VERTIV.

SmartAisle™

Installer/User Guide

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Technical Support Site

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

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

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1 Important Safety Instructions

This manual contains important safety instructions that should be followed during the installation and maintenance of the Vertiv™ SmartAisle™ Infrastructure Solution. Read this manual thoroughly before attempting to install or operate this cabinet.

Retain this manual for the entire service life of the product.

Only qualified personnel should move, install or service this equipment.

Adhere to all warnings, cautions, notices and installation, operating and safety instructions on the cabinet and in this manual.

Follow all installation, operation and maintenance instructions and all applicable national and local building, electrical and plumbing codes.

To identify the cabinet model and serial number for assistance or spare parts, locate the identification label on the cabinet.

WARNING! Risk of top-heavy unit falling over when improperly lifted or moved. Improper handling can cause equipment damage, injury or death. Read all of the following instructions and verify that all lifting and moving equipment is rated for the weight of the unit before attempting to move, lift, remove packaging from or prepare the unit for installation.

WARNING! Arc flash and electric shock hazard. Open all local and remote electric power-supply disconnect switches, verify with a voltmeter that power is Off and wear appropriate, OSHA-approved Personal Protective Equipment (PPE) per NFPA 70E before working within the electric control enclosure. Failure to comply can cause serious injury or death. Customer must provide earth ground to unit, per NEC, CEC and local codes, as applicable. Before proceeding with installation, read all instructions, verify that all the parts are included and check the nameplate to be sure the voltage matches available utility power. Refer to unit electrical schematic. Follow all local codes.

WARNING! Risk of improper wiring, piping, moving, lifting, and handling. Can cause equipment damage, serious injury or death. Only skilled personnel wearing appropriate OSHA-approved Personal Protective Equipment (PPE) should attempt to move, lift, remove packaging from or prepare the cabinet for installation.

WARNING! Some parts of the cabinet have high voltage. Special tools must be used when operating the cabinet. Direct or indirect contact with these parts through damp objects can cause injury or death.

WARNING! Before connecting cables, confirm whether the labels match site requirements. Ethernet cables should be bound separately from the cables with strong current or high voltage.

WARNING! The installation and routing of cables must comply with local and national codes and regulations. The cables with large leakage currents must be grounded before the cabinet is powered on.

WARNING! Risk of hair, clothing and jewelry entanglement with high speed rotating fan blades. Can cause equipment damage, serious injury or death. Keep hair, jewelry and loose clothing secured and away from rotating fan blades during operation.

WARNING! Risk of contact with extremely hot and/or cold surfaces. Can cause injury. Verify that all components have reached a temperature that is safe for human contact or wear appropriate, OSHA-approved PPE before working within the electric connection cabinet. Perform maintenance only when the cabinet is de-energized and component temperatures have become safe for human contact.

CAUTION: Risk of contact with sharp edges, splinters, and exposed fasteners. Can cause injury. Only properly trained and qualified personnel wearing appropriate, OSHA-approved PPE should attempt to move, lift, remove packaging from or prepare the unit for installation.

CAUTION: High touch current. The protective conductor current of the cabinet is 19 mA. The cabinet must be connected to the earth before connecting to a power supply.

CAUTION: Avoid placing tools and metal objects on the surface of the battery.

CAUTION: Disconnect all power, including the product breaker and all UPS power, before beginning any operations on the inner components of the product.

CAUTION: During installation, charging operations are prohibited.

CAUTION: The presence of sharp edges, objects, and bare hooks poses a risk of injury. Use caution when handling any of the aforementioned items.

NOTICE

After an alarm sound via the Vertiv™ Liebert® RDU501 Intelligent Monitoring Unit, it is critical to determine and treat the cause quickly to avoid further system damage.

NOTICE

The unit control must be used exclusively for its intended purpose. This product is tailored for industrial, commercial, or other professional applications such as manufacturing, electrical, and instrumentation setups. It is not meant for purposes related wholly to individuals without the necessary credentials. Strict adherence to the norms and usage should be observed. Vertiv does not assume any responsibility for any incorrect usage. The warranty is void in the case of improper use or modifications.

NOTICE

Professional maintenance personnel must be provided with a key to the product as needed when servicing the equipment.

NOTICE

Read all provided instructions, including labels on the unit and components. While the warnings and cautionary notes within this document must be observed, they do not account for all safety points. Adhere to all local protocols and rules. These may vary by region.

NOTICE

Ensure all appropriate parts and components are included.

NOTICE

Check the nameplate to verify the voltage matches the available main breaker.

NOTICE

Disconnect the control box and remote power supplies.

NOTICE

This product is only suitable for the TN-S type power grid; it does not apply to the IT type power grid.

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2 Introduction

2.1 Product Overview

The Vertiv™ SmartAisle™ is a pre-engineered edge data center complete with power, cooling, and all the critical components required to ensure continuous data center availability. SmartAisle™ is a data center solution integrated with in-row air conditioners, in-row or external UPS. This modular data center solution is applicable to indoor environments such as medium-sized and large-sized data centers or equipment rooms with the fast delivery feature. This solution is used to host IT devices in compliance with industry standards (EIA-310-D), including but not limited to servers, storage systems, network devices, rack PDUs, video recording appliances, control systems, and environmental monitoring sensors. It is used to provide device accommodation, power supply, cooling, and monitoring functions. The aisle containment technology is used to improve airflow distribution, physical separation between cold and hot air, and energy efficiency of the cooling infrastructure.

NOTE: For more detailed information about operating the components of the cabinet system, refer to the user documentation accompanying that specific component. Alternatively, user documentation can be found on the product pages at www.Vertiv.com.

2.2 Features and Benefits

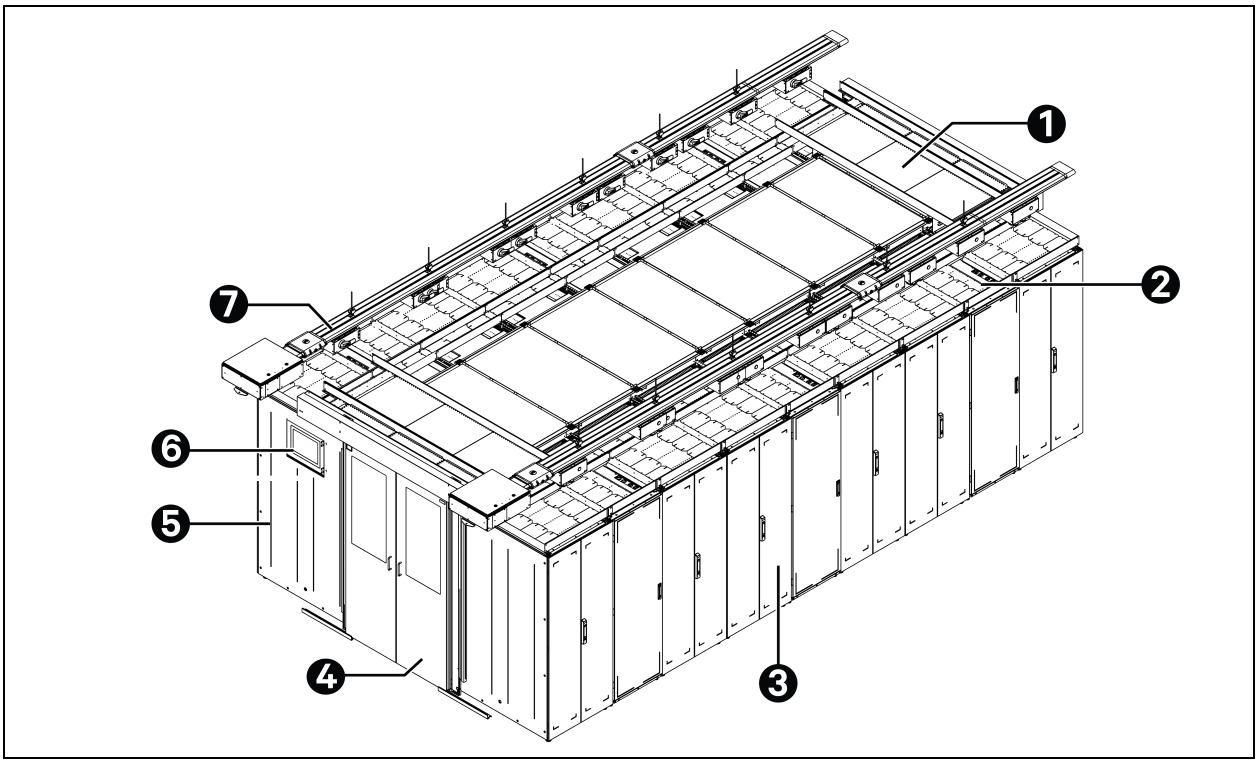
Vertiv™ SmartAisle™ solution provides the following features and benefits for your data center:

1. High efficiency and energy saving: SmartAisle™ adopts variable capacity cooling management and matches the precise air supply control and heat load functions to improve the energy saving effect of the equipment room together with the aisle containment technology.
2. Accelerate edge computing deployments: SmartAisle™ is a deployment-ready solution engineered by Vertiv, a global leader in designing, building and servicing critical infrastructures. This reduces most of the time spent on planning, design, and site preparation.
3. Intelligent physical and security: Systems include intelligent locks, IP cameras, and network video recorder. Enable remote door access via IP-based web page, local access with proximity card.
4. Reduce carbon footprint and save energy: Hot and Cold aisle containment in combination with in-row air cooling systems help reduce the energy consumption of the whole infrastructure by approximately 20% compared to the average global PUE, as published by the uptime Institute. Cooling units include capacity modulation to reduce compressor cycles and component wear and tear. Power Utilization Efficiency (PUE) is monitored with detailed and precise reporting available.
5. Convenient operations and maintenance: SmartAisle™ adopts an electric door safety anti-pin and access control system to improve the comfort and safety experience for users.
6. Smart security and safety: Physical protection enhanced by electronic handles installed on each door of the racks.
7. Human machine interface: The 15 in. ultra-large touch screen provides a simple and artistic UI, helping the user to clearly visualize the running status of the entire system.
8. N+1 Redundancy capability helps prevent downtime: Redundant power and cooling systems are provided by default to add another layer of protection from downtime. Not redundant design is available on demand. UPS system in reference design SA1E11120MFB0 and SA1E11175MFB0 are meant to be installed outside the aisle containment system.
9. Centralized IT and infrastructure management system: System visualization with 3D models for easy system monitoring. Local (control panel) and remote system health check via IP-based web page. Alarm notifications via email or SMS with downloadable activity logs and alarm history.

2.3 System Appearance and Components

The Figure 2.1 below provides an overview of the Vertiv™ SmartAisle™ solution. Based on your system configuration, the number of server rack cabinets may vary.

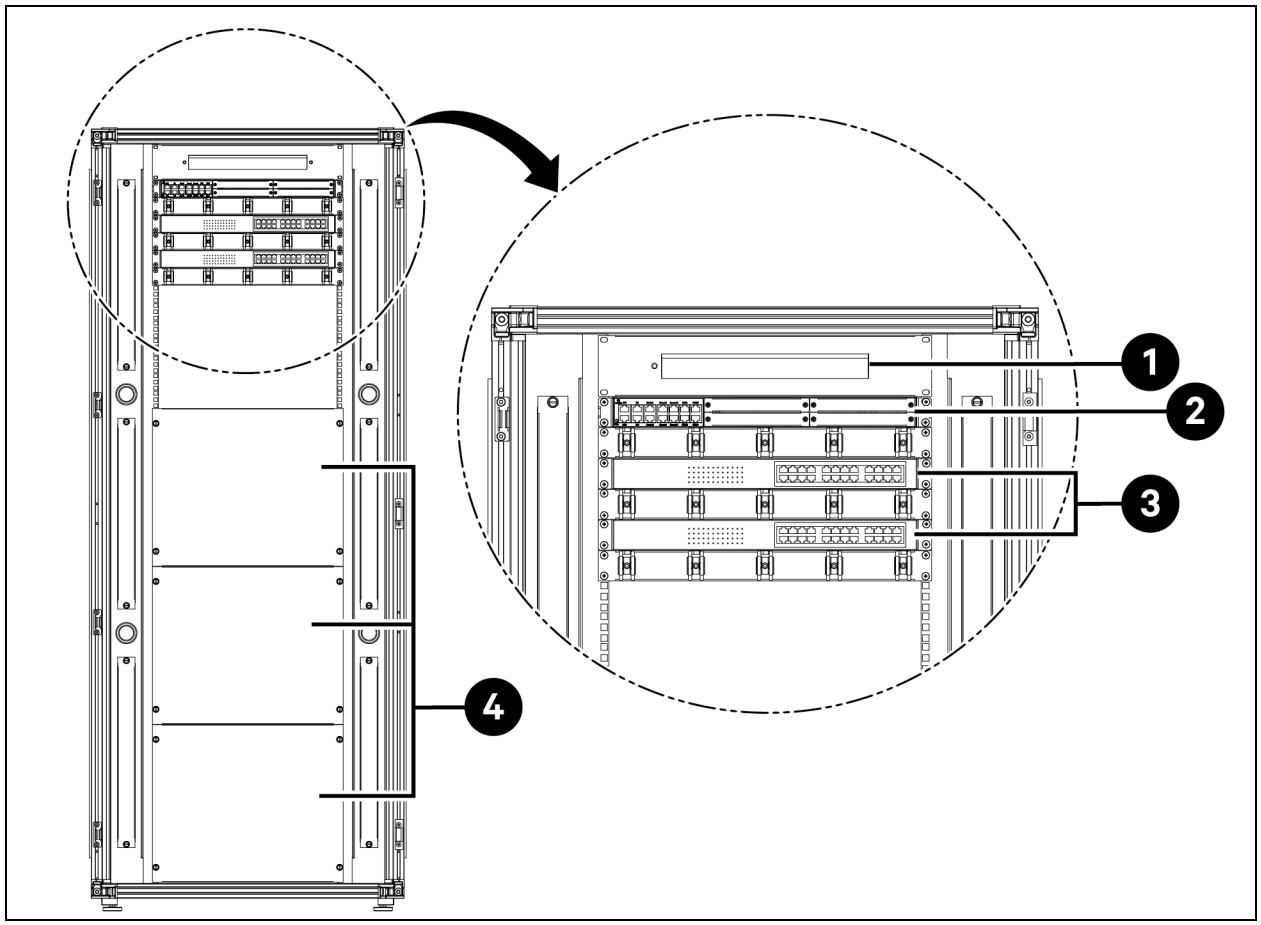
Figure 2.1 Full Dimensional Solution View



Item	Description
1	Roof element
2	CRD
3	Racks
4	Sliding door
5	Power Management Cabinet (PMC)
6	Human Machine Interface (HMI) display
7	Busbar

NOTE: **Figure 2.1** above shows the overview of model number SA1E11120MFB0 and SA1E11175HFB0 only. For model number, SA1E08060MFB0 and SA1E08090MFB0, the busbar is replaced by the LV switchboard RXA and power distribution cables.

Figure 2.2 Power Management Cabinet (PMC) Layout—Rear View



Item	Description
1	Camera - Network Video Recorder (NVR)
2	Monitor and control system RDU501 with embedded expansion card RDU501-8COM
3	Network switch with 24 Power Over Ethernet (POE) ports 10/100/1000 Mbps
4	Blanking panel

Figure 2.3 Server Rack

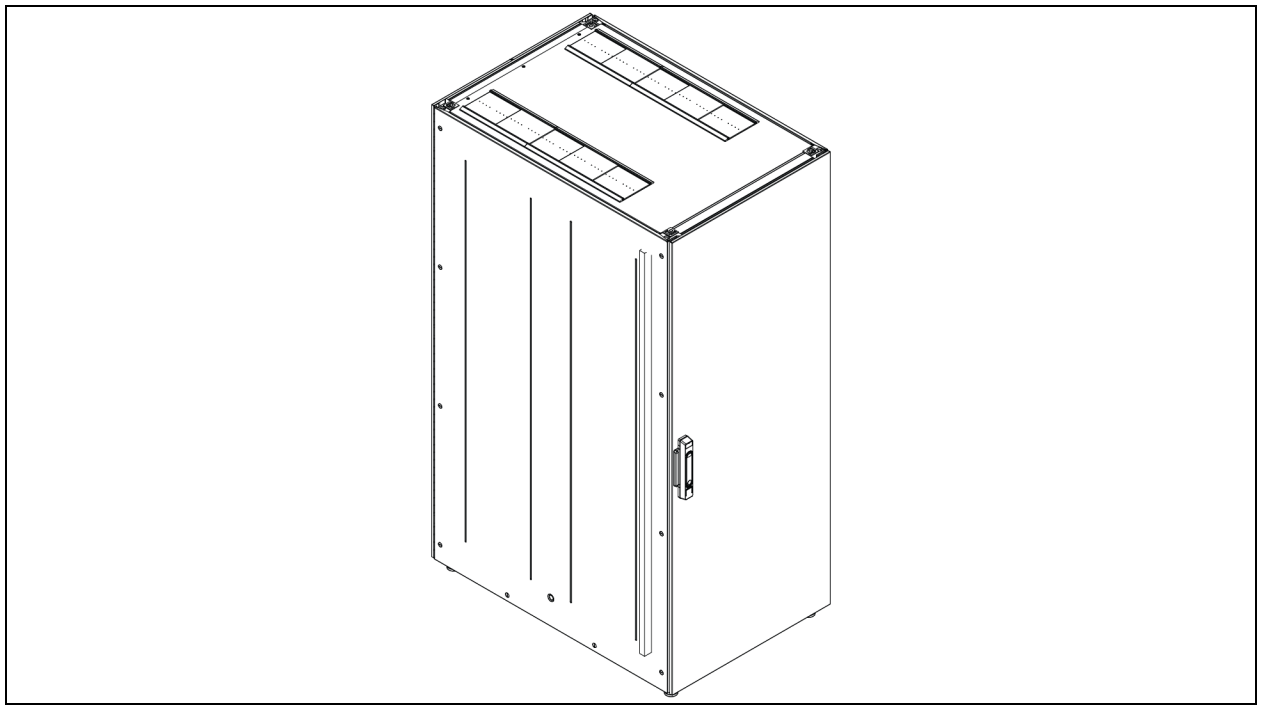


Figure 2.4 UPS Overview

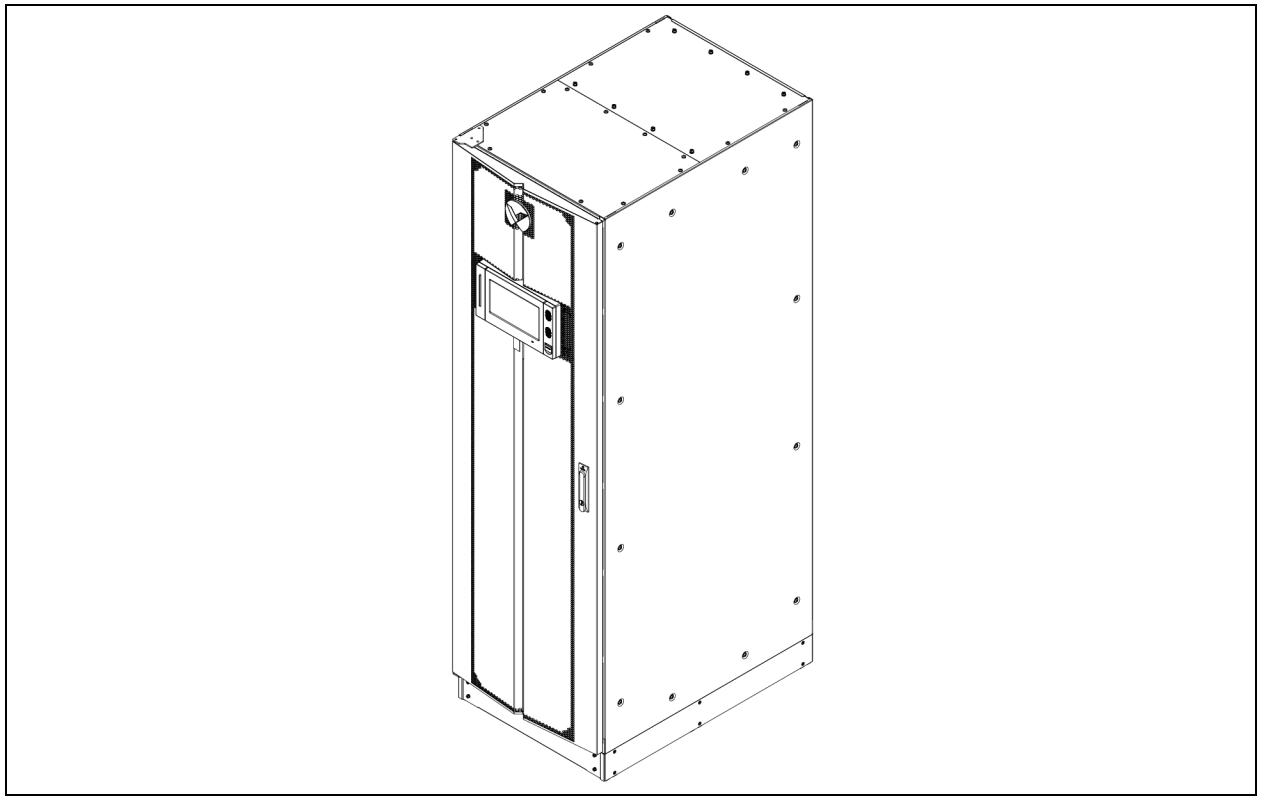
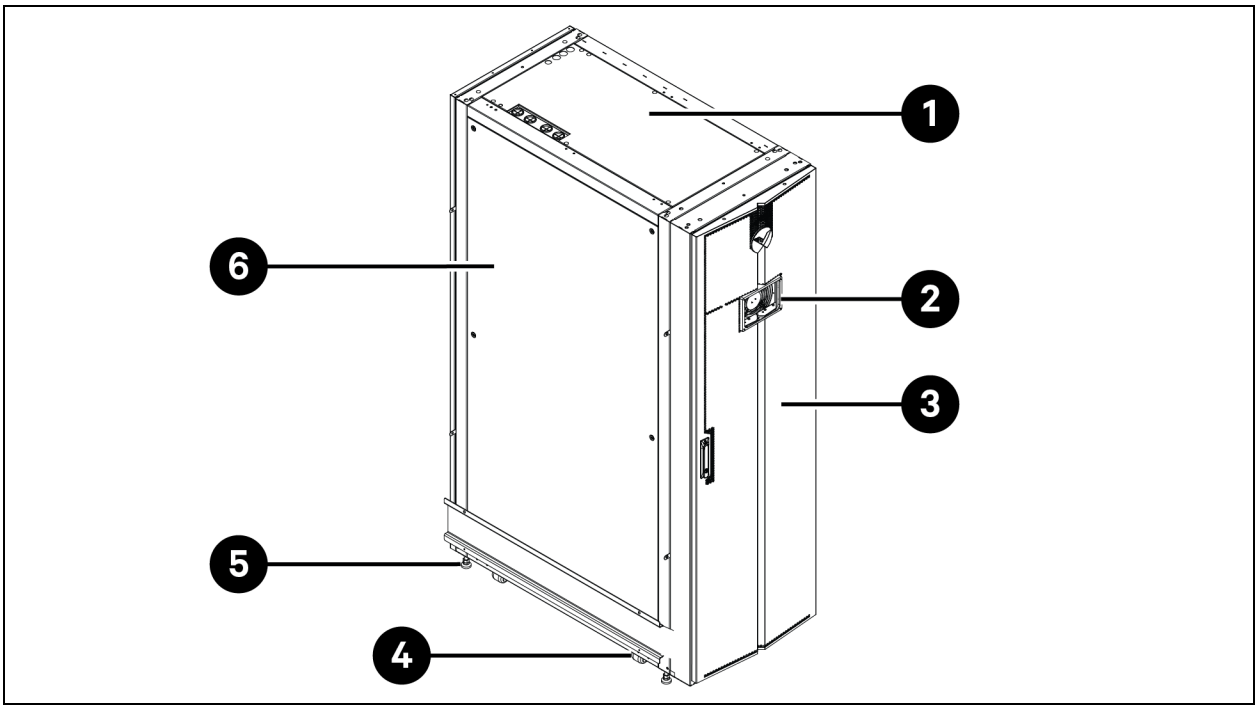


Figure 2.5 CRD Overview



Item	Description
1	Top panel
2	Human Machine Interface (HMI) display
3	Front door
4	Caster
5	Leveling foot
6	Side panel

Figure 2.6 Vertiv™ Liebert® RXA Overview

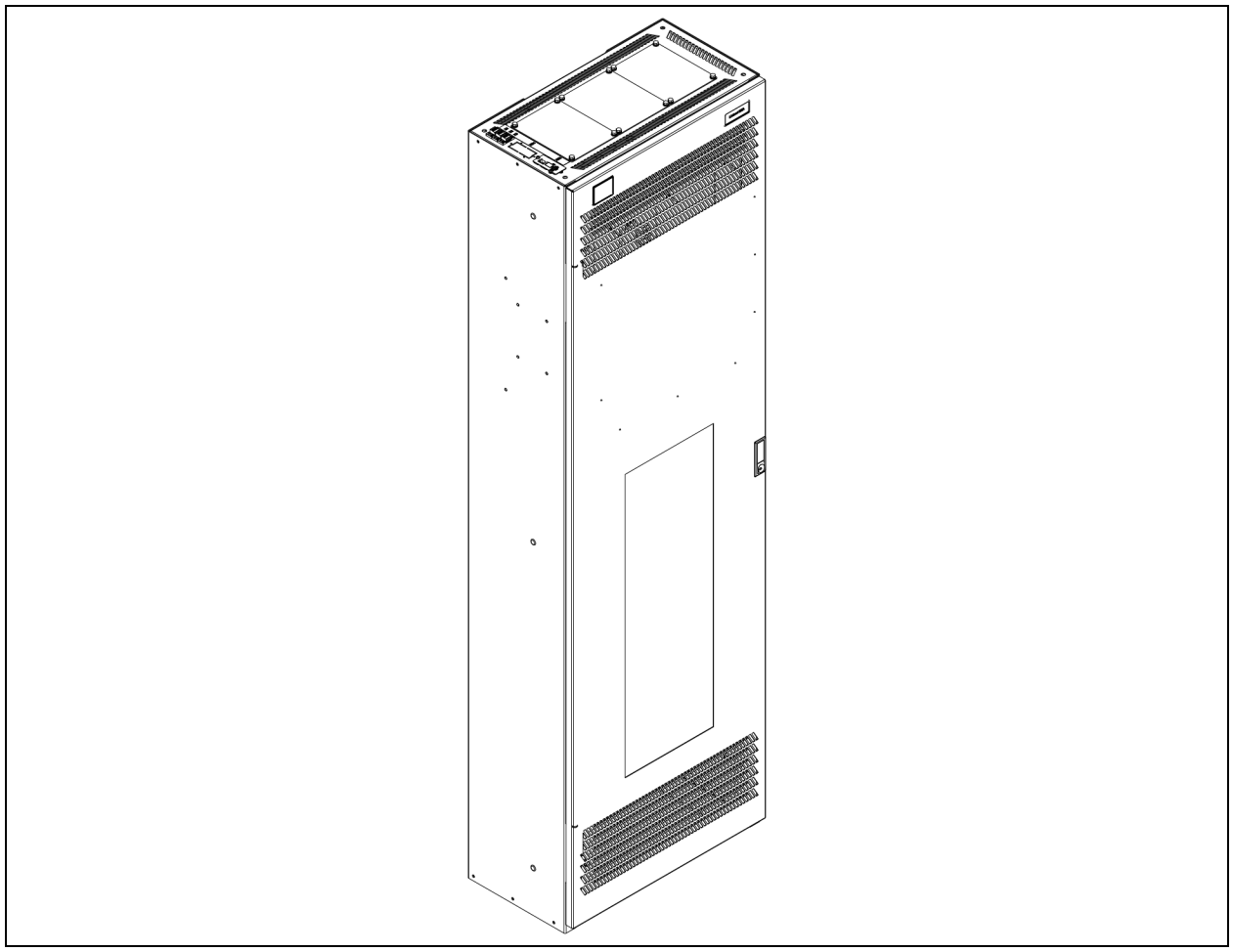
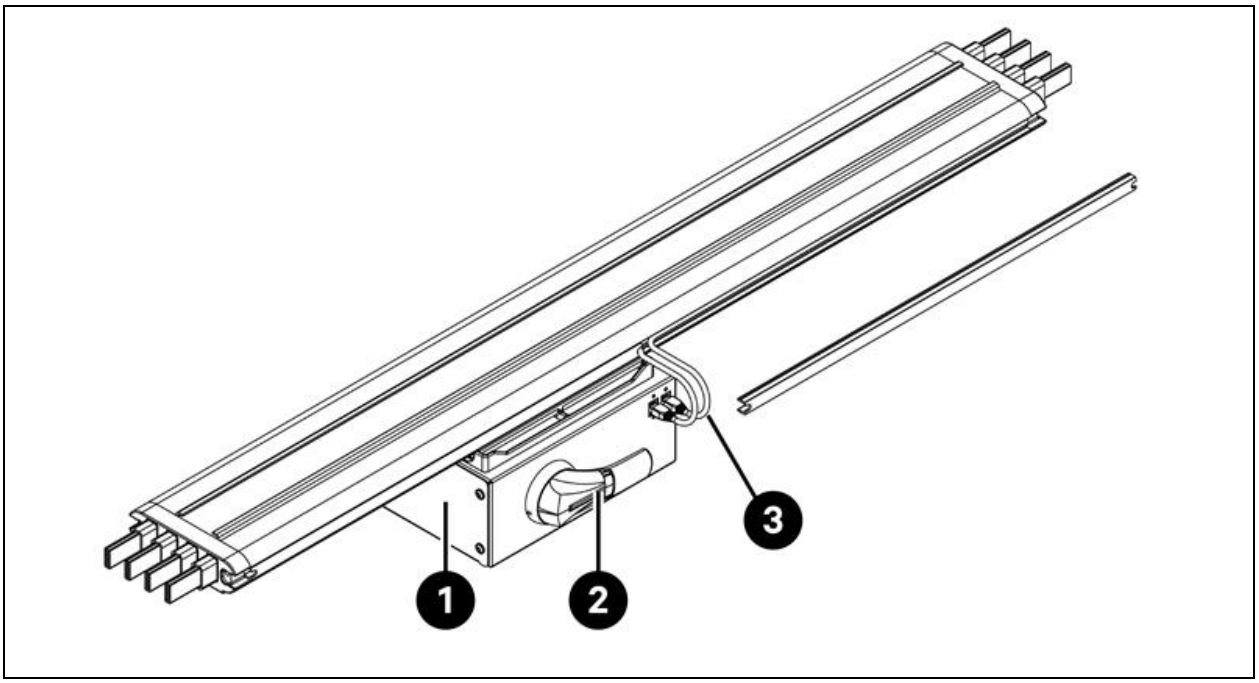


Figure 2.7 Busbar Overview



Item	Description
1	Tap-Off box
2	Rotary handle
3	Ethernet cable

2.4 Model Nomenclature

This section explains the meaning of the model numbers for the system and its components. The nomenclature tables associate each character of the model number with a numerical value.

Nomenclature and the description of model number for the reference design are given in Table 2.1 below and Table 2.2 on the next page . Table 2.1 below attributes a variable to each digit in the model number. The number can then be used to reference Table 2.2 on the next page for an explanation of what each individual character represents.

Table 2.1 Nomenclature

Model Number								
Digit	1	2	3	4	5	6	7	8
Variable	SA1	E	11	175	H	F	D	0

Table 2.2 Model Number Description

Digit	Variable	Indication	Description
1	Containment	SA1	Smart Aisle
2	Region	E	EMEA
3	Racks	8 to 20	Number of racks
4	Max aisle power	60 kVA	UPS rating in kVA
		90 kVA	
		120 kVA	
		175 kVA	
5	PDU Rack density range	L	1 x 32 A
		M	3 x 16 A
		H	3 X 32 A
6	Redundancy	N	No redundancy
		P	Power redundancy
		C	Thermal redundancy
		F	Power and thermal redundancy
		X	Thermal redundancy (UPS provided by client)
7	Rack type	A	42U x 600 x 1200
		B	42U x 800 x 1200
8	ETO	0	Standard
		1	ETO

2.5 Technical Specifications

2.5.1 Vertiv™ SmartAisle™ System

The SmartAisle™ solution is a smart cabinet system that conforms to the industry standard (EIA-310-E) of 19 in. cabinet hardware devices (server rack cabinets and PMCs), which includes servers, voice, data, internet network equipment, and more for indoor environments, such as data centers or rooms. The cabinet system includes the following parameters and components.

Table 2.3 SmartAisle™ Specifications

Model	SA1E08060MFB0	SA1E08090MFB0	SA1E11120MFB0	SA1E11175HFB0
General Description				
Designed IT load (kVA)	60	90	120	175
Number of IT racks	8		11	
Average IT load per rack (240 V)	7.40	11.04	10.90	15.90

Table 2.3 SmartAisle™ Specifications (continued)

Model	SA1E08060MFB0	SA1E08090MFB0	SA1E11120MFB0	SA1E11175HFB0
Nominal Input voltage	380/400/415 V (3P/N/PE)			
Nominal input frequency	50/60 Hz			
Redundancy level	N+1	N+1	N+1	N+1
Dimension (W x H x D), mm	5400 x 2150 x 3600	6000 x 2150 x 3600	5900 x 2150 x 3600 (aisle) 2200 x 2000 x 1000 (ups)	6900 x 2150 x 3000 (aisle) 3000 x 2000 x 1000 (ups)
Dimension (W x H x D), mm (including service passages)	7800 x 2150 x 5200	8400 x 2150 x 5200	8300 x 2150 x 5200 (aisle) 2800 x 2000 x 2000 (ups)	9300 x 2150 x 5200 (aisle) 3000 x 2000 x 2000 (ups)
Finish/Color	Visible surface of covers RAL 7021 dark-grey			
Weight (Kg)	4858.22	5447.22	7262.18	9472.91
Aisle Containment System				
Containment model	Vertiv™ SmartAisle™ Containment			
Door elements	Sliding doors with no locking system			
Roof elements	Roof panels for aisle containment in Polycarbonate, UL 94-VO/DIN 4102 B2			
Weight (Kg)	72.00	72.00	78.00	78.00
Power Management Rack				
Rack type	Vertiv™ DCM			
Dimension (W x H x D), mm	800 x 2000 x 1200			
Management station	RDU501			
Power consumption (W)	250			
HMI	15 in. touchscreen display, positioned on the left side panel for easy access from outside the SmartAisle™			
Power consumption (W)	70			
Video surveillance	Network Video Recorder complemented with 4x IP cameras supplied loose			
Network switches	2x network switches 24 ports POE			
Power consumption (W)	120			
Environmental monitoring	6x Temperature and 2 Humidity sensors mounted on the front and rear door			
Access control	2x e-handles on front and rear door			
Power consumption (W)	55.08	55.08	73.44	73.44
Power distribution box	4 (supplied loose)		6 (supplied loose)	
How supplied	Pre-assembled			
rPDU model	Vertiv™ Geist™ VP4G30A0			
rPDU type	Metered			
rPDU capacity (A)	32			
rPDU phases	1			

Table 2.3 SmartAisle™ Specifications (continued)

Model	SA1E08060MFB0	SA1E08090MFB0	SA1E11120MFB0	SA1E11175HFB0
Weight (Kg)	139.26			
Server Racks				
Rack type	Vertiv™ DCM			
Dimension (W x H x D), mm	800 x 2000 x 1200 mm			
Number of racks	8		11	
Available U-slots	42 U			
Protection rating	IP 20, according to IEC 60529			
Static load rating	15000 N			
rPDU model	Vertiv™ Geist™ VP4G20A6		Vertiv™ Geist™ VP4G30AF	
rPDU type	Metered			
rPDU capacity (A)	16		32	
rPDU phases	3			
Access control	E-handles on front and rear door			
Weight (Kg)	146.52		149.24	

2.5.2 Power Management System and Distribution

The power distribution system includes a PDU module that is powered by either Vertiv™ Liebert® APM2 30 to 120 kVA. The power distribution system includes the following parameters and components.

Table 2.4 UPS System Specification

Model	SA1E08060MFB0	SA1E08090MFB0	SA1E11120MFB0	SA1E11175HFB0
UPS System				
UPS model (kW)	Vertiv™ Liebert® APM2 30 to 120		Vertiv™ Liebert® APM2 60 to 300	
Module capacity (kVA)	30		60	
Number of modules	3	4	3	4
Deployed capacity (kVA)	90	120	180	240
Dimension (W x H x D) mm	600 x 1600 x 800		600 x 2000 x 900	
Weight (Kg)	455	480	399	437
Battery Cabinet				
Battery runtime (EOL) (min)	15	11	15	15
Battery type	VRLA	VRLA	VRLA	VRLA
Battery configuration (Ah)	1 x 40 x 82	1 x 40 x 82	2 x 40 x 82	3 x 40 x 82
Number of cabinets	1	1	2	3
Dimension (W x H x D) mm	800 x 2000 x 900		800 x 2000 x 900	

Table 2.4 UPS System Specification (continued)

Model	SA1E08060MFB0	SA1E08090MFB0	SA1E11120MFB0	SA1E11175HFB0
Weight (Kg)	1285		2570	3855
Power Distribution				
From customer switchgear	Power cords			
Number of cords	2 (UPS) + 4 (PDB)		2 (UPS) + 6 (PDB)	
From UPS to IT load	LV modular switchboard with hot-plug breakers		LV modular busbar system with hot-plug tap-off boxes	
Weight (Kg), w/o cords *	166.80	166.80	112.20	124.01
NOTE: * Busbar weight doesn't include the distance between the UPS and the SmartAisle.				

2.5.3 Cooling System

The cooling system provides variable frequency precision air conditioning and emergency ventilation systems, as shown in Figure 2.5 on page 9. Each cabinet contains one hot aisle and one cold aisle emergency fan. The emergency ventilation system is available for indoor environments, such as data centers and rooms. When the temperature of the cabinet exceeds its specified threshold, the ventilation system automatically turns on to combat the excessive heat and to allow time for maintenance personnel to troubleshoot the issue.

Table 2.5 Cooling System Specifications

Model	SA1E08060MFB0	SA1E08090MFB0	SA1E11120MFB0	SA1E11175HFB0
Indoor Cooling Units				
Indoor unit model	Vertiv™ Liebert® CRD25	Vertiv™ Liebert® CRD35	Vertiv™ Liebert® CRD25	Vertiv™ Liebert® CRD35
Number of indoor units	4		6	
Net sensible cooling capacity* (kW)	25	36	25	36
Capacity modulation Range %	20-100			
Refrigerant/Coolant	R410A			
Maximum equivalent pipe length, m	120			
Dimensions (W x H x D), mm	300 x 2000 x 1132	600 x 2000 x 1132	300 x 2000 x 1132	600 x 2000 x 1132
Weight (Kg)	272	358	272	358
Outdoor Cooling Units				
Outdoor unit model	Vertiv™ Liebert® CCD25	Vertiv™ Liebert® CCD35	Vertiv™ Liebert® CCD25	Vertiv™ Liebert® CCD35
Number of outdoor units	4		6	
Operating temperatures ** (°C)	-35 to 48			
Dimensions (W x H x D) mm	1562 x 1272 x 830	2362 x 1272 x 830	1562 x 1272 x 830	2362 x 1272 x 830

Table 2.5 Cooling System Specifications (continued)

Model	SA1E08060MFB0	SA1E08090MFB0	SA1E11120MFB0	SA1E11175HFB0
Weight (Kg)	120	175	120	175
NOTE: *Test conditions: 37 °C, 24% Return Air, 35 °C outdoor				
NOTE: ** With low ambient kit				

2.5.4 Remote Power Distribution System

Table 2.6 Remote Power Distribution System Specifications

Model	SA1E08060MFB0	SA1E08090MFB0	SA1E11120MFB0	SA1E11175HFB0
Vertiv™ Liebert® RXA				
Rated current (A)	250		-	
Busbar				
Rated current (A)	-		250	

2.6 Environment Requirements

2.6.1 Operating Conditions

The installation position of Vertiv™ SmartAisle™ should be placed away from heat sources and places that are prone to sparks and placed to avoid exposure to direct sunlight. There should be no corrosive gases and organic solvents in the equipment room. Refer to Table 2.7 below for operating conditions.

Table 2.7 Operating Conditions

Item	Description
Installation position	The product installation ground should be horizontal, and the maximum deviation should be less than 0.6 mm/m. The maximum equivalent horizontal distance between indoor and outdoor units is 50 m. Height deviation ΔH: -8 m ≤ΔH ≤30 m
Application scenario	Inside medium and large sized data centers and equipment rooms
Ambient temperature	**Indoor unit:** 0 °C (32 °F) to 45 °C (113 °F) **Outdoor unit:** -23 °C (73.4 °F) to +52 °C (125.6 °F). If low temperature components are equipped, the lowest working temperature of the outdoor unit is -34 °C (93.2 °F).
Ambient humidity	5% RH to 90% RH; 30 °C (86 °F), non-condensing
Altitude	<1000 m (derating is required when the altitude is above 1000 m)
Operating power range	380/400/415 V (3P/N/PE)
NOTE: For more information about the air conditioner derating and low temperature components, contact the local Vertiv representative.	

2.6.2 Storage Environment

Table 2.8 below describes the storage environment of Vertiv™ SmartAisle™.

Table 2.8 Storage Environment

Item	Description
Storage environment	Indoor, clean (dust free)
Ambient humidity	5 % RH to 90 % RH (non-condensing)
Ambient temperature	-23 °C to +52 °C

NOTICE

Risk of improper storage. Can cause unit damage. Keep the unit upright, indoors and protected from dampness, freezing temperatures and contact damage.

2.6.3 Space

Indoor Space

Sufficient space should be reserved during installation to facilitate product installation, maintenance, and cooling. See Table 2.3 on page 12 to check the dimension including service passages of SmartAisle models.

Outdoor Space

There should be sufficient space for installation and maintenance of the condenser. See Figure 2.8 below and Figure 2.9 on the next page for the specific space requirements.

Figure 2.8 Space Requirements for Horizontal Installation (Unit: mm)

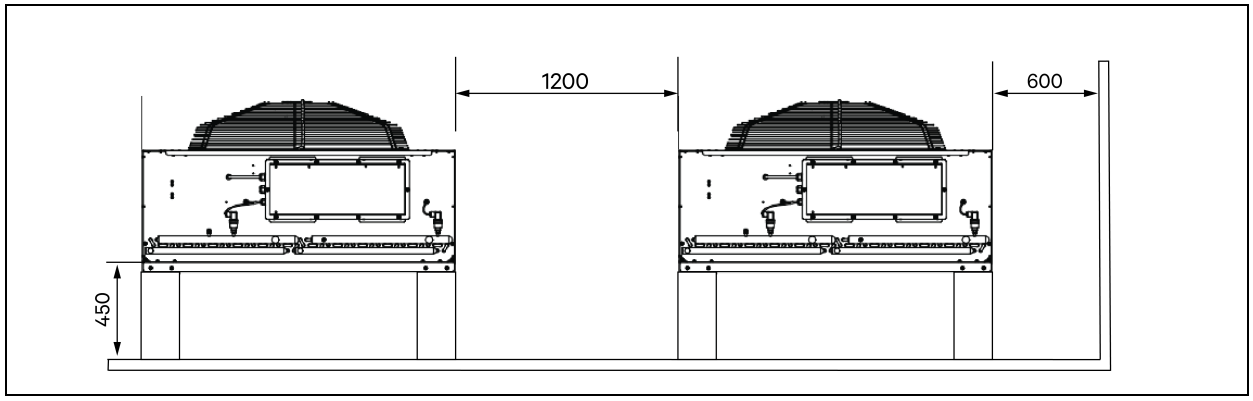
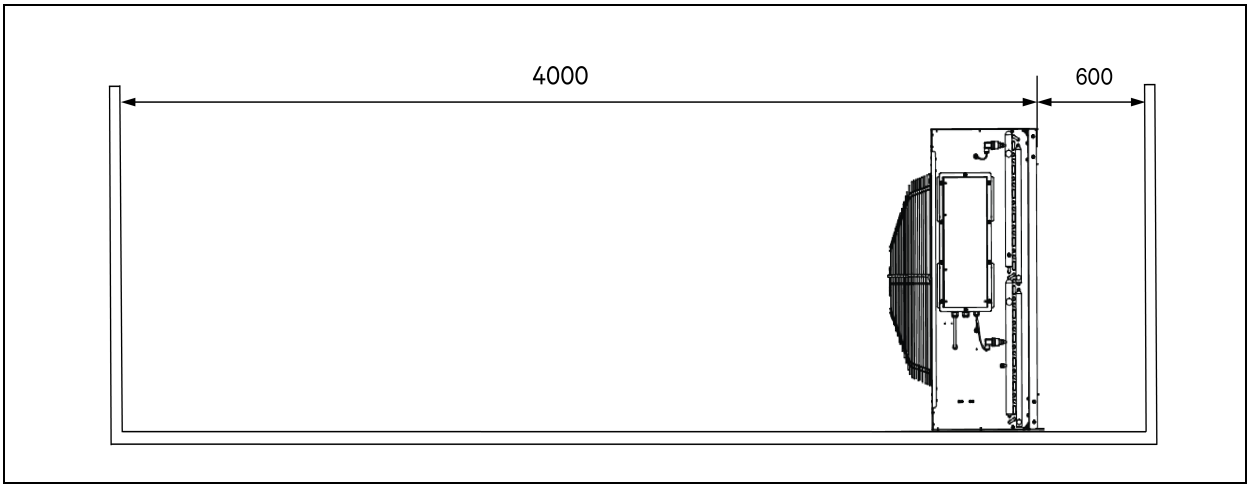


Figure 2.9 Space Requirements for Vertical Installation (Unit: mm)



NOTE: There should be no obstruction within 4000 mm of the condenser air outlet.

NOTE: There should be maintenance space with a width of 600 mm on the front, rear, left, and right sides of the condenser.

2.6.4 Distance between Indoor and Outdoor Units

If the one-way equivalent length exceeds 30 m, or the vertical height difference between the indoor unit and the outdoor unit exceeds the value specified in Table 2.9 below, check whether measures such as adding pipe extension components are required. Contact the local Vertiv representative before installation.

Table 2.9 Vertical Height Difference between the Indoor Unit and the Outdoor Unit

Relative Position	Difference
The outdoor unit is higher than the indoor unit	Maximum: +30 m
The outdoor unit is lower than the indoor unit	Maximum: -8 m

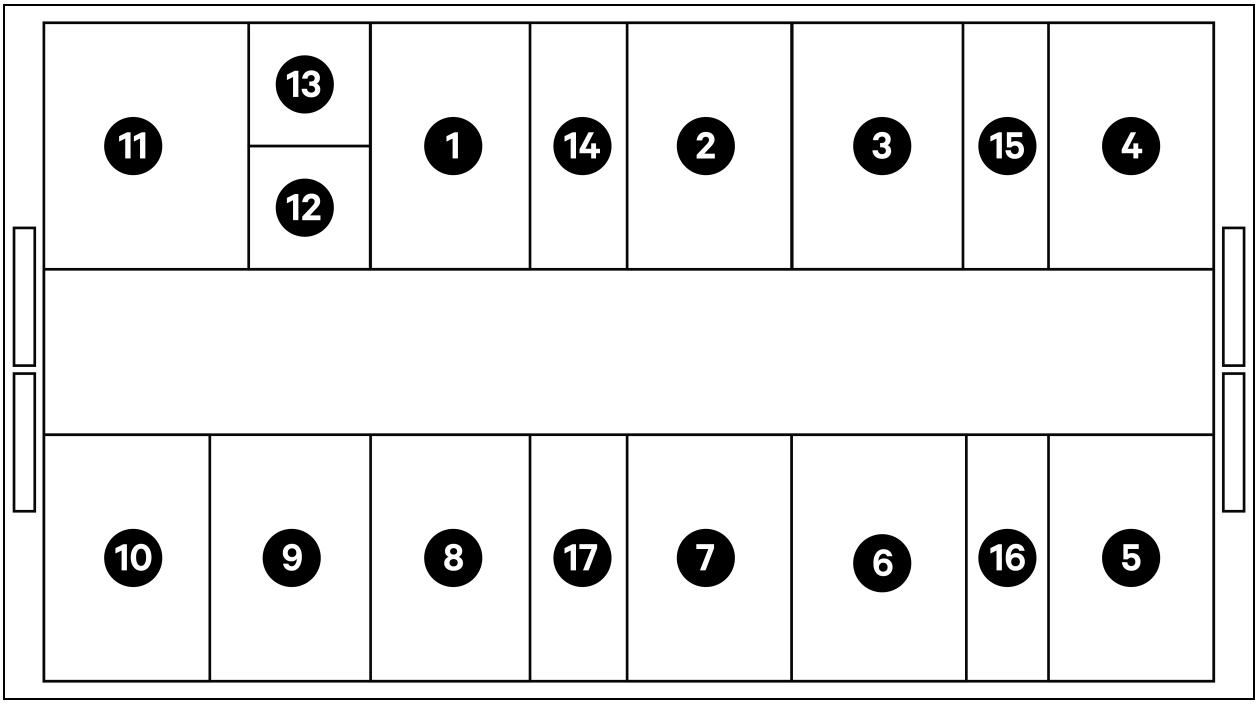
2.6.5 Load Bearing

In all configuration, Vertiv™ SmartAisle™ maximum weighs about 9.4 tons. See Table 2.3 on page 12 for more information. After user devices are installed, the equipment is heavy. Therefore, the load-bearing capability of the equipment room should be considered before installation. However, due to different weights of devices inside the cabinet, the requirements for the load-bearing capability of the equipment room vary. If the load-bearing capability cannot be determined, contact the local Vertiv representative.

