H3C CR19000-8 Core Router
Installation Guide

Preface

This document guides you through the installation of the H3C CR19000-8 core router. It includes instructions on preparing for installation, installing the router, replacing components, and troubleshooting.

This preface includes the following topics about the documentation:

- Audience.
- Conventions.
- Documentation feedback.

Audience

This documentation is intended for:

- Network planners.
- Field technical support and servicing engineers.
- Network administrators working with the CR19000-8 core router.

Conventions

The following information describes the conventions used in the documentation.

Command conventions

Convention	Description
Boldface	**Bold** text represents commands and keywords that you enter literally as shown.
Italic	*Italic* text represents arguments that you replace with actual values.
[ ]	Square brackets enclose syntax choices (keywords or arguments) that are optional.
{ x	y	... }	Braces enclose a set of required syntax choices separated by vertical bars, from which you select one.
[x	y	...]	Square brackets enclose a set of optional syntax choices separated by vertical bars, from which you select one or none.
{ x	y	... } *	Asterisk marked braces enclose a set of required syntax choices separated by vertical bars, from which you select a minimum of one.
[x	y	...] *	Asterisk marked square brackets enclose optional syntax choices separated by vertical bars, from which you select one choice, multiple choices, or none.
&<1-n>	The argument or keyword and argument combination before the ampersand (&) sign can be entered 1 to n times.
#	A line that starts with a pound (#) sign is comments.

GUI conventions

Convention	Description
Boldface	Window names, button names, field names, and menu items are in Boldface. For example, the **New User** window opens; click **OK**.

Convention	Description
>	Multi-level menus are separated by angle brackets. For example, **File** > **Create** > **Folder**.

Symbols

Convention	Description
⚠ WARNING!	An alert that calls attention to important information that if not understood or followed can result in personal injury.
△ CAUTION:	An alert that calls attention to important information that if not understood or followed can result in data loss, data corruption, or damage to hardware or software.
① IMPORTANT:	An alert that calls attention to essential information.
NOTE:	An alert that contains additional or supplementary information.
⊙ TIP:	An alert that provides helpful information.

Network topology icons

Convention	Description
	Represents a generic network device, such as a router, switch, or firewall.
	Represents a routing-capable device, such as a router or Layer 3 switch.
	Represents a generic switch, such as a Layer 2 or Layer 3 switch, or a router that supports Layer 2 forwarding and other Layer 2 features.
	Represents an access controller, a unified wired-WLAN module, or the access controller engine on a unified wired-WLAN switch.
	Represents an access point.
	Represents a wireless terminator unit.
	Represents a wireless terminator.
	Represents a mesh access point.
	Represents omnidirectional signals.
	Represents directional signals.
	Represents a security product, such as a firewall, UTM, multiservice security gateway, or load balancing device.
	Represents a security module, such as a firewall, load balancing, NetStream, SSL VPN, IPS, or ACG module.

Examples provided in this document

Examples in this document might use devices that differ from your device in hardware model, configuration, or software version. It is normal that the port numbers, sample output, screenshots, and other information in the examples differ from what you have on your device.

Documentation feedback

You can e-mail your comments about product documentation to info@h3c.com.

We appreciate your comments.

Contents

1 Preparing for installation

Safety recommendations

To avoid bodily injury and damage to the router, read all safety recommendations including the compliance and safety manual for the router carefully before installation. Note that the recommendations do not cover every possible hazardous condition.

General safety recommendations

- Keep the chassis clean and dust-free.
- Do not place the router on a moist area, and avoid liquid flowing into the router.
- Make sure the ground is dry and flat and anti-slip measures are in place.
- Ensure good ventilation in the equipment room and keep the air inlet and outlet vents of the router free of obstruction.
- When servicing the device, do not wear loose clothing or any other things that could get caught in the chassis and remove all metal jewelry such as watches, bracelets, and necklaces.
- Use a screwdriver to fasten screws.
- After completing the installation, move the empty packaging materials and installation tools away from the router.
- Keep the chassis and installation tools away from walk areas.

