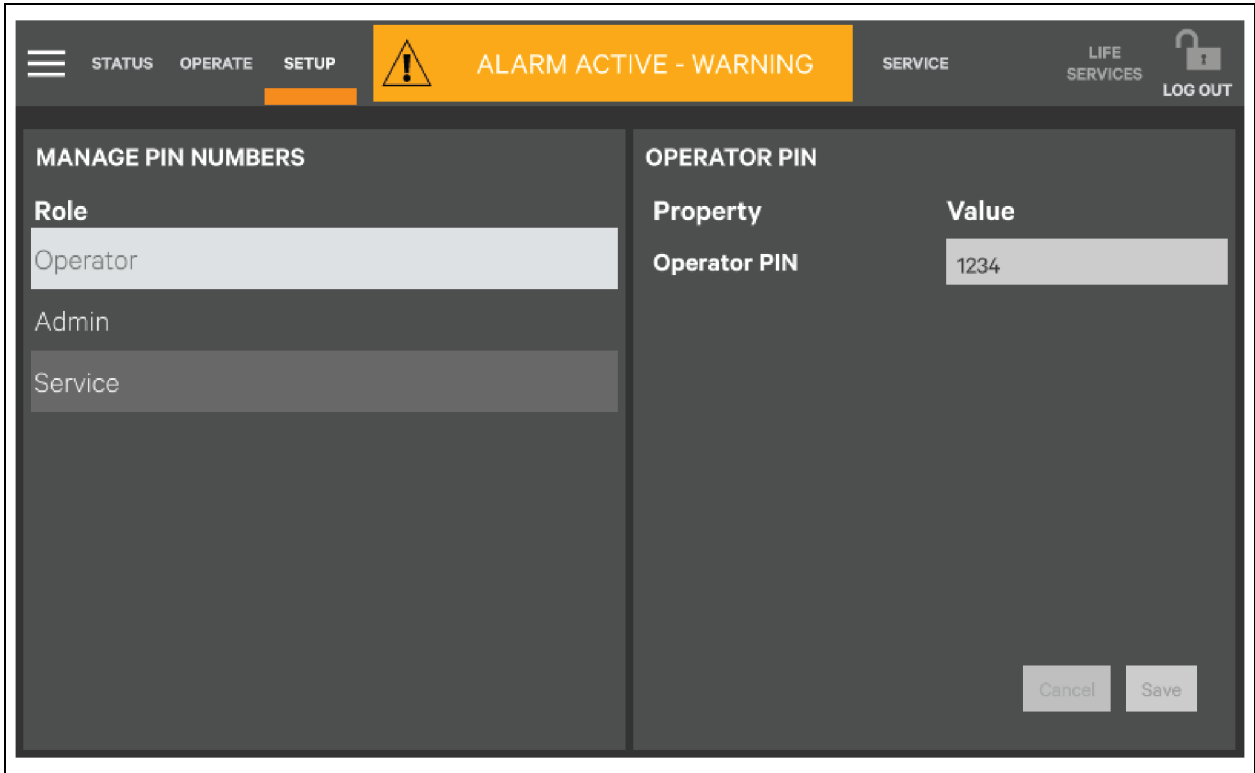


6.11 Changing Password

To change password:

- 1. Touch **Setup**.
- 2. Touch Status.
- 3. Enter the PIN in the Operator PIN field. See **Figure 6.13** below.

Figure 6.13 Setting Password



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7 Battery

This chapter provides information about the battery, the battery types, charging/discharging, battery cold start, safety, installation and maintenance information, battery protection function, and the connection of BCB cabinet (option), battery temperature sensor (option), and battery ground fault detector.

7.1 Introduction

The UPS battery string consist of several batteries in series connection and provides rated DC input voltage for the UPS inverter. The required battery backup time (that is the time for battery to supply load upon mains failure) is subject to the ampere hour value of the battery. Sometimes, it is necessary to connect several battery strings in parallel.

To facilitate the UPS installation, the battery is generally installed on a specially designed battery rack or in the battery room.

During the maintenance or repair, the battery must be disconnected from the UPS. This operation is carried out with BCB of proper capacity. This circuit breaker must be located as close as possible to the battery connecting terminal. The wiring distance of the power and signal cables connected to the UPS must be minimized.

When several strings of battery are connected in parallel to increase the battery backup time, disconnecting device shall be equipped so that the maintenance operation on a certain battery string will not affect the normal operation of other battery strings.

7.2 Safety

If you have any questions, contact Vertiv.



WARNING! Work carefully with the batteries connected to the UPS when all the blocks are connected, the battery string voltage can be up to 540 VDC. This is potentially dangerous. Follow the precautions for high voltage operation. Only qualified personnel can install and maintain the battery.

To ensure safety, the external batteries are to be installed inside a lockable cabinet or in a dedicated battery room only accessible to qualified service personnel.

Make sure that the battery switch has been disconnected before battery maintenance.

7.2.1 Hazardous Battery Voltage Present Behind Covers

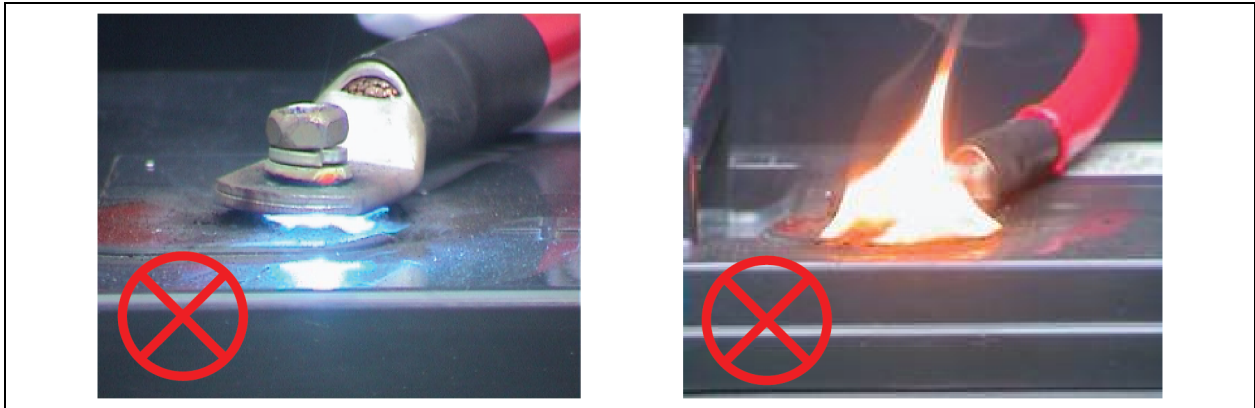
1. No user serviceable parts are located behind covers that require a tool for their removal. Only qualified service personnel are authorized to remove such covers.
2. Before working on the copper bars connected to the external battery, ensure copper bars are disconnected from all power supplies.

Figure 7.1 Proper Connection Mode



Tighten the terminal bolt of the battery with specified torque.

Figure 7.2 Improper Connection Mode



Too large or too small of a torque may cause poor connection of the terminal. Under certain conditions, the terminal may have arcing or heat accumulation, which will cause fire.

3. Observe the following safety precautions when working on the batteries:
 - a. The battery must be firmly and reliably connected. After the connection is completed, the screw connections between all the terminals and the batteries shall be calibrated. The requirements on torque specified in the specifications or user manual provided by the battery manufacturer shall be satisfied. The connections between all the wiring terminals and the batteries shall be inspected and tightened at least once a year. Otherwise it may cause fire.
 - b. The battery appearance must be inspected before accepting and using the battery. Replace the battery with a new one if the package is damage, the battery terminals are dirty, corroded, or rusted, or the shell is cracked, deformed, or leakaged. Battery capacity reduction, electric leakage, or fire may occur if the damaged battery is not replaced.

Figure 7.3 Battery Damaged During Handling or Transportation**Figure 7.4 After a Week of Normal Charge/Discharge Experiment**

- c. The battery is very heavy. Please use proper methods to move and lift the battery, so as to prevent injury or any damage to the battery terminal. Severe damage to the battery may cause fire.
- d. The battery connecting terminal must not be subject to any force, such as pulling force or twisting the cable, to avoid damage to the internal connection of the battery. Severe damage to the battery may cause fire.
- e. The battery must be installed and stored in a clean, cool and dry environment. Do not install the battery in a sealed battery chamber or a sealed room. The battery room ventilation must meet the requirement of EN50272-2001. Otherwise, battery bulging, fire, or human injury may occurs.
- f. The battery shall be installed far away from the heating products (such as transformer), used or stored far away from any fire source, and shall not be burnt or put into fire for heating. Otherwise, battery leakage, bulging, fire or explosion may be caused.
- g. Do not directly connect any conductor between the positive and negative terminals of the battery. Remove the finger rings, watch, necklace, bracelet and other metal items before operating the battery, and ensure that the tools (such as wrench) are covered with insulating material. Otherwise, battery burning, human death/injury or explosion may be caused.

- h. Do not disassemble, modify or demolish the battery. Otherwise, battery can short circuit, liquid leakage, or human injury may occur.
- i. Clean the battery enclosure with a wringed wet cloth. To avoid any static or arcing, do not use dry cloth or duster to clean the battery. Do not use the organic solvent (such as thinner, gasoline, or volatile oil) to clean the battery. Otherwise, the battery enclosure may be cracked. In worst case, fire may be caused.
- j. The battery has diluted sulfuric acid. In normal use, the diluted sulfuric acid will be absorbed to the baffle and polar plate of the battery. However, if the battery is damaged, the acid may leak from the battery. Personal protective equipment (such as protective glasses, rubber gloves, and apron) must be used when operating the battery. If diluted sulfuric acid comes in contact with the eyes, blindness may result. If it comes in contact with the skin, burns may result.
- k. The battery may have a short circuit, electrolyte dry-up, or positive pole erosion failure at the end of its life. If it is still used under this state, the battery may have thermal runaway, bulging or liquid leakage. Replace the battery before it reaches this state.
- l. Before connecting or disconnecting the battery connection cables, please isolate the charging power.
- m. Check if the battery has been unexpectedly earthed. If this is the case, remove the earth connection. Contact with any part of the earthed battery may result in an electric shock.

7.3 UPS Battery

The UPS generally adopts valve regulated battery. **Valve regulated** means the **sealed type** or **maintenance free**.

The valve regulated battery is not completely sealed, when it is over charged, there is gas escape. The volume of the gas escape is less than with a water injection battery. However, during the installation design of the battery, temperature rise should be considered, and enough room must be reserved to ensure good ventilation.

The valve regulated battery is not maintenance free. The valve regulated battery must be kept clean, and inspected regularly to check for corrosion and that the connection is reliable.

It is recommended to connect no more than 4 strings of batteries in parallel. Batteries of different types, names or newness shall not be used together. Otherwise, the battery inconsistency will cause frequent over discharge or under charge of certain battery. The battery will have premature failure and the entire string of battery will have insufficient backup time.

Batteries must be stored in a fully charged state. Batteries will lose some capacity because of self-discharge during transportation or storage. Charge the battery before use. During the storage, ensure that the ambient temperature does not exceed the range of 5 °F to 113 °F (-15 °C to +45 °C). Optimal temperature is 68 °F to 77 °F (20 °C to 25 °C). To compensate for the self-discharge of the battery during the storage, the battery must be charged every 3 months during storage. The specific time may differ for different batteries. For details, refer to the requirements of the battery manufacturer.

It is very important to fully charge the battery before carrying out on-site test on the battery backup time. The test may take several days. Conduct this test after battery is float charged for at least 1 week uninterrupted.

Battery performance increase after running for several weeks or has been subject to 2 to 3 charge/discharge cycles.

To avoid the battery over charge or under charge, set the battery management parameters according to the equalizing/float charge voltage and temperature compensation factor specified in the manuals provided by the battery manufacturer. Please charge the battery immediately after discharge.

7.4 Installation Design

NOTE: Use and maintenance of the battery are described in the relevant battery manual provided by the battery manufacturer. The safety precautions described in this section include the important precautions that must be considered during the installation design. The design results may be changed according to the local situations.

7.5 Battery Installation Environment and Number of Batteries

7.5.1 Installation Environment

Fresh air volume (EN50272-2001)

The operating environment of the battery must be ventilated. During the operation of the battery, the requirement for the fresh air ventilation is:

$$Q = 0.05 \times n \times I_{\text{gas}} \times C_{\text{rt}} \times 10^{-3} \text{ [m}^3\text{/h]}$$

Where:

Q - The fresh air ventilation volume per hour, the unit is m³/h

n - Number of cells

I_{gas} - The gas evolving current density under battery float charging or boost charge conditions, the unit is mA/Ah

I_{gas}- 1, under the float charging condition of 2.27 V/cell

I_{gas}- 8, under the boost charge condition of 2.35 V/cell

C_{rt} - 20 hours battery rated capacity

Temperature

Table 7.1 Ambient Temperature Range

Type	Temperature Value	Remark
Recommended optimal temperature	68 °F to 77 °F (20 °C to 25 °C)	The ambient temperature for the battery operation shall not be too high or too low. If the average operating temperature of the battery rises from 77 °F to 95 °F (25 °C to 35 °C), the service life of the battery will be reduced by 50%. If the operating temperature of the battery is over 104 °F (40 °C), the service life of the battery will be reduced exponentially each day.
Short time allowable temperature	5 °F to 113 °F (-15 °C to 45 °C)	

Battery life is shortened with higher temperature. Charge/discharge performance is reduced at low temperature.

The battery must be installed in cool and dry environment with the humidity less than 90%, and be protected from the heat source and direct sun rays.

The ambient temperature, ventilation, space, float/boost charge voltage, and ripple current affects the battery temperature. Uneven temperature among the battery strings causes uneven voltage distribution and result in problem. It is important to maintain balanced temperature in the battery string. The temperature difference between batteries of different layers should be kept within 37.4 °F (3 °C). A valve regulated battery is very sensitive to temperature and should be used in a temperature range of 59 °F to 77 °F (15 °C to 25 °C). If the battery cabinet is installed near the UPS, the maximum design ambient temperature should be determined according to the battery rather than the UPS. That is, if a valve regulated battery is used, the indoor ambient temperature range should be 59 °F to 77 °F (15 °C to 25 °C) rather than the operating temperature range of the main equipment. A short time temperature deviation is allowable if the average temperature does not exceed 77 °F (25 °C).

7.5.2 Number of Batteries

The number of batteries, EOD voltage, and float charging voltage for the 380 V/400 V/415 V voltage system are presented in **Table 7.2** below.

Table 7.2 Number of Batteries

Parameter	380 V/400 V/415 V
Number of cells (standard)	180 to 300 lead acid batteries, even numbers can be set consecutively; 240 to 300, UPS output power no derating.
EOD voltage	1.60 VDC/Cell to 1.90 VDC/Cell, 1.67 V/cell recommended.
Float charging voltage	2.2 VDC/Cell to 2.3 VDC/Cell, 2.27 V/cell recommended.

7.6 Battery Protection

IMPORTANT! Appropriate switching devices to protect the battery from short circuit and overload must be selected. It is recommended to use the Vertiv BCB to provide better battery protection.

The battery is connected to the UPS through the BCB. The BCB is manually closed and has an electronic tripping device controlled by the UPS control circuit. If the battery is rack mounted (or is far away from the UPS cabinet), the BCB must be installed as close to the battery as possible, and the wiring distance of the power and signal cables connected to the UPS must be minimized.

The BCB has the following features:

- Isolation
- Short circuit protection
- In case the inverter is locked by a battery that is under voltage, the switch automatically disconnects in order to avoid damage due to battery over discharge.
- If equipped with a remote EPO button, an EPO button can be used to remotely disconnect the BCB.

To obtain the required backup time, the batteries may be connected in parallel. In this case, each battery string must be connected to a separate BCB.

NOTE: Only trained personnel must operate and maintain BCB.

