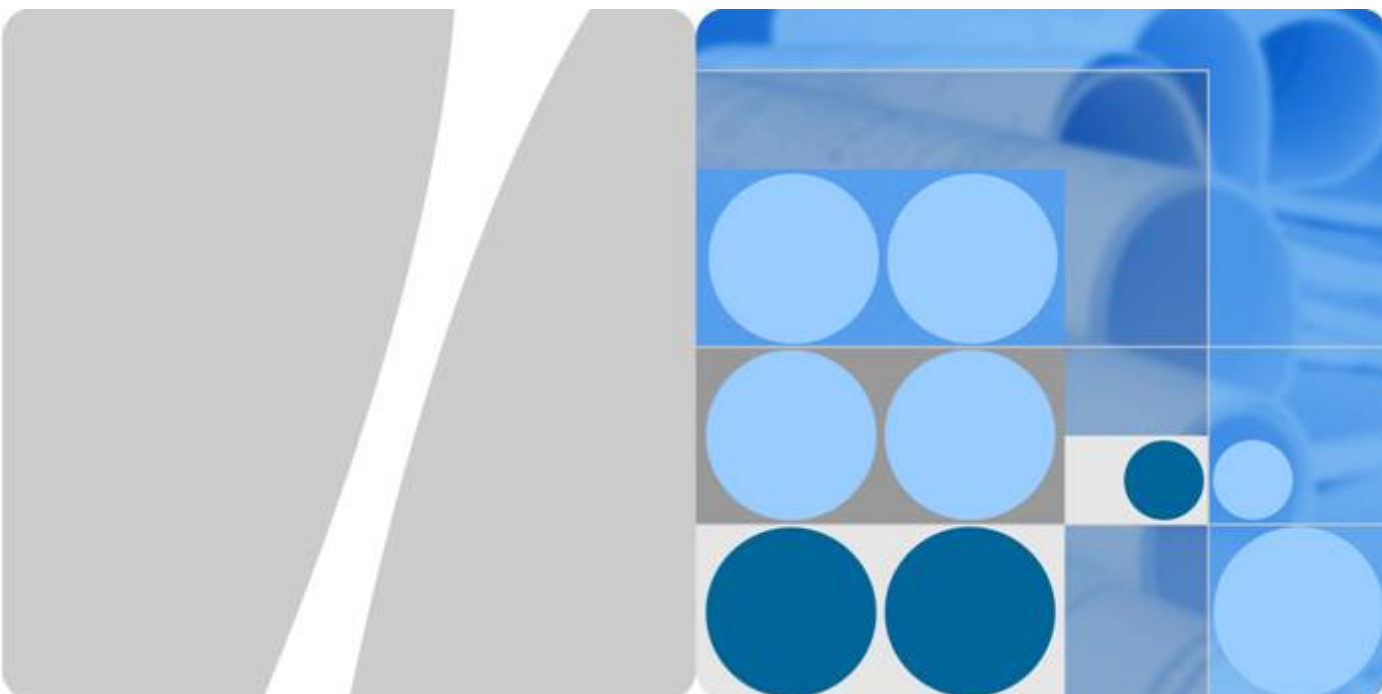




eKitEngine AR180 and AR280
V600R025C00

Hardware Installation and Maintenance Guide

Issue **01**
Date **2025-09-30**

HUAWEI TECHNOLOGIES CO., LTD.



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1 About This Document

Intended Audience

This document describes installation procedures, troubleshooting methods, and maintenance instructions for eKitEngine AR routers.

This document is intended for network engineers responsible for installation and maintenance. The engineers 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.

Notice

- The contents (including web pages, command formats, and command outputs) of this document are based on device information obtained under lab conditions. It provides instructions for common 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, cards of a certain type 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 Device Overview

Huawei eKitEngine AR180 series wireless routers are high-performance enterprise-class wireless routers designed for small and micro networks. The Huawei eKitEngine AR280 is a high-performance enterprise-class 2.5G multi-service router designed for small and medium-sized enterprises (SMEs). They have an integrated hardware structure and consist of a chassis and power module.

NOTE

- The appearances of devices and modules may differ from the actual delivered products. All figures in this document are for illustration purposes only.
- The nameplate is attached to the bottom of the device.

CAUTION

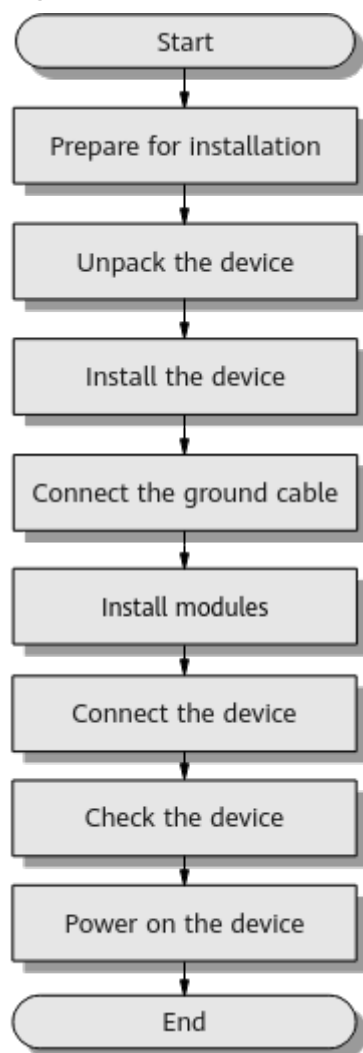
This is a class A product, which may cause radio interference in a living environment. You may need to take appropriate preventive measures against its interference.

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

3 Installation Overview

Figure 3-1 shows the flowchart of device installation.

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

Read and follow all the safety precautions described in this document and read any warning labels attached to the device to ensure personal and equipment safety during installation, operation, and maintenance.

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 device.

General Safety Guidelines

CAUTION

Always take precautions against ESD whenever you handle the device. For example, wear ESD gloves or an ESD wrist strap. To avoid electric shocks and burns, remove conductive objects like jewelry and watches.

 WARNING

After installing the device into a cabinet or rack, first connect the ground cable. 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 device in an environment with flammable or explosive gases or smoke.

NOTICE

- Keep the device away from water and dampness to prevent damage to circuits.
 - The device heats up during operation. The installation site must be well ventilated to ensure normal operation of the equipment.
-

Electrical Safety

 DANGER

- Direct contact with a high-voltage power source or indirect contact through damp objects can be fatal. Non-standard and improper high voltage operations may result in fire, electric shock, or other accidents.
 - Never install or remove the device or power cables while the power is on. Transient contact between the core of a power cable and a conductor may generate electric arcs or sparks that can cause fire or eye damage.
 - To ensure personal and equipment safety, ground the device before powering it on.
-

Laser Safety

 CAUTION

- Invisible laser beams will cause eye damage. Do not look into open optical ports without eye protection.
-

Mechanical Safety

CAUTION

- Never attempt to lift objects that are too heavy for one person to handle. Instead, seek help or use appropriate tools.
- Before installing the device 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 holes in a cabinet without permission. Non-standard holes in a cabinet affect the electromagnetic filter performance of the cabinet and damage the cables in the cabinet. In addition, metal scraps may fall into the cabinet when you drill holes, causing short circuiting on printed circuit boards (PCBs).

4.2 Checking the Installation Site

AR routers must be used in indoor equipment rooms with controllable temperature. [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 devices. Take protective measures to prevent insects, water, animal excrement, or other foreign matter from entering the device 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 result in a reduced service life and possibly failure of the device.

Item	Requirement
Temperature and humidity	The temperature and humidity in the site must be within acceptable ranges. For the operating temperature and relative humidity ranges required for your device, see the <i>Hardware Description</i> . In environments where the relative humidity exceeds 70%, use dehumidifiers or dehumidifying air conditioners. For models with forced heat dissipation, the fan speed increases as the operating temperature rises. A constant-temperature environment helps minimize noise resulting from increased fan speed due to ambient temperature changes.
Corrosive gases	The installation site must be free from acidic, alkaline, or corrosive gases.
Airflow clearance	Leave at least 50 mm clearance around the device for heat dissipation. Do not install the device with its air intake vent facing or close to the air exhaust vent of another device.
Surge protection on service ports	• Avoid routing cables overhead in an outdoor environment. Instead, bury cables underground or route them in steel tubes. • If the Ethernet cable for connecting to the device is routed outdoors, use a network port surge protector (an 8-core surge protector is recommended) for the corresponding network port. Otherwise, the device may be damaged by lightning strikes. • Observe the following rules when installing a network port surge protector: – The surge protector should be as close as possible to the device 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 (≤ 1 m) to reduce impedance. • If fiber reinforcing ribs are used, ensure that they are properly grounded to protect the devices from lightning strikes.

Item	Requirement
Grounding requirements	In all installation scenarios, devices, cabinets, independent power modules, and surge protectors must be reliably grounded. When connecting devices to network ports of an AR router, ensure that the ground screws of the devices and the PE wire of the AC power supply are reliably grounded. Do not connect the AR router to a device with current leakage. If the peer device experiences current leakage or becomes energized for any reason, abnormal energy will enter the AR router through the connected Ethernet cable, causing device faults. To avoid this problem, if the terminal connected to the AR router is powered by the mains, the ground cable of the three-phase mains of the terminal must be properly grounded. Use a multimeter to test the AC voltage of the three-phase socket. The following are the required conditions for grounding: • The voltage difference between the ground slot and neutral slot is less than 5 V. • 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 current leakage.

4.3 Checking the Cabinet or Rack

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

Table 4-2 Requirements for the cabinet or rack

Item	Requirement
Width	The cabinet or rack should be 19 inches wide. The device's dimensions comply with industry standards and it 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 sufficient space.
Grounding	The cabinet or rack must have reliable ground points for grounding the chassis.

4.4 Checking the Power Supply System

Table 4-3 lists the power supply requirements.

Table 4-3 Power supply requirements

Item	Requirement
Preparations	The power supply system must be available in the equipment room before you install the device.
Input voltage	The input voltage must be within the range defined in the device specifications. For details, see the <i>Hardware Description</i>. Ensure that the power supply voltage of the device is stable to prevent device failures caused by power grid fluctuation.
Power outlets and power cables	• If the external power supply system provides AC power outlets, use AC power cables or AC power adapters that comply with local standards. • If the external power supply system provides a power distribution unit (PDU), use C13 straight female to C14 straight male power cables. • The power cables and plugs delivered with the device are for use with this device only. Do not use them on other devices.
Circuit breaker of each channel	The rated current of a circuit breaker must be greater than the maximum input current of power modules.

4.5 Preparing Installation Tools and Accessories

Table 4-4 lists the tools required for installing a device.

Table 4-4 Installation tools

Tool	Description	Picture
ESD gloves	Used to prevent electrostatic discharge.	

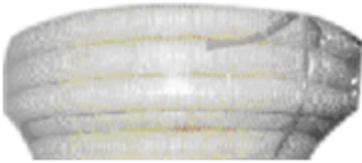
Tool	Description	Picture
Protective gloves	Used to protect hands against lacerations and abrasions.	
ESD wrist strap	Used to prevent electrostatic discharge. Wear the strap on your wrist and insert the cord into the ESD jack on the cabinet.	
Utility knife	Used to cut open cartons.	
Measuring tape	Used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

Tool	Description	Picture
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 device, cabinet, and cables.	
Hammer drill	Used to drill holes with appropriately sized drill bits (selected based on depth of holes and type of expansion bolts).	

Tool	Description	Picture
Adjustable wrench	Used to tighten or loosen hex or square bolts and nuts. The span can be adjusted to suit bolts or nuts of different sizes.	

Table 4-5 lists the accessories required for installing a device.

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.	
Corrugated pipe	Used to protect optical fibers.	

5 Unpacking a Device

Context

NOTE

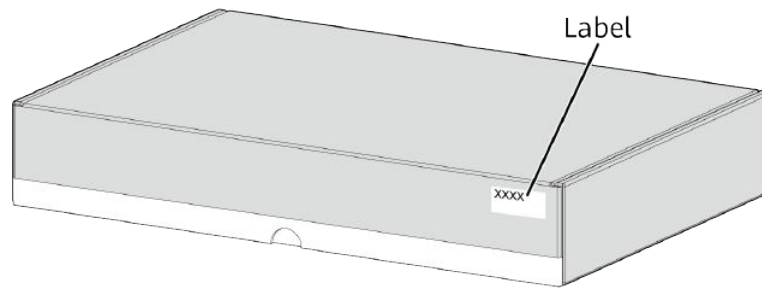
- Before opening the package, check whether the seal label or package is damaged. If there are signs of damage, stop unpacking and contact the supplier. If all packages are intact and the number of packages is correct, unpack the packages to check the device and components.
- The packing cartons of devices with different dimensions may be different, but the unpacking methods are the same.
- 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 the absorption of moisture and dust.
- Do not unpack the device until you are ready to begin installation. Moving the unpacked device over a long distance may cause damage to the device.
- If you find the device is eroded or damp, stop unpacking, check for the reason, and contact the supplier.
- Wear gloves or take other protection measures to prevent hand injuries when unpacking a carton.
- Keep the cartons safe for future transportation of the device.

Tools

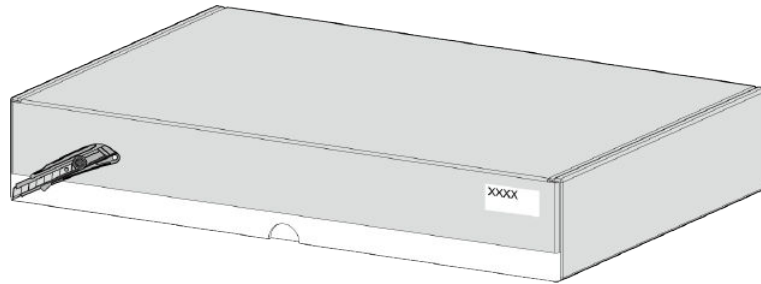
- Protective gloves
- Utility knife

Procedure

- Step 1** Check the label on the carton to confirm whether the device model is correct and understand the precautions to take.



Step 2 Use a utility knife to cut the adhesive tape around the cover of the carton.

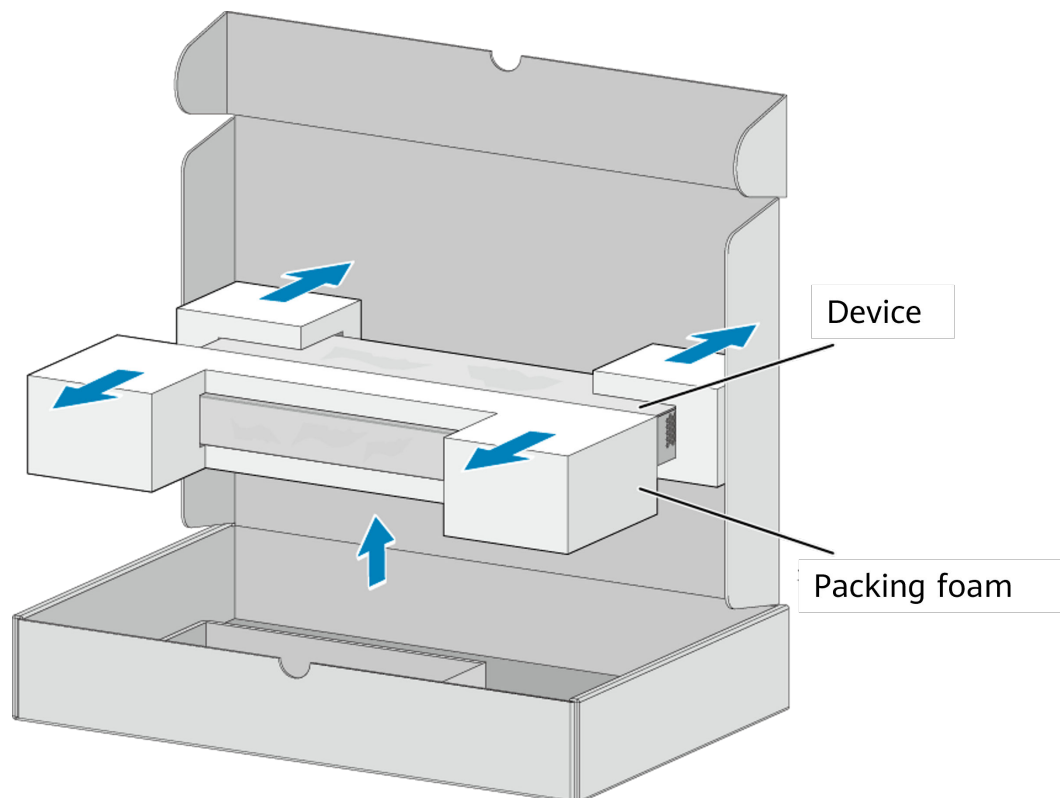


Step 3 Open the carton and take out the installation accessory package and the *Documentation Roadmap* or *Quick Start Guide*.

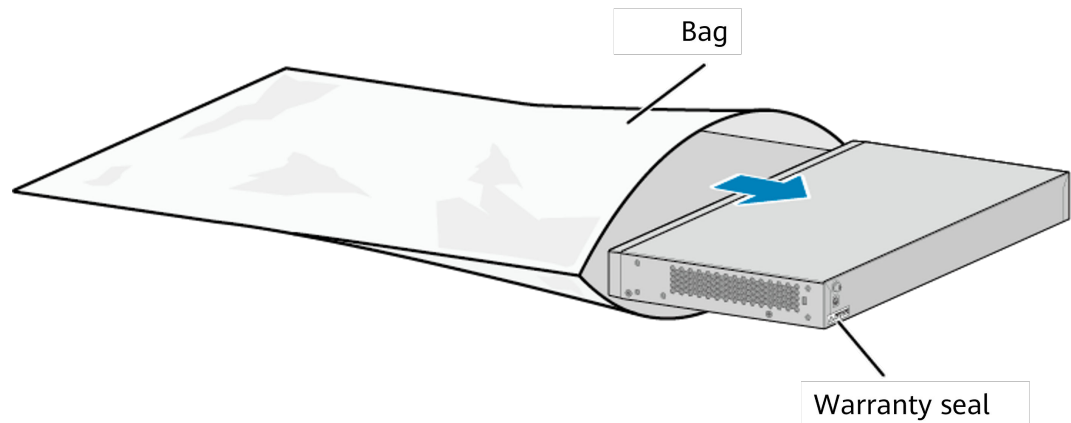
 NOTE

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

Step 4 Take the device out of the carton and remove the packing foam.



- Step 5** Take the device out of the bag and check the device surface and the warranty seal on the device. If the warranty seal is damaged, stop unpacking and contact the supplier. Warranty services are unavailable if the warranty seal is damaged or removed.



- Step 6** Check whether the nameplate on the device matches the label on the carton. The nameplate is attached to the bottom of the device.

----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 types and quantities of items in an installation accessory package vary depending on the product model.

6 Installing a Device

- 6.1 Installation Scenario Overview
- 6.2 Scenario: Cabinet/Rack Mounting
- 6.3 Scenario: Desk Mounting
- 6.4 Scenario: Wall Mounting
- 6.5 Connecting a Device

6.1 Installation Scenario Overview

Devices of different models support different installation scenarios.

Table 6-1 Installation scenarios

Product Model	Desk Mounting	Wall Mounting (Without Mounting Brackets)	Wall Mounting (with Mounting Brackets)	Cabinet/Rack Mounting
AR180	Supported	Supported	Not supported	Not supported
AR180Plus	Supported	Supported	Not supported	Not supported

Product Model	Desk Mounting	Wall Mounting (Without Mounting Brackets)	Wall Mounting (with Mounting Brackets)	Cabinet/Rack Mounting
AR180Pro	Supported	Not supported	Supported NOTE This installation scenario is supported only when the mounting brackets (part number 21240477) are purchased separately.	Supported NOTE This installation scenario is supported only when the mounting brackets (part number 21240477) are purchased separately.
AR280	Supported	Supported	Not supported	Not supported

6.2 Scenario: Cabinet/Rack Mounting

6.2.1 Cabinet/Rack Mounting: Using Front Mounting Brackets

Tools and Accessories

This installation method applies to the following device:

AR180Pro

NOTE

- The router can be installed in a 19-inch standard cabinet/rack. A separately purchased non-standard cabinet/rack must have sufficient space to accommodate the chassis.
- Leave at least 50 mm of clearance around the router for heat dissipation.
- If multiple routers are installed in a cabinet, it is recommended that at least 1 U (44.45 mm) of space be kept between two routers. These routers must have the same airflow direction; otherwise, heat dissipation is affected by hot air circulation.
- ESD wrist strap or ESD gloves
- Phillips screwdriver
- Flat-head screwdriver
- Floating nuts (four per device)
- Mounting brackets (part number 21240477, two per device)

- M4 screws (four per device)
- M6 screws (four per device)

 NOTE

Floating nuts, mounting brackets, M4 screws, and M6 screws are not delivered with the device.

Procedure

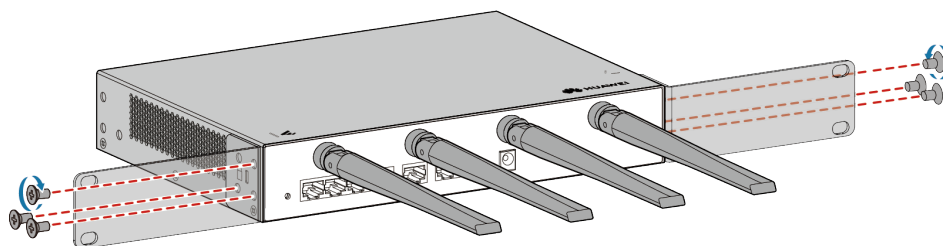
Step 1 Wear an ESD wrist strap or ESD gloves. When wearing an ESD wrist strap, ensure that it is in close contact with your wrist and grounded properly.

Step 2 Use a Phillips screwdriver and M4 screws to attach the mounting brackets to both sides of the router.

 NOTE

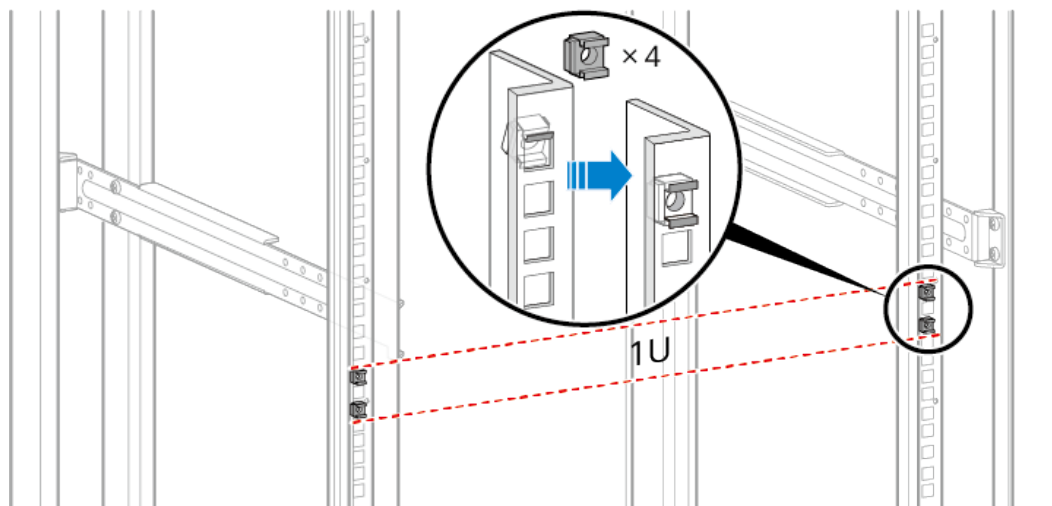
Mounting brackets must be installed on both sides of the device. The following describes how to install a mounting bracket on one side of the device. The installation of the mounting bracket on the other side is the same.

Figure 6-1 Installing a mounting bracket



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

Determine the installation positions of floating nuts on the mounting rails according to the planned installation position of the device. Use a flat-head screwdriver to install four floating nuts on the front mounting rails, two on each side. Align the mounting holes on the mounting brackets with the corresponding holes on the mounting rails, ensuring there is one unoccupied hole between each pair of mounted nuts. Ensure that the floating nuts on both sides are aligned horizontally.



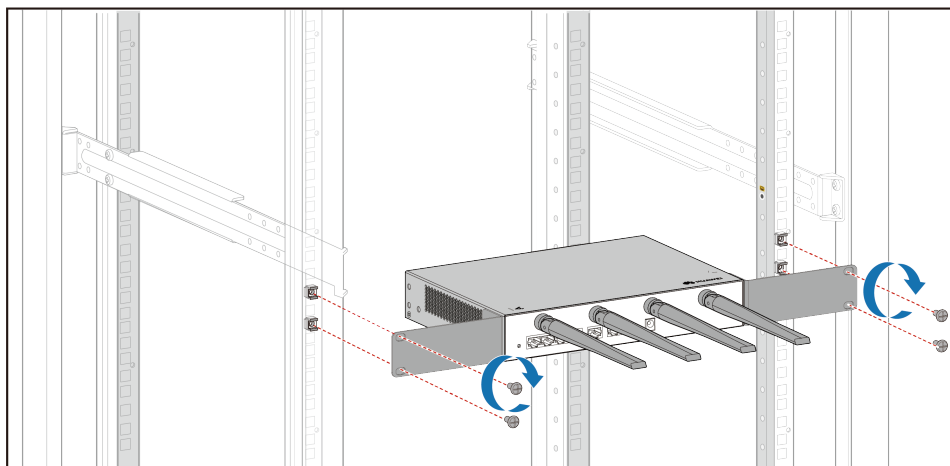
NOTE

Pay attention to the scale markings on the mounting rails because not all three adjacent mounting holes on the rails are spaced exactly 1 U apart.

