

**HUAWEI USG9500 Series
V300R001 & V500R001**

Hardware Guide

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About This Document

Related Version

The following table lists the product version related to this document.

Product Name	Version
The USG9500 has the following models: <ul style="list-style-type: none"> ● USG9520 ● USG9560 ● USG9580 	V300R001 V500R001

Intended Audience

This document describes hardware structure, installation guide, and hardware maintenance. The content of this document includes the appearance and specifications of the product, the supported expansion cards, preparation before the installation, installation, cabling, and hardware replacement.

This document is intended for installation personnel and administrators who install and maintain USG. The installation personnel or administrators must have experience in the installation and maintenance of networking devices.

Symbol Conventions

The symbols that may be found in this document are defined as follows.

Symbol	Description
 DANGER	Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.
 WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

Symbol	Description
 CAUTION	Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.
 NOTICE	Indicates a potentially hazardous situation which, if not avoided, could result in equipment damage, data loss, performance deterioration, or unanticipated results. NOTICE is used to address practices not related to personal injury.
 NOTE	Calls attention to important information, best practices and tips. NOTE is used to address information not related to personal injury, equipment damage, and environment deterioration.

Command Conventions

The command conventions that may be found in this document are defined as follows.

Convention	Description
Boldface	The keywords of a command line are in boldface .
<i>Italic</i>	Command arguments are in <i>italics</i> .
[]	Items (keywords or arguments) in brackets [] are optional.
{ x y ... }	Optional items are grouped in braces and separated by vertical bars. One item is selected.
[x y ...]	Optional items are grouped in brackets and separated by vertical bars. One item is selected or no item is selected.
{ x y ... } *	Optional items are grouped in braces and separated by vertical bars. A minimum of one item or a maximum of all items can be selected.
[x y ...] *	Optional items are grouped in brackets and separated by vertical bars. Several items or no item can be selected.
&<1-n>	The parameter before the & sign can be repeated 1 to n times.
#	A line starting with the # sign is comments.

GUI Conventions

The GUI conventions that may be found in this document are defined as follows.

Convention	Description
Boldface	Buttons, menus, parameters, tabs, window, and dialog titles are in boldface . For example, click OK .
>	Multi-level menus are in boldface and separated by the ">" signs. For example, choose File > Create > Folder .

Update History

Updates between document issues are cumulative. Therefore, the latest document issue contains all updates made in previous issues.

Updates in Issue 03 (2017-12-15) V500R001C80

The third commercial release has the following update:

- Added the description of the **1.4.4.15 Enhanced Application Security Service Processing Card A (SPCA-APPSEC-FW)**.
- Added the description of the **1.4.4.16 Enhanced Application Security Service Processing Card B (SPCB-APPSEC-FW)**.

Updates in Issue 02 (2017-06-30) V500R001C60

The second commercial release has the following update:

Added the support of the 1.25 Gbit/s SFP/eSFP optical transceiver for the 10GBase LAN/WAN-SFP+Flexible card optical interface. For details, see **1.5.2 1.25 Gbit/s SFP/eSFP Optical Module**.

Updates in Issue 01 (2017-03-28) V500R001C50

Initial commercial release.

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1 Hardware Overview

About This Chapter

This chapter provides hardware information about the USG9500 series, including the hardware appearance, power supply system, heat dissipation system, and technical specifications.

[1.1 USG9580](#)

The USG9580 is a 32 U device. It employs an integrated chassis and has 16 LPU/SPU slots. Its MPUs, SFUs, power modules, and fans work in redundancy mode.

[1.2 USG9560](#)

The USG9560 is a 14 U device. It employs an integrated chassis and has 8 LPU/SPU slots. Its SRUs, SFUs, power modules, and fans work in redundancy mode.

[1.3 USG9520](#)

The USG9520 has DC (4 U) and AC (5 U) chassis models. It employs an integrated chassis and has 3 LPU/SPU slots. Its MPUs, power modules, and fans work in redundancy mode.

[1.4 Boards](#)

This section describes various supported boards and their specifications.

[1.5 Optical/Electrical Module](#)

This section describes supported optical/electrical modules.

1.1 USG9580

The USG9580 is a 32 U device. It employs an integrated chassis and has 16 LPU/SPU slots. Its MPUs, SFUs, power modules, and fans work in redundancy mode.

1.1.1 Device Overview

This section describes the appearance and hardware system features of the USG9580.

Appearance

The USG9580 has an integrated chassis and adopts a centralized routing engine and a distributed forwarding architecture.

[Figure 1-1](#) shows the chassis of the USG9580.

Figure 1-1 Chassis



System Features

The USG9580 provides the following system features:

- Upgradable and congestion-free switching fabric, with switching capacity in the Tbit/s range.
- Distributed hardware-based forwarding and rapid service deployment
- Compact structure for increasing interface density
- Normalized system component design
- Separation of control, service, and monitoring channels for ensuring non-blocking of control and monitoring channels

- Carrier-class reliability and manageability
- Modular-level shielding for meeting Electro Magnetic Compatibility (EMC) requirements
- Hot-swappable boards, power modules, and fans
- U-shaped air channels for improving system heat dissipation
- Distributed power supply for enhancing power supply capabilities of a single chassis
- 200-mm fans
- MPUs in 1:1 backup mode
- SFUs in load balancing mode
- Backup for key components such as power modules, fan modules, clocks, and management buses
- Protection against misinsertion of boards
- Queries about alarm prompts, alarm indications, running status, and alarm status of the voltage and ambient temperature

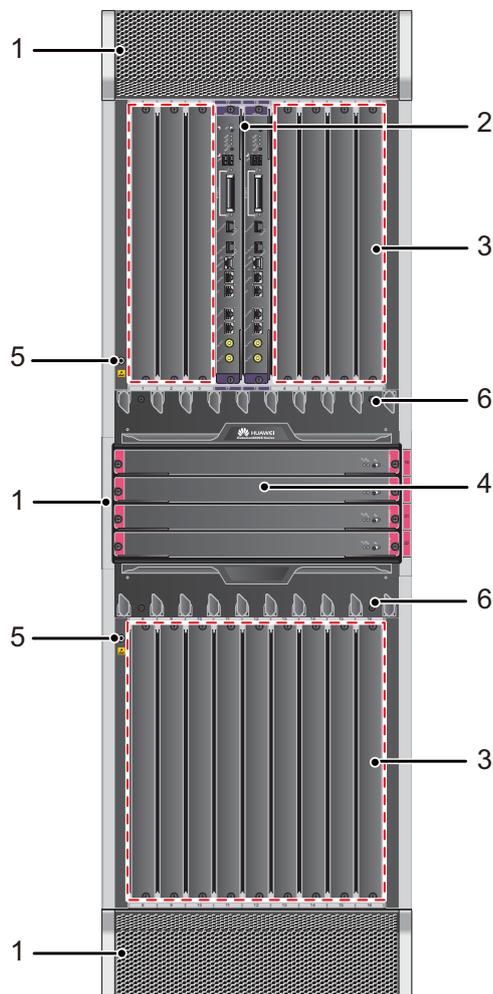
1.1.2 USG9580 Components

The section describes the main components on the front and rear panels of the USG9580.

The USG9580 has an integrated chassis. [Figure 1-2](#) and [Figure 1-3](#) show the architecture and main components of the USG9580.

Front Panel

Figure 1-2 USG9580 front panel

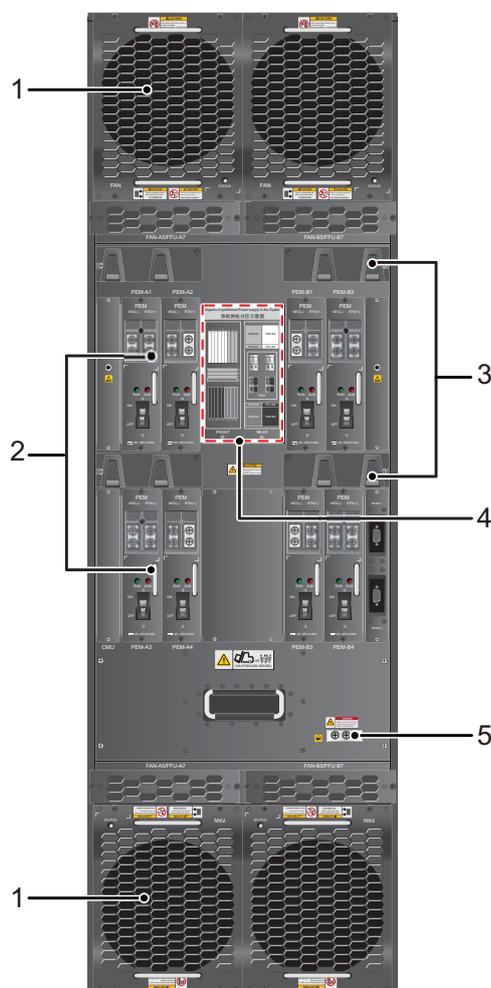


No.	Name	Description
1	Air filter	The USG9580 has three air filters on the air intake vents of the upper and lower air channels and an air intake vent at the left side of the SFU area to protect the device against dust.
2	MPU	The Main Processing Unit (MPU) on the USG9580 is in charge of system control and route information learning. It is the central control unit of the device. The USG9580 MPUs work in 1:1 backup mode. When the active MPU is faulty, the standby MPU immediately takes over for it, ensuring service continuity.
3	LPU/SPU slot	Holds an LPU or SPU.

No.	Name	Description
4	SFU	The SFUs of the USG9580 are responsible for the data switching of the entire system. The USG9580 has four SFUs that work in 3+1 backup mode to help with load balancing.
5	ESD jack	The equipment end of the wrist strap is inserted into the ESD jack. For the wrist strap to be effective, ensure that the device is grounded.
6	Front cable rack	Used for laying optical fibers and cables. It is divided into the upper and lower racks. "HUAWEI" is written on the upper cable rack, while "USG9500 Series" appears on the lower cable rack.

Rear Panel

Figure 1-3 USG9580 rear panel



No.	Name	Description
1	Fan module	The USG9580 has four fan modules that are arranged in pairs. One pair is deployed on the air exhaust vents at the upper air channels and one pair is deployed on the air exhaust vents at the lower air channels. The modules work in 2+2 backup mode.
2	PEM	The USG9580 uses eight power entry modules (PEMs) for DC power supply. The backplane is divided into four areas, each of which has two PEM power inputs. These eight power inputs work in 4+4 backup mode. If the USG9580 uses the AC power supply, two additional external AC power chassis are required.
3	Rear cable rack	Used for laying optical fibers and cables. There are four rear cable racks on the upper parts of the power modules.
4	Power supply areas	Power supply areas of the eight PEMs on the USG9580.
5	Protection ground terminal	The OT terminal of the ground cable is connected to the protection ground terminal of the device, and the other terminal of the ground cable is connected to the ground point of the cabinet or workbench or the ground bar of the equipment room.

1.1.3 Slot Layout and Boards

This section describes the layout of slots and supported boards on the USG9580.

Slots Layout

Figure 1-4 shows the slot layout on the USG9580.

Figure 1-4 USG9580 slot layout

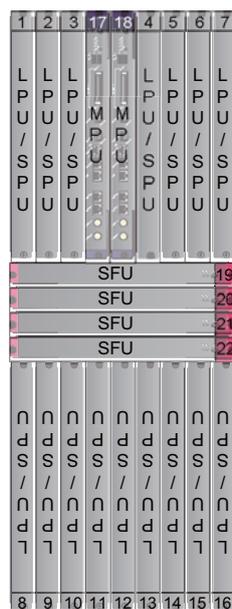


Table 1-1 describes the slot layout on the USG9580.

Table 1-1 Table 1 Board distribution on the USG9580 board cage

Slot Name	Slot Number	Quantity	Slot Height	Remarks
LPU/SPU	1 to 16	16	41 mm (1.6 inches)	These slots hold LPUs or SPUs.
MPU	17 to 18	2	41 mm (1.6 inches)	These slots hold MPUs that work in 1:1 backup mode.
SFU	19 to 22	4	41 mm (1.6 inches)	These slots hold SFUs.

Supported Boards

Table 1-2 lists the specifications of boards supported by the USG9580.

Table 1-2 Boards supported by the USG9580

Type	BOM	Description	Hot-Swappable or Not
MPU	0305G06U	1.4.2.1 EKEX16-FWCD00MPUB00	Yes
SFU	0305G08Q	1.4.3.1 E8KE-X16-SFUC-200SP	Yes
SPUs and SPCs	03056638	1.4.4.3 X8&X16 SPU (SPU-X8X16-B)	Yes
	0305G09U	1.4.4.7 Firewall Service Processing Unit (SPU-X8X16-20-O-E8KE, for USG9560/USG9580)	Yes
	03057426	1.4.4.8 Firewall Service Processing Unit (SPUA-20-O-H, for USG9560/USG9580)	Yes
	03057520	1.4.4.9 Firewall Service Processing Unit (SPUB-20-O-H, for USG9560/USG9580)	Yes
	0305G09V	1.4.4.10 Firewall Performance Expansion Card (SPC-20-O-E8KE)	Yes
	03057429	1.4.4.11 Firewall Performance Expansion Card (SPCA-20-O-H&M)	Yes
	03057522	1.4.4.12 Firewall Performance Expansion Card (SPCB-20-O-H&M)	Yes

Type	BOM	Description	Hot-Swappable or Not
	03057872	1.4.4.15 Enhanced Application Security Service Processing Card A (SPCA-APPSEC-FW)	Yes
	03057873	1.4.4.16 Enhanced Application Security Service Processing Card B (SPCB-APPSEC-FW)	Yes
	03056688	1.4.4.13 Application Security Service Processing Card (SPC-APPSEC-FW)	Yes
	03056639	1.4.4.14 Application Security Service Processing Card (SPC-IPS-20)	Yes
LPUF-240 and FPIC	03056683	1.4.5.1 LPUF-240	Yes
	03056890	1.4.5.2 20-Port 10/100/1000Base-RJ45 FPIC (FW-20X1G-RJ45)	No
	03056633	1.4.5.3 24-Port 100/1000 Base-X-SFP FPIC (E8KE-X-101-24XGE-SFP)	No
	03056632	1.4.5.4 5-Port 10GBase LAN/WAN-SFP + FPIC A (E8KE-X-101-5X10GE-SFP+)	No
	03056684	1.4.5.5 6*10GE SFP+ Daughter Card (FW-6X10G-SFP+)	No
	03056686	1.4.5.6 12*10GE SFP+ Daughter Card (FW-12X10G-SFP+)	No
	03056848	1.4.5.7 3-Port 40GBase QSFP+ FPIC (FW-3X40G-QSFP+)	No
	03056631	1.4.5.8 1-Port 40GBase LAN-CFP FPIC A (E8KE-X-101-1X40GE-CFP)	No
	03056685	1.4.5.9 1*100GE CFP Daughter Card (FW-1X100G-CFP)	No
LPUF-120 and FPIC	03056682	1.4.6.1 LPUF-120	Yes
	03056890	1.4.6.2 20-Port 10/100/1000Base-RJ45 FPIC (FW-20X1G-RJ45)	No
	03056633	1.4.6.3 24-Port 100/1000 Base-X-SFP FPIC (E8KE-X-101-24XGE-SFP)	No
	03056632	1.4.6.4 5-Port 10GBase LAN/WAN-SFP + FPIC A (E8KE-X-101-5X10GE-SFP+)	No
	03056684	1.4.6.5 6*10GE SFP+ Daughter Card (FW-6X10GE-SFP+)	No

Type	BOM	Description	Hot-Swappable or Not
	03056686	1.4.6.6 12*10GE SFP+ Daughter Card (FW-12X10GE-SFP+)	No
	03056848	1.4.6.7 3-Port 40GBase QSFP+ FPIC (FW-3X40G-QSFP+)	No
	03056631	1.4.6.8 1-Port 40GBase LAN-CFP FPIC A (E8KE-X-101-1X40GE-CFP)	No
	03056685	1.4.6.9 1*100GE CFP Daughter Card (FW-1X100GE-CFP)	No
LPUF-101 and FPIC	03056630	1.4.7.1 LPUF-101	Yes
	03056633	1.4.7.2 24-Port 100/1000 Base-X-SFP FPIC (E8KE-X-101-24XGE-SFP)	No
	0305G09L	1.4.7.3 4-Port 10G Base LAN -SFP+ FPIC (E8KE-X-101-4X10GE-SFP+)	No
	03056632	1.4.7.4 5-Port 10GBase LAN/WAN-SFP + FPIC A (E8KE-X-101-5X10GE-SFP+)	No
	03056631	1.4.7.5 1-Port 40GBase LAN-CFP FPIC A (E8KE-X-101-1X40GE-CFP)	No
LPUF-40-A and FPIC	03056627	1.4.8.1 LPUF-40-A	Yes
	03056629	1.4.8.2 20-Port 100/1000Base-X-SFP Flexible Card (P40-20xGE/FE-SFP)	No
	03056628	1.4.8.3 2-Port 10GBase LAN/WAN-XFP Flexible Card (P40-2x10GBase LAN/WAN-XFP)	No
	0305G07X	1.4.8.4 4-port 10GBase LAN/WAN-XFP FPIC (P40-4x10GBase LAN/WAN-XFP)	No
LPUF-21 and FPIC	03056624	1.4.9.1 LPUF-21	Yes
	0305G054	1.4.9.2 12-port 10Base-T/100Base-TX/1000Base-T-RJ45 FPIC (12x10/100/1000Base-TX-RJ45)	No
	03056626	1.4.9.3 12-port 100Base-FX/1000Base-X-SFP FPIC (12x100/1000Base-SFP)	No
	0305G055	1.4.9.4 1-port OC-192c/STM-64c POS-XFP FPIC (1 x OC-192c/STM-64c POS-XFP)	No
	03056625	1.4.9.5 1-port 10GBase LAN/WAN-XFP FPIC (1 x 10GBase LAN/WAN)	No

Type	BOM	Description	Hot-Swappable or Not
	0305G07W	1.4.9.6 4-Port 10GBase WAN/LAN-XFP FPIC (4x10GBase LAN/WAN)	No
Integrated Line Process Unit	03056637	1.4.10 1-Port 100GBase-CFP Integrated Line Processing Unit (LPUI-101)	Yes

1.1.4 Power Supply System

This section describes the power supply system architecture, power supply area partitioning, and AC/DC power systems of the USG9580.

1.1.4.1 Features and Distributed Architecture of the Power Supply System

This section describes the power supply mode and power supply area partitioning of the USG9580.

The USG9580 supports either DC and AC power supplies (but not at the same time).

- If DC power supply is used, connect the DC power cables to the PEM input terminals.
- If AC power supply is used, use two suitable external AC-DC convertors. The number of rectifier modules on the AC-DC convertors depends on the system power consumption. The AC-DC convertor converts AC power to DC power and supplies DC power to the PEMs.

As shown in [Figure 1-5](#), the USG9580 backplane is divided into four areas, each with two power inputs. These eight power inputs work in backup mode.

Figure 1-5 Distributed architecture of the USG9580 power supply



1.1.4.2 DC Power Supply System

This section describes the power supply architecture of the DC power system and the appearance and technical specifications of the DC power modules of the USG9580.

The USG9580 uses eight 70 A PEMs that work in 4+4 backup mode for DC power supply. [Table 1-3](#) describes the power supply solution.

Table 1-3 Power supply solution of the USG9580 DC power system

DC power module	Powered Area	Powered Part
PEM-A1 PEM-B1	Zone1	<ul style="list-style-type: none"> ● Front panel: slots 5-7, 19-21 ● Rear panel: fan modules (upper left side)

DC power module	Powered Area	Powered Part
PEM-A2 PEM-B2	Zone2	<ul style="list-style-type: none"> ● Front panel: slots 1-4, 17, 18 ● Rear panel: fan modules (upper right side)
PEM-A3 PEM-B3	Zone3	<ul style="list-style-type: none"> ● Front panel: slots 13-16, 22 ● Rear panel: fan modules (lower left side)
PEM-A4 PEM-B4	Zone4	<ul style="list-style-type: none"> ● Front panel: slots 8-12 ● Rear panel: fan modules (lower right side)
NOTE PEMs A and B back up each other.		

Figure 1-6 shows the relationships between the power modules and chassis parts. Each DC power input contains one -48 V power input and one RTN input. Two separate RTN inputs join together on the board.

Figure 1-6 Power supply architecture of the USG9580 DC power system

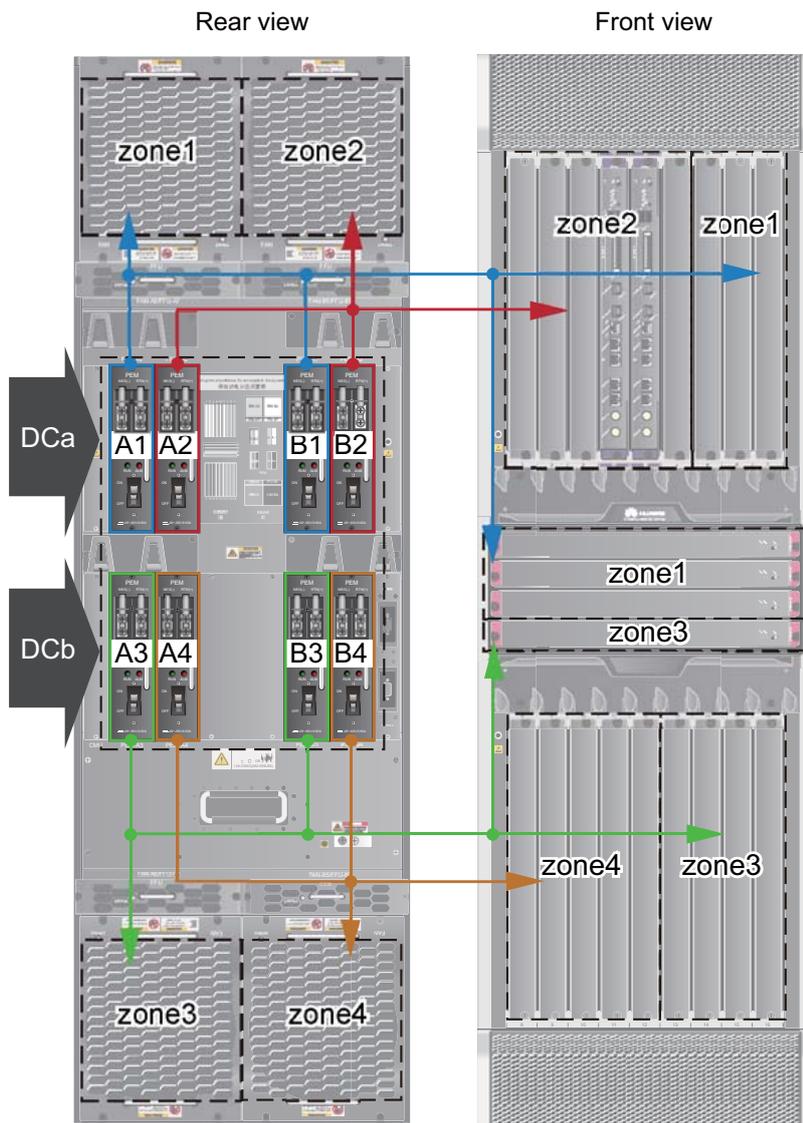


Figure 1-7 shows the PEM.

Figure 1-7 Appearance of the PEM

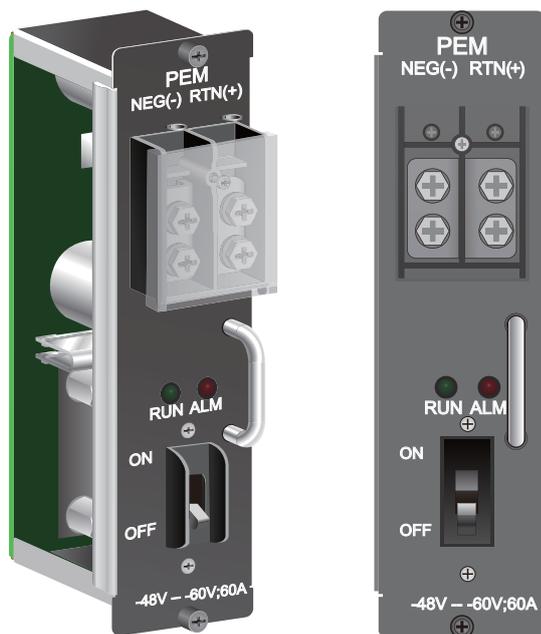


Table 1-4 describes the LED indicators on the PEM.

Table 1-4 Description of the PEM indicators

Indicator	Color	Description
RUN	Green	Indicates normal power output. If the indicator is steady on, the output is normal.
ALM	Red	Power failure indicator. If the indicator is steady on: <ul style="list-style-type: none"> ● The lightning protection link of the power module has failed. ● The input power cable is not connected to the power module.

Table 1-5 lists the technical specifications of the PEM.

Table 1-5 Technical specifications of the DC PEM

Item	Technical Specification
Type	PEMB
Dimensions (Width x Depth x Height)	58 mm x 115 mm x 220 mm
Weight	1.1 kg

Item	Technical Specification
Number of power inputs	1
Maximum input voltage range	-72 V DC to -38 V DC
Rated input voltage range	-48 V DC to -60 V DC
Input current	60 A (Each power supply input with at least 60 A current is recommended.)
Output voltage	-72 V DC to -38 V DC
Output current	60 A
Rated current of the air-break	70 A (Each PEM is controlled by an air switch).

1.1.4.3 AC Power Supply System

This section describes the power supply architecture of the AC power system and the appearance and technical specifications of the AC power chassis of the USG9580.

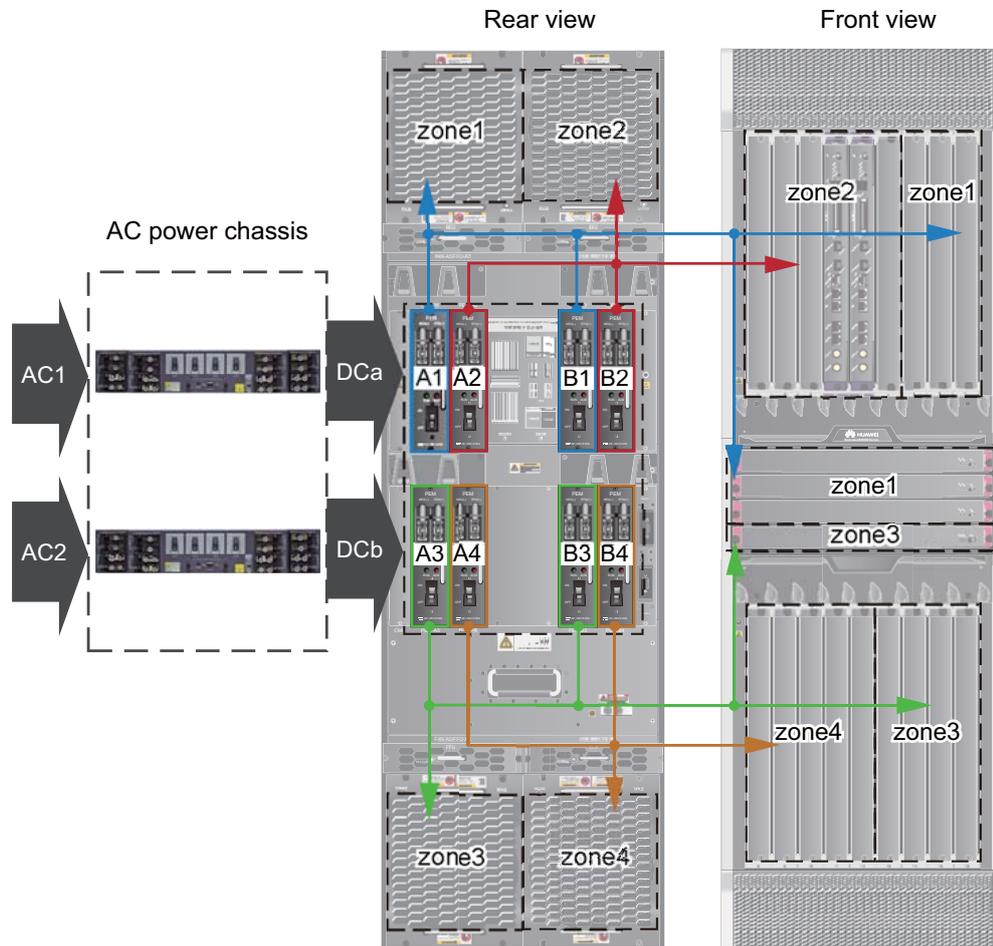
Table 1-6 shows the power supply architecture of the USG9580 AC power supply system. The input AC power is output as steady DC power after being converted by the AC/DC module and being transmitted along external cables to the PEM to power all boards and fans.

Table 1-6 Power supply solution of the USG9580 AC power system

AC Power Module	DC Power Module	Powered Area	Powered Part
AC power chassis A	PEM-A1 PEM-B1	Zone1	<ul style="list-style-type: none"> ● Front panel: slots 5-7, 19-21 ● Rear panel: fan modules (upper left side)
	PEM-A2 PEM-B2	Zone2	<ul style="list-style-type: none"> ● Front panel: slots 1-4, 17, 18 ● Rear panel: fan modules (upper right side)
AC power chassis B	PEM-A3 PEM-B3	Zone3	<ul style="list-style-type: none"> ● Front panel: slots 13-16, 22 ● Rear panel: fan modules (lower left side)
	PEM-A4 PEM-B4	Zone4	<ul style="list-style-type: none"> ● Front panel: slots 8-12 ● Rear panel: fan modules (lower right side)
<p>NOTE PEMs A and B back up each other.</p>			

Figure 1-8 shows the relationships between the AC power chassis, power modules, and chassis parts. Each DC power input contains one -48 V power input and one RTN input. Two separate RTN inputs join together on the board.

Figure 1-8 Power supply architecture of the USG9580 AC power system



An AC power chassis is 2 U high. Install the AC power chassis in the same cabinet as the device. If they cannot be installed in the same cabinet, install them in as close proximity as possible. The two AC power chassis work in 1+1 backup mode. Each AC power chassis has four circuit breakers and eight AC power inputs. The current of each air circuit breaker is 20 A.

Figure 1-9 and **Figure 1-10** show the AC power chassis.

Figure 1-9 Front view of the AC power chassis

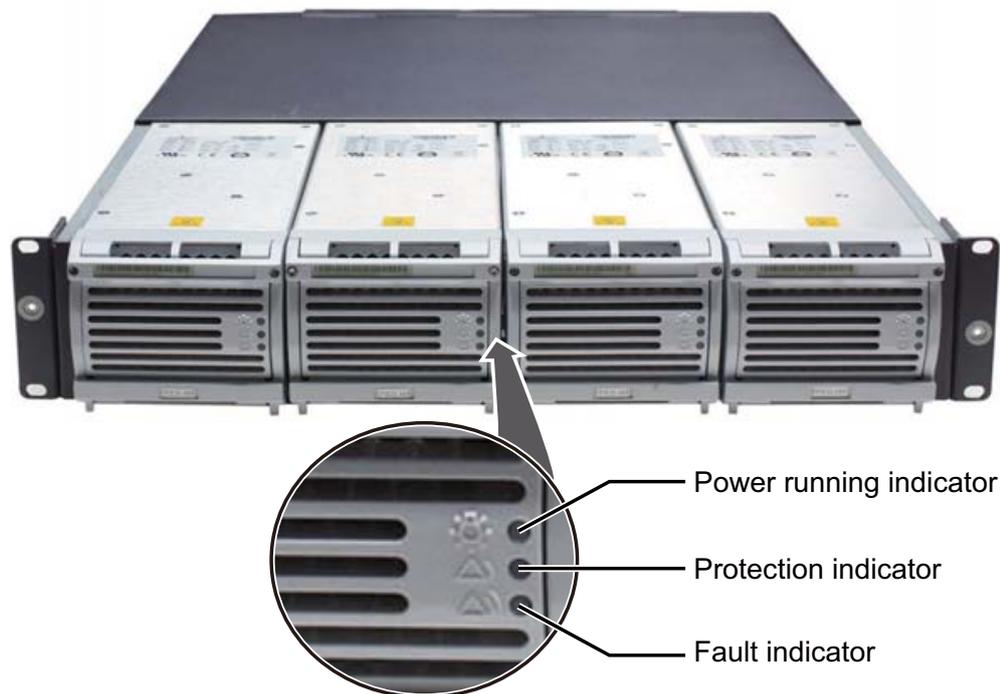
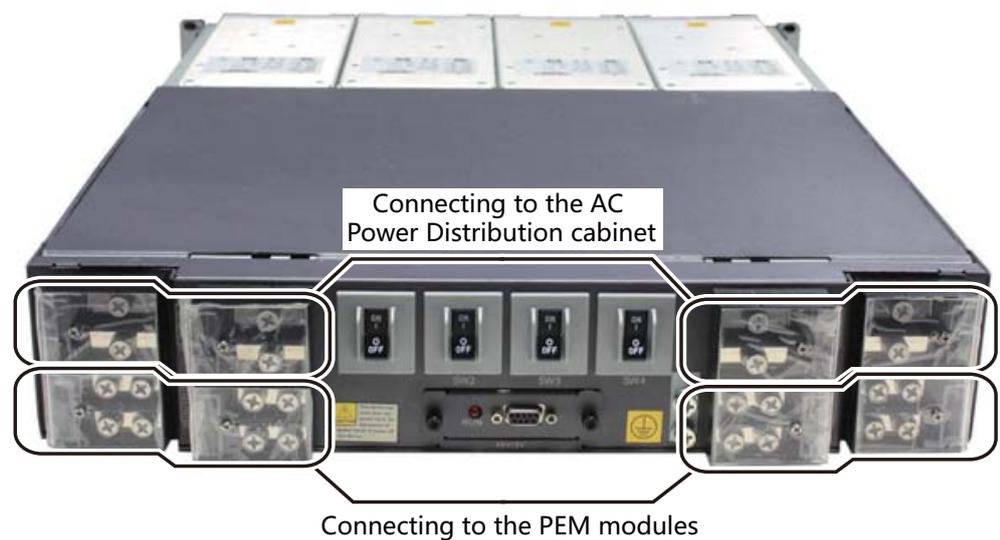


Figure 1-10 Rear view of the AC power chassis



NOTE

As the USG9580 does not support AC power chassis management, the DB9 interface on the rear of the AC power chassis does not need to connect to the monitoring cable in the installation auxiliary material package.

Table 1-7 describes indicators on the panel of the AC power chassis.

Table 1-7 Indicator description

Indicator	Color	Normal	Abnormal	Cause
Power running indicator	Green	On	Off	Power failure (no AC input, over-voltage AC input, or under-voltage AC input) and no output from the power module
Protection indicator	Yellow	Off	On	Temperature alarm (when the ambient temperature exceeds 65°C, the device is powered off.) Dormant (when the device is in dormant state, the protection indicator of the module is on but the module does not report alarms.)
Fault indicator	Red	Off	On	No output due to the over-voltage output power-off, fan fault, over-temperature power-off, or internal module fault.

Table 1-8 lists the technical specifications of the AC power chassis.

Table 1-8 Technical specifications of the AC power supply module

Item	Technical Specification
Type	EPS200-4850A
Dimensions (Width x Depth x Height)	442 mm x 650 mm x 88 mm

Item	Technical Specification
Number of power inputs	4
Maximum input voltage range	<ul style="list-style-type: none"> ● 220 V rated voltage: 175 V AC to 264 V AC, 47 Hz to 63 Hz ● 110 V rated voltage: 90 V AC to 175 V AC, 47 Hz to 63 Hz (The output power reduces to half of the maximum output when the input voltage is in the range of 90 V AC to 175 V AC.)
Rated input voltage range	<ul style="list-style-type: none"> ● 220 V rated voltage: 200 V AC to 240 V AC, 50/60 Hz ● 110 V rated voltage: 100 V AC to 120 V AC, 50/60 Hz
Input current	<ul style="list-style-type: none"> ● 220 V rated voltage: 18.5 A per module (Each power supply input with at least 18.5 A current is recommended.) ● 110 V rated voltage: 16 A per module (Each power supply input with at least 16 A current is recommended.)
Number of power outputs	4
Maximum output current	50 A/single module
Maximum output power	2900 W/single module

1.1.5 Heat Dissipation System

This section describes the heat dissipation system components and the appearance, functions, and technical specifications of fan modules.

1.1.5.1 System Air Channel

This section describes the system air channels and air flows of the USG9580.

The USG9580 has three air channels:

- The upper and lower chassis have separate air channels that draw air from the front and exhaust air from the rear. The air filters are installed over the air intake vents. Each filter covers a large area and has a curved face and low windage resistance. These features increase heat dissipation efficiency. The air filters on the upper and lower chassis are identical.
- The air channel in the SFU slot area is located on the left side of the chassis. The depth of the air filter is the same as that of an SFU, and the height of the air filter is four times the height of the SFU.

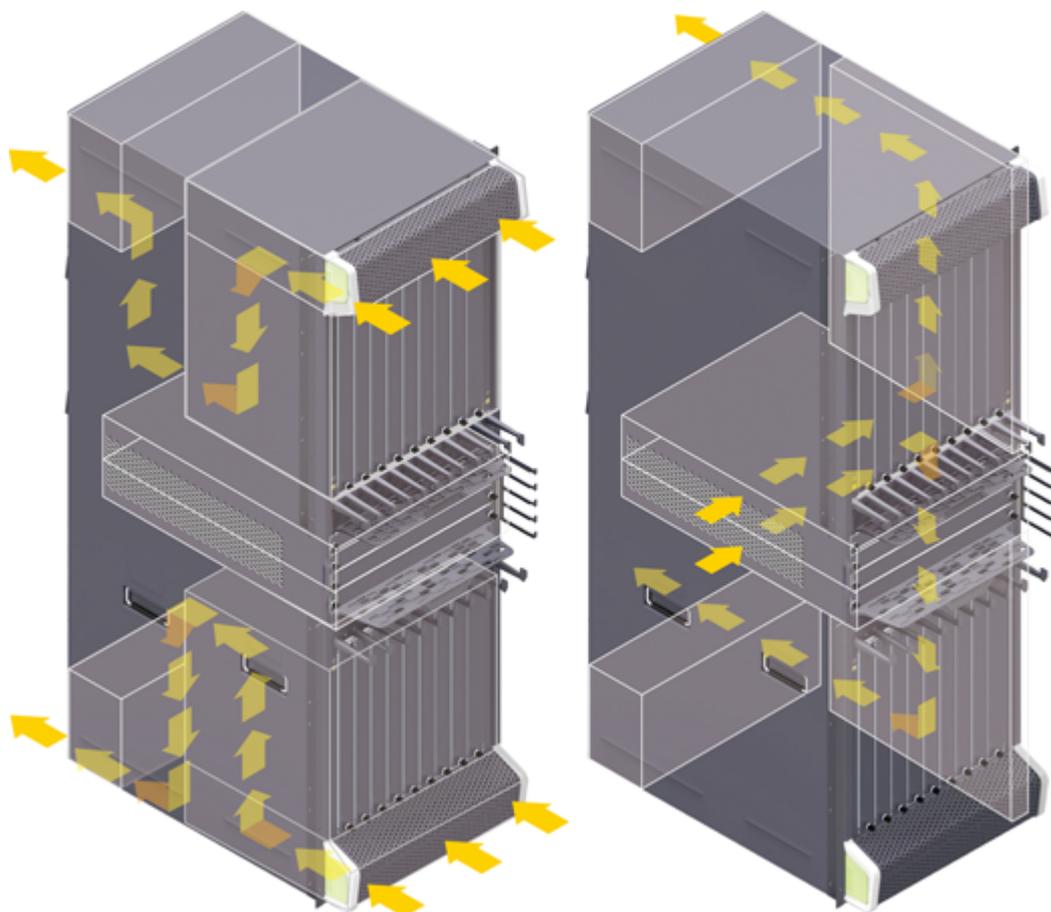
The air intake vent on the upper chassis is located above the board area on the front chassis; the air exhaust vent is located above the board area on the rear chassis. The air intake vent on the lower chassis is located below the board area on the front chassis; the air exhaust vent on the lower chassis is located below the board area on the rear chassis. The upper chassis and the lower chassis also have separate heat dissipation systems.

The middle area of the USG9580 is for SFU slots. The air intake vent in this area is located on the left side of the chassis. Two upper SFU slots in the area draw in air from the left side.

When flowing to the right, the air joins the air from the upper chassis. Two lower SFU slots in the area also draw in air from the left. When flowing to the right, the air joins the air from the lower chassis.

Figure 1-11 shows the air flow in the USG9580.

Figure 1-11 Air flow in the USG9580



1.1.5.2 Fan Module

This section describes the appearance, technical specifications, and speed adjustment of fans.

Appearance and Technical Specifications of Fan Modules

The four fan modules of the USG9580 are located side by side next with the air exhaust vents and work in 2+2 backup mode. Each fan module is equipped with one fan. When one fan fails, the heat dissipation system can still allow the device to continue operating at the ambient temperature of 40°C for a short time. The fan modules are hot-swappable.

 **NOTE**

The heat dissipation system allows the device to operate at the ambient temperature for a short time as long as, at the time of failure, the system has not been operating continuously for more than 96 hours and the accumulated operation time of the system per year does not exceed 15 days.

Figure 1-12 Fan module



Table 1-9 describes the indicators on the fan module.

Table 1-9 Description of fan module indicators

Indicator	Color	Description
STATUS	Green	If the indicator blinks once every 2 seconds (0.5 Hz), the fan module is working normally.
	Red	If the indicator blinks once every 2 seconds (0.5 Hz), the fan module or PEM is faulty, or not all PEMs are powered on.

Table 1-10 lists the technical specifications of the fan module.

Table 1-10 Technical specifications of the fan module

Item	Technical Specifications
Dimensions (width x depth x height)	210.4 mm x 100 mm x 243.7 mm
Weight	3.4 kg
Power consumption (typical value)	30 W
Maximum noise	74 dB

Fan Speed Adjustment

When the system is fully configured, fan speeds are adjusted based on temperatures reported by the temperature sensors on the LPUs, SPUs, SFUs and MPUs. **Table 1-11** lists general fan speed adjustment principles.

Table 1-11 Fan Speed Adjustment Principles

Ambient Temperature	Rotational Speed	Noise and Dissipation Standards
-5°C - +27°C (23°F - 80.6°F)	Low (50% rotational speed)	When fans rotate at a constantly low speed, noise levels meet the NEBS standard, and the fans meet heat dissipation requirements of a fully configured system.
27°C - 50°C (80.6°F - 122°F)	Linear variation	The fan speed is adjusted smoothly and linearly, without sudden increases in noise.
Over 45°C (113°F)	High (100% rotational speed)	Fans rotate at high speeds to meet heat dissipation requirements.

1.1.5.3 Air Filter

This section describes the appearance and features of air filters.

The USG9580 draws air from the front and exhausts air from the rear. The two air filters on the upper and lower chassis are identical. To maximize air intake, the filters are fully perforated. Air filters are fixed to the chassis with fasteners to facilitate filter removal and replacement. [Figure 1-13](#) shows an air filter.

Figure 1-13 Air filter



The air channel in the SFU slot area is located on the left side of the chassis. The air filter can be accessed from the front. The depth of the air filter is the same as that of an SFU, and the height of the air filter is four times the width of an SFU, as shown in [Figure 1-14](#).

Figure 1-14 Air filter in the SFU area



 **NOTE**

Placing a black sponge air filter in front of the air intake vent helps prevent dust from entering the system. You are advised to remove and clean air filters at least once every three months.

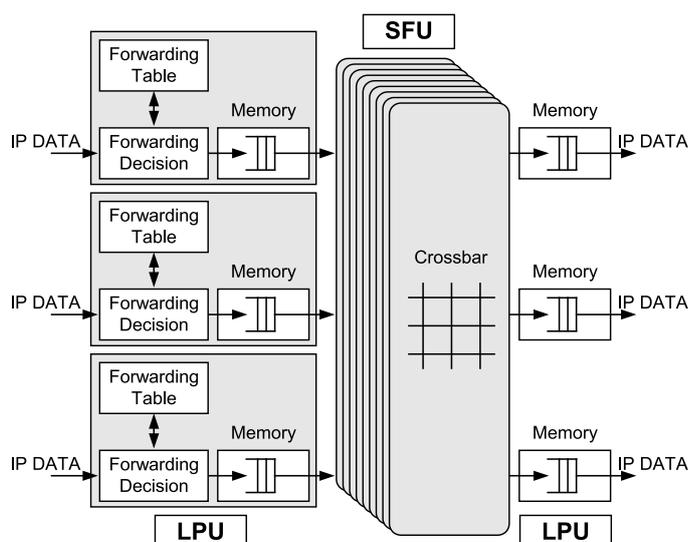
1.1.6 Switch Fabric

This section describes the mechanism of the switch fabric on the USG9580.

The USG9580 has four independent switch fabric units (SFUs) that work in 3+1 backup mode to achieve simultaneous load balancing. When one SFU is faulty or is being replaced, the other three SFUs automatically take over its tasks to ensure service continuity. For more details about USG9580 SFUs, see [1.4.3.1 E8KE-X16-SFUC-200SP](#).

The switching network responsible for switching data between LPUs/SPUs is a key component of the USG9580. The USG9580 uses switching chips developed by Huawei and Memory-Crossbar-Memory (M-C-M) to provide three-level switching. Level-1 and level-3 switching use a shared-memory model and are performed on LPUs/SPUs; level-2 switching uses a Crossbar model and is performed on SFUs. [Figure 1-15](#) shows the switching network of the USG9580. (The LPU is used as an example.)

Figure 1-15 USG9580 switching network



The level-1 switching chip on one LPU is fully connected to the level-2 switching chips on the SFUs. The level-2 switching chips on the SFUs are also fully connected to the level-3 switching chip on another LPU. In addition, the level-2 crossbar switching chips work in load balancing mode on multiple switching planes. The entire switching network is unblocked. The process of transmitting data packets across the switching network is as follows:

1. Data packets enter an LPU through physical interfaces and are fragmented into cells of a fixed length. These cells are then sent to the level-1 switching chips. After being buffered and scheduled, the cells enter the crossbar switching chips on the SFU. The level-1 switching chip on an LPU is fully connected with all of the level-2 switching chips. As a result, the same number of cells can be distributed to each level-2 switching plane. This implements load balancing on switching planes and facilitates fault tolerance.
2. After the cells reach the crossbar switching chips, the crossbar switching chips schedule the cells to the corresponding outbound interfaces according to the destination interfaces of the data packets. The cells are then sent to the level-3 switching chips on another LPU. The switching of cells by the level-2 switching chips is then completed.
3. After the cells reach the level-3 switching chips on another LPU, the system searches for the destination interfaces. Once found, the cells are reassembled and sent out through physical interfaces, completing the switching of the data packets.

1.1.7 Control Plane

This section describes the functions and features of the control plane.

USG9580 uses the MPU (EKEX16-FWCD00MPUB00) to implement the control plane functions. For details about the MPU, see [1.4.2.1 EKEX16-FWCD00MPUB00](#). The functions of the MPU are described from the aspects of system control and management, system maintenance, and reliability.

System Control and Management Unit

As the system control and management unit, the MPU provides the following functions on the system control panel:

- Route calculation: All routing protocol packets are sent by the forwarding engine to the MPU for processing. In addition, the MPU broadcasts and filters packets, and downloads routing policies from the policy server.
- Outband communication between boards: The LAN switch modules integrated on the SRU provide outband communications for the SFUs, LPUs and SPUs. In this manner, messages can be controlled, maintained, and exchanged between the boards.
- Device management and maintenance: Devices can be managed and maintained through the management interfaces (serial interfaces) provided by the MPU.
- Data configuration: The MPU stores configuration data, startup files, upgrade software, and system logs.
- Data storage: The MPU provides two interfaces for CF cards, which serve as mass storage devices to store data files.

System Maintenance Unit

As the system maintenance unit, the MPU collects monitored information to test system units locally or remotely, or implement in-service upgrading of system units.

The MPU periodically collects the operating data of system units through the Monitorbus. The MPU generates related control information based on the collected information, such as the detection of board installations and fan speed adjustments. Through the joint test action group (JTAG) bus, the MPU remotely or locally tests system units, or performs in-service upgrading of system units.

Reliability

The main control modules, clock modules, and LAN switch modules on the MPU work in 1:1 hot backup mode, improving system reliability.

The two MPUs work in 1:1 backup mode. Each MPU monitors the status of the other. If the active MPU is faulty, the standby MPU automatically takes over as the active MPU.

1.1.8 Technical Specifications

This section describes the dimensions, weight, power, and environment specifications of the USG9580.

Table 1-12 lists the technical specifications of the USG9580.

Table 1-12 USG9580 Technical Specifications

Item	Description
System specifications	
Processing unit of the MPU	Main frequency: 1.5 GHz
BootROM capacity of the MPU	8 MB
SDRAM capacity of the MPU	4 GB

Item		Description
NVRAM capacity of the MPU		4 MB
Flash capacity of the MPU		32 MB
CF card		2 x 2 GB
Number of slots	MPU	2 (slots 17 and 18)
	SFU	4 (slots 19 to 22)
	LPU/ SPU	16 (slots 1 to 16)
Dimensions and weight		
Dimensions (width ^a x depth x height ^b)		442 mm x 650 mm x 1420 mm (32 U). The depth is 770 mm covering the dust filter and cable rack.
Installation position		N68E cabinet or a standard 19-inch cabinet
Weight	Empty chassis	94.4 kg
	Full configuration (maximum)	233.9 kg
Power specifications		
Power supply mode	DC	8 hot-swappable PEMs
	AC	8 PEMs+2 external AC power chassis
Rated input voltage range	DC	-48 V DC to -60 V DC
	AC	<ul style="list-style-type: none"> ● 220 V rated voltage: 200 V AC to 240 V AC, 50/60 Hz ● 110 V rated voltage: 100 V AC to 120 V AC, 50/60 Hz
Maximum input voltage range	DC	-72 V DC to -38 V DC
	AC	<ul style="list-style-type: none"> ● 220 V rated voltage: 175 V AC to 264 V AC, 47 Hz to 63 Hz ● 110 V rated voltage: 90 V AC to 175 V AC, 47 Hz to 63 Hz (The output power reduces to half of the maximum output when the input voltage is in the range of 90 V AC to 175 V AC.)

Item		Description
Typical power (six LPUF-240s and nine SPUs are configured.)	DC	7387 W
	AC	7858 W
Maximum Power (six LPUF-240s and nine SPUs are configured.)	DC	8930 W
	AC	9500 W
Heat dissipation		
Fan module		4 hot-swappable fan modules, each of which has one fan
Air flow		Upper and lower air channels: draw air from the front and exhaust air from the rear. Middle air channels: draw air from the left side and exhaust air from the upper and lower rear.
Air filter		3 air filters in the air intake vents of air channels
Environment specifications		
System reliability	MTBF (year)	25
	MTTR (hour)	0.5
Ambient temperature ^c	Long-term ^d	0°C to 45°C
	Short-term	-5°C to 50°C
	Remarks	Limit of the temperature change rate: 30°C/hour
Storage temperature		-40°C to 70°C
Ambient relative humidity	Long-term	5% RH to 85% RH, no coagulation
	Short-term	5% RH to 95% RH, no coagulation
Storage relative humidity		0% RH to 95% RH
Long-term altitude		Lower than 3000 m
Storage altitude		Lower than 5000 m

Item	Description
<p>NOTE</p> <ul style="list-style-type: none">a. The width does not include the size of the attached mounting ear.b. The height is 1 U (1 U = 1.75 inches, or about 44.45 mm), which is a height unit defined in International Electrotechnical Commission (IEC) 60297 standards.c. The measurement point of the temperature and humidity is 1.5 m above the floor and 0.4 m in front of the cabinet without the front and the back doors.d. The heat dissipation system allows the device to operate at the ambient temperature for a short time as long as, at the time of failure, the system has not been operating continuously for more than 96 hours and the accumulated operation time of the system per year does not exceed 15 days.	

1.2 USG9560

The USG9560 is a 14 U device. It employs an integrated chassis and has 8 LPU/SPU slots. Its SRUs, SFUs, power modules, and fans work in redundancy mode.

1.2.1 Device Overview

This section describes the appearance and hardware system features of the USG9560.

Appearance

The USG9560 has an integrated chassis and adopts a centralized routing engine and a distributed forwarding architecture.

Figure 1-16 shows the chassis of the USG9560.

Figure 1-16 USG9560 chassis



System Features

The USG9560 provides the following system features:

- Upgradable and congestion-free switching fabric, with switching capacity in the Tbit/s range
- Distributed hardware-based forwarding and rapid service deployment
- Compact structure for increasing interface density
- Normalized system component design
- Separation of control, service, and monitoring channels for ensuring non-blocking of control and monitoring channels
- Carrier-class reliability and manageability
- Modular-level shielding for meeting Electro Magnetic Compatibility (EMC) requirements
- Hot-swappable boards, power modules, and fans
- U-shaped air channels for improving system heat dissipation
- Distributed power supply for enhancing power supply capabilities of a single chassis
- 200-mm fans
- SRUAs in 1:1 backup mode

- SFUs in load balancing mode
- Backup for key components such as power modules, fan modules, clocks, and management buses
- Protection against misinsertion of boards
- Queries about alarm prompts, alarm indications, running status, and alarm status of the voltage and ambient temperature

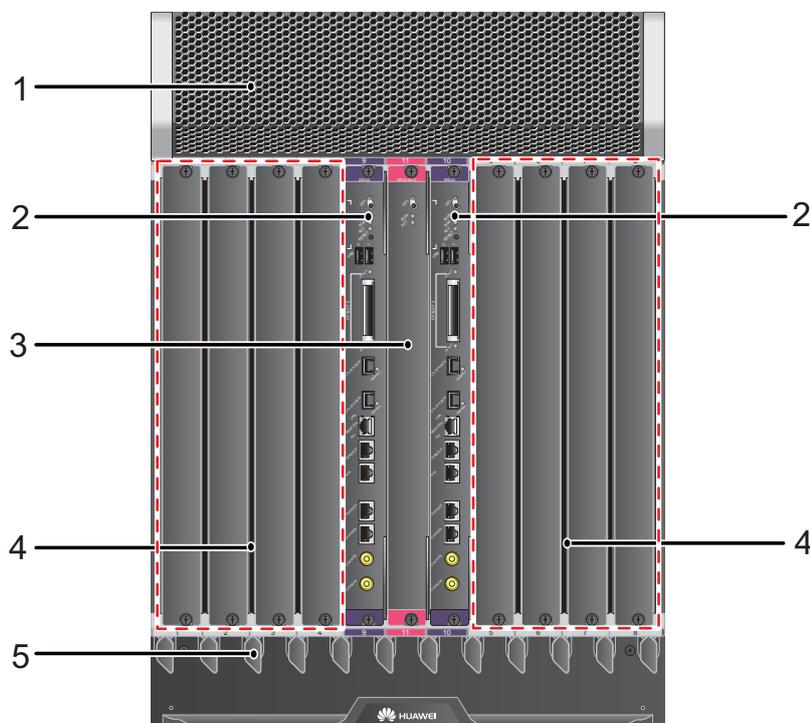
1.2.2 USG9560 Components

This section describes the main components of the USG9560.

The USG9560 has an integrated chassis. [Figure 1-17](#) and [Figure 1-18](#) show the architecture and main components of the USG9560.

Front Panel

Figure 1-17 USG9560 front panel

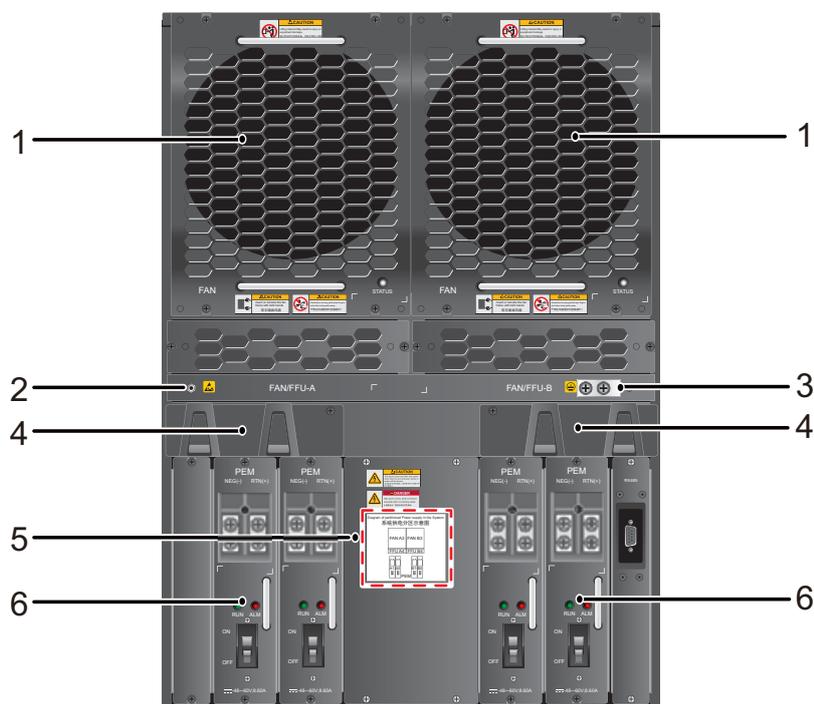


No.	Name	Description
1	Air filter	The air filters of the USG9560 are deployed on the air intake vents of chassis air channels to protect the device against dust.

No.	Name	Description
2	SRU	The Switch Router Unit (SRU) on the USG9560 is in charge of system control and route information learning. It is the central control unit of the device. The USG9560 SRUs work in 1:1 backup mode. When the active SRU is faulty, the standby SRU immediately takes over for it, ensuring service continuity. The USG9560 SRU is integrated with an SFU for data switching.
3	SFU	The SFUs of the USG9560 are responsible for the data switching of the entire system. The USG9560 has one separate SFU. It works with the SFUs integrated in the two SRUs in 2+1 backup mode for load balancing.
4	LPU/SPU slot	Holds an LPU or SPU.
5	Front cable rack	Used for laying optical fibers and cables.

Rear Panel

Figure 1-18 USG9560 rear panel



No.	Name	Description
1	Fan module	The USG9560 has two fan modules. They are deployed on the air intake vents of chassis air channels and work in 1+1 backup mode.
2	ESD jack	The equipment end of the wrist strap is inserted into the ESD jack. For the wrist strap to be effective, ensure that the device is grounded.
3	Protection ground terminal	The OT terminal of the ground cable is connected to the protection ground terminal of the device, and the other terminal of the ground cable is connected to the ground point of the cabinet or workbench or the ground bar of the equipment room.
4	Rear cable rack	Used for laying optical fibers and cables. There are two rear cable racks on the upper parts of the power modules.
5	Power supply areas	Power supply areas of the four PEMs on the USG9560.
6	PEM module	The USG9560 uses four PEMs for DC power supply. The USG9560 backplane is divided into two areas, each of which has two PEM power inputs. These eight power inputs work in 2+2 backup mode. If the USG9560 uses the AC power supply, one additional external AC power chassis is required.

1.2.3 Slot Layout and Supported Boards

This section describes the layout of slots and supported boards on the USG9560.

Slots Layout

Figure 1-19 shows the slot layout on the USG9560.

Figure 1-19 USG9560 slot layout

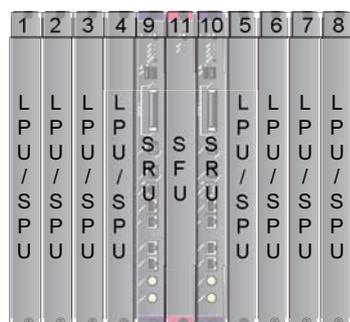


Table 1-13 describes the slot layout on the USG9560.

Table 1-13 Board distribution on the USG9560 board cage

Slot Name	Slot Number	Quantity	Slot Height	Remarks
LPU/SPU	1 to 8	8	41 mm (1.6 inches)	These slots hold LPUs or SPUs.
SRU	9 to 10	2	36 mm (1.4 inches)	These slots hold SRUs that work in 1:1 backup mode.
SFU	11	1	36 mm (1.4 inches)	The slot holds an SFU.

Supported Boards

Table 1-14 lists the specifications of boards supported by the USG9560.

Table 1-14 Boards supported by the USG9560

Type	BOM	Description	Hot-Swappable or Not
SRU	0305G08N	1.4.2.2 E8KE-X8-SRUA-200	Yes
SFU	0305G08P	1.4.3.2 E8KE-X8-SFUC-200	Yes
SPUs and SPCs	03056638	1.4.4.3 X8&X16 SPU (SPU-X8X16-B)	Yes
	0305G09U	1.4.4.7 Firewall Service Processing Unit (SPU-X8X16-20-O-E8KE, for USG9560/USG9580)	Yes
	03057426	1.4.4.8 Firewall Service Processing Unit (SPUA-20-O-H, for USG9560/USG9580)	Yes
	03057520	1.4.4.9 Firewall Service Processing Unit (SPUB-20-O-H, for USG9560/USG9580)	Yes
	0305G09V	1.4.4.10 Firewall Performance Expansion Card (SPC-20-O-E8KE)	Yes
	03057429	1.4.4.11 Firewall Performance Expansion Card (SPCA-20-O-H&M)	Yes
	03057522	1.4.4.12 Firewall Performance Expansion Card (SPCB-20-O-H&M)	Yes
	03057872	1.4.4.15 Enhanced Application Security Service Processing Card A (SPCA-APPSEC-FW)	Yes

Type	BOM	Description	Hot-Swappable or Not
	03057873	1.4.4.16 Enhanced Application Security Service Processing Card B (SPCB-APPSEC-FW)	Yes
	03056688	1.4.4.13 Application Security Service Processing Card (SPC-APPSEC-FW)	Yes
	03056639	1.4.4.14 Application Security Service Processing Card (SPC-IPS-20)	Yes
LPUF-240 and FPIC	03056683	1.4.5.1 LPUF-240	Yes
	03056890	1.4.5.2 20-Port 10/100/1000Base-RJ45 FPIC (FW-20X1G-RJ45)	No
	03056633	1.4.5.3 24-Port 100/1000 Base-X-SFP FPIC (E8KE-X-101-24XGE-SFP)	No
	03056632	1.4.5.4 5-Port 10GBase LAN/WAN-SFP + FPIC A (E8KE-X-101-5X10GE-SFP+)	No
	03056684	1.4.5.5 6*10GE SFP+ Daughter Card (FW-6X10G-SFP+)	No
	03056686	1.4.5.6 12*10GE SFP+ Daughter Card (FW-12X10G-SFP+)	No
	03056848	1.4.5.7 3-Port 40GBase QSFP+ FPIC (FW-3X40G-QSFP+)	No
	03056631	1.4.5.8 1-Port 40GBase LAN-CFP FPIC A (E8KE-X-101-1X40GE-CFP)	No
	03056685	1.4.5.9 1*100GE CFP Daughter Card (FW-1X100G-CFP)	No
LPUF-120 and FPIC	03056682	1.4.6.1 LPUF-120	Yes
	03056890	1.4.6.2 20-Port 10/100/1000Base-RJ45 FPIC (FW-20X1G-RJ45)	No
	03056633	1.4.6.3 24-Port 100/1000 Base-X-SFP FPIC (E8KE-X-101-24XGE-SFP)	No
	03056632	1.4.6.4 5-Port 10GBase LAN/WAN-SFP + FPIC A (E8KE-X-101-5X10GE-SFP+)	No
	03056684	1.4.6.5 6*10GE SFP+ Daughter Card (FW-6X10GE-SFP+)	No
	03056686	1.4.6.6 12*10GE SFP+ Daughter Card (FW-12X10GE-SFP+)	No

Type	BOM	Description	Hot-Swappable or Not
	03056848	1.4.6.7 3-Port 40GBase QSFP+ FPIC (FW-3X40G-QSFP+)	No
	03056631	1.4.6.8 1-Port 40GBase LAN-CFP FPIC A (E8KE-X-101-1X40GE-CFP)	No
	03056685	1.4.6.9 1*100GE CFP Daughter Card (FW-1X100GE-CFP)	No
LPUF-101 and FPIC	03056630	1.4.7.1 LPUF-101	Yes
	03056633	1.4.7.2 24-Port 100/1000 Base-X-SFP FPIC (E8KE-X-101-24XGE-SFP)	No
	0305G09L	1.4.7.3 4-Port 10G Base LAN -SFP+ FPIC (E8KE-X-101-4X10GE-SFP+)	No
	03056632	1.4.7.4 5-Port 10GBase LAN/WAN-SFP + FPIC A (E8KE-X-101-5X10GE-SFP+)	No
	03056631	1.4.7.5 1-Port 40GBase LAN-CFP FPIC A (E8KE-X-101-1X40GE-CFP)	No
LPUF-40-A and FPIC	03056627	1.4.8.1 LPUF-40-A	Yes
	03056629	1.4.8.2 20-Port 100/1000Base-X-SFP Flexible Card (P40-20xGE/FE-SFP)	No
	03056628	1.4.8.3 2-Port 10GBase LAN/WAN-XFP Flexible Card (P40-2x10GBase LAN/WAN-XFP)	No
	0305G07X	1.4.8.4 4-port 10GBase LAN/WAN-XFP FPIC (P40-4x10GBase LAN/WAN-XFP)	No
LPUF-21 and FPIC	03056624	1.4.9.1 LPUF-21	Yes
	0305G054	1.4.9.2 12-port 10Base-T/100Base-TX/1000Base-T-RJ45 FPIC (12x10/100/1000Base-TX-RJ45)	No
	03056626	1.4.9.3 12-port 100Base-FX/1000Base-X-SFP FPIC (12x100/1000Base-SFP)	No
	0305G055	1.4.9.4 1-port OC-192c/STM-64c POS-XFP FPIC (1 x OC-192c/STM-64c POS-XFP)	No
	03056625	1.4.9.5 1-port 10GBase LAN/WAN-XFP FPIC (1 x 10GBase LAN/WAN)	No
	0305G07W	1.4.9.6 4-Port 10GBase WAN/LAN-XFP FPIC (4x10GBase LAN/WAN)	No

Type	BOM	Description	Hot-Swappable or Not
Integrated Line Process Unit	03056637	1.4.10 1-Port 100GBase-CFP Integrated Line Processing Unit (LPUI-101)	Yes

1.2.4 Power Supply System

This section describes the power supply system architecture, power supply area partitioning, and DC/AC power system of the USG9560.

1.2.4.1 Features and Distributed Architecture of the Power Supply System

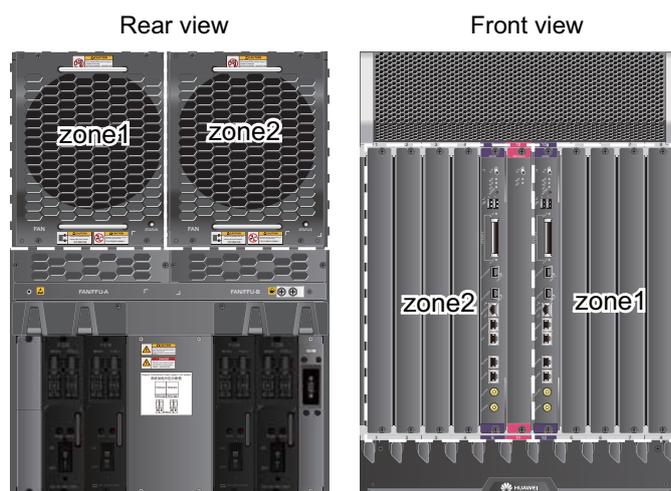
This section describes the power supply mode and power supply area partitioning of the USG9560.

The USG9560 supports either DC and AC power supplies (but not at the same time).

- If DC power supply is used, connect the DC power cables to the PEM input terminals.
- If AC power supply is used, use two suitable external AC-DC convertors. The number of rectifier modules on the AC-DC convertors depends on the system power consumption. The AC-DC convertor converts AC power to DC power and supplies DC power to the PEMs.

As shown in **Figure 1-20**, the USG9560 backplane is divided into two areas, each with two power inputs. These four power inputs work in backup mode.

Figure 1-20 Distributed architecture of the USG9560 power supply



1.2.4.2 DC Power Supply System

This section describes the power supply architecture of the DC power system and the appearance and technical specifications of the DC power modules of the USG9560.

The USG9560 uses four 70 A PEM modules that work in 2+2 backup mode for DC power supply. **Figure 1-21** describes the power supply solution.

Table 1-15 Power supply solution of the USG9560 DC power system

DC Power Module	Powered Area	Powered Part
PEM-A1 PEM-B1	Zone1	<ul style="list-style-type: none"> ● Front panel: slots 5-8, 10 ● Rear panel: fan modules (upper left side)
PEM-A2 PEM-B2	Zone2	<ul style="list-style-type: none"> ● Front panel: slots 1-4, 9, 11 ● Rear panel: fan modules (upper right side)
NOTE PEMs A and B back up each other.		

Figure 1-21 shows the relationships between the power modules and chassis parts. Each DC power input contains one -48 V power input and one RTN input. Two separate RTN inputs join together on the board.

Figure 1-21 Power supply architecture of the USG9560 DC power system

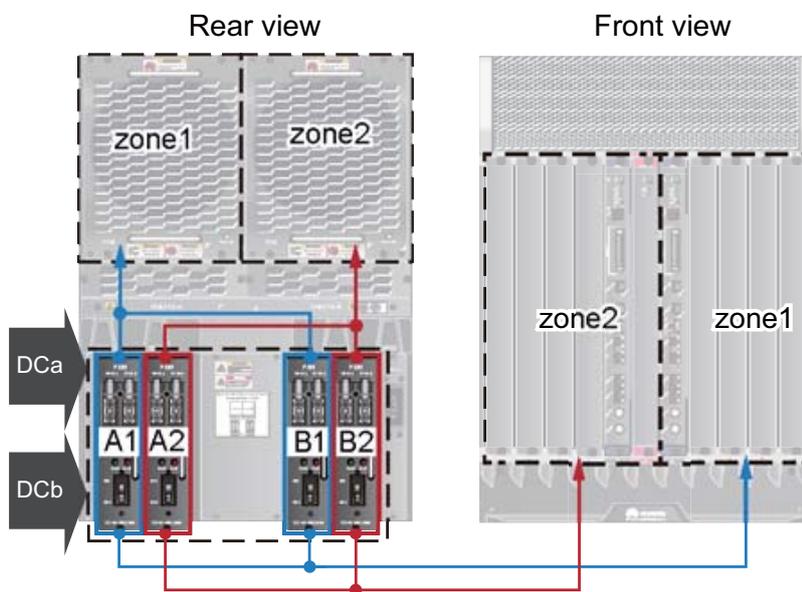


Figure 1-22 shows the PEM.

Figure 1-22 Appearance of the PEM

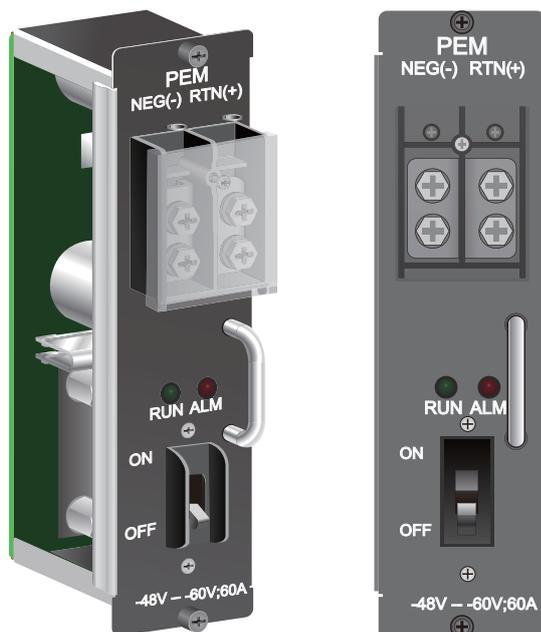


Table 1-16 describes the LED indicators on the PEM.

Table 1-16 Description of the PEM indicators

Indicator	Color	Description
RUN	Green	Indicates normal power output. If the indicator is steady on, the output is normal.
ALM	Red	Power failure indicator. If the indicator is steady on: <ul style="list-style-type: none"> ● The lightning protection link of the power module has failed. ● The input power cable is not connected to the power module.

Table 1-17 lists the technical specifications of the PEM.

Table 1-17 Technical specifications of the DC PEM

Item	Technical Specification
Type	PEMB
Dimensions (Width x Depth x Height)	58 mm x 115 mm x 220 mm
Weight	1.1 kg

Item	Technical Specification
Number of power inputs	1
Maximum input voltage range	-72 V DC to -38 V DC
Rated input voltage range	-48 V DC to -60 V DC
Input current	60 A (Each power supply input with at least 60 A current is recommended.)
Output voltage	-72 V DC to -38 V DC
Output current	60 A
Rated current of the air-break	70 A (Each PEM is controlled by an air switch).

1.2.4.3 AC Power Supply System

This section describes the power supply architecture of the AC power system and the appearance and technical specifications of the AC power chassis of the USG9560.

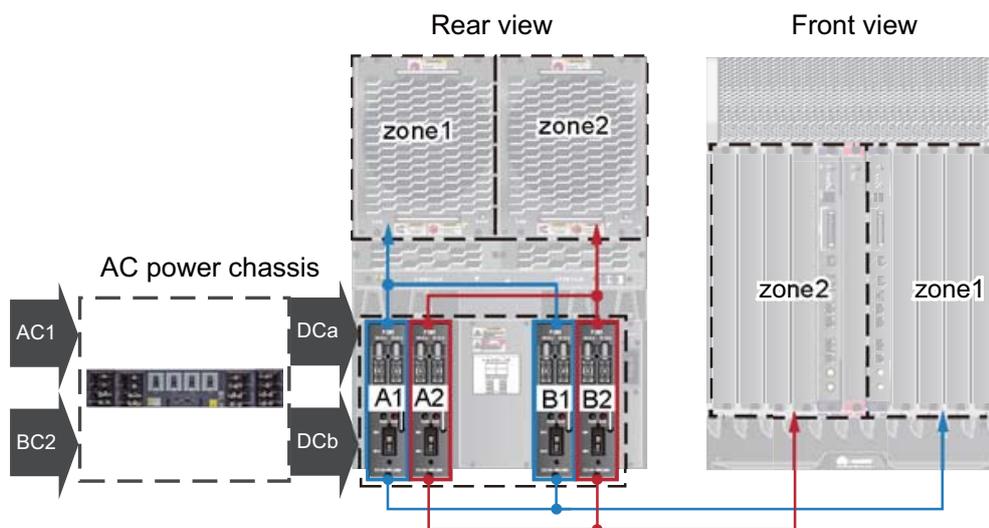
Figure 1-23 shows the power supply architecture of the USG9560 AC power supply system. The input AC power is output as steady DC power after being converted by the AC/DC module and being transmitted along external cables to the PEM to power all boards and fans.

Table 1-18 Power supply solution of the USG9560 AC power system

AC Power Module	DC Power Module	Powered Area	Powered Part
AC power chassis	PEM-A1 PEM-B1	Zone1	<ul style="list-style-type: none"> ● Front panel: slots 5-8, 10 ● Rear panel: fan modules (upper left side)
	PEM-A2 PEM-B2	Zone2	<ul style="list-style-type: none"> ● Front panel: slots 1-4, 9, 11 ● Rear panel: fan modules (upper right side)
<p>NOTE PEMs A and B back up each other.</p>			

Figure 1-23 shows the relationships between the AC power chassis, power modules, and chassis parts. Each DC power input contains one -48 V power input and one RTN input. Two separate RTN inputs join together on the board.

Figure 1-23 Power supply architecture of the USG9560 AC power system



An AC power chassis is 2 U high. Install the AC power chassis in the same cabinet as the device. If they cannot be installed in the same cabinet, install them in as close proximity as possible. The USG9560 uses one AC power chassis. There are four air circuit breakers on the AC power chassis. The current of the air circuit breaker is 20 A.

Figure 1-24 and **Figure 1-25** show the AC power chassis.

Figure 1-24 Front view of the AC power chassis

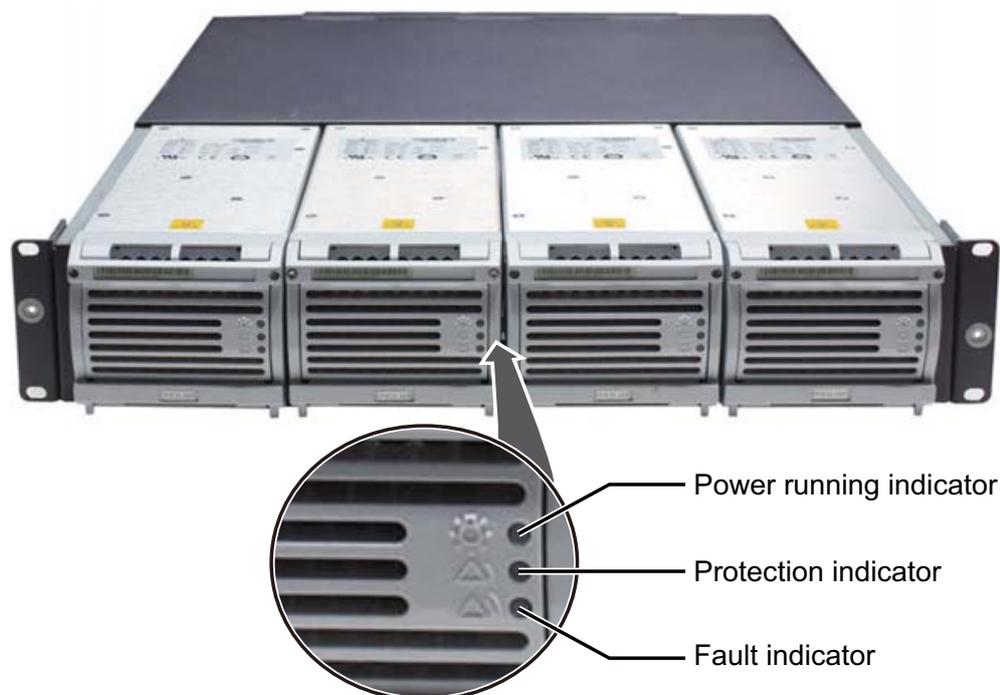
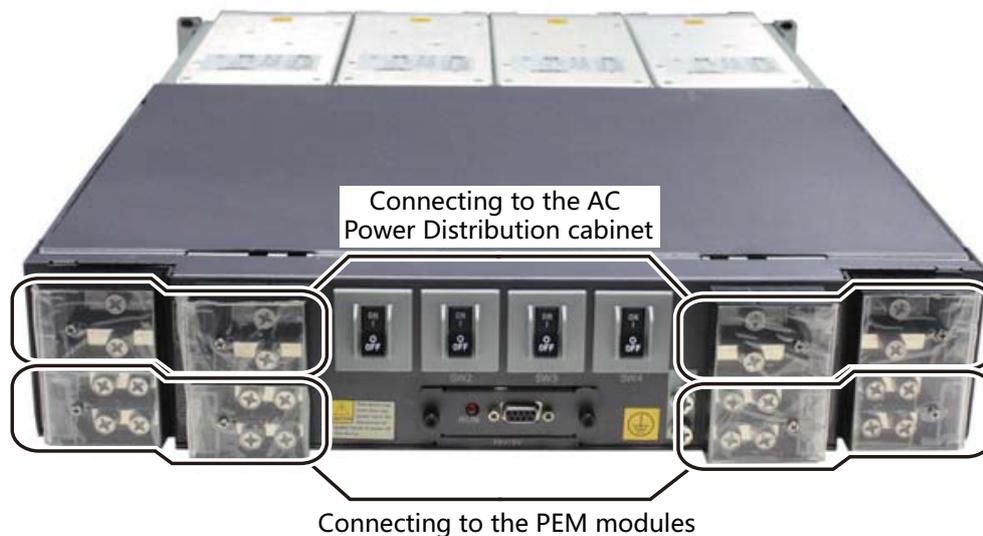


Figure 1-25 Rear view of the AC power chassis



NOTE

As the USG9580 does not support AC power chassis management, the DB9 interface on the rear of the AC power chassis does not need to connect to the monitoring cable in the installation auxiliary material package.

Table 1-19 describes indicators on the panel of the AC power chassis.

Table 1-19 Indicator description

Indicator	Color	Normal	Abnormal	Cause
Power running indicator	Green	On	Off	Power failure (no AC input, over-voltage AC input, or under-voltage AC input) and no output from the power module

Indicator	Color	Normal	Abnormal	Cause
Protection indicator	Yellow	Off	On	Temperature alarm (when the ambient temperature exceeds 65°C, the device is powered off.) Dormant (when the device is in dormant state, the protection indicator of the module is on but the module does not report alarms.)
Fault indicator	Red	Off	On	No output due to the over-voltage output power-off, fan fault, over-temperature power-off, or internal module fault.

Table 1-20 lists the technical specifications of the AC power chassis.

Table 1-20 Technical specifications of the AC power supply module

Item	Technical Specification
Type	EPS200-4850A
Dimensions (Width x Depth x Height)	442 mm x 650 mm x 88 mm
Number of power inputs	4
Maximum input voltage range	<ul style="list-style-type: none"> ● 220 V rated voltage: 175 V AC to 264 V AC, 47 Hz to 63 Hz ● 110 V rated voltage: 90 V AC to 175 V AC, 47 Hz to 63 Hz (The output power reduces to half of the maximum output when the input voltage is in the range of 90 V AC to 175 V AC.)
Rated input voltage range	<ul style="list-style-type: none"> ● 220 V rated voltage: 200 V AC to 240 V AC, 50/60 Hz ● 110 V rated voltage: 100 V AC to 120 V AC, 50/60 Hz

Item	Technical Specification
Input current	<ul style="list-style-type: none"> ● 220 V rated voltage: 18.5 A per module (Each power supply input with at least 18.5 A current is recommended.) ● 110 V rated voltage: 16 A per module (Each power supply input with at least 16 A current is recommended.)
Number of power outputs	4
Maximum output current	50 A/single module
Maximum output power	2900 W/single module

1.2.5 Heat Dissipation System

This section describes the air channel features of the heat dissipation system and the appearance, functions, and technical specifications of fan modules.

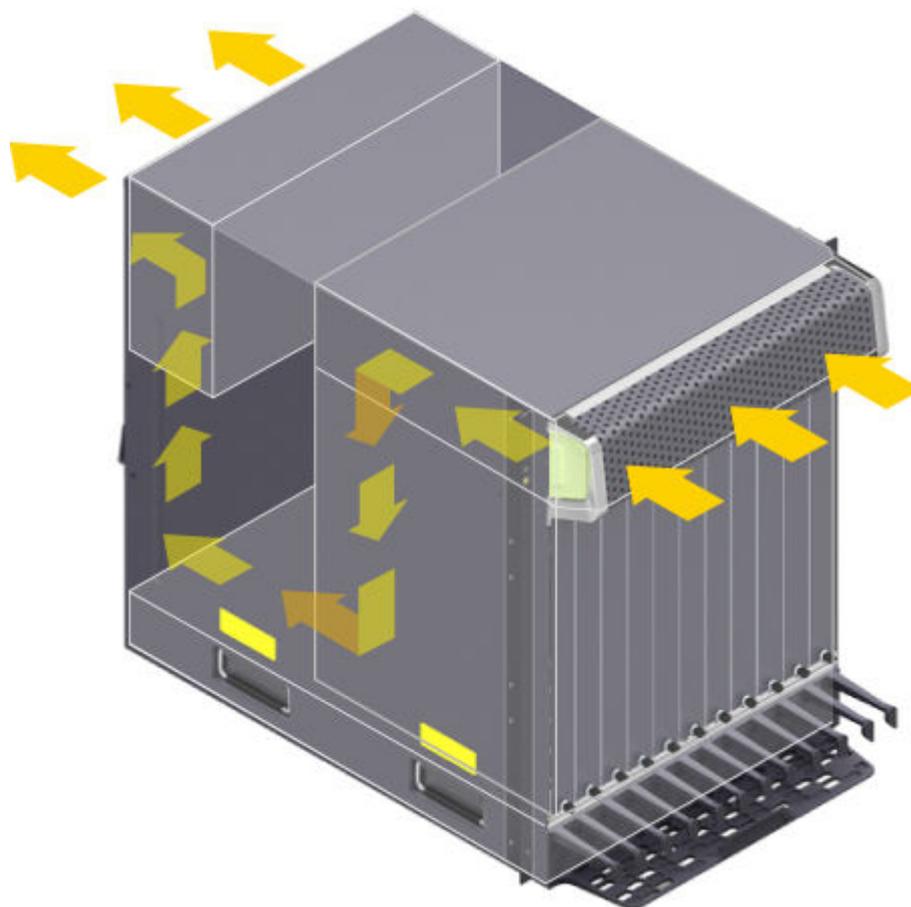
1.2.5.1 System Air Channel

This section describes the system air channels and air flows of the USG9560.

The USG9560 draws air from the front and exhausts air from the rear. The air intake vent is located above the board area on the front chassis; the air exhaust vent is located above the board area on the rear chassis. The air filter covers a large area and has a curved face and low small windage resistance. These features increase heat dissipation efficiency.

The following figure shows the air flow in the USG9560.

Figure 1-26 Air flow in the USG9560



1.2.5.2 Fan Module

This section describes the appearance, technical specifications, and speed adjustment of fans.

Appearance and Technical Specifications of Fan Modules

The two fan modules of the USG9560 are located side by side next with the air exhaust vents and work in 1+1 backup mode. Each fan module is equipped with one fan. When one fan fails, the heat dissipation system can still allow the device to continue operating at the ambient temperature of 40°C for a short time. The fan modules are hot-swappable.

 **NOTE**

The heat dissipation system allows the device to operate at the ambient temperature for a short time as long as, at the time of failure, the system has not been operating continuously for more than 96 hours and the accumulated operation time of the system per year does not exceed 15 days.

Figure 1-27 Fan module



Table 1-21 describes the indicators on the fan module.

Table 1-21 Description of fan module indicators

Indicator	Color	Description
STATUS	Green	If the indicator blinks once every 2 seconds (0.5 Hz), the fan module is working normally.
	Red	If the indicator blinks once every 2 seconds (0.5 Hz), the fan module or PEM is faulty, or not all PEMs are powered on.

Table 1-22 lists the technical specifications of the fan module.

Table 1-22 Technical specifications of the fan module

Item	Technical Specifications
Dimensions (width x depth x height)	210.4 mm x 100 mm x 243.7 mm
Weight	3.4 kg
Power consumption (typical value)	30 W
Maximum noise	74 dB

Fan Speed Adjustment

When the system is fully configured, fan speeds are adjusted based on temperatures reported by the temperature sensors on the LPUs, SPUs, SFUs and MPUs. **Table 1-23** lists general fan speed adjustment principles.

Table 1-23 Fan Speed Adjustment Principles

Ambient Temperature	Rotational Speed	Noise and Dissipation Standards
-5°C - +27°C (23°F - 80.6°F)	Low speed (50% rotational speed)	When fans rotate at a constantly low speed, noise levels meet the NEBS standard, and the fans meet heat dissipation requirements of a fully configured system.
27°C - 50°C (80.6°F - 122°F)	Linear variation	The fan speed is adjusted smoothly and linearly, without sudden increases in noise.
Over 45°C (113°F)	High speed (100% rotational speed) Fans	Fans rotate at high speeds to meet heat dissipation requirements.

1.2.5.3 Air Filter

This section describes the appearance and features of air filters.

The USG9560 draws air from the front and exhausts air from the rear. There is a 3 U high space in the upper part of the chassis and an air filter on the front of the chassis. To maximize air intake, the filter is fully perforated. The air filter is fixed to the chassis with a fastener to facilitate filter removal and replacement. **Figure 1-28** shows an air filter.

Figure 1-28 Air filter



NOTE

Placing a black sponge air filter in front of the air intake vent helps prevent dust from entering the system. You are advised to remove and clean air filters at least once every three months.

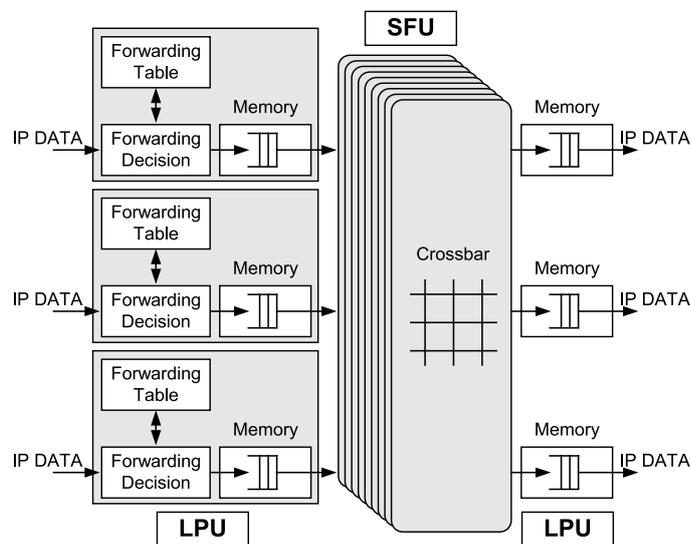
1.2.6 Switch Fabric

This section describes the mechanism of the switch fabric on the USG9560.

The USG9560 has three SFUs. Two SFUs are integrated on the two SRUs, and another SFU is independent. These three SFUs work in 2+1 backup mode to achieve simultaneous load balancing. When one SFU is faulty or is being replaced, the other two SFUs automatically take over its tasks to ensure service continuity. For details on USG9560 SFUs, see [1.4.3.2 E8KE-X8-SFUC-200](#).

The switching network responsible for switching data between LPUs/SPUs is a key component of the USG9560. The USG9560 uses switching chips developed by Huawei and Memory-Crossbar-Memory (M-C-M) to provide three-level switching. Level-1 and level-3 switching use a shared-memory model and are performed on LPUs/SPUs; level-2 switching uses a Crossbar model and is performed on an SFU. **Figure 1-29** shows the switching network of the USG9560. (The LPU is used as an example.)

Figure 1-29 USG9560 switching network



The level-1 switching chip on one LPU is fully connected to the level-2 switching chips on the SFUs. The level-2 switching chips on the SFUs are also fully connected to the level-3 switching chip on another LPU. In addition, the level-2 crossbar switching chips work in load balancing mode on multiple switching planes. The entire switching network is unblocked. The process of transmitting data packets across the switching network is as follows:

1. Data packets enter an LPU through physical interfaces and are fragmented into cells of a fixed length. These cells are then sent to the level-1 switching chips. After being buffered and scheduled, the cells enter the crossbar switching chips on the SFU. The level-1 switching chip on an LPU is fully connected with all of the level-2 switching chips. As a result, the same number of cells can be distributed to each level-2 switching plane. This implements load balancing on switching planes and facilitates fault tolerance.
2. After the cells reach the crossbar switching chips, the crossbar switching chips schedule the cells to the corresponding outbound interfaces according to the destination interfaces of the data packets. The cells are then sent to the level-3 switching chips on another LPU. The switching of cells by the level-2 switching chips is then completed.
3. After the cells reach the level-3 switching chips on another LPU, the system searches for the destination interfaces. Once found, the cells are reassembled and sent out through physical interfaces, completing the switching of the data packets.

1.2.7 Control Plane

This section describes the functions and features of the control plane.

USG9560 uses the SRU (E8KE-X8-SRUA-200) to implement the control plane functions. For details about the SRU, see [1.4.2.2 E8KE-X8-SRUA-200](#). The functions of the SRU are described from the aspects of system control and management, system maintenance, and reliability.

System Control and Management Unit

As the system control and management unit, the SRU provides the following functions on the system control panel:

- **Route calculation:** All routing protocol packets are sent by the forwarding engine to the SRU for processing. In addition, the SRU broadcasts and filters packets, and downloads routing policies from the policy server.
- **Outband communication between boards:** The LAN switch modules integrated on the SRU provide outband communications for the SFUs, LPUs and SPUs. In this manner, messages can be controlled, maintained, and exchanged between the boards.
- **Device management and maintenance:** Devices can be managed and maintained through the management interfaces (serial interfaces) provided by the SRU.
- **Data configuration:** The SRU stores configuration data, startup files, upgrade software, and system logs.
- **Data storage:** The SRU provides two interfaces for CF cards, which serve as mass storage devices to store data files.

System Maintenance Unit

As the system maintenance unit, the SRU collects monitored information to test system units locally or remotely, or implement in-service upgrading of system units.

The SRU periodically collects the operating data of system units through the Monitorbus. The SRU generates related control information based on the collected information, such as the detection of board installations and adjustments to fan speed. Through the joint test action group (JTAG) bus, the SRU remotely or locally tests system units, or performs in-service upgrading of system units.

Reliability

The main control modules, clock modules, and LAN switch modules on the SRU work in 1:1 hot backup mode, improving system reliability.

The two SRUs work in 1:1 backup mode. Each SRU monitors the status of the other. If the active SRU is faulty, the standby SRU automatically takes over as the active SRU.

1.2.8 Technical Specifications

This section describes the dimensions, weight, power, and environment specifications of the USG9560.

[Table 1-24](#) lists the technical specifications of the USG9560.

Table 1-24 USG9560 technical specifications

Item		Description
System specifications		
Processing unit of the SRU		Main frequency: 1.5 GHz
BootROM capacity of the SRU		8 MB
SDRAM capacity of the SRU		4 GB
NVRAM capacity of the SRU		4 MB
Flash capacity of the SRU		32 MB
CF card		2 x 2 GB
Number of slots	SRU	2 (slots 9 and 10)
	SFU	1 (slot 11)
	LPU/SPU	8 (slots 1 to 8)
Dimensions and weight		
Dimensions (width ^a x depth x height ^b)		442 mm x 650 mm x 620 mm (14 U). The depth is 770 mm covering the dust filter and cable rack.
Installation position		N68E cabinet or a standard 19-inch cabinet
Weight	Empty chassis	43.2 kg
	Full configuration (maximum)	112.9 kg
Power specifications		
Power supply mode	DC	4 hot-swappable PEMs
	AC	4 PEMs+1 external AC power chassis
Rated input voltage range	DC	-48 V DC to -60 V DC
	AC	<ul style="list-style-type: none"> ● 220 V rated voltage: 200 V AC to 240 V AC, 50/60 Hz ● 110 V rated voltage: 100 V AC to 120 V AC, 50/60 Hz
Maximum input voltage range	DC	-72 V DC to -38 V DC

	AC	<ul style="list-style-type: none"> ● 220 V rated voltage: 175 V AC to 264 V AC, 47 Hz to 63 Hz ● 110 V rated voltage: 90 V AC to 175 V AC, 47 Hz to 63 Hz (The output power reduces to half of the maximum output when the input voltage is in the range of 90 V AC to 175 V AC.)
Typical power (Three LPUF-240s and five SPUs are configured.)	DC	4025 W
	AC	4282 W
Maximum power (Three LPUF-240s and five SPUs are configured.)	DC	4823 W
	AC	5132 W
Heat dissipation		
Fan module	2 hot-swappable fan modules, each with one fan	
Air flow	Front-to-back airflow	
Air filter	1 air filter in the air intake vent of the air channel	
Environment specifications		
System reliability	MTBF (year)	25
	MTTR (hour)	0.5
Ambient temperature ^c	Long-term ^d	0°C to 45°C
	Short-term	-5°C to 50°C
	Remarks	Temperature change rate limit: 30°C/hour
Storage temperature	-40°C to 70°C	
Ambient relative humidity	Long-term	5% RH to 85% RH, no coagulation
	Short-term	5% RH to 95% RH, no coagulation
Storage relative humidity	0% RH to 95% RH	
Long-term altitude	Lower than 3000 m	
Storage altitude	Lower than 5000 m	

NOTE

- a. The width does not include the size of the attached mounting ear.
- b. The height is 1 U (1 U = 1.75 inches, or about 44.45 mm), which is a height unit defined in International Electrotechnical Commission (IEC) 60297 standards.
- c. The measurement point of the temperature and humidity is 1.5 m above the floor and 0.4 m in front of the cabinet without the front and the back doors.
- d. The heat dissipation system allows the device to operate at the ambient temperature for a short time as long as, at the time of failure, the system has not been operating continuously for more than 96 hours and the accumulated operation time of the system per year does not exceed 15 days.

1.3 USG9520

The USG9520 has DC (4 U) and AC (5 U) chassis models. It employs an integrated chassis and has 3 LPU/SPU slots. Its MPUs, power modules, and fans work in redundancy mode.

1.3.1 Device Overview

This section describes the appearance and hardware system features of the USG9520.

Appearance

The USG9520 has an integrated chassis and adopts a centralized routing engine and a distributed forwarding architecture.

The USG9520 chassis have both AC and DC models. [Figure 1-30](#) shows the DC chassis, and the [Figure 1-31](#) shows the AC chassis.

Figure 1-30 DC chassis



Figure 1-31 AC chassis



System Features

The USG9520 provides the following system features:

- Distributed hardware-based forwarding
- Separation of control and service channels for ensuring non-blocking of control channels
- Carrier-class reliability and manageability
- Modular-level shielding for meeting Electro Magnetic Compatibility (EMC) requirements
- Hot-swappable boards, power modules, and fans
- MPUs in 1:1 backup mode
- Backup for key components such as power modules, fan modules, clocks, and management buses
- Protection against misinsertion of boards
- Queries about alarm prompts, alarm indications, running status, and alarm status of the power supply
- Queries about alarm prompts, alarm indications, running status, and alarm status of the voltage and ambient temperature

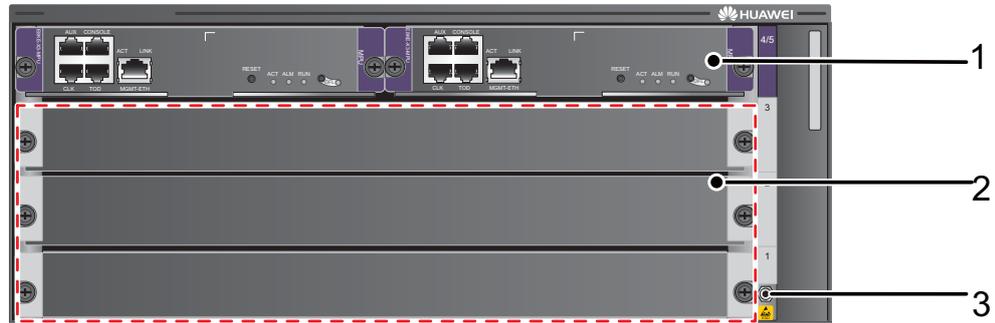
1.3.2 USG9520 Components

This section describes the main components of the USG9520.

The USG9520 has AC and DC chassis models. [Figure 1-32](#) and [Figure 1-33](#) show the parts in the DC chassis. [Figure 1-34](#) and [Figure 1-35](#) show the parts in the AC chassis.

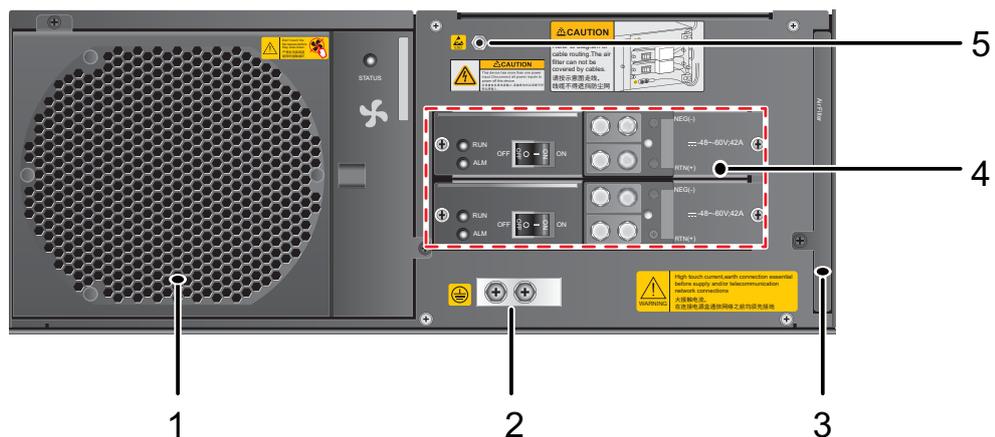
DC Chassis

Figure 1-32 Front panel of the USG9520 DC chassis



No.	Name	Description
1	MPU	The Main Processing Unit (MPU) on the USG9520 is in charge of system control and route information learning. It is the central control unit of the device. The USG9520 MPUs work in 1:1 backup mode. When the active MPU is faulty, the standby MPU immediately takes over for it, ensuring service continuity.
2	LPU/SPU slot	Holds an LPU or SPU.
3	ESD jack	The equipment end of the wrist strap is inserted into the ESD jack. For the wrist strap to be effective, ensure that the device is grounded.

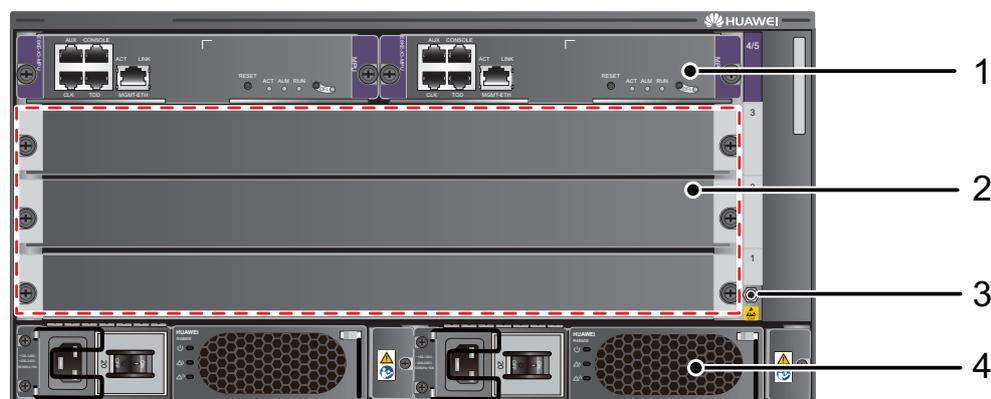
Figure 1-33 Rear panel of the USG9520 DC chassis



No.	Name	Description
1	Fan module	The USG9520 has one fan module that has two fans. They are deployed on the air intake vents of chassis air channels and work in 1+1 backup mode.
2	Protection ground terminal	The OT terminal of the ground cable is connected to the protection ground terminal of the device, and the other terminal of the ground cable is connected to the ground point of the cabinet or workbench or the ground bar of the equipment room.
3	Air filter	The air filters of the USG9520 are deployed on the air intake vents of chassis air channels to protect the device against dust.
4	DC power module	The DC power supply system of the USG9520 consists of two DC power modules that are connected to an external direct current distribution panel and work in 1+1 backup mode.
5	ESD jack	The equipment end of the wrist strap is inserted into the ESD jack. For the wrist strap to be effective, ensure that the device is grounded.

AC Chassis

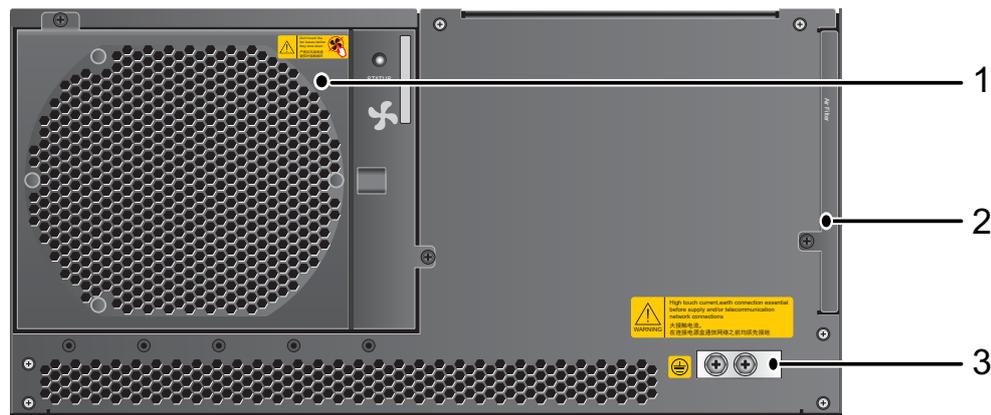
Figure 1-34 Front panel of the USG9520 AC chassis



No.	Name	Description
1	MPU	The Main Processing Unit (MPU) on the USG9520 is in charge of system control and route information learning. It is the central control unit of the device. The USG9520 MPUs work in 1:1 backup mode. When the active MPU is faulty, the standby MPU immediately takes over for it, ensuring service continuity.
2	LPU/SPU slot	Holds an LPU or SPU.

No.	Name	Description
3	ESD jack	The equipment end of the wrist strap is inserted into the ESD jack. For the wrist strap to be effective, ensure that the device is grounded.
4	AC power module	The AC power supply system of the USG9520 consists of two DC power modules that are connected to an external direct current distribution panel and work in 1+1 backup mode.

Figure 1-35 Rear panel of the USG9520 AC chassis



No.	Name	Description
1	Fan module	The USG9520 has one fan module with two fans on it. The fans are deployed on the air intake vents of chassis air channels and work in 1+1 backup mode.
2	Air filter	The air filters of the USG9520 are deployed on the air intake vents of chassis air channels to protect the device against dust.
3	Protection ground terminal	The OT terminal of the ground cable is connected to the protection ground terminal of the device, and the other terminal of the ground cable is connected to the ground point of the cabinet or workbench or the ground bar of the equipment room.

1.3.3 Slot Layout and Supported Boards

This section describes the layout of slots and supported boards on the USG9520.

Slots Layout

Figure 1-36 shows the slot layout on the USG9520.

Figure 1-36 USG9520 slot layout

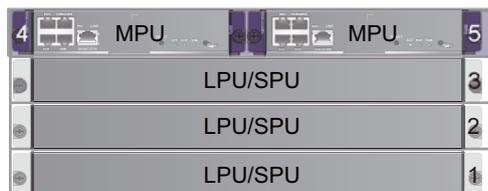


Table 1-25 describes the slot layout on the USG9520.

Table 1-25 Board distribution on the USG9520 board cage

Slot Name	Slot Number	Quantity	Slot Height	Remarks
LPU/SPU	1 to 3	3	41 mm (1.6 inches)	These slots hold LPUs or SPUs.
MPU	4 to 5	2	41 mm (1.6 inches)	These slots hold MPUs that work in 1:1 backup mode.

Supported Boards

Table 1-26 lists the specifications of boards supported by the USG9520.

