RDU501 智能监控单元

用户手册

资料版本 V3.00.00

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RDU501 Intelligent Monitoring Unit

User Manual

Version V3.00.00

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Contents

Chapter 1 Product Introduction

RDU501 intelligent monitoring unit (referred to as "RDU501") features the Web access, digital input/output, analog input/output, sensor, UPS, air conditioner and PDU, and provide USB, DP, HDMI and other interfaces to meet TCP/ IP, optical fiber, and RS232/485 networking requirements. It can be configured according to the specific requirements of various applications.

This chapter mainly introduces the RDU501 description of parts, main functions and technical specifications.

1.1 Description of Parts

RDU501 includes RDU501 main unit and optional EXP8COM card, EXP8DIAI card, EXP8DOAO card, EXP2DI6DO card.

1.1.1 RDU501 Main Unit

Figure 1-1 shows the appearance and interface of the RDU501 main unit.

1. Relay output port *2. Operation/alarm indicator* *3. Digital input port* *4.Smoke detector port*

5. Sensor port *6.Serial port* *7. Expansion slot*4*

Front view

1. Power input1 *2. Power indicator* *3. Power input2* *4. Reset button*

5. Optical fiber port indicator *6. Optical fiber port* *7.USB port* *8.HDMI port*

9. Ethernet port

Rear view

Figure 1-1 RDU501 appearance and interface diagram

Input power

There are two isolated power inputs on the rear panel of the RDU501 main unit. The location is shown in Figure 1-1. The power input parameters are shown in Table 1-1.

Table 1-1 Power input parameters

Power	Input	Range	Interface
AC Input	Voltage	100Vac to 240Vac	C14 with break-away prevention feature
	Current	<2A	
	Frequency	50/60Hz	

Indicators

The rear panel of the RDU501 has four indicators. The location is shown in Figure 1-1. See Table 1-2 for definitions.

Table 1-2 Definitions of rear panel indicator

Silk Screen Printing	Color	Status	Description
Power1	Green	On	RDU501 power supply 1 is on
		Off	RDU501 power supply 1 is off
Power2	Green	On	RDU501 power supply 2 is on
		Off	RDU501 power supply 2 is off
Link	Green	On	Correct connection
		Off	Wrong connection or disconnected
Speed	Yellow	On	1000Mbps rate
		Off	No rate

Figure 1-1 shows the positions of the indicators on the front panel of the RDU501 main unit. See Table 1-3 for definitions.

Table 1-3 Definitions of front panel indicator

Silk Screen Printing	Color	Status	Description
Run/Alarm	Green /Red	Green	No alarm
		Red	Alarm
COM/Sensor	Green	Blink	Receiving data
		Off	No data received
	Yellow	Blink	Transmitting data
		Off	No data transmitted
DI/AI/DO/AO/Smoke	Green	On	External device is connected
		Off	No external device is connected or the port is short circuited

Reset button

Press and hold the reset button (Silk Screen Printing is “Reset”) for more than 4 seconds. After the device emits a “beep” sound, the RDU501 will restore the IP address and password to the factory default after it is restarted. The default values are shown in Table 1-4.

USB port

The RDU501 main unit provides four ports of USB-A socket type, which can be connected to the USB Modem of the specified model, as well as the keyboard and mouse. The location is shown in Figure 1-1.

Ethernet port

The RDU501 main unit provides four network ports and one fiber port. The 10/100/1000M Ethernet port is used. Figure 1-1 shows the 1000M fiber. Table 1-4 lists the default network port configuration.

Table 1-4 Network port default configuration parameters

Parameter / Network card number	IP address	Subnet code	Default gateway
LAN1 (enp1s0)	192.168.0.254	255.255.255.0	192.168.0.1
LAN2 (enp2s0)	192.168.1.254	255.255.254.0	192.168.0.1
LAN3 (enp3s0)	192.168.2.254	255.255.255.0	192.168.0.1
LAN4 (enp4s0)	192.168.3.254	255.255.255.0	192.168.0.1
Fiber(enp0s20u4u4)	192.168.4.254	255.255.255.0	192.168.0.1
Note: The default password for web browser login is “Vertiv”			

HDMI port

The RDU501 main unit provides two HDMI ports. If there is need for display, use the HDMI port. The location of the port is shown in Figure 1-1.

Relay output port

The RDU501 main unit provides two relay output ports DO1 and DO2. The position is shown in Figure 1-1. The parameters are shown in Table 1-5.

Table 1-5 Parameters of relay output ports

Relay output port	Output	Range	Port	Usage
DO1/DO2	Voltage	9V to 12.5V	RJ45	1. DO output, can be connected to the alarm indicator; 2. The maximum total power of the two ports can support 2.4W; 3. Support short circuit protection
	Total current	≤0.2A		

DI port

The RDU501 main unit provides four digital input ports, as shown in Figure 1-1. The parameters are shown in Table 1-6.

Table 1-6 Electrical parameters of DI port

Silk Screen Printing	Definition	Rated Output Voltage	Output Current (Total)	Max Output Power (Total)	Port Overload Protection
DI1	Port of magnetic door switch 1	9V~12.5V	<0.16A	1.92W	Support overload protection
DI2	Port of magnetic door switch 2				
Smoke1	Port of smoke detector 1				
Smoke2	Port of smoke detector 2				

Sensor port

The RDU501 main unit provides two sensor ports, including four RJ45 interfaces. The location is shown in Figure 1-1. The parameters are shown in Table 1-7.

Table 1-7 Electrical parameters of sensor port

Silk Screen Printing	Definition	Rated Output Voltage	Output Current (Total)	Max Output Power (Total)	Port Overload Protection
Sensor1	Port of 1st sensor	9V~12.5Vdc	<0.36A	4.32W	Support overload protection
Sensor2	Port of 2nd sensor				

The port adopts RS-485 communication mode for connecting Vertiv intelligent temperature and humidity sensor, intelligent temperature sensor and intelligent digital expansion sensor. The communication parameters are shown in Table 1-8.

Table 1-8 Communication parameters of sensor port

Parameter	Baud rate	Data bit	Odd/even parity bit	Stop bit
Value	9600bps	8 bits	None	1 bit

Serial port

The RDU501 main unit provides four independent serial ports: serial port 1, serial port 2, serial port 3, and serial port 4. The location is shown in Figure 1-1. The interface adopts RS-485/232C (self adaptive) communication mode, and the communication parameters are shown in Table 1-9.

Table 1-9 Serial port communication parameters

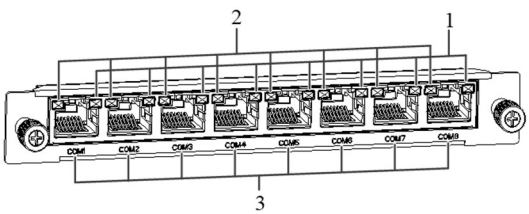
Parameter	Baud rate	Data bit	Odd/even parity bit	Stop bit
Value	1200~115200	5 to 8 bits	Even/Odd/None/Mark/Space	1 to 2 bits
Note: The combination of 5-bit word length and 2 stop bits is not supported.				

1.1.2 Expansion Card

The four expansion slots of the RDU501 main unit support hot-swap connection of EXP8COM card, EXP8DIAI card, EXP8DOAO card and EXP2DI6DO card.

EXP8COM card (optional)

The EXP8COM card provides 8 serial ports and supports RS232/RS485 communication to connect user device (RS232/RS485 line-sequence adaptive). Its appearance is shown in Figure 1-2.



1. Data receiving indicator1-8 *2. Data transmission indicator1-8* *3. Serial port 1-8*

Figure 1-2 EXP8COM card

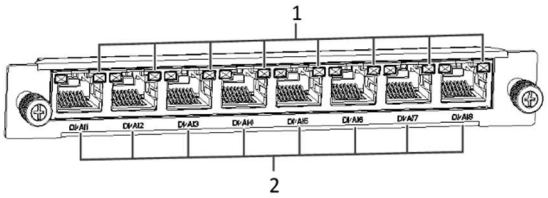
The indicators of the EXP8COM card are defined in Table 1-10.

Table 1-10 Definitions of the indicators of the EXP8COM card

Silk Screen Printing	Color	Status	Description
COM1 to COM8	Green	Blink	Receiving data
		Off	No data received
	Yellow	Blink	Transmitting data
		Off	No data transmitted

EXP8DIAI card (optional)

The EXP8DIAI card provides eight digital or analog input interfaces (digital and analog adaptive) and supports digital/analog inputs. The appearance is shown in Figure 1-3.



1. Break-away detection indicator 1-8 *2. Digital / analog input 1-8*

Figure 1-3 EXP8DIAI card

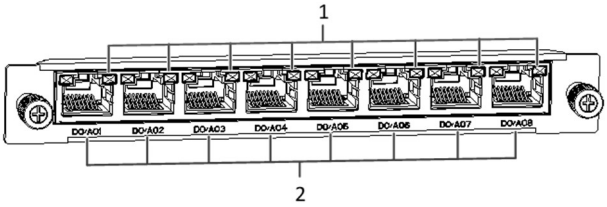
The port definition of the EXP8DIAI card is shown in Table 1-11.

Table 1-11 Definitions of the ports of the EXP8DIAI card

Port name	Port type	Silk Screen Printing	Definition
Digital or analog input 1 to 8	RJ45 port	DI/AI1 to DI/AI8	Digital input potential-free dry contact; Analog input 0 to 10V or 4mA to 20mA

EXP8DOAO card (optional)

The EXP8DOAO card provides eight digital or analog output ports (digital and analog self adaptive) and supports digital/analog output, wherein the digital output is not energized. The appearance is shown in Figure 1-4.



1. Break-away detection indicator 1-8 *2. Digital / analog input 1-8*

Figure 1-4 EXP8DOAO card

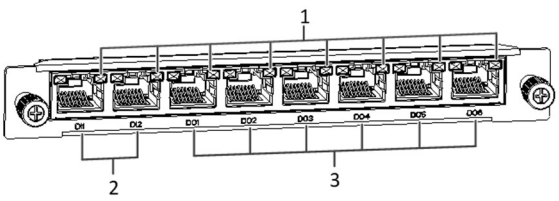
The port definition of the EXP8DOAO card is shown in Table 1-12.

Table 1-12 Definitions of the ports of the EXP8DOAO card

Port name	Port type	Silk Screen Printing	Definition
Digital or analog output 1 to 8	RJ45 port	DO/AO1 to DO/AO8	Digital output: normally open contact + normally closed contact Analog output: 0 to 10V

EXP2DI6DO card (optional)

The EXP2DI6DO card provides two digital inputs and six digital output ports. For the DI and DO line sequences, refer to the DI/Smoke and DO line sequences in Table 1-14, but the DO is not energized. Any one of the digital inputs can be linked to the 6-way digital output hardware. Its appearance is shown in Figure 1-5.



1. Break-away detection indicator 1-8 *2. Digital input 1-2* *3. Digital output 1-6*

Figure 1-5 EXP2DI6DO card

The port definition of the EXP2DI6DO card is shown in Table 1-13.

Table 1-13 Definitions of the ports of the EXP2DI6DO card

Port name	Port type	Silk Screen Printing	Definition
Digital input 1~2	RJ45 port	DI1~DI2	Digital input potential-free dry contact
Digital output 1~6	RJ45 port	DO1~DO6	Digital output potential-free dry contact

Line sequence definition of RDU501 and expansion card

The definition of RDU501 and expansion card line sequence is shown in Table 1-14.

Table 1-14 Definitions of the RDU501 and expansion card line sequence

RJ45	DO	DI/Smoke	Sensor	COM	DOAO card	DIAI card
1	12V	12V	12V	RTS	0 to 10V	12V
2				NC		
3	normally closed	NC	NC	TXD	normally closed	AI_I
4	Break-away detection	Break-away detection	GND	GND	Break-away detection	Break-away detection
5	GND	GND			GND	GND
6	normally open	DI	NC	RXD	normally open	DI
7	COM		D+	D+	COM	
8	NC	NC	D-	D-	NC	AI_V

1.2 Main Functions

The main functions of RDU501 are given in Table 1-15.

Table 1-15 RDU501 main functions

Main functions	Descriptions		
Application Scenario Setting	Select SmartAisle3 application scenario or general scenario		Specific for SmartAisle 3 scenario
Homepage	Facility Overview	Key information overview page of infrastructure intelligent devices, including DI/DO, AI/AO, sensor, UPS, air conditioner, PDU, etc.	-
	SmartAisle3 Overview	Key information overview page of SmartAisle3 solution product	SmartAisle3
	IT Device Overview	Key information overview page of IPMI and ACS devices	-
Device Monitoring	Realize the video surveillance of the data center environment, and realize the data collection and processing of different intelligent devices, and control intelligent devices through the web user interface		-
Safety Management	Access Control Management	Realize local access control management, remote door opening, log recording, etc.	-
	Video Management	Realize webcam video surveillance	-
IT Management	IPMI Device Management	Monitoring and management of IT device through IPMI	-
	Console Device Management	Monitor console output of IT device	-
	Server Shutdown Management	Configure a certain strategy to achieve on-off management of the IT server	-
Heat Mgmt	Teamwork Control of Air Conditioners	According to certain rules, monitor and dispatch each air conditioner participating in the teamwork control to achieve the purpose of reducing air conditioning energy consumption, extending the overall life of the air conditioner, and avoiding competition between the air conditioners in one team.	-
AI Lite	Energy Saving Module	Through AI algorithms, the Energy Saving Module learns the relationship between IT power, air conditioning configuration and data center temperature, PUE, and constantly searches for better air conditioning working numbers, air conditioning working positions, and air conditioning temperature set points, so as to achieve the goal of reducing PUE and keeping the data center safe	-
	Battery Management	Through AI algorithms, the AI battery management predicts the internal resistance value of a single battery one month later based on the data collected by the current lead-acid battery. The prediction can be manually triggered or can be performed automatically and periodically	
Power Management	Real-time Energy Consumption	Display PUE and load rate data	-
	History Record	Display historical data of PUE and load rate	-
	Energy Consumption	Set PUE statistics signal, support PUE of power mode and electric energy mode and	-

Main functions	Descriptions					
Application Scenario Setting	Select SmartAisle3 application scenario or general scenario					Specific for SmartAisle 3 scenario
	Setting	statistics of system load percentage				
	Battery Management	Real-time monitoring of lead acid batteries (through Vertiv™ battery collection and management equipment) and lithium batteries (through BMS system)				
	Power Train 3D	Visualize data center power distribution links in 3D				
Data & History	Current Alarm	Real-time alarm display, active alarm confirmation				-
	History Alarm	Query history alarms and view history alarm reports in graph form.				-
	Device Data	1. QUERY device main data 2. Download MIB file, OID file, and TRAP file from SNMP device; export/import SNMP upper standardized mapping table 3. Asset information data				-
	History Data	1. QUERY history data; 2. Display history data curve reports in the form of visualized charts				-
	Smart Report	Display Smart Curve Reports in the form of a visualized chart				-
	Log Data	Log data query				-
	U-level Recent Event	View the events of the U-level manager within recent days				
	Historical Data Backup	Import and export historical data				
	Clear Data	Clear history data, history alarms, and log data				
Smart Solution Modelling	Heat Mgmt	Display the temperature field data of each rack in the module in 2D form				-
	Power Management	Display the power supply capacity of each rack in the module in 2D format				-
	Asset Management	Display the space capacity usage of each rack in the module in 2D format				-
	2D Modeling	Model the module based on the actual configuration of the module				-
	Assets on the Shelves	Manage the assets in the module				-
Configuration Management	SmartAisle3 Rack Device Management	1. Can configure SmartPOD access device 2. Can re-enter the SmartAisle3 Setup Wizard page				SmartAisle3
	Infrastructure Device Management	1. Add, modify, and delete devices dynamically 2. Device type that can be installed and uninstalled, support third-party device access				-
	Batch Configuration	UPLOAD and download configuration files and system files				-
	Device Signal Configuration	1. Modify device name online 2. Modify the signal name, signal unit, store period, store threshold, and alarm level online 3. Modify the status name online				-
	Notify Type Configuration	1. Alarm notification contents of infrastructure intelligent device, IT device, battery warning events, and console device can be customized according to your requirements 2. You can select the notification mode to receive different levels of alarm information of different devices. 3. Send system running status according to your configuration timing				-
	Email & SMS Configuration	1. Realize the configuration of voice notification systems of email, SMS, phone and RDU multimedia 2. Email supports SSL function and supports HTML and plain text mail. 3. Provide an alarm test function to test whether you receive the alarm reminder information. 4. Can check the balance of the SMS MODEM phone card				-
	Alarm Action	1. Can be customized according to your requirements 2. DO1 alarm output 3. Can be combined with device signals, parameters and alarms to control the device 4. Interactive with photographing and video recording 5. Have the following logical components				-
		1) AND means “and”	2) OR means “or”	3) NOT means “Not”	4) XOR means “and/or”	-
		5) GT means “>”	6) LT means “<”	7) DS means “delay”	-	-
System Settings	Monitoring Unit	Collect RDU501 system information				-
	Security Setting	1. SSH Setting 2. Web Access Security Policy 3. Server Port Setting 4. Certificate Setting 5. Certificate Query				-
	Network Settings	1. IP, subnet mask, gateway, DNS and other related network information settings 2. Authority settings for accessing RDU501 from the upper management platform 3. SNMP settings				-

Main functions	Descriptions		
Application Scenario Setting	Select SmartAisle3 application scenario or general scenario		Specific for SmartAisle 3 scenario
	User Management	Add, modify and delete user information	-
	System Upgrade	Upgrade the app/image online	-
	SmartPOD Upgrade	Upgrade the SmartPOD software online	SmartAisle3
	Time Calibration	Calibrate the RDU501 real-time clock	-
System Settings	Restore System	Restart RDU501 and restore default configuration	-
	Site Setting	Modify site information online	-
	License Code Management	Extend RDU501 function and access capability through license code	-
	Title Bar Settings	Set the title above the web page	-
	About RDU501	Display product serial number, identify code and version information of RDU501, and provide download link of user manual	-

1.3 Technical Specifications

1.3.1 Environmental Specifications

The environmental specifications of RDU501 are shown in Table 1-16.

Table 1-16 Environmental conditions

Items	Requirements
Application site	Usually a data center or computer room, usually with an air conditioning environment
Operating temperature	0˚C to +55˚C
Relative humidity	≤95%RH, no condensation
Use environment	The dust meets the indoor standard of the GR-63 without corrosive gases, flammable gases, oil mist, water vapor, dripping or salt, etc.
Atmospheric pressure	70kPa to 106kPa
Storage temperature	-20˚C to +70˚C
Cooling method	Convection cooling
Distribution network	TT/TN
Protection level	IP20

1.3.2 Mechanical Specifications

The mechanical specifications of RDU501 are shown in Table 1-17.

Table 1-17 Mechanical specifications

External model	Measures	Values	Tolerance
RDU501	height	43.5mm	<±0.5 mm
	width	440mm	<±1 mm
	depth	445mm	<±1 mm
	weight	<10kg	/
EXP8COM EXP8DIAI EXP8DOAO EXP2DI6DO	height	20mm	<±0.5 mm
	width	152mm	<±1 mm
	depth	210mm	<±1 mm
	weight	<0.5kg	/

1.3.3 Performance Specifications

The performance specifications of the RDU501 are shown in Table 1-18.

Table 1-18 Performance specifications

Device type	Connected devices	Cable standard	Connecting length (Unit: m)	Max number of connections / connected point
Environment signals	SENSOR1 port connection contact	Standard Category 5 twisted pair	≤100	16[1]
	SENSOR2 port connection contact	Standard Category 5 twisted pair	≤100	16[2]

Device type	Connected devices	Cable standard	Connecting length (Unit: m)	Max number of connections / connected point
	DI port connection contact	Standard Category 5 twisted pair	≤100	4[3]
	DO port connection contact	Standard Category 5 twisted pair	≤100	2[4]
Power and environment intelligent devices	Number of device types supported by serial port networking Support for the number of access console devices Support access to the number of IT servers	-	-	64[5]
	Number of device types supported by networking (TCP IP/SNMP)	-	-	64[6]
	Number of supported smart devices	Standard Category 5 twisted pair (serial port)	≤100 (RS485 serial port) ≤10 (RS232 serial port)	64[7]
Video device	Video device	-	-	8[8]
Rack door lock	Number of connected rack level door locks	Standard Category 5 twisted pair	≤100	48[9]
Console device	Number of connected access console devices	Standard Category 5 twisted pair	≤15	32[10]
IT server	Number of connected IT servers	-	-	40[11]
Rack level monitoring SmartPOD	Support access to smart rack monitoring data collector	Standard Category 5 Twisted Pair Cables	Bus	56[12]

Note:
[1]: Sensor1 supports temperature or temperature and humidity sensors with an address of 1 in the group. Sensor1 supports THD sensors that the address range is 10-C0. Note: It isn't allowed to connect temperature or temperature and humidity sensors with THD sensors into Sensor1 port at the same time;
[2]: Sensor2 supports temperature or temperature and humidity sensors or digital sensors with an address of 2 in the connected group. Among them: 1. Only digital sensors with 01 and 10 addresses are supported; 2. For the temperature sensor, temperature and humidity sensor, door magnetic switch, flooding sensor, 4DI itself, 4DO itself, DO device, etc. Each sensor or device is calculated according to 1 node. For the smoke detector and infrared sensor, each sensor is calculated according to 4 nodes. Sensor 2 supports THD sensors that the address range is 13-C3. Note: It isn't allowed to connect temperature or temperature and humidity sensors with THD sensors into Sensor2 port at the same time;
[3]: DI includes four ports: DI1, DI2, Smoke1 and Smoke2. Can be extended by 8DIAI card or 2DI6DO card;
[4]: The audible and visual alarm indicators have two connection points DO1 and DO2. The two connection points can also be used as two-way digital output for other purposes. Can be extended by 8DOAO card or 2DI6DO card;
[5]: Networking through serial port, the standard supports the connection of 64 intelligent devices. Available serial ports include: 4 default serial ports + 8 (EXP8COM expansion card) * 4, a total of 36 COM ports, it is recommended that each COM port connects to the same device type;
[6]: Networking through the network (TCP IP/SNMP), the standard supports the connection of 64 intelligent devices.
[7]: The RDU501 standard version supports the connection of 64 intelligent devices, excluding the default devices (monitoring unit / ENV_TH1/ENV_TH2 / ENV_DI / ENV_4DI), 8DIAI, 8DOAO, 2DI6DO and rack-level access control devices. Among them: 1. The number of intelligent devices connected to a single COM cascade does not exceed 4; 2. The serial port connected intelligent device and the network connected intelligent device are included.
[8]: Support single-channel IPC (IP Camera) camera or support up to 8 channels of video when NVR is connected;
[9]: The RDU501 supports up to 48 rack-level access control devices, not counting the number of intelligent devices. Among them, the number of rack-level access control system cascaded by single COM is no more than six;
[10]: The RDU501 standard version supports the connection of 8 console devices. There is no more than one console device cascaded with single COM. Note: COM connected to the console device cannot connect to other intelligent devices at the same time. Expandable to 32 console devices by purchasing an authorization code;
[11]: The RDU501 standard version supports the connection of 10 IT server devices. The RDU501 supports up to 40 IT server devices through the IPMI 2.0 protocol, which can be extended by purchasing authorization codes.
[12]: In the SmartAisle3 scenario, RDU501 supports up to 56 smart racks. The data collector configured for the IT rack configuration is SmartPODR, and the data collector configured for the UPS, air conditioner and baffle is SmartPODE. The default built-in devices of SmartPODR are POD_DIDO, POD_BUST, POD_THD and POD_Power. The default built-in devices of SmartPODE are POD_DIDO and POD_BUST. SmartPODR and SmartPODE are both referred to as SmartPOD. SmartPOD comes with 4 COM ports, and each COM port supports up to 1 smart device. Therefore, SmartPOD supports up to 8 devices in total.

1.3.4 Product Certification

The RDU501 meets CE claims and is UL and FCC certified.

Chapter 2 Hardware Installation

This chapter describes the hardware installation of the RDU501, including installation preparation, installation of the RDU501 main unit, installation of expansion cards and sensors and other accessories.

2.1 Installation Preparation

2.1.1 Cautions

When installing the RDU501, pay attention to the following items to avoid injury to people and device damage caused by accidents.

All installation operations on the RDU501 must be performed after disconnecting the power supply.

Ensure that the external device is connected to the correct RDU501 port.

The installer needs to wear an anti-static wrist during the installation process.

Properly route the cables to ensure that no heavy objects are pressed on the power cord. Do not step on the cable.

The product contains button battery, so please use it in the temperature and altitude range of the product. Do not put the product into fire or mechanical extrusion and cutting.

2.1.2 Environmental Requirements

Running environment

The RDU501 must be installed indoors. See Table 1-16 for specific requirements.

Anti ESD

In order to minimize the effects of static electricity, the following measures are required:

Maintain proper temperature and humidity in the device room (see Table 1-16)

Before the human body touches the circuit board, wear an anti-static wrist strap and wear anti-static clothes. If there is no anti-static wrist and anti-static overalls on site, rinse your hands with water and dry them.

Anti disturbance

For anti disturbance, the following measures are required:

Avoid using the RDU501 operating ground with the grounding device or lightning protection grounding device of the power device.

Keep away from strong power radio launchers, radar launchers, high frequency and high current devices.

Use electromagnetic shielding if necessary.

2.1.3 Space Requirements

Place the RDU501 away from heat sources

It is recommended to install the RDU501 in a 19-inch standard rack. Leave at least 10 mm of space around the device to ensure sufficient space for heat dissipation.

2.1.4 Installation Tools

The installation tools are shown in Table 2-1.

Table 2-1 Installation tool

Tool Name	Specification Model	Usages
Screwdriver (cross)	100mm, 200mm	Install the RDU501 main unit mounting ears, expansion slot cover, etc.
Digital multimeter	3-digit display	Detecting electrical connections

2.2 Install RDU501 Main Unit

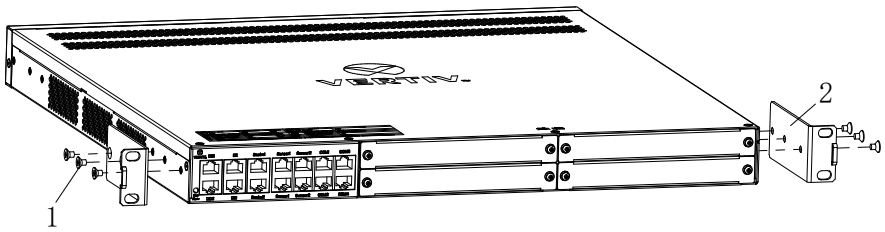
2.2.1 Mechanical Installation

The RDU501 main unit is installed in a rack.

Installation procedures:

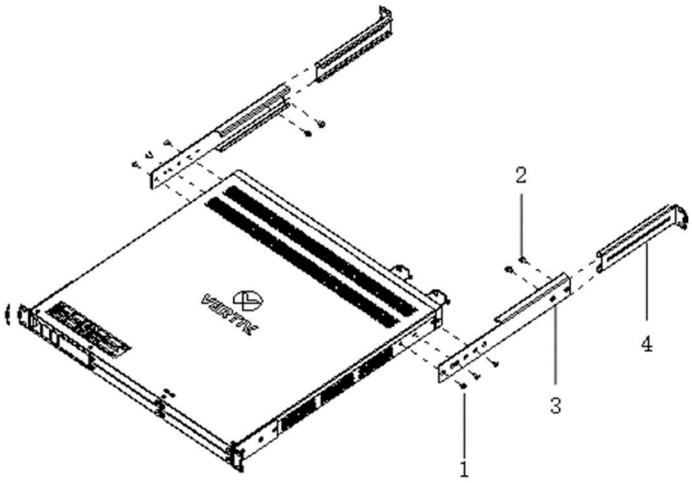
1. Make sure that the installation rack is fixed and there are no obstacles inside or outside the rack.

2. Fix the front mounting ears on both sides of the RDU501 main unit with the attached M4 screws, and then install the rear guide rails and mounting ears on both sides of the RDU501 main unit, as shown in Figure 2-1 and Figure 2-2.