Step 4 Install the device in the cabinet.

1. Hold the bottom of the device 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 6-2 Installing the device in the cabinet



----End

6.3 Scenario: Desk Mounting

Context

This installation method applies to all devices. This section uses the AR180Pro as an example.

NOTICE

- Before installation, take ESD measures, such as wearing ESD gloves or an ESD wrist strap.
 - Ensure that the desk is flat and properly grounded.
 - Leave at least 50 mm clearance around the device for heat dissipation.
 - Do not place any objects on the device.
-

Tools and Accessories

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

NOTE

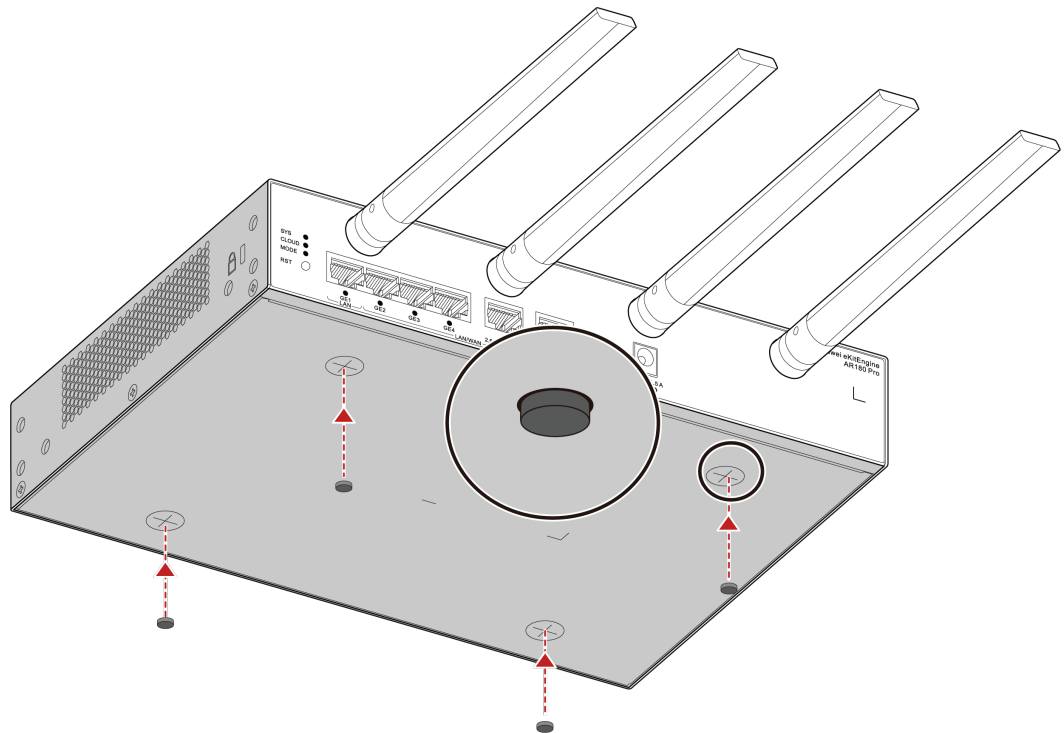
For the AR180Pro, rubber pads are delivered with the device.

For the AR180, AR280, and AR180Plus, rubber pads or integrated foot pads have been installed before delivery. In this case, you do not need to install additional rubber pads.

Procedure

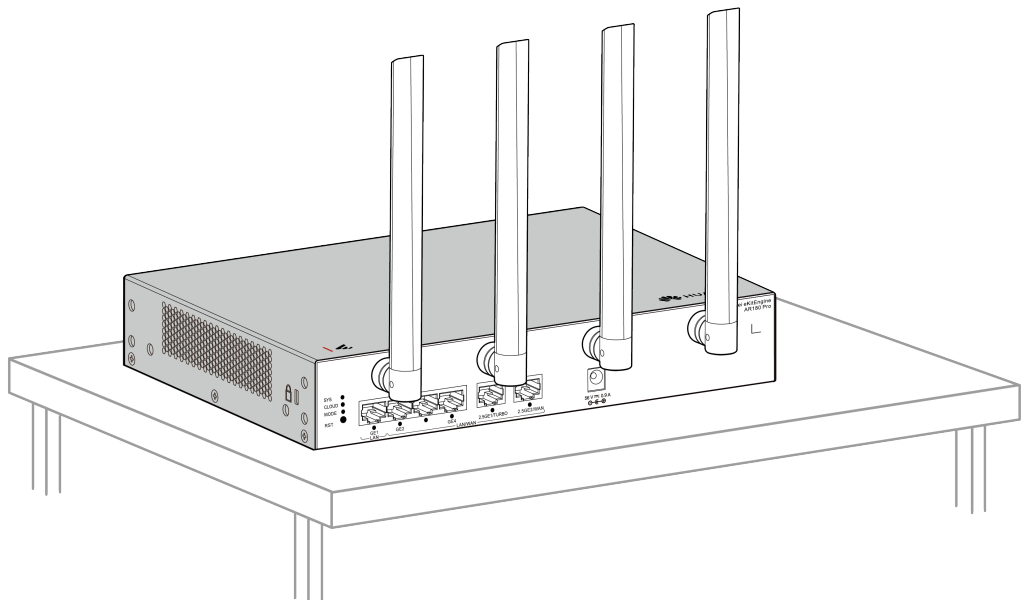
- Step 1** Wear an ESD wrist strap or ESD gloves. When wearing an ESD wrist strap, ensure that it is in close contact with your wrist and grounded properly.
- Step 2** Attach the rubber pads to the bottom of the device. Carefully turn the device upside down, and then attach four rubber pads in the imprinted round areas at the bottom of the chassis. See [Figure 6-3](#).

Figure 6-3 Attaching rubber pads to the bottom of the device



Step 3 Place the device on the desk. Turn the chassis over and gently place the chassis on the desk. See [Figure 6-4](#).

Figure 6-4 Installing the device on a desk



----End

6.4 Scenario: Wall Mounting

6.4.1 Wall Mounting: Using Mounting Brackets

Context

This installation method applies to the following device:

AR180Pro

DANGER

To prevent personal injury, before drilling holes on a wall, make sure that no power cables are hidden in the wall.

NOTICE

- Before installation, take ESD measures, such as wearing ESD gloves or an ESD wrist strap.
 - When installing the device on a wall, take waterproof and dustproof measures to prevent water and dust from entering the device, as this may damage the device.
 - Ensure that there are no flammable or explosive materials near the device and no obstructions within 100 mm around the device.
 - When installing a device on a wall using mounting brackets, reserve proper spacing (15 mm at most) between the device bottom and the wall, and proper spacing (59 mm at most) between the external surface of the device and the wall.
-

Tools and Accessories

- ESD wrist strap or ESD gloves
- Phillips screwdriver
- Hammer drill (with $\phi 8$ drill bit)
- Adjustable wrench
- M6 expansion bolts (four per device)
- M4 screws (four per device)
- Mounting brackets (part number 21240477, two per device)

NOTE

M4 screws, mounting brackets, and M6 expansion bolts need to be purchased separately.
To prevent damage to the device, do not use screws that are too long when installing mounting brackets.

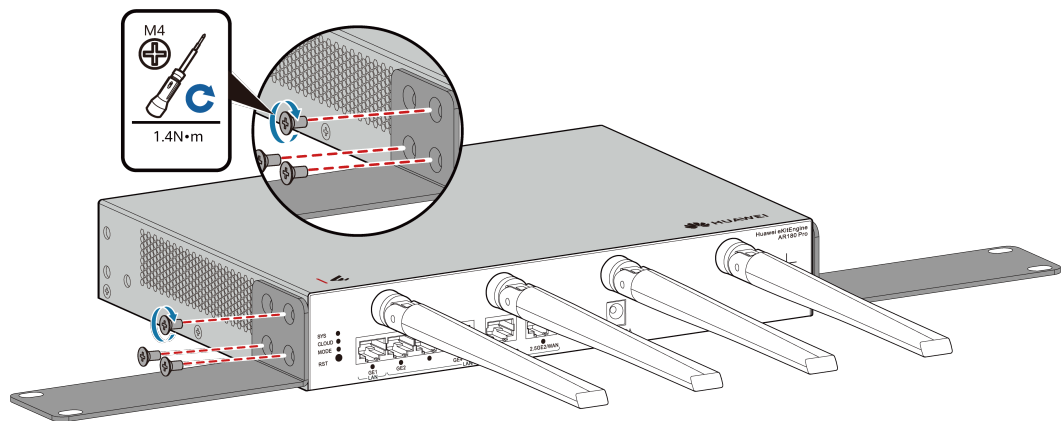
Procedure

- 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 fix mounting brackets to each side of the device.

 NOTE

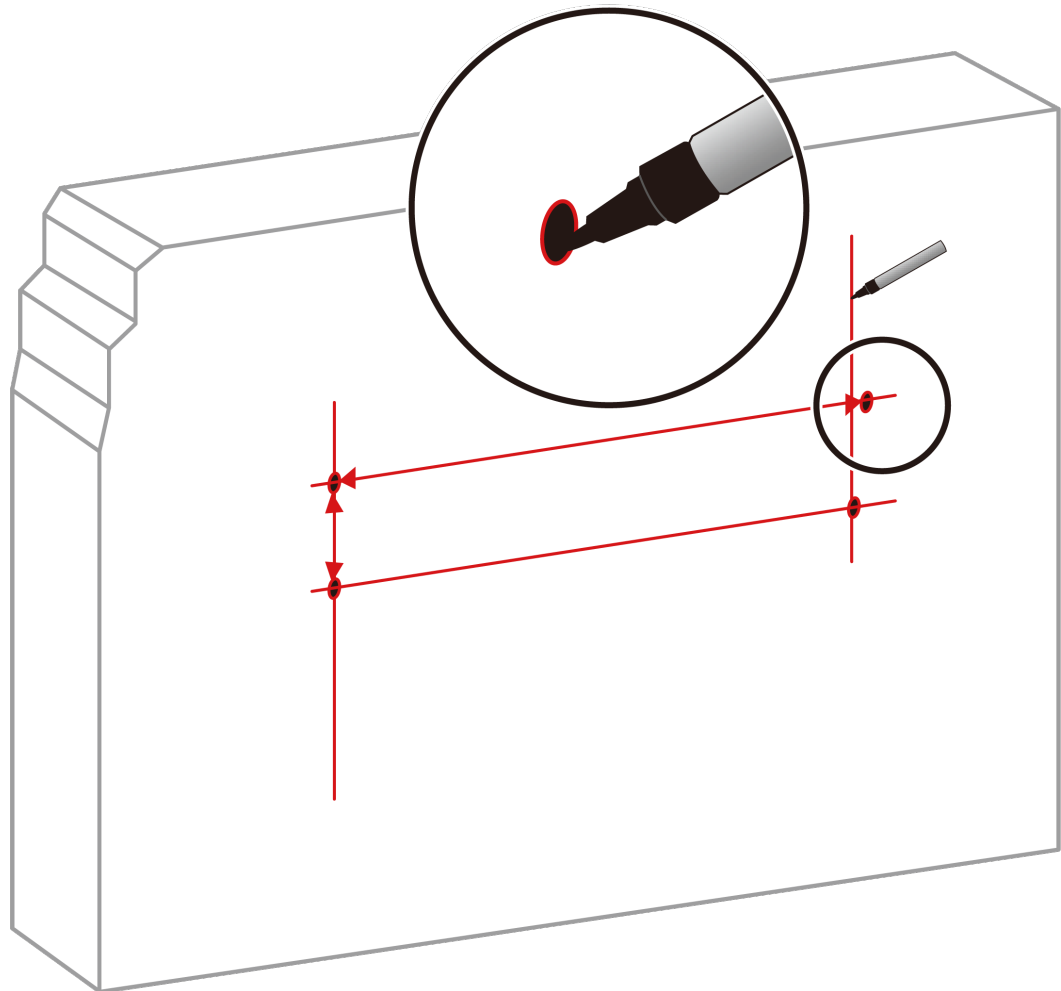
Mounting brackets must be installed on both sides of the device. The following describes how to install a mounting bracket on one side of the device. The installation of the mounting bracket on the other side is the same.

Figure 6-5 Installing a mounting bracket



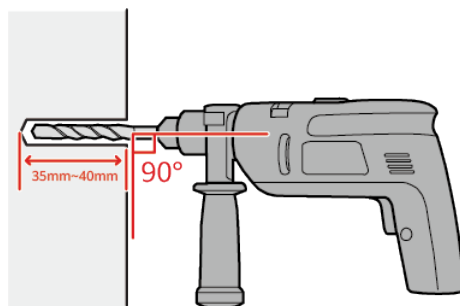
- Step 3** Mark the drilling positions through the holes of the mounting brackets. See [Figure 6-6](#).

Figure 6-6 Marking the drilling positions

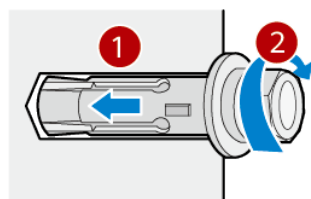


Step 4 Install M6 expansion bolts in the wall.

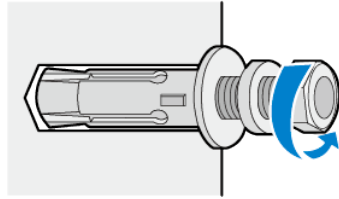
1. Use a hammer drill (with $\phi 8$ drill bit) to drill holes in the marked positions.



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



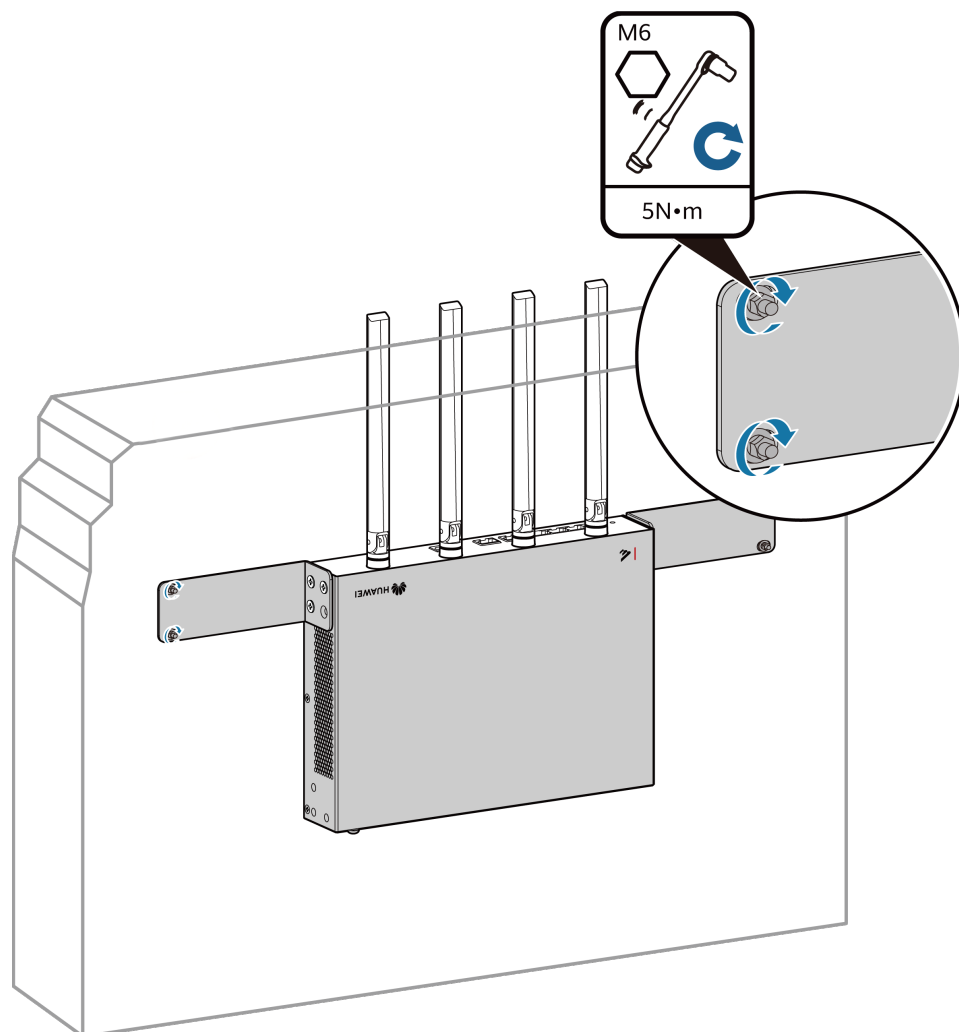
3. Loosen and remove the nuts from the M6 expansion bolts.



Step 5 Mount the device 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 6-7 Mounting the device on the wall



----End

6.4.2 Wall Mounting: Without Mounting Brackets

Context

This installation method applies to the following devices:

AR180, AR180Plus, AR280

This section uses the AR180 as an example.

DANGER

To prevent personal injury, before drilling holes on a wall, make sure that no power cables are hidden in the wall.

NOTICE

- Before installation, take ESD measures, such as wearing ESD gloves or an ESD wrist strap.
 - When installing the device on a wall, take waterproof and dustproof measures to prevent water and dust from entering the device, as this may damage the device.
 - Ensure screws are securely fastened to the wall to prevent the wall-mounted device from falling after cables are connected.
 - Ensure that there are no flammable or explosive materials near the device and no obstructions within 100 mm around the device.
 - Keep the interface panel face down when wall mounting a device.
-

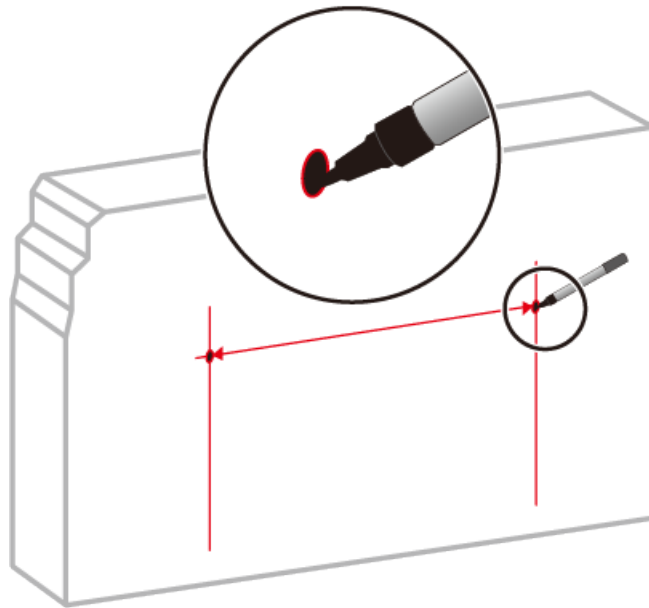
Tools and Accessories

- Measuring tape
- Marker
- Hammer drill
- Claw hammer
- Phillips screwdriver
- Wall anchors and mounting screws (two per device, purchased separately)

Procedure

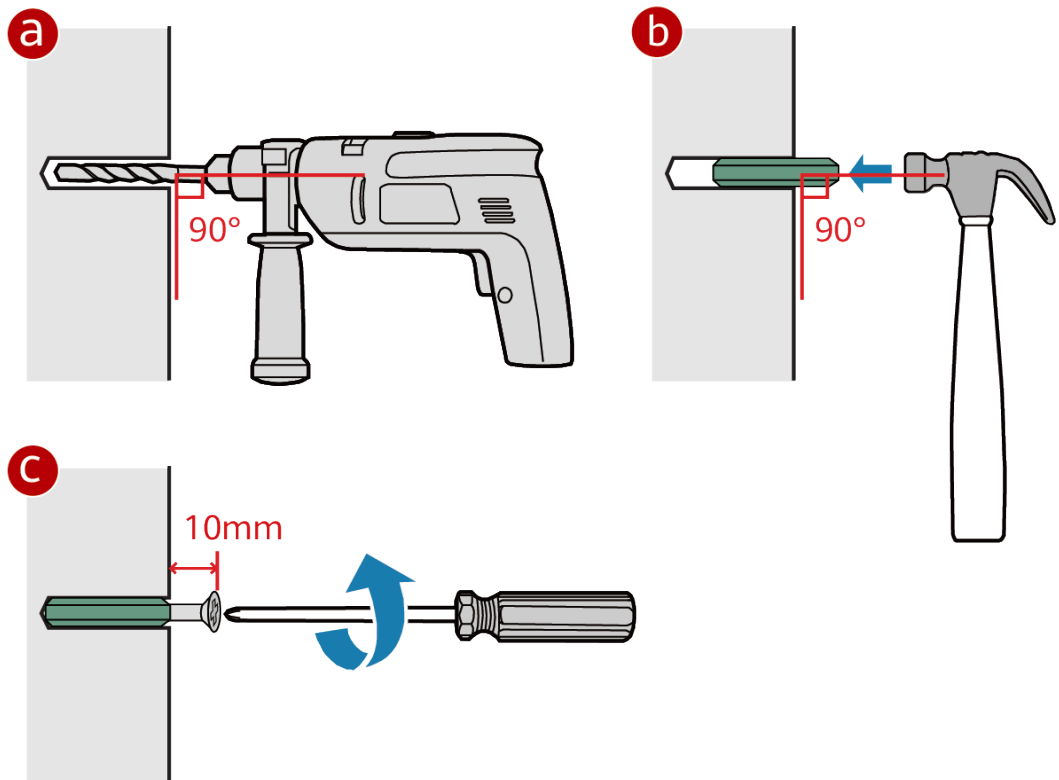
Step 1 Measure the distance between the two mounting holes on the underside of the device.

Step 2 Use a measuring tape to determine positions of two mounting holes, keep the two positions aligned, and mark the positions with a marker. Ensure that the distance between the two mounting holes is the same as that of the two holes on the device.



Step 3 Drill holes and install mounting screws.

1. Choose an appropriate drill bit according to the diameter of the mounting screws.
2. Hammer the plastic wall anchors into the mounting holes.
3. Use a Phillips screwdriver to screw the mounting screws into the wall anchors. Leave the screws protruding 10 mm from the wall.



Step 4 Align the mounting holes on the underside of the device with mounting screws and hang the device on the mounting screws.