Table 1-26 Boards supported by the USG9520

Type	BOM	Description	Hot-Swappable or Not
MPU	03056305	1.4.2.3 E8KE-X3-MPU	Yes
	0305G06R	1.4.2.4 MPUD	Yes
SPUs and SPCs	03056640	1.4.4.1 X3 SPU (SPU-X3-B)	Yes
	03056989	1.4.4.2 X3 SPU (SPU-X3-B2)	Yes
	0305G09T	1.4.4.4 Firewall Service Processing Unit (SPU-X3-20-O-E8KE, for USG9520)	Yes
	03057427	1.4.4.5 Firewall Service Processing Unit (SPUA-20-O-M, for USG9520)	Yes
	03057518	1.4.4.6 Firewall Service Processing Unit (SPUB-20-O-M, for USG9520)	Yes

Type	BOM	Description	Hot-Swappable or Not
	0305G09V	1.4.4.10 Firewall Performance Expansion Card (SPC-20-O-E8KE)	Yes
	03056688	1.4.4.13 Application Security Service Processing Card (SPC-APPSEC-FW)	Yes
	03056639	1.4.4.14 Application Security Service Processing Card (SPC-IPS-20)	Yes
	03057429	1.4.4.11 Firewall Performance Expansion Card (SPCA-20-O-H&M)	Yes
	03057522	1.4.4.12 Firewall Performance Expansion Card (SPCB-20-O-H&M)	Yes
	03057872	1.4.4.15 Enhanced Application Security Service Processing Card A (SPCA-APPSEC-FW)	Yes
	03057873	1.4.4.16 Enhanced Application Security Service Processing Card B (SPCB-APPSEC-FW)	Yes
LPUF-120 and FPIC	03056682	1.4.6.1 LPUF-120	Yes
	03056890	1.4.6.2 20-Port 10/100/1000Base-RJ45 FPIC (FW-20X1G-RJ45)	No
	03056633	1.4.6.3 24-Port 100/1000 Base-X-SFP FPIC (E8KE-X-101-24XGE-SFP)	No
	03056632	1.4.6.4 5-Port 10GBase LAN/WAN-SFP + FPIC A (E8KE-X-101-5X10GE-SFP+)	No
	03056684	1.4.6.5 6*10GE SFP+ Daughter Card (FW-6X10GE-SFP+)	No
	03056686	1.4.6.6 12*10GE SFP+ Daughter Card (FW-12X10GE-SFP+)	No
	03056848	1.4.6.7 3-Port 40GBase QSFP+ FPIC (FW-3X40G-QSFP+)	No
	03056631	1.4.6.8 1-Port 40GBase LAN-CFP FPIC A (E8KE-X-101-1X40GE-CFP)	No
	03056685	1.4.6.9 1*100GE CFP Daughter Card (FW-1X100GE-CFP)	No
LPUF-101 and FPIC	03056630	1.4.7.1 LPUF-101	Yes
	03056633	1.4.7.2 24-Port 100/1000 Base-X-SFP FPIC (E8KE-X-101-24XGE-SFP)	No

Type	BOM	Description	Hot-Swappable or Not
	0305G09L	1.4.7.3 4-Port 10G Base LAN -SFP+ FPIC (E8KE-X-101-4X10GE-SFP+)	No
	03056632	1.4.7.4 5-Port 10GBase LAN/WAN-SFP + FPIC A (E8KE-X-101-5X10GE-SFP+)	No
	03056631	1.4.7.5 1-Port 40GBase LAN-CFP FPIC A (E8KE-X-101-1X40GE-CFP)	No
LPUF-40-A and FPIC	03056627	1.4.8.1 LPUF-40-A	Yes
	03056629	1.4.8.2 20-Port 100/1000Base-X-SFP Flexible Card (P40-20xGE/FE-SFP)	No
	03056628	1.4.8.3 2-Port 10GBase LAN/WAN-XFP Flexible Card (P40-2x10GBase LAN/WAN-XFP)	No
	0305G07X	1.4.8.4 4-port 10GBase LAN/WAN-XFP FPIC (P40-4x10GBase LAN/WAN-XFP)	No
LPUF-21 and FPIC	03056624	1.4.9.1 LPUF-21	Yes
	0305G054	1.4.9.2 12-port 10Base-T/100Base-TX/1000Base-T-RJ45 FPIC (12x10/100/1000Base-TX-RJ45)	No
	03056626	1.4.9.3 12-port 100Base-FX/1000Base-X-SFP FPIC (12x100/1000Base-SFP)	No
	0305G055	1.4.9.4 1-port OC-192c/STM-64c POS-XFP FPIC (1 x OC-192c/STM-64c POS-XFP)	No
	03056625	1.4.9.5 1-port 10GBase LAN/WAN-XFP FPIC (1 x 10GBase LAN/WAN)	No
	0305G07W	1.4.9.6 4-Port 10GBase WAN/LAN-XFP FPIC (4x10GBase LAN/WAN)	No
Integrated Line Process Unit	03056637	1.4.10 1-Port 100GBase-CFP Integrated Line Processing Unit (LPUI-101)	Yes

1.3.4 Power Supply System

This section describes the power supply features, power supply area partitioning, and AC/DC power systems of the USG9520.

1.3.4.1 Features of the Power Supply System

This section describes the power supply modes of the USG9520.

The USG9520 supports DC and AC power supply (but not at the same time).

Power modules convert the input voltage into -48 V DC voltage to supply power for the entire system. The power supply system has the following features:

- Depending on the power supply mode, the power supply system consists of either two AC power modules or two DC power modules working in 1+1 backup mode.
- Both AC power modules and DC power modules support alarm functions.

1.3.4.2 DC Power Supply System

This section describes the appearance, functions, and technical specifications of the DC power module.

The USG9520 DC power module is 1 U high, as shown in [Figure 1-37](#).

The power modules are hot-swappable.

Figure 1-37 DC power module and panel



The indicators of the USG9520 DC power module are displayed on the panel through LED. [Table 1-27](#) describes the indicators.

Table 1-27 Description of DC power module indicators

Name	Color	Description
RUN	Green	Indicates normal output. If the indicator is steady green, the PEM has normal output.
ALM	Red	Indicates power failure. If the indicator is steady red: <ul style="list-style-type: none"> ● The lightning protection circuit of the PEM is faulty. ● One of the power modules is not receiving input power.

The DC power module has the following functions:

The USG9520 power module can output straight-through power and provide the following functions:

- Surge protection, filtering, and short circuit protection
- Alarm

Table 1-28 lists the technical specifications of the DC power module.

Table 1-28 Technical specifications of the DC power module

Item	Parameter
Model	CR52PEMA
Dimensions (Height × Width × Depth)	40 mm × 100 mm × 190 mm
Weight	0.7 kg
Number of inputs	1
Maximum input voltage range	-72 V DC to -38 V DC
Rated input voltage range	-48 V DC to -60 V DC
Input current	42 A (Each power supply input with at least 42 A current is recommended.)
Output voltage	-72 V DC to -38 V DC
Outgoing current	42 A
Current of customer's air breakers for power distribution	50 A (Each module corresponds to an air breaker.)

1.3.4.3 AC Power Supply System

This section describes the appearance, functions, and technical specifications of the AC power module and AC power distribution box (PDB).

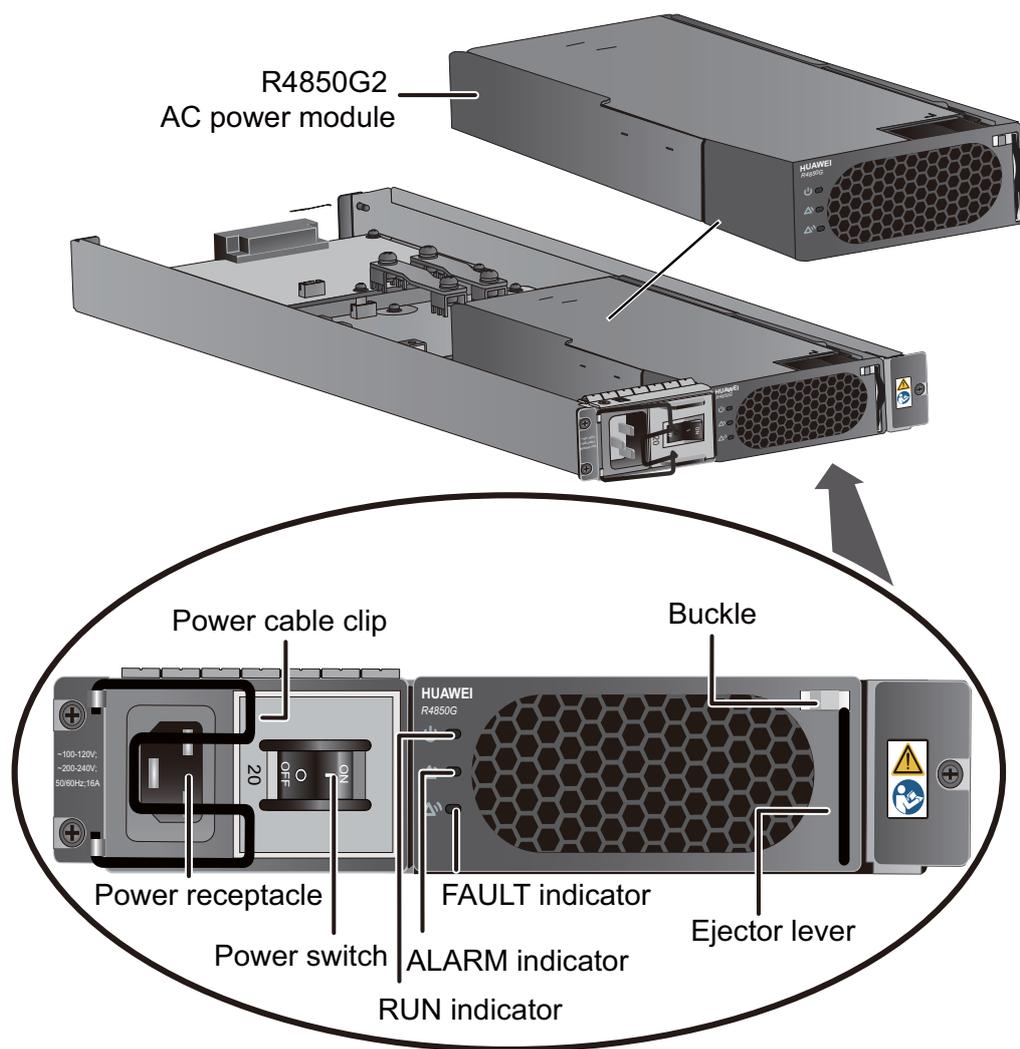
 **NOTE**

If a newly shipped USG9520 uses the 2200 W AC power module, which requires the 2200 W AC PDB and power cable with the C19 straight connector. The USG9520 shipped earlier uses the 1600 W AC power module, which requires the 1600 W AC PDB and power cable with the C13 straight connector.

2200 W AC Power System

The USG9520 2200 W AC PDB has a 1 U standard modular structure. It contains the R4850G2 AC power module. Both the 2200 W AC PDB and R4850G2 AC power module are hot-swappable. **Figure 1-38** shows the AC PDB and its panel.

Figure 1-38 2200 W AC PDB



Name	Description
Power cable clip	Fixes the power cable in place.
Power receptacle	Connects the C19 connector of the AC power cable.
Power switch	Allows you to turn the power output on or off.

Name	Description
RUN indicator (green)	<ul style="list-style-type: none"> ● Steady on: The power module is working properly. ● Off: The power input or power module is faulty. ● Blink once every 2 seconds (0.5 Hz): The power module is in manual query state. This is a normal state, and no action is required. ● Blink four times every 1 second (4 Hz): The power module is in program loading state. This is a normal state, and no action is required. After the program is loaded, the indicator blinks once every 2 seconds.
ALARM indicator (yellow)	<ul style="list-style-type: none"> ● Off: The power module does not have alarms. ● Steady on: The power module has encountered a fault, such as overvoltage, undervoltage, or overcurrent. ● Blink once every 2 seconds (0.5 Hz): The communication of the power module has been interrupted.
FAULT indicator (red)	<ul style="list-style-type: none"> ● Steady on: An unrecoverable fault occurs in the power supply module, such as fan failure, no output current, or short circuit of output current. ● Off: The power module does not have any faults.
Buckle and ejector lever	-

The R4850G2 AC power module provides protection functions against:

- Input overvoltage
- Input undervoltage
- Output overvoltage
- Output current limiting
- Output short circuit
- Overtemperature

Table 1-29 lists the technical specifications of the 4850G2 AC power module.

Table 1-29 Technical specifications of R4850G2 AC power module

Item	Description
Model	R4850G2
Dimensions (Height × Width × Depth)	40.8 mm x 105 mm x 281 mm

Item	Description
Weight	1.8 kg
Number of inputs	1
Maximum input voltage range	<ul style="list-style-type: none"> ● 220 V rated voltage: 175 V AC to 264 V AC, 47 Hz to 63 Hz ● 110 V rated voltage: 90 V AC to 175 V AC, 47 Hz to 63 Hz (The output power reduces to half of the maximum output when the input voltage is in the range of 90 V AC to 175 V AC.)
Rated input voltage range	<ul style="list-style-type: none"> ● 220 V rated voltage: 200 V AC to 240 V AC, 50/60 Hz ● 110 V rated voltage: 100 V AC to 120 V AC, 50/60 Hz
Input current	17 A (Each power supply input with at least 17 A current is recommended.)
Output voltage	-53.3V DC
Maximum output current	-53.3 V DC/50 A
Maximum output power	2200 W (rated input voltage: 220 V AC)/1100 W (rated input voltage: 110V AC)

1600 W AC Power System

The USG9520 1600 W AC PDB has a 1 U standard modular structure. It contains the EPW30B-48A AC power module. Both the 1600 W AC PDB and EPW30B-48A AC power module are hot-swappable. [Figure 1-39](#) shows the AC PDB and its panel.

Figure 1-39 EPW30B-48A AC power module



Name	Description
RUN indicator (green)	Indicates the running status. If it is steady on, the power module is working properly.
ALARM indicator (yellow)	Indicates alarms. If it is on, a recoverable fault occurs on the power module. <ul style="list-style-type: none"> ● If it is blinking, the communication has been interrupted. ● If it is steady on, the power module has encountered a fault, such as overvoltage, undervoltage, or overcurrent.
FAULT indicator (red)	Indicates a fault. If it is steady on, an unrecoverable fault occurs in the power supply module, such as fan failure, no output current, or short circuit of output current.

The EPW30B-48A AC power module provides protection functions against:

- Output overcurrent
- Output overvoltage
- Short circuit
- Various faults, through the alarm function

Table 1-30 lists the technical specifications of the EPW30B-48A AC power module.

Table 1-30 Technical specifications of EPW30B-48A AC power module

Item	Description
Model	EPW30B-48A
Dimensions (Height × Width × Depth)	40 mm x 116 mm x 208 mm
Weight	1.8 kg
Number of inputs	1
Maximum input voltage range	<ul style="list-style-type: none"> ● 220 V rated voltage: 175 V AC to 264 V AC, 47 Hz to 63 Hz ● 110 V rated voltage: 90 V AC to 175 V AC, 47 Hz to 63 Hz (The output power reduces to half of the maximum output when the input voltage is in the range of 90 V AC to 175 V AC.)
Rated input voltage range	<ul style="list-style-type: none"> ● 220 V rated voltage: 200 V AC to 240 V AC, 50/60 Hz ● 110 V rated voltage: 100 V AC to 120 V AC, 50/60 Hz

Item	Description
Input current	10 A (Each power supply input with at least 10 A current is recommended.)
Output voltage	-53.3V DC
Maximum output current	-53.3 V DC/30 A
Maximum output power	1600 W (rated input voltage: 220 V AC)/800 W (rated input voltage: 110V AC)

1.3.5 Heat Dissipation System

This section describes the air channel features of the heat dissipation system and the appearance, functions, and technical specifications of fan modules.

1.3.5.1 System Air Channel

This section describes the system air channels and air flows of the USG9520.

The USG9520 draws air from the left side and exhausts air from the rear. The air intake vent is located at the left side of the chassis, and the air exhaust vent is located at the rear of the chassis. The air filter covers a large area and has a curved face and low windage resistance, improving heat dissipation efficiency.

The system draws in air for heat dissipation in the DC and AC chassis, as shown in [Figure 1-40](#) and [Figure 1-41](#), respectively.

Figure 1-40 Air flow in the USG9520 DC chassis

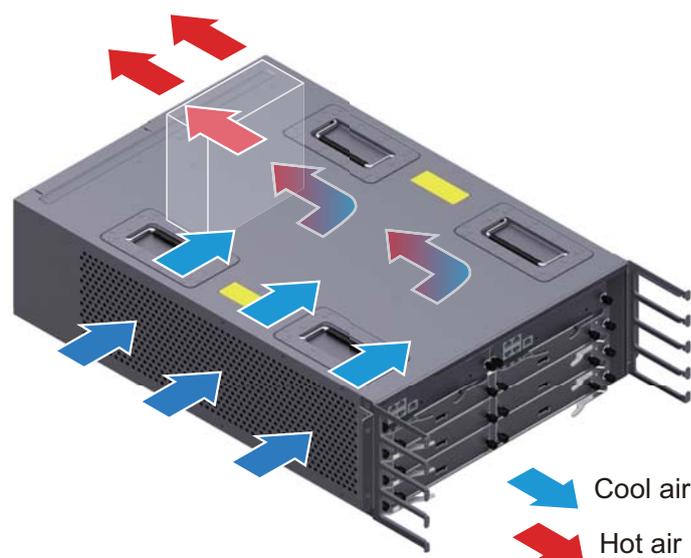
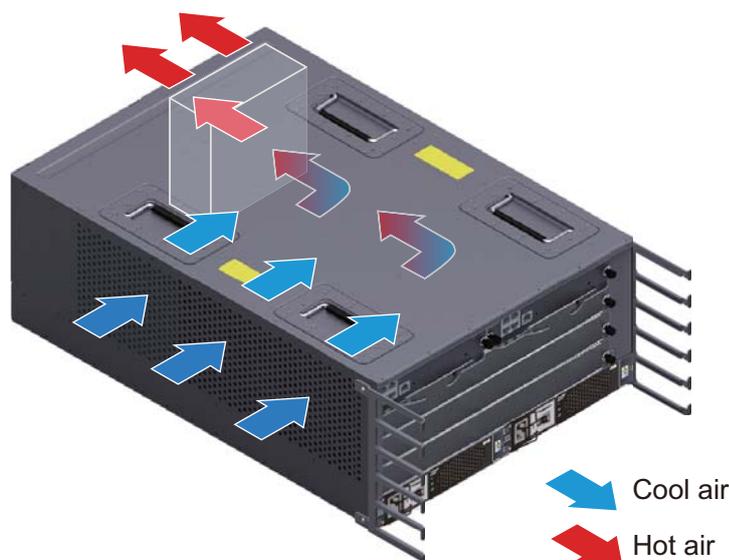


Figure 1-41 Air flow in the USG9520 AC chassis



The heat dissipation system consists of the following components:

- Two fan modules
- An air intake vent and an air exhaust vent
- An air filter
- Fans on power modules

1.3.5.2 Fan Module

This section describes the appearance, technical specifications, and speed adjustment of fans.

Appearance and Technical Specifications of Fan Modules

The fan modules of the USG9520 are located at the rear of the chassis. Each fan module has two fans that work in 1+1 backup mode. When a fan fails, the heat dissipation system enables the system to continue operating for a short time at the ambient temperature of 40°C. The fan module is hot-swappable. [Figure 1-42](#) shows the fan module.

NOTE

The heat dissipation system allows the device to operate at the ambient temperature for a short time as long as, at the time of failure, the system has not been operating continuously for more than 96 hours and the accumulated operation time of the system per year does not exceed 15 days.

Figure 1-42 Fan module



Table 1-31 describes the indicators on the fan module.

Table 1-31 Description of fan module indicators

Indicator	Color	Description
STATUS	Green	If the indicator blinks once every 2 seconds (0.5 Hz), the fan module is working normally.
	Red	If the indicator blinks once every 2 seconds (0.5 Hz), the fan module or power module is faulty, or not all PEMs are powered on.

Table 1-32 lists the technical specifications of the fan module.

Table 1-32 Technical specifications of the fan module

Item	Specifications
Dimensions (width x depth x height)	160 mm x 108 mm x 213 mm
Weight	1.5 kg
Maximum wind pressure	700 Pa
Maximum wind rate	850 m ³ /h
Maximum noise	78 dB

Fan Speed Adjustment

When the system is fully configured, fan speeds are adjusted according to temperatures reported by the temperature sensors on the LPUs, SPUs and MPUs. [Table 1-33](#) describes general fan speed adjustment principles.

Table 1-33 Fan Speed Adjustment Principles

Ambient Temperature	Rotational Speed	Noise and Dissipation Standards
-5°C- +27°C (23°F - 80.6°F)	Low (50% rotational speed)	When fans rotate at a constant low speed, the noises meet the ETSI standard and the fans meet heat dissipation requirements of a fully configured system.
27°C-45°C (80.6°F -113°F)	Linear variation	The fan speed is adjusted smoothly and linearly, without a sudden increase in volume.
Over 45°C (113°F)	High (100% rotational speed)	Fans rotate at high speeds to meet heat dissipation requirements.

1.3.5.3 Air Filter

This section describes the appearance and features of air filters.

The air filter of the USG9520 is located on the left rear of the chassis, as shown in [Figure 1-43](#).

Figure 1-43 Air filter on the USG9520 air intake frame



 **NOTE**

The air filter of the USG9520 can be adjusted through bending, facilitating the maintenance within a limited space at the rear of the chassis.

Placing a black sponge air filter at the air intake vent helps prevent dust from entering the system. You are advised to remove and clean the air filter once every three months.

1.3.6 Control Plane

This section describes the functions and features of the control plane.

USG9520 uses the MPU to implement the functions of the control plane. The functions include centralized control and management and data exchange. For details about the MPU, see [1.4.2.3 E8KE-X3-MPU](#). The functions of the MPU are described from the aspects of system control and management, system maintenance, and reliability:

System Control and Management Unit

As the system control and management unit, the MPU provides the following functions on the system control panel:

- **Route calculation:** All routing protocol packets are sent by the forwarding engine to the MPU for processing. In addition, the MPU broadcasts and filters packets, and downloads routing policies from the policy server.
- **Outband communication between boards:** The LAN switch modules integrated on the MPU provide outband communications between boards. In this manner, communications between the LPUs and SPUs are controlled and maintained, and messages can be exchanged.
- **Device management and maintenance:** Devices can be managed and maintained through the management interfaces (serial interfaces) provided by the MPU.
- **Data configuration:** The MPU stores configuration data, startup files, upgrade software, and system logs.
- **Data storage:** The MPU has one USB card, which serves as a mass storage device to store data files.

System Maintenance Unit

As the system maintenance unit, the MPU collects monitored information to test system units locally or remotely, or implements in-service upgrading of system units.

The MPU periodically collects information about the operation of system units through the Monitorbus. The MPU generates related control information based on the collected information, such as the detection of board installations and fan speed adjustments. Through the joint test action group (JTAG) bus, the MPU remotely or locally tests system units, or performs in-service upgrading of system units.

Reliability

The main control modules, clock modules, and LAN switch modules on the MPU work in 1:1 hot backup mode, improving system reliability.

The two MPUs work in 1:1 backup mode. Each MPU monitors the status of the other. If the active MPU is faulty, the standby MPU automatically takes over as the active MPU.

1.3.7 Technical Specifications

This section describes the dimensions, weight, power, and environment specifications of the USG9520.

Table 1-34 lists the technical specifications of the USG9520.

Table 1-34 USG9520 Technical Specifications

Item		Specifications
System specifications		
Processing unit of the MPU		Main frequency: 1 GHz
BootROM capacity of the MPU		1 MB
SDRAM capacity of the MPU		2 GB
NVRAM capacity of the MPU		512 MB
Flash capacity of the MPU		32 MB
CF card		1 x 2 GB
Number of slots	MPU	2 (slots 4, 5)
	SFU	-
	LPU/SPU	3 (slots 1, 2, 3)
Dimensions and weight		
Dimensions (width ^a x depth x height ^b)		DC chassis: 442 mm x 650 mm x 175 mm (4 U) AC chassis: 442 mm x 650 mm x 220 mm (5 U) The depth is 750 mm, including the dust filter and cable rack.
Installation position		N68E cabinet or a standard 19-inch cabinet
Weight	Empty chassis	DC chassis: 15kg AC chassis: 25kg
	Full configuration (maximum)	DC chassis: 30.7 kg AC chassis: 40.7 kg
Power specifications		
Power supply mode	DC	Double hot-swappable power modules
	AC	Double hot-swappable power modules
Rated input voltage range	DC	-48 V DC to -60 V DC

Item		Specifications
	AC	<ul style="list-style-type: none"> ● 220 V rated voltage: 200 V AC to 240 V AC, 50/60 Hz ● 110 V rated voltage: 100 V AC to 120 V AC, 50/60 Hz
Maximum input voltage range	DC	-72 V DC to -38 V DC
	AC	<ul style="list-style-type: none"> ● 220 V rated voltage: 175 V AC to 264 V AC, 47 Hz to 63 Hz ● 110 V rated voltage: 90 V AC to 175 V AC, 47 Hz to 63 Hz (The output power reduces to half of the maximum output when the input voltage is in the range of 90 V AC to 175 V AC.)
Typical power (One LPUF-120 and two SPUs are configured.)	DC	1066 W
	AC	1185 W
Maximum Power (One LPUF-120 and two SPUs are configured.)	DC	1272 W
	AC	1414 W
Heat dissipation		
Fan module		1 hot-swappable fan module that has two fans
Air flow		Left-to-back airflow
Air filter		1 air filter in the air intake vent of the air channel
Environment specifications		
System reliability	MTBF (year)	25
	MTTR (hour)	0.5
Ambient temperature ^c	Long-term ^d	0°C to 45°C
	Short-term	-5°C to 50°C
	Remarks	Temperature change rate limit: 30°C/hour
Storage temperature		-40°C to 70°C
Ambient relative humidity	Long-term	5% RH to 85% RH, no coagulation
	Short-term	5% RH to 95% RH, no coagulation
Storage relative humidity		0% RH to 95% RH
Long-term altitude		Lower than 3000 m

Item	Specifications
Storage altitude	Lower than 5000 m
<p>NOTE</p> <p>a. The width does not include the size of attached mounting ear.</p> <p>b. The height is 1 U (1 U = 1.75 inches, or about 44.45 mm), which is a height unit defined in International Electrotechnical Commission (IEC) 60297 standards.</p> <p>c. The measurement point of the temperature and humidity is 1.5 m above the floor and 0.4 m in front of the cabinet without the front and the back doors.</p> <p>d. The heat dissipation system allows the device to operate at the ambient temperature for a short time as long as, at the time of failure, the system has not been operating continuously for more than 96 hours and the accumulated operation time of the system per year does not exceed 15 days.</p>	

1.4 Boards

This section describes various supported boards and their specifications.

1.4.1 Board Overview

This section describes types, structures, and mappings of boards and rules for numbering board/subcard slots and interfaces.

1.4.1.1 Types and Mappings of Boards

This section describes the board types supported by the USG9500 and mappings between boards and cards.

The USG9500 supports the following types of boards:

- MPU/SRU
The USG9500 MPU/SRU has an integrated board structure. It controls the system in a centralized manner and learns routing information. It is the system's control center.
- SFU
The USG9500 SFU has an integrated board structure. It is responsible for data switching between boards.
- SPU
The USG9500 SPU has a flexible plug-in card (FPIC) structure. It is responsible for processing security services in a centralized manner.
An FPIC SPU consists of two parts: mother board and FPIC. The USG9500 provides multiple types of SPUs with different performance. An SPU motherboard can hold one or two Service Processing Cards (SPCs).
- LPU
The USG9500 LPU uses either an FPIC or integrated board structure and provides network interfaces externally.

[Table 1-35](#), [Table 1-36](#), and [Table 1-37](#) show USG9500 board mappings.

 **NOTE**

In this document, first supported software versions refer to V300 and V500 only. For V200 support, see the V200 product document.

Unless otherwise specified, the first supported software versions and their later versions support these boards. For example, if the first version that supports a board is V500R001C00, V500R001C00 and later versions also support the board.

Table 1-35 Board mappings

Type	Board Name	BO M	US G9 520	US G9 560	US G95 80	First Software Version Supporting the Board	Subcard	Hotswappable?
MP U/S RU	EKEX16-FWCD00MPUB00	0305G06U	-	-	Yes	V300R001C01	-	Yes
	E8KE-X8-SRUA-200	0305G08N	-	Yes	-	V300R001C01	-	Yes
	E8KE-X3-MPU	03056305	Yes	-	-	V500R001C00	-	Yes
	MPUD	0305G06R	Yes	-	-	V300R001C01	-	Yes
SFU	E8KE-X16-SFUC-200SP	0305G08Q	-	-	Yes	V300R001C01	-	Yes
	E8KE-X8-SFUC-200	0305G08P	-	Yes	-	V300R001C01	-	Yes
SPU	SPU-X3-B	03056640	Yes	-	-	V300R001C01	<ul style="list-style-type: none"> ● SPC-20-O-E8KE ● SPC-APPSEC-FW ● SPC-IPS-20 	Yes

Type	Board Name	BO M	US G9 520	US G9 560	US G95 80	First Software Version Supporti ng the Board	Subcard	Hotsw appabl e?
	SPU-X3-B2	030 569 89	Yes	-	-	V500R00 1C50	<ul style="list-style-type: none"> ● SPC-20-O-E8KE ● SPC-APPSEC-FW ● SPC-IPS-20 ● SPCA-20-O-H&M ● SPCB-20-O-H&M ● SPCA-APPSEC-FW ● SPCB-APPSEC-FW 	Yes
	SPU-X8X16-B	030 566 38	-	Yes	Yes	V300R00 1C01	<ul style="list-style-type: none"> ● SPC-20-O-E8KE ● SPC-APPSEC-FW ● SPC-IPS-20 ● SPCA-20-O-H&M ● SPCB-20-O-H&M ● SPCA-APPSEC-FW ● SPCB-APPSEC-FW 	Yes

Type	Board Name	BO M	US G9 520	US G9 560	US G95 80	First Software Version Supporti ng the Board	Subcard	Hotsw appabl e?
	SPU-X3-20-O-E8KE	030 566 34	Yes	-	-	V300R00 1C01	<ul style="list-style-type: none"> ● SPC-20-O-E8KE ● SPC-APPSEC-FW ● SPC-IPS-20 	Yes
	SPUA-20-O-M	030 574 27	Yes	-	-	V500R00 1C50	-	Yes
	SPUB-20-O-M	030 575 18	Yes	-	-	V500R00 1C50	-	Yes
	SPU-X8X16-20-O-E8KE	030 566 35	-	Yes	Yes	V300R00 1C01	<ul style="list-style-type: none"> ● SPC-20-O-E8KE ● SPC-APPSEC-FW ● SPC-IPS-20 ● SPCA-20-O-H&M ● SPCB-20-O-H&M ● SPCA-APPSEC-FW ● SPCB-APPSEC-FW 	Yes

Type	Board Name	BO M	US G9 520	US G9 560	US G95 80	First Software Version Supporti ng the Board	Subcard	Hotsw appabl e?
	SPUA-20-O-H	030 574 26	-	Yes	Yes	V500R00 1C50	<ul style="list-style-type: none"> ● SPC-20-O-E8KE ● SPC-APPSEC-FW ● SPC-IPS-20 ● SPCA-20-O-H&M ● SPCB-20-O-H&M ● SPCA-APPSEC-FW ● SPCB-APPSEC-FW 	Yes
	SPUB-20-O-H	030 575 20	-	Yes	Yes	V500R00 1C50	<ul style="list-style-type: none"> ● SPC-20-O-E8KE ● SPC-APPSEC-FW ● SPC-IPS-20 ● SPCA-20-O-H&M ● SPCB-20-O-H&M ● SPCA-APPSEC-FW ● SPCB-APPSEC-FW 	

Type	Board Name	BO M	US G9 520	US G9 560	US G95 80	First Software Version Supporti ng the Board	Subcard	Hotsw appabl e?
Flexi ble Card LPU	LPUF-240	030 566 83	-	Yes	Yes	V500R00 1C00	<ul style="list-style-type: none"> ● 1.4.5.2 20-Port 10/100/1000Base-RJ45 FPIC (FW-20X1G-RJ45) ● 1.4.5.3 24-Port 100/1000 Base-X-SFP FPIC (E8KE-X-101-24 XGE-SFP) ● 1.4.5.4 5-Port 10GBase LAN/WAN-SFP + FPIC A (E8KE-X-101-5X 10GE-SFP+) ● 1.4.5.5 6*10GE SFP+ Daughter Card (FW-6X10G-SFP+) ● 1.4.5.6 12*10GE SFP+ Daughter Card (FW-12X10G-SFP+) ● 1.4.5.7 3-Port 40GBase 	Yes

Type	Board Name	BOM	USG9520	USG9560	USG9580	First Software Version Supporting the Board	Subcard	Hotswappable?
							<p>QSFP+ FPIC (FW-3X40G-QSFP+)</p> <ul style="list-style-type: none"> ● 1.4.5.8 1-Port 40GBase LAN-CFP FPIC A (E8KE-X-101-1X 40GE-CFP) ● 1.4.5.9 1*100GE CFP Daughter Card (FW-1X100G-CFP) 	

Type	Board Name	BO M	US G9 520	US G9 560	US G95 80	First Software Version Supporti ng the Board	Subcard	Hotsw appabl e?
	LPUF-120	030 566 82	Yes	Yes	Yes	V500R00 1C00	<ul style="list-style-type: none"> ● 1.4.6.2 20-Port 10/100/1000Base-RJ45 FPIC (FW-20X1G-RJ45) ● 1.4.6.3 24-Port 100/1000 Base-X-SFP FPIC (E8KE-X-101-24 XGE-SFP) ● 1.4.6.4 5-Port 10GBase LAN/WAN-SFP + FPIC A (E8KE-X-101-5X 10GE-SFP+) ● 1.4.6.5 6*10GE SFP+ Daughter Card (FW-6X10GE-SFP+) ● 1.4.6.6 12*10GE SFP+ Daughter Card (FW-12X10GE-SFP+) ● 1.4.6.7 3-Port 	Yes

Type	Board Name	BOM	USG9520	USG9560	USG9580	First Software Version Supporting the Board	Subcard	Hotswappable?
							<p>40GBase QSFP+ FPIC (FW-3X40G-QSFP+)</p> <ul style="list-style-type: none"> ● 1.4.6.8 1-Port 40GBase LAN-CFP FPIC A (E8KE-X-101-1X 40GE-CFP) ● 1.4.6.9 1*100GE CFP Daughter Card (FW-1X100GE-CFP) 	

Type	Board Name	BO M	US G9 520	US G9 560	US G95 80	First Software Version Supporti ng the Board	Subcard	Hotsw appabl e?
	LPUF-101	030 566 30	Yes	Yes	Yes	V300R00 1C01	<ul style="list-style-type: none"> ● 1.4.7.2 24-Port 100/1000 Base-X-SFP FPIC (E8KE-X-101-24 XGE-SFP) ● 1.4.7.3 4-Port 10G Base LAN -SFP+ FPIC (E8KE-X-101-4X 10GE-SFP+) ● 1.4.7.4 5-Port 10GBase LAN/WAN-SFP + FPIC A (E8KE-X-101-5X 10GE-SFP+) ● 1.4.7.5 1-Port 40GBase LAN-CFP FPIC A (E8KE-X-101-1X 40GE-CFP) 	Yes

Type	Board Name	BOM	USG9520	USG9560	USG9580	First Software Version Supporting the Board	Subcard	Hotswappable?
	LPUF-40-A	03056627	Yes	Yes	Yes	V300R001C01	<ul style="list-style-type: none"> ● 1.4.8.2 20-Port 100/1000Base-X-SFP Flexible Card (P40-20x GE/FE-SFP) ● 1.4.8.3 2-Port 10GBase LAN/WAN-XFP Flexible Card (P40-2x10 GBase LAN/WAN-XFP) ● 1.4.8.4 4-port 10GBase LAN/WAN-XFP FPIC (P40-4x10 GBase LAN/WAN-XFP) 	Yes

Type	Board Name	BOM	USG9520	USG9560	USG9580	First Software Version Supporting the Board	Subcard	Hotswappable?
	LPUF-21	03056624	Yes	Yes	Yes	V300R001C01	<ul style="list-style-type: none"> ● 1.4.9.2 12-port 10Base-T/100Base-TX/1000Base-T-RJ45 FPIC (12x10/100/1000Base-TX-RJ45) ● 1.4.9.3 12-port 100Base-FX/1000Base-X-SFP FPIC (12x100/1000Base-SFP) ● 1.4.9.4 1-port OC-192c/STM-64c POS-XFP FPIC (1 x OC-192c/STM-64c POS-XFP) ● 1.4.9.5 1-port 10GBase LAN/WAN-XFP FPIC (1 x 10GBase LAN/WAN) ● 1.4.9.6 4-Port 	Yes

Type	Board Name	BOM	US G9 520	US G9 560	US G95 80	First Software Version Supporting the Board	Subcard	Hotswappable?
							10GBase WAN/ LAN-XFP FPIC (4x10GBase LAN/ WAN)	
Integrated LPU	LPUI-101	03056637	Yes	Yes	Yes	V300R001C01	-	Yes

Table 1-36 Mappings between SPUs and cards

SPU Card	BOM	SPU Mother Board									First Software Version Support the Board	Hot-swappable?
		SPU-X3-20-O-E8KE	SPU-X8X16-20-O-E8KE	SPU-X3-B	SPU-X3-B2	SPU-X8X16-B	SPU-A-20-O-M	SPU-A-20-O-H	SPU-B-20-O-M	SPU-B-20-O-H		
SPC-20-O-E8KE	03056636	Yes	Yes	Yes	Yes	Yes	-	Yes	-	Yes	V300R001C01	Yes
SPC-APPSEC-FW	03056688	Yes	Yes	Yes	Yes	Yes	-	Yes	-	Yes	V500R001C00	Yes

SPU Card	BOM	SPU Mother Board									First Software Version on Supporting the Board	Hot-swappable?
		SPU-X3-20-O-E8KE	SPU-X8X16-20-O-E8KE	SPU-X3-B	SPU-X3-B2	SPU-X8X16-B	SPU-A-20-O-M	SPU-A-20-O-H	SPU-B-20-O-M	SPU-B-20-O-H		
SPC-IPS-20	03056639	Yes	Yes	Yes	Yes	Yes	-	Yes	-	Yes	V300R001C01	Yes
SPCA-20-O-H&M	03057429	-	Yes	-	Yes	Yes	-	Yes	-	Yes	V500R001C50	Yes

SPU Card	BOM	SPU Mother Board									First Software Version on Supporting the Board	Hot-swappable?
		SPU-X3-20-O-E8KE	SPU-X8X16-20-O-E8KE	SPU-X3-B	SPU-X3-B2	SPU-X8X16-B	SPU-A-20-O-M	SPU-A-20-O-H	SPU-B-20-O-M	SPU-B-20-O-H		
SPCB-20-O-H&M	03057522	-	Yes	-	Yes	Yes	-	Yes	-	Yes	V500R001C50	Yes
SPCA-APPSEC-FW	03057872	-	Yes	-	Yes	Yes	-	Yes	-	Yes	V500R001C80	Yes

SPU Card	BOM	SPU Mother Board									First Software Version on Supporting the Board	Hot-swappable?
		SPU-X3-20-O-E8KE	SPU-X8X16-20-O-E8KE	SPU-X3-B	SPU-X3-B2	SPU-X8X16-B	SPU-A-20-O-M	SPU-A-20-O-H	SPU-B-20-O-M	SPU-B-20-O-H		
SPCB-APPSEC-FW	03057873	-	Yes	-	Yes	Yes	-	Yes	-	Yes	V500R001C80	Yes

Table 1-37 Mappings between FPIC LPUs and cards

FPIC LPU Card	BOM	FPIC LPU Mother Board					First Software Version Supporting the Board	Hot-swappable?
		LPUF-240	LPUF-120	LPUF-101	LPUF-40-A	LPUF-21		
1.4.9.2 12-Port 10Base-T/100Base-TX/1000Base-T-RJ45 FPIC (12x10/100/1000Base-TX-RJ45)	0305G054	-	-	-	-	Yes	V300R01C01	No
1.4.5.2 20-Port 10/100/1000Base-RJ45 FPIC (FW-20X1G-RJ45)	03056890	Yes	Yes	-	-	-	V500R01C50	No
1.4.9.3 12-Port 100Base-FX/1000Base-X-SFP FPIC (12x100/1000Base-SFP)	03056626	-	-	-	-	Yes	V300R01C01	No
1.4.8.2 20-Port 100/1000Base-X-SFP Flexible Card (P40-20xGE/FE-SFP)	03056629	-	-	-	Yes	-	V300R01C01	No
1.4.7.2 24-Port 100/1000Base-X-SFP FPIC (E8KE-X-101-24XGE-SFP)	03056633	Yes	Yes	Yes	-	-	V300R01C01	No

FPIC LPU Card	BOM	FPIC LPU Mother Board					First Software Version Supporting the Board	Hot-swappable?
		LPUF-240	LPUF-120	LPUF-101	LPUF-40-A	LPUF-21		
1.4.9.5 1-port 10GBase LAN/WAN-XFP FPIC (1 x 10GBase LAN/WAN)	03056625	-	-	-	-	Yes	V300 R001 C01	No
1.4.8.3 2-Port 10GBase LAN/WAN-XFP Flexible Card (P40-2x10GBase LAN/WAN-XFP)	03056628	-	-	-	Yes	-	V300 R001 C01	No
1.4.8.4 4-port 10GBase LAN/WAN-XFP FPIC (P40-4x10GBase LAN/WAN-XFP)	0305G07X	-	-	-	Yes	-	V300 R001 C01	No
1.4.9.6 4-Port 10GBase WAN/LAN-XFP FPIC (4x10GBase LAN/WAN)	0305G07W	-	-	-	-	Yes	V300 R001 C01	No
1.4.7.3 4-Port 10G Base LAN-SFP+ FPIC (E8KE-X-101-4X10GE-SFP+)	0305G09L	-	-	Yes	-	-	V300 R001 C01	No

FPIC LPU Card	BOM	FPIC LPU Mother Board					First Software Version Supporting the Board	Hot-swappable?
		LPUF-240	LPUF-120	LPUF-101	LPUF-40-A	LPUF-21		
1.4.7.4 5-Port 10GBase LAN/WAN-SFP+ FPIC A (E8KE-X-101-5X10GE-SFP+)	03056632	Yes	Yes	Yes	-	-	V300R01C01	No
1.4.5.5 6*10GE SFP + Daughter Card (FW-6X10G-SFP+)	03056684	Yes	Yes	-	-	-	V500R01C00	No
1.4.5.6 12*10GE SFP + Daughter Card (FW-12X10G-SFP+)	03056686	Yes	Yes	-	-	-	V500R01C00	No
1.4.7.5 1-Port 40GBase LAN-CFP FPIC A (E8KE-X-101-1X40GE-CFP)	03056631	Yes	Yes	Yes	-	-	V300R01C01	No
1.4.5.9 1*100GE CFP Daughter Card (FW-1X100G-CFP)	03056685	Yes	Yes	-	-	-	V500R01C00	No
1.4.5.7 3-Port 40GBase QSFP+ FPIC (FW-3X40G-QSFP+)	03056848	Yes	Yes	-	-	-	V500R01C50	No

FPIC LPU Card	BOM	FPIC LPU Mother Board					First Software Version Supporting the Board	Hot-swappable?
		LPUF-240	LPUF-120	LPUF-101	LPUF-40-A	LPUF-21		
1.4.9.4 1-port OC-192c/STM-64c POS-XFP FPIC (1 x OC-192c/STM-64c POS-XFP)	0305G055	-	-	-	-	Yes	V300 R001 C01	No

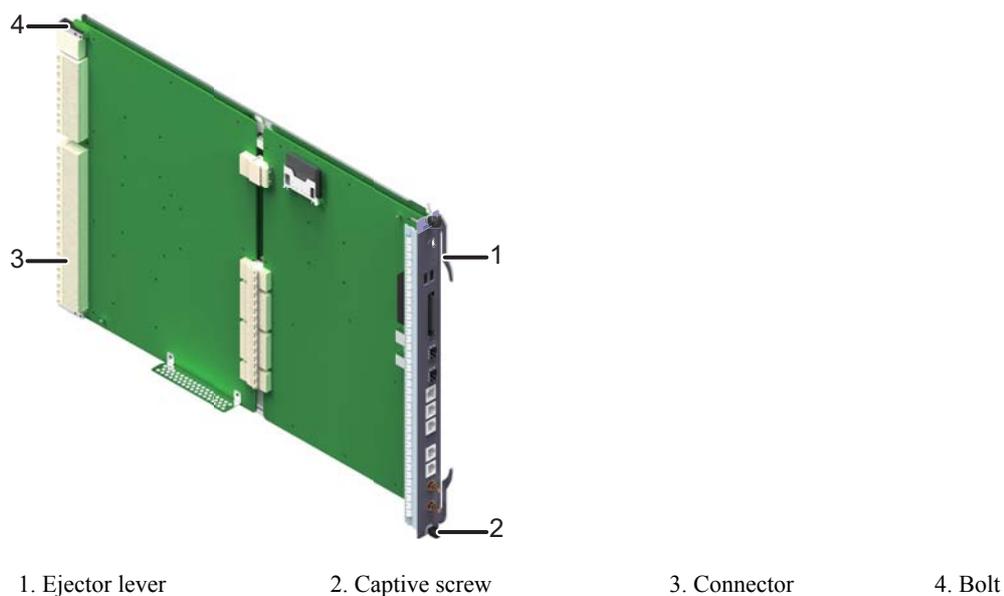
1.4.1.2 Board Structure

This section describes the structures of boards and cards.

Structure of the Integrated Board

The integrated board on the USG9500 is a plug-in board and consists of a circuit board, connectors, upward and downward ejector levers, captive screws, and a bolt, as shown in [Figure 1-44](#).

Figure 1-44 Structure of the integrated board



- 1. Ejector lever
- 2. Captive screw
- 3. Connector
- 4. Bolt

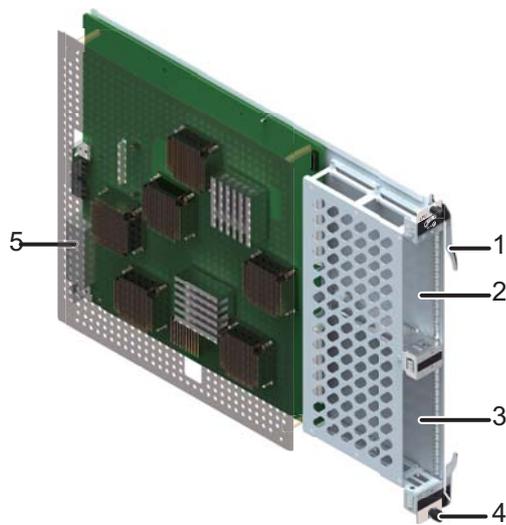
Structure of the Flexible Board

A flexible board consists of two parts:

- Motherboard
- Flexible subcard

The flexible board is a plug-in board and consists of the circuit board, connector, heat sinks, ejector lever, two subcard slots, and captive screws, as shown in [Figure 1-45](#).

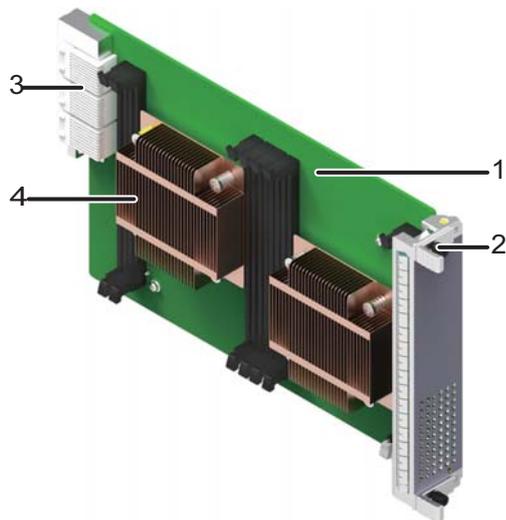
Figure 1-45 Structure of the flexible board



1. Ejector lever 2. Subcard slot 0 3. Subcard slot 1 4. Captive screw 5. Connector

The flexible subcard is a plug-in board and consists of the circuit board, connector, heat sinks, ejector lever, and captive screws, as shown in [Figure 1-46](#).

Figure 1-46 Structure of the flexible subcard



1. Circuit board 2. Captive screw 3. Connector 4. Heat sinks

1.4.1.3 Rules for Numbering Slots and Interfaces

The section describes the rule for numbering board slots, card slots, and interfaces.

Board Slot Numbering

Slots are numbered in order from left to right and top to bottom.

For example, on the USG9560, slot numbers start at 1 and go up to 8, as shown in [Figure 1-47](#).

Figure 1-47 Slot layout on the USG9560



Card Numbering

Slot numbers start from 0. The numbering rules are as follows:

- For cards without subcards, the default subcard slot number is 0, as shown in [Figure 1-48](#).

Figure 1-48 Subcard slot numbering for cards without subcards



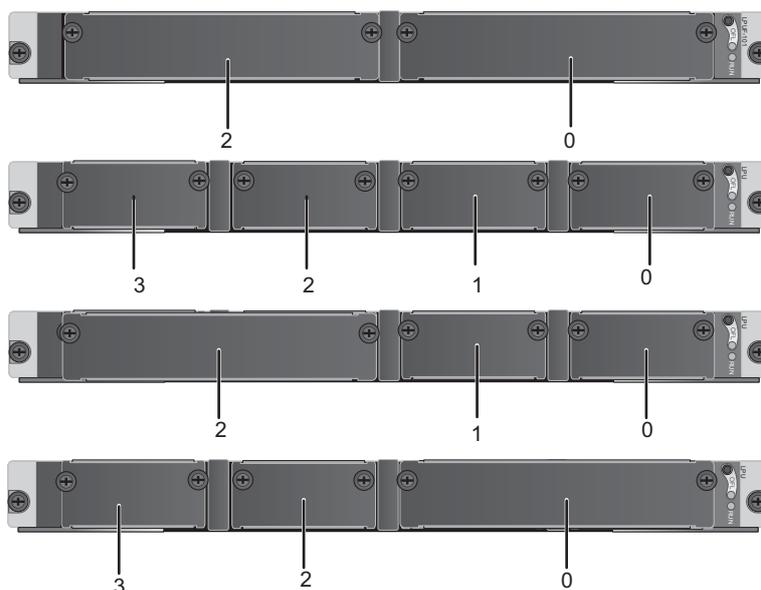
- For cards with subcards, if a card has only half-width subcards, the subcard slot numbers are 0 and 1, as shown in [Figure 1-49](#).

Figure 1-49 Subcard slot numbering for cards providing only half-width subcards



- For cards with subcards, if a card has both half-width and one-quarter-width subcards, such as LPUF-101, the subcard slot number depends on the type of inserted subcards, as shown in [Figure 1-50](#).

Figure 1-50 Subcard slot numbering for cards with half-width and one-quarter-width subcards



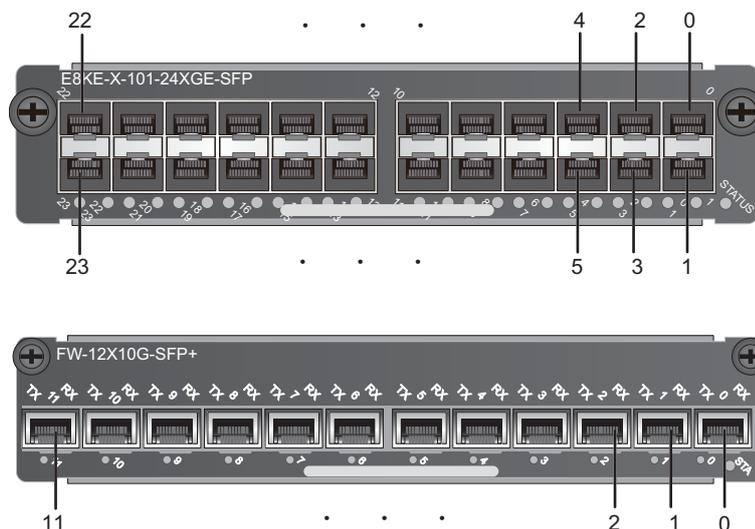
Interface Numbering

Interfaces are named using the format LPU slot/FPIC slot/interface number.

Interfaces are numbered alternating from right to left and top to bottom, beginning at 0.

Interfaces are arranged in one or two rows. [Figure 1-51](#) shows how interfaces are numbered.

Figure 1-51 Interface numbers



For example, on the USG9560, the LPU slot number is 7, the FPIC slot number is 1, and the interface number is 2. Therefore, the interface is named 7/1/2.

NOTE

If the LPU is a fixed interface board, the FPIC slot number is considered 0.

1.4.2 MPUs and SRUs

The MPU/SRU controls the system in a centralized manner and learns routing information. It is the of the system' control center.

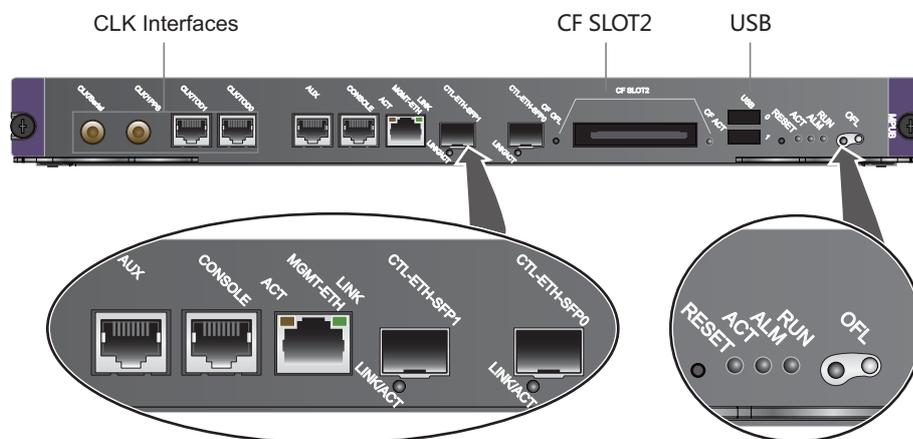
1.4.2.1 EKEX16-FWCD00MPUB00

EKEX16-FWCD00MPUB00 is the USG9580 MPU and is hot-swappable.

Panel

Figure 1-52 shows the EKEX16-FWCD00MPUB00.

Figure 1-52 EKEX16-FWCD00MPUB00 panel



Name	Description
Buttons and indicators on the panel	
OFL button	To remove a board, press and hold the button for six seconds until the OFL indicator turns on. NOTE This button only works on the standby MPU.
OFL indicator (red)	Steady on: You can remove the board.
RUN indicator (green)	<ul style="list-style-type: none"> Blinks every 2 seconds (0.5 Hz): The system is working properly. Blinks twice each second (2 Hz): The system is in the alarm state.
ALM indicator (red)	<ul style="list-style-type: none"> Steady on: The system is in the alarm state. Off: The system is working properly.
ACT active/standby indicator (green)	<ul style="list-style-type: none"> Steady on: The MPU is in the active state. Off: The MPU is in the standby state.

Name	Description
RESET button	The button is used for resetting the MPU. If you press the RESET button, the MPU resets.
CF card slot, button, and indicator	
CF SLOT2	The MPUs of the USG9580 have two CF cards numbered CF card 1 and CF card 2. CF card 1 lies on the circuit board of the MPU and is used to store system files and configuration files. CF card 2 lies on the panel of the MPU and is used to store logs and alarms.
CF ACT indicator (green)	<ul style="list-style-type: none"> ● On: The CF card is in position. ● Blinking: Data is being read or written. ● Off: The CF card is not in position or can be removed.
CF OFL button	If you press the CF OFL button, all operations on the CF card will be ended, and the CF card will be powered off.
Interfaces and indicators	
CTL-ETH-SFP interface (1000MBase-X)	It is reserved for use after capacity expansion.
SFP LINK/ACT indicator (green)	<ul style="list-style-type: none"> ● Steady on: The link is normal. ● Blinking: Data is being transmitted.
MGMT-ETH interface (10M/100M/1000M Base-TX auto-sensing)	It connects to the NMS workstation and has LINK and ACT indicators.
MGMT-ETH LINK indicator (green) (on Ethernet network interfaces)	<ul style="list-style-type: none"> ● Steady on: The link is normal. ● Off: The link is Down.
MGMT-ETH ACT indicator (amber) (on Ethernet interfaces)	<ul style="list-style-type: none"> ● Blinking: Data is being transmitted. ● Off: No data is being transmitted.
Console interface	It connects to the console for on-site configuration of the system.
AUX interface	It connects to the Modem for remote maintenance through dialing.
Others	
USB interface	It is not used and reserved.
CLK/TOD0	They are reserved to input or output clock signals.
CLK/TOD1	
CLK/1PPS	

Name	Description
CLK/Serial	

Interface Attributes

Table 1-38 lists the 1000MBase-X-SFP interface attributes.

Table 1-38 1000MBase-X-SFP interface attributes

Attribute	Description
Connector type	SFP
Operation mode	1000M fiber
Standards compliance	IEEE 802.3-2002
Cable specification	Single-mode or multi-mode fibers

Table 1-39 lists the attributes of the 10Base-T/100Base-TX/1000Base-T-RJ45 interfaces.

Table 1-39 10Base-T/100Base-TX/1000Base-T-RJ45 interface attributes

Attribute	Description
Connector type	RJ45
Operation mode	10M/100M/1000M auto-sensing interfaces, supporting full-duplex mode
Standards compliance	IEEE 802.3-2002
Cable specification	Category 5 unshielded twisted pair (UTP) cables recommended when the interface rate is 10 Mbit/s or 100 Mbit/s; super category 5 Shielded Twisted Pair (STP) cables recommended when the interface rate is 1000 Mbit/s

Table 1-40 lists the console interface attributes.

Table 1-40 Console interface attributes

Attribute	Description
Connector type	RJ45
Operation mode	Duplex Universal Asynchronous Receiver/Transmitter (UART)
Electrical attribute	RS-232

Attribute	Description
Baud rate	9600 bit/s (default value), adjustable
Data equipment type	Data Circuit-terminating Equipment (DCE)
Cable specification	8-core shielded cable

Table 1-41 lists the AUX interface attributes.

Table 1-41 AUX interface attributes

Attribute	Description
Connector type	RJ45
Operation mode	Duplex UART
Electrical attribute	RS-232
Baud rate	9600 bit/s (default value), adjustable
Data equipment type	Data Terminal Equipment (DTE)
Cable specification	8-core shielded cable

Technical Specifications

Table 1-42 lists the technical specifications of the EKEX16-FWCD00MPUB00.

Table 1-42 Technical specifications of the EKEX16-FWCD00MPUB00

Item	Specifications
Board silkscreen name	MPUB
Dimensions (width x depth x height)	398.5 mm x 554 mm x 40.5 mm
Typical power consumption	85 W
Maximum power consumption	95 W
Typical heat consumption	290 BTU/hour
Maximum heat consumption	324.2 BTU/hour
Board weight	4.2 kg

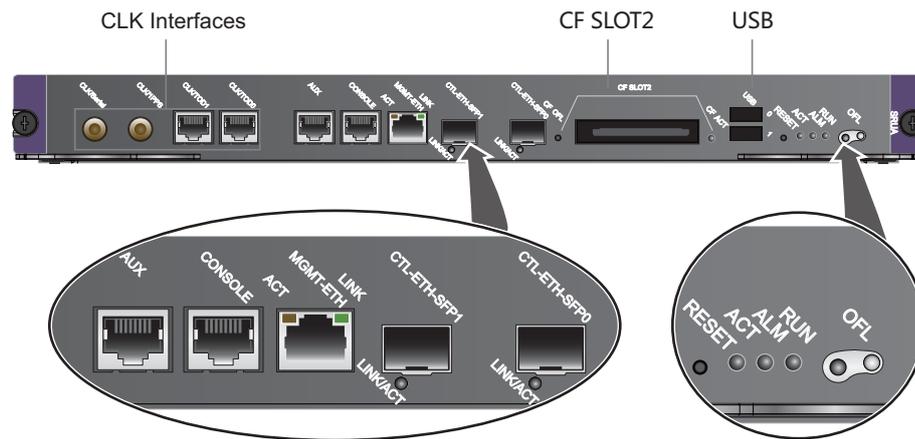
1.4.2.2 E8KE-X8-SRUA-200

E8KE-X8-SRUA-200 is the USG9560 SRU. E8KE-X8-SRUA-200 integrates a main control unit and a switch fabric unit for data switching and is hot-swappable.

Panel

Figure 1-53 shows E8KE-X8-SRUA-200.

Figure 1-53 E8KE-X8-SRUA-200



Name	Description
Buttons and indicators on the panel	
OFL button	To remove a board, press and hold the button for six seconds until the OFL indicator turns on. NOTE This button works only on the standby SRU.
OFL indicator (red)	Steady on: You can remove the board.
RUN indicator (green)	<ul style="list-style-type: none"> Blinks every 2 seconds (0.5 Hz): The system is working properly. Blinks twice each second (2 Hz): The system is in the alarm state.
ALM indicator (red)	<ul style="list-style-type: none"> Steady on: The system is in the alarm state. Off: The system is working properly.
ACT active/standby indicator (green)	<ul style="list-style-type: none"> Steady on: The SRU is in the active state. Off: The SRU is in the standby state.
RESET button	The button is used for resetting the SRU. If you press the RESET button, the SRU resets.
CF card slot, button, and indicator	

Name	Description
CF SLOT2	SRUs of the USG9560 have two CF cards numbered CF card 1 and CF card 2. CF card 1 lies on the circuit board of the SRU and stores system files and configuration files. CF card 2 lies on the panel of the SRU and stores logs and alarms.
CF ACT indicator (green)	<ul style="list-style-type: none"> ● On: The CF card is in position. ● Blinking: Data is being read or written. ● Off: The CF card is not in position or can be removed.
CF OFL button	If you press the CF OFL button, all operations on the CF card will be ended, and the CF card will be powered off.
Interfaces and indicators	
CTL-ETH-SFP interface (1000MBase-X)	It is reserved for use after capacity expansion.
SFP LINK/ACT indicator (green)	<ul style="list-style-type: none"> ● Steady on: The link is normal. ● Blinking: Data is being transmitted.
MGMT-ETH interface (10M/100M/1000M Base-TX auto-sensing)	It connects to the NMS workstation and has LINK and ACT indicators.
MGMT-ETH LINK indicator (green) (on Ethernet network interfaces)	<ul style="list-style-type: none"> ● Steady on: The link is normal. ● Off: The link is Down.
MGMT-ETH ACT indicator (amber) (on Ethernet interfaces)	<ul style="list-style-type: none"> ● Blinking: Data is being transmitted. ● Off: No data is being transmitted.
Console interface	It connects to the console for on-site configuration of the system.
AUX interface	It connects to the Modem for remote maintenance through dialing.
Others	
USB interface	It is not used and reserved.
CLK/TOD0	They are reserved to input or output clock signals.
CLK/TOD1	
CLK/1PPS	
CLK/Serial	

Interface Attributes

Table 1-43 lists the 1000MBase-X-SFP interface attributes.

Table 1-43 1000MBase-X-SFP interface attributes

Attribute	Description
Connector type	SFP
Operation mode	1000M fiber
Standards compliance	IEEE 802.3-2002
Cable specification	Single-mode or multi-mode fibers

Table 1-44 lists the attributes of the 10Base-T/100Base-TX/1000Base-T-RJ45 interfaces.

Table 1-44 10Base-T/100Base-TX/1000Base-T-RJ45 interface attributes

Attribute	Description
Connector type	RJ45
Operation mode	10M/100M/1000M auto-sensing interfaces, supporting full-duplex mode
Standards compliance	IEEE 802.3-2002
Cable specification	Category 5 unshielded twisted pair (UTP) cables recommended when the interface rate is 10 Mbit/s or 100 Mbit/s; super category 5 Shielded Twisted Pair (STP) cables recommended when the interface rate is 1000 Mbit/s

Table 1-45 lists the console interface attributes.

Table 1-45 Console interface attributes

Attribute	Description
Connector type	RJ45
Operation mode	Duplex Universal Asynchronous Receiver/Transmitter (UART)
Electrical attribute	RS-232
Baud rate	9600 bit/s (default value), adjustable
Data equipment type	Data Circuit-terminating Equipment (DCE)
Cable specification	8-core shielded cable

Table 1-46 lists the AUX interface attributes.

Table 1-46 AUX interface attributes

Attribute	Description
Connector Type	RJ45
Operation mode	Duplex UART
Electrical attribute	RS-232
Baud rate	9600 bit/s (default value), adjustable
Data equipment type	Data Terminal Equipment (DTE)
Cable specification	8-core shielded cable

Technical Specifications

Table 1-47 shows the technical specifications of the E8KE-X8-SRUA-200.

Table 1-47 Technical specifications of the E8KE-X8-SRUA-200

Item	Specifications
Board silkscreen name	SRUA
Dimensions (width x depth x height)	398.5 mm x 554 mm x 35 mm
Typical power consumption	149 W
Maximum power consumption	160 W
Typical heat consumption	508.4 BTU/hour
Maximum heat consumption	545.9 BTU/hour
Board weight	4.8 kg

1.4.2.3 E8KE-X3-MPU

E8KE-X3-MPU is the USG9520 MPU. It is hot-swappable.

Panel

Figure 1-54 shows the appearance of the E8KE-X3-MPU.

Figure 1-54 Appearance of the E8KE-X3-MPU



NOTE

This MPU uses a USB storage device. This USB storage device is installed on the PCB and is not replaceable. To be compatible with the MPUs that use CF cards as storage devices, the USB storage device is displayed as a CF card during a file operation, while is displayed as USB during an MPU restart.

Name	Description
Buttons and indicators on the panel	
OFL button	To remove a board, press and hold the button for six seconds until the OFL indicator turns on. NOTE This button takes effect only on the slave MPU.
OFL indicator (red)	Steady on: You can remove the board.
RUN indicator (green)	<ul style="list-style-type: none"> ● Blinks every two seconds (0.5 Hz): The system is working properly. ● Blinks twice each second (2 Hz): The system is in the alarm state.
ALM indicator (red)	<ul style="list-style-type: none"> ● Steady on: The system is in the alarm state. ● Off: The system is working properly.
ACT active/standby indicator (green)	<ul style="list-style-type: none"> ● Steady on: The MPU is in the active state. ● Off: The MPU is in the standby state.
RESET button	The button is used for resetting the MPU. If you press the RESET button, you can reset the MPU.
Interfaces and indicators	
MGMT-ETH interface (10M/100M/1000M Base-TX auto-sensing)	It connects to the NMS workstation and has LINK and ACT indicators.
MGMT-ETH LINK indicator (green) (on Ethernet network interfaces)	<ul style="list-style-type: none"> ● Steady on: The link is normal. ● Off: The link is Down.
MGMT-ETH ACT indicator (amber) (on Ethernet interfaces)	<ul style="list-style-type: none"> ● Blinking: Data is being transmitted. ● Off: No data is being transmitted.

Name	Description
Console interface	It connects to the console for on-site configuration of the system.
AUX interface	It connects to the Modem for remote maintenance through dialing.
Others	
CLK	They are reserved to input or output clock signals.
TOD	

Interface Attributes

Table 1-48 lists the attributes of the 10Base-T/100Base-TX/1000Base-T-RJ45 interfaces.

Table 1-48 10Base-T/100Base-TX/1000Base-T-RJ45 interface attributes

Attribute	Description
Connector type	RJ45
Operation mode	10M/100M/1000M auto-sensing interfaces, supporting full-duplex mode
Standards compliance	IEEE 802.3-2002
Cable specification	Category 5 unshielded twisted pair (UTP) cables recommended when the interface rate is 10 Mbit/s or 100 Mbit/s; super category 5 Shielded Twisted Pair (STP) cables recommended when the interface rate is 1000 Mbit/s

Table 1-49 lists the console interface attributes.

Table 1-49 Console interface attributes

Attribute	Description
Connector type	RJ45
Operation mode	Duplex Universal Asynchronous Receiver/Transmitter (UART)
Electrical attribute	RS-232
Baud rate	9600 bit/s (default value), which can be changed as required
Data equipment type	Data Circuit-terminating Equipment (DCE)
Cable specification	8-core shielded cable

Table 1-50 lists the AUX interface attributes.

Table 1-50 AUX interface attributes

Attribute	Description
Connector Type	RJ45
Operation mode	Duplex UART
Electrical attribute	RS-232
Baud rate	9600 bit/s (default value), which can be changed as required
Data equipment type	Data Terminal Equipment (DTE)
Cable specification	8-core shielded cable

Technical Specifications

Table 1-51 shows the technical specifications of the E8KE-X3-MPU.

Table 1-51 Technical specifications of the E8KE-X3-MPU

Item	Description
Silkscreen of the board name	MPU E8KE-X3-MPU
Dimensions (W x D x H)	198.5 mm x 551 mm x 40 mm
Typical power consumption	32 W
Maximum power consumption	35.2 W
Typical heat consumption	109.2 BTU/hour
Maximum heat consumption	120.1 BTU/hour
Board weight	1.7 kg

1.4.2.4 MPUD

MPUD is the USG9520 MPU and is hot-swappable.

MPUD Panel

Figure 1-55 shows the MPUD panel.

NOTE

The CF card is not hot-swappable.

Figure 1-55 MPUD panel

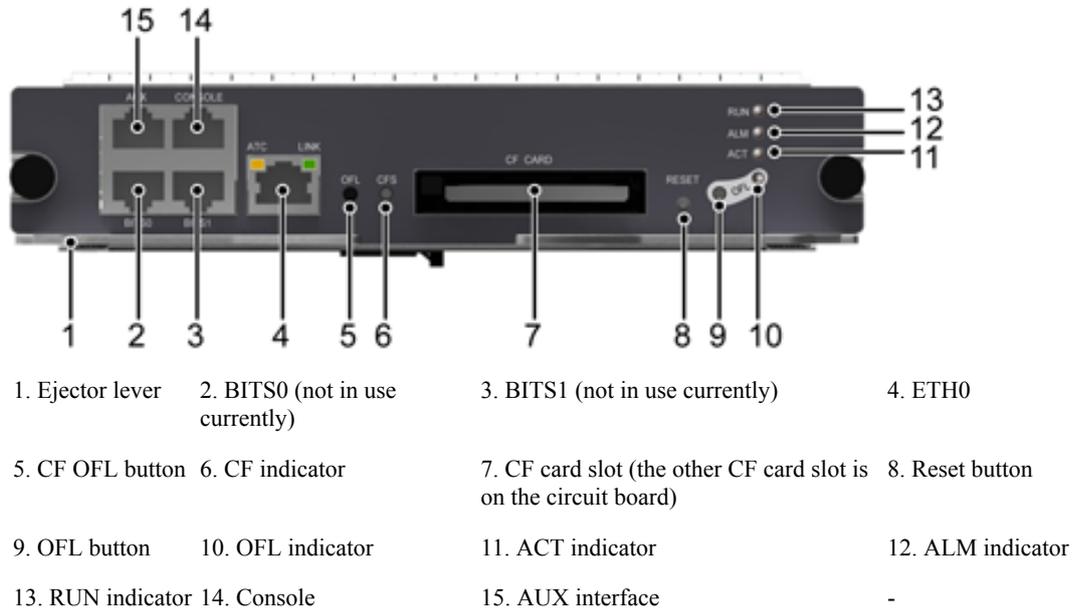


Table 1-52 describes the buttons and indicators on the MPUD panel.

Table 1-52 Buttons and indicators on the MPUD panel

Indicator/Button	Description
OFL button	To remove a board, press and hold the button for six seconds until the OFL indicator turns on. NOTE This button works only on the standby MPUD.
OFL indicator (red)	If the indicator is on, you can remove the board.
RUN indicator (green)	If the indicator blinks once every two seconds (0.5 Hz), the system is in the normal state. If the indicator blinks twice each second (2 Hz), the system is in the alarm state.
ALM indicator (red)	If the indicator is steady on, the system is in the alarm state. If the indicator is steady off, the system is in the normal state.
ACT active/standby indicator (green)	If the indicator is on, the MPUD is in the active state. If the indicator is off, the MPUD is in the standby state.
RESET button	Press this button to reset the MPUD.

Indicator/Button	Description
CF ACT indicator (green)	If the indicator is on, the CF is in the correct position. If the indicator is blinking, data is being read or written. If the indicator is off, the CF is not in the correct position or can be removed.
LINK indicator (green) (on the Ethernet interface)	If the indicator is steady on, the link is normal. If the indicator is off, the link is Down.
ACT indicator (amber) (on Ethernet interfaces)	If the indicator is blinking, data is being transmitted. If the indicator is off, no data is being transmitted.

Table 1-53 describes the interfaces on the MPUD.

Table 1-53 MPUD interfaces

Interface Name	Connector Type	Description
Eth0 (10M/100M/1000M Base-TX auto-sensing)	RJ45	Connects to the NMS workstation and has LINK and ACT indicators.
Console interface	RJ45	Connects to the console for on-site configuration of the system.
AUX interface	RJ45	Connects to the Modem for remote maintenance through dialing.
CF card interface	TYPE II standard (compatible with TYPE I standard)	Used to hold a CF card to store data files as a massive storage device.

Interface Attributes

Table 1-54 lists the attributes of the 10Base-T/100Base-TX/1000Base-T-RJ45 interfaces.

Table 1-54 10Base-T/100Base-TX/1000Base-T-RJ45 interface attributes

Attribute	Description
Connector type	RJ45
Operation mode	10M/100M/1000M auto-sensing interfaces, supporting full-duplex mode
Standards compliance	IEEE 802.3-2002

Attribute	Description
Cable specification	Category 5 unshielded twisted pair (UTP) cables recommended when the interface rate is 10 Mbit/s or 100 Mbit/s; super category 5 Shielded Twisted Pair (STP) cables recommended when the interface rate is 1000 Mbit/s

Table 1-55 lists the console interface attributes.

Table 1-55 Console interface attributes

Attribute	Description
Connector type	RJ45
Operation mode	Duplex Universal Asynchronous Receiver/Transmitter (UART)
Electrical attribute	RS-232
Baud rate	9600 bit/s (default value), adjustable
Data equipment type	Data Circuit-terminating Equipment (DCE)
Cable specification	8-core shielded cable

Table 1-56 lists the AUX interface attributes.

Table 1-56 AUX interface attributes

Attribute	Description
Connector type	RJ45
Operation mode	Duplex UART
Electrical attribute	RS-232
Baud rate	9600 bit/s (default value), adjustable
Data equipment type	Data Terminal Equipment (DTE)
Cable specification	8-core shielded cable

Technical Specifications

Table 1-57 lists the technical specifications of the MPUD.

Table 1-57 Technical specifications of the MPUD

Item	Specifications
Board silkscreen name	MPUD
Dimensions (width x depth x height)	198.5 mm x 551 mm x 40 mm
Typical power consumption	41 W
Maximum power consumption	41 W
Typical heat consumption	139.9 BTU/hour
Maximum heat consumption	139.9 BTU/hour
Board weight	2 kg

1.4.3 SFUs

SFUs are responsible for data switching between boards. The USG9520 does not support SFUs.

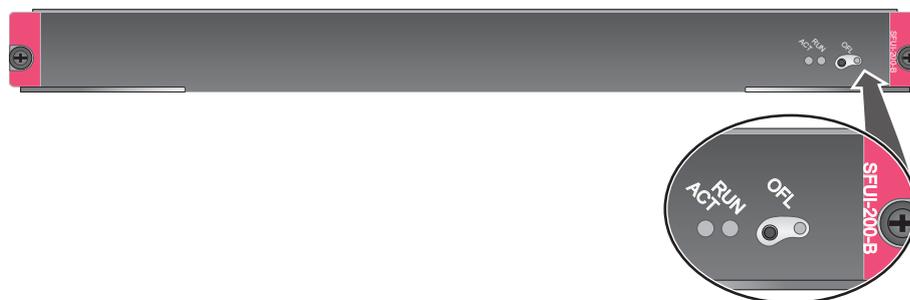
1.4.3.1 E8KE-X16-SFUC-200SP

E8KE-X16-SFUC-200SP is the USG9580 SFU. It uses non-blocking switch fabric, is hot-swappable, and is responsible for data switching of the entire system.

Panel

Figure 1-56 shows the E8KE-X16-SFUC-200SP.

Figure 1-56 E8KE-X16-SFUC-200SP



Name	Description
OFL button	To remove a board, press and hold the button for six seconds until the OFL indicator turns on.
OFL indicator (red)	Steady on: You can remove the board.
RUN indicator (green)	<ul style="list-style-type: none"> ● Blinks every 2 seconds (0.5 Hz): The system is working properly. ● Blinks twice each second (2 Hz): The system is in the alarm state.
ACT (green)	<ul style="list-style-type: none"> ● Steady on: The SFU is working properly. ● Off: The SFU is faulty.

Interface Attributes

The E8KE-X16-SFUC-200SP does not have external interfaces.

Technical Specifications

Table 1-58 shows the technical specifications of the E8KE-X16-SFUC-200SP.

Table 1-58 Technical specifications of the E8KE-X16-SFUC-200SP

Item	Specifications
Board silkscreen name	SFUI-200-B
Dimensions (width x depth x height)	410 mm x 553.5 mm x 40.5 mm
Typical power consumption	90 W
Maximum power consumption	100 W
Typical heat consumption	307.1 BTU/hour
Maximum heat consumption	341.2 BTU/hour
Board weight	4.26 kg

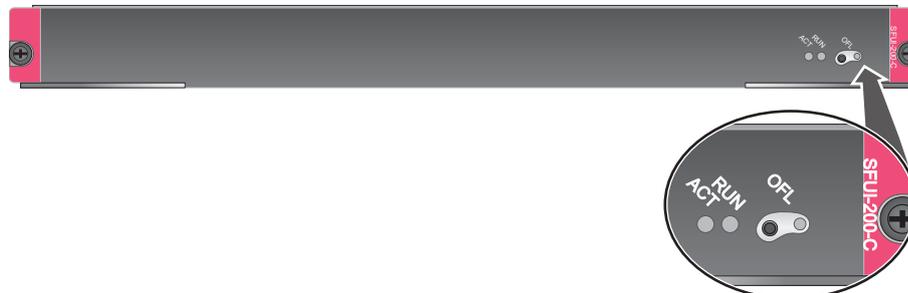
1.4.3.2 E8KE-X8-SFUC-200

E8KE-X8-SFUC-200 is the USG9560 SFU. It uses non-blocking switch fabric, is hot-swappable, and is responsible for data switching of the entire system.

Panel

Figure 1-57 shows the E8KE-X8-SFUC-200.

Figure 1-57 E8KE-X8-SFUC-200



Name	Description
OFL button	To remove a board, press and hold the button for six seconds until the OFL indicator turns on.
OFL indicator (red)	Steady on: You can remove the board.
RUN indicator (green)	<ul style="list-style-type: none"> ● Blinks every 2 seconds (0.5 Hz): The system is working properly. ● Blinks twice each second (2 Hz): The system is in the alarm state.
ACT (green)	<ul style="list-style-type: none"> ● Steady on: The SFU is working properly. ● Off: The SFU is faulty.

Interface Attributes

The E8KE-X8-SFUC-200 does not have external interfaces.

Technical Specifications

Table 1-59 shows the technical specifications of the E8KE-X8-SFUC-200.

Table 1-59 Technical specifications of the E8KE-X8-SFUC-200

Item	Specifications
Specifications	SFUI-200-C
Dimensions (width x depth x height)	400 mm x 553.5 mm x 35 mm
Typical power consumption	77 W

Item	Specifications
Maximum power consumption	90 W
Typical heat consumption	262.7 BTU/hour
Maximum heat consumption	307.1 BTU/hour
Board weight	3.82 kg

1.4.4 SPUs and SPCs

SPUs are responsible for security service processing.

1.4.4.1 X3 SPU (SPU-X3-B)

The SPU-X3-B is a motherboard used in the USG9520. By default, it does not have any service processing capability and must be used together with subcards. The board has two slots, and each slot can house a firewall SPC or an application security SPC.

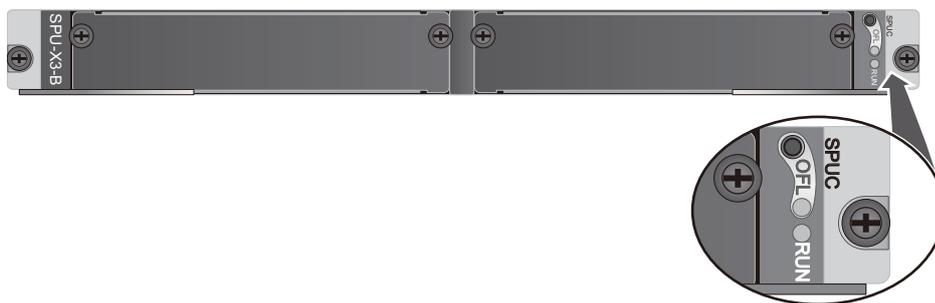
The SPU-X3-B goes into the LPU/SPU slot of the USG9520.

The board is hot-swappable.

Panel

Figure 1-58 shows the SPU-X3-B.

Figure 1-58 SPU-X3-B



Name	Description
OFL button	To remove a board, press and hold the button for six seconds until the OFL indicator turns on.
OFL indicator (red)	Steady on: You can remove the board.

Name	Description
RUN indicator (green)	<ul style="list-style-type: none"> ● Blinks every 2 seconds (0.5 Hz): The board is working properly. ● Blinks four each second (4 Hz): The board is in the alarm state or starting and not registered.

Interface Attributes

The SPU-X3-B does not have external interfaces.

Technical Specifications

Table 1-60 lists the technical specifications of the SPU-X3-B.

Table 1-60 Technical specifications of the SPU-X3-B

Item	Specifications
Board silkscreen name	SPUC SPU-X3-B
Dimensions (width x depth x height)	400 mm x 520 mm x 41 mm
Typical power consumption	116 W
Maximum power consumption	127.6 W
Typical heat consumption	395.8 BTU/hour
Maximum heat consumption	435.4 BTU/hour
Board weight	5.23 kg
Maximum input voltage range (DC)	-72 V to -38 V
CPU	1.2 GHz

1.4.4.2 X3 SPU (SPU-X3-B2)

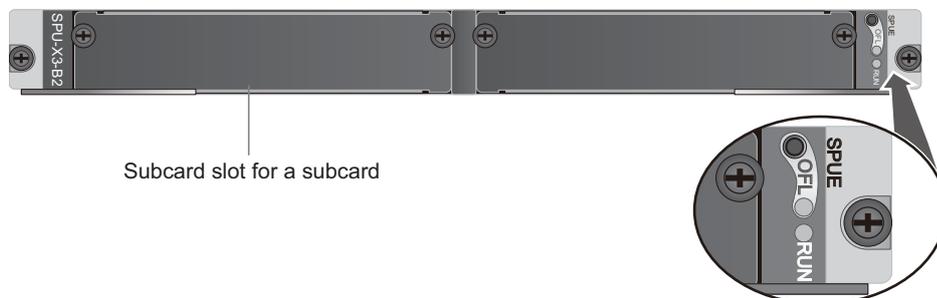
The SPU-X3-B2 is a motherboard that works with the USG9520. By default, this board does not have any service processing capability and must be used together with subcards. It has one available slot that can house a firewall SPC or application security SPC.

The SPU-X3-B2 is inserted into the LPU/SPU slot of the USG9520.

Panel

Figure 1-59 shows the SPU-X3-B2.

Figure 1-59 SPU-X3-B2



Name	Description
OFL button	To remove a board, press and hold the button for six seconds until the OFL indicator turns on.
OFL indicator (red)	Steady on: You can remove the board.
RUN indicator (green)	<ul style="list-style-type: none"> Blinks every 2 seconds (0.5 Hz): The board is working properly. Blinks four each second (4 Hz): The board is in the alarm state or starting and not registered.

Interface Attributes

The SPU-X3-B2 does not have external interfaces.

Technical Specifications

Table 1-61 lists the technical specifications of the SPU-X3-B2.

Table 1-61 Technical specifications of the SPU-X3-B2

Item	Specifications
Board silkscreen name	SPUE SPU-X3-B2
Dimensions (width x depth x height)	400 mm x 520 mm x 41 mm
Typical power consumption	80 W
Maximum power consumption	100 W

Item	Specifications
Typical heat consumption	273 BTU/hour
Maximum heat consumption	341.2 BTU/hour
Board weight	5.18 kg
Maximum input voltage range (DC)	-72 V to -38 V
CPU	1.6 GHz

1.4.4.3 X8&X16 SPU (SPU-X8X16-B)

The SPU-X8X16-B is a motherboard used in the USG9560 and USG9580. By default, it does not have any service processing capability and must be used together with subcards. Each slot can house a firewall SPC or an application security SPC.

The SPU-X8X16-B goes into the LPU/SPU slot of the USG9560 and USG9580.

The board is hot-swappable.

Panel

Figure 1-60 shows the SPU-X8X16-B.

Figure 1-60 Appearance of the SPU-X8X16-B



Name	Description
OFL button	To remove a board, press and hold the button for six seconds until the OFL indicator turns on.
OFL indicator (red)	Steady on: You can remove the board.

Name	Description
RUN indicator (green)	<ul style="list-style-type: none"> ● Blinks every 2 seconds (0.5 Hz): The board is working properly. ● Blinks four each second (4 Hz): The board is in the alarm state or starting and not registered.

Interface Attributes

The SPU-X8X16-B does not have external interfaces.

Technical Specifications

Table 1-62 lists the technical specifications of the SPU-X8X16-B.

Table 1-62 Technical specifications of the SPU-X8X16-B

Item	Specifications
Board silkscreen name	SPUD SPU-X8X16-B
Dimensions (width x depth x height)	400 mm x 520 mm x 41 mm
Typical power consumption	125 W
Maximum power consumption	138 W
Typical heat consumption	426.5 BTU/hour
Maximum heat consumption	470.9 BTU/hour
Board weight	5.34 kg
Maximum input voltage range (DC)	-72 V to -38 V
CPU	1.2 GHz

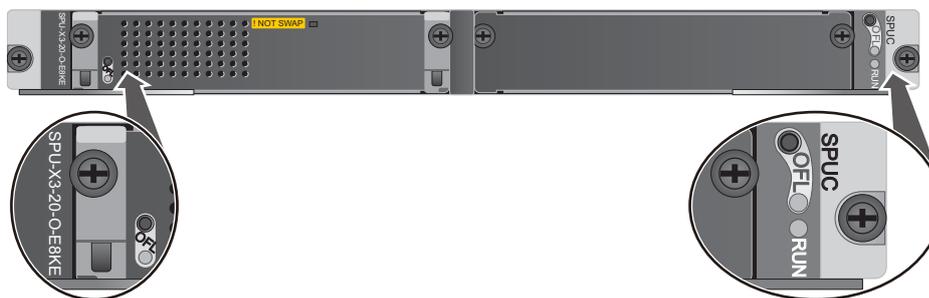
1.4.4.4 Firewall Service Processing Unit (SPU-X3-20-O-E8KE, for USG9520)

The SPU-X3-20-O-E8KE is inserted into the LPU/SPU slot of the USG9520, has an expansion slot, and is hot-swappable.

Panel

Figure 1-61 shows the SPU-X3-20-O-E8KE.

Figure 1-61 SPU-X3-20-O-E8KE



Name	Description
SPU	
OFL button	To remove an SPU, press and hold the OFL button for six seconds until the OFL indicator turns on.
OFL indicator (red)	Steady on: You can remove the SPU.
RUN indicator (green)	<ul style="list-style-type: none"> Blinks every 2 seconds (0.5 Hz): The SPU is running normally. Blinks four times every second (4 Hz): The SPU is in the alarm state or starting but not registered.
SPC	
! NOT SWAP	The SPC and SPU share one sales code in a slot. They both must be replaced at the same time.
OFL button	To remove an SPC, press and hold the OFL button for six seconds until the OFL indicator turns red for one second and then turns off.
OFL indicator	<ul style="list-style-type: none"> If the indicator is green and blinks once every second (1 Hz), the SPC is running normally. If the indicator is green and blinks four times every second (4 Hz), the SPC is in the alarm state or starting but not registered. If the indicator turns red for one second and then turns off, you can safely remove the SPC.

Interface Attributes

The SPU-X3-20-O-E8KE does not have external interfaces.

Technical Specifications

Table 1-63 lists the technical specifications of the SPU-X3-20-O-E8KE.

Table 1-63 Technical specifications of the SPU-X3-20-O-E8KE

Item	Specifications
Board silkscreen name	SPUC SPU-X3-20-O-E8KE
Dimensions (width x depth x height)	400 mm x 520 mm x 41 mm
Typical power consumption	255 W
Maximum power consumption	280.7 W
Typical heat consumption	870.1 BTU/hour
Maximum heat consumption	957.8 BTU/hour
Board weight	6.85 kg
Maximum input voltage range (DC)	-72 V to -38 V
CPU number	2
CPU	1.2 GHz
Memory	DDR3 16 GB/CPU

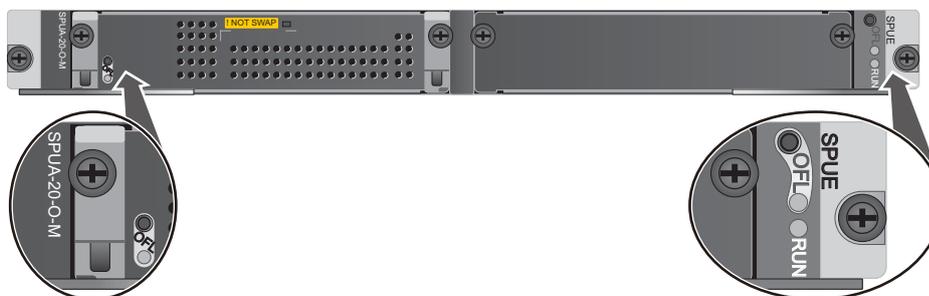
1.4.4.5 Firewall Service Processing Unit (SPUA-20-O-M, for USG9520)

The SPUA-20-O-M is inserted into the LPU/SPU slot of the USG9520, has no expansion slot, and is hot-swappable.

Panel

Figure 1-62 shows the SPUA-20-O-M.

Figure 1-62 SPUA-20-O-M



Name	Description
SPU	
OFL button	To remove an SPU, press and hold the OFL button for six seconds until the OFL indicator turns on.
OFL indicator (red)	Steady on: You can remove the SPU.
RUN indicator (green)	<ul style="list-style-type: none"> ● Blinks every 2 seconds (0.5 Hz): The SPU is running normally. ● Blinks four times every second (4 Hz): The SPU is in the alarm state or starting but not registered.
SPC	
! NOT SWAP	The SPC and SPU share one sales code in a slot. They both must be replaced at the same time.
OFL button	To remove an SPC, press and hold the OFL button for six seconds until the OFL indicator turns red for one second and then turns off.
OFL indicator	<ul style="list-style-type: none"> ● If the indicator is green and blinks once every second (1 Hz), the SPC is running normally. ● If the indicator is green and blinks four times every second (4 Hz), the SPC is in the alarm state or starting but not registered. ● If the indicator turns red for one second and then turns off, you can safely remove the SPC.

Interface Attributes

The SPUA-20-O-M does not have external interfaces.

Technical Specifications

Table 1-64 lists the technical specifications of the SPUA-20-O-M.

Table 1-64 Technical specifications of the SPUA-20-O-M

Item	Specifications
Board silkscreen name	SPUE SPUA-20-O-M
Dimensions (width x depth x height)	400 mm x 520 mm x 41 mm
Typical power consumption	180 W

Item	Specifications
Maximum power consumption	195 W
Typical heat consumption	614.2 BTU/hour
Maximum heat consumption	665.4 BTU/hour
Board weight	6.48 kg
Maximum input voltage range (DC)	-72 V to -38 V
CPU number	1
CPU	1.6 GHz
Memory	DDR4 32GB

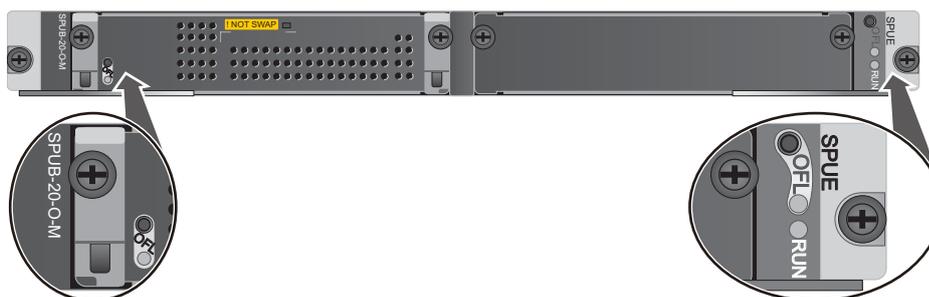
1.4.4.6 Firewall Service Processing Unit (SPUB-20-O-M, for USG9520)

The SPUB-20-O-M is inserted into the LPU/SPU slot of the USG9520, provides no expansion slot, and is hot-swappable.

Panel

Figure 1-63 shows the SPUB-20-O-M.

Figure 1-63 SPUB-20-O-M



Name	Description
SPU	
OFL button	To remove an SPU, press and hold the OFL button for six seconds until the OFL indicator turns on.
OFL indicator (red)	Steady on: You can remove the SPU.

Name	Description
RUN indicator (green)	<ul style="list-style-type: none"> ● Blinks every 2 seconds (0.5 Hz): The SPU is running normally. ● Blinks four times every second (4 Hz): The SPU is in the alarm state or starting but not registered.
SPC	
! NOT SWAP	The SPC and SPU share one sales code in a slot. They both must be replaced at the same time.
OFL button	To remove an SPC, press and hold the OFL button for six seconds until the OFL indicator turns red for one second and then turns off.
OFL indicator	<ul style="list-style-type: none"> ● If the indicator is green and blinks once every second (1 Hz), the SPC is running normally. ● If the indicator is green and blinks four times every second (4 Hz), the SPC is in the alarm state or starting but not registered. ● If the indicator turns red for one second and then turns off, you can safely remove the SPC.

Interface Attributes

The SPUB-20-O-M does not have external interfaces.

Technical Specifications

[Table 1-65](#) lists the technical specifications of the SPUB-20-O-M.

Table 1-65 Technical specifications of the SPUB-20-O-M

Item	Specifications
Board silkscreen name	SPUE SPUB-20-O-M
Dimensions (width x depth x height)	400 mm x 520 mm x 41 mm
Typical power consumption	280 W
Maximum power consumption	300 W
Typical heat consumption	955.4 BTU/hour

Item	Specifications
Maximum heat consumption	1023.6 BTU/hour
Board weight	6.6 kg
Maximum input voltage range (DC)	-72 V to -38 V
CPU number	2
CPU	1.6 GHz
Memory	DDR4 32GB/CPU

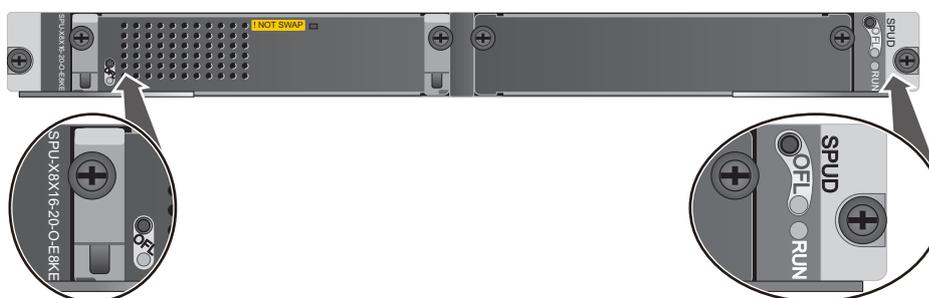
1.4.4.7 Firewall Service Processing Unit (SPU-X8X16-20-O-E8KE, for USG9560/USG9580)

The SPU-X8X16-20-O-E8KE is inserted into the LPU/SPU slot of the USG9560 and USG9580, has an expansion slot, and is hot-swappable.

Panel

Figure 1-64 shows the SPU-X8X16-20-O-E8KE.

Figure 1-64 SPU-X8X16-20-O-E8KE



Name	Description
SPU	
OFL button	To remove an SPU, press and hold the OFL button for six seconds until the OFL indicator turns on.
OFL indicator (red)	Steady on: You can remove the SPU.
RUN indicator (green)	<ul style="list-style-type: none"> Blinks every 2 seconds (0.5 Hz): The SPU is running normally. Blinks four times every second (4 Hz): The SPU is in the alarm state or starting but not registered.

Name	Description
SPC	
! NOT SWAP	The SPC and SPU share one sales code in a slot. They both must be replaced at the same time.
OFL button	To remove an SPC, press and hold the OFL button for six seconds until the OFL indicator turns red for one second and then turns off.
OFL indicator	<ul style="list-style-type: none"> ● If the indicator is green and blinks once every second (1 Hz), the SPC is running normally. ● If the indicator is green and blinks four times every second (4 Hz), the SPC is in the alarm state or starting but not registered. ● If the indicator turns red for one second and then turns off, you can safely remove the SPC.

Interface Attributes

The SPU-X8X16-20-O-E8KE does not have external interfaces.

Technical Specifications

[Table 1-66](#) lists the technical specifications of the SPU-X8X16-20-O-E8KE.

Table 1-66 Technical specifications of the SPU-X8X16-20-O-E8KE

Item	Specifications
Board silkscreen name	SPUD SPU-X8X16-20-O-E8KE
Dimensions (width x depth x height)	400 mm x 520 mm x 41 mm
Typical power consumption	284 W
Maximum power consumption	311.9 W
Typical heat consumption	969 BTU/hour
Maximum heat consumption	1064.2 BTU/hour
Board weight	6.96 kg
Maximum input voltage range (DC)	-72 V to -38 V

Item	Specifications
CPU number	2
CPU	1.2 GHz
Memory	DDR3 16 GB/CPU

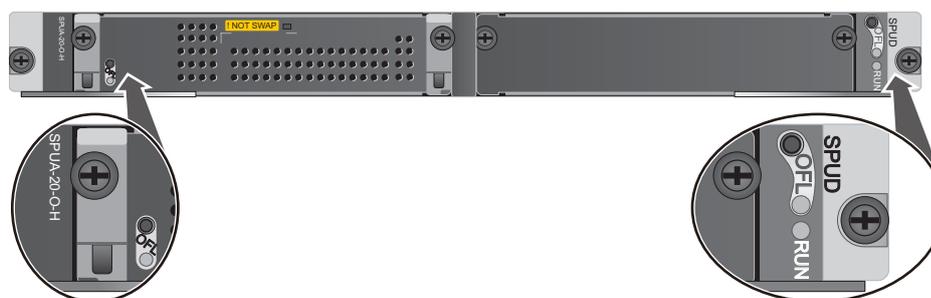
1.4.4.8 Firewall Service Processing Unit (SPUA-20-O-H, for USG9560/USG9580)

The SPUA-20-O-H is inserted into the LPU/SPU slot of the USG9560 and USG9580, provides an expansion slot, and is hot-swappable.

Panel

Figure 1-65 shows the SPUA-20-O-H.

Figure 1-65 SPUA-20-O-H



Name	Description
SPU	
OFL button	To remove an SPU, press and hold the OFL button for six seconds until the OFL indicator turns on.
OFL indicator (red)	Steady on: You can remove the SPU.
RUN indicator (green)	<ul style="list-style-type: none"> Blinks every 2 seconds (0.5 Hz): The SPU is running normally. Blinks four times every second (4 Hz): The SPU is in the alarm state or starting but not registered.
SPC	
! NOT SWAP	The SPC and SPU share one sales code in a slot. They both must be replaced at the same time.
OFL button	To remove an SPC, press and hold the OFL button for six seconds until the OFL indicator turns red for one second and then turns off.

Name	Description
OFL indicator	<ul style="list-style-type: none"> ● If the indicator is green and blinks once every second (1 Hz), the SPC is running normally. ● If the indicator is green and blinks four times every second (4 Hz), the SPC is in the alarm state or starting but not registered. ● If the indicator turns red for one second and then turns off, you can safely remove the SPC.

Interface Attributes

The SPUA-20-O-H does not have external interfaces.

Technical Specifications

[Table 1-67](#) lists the technical specifications of the SPUA-20-O-H.

Table 1-67 Technical specifications of the SPUA-20-O-H

Item	Specifications
Board silkscreen name	SPUD SPUA-20-O-H
Dimensions (width x depth x height)	400 mm x 520 mm x 41 mm
Typical power consumption	215 W
Maximum power consumption	235 W
Typical heat consumption	733.6 BTU/hour
Maximum heat consumption	801.9 BTU/hour
Board weight	6.64 kg
Maximum input voltage range (DC)	-72 V to -38 V
CPU number	1
CPU	1.6 GHz
Memory	DDR4 32GB

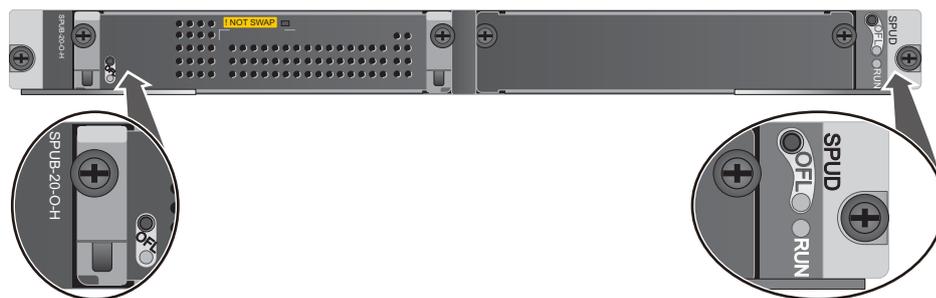
1.4.4.9 Firewall Service Processing Unit (SPUB-20-O-H, for USG9560/USG9580)

The SPUB-20-O-H is inserted into the LPU/SPU slot of the USG9560 and USG9580, provides an expansion slot, and is hot-swappable.

Panel

Figure 1-66 shows the SPUB-20-O-H.

Figure 1-66 SPUB-20-O-H



Name	Description
SPU	
OFL button	To remove an SPU, press and hold the OFL button for six seconds until the OFL indicator turns on.
OFL indicator (red)	Steady on: You can remove the SPU.
RUN indicator (green)	<ul style="list-style-type: none"> Blinks every 2 seconds (0.5 Hz): The SPU is running normally. Blinks four times every second (4 Hz): The SPU is in the alarm state or starting but not registered.
SPC	
! NOT SWAP	The SPC and SPU share one sales code in a slot. They both must be replaced at the same time.
OFL button	To remove an SPC, press and hold the OFL button for six seconds until the OFL indicator turns red for one second and then turns off.
OFL indicator	<ul style="list-style-type: none"> If the indicator is green and blinks once every second (1 Hz), the SPC is running normally. If the indicator is green and blinks four times every second (4 Hz), the SPC is in the alarm state or starting but not registered. If the indicator turns red for one second and then turns off, you can safely remove the SPC.

Interface Attributes

The SPUB-20-O-H does not have external interfaces.

Technical Specifications

Table 1-68 lists the technical specifications of the SPUB-20-O-H.

Table 1-68 Technical specifications of the SPUB-20-O-H

Item	Specifications
Board silkscreen name	SPUD SPUB-20-O-H
Dimensions (width x depth x height)	400 mm x 520 mm x 41 mm
Typical power consumption	320 W
Maximum power consumption	340 W
Typical heat consumption	1091.9 BTU/hour
Maximum heat consumption	1160.1 BTU/hour
Board weight	6.76 kg
Maximum input voltage range (DC)	-72 V to -38 V
CPU number	2
CPU	1.6 GHz
Memory	DDR4 32 GB/CPU

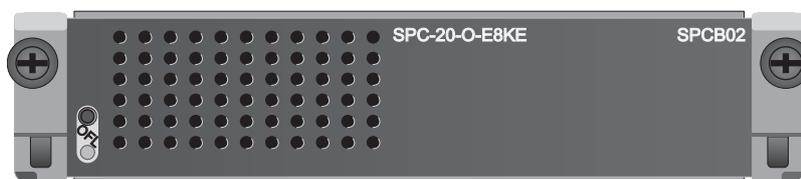
1.4.4.10 Firewall Performance Expansion Card (SPC-20-O-E8KE)

The SPC-20-O-E8KE is a dual-CPU service sub-card of the firewall service board, can be inserted into an SPU slot, and is hot-swappable.

Panel

Figure 1-67 shows the SPC-20-O-E8KE.

Figure 1-67 SPC-20-O-E8KE



Name	Description
OFL button	To remove a board, press and hold the OFL button for six seconds until the OFL indicator turns red for one second and then turns off.
OFL indicator	<ul style="list-style-type: none"> ● If the indicator is green and blinks once every second (1 Hz), the board is running normally. ● If the indicator is green and blinks four times every second (4 Hz), the board is in the alarm state or starting but not registered. ● If the indicator turns red for one second and then turns off, you can safely remove the board.

Interface Attributes

The SPC-20-O-E8KE does not have external interfaces.

Technical Specifications

Table 1-69 lists the technical specifications of the SPC-20-O-E8KE.

Table 1-69 Technical specifications of the SPC-20-O-E8KE

Item	Specifications
Board silkscreen name	SPCB02 SPC-20-O-E8KE
Dimensions (width x depth x height)	175 mm x 280 mm x 36 mm
Typical power consumption	159 W
Maximum power consumption	174.9 W
Typical heat consumption	542.5 BTU/hour
Maximum heat consumption	596.8 BTU/hour
Board weight	1.62 kg
CPU number	2
CPU	1.2 GHz
Memory	DDR3 16 GB/CPU

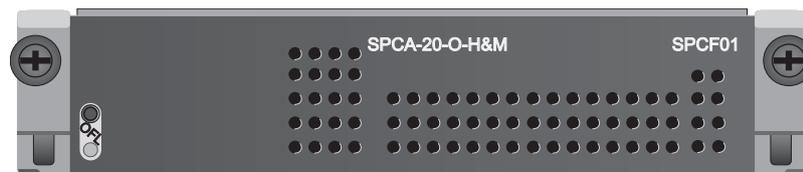
1.4.4.11 Firewall Performance Expansion Card (SPCA-20-O-H&M)

The SPCA-20-O-H&M is a single-CPU service sub-card of the firewall service board, can be inserted into an SPU slot, and is hot-swappable.

Panel

Figure 1-68 shows the SPCA-20-O-H&M.

Figure 1-68 SPCA-20-O-H&M



Name	Description
OFL button	To remove a board, press and hold the OFL button for six seconds until the OFL indicator turns red for one second and then turns off.
OFL indicator	<ul style="list-style-type: none"> ● If the indicator is green and blinks once every second (1 Hz), the board is running normally. ● If the indicator is green and blinks four times every second (4 Hz), the board is in the alarm state or starting but not registered. ● If the indicator turns red for one second and then turns off, you can safely remove the board.

Interface Attributes

The SPCA-20-O-H&M does not have external interfaces.

Technical Specifications

Table 1-70 lists the technical specifications of the SPCA-20-O-H&M.

Table 1-70 Technical specifications of the SPCA-20-O-H&M

Item	Specifications
Board silkscreen name	SPCF01 SPCA-20-O-H&M
Dimensions (width x depth x height)	175 mm x 280 mm x 36 mm

Item	Specifications
Typical power consumption	90 W
Maximum power consumption	100 W
Typical heat consumption	307.1 BTU/hour
Maximum heat consumption	341.2 BTU/hour
Board weight	1.30 kg
CPU number	1
CPU	1.6 GHz
Memory	DDR4 32 GB

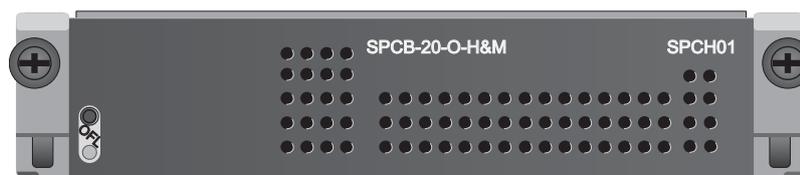
1.4.4.12 Firewall Performance Expansion Card (SPCB-20-O-H&M)

The SPCB-20-O-H&M is a dual-CPU service sub-card of the firewall service board, can be inserted into an SPU slot, and is hot-swappable.

Panel

Figure 1-69 shows the SPCB-20-O-H&M.

Figure 1-69 SPCB-20-O-H&M



Name	Description
OFL button	To remove a board, press and hold the OFL button for six seconds until the OFL indicator turns red for one second and then turns off.

Name	Description
OFL indicator	<ul style="list-style-type: none"> ● If the indicator is green and blinks once every second (1 Hz), the board is running normally. ● If the indicator is green and blinks four times every second (4 Hz), the board is in the alarm state or starting but not registered. ● If the indicator turns red for one second and then turns off, you can safely remove the board.

Interface Attributes

The SPCB-20-O-H&M does not have external interfaces.

Technical Specifications

Table 1-71 lists the technical specifications of the SPCB-20-O-H&M.

Table 1-71 Technical specifications of the SPCB-20-O-H&M

Item	Specifications
Board silkscreen name	SPCH01 SPCB-20-O-H&M
Dimensions (width x depth x height)	175 mm x 280 mm x 36 mm
Typical power consumption	180 W
Maximum power consumption	200 W
Typical heat consumption	614.2 BTU/hour
Maximum heat consumption	682.4 BTU/hour
Board weight	1.42 kg
CPU number	2
CPU	1.6 GHz
Memory	DDR4 32 GB/CPU

1.4.4.13 Application Security Service Processing Card (SPC-APPSEC-FW)

The SPC-APPSEC-FW is a dual-CPU subcard for processing application security services and has an IAE to provide content security. This subcard takes up a slot on the motherboard.

You can insert the SPC-APPSEC-FW independently in a slot on the motherboard or use it together with a firewall SPC on the motherboard. The board is hot-swappable.

Panel

Figure 1-70 shows the SPC-APPSEC-FW.

Figure 1-70 Appearance of the SPC-APPSEC-FW



Name	Description
OFL button	To remove a board, press and hold the OFL button for six seconds until the OFL indicator turns red for one second and then turns off.
OFL indicator	<ul style="list-style-type: none"> ● If the indicator is green and blinks once every second (1 Hz), the board is running normally. ● If the indicator is green and blinks four times every second (4 Hz), the board is in the alarm state or starting but not registered. ● If the indicator turns red for one second and then turns off, you can safely remove the board.

Interface Attributes

The SPC-APPSEC-FW does not have external interfaces.

Technical Specifications

Table 1-72 lists the technical specifications of the SPC-APPSEC-FW.