Electricity safety

- Clear the work area of possible electricity hazards, such as ungrounded power extension cables, missing safety grounds, and wet floors.
- Locate the emergency power-off switch in the room before installation so you can quickly shut power off when an electrical accident occurs.
- Remove all external cables, including power cords, before moving the chassis.
- Do not work alone when servicing the router with power present.
- Never assume that power has been disconnected from a circuit. Always check.

ESD prevention

⚠ **CAUTION:**
Make sure the resistance reading between human body and the ground is in the range of 1 to 10 megohms (Mohms).

Preventing electrostatic discharge

To prevent electrostatic discharge (ESD) damage, follow these guidelines:

- Ground the router reliably. For how to ground your router, see "Grounding the router."
- Always wear an ESD wrist strap when installing removable components. Make sure the wrist strap is reliably grounded.
- Hold a module by its edges. Do not touch any electronic components or PCB.

- Put a module in an antistatic bag and keep it secure if you are not to install it in the chassis.

Attaching an ESD wrist strap

1. Wear the wrist strap on your wrist.
2. Lock the wrist strap tight around your wrist to keep good contact with the skin.
3. Insert the ESD wrist strap into an ESD jack on the chassis.

   The router has one ESD jack on both the front and rear panels.
4. Make sure the rack is reliably grounded.

Laser safety

⚠ **WARNING!**

- Disconnected optical fibers or transceiver modules might emit invisible laser light. Do not stare into beams or view directly with optical instruments when the router is operating.
- Before you remove the optical fiber connector from a fiber port, execute the `shutdown` command in interface view to shut down the port.

△ **CAUTION:**

- Insert dust caps into open optical fiber connectors to protect them from contamination and ESD damage.
- Insert dust plugs into open fiber ports and transceiver module ports to protect them from contamination and ESD damage.

Moving safety

⚠ **WARNING!**

Hold the chassis handles firmly to move the router.

△ **CAUTION:**

Do not hold air vents of the chassis, the handle of a fan tray or power supply, or an ejector lever of a module to move the router. Doing so might cause equipment damage.

The router is heavy and large. When you move the router, follow these guidelines:

- Remove all power supplies, modules, and external cables (including power cords) before moving the chassis.
- Moving the chassis requires a minimum of four people. As a best practice, use a mechanical lift to move the chassis.
- Lift and put down the chassis slowly and never move it suddenly.
- Pay attention to the safety symbols on the package and handle the router accordingly. (The symbols in Table1-1 are for illustration only. The symbols on your device packages might differ from these ones.)

Table1-1 Packing symbols

Symbol	Description
	Do not stack the devices beyond the specified number (n)

Symbol	Description
	Place the device with the arrows up.
	The device is fragile. Handle it with care.
	Keep the device from humidity, rains, and wet floor.

Examining the installation site

The router must be used indoors. To ensure correct operation and long service life of your router, make sure the installation site meets the following requirements.

Weight support

Make sure the floor or ground at the installation site can support the combined weight of the router and the rack. The total weight of the router includes the chassis and its components (for example, modules, fan trays, power supplies, and cables) and accessories. For the weights of the router and its components, see "Weights and dimensions."

To mount the switch in a rack, select slide rails that can support the total weight of the router.

To assess the load-bearing requirements for the floor and slide rails, take potential system expansion (for example, adding more modules) also in consideration.

Space

> (!) **IMPORTANT:**
> - The rack must have a front door (single door as a best practice) and a rear door.
> - For easy installation and maintenance, reserve a minimum clearance of 1200 mm (47.24 in) between the rack and walls or other devices.

