

S110, S110E, and S210 Series Switches

Hardware Installation and Maintenance Guide

Issue 03
Date 2026-03-30



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1 About This Document

Intended Audience

This document describes installation procedures, troubleshooting methods, and maintenance instructions for the S series fixed switches.

This document is intended for network engineers responsible for switch installation and maintenance. You should have experience in network device installation and maintenance.

Symbol Conventions

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

Symbol	Description
	Indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.
	Indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.
	Indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.
	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.

Symbol	Description
 NOTE	Supplements the important information in the main text. 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.

Disclaimer

- This document is designed as a reference for you to configure your devices. Its contents, including web pages, command line input and output, are based on laboratory conditions. It provides instructions for general scenarios, but does not cover all use cases of all product models. The examples given may differ from your use case due to differences in software versions, models, and configuration files. When configuring your device, alter the configuration depending on your use case.

- The specifications provided in this document are tested in a lab environment (for example, a certain type of cards have been installed on the tested device or only one protocol is run on the device). Results may differ from the listed specifications when you attempt to obtain the maximum values due to factors such as differences in hardware configurations and carried services.
- In this document, public IP addresses may be used in feature introduction and configuration examples and are for reference only unless otherwise specified.

Device Dimension Conventions

The dimensions described in this document are theoretically typical dimensions and do not include dimension tolerances.

2 Switch Overview

The S series fixed Ethernet switches integrate the access and transmission functions to provide reliable access/aggregation and high-quality transmission of services on enterprise networks. The switches are built on an integrated hardware platform, and their hardware system consists of the chassis, power supply system, heat dissipation system, and Switch Control Unit (SCU).

NOTE

- All figures are for illustration purposes only and may not accurately depict the actual device or module.
- Some switch models have nameplates attached on their bottom sides.

CAUTION

All switches are Class A products. In a domestic environment, this product may cause radio interference in which case the user may be required to take adequate measures.

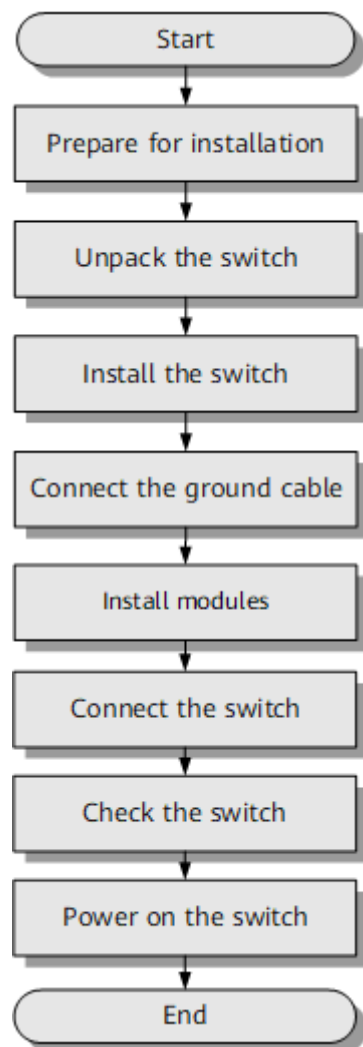
The S series fixed switch models differ in appearance and basic dimensions (excluding the parts protruding from the body).

Chassis basic dimensions determine where and how a switch can be installed. For details, see [6.1 Installation Scenario Overview](#). For the dimensions of specific switch models, see the *Hardware Description*.

3 Installation Overview

Figure 3-1 shows the sequence of tasks involved in installing a switch.

Figure 3-1 Installation flowchart



4 Preparing for Installation

[4.1 Safety Precautions](#)

[4.2 Checking the Installation Site](#)

[4.3 Checking the Cabinet or Rack](#)

[4.4 Checking the Power Supply System](#)

[4.5 Preparing Installation Tools and Accessories](#)

4.1 Safety Precautions

Before you start the installation procedure, read all safety precautions described in this document and observe any warning labels affixed to the switch. Doing so ensures your safety and protects the switch from damage.

Safety precautions provided in this document may not cover every eventuality, so remain mindful of safety at all times.

Only trained and qualified personnel should be allowed to install, operate or maintain the equipment.

General Safety Guidelines

CAUTION

Always take precautions against ESD whenever you handle a switch. For example, wear ESD gloves or an ESD wrist strap. To avoid electric shock or burn, remove conductive objects like jewelry and watch.

WARNING

Connect the ground cable first after installing the switch into a cabinet or rack. Do not remove the ground cable unless all the other cables and modules have been removed from the chassis.

Environmental Safety

** DANGER**

Do not install the switch in an environment with flammable or explosive gases or smoke.

NOTICE

Install the switch in a dry environment away from sources of water, as water or damp may damage circuits of meters.

NOTICE

The installation site must be well ventilated to prevent the switches from overheating.

Electrical Safety

** DANGER**

Contact with high-voltage power can be fatal. Never touch uninsulated electrical wires or terminals that have not been disconnected from their power source.

** DANGER**

Never install or remove the switch or power cables while the power is on.

** DANGER**

To ensure personal and equipment safety, ground the switch before powering it on.

Laser Safety

** CAUTION**

Never look directly into an optical module or the ends of optical fibers. Optical modules and connected fibers emit laser radiation that can cause eye damage.

 CAUTION

Cover fiber connectors with dust caps when they are not connected.

Mechanical Safety

 CAUTION

Use safe lifting practices when moving the switch. Never attempt to lift objects that are too heavy for one person to handle. Instead, seek help or use appropriate tools.

 CAUTION

Before installing the switch into or removing it from a cabinet, ensure there are no objects that could fall from the cabinet and cause injury.

NOTICE

Do not drill unapproved holes into a cabinet, as doing so may impair its electromagnetic shielding and damage the cables inside. In addition, drilling holes produces metal shavings that may enter the cabinet and cause short circuits on printed circuit boards (PCBs).

4.2 Checking the Installation Site

[Table 4-1](#) describes the requirements for the installation site.

Table 4-1 Requirements for the installation site

Item	Requirement
Cleanliness	The installation site must be clean, dry, well ventilated, and free from leaking or dripping water and dew. There are holes on the surface of some switches. Take protective measures to prevent insects, water, animal excrement, or other foreign matter from entering the switch through the holes.
Dust	The installation site must not have an excessive amount of dust. A buildup of dust may cause electrostatic discharge on the chassis and impair electrical connections, which will reduce the service life and may cause failure of the switch.

Item	Requirement
Temperature and humidity	The switch must be installed in a temperature-controlled environment where the temperature and humidity are within specifications. For the operating temperature and relative humidity ranges required for your switch, see the <i>Hardware Description</i> . In environments where the relative humidity exceeds 70%, use dehumidifiers or dehumidifying air conditioners. For the models with forced heat dissipation, the fan speed increases with the increase of the operating temperature. In a constant-temperature equipment room, the noise caused by the increase of the ambient temperature can be effectively avoided.
Storage environment	ETSI EN 300 019-1-1 Class 1.2 NOTE • The product has a storage life of one year. • The storage life refers to the period during which the product maintains the required quality when stored in an environment that meets the preceding requirements.
Corrosive gases	The installation site must be free from acidic, alkaline, or corrosive gases.
Airflow clearance	Leave at least 50 mm (2.0 in.) clearance around the switch for heat dissipation. Do not install a switch with its air intake vent facing or close to the air exhaust vent of other devices.

Item	Requirement
Service port surge protection	• If power and network cables of a switch need to be routed outdoors, bury them underground or put them in steel pipes to protect the switch from lightning strikes. • If the Ethernet cable for connecting to a switch is routed outdoors, use a network port surge protector (an 8-core surge protector is recommended) for the corresponding network port. Otherwise, the switch may be damaged by lightning strikes. • Observe the following rules when installing the network port surge protector: – The surge protector should be as close as possible to the switch side to reduce the lead length and minimize the impact of inductance. – Pay attention to the labels on the input and output sides of the surge protector to avoid reverse connection. – Connect the surge protector to a ground cable and ensure that it is reliably grounded (ground impedance $\leq 10 \Omega$). Specifically, secure the ground cable to the cabinet ground point or ground bar for good contact and ensure that the ground cable is as short as possible ($\leq 1 \text{ m}$) to reduce impedance. • If fiber reinforcing ribs are used, ensure that they are properly grounded to protect the switches from lightning.

Item	Requirement
Grounding requirements	In all installation scenarios, switches, cabinets, independent power modules, and surge protectors must be separately grounded. For devices connected to network ports of a switch, ensure that the ground screws of the devices and the PE wire of the AC power supply are reliably grounded. Do not connect the switch to a device with leakage current. If the peer device has leakage current on itself or due to some reason, abnormal energy will enter the device through the connected Ethernet cable, causing device faults. To avoid this problem, if the terminal connected to the switch is powered by the mains, the ground cable of the three-phase mains of the terminal must be properly grounded. To check whether the ground cable is properly grounded, ensure that: • There is less than 5 V voltage difference between the ground slot and neutral slot. • The voltage difference between the hot slot and neutral slot is 220 V or 110 V. • The voltage difference between the hot slot and ground slot is 220 V or 110 V. If the voltage difference between the ground slot and neutral slot is greater than 5 V, grounding is not performed or is improper, or the ground cable of some devices may have leakage current.

4.3 Checking the Cabinet or Rack

Table 4-2 describes the requirements for the cabinet or rack where a switch will be installed in indoor equipment rooms.

Table 4-2 Requirements for the cabinet or rack

Item	Requirement
Width	The S series fixed switches have standard dimensions and can be installed in a standard 19-inch cabinet or rack (such as an N66E or N68E cabinet).
Depth	If you use a non-standard cabinet or rack, ensure that there is a sufficient space.
Grounding	The cabinet or rack must have reliable ground points for grounding the chassis.

4.4 Checking the Power Supply System

The power supply system must be ready before the installation. [Table 4-3](#) describes the requirements for the power supply system of the S series fixed switches.

Table 4-3 Power supply requirements

Item	Requirement
Power supply requirements	• It is recommended that one power distribution circuit breaker be configured for one power module. The current specification of the power circuit breaker must be greater than or equal to the maximum input current of the power module and meet the circuit breaker derating requirements. • When multiple power supplies are used for backup, each power supply requires independent power inputs. • If a PDU supplies power to multiple power modules, ensure that the current specification of the circuit breaker inside the PDU is greater than the sum of the maximum currents of all power modules connected to the PDU. • The input voltage must be within switch specifications. For details, see the <i>Hardware Description</i>. • The output current rating of the power source for the switch must be within the maximum input current allowed for the switch. • Ensure that the power supply voltage of the device is stable to prevent device failures caused by power grid fluctuation.

Item	Requirement
Power outlet and power cable requirements	- To use AC power outlets, switches must have built-in AC power supply units or pluggable AC power modules, and use AC power cables or AC power adapters complying with local standards. - To use an AC power distribution unit (PDU), switches must have built-in AC power supply units or pluggable AC power modules, and use C13 straight female to C14 straight male power cables. - To use a 240V DC power distribution unit (PDU), switches must have built-in 240V DC power supply units or pluggable 240V DC power modules, and use C13 straight female to C14 straight male power cables. - To use a 240V DC power distribution box, switches must have built-in 240V DC power supply units or pluggable 240V DC power modules, and use C13 straight female power cables. The C13 straight female connector is connected to the power module, and cut off the other connector. Crimp OT or cord end terminals on the bare wires. Connect the blue wire to a positive terminal on the DC power distribution box, the brown wire to a negative terminal, and the yellow-green wire to a protection ground. If the switch fails to be powered on after you connect the power cable, swap the wires on the positive and negative terminals. - To use a DC power distribution box, switches must have built-in DC power supply units or pluggable DC power modules, and use DC power cables. - The power cables and plugs delivered with a switch are for use with this switch only. Do not use them on other devices.

4.5 Preparing Installation Tools and Accessories

[Table 4-4](#) and [Table 4-5](#) show the tools and accessories required for installing a switch.

Table 4-4 Installation tools

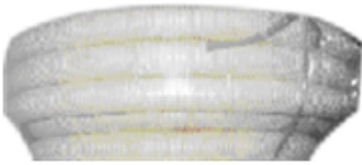
Tool	Description	Picture
ESD wrist strap	Used to prevent electrostatic discharge. Wear the strap on your wrist and insert the cord into the ESD jack on the cabinet.	
ESD gloves	Used to prevent electrostatic discharge.	
Protective gloves	Used to protect hands against lacerations and abrasions.	
Utility knife	Used to cut open cartons.	
Measuring tape	Used to measure distance.	
Marker	Used to mark the installation position of components.	

Tool	Description	Picture
Flat-head screwdriver	Used to turn slotted-head screws and bolts.	
Phillips screwdriver	Used to turn cross-head screws and bolts.	
Diagonal pliers	Used to cut insulation tubes and cables.	
Network cable tester	Used to test the connectivity of network cables.	
Multimeter	Used to test the electrical characteristics, such as voltage, current, and resistance, of the switch, cabinet, and cables.	

Tool	Description	Picture
Hammer drill	Used to drill holes with appropriately sized drill bits (selected based on depth of holes and type of expansion bolts).	
Adjustable wrench	Used to turn hex or square bolts and nuts.	

Table 4-5 Installation accessories

Accessory	Description	Picture
Cable tie	Used to bundle cables.	
Fiber binding tape	Used to bundle optical fibers.	
Insulation tape	Used to insulate power wires or other conductors.	

Accessory	Description	Picture
Corrugated pipe	Used to protect optical fibers.	

5 Unpacking a Switch

Context

A switch and its cables, cards, and power modules usually ship in cartons. This section describes how to unpack a 442.0 mm x 220.0 mm x 43.6 mm (17.4 in. x 8.7 in. x 1.72 in.) switch model. The methods for unpacking switch models of other dimensions or other components are similar.

NOTE

- Before opening the package, check whether the seal label or package is damaged. If there are signs of damage, stop unpacking and contact the supplier.
- Moving an unpacked switch over a long distance may damage the switch. Do not unpack the switch until you are ready to begin installation.
- Save the carton and packing material in case of future transportation.
- If a device is not used for a long time, it must be stored with the original package. If a device is stored without package, the components on the device may fail due to moisture absorption and dust absorption.
- If a device is stored and left unused for more than two years, you are advised to return the device to Huawei for inspection before using the device.

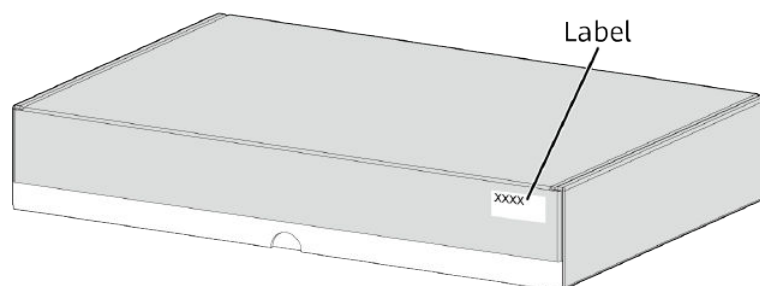
Tools

- Protective gloves
- Utility knife

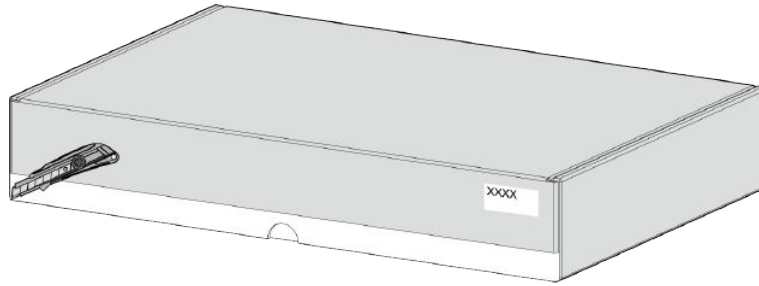
Procedure

Step 1 Wear protective gloves to protect your hands.

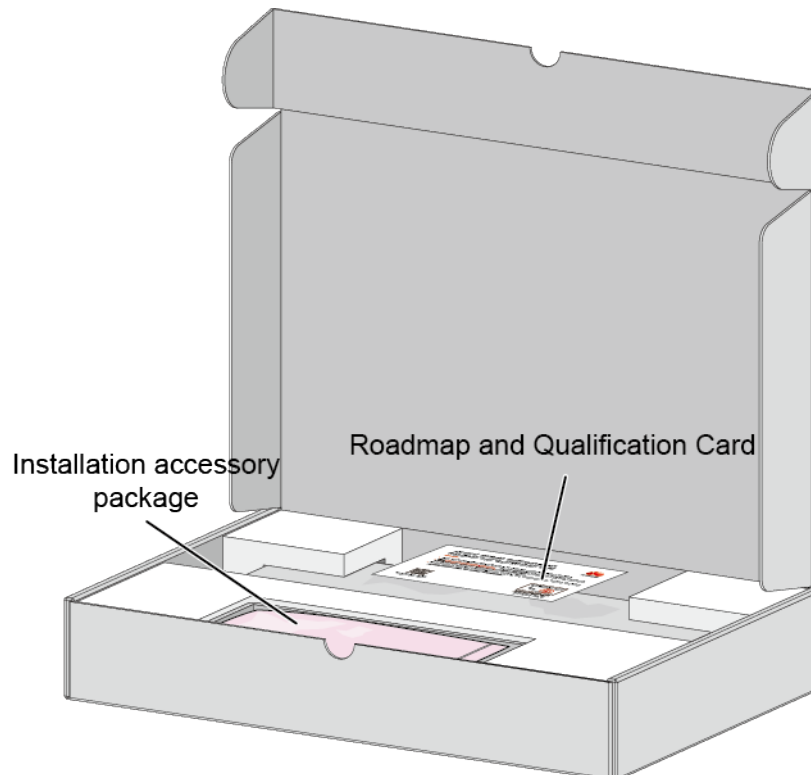
Step 2 Check the label on the carton to confirm whether the switch model is correct.



Step 3 Use a utility knife to cut the adhesive tape around the cover of the carton.



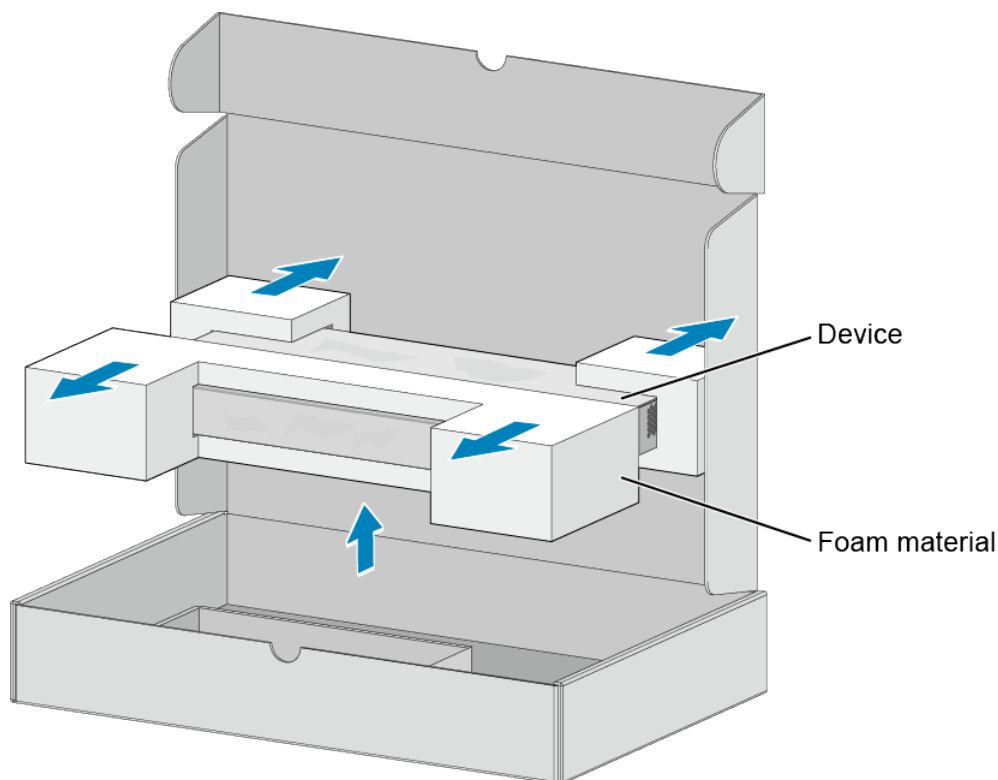
Step 4 Open the carton and take out the installation accessory package and the *Documentation Roadmap and Qualification Card*.



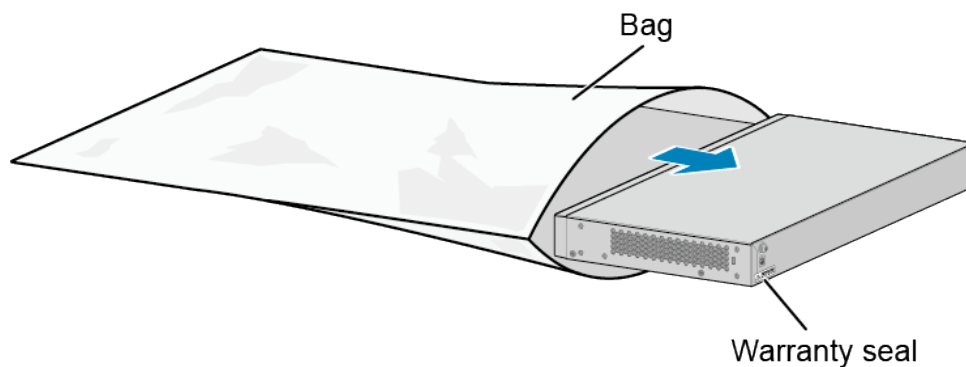
NOTE

The *Documentation Roadmap and Qualification Card* or *Quick Start Guide* manual may be included in the installation accessory package or packaged independently.

Step 5 Take the switch out of the carton and remove the foam packing materials.



Step 6 Take the switch out of the bag and check switch surfaces and the warranty seal on the switch. If the switch is found eroded or damp or if the warranty seal is damaged, stop unpacking and contact the supplier.



NOTE

Huawei is unable to provide warranty services if the warranty seal is damaged or removed.

Step 7 Check whether the nameplate on the chassis is consistent with the label on the carton. The nameplate is attached to either the top or bottom of the chassis.

----End

Follow-up Procedure

Save the installation accessory package for later use. The installation accessory package contains the following items: mounting brackets, screws, rubber pads, and dust plugs.

 NOTE

The type and quantity of items in an installation accessory package vary depending on the product model.

6 Installing a Switch

- 6.1 Installation Scenario Overview
- 6.2 Scenario: Cabinet/Rack Mounting
- 6.3 Scenario: Desk Mounting
- 6.4 Scenario: Wall Mounting
- 6.5 Scenario: Network Box Mounting
- 6.6 Scenario: DIN Rail Mounting
- 6.7 Connecting the Ground Cable

6.1 Installation Scenario Overview

The S series fixed switches of different sizes support different installation scenarios.

Table 6-1 Installation scenarios for S110 switches

Dimensions (H x W x D)	Scenario: Cabinet/Rack Mounting	Scenario: Desk Mounting	Scenario: Wall Mounting	Scenario: Network Box Mounting
22.5 mm x 100.0 mm x 65.0 mm (0.89 in. x 3.94 in. x 2.56 in.)	Not supported	Supported	Not supported	Not supported
35.0 mm x 210.0 mm x 130.0 mm (1.38 in. x 8.27 in. x 5.12 in.)	Not supported	Supported	Supported	Not supported

Dimensions (H x W x D)	Scenario: Cabinet/Rack Mounting	Scenario: Desk Mounting	Scenario: Wall Mounting	Scenario: Network Box Mounting
29 mm x 230.0 mm x 49.5 mm (1.14 in. x 9.06 in. x 1.95 in.)	Not supported	Not supported	Not supported	Supported
43.6 mm x 320.0 mm x 210.0 mm (1.72 in. x 12.6 in. x 8.27 in.)	Supported	Supported	Supported	Not supported
43.6 mm x 442.0 mm x 160.0 mm (1.72 in. x 17.4 in. x 6.3 in.)	Supported	Supported	Supported	Not supported
43.6 mm x 442.0 mm x 260.0 mm (1.72 in. x 17.40 in. x 10.24 in.)	Supported	Supported	Supported	Not supported

Table 6-2 Installation scenarios for S110E switches

Dimensions (H x W x D)	Scenario: Cabinet/Rack Mounting	Scenario: Desk Mounting	Scenario: Wall Mounting
43.6 mm x 442.0 mm x 160.0 mm (1.72 in. x 17.4 in. x 6.3 in.)	Supported	Supported	Supported
43.6 mm x 442.0 mm x 220.0 mm (1.72 in. x 17.4 in. x 8.7 in.)	Supported	Supported	Supported

Table 6-3 Installation scenarios for S210

Dimensions (H x W x D)	Scenario: Cabinet/Rack Mounting	Scenario: Desk Mounting	Scenario: Wall Mounting
35.0 mm x 195.0 mm x 130.0 mm (1.38 in. x 7.68 in. x 5.12 in.)	Not supported	Supported	Supported
43.6 mm x 195.0 mm x 160.0 mm (1.72 in. x 7.68 in. x 6.3 in.)	Not supported	Supported	Supported
43.6 mm x 250.0 mm x 180.0 mm (1.72 in. x 9.84 in. x 7.1 in.)	Supported	Supported	Supported
43.6 mm x 442.0 mm x 160.0 mm (1.72 in. x 17.4 in. x 6.3 in.)	Supported	Supported	Supported
43.6 mm x 442.0 mm x 220.0 mm (1.72 in. x 17.40 in. x 8.7 in.)	Supported	Supported	Supported

Table 6-4 Installation scenarios for S210I

Dimensions (H x W x D)	Scenario: Cabinet Mounting	Scenario: DIN Rail Mounting
150.0mm × 44.0mm × 133.0mm (5.91 in. x 1.73 in. x 5.24 in.)	Supported Use horizontal rack-mounting kit.	Supported

6.2 Scenario: Cabinet/Rack Mounting

6.2.1 Cabinet/Rack Mounting: Using Front Mounting Brackets

Context

This installation method applies to the following switches:

- S110-24T2SR, S110-16T2S, S110-16LP2SR, and S110-24LP2SR
- All S110E series
- S210-4P8UN2X, S210-24T2J and S210-24P2J

Follow these precautions before or during the installation:

- Leave sufficient vertical space in the cabinet or rack for the switch.
- Leave at least 50 mm (2.0 in.) clearance around the switch for heat dissipation. Do not install a switch with its air intake vent facing or close to the air exhaust vent of other devices.
- To install multiple switches in one cabinet or rack, leave at least 1 U (1 U = 44.45 mm) between switches that use natural heat dissipation. For switches that use forced or intelligent air cooling, the recommended spacing between them is 1 U.
- Align the mounting brackets on the left and right mounting rails. If they are not on a horizontal line, forcibly mounting the switch may distort the chassis.