Figure 6-8 Wall mounting an AR180 device

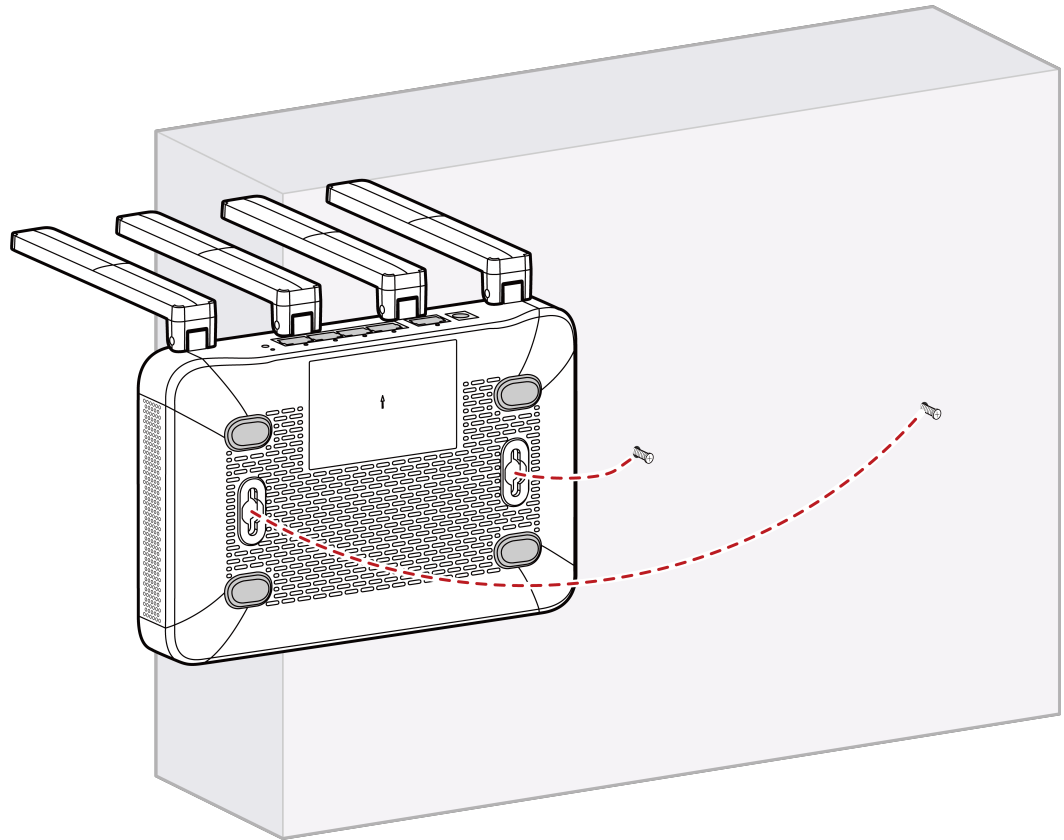
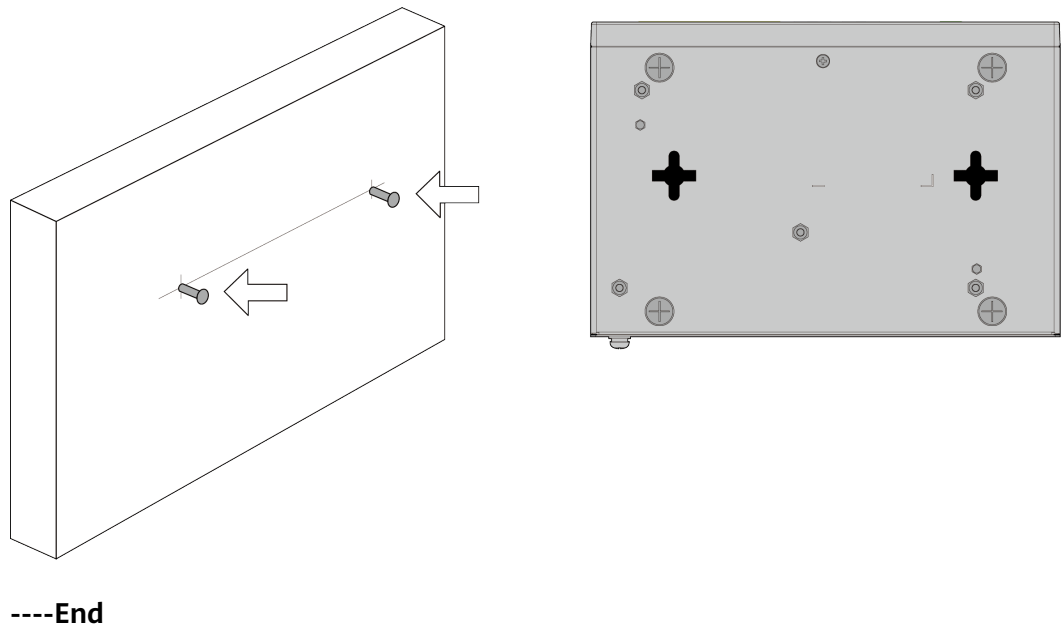


Figure 6-9 Mounting the AR280 on the wall



6.5 Connecting a Device

6.5.1 Connecting the Ground Cable

Context

This section applies to the AR180Pro and AR280.

Grounding is a key step in installation. Grounding the device helps protect it from lightning, electromagnetic interference, and electrostatic discharge.

The ground cable can be connected to a ground point on the cabinet/rack or a ground bar, depending on the actual environment. The following procedure connects the ground cable to a ground point on the cabinet/rack.

NOTE

If a cabinet or rack has anti-rust coating, scrape off the paint around the ground point to ensure reliable grounding.

Tools and Accessories

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

NOTE

The ground cable is not delivered with 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 Connect the ground cable.

1. Use a Phillips screwdriver to remove the M4 screws from the ground point on the device. Keep the M4 screw in an appropriate place for later use.
2. Connect the M4 lug of the ground cable to the ground point on the device and fix it with an M4 screw.
3. Connect the M6 lug of the ground cable to the ground point on the cabinet and fix it with an M6 screw.



----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 Ω on a multimeter.

6.5.2 Connecting the Power Adapter

Context



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

NOTICE

- Before making any connections, ensure that you take appropriate ESD measures, such as wearing ESD gloves or an ESD wrist strap.
- Do not route power cables aerially outdoors. Power cables led in from outside must be routed indoors or buried underground.
- Do not power on the device until you have finished installing the device and connecting all cables.
- Power cables delivered with the device are for use with this device only.
- The AC power cables used in different countries and regions have different specifications. The cables in the figures are for reference only and may differ from the cables delivered.

Tools and Accessories

- ESD wrist strap
- Power adapter
- AC power cable

Procedure

Step 1 Verify that the device is reliably grounded.

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

Step 3 Connect the device to the power adapter.

NOTE

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

Power the device using the power adapter delivered with it. Third-party power adapters are not recommended.

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 cable, and connect the AC power cable to an AC power outlet.

Figure 6-10 Connecting an AR280 to a power adapter

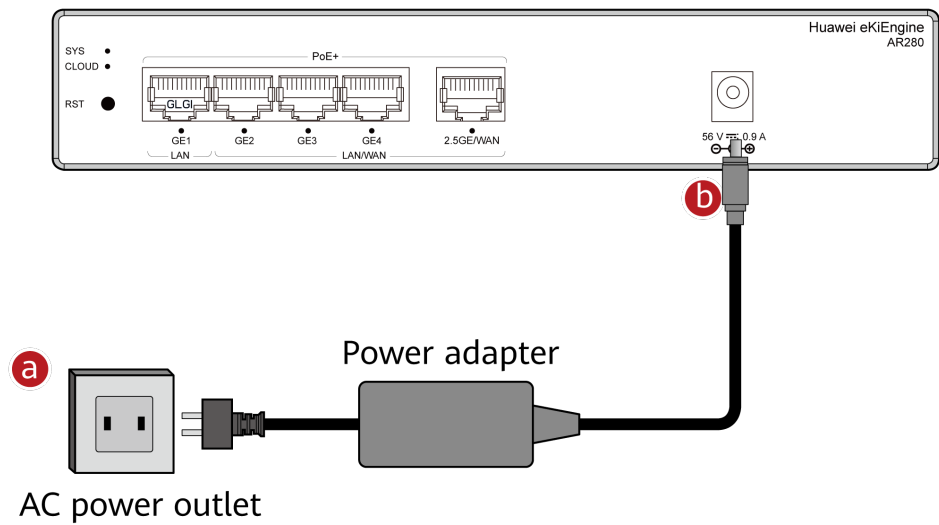
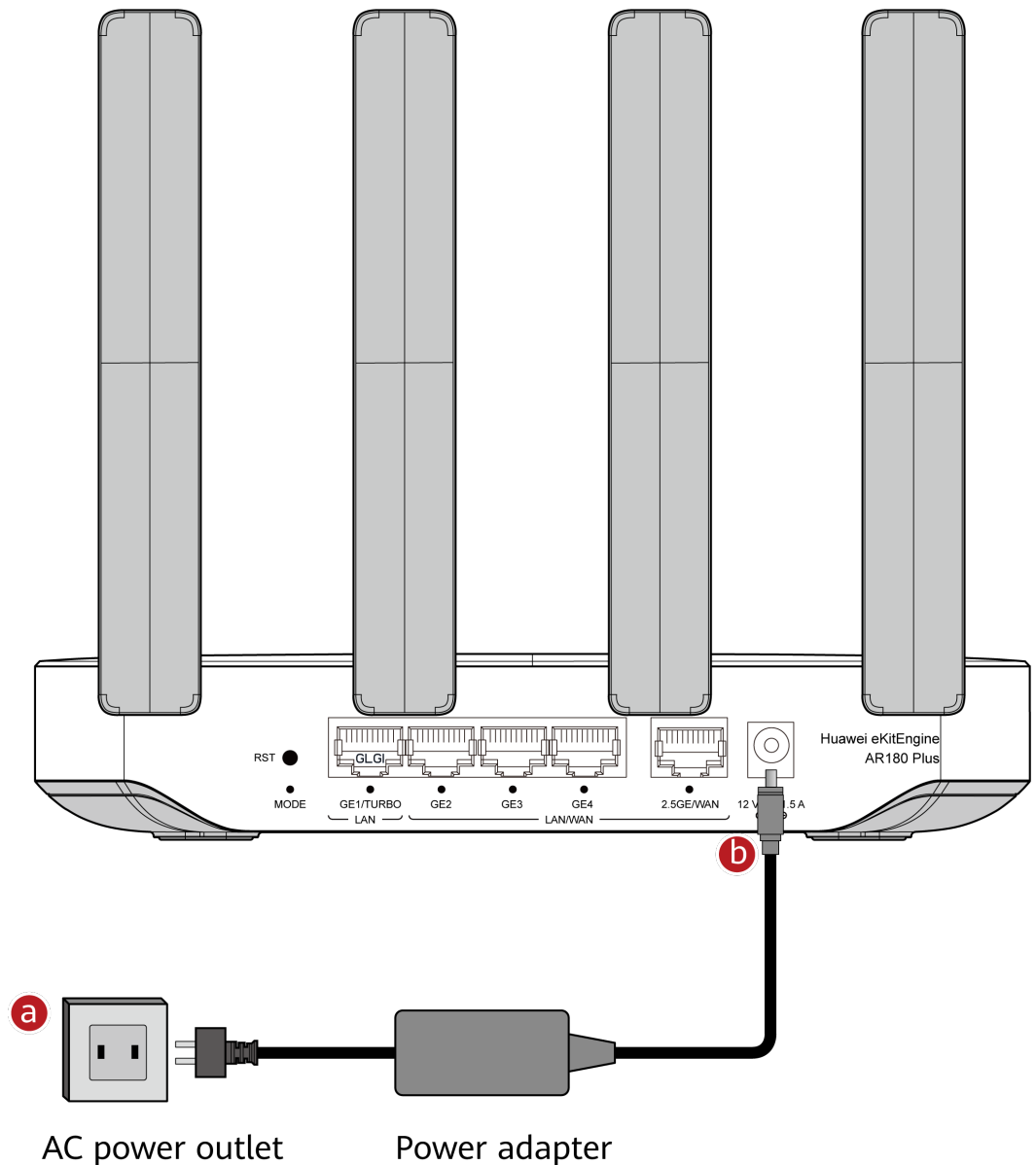


Figure 6-11 Connecting an AR180Plus to a power adapter



----End

Follow-up Procedure

Perform the following operations after connecting the power adapter:

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

6.5.3 Connecting Ethernet Cables

Tools and Accessories

This section uses the AR180Plus as an example.

NOTICE

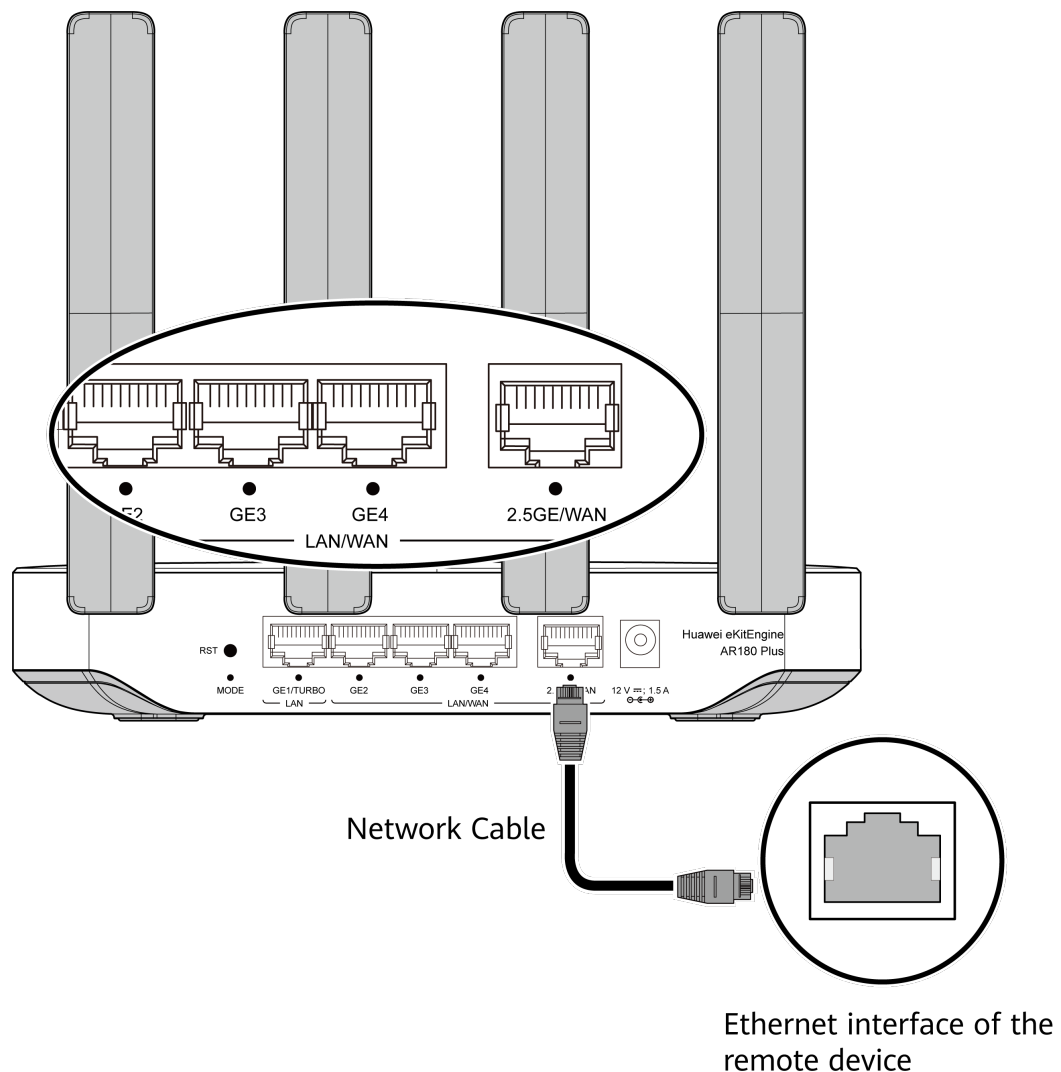
- Before deploying Ethernet cables, test their continuity.
- Before making any connections, ensure that you take appropriate ESD measures, such as wearing ESD gloves or an ESD wrist strap.
- To prevent the device from being damaged by lightning strikes, do not route Ethernet cables overhead outdoors. Instead, bury cables underground or route them in steel tubes.
- Keep signal cables more than 10 cm away from power cables.
- Ensure Ethernet cables are installed in a stable environment. To avoid damage through current leakage, there should be no external power cables in contact with Ethernet cables or devices at either end of the Ethernet cables.

-
- Diagonal pliers
 - Cable ties
 - Marker
 - Ethernet cables (purchased separately)
 - Ethernet cable labels

Procedure

- Step 1** Select Ethernet cables of appropriate quantity and lengths according to the number of ports and measured cabling distances.
- Step 2** Attach temporary labels to both ends of each Ethernet cable and number them corresponding to port numbers.
- Step 3** Connect one end of an Ethernet cable to an Ethernet port of the device and the other end to an Ethernet port of the peer device.

Figure 6-12 Installation diagram (AR180Plus as an example)



Step 4 Arrange the Ethernet cables to prevent them from twisting around each other, and then bundle them with cable ties. Use diagonal pliers to cut off excess cable ties.

Step 5 Remove the temporary labels and attach labels (2 cm away from connectors) to both ends of the Ethernet cable.

----End

Follow-up Procedure

After the Ethernet cables are connected, verify that:

- Labels are correctly marked and securely attached to cables, with text facing the same direction.
- Ethernet cables and connectors are intact and tightly connected. All cables are correctly connected.

7

Verifying the Installation

Table 7-1 lists the items to be checked after the installation and the corresponding check methods.

Table 7-1 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 other objects on the device.	Observe
6	Leave at least 50 mm clearance around the device for heat dissipation. The air intake vent of the device does not face and is not close to the air exhaust vent of another device.	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

8 Powering On or Off a Device

Tools and Accessories

- ESD wrist strap or ESD gloves
- Multimeter

Procedure

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

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 device.
3. Check that the power switch of the external power supply system is turned off.
4. Check that the power cables are correctly connected.

Step 2 Turn on the external power supply system connected to the device.

Step 3 After the device completes its startup, check the indicators on the device.

For details about the indicators, see the *Hardware Description*.

----End

Follow-up Procedure

To power off the device, perform the following steps:

NOTICE

- Powering off the device will interrupt all services on the device. Exercise caution when you perform this operation.
- You are advised to save and back up the device configuration before powering off the device. If the current configuration is not saved before the device is powered off, the device will restore the last saved configuration upon startup.
- Unless required for special operations, frequent power-off is not recommended. This is an enterprise-grade device, unlike home products. In the absence of identified issues, prolonged operation will not lead to performance degradation, nor will rebooting the device improve speed or resolve forwarding issues. On the contrary, maintaining a stable power supply will help extend the device's lifespan and ensure its reliability.

-
1. Save the configuration file of the device.
 2. Turn off the external power supply system connected to the device.
 3. Verify that the device is powered off.

9 Appendix

- [9.1 Appendix A: On-site Cable Assembly and Installation](#)
- [9.2 Appendix B: Environmental Requirements for Device Operation](#)
- [9.3 Appendix C: Equipment Grounding Specifications](#)
- [9.4 Appendix D: Engineering Labels for Cables](#)
- [9.5 Appendix E: Guide to Using Optical Modules](#)
- [9.6 Appendix F: Faulty Parts Return Form \(Customer Copy\)](#)

9.1 Appendix A: On-site Cable Assembly and Installation

9.1.1 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.

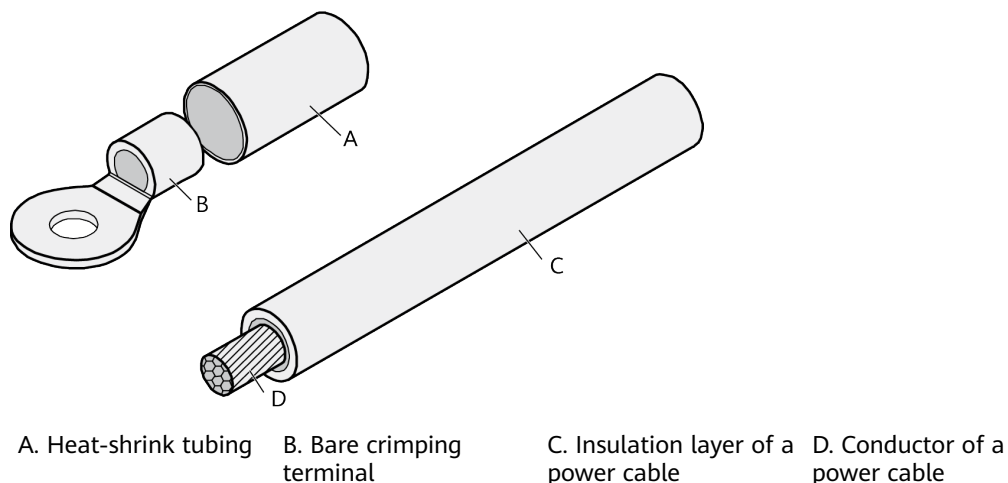
9.1.2 Assembling Power Cables

9.1.2.1 Assembling an OT Terminal and a Power Cable

Context

Figure 9-1 shows the components of an OT terminal and a power cable.

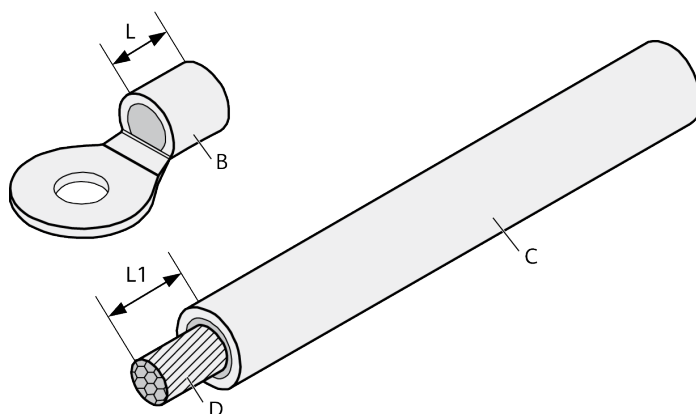
Figure 9-1 Components of an OT terminal and a power cable



Procedure

- Step 1** Measure the cross-sectional area of the cable conductor, and strip part of the cable insulation (C) to expose the cable conductor (D) of length L1, as shown in [Figure 9-2](#). [Table 9-1](#) lists the recommended values of L1.

Figure 9-2 Stripping a power cable (OT terminal)



NOTICE

- When stripping a power cable, do not damage the conductor of the cable.
- If a bare crimping terminal that is not provided by Huawei is used, adjust the L1 value according to the L value of this terminal, and ensure that the L1 value is 1 mm to 2 mm greater than the L value.

Table 9-1 Mapping between the cross-sectional area of the conductor and the value of L1

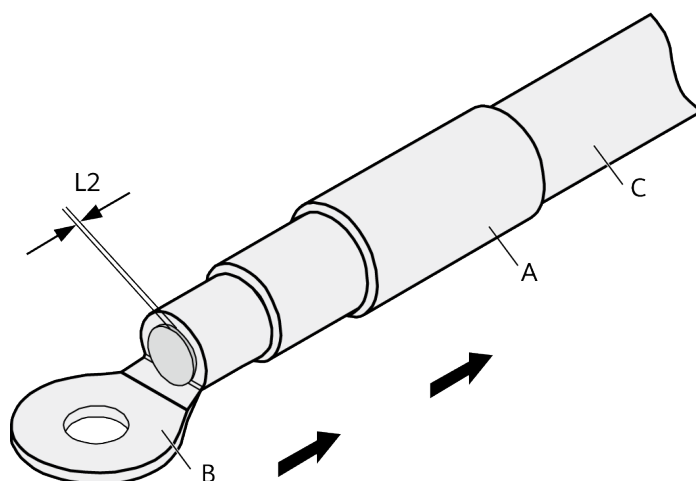
Cross-Sectional Area of Conductor (mm ²)	Value of L1 (mm)	Cross-Sectional Area of Conductor (mm ²)	Value of L1 (mm)
1	7	10	11
1.5	7	16	13
2.5	7	25	14
4	8	35	16
6	9	50	16

NOTE

The length of the insulation layer to be stripped can be determined by comparing the part of the connector to be crimped and the power cable.

Step 2 Put the heat-shrink tubing (A) onto the bare crimping terminal, as shown in [Figure 9-3](#).

Figure 9-3 Putting the heat shrink tubing onto the bare crimping terminal



Step 3 Put OT terminal (B) onto the exposed conductor, and ensure that the OT terminal is in good contact with insulation (C), as shown in [Figure 9-3](#).

NOTICE

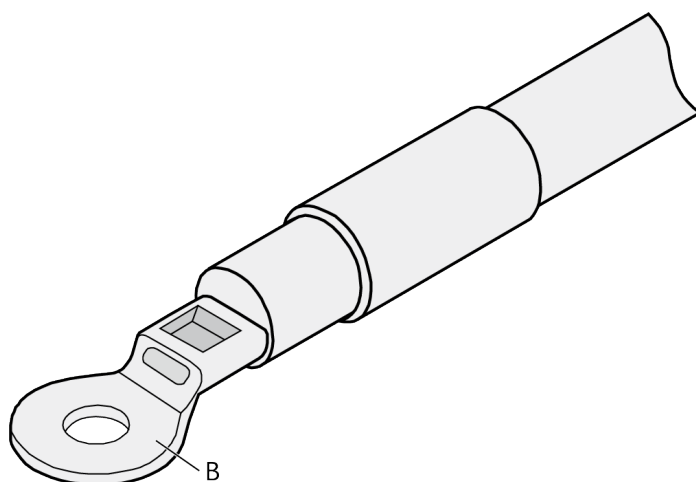
After the conductor is fed into the OT terminal, the protruding part (L2) of the conductor must be no longer than 2 mm (0.08 in.), as shown in [Figure 9-3](#).

- Step 4** Crimp the joint parts of the bare crimping terminal and the conductor, as shown in [Figure 9-4](#).

 NOTE

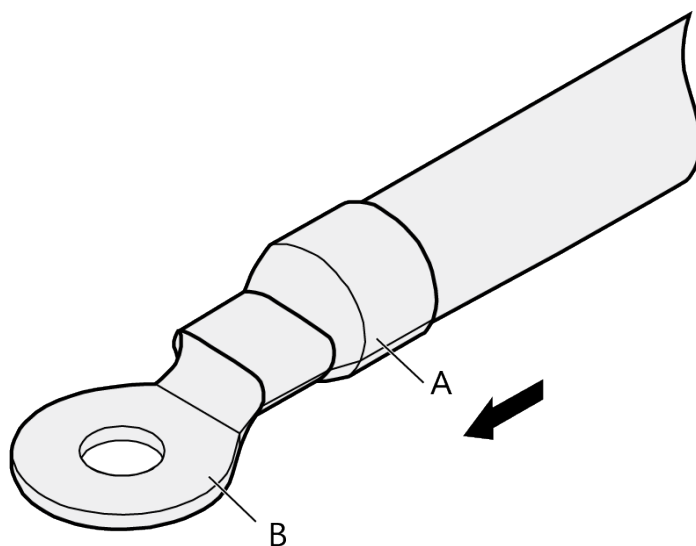
The shapes of crimped parts may vary with the crimping dies.