Table 1-72 Technical specifications of the SPC-APPSEC-FW

Item	Specifications
Board silkscreen name	SPC-APPSEC-FW
Dimensions (width x depth x height)	175 mm x 280 mm x 36 mm
Typical power consumption	159 W

Item	Specifications
Maximum power consumption	174.9 W
Typical heat consumption	542.5 BTU/hour
Maximum heat consumption	596.8 BTU/hour
Board weight	1.62 kg
CPU number	2
CPU	1.2 GHz
Memory	DDR3 16 GB/CPU

1.4.4.14 Application Security Service Processing Card (SPC-IPS-20)

The SPC-IPS-20 is a dual-CPU subcard for processing application security services, which has an IAE to provide content security. This subcard occupies a slot on the mother board. You can insert the SPC-IPS-20 in a slot on the mother board or use it together with a firewall SPC on the motherboard. This board is hot-swappable.

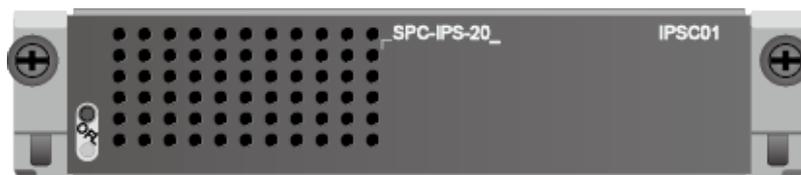
 **NOTE**

With version V300R001, the SPC-IPS-20 only processes the IPS services.

Panel

Figure 1-71 shows the SPC-IPS-20.

Figure 1-71 SPC-IPS-20



Name	Description
OFL button	To remove a board, press and hold the OFL button for six seconds until the OFL indicator turns red for one second and then turns off.

Name	Description
OFL indicator	<ul style="list-style-type: none"> ● If the indicator is green and blinks once every second (1 Hz), the board is running normally. ● If the indicator is green and blinks four times every second (4 Hz), the board is in the alarm state or starting but not registered. ● If the indicator turns red for one second and then turns off, you can safely remove the board.

Interface Attributes

The SPC-IPS-20 does not have external interfaces.

Technical Specifications

Table 1-73 lists the technical specifications of the SPC-IPS-20.

Table 1-73 Technical specifications of the SPC-IPS-20

Item	Specifications
Board silkscreen name	IPSC01 SPC-IPS-20
Dimensions (width x depth x height)	175 mm x 280 mm x 36 mm
Typical power consumption	159 W
Maximum power consumption	174.9 W
Typical heat consumption	542.5 BTU/hour
Maximum heat consumption	596.8 BTU/hour
Board weight	1.8 kg
CPU number	2
CPU	1.2 GHz
Memory	DDR3 16 GB/CPU

1.4.4.15 Enhanced Application Security Service Processing Card A (SPCA-APPSEC-FW)

The SPCA-APPSEC-FW is a single-CPU subcard for processing application security services and has an IAE to provide content security. This subcard takes up a slot on the motherboard. You can insert the SPCA-APPSEC-FW independently in a slot on the motherboard or use it together with a firewall SPC on the motherboard. The board is hot-swappable.

Panel

Figure 1-72 shows the SPCA-APPSEC-FW.

Figure 1-72 SPCA-APPSEC-FW



Name	Description
OFL button	To remove a board, press and hold the OFL button for six seconds until the OFL indicator turns red for one second and then turns off.
OFL indicator	<ul style="list-style-type: none"> ● If the indicator is green and blinks once every second (1 Hz), the board is running normally. ● If the indicator is green and blinks four times every second (4 Hz), the board is in the alarm state or starting but not registered. ● If the indicator turns red for one second and then turns off, you can safely remove the board.

Interface Attributes

The SPCA-APPSEC-FW does not have external interfaces.

Technical Specifications

Table 1-74 lists the technical specifications of the SPCA-APPSEC-FW.

Table 1-74 Technical specifications of the SPCA-APPSEC-FW

Item	Specifications
Board silkscreen name	SPCF01 SPCA-APPSEC-FW

Item	Specifications
Dimensions (width x depth x height)	175 mm x 280 mm x 36 mm
Typical power consumption	90 W
Maximum power consumption	100 W
Typical heat consumption	307.1 BTU/hour
Maximum heat consumption	341.2 BTU/hour
Board weight	1.30 kg
CPU number	1
CPU	1.6 GHz
Memory	DDR4 32 GB

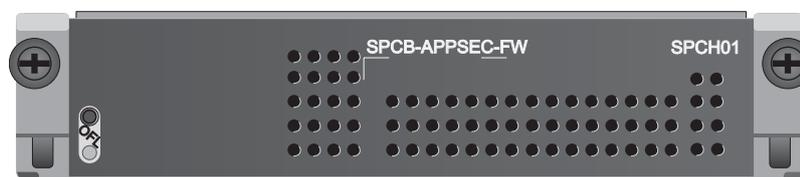
1.4.4.16 Enhanced Application Security Service Processing Card B (SPCB-APPSEC-FW)

The SPCB-APPSEC-FW is a dual-CPU subcard for processing application security services and has an IAE to provide content security. This subcard takes up a slot on the motherboard. You can insert the SPCB-APPSEC-FW independently in a slot on the motherboard or use it together with a firewall SPC on the motherboard. The board is hot-swappable.

Panel

Figure 1-73 shows the SPCB-APPSEC-FW.

Figure 1-73 SPCB-APPSEC-FW



Name	Description
OFL button	To remove a board, press and hold the OFL button for six seconds until the OFL indicator turns red for one second and then turns off.

Name	Description
OFL indicator	<ul style="list-style-type: none"> ● If the indicator is green and blinks once every second (1 Hz), the board is running normally. ● If the indicator is green and blinks four times every second (4 Hz), the board is in the alarm state or starting but not registered. ● If the indicator turns red for one second and then turns off, you can safely remove the board.

Interface Attributes

The SPCB-APPSEC-FW does not have external interfaces.

Technical Specifications

Table 1-75 lists the technical specifications of the SPCB-APPSEC-FW.

Table 1-75 Technical specifications of the SPCB-APPSEC-FW

Item	Specifications
Board silkscreen name	SPCH01 SPCB-APPSEC-FW
Dimensions (width x depth x height)	175 mm x 280 mm x 36 mm
Typical power consumption	180 W
Maximum power consumption	200 W
Typical heat consumption	614.2 BTU/hour
Maximum heat consumption	682.4 BTU/hour
Board weight	1.42 kg
CPU number	2
CPU	1.6 GHz
Memory	DDR4 32 GB/CPU

1.4.5 LPUF-240 and FPICs

The flexible LPU comprises the motherboard (LPUF-240) and multiple flexible cards (subcards), improving networking flexibility. The flexible LPU supports 240G line-rate forwarding, which reduces costs and provides customized solutions for users.

1.4.5.1 LPUF-240

The hot-swappable LPUF-240 supports 240G line-rate forwarding. It supports mixed insertion among different FPICs and has two half-width slots, each of which holds one FPIC.

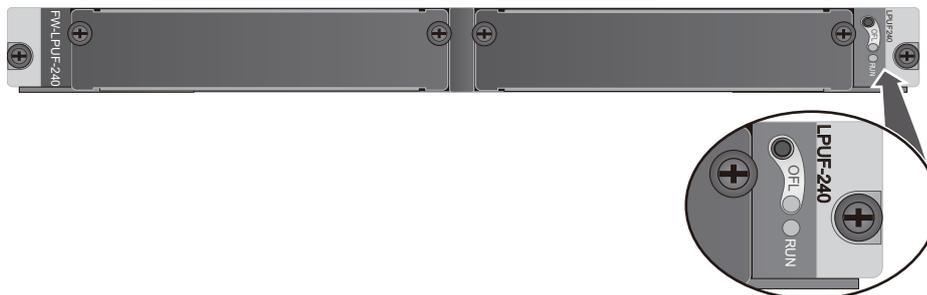
NOTICE

The LPUF-240 does not support the hot swap of FPICs.
The LPUF-240 is not compatible with the USG9520.

Panel

[Figure 1-74](#) shows the LPUF-240.

Figure 1-74 LPUF-240



Name	Description
OFL button	To remove a board, press and hold the button for five seconds until the OFL indicator turns on.
OFL indicator (red)	Steady on: You can remove the board.
RUN indicator (green)	<ul style="list-style-type: none"> Blinks every 2 seconds (0.5 Hz): The system is working properly. Blinks twice each second (2 Hz): The system is in the alarm state.

Interface Attributes

The LPUF-240 does not have external interfaces.

Technical Specifications

Table 1-76 lists the technical specifications of the LPUF-240.

Table 1-76 Technical specifications of the LPUF-240

Item	Specifications
Board silkscreen name	LPUF-240 FW-LPUF-240
Dimensions (width x depth x height)	399.2 mm x 555.2 mm x 40.1 mm
Typical power consumption	353 W
Maximum power consumption	410 W
Typical heat consumption	1204.5 BTU/hour
Maximum heat consumption	1399 BTU/hour
Board weight	9 kg

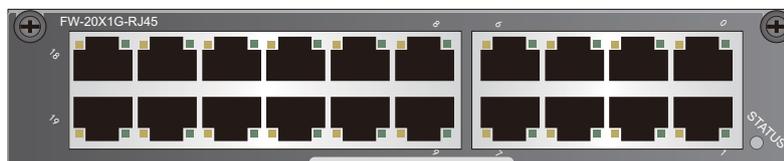
1.4.5.2 20-Port 10/100/1000Base-RJ45 FPIC (FW-20X1G-RJ45)

The FW-20X1G-RJ45 occupies one 1/2-width flexible card slot, is compatible with LPUF-240s, and LPUF-120s, but is not hot-swappable.

Panel

Figure 1-75 shows the FW-20X1G-RJ45.

Figure 1-75 20-port 10/100/1000Base-RJ45 FPIC panel



Component	Description
STATUS (green)	<ul style="list-style-type: none"> ● Blinks every 2 seconds (0.5 Hz): The system is running normally. ● Blinks twice each second (2 Hz): The system is in the alarm state.
LINK (green)/ACT (yellow)	<ul style="list-style-type: none"> ● Steady on: The link is connected. ● Blinking: Data is being transmitted or received. ● Off: The link is disconnected.

Interface Attributes

Table 1-77 lists the attributes of interfaces on FW-20X1G-RJ45.

Table 1-77 FW-20X1G-RJ45 interface attributes

Attribute	Description
Connector type	RJ45
Working mode	10M/100M/1000M adaptive, supporting full duplex
Cable specifications	When the working mode is 10M or 100M, it is recommended that Category 5 unshielded twisted pairs be used. When the working mode is 1000M, it is recommended that super Category 5 unshielded twisted pairs be used.
Frame format	Ethernet_II, Ethernet_SAP, and Ethernet_SNAP
Network protocol	IP

Technical Specifications

Table 1-78 lists the technical specifications of the FW-20X1G-RJ45.

Table 1-78 Technical specifications of the FW-20X1G-RJ45

Item	Specifications
Silk-screen board name	FW-20X1G-RJ45
Dimensions (width x depth x height)	178 mm x 225 mm x 38 mm
Typical power consumption	31 W
Maximum power consumption	34.1 W

Item	Specifications
Typical heat consumption	105.8 BTU/hour
Maximum heat consumption	116.4 BTU/hour
Board weight	0.8 kg

1.4.5.3 24-Port 100/1000 Base-X-SFP FPIC (E8KE-X-101-24XGE-SFP)

The E8KE-X-101-24XGE-SFP occupies one 1/2-width flexible card slot, is compatible with LPUF-240s, LPUF-120s, and LPUF-101s, but is not hot-swappable.

The 24-port 100/1000Base-X-SFP flexible card supports the following features:

- GE optical module, supporting GE optical interface features.
- FE optical module, supporting FE optical interface features.
- Electrical SFP module, supporting 1000M electrical interface feature.
- Mixed insertion among the above modules.

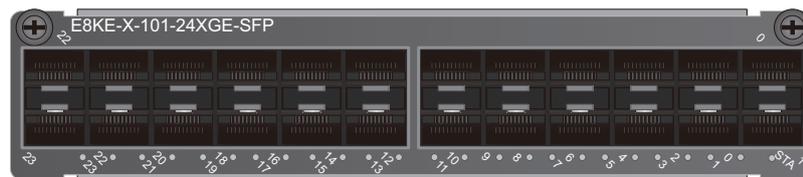
 **NOTE**

Only the interfaces indexed in odd numbers support the electrical interface module.

Panel

Figure 1-76 shows the E8KE-X-101-24XGE-SFP.

Figure 1-76 E8KE-X-101-24XGE-SFP



Name	Description
STATUS (green)	<ul style="list-style-type: none"> ● Blinks every 2 seconds (0.5 Hz): The system is working properly. ● Blinks twice each second (2 Hz): The system is in the alarm state.
Indicator below the interface (green)	<ul style="list-style-type: none"> ● Steady on: The link is connected. ● Blinking: Data is being transmitted or received. ● Off: The link is disconnected.

Interface Attributes

Table 1-79 lists the attributes of interfaces on the E8KE-X-101-24XGE-SFP.

Table 1-79 E8KE-X-101-24XGE-SFP interface attributes

Attribute	Description
Connector type	LC/PC
Optical interface attribute	Compliant with the selected SFP optical module For details about the optional attributes of the optical module, see: <ul style="list-style-type: none"> ● 1.5.1 1 Gbit/s Electrical Transceiver ● 1.5.2 1.25 Gbit/s SFP/eSFP Optical Module
Working mode	Full duplex
Standards compliance	IEEE 802.3-2002
Frame format	Ethernet_II, Ethernet_SAP, Ethernet_SNAP, and 802.3
Network protocol	IP

Technical Specifications

Table 1-80 lists the technical specifications of the E8KE-X-101-24XGE-SFP.

Table 1-80 Technical specifications of the E8KE-X-101-24XGE-SFP

Item	Specifications
Board silkscreen name	E8KE-X-101-24XGE-SFP
Dimensions (width x depth x height)	178 mm x 225 mm x 38 mm
Typical power consumption	37 W
Maximum power consumption	40.7 W
Typical heat consumption	126.2 BTU/hour
Maximum heat consumption	138.9 BTU/hour
Board weight	0.9 kg

1.4.5.4 5-Port 10GBase LAN/WAN-SFP+ FPIC A (E8KE-X-101-5X10GE-SFP+)

The E8KE-X-101-5X10GE-SFP+ occupies one 1/2-width flexible card slot, is compatible with LPUF-240s, LPUF-120s, and LPUF-101s, works in LAN or WAN mode, uses SFP+ optical modules, but is not hot-swappable.

Panel

Figure 1-77 shows the E8KE-X-101-5X10GE-SFP+.

Figure 1-77 E8KE-X-101-5X10GE-SFP+



Name	Description
STATUS (green)	<ul style="list-style-type: none"> ● Blinks every 2 seconds (0.5 Hz): The system is working properly. ● Blinks twice each second (2 Hz): The system is in the alarm state.
L/A (green)	<ul style="list-style-type: none"> ● Steady on: The link is connected. ● Blinking: Data is being transmitted or received. ● Off: The link is disconnected.

Interface Attributes

Table 1-81 lists the attributes of interfaces on the E8KE-X-101-5X10GE-SFP+.

Table 1-81 E8KE-X-101-5X10GE-SFP+ interface attributes

Attribute	Description
Connector type	LC/PC

Attribute	Description
Optical interface attribute	<p>Compliant with the selected SFP+ optical module.</p> <p>For details about the optional attributes of the optical module, see:</p> <ul style="list-style-type: none"> ● 1.5.1 1 Gbit/s Electrical Transceiver ● 1.5.2 1.25 Gbit/s SFP/eSFP Optical Module ● 1.5.4 10 Gbit/s SFP+ Optical Module <p>NOTICE</p> <p>The optical interface of the 10GBase LAN/WAN-SFP+ FPIC supports 1.5.1 1 Gbit/s Electrical Transceiver and 1.5.2 1.25 Gbit/s SFP/eSFP Optical Module in V500R001C60 and later versions. To use 1.5.1 1 Gbit/s Electrical Transceiver and 1.5.2 1.25 Gbit/s SFP/eSFP Optical Module in earlier versions, you need to upgrade the software version.</p>
Working mode	Full-duplex
Frame format	Ethernet_II, Ethernet_SAP, and Ethernet_SNAP
Network protocol	IP

Technical Specifications

[Table 1-82](#) lists the technical specifications of the E8KE-X-101-5X10GE-SFP+.

Table 1-82 Technical specifications of the E8KE-X-101-5X10GE-SFP+

Attribute	Specifications
Board silkscreen name	E8KE-X-101-5X10GE-SFP+
Dimensions (width x depth x height)	203.3 mm x 178.65 mm x 37.2 mm
Typical power consumption	29 W
Maximum power consumption	31.9 W
Typical heat consumption	99 BTU/hour
Maximum heat consumption	108.8 BTU/hour
Board weight	0.9 kg

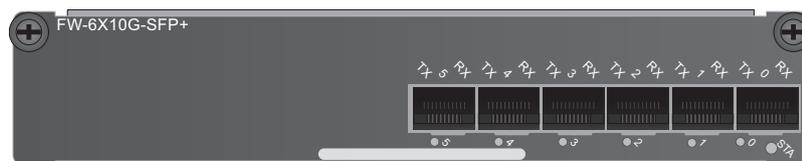
1.4.5.5 6*10GE SFP+ Daughter Card (FW-6X10G-SFP+)

The FW-6X10G-SFP+ occupies one 1/2-width slot, is compatible with LPUF-240s and LPUF-120s, works in LAN or WAN mode, uses SFP+ optical modules, but is not hot-swappable.

Panel

Figure 1-78 shows the FW-6X10G-SFP+.

Figure 1-78 FW-6X10G-SFP+



Name	Description
STA (green)	<ul style="list-style-type: none"> ● Blinks every 2 seconds (0.5 Hz): The system is working properly. ● Blinks twice each second (2 Hz): The system is in the alarm state.
Indicator below the interface (green)	<ul style="list-style-type: none"> ● Steady on: The link is connected. ● Blinking: Data is being transmitted or received. ● Off: The link is disconnected.

Interface Attributes

Table 1-83 lists the attributes of interfaces on the FW-6X10G-SFP+.

Table 1-83 FW-6X10G-SFP+ interface attributes

Attribute	Description
Connector type	LC/PC

Attribute	Description
Optical interface attribute	<p>Compliant with the selected SFP+ optical module.</p> <p>For details about the optional attributes of the optical module, see:</p> <ul style="list-style-type: none"> ● 1.5.1 1 Gbit/s Electrical Transceiver ● 1.5.2 1.25 Gbit/s SFP/eSFP Optical Module ● 1.5.4 10 Gbit/s SFP+ Optical Module <p>NOTICE</p> <p>The optical interface of the 10GBase LAN/WAN-SFP+ FPIC supports 1.5.1 1 Gbit/s Electrical Transceiver and 1.5.2 1.25 Gbit/s SFP/eSFP Optical Module in V500R001C60 and later versions. To use 1.5.1 1 Gbit/s Electrical Transceiver and 1.5.2 1.25 Gbit/s SFP/eSFP Optical Module in earlier versions, you need to upgrade the software version.</p>
Working mode	Full-duplex
Frame format	Ethernet_II, Ethernet_SAP, and Ethernet_SNAP
Network protocol	IP

Technical Specifications

Table 1-84 lists the technical specifications of the FW-6X10G-SFP+.

Table 1-84 Technical specifications of the FW-6X10G-SFP+

Item	Specifications
Board silkscreen name	FW-6X10G-SFP+
Dimensions (width x depth x height)	178 mm x 180 mm x 38 mm
Typical power consumption	34 W
Maximum power consumption	37.4 W
Typical heat consumption	116 BTU/hour
Maximum heat consumption	127.6 BTU/hour
Board weight	0.65 kg

1.4.5.6 12*10GE SFP+ Daughter Card (FW-12X10G-SFP+)

The FW-12X10G-SFP+ occupies one 1/2-width slot, is compatible with LPUF-240s and LPUF-120s, works in LAN or WAN mode, uses SFP+ optical modules, but is not hot-swappable.

Panel

Figure 1-79 shows the FW-12X10G-SFP+.

Figure 1-79 FW-12X10G-SFP+



Name	Description
STA (green)	<ul style="list-style-type: none"> ● Blinks every 2 seconds (0.5 Hz): The system is working properly. ● Blinks twice each second (2 Hz): The system is in the alarm state.
Indicator below the interface (green)	<ul style="list-style-type: none"> ● Steady on: The link is connected. ● Blinking: Data is being transmitted or received. ● Off: The link is disconnected.

Interface Attributes

Table 1-85 lists the attributes of interfaces on the FW-12X10G-SFP+.

Table 1-85 FW-12X10G-SFP+ interface attributes

Attribute	Description
Connector type	LC/PC

Attribute	Description
Optical interface attribute	<p>Compliant with the selected SFP+ optical module.</p> <p>For details about the optional attributes of the optical module, see:</p> <ul style="list-style-type: none"> ● 1.5.1 1 Gbit/s Electrical Transceiver ● 1.5.2 1.25 Gbit/s SFP/eSFP Optical Module ● 1.5.4 10 Gbit/s SFP+ Optical Module <p>NOTICE</p> <p>The optical interface of the 10GBase LAN/WAN-SFP+ FPIC supports 1.5.1 1 Gbit/s Electrical Transceiver and 1.5.2 1.25 Gbit/s SFP/eSFP Optical Module in V500R001C60 and later versions. To use 1.5.1 1 Gbit/s Electrical Transceiver and 1.5.2 1.25 Gbit/s SFP/eSFP Optical Module in earlier versions, you need to upgrade the software version.</p>
Working mode	Full-duplex
Frame format	Ethernet_II, Ethernet_SAP, and Ethernet_SNAP
Network protocol	IP

Technical Specifications

Table 1-86 lists the technical specifications of the FW-12X10G-SFP+.

Table 1-86 Technical specifications of the FW-12X10G-SFP+

Item	Specifications
Board silkscreen name	FW-12X10G-SFP+
Dimensions (width x depth x height)	193 mm x 178.65 mm x 37.2 mm
Typical power consumption	52 W
Maximum power consumption	57.2 W
Typical heat consumption	177.4 BTU/hour
Maximum heat consumption	195.2 BTU/hour
Board weight	0.75 kg

1.4.5.7 3-Port 40GBase QSFP+ FPIC (FW-3X40G-QSFP+)

The FW-3X40G-QSFP+ occupies one 1/2-width flexible card slot, is compatible with LPUF-240s and LPUF-120s, works in LAN mode, uses QSFP+ optical modules, but is not hot-swappable.

Panel

Figure 1-80 shows the FW-3X40G-QSFP+.

Figure 1-80 FW-3X40G-QSFP+



Name	Description
STATUS (green)	<ul style="list-style-type: none"> Blinks every 2 seconds (0.5 Hz): The system is working properly. Blinks twice each second (2 Hz): The system is in the alarm state.
L/A (green)	<ul style="list-style-type: none"> Steady on: The link is connected. Blinking: Data is being transmitted or received. Off: The link is disconnected.

Interface Attributes

Table 1-87 lists the attributes of interfaces on FW-3X40G-QSFP+.

Table 1-87 FW-3X40G-QSFP+ interface attributes

Attribute	Description
Connector type	LC/PC
Optical interface attributes	Compliant with the selected SFP+ optical module. For details about the optional attributes of the optical module, see 1.5.6 40 Gbit/s QSFP+ Optical Module .
Working mode	Full-duplex
Standards compliance	IEEE 802.3-2002
Frame format	Ethernet_II, Ethernet_SAP, and Ethernet_SNAP

Attribute	Description
Network protocol	IP

Technical Specifications

Table 1-88 lists the technical specifications of the FW-3X40G-QSFP+.

Table 1-88 Technical specifications of the FW-3X40G-QSFP+

Item	Specifications
Board silkscreen name	FW-3X40G-QSFP+
Dimensions (width x depth x height)	178 mm x 225 mm x 38 mm
Typical power consumption	50 W
Maximum power consumption	55 W
Typical heat consumption	170.6 BTU/hour
Maximum heat consumption	187.7 BTU/hour
Board weight	0.85 kg

1.4.5.8 1-Port 40GBase LAN-CFP FPIC A (E8KE-X-101-1X40GE-CFP)

The E8KE-X-101-1X40GE-CFP occupies one 1/2-width flexible card slot, is compatible with LPUF-240s, LPUF-120s and LPUF-101s, works in LAN mode, uses CFP optical modules, but is not hot-swappable.

Panel

Figure 1-81 shows the E8KE-X-101-1X40GE-CFP.

Figure 1-81 E8KE-X-101-1X40GE-CFP



Name	Description
STATUS (green)	<ul style="list-style-type: none"> ● Blinks every 2 seconds (0.5 Hz): The system is working properly. ● Blinks twice each second (2 Hz): The system is in the alarm state.
L/A (green)	<ul style="list-style-type: none"> ● Steady on: The link is connected. ● Blinking: Data is being transmitted or received. ● Off: The link is disconnected.

Interface Attributes

Table 1-89 lists the attributes of interfaces on the E8KE-X-101-1X40GE-CFP.

Table 1-89 E8KE-X-101-1X40GE-CFP interface attributes

Attribute	Description
Connector type	LC/PC
Optical interface attribute	Compliant with the selected CFP optical module For details about the optional attributes of the optical module, see 1.5.5 40 Gbit/s CFP Optical Modules .
Working mode	Full duplex
Frame format	Ethernet_II, Ethernet_SAP, and Ethernet_SNAP
Network protocol	IP

Technical Specifications

Table 1-90 lists the technical specifications of the E8KE-X-101-1X40GE-CFP.

Table 1-90 Technical specifications of the E8KE-X-101-1X40GE-CFP

Item	Specifications
Board silkscreen name	E8KE-X-101-1X40GE-CFP
Dimensions (width x depth x height)	178 mm x 225 mm x 38 mm
Typical power consumption	28 W
Maximum power consumption	30.8 W

Item	Specifications
Typical heat consumption	95.5 BTU/hour
Maximum heat consumption	105.1 BTU/hour
Board weight	0.9 kg

1.4.5.9 1*100GE CFP Daughter Card (FW-1X100G-CFP)

The FW-1X100G-CFP occupies one 1/2-width slot, is compatible with LPUF-240s, LPUF-120s and LPUF-101s, works in LAN mode, uses CFP optical modules, but is not hot-swappable.

Panel

Figure 1-82 shows the FW-1X100G-CFP.

Figure 1-82 FW-1X100G-CFP



Name	Description
STATUS (green)	<ul style="list-style-type: none"> ● Blinks every 2 seconds (0.5 Hz): The system is working properly. ● Blinks twice each second (2 Hz): The system is in the alarm state.
L/A (green)	<ul style="list-style-type: none"> ● Steady on: The link is connected. ● Blinking: Data is being transmitted or received. ● Off: The link is disconnected.

Interface Attributes

Table 1-91 lists the attributes of interfaces on the FW-1X100G-CFP.

Table 1-91 FW-1X100G-CFP interface attributes

Attribute	Description
Connector type	LC/PC
Optical interface attribute	Compliant with the selected CFP optical module For details about the optional attributes of the optical module, see 1.5.7 100 Gbit/s CFP Optical Modules .
Working mode	Full duplex
Frame format	Ethernet_II, Ethernet_SAP, and Ethernet_SNAP
Network protocol	IP

Technical Specifications

[Table 1-92](#) lists the technical specifications of the FW-1X100G-CFP.

Table 1-92 Technical specifications of the FW-1X100G-CFP

Item	Specifications
Board silkscreen name	FW-1X100G-CFP
Dimensions (width x depth x height)	178 mm x 130 mm x 35 mm
Typical power consumption	51 W
Maximum power consumption	56.1 W
Typical heat consumption	174 BTU/hour
Maximum heat consumption	191.4 BTU/hour
Board weight	1.3 kg

1.4.6 LPUF-120 and FPICs

The flexible LPU comprises the motherboard (LPUF-120) and multiple flexible cards (subcards), improving networking flexibility. The flexible LPU supports 120G line-rate forwarding, which reduces costs and provides customized solutions for users.

1.4.6.1 LPUF-120

The hot-swappable LPUF-120 provides two 1/2-width slots, each of which holds one subcard. It supports 120G line-rate forwarding and mixed insertion among different FPICs.

NOTICE

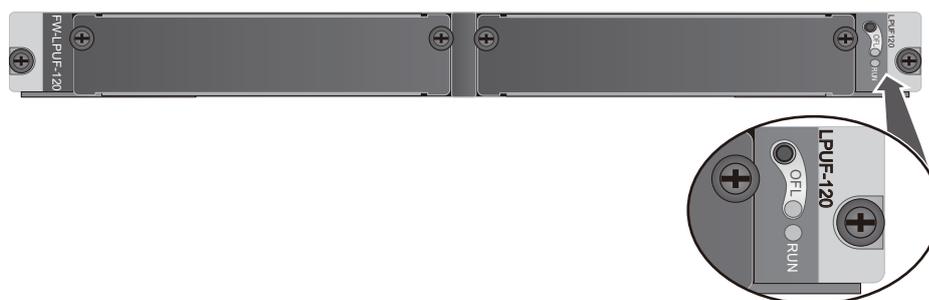
The LPUF-120 does not support the hot swap of FPICs.

The total LPUF-120 subcard performance cannot exceed 120G. To insert the FW-1X100G-CFP on the LPUF-120, you can insert only one FW-1X100G-CFP only into slot 1 of the LPUF-120.

Panel

Figure 1-83 shows the LPUF-120.

Figure 1-83 LPUF-120



Name	Description
OFL button	To remove a board, press and hold the button for five seconds until the OFL indicator turns on.
OFL indicator (red)	Steady on: You can remove the board.
RUN indicator (green)	<ul style="list-style-type: none"> Blinks every 2 seconds (0.5 Hz): The system is working properly. Blinks twice each second (2 Hz): The system is in the alarm state.

Interface Attributes

The LPUF-120 does not have external interfaces.

Technical Specifications

Table 1-93 lists the technical specifications of the LPUF-120.

Table 1-93 Technical specifications of the LPUF-120

Item	Specifications
Board silkscreen name	LPUF-120 FW-LPUF-120
Dimensions (width x depth x height)	400 mm x 530 mm x 41 mm
Typical power consumption	195 W
Maximum power consumption	214.5 W
Typical heat consumption	665.4 BTU/hour
Maximum heat consumption	731.9 BTU/hour
Board weight	7.15 kg

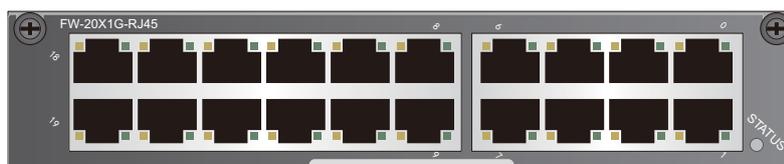
1.4.6.2 20-Port 10/100/1000Base-RJ45 FPIC (FW-20X1G-RJ45)

The FW-20X1G-RJ45 occupies one 1/2-width flexible card slot, is compatible with LPUF-240s, and LPUF-120s, but is not hot-swappable.

Panel

Figure 1-84 shows the FW-20X1G-RJ45.

Figure 1-84 20-port 10/100/1000Base-RJ45 FPIC panel



Component	Description
STATUS (green)	<ul style="list-style-type: none"> ● Blinks every 2 seconds (0.5 Hz): The system is running normally. ● Blinks twice each second (2 Hz): The system is in the alarm state.

Component	Description
LINK (green)/ACT (yellow)	<ul style="list-style-type: none"> ● Steady on: The link is connected. ● Blinking: Data is being transmitted or received. ● Off: The link is disconnected.

Interface Attributes

Table 1-94 lists the attributes of interfaces on FW-20X1G-RJ45.

Table 1-94 FW-20X1G-RJ45 interface attributes

Attribute	Description
Connector type	RJ45
Working mode	10M/100M/1000M adaptive, supporting full duplex
Cable specifications	When the working mode is 10M or 100M, it is recommended that Category 5 unshielded twisted pairs be used. When the working mode is 1000M, it is recommended that super Category 5 unshielded twisted pairs be used.
Frame format	Ethernet_II, Ethernet_SAP, and Ethernet_SNAP
Network protocol	IP

Technical Specifications

Table 1-95 lists the technical specifications of the FW-20X1G-RJ45.

Table 1-95 Technical specifications of the FW-20X1G-RJ45

Item	Specifications
Silk-screen board name	FW-20X1G-RJ45
Dimensions (width x depth x height)	178 mm x 225 mm x 38 mm
Typical power consumption	31 W
Maximum power consumption	34.1 W
Typical heat consumption	105.8 BTU/hour
Maximum heat consumption	116.4 BTU/hour

Item	Specifications
Board weight	0.8 kg

1.4.6.3 24-Port 100/1000 Base-X-SFP FPIC (E8KE-X-101-24XGE-SFP)

The E8KE-X-101-24XGE-SFP occupies one 1/2-width flexible card slot, is compatible with LPUF-240s, LPUF-120s, and LPUF-101s, but is not hot-swappable.

The 24-port 100/1000Base-X-SFP flexible card supports the following features:

- GE optical module, supporting GE optical interface features.
- FE optical module, supporting FE optical interface features.
- Electrical SFP module, supporting 1000M electrical interface feature.
- Mixed insertion among the above modules.

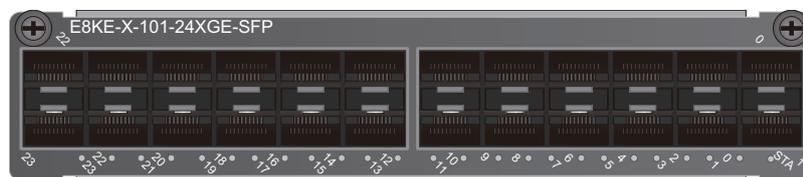
 **NOTE**

Only the interfaces indexed in odd numbers support the electrical interface module.

Panel

[Figure 1-85](#) shows the E8KE-X-101-24XGE-SFP.

Figure 1-85 E8KE-X-101-24XGE-SFP



Name	Description
STATUS (green)	<ul style="list-style-type: none"> ● Blinks every 2 seconds (0.5 Hz): The system is working properly. ● Blinks twice each second (2 Hz): The system is in the alarm state.
Indicator below the interface (green)	<ul style="list-style-type: none"> ● Steady on: The link is connected. ● Blinking: Data is being transmitted or received. ● Off: The link is disconnected.

Interface Attributes

[Table 1-96](#) lists the attributes of interfaces on the E8KE-X-101-24XGE-SFP.

Table 1-96 E8KE-X-101-24XGE-SFP interface attributes

Attribute	Description
Connector type	LC/PC
Optical interface attribute	Compliant with the selected SFP optical module For details about the optional attributes of the optical module, see: <ul style="list-style-type: none"> ● 1.5.1 1 Gbit/s Electrical Transceiver ● 1.5.2 1.25 Gbit/s SFP/eSFP Optical Module
Working mode	Full duplex
Standards compliance	IEEE 802.3-2002
Frame format	Ethernet_II, Ethernet_SAP, Ethernet_SNAP, and 802.3
Network protocol	IP

Technical Specifications

[Table 1-97](#) lists the technical specifications of the E8KE-X-101-24XGE-SFP.

Table 1-97 Technical specifications of the E8KE-X-101-24XGE-SFP

Item	Specifications
Board silkscreen name	E8KE-X-101-24XGE-SFP
Dimensions (width x depth x height)	178 mm x 225 mm x 38 mm
Typical power consumption	37 W
Maximum power consumption	40.7 W
Typical heat consumption	126.2 BTU/hour
Maximum heat consumption	138.9 BTU/hour
Board weight	0.9 kg

1.4.6.4 5-Port 10GBase LAN/WAN-SFP+ FPIC A (E8KE-X-101-5X10GE-SFP+)

The E8KE-X-101-5X10GE-SFP+ occupies one 1/2-width flexible card slot, is compatible with LPUF-240s, LPUF-120s, and LPUF-101s, works in LAN or WAN mode, uses SFP+ optical modules, but is not hot-swappable.

Panel

Figure 1-86 shows the E8KE-X-101-5X10GE-SFP+.

Figure 1-86 E8KE-X-101-5X10GE-SFP+



Name	Description
STATUS (green)	<ul style="list-style-type: none"> ● Blinks every 2 seconds (0.5 Hz): The system is working properly. ● Blinks twice each second (2 Hz): The system is in the alarm state.
L/A (green)	<ul style="list-style-type: none"> ● Steady on: The link is connected. ● Blinking: Data is being transmitted or received. ● Off: The link is disconnected.

Interface Attributes

Table 1-98 lists the attributes of interfaces on the E8KE-X-101-5X10GE-SFP+.

Table 1-98 E8KE-X-101-5X10GE-SFP+ interface attributes

Attribute	Description
Connector type	LC/PC
Optical interface attribute	<p>Compliant with the selected SFP+ optical module.</p> <p>For details about the optional attributes of the optical module, see:</p> <ul style="list-style-type: none"> ● 1.5.1 1 Gbit/s Electrical Transceiver ● 1.5.2 1.25 Gbit/s SFP/eSFP Optical Module ● 1.5.4 10 Gbit/s SFP+ Optical Module <p>NOTICE</p> <p>The optical interface of the 10GBase LAN/WAN-SFP+ FPIC supports 1.5.1 1 Gbit/s Electrical Transceiver and 1.5.2 1.25 Gbit/s SFP/eSFP Optical Module in V500R001C60 and later versions. To use 1.5.1 1 Gbit/s Electrical Transceiver and 1.5.2 1.25 Gbit/s SFP/eSFP Optical Module in earlier versions, you need to upgrade the software version.</p>
Working mode	Full-duplex

Attribute	Description
Frame format	Ethernet_II, Ethernet_SAP, and Ethernet_SNAP
Network protocol	IP

Technical Specifications

Table 1-99 lists the technical specifications of the E8KE-X-101-5X10GE-SFP+.

Table 1-99 Technical specifications of the E8KE-X-101-5X10GE-SFP+

Attribute	Specifications
Board silkscreen name	E8KE-X-101-5X10GE-SFP+
Dimensions (width x depth x height)	203.3 mm x 178.65 mm x 37.2 mm
Typical power consumption	29 W
Maximum power consumption	31.9 W
Typical heat consumption	99 BTU/hour
Maximum heat consumption	108.8 BTU/hour
Board weight	0.9 kg

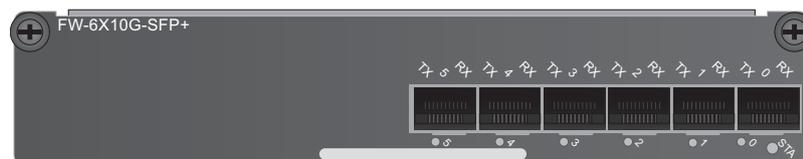
1.4.6.5 6*10GE SFP+ Daughter Card (FW-6X10GE-SFP+)

The FW-6X10G-SFP+ occupies one 1/2-width flexible card slot, is compatible with LPUF-240s and LPUF-120s, works in LAN or WAN mode, uses SFP+ optical modules, but is not hot-swappable.

Panel

Figure 1-87 shows the FW-6X10G-SFP+.

Figure 1-87 FW-6X10G-SFP+



Name	Description
STA (green)	<ul style="list-style-type: none"> ● Blinks every 2 seconds (0.5 Hz): The system is working properly. ● Blinks twice each second (2 Hz): The system is in the alarm state.
Indicator below the interface (green)	<ul style="list-style-type: none"> ● Steady on: The link is connected. ● Blinking: Data is being transmitted or received. ● Off: The link is disconnected.

Interface Attributes

Table 1-100 lists the attributes of interfaces on the FW-6X10G-SFP+.

Table 1-100 FW-6X10G-SFP+ interface attributes

Attribute	Description
Connector type	LC/PC
Optical interface attribute	<p>Compliant with the selected SFP+ optical module. For details about the optional attributes of the optical module, see:</p> <ul style="list-style-type: none"> ● 1.5.1 1 Gbit/s Electrical Transceiver ● 1.5.2 1.25 Gbit/s SFP/eSFP Optical Module ● 1.5.4 10 Gbit/s SFP+ Optical Module <p>NOTICE The optical interface of the 10GBase LAN/WAN-SFP+ FPIC supports 1.5.1 1 Gbit/s Electrical Transceiver and 1.5.2 1.25 Gbit/s SFP/eSFP Optical Module in V500R001C60 and later versions. To use 1.5.1 1 Gbit/s Electrical Transceiver and 1.5.2 1.25 Gbit/s SFP/eSFP Optical Module in earlier versions, you need to upgrade the software version.</p>
Working mode	Full-duplex
Frame format	Ethernet_II, Ethernet_SAP, and Ethernet_SNAP
Network protocol	IP

Technical Specifications

Table 1-101 lists the technical specifications of the FW-6X10G-SFP+.

Table 1-101 Technical specifications of the FW-6X10G-SFP+

Item	Specifications
Board silkscreen name	FW-6X10G-SFP+
Dimensions (width x depth x height)	178 mm x 180 mm x 38 mm
Typical power consumption	34 W
Maximum power consumption	37.4 W
Typical heat consumption	116 BTU/hour
Maximum heat consumption	127.6 BTU/hour
Board weight	0.65 kg

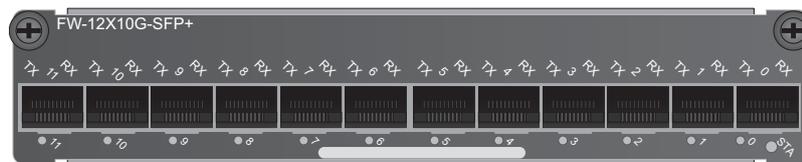
1.4.6.6 12*10GE SFP+ Daughter Card (FW-12X10GE-SFP+)

The FW-12X10G-SFP+ occupies one 1/2-width flexible card slot, is compatible with LPUF-240s and LPUF-120s, works in LAN or WAN mode, uses SFP+ optical modules, but is not hot-swappable.

Panel

Figure 1-88 shows the FW-12X10G-SFP+.

Figure 1-88 FW-12X10G-SFP+



Name	Description
STA (green)	<ul style="list-style-type: none"> ● Blinks every 2 seconds (0.5 Hz): The system is working properly. ● Blinks twice each second (2 Hz): The system is in the alarm state.
Indicator below the interface (green)	<ul style="list-style-type: none"> ● Steady on: The link is connected. ● Blinking: Data is being transmitted or received. ● Off: The link is disconnected.

Interface Attributes

Table 1-102 lists the attributes of interfaces on the FW-12X10G-SFP+.

Table 1-102 FW-12X10G-SFP+ interface attributes

Attribute	Description
Connector type	LC/PC
Optical interface attribute	<p>Compliant with the selected SFP+ optical module. For details about the optional attributes of the optical module, see:</p> <ul style="list-style-type: none"> ● 1.5.1 1 Gbit/s Electrical Transceiver ● 1.5.2 1.25 Gbit/s SFP/eSFP Optical Module ● 1.5.4 10 Gbit/s SFP+ Optical Module <p>NOTICE The optical interface of the 10GBase LAN/WAN-SFP+ FPIC supports 1.5.1 1 Gbit/s Electrical Transceiver and 1.5.2 1.25 Gbit/s SFP/eSFP Optical Module in V500R001C60 and later versions. To use 1.5.1 1 Gbit/s Electrical Transceiver and 1.5.2 1.25 Gbit/s SFP/eSFP Optical Module in earlier versions, you need to upgrade the software version.</p>
Working mode	Full-duplex
Frame format	Ethernet_II, Ethernet_SAP, and Ethernet_SNAP
Network protocol	IP

Technical Specifications

Table 1-103 lists the technical specifications of the FW-12X10G-SFP+.

Table 1-103 Technical specifications of the FW-12X10G-SFP+

Item	Specifications
Board silkscreen name	FW-12X10G-SFP+
Dimensions (width x depth x height)	193 mm x 178.65 mm x 37.2 mm
Typical power consumption	52 W
Maximum power consumption	57.2 W

Item	Specifications
Typical heat consumption	177.4 BTU/hour
Maximum heat consumption	195.2 BTU/hour
Board weight	0.75 kg

1.4.6.7 3-Port 40GBase QSFP+ FPIC (FW-3X40G-QSFP+)

The FW-3X40G-QSFP+ occupies one 1/2-width flexible card slot, is compatible with LPUF-240s and LPUF-120s, works in LAN mode, uses QSFP+ optical modules, but is not hot-swappable.

Panel

Figure 1-89 shows the FW-3X40G-QSFP+.

Figure 1-89 FW-3X40G-QSFP+



Name	Description
STATUS (green)	<ul style="list-style-type: none"> ● Blinks every 2 seconds (0.5 Hz): The system is working properly. ● Blinks twice each second (2 Hz): The system is in the alarm state.
L/A (green)	<ul style="list-style-type: none"> ● Steady on: The link is connected. ● Blinking: Data is being transmitted or received. ● Off: The link is disconnected.

Interface Attributes

Table 1-104 lists the attributes of interfaces on FW-3X40G-QSFP+.

Table 1-104 FW-3X40G-QSFP+ interface attributes

Attribute	Description
Connector type	LC/PC
Optical interface attributes	Compliant with the selected SFP+ optical module. For details about the optional attributes of the optical module, see 1.5.6 40 Gbit/s QSFP+ Optical Module .
Working mode	Full-duplex
Standards compliance	IEEE 802.3-2002
Frame format	Ethernet_II, Ethernet_SAP, and Ethernet_SNAP
Network protocol	IP

Technical Specifications

[Table 1-105](#) lists the technical specifications of the FW-3X40G-QSFP+.

Table 1-105 Technical specifications of the FW-3X40G-QSFP+

Item	Specifications
Board silkscreen name	FW-3X40G-QSFP+
Dimensions (width x depth x height)	178 mm x 225 mm x 38 mm
Typical power consumption	50 W
Maximum power consumption	55 W
Typical heat consumption	170.6 BTU/hour
Maximum heat consumption	187.7 BTU/hour
Board weight	0.85 kg

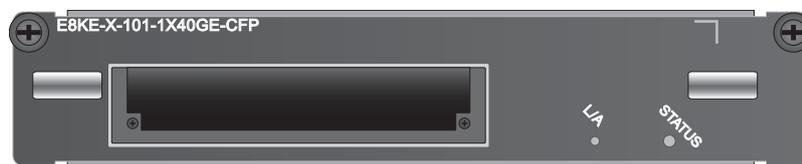
1.4.6.8 1-Port 40GBase LAN-CFP FPIC A (E8KE-X-101-1X40GE-CFP)

The E8KE-X-101-1X40GE-CFP occupies one 1/2-width flexible card slot, is compatible with LPUF-240s, LPUF-120s and LPUF-101s, works in LAN mode, uses CFP optical modules, but is not hot-swappable.

Panel

Figure 1-90 shows the E8KE-X-101-1X40GE-CFP.

Figure 1-90 E8KE-X-101-1X40GE-CFP



Name	Description
STATUS (green)	<ul style="list-style-type: none"> Blinks every 2 seconds (0.5 Hz): The system is working properly. Blinks twice each second (2 Hz): The system is in the alarm state.
L/A (green)	<ul style="list-style-type: none"> Steady on: The link is connected. Blinking: Data is being transmitted or received. Off: The link is disconnected.

Interface Attributes

Table 1-106 lists the attributes of interfaces on the E8KE-X-101-1X40GE-CFP.

Table 1-106 E8KE-X-101-1X40GE-CFP interface attributes

Attribute	Description
Connector type	LC/PC
Optical interface attribute	Compliant with the selected CFP optical module For details about the optional attributes of the optical module, see 1.5.5 40 Gbit/s CFP Optical Modules .
Working mode	Full duplex
Frame format	Ethernet_II, Ethernet_SAP, and Ethernet_SNAP
Network protocol	IP

Technical Specifications

Table 1-107 lists the technical specifications of the E8KE-X-101-1X40GE-CFP.

Table 1-107 Technical specifications of the E8KE-X-101-1X40GE-CFP

Item	Specifications
Board silkscreen name	E8KE-X-101-1X40GE-CFP
Dimensions (width x depth x height)	178 mm x 225 mm x 38 mm
Typical power consumption	28 W
Maximum power consumption	30.8 W
Typical heat consumption	95.5 BTU/hour
Maximum heat consumption	105.1 BTU/hour
Board weight	0.9 kg

1.4.6.9 1*100GE CFP Daughter Card (FW-1X100GE-CFP)

The FW-1X100G-CFP occupies one 1/2-width flexible card slot, is compatible with LPUF-240s, LPUF-120s and LPUF-101s, works in LAN mode, uses CFP optical modules, but is not hot-swappable.

Panel

Figure 1-91 shows the FW-1X100G-CFP.

Figure 1-91 FW-1X100G-CFP



Name	Description
STATUS (green)	<ul style="list-style-type: none"> ● Blinks every 2 seconds (0.5 Hz): The system is working properly. ● Blinks twice each second (2 Hz): The system is in the alarm state.
L/A (green)	<ul style="list-style-type: none"> ● Steady on: The link is connected. ● Blinking: Data is being transmitted or received. ● Off: The link is disconnected.

Interface Attributes

Table 1-108 lists the attributes of interfaces on the FW-1X100G-CFP.

Table 1-108 FW-1X100G-CFP interface attributes

Attribute	Description
Connector type	LC/PC
Optical interface attribute	Compliant with the selected CFP optical module For details about the optional attributes of the optical module, see 1.5.7 100 Gbit/s CFP Optical Modules .
Working mode	Full duplex
Frame format	Ethernet_II, Ethernet_SAP, and Ethernet_SNAP
Network protocol	IP

Technical Specifications

Table 1-109 lists the technical specifications of the FW-1X100G-CFP.

Table 1-109 Technical specifications of the FW-1X100G-CFP

Item	Specifications
Board silkscreen name	FW-1X100G-CFP
Dimensions (width x depth x height)	178 mm x 130 mm x 35 mm
Typical power consumption	51 W
Maximum power consumption	56.1 W
Typical heat consumption	174 BTU/hour
Maximum heat consumption	191.4 BTU/hour
Board weight	1.3 kg

1.4.7 LPUF-101 and FPICs

The flexible LPU comprises the motherboard (LPUF-101) and multiple flexible cards (subcards), improving networking flexibility. The flexible LPU supports 100G line-rate forwarding, which reduces costs and provides customized solutions for users.

1.4.7.1 LPUF-101

The hot-swappable LPUF-101 has four 1/4-width slots or two 1/2-width slots, each of which holds one FPIC. It supports 100G line-rate forwarding and mixed insertion of FPICs with different width. By default, each LPUF-101 is delivered with two 1/2-width slots. To install 1/4-width flexible plug-in cards, install the guide rails delivered with cards.

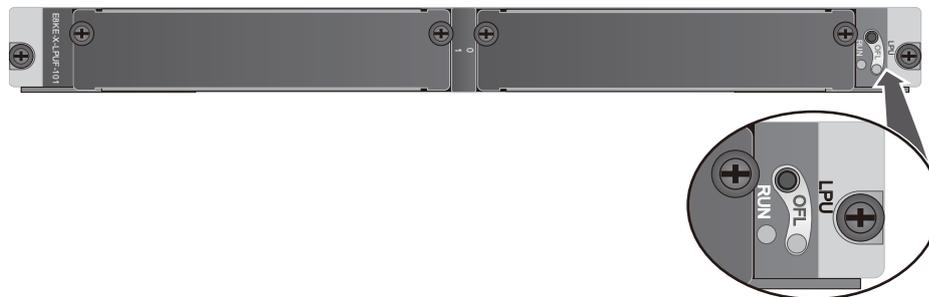
NOTICE

The LPUF-101 does not support the hot swap of FPICs.

Panel

[Figure 1-92](#) shows the LPUF-101.

Figure 1-92 LPUF-101



Name	Description
OFL button	To remove a board, press and hold the button for five seconds until the OFL indicator turns on.
OFL indicator (red)	Steady on: You can remove the board.
RUN indicator (green)	<ul style="list-style-type: none"> Blinks every 2 seconds (0.5 Hz): The system is working properly. Blinks twice each second (2 Hz): The system is in the alarm state.

Interface Attributes

The LPUF-101 does not have external interfaces.

Technical Specifications

Table 1-110 lists the technical specifications of the LPUF-101.

Table 1-110 Technical specifications of the LPUF-101

Item	Specifications
Board silkscreen name	LPUF-101 E8KE-X-LPUF-101
Dimensions (width x depth x height)	399.2 mm x 532.6 mm x 40.1 mm
Typical power consumption	260 W
Maximum power consumption	286 W
Typical heat consumption	887.2 BTU/hour
Maximum heat consumption	975.9 BTU/hour
Board weight	6.8 kg

1.4.7.2 24-Port 100/1000 Base-X-SFP FPIC (E8KE-X-101-24XGE-SFP)

The E8KE-X-101-24XGE-SFP occupies one 1/2-width flexible card slot, is compatible with LPUF-240s, LPUF-120s, and LPUF-101s, but is not hot-swappable.

The 24-port 100/1000Base-X-SFP flexible card supports the following features:

- GE optical module, supporting GE optical interface features.
- FE optical module, supporting FE optical interface features.
- Electrical SFP module, supporting 1000M electrical interface feature.
- Mixed insertion among the above modules.

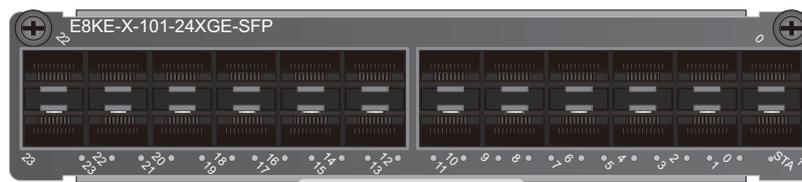
 **NOTE**

Only the interfaces indexed in odd numbers support the electrical interface module.

Panel

Figure 1-93 shows the E8KE-X-101-24XGE-SFP.

Figure 1-93 E8KE-X-101-24XGE-SFP



Name	Description
STATUS (green)	<ul style="list-style-type: none"> ● Blinks every 2 seconds (0.5 Hz): The system is working properly. ● Blinks twice each second (2 Hz): The system is in the alarm state.
Indicator below the interface (green)	<ul style="list-style-type: none"> ● Steady on: The link is connected. ● Blinking: Data is being transmitted or received. ● Off: The link is disconnected.

Interface Attributes

Table 1-111 lists the attributes of interfaces on the E8KE-X-101-24XGE-SFP.

Table 1-111 E8KE-X-101-24XGE-SFP interface attributes

Attribute	Description
Connector type	LC/PC
Optical interface attribute	Compliant with the selected SFP optical module For details about the optional attributes of the optical module, see: <ul style="list-style-type: none"> ● 1.5.1 1 Gbit/s Electrical Transceiver ● 1.5.2 1.25 Gbit/s SFP/eSFP Optical Module
Working mode	Full duplex
Standards compliance	IEEE 802.3-2002
Frame format	Ethernet_II, Ethernet_SAP, Ethernet_SNAP, and 802.3
Network protocol	IP

Technical Specifications

Table 1-112 lists the technical specifications of the E8KE-X-101-24XGE-SFP.

Table 1-112 Technical specifications of the E8KE-X-101-24XGE-SFP

Item	Specifications
Board silkscreen name	E8KE-X-101-24XGE-SFP
Dimensions (width x depth x height)	178 mm x 225 mm x 38 mm
Typical power consumption	37 W
Maximum power consumption	40.7 W
Typical heat consumption	126.2 BTU/hour
Maximum heat consumption	138.9 BTU/hour
Board weight	0.9 kg

1.4.7.3 4-Port 10G Base LAN -SFP+ FPIC (E8KE-X-101-4X10GE-SFP+)

The E8KE-X-101-4X10GE-SFP+ occupies one 1/4-width flexible card slot, is compatible with LPUF-101s, but is not hot-swappable.

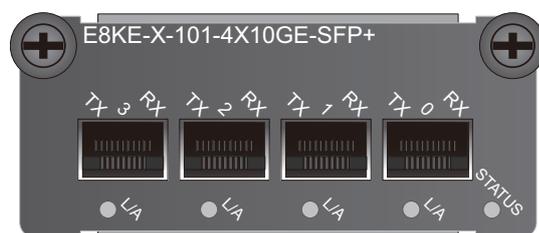
 **NOTE**

The E8KE-X-101-4X10GE-SFP+ is a convergence subcard. On average, each port can converge to 20G.

Panel

Figure 1-94 shows the E8KE-X-101-4X10GE-SFP+.

Figure 1-94 E8KE-X-101-4X10GE-SFP+



Name	Description
STATUS (green)	<ul style="list-style-type: none"> Blinks every 2 seconds (0.5 Hz): The system is working properly. Blinks twice each second (2 Hz): The system is in the alarm state.

Name	Description
L/A (green)	<ul style="list-style-type: none"> ● Steady on: The link is connected. ● Blinking: Data is being transmitted or received. ● Off: The link is disconnected.

Interface Attributes

Table 1-113 lists the attributes of interfaces on the E8KE-X-101-4X10GE-SFP+.

Table 1-113 E8KE-X-101-4X10GE-SFP+ interface attributes

Attribute	Description
Connector type	LC/PC
Optical interface attribute	Compliant with the selected SFP+ optical module For details about the optional attributes of the optical module, see 1.5.4 10 Gbit/s SFP+ Optical Module .
Frame format	Ethernet_II, Ethernet_SAP, and Ethernet_SNAP
Network protocol	IP

Technical Specifications

Table 1-114 lists the technical specifications of the E8KE-X-101-4X10GE-SFP+.

Table 1-114 Technical specifications of the E8KE-X-101-4X10GE-SFP+

Parameter	Specifications
Board silkscreen name	E8KE-X-101-4X10GE-SFP+
Dimensions (width x depth x height)	89.1 mm x 203.3 mm x 37.2 mm
Typical power consumption	20 W
Maximum power consumption	22 W
Typical heat consumption	68.2 BTU/hour
Maximum heat consumption	75.1 BTU/hour
Board weight	0.4 kg

1.4.7.4 5-Port 10GBase LAN/WAN-SFP+ FPIC A (E8KE-X-101-5X10GE-SFP+)

The E8KE-X-101-5X10GE-SFP+ occupies one 1/2-width flexible card slot, is compatible with LPUF-240s, LPUF-120s, and LPUF-101s, works in LAN or WAN mode, uses SFP+ optical modules, but is not hot-swappable.

Panel

Figure 1-95 shows the E8KE-X-101-5X10GE-SFP+.

Figure 1-95 E8KE-X-101-5X10GE-SFP+



Name	Description
STATUS (green)	<ul style="list-style-type: none"> Blinks every 2 seconds (0.5 Hz): The system is working properly. Blinks twice each second (2 Hz): The system is in the alarm state.
L/A (green)	<ul style="list-style-type: none"> Steady on: The link is connected. Blinking: Data is being transmitted or received. Off: The link is disconnected.

Interface Attributes

Table 1-115 lists the attributes of interfaces on the E8KE-X-101-5X10GE-SFP+.

Table 1-115 E8KE-X-101-5X10GE-SFP+ interface attributes

Attribute	Description
Connector type	LC/PC

Attribute	Description
Optical interface attribute	<p>Compliant with the selected SFP+ optical module.</p> <p>For details about the optional attributes of the optical module, see:</p> <ul style="list-style-type: none"> ● 1.5.1 1 Gbit/s Electrical Transceiver ● 1.5.2 1.25 Gbit/s SFP/eSFP Optical Module ● 1.5.4 10 Gbit/s SFP+ Optical Module <p>NOTICE</p> <p>The optical interface of the 10GBase LAN/WAN-SFP+ FPIC supports 1.5.1 1 Gbit/s Electrical Transceiver and 1.5.2 1.25 Gbit/s SFP/eSFP Optical Module in V500R001C60 and later versions. To use 1.5.1 1 Gbit/s Electrical Transceiver and 1.5.2 1.25 Gbit/s SFP/eSFP Optical Module in earlier versions, you need to upgrade the software version.</p>
Working mode	Full-duplex
Frame format	Ethernet_II, Ethernet_SAP, and Ethernet_SNAP
Network protocol	IP

Technical Specifications

[Table 1-116](#) lists the technical specifications of the E8KE-X-101-5X10GE-SFP+.

Table 1-116 Technical specifications of the E8KE-X-101-5X10GE-SFP+

Attribute	Specifications
Board silkscreen name	E8KE-X-101-5X10GE-SFP+
Dimensions (width x depth x height)	203.3 mm x 178.65 mm x 37.2 mm
Typical power consumption	29 W
Maximum power consumption	31.9 W
Typical heat consumption	99 BTU/hour
Maximum heat consumption	108.8 BTU/hour
Board weight	0.9 kg

1.4.7.5 1-Port 40GBase LAN-CFP FPIC A (E8KE-X-101-1X40GE-CFP)

The E8KE-X-101-1X40GE-CFP occupies one 1/2-width flexible card slot, is compatible with LPUF-240s, LPUF-120s, and LPUF-101s, works in LAN mode, uses CFP optical modules, but is not hot-swappable.

Panel

Figure 1-96 shows the E8KE-X-101-1X40GE-CFP.

Figure 1-96 E8KE-X-101-1X40GE-CFP



Name	Description
STATUS (green)	<ul style="list-style-type: none"> ● Blinks every 2 seconds (0.5 Hz): The system is working properly. ● Blinks twice each second (2 Hz): The system is in the alarm state.
L/A (green)	<ul style="list-style-type: none"> ● Steady on: The link is connected. ● Blinking: Data is being transmitted or received. ● Off: The link is disconnected.

Interface Attributes

Table 1-117 lists the attributes of interfaces on the E8KE-X-101-1X40GE-CFP.

Table 1-117 E8KE-X-101-1X40GE-CFP interface attributes

Attribute	Description
Connector type	LC/PC
Optical interface attribute	Compliant with the selected CFP optical module For details about the optional attributes of the optical module, see 1.5.5 40 Gbit/s CFP Optical Modules .
Working mode	Full duplex
Frame format	Ethernet_II, Ethernet_SAP, and Ethernet_SNAP
Network protocol	IP

Technical Specifications

Table 1-118 lists the technical specifications of the E8KE-X-101-1X40GE-CFP.

Table 1-118 Technical specifications of the E8KE-X-101-1X40GE-CFP

Item	Specifications
Board silkscreen name	E8KE-X-101-1X40GE-CFP
Dimensions (width x depth x height)	178 mm x 225 mm x 38 mm
Typical power consumption	28 W
Maximum power consumption	30.8 W
Typical heat consumption	95.5 BTU/hour
Maximum heat consumption	105.1 BTU/hour
Board weight	0.9 kg

1.4.8 LPUF-40-A and FPIC

This section describes the structure and specifications of the Flexible Card Line Processing Unit (LPUF-40-A, 2 sub-slots) and FPIC.

1.4.8.1 LPUF-40-A

The LPUF-40-A is hot swappable and provides two 1/2-width slots, each of which holds one FPIC. It supports the following functions: 1. Forwards packets at the line speed of 40 Gbit/s. 2. Enhances networking flexibility and provides low-cost and customized solutions. 3. Supports mixed insertion between different FPICs.



NOTICE

The LPUF-40-A backplane does not support the hot swap of FPICs.

The sum of the LPUF-40-A subcard performance cannot exceed 40G. Each slot supports a maximum of 20-Gbit/s bandwidth.

Panel

Figure 1-97 shows the appearance of the LPUF-40-A.

Figure 1-97 Appearance of the LPUF-40-A



Name	Description
OFL button	To remove a board, press and hold the button for five seconds until the OFL indicator turns on.
OFL indicator (red)	Steady on: You can remove the board.
RUN indicator (green)	<ul style="list-style-type: none"> Blinks every 2 seconds (0.5 Hz): The system is working properly. Blinks twice each second (2 Hz): The system is in the alarm state.

Interface Attributes

The LPUF-40-A does not provide interfaces externally.

Technical Specifications

Table 1-119 lists the technical specifications of the LPUF-40-A.

Table 1-119 Technical specifications of the LPUF-40-A

Item	Description
Silkscreen of the board name	LPUF-40-A E8KE-X-LPUF-40-A
Dimensions (W x D x H)	400 mm x 520 mm x 41 mm
Typical power consumption	280 W
Maximum power consumption	290 W
Typical heat consumption	955.4 BTU/hour

Item	Description
Maximum heat consumption	989.5 BTU/hour
Board weight	6.6 kg

1.4.8.2 20-Port 100/1000Base-X-SFP Flexible Card (P40-20xGE/FE-SFP)

The P40-20xGE/FE-SFP occupies one 1/2-width flexible card slot, is compatible with LPUF-40-A, but is not hot-swappable.

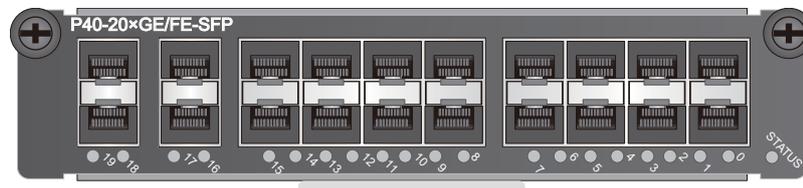
The P40-20xGE/FE-SFP supports the following features:

- GE optical module, for GE optical interface features
- FE optical module, for FE optical interface features
- Electrical SFP module, for features of the 10M/100M/1000M auto-sensing electrical interfaces
- Mixed application of GE optical, FE optical, and electrical SFP modules

Panel

Figure 1-98 shows the P40-20xGE/FE-SFP.

Figure 1-98 P40-20xGE/FE-SFP



Name	Description
STATUS (green)	<ul style="list-style-type: none"> ● Blinks every 2 seconds (0.5 Hz): The system is running normally. ● Blinks twice each second (2 Hz): The system is in the alarm state.
Indicator below the interface (green)	<ul style="list-style-type: none"> ● Steady on: The link is connected. ● Blinking: Data is being transmitted or received. ● Off: The link is disconnected.

Interface Attributes

Table 1-120 lists the attributes of interfaces on the P40-20xGE/FE-SFP.

Table 1-120 P40-20xGE/FE-SFP interface attributes

Attributes	Description
Connector type	LC/PC
Optical interface attributes	Compliant with the selected SFP optical module. For details about the optional attributes of the optical module, see: <ul style="list-style-type: none"> ● 1.5.1 1 Gbit/s Electrical Transceiver ● 1.5.2 1.25 Gbit/s SFP/eSFP Optical Module
Working mode	Full-duplex
Frame format	Ethernet_II, Ethernet_SAP, and Ethernet_SNAP
Network protocol	IP

Technical Specifications

Table 1-121 lists the technical specifications of the P40-20xGE/FE-SFP.

Table 1-121 Technical specifications of the P40-20xGE/FE-SFP

Item	Specifications
Board silkscreen name	P40-20xGE/FE-SFP
Dimensions (width x depth x height)	180 mm x 145 mm x 40 mm
Typical power consumption	37 W
Maximum power consumption	41 W
Typical heat consumption	126.2 BTU/hour
Maximum heat consumption	139.9 BTU/hour
Board weight	0.6 kg

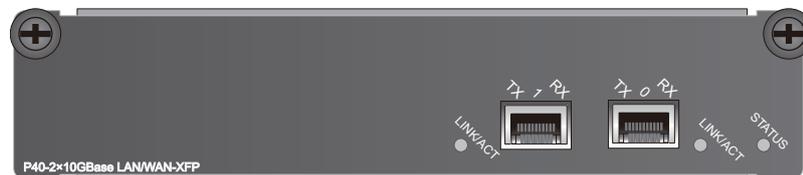
1.4.8.3 2-Port 10GBase LAN/WAN-XFP Flexible Card (P40-2x10GBase LAN/WAN-XFP)

The P40-2x10GBase LAN/WAN-XFP occupies one 1/2-width flexible card slot, is compatible with LPUF-40-A, works in LAN or WAN mode, uses XFP optical modules, but is not hot-swappable.

Panel

Figure 1-99 shows the P40-2x10GBase LAN/WAN-XFP.

Figure 1-99 P40-2x10GBase LAN/WAN-XFP



Name	Description
STATUS (green)	<ul style="list-style-type: none"> ● Blinks every 2 seconds (0.5 Hz): The system is running normally. ● Blinks twice each second (2 Hz): The system is in the alarm state.
LINK/ACT (green)	<ul style="list-style-type: none"> ● Steady on: The link is connected. ● Blinking: Data is being transmitted or received. ● Off: The link is disconnected.

Interface Attributes

Table 1-122 lists the attributes of interfaces on the P40-2x10GBase LAN/WAN-XFP.



If you configure a 10 GE interface to work in WAN mode, use single-mode optical fibers to connect devices.

Table 1-122 P40-2x10GBase LAN/WAN-XFP interface attributes

Attributes	Description
Connector type	LC/PC
Optical interface attributes	Compliant with the selected XFP optical module. For details about the optional attributes of the optical module, see 1.5.3 10 Gbit/s XFP Optical Module .
Working mode	Full-duplex
Frame format	Ethernet_II, Ethernet_SAP, and Ethernet_SNAP
Network protocol	IP

Technical Specifications

Table 1-123 lists the technical specifications of the P40-2x10GBase LAN/WAN-XFP.

Table 1-123 Technical specifications of the P40-2x10GBase LAN/WAN-XFP

Item	Specifications
Board silkscreen name	P40-2x10GBase LAN/WAN-XFP
Dimensions (width x depth x height)	180 mm x 145 mm x 40 mm
Typical power consumption	12 W
Maximum power consumption	12 W
Typical heat consumption	40.9 BTU/hour
Maximum heat consumption	40.9 BTU/hour
Board weight	0.6 kg

1.4.8.4 4-port 10GBase LAN/WAN-XFP FPIC (P40-4x10GBase LAN/WAN-XFP)

The P40-4x10GBase LAN/WAN-XFP occupies one 1/2-width flexible card slot, is compatible with LPUF-40-A, works in LAN or WAN mode, uses XFP optical modules, but is not hot-swappable.

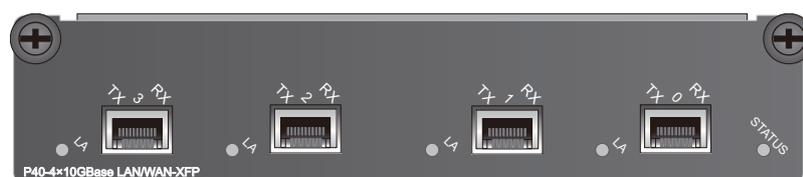
 **NOTE**

The P40-4x10GBase LAN/WAN-XFP supports convergence. The left-most two ports can be converged to 10 Gbit/s on average. The right-most two ports can be converged to 10 Gbit/s on average.

Panel

Figure 1-100 shows the P40-4x10GBase LAN/WAN-XFP.

Figure 1-100 P40-4x10GBase LAN/WAN-XFP



Name	Description
STATUS (green)	<ul style="list-style-type: none"> ● Blinks every 2 seconds (0.5 Hz): The system is running normally. ● Blinks twice each second (2 Hz): The system is in the alarm state.
LA (green)	<ul style="list-style-type: none"> ● Steady on: The link is connected. ● Blinking: Data is being transmitted or received. ● Off: The link is disconnected.

Interface Attributes

Table 1-124 lists the attributes of interfaces on the P40-4x10GBase LAN/WAN-XFP.



NOTICE

If you configure a 10 GE interface to work in WAN mode, use single-mode optical fibers to connect devices.

Table 1-124 P40-4x10GBase LAN/WAN-XFP interface attributes

Attributes	Description
Connector type	LC/PC
Optical interface attributes	Compliant with the selected XFP optical module. For details about the optional attributes of the optical module, see 1.5.3 10 Gbit/s XFP Optical Module .
Frame format	Ethernet_II, Ethernet_SAP, and Ethernet_SNAP
Network protocol	IP

Technical Specifications

Table 1-125 lists the technical specifications of the P40-4x10GBase LAN/WAN-XFP.

Table 1-125 Technical specifications of the P40-4x10GBase LAN/WAN-XFP

Item	Specifications
Board silkscreen name	P40-4x10GBase LAN/WAN-XFP
Dimensions (width x depth x height)	180 mm x 145 mm x 40 mm

Item	Specifications
Typical power consumption	25 W
Maximum power consumption	28 W
Typical heat consumption	85.3 BTU/hour
Maximum heat consumption	95.5 BTU/hour
Board weight	0.58 kg

1.4.9 LPUF-21 and FPIC

This section describes the structure and specifications of the Flexible Card Line Processing Unit (LPUF-21, 2 sub-slots) and FPIC.

1.4.9.1 LPUF-21

The LPUF-21 is hot-swappable and has two 1/2-width slots, each of which holds one FPIC. It supports the following functions: 1. forwarding packets at the line speed of 20 Gbit/s; 2. Networking flexibility and provisioning of low-cost and customized solutions; 3. Mixed application of different FPICs.



NOTICE

The LPUF-21 backplane does not support the hot swapping of FPICs.

Panel

Figure 1-101 shows the LPUF-21.

Figure 1-101 LPUF-21



Name	Description
OFL button	To remove a board, press and hold the button for five seconds until the OFL indicator turns on.
OFL indicator (red)	Steady on: You can remove the board.
RUN indicator (green)	<ul style="list-style-type: none"> ● Blinks every 2 seconds (0.5 Hz): The system is working properly. ● Blinks twice each second (2 Hz): The system is in the alarm state.

Interface Attributes

The LPUF-21 does not have external interfaces.

Technical Specifications

[Table 1-126](#) lists the technical specifications of the LPUF-21.

Table 1-126 Technical specifications of the LPUF-21

Item	Specifications
Board silkscreen name	LPUF-21 E8KE-X-LPUF-21
Dimensions (width x depth x height)	400 mm x 520 mm x 41 mm
Typical power consumption	170 W
Maximum power consumption	187 W
Typical heat consumption	580.1 BTU/hour
Maximum heat consumption	638.1 BTU/hour
Board weight	5.0 kg

1.4.9.2 12-port 10Base-T/100Base-TX/1000Base-T-RJ45 FPIC (12x10/100/1000Base-TX-RJ45)

The 12x10/100/1000Base-TX-RJ45 occupies one 1/2-width flexible card slot, is compatible with LPUF-21, but is not hot-swappable.

Panel

Figure 1-102 shows the 12x10/100/1000Base-TX-RJ45.

Figure 1-102 12x10/100/1000Base-TX-RJ45



Name	Description
STATUS (green)	<ul style="list-style-type: none"> ● Blinks every 2 seconds (0.5 Hz): The system is running normally. ● Blinks twice each second (2 Hz): The system is in the alarm state.
LINK (green)/ACT (yellow)	<ul style="list-style-type: none"> ● Steady on: The link is connected. ● Blinking: Data is transmitted or received. ● Off: The link is disconnected.

Interface Attributes

Table 1-127 lists the attributes of interfaces on the 12x10/100/1000Base-TX-RJ45.

Table 1-127 12x10/100/1000Base-TX-RJ45 interface attributes

Attribute	Description
Connector type	RJ45
Working mode	10M/100M/1000M adaptive, supporting full duplex
Cable specifications	When the working mode is 10M or 100M, it is recommended that Category 5 unshielded twisted pairs be used. When the working mode is 1000M, it is recommended that super Category 5 unshielded twisted pairs be used.
Compliance	IEEE802.3-2002
Frame format	Ethernet_II, Ethernet_SAP, and Ethernet_SNAP
Network protocol	IP

Technical Specifications

Table 1-128 lists the technical specifications of the 12x10/100/1000Base-TX-RJ45.

Table 1-128 Technical specifications of the 12x10/100/1000Base-TX-RJ45

Item	Specifications
Board silkscreen name	12x10/100/1000Base-TX-RJ45
Dimensions (width x depth x height)	180 mm x 145 mm x 40 mm
Typical power consumption	10 W
Maximum power consumption	11 W
Typical heat consumption	34.1 BTU/hour
Maximum heat consumption	37.5 BTU/hour
Board weight	0.50 kg

1.4.9.3 12-port 100Base-FX/1000Base-X-SFP FPIC (12x100/1000Base-SFP)

The 12x100/1000Base-SFP occupies one 1/2-width flexible card slot, is compatible with LPUF-21, but is not hot-swappable.

The 12x100/1000Base-SFP supports the following features:

- GE optical module, for GE optical interface features
- FE optical module, for FE optical interface features
- Electrical SFP module, for features of the 10M/100M/1000M auto-sensing electrical interfaces
- Mixed application of GE optical, FE optical, and electrical SFP modules

Panel

Figure 1-103 shows the 12x100/1000Base-SFP.

Figure 1-103 12x100/1000Base-SFP



Name	Description
STATUS (green)	<ul style="list-style-type: none"> ● Blinks every 2 seconds (0.5 Hz): The system is running normally. ● Blinks twice each second (2 Hz): The system is in the alarm state.
L/A (green)	<ul style="list-style-type: none"> ● Steady on: The link is connected. ● Blinking: Data is being transmitted or received. ● Off: The link is disconnected.

Interface Attributes

Table 1-129 lists the attributes of interfaces on the 12x100/1000Base-SFP.

Table 1-129 12x100/1000Base-SFP interface attributes

Attribute	Description
Connector type	LC/PC
Interface attributes	Compliant with the selected SFP optical module. For details about the optional attributes of the optical module, see <ul style="list-style-type: none"> ● 1.5.1 1 Gbit/s Electrical Transceiver ● 1.5.2 1.25 Gbit/s SFP/eSFP Optical Module
Working mode	Full-duplex
Compliance	IEEE 802.3-2002
Frame format	Ethernet_II, Ethernet_SAP, and Ethernet_SNAP
Network protocol	IP

Technical Specifications

Table 1-130 shows the technical specifications of 12x100/1000Base-SFP.

Table 1-130 Technical specifications of 12x100/1000Base-SFP

Item	Specifications
Board silkscreen name	12x100/1000Base-SFP
Dimensions (width x depth x height)	180 mm x 145 mm x 40 mm
Typical power consumption	13 W

Item	Specifications
Maximum power consumption	14.3 W
Typical heat consumption	44.4 BTU/hour
Maximum heat consumption	48.8 BTU/hour
Board weight	0.50 kg

1.4.9.4 1-port OC-192c/STM-64c POS-XFP (1 x OC-192c/STM-64c POS-XFP)

The 1 x OC-192c/STM-64c POS-XFP occupies one 1/2-width flexible card slot, is compatible with LPUF-21, uses 10G XFP optical modules, provides one 10 GE POS interface, but is not hot-swappable.

Panel

Figure 1-104 shows the 1 x OC-192c/STM-64c POS-XFP.

Figure 1-104 1 x OC-192c/STM-64c POS-XFP



Name	Description
STATUS (green)	<ul style="list-style-type: none"> ● Blinks every 2 seconds (0.5 Hz): The system is running normally. ● Blinks twice each second (2 Hz): The system is in the alarm state.
LINK/ACT (green)	<ul style="list-style-type: none"> ● Steady on: The link is connected. ● Blinking: Data is being transmitted or received. ● Off: The link is disconnected.

Interface Attributes

Table 1-131 lists the attributes of interfaces on the 1 x OC-192c/STM-64c POS-XFP.

Table 1-131 1 x OC-192c/STM-64c POS-XFP interface attributes

Attribute	Description
Connector type	LC/PC
Optical interface attributes	Compliant with the selected XFP optical module. For details about the optional attributes of the optical module, see 1.5.3 10 Gbit/s XFP Optical Module .
Working mode	Full duplex
Compliance	STM-64c SDH/OC-192c SONET and RFC 2615 (1619)/1662
Link protocol	PPP and HDLC
Network protocol	IP

Technical Specifications

Table 1-132 lists the technical specifications of the 1-port OC-192c/STM-64c POS-XFP FPIC.

Table 1-132 Technical specifications of the 1-port OC-192c/STM-64c POS-XFP FPIC

Item	Specifications
Board silkscreen name	1 x OC-192c/STM-64c POS-XFP
Dimensions (width x depth x height)	180 mm x 145 mm x 40 mm
Typical power consumption	16 W
Maximum power consumption	17.6 W
Typical heat consumption	54.6 BTU/hour
Maximum heat consumption	60.1 BTU/hour
Board weight	0.50 kg

1.4.9.5 1-port 10GBase LAN/WAN-XFP FPIC (1 x 10GBase LAN/WAN)

The 1 x 10GBase LAN/WAN occupies one 1/2-width flexible card slot, is compatible with LPUF-21, works in LAN or WAN mode, uses XFP optical modules, but is not hot-swappable.

Panel

Figure 1-105 shows the 1 x 10GBase LAN/WAN.

Figure 1-105 1 x 10GBase LAN/WAN



Name	Description
STATUS (green)	<ul style="list-style-type: none"> ● Blinks every 2 seconds (0.5 Hz): The system is running normally. ● Blinks twice each second (2 Hz): The system is in the alarm state.
L/A (green)	<ul style="list-style-type: none"> ● Steady on: The link is connected. ● Blinking: Data is being transmitted or received. ● Off: The link is disconnected.

Interface Attributes

Table 1-133 lists the attributes of interfaces on the 1 x 10GBase LAN/WAN.

NOTICE

If you configure a 10 GE interface to work in WAN mode, use single-mode optical fibers to connect devices.

Table 1-133 1 x 10GBase LAN/WAN interface attributes

Attribute	Description
Connector type	LC/PC
Optical interface attributes	Compliant with the selected XFP optical module. For details about the optional attributes of the optical module, see 1.5.3 10 Gbit/s XFP Optical Module .
Compliance	IEEE 802.3ae
Frame format	Ethernet_II, Ethernet_SAP, and Ethernet_SNAP
Network protocol	IP

Technical Specifications

Table 1-134 shows the technical specifications of 1 x 10GBase LAN/WAN.

Table 1-134 Technical specifications of the 1 x 10GBase LAN/WAN

Item	Specifications
Board silkscreen name	1 x 10GBase LAN/WAN
Dimensions (width x depth x height)	180 mm x 145 mm x 40 mm
Typical power consumption	16 W
Maximum power consumption	17.6 W
Typical heat consumption	54.6 BTU/hour
Maximum heat consumption	60.1 BTU/hour
Board weight	0.5 kg

1.4.9.6 4-Port 10GBase WAN/LAN-XFP FPIC (4x10GBase LAN/WAN)

The 4x10GBase LAN/WAN occupies two 1/2-width flexible card slots, applies to LPUF-21, works in LAN or WAN mode, uses XFP optical modules, but does not support hot swap.

 **NOTE**

The 4x10GBase LAN/WAN supports convergence. The left-most two ports can be converged to 10 Gbit/s on average. The right-most two ports can be converged to 10 Gbit/s on average.

Panel

Figure 1-106 shows the 4x10GBase LAN/WAN.

Figure 1-106 4x10GBase LAN/WAN



Name	Description
STATUS (green)	<ul style="list-style-type: none"> ● Blinks every 2 seconds (0.5 Hz): The system is running normally. ● Blinks twice each second (2 Hz): The system is in the alarm state.

Name	Description
LINK/ACT (green)	<ul style="list-style-type: none"> ● Steady on: The link is connected. ● Blinking: Data is being transmitted or received. ● Off: The link is disconnected.

Interface Attributes

Table 1-135 lists the attributes of interfaces on the 4x10GBase LAN/WAN.

Table 1-135 4x10GBase LAN/WAN interface attributes

Attributes	Description
Connector type	LC/PC
Optical interface attributes	Compliant with the selected XFP optical module. For details about the optional attributes of the optical module, see 1.5.3 10 Gbit/s XFP Optical Module .
Working mode	Full-duplex
Frame format	Ethernet_II, Ethernet_SAP, and Ethernet_SNAP
Network protocol	IP

Technical Specifications

Table 1-136 lists the technical specifications of the 4x10GBase LAN/WAN.

Table 1-136 Technical specifications of the 4x10GBase LAN/WAN

Item	Specifications
Board silkscreen name	4x10GBase LAN/WAN
Dimensions (width x depth x height)	340 mm x 180 mm x 40 mm
Typical power consumption	31 W
Maximum power consumption	34.1 W
Typical heat consumption	105.8 BTU/hour
Maximum heat consumption	116.4 BTU/hour

Item	Specifications
Board weight	1.2 kg

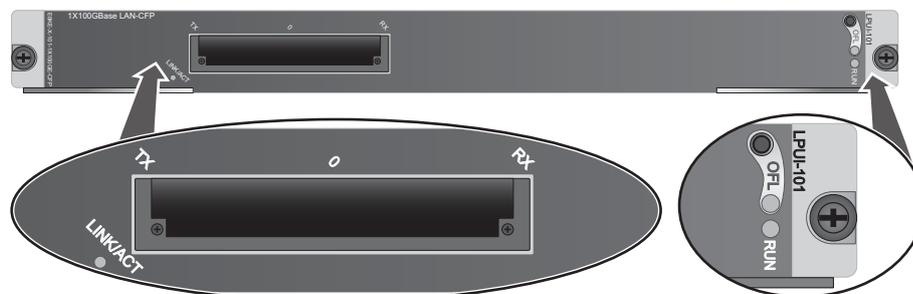
1.4.10 1-Port 100GBase-CFP Integrated Line Processing Unit (LPUI-101)

The hot-swappable LPUI-101 supports 100G line-rate forwarding on a single interface. The interface can work only in LAN mode and uses CFP optical module.

Panel

Figure 1-107 shows the LPUI-101.

Figure 1-107 LPUI-101



Name	Description
OFL button	To remove a board, press and hold the button for five seconds until the OFL indicator turns on.
OFL indicator (red)	Steady on: You can remove the board.
RUN indicator (green)	<ul style="list-style-type: none"> Blinks every 2 seconds (0.5 Hz): The system is working properly. Blinks twice each second (2 Hz): The system is in the alarm state.
LINK/ACT (green)	<ul style="list-style-type: none"> Steady on: The link is connected. Blinking: Data is being transmitted or received. Off: The link is disconnected.

Interface Attributes

Table 1-137 lists the attributes of interfaces on the LPUI-101.

Table 1-137 LPUI-101 Interface attributes

Attribute	Description
Connector type	LC/PC
Optical interface attribute	Compliant with the selected CFP optical module For details about the optional attributes of the optical module, see 1.5.7 100 Gbit/s CFP Optical Modules .
Working mode	Full duplex
Standards compliance	IEEE 802.3-2002
Frame format	Ethernet_II, Ethernet_SAP, and Ethernet_SNAP
Network protocol	IP

Technical Specifications

[Table 1-138](#) lists the technical specifications of the LPUI-101.

Table 1-138 Technical specifications of the LPUI-101

Item	Specifications
Board silkscreen name	LPUI-101 1x100GBase LAN-CFP E8KE-X-101-1X100GE-CFP
Dimensions (width x depth x height)	399.2 mm x 532.6 mm x 40.1 mm
Typical power consumption	339 W
Maximum power consumption	373 W
Typical heat consumption	1156.7 BTU/hour
Maximum heat consumption	1272.7 BTU/hour
Board weight	8.28 kg

1.5 Optical/Electrical Module

This section describes supported optical/electrical modules.

1.5.1 1 Gbit/s Electrical Transceiver

Electrical transceivers apply to GE and 10GE interfaces for interconnection between GE optical and electrical interfaces and between 10GE optical and GE electrical interfaces.

Figure 1-108 1 Gbit/s electrical transceiver



Table 1-139 lists the currently available 1 Gbit/s electrical transceivers.

Table 1-139 1 Gbit/s electrical transceivers

Product Model	BOM Number	Interface Standard	Transmission Distance	Transmission Medium	Auto-negotiation	Remarks
SFP-1000 BaseT	02314171	1000BAS E-T	100 m (328.08 ft)	RJ-45	Supported	To meet NEBS standards, shielded cables must be available for this type of optical module used at sites in North America.

Table 1-140 lists the basic features of 1 Gbit/s electrical transceivers and compliance standards.

Table 1-140 Basic features of 1 Gbit/s electrical transceivers and compliance standards

Item	Description
Interface standard	IEEE Std 802.3z, IEEE Std 802.3ab SFP MSA
Temperature	0-75°C (32°F - 167°F)
Digital diagnosis	N/A
Environment standard	RoHS(exempted)
Security standard	FCC class B, IEC 61000-4-3
ESD	> 500 V (Human body model)

Table 1-141 lists the specifications of 1 Gbit/s electrical transceivers.

Table 1-141 Specifications of 1 Gbit/s electrical transceivers

Item	Description	Remarks
Interface standard	1000BASE-T	-
Transmission rate	10-1000 Mbit/s	Complying with IEEE802.3
Interface type	RJ-45	-
Transmission distance	100m (328.08 ft)	Category 5 UTP, BER < 10 ⁻¹² , (SFP/RJ45-GE-100)

1.5.2 1.25 Gbit/s SFP/eSFP Optical Module

You can use different levels of 1.25 Gbit/s SFP/eSFP optical modules with GE interfaces and 10 GE interfaces. The wavelength of common 1.25 Gbit/s SFP/eSFP optical modules can be 850 nm, 1310 nm, or 1550 nm, and the transmission distance ranges from 0.5 km (0.31 mi) to 80 km (49.71 mi).

Figure 1-109 1.25 Gbit/s SFP/eSFP optical module



Table 1-142 lists the currently available 1.25 Gbit/s SFP/eSFP optical modules.

Table 1-142 1.25 Gbit/s SFP/eSFP optical modules

Product Model	BOM Number	Interface Standard	Transmission Distance (km) (mi)	Transmission Medium	Wavelength (nm)	Remarks
eSFP-GE-SX-MM850	02315204	1000BASE-SX	0.5 (0.31)	Multi-mode	850	Preferred
SFP-GE-LX-SM1310	02315200	1000BASE-LX	10 (6.21)	Single-mode	1310	Preferred
S-SFP-GE-LH40-SM1310	02317346	1000BASE-LX	40 (24.86)	Single-mode	1310	Preferred When performing a self-loop test, use an optical attenuator
S-SFP-GE-LH80-SM1550	02317348	1000BASE-ZX	80 (49.71)	Single-mode	1550	Preferred When performing a self-loop test, use an optical attenuator

Table 1-143 lists the basic features of 1.25 Gbit/s SFP/eSFP optical modules and compliance standards.

Table 1-143 Basic features of 1.25 Gbit/s SFP/eSFP optical modules and compliance standards

Item	Description
Interface standard	IEEE802.3, SFP MSA
Bit Error Ratio (BER)	$< 1 \times 10E^{-12}$
Temperature	0°C -70°C (32°F -158°F)
Digital diagnosis	SFF-8472(exclude SFP optical modules)
Environment standard	RoHS (exempted)

Item	Description
Security standard	FCC class B, IEC 60825-1 Class 1
ESD	> 500 V (Human body model)

Table 1-144 lists the specifications of the eSFP-GE-SX-MM850 optical module.

Table 1-144 Specifications of the eSFP-GE-SX-MM850 optical module

Item	Specifications
Interface standard	1000BASE-SX
Transmission rate	1.25 Gbit/s
Interface type	LC/PC
Applicable cable and maximum transmission distance	<ul style="list-style-type: none"> ● Multimode fiber (with diameter of 62.5 μm): 220 m ● Multimode fiber (OM1) (with diameter of 62.5 μm): 275 m ● Multimode fiber (with diameter of 50 μm): 500 m ● Multimode fiber (OM2) (with diameter of 50 μm): 550 m
Modal bandwidth	<ul style="list-style-type: none"> ● Multimode fiber: 160 MHz*km ● Multimode fiber (OM1): 200 MHz*km ● Multimode fiber: 400 MHz*km ● Multimode fiber (OM2): 500 MHz*km
Optical transmitter	
Optical source type	VCSEL
Center wavelength	850 nm
Operating wavelength range	830 nm-860 nm
Spectral characteristics	
Maximum root mean square (RMS) Spectral Width	0.85 nm
Maximum spectral width (-20 dB)	N/A
Minimum side mode suppression ratio (SMSR)	N/A
Average transmit optical power	
Maximum transmit optical power	-3 dBm

Item	Specifications
Minimum transmit optical power	-9 dBm
Minimum extinction ratio	9.0 dB
Optical receiver	
Operating wavelength range	770 nm - 860 nm
Maximum receiver sensitivity	-17 dBm
Overload power	0 dBm
Maximum optical channel cost	N/A
Maximum reflection factor	N/A

Table 1-145 lists the specifications of the SFP-GE-LX-SM1310 optical module.

Table 1-145 Specifications of the SFP-GE-LX-SM1310 optical module

Parameter	Specifications
Interface standard	1000BASE-LX
Transmission rate	1.25 Gbit/s
Interface type	LC
Transmission distance	10 km(6.21 mi)
Optical transmitter	
Optical source type	FP
Center wavelength	1310 nm
Operating wavelength range	1270-1355 nm
Spectral characteristics	
Maximum root mean square (RMS) Spectral Width	4 nm
Maximum spectral width (-20 dB)	N/A
Minimum side mode suppression ratio (SMSR)	N/A
Average transmit optical power	
Maximum transmit optical power	-3 dBm
Minimum transmit optical power	-9 dBm
Minimum extinction ratio	9.5 dB

Parameter	Specifications
Optical receiver	
Operating wavelength range	1260-1580 nm
Minimum receiver sensitivity	-20 dBm
Overload power	-3 dBm
Maximum optical channel cost	N/A
Maximum reflection factor	N/A

Table 1-146 lists the specifications of the S-SFP-GE-LH40-SM1310 optical module.

Table 1-146 Specifications of the S-SFP-GE-LH40-SM1310 optical module

Parameter	Specifications
Interface standard	1000BASE-ZX
Transmission rate	1.25 Gbit/s
Interface type	LC/PC
Transmission distance	40 km (25 mi)
Optical transmitter	
Optical source type	DFB
Center wavelength	1310 nm
Operating wavelength range	1275 nm-1335 nm
Spectral characteristics	
Maximum root mean square (RMS) Spectral Width	N/A
Maximum spectral width (-20 dB)	1.0 nm
Minimum side mode suppression ratio (SMSR)	30 dB
Average transmit optical power	
Maximum transmit optical power	0 (34060298) dBm
Minimum transmit optical power	-5 (34060298) dBm
Minimum extinction ratio	9dB
Optical receiver	
Operating wavelength range	1260 nm-1580 nm

Parameter	Specifications
Receiver sensitivity	-23 dBm
Overload power	-3 dBm
Maximum optical channel cost	N/A
Maximum reflection factor	N/A

Table 1-147 lists the specifications of the S-SFP-GE-LH80-SM1550 optical module.

Table 1-147 Specifications of the S-SFP-GE-LH80-SM1550 optical module

Parameter	Specifications
Interface standard	1000BASE-ZX
Transmission rate	1.25 Gbit/s
Interface type	LC/PC
Transmission distance	80 km (50 mi)
Optical transmitter	
Optical source type	DFB
Center wavelength	1550 nm
Operating wavelength range	1540 nm-1570 nm
Spectral characteristics	
Maximum root mean square (RMS) Spectral Width	N/A
Maximum spectral width (-20 dB)	1.0 nm
Minimum side mode suppression ratio (SMSR)	30 dB
Average transmit optical power	
Maximum transmit optical power	3 dBm
Minimum transmit optical power	-2 dBm
Minimum extinction ratio	9 dB
Optical receiver	
Operating wavelength range	1270 nm-1570 nm
Minimum receiver sensitivity	-22 dBm
Overload power	-3 dBm

Parameter	Specifications
Maximum optical channel cost	N/A
Maximum reflection factor	N/A

1.5.3 10 Gbit/s XFP Optical Module

You can use different levels of 10 Gbit/s XFP optical modules with OC-192/STM-64 POS interfaces and 10 GE interfaces. The wavelength of these 10 Gbit/s XFP optical modules can be 850 nm, 1310 nm, or 1550 nm, and the transmission distance ranges from 0.3 km (0.19 mi.) to 80 km (49.71 mi.).

Figure 1-110 10 Gbit/s XFP Optical Module



Table 1-148 lists the currently available 10 Gbit/s XFP optical modules.

Table 1-148 10 Gbit/s XFP optical modules

Product Model	BOM Number	Interface Standard	Transmission Distance (km)	Transmission Medium	Wavelength (nm)	Remarks
XFP-SX-MM850	02315176	10GBASE-SR/SW	0.3 (0.19 mi.)	Multi-mode	850	-
XFP-STM64-LX-SM1310	02315208	10GBASE-LR/LW STM-64/OC-192	10 (6.21 mi.)	Single-mode	1310	-

Product Model	BOM Number	Interface Standard	Transmission Distance (km)	Transmission Medium	Wavelength (nm)	Remarks
XFP-STM64-LH40-SM1550	02315209	10GBASE-ER/EW STM-64/OC-192	40 (24.86 mi.)	Single-mode	1550	When performing a self-loop test, use an optical attenuator
XFP-STM64-SM1550-80km	02315143	10GBASE-ZR/ZW STM-64/OC-192	80 (49.71 mi.)	Single-mode	1550	When performing a self-loop test, use an optical attenuator

Table 1-149 lists the basic features of 10 Gbit/s XFP optical modules and compliance standards.

Table 1-149 Basic features of 10 Gbit/s XFP optical modules and compliance standards

Item	Description
Interface standard	IEEE802.3ae 10GE, SONET OC-192/SDH STM-64, XFP MSA XFP-10G-MM850-300 do not support SONET OC-192/SDH STM-64
Bit Error Ratio (BER)	$< 1 \times 10E^{-12}$
Temperature	0-70°C (32°F to 158°F)
Digital diagnosis	XFP MSA INF8077i
Environment standard	RoHS (exempted)
Security standard	FCC class B, IEC 60825-1 Class 1 laser eye safe
ESD	> 500 V (Human body model)

Table 1-150 lists the specifications of the XFP-SX-MM850 optical module.

Table 1-150 Specifications of the XFP-SX-MM850 optical module

Item	Specifications
Interface standard	10GBASE-SR/SW
Transmission rate	10.3125 Gbit/s (10GBASE-SR/SW) 9.95328 Gbit/s (10GBASE-SW)
Interface type	LC
Applicable cable and maximum transmission distance	<ul style="list-style-type: none"> ● Multimode fiber (with diameter of 62.5 μm): 26 m ● Multimode fiber (OM1) (with diameter of 62.5 μm): 33 m ● Multimode fiber (with diameter of 50 μm): 66 m ● Multimode fiber (OM2) (with diameter of 50 μm): 82 m ● Multimode fiber (OM3) (with diameter of 50 μm): 300 m ● Multimode fiber (OM4) (with diameter of 50 μm): 400 m
Modal bandwidth	<ul style="list-style-type: none"> ● Multimode fiber: 160 MHz*km ● Multimode fiber (OM1): 200 MHz*km ● Multimode fiber: 400 MHz*km ● Multimode fiber (OM2): 500 MHz*km ● Multimode fiber (OM3): 2000 MHz*km ● Multimode fiber (OM4): 4700 MHz*km
Optical transmitter	
Optical source type	VCSEL
Center wavelength	850 nm
Operating wavelength range	840-860 nm
Spectral characteristics	
Maximum root mean square (RMS) Spectral Width	0.45 nm
Maximum spectral width (-20 dB)	N/A
Minimum side mode suppression ratio (SMSR)	N/A
Average transmit optical power	
Maximum transmit optical power	-1.3 dBm
Minimum transmit optical power	-7.3 dBm

Item	Specifications
Minimum extinction ratio	3.0 dB
Optical receiver	
Operating wavelength range	840-860 nm
Receiver sensitivity	-9.9 dBm
Overload power	-1 dBm
Maximum optical channel cost	N/A
Maximum reflection factor	-12 dB

Table 1-151 lists the specifications of the XFP-STM64-LX-SM1310 optical module.

Table 1-151 Specifications of the XFP-STM64-LX-SM1310 optical module

Item	Specifications
Interface standard	10GBASE-LR/LW, STM-64/OC-192
Transmission rate	9.95328 Gbit/s (STM-64/OC-192/10GBASE-LW)
	10.3125 Gbit/s (10GBASE-LR/LW)
Interface type	LC
Transmission distance	10 km (6.21 mi.)
Optical transmitter	
Optical source type	DFB
Center wavelength	1310 nm
Operating wavelength range	1290-1330 nm
Spectral characteristics	
Maximum root mean square (RMS) Spectral Width	N/A
Maximum spectral width (-20 dB)	1.0 nm
Minimum side mode suppression ratio (SMSR)	30 dB
Average transmit optical power	
Maximum transmit optical power	-1 dBm
Minimum transmit optical power	-6 dBm

Item	Specifications
Minimum extinction ratio	6 dB
Optical receiver	
Operating wavelength range	1270-1565 nm
Receiver sensitivity	-14.4 dBm
Overload power	0.5 dBm
Maximum optical channel cost	1 dB
Maximum reflection factor	-14 dB

Table 1-152 lists the specifications of the XFP-STM64-LH40-SM1550 optical module.

Table 1-152 Specifications of the XFP-STM64-LH40-SM1550 optical module

Item	Specifications
Interface standard	10GBASE-ER/EW, STM-64/OC-192
Transmission rate	9.95328 Gbit/s (STM-64/OC-192/EW)
	10.3125 Gbit/s (10GBASE-ER)
Interface type	LC
Transmission distance	40 km (24.86 mi.)
Optical transmitter	
Optical source type	EML
Center wavelength	1550 nm
Operating wavelength range	1530-1565 nm
Spectral characteristics	
Maximum root mean square (RMS) Spectral Width	N/A
Maximum spectral width (-20 dB)	1.0 nm
Minimum side mode suppression ratio (SMSR)	30 dB
Average transmit optical power	
Maximum transmit optical power	2 dBm
Minimum transmit optical power	-1 dBm
Minimum extinction ratio	8.2 dB

Item	Specifications
Optical receiver	
Operating wavelength range	1270-1565 nm
Receiver sensitivity	-15.8 dBm
Overload power	-1 dBm
Maximum optical channel cost	2 dB
Maximum reflection factor	-26 dB

Table 1-153 lists the specifications of the XFP-STM64-SM1550-80km optical module.

Table 1-153 Specifications of the XFP-STM64-SM1550-80km optical module

Item	Specifications
Interface standard	10GBASE-ZR/ZW, STM-64/OC-192
Transmission rate	9.95328 Gbit/s (STM-64/OC-192/ZW)
	10.3125 Gbit/s (10GBASE-ZR)
Interface type	LC/PC
Transmission distance	80 km (49.71 mi.)
Optical transmitter	
Optical source type	EML
Center wavelength	1550 nm
Operating wavelength range	1530-1565 nm
Spectral characteristics	
Maximum root mean square (RMS) Spectral Width	N/A
Maximum spectral width (-20 dB)	1.0 nm
Minimum side mode suppression ratio (SMSR)	30 dB
Average transmit optical power	
Maximum transmit optical power	4 dBm
Minimum transmit optical power	0 dBm
Minimum extinction ratio	9 dB
Optical receiver	

Item	Specifications
Operating wavelength range	1270-1600 nm
Receiver sensitivity	-24 dBm
Overload power	-7 dBm
Maximum optical channel cost	2 dB
Maximum reflection factor	-27 dB

1.5.4 10 Gbit/s SFP+ Optical Module

You can use different levels of 10 Gbit/s SFP+ optical modules only with 10 GE interfaces. The wavelength of these 10 Gbit/s SFP+ optical modules can be 850 nm, 1310 nm, or 1550 nm, and the transmission distance ranges from 0.3 km (0.19 mi.) to 80 km (49.71 mi.).

Figure 1-111 10 Gbit/s SFP+ optical module



Table 1-154 lists the currently available 10 Gbit/s SFP+ optical modules.

Table 1-154 10 Gbit/s SFP+ optical modules

Product Model	BOM Number	Interface Standard	Transmission Distance (km)	Transmission Medium	Wavelength (nm)	Remarks
OMXD30000	02318169	10GBASE-SR	0.3 (0.19 mi.)	Multi-mode	850	-
OSX01000	02318170	10GBASE-LR	10 (6.21 mi.)	Single-mode	1310	-

Product Model	BOM Number	Interface Standard	Transmission Distance (km)	Transmission Medium	Wavelength (nm)	Remarks
OSX040N01	02310CNF	10GBASE-ER	40 (24.86 mi.)	Single-mode	1550	The optical modules of FINISAR are of the cooled type, and the initialization time does not exceed 90s. When performing a self-loop test, use an optical attenuator.
SFP-10G-ZR	02310SNN	10GBASE-ZR	80 (49.71 mi.)	Single-mode	1550	When performing a self-loop test, use an optical attenuator.

Table 1-155 lists the basic features of 10 Gbit/s SFP+ optical modules and compliance standards.

Table 1-155 Basic features of 10 Gbit/s SFP+ optical modules and compliance standards

Item	Description
Interface standard	IEEE802.3ae 10GE, SFP+ MSA,SFF-8472 SONET OC-192/SDH STM-64 is not supported.
Bit Error Ratio (BER)	<1x10E ⁻¹²

Item	Description
Temperature	0°C to 70°C (32°F to 158°F)
Digital diagnosis	SFF-8472
Environment standard	RoHS-6 (lead free)
Security standard	IEC 60825-1 Class 1 laser eye safe
ESD	>500 V (Human body model)

Table 1-156 lists the specifications of the OMXD30000 optical modules.

Table 1-156 Specifications of the OMXD30000 optical modules

Item	Specifications
Interface standard	10GBASE-SR
Transmission rate	10.3125 Gbit/s (10GBASE-SR)
Interface type	LC
Applicable cable and maximum transmission distance	<ul style="list-style-type: none"> ● Multimode fiber (with diameter of 62.5 μm): 26 m ● Multimode fiber (OM1) (with diameter of 62.5 μm): 33 m ● Multimode fiber (with diameter of 50 μm): 66 m ● Multimode fiber (OM2) (with diameter of 50 μm): 82 m ● Multimode fiber (OM3) (with diameter of 50 μm): 300 m ● Multimode fiber (OM4) (with diameter of 50 μm): 400 m
Modal bandwidth	<ul style="list-style-type: none"> ● Multimode fiber: 160 MHz*km ● Multimode fiber (OM1): 200 MHz*km ● Multimode fiber: 400 MHz*km ● Multimode fiber (OM2): 500 MHz*km ● Multimode fiber (OM3): 2000 MHz*km ● Multimode fiber (OM4): 4700 MHz*km
Optical transmitter	
Optical source type	VCSEL
Center wavelength	850 nm
Operating wavelength range	840-860 nm

Item	Specifications
Spectral characteristics	
Maximum root mean square (RMS) spectral width	0.45 nm
Maximum spectral width (-20 dB)	N/A
Minimum side mode suppression ratio (SMSR)	N/A
Average transmit optical power	
Maximum transmit optical power	-1 dBm
Minimum transmit optical power	-7.3 dBm
Minimum extinction ratio	3.0 dB
Optical receiver	
Operating wavelength range	840-860 nm
Receiver sensitivity	-9.9 dBm
Overload power	-1 dBm
Maximum optical channel cost	N/A
Maximum reflection factor	-12 dB

Table 1-157 lists the specifications of the OSX010000 optical modules.

Table 1-157 Specifications of the OSX010000 optical modules

Item	Specifications
Interface standard	10GBASE-LR
Transmission rate	10.3125 Gbit/s (10GBASE-LR)
Interface type	LC
Transmission distance	10 km (6.21 mi.)
Optical transmitter	
Optical source type	DFB
Center wavelength	1310 nm
Operating wavelength range	1260-1355 nm
Spectral characteristics	

Item	Specifications
Maximum root mean square (RMS) spectral width	N/A
Maximum spectral width (-20dB)	N/A
Minimum side mode suppression ratio (SMSR)	30 dB
Average transmit optical power	
Maximum transmit optical power	0.5 dBm
Minimum transmit optical power	-8.2 dBm
Minimum extinction ratio	3.5 dB
Optical receiver	
Operating wavelength range	1260-1355 nm
Receiver sensitivity	-14.4 dBm
Overload power	0.5 dBm
Maximum optical channel cost	N/A
Maximum reflection factor	-12 dB

Table 1-158 lists the specifications of the OSX040N01 optical modules.

Table 1-158 Specifications of the OSX040N01 optical modules

Item	Specifications
Interface standard	10GBASE-ER
Transmission rate	10.3125 Gbit/s (10GBASE-ER)
Interface type	LC
Transmission distance	40 km (24.86 mi.)
Optical transmitter	
Optical source type	EML
Center wavelength	1550 nm
Operating wavelength range	1530-1565 nm
Spectral characteristics	
Maximum root mean square (RMS) spectral width	N/A

Item	Specifications
Maximum spectral width (-20dB)	1 nm
Minimum side mode suppression ratio (SMSR)	30 dB
Average transmit optical power	
Maximum transmit optical power	4 dBm
Minimum transmit optical power	-4.7 dBm
Minimum extinction ratio	3 dB
Optical receiver	
Operating wavelength range	1530-1565 nm
Receiver sensitivity	-15.8 dBm
Overload power	0.5 dBm
Maximum optical channel cost	N/A
Maximum reflection factor	-26 dB

Table 1-159 lists the specifications of the SFP-10G-ZR optical modules.