2.7 Configuration Scheme

This section shows the typical configuration layout of Vertiv™ SmartAisle™ models.

Figure 2.10 Layout of Model Number SA1E08060MFB0



Item	Description
1 to 8	Server racks
9	Vertiv™ Liebert® APM2 UPS
10	Battery cabinet
11	PMC
12	Vertiv™ Liebert® RXA
13	Offset rack
14 to 17	CRD 25

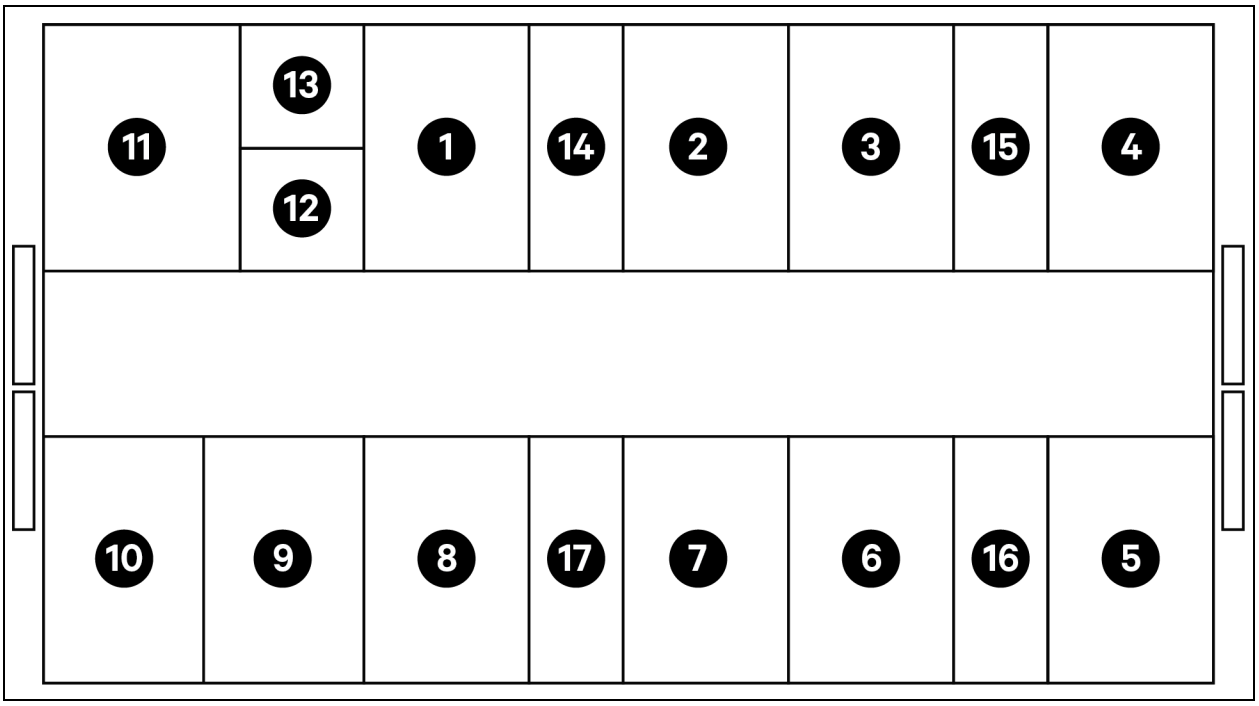
Table 2.10 Typical Configuration List of Model Number SA1E08060MFB0

Component	Description of Component	Part Number	Description of Part Number	Quantity
Data center containment (DCC)	Aisle containment system for server racks	030290008001	Vertiv™ DCC containment roof - L5200 AW1200 H2000, consist of: • 1 x DCC roof elements L5200 AW1200 • 1 x RXA filler element • Set of balancing sheet metal • Sealing set • Set protector brackets	1
		030290268011	Vertiv™ SmartAisle™ Sliding door Set-M, no lock, contains: Mechanical door closing: • 2 x DCC sliding door AW1200 H2000 • 2 x Mechanical door closing system	1
		050450008010	Cable Raceway L5200 - 1 x W200/1 x W600, consist of: • 9 x Depth support D1200 • 1 x Set of cross walls for cable raceway W200 along the aisle length • 1 x Set of cross walls for 2 cable raceways W600 along the aisle length. (battery cabinet and Vertiv™ Liebert® APM2 not equipped) • 1 x Set of center sections W800 w200 • 1 x Set of center sections W200/ w600 • 1 x Set of end walls • 6 x Sets of filler panels 229 x 183 • Mounting hardware	1
		050450008014	Cable duct bridge AW1200 - 1 x W200/ 1xW600 consist of: • 2 x Cross support W800 • 2 x Cross wall L2400 • 4 x Joining section w200 • 2 x Set cross cable filler panel 200 x 200 • 1 x Set cross cable filler panel 600 x 600	2
Rack 3X16A	Server rackH2000 W800 D1200, to be equipped with e-handles, 3x16A monitored PDUs, and environmental sensors	011477228001	Vertiv™ DCM Rack ST SP H2000 W800 D1200 MLR2500 electronic lock front and rear door 2 pieces. PDU brackets installed.	8
		VP4G20A6	MG05M4B0-36CF13-2PS56B2A10-S-A rPDU, Monitored Unit Level EC, 16A, 230/400V WYE, 11.0kW, vertical, (36) combination C13/C19, 10 ft / 3 m power cord with 3P+N+E (IP44), black powder coat.	16
		2070244	CHD8029 Lock controller gateway	16
		11800359000001	12 v 500 mA PSU	16
		2312280	Vertiv™ Liebert® RDU501 set of 6 THD sensors	8

Table 2.10 Typical Configuration List of Model Number SA1E08060MFB0 (continued)

Component	Description of Component	Part Number	Description of Part Number	Quantity
Uninterruptable Power Supply (UPS)	Vertiv™ Liebert® AMP2 60 kVA UPS with N+1 configuration supplied with a separate battery cabinet	APMZ6011AAAA000	Vertiv™ Liebert® APM2 60 kVA N+1 120 kVA compact Maint. switch No Int. bat. IP20 CoO China.	1
		VB60K1DEAL20000	Battery cabinet -10Y: 40X82 AH TYPE K - 2 wires (ex 75Ah)	1
		10H32479P01	Battery temperature compensation kit.	1
		IS-UNITY-DP	Vertiv™ Liebert® IS-UNITY Communications card enables SNMP/Web, Modbus, BACnet and LIFE communication for thermal (Vertiv™ Liebert® HPC, Vertiv™ Liebert® CRV, Vertiv™ Liebert® PCW, Vertiv™ Liebert® PDX, Vertiv™ Liebert® HPM) and Power (Vertiv™ Liebert® GXT3, Vertiv™ Liebert® GXT4, Vertiv™ Liebert® NXC, Vertiv™ Liebert® EXS, Vertiv™ Liebert® APM, Vertiv™ Liebert® APS, EXL S1, Vertiv™ Liebert® ITA, Vertiv™ Liebert® ITA2) products. Compatible with Vertiv™ Liebert® SN sensors.	1
		IS-RELAY	Vertiv™ Liebert® IntelliSlot™ Interface kit for relay contacts for power products (Vertiv™ Liebert® APM, Vertiv™ Liebert® NXC, Vertiv™ Liebert® APS, Vertiv™ Liebert® ITA).	1
Vertiv™ Liebert® RXA	LV Switchboard with hot swappable branch circuits and offset rack	REUAS64AAA00	Vertiv™ Liebert® RXA 250 A 84 P Smissline - No monitoring	1
		RAUABS401MC32N	Miniature circuit breaker 1P+N C32A	1
		RAUABS403MC16N	Miniature circuit breaker 3P+N C16A	16
Cooling	Vertiv™ Liebert® CRD25 In-row, high-precision cooling unit 25kW useful capacity at 48°C outside temperature	CRD255-PD00A	Row based Vertiv™ Liebert® DX Cooling unit Vertiv™ Liebert® CRD25, 300 mm wide, 400V/3ph/50Hz with reheat, humidifier and dual power supply.	4
		CCD254H-00A	Condenser forVertiv™ Liebert® CRD25 with EC fans, 400V/3ph/50Hz	4
		FE10CR	100 mm front extension to increase the unit depth to 1232 mm	4
PDB	Power distribution box	PDB2U4101	Power distribution box for CRV 40A, 2x 40A, 3-pole.	4
Support Rails	Sliding support rails	VRA3004	Sliding support rails for 1P UPS systems, to be mounted in the PMC/DCC rack.	4
PMC	Power Management Cabinet	See Power Management Cabinet on page 32 .		1

Figure 2.11 Layout of Model Number SA1E08090MFB0



Item	Description
1 to 8	Server racks
9	Vertiv™ Liebert® APM2 UPS
10	Battery cabinet
11	PMC
12	Secondary Vertiv™ RXA
13	Offset
14 to 17	Vertiv™ Liebert® CRD35

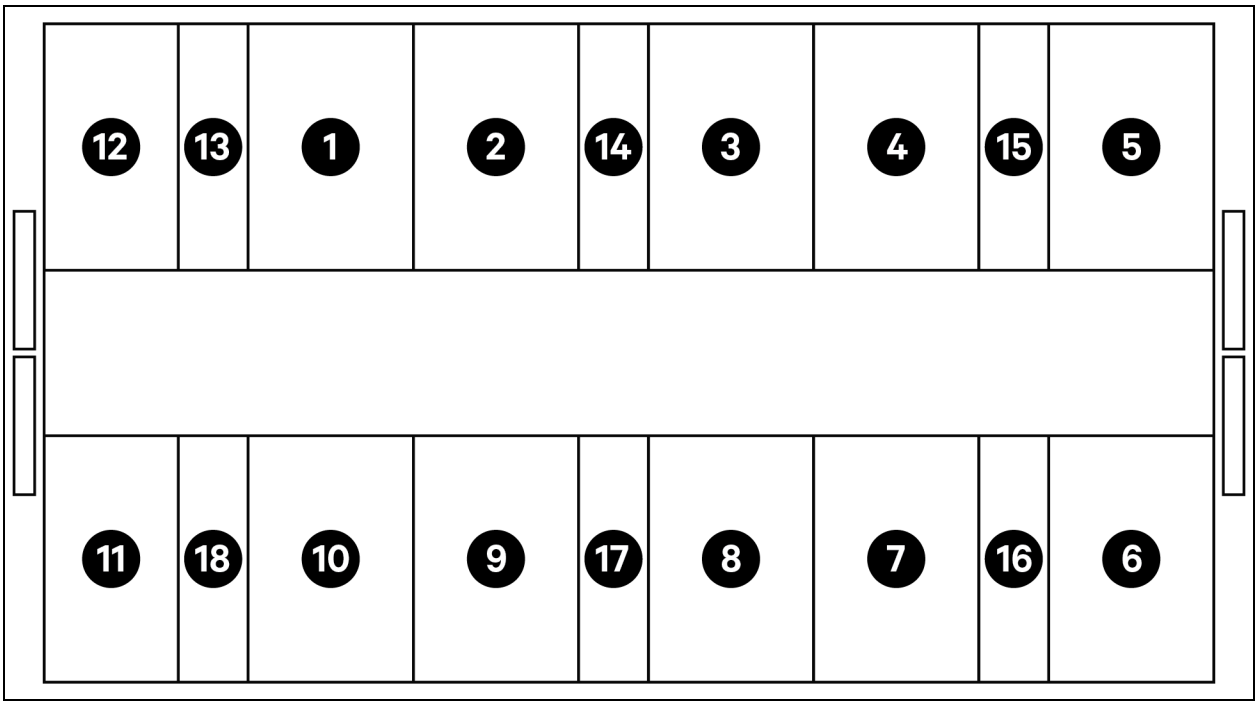
Table 2.11 Typical Configuration List of Model Number SA1E08090MFB0

Component	Description of Component	Part Number	Description of Part Number	Quantity
DCC	Aisle containment system for server racks	030290008002	Vertiv™ DCC containment roof - L5800 AW1200 H2000, consist of: • 1x DCC roof elements L5800 AW1200 • 1x RXA Filler element • Set of balancing sheet metal • Sealing set • Set protector brackets	1
		030290268011	Vertiv™ SmartAisle™ sliding door Set- M - no lock, contains: Mechanical door closing • 2x DCC Sliding door AW1200 H2000 • 2x Mechanical door closing system.	1
		050450008011	Cable Raceway L5600 - 1x W200/1xW600, consist of: • 9x Depth support D1200 • 1x Set of cross walls for cable raceway W200 along the aisle length. • 1x Set of cross walls for cable raceway W600 along the aisle length. (Battery cabinet and APM2 not equipped) • 1x Set of center sections W800 w200 • 1x Set of joining sections w200 / w600 • 1x Set of end walls • 7x Sets of filler panels 229x183 • Mounting hardware	1
		050450008014	Cable Duct Bridge AW1200-1xW200/1xW600 consist of: • 2x Cross support W800 • 2x Cross wall L2400 • 4x Joining section w200 • 2x Set cross cable filler panel 200x200 • 1x Set cross cable filler panel 600x600	2
Rack 3X16A	Server rack H2000 W800 D1200, to be equipped with e-handles, 3x16A monitored PDUs, and environmental sensors	011477228001	Vertiv™ DCM Rack ST SP H2000 W800 D1200 MLR2500 electronic lock front and rear door 2 pieces. PDU brackets installed.	8
		VP4G20A6	MG05M4B0-36CF13-2PS56B2A10-S-A rPDU, Monitored Unit Level EC, 16A, 230/400 V WYE, 11.0 kW, Vertical, (36) combination C13/C19, 10 ft / 3 m power cord with 3P+N+E (IP44), black powder coat.	16
		2070244	CHD8029 Lock controller gateway	16
		11800359000001	12 v 500 mA PSU	16
		2312280	Vertiv™ Liebert® RDU501 set of 6 THD sensors	8

Table 2.11 Typical Configuration List of Model Number SA1E08090MFB0 (continued)

Component	Description of Component	Part Number	Description of Part Number	Quantity
UPS	Vertiv™ Liebert® AMP2 90 kVA UPS with N+1 configuration supplied with a separate battery cabinet	APMZ9011AAAA000	Vertiv™ Liebert® APM2 90 kVA N+1 120 kVA compact Maint. switch no Int. bat. IP20 CoO China	1
		VB60K1DEAL20000	Battery cabinet -10Y: 40X82AH Type K - 2 wires (ex 75Ah)	1
		10H32479P01	Battery temperature compensation kit.	1
		IS-UNITY-DP	Vertiv™ Liebert® IS-UNITY Communications Card enables SNMP/Web, Modbus, BACnet and LIFE communication for thermal (Vertiv™ Liebert® HPC, Vertiv™ Liebert® CRV, Vertiv™ Liebert® PCW, Vertiv™ Liebert® PDX, Vertiv™ Liebert® HPM) and Power (Vertiv™ Liebert® GXT3, Vertiv™ Liebert® GXT4, Vertiv™ Liebert® NXC, Vertiv™ Liebert® EXS, Vertiv™ Liebert® APM, Vertiv™ Liebert® APS, EXL S1, Vertiv™ Liebert® ITA, Vertiv™ Liebert® ITA2) products. Compatible with Vertiv™ Liebert® SN sensors.	1
		IS-RELAY	Vertiv™ Intellislot interface kit for relay contacts for power products (Vertiv™ Liebert® APM, Vertiv™ Liebert® NXC, Vertiv™ Liebert® APS, Vertiv™ Liebert® ITA).	1
Vertiv™ Liebert® RXA	LV Switchboard with hot-swappable branch circuits and offset rack	REUAS64AAA00	Vertiv™ Liebert® RXA 250 A 84P Smissline - No monitoring	1
		RAUABS401MC32N	Miniature circuit breaker 1P+N C32A	1
		RAUABS403MC16N	Miniature circuit breaker 3P+N C16A	16
Cooling	Vertiv™ Liebert® CRD35 In-row, high-precision cooling unit 35kW useful capacity at 48°C outside temperature	CRD355-PD00A	Row based Vertiv™ Liebert® DX cooling unit Vertiv™ Liebert® CRD35, 600 mm wide, 400V/3ph/50Hz with reheat, humidifier and dual power supply.	4
		CCD354H-00A	Condenser for CRD35 with EC fans, 400V/3ph/50Hz	4
		FE10CR60	100 mm front extension to increase the unit depth to 1232 mm	4
PDB	Power distribution unit	PDB2U6101	Power distribution box 60A, 2x 60A, 3-pole	4
Support rails	Sliding support rails	VRA3004	Sliding support rails for 1P UPS systems, to be mounted in the PMC/DCC rack	4
PMC	Power Management Cabinet	See Power Management Cabinet on page 32 .		1

Figure 2.12 Layout of Model Number SA1E11120MFB0



Item	Description
1 to 11	Server racks
12	PMC
13 to 18	Vertiv™ Liebert® CRD25

NOTE: UPS and battery cabinets are placed externally according to space requirements around 3 m from base unit.

Table 2.12 Typical Configuration List of Model Number SA1E11120MFB0

Component	Description of Component	Part Number	Description of Part Number	Quantity
DCC	Aisle containment system for server racks	030290008003	Vertiv DCC Containment Roof - L5700 AW1200 H2000, consist of: • 1x DCC Roof elements L5700 AW1200 • Set of balancing sheet metal • Sealing set • Set Protector brackets	1
		030290268011	Vertiv™ SmartAisle™ sliding door set-M - no Lock, contains Mechanical door closing • 2x DCC sliding door AW1200 H2000 • 2x Mechanical door closing system	1
		050450008012	Cable - Raceway L5700 - 1x W200 / 1xW600, consist of: • 12x Depth support D1200	1

Table 2.12 Typical Configuration List of Model Number SA1E11120MFB0 (continued)

Component	Description of Component	Part Number	Description of Part Number	Quantity
			• 1x Set of cross walls for cable raceway W200 along the aisle length. • 1x Set of cross walls for cable raceway W600 along the aisle length. • 1x Set of center sections W800 w200 • 1x Set of joining sections w200 / w600 • 1x Set of end walls • 6x Sets of filler panels 229x183 • Mounting hardware	
		050450008014	Cable Duct Bridge AW1200-1xW200/1xW600, consist of: • 2x Cross support W800 2x cross wall L2400 • 4x Joining section w200 • 2x Set cross cable filler panel 200x200 • 1x Set cross cable filler panel 600x600	2
Rack 3x16A	Server rack H2000 W800 D1200 , to be equipped with e-handles, 3x16A monitored PDUs, and env. sensors	011477228001	Vertiv™ DCM rack ST SP H2000 W800 D1200 MLR2500 electronic lock front and rear door 2 pieces. PDU brackets installed.	11
		VP4G20A6	MG05M4B0-36CF13-2PS56B2A10-S-A rPDU, Monitored Unit Level EC, 16A, 230/400V WYE, 11.0kW, Vertical, (36) Combination C13/C19, 10ft / 3m power cord with 3P+N+E (IP44), black powder coat.	22
		2070244	CHD8029 Lock controller gateway	22
		11800359000001	12 v 500 mA PSU	22
		2312280	Vertiv™ Liebert® RDU501 set of 6 THD sensors.	11

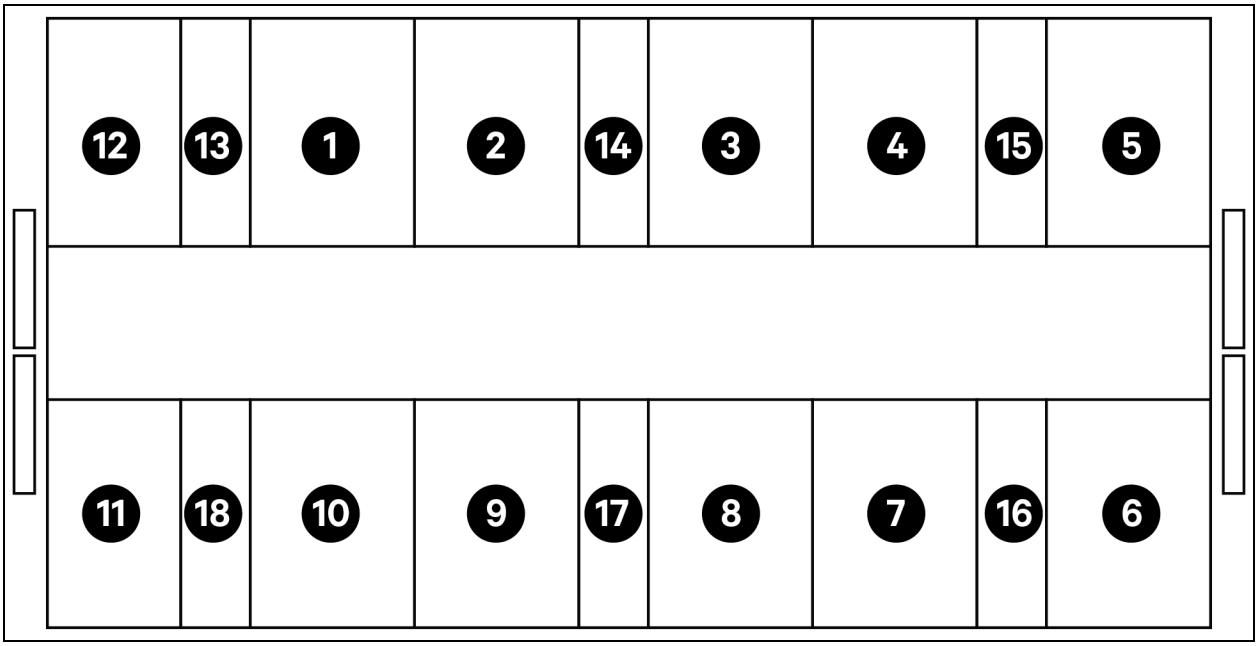
Table 2.12 Typical Configuration List of Model Number SA1E11120MFB0 (continued)

Component	Description of Component	Part Number	Description of Part Number	Quantity
UPS	Vertiv™ Liebert® AMP2 120 kVA UPS with N+1 configuration supplied with a separate battery cabinet	APMZ1211AAAA000	Vertiv™ Liebert® APM2 120kVA N+1, 120kVA compact Maint. switch No int.bat. IP20 CoO China	1
		VB60K1DEAL20000	Battery Cabinet -10Y: 40 X 82AH TYPE K - 2 wires (ex 75Ah)	2
		10H32479P01	Battery temperature compensation kit.	1
		IS-UNITY-DP	Vertiv™ Liebert® IS-UNITY communications card enables SNMP/Web, Modbus, BACnet and LIFE communication for thermal (Vertiv™ Liebert® HPC, Vertiv™ Liebert® CRV, Vertiv™ Liebert® PCW, Vertiv™ Liebert® PDX, Vertiv™ Liebert®® HPM) and Power (Vertiv™ Liebert® GXT3, Vertiv™ Liebert® GXT4, Vertiv™ Liebert® NXC, Vertiv™ Liebert® EXS, Vertiv™ Liebert® APM, Vertiv™ Liebert® APS, EXL S1, Vertiv™ Liebert® ITA, Vertiv™ Liebert® ITA2) products. Compatible with Vertiv™ Liebert® SN sensors.	1
		IS-RELAY	Vertiv™ Intellislot interface kit for relay contacts for power products (Vertiv™ Liebert® APM, Vertiv™ Liebert® NXC, Vertiv™ Liebert® APS, Vertiv™ Liebert® ITA).	1
Busbar	Vertiv™ Powerbar iMPB, IMPB-BUSBAR-RUN-160A-5-CU-5.5M	IMB-IEC01-FLN-149	160A - TPNE - iMPB - Open Channel - Copper Busbar - 4 m Length	2
		IMB-IEC01-FLN-148	160A - TPNE - iMPB - Open Channel - Copper Busbar - 1.5 m Length	2
		IMB-IEC01-JPK-32	160A - TPNE - iMPB - Joint Pack	4
		IMPB-EC-5B-S-B	iMPB 5 Bar End Cap - Small - Black	2
		IMPB-BKT-HB1	iMPB Fixing Brackets - Drop Rod - Horizontal - HB1	6
		IMPB-BKT-HB2	iMPB Fixing Brackets - Drop Rod - Horizontal - HB2	6
		C-IMP-400-5BX-0051-NL-H	160A - TPNE - iMPB - Cable End Feed - Horizontal T1	1
		C-IMP-400-5BX-0051-NR-H	160A - TPNE - iMPB - Cable End Feed - Horizontal T2	1
		iV2C/2AB316CB/G516RSXXFT01/N	iMPB Tap Off Boxes V2 TPNE with 2 x Mcbs 16A 3P C Curve 15 kA ABB with Gewiss Receptacle L1/L2/L3 - All Circuits	11
		iV2C/2AB132CB/G332RSXXFS04/N	iMPB Tap Off Boxes V2 TPNE with 2 x Mcbs 32A 1P C Curve 15 kA ABB with Gewiss Receptacle L1 - L2	1
Cooling	Vertiv™ Liebert® CRD25 In-row, high-precision cooling unit 25kW useful capacity at 48°C outside temperature	CRD255-PD00A	Row based Vertiv™ Liebert® DX Cooling unit Vertiv™ Liebert® CRD25, 300 mm wide, 400V/3ph/50Hz with reheat, humidifier and dual power supply.	6
		CCD254H-00A	Condenser for Vertiv™ Liebert® CRD25 with EC fans, 400V/3ph/50Hz	6
		FE10CR	100 mm front extension to increase the unit depth to 1232 mm.	6
PDB	Power	PDB2U4101	Power distribution box for CRV 40A, 2x 40A, 3-pole	6

Table 2.12 Typical Configuration List of Model Number SA1E11120MFB0 (continued)

Component	Description of Component	Part Number	Description of Part Number	Quantity
	distribution unit			
Support rails	Sliding support rails	VRA3004	Sliding support rails for 1P UPS systems, to be mounted in the PMC/DCC rack	6
PMC	Power Management Cabinet	See Power Management Cabinet on page 32 .		1

Figure 2.13 Layout of Model Number SA1E11175HFB0



Item	Description
1 to 11	Server racks
12	PMC
13 to 18	Vertiv™ Liebert® CRD35

NOTE: UPS and battery cabinets are placed externally according to space requirements around 3 m from base unit.

Table 2.13 Typical Configuration List of Model Number SA1E11175HFB0

Component	Description of Component	Part Number	Description of Part Number	Quantity
DCC	Aisle containment system for server racks	030290008004	Vertiv™ DCC containment roof - L6600 AW1200 H2000, consist of: • 1x DCC roof elements L6600 AW1200 • Set of balancing sheet metal • Sealing set • Set protector brackets	1
		030290268011	Vertiv™ SmartAisle™ sliding door -M - no Lock. Contains Mechanical door closing • 2x DCC sliding door AW1200 H2000 • 2x Mechanical door closing system	1
		050450008013	Cable - Raceway L6600 - 1x W200 / 1xW600 • 12x Depth support D1200 • 1x Set of cross walls for cable raceway W200 along the aisle length. • 1x Set of cross walls for cable raceway W600 along the aisle length. • 1x Set of center sections W800 w200 • 1x Set of joining sections w200 / w600 • 1x Set of end walls • 6x Sets of filler panels 229x183 • Mounting hardware	1
		050450008014	Cable Duct Bridge AW1200-1xW200/1xW600 consist of: • 2x Cross support W800 • 2x Cross wall L2400 • 4x Joining section w200 • 2x Set cross cable filler panel 200x200 • 1x Set cross cable filler panel 600x600	2
Rack 3x32A	Server rack H2000 W800 D1200, to be equipped with e-handles, 3x32A monitored PDUs, and environmental sensors	011477228001	Vertiv™ DCM rack ST SP H2000 W800 D1200 MLR2500 electronic lock front and rear door 2 pieces. PDU brackets installed.	11
		VP4G30AF	MG05M4W1-36CF13-3PS56B2A10-S-A rPDU, Monitored Unit Level EC, 32A, 230/400V WYE, 22.0kW, vertical, (36) Combination C13/C19, 3 m power cord with 3P+N+E (IP44), black powder coat.	22
		2070244	CHD8029 Lock controller gateway	22
		11800359000001	12 v 500 mA PSU	22
		2312280	Vertiv™ Liebert® RDU501 set of 6 THD sensors	11

Table 2.13 Typical Configuration List of Model Number SA1E11175HFB0 (continued)

Component	Description of Component	Part Number	Description of Part Number	Quantity
UPS	Vertiv™ Liebert® AMP2 150 kVA UPS with N+1 configuration supplied with a separate battery cabinet	APMZ181FAAA0000	Vertiv™ Liebert® APM2, 180kVA, N+1, 300k maint switch TE entry, IP20, Made in China.	1
		VB60K1DEAL20000	Battery cabinet -10Y: 40X82AH TYPE K - 2 wires (ex 75Ah)	3
		10H32479P01	Battery temperature compensation kit.	1
		IS-UNITY-DP	Vertiv™ Liebert® IS-UNITY Communications Card enables SNMP/Web, Modbus, BACnet and LIFE communication for Thermal (Vertiv™ Liebert® HPC, Vertiv™ Liebert® CRV, Vertiv™ Liebert® PCW, Vertiv™ Liebert® PDX, Vertiv™ Liebert® HPM) and Power (Vertiv™ Liebert® GXT3, Vertiv™ Liebert® GXT4, Vertiv™ Liebert® NXC, Vertiv™ Liebert® EXS, Vertiv™ Liebert® APM, Vertiv™ Liebert® APS, EXL S1, Vertiv™ Liebert® ITA, Vertiv™ Liebert® ITA2) products. compatible with SN sensors.	1
		IS-RELAY	Vertiv Intellislot Interface kit for relay contacts for power products (Vertiv™ Liebert® APM, Vertiv™ Liebert® NXC, Vertiv™ Liebert® APS, Vertiv™ Liebert® ITA).	1
Busbars	Vertiv™ Powerbar iMPB	IMB-IEC01-FLN-149	160A - TPNE - iMPB - Open channel - Copper Busbar - 4 m length	2
		IMB-IEC01-FLN-147	160A - TPNE - iMPB - Open channel - Copper Busbar - 2.5 m length	2
		IMB-IEC01-JPK-32	160A - TPNE - iMPB - Joint pack	4
		IMPB-EC-5B-S-B	iMPB 5 Bar End Cap - Small	2
		IMPB-BKT-HB1	iMPB Fixing Brackets - Drop Rod - Horizontal - HB1	7
		IMPB-BKT-HB2	iMPB Fixing Brackets - Drop Rod - Horizontal - HB2	7
		C-IMP-400-5BX-0051-NL-H	160A - TPNE - iMPB - Cable End Feed - Horizontal T1	1
		C-IMP-400-5BX-0051-NR-H	160A - TPNE - iMPB - Cable End Feed - Horizontal T2	1
		iV2C/2AB332CB/G532RSXXFT01/N	iMPB Tap Off Boxes V2 TPNE with 2 x Mcbs 32A 3P C Curve 15 kA ABB with Gewiss Receptacle L1/L2/L3 - All Circuits	11
		iV2C/2AB132CB/G332RSXXFS04/N	iMPB Tap Off Boxes V2 TPNE with 2 x Mcbs 32A 1P C Curve 15 kA ABB with Gewiss Receptacle L1 - L2	1
Cooling	Vertiv™ Liebert® CRD35 In-row, high-precision cooling unit 35kW useful capacity at 48°C outside temperature	CRD355-PD00A	Row based Vertiv™ Liebert® DX cooling unit Vertiv™ Liebert® CRD35, 600 mm wide, 400V/3ph/50Hz with reheat, humidifier and dual power supply.	6

Table 2.13 Typical Configuration List of Model Number SA1E11175HFB0 (continued)

Component	Description of Component	Part Number	Description of Part Number	Quantity
		CCD354H-00A	Condenser for CRD35 with EC fans, 400V/3ph/50Hz	6
		FE10CR60	100 mm front extension to increase the unit depth to 1232 mm	6
PDB	Power distribution box	PDB2U6101	Power distribution box 60 A, 2x 60 A, 3-pole	6
Support rails	Sliding support rails	VRA3004	Sliding support rails for 1P UPS systems, to be mounted in the PMC/DCC rack	6
PMC	Power Management Cabinet	See Power Management Cabinet below .		1

2.7.1 Power Management Cabinet

Part Number	Description	Quantity
01142015X	DCM Rack ST SP H2000 W800 D1200 MLR2500 electronic lock front and rear door 2 pieces. PDU brackets installed	1
02313945	RDU501	1
02312341	RDU501 8COM card	1
02312280	RDU501 Set of 6 THD sensors	1
02100103	RDU501 15 in. HMI display	1
011802249000012	MLR2500 Rack handle	2
2070244	CHD8029 Lock controller gateway	2
11800359000001	12 v 500 mA PSU	2
61084729000001	Beacon	1
12058329001004	Water leak sensor	1
POE Switch 24 Port	Network switch	2
SmartCam Bullet Kit4	Video surveillance kit, composed by: • Network Video Recorder (NVR), rack-mounted (to be shipped loose, mounting recommendations) • 4x IP cameras, shipped loose to be installed onsite according to customer preferences or Vertiv recommendations.	1
VP4G30A0	MG05M4B1-26PJ63-3PS6B2A10-S. rPDU, Monitored Unit Level EC, 32A, 230V, 7.3kW, Vertical, (20) Locking IEC C13, (6) Locking IEC C19, 3 m power cord with 1P+N+E (IP44), Black Powder Coat.	1

3 Installation

The Vertiv™ SmartAisle™ product is on the heavier side and there is a risk of severe injury if not handled properly. Read all the instructions carefully prior to unpacking, shifting, or installing the unit.

NOTE: The components of the SmartAisle™ solution are designed for computer centers used in a dry industrial environment. Use in other areas, for example in a wet room or outdoors, is improper. The manufacturer refuses all warranty and liability claims caused by improper usage or if components are added or modified without authorization.

WARNING! Risk of top-heavy unit falling over when improperly lifted or moved. Can cause serious injury or death. Building and equipment damage may also result. Read all of the following instructions and verify that all lifting and moving equipment are rated for the weight of the unit before attempting to move, lift, remove packaging from or prepare the unit for installation. Unit weights are specified in Table 2.3 on page 12.

CAUTION: Risk of improper handling heavy and lengthy parts. Can cause injury. Building and equipment damage may also result. Cabinet panels can exceed 1.5 m (5 ft.) in length and weigh more than 15.9 kg (35 lb). Follow relevant OSHA lifting recommendations and consider using a two-person lift for safe and comfortable removal and installation of cabinet panels. Only properly trained and qualified personnel wearing appropriate, OSHA-approved PPE should attempt to remove or install cabinet panels.

NOTICE

Risk of passageway interference. Can cause unit and/or structure damage. The unit may be too large to fit through a passageway while on or off the skid. Measure the unit and passageway dimensions and refer to the installation plans prior to moving the unit to verify clearances.

CAUTION: Risk of contact with sharp edges, splinters and exposed fasteners. Can cause injury. Only properly trained and qualified personnel wearing appropriate OSHA-approved PPE should attempt to move, lift, or remove packaging from or prepare the unit for installation.

NOTE: Cabinets, UPS, air conditioners, and aisle doors may be too high to pass through the doorways or freight elevators. Measure the height of each component, doorway, and freight elevator, and confirm the space before moving each component to avoid damage to equipment and buildings.

NOTE: For the different cabinets, power distribution cabinets, air conditioning and other equipment, the package weight and size can be obtained by referring to the specific manuals.

3.1 Related Manuals

This user manual for the Vertiv™ SmartAisle™ refers to the user manuals of other products.

These manuals include those listed below. These are available from Vertiv.com.

1. SL-70747 Vertiv™ Liebert® CRV CRD25 and CRD35 User Manual
2. SL-71076 Vertiv™ Liebert® APM2 30 to 120 kVA UPS User Manual
3. SL-70642 Vertiv™ Liebert® CCD25 and CCD35 User Manual
4. SL-71186 Vertiv™ Liebert® RDU501 Intelligent Monitoring Unit User Manual

5. SL-70634 Vertiv™ Liebert® RXA Remote Distribution Cabinet User Manual
6. SL-70927 Vertiv™ PowerBar iMPB Installer/User Guide
7. SL-71013 Vertiv™ iMPB Submittals Addendum Document
8. SL-71922 Vertiv™ SmartAisle™ 2 Cold Aisle Containment Assembly Instructions
9. SL-71211 Vertiv™ Geist™ Rack Power Distribution Unit Installer/User Guide

3.2 Installation Precautions

Following are the measures to be adhered prior to installation of the SmartAisle™ unit:

1. Close all the doors of the equipment and cabinets before using a forklift to lift the unit.
2. Measure and verify the installation site level prior to installation.
3. Confirm that charging operations are stalled and the installed power is disconnected before installation.
4. For installation of indoor and outdoor air conditioning units, refer to SL-70747 Vertiv™ Liebert® CRV CRD25 and CRD35 User Manual.
5. For installation of the UPS, refer the following manuals:
   - SL-71076 Vertiv™ Liebert® APM2 30 to 120 kVA UPS User Manual

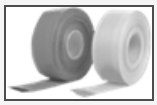
3.3 Installation Tools

WARNING! Risk of electric shock and hazardous voltage. Can cause personal injury or death. Installation tools used during live operation must be insulated.

Table 3.1 Tools Required

Name of Tools	Drawing	Name of Tools	Drawing
Electric hand drill		Adjustable wrench	
Slotted screwdriver		Cross head screwdriver	
Stepladder		Forklift	
Level		Wire cutting pliers	
Claw hammer		Diagonal cutting pliers	
Insulating shoes		Antistatic gloves	

Table 3.1 Tools Required (continued)

Name of Tools	Drawing	Name of Tools	Drawing
Electrician knife		Cable ties	
Crimping pliers		Insulating gloves	
Insulated torque wrench		Heat shrinkable tube	
Multimeter		Torque screwdriver	
Clip-on ammeter		Insulating Shoes	
Cutter knife		Adjustable spanner	
Socket wrench		Phillips screwdriver	

3.4 Installation Steps

1. Place the cabinet in position.
    a. Level the cabinets and position them side by side.

NOTE: Part Number 011476427 is not designed to connect APM2 or CRD units with the racks. There are no useful connection points to allow this within the Liebert parts. Due to this, the racks are just bayed between each other while the other equipment is just placed next to the racks.

    b. Divide the cold and warm sections of the cabinets.
    c. Seal openings in the double floor (for example cable passages).

NOTE: The sealing of the bottom part of the racks must be done with foam to eliminate mixing of hot air stream and cold air stream.

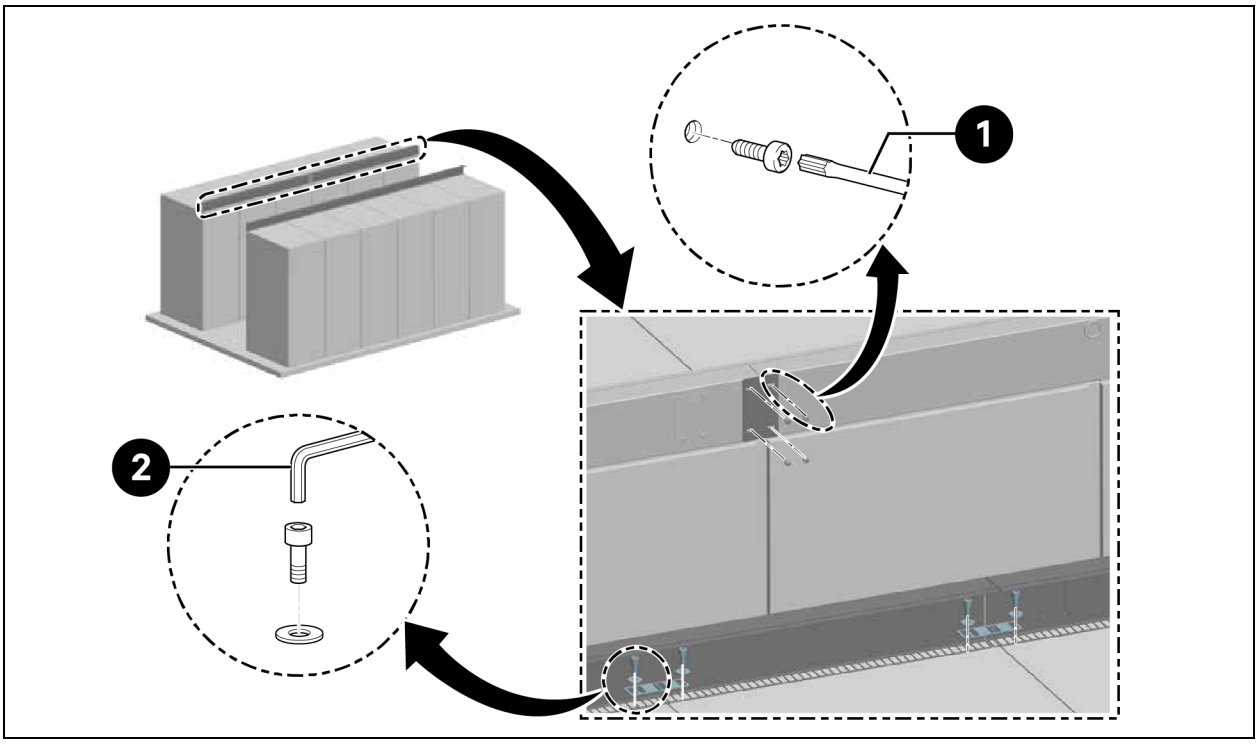
Refer the below manuals for more details:

- SL-70747 Vertiv™ Liebert® CRV CRD25 and CRD35 User Manual
- SL-70642 Vertiv™ Liebert® CCD25 and CCD35 User Manual
- SL-71076 Vertiv™ Liebert® APM2 30 to 120 kVA UPS User Manual

2. Install the SmartAisle™ roof element.
    a. Remove the top screw from the boreholes in the cabinet cover.
    b. Remove the webs in the angle sections with side cutting pliers if necessary. Position angle sections such that the U-shaped opening faces the rear wall of the cabinet with air regulation openings at the ends of the aisles.
    c. Secure each angle section using at least two screws. Do not bolt the angle sections at the ends of the aisles.

        As from two angle sections per aisle side: Connect two angle sections with cover strips and four screws. See Figure 3.1 on the facing page.

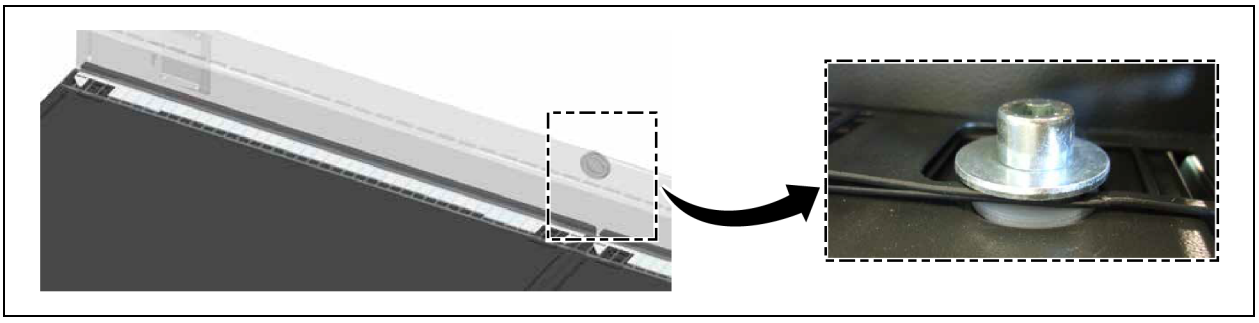
Figure 3.1 Placing Angle Section



Item	Description
1	Torx screwdriver TX 30
2	Allen key (10 mm)

NOTE: When the Vertiv™ DCM racks are placed in a row, the alignment plates must be inserted between the angle section and rack.

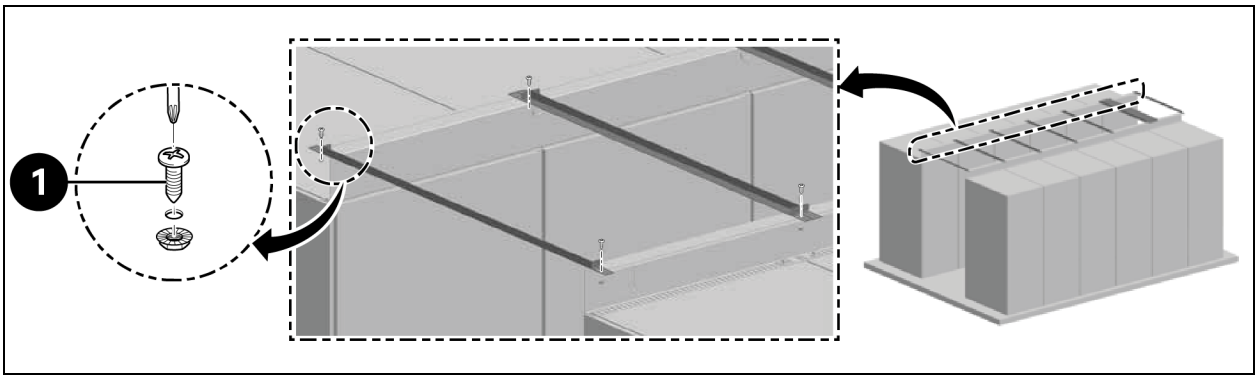
Figure 3.2 Alignment Plates and Washer



3. To bridge the height difference between cabinets with a height of 2200 mm and cabinets with a height of 2000 mm, secure angle section using at least two screws.
    a. Fit separating strips at intervals of 600 mm or 800 mm depending on the width of the Plexiglas panels.
    b. Secure the end separating strips flush with the angle sections to act as closing elements using two screws on each.

c. Secure separating strips diagonally to act as interim elements using two screws on each. See Figure 3.3 below.

Figure 3.3 Securing Separating Strips

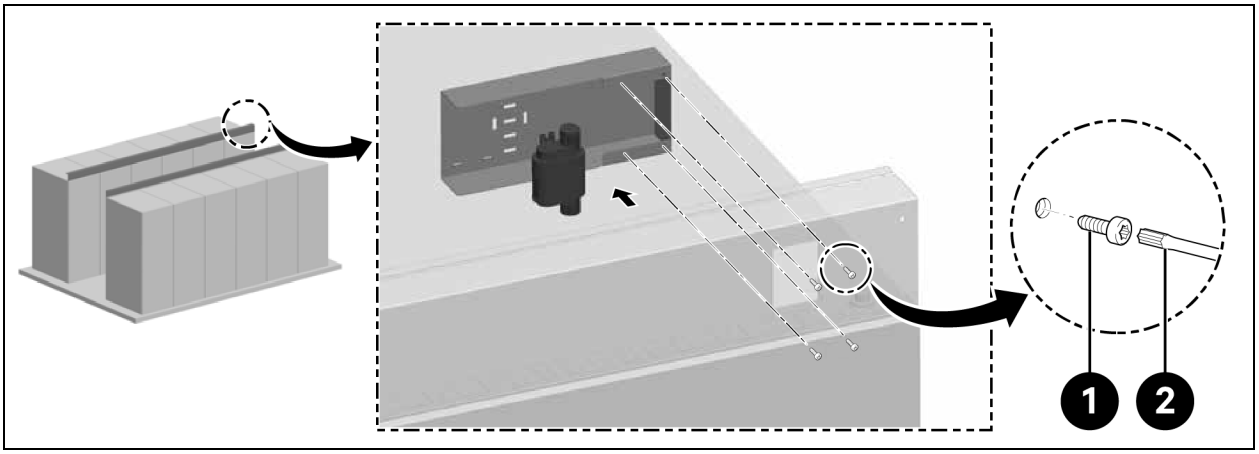


Item	Description
1	Screws (quantity: 2)

d. Affix the sealing strip between the separating strips on the angle section. Place the plexiglas panels. Apply the foam around the perimeter to seal the gaps,

4. Secure the protection bracket with two screws each.
   a. Remove the cover plate of the air regulation opening in the angle bracket.
   b. Install the sensor onto the air duct. Attach the SensorBOX from the outside to the angle bracket.

Figure 3.4 SensorBOX Installation



Item	Description
1	Screws (quantity: 4)
2	Torx screwdriver TX 25

NOTE: Roof element must be installed before door mounting.