7.7 Battery Installation and Connection

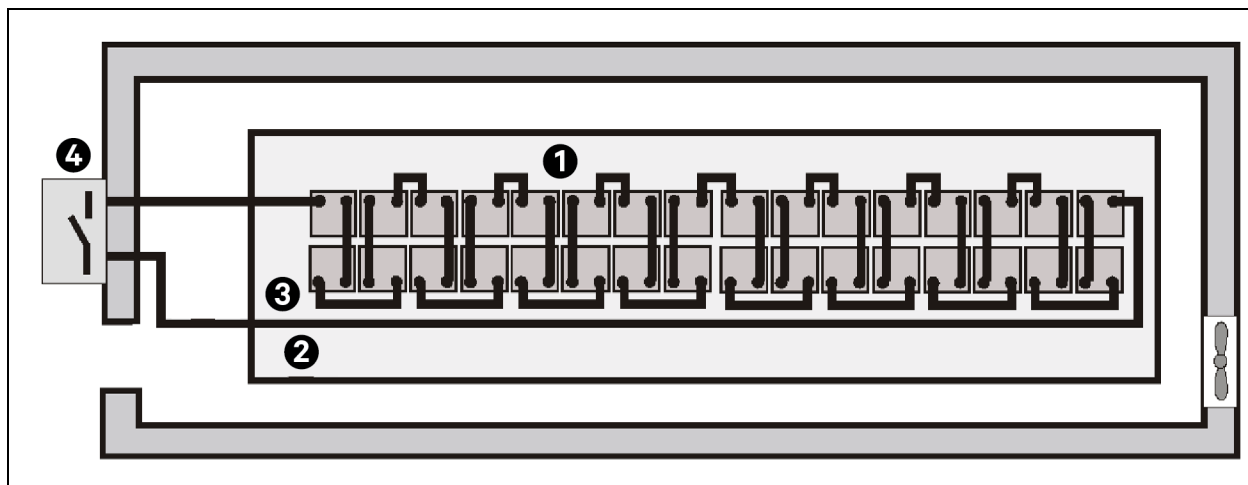


WARNING! Only a qualified engineer should install and connect the batteries. The battery has hazardous high voltage, and requires insulated tools for safety protection.

1. Before installation, check the battery appearance to ensure that there is no damage, inspect and count the accessories, and carefully read this manual and documentation provided by the battery manufacturer.
2. Make sure that there is at least 0.4 in. (10 mm) gap between the batteries vertically to permit circulation.
3. Clearance should be maintained between the battery top and the upper row to facilitate monitoring and maintenance of the battery.
4. The batteries should be installed from the bottom to top to avoid a too high gravity center. The batteries should be installed to protect from vibration and shock.

7.8 Design of Battery Room

Figure 7.5 Design of Battery Room



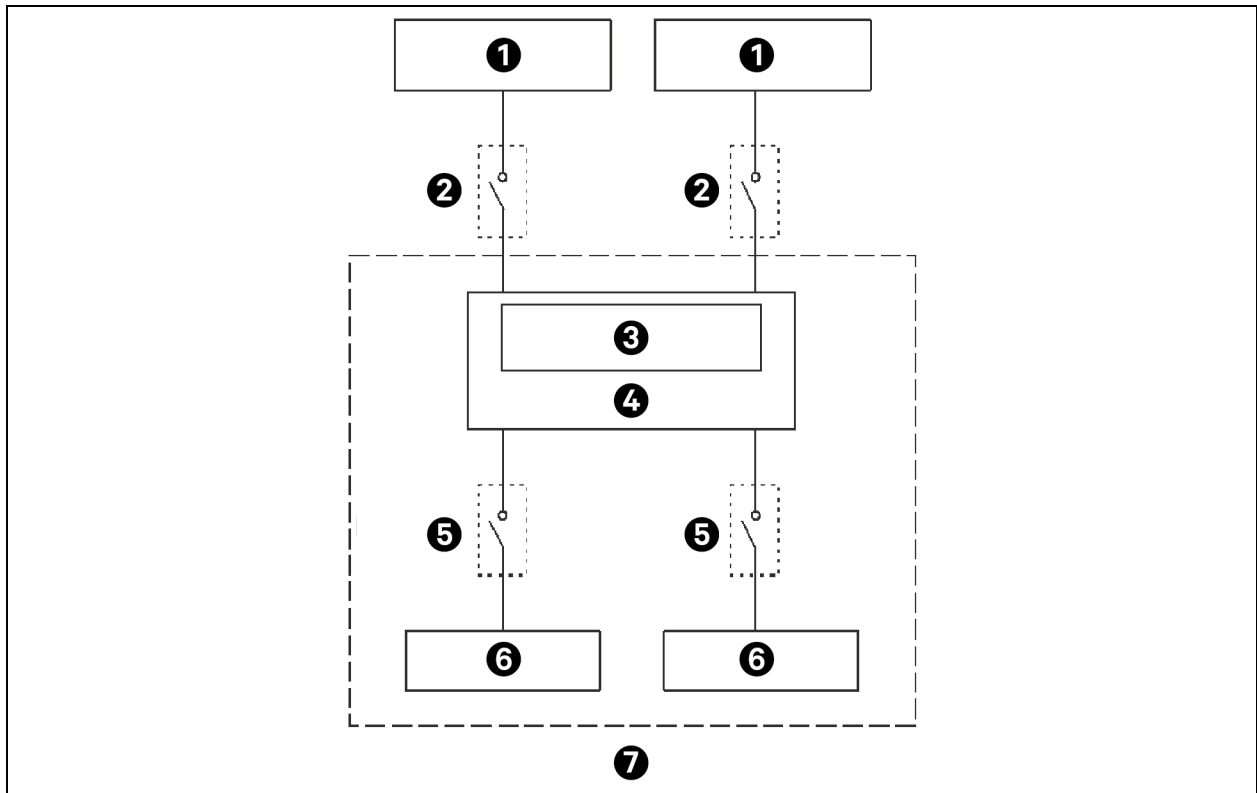
Item	Description
1	Layout of cells The battery should not get in contact with 2 naked live parts with the potential difference over 150 V at the same time. If it is unavoidable, insulated terminal shield and insulated cable must be used for the connection.
2	Workbench The workbench (or pedal) must be skid proof and insulated, and at least 3.3 ft. (1 m) wide.
3	Wiring All the wiring distances should be minimized.
4	BCB The BCB is generally installed in the wall mounted box near the battery.

7.9 Common Battery String

The UPS supports common battery string function, which indicates that each unit in the parallel system shares the same battery string for energy saving, space saving, and efficiency improving. The cable connection for the common battery string is shown in **Figure 7.6** below. Make sure that the following requirements are fulfilled before connecting the common battery string:

1. All the units in parallel system share the same battery string.
2. Do not connect the common battery string with independent battery.
3. Each unit should use the common battery string.
4. Each UPS has its own BCB box.

Figure 7.6 Connection of Common Battery String



Item	Description
1	UPS
2	BCB
3	Bus
4	Junction box
5	BCB box
6	Battery
7	Battery System

7.10 Battery Maintenance

For the battery maintenance and maintenance precautions, refer to IEEE-Std-1188-2005 and the relevant documentation provided by the battery manufacturer.

Important maintenance steps to be followed:

1. Periodically check and tighten screws at the battery connection points.
2. Ensure that all safety devices are operating normally.
3. Make sure that all battery management parameters are set properly.
4. Measure and record the air temperature inside the battery room.
5. Make sure that the battery terminals have no damage or heat generating trace.
6. Ensure the battery enclosure and terminal shields are intact.

7.11 Disposal of Used Battery

If the battery has liquid leakage or is damaged, place the battery into a container that can withstand sulfuric acid. and discard it according to the local regulations.

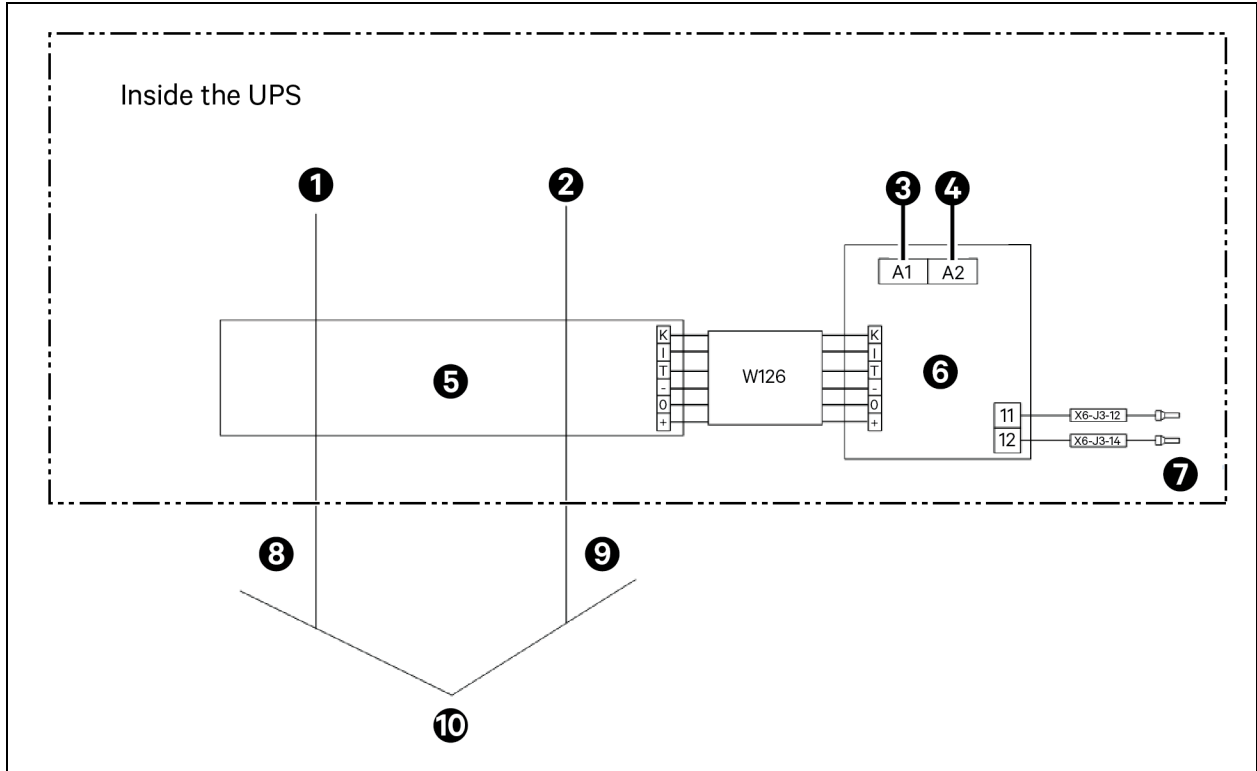
Used lead acid batteries are dangerous to store. The storage, transportation, use and disposal of the battery must comply with national and local laws and regulations regarding dangerous waste and used battery pollution prevention.

Recycle the used lead acid battery according to local and national regulations. Do not dispose using other methods. Do not randomly discard or dispose of a use lead acid into the local waste stream. There may be legal repercussions for the improper disposal of a lead acid battery.

7.12 Battery Ground Fault (Optional)

Vertiv offers an optional battery ground fault detector. The battery ground fault detector includes a mutual inductor and monitor and must be installed in the battery copper bar of the UPS. The monitor is installed above the front panel of the UPS. This option is assembled before delivery. **Figure 7.7** below shows the cable connection.

Figure 7.7 Wiring of Battery Ground Fault (Optional)



Item	Description
1	UPS+
2	UPS-
3	UPS output A phase
4	N
5	CT
6	Monitor
7	To dry contact of X6 board
8	BAT+
9	BAT-
10	To battery

7.13 Battery Circuit Breaker Reference Current and Connection

Table 7.3 below provides recommended BCB rated current and battery maximum discharge current at full load. Refer to Table 3B in IEC60950-1 and select the appropriate cable CSA according to local electrical codes and standards.

Table 7.3 BCB Rated Current and Battery Maximum Discharge Current at Full Load (Recommended)

Items		Unit	UPS Rated Power (1250 kVA)
30-block to 40-block battery	Rated battery discharge current at full load	A	3328
	Reference rated current of BCB	A	3600
	CSA of connection cable	mm ²	8 x 240
42-block battery	Rated battery discharge current at full load	A	3169
	Reference rated current of BCB	A	3600
	CSA of connection cable	mm ²	8 x 240
44-block battery	Rated battery discharge current at full load	A	3025
	Reference rated current of BCB	A	3600
	CSA of connection cable	mm ²	8 x 240
46-block battery	Rated battery discharge current at full load	A	2893
	Reference rated current of BCB	A	3000
	CSA of connection cable	mm ²	6 x 240
48-block battery	Rated battery discharge current at full load	A	2773
	Reference rated current of BCB	A	3000
	CSA of connection cable	mm ²	6 x 240
50-block battery	Rated battery discharge current at full load	A	2662
	Reference rated current of BCB	A	3000
	CSA of connection cable	mm ²	6 x 240

NOTE: Current calculation is according to the DC/AC efficiency of 0.96 and EOD voltage of 1.63 V/cell.

NOTE: It is recommended to use a DC breaker. This breaker should have a rated voltage no less than the the total voltage of the battery (or batteries).

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8 Parallel System and Load Bus Synchronization System

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

8.1 General

The parallel system is comprised of up to 4 UPS units of the same power rating and connected in parallel without the need for a centralized mains static bypass. Instead the bypass static switches of each UPS share the load when the system transfers to the mains bypass supply.

In a parallel system, 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 that are multicore ribbon cables connected between the units of the system to form a closed loop.

8.2 System Installation Procedures

The basic installation procedure of a parallel system is the same as that of single module 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.

8.2.1 Preliminary Checks

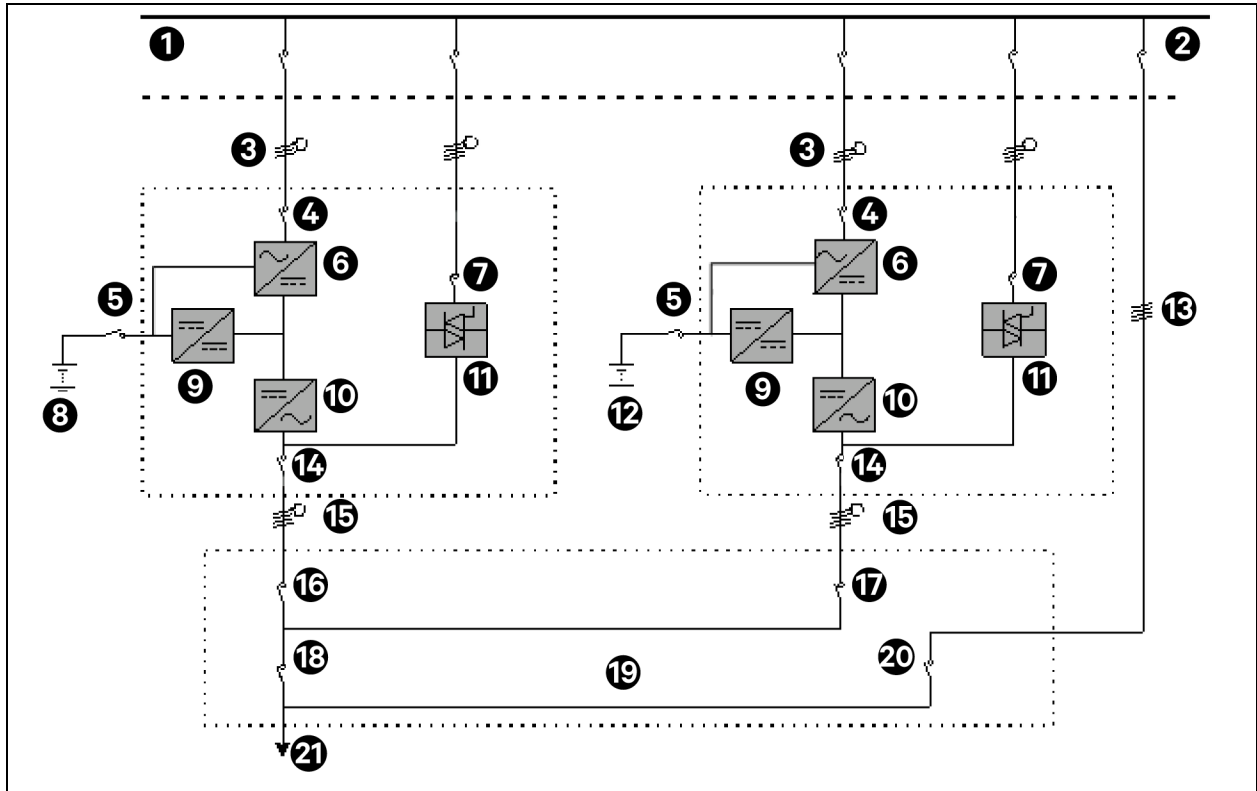
Ensure that the selections of the parallel cables are correct, and that the modules are of the same rating, model, and with the same software and hardware release.