Table 1-159 Specifications of the SFP-10G-ZR optical modules

Item	Specifications
Interface standard	10GBASE-ER
Transmission rate	10.3125 (10GBASE-ER) 9.953 (10GBASE-WAN)
Interface type	LC
Transmission distance	80 km (49.72 mi.)
Optical transmitter	
Optical source type	EML
Center wavelength	1550 nm
Operating wavelength range	1530-1565 nm
Spectral characteristics	
Maximum root mean square (RMS) spectral width	N/A
Maximum spectral width (-20dB)	1 nm

Item	Specifications
Minimum side mode suppression ratio (SMSR)	30 dB
Average transmit optical power	
Maximum transmit optical power	4 dBm
Minimum transmit optical power	0 dBm
Minimum extinction ratio	9 dB
Optical receiver	
Operating wavelength range	1530-1565 nm
Receiver sensitivity	-24 dBm
Overload power	-7 dBm
Maximum optical channel cost	N/A
Maximum reflection factor	-27 dB

1.5.5 40 Gbit/s CFP Optical Modules

You can use 40 Gbit/s CFP optical modules only on 40 GE interfaces. They provide multiple wavelength ranges. The transmission distance is 10 km (6.21 mi).

Figure 1-112 40 Gbit/s CFP optical modules



Table 1-160 lists the available 40 Gbit/s CFP optical modules.

Table 1-160 40 Gbit/s CFP optical modules

Model	BOM Number	Interface Standard	Transmission Distance (km) (mi)	Transmission Medium	Wavelength (nm)	Remarks
CFP40-1331-10-LC	02310TMD	40GBASE-LR4	10 (6.21)	Single mode	1271 1291 1311 1331	-

Table 1-161 lists the attributes and standards of 40 Gbit/s CFP optical modules.

Table 1-161 Attributes and standards of 40 Gbit/s CFP optical modules

Attribute and standard	Description
Interface standard	40GBASE-LR4, ITU-T G.959.1 4I1-9D1F
Bit error rate (BER)	$< 1 \times 10E^{-12}$
Operating temperature	0-70°C (32°F to 158°F)
Digital diagnosis	
Environment standard	RoHS (exempted)
Safety standard	FCC class B, IEC 60825-1 Class 1 laser eye safe
ESD	>500V (Human Body Model (HBM))

Table 1-162 lists the CFP40-1331-10-LC optical module specifications.

Table 1-162 CFP40-1331-10-LC optical module specifications

Item	Specifications
Interface standard	40GBASE-LR4
Transmission rate	41.25 Gbit/s
Interface type	LC
Transmission distance	10 km (6.21 mi)
Optical transmitter	
Optical source type	Semi-cooled EA-DFB

Item	Specifications
Center wavelength	1271 nm 1291 nm 1311 nm 1331 nm
Working wavelength	1264.5-1277.5 nm 1284.5-1297.5 nm 1304.5-1317.5 nm 1324.5-1337.5 nm
Spectrum attributes	
Maximum root-mean-square (RMS) spectral width	N/A
Maximum spectrum width (-20 dB)	N/A
Minimum Side Mode Suppression Ratio (SMSR)	30 dB
Average transmit optical power	
Maximum transmit optical power	3.5 dBm
Minimum transmit optical power	-4 dBm
Minimum extinction ratio	4.0 dB
Optical receiver	
Working wavelength	1264.5-1277.5 nm 1284.5-1297.5 nm 1304.5-1317.5 nm 1324.5-1337.5 nm
Minimum receiver sensitivity	-13.7 dBm
Overload optical power	3.5 dBm
Minimum optical channel overhead	1.5 dB
Maximum reflection coefficient	-26 dB

1.5.6 40 Gbit/s QSFP+ Optical Module

The 40 Gbit/s QSFP+ optical modules can only be used with 40 GE interfaces. The wavelength of these 40 Gbit/s QSFP+ optical modules can be 850 nm, or 1310 nm-center multiple wavelength ranges. Transmission distances can be 0.15 km (0.09 mi.), 0.3 km (0.18 mi.), or 10 km (6.21 mi.).

Figure 1-113 40 Gbit/s QSFP+ optical module



Table 1-163 lists the currently available 40 Gbit/s QSFP+ optical modules.

Table 1-163 40 Gbit/s QSFP+ optical modules

Product Model	BOM Number	Interface Standard	Transmission Distance (km)	Mode	Wavelength (nm)	Remarks
QSFP-40 G-LR4	02310MHS	40GBASE-LR4	10 (6.21 mi.)	Single-mode	1271 1291 1311 1331	-
QSFP-40 G-iSR4	02310MHR	40GBASE-SR4	0.15 (0.09 mi.)	Multi-mode	850	-
QSFP-40 G-eSR4	02310RMB	40GBase-eSR4	0.3 (0.18 mi.)	Multi-mode	850	-

Table 1-164 lists the basic features of 40 Gbit/s QSFP+ optical modules and their compliance standards.

Table 1-164 Basic features of 40 Gbit/s QSFP+ optical modules and their compliance standards

Item	Description
Interface standard	IEEE 802.3ba
Bit Error Ratio (BER)	<1x10E ⁻¹²
Temperature	0°C to 70°C (32°F to 158°F)
Digital diagnosis	QSFP MSA

Item	Description
Environment standard	RoHS-6 (lead free)
Security standard	-
ESD	>500 V (Human body model)

Table 1-165 lists the specifications of the QSFP-40G-LR4 optical modules.

Table 1-165 Specifications of the QSFP-40G-LR4 optical modules

Item	Specifications
Interface standard	40GBASE-LR4
Transmission rate	41.25 Gbit/s
Interface type	LC
Transmission distance	10 km (6.21 mi.)
Optical transmitter	
Optical source type	DFB
Center wavelength	1310 nm
Operating wavelength range	1264.5 nm-1277.5 nm 1284.5 nm-1297.5 nm 1304.5 nm-1317.5 nm 1324.5 nm-1337.5 nm
Spectral characteristics	
Maximum root mean square (RMS) spectral width	N/A
Maximum spectral width (-20 dB)	N/A
Minimum side mode suppression ratio (SMSR)	N/A
Average transmit optical power	
Maximum transmit optical power	2.3 dBm
Minimum transmit optical power	- 7 dBm
Minimum extinction ratio	3.5 dB
Optical receiver	

Item	Specifications
Operating wavelength range	1264.5 nm-1277.5 nm 1284.5 nm-1297.5 nm 1304.5 nm-1317.5 nm 1324.5 nm-1337.5 nm
Receiver sensitivity	- 11.5 dBm
Overload power	2.3 dBm
Maximum optical channel cost	1.9 dB
Maximum reflection factor	N/A

Table 1-166 lists the specifications of the QSFP-40G-iSR4 optical modules.

Table 1-166 Specifications of the QSFP-40G-iSR4 optical modules

Item	Specifications
Interface standard	40GBASE-SR4
Transmission rate	41.25Gbit/s
Interface type	MPO
Applicable cable and maximum transmission distance	<ul style="list-style-type: none"> ● Multimode fiber (OM2) (with diameter of 50 μm): 30 m ● Multimode fiber (OM3) (with diameter of 50 μm): 100 m ● Multimode fiber (OM4) (with diameter of 50 μm): 150 m
Modal bandwidth	<ul style="list-style-type: none"> ● Multimode fiber (OM2): 500 MHz*km ● Multimode fiber (OM3): 2000 MHz*km ● Multimode fiber (OM4): 4700 MHz*km
Optical transmitter	
Optical source type	VCSEL
Center wavelength	850 nm
Operating wavelength range	840 nm-860 nm
Spectral characteristics	
Maximum root mean square (RMS) spectral width	N/A
Maximum spectral width (-20dB)	N/A

Item	Specifications
Minimum side mode suppression ratio (SMSR)	N/A
Average transmit optical power	
Maximum transmit optical power	-1 dBm
Minimum transmit optical power	-7.6 dBm
Minimum extinction ratio	3 dB
Optical receiver	
Operating wavelength range	840 nm-860 nm
Receiver sensitivity	-9.5 dBm
Overload power	2.4 dBm
Maximum optical channel cost	N/A
Maximum reflection factor	N/A

Table 1-167 lists the specifications of the QSFP-40G-eSR4 optical modules.

Table 1-167 Specifications of the QSFP-40G-eSR4 optical modules

Item	Specifications
Interface standard	40GBase-eSR4
Transmission rate	41.25 Gbit/s
Interface type	MPO
Applicable cable and maximum transmission distance	<ul style="list-style-type: none"> ● Multimode fiber (OM2) (with diameter of 50 μm): 82 m ● Multimode fiber (OM3) (with diameter of 50 μm): 300 m ● Multimode fiber (OM4) (with diameter of 50 μm): 400 m
Modal bandwidth	<ul style="list-style-type: none"> ● Multimode fiber (OM2): 500 MHz*km ● Multimode fiber (OM3): 2000 MHz*km ● Multimode fiber (OM4): 4700 MHz*km
Optical transmitter	
Optical source type	VCSEL
Center wavelength	850 nm
Operating wavelength range	840 nm-860 nm

Item	Specifications
Spectral characteristics	
Maximum root mean square (RMS) spectral width	N/A
Maximum spectral width (-20dB)	N/A
Minimum side mode suppression ratio (SMSR)	N/A
Average transmit optical power	
Maximum transmit optical power	-1 dBm
Minimum transmit optical power	-7.6 dBm
Minimum extinction ratio	3 dB
Optical receiver	
Operating wavelength range	840 nm-860 nm
Receiver sensitivity	-9.9 dBm
Overload power	2.4 dBm
Maximum optical channel cost	N/A
Maximum reflection factor	N/A

1.5.7 100 Gbit/s CFP Optical Modules

You can use 100 Gbit/s CFP optical modules only on 100 GE interfaces. They provide multiple wavelength ranges. The transmission distance ranges from 0.1 km (0.06 mi.) to 10 km (6.21 mi.).

Figure 1-114 100 Gbit/s CFP optical modules



Table 1-168 lists the available 100 Gbit/s CFP optical modules.

Table 1-168 100 Gbit/s CFP optical modules

Model	BOM Number	Interface Standard	Transmission Distance (km) (mi)	Transmission Medium	Wavelength (nm)
CFP-100G-LR4	02310YTD	100GBASE-LR4	10 (6.21)	Single mode	1295 1300 1304 1309
CFP-100G-SR10 CFP-100G-MPO	02310YTB 02310YNE	100GBASE-SR10	0.1 (0.06)	Multi-mode	850

Table 1-169 lists the attributes and standards of 100 Gbit/s CFP optical modules.

Table 1-169 Attributes and standards of 100 Gbit/s CFP optical modules

Item	Description
Interface standard	100GBASE-LR4 100GBASE-SR10
Bit error rate (BER)	$< 1 \times 10E^{-12}$
Operating temperature	0-70°C (32°F to 158°F)
Digital diagnosis	-
Environment standard	RoHS (exempted)
Safety standard	FCC class B, IEC 60825-1 Class 1 laser eye safe
ESD	>500V

Table 1-170 lists the CFP-100G-LR4 optical module specifications.

Table 1-170 CFP-100G-LR4 optical module specifications

Item	Specifications
Interface standard	100GBASE-LR4
Transmission rate	103.125 Gbit/s

Item	Specifications
Interface type	LC/PC
Transmission distance	10 km (6.21 mi)
Optical transmitter	
Optical source type	EML
Center wavelength	1295 nm 1300 nm 1304 nm 1309 nm
Working wavelength	1294.53-1296.59 nm 1299.02-1301.09 nm 1303.54-1305.63 nm 1308.09-1310.19 nm
Spectrum attributes	
Maximum root-mean-square (RMS) spectral width	N/A
Maximum spectrum width (-20 dB)	N/A
Minimum Side Mode Suppression Ratio (SMSR)	30 dB
Average transmit optical power	
Maximum transmit optical power	4.5 dBm
Minimum transmit optical power	-4.3 dBm
Minimum extinction ratio	4.0 dB
Optical receiver	
Working wavelength	1294.53-1296.59 nm 1299.02-1301.09 nm 1303.54-1305.63 nm 1308.09-1310.19 nm
Receiver sensitivity	-10.6 dBm
Overload optical power	4.5 dBm
Minimum optical channel overhead	1.5 dB
Maximum reflection coefficient	-26 dB

Table 1-171 lists the CFP-100G-SR10/CFP-100G-MPO optical module specifications.

Table 1-171 CFP-100G-SR10/CFP-100G-MPO optical module specifications

Item	Specifications
Interface standard	100GBASE-SR10
Transmission rate	103.125 Gbit/s
Interface type	MPO
Applicable cable and maximum transmission distance	<ul style="list-style-type: none"> ● Multimode fiber (OM2) (with diameter of 50 μm): 30 m ● Multimode fiber (OM3) (with diameter of 50 μm): 100 m ● Multimode fiber (OM4) (with diameter of 50 μm): 150 m
Modal bandwidth	<ul style="list-style-type: none"> ● Multimode fiber (OM2): 500 MHz*km ● Multimode fiber (OM3): 2000 MHz*km ● Multimode fiber (OM4): 4700 MHz*km
Optical transmitter	
Optical source type	DFB
Center wavelength	850 nm
Working wavelength	840-860 nm
Spectrum attributes	
Maximum root-mean-square (RMS) spectral width	-
Maximum spectrum width (-20 dB)	-
Minimum Side Mode Suppression Ratio (SMSR)	-
Average transmit optical power	
Maximum transmit optical power	-2.4 dBm
Minimum transmit optical power	-7.6 dBm
Minimum extinction ratio	3 dB
Optical receiver	
Working wavelength	840-860 nm
Receiver sensitivity	-9.5 dBm
Overload optical power	2.5 dBm
Minimum optical channel overhead	3.5 dB
Maximum reflection coefficient	-

2 Hardware Installation

About This Chapter

This chapter describes hardware installation procedures and precautions.

[2.1 Preparing for the Installation](#)

Before installing the USG9500, prepare the technical documentation, tools and meters, arrange experienced installation engineers, survey the installation environment, and unpack and check the products.

[2.2 Installing USG9580](#)

This section describes how to install the USG9580.

[2.3 Installing USG9560](#)

This section describes how to install the USG9560.

[2.4 Installing USG9520](#)

This section describes how to install the USG9520.

[2.5 Power Distribution Design Guide](#)

This section describes how to configure power distribution.

2.1 Preparing for the Installation

Before installing the USG9500, prepare the technical documentation, tools and meters, arrange experienced installation engineers, survey the installation environment, and unpack and check the products.

2.1.1 Preparing Technical Documents

Technical documents are a vital prerequisite for installing a cabinet successfully. They are also the important information to be referred to during the installation.

Before installation, read the technical documents listed in [Table 2-1](#) carefully and refer to them as necessary throughout the installation.

Table 2-1 Technical documents related to hardware installation

Document Category	Document Name	Description
Installation guide	Equipment Room Design Construction Diagram Cable Route Diagram	Prepared by the customer. The user or a Huawei site survey engineer should provide copies before delivery.
	Machine room site survey report	Produced by a Huawei site survey engineer after site survey.
	Engineering design, including network functions, networking diagrams, and network addresses planning	Compiled by the Huawei Engineering Design Department according to the equipment configuration of the sites. Delivered at the installation site along with the equipment.
Product manual	Attached disk Quick Installation Guide	Provided by Huawei and shipped along with the equipment. Installers can refer to these manuals during installation and maintenance.
Related document	Contract Configuration Table Packing List	Provided by Huawei during delivery.

2.1.2 Preparing Tools and Meters

The installer needs to arrange the tools and meters required for hardware installation.

[Table 2-2](#) lists the required tools and meters for USG9500 installation.

Table 2-2 Required tools and meters

Category	Tool/Meter
Measuring and lineation instruments	<ul style="list-style-type: none"> ● Ruler: used for measuring ● Marker: used to indicate specific lengths with lines
Fastening tools	<ul style="list-style-type: none"> ● Flat-head screwdriver: used to fasten small screws and bolts ● Phillips screwdriver: used to fasten small screws and bolts
Drilling tools	<ul style="list-style-type: none"> ● Hammer drill: used to drill mounting holes ● Vacuum cleaner: used to remove dust and debris produced while drilling holes ● Hammer: used to drive hollow wall anchors into mounting holes
Pliers	<ul style="list-style-type: none"> ● Needle-nose pliers: used to hold small fittings and twist fine wires in a narrow workplace ● Diagonal cutting pliers: used to cut insulated sleeves and tie wraps
Auxiliary tools	<ul style="list-style-type: none"> ● Knife: used to peel insulated sleeves from cables ● Ladder: used to access overhead cabling
Special tools	<ul style="list-style-type: none"> ● Wire stripper: used to peel the insulated sleeve of the communication cable ● RJ-45 crimping tool: used to crimp RJ-45 cables for telephony and Ethernet applications ● Crimping tool: used to crimp the metal sleeve at the ends of coaxial cables ● ESD gloves: used to protect the device from damage caused by static electricity ● ESD wrist strip: used to protect the device from damage caused by static electricity ● Protective gloves: used to protect hands from sharp objects
Meters	<ul style="list-style-type: none"> ● Network cable tester: used to test whether network cables are connected and check the connection sequence in a network cable ● Optical power meter: used to test optical power ● Optical attenuator: used to measure optical attenuation ● Multimeter: used to test cabinet insulation, cable connections, and electric performance specifications of the device, such as the voltage, current, and resistance ● Ground resistance tester: used to measure ground resistance ● Configuration terminal (A common PC is also applicable)

2.1.3 Surveying the Installation Environment

Before installing the USG9500, check that the installation environment meets requirements to ensure normal running and maximum service life of the USG9500.

Table 2-3 lists installation environment check items.

Table 2-3 Installation environment checklist

Check Item	Requirements	Compliance
Site for the Equipment Room	As stated in A.3.1 Equipment Room Site Requirements.	<input type="checkbox"/> Y <input type="checkbox"/> N <input type="checkbox"/> N/A
Construction for the equipment room	As stated in A.3.3 Construction Requirements for the Equipment Room.	<input type="checkbox"/> Y <input type="checkbox"/> N <input type="checkbox"/> N/A
Temperature	As stated in A.3.4 Requirements for Temperature, Humidity, and Altitude.	<input type="checkbox"/> Y <input type="checkbox"/> N <input type="checkbox"/> N/A
Relative humidity		<input type="checkbox"/> Y <input type="checkbox"/> N <input type="checkbox"/> N/A
Altitude		<input type="checkbox"/> Y <input type="checkbox"/> N <input type="checkbox"/> N/A
Neatness	As stated in A.3.5 Dust Requirements.	<input type="checkbox"/> Y <input type="checkbox"/> N <input type="checkbox"/> N/A
Corrosive Gases	As stated in A.3.6 Corrosive Gases Requirements.	<input type="checkbox"/> Y <input type="checkbox"/> N <input type="checkbox"/> N/A
Electrostatic discharging	As stated in A.3.7 ESD Prevention Requirements.	<input type="checkbox"/> Y <input type="checkbox"/> N <input type="checkbox"/> N/A
Electromagnetic shielding	As stated in A.3.8 Electromagnetism Requirements for the Equipment Room.	<input type="checkbox"/> Y <input type="checkbox"/> N <input type="checkbox"/> N/A
Surge protection	As stated in A.3.9 Requirements for Lightning Proof Grounding.	<input type="checkbox"/> Y <input type="checkbox"/> N <input type="checkbox"/> N/A
Power supply facility	As stated in A.3.10 Power Supply Requirements.	<input type="checkbox"/> Y <input type="checkbox"/> N <input type="checkbox"/> N/A

2.1.4 Unpacking and Checking the Products

This section describes the procedure and precaution for unpacking and checking the products before installation has started.

2.1.4.1 Checking the Package Container

Before unpacking and checking the products, check whether the package container is intact.

Procedure

Step 1 Unload the products.



To facilitate checking, when unloading the products, arrange the packages in order and make sure that the product labels on the packages face the same direction.

Step 2 After unloading the products, check whether the total number of the products is the same as the number indicated on the *Packing List*. Check whether the destination of delivery is the same as the actual installation site.

Condition	Action
The total number of products is the same as the number indicated on the <i>Packing List</i> , and the products are delivered to the correct destination.	Perform step 4 .
The total number of products is different from the number indicated on the <i>Packing List</i> , or the products are delivered to the wrong destination.	Perform step 3 .

Step 3 The engineering supervisor must send the *Cargo Inspection Feedback Form* that is confirmed and signed by the customer to the order management engineer in the local Huawei representative office within three days. At the same time, stop unpacking the products.

Step 4 Check whether the exterior of the package container is intact. Check whether the package container is placed correctly during transportation.

Condition	Action
The package is intact.	Unpack and check the products.
The package is seriously damaged or shows signs of water intrusion.	Perform step 5 .

Step 5 Stop unpacking the products. Trace the cause and report the problem to the order management engineer of the local Huawei representative office. Then wait for further assistance.

**NOTICE**

To protect the device and trace the cause, transfer the unpacked device indoors to ensure proper storage. Take photographs of the storage site, any rusted or corroded device, package in question, and package materials. Preserve the package and unpacked materials.

----End

2.1.4.2 Unpacking the Wooden Case

Wooden cases are used to pack heavy goods such as racks, cabinets and batteries. Cabinet packaging consists of wooden panels, steel edges, tongues, and foam plates. If possible, move the wooden case into or near the equipment room and then unpack the cabinet to avoid damaging the cabinet during transportation.

Prerequisites

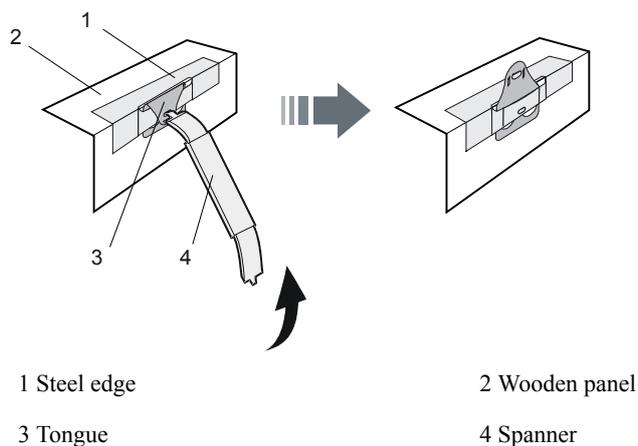
**NOTICE**

- When carrying the cabinet, always hold on to a more durable part of the cabinet, such as the support or the rack. Do not exert force on the more fragile parts, such as the cable support or the cable fixing beam. Doing so may damage the cabinet or cause an injury. Remove the backing blocks from the rack only after the cabinet is carried to the installation site to avoid damaging signal cables and boards during transportation.
 - Correctly orient the wooden case. Do not place the wooden case upside-down. Doing so may severely damage the device.
-

Procedure

- Step 1** Put on protective gloves.
- Step 2** Place the wooden case on the ground. Make sure that the case is level and the pallet side faces downwards.
- Step 3** Insert one end of the spanner into the hole of the tongue on the cover of the wooden case. Lift the spanner to straighten the tongue, as shown in [Figure 2-1](#). (You can also use a screwdriver or a claw hammer to straighten the tongue.)

Figure 2-1 Straightening the tongue

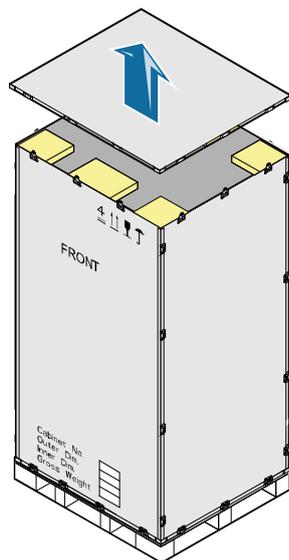


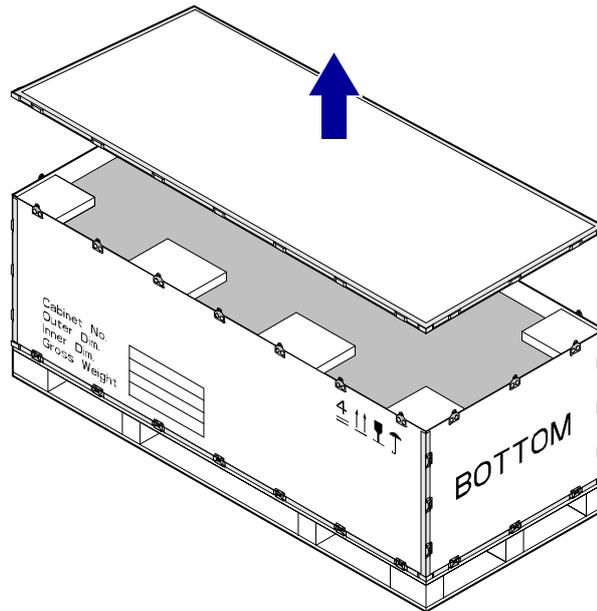
NOTICE

Tongue edges are sharp and may cause injury.

Step 4 After straightening all the tongues on the cover, remove the cover as shown in [Figure 2-2](#).

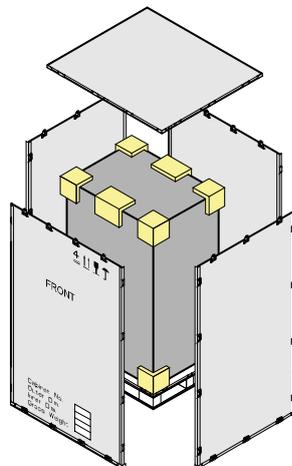
Figure 2-2 Removing the cover

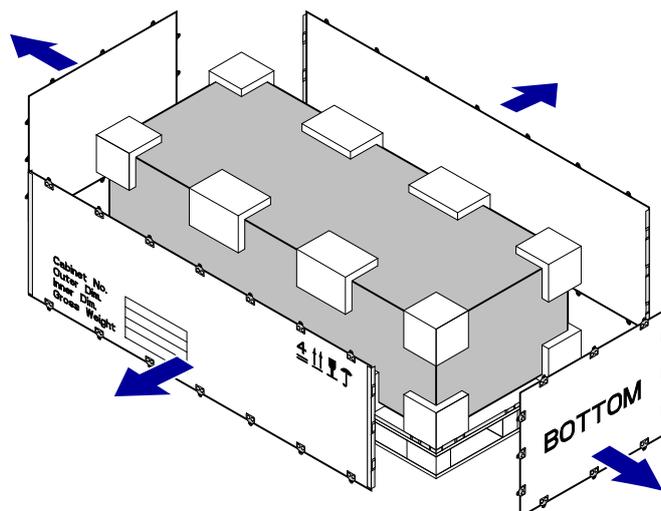




Step 5 Straighten all the tongues that hold together the side wooden panels and remove the side wooden panel, as shown in [Figure 2-3](#).

Figure 2-3 Removing the side wooden panels





Step 6 Stand the cabinet upright. Remove the pallet, foam plates, and package bag.



NOTICE

Three to five people are required to stand the cabinet up. If the cabinet tips over, injuries may occur.

Step 7 Check the following items:

- The appearance of the cabinet. Ensure that the exterior (especially the bottom) of the cabinet is intact, free from water penetration, distortion, and rust.
- The cabinet door. Ensure that the cabinet door can be opened and closed normally.
- The cabinet surface. Ensure that the cabinet surface is clean, neat, and completely painted.
- The labels on the cabinet. Ensure that the labels on the cabinet are correct, legible, and complete.

----End

2.1.4.3 Unpacking the Carton

Cartons contain cables, boards, and terminal devices.

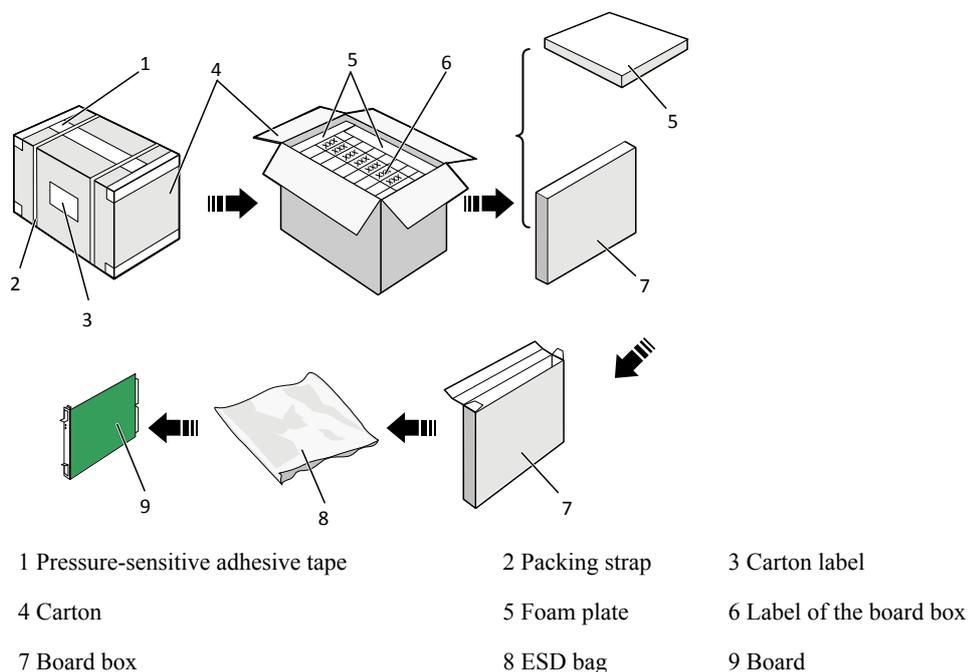
Procedure

- Step 1** Read the carton label carefully to understand the types and quantities of the boards in the carton.
- Step 2** Cut off packing straps with diagonal pliers.
- Step 3** Cut the tape along the seams of the carton cover with a paper knife. Do not penetrate the carton with the knife more than is necessary as this may damage the carton contents.

- Step 4** Open the carton and take out the foam plates.
- Step 5** Check the label on the box that contains the board, and check whether the board quantity is consistent with the quantity indicated on the carton label. Then, take out the boxes.
- Step 6** Wear an ESD wrist strap and ground it correctly. Unpack the ESD bag that contains the board. Check whether the board has any obvious damage.
- Step 7** Check the types and quantity of boards in the carton against the *Packing List*. The *Packing List* must be confirmed and signed on site by the customer.

Figure 2-4 shows the procedure for unpacking the carton.

Figure 2-4 Unpacking the carton



NOTICE

Do not throw away any carton containing boards. It is recommended that one person unpacks one carton. After unpacking a carton, make sure that it is empty before unpacking another carton.

----End

2.1.4.4 Checking the Boards

This section describes the criteria for checking boards.

Before installing the boards, clean the chassis and cabinet. Wear an ESD wrist strap when removing the board from the antistatic package. Check whether the board name is consistent

with the identifier on the package, and whether any device is damaged or any component is missing.

Check the pins on the backplane of the chassis. The pins should be straight and clean. Repair any bent pins on the backplane board slots.

The boards are sensitive to Electrostatic Discharge (ESD). When handling boards, observe the following rules:

- Check whether the device is safely grounded.
- Wear an ESD wrist strap during the installation.
- Ensure that the metal button on the ESD wrist strap is in complete contact with your skin and that the other end of the strap (ESD connector) is inserted into the ground point on the device.
- Ensure that the wrist strap is working properly. Its resistance value must be between 0.75 megohm and 10 megohm. If the service life (usually two years) of the wrist strap has been exceeded or the resistance value fails to meet requirements, replace the wrist strap.
- Do not touch the board with your clothes. The ESD wrist strap cannot protect the board from ESD when it is in contact with clothes.
- Wear ESD gloves and place the board on an antistatic pad when replacing the chip of the board. Use antistatic tweezers or extraction tools to replace chips. Do not touch chips, circuits, or pins with your bare hands.
- Keep the board and other ESD sensitive parts to be installed in antistatic bags. Place the removed boards and components on an antistatic pad or other antistatic materials. Do not use non-antistatic materials such as white foams, common plastic bags, or paper bags to pack boards and do not let such materials touch boards.
- Wear an ESD wrist strap when operating the ports of boards as they are also ESD-sensitive. Discharge the static electricity of cables and protective sleeves before connecting them to the ports.
- Reserve some materials that can hold boards, such as vacuum formed boxes and antistatic bags, in the equipment room for later use.

2.2 Installing USG9580

This section describes how to install the USG9580.

2.2.1 Deployment Requirements

Prior to device installation, deploy the cabinet and device as required to ensure normal device operating.

Power Supply System

- If DC power supply is used, ensure that the outputs of the DC power distribution box fall between -72 V DC and -38 V DC. Two power modules are needed, and each power module must be connected to two different power sources for redundancy.
- If AC power supply is used, ensure that the output voltage of the AC power distribution cabinet falls between 90 V AC and 175 V AC (with rated input voltage being 110 V) or between 175 V AC and 264 V AC (with rated input voltage being 220 V) and that two groups of power modules are provided for redundancy. Meanwhile, two AC power chassis must be installed on the device.

NOTICE

With the 110 V AC power supply, the USG9580 must use 110 V dual-live-wire AC input to meet the maximum system power consumption with the full configuration. This is because AC power modules are half-load output with 110 V AC input, which cannot meet the system power consumption.

Cabinet Requirements

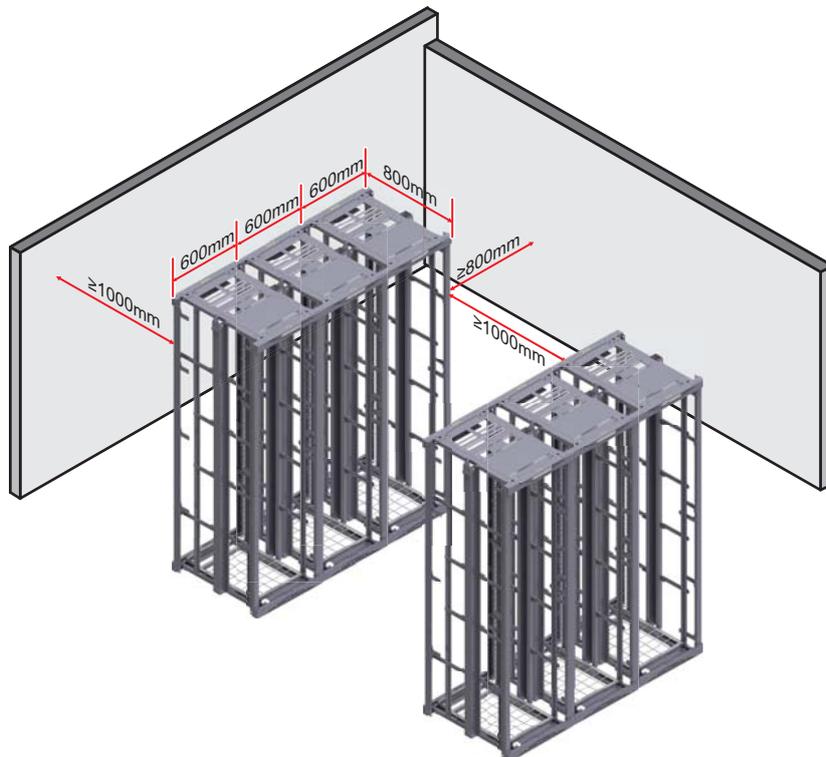
You are advised to use Huawei standard NE68E cabinet. Any other cabinet must meet [A.6 Requirements for Customers' Cabinets Purchased from Other Vendors](#).

Cabinet Clearance Requirements

The N68E-22 cabinet is used as an example. As shown in [Figure 2-5](#), cabinet clearance must meet the following requirements:

- Aisles in the equipment room ≥ 1000 mm; aisles between cabinet rows ≥ 1000 mm
- Space between cabinet sides and wall ≥ 800 mm
- Space between cabinet row and wall ≥ 1000 mm

Figure 2-5 Diagram for cabinet deployment



Device Deployment Requirements

The USG9580 chassis is 32 U high and requires front and back maintenance mode. Device deployment must meet the following airflow and maintenance clearance requirements:

- Airflow
 - A minimum of 750 mm space between the device and the equipment room wall and between two neighboring devices to prevent hot air recirculation
 - A minimum of 2 U between devices installed in the same cabinet, between the top-most device and the top of the cabinet, and between the bottom-most device and the bottom of the cabinet
- Maintenance
 - A minimum of 700 mm between devices and between devices and walls

 **NOTE**

The length of three holes on the mounting rails is 1 U, which is equivalent to 44.45 mm.

2.2.2 Installing the Chassis into the Cabinet

You can mount the USG9580 in a 19-inch standard cabinet using guide rails.

Context



CAUTION

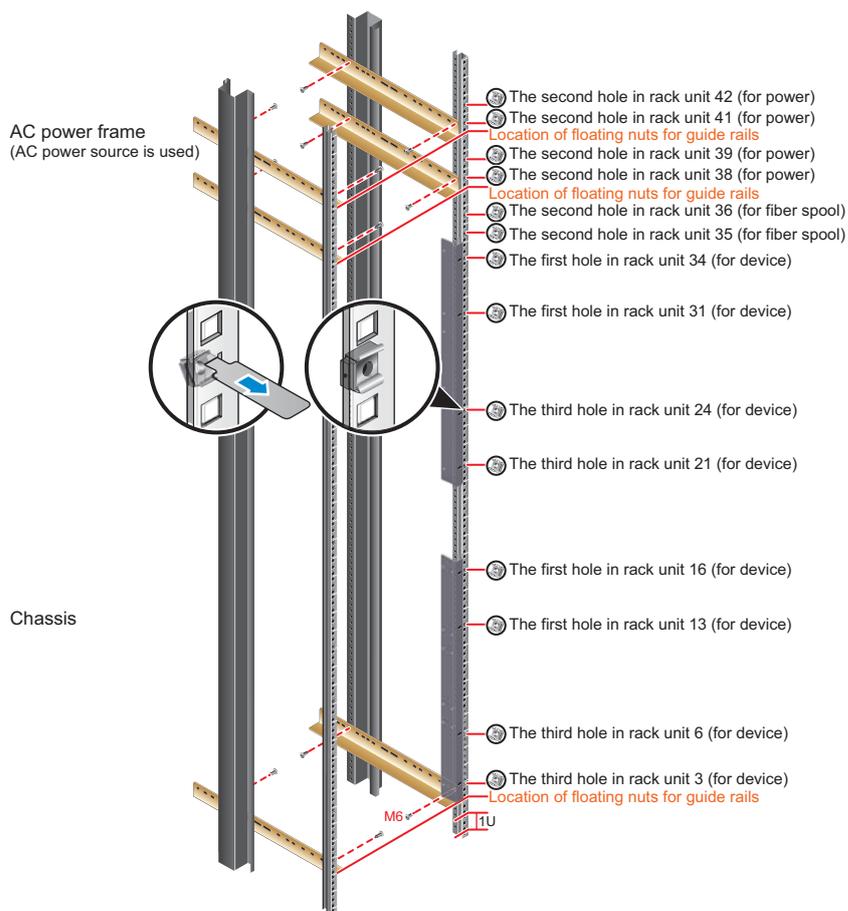
- The USG9580 is heavy and requires four people to lift and move.
 - When moving the device, use the handles on the chassis sides. To avoid damaging the device, do not use the handles on modules.
 - Do not step on the air filter at the bottom of the cabinet.
-

Procedure

Step 1 Install floating nuts and guide rails.

1. Determine where to install floating nuts and mark the positions using a marker, as shown in [Figure 2-6](#).
2. Install the floating nuts at the marked positions.
3. Use M6 screws to fix the guide rails in position.

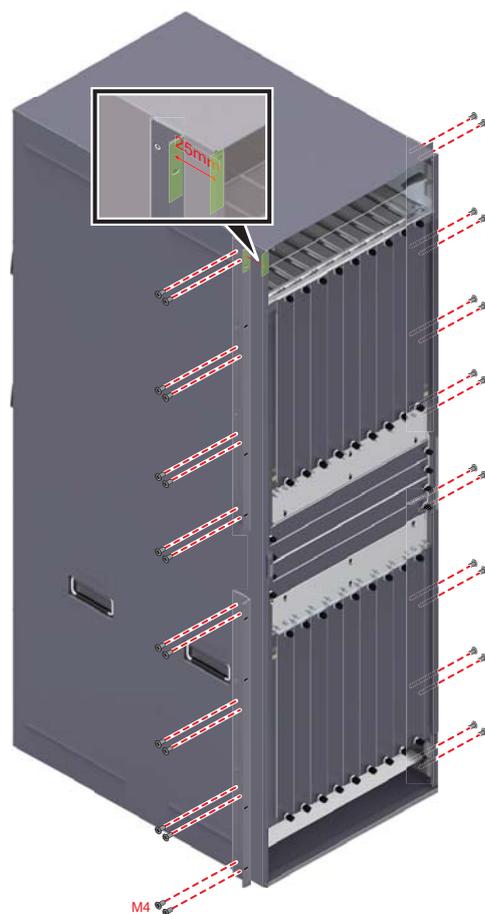
Figure 2-6 Installing floating nuts and guide rails



Step 2 Install mounting ears.

Use a Phillips screwdriver to fix the mounting ears to both sides of the chassis with M4 screws, as shown in [Figure 2-7](#).

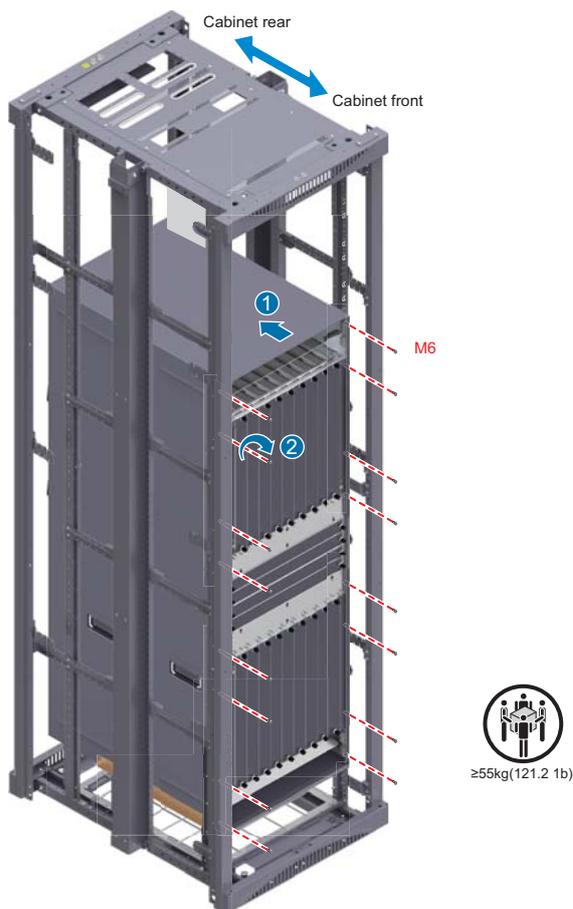
Figure 2-7 Installing mounting ears



Step 3 Mount the USG9580 in the cabinet.

1. Lift up the USG9580, move it to the cabinet, place it onto the guide rails, and push it into the cabinet.
2. Use M6 screws to fix the mounting ears of the USG9580 to the mounting rack, as shown in [Figure 2-8](#).

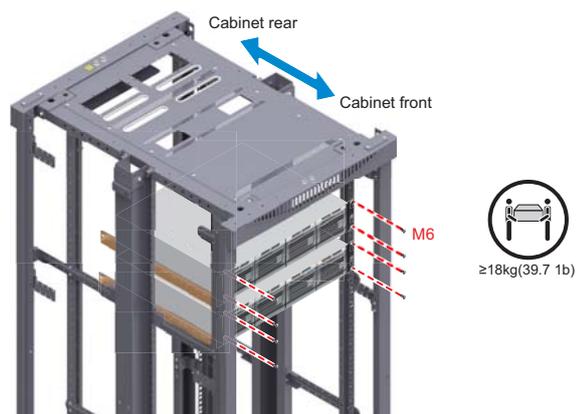
Figure 2-8 Mounting the USG9580 in the cabinet



Step 4 Mount the AC power chassis in the cabinet. (Mandatory for AC power supply)

If the equipment room uses AC power supply, one USG9580 requires two AC power chassis, as shown in [Figure 2-9](#).

Figure 2-9 Mounting the AC power chassis in the cabinet



----End

Follow-up Procedure

Verify the following:

- The USG9580 is securely mounted.
- The exhaust area on the USG9580 is not unobstructed.

2.2.3 Installing the PGND Cable

Correctly connecting the PGND cable of the USG9580 is essential for surge protection and resisting to interference. Before using the USG9580, connect the PGND cable.

Prerequisites

Before installing the PGND cable of the device, ensure that the PGND cable of the cabinet is correctly connected and the ground resistance is zero ohm.

Context

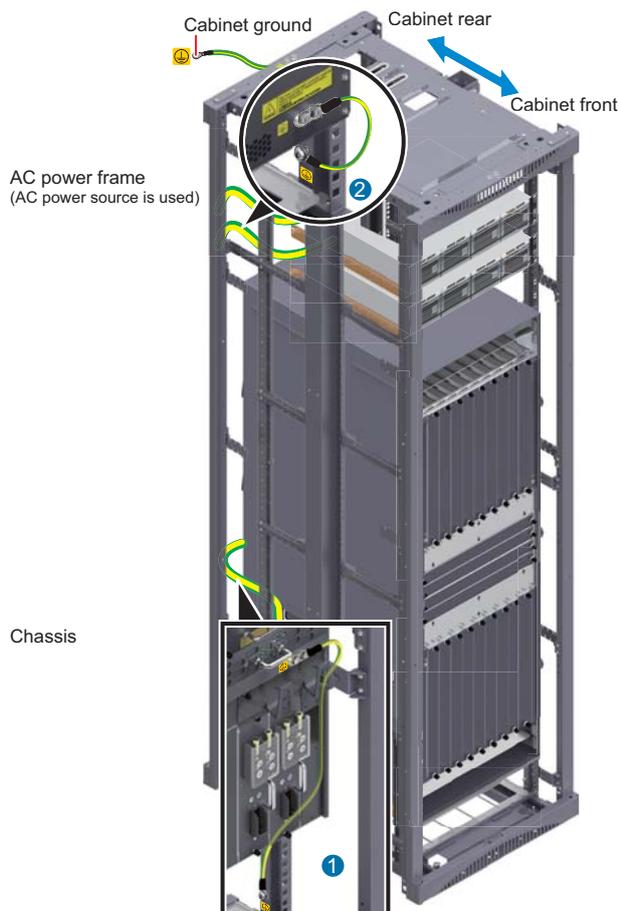
If the chassis is close to the ground bar in the equipment room, connect the PGND cable of the chassis directly to the ground bar. If the chassis is far away from the ground bar, connect the PGND cable to the ground point on the cabinet.

In this section, connecting the PGND cable to the ground point on the cabinet is used as an example.

Procedure

- Step 1** Install the chassis ground cable, as shown in [Figure 2-10](#).
- Step 2** Install the ground cable of the AC power chassis (which is mandatory for AC power supply), as shown in [Figure 2-10](#).

Figure 2-10 Connecting the PGND cable



----End

Follow-up Procedure

Verify the following:

- The PGND cable is securely connected to the ground terminal.
- The electrical resistance between the ground terminal and ground point is less than 10 ohm on a multimeter.

2.2.4 Installing Boards and Subcards

This section describes how to install boards and subcards.

Context



CAUTION

- Ensure that the device and board are completely dry and free of liquid before inserting the board into the device.
- Before installing boards, wear the ESD wrist strap and ensure that the strap is well grounded to prevent any electrostatic discharge from damaging sensitive components.

NOTICE

The installation method for boards in the lower chassis is the same as that for boards in the upper chassis, but they must be inversely installed.

Procedure

Step 1 Select slots based on slot distribution.

You can determine whether a slot is suitable for a board by checking whether the color on both ends of the board panel is the same as the color on the slot.

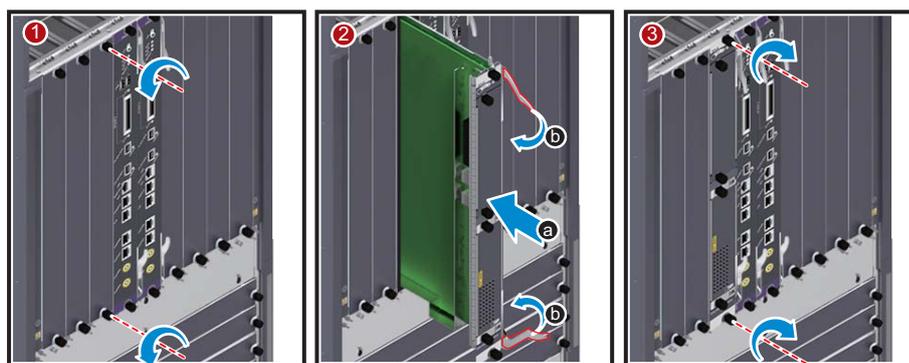
Figure 2-11 Slot layout



Step 2 Install a board.

1. Remove the filler panel from the selected slot.
2. Extend the ejector levels of the board, insert the board fully into the slot, and rotate the ejector level to the front of the board.
3. Use a Phillips screwdriver to fasten the captive screws to the board.

Figure 2-12 Installing a board



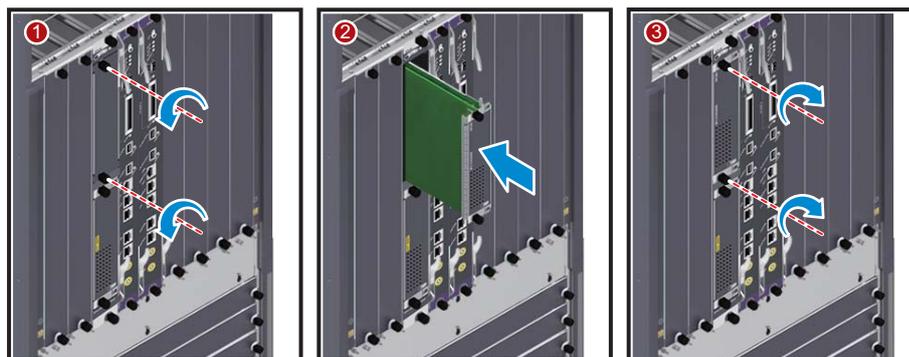
Step 3 Install a subcard.

 **NOTE**

Before you install a subcard, remove redundant guide rails from the board and store them for future use.

1. Remove the filler panel from the board.
2. Smoothly insert the subcard into the board along the guide rail.
3. Use a Phillips screwdriver to fasten the captive screws to the board.

Figure 2-13 Installing a subcard



----End

Follow-up Procedure

Verify the following:

- Boards and subcards are installed in the correct position and captive screws are tightly fastened.
- Filler panels are inserted into vacant slots. Filler panels prevent intrusion of dust and ensure heat dissipation.

2.2.5 Installing Chassis Components

Air filters are used to protect devices against dust, and cable racks are used to route optical fibers and cables.

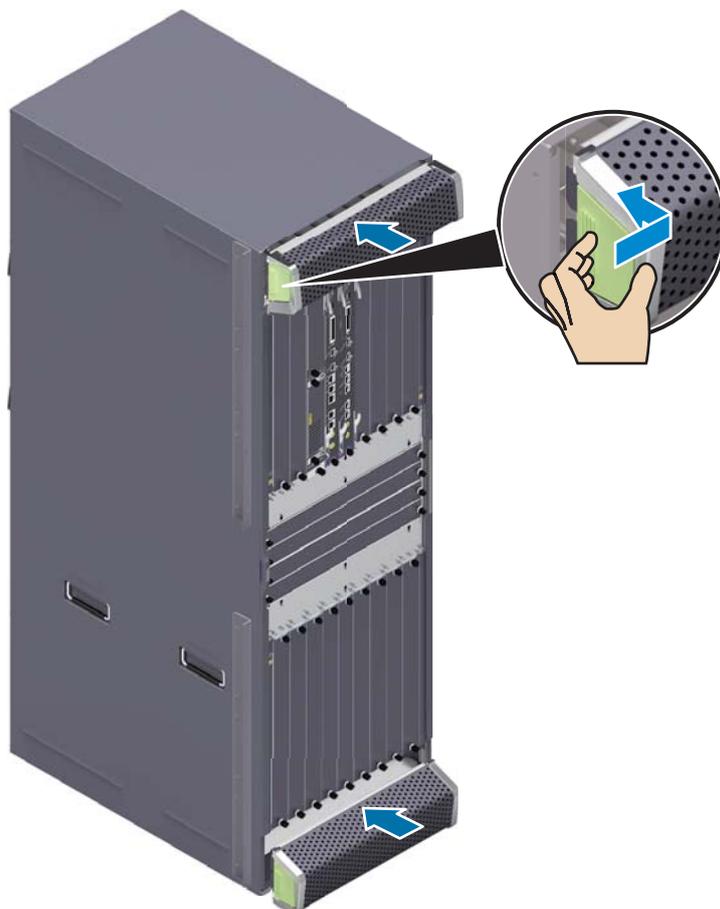
Procedure

- Install air filters on the upper and lower air intake frames.

 **NOTE**

The air intake vent has two air filters, one on the upper end of the front panel of the chassis and one on the lower end. Orient the pin on the air filter towards the hole to prevent installing upside down. Otherwise, the air filter cannot be installed.

Figure 2-14 Installing air filters on the upper and lower air intake frames



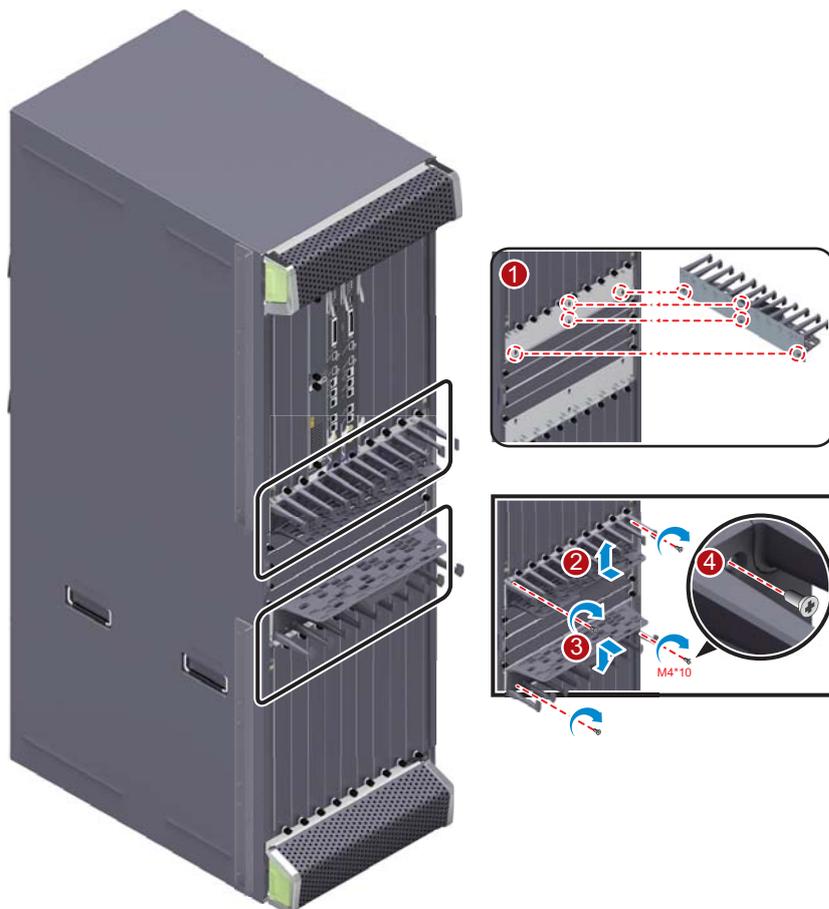
- Install the front cable rack.

 **NOTE**

The front cable rack is divided into upper and lower cable racks. "HUAWEI" is written on the upper cable rack, while "USG9500 Series" appears on the lower cable rack.

- Align the studs of the cable rack with the holes on the front panel of the device and insert the rack.
- Push the upper rack upward until it clicks into place.
- Push the lower downward until it clicks into place.
- Use ten M4 screws to fasten the cable rack into place.

Figure 2-15 Installing the front cable rack



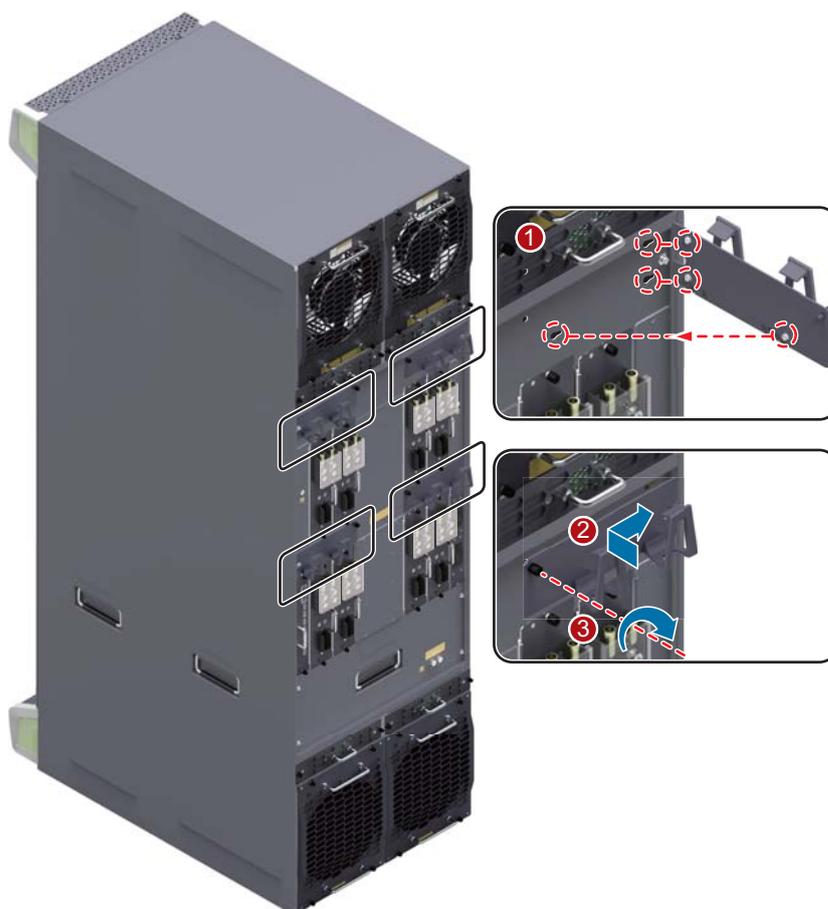
- Install the rear cable rack.

 **NOTE**

There are four rear cable racks on the rear panel of the chassis.

- a. Align the studs of the cable rack with the holes on the rear panel of the device and insert the rack.
- b. Push the rack to the left or right until it clicks into place.
- c. Tighten the captive screws.

Figure 2-16 Installing the rear cable rack



---End

2.2.6 Installing Power Cables - DC Power Distribution

In standard configuration, the USG9580 has eight PEM modules. Each PEM module requires an NEG DC power cable and an RTN DC power cable. This section describes how to connect power cables to the two DC supply modules.

Context



DANGER

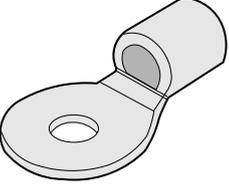
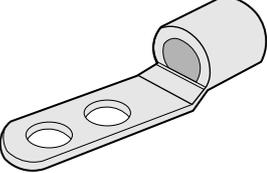
Never install power cables when the power is on.

Before installing power cables, ensure that the device is adequately grounded.

-
- There is a length of copper core inside the cable. Do not connect anything to the core.
 - DC power distribution cables

Cable	Image
NEG cable	
RTN cable	

- DC cable terminals

Terminal	Image
OT bare crimping terminal (M8)	
JG2 double-hole bare crimping terminal (M6)	

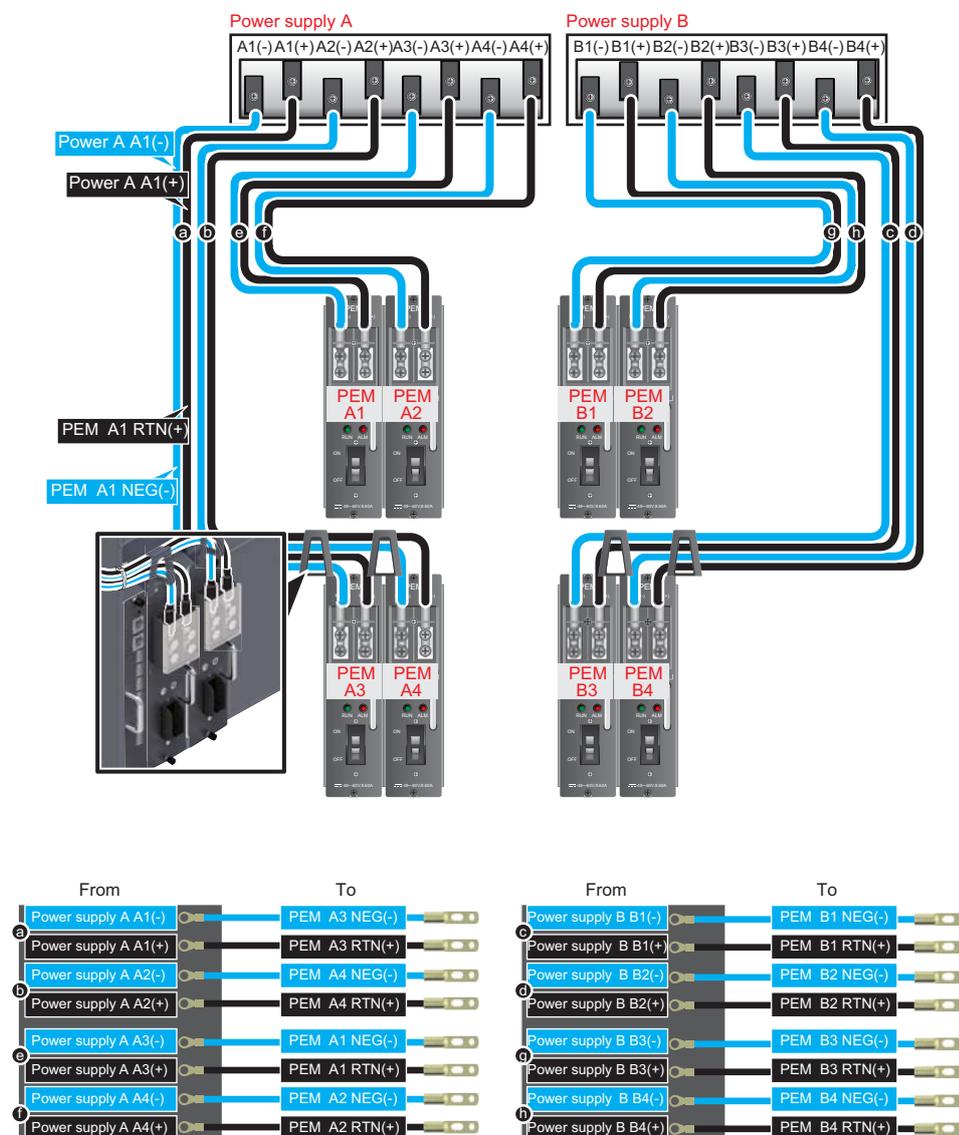
- For details, see [Guide to Power Distribution Design of the USG9580](#).

Procedure

- Step 1** Mark both ends of each power cable using a non-permanent marker.
- Step 2** Connect the M6 JG2 terminals of the DC power cable to the PEM modules on USG9580. Connect the M8 OT terminals of the DC power cable to the output terminals on the power supply device.
- Step 3** Use cable ties to bind the cables together at 100 mm intervals, fixing the cables along the cabling rack from bottom to top.

Step 4 Affix permanent labels 20 mm from both ends of each power cable.

Figure 2-17 Affixing permanent labels



----End

Follow-up Procedure

NOTICE

The power cable has polarity. After the device is powered on, if the PEM indicator blinks red, check whether the anode and cathode of the PEM power cable are properly connected. If they are not properly connected, immediately switch off the previous-stage power and properly connect the power cable.

1. Install a plastic cover on each power module.

2. The power cables are fixed securely and have sufficient contact with the terminals.
3. The cables in the corner are unbent.
4. The power cable labels are filled in and attached to the cables as required. All labels are neat and face the same direction, allowing for easy viewing.
5. The power cable, ground cable, and signal cable are bound separately. The distance between them must be greater than 3 cm.

2.2.7 Installing Power Cables - AC Power Distribution

When the USG9580 uses AC power supply, two external AC power chassis are added to the DC power supply system to form an AC power supply system. Four AC power cables are used to connect each AC power chassis to the AC PDF.

Context



DANGER

Never install power cables when the power is on.

Before installing power cables, ensure that the device is adequately grounded.

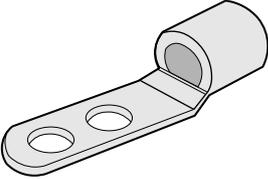


NOTICE

With the 110 V AC power supply, the USG9580 must use 110 V dual-live-wire AC input to meet the maximum system power consumption requirements with the full configuration. This is because AC power modules are half-load output with 110 V AC input. This does not meet the system power consumption requirements.

- There is a length of copper core inside the cable. Do not connect anything to the core.
- AC power distribution cables

Cable		Image
DC cables from the device to the AC power chassis	NEG cable	

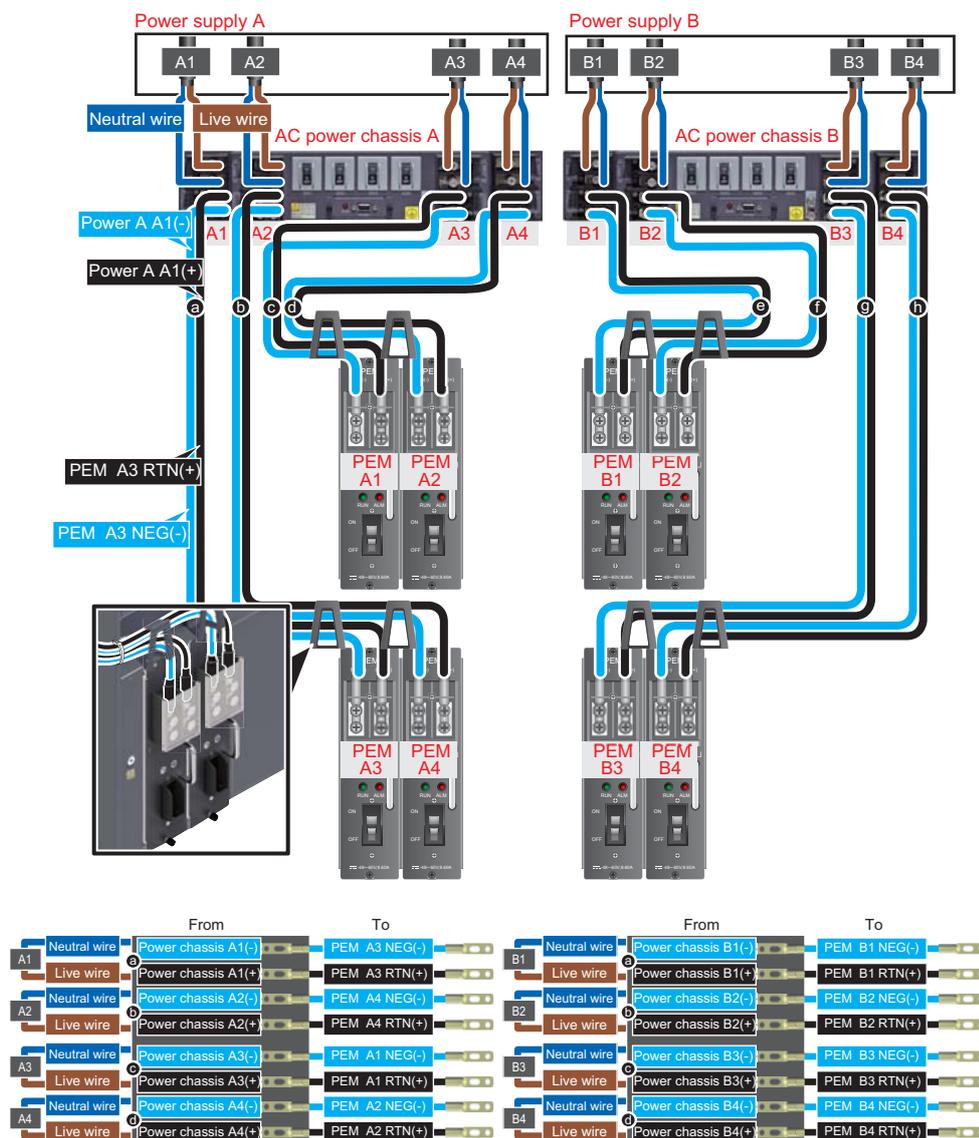
Cable		Image
	RTN cable	
Terminals on DC cables from the device to the AC power chassis	JG2 double-hole bare crimping terminal (M6)	
	AC cables from the AC power chassis to the AC power supply device	

- For details, see [Guide to Power Distribution Design of the USG9580](#).

Procedure

- Step 1** Mark both ends of each power cable using a non-permanent marker.
- Step 2** Connect the ends of AC power cables to the input terminals of the AC power chassis. Connect the other ends of the AC power cables to the AC power supply device.
- Step 3** Connect the ends of the DC power cables to the PEM on the USG9580. Connect the other ends of the DC power cables to the output terminals of the AC power chassis.
- Step 4** Use cable ties to bind the cables together at 100 mm intervals, fixing the cables along the cabling rack from bottom to top.
- Step 5** Affix permanent labels 20 mm from both ends of each power cable.

Figure 2-18 Affixing permanent labels



----End

Follow-up Procedure

NOTICE

The power cable has polarity. After the device is powered on, if the PEM indicator blinks red, check whether the anode and cathode of the PEM power cable are properly connected. If they are not properly connected, immediately switch off the previous-stage power and properly connect the power cable.

1. Install a plastic cover on each power module.
2. The power cables are fixed securely and have sufficient contact with the terminals.

3. The cables in the corner are unbent.
4. The power cable labels are filled in and attached to the cables as required. All labels are neat and face the same direction, allowing for easy viewing.
5. The power cable, ground cable, and signal cable are bound separately. The distance between them must be greater than 3 cm.

2.2.8 Connecting Network Cables

This section describes how to install electrical transceivers on the ports and how to connect them to the peer device ports using network cables according to the network plan.

Context

Before connecting the network cable, check the following:

- Construction conditions
Ensure that the peer device has been installed in the equipment room and the port to which the network cable is to be connected has been determined.
- Cabling route
The engineering document specifies the cabling route from the cabinet to the peer device in the equipment room. Ensure that the cable length is calculated based on the cabling path.
- Cable label
Ensure that the cable is labeled before being connected to the devices.

Network cables are either crossover or straight-through cables. Currently, Ethernet ports on most devices can dynamically adapt to both types of cables. For devices that do not support dynamic adaptation, use the correct cables.

In terms of electromagnetic compatibility, network cables are either ordinary or shielded cables. Shielded cables are preferred because of their higher electromagnetic compatibility.



Before connecting a cable, ensure that the port is labeled and that the cable is inserted into the correct port. Otherwise, the port module or the device may be damaged.

Before bundling network cables, use a network cable tester to test cable connectivity. Bind the network cables to form a rectangle inside the cabinet. Each bundle contains a maximum of 20 network cables. Ensure that the cable ties are tidy and tied in the same direction.

The distance between the power cable, PGND cable, and signal cable must be greater than 30 mm.

Procedure

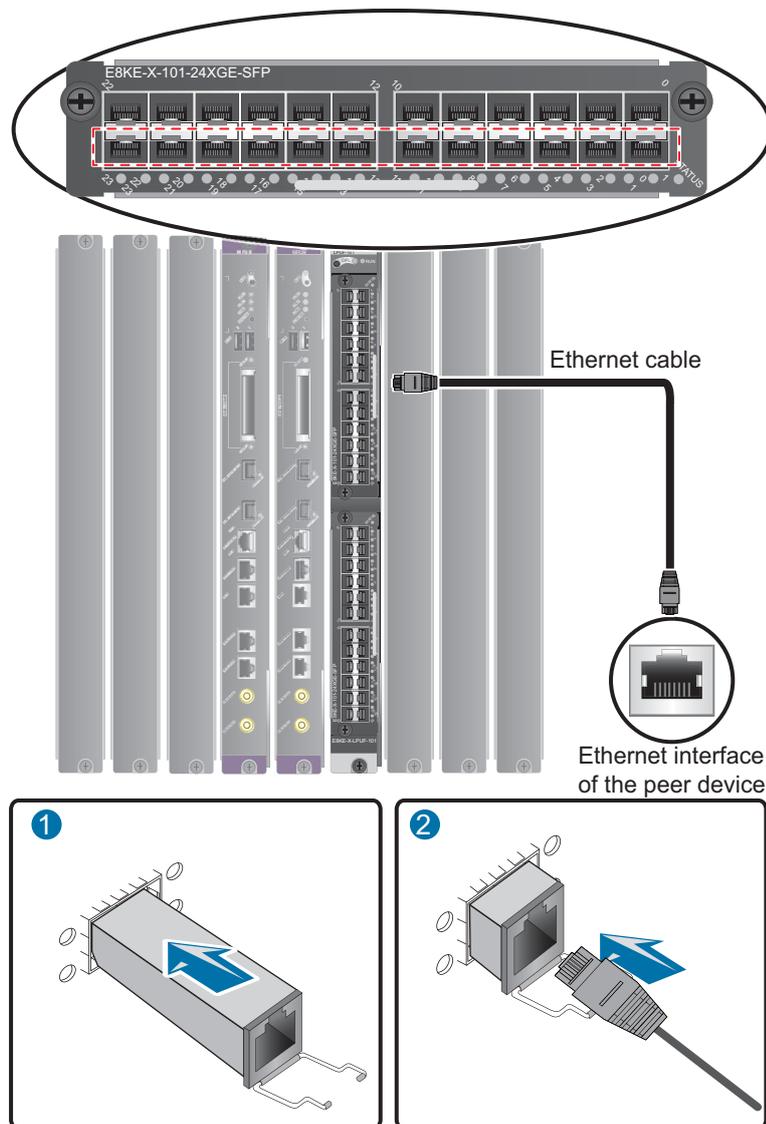
- Step 1** If multiple network cables must be connected, attach temporary labels to each end of each cable for identification.
- Step 2** Remove the dust-proof caps from a board interface and insert the electrical module into the interface.

 **NOTE**

The electrical module can be inserted only in odd-numbered interfaces on the 24-port 100/1000Base-X-SFP flexible interface card.

- Step 3** Connect one end of a network cable to the electrical transceiver of the USG9580 and the other end to the Ethernet port of the peer device based on the network plan.

Figure 2-19 Connecting a network cable



- Step 4** Lay out the network cable along a cabinet and route the cable through the cable hole for the signal cables at the top (overhead cabling) or bottom (underfloor cabling) of the cabinet.

- Step 5** Remove the temporary labels and attach labels (20 mm away from the connectors) at each end of the network cable.

----End

Follow-up Procedure

Verify the following:

- The labels at each end of the cable are correct, clear, neat, and facing the same direction.
- The cables and connectors are free of any damage and are connected properly and securely.

2.2.9 Connecting Optical Fibers

This section describes how to install optical transceivers on the ports and how to connect them to the peer device ports using optical fibers according to the network plan.

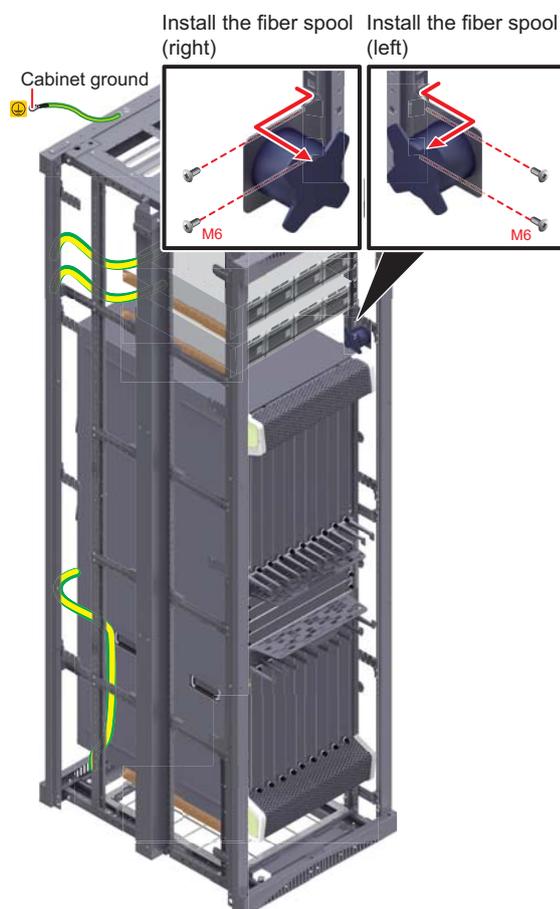
Installing Fiber Spools

 **NOTE**

Wind excess optical fibers around fiber spools for convenient cable routing and device maintenance.

Determine the locations of the fiber spools based on the device arrangement in the cabinet. Positioning the fiber spools too close to the device operation area may inhibit board insertion or removal or cabling. However, positioning the fiber spools too far away from the device may inhibit fiber spool operation.

Figure 2-20 Installing fiber spools



Installing Optical Transceivers and Connecting Optical Fibers



CAUTION

Do not look into the optical interface of the optical module or the optical fiber connector without eye protection.

Put on the ESD wrist strap or ESD gloves before installing optical modules.

When handling optical fiber cables, take the following precautions:

- Do not overbend optical fibers. The radius should not be shorter than 40 mm.
- Do not bundle the optical fibers too tightly; otherwise, the transmission performance of the optical fibers and the communication between devices may be affected.

Step 1 Before connecting an optical fiber, attach temporary labels to each end of the optical fiber.

Step 2 Remove the dust cap from an optical interface and insert an optical module into the optical interface.

Step 3 Remove the dust cap from the optical transceiver.



NOTE

Store the dust cap for future use. When optical fibers are disconnected for maintenance, use the dust cap to protect the optical transceiver from dust.

Step 4 Remove protective caps from optical fiber connectors, insert optical fibers into the optical transceiver, and connect the fiber to the peer device.

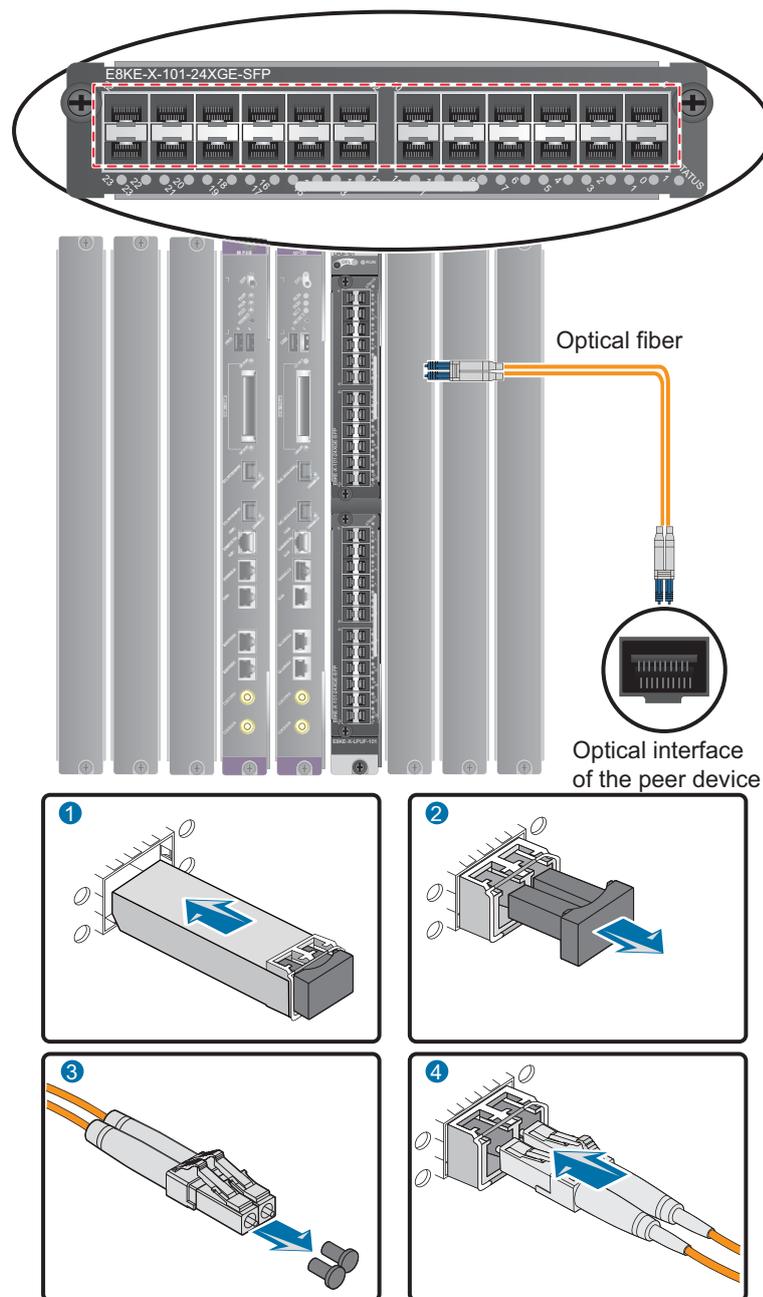


NOTE

Ensure that the Tx and Rx ports are correctly connected.

Ensure that the Tx and Rx ports on one end of the optical fiber cable are connected to the respective Rx and Tx ports on the other end.

Figure 2-21 Installing optical transceivers and connecting optical fibers



Step 5 Repeat **Step 1** through **Step 4** to install all optical transceivers and connect all optical fibers.

Step 6 Wind up the redundant optical fibers around a fiber management tray.

Step 7 Bind optical fibers at 200 mm intervals with tape and use cable ties to fix the optical fiber bundle to the cabling rack.

Step 8 Affix permanent labels 20 mm from both ends of the optical fiber.

----End

Follow-up Procedure

After you power on the USG9500, check the connection by looking at the optical port indicator. If the indicator is on or blinking, the link is connected or data is being transmitted. If the indicator is off, the link is disconnected. Possible disconnection causes include:

- The optical fiber is improperly inserted. Pull out the optical fiber and re-insert it.
- The Rx and Tx optical ports are reversed. Pull out the optical fibers and re-insert them into the correct ports.
- The optical module or optical fiber is damaged and must be replaced.

2.2.10 Post - Installation Checklists

After you install the device in a cabinet and before you power on the device, verify that the cables and NE40E have been installed correctly.

Cabinet Installation Checklist

No.	Item
1	The cabinet is positioned according to instructions in the engineering design document.
2	The deviation of the cabinet is less than 3 mm horizontally and not more than 3 mm vertically.
3	All bolts are firmly fastened, especially those for electrical connections. Both flat washers and spring washers are used and the spring washers are placed over the flat washers.
4	The cabinet is neat and clean.
5	The doors can be opened and closed smoothly.
6	All labels, tags, and nameplates are correct, legible, and complete.

Installation Environment Checklist

No.	Item
1	The equipment is free of fingerprints or other smudging.
2	The cables are free of excessive electrical tape and cable ties.
3	The area around the equipment is free of tape, cable ties, packaging bags, and trash.
4	All items around the equipment are neat, clean, and intact.

Cable Installation Checklist

No.	Item
1	All the self-made ground cables are copper-based with proper wire diameters. There is no switch or fuse on the cable and no area of disconnection.
2	Ground cables, AC input power cables, and cables in the cabinet are connected correctly according to the power system wiring diagram. Screws are tightened. Output and input cables are not short-circuited.
3	Extra power and ground cable are stripped off, not coiled.
4	The lugs at both ends of each power cable or ground cable are properly crimped.
5	Bare wires and lug handles at the wiring terminals are wrapped tightly with insulation tape or heat shrink tubing.
6	The flat washer and spring washer are mounted securely to all the wiring terminals.
7	All cable connectors are securely linked, especially those at the bottom of the cabinet.
8	The cables are properly bound. Cable ties are tied at equal intervals and in the same direction
9	The power cable and ground cable are routed separately from other cables.
10	The cable layout facilitates future maintenance and expansion.
11	The labels at each end of each cable are legible.
12	Excess cable tie is trimmed off without leaving rough edges.

2.2.11 Powering On the USG9580 - DC Power Distribution

Check whether the USG9580 is operating properly with the DC power supply. To prevent damage, power on the USG9580 according to the instructions in this section.

Context



CAUTION

Before performing a power-on check, switch all circuit breakers to the OFF position.

Before you power on the USG9580, ensure that:

- The power cable and PGND cable are properly connected.
- The power switch in the equipment room is easy to locate so that you can quickly power off devices in case of any problems.

Procedure

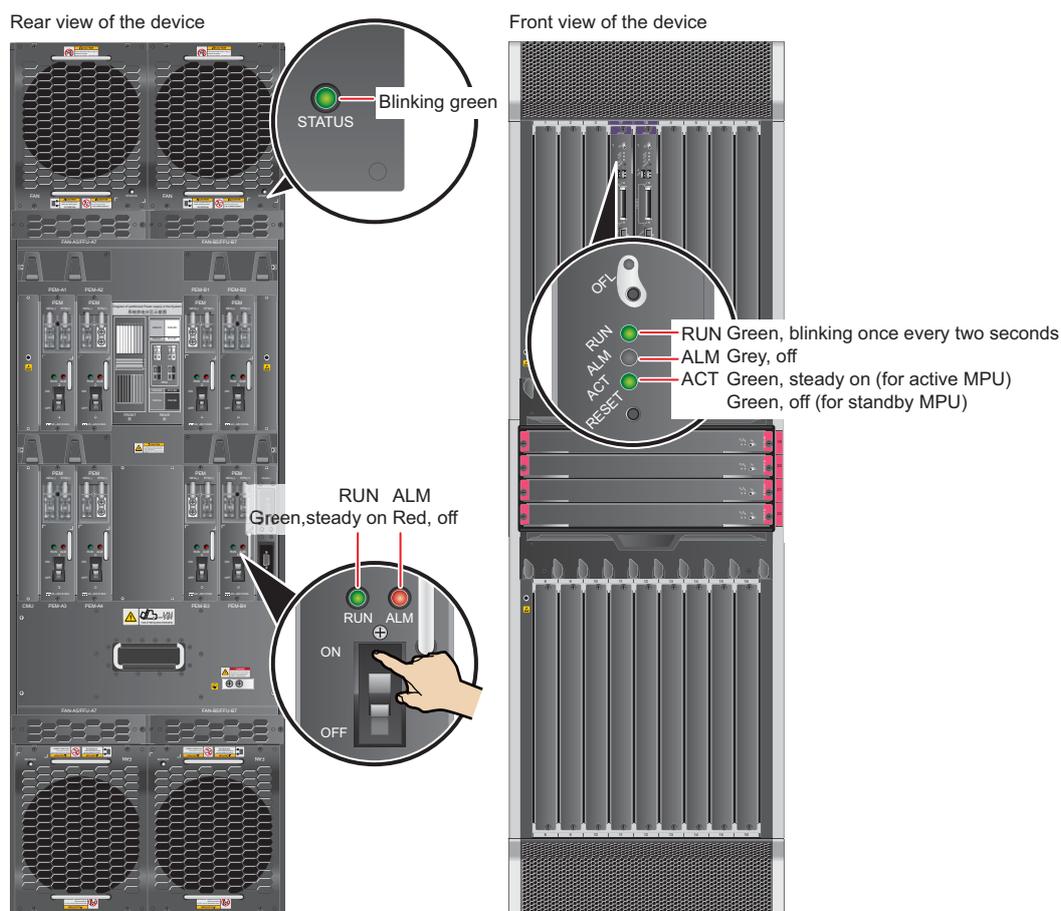
- Step 1** Turn on the circuit breakers of external DC power supplies A and B.
- Step 2** Measure the input voltage of the device with a multimeter to ensure that the voltage falls between -72 V DC and -38 V DC.
- Step 3** Turn on the DC power switch of the device.
- Step 4** Wait three minutes and then check the status of the indicators.

Figure 2-22 shows the indicator status of main parts when the device is operating properly. **Table 2-4** describes all indicators.

NOTE

If not all power modules have eight inputs, the STATUS indicator of the fan module is steady red.

Figure 2-22 Indicator status when the USG9580 is operating properly



----End

Result

Table 2-4 Device indicators

Item	Indicator	Color	Status Description
PEM	RUN	Green	If the indicator is steady green, the PEM has normal output.
	ALM	Red	Alarm indicator. If the indicator is steady red: <ul style="list-style-type: none"> ● The lightning protection circuit of the PEM is faulty. ● There is no power input.
FAN	STATUS	Green	If the indicator blinks once every two seconds (0.5 Hz), the FAN is working properly.
		Red	If the indicator blinks once every two seconds (0.5 Hz), the fan module or PEM is faulty, or not all PEMs are powered on.
MPU/SRU	RUN	Green	From the time the MPU/SRU is powered on until it is registered, the indicator status changes from off, blink once every 250 ms (4 Hz), off, steady on, and then to blink once every two seconds (0.5 Hz). After the MPU/SRU is registered, the MPU/SRU is working properly if the indicator blinks at 0.5 Hz. NOTE Possible causes for an off indicator include: <ul style="list-style-type: none"> ● The BootROM is damaged. ● The MPU cannot be powered on. Possible causes for the indicator blinking quickly include: <ul style="list-style-type: none"> ● The CF card is faulty. ● The other control chips on the MPU/SRU are faulty, preventing the MPU/SRU from initializing.
	ALM	Red	If the indicator is steady off, the MPU/SRU is in the normal state. If the indicator is steady red, an alarm is generated.

Item	Indicator	Color	Status Description
SFU	RUN	Green	From the time the SFU is powered on until it is registered, the indicator status changes from off, blink once every 250 ms (4 Hz), off, steady on, and then to blink once every two seconds (0.5 Hz). After the SFU is registered, the SFU is working properly if the indicator blinks at 0.5 Hz.
	ACT	Green	If the indicator is steady green, the SFU is working properly; if the indicator is off, the SFU is faulty.

2.2.12 Powering On the USG9580 - AC Power Distribution

Check whether the USG9580 is operating properly with AC power supply. To prevent damage, power on the USG9580 according to the instructions in this section.

Context



CAUTION

Before performing a power-on check, switch all circuit breakers to the OFF position.

Before you power on the USG9580, ensure that:

- The power cable and PGND cable are properly connected.
- The power switch in the equipment room is easy to locate so that you can quickly power off devices in case of any problems.

Procedure

- Step 1** Turn on external AC power supplies A and B.
- Step 2** Measure the input voltage of the AC power chassis with a multimeter to ensure that the voltage falls between 90 V AC and 264 V AC.
- Step 3** Turn on the circuit breakers of external AC power supplies A and B and check the status of the indicators on the AC power chassis.
- Step 4** Measure the input voltage of the device with a multimeter to ensure that the voltage falls between -72 V DC and -38 V DC.
- Step 5** Measure the input voltage of the device with a multimeter to ensure that the voltage falls between -72 V DC and -38 V DC.
- Step 6** Wait for three minutes and then check the status of the indicators.

Figure 2-23 and **Figure 2-24** show the indicator status of main parts when the device is operating properly. **Table 2-6** describes all indicators.

Figure 2-23 Indicator status when the AC power chassis is working properly

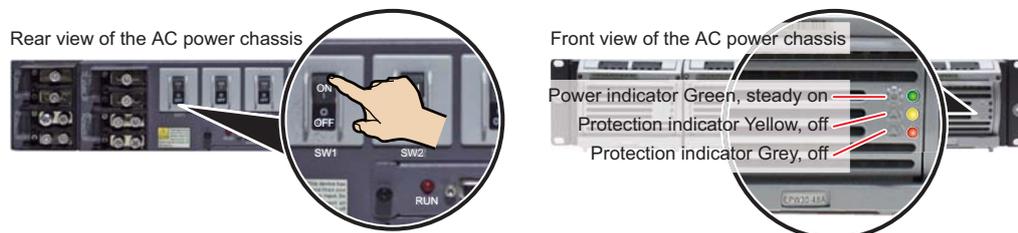
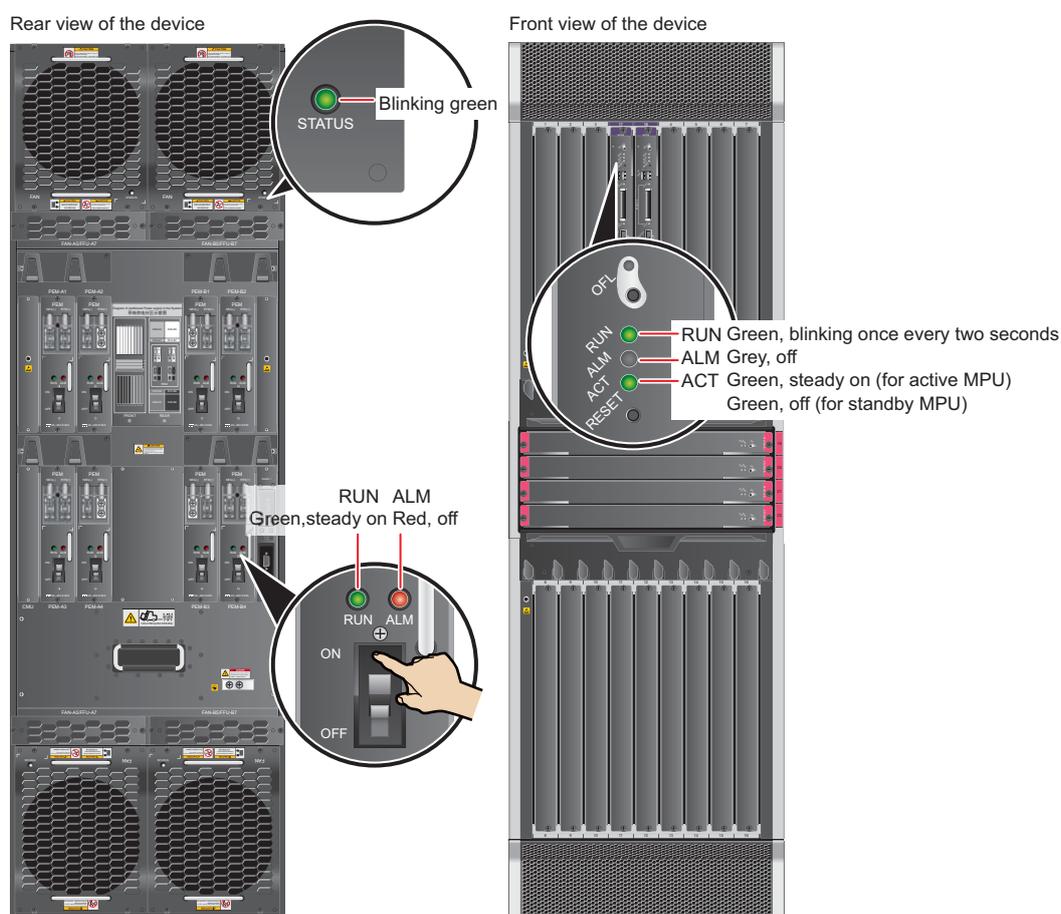


Figure 2-24 Indicator status when the USG9580 is operating properly



----End

Result

Table 2-5 Indicators on the AC power chassis

Item	Color	Status Description	Possible Exception Causes
Operation indicator	Green	If the indicator is steady green, the AC power chassis is running properly. If the indicator is off, an exception occurs.	There is no main AC power being input. The AC input voltage is higher or lower than the normal range, or the AC power chassis has no output.
Protection indicator	Yellow	If the indicator is off, the AC power chassis is running properly. If the indicator is on, an exception occurs.	A temperature alarm is generated (if the temperature exceeds 65°C, the AC power chassis will be powered off), or the AC power chassis is in the dormant state (the indicator is on and no alarm is generated).
Fault indicator	Red	If the indicator is off, the AC power chassis is running properly. If the indicator is on, an exception has occurred.	The AC power chassis is powered off due to over-voltage or over-temperature, or fans are faulty, or the AC power chassis has no output due to its internal faults.
DC output voltage	-	The normal voltage ranges from -43.2 V DC to -57 V DC.	-

Table 2-6 Device indicators

Item	Indicator	Color	Status Description
PEM	RUN	Green	If the indicator is steady green, the PEM has normal output.
	ALM	Red	Alarm indicator. If the indicator is steady red, <ul style="list-style-type: none"> ● The lightning protection circuit of the PEM is faulty. ● There is no power input.
FAN	STATUS	Green	If the indicator blinks once every two seconds (0.5 Hz), the FAN is working properly.

Item	Indicator	Color	Status Description
		Red	If the indicator blinks once every two seconds (0.5 Hz), the fan module or PEM is faulty, or not all PEMs are powered on.
MPU/SRU	RUN	Green	<p>From the MPU/SRU being powered on until it is registered, the indicator status changes from off, blink once every 250 ms (4 Hz), off, steady on, and then to blink once every two seconds (0.5 Hz). After the MPU/SRU is registered, the MPU/SRU is working properly if the indicator blinks at 0.5 Hz.</p> <p>NOTE Possible causes for the indicator being off include:</p> <ul style="list-style-type: none"> ● The BootROM is damaged. ● The MPU cannot be powered on. <p>Possible causes for the indicator blinking quickly include:</p> <ul style="list-style-type: none"> ● The CF card is faulty. ● The other control chips on the MPU/SRU are faulty, preventing the MPU/SRU from initializing.
	ALM	Red	If the indicator is steady off, the MPU/SRU is in the normal state. If the indicator is steady red, an alarm is generated.
SFU	RUN	Green	<p>From the SFU being powered on until it is registered, the indicator status changes from off, blink once every 250 ms (4 Hz), off, steady on, and then to blink once every two seconds (0.5 Hz). After the SFU is registered, the SFU is working properly if the indicator blinks at 0.5 Hz.</p>
	ACT	Green	If the indicator is steady green, the SFU is working properly; if the indicator is off, the SFU is faulty.

2.3 Installing USG9560

This section describes how to install the USG9560.

2.3.1 Preparing the Site

Prior to device installation, deploy the cabinet and device according to the following power supply, cabinet, cabinet clearance, and device clearance requirements to ensure that the device works properly.

Power Supply System Requirements

- If DC power supply is used, ensure that the outputs of the DC power distribution box fall between -72 V DC and -38 V DC. Two power modules are needed, and each power module must be connected to two different power sources for redundancy.
- If AC power supply is used, ensure that the output voltage of the AC power distribution cabinet falls between 90 V AC and 175 V AC (with rated input voltage being 110 V) or between 175 V AC and 264 V AC (with rated input voltage being 220 V) and that two groups of power modules are provided for redundancy. Meanwhile, one AC power chassis must be installed on the device.



NOTICE

With the 110 V AC power supply, the USG9560 must use 110 V dual-live-wire AC input to meet the maximum system power consumption with the full configuration. This is because AC power modules are half-load output with 110 V AC input, which cannot meet the system power consumption.

Cabinet Requirements

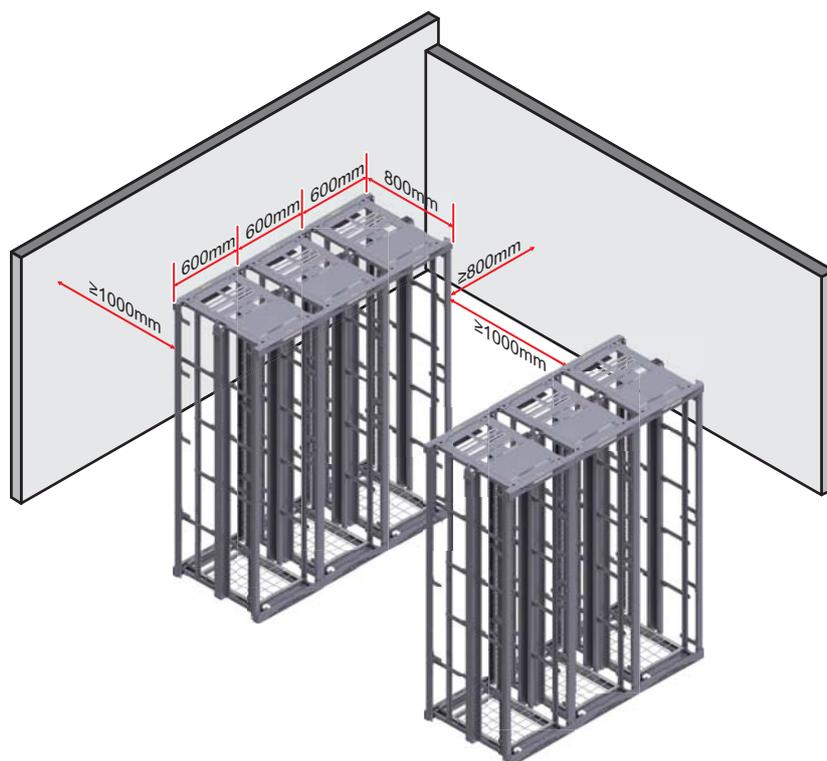
You are advised to use Huawei standard NE68E cabinet. Any other cabinet must meet [A.6 Requirements for Customers' Cabinets Purchased from Other Vendors](#).

Cabinet Clearance Requirements

The N68E-22 cabinet is used as an example. As shown in [Figure 2-25](#), cabinet clearance must meet the following requirements:

- Aisles in the equipment room ≥ 1000 mm; aisles between cabinet rows ≥ 1000 mm
- Space between cabinet sides and wall ≥ 800 mm
- Space between cabinet row and wall ≥ 1000 mm

Figure 2-25 Diagram for cabinet deployment



Device Clearance Requirements

The USG9560 chassis is 14 U high and requires front and back maintenance mode. The device must meet the following clearance requirements:

- Airflow
 - A minimum of 750 mm between the device and the equipment room wall and between two neighboring devices
 - A minimum of 2 U between devices installed in the same cabinet, between the top-most device and the cabinet top, and between the bottom-most device and the cabinet bottom
- Maintenance
 - A minimum of 700 mm between devices and between devices and walls

 **NOTE**

The length of three holes on the mounting rails is 1 U, which is equivalent to 44.45 mm.

2.3.2 Installing the Chassis into the Cabinet

You can mount the USG9560 in a 19-inch standard cabinet using guide rails.

Context



CAUTION

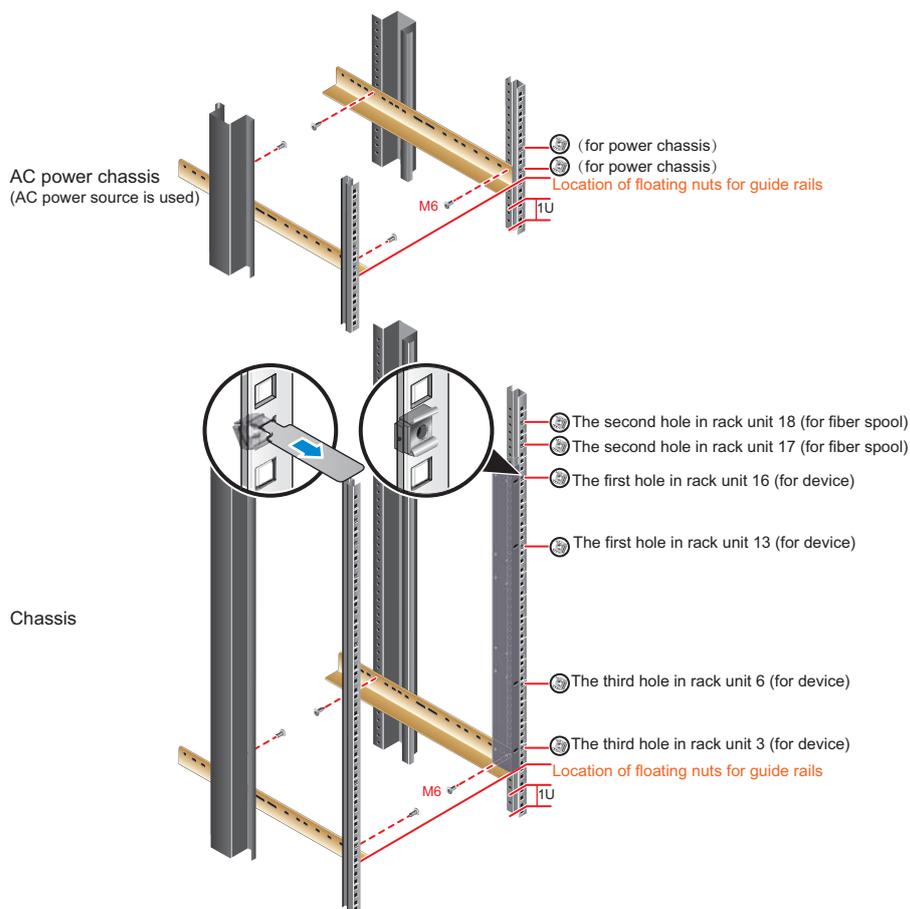
- The USG9560 is heavy and requires four people to lift and move.
- Use the handles on the chassis sides when moving the device. To avoid damaging the device, do not use the handles on modules.
- Do not step on the air filter at the bottom of the cabinet.

Procedure

Step 1 Install floating nuts and guide rails.

1. Determine where to install floating nuts and mark the positions using a marker, as shown in [Figure 2-26](#).
2. Fix the floating nuts in the positions.
3. Use M6 screws to fix the guide rails in position.

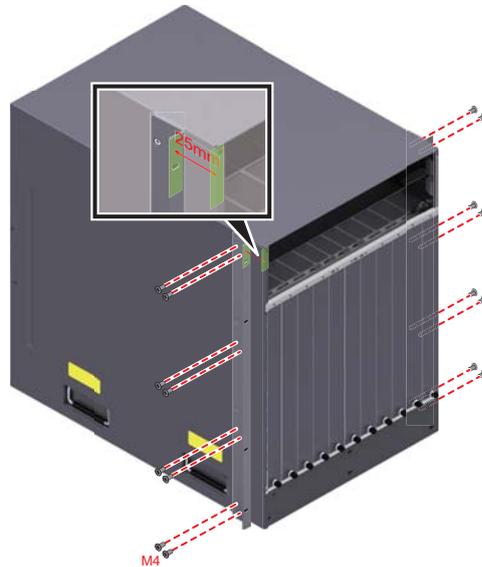
Figure 2-26 Installing floating nuts and guide rails



Step 2 Install mounting ears on the USG9560.

Use a Phillips screwdriver to fix the mounting ears to both sides of the chassis with M4 screws, as shown in **Figure 2-27**.

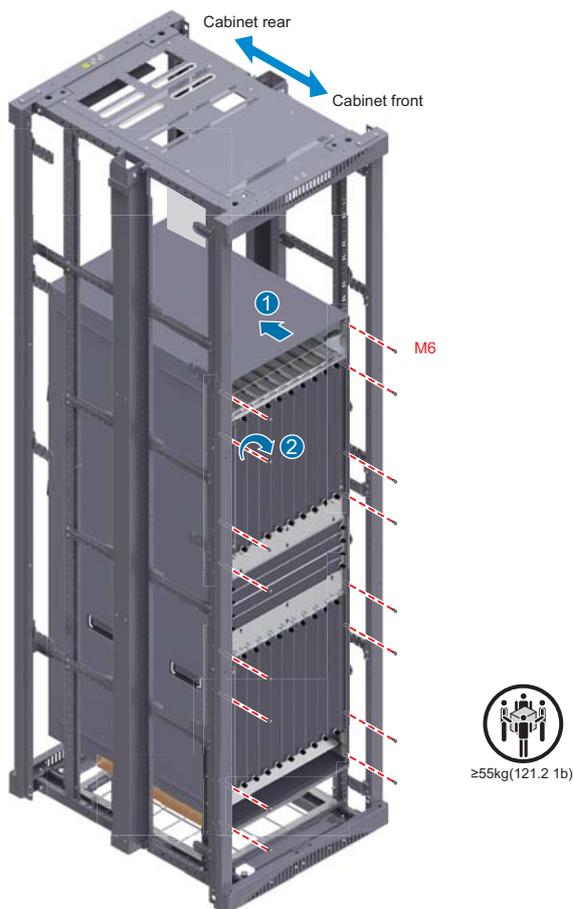
Figure 2-27 Installing mounting ears



Step 3 Mount the USG9560 in the cabinet.