Tools and Accessories

- ESD wrist strap or ESD gloves
- Phillips screwdriver
- Flat-head screwdriver
- Floating nuts (four per switch, purchased separately)
- M4 screws (four or six per switch, the quantity depends on the switch.)
- M6 screws (four per switch, purchased separately)
- Front mounting brackets (two per switch)
- Guide rails (optional)

NOTE

When installing mounting brackets, use screws of the same specifications as those configured by the manufacturer. Do not use screws that are too long to prevent damage to the device.

Procedure

- Step 1** Wear an ESD wrist strap or ESD gloves. When wearing an ESD wrist strap, ensure that it is in close contact with your wrist and grounded properly.
- Step 2** Use M4 screws to attach a front mounting bracket delivered with the switch to each side of the switch. [Figure 6-1](#) shows the front mounting brackets delivered with different switch models and associated installation methods.

NOTE

- See **Figure 6-1** for the number of screws required for each mounting bracket.
- When installing mounting bracket b, pay attention to the R/L label on the mounting bracket. The mounting bracket labeled R is installed on the right side of the device, and the mounting bracket labeled L is installed on the left side of the device. In addition, the mounting bracket marked with R has a ground hole for connecting a ground cable to provide the grounding function.
- The 442 mm wide switch is delivered with mounting bracket **a** by default, the 320 mm wide switch is delivered with mounting bracket **b** by default, and the 250 mm wide switch is delivered with mounting bracket **c** by default.

Figure 6-1 Installing front mounting brackets

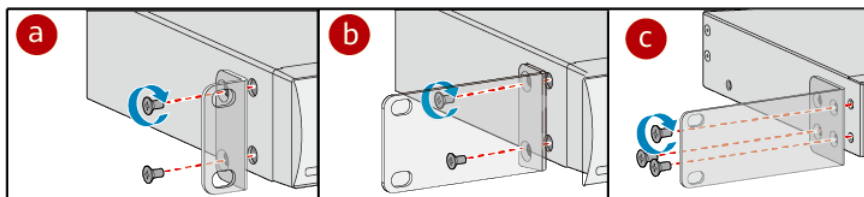
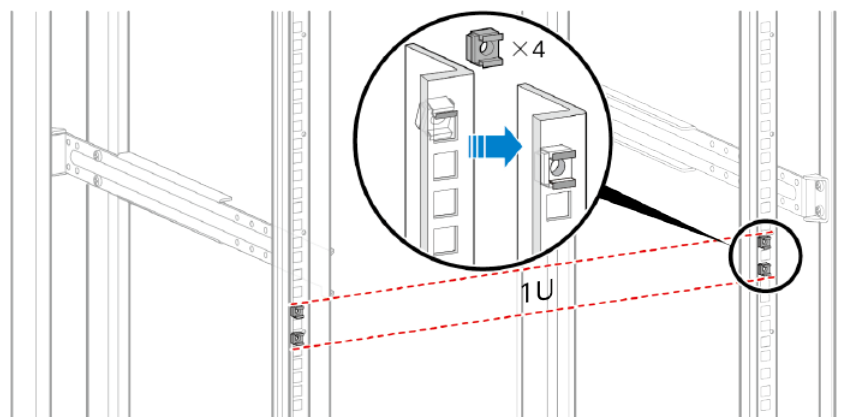


Figure 6-2 Spacing of mounting holes for different mounting brackets

a	
b	
c	

Step 3 Install floating nuts on the mounting rails of the cabinet.

Determine the installation position of the switch and use a flat-head screwdriver to install two floating nuts on each front mounting rail accordingly. Leave a gap of one mounting hole between the two floating nuts and ensure that they are level with those on the other rail.

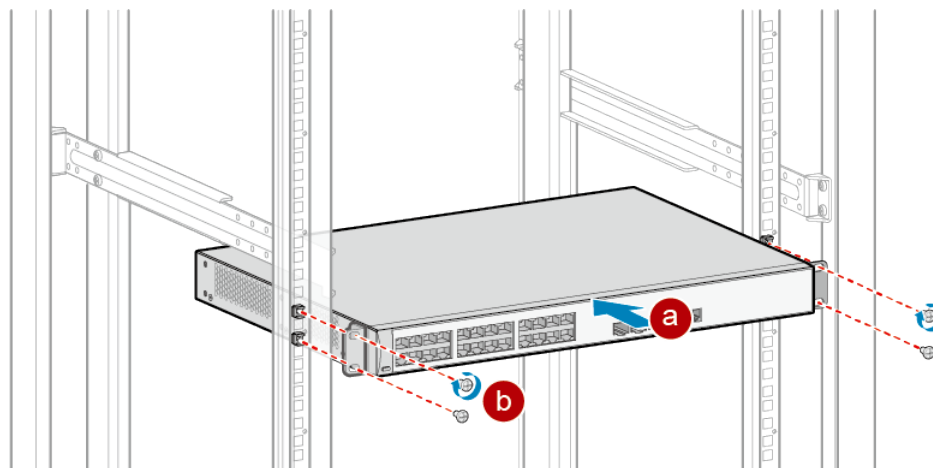


NOTE

Pay attention to the scale markings on the mounting rails because three adjacent mounting holes may not be 1 U.

- Step 4** Install the switch in the cabinet. The methods for installing switches that use different front mounting brackets are the same. [Figure 6-3](#) shows an example.
1. Hold the bottom of the switch and align the holes on the front mounting brackets with the floating nuts on the front mounting rails.
 2. Secure the mounting brackets to the mounting rails with M6 screws (two on each side) using a Phillips screwdriver.

Figure 6-3 Installing the switch in the cabinet



----End

6.2.2 Cabinet/Rack Mounting: Using Horizontal Rack-mounting Kit

Context

This installation method applies to the S210I-8T4SX and S210I-8P4SX.

NOTICE

When multiple S210I switches are installed on the same horizontal rack-mounting kit, there must be a clearance of at least 88 mm between two neighboring switches. The clearance above a switch must be at least two times the switch's height and that below must be greater than or equal to the switch's height.

Make sure the following prerequisites are met before the installation:

- The cabinet is well fixed.
- The switch installation position in the cabinet is determined and arranged properly.
- The switch to be installed is available and located near the cabinet for convenient movement.

Tools and Accessories

- Phillips screwdriver
- Flat-head screwdriver
- Floating nuts
- M6 screws
- Horizontal rack-mounting kit

NOTE

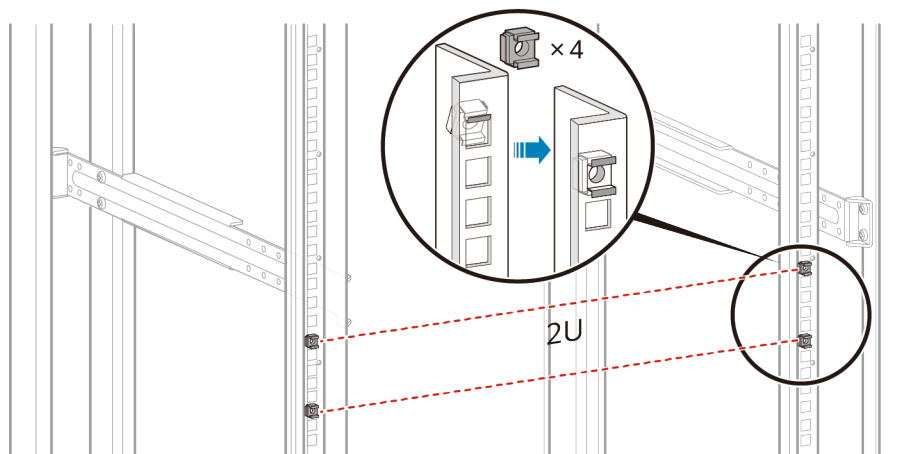
The horizontal rack-mounting kit (part number: 21241946), floating nuts, and M6 screws are not included in the installation accessory package and needs to be purchased separately.

Procedure

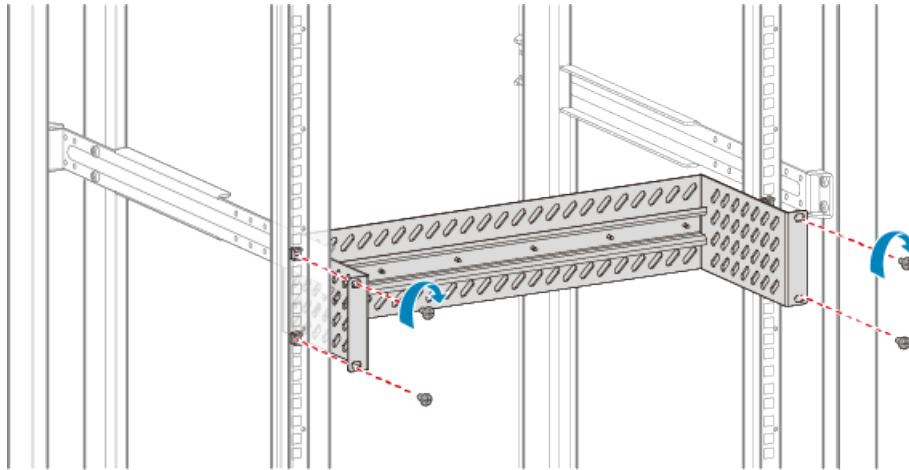
- Step 1** Install two floating nuts on each front mounting rail of the cabinet. Leave four mounting holes between the two floating nuts on the same mounting rail.

NOTE

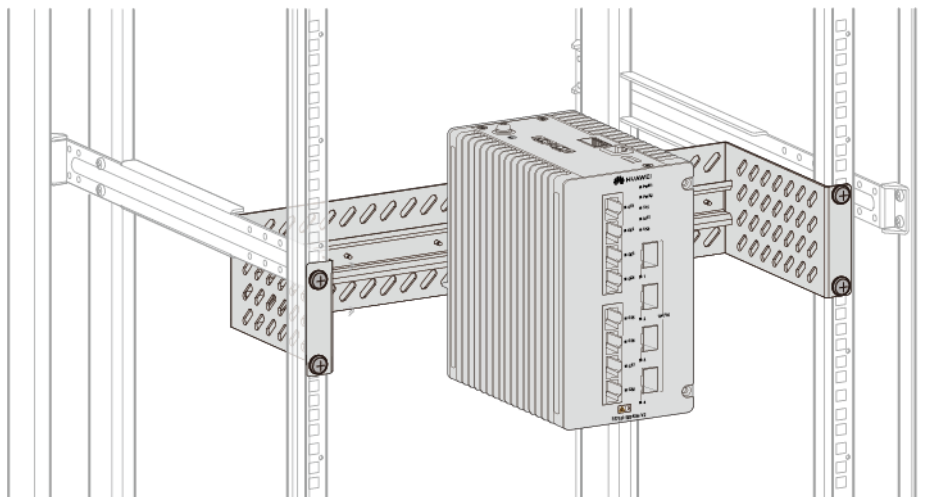
- The length of six adjacent mounting holes may not be 2 U. Observe the scale ticks on the mounting rails when installing floating nuts.
- You can use a flat-head screwdriver to install floating nuts.



- Step 2** Attach the brackets of the horizontal rack-mounting kit on the front mounting rails of the cabinet and insert M6 screws in the mounting holes. Use a Phillips screwdriver to tighten the lower M6 screws and then the upper ones to fix the rack-mounting kit.



- Step 3** Place the rear panel of the switch in front of the DIN rail on the rack-mounting kit and ensure that the DIN rail fits in between the fixture near the top of the switch and the spring latch near the bottom.
- Step 4** Make the switch incline forward with the bottom away from the DIN rail, and place the fixture at the rear of the switch on the top of the DIN rail.
- Step 5** Slowly push the switch toward the DIN rail to make the spring latch at the rear of the switch move down. The spring latch then bounces back to fix the switch on the DIN rail.



NOTE

If the spring latch is too tight to move down, you can use a flat-head screwdriver to hold down the spring latch during the installation.

For details about how to install a switch on a DIN rail, see [6.6 Scenario: DIN Rail Mounting](#).

----End

6.3 Scenario: Desk Mounting

Context

This installation method applies to all fixed switches except the following models:

- S110-4P1T-BU-V2 and S110-8P2T-BU-V2
- S210I-8T4SX and S210I-8P4SX

Follow these precautions:

- Ensure that the desk is flat, sturdy, and properly grounded.
- Leave at least 50 mm (2.0 in.) clearance around the switch for heat dissipation. Do not install a switch with its air intake vent facing or close to the air exhaust vent of other devices.
- Do not place any objects on the switch.

Tools and Accessories

- ESD wrist strap or ESD gloves
- Rubber pads (four per switch)
- Security lock (optional, purchased separately)

NOTE

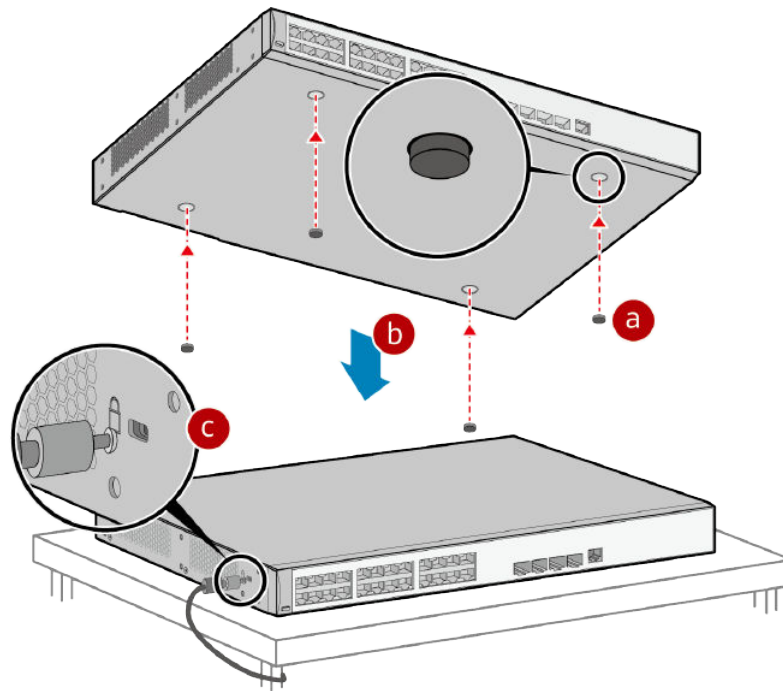
Rubber pads are delivered with a switch that supports desk mounting.

For some models, rubber pads have been installed before delivery. In this case, you do not need to install additional rubber pads.

Procedure

- Step 1** Wear an ESD wrist strap or ESD gloves. When wearing an ESD wrist strap, ensure that it is in close contact with your wrist and grounded properly.
- Step 2** Attach the rubber pads to the imprinted round areas at the bottom of the switch. See **a** in [Figure 6-4](#).
- Step 3** Place the switch gently on the desk. See **b** in [Figure 6-4](#).
- Step 4** (Optional) Install a security lock to lock the switch to the desk. See **c** in [Figure 6-4](#).

Figure 6-4 Installing a switch on a desk



NOTE

To determine whether a security lock can be installed, check for the security slot marked with a padlock icon on the chassis. See [Figure 6-5](#). If there is no security slot on the switch, it means that the security lock is not supported.

The security slot is 7 mm long and 3 mm wide. The maximum radius of its four round corners is 1 mm.

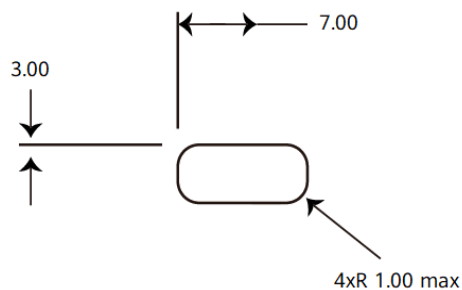
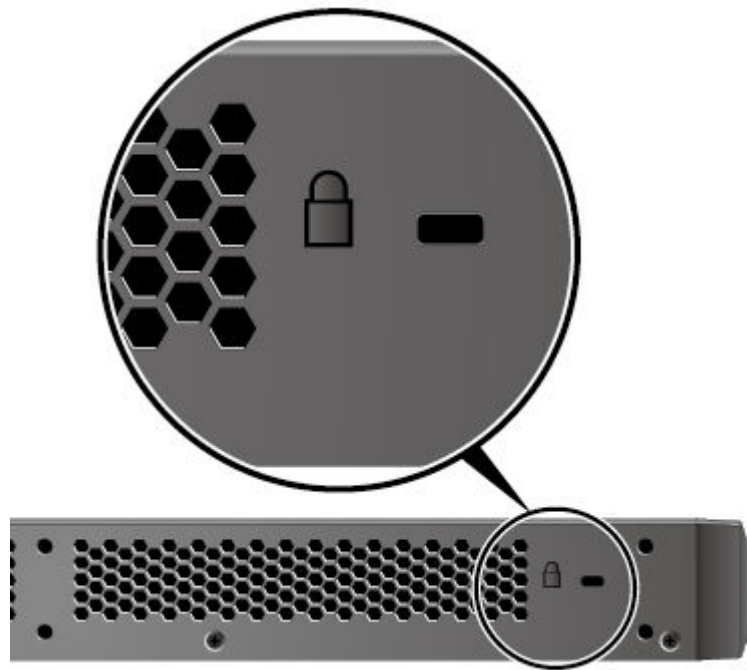


Figure 6-5 Security slot marked with padlock icon



----End

6.4 Scenario: Wall Mounting

6.4.1 Wall Mounting: Using Mounting Brackets

Context

This installation method applies to the following switches:

- S110-24T2SR, S110-16T2S, S110-16LP2SR, and S110-24LP2SR
- All S110E series
- S210-4P8UN2X, S210-24T2J, and S210-24P2J

DANGER

Before drilling holes on a wall, make sure that no power cables are hidden in the wall.

NOTICE

- For a wall-mounted switch, take water-proofing and dust-proofing measures to protect the switch from damage caused by water and dust.
- Ensure that there are no flammable or explosive materials nearby the switch.
- Ensure that the switch has at least 100 mm (3.9 in.) free space in all directions.
- When installing a device on a wall using mounting brackets, reserve proper spacing (59 mm at most) between the device top and the wall.

Tools and Accessories

- Protective gloves
- ESD wrist strap or ESD gloves
- Phillips screwdriver
- Hammer drill (with $\phi 8$ drill bit)
- Adjustable wrench
- Marker
- M4 screws (four or six per switch, depending on the switch model.)
- M6 expansion bolts (four per switch, purchased separately)
- Front mounting brackets (two per switch)

NOTE

The M4 screws and front mounting brackets are included in the installation accessory package.

When installing mounting brackets, use screws of the same specifications as those configured by the manufacturer. Do not use screws that are too long to prevent damage to the device.

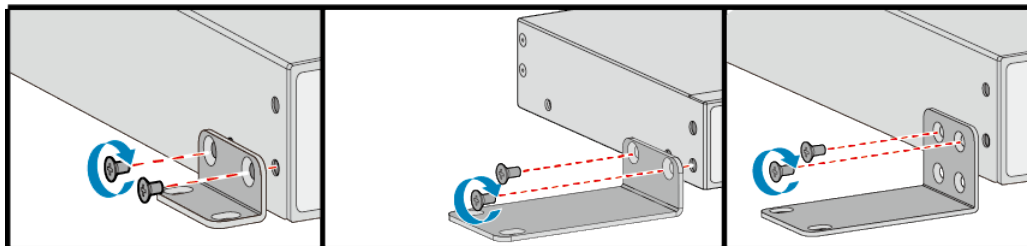
Procedure

- Step 1** Wear an ESD wrist strap or ESD gloves. When wearing an ESD wrist strap, ensure that it is in close contact with your wrist and grounded properly.
- Step 2** Use M4 screws to attach a front mounting bracket to each side of the switch. The type of mounting brackets and the installation method differ depending on switch model. [Figure 6-6](#) shows the installation methods of different mounting brackets.

NOTE

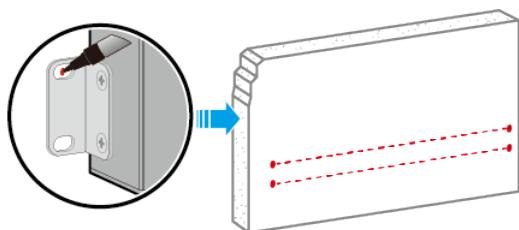
If the mounting ear is labeled R/L, install the mounting ear labeled R on the right side of the device, and install the mounting ear labeled L on the left side of the device. In addition, the mounting ear marked with R has a ground hole for connecting a ground cable to provide the grounding function.

Figure 6-6 Installing mounting brackets



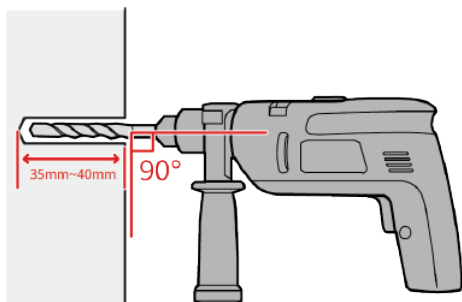
Step 3 Place the switch against the wall and mark the drilling positions through the holes of the mounting brackets. See [Figure 6-7](#).

Figure 6-7 Marking the drilling positions

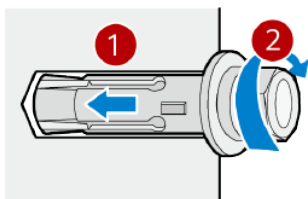


Step 4 Install M6 expansion bolts in the wall.

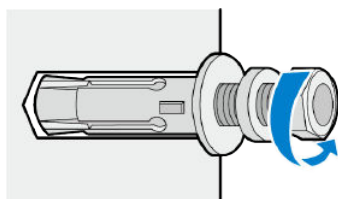
1. Use a hammer drill (with $\phi 8$ drill bit) to drill holes in the marked positions.



2. Insert M6 expansion bolts into the holes and tighten the nuts to secure the bolts in place.



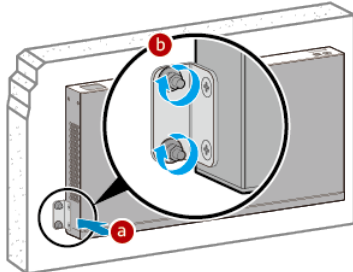
3. Loosen and remove the nuts from M6 expansion bolts.



Step 5 Mount the switch on the wall.

1. Align the holes on the mounting brackets with the M6 expansion bolts and push the brackets onto the M6 expansion bolts.
2. Fasten the nuts on the M6 expansion bolts.

Figure 6-8 Wall mounting a switch



----End

6.4.2 Wall Mounting: Without Using Mounting Brackets

Context

This installation method applies to the S110-8T2ST, S110-8T2ST-V2, S110-8P2ST, and S110-8P2ST-V2.

This installation method applies to the S210-8T, S210-8T2J, S210-8LP2J, and S210-8P2J.



DANGER

Before drilling holes on a wall, make sure that no power cables are hidden in the wall.

NOTICE

- For a wall-mounted switch, take water-proofing and dust-proofing measures to protect the switch from damage caused by water and dust.
- Ensure that there are no flammable or explosive materials nearby the switch.
- Ensure that the switch has at least 100 mm (3.9 in.) free space in all directions.

Tools and Accessories

- Hammer drill (with $\phi 6$ drill bit)
- Expansion Bolts (two)
- Screws (two)



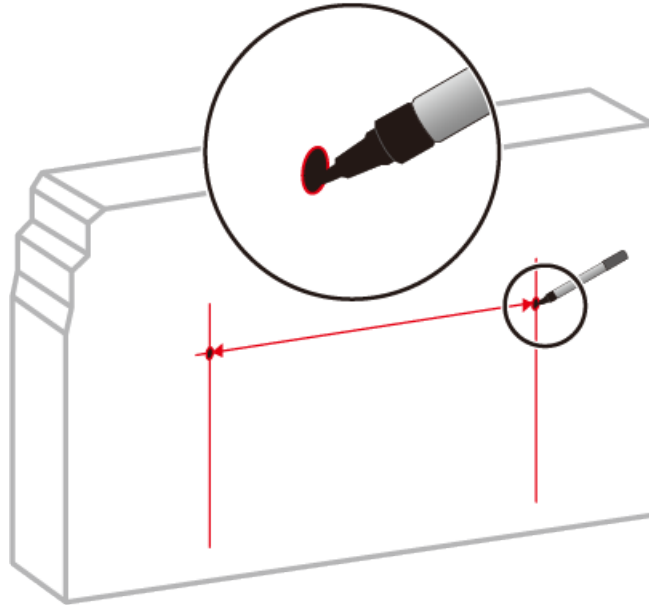
NOTE

The Screws and expansion bolts need to be purchased separately.

Procedure

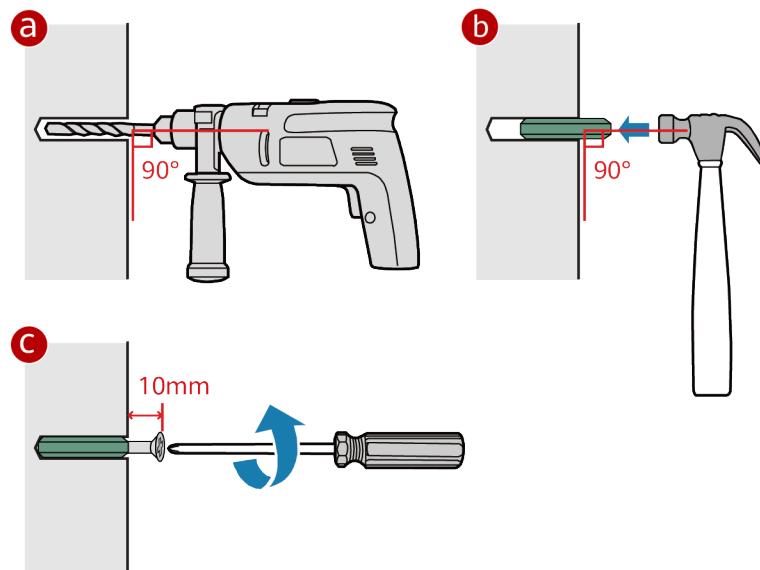
- Step 1** Measure the distance between the two mounting holes on the rear panel of the switch.
- Step 2** Mark the holes accordingly on the wall.

Figure 6-9 Marking the drilling positions



- Step 3** Use a hammer drill (with $\phi 6$ drill bit) to drill holes, and fix expansion bolts on the wall.