Figure 9-4 Crimping the joint parts of the bare crimping terminal and the conductor (OT terminal)



- Step 5** Push the heat-shrinkable tubing (A) toward the connector until the tubing covers the crimped part, and then use a heat gun to heat the tubing, as shown in [Figure 9-5](#).

Figure 9-5 Heating the heat shrink tubing (OT terminal)



NOTICE

Stop heating the shrink tubing when the connector is securely locked in the shrink tubing. Do not heat the shrink tubing too long as this may damage the insulation coating.

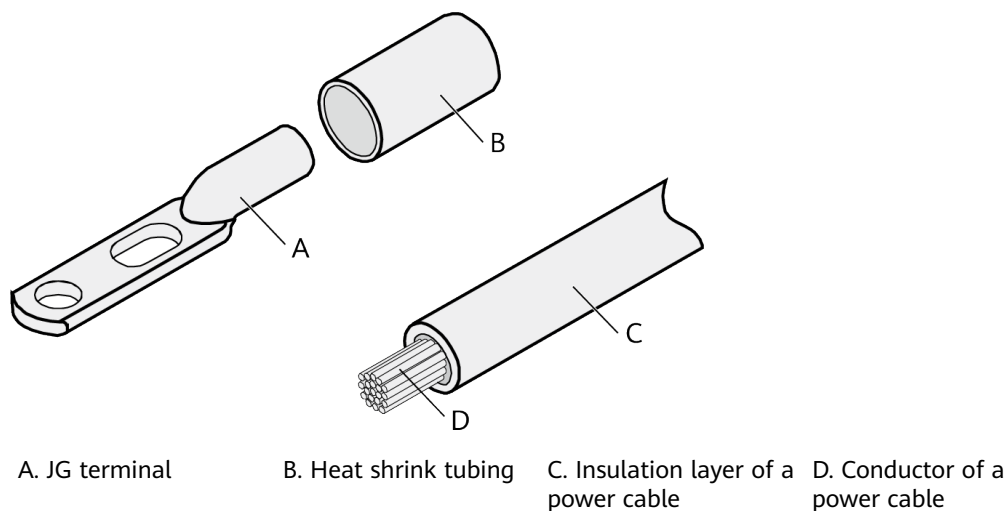
----End

9.1.2.2 Assembling a JG Terminal and a Power Cable

Context

Figure 9-6 shows the components of a JG terminal and a power cable.

Figure 9-6 Components of a JG terminal and a power cable



Procedure

- Step 1** Measure the cross-sectional area of the cable conductor, and strip part of the insulation layer (C) to expose the cable conductor (D) with a length of L, as shown in **Figure 9-7**. **Table 9-2** lists the recommended values of L.

NOTICE

- When you strip a power cable, do not damage the conductor of the cable.
- If the bare crimping terminal is not provided by Huawei, adjust the value of L as needed.

Figure 9-7 Stripping a power cable (JG terminal)

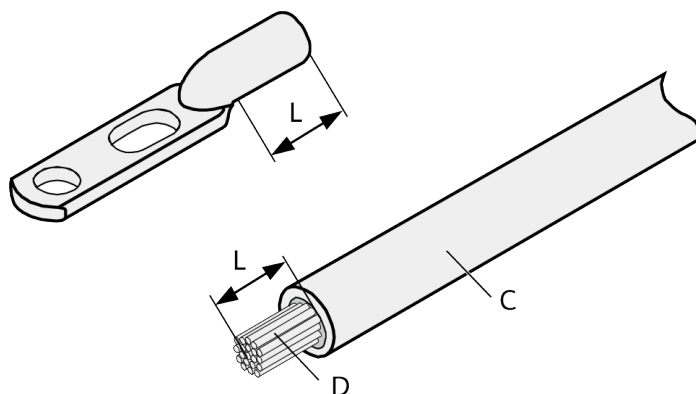
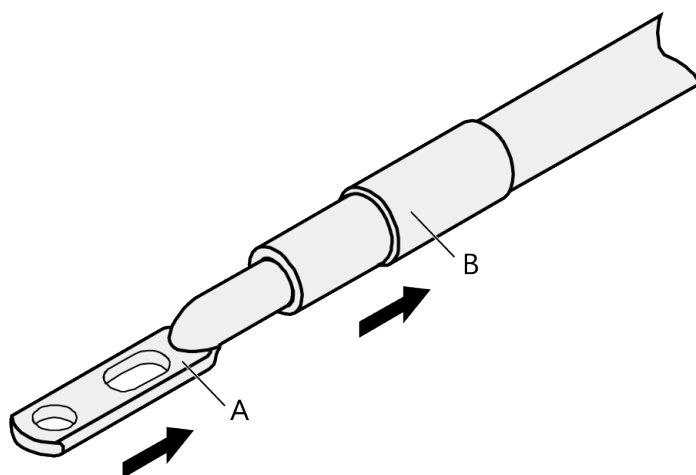


Table 9-2 Mapping between the cross-sectional area of the conductor and the value of L

Cross-Sectional Area of Conductor (mm ²)	Value of L (mm)
16	13
25	14
35	16
50	16

Step 2 Put the heat shrink tubing (B) onto the bare crimping terminal, as shown in [Figure 9-8](#).

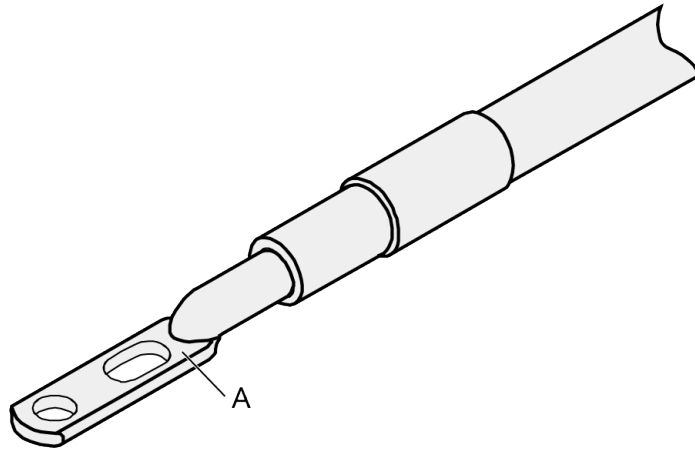
Figure 9-8 Putting the heat shrink tubing onto the bare crimping terminal



Step 3 Put the bare crimping terminal onto the exposed conductor, and ensure that the bare crimping terminal is in good contact with the insulation of the power cable, as shown in [Figure 9-8](#).

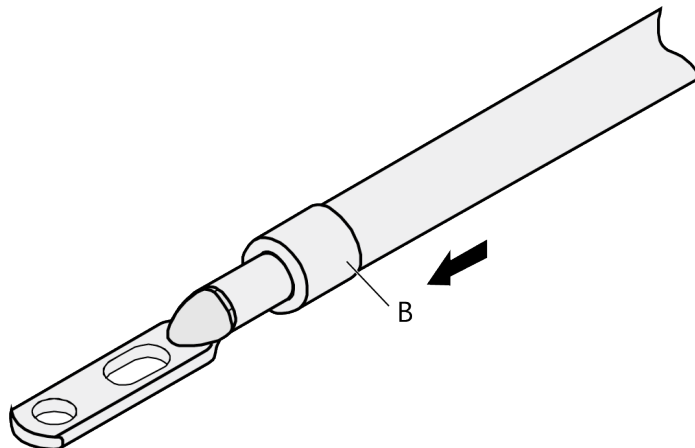
Step 4 Crimp the joint parts of the bare crimping terminal and the conductor, as shown in [Figure 9-9](#).

Figure 9-9 Crimping the joint parts of the bare crimping terminal and the conductor (JG terminal)



Step 5 Push the heat shrink tubing (B) toward the connector until the tube covers the crimped part, and then use a heat gun to heat the tube, as shown in [Figure 9-10](#).

Figure 9-10 Heating the heat shrink tubing (JG terminal)



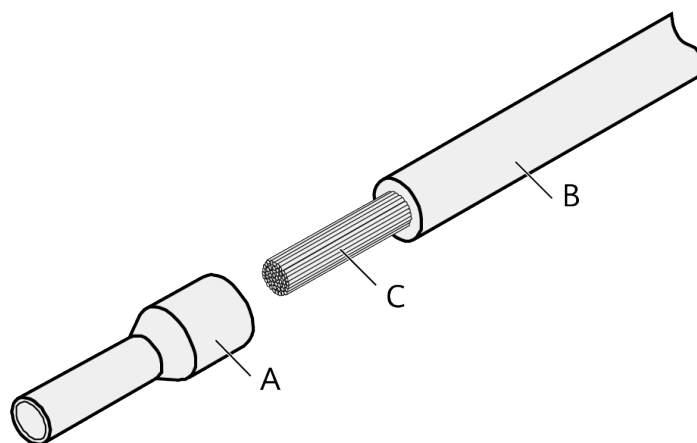
----End

9.1.2.3 Assembling a Cord End Terminal and a Power Cable

Context

[Figure 9-11](#) shows the components of a cord end terminal and a power cable.

Figure 9-11 Components of a cord end terminal and a power cable



A. Cord end terminal

B. Insulation of a power cable

C. Conductor of a power cable

Procedure

- Step 1** Measure the cross-sectional area of the cable conductor, and strip part of the cable insulation (B) to expose the cable conductor (C) of length L1, as shown in [Figure 9-12](#). [Table 9-3](#) lists the recommended values of L1.

NOTICE

When you strip a power cable, do not damage the conductor of the cable.

Figure 9-12 Stripping a power cable (cord end terminal)

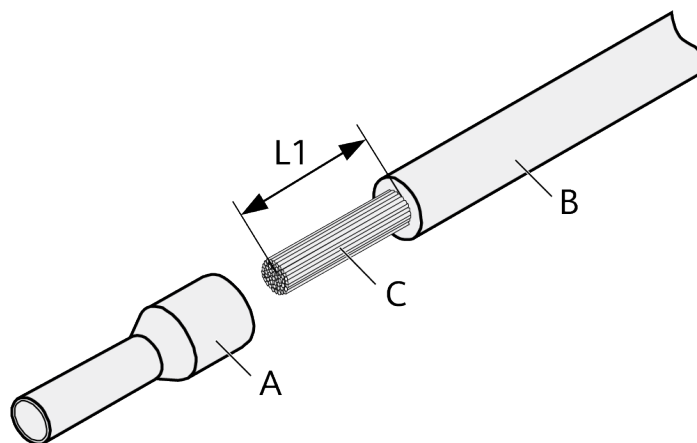


Table 9-3 Mapping between the cross-sectional area of the conductor and the value of L1

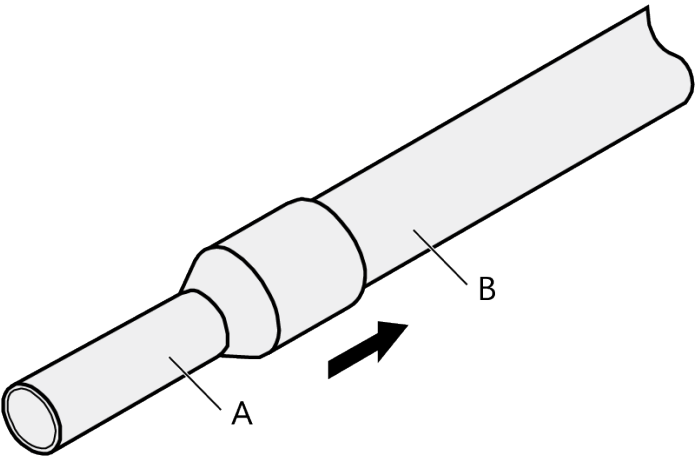
Cross-Sectional Area of Conductor (mm ²)	Value of L1 (mm)	Cross-Sectional Area of Conductor (mm ²)	Value of L1 (mm)
1	8	10	15
1.5	10	16	15
2.5	10	25	18
4	12	35	19
6	14	50	26

Step 2 Fit the cord end terminal (A) onto the stripped conductor and align the conductor with the terminal's edge, as shown in [Figure 9-13](#).

NOTICE

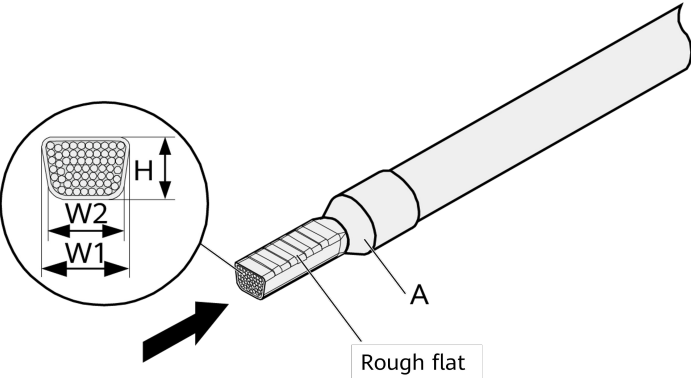
After the conductor is fed into the cord end terminal, the protruding part of the conductor must be no longer than 1 mm.

Figure 9-13 Putting the cord end terminal onto the conductor



Step 3 Use a crimping tool matching the power cable conductor's cross-sectional area to crimp the cord end terminal and conductor, as shown in [Figure 9-14](#).

Figure 9-14 Crimping the cord end terminal and power cable conductor



Step 4 Check the maximum width of the tubular crimped terminal. The width of a crimped tubular terminal must be less than the width specified in [Table 9-4](#).

Table 9-4 Maximum width of a tubular crimped terminal

Cross-Sectional Area of Tubular Terminal (mm ²)	Maximum Width of Crimped Terminal W1 (mm)
0.25	1
0.5	1
1.0	1.5
1.5	1.5
2.5	2.4
4	3.1
6	4
10	5.3
16	6
25	8.7
35	10

----End

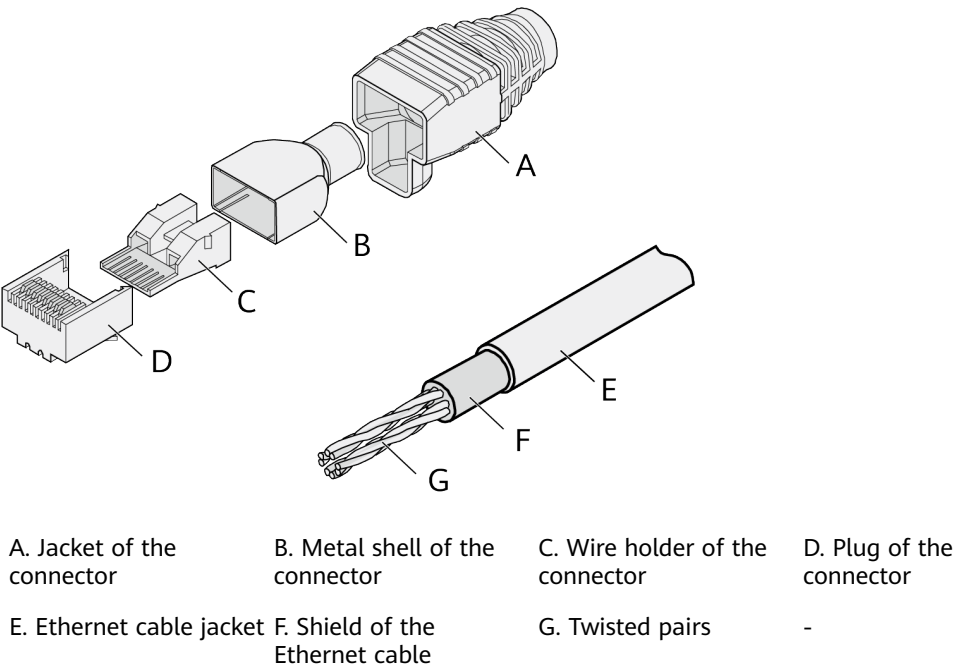
9.1.3 Assembling Ethernet Cables

9.1.3.1 Assembling a Shielded RJ45 Connector and an Ethernet Cable

Context

Figure 9-15 shows the components of an RJ45 connector and a shielded Ethernet cable.

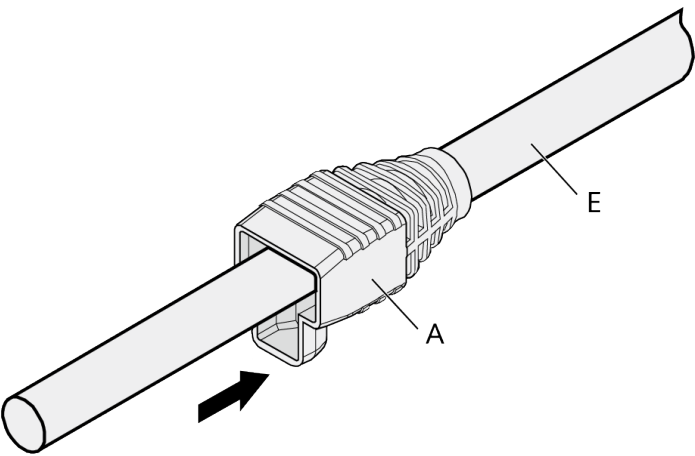
Figure 9-15 Shielded RJ45 connector and Ethernet cable



Procedure

Step 1 Feed the Ethernet cable through the connector jacket (A), as shown in Figure 9-16.

Figure 9-16 Feeding the jacket of the connector through the Ethernet cable

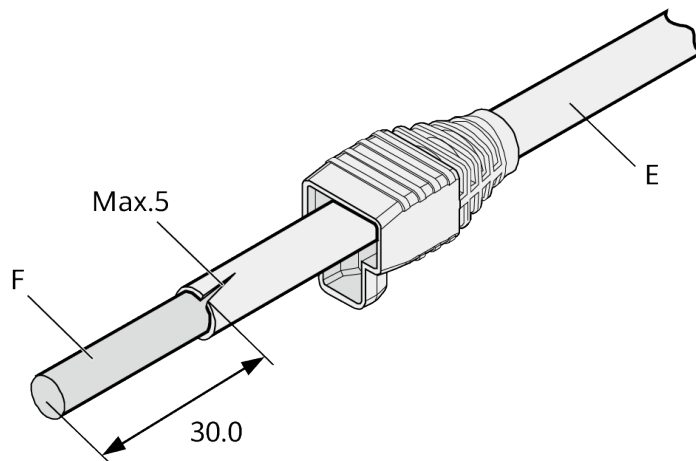


Step 2 Strip 30 mm of the jacket (E), cut off the nylon twine inside the jacket, and cut a no more than 5 mm cleft in the jacket, as shown in Figure 9-17.

NOTICE

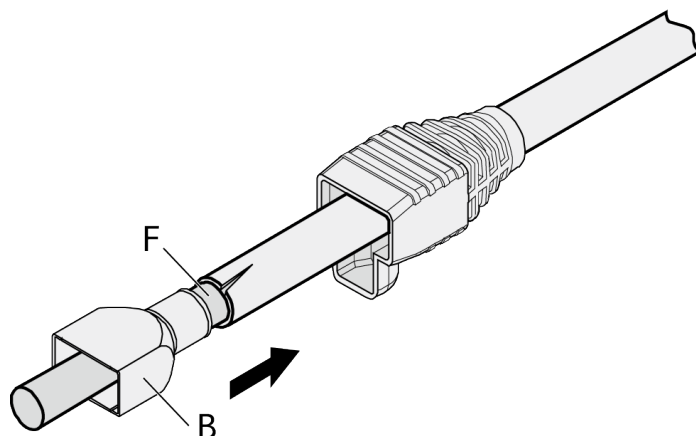
- When you remove a section of the jacket, do not damage the shield layer of the twisted-pair cable.
- When stripping the shield layer, do not damage the insulation layer of the twisted core wire.

Figure 9-17 Removing the jacket of a twisted-pair cable (unit: mm)



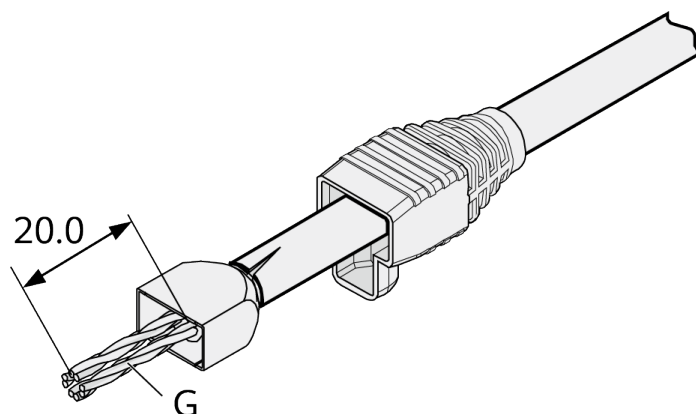
- Step 3** Slide the metal shell (B) onto the twisted-pair cable and make sure that the shield (F) is covered completely by the metal shell, as shown in [Figure 9-18](#).

Figure 9-18 Sliding the metal shell onto the twisted-pair cable



- Step 4** Fit the metal shell onto the twisted-pair cable until the shield is covered completely. Along the edge of the metal shell, cut off the shield and aluminum foil neatly and ensure that there is no surplus copper wire. The exposed twisted-pair cable (G) should be about 20 mm long, as shown in [Figure 9-19](#).

Figure 9-19 Removing the shield layer of a twisted-pair cable (unit: mm)



Step 5 Feed the four twisted pairs through the wire holder (C), as shown in [Figure 9-20](#). Ensure that the colored wires are in the correct locations in the wire holder, as shown in [Figure 9-21](#).

Figure 9-20 Leading wires through the wire holder

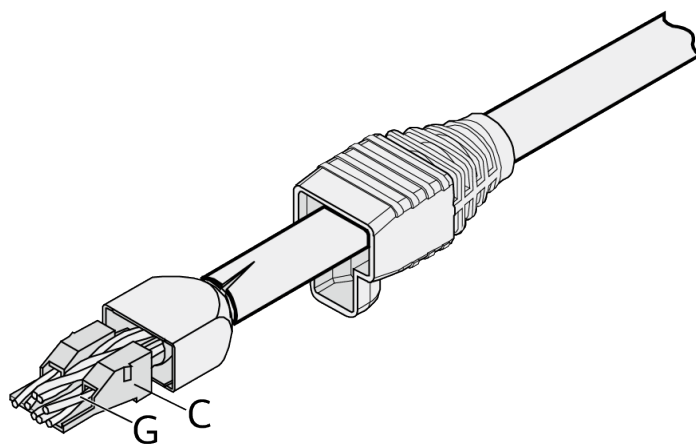
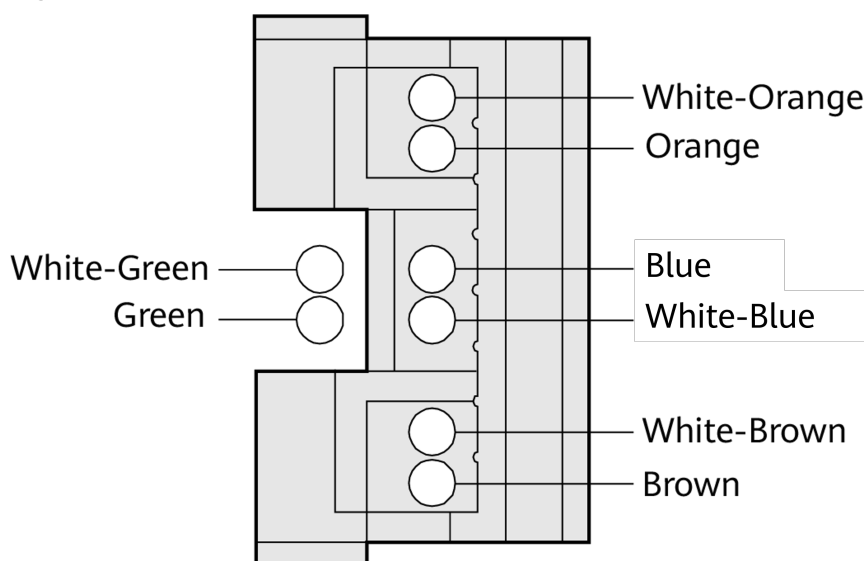


Figure 9-21 Cable locations in a wire holder



Step 6 Align the four pairs of wires (G) in the wire holder (C), as shown in [Figure 9-22](#). The connections between the wires and the pins are shown in [Figure 9-23](#) and listed in [Table 9-5](#).