Table1-2 Router dimensions and rack requirements

Model	Chassis dimensions	Rack requirements

CR19000-8	• **Height**—843 mm (33.19 in)/19 RU
	• **Width**—440 mm (17.32 in)
	• **Depth**—745 mm (29.33 in)
	  ○ 650 mm (25.59 in) for the chassis
	  ○ 95 mm (3.74 in) from the rack-mounting surface of the mounting bracket to the cable management bracket front end
		• A minimum of 1000 m (39.37 in) in depth (recommended).
		• You can also use a rack with a depth of 800 mm (31.50 in) (with the door thickness not exceeding 25 mm (0.98 in).
		• A minimum of 100 mm (3.94 in) between the front rack posts and the front door.
		• A minimum of 650 mm (25.59 in) between the front rack posts and the rear door.

Figure1-1 Chassis dimensions

Captive screw

Mounting bracket

Cable management bracket

843 mm (33.19 in)

650 mm (25.59 in)

95 mm (3.74 in)
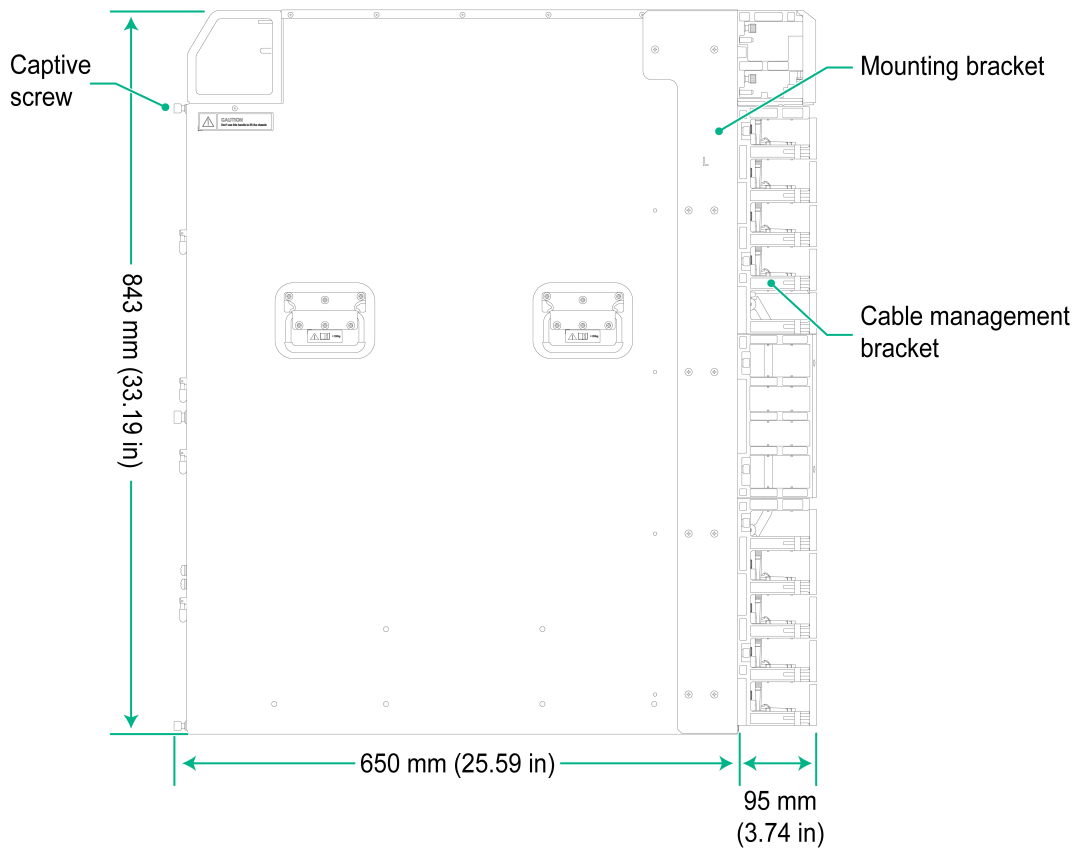
Figure1-2 Rack requirements

1000 mm (39.37 in)

Front door

≥650 mm (25.59 in)

≥100 mm (3.94 in)