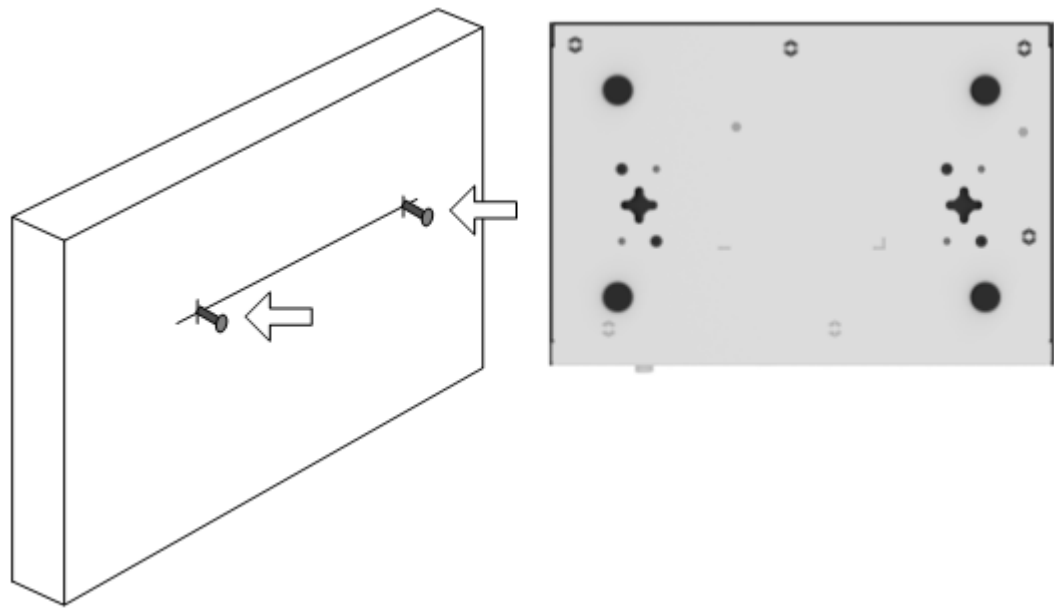
Figure 6-10 Drilling holes in marked positions



- Step 4** Mount the switch on the wall.
1. Insert the screws into the expansion bolts on the wall.

2. Mount the device onto the screws.

Figure 6-11 Wall mounting a switch



----End

6.5 Scenario: Network Box Mounting

Context

This installation method applies to:

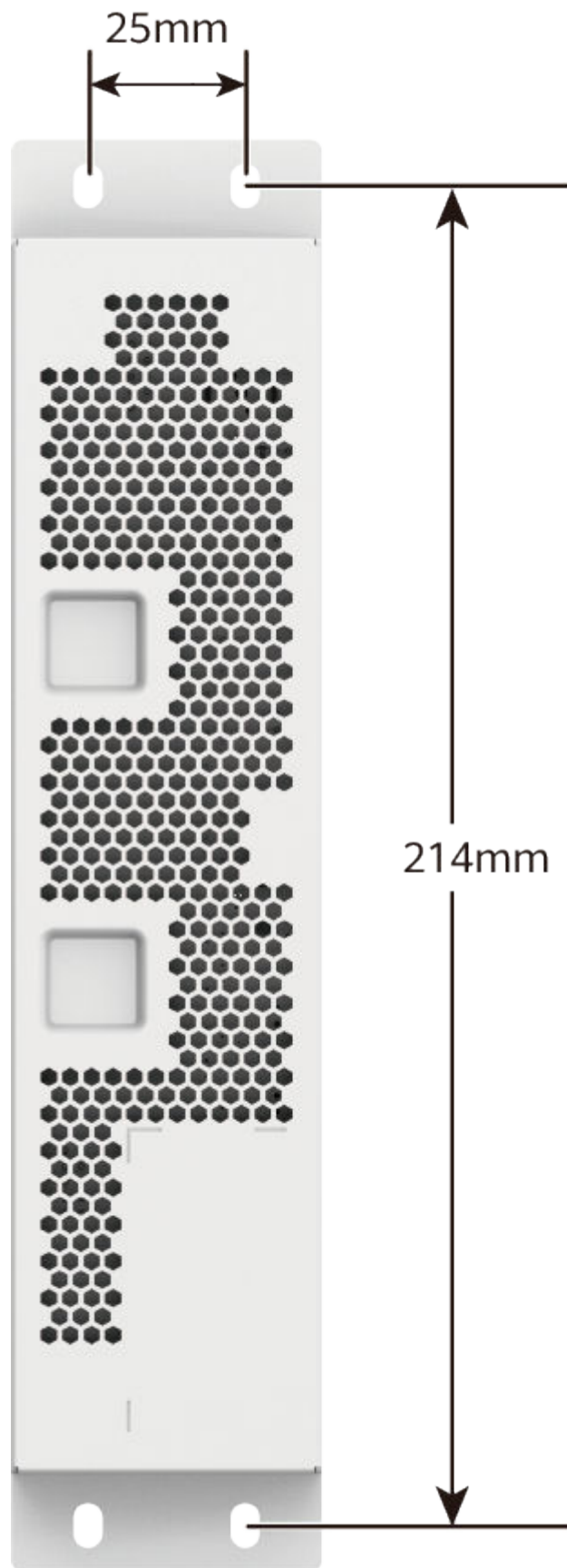
S110-4P1T-BU, S110-4P1T-BU-V2, S110-8LP2T-BU, S110-8P2T-BU, and S110-8P2T-BU-V2

NOTICE

- Do not install the switch outdoors. This switch can only be installed indoors.
- Use a standard power adapter delivered with the switch to supply power. Otherwise, the switch may not work properly or security risks may be introduced.
- Do not route Ethernet cables or power adapter cables outside a network box.
- The switch installed in a network box must be operated and maintained by professionals.
- Do not use an enclosed network box and ensure that the air intake and exhaust vents are not blocked to ensure proper heat dissipation of the switch.
- If the network box is installed indoors or in a corridor that is free from rain, the network box must meet the requirements of IP31 rating protection. (The first number "3" indicates that the network box can prevent a solid object with the diameter greater than or equal to 2.5 mm from entering the network box. The second number "1" indicates that vertically falling drops shall have no harmful effects.)
- The vertical distance between the door of the network box and the device must be greater than 60 mm.

The switch provides four screw mounting holes. Before installing the switch in a network box, ensure that the distance between the mounting holes in the network box meets the requirements shown in [Figure 6-12](#).

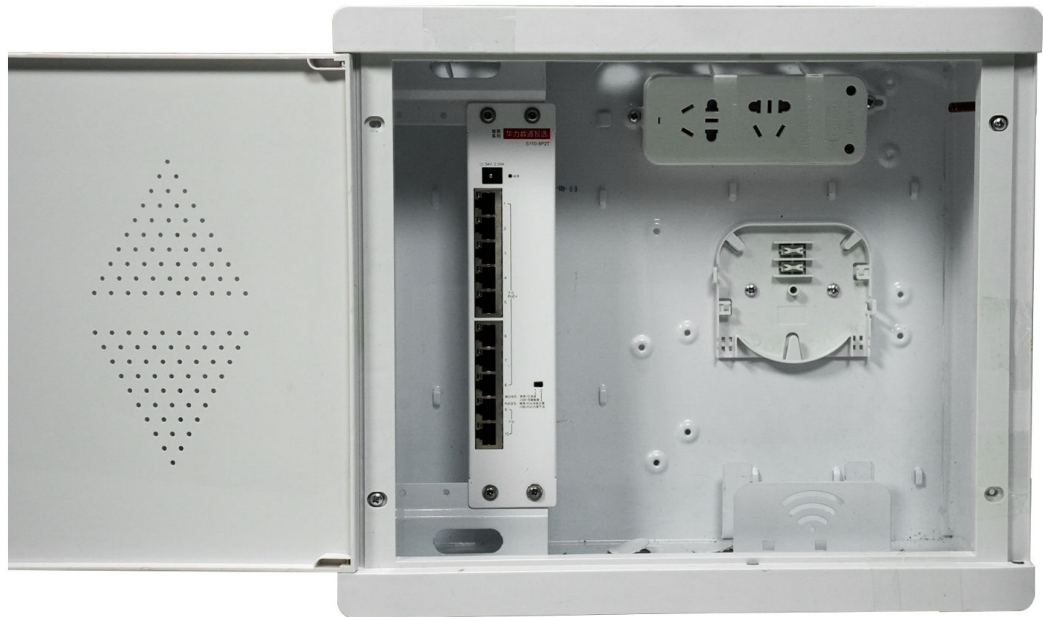
Figure 6-12 Spacing of mounting holes on the switch



Procedure

1. Align the mounting holes on both sides of the switch with the holes on the mounting kits of the network box.
2. Use a Phillips screwdriver and M4 screws (four delivered with the device) to secure the switch to the mounting kits of the network box.

Figure 6-13 Installing a switch in a network box



6.6 Scenario: DIN Rail Mounting

Context

This installation method applies to the S210I-8T4SX and S210I-8P4SX.

Make sure the following prerequisites are met before the installation:

- The DIN rail has been secured in position.
- The switch is placed near the DIN rail for convenient movement.

NOTICE

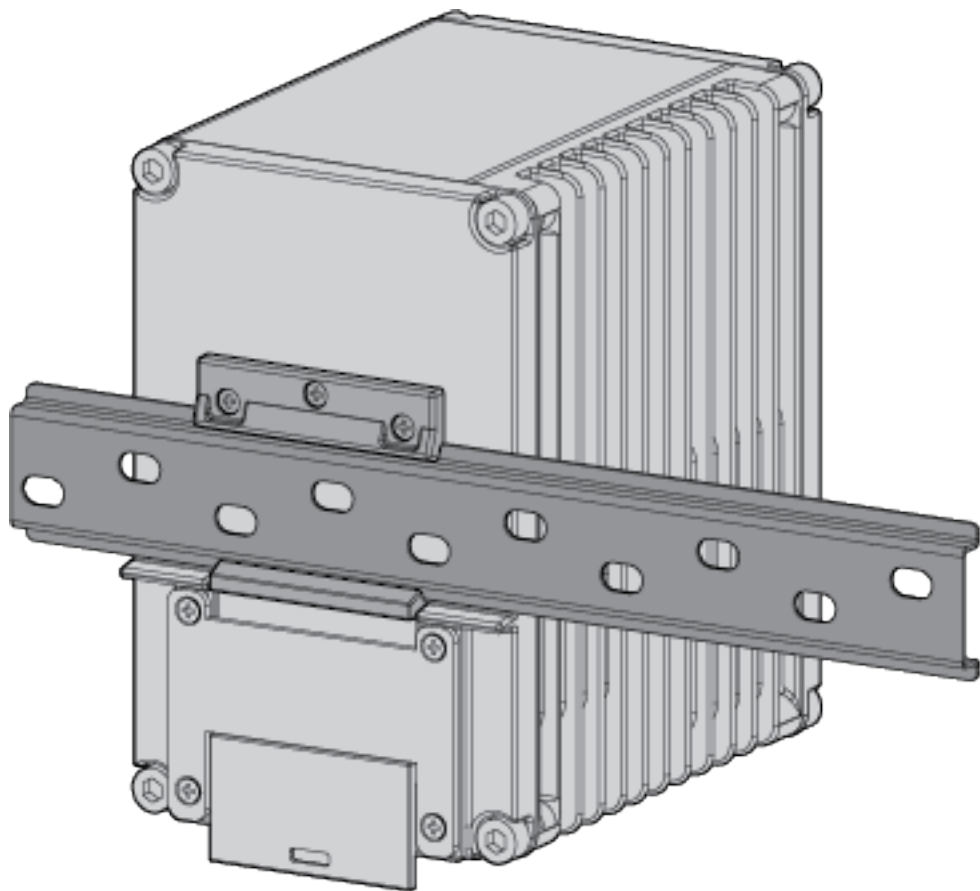
When multiple S210I switches are installed on the same DIN rail, there must be a clearance of at least 88 mm between two neighboring switches. The clearance above a switch must be at least two times the switch's height and that below must be greater than or equal to the switch's height.

Tools and Accessories

- DIN rail (DIN35-7.5 or DIN35-15, prepared by the customer)

Procedure

- Step 1** Place the switch's rear panel in front of the DIN rail and ensure that the DIN rail fits in between the fixture near the top of the switch and spring latch near the bottom.
- Step 2** Make the switch incline forward with the bottom away from the DIN rail, and place the fixture on the top of the DIN rail.
- Step 3** Slowly push the switch toward the DIN rail to make the spring latch at the rear of the switch move down. The spring latch then bounces back to fix the switch on the DIN rail.



NOTE

- If the spring latch is too tight to move down, you can pull down the spring latch during the installation.
- You can also take fixing measures in the horizontal direction of the switch.

----End

6.7 Connecting the Ground Cable

Context

Grounding the switch helps protect it from lightning, electromagnetic interference, and electrostatic discharge, and is the prerequisite for a PoE switch to provide power for a PD.

The ground cable can be connected to a ground bar or a ground point on the cabinet or rack. The following procedure uses the connection to a ground point as an example.



WARNING

The switch must be grounded before it is powered on. This protects operators from electric shock and avoids equipment damage caused by lightning, electromagnetic interference, or electrostatic discharge.



NOTE

If a cabinet or rack has a protective coating, remove this coating from around the ground point to ensure a reliable connection.

Tools and Accessories

- ESD wrist strap or ESD gloves
- Phillips screwdriver
- Ground cable (one per switch)
- M4 screw (already installed on the switch ground point)
- M6 screw (one, purchased separately)



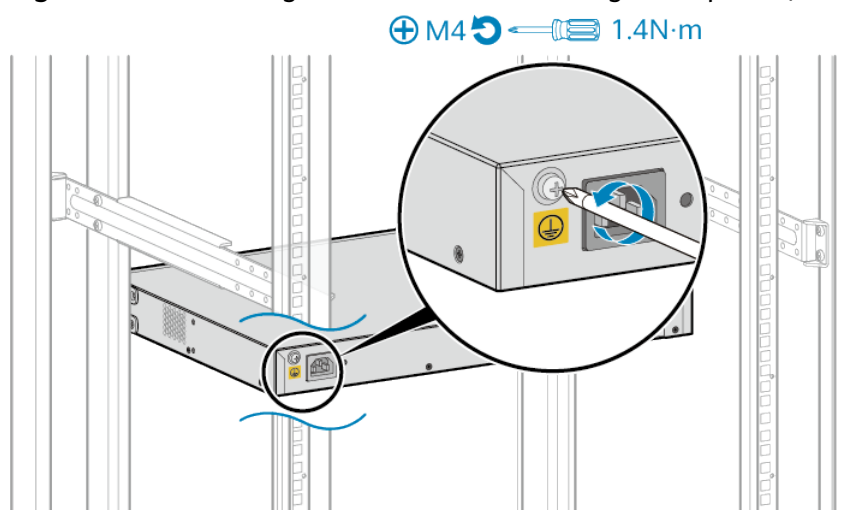
NOTE

The ground cable is included in the installation accessory package.

Procedure

- Step 1** Wear an ESD wrist strap or ESD gloves. When wearing an ESD wrist strap, ensure that it is in close contact with your wrist and grounded properly.
- Step 2** Use a Phillips screwdriver to remove the M4 screw from the ground point on the switch. Keep the M4 screw for later use.

Figure 6-14 Removing the M4 screw from the ground point (excluding S210I)



Step 3 Attach the M4 lug of the ground cable to the ground point on the switch with the M4 screw you removed in step 2. Tighten the M4 screw with a torque of 1.4 N m.

NOTE

The ground cable has an M4 lug at one end and an M6 lug at the other end. The M4 lug is the smaller of the two.

Figure 6-15 Connecting the ground cable to the switch (excluding S210I)

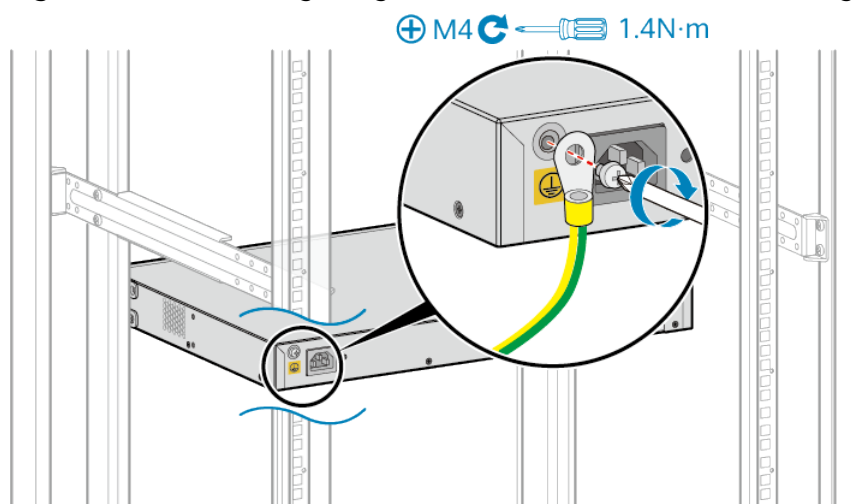
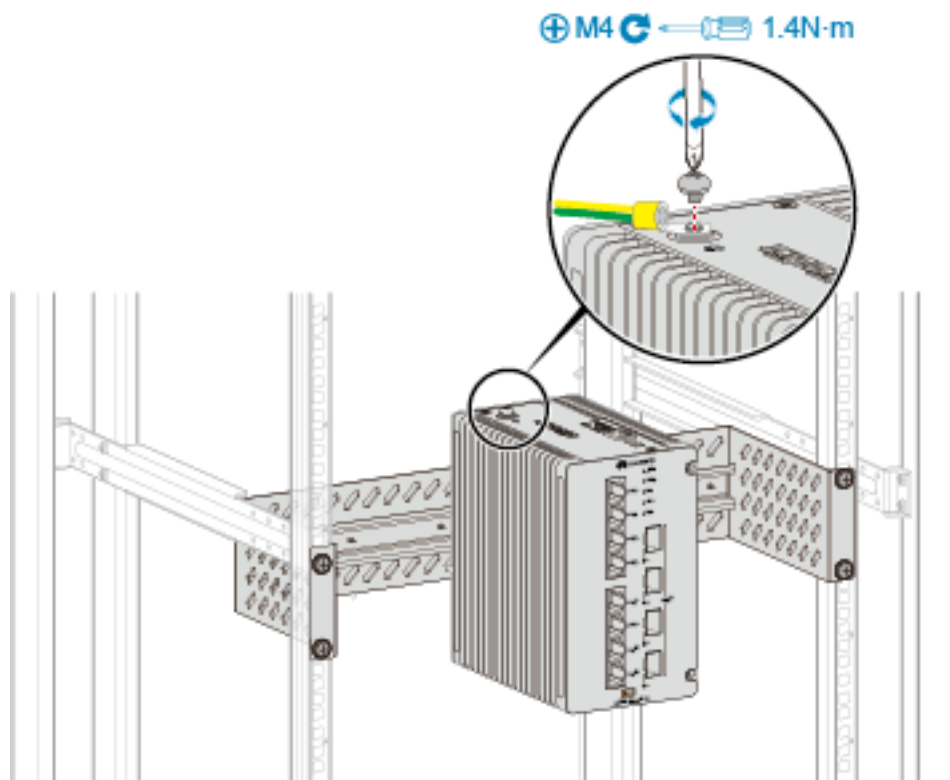


Figure 6-16 Connecting the ground cable to the switch (applicable to S210I)



Step 4 Attach the M6 lug of the ground cable to a ground point on the cabinet or rack with an M6 screw. Tighten the M6 screw with a torque of 4.8 N m.

Figure 6-17 Connecting the ground cable to a ground point on the cabinet (excluding S210I)

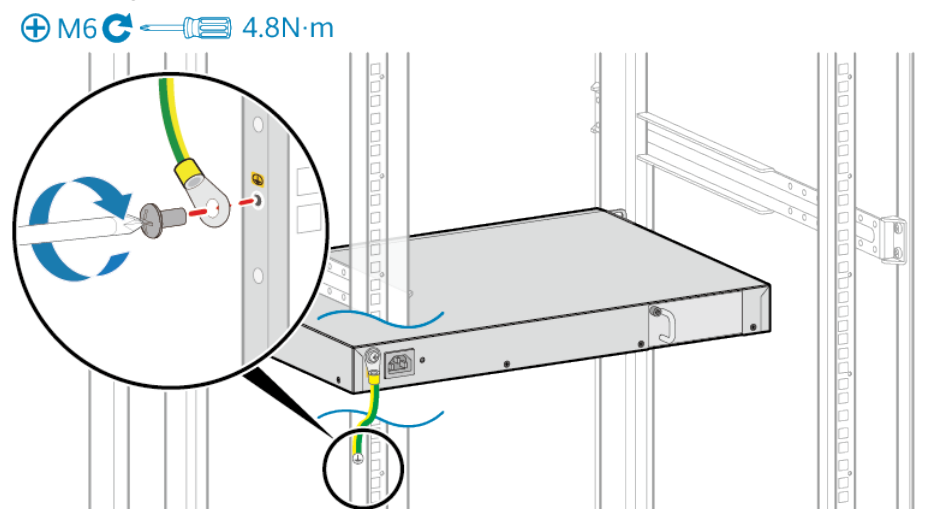
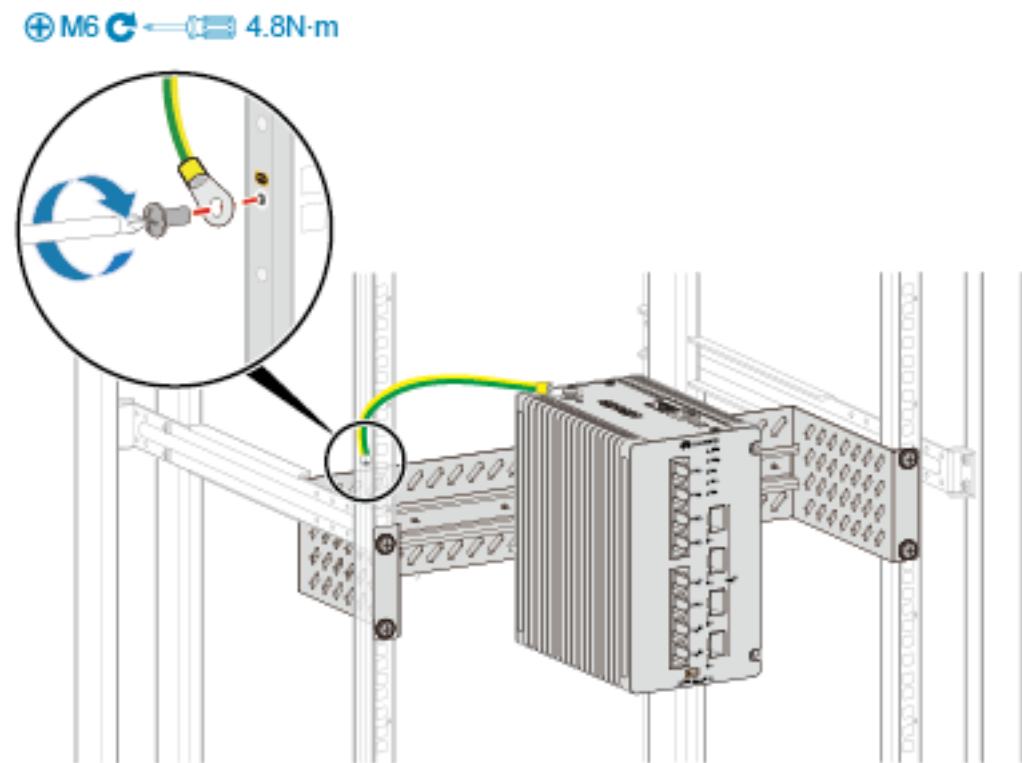


Figure 6-18 Connecting the ground cable to a ground point on the cabinet
(applicable to S210I)



----End

Follow-up Procedure

After the ground cable is connected, verify that the electrical resistance between the ground terminal and ground point is less than 0.1 ohm on a multimeter.

7 Installing a Power Module

[7.1 Installing a 60 W Independent Power Module](#)

[7.2 Installing a 240 W Independent Power Module](#)

7.1 Installing a 60 W Independent Power Module

Context



To avoid electric shock, do not connect power cables while the power is on.

Make sure the following prerequisites are met before the installation:

- The DIN rail has been secured in position.
- The 60 W AC power module is placed near the DIN rail for convenient movement.

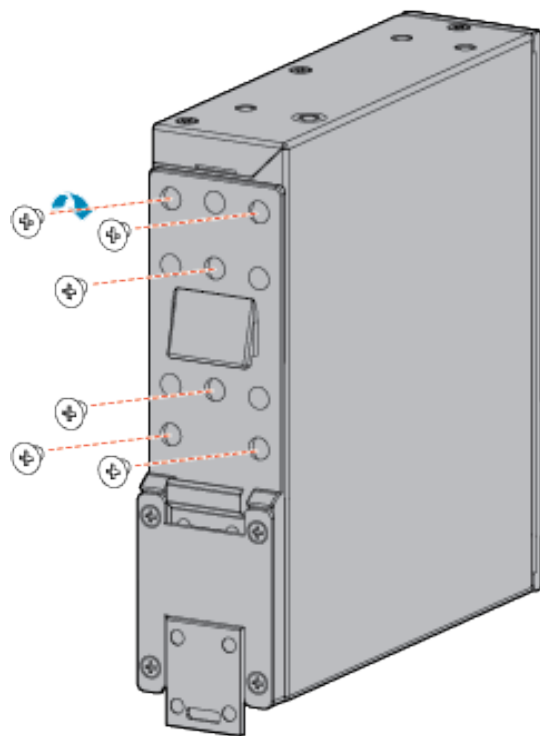
Tools and Accessories

- ESD wrist strap
- Phillips screwdriver
- M3 screws
- DIN rail
- 60 W AC power module

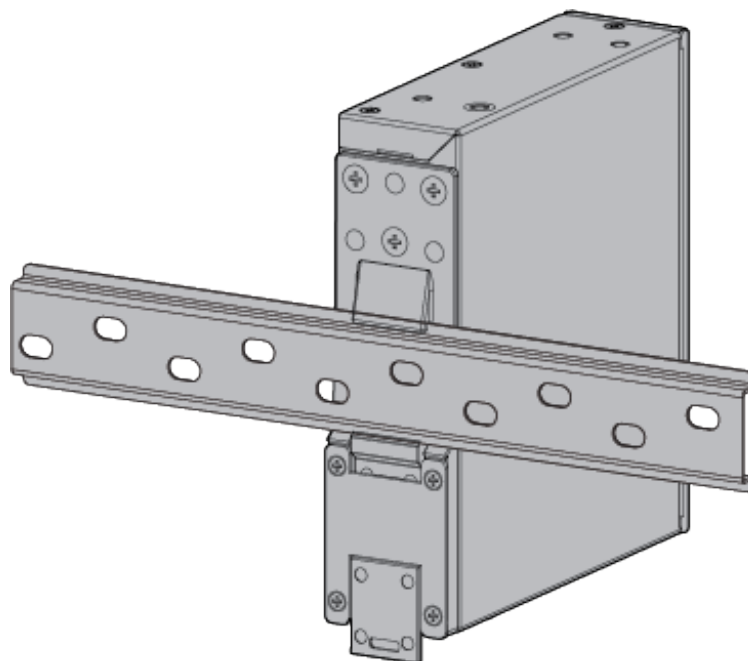
Procedure

Step 1 Wear an ESD wrist strap. Ensure that the ESD wrist strap is grounded and in a close contact with your wrist.

Step 2 Mount the DIN mounting kit onto the rear panel of the 60 W AC power module with M3 screws, and then use a Phillips screwdriver to tighten the M3 screws.