IMPORTANT! Vertiv service personnel must configure each module separately using Vertiv setting software to achieve coordinated operation of the modules in the parallel system.

8.2.2 Cabinet Installation

Place the UPS units side by side and interconnect as shown in **Figure 8.1** on the next page. The output distribution mode (QE1, QE2 must be configured) shown in **Figure 8.1** on the next page is recommended to facilitate maintenance and system testing.

Figure 8.1 Schematic of Typical Parallel System with Common Input, Separate Batteries and Output



Item	Description	Item	Description
1	Input power supply	12	Battery 2
2	External bypass switch	13	External maintenance bypass
3	Mains input L1, L2, L3, N	14	Q5
4	Q1	15	L1, L2, L3, N
5	BCB	16	QE in GHMI 1
6	Rectifier	17	QE in GHMI 2
7	Q2	18	QOP
8	Battery 1	19	Output distribution
9	Charger	20	QBP
10	Inverter	21	To load
11	Static switch		

8.2.3 External Protective Device

See the [External Protective Devices](#) on page 31.

8.2.4 Power Cable

The power cable wiring is done same as that of a single UPS module. See [Power Cable Wiring](#) on page 29.

The bypass and rectifier should be connected with same neutral line input terminal. The current leakage protective device must be installed on the upstream of the neutral line input terminal.

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

8.2.5 Parallel Cable

The cables must be interconnected in a ring shaped connection between the UPS modules, as shown in **Figure 8.2** below. The ring connection ensures the reliability of the control of the parallel system.

NOTE: Shielded and double insulated parallel cables are available in lengths of 16.4 ft, 32.8 ft and 49.2 ft (5 m, 10 m, and 15 m).

The specific connection method is: The parallel cable of one single UPS is connected from the PARA1 port of the communication box to the PARA2 port of the immediate next single machine communication box and is in sequence. The front panel of the communication module provides parallel ports, as shown in **Figure 8.3** on the next page. Make sure to check all the reliable cable connections before starting up the UPS system.

Figure 8.2 Parallel Signal Cables Connection (Parallel System)

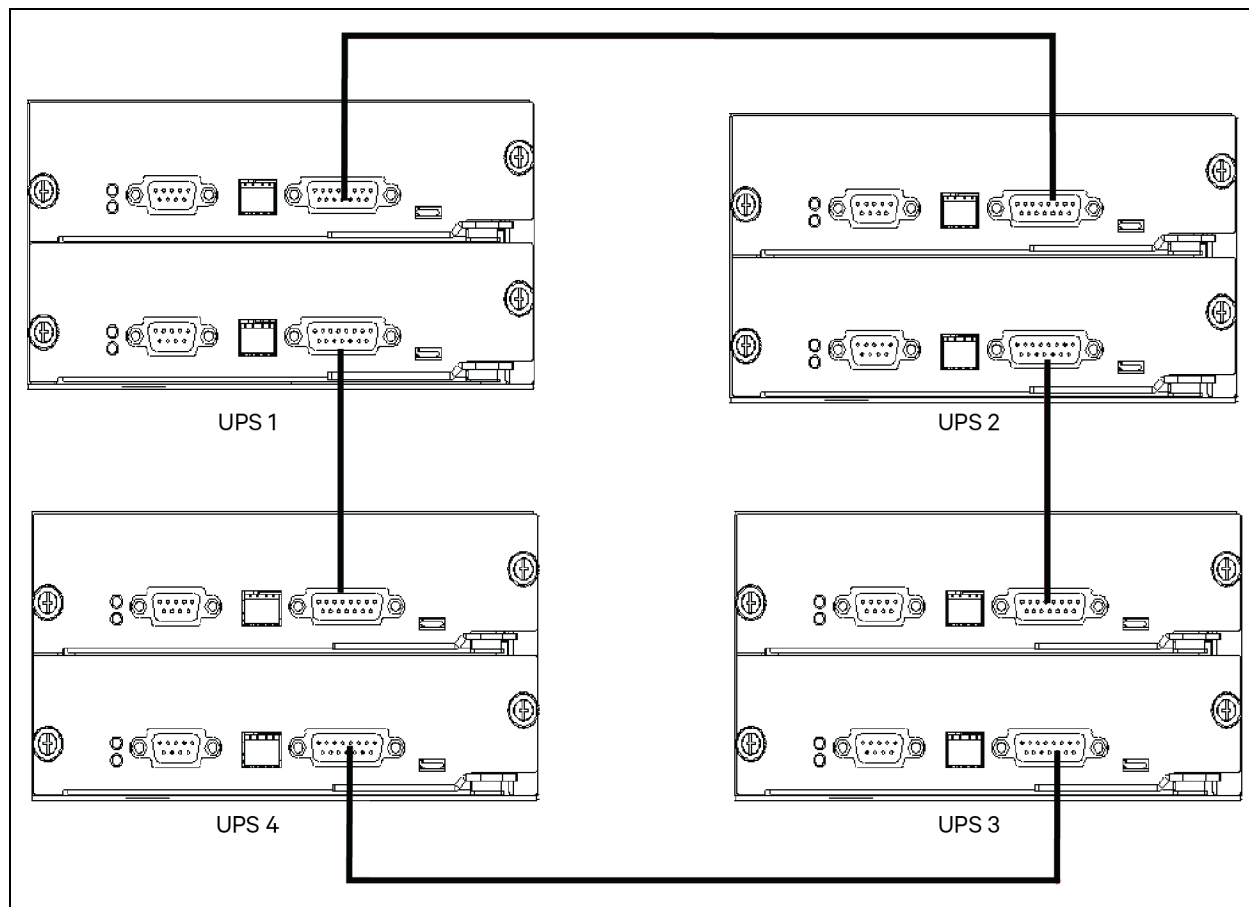
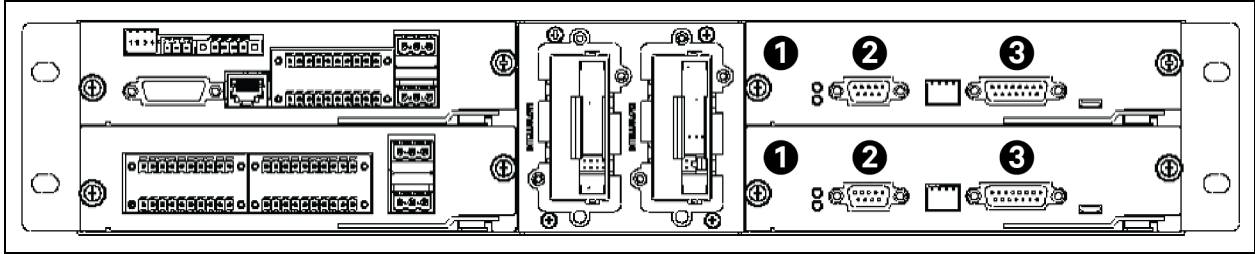


Figure 8.3 Parallel Port On the System Control Module



Item	Description
1	U4
2	LBS
3	Parallel

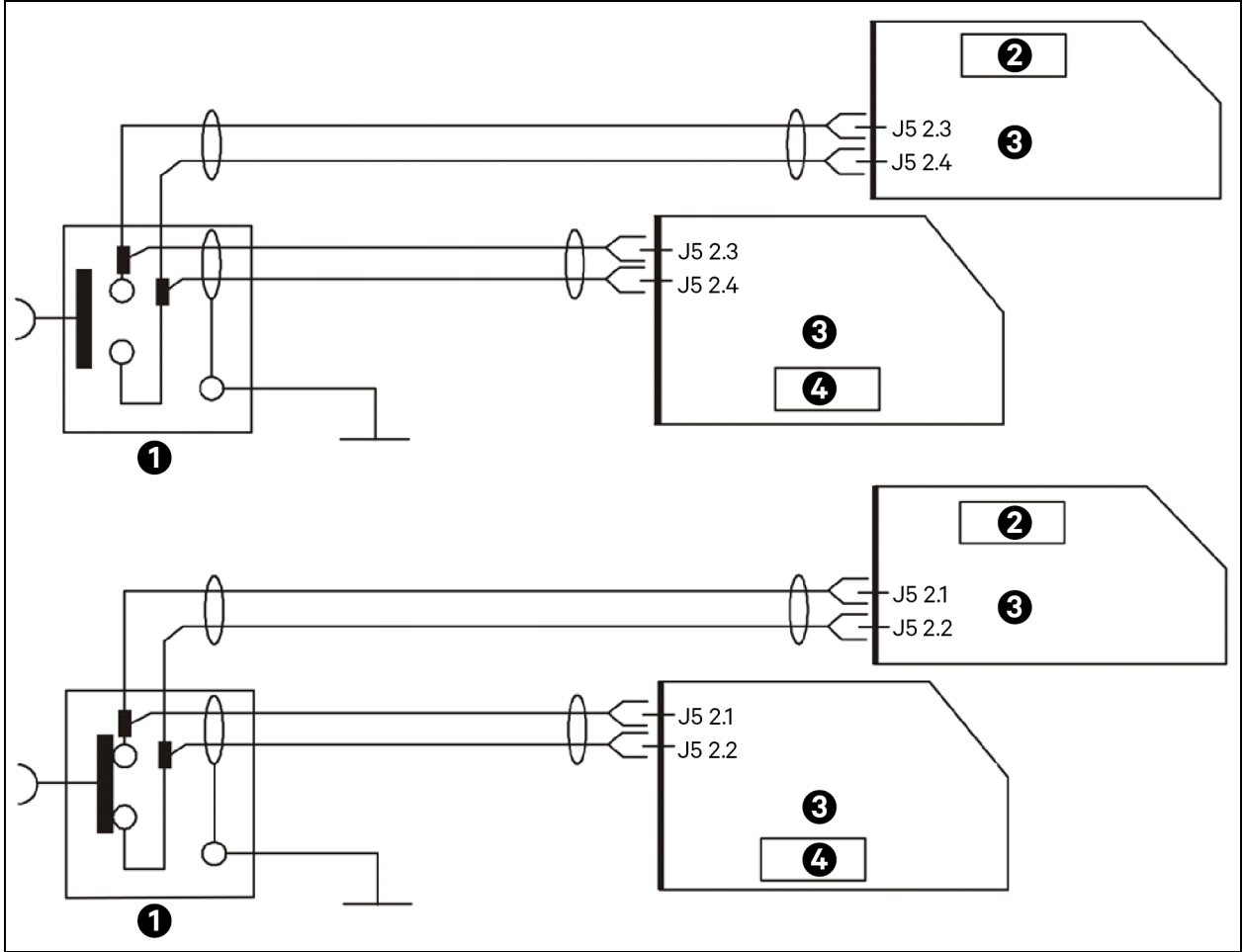
8.2.6 Remote Emergency Power Off

In addition to the EPO switch provided on the operator control and display panel of each UPS module for controlling the EPO of each module respectively, the parallel system also provides remote EPO function for controlling all UPS modules to shut down simultaneously from a remote terminal, as shown in **Figure 8.4** on the facing page.

NOTE: The remote EPO switch must provide dry contact signal, which is normally open or normally closed. The open circuit voltage provided is 12 VDC, <20 mA.

NOTE: The external EPO device is consists of another control system which can disconnect UPS mains supply or bypass input. Pins 1 and 2 of the normally closed EPO port on the integrated control module is linked in factory.

Figure 8.4 EPO Circuit Diagram



Item	Description
1	EPO
2	UPS 2
3	Integrated control module
4	UPS 1

NOTE: In Figure 8.4 above, the upper one is normally open type, and the lower one is normally closed type.

8.3 Operation Procedures for Parallel System

Only one step is required at a time, and the subsequent step may only be completed when this operation step of each UPS module has been completed.

8.3.1 Startup Procedures in Normal Mode

These procedures are applicable to start the UPS under total power down state, which means the UPS or the maintenance bypass switch has not supplied the load before. Make sure UPS has been completely installed and commissioned by the engineer, and external power supply switch has been turned off.



WARNING! These procedures result in mains voltage being applied to the UPS output terminals. If any load equipment is connected to the UPS output terminals, check with that it is safe to apply power. If the load is not ready to receive power, disconnect the downstream load switch and place a warning label on the connection point of the load.

Procedure to turn On the UPS from a fully powered down condition:

1. Confirm that the total external maintenance bypass switches are disconnected.
2. Open the front door of each UPS in turn.
3. Ensure that the internal maintenance bypass switch Q3 is disconnected.
4. Check all the input cables, parallel cables and copper bars are connected properly.



WARNING! In a parallel UPS configuration, all operations related to disconnection or connection of the maintenance bypass switch must be performed within three seconds to avoid overload situations and damage to the maintenance bypass switch.

5. Close the total bypass input switches.
6. Close the output switch Q5, bypass input switch Q2, rectifier input switch Q1, and all external output isolating switches (if any) of each UPS in turn.

When the above steps are complete, the system is powered on, and the startup screen pops up.

Wait 25 seconds and confirm that the touchscreen shows that the rectifier power supply and the bypass power supply are normal.

If not, check whether the Q1 and Q2 switches are closed. Then the rectifier starts up, about 30 seconds after the rectifier enters normal operation, the bypass static switch is closed.

7. When the rectifier start process is finished and the rectifier indicator turns solid green, close the external BCB.
8. For each UPS, manually turn on the inverter. The inverter starts up, the whole UPS system will power the load.

8.3.2 Procedures for Isolating One UPS Module from Parallel System

Isolating a UPS module from the parallel system may be required in order to perform repairs.



CAUTION: Place a notice at the AC input distribution (generally far away from the UPS) to alert that UPS maintenance is being performed.

IMPORTANT! The isolation procedures should be carried out only by Vertiv certified service personnel.

NOTE: To avoid system overload, perform this operation when the system is not fully loaded.

To isolate the UPS module from the parallel system , follow the below steps:

1. Turn off the rectifier, inverter, static switch and battery with the EPO button on the gesture human machine interface (GHMI).

NOTE: Turning off the rectifier, inverter, static switch, and battery will not affect other UPS units in the parallel system and the load remains powered normally.

2. Disconnect the external power mains switch, rectifier input switch Q1, external power bypass switch, bypass input switch Q2, output switch Q5, BCB and single module external output switch.

IMPORTANT! Wait 10 minutes for the internal DC bus capacitance discharging. Then the UPS is completely shut down.

8.3.3 Procedures for Inserting One Isolated UPS Module in Parallel System

IMPORTANT! 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. Confirm that the I/O cable, battery cable, and parallel cable of the single module are correctly connected.
2. Confirm that the maintenance bypass switch Q3 or the single module external maintenance switch is disconnected.
3. Close the output switch Q5, external output switch, external power bypass switch, bypass input switch Q2, rectifier input switch Q1, and external power mains switch of each UPS in turn.
4. When the single module starts, close the BCB and then manually turn on the inverter.

Wait for few seconds after starting the inverter the UPS system, it connects with existing systems for parallel operation automatically.

8.3.4 Procedures for Completely Powering Down UPS

Follow this procedure to completely shutdown the UPS. Load power must be off. Disconnect all power switches, isolation switches, and breakers so that the UPS no longer supplies power to the load.

1. Press the EPO button of each UPS to stop the operation of rectifier, inverter, static switch, and battery.
2. Disconnect the rectifier input switch Q1 and bypass input switch Q2 of each UPS that will close the internal power supply and the touch screen display will stop functioning.
3. Disconnect the output switch Q5 of each UPS.



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



CAUTION: Place a notice at the AC input distribution (generally far away from the UPS) to alert that the UPS maintenance is being performed.



CAUTION: Wait 10 minutes while the internal DC bus capacitance discharging. Then the UPS is completely shut down.