Rear door

Chassis

Rack

Front rack post
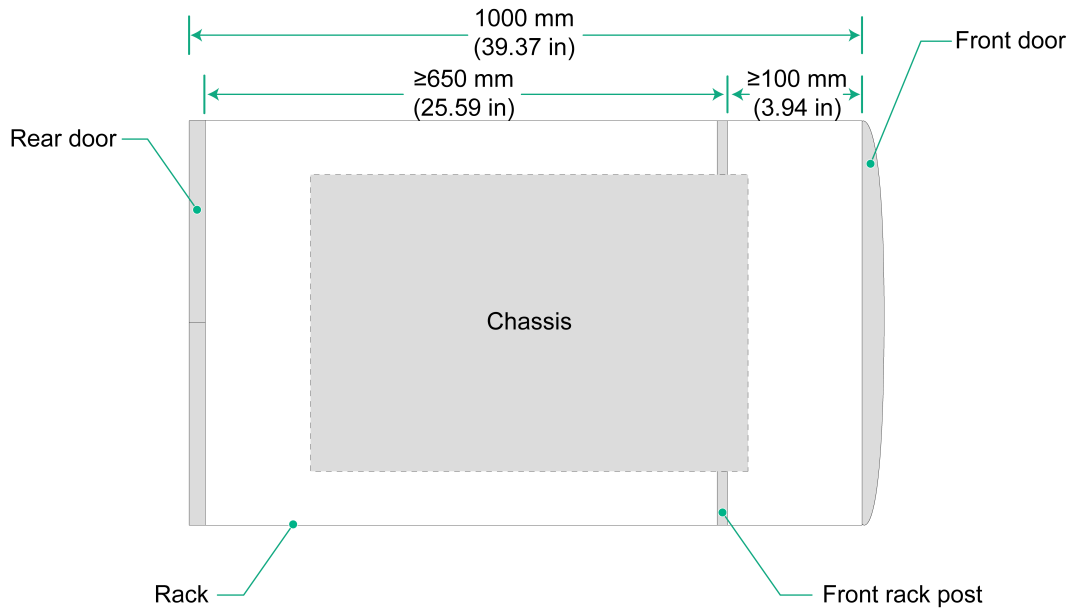
Cooling

The router uses super-short cut-through ventilation aisles to provide front-to-rear airflow for heat dissipation, as shown in Figure1-3.

For adequate cooling of the device, make sure the following requirements are met:

- Plan the installation location for the router based on its airflow direction.
- The air inlet and outlet vents of the router are not blocked and adequate clearance is reserved around the air vents.
- The rack for the router has a good cooling system, with the perforation rate of rack doors greater than 50%.
- The installation site has a good cooling system.
- The air conditioners do not blow air directly onto the router.

Figure1-3 Airflow through the chassis
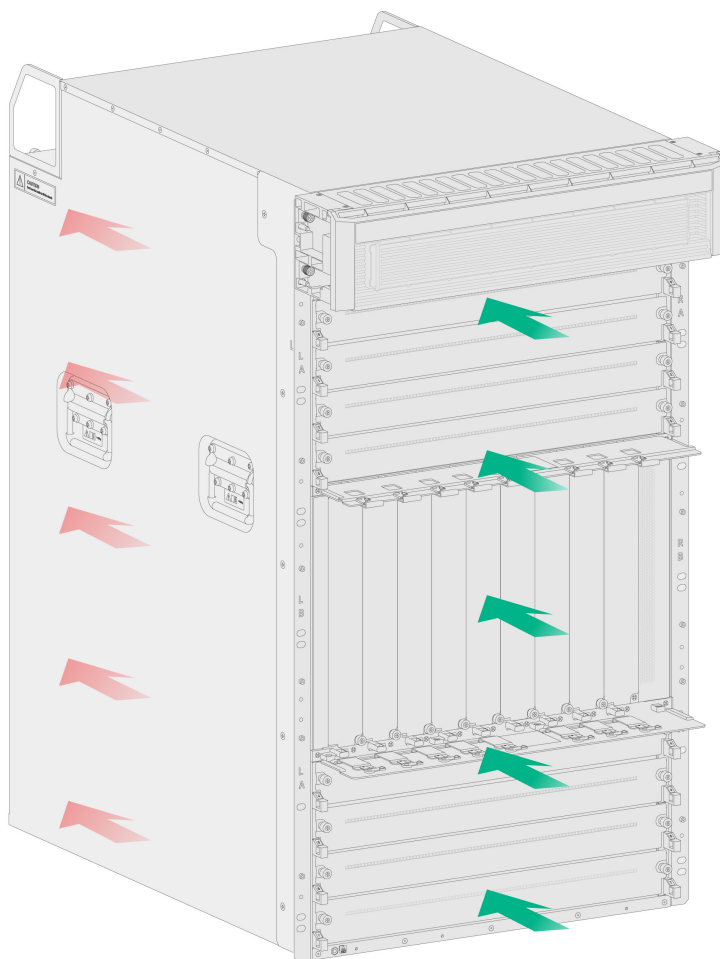
Power supply