- Step 3** Place the rear panel of the 60 W AC power module in front of the DIN rail and ensure that the DIN rail fits in between the fixture near the top of the DIN mounting kit and spring latch near the bottom.
- Step 4** Make the power module incline forward with the bottom away from the DIN rail, and place the fixture at the rear of the DIN mounting kit on the top of the DIN rail.
- Step 5** Slowly push the power module toward the DIN rail to make the spring latch near the bottom of the DIN mounting kit move down. The spring latch then bounces back to fix the power module on the DIN rail.



 NOTE

If the spring latch is too tight to move down, you can pull down the spring latch during the installation.

----End

7.2 Installing a 240 W Independent Power Module

Context

- The PAC240S56-CN power module uses 220 V AC or 240 V DC input and provides four 56 V DC outputs. When the switch is installed in a scenario where 220 V AC or 240 V DC power is provided, the PAC240S56-CN can be used to transfer power. A DIN rail is required for installing a PAC240S56-CN in a cabinet. This section describes how to install the PAC240S56-CN.

Ensure that the following prerequisites are met before the installation:

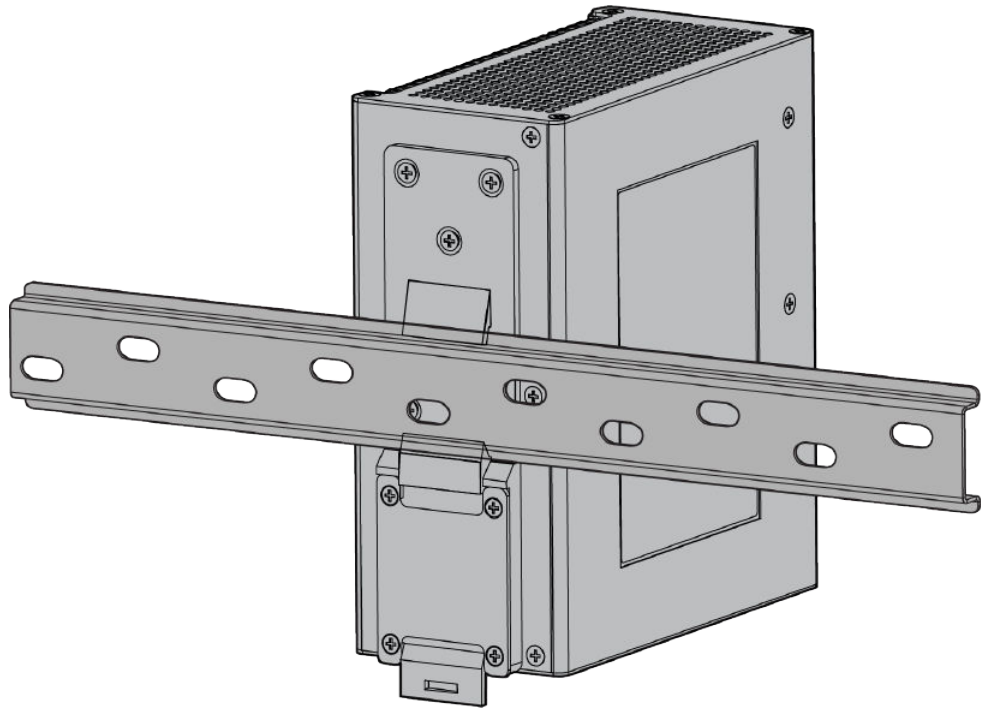
- The DIN rail has been secured on the switch.
- Place the PAC240S56-CN near the DIN rail for convenient movement.

Tools and Accessories

- ESD wrist strap
- DIN rail (DIN35-7.5 or DIN35-15, prepared by the customer)
- PAC240S56-CN 240 W AC power module

Procedure

- Step 1** Place the real panel of the power module in front of the DIN rail, and ensure that the DIN rail fits in between the fixture near the top of the DIN mounting kit and spring latch near the bottom.
- Step 2** Make the power module incline forward with the bottom away from the DIN rail, and place the fixture at the rear of the DIN mounting kit on the top of the DIN rail.
- Step 3** Slowly push the power module toward the DIN rail to make the spring latch near the bottom of the DIN mounting kit move down. The spring latch then bounces back to fix the switch on the DIN rail.



 NOTE

If the spring latch is too tight to move down, you can pull down the spring latch during the installation.

----End

8 Installing an Optical Module

Context

This section describes how to install an optical module. The method used to install a copper transceiver module is the same, except that the copper transceiver module connects to a network cable instead of optical fibers.

DANGER

Never look directly into an optical module or the ends of optical fibers. Optical modules and connected fibers emit laser radiation that can cause eye damage.

NOTICE

- A switch must use optical or copper modules that have been certified for use on Huawei S switches. Non-certified optical or copper modules cannot ensure transmission reliability and may affect service stability. Huawei is not liable for any problem caused by the use of non-certified optical or copper modules and will not fix such problems.
 - Do not touch the edge connector of an optical module during the installation.
 - Install an optical module on a port before connecting optical fibers to the transceiver module.
 - Install dust plugs on idle optical ports.
 - If an optical module cannot be completely inserted into an optical port, turn the optical module over and try again.
 - Before connecting the optical fiber to the optical module, measure the input optical power to ensure that the input optical power is within the normal range. Otherwise, the input optical power may be overloaded and damage the optical module.
 - For details about how to use optical modules, see [13.5 Appendix E Guide to Using Optical Modules](#).
-

Tools and Accessories

- ESD wrist strap or ESD gloves
- Dust plugs

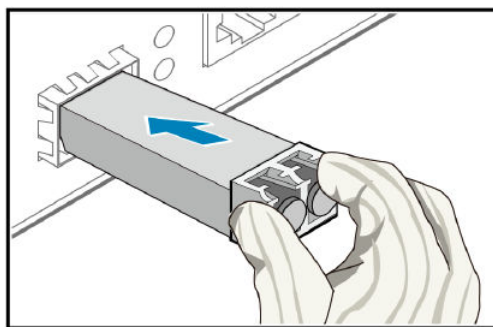
Procedure

- Step 1** Wear an ESD wrist strap or ESD gloves. When wearing an ESD wrist strap, ensure that it is in close contact with your wrist and grounded properly.
- Step 2** Remove the dust plug from an optical port. Keep the dust plug for future use.
- Step 3** Ensure that the optical module is correctly oriented and gently push it into the optical port until you hear a click.

NOTICE

If the optical module cannot be completely inserted into the optical port, do not force it into the port. Turn the optical module 180 degrees and try again.

Figure 8-1 Installing an optical module



- Step 4** Check whether the transceiver module is securely seated. While keeping the handle of the transceiver module closed, grasp the two sides of the transceiver module with your thumb and forefinger and gently pull it.
- If the transceiver module does not pull out, it is installed correctly.
 - If the transceiver module pulls out, reinstall it.

NOTE

Ensure that transceiver modules are fitted with dust plugs when not in use and remove the dust plugs only when you are ready to connect optical fibers.

----End

9 Connecting a Switch

- [9.1 Connecting Power Cables](#)
- [9.2 Connecting the Power Adapter](#)
- [9.3 Connecting Power Cables \(2-Pin Phoenix Connector\)](#)
- [9.4 Connecting a DI/DO Cable](#)
- [9.5 Connecting Ethernet Cables](#)
- [9.6 Connecting Optical Fibers](#)
- [9.7 Installing a Surge Protector](#)

9.1 Connecting Power Cables

Context

** DANGER**

There is a risk of electrical shock when connecting power cables. To avoid electric shock, do not connect power cable while the power is on.

NOTICE

- Power cables of the switch must be routed indoors or buried underground if they are led in from the outside. Do not aerially route the power cables outdoors.
 - Do not power on the switch until you finish installing the switch and connecting all cables.
 - Power cables delivered with the switch are for use with this switch only.
-

The S series switches have a built-in power supply unit or support pluggable power modules. The required power cables and their connection methods vary according to the power modules used on the switches.

 NOTE

The AC power cable parameters vary in different countries or regions. The figures in this section are only for reference.

Tools and Accessories

- ESD wrist strap or ESD gloves
- (Optional) AC terminal locking latch

Procedure

Step 1 Wear an ESD wrist strap or ESD gloves. When wearing an ESD wrist strap, ensure that it is in close contact with your wrist and grounded properly.

Step 2 Turn off the external power supply system for the switch.

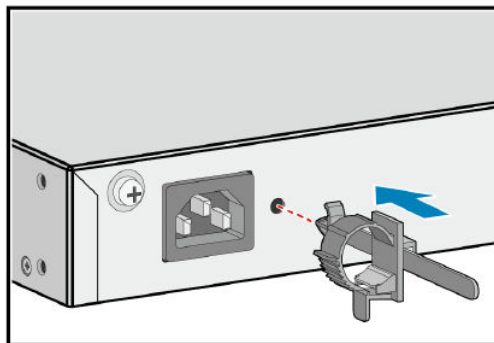
Step 3 Turn off the power switch on the switch or power module.

 NOTE

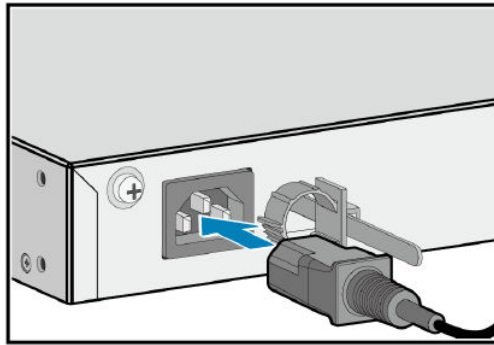
Skip this step if there is no power switch on the switch or power module.

Step 4 Connect a power cable to the switch or power module.

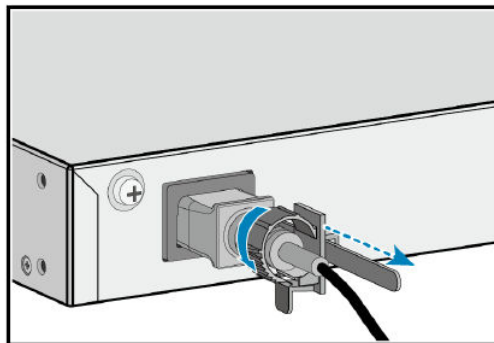
- To connect an AC power cable to a built-in AC power supply unit or AC power module, perform the following steps (built-in AC power supply used as an example):
 - a. (Optional) Install the AC power cable locking strap.
The AC power cable locking strap is not delivered with the switch.



- b. Insert the AC power cable plug into the power socket on the switch or AC power module.



- c. (Optional) If an AC power cable locking strap is installed, adjust its size to fit the AC power cable plug.



Step 5 Connect the power cables to the external power supply system.

- If you are using the standard AC power cables for your geographical location, connect them to an AC power strip or power distribution box.
- If you are using C13 straight female to C14 straight male AC power cables, connect them to a PDU.

----End

9.2 Connecting the Power Adapter

Context

 **DANGER**

To avoid electric shock, do not connect power cables while the power is on.

NOTICE

- Power cables of the device must be routed indoors or buried underground if they are led in from the outside. Do not aerially route the power cables outdoors.
- Do not power on the device until you finish installing the device and connecting all cables.
- Power cables delivered with the device are for use with this device only.

Tools and Accessories

- ESD wrist strap
- Power adapter
- AC Power Cable

Procedure

Step 1 Verify that the device is reliably grounded.

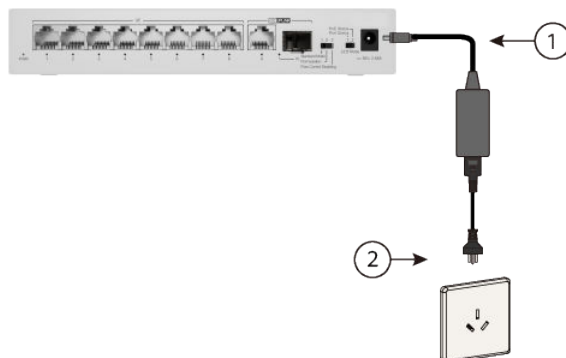
Step 2 Wear an ESD wrist strap. Ensure that the ESD wrist strap is grounded and in a close contact with your wrist.

Step 3 Connect the power adapter.

NOTE

The device does not have a power switch, and its power supply is controlled by the power switch of the external power supply system.

1. Connect one end of the power adapter to the power socket on the device.
2. Connect the other end of the power adapter to an AC power outlet.



----End

Follow-up Procedure

Perform the following operations after connecting the power adapter:

- Verify that power adapter is securely connected to the power jack.
- If multiple devices are installed, attach labels to both ends of each power cable and write numbers on the labels to identify them.

9.3 Connecting Power Cables (2-Pin Phoenix Connector)

Context

** DANGER**

To avoid personal injury, do not connect power cables or remove/insert power connectors when the power is on.

NOTICE

- Before the connection, take ESD measures, for example, wearing ESD gloves or an ESD wrist strap.
 - Power cables of the switch must be routed indoors or buried underground if they are led in from the outside. Do not aurally route the power cables outdoors.
 - Do not power on the switch until you finish installing the switch and connecting all cables.
 - For DC industrial switches, 2-pin Phoenix connectors and recommended power cables are required. The power supply units or power modules of the industrial switches are secured by screws. To ensure safety, you need to install an external disconnecter (such as a circuit breaker) on the other end of the power supply.
-

Tools and Accessories

- ESD wrist strap or ESD gloves
- M2 flat-head screwdriver
- Wire stripper
- Power cables (prepared separately. The recommended conductor diameter is 1.5 mm².)

Procedure

- Step 1** Wear an ESD wrist strap or ESD gloves. When wearing an ESD wrist strap, ensure that it is in close contact with your wrist and grounded properly.
- Step 2** Turn off the external power supply system for the switch.
- Step 3** Turn off the power switch on the switch or power module.

 NOTE

Skip this step if there is no power switch on the switch or power module.

Step 4 Connect a power cable to the switch or power module.

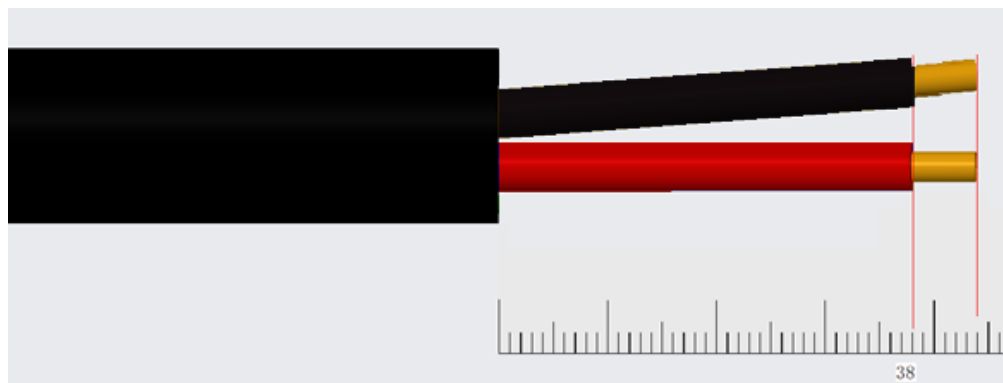
1. Select a DC power cable.
 - If semi-finished DC power wires are used, cut the power wires to a proper length based on the installation position of the device in the cabinet. You are advised to use cable colors to differentiate between the positive cables and negative wires.



- If a finished DC power cable is used, cut off one end of the finished DC power cable (for example, N2XC2Y power cable).
2. Use a wire stripper to peel 5–6 mm length of insulation off one end of the power wires.



If a finished cable is used, strip the sheath of the power cable to a length greater than 48 mm.



NOTE

- To avoid damaging the conductor metal, do not apply excessive force when stripping the insulation.
 - Use diagonal pliers to cut off the fillers and ensure that the wires do not split during stripping.
3. Insert the crimped positive wires (+) and negative wires (-) into the 2-pin Phoenix connector sockets in sequence, and use a screwdriver to tighten the wires. Pull the wires to check whether they are securely installed.

NOTE

The positive wire (+) and negative wire (-) of the power cable must be consistent with the polarities of the connector sockets on DC1 or DC2.

DANGER

Ensure the wires are securely and properly installed in the correct connector sockets.

Ensure each wire is firmly installed.

Ensure that no metal wire is exposed outside the power plug.

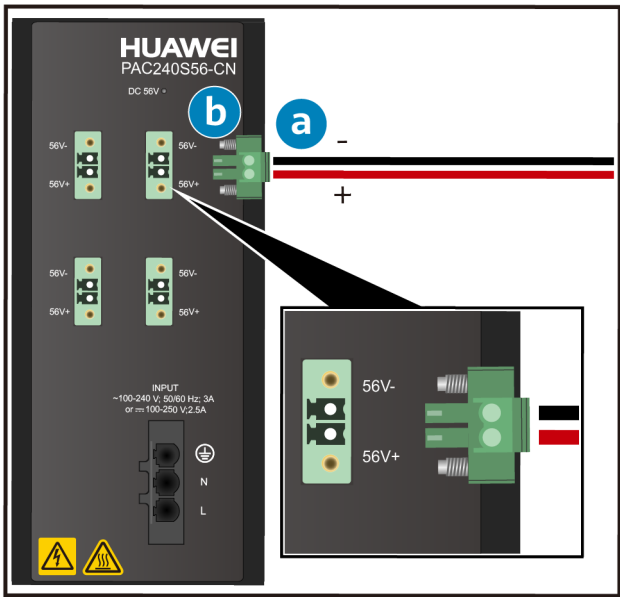
Before removing the Phoenix connector, ensure that the screws on both sides of the connector are loosened.

4. Insert the Phoenix connector into the DC input port on the switch, and tighten the screws on both sides of the Phoenix connector. Use an M2 flat-head torque screwdriver to tighten the screws on the connector to 0.3 N·m.

Step 5 Connect the power cable to the external power supply system.

- A power cable is typically connected to a DC power distribution box. Ensure correct connections of the positive and negative power wires. If the DC output of the PAC60S12-AN or PAC240S56-CN power module is used, connect the power cable as follows:
 - a. Use a wire stripper to peel about 5–6 mm length of insulation off one end of the positive and negative wires. Insert the bare wires of the power cable into the Phoenix connector sockets according to the sequence shown in the figure. Then, tighten the screws using an M2 flat-head screwdriver to securely lock the cable in place.
 - b. Insert the Phoenix connector into the DC output port on the power module, and tighten the screws on both sides of the Phoenix connector.

Figure 9-1 Connections of DC output power cables for the PAC240S56-CN



----End

9.4 Connecting a DI/DO Cable

Context

A DI interface receives alarm input (9.6–60 V), and a DO interface sends output signals to instruct an external device to perform required actions. Table 9-1 lists the DI/DO interface attributes.

Table 9-1 DI/DO interface attributes

Attribute	Description
Connector type	5-pin Phoenix connector
Signal type	- DI: 9.6–60 V DC power input - DO: Boolean value (short circuit and open circuit)

NOTICE

- Do not power on the device before you finish connecting the power cable and other cables.
- When connecting cables, notice port identifiers to ensure correct cable connections. Incorrect cable connections may cause damage to the port module or the device.

Tools and Accessories

- Wire stripper
- 5-pin Phoenix connector
- Five wires (separately purchased)

Procedure

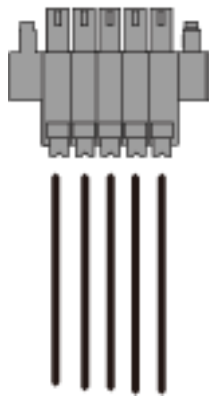
Step 1 Prepare a DI/DO cable.

1. Use a wire stripper to strip about 7 mm length of the insulation off one end of wires.

NOTICE

Do not damage the metal conductor of the wires when stripping the insulation.

2. Insert the bare wires into the wire holes.

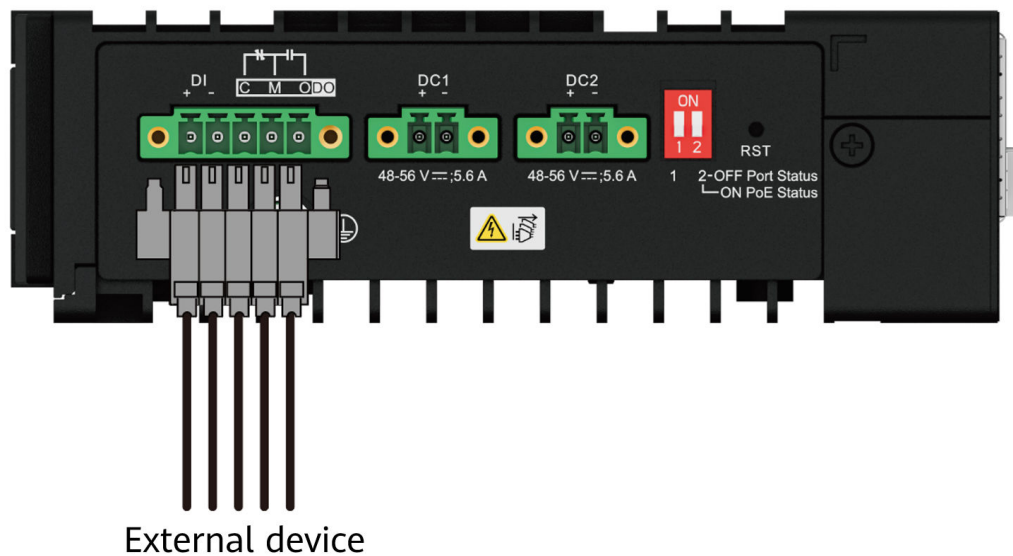


NOTICE

There must be no exposed metal part at the joints of wire holes on the 5-pin Phoenix connector and bare wires.

Step 2 Connect the DI/DO cable.

1. Insert the 5-pin Phoenix connector to the DI/DO interface of the device, and then tighten the slotted screws at both ends of the connector with a flat-head screwdriver.
2. Connect the other end of the DI/DO cable to an external device.



----End

9.5 Connecting Ethernet Cables

Context

NOTICE

- Before deploying Ethernet cables, test their continuity.
- If Ethernet cables of the switch need to be routed outdoors, bury them underground or put them through steel pipes to avoid lightning strikes to the switch. Do not aerially route Ethernet cables outdoors.
- Keep signal cables more than 10 cm away from power cables.
- Ensure Ethernet cables have a stable environment. There should be no external power cables in contact with Ethernet cables or devices at either end of the Ethernet cables, as external power cables may damage the devices or Ethernet cables through leakage current.
- Strong interference may cause a packet loss rate of no more than 1% on Ethernet electrical interfaces. To prevent this problem, keep the switch away from interference sources or take adequate anti-interference measures.

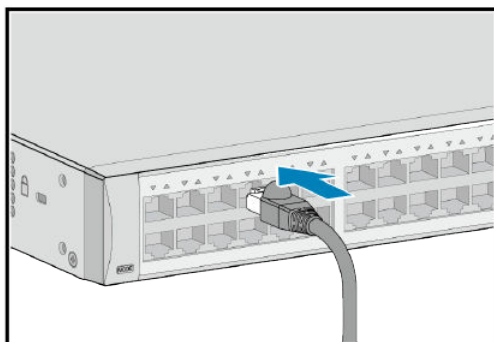
Tools and Accessories

- ESD wrist strap or ESD gloves
- Cable tie gun
- Cable ties
- Marker

- Network cable labels

Procedure

- Step 1** Determine the number and type of ports to be connected and plan the cabling routes.
- Step 2** Obtain the desired quantity and lengths of Ethernet cables.
- Step 3** Attach temporary labels to both ends of each Ethernet cable and number them corresponding to port numbers.
- Step 4** Route the Ethernet cables, arrange the cables in the cabinet, and then install cable connectors. Cable connectors made onsite must be securely attached and comply with related standards.
- Step 5** Wear an ESD wrist strap or ESD gloves. When wearing an ESD wrist strap, ensure that it is in close contact with your wrist and grounded properly.
- Step 6** Connect the cable connectors to the ports, matching the numbers on the Ethernet cables to those on the ports. After connecting the cables, verify that they are all correctly connected.



- Step 7** Arrange the Ethernet cables so that they are parallel, and then bundle them with cable ties loosely according to [Table 9-2](#). Use a cable tie gun to cut off redundant cable ties. The use of protective pads under the cable ties is recommended, as shown in [Figure 9-2](#).

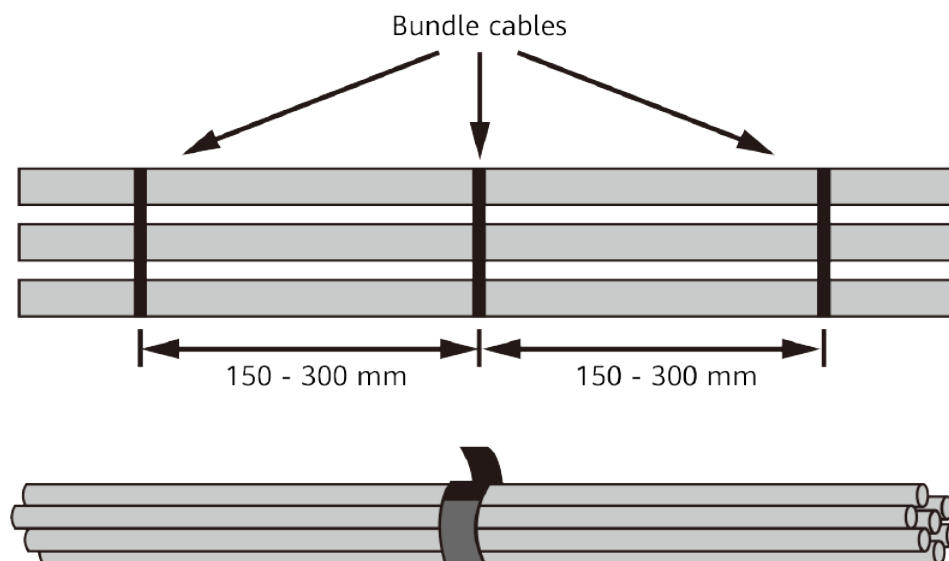
NOTE

A bundle cannot have more than 24 cables. A bundle of no more than 12 cables is recommended.

Table 9-2 Spacing between cable ties

Diameter of a Bundle	Spacing Between Cable Ties
< 10 mm (0.39 in.)	150 mm (5.91 in.)
10-30 mm (0.39-1.18 ft.)	200 mm (7.87 in.)
> 30 mm (1.18 ft.)	300 mm (11.81 in.)

Figure 9-2 Bundling Ethernet cables



Step 8 Replace all the temporary labels on the Ethernet cables with permanent labels.

----End

9.6 Connecting Optical Fibers

Context



DANGER

Never look directly into an optical module or the ends of optical fibers. Optical modules and connected fibers emit laser radiation that can cause eye damage.

NOTICE

Before deploying optical fibers, test connectivity of the optical fibers.

NOTICE

- Keep optical fibers more than 10 cm (3.9 in.) away from power cables.
- Use corrugated pipes to protect optical fibers routed in a cabinet. The bend radius of an optical fiber must be at least 20 times larger than its diameter. Generally, the bend radius of optical fibers should be no less than 40 mm (1.57 in.).