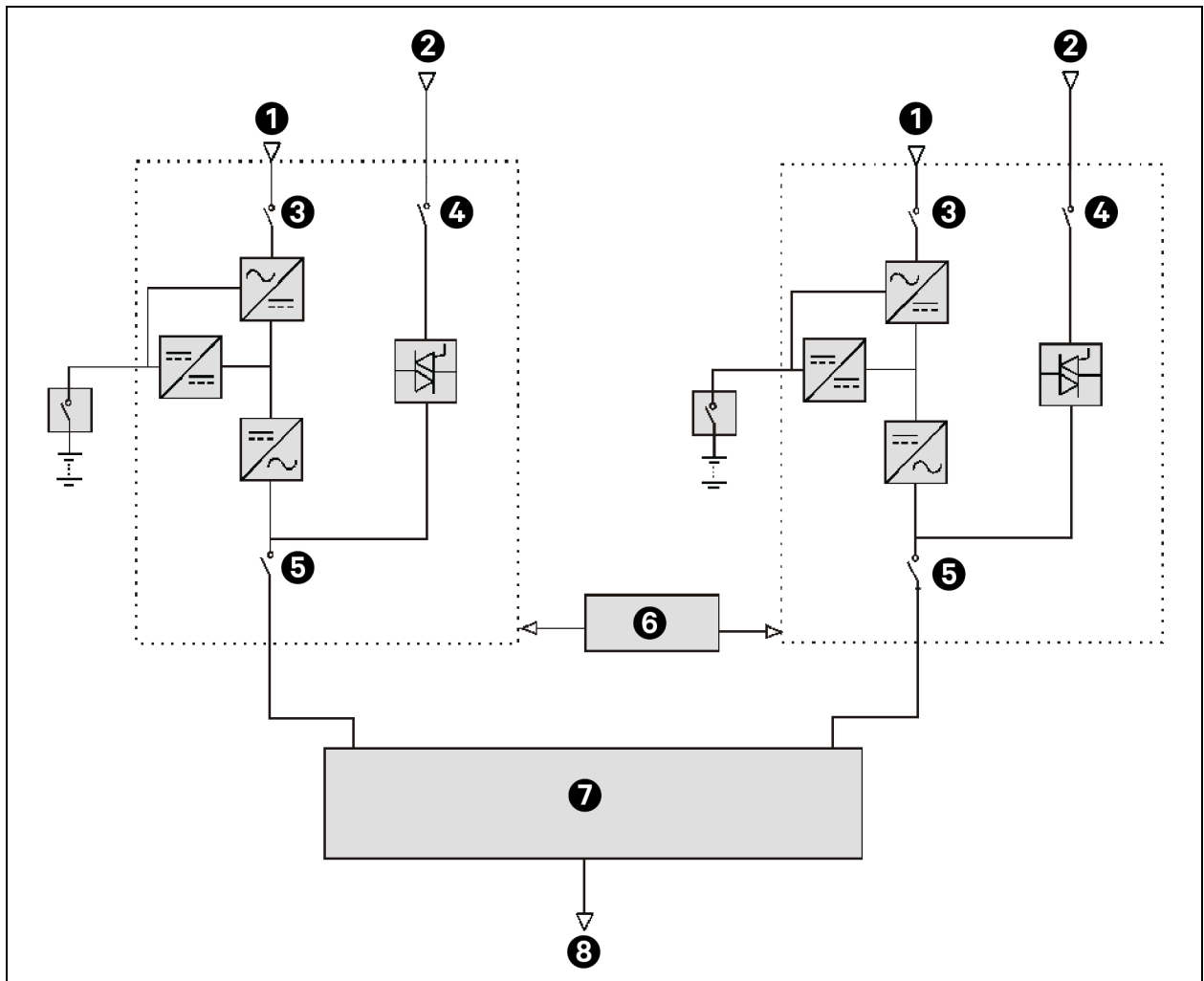
8.4 Load Bus Synchronization System

8.4.1 Cabinet Installation

An LBS system consists of two independent UPS systems, each containing one or more parallel UPS modules, as shown in **Figure 8.5** below and **Figure 8.6** on the facing page. The LBS system has high reliability and is applicable to the load with multiple inputs. For single input load, a STS can be installed to feed power to the load.

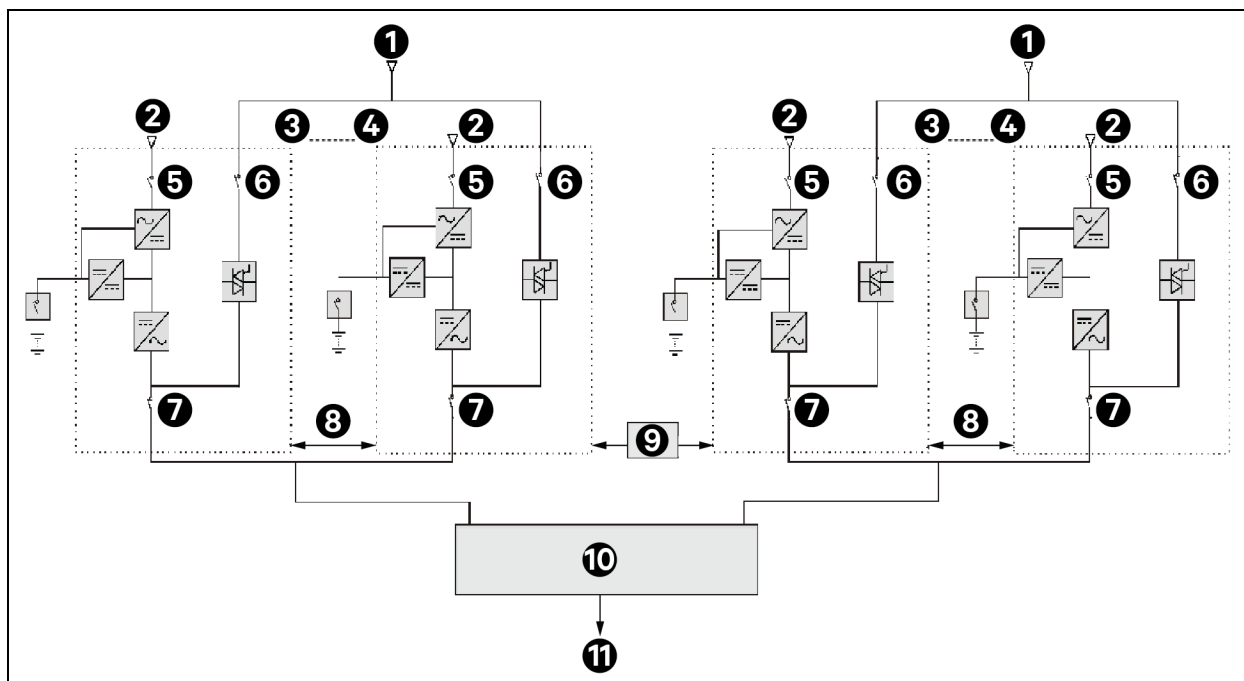
The system uses the LBS cables to keep the output of two independent UPS systems in synchronization. One set of UPS system (single/parallel) is designated as the primary system, the other set of UPS system (single/parallel) is designated as the secondary system for the operation in LBS mode.

Figure 8.5 LBS System (UPS Module)



Item	Description	Item	Description
1	Rectifier	5	Q5
2	Bypass	6	LBS
3	Q1	7	STS
4	Q2	8	To load

Figure 8.6 LBS System (Parallel System)



Item	Description	Item	Description
1	Bypass	7	Q5
2	Rectifier	8	Parallel cable
3	UPS1	9	LBS
4	UPS4	10	STS
5	Q1	11	To load
6	Q2		

NOTE: Q1, Q2, and Q5 are optional while Q3 is standard.

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

8.4.2 External Protective Device

See the [External Protective Devices](#) on page 31.

8.4.3 Power Cable

The power cable of dual bus power system is similar to that of single system. See the [Power Cable Wiring](#) on page 29.

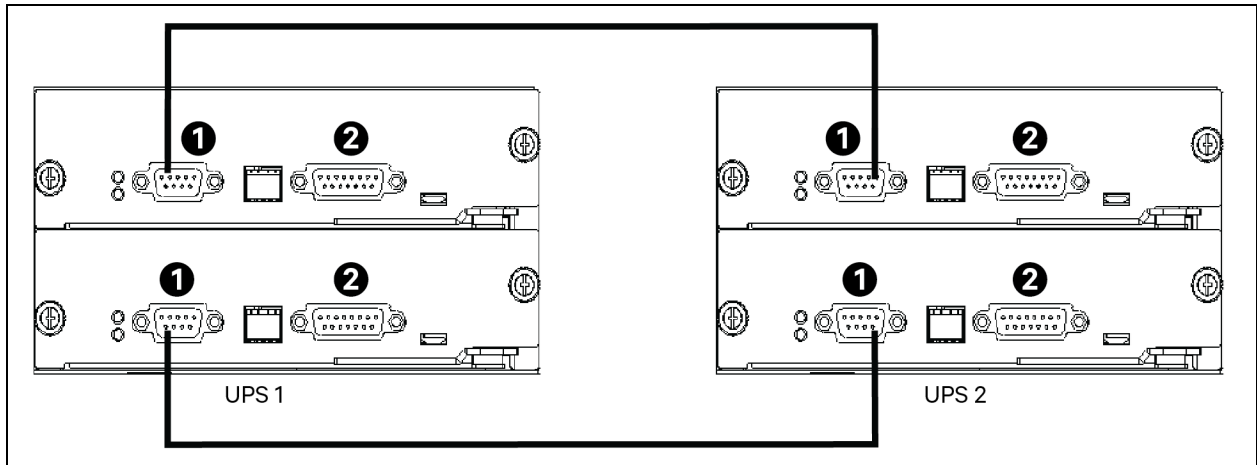
The bypass and rectifier input supplies must use the same neutral line input terminal. If the input has a current leakage protective device, the device should be installed with upstream of the neutral line input terminal.

8.4.4 Load Bus Synchronization Cable

Connect the optional LBS cables 32.8 ft., 49.2 ft., and 65.5 ft. (10 m, 15 m, and 20 m) between the LBS ports or PARA2 and LBS port of the two UPS systems, for 1250 kVA dual bus system, shown in **Figure 8.7** below and **Figure 8.8** on the facing page. The LBS port is shown in **Figure 8.9** on page 108.

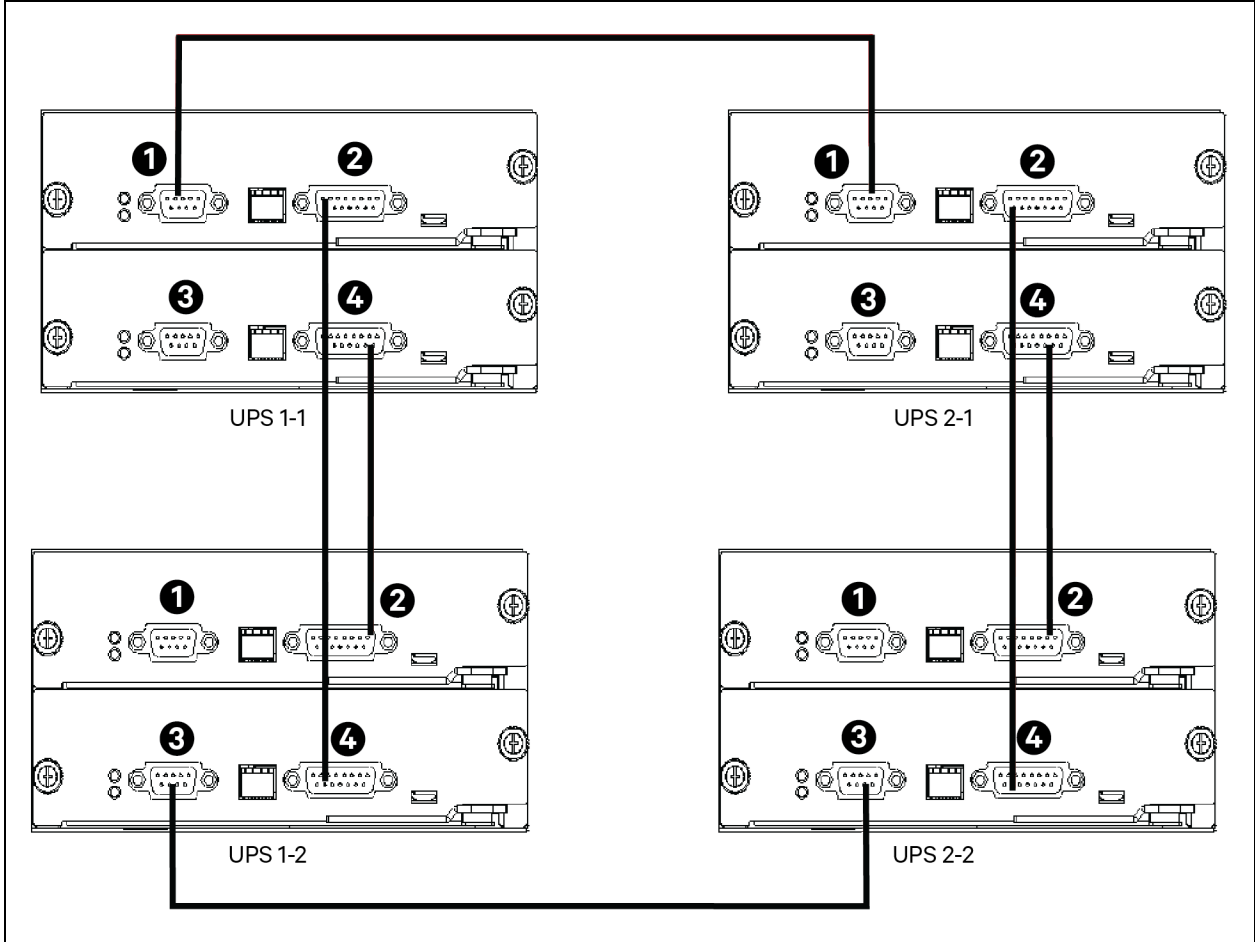
NOTE: You must use the shortest LBS cable suitable for the application. Do not coil excess. Separate the LBS cable from the power cables to prevent electrical interference.

Figure 8.7 Connection of Typical LBS System (Single Module)



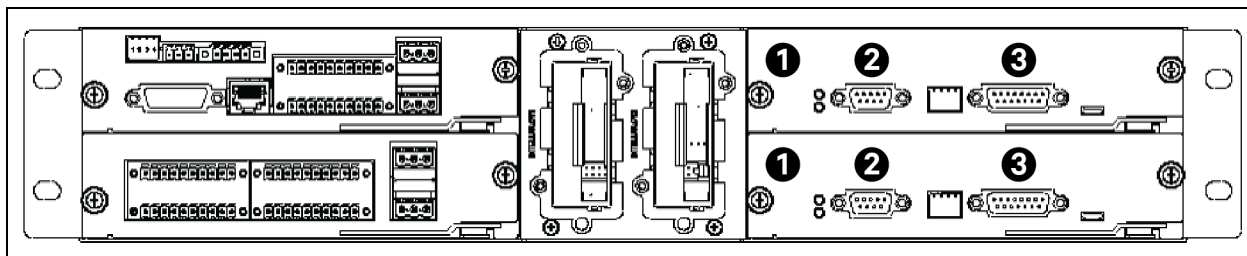
Item	Description
1	LBS
2	Parallel

Figure 8.8 Connection of Typical LBS System (Parallel System)



Item	Description
1	LBS 1
2	Parallel 1
3	LBS 1
4	Parallel 2

Figure 8.9 LBS Port



Item	Description
1	U4
2	LBS
3	Parallel

9 Options

This chapter provides the UPS option list, and introduces the functions, installation and configuration of each option.

9.1 Options List

Table 9.1 Options List

No.	Option Name	Remark
1	Battery temperature sensor kit	—
2	Battery ground fault kit	—
3	Seismic anchor kit	—
4	SIC card	Vertiv™ Liebert® Intellislot™ ports 1 to 2
5	UF-RS-485 card	Liebert® Intellislot™ port 1
6	IS-RELAY card	Liebert® Intellislot™ ports 1 to 2
7	RDU120 card	Liebert® Intellislot™ ports 1 to 2
8	External remote LBS box	—
9	Parallel cable	Available in 16.4 ft., 32.8 ft., and 49.2 ft. (5 m, 10 m, and 15 m)
10	LBS cable	Available in 32.8 ft., 49.2 ft., and 65.5 ft. (10 m, 15 m, and 20 m)
11	Common source copper bar	—
12	Bypass backfeed cabinet	—

9.2 Options Introduction

9.2.1 Battery Temperature Sensor Kit

The battery temperature sensor is used to detect the battery temperature. This kit allows for adjustment of the float charging voltage of the battery that makes it inversely proportional to the ambient temperature of the battery. This helps to prevent over charging of the battery during high ambient temperature.