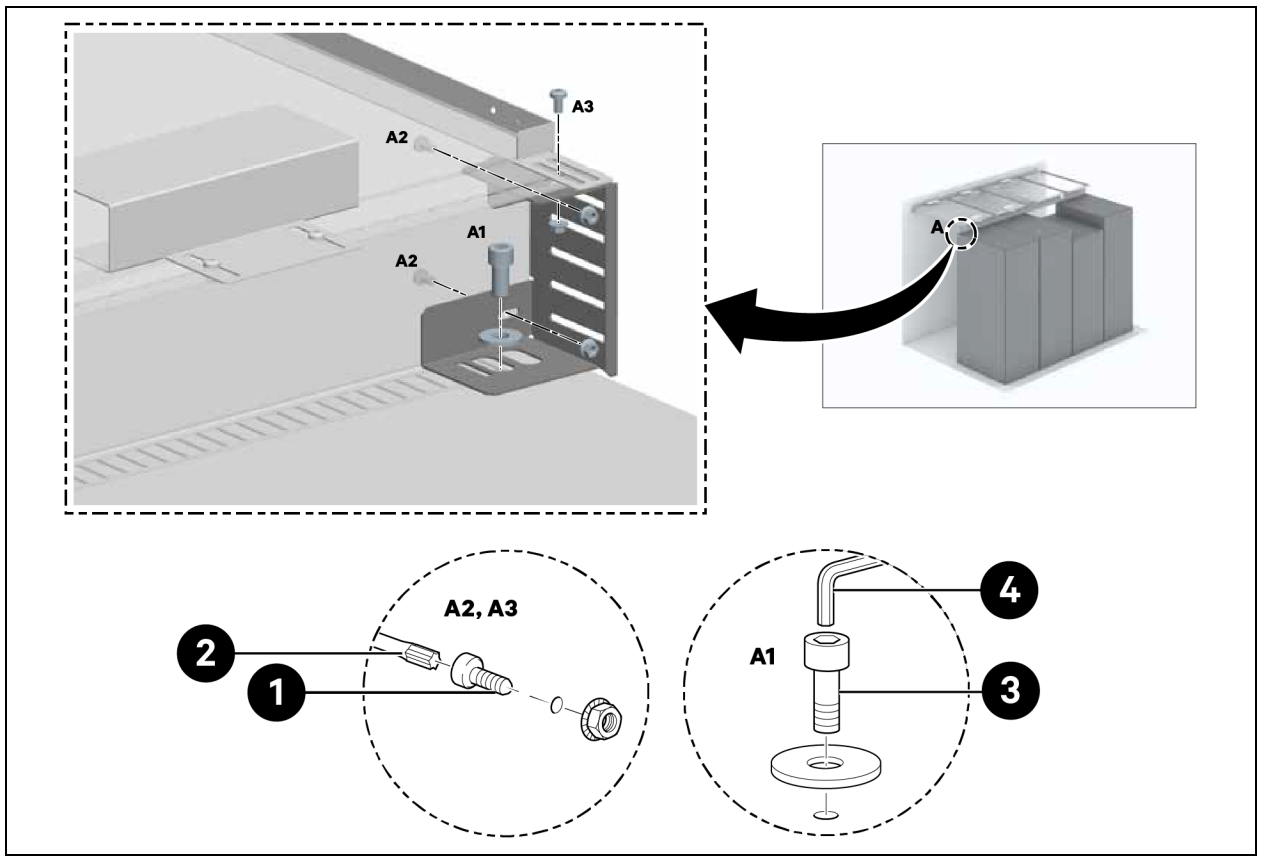
3.5 Sliding Door Installation

3.5.1 Door Frame

For installing door frame follow below process:

1. Attach the mounting bracket.

Figure 3.5 Door Frame

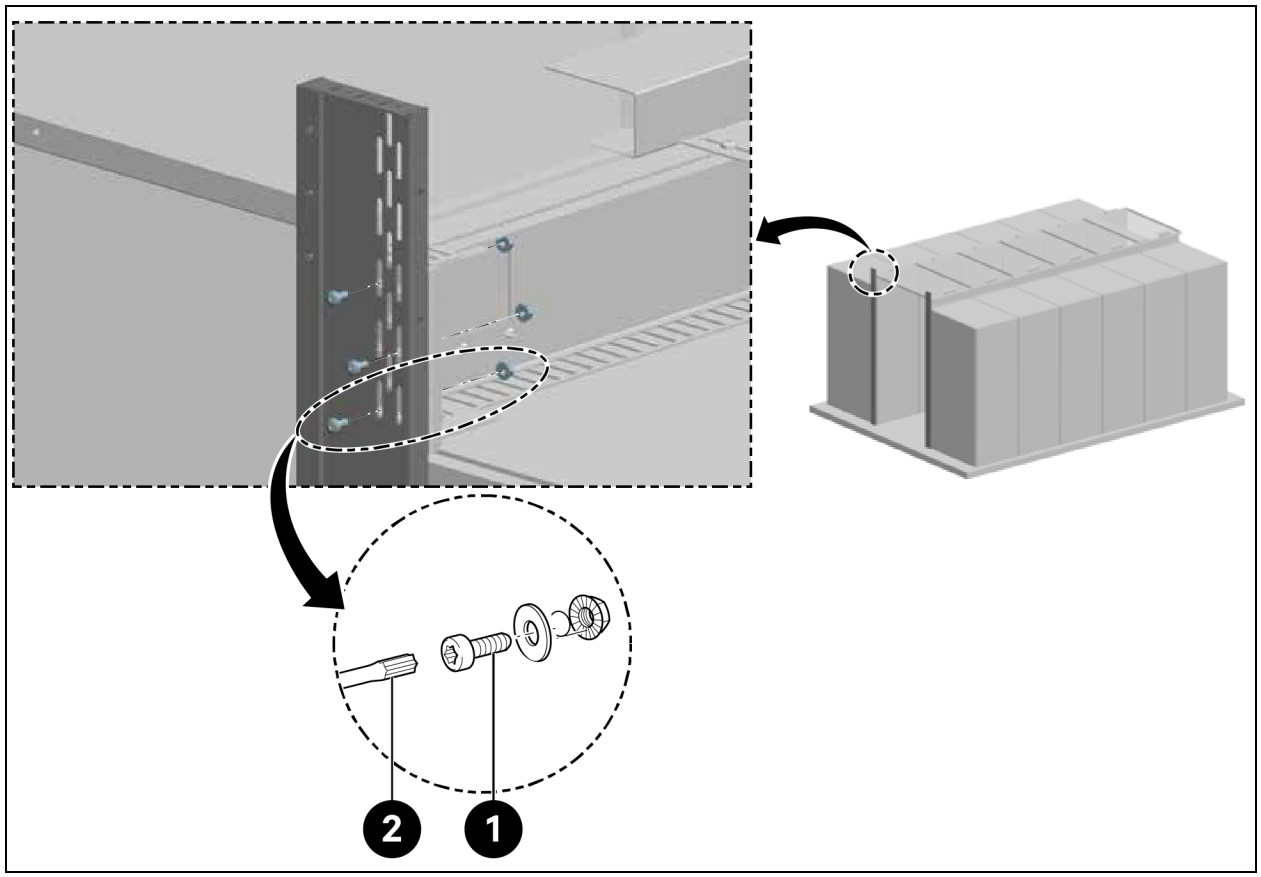


Item	Description
1	Screws (quantity: 6)
2	Torx screwdriver TX 30
3	Screws (quantity: 2)
4	Allen key (10 mm)

2. Attach the side parts to the mounting brackets at a distance of 1220 mm.

   Do not tighten the screws.

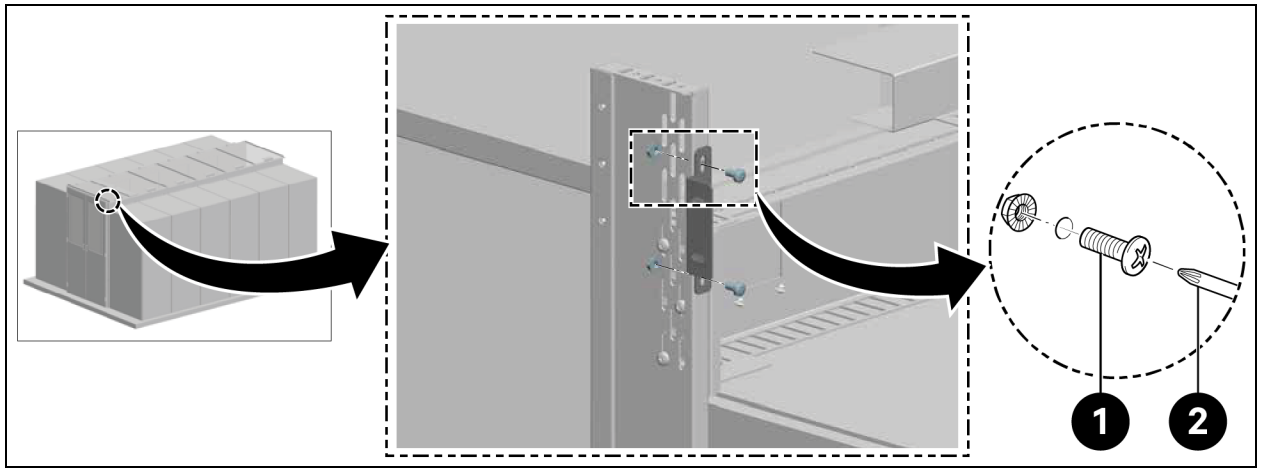
Figure 3.6 Door Frame Mounting Bracket



Item	Description
1	Screws (quantity: 6)
2	Torx screwdriver TX 30

3. For aisle height of 2000 mm and aisle width of 1500 mm and 1800 mm, attached door bracket.

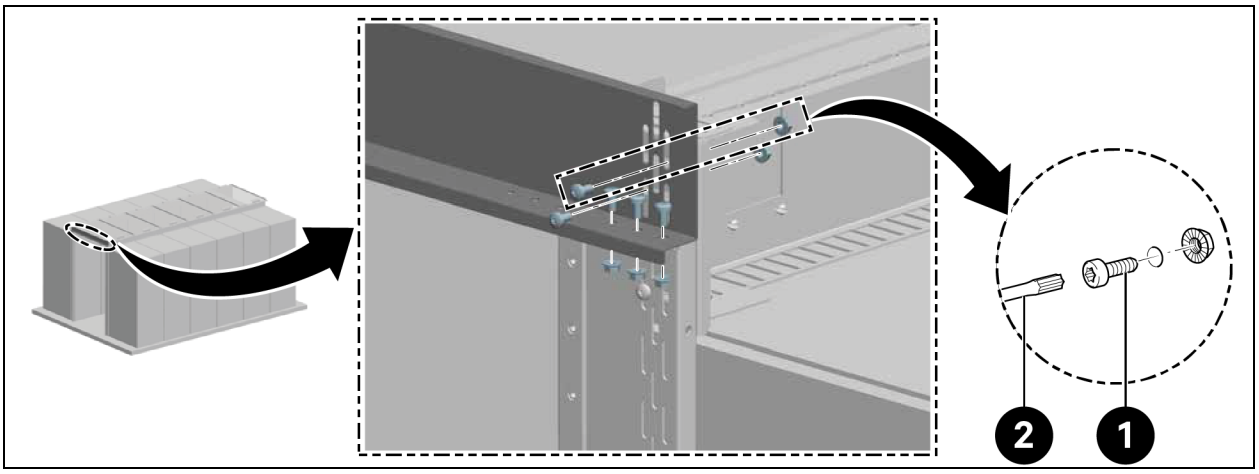
Figure 3.7 Attaching Door Bracket



Item	Description
1	Screws (quantity: 4)
2	Torx screwdriver TX 30

4. For aisle height of 2200 mm, attached the top frame part.

Figure 3.8 Attaching Top Frame



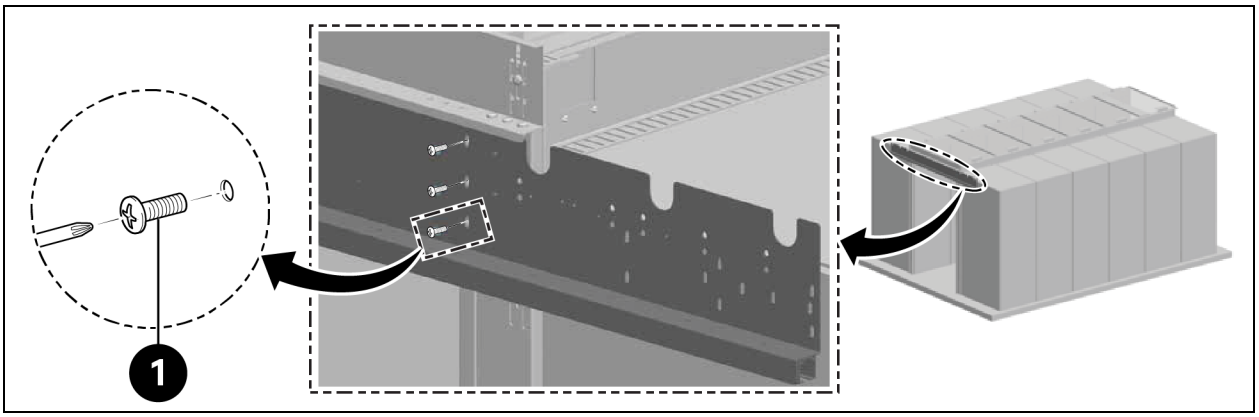
Item	Description
1	Screws (quantity: 10)
2	Torx screwdriver TX 30

4. Align the frame centrally and tighten the screws on the side parts, as shown in Figure 3.6 on the previous page.

3.5.2 Retaining Rail

1. Align the retaining rail horizontally.
2. Install the retaining rail at a distance of 2082 mm to the underside of the retaining rail, as shown in Figure 3.9 below.

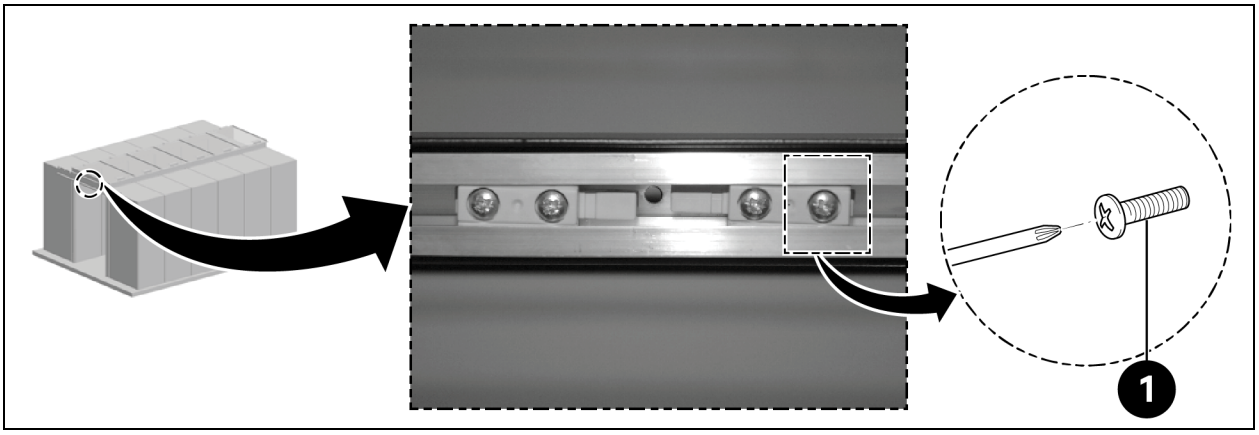
Figure 3.9 Retaining Rail



Item	Description
1	Screws (quantity: 6)

Install the internal door stoppers in the rail, as shown in Figure 3.10 below.

Figure 3.10 Retaining Rail Stopper

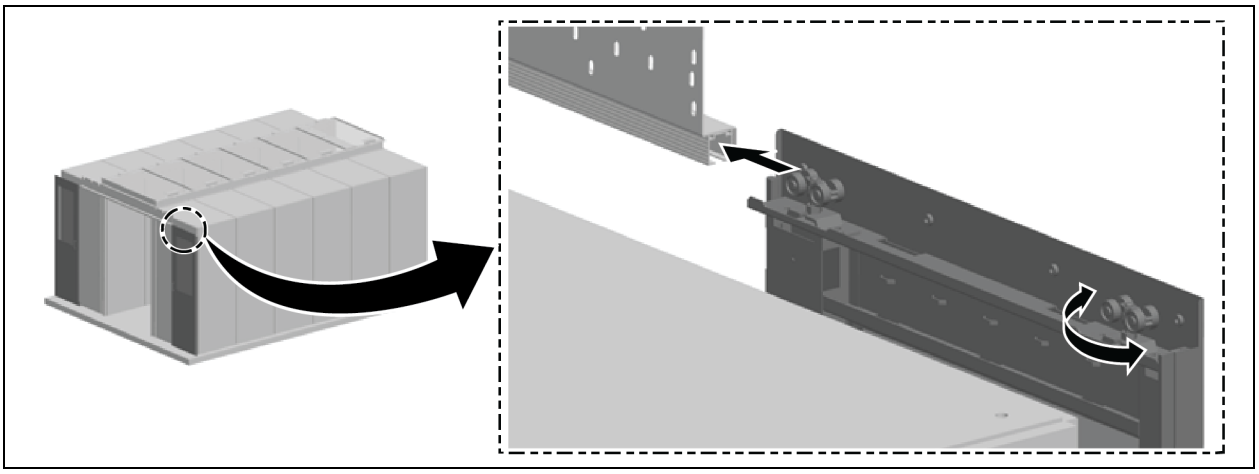


Item	Description
1	Screws (quantity: 4)

3.5.3 Door Leafs

Slide in the door leafs.

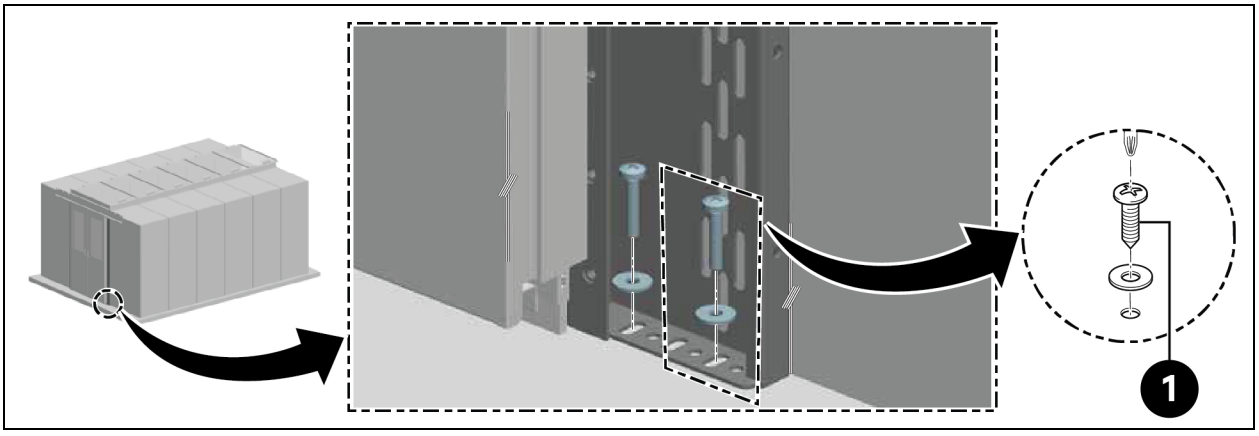
Figure 3.11 Door Leaf



Align the doors vertically:

1. Pull out the doors a little and move the outer door rollers up or down by moving them through 180°, as shown in Figure 3.11 above.
2. Align the side frame parallel to the closed sliding doors and secure it, as shown in Figure 3.12 below.

Figure 3.12 Door Leaf Alignment



Item	Description
1	Screws (quantity: 4)

Attach the outer door stoppers:

1. Check the alignment of the door stoppers.
   - Sliding door with electrical door closer: Handles point outwards.
   - Sliding door with mechanical door closer: Handles point inwards.

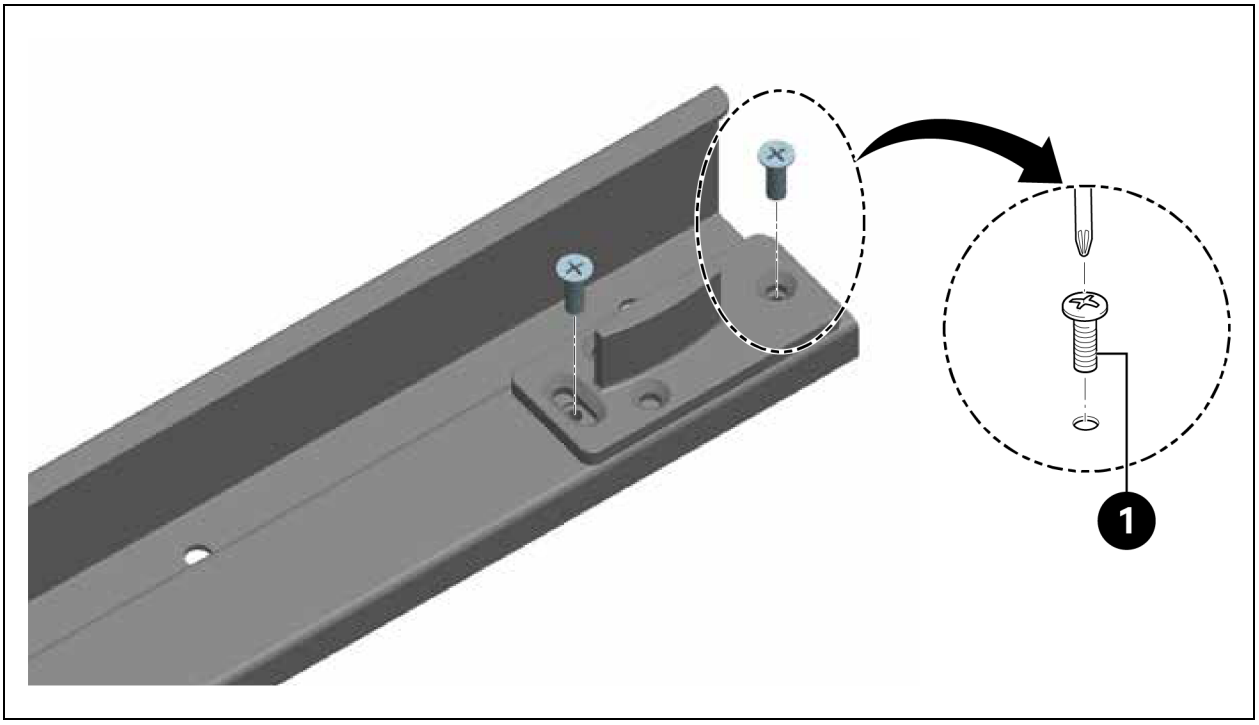
2. Attach the door stoppers in the rail using two screws on the left and right. Maintain a distance of 100 mm to the ends of the rail.

3.5.4 Floor Rails

1. Align the rails:
   - Parallel to the side frame.
   - Centrally to the longitudinal directions of the bottoms of the doors.
   - Approximately 8 cm below the closed doors.

Attach the bottom guide to the rail.

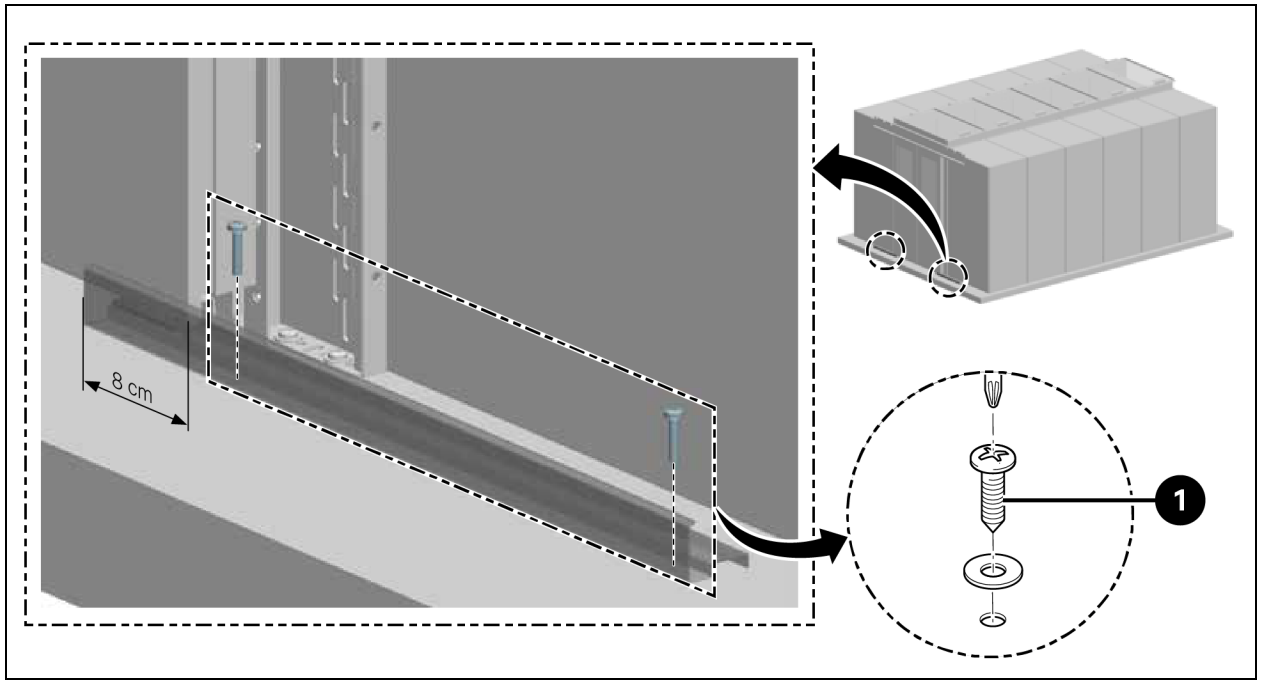
Figure 3.13 Floor Rails Bottom Guide



Item	Description
1	Screws (quantity: 4)

2. Install the rails.

Figure 3.14 Floor Rail Installation

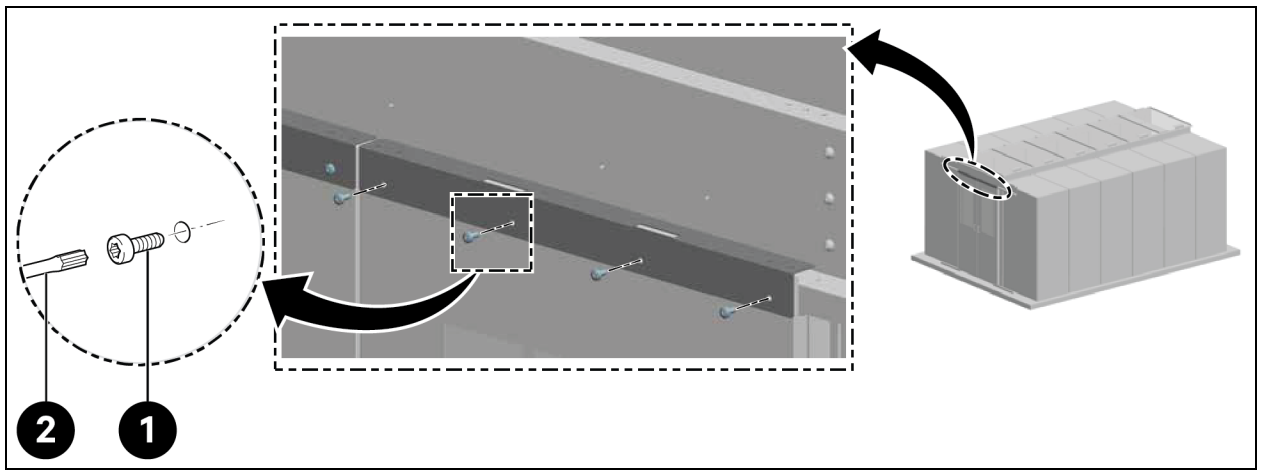


Item	Description
1	Screws (quantity: 4)

3.5.5 Mechanical Door Closer

1. Attach the mounting bracket for the cam.

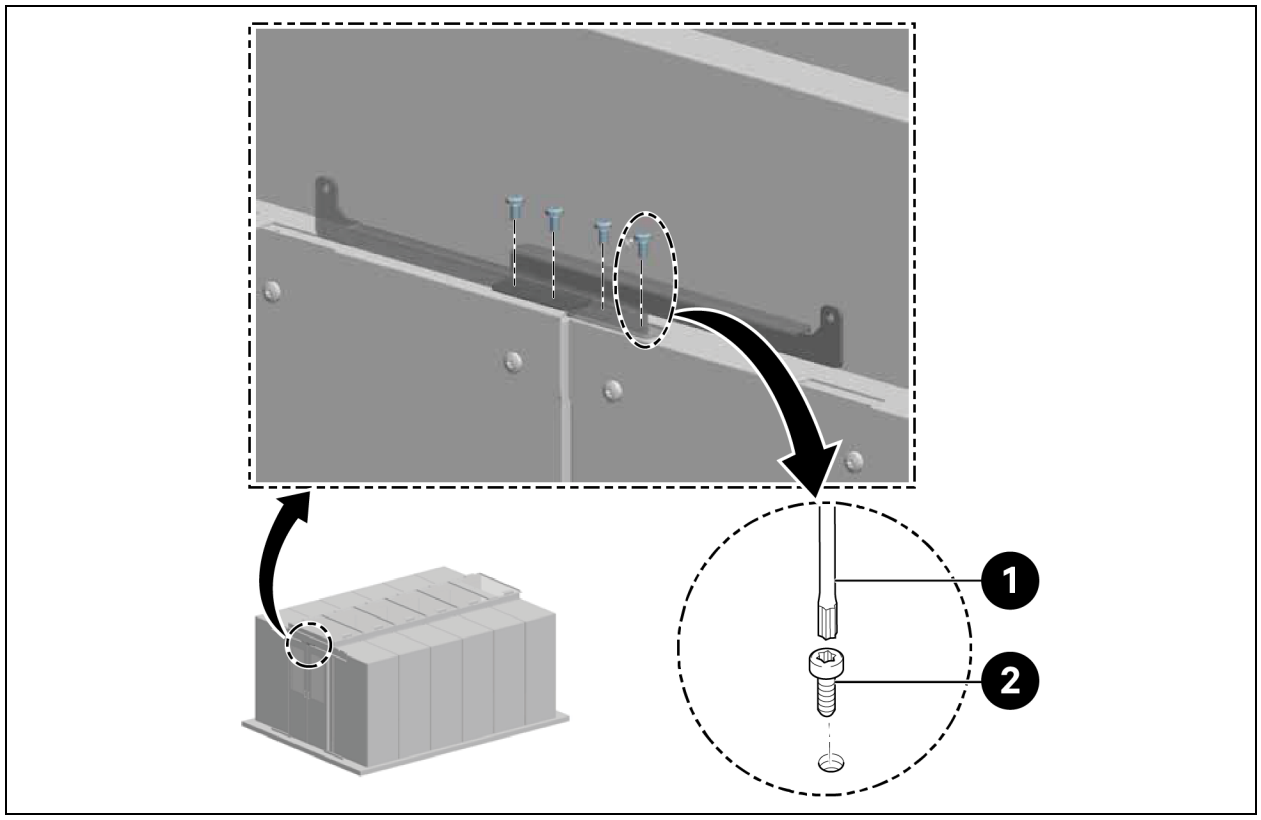
Figure 3.15 Mounting Bracket for Cam



Item	Description
1	Screws (quantity: 8)
2	Torx screwdriver TX 30

2. Attach the cam.

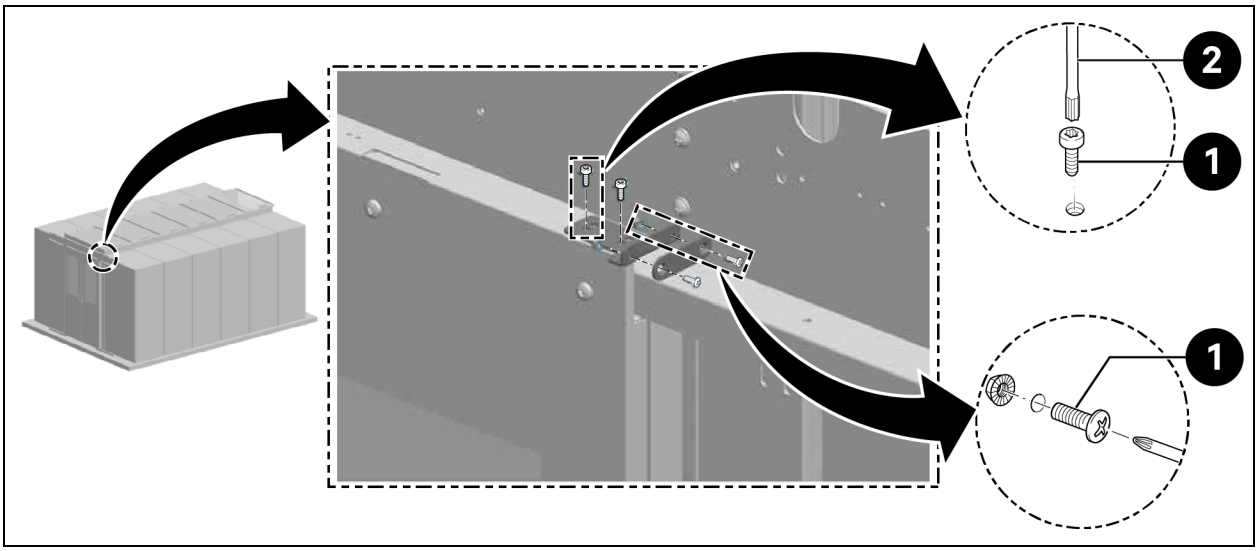
Figure 3.16 Cam Attachment



Item	Description
1	Screws (quantity: 4)
2	Torx screwdriver TX 25

3. Attach the counter piece at the end of the door leafs.

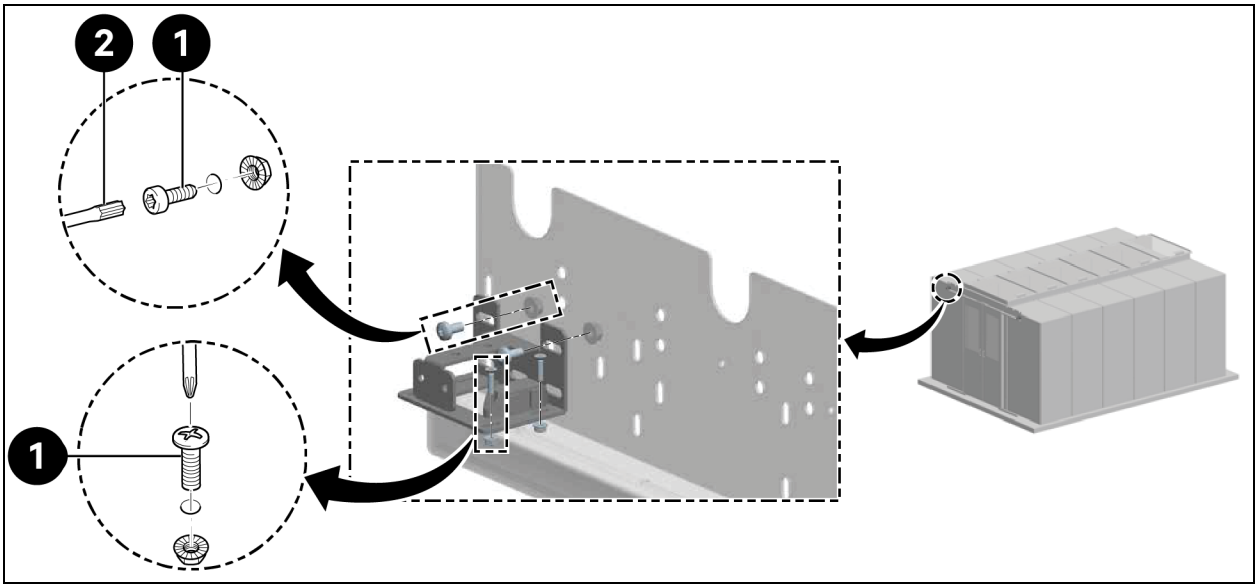
Figure 3.17 Counter Piece at Door Leaf



Item	Description
1	Screws (quantity: 6)
2	Torx screwdriver TX 25

4. Attach the counter holder and magnet.

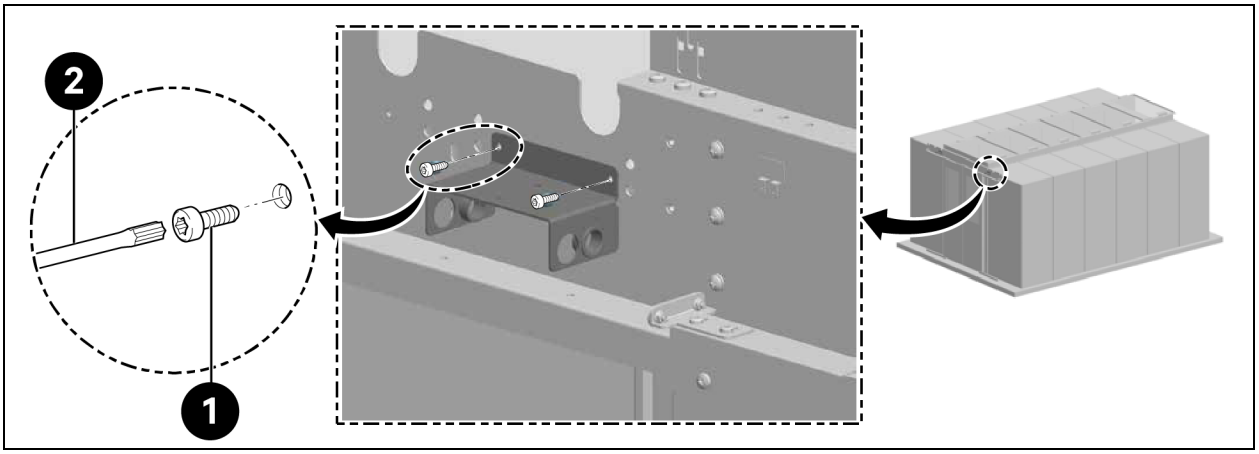
Figure 3.18 Attaching Counter Holder and Magnet



Item	Description
1	Screws (quantity: 8)
2	Torx screwdriver TX 30

5. Attach the guide bracket.

Figure 3.19 Guide Bracket



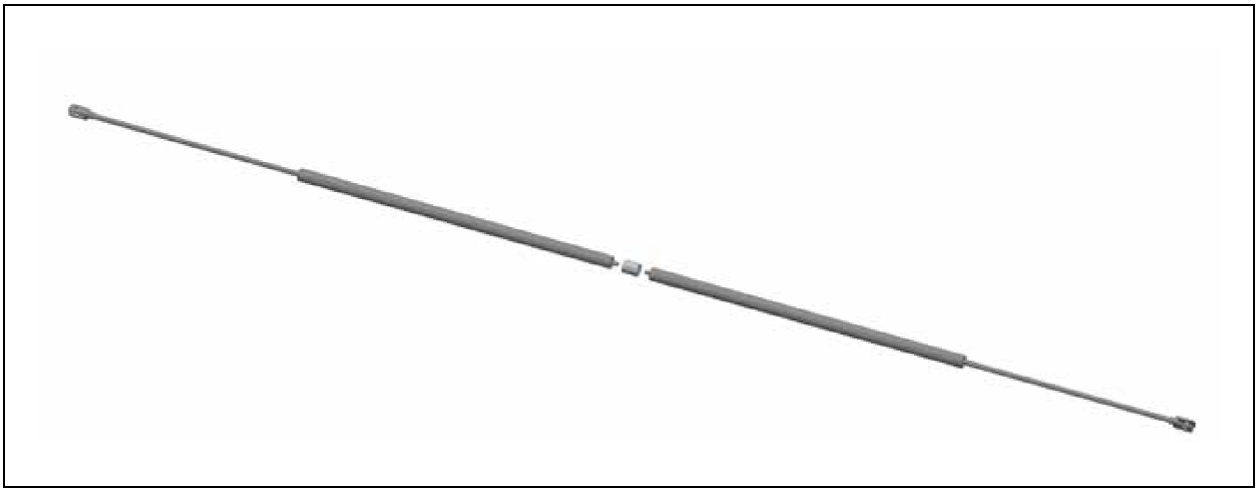
Item	Description
1	Screws (quantity: 4)
2	Torx screwdriver TX 25

Install rear gas pressure springs.

NOTE: Position plastic grommets in the passage openings in the guide bracket corresponding to the positions of the gas pressure springs, as shown in Figure 3.19 above.

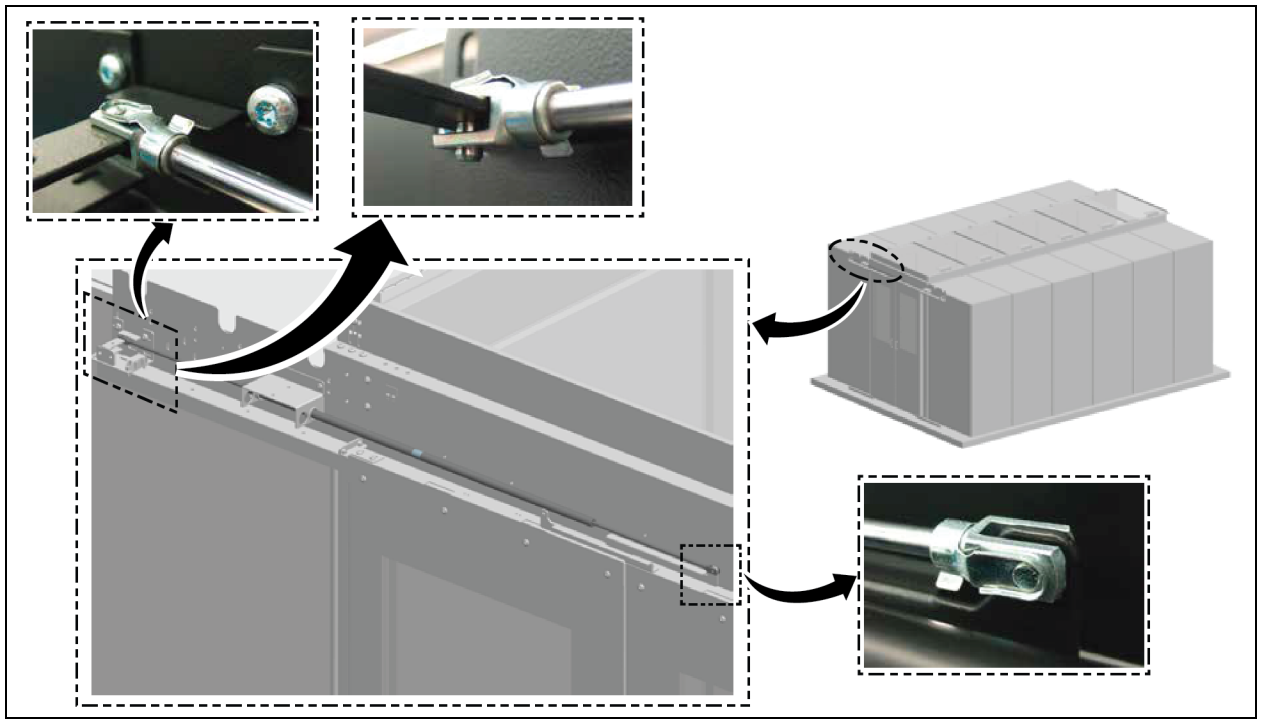
6. Connect the gas pressure springs using an adapter, as shown in Figure 3.20 below.

Figure 3.20 Gas Pressure Springs and Adapter



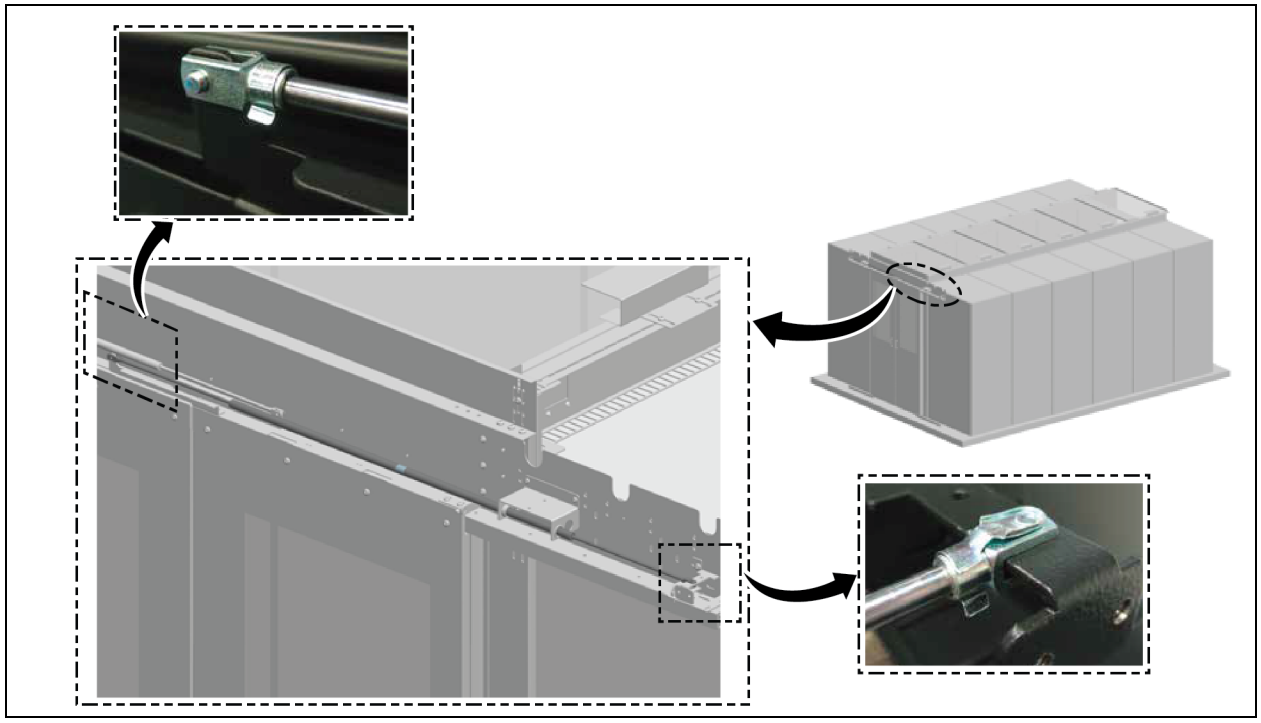
7. Pull the gas pressure springs through the guide bracket and secure them.

Figure 3.21 Securing Gas Pressure Springs



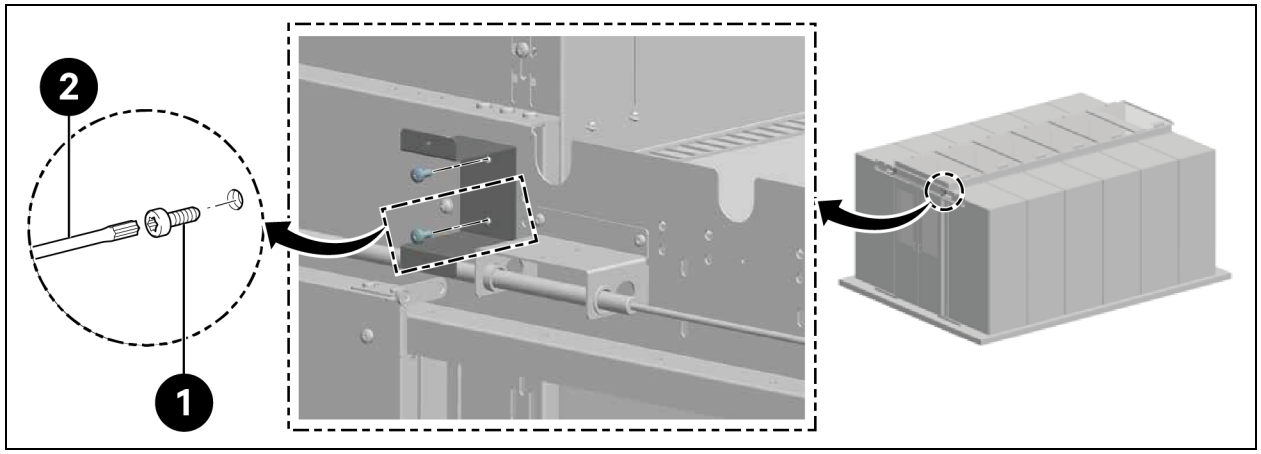
8. Install front gas pressure springs.

Figure 3.22 Front Gas Pressure Springs



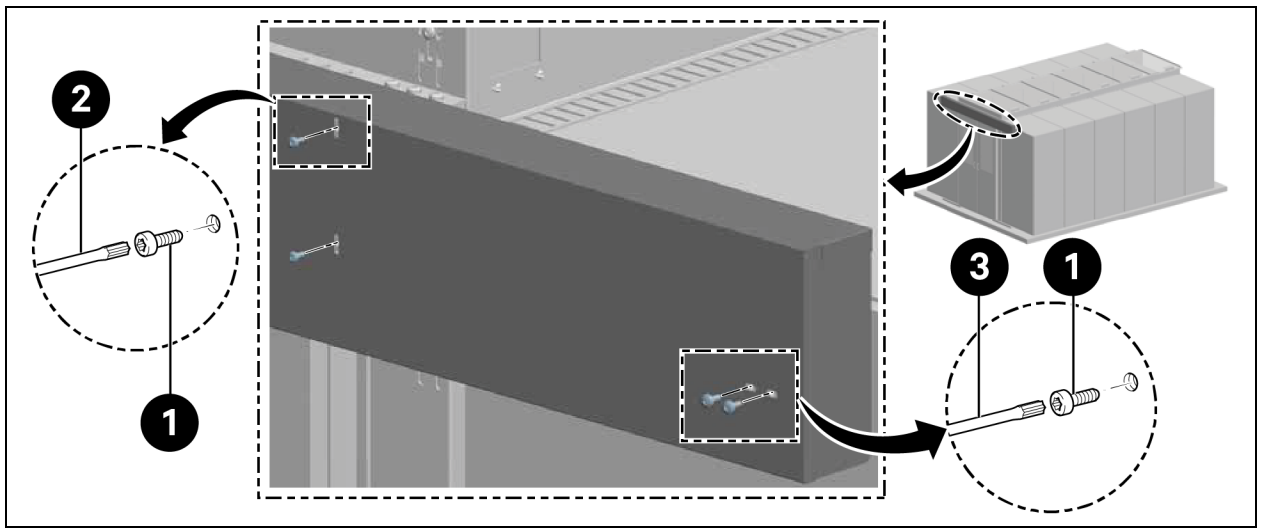
9. Install the cover trim.