1. Lift up the USG9560, place it onto the cabinet guide rails, and push it into the cabinet.
2. Use M6 screws to fix the mounting ears of the USG9560 to the mounting rack, as shown in **Figure 2-28**.

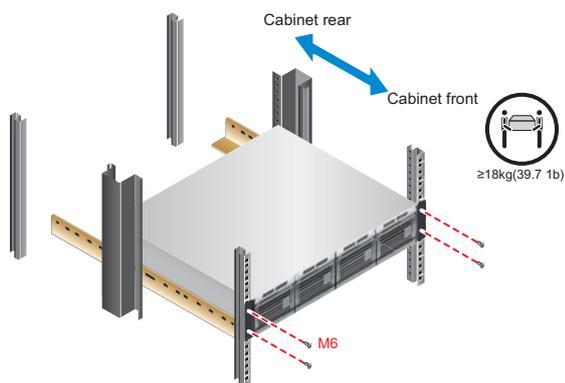
Figure 2-28 Mounting the USG9560 in the cabinet



Step 4 Mount the AC power chassis in the cabinet (mandatory for AC power supply).

When AC power supply is used, one AC power chassis is required for the USG9560, as shown in [Figure 2-29](#).

Figure 2-29 Mounting the AC power chassis in the cabinet



---End

Follow-up Procedure

Perform the following checks after the installation:

- Ensure that the USG9560 is securely mounted.
- Ensure that the exhaust area of the USG9560 is unobstructed.

2.3.3 Connecting the PGND Cable

Connecting the PGND cable of the USG9560 properly is essential for surge protection and interference resistance. Before using the USG9560, correctly connect the PGND cable.

Prerequisites

Before installing the PGND cable of the device, ensure that the PGND cable of the cabinet is correctly connected and the ground resistance is zero ohm.

Context

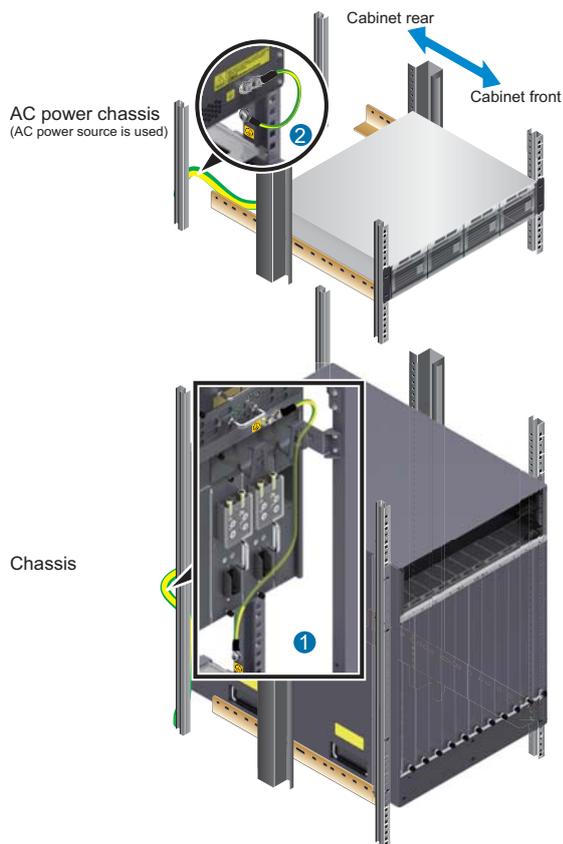
If the chassis is close to the ground bar in the equipment room, connect the PGND cable of the chassis directly to the ground bar. If the chassis is far away from the ground bar, connect the PGND cable to the ground point on the cabinet.

In this section, connecting the PGND cable to the ground point on the cabinet is used as an example.

Procedure

- Step 1** Install the chassis ground cable, as shown in [Figure 2-30](#).
- Step 2** Install the ground cable of the AC power chassis (which is mandatory for AC power supply), as shown in [Figure 2-30](#).

Figure 2-30 Connecting the PGND cable



----End

Follow-up Procedure

Verify the following:

- The PGND cable is securely connected to the ground terminal.
- The electrical resistance between the ground terminal and ground point is less than 10 ohm on a multimeter.

2.3.4 Installing Boards and Subcards

This section describes how to install boards and subcards.

Context



CAUTION

- Ensure that the device and board are completely dry and free of liquid before inserting the board into the device.
- Before installing boards, wear the ESD wrist strap and ensure that the strap is well grounded to prevent any electrostatic discharge from damaging sensitive components.

Procedure

Step 1 Select slots based on slot distribution.

You can determine whether a slot is suitable for a board by checking whether the color on both ends of the board panel is the same as the color on the slot.

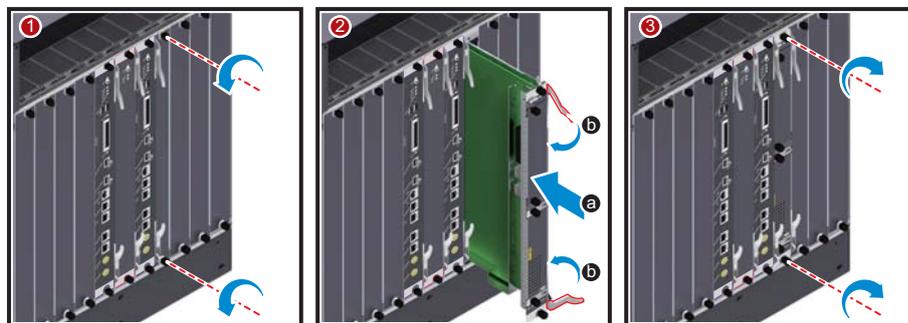
Figure 2-31 Slot layout



Step 2 Install a board.

1. Remove the filler panel from the selected slot.
2. Extend the ejector levels of the board, insert the board fully into the slot, and rotate the ejector level to the front of the board.
3. Use a Phillips screwdriver to fasten the captive screws to the board.

Figure 2-32 Installing a board



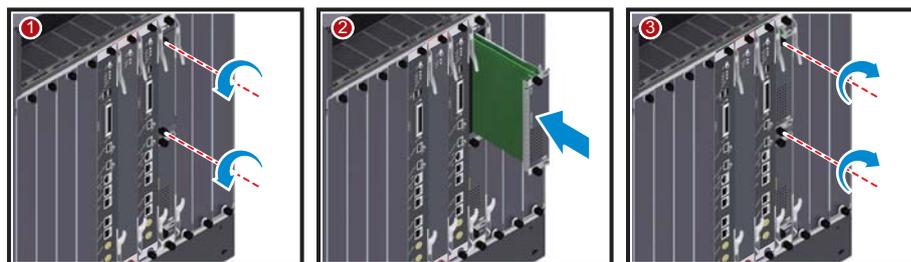
Step 3 Install a subcard.

NOTE

Before you install a subcard, remove redundant guide rails from the board and store them for future use.

1. Remove the filler panel from the board.
2. Smoothly insert the subcard into the board along the guide rail.
3. Use a Phillips screwdriver to fasten the captive screws to the board.

Figure 2-33 Installing a subcard



---End

Follow-up Procedure

Verify the following:

- Boards and subcards are installed in the correct position and captive screws are tightly fastened.
- Filler panels are inserted into vacant slots. Filler panels prevent intrusion of dust and ensure heat dissipation.

2.3.5 Installing Chassis Components

Air filters are used to protect devices against dust, and cable racks are used to route optical fibers and cables.

Procedure

- Install air filters on the air intake frame.

 **NOTE**

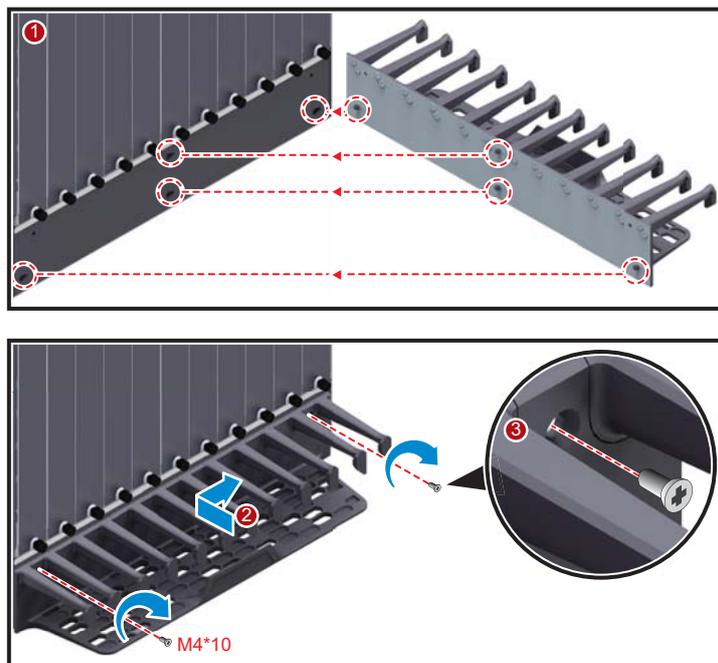
Orient the pin on the air filter towards the hole to prevent installing upside down. Otherwise, the air filter cannot be installed.

Figure 2-34 Installing air filters on the air intake frame



- Install the cable rack.
 - a. Attach the front cable rack to the cabinet.
 - b. Slide the rack to the right to click it into place.
 - c. Use two M4 x 10 screws to fasten the cable rack.

Figure 2-35 Installing the cable rack



---End

2.3.6 Installing Power Cables - DC Power Distribution

In standard configuration, the USG9560 has four PEMs. Each PEM requires an NEG DC power cable and an RTN DC power cable. This section describes how to connect power cables to the two DC supply modules.

Context



DANGER

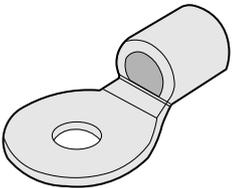
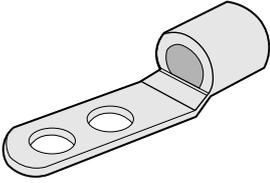
Never install power cables when the power is on.

Before installing power cables, ensure that the device is adequately grounded.

- There is a length of copper core inside the cable. Do not connect anything to the core.
- DC power distribution cables

Cable	Image
NEG cable	
RTN cable	

- DC cable terminals

Terminal	Image
OT bare crimping terminal	
JG2 double-hole bare crimping terminal	

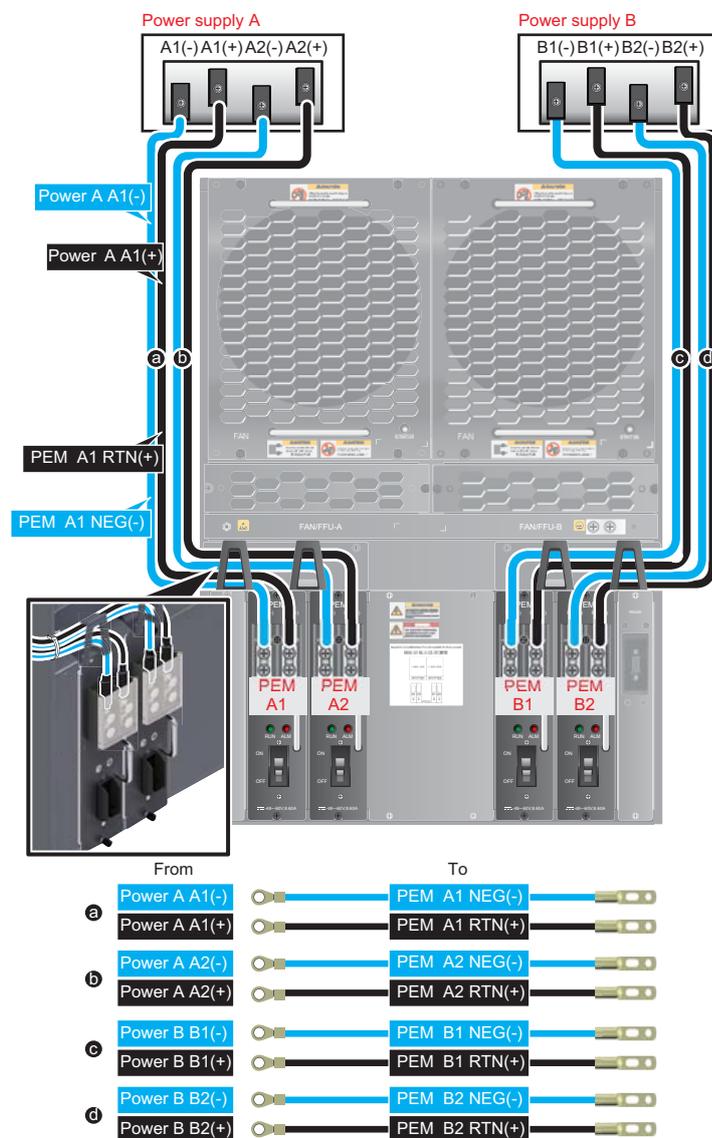
- For details, see [Guide to Power Distribution Design of the USG9560](#).

Procedure

- Step 1** Mark both ends of each power cable using a non-permanent marker.
- Step 2** Connect the M6 JG2 terminals of the DC power cable to the PEMs on the USG9560. Connect the M8 OT terminals of the DC power cable to the output terminals on the power supply device.
- Step 3** Use cable ties to bind the cables together at 100 mm intervals, fixing the cables along the cabling rack from bottom to top.

Step 4 Affix permanent labels 20 mm from both ends of each power cable.

Figure 2-36 Affixing permanent labels



----End

Follow-up Procedure



NOTICE

The power cable has polarity. After the device is powered on, if the PEM indicator blinks red, check whether the anode and cathode of the PEM power cable are properly connected. If they are not properly connected, immediately switch off the previous-stage power and properly connect the power cable.

1. Install a plastic cover on each power module.

2. The power cables are fixed securely and have sufficient contact with the terminals.
3. The cables in the corner are unbent.
4. The power cable labels are filled in and attached to the cables as required. All labels are neat and face the same direction, allowing for easy viewing.
5. The power cable, ground cable, and signal cable are bound separately. The distance between them must be greater than 3 cm.

2.3.7 Installing Power Cables - AC Power Distribution

When the USG9560 uses AC power supply, one external AC power chassis is added to the DC power supply system to form an AC power supply system. Four AC power cables are used to connect each AC power chassis to the AC PDF.

Context



DANGER

Never install power cables when the power is on.

Before installing power cables, ensure that the device is adequately grounded.

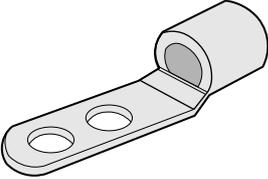


NOTICE

- With the 110 V AC power supply, the USG9560 must use 110 V dual-live-wire AC input to meet the maximum system power consumption requirements with the full configuration. This is because AC power modules are half-load output with 110 V AC input, which cannot meet system power consumption requirements.
- As the USG9560 does not support AC power chassis management, the DB9 interface on the rear of an AC power chassis does not need to connect to the monitoring cable in the installation auxiliary material package.

- There is a length of copper core inside the cable. Do not connect anything to the core.
- AC power distribution cables

Cable		Image
DC cables from the device to the AC power chassis	NEG cable	

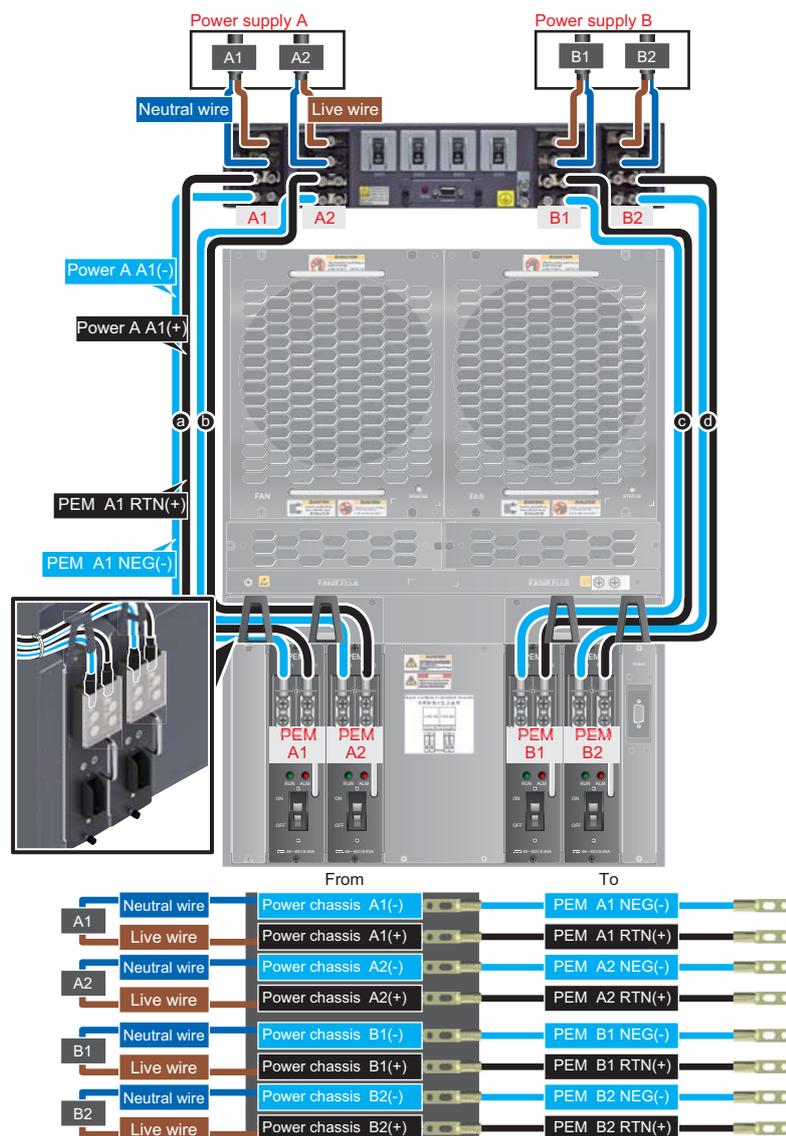
Cable		Image
	RTN cable	
Terminals on DC cables from the device to the AC power chassis	JG2 double-hole bare crimping terminal (M6)	
	AC cables from the AC power chassis to the AC power supply device	

- For details, see [Guide to Power Distribution Design of the USG9560](#).

Procedure

- Step 1** Mark both ends of each power cable using a non-permanent marker.
- Step 2** Connect the ends of AC power cables to the input terminals of the AC power chassis. Connect the other ends of the AC power cables to the AC power supply device.
- Step 3** Connect the ends of DC power cables to the PEM modules on USG9560. Connect the other ends of the DC power cables to the output terminals of the AC power chassis.
- Step 4** Use cable ties to bind the cables together at 100 mm intervals, fixing the cables along the cabling rack from bottom to top.
- Step 5** Affix permanent labels 20 mm from both ends of each power cable.

Figure 2-37 Affixing permanent labels



----End

Follow-up Procedure

NOTICE

The power cable has polarity. After the device is powered on, if the PEM indicator blinks red, check whether the anode and cathode of the PEM power cable are properly connected. If they are not properly connected, immediately switch off the previous-stage power and properly connect the power cable.

1. Install a plastic cover on each power module.
2. The power cables are fixed securely and have sufficient contact with the terminals.

3. The cables in the corner are unbent.
4. The power cable labels are filled in and attached to the cables as required. All labels are neat and face the same direction, allowing for easy viewing.
5. The power cable, ground cable, and signal cable are bound separately. The distance between them must be greater than 3 cm.

2.3.8 Connecting Network Cables

This section describes how to install electrical transceivers on the ports and how to connect them to the peer device ports using network cables according to the network plan.

Context

Before connecting the network cable, check the following:

- Construction conditions
Ensure that the peer device has been installed in the equipment room and the port to which the network cable is to be connected has been determined.
- Cabling route
The engineering document specifies the cabling route from the cabinet to the peer device in the equipment room. Ensure that the cable length is calculated based on the cabling path.
- Cable label
Ensure that the cable is labeled before being connected to the devices.

Network cables are either crossover or straight-through cables. Currently, Ethernet ports on most devices can dynamically adapt to both types of cables. For devices that do not support dynamic adaptation, use the correct cables.

In terms of electromagnetic compatibility, network cables are either ordinary or shielded cables. Shielded cables are preferred because of their higher electromagnetic compatibility.



NOTICE

Before connecting a cable, ensure that the port is labeled and that the cable is inserted into the correct port. Otherwise, the port module or the device may be damaged.

Before bundling network cables, use a network cable tester to test cable connectivity. Bind the network cables to form a rectangle inside the cabinet. Each bundle contains a maximum of 20 network cables. Ensure that the cable ties are tidy and tied in the same direction.

The distance between the power cable, PGND cable, and signal cable must be greater than 30 mm.

Procedure

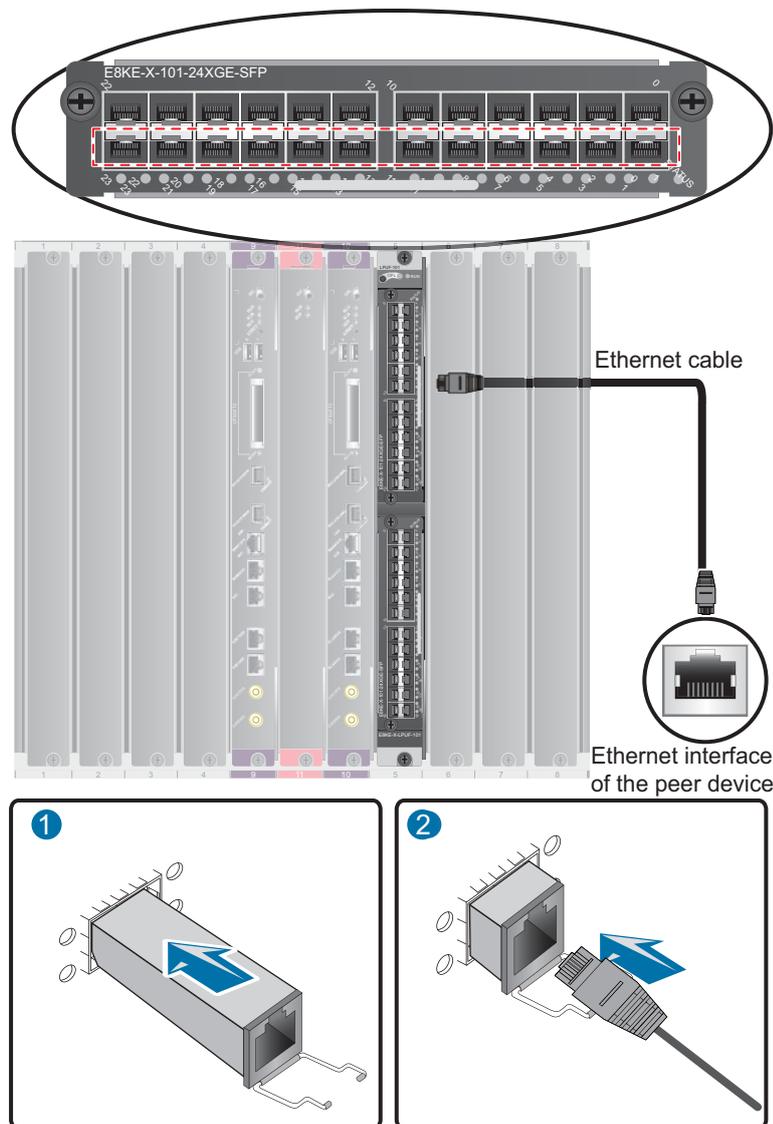
- Step 1** If multiple network cables need to be connected, attach temporary labels to both ends of each cable.
- Step 2** Remove the dust-proof caps from a board interface and insert the electrical module into the interface.

NOTE

The electrical module can be inserted only in odd-numbered interfaces on the 24-port 100/1000Base-X-SFP flexible interface card.

- Step 3** Connect one end of a network cable to the electrical transceiver of the USG9560 and the other end to the Ethernet port of the peer device based on the network plan.

Figure 2-38 Connecting a network cable



- Step 4** Lay out the network cable along a cabinet and route the cable through the cable hole for the signal cables at the top (overhead cabling) or bottom (underfloor cabling) of the cabinet.
- Step 5** Remove the temporary labels. Attach labels (20 mm away from the connectors) at each end of the network cable.

----End

Follow-up Procedure

Verify the following:

- The labels at each end of the cable are correct, clear, neat, and facing the same direction.
- The cables and connectors are free of any damage and are connected properly and securely.

2.3.9 Connecting Optical Fibers

This section describes how to install optical transceivers on the ports and how to connect them to the peer device ports using optical fibers according to the network plan.

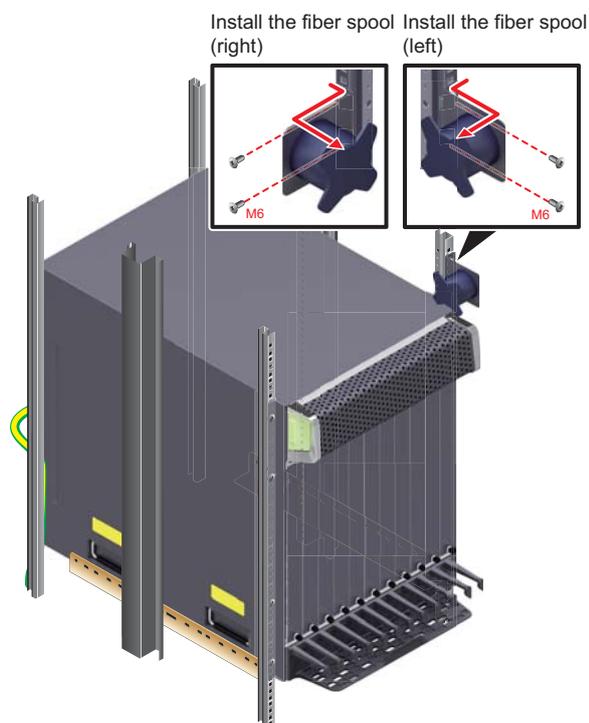
Installing Fiber Spools

 **NOTE**

Wind excess optical fibers around fiber spools for convenient cable routing and device maintenance.

Determine the locations of the fiber spools based on the device arrangement in the cabinet. Positioning the fiber spools too close to the device operation area may inhibit board insertion or removal or cabling. However, positioning the fiber spools too far away from the device may inhibit fiber spool operation.

Figure 2-39 Installing fiber spools



Installing Optical Transceivers and Connecting Optical Fibers



CAUTION

Do not look into the optical interface of the optical module or the optical fiber connector without eye protection.

Put on the ESD wrist strap or ESD gloves before installing optical modules.

When handling optical fiber cables, take the following precautions:

- Do not overbend optical fibers. The radius should not be shorter than 40 mm.
- Do not bundle the optical fibers too tightly; otherwise, the transmission performance of the optical fibers and the communication between devices may be affected.

Step 1 Before connecting an optical fiber, attach temporary labels to each end of the optical fiber.

Step 2 Remove the dust cap from an optical interface and insert an optical module into the optical interface.

Step 3 Remove the dust cap from the optical transceiver.

 **NOTE**

Store the dust cap for future use. When an optical fiber is disconnected for maintenance, use the dust cap to protect the optical transceiver.

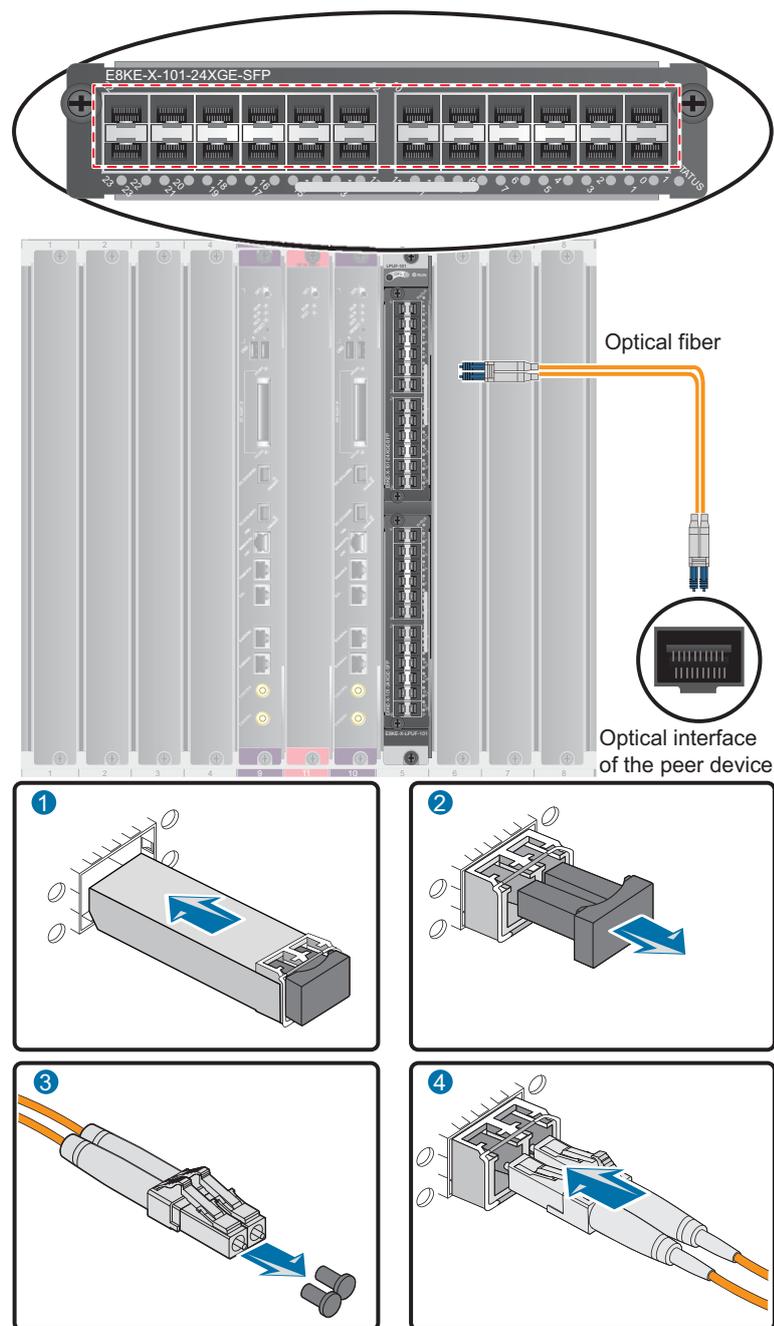
Step 4 Remove protective caps from optical fiber connectors, insert optical fibers into the optical transceiver, and connect the fiber to the peer device.

 **NOTE**

Ensure that the Tx and Rx ports are correctly connected.

Ensure that the Tx and Rx ports on one end of the optical fiber cable are connected to the respective Rx and Tx ports on the other end.

Figure 2-40 Installing optical transceivers and connecting optical fibers



Step 5 Repeat **Step 1** through **Step 4** to install all optical transceivers and connect all optical fibers.

Step 6 Wind up excess optical fibers around a fiber management tray.

Step 7 Use tape to bind the optical fibers together at 200 mm intervals. Use cable ties to fix the fibers along the cabling rack.

Step 8 Remove Affix permanent labels 20 mm from both ends of the optical fiber.

----End

Follow-up Procedure

After you power on the USG9500, check the connection by looking at the optical port indicator. If the indicator is on or blinking, the link is connected or data is being transmitted. If the indicator is off, the link is disconnected. Possible disconnection causes include:

- The optical fiber is improperly inserted. Pull out the optical fiber and re-insert it.
- The Rx and Tx optical ports are reversed. Pull out the optical fibers and re-insert them into the correct ports.
- The optical module or optical fiber is damaged and must be replaced.

2.3.10 Checking After Installation

After you install the device in a cabinet and before you power on the device, verify that the cables and NE40E have been installed correctly.

Cabinet Installation Checklist

No.	Item
1	The cabinet is positioned according to instructions in the engineering design document.
2	The deviation of the cabinet is less than 3 mm horizontally and not more than 3 mm vertically.
3	All bolts are firmly fastened, especially those for electrical connections. Both flat washers and spring washers are used and the spring washers are placed over the flat washers.
4	The cabinet is neat and clean.
5	The doors can be opened and closed smoothly.
6	All labels, tags, and nameplates are correct, legible, and complete.

Installation Environment Checklist

No.	Item
1	The equipment is free of fingerprints or other smudging.
2	The cables are free of excessive electrical tape and cable ties.
3	The area around the equipment is free of tape, cable ties, packaging bags, and trash.
4	All items around the equipment are neat, clean, and intact.

Cable Installation Checklist

No.	Item
1	All the self-made ground cables are copper-based with proper wire diameters. There is no switch or fuse on the cable and no area of disconnection.
2	Ground cables, AC input power cables, and cables in the cabinet are connected correctly according to the power system wiring diagram. Screws are tightened. Output and input cables are not short-circuited.
3	Extra power and ground cable are stripped off, not coiled.
4	The lugs at both ends of each power cable or ground cable are properly crimped.
5	Bare wires and lug handles at the wiring terminals are wrapped tightly with insulation tape or heat shrink tubing.
6	The flat washer and spring washer are mounted securely to all the wiring terminals.
7	All cable connectors are securely linked, especially those at the bottom of the cabinet.
8	The cables are properly bound. Cable ties are tied at equal intervals and in the same direction
9	The power cable and ground cable are routed separately from other cables.
10	The cable layout facilitates future maintenance and expansion.
11	The labels at each end of each cable are legible.
12	Excess cable tie is trimmed off without leaving rough edges.

2.3.11 Powering On the USG9560 - DC Power Distribution

Check whether the USG9560 is operating properly with the DC power supply. Power on the USG9560 according to the following requirements to ensure device security.

Context



CAUTION

Before performing a power-on check, switch all circuit breakers to the OFF position.

Before you power on the USG9580, ensure that:

- The power cable and PGND cable are properly connected.
- The power switch in the equipment room is easy to locate so that you can quickly power off devices in case of any problems.

Procedure

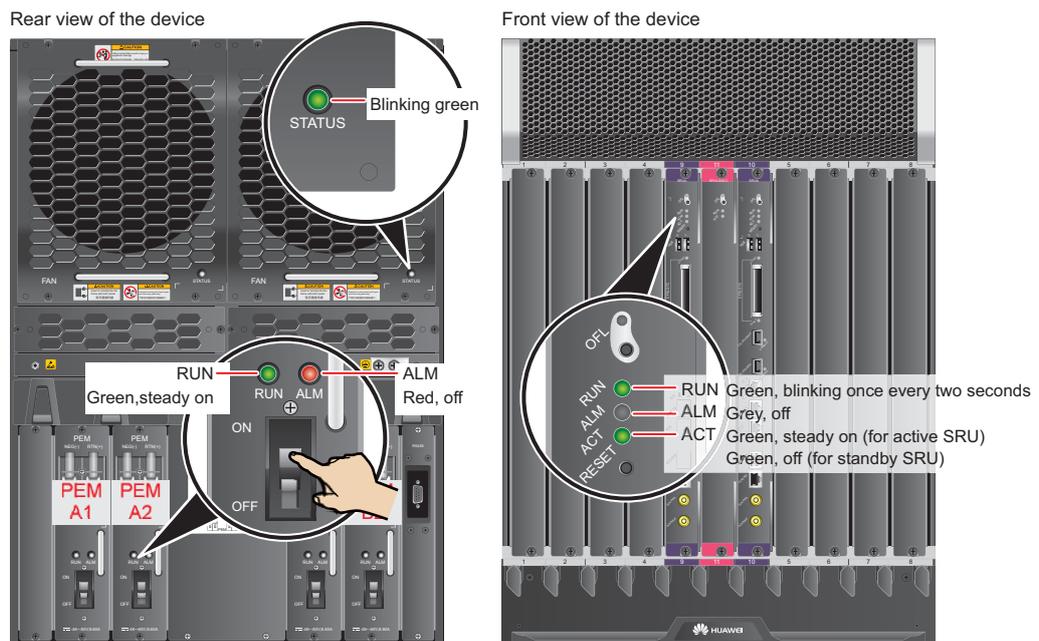
- Step 1** Turn on the circuit breakers of external DC power supplies A and B.
- Step 2** Measure the input voltage of the device with a multimeter. Ensure that the voltage falls between -72 V DC and -38 V DC.
- Step 3** Turn on the DC power switch of the device.
- Step 4** Wait three minutes and then check the status of the indicators.

Figure 2-41 shows the indicator status of main parts when the device is operating properly. **Table 2-7** describes all indicators.

NOTE

If not all power modules have four inputs, the STATUS indicator of the fan module is steady red.

Figure 2-41 Indicator status when the USG9560 is operating properly



----End

Result

Table 2-7 Device indicators

Item	Indicator	Color	Status Description
PEM	RUN	Green	If the indicator is steady green, the PEM has normal output.

Item	Indicator	Color	Status Description
	ALM	Red	Alarm indicator. If the indicator is steady red: <ul style="list-style-type: none"> ● The lightning protection circuit of the PEM is faulty. ● There is no power input.
FAN	STATUS	Green	If the indicator blinks once every two seconds (0.5 Hz), the FAN is working properly.
		Red	If the indicator blinks once every two seconds (0.5 Hz), the fan module or PEM is faulty, or not all PEMs are powered on.
MPU/SRU	RUN	Green	From the time the MPU/SRU is powered on until it is registered, the indicator status changes from off, blink once every 250 ms (4 Hz), off, steady on, and then to blink once every two seconds (0.5 Hz). After the MPU/SRU is registered, the MPU/SRU is working properly if the indicator blinks at 0.5 Hz. NOTE Possible causes for an offline indicator are: <ul style="list-style-type: none"> ● The BootROM is damaged. ● The MPU cannot be powered on. Possible causes for the indicator blinking quickly include: <ul style="list-style-type: none"> ● The CF card is faulty. ● The other control chips on the MPU/SRU are faulty, preventing the MPU/SRU from initializing.
	ALM	Red	If the indicator is steady off, the MPU/SRU is in the normal state. If the indicator is steady red, an alarm is generated.
SFU	RUN	Green	From the time the SFU is powered on until it is registered, the indicator status changes from off, blink once every 250 ms (4 Hz), off, steady on, and then to blink once every two seconds (0.5 Hz). After the SFU is registered, the SFU is working properly if the indicator blinks at 0.5 Hz.

Item	Indicator	Color	Status Description
	ACT	Green	If the indicator is steady green, the SFU is working properly; if the indicator is off, the SFU is faulty.

2.3.12 Powering On the USG9560 - AC Power Distribution

Check whether the USG9560 is operating properly with the AC power supply. To prevent damage, power on the USG9560 according to the instructions in this section.

Context



CAUTION

Before performing a power-on check, switch all circuit breakers to the OFF position.

Before you power on the USG9580, ensure that:

- The power cable and PGND cable are properly connected.
- The power switch in the equipment room is easy to locate so that you can quickly power off devices in case of any problems.

Procedure

- Step 1** Turn on external AC power supplies A and B.
- Step 2** Measure the input voltage of the AC power chassis with a multimeter to ensure that the voltage falls between 90 V AC and 264 V AC.
- Step 3** Turn on the circuit breakers of external AC power supplies A and B and check the status of the indicators on the AC power chassis.
- Step 4** Measure the input voltage of the device with a multimeter to ensure that the voltage falls between -72 V DC and -38 V DC.
- Step 5** Measure the input voltage of the device with a multimeter to ensure that the voltage falls between -72 V DC and -38 V DC.
- Step 6** Wait three minutes and then check the status of the indicators.

Figure 2-42 and **Figure 2-43** show the indicator status of main parts when the device is operating properly. **Table 2-9** and **Table 2-8** describe all indicators.

Figure 2-42 Indicator status when the AC power chassis is working properly

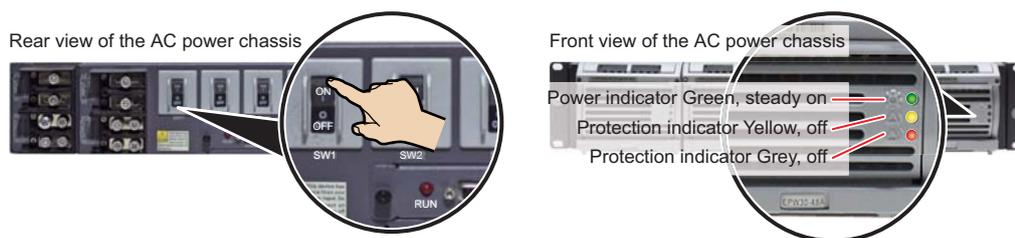
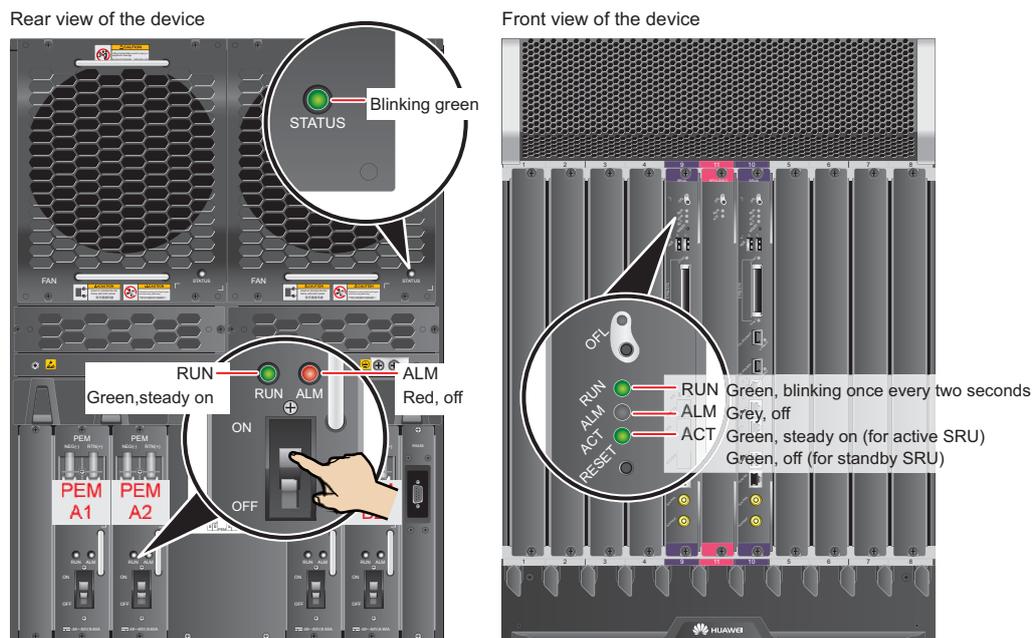


Figure 2-43 Indicator status when the USG9560 is operating properly



---End

Result

Table 2-8 Indicators on the AC power chassis

Item	Color	Status Description	Possible Exception Causes
Operation indicator	Green	If the indicator is steady green, the AC power chassis is running properly. If the indicator is off, an exception occurs.	There is no main AC power input, the AC input voltage is higher or lower than the normal range, or the AC power chassis has no output.
Protection indicator	Yellow	If the indicator is off, the AC power chassis is running properly. If the indicator is on, an exception occurs.	A temperature alarm is generated (if the temperature exceeds 65°C, the AC power chassis will be powered off), or the AC power chassis is in the dormant state (the indicator is on and no alarm is generated).
Fault indicator	Red	If the indicator is off, the AC power chassis is running properly. If the indicator is on, an exception has occurred.	The AC power chassis is powered off due to over-voltage or over-temperature, or fans are faulty, or the AC power chassis has no output due to its internal faults.

Item	Color	Status Description	Possible Exception Causes
DC output voltage	-	The normal voltage ranges from -43.2 V DC to -57 V DC	-

Table 2-9 Device indicators

Item	Indicator	Color	Status Description
PEM	RUN	Green	If the indicator is steady green, the PEM has normal output.
	ALM	Red	Alarm indicator. If the indicator is steady red: <ul style="list-style-type: none"> ● The lightning protection circuit of the PEM is faulty. ● There is no power input.
FAN	STATUS	Green	If the indicator blinks once every two seconds (0.5 Hz), the FAN is working properly.
		Red	If the indicator blinks once every two seconds (0.5 Hz), the fan module or PEM is faulty, or not all PEMs are powered on.
MPU/SRU	RUN	Green	<p>From the time the MPU/SRU is powered on until it is registered, the indicator status changes from off, blink once every 250 ms (4 Hz), off, steady on, and then to blink once every two seconds (0.5 Hz).</p> <p>After the MPU/SRU is registered, the MPU/SRU is working properly if the indicator blinks at 0.5 Hz.</p> <p>NOTE</p> <p>Possible causes for an off indicator include:</p> <ul style="list-style-type: none"> ● The BootROM is damaged. ● The MPU cannot be powered on. <p>Possible causes for the indicator blinking quickly include:</p> <ul style="list-style-type: none"> ● The CF card is faulty. ● The other control chips on the MPU/SRU are faulty, preventing the MPU/SRU from initializing.

Item	Indicator	Color	Status Description
	ALM	Red	If the indicator is steady off, the MPU/SRU is in the normal state. If the indicator is steady red, an alarm is generated.
SFU	RUN	Green	From the time the SFU is powered on until it is registered, the indicator status changes from off, blink once every 250 ms (4 Hz), off, steady on, and then to blink once every two seconds (0.5 Hz). After the SFU is registered, the SFU is working properly if the indicator blinks at 0.5 Hz.
	ACT	Green	If the indicator is steady green, the SFU is working properly; if the indicator is off, the SFU is faulty.

2.4 Installing USG9520

This section describes how to install the USG9520.

2.4.1 Preparing the Site

Prior to device installation, deploy the cabinet and device according to the following power supply, cabinet, cabinet clearance, and device clearance requirements to ensure that the device works properly.

Power Supply System Requirements

- If DC power supply is used, ensure that the outputs of the DC power distribution box fall between -72 V DC and -38 V DC. Two power modules are needed, and each power module must be connected to two different power sources for redundancy.
- If AC power supply is used, ensure that the output voltage of the AC power distribution cabinet falls between 90 V AC and 175 V AC (with rated input voltage being 110 V) or between 175 V AC and 264 V AC (with rated input voltage being 220 V) and that two groups of power modules are provided for redundancy.



With the 110 V AC power supply, the USG9520 must use 110 V dual-live-wire AC input to meet the maximum system power consumption with the full configuration. This is because AC power modules are half-load output with 110 V AC input, which cannot meet the system power consumption.

Cabinet Requirements

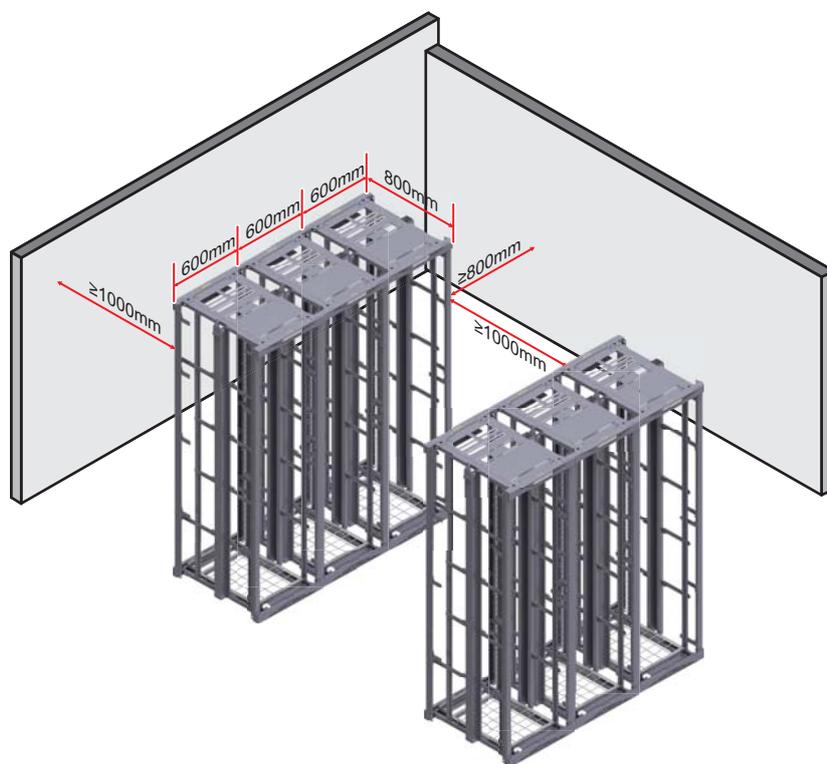
You are advised to use Huawei standard NE68E cabinet. Any other cabinet must meet [A.6 Requirements for Customers' Cabinets Purchased from Other Vendors](#).

Cabinet Clearance Requirements

The N68E-22 cabinet is used as an example. As shown in [Figure 2-44](#), cabinet clearance must meet the following requirements:

- Aisles in the equipment room ≥ 1000 mm; aisles between cabinet rows ≥ 1000 mm
- Space between cabinet sides and wall ≥ 800 mm
- Space between cabinet row and wall ≥ 1000 mm

Figure 2-44 Diagram for cabinet deployment



Device Clearance Requirements

The USG9520 DC chassis is 4 U high, and the USG9520 AC chassis is 5 U. The USG9520 requires front and back maintenance mode. The device must meet the following clearance requirements:

- Airflow
 - A minimum of 75 mm between the air intake of the cabinet and neighboring objects. If the air intake of the cabinet is next to another communication device, a minimum of 150 mm is required
 - A minimum of 2 U between devices installed in the same cabinet, between the top-most device and the cabinet top, and between the bottom-most device and the cabinet bottom

- Maintenance

A minimum of 350 mm between the rear of the cabinet and neighboring objects

 **NOTE**

The length of three holes on the mounting rails is 1 U, which is equivalent to 44.45 mm.

2.4.2 Installing Cable Racks and Mounting Ears

Mounting ears are used to fix a device to the cabinet, and cable racks are used to route optical fibers and cables.

Procedure

- Install the cable rack.

Figure 2-45 Installing the cable rack



- Install the mounting ears

 **NOTE**

Before installing the mounting ears, measure the distance (L) between the mounting bar and the front door. The mounting ear is installed in different ways depending on the distance L, as shown in the following figures.

Figure 2-46 Space between the surface of the mounting ear and the inside of the front door

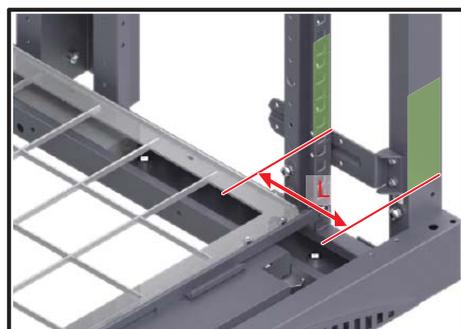
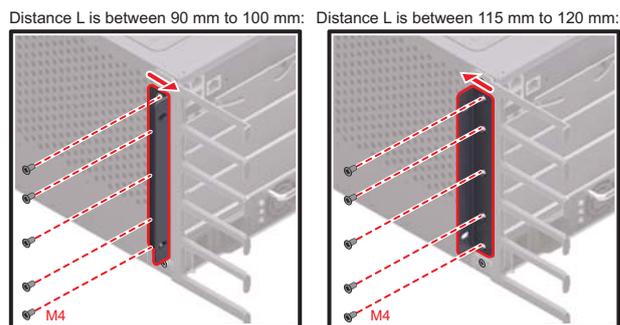


Figure 2-47 Direction of mounting ear installation depending on distance L



---End

2.4.3 Installing the Chassis into the Cabinet

You can install the USG9520 in a 19-inch standard cabinet using guide rails.

Context



CAUTION

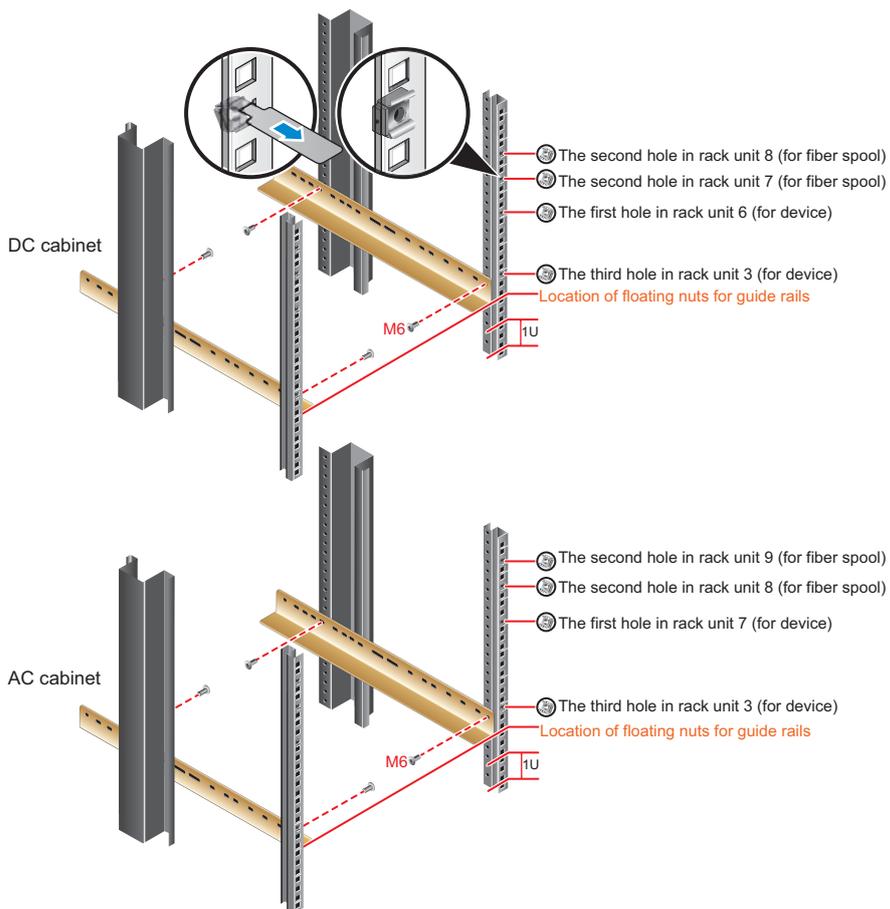
- The USG9520 is heavy and requires two people to lift and move.
 - Use the handles on the chassis sides when moving the device. To avoid damaging the device, do not use the module handles.
 - Do not step on the air filter at the bottom of the cabinet.
-

Procedure

Step 1 Install floating nuts and guide rails.

1. Determine where to install floating nuts and mark the positions using a marker, as shown in [Figure 2-48](#).
2. Fix the floating nuts in the positions.
3. Use M6 screws to fix the guide rails in position.

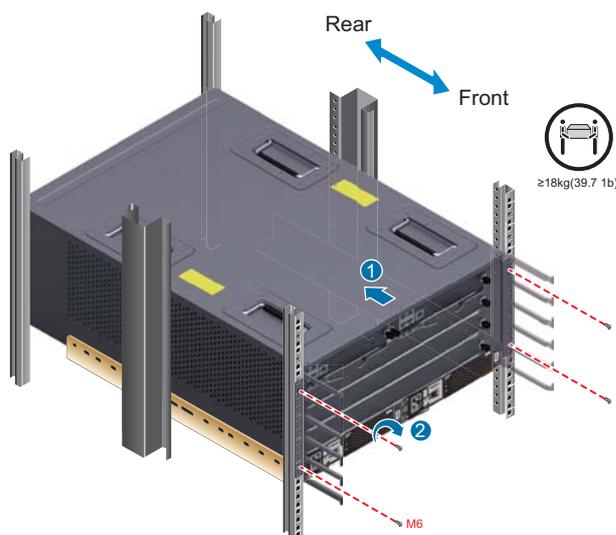
Figure 2-48 Installing floating nuts and guide rails



Step 2 Mount the USG9520 in the cabinet.

1. Lift up the USG9520, place it onto the cabinet guide rails, and push it into the cabinet.
2. Use M6 screws to fix the mounting ears of the USG9520 to the mounting rack, as shown in [Figure 2-49](#).

Figure 2-49 Mounting the USG9520 in the cabinet



---End

Follow-up Procedure

Perform the following checks after the installation:

- Ensure that the USG9520 is placed securely inside the cabinet.
- Ensure that the exhaust area of the USG9520 is unobstructed.

2.4.4 Connecting the PGND Cable

Correctly connecting the PGND cable of the USG9520 is essential for surge protection and interference resistance. Before using the USG9520, connect the PGND cable.

Prerequisites

Before installing the PGND cable of the device, ensure that the PGND cable of the cabinet is correctly connected and the ground resistance is zero ohm.

Context

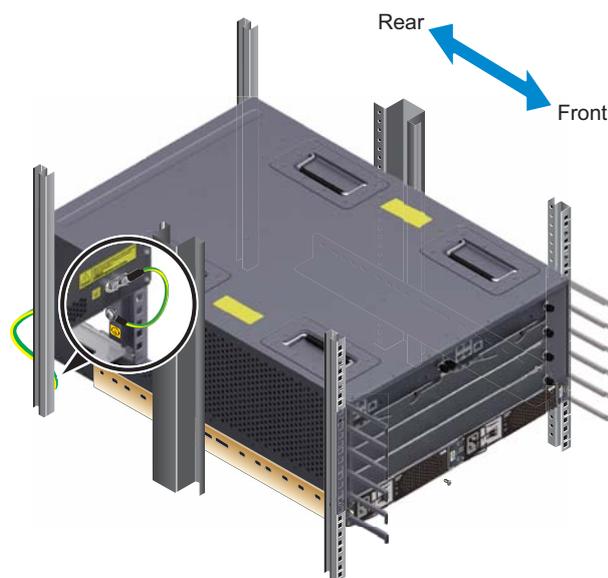
If the chassis is close to the ground bar in the equipment room, connect the PGND cable of the chassis directly to the ground bar. If the chassis is far away from the ground bar, connect the PGND cable to the ground point on the cabinet.

In this section, connecting the PGND cable to the ground point on the cabinet is used as an example.

Procedure

- Step 1** Install the chassis ground cable. The AC chassis is used as an example, as shown in [Figure 2-50](#).

Figure 2-50 Connecting the PGND cable



---End

Follow-up Procedure

Verify the following:

- The PGND cable is securely connected to the ground terminal.
- The electrical resistance between the ground terminal and ground point is less than 10 ohm on a multimeter.

2.4.5 Installing Boards and Subcards

This section describes how to install boards and subcards.

Context



CAUTION

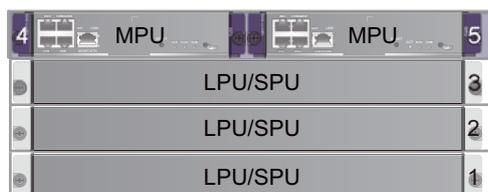
- Ensure that the device and board are completely dry and free of liquid before inserting the board into the device.
 - Before installing boards, wear the ESD wrist strap and ensure that the strap is well grounded to prevent any electrostatic discharge from damaging sensitive components.
-

Procedure

Step 1 Select slots based on slot distribution.

You can determine whether a slot is suitable for a board by checking whether the color on both ends of the board panel is the same as the color on the slot.

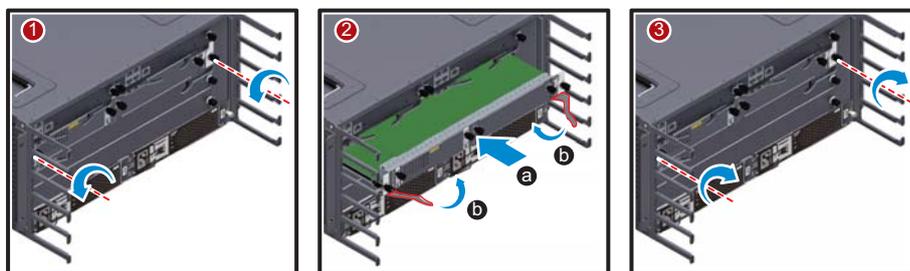
Figure 2-51 Slot layout



Step 2 Install a board.

1. Remove the filler panel from the selected slot.
2. Extend the ejector levels of the board, insert the board fully into the slot, and rotate the ejector level to the front of the board.
3. Use a Phillips screwdriver to fasten the captive screws to the board.

Figure 2-52 Installing a board



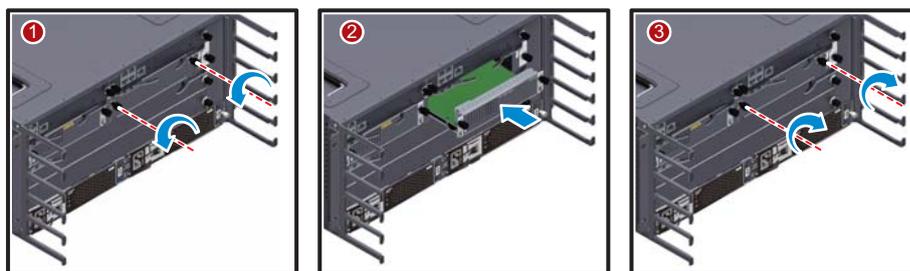
Step 3 Install a subcard.

NOTE

Before you install a subcard, remove redundant guide rails from the board and store them for future use.

1. Remove the filler panel from the board.
2. Smoothly insert the subcard into the board along the guide rail.
3. Use a Phillips screwdriver to fasten the captive screws to the board.

Figure 2-53 Installing a subcard



----End

Follow-up Procedure

Verify the following:

- Boards and subcards are installed in the correct position and captive screws are tightly fastened.

- Filler panels are inserted into vacant slots. Filler panels prevent intrusion of dust and ensure heat dissipation.

2.4.6 Installing Power Cables - DC Power Distribution

In standard configuration, the USG9520 has two DC power supply modules. Each module requires an NEG DC power cable and an RTN DC power cable. This section describes how to connect power cables to the two DC supply modules.

Context



DANGER

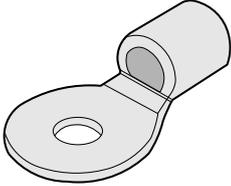
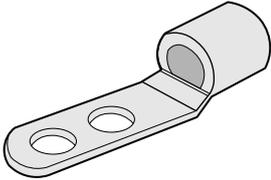
Never install power cables when the power is on.

Before installing power cables, ensure that the device is adequately grounded.

- There is a length of copper core inside the cable. Do not connect anything to the core.
- DC power distribution cables

Cable	Image
NEG cable	
RTN cable	

- DC cable terminals

Terminal	Image
OT bare crimping terminal	
JG2 double-hole bare crimping terminal	

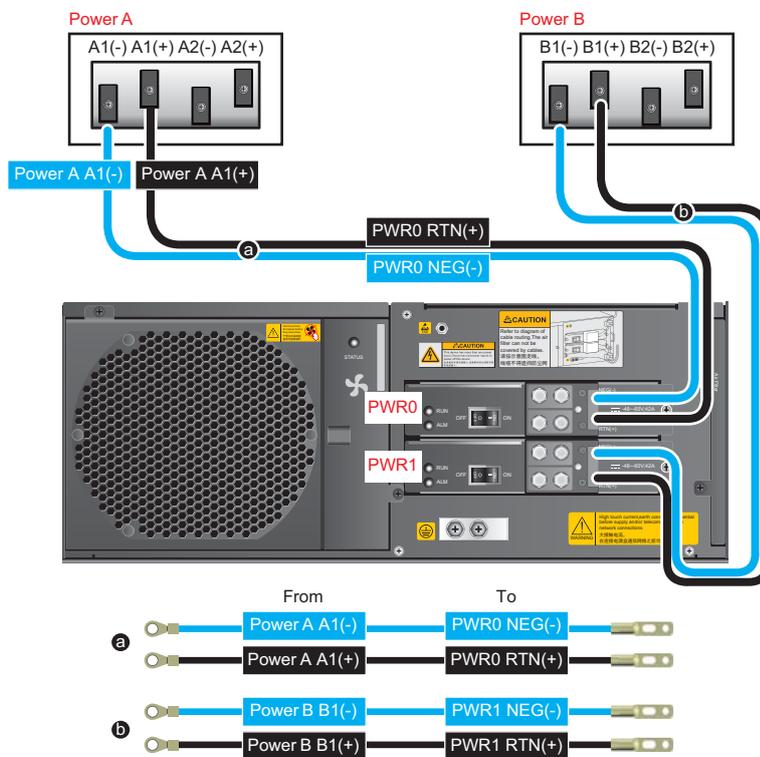
- For details, see [Guide to Power Distribution Design of the USG9520](#).

Procedure

Step 1 Mark both ends of each power cable using a non-permanent marker.

Step 2 Connect the M6 JG2 terminals of the DC power cable to the DC power modules on the USG9520. Connect the M8 OT terminals of the DC power cable to the output terminals on the power supply device.

Figure 2-54 Installing power cables



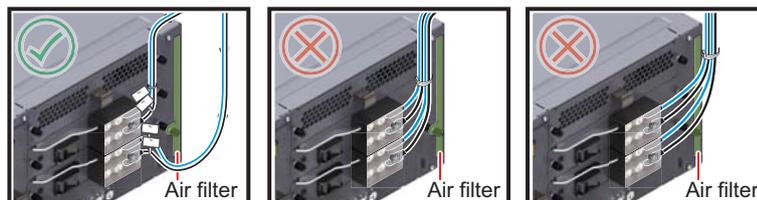
Step 3 Use cable ties to bind the cables together at 100 mm intervals, fixing the cables along the cabling rack from bottom to top.

 **NOTE**

To facilitate future maintenance:

- Ensure that power module cables are tied separately to facilitate the removal of individual modules.
- Ensure that the power cables do not block the air filter and that the cables of one power module do not block the access to the cables of the other module.

Figure 2-55 Installing power cables



Step 4 Affix permanent labels 20 mm from both ends of each power cable.

---End

Follow-up Procedure



NOTICE

The power cable has polarity. After the device is powered on, if the PEM indicator blinks red, check whether the anode and cathode of the PEM power cable are properly connected. If they are not properly connected, immediately switch off the previous-stage power and properly connect the power cable.

1. Install a plastic cover on each power module.
2. The power cables are fixed securely and have sufficient contact with the terminals.
3. The cables in the corner are unbent.
4. The power cable labels are filled in and attached to the cables as required. All labels are neat and face the same direction, allowing for easy viewing.
5. The power cable, ground cable, and signal cable are bound separately. The distance between them must be greater than 3 cm.

2.4.7 Installing Power Cables - AC Power Distribution

In standard configuration, the USG9520 has two AC power supply modules. Each module requires a power cable. This section describes how to connect power cables to the two AC supply modules.

Context



DANGER

Never install power cables when the power is on.

Before installing power cables, ensure that the device is adequately grounded.



NOTICE

With the 110 V AC power supply, the USG9520 must use 110 V dual-live-wire AC input to meet the maximum system power consumption requirements with the full configuration. This is because AC power modules are half-load output with 110 V AC input, which cannot meet system power consumption requirements.

- There is a length of copper core inside the cable. Do not connect anything to the core.
- AC power distribution cables

Figure 2-56 AC power distribution cables



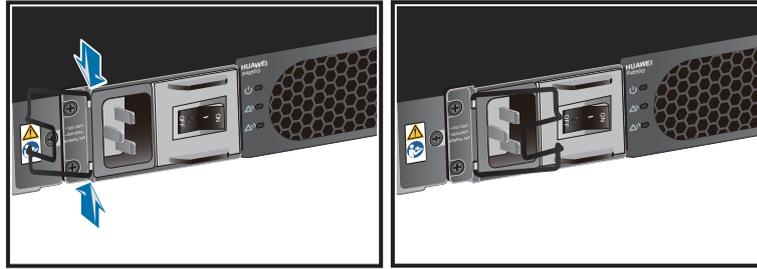
- For details, see [Guide to Power Distribution Design of the USG9520](#).

Procedure

Step 1 Mark both ends of each power cable using a non-permanent marker.

Step 2 Install an AC power cable clip.

Figure 2-57 Installing an AC power cable clip



Step 3 Insert the AC power cable into the receptacle on the AC power module and close the cable clip around the plug. Insert the other end of the AC power cable into a socket or a power supply device on the top of the cabinet.

Figure 2-58 Installing AC power cables

部件名称	有毒有害物质或元素					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr6+)	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
机柜	×	○	○	○	○	○
PCBA	×	○	○	○	○	○
线缆	×	○	○	○	○	○
配套件	×	○	○	○	○	○

本表格依据SJ/T 11364的规定编制。
 ○：表示该有毒有害物质在该部件所有均质材料中的含量均在GB/T 26572规定的限量要求以下。
 ×：表示该有毒有害物质至少在该部件的某一均质材料中的含量超出GB/T 26572规定的限量要求。

Step 4 Use cable ties to bind the cables at 100 mm intervals and fix the cables to the cabling rack from bottom to top.

Step 5 Affix permanent labels 20 mm from both ends of each power cable.

---End

Follow-up Procedure



NOTICE

The power cable has polarity. After the device is powered on, if the PEM indicator blinks red, check whether the anode and cathode of the PEM power cable are properly connected. If they are not properly connected, immediately switch off the previous-stage power and properly connect the power cable.

-
1. The power cables are fixed securely and have sufficient contact with the terminals.
 2. The cables in the corner are unbent.
 3. The power cable labels are filled in and attached to the cables as required. All labels are neat and face the same direction, allowing for easy viewing.
 4. The power cable, ground cable, and signal cable are bound separately. The distance between them must be greater than 3 cm.

2.4.8 Connecting Network Cables

This section describes how to install electrical transceivers on the ports and how to connect them to the peer device ports using network cables according to the network plan.

Context

Before connecting the network cable, check the following:

- Construction conditions
Ensure that the peer device has been installed in the equipment room and the port to which the network cable is to be connected has been determined.
- Cabling route
The engineering document specifies the cabling route from the cabinet to the peer device in the equipment room. Ensure that the cable length is calculated based on the cabling path.
- Cable label
Ensure that the cable is labeled before being connected to the devices.

Network cables are either crossover or straight-through cables. Currently, Ethernet ports on most devices can dynamically adapt to both types of cables. For devices that do not support dynamic adaptation, use the correct cables.

In terms of electromagnetic compatibility, network cables are either ordinary or shielded cables. Shielded cables are preferred because of their higher electromagnetic compatibility.

NOTICE

Before connecting a cable, ensure that the port is labeled and that the cable is inserted into the correct port. Otherwise, the port module or the device may be damaged.

Before bundling network cables, use a network cable tester to test cable connectivity. Bind the network cables to form a rectangle inside the cabinet. Each bundle contains a maximum of 20 network cables. Ensure that the cable ties are tidy and tied in the same direction.

The distance between the power cable, PGND cable, and signal cable must be greater than 30 mm.

Procedure

Step 1 If multiple network cables need to be connected, attach temporary labels to both ends of each cable.

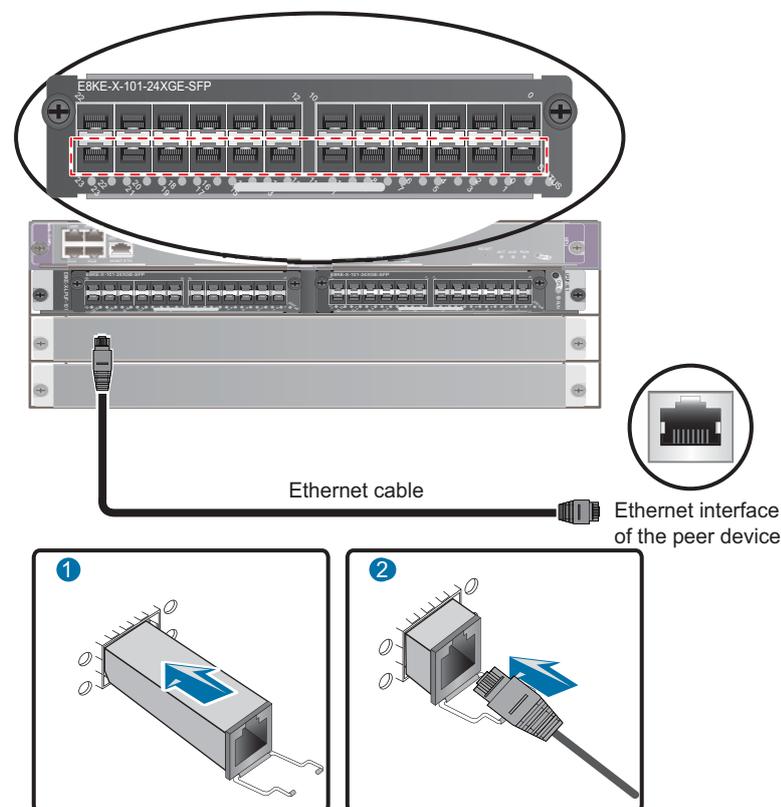
Step 2 Remove the dust-proof caps from a board interface and insert the electrical module into the interface.

NOTE

The electrical module can be inserted only in odd-numbered interfaces on the 24-port 100/1000Base-X-SFP flexible interface card.

Step 3 Connect one end of a network cable to the electrical transceiver of the USG9520 and the other end to the Ethernet port of the peer device based on the network plan.

Figure 2-59 Connecting a network cable



- Step 4** Lay out the network cable along a cabinet and route the cable through the cable hole for the signal cables at the top (overhead cabling) or bottom (underfloor cabling) of the cabinet.
- Step 5** Remove the temporary labels and attach labels (20 mm away from the connectors) at each end of the network cable.

----End

Follow-up Procedure

Verify the following:

- The labels at each end of the cable are correct, clear, neat, and facing the same direction.
- The cables and connectors are free of any damage and are connected properly and securely.

2.4.9 Connecting Optical Fibers

This section describes how to install optical transceivers on the ports and connect them to the ports of the peer device using optical fibers according to the network plan.

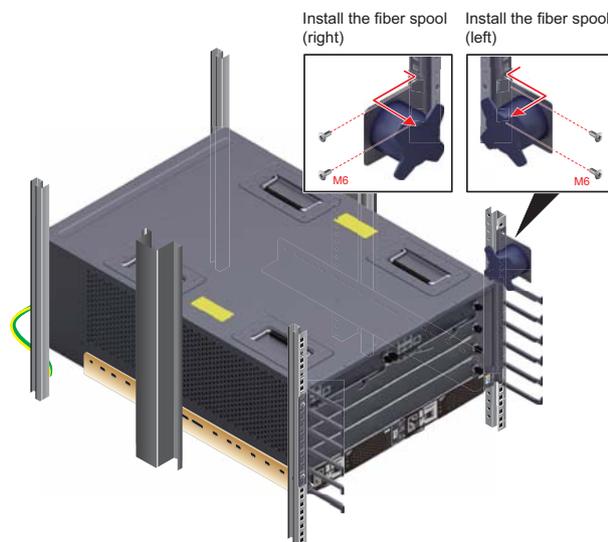
Installing Fiber Spools

NOTE

Wind excess optical fibers around fiber spools for convenient cable routing and device maintenance.

Determine the locations of the fiber spools based on the device arrangement in the cabinet. Positioning the fiber spools too close to the device operation area may inhibit board insertion or removal or cabling. However, positioning the fiber spools too far away from the device may inhibit fiber spool operation.

Figure 2-60 Installing fiber spools



Installing Optical Transceivers and Connecting Optical Fibers



CAUTION

Do not look into the optical interface of the optical module or the optical fiber connector without eye protection.

Put on the ESD wrist strap or ESD gloves before installing optical modules.

When handling optical fiber cables, take the following precautions:

- Do not overbend optical fibers. The radius should not be shorter than 40 mm.
- Do not bundle the optical fibers too tightly; otherwise, the transmission performance of the optical fibers and the communication between devices may be affected.

Step 1 Before connecting an optical fiber, attach temporary labels to each end of the optical fiber.

Step 2 Remove the dust cap from an optical interface and insert an optical module into the optical interface.

Step 3 Remove the dust cap from the optical transceiver.



NOTE

Store the dust cap for future use. When optical fibers are disconnected for maintenance, use the dust cap to protect the optical transceiver from intrusion of dust.

Step 4 Remove protective caps from optical fiber connectors, insert optical fibers into the optical transceiver, and connect the fiber to the peer device.

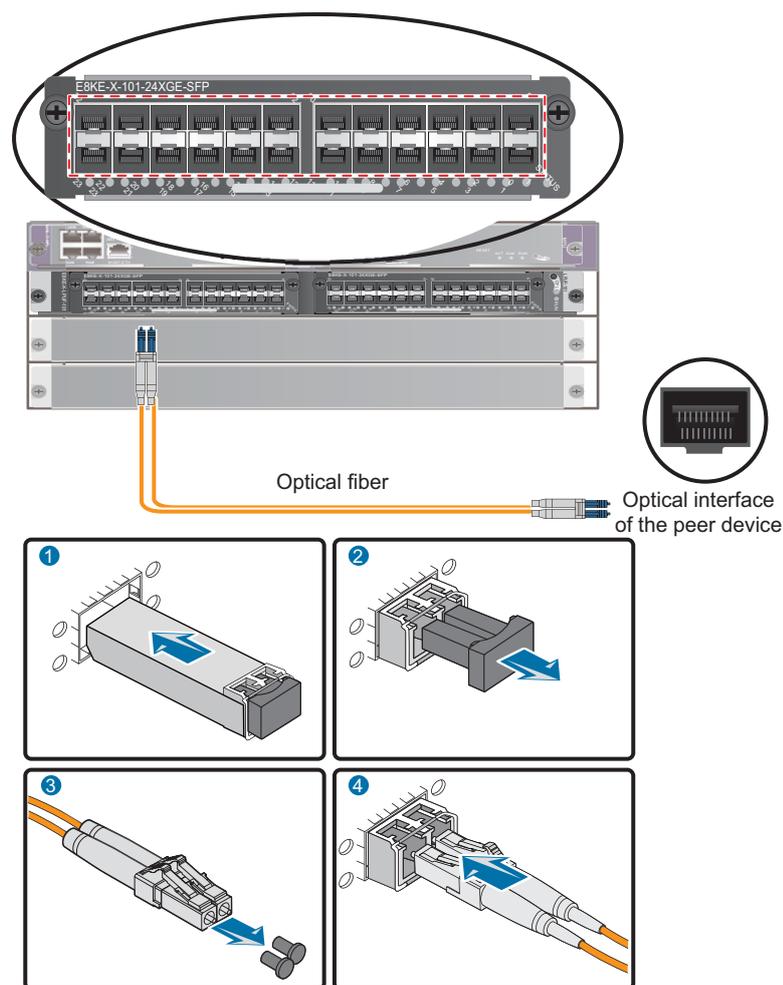


NOTE

Ensure that the Tx and Rx ports are correctly connected.

Ensure that the Tx and Rx ports on one end of the optical fiber cable are connected to the respective Rx and Tx ports on the other end.

Figure 2-61 Installing optical transceivers and connecting optical fibers



Step 5 Repeat **Step 1** through **Step 4** to install all optical transceivers and connect all optical fibers.

Step 6 Wind up excess optical fibers around a fiber management tray.

Step 7 Bind optical fibers at 200 mm intervals with binding tape and use cable ties to fix the bundle of the optical fibers to the cabling rack.

Step 8 Affix permanent labels 20 mm from both ends of the optical fiber.

----End

Follow-up Procedure

After you power on the USG9500, check the connection by looking at the optical port indicator. If the indicator is on or blinking, the link is connected or data is being transmitted. If the indicator is off, the link is disconnected. Possible disconnection causes include:

- The optical fiber is improperly inserted. Pull out the optical fiber and re-insert it.
- The Rx and Tx optical ports are reversed. Pull out the optical fibers and re-insert them into the correct ports.

- The optical module or optical fiber is damaged and must be replaced.

2.4.10 Checking After Installation

After you install the device in a cabinet and before you power on the device, verify that the cables and NE40E have been installed correctly.

Cabinet Installation Checklist

No.	Item
1	The cabinet is positioned according to instructions in the engineering design document.
2	The deviation of the cabinet is less than 3 mm horizontally and not more than 3 mm vertically.
3	All bolts are firmly fastened, especially those for electrical connections. Both flat washers and spring washers are used and the spring washers are placed over the flat washers.
4	The cabinet is neat and clean.
5	The doors can be opened and closed smoothly.
6	All labels, tags, and nameplates are correct, legible, and complete.

Installation Environment Checklist

No.	Item
1	The equipment is free of fingerprints or other smudging.
2	The cables are free of excessive electrical tape and cable ties.
3	The area around the equipment is free of tape, cable ties, packaging bags, and trash.
4	All items around the equipment are neat, clean, and intact.

Cable Installation Checklist

No.	Item
1	All the self-made ground cables are copper-based with proper wire diameters. There is no switch or fuse on the cable and no area of disconnection.

No.	Item
2	Ground cables, AC input power cables, and cables in the cabinet are connected correctly according to the power system wiring diagram. Screws are tightened. Output and input cables are not short-circuited.
3	Extra power and ground cable are stripped off, not coiled.
4	The lugs at both ends of each power cable or ground cable are properly crimped.
5	Bare wires and lug handles at the wiring terminals are wrapped tightly with insulation tape or heat shrink tubing.
6	The flat washer and spring washer are mounted securely to all the wiring terminals.
7	All cable connectors are securely linked, especially those at the bottom of the cabinet.
8	The cables are properly bound. Cable ties are tied at equal intervals and in the same direction
9	The power cable and ground cable are routed separately from other cables.
10	The cable layout facilitates future maintenance and expansion.
11	The labels at each end of each cable are legible.
12	Excess cable tie is trimmed off without leaving rough edges.

2.4.11 Powering On the USG9520 - DC Power Distribution

Check whether the USG9520 is operating properly with the DC power supply. Power on the USG9520 according to the following requirements to ensure device security.

Context



CAUTION

Before performing a power-on check, switch all circuit breakers to the OFF position.

Before you power on the USG9580, ensure that:

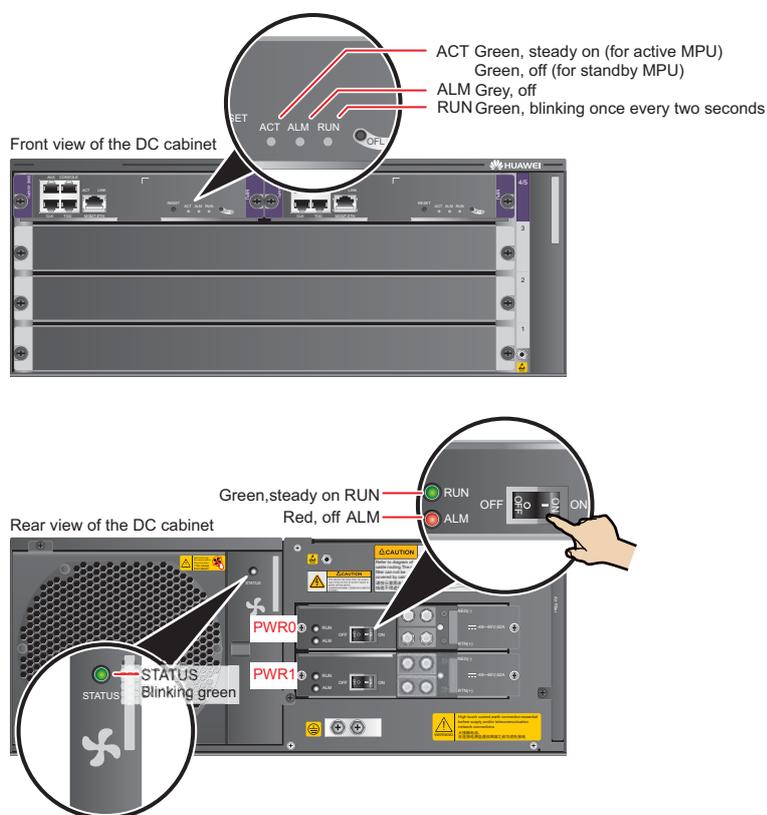
- The power cable and PGND cable are properly connected.
- The power switch in the equipment room is easy to locate so that you can quickly power off devices in case of any problems.

Procedure

- Step 1** Turn on the circuit breakers of external DC power supplies A and B.
- Step 2** Measure the input voltage of the device with a multimeter to ensure that the voltage falls between -72 V DC and -38 V DC.
- Step 3** Turn on the DC power switch of the device.
- Step 4** Wait three minutes and then check the status of the indicators.

Figure 2-62 shows the indicator status of main parts when the device is operating properly. **Table 2-10** describes all indicators.

Figure 2-62 Indicator status when the USG9520 is operating properly



----End

Result

Table 2-10 Device indicators

Item	Indicator	Color	Status Description
DC power module	RUN	Green	If this indicator is steady on, the power module is working properly.

Item	Indicator	Color	Status Description
	ALM	Red	Alarm indicator. If the indicator is steady red: <ul style="list-style-type: none"> ● The lightning protection circuit of the power module is faulty. ● There is no power input.
FAN	STATUS	Green	If the indicator blinks once every two seconds (0.5 Hz), the FAN is working properly.
		Red	If the indicator blinks once every two seconds (0.5 Hz), the fan module or power module is faulty, or the power module does not have input power.
MPU	RUN	Green	From the time the MPU is powered on until it is registered, the indicator status changes from off, blink once every 250 ms (4 Hz), off, steady on, and then to blink once every two seconds (0.5 Hz). After the MPU is registered, the MPU is working properly if the indicator blinks at 0.5 Hz. NOTE Possible causes for an off indicator include: <ul style="list-style-type: none"> ● The BootROM is damaged. ● The MPU cannot be powered on. Possible causes for the indicator blinking quickly include: <ul style="list-style-type: none"> ● The CF card is faulty. ● The other control chips on the MPU are faulty, preventing the MPU from initializing.
	ALM	Red	If the indicator is steady off, the MPU is in the normal state. If the indicator is steady red, an alarm is generated.

2.4.12 Powering On the USG9520 - AC Power Distribution

Check whether the USG9520 is operating properly with the AC power supply. Power on the USG9520 according to the following requirements to ensure device security.

Context



CAUTION

Before performing a power-on check, switch all circuit breakers to the OFF position.

Before you power on the USG9580, ensure that:

- The power cable and PGND cable are properly connected.
- The power switch in the equipment room is easy to locate so that you can quickly power off devices in case of any problems.

Procedure

Step 1 Turn on external AC power supplies A and B.

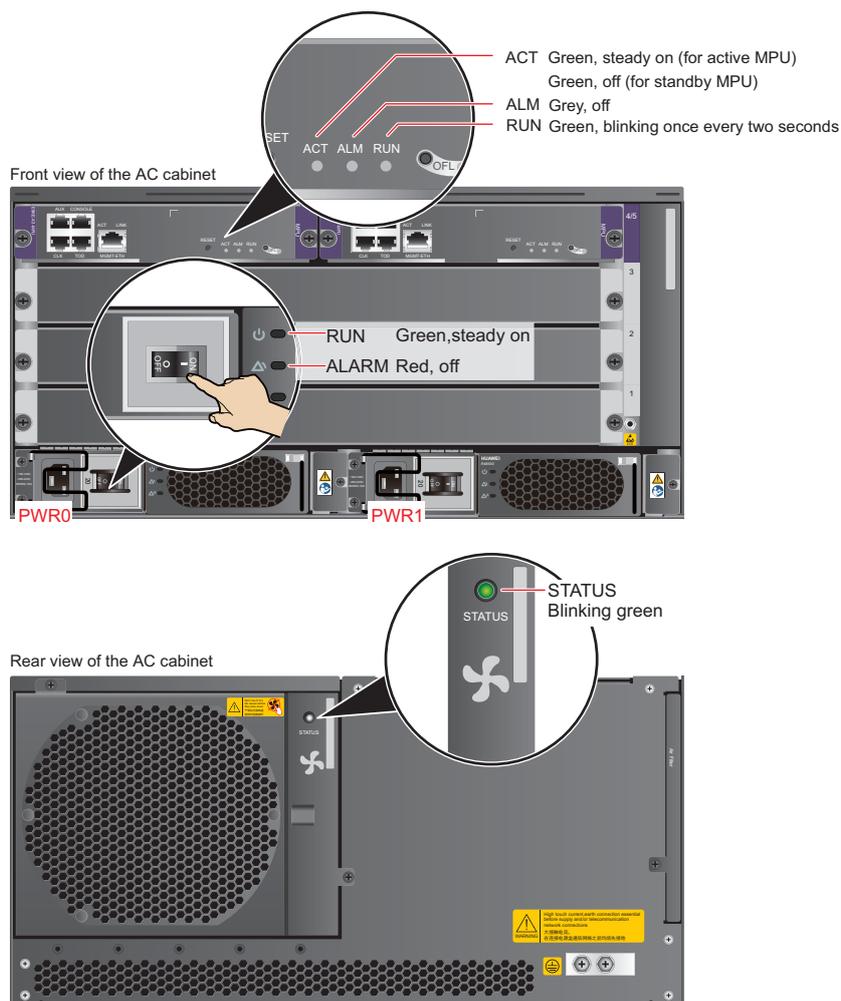
Step 2 Measure the input voltage of the device with a multimeter. Ensure that the voltage falls between 90 V AC and 264 V AC.

Step 3 Turn on the AC power switch of the device.

Step 4 Wait three minutes and then check the status of the indicators.

Figure 2-63 shows the indicator status of main parts when the device is operating properly. **Table 2-11** describes all indicators.

Figure 2-63 Indicator status when the USG9520 is operating properly



---End

Result

Table 2-11 Device indicators

Item	Indicator	Color	Status Description
AC power module	RUN	Green	Operation indicator. If this indicator is steady on, the power module is working properly.
	ALARM	Yellow	Alarm indicator. <ul style="list-style-type: none"> ● If this indicator is blinking, the communication is interrupted. ● If this indicator is steady on, a fault such as input overvoltage, undervoltage, or overcurrent, has occurred.

Item	Indicator	Color	Status Description
	FAULT	Red	Fault indicator. If this indicator is steady on, an unrecoverable fault, such as a fan failure, no output, or short circuit, has occurred.
FAN	STATUS	Green	If the indicator blinks once every two seconds (0.5 Hz), the FAN is working properly.
		Red	If the indicator blinks once every two seconds (0.5 Hz), the fan module or power module is faulty, or the power module does not have input power.
MPU	RUN	Green	<p>From the time the MPU is powered on until it is registered, the indicator status changes from off, blink once every 250 ms (4 Hz), off, steady on, and then to blink once every two seconds (0.5 Hz). After the MPU is registered, the MPU is working properly if the indicator blinks at 0.5 Hz.</p> <p>NOTE Possible causes for an off indicator include:</p> <ul style="list-style-type: none"> ● The BootROM is damaged. ● The MPU cannot be powered on. <p>Possible causes for the indicator blinking quickly include:</p> <ul style="list-style-type: none"> ● The CF card is faulty. ● The other control chips on the MPU are faulty, causing the MPU not to be able to initialize.
	ALM	Red	If the indicator is steady off, the MPU is in the normal state. If the indicator is steady red, an alarm is generated.

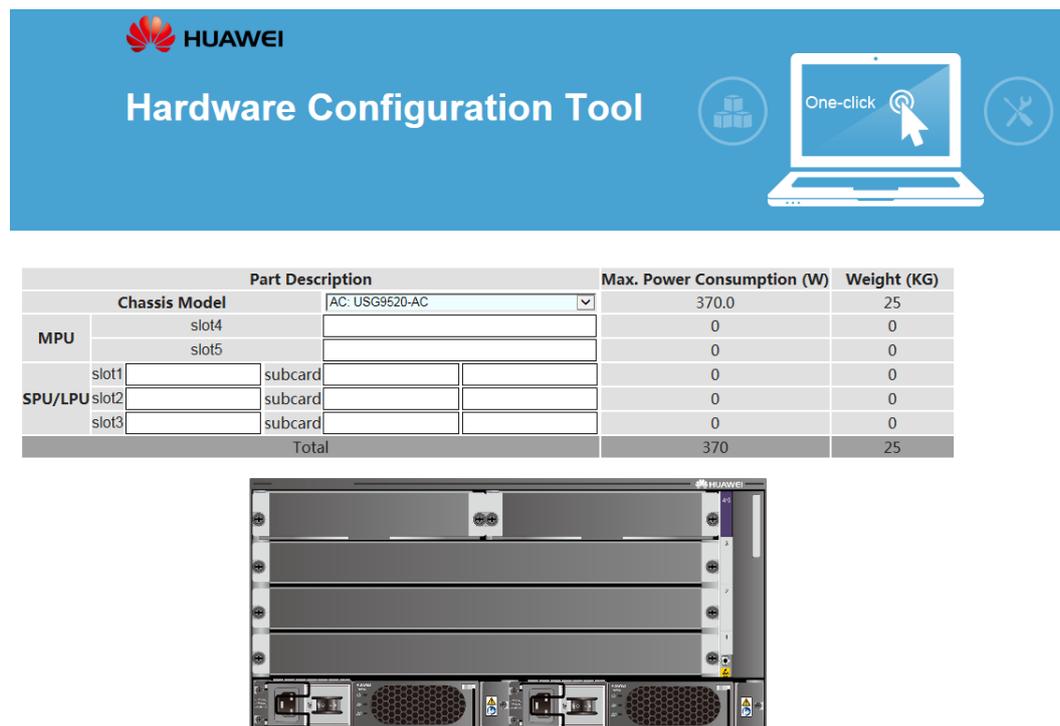
2.5 Power Distribution Design Guide

This section describes how to configure power distribution.

2.5.1 Hardware Configuration Tool

Hardware Configuration Tool的使用界面**Figure1**所示, 该工具可以根据各个模块的功耗计算出防火墙的功耗。

Figure 2-64 硬件配置工具界面



2.5.2 USG9580 Power Distribution Design Guide

This section describes how to configure power distribution for the USG9580.

2.5.2.1 DC Power Distribution Guide

This section describes how to select DC power distribution cables and circuit breakers of the DC PDF.

Figure 2-65 shows the schematic diagram on the DC PEMB.

Figure 2-65 Schematic diagram of DC PEMB

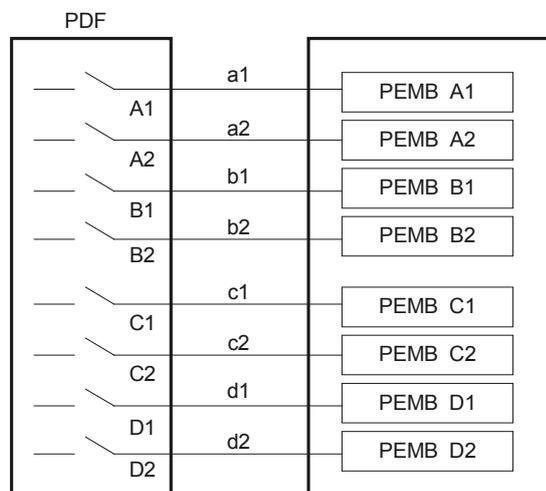


Table 2-12 lists the current parameters of each circuit breaker and each power line for the PDF

Table 2-12 Current parameters of circuit breakers and power lines for the PDF (DC PEMB)

Item	Specification	Note
Each circuit breaker (A1,A2,B1,B2,C1,C2,D1,D2)	≥ 60 A	To protect power supplies of different levels, it is recommended that the current of the circuit breaker on the user side should be greater than or equal to that of the circuit breaker of the power module (70 A).
Each power supply (A1,A2,B1,B2,C1,C2,D1,D2)	≥ 60 A	To support the maximum configuration, it is recommended that each DC power line should provide a minimum of 60 A current.
<p>If the PDF cannot provide 70 A circuit breakers and full configuration is unnecessary, select the circuit breaker of each DC line using the following formula (A1,A2,B1,B2,C1,C2,D1,D2):</p> $I = P / (V_{in} * D * 4)$ <p>I: rated current of the circuit breaker of each line on the PDF, in Ampere (A). P: total power of each device. V_{in}: input voltage of the power supply. (38 < V_{in} < 72) D: derating coefficient. The recommended coefficient is 0.8. 4: number of input lines on the power module.</p>		

Table 2-13 describes how to select power cables (a1,a2,b1,b2,c1,c2,d1,d2)

Table 2-13 PEMB cables

Distance from the PDF to the Device	Power Cables a and b	
Shorter than or equal to 15 m	Wire,450/750V,227 IEC 02(RV)16mm ² ,blue,85A	Each power module should be equipped with one cable of this type. The cable length is determined by an onsite project survey.

Distance from the PDF to the Device	Power Cables a and b	
	Wire,450/750V,227 IEC 02(RV)16mm ² ,black,85A	Each power module should be equipped with one cable of this type. The cable length is determined by an on site project survey.
	Naked Crimping Terminal,JG2,16mm ² ,M6,95 A,Tin Plated,for OEM	Each cable should be equipped with one terminal of this type.
	Naked Crimping Terminal,OT,16mm ² ,M8,Tin Plating,Naked Ring Terminal	Each cable should be equipped with one terminal of this type.
Longer than 15 m or shorter than or equal to 25 m	Wire,450/750V,227 IEC 02(RV)25mm ² ,blue,110A	Each power module should be equipped with one cable of this type. The cable length is determined by an onsite project survey.
	Wire,450/750V,227 IEC 02(RV)25mm ² ,black,110A	Each power module should be equipped with one cable of this type. The cable length is determined by an onsite project survey.
	Naked Crimping Connector,JG2,25mm ² ,M6,150A,Tin Plating,For OEM	Each cable should be equipped with one terminal of this type.
	Naked Crimping Terminal,OT,25mm ² ,M8,Tin Plating,Naked Ring Terminal	Each cable should be equipped with one terminal of this type.
Longer than 25 m or shorter than or equal to 35 m	Wire,450/750V,227 IEC 02(RV)35mm ² ,Blue,135A	Each power module should be equipped with one cable of this type. The cable length is determined by an onsite project survey.
	Wire,450/750V,227 IEC 02(RV)35mm ² ,black,135A	Each power module should be equipped with one cable of this type. The cable length is determined by an onsite project survey.

Distance from the PDF to the Device	Power Cables a and b	
	Naked Crimping Connector, JG2, 34.3mm ² , M6(1/4"), 134A, Tin Plated, 2AWG, Hole Center Distance 15.875mm(5/8"), Short Tube, for North American	Each cable should be equipped with one terminal of this type.
	Naked Crimping Terminal, OT, 35mm ² , M8, Tin Plating, Naked Ring Terminal	Each cable should be equipped with one terminal of this type.
Longer than 35 m	A PDF should be placed near the device.	
Formula for calculating cable cross-sectional area	$S = (I * L) / 74$ S: cross-sectional area I: current flowing through the cable L: distance from the PDF to the device	

2.5.2.2 AC Power Distribution Guide

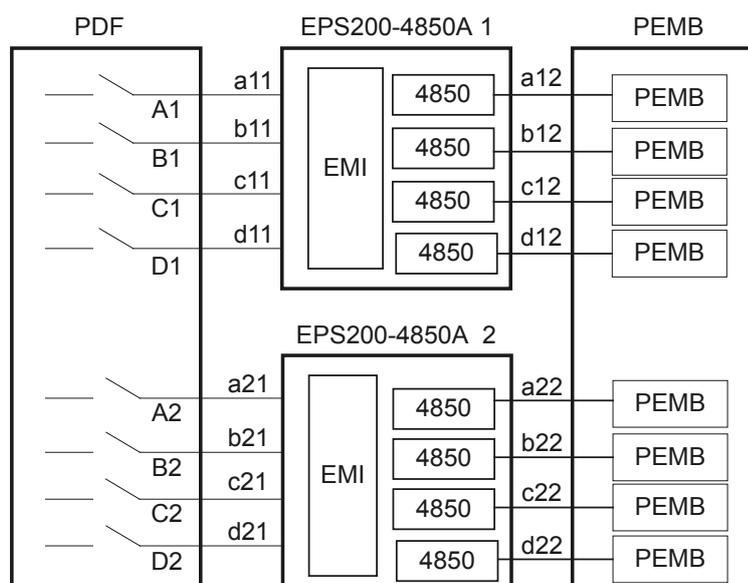
This section describes AC power distribution and AC cable matchings.

 **NOTE**

If the customer uses a purchased three-core cable, the ground core does not need to be connected to the ground terminal on the device. This is because the ground terminal on the device has already been connected to a separate ground cable, ensuring that the device is properly grounded.

Figure 2-66 shows the AC power module EPS200-4850A. AC power input is converted into regulated DC power through an AC/DC converter. The resulting DC power output is connected to the PEMs through external cables to supply power to all boards and fan modules.

Figure 2-66 AC EPS200-4850A power distribution



NOTE

It is recommended that the current specifications of the circuit breakers on the PDF or distribution box be no less than 16 A

Table 2-14 lists the cables and terminals for the AC power module EPS200-4850A.

Table 2-14 Cables and terminals for the EPS200-4850A

Item		Description
a11,b11,c11, d11, a21,b21,c21, d21	Power cable	Power Cable,300/500V,60227IEC10(BVV),6mm ² ,Black Jacket(Cores:Blue,Brown),43A,2 Equivalent Cores
	Terminal	Naked Crimping Terminal,OT,6mm ² ,M6,Tin Plating,Insulated Ring Terminal,12~10AWG,yellow
		Naked Crimping Terminal,OT,6mm ² ,M8,Tin Plating,Insulated Ring Terminal,12~10AWG,yellow
a12,b12,c12, d12, a22,b22,c22, d22	Cables	Monitor and Alarm Cable,3m,D9M,CC4P0.48B(S),D9M
		Wire,450/750V,227 IEC 02(RV)16mm ² ,blue,85A
		Wire,450/750V,227 IEC 02(RV)16mm ² ,black,85A
	Terminal	Naked Crimping Terminal,JG2,16mm ² ,M6,95A,Tin Plated,for OEM

2.5.3 USG9560 Power Distribution Design Guide

This section describes how to configure power distribution for the USG9560.

2.5.3.1 DC Power Distribution Guide

This section describes how to select DC power distribution cables and circuit breakers of the DC PDF.

Figure 2-67 shows the DC PEMB.

Figure 2-67 DC PEMB

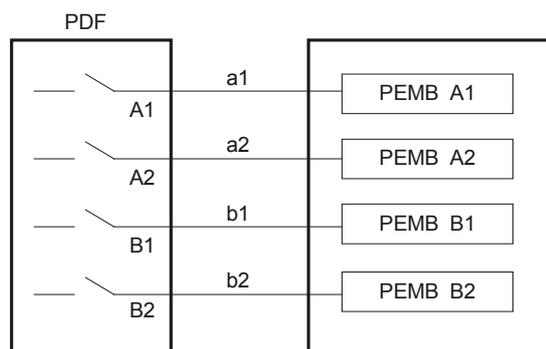


Table 2-15 lists the current parameters of each circuit breaker and each power line for the PDF

Table 2-15 Current parameters of circuit breakers and power lines for the PDF (DC PEMB)

Item	Specification	Note
Each circuit breaker (A1,A2,B1,B2)	≥ 60 A	To protect power supplies of different levels, it is recommended that the current of the circuit breaker on the user side be greater than or equal to that of the circuit breaker of the power module (70 A).
Each power supply (A1,A2,B1,B2)	≥ 60 A	To support the maximum configuration, it is recommended that each DC power line should provide a minimum of 60 A current.

Item	Specification	Note
	<p>If the PDF cannot provide 70 A circuit breakers and full configuration is unnecessary, select the circuit breaker of each DC line using the following formula (A1,A2,B1,B2).</p> $I = P / (V_{in} * D * 2)$ <p>I: rated current of the circuit breaker of each line on the PDF, in Ampere (A). P: total power of each device. V_{in}: input voltage of the power supply. (38 < V_{in} < 72) D: derating coefficient. The recommended coefficient is 0.8. 2: number of the input lines of power module.</p>	

Table 2-16 describes how to select power cables (a1,a2,b1,b2)

Table 2-16 Cables for the PEMB

Distance from the PDF to the Device	Power Cables a and b	
Shorter than or equal to 15 m	Wire,450/750V,227 IEC 02(RV)16mm ² ,blue,85A	Each power module should be equipped with one cable of this type. The cable length is determined by an onsite project survey.
	Wire,450/750V,227 IEC 02(RV)16mm ² ,black,85A	Each power module should be equipped with one cable of this type. The cable length is determined by an onsite project survey.
	Naked Crimping Terminal,JG2,16mm ² ,M6,95 A,Tin Plated,for OEM	Each cable should be equipped with one terminal of this type.
	Naked Crimping Terminal,OT,16mm ² ,M8,Tin Plating,Naked Ring Terminal	Each cable should be equipped with one terminal of this type.
Longer than 15 m or shorter than or equal to 25 m	Wire,450/750V,227 IEC 02(RV)25mm ² ,blue,110A	Each power module should be equipped with one cable of this type. The cable length is determined by an onsite project survey.
	Wire,450/750V,227 IEC 02(RV)25mm ² ,black,110A	Each power module should be equipped with one cable of this type. The cable length is determined by an onsite project survey.

Distance from the PDF to the Device	Power Cables a and b	
	Naked Crimping Connector, JG2, 25mm ² , M6, 150A, Tin Plating, For OEM	Each cable should be equipped with one terminal of this type.
	Naked Crimping Terminal, OT, 25mm ² , M8, Tin Plating, Naked Ring Terminal	Each cable should be equipped with one terminal of this type.
Longer than 25 m or shorter than or equal to 35 m	Wire, 450/750V, 227 IEC 02(RV)35mm ² , Blue, 135A	Each power module should be equipped with one cable of this type. The cable length is determined by an onsite project survey.
	Wire, 450/750V, 227 IEC 02(RV)35mm ² , black, 135A	Each power module should be equipped with one cable of this type. The cable length is determined by an onsite project survey.
	Naked Crimping Connector, JG2, 34.3mm ² , M6(1/4"), 134A, Tin Plated, 2AWG, Hole Center Distance 15.875mm(5/8"), Short Tube, for North American	Each cable should be equipped with one terminal of this type.
	Naked Crimping Terminal, OT, 35mm ² , M8, Tin Plating, Naked Ring Terminal	Each cable should be equipped with one terminal of this type.
Longer than 35 m	A PDF should be placed near the device.	
Formula for calculating cable cross-sectional area	$S = (I * L) / 74$ <p>S: cross-sectional area I: the current flowing through the cable L: distance from the PDF to the device</p>	

2.5.3.2 AC Power Distribution Guide

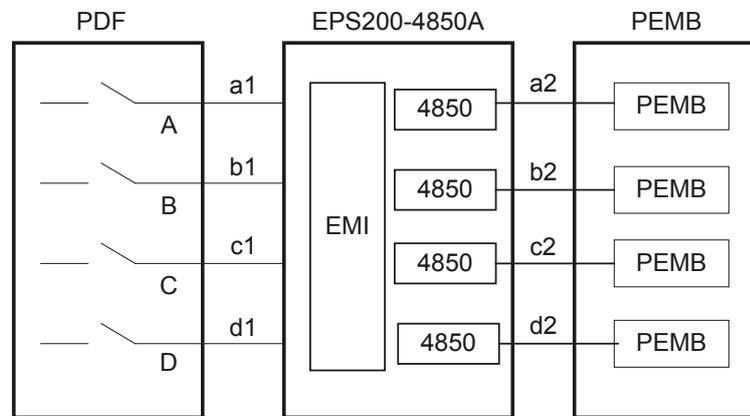
This section describes AC power distribution and AC cable matchings.

 **NOTE**

If the customer uses a purchased three-core cable, the ground core does not need to be connected to the ground terminal on the device. This is because the ground terminal on the device has already been connected to a separate ground cable, ensuring that the device is properly grounded.

Figure 2-68 shows the AC power module EPS200-4850A. AC power input is converted into regulated DC power through an AC/DC converter. The resulting DC power output is connected to the PEMBs through external cables to supply power to all boards and fan modules.

Figure 2-68 AC EPS200-4850A power distribution



NOTE

It is recommended that the current specifications of the circuit breakers on the PDF or distribution box be no less than 16 A

Table 2-17 lists the cables and terminals for the AC power module EPS200-4850A.

Table 2-17 Cables and terminals for the EPS200-4850A

Item		Description
a1,b1,c1,d1	Power cable	Power Cable,300/500V,60227IEC10(BVV),6mm ² ,Black Jacket(Cores:Blue,Brown),43A,2 Equivalent Cores
	Terminal	Naked Crimping Terminal,OT,6mm ² ,M6, Tin Plating,Insulated Ring Terminal,12~10AWG,yellow
		Naked Crimping Terminal,OT,6mm ² ,M8, Tin Plating,Insulated Ring Terminal,12~10AWG,yellow
a2,b2,c2,d2	Cables	Monitor and Alarm Cable, 3m,D9M,CC4P0.48B(S),D9M
		Wire,450/750V,227 IEC 02(RV)16mm ² ,blue,85A
	Terminal	Wire,450/750V,227 IEC 02(RV)16mm ² ,black,85A
		Naked Crimping Terminal,JG2,16mm ² ,M6,95A, Tin Plated,for OEM

2.5.4 USG9520 Power Distribution Design Guide

This section describes how to configure power distribution for the USG9520.