1.M4 countersunk screws (6 PCS) *2. Mounting ears (2 PCS)*

Figure 2-1 Install the mounting ears in the front side



1.M4 countersunk screw (6pcs) *2.M4 pan head screw (4pcs)* *3.Guide rails (2pcs)* *4.Mounting ears (2pcs)*

Figure 2-2 Install the guide rails and mounting ears in the rear side

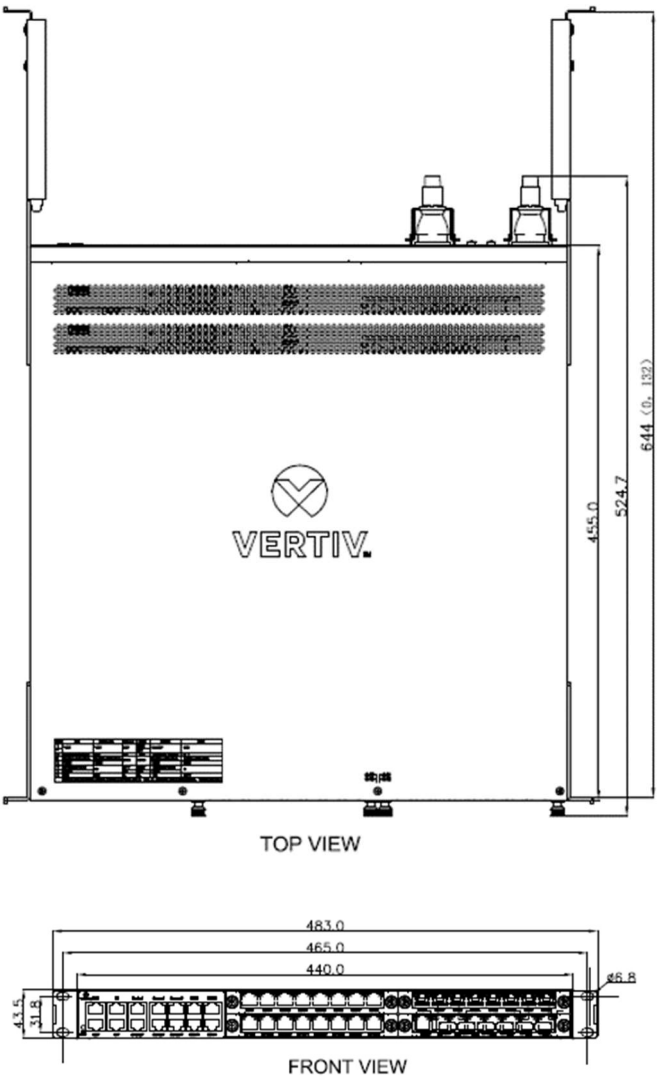


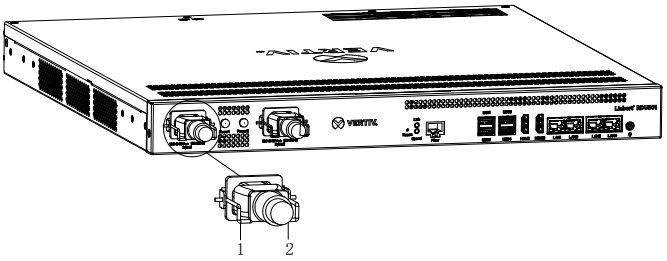
Figure 2-3 Installation dimensions

3. Use the M6 floating nut and M6 screw to fix the RDU501 main unit to the rack through the mounting ears on both sides.

2.2.2 Electrical Connection

Electrical connection procedures of RDU501 main unit:

1. Remove the power cable from the RDU501. Connect one end to the power input port of the RDU501 main unit and clip the anti-breakaway kit shown in Figure 2-4.



1.Anti-breakaway kit *2. One end of power cord*

Figure 2-4 Anti-breakaway kit of power supply

2. After confirming that the connection is correct, connect the other end of the power cord to a socket with a ground connection.

Note

The RDU501 main unit provides dual backup power supply, which can be either one-way or two-way. Input voltage: 100Vac to 240Vac, frequency: 50/60Hz.

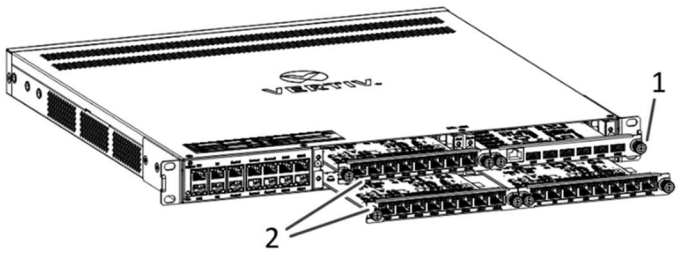
2.3 Install Accessories of Expansion Card and Sensor

> 🕮 Note
>
> The EXP8COM/EXP8DIAI/EXP8DOAO/EXP2DI6DO expansion card and SFP module are optional accessories, and you can choose whether to purchase or install.

2.3.1 Install Expansion Card

The expansion cards include EXP8COM, EXP8DIAI, EXP8DOAO and EXP2DI6DO. The installation procedures are as follows:

Remove the baffles of the expansion slots (Slot1, Slot2, Slot3, or Slot4) on the front panel of the RDU501. Insert the expansion card into the expansion slot of the RDU501 and tighten the screws on both sides, as shown in Figure 2-5.



1. expansion card *2. screw*

Figure 2-5 Installation of expansion card

2.3.2 Install Intelligent Sensors

The intelligent sensors include: IRM-S01T intelligent temperature sensor (IRM-S01T), IRM-S02TH intelligent temperature and humidity sensor (IRM-S02TH), IRM- S04DI Phoenix Interface Intelligent Digital Input Sensor (IRM-S04DI for short), IRM-S04DIF RJ45 Interface Intelligent Digital Input Sensor (IRM-S04DIF) and IRM-S04DO Phoenix Interface Intelligent Digital Output Sensor (IRM-S04DO), as shown in Figure 2-6.

IRM-S01T

IRM-S02TH

IRM-S04DI

IRM-S04DIF

IRM-S04DO

Figure 2-6 Intelligent sensors

Installation procedures

The installation procedures for smart sensors can be found in the user manual for the corresponding intelligent sensor:

IRM-S01T can be found in the IRM-S01T Intelligent Temperature Sensor User Manual;

IRM-S02TH can be found in the IRM-S02TH Intelligent Temperature and Humidity Sensor User Manual;

IRM-S04DI can be found in the IRM-S04DI Phoenix Interface Intelligent Digital Input Sensor User Manual;

IRM-S04DIF can be found in the IRM-S04DIF RJ45 Port Intelligent Digital Input Sensor User Manual;

IRM-S04DO can be found in the IRM-S04DO Phoenix Port Intelligent Digital Output Sensor User Manual.

IRM-THD can be found in the IRM-THD User Manual.

2.3.3 Connect Physics Sensor

The physics sensors include: smoke detector, flood sensors, infrared sensors, and door magnetic switches.

There are two methods to connect the smoke detector, flood sensors, infrared sensors, and door magnetic switches:

Directly connect the DI port on the front panel of the RDU501 (Silk Screen Printing is DI1, DI2, Smoke1, and Smoke2, each port can be arbitrarily connected to one of smoke detector, flood sensors, infrared sensors, and door magnetic switches). The wiring sequence is shown in Table 1-14.

Connect the RDU501 through the IRM-S04DI or IRM-S04DIF: Connect the sensor to the IRM-S04DI or IRM-S04DIF Digital input port. For the wiring sequence, refer to the IRM-S04DI Phoenix Port Intelligent Digital Input Sensor User Manual or IRM- S04DIF RJ45 Port Intelligent Digital Input Sensor User Manual.

Chapter 3 Web Interface

This chapter describes how to log in to the RDU501 and RDU501 related functions through the Web, including login preparation, login to RDU501 and RDU501 home page, and menu items.

3.1 Login Preparation

To ensure the normal use of the RDU501 webpage function, please refer to the contents of this section to check and select the web browser.

3.1.1 Checking IP Address Connectivity

Prior to logging in to the RDU501 through the Web, first confirm the IP address of the RDU501 and test its connectivity. For the test method, see "Issue 1" in section *6.2 Troubleshooting*.

3.1.2 Checking Web Browser

Support mainstream web browsers such as Google Chrome, Firefox, Safari, and Edge. Google Chrome browser is recommended.

3.2 Login

3.2.1 Authorized Startup

1. When logging in to the RDU501 for the first time, open the browser and enter the IP address of the RDU501 in the address bar (the default IP of LAN1 is 192.168.0.254; the default IP of LAN2 is 192.168.1.254). Open the authorized startup page, as shown in Figure 3-1. The authorized startup page does not appear. See "Issue 1" in *6.2 Troubleshooting*.

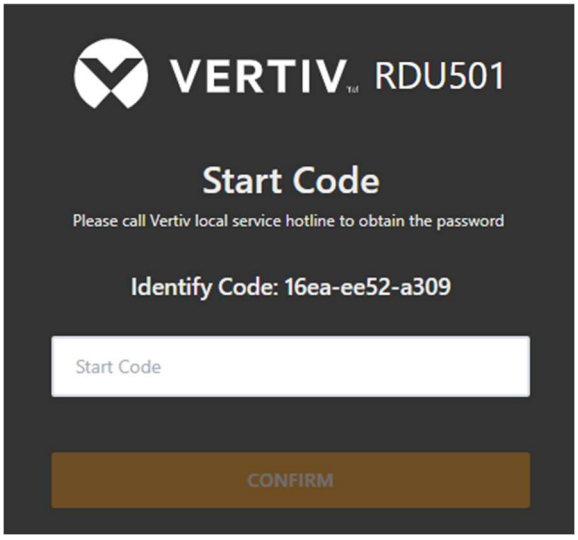


Figure 3-1 Authorized startup page

2. Please contact Vertiv Customer Service Center, provide the Identify Code, serial number and necessary customer information to the customer service staff to get the startup password.

3. Enter the obtained Start Code in the power-on password text box and click **CONFIRM**. If the Start Code is correct, the system automatically jumps to the Application Scenario Selection page.

3.2.2 Application Scenario Selection

On the Application Scenario Selection page, select the corresponding scenario according to the hardware configuration of the data center: SmartAisle3 or general scenarios.

The following chapters describe the functions after selecting the general scenario. The relevant functions after selecting the SmartAisle3 scenario will be introduced separately in *Chapter 4 SmartAisle3 Application Scenario*.

3.2.3 Login Page

1. Open the browser and enter the IP address of the RDU501 in the address bar. The login page appears as shown in Figure 3-2. If the login page does not appear, see "Issue 1" in section *6.2 Troubleshooting*.

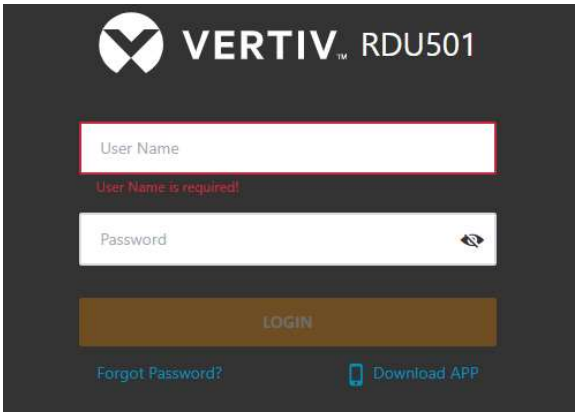


Figure 3-2 Login page

2. Select the General Scenario or enter the user name and password (default user name: admin, default password: Vertiv) and click **LOGIN**, the home page of the General Scenario will open and pop up Modify the default password confirmation interface.

Click **CANCEL** to return login page; click **CONFIRM** to enter the Change password page

After modifying the default password to open the RDU501 home page.

📖 Note

1. After logging in to the system for the first time, it is recommended to change the default password of the system.
2. For new users added, if you do not want to enable the function of changing the default password, you can disable this function through **System Options** > **Security Setting** page.
3. It is recommended to change the password periodically.
4. Click to download app, and a QR code will be displayed. You can scan the QR code to download the app.

3.2.4 Retrieving the password

If you forget the password, you can click the **Forgot Password** link on the login page to display the Retrieve Password page.

Enter your username, click **SEND**, your password will be sent to your previously set mailbox or phone; click the **Try to login?** link to return to the login page.

📖 Note

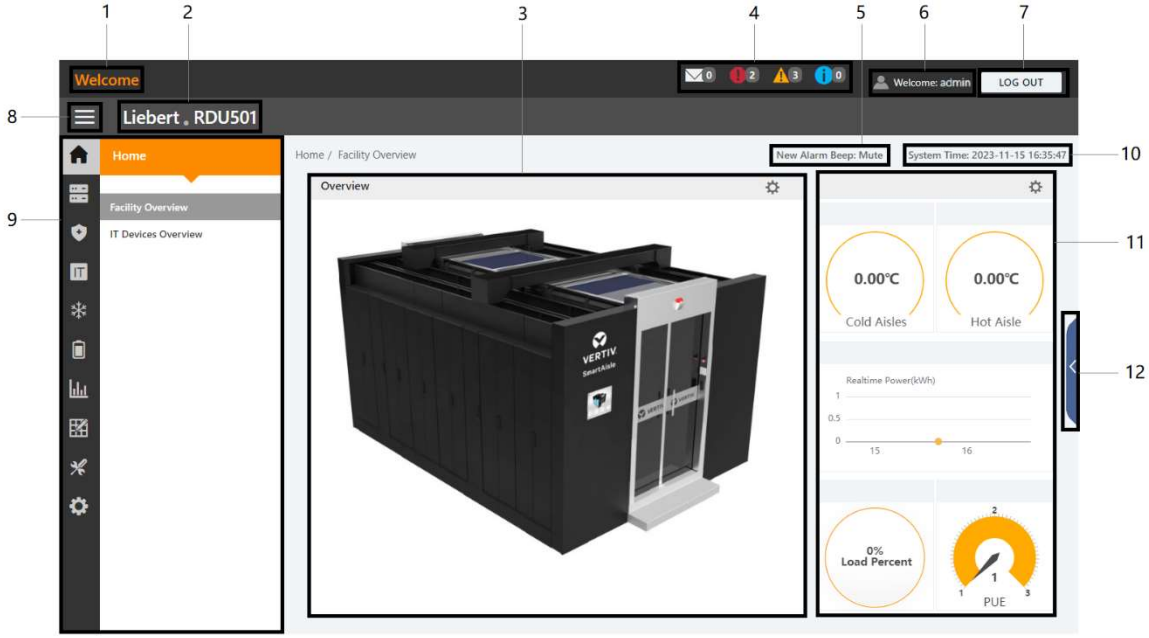
1. You can only receive the password sent by the system if you have set the email or SMS parameters correctly in the **Email &SMS Configuration** page. For details, see **Email & SMS Configuration** *in* section *3.4.9 Device Options*.
2. The retrieved password is a new password generated randomly by the system. Please modify it after you log in successfully.

3.3 RDU501 Homepage

In the RDU501 homepage, click on the left **Home** menu to see two submenus, including: Facility Overview and IT Devices Overview.

3.3.1 Facility Overview

Click on the Facility Overview menu to open the Facility Overview page. You can customize a flat layout based on the physical location of the device room for centralized display. After configuration, the effect is shown in Figure 3-3.



1. System title
2. Product name
3. Room information area
4. Number of real-time alarms
5. Alarm reminder sound settings
6. User name
7. Logout [current user]
8. Submenu collapse icon
9. Menu item
10. System Time and time calibrating link
11. Controls display bar
12. Controls collapse icon

Figure 3-3 RDU501 Homepage (Power and Environment Overview)

- The number of active alarm displays the number of IT device event / alarm, Critical Alarm, Moderate Alarm and Low Alarm.
- Click the Controls collapse icon to hide the Controls display bar.

Hotspot setting

Click the Setup Mode icon to the right of Overview to enter the setup mode.

1. Device hotspot setting

Click the **New device hotspot** icon, a hot spot will be added.

Press the left mouse to drag the hotspot to move the hotspot location.

Click the hot spot, the **Edit** and **Delete** options will pop up.

Click **Edit** to enter the device signal setting page.

- On the hotspot editing page, click **Add** on the left side of the device signal setting page, and the Add Hotspot Type dialogue box is displayed (Hotspot Name is required; Hotspot Icon is optional). After filling in, click **CONFIRM**. After adding a hotspot type, you can click the delete icon to delete the hotspot type. The default hotspot types and the currently used types cannot be deleted. The built-in hotspot types include AC, ACC, AMM, ENV, PDU, UPS, BAT and Other.
- On the hotspot editing page, click **Add** on the right side of the device signal setting page to add a new signal displayed by the current hotspot. You can also click the **Delete** icon on the right to delete the signal. You need to keep one signal to save the hotspot.
- After completing the above operations, you need to click **CONFIRM** to make the above operations take effect.

Click **Delete**, and a confirmation box to confirm deletion of the hotspot will pop up. Click **CONFIRM** to delete the hotspot.

Note

1) The upper limit of new hotspots is 128.

2) The upper limit of the number of hotspot types is 30. To upload the hotspot type icon, the image with the following suffix is supported: .svg, .png, .jpg, .jpeg, .bmp, .ico. The icon file size should not exceed 500KB.
3) Each hotspot can be bound to no more than 16 signals. The hotspot needs to be bound to at least one signal before it can be saved to the backend.

2. Save

Click the **SAVE** icon to make all configurations effective and return to browsing status.

Note

After modifying the hotspot information, you need to click the SAVE icon to save, otherwise the hotspot configuration information will be lost.

3. Background setting

- Click the **Change background image** icon, the Background Setting page is displayed.
- Click on the image, the "Are you sure to replace current background picture" prompt is displayed. Click **CONFIRM**, and the background picture will be displayed on the homepage.
- Click the switch icons on both sides to browse background pictures.
- Click the **Delete** icon to delete the current background image. The background picture in use cannot be deleted.
- Click **Browse** to select a background picture. After selecting the image file, click **UPLOAD**, and the image will be added to the background picture list.

Note

Only images of png, jpg, jpeg, bmp and gif are allowed to be uploaded, the size is up to 10MB.

4. Signal display mode

- Click the **Signal Display Mode** icon, and the Display Setting page is displayed.
- Select **On Hover**, **Always Show**, or **Auto Polling** as the Signal Display Mode. If Auto Polling is selected, the default polling interval is 5 seconds, and the interval can be customized.

5. Back to the browsing state

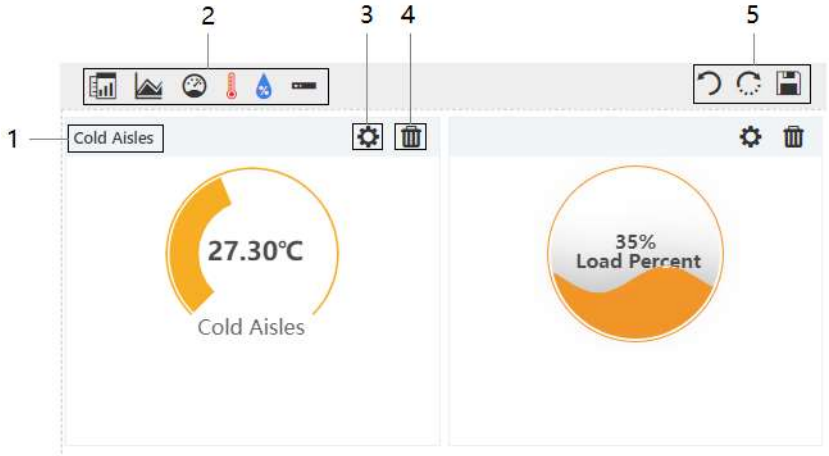
Click to the **Back to Browser** icon to return to the browsing state from the configuring state.

6. Jumping from a battery hotspot

In the hotspots that have been added on the home page, click the icon to jump to the battery management page.

Controls setting

Click the icon at the right side to enter the controls setting page.



1. Controls name (editable) 2. Controls type 3. Setting controls 4. Deleting controls
5. Editing controls

Figure 3-4 RDU501 Controls Settings (Power and Environment Overview)

1. Manage controls

Drag the icons in the upper left corner to the blank area below, and new controls will be generated. Click the icon of the new control to enter the **Element Setting** page to set **Element Name** and **Element Signals**. You can click the to delete the control.

If you need to adjust the position of the control, drag the control to the specified position.

- **Cold Aisle** and **Hot Aisle** show the average temperature of the cold aisle and the hot aisle. For details on configuring the temperature sensor in the module, see setting properties for 2D Modeling in *Section 3.4.8 Smart Solution Modeling*.
- **Realtime Power** shows the power of the system in real time. For details on configuration, see the real-time power settings at energy settings in *Section 3.4.6 Power Mgmt*.
- **Load Percent** is the percentage of the system's real-time power and the system's rated total power. **PUE** is the actual value of power usage efficiency.

Note

Bar graph, curve graph, dashboard, thermometer and percentage only support a maximum of 1 signal. If the element signal is not set for a newly added control, the control will not be saved to the backend.

2. Return to the browsing state

Click the icon to exit the editing state and return to the browsing state.

3. Restore to default

Click the icon to undo the user's settings for the entire control interface and return it to the initial state.

4. Save the settings

Click the icon to save the settings of the control to the backend so that modifications to the control can take effect.

Note

If you click the return icon after editing, the edited contents will not be saved to the backend.

3.3.2 Overview of IT Device

The page displays the corresponding information of the device, as shown in Figure 3-5.

1. U-level availability
2. IPMI device online rate
3. IPMI alarm device number
4. Number of console alarm devices
5. The last 10 current alarms of IPMI
6. The last 10 events of the console device

Figure 3-5 RDU501 homepage (IT device overview)

1. U-level availability is the ratio of the number of available U-levels to the total number of U-levels.
2. The IPMI device online rate is the ratio of the number of online IPMI devices to the total number of IPMI devices.
3. The ratio of the number of devices with IPMI alarms to the total number of IPMI devices.
4. The ratio of the number of devices with alarms to the total number of console devices in the console device for the past 3 days.

5. Display the last 10 current alarms of IPMI.

6. Display the last 10 events of the console device.

3.3.3 Time Calibrating link

The RDU501 system time is displayed at the top right of the page. Clicking on the System Time will jump to the time calibration page. For details, see Date / Time Setting in section *3.4.10 System* .

3.3.4 Logout

Click **Log Out** in the upper right corner of the homepage, and the prompt “Are you sure to logout?” will pop up. Click **OK** to exit safely.

3.3.5 Real-time Alarm Reminder Settings

The number of real-time alarms is displayed in the upper right corner of the system home page.

1. Click the **IT Events/Alarms** icon to display the number of events in the console for the last 3 days, the number of IPMI device alarms, and the number of events in the U-level for the last 3 days.

2. Click the **Critical Alarms** icon to display the critical alarm list.

3. Click the **Moderate Alarms** icon to display a list of Moderate Alarms;

4. Click the **Low Alarms** icon to display the Low Alarm list.

5. The new alarm sound defaults to the “Mute” state. Click the "Mute" link to set the new alarm tone to "Open", when the system has a new alarm, it will play an alarm sound.

3.4 Menu Items

In RDU501, menu items include Device, Safe Management, IT Management, Heat Management, Power Management, Data & History, Smart Solution Modeling, Device Options, and System Options.

3.4.1 Device

Click on the first level menu **Device**, the second level menu will display all the currently installed device types, click on the device type, and the content area on the right side will display all devices of that type. The device is displayed in the form of a card. The icon in the upper left corner of the card displays different colors according to the alarm status of the device. The right side of the card displays the attention signal. The device name is displayed at the bottom of the card. Click the device name to modify the device name.

Note

1. The ENV-TH device in the **Device** is a virtual device, indicating all temperature and temperature and humidity sensors connected to the RDU501 body and the name cannot be changed.
2. The attention signal can be set on the **Device - Sampling** page.

Device overview

Click on the device in the device card list to go to the device details page. Select the **Overview** tab to open the device overview page.

Click the **Edit** icon to enter the edit page, you can customize the overview page.

1. List of available controls
2. Configure controls
3. Delete controls
4. Back to browse
5. The same type of device is valid
6. Restore the default
7. Save the configuration

Figure 3-6 Device Overview -Edit

In the edit state, click the icon to batch configure other devices of the same type; click the icon to restore the default; click the icon to save; click the icon to convert the page back to the browse state.

Note

1. The **Overview** page has different default control display modes according to different device types. Click the **Restore System** icon to return to the default state.
2. Some types of devices have specific state diagrams that are not removable and not configurable. They can only update state map location information, such as air conditioners, UPS, and so on.

Sampling signal

Click the **Sampling** tab to enter the sampling signal page to display the sampling signal of the selected device.

The yellow asterisk in the last column indicates that the current signal is the attention signal and the attention signal will appear in the device card list. When you click on the asterisk in the column, the "Confirm to change the favorite signal? Will effect on the same equipment type." prompt information will be displayed, click the **OK** icon, the current signal will be set as the attention signal, and the asterisk will turn yellow.

In the signal name column, click the Modify icon or the Restore Default icon to modify the signal name or restore the signal name to the default name. (The following "Control Signal" and "Set Signal" functions also support modifying or restoring the signal name.)

Note

If a signal is in an alarm state, the line of the signal is displayed in red.

Control signal

Click the **Control** tab to enter the Control Signal page to display the control signals for the selected device. Click **CONTROL** to control the device.

Set signal

Click the **Setting** tab to enter the signal setup page to display the setup signal for the selected device.

Note

Batch settings can be made for signals by checking multiple check boxes, and 16 signals can be set in maximum batch size at a time.

3.4.2 Safe Management

Safe Mgmt monitors and manages the security of the rack through video surveillance and access control functions.

In the RDU501 homepage, click on the Security Mgmt menu to see two submenus, including: **Door Access Mgmt, and Video Surveillance** .

Door Access Management

1. Access card management

Click the **Add** icon to open the page for adding the access control card, enter the required information. For the meaning of each field, see Table 3-1. Click **SAVE** to complete the addition.

Table 3-1 Add the parameter description of the access control card

Parameter	Note
Access card number	Mandatory, you can manually enter the card number, or install a card reader to automatically read the card number. Click to download the card reader plug-in, click to view the plug-in help details
Cardholder	Not mandatory
Password	Mandatory, only numbers are allowed, and the length must be 4 digits
Valid period	Set the validity period according to actual needs
Telephone number	Not mandatory, please enter the phone number in the following format: 1. Only enter the phone number; 2. "+" + "Country Code" + "Phone Number"
Department	Not mandatory
Finger print	1.Connect the fingerprint machine to the computer, and if the computer can correctly identify the fingerprint machine, as shown "serial port connected successfully", you can perform the following operations: Click **Finger 1**, and the Register fingerprint page will pop up. Click the **Start** button on this page. After the fingerprint machine beeps, please press the fingerprint on the fingerprint machine and repeat the operation three times. Each time the input is successful, there will be a beep. After three successful attempts, the fingerprint information will be displayed on the page; if the fingerprint entry fails, you need to click the **Stop** button and then the **Start** button to restart the register. The same access control device is not allowed to register duplicate fingerprints, otherwise it will cause authorization failure; 2.After successfully registering fingerprint one, you can continue to register fingerprint two, and the operation steps are the same as those of fingerprint one. Each card can enter up to 2 fingerprints; 3.Click the **Cancel Fingerprint** button to cancel all fingerprint information associated with the card number; 4.Click the **Save** button, the registered fingerprint information will be sent to the corresponding access control device synchronously, or the fingerprint information saved on the corresponding access control device will be cancelled; 5.Click the **Cancel** button or in the upper left corner to abandon this operation.

Select an access control card to **Modify or Delete** the access control card information. When modifying the access control card information, you cannot modify the access control card number.

Click the **Card Auth Info** button to query All authorization information of the access control card.

Note

1. You can set the display or hide access control management module in **System Options -> Monitoring Unit -> Settings** .
2. After the RDU501 is connected to the higher level management platform, the access management function can be implemented through the higher level management platform.
3. Maximum number of access controllers: 4 aisle door controllers + 2 x 24 rack door lock controllers.
4. When adding an access control card, you cannot only manually enter the access card number, but also click the card number link from the access control history to add.

2. Authority management

Authority can be configured in two ways:

Method 1:

Select the **Access control equip** , check or uncheck the access control card and click the **SAVE** button to authorize or deauthorize the access control card.

Method 2:

Select the access control card and the access control card number, check or uncheck the access control device and click the **SAVE** button to authorize or deauthorize the access control device.

Note

1. For method 1, the maximum number of users for a single operation is 4.
2. For method 2, the maximum number of locks for a single operation is 100.
3. When the fingerprint card reader is configured, it is necessary to ensure that all fingerprint machine communications are in a normal state so that the authorization or cancellation of authorization can succeed. Otherwise, it will prompt failure to execute authorization or cancel authorization.

3. Historical query

You can select the type of query: event record or door opening record, then select the access control device, click the **Query** button, and query the history record of the access control device. Click the **Download** button to download.

When querying door opening records, when the access control card number is empty, 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.

If the cardholder's name in the door opening record displays "--", it means that the user has been deleted.

Clicking on the invalid card swiping event in the history log to add this card, you can jump to the access control card management tab to add the card.

4. Reset authorization

You can select from the table the access control device whose authorization needs to clear and click the CLEAR AUTHORIZATION button to clear the authorization information of all the access control cards on the selected access control device. If a fingerprint card reader is configured, the reset authorization operation will delete all the authorized user cards and the fingerprint data associated with the user cards.