Figure 9-22 Four pairs of cables on a wire holder

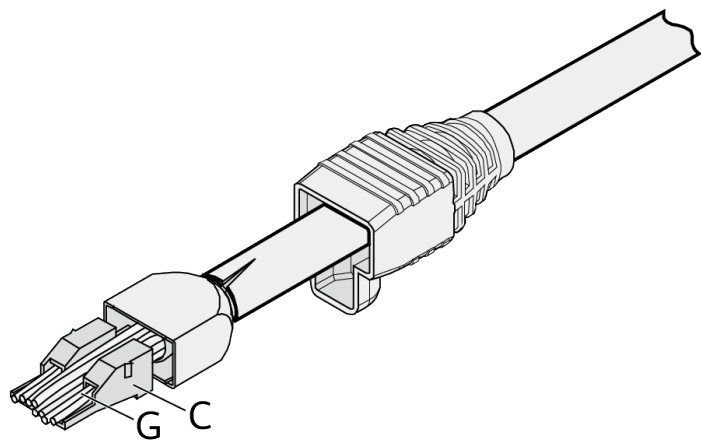


Figure 9-23 Connections between wires and pins

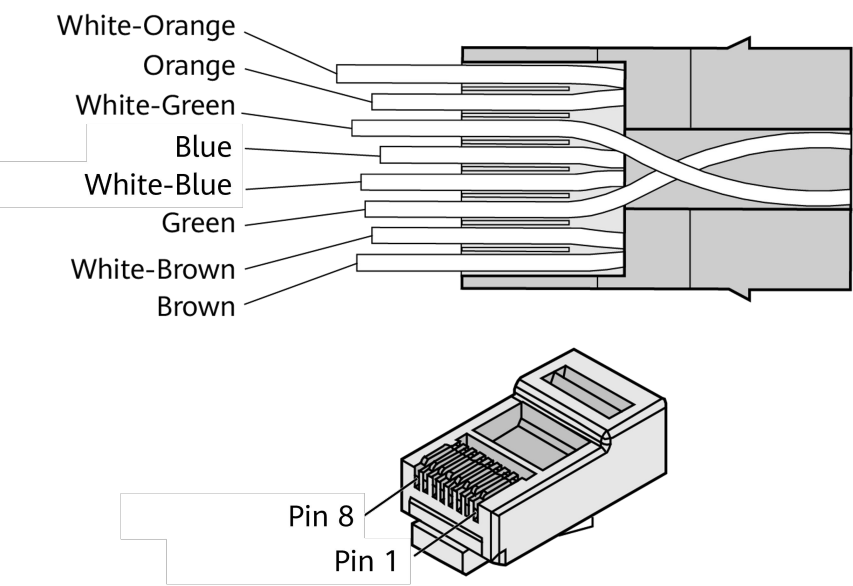


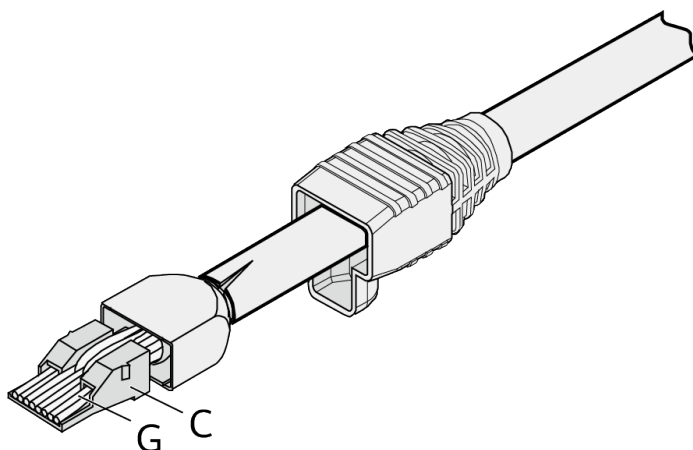
Table 9-5 Connections between wires and pins (using a straight-through cable as an example)

Matching Pin	Wire Color
1	White-Orange
2	Orange
3	White-Green
4	Blue
5	White-Blue

Matching Pin	Wire Color
6	Green
7	White-Brown
8	Brown

Step 7 Cut off the surplus wires along the lower edge of the wire holder, as shown in [Figure 9-24](#).

Figure 9-24 Cutting off surplus cables

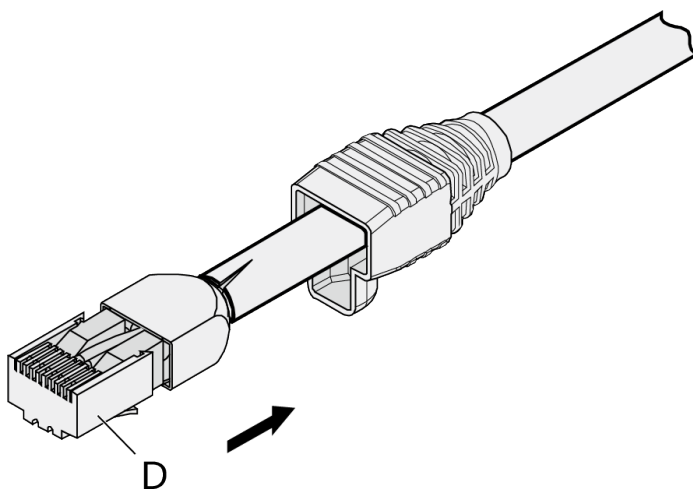


Step 8 Fit the connector plug (D) onto the wire holder and turn the metal shell by 90 degrees, as shown in [Figure 9-25](#).

NOTE

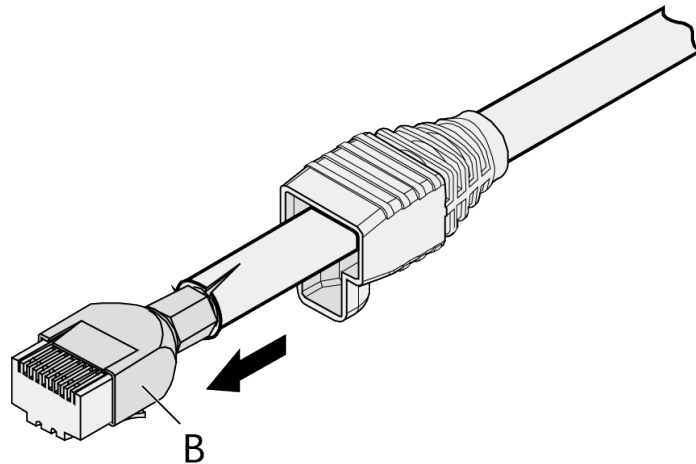
Ensure that the wire holder is in good contact with the connector body.

Figure 9-25 Fitting the connector body onto the wire holder



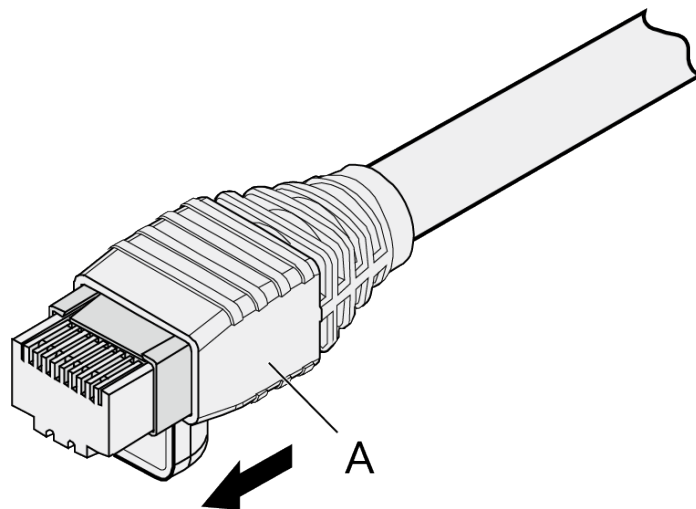
Step 9 Push the metal shell (B) toward the connector plug until the wire holder and the connector plug are engaged completely, and then crimp the connector, as shown in [Figure 9-26](#).

Figure 9-26 Crimping the connector



Step 10 Push the connector jacket (A) towards the metal shell until the metal shell is covered, as shown in [Figure 9-27](#). The assembly of one end of the cable is now complete.

Figure 9-27 Pushing the metal shell



Step 11 Repeat steps 1 to 10 to complete the assembly of the other end of the cable.

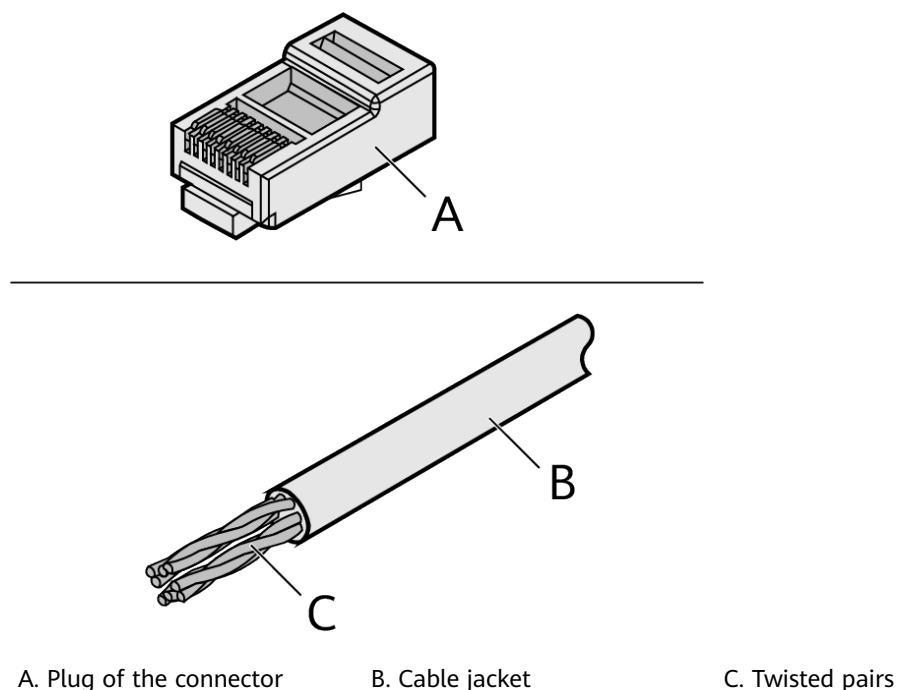
----End

9.1.3.2 Assembling an Unshielded RJ45 Connector and an Ethernet Cable

Context

[Figure 9-28](#) shows the components of an unshielded RJ45 connector and an Ethernet cable.

Figure 9-28 Components of an unshielded RJ45 connector and Ethernet cable



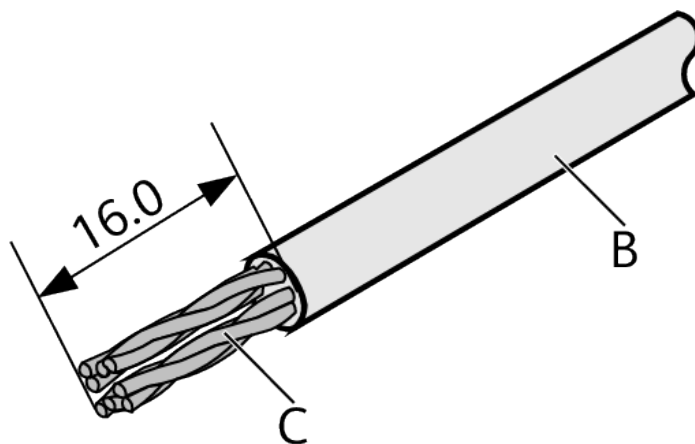
Procedure

Step 1 Strip 16 mm of the jacket, as shown in [Figure 9-29](#).

NOTICE

When you remove the shield layer, do not damage the insulation of the twisted-pair cable.

Figure 9-29 Removing the jacket of a twisted-pair cable (unit: mm)



Step 2 Arrange the twisted pairs according to the color order shown in [Figure 9-30](#), and cut off the ends neatly. [Table 9-6](#) lists the mapping between core wire colors and pins.

Figure 9-30 Connections between wires and pins (unit: mm)

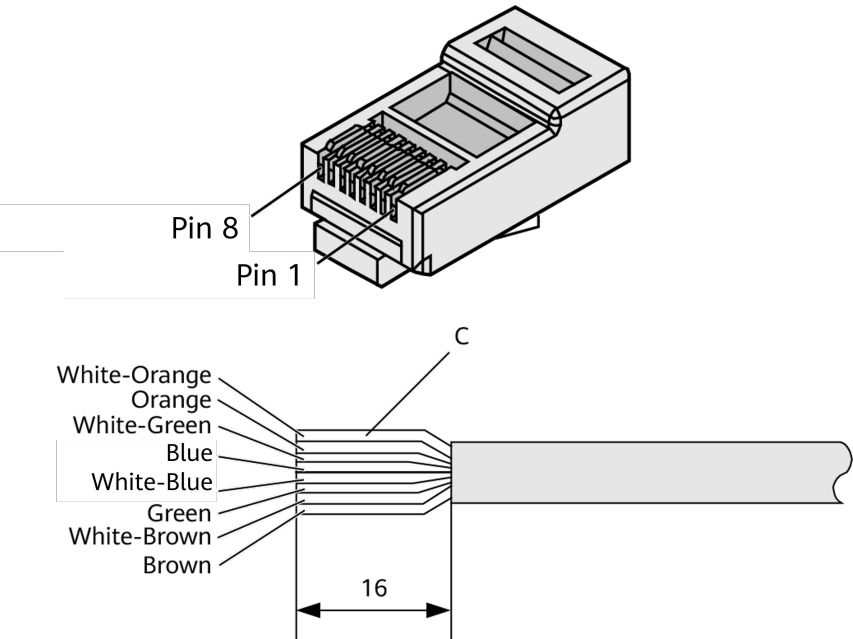


Table 9-6 Connections between wires and pins (using a straight-through cable as an example)

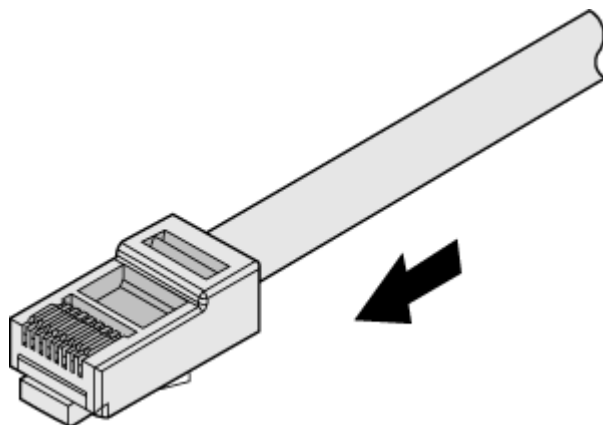
Matching Pin	Wire Color
1	White-Orange
2	Orange
3	White-Green
4	Blue
5	White-Blue
6	Green
7	White-Brown
8	Brown

Step 3 Feed the wires into the connector plug, and crimp the connector, as shown in [Figure 9-31](#).

 NOTE

When feeding the wires into the connector plug, observe from the side or bore of the plug to ensure that the wires are completely seated in the plug.

Figure 9-31 Crimping the connector



Step 4 Repeat steps 1 to 3 to complete the assembly of the other end of the cable.

----End

9.1.3.3 Checking the Appearance of Metal Contact Strips

Context

- To ensure proper contact between the crimped parts and core wires, the heights and sizes of the metal contact strips must be uniform and standard.
- The metal contact strips must be parallel to each other, with an error of no more than $\pm 5^\circ$. The top edge of a metal contact strip must be parallel to the axis of the RJ45 connector, with an error of less than ± 10 degrees.
- To ensure proper conduction, the surface of each metal contact strip must be clean.
- Metal contact strips must be in good contact with the RJ45 socket. RJ45 plastic separators must remain intact and be neatly arranged with equal spacing.
- The crimping edges of metal contact strips must surpass the ends of core wires. The end of each core wire must be in contact with the end face of the RJ45 cable trough. Theoretically, the distance between them must be in the range from 0 mm to 0.5 mm.

Procedure

Step 1 Hold the crimped connector, with the front side facing you, and check whether the contact strips are of the same height. The height should be 6.02 ± 0.13 mm (0.237 ± 0.005). If you have no professional measuring tool, you can visually compare the connector with a standard connector. [Figure 9-32](#) shows a non-compliant connector, and [Figure 9-33](#) shows a compliant connector.

NOTE

All non-compliant pieces must be crimped again.

Figure 9-32 Contact strips at different heights



Figure 9-33 Contact strips at the same height



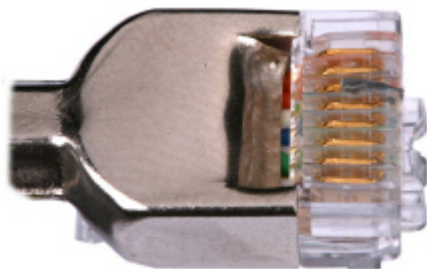
Step 2 Hold an RJ45 connector and turn it 45°. Observe the top edges of the metal contact strips. **Figure 9-34** shows a non-compliant connector.

Figure 9-34 Unparallel contact strips of different heights



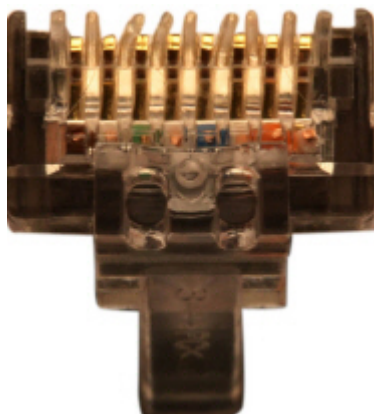
Step 3 Check whether the contact strips are clean. Remove the perceptible objects, dirt, or rust, if there is any. If you cannot remove these, the connector is non-compliant. Replace the RJ45 connector. **Figure 9-35** shows a non-compliant connector.

Figure 9-35 Dirt on a contact strip



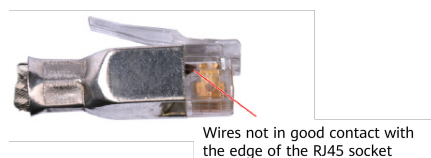
Step 4 Check whether the contact strips and the plastic separators are well aligned and intact. If a part is bent and cannot be fixed, replace the RJ45 connector. **Figure 9-36** shows a non-compliant connector.

Figure 9-36 Bent plastic separators



Step 5 Hold the RJ45 connector, with its end face facing you. Check whether you can see the cross-sections of the core wires. Ensure that the ends of the wires are in good contact with the edge of the RJ45, and that the contact strip blade extends beyond the ends of the wires and is crimped with the wires. If not, replace the RJ45 connector. **Figure 9-37** shows a non-compliant connector.

Figure 9-37 Wires not in good contact with the edge of the RJ45 socket



----End

9.1.3.4 Testing the Connectivity of Assembled Ethernet Cables

Context

Huawei provides two types of Ethernet cables: straight-through cables and crossover cables.

- Straight-through cables are connected in a one-to-one manner. They are used to connect terminal devices such as a PC or switch to network devices. [Table 9-7](#) lists the connections of core wires in a straight-through cable.

Table 9-7 Connections of core wires in a straight-through cable

RJ45 Connector 1	RJ45 Connector 2	Core Wire Color	Twisted or Not
2	2	Orange	Twisted
1	1	Orange-White	
6	6	Green	Twisted
3	3	Green-White	
4	4	Blue	Twisted
5	5	Blue-White	
8	8	Brown	Twisted
7	7	Brown-White	

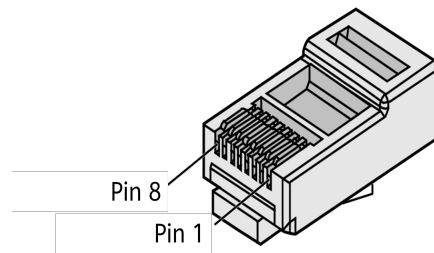
- Crossover cables are connected in a crossover manner. They are used to connect terminals to each other, such as PCs or switches. [Table 9-8](#) lists the connections of core wires in a crossover cable.

Table 9-8 Connections of core wires in a straight crossover cable

RJ45 Connector 1	RJ45 Connector 2	Core Wire Color	Twisted or Not
6	2	Orange	Twisted
3	1	Orange-White	
2	6	Green	Twisted
1	3	Green-White	
4	4	Blue	Twisted
5	5	Blue-White	
8	8	Brown	Twisted
7	7	Brown-White	

[Figure 9-38](#) shows the pins of an RJ45 connector.

Figure 9-38 Pins of an RJ45 connector



Procedure

- Step 1** Insert the RJ45 connectors at the two ends of an assembled Ethernet cable into the RJ45 female ports of the cable tester.
- Step 2** After the connectors are properly inserted, turn on the tester. If the indicators from 1 to G turn on simultaneously, you can infer that the pins work normally and the wires are correctly connected.

NOTE

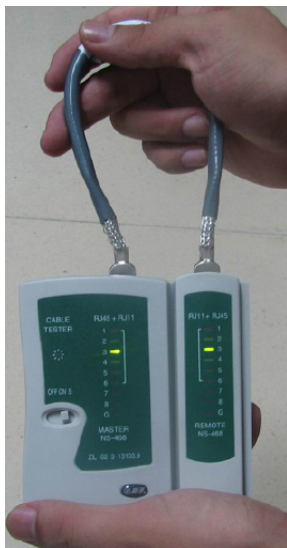
Move the switch to the S position to slow down lighting of the indicators so that you can observe the indicators more clearly, as shown in [Figure 9-39](#).

Figure 9-39 Testing the conduction and connections of wires



- Step 3** Gently shake the connectors and repeat [Step 2](#) to check whether the metal contact strips are in good contact with the core wires and the female ports, as shown in [Figure 9-40](#).

Figure 9-40 Checking the reliability



The procedure for testing a crossover Ethernet cable is the same as that for testing a straight-through cable except for the sequence in which the indicators go on. The crossover Ethernet cable needs to be tested according to its wire connections.

A crossover cable is compliant if the indicators turn on in the following sequence:

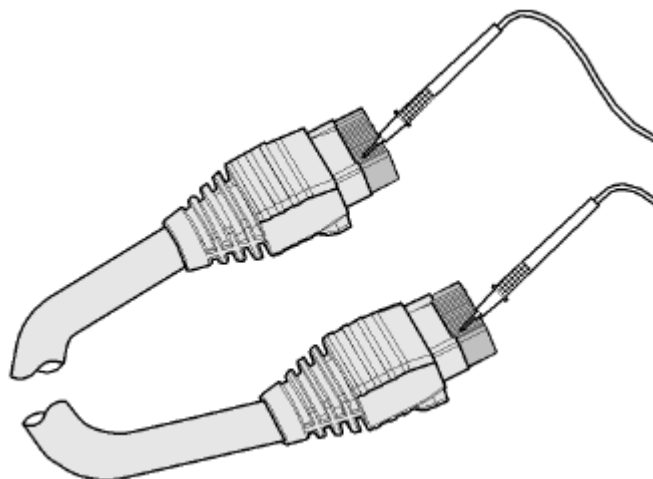
If the indicators on the master end go on in the 1-8-G sequence and the indicators on the slave end go on in the 3-6-1-4-5-2-7-8-G sequence, the cable continuity is normal.

If the indicators do not come on in this sequence or some of the indicators do not go on, the Ethernet cable is non-compliant.

NOTE

If no cable tester is available, use a multimeter (ohms range) to perform a simple continuity test, as shown in [Figure 9-41](#).

Figure 9-41 Testing the connectivity of an Ethernet cable



----End

9.1.4 Installing Cable Accessories

9.1.4.1 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 9-9](#).

Table 9-9 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.

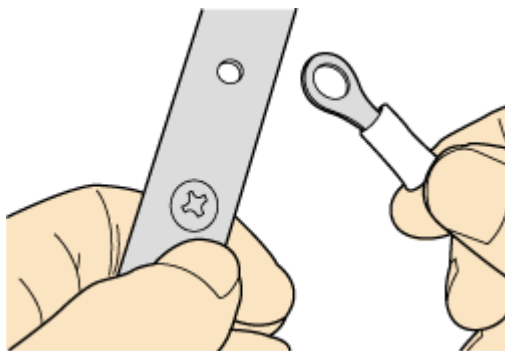
9.1.4.2 Installing Power Adapters

9.1.4.2.1 Installing an 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 9-42](#).

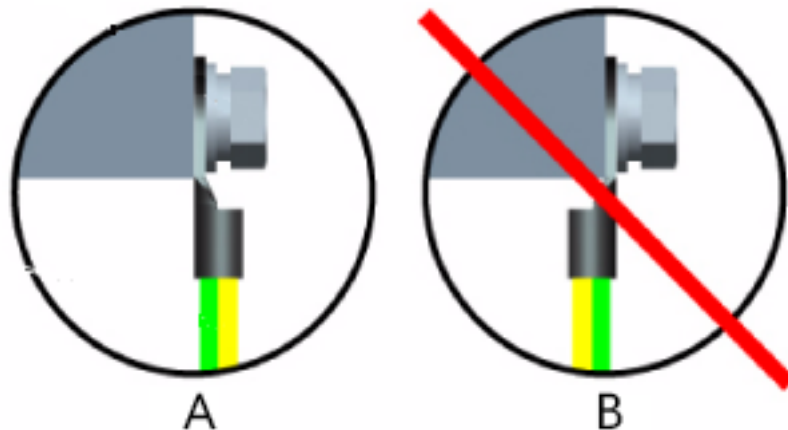
Figure 9-42 Aligning the OT terminal with a connecting hole



 NOTE

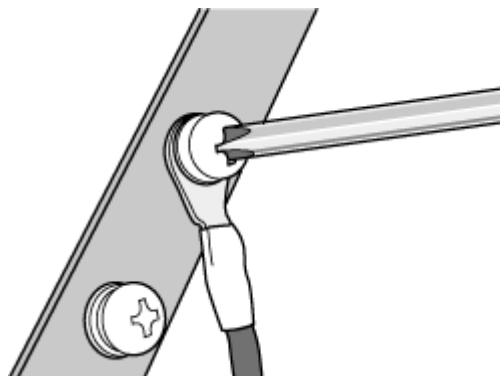
When you install an OT terminal, make sure that the crimping sleeve is installed correctly. In [Figure 9-43](#), A shows the correct orientation while B shows the incorrect orientation.