2.5.4.1 DC Power Distribution Guide

This section describes how to select DC power distribution cables and circuit breakers for the DC PDF.

Figure 2-69 shows the schematic diagram of the DC power distribution.

Figure 2-69 Schematic diagram of the DC power distribution

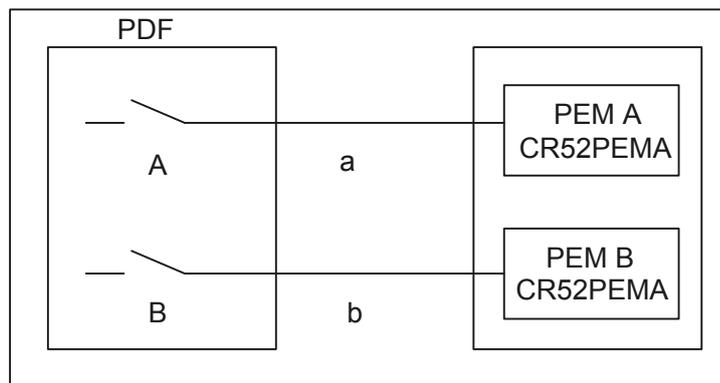


Table 2-18 shows the current parameters of each circuit breaker and each power line for the PDF.

Table 2-18 Current parameters of each circuit breaker and each power line for the PDF (DC PEMA)

Item	Specification	Note
Each circuit breaker (A and B)	≥ 50 A	To protect power supplies of different levels, it is recommended that the current of the circuit breaker on the user side should be greater than or equal to that of the circuit breaker of the power module (50 A).
Each power supply (A and B)	≥ 42 A	To support the maximum configuration, it is recommended that each DC power line should provide a minimum of 42 A current.

Item	Specification	Note
	<p>If the PDF cannot provide 50 A circuit breakers and the full configuration is unnecessary, you can select the circuit breaker of each DC line by using the following formula.</p> $I = P / (V_{in} * D * 1)$ <p>I: indicates the rated current of the circuit breaker of each line on the PDF, in Ampere (A). P: indicates the total power of each device. V_{in}: indicates the input voltage of the power supply. (38 < V_{in} < 72) D: indicates the derating coefficient. The recommended coefficient is 0.8. 1: indicates the number of the input lines of the power module.</p>	

Table 2-19 shows the selection of power cables a and b.

Table 2-19 Cables for the PEMA

Distance from the PDF to the Device	Selection of Power Cables a and b	
Equal to or shorter than 15 m	Wire,450/750V,227 IEC 02(RV)16mm ² ,blue,85A	Each power module should be equipped with one cable of this type. The cable length is determined by the project survey on site.
	Wire,450/750V,227 IEC 02(RV)16mm ² ,black,85A	Each power module should be equipped with one cable of this type. The cable length is determined by the project survey on site.
	Naked Crimping Terminal,JG2,16mm ² ,M6,95 A,Tin Plated,for OEM	Each cable should be equipped with one terminal of this type.
	Naked Crimping Terminal,OT,16mm ² ,M8,Tin Plating,Naked Ring Terminal	Each cable should be equipped with one terminal of this type.
Longer than 15 m and equal to or shorter than 35 m	Wire,450/750V,227 IEC 02(RV)25mm ² ,blue,110A	Each power module should be equipped with one cable of this type. The cable length is determined by the project survey on site.
	Wire,450/750V,227 IEC 02(RV)25mm ² ,black,110A	Each power module should be equipped with one cable of this type. The cable length is determined by the project survey on site.

Distance from the PDF to the Device	Selection of Power Cables a and b	
	Naked Crimping Connector, JG2, 25mm ² , M6, 150A, Tin Plating, For OEM	Each cable should be equipped with one terminal of this type.
	Naked Crimping Terminal, OT, 25mm ² , M8, Tin Plating, Naked Ring Terminal	Each cable should be equipped with one terminal of this type.
Longer than 35 m	A PDF should be placed near the device.	
Formula calculating cable cross-sectional area	$S = (I * L) / 74$ S: indicates cross-sectional area. I: indicates the current flowing through the cable. L: indicates distance from the PDF to the device.	

2.5.4.2 AC Power Distribution Guide

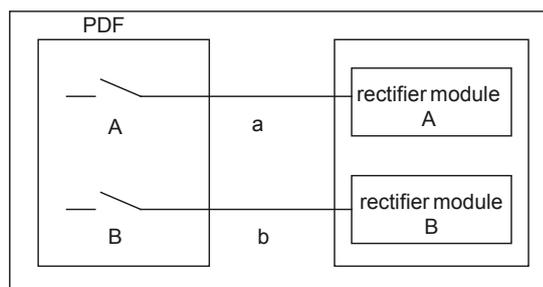
This section describes AC power distribution and AC cable matchings.

 **NOTE**

If the customer uses a purchased three-core cable, the ground core does not need to be connected to the ground terminal on the device. This is because the ground terminal on the device has already been connected to a separate ground cable, ensuring that the device is properly grounded.

Figure 2-70 shows the AC power module.

Figure 2-70 AC power distribution



 **NOTE**

AC power modules A and B are connected to two AC PDFs or AC distribution box through cables a and b.

It is recommended that the current specifications of the circuit breakers (A and B) on the PDF or distribution box be no less than 20 A (because the current specifications of the circuit breaker of the R4850G2 power module is 20 A).

It is recommended that the current specifications of the circuit breakers (A and B) on the PDF or distribution box be no less than 10 A (because the current specifications of the circuit breaker of the EPW30B-48A power module is 10 A).

Table 2-20 lists the cables and terminals for the AC power module.

Table 2-20 Cables and terminals for the AC power module

Type	Description	Quantity
R4850G2	External Suite, Power Cords All Over The World, Class I Equipment With Connector C19, External Cable Set	Each power module should be equipped with one cable of this type. The cable length is determined by an onsite project survey.
EPW30B-48 A	External Suite, Power Cords All Over The World, Class I Equipment With Connector C13, External Cable Set	Each power module should be equipped with one cable of this type. The cable length is determined by an onsite project survey.

3 Hardware Maintenance

About This Chapter

This chapter describes the precaution and procedure for replacing the boards, power modules, fan modules, and air filters of the USG9500.

[3.1 Replacing Boards](#)

This section describes the precaution and procedure for replacing the MPU/SRU, SFU, FPIC of the LPU, and SPC of the SPU.

[3.2 Expanding SPU Capacity](#)

This section describes how to expand SPU capacity.

[3.3 Replacing a Fan Module](#)

This section describes the fan module of the device and the procedure for replacing the fan module.

[3.4 Replacing Power Modules](#)

This section describes the power modules of the device and the procedure for replacing the power modules.

[3.5 Replacing a CF Card](#)

This section describes the procedure for replacing a CF card.

[3.6 Replacing an Optical Module](#)

This section describes the procedure for replacing an optical module.

[3.7 Replacing an Air Filter](#)

This section describes the procedure for replacing an air filter.

[3.8 Replacing Cables](#)

This section describes the precaution and procedure for replacing the power cable, network cable, trunk cable, and optical cable.

3.1 Replacing Boards

This section describes the precaution and procedure for replacing the MPU/SRU, SFU, FPIC of the LPU, and SPC of the SPU.

3.1.1 Replacing an MPU/SRU

This section describes the precaution and procedure for replacing an MPU/SRU.

Context

Before replacing a Main Processing Unit (MPU)/Switch and Route Processing Unit (SRU), note the following:

- When the system is running, you can replace only the standby MPU/SRU.
- If you need to replace the active MPU/SRU, you must first perform an active/standby switchover to enable the active MPU/SRU to be replaced to become the standby one.
- During MPU replacement, you can use either CF card 1 of the to-be-replaced MPU or that of the new MPU. Specific operations vary in these two scenarios.
- The system software package and configuration file in the new MPU/SRU must be consistent with those in the MPU/SRU to be replaced.
- The USG9500 can use the MPU/SRU ESN and backplane ESN to apply for a license file. If the license file is requested with the backplane ESN, services can operate properly, without the reapplication of the license file. If the license file is requested with the ESN of the MPU/SRU to be replaced, you need to reapply for the license file after the MPU/SRU is replaced.
- After creating an SSH user and RSA key pair, log in to the device through SSH. If the MPU/SRU needs to be replaced, replace the MPU/SRU and then run the **rsa local-key-pair create** command to create an RSA key pair that has the same name as that on the previous MPU/SRU. Otherwise, you cannot log in to the device through SSH.

Tool

Before replacing an MPU/SRU, you need the following tools:

- ESD wrist strap or ESD gloves
- Phillips screwdriver
- ESD bag

Procedure

Step 1 Check the software package version.

Run the **display version** command to check the version of the running software package.

Step 2 Apply for a license file.

NOTE

You are advised to use the backplane ESN to apply for a license file. The **display esn all** command can be used to query the backplane ESN.

Note the following points when applying for a license file:

- To use the ESN of the MPU/SRU to apply for a license file, obtain the revocation code of the license file. Then use the revocation code of the ESN to apply for the license file. For details, see *License Application Guide for Security Product on ESDP*.

According to the *License Application Guide for Security Product on ESDP*, use the registered account to access <http://support.huawei.com/enterprise> and choose **Enterprise Network > Security > Firewall & VPN Gateway > NGFW Module**.

- If the ESN of the MPU/SRU to be replaced is not used to apply for a license file, you need to reapply for a license file. For details, see *Applying For a License File*.

Step 3 Save the current configuration.

Run the **save** command to save the current configuration.

Run the **compare configuration** command to compare the saved configuration file and the current configuration file.

Step 4 Save the startup software package and configuration file on the to-be-replaced MPU to the local PC.

1. Run the **ftp** command to establish a connection with the remote FTP server, namely, the local PC.
2. Run the **put xxx.cc** command to save the startup software package to the local PC.
3. Run the **put vrpcfg.zip** command to save the configuration file to the local PC.

Step 5 Prepare a new MPU/SRU and check whether there is any bent pin in the connector.

Step 6 Check the location of the MPU/SRU to be replaced.

Before pulling out an MPU/SRU that is to be replaced, determine the location of the MPU/SRU, that is, the cabinet, chassis, and slot where the MPU/SRU resides. The USG9500 have two MPUs/SRUs.

- The MPUs of the USG9520 reside in slots 4 and 5.
- The SRUs of the USG9560 reside in slots 9 and 10.
- The MPUs of the USG9580 reside in slots 17 and 18.

Locate the MPU/SRU to be replaced in the chassis and label the MPU/SRU.

Step 7 Check whether the MPU/SRU to be replaced is the active MPU/SRU.

Run the **display device** command to check the slot number of the current MPU/SRU. If the MPU/SRU to be replaced is the active one, you must run the **slave switchover** command on the console interface to force the active/standby switchover. If the output is displayed as follows on the console interface, the switchover is successful. Then run the **display device** command to check the slot number of the MPU/SRU after the active/standby switchover. If the MPU to be replaced is the standby MPU, these operations are unnecessary.

```
[sysname] standby switchover enable
[sysname] standby switchover
Caution!!! Confirm switch standby to active[Y/N]? y
Switching.....
[sysname]
```

Step 8 Remove the cables from the MPU/SRU and label the cables.

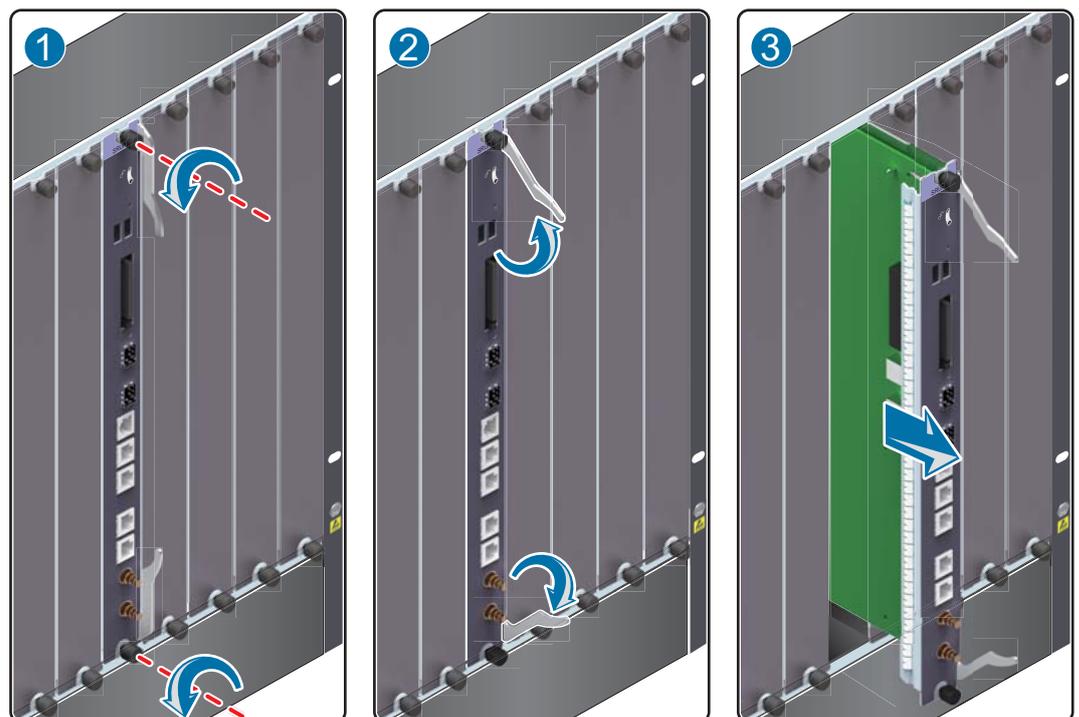
Step 9 Power off the MPU/SRU to be replaced.

Press and hold the OFL button on the panel of the MPU/SRU for six seconds until the OFL indicator is on.

Step 10 Pull out the MPU/SRU to be replaced from the chassis.

1. Put on the ESD wrist strap and connect the grounding terminal to the ESD jack on the rack.
2. Using a Phillips screwdriver, turn the two captive screws on the board counter-clockwise to loosen them, as shown in **Figure 3-1** (1).
3. Turn the ejector levers on the panel of the MPU/SRU outward and upward. When the ejector levers and the panel form a 45-degree angle, the MPU/SRU is removed from the backplane, as shown in **Figure 3-1** (2).
4. Hold the ejector levers on the panel of the MPU/SRU and pull out the MPU/SRU smoothly from the chassis along the guide rail of the slot. After the MPU/SRU protrudes from the chassis by roughly 40 cm, support the lower edge of the MPU/SRU with one hand and hold the panel of the MPU/SRU with the other hand. Then, pull out the MPU/SRU smoothly from the slot, as shown in **Figure 3-1** (3).
5. Place the moved MPU/SRU in the ESD bag.

Figure 3-1 Removing an MPU/SRU



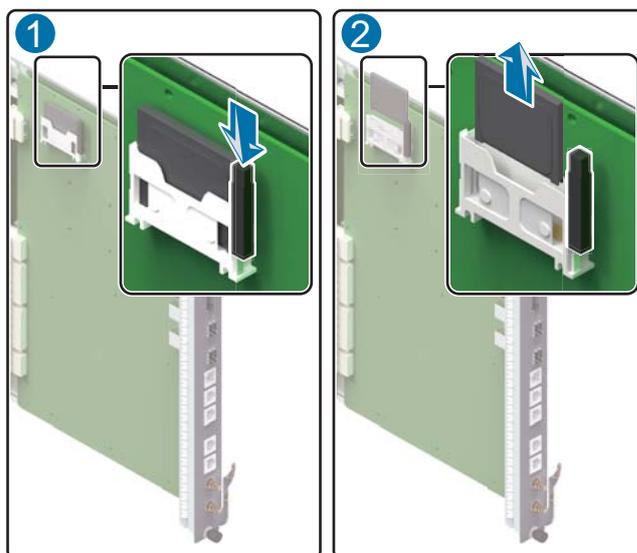
Step 11 (Optional) To use CF card 1 on the to-be-replaced MPU, remove it from this MPU and insert it to the new MPU.

To use CF card 1 of the new MPU, skip this step and go to step **Step 12**.

1. Remove CF card 1 from the to-be-replaced MPU and the new MPU.

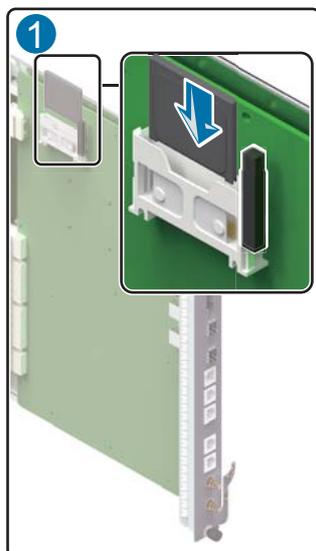
Press the button above the jack of CF card 1, as shown in (1) in **Figure 3-2**. Then the CF card automatically comes out. Pull out the CF card horizontally, as shown in (2) of **Figure 3-2**.

Figure 3-2 Removing CF card 1



2. Put CF card 1 removed from the new MPU into the electrostatic discharge (ESD) bag.
3. Insert CF card 1 removed from the to-be-replaced MPU to the CF card 1 slot of the new MPU and press the CF card as shown in (1) in [Figure 3-3](#).

Figure 3-3 Inserting CF card 1



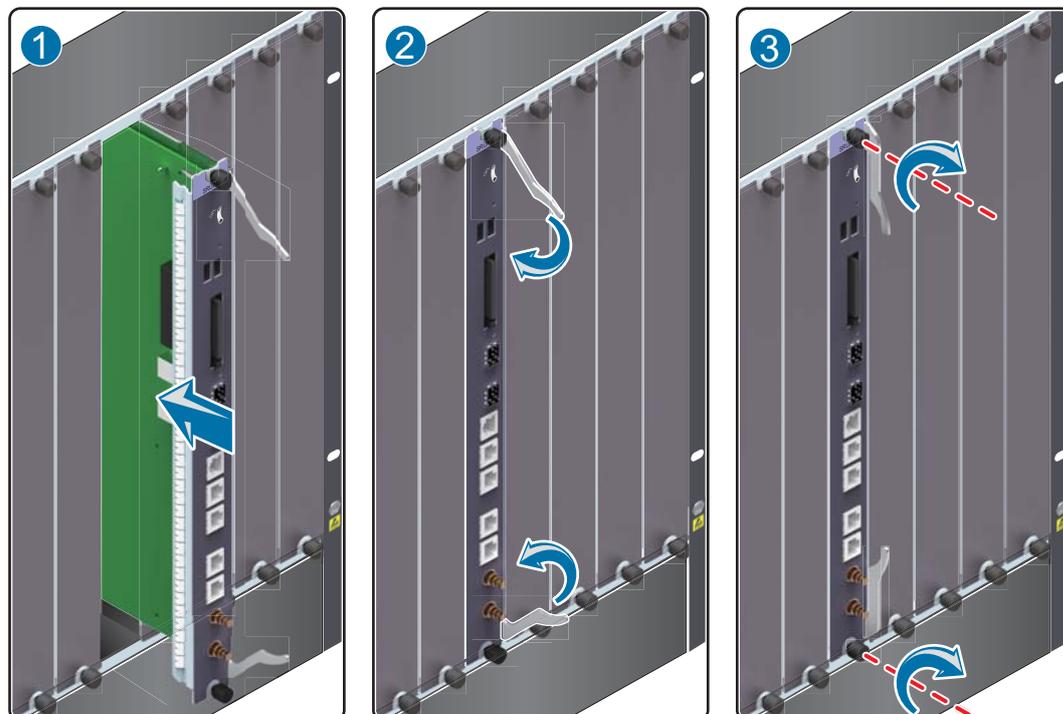
Step 12 Insert the new MPU/SRU into the chassis.

1. Support the lower edge of the new MPU/SRU with one hand and hold the panel with the other hand. Then, insert the new MPU/SRU smoothly into the chassis along the guide rail of the slot. Stop sliding the MPU/SRU forward when the ejector levers on the front panel of the MPU/SRU reach the chassis, as shown in [Figure 3-4](#) (1).
2. Turn the ejector levers on the MPU/SRU outward and upward to form a 45-degree angle, and at the same time push the MPU/SRU into the slot. Then, turn the ejector levers

inward and downward until the panel of the MPU/SRU touches the slot, as shown in [Figure 3-4](#) (2).

- Using the Phillips screwdriver, turn the two captive screws clockwise to tighten them, as shown in [Figure 3-4](#) (3).

Figure 3-4 Inserting an MPU/SRU



Step 13 Restart the new MPU. During device startup, press **Ctrl+B** when message "Press Ctrl+B to enter Main Menu" is displayed and enter the BootROM password (**WWW@HUAWEI** by default) to enter the extended BootROM menu.

Step 14 (Optional) To use CF card 1 of the new MPU, you need to load the startup software package, PAF file, license file, and configuration file saved to the local PC to CF card 1.

To use CF card 1 of the to-be-replaced MPU, skip this step and go to step [Step 15](#).

- In the main menu, enter **3** to enter the Ethernet submenu.

```

Main Menu (bootload ver:
163.00)

    1. Boot with default
mode
    2. Boot from
CFcard
    3. Enter ethernet
submenu
    4. Set boot file and
path
    5. Modify boot ROM
password
    6. Chkdisk
CFcard
    7. Format
    
```

```
CFcard
  8. List file in
CFcard
  9. Delete file from
CFcard
  10. Set patch
mode
  11. Set version back
signal
  12.
Reboot

    Press Ctrl+B to return Main Menu in any sub
menu.
```

Enter your choice(1-12): **3**

- In the Ethernet submenu, enter **3** to modify Ethernet interface boot parameters. As shown in the output, the parameters that must be set are commented. For the other parameters, keep the default values. After the settings are complete, return to the Ethernet submenu.

```

                Ethernet
Submenu

    1. Download file to SDRAM through ethernet interface and
boot
    2. Download file to CFcard through ethernet
interface
    3. Modify ethernet interface boot
parameters
    4. Return to main
menu

Enter your choice(1-4): 3

Note: two protocols for download, tftp &
ftp.
    You can modify the flags following the
menu.
    tftp--0x80,
ftp--0x0.

',' = clear field; '-' = go to previous field; ^D =
quit

boot device          :
mottsec3
processor number    :
0
host name           :
host
file name           : vxWorks.st   V500R001_software.cc //Indicates the
name of the file to be downloaded.
inet on ethernet (e) : 192.168.71.0   172.16.104.208 //Indicates the IP
address of the local interface. This IP address must reside on the same
subnet as the FTP server IP address.
inet on backplane
(b):
host inet (h)       : 192.168.61.0   172.16.104.10 //Indicates the IP
address of the FTP server
gateway inet (g)    : //Indicates the gateway IP
```

```

address. You need to set this parameter when the IP address of the local
interface resides on a different subnet as the FTP server IP address.
user (u)          : 8090   ftp123 //Indicates the FTP user name. This
user name must already have been set on the device that provides the FTP
service.
ftp password (pw) (blank = use rsh): ***** Hello@123 //Indicates the
FTP password. This password must already have been set on the device that
provides the FTP service.
flags (f)         : 0x0 //Indicates the protocol
used for downloading files. 0x0 indicates FTP, and 0x80 indicates TFTP. Here,
FTP is used as an example.
target name
(tn)             :
startup script
(s)             :
other
(o)             :

```

3. In the Ethernet submenu, enter **2** to download the file to the CF card.

```

Ethernet
Submenu

1. Download file to SDRAM through ethernet interface and
boot
2. Download file to CFcard through ethernet
interface
3. Modify ethernet interface boot
parameters
4. Return to main
menu

Enter your choice(1-4):
2

```

4. In the submenu, enter **1** to download the file to CF card 1.

```

Download to CFcard through ethernet interface
Submenu

1. Download file to
CFcard
2. Download file to
CFcard2
3. Return to up
menu

Enter your choice(1-3):
1
Attaching interface lo0...
done
Attached IPv4 interface to mottsec unit
3

boot device          :
mottsec
unit number         :
0
processor number     :
0
host name           :

```



```
Enter your choice(1-12): 4
```

2. In the boot files submenu, enter **1** and then specify the system software for the next startup.

```

                Boot Files
Submenu

    1. Modify the boot
file
    2. Modify the paf
file
    3. Modify the license
file
    4. Modify the config
file
    5. Modify the patch
file
    6. Modify the patch states
file
    7. Return to main
menu

Enter your choice(1-7): 1

Boot file is cfcard:/USG9500_v500r001c00spc200b083_linux_x3.cc, modify the
file name if
needed.
Please input correctly, e.g.: cfcard:/V200R001B019.cc cfcard:/
V500R001_software.cc //Enter an absolute path.
The file name you input is cfcard:/
V500R001_software.cc.
Are you sure? Yes or No(Y/N)y
Setting ...Done!

Clear version back signal...Done!

Recover bcf by user
command.
```

3. Repeat [Step 15.2](#) and specify the PAF and license files to be used for the next startup. The file names are **paf.txt** and **license.txt**.
4. Repeat step [Step 15.2](#) to specify the configuration file to be used for the next startup.
5. In the startup file menu, enter **1** to return to the BootROM main menu.
6. On the BootROM main menu, enter **12** to restart the device.

Step 16 Check the running status of the new MPU/SRU.

Normally, after the new MPU/SRU is inserted into the chassis, the MPU/SRU automatically communicates with the boards in the chassis. In this case, you can check the running status of the new MPU/SRU in the following ways:

- Check the RUN indicator on the panel of the MPU/SRU. If it is on (green), the MPU/SRU is working normally.

- Check the alarms. If the system does not generate any alarm related to the new MPU/SRU, the MPU/SRU is working normally.
- Run the **display device** command on the console interface. The MPU/SRU is working normally if the displayed output is as follows:

```
<sysname> display device
USG9560's Device status:
Slot #   Type   Online   Register   Status   Primary
-----
1        SPU    Present  Registered  Normal   NA
2        SPU    Present  Registered  Normal   NA
3        SPU    Present  Registered  Normal   NA
4        SPU    Present  Registered  Normal   NA
5        SPU    Present  Registered  Normal   NA
6        LPU    Present  Registered  Normal   NA
7        LPU    Present  Registered  Normal   NA
8        LPU    Present  Registered  Normal   NA
9        MPU    Present  NA          Normal   active
10       MPU    Present  Registered  Normal   standby
11       SFU    Present  Registered  Normal   NA
12       SFU    Present  Registered  Normal   NA
13       SFU    Present  Registered  Normal   NA
14       CLK    Present  Registered  Normal   active
15       CLK    Present  Registered  Normal   standby
16       PWR    Present  Registered  Normal   NA
17       PWR    Present  Registered  Normal   NA
18       FAN    Present  Registered  Normal   NA
19       FAN    Present  Registered  Normal   NA
-----
```

Step 17 Upload the license file and activate it. For details, see [Uploading a License File and Activating a License](#).

----End

Follow-up Procedure

After replacing the MPU/SRU, collect all tools. If the replaced MPU/SRU is faulty, fill in the [Repair Transmission Sheet](#) and send the faulty module with the Repair Transmission Sheet to the equipment supplier or the specified repair service provider.

3.1.2 Replacing an SFU

This section describes the precaution and procedure for replacing an SFU.

Context

When replacing a Switch Fabric Unit (SFU), note the following:

- The USG9560 has three SFUs. Only one SFU can be replaced independently.
- The USG9580 has four SFUs. All four SFUs can be replaced independently. However, when the device is running, only one SFU can be replaced at a time. To replace multiple SFUs, first replace one SFU, wait to confirm that the new SFU works normally, and then replace the rest one by one.

NOTE

The USG9520 does not have an independent SFU.

Tool

Before replacing an SFU, you need the following tools:

- ESD wrist strap or ESD gloves
- Phillips screwdriver
- ESD bag

Procedure

Step 1 Check the location of the SFU to be replaced.

Before pulling out an SFU that is to be replaced, first determine the location of the SFU, that is, the cabinet, chassis, and slot where the SFU resides.

- The USG9560 has one SFU, which resides in slot 11.
- The USG9580 has four SFUs in slots 19, 20, 21, and 22 separately.

Locate the SFU to be replaced in the chassis and label the SFU.

Step 2 Prepare a new SFU and check whether there is any bent pin in the connector.

Step 3 Power off the SFU to be replaced.

Use either of the following methods:

- Press and hold the OFL button on the panel of the SFU for six seconds until the OFL indicator is on.
- In the user view, run the **power off slot** *slot-id* command.

Step 4 Pull out the SFU to be replaced from the chassis.

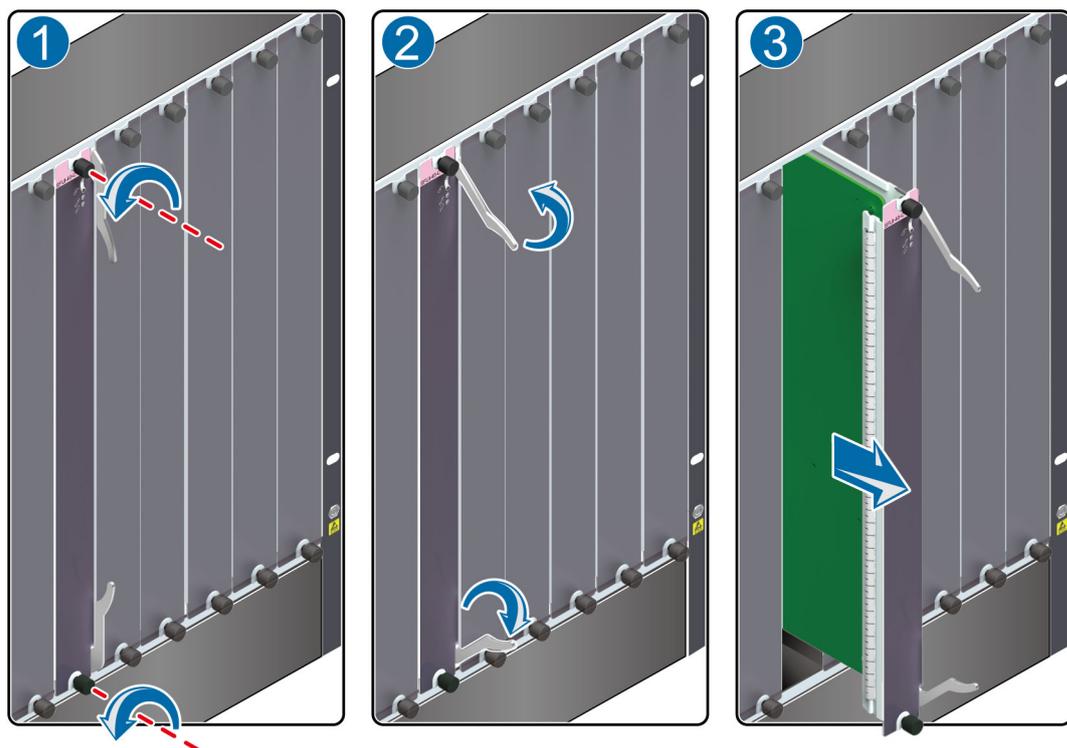
1. Put on the ESD wrist strap and connect the grounding terminal to the ESD jack on the rack.
2. Loosen the two captive screws by turning them counter-clockwise with a Phillips screwdriver, as shown in [Figure 3-5](#) (1).
3. Turn the ejector levers on the panel of the SFU outward and upward. When the ejector levers and the panel form a 45-degree angle, the SFU is removed from the backplane, as shown in [Figure 3-5](#) (2).



NOTICE

- Pull out the SFU slowly and smoothly to prevent it from hitting neighboring boards and affecting running boards.
 - Touching parts on the SFU when swapping it may damage the SFU.
-
4. Hold the ejector levers on the panel of the SFU and pull out the SFU smoothly from the chassis along the guide rail of the slot. After the SFU protrudes from the chassis by roughly 30 cm to 40 cm, support the lower edge of the SFU with one hand and hold the panel of the SFU with the other hand. Then, pull out the SFU smoothly from the slot, as shown in [Figure 3-5](#) (3).
 5. Place the removed SFU in the ESD bag.

Figure 3-5 Removing an SFU



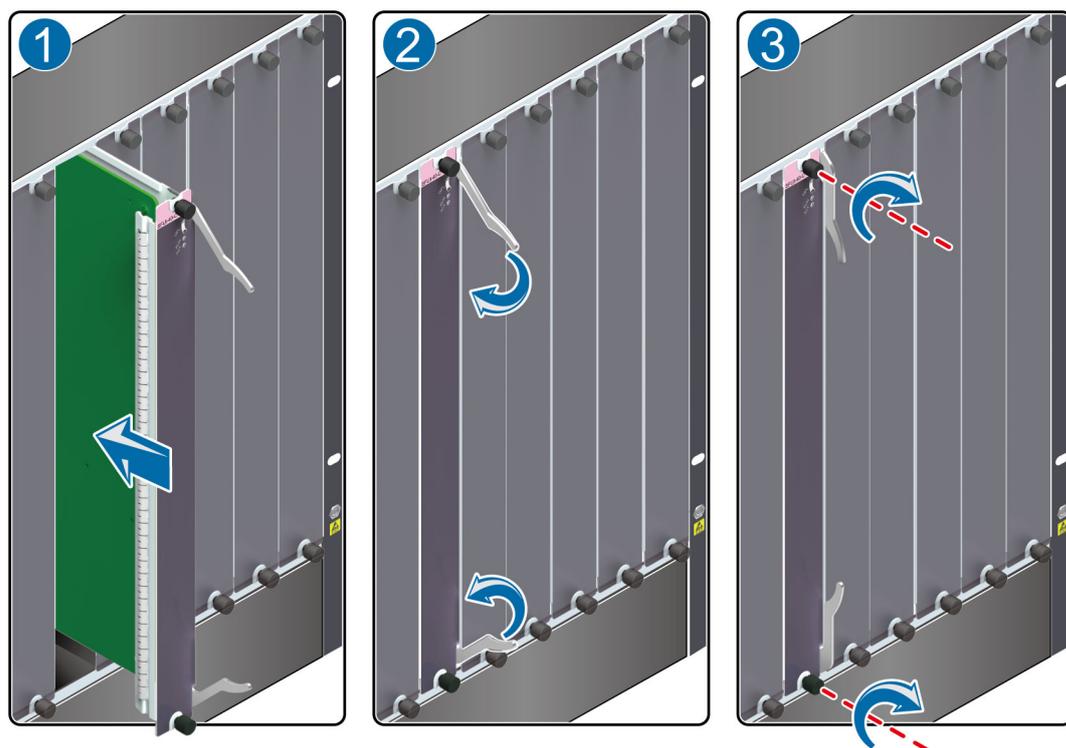
Step 5 Insert the new SFU into the chassis.

1. Take out the new SFU from the ESD bag.

 **NOTICE**

- Pull out the SFU slowly and smoothly to prevent it from hitting neighboring boards and affecting running boards.
 - Touching parts on the SFU when swapping it may damage the SFU.
-
2. Support the lower edge of the new SFU with one hand and hold the panel with the other hand. Then, insert the new SFU smoothly into the chassis along the guide rail of the slot, as shown in [Figure 3-6](#) (1). Stop sliding the SFU forward when the ejector levers on the front panel of the SFU reaches the chassis.
 3. Turn the ejector levers on the SFU outward and upward to form a 45-degree angle, and at the same time push the SFU into the slot. Then, turn the ejector levers inward and downward until the panel of the SFU touches the slot, as shown in [Figure 3-6](#) (2).
 4. Using a Phillips screwdriver, turn the two captive screws clockwise to tighten them, as shown in [Figure 3-6](#) (3).

Figure 3-6 Inserting a new SFU



Step 6 Check the running status of the new SFU.

Normally, after the new SFU is inserted into the chassis, the SFU automatically communicates with the boards in the chassis. In this case, you can check the running status of the new SFU in the following ways:

- Check the RUN indicator on the panel of the SFU. If it is on (green), the SFU is working normally.
- Check the alarms. If the system does not generate any alarm related to the new SFU, the SFU is working normally.
- Run the **display device** command on the console interface. If the SFUs are working normally, the following is displayed:

```
<sysname> display device
USG9560's Device status:
```

Slot #	Type	Online	Register	Status	Primary
1	SPU	Present	Registered	Normal	NA
2	SPU	Present	Registered	Normal	NA
3	SPU	Present	Registered	Normal	NA
4	SPU	Present	Registered	Normal	NA
5	SPU	Present	Registered	Normal	NA
6	LPU	Present	Registered	Normal	NA
7	LPU	Present	Registered	Normal	NA
8	LPU	Present	Registered	Normal	NA
9	MPU	Present	NA	Normal	Master
10	MPU	Present	Registered	Normal	Slave
11	SFU	Present	Registered	Normal	NA
12	SFU	Present	Registered	Normal	NA
13	SFU	Present	Registered	Normal	NA
14	CLK	Present	Registered	Normal	Master
15	CLK	Present	Registered	Normal	Slave

16	PWR	Present	Registered	Normal	NA
17	PWR	Present	Registered	Normal	NA
18	FAN	Present	Registered	Normal	NA
19	FAN	Present	Registered	Normal	NA

----End

Follow-up Procedure

After replacing the SFU, collect all tools. If the replaced SFU is faulty, fill in the [Repair Transmission Sheet](#) and send the faulty module with the Repair Transmission Sheet to the equipment supplier or the specified repair service provider.

3.1.3 Replacing an LPU

This section describes the precaution and procedure for replacing an LPU.

Context

Before replacing an LPU, note the following:

- You must first prepare a new LPU before replacing an LPU.
- When replacing boards on the USG9580, ensure that the boards in the lower chassis are installed inversely.

Tool

Before replacing an LPU, you need the following tools:

- ESD wrist strap or ESD gloves
- Phillips screwdriver
- ESD bag

Procedure

Step 1 Check the location of the LPU to be replaced.

- Before pulling out an LPU that is to be replaced, first check the location of the LPU, that is, the cabinet, chassis, and slot where the LPU resides.
- USG9580 has 16 LPU slots numbered from 1 to 16.
- USG9560 has 8 LPU slots numbered from 1 to 8.
- USG9520 has 3 LPU slots numbered from 1 to 3.

Locate the LPU to be replaced in the chassis and label the LPU.

Step 2 Check whether there is any bent pin in the connector of the new LPU.

Step 3 Power off the LPU to be replaced.

Use either of the following methods:

- Press and hold the OFL button on the panel of the LPU for five seconds until the OFL indicator turns on.
- In the user view, run the **power off slot** *slot-id* command.

Step 4 Remove the cables from the LPU and label the cables to mark the corresponding interface numbers.

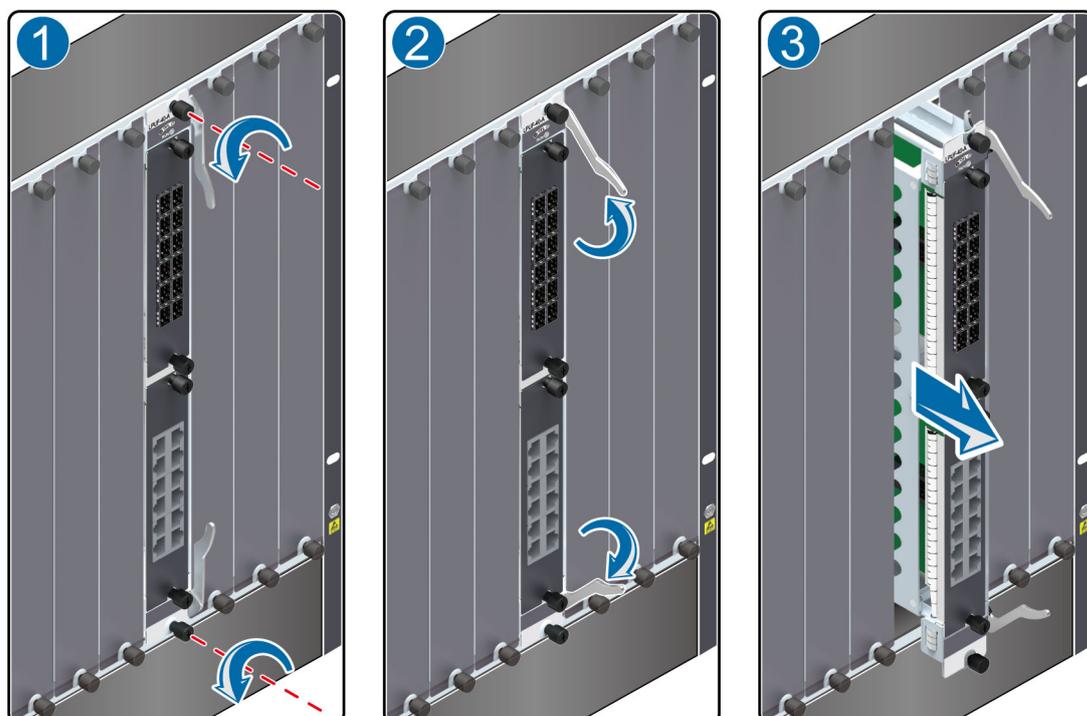
Step 5 Pull out the LPU to be replaced from the chassis.

1. Put on the ESD wrist strap and connect the grounding terminal to the ESD jack on the rack.
2. Using the Phillips screwdriver, turn the two captive screws counter-clockwise to loosen them, as shown in [Figure 3-7](#) (1).
3. Turn the ejector levers on the panel of the LPU outward and upward. When the ejector levers and the panel form a 45-degree angle, the LPU is removed from the backplane, as shown in [Figure 3-7](#) (2).

 **NOTICE**

- Pull out the LPU slowly and smoothly to prevent it from hitting neighboring boards and affecting running boards.
 - Touching parts on the LPU when swapping it may damage the LPU.
-
4. Hold the ejector levers on the panel of the LPU and pull out the LPU smoothly from the chassis along the guide rail of the slot. After the LPU protrudes from the chassis by roughly 40 cm, support the lower edge of the LPU with one hand and hold the panel of the LPU with the other hand. Then, pull out the LPU smoothly from the slot, as shown in [Figure 3-7](#) (3).
 5. Place the removed LPU in the ESD bag.

Figure 3-7 Removing an LPU

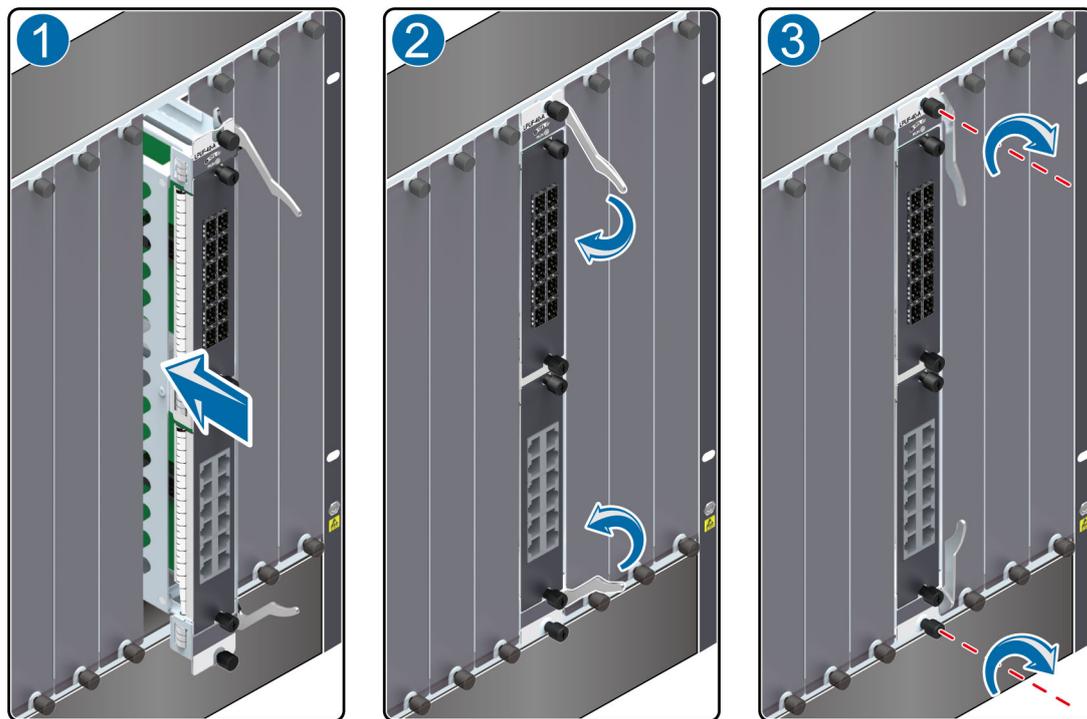


- Step 6** Insert a new LPU into the chassis.
1. Take out a new LPU from the ESD bag.

 **NOTICE**

- Pull out the LPU slowly and smoothly to prevent it from hitting neighboring boards and affecting running boards.
 - Touching parts on the LPU when swapping it may damage the LPU.
-
2. Support the lower edge of the new LPU with one hand and hold the panel with the other hand. Then, insert the new LPU smoothly into the chassis along the guide rail of the slot. Stop sliding the LPU forward when the ejector lever on the front panel of the LPU reaches the chassis, as shown in **Figure 3-8** (1).
 3. Turn the ejector levers on the LPU outward and upward to form a 45-degree angle, and at the same time push the LPU into the slot. Then, turn the ejector levers inward and downward until the panel of the LPU touches the frame, as shown in **Figure 3-8** (2).
 4. Using the Phillips screwdriver, turn the two captive screws clockwise to tighten them, as shown in **Figure 3-8** (3).

Figure 3-8 Insert an LPU



Step 7 Connect the cables to the corresponding interfaces in the original sequence.

Step 8 Check the running status of the new LPU.

Normally, after the new LPU is inserted into the chassis, the LPU automatically communicates with the MPU. In this case, check the running status of the new LPU in the following ways:

- Check the RUN indicator on the panel of the LPU. If it is on (green), the LPU is working normally.
- Check the alarms. If the system does not generate any alarm related to the new LPU, the LPU is working normally.
- Run the **display device** command on the console interface. If the LPUs in the corresponding slots are working normally, the following is displayed:

```
<sysname> display device
USG9560's Device status:
Slot #   Type   Online   Register   Status   Primary
-----
1        SPU    Present  Registered Normal    NA
2        SPU    Present  Registered Normal    NA
3        SPU    Present  Registered Normal    NA
4        SPU    Present  Registered Normal    NA
5        SPU    Present  Registered Normal    NA
6        LPU    Present  Registered Normal    NA
7        LPU    Present  Registered Normal    NA
8        LPU    Present  Registered Normal    NA
9        MPU    Present  NA         Normal   Master
10       MPU    Present  Registered Normal   Slave
11       SFU    Present  Registered Normal   NA
12       SFU    Present  Registered Normal   NA
13       SFU    Present  Registered Normal   NA
14       CLK    Present  Registered Normal   Master
15       CLK    Present  Registered Normal   Slave
16       PWR    Present  Registered Normal   NA
17       PWR    Present  Registered Normal   NA
18       FAN    Present  Registered Normal   NA
19       FAN    Present  Registered Normal   NA
-----
```

Step 9 Check service operations.

----End

Follow-up Procedure

After replacing the LPU, collect all tools. If the replaced LPU is faulty, fill in the [Repair Transmission Sheet](#) and send the faulty module with the Repair Transmission Sheet to the equipment supplier or the specified repair service provider.

3.1.4 Replacing an FPIC of the LPU

This section describes the precautions and procedures for replacing an FPIC.

Context

Flexible Plug-in Card (FPIC) Line Processing Unit (LPU) boards include the LPUF-240, LPUF-120, LPUF-101, LPUF-40-A, and LPUF-21.

Before replacing an FPIC, note the following:

- You must prepare the same kind of FPIC as the one that is to be replaced.
- FPICs do not support hot swap. Before replacement, you must power off the LPU where the FPIC to be replaced resides.

Tool

Before replacing an FPIC, you need the following tools:

- ESD wrist strap or ESD gloves
- Phillips screwdriver
- ESD bag

Procedure

Step 1 Check the location of the FPIC to be replaced.

Before pulling out an FPIC to be replaced, first check the location of the FPIC, that is, the cabinet, chassis, and slot where the FPIC resides. Then, locate the FPIC to be replaced in the chassis and label the FPIC.

Step 2 Check whether there is any bent pin in the connector of the new FPIC.

Step 3 Pull out the cables from the FPIC and label the cables with the corresponding interface numbers.

Step 4 Power off the LPU to be replaced.

Use either of the following methods:

- Press and hold the OFL button on the panel of the LPU for five seconds until the OFL indicator turns on.
- In the user view, run the **power off slot** *slot-id* command.

Step 5 Pull out the FPIC to be replaced from the LPU.

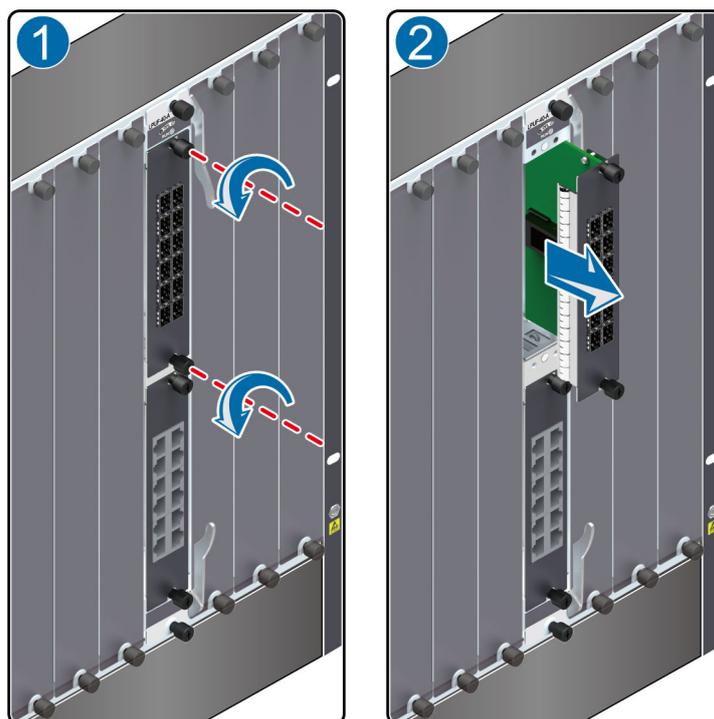
1. Put on the ESD wrist strap and connect the ground terminal to the ESD jack on the rack.
2. Using the Phillips screwdriver, turn the two captive screws counter-clockwise to loosen them, as shown in [Figure 3-9](#) (1).
3. Hold the captive screws of the FPIC and pull out the FPIC, as shown in [Figure 3-9](#) (2).



NOTICE

- Pull out the LPU slowly and smoothly to prevent it from hitting neighboring boards and affecting running boards.
 - Touching parts on the LPU when swapping it may damage the LPU.
-

Figure 3-9 Removing an FPIC from the LPU



4. Place the removed FPIC into the ESD bag.

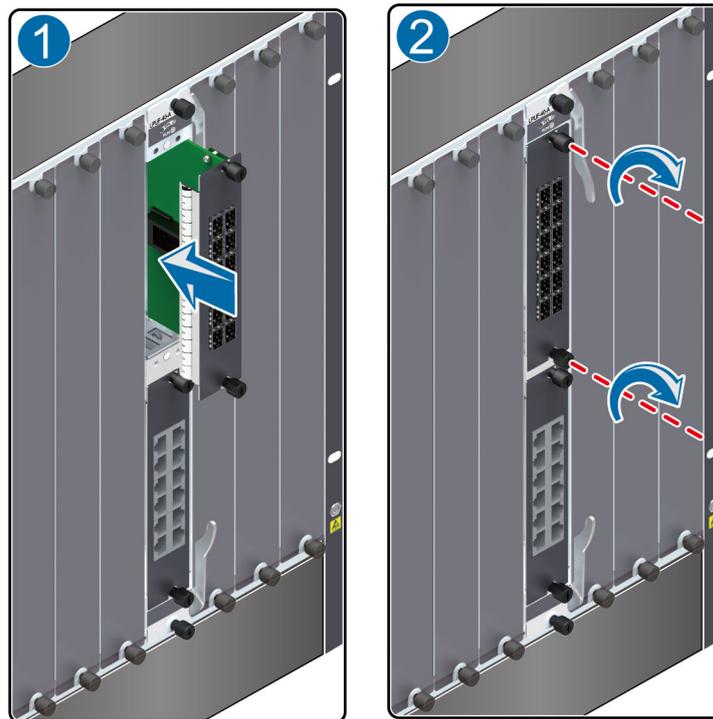
Step 6 Insert a new FPIC into the LPU.

1. Take out the new FPIC from the ESD bag.

 **NOTICE**

- Pull out the LPU slowly and smoothly to prevent it from hitting neighboring boards and affecting running boards.
 - Touching parts on the LPU when swapping it may damage the LPU.
-
2. Hold the captive screws of the FPIC, and insert the FPIC smoothly along the guide rails of the slot until the FPIC is completely seated in the slot, as shown in [Figure 3-10](#) (1).
 3. Using the Phillips screwdriver, turn the two captive screws clockwise to tighten them, as shown in [Figure 3-10](#) (2).

Figure 3-10 Inserting an FPIC into the LPU



Step 7 Connect the cables to the corresponding interfaces in the original sequence.

Step 8 Log in to the device and run the **power on slotslot-id** command to power on the LPU backplane whose FPIC has been replaced.

Step 9 Check the running status of the new FPIC.

Check the running status of the new FPIC in the following ways:

- Check the STATUS indicator on the panel of the FPIC. If it is on (green), the FPIC is working normally.
- Check the alarms. If the system does not generate any alarm related to the new FPIC, the new FPIC is working normally.
- Run the **display device** command on the console interface. If the LPUs in the corresponding slots are working normally, the following is displayed:

```
<sysname> display device
USG9520's Device status:
Slot #   Type      Online   Register  Status
-----
Primary
-
1        SPU       Present  Registered Normal
NA
2       LPU     Present Registered Normal
NA
4        MPU       Present  NA         Normal
Master
5        MPU       Present  Registered Normal
Slave
6        CLK       Present  Registered Normal
Master
7        CLK       Present  Registered Normal
```

Slave						
8	FWR	Present	Registered	Normal		
NA						
9	FWR	Present	Registered	Normal		
NA						
10	FAN	Present	Registered	Normal		NA

- Run the **display device pic-status** command on the console interface to view the running status of FPICs. If the FPICs on the corresponding LPUs are working normally, the following is displayed:

```
<sysname> display device pic-status
Pic-status information in Chassis
1:
-----
SLOT PIC Status      Type                Port_count Init_result  Logic
down
Registered
Cpu
1 1 Registered SPU_CARD_TYPE_SPCC 0          SUCCESS
SUCCESS
CPU3
2 1 Registered ETH_12XGE_CARD 12         SUCCESS
SUCCESS
-----
```

Step 10 Check whether services are working normally.

----End

Follow-up Procedure

After replacing the FPIC, collect all tools. If the replaced FPIC is faulty, fill in the [Repair Transmission Sheet](#) and send the faulty module with the Repair Transmission Sheet to the equipment supplier or the specified repair service provider.

3.1.5 Replacing an SPU

This section describes the precautions and procedures for replacing an SPU.

Context

The new SPU must be of the same type as the one that is to be replaced.

Tool

Before replacing the SPU, you need the following tools:

- ESD wrist strap or ESD gloves
- Phillips screwdriver
- ESD bag

Procedure

Step 1 Check the location of the SPU to be replaced.

Before pulling out the SPU to be replaced, first check the location of the SPU, that is, the cabinet and chassis where the SPU resides, and label it.

Step 2 Check whether there is any bent pin in the connector of the new SPU.

Step 3 Power off the SPU to be replaced.

 **NOTE**

- Before replacing an SPU, you must power it off. If you remove an SPU while it is running and then insert a new one, the SPU and its SPC may not work properly.
- After powering off the SPU, the number of CPUs in the device changes. In this case, sessions reselect CPUs based on the hash algorithm. If the selected CPU is different from the previous one, the session will be interrupted, and the service will re-initiate a connection.

Use either of the following methods:

- Press and hold the OFL button on the panel of the SPU for six seconds until the OFL indicator turns on.
- In the user view, run the **power off slot** *slot-id* command.

Step 4 Pull out the SPU.

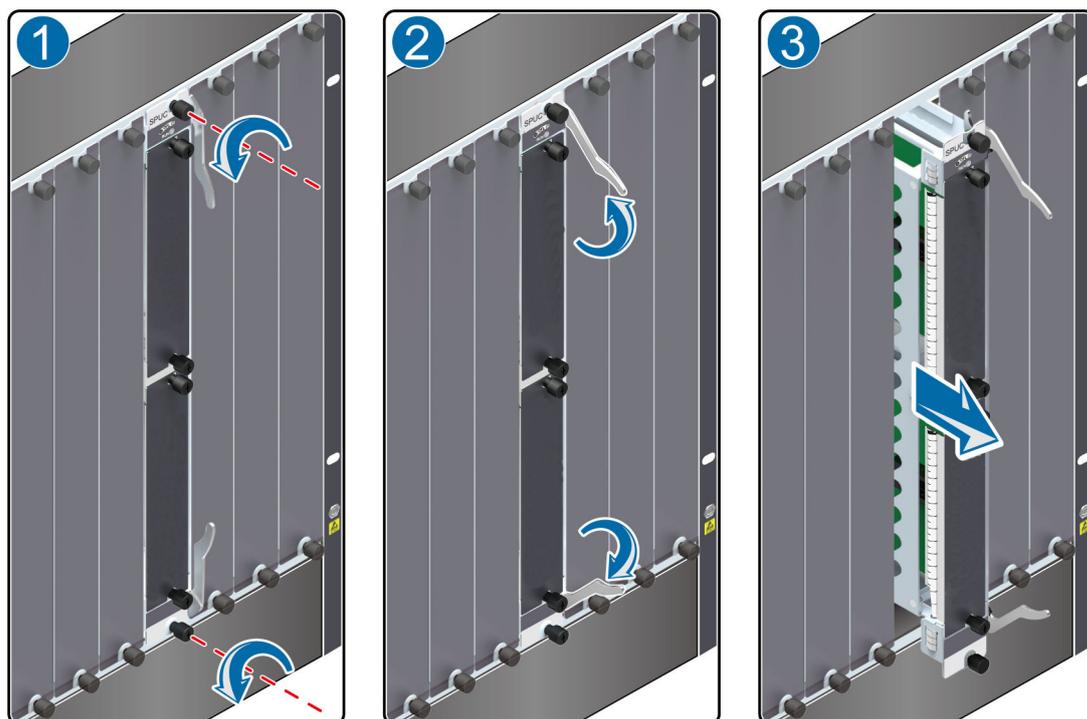
1. Put on the ESD wrist strap and connect the ground terminal to the ESD jack on the chassis.
2. Using the Phillips screwdriver turn the two captive screws counter-clockwise to loosen them, as shown in [Figure 3-11](#) (1).
3. Turn the ejector levers on the panel of the SPU outward and upward. When the ejector levers and the panel form a 45-degree angle, the SPU is removed from the backplane, as shown in [Figure 3-11](#) (2).
4. Holding the captive screws, pull out the SPU, as shown in [Figure 3-11](#) (3).



NOTICE

- Pull out the SPU slowly and smoothly to prevent it from hitting neighboring boards and affecting running boards.
 - When removing an SPU, do not touch any parts on the SPU to avoid damaging it.
-

Figure 3-11 Pulling out an SPU



5. Place the removed SPU into the ESD bag.

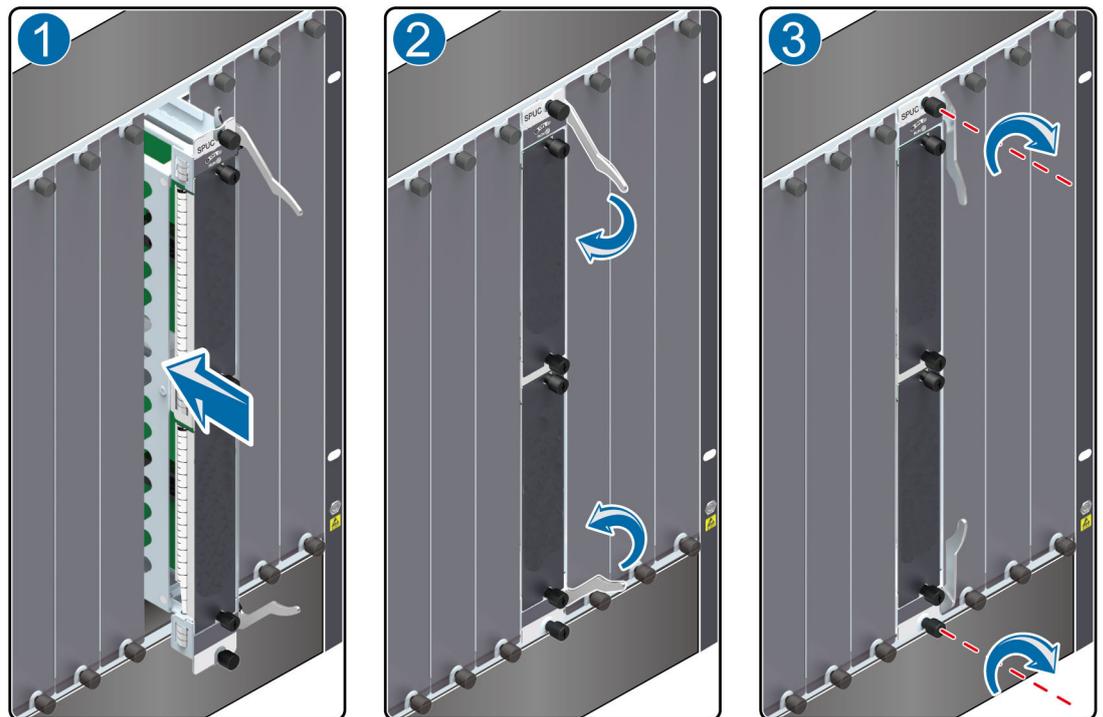
Step 5 Insert a new SPU.

1. Take out the new SPU from the ESD bag.

 **NOTICE**

- Pull out the SPU slowly and smoothly to prevent it from hitting neighboring boards and affecting running boards.
 - When removing an SPU, do not touch any parts on the SPU to avoid damaging it.
-
2. Hold the captive screws of the SPU, and insert the SPU smoothly along the guide rails of the slot until the SPU is completely seated in the slot, as shown in [Figure 3-12](#) (1).
 3. Turn the ejector levers on the SPU outward and upward to form a 45-degree angle, and at the same time push the SPU into the slot. Then, turn the ejector levers inward and downward until the panel of the SPU touches the slot, as shown in [Figure 3-12](#) (2).
 4. Using the Phillips screwdriver, turn the two captive screws clockwise to tighten them, as shown in [Figure 3-12](#) (3).

Figure 3-12 Inserting an SPU



Step 6 Check the running status of the new SPU.

Check the running status of the new SPU in the following ways:

- Check the RUN indicator on the panel of the SPU. If it is on (green), the SPU is working normally.
- Check the alarms. If the system does not generate any alarm related to the new SPU, the SPU is working normally.
- Run the **display device** command on the console interface. If the SPUs in the corresponding slots are working normally, the following is displayed:

```
<sysname> display device
USG9560's Device status:
```

Slot #	Type	Online	Register	Status	Primary
1	SPU	Present	Registered	Normal	NA
2	SPU	Present	Registered	Normal	NA
3	SPU	Present	Registered	Normal	NA
4	SPU	Present	Registered	Normal	NA
5	SPU	Present	Registered	Normal	NA
6	LPU	Present	Registered	Normal	NA
7	LPU	Present	Registered	Normal	NA
8	LPU	Present	Registered	Normal	NA
9	MPU	Present	NA	Normal	Master
10	MPU	Present	Registered	Normal	Slave
11	SFU	Present	Registered	Normal	NA
12	SFU	Present	Registered	Normal	NA
13	SFU	Present	Registered	Normal	NA
14	CLK	Present	Registered	Normal	Master
15	CLK	Present	Registered	Normal	Slave
16	PWR	Present	Registered	Normal	NA
17	PWR	Present	Registered	Normal	NA
18	FAN	Present	Registered	Normal	NA
19	FAN	Present	Registered	Normal	NA

Step 7 Check whether services are working normally.

----End

Follow-up Procedure

After replacing the SPU, collect all tools. If the replaced SPU is faulty, fill in the [Repair Transmission Sheet](#) and send the faulty module with the Repair Transmission Sheet to the equipment supplier or the specified repair service provider.

3.1.6 Replacing the SPC of the SPU

This section describes the precautions and procedures for replacing the SPC of the SPU.

Context

The new SPC must be the same type as the one to be replaced.

Tool

Before replacing the SPC, you need the following tools:

- ESD wrist strap or ESD gloves
- Phillips screwdriver
- ESD bag

Procedure

Step 1 Check the location of the SPC to be replaced.

Before pulling out the SPC to be replaced first check the location of the SPC, that is, the cabinet, chassis, and SPU where the SPC resides. Then, locate the SPC to be replaced in the chassis and label the SPC.

Step 2 Check whether there is any bent pin in the connector of the new SPC.

Step 3 Power off the SPC to be replaced.

NOTE

- Before replacing an SPC, power it off. If you remove a SPC while it is running and then insert another one, the SPC and its SPU may not work properly.
- After powering off the SPC, the number of device CPUs. In this case, sessions reselect CPUs based on the hash algorithm. If the selected CPU is different from the previous one, the session will be interrupted, and the service will re-initiate a connection.

Use either of the following methods:

- Press and hold the OFL button on the panel of the SPC for six seconds until the OFL indicator turns red for one second and then turns off.
- In the user view, run the **power off slot *slot-id* card *card-id*** command.

Step 4 Pull out the SPC to be replaced from the SPU.

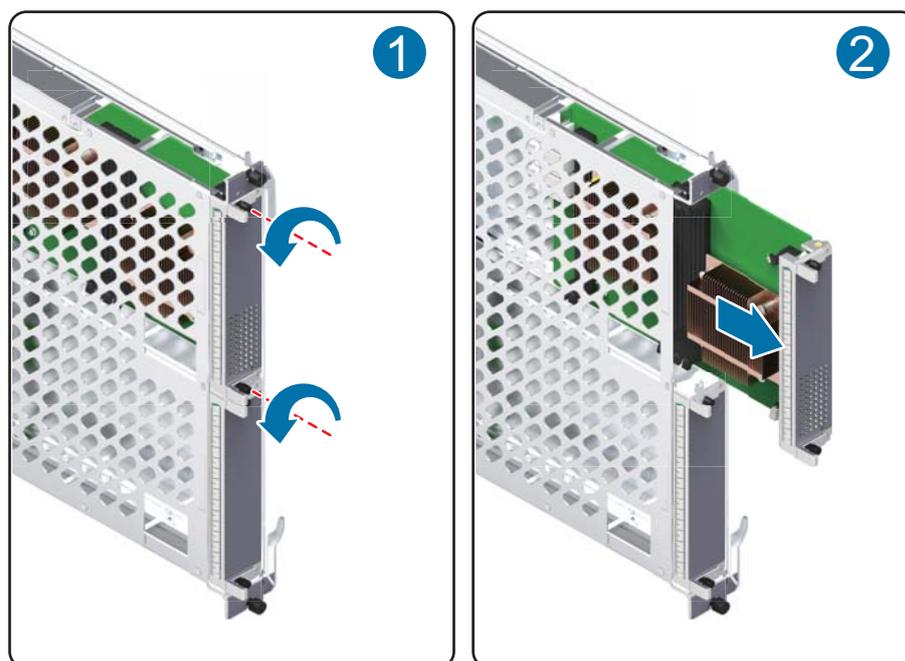
1. Put on the ESD wrist strap and connect the ground terminal to the ESD jack on the rack.
2. Using the Phillips screwdriver, turn the two captive screws counter-clockwise to loosen them, as shown in [Figure 3-13](#) (1).

3. Holding the captive screws of the SPC, pull out the SPC, as shown in [Figure 3-13](#) (2).

 **NOTICE**

- Pull out the SPC slowly and smoothly so that it does not bump into neighboring boards and cause a malfunction.
 - When removing an SPC, do not touch the parts on it to avoid damaging the SPC.
-

Figure 3-13 Pulling out an SPC from an SPU



4. Place the removed SPC into the ESD bag.

Step 5 Insert a new SPC into the SPU.

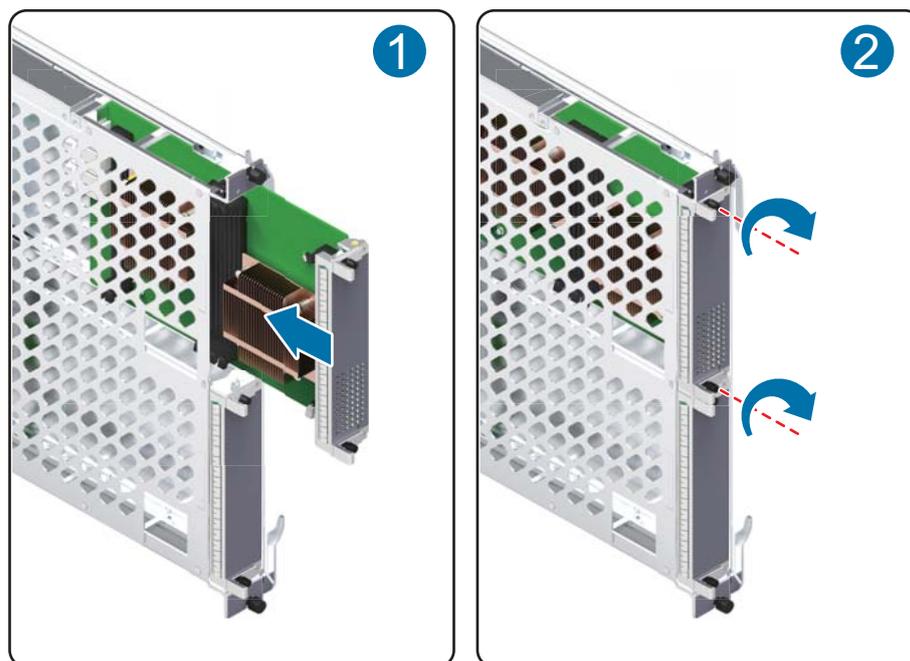
1. Take out the new SPC from the ESD bag.

 **NOTICE**

- Pull out the SPC slowly and smoothly so that it does not bump into neighboring boards and cause a malfunction.
 - When removing an SPC, do not touch the parts on it to avoid damaging the SPC.
-

2. Holding the captive screws of the SPC, insert the SPC smoothly along the guide rails of the slot until the SPC is full inserted, as shown in [Figure 3-14](#) (1).
3. Using the Phillips screwdriver, turn the two captive screws clockwise to tighten them, as shown in [Figure 3-14](#) (2).

Figure 3-14 Inserting an SPC into an SPU



Step 6 Check the running status of the new SPC.

Check the running status of the new SPC in the following ways:

- Check the STATUS indicator on the panel of the SPC. If it is on (green), the SPC is working normally.
- Check the alarms. If the system does not generate any alarm related to the new SPC, the SPC is working normally.
- Run the **display device** command on the console interface to view the running status of SPUs. If the SPUs in the corresponding slots are working normally, the following is displayed:

```
<sysname> display device
USG9520's Device status:
Slot #   Type      Online   Register  Status
-----
Primary
-----
1        SPU       Present  Registered Normal
NA
2        LPU       Present  Registered Normal
NA
4        MPU       Present  NA        Normal
Master
5        MPU       Present  Registered Normal
Slave
6        CLK       Present  Registered Normal
Master
7        CLK       Present  Registered Normal
Slave
8        PWR       Present  Registered Normal
NA
9        PWR       Present  Registered Normal
NA
10       FAN       Present  Registered Normal    NA
```

- Run the **display device pic-status** command on the console interface to view the running status of SPCs. If the SPCs on the corresponding SPUs are working normally, the following is displayed:

```
<sysname> display device pic-status
Pic-status information in Chassis
1:
-----
SLOT PIC Status      Type                      Port_count Init_result  Logic
down
Registered
Cpu
1    1    Registered SPU_CARD_TYPE_SPC  0          SUCCESS
SUCCESS
CPU3
2    1    Registered ETH_12XGE_CARD  12         SUCCESS
SUCCESS
-----
```

Step 7 Check whether services are working normally.

----End

Follow-up Procedure

After replacing the SPC, collect all tools. If the replaced SPC is faulty, fill in the [Repair Transmission Sheet](#) and send the faulty module with the Repair Transmission Sheet to the equipment supplier or the specified repair service provider.

3.2 Expanding SPU Capacity

This section describes how to expand SPU capacity.

3.2.1 Expanding SPU Capacity for the Active and Standby FWs in Hot Standby Scenarios (V500R001C50 and Later Versions)

This section describes how to expand SPU capacity for the active and standby FWs in hot standby scenarios.

Precautions

Expand SPU capacity as follows only when V500R001C50 or a later version is being used on the FW.

Before expanding SPU capacity, prepare new SPUs. The SPUs to be installed on the active and standby FWs for capacity expansion must be of the same model. In addition, they must be installed in the same slot on the active and standby FWs.

If two FWs work in active/standby mode, you must first expand the SPU capacity for the standby FW and then for the active FW. If two FWs work in load balancing mode, run the **hrp switch active** command on one FW to switch the operating mode to the active/standby mode and then expand SPU capacities.

The following table lists which services are affected when an SPU is hot-swapped.

Service	Affected?
IPv4 session	No
IPv6 session	No
Source NAT (PAT or easy-IP mode)	No
Source NAT (No-PAT mode or triplet NAT)	Yes
Port pre-allocation	Yes
PCP	Yes
NAT Server	No
Destination NAT	No
IPSec SA	No

Preparations

Tools:

- ESD wrist strap or ESD gloves
- Phillips screwdriver
- ESD bag

Record card tables for the two FWs. This will allow you to compare the card tables with those after capacity expansion to check whether the capacity expansion succeeds.

```
HRP_M<sysname> system-view
HRP_M[sysname] diagnose
HRP_M[sysname-diagnose] display firewall cpu-table
MainBrd Cpu-table .
Slot = 1, Cpu = 1, Tptb =80, Count = 342.

Slot = 2, Cpu = 1, Tptb =84, Count = 341.

Slot = 2, Cpu = 3, Tptb =85, Count = 341.

80 84 85 80 84 85 80 84 85 80 84 85 80 84 85 80
84 85 80 84 85 80 84 85 80 84 85 80 84 85 80 84
85 80 84 85 80 84 85 80 84 85 80 84 85 80 84 85
80 84 85 80 84 85 80 84 85 80 84 85 80 84 85 80
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85 80 84 85 80 84 85 80 84 85 80 84 85 80 84 85
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85 80 84 85 80 84 85 80 84 85 80 84 85 80 84 85
80 84 85 80 84 85 80 84 85 80 84 85 80 84 85 80
84 85 80 84 85 80 84 85 80 84 85 80 84 85 80 84
85 80 84 85 80 84 85 80 84 85 80 84 85 80 84 85
```

80 84 85 80 84 85 80 84 85 80 84 85 80 84 85 80
84 85 80 84 85 80 84 85 80 84 85 80 84 85 80 84
85 80 84 85 80 84 85 80 84 85 80 84 85 80 84 85
80 84 85 80 84 85 80 84 85 80 84 85 80 84 85 80
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85 80 84 85 80 84 85 80 84 85 80 84 85 80 84 85
80 84 85 80 84 85 80 84 85 80 84 85 80 84 85 80

Procedure

Step 1 Confirm where the SPUs are to be installed.

Before expanding SPU capacity, first confirm where the SPUs are to be installed, including the cabinets, chassis, and slots. Ensure that the SPUs are installed in the same slot on the active and standby FWs.

Step 2 Check whether the connectors of the SPUs to be installed are damaged.

Step 3 Optional: If two FWs work in load balancing mode, switch the operating mode to the active/standby mode. To switch the operating mode, run the **hrp switch active** command on either FW.

NOTE

If the two FWs work in active/standby mode, skip this step.

```
HRP_M<sysname> system-view
HRP_M[sysname] hrp switch active
```

The FW on which the **hrp switch active** command is executed has its VGMP group priority increased by 1 to be higher than that of the other FW and therefore becomes the active FW. The other FW becomes the standby FW. Services on the standby FW are switched to the active FW. Service switchover takes a few moments. To ensure service continuity, run the **hrp switch active** command and wait one minute before performing subsequent operations.

Step 4 Run the **undo hrp track spu enable** command on the standby FW to disable the VGMP group from monitoring the SPU.

```
HRP_S<sysname> system-view  
HRP_S[sysname] undo hrp track spu enable
```

After the SPU is inserted into the standby FW, its VGMP group priority increases and becomes higher than that of the active FW, triggering active/standby switchover. In addition, after the SPU is inserted, session tables on the standby FW are deleted. If active/standby switchover occurs at this time, service traffic is discarded by the standby FW due to failure to match session tables after being diverted to the standby FW. Therefore, before the SPU is inserted into the standby FW, run the **undo hrp track spu enable** command on the standby FW to disable the VGMP group from monitoring the SPU. In this way, after the SPU is inserted into the standby FW, its VGMP group priority does not increase, active/standby switchover is not triggered, and service traffic is still forwarded by the active FW.

Step 5 Insert the SPU into the slot of the standby FW.

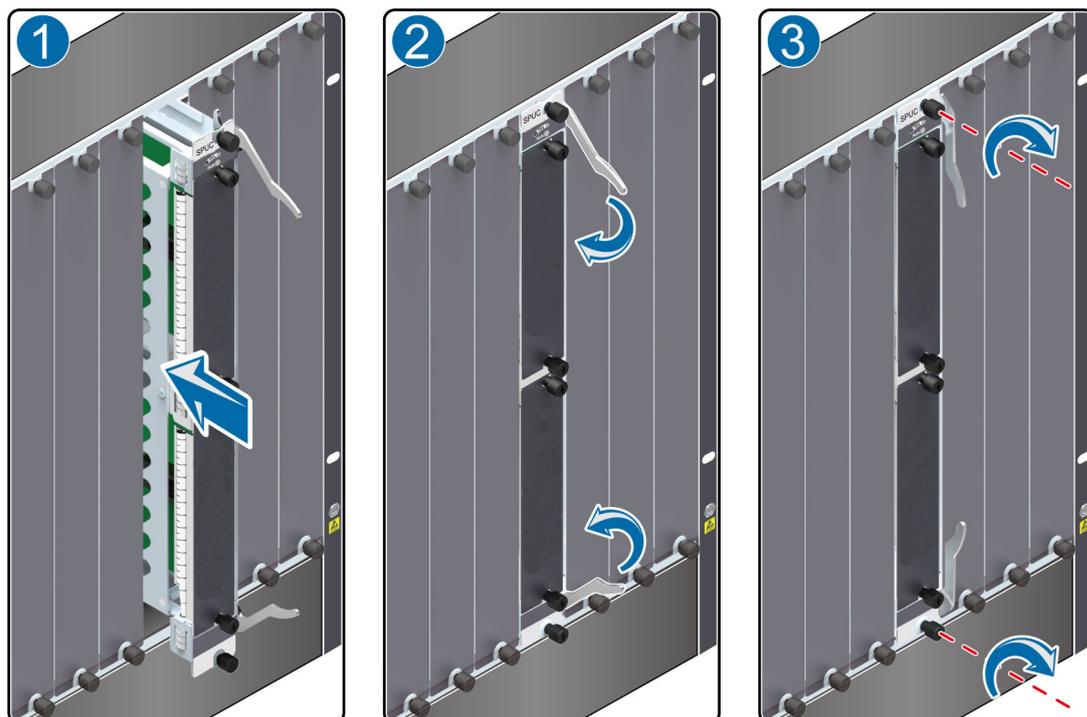
1. Take out the new SPU from the ESD bag.



NOTICE

- Pull out the SPU slowly and smoothly so that it does not bump into neighboring boards and cause a malfunction.
 - When inserting an SPU, do not touch the parts on it to avoid damaging the SPU.
-
2. Holding the captive screws, insert the SPU smoothly along the guide rails of the slot until the SPU is inserted fully into the slot, as shown in [Figure 3-15](#) (1).
 3. Turn the ejector levers on the SPU outward and upward to form a 45-degree angle, and at the same time push the SPU into the slot. Then, turn the ejector levers inward and downward until the panel of the SPU touches the slot, as shown in [Figure 3-15](#) (2).
 4. Using the Phillips screwdriver, turn the two captive screws clockwise to tighten them, as shown in [Figure 3-15](#) (3).

Figure 3-15 Inserting an SPU



Step 6 Check the running status of the inserted SPU.

1. Run the **display device** command on the standby FW to query the running status of the SPU motherboard. The SPU motherboard is running properly if all items on the SPU motherboard in the corresponding slot are displayed as follows:

```
HRP_S<sysname> display device
USG9520's Device status:
Slot #   Type      Online   Register   Status     Primary
-----
1        SPU       Present Registered Normal      NA
2        SPU       Present Registered Normal      NA
3        LPU       Present Registered Normal      NA
4        MPU       Present  NA         Normal     Master
6        CLK       Present Registered Normal     Master
8        PWR       Present Registered Normal      NA
9        PWR       Present Registered Abnormal   NA
10       FAN       Present Registered Normal      NA
```

2. Run the **display device pic-status** command on the standby FW to query the running status of the subcard. The subcard is running properly if all items on the corresponding subcard are displayed as follows:

```
HRP_S<sysname> display device pic-status
Pic-status information in Chassis
1:
-----
SLOT PIC Status   Type                               Port_count Init_result  Logic
down Registered Cpu
1    0  Registered SPU_CARD_TYPE_IPS           0          SUCCESS
SUCCESS CPU1
1    1  Registered SPU_CARD_TYPE_SPCC           0          SUCCESS
SUCCESS CPU3
2    1  Registered SPU_CARD_TYPE_SPCH           0          SUCCESS
SUCCESS CPU2,CPU3
```

```
3 0 Registered LAN_WAN_5x10GF_B_CARD 5 SUCCESS
SUCCESS
3 2 Registered ETH_24xGF_B_CARD 24 SUCCESS
SUCCESS
```

3. Run the **display firewall cpu-table** command on the standby FW to view the card table. Compare the card table after expansion with that before capacity expansion to confirm whether the card table is updated. If the card tables before and after capacity expansion are different, the card table has been updated successfully.

```
HRP_S<sysname> system-view
HRP_S[sysname] diagnose
HRP_S[sysname-diagnose] display firewall cpu-table
```

The FW allocates sessions to various CPUs for processing based on the card table. After the card table of the standby FW is updated, the standby FW sends the updated card table to the active FW. After receiving the new card table from the standby FW, the active FW synchronizes session tables to the standby FW. During session backup, the active FW allocates sessions to CPUs for processing based on the card table of the standby FW. In this way, the standby FW can properly identify and process sessions after they are backed up to the standby FW.

Registering the SPU and updating the card table on the standby FW takes around 20 minutes.

Session backup between the active and standby FWs takes around 2 minutes. Therefore, after confirming that the card table is updated, wait 2 minutes before performing subsequent operations.

- Step 7** Run the **hrp track spu enable** command on the standby FW to enable the VGMP group to monitor the SPU.

```
HRP_S<sysname> system-view
HRP_S[sysname] hrp track spu enable
```

After the VGMP group is enabled to monitor the SPU, the VGMP group priority of the standby FW becomes higher than that of the active FW, triggering active/standby switchover. The standby FW assumes the active role and processes service traffic, and the active FW enters the standby mode.

Service switchover takes a moment. To ensure service continuity, run the **hrp track spu enable** command and wait one minute before performing subsequent operations.

- Step 8 Optional:** If two FWs work in load balancing mode, perform [Step 3](#) to switch the operating mode to the active/standby mode. After [Step 7](#) is complete, run the **undo hrp switch active** command on the FW on which the **hrp switch active** command is executed (namely, the FW in standby status) to cancel the operations from [Step 3](#).

If two FWs work in active/standby mode, and operations in [Step 3](#) are not performed, skip this step.

```
HRP_S<sysname> system-view
HRP_S[sysname] undo hrp switch active
```

- Step 9** Repeat [Step 4](#) to [Step 7](#) on the original active (now standby) FW to expand its SPU capacity.

- Step 10** Check whether the service is working properly.

----End

3.2.2 Expanding SPC Capacity for the Active and Standby FWs in Hot Standby Scenarios (for V500R001C50 and Later Versions)

This section describes how to expand SPC capacity for the active and standby FWs in hot standby scenarios.

Precautions

Expand SPC capacity as follows only when the software is of V500R001C50 or a later version.

Before expanding SPC capacity, prepare new SPCs. The SPCs to be installed on the active and standby FWs for capacity expansion must be of the same model. In addition, they must be installed in the same slot on the active and standby FWs.

If two FWs work in active/standby mode, you must first expand the SPC capacity for the standby FW and then expand the capacity for the active FW. If two FWs work in load balancing mode, run the **hrp switch active** command on one FW to switch the operating mode to the active/standby mode and then expand SPC capacity.

The following table lists which services are affected when an SPC is hot-swapped.

Service	Affected?
IPv4 session	No
IPv6 session	No
Source NAT (PAT or easy-IP mode)	No
Source NAT (No-PAT mode or triplet NAT)	Yes
Port pre-allocation	Yes
PCP	Yes
NAT Server	No
Destination NAT	No
IPSec SA	No

Preparations

Tools:

- ESD wrist strap or ESD gloves
- Phillips screwdriver
- ESD bag

Before capacity expansion, record card tables of the two FWs. This will allow you to compare the card tables with those after capacity expansion to check whether the capacity expansion was successful.


```
85 80 84 85 80 84 85 80 84 85 80 84 85 80 84 85
80 84 85 80 84 85 80 84 85 80 84 85 80 84 85 80
84 85 80 84 85 80 84 85 80 84 85 80 84 85 80 84
85 80 84 85 80 84 85 80 84 85 80 84 85 80 84 85
80 84 85 80 84 85 80 84 85 80 84 85 80 84 85 80
```

Procedure

Step 1 Confirm where the SPCs are to be installed.

Before expanding SPC capacity, first confirm where the SPCs are to be installed, including the cabinets, chassis, and slots. Ensure that the SPCs are installed in the same slot on the active and standby FWs.

Step 2 Check whether the connectors of the SPCs to be installed are damaged.

Step 3 Optional: If two FWs work in load balancing mode, switch the operating mode to the active/standby mode. To switch the operating mode, run the **hrp switch active** command on either FW.

NOTE

If the two FWs work in active/standby mode, skip this step.

```
HRP_M<sysname> system-view
HRP_M[sysname] hrp switch active
```

The FW on which the **hrp switch active** command is executed has its VGMP group priority increased by 1 to be higher than that of the other FW and therefore becomes the active FW. The other FW become the standby FW. Services on the standby FW are switched to the active FW. Service switchover takes a few moments. To ensure service continuity, run the **hrp switch active** command and wait one minute before performing subsequent operations.

Step 4 Run the **undo hrp track spu enable** command on the standby FW to disable the VGMP group from monitoring the SPU.

```
HRP_S<sysname> system-view
HRP_S[sysname] undo hrp track spu enable
```

After the SPC is inserted into the standby FW, its VGMP group priority increases and becomes higher than that of the active FW, triggering active/standby switchover. In addition, after the SPU is inserted, session tables on the standby FW are deleted. If active/standby switchover occurs at this time, service traffic is discarded by the standby FW due to failure to match session tables after being diverted to the standby FW. Therefore, before the SPC is inserted into the standby FW, run the **undo hrp track spu enable** command on the standby FW to disable the VGMP group from monitoring the SPU. In this way, after the SPC is inserted into the standby FW, its VGMP group priority does not increase, active/standby switchover is not triggered, and service traffic is still forwarded by the active FW.

Step 5 Insert the SPC into the SPU motherboard of the standby FW.

1. Take out the new SPC from the ESD bag.

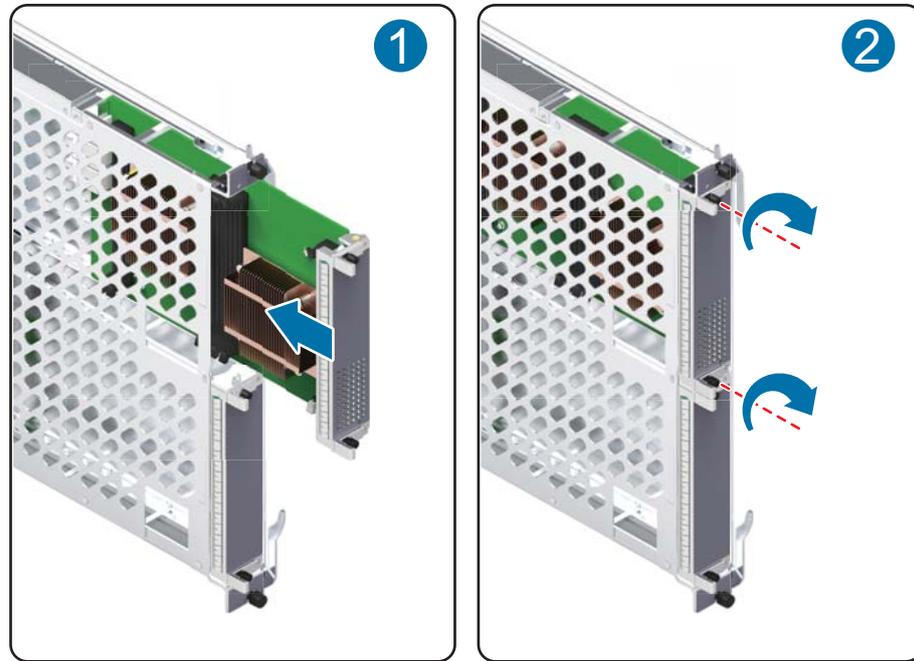


NOTICE

- Pull out the SPU slowly and smoothly so that it does not bump into neighboring boards and cause a malfunction.
- When inserting an SPC, do not touch the parts on it to avoid damaging the SPC.

2. Holding the captive screws of the SPC, insert the SPC smoothly along the guide rails of the slot until the SPC is fully inserted into the slot, as shown in **Figure 3-16 (1)**.
3. Using the Phillips screwdriver, turn the two captive screws clockwise to tighten them, as shown in **Figure 3-16 (2)**.

Figure 3-16 Inserting an SPC into the SPU



Step 6 Check the running status of the inserted SPC.

1. Run the **display device** command on the standby FW to query the running status of the SPU motherboard. The SPU motherboard is running properly if all items on the SPU motherboard in the corresponding slot are displayed as follows:

```
HRP_S<sysname> display device
USG9520's Device status:
Slot #   Type      Online   Register  Status    Primary
-----
1        SPU       Present  Registered Normal     NA
2        SPU       Present  Registered Normal     NA
3        LPU       Present  Registered Normal     NA
4        MPU       Present  NA         Normal    Master
6        CLK       Present  Registered Normal    Master
8        PWR       Present  Registered Normal     NA
9        PWR       Present  Registered Abnormal  NA
10       FAN       Present  Registered Normal     NA
```

2. Run the **display device pic-status** command on the standby FW to query the operating status of the subcard. The subcard is running properly if all items on the corresponding subcard are displayed as follows:

```
HRP_S<sysname> display device pic-status
Pic-status information in Chassis
1:
-----
SLOT PIC Status   Type                               Port_count Init_result  Logic
down Registered Cpu
1    0  Registered SPU_CARD_TYPE_IPS                0          SUCCESS
```

```

SUCCESS      CPU1
1      1      Registered SPU_CARD_TYPE_SPCC      0      SUCCESS
SUCCESS
                CPU3
2      1      Registered SPU_CARD_TYPE_SPCH      0      SUCCESS
SUCCESS
                CPU2,CPU3
3      0      Registered LAN_WAN_5x10GF_B_CARD      5      SUCCESS
SUCCESS
3      2      Registered ETH_24xGF_B_CARD      24      SUCCESS
SUCCESS

```

3. Run the **display firewall cpu-table** command on the standby FW to view the card table. Compare the card table after expansion with that before capacity expansion to confirm whether the card table is updated. If the card tables before and after capacity expansion are different, the card table has been updated successfully.

```

HRP_S<sysname> system-view
HRP_S[sysname] diagnose
HRP_S[sysname-diagnose] display firewall cpu-table

```

The FW allocates sessions to various CPUs for processing based on the card table. After the card table of the standby FW is updated, the standby FW sends the updated card table to the active FW. After receiving the new card table from the standby FW, the active FW synchronizes session tables to the standby FW. During session backup, the active FW allocates sessions to CPUs for processing based on the card table of the standby FW. In this way, the standby FW can properly identify and process sessions after they are backed up to the standby FW.

Registering the SPC and updating the card table on the standby FW takes around 20 minutes.

Session backup between the active and standby FWs takes around 2 minutes. Therefore, after confirming that the card table is updated, wait 2 minutes before performing subsequent operations.

- Step 7** Run the **hrp track spu enable** command on the standby FW to enable the VGMP group to monitor the SPU.

```

HRP_S<sysname> system-view
HRP_S[sysname] hrp track spu enable

```

After the VGMP group is enabled to monitor the SPU, the VGMP group priority of the standby FW becomes higher than that of the active FW, triggering active/standby switchover. The standby FW assumes the active role and processes service traffic, and the active FW enters the standby mode.

Service switchover takes a moment. To ensure service continuity, run the **hrp track spu enable** command, and wait one minute before performing subsequent operations.

- Step 8 Optional:** If two FWs work in load balancing mode, perform [Step 3](#) to switch the operating mode to the active/standby mode. After [Step 7](#) is complete, run the **undo hrp switch active** command on the FW on which the **hrp switch active** command is executed (namely, the FW in standby status) to cancel operations in [Step 3](#).

If two FWs work in active/standby mode, and operations in [Step 3](#) are not performed, skip this step.

```

HRP_S<sysname> system-view
HRP_S[sysname] undo hrp switch active

```

- Step 9** Repeat [Step 4](#) to [Step 7](#) on the original active (now standby) FW to expand its SPC capacity.

- Step 10** Check whether the service is working properly.

----End

3.3 Replacing a Fan Module

This section describes the fan module of the device and the procedure for replacing the fan module.

3.3.1 Replacing the Fan Module of the USG9580

This section describes the fan module of the USG9580 and the procedure for replacing the fan module.

Precautions

- When removing an old fan module, first pull it out about 5 cm and then stop. After the fans stop rotating, you can continue pulling out the module.
- The USG9580 has four fans. You can replace only one fan at a time.
- The fan modules of the USG9580 are located at the rear of the chassis. [Figure 3-17](#) shows the appearance of a fan module.

Figure 3-17 Fan module



Tools

- ESD wrist strap or ESD gloves
- Phillips screwdriver

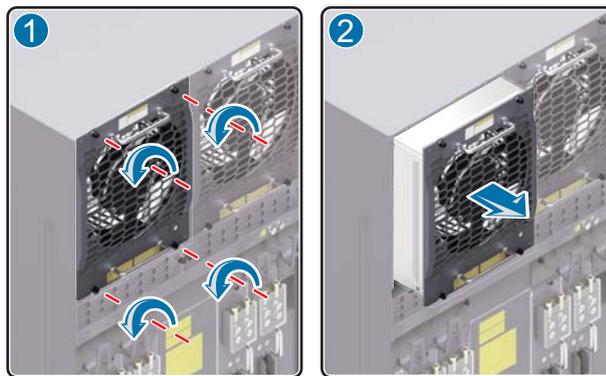
Procedure

Step 1 Check the location of the fan module to be replaced.

Before removing the old fan module, check its location, that is , the cabinet and chassis where the fan module resides, and then label it.

- Step 2** Put on the ESD wrist strap and connect the ground terminal to the ESD jack on the chassis.
- Step 3** Using the Phillips screwdriver, turn the captive screws on the fan module to loosen them, as shown in **Figure 3-18** (1).
- Step 4** Pull the upper handle upward and the lower handle downward to draw the fan module about 5 cm out of the slot, then stop. When the fans stop rotating, continue pulling out the fan module, as shown in **Figure 3-18** (2).

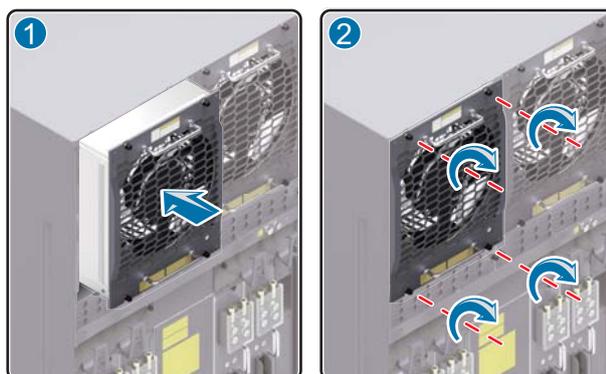
Figure 3-18 Removing the fan module from the USG9580



- Step 5** Insert a new fan module into the chassis.

Hold the upper and lower handles of the fan module, and slowly and horizontally insert the fan module along the guide rails in the slot until the back of the fan module properly connects to the backplane. Using the Phillips screwdriver, fasten the fan module to the chassis by tightening the captive screws, as shown in **Figure 3-19**.

Figure 3-19 Installing the fan module on the USG9580



- Step 6** Verify that the fan module is working properly.

Normally, after the new fan module is inserted into the chassis, the fans inside it immediately start to draw air from the chassis. In this case, you can check whether the new fan module is working normally in the following ways:

- Check the FAN indicator on the panel of the fan module. If it is green, the fan module is working normally. If the indicator is red, the fan module is not working normally.

- Run the **display fan** command on the console interface to view the running status of the fan module. The fan module is working normally if the following is displayed:

```
<sysname> display fan
Slotid      : 27
Present     : YES
Registered  : YES
Status      : AUTO
FanSpeed    : [No.]Speed
             [1]40%
Slotid      : 28
Present     : YES
Registered  : YES
Status      : AUTO
FanSpeed    : [No.]Speed
             [1]40%
Slotid      : 29
Present     : YES
Registered  : YES
Status      : AUTO
FanSpeed    : [No.]Speed
             [1]40%
Slotid      : 30
Present     : YES
Registered  : YES
Status      : AUTO
FanSpeed    : [No.]Speed
             [1]40%
```

The preceding command output indicates that the new fan module is normal. If the new fan module is not working normally, contact Huawei technical personnel

----End

Follow-up Procedure

- Gather up and store the tools.
- If a replaced fan module is confirmed to be faulty, fill in the *Faulty Card for Repair* and send the faulty fan module and the card to the local Huawei office for repair.

After replacing the fan module, collect all tools. If the replaced fan module is faulty, fill in the [Repair Transmission Sheet](#) and send the faulty module with the Repair Transmission Sheet to the equipment supplier or the specified repair service provider.

3.3.2 Replacing the Fan Module of the USG9560

This section describes the fan module of the USG9560 and the procedure for replacing the fan module.

Precautions

- When removing an old fan module, first pull it out about 5 cm, then stop. After the fans stop rotating, continue pulling out the module.
- The USG9560 has two fan modules. You can replace only one fan at a time.
- The fan modules of the USG9560 are located at the rear of the chassis. [Figure 3-20](#) shows a fan module.

Figure 3-20 Fan module



Tools

- ESD wrist strap or ESD gloves
- Phillips screwdriver

Procedure

Step 1 Check the location of the fan module to be replaced.

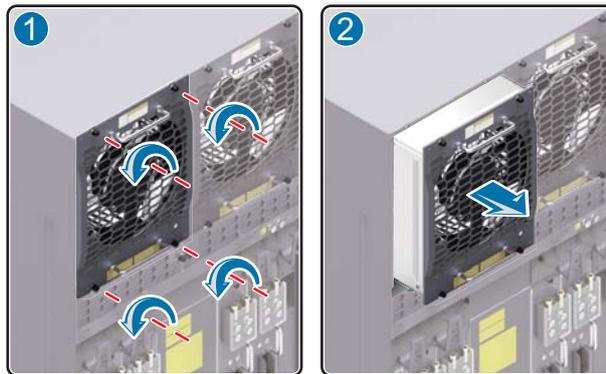
Before removing the old fan module, check its location, that is, the cabinet and chassis where the fan module resides, and label it.

Step 2 Put on the ESD wrist strap and connect the ground terminal to the ESD jack on the chassis.

Step 3 Using the Phillips screwdriver, loosen the captive screws on the fan module, as shown in [Figure 3-21](#).

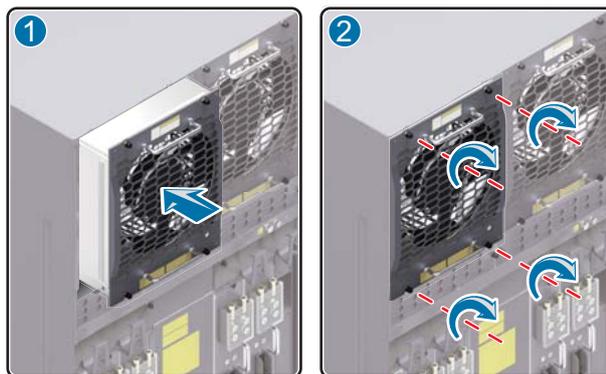
Step 4 Pull the upper handle upward and the lower handle downward and draw the fan module about 5 cm out of the slot, then stop. When the fan blades stop rotating, continue pulling out the fan module, as shown in [Figure 3-21](#).

Figure 3-21 Removing the fan module from the USG9560



- Step 5** Holding the upper and lower handles of the fan module, slowly insert the fan module horizontally along the guide rails in the slot until the rear of the fan module properly connects to the backplane. Using the Phillips screwdriver, fasten the fan module to the chassis by tightening the captive screws, as shown in [Figure 3-22](#).

Figure 3-22 Installing the fan module on the USG9560



- Step 6** Verify that the new fan module is working properly.

Normally, after the new fan module is inserted into the chassis, the fans inside it immediately start drawing air from the chassis. In this case, you can check whether the new fan module is working properly in the following ways:

- Check the FAN indicator on the panel of the fan module. If it is green, the fan module is working normally. If the indicator is red, the fan module is not working normally.
- Run the **display fan** command on the console interface to view the running status of the fan module. The fan module is working normally if the following is displayed:

```
<sysname> display fan
Slotid   : 18
Present  : YES
Registered: YES
Status   : AUTO
FanSpeed : [No.]Speed
          [1]46%
Slotid   : 19
Present  : YES
Registered: YES
Status   : AUTO
FanSpeed : [No.]Speed
          [1]45%
```

The preceding command output indicates that the new fan module is normal. If the new fan module fails to work normally, contact Huawei technical personnel.

---End

Follow-up Procedure

After replacing the fan module, collect all tools. If the replaced fan module is faulty, fill in the [Repair Transmission Sheet](#) and send the faulty module with the Repair Transmission Sheet to the equipment supplier or the specified repair service provider.

3.3.3 Replacing the Fan Module of the USG9520

This section describes the procedure for replacing the fan module of the USG9520.

Context

Before replacing a fan module, note the following:

- You must spend not more than five minutes to replace a fan module. Otherwise, the security and stability of the device is severely affected.
- During the process of pulling out the old fan module, first pull out part of the fan module. After the fans stop rotating, pull out the fan module completely.
- The USG9520 has one fan module. The fan module is located at the rear of the chassis. [Figure 3-23](#) shows the fan module.

Figure 3-23 Fan module



NOTE

The method for replacing a fan module in the USG9520 chassis that is configured with a DC power supply module is the same as the method for replacing a fan module in a chassis that is configured with an AC power supply module.

Tool

Before replacing a fan module, you need the following tools:

- ESD wrist strap or ESD gloves
- Phillips screwdriver

Procedure

Step 1 Check the location of the fan module to be replaced.

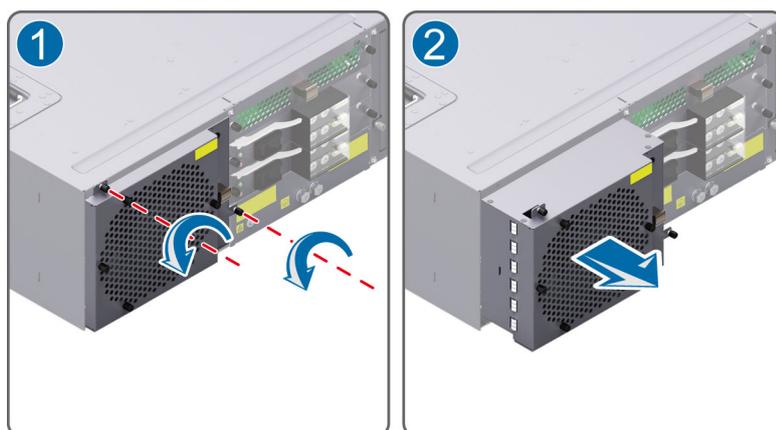
Before pulling out a fan module that is to be replaced, first check the location of the fan module, that is, the cabinet and chassis where the fan module resides, and label it.

Step 2 Put on the ESD wrist strap and connect the grounding terminal to the ESD jack on the rack.

Step 3 Using the Phillips screwdriver, loosen the captive screws on both ends of the fan module, as shown in [Figure 3-24](#) (1).

Step 4 Holding the handle on the fan module, draw out the fan module about 5 cm, then stop. When the fans stop rotating, continue pulling out the fan module, as shown in [Figure 3-24](#) (2).

Figure 3-24 Pulling out the fan module of the USG9520



NOTICE

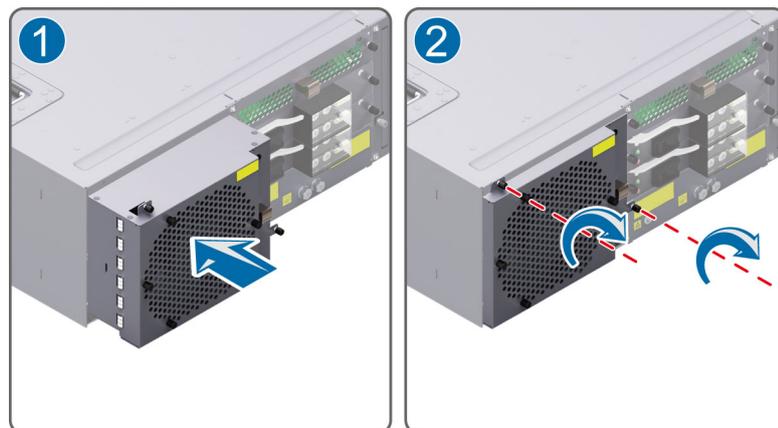
Do not take more than five minutes to replace a fan module. Otherwise, the security and stability of the device will be severely affected.

Step 5 Insert the backup fan module into the chassis.

Hold the handle of the fan module with one hand and support the bottom of the fan module with the other hand. Then, insert the fan module smoothly and slowly along the guide rail of the slot until the rear of the fan module is connected properly to the backplane of the chassis, as shown in [Figure 3-25](#) (1).

Step 6 Using the Phillips screwdriver, fasten the fan module to the chassis by tightening the captive screws, as shown in [Figure 3-25](#) (2).

Figure 3-25 Inserting a fan module into the USG9520



Step 7 Verify that the new fan module works properly.

Normally, after the new fan module is inserted into the chassis, the fans start working. In this case, check whether the fan module is working normally in the following ways:

- Check the Status indicator on the panel of the fan module. If the Status indicator on the panel of the fan module is green and blinking at a rate of 0.5 Hz, the fan module is working normally. If the Status indicator on the panel of the fan module is green and blinking at a rate of 4 Hz, or if it is yellow or red, the fan module is not working normally.
- Run the **display fan** command on the console interface to view the running status of the fan module. The fan module is working normally if the following is displayed:

```
<sysname> display fan
Slotid      : 10
Present     : YES
Registered  : YES
Status      : AUTO
FanSpeed    : [No.]Speed
             [1]75% [2]75%
```

The preceding output also indicates that the fan module has returned to the normal state. If the fan module does not work normally, contact a local Huawei office for technical support.

----End

Follow-up Procedure

After replacing the fan module, collect all tools. If the replaced fan module is faulty, fill in the [Repair Transmission Sheet](#) and send the faulty module with the Repair Transmission Sheet to the equipment supplier or the specified repair service provider.

3.4 Replacing Power Modules

This section describes the power modules of the device and the procedure for replacing the power modules.

3.4.1 Replacing the DC PEM of the USG9580

This section describes the DC power module of the USG9580 and the procedure for replacing the power module.