5. Remote control

You can perform operations such as "remote opening" on the access control device.

6. Fingerprint card reader management

Select the controller and the door lock under the controller in the access control device area, add the corresponding fingerprint card reader, click the Add button, enter the fingerprint card reader address, and select the desired working mode, four alternative working methods are provided: independent work, swiping card + fingerprint, swiping card + password, fingerprint + password. After entering, click the ✓ button in the options to add. Click the ✕ button to cancel.

Note

1. Single door access control supports up to 2 fingerprint card readers, and multi door access control supports up to 2 fingerprint card readers per door.
2. When adding a fingerprint card reader, the access control device can only be connected to one fingerprint card reader at a time for adding. When all the fingerprint readers are added in sequence, then all of them are connected to the access control device.
3. The fingerprint card reader that has been added can only modify the working mode, not the communication address. If you need to modify the communication address of the fingerprint card reader, you must first disconnect the other fingerprint card reader from the access control device, delete the fingerprint card reader whose communication address is to be modified, and add it again.
4. When the work mode is set to independent work mode, the event record will only be generated when the invalid card is swiped.(In other modes, the event record will not be generated when the invalid card is swiped)
5. RDU501 supports various types of intelligent door locks. If you have any questions, please contact Vertiv Customer Service Center at 4008876510.

Video Management

1. Video device management

Enter the Video device IP of the video device, Login User and Login Password, click the drop-down box to select the correct device type (NVR/IPC), and click the connection Test button to test whether the video device is successfully connected. If the prompt message "Video device connection test is successful!" is displayed, the connection is successful, otherwise the connection fails. Please check whether the input video device information is correct and the video device connection is normal. Click the SAVE button to save the entered video device information. Click the CLEAR button to clear the saved video device information.

Note

1. Please ensure that the IP address of the video device is available, and each parameter must be consistent with the actual device.
2. Support the access to an NVR (Network Video Recorder) or an IPC (IP Camera).
3. NVR and IPC need to support both the onvif protocol and the RTSP protocol.
4. The video management module supports up to 8 channels of video access.
5. Video management supports Google Chrome and Microsoft Edge. Google Chrome is recommended.

2. Realtime video

Table 3-2 Live video page icon description

Icon	Descriptions
	Single device start/stop real-time browsing
	Set the current page to browse in 1*1, 2*2, or 3*3 mode
	Start/stop real-time browsing of all devices
	Capture
	Turn on video image magnification
	Turn off video image magnification

3. Video Replay

Table 3-3 Video replay page icon description

Icon	Descriptions
Device column on the left side	Select playback device
Query	Select the date of playback to find
	Play
	Stop
	Capture
	Turn on video image magnification
	Turn off video image magnification

4. If you need to set video parameters, please visit NVR/IPC to set parameters.

5. If you need to download the video, please visit NVR/IPC to download.

6. Snapshot download.

Click the **Alarm Action** submenu under the **Device Options** menu to add the alarm action configuration. See section *3.4.9 Device Options*. After the configured alarm condition is triggered, the video device will capture or record the captured image. The captured image can only be downloaded by clicking the **Snapshot DOWNLOAD** in the **Video Surveillance** menu to view and delete the photos. The system can save up to 50 latest photos. The captured video can be viewed through the **Video Replay** tab under the **Video Surveillance** menu.

Note

The video triggered can be displayed as yellow manual video recording when it is played back.

3.4.3 IT Management

IT management monitors and manages IT equipment through IPMI device management, console device management, and server shutdown management.

In the RDU501 homepage, click on the IT Mgmt menu to see seven submenus, including: IPMI Device List, IPMI Device Mgmt, IPMI Device Alarms, Console Device List, Console Device Mgmt, Console History Log, and Power Chain Shutdown.

IPMI Device Management

The icon color in the device card indicates the status of the device. When the communication is normal, it is displayed in green. When the communication fails, it is grayed out. When the device has an alarm, it is displayed in red.

1. IPMI device detailed information

Click on the card in the IPMI device list to enter the device detailed information page, which displays the device **Overview** page by default. The device **Overview** page displays basic information, shortcut menus, version information, and the latest event log of the IPMI device.

The running status is divided into normal and alarm. The icon is displayed in the normal state and the icon is displayed in the alarm status.

Click the **Time Setting** tab in the device detailed information page to enter the time setting page. After selecting the time to be set, click the SAVE button to complete the modification of the BMC time of the device.

Click the **Power Control** tab in the device detailed information page to enter the Power Control page. After selecting the control option (Power On, Power Off, or Graceful Shutdown), click the **Perform Action** button to complete the power on/off control of the device.

Click the **Event Log** tab in the device detailed information page to enter the event log page. The latest 100 log data is displayed on the page. You can download all event logs by clicking the **Export Log** button. Click the **Clear Log** button to clear all event logs for this device.

Click the **FRU Information** tab on the device detailed information page to enter the FRU information page, which displays the FRU System Board's properties and values.

Click the **Sensor Information** tab on the device detailed information to enter the Sensor Information page. By default, all categories are selected. You can click on **Temperature, Voltage, Fan or Other** category to display the information of the corresponding category of the sensor.

The status is divided into normal, alarm, and unknown. The icon is displayed in the normal state, the icon is displayed in the alarm state, and the icon is displayed in the unknown state.

Note

Depending on the third-party server's implementation of the IPMI protocol, the IT server's related status on RDU501 may be inconsistent with the actual situation. Please refer to the IT equipment client status.

2. IPMI Device Mgmt

Click the **IPMI Device Mgmt** submenu under the **IT Mgmt** menu. You can modify or delete the information of an IPMI device.

Click the **Add** button to open the page for adding devices. After entering the device information, click the SAVE button.

After modifying the device information, you need to click the **Save Configuration** button to make the configuration take effect. After clicking **Save Configuration** , the User Security Verification dialog box pops up, prompting you to enter the current user's login password. After entering the correct password, click the **OK** button to complete the save operation.

📖 Note

1. The IPMI device specifically refers to an IT device accessed through the IPMI 2.0 protocol, and its accessibility and communication stability are related to the support capabilities of the IT device itself.
2. The device IP address is not allowed to be duplicated. When modifying device information, you cannot modify the IP address.
3. If you have not modified any device information, you cannot click the **Save Configuration** button.
4. After modifying the device information, if you leave the page without clicking the **Save Configuration** button, a prompt box will pop up asking if you want to confirm leaving the page. Clicking the CANCEL button will leave the current page, and clicking the **CONFIRM** button will leave the page and ignore the modification information.
5. By default, the system can add 10 IPMI devices. If you need to expand your connecting capabilities, please contact the Vertiv Customer Service Center for purchase. The system allows a maximum of 40 IPMI devices to be added.
6. After installing the authorization code, you need to manually click the **Enable** icon ✓ to enable the device again.

3. IPMI device alarm

Click the **ACKNOWLEDGE** button to confirm the alarm. After the alarm is confirmed, the alarm notification will not be sent. When the mouse cursor is hovering over the **ACKNOWLEDGE** text, the alarm confirmation message will be displayed in a floating manner, and the mouse cursor will disappear automatically after being removed.

History Alarms

Select the device name, start time, and end time. Click the QUERY button to query the historical alarm of the selected device. Click **DOWNLOAD** to download the corresponding historical alarm list.

Alarm Notify Log

Select the start time and end time, and click the **QUERY** button to query the historical alarm of the IPMI device. Click the **DOWNLOAD** button to download the corresponding alarm notification log list.

📖 Note

The alarm notification log page and the historical alarm page display up to 500 queried results. If there are more than 500 PCS, you need to download through “DOWNLOAD” to download all queried results.

Console Device Management

When you access the device through RDU501, the device is defined as idle and the card is displayed in green. When the device is being accessed through RDU501, the device is defined as being in use and the card is displayed in red.

1. Console device details

You can open the terminal viewer by clicking the card in the **Console Device List** . If the device status is in use, you cannot open the terminal viewer for access. Open the terminal viewer window, which simulates the terminal display. You can directly input commands to operate the serial port target device in the window.

📖 Note

1. A serial port device can only be accessed by one user at a time, so multiple web users can only access their own serial port devices at the same time.
2. After opening the serial port device, if you leave the **Console Device List** page, a prompt box will pop up asking if you want to close the open terminal viewer. Clicking the **No** button will not close the opened window, clicking the **Yes** button will close the opened window.

2. Console device management

Click the **Console Device Mgmt** submenu under the **IT Mgmt** menu. Select a console device to modify, add, or delete the device's keywords. You can also modify or delete the device information.

Click the **default keyword mgmt** button to open the default keyword management page, click the **Add** button, enter the keyword you want to add, click the **OK** button. When you add a keyword to a specific device, you can directly select the keywords that have been added in the default keyword. The RDU501 can filter the input/output information of the serial port target device through user-defined keywords and generate an event when the keyword matches.

Click the **Add** button to open the page for adding devices. After entering the device information, click the **SAVE** button.

After modifying the device information, you need to click the **Save Configuration** button to make the configuration take effect. After clicking Save Configuration, the User Security Verification dialog box pops up, prompting you to enter the current user's login password. After entering the correct password, click the **OK** button to complete the save operation.

📖 Note

1. You can define keywords for each serial port target device, up to a maximum of 20.
2. If you have not modified any device information, you cannot click the **Save Configuration** button.

3. After modifying the device information, if you leave the page without clicking the **Save Configuration** button, a prompt box will pop up asking if you want to confirm leaving the page. Clicking the CANCEL button will stay in the current page, and clicking the **OK** button will leave the page and ignore the modification information.

4. By default, the system can add 8 Console devices. If you need to expand your connecting capabilities, please contact the Vertiv Customer Service Center for purchase. The system allows a maximum of 32 Console devices to be added.

5. After installing the authorization code, you need to manually click the **Enable** icon to enable the device again.

3. Console log data

Click the **Console History Log** submenu under the **IT Mgmt** menu. The console log data page contains two tabs, the Log QUERY and the Event Notify Log.

Select the query type, device name, start time, and deadline. Click the **QUERY** button to query the event log that meets the filter criteria. Click the **DOWNLOAD** button to download the corresponding event log list. The historical log can only be viewed after downloading, and cannot be directly queried.

Select the start time and the end time, click the **QUERY** button to query the event notification log within the selected time period. Click the **DOWNLOAD** button to download a log that matches the filter criteria.

Note

The log query page and event notification log page display up to 500 queried results. If there are more than 500 PCS, you need to download through “DOWNLOAD” to download all queried results.

Power Chain Shutdown

This function controls the IT server switch with the power and environment monitoring device signal or time schedule as input.

Note

In the RDU501 standard product, this module only provides relatively basic functions. If you have more functional requirements, please contact us.

Click the **Power Chain Shutdown** submenu under the **IT Mgmt** menu to open the **Power Chain Shutdown Mgmt** page and display the strategy list.

- Enable strategy

The icon in the strategy list indicates that the current strategy is disabled. Clicking on the icon will bring up the prompt "Are you sure to enable the strategy?", click the OK button to enable the strategy.

- Disable strategy

The icon in the strategy list indicates that the current strategy is enabled. Clicking on the icon will bring up the prompt "Are you sure to disable the strategy?", click the OK button to disable the strategy.

- Delete strategy

Select the strategy you want to delete in the strategy list, click the Delete icon, the confirmation delete dialog box will pop up, click the OK button to delete the selected strategy.

- Add/modify strategy

1. Conditional strategy

When you click the **Add Condition** button or modify a conditional strategy, you can open the detailed information page for the conditional strategy. The page includes basic information about the conditional strategy (name, description, priority, etc.) and a list of input conditions.

Click the **ADD** button in the input condition list to open a page that adds input criteria. Fill in the device, signal type (acquisition or alarm signal) signal name and other information, click the **SAVE** button.

After filling in the basic information and input conditions of the conditional strategy, click the SAVE button in the lower right corner of the page. After saving successfully, it will automatically return to the strategy list page.

Note

1. When the signal type of the input condition selects the sampling signal, both the operator and value need to be selected. When the alarm signal is selected, only the value needs to be selected, and the value includes the alarm generation and the alarm disappearing values.
2. Supports up to 16 input conditions.

2. Plan strategy

When you click the **Add Plan** button or modify a plan strategy, you can open the detailed information page for the plan strategy. The page includes information such as the name, description, and priority of the plan strategy.

The modes of the planning strategies fall into three categories: once, daily, and weekly. When the mode is “once”, you need to select the year, month, day, and hour, minute, and second. When the mode is “daily”, you only need to select the hour, minute, and second. When the mode is “weekly”, you need to select Week (Monday to Sunday) and time (hour, minute, second).

After entering the planning strategy information, click the **SAVE** button in the lower right corner of the page. After saving successfully, it will automatically return to the strategy list page.

3.4.4 Heat Management

Teamwork control of air conditioner

The air-conditioning teamwork control function monitors and dispatches each air conditioner participating in the teamwork control according to certain rules to achieve the purpose of reducing air conditioning energy consumption, extending the overall life of the air conditioner, and avoiding competition between air conditioners in one team.

In the RDU501 homepage, click on the **AC Teamwork** menu on the left side, you can see two sub-menus, including: TeamWork Status and TeamWork Setting.

1. TeamWork Status

Click the **TeamWork Status** tab under the **AC Teamwork** menu to pop up the TeamWork Status page.

The TeamWork Status page shows the main operating parameters of the air conditioner in all air conditioner groups. Operating parameters include: group name, connection method, cooling name, device status, operation status, change reason, alarm status, rotation, last polling time, polling result, next polling time, sensor name, and lead/lag.

2. Teamwork control settings

> 🕮 Note
>
> The air conditioner teamwork control function of the RDU501 is divided into two versions: standard version and authorized version. The standard version has the air conditioner teamwork control function configured by the RDU501 standard software; the authorized version is the software version after you separately purchase and install the authorization code.

1) Teamwork control parameter setting

Click the **TeamWork Setting** tab under the **AC Teamwork** menu to pop up the teamwork control parameter setting page, as shown in Figure 3-7.

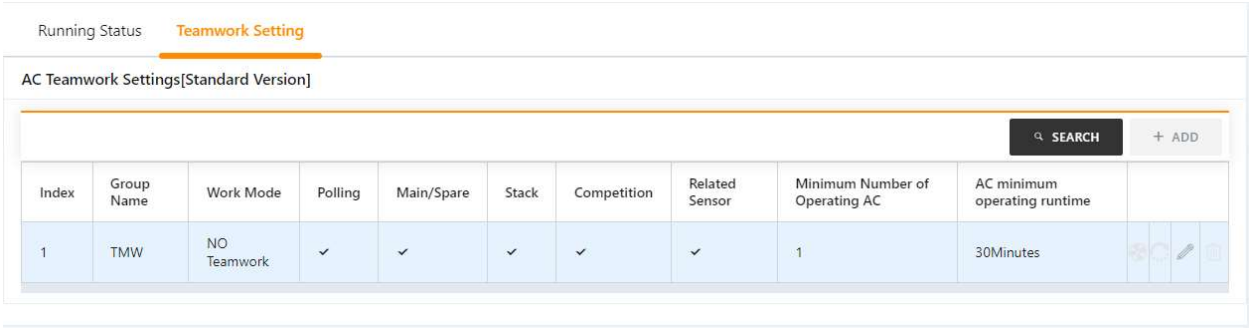


Figure 3-7 Teamwork control parameter setting page

The description of the RDU501 teamwork control function is as follows:

The standard version only supports 1 air conditioning group. The default is **TMW**. The addition and deletion teamwork functions are not provided and the group name cannot be changed. The authorized version is not subject to this restriction.

In the authorized version, click the **Add** button to add a new air conditioning group. After completing the group parameter configuration, click the SAVE button to save the settings. At this time, the added group will appear in the **AC Group** on the parent page.

The parameter description of the group parameter setting page is shown in the table below.

Add, modify or delete the air conditioner in the group on the air conditioner parameter setting page, please refer to 2) air conditioner parameter setting in this section;

In the authorized version, selecting the **AC Group** that needs to be modified in the air conditioner group list is similar to the step of adding a group, modify the teamwork parameters on the teamwork parameter setting page, set the air conditioner parameters in the group on the air conditioner parameter setting page, and complete the modification. After that, click the SAVE button to save the settings;

In the authorized version, select the **AC Group** that needs to be deleted in the air conditioner group list, click the **Delete** button to save the settings.

Table 3-4 Teamwork control parameter settings

Teamwork parameters	Default value	Low limit	High limit	Remark	Standard version	Authorized version
Teamwork mode	Single unit	Single unit(0)	Teamwork control mode(1)	Single unit(0) : The air conditioners in the group operate separately; Teamwork control mode(1) : The air conditioners in the group participate in teamwork logic operations	√	√

Teamwork parameters	Default value	Low limit	High limit	Remark	Standard version	Authorized version
Minimum Number of Operating AC	1	1	Number of teamwork air conditioners	-	-	√
AC minimum operating runtime	30	5	180	Unit: Min	-	√
Return Air Temperature Setpoint	20	15	40	Unit: ˚C	√	√
Return Air Temperature Sensitivity Settings	5	1	5	Unit: ˚C	√	√
Rotation Quantity	1	1	Number of teamwork air conditioners	Smaller value between the number of running units and the number of standby units	-	√
Rotation Frequency	By day	By day, by week		-	√	√
Rotate interval	1	1	99	By day	√	√
Rotate On	1	1	7	by week Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, Sunday	√	√
Rotate Time	00:00	00:00	23:00	/	√	√
Rotate Once	No	No	Yes	Used for commissioning	√	√
Reset to Default	No	No	Yes	Initialize air conditioner status	√	√
AC Turn ON Temperature	25	15	40	-	√	√
AC Turn OFF Temperature	17	15	40	-	√	√
Note: " √ " means the version selected can be configured; button for "One time manual rotation" is , button for "Reset air conditioner status" is .						

Note

1. If you need an authorized version of RDU501, please contact Vertiv Customer Service Center for purchase.
2. The standard version only supports 4 air conditioners by default, including Vertiv™ DME series air conditioner and SmartRow2 built-in air conditioner.
3. The RDU501 supports up to 8 groups.

2) Air conditioner parameter setting

In the air conditioner parameter setting page, you can add, modify and delete the air conditioner in the group. Click the **Add/Modify In Row** button in the air conditioner list to pop up the Modify page.

●Procedures for adding air conditioner:

1) In the **AC No.** bar, enter the index of the air conditioner in the group (the default index will be increased from 1);

2) Select the air conditioner that needs teamwork control from the air conditioner drop-down box, and fill it only in the protocol connection;

3) Check whether to participate in the rotation schedule;

4) Select the device with DO from the **Associated DO Controller** (optional);

5) Select the signal corresponding to the DO device from the **Associated DO Controller Signal** drop-down box (optional);

6) Select the active and standby properties to specify the current active and standby properties of the air conditioner. This attribute will change. For example, if the A air conditioner is currently set as the host, when the rotating time is reached, the attribute of the air conditioner A will become the standby unit.

7) Set the **Associated T Sensor** , each air conditioner can be connected with up to 5 temperature sensors. When the highest temperature in the associated sensor is higher than the air conditioner startup temperature, if the current running state of the air conditioner is off, the air conditioner will be started. When the maximum temperature is lower than the air conditioner shutdown temperature, if the current running state of the air conditioner is running, the air conditioner will be turned off.

8) Set the air conditioner fault alarm signal which are generated if the air conditioner is faulty or unavailable. A maximum of 15 fault alarm signals are allowed for each air conditioner.

9) In the **Cooling Name** field, enter the name of the air conditioner in the teamwork control and fill it only in the DI connection;

10) Select the switch device to be associated in the drop-down box of the **Associated ON/OFF Device** , and select only in the DI access;

11) Select the signal of the associated switch device in the **Associated ON/OFF Signal** drop-down box, and select only in the DI access;

12) Select the fault status device to be associated in the **Associated Faulty Device** drop-down box and select only in the DI access;

13) Select the signal of the associated fault state device in the **Associated Faulty Signal** drop-down box and select only in the DI access;

14) Click the SAVE button to add air conditioner to complete the air conditioner operation. The basic information of the air conditioner will also be displayed in the parent page list.

🕮 Note

1. The set air conditioner index cannot be greater than the number of air conditioners in the group.
2. The standard version will only display DME air conditioners, SmartRow V2 built-in air conditioners, and other models of air conditioners cannot be displayed.

- The procedures to modify the air conditioner are as follows:

1) Select the air conditioner to be modified in the air conditioner list, and modify the air conditioner index, temperature sensor correlation and air conditioner fault alarm signal.

2) After the modification is completed, click the SAVE button to complete the modification of the air conditioning operation. The basic information of the air conditioner will also be displayed in the parent page list.

The procedures to delete the air conditioner are as follows:

Select the air conditioner to be deleted in the air conditioner list, click the Delete button on the right to delete the air conditioner, and the basic information of the air conditioner will be deleted from the page list.

🕮 Note

After modifying the air conditioner parameters, you need to click the save button at the bottom of the group parameter settings to make it effective, otherwise the data will be lost after switching pages.

3.4.5 AI Lite

Energy Saving Module

Through AI algorithm, the Energy Saving Module learns the relationship between IT power, air conditioner configuration and data center temperature, PUE, and constantly searches for better air conditioner working numbers, air conditioner working positions, and air conditioner temperature set points, so as to achieve the goal of reducing PUE and keeping the data center safe.

Authorize Energy Saving Module

Use the USB Key to authorize Energy Saving Module: after getting the USB Key, stick it into the USB port of RDU501. Then log in RDU501, and the tip of enabling Energy Saving Module will pop up.

🕮 Note

1. If you need an authorized version of RDU501, please contact Vertiv Customer Service Center for purchase.
2. When you stick the special USB Key into RDU501, only the administrator-level users will see the tip of enabling Energy Saving Module; other users will see the tip "the user's level is not enough to enable Energy Saving Module".

Click confirm button after entering the password, you will be navigated to the restart page; then log in the system, you will see the AI Lite menu.

Enable Energy Saving Module Function

In the Parameter Setting page, click the "ENABLE" button, and the Energy Saving Module will switch to enabled status.

Pages of Energy Saving Module

Energy Saving Module includes four pages: Data Overview page, Parameter Setting page, Environmental Setting page and AC Status page.

1.Data Overview

This page mainly displays the running result of AI algorithm.

This page's top part shows the energy data and PUE. The energy data includes AI saved energy, IT energy and total energy.

There are three charts in the main part of this page: PUE chart, Power Consumption chart and Rack Environment chart.

- The **PUE chart** displays PUE tendency, which includes two elements: AI Measured PUE and Process Estimation PUE. AI Measured PUE is the instantaneous PUE value under the control of AI algorithm; Process Estimation PUE is the estimated PUE value under the control of another scheme. Meanwhile, the PUE chart provides "Day, Week, Month, Customize" options to query the PUE data.
- The **Power Consumption chart** displays the tendency of power consumption in the last 7 days, including infrastructure consumption and IT consumption.
- The **Rack Environment chart** displays the tendency of average cold aisle temperature and system load rate in the last 7 days.

The PUE chart and the Rack Environment chart support comparison line setting: you can click the gear button in the upper right corner of the chart to set the comparison line.

2.Parameter Setting

The Parameter Setting page is the control page for Energy Saving Module, including Participate in AI air conditioning configuration, Parameter Setting and AI Energy Saving Enable and Reset.

Users can choose whether the current AI scenario type is configured as aisle level or room level. If the aisle level type is selected, the user does not need to manually config Acs to participate in the list of AC, and the RDU501 system will automatically synchronize the ACs listed in the 2D modeling, aisle level type supports 2~6 ACs; if the room level type is selected, the user needs to manually select Acs to participate in the list of AC and click the SAVE button, room level type supports 2~5 ACs . The parameter setting includes two key parameters of Energy Saving Module: Minimum Number of Working AC and Cold Aisle Target Temperature. Click the ADVANCED PARAMS SET button to view and modify more related parameters. Only admin can enter the Advanced Params Set page.The minimum number of working air conditioners is the allowed minimum number of working air conditioners while the Energy Saving Module is running. The cold aisle's target temperature is the expected average cold aisle temperature while the Energy Saving Module is running.

🕮 Note

If you need to change the parameters in Parameter Setting or Advanced Params Set, please contact Vertiv technical service personnel.

Users can click the ENABLE button to turn on the AI energy-saving module. After enabling it, they can click the DISABLE button to turn off the AI energy-saving module.Reset AI Module: the AI algorithm will discard the module learned before, and then restart to learn and establish new module to control air conditioners.

Clear AI Data: this function will clear all data on the overview page.

3. Environmental Setting

The Environmental Setting page is mainly the environmental signal configuration page participating in the AI energy-saving module, including cold aisle temperature signals, hot aisle temperature signals, etc. If the current AI scenario type is room level, click the ADD button to configure the environmental signals; if the current AI scenario type is aisle level, the system will automatically synchronize the hot and cold aisle temperature signals bound to the cabinet in the 2D modeling, and the remaining signals still need to be configed manually.

4. AC Status

The AC status page mainly displays some signal values participating in the AI energy saving, including the on/off status of the ACs, supply air temperature, return air temperature, fan speed and compressor capacity.AI Battery Management

Through AI algorithms, the AI battery management predicts the internal resistance value of a single battery one month later based on the data collected by the current lead-acid battery. The prediction can be manually triggered or can be performed automatically and periodically.

AI Battery Management Authorization

You can authorize AI battery management in the following two ways:

- USB. When you authorize the AI energy-saving module using the USB, the AI battery management will be automatically enabled.
- Authorization code. You can purchase the AI battery management authorization code to enable this function.

🕮 Note

If you need the authorization code of AI battery management, please contact Vertiv Customer Service Center at 4008876510 and purchase the code.

After authorization, the restart page will be displayed. After the restart and logging in to the system, you will see the AI Lite / AI Battery Management menu.

AI Battery Management Page

AI battery management Includes three pages: Data Overview, Warning Event, and Parameter Setting.

1. Data Overview

The upper area of the Data Overview page shows the top 10 latest warnings and the warning distribution. The latest 10 warnings are displayed dynamically. The warning distribution is displayed in a pie chart with the proportion of the confirmed warnings and the unconfirmed warnings.

The lower area of the Data Overview page shows the last successful prediction of the lead-acid battery, including the prediction time, the next prediction time, and the histogram of the predicted value. The abscissa of the histogram is the serial number of the single battery, and the ordinate is the internal resistance value. The diagram compares the internal resistance value and the predicted value. You can switch between different lead-acid batteries in the device drop-down menu.

2. Warning Event

If the internal resistance value of a single battery predicted by the RDU501 is greater than the internal resistance upper limit, a warning will be generated. All warnings are displayed on this page. You can click the warning snapshot icon to view the detailed information of the device when the warning is generated. You can click the WARNING CONFIRM button to confirm the warning.

🕮 Note

1. A maximum of 500 warnings can be displayed on the **Warning Event** page. If there are more than 500 warnings, you can view all the warnings by downloading them.

2. If you need to generate a warning during prediction, configure the internal resistance warning upper limit (%) and the internal resistance reference value (μΩ) on the parameter settings page.

3. Battery internal resistance warning upper limit = Internal resistance warning upper limit (%) x Battery internal resistance reference value (μΩ).

3. Parameter Setting

On the Parameter Setting page, you can set the predication parameter and the internal resistance reference value.

- AI prediction cycle indicates the cycle of the AI battery management periodic prediction. When the cycle is monthly, the periodic prediction starts at 8:00 on the first day of each month. When the cycle is weekly, the periodic prediction starts at 8:00 on every Monday. The default cycle is monthly.
- Internal resistance warning upper limit (%) is a percentage value. The default is 150%.
- Internal resistance reference value indicates the internal resistance reference value of the battery. After selecting the battery device, you can manually input the internal resistance reference value or click to calculate the reference value. After that, click the Save button. The default internal resistance reference value of each battery device is none.

🕮 Note

When the internal resistance reference value (μΩ) is a valid value, the internal resistance baseline will be shown in the AI prediction histogram on the Data Overview page.

3.4.6 Power Mgmt

The Power Mgmt function displays current and historical energy consumption data in accordance with user-defined rules to help users analyze the overall energy consumption of the equipment room.

In the RDU501 home page, click on the Power Mgmt menu on the left to see submenus, including: current data, history data, energy consumption settings, and power train 3D. If a battery device is added to the RDU501, Battery Mgmt will appear as the new submenu.

Current Data

Click the Current Data sub-menu under the Power Mgmt menu to display the current PUE and system load rate; meanwhile, use the selector in the header of this page to switch the statistics mode of current PUE(power mode or energy consumption mode).

History Data

Click the History Data submenu under the Power Mgmt menu to display the historical data recorded in the system. Click DOWNLOAD to download all historical data recorded in the system.