Power supply system

A good power supply system is essential for correct operation of the router. The router supports AC and DC power inputs. Make sure the equipment room meets the following requirements for the power supply systems.

- The AC power supply system is stable and reliable and capable of providing power required by the router. A diesel generator is available in the equipment room as a backup power source.
- The DC power supply system is stable and reliable and its output voltage is stable and within the acceptable range allowed by the device.
- Enough batteries are available to ensure uninterrupted device operation in the event of a power failure.

Power

For the power supply system to provide power as required by the router:

- Determine the number of power supplies based on the total power consumption of the router. Make sure the total maximum output power of the power supplies is greater than the total power consumption of the router.
- Verify that the power supply system at the installation site is stable and provides power that meets the power supply specifications, including the rated input voltage and input current.

  For the power supply specifications, see "Power supplies."

Grounding

Correctly grounding the router is crucial to lightning protection, anti-interference, and ESD prevention. Use a good grounding system for the router. Make sure the resistance between the chassis and the ground is less than 1 ohm.

For more information about grounding the router, see "Grounding the router."

Temperature and humidity

⚠ **CAUTION:**

If condensation occurs on the chassis when you move it from a lower temperature to a higher temperature, dry the chassis before powering it on to avoid short circuits.

If the temperature in the equipment room is too high, too low, or changes dramatically, the device reliability is reduced and its service lifetime is shortened. For long-term, highly available operation of the router, make sure temperature and humidity in the equipment room meets the requirements described in Table1-3.

- High temperature can accelerate the aging of insulation materials and significantly lower the reliability and lifespan of the router.
- Lasting high relative humidity can cause poor insulation, electricity leakage, mechanical property change of materials, and metal corrosion.
- Lasting low relative humidity can cause washer contraction and ESD and bring problems including loose screws and circuit failure.

Table1-3 Temperature and humidity requirements

Item	Operating	Storage
Temperature	0°C to 45°C (32°F to 113°F)	–40°C to +70°C (–40°F to +158°F)
Humidity	5% RH to 95% RH, noncondensing	5% RH to 95% RH, noncondensing

Cleanliness

Mechanically active substances buildup on the chassis might result in electrostatic adsorption, which causes poor contact of metal components and contact points. In the worst case, electrostatic adsorption can cause communication failure.

Table1-4 Mechanically active substance concentration limit in the equipment room

Substance	Particle diameter	Concentration limit
Dust particles	≥ 5 μm	$\leq 3 \times 10^4$ particles/m^3 (No visible dust on desk in three days)
Dust (suspension)	≤ 75 μm	≤ 0.2 mg/m^3
Dust (sedimentation)	75 μm to 150 μm	≤ 1.5 mg/(m^2h)
Sand	150 μm to 1000 μm	≤ 30 mg/m^3

To maintain cleanliness in the equipment room, follow these guidelines:

- Use dustproof materials for floors and walls and use coating that does not produce powders.
- Use double-layer glass in windows and seal doors and windows with dust-proof rubber strips. Use screen doors and screen windows in the external side.
- Keep the equipment room clean and clean the air filters of the rack regularly.
- Wear ESD clothing and shoe covers before entering the equipment room.