NOTE: Have one battery temperature sensor and one cross head screwdriver handy before starting the installation.



CAUTION: Install the battery temperature sensor kit following the given steps, to avoid, damages to the UPS and the battery.



CAUTION: When installing the battery temperature sensor, turn off the UPS. During installation, be sure not to touch the battery terminals, exposed copper bars and components.

To Install the battery temperature sensor, follow the steps below:

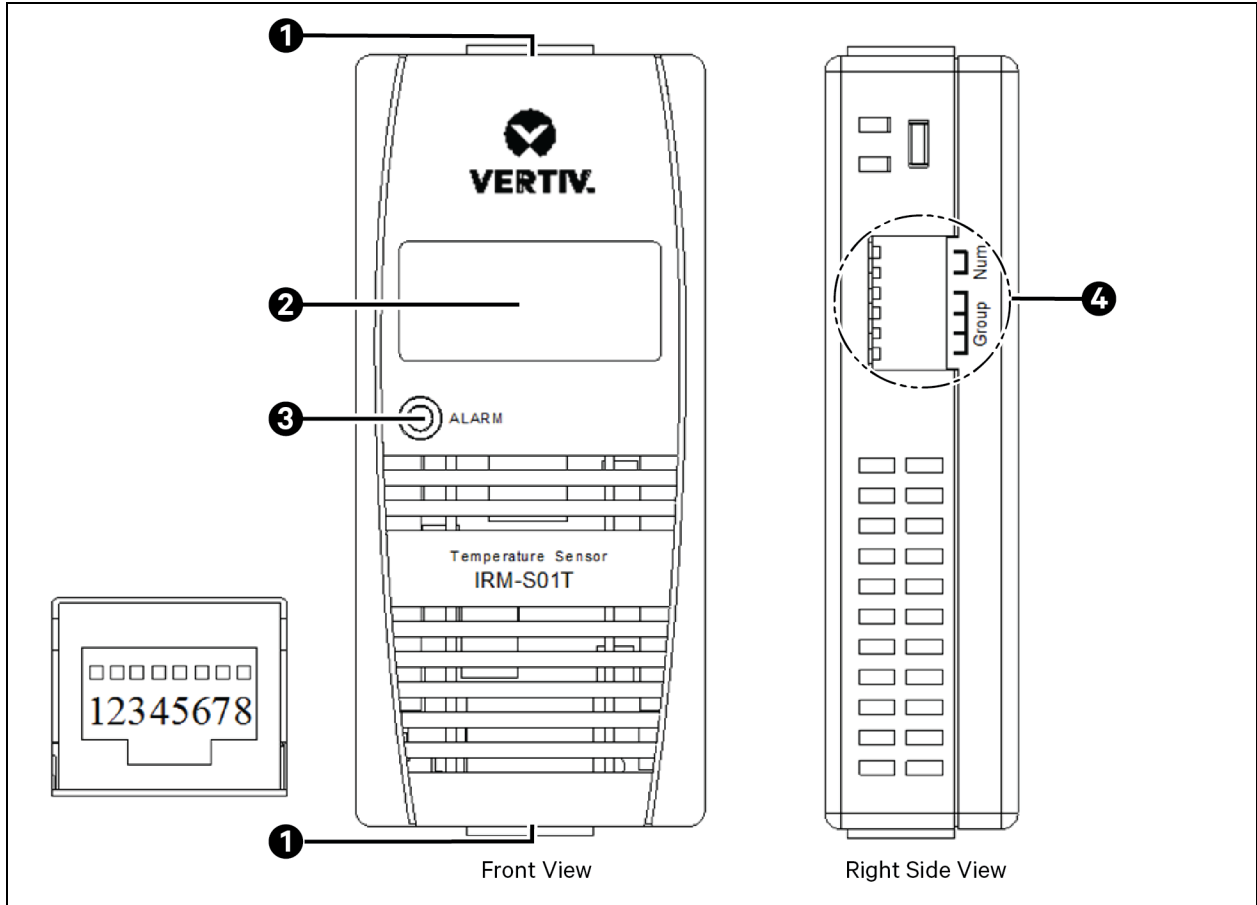
1. Power down the UPS completely.
2. Turn Off the load.

3. Wait the UPS indicators to turn off.
4. Wait for five minutes so that the UPS internal DC bus completely discharges. completely.
5. Connect one end of the network cable with shielded RJ45 port to the battery temperature sensor and plug the other end into the J2 dry contact port on the X6 BATT: Battery temperature or BMS communication port.

NOTE: The temperature sensor can be connected in series with a maximum of 20 sensors and a maximum distance of 164 ft. (50 m).

6. Route the power cables and other cables separately to avoid the EMI generation from the cables.

Figure 9.1 Sensor Appearance



Item	Description
1	RJ45 Port
2	LCD
3	Alarm indicator
4	DIP Switch

Item	Parameter
Dimension (H×W×D) in. (mm)	3.8 X 1.7 X 0.86 (97 X 44 X 22)
Weight lbs (kg)	about 0.22 (100)

RJ45 port

The electrical connection between the sensor and the external is completed through two RJ45 interfaces, which are used for power supply, communication and equipment cascading, and its definition is shown in the **Table 9.2** below.

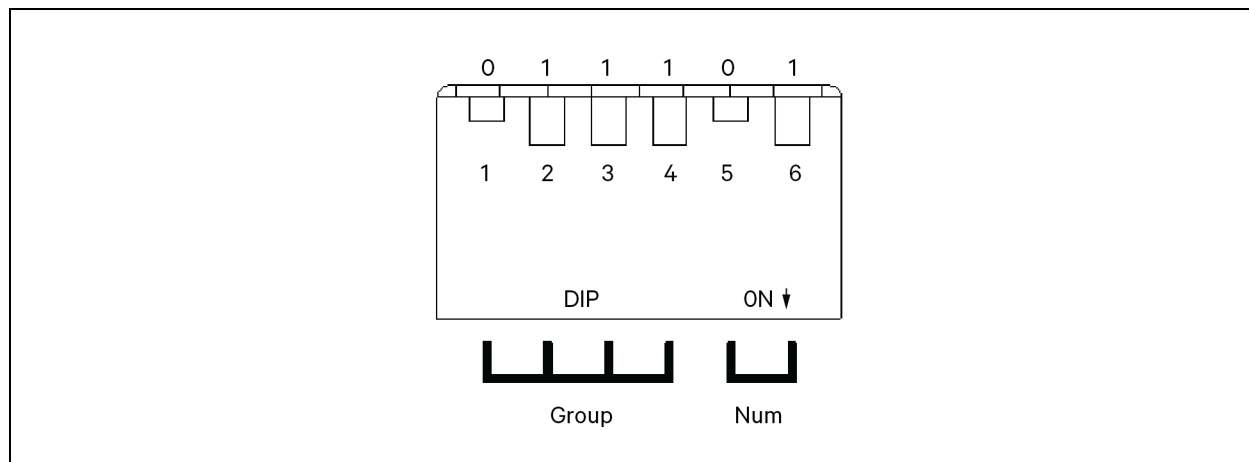
Table 9.2 Pins Description

Pin	Description
Pin1, Pin2	+12 V / 24 V
Pin3, Pin6	NC
Pin4, Pin5	GND
Pin7	D+
Pin8	D-

DIP switch

The DIP switch is used to set the address of the sensor that communicates with the upper device through the MODBUS protocol. The sensor address consists of a group number and a sequence number within the group, among which DIP1 to DIP4 are used to set the group number, and DIP5 to DIP6 are used to set the sequence number within the group. See **Figure 9.2** below for details, the setting up sensor address 71. Here 0111 represents group number 7, and 01 represents sequence number 1 within the group.

Figure 9.2 DIP Switch



NOTE: On indicates 1, Off indicates 0 address. It cannot be to 00 as this is the broadcast address.

The Vertiv™ PowerUPS 9000 1250 kVA Modular UPS CE series UPS supports multiple external battery cabinets to be grouped and numbered to monitor and manage the temperature of the battery cabinets.

The settings of the DIP switches DIP1 to DIP6 of the battery temperature sensor are shown in the **Table 9.3** on page 113:

Table 9.3 DIP Switch Setting

DIP1 to DIP4	DIP5 to DIP6	Sensor Address	Matched Battery Cabinet Number
0001	00	10	Battery cabinet 1
	01	11	
	10	12	
	11	13	
0010	00	20	Battery cabinet 2
	01	21	
	10	22	
	11	23	
0011	00	30	Battery cabinet 3
	01	31	
	10	32	
	11	33	
0100	00	40	Battery cabinet 4
	01	41	
	10	42	
	11	43	
0101	00	50	Battery cabinet 5
	01	51	
	10	52	
	11	53	
0110	00	60	Battery cabinet 6
	01	61	
	10	62	
	11	63	
0111	00	70	Battery cabinet 7
	01	71	
	10	72	
	11	73	
1000	00	80	Battery cabinet 8
	01	81	
	10	82	
	11	83	

Table 9.3 DIP Switch Setting (continued)

DIP1 to DIP4	DIP5 to DIP6	Sensor Address	Matched Battery Cabinet Number
1011	00	B0	Battery cabinet 1
	01	B1	
	10	B2	
	11	B3	
1100	00	C0	Battery cabinet 2
	01	C1	
	10	C2	
	11	C3	
1101	00	D0	Battery cabinet 3
	01	D1	
	10	D2	
	11	D3	
1110	00	E0	Battery cabinet 4
	01	E1	
	10	E2	
	11	E3	

For other installation steps, please refer to [IRM-S01T Smart Temperature Sensor User Manual](#).

9.2.2 Battery Ground Fault Kit

The Vertiv™ PowerUPS 9000 1250 kVA Modular UPS CE has an optional battery ground fault detector kit, it helps to detect and remove battery ground fault to ensure reliable system operation.

When a battery ground fault is detected, the alarm indicator is ON on the UPS display panel.

The battery ground fault detector kit includes a mutual inductor and a PCB, to be installed in the BCB box. To install and connect of the battery ground fault detector, see [Battery Ground Fault Detector \(Optional\)](#) on page 1.

9.2.3 Seismic Anchor Kit

The PowerUPS 9000 1250 kVA Modular UPS CE provides seismic anchor kits to avoid and reduce the damage to UPS caused by earthquake or vibration.

Fix the UPS onto the concrete floor.



WARNING! Only Vertiv authorized engineers are to perform installation in order to avoid personal injury or damage to the UPS anchor kits.

Preparation:

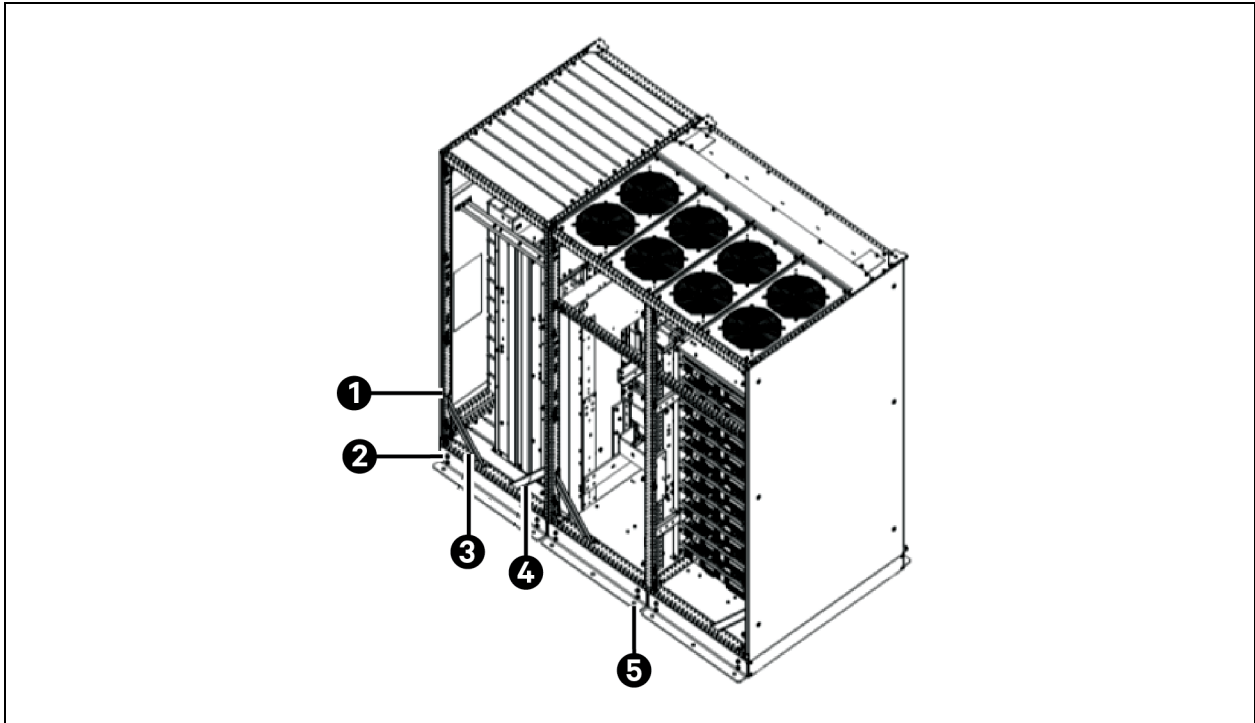
1. Prepare the installation tools, including a cross head screwdriver, a torque spanner and an adjustable spanner.

2. Check that all installation materials are present and complete, including: six seismic brackets, three seismic components inclined beam 1, three seismic components inclined beam 2, twenty-four M8×25 combination screws, twenty-four M6x12 self-tapping locking screws and eighteen M12 expansion bolts.

Installing the Seismic anchor:

1. Use M8 X 25 tapping screws (quantity = 4) to install seismic anchor on the rear bottom side of the UPS cabinet, then fasten the inclined beam 1 and inclined beam 2 to the lower part of the cabinet with M6 self-tapping locking screws, fasten the seismic anchor to the ground with M12 expansion bolts as shown in **Figure 9.3** below.

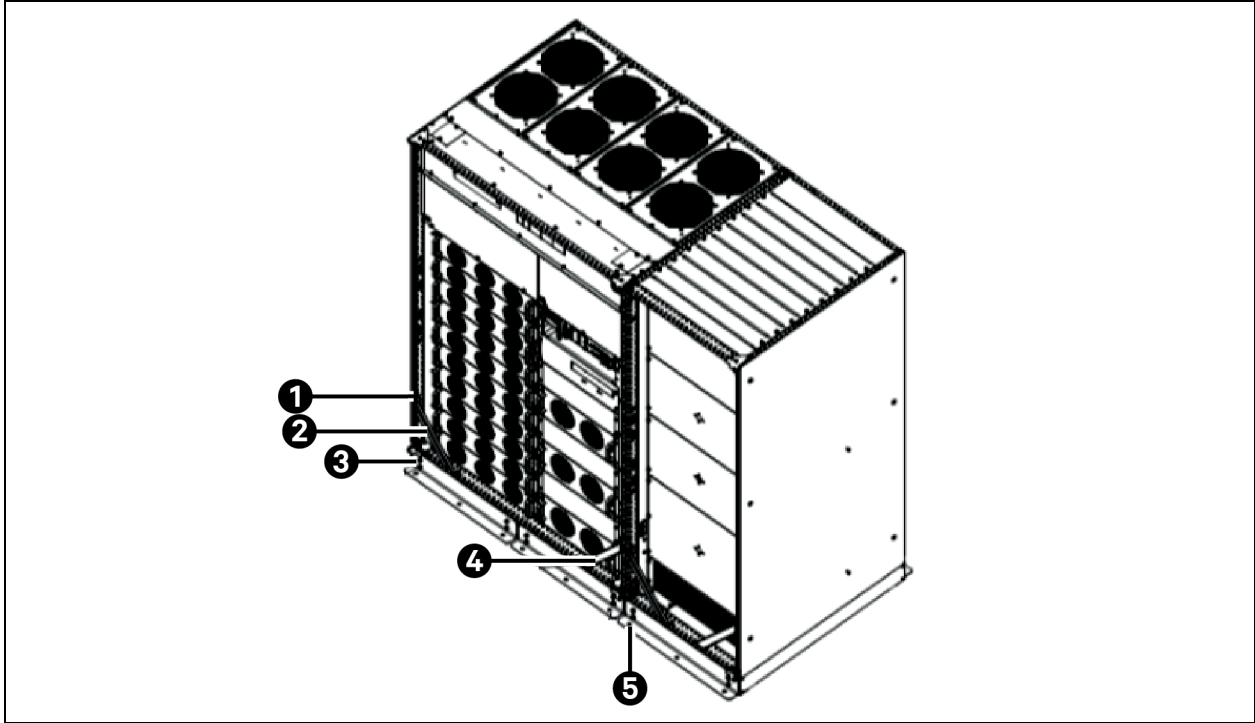
Figure 9.3 Installing Seismic Anchor (Rear Installation)



Item	Description	Quantity
1	M6 x 12 self-tapping locking screws	8
2	M8 x 25 tapping screws	12
3	Inclined beam 1	1
4	Inclined beam 2	1
5	M12 expansions bolts	9

2. Use M8 × 25 tapping screws (quantity = 4) to install seismic anchor on the front bottom side of the UPS cabinet. Then fasten the inclined beam 1 and inclined beam 2 to the lower part of the cabinet with M6 self-tapping locking screws finally fasten the seismic anchor to the ground with M12 expansion bolts, as shown in **Figure 9.4** on the facing page.