🕮 Note

1. The RDU501 records and displays up to 1000 energy consumption history records.
2. After you have set the energy consumption, the system will save the record every 1 hour according to the user's configuration.
3. When you do not perform any energy consumption statistics setting, the system does not save the energy consumption record.
4. When you have set the energy consumption statistics without setting the system load percent, the system will still save the energy consumption record, but the load rate will always be 0.

Calculation Setting

The current PUE can be calculated by power mode PUE setting or energy consumption mode PUE setting. For the convenience of description, define A=IT equipment energy consumption, B=power and environment equipment energy consumption, C=all equipment energy consumption, the rules are as follows:

If statistics A and B are configured, then PUE=(A+B)/A;

If statistics A and C are configured, then PUE=C/A;

If statistics B and C are configured, then PUE=C/(C-B);

Wherein, each energy type can be configured with up to 64 signals, and each signal can be selected with an addition and subtraction operator. The values of A, B, and C are the arithmetic sums of the signal values they configure, respectively.

Meanwhile, there are calibration options provided to meet the demand of flexible configuration which you can use to make configuration based on real environment.

1. Power Mode PUE Setting

In power mode, current PUE will be calculated by the instantaneous equipment power. For example:

The current power value of IT equipment is 8kW, and the value of all equipment is 10kW. Then the PUE is: 10 / 8 = 1.25

2. Energy Consumption Mode PUE Setting

In the energy consumption mode, the system will count the energy consumed by devices during the interval at each o'clock, and calculate the PUE value during the period, for example:

The energy consumption value at 11:00: IT equipment's value is 28kWh, and all equipment's value is 62kWh;

The energy consumption value at 12:00: IT equipment's value is 36kWh, and all equipment's value is 72kWh;

The PUE for the 11:00 to 12:00 period is: (72 - 62) / (36 - 28) = 10 / 8 = 1.25.

Note

If the **Power Mode** is selected, the power signal needs to be selected. If the **Energy Consumption Mode** is selected, the energy consumption signal needs to be selected.

3. System Load Percent Setting

You can configure the current power signals and the rated power to calculate system load percent. The rules are as follows:

System load percent = current power / rated power

Wherein: Current power is the sum of all power signals in the list of current power signals on the page.

Note

1. Up to 64 current power signals can be configured in the current power setting.
2. In the SmartAisle3 scenario, the rated total power does not support editing. If you need to change it, please enter the SmartAisle3 setup wizard configuration plan page to modify the SmartAisle3 total power.

Battery Management

You can monitor batteries in real time on the lead acid battery management page and lithium battery management page.

1. Lead acid battery management

After adding a lead-acid battery to the RDU501, the **Lead Acid Battery Mgmt** tab will be displayed under the Battery Mgmt menu. All lead-acid battery devices are displayed in the card-styled boxes. Click the Setting icon in the upper right corner to bind the lead-acid battery with the UPS connected to the RDU501. After saving the operation, click the Return button and the lead-acid batteries will be rearranged and listed according to the bound UPS. Click the lead-acid battery card to display the detailed parameter information, as shown in Figure 3-8.

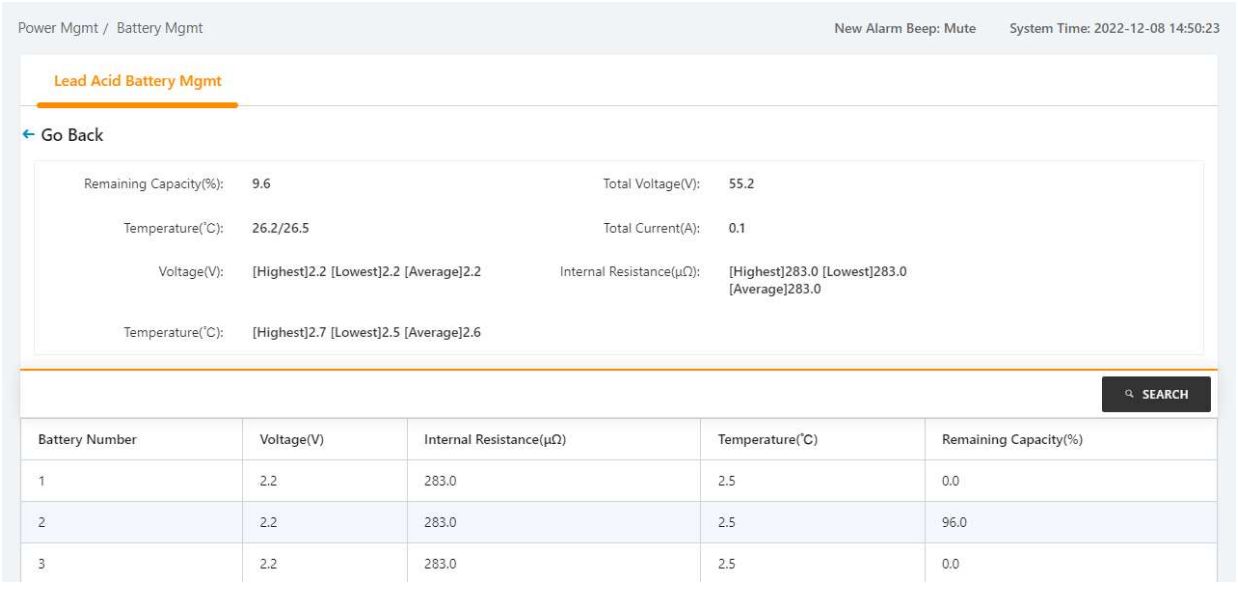


Figure 3-8 Home page of lead-acid battery

Note

Multiple UPS devices cannot be bound to one lead-acid battery.

2. Li Battery Mgmt

After adding a lithium battery to the RDU501, the **Li Battery Mgmt** tab will appear under the Battery Mgmt menu, displaying the parameter information of the selected lithium battery.

You need to set the number of battery cabinet monitoring modules on the device page of the lithium battery. When the number of monitoring modules in the battery cabinet is not 0, the battery cabinet will appear on the **Li Battery Mgmt** tab.

If you create the 2D model and there are in-row battery cabinets in the model, the battery cabinets and locations are displayed in 2D model on the **Li Battery Mgmt** tab, as shown in Figure 3-9. If you do not create the 2D model or there isn't any in-row battery cabinets in the model, the battery cabinets and locations are displayed in the card form, as shown in Figure 3-10.

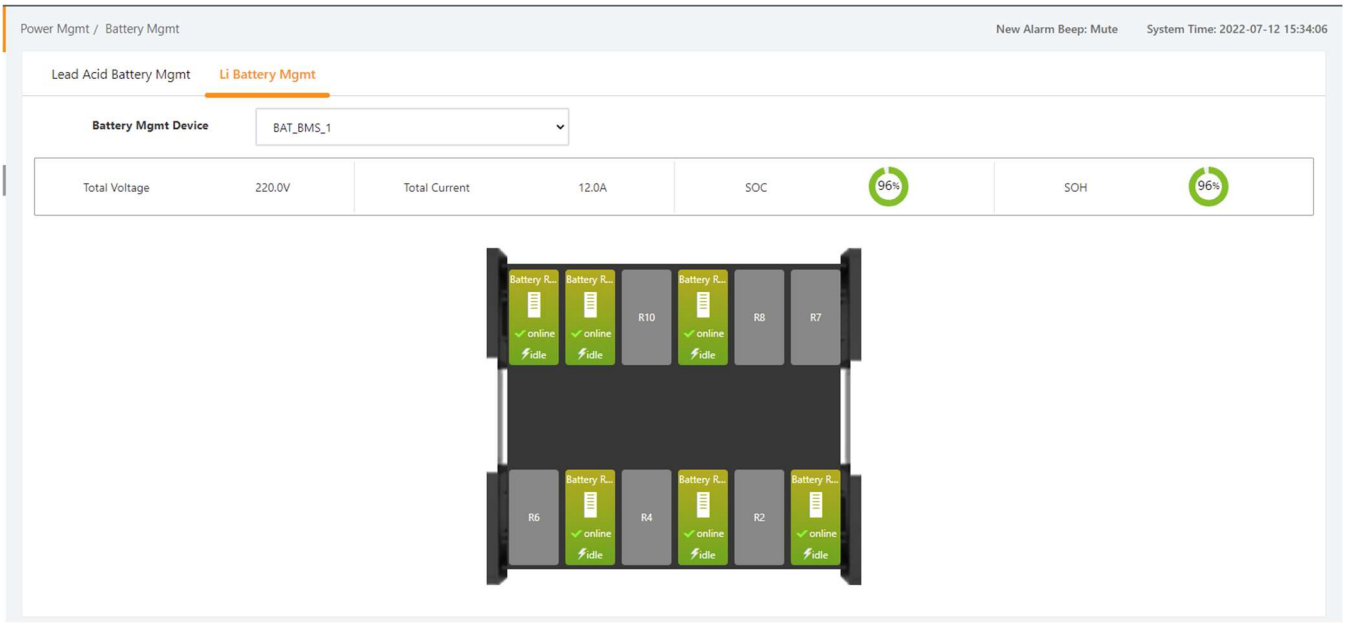


Figure 3-9 In-row lithium battery cabinet

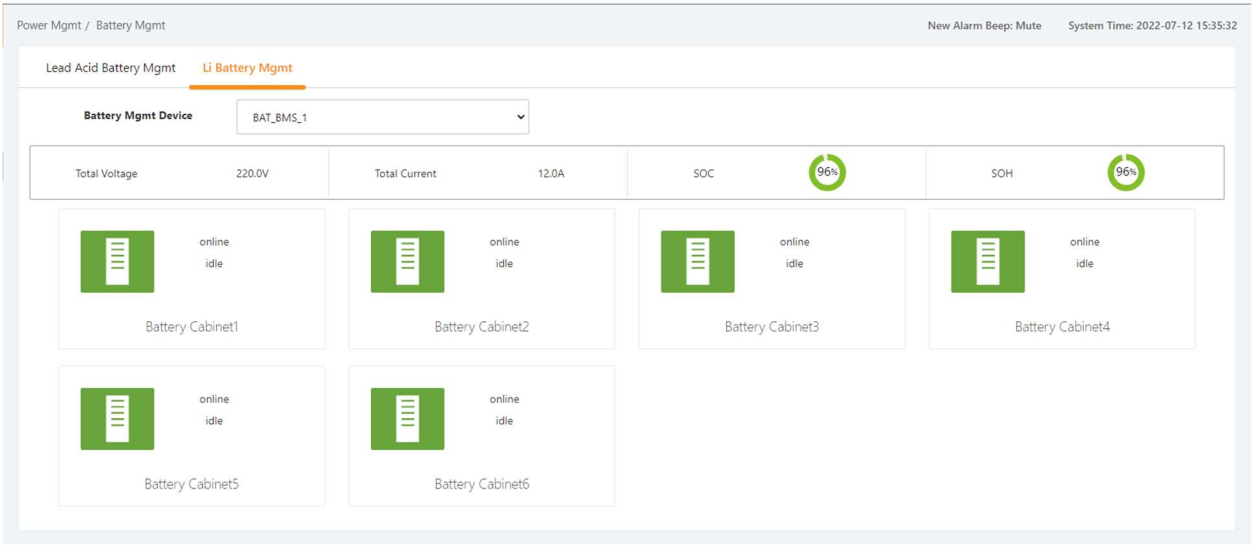


Figure 3-10 Non in-row lithium battery cabinet

Click the battery cabinet to enter the detailed information page. The parameters of the battery cabinet are displayed on the left side of the page, and the parameters of each module are displayed in turn on the right side of the page. The temperature field and certain parameters of the module are displayed in the middle of the page. Click the module color setting icon to modify the color of the temperature field.

Note

1. When the number of battery cabinet monitoring modules on the lithium battery setting page is 0, the battery cabinet is not displayed on the lithium battery homepage. You can set the HPL P1 battery cabinet monitoring numbers to 10. The default is 0.
2. SmartAisle3 does not support binding the lithium battery cabinet in the 2D modeling. The lithium battery homepage displays the battery cabinet in the card form.
3 The current version is compatible with HPL P1 lithium battery and IBMU lead acid battery. If you want to monitor other models of battery, please contact Vertiv Customer Service Center.
4. The battery management function only shows basic parameters. For more advanced functions, please operate in the corresponding battery management system.

Power Train 3D

Click **Power Train 3D** under **Power Mgmt** to add, bind, display and delete the power train 3D image.

1. Add power train 3D image.

Click **ADD**. In the displayed dialogue box, click **CONFIRM** to enter the Select Components page.

Figure 3-11 Select Components page

All the components are displayed as shadows by default. After clicking on the component that needs to be added, the component will become a solid entity. Click the ✔ icon in the upper right corner to enter the Integrated Components page.

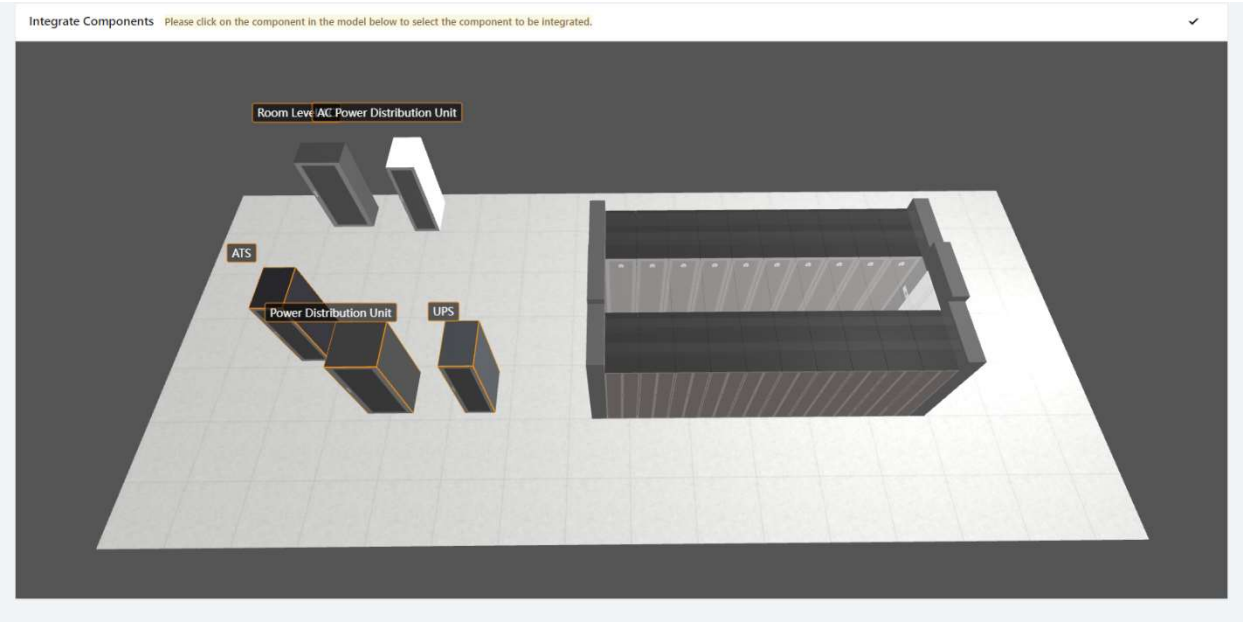


Figure 3-12 Integrated Components page

All components added by the user will be displayed. After clicking on the component that needs to be integrated, the outer border of the component will be displayed in orange. Click the ✔ icon in the upper right corner, and the component is successfully integrated. After the components are integrated, the system dynamically generates power links between user-added components to show the direction of current flow.

Note

If you haven't performed the 2D modelling, when you try to add a power train 3D image, you will be prompted with "Please config 2D Modeling". Click **Please config 2D Modeling** to enter the **2D Modeling** page.

2. Bind power train 3D image

Click the ⚙ icon to enter the Bind page.

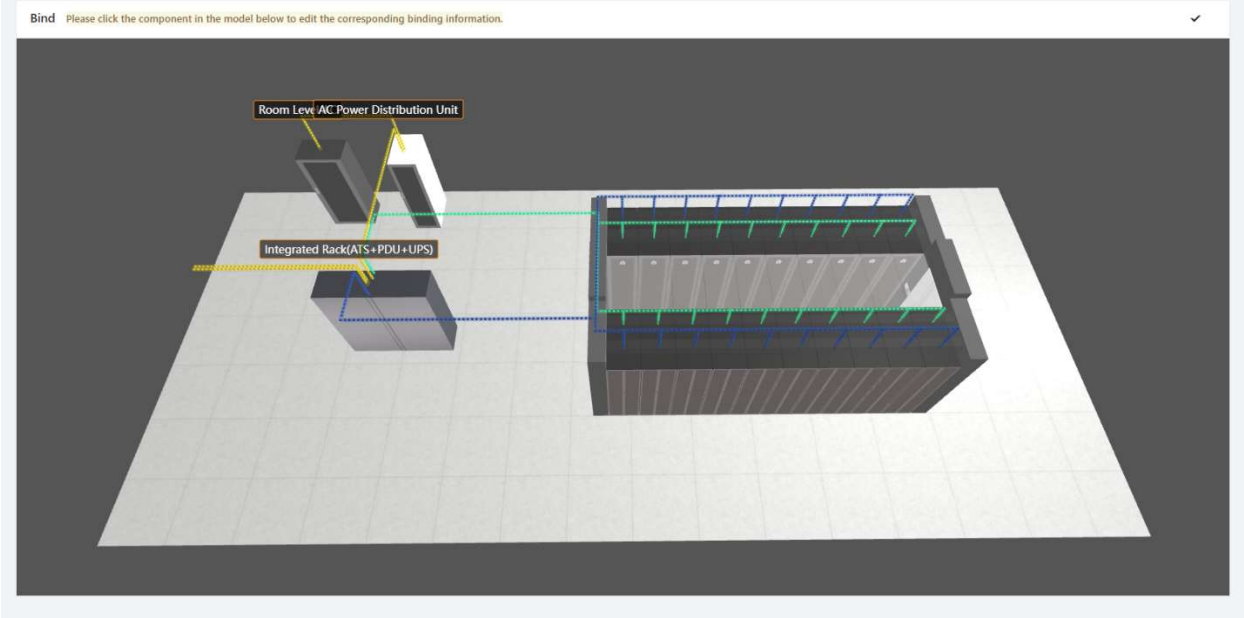


Figure 3-13 Bind page

Click a component to enter the Component Property page. You can set Bind Device, Component Name, Capacity(kW), Custom Property Information, and Device Signal.

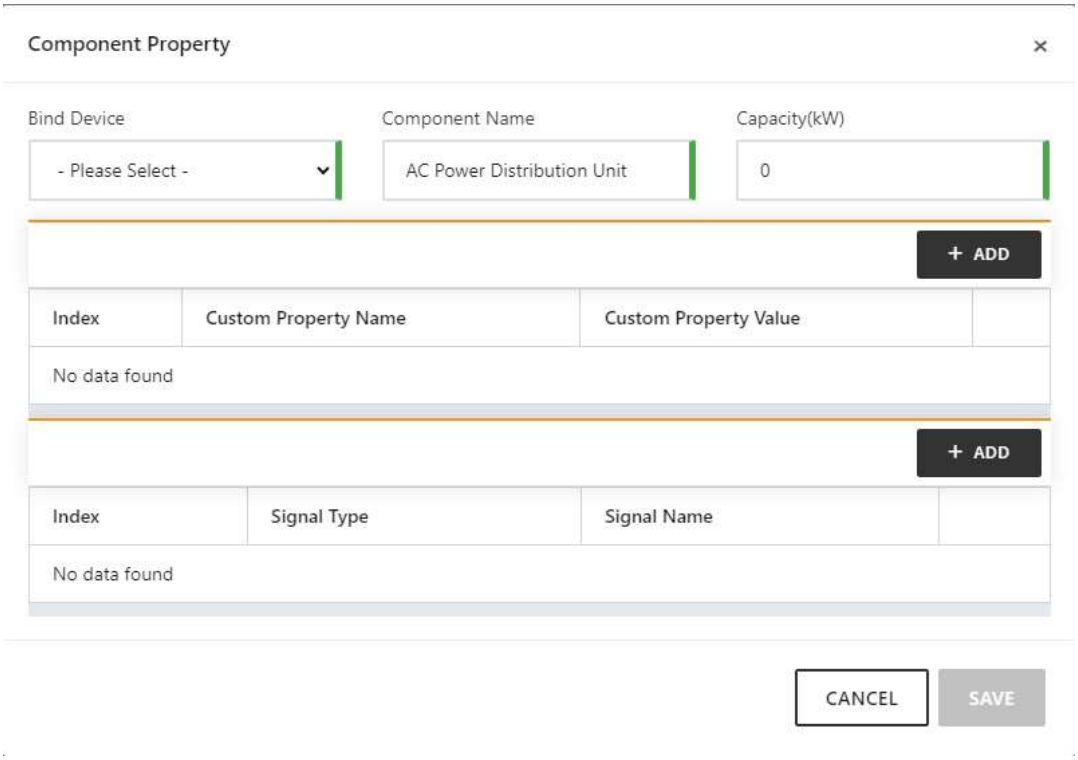


Figure 3-14 Component Property page

Note

1. One component can be bound to at most one device.
2. One component supports up to three sets of user-defined information. ,
3. One component can be bound to up to 16 signals.
4. The component can be bound to only the sample signals and the alarm signals of the device.
5. The property of the component outside the module is modified on the power train 3D bind page. The property of the component in the module is modified on the 2D modeling page.
6. The binding relationship between the component and the device and the binding relationship between the component and the device signal will be automatically released after the device is deleted.

3. Display power train 3D image

After adding the power train 3D image, the power distribution status of the components is displayed based on the components added by the user and the binding device and signals. You can hover the mouse pointer over the component to see the name, capacity, binding signal and alarm signal.

Click the alarm icon to turn on or off the dynamic environment alarm function. When the alarm is on, if the dynamic environment device generates an alarm, the display status of the component bound to the device will change accordingly. When the alarm is off, if the dynamic environment device generates an alarm, the display status of the component bound to the device will not change accordingly.

Table 3-5 Style and description of power distribution components

Component style	Descriptions
Normal	The component is not bound to a device; the communication status of the component-bound device is normal and there are no alarms.
Red	The component is only bound to the device and the device has alarms; the component is bound to both the device and the device alarm signal and the device alarm signal has alarms.
Grey	The communication status of the device to which the component is bound is abnormal.

Table 3-6 Style and description of power distribution link

Link type	Link style	Descriptions
Normal link	Flowing	The link is in the powered state
	Grey, not flowing	The link is not in the powered state
	Greyish white, not flowing	Whether or not the link is in the powered state is unknown. (The component is not bound to any devices or the device communication is abnormal)
Link between UPS component and battery component	Flowing from UPS component to battery component	The battery is the charging state
	Flowing from battery component to UPS component	The battery is in the discharging state
	Yellow, not flowing	The battery is not in either the charging state or the discharging state
	Greyish white, not flowing	Whether or not the battery is in the charging state is unknown. (The component is not bound to any devices or the device communication is abnormal)

📖 Note

The style of the device has the highest priority, when the devices to which the component is bound has abnormal communication.

4. Delete power train 3D image

Click the delete icon on the power train 3D page, and a dialogue box is displayed. Click **CONFRIM** to delete the image.

3.4.7 Data & History

The Data & History function provides several types of historical data and log data query services.

In the RDU501 home page, click the Data & History menu on the left to display 9 submenus, including: Current Alarms, History Alarms, Device Information, History Data, Smart Reports, History Log, U-level Recent Events, Historical Data Backup and Clear History.

Current Alarms

1. The **Current Alarms** can display the current alarm of the system by clicking the alarm level on the tab of the **Current Alarms** page.
2. Click the **CONFIRM** button to confirm the alarm. The confirmed alarm will no longer participate in the alarm action, and the alarm notification will be sent only once.
3. When the mouse cursor is on the confirmed link, the alarm confirmation message will be displayed in floating position, and the mouse cursor will disappear automatically after being removed.

History Alarm

There are two sub-tabs: **History Alarm Query** and **Alarm Report**.

1. History Alarm Query

Click the **History Alarm Query** submenu to view historical alarm records. Select a device (such as "All Devices") and set the **Start Time** (for example "2019-01-01 00:00:00") and the **End Time** (for example "2019-01-02 23:59:59"). Then click the QUERY button to list all the alarm records from the start time to the end time, including: **Index, Device Name, Signal Name, Alarm Level, Trigger Value/Ref. Video, Start Time, Confirmed by, Confirmed at** and **End Time**.

Click the **DOWNLOAD** button to download the queried results.

📖 Note

The page displays up to 500 results, and more than 500 items need to be downloaded through the DOWNLOAD button.

2. Alarm Statistics Report

Click the **Alarm Report** submenu to view alarm statistics. Select the report type (for example, "Statistic by device alarm level"), set the query period (for example, "2019-01-01 00:00:00" and "2019-01-01 23:59:59"), and then select the device type. (eg "ENP_ENV_TH1[SENSOR]"), select an alarm level (eg "Low Alarms") and finally select one or more devices (eg "ENV_TH1") in the device list. Then click the **Show Statistics Report** button. A statistical report will be generated graphically.

When the mouse is hovered over  , it will be saved as a picture, click on the icon, and the statistics will generate a .png format file, which can be downloaded and saved.

The alarm statistics report provides the following three statistical dimensions to view alarm information:

Statistics by Alarm Level: The number of alarms of a certain alarm level of multiple devices that belong to the same device type in a certain period of time is displayed in a pie chart.

Statistics by Alarm Signal: the number of alarms of a certain alarm signal of multiple devices that belong to the same device type in a certain period of time.

Statistics by All Site: Simultaneously generate a pie chart of the proportion of each alarm level in the selected time period, a histogram of the number of alarms by month, and the number of occurrence times of the five alarms with the most occurrences.

Device Information List

The **Device Information List** page contains five sub-pages: **Device Information List, Export SNMP, Asset Inventory, Asset Batch Configuration,** and **Asset Bind**.

1. Device information list

Click the **DOWNLOAD** button to download the queried results.

2. Configure SNMP

You can choose to export MIB information, OID information and TRAP information, and you can choose to export/import SNMP northbound standardized mapping table.

1). Export SNMP MIB

You can select all devices or a certain device type, click the **DOWNLOAD** button, and export the SNMP MIB files of all devices or a certain device type.

2). Export SNMP OID

You can select all devices or a device, click the **DOWNLOAD** button to export the SNMP OID file of all devices or a device.

3). Export SNMP TRAP

You can select all devices or a device, click the **DOWNLOAD** button to export the SNMP TRAP file of all devices or a device.

4). Export/import SNMP northbound standardized mapping table

Click the **DOWNLOAD** button to export the northbound standardized mapping table of all devices. After customizing and modifying the exported table, you can click the **UPLOAD** button to import the table to RDU501.

📖 **Note**

If the SNMP service authorization is not obtained, the Configure SNMP page will not be displayed. To obtain the SNMP service authorization, please contact the Vertiv Customer Service Center to purchase.

3. Asset Inventory

You can view all asset information under the current RDU501, select the query type, and enter the query conditions to view all eligible asset information.

1) Asset Information Inquiry

The asset information provides 4 ways to query:

Query by name: Enter a non-null string to return the asset information containing the string in the asset name;

Query by Number: Enter a non-null string to return the asset information containing the string in the asset code;

Query by ID Range: Enter two integer numbers M and N, where M < N, return the asset information whose asset ID is greater than or equal to M and less than or equal to N;

Query by Expired Date: Select a date and return the asset information with warranty period within 3 months before and after the date.

2) Asset Information Editing

You can enter the U-level label ID on the asset information editing page, and bind the asset to a label on a U-level of the U-level manager, so as to realize the automatic management of asset listing and unlisting.

Asset binding has the following constraints:

- The U-level label ID can be obtained by scanning the QR code on the label.
- Different assets cannot be bound to the same U-level label ID.
- U-level label ID contains a maximum of 6 characters between [0-9] or [A-F].

🕮 Note

1. When the RDU501 is started for the first time, there is no asset data on the asset information page. You need to manually add common assets by adding the device asset or asset information page through the Save Configuration button on the **Device Options -> Infrastructure Device Mgmt** -> Device Mgmt page.

2. In order to meet the needs of asset management of the high level management platform, an asset type attribute is added to distinguish between device assets and common assets, so a distinction is made when importing assets. RDU501 does not care about asset types, so it does not distinguish between web page displays.

3. Device assets: Corresponding with the devices on the RDU501 device management, and the asset information is automatically imported through the "Save Configuration" button on the device management page.

4. Ordinary assets: Assets that are not in the scope of monitoring of RDU501, and are manually added through the asset information page.

4. Asset Batch Configuration

The RDU501 provides an asset out-of-warranty alert reminder for asset information. You can click **Enabled** to enable the asset out-of-warranty alert feature. Click the **DOWNLOAD** button to export current asset information to your local computer, and the file is stored in the .xls file format. Use the file as a template, after editing the added asset information, click the **UPLOAD** button to import the asset information in the local computer to the RDU501 in batches.