Figure 3.23 Cover Trim Installation



Item	Description
1	Screws (quantity: 4)
2	Torx screwdriver TX 30

Figure 3.24 Securing Cover Trim



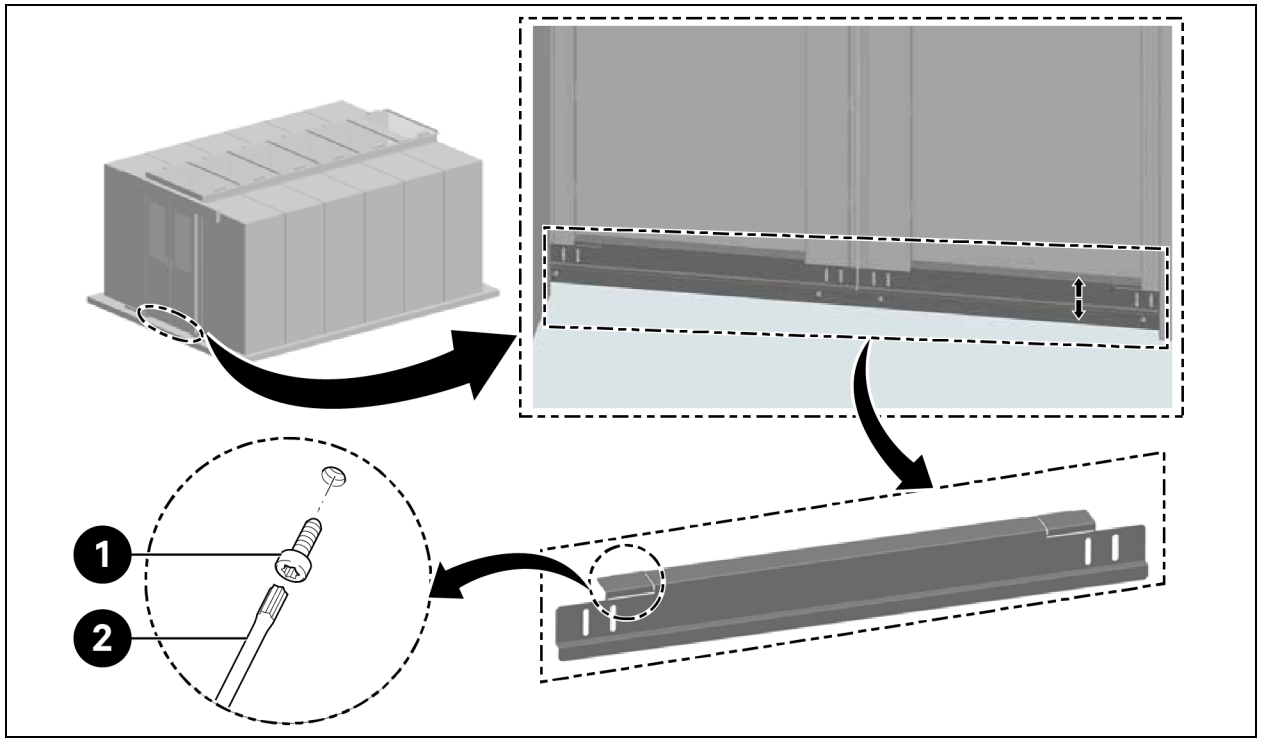
Item	Description
1	Screws (quantity: 8)
2	Torx screwdriver TX 25
3	Torx screwdriver TX 30

3.5.6 Brush Strips

Attach the horizontal brush strip at the bottom of the door leaf and adjust it to height.

Depending on the version (left/right), cut the ribs on the support bracket flushly with side cutting pliers as shown in **Figure 3.25** below.

Figure 3.25 Brush Strips



Item	Description
1	Screws (quantity: 4)
2	Torx screwdriver TX 30

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4 Piping and Refrigeration Connections

4.1 Connecting Pipelines of Indoor Cooling System

For connections of pipelines of the indoor cooling system, refer to the SL-70747 Vertiv™ Liebert® CRV CRD25 and CRD35 User Manual.

4.2 Connecting Pipelines of Outdoor Cooling System

For connections of pipelines of the outdoor cooling system, refer to the SL-70642 Vertiv™ Liebert® CCD25 and CCD35 User Manual.

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5 Cooling Units and UPS Power Connections

5.1 Indoor Cooling Unit Power Connections

WARNING! Arc flash and electric shock hazard. Open all local and remote electric power supply disconnect switches, verify with a voltmeter that power is Off and wear appropriate, OSHA-approved Personal Protective Equipment (PPE) per NFPA 70E before working within the electric control enclosure. Failure to comply can cause serious injury or death. Customer must provide earth ground to unit, per NEC, CEC and local codes, as applicable. Before proceeding with installation, read all instructions, verify that all the parts are included and check the nameplate to be sure the voltage matches available utility power. The controller does not isolate power from the unit, even in the Unit Off mode. Some internal components require and receive power even during the Unit Off mode of the controller. The only way to ensure that there is NO voltage inside the unit is to install and open a remote disconnect switch. Refer to unit electrical schematic. Follow all local codes.

WARNING! Risk of electric shock. Can cause equipment damage, injury or death. Open all local and remote electric power supply disconnect switches and verify with a voltmeter that power is off before working within any electric connection enclosures. Service and maintenance work must be performed only by properly trained and qualified personnel and in accordance with applicable regulations and manufacturers specifications. Opening or removing the covers to any equipment may expose personnel to lethal voltages within the unit even when it is apparently not operating and the input wiring is disconnected from the electrical source.

NOTE: The equipment shall be installed in accordance with national wiring regulations.

NOTE: A means for disconnection from the supply mains having a contact separation in all poles that provide full disconnection under over voltage category III conditions must be incorporated in the fixed wiring.

Before proceeding with the electrical connections, ensure that:

- The unit has been fixed to the floor or the adjacent cabinets.
- All electrical components are in good condition.
- All terminal screws are tight.
- The supply voltage and frequency are indicated on the unit.

5.2 Connecting Power Supply Cable

The power supply is 400V/3Ph/50/60Hz for the unit. The size of power cable must support the full load current. Do not fit the supply cable in the raceways inside the electrical panel. Use multipolar cables with sheath (CEI20-22) only.

Table 5.1 Rated Full Load Current (Amperes)

Item	Model	CRD25			CRD35		
	Power Phase	L1	L2	L3	L1	L2	L3
Indoor unit	Compressor	14.1	14.1	14.1	18.6	18.6	18.6
	Fans power module	-	-	9.1	-	-	9.1
	Heaters	7.5	7.5	-	15	15	-
	Humidifier	-	11.2	-	-	11.2	-
	Compressor+fans	14.1	14.1	23.2	18.6	18.6	27.7
	Fans+heaters	7.5	7.5	9.1	15	15	9.1
	Fans+humidifier	-	11.2	9.1	-	11.2	9.1
	Compressor+fans+heaters	21.6	21.6	23.2	***33.6***	33.6	27.7
	Compressor+fans+humidifier	14.1	***25.3***	23.2	18.6	29.8	27.7
Condenser	Without low ambient kit	1.4	1.4	1.4	2.8	2.8	2.8
	Low ambient kit heater	1.3	-	-	1.3	-	-
	With low ambient kit	***2.7***	1.4	1.4	***4.1***	2.8	2.8
Indoor unit+condenser	Full load current per phase	24.3	***26.7***	24.6	***37.7***	36.4	30.5
	Rated full load current	***26.7***			***37.7***		

NOTE: The bolded text means the maximum full load current of indoor unit or outdoor unit or the overall unit. The rated full load current depends on the maximum full load current per phase.

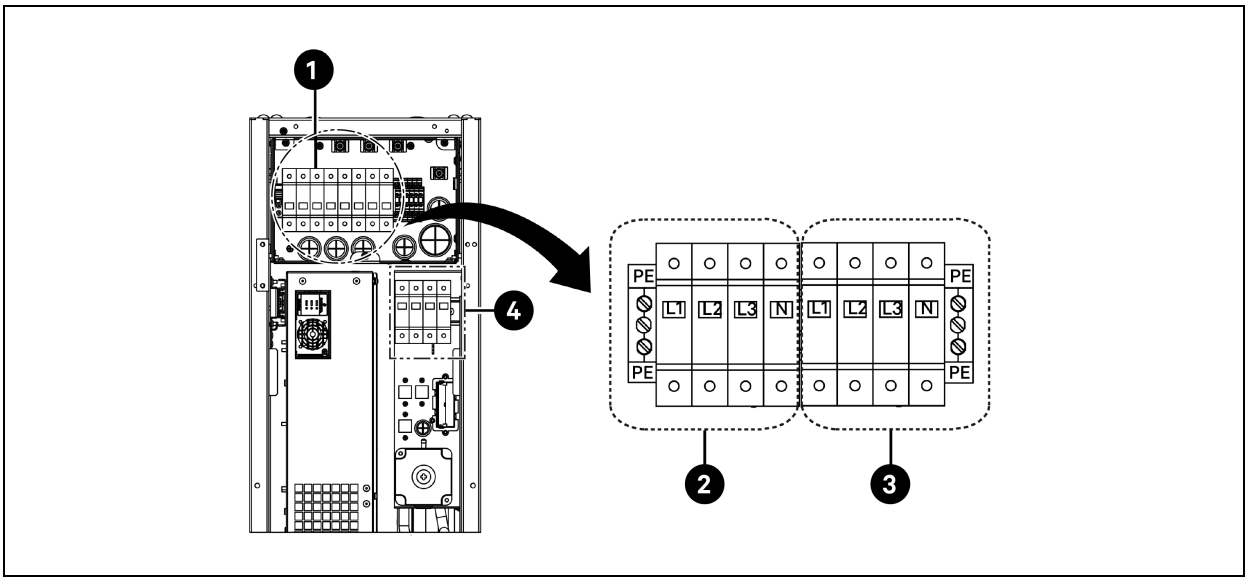
NOTE: The heater and humidifier will not work at the same time.

To connect the power supply cables:

1. Open the rear door. The electrical box 1 is located under the top panel. Remove the cover plate from the electrical box 1 by removing three M4 x 10 pan head screws for CRD25 and four M4 x 10 pan head screws for CRD35.
2. Route the power supply cables into the unit from the top or bottom panel and connect the cables to the L1, L2, L3, N, and PE terminals of power supply 1 and power supply 2 on the main circuit breaker.

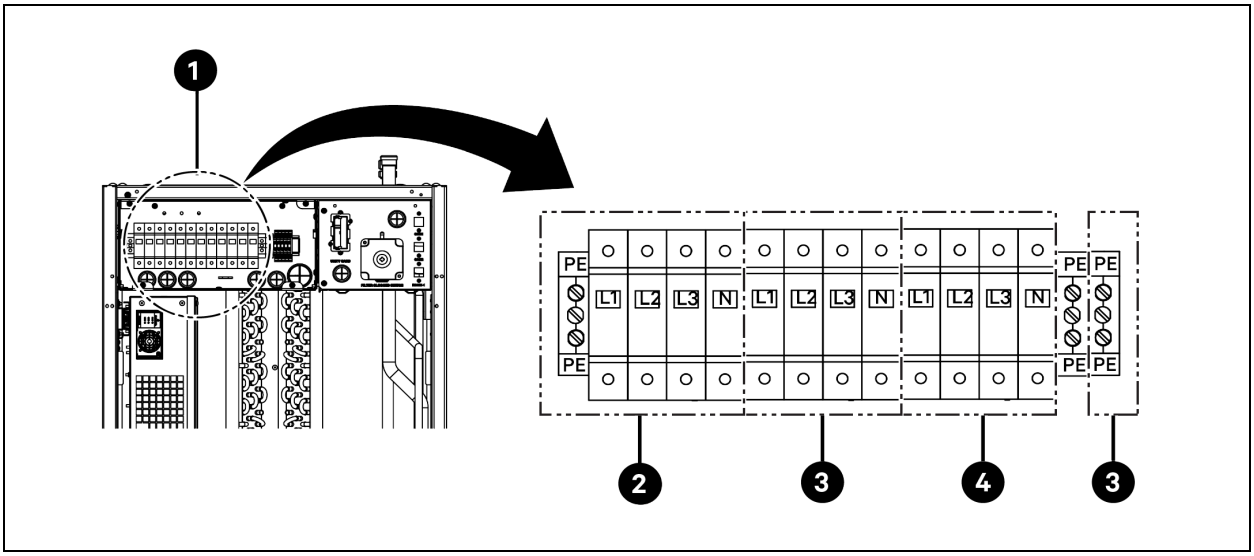
NOTE: Dual power supplies are provided to the unit, with power supply 1 as the primary power feed and power supply 2 as secondary. When power supply 1 fails, power supply 2 automatically takes over. When power supply 1 restores, it automatically resumes its function as the primary power feed.

Figure 5.1 Power Supply Cable Connections for CRD25



Item	Description	Item	Description
1	Main circuit breaker	3	Connecting to power supply 2
2	Connecting to power supply 1	4	Connecting to condenser

Figure 5.2 Power Supply Cable Connections for CRD35



Item	Description	Item	Description
1	Main circuit breaker	3	Connecting to power supply 2
2	Connecting to power supply 1	4	Connecting to condenser

5.3 Outdoor Cooling Unit Power Connections

5.3.1 Connecting the Power Cables and Communications Cable

WARNING! Arc flash and electric shock hazard. Can cause serious injury or death. Disconnect all local and remote electric power supplies and wear appropriate, OSHA-approved personal protective equipment (PPE) per NFPA 70E before working within the electric control enclosure. Customer must provide earth ground to unit, per NEC, CEC and local codes, as applicable.

WARNING! Risk of improper wire sizing/rating and loose electrical connections causing overheated wire and electrical connection terminals resulting in smoke or fire. Can cause serious injury or death. Use correctly sized copper wire only and verify that all electrical connections are tight before turning power On. Check all electrical connections periodically and tighten as necessary.

NOTE: Install a manual electrical disconnect switch within 1.6 m (5 ft) of the condenser and in accordance with local codes.

NOTE: Wiring should be protected from touched heated surfaces like refrigeration piping and any heated surface to avoid damage to the wiring insulation.

NOTE: The power supply wiring of the unit should be installed by a professional licensed electrical contractor in accordance with local electrical codes.

NOTE: The power supply wires for the outdoor unit are L+N+PE. The recommended wire size for the power supply cable is no less than 16 AWG (1.5 mm^2).

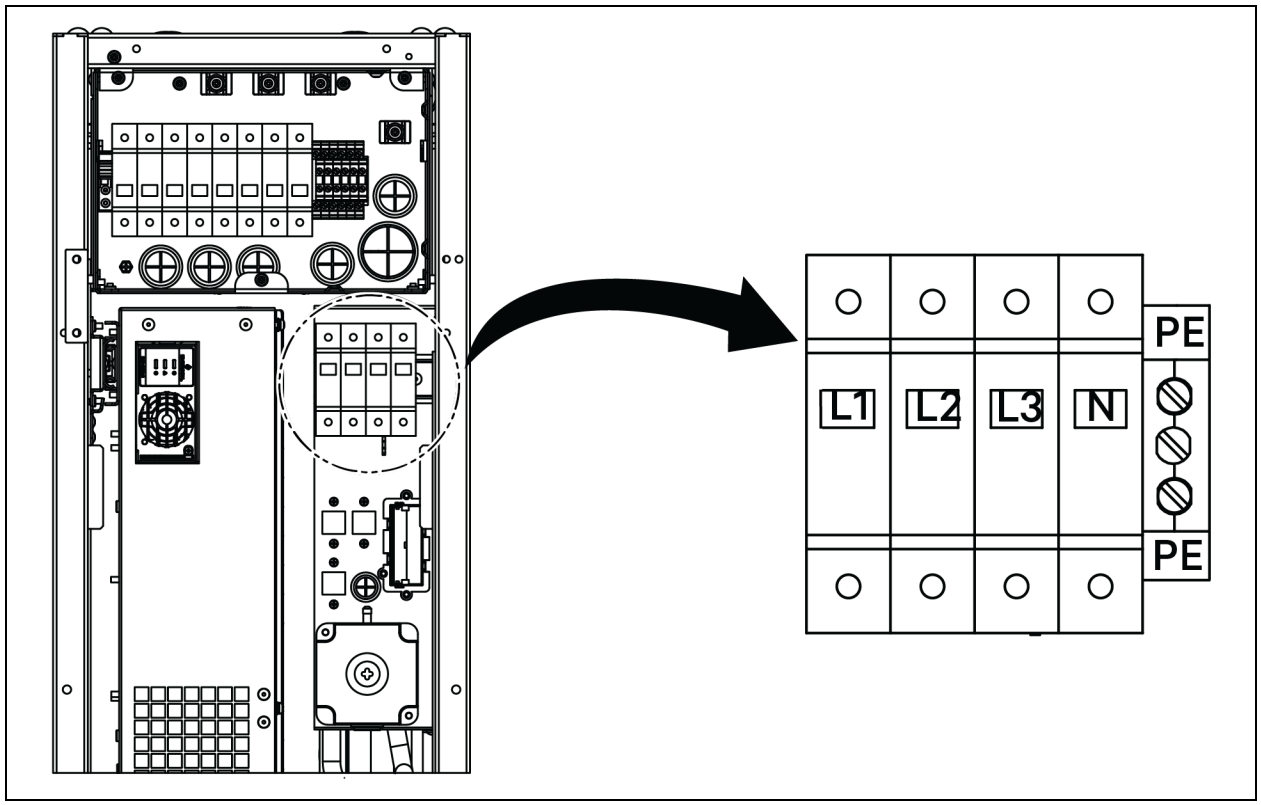
5.3.2 Connecting the Power Cable for the Condenser

Power is supplied to the condenser from the evaporator. Connect one end of the power supply cable to the outdoor breaker in the evaporator side, and the other end to the circuit breaker in condenser side.

Connecting power cable for condenser CCD25:

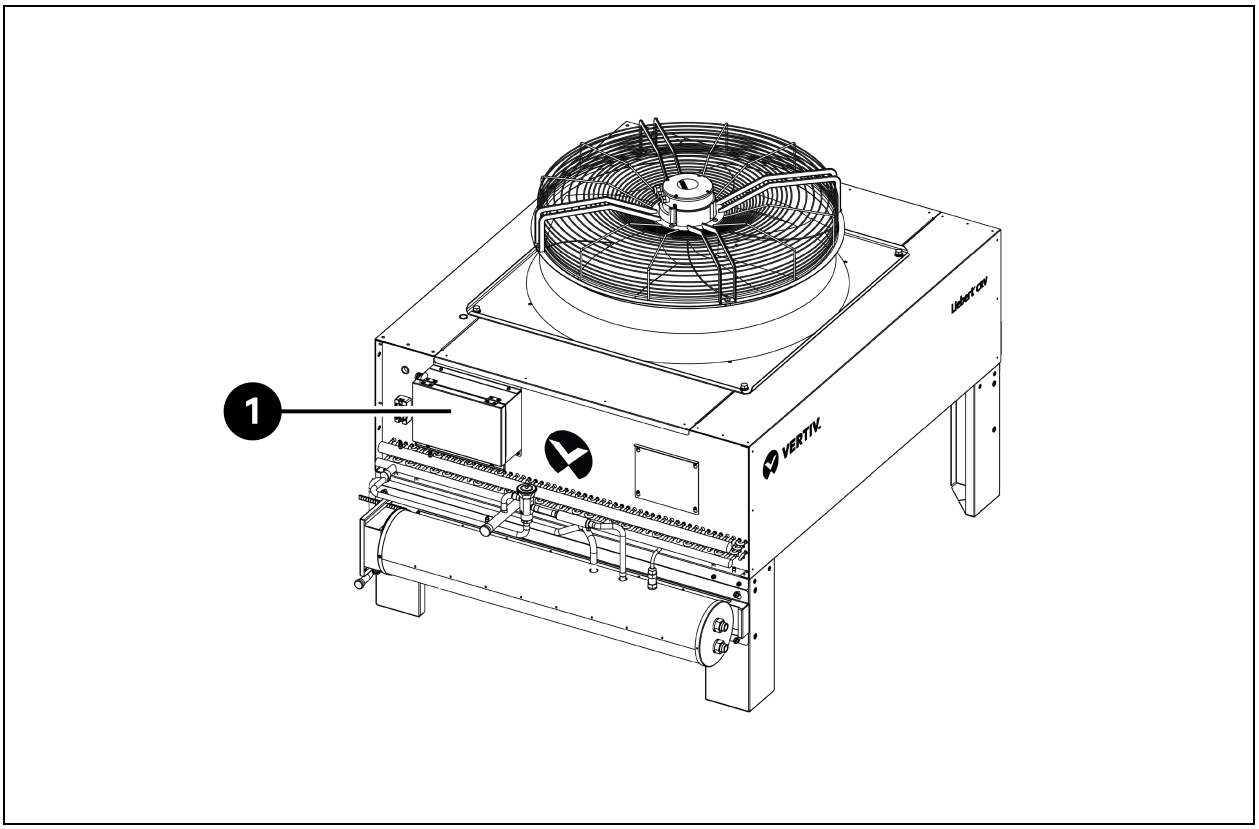
1. In the evaporator CRD25 condenser (used with the CCD25 condenser), open the rear door and remove filters. The outdoor breaker is located under the electric control box 1.
2. Connect one end of the power cable to the L1, L2, L3, N, and PE terminals of the outdoor breaker.

Figure 5.3 Location of the Outdoor Breaker in Evaporator CRD25



3. In the CCD25 condenser, remove two M5 screws from its electric control box and remove the cover.
4. Connect the other end of the power cable to the L1, L2, L3, N, and PE terminals of the circuit breaker.

Figure 5.4 CCD25 — Location of the Electric Control Box in Condenser



Item	Description
1	Electric control box

Figure 5.5 CCD25 — Circuit Breaker in Condenser

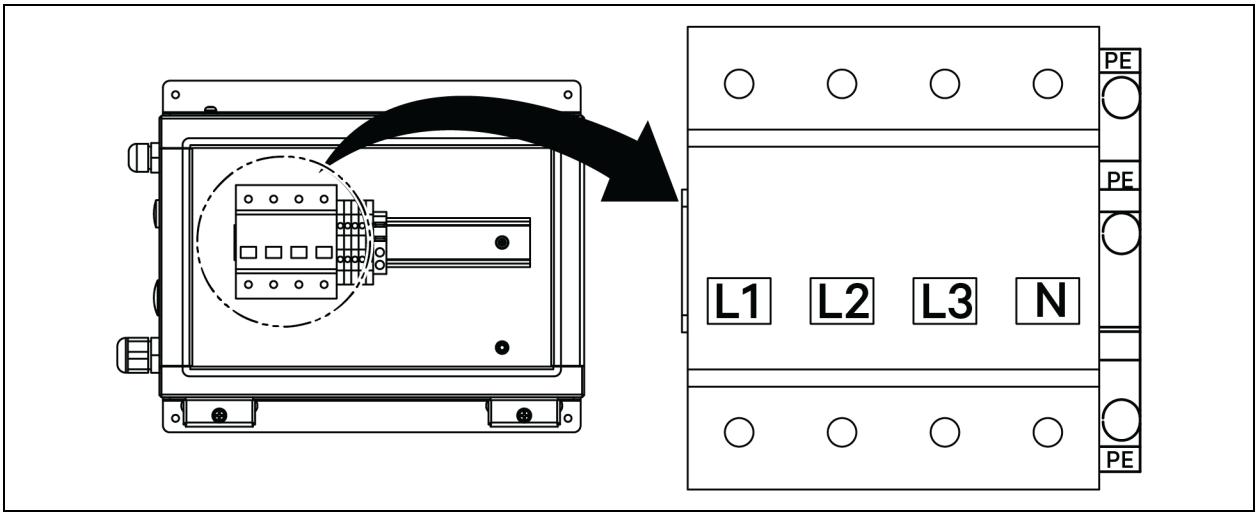
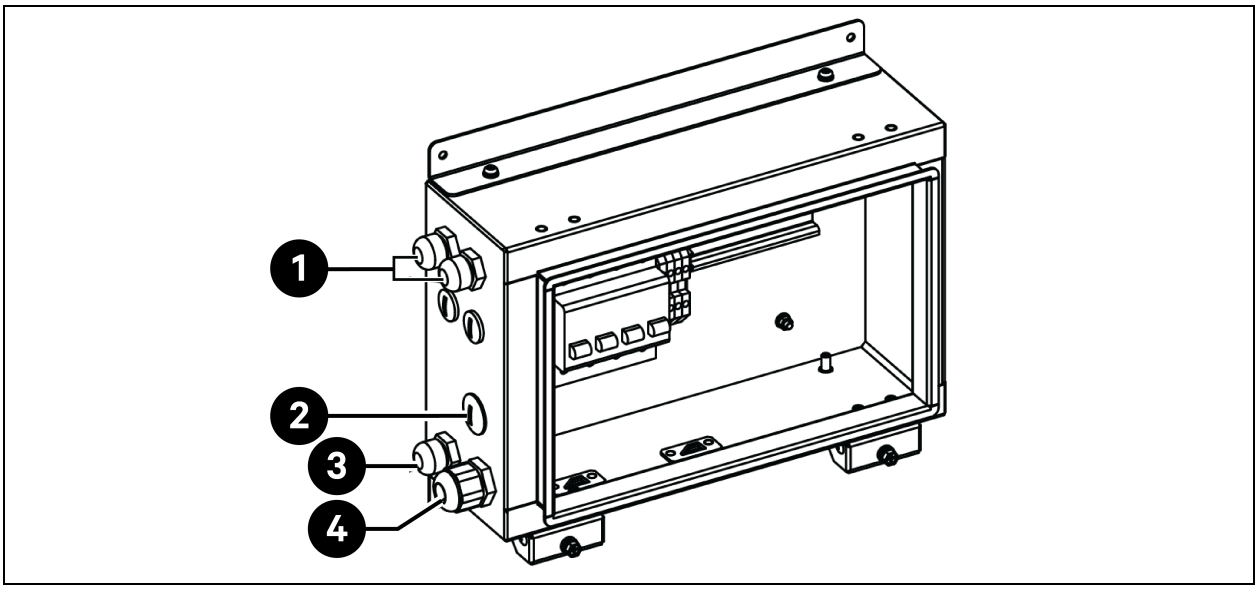


Figure 5.6 CCD25 — Location of Cable Access on Electrical Box in Condenser

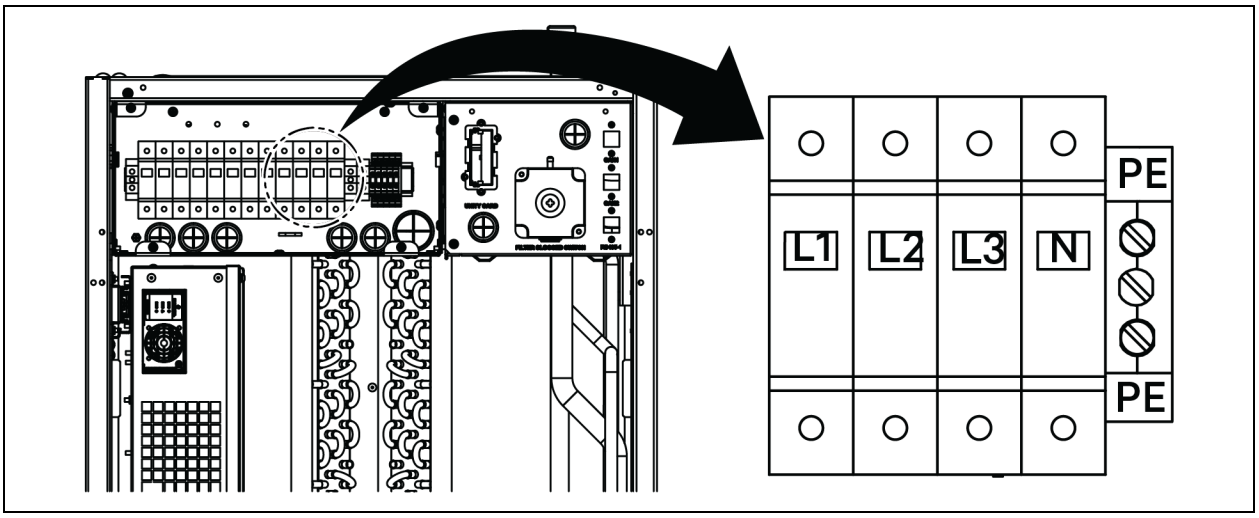


Item	Description
1	Access for condenser fan power supply cable
2	Access for low ambient kit power supply cable (reserved)
3	Access for communications cable
4	Access for condenser power supply cable

Connecting the Power Cable for Condenser CCD35:

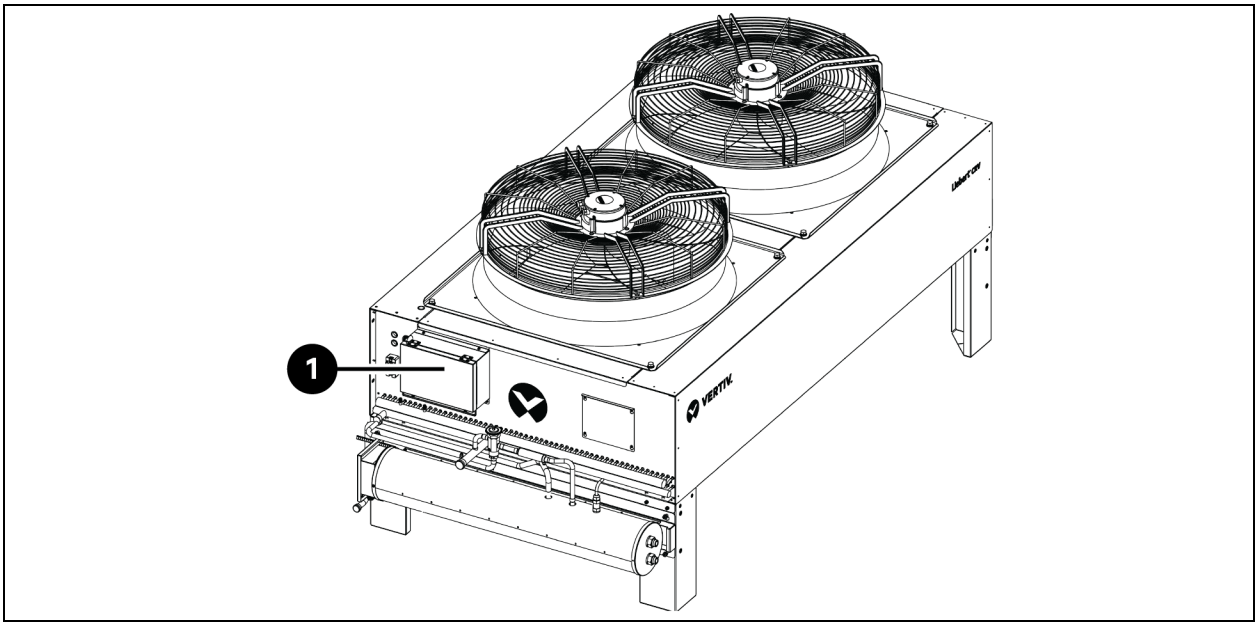
1. In the condenser CRD35 evaporator (used with the CCD35 condenser), open its rear door, and the outdoor breaker is located inside the electric control box 1. Remove four M4 screws from the electric control box cover and remove the cover.
2. Connect one end of the power cable to the L1, L2, L3, N, and PE terminals of the outdoor breaker.

Figure 5.7 CRD35 — Location of the Outdoor Breaker in Evaporator



3. In condenser CCD35, remove two M5 screws from its electric control box and remove the cover.
4. Connect the other end of the power cable to the L1, L2, L3, N, and PE terminals of the circuit breaker.

Figure 5.8 CCD35 — Location of the Electric Control Box in Condenser



Item	Description
1	Electric control box

Figure 5.9 CCD35 — Circuit Breaker in Condenser

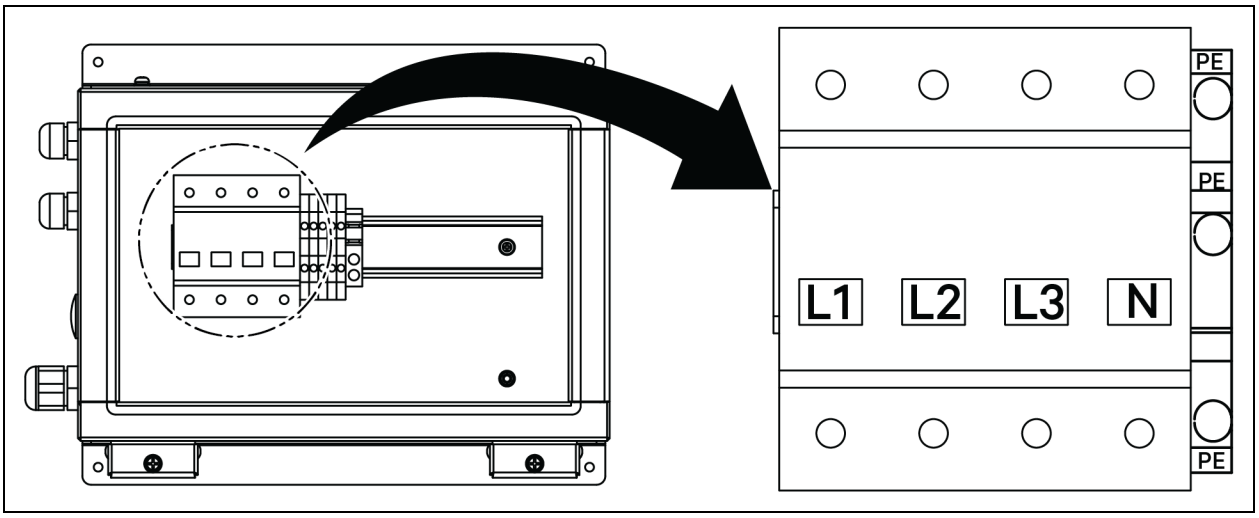
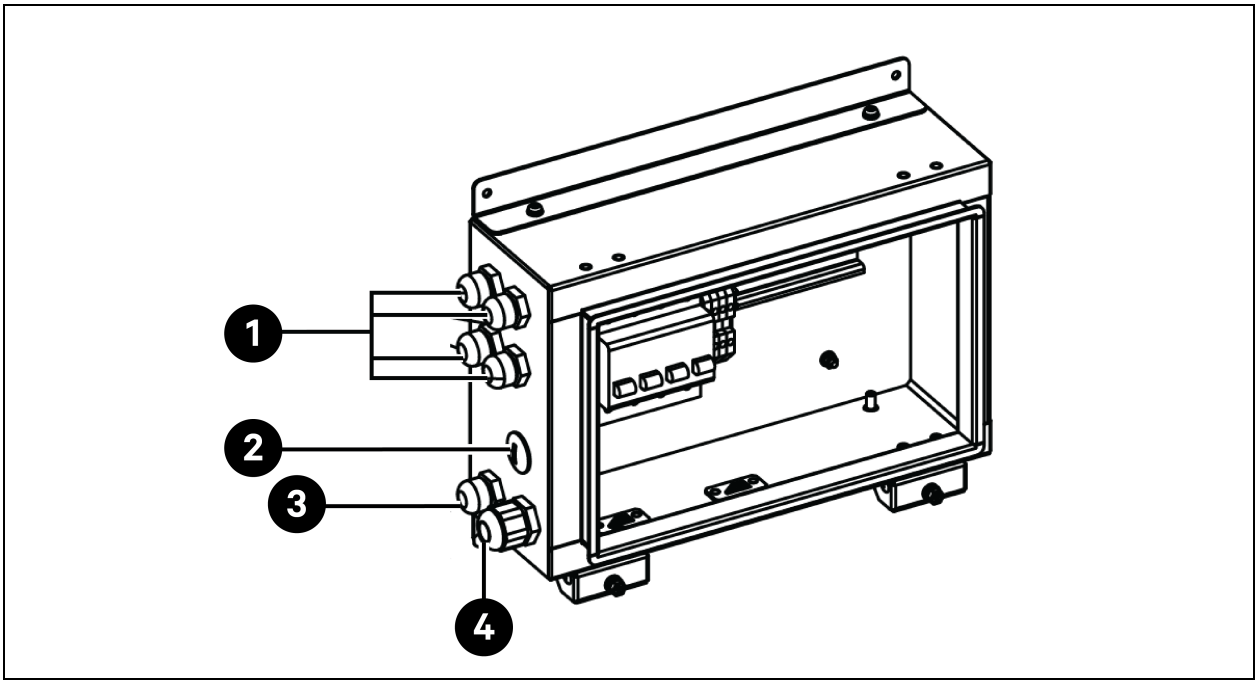


Figure 5.10 CCD35 — Location of Cable Access on Electrical Box in Condenser



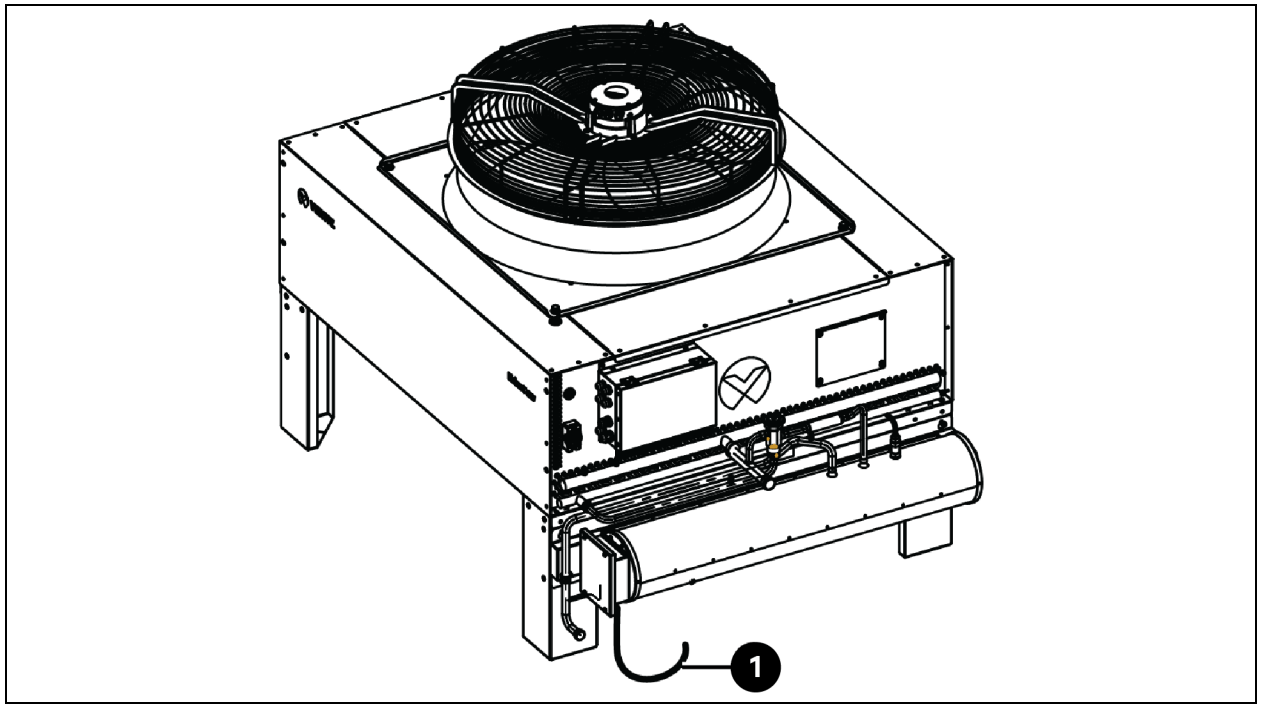
Item	Description
1	Access for condenser fan power supply cable
2	Access for low ambient kit power supply cable (reserved)
3	Access for communications cable
4	Access for condenser power supply cable

5.3.3 Connecting Power Cable for the Low Ambient Kit

Power is provided to the low ambient kit by the condenser. One end of the power cable for the low ambient kit is shipped connected at the factory. Connect the other end of the cable to the electric control box of the condenser.

1. On the electric control box, remove the plug from the hole.
2. Take out a cable gland from the accessories bag, insert the cable through the cable gland, and route the cable to the electric control box through the hole.

Figure 5.11 Connecting Power Cable for the Low Ambient Kit



Item	Description
1	Power cable of the low ambient kit

3. Connect the cable to the L and N terminals of the terminal block.
4. Fasten the cable gland.

Figure 5.12 CCD25 — Communications Terminal in Condenser

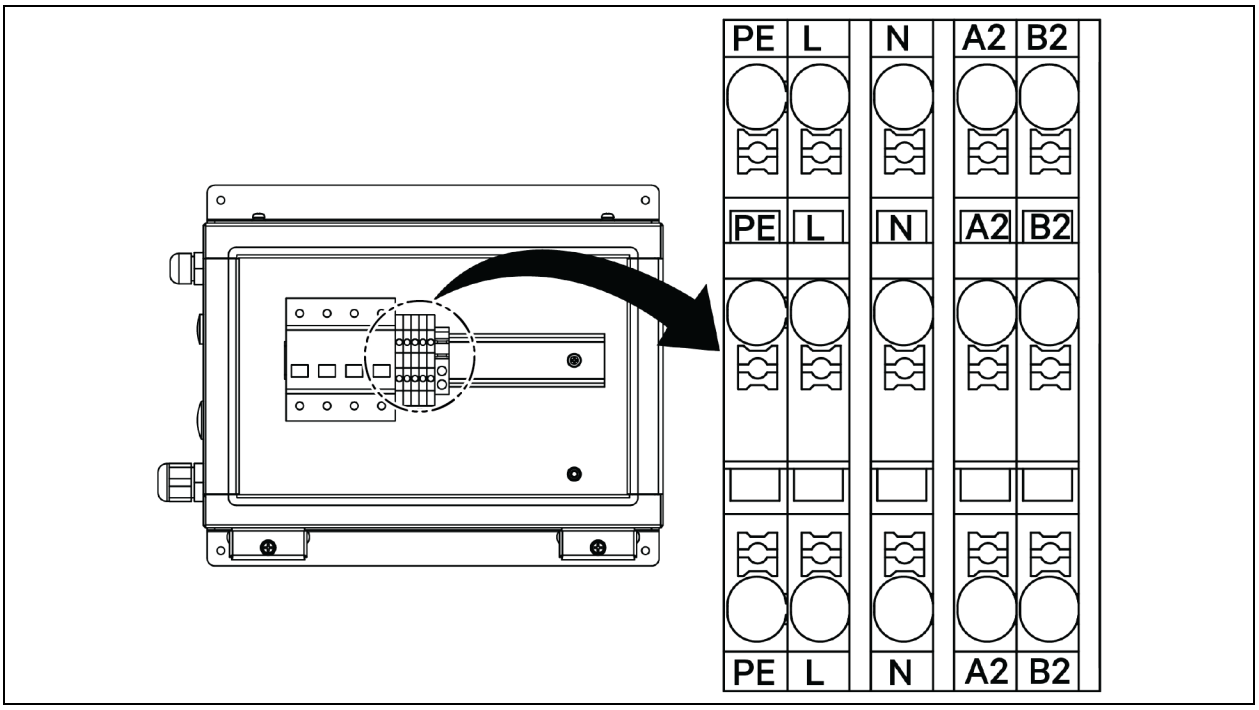
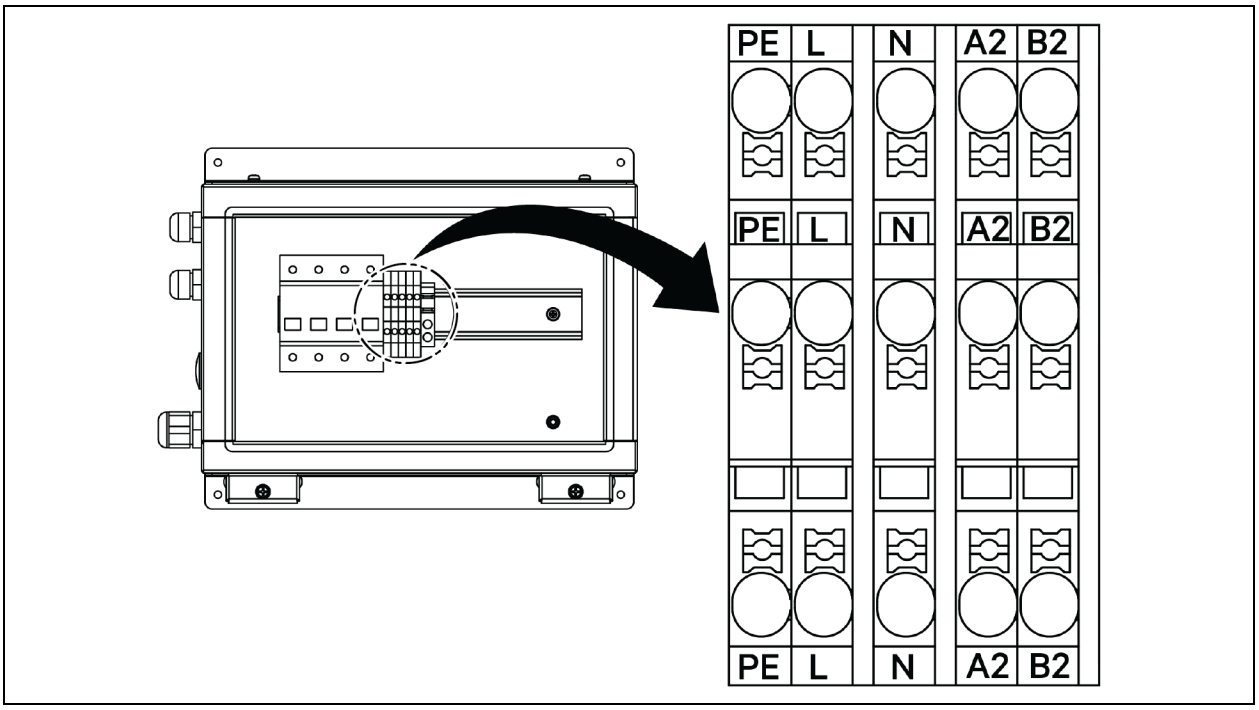


Figure 5.13 CCD35 — Communications Terminal in Condenser



5.4 UPS Connections

This section describes the electrical installation of the Vertiv™ Liebert® APM2 UPS.

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

All 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, personnel injury, or death. Do not turn on power to the UPS before the arrival of authorized service engineer. Only an authorized engineer can route the APM2 UPS cables in accordance with the information given in this chapter.

5.5 Power Cable Wiring

5.5.1 System Configuration

The power cables of the system must be sized as follows:

UPS Input Cables

The UPS input cables must be sized for the maximum input current, including the maximum battery charge current, with respect to the UPS power ratings and the input AC voltages. See Table 5.2 on the facing page.

UPS Bypass and Output Cables

The UPS bypass and output cables must be sized for the nominal output or bypass current, with respect to the UPS power ratings and the output AC voltages. See Table 5.2 on the facing page.

NOTE: The UPS is pre-linked with input and bypass connections. If a separate bypass input is required, these links must be removed on site.

Battery Cables

Each UPS connects to its battery through the three cables connecting to the positive pole, negative pole and ground cable. 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. See Table 5.2 on the facing page.

5.5.2 Maximum Steady State AC and DC Currents

The power cables must be selected in accordance with current and voltage values as provided in Table 5.2 on the facing page and must meet local wiring regulations and environmental conditions (temperature and physical media). Refer to Table 3B in IEC 60950- 1 for more information on size of the cables.

Table 5.2 Maximum Steady State AC and DC Current

UPS Power (kVA)	Rated Current (A)					Bus Stud Bolt/Nut Specification	
	Maximum Input Current[1]	Output/Bypass Current[2] at Full Load			Battery Discharge [3, 4] Current (+, -, N) at Rated Battery Voltage	Input, Battery, Output, Bypass/PE Cable	Recommended Torque (Nm)
		380 V	400 V	415 V			
120	238	182	173	167	400	M8	11±10%
90	179	137	130	126	300	M8	11±10%
60	119	91	87	84	200	M8	11±10%
30	60	46	44	42	100	M8	11±10%

1. Maximum input current is calculated according to the low voltage input of 176 V (L-N) 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 32, EOD voltage of 1.6 V and 100% load percentage.

5.5.3 Recommended Cross Sectional Area (CSA) of UPS Cable

The recommended CSA of the UPS cable is given in Table 5.3 below.

Table 5.3 Recommended CSA of the UPS Single Module Cable (Unit: mm^2), Ambient Temperature 25 °C (77 °F)

Model	Mains Input	Output	Bypass Input	Battery Input (External Battery)
300 kVA	2 x 150 + 1 x 150	2 x 150 + 1 x 150	2 x 150 +1 x 150	2 x 185 +1 x 150
120 kVA	4 x 50 + 1 x 25	4 x 50 + 1 x 25	4 x 50 + 1 x 25	2 x 185 + 1 x 25
	3-phase line, N line, PE line	3-phase line, N line, PE line	3-phase line, N line, PE line	+, -, PE

5.5.4 Selection of UPS I/O Switch

The air switch configuration in the UPS cabinet is shown in the Table 5.4 below. For the values of I/O current and battery current, see Table 5.2 above.

Table 5.4 Cabinet Air Switch Configuration

Model	Mains Input	AC Output	Bypass Input
120 kVA	250 A/3P	250 A/4P	250 A/3P

WARNING! When the output switch is loaded and closed, it may cause the bypass switch to trip.