Figure 9-43 Installing an OT terminal, showing the orientation of crimping sleeve



- b. Place the spring washer and then the flat washer, mount a matching screw, and fasten it clockwise, as shown in [Figure 9-44](#).

Figure 9-44 Installing two terminals back to back

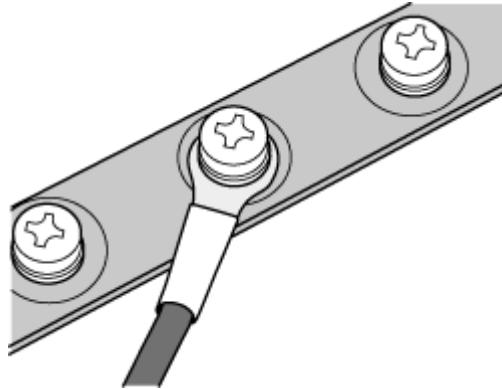


NOTICE

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

- c. Pull the cable gently to check that it is securely installed. [Figure 9-45](#) shows a well-connected OT terminal.

Figure 9-45 Installed OT terminal



- Install two OT terminals on a post.

Before installing 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 9-46](#).
- Cross the two OT terminals, as shown in [Figure 9-47](#).

Figure 9-46 Bending the upper OT terminal at a 45- or 90-degree angle

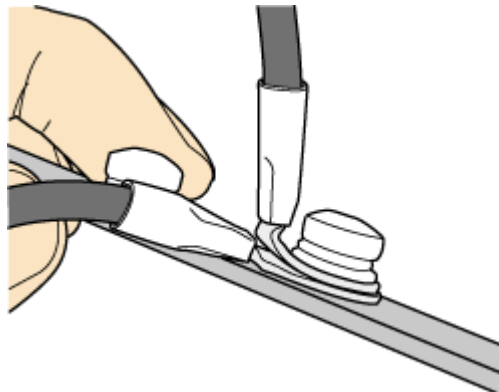
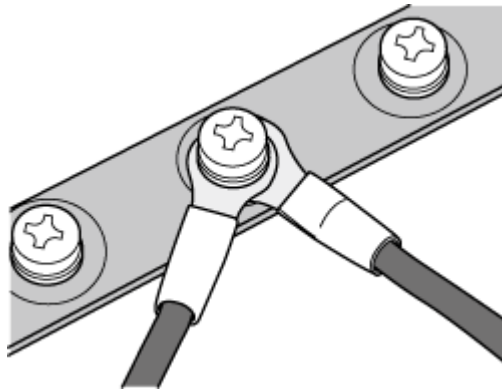


Figure 9-47 Crossing two OT terminals



NOTICE

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

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

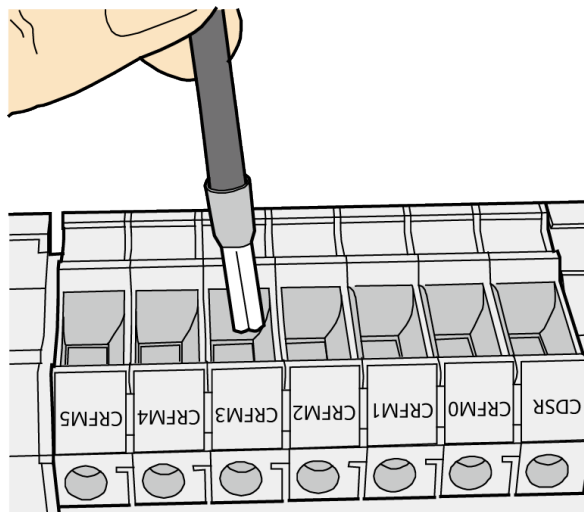
----End

9.1.4.2.2 Installing the Cord End Terminal

Procedure

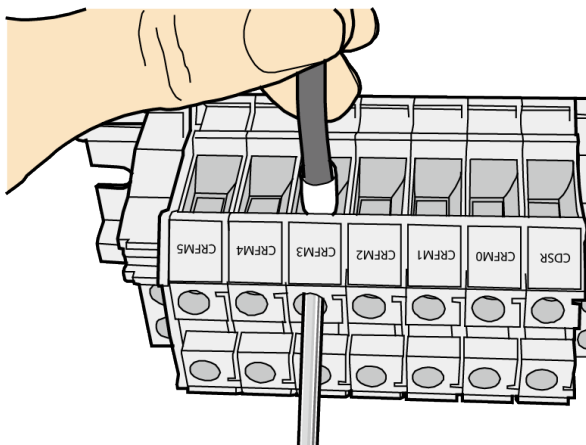
- Step 1** Hold a cord end terminal upright and place it over a terminal block, as shown in [Figure 9-48](#). To ensure the largest area of contact, place the plain side of the terminal so that it is facing outwards.

Figure 9-48 Placing a terminal on a terminal jack vertically



- Step 2** Feed the terminal into the terminal jack vertically, and fasten the terminal by turning the matching screw clockwise, as shown in [Figure 9-49](#).

Figure 9-49 Feeding the cord end terminal into the terminal block



NOTICE

- Ensure that the exposed section of the terminal is less than 2 mm in length.
- Do not press the insulation of the terminal.
- Feed only one terminal into one block.

- Step 3** Pull the cable gently to check that it is securely installed.

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

----End

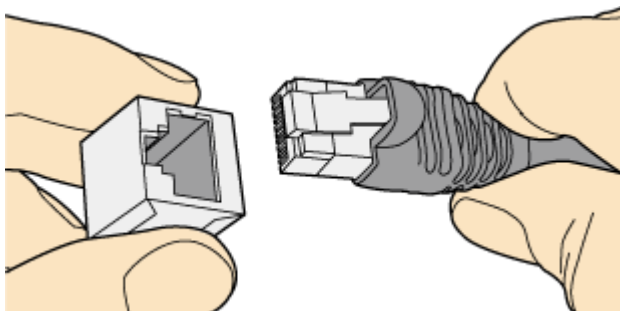
9.1.4.3 Installing Ethernet Adapters

9.1.4.3.1 Installing a Shielded Ethernet Connector

Procedure

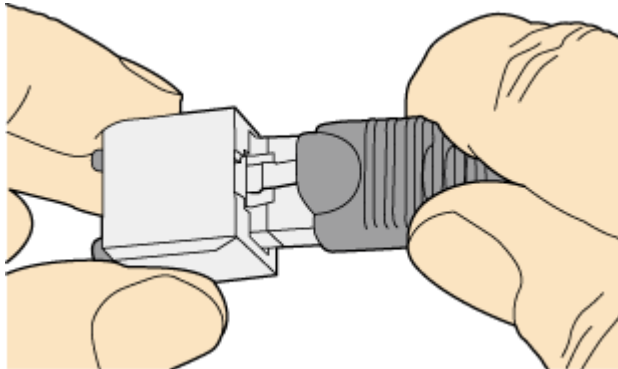
- Step 1** Hold the male and female connectors, with the male connector facing the female connector, as shown in [Figure 9-50](#).

Figure 9-50 Holding the male and female shielded connectors



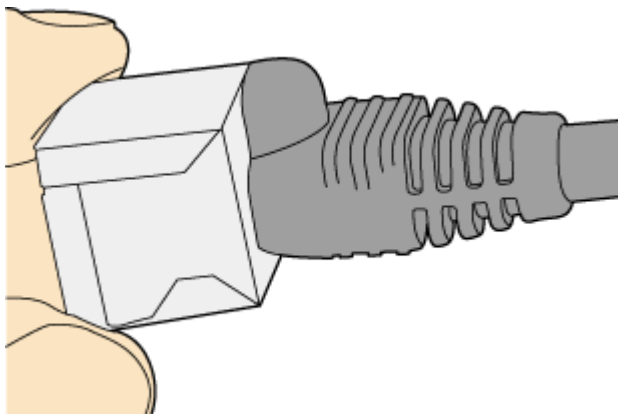
Step 2 Insert the male connector into the female connector, as shown in [Figure 9-51](#).

Figure 9-51 Feeding the male shielded connector into the female shielded connector



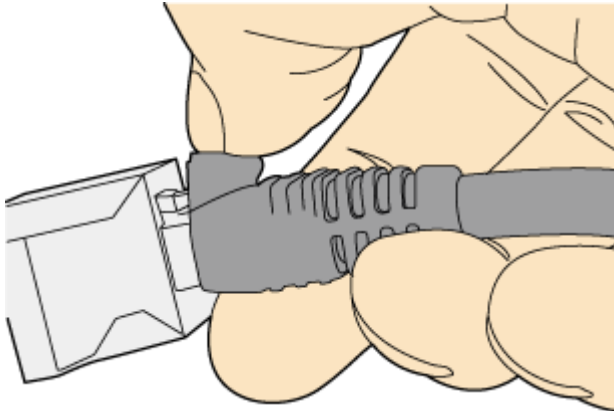
Step 3 When you hear a click, the cable connector is completely inserted in the port. (The clip on the cable connector pops up to fix the connector in the port.) Pull the connector slightly and ensure that it is securely connected, as shown in [Figure 9-52](#).

Figure 9-52 Installed shielded Ethernet connector



Step 4 To remove an Ethernet connector, press the locking key and pull out the connector, as shown in [Figure 9-53](#).

Figure 9-53 Removing a shielded Ethernet connector



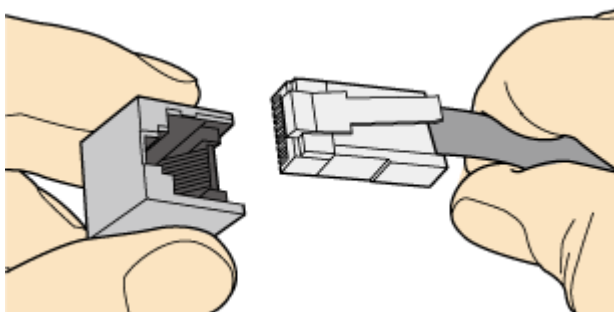
----End

9.1.4.3.2 Installing an Unshielded Ethernet Connector

Procedure

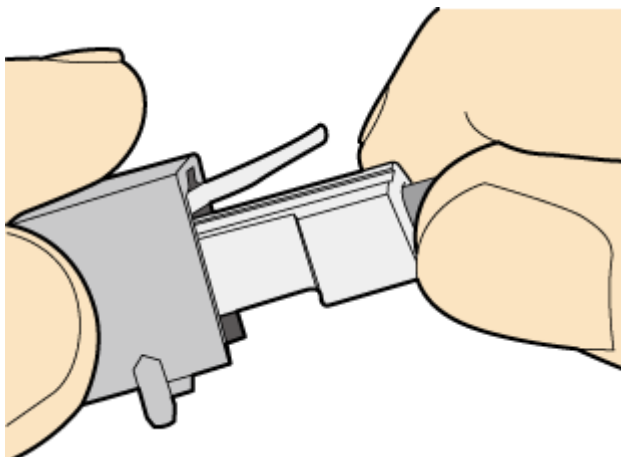
- Step 1** Hold the male and female connectors, with the male connector facing the female connector, as shown in [Figure 9-54](#).

Figure 9-54 Holding the male and female unshielded connectors



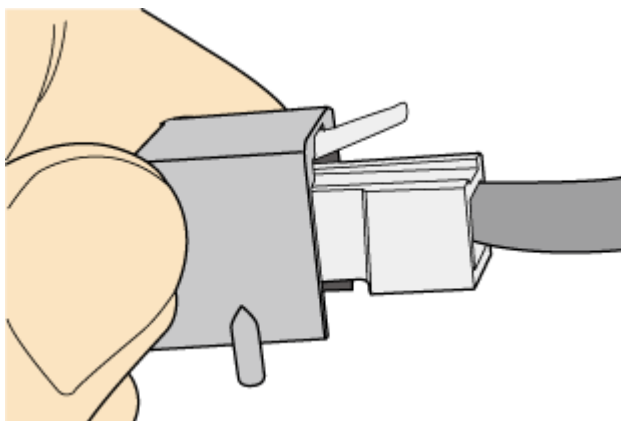
- Step 2** Feed the male connector into the female connector, as shown in [Figure 9-55](#).

Figure 9-55 Feeding the male connector into the female unshielded connector



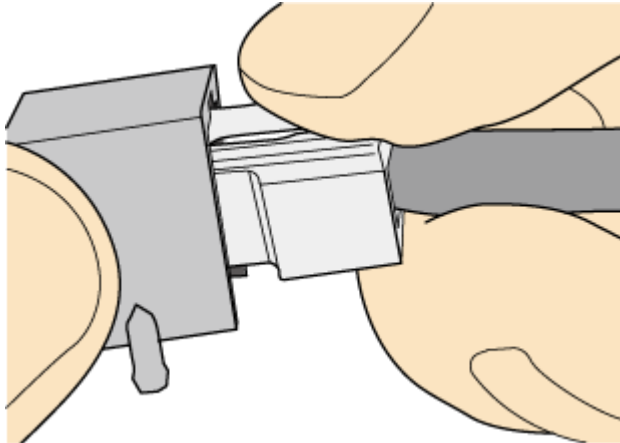
Step 3 A crisp click indicates that the connector is locked by the locking key. Pull the connector slightly and ensure that it is securely connected. [Figure 9-56](#) shows an installed Ethernet connector.

Figure 9-56 Installed unshielded Ethernet connector



Step 4 To remove an Ethernet connector, press the locking key and pull out the connector, as shown in [Figure 9-57](#).

Figure 9-57 Removing an unshielded Ethernet connector



----End

9.1.4.4 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.

9.1.4.4.1 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.

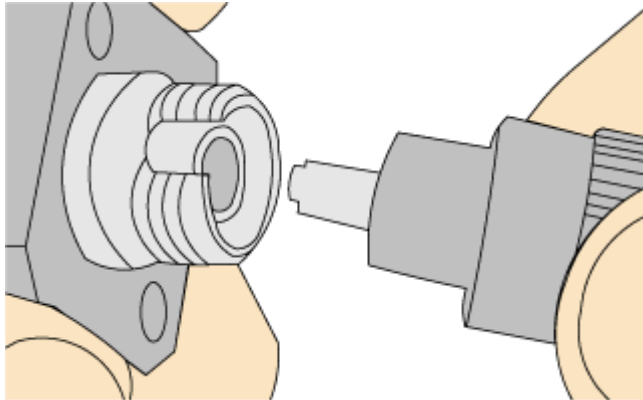
----End

9.1.4.4.2 Installing an FC Fiber Connector

Procedure

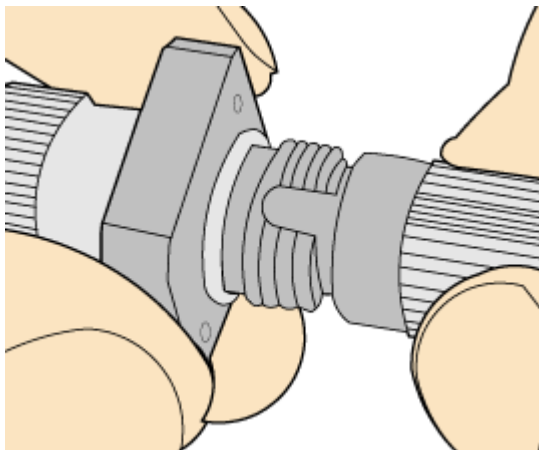
- Step 1** Remove the dustproof cap of the FC connector and store it for future use.
- Step 2** Align the core pin of the male connector with that of the female connector, as shown in [Figure 9-58](#).

Figure 9-58 Aligning the male connector with the female connector



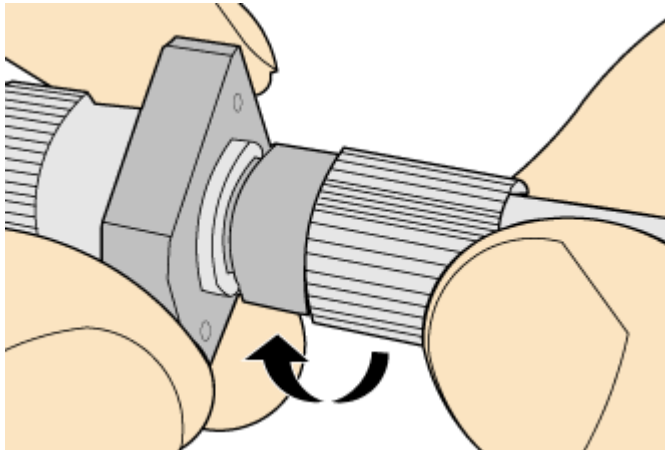
- Step 3** Align the male connector with the female connector and gently push the male connector until it is completely seated in the female connector, as shown in [Figure 9-59](#).

Figure 9-59 Feeding the male connector into the female connector



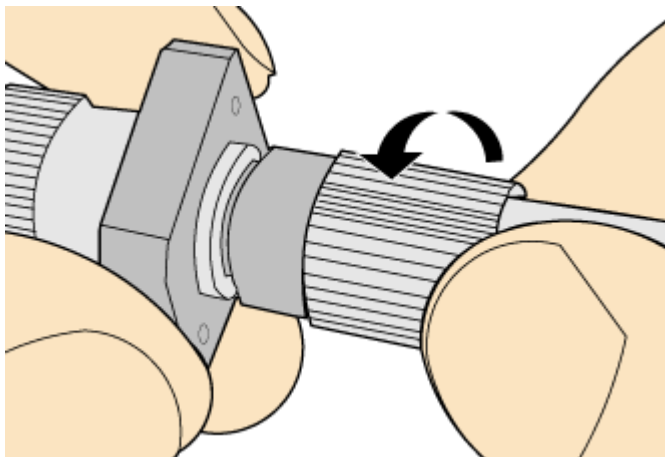
- Step 4** Fasten the locking nut clockwise and ensure that the connector is securely installed, as shown in [Figure 9-60](#).

Figure 9-60 Fastening the locking nut



Step 5 To disassemble an FC fiber connector, loosen the locking nut counterclockwise, and gently pull the male connector, as shown in [Figure 9-61](#).

Figure 9-61 Disassembling an FC fiber connector



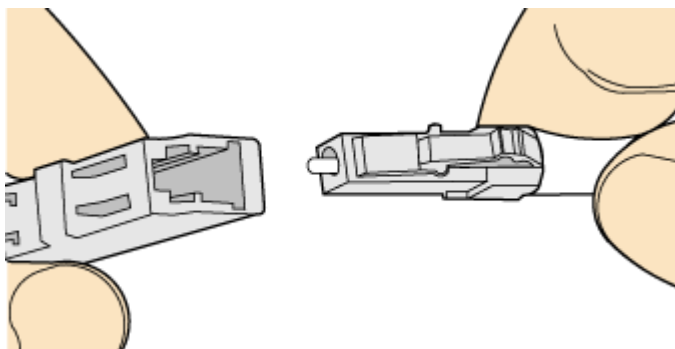
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9.1.4.4.3 Installing an LC Fiber Connector

Procedure

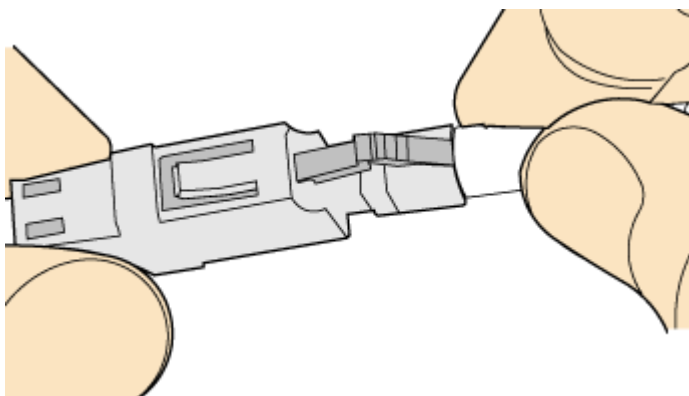
- Step 1** Remove the dustproof cap of the LC fiber connector and store it for future use.
- Step 2** Align the core pin of the male connector with that of the female connector, as shown in [Figure 9-62](#).

Figure 9-62 Aligning the male connector with the female connector



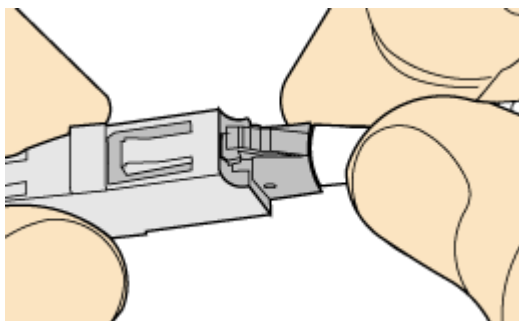
Step 3 Align the male connector with the fiber adapter and gently push the male connector until it is completely seated in the fiber connector, as shown in [Figure 9-63](#).

Figure 9-63 Feeding the male connector into the female connector



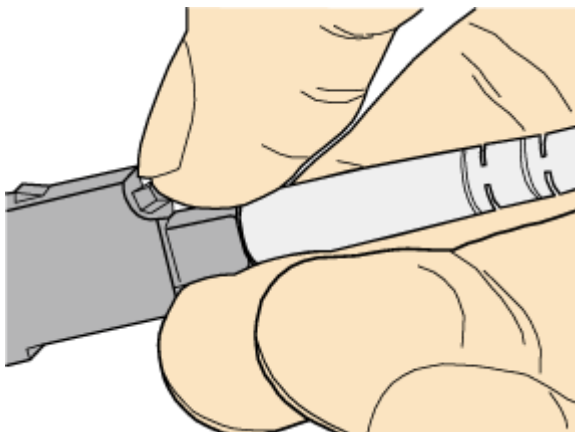
Step 4 A clicking sound indicates that the male connector is locked, as shown in [Figure 9-64](#).

Figure 9-64 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 9-65](#).

Figure 9-65 Disassembling an LC fiber connector



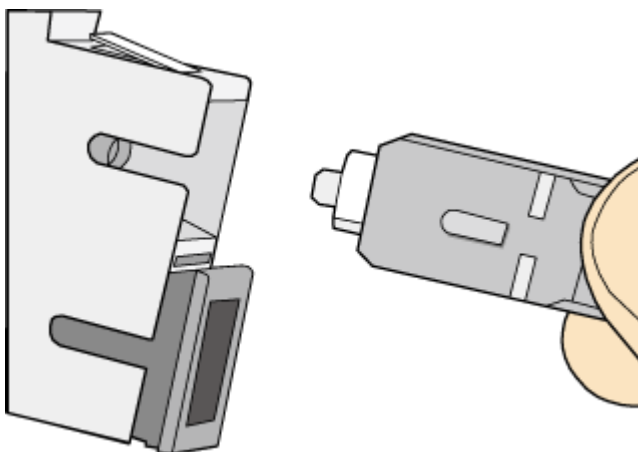
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9.1.4.4.4 Installing the SC Fiber Connector

Procedure

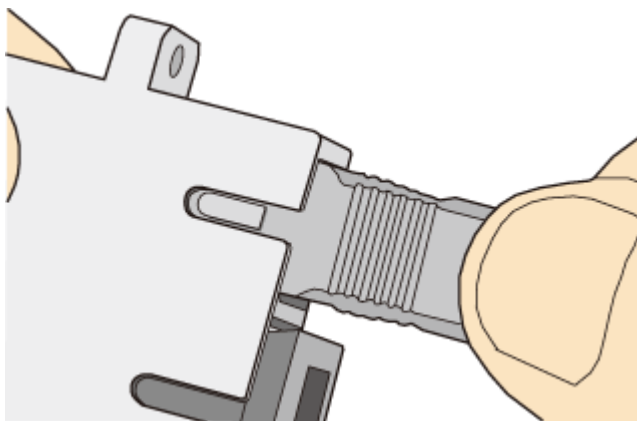
- Step 1** Remove the dustproof cap of the SC fiber connector and store it for future use.
- Step 2** Align the core pin of the male connector with that of the female connector, as shown in [Figure 9-66](#).