Asset out-of-warranty alert

When you enable the asset out-of-warranty alert reminder function, if an asset will be out of warranty within 3 months, it is counted as an out-of-warranty device, and the date of the out-of-warranty is marked with a red background in the asset information list. When the RDU501 WEB page is refreshed or the RDU501 WEB page is logged in, you are reminded of the out-of-warranty of the device in the form of a pop-up reminder. You can manually close the pop-up reminder. If it is not manually closed, the pop-up reminder will be automatically closed after 5 minutes.

The system will detect on the 1st day of every month. If the device in the asset information is in the out-of-warranty state, and the admin user of the RDU501 is configured with the phone or email contact, it will send a text message or email reminder. If you purchase the maintenance and updates the warranty date after receiving the email reminder, the reminder will not be sent.

🕮 Note

1. If the asset code in the file is different from the existing asset code in RDU501, a new common asset is added.

2. If the asset code in the file is the same as the existing asset code in RDU501, the current information of RDU501 is overwritten with the asset information in the file. If the original asset is a device asset, it is still the device asset; otherwise it is a common asset.

3. When importing asset information, it will check whether each information field is valid. If it contains invalid information, a prompt box will pop up, indicating which cell information is incorrect.

5. Asset Bind

You can click the Upload button on the Asset Bind page to import the asset binding file from the local computer to the RDU501 to perform the batch binding of assets and U-level tags.

🕮 Note

1. If the Vertiv™ U-level manager A model device is not added, the Asset Binding page will not be displayed.

2. The asset binding file is exported by the Vertiv™ U-level manager A model handheld terminal. The exported file is the XLS or XLSX file.

History Data

There are three sub-tabs for **History Report, History Curve** and **Curve Setting** .

1. History Report

Select a device name (for example, "All Devices"), select the query type (for example, "Historical Data") and set the start time and the end time (for example, from 2019-01-01 00: 00:00 to 2019-01-01 23:59:59), then click the **QUERY** button to list all historical data from the start time to the end time. Click the **DOWNLOAD** button to download all the queried results.

🕮 Note

The page displays up to 500 queried results. If there are more than 500 PCS, you need to use "DOWNLOAD" button to download the data.

2. Curve Report

Select a report name (for example, "TH Temperature Cure") and set the query period (for example, from 2019-01-01 00:00:00 to 2019-01-01 23:59:59) , and then click the **History Curve** button. If the historical data is queried, the history curve will be generated by signal.

🕮 Note

Report Name: For the name of the report added on the Curve Report Settings page, please refer to the next section.

3. Curve Setting

Click the delete button on the right to delete the corresponding report configuration.

Enter the report name (for example, "TH23"), select the device type (for example: "ENV_TH"), select the device (for example: "ENV_TH"), select the signal (for example: "Temp 21"), and enter the reference line value (for example: The minimum interval is “20” and the maximum is “30”. Click the **SAVE** button to add a curve report. You can add up to 16 reports.

🕮 Note

Up to 8 curves can be displayed in the same icon system, ie 1 <= m*n <= 8 (m: number of devices selected, n: number of selected signals). For reporting requirements with more than 8 curves, please export historical data processing manually.

Smart Report View

There are two tabs for **Smart Report View** and **Smart Report Settings** .

1. Smart Report View

Select a report name (for example, "Cold Aisle Temperature Curve Report") and set the query period (for example, from 2019-01-01 00:00:00 to 2019-01-01 23:59:59), and then click the **QUERY** button. If the historical data is queried, the historical curve will be generated according to the signal.

🕮 Note

Report Name: One of the three reports provided on the Smart Report Settings page, please refer to section 2.

2. Smart Report Setting

The Smart Report only provides three reports: Cold Aisle Temperature Curve Report, Hot Aisle Temperature Curve Report, and UPS Output Power Curve Report.

Select the report type (for example, "Cold Aisle Temperature Curve Report"), select the device type (for example: "ENV_TH"), select the device (for example: "ENV_TH"), select the signal (for example: "Temperature 21"), enter the reference standard Interval (for example: “26”, “32”), click the **SAVE** button to save the curve report setting.

🕮 Note

Up to 24 curves can be displayed in one report. That is 1 <= m*n <= 24 (m: number of devices selected, n: number of selected signals). For reporting requirements with more than 24 curves, please export historical data and process manually.

History Log

Select the query type (for example, "Control Log") and set the start time and the end time (for example, from 2019-01-01 00:00:00 to 2019-01-01 23: 59:59), then click on the QUERY button to list all control logs from the start time to the end time. Click the **DOWNLOAD** button to download all the queried results.

🕮 Note

1. When the query type is "System Log" or "Drive Log", the queried result will not be displayed on the page after clicking the QUERY button, but will be downloaded directly as a compressed package.
2. The page displays up to 500 queried results. If there are more than 500 PCS, click “**DOWNLOAD**” button to download all queried results.
3. It is recommended to check the history log periodically to find out the abnormal operation record in time.

U-level Recent Events

You can view recent U-level events on this page. By setting the start time and end time (for example, from 2019-01-01 00:00:00 to 2019-01-01 23:59:59) and clicking the **QUERY** button, all U-level events from the start time to the end time will be listed. Click the **DOWNLOAD** button to download all query results.

The RDU501 supports the following three types of U-level events:

1. Assets are listed in a U-level of a cabinet.
2. Assets are removed from a U-level of a cabinet.
3. A U-level asset in a cabinet is replaced with another asset.

🕮 Note

1. The U-level recent events page displays a maximum of 500 U-level events. You can download to see all the events.
2. The U-level manager with abnormal communication status will not generate a U-level event.

Historical Data Backup

You can perform uploading and downloading to import and export historical data. The data includes the following:

- Historical alarms of dynamic environment equipment and IPMI historical alarms.
- Historical data and statistical data.
- User operation log, control log, alarm notification log, IPMI alarm notification log, console event log, console event notification log, battery warning event notification log, and system status notification log.

- Battery warning events, U-level events, and Door access events.
- Power management history.

📖 Note

1. Downloading historical data takes a long time, up to about 6 minutes.
2. When uploading historical data, the restart of RDU501 takes a long time, and the longest time is about 11 minutes..

Clear History

You can select “History Data” and then click the CLEAR button to clear all history data. Similarly, you can clear any other available data in the drop down box.

3.4.8 Smart Solution Modeling

Heat Mgmt

The heat management page displays the temperature field data of each rack in the module in 2D. Wherein FT represents the front door temperature and RT represents the rear door temperature. The color of the rack reflects the temperature distribution of the rack.

The heat management page displays the Top View by default, and the Top View shows the front door (top) and rear door (top) configuration sensor temperature data. Click on the Middle and Bottom Views in the upper right to view the temperature data of the front door (middle), rear door (middle) and front door (bottom) and rear door (bottom).

Clicking on a single rack will open the temperature field page of the rack.

The heat management page for a single rack displays the Front Door view by default, and the Front Door view shows the temperature distribution of the sensors respectively on the front door (top), front door (middle), and front door (bottom).

You can switch to the Rear Door view and the IT Device view by clicking the Rear Door and IT Device at the top right of the page. The rear door view shows the temperature distribution of the sensors respectively on the rear door (top), rear door (middle), and rear door (bottom). The IT Device view shows the temperature distribution of the IT Device on the rack.

📖 Note

1. If 2D modeling is not completed, when accessing the heat management page, prompt “Please config 2D modeling”. Click on "Please config 2D modeling" and you will be taken to the 2D modeling page.
2. To view the temperature field of the IT equipment in a single rack, you need to configure the temperature signal of the IT equipment. Select the temperature signal in the Smart Solution Modeling -> Assets In -> Properties Assets In .
3. When the sensor is not configured, the color in the rack is grayed out. The range and color of the module's temperature field level can be modified in the module temperature field color of the Smart Solution Modeling -> 2D Modeling -> Temperature Field Color Configuration.

Power Mgmt

The power management page displays the power supply capacity of each rack in the module in 2D mode. If the power distribution signal of the rack is configured, the power supply capacity = the sum of the power consumption of the rack (power distribution signal) / the rated power of the rack; if the power distribution signal is not configured, the power supply capacity = the sum of the rated power of the equipment in the rack of the rack / rack rated power.

📖 Note

1. If 2D modeling is not completed, when accessing the power management page, prompt “Please config 2D modeling”. Click on "Please config 2D modeling" and you will be taken to the 2D modeling page.
2. The range and color of the power supply capacity level can be modified in the power supply capacity color of the Smart Solution Modeling -> 2D Modeling -> Capacity Color Configuration .

Assets Mgmt

The asset management page displays the space capacity usage of each rack in the module in 2D mode. The space capacity of the rack = the U-number occupied by the assets on shelf/ the total U-digit number of the rack.

Clicking on a single rack will open the asset page of the rack.

The asset management page of a single rack displays specific information about the shelves in the rack. When the mouse is hovering over the device, basic information about the device is displayed, including the asset number, asset name, asset type, location, and U-digit number.

When you add a U-level manager and bind the U-level manager to the cabinet in the model, an automatic inventory button will appear in the upper right corner of the model on the page. After clicking the automatic inventory button, the system will perform the following two operations according to the status of the U-level label on the U-level manager:

1. When there is a binding relationship between the U-level label and the asset, the system will automatically detect the asset bound with the U-level label, and then list the asset according to the number of U levels occupied by the asset.

2. When the U-level label is not bound to the asset, the system will regard it as an unknown asset. The U-number will be set to 1U, and the asset will be listed. After you unbind the U-level manager for all cabinets in the model, the automatic inventory button will be automatically hidden.

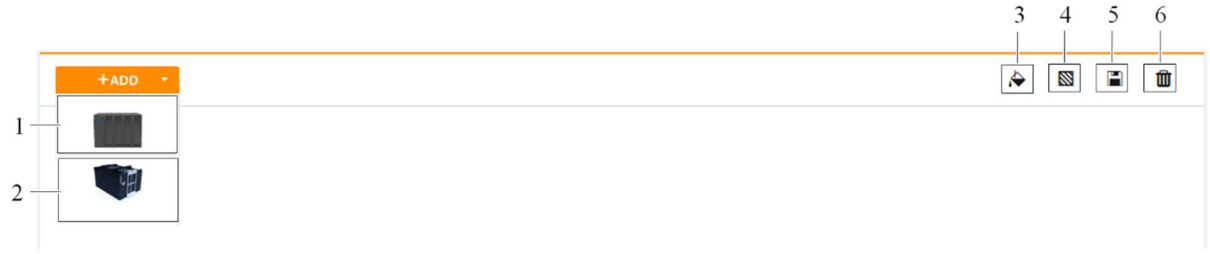
Automatic inventory: For each U-level label detected by the U-level manager, the system determines the corresponding asset and the asset location, records the information, and displays it on the cabinet bound to the U-level manager as the result of asset listing. At the same time, through the asset listing information, the system will automatically calculate the U-level occupancy rate of the cabinet and display it.

Note

1. If 2D modeling is not completed, when accessing the asset management page, prompt “Please config 2D modeling”. Click on "Please config 2D modeling" and you will be taken to the 2D modeling page.
2. The range and color of the space capacity level can be modified in the Space Capacity Color of the **Smart Solution Modeling** -> **2D Modeling** -> **Capacity Color Configuration** .
3. You can use the U-level manager to manage asset information. When the communication status of the U-level manager bound to all cabinets is abnormal, the automatic inventory will fail. Only when the communication status of the U-level manager returns to normal, click the automatic inventory button again and the automatic inventory will be executed successfully.
4. During the automatic inventory process, if there is abnormal communication of the U-level manager of the bound cabinets, after the inventory is completed, the assets of these cabinets will be restored to the initial state, and other cabinets bound with the U-level manager will display the asset information after the inventory is completed.
5. Before viewing the asset-related information, you can manually click the automatic inventory button to ensure that the asset-related information is consistent with the actual situation.
6. The current version is compatible with Vertiv™ U-level manager A model and B model. If you require support of other models of U-level manager, please contact the Vertiv Customer Service at 4008876510.
7. The initial U-level number of Vertiv U-level Manager Type B is 0U. When using it for the first time, you need to manually set the U-level number on the device setting signal page. The number should be consistent with the actual U-level number.

2D Modeling

Click the **2D Modeling** submenu under the **Smart Solution Modeling** menu to open the page shown in Figure 3-15.



1. Add SmartRow
2. Add SmartAisle
3. Temperature Field Color Configuration
4. Capacity Color Configuration
5. Save
6. Clear

Figure 3-15 2D modeling

1. Add/Modify/Delete Model

Click the Add Model icon (including SmartRow and SmartAisle) on the 2D Modeling page to create a model of the corresponding type on the right side. Here, SmartAisle is used as an example. After clicking the Add SmartAisle icon, create a model.

- Module properties

Click on the background area in the model to display the module properties area. The module properties include module name, width, depth, number of racks, and U-level display light settings.

Through the U-level display light settings, you can customize the color of the occupied and free U levels on the U-level manager. By default, the light flashes blue when the U level is occupied and the light is off when the U level is free. After configuring the U level display light, when you are adding or removing assets from the U-level manager, the light will automatically display the corresponding color according to the number of U levels occupied by the asset.

Note

Only Vertiv™ U-level manager A model supports the U-level display light. If this model is not configured, the light settings will be hidden automatically.

- Rack properties

Click on the rack in the model to display the rack properties area. The rack properties include name, rack type, width, depth, total U-digit number, rated power, sensor and power distribution branch, and U-level manager.

After you add the U-level manager, the U-level manager can be bound in the cabinet properties of each cabinet in the model.

After adding or modifying module properties and rack properties, you need to save the configuration by clicking the Save icon at the top right of the page.

When deleting the model, click the Clear icon at the top right of the page, a prompt box will pop up, prompting that the modeling information will be deleted and the relevant asset binding information will be cleared. After clicking the **Confirm** button, the current model will be deleted.

Note

1. The width of the rack in the module is 60cm by default and the default depth is 115cm. The default number of SmartRow racks is 7. The default number of SmartAisle racks is 12.
2. After the cabinet is bound to the U-level manager, the asset information previously listed on the shelf will be cleared, and an automatic inventory operation will be performed automatically.
3. After the cabinet is unbound from the U-level manager, the asset information that was automatically counted before will be cleared.
4. If the power train 3D image exists, you are not allowed to modify the rack quantity, rack type, and APM type.

2. Temperature Field Color Configuration

The level range of the temperature field of the module and the temperature field of the IT equipment can be set in the temperature field color setting page. Drag in the level range, change the level range and click Save to complete the setting.

3. Capacity Color Configuration

The level range of the power supply capacity and the space capacity color can be set in the Capacity Color Configuration page. Drag in the level range, change the level range and click Save to complete the setting.

Assets on the shelves

Assets In

Click the **Assets In** menu under the **Smart Solution Modeling** menu to open the **Assets In** page. The **Assets In** page displays the space capacity of each rack in the module in 2D by default.

Clicking on a single rack will open the asset management page of the rack. The left side of the page is the list of devices to be put in shelf, and the right side is the rack and devices in shelf.

When putting the asset on the shelf, use the mouse to select the device to be mounted. Hold down the left mouse button and drag the device to the U position corresponding to the right rack.

After the assets are put in the shelf, you can display the asset properties area by selecting the device that has been put in shelf. The asset properties include asset name, asset type, location, U-digit number, asset number, and temperature signal. After modifying the temperature signal of the asset, you can view the IT equipment temperature field in the **Heat Mgmt** single rack IT equipment temperature field. Only the temperature signal list of the IT server connected to IPMI is not empty, you can choose to bind.

When you remove an asset, drag the device from the rack to the asset list on the left.

After completing the operation of removing an asset, you need to click the SAVE button at the top right of the page to save.

Note

1. If 2D modeling is not completed, when accessing the “Assets In” page, the message "Please config 2D modeling". Click on "Please config 2D modeling" and you will be taken to the 2D modeling page.
2. The range and color of the space capacity level can be modified in the Space Capacity Color of the **Smart Solution Modeling -> 2D Modeling -> Capacity Color Configuration** .
3. After you bind the U-level manager for the cabinet on the 2D modeling page, the assets will be automatically managed by the U-level manager. The single-cabinet asset page no longer supports manually dragging and dropping assets, and only displays information about single-cabinet models and listed assets.

3.4.9 Device Options

In the RDU501 homepage, click the Device Options menu on the left to view seven submenus, including: SmartAisle3 Distributed Rack Device Management, Infrastructure Device Mgmt, Batch Configuration, Signal Setting, Notify Type Configuration, Email & SMS Configuration, and Alarm Actions. For SmartAisle3 distributed rack Device management, please refer to section *4.4.3 SmartAisle3 Distributed Rack Device Management*.

Infrastructure Device Mgmt

1. Device management

In the device management page, you can add/modify/delete device information as follows:

Add equipment

Click the **Add** button, the device edit box interface will pop up, and the corresponding device will be added.

1) Select the device type;

2) Enter the **Device Name** in the text box of the device name, or use the default device name;

3) After selecting the device type, the default Server Port of this device type will be automatically listed in the drop-down box of the **Port**; if the device type is not selected, the Server Port cannot be selected;

4) Enter the **Address** in the text box of the device address. The device address must be a positive integer from 1 to 100000, and the device address under the same Server Port is not allowed to be duplicated. Some device types do not require entering device address, in which case the text box for the **Address** will be grayed out and cannot be edited. When a device has multiple modules, you need to add a module address. The module address must be an integer from 0 to 30000, and the module address under one device is not allowed to be repetitive.

5) Enter the communication parameter in the text box of the **Parameter**. When the device type is determined, the message box of the **Parameter** will display the prompt of the communication parameter, including the device type communication parameter format and the default communication parameter.

6) Click the SAVE button and a message will pop up "Save successfully, please click the [Save Configuration] button to make the configuration take effect" and add a device information to the device list.

7) Click the **Save Configuration** button to bring up the second confirmation password dialog box.

If you click the **CANCEL** button, the unsaved configuration will be discarded. If you enter the current login password, click the **CONFIRM** button. After the password verification is passed, the system will jump to the system restart interface.

8) Re-login to the RDU501 system and the newly added device will be displayed in the list on the device management page.

🕮 **Note**

1. By default, the system can add 64 intelligent devices, including RDU501 itself, ENV-TH, ENV-4DI, 8DIAI card, 8DOAO card and rack-level access control devices. If you need to expand your connecting capabilities, please contact the Vertiv Customer Service Center at 4008876510.
2. If the device is configured on the EXP8COM expansion card, after remove the card and then re-inserting, you need to manually click the **Enabled** icon ✔ to enable the device again.

●Delete the device:

1) Select the device to be deleted in the device list;

2) Click the **Delete** button to delete the device;

3) Click the **Save Configuration** button to make the device-deleting operation take effect, the same as adding a new device.

🕮 **Note**

Only administrators or engineer users can delete devices.

●Modify the device:

1) Select the device to be modified in the device list;

2) Modify device information;

3) Click the **Modify** button to modify the device information;

4) Click the Save Configuration button to make the device-modification take effect, the same as adding a new device.

🕮 **Note**

1. The "**Save Configuration"** button can be clicked to save all operation results at once.
2. After adding, modifying, or deleting in the device management page, if you leave the page without clicking the **Save Configuration** button, a prompt box will pop up asking if you want to confirm leaving the page. Clicking the CANCEL button will stay the current page, and clicking the **OK** button will leave the page and ignore the modification information.

2. Device Type Management

Click the **Infrastructure Device Mgmt** submenu under the **Device Options** menu, and then click the **Device Type Mgmt** tab. The device type management page is displayed.

Click the **Browse** button to upload the driver configuration package (.iru file format) from the local directory and click the **INSTALL** button to install the new device type.

🕮 **Note**

The number of device types supported by the system depends on the remaining space of the system and the size of the driver configuration package itself, but no more than 64.

The page displays the device type information of the installed device. Select the corresponding device type, click the **UNINSTALL** button to pop up the **Confirm Uninstall** dialog box and click the **OK** button to uninstall the corresponding device type.

🕮 **Note**

1. During installation, if the device type exists and the device driver version is higher than the driver to be installed, the device type cannot be installed repeatedly.
2. If the installation package does not have version information or the version information does not match the software version, the device type cannot be installed.

3. If a device uses this device type, the **UNINSTALL** button will be grayed out. The driver status is displayed as in use and this type of device cannot be uninstalled.
4. RDU501 and RDU-A G2 drivers are not compatible.

Batch Configuration

You can perform **UPLOAD** and **DOWNLOAD** operations to complete system batch configuration. Uploading a batch configuration package can perform two operations: restoring configuration and cloning configuration

🕮 Note

1. Only the admin user has the authority to perform batch configuration. If batch configuration cannot be performed, click **Show Help** for help.
2. The batch configuration files are encrypted after being downloaded to the local.
3. If the version of the imported batch configuration package is lower than the current system version, the PLC configuration may become invalid. If the imported batch configuration package version is lower than V2.01.00, the user password will be restored, some cabinet door lock drivers will be removed, and the access control device may need to be reauthorized.

Signal Setting

1. Modify the Device Name

In the modify device name page, you can modify the device name. After entering the new device name, the **Settings** button will appear in the upper right corner of the list, and click the Settings button to make the batch settings.

🕮 Note

Device name or signal name can contain up to 32 characters. It cannot be all spaces and cannot contain invalid characters.

2. Modify Signal

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 make the batch settings.

1) Modify the Signal Name

Select the **Device Type/Device Name** check box, select a device type/device in the drop-down box, select a signal in the signal type, a corresponding signal list will appear, enter a new signal name in the input box, and the SET button will appear in upper right corner. After clicking the **SET** button, the signal name is updated successfully.

2) Modify Storage Cycle/Storage Threshold

Select the **Device Type** check box, select a device type in the drop-down box, and then select the sampling signal in the signal type drop-down box, the signal list appears, you can enter the storage cycle/storage threshold in a row. Click the **SET** button to make one or more changes.

Click on the table title of "**Store Threshold**", the storage cycle input box will pop up, enter a new storage cycle (for example: 3600), click the **OK** button, and all non-zero storage cycles in the device type sampling signal will be updated to 3600.

Click the row header **New Store Threshold**, pop-up the storage threshold input box, enter a new storage threshold (for example: 5), click the **OK** button, and all storage thresholds that are not 0 in the device type sampling signal will be updated to 5.

3) Modify the Alarm Level

Select the **Device Type/Device Name** check box, select a device type/device from the drop-down box, and then select the alarm signal in the signal type drop-down box. The signal list appears. You can select an alarm level in a row, and click the **SET** button to make one or more changes.

4) Modify the Signal Unit

Select the **Device Name** check box, select the THD/8DIAI device in the drop-down box, and then select the setting signal in the signal type drop-down box. The signal list appears. You can enter a new signal unit in a row and click **SET** to make one or more changes.

5) Restore the Default Name

Select the **Device Name** check box, select any device in the drop-down box, and then select a signal type in the signal type drop-down box, the signal list appears, you can click the **Restore System Name** button on the right side of the device. The initial signal name of the current signal can be restored.

🕮 Note

1. For ENV-TH, ENV-THD and ENV-4DI, the system has the function of linkage modification of the signal name, that is, if the name of the sampling signal is modified, and the corresponding control signal, setting signal and alarm signal name will be modified accordingly, so the page only provides the function to modify the sampling signal name.
2. The signal name modified here will be used as the default signal name for the device.
3. When modifying by device, for the analog signal of ENV-THD and 8DIAI devices, modifying the signal unit is supported.
4. When modifying by device, the function of restoring the default signal name is supported.

5. You can set the signal in batches by checking multiple leftmost check boxes, and set up 16 signals at the maximum batch size.

3. Modify Signal Status

Click **Modify Signal Status** to open the Modify Signal Status page. Selecting the device type will display all status signals under the device type. Click the **Modify** button on the right side of the list to modify the signal status.

Click the **Modify** button to open the Modify Signal Status page. Enter the new status name and click the SAVE button to complete the modification of the status name of the signal.

Notify Type Configuration

1. Power and Environment Device Alarm Notification Setting

Click the **Notify Type Configuration** submenu under the **Device Options** menu, and then click the **Infrastructure Devices Alarm Notification Configuration** tab. The notify type configuration page is displayed.

In the notify type configuration page, you can choose which notification mode is used to receive which level of alarm notifications for the power and environment device. You can select the language type of the alarm notification information and customize the alarm contents (the device name, alarm description, alarm time and alarm status are included by default).

Click the SAVE button to complete the alarm configuration. When the alarm is generated, you will be notified by the configured notification method.

🕮 Note

1. You must first select the notification mode before the **Alarm Notification Configuration Table** at the bottom of the page can be edited;
2. When you select the checkbox in front of the device name, all devices are configured with the same alarm level.
3. When you select a low-level alarm, all alarms above this level will be selected.
4. When you select a device, the **Critical alarm** of the highest level is selected by default.
5. When the alarm is not confirmed or not completed, the system will send an alarm notification every 4 hours, up to 3 times.
6. In some areas, affected by the operator's signal strength, the alert SMS notification calls and SMS may be delayed or cannot be received.
7. When a large number of users are trying to receive alarm notification SMS, some users might not receive the alarm SMS.

2. IT Devices Alarm Notification Configuration

You can choose to receive the alarms of which IPMI device by email notification.

🕮 Note

1. You must first select the **Notification Type**, and the **Alarm Notification Configuration Table** at the bottom of the page can be edited.
2. When you select the checkbox in front of the device name, all devices are configured with alarm notifications at the same time.
3. The notification language must be consistent with the settings of the **Infrastructure Devices Alarm Notification** .
4. When the alarm is not confirmed or not completed, the system will send an alarm notification every 4 hours, up to 3 times.

3. Console Device Event Notification Setting

You can choose which console devices to receive alarm notifications by email notification. You can choose to receive the alarms of which console device by email notification.

🕮 Note

1. You must first select the **Notification Type**, and then you can edit the **Alarm notification configuration table** at the bottom of the page.
2. When you select the checkbox in front of the device name, all devices are configured with alarm notifications at the same time.
3. The notification language must be consistent with the settings of the **Infrastructure Devices Alarm Notification** .

4. Battery Alert Notification Settings

You can choose to use Email to receive the AI warning notification of the lead-acid battery.

Note

1. You must first select the **Notification Type**, and then you can edit the **Alarm notification configuration table** at the bottom of the page.
2. When you select the checkbox in front of the device name, all devices are configured with alarm notifications at the same time.
3. The notification language must be consistent with the settings of the **Infrastructure Devices Alarm Notification**.

5. System Status Timed Notification Configuration

Click the **Notify Type Configuration** submenu under the **Device Options** menu, and then click the **Scheduled Notification Configuration** tab. The system status timed notification configuration page is displayed.

Note

1. The Scheduled Notification Configuration must be used in conjunction with the Infrastructure Devices Alarm Notification Configuration. Otherwise, the User Name, Notification Type, and Language Type cannot be selected.
2. For system status timed notification, the telephone notification method is not supported;
3. The system status timed notification refers to sending the current running status of the entire system of the current RDU 501 to the user, that is, normal or alarm status.

1) Complete and save the settings of the sending user, notification mode, and notification language on the **User Alarm Notification Configuration** page;

2) Select whether to enable system status notification on the **Scheduled Notification Configuration** page;

3) When **Enable The Notify** is enabled, set the sending period mode (default: day), **Interval of Notification** (default: 1 day) and **Send Time Setting** in the **Scheduled Notification Configuration** page (default: 11:00).

4) Click the SAVE button to save the system status notification configuration.

Email & SMS Configuration

1. SMS Module and Mail Server Configuration

You can perform **SMS Module Configuration** or **RDU Voice Notification System Setting** for SMS or phone alarm notification reminder, or configure the **Email Server** to enable the system to notify the alarm by email. Modify the product service information through the Email Content Configuration. The configuration procedures are as follows:

●SMS Module Configuration

1) Connect the SMS MODEM through the USB port (USB1~USB4 port on RDU501 panel) according to the need (only 1 SMS MODEM can be connected, model is TD8411), and then select the **Port Type**;

2) Select the type of **SMS Module** (GSM/CDMA) according to the model of the incoming SMS MODEM;

3) Set the communication parameters of the short message MODEM;

4) Set the SMS sending interval (0-10s, the default value is 0s);

5) Start the alarm SMS confirmation function and the balance inquiry function. Only when this option is enabled, the alarm SMS confirmation function and the balance inquiry function are available;

6) The SMS encoding settings support UCS2 and 7BIT encoding formats;

7) Click the SAVE button to save the current user's SMS module configuration.

●RDU Multimedia Voice Notification System Setting

1) Enter the server IP address at the **Server IP** address;

2) Enter the Server Port in the **Port** field, the default is 13393;

3) Click the SAVE button to save the multimedia voice notification system configuration.