NOTICE

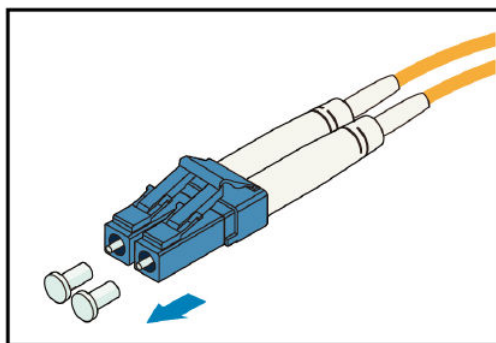
Fiber connectors must be tidy and clean to ensure normal communication. If a fiber connector is contaminated, clean it with fiber cleaning fabric.

Tools and Accessories

- ESD wrist strap or ESD gloves
- Corrugated pipe
- Fiber binding tape
- Marker
- Engineering labels for optical fibers
- (Optional) Tweezers

Procedure

- Step 1** Determine the number and type of ports to be connected and plan the cabling routes.
- Step 2** Obtain the desired types, quantity, and lengths of optical fibers.
- Step 3** Wear an ESD wrist strap or ESD gloves. When wearing an ESD wrist strap, ensure that it is in close contact with your wrist and grounded properly.
- Step 4** Attach temporary labels to both ends of each optical fiber and number them corresponding to port numbers.
- Step 5** Remove the dust plugs from optical modules and the dust caps from the optical fibers to be connected.

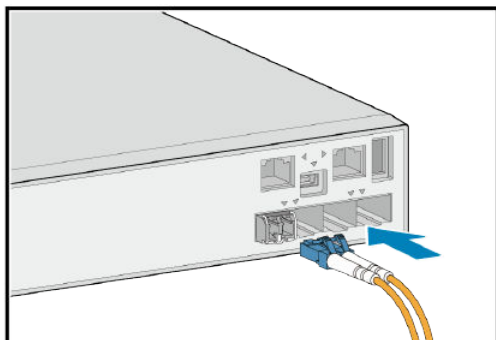


- Step 6** Connect optical fibers to the optical modules on the device, matching the numbers on the optical fibers to those on the ports. To connect them, align the fiber connector with the bores on the optical module and insert the fiber connector. When you hear a click, the fiber connector is securely connected. See [Figure 9-3](#). After connecting the optical fibers, verify that they are all correctly connected.

NOTE

Connect the receive and transmit ends of a fiber connector to the receive and transmit bores of the optical module.

Figure 9-3 Connecting optical fibers to an optical module

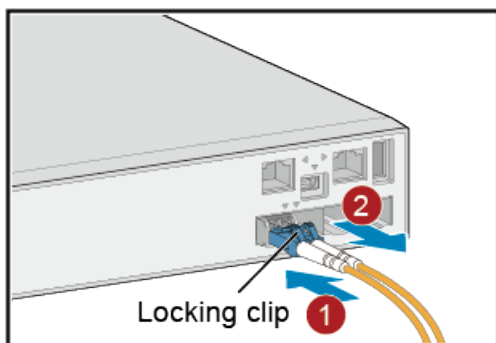


To remove optical fibers from an optical module, gently push the fiber connector inward, and then pull the fiber connector out while pressing the locking clips. Do not forcibly pull the fiber connector. See [Figure 9-4](#).

 NOTE

If optical ports are densely populated, use the tweezers to remove optical fibers.

Figure 9-4 Removing optical fibers



Step 7 Arrange the optical fibers to make them parallel and bundle them with fiber binding tape at a spacing of 150-300 mm (5.9-11.8 in.).

Step 8 Replace all the temporary labels on the optical fibers with permanent labels.

----End

9.7 Installing a Surge Protector

9.7.1 Installing a Network Port Surge Protector

Tools and Accessories

- ESD wrist strap or ESD gloves
- Ejector lever
- Crimping tool
- Bare crimp terminal

- Yellow-green ground cable
- Cable ties

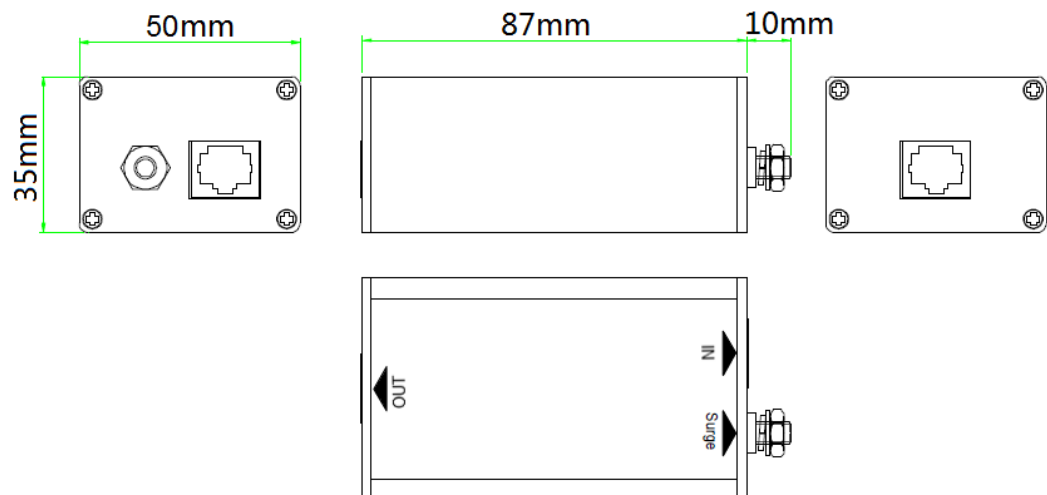
Before installation, ensure that:

- The power adapter is connected to the power socket.
- The position where the device is installed has a reliable ground point.
- The number of network port surge protectors has been determined based on the number of outdoor ports.

Context

Huawei network port surge protectors with part number 19020303 or surge protectors that have equivalent or higher specifications are recommended. [Figure 9-5](#) shows the structure of the Huawei network port surge protector with part number 19020303.

Figure 9-5 Structure of a network port surge protector



NOTE

During normal use, particularly if there is a risk of thunderstorm, check the grounding system regularly to ensure that network port surge protectors are properly grounded. Failure to do so may result in a decreased level of protection provided by the surge protectors. Additionally, an open-circuited ground cable will render surge protectors ineffective.

Procedure

1. Position a network port surge protector in the distribution box.
2. Connect the network port surge protector.
 - a. Connect the IN port to the connected terminal using a network cable.
 - b. Connect the OUT port to the industrial switch using a network cable.
 - c. Connect the Surge port using a ground cable.

 NOTE

It is recommended that the yellow-green ground cable connected to the network port surge protector have a cross-sectional area greater than 4 mm² and be no longer than 0.5 m in length.

3. Secure the power adapter and network port surge protector in the distribution box with cable ties.

10 Post-installation Checks

Table 10-1 lists the post-installation items to be checked.

Table 10-1 Post-installation checklist

No.	Check Item	Method
1	The installation position of the device meets the requirement in the associated engineering design document.	Observe
2	The surfaces of the device are clean and smooth, free from fingerprints, stains, and scratches.	Observe
3	Components are correctly installed in the cabinet. No component is loose or damaged.	Observe
4	All screws are correctly tightened.	Observe
5	There are no objects on the chassis.	Observe
6	Leave at least 50 mm (2.0 in.) clearance around the device for heat dissipation. Do not install a device with its air intake vent facing or close to the air exhaust vent of other devices.	Measure
7	Signal cables are not damaged or broken and have no splices.	Observe
8	Signal cable connectors are clean, intact, and correctly connected. Wires of each signal cable are securely clamped in the connectors.	Observe
9	Each signal cable has labels attached at both ends, with clear text facing the same direction.	Observe
10	The power cables and ground cable are all copper wires, and are not spliced or damaged.	Observe

No.	Check Item	Method
11	The power cables and ground cable are routed in compliance with the associated engineering design document and meet the power distribution requirements.	Observe
12	The power cables and ground cable are securely connected in compliance with regulations. Ground cable lugs are protected with spring washers on flat washers.	Observe
13	The power cables and ground cable are separated from the signal cables.	Observe
14	The power cables and ground cable are routed straightly and bundled neatly. Sufficient slack is left at the bent part of the cables.	Observe
15	Optical fibers routed out of the cabinet are protected. For example, they are routed in a corrugated pipe or trough.	Observe
16	The bend radius of optical fibers is 20 times larger than their diameter. Generally, the bend radius is larger than 40 mm.	Measure
17	Optical fibers are bundled neatly using binding tape with suitable force.	Observe
18	No signal cables are routed near the heat vents on the cabinet.	Observe
19	Cables in the cabinet do not cross each other and cables outside the cabinet are bundled.	Observe

11

Powering On or Off a Switch

Tools and Accessories

- ESD wrist strap or ESD gloves
- Multimeter

Procedure

Step 1 Perform the following checks before powering on a switch:

1. Use a multimeter to check that there is no short-circuit condition between the phase wire (live wire), ground wire, and neutral wire in each power outlet.
2. Use the multimeter to check that the input voltage provided by the external power supply system is within the operating voltage range for the switch. For the operating voltage range, see [4.4 Checking the Power Supply System](#).
3. Check that the power switches of the external power supply system and the switch or the power module are both turned off.
4. Check that the power cables are correctly connected.

Step 2 Wear an ESD wrist strap or ESD gloves. When wearing an ESD wrist strap, ensure that it is in close contact with your wrist and grounded properly.

Step 3 Turn on the external power supply system connected to the switch.

Step 4 Turn on the power switch on the switch or power module.

NOTE

Skip this step if the switch does not support pluggable power modules or does not have a power switch.

Step 5 After the switch completes its startup, check the indicators on the switch and power modules.

For details about the indicators of specific switch models, see the *Hardware Description*.

----End

Follow-up Procedure

To power off the switch, perform the following steps:

NOTICE

- Powering off the switch will interrupt all services on the switch. Exercise caution when you perform this operation.
- You are advised to save and back up the switch configuration before powering off the switch. If the switch is powered off before the current configuration is saved, the configuration saved last time is restored when the switch is started.
- Some power modules have independent switch. Turning off the switch before powering off the device can protect the power modules. Devices without external power modules can be powered off directly.
- Do not frequently power off the switch without special operations. The switch is an enterprise-level product, which is different from home devices. If there is no known problem, the switch does not run slowly for a long time, run faster after being powered off, or rectify forwarding faults. On the contrary, stable power supply can prolong the service life and stability of the switch.

-
1. Save the configuration file of the switch.
 2. Turn off the power switch on the switch or power module.
 3. Turn off the external power supply system connected to the switch.
 4. Check that the switch and all its modules are powered off. (All indicators are off.)

12 Maintaining a Device

NOTICE

Before sending a switch for repair or discarding it, format its flash storage to ensure data security.

When installed in a normal operating environment, fixed switches do not need dust cleaning. Do not disassemble the equipment.

[12.1 Replacing an Optical Module](#)

[12.2 Replacing a Switch](#)

12.1 Replacing an Optical Module

Context

CAUTION

Never look directly into an optical module or the ends of optical fibers. Optical modules and connected fibers emit laser radiation that will cause eye damage.

NOTICE

A switch must use optical or copper modules that have been certified for use on Huawei S switches. Non-certified optical or copper modules cannot ensure transmission reliability and may affect service stability. Huawei is not liable for any problem caused by the use of non-certified optical or copper modules and will not fix such problems.

NOTICE

Ensure that the new optical module has the same center wavelength and complies with the same standards as the old one.

NOTICE

Optical modules are electrostatic-sensitive components. Take ESD protection measures when replacing optical modules.

NOTICE

- Unplug the optical fibers from the optical module before removing it. Install or remove optical fibers carefully to avoid damaging the fiber connectors. Applying too much force to the optical fibers may damage the optical module.
 - If an optical module cannot be completely inserted into an optical port, turn the optical module over and try again.
 - Cover unconnected optical modules with dust plugs.
-

Tools and Accessories

- ESD wrist strap or ESD gloves
- Dust caps
- Dust plugs
- Alcohol swab

Procedure

- Step 1** Wear an ESD wrist strap or ESD gloves. Ensure that the ESD wrist strap is grounded and in a close contact with your wrist.
- Step 2** Record the location of each optical fiber on the old optical module and check whether the labels on the optical fibers are correct and clear. If any labels are unclear, replace them and ensure that the details are correct.
- Step 3** Release the locking clip on the fiber connector, gently push the fiber connector inward, and then pull out the optical fiber. After removing the optical fibers from the optical module, cover the connectors with dust caps.

The locking clip varies on different fiber connectors.

- **Figure 12-1** shows the locking clips on an LC/PC connector. Hold down the locking clips when pulling the optical fibers.
- **Figure 12-2** shows the locking clip on an MPO connector. The locking clip is released automatically when you pull the MPO connector.
- **Figure 12-3** shows the locking clip on an SC/PC connector. The locking clip is released automatically when you pull the SC/PC connector.

Figure 12-1 LC/PC connector

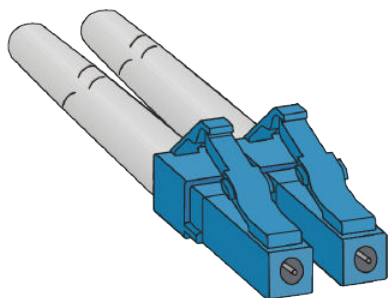


Figure 12-2 MPO connector

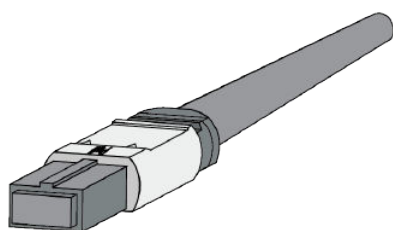
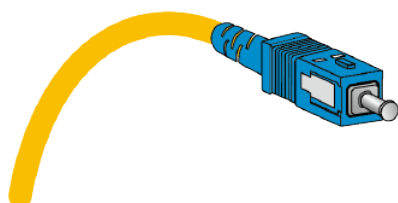


Figure 12-3 SC/PC connector



Step 4 Remove the optical module and cover the bores with dust plugs. Store optical module safely.

The latch varies on different optical modules. [Figure 12-4](#) shows an optical module with a clasp latch. To release the clasp latch, rotate it down. [Figure 12-5](#) shows an optical module with a tab latch. The tab latch is released when you pull it.

Figure 12-4 Optical module with a clasp latch

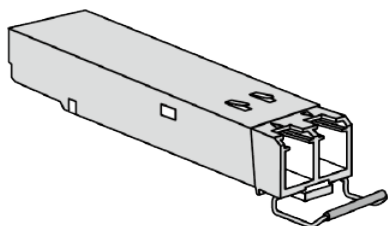
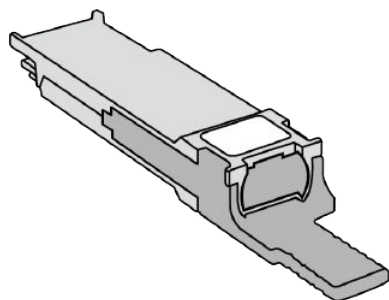


Figure 12-5 Optical module with a tab latch



- Step 5** Take out the new optical module from the package. Ensure that the optical module is correctly oriented and gently push it into the optical port until you hear a click.

 NOTE

The new optical module must have the same optical parameters as the remote optical module connected to it.

- Step 6** Identify the optical fibers to be connected to the optical module. Remove the dust caps from the optical fibers and insert the optical fibers to the bores of the optical module.

----End

Follow-up Procedure

If the new optical module does not work, unplug the optical fibers and clean their connectors in one direction with an alcohol swab. Then, re-connect them. If this fails to resolve the issue, contact the equipment supplier or local maintenance personnel for technical support.

12.2 Replacing a Switch

Context

The chassis is severely damaged or a hardware fault occurs due to external forces.

NOTICE

Power off the switch before replacing it, which will interrupt services.

Tools and Accessories

- ESD wrist strap or ESD gloves
- Phillips screwdriver

Procedure

- Step 1** Wear an ESD wrist strap or ESD gloves. When wearing an ESD wrist strap, ensure that it is in close contact with your wrist and grounded properly.
- Step 2** Confirm that the names, models, and specifications of the new and original switches are the same. If a mismatch is found, contact technical support as soon as possible.
- Step 3** Record the IDs of slots where modules are installed and cable connections on ports of the original switch.
- Step 4** Back up configuration data and License files of the original switch. (skip this step for the unmanaged switch).
- Step 5** Power off the original switch.

 CAUTION

The switch is successfully powered off when all indicators are off.

- Step 6** Remove all cables and pluggable modules from the switch.
- Step 7** Remove M6 screws from the mounting brackets and remove the switch from the cabinet (skip this step for models without mounting brackets).

 CAUTION

When removing screws from the mounting brackets, hold the bottom of the switch to prevent it from falling down to cause personnel injury or damage to other devices.

- Step 8** Remove mounting brackets from the original switch and install the mounting brackets on the new switch (skip this step for models without mounting brackets).
- Step 9** Install the new switch in the same position as the original switch.
- Step 10** Install the original modules and cables according to the recorded information.
- Step 11** Power on the new switch and observe indicators on it. For details about the indicators of specific switch models, see the *Hardware Description*.
- Step 12** Log in to the new switch and check whether the switch is working properly.

----End

Follow-up Procedure

If the new switch does not work normally, contact the equipment supplier or local maintenance personnel for technical support.

13 Appendix

- [13.1 Appendix A On-site Cable Assembly and Installation](#)
- [13.2 Appendix B Environmental Requirements for Device Operation](#)
- [13.3 Appendix C Equipment Grounding Specifications](#)
- [13.4 Appendix D Engineering Labels for Cables](#)
- [13.5 Appendix E Guide to Using Optical Modules](#)
- [13.6 Appendix F Fault Tag](#)

13.1 Appendix A On-site Cable Assembly and Installation

13.1.1 Cable Assembly Precautions

Checking the Appearance of Cables

- If the cable jacket or insulation is visibly dirty, clean it before assembly.
- If the jacket or insulation of a cable has visible damage, irreparable scuffing, or other defects, do not use the cable.
- If the shield layer of a cable is damaged, do not use the cable.
- If the cable jacket or insulation cracks after the cable is bent or twisted, discard this cable and check whether other cables have the same problem. If other cables have the same problem, replace these cables.

Checking the Appearance of Connectors

- Do not use connectors with visible defects, damage, rust or scuffing.
- Do not use connectors if their shells or pins have exposed part or uneven plating, or their pins are lost, broken, or bent.

- Do not use connectors that have dirt on their pins or in their jacks or if there are conductors between pins or between pins and the shell.

Precautions for Assembly

- Use dedicated tools or tools delivered by Huawei and follow the methods given here during assembly.
- Hold terminals of cables instead of pulling the cables themselves when installing or removing cable components.
- Take the following precautions when cutting or stripping cables:
 - Make cables slightly longer than necessary.
 - Coil cables longer than 2 m (6.56 ft) after cutting. Bind and fasten the coils using bundling ropes. The inner diameters of the coils should be larger than 20 times the outer diameters of the cables.
 - When stripping the jackets of cables, avoid damaging the shield layers (braid or aluminum foil), insulation, core conductors, and other jackets that do not need to be stripped.
 - After assembling cables, cut all visible cross sections of jackets to ensure that the cross sections are arranged neatly.
 - Do not touch the core conductors of cables with your hands. Terminate exposed conductors in a timely way after stripping off insulation so that the surface of the conductors does not become oxidized.
- Take the following precautions when crimping and connecting cables or connectors:
 - The terminals and conductors should be connected tightly after they are crimped. They should not be moved or turned.
 - Cut all the exposed copper wires.
 - Try to avoid a second crimping of sleeves.
 - Keep all the conductors clean and aligned.

NOTE

The connectors, cables, and tools provided by different vendors may be different. The figures in this document are for your reference only.

13.1.2 Installing Cable Accessories

13.1.2.1 Precautions for Installing Cable Accessories

Tools

Use dedicated tools provided or specified by Huawei and follow the installation procedure described here.

NOTE

The illustrations in this document may differ from actual situations, but the installation methods are the same. For example, in this document, the adapters of cable connectors have separate interfaces. In the actual situation, the adapters may have interfaces fixed on equipment.

Bending Radius

Unless otherwise specified, bending radius (R) of cables or fibers must meet the requirements listed in [Table 13-1](#).

Table 13-1 Bending radius of cables or fibers

Cable or Fiber	Bending Radius (R)
Ordinary cable	In normal cases, $R \geq 2d$. When the cable is connected with a connector, $R \geq 5d$.
Fiber	$R \geq 40$ mm (1.57 in.); Bending angle $> 90^\circ$

NOTE

The letter d indicates the diameter of a cable or fiber.

Precautions for Installation

- Hold terminals of cables instead of pulling the cables themselves when installing or removing cable components.
- Do not insert a connector forcibly when the connector is blocked. Use a dedicated tool to pull out the connector. Install the connector again after you check that the pins are inserted properly.
- Before tightening screws on cable connectors, ensure that the connectors are properly connected to their adapters. Tighten the screw with appropriate force using a flat-head or Phillips screwdriver instead of bare hands or an electric screwdriver. If the screw cannot be screwed into the tapped hole, determine the reason and try again. Do not apply too much force, or the screw or adapter may be damaged.
- When removing densely aligned cables or fiber connectors, use dedicated pliers such as cable-pulling pliers and fiber-pulling pliers.
- Do not twist, bend, stretch, or extrude fibers during installation.
- Cover the idle fiber connectors with dust caps. Remove the dust caps before using the fiber connectors.

Requirements for Cable Routing

- To protect cables, remove the burrs in the cable through-holes or install protective rings in the holes.
- To ease the connection and to avoid stress, keep cable joints slack. After connecting multiple cables to a connector that has multiple interfaces, keep the cables slack to avoid generating stress.
- Bind or clean cables gently because cable distortion affects signal quality.
- Keep cables away from moveable components such as doors.
- Sharp objects must not touch cable wiring to prevent damage to cables.

- To protect power cables, route power cables of the active and standby power modules separately.

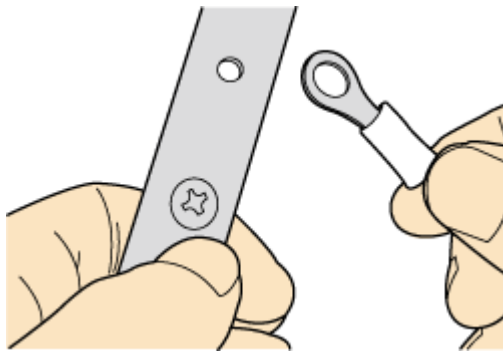
13.1.2.2 Installing Power Adapters

13.1.2.2.1 Installing the OT Terminal

Procedure

- Install an OT terminal.
 - a. Align the hole of the OT terminal (conductor upward) with a connecting hole, as shown in [Figure 13-1](#).

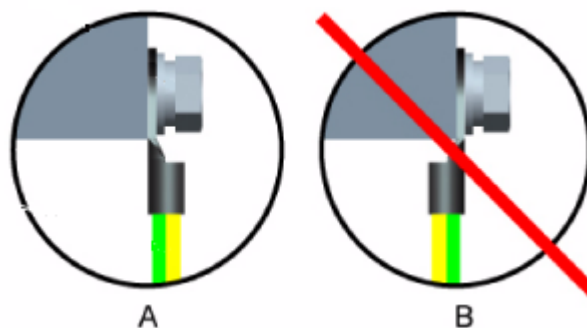
Figure 13-1 Aligning the OT terminal with a connecting hole



NOTE

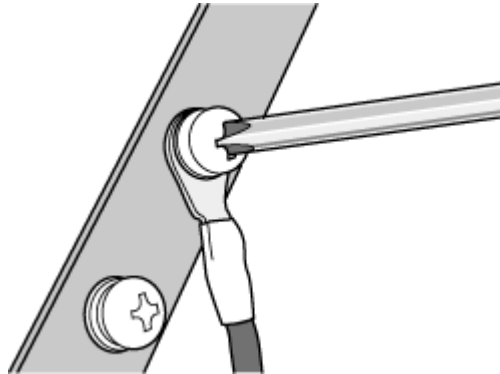
When you install an OT terminal, the crimping sleeve is installed as shown in [Figure 13-2](#), where A is correct and B is incorrect.

Figure 13-2 Installing an OT terminal, showing the orientation of crimping sleeve



- b. Place the spring washer and flat washer in turn, mount a matching screw, and fasten it clockwise, as shown in [Figure 13-3](#).

Figure 13-3 Installing two terminals back to back

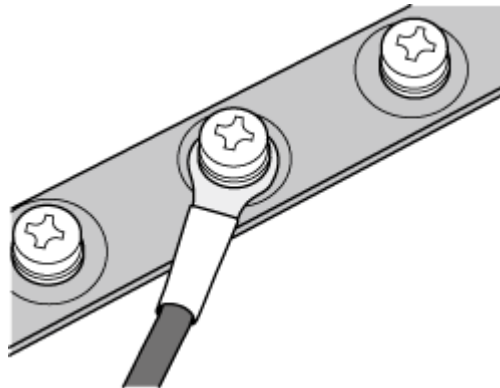


NOTICE

Ensure that the OT terminal is not in contact with other terminals or metal components.

- c. Move the cable slightly and ensure that it is securely connected, as shown in [Figure 13-4](#).

Figure 13-4 Installed OT terminal



- Install two OT terminals on a post.

Before you install two OT terminals on a post, ensure that the two terminals can be installed on the post and that the electrical connecting pieces have a large contact area. Two OT terminals can be installed using any of these methods:

- Bend the upper OT terminal at a 45- or 90-degree angle, as shown in [Figure 13-5](#).
- Cross the two terminals, as shown in [Figure 13-6](#).

Figure 13-5 Bending the upper OT terminal at a 45- or 90-degree angle

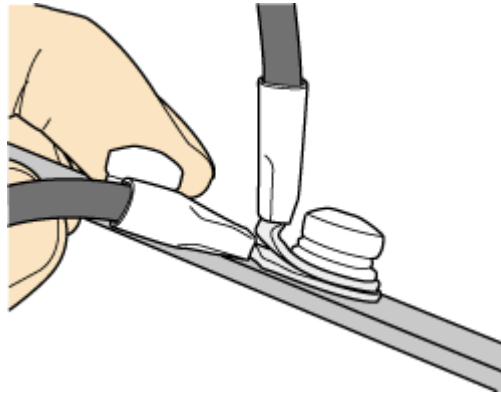
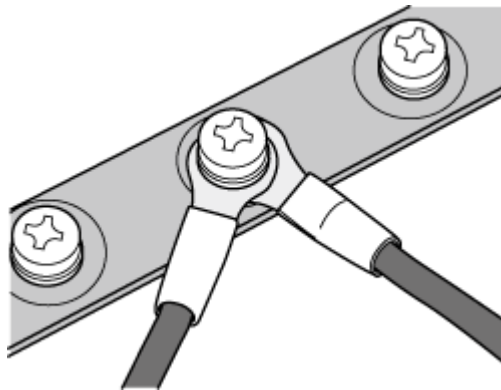


Figure 13-6 Crossing two terminals



NOTICE

If the two terminals are different sizes, place the smaller one above the bigger one. A maximum of two terminals can be installed on a post.