5.5.5 Distance between the UPS Connection Point and Floor

Table 5.5 Minimum Distance Between UPS Connection Point and Floor

UPS Connection Point	Minimum Distance (mm)
Mains input	199
Bypass input	199
AC output	241
Battery power	183
Ground bar	214

5.5.6 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. Small cable parallel connection 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 5.2 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).

5.5.7 Power Cable Connecting Terminal

The rectifier input, bypass input, output, and battery power cables are connected to the respective terminals as specified in the Power Cable Connection Steps on page 70 .

5.5.8 Protective Ground

The protective earth cable is securely connected to the PE input terminal through the fixing bolt (see Power Cable Connection Steps on page 70). All the cabinets and cable conduits must 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.

5.5.9 External Protective Devices

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 should 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. 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.

   Refer to SL-71076 Vertiv™ Liebert® APM2 30 to 120 kVA UPS User Manual for more information.

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, 4-pole protective components must be installed for the UPS external input power distribution.

NOTE: Users need to pay attention to the selection of UPS external upper and lower-level power distribution switches and ensure that the UPS external upper and lower level power distribution circuit breakers meet the selective protection requirements.

3. Ground fault protection.

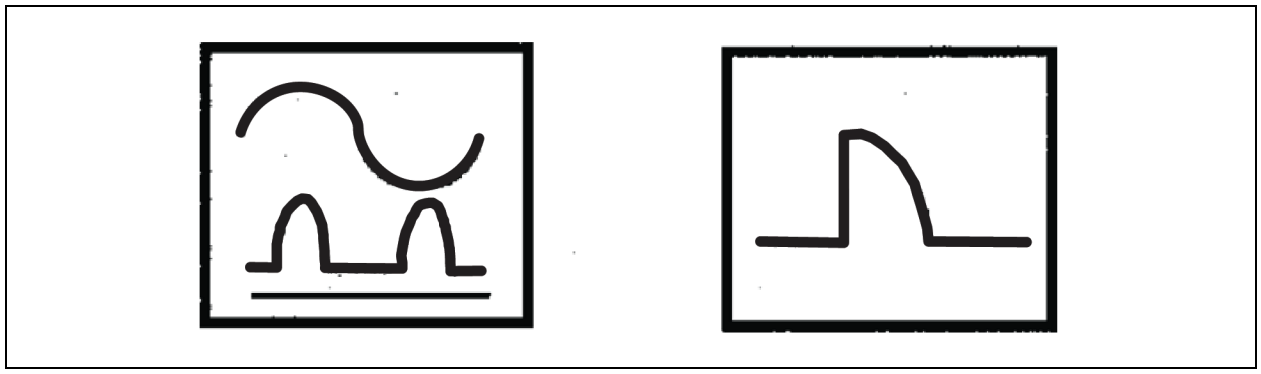
   If the upstream input power supply has a Residual Current Detector (RCD), the transient state and steady state ground leakage current upon the startup of the UPS must be considered.

   The Residual Current Circuit Breakers (RCCB) must 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 0.3 A to 3 A.

The RCCB symbols are shown in Figure 5.14 on the next page.

Figure 5.14 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 (mandatory) must be installed for protecting 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. Refer SL-71076 Vertiv™ Liebert® APM2 30 to 120 kVA UPS User Manual.

NOTE: An IT grid system, 4-pole protective components must be installed for the UPS external input power distribution.

5.5.10 Power Cable Connection Steps

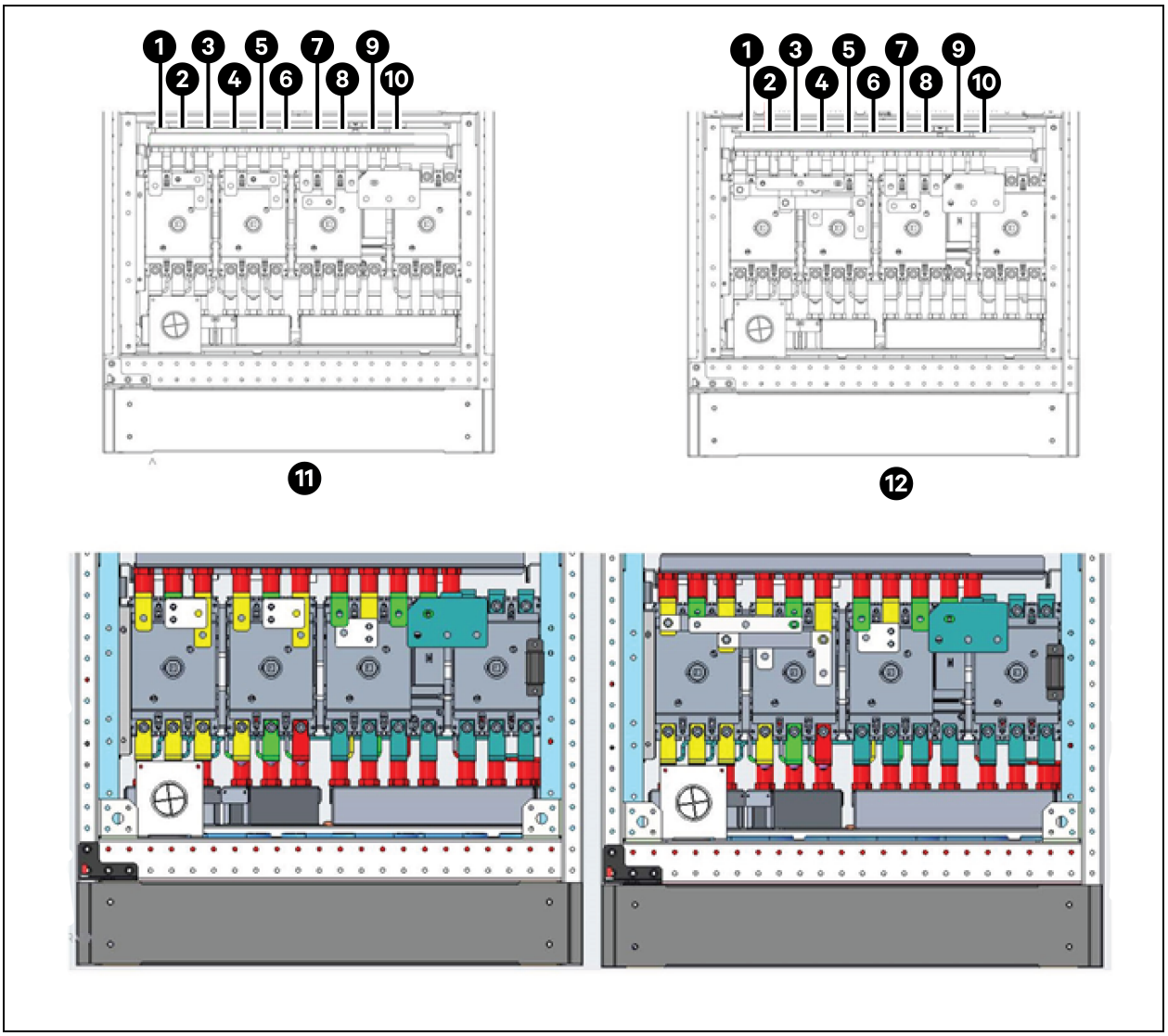
Connection terminal

Figure 5.15 on the facing page on the next page shows the connection terminals of the UPS power cable. Figure 5.16 on page 72 shows the power cable entry and routing methods. Refer to the cabling method to route cables and then connect them to corresponding terminals as shown in Figure 5.16 on page 72.

NOTE: The power cables should be routed through tunnels or cable conduits to prevent cable damage due to mechanical stress. After that reduce the electromagnetic interference 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 5.15 Power Cable Connection Terminals 120 kVA

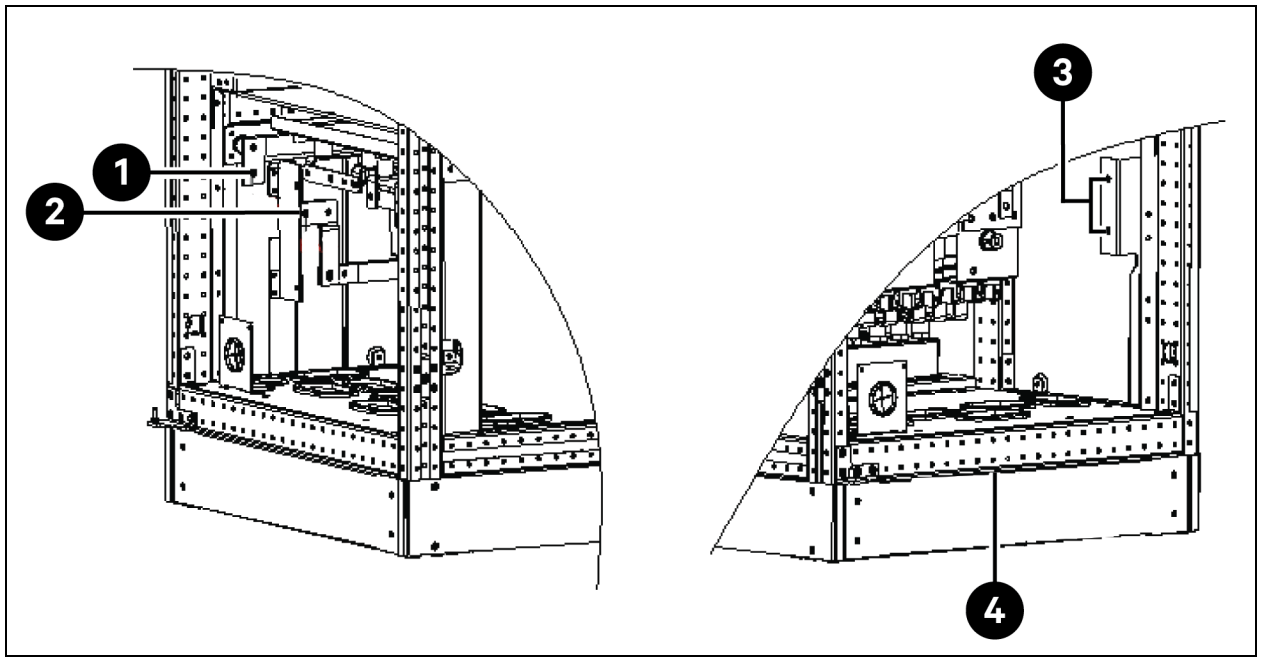


Item	Description	Item	Description
1	mA	7	oA
2	mB	8	oB
3	mC	9	oC
4	bA	10	N
5	bB	11	Split-bypass
6	bC	12	Common input

Cabling method

The UPS single switch, UPS no switch, and the UPS with four switches model supports bottom cable access.

Figure 5.16 Power Cables Wiring Route of 120 kVA



Item	Description	Item	Description
1	BAT+	3	PE
2	BAT-	4	Bottom cable access

WARNING! Before connecting cables, 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 get access to the power cable connection terminals. Connect the protective earth cable to the PE input terminal in the cabinet. See Figure 5.15 on the previous page and Figure 5.16 above.

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.

Connection of System Input

1. Common input configuration.

   Connect the AC input cables to the bypass input terminals (bA-bB-bC) in the cabinet and tighten the connection. Connect the input neutral line to the neutral terminal N in the cabinet and tighten the connection. Ensure correct phase rotation.

NOTE: Ensure that the shorting copper bars between the rectifier input terminals and the bypass input terminals are connected respectively.

2. Split bypass configuration (default).

   Remove the shorting copper bars. 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 and tighten the connection. Connect the rectifier input neutral line and bypass neutral line to the neutral terminal N in the cabinet and tighten the connection. Ensure correct phase rotation.

System Output Connection

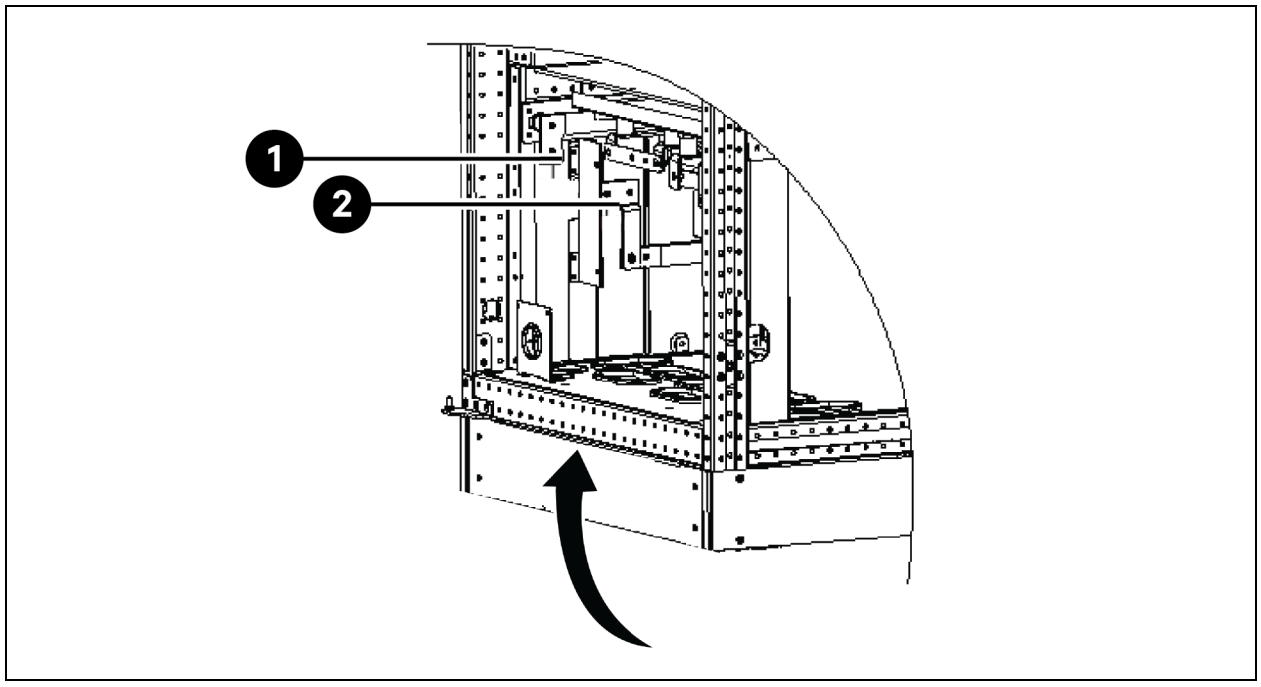
Connect the system output cables between the output terminals (oA-oB-oC-N) in the cabinet and the load and tighten the connection. See Table 5.2 on page 67 for the torque value. Ensure correct phase rotation.

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.

Battery Connection

1. If the built-in battery module is selected, there is no need to connect the battery cable. If the purchased battery is an external battery cabinet, the battery cable needs to be connected to the UPS separately. The specific wiring method and copper bar location are shown in Figure 5.17 on the next page.
2. 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 (-), (N) to (N). Do not reconnect these links and do not close the battery switch box before authorization to do so by the service engineer.

Figure 5.17 Battery Connection



Item	Description
1	Battery positive connection
2	Battery negative connection

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

3. Refit all protective covers removed for cable installation.

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

5.6 Power Connection of PMC Rack

The PMC hosts Power Distribution Boxes (PDBs), and a rack Power Distribution Unit (rPDU).

The number of PDBs depend on the configuration and by design it is equivalent to the number of in-row cooling units installed in the SmartAisle. Each PDB has one infeed power cord and 2 outfeed power cords. The power is supplied to the PDBs from the customer switch board. The outfeed from the PDB is supplied to the AC indoor units. The Rack PDU gets power from either from panel board of RXA or TOBs as per the reference design type and outfeed from the PDU is supplied to adapter of HMI, RDU501, Network Switch, NVR, Beacon, and Power Supply Units (PSUs).

NOTE: Model numbers SA1E08060MFB0 and SA1E08090MFB0 have rack PDUs powered by RXA, whereas SA1E11120MFB0 and SA1E11175HFB0 have busbars.

5.7 Power Connection through the Vertiv™ Liebert® RXA Remote Power Distribution System

NOTE: The power connection of RXA Remote Power Distribution System is required only for models SA1E08060MFB0 and SA1E08090MFB0.

Power wiring must be installed by licensed electricians. All power wiring must comply with applicable local codes.

5.7.1 Input Power Connections

NOTE: Remove the Vertiv™ Liebert® RXA conduit plate prior to punching or drilling to prevent metallic debris from entering the unit.

WARNING! Risk of electric shock. Can cause personal injury or death.

Verify that all incoming line voltage (power) circuits are de-energized and locked out before installing cables or making connections in the unit. Before proceeding with installation, read all instructions, verify that all the parts are included and check the nameplate to be sure the voltage matches available utility power. Follow all local codes.

To minimize disturbances caused by other loads in the building, the power input to the unit should be supplied directly from a dedicated power source.

Input power cables must be sized following IEC 60634-5-52 and National Wiring Standard and any local building codes to ensure the feeder's ability to safely carry the system's full load current, including losses.

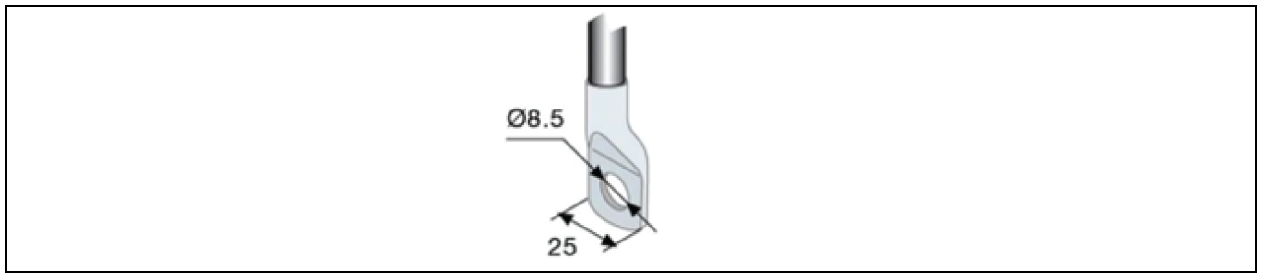
Input feeder conductors should be sized for no more than 2% voltage drop. If operation at under-voltage conditions for extended periods of time is desired, the input feeders must be oversized.

Input neutral and ground cables must be sized following IEC 60634-5-54. The main input feeder must consist of 3-phase conductors, one neutral and one (safety) ground conductor (4W + G).

To install input power cabling to the Vertiv™ Liebert® RXA unit follow the steps below:

1. Unscrew the top and/or bottom metallic gland plate, drill to match the size and number of the input cables.
2. Cut the wire ties and remove the CTs.
3. Run the input phases, ground and neutral cables through the CTs and secure to the cable with non-conductive wire ties.
4. Connect the input cables from UPS outfeed to the main input breaker.
5. Torque the bolts on the input breaker according to the breaker manufacturer's instructions.

Figure 5.18 RXA 250A Cable and Lug Dimensions



Cable lugs	
Tightening torque (Nm)	8
Clamping screw	M8

If using lugs larger than 25 mm for the 250 A, a custom termination solution is available on request.

Follow the steps below to install input power cabling in RXA 250 with bottom cable entry:

1. Open the bottom second access door.
2. Unscrew the bottom aluminum gland plate, drill to match the size and number of the input cables.
3. Remove the bottom terminal covers and connect the input cables to the terminals (tightening torque: max 20 Nm) as per stickers indications, see Figure 5.19 below.
4. Replace the bottom terminal covers.

Figure 5.19 Location of Terminals

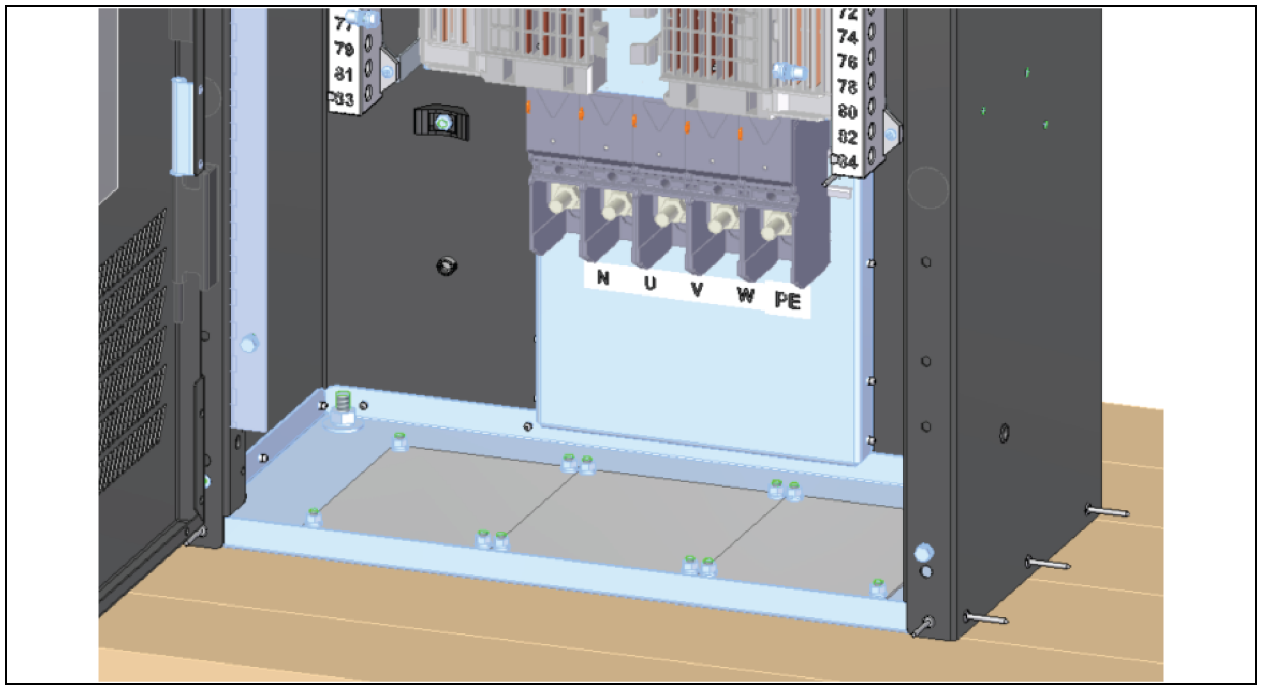


Figure 5.20 Input Electrical Field Connection Location for Units with Main Panel Board Breaker (without Optional Monitoring Hardware)

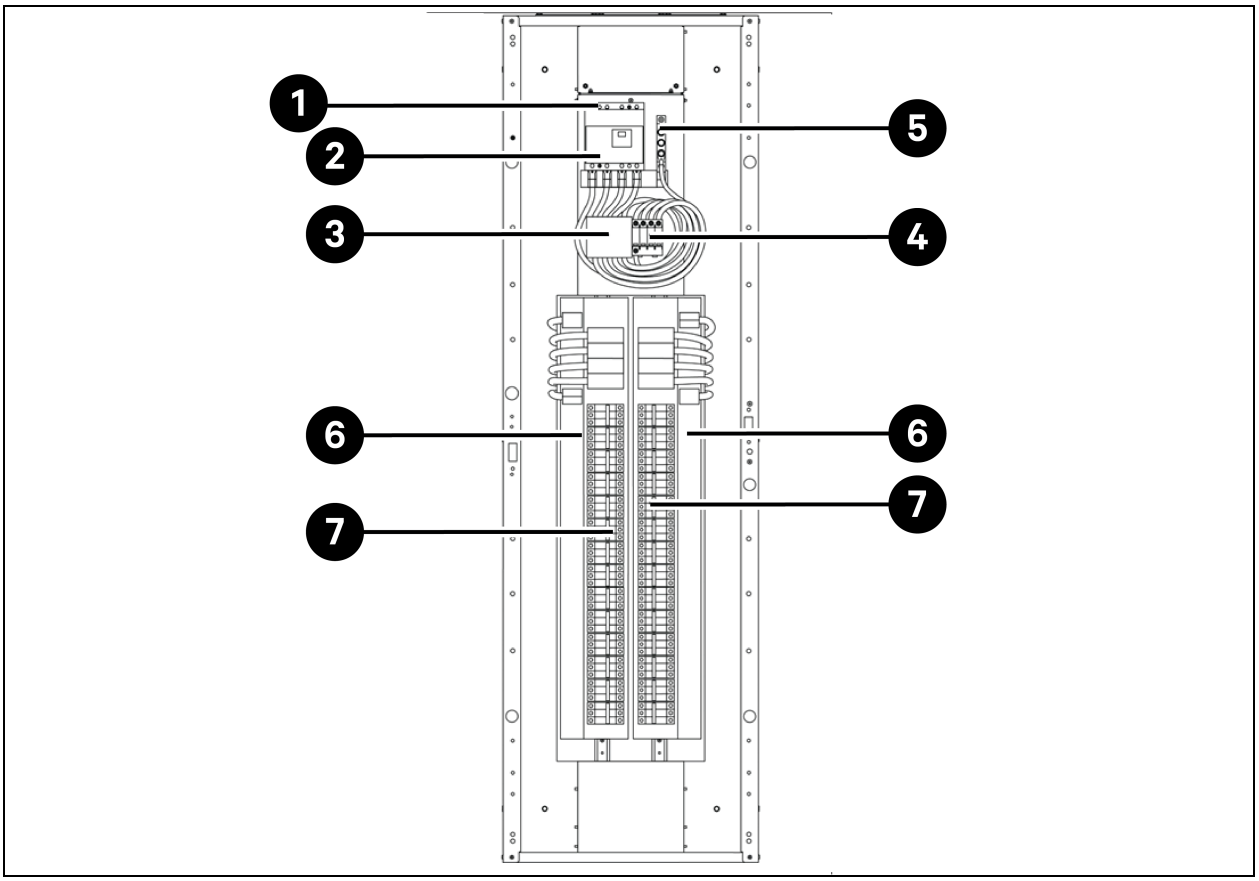


Table 5.6 Input Electrical Field Connection Location for Units with Main Panel Board Breaker (without Optional Monitoring Hardware)

Item	Description
1	Input phase and neutral connection
2	Main input circuit breaker
3	TVSS fuses (optional)
4	TVSS/OVR Surge protective device (optional)
5	Input ground connection
6	42 Poles distribution panel board (PE + N)
7	42 Poles distribution panel board (PE + N)

NOTE: The main circuit breaker is supplied, installed, and cabled. The other circuit breakers are supplied separately by Vertiv and must be installed at a later stage by the Vertiv technician.

NOTE: The other circuit breakers are Miniature Circuit Breaker (MCB) and are hot-swappable and plug-in breakers that can be installed directly in the panelboard inside the RXA.

5.7.2 Output Power Connections

An output panel board with ground and neutral provisions is provided inside the unit for connecting loads to the PDUs of SmartAisle solution.

Flexible output distribution cables are used in data processing areas under a raised floor. Cable lengths and layout should be well planned:

- Cable routes should follow aisles between equipment. This will facilitate access to cables for installation, routine inspection and future changes.
- Determine the required cable length by measuring the distance to the load equipment following right- angle paths, rather than diagonally or directly. Always measure to the extreme far side of the equipment with respect to the unit to insure adequate cable length.
- Prevent restriction of airflow under the raised floor by running the flexible conduits flat on the sub-floor, in parallel paths.
- Initial system output loading should be between 50 % and 75 % of rated capacity. This allows the addition of future loads without immediately investing in another Vertiv™ Liebert® RXA.
- Balancing of loads is good design practice on any 3-phase system.

WARNING! Risk of electric shock. Can cause personal injury or death. Verify that all incoming line voltage (power) circuits are de-energized and locked out before installing cables or making connections in the unit. Before proceeding with installation, read all instructions, verify that all the parts are included and check the nameplate to be sure the voltage matches available utility power. Follow all local codes.

- All output cables and connections must comply with IEC 60634-5-52 (for power cables), IEC 60634-5-54 (for Neutral and PE), and Local Electric Codes.
- Refer to local laws concerning OSHA requirements.

5.8 Power Connection through the Busbar

NOTE: The power connection of Busbar is required only for models SA1E11120MFB0 and SA1E11175HFB0.

Vertiv™ PowerBar iMPB provides high density distribution while providing full flexibility to position individual rack power connections. The modular system ensures correct power configuration at set-up that can be easily reconfigured as data center needs change. The UPS outfeed is supplied to PDUs through busbar. Refer SL-70927 Vertiv™ PowerBar iMPB Installer/User Guide and SL-71013 Vertiv™ iMPB Submittals Addendum Document for more details.

6 Data Communication Connection

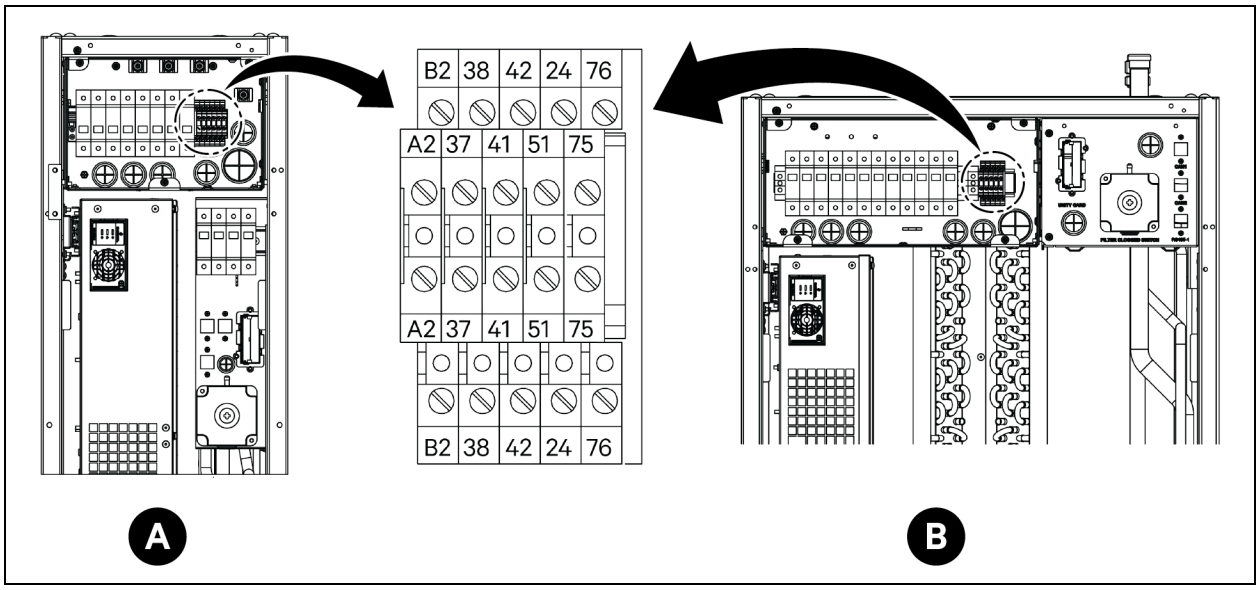
6.1 Connecting Communications Cables of Indoor Cooling Unit

6.1.1 General Arrangement

NOTE: Take anti-static measures when connecting communications cables.

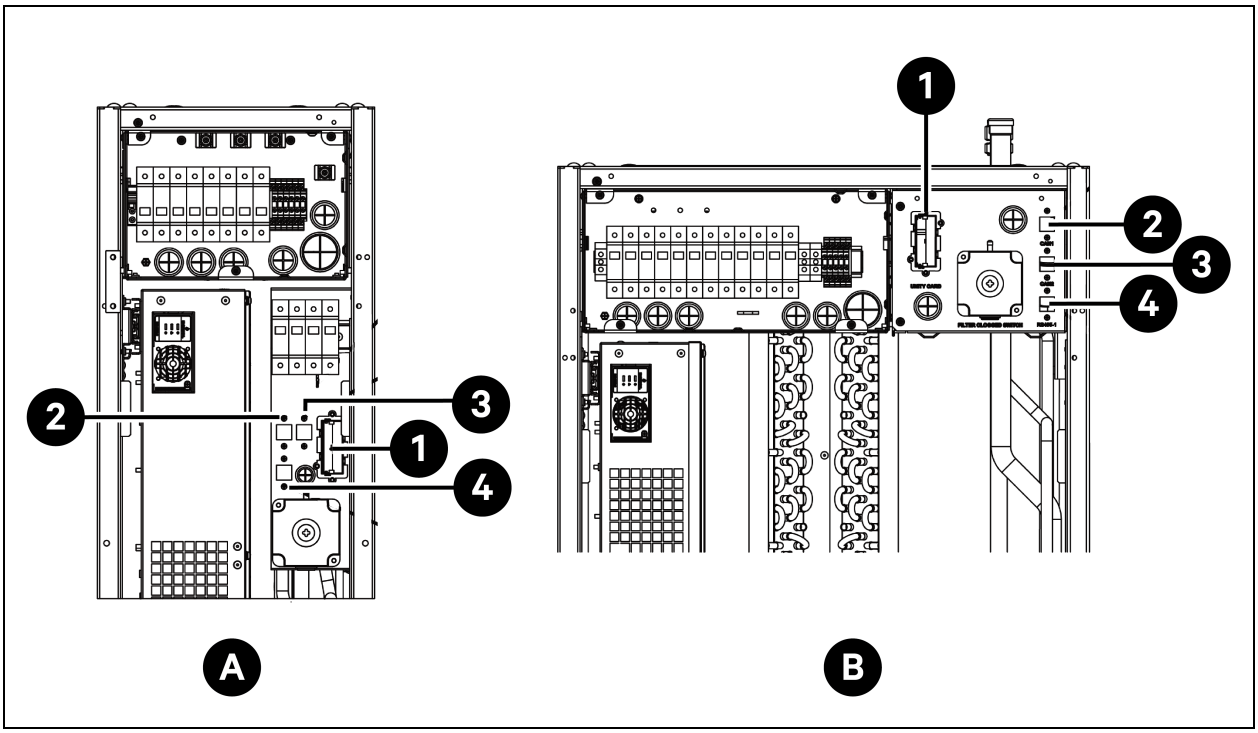
NOTE: The RJ45 port on the back of HMI is not available for any usage.

Figure 6.1 Terminal Block



Item	Description	Item	Description
A	CRD25 evaporator	41/42	Static pressure sensor
B	CRD35 evaporator	24/51	Water leakage sensor
A2/B2	RS485	75/76	Common alarm
37/38	Remote on/off device		

Figure 6.2 Communications Ports



Item	Description	Item	Description
A	CRD25 evaporator	2	CAN 1 port
B	CRD35 evaporator	3	CAN 2 port
1	Unity card	4	RS485-1

6.1.2 Connecting the Communications Cable between the Evaporator and Condenser

The communications cable is not provided with the unit. To connect the communications cable, connect one end of the cable to the A2 and B2 terminals of the evaporator, and connect the other end to the A2 and B2 terminals of the condenser. The Liebert® iCOM™ edge board controls the operation of condenser fans through the communications cable.

NOTE: Use shielded cables as communication cables. The size of the cable should be larger than 0.75 mm^2, and the length should be shorter than 150 m (492.1 ft).

NOTE: Do not run the communication cable in the same conduit, raceway, or chase used for power cable.

6.1.3 Connecting the Water Leakage Sensor

The water leakage sensor is provided in the accessories bag. To connect the water leakage sensor, connect it to the 51 and 24 terminals.

6.1.4 Connecting the Monitor Device to Unity Card

The monitor device is not provided with the unit. To connect the monitor device, connect it to the Ethernet port on the unity card.

6.1.5 Connecting Remote Temperature Sensors

One remote temperature sensor is provided in the accessories bag. The unit can be connected with a maximum of 10 temperature sensors. It is recommended to place the sensors in front of the heat loads, 1.5 m (4.9 ft) higher than the unit base.

To connect remote temperature sensors:

1. Insert the connector of the sensor to the RS485-1 port. Route the cable through the top or bottom of the unit. Connect the second sensor to the first sensor.
2. Fix the sensor on rack surface using the magnets provided in the kit. Do not fix it on an empty rack. Set the address on the dialing switch on the sensor, according to the Table 6.1 below.

Table 6.1 Address Settings for Remote Temperature Sensors

Sensor	1	2	3	4	5	6	ID
Remote temperature sensor 1	OFF	OFF	OFF	ON	OFF	OFF	10
Remote temperature sensor 2	OFF	OFF	OFF	ON	OFF	ON	11
Remote temperature sensor 3	OFF	OFF	OFF	ON	ON	OFF	12
Remote temperature sensor 4	OFF	OFF	OFF	ON	ON	ON	13
Remote temperature sensor 5	OFF	OFF	ON	OFF	OFF	OFF	20
Remote temperature sensor 6	OFF	OFF	ON	OFF	OFF	ON	21
Remote temperature sensor 7	OFF	OFF	ON	OFF	ON	OFF	22
Remote temperature sensor 8	OFF	OFF	ON	OFF	ON	ON	23
Remote temperature sensor 9	OFF	OFF	ON	ON	OFF	OFF	30
Remote temperature sensor 10	OFF	OFF	ON	ON	OFF	ON	31

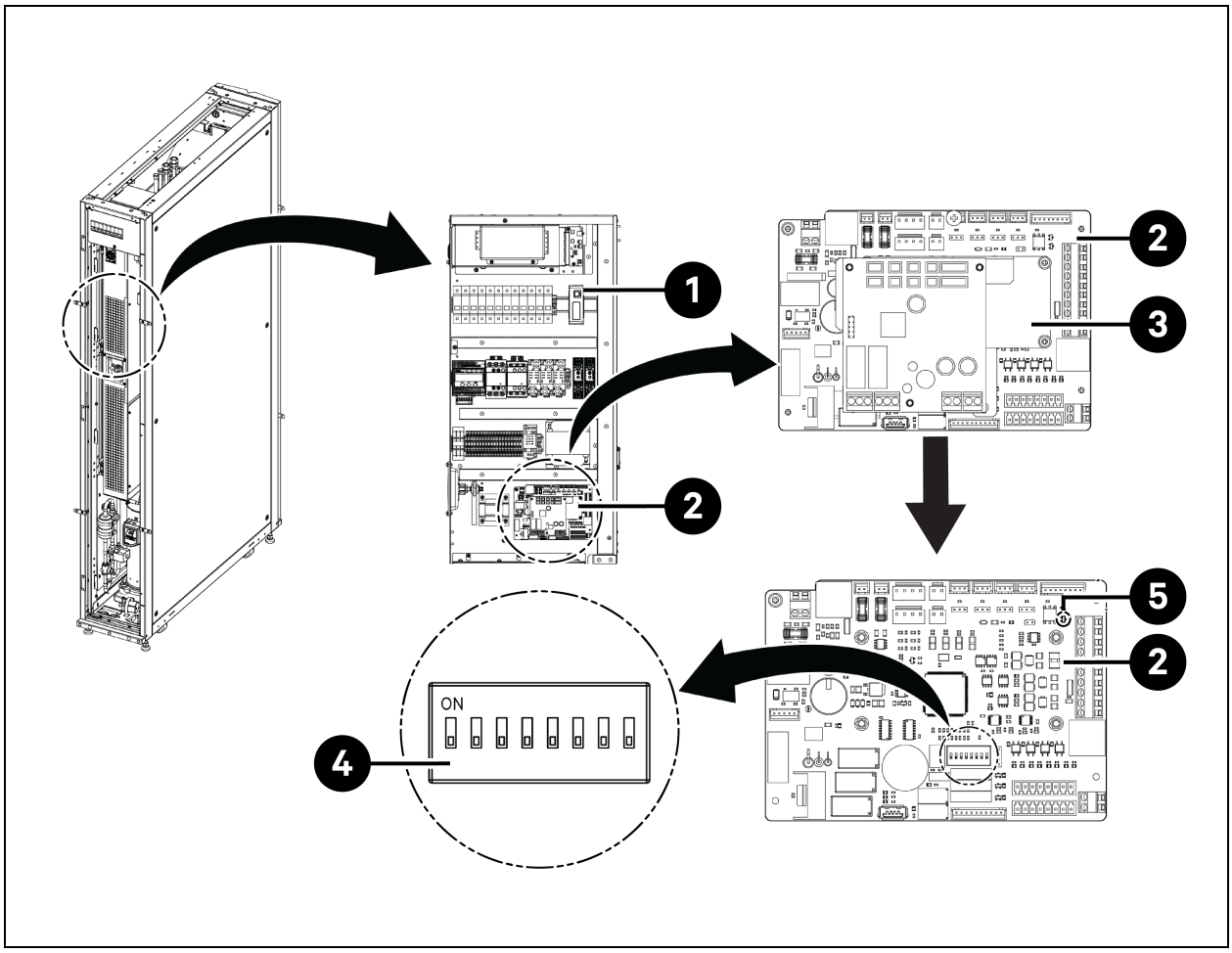
6.1.6 Connecting for Teamwork

Connect the CAN port of one unit to the CAN port of another unit using a CAN network cable. Set the CAN ID of each unit on the DIP SW3 and set the connection of the Jumper J27. The DIP SW3 and Jumper J27 are located on the Liebert® iCOM™ Edge board, under the EEV Drive board.

To access the DIP SW3:

1. Open the rear door and remove filters. For details on removing filters, see Figure 6.3 below.
2. Hold the handle and pull the electrical box 2. Remove the side cover from the box by removing three M4 x 10 pan head screws.
3. Remove the EEV Driver board from the Liebert® iCOM™ Edge board.

Figure 6.3 Location of DIP SW3 and Jumper J27



Item	Description	Item	Description
1	Slider electrical box (electrical box 2)	4	DIP SW3
2	Liebert® iCOM™ Edge board	5	Jumper J27
3	EEV Driver board		

To set the connection of jumper J27:

1. It is necessary to short jumper J27 of the Liebert® iCOM™ edge board of the master teamwork unit and the last teamwork unit and remove the connection cap of J27 of the Liebert® iCOM™ edge board of the units between the master and last units.
2. For the Liebert® iCOM™ Edge board, the jumper J27 is in shorted connection by factory default.

Table 6.2 Address Settings of CAN ID

CAN ID	SW3-1	SW3-2	SW3-3	SW3-4	SW3-5	SW3-6	SW3-7	SW3-8	Note
0	ON	ON	ON	ON	ON	ON	ON	ON	Master Unit
1	OFF	ON	ON	ON	ON	ON	ON	ON	Subordinate Unit 1
2	ON	OFF	ON	ON	ON	ON	ON	ON	Subordinate Unit 2
3	OFF	OFF	ON	ON	ON	ON	ON	ON	Subordinate Unit 3
4	ON	ON	OFF	ON	ON	ON	ON	ON	Subordinate Unit 4
5	OFF	ON	OFF	ON	ON	ON	ON	ON	Subordinate Unit 5
6	ON	OFF	OFF	ON	ON	ON	ON	ON	Subordinate Unit 6
7	OFF	OFF	OFF	ON	ON	ON	ON	ON	Subordinate Unit 7
8	ON	ON	ON	OFF	ON	ON	ON	ON	Subordinate Unit 8
9	OFF	ON	ON	OFF	ON	ON	ON	ON	Subordinate Unit 9
10	ON	OFF	ON	OFF	ON	ON	ON	ON	Subordinate Unit 10
11	OFF	OFF	ON	OFF	ON	ON	ON	ON	Subordinate Unit 11
12	ON	ON	OFF	OFF	ON	ON	ON	ON	Subordinate Unit 12
13	OFF	ON	OFF	OFF	ON	ON	ON	ON	Subordinate Unit 13
14	ON	OFF	OFF	OFF	ON	ON	ON	ON	Subordinate Unit 14
15	OFF	OFF	OFF	OFF	ON	ON	ON	ON	Subordinate Unit 15

NOTE: The Liebert® iCOM™ edge board can connect up to 16 units. Unit CAN ID address must be set in sequence from 0 to 15.

NOTE: CAN ID 0 is master unit. Teamwork parameters only can be set in master unit and then shared to secondary units. Secondary units upload operation status and alarms to the master unit.

NOTE: The recommended maximum length of CAN network cable is 40 m (131 ft.), but please minimize the length of this CAN network cable to ensure efficient communication.

6.1.7 Communication Cable Connections of Outdoor Cooling Unit

Connecting communications cable for condenser

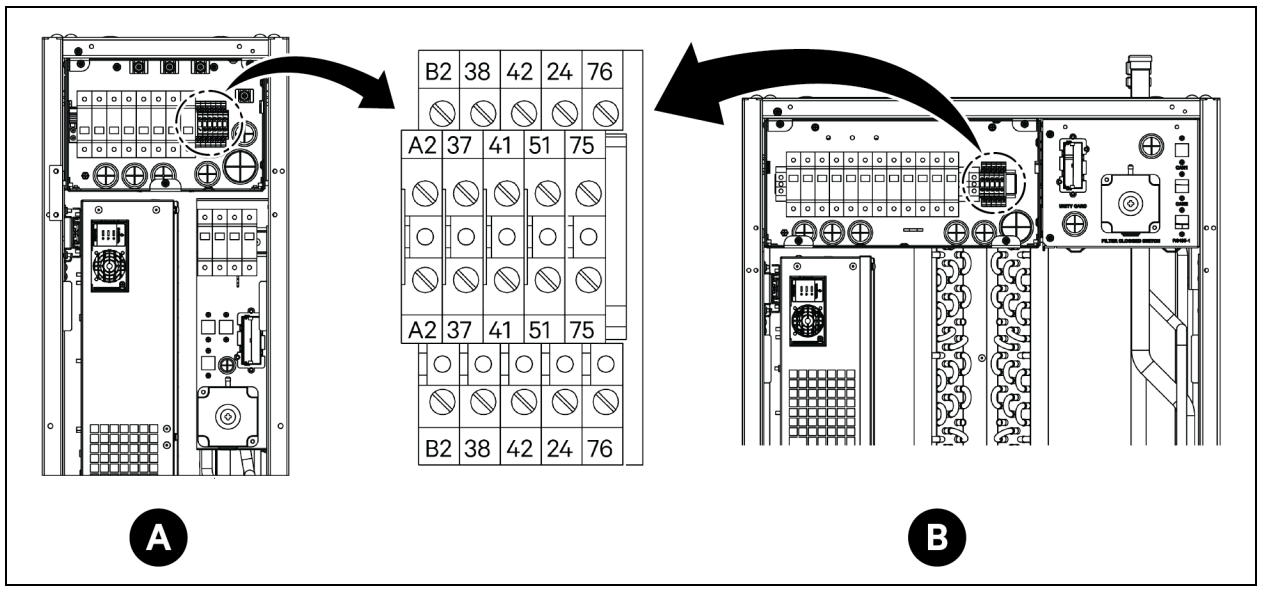
1. For both CCD25 and CCD35, remove two M5 screws from the electric control box cover and remove the cover. Use a field supplied shielded cable.
2. Connect one end to the A2 and B2 terminals and connect the shielding layer of the cable to the PE terminal on the terminal block.

   The communications terminal of CCD25 is shown in Figure 5.12 on page 65 and the communications terminal of CCD35 is shown in Figure 5.13 on page 65.

NOTE: Use shielded cables as communication cables. The size of the cable should be larger than 0.75 mm^2 and the length should be shorter than 150 m (492.1 ft).

NOTE: Do not run the communication cable in the same conduit, raceway, or chase used for a power cable.

Figure 6.4 Communications Terminal in Evaporator CRD25 and CRD35



Item	Description	Item	Description
A	CRD25 evaporator	41/42	Static pressure sensor
B	CRD35 evaporator	24/51	Water leakage sensor
A2/B2	RS485	75/76	Common alarm
37/38	Remote on/off device		

6.2 Communication Cable Connections of UPS

Vertiv™ Liebert® APM2 supports:

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

6.2.1 SNMP Protocol Communication

Vertiv's UNITY network management card make the UPS an IOT device. These cards support SNMP protocol that helps to monitor the UPS through network.

IRM series sensor can also be connected to these cards to provide environmental monitoring function. When the intelligent equipment generates an alarm, the UNITY card can notifies you by recording the log, sending trap information, and triggering e-mails.

The UNITY card provides three approaches to monitor the intelligent equipment and equipment room environment:

- Using a web browser through the web server function provided by the UNITY card.
- Using Network Management System (NMS) through the SNMP function provided by the UNITY card.
- Using SiteMonitor, network management software for equipment room power and environment through the TCP/IP interface provided by the UNITY card.

The UNITY 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.