●Mail Server Configuration

1) Enter the server IP address or domain name in the **Mail Server** field;

2) Enter the Server Port, Email User, Email Password and Sender Email Address in the corresponding fields;

3) Click the SAVE button to save the current user's mail server configuration.

Note

1. The Server Port defaults to 25. When you select **Enable SSL**, the Server Port automatically changes to 465. When TLS is enabled, the Server Port automatically changes to 587.
2. When using SSL/TLS, make sure the mail server supports SSL/TLS function.
3. The mail encoding format defaults to HTML format, and you can select plain text format.
4. Alarm SMS confirmation and balance inquiry are not enabled by default.
5. The default SMS encoding format is UCS2. If you choose 7BIT format, please contact Vertiv Customer Service Center.

●Alarm Email Information Configuration

1) Enter the email address of the service center in the **Contact** field;

2) Enter the phone number of the service center in the **Service Phone** field.

3) Click the SAVE button to save the modified alarm email information configuration.

2. SMS Balance Inquiry

The SMS balance query provides periodic query and manual query. Fill in the service number, service code and query cycle. Click the **SAVE and QUERY** button to complete the configuration saving and send the query SMS. The system receives the balance SMS sent by the carrier and saves it to the database and forwards it to the admin user's mobile phone. You can view the balance SMS on the web page by manually clicking the **REFRESH QUERY RECORD** button.

Note

1. The SMS balance information is forwarded to the admin user's mobile phone. The admin user is required to configure the mobile phone number.
2. Since there is a certain delay in the balance message sent by the carrier, please check the receiving time of the SMS to judge whether the queried SMS information has been updated.
3. In some areas, affected by the strength of the operator's service signal, sometimes it may not be possible to receive the SMS of balance information.

Alarm Actions

Click the **Alarm Actions** submenu under the **Alarm Mgmt** menu to open the Alarm Actions page, as shown in Figure 3-16.

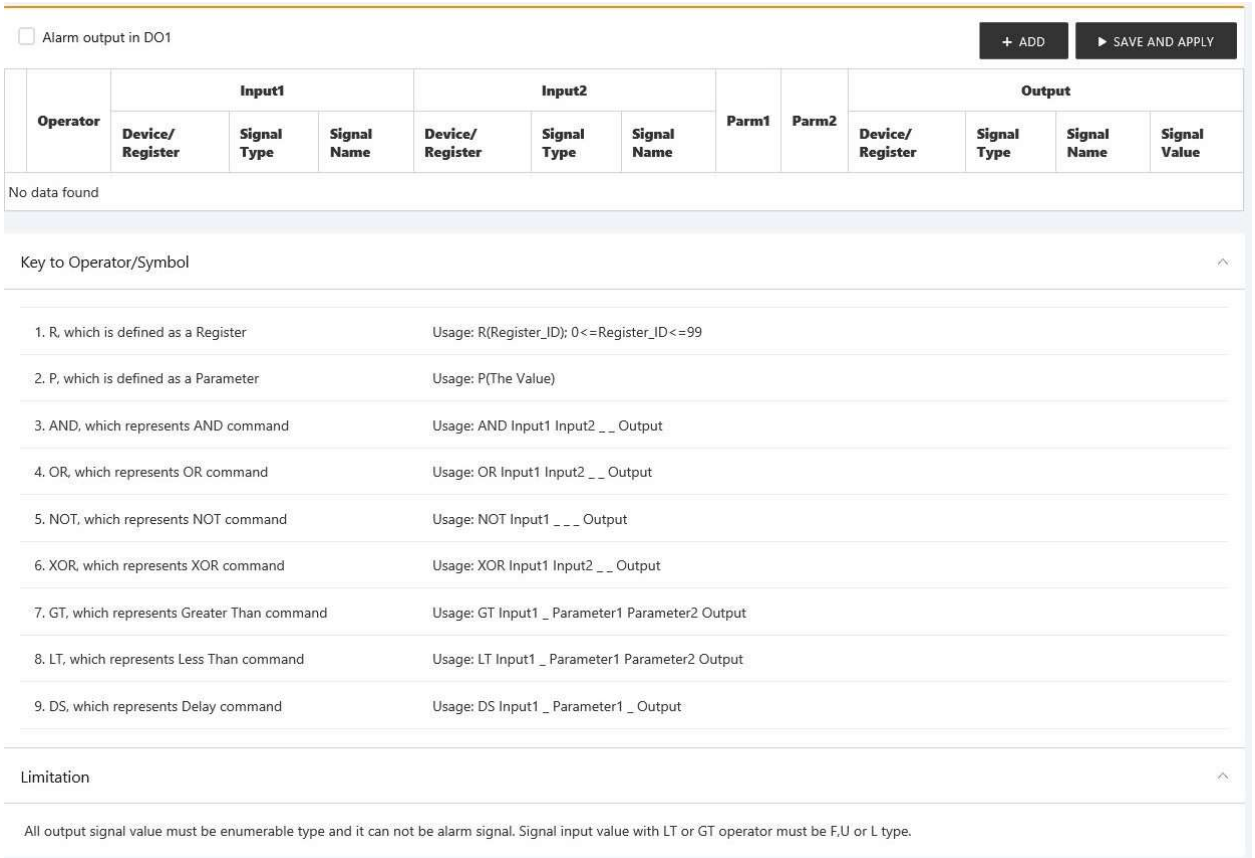


Figure 3-16 Alarm action configuration1

- DO1 alarm output function

If the **Alarm Output in DO1** is enabled, the relay will separately control the output of the DO1 port. If the system has an alarm and the alarm is not confirmed, the relay is closed. If the system has no alarm or all alarms have been confirmed, the relay is disconnected. At this time, DO1 no longer participates in linkage alarms.

- Alarm action function

As shown in Figure 3-16, the **Key to Operator/Symbol** shows all the commands and their uses. Click the **ADD** button, and the actions configuration sheet pops up under the alarm action list. Edit this form and click **SAVE** to add a new alarm action expression, as shown in Figure 3-17.

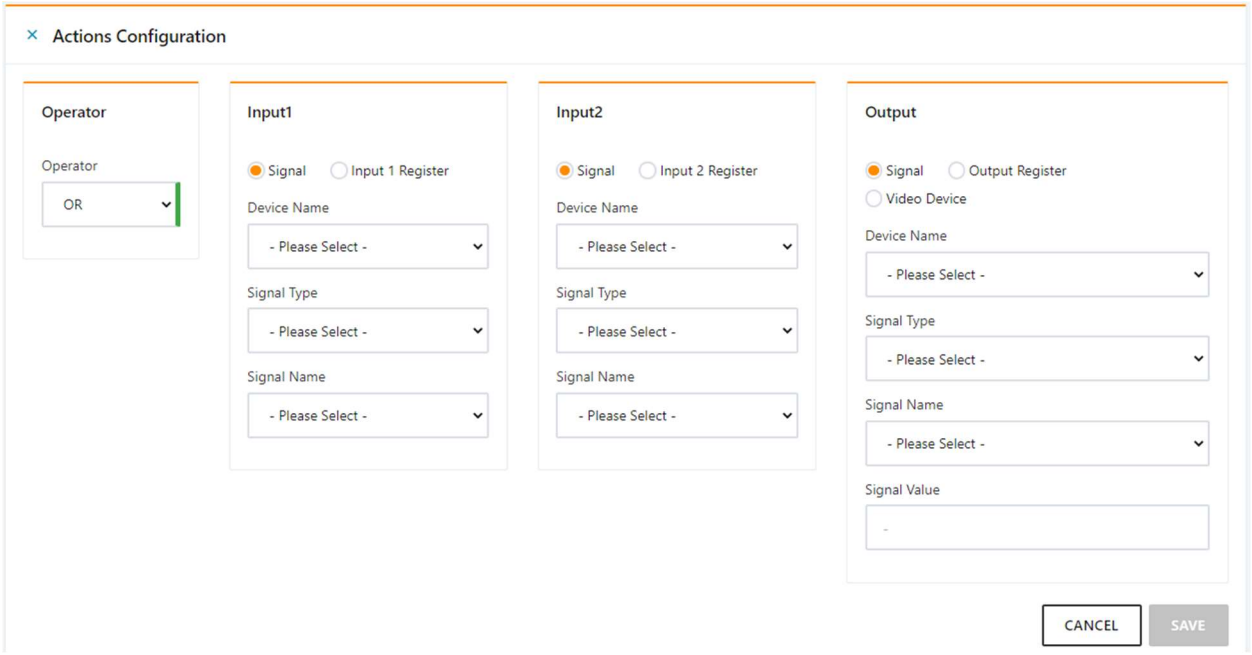


Figure 3-17 Alarm action configuration 2

First, select an operator, for example, "OR", the expression is "Signal 1 [Input 1 Register] or Signal 2 [Input 2 Register] = Output Signal [Output Register, Video Device]".

Second, when the input or output parameter in the expression is selected as the signal, first select the device name in the **Device Name** drop-down list, then select the signal type in the **Signal Type** drop-down list, and finally select the signal name in the **Signal Name** drop-down list. Input 1, output 2, and output signals may be any of the signals available in RDU 501.

Finally, when the parameter in the expression is selected as a **Register**, you need to select the name of the corresponding register, such as R(0), R(1), and so on.

Click the SAVE button to add a new alarm action expression, otherwise click the CANCEL button.

If you click the SAVE button, as shown in Figure 3-18, the alarm action expression has been added, click the **SAVE** button to make it effective. Click the **Delete** button to delete the alarm action expression and click the **SAVE** button to make it effective.

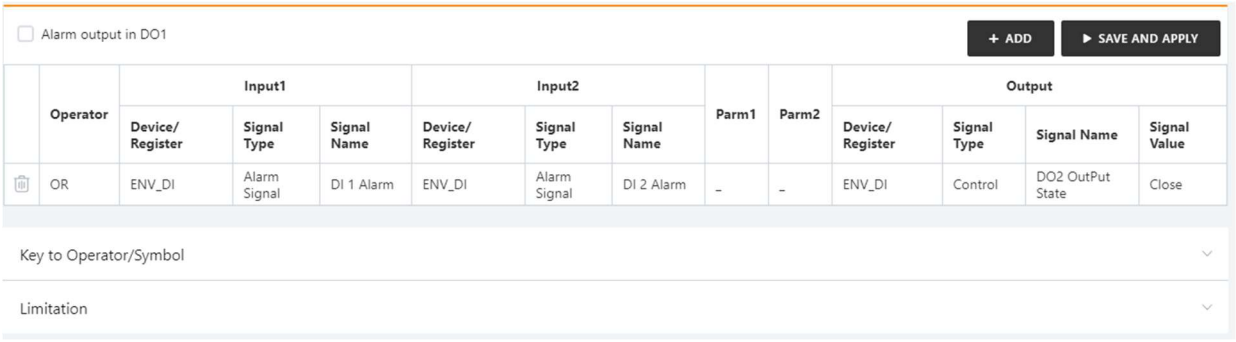


Figure 3-18 Alarm action configuration 3

For the usage of each operator in alarm action, see Table 3-7.

Table 3-7 Alarm action operator usage

Operator	Input1	Input 2	Parameter1	Parameter 2	Output	Expression
AND	Sin1 /Rin1	Sin2 /Rin2	-	-	Sout/Rout	Sin1 [Rin1] AND Sin2 [Rin2]=Sout [Rout]
OR	Sin1 /Rin1	Sin2 /Rin2	-	-	Sout/Rout	Sin1 [Rin1] OR Sin2[Rin2]=Sout [Rout]
NOT	Sin1 /Rin1	-	-	-	Sout/Rout	Sin1 [Rin1] NOT=Sout [Rout]
XOR	Sin1 /Rin1	Sin2 /Rin2	-	-	Sout/Rout	Sin1 [Rin1] XOR Sin2[Rin2]=Sout [Rout]
GT	Sin1 /Rin1	-	P1	P2	Sout/Rout	Sin1 [Rin1]>P1, Sout [Rout]=1; Sin1 [Rin1]<P1-P2, Sout [Rout]=0
LT	Sin1 /Rin1	-	P1	P2	Sout/Rout	Sin1 [Rin1]<P1, Sout [Rout]=1; Sin1 [Rin1]>P1+P2, Sout [Rout]=0
DS	Sin1 /Rin1	-	P1	-	Sout/Rout	Sin1 [Rin1] DS P1 output to Sout [Rout]

Operator	Input1	Input 2	Parameter1	Parameter 2	Output	Expression
Note: 1. Sin1, Rin1, Sin2, Rin2, P1, P2, Sout, Rout respectively refer to signal 1, input 1 register, signal 2, input 2 register, parameter 1, parameter 2, signal 3, output register; 2. The input signal of the logical operator AND/OR/NOT/XOR/DS can only select the alarm signal; 3. The input signal value of the arithmetic operator GT/LT can only be floating point, integer or long integer; 4. The output signal can be a control signal or a set signal						

The following is an application example of alarm action.

Example 1:

If the temperature and humidity sensor 01 of the RDU501 system needs to be connected to the temperature and humidity sensor of the RDU501 system, the alarm indicator will be illuminated. If the alarm indicator is installed on the DO1 interface, you can complete the alarm action function through the following configurations.

Expression: [Temperature 01 High Temperature Alarm] DS P(3) [DO1][Closed]

Figure 3-19 shows the configuration method. The meaning is that when the temperature 01 generates a high temperature alarm, the DO1 is turned off after a delay of 3 seconds, thereby lighting the alarm indicator.

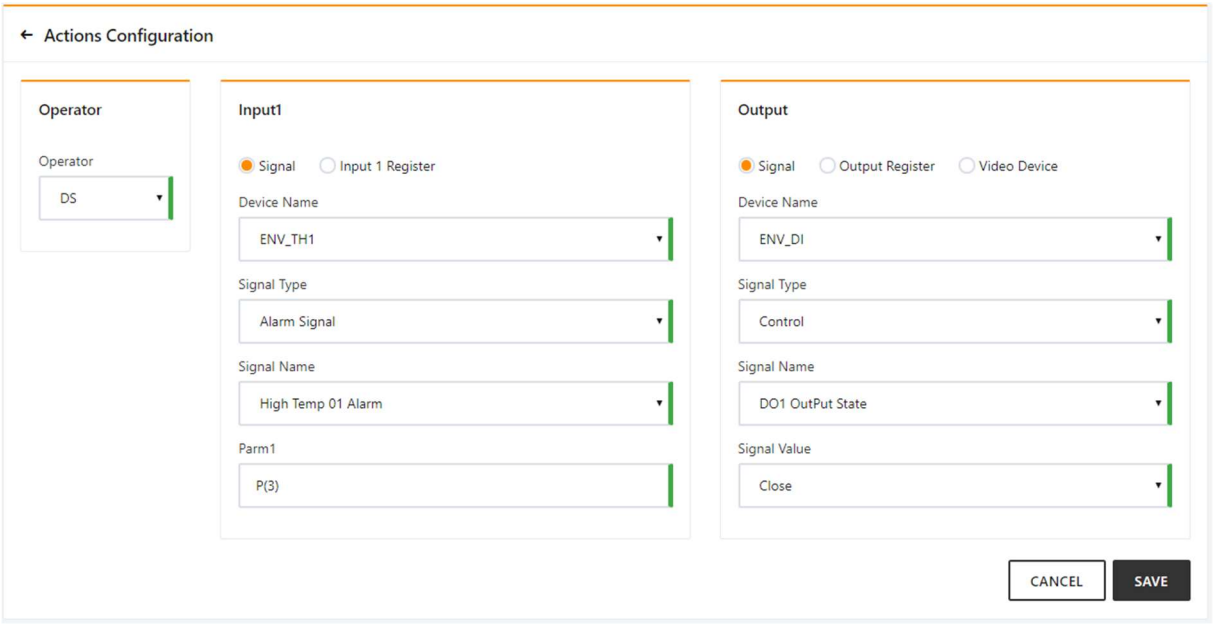


Figure 3-19 Configuration example of alarm action 1

Example 2:

If the front or rear door of the rack is open, the alarm indicator is illuminated. Assume that the DI1 and DI2 interfaces of the RDU501 are connected to the front and rear door magnetic sensors of the rack. The alarm indicator are installed on the DO1 interface. You can use following method to complete the configuration:

Expression: [DI1 Alarm] OR [DI2 Alarm] = [DO1] [Closed]

Figure 3-20 shows the configuration method. The meaning is that when the alarm signal RDU501 DI1 is turned on or the RDU501 DI2 is turned on to generate an alarm, the RDU501 DO1 is triggered to be closed, thereby lighting the alarm indicator.

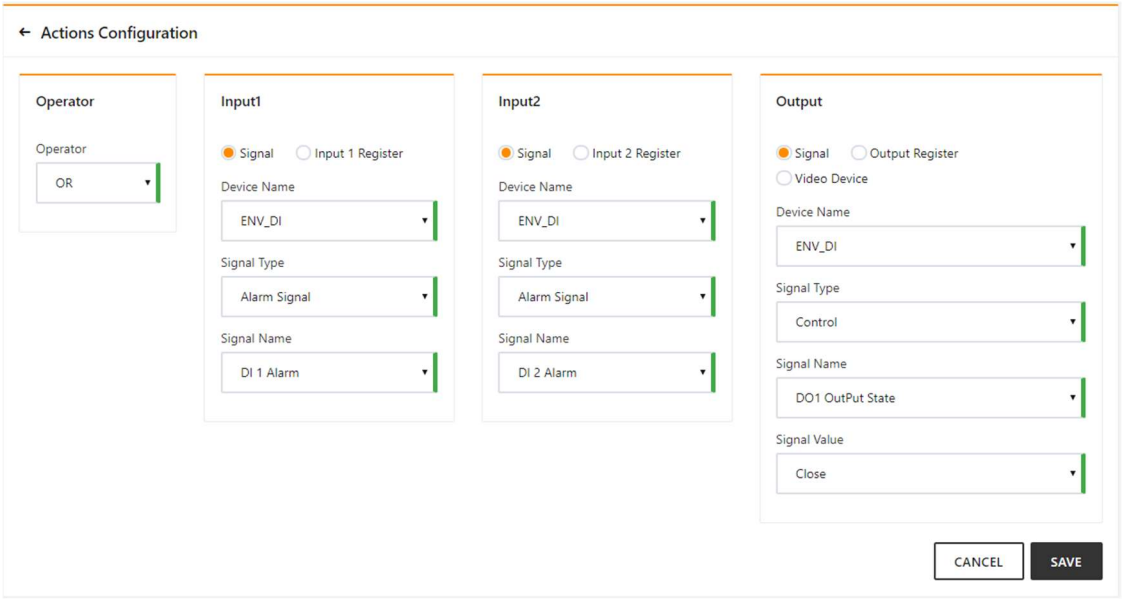


Figure 3-20 Configuration example of alarm action 2

3.4.10 System Options

In the RDU501 home page, click on the System Options menu on the left, and you can see some submenus, including: Monitoring Unit, Security Setting, Network Access Setting, User Management, System Upgrade, Date/Time Setting, Restore System, Site Setting, License Mgmt, System Title Setting and About RDU501.

Monitoring unit

The **Monitoring Unit** submenu is set for the signal of the RDU501 system itself, including the **Sampling** signal and the **Setting** signal.

For the method of operating the sampling signal and the **Setting** signal tabs in the monitoring unit, see *3.4.1 Device*.

Click the **Setting** tab to enter the signal setup page and display the signal settings of the monitor unit. The value setting is shown in the table below.

Table 3-8 Value setting on the signal page

No.	Signal name	Value setting
1	Auto/Man State	Auto / Manual
2	Outgoing Alarm Blocked	Normal / Blocked
3	Data stat start oclock	0 to 23
4	Data stat period	1 to 24
5	Whether Save Equip Data When Alarm	Do Not Save / Save
6	Whether Save Equip Data When State Changes	Do Not Save / Save
7	Door Access Control	Hide / Display
8	PLC Ctrl Mode	Set Always / Set When Diff

📖 Note

If the **Outgoing Alarm Blocked** is set to "Yes" in the **Value Setting** tab, the current alarm will be blocked. In this case:

1. Except for the current alarm that is blocked, all others are terminated.
2. The “Yes” setting of the **Outgoing Alarm Blocked** is automatically released after 24 hours.

Security Setting

Only administrators can browse and configure **Security Setting** .

The security settings include the SSH Setting, Web Access Security Policy, Server Port Setting, Certificate Setting and Certificate Query.

1. SSH Setting: Choose to enable or disable the SSH service of the RDU501. The default is permanently enabled.

Select **Disabled**, then click **SAVE**, and the system will close the SSH service.
Select **Enabled**, and select **Permanent** or **Customize** for **SSH Session Timeout** . When **Customize** is selected, the input field appears for you to cusotmize the time (default is 30 minutes). Click **SAVE** to start the SSH service.

2. Web Access Security Policy:

The Web access security Strategy consists of seven parts: Enable two factor login, Forced change default password when login, Allow default admin account login, Send security event email to administrators, Duplicate login policy, Session timeout, Enable Account Security Policy. After configuration, click **SAVE**.

a) Enable two factor login:

The two factor login is disabled by default. The check strage can be enabled after configuring email server and mailbox for RDU501 each user. When enabling the two factor login, RDU501 login page is as shown in Figure 3-21. Enter username and password, and then click SEND EMAIL button to get RDU501 login dynamic PIN, click login button to login into RDU501 system.

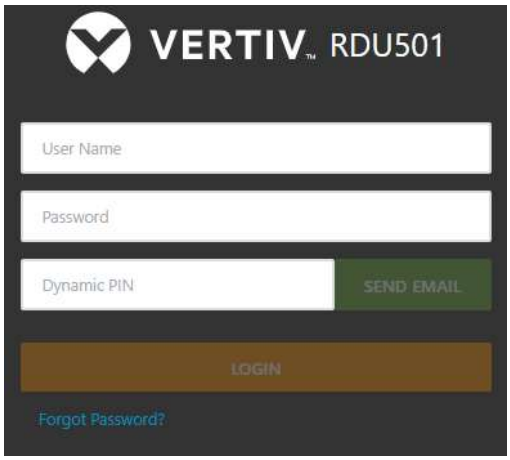


Figure 3-21 RDU501 login page when enabling the two factor login

b) Forced change default password when login:

The forced change default password when login is enabled by default. When you log in for the first time, it is forced to modiy password. Please refer to *3.2.2 Login page*. The adminstrator level user can disable the strage.

c) Allow default admin account login:

The allow default admin account login is enabled by default. When adding administrator level user, it is allowed to disable default user admin.

d) Send security event email to administrators:

The send security event email to administrators is enabled by default. RDU501 will send the security notification email to administrators in following cases: try upload illegal file to RDU501, login restrictions violation or too many times failure login.

e) Duplicate login policy

Duplicate login policy is **Enabled** by default. If it is set to Disabled, one user cannot log on to another web interface at the same time. If it is set to Enabled, the new login request will force the old session page to close.

f) Session timeout

If there is no operation on the user session page within the timeout period, the user will automatically log out. Administrator-level users can configure the login session timeout on the security setting page. The setting range is 5 to 9999999 minutes, and the default is 15 minutes.

g) Password expiration policy

- When a user logs in, once he or she enters an incorrect username or password, or enters an incorrect dynamic password when Enable two factor login is Enabled, the system immediately displays a verification code and requires that this verification code be entered the next time the user logs in, as shown in Figure 3-22.

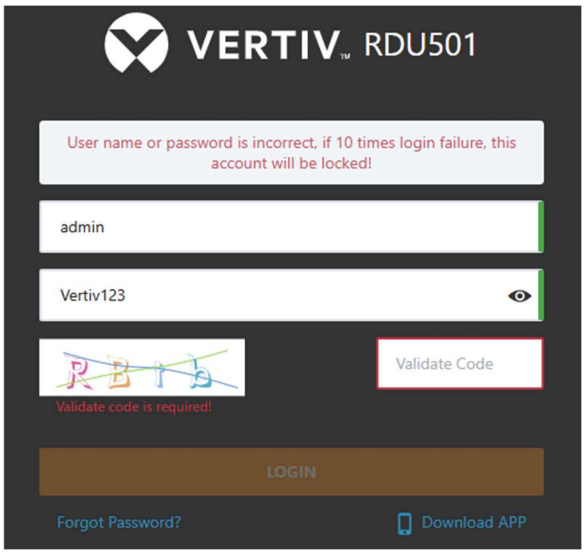


Figure 3-22 Login requires a verification code

- After the same valid user fails to log in 10 times in a row, he or she cannot enter the password to log in again. The user can only continue logging in after the specified time has elapsed.
- The user account password is valid within the specified time from the time it is created or modified. The validity time length can be configured in **Account Valid Period(Day)** , ranging from 0 to 999 days. The default is 90 days. 0 day means the password will never expire.
- The password validity period applies to all other accounts except admin, and the admin account password will never expire.
- The administrator can refresh the validity period of an account. The new validity period starts from the set time and ends when the validity period is reached. For details, see Refresh expiration period in the following User Management content.
- Administrators can reset and unlock accounts that are currently locked. For details, see Unlock in the following User Management content.
- The length of the lockout time can be configured in **Account Lock Time(Minute)** . The default is 5 minutes.

3. Server Port Setting : The protocol that can be used to access the web page is HTTP or HTTPS. The default is the HTTP protocol.

After selecting, click the SAVE button and the browser prompts you to wait.

When the waiting time is out, the browser displays the new access hyperlink. Click on the hyperlink to display the login interface launched with the new web access method.

4. Certificate Setting

Click the Browse button to select the certificate file, private key file, and root certificate file from the local directory, and then click the UPLOAD button to import the certificate.

Click the RESTORE SYSTEM DEFAULT CERTIFICATE button, the system will clear the user's imported certificate and restore the system default certificate.

Note

The system only supports uploading certificate and private key files in PEM encoded format, and the private key file should be a password-free file.

5. Certificate Query

Click the QUERY CERTIFICATE INFORMATION button to view the certificate related information. The start time and end time of the certificate are in Greenwich Mean Time (GMT).

Network Access Settings

1. Network settings

The RDU501 provides two IP setting modes: DHCP dynamic acquisition and manual static setting. It also supports DNS domain name resolution.

The network parameters that you can configure are as follows: **IP Setting** and **Address, Mask, Default Gateway, DNS1 (preferred DNS server), and DNS2 (alternate DNS server)** . After modifying the network parameters, click the SAVE button to make the parameters take effect.

Note

1. If the NIC chooses to use a static IP address, the DNS address cannot be obtained automatically.

2. After modifying the IP address, you need to log in to the RDU501 again with the new network address. By default, will redirect to the IP address of the network card 1.

2. Access control

When adding a visitor, enter the new IP address in the **IP Address of Upper System** text box, and click the **Set** button to complete the configuration.

🕮 **Note**

The system can add up to 3 higher level management platform IP addresses.

3. SNMP configuration

The SNMP port number can be modified, and the default is 161. The SNMP Trap port number can be modified, and the default is 162. After modifying the port, click **SAVE** and the RDU501 will restart.

Users can choose to enable or disable the Trap resend function, and the default is Disabled. Select **Enabled**, set **Resend Times** and **Resend Interval**, and click **SAVE** to enable the Trap resend function. Select **Disabled** and click **SAVE** to disable the Trap resend function.

The SNMP agent of the RDU501 system supports both V2 and V3 versions.

The SNMP V2 can be set as follows:

1) Set the NMS IP (host IP address of the SNMP agent data receiving end);

2) Set whether to send Trap: “Enable” or “Disable”;

3) Other parameters remain at their default values.

The SNMP V3 can be set as follows:

1) Set the **NMS IP** (host IP address of the SNMP agent data receiving end);

2) Select whether to send Trap: “Enable” or “Disable”;

3) Set the **User Name**;

4) Select the **User Type**: "Authentication and Encryption";

5) Select the **Authentication Protocol**: "MD5", "SHA";

6) Select the **Privacy Protocol**: "DES", “AES”

7) Customize the password for the authentication algorithm and encryption algorithm.

🕮 **Note**

1. Based on SNMP V2, SNMP V3 adds user authentication and encryption strategies.
2. If the "Do not authenticate without encryption" strategy is selected for the **User Type**, the **Authenticated & Encrypted** drop-down box is grayed out and cannot be set.
3. The current **Privacy Protocol** supports "DES" and “AES”.
4. You need to customize the authentication and encryption passwords of more than 8 characters, and the password must be the same as the password set by the host of the SNMP agent data receiving end. Otherwise, the password cannot be decrypted and received.

After completing the parameter settings, click the **Add** button to add the NMS;

To modify the NMS settings, select the NMS you want to modify, modify the settings, and then click the **Modify** button to save the settings.

To delete the NMS, select the NMS you want to delete and click the **Delete** button to delete the NMS.

🕮 **Note**

RDU501 does not provide SNMP proxy service by default. If SNMP service authorization is required, please contact Vertiv Customer Service Center for purchase.