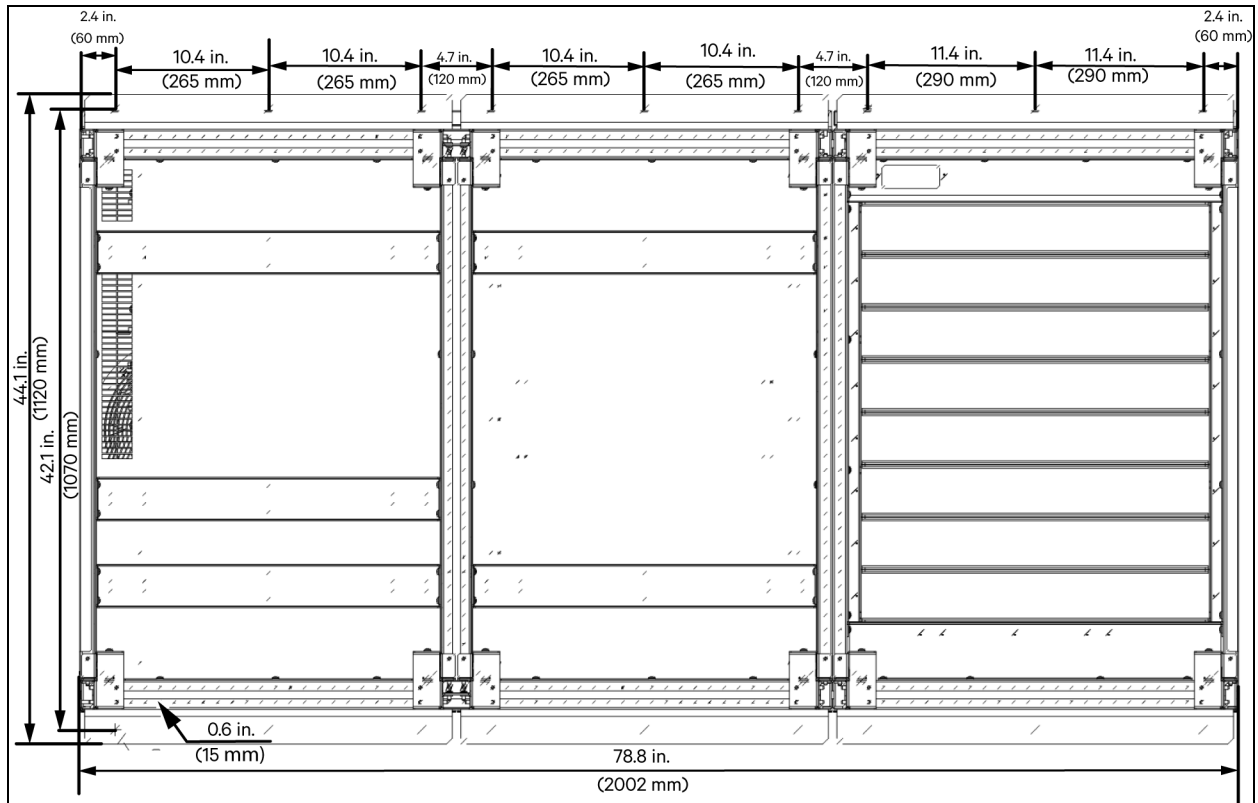
Figure 9.4 Installing Seismic Anchor (Front Installation)



Item	Description	Quantity
1	M6 x 12 self-tapping locking screws	16
2	Inclined beam 1	1
3	M8 x 25 tapping screws	12
4	Inclined beam 2	1
5	M12 expansion bolts	9

The bottom installation dimensions of the seismic anchors are shown in Figure 9.5 on the next page.

Figure 9.5 Seismic Anchor Dimensions for 1250 kVA



9.2.4 SIC Card

The SIC card shown in **Figure 9.6** on the facing page is a network management card. It enables the network communication capability for the Vertiv™ PowerUPS 9000 1250 kVA Modular UPS CE. It can also support theVIRM series sensor to monitor the environment. When the intelligent equipment generates an alarm, the SIC card can notify the user by recording the log, sending trap information, and sending an email. SIC card also supports Modbus RTU protocol.

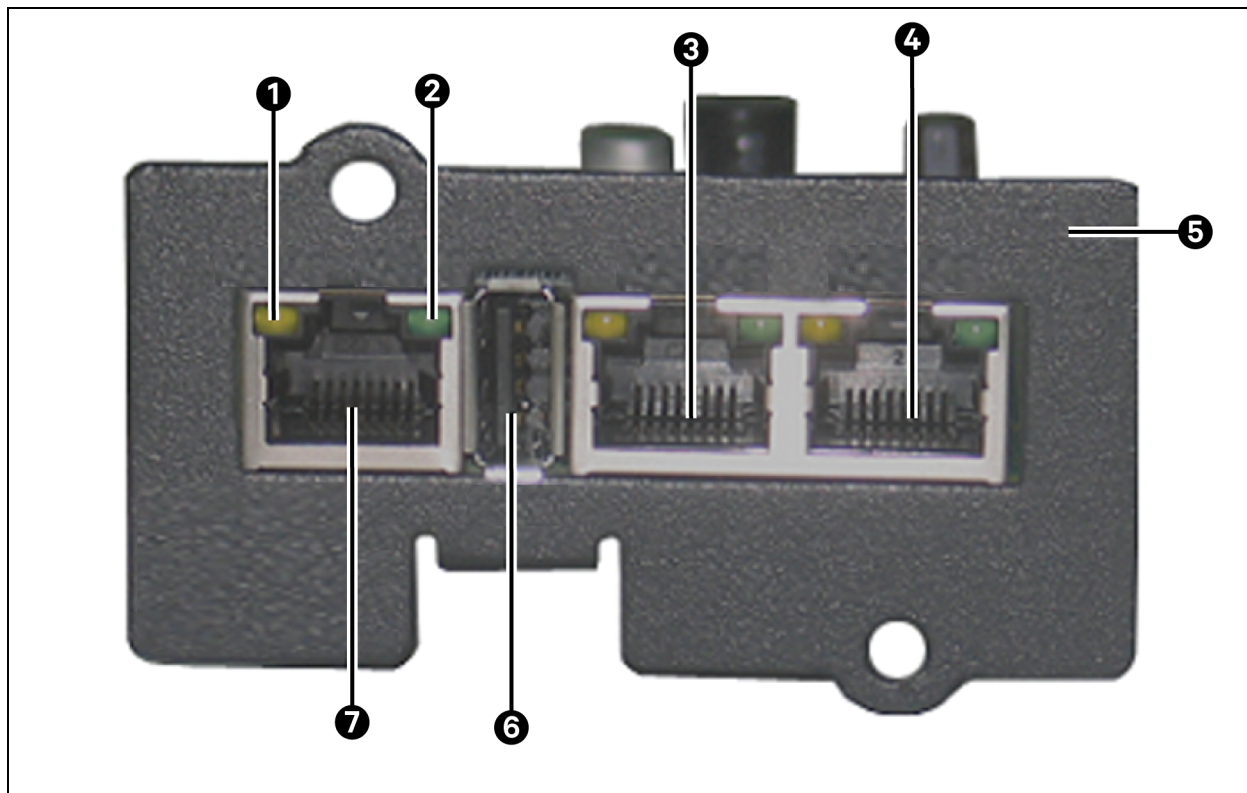
NOTE: Keep the installation materials, including SIC card and one cross head screwdriver, handy before starting the installation.

NOTE: There is no need to shut down the UPS during SIC card installation because the SIC card is hot pluggable.



WARNING! Some electronic components in SIC card are sensitive to static. Do not touch the electronic components or circuits in SIC card or other conductive materials by hand, to protect the SIC card against static shock. Hold the side edge of the card to remove or install the SIC card.

Figure 9.6 SIC Card



Item	Description
1	RUN indicator
2	LAN indicator
3	COM1 port
4	COM2 port
5	Front panel
6	USB port
7	RJ45 port

The SIC card is installed in the Intellislot™ port in the UPS. See **Table 4.15** on page 47 for installation positions of optional cards. See **Figure 4.6** on page 38.

Installing the SIC card:

1. Remove the cover of Intellislot™ port.

NOTE: Preserve the screws and port cover for future use.

2. Insert the SIC card (along two sides of the Intellislot™ port) into the indicated position recommended in **Table 4.15** on page 47, and then tighten the screws.

For more information of the SIC card, refer to **Site Interface Web/SNMP Agent Card User Manual SL-52645**.

See [Signal Cable Connection Steps](#) on page 48 for the cabling and routing of the signal cables.

9.2.5 IS-Relay Card

The Vertiv™ PowerUPS 9000 1250 kVA Modular UPS CE has an optional IS-Relay card to use the dry contact signal to monitor the UPS functionality. See **Figure 9.7** below. The functions of the IS-Relay card are listed in **Table 9.4** on the facing page.

Figure 9.7 IS-Relay Card



Table 9.4 Function of UPS IS-Relay card

Pin	Function	Operation
1	Common-Low Battery	
2	Low Battery	Closed if low battery point occurs
3	Low Battery	Closed if battery is OK
4	Common-UPS Fault	
5	UPS Fault	Closed if UPS fault occurs
6	UPS Fault	Closed if no UPS failure
7	Common-On Battery	
8	On Battery	Closed if On Battery power (Utility failure)
9	On Battery	Closed if not On Battery power (Utility OK)
10	Signal Ground	Future release
11	Signal Ground	Future release
12	UPS Any-Mode Shutdown	Future release
13	Summary Alarm	Closed if no alarm conditions are present
14	Summary Alarm	Closed if summary alarm occurs
15	Common-Summary Alarm	

Table 9.4 Function of UPS IS-Relay card (continued)

Pin	Function	Operation
16	On UPS	Closed if On UPS (inverter) power
17	On Bypass	Closed if On Bypass
18	Common-On Bypass	

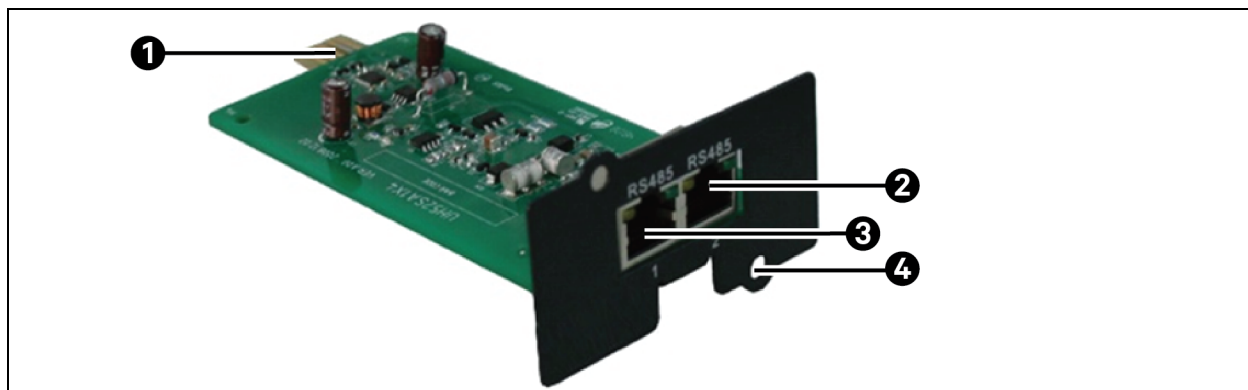
For more information of the IS-Relay card, refer to the [Vertiv™ IS-Relay Card User Manual SL-52645](#).

The installation method of the IS-Relay card is the same as that of the SIC card described in [SIC Card](#) on page 116. See the [Signal Cable Connection Steps](#) on page 48 for the cabling and routing of the signal cables.

9.2.6 UF-RS-485 Card

The UF-RS-485 card converts a RS-232 signal to RS-485 signal to ensure UPS networking and communication. It is to be installed in an Intellislot port of the UPS. See [Table 9.1](#) on page 109 for details. It is hot pluggable for easy installation.

The appearance of the UF-RS485 card is shown in [Figure 9.8](#) below.

Figure 9.8 UF-RS-485 Card

Item	Description
1	Goldfinger
2	RJ45 port 2
3	RJ45 port 1
4	Installation hole (quantity = 2)

The gold finger is used for insertion into the Intellislot port of the UPS. It provides RS232 input signal. The RJ45 port 1 and RJ45 port 2 are in parallel connection. They provide RS-485 output signal.

NOTE: There is no need to shut down the UPS during xxx card installation because the UF-RS-485 card is hot pluggable.



CAUTION: Some electronic components on the UF-RS-485 card are quite sensitive to static electricity. To prevent static electricity from damaging the card, do not touch its electronic components or circuits. Please hold the card by side edges of the UF-RS-485 card when moving or installing it.

Installing the UF-RS-485 Card:

1. Remove the Intellislot port cover on the front panel of the bypass module.

NOTE: Preserve the port cover for future use.

2. Align the UF-RS-485 card with the Intellislot port.
3. Insert the card into the port UPS along the grooves on both sides of the port.
4. Fix the UF-RS-485 card through the fixing holes on the UF-RS-485 card panel with the screws provided with the Intellislot port cover.
5. Connect the cable by Inserting one end of the standard network cable into the RJ45 port 1 or RJ45 port 2 of the UF-RS-485 card.

NOTE: Select whatever length of standard network cable required.

6. Insert the other end of the cable to the corresponding port of the equipment.



WARNING! The RJ45 ports of the UF-RS-485 card must connect to SELV circuit. Failure to observe this could cause damage to the card and even result in accidents.

Troubleshooting

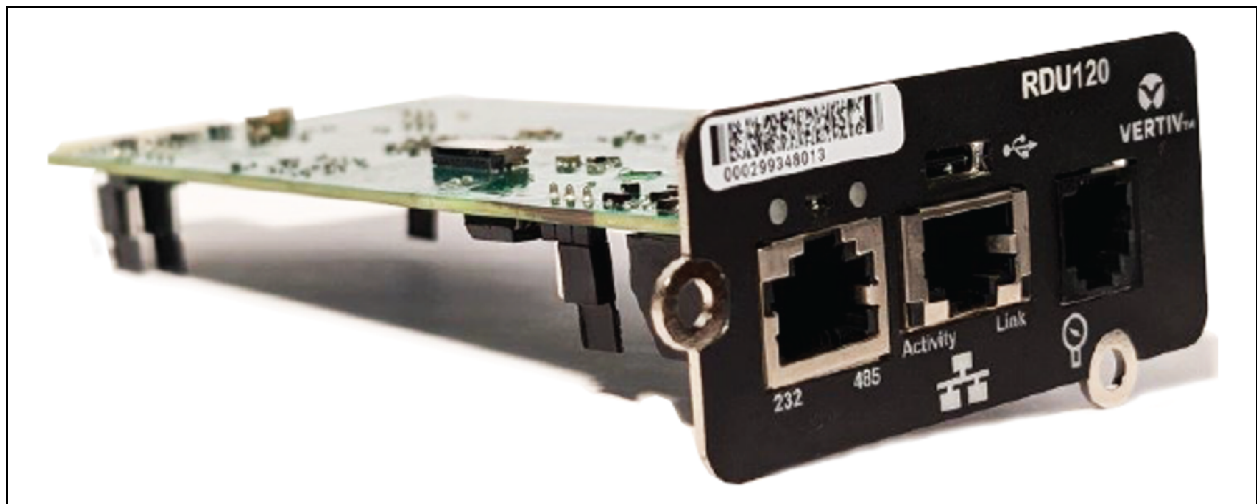
If the UF-RS-485 output signal does not change with the UPS status, then ensure that the UF-RS-485 card is properly inserted into the Intellislot port, and the network cable is properly connected.