6.2.2 Modbus Protocol Communication

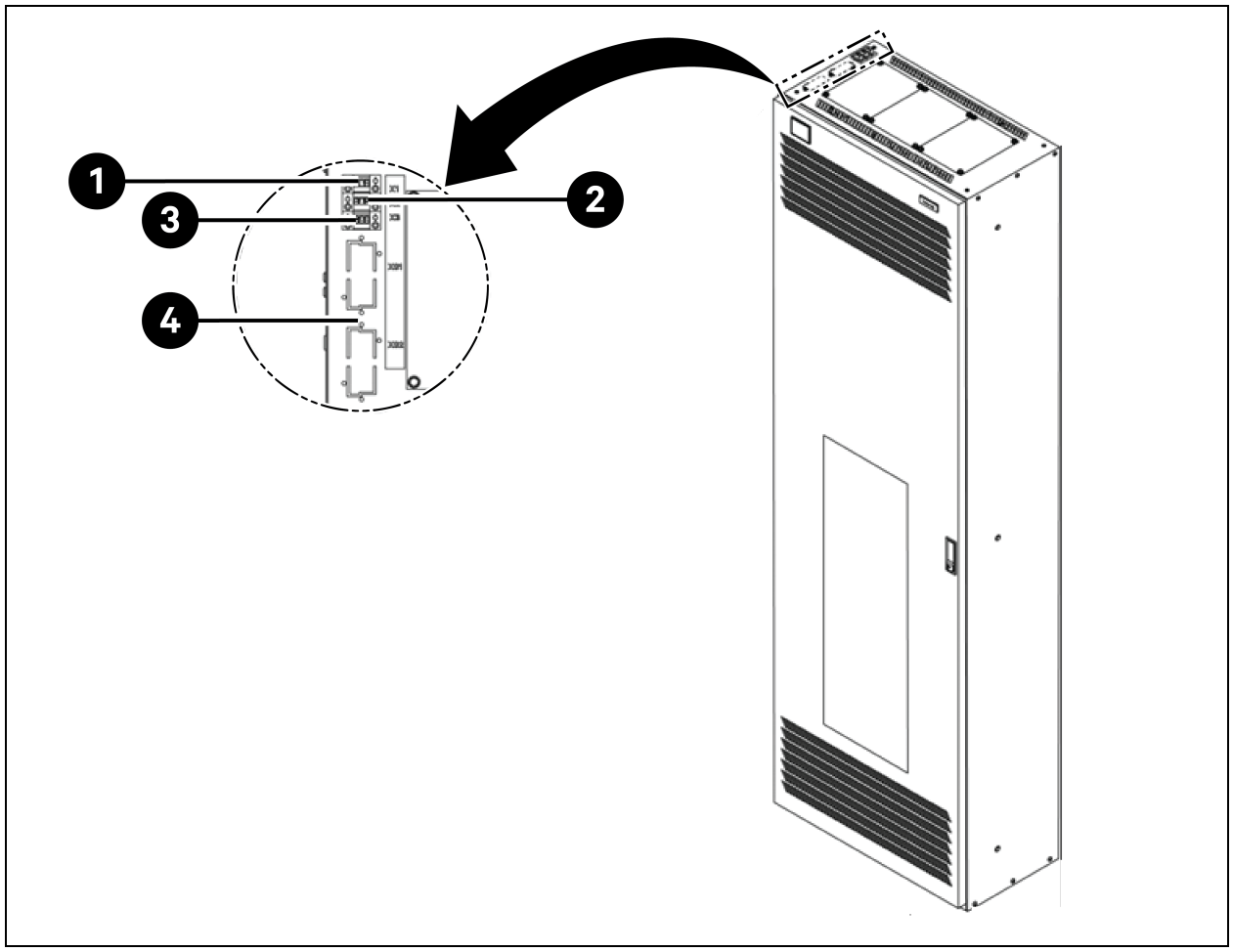
The Modbus RTU protocol communication is supported by the UNITY card.

6.3 PMC Communication Cable Connections

For PMC communication cable connections, see Submittal Drawings on page 153 .

6.4 Vertiv™ Liebert® RXA Data Communication Connection

Figure 6.5 Connectivity without Vertiv™ Liebert® DPM



Item	Description
1	**X1 Terminal:** MICB Coil (for remote EPO) • **Pin 1:** +24 V • **Pin 2:** GND • **Pin 3:** N/A
2	**X2 Terminal:** MICB Status • **Pin 1:** COM • **Pin 2:** NO • **Pin 3:** NC
3	**X3 Terminal:** OVR/TVSS Status (optional) • **Pin 1:** COM • **Pin 2:** NC • **Pin 3:** N/A

7 Configuring the Network Settings

7.1 Vertiv™ Liebert® RDU-THD Sensors

A temperature and humidity string are installed on the front and rear doors of each cabinet in the system. The Temperature and Humidity collector (THD) summarizes the temperature and humidity of each door. Setting the sensor address can be done only through the dialing code.

Set of 6 THD Sensors preinstalled on the front and rear doors in the PMC at the heights of 6U, 22U, and 36U and set of 6 THD Sensors install on the front and rear doors in each server racks on site.

Before setting the THD sensor address, note the following information:

- The sensor address cannot be set as 00 as it is the broadcast address.
- DIP4 is the least significant. Address IT cabinet 1 has DIP4 at ON while others are OFF.
- DIP switch in the ON position means 1 or 0.

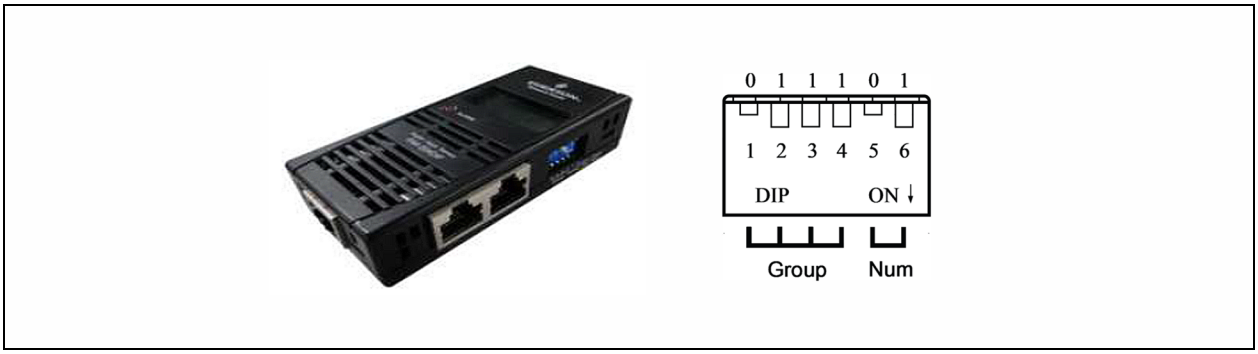
7.1.1 Setting the THD Sensor Address

To set the THD sensor address, refer to Table 7.1 below and Figure 7.1 on the next page .

Table 7.1 THD Sensor Address—Dial Code Settings

Cabinet	Group Number	Sequence Number	Address
	DIP1 - DIP4	DIP5 - DIP6	
THD-PMC	1001	00	90
THD-1	0001	00	10
THD-2	0010	00	20
THD-3	0011	00	30
THD-4	0100	00	40
THD-5	0101	00	50
THD-6	0110	00	60
THD-7	0111	00	70
THD-8	1000	00	80

Figure 7.1 THD Sensor Address: Dial Code Settings



NOTE: The DIP switch is used to set sensor address and connected equipment type to communicate with upper equipment through MODBUS protocol.

NOTE: DIP switch in the ON position means 1, or it means 0. The sensor address cannot be set as 00, which is the broadcast address.

When the Group is 0001 and Num is 00, the temperature and humidity data collected by the sensor is displayed on the LCD screen and WEB as the environment volume of cabinet 1; the cut data of the temperature and humidity data of cabinet 1 is the same as that displayed on the LCD screen and WEB cabinet 1. There is one-to-one correspondence between temperature and humidity.

7.2 Power Distribution Unit (PDU)

To ensure the accuracy of the PDU monitoring data, the PDU address settings must be completed in according to Table 7.3 on page 91.

All Vertiv™ Geist™ Monitored and Switched rPDUs are shipped with the IMD-5M module. The module provides the same features as the IMD-3E, with the addition of an RS-232 serial port via RJ-45.

Figure 7.2 PDU Operation Display Panel

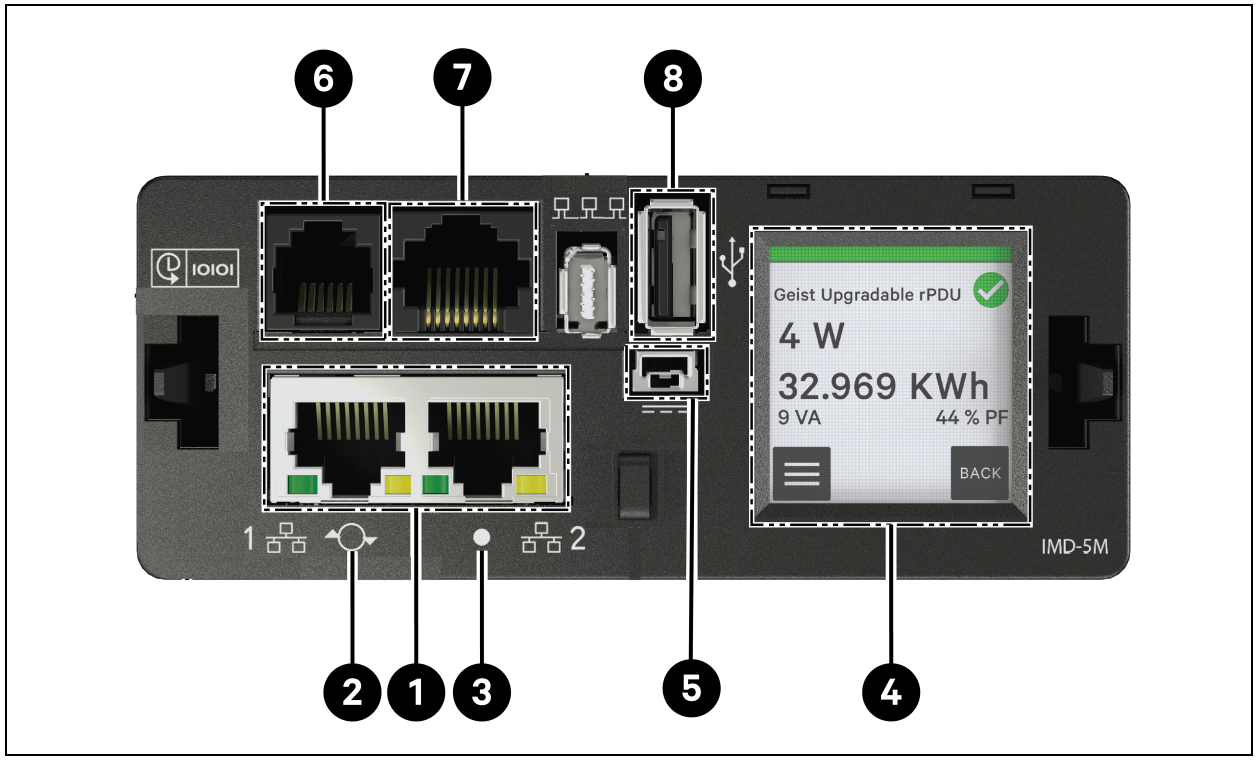


Table 7.2 PDU Operation Display Panel

Item	Name	Description
1	Dual Ethernet ports	The dual Ethernet ports act as a two-port Ethernet switch, allowing for multiple devices to be daisy chained. The dual Ethernet ports can be independently configured dual Ethernet network interfaces, allowing the rPDU to connect to two different networks.
2	Restart/Reset button	Press and hold the button for 10 seconds restarts the IMD. This acts as a power cycle for the IMD; it does not change or remove any user information. Press and hold the button for 25 seconds during normal operation will restore the default IP address and reset the user accounts.
3	RGB status LED	**Green LED:** Unit is up and running. **Yellow LED:** Unit is booting up.
4	Touchscreen menu	Use the touchscreen menu to find the phase, line, and circuit current values (in amperes).
5	Redundant power input	If optional connection cable is plugged into second unit, the IMD will remain powered when rPDU loses power.
6	Remote Sensor Port	RJ-12 port for connecting a Vertiv™ plug-and-play remote digital sensors (sold separately). Each digital sensor has a unique serial number and is automatically discovered. GU2 PDUs support up to

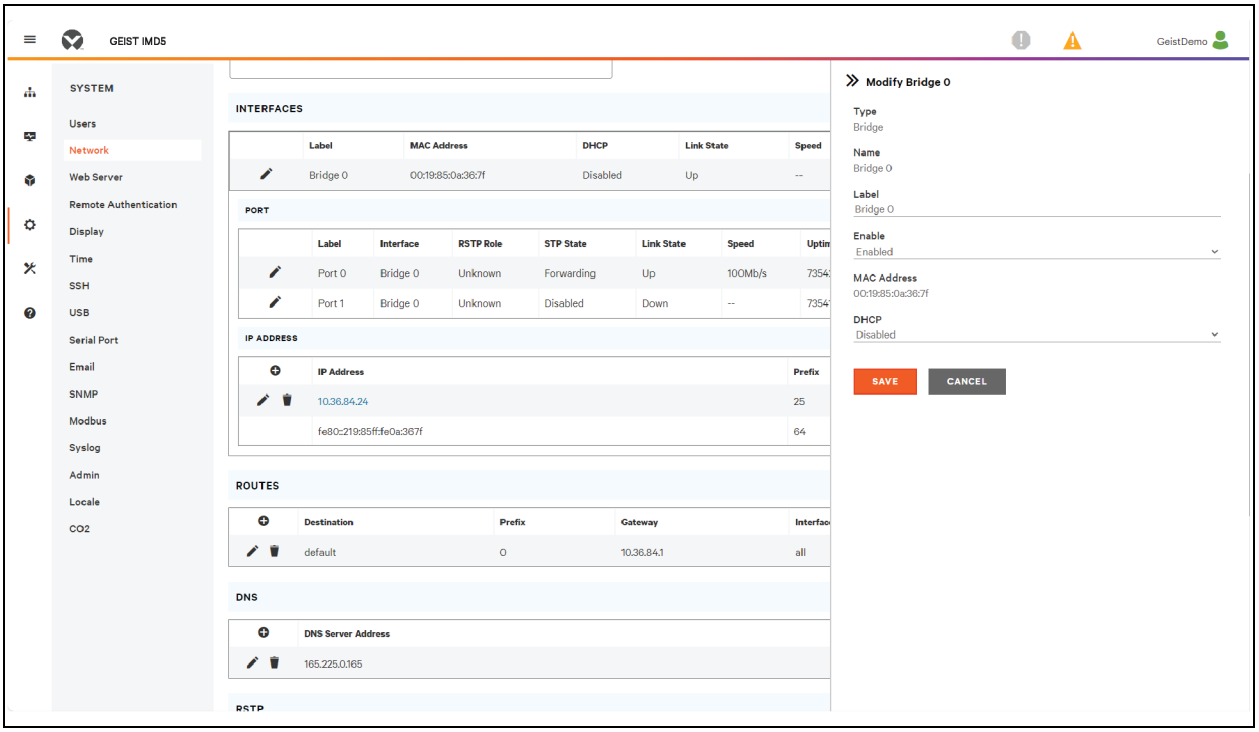
Table 7.2 PDU Operation Display Panel (continued)

Item	Name	Description
		16 sensors. The optional Vertiv™ A2D Converter can be added to support analog sensing. The optional SN-ADAPTER can be added to support Liebert® Integrated and Modular Sensors.
7	Serial port	RS-232 via RJ-45 port.
8	USB port	USB port used to upload firmware, backup/restore device configuration, expand logging capacity via a USB storage device or support TP-Link wireless USB adapters. Provides up to 0.5 Watt for Unit Monitored Level and 5 Watt for Monitored Outlet Level/Switched Unit Level/Switched Outlet Level.

7.2.1 Setting the PDU IP Address

From the PDU web page, click *System* > *Network*. The Network page allows you to configure the network manually or via DHCP. It is recommended to use a static IP or a reserved DHCP.

Figure 7.3 PDU Network Settings



The Upgradeable IMD-5M module has a default IP address for initial setup and access displayed on the front of the unit:

- **IP Address:** 192.168.123.123
- **Subnet Mask:** 255.255.255.0
- **Gateway:** 192.168.123.1

To access the unit for the first time:

1. Temporarily change your computer's network settings to match the 192.168.123.xxx subnet.
2. Connect the PDU to your computer's Ethernet port, then follow the instructions applicable to your computer's operating system as detailed in the manual shipped with the PDU.
3. Connect the network port 1 of the host PDU to an upper-layer device.
4. Navigate to the web page of the PDU.

To configure a static IP address:

1. From the PDU web page, go to System > Network.
2. Under the Interface section, ensure the DHCP function is disabled.
3. Add a static IP address by referring to Table 7.3 below.

Table 7.3 Single Cabinet, Dual PDU Cascade Address Settings

Cabinets	Web UI PDU Number	PDU Address
PMC	0.1	IP：192.168.1.121
Cabinet 1	1.1	IP：192.168.1.123
	1.2	IP：192.168.1.124
Cabinet 2	2.1	IP：192.168.1.124
	2.2	IP：192.168.1.126
Cabinet 3	3.1	IP：192.168.1.125
	3.2	IP：192.168.1.128
Cabinet 4	4.1	IP：192.168.1.126
	4.2	IP：192.168.1.130
Cabinet 5	5.1	IP：192.168.1.131
	5.2	IP：192.168.1.132
Cabinet 6	6.1	IP：192.168.1.133
	6.2	IP：192.168.1.134
Cabinet 7	7.1	IP：192.168.1.135
	7.2	IP：192.168.1.136
Cabinet 8	8.1	IP：192.168.1.137
	8.2	IP：192.168.1.138

7.2.2 Restoring Account Information

If the address or passwords have been lost or forgotten, perform one of the following steps:

- Press and hold the Network Reset button located below the Ethernet Port for 15 seconds.

  -or-

- Press and hold the button in the center of the LED display for 10 seconds.

If the IP address of each PDU is set, check the IP on the display. Pressing both the Play and Stop buttons simultaneously displays the primary IPv4 address of the unit.

7.3 Intelligent Locks

The system can be equipped with an integrated IC card access control cabinet lock, which allows five possible access methods: physical key, numerical code, remote control, opening card or badge.

These access methods realize the network control function of intelligent door locks for each front and rear cabinet door. By default, all communication addresses for IT cabinets with intelligent locks are set to 0. The server rack cabinet addresses need to be re-adjusted according to the placement of the cabinet on-site.

NOTE: The communication address of the PMC does not need to be adjusted.

7.3.1 Setting the Communication Address

To set the communication address for intelligent locks on server rack cabinets:

The address setting can be done through the intelligent lock debugging program or through the web UI of the Vertiv™ Liebert® RDU501 Intelligent Monitoring Unit. The Table 7.4 below shows the DIP switch numbers (on the back of the lock) and the corresponding communication addresses.

Table 7.4 Intelligent Lock DIP Switch Communication Address

Name	Address (Front and Rear)	Name	Address (Front and Rear)
PMC locks	9	IT Rack 5 Locks	5
IT Rack 1 Locks	1	IT Rack 6 Locks	6
IT Rack 2 Locks	2	IT Rack 7 Locks	7
IT Rack 3 Locks	3	IT Rack 8 Locks	8
IT Rack 4 Locks	4		

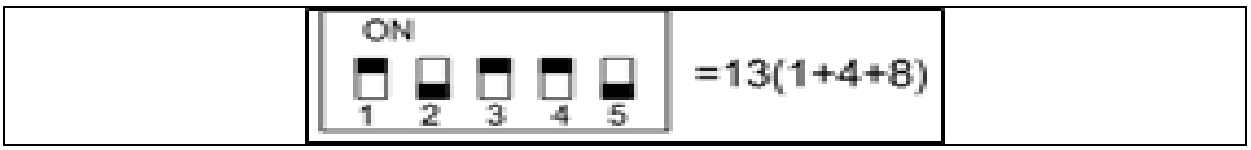
The Table 7.5 below describes the setup of the intelligent door lock IDs.

Table 7.5 Intelligent Lock ID Settings

Product	Cabinet Front Door Smart Lock Address	Connect to Intelligent Monitoring Unit	Cabinet Rear Door Smart Lock Address	Connect to Intelligent Monitoring Unit
PMC	9	8COM Card/COM 1	9	8COM Card/COM 2
Server Rack 1	1		1	
Server Rack 2	2		2	
Server Rack 3	3		3	
Server Rack 4	4		4	
Server Rack 5	5		5	
Server Rack 6	6	8COM Card/COM 3	6	8COM Card/COM 4
Server Rack 7	7		7	
Server Rack 8	8		8	

7.3.2 Communication Address Example

Figure 7.4 Intelligent Lock Address Number



For example, since the numbers 1, 3, and 4 are ON in Figure 7.4 above. The communication address numbers are 1, 4, and 8. To determine the communication address, add together those three values (1+4+8). The communication address for the intelligent door lock is 13.

NOTE: Perform the procedure described above for each server rack cabinet until all communication addresses have been successfully changed.

7.4 Vertiv™ Liebert® APM2 Option Configurations

This chapter provides the information about available options for Liebert® APM2 UPS.

7.4.1 Options List

Table 7.6 Options List

Serial Number	Option Name	Remark
1	Battery temperature sensor kit	-
2	Battery ground fault kit	-
3	Seismic anchor kit	-
4	IS-UNITY-DP card	Intellislot ports 1 to 2
5	External remote LBS box	
6	BCB cabinet	
7	Parallel cable	Available in 5 m, 10 m, 15 m
8	LBS cable	Available in 10 m, 15 m, 20 m
9	Common source copper bar	-

7.5 Options Introduction

7.5.1 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: Keep 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.

WARNING! 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 for the UPS indicators to turn off.

All the UPS indicators turns off.

4. Wait for five minutes to completely discharge the internal DC bus capacitors of the UPS.
5. Connect one end of the network cable with shielded RJ-45 port to the battery temperature sensor and plug the other end into the J2 dry contact port on the UPS bypass.

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

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

Battery Ground Fault Kit

Vertiv™ Liebert® APM2 UPS 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 indicator alarms ON the UPS display panel.

The battery ground fault detector kit includes a mutual inductor and a PCB, to be installed in the Battery Circuit Breaker (BCB) box. For the installation and connection of the battery ground fault detector.

Seismic Anchor Kit

Vertiv™ Liebert® APM2 UPS has an optional seismic anchor kit. It helps to avoid and reduce the damage to UPS caused by earthquake or vibration in the earthquake prone areas.

See Table 7.7 below for dimensions of the seismic anchor kit.

Table 7.7 Dimensions and Content of the Seismic Anchor Kit

Item	Width (mm)	Length (mm)
Seismic anchor	60	585

WARNING! Execute the installation according to the instructions. Failure to do so can cause personnel injury or damage to the UPS and seismic anchor kits.

Preparation:

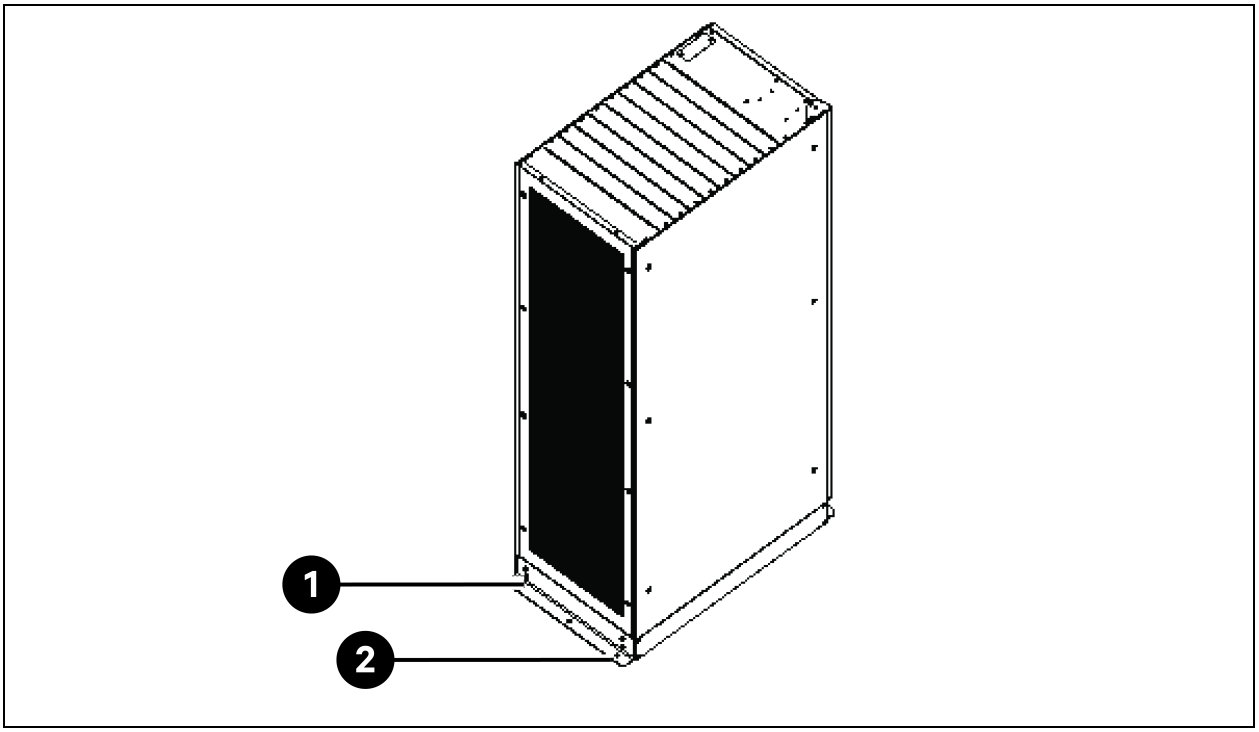
1. Prepare the installation tools, including a cross head screwdriver, a torque spanner and an adjustable spanner.
2. Check that all installation materials are present and complete, including:

   Without switch, single switch: two seismic anchors, eight M8 × 25 tapping screws, six M12 expansion bolts. Four switches: four seismic anchors, 16 M8 × 25 tapping screws, 12 M12 expansion bolts.

Installing the Seismic Anchor:

1. Use M8 × 25 tapping screws (4 pieces) to install seismic anchor on the rear bottom side of the UPS cabinet, and use M12 expansion bolts (3 pieces) to install seismic anchor on the ground, as shown in Figure 7.5 below.

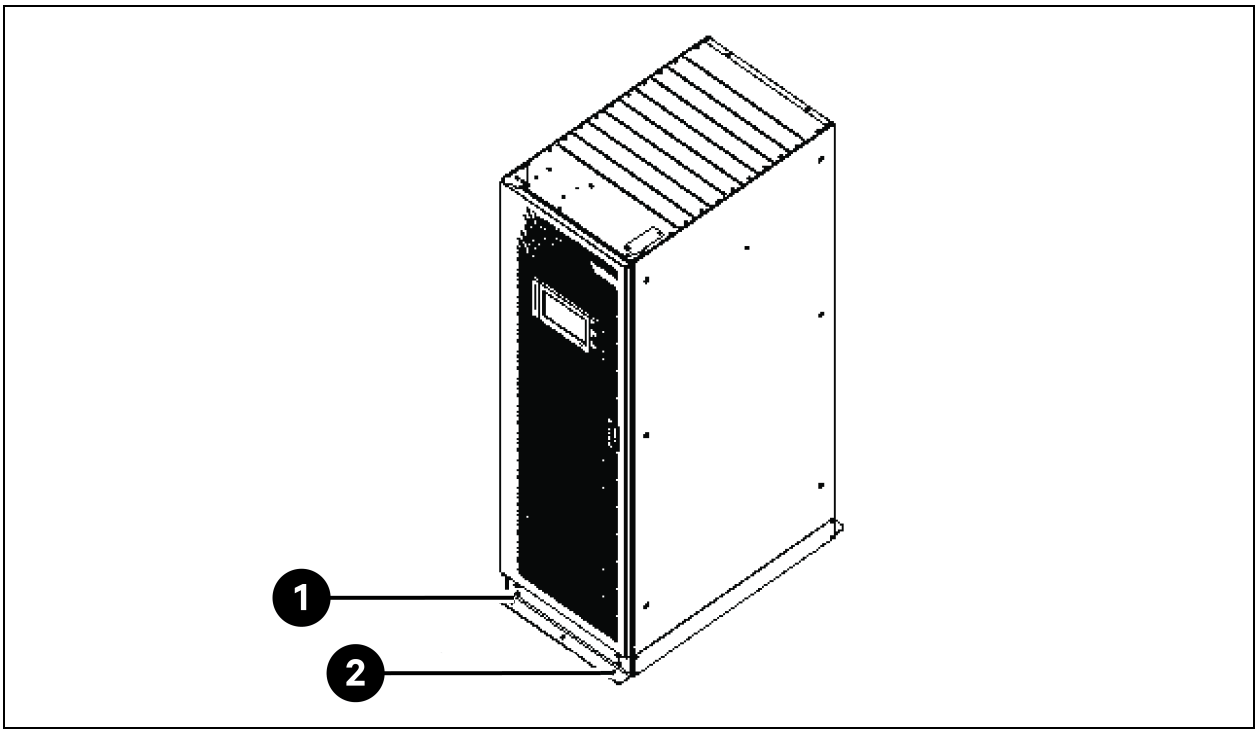
Figure 7.5 Installing Seismic Anchor (Rear Installation)



Item	Description	Quantity
1	M8 x 25 tapping screws	4
2	M12 expansion bolts	3

2. Use M8 × 25 tapping screws (4 pieces) to install seismic anchor on the front bottom side of the UPS cabinet, and use M12 expansion bolts (3 pieces) to install seismic anchor on the ground, as shown in Figure 7.6 on the next page.

Figure 7.6 Installing Seismic Anchor (Front Installation)



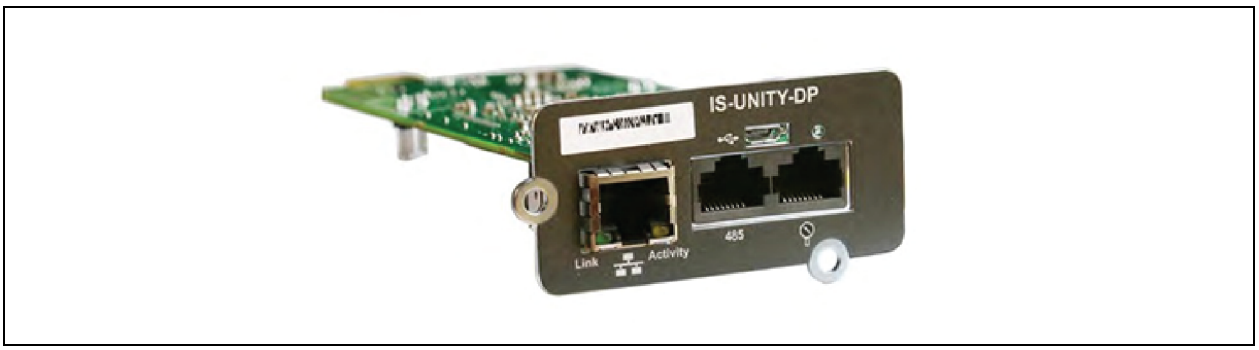
Item	Description	Quantity
1	M8 x 25 tapping screws	4
2	M12 expansion bolts	3

IS-UNITY-DP Card

CAUTION: It is recommended to use the shielded cables to enhance the Electromagnetic Compatibility (EMC).

The appearance of the IS-UNITY-DP card is shown in Figure 7.7 below.

Figure 7.7 IS-UNITY-DP Card



Before setting the IP address, complete the following:

1. Connect the computer network port directly to the Vertiv™ Liebert® IntelliSlot™ Unity communications card using a network cable.
2. Set the IP address of the computer's corresponding interface to the same network segment as the default IP of the Vertiv™ Liebert® IntelliSlot™ Unity communications card (169.254.24.7).

   Proceed to the next section to complete the network configurations for the cooling systems.

Figure 7.8 Vertiv™ Liebert® IntelliSlot™ Unity Communications Card

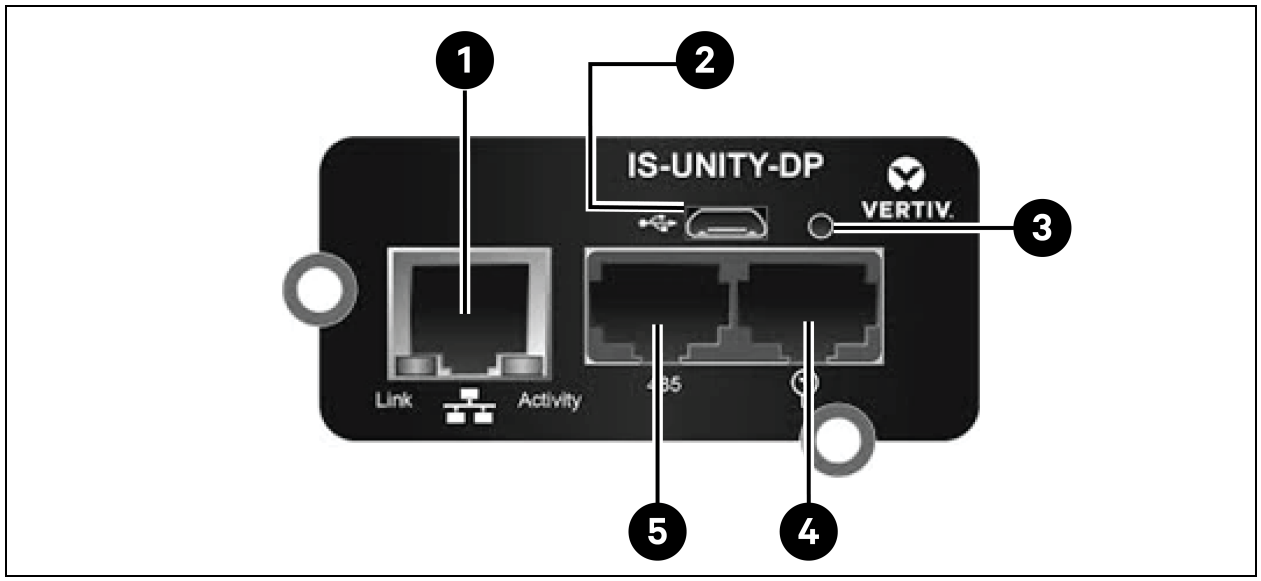


Table 7.8 Vertiv™ Liebert® IntelliSlot™ Unity Communications Card

Item	Description
1	RJ-45 Ethernet port
2	Micro-USB port
3	Reset button
4	Sensor-network ports (SN sensors only)
5	RS-485 port (BACnet/MSTP, Modbus RTU or YDN23. Only one may be used)

For further description and installation of the IS-UNITY-DP card, refer to SL-52645 Vertiv™ Liebert® IntelliSlot™ Unity Card User Manual.

BCB Cabinet

If users wish to choose a battery system with a long backup time, they can choose an external battery cabinet, which can carry more battery modules. For lead-acid batteries, up to 32 modules can be placed, and for lithium battery modules, up to 16 modules can be placed.

Table 7.9 on the next page provides the mechanical specifications of the BCB cabinet.

Table 7.9 Parameters of BCB Cabinet

Dimensions (H × W × D) (mm)	Weight (kg)	Recommended Screw
2000 × 600 × 987	250	M16

The external BCB cabinet should be installed as close as possible to the battery. It can be installed on a horizontal surface.

Besides the local regulations, to enable routine operation of switches in the BCB cabinet within the BCB cabinet, it is recommended that clearance around the front of the UPS should be larger than 1200 mm and enough to enable free passage of personnel with the door fully open. Meanwhile, maintain at the back of the cabinet a clearance at least 200 mm to permit adequate circulation of air coming out of the UPS.

See Figure 7.9 below to Figure 7.10 on the facing page to install and connect the BCB cabinet. There are connection terminals in the BCB cabinet for connecting the power cables from the UPS and battery. Before powering on the UPS, lead out the internal 485 communication cables from the BCB cabinet to connect the UPS control module.

NOTE: The BCB cabinet can use bottom cable entry method. It provides one big and one small cable entry holes on both the top plate and bottom plate. The big one is for power cable entry, and the small one is for signal cable entry. After connection, take appropriate measures to seal the cable entry holes.

NOTE: The signal cable must be run separate from the battery power cables. 485 cable is a shield cable, both ends of its shield layer must be connected to the enclosure. The UPS and BCB cabinet must be earthed separately.

NOTE: Make sure that the UPS rectifier has started before closing the BCB.

NOTE: Mark the battery string when configuring the divided BCB cabinet and note that the marked number must be correspond to the battery terminals in the BCB cabinet when connecting the power cables.

Figure 7.9 Front Dimension of BCB Cabinet (unit: mm)

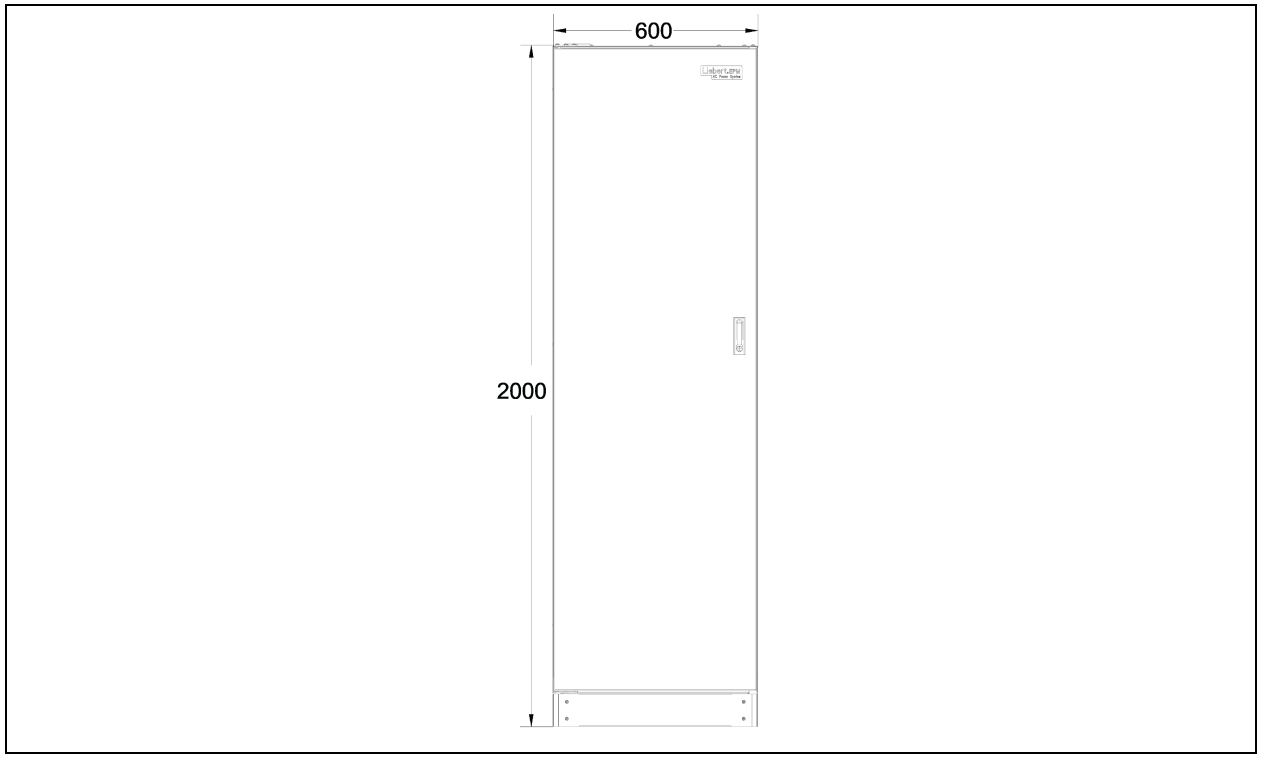
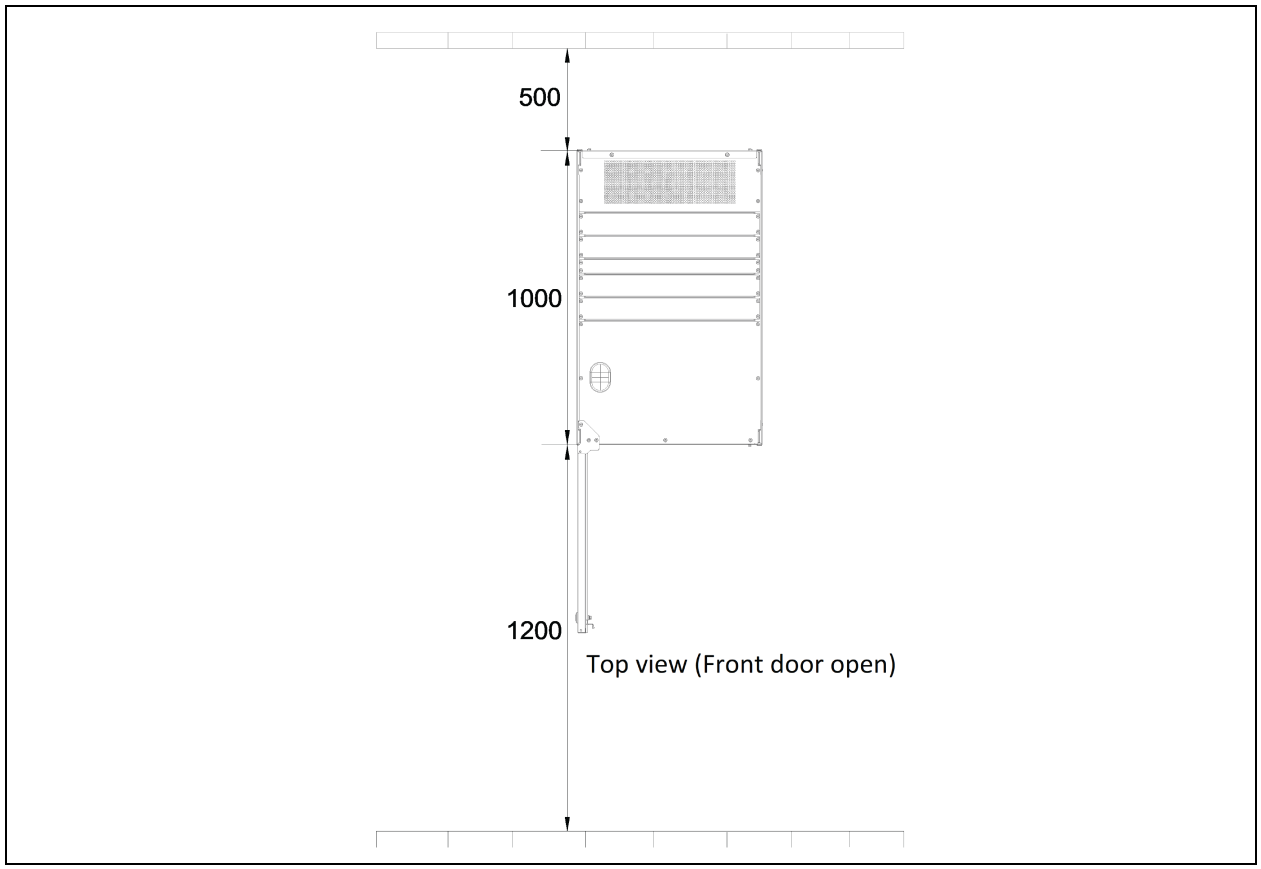


Figure 7.10 Dimensions of BCB Cabinet



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 5 m, 10 m and 15 m must be interconnected in a ring configuration between the UPS modules.

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

LBS Cable

Shielded and double-insulated parallel control cables (LBS1 and LBS2) available in lengths of 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.

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.

7.5.2 Cooling Systems

Prerequisites

Before setting the IP address, complete the following:

1. Connect the computer network port directly to the Vertiv™ Liebert® IntelliSlot™ Unity communications card using a network cable.
2. Set the IP address of the computer's corresponding interface to the same network segment as the default IP of the Vertiv™ Liebert® IntelliSlot™ Unity communications card (169.254.24.7).

   Proceed to the next section to complete the network configurations for the cooling systems.

Figure 7.11 Vertiv™ Liebert® IntelliSlot™ Unity Communications Card

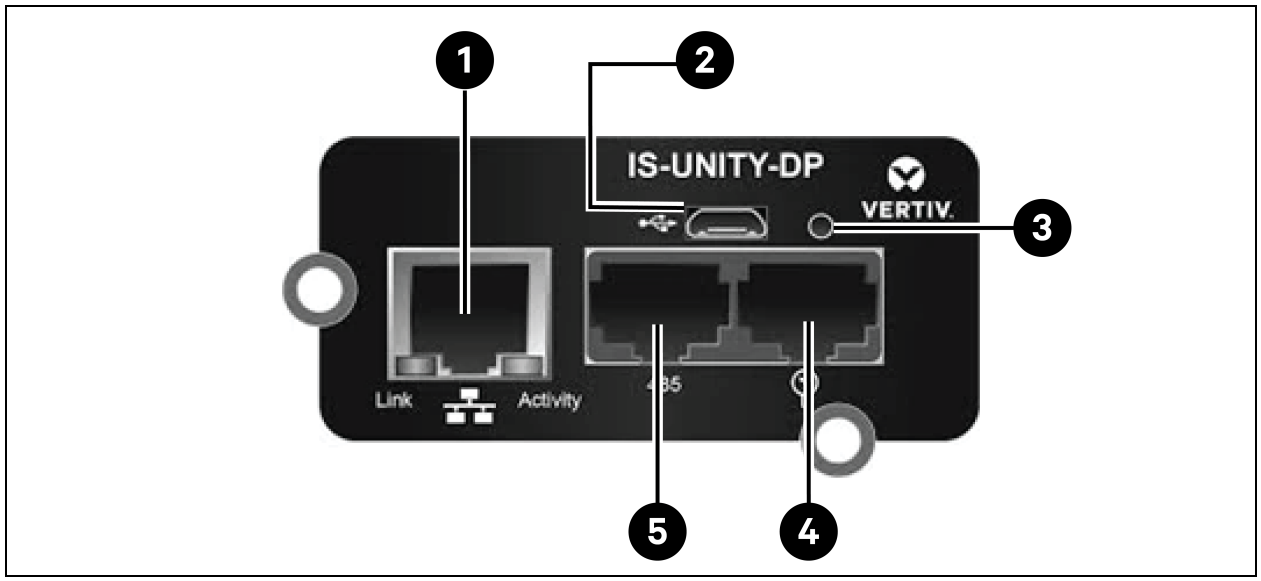


Table 7.10 Vertiv™ Liebert® IntelliSlot™ Unity Communications Card

Item	Description
1	RJ-45 Ethernet port
2	Micro-USB port
3	Reset button
4	Sensor-network ports (SN sensors only)
5	RS-485 port (BACnet/MSTP, Modbus RTU or YDN23. Only one may be used)

7.5.3 Setting up the Vertiv™ Liebert® CRV CRD25 and CRD35

HMI Display

The HMI display is a 7 inch touchscreen color display.

Figure 7.12 HMI Display

The indicator (1) is located under the screen. Its colors and indication are described in Table 7.11 below.

Table 7.11 Indicator Description

Indicator Color	Description
Blue	Display is starting
Yellow	Unit is shut down, or the display fails to communicate with Liebert® iCOM™ edge
Green	Unit is running normally
Red	An alarm has been generated and the buzzer keeps generating sound (you can tap the display to stop the buzzer)

7.5.4 Main Functions

Home Page

After the HMI display is powered on for one minute, press **Locked**, input password **1490**, and press **Enter**. The home page will be displayed. You can power on or off the unit by pressing and holding the ON/OFF button for three seconds.

NOTE: If no password is entered, you can only view the menu settings.