- To remove an OT terminal, loosen the screw counterclockwise.

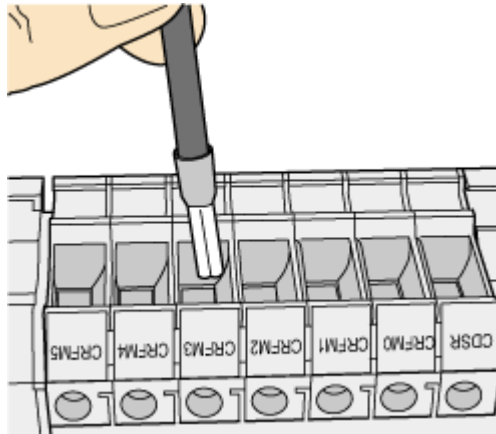
----End

13.1.2.2 Installing the Cord End Terminal

Procedure

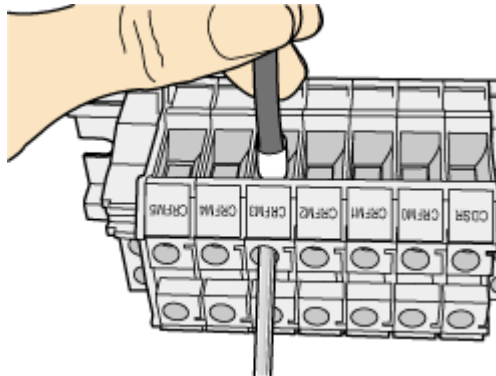
- Step 1** Hold a cord end terminal upright and place it on a terminal jack, as shown in [Figure 13-7](#). To ensure bump contact and dense connection, place the plain side of the terminal outwards.

Figure 13-7 Placing a terminal on a terminal jack vertically



Step 2 Insert the terminal into the jack vertically, and turn the screw clockwise to fasten the terminal, as shown in [Figure 13-8](#).

Figure 13-8 Feeding the terminal into the jack



NOTICE

- Ensure that the exposed section of the terminal is less than 2 mm (0.079 in.) in length.
 - Do not press the insulation of the terminal.
 - Insert only one terminal into one jack.
-

Step 3 Move the cable slightly and ensure that it is securely connected.

Step 4 Before you remove a cord end terminal, loosen the screw counterclockwise.

----End

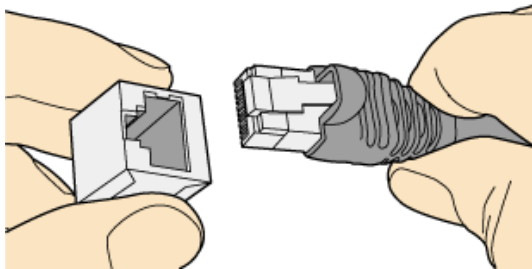
13.1.2.3 Installing Ethernet Adapters

13.1.2.3.1 Installing a Shielded Ethernet Connector

Procedure

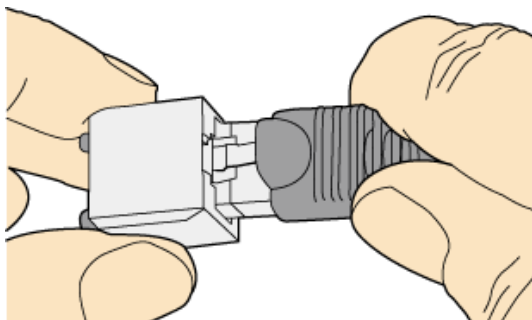
- Step 1** Hold the male and female connectors, with the male connector facing the female connector, as shown in [Figure 13-9](#).

Figure 13-9 Holding the male and female shielded connectors



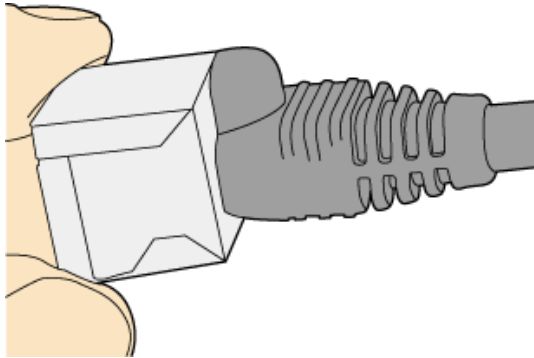
- Step 2** Insert the male connector into the female connector, as shown in [Figure 13-10](#).

Figure 13-10 Feeding the male shielded connector into the female shielded connector



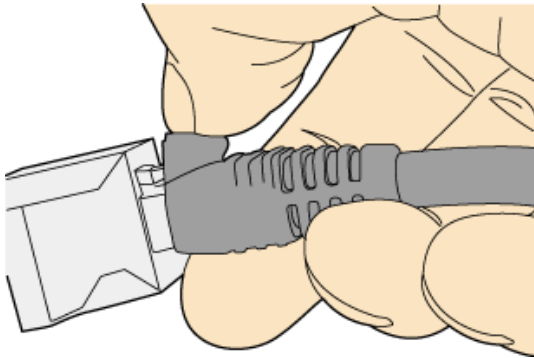
- Step 3** When you hear a click, the cable connector is completely inserted in the port. (The clip on the cable connector pops up to fix the connector in the port.) Pull the connector slightly and ensure that it is securely connected, as shown in [Figure 13-11](#).

Figure 13-11 Installed shielded Ethernet connector



Step 4 To remove an Ethernet connector, press the locking key and pull out the connector, as shown in [Figure 13-12](#).

Figure 13-12 Removing a shielded Ethernet connector



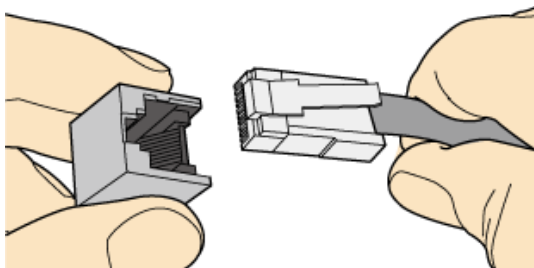
----End

13.1.2.3.2 Installing an Unshielded Ethernet Connector

Procedure

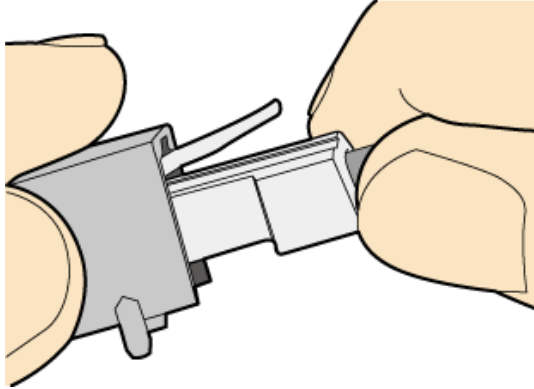
Step 1 Hold the male and female connectors, with the male connector facing the female connector, as shown in [Figure 13-13](#).

Figure 13-13 Holding the male and female unshielded connectors



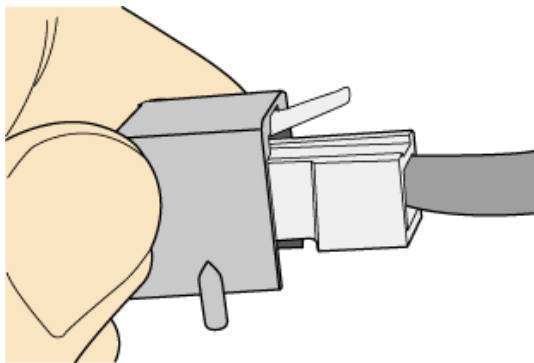
Step 2 Feed the male connector into the female connector, as shown in [Figure 13-14](#).

Figure 13-14 Feeding the male connector into the female unshielded connector



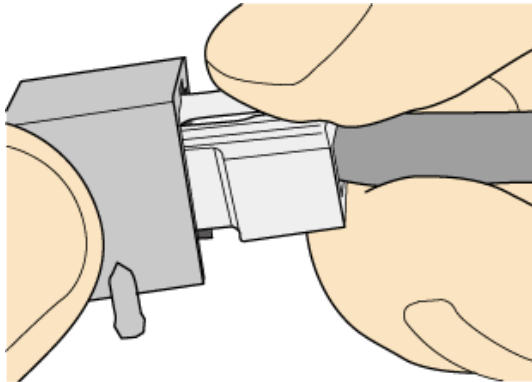
Step 3 A crisp click indicates that the connector is locked by the locking key. Pull the connector slightly and ensure that it is securely connected. [Figure 13-15](#) shows an installed Ethernet connector.

Figure 13-15 Installed unshielded Ethernet connector



Step 4 To remove an Ethernet connector, press the locking key and pull out the connector, as shown in [Figure 13-16](#).

Figure 13-16 Removing an unshielded Ethernet connector



----End

13.1.2.4 Installing Fiber Connectors

Context

NOTICE

- After you remove the dustproof cap, ensure that the fiber pins are clean and install them as soon as possible.
- When you disassemble fiber connectors, you must use a dedicated tool if the connectors are densely installed.

13.1.2.4.1 Cleaning Fiber Connectors

Procedure

- Step 1** Clean the pins of a fiber connector by using lint-free cotton and alcohol.
- Step 2** Clean the pins again by using dust-free cotton. If necessary, clean the pins by using an air gun. Ensure that the pins are free from any fiber or debris.

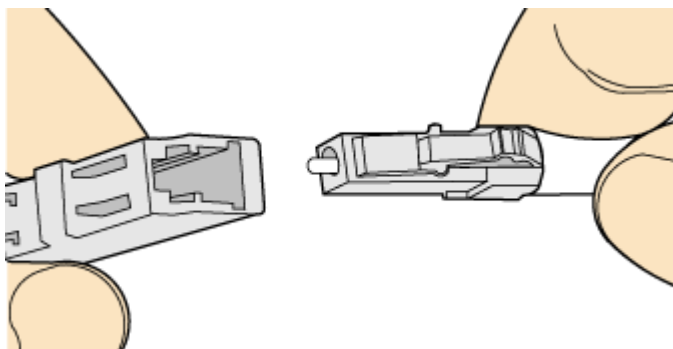
----End

13.1.2.4.2 Installing an LC Fiber Connector

Procedure

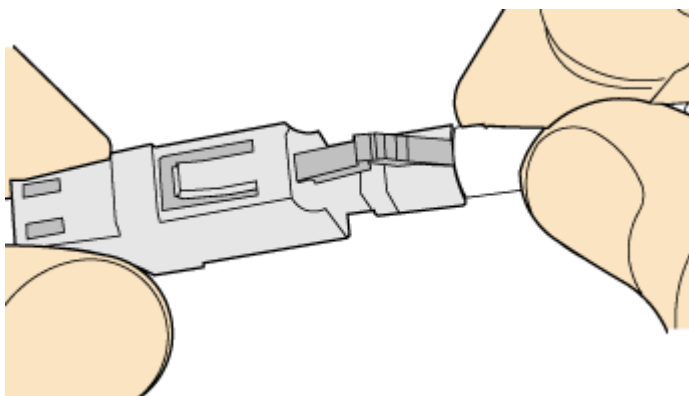
- Step 1** Remove the dustproof cap of the LC fiber connector and store it for future use.
- Step 2** Align the core pin of the male connector with that of the female connector, as shown in [Figure 13-17](#).

Figure 13-17 Aligning the male connector with the female connector



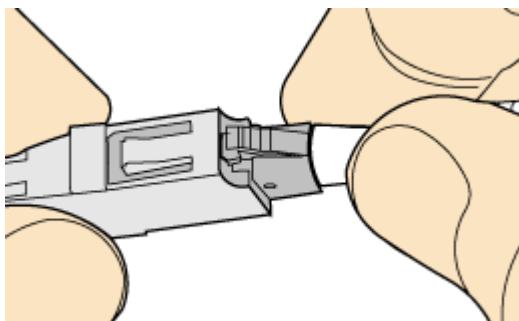
Step 3 Align the male connector with the fiber adapter and gently push the male connector until it is completely seated in the fiber connector, as shown in [Figure 13-18](#).

Figure 13-18 Feeding the male connector into the female connector



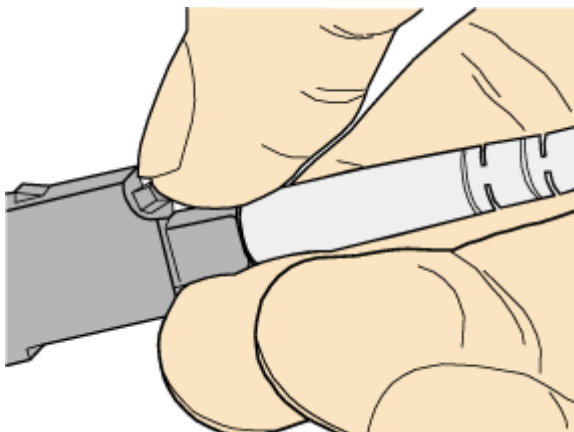
Step 4 A clicking sound indicates that the male connector is locked, as shown in [Figure 13-19](#).

Figure 13-19 Installed LC connector



Step 5 To disassemble an LC fiber connector, press the locking nut to release the locking clips from the bore, and gently pull the male connector, as shown in [Figure 13-20](#).

Figure 13-20 Disassembling an LC fiber connector



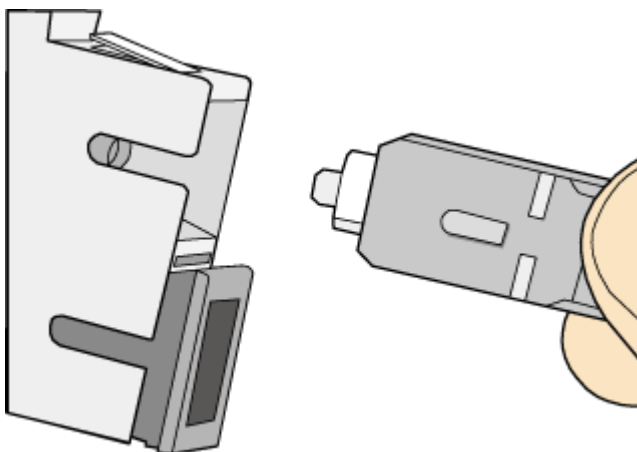
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13.1.2.4.3 Installing the SC Fiber Connector

Procedure

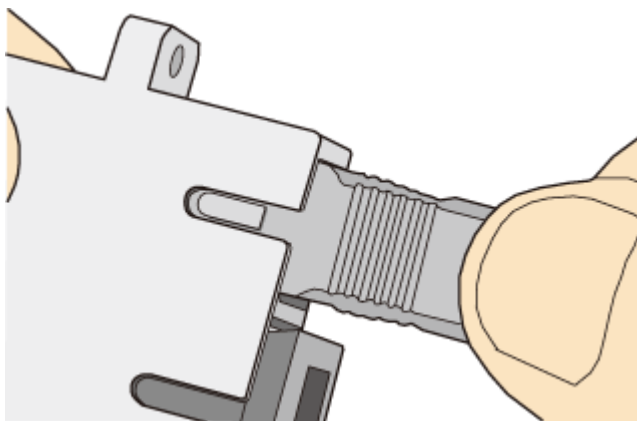
- Step 1** Remove the dustproof cap of the SC fiber connector and store it for future use.
- Step 2** Align the core pin of the male connector with that of the female connector, as shown in [Figure 13-21](#).

Figure 13-21 Aligning the male connector with the female connector



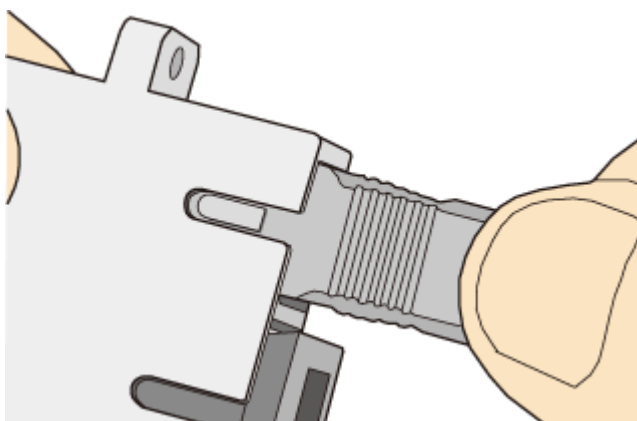
- Step 3** Feed the fiber connector into the female connector, with your fingers holding the shell of the fiber connector (not the pigtail). When you hear a click, the fiber connector is secured by the clips (internal parts, not illustrated in the figure). Pull the fiber connector gently. If the connector does not loosen, the installation is complete. See [Figure 13-22](#).

Figure 13-22 Installed SC fiber connector



- Step 4** To disassemble an SC fiber connector, hold the shell of the connector (do not hold the fiber) and gently pull the connector in the direction vertical to the adapter. Unlock the male connector, and then separate it from the shell, as shown in [Figure 13-23](#).

Figure 13-23 Disassembling an SC fiber connector



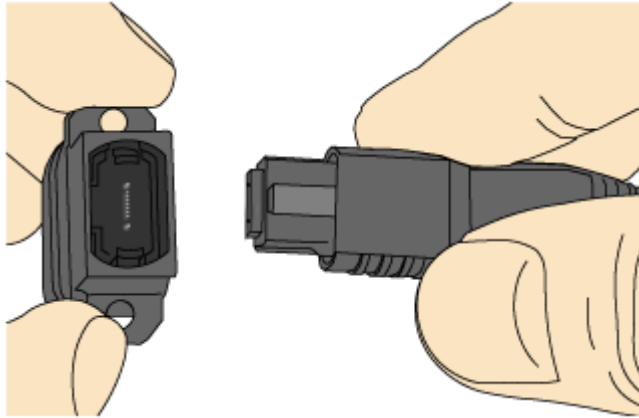
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13.1.2.4.4 Installing an MPO Connector

Procedure

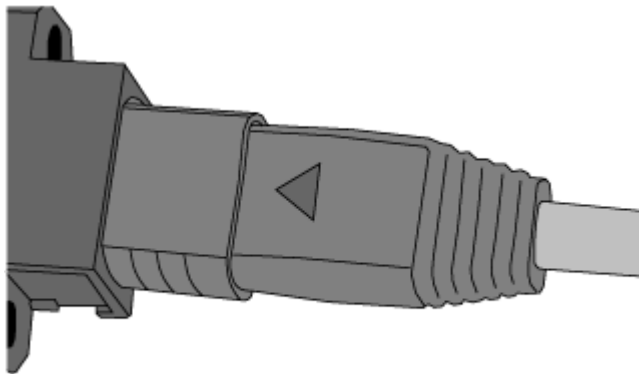
- Step 1** Remove the dustproof cap of the MPO fiber connector and store it for future use.
- Step 2** Align the core pin of the male connector with that of the female connector, as shown in [Figure 13-24](#).

Figure 13-24 Aligning the male connector with the female connector



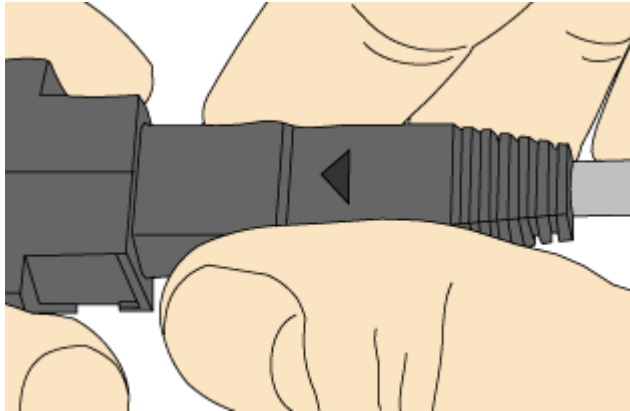
- Step 3** Hold the shell labeled "PUSH" and feed the male connector into the female connector until you hear a clicking sound. The male and female connectors are securely installed, as shown in [Figure 13-25](#).

Figure 13-25 Installed MPO fiber connector



- Step 4** To disassemble an MPO fiber connector, hold the shell labeled "PULL" and remove the male connector, as shown in [Figure 13-26](#).

Figure 13-26 Disassembling an MPO fiber connector



----End

13.2 Appendix B Environmental Requirements for Device Operation

13.2.1 Environmental Requirements for an Equipment Room

13.2.1.1 Requirements for Selecting a Site for an Equipment Room

When designing a project, consider the communication network planning and technical requirements of the equipment. Also consider hydrographic, geological, seismic, power supply, and transportation factors.

Construction, structure, heating and ventilation, power supply, lighting and fire-proof construction of the equipment room should be designed by specialized construction designers to suit the environmental requirements of devices. The equipment room should also follow local regulations concerning the industrial construction, environmental protection, fire safety, and civil air defense. Construction must conform to government standards, regulations, and other requirements.

The equipment room should be located in a place free from high temperature, dust, toxic gases, explosive materials, or unstable voltage. Keep the equipment room away from significant vibrations or loud noises, as well as power transformer stations.

The specific requirements for selecting a site for an equipment room are as follows:

- The room should be located at a distance of at least 5 km (3.11 mi.) from heavy pollution sources such as smelting and coal mines. It should be located at a distance of at least 3.7 km (2.30 mi.) from moderate pollution sources such as chemical, rubber, and galvanization factories. It should be located at a

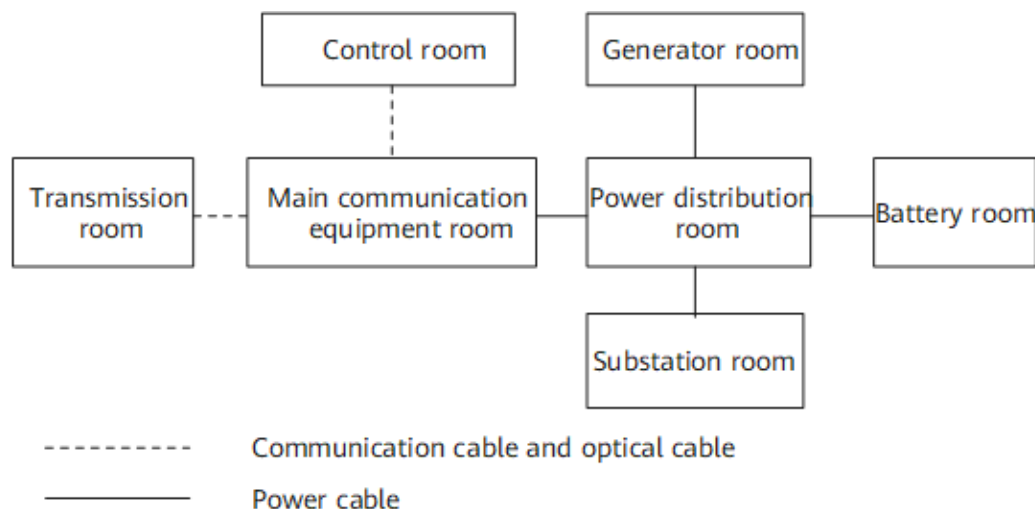
distance of at least 2 km (1.24 mi.) from light pollution sources such as packinghouses and tanyards. If these pollution sources cannot be avoided, ensure that the equipment room is upwind of the pollution sources. In addition, use a high-quality equipment room or protection products.

- The room should be located away from livestock farms, or be upwind of the livestock farms. Do not use an old livestock room or fertilizer warehouse as the equipment room.
- The equipment room must be far away from residential areas. An equipment room that is not far away from residential areas must comply with equipment room construction standards to avoid noise pollution.
- The room should be located far away from industrial and heating boilers.
- The room should be at least 3.7 km (2.30 mi.) away from the seaside or salt lake. Otherwise, the equipment room should be airtight with cooling facilities. In addition, alkalized soil cannot be used as the construction material. Otherwise, equipment suitable for wet conditions must be used.
- The doors and windows of the equipment room must be kept closed to maintain an airtight room.
- Using steel doors to ensure sound insulation is recommended.
- No cracks or openings are allowed on the walls or floors. The outlet holes on the walls or windows must be sealed. Walls must be constructed such that they are smooth, wear-resistant, dustproof, flame retardant, sound insulated, heat absorptive, and have electromagnetic shielding.
- The air vent of the room should be far from the exhaust of city waste pipes, big cesspools and sewage treatment tanks. The room should be in the positive pressure state to prevent corrosive gases from entering the equipment room and corroding components and circuit boards.
- It is recommended that the room be on or above the second floor. If this requirement cannot be met, the ground for equipment installation in the room should be at least 600 mm (23.62 in.) above the maximum flood level.
- The equipment room should be strong enough to resist winds and downpours.
- The room should be located away from dusty roads or sand. If this is unavoidable, the doors and windows of the equipment room must not face pollution sources.
- Do not place air conditioning vents near the equipment so that they blow directly on the equipment because condensation may be blown into the equipment.
- Do not use decorative materials that contain sulfur in the equipment room.

13.2.1.2 Equipment Room Layout

An equipment room usually contains mobile switching equipment, telecommunications equipment, power supply equipment, and other auxiliary equipment. To ensure easy maintenance and management, place the equipment in different rooms. [Figure 13-27](#) shows the layout of the equipment room.

Figure 13-27 Layout of the equipment room



The general layout principles of the equipment room are as follows:

- It should meet requirements for laying out and maintaining communication cables and power cables.
- It should reduce the cabling distance, which facilitates cable maintenance, reduces potential communication faults, and maximizes efficiency.
- To ensure normal operation of equipment in the equipment room when the mains supply is disconnected, configure an emergency power generation system for the equipment room.

13.2.1.3 Construction Requirements for the Equipment Room

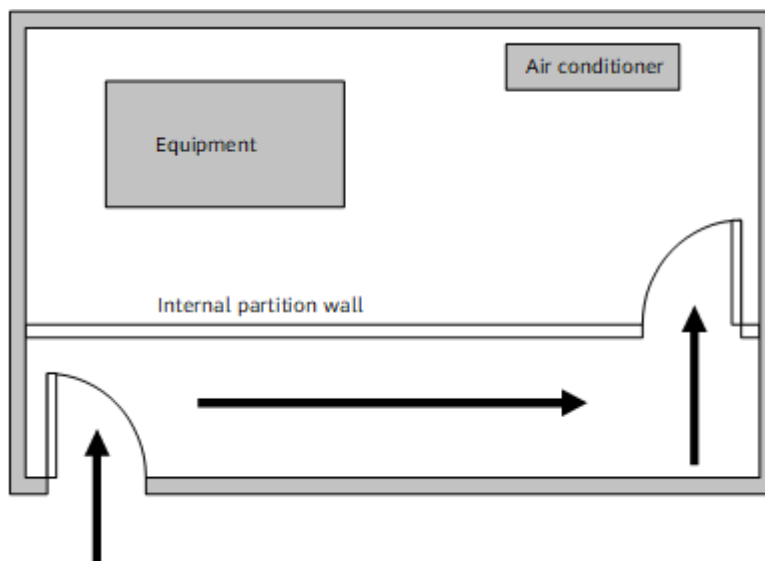
Table 13-2 describes the construction requirements for the equipment room.