9.2.7 RDU120 Card

The Vertiv™ Liebert® Intellislot™ RDU120 card provides Web access to UPS devices and transfers data over SNMP, Modbus, and BACNet. Environmental sensor data access is provided through Web and SNMP. The RDU120 card uses an Ethernet network to monitor and manage various operating parameters, alarms, and notifications.

Figure 9.9 below shows the appearance of the RDU120.

Figure 9.9 RDU120 Card



For details, refer to Liebert® Intellislot™ RDU120 User Manual SL-52645.

The installation method of the IS-Relay card is the same as that of the SIC card described in [SIC Card](#) on page 116. See the [Signal Cable Connection Steps](#) on page 48 for the cabling and routing of the signal cables.

9.2.8 Parallel Cable

Connect a module parallel cable from its PARA1 port to the PARA2 port of another module. Similarly connect other parallel cables.

Shielded and double insulated parallel cables available in lengths of 16.4 ft., 32.9 ft., and 49.3 ft. (5 m, 10 m, and 15 m) must be interconnected in a ring configuration between the UPS modules, as shown in **Figure 8.2** on page 99.

The ring connection ensures the reliability of the control of the parallel system. Verify the cable connection before starting up the UPS system.

9.2.9 Load Bus Synchronization Cable

Shielded and double-insulated parallel control cables (LBS1 and LBS2) available in lengths of 32.9 ft., 49.3 ft., and 65.7 ft. (10 m, 15 m, and 20 m). The LBS cable must be interconnected in a branch configuration between LBS1 and LBS2 of any UPS modules, as shown in **Figure 8.7** on page 106, **Figure 8.8** on page 107, and **Figure 8.9** on page 108.

9.2.10 Shorting Copper Bar Kit

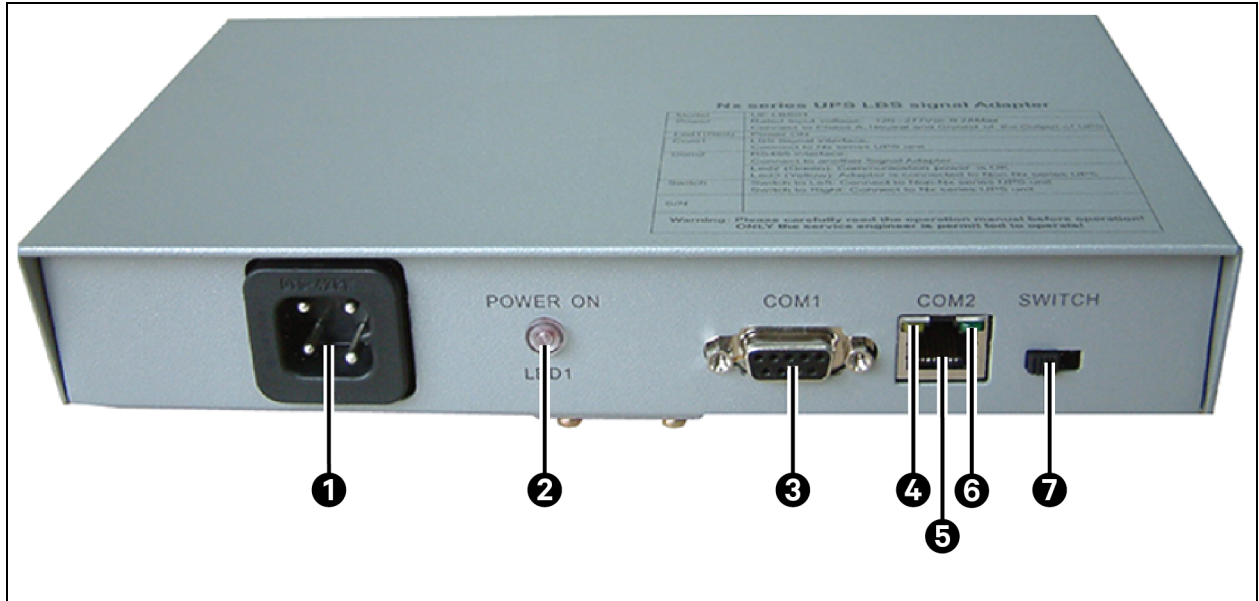
For the UPS with shorting copper bar of common input configuration, the user should select the shorting copper bar kit to short the mains input and bypass input.

9.2.11 Load Bus Synchronization Adapter

The LBS adapter is designed to extend the LBS function up to 150m between the two UPS units or systems of a dual bus system, and it also enables the UPS to synchronize with other Vertiv™ PowerUPS 9000 1250 kVA Modular UPS CE models.

The appearance of the LBS adapter is shown in **Figure 9.10** below.

Figure 9.10 LBS Adapter



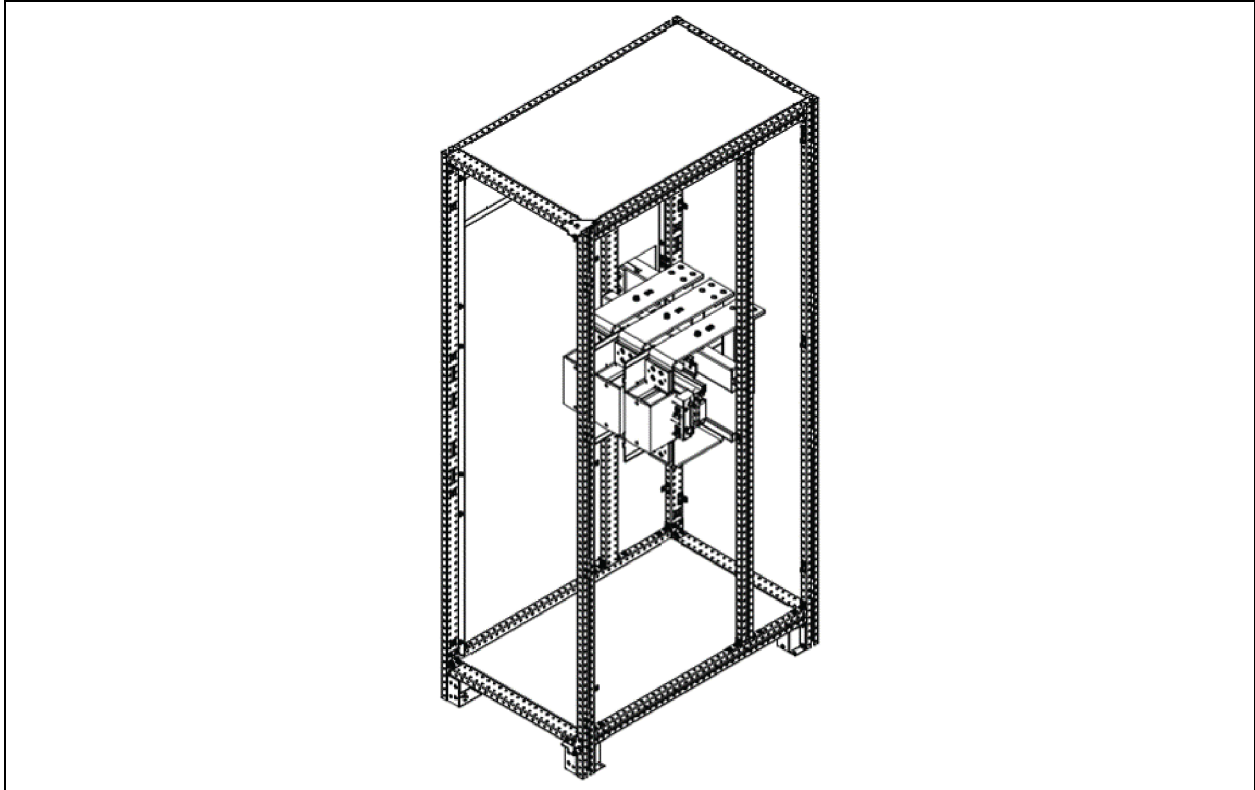
Item	Description	Item	Description
1	Power Port	5	COM2
2	LED1	6	Green LED
3	COM1	7	Switch
4	Yellow LED		

For details about how to install and connect cables, refer to the **Dual Bus UPS LBSTM Expander/Adapter Installation Manual SL-71058**.

9.2.12 Bypass Backfeed Cabinet (Optional)

A bypass backfeed contactor option is provided. The contactor is installed inside the side cabinet with a width of 600mm. When using this component, the side cabinet needs to be connected with the UPS. The contactor is directly powered by the input power and the contactor is disconnected when the input power fails. See **Figure 9.11** below.

Figure 9.11 Schematic Diagram of Installing Backfeed Cabinet Option



Option	Dimension (W × D × H) in. (mm)
Backfeed cabinet	23.6 X 39.3 X 78.7 (600 x 1000 x 2000)

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10 Communication

This chapter provides information about the compatible communication protocols.

The Vertiv™ PowerUPS 9000 1250 kVA Modular UPS CE Supports:

- SNMP Protocol communication
- Modbus protocol communication
- Dry contact communication
- Velocity protocol communication.

Selecting Velocity means the system supports the Velocity protocol communication.

10.1 SNMP Protocol Communication

If you need to monitor the UPS through network, you may select the RDU120 card or SIC card provided by Vertiv. The RDU120 card or SIC card provided by Vertiv.

Both the RDU120 card and SIC card are network management cards, which make the UPS an internet of things device. Infrared receiver module series sensor can also be connected to these cards to provide environmental monitoring function. When the intelligent equipment generates an alarm, the RDU120 card and SIC card send notifications by recording the log, sending trap information, and sending a mail.

The RDU120 card and SIC card provide three approaches for you to monitor your intelligent equipment and equipment room environment:

- Web browser. You can use Web browser to monitor your intelligent equipment and equipment room environment through the Web server function provided by the SIC card or RDU120 card.
- Network management system (NMS). You can use NMS to monitor your intelligent equipment and equipment room environment through the SNMP function provided by the SIC card or RDU120 card.
- SiteMonitor, network management software for equipment room power and environment. You can use SiteMonitor to monitor your intelligent equipment and equipment room environment through the TCP/IP interface provided by the SIC card.

The SIC card can also work with the Network Shutdown computer safe shutdown program developed by Vertiv to provide automatic safe shutdown function for your computer installed with Network Shutdown, so as to prevent data loss.

The communication card shall be installed at the Intellislot™ port. See **Figure 4.6** on page 38.

For the installation and setting information of the RDU120 card, refer to **Liebert® IntelliSlot™ RDU120 User Manual SL-52645**.

For the installation and setting information of the SIC card, refer to the **Site Interface Web/SNMP Agent Card User Manual SL-52645**.

10.2 Modbus Protocol Communication

The Modbus (RTU) protocol communication is supported by the SIC card and RDU120 card.

10.3 Dry Contact Communication

The UPS provides the following two dry contact communications:

- IS-Relay card (Optional)
- Dry contact port of central control module

10.3.1 Communication through IS-Relay Card

The UPS provides an Vertiv™ IS-Relay card user to use dry contact signals to monitor the UPS. For the installation and use of the IS-Relay card, refer to [Vertiv™ IntelliSlot™ IS-Relay Card User Manual SL-26100](#).

10.3.2 Communication through Dry Contact Port of Central Control Module

For field specific needs, the UPS may need auxiliary connection to have functions such as acquiring external equipment status information, providing alarm signals to external devices, and remote EPO. These functions are realized through the following interfaces on the bypass control module:

- Input dry contact port of external device status information.
- Output dry contact ports of alarm signal.
- EPO input port.

For the functions and detailed information of these ports, see [Wiring of Signal Cable](#) on page 37.

11 Service and Maintenance

The UPS system (including the battery) requires periodic service and maintenance to ensure long service life. This chapter provides information about the service life, regular inspection, maintenance, and replacement of the key UPS components.

NOTE: Effective maintenance of the UPS system can reduce the risk of UPS failure and will increase the UPS service life.

11.1 Safety for Service and Maintenance



WARNING! Replacement, service, and maintenance is to be performed only by authorized Vertiv personnel to prevent device malfunction.



WARNING! The neutral line has hazardous voltage. When servicing the UPS, pay attention to safety.



WARNING! If the UPS does not have a switch or if it has 3 switches, switch off the disconnect device before maintenance, and check whether the UPS is powered on.



CAUTION: The components that can only be accessed by opening the protective cover with tools cannot be operated by the user. Only qualified service personnel are authorized to remove such covers.

11.2 Service Procedures of Power Module and Bypass Power Module

NOTE: Only Vertiv service engineers are to service the power modules and bypass power modules.

1. Remove the power modules and bypass power module from top to bottom to prevent cabinet toppling due to high gravity center.
2. Do not disassemble the power module, bypass power module, and central control module. They may have high voltage inside.
3. Service the power modules and bypass power modules after 5 minutes of unplugging from power source.
4. Put the modules back into the cabinet after 5 minutes after servicing.
5. Do not pull different types of modules out of the cabinet at the same time.

11.2.1 Service Procedures of Bypass Power Module

1. Place the ready switch on the front panel of the power module to unready state, the green indicator beside the ready switch should be off and the red indicator is on.
2. Ensure that the red indicator on the power module is on.
3. Remove the fixing screws on both sides of the front panel of the module, and pull the bypass module out of the cabinet.

NOTE: When the module is pulled out halfway, it is blocked by the leaf spring on the right side of the module. The leaf spring must be pressed down to pull out the module.

4. After servicing the module, check that the ready switch is in unready state.
5. Put the module into the cabinet and tighten the screws on both sides.

NOTE: Install the another serviced module inside the cabinet after 10 seconds.

6. Place the ready switch of the module to the left position, and the module will get connected to the system automatically.

11.2.2 Replacement Procedures of Bypass Power Module

Service procedures in bypass mode:

1. Enable Normal mode or Maintenance bypass mode, see [Procedures for Transfer Between Operation Modes](#) on page 75 or [UPS Battery](#) on page 88.
2. Place the ready switch on the front panel of the power module to unready state. This turns the red indicator beside the ready switch On.
3. Remove the fixing screws on both sides of the front panel of the bypass power module and pull the module out of the cabinet to service the module.
4. After servicing the module, put the module back into the cabinet and tighten the screws on both sides.

NOTE: The module is large and heavy, when pulling the bypass power module out of the system, the service engineer should move it leftward and rightward before it can be completely pulled out.

NOTE: Loose contact of the bypass module can affect the normal operation of the bypass power module and the overall unit.

NOTE: When putting the bypass power module back in the cabinet, push it to ensure it connects correctly with the system. The brackets on both sides of the module are close to the cabinet column.

5. Place the ready switch to ready state. This will turn the red indicator beside the ready switch Off and the green indicator On.
6. Ensure to enable to the Bypass mode, see [Procedures for Transfer Between Operation Modes](#) on page 75 or [UPS Battery](#) on page 88.

Service procedures for single UPS in normal mode:

1. Place the ready switch on the front panel of the power module to unready state. This turns the red indicator beside the ready switch On.
2. Remove the fixing screws on both sides of the front panel of the bypass power module and pull the module out of the cabinet.
3. After servicing the module, put the module into the cabinet and tighten the screws on both sides.
4. Place the ready switch to ready state. This turns the red indicator beside the ready switch Off and the green indicator On.

11.3 Key Components and Service Life of UPS

When in use, some components of UPS system will have shorter service life compared to the UPS due to abrasion. For the safety of the UPS supply system, it is necessary to have regular inspection and replacement of these components. This section introduces the key components of UPS and the reference years of service life. For systems under different conditions (environment or load rate) assessment and advice by service engineers on whether to replace the device are required with reference to the information provided in this section.