Figure 7.13 Entering Password

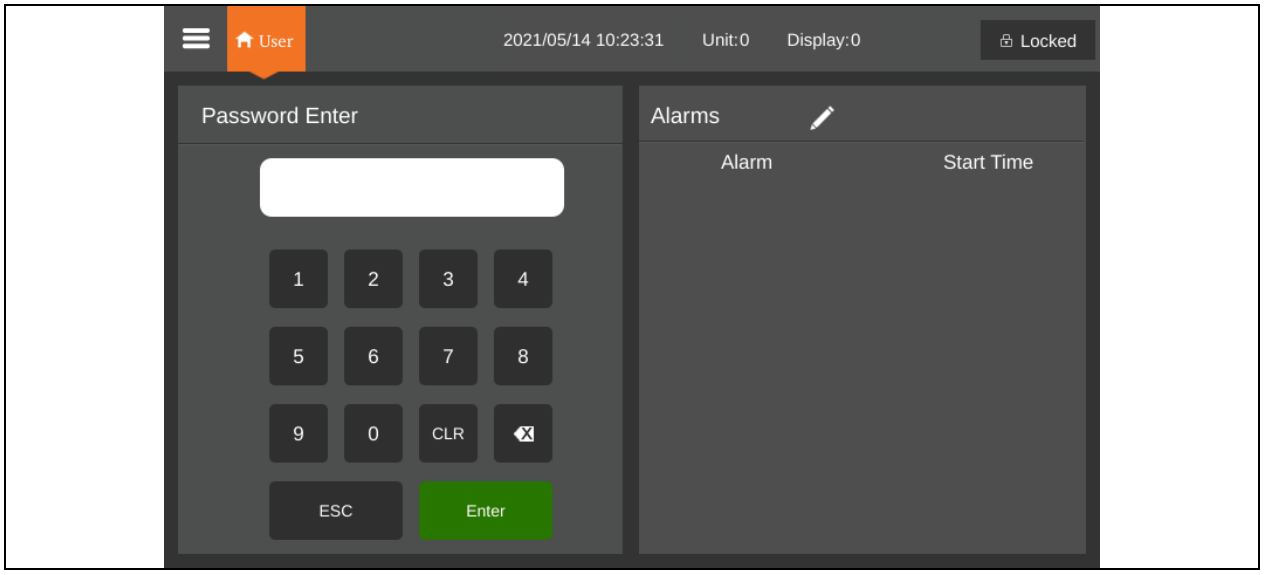


Figure 7.14 Functional Keys

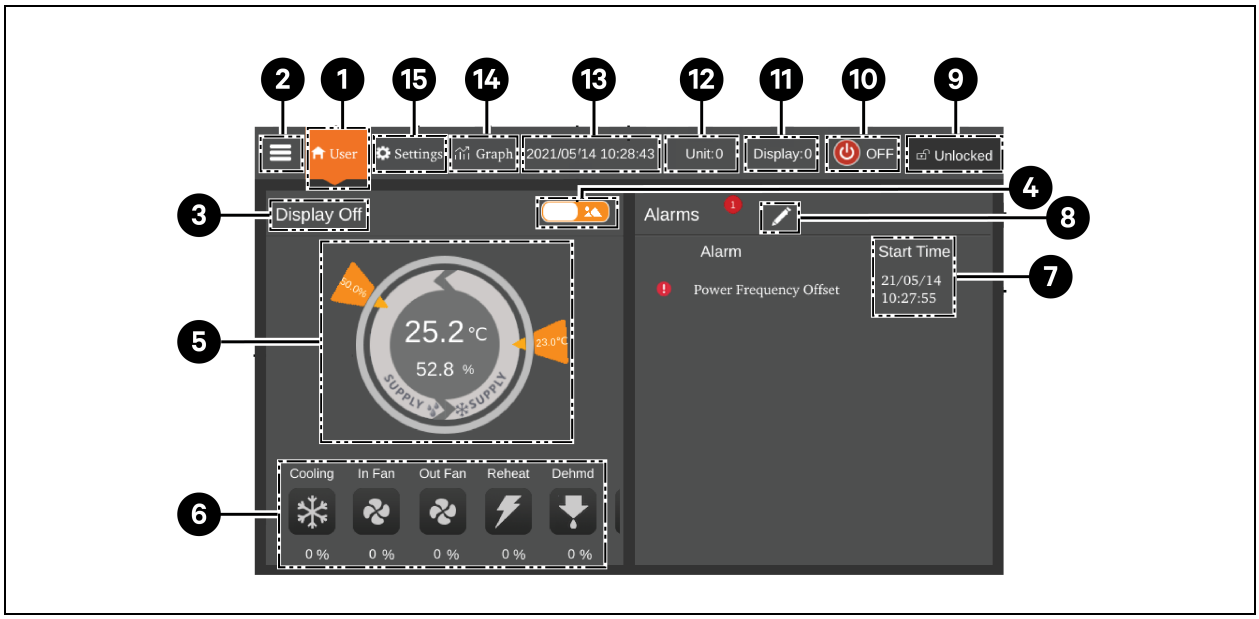


Table 7.12 Function Description

Item	Touch Keys	Function Description
1	Home button	To return to the home page
2	Menu button	Check or configure operation status, alarm information, temperature and humidity settings, parameter settings, temperature and humidity graph, and check version information and service information.
3	Operating status	Displays the current state of the unit: unit run, remote off, display off, monitor off, standby.
4	Toggle button 1	Switch between graphical display mode and list display mode.
5	Control mode	Shows unit settings and temperature and humidity data.
6	Status display	Shows the data of cooling, fan, electric heater, humidifier, dehumidifier, fan speed, heating status, and humidifier status.
7	Alarm list	Shows current alarms and the time when they are generated.
8	Toggle button 2	Switch between the sensor data page and the alarm page.
9	Unlock button	To Unlock the HMI display.
10	ON/OFF button	Press the button for three seconds to start or stop the unit.
11	Display address	Shows HMI address and set HMI address.
12	Unit address	Shows unit address.
13	Time display	Shows current time and date.
14	Graph button	Shows the graphs of average return air temperature, average return air humidity, average supply air temperature, and average remote temperature.
15	Setting button	To set temperature and humidity.

Control Mode

The compressor and fans are controlled according to temperature (supply air temperature, return air temperature, and remote temperature) and humidity (supply air humidity, return air humidity, and remote humidity).

Figure 7.15 Control Mode Diagram

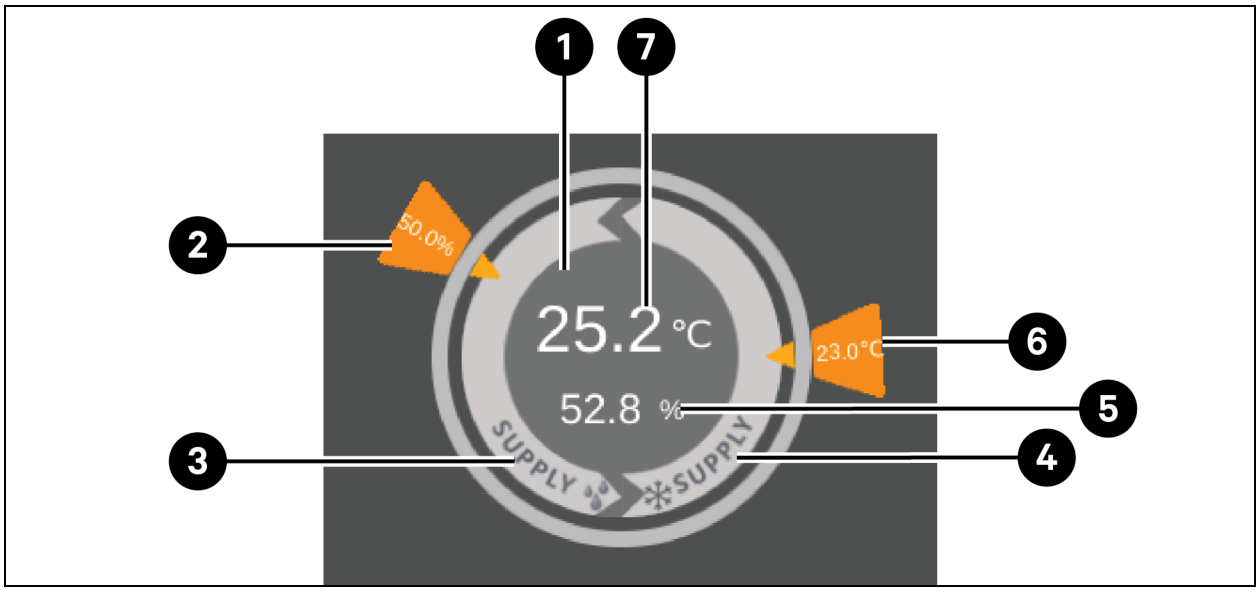


Table 7.13 Description of Control Mode Diagram

Item	Description
1	Each color of this area indicates different status: • **Green:** The unit is On and the temperature within normal range • **Red:** The unit is On and the temperature is not within normal range • **Grey:** The unit is Off
2	Desired humidity set by user
3	Control mode: compressor is controlled according to supply air humidity
4	Control mode: compressor is controlled according to supply air temperature, return air temperature, or remote temperature
5	Theoretical supply air humidity calculated according to current data
6	Desired supply air temperature, return air temperature, or remote temperature set by user
7	Supply air temperature, return air temperature, or remote temperature, depending on the control mode

7.5.5 Menu Structure and Parameters

For menu structure and parameters, refer SL-70747 Vertiv™ Liebert® CRV CRD25 and CRD35 User Manual.

7.5.6 Alarm Information

Press the menu button and choose Alarm Information to check active alarms and historical alarms. Active Alarms show the active alarms and the time they are generated. Historical Alarms show active alarms and historical alarms, and the time they are generated and closed (if the alarm has been resolved).

NOTE: Alarms are displayed in time sequence, starting with the latest one.

NOTE: Up to 500 historical alarms can be stored. They will not be cleared when unit is powered off.

7.5.7 Teamwork Control

Press the menu button and choose Parameter Settings > Teamwork Settings to set teamwork control. Teamwork Mode includes Teamwork 0, Teamwork 1, Teamwork 2, and Teamwork 3. Teamwork 0 indicates standby and rotation control. Teamwork 1 indicates standby, rotation, and cooling/heating cascade control. Teamwork 2 indicates standby, rotation, and avoid fighting control. Teamwork 3 indicates standby, rotation, and fan cascade control.

Standby function

One or several units can be defined as standby unit. The standby unit fan runs at a default speed of 20%. If a critical alarm or normal alarm is generated on the master unit, a standby unit will start to run.

- Critical fault alarms: High pressure lock, low pressure lock, high discharge temperature lock, low discharge superheat lock, low pressure sensor fail lock, compressor drive fail lock, fan fail alarm (when its alarm handling is set to shut down), water underfloor alarm (when its alarm handling is set to shut down), power fail alarm.
- Normal alarms: High discharge temperature alarm, air flow temperature sensor failure, air flow loss alarm, discharge temperature sensor failure, suction temperature sensor failure, low pressure sensor failure, EEV drive communication failure, compressor drive communication failure, compressor temperature control sensors failure, fan temperature control sensors failure, high supply temperature alarm, high return temperature alarm, and high remote temperature alarm.

Rotation function

This function ensures that all the units have equal runtime.

Avoid fighting function

This function prevents the units from performing conflicting operations, such as cooling and heating, humidifying and dehumidifying. The master unit will calculate the number of cooling units and heating units (or humidifying units and dehumidifying units). If cooling units (or humidifying units) are more than heating units (or dehumidifying units), the heating units (or humidifying units) will stop working.

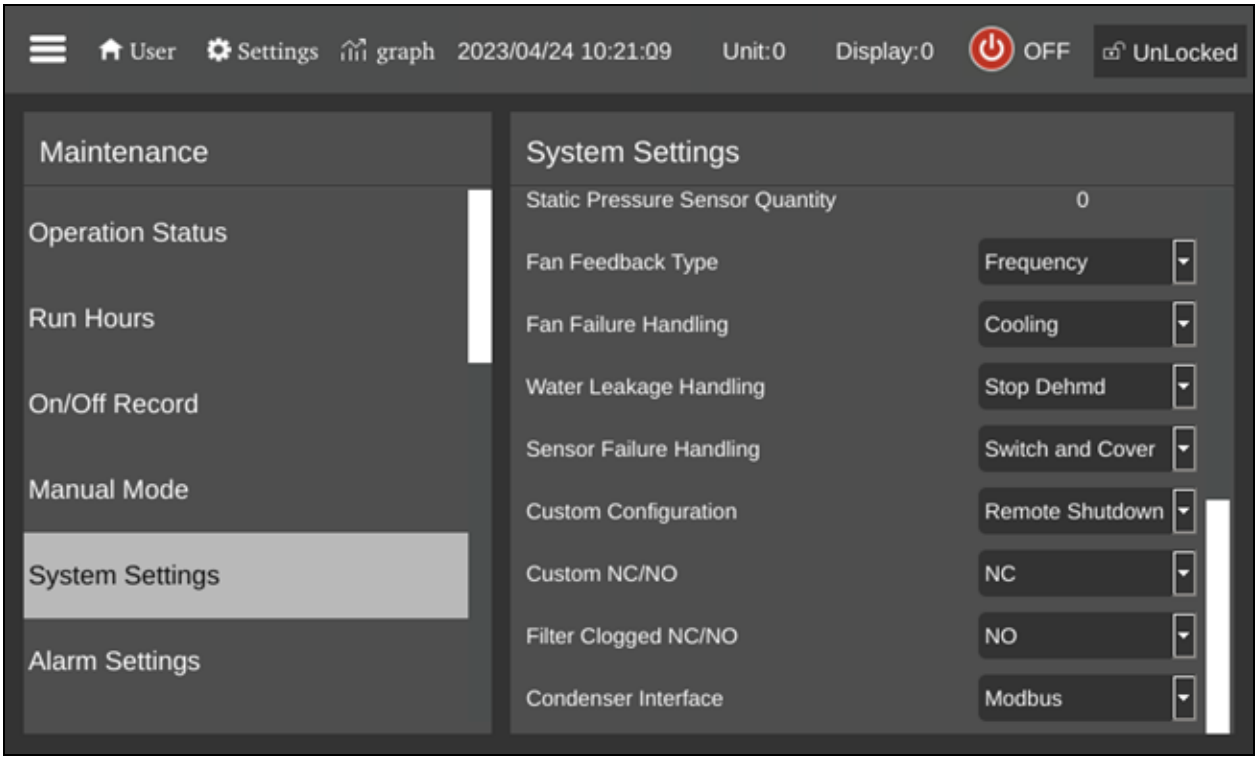
Cascade function

If an alarm is generated on the master unit, a standby unit will start to run.

7.5.8 Third-Party Condenser Setting

The CRD cooling units are equipped with Vertiv CCD condenser by default, if a third-party condenser is selected, the condenser interface should be set up on the HMI. Press the menu button and select *Maintenance > System Settings* to set the condenser interface. The condenser interface for Vertiv CCD condenser defaults to ModBus and for a third-party condenser should be set to None.

Figure 7.16 Condenser Interface Setting Schematic



NOTE: A third-party condenser which must be provided with its own condenser fan speed controller. It will not be possible to apply the Vertiv Low Ambient Kit (LAK) to a third-party condenser. Thus, the third-party condenser can be used only if there is no risk that the ambient temperature drops below -20°C (-4°F).

NOTE: This parameter must be set with the unit turned OFF only and it must be set up by Vertiv professional technical support team. For more information and precautions, please confirm with Vertiv technical support team before selecting and installing a third-party condenser in advance.

7.5.9 IP Camera

Installing on a network

To install the IP camera on a network:

1. Using a standard network cable, connect the camera to your network.
2. Connect to power using one of the following methods:
   - Use the optional power adapter to connect to power.

     -or-

   - Use the Power over Ethernet (PoE) function in which power is supplied over the network cable.

The camera is now installed on the network, and the web UI of the camera is accessible.

To access the web UI:

- If the camera is installed on a LAN with a DHCP server, refer to Identifying the Dynamic IP Address below .

  -or-

- If the camera is installed on a LAN without a DHCP server. refer to Configuring the Default IP Address below .

Identifying the Dynamic IP Address

By default, when the device is connected to LAN with a DHCP server, it is automatically assigned with a dynamic IP address.

To identify the dynamic IP address and log into the web UI:

1. Download and install GV-IP Device Utility from the company website: https://www.geovision.com.tw/download/product/

NOTE: The PC installed with GV-IP Device Utility must be under the same LAN as the camera to be configured.

NOTE: By default, the administrator's username is admin and cannot be modified.

2. On the GV-IP Device Utility window, click the Search icon (a magnifying glass) to search for the IP devices connected on the same LAN. Click the Name or Mac Address column to sort the entries.
3. Find the camera with its mac address, then click on its IP address.
4. First-time users are prompted to set up a password. Enter a new password, then click *OK*. You are redirected to the Login page.
5. Enter your username and password on the login page and click *Login*.

Configuring the Default IP Address

By default, when the device is connected to LAN without a DHCP server, it is assigned with a default static IP address of 192.168.0.10. A new IP address should be assigned to avoid conflicts with other devices.

To configure a static IP address:

1. Open a web browser and enter the default IP address 192.168.0.10.
2. Enter your username and password, then click *Login*.
3. Click *Setup*.

4. Select Common in the left menu and select *Network*.
5. Select Static IP from the Obtain IP Address drop-down menu.
6. Enter the IP address, subnet mask, and default gateway address. Make sure the camera IP address is unique.
7. Click *Save*.

Configuring the On-Screen Display (OSD)

1. From the camera's web UI, click *Setup*.
2. Select Common in the left menu and select *OSD*.
3. Enable a number to select an area, and click Overlay OSD Content to select the content to display on the screen.
4. Adjust the position of the Area boxes either by dragging them directly on the live view or by specifying the coordinates under X-Axis/Y-Axis column.

NOTE: An OSD of type custom must be set, responsible for the IP camera name not being displayed in the Vertiv™ Liebert® RDU501 Intelligent Monitoring Unit.

Configuring the Video Parameters

NOTE: Since the Vertiv™ Liebert® RDU501 Intelligent Monitoring Unit currently only supports H.264 compression video, the video compression must be set to H.264.

To configure the video parameters:

1. From the camera's web UI, click *Setup*.
2. Select *Video & Audio* in the left menu and select *Video*.
3. Set the Video Compression setting to H.264. The recommended Resolution setting is 1280 x 720 (720P).
4. Leave all other settings as their default values.

7.5.10 Network Video Recorder (NVR)

Installing on a Network

To install the NVR on a network:

1. Using a standard network cable, connect the NVR to your network.
2. Use the optional power adapter to connect to power.

The NVR is now installed on the network, and the web UI of the NVR is accessible.

To access the web UI:

- If the camera is installed on a LAN with a DHCP server, refer to Identifying the Dynamic IP Address on the previous page .

  -or-

- If the camera is installed on a LAN without a DHCP server, refer to Configuring the Default IP Address on the previous page .

Identifying the Dynamic IP Address

By default, when the device is connected to LAN with a DHCP server, it is automatically assigned with a dynamic IP address.

To identify the dynamic IP address and log into the web UI:

1. Download and install UVS Device Utility from the company website: https://www.geovision.com.tw/us/download/product/UA-SNVRL810-P
2. On the UVS Device Utility window, click the button to search for the IP devices connected in the same LAN.

Configuring the Default IP Address

By default, when the device is connected to LAN without a DHCP server, it is assigned with a default static IP address of 192.168.1.100. A new IP address should be assigned to avoid conflicts with other devices.

To configure a static IP address:

1. Open a web browser and enter the default IP address 192.168.1.100.
2. First-time users are prompted to set up a password. Enter a new password, then click *OK*. You are redirected to the Login page.
3. Enter your username and password on the login page and click *Login*.
4. Click *Remote Setting*.
5. Select Network in the left menu and select *General*.
6. Disable DHCP using the toggle button.
7. Enter the IP address, subnet mask, and default gateway address. Make sure the NVR IP address is unique.
8. Click *Save* and log in again.

Adding the IP Camera to the NVR

To add the IP camera to the NVR:

1. From the NVR web UI, click *Remote Setting*.
2. Select *Channel* in the left menu and select *IP Channels*.
3. Click the Edit icon (the pencil) and select *Manual* mode from the Mode drop-down menu.
4. Click *OK*.
5. Click the Add icon (the plus (+) symbol).
6. Enter the IP address, username, and password of the IP camera.
7. Select Onvif for the protocol using the Protocol drop-down menu.
8. Click *OK*.

Enabling Onvif

To enable the Onvif protocol:

1. From the NVR web UI, click *Remote Setting*.
2. Select *Network* in the left menu and select *Platform Access*.
3. From the Onvif tab, enable Onvif by clicking the Enable toggle button.
4. Select *Digest/WSSE* from the Authentication Type drop-down menu.
5. Select *HTTP/HTTPS* from the Protocol drop-down menu.
6. Enter the administrator's username and password.
7. Click *OK*.

Formatting a Hard Disk

To format a hard disk:

1. From the NVR web UI, click *Remote Setting*.
2. Select Storage in the left menu and select *Disk*.
3. Select the hard disk to be formatted.
4. Click the Format Hard Disk radio button.
5. Select the button for Format the entire hard disk and all data will be erased, then click *OK*.

Configuring the Recording Schedule

To configure the recording schedule:

1. From the NVR web UI, click *Remote Setting*.
2. Select Record in the left menu and select *Record*.
3. Select Channel from the Channel drop-down menu.
4. Select *Main Stream* from the Stream Mode drop-down menu.
5. Click *Save*.
6. Click Schedule and set the recording time.

8 Navigating the Monitoring Unit Web User Interface

This chapter provides detailed information about using the Vertiv™ Liebert® RDU501 intelligent monitoring unit. After connecting the unit to a network and completing the initial installation setup procedures, you can access the unit directly via its Web User Interface (UI). For more detailed information and instructions, refer to the SL-71186 Vertiv™ Liebert® RDU501 Intelligent Monitoring Unit User Manual shipped with the unit and located on www.Vertiv.com.

8.1 Verifying Network Connectivity

Prior to logging into the monitoring unit's web UI, confirm the IP address of the unit and test its connectivity, using the following procedures.

Verify the IP address is accurate:

1. The monitoring unit has two network cards. Verify that the Ethernet cable is plugged into the correct interface.
2. If the IP address is static, the unit's default IP address may be found on the Ethernet port in the area dedicated to the monitoring unit.

Test the IP address connection:

1. Open the Windows operating system command prompt.
2. On the command line, enter ping and the IP address (for example, ping 192.168.0.254) to see if the transmission is successful.
3. If the IP transmissions is not successful, press the Reset button on the device to restore the default IP address.

Supported web browsers

The monitoring unit web UI supports the latest versions of the following web browsers:

- Google Chrome (recommended)
- Mozilla Firefox
- Apple Safari
- Microsoft Edge

8.2 Login

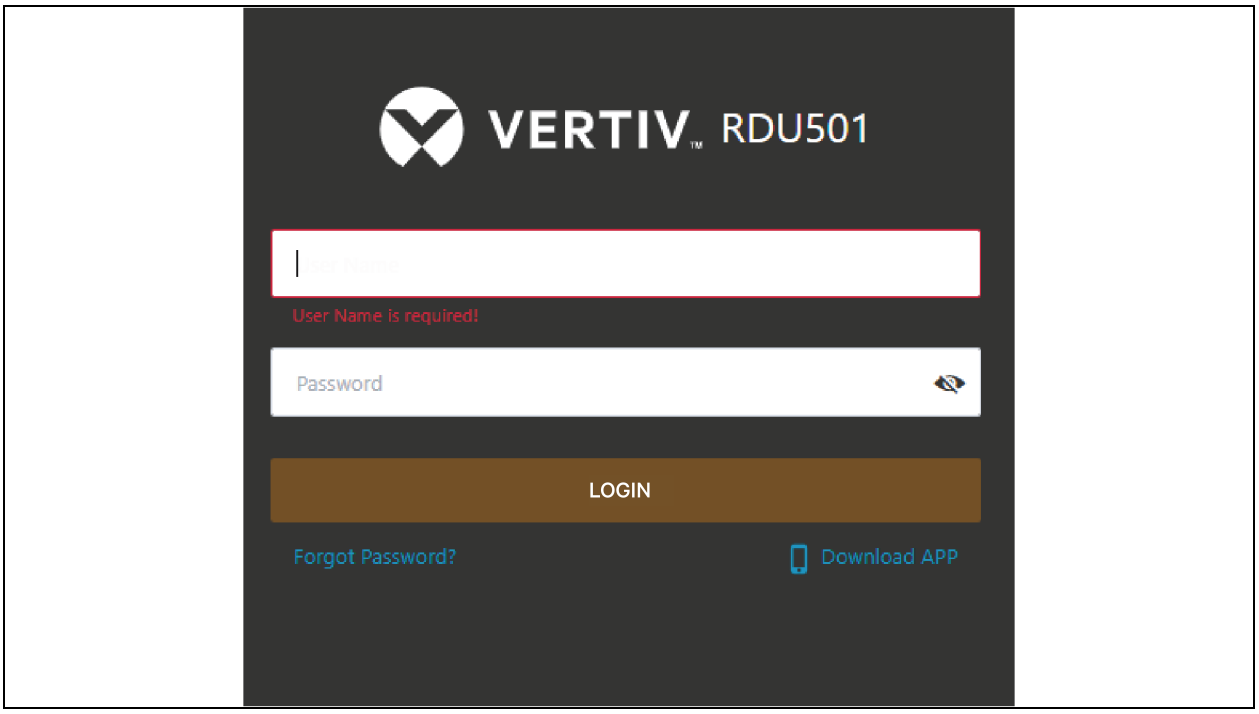
To log into the RDU501 Intelligent Monitoring Unit web UI:

1. Open a web browser, then enter the monitoring unit's IP address. The Login page appears.

NOTE: If the Login page does not appear, refer to the appropriate troubleshooting procedure in this section: Authorization in Table 11.1 on page 145.

NOTE: To download the app version of the web UI, click *Download APP*. Scan the QR code that appears on the screen and download the app.

Figure 8.1 Web UI Login Page



2. Enter the default username and password: admin/Vertiv
3. Click *LOGIN*. After logging into the system for the first time, you must change the default password.

To change the default password:

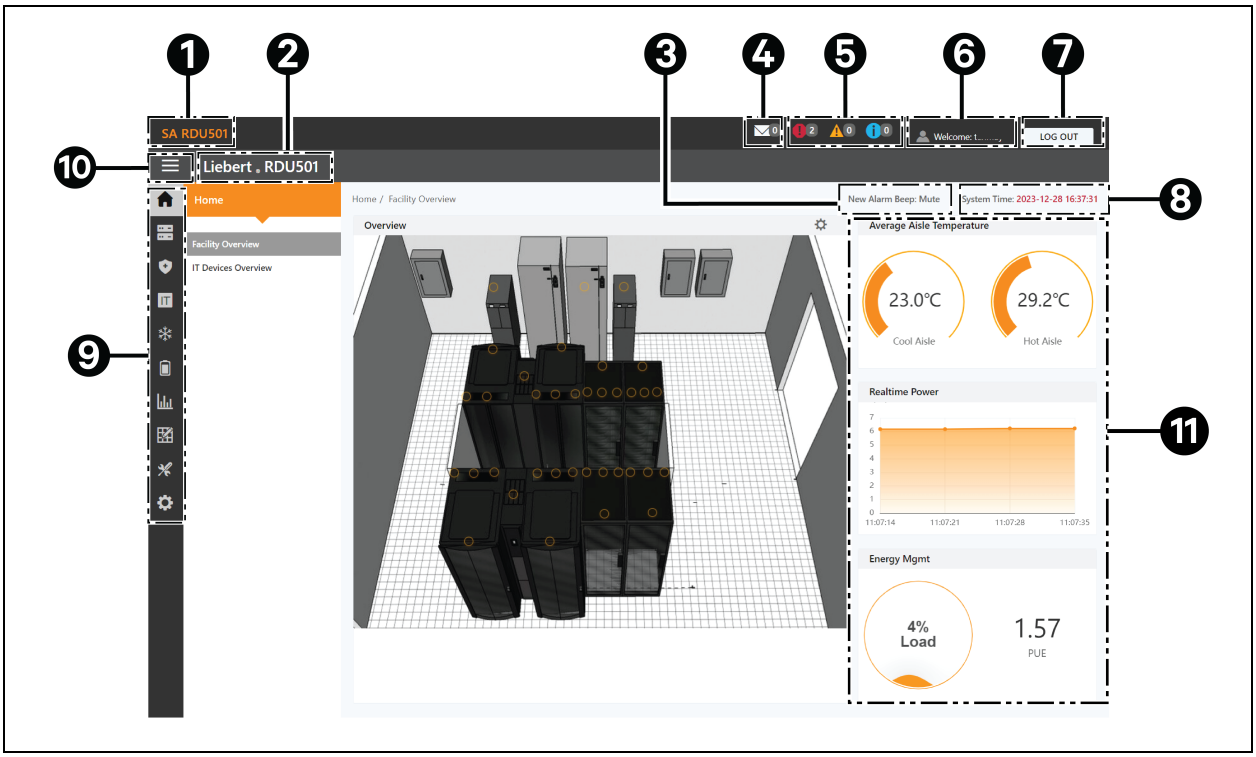
1. The General Scenario page opens and displays the prompt: Modify the default password confirmation interface. Click *Confirm*.
2. Enter a new password.
3. Log into the monitoring unit's web UI with the default username and your new password.

NOTE: It is recommended to change the password periodically.

8.3 Home

From the left-hand sidebar, click the Home icon. The Home page displays two sub menus: Facility Overview and IT Devices Overview. The Facility Overview includes the Power and Environment Overview.

Figure 8.2 Home Page Overview



Item	Description
1	System title
2	Product name
3	Alarm reminder sound settings
4	IT Mgmt events
5	Alarm information
6	Username
7	Logout button
8	System time

Item	Description
9	Main menu
10	Fold submenu button
11	Critical system information, including the following: • **Aisle Temperature:** The average temperature of the cold and hot aisles in the module. For details about the temperature sensor of the rack in the module, refer to **SL-71186 Vertiv™ Liebert® RDU501 Intelligent Monitoring Unit User Manual** shipped with the unit and located on www.Vertiv.com. • **Real-time Power:** The current power levels of the system. For details, see Power Management on page 123 . • **Energy Consumption:** The current system load rate and PUE. For details, see Power Management on page 123 .

To navigate through the home page:

- Access the Time Calibration page by clicking the system time in the top right corner.
- Log out of the web UI by clicking the *Log Out* button in the top right corner.
- View the number of events in the console and in the U-level from the past three days and the number of IPMI device alarms by clicking the IT Events/Alarms icon.
- View critical, moderate, and low alarms by clicking the appropriate icon.
- Configure the alarm sound by clicking the Mute link to set the new alarm tone to Open. When an alarm is generated, a sound will play.

8.4 Device

8.4.1 Device Type

To navigate through the device type page:

- View devices of a certain type by clicking on the device type. The content area on the right side displays all devices of that type in a card format. The icon in the top left corner of the card displays different colors based on the alarm status of the device. The right side of the card displays the attention signal. The bottom of the card displays the device name.
- After Clicking on Device name, Modify device name window appears, users can rename the device name through this window
- View and configure device details, including general information, sampling signals, control signals, and settings.

NOTE: The ENV-TH device type is a virtual device. Therefore, the temperature and humidity sensors connected to the monitoring unit and the device name cannot be changed.

8.4.2 Facility Overview

The Facility Overview section allows you to configure the signal display mode.

To configure the Signal Display Mode:

1. Click the enter setup mode icon on the right-hand side of the Overview section to enter the setup state.
2. Click the Signal Display Mode icon.
3. Select the appropriate Signal Display Mode: On Hover, Always Show, or Auto Polling.

NOTE: If selecting Auto Polling, you must enter the auto polling interval time in seconds.

4. Click *Save*.

To return to the browser state:

1. Click the enter setup mode icon on the right-hand side of the Overview section to enter the setup state.
2. Click the Back to Browser icon to return to the browse state.

8.4.3 IT Devices Overview

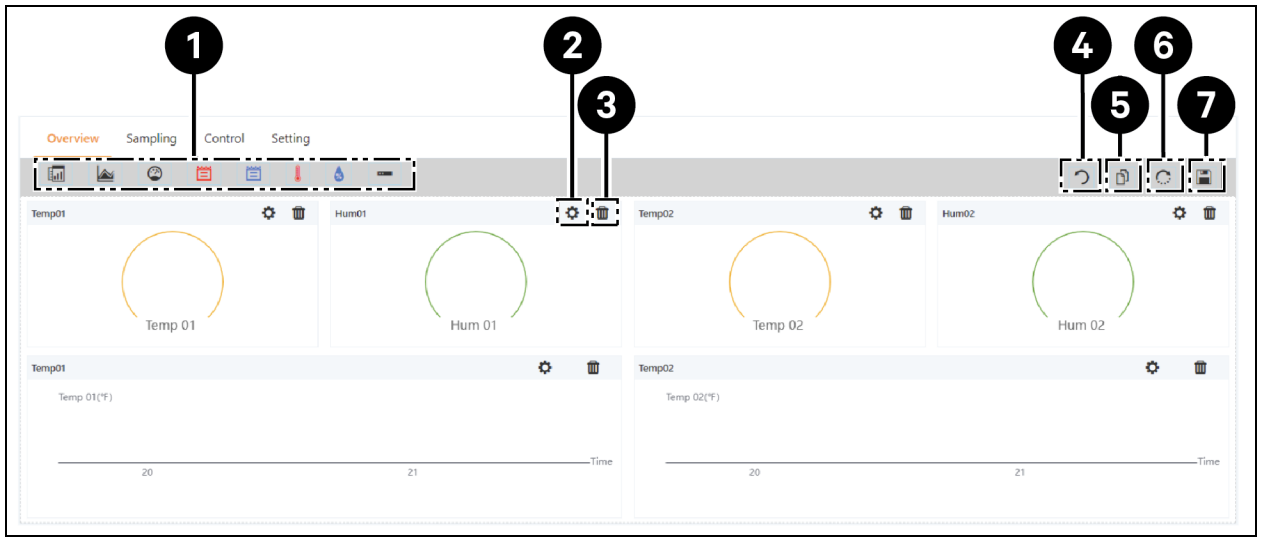
From the Home page, click *IT Device Overview*. The IT Devices Overview page contains corresponding information related to the devices.

8.4.4 Overview

Click *Device Type* > *ENV*. Select a device and click *Overview*. The Overview page displays the different default control modes, according to the different device types.

NOTE: Some device types have specific state diagrams that cannot be removed nor configured. The diagrams can only be updated with state map location information, such as Computer Room Air Conditioning (CRACs), UPSs, and so on.

Figure 8.3 Device Overview Page



Item	Description
1	List of available controls
2	Configure controls
3	Delete controls
4	Back to browser
5	Same type of equipment effectively
6	Restore the default settings
7	Save the configuration

To configure the Overview page for a device:

Click the *Edit* button in the top right corner to customize the page display. In the edit state, you can perform the following functions:

- Drag and drop the overview controls, as desired.
- Click the Back to Browser icon to exit the edit state.
- Click the Same Type of Equipment Effectively icon to batch configure other devices of the same type.
- Click the Restore System icon to restore the default configurations.
- Click the Save icon to save all configurations.

8.4.5 Sampling

Click *Device Type* > *ENV*. Select a device and click *Sampling*. The Sampling page contains a table that displays the sampling signal of the selected device.

NOTE: If a signal is in an alarm state, then the signal's row is highlighted red.

NOTE: If a yellow asterisk is present in the Favorite on Card column, then that specific signal is the default signal value that will appear in the device card list.

To configure the Sampling page for a device:

1. Click the Modify icon on the right side of the Signal Name column to modify the signal name.
2. Click the Restore Default icon on the right side of the Signal Name column to restore the default signal name.
3. Click the *Search* button to find or filter the signal by name.
4. Click on the asterisk in the Favorite on Card column to change the default signal that appears in the device card list, then confirm your selection.

8.4.6 Control

Click *Device Type > ENV*, then select a device and click *Control*. The Control page displays the control signals of the selected device. The availability of control signals is dependent on the device protocol documentation and the accessible controls.

To configure the Control page for a device:

1. Control the device by clicking the *Control* button from the left side of the desired device's row. On the confirmation screen, click *Confirm*.
2. Click the *Search* button to find or filter the signal by name.
3. Click the Modify icon on the right side of the signal name column to modify the signal name.
4. Click the Restore Default icon on the right side of the signal name column to restore the default signal name.

8.4.7 Setting

Click *Device Type > ENV*, then select a device and click *Setting*. The Setting page displays the signal setup for the selected device and allows you to configure various signal settings, such as threshold limits or time delays. The accessible signals are identified on the device protocol documentation.

To configure the setting page for a device:

1. Modify the signal records by typing or using the arrow to set the value in the Value Setting column. Then click the *SET* button to confirm your selection. The modified date and time are displayed in the Refresh Date/Time column.

NOTE: It is critical to modify signal records when you want to report driver issues by attaching the driver data into the monitoring system's log.

Check the boxes next to the Index column to configure multiple signals simultaneously.

NOTE: A maximum of 16 signals can be set at once.

2. Click the *Search* button to find or filter the signal by name.
3. Click the Modify icon on the right side of the signal name column to modify the signal name.
4. Click the Restore Default icon on the right side of the signal name column to restore the default signal name.

8.5 Safe Management

The Safe Mgmt page monitors and manages the security of the cabinet through video surveillance, access control, and firefighting management functions. To access Safe Management, click the Safe Mgmt icon (the shield). This page has three sub-menus: Fire Fighting, Door Access Management, and Video Surveillance.

8.5.1 Fire Fighting

This feature is not applicable for this solution.

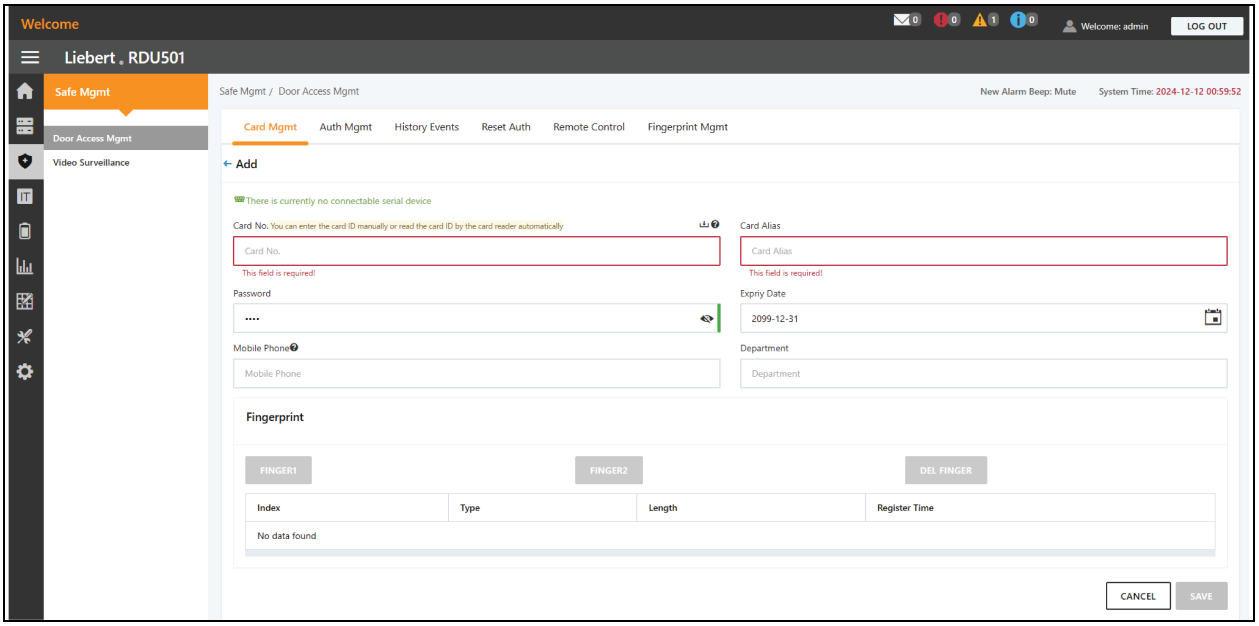
8.5.2 Door Access Management

From the Safe Mgmt page, click *Door Access Mgmt*. The Door Access Mgmt page allows you to configure and view information related to card management, authorization management, historical events, resetting authorization, and remote control capabilities.

Card Management

Click *Door Access Mgmt* > *Card Mgmt*. The Card Mgmt page allows you to add, modify and delete an access control card. You can also view the authorization information for each card. The Card Mgmt page can be hidden from the System Settings > Monitoring Unit > Settings Signal page.

Figure 8.4 Card Management



To add an access control card:

1. Click *Add*.
2. Manually enter the access card number.

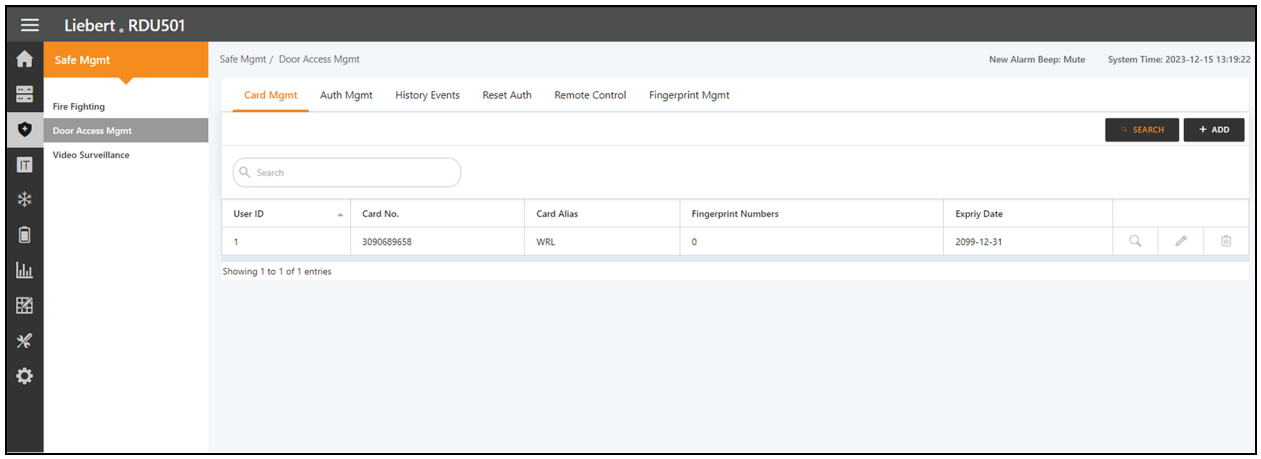
   -or-

   Swipe an unknown card at a door lock then follow the steps described in the procedure To add an invalid card from the history log: on page 120 .

   -or-

   Install a card reader to automatically read the card number. Click the Download icon to download the card reader plug-in. Click the question mark icon to view the plug-in help details.
3. Enter the name of the cardholder.
4. Enter the numeric password. The password must be at least four digits long.
5. Enter the desired period of validity for the access card.
6. Enter the cardholder's telephone number in this format: [+] + [country code] + [phone number] (optional).
7. Enter the cardholder's department (optional).
8. Click *Save*. The access control card appears in the Card Mgmt tab. See **Figure 8.5** on the facing page.

Figure 8.5 Access Control Card Added



To modify an access control card:

Click the Edit icon (the pencil) on the right side of the card entry.

NOTE: The access control card number cannot be modified.

To delete an access control card:

Click the Remove icon (the trash can) on the right side of the card entry.

To change the password:

Change the password, then click *Save*. You can now use your new password to unlock RACK_1 Front Door lock. Alternatively, you can use the password ID, which follows this format: [four digit ID number][access card password].

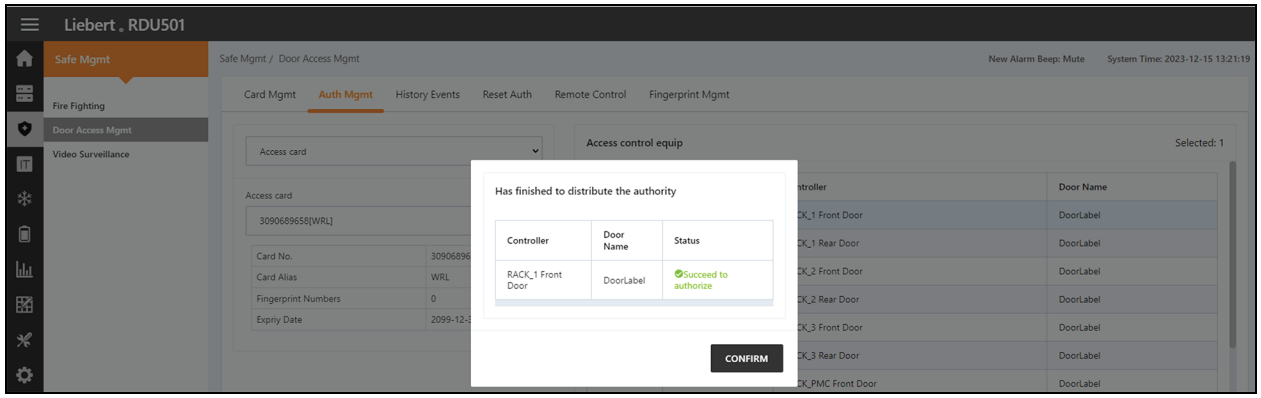
For example, if the ID is 1 and the password is 4321, then the password ID is 00014321.

Authority management

Click *Door Access Mgmt* > *Auth Mgmt*. The Auth Mgmt page allows you to configure the authorization settings of the access control cards.

NOTE: The maximum number of users for a single operation is 4. The maximum number of locks for a single operation is 100.

Figure 8.6 Authorization Management



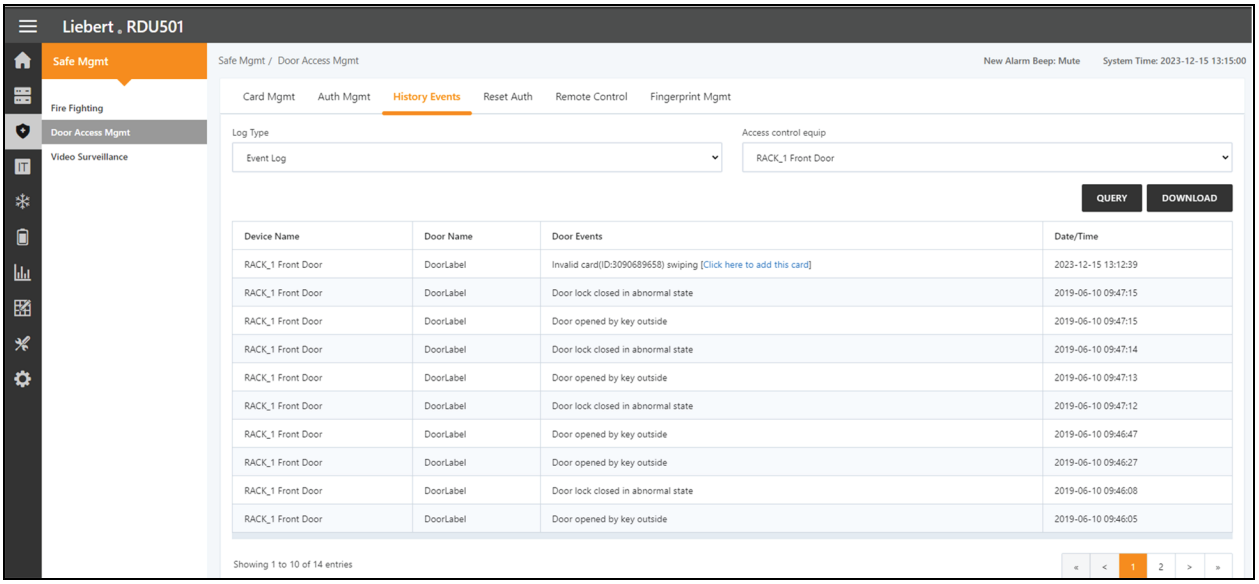
To configure authorization settings:

1. Select the desired controller/lock using the drop-down menu.
2. Check or uncheck the access control card.
3. Click *Save* to authorize or deauthorize the access control card.

History Events

Click *Door Access Mgmt* > *History Events*. The History Events page allows you to query the historical records of events and door openings for the access control devices.

Figure 8.7 History Events



To view the historical records of the access control device:

1. Select the type of query: Event record or Door opening record.
2. Select the access control device.
3. Click the *QUERY* button. The historical record of the device appears.
4. Click the *DOWNLOAD* button to download the historical records (optional).

NOTE: If the access control card number is empty when querying door opening records, you should query the door opening records of all card numbers. Enter the access control card number to query the door opening records of the specified card number.

NOTE: If the cardholders name in the door opening record displays --, it means that the user has been deleted.

To add an invalid card from the history log:

Locate the invalid card swiping event in the history log, then select it to be redirected to the Card Mgmt tab where you can add the card.

Reset Authorization

To remove the authorization information from all access cards on a device:

1. Click *Door Access Mgmt > Reset Auth*.
2. Select the access control device.
3. Click *CLEAR AUTHORIZATION*.

Remote Control

Click *Door Access Mgmt > Remote Control*. You can perform functions such as remote opening on the access control device.

8.5.3 Video Surveillance

From the Safe Mgmt page, click *Video Surveillance*. The Video Surveillance page allows you to view and customize live video, configure video devices, and manage recorded images and videos.

Realtime Video

Click *Video Surveillance > Realtime Video* to view the live video of the device.

To play live video:

Click the Play icon next to the Device column to play the live video.

To customize the video display:

Select the icons on the Realtime Video screen to customize the video display. Refer to Table 8.1 below for icon descriptions.

Table 8.1 Live Video Icon Descriptions

Icon	Description	Function
	Play	Start/stop real-time browsing of a single device.
	Video Monitoring	Set the current page to browse in 1x1, 2x2, or 3x3 mode. When browsing the current page in 1x1 mode, switch to browse video monitoring of different devices.
	Start All Play	Start/stop real-time browsing of all devices.
	Snapshot	Capture a snapshot of the live video. The image is saved to this file path: settings\local configuration\corresponding operation.
	Zoom	Turn on the video image magnification. **NOTE: A red icon indicates turn on the video image magnification.**
	Zoom	Turn off the video image magnification.

Video Replay

Click *Video Surveillance* > *Video Replay* to playback the video of the device.

To replay a recorded video:

1. Select the device from the Device column on the left-hand side.
2. Select the date of the playback to find, then click the Play icon.

To customize the video replay display:

Select the icons on the Video Replay screen to customize the video display. Refer to Table 8.2 below for icon descriptions.

Table 8.2 Video Replay Icon Descriptions

Icon	Description	Function
	Play	Play the video.
	Stop	Stop the video.
	Snapshot	Capture a snapshot of the live video. The image is saved to this file path: *settings\local configuration\corresponding operation.*
	Zoom	Turn on the video image magnification. **NOTE: A red icon indicates turn on the video image magnification.**
	Zoom	Turn off the video image magnification.

Video Device Management

Click *Video Surveillance* > *Video Device Management* to connect a video device. The monitoring unit supports four channels of video access via one Network Video Recorder (NVR), to which a maximum of four IP cameras can be connected. The NVR and IP cameras must support both the onvif protocol and the RTSP protocol.

Video management supports the latest versions of these browsers:

- Google Chrome (recommended)
- Microsoft Edge

To connect a video device:

1. Click the *CLEAR* button to remove any existing video device information, if applicable.
2. Enter the IP address of the video device in the Video device IP field.

NOTE: Ensure the IP address is available, and all parameters are consistent with the device.

3. Enter the username and password.
4. Select either NVR or IPC from the Device Type drop-down menu.
5. Click the *Connection Test* button to test whether the video device is successfully connected. A prompt message appears if the connection was successful.
6. Click the *SAVE* button.

To set video parameters:

Refer to Configuring the Video Parameters on page 108 .

Snapshot Download

Click *Video Surveillance > Snapshot Download* to save up to 50 photos and to download a maximum of five historical videos at once. Captured videos can be viewed from the Video Replay tab under the Video Surveillance menu. The video triggered can be displayed as yellow manual video recording when it is played back.

To capture or record the captured image by video device:

You must first add the alarm linkage configuration. For more information, see Alarm Actions on page 126 . When the configured alarm condition is triggered, the captured image can be downloaded and deleted only through the Snapshot Download tab.