Precautions

- Before replacing a PEM, power it off by turning off the corresponding air circuit breaker on the power distribution cabinet. The PEM to be replaced is powered off. In addition, switch off the PEM.
- Before replacing a PEM, ensure that its backup PEM works properly.
- The USG9580 has eight PEMs working in 4+4 backup mode. You can power off one PEM at a time during replacement. **Figure 3-26** shows a PEM.

Figure 3-26 PEM



Tools

- ESD wrist strap or ESD gloves
- Phillips screwdriver

Procedure

Step 1 Check the location of the PEM to be replaced.

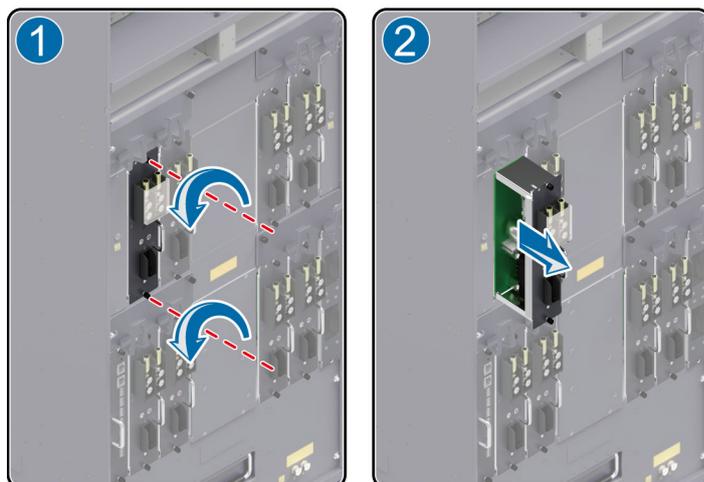
Before removing the old PEM, check its location, that is, the cabinet and chassis where the PEM resides, and label the PEM.

Step 2 Put on the ESD wrist strap and connect the grounding terminal to the ESD jack on the chassis.

Step 3 Turn off the corresponding air circuit breaker on the power distribution cabinet. This will power off the PEM to be replaced. In addition, switch off the PEM.

- Step 4** Remove the cables from the power module to be replaced.
- Step 5** Use the Phillips screwdriver to loosen the captive screws on the PEM, as shown in [Figure 3-27](#).
- Step 6** Hold the handle on the PEM with one hand and hold the PEM with the other hand. Then pull the PEM horizontally and slowly out of the chassis, as shown in [Figure 3-27](#).

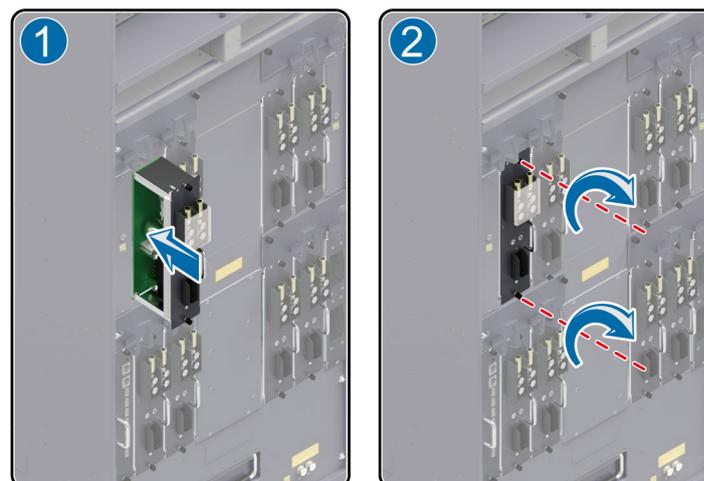
Figure 3-27 Removing the PEM from the USG9580



- Step 7** Insert the new PEM into the chassis.

Holding the handle on the PEM with one hand and supporting the PEM with the other hand, slowly insert the PEM vertically along the guide rails in the slot until the rear of the PEM properly connects to the backplane. Using the Phillips screwdriver, fasten the PEM to the chassis by turning the captive screws clockwise to tighten them, as shown in [Figure 3-28](#).

Figure 3-28 Installing the PEM on the USG9580



- Step 8** Connect the cables to the power module in the original sequence.
- Step 9** Verify that the new PEM is working normally.
- Check the RUN indicator on the PEM panel. If it is green, the PEM is working normally. Check the ALM indicator on the PEM panel. If it is red, the PEM fails is not working normally.

- Run the **display device slot id** command on the console interface to check the running status of the new PEM. The PEM is working normally if the PEM statuses displayed match the following bold characters:

```
<sysname> display device
USG9580's Device status:
Slot #   Type      Online   Register   Status     Primary
-----
1        SPU       Present Registered Normal     NA
2        SPU       Present Registered Normal     NA
3        SPU       Present Registered Normal     NA
4        SPU       Present Registered Normal     NA
5        SPU       Present Registered Normal     NA
6        SPU       Present Registered Normal     NA
7        SPU       Present Registered Normal     NA
8        SPU       Present Registered Normal     NA
9        SPU       Present Registered Normal     NA
10       SPU       Present Registered Normal     NA
11       LPU       Present Registered Normal     NA
12       LPU       Present Registered Normal     NA
13       LPU       Present Registered Normal     NA
14       LPU       Present Registered Normal     NA
15       LPU       Present Registered Normal     NA
16       LPU       Present Registered Normal     NA
17       MPU       Present  NA        Normal    Master
18       MPU       Present Registered Normal    Slave
19       SFU       Present Registered Normal    NA
20       SFU       Present Registered Normal    NA
21       SFU       Present Registered Normal    NA
22       SFU       Present Registered Normal    NA
23       CLK       Present Registered Normal    Master
24       CLK       Present Registered Normal    Slave
25      PWR       Present Registered Normal    NA
26      PWR       Present Registered Normal    NA
27       FAN       Present Registered Normal    NA
28       FAN       Present Registered Normal    NA
29       FAN       Present Registered Normal    NA
30       FAN       Present Registered Normal    NA
-----

<sysname> display device 25
Type      :NEPS2250-D
Present   :PRESENT
Status    :NORMAL
Cable     :PLUG
Mode      :DC
PowerNum  :2
TotalPower:842

Module    : 0[B2]
Present   :PRESENT
CpuStatus :NORMAL
InputVoltage:53.13
InputCurrent:9.33
InputPower :495

Module    : 1[A1]
Present   :PRESENT
CpuStatus :NORMAL
InputVoltage:53.13
InputCurrent:8.42
InputPower :447
```

The preceding command output indicates that the new PEM is normal. If the new PEM does not work normally, contact the local Huawei office for technical support.

----End

Follow-up Procedure

After replacing the PEM, collect all tools. If the replaced PEM is faulty, fill in the [Repair Transmission Sheet](#) and send the faulty module with the Repair Transmission Sheet to the equipment supplier or the specified repair service provider.

3.4.2 Replacing the DC PEM of the USG9560

This section describes the procedure for replacing the DC power module of the USG9560.

Precautions

- Before replacing a PEM, power it off by turning off the corresponding air circuit breaker on the power distribution cabinet. The PEM to be replaced is powered off. In addition, you need to switch off the PEM.
- The USG9560 has four PEMs, You can power off one PEM during replacement. [Figure 3-29](#) shows the PEM.

Figure 3-29 PEM



Tools

- ESD wrist strap or ESD gloves
- Phillips screwdriver

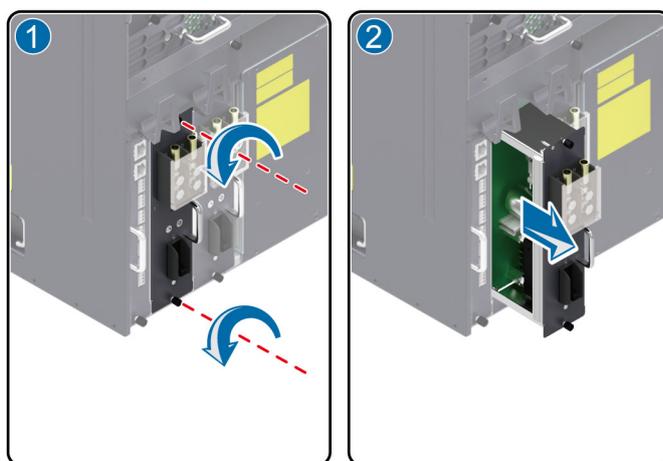
Procedure

Step 1 Check the location of the PEM to be replaced.

Before removing the old PEM, check its location, that is, the cabinet and chassis where the PEM resides, and label the PEM.

- Step 2** Put on the ESD wrist strap and connect the grounding terminal to the ESD jack on the chassis.
- Step 3** Turn off the corresponding air circuit breaker on the power distribution cabinet. This turns off the PEM to be replaced. In addition, switch off the PEM.
- Step 4** Remove the cables from the power module to be replaced.
- Step 5** Using the Phillips screwdriver, turn the captive screws on the PEM counter-clockwise to loosen them, as shown in **Figure 3-30**.
- Step 6** Holding the handle on the PEM with one hand and supporting the PEM with the other hand, slowly pull the PEM vertically out of the chassis, as shown in **Figure 3-30**.

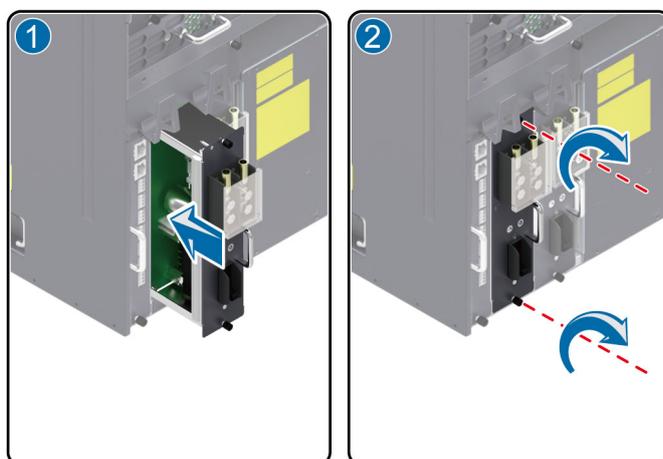
Figure 3-30 Removing the PEM from the USG9560



- Step 7** Insert the new PEM into the chassis.

Holding the handle on the PEM with one hand and supporting the PEM with the other hand, slowly insert the PEM vertically along the guide rails in the slot until the rear of the PEM properly connects to the backplane. Using the Phillips screwdriver, fasten the PEM to the chassis by turning the captive screws counter-clockwise to tighten them, as shown in **Figure 3-31**.

Figure 3-31 Installing the PEM on the USG9560



- Step 8** Connect the cables to the power module in the original sequence.

Step 9 Verify that the new PEM is working properly.

- Check the RUN indicator on the PEM panel. If it is green, the PEM is working normally. Check the ALM indicator on the PEM panel. If it is red, the PEM is not working normally.
- Run the **display device** command on the console interface to check the running status of the new PEM. The PEM is working normally if the PEM statuses displayed match the following bold characters:

```
<sysname> display device
USG9560's Device status:
Slot #   Type   Online  Register  Status   Primary
-----
1        SPU    Present Registered Normal    NA
2        SPU    Present Registered Normal    NA
3        SPU    Present Registered Normal    NA
4        SPU    Present Registered Normal    NA
5        SPU    Present Registered Normal    NA
6        LPU    Present Registered Normal    NA
7        LPU    Present Registered Normal    NA
8        LPU    Present Registered Normal    NA
9        MPU    Present NA       Normal   Master
10       MPU    Present Registered Normal   Slave
11       SFU    Present Registered Normal   NA
12       SFU    Present Registered Normal   NA
13       SFU    Present Registered Normal   NA
14       CLK    Present Registered Normal   Master
15       CLK    Present Registered Normal   Slave
16      PWR    Present Registered Normal   NA
17      PWR    Present Registered Normal   NA
18       FAN    Present Registered Normal   NA
19       FAN    Present Registered Normal   NA
-----
```

The preceding command output indicates that the new PEM is normal. If the new PEM does not work normally, contact a local Huawei office for technical support.

----End

Follow-up Procedure

After replacing the PEM, collect all tools. If the replaced PEM is faulty, fill in the [Repair Transmission Sheet](#) and send the faulty module with the Repair Transmission Sheet to the equipment supplier or the specified repair service provider.

3.4.3 Replacing a DC Power Module of USG9520

This section describes the procedure for replacing the power module of the USG9520.

Context

- Before replacing a power module, switch off the corresponding air circuit breaker on the power distribution cabinet. This switches off the power module to be replaced. In addition, switch off the power module to be replaced.
- The USG9520 has two power modules. Do not power off the other during the process of removing one power module. [Figure 3-32](#) shows the PEM.

Figure 3-32 DC power module



Tool

- ESD wrist strap or ESD gloves
- Phillips screwdriver

Procedure

Step 1 Check the location of the power module to be replaced.

Before pulling out a power module that is to be replaced, check its location, that is, the cabinet and chassis where the power module resides, and label the power module.

Step 2 Switch off the corresponding air circuit breaker on the power distribution cabinet. This switches off the power module to be replaced. In addition, switch off the power module to be replaced.

Step 3 Put on the ESD wrist strap and connect the grounding terminal to the ESD jack on the rack.

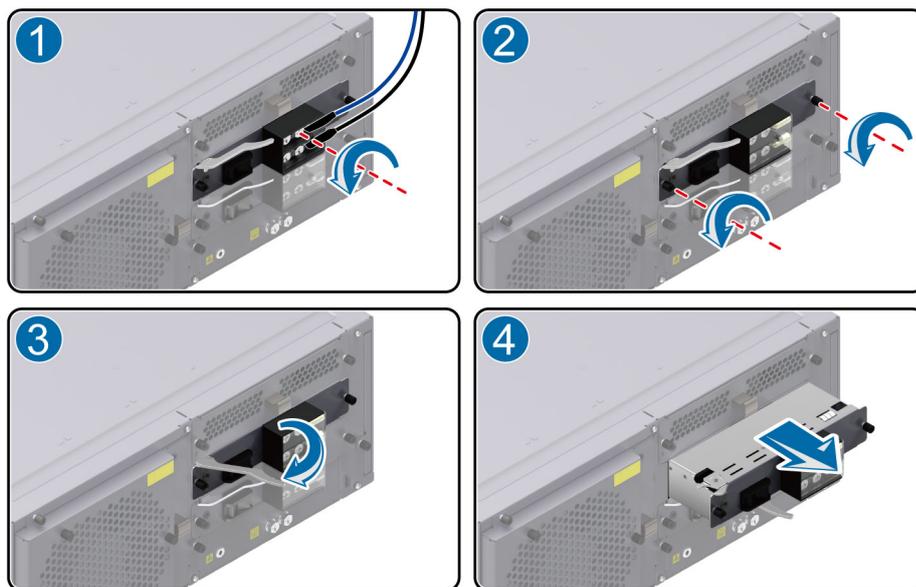
Step 4 Remove the cables from the power module to be replaced, as shown in [Figure 3-33](#) (1).

Step 5 Using the Phillips screwdriver, loosen the captive screws on both sides of the power module, as shown in [Figure 3-33](#) (2).

Step 6 Turn the ejector levers on the panel of the power module outward and upward. When the ejector levers and the panel form a 45-degree angle, the power module is removed from the backplane, as shown in [Figure 3-33](#) (3).

Step 7 Holding both sides of the power module, pull the power module out of the chassis, as shown in [Figure 3-33](#) (4).

Figure 3-33 Removing the power module on the USG9520



Step 8 Insert the backup power module into the chassis.

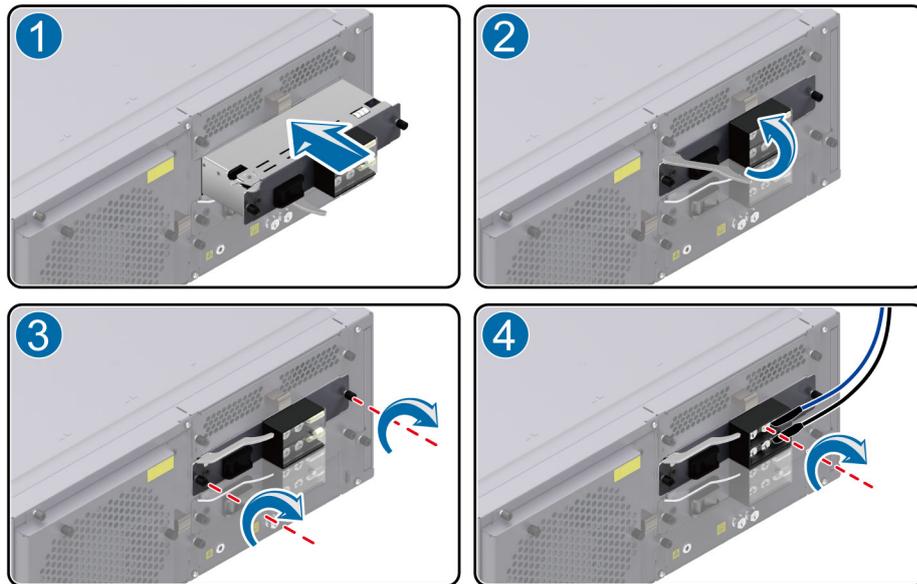
Holding both sides of the power module, insert the module into the guide rail of the slot, as shown in [Figure 3-34](#) (1). Ensure that the power module is in sufficient contact with the backplane of the chassis.

Step 9 Turn the ejector levers inward and downward with both hands until the power module touches the slot, as shown in [Figure 3-34](#)(2).

Step 10 Using the Phillips screwdriver, fasten the power module to the chassis by screwing the captive screws, as shown in [Figure 3-34](#) (3).

Step 11 Connect the cables to the power module in the original sequence, as (4) shown in [Figure 3-34](#).

Figure 3-34 Installing a power module on the USG9520



Step 12 Verify that the new power module is working normally.

After inserting the power module into the chassis, switch on the air circuit breaker on the power distribution cabinet and then switch on the power module. Then, you can check the new power module in the following ways:

- Check the RUN indicator on the panel of the power module. If it is green, the power module is working normally.
Check the ALM indicator on the panel of the power module, If it is red, the power module is not working normally.
- Run the **display device** command on the console interface to check the running status of the new power module. If the power module is working normally, the following is displayed:

```
<sysname> display device
USG9520's Device status:
Slot #   Type   Online  Register  Status   Primary
-----
1        SPU    Present Registered Normal    NA
2        SPU    Present Registered Normal    NA
3        LPU    Present Registered Normal    NA
4        MPU    Present NA       Normal    Master
5        MPU    Present Registered Normal    Slave
6        CLK    Present Registered Normal    Master
7        CLK    Present Registered Normal    Slave
8        PWR    Present Registered Normal    NA
9        PWR    Present Registered Normal    NA
10       FAN    Present Registered Normal    NA
-----
```

The preceding output also indicates that the power module has returned to the normal state. If the power module is not working normally, contact a local Huawei office for technical support.

----End

Follow-up Procedure

After replacing the power module, collect all tools. If the replaced power module is faulty, fill in the [Repair Transmission Sheet](#) and send the faulty module with the Repair Transmission Sheet to the equipment supplier or the specified repair service provider.

3.4.4 Replacing an AC Power Module of the USG9520

This section describes the procedure for replacing an AC power module of the USG9520.

Context

- Before replacing a power module, switch off the corresponding circuit breaker on the power distribution cabinet. This powers off the power module to be replaced. In addition, switch off the power module to be replaced.
- The USG9520 has two power modules. Do not power off the other during the process of removing one power module.
- The USG9520 has two types of AC power modules: 1600 W and 2200 W. [Figure 3-35](#) and [Figure 3-36](#) show the power modules respectively. These two types of power modules cannot be inserted on the same device.

Figure 3-35 R4850G2 AC power module (2200 W)



Figure 3-36 EPW30B-48A AC power module (1600 W)



NOTICE

When AC 110 V input is used, the AC power module is half-load output, which cannot support the maximum system power consumption with the full configuration. Therefore, two AC power modules are required for the device to work properly. If one AC power module fails, the other cannot support the maximum system power consumption. That is, 1+1 redundancy fails.

Tool

- ESD wrist strap or ESD gloves
- Phillips screwdriver

Procedure

Step 1 Check the location of the power module to be replaced.

Before pulling out a power module to be replaced, check its location, that is, the cabinet and chassis where the power module resides, and label the power module.

Step 2 Switch off the corresponding circuit breaker on the power distribution cabinet. This powers off the power module to be replaced. In addition, switch off the power module to be replaced.

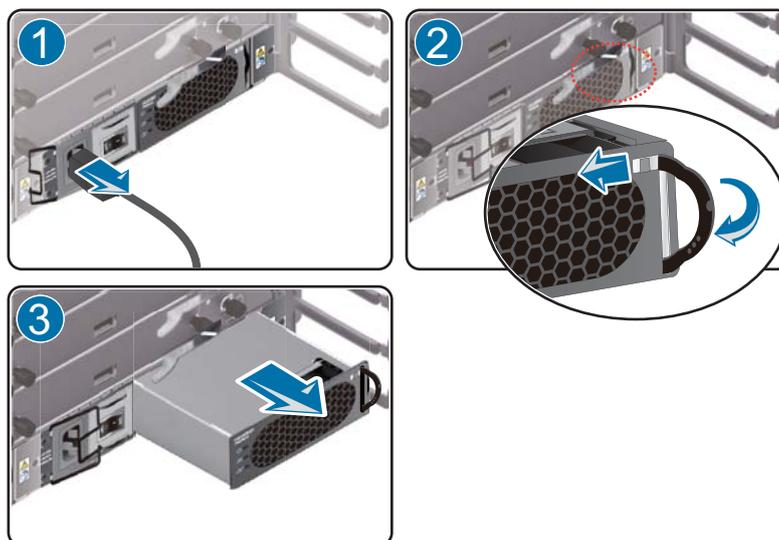
Step 3 Put on the ESD wrist strap and connect the grounding terminal to the ESD jack on the rack.

Step 4 Remove the cables from the power module to be replaced, as shown in [Figure 3-37](#) or [Figure 3-39](#) (1).

Step 5 Replace the power module as follows:

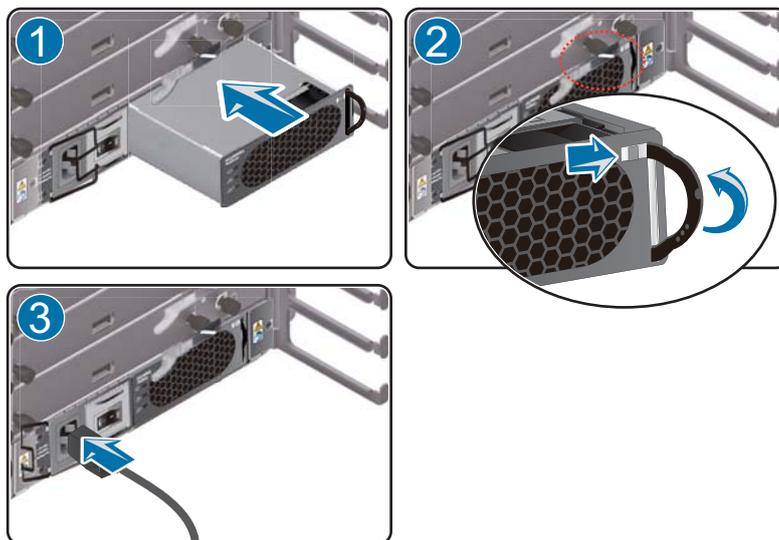
- Replace the R4850G2 power module.
 - a. Disconnect the buckle in the upper right of the power module and lower the ejector lever on the right. Holding the ejector lever, remove the power module from the slot.

Figure 3-37 Removing an R4850G2 power module on the USG9520



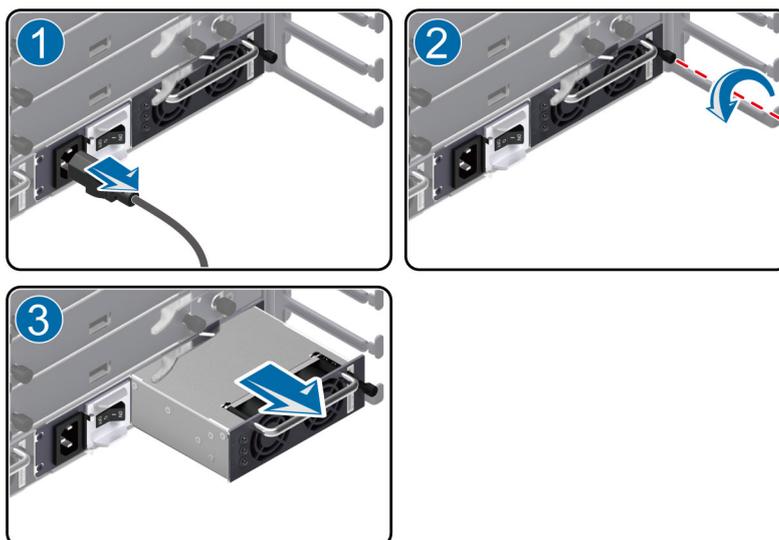
- b. Place the new power module in the slot and disconnect the buckle in the upper right. Lower the ejector lever on the right, push the power module slowly along the guide rails until it is in position. Then push the ejector lever back and fasten the buckle. Finally, connect the power cable to the new power module.

Figure 3-38 Installing the R4850G2 power module on the USG9520



- Replace the EPW30B-48A power module.
 - a. Use the Phillips screwdriver to loosen the captive screw on the right of the power module. Holding the handle, slowly pull out the power module horizontally.

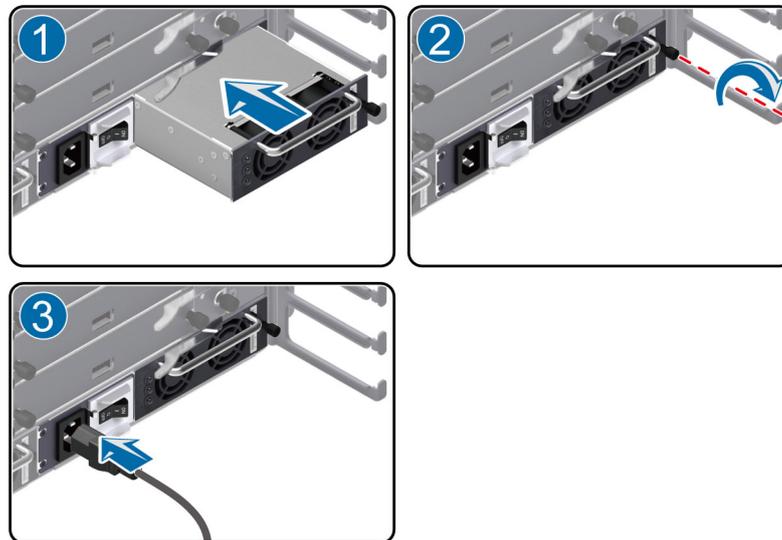
Figure 3-39 Removing an EPW30B-48A power module on the USG9520



- b. Place the new power module on the slot. Holding the handle with one hand and supporting the bottom of the power module with the other hand, slowly push the

power module along the guide rails horizontally until the power module properly connects to the backplane. Fasten the captive screw with the Phillips screwdriver and connect the power cable to the new power module.

Figure 3-40 Installing an EPW30B-48A power module on the USG9520



Step 6 Verify that the new power module is working normally.

After inserting the power module into the chassis, switch on the circuit breaker on the power distribution cabinet and then switch on the power module. Then, you can verify if the new power module is working properly in the following ways:

- Check the RUN indicator on the panel of the power module. If it is green, the power module is working normally.
Check the ALARM indicator on the panel of the power module. If it is yellow, a recoverable fault has occurred on the power module.
Check the FAULT indicator on the panel of the power module. If it is red, an unrecoverable fault has occurred on the power module.
- Run the **display device** command on the console interface to check the running status of the new power module. The power module is working normally if the following is displayed:

```
<sysname> display device
USG9520's Device status:
Slot #   Type   Online  Register   Status   Primary
-----
1        SPU    Present Registered Normal    NA
2        SPU    Present Registered Normal    NA
3        LPU    Present Registered Normal    NA
4        MPU    Present NA        Normal    Master
5        MPU    Present Registered Normal    Slave
6        CLK    Present Registered Normal    Master
7        CLK    Present Registered Normal    Slave
8        PWR    Present Registered Normal    NA
9        PWR    Present Registered Normal    NA
10       FAN    Present Registered Normal    NA
-----
```

The preceding output also indicates that the power module has returned to the normal state. If the power module fails is not working normally, contact a local Huawei office for technical support.

----End

Follow-up Procedure

After replacing the power module, collect all tools. If the replaced power module is faulty, fill in the [Repair Transmission Sheet](#) and send the faulty module with the Repair Transmission Sheet to the equipment supplier or the specified repair service provider.

3.5 Replacing a CF Card

This section describes the procedure for replacing a CF card.

3.5.1 Replacing CF Card 1

This section describes the procedure for replacing CF card 1.

Context

Before replacing CF card 1, note the following:

- CF card 1 lies on the circuit board of the MPU/SRU. Pull out the MPU/SRU before replacing CF card 1.
- The contents on the new CF card must be consistent with the contents on CF card 1.

Tool

Before replacing CF card 1, you need the following tools:

- ESD wrist strap or ESD gloves
- ESD bag

Procedure

Step 1 Check the location of the CF card to be replaced.

Before pulling out the CF card that is to be replaced, check the location of the CF card, that is, the cabinet and chassis where the CF card resides. Then, locate the MPU/SRU whose CF card is to be replaced and label the MPU/SRU.

Step 2 Check whether the MPU/SRU whose CF card is to be replaced is the active MPU/SRU.

Look at the ACT indicator on the MPU/SRU to check whether the MPU/SRU is the active. The MPU/SRU whose ACT indicator is the active. The MPU/SRU who ACT indicator is off is the standby.

Step 3 If the MPU/SRU whose the CF card is to be replaced is the active, run the following commands to perform the active/standby switchover:

```
<sysname> system-view
[sysname] slave switchover enable
[sysname] slave switchover
```

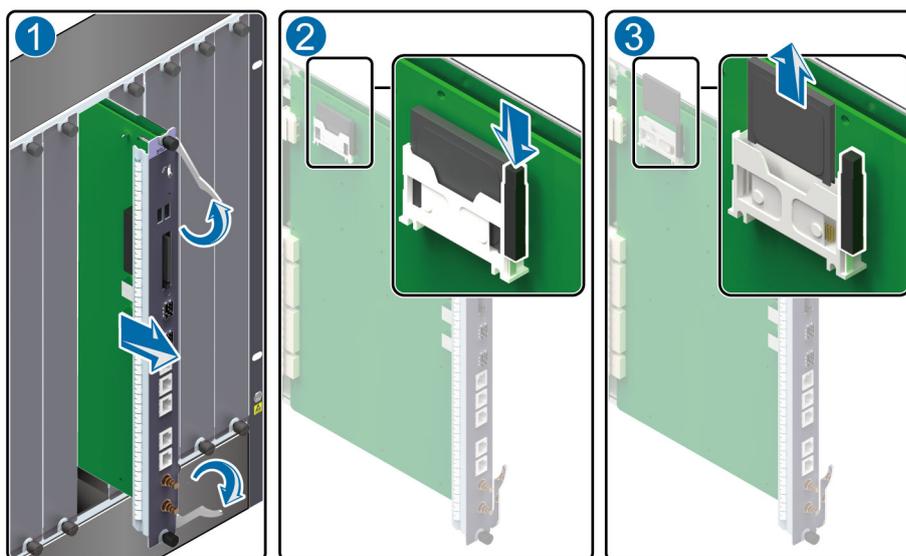
Step 4 Power off the MPU/SRU whose CF card needs to be replaced.

Press and hold the OFL button on the panel of the MPU/SRU for six seconds until the OFL indicator turns on. This means that the MPU/SRU is powered off.

Step 5 Pull out the MPU/SRU whose CF card is to be replaced and place the MPU/SRU horizontally on the worktable, as shown in [Figure 3-41](#) (1). For more details, see "[3.1.1 Replacing an MPU/SRU](#)."

Step 6 Press the button on the jack of CF card 1, as shown in [Figure 3-41](#) (2). The CF card automatically pops out. Remove the CF card vertically, as shown in [Figure 3-41](#) (3).

Figure 3-41 Pulling out CF card 1

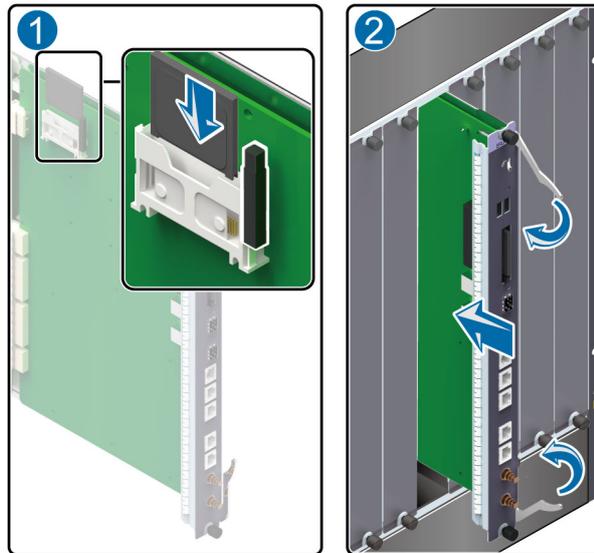


Step 7 Place the removed CF card in the ESD bag.

Step 8 Insert the new CF card into the CF card 1 slot on the MPU/SRU and push the CF card into the proper position, as shown in [Figure 3-42](#) (1).

Step 9 Insert the MPU/SRU into the chassis, as shown in [Figure 3-42](#) (2). For more details, see [3.1.1 Replacing an MPU/SRU](#).

Figure 3-42 Inserting CF card 1



Step 10 Check whether the new CF card is working normally.

You can check the running status of the new CF card in the following ways:

- Check the CF ACT indicator (green) on the panel of the MPU/SRU. If it is steady on or blinking, the new CF card is working normally.
- Run the **dir** command on the console interface to check whether the new CF card can be displayed. If the new CF card is working normally, the following is displayed:

```
<sysname> dir ?
/all          List all files
STRING<1-64> [drive][path][file name]
cfcard2:     Device name
cfcard:    Device name
slave#cfcard2: Device name
slave#cfcard: Device name
```

The preceding output also indicates that the new CF card has returned to the normal state. If the new CF card does not work normally, contact a local Huawei office for technical support.

---End

Follow-up Procedure

After replacing the CF card, collect all tools. If the replaced CF card is faulty, fill in the [Repair Transmission Sheet](#) and send the faulty module with the Repair Transmission Sheet to the equipment supplier or the specified repair service provider.

3.5.2 Replacing CF Card 2

This section describes the procedure for replacing CF card 2.

Context

Before replacing CF card 2, note the following:

- CF card 2 of a USG device supports hot swap. Therefore, before replacing CF card 2 of a USG device, press the CF OFL button on the panel of the MPU/SRU.
- CF card 2 lies on the panel of the MPU/SRU, so you do not need to pull out the MPU/SRU before replacing CF card 2.
- When CF card 2 is replaced, the device log and alarm information cannot be stored.

Tool

Before replacing CF card 2, you need the following tools:

- ESD wrist strap or ESD gloves
- ESD bag

Procedure

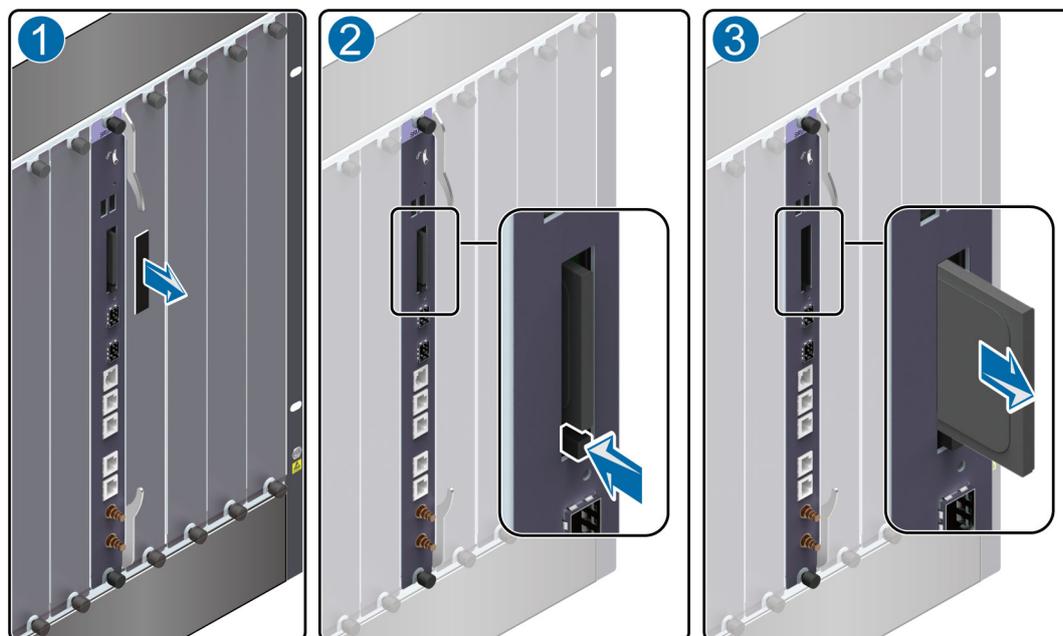
Step 1 Check the location of the CF card to be replaced.

Before pulling out the CF card that is to be replaced, check the location of the CF card, that is, the cabinet and chassis where the CF card resides. Then locate the MPU/SRU whose CF card is to be replaced and label the MPU/SRU.

Step 2 Press the CF OFL button on the panel of the MPU/SRU for about 6 seconds until the CF ACT indicator turns off.

Step 3 Open the shielding can on the CF card, as shown in [Figure 3-43](#) (1). Press the button on the CF card 2 jack, as shown in [Figure 3-43](#) (2). The CF card automatically pops out. Remove the CF card, as shown in [Figure 3-43](#) (3).

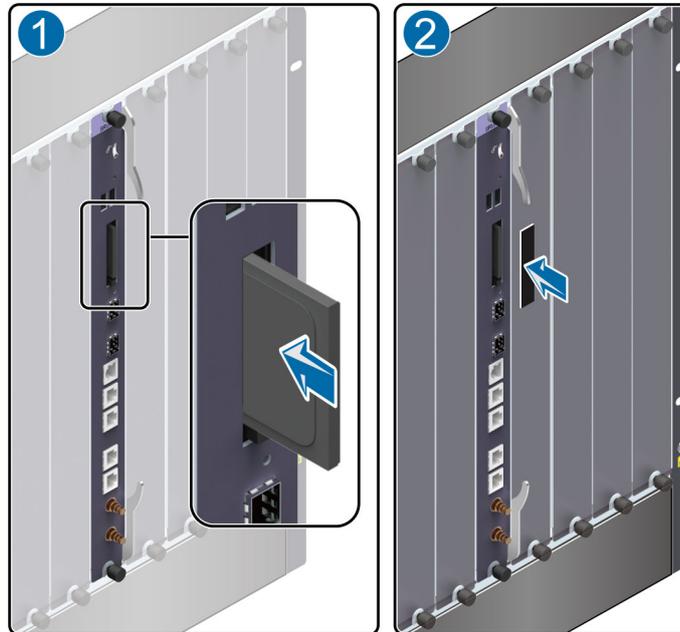
Figure 3-43 Pulling out CF card 2



Step 4 Place the removed CF card in the ESD bag.

- Step 5** Insert the new CF card into the CF card 2 slot the MPU/SRU and push it in the proper position, as shown in **Figure 3-44** (1). Close the shielding can properly, as shown in **Figure 3-44** (2).

Figure 3-44 Inserting CF card 2



- Step 6** Check whether the new CF card is working properly.

You can check the running status of the new CF card in the following ways:

- Check the CF ACT indicator (green) on the panel of the MPU/SRU. If it is steady on or blinking, the new CF card is working normally.
- Check the alarms. If the system does not generate any alarm related to the new MPU/SRU, the CF card is working properly.
- Run the **dir** command on the console interface to check whether the new CF card can be displayed. If the new CF card is working normally, the following is displayed:

```
<sysname> dir ?
/all          List all files
STRING<1-64> [drive][path][file name]
cfcard2:     Device name
cfcard:      Device name
slave#cfcard2: Device name
slave#cfcard: Device name
<cr>
```

The preceding output also indicates that the new CF card has returned to the normal state. If the new CF card does not work normally, contact a local Huawei office for technical support.

----End

Follow-up Procedure

After replacing the CF card, collect all tools. If the replaced CF card is faulty, fill in the [Repair Transmission Sheet](#) and send the faulty module with the Repair Transmission Sheet to the equipment supplier or the specified repair service provider.

3.6 Replacing an Optical Module

This section describes the procedure for replacing an optical module.

Context

Before replacing an optical module, note the following:

- Replacing an optical module interrupts services. Ensure that the optical module is faulty before replacing it.
- Only external optical modules can be replaced. Internal optical modules can not be replaced.
- You need to take antistatic measures before replacing an optical module.
- When replacing an optical module, you do not need to swap boards.
- When removing or inserting optical cables, be careful not to damage the optical cable connector.
- When replacing an optical module, do not look directly into the fiber connector because the laser may harm your eyes.



CAUTION

An optical module is an electrostatic sensitive device. Therefore, you must take antistatic measures during the whole process of replacing an optical module to prevent the optical module from being damaged

NOTE

Currently, the USG9500 supports SFP, XFP, SFP+, CFP, and QSFP+ optical modules. Here, the SFP optical module is used as an example.

Tool

Before replacing an optical module, you need the following tools:

- ESD wrist strap or ESD gloves
- ESD bag

Procedure

Step 1 Check the location of the optical module to be replaced.

Before pulling out an optical module that is to be replaced, first check the location of the module, that is, the cabinet and chassis where the optical module resides, and label the optical module.

Step 2 Run the **display interface interface-type interface-number** command to view and record the type of the optical module to be replaced. The following displays the type in bold:

```
<sysname> display interface gigabitethernet2/0/1
GigabitEthernet2/0/1 current state : DOWN
Line protocol current state : DOWN
Description : Huawei, GigabitEthernet2/0/1 Interface, Route Port
The Maximum Transmit Unit is 1500 bytes
Internet Address is 172.16.1.1/24
IP Sending Frames' Format is PKTFMT_ETHNT_2, Hardware address is 00e0-fcd4-7aad
The Vendor PN is SCP6F86-GL-CWH
Port BW: 1G, Transceiver max BW: 1G, Transceiver Mode: MultiMode
WaveLength: 850nm, Transmission Distance: 300m
Loopback:none, full-duplex mode, negotiation: disable, Pause Flowcontrol:Send and Receive Enable
Statistics last cleared: never
Last 30 seconds input rate: 0 bits/sec, 0 packets/sec
Last 30 seconds output rate: 0 bits/sec, 0 packets/sec
Input: 0 bytes, 0 packets
Output: 0 bytes, 0 packets
Input:
  Unicast: 0, Multicast: 0
  Broadcast: 0, Jumbo: 0
  CRC: 0, Symbol: 0
  Overrun: 0 , InRangeLength: 0
  LongPacket: 0 , Jabber: 0, Alignment: 0
  Fragment: 0, Undersized Frame: 0
  RxPause: 0
---- More ----
```

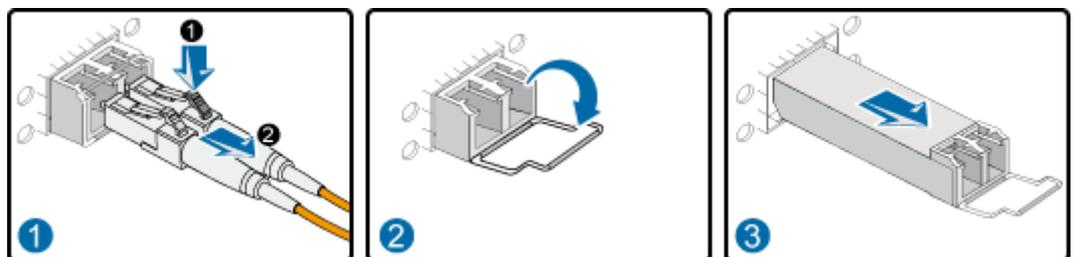
Step 3 Record the location of the cables and check whether the labels on the cables are correct and clear. If the labels are not clear, re-make labels and re-label the cables.

Step 4 Wear the ESD gloves or wrist strap and connect the grounding terminal to the ESD jack on the rack.

Step 5 Pull out the optical module to be replaced.

1. Remove the optical cables from the connector and cover the connector with a dust cap.
2. Turn the optical module flap downward, as shown in [Figure 3-45](#).
3. Hold the flap to pull out the optical module carefully from the optical interface, as shown in [Figure 3-45](#).
4. Place the removed optical module in the ESD bag.

Figure 3-45 Pulling out an optical module



Step 6 Insert the new optical module into the optical interface.

1. Take out the new optical module from the ESD bag and check whether there is any damage to it or component missing. Check whether the new optical module is of the same type as the optical module to be replaced.

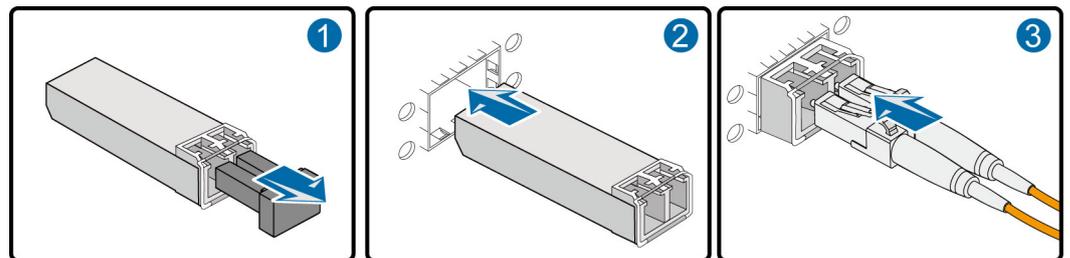
2. Insert the new optical module into the optical interface, as shown in [Figure 3-46](#). The optical module is correctly inserted when you hear its reed click into place.



CAUTION

If you cannot completely insert an optical module into an interface, do not force it. Instead, re-orient the module and insert it into the interface again.

Figure 3-46 Inserting an optical module



3. Remove the dust cap from the connector and insert the optical cables in the original sequence.

Step 7 Verify that the new optical module is working normally.

Verify that the new optical module is working normally in the following ways:

- Check the LINK indicator on the optical interface. If the indicator is green, the links connected to the interface are Up.
- Run the **display interface interface-type interface-number** command on the console interface to view the type and running status of the new optical module. Check whether the type of the new optical module corresponds to that of the original optical module, as is displayed in bold as follows:

```
<sysname> display interface gigabitethernet2/0/1
GigabitEthernet2/0/1 current state : UP
Line protocol current state : UP
Description : Huawei, GigabitEthernet2/0/1 Interface, Route Port
The Maximum Transmit Unit is 1500 bytes
Internet Address is 172.16.1.1/24
IP Sending Frames' Format is PKTFMT_ETHNT_2, Hardware address is 00e0-fcd4-7aad
The Vendor PN is SCP6F86-GL-CWH
Port BW: 1G, Transceiver max BW: 1G, Transceiver Mode: MultiMode
WaveLength: 850nm, Transmission Distance: 300m
Loopback:none, full-duplex mode, negotiation: disable, Pause Flowcontrol:Send and Receive Enable
Statistics last cleared: never
  Last 30 seconds input rate: 0 bits/sec, 0 packets/sec
  Last 30 seconds output rate: 0 bits/sec, 0 packets/sec
  Input: 0 bytes, 0 packets
  Output: 0 bytes, 0 packets
  Input:
    Unicast: 0, Multicast: 0
    Broadcast: 0, Jumbo: 0
    CRC: 0, Symbol: 0
    Overrun: 0 , InRangeLength: 0
    LongPacket: 0 , Jabber: 0, Alignment: 0
```

```
Fragment: 0, Undersized Frame: 0  
RxPause: 0  
---- More ----
```

- Check whether there is any new alarm or performance event.
- Check whether the services are normal on the new optical module. If the services are normal, replacement is successful.

If the new optical module is not working normally, contact a local Huawei office for technical support.

----End

Follow-up Procedure

After replacing the optical module, collect all tools. If the replaced optical module is faulty, fill in the [Repair Transmission Sheet](#) and send the faulty module with the Repair Transmission Sheet to the equipment supplier or the specified repair service provider.

3.7 Replacing an Air Filter

This section describes the procedure for replacing an air filter.

3.7.1 Replacing the Air Filter of the USG9580

This section describes the procedure for replacing the air filter on the USG9580.

Precautions

To ensure proper heat dissipation and ventilation for the system and to prevent the accumulation of dust in the air filter, clean the air filter at least once every three months and replace it once a year. If the environment is especially dusty, clean the air filter more frequently.

Configuring a Cleaning Cycle for the Air Filter

You can configure a cleaning cycle for the air filter on the chassis using the **dustproof check-timer day *days*** command in the system view.

When the air filter has already been running for a period of time, the system generates an alarm to remind you to clean the air filter. You can use the **reset dustproof run-time** command to clear the alarm and re-count the runtime of the air filter. The default cleaning cycle is 90 days. The value 0 indicates that the air filter monitoring is stopped.

NOTE

The air filter does not have memory. All monitored information is saved on the MPU, which may be inserted, removed, switched, or replaced at any time. Therefore, the monitoring cycle may differ from the set cycle. However, this does not affect the monitoring function.

Tools

ESD wrist strap or ESD gloves

Procedure

Step 1 Check the location of the air filter to be replaced.

Before removing the old air filter, check its location, that is, the cabinet and chassis where the air filter resides, and then label the air filter.

Step 2 Put on the ESD wrist strap and connect the grounding terminal to the ESD jack on the chassis.

Step 3 Remove the air filter from the air intake frame.

1. There is an air intake frame on the upper and lower chassis. Place your fingers into the holes on both sides of the panel to pull it out of the air intake frame. Then remove the air filter from the panel of the air intake frame, as shown in [Figure 3-47](#).

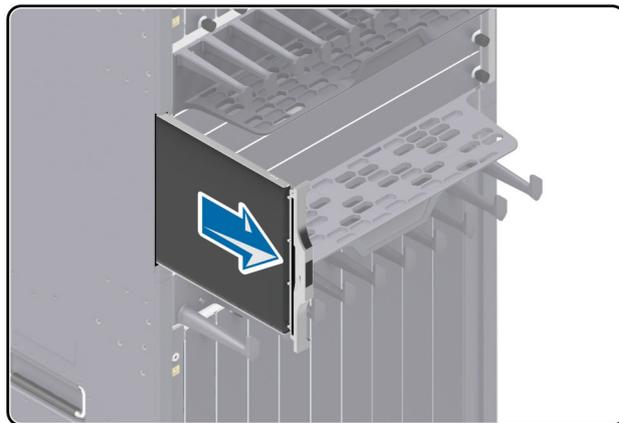
Figure 3-47 Removing the air filter from the air intake frame on the USG9580



Step 4 Remove the air filter from the SFU area.

1. The air filter is located on the left halfway up the chassis. When removing the air filter, hold the upper handle of the air filter with one hand and pull the air filter out horizontally, as shown in [Figure 3-48](#).

Figure 3-48 Removing the air filter from the SFU area on the USG9580



Step 5 Install an air filter on the air intake frame.

1. Place the clean and dry air filter onto the panel of the air intake frame. Put your fingers in the holes on both sides of the panel to install the panel back into its original position, as shown in [Figure 3-49](#).

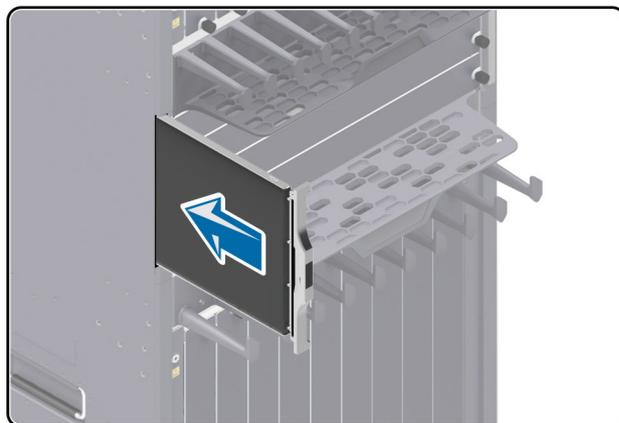
Figure 3-49 Installing the air filter on the air intake frame of the USG9580



Step 6 Install an air filter in the SFU area.

1. Supporting the bottom of the air filter with one hand and holding the handle on the air filter with the other hand, insert the clean and dry air filter into the chassis horizontally, as shown in [Figure 3-50](#).

Figure 3-50 Installing the air filter in the SFU area on the USG9580



---End

Follow-up Procedure

- Gather up and store the tools.
- Dispose of the replaced air filter according to the compliance and safety standards.

3.7.2 Replacing the Air Filter of the USG9560

This section describes the procedure for replacing the air filter on the USG9560.

Precautions

To ensure good heat dissipation and ventilation for the system and to prevent the accumulation of dust on an air filter, you need to clean the air filter regularly. It is recommended that an air filter be cleaned at least once every three months and be replaced once every year. When an air filter is placed in the dusty environment, it needs to be cleaned more frequently.

Configuring a Cleaning Cycle for the Air Filter

You can configure a cleaning cycle using the **dustproof check-timer day *days*** command in the system view.

When the air filter has already been running for a period of time, the system generates an alarm to remind you to clean the air filter. You can use the **reset dustproof run-time** command to clear the alarm and re-count the runtime of the air filter. The default cleaning cycle is 90 days. The value 0 indicates that the air filter monitoring is stopped.

 **NOTE**

The air filter does not have memory. All monitored information is saved on the MPU, which may be inserted, removed, switched, or replaced at any time. Therefore, the monitoring cycle may differ from the set cycle. However, this does not affect the monitoring function.

Tools

ESD wrist strap or ESD gloves

Procedure

Step 1 Check the location of the air filter to be replaced.

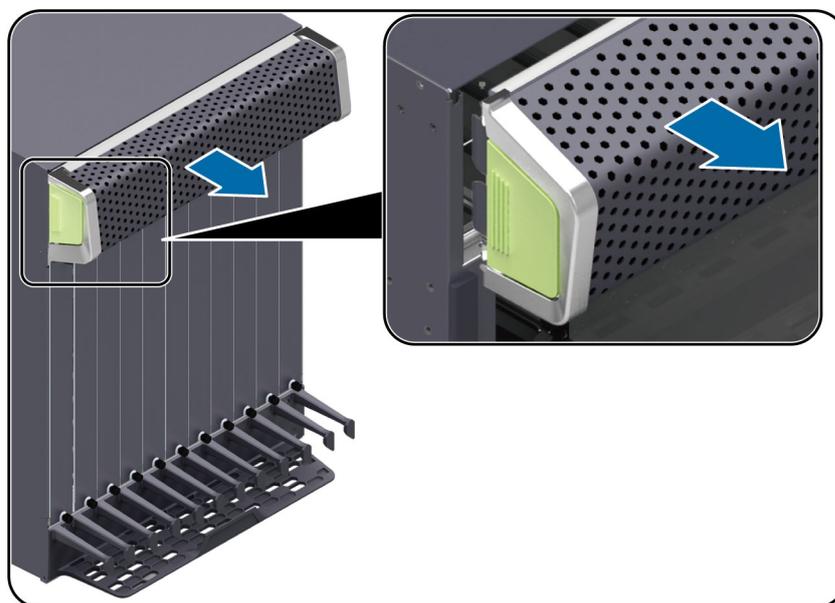
Before removing the old air filter, check its location, that is, the cabinet and chassis where the air filter resides, and then label the air filter.

Step 2 Put on the ESD wrist strap and connect the grounding terminal to the ESD jack on the chassis.

Step 3 Remove the air filter from the air intake frame.

1. Place your fingers into the holes on both sides of the panel to pull it out of the air intake frame. Then remove the air filter from the panel of the air intake frame, as shown in [Figure 3-51](#).

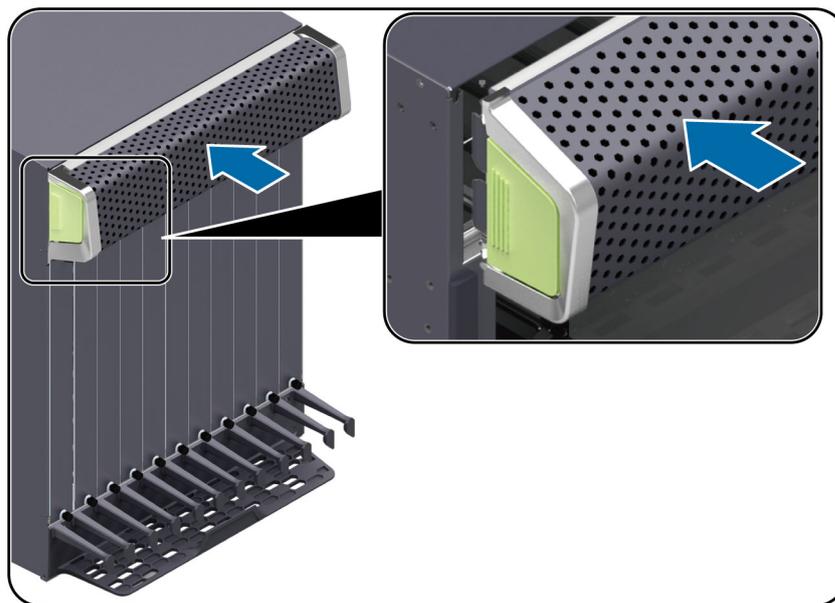
Figure 3-51 Removing the air filter from the air intake frame on the USG9560



Step 4 Install an air filter on the air intake frame.

1. Place a clean and dry air filter onto the air intake frame and press it into place. Install the panel of the air intake frame back in its original position in the chassis, as shown in [Figure 3-52](#).

Figure 3-52 Installing the air filter on the air intake frame of the USG9560



---End

Follow-up Procedure

- Gather up and store the tools.
- Dispose of the replaced air filter according to the compliance and safety standards.

3.7.3 Replacing the Air Filter of the USG9520

This section describes the procedure for replacing the air filter on the USG9520.

Context

To ensure proper heat dissipation and ventilation for the system, and to prevent the accumulation of dust on the air filter, you need to clean the air filter regularly. It is recommended that an air filter be cleaned at least once every three months and be replaced once every year. When an air filter is placed in the dusty environment such as an equipment room, the air filter should be cleaned more frequently.

NOTE

The method for replacing an air filter of the USG9520 chassis configured with DC power supply is the same as that of replacing an air filter on a chassis configured with AC power supply.

Configuring a Cleaning Cycle for the Air Filter

You can configure a cleaning cycle for the air filter on the chassis using the **dustproof check-timer day** *days* command in the system view.

When the air filter has already been running for a period of time, the system generates an alarm to remind you to clean the air filter. You can use the **reset dustproof run-time** command to clear the alarm and re-count the runtime of the air filter. The default cleaning cycle is 90 days. The value 0 indicates that the air filter monitoring is stopped.

 **NOTE**

The air filter does not have memory. All monitored information is saved on the MPU, which may be inserted, removed, switched, or replaced at any time. Therefore, the monitoring cycle may differ from the set cycle. However, this does not affect the monitoring function.

Tool

Before replacing an air filter, you need the following tools:

- ESD wrist strap or ESD gloves
- Phillips screwdriver

Procedure

Step 1 Check the location of the air filter to be replaced.

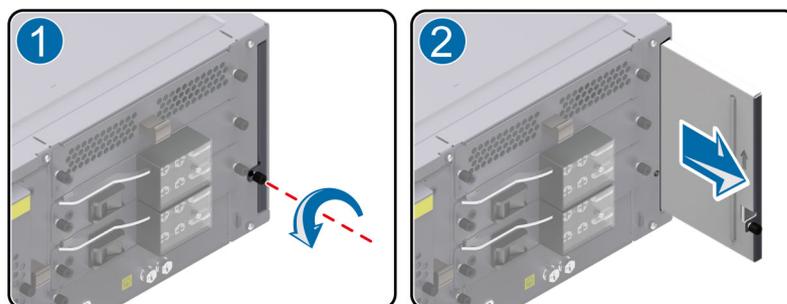
Before pulling out an air filter that is to be replaced, check its location, that is, the cabinet and chassis where the air filter resides and then label the air filter.

Step 2 Put on the ESD wrist strap and connect the grounding terminal to the ESD jack on the rack.

Step 3 Remove the air filter from the air intake frame.

1. The air filter is located behind the device. Loosen the captive screws on the panel on the rear of the device, as shown in [Figure 3-53](#) (1).
2. Holding the panel of the air filter, slowly pull the air filter out until it leaves the chassis, as shown in [Figure 3-53](#) (2).

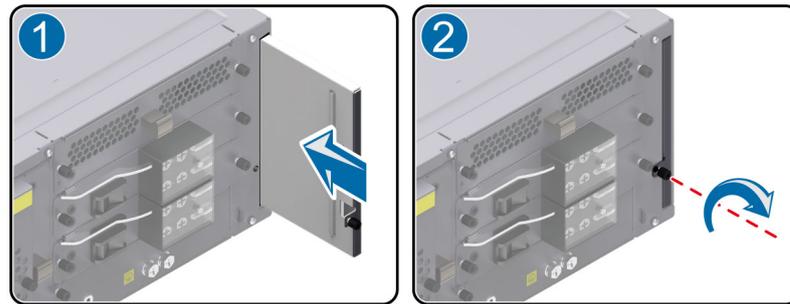
Figure 3-53 Removing the air filter from the air intake frame on the USG9520



Step 4 Install a clean and dry air filter in the air intake frame.

1. Insert the clean and dry air filter into the chassis, as shown in [Figure 3-54](#) (1).
2. Fasten the captive screws onto the panel of the air filter, as shown in [Figure 3-54](#) (2).

Figure 3-54 Installing the air filter of the air intake frame on the USG9520



---End

Follow-up Procedure

- Gather up and store the tools.
- Dispose of the replaced air filter according to the compliance and safety standards.

3.8 Replacing Cables

This section describes the precaution and procedure for replacing the power cable, network cable, trunk cable, and optical cable.

3.8.1 Replacing a Power Cable

This section describes the procedure for replacing a power cable.

Context

Before replacing a power cable, note the following:

- Ensure that service data is backed up before replacing a power cable.
- Before operating the device, make sure to cut off all input power supplies to the power distribution cabinet, and label the switch to be used.
- The DC power cable terminals and other exposed surfaces must be fully insulated.

Tool

Before replacing a power cable, you need the following tools:

- Power module terminal
- Power cable
- ESD wrist strap
- Phillips screwdriver

Procedure

Step 1 Record the location of both ends of the power cable to be replaced and the cabling mode.

- Step 2** Make a new power cable. For details, refer to [A.2 On-site Cable Assembly and Installation](#).
- Step 3** Loosen the screws on the terminal of the power module with a wrench. Then, remove the terminal. Pull out the power cable from the guide-in hole on the cabinet.
- Step 4** Install the power cable. Pass the new power cable through the guide-in hole on the cabinet, and connect the terminal of the power module to the input terminal of the power module in the power distribution cabinet. Then, tighten the setscrews with a wrench.
- Step 5** Make new labels according to the contents of the labels on the old power cable. For label regulations, refer to the [A.5 Engineering Labels for Cables](#).

----End

Follow-up Procedure

- Gather up and store the tools and the old cable.
- Separate the old and new cables to avoid confusion.

3.8.2 Replacing a Network Cable

This section describes the procedure for replacing a network cable.

Context

Before replacing a network cable note the following:

- When network cables are replaced, services are interrupted temporarily.
- Replace network cables during a time when the network is not busy, for example, between 00:00 am and 06:00 am.

Tool

Before replacing a network cable, you need the following tools:

- Cutter
- Cable ties
- ESD wrist strap or ESD gloves
- Cable tester
- Crimper

Procedure

- Step 1** Check the location and cabling of the network cable to be replaced.
- Step 2** Prepare a new network cable that of the same type as old network cable. After a new network cable is made, test its connectivity with a cable tester.
- Step 3** Put on the ESD gloves or wrist strap and connect the grounding terminal to the ESD jack on the rack.
- Step 4** Lay out the new network cable according to the original cabling mode.

If you need to replace more than one network cable at a time and label the new network cables so that you can distinguish between them. The new network cables must be numbered consistently with the network cables to be replaced.

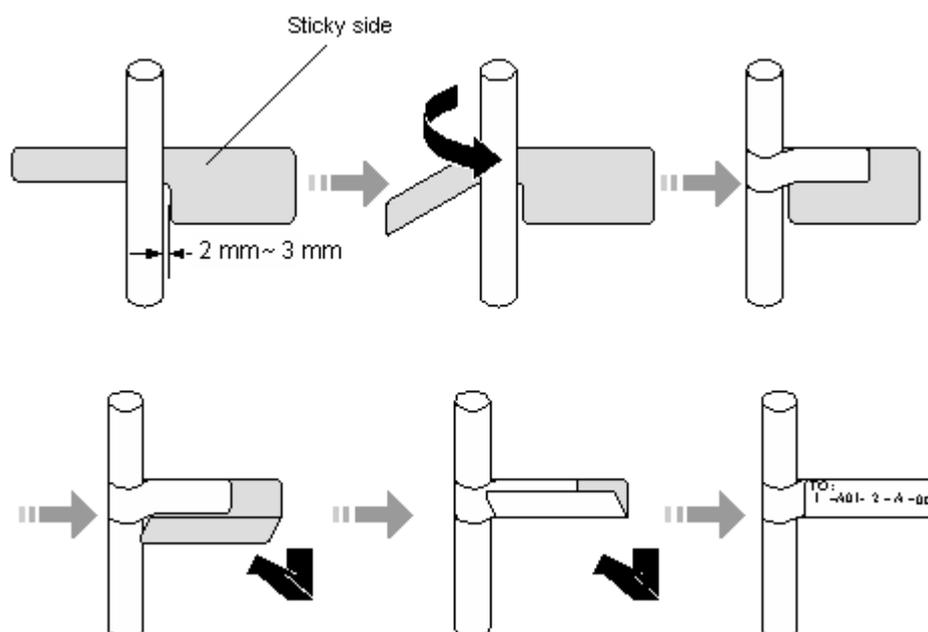
Step 5 Remove the old network cable and record the location where it is installed.

1. Remove the network cable connectors.
2. Cut the cable tie with a cutter and remove the network cable.

Step 6 Insert the new network cable connector into the network interface at the reported location. If you hear a click, the connector is fully inserted. If the indicator of the network interface is steady green, the link is Up.

Step 7 Label the new network cable, as shown in [Figure 3-55](#).

Figure 3-55 Labeling a new network cable



Step 8 Bind the cable with a cable tie and cut off any extra lengths of tie.

Step 9 Run the **ping** command to check the connection between both ends of the new network cable. If both ends fail to communicate normally, check whether the network cable is damaged or connectors are secure.

----End

Follow-up Procedure

- Gather up and store the tools and the old cable.
- Separate the old and new cables to avoid confusion.

3.8.3 Replacing an Optical Cable

This section describes the procedure for replacing an optical cable.

Context

Before replacing an optical cable, note the following:

- During the process of replacing an optical cable, the services are interrupted temporarily.
- Be careful when you remove or insert an optical cable in case that the connector of the optical cable is damaged.
- When installing or maintaining an optical interface board or an optical cable, do not observe an optical interface or connectors of an optical cable.
- The curvature radius of an optical cable should be 20 times greater than its diameter. Generally, the curvature radius should be greater than 40 mm.
- Connectors of optical cables are divided into the LC type and the SC type. You must select an optical cable according to the interface type.

Tool

Before replacing an optical cable, you need the following tools:

- Cutter
- Binding strap
- ESD wrist strap or ESD gloves

Procedure

Step 1 Record the location of both ends of the optical cable to be replaced and the cabling mode.

Step 2 Take out the new optical cable and check whether the type of the new optical cable is consistent with that of the old one. The multi-mode optical cable is orange, and the single-mode optical cable is yellow.

Step 3 Make a new label based on information from the old optical cable label.

Step 4 Lay out the new optical cable in the original place.

Step 5 Remove the old optical cable.

1. Put on the ESD gloves or wrist strap and connect the grounding terminal to the ESD jack on the rack.
2. Remove the connectors. Then, cover the connectors with dust caps.

 **NOTE**

If a connector is dusty, clean it with a dust cloth or fiber cleaning tissue.

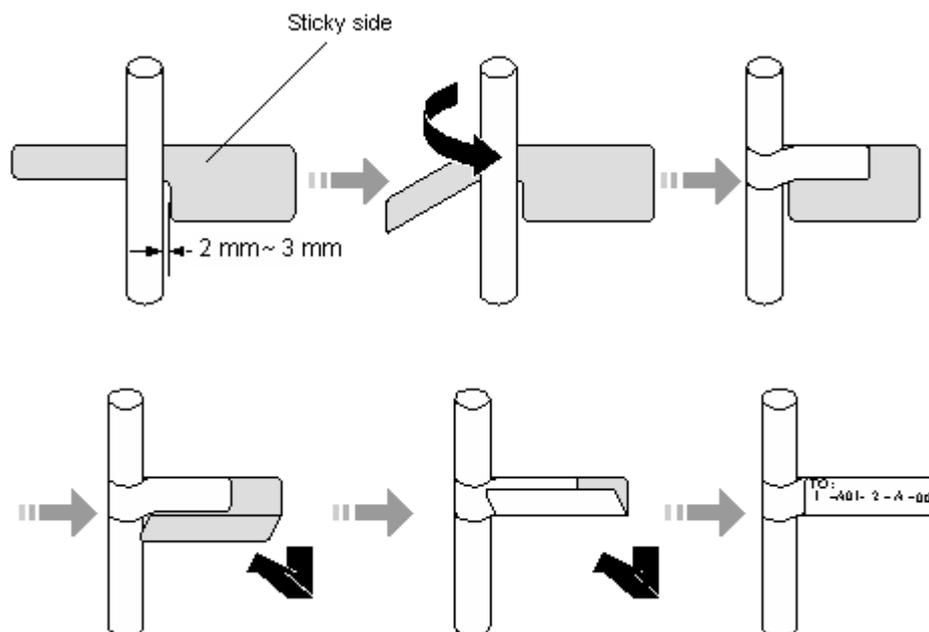
3. Remove the old optical cable from the corrugated pipe.

Step 6 Insert the new optical cable.

Before inserting the new optical cable, remove the dust caps store them for future use. Then, connect both ends of the new optical cable to the optical interfaces.

Step 7 Label the new optical cable, as shown in [Figure 3-56](#).

Figure 3-56 Labeling a new optical cable



Step 8 Lay out the new optical cable neatly in the cabinet and bind the cable with a binding strap. The optical cable must be bound with adequate tightness and leaving enough space. Bind any extra cable to the ODF side.

Step 9 Check whether the new optical cable is working normally.

- Check the LINK indicator at the optical interface. If the indicator is steady green, the link is Up.
- Check whether the service on the board where the new optical cable connects is normal. If services are normal, the optical cable is replaced successfully.
- Check whether there is any new alarm or performance event.

----End

Follow-up Procedure

- Gather up and store the tools and old optical cable.
- Separate the old and the optical cables to avoid confusion.

A Appendix

This chapter describes the specifications of the USG9500 as well as the cables and environmental requirements for device running.

[A.1 Cable](#)

This section describes the PGND cable, power cable, configuration cable, Ethernet cable, and optical fiber of the USG9500.

[A.2 On-site Cable Assembly and Installation](#)

This section describes how to assemble and install power cables, Ethernet cables, and other cables.

[A.3 Environmental Requirements for Device Running](#)

This section describes the environment requirements for device running, including the requirements for the equipment room environment and power supply conditions.

[A.4 Equipment Grounding Specifications](#)

This section describes grounding specifications, including general grounding specifications, the grounding specifications for equipment rooms, devices, communication power modules, signal cables, and signal cables, and the specifications for laying out ground cables.

[A.5 Engineering Labels for Cables](#)

This section provides an overview of labels and describes the labels for optical fibers, Ethernet cables, and power cables.

[A.6 Requirements for Customers' Cabinets Purchased from Other Vendors](#)

This section describes the requirements on customers' cabinets purchased from other vendors.

[A.7 Fault Tag](#)

A.1 Cable

This section describes the PGND cable, power cable, configuration cable, Ethernet cable, and optical fiber of the USG9500.

A.1.1 DC Power Cable

This section describes the DC power cables of the USG9500 with DC power supply. Learn about the structure and specifications of the DC power cable before you make or purchase any power cables for the USG9500.

A.1.1.1 DC Power Cable of the USG9580

This section describes the DC power cable of the USG9580.

DC power cables are used as:

- DC-input power cables.
- Cables between the AC power chassis and device.

Structure and Appearance

The DC power cable consists of a -48 V power cable NEG(-), and a cable RTN (+). The power cable transfers -48 V DC from the DC distribution equipment to the terminal block of the USG9500 power module, supplying power for the USG9500.

The DC power cables of the USG9500 are delivered in an integrated way. Cut the power cables to adjust them according to site requirements. [Figure A-1](#) and [Figure A-2](#) show the two power cables.

Figure A-1 NEG(-)



Figure A-2 RTN (+)



DC cable terminals vary based on the device. Two commonly used terminals are the OT bare crimping terminal and the JG2 double-hole bare crimping terminal.

Bare crimping terminals must be crimped on both ends of the power cable.

Figure A-3 shows the OT bare crimping terminal without a cable.

Figure A-3 OT bare crimping terminal

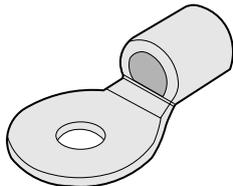
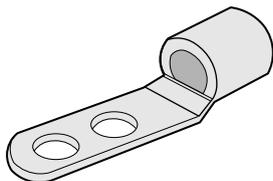


Figure A-4 shows the JG2 double-hole bare crimping terminal without a cable.

Figure A-4 JG2 double-hole bare crimping terminal



NOTICE

If the power supply distance is longer than 35 m, you must place the DC power distribution cabinet closer to the USG9500.

Prepare cables according to the distance between the USG9500 and the power distribution cabinet.

Power Supply Distance Shorter Than 3 m (Cables Between the AC power chassis and the USG9580)

Place the AC power chassis as close to the device as possible. If the distance is shorter than or equal to 3 m, use the cabling scheme described in [Table A-1](#).

Table A-1 Cable types and terminals of the AC-input power cable

Item		Description
Cable Type	NEG power cable (-48 V)	Wire,450/750V,60227 IEC 02(RV)16mm ² ,blue,85A
	RTN power cable	Wire,450/750V,60227 IEC 02(RV)16mm ² ,black,85A
Terminal	USG9580 terminal	Naked Crimping Terminal,JG2,16mm ² ,M6,95A,Tin Plated,for OEM
	AC power chassis	Naked Crimping Terminal,JG2,16mm ² ,M6,95A,Tin Plated,for OEM

Power Supply Distance Shorter Than or Equal to 15 m

If the power supply distance is shorter than or equal to 15 m, use the 16 mm² power cable to connect the USG9580 and the power distribution cabinet. [Table A-2](#) lists the cable terminals and cable types.

Table A-2 Cables for power supply distance shorter than or equal to 15 m

Item		Description
Cable type	NEG power cable (-48 V)	Wire,450/750V,60227 IEC 02(RV)16mm ² ,blue,85A
	RTN power cable	Wire,450/750V,60227 IEC 02(RV)16mm ² ,black,85A
Terminal	USG9580	Naked Crimping Terminal,JG2,16mm ² ,M6,95A,Tin Plated,for OEM
	DC power distribution cabinet	Naked Crimping Terminal,OT,16mm ² ,M8,Tin Plating,Naked Ring Terminal

Power Supply Distance Longer Than 15 m or Shorter Than or Equal to 25 m

If the power supply distance is longer than 15 m or shorter than or equal to 25 m, use the 25 mm² power cable to connect the USG9580 to the power distribution cabinet. [Table A-3](#) lists the cable terminals and cable types.

Table A-3 Cables for power supply distance longer than 15 m or shorter than or equal to 25 m

Item		Description
Cable type	NEG power cable (-48 V)	Wire,450/750V,227 IEC 02(RV)25mm ² ,blue,110A
	RTN power cable	Wire,450/750V,227 IEC 02(RV)25mm ² ,black,110A
Terminal	USG9580	Naked Crimping Connector,JG2,25mm ² ,M6,150A,Tin Plating,For OEM
	DC power distribution cabinet	Naked Crimping Terminal,OT,25mm ² ,M8,Tin Plating,Naked Ring Terminal

Power Supply Distance Longer Than 25 m or Shorter Than or Equal to 35 m

If the power supply distance is longer than 25 m or shorter than or equal to 35 m, use the 35 mm² power cable to connect the USG9580 and the power distribution cabinet. [Table A-4](#) lists the cable terminals and cable types.

Table A-4 Cables for power supply distance longer than 25 m or shorter than or equal to 35 m

Item		Description
Cable type	NEG power cable (-48 V)	Wire,450/750V,60227 IECs 02(RV)35mm ² ,Blue,135A
	RTN power cable	Wire,450/750V,60227 IEC 02(RV)35mm ² ,black,135A
Terminal	USG9580	Naked Crimping Connector,JG2,34.3mm ² ,M6(1/4"),134A,Tin Plated,2AWG,Hole Center Distance 15.875mm(5/8"),Short Tube,for North American
	DC power distribution cabinet	Naked Crimping Terminal,OT,35mm ² ,M8,Tin Plating,Naked Ring Terminal

A.1.1.2 DC Power Cable of the USG9560

This section describes the DC power cable of the USG9560.

DC power cable uses as:

- DC-input power cable.
- The cable between the AC power chassis and the device.

Structure and Appearance

The DC power cable consists of a -48 V power cable NEG(-), and a cable RTN (+). The power cable transfers -48 V DC from the DC distribution equipment to the terminal block of the USG9500 power module, supplying power for the USG9500.

The DC power cables of the USG9500 are delivered in an integrated way. Cut the power cables to adjust them according to site requirements. [Figure A-5](#) and [Figure A-6](#) show the two power cables.

Figure A-5 NEG(-)



Figure A-6 RTN (+)



DC cable terminals vary based on the device. Two commonly used terminals are the OT bare crimping terminal and the JG2 double-hole bare crimping terminal.

Bare crimping terminals must be crimped on both ends of the power cable.

[Figure A-7](#) shows the OT bare crimping terminal without a cable.

Figure A-7 OT bare crimping terminal

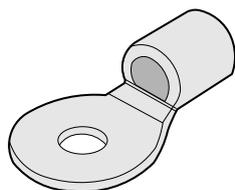
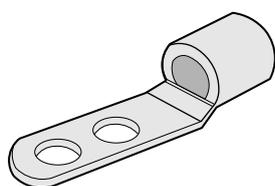


Figure A-8 shows the JG2 double-hole bare crimping terminal without a cable.

Figure A-8 JG2 double-hole bare crimping terminal



NOTICE

If the power supply distance is longer than 35 m, you must place the DC power distribution cabinet closer to the USG9500.

Prepare cables according to the distance between the USG9500 and the power distribution cabinet.

Power Supply Distance Shorter Than 3 m (Cables Between the AC power chassis and the USG9560)

Place the AC power chassis as close to the device as possible. If the distance is shorter than or equal to 3 m, use the cabling scheme described in [Table A-5](#).

Table A-5 Cable types and terminals of the AC-input power cable

Item		Description
Cable Type	NEG power cable (-48 V)	Wire, 450/750V, 60227 IEC 02(RV) 16mm ² , blue, 85A
	RTN power cable	Wire, 450/750V, 60227 IEC 02(RV) 16mm ² , black, 85A

Item		Description
Terminal	USG9560	Naked Crimping Terminal,JG2,16mm ² ,M6,95A,Tin Plated,for OEM

Power Supply Distance Shorter Than or Equal to 15 m

If the power supply distance is shorter than or equal to 15 m, use the 16 mm² power cable to connect the USG9560 and the power distribution cabinet. [Table A-6](#) lists the cable terminals and cable types.

Table A-6 Cables for power supply distance shorter than or equal to 15 m

Item		Description
Cable type	NEG power cable (-48 V)	Wire,450/750V,60227 IEC 02(RV)16mm ² ,blue,85A
	RTN power cable	Wire,450/750V,60227 IEC 02(RV)16mm ² ,black,85A
Terminal	USG9560	Naked Crimping Terminal,JG2,16mm ² ,M6,95A,Tin Plated,for OEM
	DC power distribution cabinet	Naked Crimping Terminal,OT,16mm ² ,M8,Tin Plating,Naked Ring Terminal

Power Supply Distance Longer Than 15 m or Shorter Than or Equal to 25 m

If the power supply distance is longer than 15 m or shorter than or equal to 25 m, use the 25 mm² power cable to connect the USG9560 to the power distribution cabinet. [Table A-7](#) lists the cable terminals and cable types.

Table A-7 Cables for power supply distance longer than 15 m or shorter than or equal to 25 m

Item		Description
Cable type	NEG power cable (-48 V)	Wire,450/750V,227 IEC 02(RV)25mm ² ,blue,110A
	RTN power cable	Wire,450/750V,227 IEC 02(RV)25mm ² ,black,110A

Item		Description
Terminal	USG9560	Naked Crimping Connector,JG2,25mm ² ,M6,150A,Tin Plating,For OEM
	DC power distribution cabinet	Naked Crimping Terminal,OT,25mm ² ,M8,Tin Plating,Naked Ring Terminal

Power Supply Distance Longer Than 25 m or Shorter Than or Equal to 35 m

If the power supply distance is longer than 25 m or shorter than or equal to 35 m, use the 35 mm² power cable to connect the USG9560 and the power distribution cabinet. [Table A-8](#) lists the cable terminals and cable types.

Table A-8 Cables for power supply distance longer than 25 m or shorter than or equal to 35 m

Item		Description
Cable type	NEG power cable (-48 V)	Wire,450/750V,60227 IEC 02(RV)35mm ² ,Blue,135A
	RTN power cable	Wire,450/750V,60227 IEC 02(RV)35mm ² ,black,135A
Terminal	USG9560	Naked Crimping Connector,JG2,34.3mm ² ,M6(1/4"),134A,Tin Plated,2AWG,Hole Center Distance 15.875mm(5/8"),Short Tube,for North American
	DC power distribution cabinet	Naked Crimping Terminal,OT,35mm ² ,M8,Tin Plating,Naked Ring Terminal

A.1.1.3 DC Power Cable of the USG9520

This section describes the DC power cable of the USG9520.

Structure and Appearance

The DC power cable consists of a -48 V power cable NEG(-), and a cable RTN (+). The power cable transfers -48 V DC from the DC distribution equipment to the terminal block of the USG9500 power module, supplying power for the USG9500.

The DC power cables of the USG9500 are delivered in an integrated way. Cut the power cables to adjust them according to site requirements. [Figure A-9](#) and [Figure A-10](#) show the two power cables.

Figure A-9 NEG(-)



Figure A-10 RTN (+)



DC cable terminals vary based on the device. Two commonly used terminals are the OT bare crimping terminal and the JG2 double-hole bare crimping terminal.

Bare crimping terminals must be crimped on both ends of the power cable.

Figure A-11 shows the OT bare crimping terminal without a cable.

Figure A-11 OT bare crimping terminal

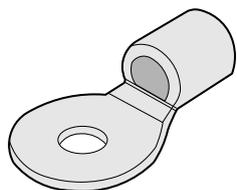
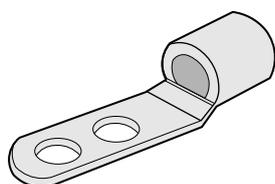


Figure A-12 shows the JG2 double-hole bare crimping terminal without a cable.

Figure A-12 JG2 double-hole bare crimping terminal





NOTICE

If the power supply distance is longer than 35 m, you must place the DC power distribution cabinet closer to the USG9500.

Prepare cables according to the distance between the USG9500 and the power distribution cabinet.

Power Supply Distance Shorter Than or Equal to 15 m

If the power supply distance is shorter than or equal to 15 m, use the 16 mm² power cable to connect the USG and the DC power distribution cabinet. [Table A-9](#) lists the cable terminals and cable types.

Table A-9 Cable for power supply distance shorter than or equal to 15 m

Item		Description
Cable type	NEG power cable (-48 V)	Wire, 450/750V, 60227 IEC 02(RV) 16mm ² , blue, 85A
	RTN power cable	Wire, 450/750V, 60227 IEC 02(RV) 16mm ² , black, 85A
Terminal	USG9520	Naked Crimping Terminal, JG2, 16mm ² , M6, 95A, Tin Plated, for OEM
	DC power distribution cabinet	Naked Crimping Terminal, OT, 16mm ² , M8, Tin Plating, Naked Ring Terminal

Power Supply Distance Longer Than 15 m or Shorter Than or Equal to 35 m

If the power supply distance is longer than 15 m or shorter than or equal to 35 m, use the 25 mm² power cable to connect in the USG9520 and the DC power distribution cabinet. [Table A-10](#) lists the cable terminals and cable types.

Table A-10 Cables for power supply distance longer than 15 m or shorter than or equal to 35m

Item		Description
Cable type	NEG power cable (-48 V)	Wire,450/750V,227 IEC 02(RV)25mm ² ,blue,110A
	RTN power cable	Wire,450/750V,227 IEC 02(RV)25mm ² ,black,110A
Terminal	USG9520	Naked Crimping Connector,JG2,25mm ² ,M6,150A,Tin Plating,For OEM
	DC power distribution cabinet	Naked Crimping Terminal,OT,25mm ² ,M8,Tin Plating,Naked Ring Terminal

A.1.2 AC Power Cable

This section describes the AC power cables of the USG9500 that uses the AC power supply. Learn about the structure and specifications of the AC power cable before you make or purchase any for the USG9500.

A.1.2.1 AC Power Cable of the USG9580

This section describes the AC power cable of the USG9580.

USG9580 AC Power Cable includes two parts:

- Cable between the AC power chassis and the USG9580
- Between the AC power chassis and the AC Power Distribution cabinet

NOTE

When the AC power passes through the AC power chassis, the convertor converts the AC power into the DC power. Therefore, the DC power cable needs to be used between the AC power chassis and the USG9580. For detailed information, please check [Cables Between the AC power chassis and the USG9580](#).

Structure and Appearance

The USG9580 uses electric and electronic cables as AC power cables, as shown in [Figure A-13](#).

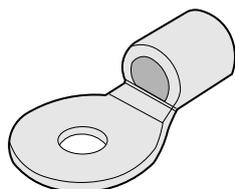
Figure A-13 Fixed-length electric and electronic cable



An electric and electronic cable consists of a cable and two terminals. The terminals are mainly OT bare crimp terminals.

Figure A-14 shows the OT bare crimping terminal without a cable.

Figure A-14 OT bare crimping terminal



Cables Between the AC power chassis and the AC Power Distribution cabinet

If the power supply distance is longer than 50 m, you must place the power distribution cabinet closer to the AC power chassis.

If the distance between an AC power chassis and the power distribution cabinet is shorter than 50 m, use the AC power cable shown in **Table A-11**.

Table A-11 Cable types and cable terminals of the AC-input power cable

Item		Description
Cable Type	Two-wire AC power cable	Power Cable,300/500V,60227 IEC 10(BVV),6mm ² ,Black Jacket(Cores:Blue,Brown),43A,2 Equivalent Cores
Terminal	AC power chassis	Naked Crimping Terminal,OT,6mm ² ,M6,Tin Plating,Insulated Ring Terminal,12~10AWG,yellow
	DC power distribution cabinet	Naked Crimping Terminal,OT,6mm ² ,M8,Tin Plating,Insulated Ring Terminal,12~10AWG,yellow

A.1.2.2 AC Power Cable of the USG9560

This section describes the AC power cable of the USG9560.

USG9560 AC Power Cable includes two parts:

- Cable between the AC power chassis and the USG9560
- Between the AC power chassis and the AC Power Distribution cabinet

 **NOTE**

When the AC power passes through the AC power chassis, the convertor converts the AC power into the DC power. Therefore, the DC power cable needs to be used between the AC power chassis and the USG9580. For detailed information, please check [Cables Between the AC power chassis and the USG9560](#).

Structure and Appearance

The USG9560 uses electric and electronic cables as AC power cables, as shown in [Figure A-15](#).

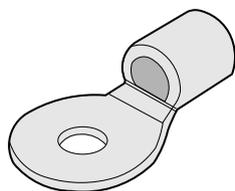
Figure A-15 Fixed-length electric and electronic cable



An electric and electronic cable consists of a cable and two terminals. The terminals are mainly OT bare crimp terminals.

[Figure A-16](#) shows the OT bare crimping terminal without a cable.

Figure A-16 OT bare crimping terminal



Cables Between the AC power chassis and the AC Power Distribution cabinet

If the power supply distance is longer than 50 m, you must place the power distribution cabinet closer to the AC power chassis.

If the distance between an AC power chassis and the power distribution cabinet is shorter than 50 m, use the AC power cable shown in [Table A-12](#).

Table A-12 Cable types and cable terminals of the AC-input power cable

Item		Description
Cable Type	Two-wire AC power cable	Power Cable,300/500V,60227 IEC 10(BVV),6mm ² ,Black Jacket(Cores:Blue,Brown),43A,2 Equivalent Cores
Terminal	AC power chassis	Naked Crimping Terminal,OT,6mm ² ,M6,Tin Plating,Insulated Ring Terminal,12~10AWG,yellow
	DC power distribution cabinet	Naked Crimping Terminal,OT,6mm ² ,M8,Tin Plating,Insulated Ring Terminal,12~10AWG,yellow

A.1.2.3 AC Power Cable of the USG9520

This section describes the AC power cable of the USG9520.

Structure and Appearance

The USG9520 uses an external AC cable suite. In addition to Chinese standard AC power cables, local-standard AC power cables for Europe and North America are included. [Figure A-17](#) and [Figure A-18](#) are for reference. Select power cables as required.

Figure A-17 Chinese standard AC power cable (for the R4850G2 AC power module)



Figure A-18 Chinese standard AC power cable (for the EPW30B-48A AC power module)



Technical Specifications

Table A-13 and **Table A-14** show the technical specifications for the R4850G2 and EPW30B-48A AC power cables, respectively.



NOTICE

You must connect the AC cable in compliance with local standards and requirements.

Table A-13 Technical specifications of the R4850G2 AC cable

Item	Specifications
Type of connector on the device	C19 straight female
Type of connector on the peer end	PI straight male, PI angle male, PF angle male, and PG angle male based on countries and regions
Cable length	3 m
Maximum voltage	125 V/250 V
Maximum current	16 A

Table A-14 Technical specifications of the EPW30B-48A AC cable

Item	Specifications
Type of connector on the device	C13 straight female
Type of connector on the peer end	PI straight male, PB straight male, PF straight male, and PG angle male based on countries and regions

Item	Specifications
Cable length	3 m
Maximum voltage	125 V/250 V
Maximum current	10 A

A.1.3 PGND Cable

This section describes the structure and specifications of the protection ground (PGND) cable for grounding the USG9500. Read this section before you make or purchase any PGND cables for the USG9500.

The PGND cable is used in the following situations:

- The USG9500 is installed inside the cabinet.
If the cabinet has been properly grounded, connect one end of the PGND cable to the ground terminal of the USG9500 and the other end to the ground port of the cabinet.
- The USG9500 is installed outside the cabinet.
Connect one end of the PGND cable to the ground terminal of the USG9500 and the other end to the ground bar in the equipment room.



NOTICE

Unreliable grounding may damage the USG9500. Therefore, ensure that the USG9500 is reliably grounded.

Structure and Appearance

A PGND cable has two OT bare crimp terminals and a copper cable with yellow/green plastic encapsulation. [Figure A-19](#) shows a type of PGND cables.

NOTE

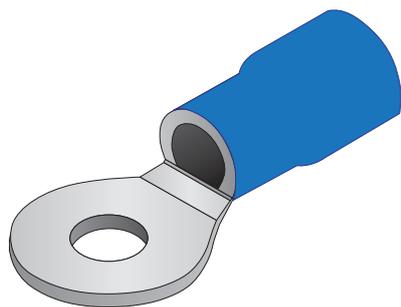
The figure is for reference only.

Figure A-19 PGND cable



[Figure A-20](#) shows the OT bare crimp terminal.

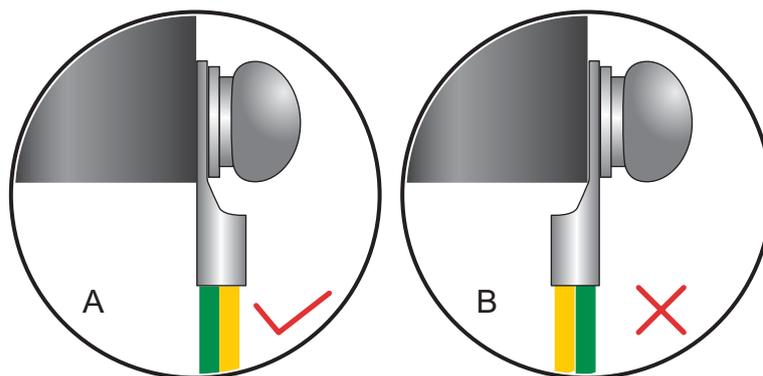
Figure A-20 OT bare crimp terminal



Installation

1. Connect the OT bare crimp terminal at one end of the PGND cable to the connection hole of the USG9500, with the conducting wire upward, as shown in **Figure A-21** (A).

Figure A-21 Installing the OT bare crimp terminal



2. Select a matching screw for the screw jack and screw it in clockwise. For a reliable connection, make sure that at least two full threads match each other.
3. Tug on the power cable gently to verify that it is connected securely.
4. Connect the other end of the PGND cable to the ground port of the equipment room or cabinet.



NOTICE

The OT terminal may rotate, causing damage to the device. Ensure that the OT terminal is not touching adjacent metal mechanical parts and other terminals.

Technical Specifications

Table A-15 shows the technical specifications of the PGND cable.

Table A-15 Technical specifications of the PGND cable

Item		Specifications
PGND cable	Cable type	Wire,450/750V,227 IEC 02(RV)25mm ² ,yellow green,110A
	Terminal	Naked Crimping Terminal,OT,25mm ² ,M8,Tin Plating,Naked Ring Terminal
Fireproof class		CM

A.1.4 Console Cable

The console interface cable is used to connect the console interface on the USG9500 to the serial interface of the console to transmit configuration data of the USG9500.

The console interface cable is an 8-core shielded cable. One end of the cable is an RJ45 connector that connects to the console interface on the MPU. The other end has DB9 and DB25 connectors, either of which connects to the serial interface on a computer.

Structure and Appearance

Figure A-22 shows the structure of a console interface cable. **Table A-16** describes the pin assignment on the console interface cable.

Figure A-22 Console interface cable structure

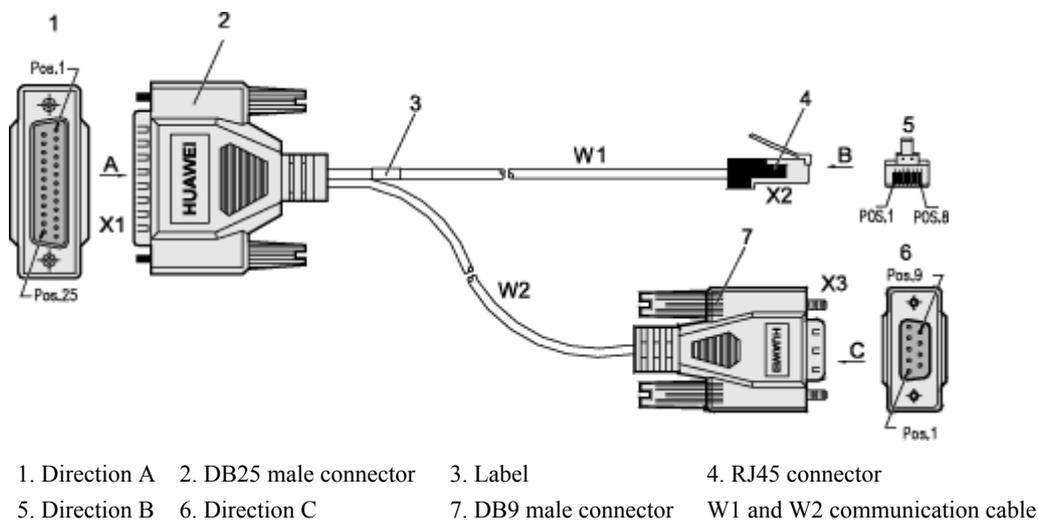


Table A-16 Pin assignment on the console interface cable

RJ45	Direction	DB25	DB9	Signal
1	->	5	8	CTS (Clear to Send)
2	->	6	6	DSR (Data Set Ready)

RJ45	Direction	DB25	DB9	Signal
3	->	3	2	RXD (Receive Data)
4	—	7	5	GND
5	—	8	1	GND
6	<-	2	3	TXD (Transmit Data)
7	<-	20	4	DTR (Data Terminal Ready)
8	<-	4	7	RTS (Request to Send)

Technical Specifications

Table A-17 lists the technical specifications of the console interface cable.

Table A-17 Technical specifications of the console interface cable

Item	Specifications
Connector X1	Network interface connector-crystal connector -8PIN-8bit-shielded plug
Connector X2	Cable connector-D style-25PIN-male
Connector X3	Cable connector-D style-9PIN-male
Cable type	<ul style="list-style-type: none"> ● Symmetrical twisted cable-120-ohm-SEYVPV-0.5mm-24AWG-8core-PANTONE 430U ● Symmetrical twisted cable-100-ohm-SEYVP-0.48mm-26AWG-8core-black
Number of cores	8
Fireproof class	CM
Available length	15 m for the 120-ohm cable 3 m for the 100-ohm cable

A.1.5 Auxiliary Port Cable

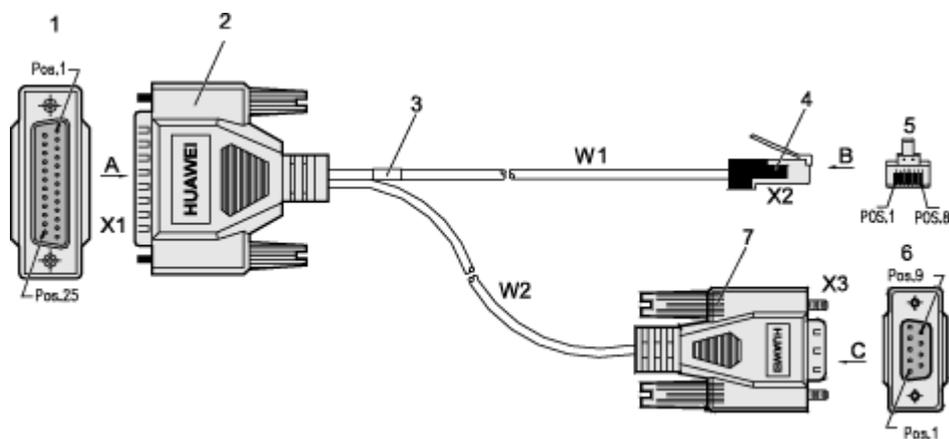
The AUX interface cable is used to connect the AUX interface on the USG9500 to a modem to remotely transmit the configuration data of the USG9500.

The AUX interface cable is an 8-core shielded cable. One end of the cable is an RJ45 connector that connects to the AUX interface on the MPU. The other end has DB9 and DB25 connectors, either of which can connect to the serial interface on a computer.

Structure and Appearance

As shown in **Figure A-23** the structure of the AUX interface cable is the same as that of the console interface cable. **Table A-18** describes the pin assignment on the AUX interface cable.

Figure A-23 AUX interface cable structure



1. Direction A 2. DB25 male connector 3. Label 4. RJ45 connector
5. Direction B 6. Direction C 7. DB9 male connector W1 and W2 communication cable

Table A-18 Pin assignment on the AUX interface cable

RJ45	Direction	DB25	DB9	Signal
1	->	4	7	RTS
2	->	20	4	DTR
3	->	2	3	TXD
4	—	8	1	GND
5	—	7	5	GND
6	<-	3	2	RXD
7	<-	6	6	DSR
8	<-	5	8	CTS

Technical Specifications

Table A-19 lists the technical specifications of the AUX interface cable.

Table A-19 Technical specifications of the AUX interface cable

Item	Specifications
Connector X1	Network interface connector-crystal connector-8PIN-8bit-shielded plug
Connector X2	Cable connector-D type-25PIN-male
Connector X3	Cable connector-D type-9PIN-male
Cable type	Symmetrical twisted cable-120-ohm-SEYVPV-0.5mm-24AWG-8core-PANTONE 430U Symmetrical twisted cable-100-ohm-SEYVP-0.48mm-26AWG-8core-black
Number of cores	8
Fireproof class	CM
Available length	15 m for the 120-ohm cable 3 m for the 100-ohm cable

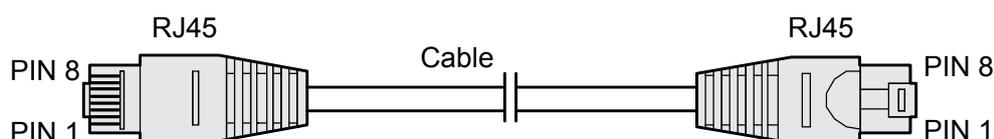
A.1.6 Ethernet Cable

The Ethernet cable, also called the network cable, is used to carry signals on Gigabit networks or networks with lower packet rates.

Structure and Appearance

An Ethernet cable consists of twisted pairs and RJ45 connectors, as shown in [Figure A-24](#).

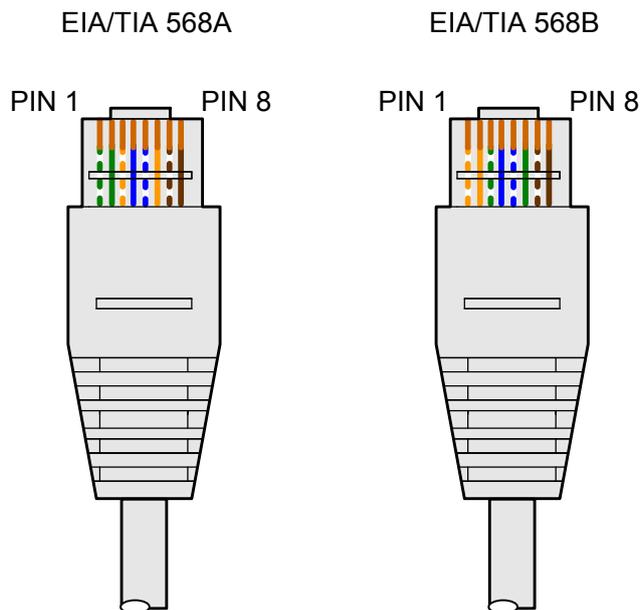
Figure A-24 Ethernet cable structure



Name	Description
RJ45	RJ45 connector
Cable	Category 5 or higher twisted pair network cable
PIN1 to PIN8	8 pins. Each pin has an ID ranging from 1 to 8.

The twisted pair network cable has eight wires. The connection between wires and RJ45 connector pins complies with either wiring scheme EIA/TIA 568A or EIA/TIA 568B, as shown in [Figure A-25](#).

Figure A-25 Wiring scheme EIA/TIA 568A or EIA/TIA 568B



EIA/TIA 568A		EIA/TIA 568B	
PIN ^a	Core Wire ^b	PIN	Core Wire
1	Green-white	1	Orange-white
2	Green	2	Orange
3	Orange-white	3	Green-white
4	Blue	4	Blue
5	Blue-white	5	Blue-white
6	Orange	6	Green
7	Brown-white	7	Brown-white
8	Brown	8	Brown

NOTE

- a. An RJ45 connector has eight pins.
- b. The twisted pair wire connects to the RJ45 connector pin. The color of the plastic jacket is used for the wire name.

Straight-Through and Crossover Cables

Ethernet cables are classified into straight-through and crossover cables according to the wiring scheme used at the two ends of the cables. Interfaces on most devices can dynamically adapt to straight-through cables and crossover cables. For interfaces that cannot dynamically adapt to either type of cable, connect interfaces at the same layer using the crossover cables and interfaces at different layers using the straight-through cables.

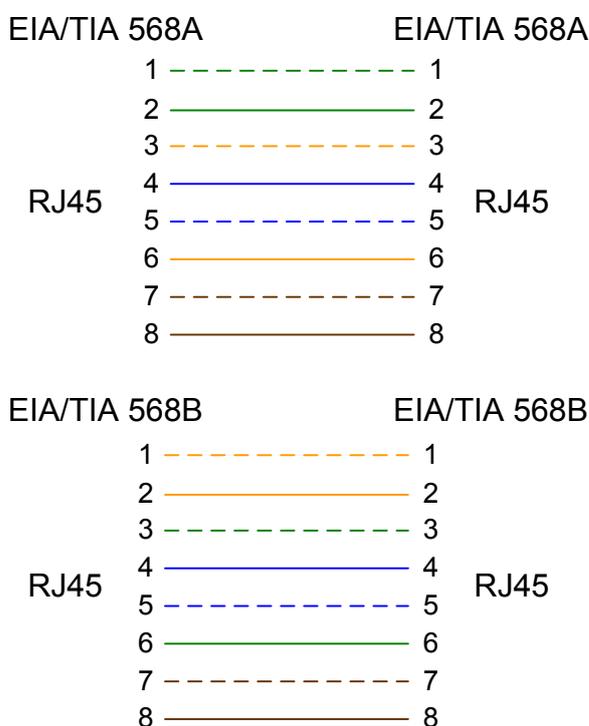
 **NOTICE**

Figure A-26 and **Figure A-27** show how to distinguish and make straight-through cables and crossover cables. Strictly adhere to the wiring scheme to ensure service quality.

- Straight-through cable

Straight-through cables are also called standard cables. Both ends of the cable use wiring scheme EIA/TIA T568A or EIA/TIA T568B. You are advised to use wiring scheme EIA/TIA T568B for straight-through cables. **Figure A-26** shows EIA/TIA T568A and EIA/TIA T568B wiring schemes.

Figure A-26 Connection scheme of straight-through cables



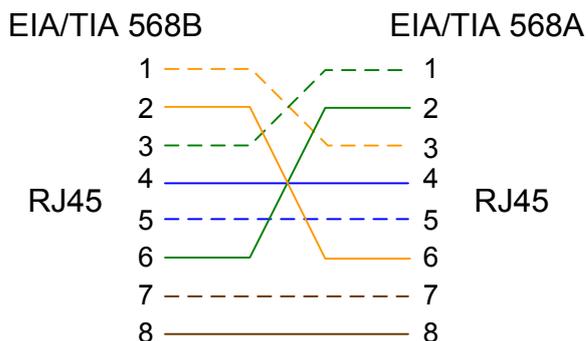
You can use straight-through cables to connect:

- A switch or hub with an USG9500
- Computers (including servers and workstations) with USG9500s or hubs
- Two switches through the uplink interface

- Crossover cable

Crossover cables use wiring scheme EIA/TIA T568A on one end and EIA/TIA T568B for the other, as shown in **Figure A-27**.

Figure A-27 Connection scheme of crossover cables



You can use the crossover cables to connect:

- A computer and a router
- Two switches
- Two hubs
- Two computers
- Interfaces on different routers
- Ethernet interfaces on an ADSL modem and the network adapter on a computer

Shielded Cable and Unshielded Cable

Network cables are classified into shielded and unshielded ones based on whether the twisted pair and RJ45 connector are shielded. [Figure A-28](#) shows a shielded cable, and [Figure A-29](#) shows an unshielded cable.



NOTICE

Only shielded cables are supported on the USG9500.

Figure A-28 Shielded cable



Figure A-29 Unshielded cable



NOTE

The figure is for reference only.

Technical Specifications

Table A-20 and **Table A-21** show the technical specifications of the straight-through cable and crossover cable, respectively.

Table A-20 Technical specifications of the straight-through cable

Item	Specifications
Connector X1/X2	Network port connector-crystal connector-8PIN-8bit-shield-plug-24-26AWG-CAT 6/SFTP network cable
Cable type	Communication cable-100±15ohm-shielded enhanced 5 types-CAT5E SFTP 24AWG-8 core PANTONE 445U
Number of cores	8
Fireproof class	CM
Available length	5 m, 10 m, 20 m, and 30 m

Table A-21 Technical specifications of the crossover cable

Item	Specifications
Connector X1/X2	Network port connector-crystal connector-8PIN-8bit-shield-plug-24~26AWG-CAT 6/SFTP network cable
Cable type	Communication cable-100±15ohm-shielded enhanced 5 types-CAT5E SFTP 24AWG-8 core PANTONE 646U
Number of cores	8
Fireproof class	CM
Available length	5 m and 30 m

A.1.7 Optical Fiber

Optical fibers are used for carrying signals on Gigabit networks or networks with higher packet rates.