User Management

- Login policy setting

The administrator level user clicks icon to open login restriction policy page. In the page, login restriction policy can be set for each user except the admin account. These policies include allowed login day, allowed login start time and end time, allowed IP segment start and end. The admin account can set login restriction policy for each user.

- Refresh expiration date

If the web access security strategy is enabled, the account expiration time for the selected user is displayed on the interface. The administrator clicks the refresh expiration icon to refresh the new password expiration date for the selected user. For the new expiration date, see the **Password expiration strategy** in the **Web Access Security Policy** section of the **Network Setting** section.

- Unlock

If the web access security strategy is enabled, for locked accounts, the administrator can unlock it by clicking the unlock icon. See the **Account Lockout Policy** in the **Web Access Security Policy** section of the **Network Setting** section.

●Add users

Click the Add button at the top right of the user list to open the Add User page.

1. Enter the username in the text box of the username;

2. Select the user's authorities

3. Configure the user password. The password must contain at least 8 characters, and must contain two types of the following: uppercase letters, lowercase letters, numbers, and special symbols.

4. Repeat the password in the Confirm Password text box;

5. (Optional) Enter the user's phone number. The phone number can use the following numbers and characters: 0123456789, +;

6. (Optional) Enter the email address;

7. (Optional) Enter the serial number of the mobile terminal that allows access to the RDU 501 through the mobile terminal APP;

8. Click the SAVE button to complete the addition of the new user.

🕮 Note

1. User names can only use English letters, numbers, and - and _, and the first character must be a letter.

2. Allow up to two bind phone serial numbers, separated by commas.

3. If the binding sequence number is not entered, the system will bind the serial number of the first two mobile devices logged in from the APP.

4. After binding, the system only allows the bound mobile terminal to access the RDU501 from the APP. If you want to re-bind, just modify or delete the binding serial number.

5. The phone number and email address cannot be empty at the same time.

●Delete user

Click the delete icon on the right side of the user list, the dialog box for confirming the deletion will pop up, click the **OK** button to delete the selected user.

🕮 Note

Admin user cannot be deleted.

●Modify users

1. Click the edit icon to the right of the user list to open the modify user page.

2. Modify user information;

3. Click the SAVE button to save the modified user information.

Users who log in to the RDU501 can be divided into four user groups. They have different security levels and user authorities. For details, see Table 3-9.

Table 3-9 User security level

Security levels	User group	User authorities
Level A	Administrator	The administrator has full rights: send control commands to the intelligent device; browse, control, modify parameters; upload and download files; modify, add, and delete user information; air conditioner teamwork control parameter settings; system firmware upgrade; modify account validity period; unlock locked User account
Level B	Engineer	The engineer has the following rights: Send control commands to the intelligent device; Browse, control, modify parameters; download files; modify own user information (except account validity period and lock status)
Level C	Operator	The operator can send control commands to the intelligent device
Level D	Viewer	All users can view device information

The **SMS/Phone Test** and the **Email Test** can be performed on the Modify User Information page.

Before using this test function, you need to configure the SMS module and mail server for the current user. For details, see *Device Options* in *3.4.9* .

●SMS/telephone alarm notification test

Enter the phone number and click the **SMS/Phone Test** button to test if the current user's phone number is connected. If the user receives a test message and a phone call, the test is successful. Otherwise, the test fails. Please check if the current user's phone number is correct and the SMS MODEM connection is correct.

●Email alert notification test

Enter the **Email Address** and click the **Email Test** button to test if the current user's email address is correct. If you receive a test email, the test is successful, otherwise the test has failed. Please check if the above information is entered correctly.

🕮 Note

When adding or modifying users, you must enter a phone number or email address, otherwise the settings cannot be completed.

System Upgrade

Click the System Upgrade submenu under the System Options menu to bring up the system upgrade page.

On the system upgrade page, click the Browse button to choose the upgrade package (.rdux file format) from the local directory, and then click the Install button to perform the firmware upgrade.

🕮 Note

1. **The RDU501 supports the incremental upgrade function.**

2. **The RDU501 supports image upgrade function.**

3. It is recommended to contact customer service personnel to perform regular system upgrades to ensure safe and stable operation of the system.

Date / Time Setting

The clock can be calibrated by clicking the Date / Time Setting submenu under the System Options menu. The RDU501 can automatically obtain time from the time server. Enter the IP addresses of the Primary Server and Secondary Server in turn, enter the Interval to Calibrate System Time (hour) , select the time zone, and the Calibrating Protocol , then click the SET button to make the settings take effect.

The RDU501 can also acquire the local time, select the Specify Date / Time and click the Local Host Time button to get the local time, then click the Setting button to make the new time take effect.

🕮 Note

Time calibration defaults to Specify Date / Time.

Restore System

Click the Restore System submenu under the System Options menu to bring up the restore system page.

Click the REBOOT RDU501 button to restart the system.

Click the Restore System button to restore the RDU501 to the default settings.

🕮 Note

If you use the recovery function, the RDU501 will restore the original configuration scheme. After the recovery operation, please confirm to wait for 1 minute and then re-enter the RDU501 through the network to make it complete initialization.

Site Setting

You can modify the site information of the RDU501, including the Site Name, Site Location, and Site Description .

Authorization code management

On the System Title Setting page, you can complete the authorization of the restricted function (such as SNMP service) and the existing authorized function. When you obtain the authorization code, enter the legal authorization code in the authorization code input box, and click the SAVE button to complete the installation. The licensable functions of the RDU501 are shown in Table 3-10.

Table 3-10 Overview of RDU501 authorization functions

Authorization function	Description
Air conditioner teamwork control	Authorized air conditioner teamwork control version and number of air conditioners participating in teamwork control, authorized to connect up to 32 air conditioners to participate in teamwork control
SNMP service	Authorized to open SNMP agent service
Maximum number of devices connected	Max number of IPMI devices authorized to expand, can be expanded to 40 IPMI devices; Max number of console devices authorized to expand, can be expanded to 32 console devices
AI battery management	Provides authorization to start the AI battery management

🕮 Note

The authorization code of some functions will not take effect until the system is successfully installed.

System title setting

You can modify the system title directly above the page. Enter the self-defined system title in the System Title text box and click the CONFIRM button to make it effective.

About RDU501

The RDU501 page displays the Software Version, Serial Number , and Identity Code of the RDU501 and provides the user manual download link.

Chapter 4 SmartAisle3 Application Scenario

SmartAisle3 computer room solution product (SmartAisle3 product for short) is a data center solution product produced by Vertiv Technology Co., Ltd. RDU501 provides a set of one-key configuration process and scenario features for SmartAisle3 products.

This chapter mainly introduces SmartAisle3 one-key configuration, SmartAisle3 homepage, SmartPOD batch upgrade and other functions.

4.1 SmartAisle3 Typical Monitoring Configuration

The typical monitoring configurations of SmartAisle3 are given in Table 4-1.

Table 4-1 SmartAisle3 typical monitoring configuration table

Type	Product Name	Product Mode
Monitoring system	RDU501 data collector	RDU501
	Temperature Sensor	IRM-S01T
	4-way DI sensor	IRM-S04DI/IRM-S04DIF
	8DIAI expansion card	EXP8DIAI
	8COM expansion card	EXP8COM
	2DI6DO expansion card	EXP2DI6DO
	10m belt-type flood sensor	IRM-S01W(10m)
	AMM YD2015 Electricity Meter	EEM-2015Y
	Access controller	CHD-806-1U
Power supply	Prefabricated APM 160kVA electrical rack (excluding power distribution, only suitable for single input power supply occasions)	-
	40kVA power module PM40B (assembled after delivery)	APM 0160kMK16FN02
	Bus A/Bus B	-
	Rack level monitoring PODE	SmartPODE
Cooling	Prefabricated CRV4_035 dual power indoor unit with humidification and heating air guide style grid and water pump CR035 matching outdoor unit	CR035RA1N8S712E30000PV040
	CR035 outdoor unit	LSF42-R3
		LSF52-R3
		LSF76-R3
	Bus A/Bus B	-
	Rack level monitoring PODE	SmartPODE
Entire rack	600*1100*2100mm entire rack, ID lock, no side panel	SA-R061120BNSDDEB18D06YY
	800*1100*2100mm entire rack, ID lock, no side panel	SA-R081120BNSDDEB18D06YY
	Rack level monitoring PODR (single rack)	SmartPODR
	Bus A/Bus B (single rack)	-
		-
	Three-phase 16A PDU (white/orange) (single rack)	MC0AKD0B18D6WAX
		MC0AKD0B18D6WAX
	Temperature and humidity string (single rack)	RDU-THCP3480
		RDU-THCP2580
	Smart door lock (single rack)	CHD806D2M3
Entire rack	Micro Switch (single rack)	-
	Three-color light (single rack)	-

4.2 One-key Networking Configuration

4.2.1 Confirm Configuration

After the hardware device wiring is ready, enter the IP address of RDU501 in the browser address bar to enter the application scenario selection interface. Select the SmartAisle3 application scenario and enter the SmartAisle3 setting wizard configuration Method page.

Enter the SmartAisle3 site name, the aisle door, the number of SmartAisle3 racks, the number of pillars, the default rack width, the default rack depth, the SmartAisle3 total power and the appearance of SmartAisle3 according to the actual configuration of the product, and click the SAVE button to complete the configuration of the SmartAisle3 module information.

🕮 Note

1. The number of racks and the number of columns must be consistent with the actual number.
2. SmartAisle3 rack type includes: rack, air conditioner, UPS and baffle. RDU501 can automatically identify the rack type.
3. If Aisle Door is set to Basic, the type of the electricity meter is YD2015. If Aisle Door is Advanced, the type of the electricity meter is YD2010C.

4.2.2 Start Networking

After completing the configuration of the SmartAisle3 module information, click the **Next Step** button to enter the automatic networking page.

Then click the **One-key Networking** button, the racks on the Web page will light up one by one, and the three-color lights on the top of the rack will light up in the same order to complete the networking of all racks.

If the implementation of one-key networking fails, you need to locate the line fault based on the lighting conditions of the Web rack and the lighting conditions of the three-color lights of the actual rack. The page shown in Figure 4-1 below indicates that the cable connection between the air conditioner and the rack 13 is abnormal. To troubleshoot networking, please refer to 6.2 Common fault handling “Fault 9”. After that, continue to click the One-key Networking button until the setting is successful, The page jumps to the rack link status page. If there are abnormalities in the rack links, according to the page tips locate and troubleshoot the line fault and click the refresh button until the network links and serial links of all cabinets are normal, and the next button will appear.

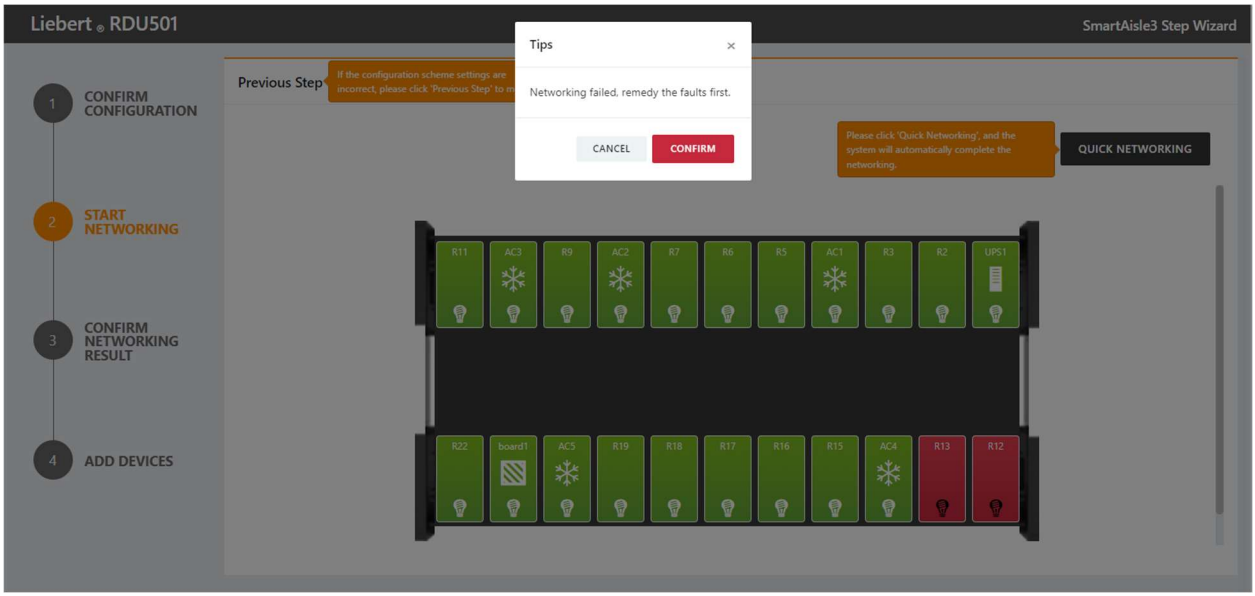


Figure 4-1 One-key Networking-Failed Networking

If the number of columns set by the user in the configuration method page is not 0, the column position setting must be completed before the **One-key Networking** button appears, you can right-click anywhere in the rack to complete the column setting.

4.2.3 Confirm Networking Result

After completing the one-key networking, click the **Next** button to turn off the three-color lights of each rack lit by the one-key networking, and enter the page for confirming the networking results. On this page, you can do the following operations:

1. Click the light button at the bottom of each rack to turn on the three-color white light on the top of the rack. Through this operation, you can confirm whether the rack position in the model matches the actual placement position.

2. Left-click anywhere on the rack, and the Rack Property page will pop up. On this page, you can view the Rack **type, IP address, Subnet mask** and **Serial port communication address** . You can set the Rack **name, Width (cm), Depth (cm), Total U number** and **Rated power (kW)**.

3. Click the **Save Rack Information** button. RDU501 will automatically configure the rack to connect to the smart device and configure each rack to associate with the cold and hot aisle temperature measurement points and the rack power measurement point. It will automatically configure the smart rack door lock and the U-level manager and binds the detected U-level manager to the rack. According to the selected aisle door type, RDU501 will automatically configures the meter type, lightning protection, air conditioner power supply fire excitation facilities and PUE settings. It will automatically configure the real-time power data signal on the system load percentage page, and automatically configure the rated power value based on the total power of SmartAisle3.

🕮 **Note**

During the networking of the SmartAisle3, if the intelligent rack door lock and the U-level Manager have abnormal communication, user needs to manually add these device.

4.2.4 Add Devices

After saving the rack information, click the **Next** button, and the Add Rack Device page will pop up.

On the page, you can complete the following configuration:

1. Click the **Setting** button on each rack to configure the self-defined device connected through the rack data collector SmartPOD:

- Add device

1) Select the type of equipment;

2) Enter the device name in the device name text box, or use the default device name;

3) After selecting the device type, the drop-down box under the port number will automatically list the default port number of this device type; if the device type is not selected, the port number cannot be selected;

4) Enter the device address in the text box of the device address. The device address must be a positive integer from 1 to 100000, and the device address under the same port number is not allowed to be repeated. Some device types do not need to enter the device address. At this time, the text box of the device address will turn gray and cannot be edited. When a device has multiple modules, the module address needs to be added. The module address must be an integer from 0 to 30000, and the module address under a device is not allowed to be repeated;

5) Enter the communication parameters in the communication parameter text box. When the device type is determined, the communication parameter prompt will be displayed on the communication parameter text box, including the communication parameter format and default communication parameters of the device type;

6) Click the **SAVE** button, and a piece of equipment information will be added to the rack equipment list. If you click the **Cancel** button, the configuration will not be saved.

🕮 **Note**

Each physical COM port on SmartPOD includes COM1, COM2, COM3, and COM4, and only one smart device is allowed to be added.

- Delete a device

1) Select the device to be deleted in the device list;

2) Click the **Delete** button to delete the device;

- Modify device

1) Select the device to be modified in the device list;

2) Modify device information;

3) Click the **SAVE** button to modify the device information;

🕮 **Note**

The default device of the rack cannot be modified or deleted. The default equipment of the rack includes: THD, Power, DIDO and BUST.

1. Click the **Copy** button on the rack, and the Pod Device Copying page will pop up. Select the device to be copied from the source POD device list on the left, selects the POD to be configured from the target POD list, and clicks the **Save configuration** button to copy the selected device configuration of a certain rack to other PODs of the same type.

2. Click the **RDU501 device configuration** button, and you can add, delete, and modify the connected RDU501 device. For specific operation steps, please refer to **Infrastructure Device Mgmt** in section 3.4.9.

3. Click the **Install Driver** button, and you can install a new device type or delete an existing device type. For specific operation steps, please refer to **Infrastructure Device Mgmt** in section *3.4.9*.

4. After all the above operations are completed, you can click the **Save and Restart** button, and the secondary confirmation password dialog box will pop up; If you click the **Cancel** button, you will give up saving the configuration; if you enter the current user's login password and click the **OK** button, after the password verification is passed, it will jump to the system restart interface.

Log in to the RDU501 system again and enter the SmartAisle3 overview page, as shown in Figure 4-2.

🕮 **Note**

1. Automatically create 2D models of SmartAisle3 products through one-key configuration, and you do not need to create manually in the 2D modeling menu.

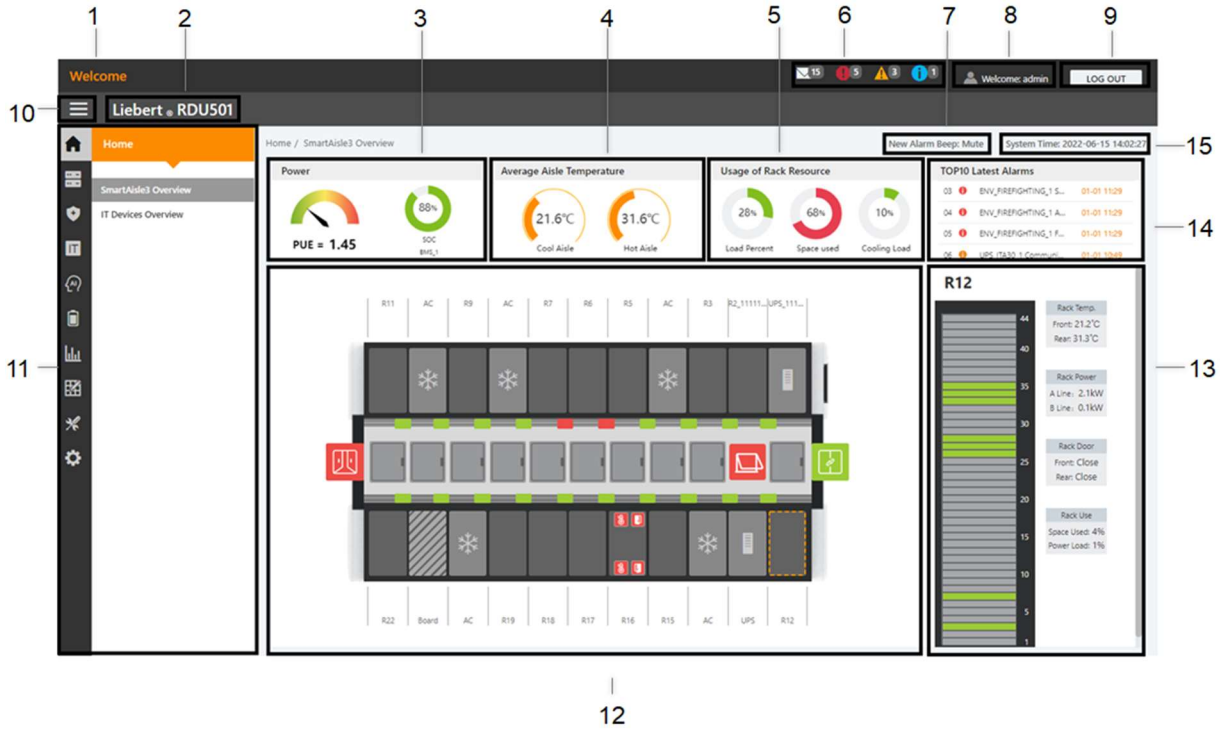
2. Air-conditioner equipment (model: CRV035), UPS equipment (model: APM160 UPS), intelligent rack door lock (model: CHD2100J3A and CHD21990000J10) and U-level Manager (model: Vertiv U-level manager type A and Vertiv U-level manager type B) in the typical configuration table can be automatically added through one-key networking. If the air conditioner or UPS is another model, you need to manually configure it in adding rack. Please refer to section *4.2.4* to ***Add Device***.

3. SmartAisle3 channel temperature field color and volume color can be configured in 2D modeling. Please refer to ***2D Modeling*** in section *3.4.8* .

4. The assets in the SmartAisle3 rack can be configured in the Smart Solution modeling assets on the shelf. Please refer to **Assets In in** section *3.4.8* .

4.3 SmartAisle3 Homepage

Select the SmartAisle3 scenario, log in to the RDU501 system after the one-key configuration restarts, and the SmartAisle3 overview page shown in Figure 4-2 will pop up.



1. System Title	2. Product name	3. System power	4. SmartAisle3 channel average temperature
5. Utilization rate of rack environment	6. Number of real-time alarms of each level	7. Alarm reminder sound setting	8. Username
9. Logout [Current User]	10. Collapse submenu button	11. Menu items	12. SmartAisle3 top view layout
13. Rack parameters	14. TOP10 latest alarms	15. System time and school time link	

Figure 4-2 SmartTrain overview page

SmartAisle3 overview page elements:

- Power: includes real-time PUE and battery SOC. For real-time PUE, the energy consumption of the entire channel of SmartAisle3 is displayed in real time. For battery SOC, when RDU501 adds battery devices, the SOC of each battery device is displayed dynamically.
- Average temperature in the aisle: real-time display of the average temperature of the entire cold aisle and the average temperature of the entire hot aisle of SmartAisle3.
- Rack environment usage: including system load rate, space utilization rate and cooling load rate. The system load rate refers to the percentage of the load of the entire system. The space utilization rate refers to the ratio of the used U number to the total U numbers in the entire SmartAisle3 channel. The cooling load rate refers to the cooling load rate of the air conditioner configured for the entire SmartAisle3 channel.
- TOP10 latest alarms: the latest 10 alarms of the system.
- SmartAisle3 entire aisle model: Displays the position and layout of racks, air conditioners, UPS, baffles and columns in the entire aisle, the status of front and rear doors of SmartAisle3, the opening status of the top plate, and the bus temperature status. The rack area in the SmartAisle3 model can display the temperature alarm status of the front and rear doors of the rack and the open status of the front and rear doors.
- Display of detailed rack parameters: including rack temperature, rack power, rack access control and rack usage. Rack temperature: the average temperature of the front door and the rear door. Rack power: rack channel A active power and channel B active power. Rack access control: rack front door status and rear door status. Rack usage: space occupancy and power load percentage. When an alarm occurs, the corresponding parameter font will be displayed in red.

- In the SmartAisle3 aisle model, click the polling button in the middle of the rack area to poll the parameters of each rack, and click again to stop the polling.
- For other homepage elements, please refer to section *3.3 RDU501 Homepage*.

4.4 SmartAisle3 Relevant Pages

4.4.1 SmartPOD Access Device

Click the first-level menu **Device**, and the **SmartPOD Access Device** will be displayed in the second-level menu. Click SmartPOD access device, and the SmartAisle3 model is displayed in the content area on the right. The upper part of each rack displays the rack name, the middle part of the rack displays the network link status, and the bottom of the rack displays the serial port link status. Among them: when a rack communicates with the RDU501 network link normally, it will display online √, and when the communication fails, it will display offline x. The serial port link status is displayed in the same way as the network link.

Left-click on any position of the rack, air conditioner, UPS or baffle icon in the above figure, and all devices connected through the rack level monitoring data collector SmartPOD configured by the rack, air conditioner, UPS or baffle will be displayed. The device is displayed in the form of a card. The icon in the upper left corner of the card will display different colors according to the alarm status of the device, and the attention signal is displayed on the right side of the card.

4.4.2 Browse SmartPOD Built-in Devices by Device Type

Click on the first-level menu **Device**, and the sub-menu by **Device Type** will be displayed in the second-level menu. Click by **Device Type**, the content area on the right displays all devices installed under the ENV device type by default. You can view all devices of a certain type by switching the device type tab.

Under ENV device type, the default built-in devices under SmartPOD are folded and displayed according to specific types. Click the THD button to display all THD devices connected to SmartPOD. Click the BUST button to display all bus temperature devices connected to the SmartPOD.

There is the **Batch Configuration** button for THD device's signals on the left of THD button, as the page shown in Figure 4-3:

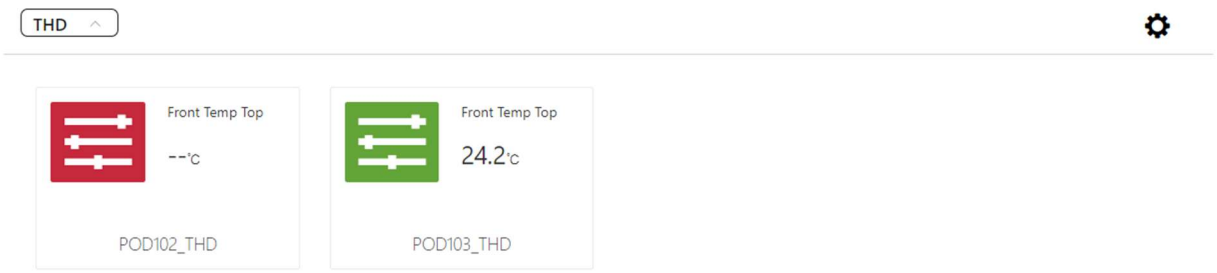


Figure 4-3 The Batch Configuration button for THD device's signals

Click the **Batch Configuration** button and the batch configuration page will show up. In this page, the THD device's signals can be configured. The configuration will change the top, middle and bottom position's value of the specific signal.

4.4.3 SmartAisle3 Distributed Rack Device Management

In the SmartAisle3 scenario, click the first level menu **Device Options**, and you can see the **SmartAisle3 Distributed** Rack **Device Management** submenu. Click the setting button of each rack on this page to configure the smart devices connected to each rack through SmartPOD. Click the Copy button of the rack on this page to copy the device of a rack to other racks of the same type. Please refer to the relevant introduction in Section *4.2.4 Add Device*.

Click the **Setup Wizard** button on this page, and the page for setup wizard confirmation Interface will pop up. Click the OK button on this page to directly enter the Setup Wizard -> Configuration Method page, please refer to section *4.2 One-key Networking* Configuration. Click the **Cancel** button to cancel this operation.

4.4.4 SmartPOD Upgrade

Click the **Browse** button to select the upgrade package (.pod file format) from the local directory, select the SmartPOD that needs to be upgraded, and then click the **Install** button to upgrade.

Click the **Refresh SmartPOD Status** button to view the online status of SmartPOD.

Note

Only the online SmartPOD supports software upgrades.

4.4.5 SmartPOD Log

Click the **Log Data** submenu under the **Data Mgmt** menu, and the Log Data page will pop up.

On this page, select the query type—SmartPOD log and select the corresponding SmartPOD (for example, UPS and rack 2), and then click the **Download** button to download the running logs of rack 1 and rack 2.

4.5 SmartAisle3 Three-color Light Control

4.5.1 Alarm Linkage Control of Rack Three-color Lights

Among the three-color lights of the rack (the three colors refer to blue, red, and white), **white has the highest priority and blue has the lowest priority**. The specific state switching logic is shown in Figure 4-4.

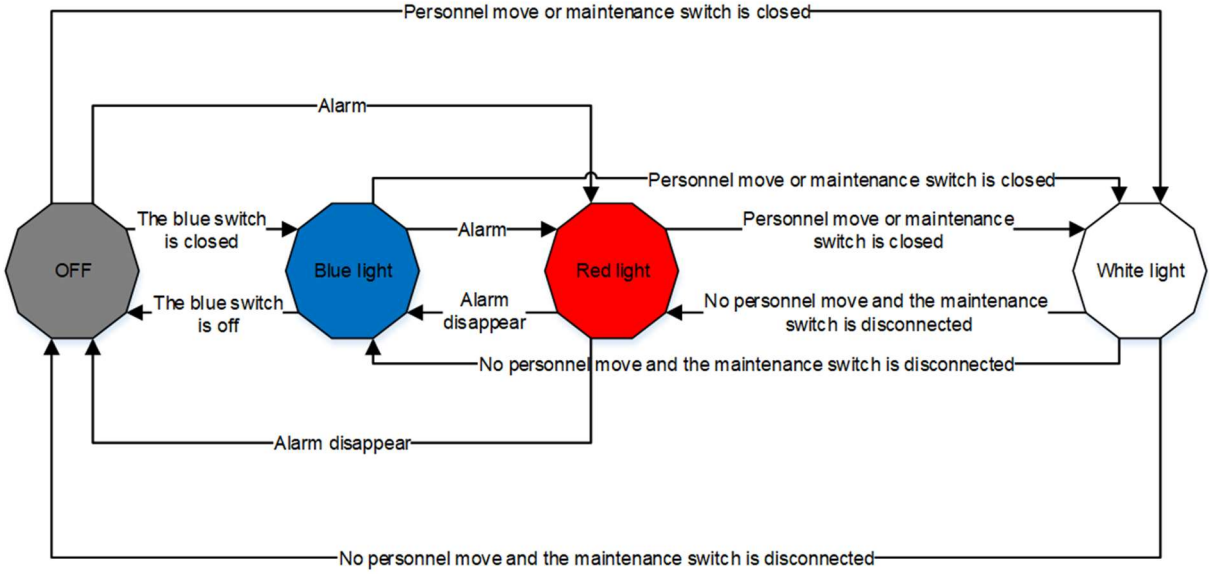


Figure 4-4 Three-color light control logic

1. The three-color indicator lights up blue by default after power on. After the system is started, the blue lights of the whole rack can be turned off and on through the blue light control switch.