To download the image:

Click on the photograph linkage on the Snapshot Download page.

To delete the image:

Click the *Delete* button on the right side of the Snapshot Download page.

8.6 Power Management

From the left-hand sidebar, click the Power Mgmt icon (the battery). The Power Mgmt page displays the current and historical record of energy consumption data in accordance with user-defined rules to help users analyze the overall energy consumption of the equipment room. This page has three sub-menus: Current PUE, History PUE, and Calculation Setting.

8.6.1 Calculation Setting

From the Power Mgmt page, click *Calculation Setting*. The Calculation Setting page allows you to view the system load percent settings and PUE modes. You can also clean up the configuration information on the page.

To switch PUE modes:

Click the *Power Mode* or *Power Consumption Mode* radio button at the top of the screen.

To clean configuration information:

1. Click the *CLEAN UP* button to clean the configuration information.
2. At the confirmation window, click the *CONFIRM* button.
3. Click *SAVE*, then click *CONFIRM*.

Figure 8.8 Power Mode Tab

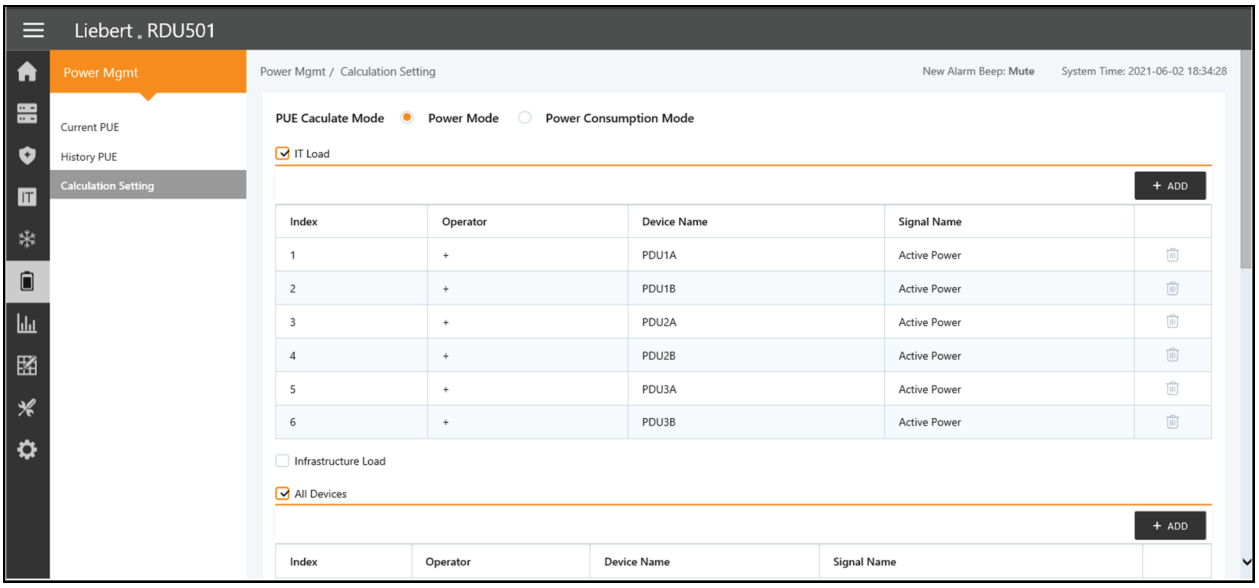
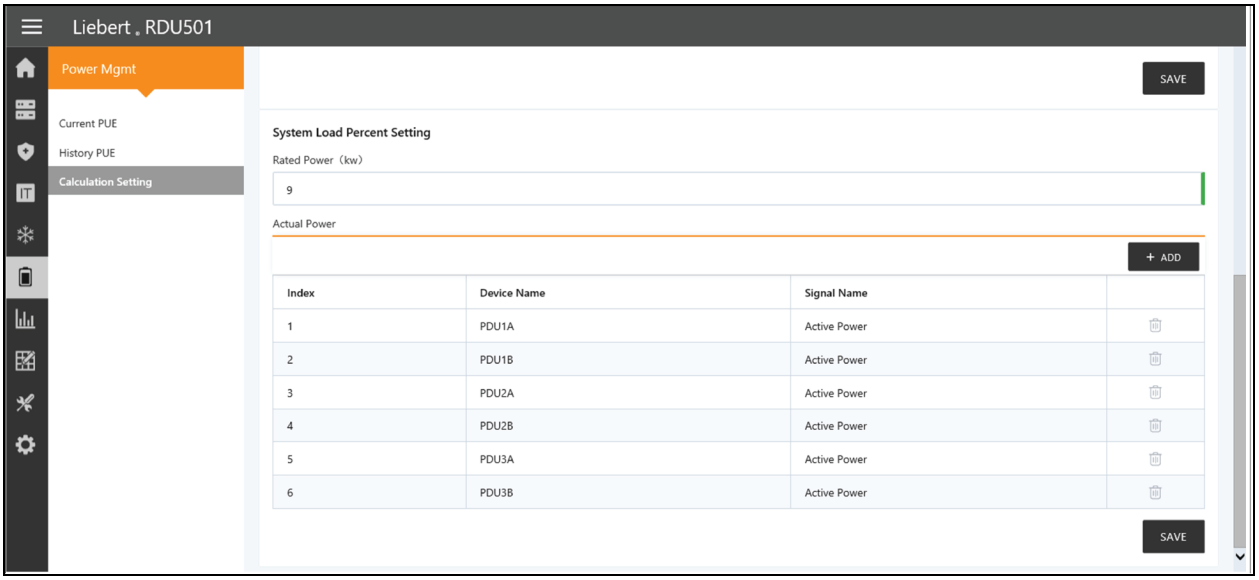


Figure 8.9 System Load Percent Setting Tab



8.7 Device Options

From the left-hand sidebar, click the Device Options icon (the tools). The Device Options page allows you to configure and add device information, perform batch configurations, modify the device and signal name, modify the signal status, configure alarm notifications and actions, define the SMS and email information. This page has six sub-menus: Infrastructure Device Mgmt, Batch Configuration, Signal Setting, Notify Type Configuration, Email and SMS Configuration, and Alarm Actions.

8.7.1 Signal Setting

To modify the device name:

From the Modify Device Name page, you can change the device name. Enter the new device name in the provided field. Upon entry, the Settings button appears in the top right corner of the list. Use the Settings button to configure the batch settings.

NOTE: The device name or signal name may contain up to 32 characters. It cannot consist of all spaces nor contain Special characters.

Signal Modifications

You can modify the signal name, the storage period of the sampling signal, the storage threshold of the sampling signal, the signal unit of the set signal, and the alarm level of the alarm signal according to the device type or device name. Select the Device Type/Device and Signal Type, enter the new signal information, and click the *Settings* button to configure the batch settings.

NOTE: You can set the signal in batches by checking multiple check boxes on the left-hand side and setting up 16 signals at the maximum batch size.

NOTE: For ENV-TH, ENV-THD and ENV-4DI, the system offers the linkage modification function of the signal name. Linkage modification refers to the modification of the sampling signal name resulting in the subsequent modification of the corresponding control signal, setting signal, and alarm signal name. Since all other signal names are updated accordingly, the page only allows the sampling signal name to be modified.

To modify the signal name:

NOTE: The signal name modified here will be used as the default signal name for the device.

1. Select the Device Type/Device Name checkbox.
2. Select a device type/device in the drop-down menu.
3. Select a signal in the Signal Type drop-down menu. A corresponding signal list appears.
4. Enter a new signal name in the Update Device Name Box. A SET button appears in the top right corner.
5. Click the *SET* button. Upon selection, the signal name updates successfully.

To modify storage cycle/storage threshold:

1. Select the Device Type checkbox.
2. Select a device type in the drop-down menu.
3. Select the sampling signal in the Signal Type drop-down menu. The signal list appears.
4. Enter the storage cycle/storage threshold in a row.
5. Click the *SET* button to make one or more changes.
6. Click on the Store Threshold table title. The storage cycle input box pops up.
7. Enter a new storage cycle (for example: 3600), then click the *OK* button. All non-zero storage cycles in the device type sampling signal update to the new specified cycle.

8. Click the New Store Threshold header row. The storage threshold input box appears.
9. Enter a new storage threshold (for example: 5), then click the *OK* button. All storage thresholds that are not 0 in the device type sampling signal update to the new specified threshold.

To modify the alarm level:

1. Select the Device Type/Device Name checkbox.
2. Select a Device Type/Device from the drop-down menu, then select the alarm signal in the Signal Type drop-down menu. The signal list appears.
3. Select an alarm level in a row and click the *SET* button to make one or more changes.

To modify the signal unit:

NOTE: Modifying the signal unit is only supported when the analog signal of ENV-THD and 8DIAI devices is being modified by device.

1. Select the Device Name checkbox.
2. Select the THD/8DIAI device in the drop-down menu, then select the setting signal in the Signal Type drop-down box. The signal list appears.
3. Enter a new signal unit in a row and click *SET* to make one or more changes.

To restore the default name:

NOTE: Restoring the default signal name is only supported when modifying by device.

1. Select the Device Name checkbox.
2. Select any device in the drop-down menu, then select a signal type in the Signal Type drop-down menu. The signal list appears.
3. Click the Restore System Name icon on the right side of the device to restore the initial signal name of the selected signal.

8.7.2 Alarm Actions

From the Device Options page, click *Alarm Actions*. The alarm actions page allows you to add new alarm actions. The monitoring system generates a cabinet high temperature alarm when at least two temperature collection points at front door have exceeded the thresholds. This alarm disappears when the collection points fall below two. When the cabinet high temperature number is greater than one and the fire protection is not discharged, the monitoring system turns on all emergency fans.

Additionally, this page contains the information for the fan controller and three LED indicator lights. The back door of the cabinet is equipped with monochromatic lights. The PMC and front door of the cabinet are equipped with three colored lights. Refer to Table 8.3 on the facing page for the meaning of each color.

Figure 8.10 Alarm Actions Page

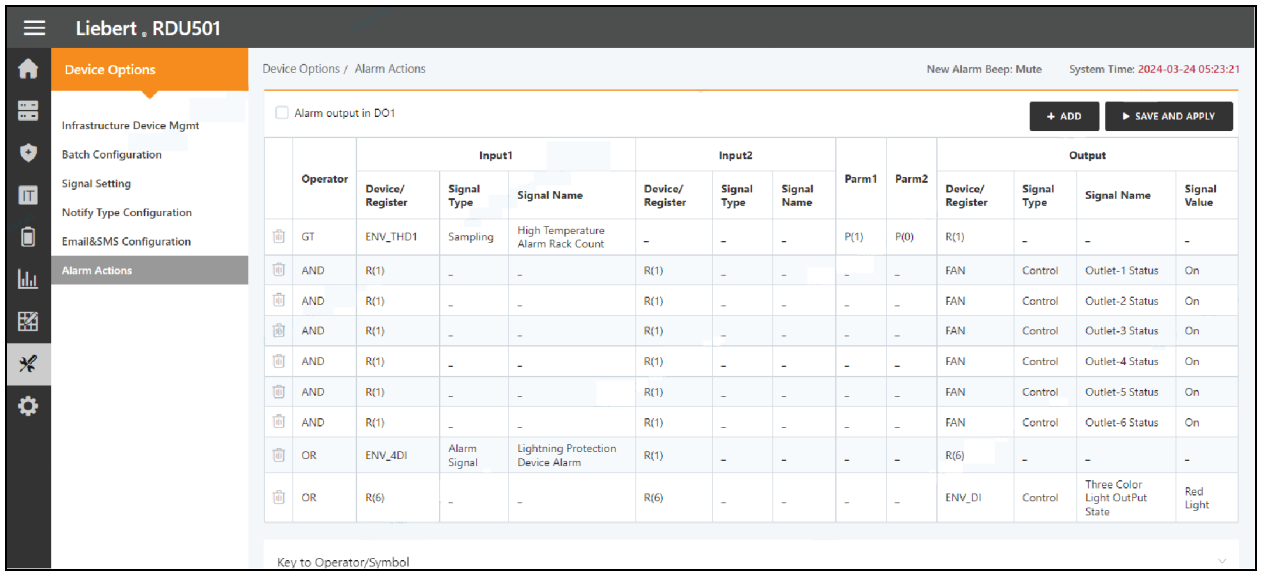


Table 8.3 LED Indicator Description

Color	Description	Function
White	Maintenance	Indicates a cabinet door is open.
Blue	Normal	Indicates all doors are closed, and no alarms are triggered.
Red	Alarm	Indicates all doors are closed, but an alarm has been triggered.

To navigate through the Alarm Actions page:

From the Device Options tab, click the *Alarm Actions* tab to perform the following functions:

- Enable the DO1 alarm output by checking the Alarm output in DO1 box and clicking *Confirm*.
- View the operator's name and information for Input1-2, Parm1-2, and Output.
- View the specification of the symbol under the Key to Operator/Symbol.
- Add a new alarm linkage expression.

To set the fire alarm strategy (optional):

The default alarm configuration of the front door 3-color red light is as follows: surge protector alarm, cabinet high temperature ≥ 2, alarm (firefighting alarm). The fire alarm strategy can be configured from the Safe Mgmt > Fire Fighting > Fire Alarm Strategy page.

NOTE: If the firefighting spray is activated, the monitoring unit turns off all emergency fans by default.

To extinguish the front door 3-color light-blue light:

Use the rocker switch located on the front panel of the PMC to turn off the light.

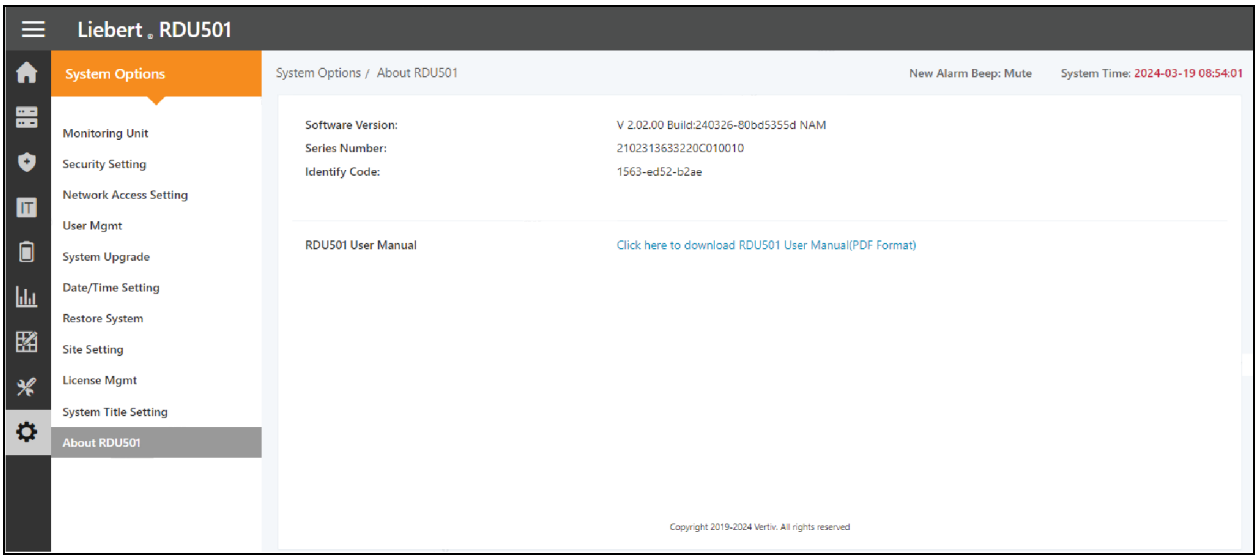
8.8 Additional Information

For more information on the functionality and usage of the Vertiv™ Liebert® RDU501 intelligent monitoring unit, refer **SL-71186 Vertiv™ Liebert® RDU501 Intelligent Monitoring Unit User Manual**. The user manual is shipped with the unit and can be also located through the interface.

To locate the Vertiv™ Liebert® RDU501 Intelligent Monitoring Unit User Manual in the web UI:

1. From the left-hand sidebar of the monitoring unit's web UI, click the Settings icon.
2. Click the *About RDU501* tab.
3. Click the link to the right of RDU501 User Manual to download the PDF.

Figure 8.11 Monitoring Unit User Manual



9 Operation

This chapter describes the Vertiv™ SmartAisle™ operations, including the pre-startup check, startup, system commissioning, and shutdown.

9.1 Pre-Startup Check

The checklist in Table 9.1 below, needs to be evaluated to verify that all items and parameters are fulfilled.

Table 9.1 Installation Check

Type	Check Item	Check Result
Mechanical	All cables and circuit connectors are tightened, and the fastening screws are tightened.	
	The product is installed properly.	
	Fasteners used for transport are removed.	
	After the equipment is installed, the debris inside or around the equipment is removed (such as transport materials, structural materials, and tools).	
Cooling	All valves in the refrigerant circuit are opened according to the instruction tags on the valves.	
	The cooling piping system has passed the pressure and leakage tests and confirmed to be qualified.	
	The water supply and drainage piping system of the humidification system is reliably connected and inspected for leakage in accordance with the specified material requirements.	
	Correct refrigerant is charged.	
	The compressor heating belt is preheated for more than 12 hours.	
	The temperature of the equipment room is above 18 °C (64.4 °F) and has a certain heat load. If the condition is unavailable, use other heating devices or manually operate the heaters of the unit and adjacent equipment forcibly (carry out the operation in accordance with the SL-70747 Vertiv™ Liebert® CRV CRD25 and CRD35 User Manual to preheat the environment of the equipment room, so as to ensure the amount of heat load necessary for commissioning.	
	The water level switch cable is connected and the water level floater can work properly.	
	The power supply disconnector of the air-cooled condenser of the outdoor unit is connected.	
Power supply and distribution	The cable inlet voltage measured using the multimeter is normal and the same as the rated voltage on the equipment nameplate.	
	There is no open circuit or short circuit in the electrical circuit of the system.	
	All electrical or control connections are correct, and all electrical and control connectors are tightened	
	Each switch is opened and closed to check the mechanical performance.	
	The prefabricated intelligent rack power distribution system connector on the top of the cabinet is connected reliably.	
Lighting	The power supply of the lighting controller is connected correctly.	
Monitoring	The line sequence of all communication cables is correct.	

WARNING! It is prohibited to power on the system before Vertiv authorized professional personnel check and confirm the required items.

NOTE: Before opening and closing the input switch, ensure that the input power is completely disconnected.

9.2 Startup

Before starting up Vertiv™ SmartAisle™, contact Vertiv customer service hotline for authorization before proceeding with the subsequent steps and this type of activities needs to be done by a Vertiv technician.

The startup procedure is as follows:

1. Close the UPS external input power switch, and confirm that the UPS input power voltage, frequency, and phase are normal. Close the main circuit input switch and output switch in turn and observe whether the running status is normal through the UPS display panel.
2. Close the circuit breaker protecting the rPDU of the PMC rack. At this time, the electric door of the PMC rack is powered on and enters the self-check state. Observe whether the running status is normal. In addition, power on the RDU501 and the control screen, and observe whether the system is running normally through the control panel.
3. Close the circuit breakers of each PDB to power on the in-row cooling units.
4. Close the main switch and downstream switch of the indoor unit and the switch of the outdoor unit. Observe whether the running status is normal through the air conditioner display panel.
5. Close all the circuit breakers protecting the rack PDUs, either in the RXA or in the TOBs.

NOTE: After the UPS is powered on, manually turn on the inverter on the panel. For the more information about the precautions for the UPS startup process, refer the SL-71076 Vertiv™ Liebert® APM2 30 to 120 kVA UPS User Manual .

NOTE: For more information about the precautions for the air conditioner startup process, refer the SL-70747 Vertiv™ Liebert® CRV CRD25 and CRD35 User Manual.

WARNING! The SmartAisle™ system start-up must be carried out by authorized professionals who have taken the corresponding training. Vertiv customer service personnel are recommended.

9.3 Monitoring and Commissioning

9.3.1 Requirements for Vertiv™ Liebert® RDU501

The Vertiv™ Liebert® RDU501 is equipped with a built-in web server, automated IT server shutdown and out-of-band management to offer the customer compete control over the data center infrastructure.

The Liebert® RDU501 enables data center managers to perform the following operations through a secure web interface:

- Monitor the health and status of equipment.
- Access the server's service processor.
- Manage out-of-band and serial console connections.
- Monitor enhanced communication speed for transmitting controls, commands, and parameter settings.

Vertiv™ Liebert® RDU501 Also supports third-party communication protocols:

- SNMP
- Modbus 485
- Dry contacts
- Analog signals

Table 9.2 Mechanical Specifications

External Model	Measurement	Value
Liebert® RDU501	Height, mm	43.5
	Width, mm	440
	Depth, mm	455
	Weight, kg	10
IRM-4COM IRM-8DIAI IRM-8DOAO	Height, mm	20
	Width, mm	152
	Depth, mm	199
	Weight, kg	1

Table 9.3 Environmental Conditions

Item	Requirement
Application location	Usually in data center or computer room, with air conditioner
Working temperature	0 °C (32 °F) to +60 °C (140 °F)
Relative humidity	5 % RH to 95 % RH, no condensing
Working environment	Dust: compliant with the indoor requirements of GR-63. No corrosive gas, flammable gas, oily mist, steam, water drops or salt
Air pressure	70 kPa to 106 kPa
Storage temperature	-20 °C (68 °F) to +70 °C (158 °F)
Cooling	Natural cooling, fan-less design
Power distribution network	TT/TN
Protection level	IP20

Table 9.4 Performance Specifications

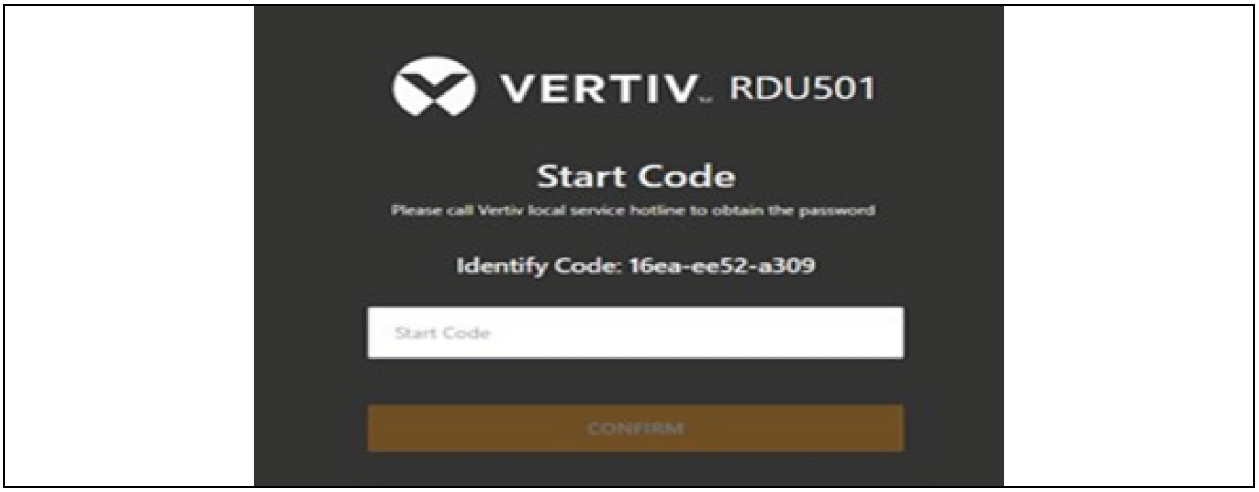
Ports	Cable Standard	Distance (Unit: m)
SENSOR1	Standard category 4 twisted-pair cable	Less than or equal to 100
SENSOR2	Standard category 4 twisted-pair cable	Less than or equal to 100
DI ports	Standard category 4 twisted-pair cable	Less than or equal to 100
DO ports	Standard category 4 twisted-pair cable	Less than or equal to 100
COM ports	Standard category 4 twisted-pair cable	Less than or equal to 100

NOTE: Product Certificate: RDU501 satisfies CE allege, UL, CE, FCC and RoHS R10.

9.3.2 Authorized Startup

1. When logging in to Vertiv™ Liebert® RDU501 for the first time, open the browser and enter the IP address of RDU501 in the address bar (the default IP address of LAN1 is 192.168.0.254 and the default IP address of LAN2 is 192.168.1.254), and open the authorized startup page, as shown in Figure 9.1 below.

Figure 9.1 Authorized Startup Page

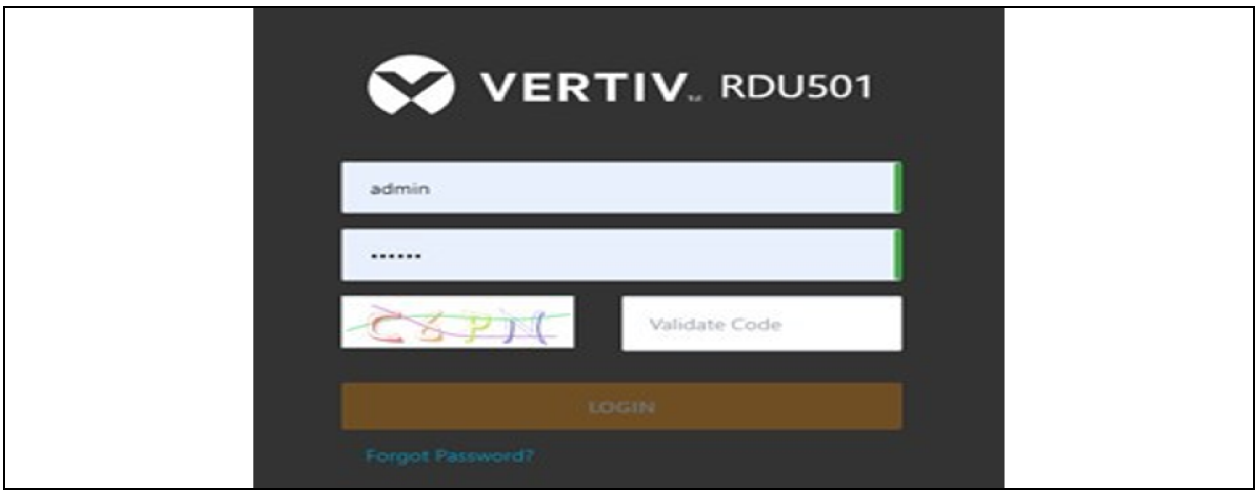


2. Call Vertiv customer service hotline (400-887-6510) and provide the feature code, SN, and necessary customer information to the customer service personnel to obtain the startup password.
3. Enter the obtained startup password in the startup password text box and click the *OK* button. If the startup password is correct, the system automatically redirects to the login page, as shown in Figure 9.2 below.

9.3.3 Login Page

1. Open the browser and enter the IP address of RDU501 in the address bar. The login page is displayed, as shown in Figure 9.2 below.

Figure 9.2 RDU501 Login Page



2. Enter the username and password (the default user name and password are admin and Vertiv respectively), and click the *LOGIN* button.

3. Enter the networking status. For specific networking operation process, refer SL-71186 Vertiv™ Liebert® RDU501 Intelligent Monitoring Unit User Manual.

NOTE: Only the admin user can perform the upload operation. Perform this operation under the guidance of professionals.

NOTE: For more information about the use methods and precautions for the Liebert® RDU501 monitoring system, refer the SL-71186 Vertiv™ Liebert® RDU501 Intelligent Monitoring Unit User Manual.

NOTE: Monitor whether each equipment enters the normal running status on the Vertiv™ Liebert® RDU501 monitoring platform.

NOTE: After all equipment runs properly, turn on IT equipment such as user server.

NOTE: If the Liebert® RDU501 monitoring package is used, carry out the preceding commissioning operations on the Liebert® RDU501. For more information, refer the SL-71186 Vertiv™ Liebert® RDU501 Intelligent Monitoring Unit User Manual.

9.4 AC/UPS Commissioning

For more information about the air conditioner operations and precautions, see the SL-70747 Vertiv™ Liebert® CRV CRD25 and CRD35 User Manual.

For more information about the UPS operations and precautions, see the SL-71076 Vertiv™ Liebert® APM2 30 to 120 kVA UPS User Manual.

9.5 Shutdown

The shutdown procedure is as follows:

1. Ensure that all user IT equipment is completely powered off.
2. Open all the server rack doors before disconnecting the circuit breaker.
3. Disconnect the circuit breaker of the monitoring system.
4. Press the shutdown button on the display panel of the each in-row cooling unit.
5. Disconnect the circuit breakers of either RXA or TOBs.
6. Disconnect the UPS input and output circuit breakers. Refer UPS Shutdown procures for more information.
7. Disconnect the circuit breakers of customer switchboard to shutdown PDBs.
8. Check if all electrical equipment is completely powered off.

9.5.1 Procedures For Completely Powering Down UPS

WARNING! The following procedures will switch off all power to the load.

1. Press the EPO key on the UPS operator control and display panel. This disables the rectifier, inverter and static switch operation, and the corresponding UPS is isolated from the load.

NOTE: Unless in an emergency situation, do not press the remote EPO key.

2. Open the rectifier input switch, bypass input switch and BCB.

   In a parallel system, at this point, other UPSs report Parallel Comm. Fail, which is normal. Other UPSs continue to power the load through the inverter.

All of the indicators and the LCD on the operator control and display panel will extinguish as the mains-driven internal power supplies decay.

3. Open the output switch of the UPS.

WARNING! After the UPS is powered down completely, the battery terminals still remain energized at hazardous voltage levels.

9.5.2 Procedures for Completely Powering Down UPS While Maintaining Power to Load

The following procedures are applicable for completely powering down the UPS and still keeping the power supply to the load. In a parallel system, perform each step of the procedures in every UPS module before proceeding to the next step.

1. Transfer the UPS from normal mode to maintenance mode. For more information, refer SL-71076 Vertiv™ Liebert® APM2 30 to 120 kVA UPS User Manual.
2. Close the maintenance bypass switch of the external maintenance bypass cabinet.
3. Open the rectifier input switch and bypass input switch of the UPS.
4. Open the output switch of the UPS.

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10 Maintenance

This chapter provides a general maintenance checklist for the Vertiv™ SmartAisle™ solution and a maintenance schedule for the cooling system to ensure system operations are being properly maintained.

WARNING! Maintenance operations must be done by professional personnel authorized by Vertiv Technical Training.

WARNING! All maintenance operations must be carried out strictly observing the European and National accident prevention regulations, especially the accident prevention regulations concerning electrical systems, refrigerators and manufacturing resources. Maintenance may be done to air conditioning equipment only by authorized and qualified technicians. To keep all warranties valid, the maintenance must adhere to the manufacturer's instructions.

WARNING! To ensure personal safety, professional maintenance personnel must determine if it is necessary to cut off the total input power to the SmartAisle™ solution based on the system's usage status and maintenance content.

NOTICE

- It is recommended to select the original parts produced by Vertiv to ensure the economics, stability, and maintainability of the system operation.
- Ensure proper use of the SmartAisle™ solution and follow daily inspection strictly accordance with the relevant descriptions in the user manual.
- The external installation of the infrastructure solution (including external power wiring, line installation, and related engineering installation) is subject to strict compliance with user manual requirements and local regulations, especially for power, refrigeration, and production.
- To ensure the normal operation of the equipment, routine inspections must be carried out on a regular basis. Monthly inspections are recommended.

10.1 Preventive Maintenance Checklist

Table 10.1 General Maintenance Checklist

Parameters	Frequency
Environmental Checks • Ambient Temperature • Cleanliness • Location • Firm and Suitable Installation • Check exterior for damage and interior for cleanliness and condition of wiring.	Annually
Check List Report • Record all checks and measure.	Annually
NOTE: General maintenance checklist should be followed at a time of the preventative maintenance plan.	

Table 10.2 Modular UPS Maintenance Checklist

Parameters	Frequency
Visual Checks • Insulation, overheating, damage major visit only • Complete visual inspection including sub-assemblies, wiring-harnesses, contacts, nuts, bolts, screws, and connectors Inspect for broken, brittle, damaged or heat stresses component and cables.	Every 6 months
Output Measurements (On Line) • Output RMS current (phases and neutral) • Output peak current (phases and neutral) • Output voltage • Output power (kW, kVA, kVAR)	
Cleaning/Air Flow • Check fans, door/compartment seals. • Replace air filters (If required). • Clean any foreign material and dust from internal. • Compartments	
Synchronizing Major Visit Only • Verify Inverter to mains synchronization. • Verify transfer from inverter to bypass and vice-versa. • Verify voltage and phase lockout.	
Battery • Discharge test (with customer approval) major visit only check all connectors for tightness.	

Table 10.2 Modular UPS Maintenance Checklist (continued)

Parameters	Frequency
Control Calibrations Major Visit Only • Calibrate UPS metering and ensure all UPS metering is within UPS specification. • Install or perform engineering field modification including firmware revisions as necessary.	
Metering • Battery DC volts and current • Input volts/current • Output voltage, current and frequency	
Software • Status check of all alarm circuits and display messages; download and record all the configuration data, alarm history, fault data.	

Table 10.3 Direct Expansion CRV

Parameters	Frequency
Air Filters • Check for soiling, damage, corrosion.	Every 3 to 4 months
Ultrasonic Humidifier (if Applicable) • Check air filter. • Check and clean the pan. • Water presence check. • Check for leaks. • Check operation of humidifier water pumps (if applicable). Major Visit Only • Check pressure transducer cleanliness.	
Water/Glycol Circuits (if Applicable) • Purge air from water circuit. • Examine for any water/glycol leaks. • Check coils cleanliness. • Check coils for damage and corrosion. Major Visit Only • Check chilled water in/out temperatures and pressures. • Check chilled water valve proper functioning.	
Electrodes Humidifier (If Applicable) • Check the canister for any deposits. • Check the condition of all steam hoses. • Check for leaks. • Check operation of humidifier water pumps (if applicable). Major Visit Only • Check power and current absorption.	
Fans Section	

Table 10.3 Direct Expansion CRV (continued)

Parameters	Frequency
• Check for soiling, damage and corrosion. • Check blower noise. • Examine motor mounts for tightness. • Check for abnormal vibrations. Major Visit Only • Measure the current and power consumption. • Check the electrical connections.	
Infrared Humidifier (If Applicable) • Check the pan drain for any type of blockage. • Examine the humidifier lamps for proper operation. • Check the pan for any type of mineral deposits. • Check and clean internal drains. • Check for leaks. • Check operation of humidifier water pumps (if applicable).	
Refrigerant Cycle/Section • Examine refrigerant lines for leaks or damage. • Using the sight glass, check lines for moisture. • Check superheat. • Check sub-cooling. • Check compressor noise vibration. • Check compressor starting and running currents. • Check coils cleanliness. • Check coils for damage and corrosion. • Check condensate drain from evaporator coil. Major Visit Only • Set, adjust and tighten the functional elements. • Monitor suction, head and discharge pressure.	Every 3 to 4 months

Table 10.3 Direct Expansion CRV (continued)

Parameters	Frequency

Controls
• Check connections for electric and mechanical functions.
• Check parameters setting and sensor calibration.
Major Visit Only
• Check safety devices for proper operation and adjust accordingly:
  • Air clogged filter device.
  • Fan safety device
  • Humidifier safety devices.
  • Electrical heater safety devices.
  • Hydraulic circuit safety devices.
• Functional tests on:
  • Fans, humidifier, heaters, air damper and hydraulic circuits.
  • Check operation sequence.	

Electric heaters (if applicable) • Check correct fixing major visit only. • Check power and current absorption.	

Table 10.4 Vertiv™ Liebert® RXA Checklist

Parameters	Frequency
Thermal infra-red image • Thermal infra-red image at the main breaker and ABB smissline. **NOTE: This checkpoint is also applicable for Busbar maintainance.**	Annually
Check/Record Voltage and Currents	
Calibration Calibration verification. voltage and current measure (compared with calibrated multi-meter) at each ABB smissline.	
Output Measurements Waveform • Output RMS Current • Output Peak Current – as required • Output voltage	Annually
Cleaning/Air Flow • Check air flow, door/compartment seals. • Clean grids, power module and PCB. • Clean inlet/outlet air flow.	
Busway • Thermal imaging report	

Table 10.5 Power Management Cabinet Checklist

Parameters	Frequency
• Ensure all devices are communicating with the RDU501. • Ensure all door access controllers are functioning correctly. • Check smoke alarms are functioning. • Check CCTV cameras are operational, and NVR is recording. • Check calibration of all rack temperature/humidity sensors. • Check air gaps (server/blanking plate install) in all racks..	Annually
Rack and PDU Checklist	
• Complete visual inspection. • Checks for oxidation spots. • Check fixings (screw). • Check cable arrangement. • Check signal plugs (RJ45). • Check tightening torque.	Annually
Electrical Measurements (On Line – Metered Model) • Input RMS current/voltage (phases and neutral) • Output RMS current/voltage	Annually

Table 10.6 Tap-Off Box Checklist

Parameters	Frequency
NOTE: Upon identifying a local problem, preventive maintenance should be investigated with the busway track isolated. • Visually check the installation of the Tap-Off Box. • Check outgoing cable connections. • Check the operation of the switching On/Off operation. • Examine protective device for signs of short circuit operation. If a short circuit has occurred on the equipment connected to the Tap-Off Module, check operation of device and the integrity of the device.	Annually

Table 10.7 Checklist for Power Distribution Cabinets (PDCs)

Parameters	Frequency
PDC • Check date and time on PDC HMI matches EPMS within 1 minute. • Check alarms on HMI. • Check alarms on EPMS. • Check discrepancies between PDC setpoints and latest design criteria. • Check all internal lamps functioning. • Check HMI and Meter data files are latest version. • Check mains meter values for line to line voltage and current. • Check and measure discharge duration. • Check all temperature sensors functional within 10C of infrared measurement. • Check all industrial modular connector latches on roof are securely closed. • Confirm no debris is accumulated on roof/top panel of PDC. • Check all air intake and extract fans are operational with no visible debris on guards. • Check fan fault circuit is operational and confirm fan fault alarm is generated. • Check all door latches are secured. • Check no active alarms on HMI or EPMS.	Annually

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11 Troubleshooting

This chapter details troubleshooting procedures for the Vertiv™ SmartAisle™ infrastructure solution and the Vertiv™ RDU501 intelligent monitoring unit.

11.1 Monitoring Unit Common Issues and Solutions

For troubleshooting the Vertiv™ Liebert® RDU501 Intelligent Monitoring Unit, refer to the **Table 11.1** below for common issues, causes, and solutions. If your specific issue is not addressed in the **Table 11.1** below, refer to the **SL-71186 Vertiv™ Liebert® RDU501 Intelligent Monitoring Unit User Manual** shipped with the unit and located on www.Vertiv.com.

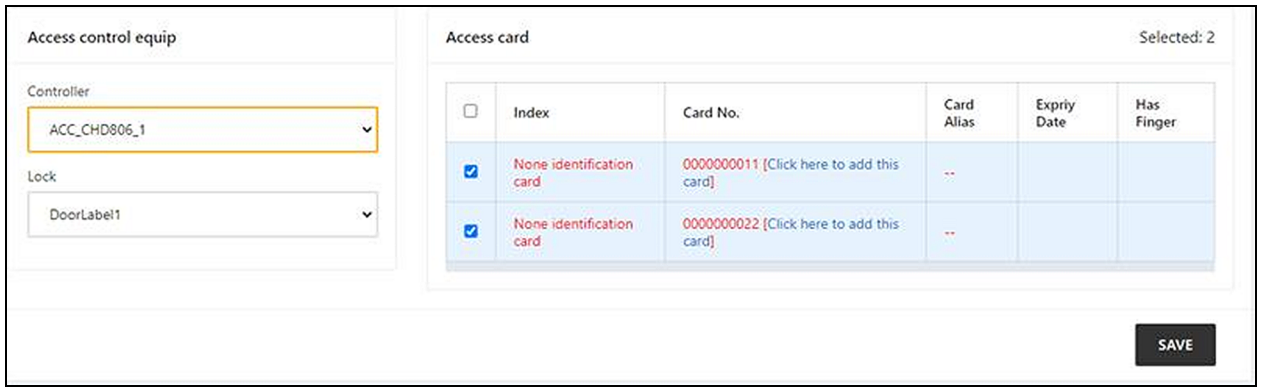
Table 11.1 Monitoring Unit Troubleshooting

Category	Issue	Possible Causes	Solutions
Alarm	Communication failure with any of the monitoring devices.	Improper cabling.	Check the cable clamp to ensure it's intact, and check if the cable connection has been loosened.
	After an alarm generates, the notification system does not respond properly. I'm receiving less than three email or SMS notification (or none at all).	Incorrect SMS module and mail server configurations.	Verify that the notification configurations are correct.
		Blocked SMS function.	Contact the operator to confirm if the SMS function is blocked and possible work arounds.
		Suspended telephone card.	Confirm if the telephone card has been suspended.
		If the above solutions do not resolve the issue, click *Data & History > History Log*. Check the log for a record of failed mail delivery. If there is a record of such, then the network or mail server communication is busy.	
Authorization of Monitoring Unit	Despite the monitoring unit's communication being normal, the login page is not appearing.	Incorrect IP address.	Confirm the IP address is correct. As the unit uses two network cards, ensure the Ethernet cable is plugged into the proper interface. If the address is static, refer to the Ethernet port in the monitoring unit section for the default IP value.
		Poor connection.	Open a Windows command prompt, then enter the following ping command to confirm the IP address connectivity: ping [IP address]. The ping statistics should inform you if there has been a loss of connection.
		If the above solutions do not resolve the issue, reset the device to restore the default IP address.	
Authorization of Access Card	A new access card needs to be added to record the authorized user's information in the monitoring unit system. See **Figure 11.1** on the next page for reference.	The access control has been connected to the monitoring unit for management. It is damaged during use and needs to be replaced.	Perform a permission reset for the access control device.
		The monitoring unit data collector is damaged during use and needs to be replaced.	
		Access control is connected to the monitoring unit A for management. Among them, authorization information already exists for the access control. It is not allowed to switch to monitoring unit B for management.	

Table 11.1 Monitoring Unit Troubleshooting (continued)

Category	Issue	Possible Causes	Solutions
		The fingerprint card reader is connected through the access control A for management. Among them, the fingerprint card reader already has authorization information, and it is not allowed to switch to access control B for management.	
Sensor	The intelligent sensor has no display and cannot be displayed on the monitoring unit page.	Disconnected from the unit's sensor port.	Connect the intelligent sensor to the monitoring unit's SENSOR port.
		Connected to the wrong sensor port.	Ensure address **1** is connected to SENSOR 1 and address **2** is connected to SENSOR2.
		Incorrect sensor address.	Ensure the address is not set to **00**.
		Improper cabling.	The connection cable must be a direct-through and intact.
	The alarm indicator of the intelligent sensor is always on.	Device malfunctioning.	Return the intelligent sensor to the service center of the Vertiv office.
Server	IT equipment accessed through the IPMI2.0 protocol is experiencing communication failure.	Server does not support IPMI2.0 protocol.	Refer to the user manual provided by the server manufacturer to determine if the server support the protocol.
		Poor connection.	Open a Windows command prompt, then enter the following ping command to confirm the IP address connectivity: ping [IP address]. The ping statistics should inform you if there has been a loss of connection.
		Incorrect parameters for the IPMI device management page.	Verify that the correct parameters for the IP address, port, username, and password have been entered.
		If the above solutions do not resolve the issue, the server may be rejecting the session request from the monitoring unit. Contact Vertiv Technical Support for additional assistance.	

Figure 11.1 Access Card Troubleshooting



11.2 Vertiv™ SmartAisle™ Common Issues and Solutions

For troubleshooting the SmartAisle™ solution, refer to the Table 11.2 below for commons issues, causes, and solutions. If your specific issues are not addressed in the below table, contact Vertiv Technical Support.

Table 11.2 SmartAisle™ Troubleshooting

Category	Issue	Possible Cause	Solution
Temperature	The amount of ambient heat alert.	Unreasonable value for the high temperature alarm value.	Check the high temperature warning values of the temperature and humidity sensors at the adjustment front door.
		Overloaded use	Check if the maximum thermal load exceeds the cooling system rating. **NOTE: Operating temperature of cooling system is -35 to 48 °C. The maximum allowable outdoor temperature is 52 °C (125.6 °F) with derating of the nominal capacity (approx. 30%). Refer to Project Hirating data for performance specification of this project.**
		Fan operating improperly.	Check to see if the fan is open or closed.
		Fan failure	Contact Vertiv technical support.
		Faulty air conditioning cooling output.	Contact Vertiv technical support.
		Door not fully closed.	Close all unit doors.
	The high temperature threshold has been exceeded, and the alarm is sounding.	Unreasonable value for the high temperature alarm threshold setting.	Reset the value.
		Indoor load exceeds design capability of the equipment.	Check the room seal or further expand the capacity.
	The temperature is imbalanced.	Fins in front of CRVs are obstructed.	Adjust the grills in the front of the CRVs to manipulate airflow.
		IT infrastructure not installed uniformly.	Adjust the individual cabinet loads to equilibrium as required.
		Load fluctuates sharply in the short term.	Check and allow the 5 to 10 minutes time to stabilize temperature.
Humidity	The humidity sent from the air conditioning is too high.	Faulty drainage pump	Check the condensate pump interface status and condensate pump function
	The high humidity threshold has been exceeded, and the alarm is sounding.	Unreasonable value for the high humidity threshold setting.	Reset the value.
	The low humidity Threshold has been exceeded, and the alarm is sounding.	Unreasonable value for the low humidity threshold setting.	Reset the value.

Table 11.2 SmartAisle™ Troubleshooting (continued)

Category	Issue	Possible Cause	Solution
Sensor	The door status sensor is sending alerts.	Unit doors are not fully closed.	Close all unit doors.
		Poorly installed or damaged door state microswitch.	Contact Vertiv Technical Support.
	The belt flood sensor is sending alerts.	Water enters the detection zone area.	Check the engine room for leaks.
		Air conditioning condensate pipe leaks.	Check that the condensate pipe connection is reliable.
Cooling	The air conditioning equipment does not start.	Device is unplugged.	Check the input voltage of the device.
		Circuit breaker controlling the voltage is open (on the transformer).	Look for a short circuit and reset the open switch.
		Excessively high water level for the condensate pump and disconnected water level switch relay.	Check that the drains and lines are blocked or that the condensate pump is damaged.
		Jumper cable is in the wrong position.	Check the interface board jumper cable.
	The air conditioning is not cooled.	The contactor of the compressor is in poor contact	Check that the interface board J74 port voltage is 24 Vac ± 2 Vac. If so, check the contactor body.
		Excessively high exhaust pressure from the compressor.	Refer to the inspection and repair instructions for the High Voltage Alarm item below.
		Blocked filter	Clean or replace the filter.
		Low refrigerant charge.	Check the pressure with a composite pressure gauge to see if there are obvious bubbles in the mirror.
		Limited condensation air.	Remove impurities from the surface of the coil or near the air entrance.
Pressure	Air conditioning high-pressure alarm.	Condenser is not turning.	Check that the fan speed controller wiring is loose, outdoor machine wiring is loose, fan speed control controller L1 has an output, and condensation pressure sensor is OK.
		Refrigerant leak.	Find the leak point and seal it, then replenish the refrigerant.
	Air conditioning low pressure alarm.	Low ambient temperature outside.	Contact your local service engineer for processing.
		Outdoor fan operates at full speed at low outdoor ambient temperatures.	Check that the L1 of the fan speed controller is on with L and that the connection between the condensation pressure sensor and the fan speed controller is loose.

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

Vertiv International GmbH

Victor-von-Bruns-Strasse 21

8212 Neuhausen am Rheinfall

Switzerland

Asia

7/F, Dah Sing Financial Centre

3108 Gloucester Road, Wanchai

Hong Kong

A.3 Vertiv™ SmartAisle™ Solution

Location

Europe, Middle East, and Asia

Vertiv Romania, Strada Someşului 30, Cluj-Napoca 400145, Romania

Contact

NOTE: For the countries not listed below, the toll free contact number is +49872327750.

Location	Main Telephone Number
Austria	0080011554499
Belgium	
Czech Republic	
France	
Germany	
Hungary	
Ireland	
Italy	
Luxembourg	
Netherlands	
Poland	
Switzerland	
United Kingdom	
Spain	
Russia	
South Africa	002780080011554499
Sweden	00460080011554499
UAE	0097100800035702985
Saudi Arabia	009668008446628
Qatar	0097400800100439
Romania	00400800477000
Croatia	003850800989019
Nigeria	002347080601125
Ghana	00233242426263
Turkey	00902164449545
Egypt	0049872327743

Location	Main Telephone Number
Bahrain	0049872327744
Greece	0080044146622
Denmark	0049872327746
Norway	0049872327747
Finland	0049872327748

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Appendix B: Submittal Drawings

Drawing Number	Title
SA1E08060MFB0	Vertiv™ SmartAisle™: 8 x IT Rack, 60 kW, N+1 Solution
SA1E08090MFB0	Vertiv™ SmartAisle™: 8 x IT Rack, 90 kW, N+1 Solution
SA1E11120MFB0	Vertiv™ SmartAisle™: 11 x IT Rack, 120 kW, N+1 Solution
SA1E11175HFB0	Vertiv™ SmartAisle™: 11 x IT Rack, 175 kW, N+1 Solution

NOTE: Refer to the submittal drawing available on vertiv.com for more information.

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 https://www.instagram.com/vertiv/

 https://www.linkedin.com/company/vertiv/

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SL-71372_REVA_03-25