Optical fibers connect to the interface on the USG9500 through an optical module. Select optical modules and fibers based on peer device interfaces.



NOTICE

You are advised to use Huawei optical modules. Optical modules from other vendors may cause incompatibility issues and lead to faults on the USG9500.

Structure and Appearance

Optical fibers are classified into single-mode and multi-mode optical fibers. Single-mode optical fibers are used for long-distance transmission whereas multi-mode optical fibers are used for short-distance transmission. Indoor single-mode optical fibers usually have a yellow jacket, as shown in [Figure A-30](#). Indoor multi-mode optical fibers usually have an orange jacket, as shown in [Figure A-31](#). Optical fibers are not delivered with the USG9500. Purchase optical fibers separately as required.

Figure A-30 LC/PC-LC/PC single-mode optical fiber



Figure A-31 LC/PC-LC/PC multi-mode optical fiber





NOTICE

- To ensure the normal transmission of optical signals, do not use single-mode optical fibers to connect multi-mode optical modules, nor multi-mode optical fibers to connect single-mode optical modules.
 - To connect extension optical fibers, purchase LC/PC-LC/PC adapters.
-

Optical fibers have multiple types of connectors. Common connectors types include LC/PC, SC/PC, and FC/PC.

- LC/PC connector



The procedure for inserting and removing LC/PC connectors is as follows:

- Insert and remove the connector along the axis without rotating the connector.
- When you insert the fiber, carefully insert the fiber head into the optical interface on the interface board.
- To remove the optical fiber, squeeze the pinch on the fiber connector, gently push on the fiber connector, and then pull it out.

- SC/PC connector



The procedure for inserting and removing SC/PC connectors is as follows:

- Insert and remove the connector along the axis without rotating the connector.
- When you insert the fiber, carefully insert the fiber head into the optical interface on the interface board.
- To remove the optical fiber, gently push on the fiber connector, and then pull out the connector.

- FC/PC connector



The procedure for inserting and removing FC/PC connectors is as follows:

- When you insert an optical fiber, aim the FC/PC connector at the optical interface on the interface board to avoid damaging the inner layer of the optical interface. Then insert the fiber into the optical interface, rotate the outer screw jacket clockwise, and then fasten the optical connector.
- To remove an optical fiber, rotate the outer screw jacket counter-clockwise on the optical interface until the screw loosens. Then gently pull out the optical fiber.

There are three types of optical fibers for the USG9500: LC/PC-LC/PC, LC/PC-SC/PC, and LC/PC-FC/PC, which are based on the types of connectors on both ends of the fibers, as listed in [Table A-22](#).

Table A-22 Common optical fiber types

Type	Transmission Mode	Connector	
		On the USG9500	On the peer device
LC/PC-LC/PC	Single-mode/ Multi-mode	LC/PC	LC/PC
LC/PC-SC/PC			SC/PC
LC/PC-FC/PC			FC/PC

Precautions

When using optical modules and optical fibers, pay attention to the following to ensure proper communication between devices:

- Use single-mode and multi-mode optical fibers as required.
- Tx (sending) of the local device corresponds to Rx (receiving) of the peer device.
- The wavelengths of the optical modules on both ends must be the same.
- Do not overbend optical fibers. The bend radius must not be shorter than 40 mm.



CAUTION

To avoid eye injuries, do not look straight at the optical transmit interface of the laser or the optical connector.

Technical Specifications

Table A-23 lists the technical specifications of the optical fiber and is for reference only. Select optical fibers as required.

Table A-23 Technical specifications of the optical fiber

Item	Specifications
Transmission mode	Single-mode/Multi-mode
Connector	<ul style="list-style-type: none"> ● On the USG9500: LC/PC ● On the peer device: LC/PC, SC/PC, or FC/PC
Outer diameter	2 mm
Length	5 m, 10 m, or 20 m

A.2 On-site Cable Assembly and Installation

This section describes how to assemble and install power cables, Ethernet cables, and other cables.

A.2.1 Cable Assembly Precautions

Check the cables and connector components, choose appropriate cables and connector components, and assemble them properly according to the cable assembly precautions.

Checking the Cables

- If the jacket or insulation layer of a cable is visibly dirty, clean it before assembly.
- If the jacket or insulation layer of a cable is visibly damaged or has any significant defect, do not use the cable.
- If the shield layer of a cable is visibly damaged, do not use the cable.
- If the jacket or insulation layer of a cable crack after the cable is bent or twisted, check whether other cables have the same problem. If other cables do not have this problem, use one of them instead of the defective cable. If other cables have the same problem, do not use any of the cables and obtain replacements.

Checking the Connectors

- If a connector has any visible defect, damage, rust, or scuffing, do not use it.
- If the pins or shells of a connector are damaged, do not use the connector.
- If there is dirt on the pins or in the jacks of a connector or if there are conductors between pins or between pins and the shell, do not use the connector.

Precautions for Assembly

- Use dedicated tools or tools from Huawei and follow the assembly procedure.
- When installing or removing cable components, handle the cable terminals instead of the cables.
- Take the following precautions when cutting or peeling cables:
 - After cutting cables, keep the extra lengths of cable.
 - After cutting cables, coil the cables that exceed 2 m. Bind and fasten the coils using bundling ropes. Ensure that the inner diameter of the coils is at least 20 times greater than the outer diameters of the cables.
 - When peeling the cable jackets, avoid damaging the shielding layers (braid or aluminum foil), insulation layers, core conductors, and other jackets that do not need to be peeled.
 - Clean sections of exposed jacket (for example, the dead ends of power cables). Cut all cables flush.
 - Do not touch the core conductors of cables. Handle the conductor peeled from cables quickly so that the conductor surface does not oxidize.
- Take the following precautions when crimping and connecting cables or connectors:
 - Ensure that terminals and conductors are connected securely after they are crimped. Do not move or bend them.

- Cut all exposed copper wire.
- Avoid crimping sleeves twice.
- Keep all conductors clean and neat.

 **NOTE**

Connectors, cables, and tools provided by different vendors may differ. Figures in this document are for reference only.

A.2.2 Assembling Power Cables

This section describes how to assemble power cables with OT terminals, JG terminals, cord end terminals, and power cables.

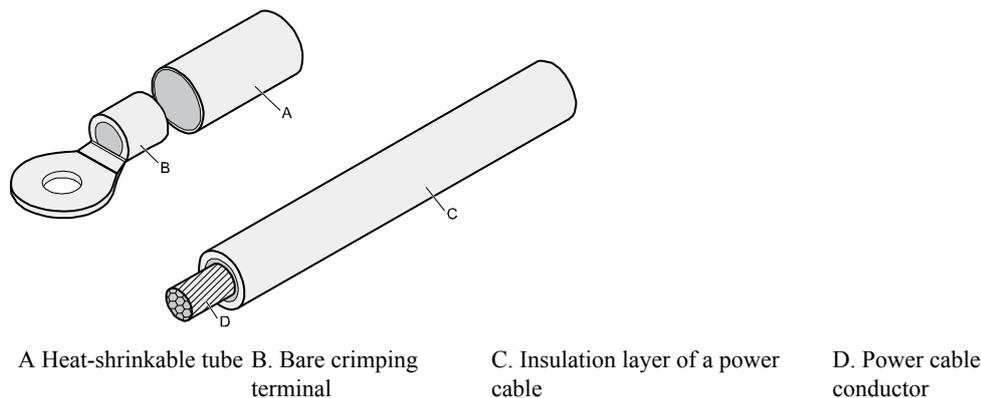
A.2.2.1 Assembling the OT Terminal and the Power Cable

This section describes how to assemble an OT terminal and a power cable.

Context

[Figure A-32](#) shows the components of an OT terminal and a power cable.

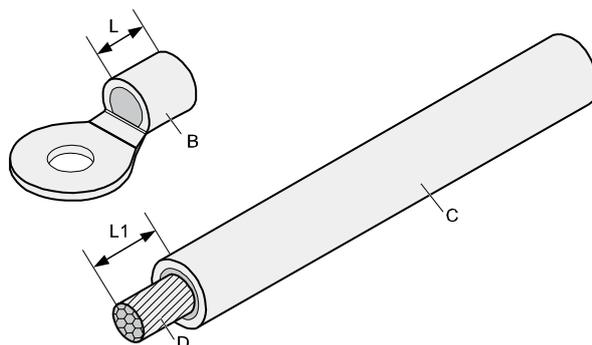
Figure A-32 Components of an OT terminal and a power cable



Procedure

- Step 1** Where the cross-section of the cable conductor (D) is visible, strip away a length L1 from the insulation layer (C), exposing the conductor, as shown in [Figure A-33](#). Recommended L1 values are listed in [Table A-24](#).

Figure A-33 Stripping a power cable (OT terminal)



NOTICE

- When you strip a power cable, be careful not to damage the cable conductor.
- If the bare crimping terminal is not provided by Huawei, the value of L1 is 1-2 mm greater than L.

Table A-24 Mapping between the cross-sectional area of the conductor and the value of L1

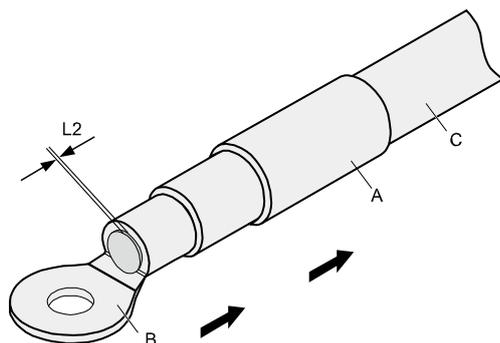
Cross-Sectional Area of Conductor (mm ²)	Value of L1 (mm)	Cross-Sectional Area of Conductor (mm ²)	Value of L1 (mm)
1	7	10	11
1.5	7	16	13
2.5	7	25	14
4	8	35	16
6	9	50	16

NOTE

If you are proficient in assembling OT terminals and power cables, you can obtain the value of L1 by simply comparing the part to be crimped with the power cable.

Step 2 Slide the heat-shrink tubing (A) onto the bare crimping terminal, as shown in [Figure A-34](#).

Figure A-34 Sliding the heat-shrink tubing onto the bare crimping terminal



- Step 3** Fix the OT terminal (B) onto the exposed conductor, ensuring that the OT terminal is in sufficient contact with the insulation layer of the power cable (C), as shown in [Figure A-34](#).

 **NOTICE**

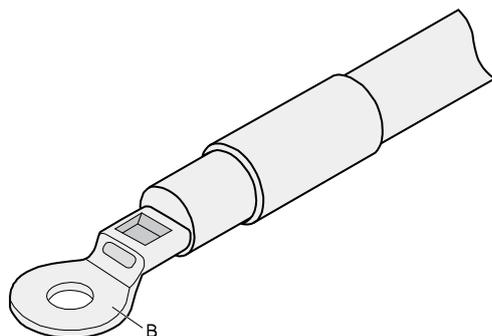
After the conductor is fed into the OT terminal, the protruding section of conductor (or L2 in [Figure A-34](#)) must not exceed 2 mm.

- Step 4** Crimp the joint parts of the bare crimping terminal and the conductor, as shown in [Figure A-35](#).

 **NOTE**

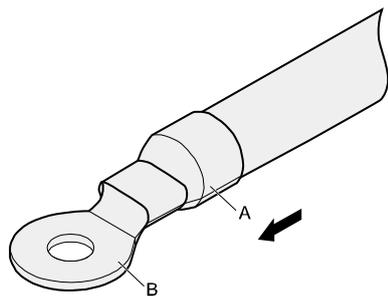
The shapes of crimped parts may vary with the crimping dies.

Figure A-35 Crimping the joint parts of the bare crimping terminal and the conductor



- Step 5** Slide the heat-shrink tubing (A) towards the connector until the tube covers the crimped part and then heat the tube with a heat gun, as shown in [Figure A-36](#).

Figure A-36 Heating the heat-shrink tubing



NOTICE

Do not heat the heat-shrink tubing for too long.

---End

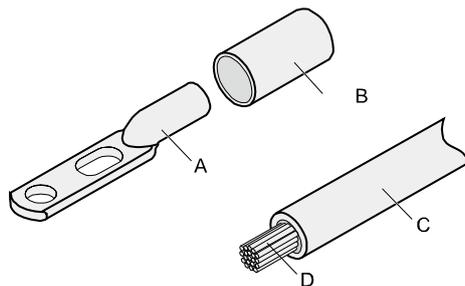
A.2.2.2 Assembling the JG Terminal and the Power Cable

This section describes how to assemble a JG terminal and a power cable.

Context

Figure A-37 shows the components of a JG terminal and a power cable.

Figure A-37 Components of a JG terminal and a power cable



A. JG terminal B. Heat-shrink tubing C. Insulation layer of a power cable D. Power cable conductor

Procedure

- Step 1** Where the cross-section of cable conductor (D) is exposed, strip away a length L1 of insulation layer (C), as shown in **Figure A-38**. Recommended values of L1 are listed in **Table A-25**.

 **NOTICE**

- When you strip a power cable, be careful not to damage the cable conductor.
- If the bare crimping terminal is not from Huawei, adjust the value of L as required.

Figure A-38 Stripping a power cable (JG terminal)

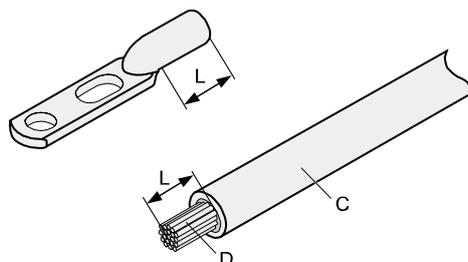
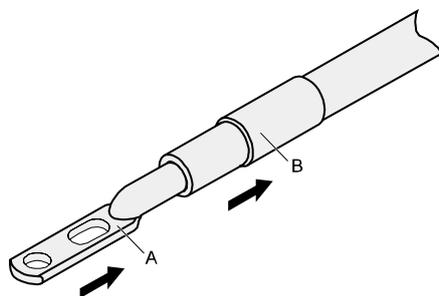


Table A-25 Mapping between the cross-sectional area of the conductor and the value of L

Cross-Sectional Area of Conductor (mm ²)	Value of L (mm)
16	13
25	14
35	16
50	16

Step 2 Slide the heat-shrink tubing (B) onto the bare crimping terminal, as shown in [Figure A-39](#).

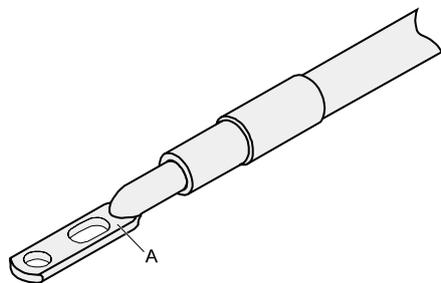
Figure A-39 Sliding the heat-shrink tubing onto the bare crimping terminal



Step 3 Attach the bare crimping terminal (A) to the exposed conductor, and ensure that the bare crimping terminal is in sufficient contact with the insulation layer of the power cable, as shown in [Figure A-39](#).

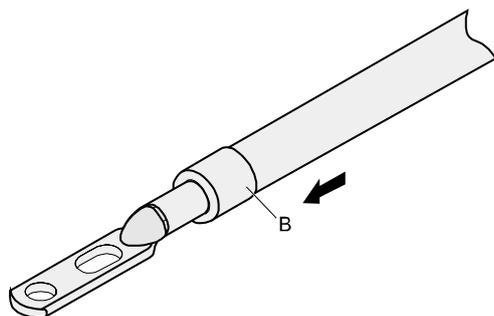
- Step 4** Crimp the joint parts of the bare crimping terminal and the conductor, as shown in **Figure A-40**.

Figure A-40 Crimping the joint parts of the bare crimping terminal and the conductor (JG terminal)



- Step 5** Slide the heat-shrink tubing (B) towards the connector until the tube covers the crimped part. Then, heat the tube with a heat gun, as shown in **Figure A-41**.

Figure A-41 Heating the heat-shrink tubing (JG terminal)



---End

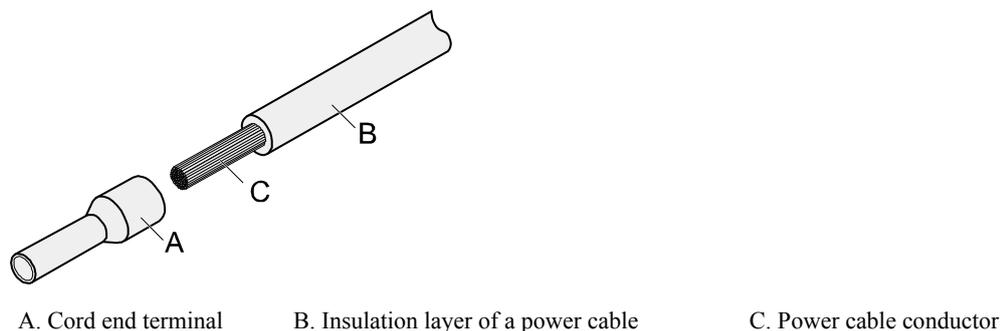
A.2.2.3 Assembling the Cord End Terminal and the Power Cable

This section describes how to assemble a cord end terminal and a power cable.

Context

Figure A-42 shows the components of a cord end terminal and a power cable. The component labels in the following figure apply to all similar figures in this section.

Figure A-42 Components of a cord end terminal and a power cable



Procedure

- Step 1** Where the cross-section of cable conductor (C) is exposed, strip away a length L1 of insulation layer (B), as shown in [Figure A-43](#). Recommended values of L1 are listed in [Table A-26](#).



When stripping a power cable, be careful not to damage the cable conductor.

Figure A-43 Stripping a power cable (cord end terminal)

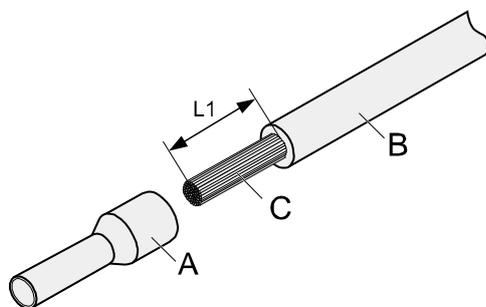


Table A-26 Mapping between the cross-sectional area of the conductor and the value of L1

Cross-Sectional Area of Conductor (mm ²)	Value of L1 (mm)	Cross-Sectional Area of Conductor (mm ²)	Value of L1 (mm)
1	8	10	15
1.5	10	16	15

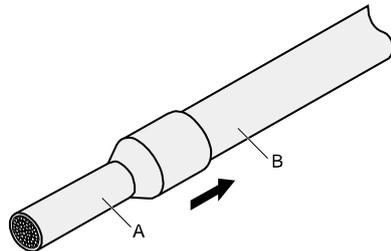
Cross-Sectional Area of Conductor (mm ²)	Value of L1 (mm)	Cross-Sectional Area of Conductor (mm ²)	Value of L1 (mm)
2.5	10	25	18
4	12	35	19
6	14	50	26

Step 2 Attach the cord end terminal (A) to the conductor, and ensure that the conductor is aligned with the edge of the cord end terminal, as shown in [Figure A-44](#).

 **NOTICE**

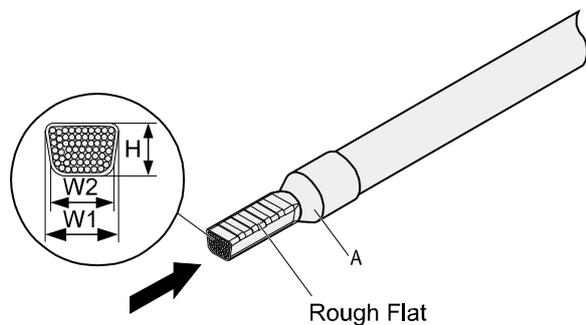
After the conductor is fed into the cord end terminal, ensure that the protruding length of conductor does not exceed 1mm.

Figure A-44 Attaching the cord end terminal to the conductor



Step 3 Crimp the joint parts of the cord end terminal and the conductor, as shown in [Figure A-45](#).

Figure A-45 Crimping the cord end terminal and the conductor



Step 4 Check the maximum width of the tubular crimped terminal. Maximum widths are listed in [Table A-27](#).

Table A-27 Maximum width of a tubular crimped terminal

Cross-Sectional Area of Tubular Terminal (mm ²)	Maximum Width of Crimped Terminal W1 (mm)
0.25	1
0.5	1
1.0	1.5
1.5	1.5
2.5	2.4
4	3.1
6	4
10	5.3
16	6
25	8.7
35	10

---End

A.2.3 Assembling Ethernet Cables

This section describes how to assemble RJ45 connectors and Ethernet cables.

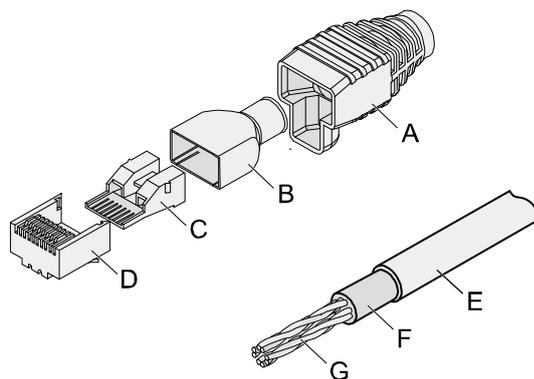
A.2.3.1 Assembling the Shielded RJ45 Connector and the Ethernet Cable

This section describes how to assemble a shielded RJ45 connector and a straight-through Ethernet cable.

Context

Figure A-46 shows the components of an RJ45 connector and a shielded Ethernet cable.

Figure A-46 Shielded RJ45 connector

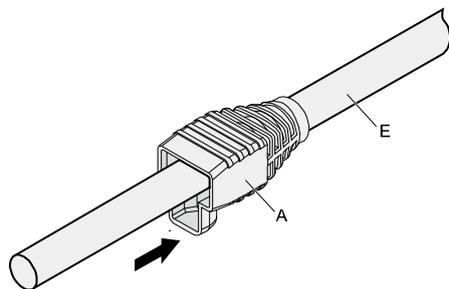


- A. Connector jacket B. Metal shell of connector C. Connector wire holder D. Connector plug
E. Ethernet cable jacket F. Shield layer of Ethernet cable G. Twisted-pair cable -

Procedure

Step 1 Fit the connector jacket onto the Ethernet cable, as shown in [Figure A-47](#).

Figure A-47 Fitting the jacket of the connector onto the Ethernet cable

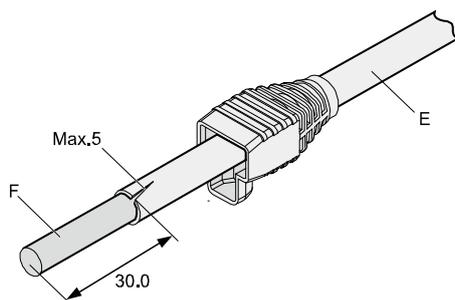


Step 2 Remove a 30-mm long section of the jacket, cut off the nylon twine inside the jacket, and cut a 5-mm cleft in the cable jacket, as shown [Figure A-48](#).

NOTICE

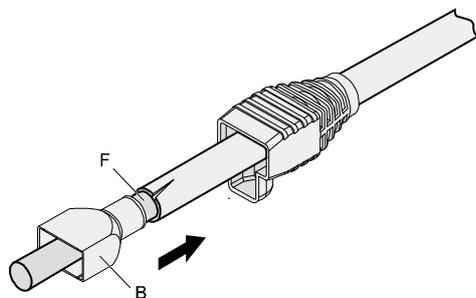
- When removing a section of the jacket, be careful not to damage the shield layer of the twisted-pair cable.
 - When removing the shielding layer, be careful not to damage the insulation layer of the twisted-pair cable.
-

Figure A-48 Removing the jacket of a twisted-pair cable (unit: mm)



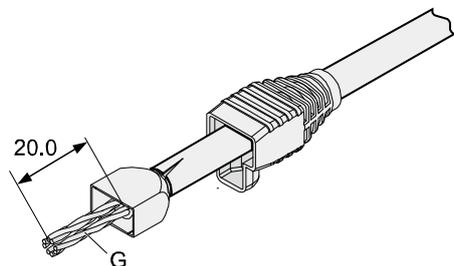
Step 3 Fit the metal shell onto the twisted-pair cable. The shield layer is covered by the metal shell, as shown in [Figure A-49](#).

Figure A-49 Fitting the metal shell onto the twisted-pair cable



Step 4 Fit the metal shell onto the twisted-pair cable until the shield layer is covered completely. Along the edge of the metal shell, cut off the shield layer with aluminum foil and ensure that there is no extra copper wire protruding. Ensure that the exposed twisted-pair cable is about 20 mm long, as shown in [Figure A-50](#).

Figure A-50 Removing the shield layer of a twisted-pair cable (unit: mm)



Step 5 According to colors, lead the four pairs of twisted-pair cables through the wire holder, as shown in [Figure A-51](#) and [Figure A-52](#).

Figure A-51 Leading cables through the wire holder

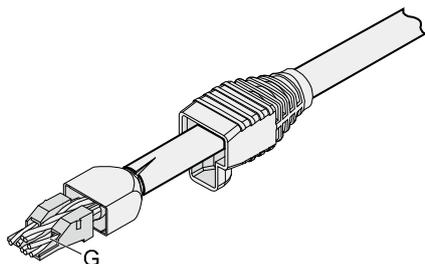
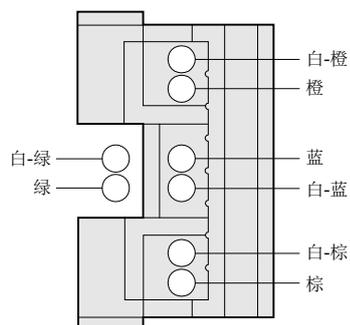


Figure A-52 Cable locations in a wire holder



Step 6 Align the four pairs of cables on the holder, as shown in [Figure A-53](#). The connections between the core wires and the pins are shown in [Figure A-54](#) and listed in [Table A-28](#).

Figure A-53 Aligning four pairs of cables on a wire holder

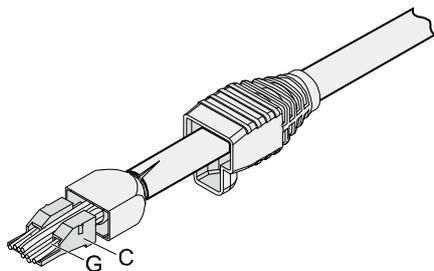


Figure A-54 Connections between core wires and pins

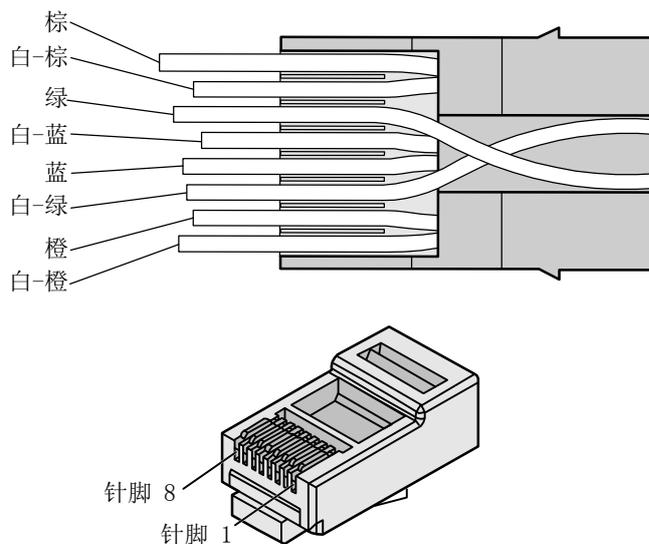
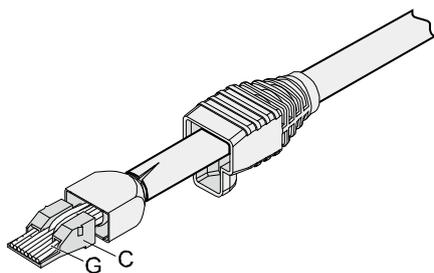


Table A-28 Connections between core wires and pins

Matching Wire Pins	Core Wire Color
1	White-Orange
2	Orange
3	White-Green
4	Blue
5	White-Blue
6	Green
7	White-Brown
8	Brown

Step 7 Cut off the extra lengths of cable along the lower edge of the wire holder, as shown in [Figure A-55](#).

Figure A-55 Cutting off extra cable

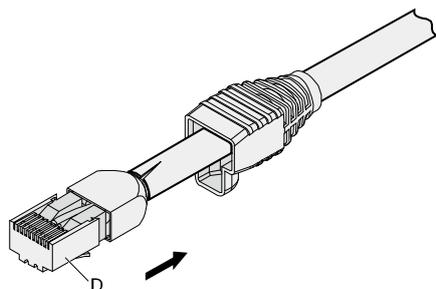


- Step 8** Attack the connector body to the wire holder and turn the metal shell 90°, as shown in [Figure A-56](#).

 **NOTE**

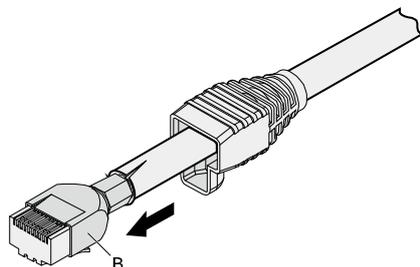
Ensure that the wire holder is in sufficient contact with the connector body.

Figure A-56 Attaching the connector body to the wire holder



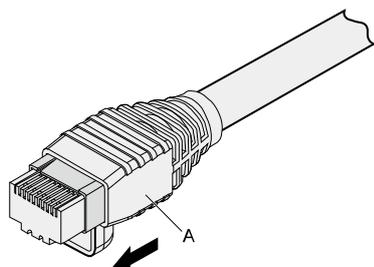
- Step 9** Slide the metal shell towards the connector body until the wire holder and the connector body are wrapped completely. Crimp the connector, as shown in [Figure A-57](#).

Figure A-57 Crimping the connector



- Step 10** Slide the jacket towards the metal shell until the metal shell is wrapped. One end of the cable is now completely assembled, as shown in [Figure A-58](#).

Figure A-58 Wrapping the metal shell



Step 11 To complete the assembly of the other end, repeat [Step 1](#) through [Step 10](#).

---End

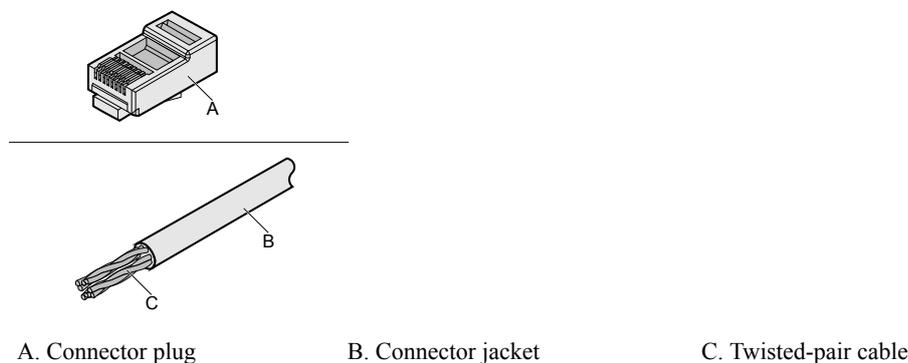
A.2.3.2 Assembling the Unshielded RJ45 Connector and the Ethernet Cable

This section describes how to assemble an unshielded RJ45 connector and a straight-through Ethernet cable.

Context

[Figure A-59](#) shows the components of an unshielded RJ45 connector.

Figure A-59 Unshielded RJ45 connector components



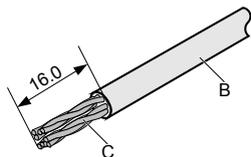
Procedure

Step 1 Remove a 16-mm long section of the jacket, as shown in [Figure A-60](#).



When removing the shielding layer, be careful not to damage the insulation layer of the twisted-pair cable.

Figure A-60 Removing the jacket of a twisted-pair cable (unit: mm)



Step 2 Align the four pairs of cables and cut the ends neatly, as shown in [Figure A-61](#). The connections between the core wires and the pins are listed in [Table A-29](#).

Figure A-61 Connections between core wires and pins (unit: mm)

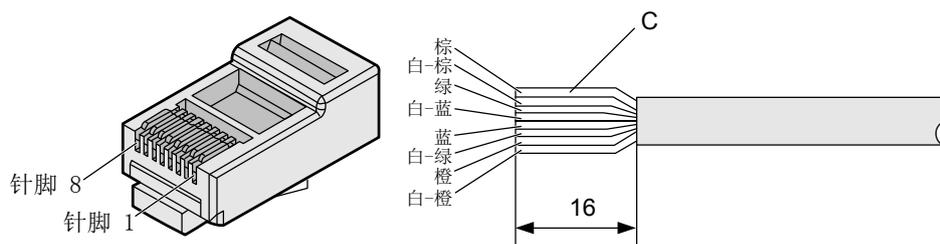


Table A-29 Connections between core wires and pins

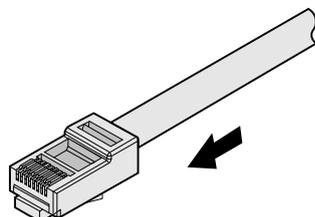
Matching Wire Pins	Core Wire Color
1	White-Orange
2	Orange
3	White-Green
4	Blue
5	White-Blue
6	Green
7	White-Brown
8	Brown

Step 3 Feed the cable into the plug and crimp the connector, as shown in [Figure A-62](#).

NOTE

Ensure that the cable is in sufficient contact with the plug.

Figure A-62 Crimping the connector



Step 4 To complete the assembly of the other end, repeat [Step 1](#) through [Step 3](#).

---End

A.2.3.3 Checking Metal Contact Strips

This section describes how to check the metal contact strips and how to check whether an assembled RJ45 connector is qualified.

Context

- To ensure proper contact between the crimped parts and the core wires, the heights and sizes of the metal contact strips must be uniform and standard.
- The metal contact strips must be parallel to each other and offset by no more than 5°. The top margin of a strip must be parallel to the axis of the connector and offset by no more than 10°.
- To ensure proper conduction, the surface of the metal contact strips must be clean.
- The metal contact strips must be in sufficient with the RJ45 socket. The plastic septa must remain intact and be aligned properly.
- The soldering edge of a metal contact strip must surpass the ends of the core wires. The ends of the core wires must be in contact with the edge of the RJ45 trough. The distance between them must be less than 0.5 mm.

Procedure

- Step 1** Hold the crimped connector with the front side facing you and check whether the metal contact strips are the same height. The height of all metal contact strips should be 6.02 ± 0.13 mm. If a measuring tool is not available, compare the connector with a standard connector. [Figure A-63](#) shows an unqualified connector, and [Figure A-64](#) shows a qualified connector.

NOTE

All unqualified connectors must be crimped again.

Figure A-63 Metal contact strips of different heights



Figure A-64 Metal contact strips of the same height



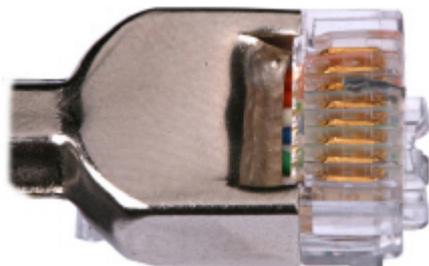
Step 2 Hold an RJ45 connector at 45° to better visualize its metal contact strips. Ensure that the top edges of the metal contact strips are parallel. **Figure A-65** shows an unqualified connector with uneven metal contact strips.

Figure A-65 Uneven metal contact strips



Step 3 Check whether the metal contact strips are clean. If they are not clean and cannot be cleaned, replace the RJ45 connector with a new one. **Figure A-66** shows an unqualified connector.

Figure A-66 Dirty metal contact strip



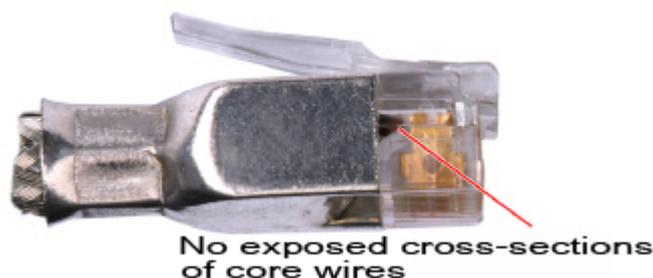
Step 4 Check whether the metal contact strips and the plastic septa are aligned and intact. If a part is skewed and it cannot be fixed, replace the RJ45 connector. **Figure A-67** shows an unqualified connector with askew plastic septa.

Figure A-67 Skew plastic septa



- Step 5** Hold the connector with the side facing towards you and check whether you can see the cross-sections of the core wires. Ensure that the ends of the core wires are in sufficient contact with the edge of the RJ45 trough and that the soldering edge of a metal contact strip surpasses the ends of the core wires and is reliably crimped with the core wires. If the RJ45 does not meet these requirements, replace the connector with a new one. **Figure A-68** shows an unqualified connector with core wires that are in insufficient contact with the edge of the RJ45 trough.

Figure A-68 Core wires in insufficient contact with the edge of the RJ45 trough



----End

A.2.3.4 Testing the Connection of Assembled Cables

This section describes how to test an assembled Ethernet cable, which ensures that the connectors and wires at both ends are correctly connected. This section illustrates how to test a straight-through Ethernet cable.

Context

Huawei provides two types of Ethernet cables: straight-through and crossover cables.

- Straight-through cables are connected in a one-to-one manner. They are used to connect network adapters to equipment such as switches or hubs. **Table A-30** lists the connections of core wires in a straight-through cable.

Table A-30 Connections of core wires in a straight-through cable

RJ45 Connector 1	RJ45 Connector 2	Core Wire Color	Twisted?
2	2	Orange	Yes
1	1	Orange-White	
6	6	Green	Yes
3	3	Green-White	
4	4	Blue	Yes
5	5	Blue-White	
8	8	Brown	Yes
7	7	Brown-White	

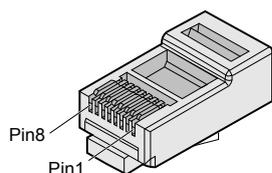
- Crossover cables are connected in a crossover manner. They are used to connect network adapters to equipment such as switches or hubs. [Table A-31](#) lists the connections of core wires in a crossover cable.

Table A-31 Connections of core wires in a straight crossover cable

RJ45 Connector 1	RJ45 Connector 2	Core Wire Color	Twisted?
6	2	Orange	Yes
3	1	Orange-White	
2	6	Green	Yes
1	3	Green-White	
4	4	Blue	Twisted
5	5	Blue-White	
8	8	Brown	Yes
7	7	Brown-White	

[Figure A-69](#) shows the pins of an RJ45 connector.

Figure A-69 RJ45 connector pins



Procedure

- Step 1** Feed both cable connectors into the ports of the cable tester.
- Step 2** After the connectors are properly inserted, turn on the tester. If the indicators from 1 to G turn on simultaneously, the pins are working normally and the wires are correctly connected.

 **NOTE**

Turn the switch to the S position and check whether the indicators turn on simultaneously. [Figure A-70](#) shows a test with both indicators on.

Figure A-70 Testing wire connection and conduction



- Step 3** Hold the connectors shown in [Figure A-71](#) and gently shake it. Then repeat [Step 2](#) to check whether the metal contact strips are in sufficient contact with the core wires and Ethernet ports.

Figure A-71 Checking connection reliability



The procedure for testing a crossover cable is the same as that for testing a straight-through cable except for the sequence in which the indicators turn on. For that sequence, refer to crossover cable wire connections.

The Ethernet cable is qualified if the indicators turn on in the following sequence:

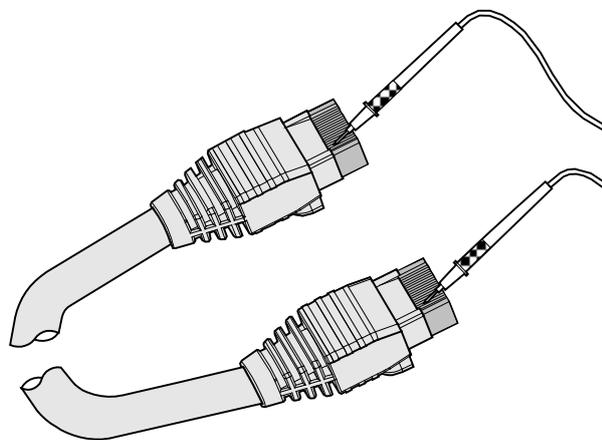
On the tester's master panel (on the left), the indicators turn on in the sequence 1-8-G. On the tester's slave panel (on the right), the indicators turn on in the sequence 3-6-1-4-5-2-7-8-G.

If the indicators do not turn on in those sequences, the Ethernet cable is unqualified.

 **NOTE**

If a tester is not available, use a multimeter to perform a simple test, as shown in [Figure A-72](#).

Figure A-72 Testing the connection of an Ethernet cable with a multimeter



----End

A.3 Environmental Requirements for Device Running

This section describes the environment requirements for device running, including the requirements for the equipment room environment and power supply conditions.

A.3.1 Equipment Room Site Requirements

Telecom equipment should run in a suitable environment. When designing a project, consider the communication network planning and the technical requirements of the equipment. Consider hydrographic, geological, seismic, power supply, and transportation factors.

An equipment room's physical construction and layout, heating and ventilation, power supply, lighting, and fire protection measures should be designed by specialists according to the device's environment requirements. The equipment room should also conform to relevant industrial, environmental, fire, and civil air defense regulations, including those set forth by the state.

The site of the equipment room should be chosen to avoid high temperatures, dust, toxic gases, explosive materials, and unstable voltage. Keep the equipment room away from power transformer stations as well as areas susceptible to strong vibrations and very loud noises.

The specific requirements for selecting an equipment room site are as follows:

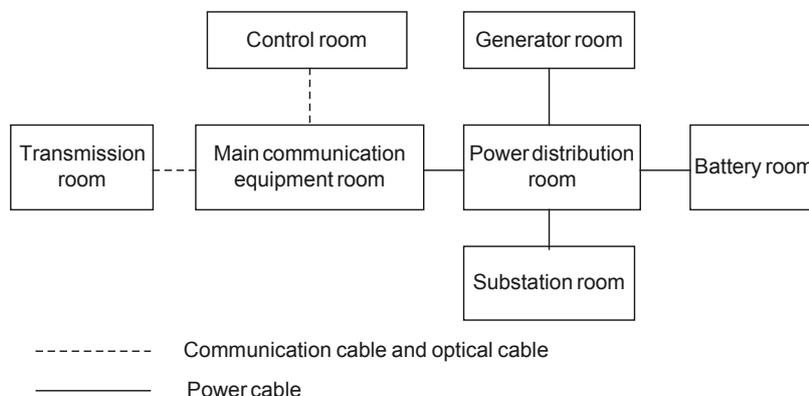
- The room should be located at least 5 km away from heavy pollution sources such as smelting plants and coal mines, at least 3.7 km away from moderate pollution sources such as chemical, rubber, and galvanization plants, and at least 2 km away from light pollution sources such as packinghouses and tanyards. If these pollution sources cannot be avoided, ensure that the equipment room is situated upwind of and as far away from the pollution sources as possible and invest in protection products.
- The room should be located far away from or upwind of livestock farms. Do not use a former livestock room or fertilizer warehouse as the equipment room.
- The room's air vent should be located far away from city waste exhaust pipes, large cesspools, and sewage treatment tanks. The room should be in the positive pressure state, lest corrosive gases enter the equipment room and erode components and circuit boards.
- The room should be located far away from industrial and heating boilers.
- The room should be on the second floor or higher. If this requirement cannot be met, the equipment in the room should be on ground at least 600 mm above the highest flood level on local records. The room should be at an altitude of less than 3,000 m.
- The room should be at least 3.7 km away from the ocean or a salt lake. Otherwise, the equipment room must be airtight and contain cooling facilities. In addition, alkalized soil cannot be used as the construction material. Otherwise, equipment suitable for wet conditions must be used.
- The equipment room should be strong enough to resist winds and downpours.
- The room should be located away from dusty roads or sand fields. If this is unavoidable, the doors and windows of the equipment room should not face pollution sources.

A.3.2 Equipment Room Layout

The equipment room is usually used to install mobile switching equipment, telecom transmission equipment, and power supply equipment as well as other auxiliary equipment. To facilitate maintenance and management, place telecom equipment in different rooms.

Figure A-73 shows the recommended layout of the equipment room.

Figure A-73 Layout of the equipment room



The general layout principles of the equipment room are as follows:

- Meet requirements for laying out and maintaining communication cables and power cables.
- Minimize cabling distance, which facilitates cable maintenance, reduces potential communication faults, and raises efficiency.

A.3.3 Construction Requirements for the Equipment Room

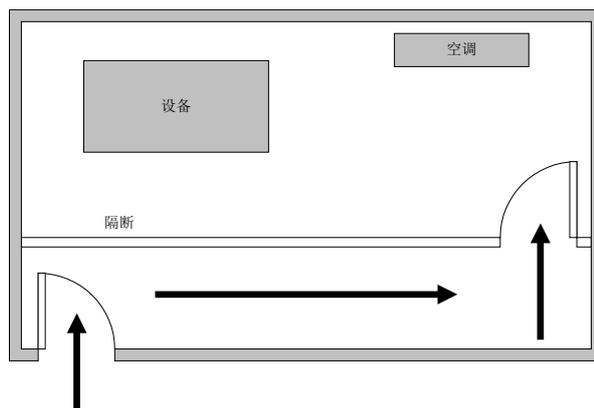
Table A-32 describes the construction requirements for the equipment room.

Table A-32 Construction requirements for the equipment room

Item	Requirements
Area	The smallest area of the equipment room can accommodate the equipment with the largest capacity.
Net height	The minimum height of the equipment room indicates the net height below the beam or the ventilation pipe. The minimum height of the equipment room is 3 m.
Floor	The floor in the equipment room should be semi-conductive and dustproof. A raised floor with an ESD function is recommended. Pave the floor solidly and evenly. The horizontal tolerance of each square meter should be less than 2 mm. If a raised floor is not possible, use floor material that conducts static electricity, with a volume resistivity of 1.0×10^7 ohms to 1.0×10^{10} ohms. Ground the floor material that conducts static electricity or raise the floor so that static electricity can be conducted. You can connect them with the grounding unit by using the current limiting resistor and connection line. The resistance of the current limiting resistor is one megohm.
Load-bearing capacity	Larger than 150 kg/m^2 .
Door and windows	The door of the equipment room should be 2 m high and 1 m wide. One door is sufficient. Install doors and windows with dustproof plastic tape to maintain a seal. Install double-layer windows and seal them.
Wall surface treatment	Install wallpaper or apply flat paint to the wall surface. Do not use pulverized paint.
Grooves	Use grooves to arrange cables. The inner faces of the grooves must be smooth. The reserved length and width of the grooves and the number, position, and dimensions of the holes must comply with the requirements of device arrangement.
Water pipe	Do not pass service pipes, drainpipes, or storm sewers through the equipment room. Do not install a fire hydrant in the equipment room. A fire hydrant can be installed in a hall or near a staircase.
Internal partition wall	Divide the equipment and the door using an internal partition wall. This prevents intrusion of dust.

Item	Requirements
Installation position of the air conditioner	Install the air conditioner in a suitable location so that it does not blow air directly onto the device.
Other	Protect the equipment room from mildew and rodents.

Figure A-74 Internal partition wall inside the equipment room



A.3.4 Requirements for Temperature, Humidity, and Altitude

Ensure proper temperature and humidity in the equipment room. Ensure the altitude of the equipment room in the regulated range. [Table A-33](#) lists the temperature, humidity, and altitude requirements for the equipment room.

Table A-33 Requirements for temperature, humidity, and altitude

Item	Requirements	
Environmental temperature ^a	Long-term operation ^b	0°C to 45°C
	Short-term operation	-5°C to 50°C
Storage temperature	-40°C to 70°C	
Environmental relative humidity	Long-term operation	5% RH to 85% RH, no coagulation
	Short-term operation	5% RH to 95% RH, no coagulation
Storage relative humidity	0% to 95%	
Long-term altitude	Less than 3,000 m	

Item	Requirements
Storage altitude	Less than 5,000 m

 **NOTE**

- a. Temperature and humidity should be measured at a height of 1.5 m above the floor and 0.4 m away from the front of the cabinet. There should be no protection boards at the front or back of the cabinet.
- b. Short-term operation means that the continuous running time of devices does not exceed 96 hours and the accumulated time of continuous running does not exceed 15 days per year. Running time that exceeds these parameters is considered long-term operation.

To meet the preceding requirements, take the following measures:

- Use a perennial temperature-control device regardless of the local climate.
- Mop the ground regularly or use a humidifier to maintain proper humidity in dry areas of in the equipment room.
- Use a dehumidifier where the humidity is high.

A.3.5 Dust Requirements

The dust accumulated on the device may cause electrostatic force, resulting in poor contact for metal connectors or metal connection points. Electrostatic force not only affects the device's life span, but also easily causes faults on the device.

The equipment room is free from explosive, conductive, magnetism-permeable, and corrosive dust. [Table A-34](#) describes requirements on dust concentration in the equipment room.

Table A-34 Requirements on dust concentration in the equipment room

Mechanical active material	Unit	Concentration
Dust particle	Particle /m ³	≤3×10 ⁴ (no visible dust accumulated on the workbench in three days)
Description Dust particle diameter ≥ 5 μm		
Suspended dust	mg/m ³	≤0.2
Precipitable dust	mg/m ² ·h	≤1.5
Sand	mg/m ³	-
Description <ul style="list-style-type: none"> ● Suspended dust diameter ≤ 75 μm ● 75 μm ≤ precipitable dust diameter ≤ 150 μm ● 150 μm ≤ sand diameter ≤ 1000 μm 		

To meet the preceding dust concentration requirements, take the following measures:

- Use dustproof materials during ground, wall, and ceiling construction.
- Install screens on doors and windows facing outside. Outer windows should be dust-proof.
- Clean the equipment room regularly and clean the air filter monthly.
- Put on shoe covers and ESD clothes before entering the equipment room.

A.3.6 Corrosive Gases Requirements

The room should be free of corrosive gases, such as SO₂, H₂S, and NH₃. [Table A-35](#) lists the requirements on the corrosive gas concentration.

Table A-35 Requirements on corrosive gas concentration

Chemical active material	Unit	Concentration
SO ₂	mg/m ³	≤0.20
H ₂ S	mg/m ³	≤0.006
NH ₃	mg/m ³	≤0.05
Cl ₂	mg/m ³	≤0.01

To meet the preceding requirements, take the following measures:

- The equipment room should not be located near an area where the corrosive gas concentration is high, such as a chemical plant.
- Ensure the air intake vent of the room is upwind of the pollution source.
- Batteries should be separated and ideally set up in different rooms.
- An authoritative organization should monitor corrosive gas conditions regularly.

A.3.7 ESD Prevention Requirements

The absolute value of electrostatic voltage must be less than 1000 V.

To ensure this, take the following measures:

- Train operators on ESD prevention.
- Maintain proper humidity in the equipment room to reduce the impact of static electricity.
- Lay out ESD flooring in equipment rooms.
- Put on antistatic shoes and clothing before entering an equipment room.
- Use ESD tools, such as wrist straps, tweezers, and pliers.
- Ground all conductive materials in the room, including computer terminals. Use antistatic worktables.

- Keep non-antistatic materials (such as household bags, foams, and rubbers) at least 30 cm away from boards and ESD-sensitive components.

A.3.8 Electromagnetism Requirements for the Equipment Room

All sources of interference, whether from outside or inside the equipment or application system, will influence equipment negatively in the conduction patterns of capacitance coupling, inductance coupling, electromagnetic wave radiation, and common impedance (including grounding system) coupling. To prevent interference, take the following measures:

- Take effective measures against electricity net interference with the power supply system.
- Do not use the working ground of the equipment together with the grounding or lightning protection grounding device of the power equipment. Separate them as much as possible.
- Keep the equipment far away from strong power wireless launchers, radar launchers, and high frequency and high-current equipment.
- Use electromagnetic shielding as necessary.

A.3.9 Requirements for Lightning Proof Grounding

[Table A-36](#) describes requirements for lightning proof grounding.

Table A-36 Requirements for lightning proof grounding

Item	Requirements
Capital construction	Use reinforced concrete in equipment room construction Install the lightning proof device like a lightning rod in the room. The lightning proof ground shares the same grounding body with the room's protection ground.
TN-S power system	Use a special power transformer on the telecommunication site. Use a metal jacket or steel tube to cover the power cables before burying them under the ground. Properly ground both ends of the metal jacket or steel tube nearby with the buried length less than 15 m. Install a gapless zinc oxide arrester to each of the three phase lines at the low-voltage side of the AC power transformer. Nearby, properly ground the transformer enclosure, the neutral lines at the low-voltage side, and the metal steel tubes of the power cables that are connected to the transformer enclosure.

Item	Requirements
Lightning arrester requirements (for power cables leading in the communications site)	<p>Do not lead the AC/DC power cables in/out the communications site in aerial mode.</p> <p>After the low-voltage power cables are led into the room, install the lightning arrester for the power cables in the AC voltage stabilizer and the AC power distribution panel (box). Properly ground the arrester nearby.</p> <p>For equipment rooms in mountain areas that are susceptible to lightning strike and equipment rooms in separate high-rise buildings cities, install a power supply arrester with a nominal discharging current larger than 100 kA.</p> <p>The PGND cable of the lightning arrester should not exceed 1 m in length.</p>
Grounding of DC power distribution	<p>Connect the DC working ground (positive pole of the -48 V DC power supply or the negative pole of the 24 V DC power supply) with the indoor collective PGND cable nearby. The PGND cable should meet maximum load requirements for the equipment.</p> <p>The power equipment must have a DC working PGND cable, which can connect the power equipment to the collective PGND cable of the telecommunication site (or the protection ground bar of the equipment room).</p>
Equipotential connection	<p>Properly ground the devices and auxiliary devices in the room such as mobile base station, transmission, switching equipment, power supply equipment, and cable distribution frame. Connect all protection PGND cables to the collective protection ground bar. Connect all protection PGND cables in one equipment room to one protection ground bar.</p> <p>Apply joint grounding to the working ground and protection ground of devices such that the two share one grounding network.</p> <p>The cabling rack, shell, metal ventilation pipe, metal door, or window on the equipment should be grounded for protection.</p>
General grounding	<p>Do not connect the neutral line of the AC power cable with the protection ground of any telecom equipment in the equipment room.</p> <p>Do not install the fuse or switch on the PGND cable.</p> <p>All PGND cables should be as short and routed as straight as possible.</p>
Grounding resistance	<p>The grounding resistance must be lower than 1 ohm.</p> <p>The upper end of the grounding body should be at least 0.7 m above the ground. In cold areas, bury the grounding body below the frozen ground.</p> <p>Measure the grounding resistance periodically to ensure effective grounding.</p>

Item	Requirements
Signal cable routing	<p>Do not arrange the signal cables overhead in the equipment room. All signal cables must be led into the site underground.</p> <p>Use cables with metal jackets or place them into a metal pipe if they come out/in the equipment room.</p> <p>Keep the PGND cable of the lightning arrester as short as possible. Ground the idle lines inside the cable in the equipment room.</p>
Collective ground cable	<p>Use the grounding ring or ground bar for the collective ground cable.</p> <p>Do not use aluminum cables as ground cables. Adopt measures to prevent electrification corrosion when connecting different metal parts together.</p> <p>Use the copper busbar as the collective ground cable a the cross-sectional area not less than 120 mm². Alternatively, use the galvanized flat steel with the same resistance. Insulate the collective ground cable from the reinforcing steel bars of the building.</p>
Grounding lead-in	<p>The grounding lead-in should not exceed 30 m long in length. Use galvanized flat steel with a cross-sectional area of 40 mm x 4 mm or 50 mm x 5 mm.</p>

A.3.10 Power Supply Requirements

This section describes the requirements for power supply conditions.

DC Power Supply Requirements

The telecommunication site should receive stable and reliable DC power supply. Deploy the power equipment near the telecom equipment to make the DC feeder as short as possible. To reduce power consumption and installation costs, ensure that the loop voltage drop from the battery port to the equipment port is less than 3.2 V.

For sites with heavy traffic or with more than two switching systems, two or more independent power supply systems are required.

For a large-scale communication site, configure multiple power supply systems in different floors to supply power to different equipment rooms. For a common communication site with medium traffic, configure a centralized power room or battery room. You can also adopt the distributed power supply mode. For a site with light traffic, use integrated power supply. Protect the circuit board from corrosive gas released by the battery.

Table A-37 lists the specifications for the DC power supply.

Table A-37 Specifications for the DC power supply

Item	Specifications
Range of the -48 V input voltage	-38 V to -72 V

Item	Specifications
DC power capacity for supporting the surge current	At least more than 1.5 times the rated current
Regulated voltage precision	If the AC input voltage is in the range of 85% to 110% of the rated value and the load current is in the range of 5% to 100% of the rated value, the output voltage of the rectifier is an integer in the range of -46.0 V to 56.4 V with a regulated voltage precision equal to or lower than 1%.
Overshoot amplitude of switch on/off	Integral value of the DC output voltage $\pm 5\%$
Peak-to-peak noise voltage	≤ 200 mV
Dynamic response	The recovery time is less than 200 ms. The overshoot is in the range of the integral value of the DC output voltage $\pm 5\%$.

DC Power Supply Recommendations

Recommendations for DC power supply are as follows:

- Adopt dispersed power supply mode. Use multiple DC power supply systems and set power equipment in multiple positions.
- Adopt the standard DC power supply system and set the output voltage of the communications equipment within the required range.
- Improve the reliability of the AC power supply system, and reduce the capacity of storage batteries. For small offices, if it is difficult to enhance the reliability of the AC power supply system, increase the capacity of storage batteries.
- The total capacity of the high-frequency switch rectifier must satisfy the power requirements for the communication loading and battery charging. Configure the backup rectifier modules. If there are 10 or fewer active modules, configure one backup module. If there are more than 10 active modules, configure one backup module for every 10 active modules.
- Install storage batteries in two or more groups. Capacity is determined by the duration when the storage batteries supply power to the load. Batteries in most offices should be able to supply power for at least one hour.

AC Power Supply Requirements

An AC power supply that consists of mains, Uninterrupted Power Supply (UPS), and an independently acquired electric generator set is suitable for integrated power supply. In addition to meeting server load requirements, AC power supply has features such as simple connection line, safe operation, flexible scheduling, and easy maintenance.

A low voltage power supply should adopt three-phase five-wire mode or monophase three-wire mode. Low AC power supply voltages are 110 V/127 V/220 V/380 V, with a frequency of 50 Hz.

UPS is required to function as the AC potential power, which should be the same phase as mains. The switching time for UPS and mains should be less than 10 ms; otherwise, the device will reboot or reset.

For power distribution capacity in the equipment room, the working current and fault current of the device should be calculated. Ensure that independent AC power supply protects the independent device. Configure the current capacity of the protection switch of the equipment room as greater than the current capacity of the device.

Table A-38 describes the voltage range of AC power supply for the device.

Table A-38 Voltage range of AC power supply

Item	Requirements
AC power capacity to support the device	-10% to +5% of the rated voltage
AC power capacity to support the power modules and important buildings	-15% to +10% of the rated voltage
Frequency of alternating current	-4% to +4% of the rated voltage
Voltage wave shape sine distortion rate	Within 5% of the rated current

As an automated generator set, the independently acquired electric generator set of telecommunication server with the standard interface supports telecommunication protocol, remote telecommunication, monitoring, and control by adopting automatic input, removal, and supply.

AC power cables should meet the following requirements:

- AC neutral uses the conductor with the same cross section as the phase line.
- AC wires are non-flammable and comply with local regulations. Low-voltage power distribution rooms comply with local regulations.

AC Power Supply Recommendations

Recommendations for AC power supply are as follows:

- If the power voltage of the mains, which supplies power for the device directly, exceeds the rated voltage by -10% to 5% or exceeds the voltage range that the device can support, a voltage regulating device or voltage stabilizing device is required.
- If the mains does not supply power for the device directly, the mains voltage exceeds the rated voltage by -15% to 10%, or exceeds the voltage range that the DC power supply device allows AC to input, a voltage regulating device or voltage stabilizing device is required.
- The UPS system or inverter power supply system is required for uninterrupted or non-transient telecommunication load of AC.
- When an abnormality occurs on mains, the telecommunication server should be equipped with independently acquired electric generator set as power supply to ensure the key

telecommunication load and force load. The capacity should be not less than 150% to 200% of the total uninterrupted AC power device.

- Storage batteries are usually installed in two parallel groups. UPS storage batteries are generally installed in one group. Redundancy required for UPS can adopt concatenation or parallel connection. When an inverter or a UPS is used, the active inverter is determined by the maximum power and a backup inverter is required.

A.4 Equipment Grounding Specifications

This section describes grounding specifications, including general grounding specifications, the grounding specifications for equipment rooms, devices, communication power modules, signal cables, and signal cables, and the specifications for laying out ground cables.

A.4.1 General Grounding Specifications

This section describes general grounding specifications.

Table A-39 lists the general grounding specifications.

Table A-39 General grounding specifications

No.	
1	The grounding design should follow the principles of equal voltage and equal potential. That is, the working grounding and protection grounding, including the shielded grounding and the lightning-proof grounding of the cable distribution frame are jointly grounded at the same group of grounding body.
2	The cabling racks, shells, metal ventilation pipes, metal doors, and windows in the equipment room should be grounded for protection.
3	The metal parts of equipment, which are neutral in normal conditions, should be grounded for protection.
4	The ground cable must be connected properly to the protection ground bar of the equipment room.
5	Do not use other equipment for the component part of the ground cable or electrical connection.

A.4.2 Grounding Specifications for an Equipment Room

This section describes the requirements for grounding the equipment room.

The grounding resistance of a comprehensive communication building should be less than or equal to one ohm. The grounding resistance of an ordinary communication office should be less than five ohms. The grounding resistance in the area where earth resistance rate is high should be less than 10 ohms.

A.4.3 Grounding Specifications for the Device

This section describes the requirements for grounding the device.

Table A-40 lists the equipment grounding specifications.

Table A-40 Equipment grounding specifications

No.	Description
1	All communication devices and auxiliary devices (such as mobile base stations, transmission and switching devices, power supply devices) in the equipment room should be grounded for protection. Connect all protection grounding for various devices jointly to a general ground bar and then to the same protection ground bar in the room together with the protection ground (PGND) of the device.
2	The PGND of the equipment should be shorted to the copper protection ground bar provided by the user. The short-circuiting cable used should be an alternating yellow and green plastic insulating cable with a copper core and a cross-sectional area greater than 35 sq. mm.
3	There are grounding terminals and grounding flags at the lower part of the front door, rear door, and side panel of the cabinet connected to the grounding terminals of the cabinet framework through connection cables with cross-sectional areas no less than 1.6 sq. mm.
4	Ensure that all metal components of the cabinet have good conductivity. Do not spray any insulating coating on the connection part of the metal components.
5	Securely connect the cabinets in the same row by fastening the captive screws and gaskets on the top of the cabinets. Do not spray coating onto a rectangle area of 30 mm x 50 mm around the connection hole for captive bolt. You must take measure to preventing rust and corrosion in this area. Zinc electroplating with iridescent yellow chromate conversion coating should be applied to the gasket and nut to ensure sufficient electric contact.
6	When combining cabinets of the same type, short-circuiting cables are required to connect any grounding busbars in the cabinets. The cross-sectional area of the short-circuiting cable is 6 sq. mm and is less than 300 mm long. Connect the two ends of the short-circuiting cable to the respective ground busbar terminals of the neighboring cabinets and fix them firmly.

A.4.4 Grounding Specifications for Communications Power Supply

This section describes the requirements for grounding communications power modules.

Table A-41 lists the grounding specifications for communication power supply.

Table A-41 Grounding specifications for communication power supply

No.	Description
1	The AC power supply system of the communication equipment room should adopt the TN-S power supply mode.

No.	Description
2	The inlet for the AC power cable at the equipment room should be equipped with a lightning protection device (C-level) with a nominal discharging current no less than 20 kA.
3	The protection ground for the power supply and that for communication equipment share the same grounding body group. If the power supply and equipment are in the same equipment room, try to use the same protection ground bar for both of them.
4	Add a lightning protection circuit for the AC power interface.
5	The anode of the -48 V DC power supply or negative pole of the 24 V DC power supply should be grounded at the output of the DC power supply.
6	The working ground and protection ground of the DC power supply equipment should use the same grounding body group with the protection ground of the switching equipment. If the power supply and equipment are in the same equipment room, try to use the same protection ground bar for both of them.
7	Add surge protection for the DC power interface.

A.4.5 Grounding Specifications for Signal Cables

This section describes the requirements for grounding signal cables.

[Table A-42](#) lists the grounding specifications for signal cables.

Table A-42 Grounding specifications for signal cables

No.	Description
1	If there are digital trunks that connect the transmission equipment directly or indirectly to the wireless communication equipment in the station, install an E1 lightning protection device for the relative interface of the transmission equipment.
2	Equip the outdoor cable with a metal jacket and ground its two ends or connect them to the protection ground bar in the equipment room. For cables inside the equipment room, install lightning protection devices at the corresponding interface of the equipment. The protection ground cable for the lightning protection devices should be as short as possible.
3	Both ends of the external conductor of the coaxial cable and those of the shielding layer of the shielded cable should have good electric contact with the metal shell to which the equipment connects.
4	The incoming and outgoing signal cables to and from the office and the idle line pair inside the cable should be grounded for protection.
5	The Tone & Data Access (TDA) cable must pass the Main Distribution Frame (MDF) with a security unit when going out of the office. Its shielding layer should be connected to the protection ground of the MDF. The MDF should use the same grounding body group as the cabinet.

No.	Description
6	The signal cables within the area of the communication office and mobile station should not be arranged aerially.

A.4.6 Specifications for Laying Out Grounding Cables

This section describes the requirements for laying out ground cables.

Table A-43 list the cabling specifications for the ground cable.

Table A-43 Specifications for laying out ground cables

No.	Description
1	The ground cable should not be next to or twist around the signal cable.
2	The ground cable cannot be led in aerially, but should be completely buried underground or arranged indoors.
3	Do not extend the protection ground cable or add any switch or fuse.
4	The protection ground cable used should be an alternating yellow and green plastic insulating cable with a copper core.
5	The neutral line of the AC power cable cannot be connected with the protection ground of various transmission and communication equipment in the equipment room.
6	The length of the protection ground cable should not exceed 45 m. The protection ground cable should be as short as possible. When the cable is longer than 45 m, advise the user to replace the ground bar nearby.

A.5 Engineering Labels for Cables

This section provides an overview of labels and describes the labels for optical fibers, Ethernet cables, and power cables.

Labels facilitate on-site installation and maintenance.

There are two main types of cable labels:

- Single cable labels used on network cables, optical fibers, trunk cables, and user cables (excluding antenna feeders)
- Power cable labels used on AC power cables and DC power cables (excluding the power bus cable)

NOTE

If the user needs an integrated label description, fill in the label according to the user's requirements. Make a note of this in the self-check report.

A.5.1 Introduction to Labels

This section describes the material, types, structure, and label contents and how to print, fill in, and attach labels, as well as related precautions.

A.5.1.1 Label Specifications

Features:

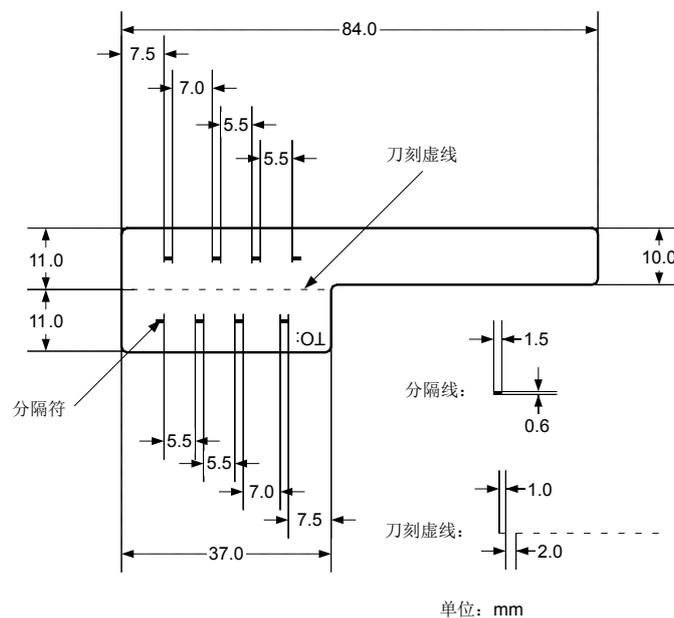
- Thickness: 0.09 mm
- Color: chalk white
- Material: polyester (PET)
- Ambient temperature: -29°C to +149°C
- Compatible with laser print and oiliness markers
- Passes the UL and CSA authentication

A.5.1.2 Type and Structure

Signal Cable Labels

The label for signal cables is L-shaped with fixed dimensions, as shown in [Figure A-75](#).

Figure A-75 Signal cable labels



To clearly specify the position of a cable, use the dividing lines on the label. There is a dividing line between the cabinet number and the chassis number, and another one between the chassis number and the slot number. The dividing line is 1.5 mm x 0.6 mm in size and is colored PONTONE 656c (light blue).

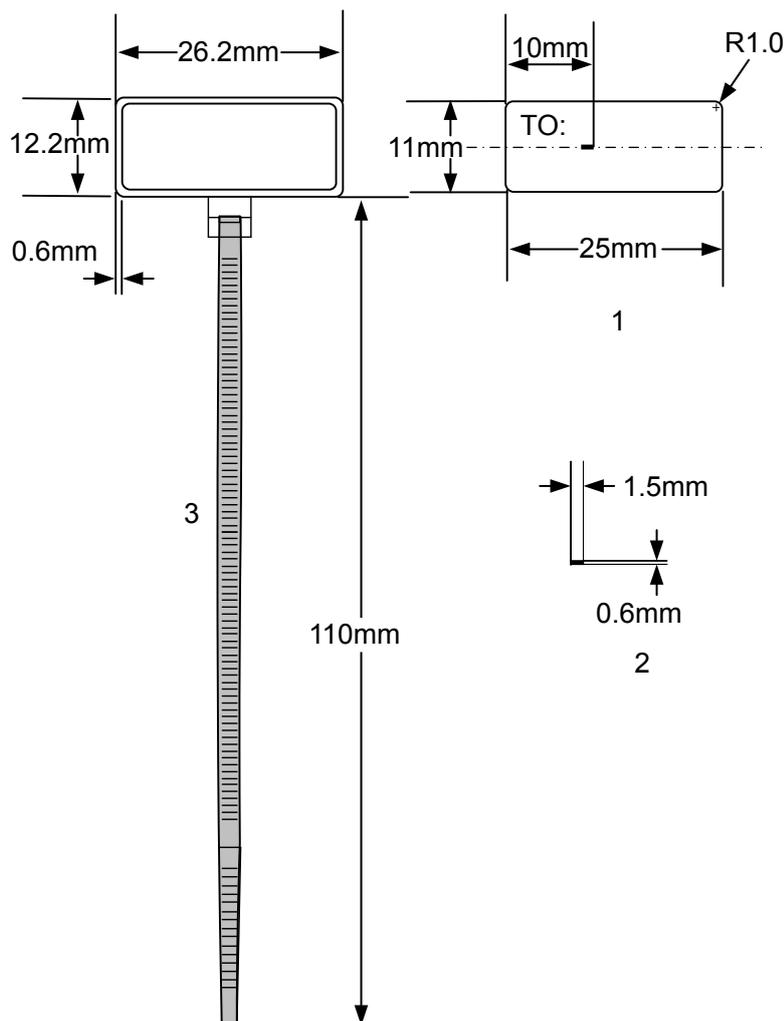
The perforated line helps with folding the label when affixed to the cable. Its size is 1 mm x 2 mm.

The lower right corner of the label is marked with "TO:" (upside-down in the figure). The mark is used to identify the opposite end of the cable on which the label is affixed.

Power Cable Label

The label for power cables should be attached to the identification plate on the cable ties that are bundled to the cable. The identification plate has an embossment of 0.2 mm x 0.6 mm around (symmetrical on both sides) and the area in the middle is for affixing the label, as shown in [Figure A-76](#).

Figure A-76 Power cable label



A.5.1.3 Label Printing

Contents can be printed or written on labels. Printing is recommended for clarity and efficiency.

Template for Printing

You must use a template to print labels. You can obtain the template through the following methods:

- Download it at <http://support.huawei.com/enterprise>.
- Contact a local Huawei office.

The templates are made in Microsoft Word. Adhere to the following template requirements:

- Directly modify the contents on the template. Do not change the centered characters, direction, or fonts.
- When there are too many characters to be filled in, zoom out the characters while ensuring that the printouts are still clear.

Merging Cells in the Template

To merge two or more cells, perform the following operations:

1. Select **Edit/Select All**.
2. Select **Format/Borders and Shading/Borders**. Select **Box** tab and click **OK**.
3. Drag the mouse to select cells to be merged and select the **Table/Merge Cells**.

Printer Requirements

A laser jet printer must be used to print labels. There is no restriction on the printer model. Before printing labels, do a test print as follows:

1. Try printing on a piece of standard paper that is blank on both sides. Cover the label paper with the piece of standard paper and check whether the page setup conforms to the requirement.
2. Make sure the printer properties, such as "paper size" and "direction", have been set correctly.
 - If the printout conforms to the requirement, print it to label paper.
 - If the printout does not conform to the requirement, adjust the page setup, and print again until the correct printout is produced.

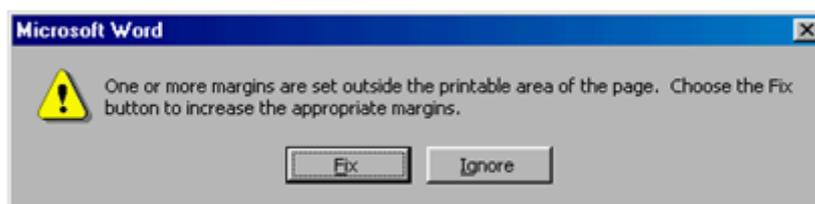
The method of adjusting the page setup is as follows:

1. Select **File/Page Setup**.
2. Select **Layout** and set Header and Footer as 0.
3. Select the **Margins** tab page. Select Left for Gutter Position and adjust the values of Top, Bottom, Left, and Right.

NOTE

If the warning prompt as shown in [Figure A-77](#) appears before printing, click **Ignore** to continue the printing.

Figure A-77 Warning prompt before printing



After the page setup has been configured, save it for future use. You only need to configure the page setup the first time you use the template to print the labels.

Requirements on Feeding Labels into the Printer

The label paper is different from standard paper and is composed of two pages. No matter which model of printer you are using, feed in the labels by hand one after the other. Never use the auto-feed mode.

Different printer models may have different feeding modes. Make sure to feed in the labels correctly.

Requirements for Printed Labels

Make sure that the printed labels satisfy the following requirements:

- All printing is done on the label side and not the reverse side.
- Cell contents are aligned in the center. In a single-line printout, the dividing lines and the "TO:" mark are not obscured by the printed text.
- When the cells are merged and printing is done on multiple lines, avoid obscuring the "To:" mark. When aligning the text, use the space bar to move the text to the next line.

A.5.1.4 Writing Labels

Writing Tools

To ensure that the labels are clear, when filling out the labels by hand, use black oiliness markers instead of ballpoint pens.

In special cases, black ballpoint pens are allowed, but they are not recommended. When writing with a ballpoint pen, do not leave any wet ink on the label because it may smudge.

NOTE

The included marker has two nibs. Use the smaller nib to write labels.

Font

To ensure clarity when writing by hand, try to emulate the Times New Roman typeface (uppercase) as accurately as possible. [Table A-44](#) shows uppercase Times New Roman.

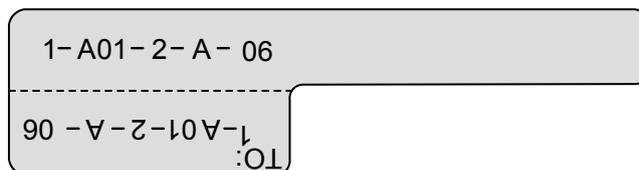
Table A-44 Times New Roman (uppercase)

0	1	2	3	4	5	6	7	8
9	A	B	C	D	E	F	G	H
I	J	K	L	M	N	O	P	Q
R	S	T	U	V	W	X	Y	Z

Do not write too large or too small of text. Writing should be clear and neat.

Writing direction: The direction is as shown in [Figure A-78](#):

Figure A-78 Direction of text on labels



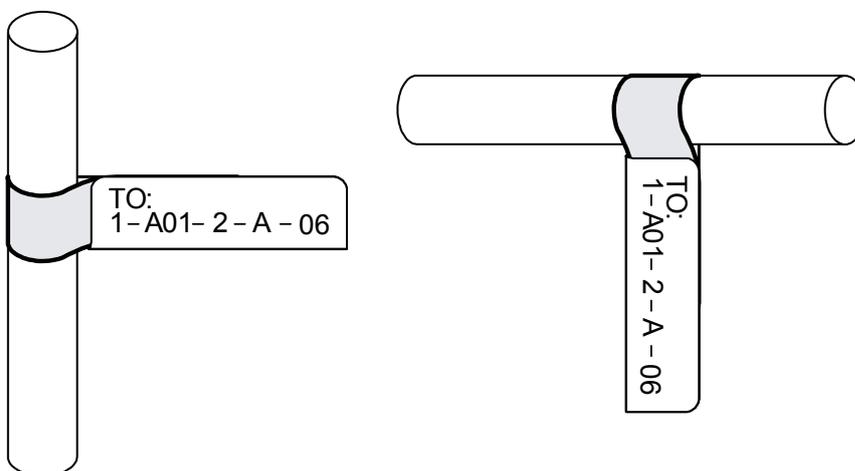
A.5.1.5 Affixing Labels

After printing or writing a label, remove the label from the label sheet and affix it to the signal cable or the identification plate of the power cable.

Affixing Signal Cable Labels

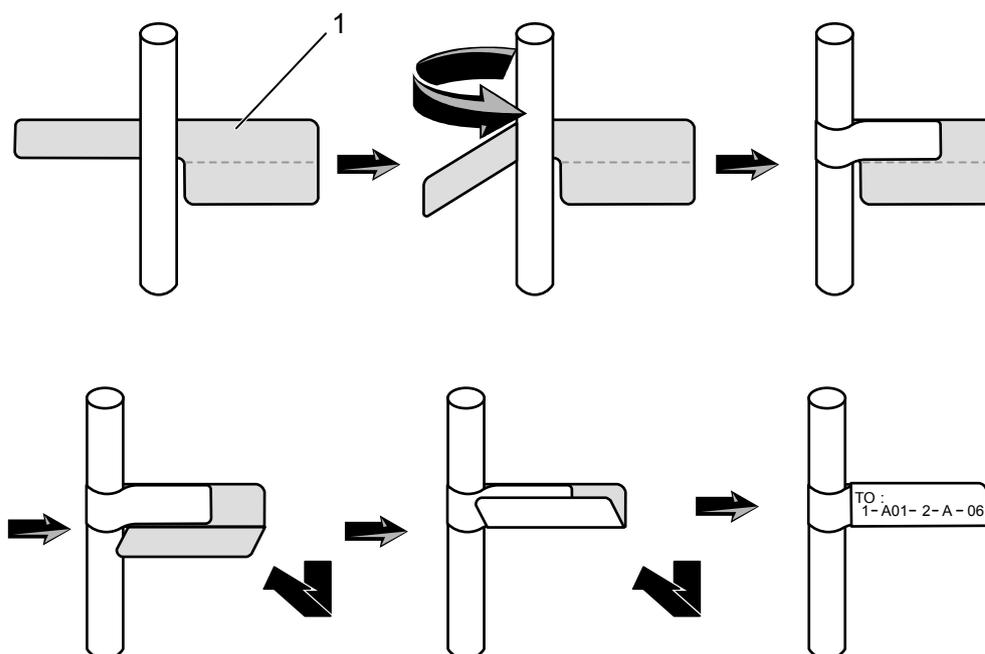
- Choose where to affix labels.
Affix the label 2 cm from the connector on the signal cable. In special cases, to avoid bending or otherwise affecting cables, affix the label elsewhere. As shown in [Figure A-79](#), orient the labels according to the following specifications:
 - For vertical cabling, orient the rectangular part of the label out to the right.
 - For cabling laid out horizontally, orient the rectangular part of the label downward.

Figure A-79 Signal cable labeling orientation



- Affix labels.
[Figure A-80](#) shows the procedures for affixing labels.

Figure A-80 Signal cable labeling procedure



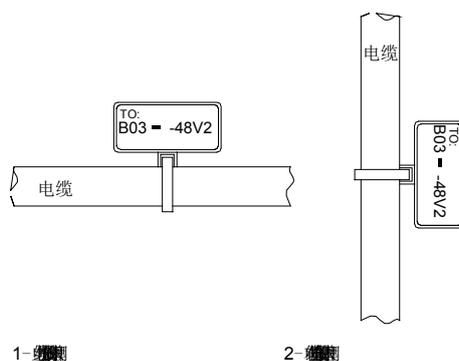
Affixing the Power Cable Label

Remove the label from the bottom page and then affix it to the identification plate on the cable tie. Affix the label to the rectangular flute on only one side of the identification plate. Cable ties are bound 2 cm from the connectors. In special circumstances, other positions are allowed.

Cable ties should be bound on both ends of a cable. After cable ties are in position, depending on the orientation of the cabling, the finished identification plate should be positioned on the top or on the right side of the cable, as shown in [Figure A-81](#). Orientation rules are as follows:

- For vertical cabling, orient the identification card out to the right of the cable.
- For cabling laid out horizontally, orient the identification card above the cable and make sure the label is facing out.

Figure A-81 Power cable labeling orientation



A.5.1.6 Label Contents

Label Contents for Power Cables

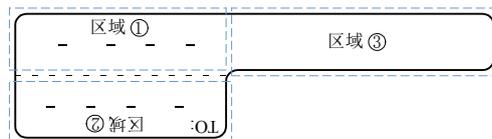
Labels for power cables are only affixed on one side of the identification plates. They contain information about the location of the device on the other end of the cable, like the location of control cabinet, distribution box, or power socket.

Label Contents for Signal Cables

Both sides of the label affixed on the signal cable contain information about the location of the ports connected to both ends of the cable. **Figure A-82** shows the information on both sides of the signal cable labels.

- Area 1 contains information about the location of the local end of the cable.
- Area 2 (marked with "TO:") contains information about the location of the opposite end of the cable.
- Area 3 is folded inside the label and contains no information.

Figure A-82 Areas on signal cable labels



From the perspective of the cabling end of the equipment, the text part of the label is on the right side of the cable. The side marked "TO:" faces outward and contains information about the location of the opposite end of the cable; the other side contains information about the location of the local end.

Information in Area 1 at one end of the cable is the same as the information in Area 2 at the other end of the cable.

A.5.1.7 Labeling Precautions

When using labels, note the following:

- When printing, writing on, or affixing labels, keep the labels clean.
- Since the label paper is made of moistureproof and waterproof material, ink-jet printers and fountain pens cannot be used for labeling.
- Labels should be affixed neatly. Newer label types are strip-shaped.
- Power cable ties should be tied in the same position as power cables with identification plates on the same side.
- The directions "up", "down", "left" or "right" are all based on the viewpoint of the working engineer.

A.5.2 Engineering Labels for Optical Fibers

This section describes the engineering labels for optical fibers, including the labels for the optical fibers between devices and the labels for the optical fibers between a device and an ODF.

These labels are affixed to the optical fibers that connect the optical interfaces on the boards in a chassis or on the device boxes. There are two types of labels for optical cables:

- Label for the fiber that connects the optical interfaces on two devices
- Label for the fiber that connects the device and the ODF

A.5.2.1 Labels for Optical Fibers Connecting Devices

Meaning of Labels

Table A-45 lists information on both sides of the labels affixed to the optical fibers that connect two devices.

Table A-45 Information on one side of labels affixed to the optical fiber that connects two devices

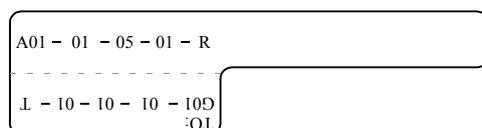
Content	Meaning	Example
MN-B-C-D-R/T	MN: cabinet number	M: The cabinet rows from front to back are labeled from A to Z. N: The cabinet columns from left to right are labeled from 01 to 99. A01 is the cabinet in Row A and Column 01.
	B: chassis number	Numbered bottom to top with two digits, such as 01.
	C: physical slot number	Numbered top to bottom and left to right starting from 01. For example, A01 is the slot with number 1.
	D: optical interface number.	Numbered from top to bottom and left to right with two digits. For example, 01 is the number 1 optical interface.
	R: optical receiving interface T: optical transmitting interface	-

Content	Meaning	Example
MN-B-C-D-R/T	MN: cabinet number	M: The cabinet rows from front to back are labeled from A to Z. N: The cabinet columns from left to right are labeled from 01 to 99. For example, A01 is the cabinet in Row A and Column 01. Numbered from bottom to top with two digits, such as 01.
	B: chassis number	-
	C: physical slot number	Numbered from top to bottom and left to right with two digits starting from 01. For example, A01 is the slot with number 1.
	D: optical interface number.	Numbered from top to bottom and left to right with two digits. For example, 01 is the number 1 optical interface.
	R: optical receiving interface T: optical transmitting interface	-

Label Example

Figure A-83 shows an example of a label on an optical fiber connecting two devices.

Figure A-83 Example of the label on the optical fiber between two devices



The labels are described as follows:

- "A0-01-05-01-R" indicates that the local end of the optical fiber is connected with the optical receiving interface 01 on slot 5, chassis 01 in the cabinet in row A, column 01 in the machine room.
- "G01-01-01-01-T" indicates that the opposite end of the optical fiber is connected with optical transmitting interface 01 on slot 01, chassis 01 in the cabinet on row G, column 01 in the machine room.

A.5.2.2 Labels for the Optical Fibers Connecting the Device and an ODF

Meaning of the Labels

Table A-46 shows the information on both sides of the labels affixed to the optical fiber that connects the device and the ODF.

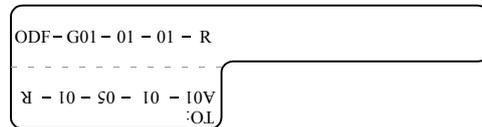
Table A-46 Information on one side of the label affixed to the fiber between the device and the ODF

Content	Meaning	Example
MN-B-C-D-R/T	MN: cabinet number	A01.
	B: chassis number	Numbered from bottom to top with two digits, such as 01.
	C: physical slot number	Numbered bottom to top with two digits, such as 01.
	D: optical interface number.	Numbered bottom to top and left to right, such as 01
	R: optical receiving interface T: optical transmitting interface	-
ODF-MN-B-C-R/T	MN: row number and column number of an ODF	M: The cabinet rows from front to back are labeled from A to Z. N: The cabinet columns from left to right are labeled from 01 to 99. For example, G01 is the ODF of Row G and Column 01.
	B: row number of the terminal device	Range from 01 to 99, such as 01-01.
	C: row number of the terminal device	
	R: optical receiving interface T: optical transmitting interface	-

Label Example

Figure A-84 shows an example of a label on an optical fiber that connects the device and the ODF.

Figure A-84 Example of the label on the optical fiber between the device and the ODF



The labels in **Figure A-84** are described as follows:

- "ODF-G01-01-01-R" indicates that the local end of the optical fiber is connected with the optical receiving terminal in row 01, column 01 of the ODF in row G, column 01 in the machine room.
- "A01-01-05-01-R" indicates that the opposite end of the optical fiber is connected with optical receiving interface 1 on Slot 01, chassis 01 in the cabinet in row A, column 01 in the machine room.

A.5.3 Engineering Labels for Network Cables

This section describes the applicable range and contents of the labels for network cables and provides examples.

Applicable Ranges

The labels can be applied to Ethernet cables only.

Label Content

Table A-47 describes the content on both sides of the labels affixed to Ethernet cables.

You can also fill in the labels according to the actual environment. If the device is not installed in a cabinet, remove the cabinet number.

Table A-47 Information on the Ethernet cable labels

Content	Meaning	Example
MN-B-C-D	MN: cabinet number	A01 is the first cabinet in row A.
	B: chassis number	Numbered from bottom to top with two digits, such as 01.
	C: physical slot number	Numbered from bottom to top and left to right with two digits, such as 01.
	D: network port number	Numbered top to bottom and left to right with two digits, such as 01.

Content	Meaning	Example
MN-Z	MN: cabinet number	B02 is the second cabinet in Row B.
	Z: Location number	Fill in the valid location number of the terminal device on site. If the cable is connected to a router in a cabinet, specify the serial numbers of the cabinet, the chassis, and the Ethernet interface of the router, for example, B02-03-12. If the cable is connected to the Network Management Station (NMS), specify the location of the NMS.

Fill out the labels for network cables connecting hubs and routers or agents and the network cables for other purposes according to actual connections:

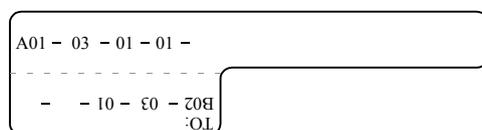
- For the network cable connecting a hub and router, the label on the hub end should specify the numbers of the chassis and cabinet where the hub resides as well as the serial number on the hub. The label on the router end should indicate the number of the chassis and cabinet where the router locates. If the router is stand-alone, provide the specific position of the router.
- For the network cable connecting a hub and an agent or a terminal, the label on the agent or terminal end should specify the serial number of the network interface. The definitions of the cabinet number and chassis number are the same as those described in Table D-4.
- For a stand-alone hub without any cabinet or chassis, the label should specify the precise location of the hub.

The serial number on the hub, the network interface number of the agent or terminal, and the location of the stand-alone router should be specified according to actual connections.

Label Example

Figure A-85 shows an example network cable label.

Figure A-85 Example of the label on network cables



The labels in **Figure A-85** are described as follows:

- "A01-03-01-01" indicates that one end of the network cable is connected to network interface 01 of slot 01, chassis 03 of the cabinet in row A, column 01 in the equipment room.
- "B02-03-01" indicates that another end of the network cable is connected to network interface 01, chassis 03 of the cabinet in row B, column 02 in the equipment room. There is no slot number.

A.5.4 Engineering Labels for Trunk Cables

This section describes the engineering labels for trunk cables, including the labels for the cables between devices and the labels for the cables between a device and an MDF.

There are two types of labels for trunk cables:

- Labels for the cables between devices. For example, the label for the cable between a trunk board and a built-in transmission device and the label for the cable between two trunk boards. Attach labels to both ends of the cable to indicate the locations of the cable on both devices or on both trunk boards of a device.
- Labels for the cables between the device and a DDF. Attach labels to both ends of the cable to indicate the locations of the cable on the device and DDF.

The trunk cables are 75Ω/120Ω E1 cable, 100Ω T1 cable, 34M, 45M, 140M, and 155M cables, and 120Ω to 75Ω trunk cables.

A.5.4.1 Engineering Labels for Trunk Cables Between Devices

Label Interpretation

Table A-48 describes the engineering labels for trunk cables between devices.

Table A-48 Contents of engineering labels for trunk cables between devices

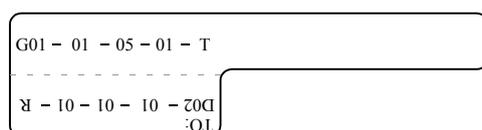
Content	Meaning	Example
MN-B-C-D-R/T	MN: cabinet number	A01.
	B: chassis number	Numbered bottom to top with two digits, such as 01.
	C: physical slot number	Numbered left to right and top to bottom with two digits, such as 01.
	D: interface number	Numbered top to bottom and left to right with two digits, such as 01.
	R: optical receiving interface, T: optical transmit interface.	-
MN-B-C-D-R/T	MN: cabinet number	A01.
	B: chassis number	Numbered bottom to top with two digits, such as 01.
	C: physical slot number	Numbered left to right and top to bottom with two digits, such as 01.

Content	Meaning	Example
	D: interface number	Numbered top to bottom and left to right with two digits, such as 01.
	R: optical receiving interface T: optical transmit interface	-

Label Example

Figure A-86 shows an example of a label for trunk cables between devices.

Figure A-86 Example of engineering labels for trunk cables between devices



The labels in **Figure A-86** are described as follows:

- "G01-01-05-01-T" indicates that the local end of the trunk cable is connected to transmitting interface 01 on slot 05, chassis 01 in the cabinet in row G, column 01 in the equipment room.
- "D02-01-01-01-R" indicates that the opposite end of the trunk cable is connected to receiving interface 01 on slot 01, chassis 01 in the cabinet in row D, column 02 in the equipment room.

A.5.4.2 Engineering Labels for Trunk Cables Between the Device and a DDF

Label Interpretation

Table A-49 describes the engineering labels for trunk cables between the device and a DDF.

Table A-49 Contents of the labels for trunk cables between the device and a DDF

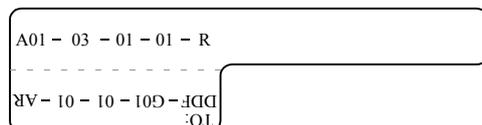
Content	Meaning	Example
MN-B-C-D-R/T	MN: cabinet number	A01.
	B: chassis number	Numbered bottom to top with two digits, such as 03.

Content	Meaning	Example
	C: physical slot number	Numbered left to right and top to bottom with two digits, such as 01.
	D: interface number	01.
	R: optical receiving interface T: optical transmit interface	-
DDF-MN-B-C-D/R/T	MN: row number and column number of a DDF	M: The rows of cabinets from front to back are labeled from A to Z. N: The columns of cabinets from left to right are numbered from 01 to 99. G01 is the DDF of row G and column 01.
	B: row number of the terminal device	Range: 01 to 99, such as 01-01.
	C: row number of the terminal device	
DDF-MN-B-C-D/R/T	R: optical receiving interface T: optical transmit interface	Usually, a DDF is marked "A" or "B." A: indicates that the DDF terminal is connected to an optical network device. B: indicates that the DDF terminal is connected to a switching device.

Label Example

Figure A-87 shows an example of a label for trunk cables between the device and a DDF.

Figure A-87 Engineering labels for trunk cables between the device and a DDF



The labels in **Figure A-87** are described as follows:

- "A01-03-01-01-R" indicates that the local end of the trunk cable is connected to receiving interface 01 on slot 01, chassis 03 in the cabinet in row A, column 01 in the equipment room.

- "DDF-G01-01-01-AR" indicates that the opposite end of the trunk cable is connected to the receiving interface in row 01, column 01 of the DDF in row G, column 01 in the equipment room.

A.5.5 Engineering Labels for User Cables

This section describes the applicable ranges and contents of the engineering labels for user cables and provides examples.

Attach labels to both ends of the cable to indicate the locations of the cable on the device and MDF.

Label Interpretation

Table A-50 describes the contents of the labels.

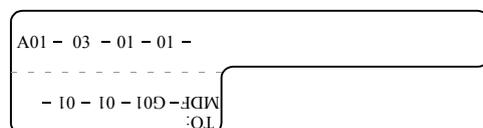
Table A-50 Contents of the engineering labels for user cables

Content	Meaning	Example
MN-B-C-D	MN: cabinet number	A01 is the first cabinet in row A.
	B: frame number	Numbered bottom to top with two digits, such as 03.
	C: physical slot number	Numbered top to bottom and left to right with two digits, such as 01.
	D: cable number	Numbered top to bottom and left to right with two digits, such as 01.
MDF-MN-B-C	MN: row number and column number of the MDF	M: The rows of cabinets from front to back are labeled from A to Z. N: The columns of cabinets from left to right are numbered from 01 to 99. G01 is the MDF of row G and column 01.
	B: row number of the terminal device	Ranges from 01 to 99, for example, 01.
	C: column number of the terminal device	

Label Example

Figure A-88 shows of a label for user cables.

Figure A-88 Example of labels for user cables



The labels in [Figure A-88](#) are described as follows:

- "A01-03-01-01" indicates that the local end of the user cable is connected to port 1 on slot 1, chassis 03 of the cabinet in row A, column 01 in the equipment room.
- "MDF-G01-01-01-AR" indicates that the opposite end of the user cable is connected to the terminal in row 01, column 01 of the MDF in row G, column 01 in the equipment room.

A.5.6 Engineering Labels for Power Cables

This section describes the engineering labels for power cables, including DC and AC power cables.

A.5.6.1 Engineering Labels for DC Power Cables

DC power cable labels are affixed to the DC power cables that provide power supply for cabinets, including the -48 V, PGND, and BGND cables. Here, the DC power cables also include power cables and protection ground cables.

The labels for DC power cables are affixed to one side of the identification plates on cable ties. [Table A-51](#) describes the meaning of contents on the DC power cable labels.

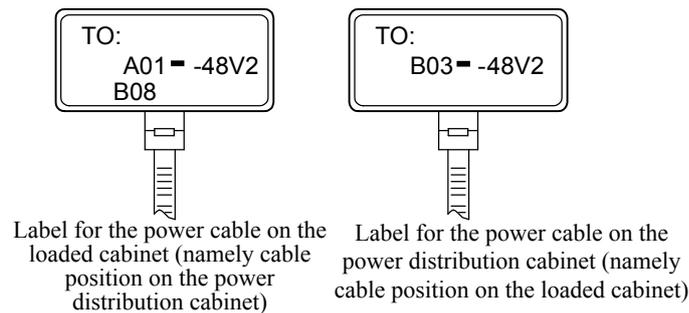
Table A-51 DC power cable label content

Content	Meaning
MN(BC)-B--48Vn	MN(BC): BC is written under MN. B: chassis number, numbered bottom to top with two digits, such as 01.
MN(BC)-B-BGND	N: power socket number, numbered 1 to 3 bottom to top and left to right.
MN(BC)-B-PGND	On the loaded cabinet side, only MN is used to identify the cabinet. On the power cabinet side, MN identifies the row and column number of the power distribution equipment like a control cabinet and distribution box, and BC identifies the row and column number of the -48 V connector. If there is no row or column number, or the connector can be identified without them, you can omit BC. It is unnecessary for BGND and PGND to identify the row and column number.

The label only contains information about the destination direction of the power cable. Information about the local end is unnecessary. That is, the label only contains information about the location of the equipment on the other end of the cable, the control cabinet, or the distribution box. [Table D-8](#) lists the information that appears on the label about the two -48 V power supplies. Provide the information about other DC voltages, such as 24 V and 60 V in similar way.

Make sure that labels are affixed in the correct direction. That is, after the cable ties are used to bundle up the cable, the identification plates with labels should face up and the text on the labels in the same cabinet should be in the same direction. For details, see [Figure A-89](#).

Figure A-89 Example of the labels for DC power cables



The labels in [Figure A-89](#) are described as follows:

- On the loaded cabinet side, the label "A01/B08--48V2" on the cable indicates that the cable is -48 V DC supply, which is from the eighth connector in row B of -48 V busbar in the cabinet in row A, and in column 1 in the equipment room.
- On the distribution box side, the label "B03--48V2" indicates that the cable is -48 V DC supply, connected to DC power socket 2 in row B, column 03 in the equipment room.

 **NOTE**

In the power distribution box or the first power cabinet of a row in a transmission equipment room, every terminal block on the -48 V connector bar is identified with a number. For example, in the above "A01/B08--48V2" label, "08" (or sometimes "8") is the numeric identifier of the terminal block.

PGND and BGND are both copper bars on which the terminal blocks are short-circuited. Therefore, you can connect to either terminal. It is only necessary to provide the row and column of the power distribution box, instead of the specific serial number of the terminal block on the copper bar. For example, if the label on the loaded cabinet side is "A01-BGND", it means that the power cable is a BGND that connects a BGND copper bar in the power distribution box in Row A, Column 01 in the machine room. Provide information on labels for PGND cables in a similar way.

A.5.6.2 Engineering Labels for AC Power Cables

AC power cable labels are affixed to both ends of an AC power cable that provides AC power supply to cabinets, including 220 V, PGND, and BGND cables. 220 V AC cables and related PGND and BGND cables are covered with an insulating sheath, so the labels need to contain only "AC" and the cabinet numbers.

Affix AC power cable labels to one side of the identification plates on cable ties. [Table A-52](#) describes the contents on AC power cable labels.

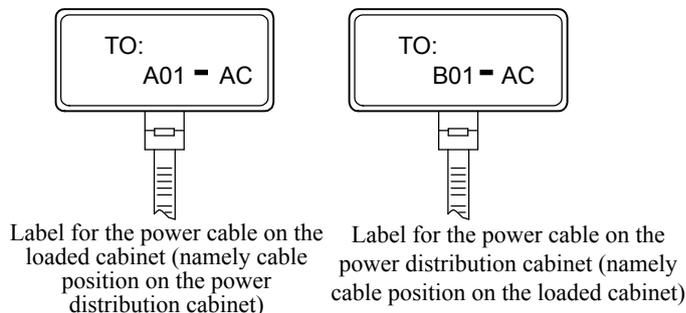
Table A-52 AC power cable label content

Content	Description
MN-(B)-ACn	<p>MN: serial number of the cabinet or the socket where the power is led in</p> <p>B: chassis number, numbered bottom to top with two digits, such as 01.</p> <p>n: power port number, numbered as 1 to 3 from bottom to top and left to right.</p> <p>Serial number of the socket where the power is led in: the location of the socket is marked according to the actual situation. If the sockets can be identified by row numbers and column numbers, they can be numbered using the same rules as for the cabinets. If the sockets cannot be identified by rows and columns, specify the precise location to avoid confusion with other sockets.</p>

The label only contains information about the location of the equipment on the opposite end of the cable as well as the power socket. Information about the local end is unnecessary.

Make sure that labels are affixed in the correct direction. That is, after the cable is bundled with cable ties, the identification plates with labels should face up and the text on the labels in the same cabinet should be in the same direction, as shown in [Figure A-90](#).

Figure A-90 Labels for AC power cables



The labels in [Figure A-90](#) are described as follows:

- On the loaded cabinet side, the label "A01-AC" indicates that the power cable is connected to the socket of Row A and Column 01 in the machine room.
- On the power socket side, the label "B01-AC1" indicates that the power cable is connected to the AC power socket in Row B, Column 01 in the machine room.

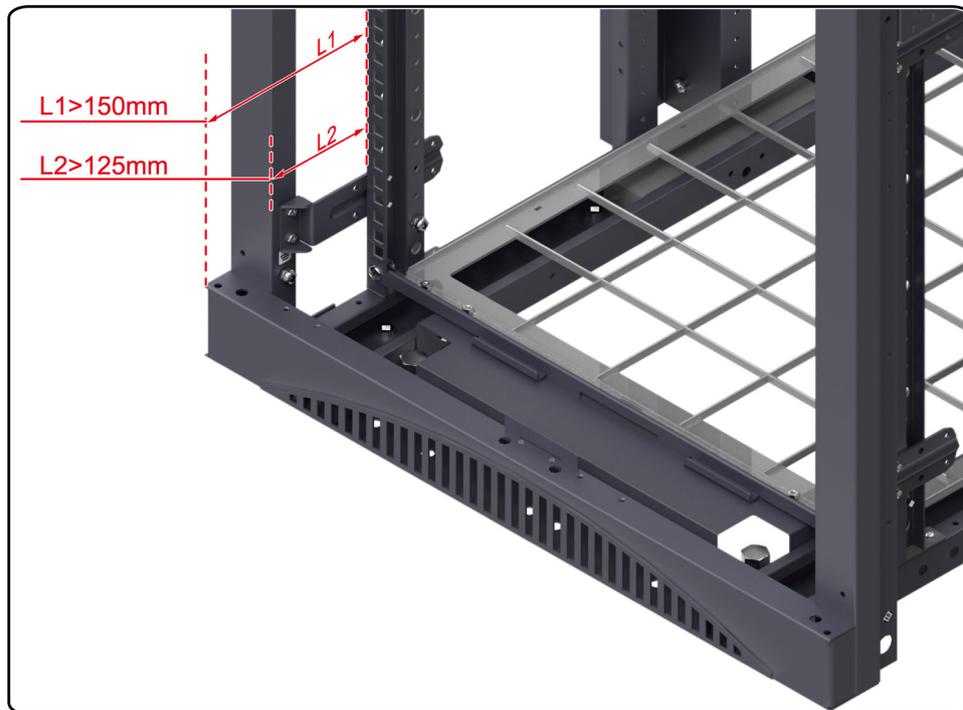
A.6 Requirements for Customers' Cabinets Purchased from Other Vendors

This section describes the requirements on customers' cabinets purchased from other vendors.

Cabinets purchased from other vendors must meet the following requirements:

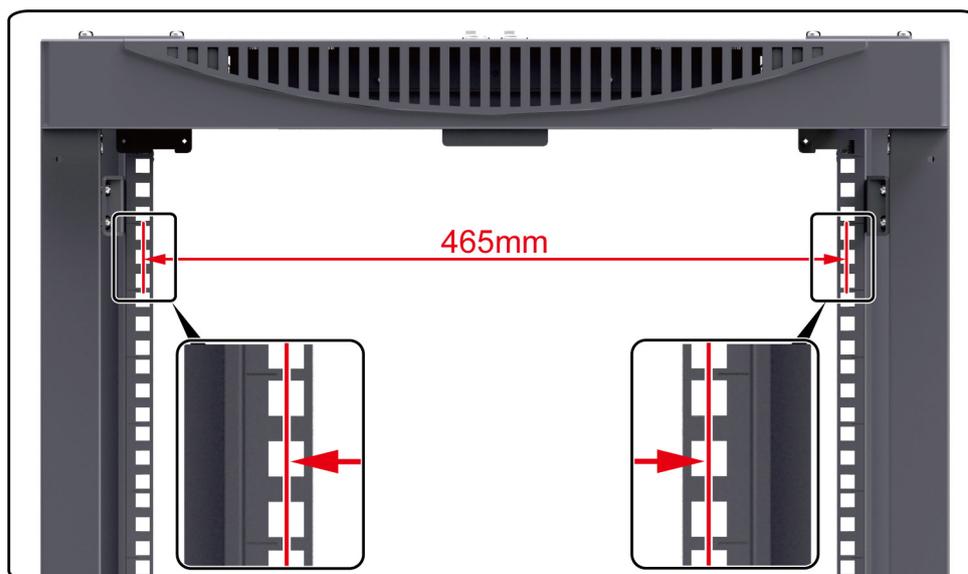
- The rack mounting rail is positioned more than 150 mm from the front door of the cabinet, and the front door is less than 25 mm thick, ensuring that the available space is at least 125 mm.

Figure A-91 Rack mounting rail requirements



- Customized cabinets must be 19-inch standard cabinets with a depth of more than 800 mm and 465 mm of space between the installation holes on the two rack mounting rails.

Figure A-92 Customized cabinet requirements



- If overhead cabling is used, a cable outlet must be reserved on the top of the cabinet; if underfloor cabling is used, a cable outlet must be reserved in the bottom of the cabinet.
- The cabinets contain installation accessories such as slide rails, captive nuts, and screws.
- The cabinets contain ground points. If the ground point is reserved, connect the device to the ground point and connect the ground point to the ground busbar. If the ground point is not reserved, connect the device to the ground busbar directly.
- On customized cabinets, porosity must be greater than 50% on the front and rear doors.
- If a device uses front and rear access modes, it cannot be installed against a wall. This is to ensure that at least 760 mm of space is available for maintenance.

A.7 Fault Tag

Fault Tag

*Customer name:						
Address:						
Contact person:						
Tel.:			Fax:			
Category*: <input type="checkbox"/> RMA <input type="checkbox"/> Return <input type="checkbox"/> Analysis						
BOM Code	Product Description	Bar Code*	Fault Occurring Date*	Description of the Fault Phenomena*	Category No.*	Software Version*
Reasons for Repairing (Category No.):						

Category No. includes the following eight types:

F001 - Wear out damaged (◇ In warranty Period ◇ Out of warranty period)

F002 - Deployment damaged

F003 - Intransit damaged

F004 - Version upgrade

F005 - Batch replace

F007 - Overdue spare parts inspecting

F008 - Others

F011 - Running circumstance change

Note:

- For optical interface cards returned, the optical interfaces should be covered with protection caps.
- In general, the analysis card will not be returned to you. If you have any special requirements, please contact Huawei.
- One **Fault Tag** should be adapted in one return category, such as RMA/Return/Analysis.
- The items marked with "*" are the mandatory fields that you must fill in.