Harmful gas limit

The equipment room must also meet limits on salts, acids, and sulfides to eliminate corrosion and premature aging of components, as shown in Table1-5.

Table1-5 Harmful gas limits in the equipment room

Gas	Maximum concentration (mg/m^3)
SO_2	0.2
H_2S	0.006
NH_3	0.05
Cl_2	0.01
NO_2	0.04

To control harmful gases, use the following guidelines:

- Use environmentally friendly materials to decorate the equipment room. Avoid using materials that contains harmful gases, such as sulfur or chlorine-containing insulation cottons and rubber mats.
- Keep the air inlet of the equipment room away from the pollution source and the sewer.
- Place batteries separately, preferably in a separate room.
- Employ a professional company to monitor and control harmful gases in the equipment room regularly.

EMI

All electromagnetic interference (EMI) sources, from outside or inside of the router and application system, adversely affect the router in the following ways:

- A conduction pattern of capacitance coupling.
- Inductance coupling.
- Electromagnetic wave radiation.
- Common impedance (including the grounding system) coupling.

To prevent EMI, use the following guidelines:

- Take effective measures to filter interference from the power grid.
- Separate the working earthing system of the router from the grounding facility and lightning protection facility of the other electrical devices as far as possible.
- Keep the router far away from radio transmitting stations, radar stations, and high-frequency devices.
- Use electromagnetic shielding, for example, shielded interface cables, when necessary.

Unpacking and inspecting the router

Physical specifications

Table1-6 Physical specifications

Model	Shipping weight	Dimensions (H × W × D)
CR19000-8	115 kg (253.53 lb)	843 × 440 × 650 mm (33.19 × 17.32 × 25.59 in)

NOTE:

The shipping weight of the router includes the chassis and packaging material. You can determine a moving method for the chassis based on its shipping weight.

Unpacking the chassis

⚠ **WARNING!**

To avoid bodily injury, wear protective gloves when unpacking the chassis.

⚠ **CAUTION:**

- To avoid device damage, move the carton to a location close to the installation site before unpacking it.
- Do not place the carton upside down.
- If you find the router water-soaked or its surface rusted, stop unpacking it and contact the equipment supplier.
- Use a mechanical lift to move the shipping pallet and keep the router upright during the moving process.
- If no mechanical lift is used, cooperate with a minimum of four people to move the chassis by using the chassis handles.
- When transporting, moving, and installing the chassis, be careful not to bump the router into the door or wall.

To unpack the chassis:

1. Place the carton flat on the floor with the pallet at the bottom.
2. Use scissors or diagonal pliers to cut the straps on the carton.

   Figure1-4 Cutting the strap on the carton
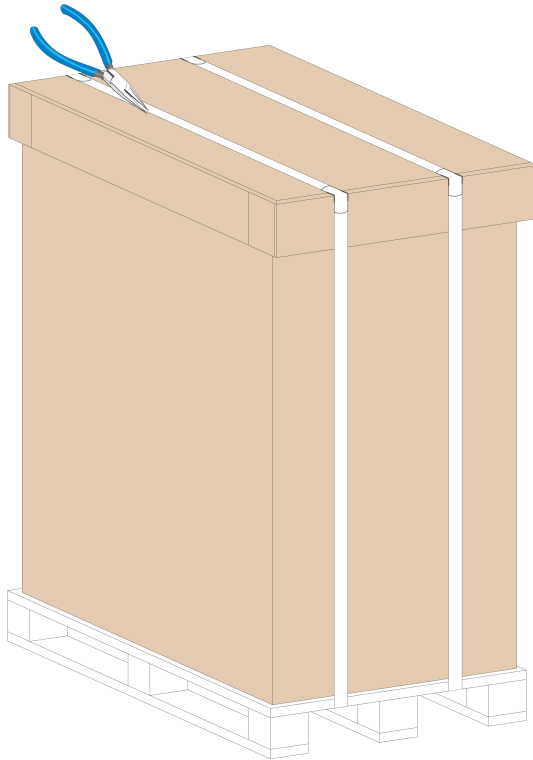
3. Lift the top cap from the carton, take out the accessory box, and remove the packaging materials such as the packaging carton and foam cushion.