Figure 9-66 Aligning the male connector with the female connector



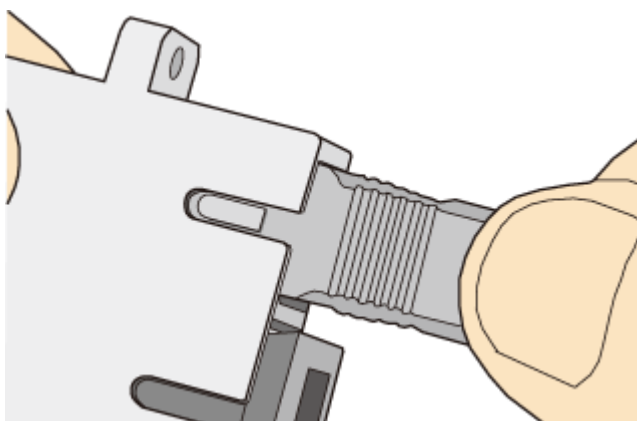
- Step 3** Feed the fiber connector into the female connector, with your fingers holding the shell of the fiber connector (not the pigtail). When you hear a click, the fiber connector is secured by the clips (internal parts, not illustrated in the figure). Pull the fiber connector gently. If the connector does not loosen, the installation is complete. See [Figure 9-67](#).

Figure 9-67 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 9-68](#).

Figure 9-68 Disassembling an SC fiber connector



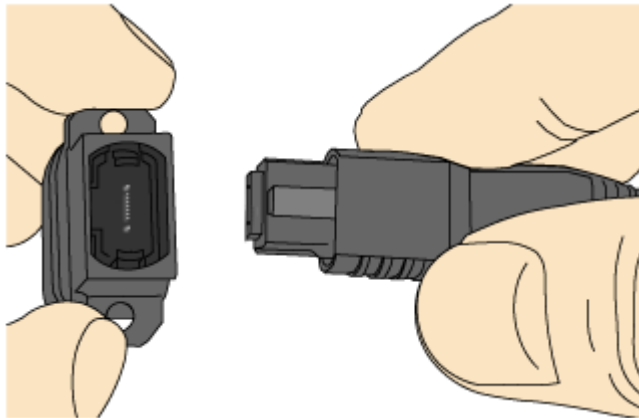
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9.1.4.4.5 Installing an MPO Connector

Procedure

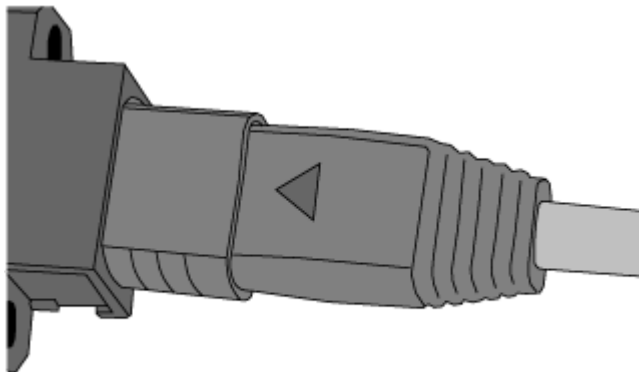
- Step 1** Remove the dustproof cap of the MPO fiber connector and store it for future use.
- Step 2** Align the core pin of the male connector with that of the female connector, as shown in [Figure 9-69](#).

Figure 9-69 Aligning the male connector with the female connector



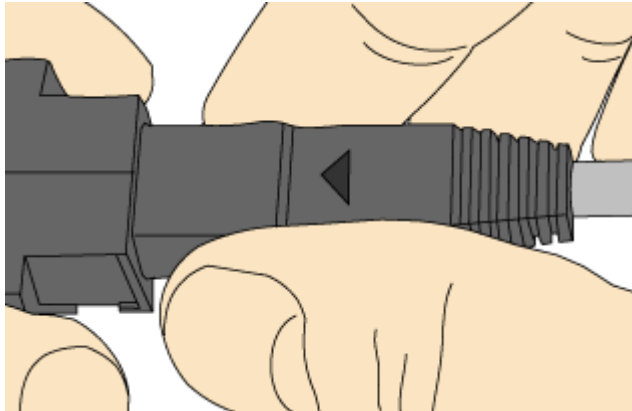
- Step 3** Hold the shell labeled "PUSH" and feed the male connector into the female connector until you hear a clicking sound. The male and female connectors are securely installed, as shown in [Figure 9-70](#).

Figure 9-70 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 9-71](#).

Figure 9-71 Disassembling an MPO fiber connector



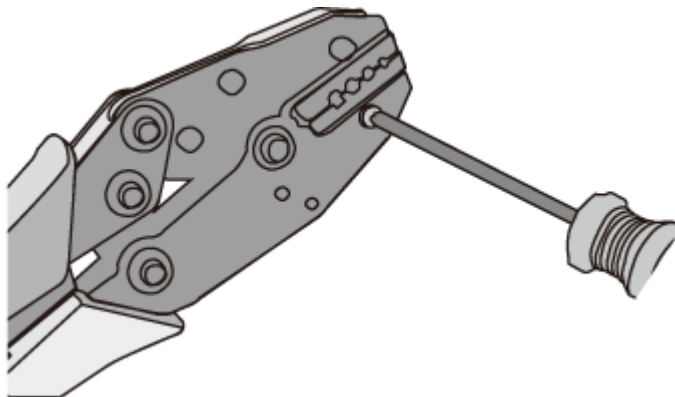
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9.1.5 Replacing the Mold of the Crimping Tool

Procedure

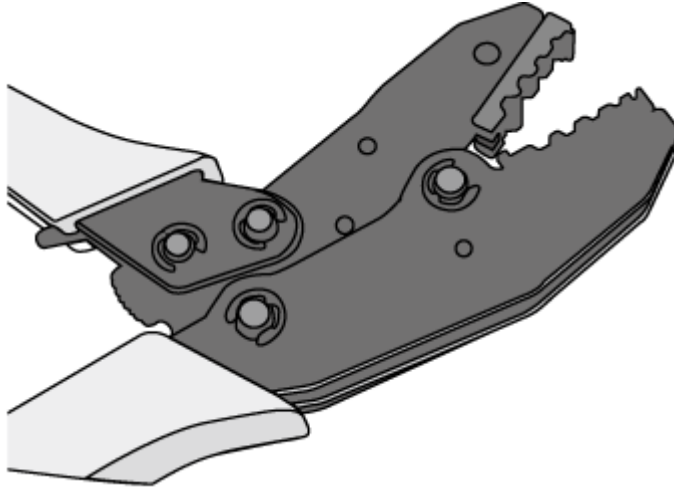
- Step 1** Hold the handles of a pair of COAX crimping tools. Loosen the two fastening screws counterclockwise, as shown in [Figure 9-72](#).

Figure 9-72 Loosening two fastening screws



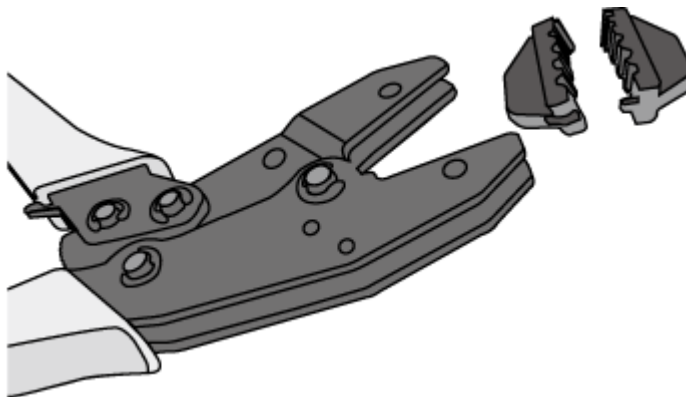
- Step 2** Hold the handles of the COAX crimping tools to open the self-locking mechanism. The jaw of the COAX crimping tools opens automatically, as shown in [Figure 9-73](#).

Figure 9-73 Pliers jaw opening automatically



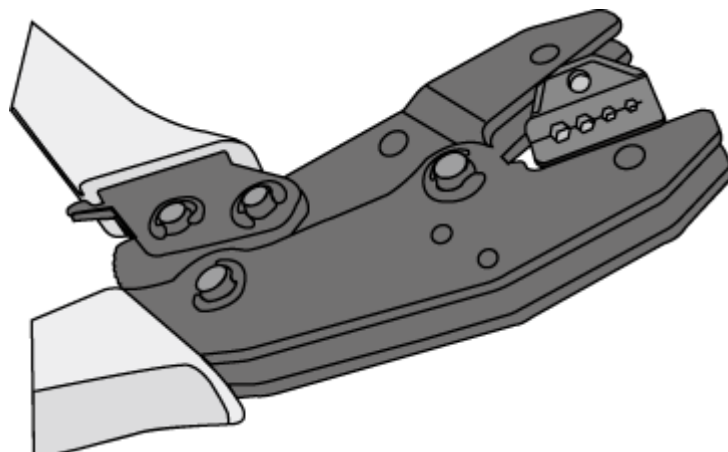
Step 3 Remove the mold from the COAX crimping tools, as shown in [Figure 9-74](#).

Figure 9-74 Removing the mold from the COAX crimping tools



Step 4 Place the mold to be installed into the jaw of the COAX crimping tools and align the screw holes, as shown in [Figure 9-75](#).

Figure 9-75 Installing a new mold in the COAX crimping tool

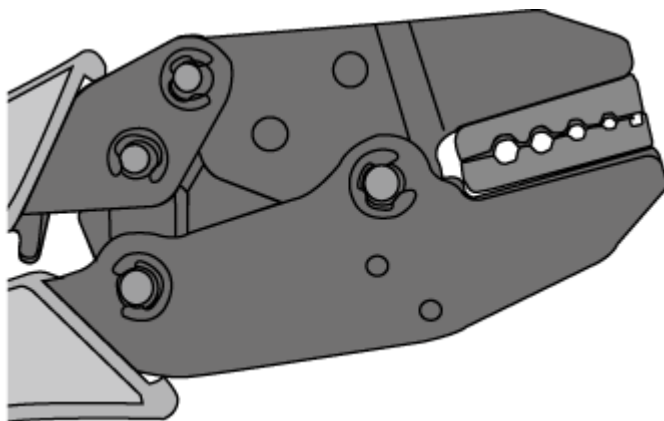


NOTICE

Keep the short side of the mold inwards and the long side outwards, with the teeth of the mold aligning from the larger size to the smaller size.

- Step 5** Hold the handles of the COAX crimping tools tightly to match the mold and the jaw completely. Align the screw holes, as shown in [Figure 9-76](#).

Figure 9-76 Aligning the screw holes



- Step 6** Hold the handles of the COAX crimping tools with one hand. Tighten the two fastening screws clockwise. [Figure 9-77](#) and [Figure 9-78](#) shows the mold installed in the COAX crimping tool.

Figure 9-77 Mold installed in the COAX crimping tool

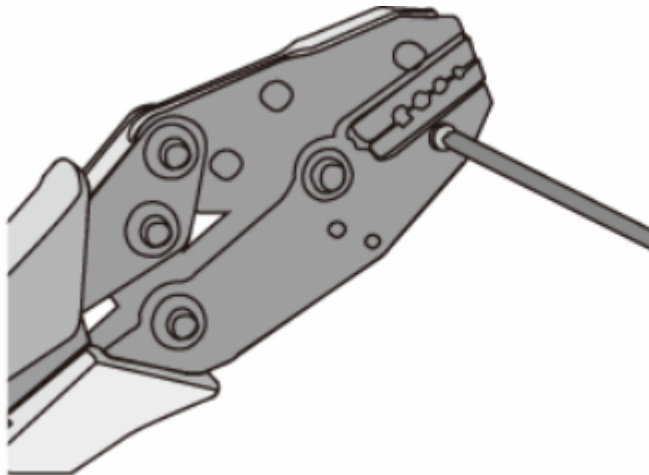
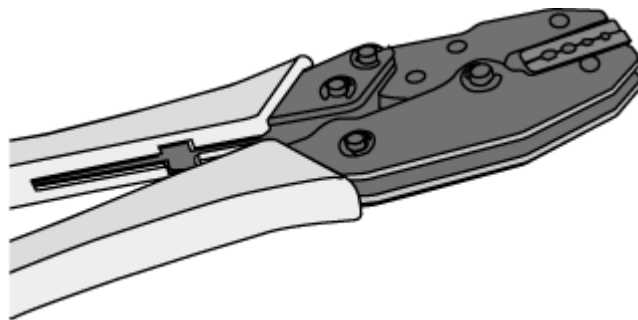


Figure 9-78 An installed mold



----End

9.2 Appendix B: Environmental Requirements for Device Operation

9.2.1 Environmental Requirements for an Equipment Room

9.2.1.1 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:

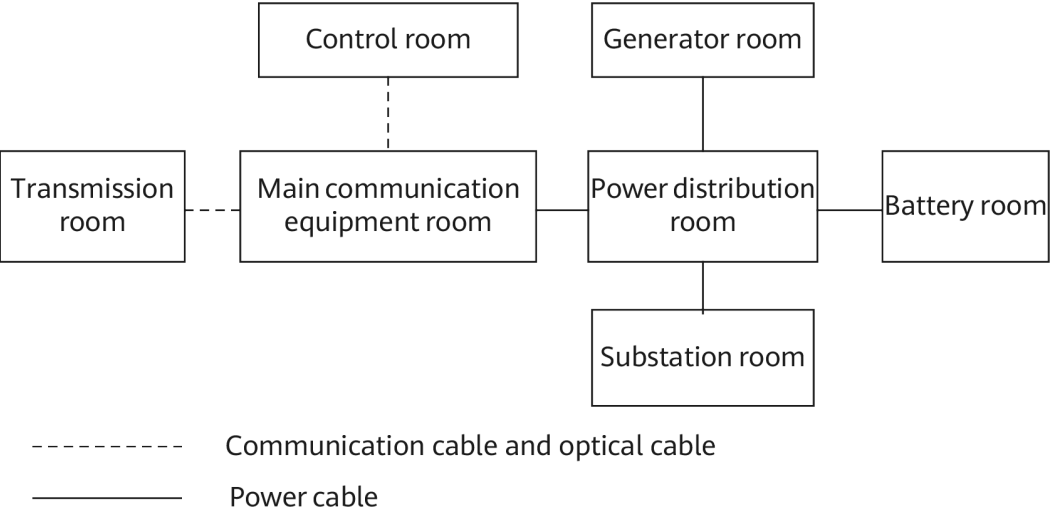
- The room should be located at a distance of at least 5 km (3.11 mi.) from heavy pollution sources such as smelting and coal mines. It should be located at a distance of at least 3.7 km (2.30 mi.) from moderate pollution sources such as chemical, rubber, and galvanization factories. It should be located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

9.2.1.2 Equipment Room Layout

An equipment room typically houses mobile switching equipment, telecommunications equipment, power supply equipment, and other auxiliary equipment. To facilitate maintenance and management, place equipment in different rooms. [Figure 9-79](#) shows the plane layout of an equipment room.

Figure 9-79 Layout of the equipment room



- The general layout rules for an equipment room are as follows:
- It should meet requirements for laying out and maintaining communication cables and power cables.
 - Cabling distance should be minimized to simplify maintenance, reduce potential communication faults, and enhance overall efficiency.

9.2.1.3 Construction Requirements for the Equipment Room

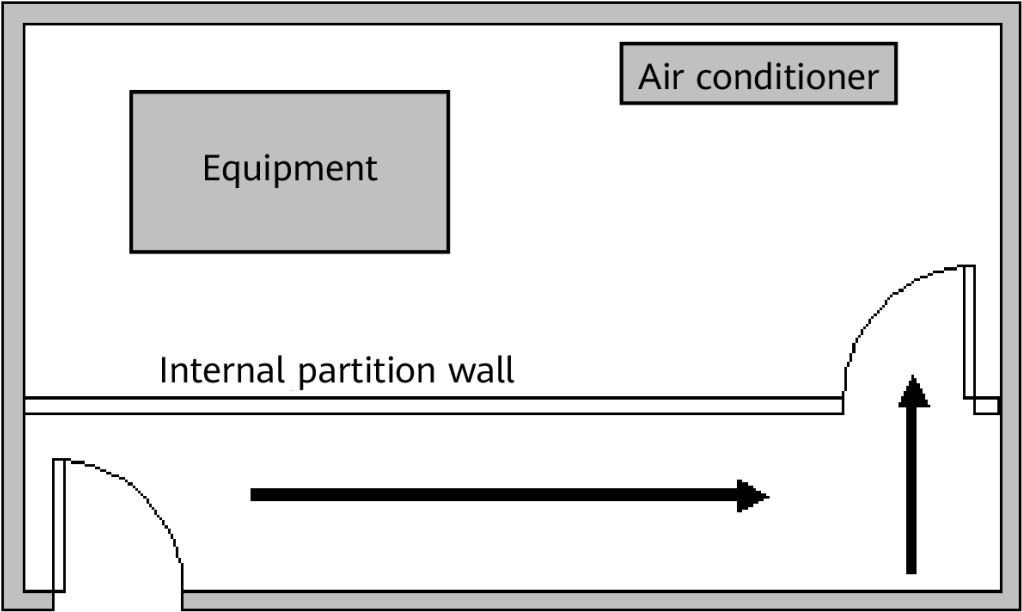
[Table 9-10](#) lists the construction requirements for the equipment room.

Table 9-10 Construction requirements for the equipment room

Item	Requirements
Area	The area of the equipment room should be large enough to accommodate not only the current equipment but also equipment that is expected to be added in the future.
Net height	The net height of the equipment room indicates the height below the beam or the ventilation pipe. It should not be less than 3 m.

Item	Requirements
Floor	The floor in the equipment room must be semi-conductive and dust-proof. A raised ESD floor is recommended. The floor boards should be laid tightly and firmly. For each square meter of floor space, the horizontal tolerance should not be greater than 2 mm. If raised floors are unavailable, use static electricity conductive floor material, with a volume resistivity of $1.0 \times 10^7 \Omega$ to $1.0 \times 10^{10} \Omega$. The static-electricity-conductive floor material or raised floor must be grounded so that the static electricity can be discharged. It can be connected with the grounding device through a current limiting resistor and connection lines. The resistance of the current limiting resistor is 1 M Ω .
Load-bearing capacity	The floor must bear loads larger than 150 kg/m ² .
Door and windows	The equipment room should have one door, which is 2 m high and 1 m wide. One door is enough. The door and windows must be equipped with dust-proof plastic sealing tapes. Double-layer glass windows are recommended and must be sealed 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, or storm sewers through the equipment room. Place a fire hydrant in the corridor or near the staircase outside the equipment room, but not in the equipment room itself.
Internal partition wall	Build an internal partition wall to 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 9-80 Internal partition wall inside the equipment room



9.2.1.4 Equipment Room Environment

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 9-11](#) lists the requirement for dust concentration in the equipment room.

Table 9-11 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
Description - Dust particle diameter ≥ 5 μm - Suspending dust diameter ≤ 75 μm 75 μm ≤ precipitable dust diameter ≤ 150 μm		

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.

9.2.1.5 Requirements for Corrosive Gases

The room should be free from dusts and corrosive gases, such as SO₂, H₂S, and NH₃. [Table 9-12](#) lists the requirements for the corrosive gas concentration.

Table 9-12 Requirements for corrosive gas concentration

Chemical active material	Unit	Concentration
SO ₂	mg/m ³	≤0.20
H ₂ S	mg/m ³	≤0.006
NH ₃	mg/m ³	≤0.05
Cl ₂	mg/m ³	≤0.01

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.
- 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.

9.2.1.6 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.

9.2.1.7 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.

9.2.1.8 Requirements for Lightning Proof Grounding

Table 9-13 lists the requirements for lightning proof grounding.

Table 9-13 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.
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).

Item	Requirements
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.
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.

Item	Requirements
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.).
Grounding of the cabinet	• All the devices including the surge protection device in the cabinet must be connected in an equipotential manner. The ground cables can be aggregated to the ground bar or surge protector socket first, and then the ground bar or surge protector socket can be connected to the ground. • The resistance between the device ground terminals and ground bar cannot exceed 0.1 ohm. • The cabinet can be grounded using the protecting earthing (PE) wire of the electrical network in the building, zinc-coated angle steel, or the main steel bar of the building. • If the cabinet is grounded using the PE wire of the electrical network, use a multimeter to test the grounding status. If the voltage between the PE wire and neutral wire is lower than 5 V and the voltage between the PE wire and live wire is about 220 V, the PE wire is grounded well. If the tested AC voltages are not within the ranges, the cabinet must be grounded in other ways. • The yellow-green ground cable contains multiple copper wires. The cross-sectional area of the ground cable must be no less than 6 mm² (0.0093 in.²) and the length cannot exceed 3 m (9.84 ft.). • Ground cables cannot be twisted with signal cables. • Antirust and anticorrosion measures must be taken on the ground terminals. • The fiber reinforcing rib can be directly connected to the ground bar of the cabinet. Before wrapping the reinforcing rib with insulation tape, cut a 0.5 m (1.64 ft.) segment from the reinforcing rib. Wrap the reinforcing rib with at least five layers of insulation tape. Keep the reinforcing rib at least 5 cm (1.969 in.) from the cabinet surface.

9.2.2 Requirements for Power Supply

9.2.2.1 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 9-14 lists the voltage range of the AC power supply for the devices.

Table 9-14 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.

9.2.2.2 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.

9.2.2.3 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 costs, 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 9-15 lists the specifications for the DC power supply.

Table 9-15 Specifications for the DC power supply

Item	Requirements
DC power capacity to support the surge current	Greater than 1.5 times the rated current

Item	Requirements
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 $\pm 5\%$
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 $\pm 5\%$.

9.2.2.4 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.

9.3 Appendix C: Equipment Grounding Specifications

9.3.1 General Grounding Specifications

[Table 9-16](#) shows the general grounding specifications.

Table 9-16 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.
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.

9.3.2 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.

9.3.3 Grounding Specifications for Devices

Table 9-17 lists the equipment grounding specifications.

Table 9-17 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.).

No.	Description
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.
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.

9.3.4 Grounding Specifications for Communications Power Supply

Table 9-18 shows the grounding specifications for communication power supplies.

Table 9-18 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.

No.	Description
6	Add surge protection on the DC power interface.

9.3.5 Grounding Specifications for Signal Cables

Table 9-19 lists the grounding specifications for signal cables.

Table 9-19 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.

9.3.6 Specifications for Laying Out Grounding Cables

Table 9-20 shows the specifications for the ground cable.

Table 9-20 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.

No.	Description
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).

9.4 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, as well as 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.

9.4.1 Introduction to Labels

9.4.1.1 Label Materials

Features:

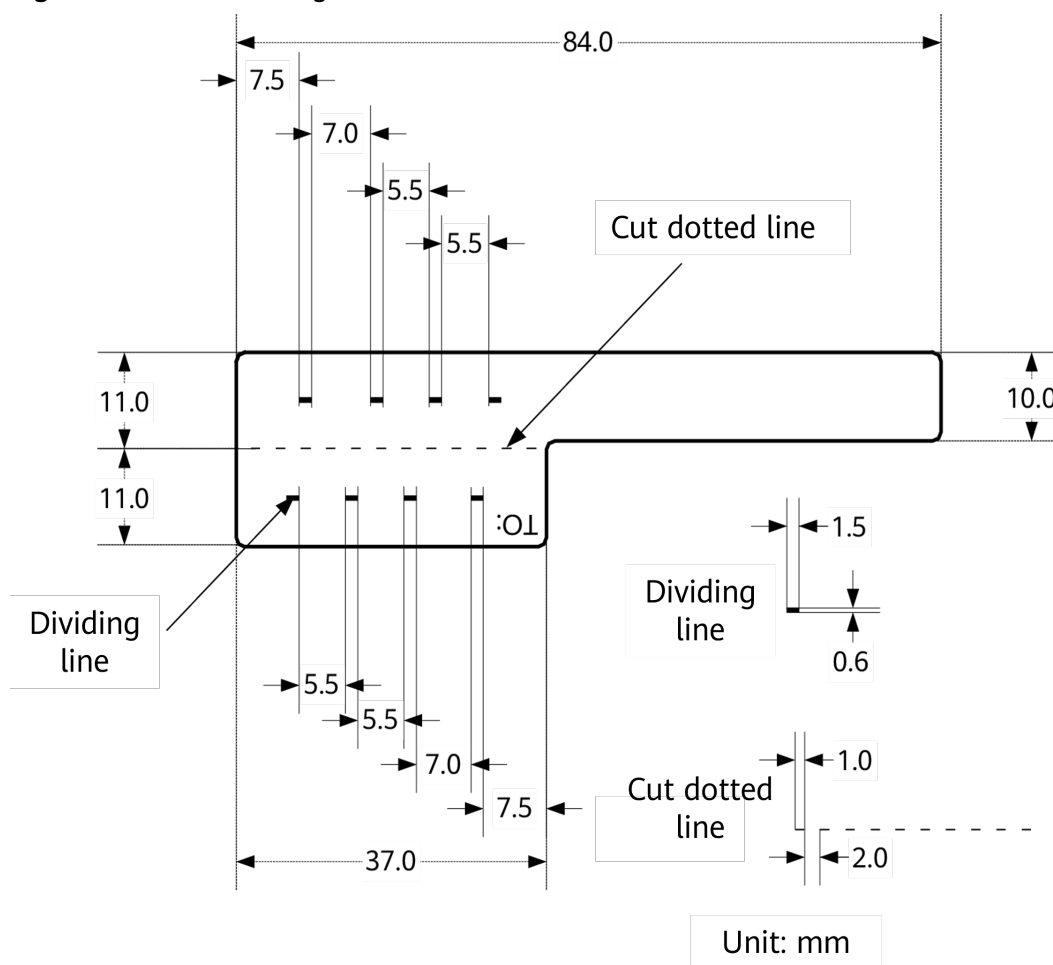
- Thickness: 0.09 mm (0.004 in.)
- Color: chalk white
- Material: polyester (PET)
- Ambient temperature: -29°C (-20.2°F) to +149°C (300.2°F)
- Printed by a laser printer and written with a marker
- Pass UL and CSA authentication

9.4.1.2 Type and Structure

Label for Signal Cables

The label for signal cables is L-shaped with fixed dimensions, as shown in [Figure 9-81](#).