2. When the current three-color light is off or the blue light is on, if an alarm is generated, the red light will light up. Among them, the red lights of all the racks are on or the red light in a certain rack is on. For specific alarms, please refer to Table 4-3 Alarm List of Linked Three-color Lights.

3. When the red light is on, if the alarm disappears, the previous color needs to be restored, that is, the blue light is on when the blue switch is closed, and the light is off when the blue switch is off;

4. No matter it is currently in any of the above states, if there are people moving in the aisle or the maintenance switch is closed, the white lights of all the racks will be on;

5. If there are no people moving in the aisle and the maintenance switch is turned off, the rack lights will restore their previous colors.

Table 4-3 Alarm List of Linked Three-color Lights

Device name	Alarm name	Three-color light action
UPS	Output prohibited	UPS rack red light on
	Emergency shutdown	
	Bypass SCR failure	
	Discharger failure	
	Charger failure	
	Auxiliary power supply failure	
	Inverter relay failure	
	Output fuse blown	
	System main circuit fuse blown	
	Bypass fuse blown	
	System output fuse blown	
	Output short circuit	
AC	Air loss alarm	AC rack red light on
	Low pressure sensor fault lockout	
	High pressure lockout alarm	
	Low pressure lockout alarm	
	Exhaust high temperature lockout alarm	
	Low exhaust superheat lockout alarm	
	Compressor drive failure lockout	
	Compressor drive communication lockout	
System environment	Circuit A switch status alarm	Red light of some rack on
	Circuit B switch status alarm	
	Circuit A three-phase imbalance over-limit alarm	
	Circuit B three-phase imbalance over-limit alarm	
	Circuit A three-phase current percentage overrun alarm	
	Circuit B three-phase current percentage overrun alarm	
	High temperature alarm at front door	
	Manual fire-fighting button closed	Red lights of all racks on
	Building fire-fighting signal	
	The white light is always on and the button is closed	White lights of all racks on
	Microwave sensor	

4.5.2 Rack Skylight Alarm Linkage Control

The rack skylight falls, which is triggered by the rack high temperature signal and fire-fighting signal. Among them: when the number of racks with high temperature is greater than or equal to two, the building's fire-fighting linkage signal or manual fire-fighting signal is generated, it will cause the skylight to open automatically.

4.5.3 Link Abnormal Alarm Report

When the SmartPOD serial link of any one or more racks is abnormal, the serial link abnormal alarm is reported, and the alarm is cleared when the SmartPOD serial links of all the racks are restored; when the SmartPOD network links of any one or more rack are abnormal, the network link abnormal alarm is reported. The alarm is cleared when the SmartPOD network link of all racks is restored.

After the link abnormal alarm is generated, you can view the link status of the SmartPOD of the specific rack on the SmartPOD access device page. See section *4.4.1 SmartPOD Access Device*.

Chapter 5 Control Panel Interface

This chapter introduces the related functions of the RUD501 control panel in detail, including control panel configuration and control panel interface.

5.1 Control Panel Configuration

The SmartAisle2 product completes the setting of the control panel model and related parameters through 2D modeling on the RDU501 Web page. Please refer to *3.4.8 Smart Solution Modeling*.

The SmartAisle3 product automatically creates the SmartAisle3 web model and control panel model through the one-key networking function, and completes the relevant parameter settings. Please refer to section *4.2 One-key Networking* Configuration.

5.2 Control Panel Interface

The control panel pages of SmartAisle2 and SmartAisle3 only have different appearance models. The following chapters will take SmartAisle3's management and control panel interface as an example to introduce. The management and control panel interface mainly includes eight modules: **main page, temperature field, electric energy, assets, alarm** , **PUE, AI** and **PT2D (PowerTrain2D)** .

5.2.1 Main Page

The main page of the control panel displays the SmartAisle3 module, load factor dial, PUE dial, ambient temperature dial, and alarm dial. As shown in Figure 5-1 (SmartAisle3 provides three optional appearances, and the display pictures of the control panel interface are all white appearances).

Figure 5-1 Main page

The load factor dial shows the percentage of air-conditioner compressor capacity and the percentage of UPS output load.

The PUE dial shows the historical PUE curve 5 days before the current date.

The ambient temperature dial shows the average temperature of the cold and hot aisle temperature sensors.

The alarm dial shows the number of alarms (critical, major, minor) of the device in the module.

The bottom of the main page scrolls to display the alarm information of the equipment in the module. indicates a critical alarm, indicates a major alarm, and indicates a minor alarm.

Click the menu icon in the upper right corner of the page to pop up the **basic, temperature field, power, asset, alarm and PT2D menus**. After clicking the basic menu, the pop-up drop-down menu displays basic module information, including the number of system racks, total system power supply capacity, total system cooling capacity, and overview of available space and system alarms.

📖 Note

1. Click on a blank area of the page to hide the drop-down menu.
2. Click the Logo icon in the upper left corner of the page to return to the main page.
3. Click Chinese | English at the top of the page to switch the display language.
4. Click to download the app for mobile devices, and a QR code is displayed. You can scan the QR code to download the app.

5.2.2 Temperature Field

Click the menu icon in the upper right corner of the page, and click the temperature field in the pop-up menu to open the temperature field page.

Click drop-down menu which pops up from temperature field to show the maximum temperature and the minimum temperature inside and outside the aisle.

The temperature field page shows temperature field of the module in 3D-form. The colors in the module represent different temperatures. Click the rotating icon , the module will rotate clockwise, and it rotates 1/8 every time. Clicking the **Front Door and Rear Door** icon can switch between the temperature inside the aisle and outside the aisle.

📖 Note

1. To configure the temperature field colors of the sensors and modules of the front and rear doors of the rack in the RDU501 system, refer to *3.4.8 Smart Solution Modeling -> 2D Modeling*.
2. In the temperature field, the air conditioners, columns or other non-IT racks are displayed in black, and gray when the rack is not bound to the sensor or communication with the sensor fails.
3. Click the temperature dial at the bottom of the main page to open the temperature field page.

Click the rack in the temperature field to open the single rack temperature field.

On the single rack temperature field page, the colors of the rack indicate different temperature ranges. Click the **front door** , **rear door** and **IT** icon to switch to display the temperature field of the channel inside, outside the channel and IT equipment.

Click the **Module Temperature Field** in the temperature field drop-down menu to open the module temperature field page. The page displays the temperature values of all sensors in the hot aisle and cold aisle in table form.

5.2.3 Electric Energy

Click the menu icon in the upper right corner of the page, and click **Electric Energy** in the pop-up menu to open the energy page.

Click on the drop-down menu that pops up to display the IT load rate and power supply capacity. If a battery device is added to the RDU501, the corresponding battery device will be displayed on the menu page. After clicking the corresponding device, the SOC and total voltage parameters of the battery are displayed. After clicking the **Module Power** in the drop-down menu, the drop-down menu displays the IT load rate of each rack.

The power page displays the power supply capacity of each rack in 3D form. The height and color of the column at the rack position reflect the power supply capacity. If the power distribution signal of the rack has been configured, the power supply capacity = the sum of the power consumption of the rack (distribution signal) / the rated power of the rack; if the power distribution signal is not configured, the power supply capacity = the sum of the rated power of the equipment on the rack / the rack rated power.

Click the Rotate icon and the module will rotate in a clockwise direction, 1/8 each time.

📖 Note

In RDU501 system SmartAisle3, if the binding signal of the distribution branch needs to be changed or the color of the power supply capacity needs to be configured, please refer to 3.4.8 *Smart Solution Modeling -> 2D Modeling*.

5.2.4 Asset

Click the menu icon in the upper right corner of the page, and click **Assets** in the pop-up menu to open the asset page.

Click the asset pop-up drop-down menu to display the module's space capacity usage. After clicking the **Module Asset** in the drop-down menu, the drop-down menu displays the space capacity of each rack.

The asset page displays the space capacity usage of each rack in 3D form. The height and color of the column in the rack position reflect the level of space capacity. Rack space capacity = U-number occupied by listed assets / total number of U-levels in the rack.

Click the Rotate icon and the module will rotate in a clockwise direction, 1/8 each time.

📖 Note

For the colors of assets and allocation space capacity in the RDU501 system, see *3.4.8 Smart Solution Modeling -> 2D Modeling*.

Click on the rack to open the asset page of a single rack.

The single-rack asset page displays the U-number and occupancy in the rack, and the asset drop-down menu displays a list of assets in the rack, including asset names and U-number space occupied by the assets.

5.2.5 Alarm

Click the menu icon ☰ in the upper right corner of the page, and click **Alarm** in the pop-up menu to open the alarm page.

Click the drop-down menu that pops up to display the number of critical, major, and minor alarms. After clicking the system alarm in the drop-down menu, the drop-down menu displays a detailed list of three types of alarms.

The alarm page displays the alarm status of the device in each rack in 3D. The color of the column reflects the current highest-level alarm of the equipment in the rack. Red indicates a critical alarm, orange indicates a major alarm, blue indicates a minor alarm, and green indicates no alarm.

Click the Rotate icon and the module will rotate in a clockwise direction, 1/8 each time.

🕮 Note

1. When there is no alarm, the color of the column is green. When multiple alarms occur in the same rack, the color shows the highest alarm color.
2. Click the **Alarm** dial at the bottom of the main page to open the alarm page.
3. The rack device includes: the listed asset device, please refer to **Assets In** in section *3.4.8* ; the device related to the temperature signal and power signal bound to the rack.

5.2.6 PUE

Click the PUE dial at the bottom of the main page to open the PUE page.

The PUE page displays real-time PUE pointer dial, energy consumption distribution pie figure and PUE historical curve. In PUE historical curve, you can click month, week to view the PUE historical curve of the last 30 days and the last 7 days. The minimum, maximum, and average display the minimum, maximum, and average values of PUE in the interval, respectively.

🕮 Note

To configure PUE in the RDU501 system, refer to 3.4.6 *Power Mgmt -> Calculation setting*

5.2.7 AI

After authorizing the Energy Saving Module, there will be a new menu option called AI added in the menu. Click the AI menu option, then the Energy Saving Module page will display.

The dial in the middle part displays AI saved energy, and the four charts around the dial are PUE chart, Power Consumption chart, AI Optimization chart and Rack Environment chart.

For PUE chart, Power Consumption chart and Rack Environment chart, see section *3.4.5*.

AI Optimization chart displays the tendency of the air conditioner working numbers in the last 7 days.

5.2.8 PT2D

The PT2D page displays the power distribution links of the data center in 2D form.

Click the menu icon ☰ in the upper right corner of the page and click PT2D in the pop-up menu to open the PT2D page.

Clicking on a component will display the component name, and the device name and alarm signal to which the component is bound.

For the component style and description and the link style and description of the Power Train 2D image, see *Table 3-5* and *Table 3-6*.

🕮 Note

1. The 2D Power Train image will only be displayed after adding the 3D Power Train image in Web.
2. The alarm status changes of components in the 2D power train image need to take effect after the dynamic environment alarm function is enabled in the 3D power train image.

Chapter 6 Maintenance

This chapter describes the maintenance of RDU501, including restoring default settings and troubleshooting.

6.1 Restore System Settings

Restoring the default settings can be done in both software and hardware.

For software recovery, see Restoring Defaults in section *3.4.10 System* .

Hardware recovery includes restoring the RDU501 administrator password (default username: admin, password: Vertiv) and the IP address of the RDU501 (for the default IP address, see 1.1.1 Network Ports in the RDU501 main unit section). The method is as follows: Press and hold the reset button (see Figure 6-1) for 4 seconds. After the running/alarm light is off, the RDU501 will restore the IP address and password after the system restarts.

Figure 6-1 Reset button

6.2 Troubleshooting

Issue 1: Why does the RDU501 login page not appear when the RDU501 communication is normal?

Answer: There are three solutions to the above Issue:

Step 1: Please confirm the correctness of the IP address.

The RDU501 has four network cards. Please confirm whether the Ethernet cable is plugged into the wrong interface.

If it is a static IP address, refer to the Ethernet port in the RDU501 main unit section for the default IP value of the RDU501.

Step 2: Please confirm the connectivity of the IP address.

To confirm the IP address connectivity, use the ping command as follows:

1) Open a command prompt for the Windows operating system as shown in Figure 6-2.

2) Enter "ping" and IP address on the command line (for example, ping 192.168.0.254) to see if the communication is successful.

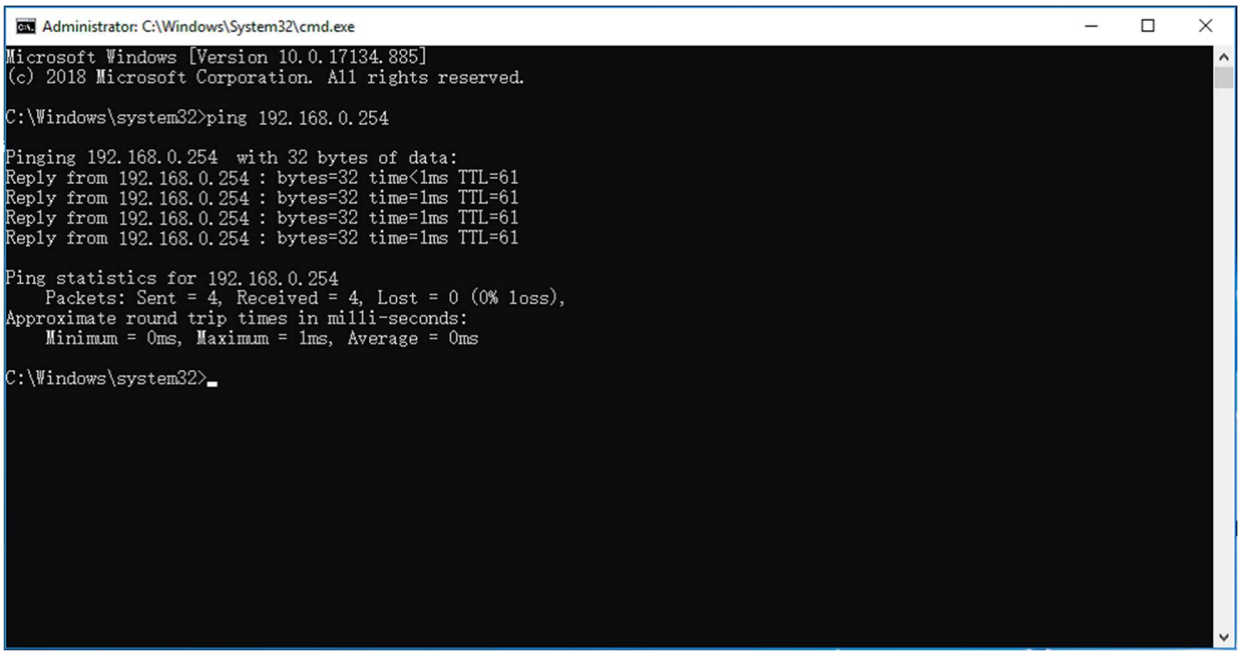


Figure 6-2 Access Control Mgmt-> Authority Management

Step 3: If the network connection is not completed after the above two steps, please use the reset button on the device body to restore the default IP.

Step 4: Refer to *3.1 Login Preparation* to complete the related operations.

Issue 2: How do I troubleshoot a sensor?

Fault phenomenon 1 : The intelligent sensor has no display and cannot be displayed on the RDU501 web page.

Answer: Take following steps below to troubleshoot:

1) Confirm whether the intelligent sensor is connected to the SENSOR port of the RDU501. At the same time, the address "1" within the group can only be connected to SENSOR1, and the address "2" within the group can only be connected to SENSOR2.

2) Check if the connecting cable is intact, the connector crimping wire is intact, and whether it is a direct-through cable;

3) Check if the intelligent sensor is normal;

4) Make sure the sensor address is not 00;

5) If multiple intelligent sensors are connected, make sure the sensor addresses are not duplicated and follow the steps 2 and 3 one by one.

Fault phenomenon 2 : The alarm indicator of the intelligent sensor is always on.

Answer: Return the intelligent sensor to the service center of the Vertiv office.

Fault phenomenon 3 : There are intelligent communication failure alarms in the RDU501 historical alarm.

Answer: Check that the cable clamp is intact. Check if the cable connection is loosened.

Issue 3: After the alarm is generated, no email or SMS notification is received, or if the alarm is not ceased, the number of email or SMS notifications is less than 3. How to deal with it?

Answer: Take following steps below to troubleshoot:

1) Please check whether the SMS module and mail server configuration are correct. For details, see *3.4.9 Device Options*.

2) If you have not received the SMS notification:

- Please confirm whether the telephone card has been suspended and is in arrears;
- Please contact the operator to confirm whether the SMS function is blocked;
- If you use China Mobile or China Unicom card, please contact the operator to confirm whether the 2G network has been shut down.

3) If you have not received the email notification, please click menu **Data & History** -> **History Log** to check whether the alarm notification sending log has a record of failed mail delivery. If there is, it means the network is busy or the mail server communication is busy.

Issue 4: When the first login system has an alarm or a new alarm is generated, there is no alarm sound. How to deal with it?

Answer: Take following steps below to troubleshoot:

1) Please check if the current computer is muted and can play other sounds normally;

2) Please check if the browser allows the website to play sounds;

This document uses the settings of Chrome and Safari as an example for brief description. For other browser settings, please refer to the following descriptions in implementation.

Chrome: Settings - Advanced - Website Settings - Sounds, check if there is a current system address under the "Mute" item, if it exists, please delete it;

Safari: Preferences - Website - Auto Play, set the current system address to "Allow all auto play";

Note, due to the continuous development of the browser, the above settings may change or fail.

Issue 5: Set the web access mode to https, and successfully access it, and then modify it to http access. When prompted 404, how to deal with it?

Answer: Please clear the browser cache and access it again with http.

Issue 6: How to deal with the communication failure of IT equipment accessed through IPMI2.0 protocol?

Answer: Take following steps below to troubleshoot:

1) Please check the user manual provided by the server manufacturer to confirm whether the server supports the IPMI2.0 protocol. If it is supported, go to step 2;

2) Please refer to the ping command usage method in **Issue 1** to check the connectivity of the server's IP address. If the network connection is normal, go to step 3.

3) Please check whether the relevant parameters of the IPMI device management page are correct, including: IP address, port, username and password. If it is correct, go to step 4;

4) If the above check results are normal, it may be that the server side rejects the session request of the RDU501. Please contact Vertiv technical service personnel.

Issue 7: *3.4.2* Section Security Mgmt-> Access Control Mgmt. If there is a card that needs to be added, as shown in Figure 6-3, it means that there is authorized user information that is not recorded by the RDU501 system in the access control device. In this case, you need to perform a permission reset for the access control device, otherwise it will cause authorization or abnormal door opening.

Description of application scenarios for access control device:

1. The access control has been connected to RDU501 for management. It is damaged during use and needs to be replaced.

2. The fingerprint card reader has been connected to RDU501 for management through a certain access control device. It is damaged during use and needs to be replaced.

3. The RDU501 monitoring data collector is damaged during use and needs to be replaced.

4. Access control is connected to RDU501 A for management. Among them: authorization information already exists for the access control. It is not allowed to switch to RDU501 B for management. If you need to switch, you need to perform a permission reset.

5. The fingerprint card reader is connected to RDU501 through 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. If you need to switch, you need to perform a permission reset.

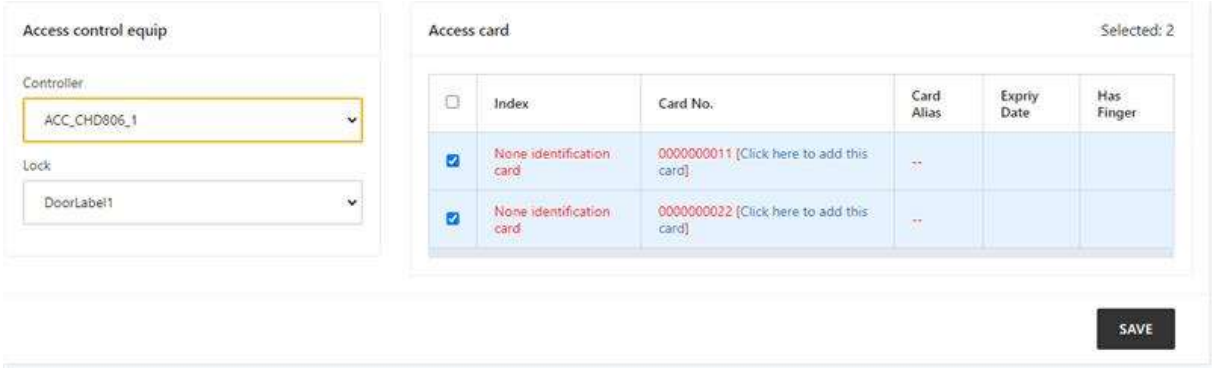


Figure 6-3 Access Control Mgmt-> Authority Management

Issue 8: How to locate the line fault when the quick networking fails.

1. Click the QUICK NETWORKING button, the web page cabinet starts from the #101 in the upper right corner and turns green in the U-shape sequence. Cabinets #101 to #111 in the first row turn green, cabinets #211, #210, ..., #203 in the second row turn green in sequence, and cabinets 202 and 201 remain gray.The three-color lights on the top of cabinets in the SmartAisle3 aisle turn on in sequence from #101 to #111, and the three-color light on the top of the second row cabinets turn on in sequence from #211 to #203. A tip pops up on the page: Networking failed, R13(#202) Network link communication is abnormal, please check. Through the above phenomenon, the network link failure can be preliminarily judged, and the failure point is shown in Figure 6-4 below. It is necessary to detect the network link between the LAN2 port of the cabinet 203 and the LAN1 port of the cabinet 202. As shown in Figure 6-5, check whether the two cables ①② in the figure are connected normally.

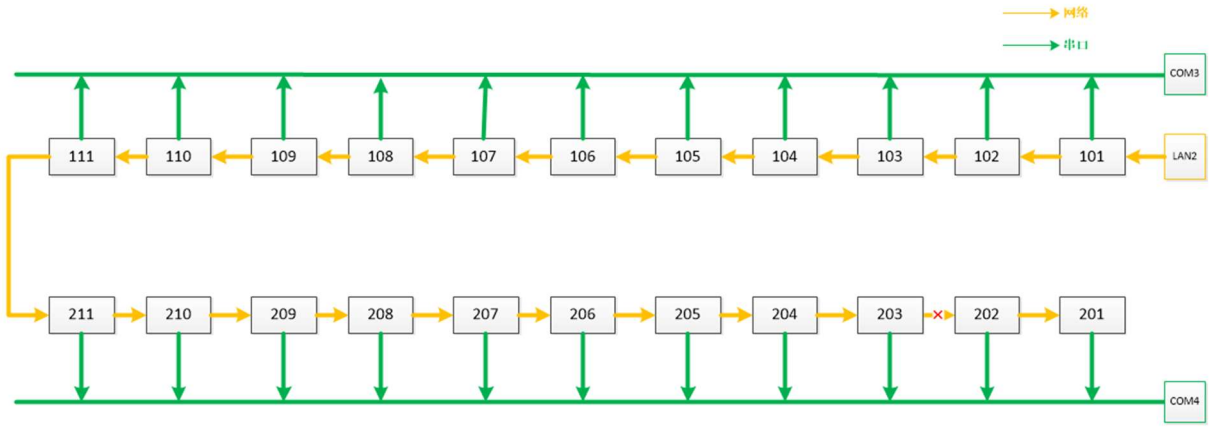


Figure 6-4 Illustration of network link failure

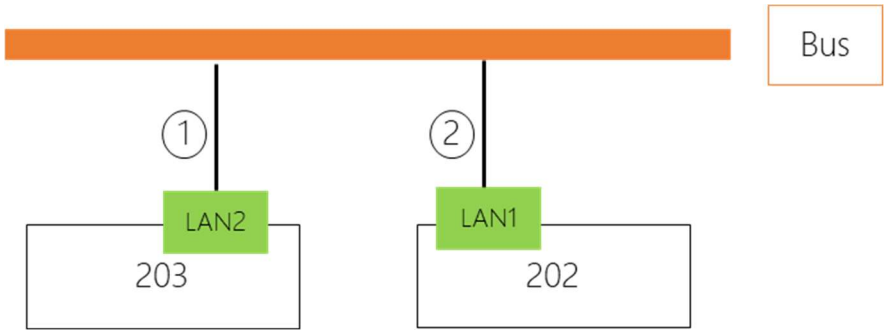


Figure 6-5 Network link between the LAN2 port of the cabinet 203 and the LAN1 port of the cabinet 202

2. After the QUICK NETWORKING is successful and entering the cabinet link status display page, the serial link of cabinet 202 is abnormal. In the page, the network link status of the cabinet R13(202) displays √, but its serial link status displays ✕. Based on the above phenomenon, it can be preliminarily judged that the network link is abnormal, and the fault point is shown in Figure 6-6below.

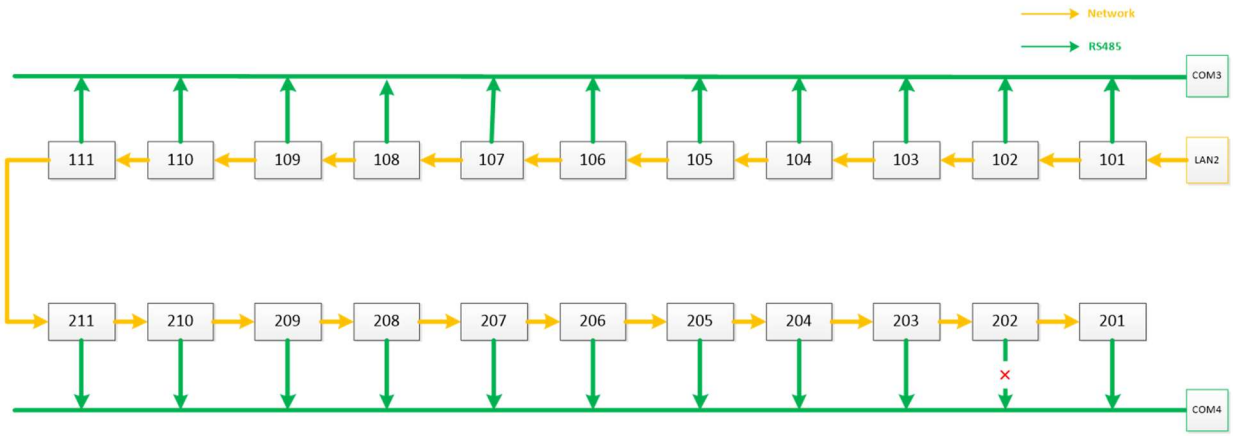


Figure 6-6 Network link failure indication

Appendix 1 Abbreviations

DI	Digital Input
DO	Digital Output
FAQ	Frequently Asked Questions
IPMI	Intelligent Platform MgmtInterface
BMC	Baseboard MgmtController
FRU	Field Replaceable Unit
PUE	Power Usage Effectiveness

Appendix 2 Standard Configuration List

No.	Description	Quantity	Unit
1	RDU501 intelligent monitoring unit	1	EA
2	RDU501 intelligent monitoring unit installation and commissioning manual	1	EA
3	Small hardware - 21-inch mounting ears	2	EA
4	Small hardware--RDU line card	2	EA
5	Wire and Cable-IEC60320 C13 Plug-IEC60320 C14 Plug-H05VV-F-3C-1mm^2-Black-2000mm-EU	2	EA
6	Small hardware -mounting ears	2	EA
7	M4×10 Standard parts-GB819.1-2000-cross recessed countersunk head screw M4×10	6	EA
8	Complete sets or other labels - certificate label	1	EA

Appendix 3 FCC Certification Description

🕮 Note

This device has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the device is operated in a commercial environment. This device generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this device in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

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