   Verify that the accessory box package is intact. Check the accessories against the packing list.

Figure1-5 Removing the top cap from the carton
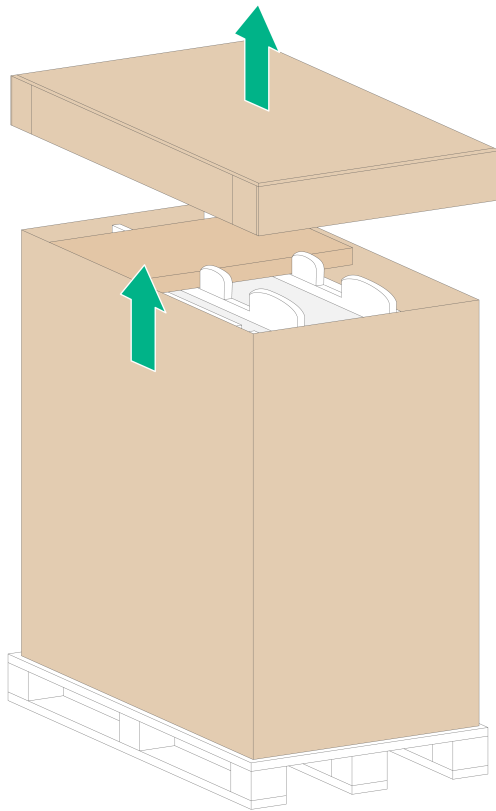
4. Use Philips screwdrivers and adjustable wrench to remove the screws on the L-type brackets, to separate the router from the pallet.

Figure1-6 Separating the chassis form the pallet
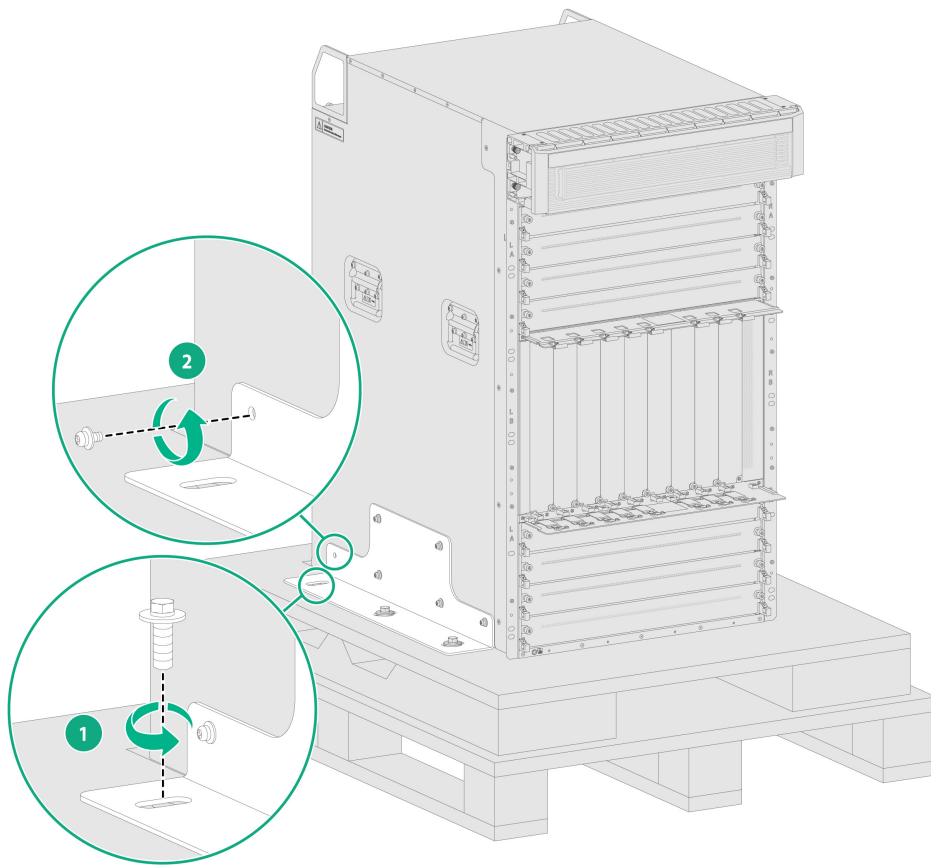
5. Verify that the router is intact without any signs of water soaking or corrosion and the labels on the chassis are correct, clear, and complete.