Table 13-2 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 should not be less than 3 m (9.84 ft). The minimum height of the equipment room is the net height below overhead beams or ventilation pipes.

Item	Requirements
Floor	The floor in the equipment room should be semi-conductive and dustproof. A raised floor with an ESD covering is recommended. Cover the raised floor tightly and solidly. The horizontal tolerance of each square meter should be less than 2 mm (0.08 in.). If raised floors are unavailable, use a static-electricity-conductive floor material, with a volume resistivity of 1.0×10^7 ohms to 1.0×10^{10} ohms. Ground this floor material or raised floor. You can connect them to ground using a one megohm current-limiting resistor and connection line.
Load-bearing capacity	The floor must bear loads larger than 150 kg/m^2 (0.21 bf/in.^2).
Door and windows	The door of the equipment room should be 2 m (6.56 ft) high and 1 m (3.28 ft) wide. One door is enough. Seal the doors and windows with dustproof plastic tape. Use double-pane glass in the windows and seal them tightly.
Wall surface treatment	Paste wallpaper on the wall or apply flat paint. Do not use pulverized paint.
Cable trays	Use cable trays to arrange cables. The inner faces of the cable trays must be smooth. The reserved length and width of the cable trays, 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, and storm sewers through the equipment room. Do not place a fire hydrant in the equipment room, but place it in the corridor or near the staircase.
Internal partition wall	Separate the area where the equipment is installed from the equipment room door. The partition wall can block some outside dust.
Installation position of the air conditioner	Install air conditioner vents so that the air does not blow directly on equipment.
Other requirements	Avoid the proliferation of mildew, and keep out rodents (like mice).

Figure 13-28 Internal partition wall inside the equipment room



13.2.1.4 Equipment Room Environment

Conductive dust in the external environment may cause short circuit, reset button failure (which may cause device restart or configuration loss), and mode switch button failure. Ensure that the equipment room is free from conductive dust.

Dust on devices may cause electrostatic discharge and result in poor contact for connectors or metal connection points. This problem can shorten the life span of devices and cause faults.

The equipment room must be free from explosive, conductive, magnetically-permeable, and corrosive dust. [Table 13-3](#) lists the requirement for dust concentration in the equipment room.

Table 13-3 Requirements for dust particles in the equipment room

Mechanical active material	Unit	Concentration
Dust particle	Particle /m ³	≤ 3x 10 ⁴ (no visible dust accumulated on a workbench in three days)
Suspending dust	mg/m ³	≤0.2
Precipitable dust	mg/m ² ·h	≤1.5

Mechanical active material	Unit	Concentration
Description - Dust particle diameter $\geq 5\ \mu\text{m}$ - Suspending dust diameter $\leq 75\ \mu\text{m}$ $75\ \mu\text{m} \leq$ precipitable dust diameter $\leq 150\ \mu\text{m}$		

Take the following measures to meet the requirements:

- Use dustproof materials for ground, wall, and ceiling construction.
- Use screens on the door and windows facing outside. The outer windows should be dust-proof.
- Clean the equipment room regularly and clean the air filter monthly.
- Wear shoe covers and ESD clothing before entering the equipment room.
- Install a door with an air filter in the cabinet where the device is located.

13.2.1.5 Requirements for Corrosive Gases

The room should be free from dusts and corrosive gases, such as SO_2 and H_2S . The concentration of corrosive gases must meet the requirements of ISA71.04 G1. For details, see the [Table 13-4](#).

Table 13-4 Requirements for corrosive gas concentration

Chemical active material	Unit	Concentration
SO_2, SO_3	ppb	< 10
H_2S	ppb	< 3
$\text{HCl}+\text{Cl}_2$	ppb	< 1
NO_x	ppb	< 50
NH_3	ppb	< 500
HF	ppb	< 1
O_3	ppb	< 2

Take the following measures to meet the requirements:

- Avoid constructing the room near a place where the corrosive gas concentration is high, such as a chemical plant, breeding farm, or sewage plant.
- Ensure the air intake vent of the room is in the prevailing upwind direction from any pollution source.

- Place batteries in different rooms.
- A professional service should monitor the corrosive gas conditions regularly.

13.2.1.6 Requirements for ESD Prevention

The absolute value of electrostatic voltage must be less than 1000 V.

Take the following measures to meet this requirement:

- Train operators about ESD prevention.
- Keep the correct humidity level in the equipment room to reduce the impact of static electricity.
- Lay out an ESD floor in equipment rooms.
- Wear ESD shoes and clothing before entering equipment room.
- Use ESD tools, such as wrist straps, tweezers, and pullers.
- Ground all conductive materials in the room, including computer terminals. Use ESD worktables.
- Keep non-ESD materials (such as common bags, foam, and rubber) at least 30 cm (11.81 in.) away from boards and ESD-sensitive components.

13.2.1.7 Electromagnetism Requirements for the Equipment Room

All interference sources, inside or outside the equipment room, can cause equipment problems with capacitive coupling, inductive coupling, electromagnetic wave radiation, and common impedance (including grounding system) coupling. Prevent the interference using these approaches:

- Take effective measures against electrical interference from the power supply system.
- Do not use the working ground of the equipment as the same ground for surge protection. Separate them as far as possible.
- Keep the equipment far away from high-power radio transmitters, radar units, and high-frequency and high-current equipment.
- Use electromagnetic shielding if necessary.

13.2.1.8 Requirements for Lightning Proof Grounding

Table 13-5 lists the requirements for lightning proof grounding.

Table 13-5 Requirements for lightning proof grounding

Item	Requirements
Capital construction	• Use reinforced concrete to construct the equipment room. • Install a lightning proof device like a lightning rod outside the room. • The lightning proof ground shares the same grounding body with the protective ground of the room.

Item	Requirements
Power cables leading in the equipment room need to be equipped with a surge protector	- After the low-voltage power cables are led into the room, install the surge protector for the power cables in the AC voltage stabilizer and the AC power distribution panel (box). Correctly ground the surge protector nearby. - For an equipment room in urban area, install a power supply surge protector with the nominal discharge current of no less than 20 kA. For an equipment room that is built in a suburb and subject to lightning strikes, install a power supply surge protector with the nominal discharge current of more than 60 kA. For an equipment room that is built in a mountain area and subject to frequent lightning strikes, or in a separate high-rise building in a city, install a power supply surge protector with the nominal discharge current of more than 100 kA. - The ground cable of the surge protector should be no longer than 1 m (3.28 ft).
Grounding for DC power distribution	- 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 ground cable nearby. The total ground cable should meet the maximum load of the equipment. - The power equipment must have a DC working ground cable, which can connect the power equipment to the collective ground cable of the telecommunication site (or the protective ground bar of the equipment room).
Equipotential connection	- 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 PGND cables to the collective protective ground bar. Connect all PGND cables in one equipment room to one protective ground bar. - Apply joint grounding to the working ground and protective ground of devices, which means the two share one grounding network. - The cable tray, rack or shell, metal ventilation pipe, metal door or window of the equipment should be grounded for protection.
General requirements for grounding	- Do not connect the neutral line of the AC power cable with the protective ground of any telecom equipment in the equipment room. - Do not install a fuse or switch on the ground cable. - All ground cables should be as short as possible, and arranged in a straight line.

Item	Requirements
Grounding resistance	- The grounding resistance must be lower than 1 ohm. - The upper end of the grounding body should be at least 0.7 m (2.30 ft) over the ground. In cold areas, bury the grounding body below the frozen ground. - Measure the grounding resistance periodically to ensure effective grounding.
Routing of signal cable	- Do not arrange the signal cables overhead in the equipment room. All signal cables must be led into the site underground. - Use the cables with a metal jacket or place them into a metal pipe if they come out/in the equipment room. - Ground the idle lines inside the cable in the equipment room. - Signal cables should be deployed on internal walls. Do not deploy outdoor aerial cables. - Keep signal cables away from power cables and surge protection devices.
Collective ground cable	- Use a ground ring or ground bar for the collective ground cable. - Do not use aluminum cables as ground cables. Adopt measures to prevent electrification corrosion when connecting different metal parts together. - Use a copper busbar as the collective ground cable with a cross-sectional area of no less than 120 mm² (0.19 in.²), or use the galvanized flat steel of the same resistance. Insulate the collective ground cable from the reinforcing steel bars of the building.
Grounding lead-in	The grounding lead-in should be a maximum of 30 m (98.42 ft) long. Use the galvanized flat steel with cross-sectional area of 40 mm x 4 mm (1.58 in. x 0.158 in.) or 50 mm x 5 mm (1.97 in. x 0.197 in.).

13.2.2 Requirements for Power Supply

13.2.2.1 Requirements for AC Power Supply

An AC power supply system consists of power mains, uninterruptible power supplies (UPSs), and self-supplied electric generators. In addition to meeting the requirements of the server load, the AC power supply must have a simple connection line, safe operation, flexible scheduling, and easy maintenance.

The low-voltage power supply should be 3-phase, 5-wire mode or monophas 3-wire mode. This AC power supply should be 110 V/220 V, with a frequency of 50 Hz.

The UPS should supply the same power and operate at the same phase as the power mains. The switching time between the UPS and mains should be less than 10 ms; otherwise, the networking devices will reboot or reset.

For power distribution capacity in the equipment room, both the working current and fault current of the devices should be considered. Ensure that independent AC power supplies protect independent devices. Configure the current-carrying capacity of the protection switch of the equipment room for more than that of the devices.

Table 13-6 lists the voltage range of the AC power supply for the devices.

Table 13-6 Voltage range of AC power supply

Item	Requirements
AC power capacity to support the devices	-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 value
Voltage wave shape sine distortion	Within 5% of the rated voltage

The automated electric generator must have a standard interface that supports telecommunication protocols, remote telecommunication, monitoring, and control.

AC power cables should meet the following specifications:

- AC neutral should have a conductor with the same cross section as the phase line.
- AC cables should have non-flammable insulation. The layout of AC cables should comply with local regulations. Low-voltage power distribution rooms should comply with local regulations.

13.2.2.2 Recommendations for AC Power Supply

The following are recommendations for the AC power supply.

- If the voltage of the power mains that supply power directly to devices exceeds the rated voltage by -10% to 5%, or exceeds the voltage range that devices can support, a voltage regulating device or voltage stabilizing device is required.
- If the mains do not supply power for the device directly, or if the mains voltage exceeds the rated voltage by -15% to 10% or exceeds the input

voltage range of the DC power supply, a voltage regulating device or voltage stabilizing device is required.

- A UPS or inverter power supply system is required to provide uninterrupted AC power to support the telecommunication load.
- If abnormalities occur on the mains, telecommunication servers should be equipped with a self-supplied electric generator to support the key telecommunication load. The capacity should be not less than 150% to 200% of the total uninterruptible power supply.
- Storage batteries are usually installed in a parallel connection of two groups. UPS storage batteries are generally installed in one group. The redundancy required for the UPS can rely on 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.

13.2.2.3 Requirements for DC Power Supply

The equipment room should receive stable and reliable DC power. Deploy the power equipment near the telecommunications equipment to make the DC feeder as short as possible. To reduce power consumption and installation cost, the loop voltage drop from the battery port to the equipment port should be less than 3.2 V.

- A large-scale enterprise can deploy an independent power supply system on each floor to supply power to the telecommunications equipment room on the respective floor.
- A medium-scale enterprise can use a power room and a battery room for centralized power supply or use distributed power supply systems.
- A small-scale enterprise can deploy an integrated power supply system in its equipment room but must take measures to prevent corrosive gases released from batteries from eroding circuit boards of telecommunications equipment.

Table 13-7 lists the specifications for the DC power supply.

Table 13-7 Specifications for the DC power supply

Item	Requirements
DC power capacity to support the surge current	Greater 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 ranges from -46.0 V to -56.4 V, with the regulated voltage precision less than or equal to 1%.
Overshoot amplitude of switch on/off	Integral value of the DC output voltage $\pm 5\%$

Item	Requirements
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 $\pm 5\%$.

13.2.2.4 Recommendations for DC Power Supply

The following are recommendations for the DC power supply.

- Use distributed power supply mode. Use multiple DC power supply systems and put power equipment in multiple locations.
- Adopt a standard DC power supply system, and set the output voltage to the communications equipment within the required range.
- Improve reliability of the AC power supply system to reduce the necessary capacity of storage batteries. For small offices, increase the capacity of storage batteries if it is difficult to enhance reliability of the AC power supply system.
- The total capacity of the high-frequency switching rectifier must satisfy the power of the communication loading and battery charging. If there are 10 or fewer active rectifier 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. The capacity is determined by the duration for which the storage batteries must supply power. For most offices, the batteries should be able to supply power for at least one hour.

13.3 Appendix C Equipment Grounding Specifications

13.3.1 General Grounding Specifications

Table 13-8 shows the general grounding specifications.

Table 13-8 General grounding specifications

No.	Description
1	The working ground and protective ground, including the shielded ground and the lightning-proof ground of the cable distribution frame should share the same grounding conductor.
2	The cable trays, shells, metal ventilation pipes, metal doors and windows in the equipment room should be grounded for protection.
3	The metal parts of the equipment which are electrically floating in normal conditions should be grounded for protection.

No.	Description
4	The ground cable must be connected securely to the protective ground bar of the equipment room.
5	Do not use other equipment as part of the ground cable or electrical connection.

13.3.2 Grounding Specifications for an 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 an area where the earth resistance rate is high should be less than 10 ohms.

13.3.3 Grounding Specifications for Devices

Table 13-9 lists the equipment grounding specifications.

Table 13-9 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 protective ground for various devices jointly to a general ground bar, and then to the same protective ground bar in the room together with the protective ground (PGND) of the device.
2	The PGND of the equipment is shorted to the copper ground bar provided by the customer. The short-circuiting cable used should be a yellow-green plastic insulated cable with a copper core and a cross-sectional area greater than 25 sq. mm (0.039 sq. in.).
3	There are grounding terminals and grounding lugs 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 area of no less than 1.6 sq. mm (0.002 sq. in.).
4	Ensure that all metal components of the cabinet conduct well. No insulating coating should be sprayed on the connection part of the metal components.

No.	Description
5	Connect the cabinets in the same row by fastening captive screws and gaskets on the top of the cabinets. Do not spray any coating into a rectangular area measuring 30 mm x 50 mm (1.18 in. x 1.97 in.) around the connection hole for a captive bolt. Measures to prevent rust and corrosion must be taken for this area. Zinc electroplating with iridescent yellow chromate conversion coating should be applied to the gasket and nut to ensure good electrical contact.
6	When combining cabinets of the same type, short-circuiting cables are required to connect the ground busbars (if any) of the cabinets. The cross-sectional area of the short-circuiting cable is 6 sq. mm (0.009 sq. in.) and is no more than 300 mm (11.8 in.) long. Connect the two ends of the short-circuiting cable to the ground busbar terminals of neighboring cabinets and fix them firmly.

13.3.4 Grounding Specifications for Communications Power Supply

Table 13-10 shows the grounding specifications for communication power supplies.

Table 13-10 Grounding specifications for communication power supplies

No.	Description
1	The inlet for the AC power cable at the equipment room should be equipped with a surge protection device (C-level) with a nominal discharge current no less than 20 kA.
2	The protective ground for the power supply and that for communication equipment share the same grounding conductor. If the power supply and the equipment are in the same equipment room, use the same protective ground bar for them if possible.
3	Use a surge protection circuit on the AC power interface.
4	The positive 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.
5	The working ground and protective ground of the DC power supply equipment should use the same grounding conductor with the protective ground of the switching equipment. If the power supply and equipment are in the same equipment room, use the same protection ground bar for them if possible.
6	Add surge protection on the DC power interface.

13.3.5 Grounding Specifications for Signal Cables

Table 13-11 lists the grounding specifications for signal cables.

Table 13-11 Grounding specifications for signal cables

No.	Description
1	Equip the cable outdoors with a metal jacket, well grounded at both ends, or connect the ends of the metal jacket to the protective ground bar of the equipment room. For cables inside the equipment room, install surge protection devices at the interface to the equipment. The PGND cable for the surge protection devices should be as short as possible.
2	The incoming and outgoing signal cables to and from the office and unused wires inside the cable should be grounded for protection.
3	The Tone & Data Access (TDA) cable must pass through the Main Distribution Frame (MDF) with surge protective device (SPD) when going out of the office. The cable's shield layer should be connected to the protective ground of the MDF. The MDF should use the same grounding conductor as the cabinet.
4	Do not route signal cables overhead.

13.3.6 Specifications for Laying Out Grounding Cables

Table 13-12 shows the specifications for the ground cable.

Table 13-12 Specifications for laying out ground cables

No.	Description
1	The grounding wire should not run parallel to or twist around the signal cable.
2	Bury ground underground or arrange them indoors. Do not route ground cables overhead.
3	Do not connect two cables together to extend the PGND cable, or add any switches or fuses.
4	The PGND cable should be an alternating yellow and green plastic insulated one with a copper core.
5	The neutral line of the AC power cable cannot be connected to the protective ground of transmission and communication equipment in the equipment room.
6	A PGND cable should be as short as possible, with a length of no more than 45 m (147.64 ft).

13.4 Appendix D Engineering Labels for Cables

An engineering label serves as an identifier for on-site installation and maintenance after the installation. Labels on the cables facilitate correct and orderly connection of cables, and easy maintenance after installation.

Engineering labels are specialized for power cables and signal cables:

- Signal cables include network cables, optical fibers, and user cables.
- Power cables include the AC power cables and DC power cables.

NOTE

Fill in labels according to specified requirements to keep consistency of labels in the equipment room. Make a relevant statement in the self-check report.

13.4.1 Introduction to Labels

13.4.1.1 Label Materials

Features:

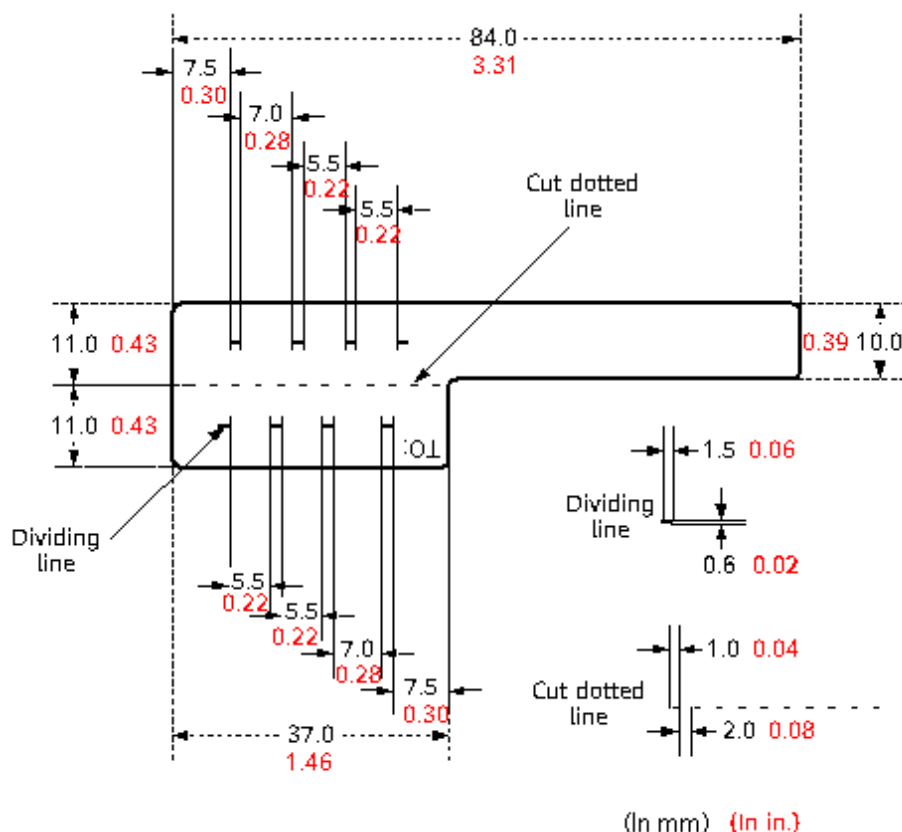
- Thickness: 0.09 mm (0.004 in.)
- Color: chalk white
- Material: polyester (PET)
- Ambient temperature: -29°C (-20.2°F) to +149°C (300.2°F)
- Printed by a laser printer and written with a marker
- Pass UL and CSA authentication

13.4.1.2 Type and Structure

Label for Signal Cables

The label for signal cables is L-shaped with fixed dimensions, as shown in [Figure 13-29](#).

Figure 13-29 Label for signal cables



To specify more clearly the position of a cable, use the dividing lines on the label. For example, there is a dividing line between the cabinet number and the chassis number, and another one between the chassis number and the slot number. Each dividing line is light blue (Pantone 656c) and 1.5 mm x 0.6 mm (0.06 in. x 0.02 in.).

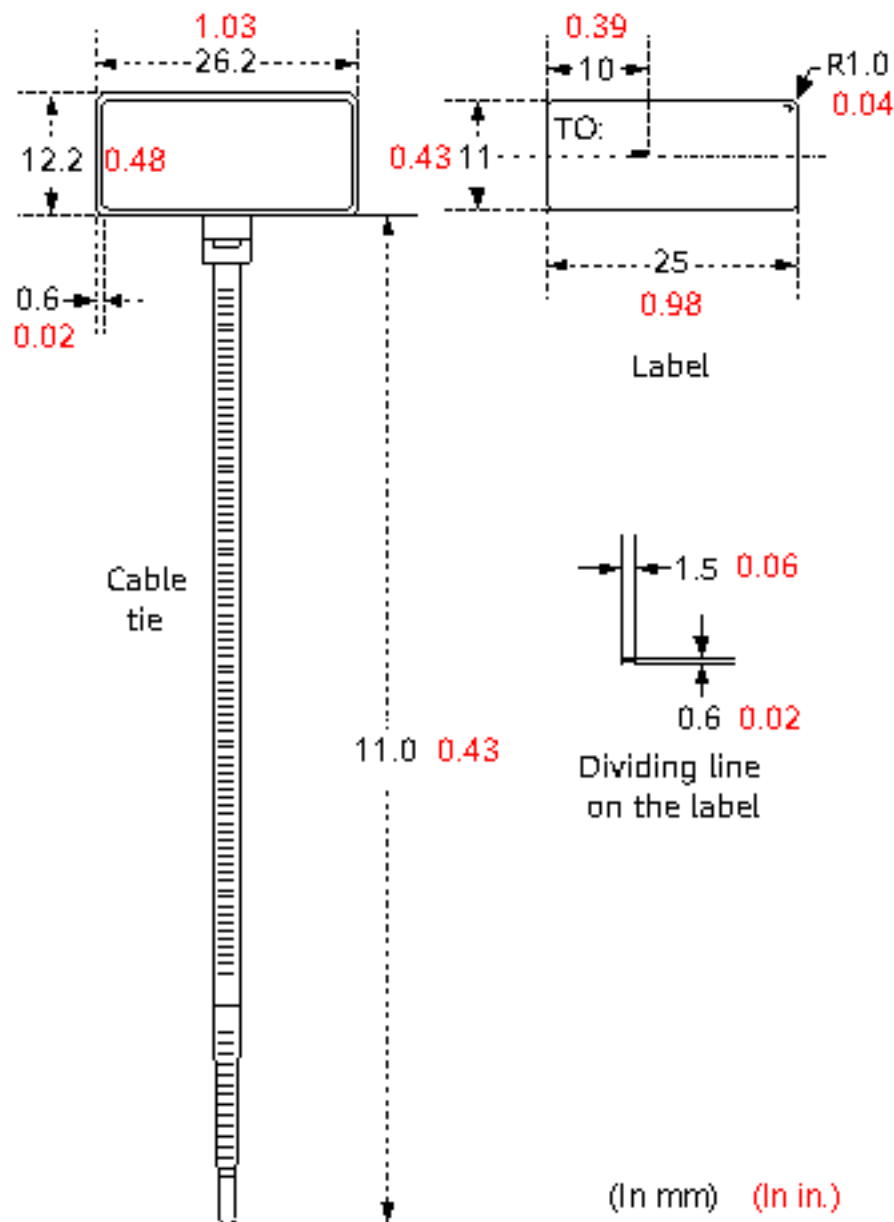
The cut dotted line helps to fold the label when affixed to the cable, and its size is 1 mm x 2 mm (0.04 in. x 0.08 in.).

The word "TO:" (upside down in the figure) at the lower right corner of the label 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 attached to the cable. The identification plate has an embossed area 0.2 mm x 0.6 mm (0.008 in. x 0.02 in.) around (symmetric on both sides), and the area in the middle is for affixing the label, as shown in [Figure 13-30](#).

Figure 13-30 Power cable label



13.4.1.3 Label Printing

The contents can be printed or written on the labels. Printing is recommended for the sake of high efficiency and eye-pleasant layout.

Template for Printing

You can obtain a template from the Huawei local office to print labels.

Follow these instructions to use the template:

- You can modify the contents of the template. Do not change settings of centered characters, direction, and fonts.

- If many characters need to be filled in, decrease the font size, but make sure that the printouts are clear and legible.

Merging Cells in the Template

To merge two or more cells, do as follows:

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**.

Requirements on the Printer

To print labels, use a laser jet printer of any model. Before printing labels, set up the page and try printing.

1. Try printing on ordinary paper with both sides blank. Place the blank paper over the whole page of the label paper, and check whether the page setup conforms to the label layout.
2. Make sure the printer properties, such as "paper size" and "direction", have been set correctly.
 - If the printout conforms to the sheet of labels, print the labels on the label paper.
 - If the printout does not conform, adjust the page setup and try printing again until the correct printout is produced.

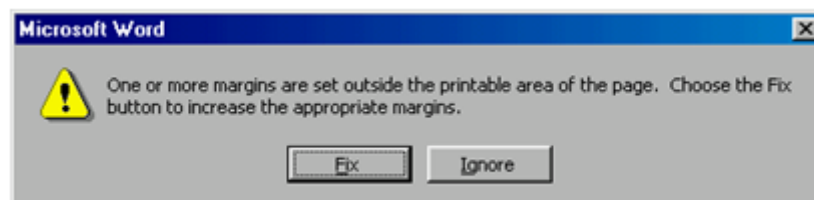
The method for adjusting the page setup is as follows.

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 13-31](#) appears before printing, click **Ignore** to continue the printing.

Figure 13-31 Warning prompt before printing



After the page setup has been made correctly, save it for future use. This page setup is only necessary the first time you use the template to print the labels.

Requirements for Feeding the Printer

The label paper consists of two layers and has undergone multiple processing procedures such as printing and cutting. No matter what model of printer you use, feed in the labels one page at a time. To avoid jamming the labels, never use the auto-feed mode.

Feed in the label paper in the correct direction to ensure that the text is printed in a correct position.