Figure 9-81 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. The dividing line is 1.5 mm x 0.6 mm (0.06 in. x 0.02 in.) in size and Pantone 656c (light blue) in color.

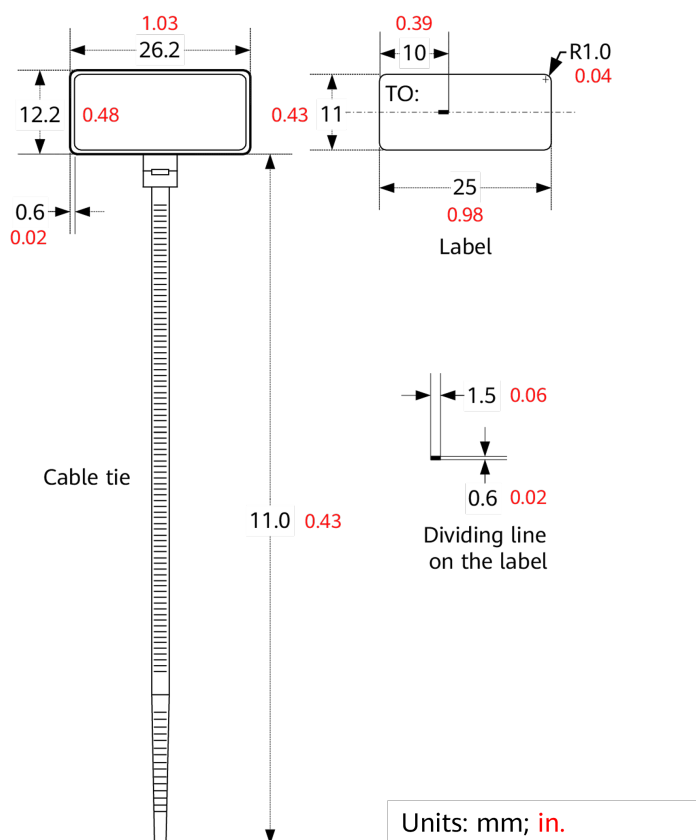
The cut dotted line helps to fold the label when attached to the cable, and its size is 1 mm x 2 mm (0.04 in. x 0.08 in.).

There is a mark **TO:** (upside down in the figure) at the lower right corner of the label. The mark identifies the peer end of the cable on which the label is attached.

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 9-82](#).

Figure 9-82 Power cable label



9.4.1.3 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.

The template is made in Microsoft Word. 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.

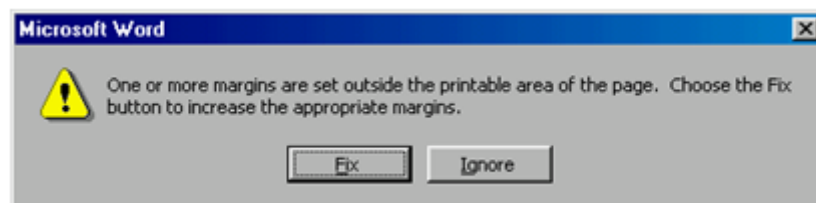
The method for adjusting the page setup is as follows.

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 9-83](#) appears before printing, click **Ignore** to continue the printing.

Figure 9-83 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.

9.4.1.4 Writing Labels

Writing Tools

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

If no marker is available, black ball-point pens can be used, although they are not recommended. Compared with ball-point pens, waterproof markers are better. When writing with a ball-point pen, do not leave ink from the ball-point pen on the label, as it may lead to contamination and result in blurred markings.

NOTE

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

Font

For improved legibility, the handwritten letters should be as close as possible to the standard typeface (Times New Roman), as shown in [Table 9-21](#).

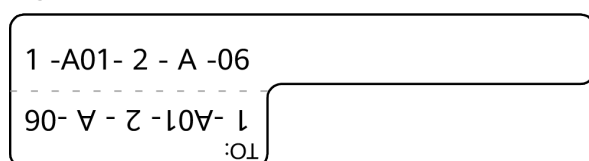
Table 9-21 Standard typeface for handwriting

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 9-84](#).

Figure 9-84 Placement of text on a label



9.4.1.5 Attaching Labels

After printing or writing on the label, peel 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.

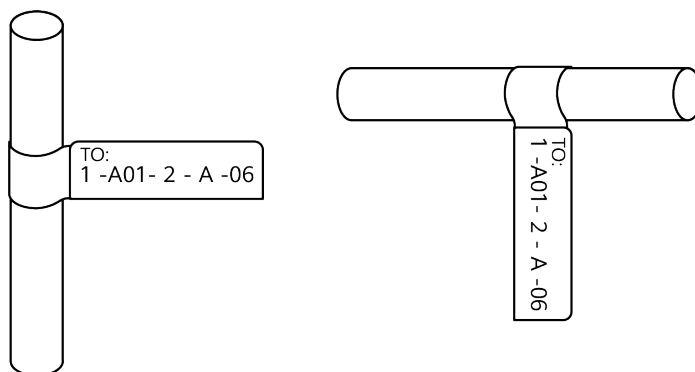
Label for Signal Cables

- Choose the place to attach labels.

The label should be attached 2 cm from the connector on a signal cable. In special cases (for example, to avoid cable bending or affecting other cables), labels can be attached at other positions. The rectangle part with text is attached facing right or downward, as shown in [Figure 9-85](#). 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.

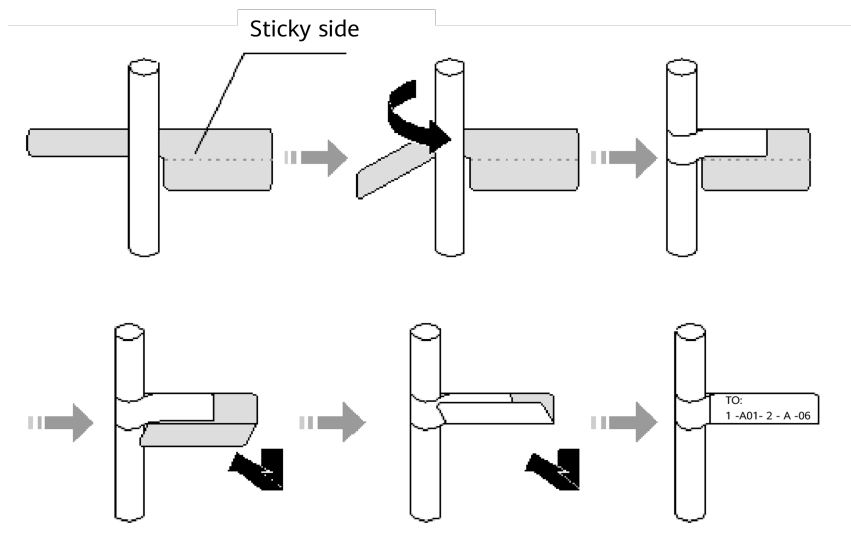
Figure 9-85 Text area of the label



- Procedure for attaching labels

[Figure 9-86](#) shows how to attach a label.

Figure 9-86 Label for signal cables



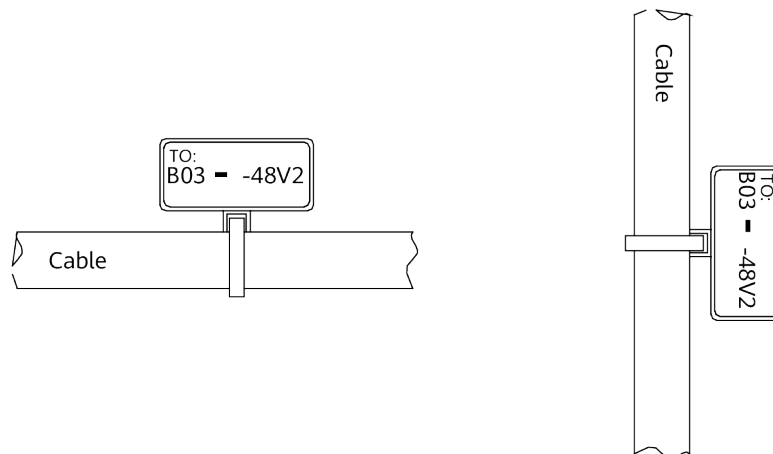
Power Cable Label

Peel the label off 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 9-87](#). 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 9-87 Binding the label for the power cable



The identification card is on the top of the cable in horizontal cabling.

The identification card is to the right of the cable in vertical cabling.

9.4.1.6 Contents of Engineering Labels

Contents of Labels for Power Cables

Labels for power cables are attached to 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.

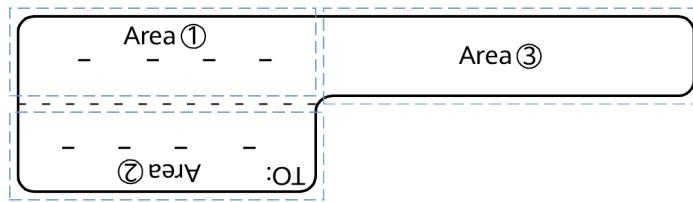
Contents of Labels for Signal Cables

The two sides of the label attached to the signal cable carry information about the location of the ports connected to both ends of the cable. [Figure 9-88](#) shows the information on both sides of the labels attached 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 9-88 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:" facing outside carries the location information of the opposite end. 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.

9.4.1.7 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.

9.4.2 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.

9.4.2.1 Labels for the Optical Fibers Connecting Devices

Meaning of the Label

Table 9-22 lists information on both sides of the labels attached to the optical fibers that connect two devices.

Table 9-22 Information on labels attached to the fibers between two devices

Content	Meaning	Example
MN-B-C-D-R/T	MN: cabinet number	M: cabinet row. From front to back, cabinet rows are numbered from A to Z. N: cabinet column. From left to right, cabinet columns 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 9-89 shows a sample label on an optical fiber.

Figure 9-89 Sample label on an optical fiber between two devices



The meaning of the label is listed in Figure 9-89.

- "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 equipment 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 equipment room.

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

Meaning of the Labels

Table 9-23 shows information on both sides of labels attached to an optical fiber between a device and an optical distribution frame (ODF).

Table 9-23 Information on labels attached to a fiber between a device and an ODF

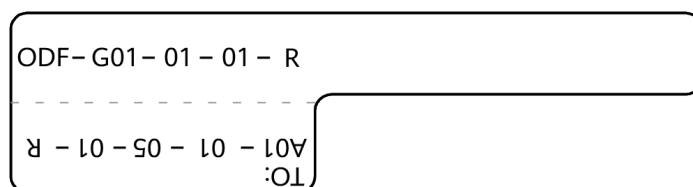
Content	Meaning	Example
MN-B-C-D-R/T	MN: cabinet number	For example, A01.
	B: chassis number	Numbered in bottom-up order with two digits, for example, 01.
	C: physical slot number	Numbered in top-down and left-right order starting from 01. For example, 01 is the first slot at the top left of the chassis.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

Content	Meaning	Example
	R: optical receiving interface T: optical transmitting interface	-

Example of the Label

Figure 9-90 shows a sample label on an optical fiber.

Figure 9-90 Sample label on an optical fiber between the device and the ODF



Meaning of the label in **Figure 9-90**

- "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 equipment 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 equipment room.

9.4.3 Engineering Labels for Network Cables

Applicable Ranges

The labels can be used with Ethernet cables.

Label Content

Table 9-24 shows the information on both sides of the labels attached 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 9-24 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:

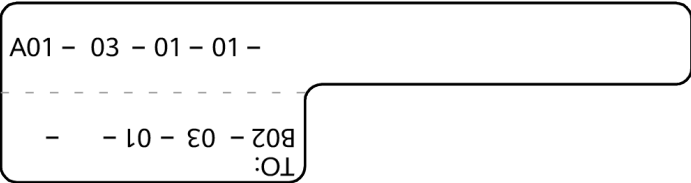
- For a network cable connecting a hub and device, the label on the hub end should indicate the numbers of the chassis and cabinet where the hub resides, and the serial number on the hub. The label on the device end should indicate the number of the chassis and cabinet where the device is located. If 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 9-24](#).
- 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 9-91](#) shows a sample label on an Ethernet cable.

Figure 9-91 Sample label on an Ethernet cable



Meaning of the label in [Figure 9-91](#).

- "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.

9.4.4 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 9-25](#) shows the contents of the labels.

Table 9-25 Contents of the engineering labels for user cables

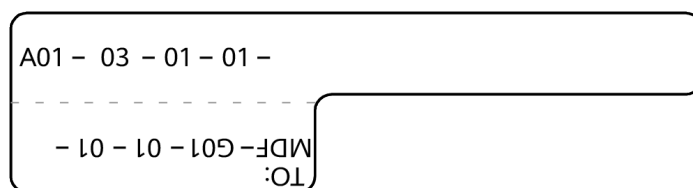
Content	Meaning	Example
MN-B-C-D	MN: cabinet number	For example, A01 is the first cabinet in row A.
	B: frame number	Numbered in the bottom-up order with two digits, for example, 03.
	C: physical slot number	Numbered with two digits in top-down and left-right order. For example, 01.
	D: cable number	Numbered with two digits in top-down and left-right order. For example, 01.
MDF-MN-B-C	MN: row number and column number of the MDF	M: cabinet row. From front to back, cabinet rows are numbered from A to Z. N: cabinet column. From left to right, cabinet columns 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	The rows are numbered from 01 to 99, for example, 01-01.

Content	Meaning	Example
	C: column number of the terminal device	

Example of the Label

Figure 9-92 shows a sample label on a user cable.

Figure 9-92 Sample label on a user cable



The meaning of the label in **Figure 9-92** 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.

9.4.5 Engineering Labels for Power Cables

9.4.5.1 Engineering Labels for DC Power Cables

These labels are attached 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 attached to one side of the identification plates on cable ties. For details of the labels, see **Table 9-26**.

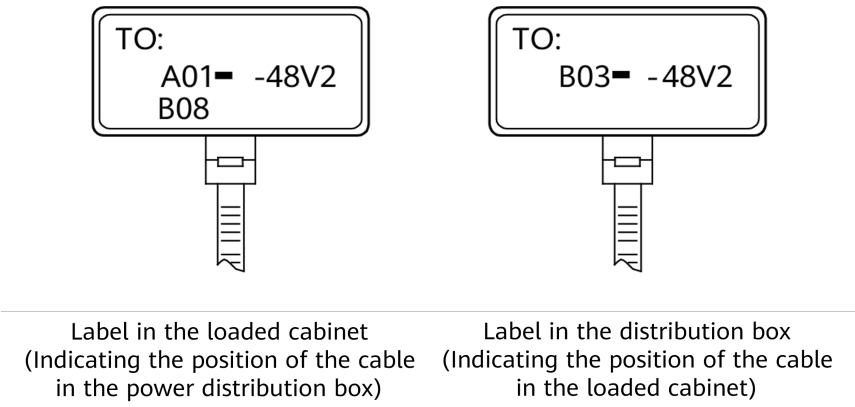
Table 9-26 Contents of the label

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. n: power socket number, numbered as 1 to 3 in the bottom-up and left-to-right orders. 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.
MN(BC)-B- BGND	
MN(BC)-B- 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 9-26 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 attached 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 9-93.

Figure 9-93 Example of the labels for DC power cables



The meaning of the label in Figure 9-93 is as follows:

- In the loaded cabinet, the label "A01/B08--48V2" on the cable indicates that the cable provides -48 V DC supply, and is positioned in the eighth connector in row B of -48 V bus bar in the cabinet in row A, and column 01 in the equipment room.

- In the distribution box, the label "B03--48V2" indicates that the cable provides -48 V DC supply, and is 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. There is no need to give 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 equipment room. Information on the labels for PGND cables should be given in a similar way.

9.4.5.2 Engineering Labels for AC Power Cables

These labels are attached 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 attached to one side of the identification plates on cable ties. For details, see [Table 9-27](#).

Table 9-27 Label content

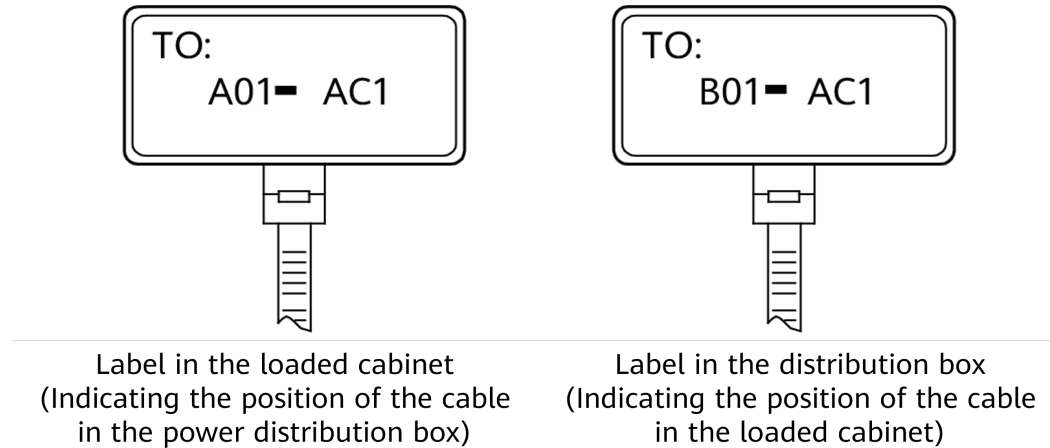
Content	Meaning
MN-(B)-ACn	MN: serial number of the cabinet or the socket where the power is led in B: chassis number, numbered in bottom-up order with two digits, for example, 01. n: power socket number, numbered as 1 to 3 in the bottom-up and left-to-right orders. Serial number of the socket where 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 not necessary.

Make sure that labels are attached 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 9-94](#).

Figure 9-94 Labels for AC power cables



The meanings of the labels in [Figure 9-94](#) are as follows:

- In the loaded cabinet, the label "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, the label "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.

9.5 Appendix E: Guide to Using Optical Modules

Common Faults of an Optical Module

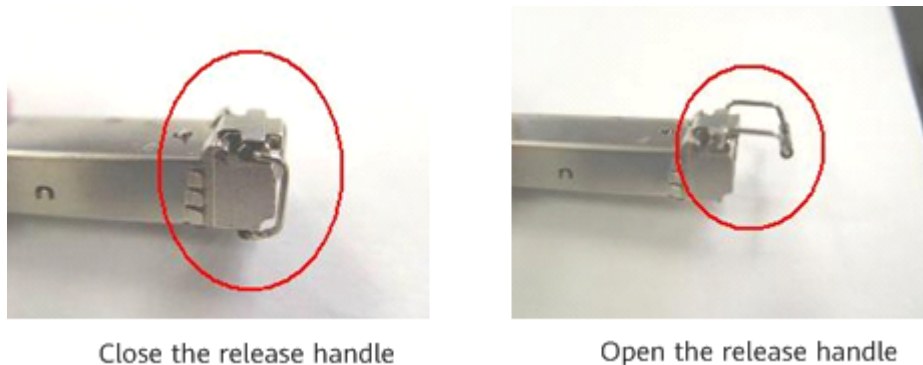
1. An optical module is not completely installed in position.
If the optical module is not completely installed in position and the latch boss is not secured, the device cannot identify the optical module. After the optical module has been working for a long time, it will be ejected under external stress.
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). The optical module is then burnt.

The preceding faults lead to temporary or long-term cut-off of optical signals; or even cause permanent damage 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 9-95** 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 spring locks the optical module. After the optical module is inserted, try pulling it out to see whether it is installed in position. If the optical module cannot be pulled out, it is secured.

Figure 9-95 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 9-96 Cleaning optical fibers with special cleaning tissues

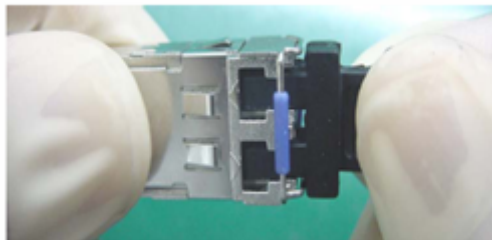


 NOTE

Place at least three cleaning tissues on the work bench. As shown in [Figure 9-96](#), wipe the end of an optical connector from left to right or from right to left on a cleaning tissue, and then continue wiping the connector end on an unused part of the cleaning tissue until it is clean.

2. Cover an unused optical module with a protective cap to prevent dust, as shown in [Figure 9-97](#).

Figure 9-97 Installing a protective cap



If no protective cap is available, use fibers to protect the optical module, as shown in [Figure 9-98](#).

Figure 9-98 Using fibers to protect an optical module



3. Cover unused optical connectors with dustproof caps, as shown in [Figure 9-99](#), and then lay out fibers on the fiber rack or coil them in a fiber management tray to prevent them from being squeezed.

Figure 9-99 Installing a protective cap on a fiber



4. If a receptacle or an optical connector has not been used for a long time and has not been covered with a protective cap, you need to clean it before using it. Clean a receptacle with a cotton swab, as shown in [Figure 9-100](#). Clean an optical connector with cleaning tissues.

Figure 9-100 Cleaning a receptacle with a cotton swab



NOTICE

When cleaning a receptacle, insert the cotton swab and rotate it slowly in the receptacle. Do not use too much force because the receptacle may become damaged.

- 5. If optical signals are lost while a device is running, use the preceding method to clean the receptacle or the optical connector. This can prevent contamination.

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 mistakenly 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. Specifically, 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.

9.6 Appendix F: Faulty Parts Return Form (Customer Copy)

*Address		*Customer Name		Postal Code	
*Contact		Email			

*Tel.		Fax		*Total Quant ity		Delivery Date	
No.	*Product Model and Specificati ons	Bar Code	*Return Reason	*Symptom		*Board Network Attribute (Network Name, System, and Site)	Remarks
1			☐ Repair ☐ Test ☐ Upgrade ☐ Rectify			☐ National backbone ☐ Provincial backbone ☐ Local	
2			☐ Repair ☐ Test ☐ Upgrade ☐ Rectify			☐ National backbone ☐ Provincial backbone ☐ Local	
3			☐ Repair ☐ Test ☐ Upgrade ☐ Rectify			☐ National backbone ☐ Provincial backbone ☐ Local	
4			☐ Repair ☐ Test ☐ Upgrade ☐ Rectify			☐ National backbone ☐ Provincial backbone ☐ Local	
5			☐ Repair ☐ Test ☐ Upgrade ☐ Rectify			☐ National backbone ☐ Provincial backbone ☐ Local	
6			☐ Repair ☐ Test ☐ Upgrade ☐ Rectify			☐ National backbone ☐ Provincial backbone ☐ Local	
7			☐ Repair ☐ Test ☐ Upgrade ☐ Rectify			☐ National backbone ☐ Provincial backbone ☐ Local	

8			☐ Repair ☐ ☐ Test ☐ ☐ Upgrade ☐ ☐ Rectify		☐ National backbone ☐ ☐ Provincial backbone ☐ ☐ Local	
9			☐ Repair ☐ ☐ Test ☐ ☐ Upgrade ☐ ☐ Rectify		☐ National backbone ☐ ☐ Provincial backbone ☐ ☐ Local	
10			☐ Repair ☐ ☐ Test ☐ ☐ Upgrade ☐ ☐ Rectify		☐ National backbone ☐ ☐ Provincial backbone ☐ ☐ Local	
Delivered by: Approved by: Department seal:						

The following is filled by Huawei:

Huawei spare parts repair center	Recipient signature:	Reception: ☐ Normal ☐ Abnormal	Date:
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Note:

1. This form should be filled in by the customer of Huawei and attached to the packing case of the faulty equipment or components.
2. If you have any questions about equipment and components, call Huawei repair service hotline: 86-755-28560555.
3. If Huawei-produced cards or components are faulty, send them to:
 Address: Huawei Southern Factories District C, C7-1F, Xincheng Avenue No. 6, Songshan Lake Science Park, Dongguan, Guangdong, PRC
 Recipient: Huawei Repair Service Center
 Postal code: 523808
 Fax: 0755-28565040
 E-mail: wxfw@huawei.com

4. The items marked with * are mandatory.