11.3.1 Life Parameters and the Recommended Replacement Time of Key Components

Key components in **Table 11.1** below are used in the UPS system. To prevent system failures due to some device failure by wear, it execute the regular inspection and replacement during its estimated life.

Table 11.1 Life Parameters and the Recommended Replacement Time of Key Components

Key Components	Estimated Life	Recommended Replacement Time	Recommended Inspection Period
Fan	Not less than 7 years	5 years	1 year
Air filter	1 year to 3 years	1 year to 2 years	2 months
VRLA battery (5-year life)	5 years	3 years to 4 years	6 months
VRLA battery (10-year life)	10 years	6 years to 8 years	6 months

11.3.2 Replacement of Air Filter

NOTE: The air filters need regular inspection and replacement, which depends on the environmental conditions of the UPS. Under normal environmental conditions, the air filters should be cleaned or replaced once every two months and need more frequent cleaning and replacement in dusty or other unclean environments.

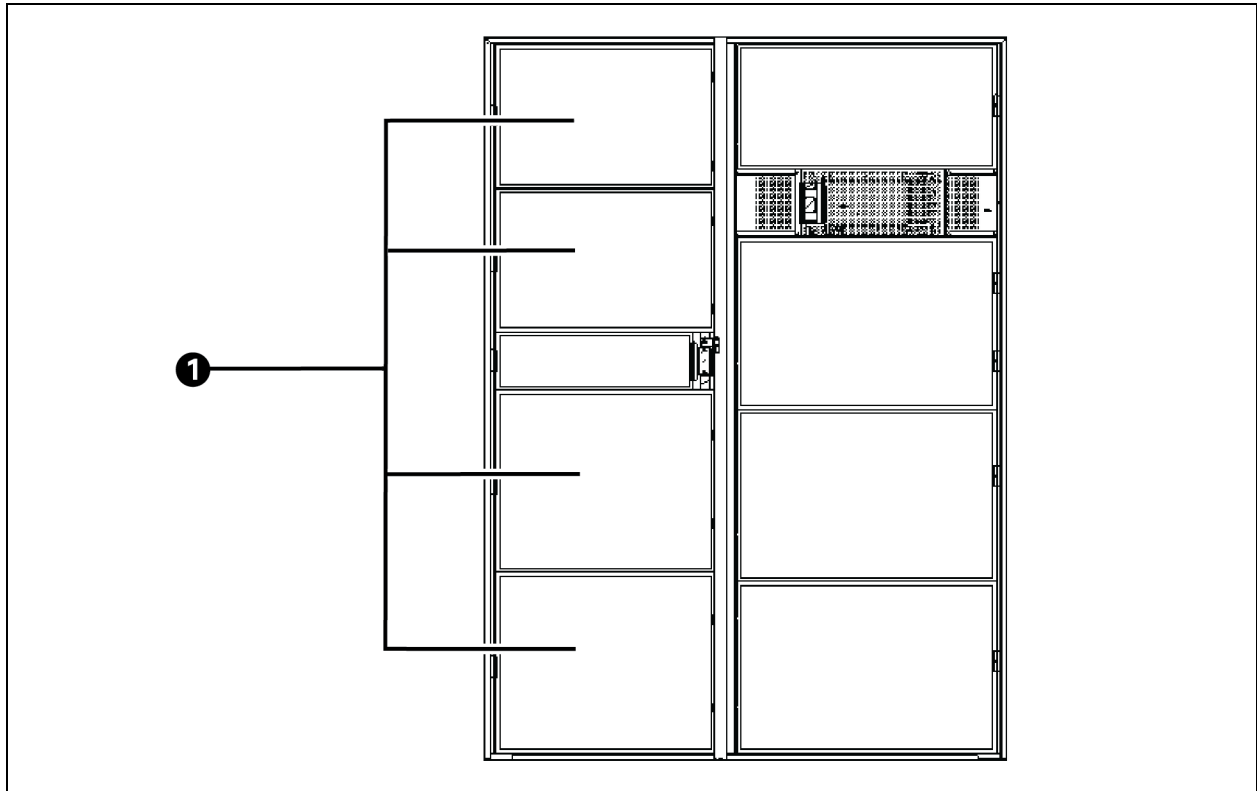
The UPS has air filters mounted on the rear side of the front door of the cabinet. The filters can be replaced while the UPS is operational.

The air filters are fixed by bars on both the sides. See **Figure 11.1** on the next page.

Procedure to replace the air filters:

1. Open the front door of the UPS to reveal the air filter on the back of the front door.
2. Remove a fixing bar on one side and loosen the fixing screws of the fixing bar on the other side. There is no need to remove this fixing bar.
3. Remove the air filter to be replaced, insert a clean one.
4. Re-install the removed fixing bar in the original place and tighten the fixing screws.
5. Tighten the fixing screws of the fixing bar on the other side.

Figure 11.1 Replacing Air Filter



Item	Description
1	Air filter

11.4 Maintenance of UPS and Options

UPS and the options need common maintenance:

1. Keep good maintenance records. Keeping good maintenance records facilitates failure treatment.
2. Keep the surrounding environment clean to prevent dust and moisture entering the UPS.
3. Maintain an ambient temperature of 68 °F to 77 °F (20 °C to 25 °C) for the battery.

NOTE: Very low temperature will reduce the battery capacity and if it is too high the battery life will reduce.

4. Check all wiring regularly for damage.
5. Check and tighten all the screws and tighten all the screws, at least once a year.
6. Check regularly for any abnormality in the upstream or downstream switch to maintain reliability when cutting off of the input or output when the current is too large.
7. Regularly check the status of the LED light on the built in lightning protection board of the UPS. If the indicator light is abnormally off, replace the lightning protection board. See [Power Switch](#) on page 69 for the position of the lightning protection board.

Maintenance staff should be aware of the typical ambient conditions where UPS is working to detect the unusual ambient conditions. The setting of UPS touchscreen must be known to all maintenance staff.

For information of the UPS battery maintenance, see [Battery Maintenance](#) on page 93.

12 Specifications

This chapter includes all the required UPS specifications.

12.1 Conformance and Standards

The UPS is designed to comply with the European and international standards listed in **Table 12.1** below.

Table 12.1 European and International Standards

Item	Normative Reference
General safety requirements for UPS	IEC 62040-1
EMC requirements for UPS	IEC 62040-2
Method of specifying the performance and test requirements of UPS	VFI-SS-111
UPS: Environmental Factors, Requirements and Reports	CE

NOTE: The product standards in this table incorporate relevant compliance clauses with generic IEC and EN standards for safety (IEC/EN/AS60950), electromagnetic emission and immunity (IEC/EN/AS61000 series) and construction (IEC/EN/AS60146 series and 60529).

12.2 Environmental Characteristics

Table 12.2 Environmental Characteristics

Item	Normative Reference	Rated Power (1250 kVA)
Noise within 3.3 ft. (1 m) (in the front)	dB (A)	≤ 79
Altitude	m	≤ 3000, derate power by 1% per 329 ft. (100 m) between 4922 ft. (1500 m), and 9843 ft. (3000 m)
Relative humidity	%RH	0 to 95%, non condensing
Operating temperature	°C	0 to 50 to 40, at full load, 41 to 45, 90% load, 46 to 50, 80% load
Storage and transportation temperature for UPS	°C	Storage: -13 °F to 131 °F (-25 °C to +55 °C), Transportation: -40 °F to 158 °F (-40 °C to +70 °C)
Over voltage level		Level 3
Pollution level		Level 2
Grid system		TN, TT, IT, TN-S

12.3 Mechanical Characteristics

Table 12.3 Mechanical Characteristics

Item		Unit	Power Module and 1250 kVA UPS		
			Power Module	1250 kVA UPS	With Backfeed Cabinet Option
Dimensions (W×D×H)	Packing excluded	in. (mm)	22.9 x 27.5 x 5.2 (580 x 698 x 130)	82.7 x 39.4 x 78.8 (2100 x 1000 x 2000)	102.4 x 39.4 x 78.8 (2600 x 1000 x 2000)
	Packing included	in. (mm)	31.3 x 38.8 x 137.8 (795 x 985 x 3500)	86.9 x 45.2 x 88 (2206 x 1146 x 2234)	106.6 x 45.2 x 88 (2706 x 1146 x 2234)
Net weight		lbs (kg)	143.3 (65)	2378.8 (1079)	3033.6 (1376)
Gross weight		lbs (kg)	150 (68)	2522.1 (1144)	3221 (1461)
Color			RAL7021 black orange pattern		
Protection degree, IEC (60529)			IP20 (front door open or closed)		

12.4 Electrical Characteristics (Input Rectifier)

Table 12.4 Rectifier AC Input (Mains)

Item	Unit	Rated Power (1250 kVA)
Rated AC input voltage ¹	VAC	380/400/415
Input voltage range ²	VAC	305 V to 478 V, no derating 228 V to 305 V, derating
Frequency ²	Hz	50/60 (range: 40 to 70)
Power factor	kW/kVA, full load (half load)	0.99
Input current	A, rated ³	1870
Total current harmonic distortion (at full load)	%	3
¹ Rectifiers operate at any of the rated supply voltages and frequencies without further adjustment. ² At 305 V input mains the UPS maintains the specified output voltage at rated load without discharging a battery. ³ At rated load, input voltage is 400 V, battery remains fully charged.		

12.5 Electrical Characteristics (Battery Bus)

Table 12.5 Battery

Item	Unit	Rated Power (1250 kVA)
Max. charging current ¹	A	550
Quantity of lead-acid cells (nominal)	Block	30 to 50 (12 VDC). (40 to 50 full load, 38 derated to 75%, Linear derated between 30 and 40 block)
Lead-acid battery capacity	Ah	> 200
Float voltage	V/cell (VRLA)	2.27 (selectable from 2.20 V/cell to 2.30 V/cell) Constant current and constant voltage charge mode
Temperature compensation	mV/°C/cell	-3.0 (selectable from 0 to -5.0 around 77 °F (25 °C) or 86 °F (30 °C), or inhibit)
Ripple current	% C ₁₀	≤ 5
Boost voltage	V/cell (VRLA)	2.35 (selectable from 2.3 to 2.4) Constant current and constant voltage charge mode
Boost control		Float-boost current trigger 0.050C ₁₀ (selectable from 0.001 to 0.070) Boost-float current trigger 0.010C ₁₀ (selectable from 0.001 to 0.025) 8 hours safety time timeout (selectable from 8 hours to 30 hours) Boost mode inhibit also selectable
EOD voltage	V/cell (VRLA)	EOD Lower Voltage: 1.60-1.67Vpc, 1.63Vpc default for lead acid battery EOD Upper Voltage: 1.67-1.85Vpc, 1.75Vpc default for lead acid battery
¹ The charging capacity is limited by the system load rate. The maximum charging capacity is 25% of the system capacity.		

12.6 Electrical Characteristics (Inverter Output)

Table 12.6 Inverter Output (to Critical Load)

Item	Unit	Rated Power (1250 kVA)
Rated AC voltage ¹	VAC	380/400/415
Frequency ²	Hz	50/60
Power factor		1
Overload	%	<105%, long time, 105% to 125%, ≤10 minutes, 125% to 150%, ≤1 minutes, >150, ≤200 milliseconds
Short circuit capacity	A	180% rated output current, 200 milliseconds
Non-linear load capability ³	kVA	100
Steady state voltage stability	%	±1
Transient voltage response	%	±5
Total voltage harmonic distortion	%	<1 (linear load), <3 (non-linear load ³)

Table 12.6 Inverter Output (to Critical Load) (continued)

Item	Unit	Rated Power (1250 kVA)
Synchronization window	Hz	Upper limit: 0.5 Hz, 1 Hz, 2 Hz, 3 Hz, +10%; Default: +10%. Lower limit: -0.5 Hz, -1 Hz, -2 Hz, -3 Hz, -10%; Default: -10%
Slew rate (maximum change rate of synchronization frequency)	Hz/s	0.6, setting range: 0.1 to 3
<p>¹ Factory set to 380 V, 400 V or 415 V can be selected by service engineer at site.</p> <p>² Factory set to 50 Hz. 60 Hz can be selected by service engineer at site. Note that the system frequency can be changed only when the UPS is on bypass. It is strictly prohibited to change the system frequency when the UPS is on inverter.</p> <p>³ EN 50091-3 (1.4.58) crest factor 3:1, non-linear load.</p>		

12.7 Electrical Characteristics (Bypass Input)

Table 12.7 Bypass Input

Item	Unit	Rated Power (1250 kVA)
Rated AC voltage ¹	VAC	380/400/415
Rated current	A	1916/1820/1754
Frequency ²	Hz	50/60
Bypass voltage tolerance	%VAC	Upper limit selections: +10, +15 or +20; default: +15 Lower limit selections: -10, -15; -20, -30 or -40; default -20
Bypass frequency tolerance	%	±10
<p>¹ Factory set to 380 V, 400 V or 415 V can be selected by service engineer at site.</p> <p>² Factory set to 50 Hz. 60 Hz can be selected by service engineer at site.</p> <p>³ In the 415 V system, the upper limit of the bypass voltage range is 15%.</p>		

12.8 Efficiency and Loss

Table 12.8 Efficiency and Loss

Item	Unit	Rated Power (1250 kVA)
Rated normal mode (full load) loss	kW	47.4
Rated normal mode (no load) loss	kW	4.7
ECO mode (full load) loss	kW	12.9
Dual conversion mode efficiency	Up to 97.5% ±0.2%	
ECO mode efficiency	Up to 99%	
NOTE: For all of the above values, data obtain at nominal voltage and input/output THDi/THDv factor ≤1%.		

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: Hazardous Substances and Content

Parts	Hazardous Substances					
	Plumbum	Mercury	Cadmium	Chrome ⁶⁺	Polybrominated Biphenyls	Polybrominated Diphenyl Ethers
	(Pb)	(Hg)	(Cd)	Cr (VI)	(PBB)	(PBDE)
Hex copper stud	X	○	○	○	○	○
PCBA	X	○	○	○	○	○
AC Capacitor	X	○	○	○	○	○
DC Capacitor	X	○	○	○	○	○
Fan	X	○	○	○	○	○
Cables	X	○	○	○	○	○
LCD	X	X	○	○	○	○
Sensors	X	○	○	○	○	○
Large-medium power magnetic components	X	○	○	○	○	○
Circuit breaker/rotating switch	X	○	○	○	○	○
Semiconductors	X	○	○	○	○	○
Battery (if applicable)	X	○	○	○	○	○
Insulation monitoring device (if applicable)	x	○	○	○	○	X
<p>NOTE: This table is prepared based on the regulation of SJ/T 11364.</p> <p>Content of the hazardous substances in all the average quality materials of the parts is within:</p> <p>○ : The specified limits.</p> <p>x: Outsides specified the limits.</p> <p>About battery: Generally follow the environmental protection use period of the battery, otherwise five years.</p> <p>The Hazardous Substances and Content mentioned are applicable to Vertiv™ PowerUPS 9000 1250 kVA Modular UPS CE.</p>						

Appendix C: Glossary

Term	Definition
AC	Alternating current
BCB	Battery circuit breaker
BFD	Bypass feedback detector
CSA	Cross sectional area
DC	Direct current
DSP	Digital signal processor
ECO	Economy control operation
EIB	External interface board
EMC	Electromagnetic compatibility
EMI	Electromagnetic interference
EOD	End of discharge
EPO	Emergency power off
FPGA	Field programmable gate array
GFD	Ground fault detector
GND	Ground
GHMI	Global human machine interface
HMI	Human machine interface
I/O	Input/output
IGBT	Integrated gate bipolar transistor KAIC Kilo ampere interrupting capacity
LBS	Load bus synchronizer
LCD	Liquid crystal display
LED	Light-emitting diode
PC	Personal computer
PE	Protective earth
RCCB	Residual current circuit breaker
RCD	Residual current detector
REPO	Remote emergency power off
SCR	Silicon-controlled rectifier
SNMP	Simple network monitoring protocol
STS	Static transfer switch
SVPWM	Space vector pulse width modulation
UPS	Uninterruptible power system
VRLA	Valve regulated lead-acid

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