Requirements for the Printed Label

Make sure that the printed labels satisfy the following requirements:

- All the printouts must be on the label, and nothing should be printed on the backing layer of the label page.
- Contents in the cells should be aligned in the center. In a single-line printout, the dividing lines and the word "TO:" should not be covered by printed characters.
- When the cells are merged and the printouts are made in multiple lines, avoid covering the word "TO:" when printing the text. Use the space bar to move the text to the next line.

13.4.1.4 Writing Labels

Writing Tools

To make sure the printouts are clear and legible, use black markers instead of ball-point pens to write the labels.

If no marker is available, black ball-point pens are allowed, although not recommended. Compared with ball-point pens, waterproof markers are better. When writing with a ball-point pen, do not leave the oil on the label, which may contaminate the label and blur the words.

NOTE

The delivered marker has two nibs. Use the smaller nib to write the labels.

Font

For the sake of legibility, use standard block letters and numbers as shown in [Table 13-13](#) (Times New Roman).

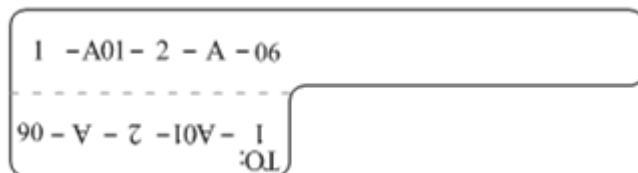
Table 13-13 Standard typeface for handwriting

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

Determine the size of characters based on the number of letters or digits and ensure that the characters are distinct and tidy.

Placement of text on a label is shown in [Figure 13-32](#).

Figure 13-32 Placement of text on a label



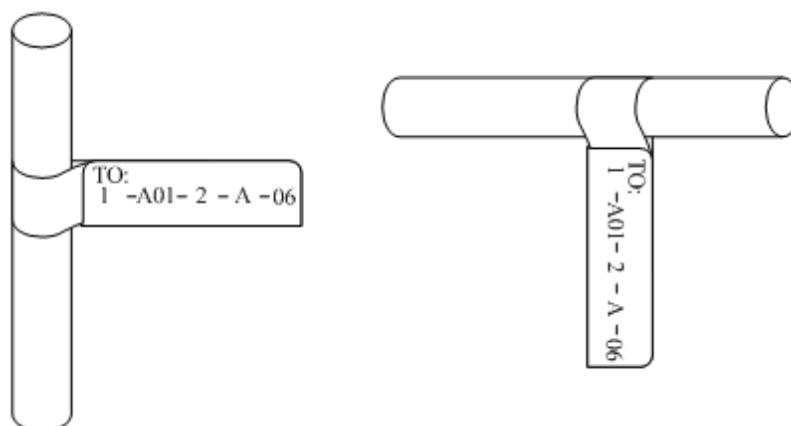
13.4.1.5 Attaching Labels

After printing or writing the label, remove the label from the page and attach it to the signal cable, or the identification plate of the power cable. The methods for attaching labels are described in the following sections.

Label for Signal Cables

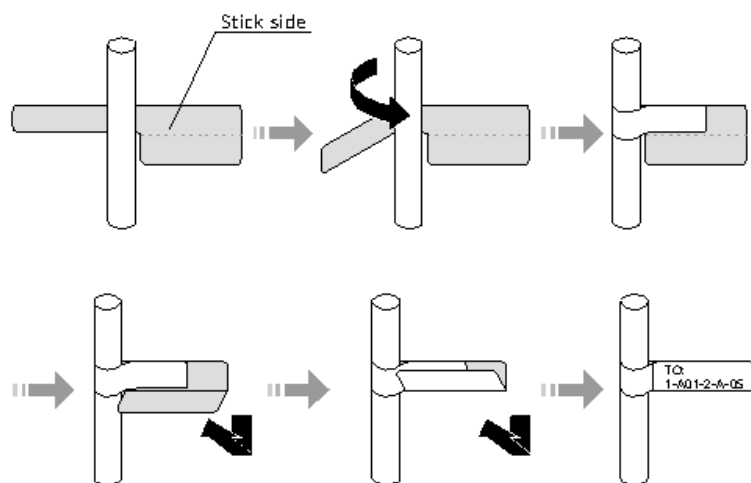
- Choose the place to attach labels.
The label is attached 2 cm (0.79 in.) from the connector on a signal cable. In special cases (for example, to avoid cable bending or affecting other cables), other positions are allowed to attach the labels. The rectangular part with text is attached facing right or downward, as shown in [Figure 13-33](#). The details are as follows:
 - The identification card is to the right of the cable in vertical cabling.
 - The identification card should be downward when you lay out the cable horizontally.

Figure 13-33 Text area of the label



- Procedure for attaching labels
[Figure 13-34](#) shows the methods and procedures for attaching labels.

Figure 13-34 Label for signal cables



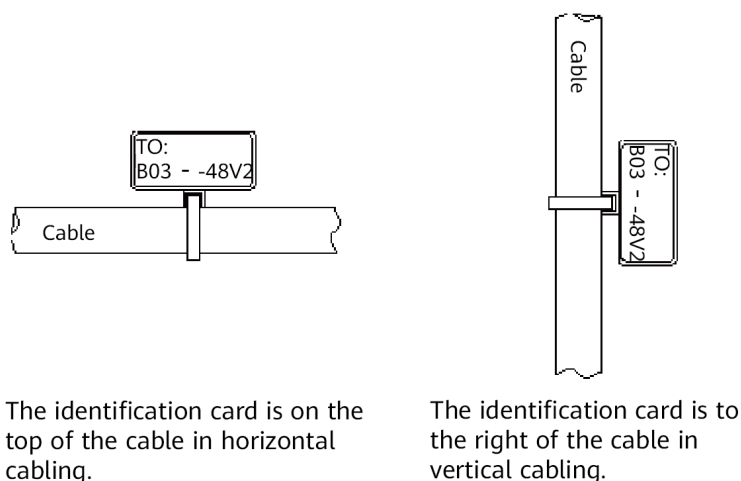
Power Cable Label

Remove the label from the backing page, and attach it to the identification plate on the cable tie. The label should be attached to the rectangular flute on the identification plate, and attached to only one side of the identification plate. The cable ties are bundled at 2 cm (0.79 in.) from the connectors, and other positions are allowed in special circumstances.

Cable ties should be bound on both ends of a cable. After the bundling, the finished identification plate should be on top of the cable in horizontal cabling, or on the right side of the cable in vertical cabling, as shown in [Figure 13-35](#). The details are as follows:

- The identification card is to the right of the cable in vertical cabling.
- The identification card is on the top of the cable in horizontal cabling. Make sure that the label is facing out.

Figure 13-35 Binding the label for the power cable



13.4.1.6 Contents of Engineering Labels

Contents of Labels for Power Cables

Labels for power cables are affixed on only one side of the identification plates. On the labels, there is information (the part after the word "TO:") about the location of the device on the other end of the cable, like the location of control cabinet, distribution box or power socket.

Contents of Labels for Signal Cables

The two sides of the label affixed on the signal cable carry information about the location of the ports connected to both ends of the cable. [Figure 13-36](#) shows the information on both sides of the labels affixed to the signal cables.

- Area 1 contains the location information of the local end of the cable.
- Area 2 (with the word "TO:") contains the location information of the opposite end of the cable.
- Area 3 has been folded up inside the label.

Figure 13-36 Printed parts on the label for signal cables



Seen from the cabling end of the equipment, the text part of the label is on the right side of the cable. The side with "TO:" that is facing outside carries the location information of the opposite end; and the other side carries the location information of the local end.

In other words, the information in Area 1 at one end is the same as the information in Area 2 at the other end of the cable.

13.4.1.7 Precautions for Using Engineering Labels

When using labels, pay attention to the following points:

- When printing, writing, or attaching labels, keep the labels clean.
- Since the label paper is made of moistureproof material, ink-jet printers and ink pens cannot be used to print and write labels.
- Labels should be attached neatly. New-type labels are L-shaped. If they are pasted at incorrect locations or in the incorrect direction, the appearance of the device is affected.
- Power cable ties should be attached in the same positions on power cables, with identification plates on the same side.

- The positions of "up", "down", "left" or "right" are all based on the viewpoint of the engineering person who is working on the label.

13.4.2 Engineering Labels for Optical Fibers

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:

- One is for the fiber that connects the optical interfaces on two devices.
- The other is for the fiber that connects the device and the ODF.

13.4.2.1 Labels for the Optical Fibers Connecting Devices

Meaning of the Label

Table 13-14 lists information on both sides of the labels affixed to the optical fibers that connect two devices.

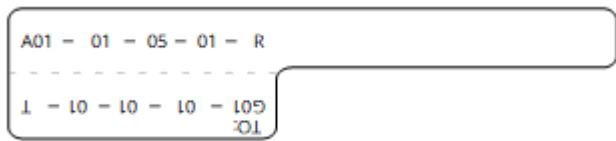
Table 13-14 Information on labels affixed to the fibers between two devices

Content	Meaning	Example
MN-B-C-D-R/T	MN: cabinet number	M: The cabinet rows from front to back are numbered from A to Z. N: The cabinet columns from left to right are numbered from 01 to 99. For example, A01 is the cabinet in row A and column 01.
	B: chassis number	Numbered in bottom-up order with two digits, for example, 01.
	C: physical slot number	Numbered in top-down and left-right order starting from 01. For example, 01 is the first slot at the top left of the chassis.
	D: optical interface number.	Numbered in top-down and left-right order, consistent with the port sequence number on the device.
	R: Receiving interface T: optical transmitting interface	-

Example of the Label

Figure 13-37 shows a sample label on an optical fiber.

Figure 13-37 Sample label on an optical fiber between two devices



The meaning of the label is listed in [Figure 13-37](#).

- "A01-01-05-01-R" indicates that the local end of the optical fiber is connected to the optical receiving interface 01 in 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 in slot 01, chassis 01 in the cabinet in row G, column 01 in the machine room.

13.4.2.2 Labels for the Optical Fibers Connecting the Device and an ODF

Meaning of the Labels

[Table 13-15](#) shows information on both sides of labels attached to an optical fiber between a device and an optical distribution frame (ODF).

Table 13-15 Information on labels affixed to a fiber between a device and an ODF

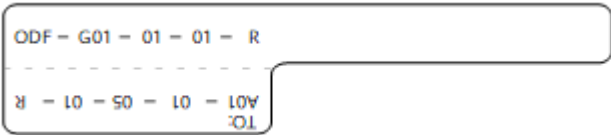
Content	Meaning	Example
MN-B-C-D-R/T	MN: cabinet number	For example, A01.
	B: chassis number	Numbered in bottom-up order with two digits, for example, 01.
	C: physical slot number	Numbered in top-down and left-right order starting from 01. For example, 01 is the first slot at the top left of the chassis.
	D: optical interface number.	Numbered in top-down and left-right order, consistent with the port sequence number on the device.
	R: Optical receiving interface T: optical transmitting interface	-

Content	Meaning	Example
ODF-MN-B-C-R/T	MN: row number and column number of an ODF	M: The cabinet rows from front to back are numbered from A to Z. N: The cabinet columns from left to right are numbered 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, for example, 01-01.
	C: column number of the terminal device	
	R: Optical receiving interface T: optical transmitting interface	-

Example of the Label

Figure 13-38 shows a sample label on an optical fiber.

Figure 13-38 Sample label on an optical fiber between the device and the ODF



Meaning of the label in Figure 13-38

- "ODF-G01-01-01-R" indicates that the local end of the optical fiber is connected to 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 to optical receiving interface 1 in slot 05, chassis 01 in the cabinet in row A, column 01 in the machine room.

13.4.3 Engineering Labels for Network Cables

Applicable Ranges

The labels can be applied to Ethernet cables.

Label Content

Table 13-16 shows the information on both sides of the labels affixed to Ethernet cables.

You can also decide the label content based on the actual environment. If the device is not installed in the cabinet, for example, you can remove the cabinet number.

Table 13-16 Information on the Ethernet cables

Content	Meaning	Example
MN-B-C-D	MN: cabinet number	For example, A01 is the first cabinet in row A.
	B: chassis number	Numbered in bottom-up order with two digits, for example, 01.
	C: physical slot number	Numbered with two digits in top-down and left-right order. For example, 01.
	D: network port number	Numbered in top-down and left-right orders. For example, 01.
MN-Z	MN: cabinet number	For example, B02 is the second cabinet in row B.
	Z: Location number	Fill in the location number of the terminal device on site. If the cable is connected to a device in a cabinet, specify the serial numbers of the cabinet, the chassis, and the Ethernet interface of the device. For example, B02-03-12. If the cable is connected to the Network Management Station (NMS), specify the specific location of the NMS.

The contents of the labels for network cables connecting hubs and devices or agents and the network cables for other purposes should be specified according to actual connections. The details are as follows:

- For a network cable connecting a hub and device, the label on the hub end should indicate the numbers of the chassis and cabinet where the hub resides, and the serial number on the hub. The label on the device end should indicate the number of the chassis and cabinet where the device is located. If the device is a standalone device, provide the specific position of the device.
- For a network cable connecting a hub and an agent or terminal, the label on the agent or terminal end should contain the serial number of the network interface. The definitions of the cabinet number and chassis number are the same as those described in **Table 13-16**.

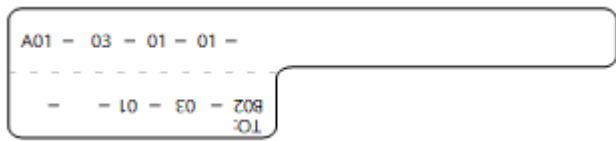
- If the hub is a standalone device without a cabinet or chassis, the label should contain specific location information that identifies the hub.

The serial number on the hub, the network interface number of the agent or terminal, and the location of the standalone device should be specified according to actual connections.

Label Example

Figure 13-39 shows a sample label on an Ethernet cable.

Figure 13-39 Sample label on an Ethernet cable



Meaning of the label in Figure 13-39.

- "A01-03-01-01" indicates that one end of the network cable is connected to network interface 01 in 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 in chassis 03 of the cabinet on row B, column 02 in the equipment room. No slot number is given.

13.4.4 Engineering Labels for User Cables

Attach labels to both ends of a user cable to indicate the locations of the cable on the device and main distribution frame (MDF).

Meaning of the Engineering Labels for User Cables

Table 13-17 shows the contents of the labels.

Table 13-17 Contents of the engineering labels for user cables

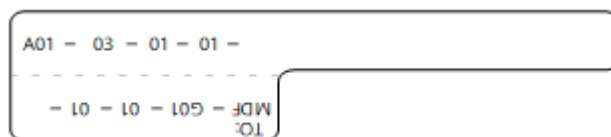
Content	Meaning	Example
MN-B-C-D	MN: cabinet number	For example, A01 is the first cabinet in row A.
	B: frame number	Numbered in the bottom-up order with two digits, for example, 03.
	C: physical slot number	Numbered with two digits in top-down and left-right order. For example, 01.
	D: cable number	Numbered with two digits in top-down and left-right order. For example, 01.

Content	Meaning	Example
MDF-MN-B-C	MN: row number and column number of the MDF	M: The rows of cabinets from front to back are numbered from A to Z. N: The columns of cabinets from left to right are numbered from 01 to 99. For example, G01 is the MDF of Row G and Column 01.
	B: row number of the terminal device	Ranges from 01 to 99, for example, 01-01.
	C: column number of the terminal device	

Example of the Label

Figure 13-40 shows a sample label on a user cable.

Figure 13-40 Sample label on a user cable



The meaning of the label in Figure 13-40 is as follows:

- "A01-03-01-01" indicates that the local end of the user cable is connected to port 1 in slot 1, chassis 03 of the cabinet in row A, column 01 in the equipment room.
- "MDF-G01-01-01" 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.

13.4.5 Engineering Labels for Power Cables

13.4.5.1 Engineering Labels for DC Power Cables

These 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 PGND cables.

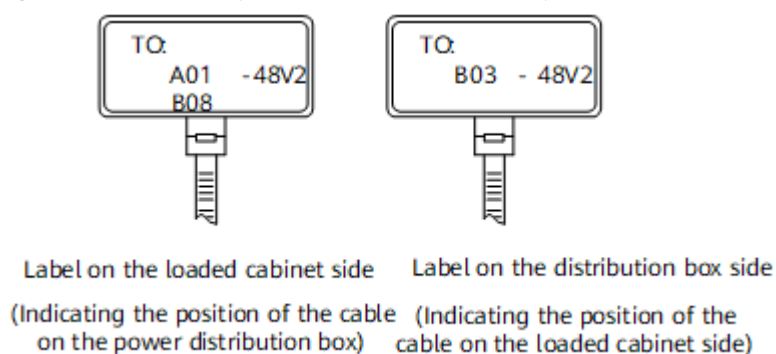
The labels for DC power cables are affixed to one side of the identification plates on cable ties. For details of the labels, see Table 13-18.

Table 13-18 Contents of the label

Content	Meaning
MN(BC)- B--48Vn	MN(BC): BC is written right under MN. B: chassis number, numbered in bottom-up order with two digits, for example, 01.
MN(BC)-B- BGND	N: power socket number, numbered as 1 to 3 in the bottom-up and left-to-right orders.
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 number or column number, or the connector can be identified without them, BC can be omitted. It is unnecessary to identify the row and column number for BGND and PGND.

The label only carries location information about the destination direction of the power cable whereas information about the local end is unnecessary. That is, the label only carries location information about the opposite equipment, the control cabinet, or the distribution box. [Table 13-18](#) lists the information on two -48 V power supplies on the label. The information on other DC voltages, such as 24 V and 60 V should be given in similar methods.

Make sure that labels are affixed in the correct direction. That is, after the cable ties are bundled onto the cable, the identification plates with the labels should face up, and the text on the labels in the same cabinet should be in the same direction. For details, see [Figure 13-41](#).

Figure 13-41 Example of the labels for DC power cables

The meaning of the label in [Figure 13-41](#) is 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 bus bar in the cabinet in row A, and 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 has a numeric identification. For example, in the above label of "A01/B08--48V2", "08" (or sometimes "8") is the numeric identification of the terminal block.

PGND and BGND are two copper bars, on which the terminal blocks are short-circuited. Therefore, it makes no difference which terminal is connected to them. It is only necessary to give the row and column of the power distribution box, instead of giving 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 BGND copper bar in the power distribution box in row A, column 01 in the machine room. Information on the labels for PGND cables should be given in a similar way.

13.4.5.2 Engineering Labels for AC Power Cables

These labels are affixed to both ends of an AC power cable that provides AC power supply to cabinets, including 110/220 V, PGND, and BGND cables. The 110/220 V AC cables and related PGND and BGND cables are covered with an insulating sheath, so the labels need to contain only the word "AC" and the cabinet numbers.

The labels for AC power cables are affixed to one side of the identification plates on cable ties. For details, see [Table 13-19](#).

Table 13-19 Label content

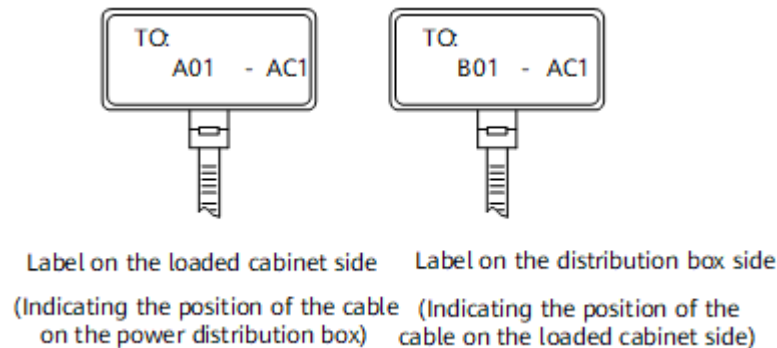
Content	Meaning
MN-(B)-ACn	MN: serial number of the cabinet or the socket where the power is led in B: chassis number, numbered in bottom-up order with two digits, for example, 01. n: power port number, numbered as 1 to 3 in bottom-up and left-to-right order. Serial number of the socket where the power 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 following the same rule for the cabinets. If the sockets cannot be identified by rows and columns, specify the detailed locations to avoid confusion with other sockets.

The label only carries location information about the opposite equipment and 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 ties are bundled onto the cable, the identification plates with the labels should

face up, and the text on the labels in the same cabinet should be in the same direction, as shown in [Figure 13-42](#).

Figure 13-42 Labels for AC power cables



Meaning of the label in [Figure 13-42](#).

- On the equipment cabinet side, the label marked "A01-AC1" indicates that the power cable is connected to the first AC power socket of row A and column 01 in the equipment room.
- On the power socket side, the label marked "B01-AC1" indicates that the power cable is connected to the first AC power socket in the cabinet of row B and column 01 in the equipment room.

13.5 Appendix E Guide to Using Optical Modules

Common Faults of an Optical Module

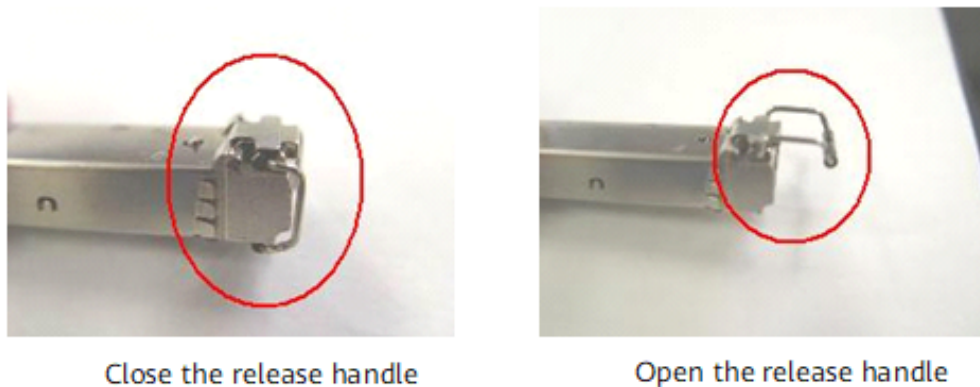
1. An optical module is not completely installed in position.
If the optical module is not completely installed in position and the latch boss is not secured, the device cannot identify the optical module. After the optical module works for a long time, it will be ejected under external stress.
2. The optical receptacle on an optical module is contaminated.
If an optical module is not cleaned or protected properly, contaminants may accumulate on the fiber pin in the optical module. As a result, the coupling efficiency is reduced, optical signals are cut off, or even worse, the surface of the fiber pin is damaged permanently.
3. An optical module is burnt.
If high-power optical signals (caused by an optical time domain reflectometer or self-loop test) are transmitted through an optical module that is used for long-distance transmission but no optical attenuator is used, the optical power will exceed the overload power of the avalanche photodiode (APD). Then the optical module is burnt.

The preceding faults lead to temporary or long-term cut-off of optical signals; or even cause permanent damages to the optical module, affecting communication services.

Measures to Prevent a Loosened Optical Module

1. When installing an optical module, insert it in position. If you hear a click or feel a slight shake, it indicates that the latch boss is secured.
If the latch boss is not secured, the gold finger of the optical module is not in good contact with the connector on the board. In this case, the link may be connected but optical signals will be cut off or the optical module will be loosened when the optical module is shaken or hit.
2. **Figure 13-43** shows the release handle on an optical module when it is open and closed. When inserting the optical module, make sure that the release handle is closed. At this time, the latch boss locks the optical module. After the optical module is inserted, try pulling it out to see if it is installed in position. If the optical module cannot be pulled out, it is secured.

Figure 13-43 State of the release handle



Measures to Prevent Receptacle Contamination

1. Cleaning tissues must be prepared on site. You need to clean the optical connector before inserting it in the receptacle. This protects the receptacle against contamination on the surface of the optical connector.

Figure 13-44 Cleaning optical fibers with special cleaning tissues



NOTE

- Place at least three cleaning tissues on the work bench. As shown in **Figure 13-44**, wipe the end of an optical connector from left to right or from right to left on a cleaning tissue, and then move the connector end to the unused part of the cleaning tissue to continue.
2. Cover an unused optical module with a protective cap to prevent dust, as shown in **Figure 13-45**.

Figure 13-45 Installing a protective cap



If no protective cap is available, use fibers to protect the optical module, as shown in [Figure 13-46](#).

Figure 13-46 Using fibers to protect an optical module



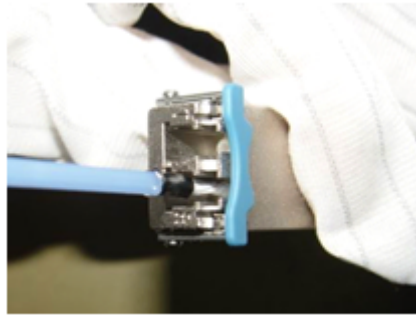
3. Cover unused optical connectors with protective caps, as shown in [Figure 13-47](#), and then lay out fibers on the fiber rack or coil them in a fiber management tray to prevent fibers from being squeezed.

Figure 13-47 Installing a protective cap on a fiber



4. If a receptacle or an optical connector has not been used for a long time and is not covered with a protective cap, you need to clean it before using it. Clean a receptacle with a cotton swab, as shown in [Figure 13-48](#). Clean an optical connector with cleaning tissues.

Figure 13-48 Cleaning a receptacle with a cotton swab



NOTICE

When cleaning a receptacle, insert the cotton swab and turn it slowly in the receptacle. Do not use too much strength because the receptacle may be damaged.

-
5. If optical signals are lost during the operation of a device, use the preceding method to clean the receptacle or the optical connector. In this manner, the possibility of contamination can be excluded.

Measures to Prevent an Optical Module from Being Burnt

1. Before using an optical time-domain reflectometer (OTDR) to test the connectivity or the attenuation of optical signals, disconnect the optical fibers from the optical module. Otherwise, the optical module will be burnt.
2. When performing a self-loop test, use an optical attenuator. Do not loosen the optical connector instead of the optical attenuator.

Precautions

1. The optical connector should be vertically inserted in the receptacle to avoid damages to the receptacle.
2. Fibers must be inserted into optical modules of the corresponding type. That is, multimode fibers must be inserted into multimode optical modules, and single mode fibers must be inserted into single mode optical modules. If a fiber is inserted into an optical module of a different mode, faults may occur. For example, optical signals will be lost.
3. For single-mode optical modules, single-mode optical splitters are not recommended due to considerations on the IEEE standard link budget and the impact of single-mode optical splitters on optical signal attenuation on backbone fiber links. If optical splitters must be used for special scenarios or requirements, strictly follow the link budget and insertion loss specifications of different single-mode optical modules. Ensure that the insertion loss of the single-mode optical splitter plus the inherent attenuation of the backbone link is less than the link budget supported by the corresponding single-mode optical modules, with a certain link budget margin reserved.
4. Multi-mode optical modules cannot be reliably used in scenarios where optical splitters are used due to considerations on the IEEE standard link budget and the impact of multi-mode optical splitter on multi-mode optical signals.

13.6 Appendix F Fault Tag

*Customer name:						
Address:						
Contact person:						
Tel.:			Fax:			
Category*: ☐ RMA ☐ Return ☐ 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.						