Unpacking and inspecting the components

ⓘ **IMPORTANT:**

Before unpacking a component, read the label on the carton carefully to verify the model of the component packaged in the carton.

Typically, modules, power supplies, and fan trays are packaged in cartons. The packaging materials include cartons, foam cushions, and anti-static bags.

To unpack and inspect a component:

1. Use a utility knife to cut the straps on the carton. Open the carton and take the top foam cushion out of the carton.
2. Wear an ESD wrist strap and make sure the wrist strap is reliably grounded.
3. Take the component out of the anti-static bag.
4. Check the items in the carton against the packing list to verify that the items are as ordered.

Figure1-7 Unpacking a component packaged in a carton
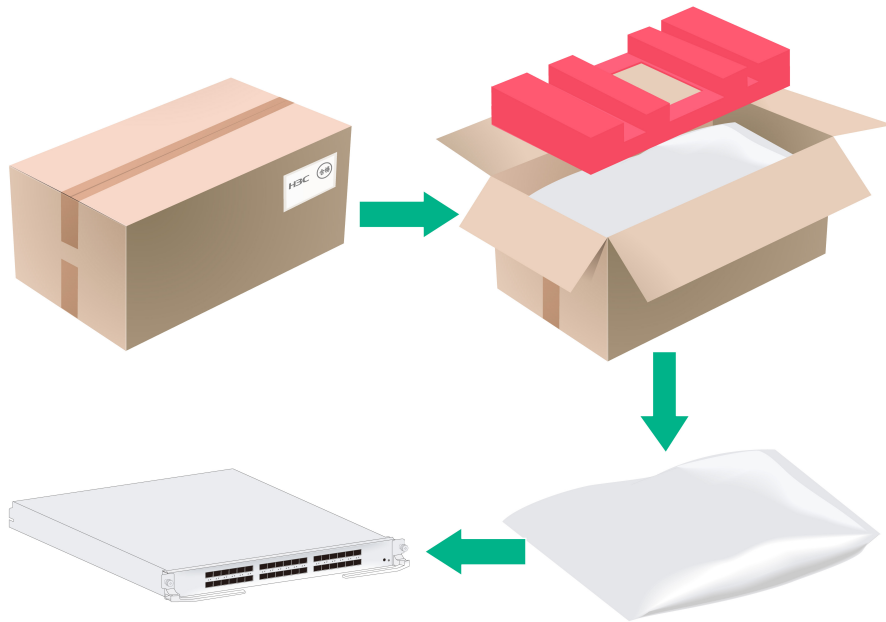
Installation tools

Installation tools are required when installing the router. Prepare installation tools as required. Figure1-8 provides installation tools for your reference.

Figure1-8 Installation tools

Needle-nose pliers	Wire stripper	Diagonal pliers	Crimping tool	Mechanical crimping tool
Flat-head screwdriver	Phillips screwdriver	Rubber hammer	Claw hammer	Heat gun
Hammer drill	Releasable cable tie	Velcro strap	ESD wrist strap	Antistatic gloves
Network cable tester	Multimeter	Marker	Adjustable wrench	Protective gloves
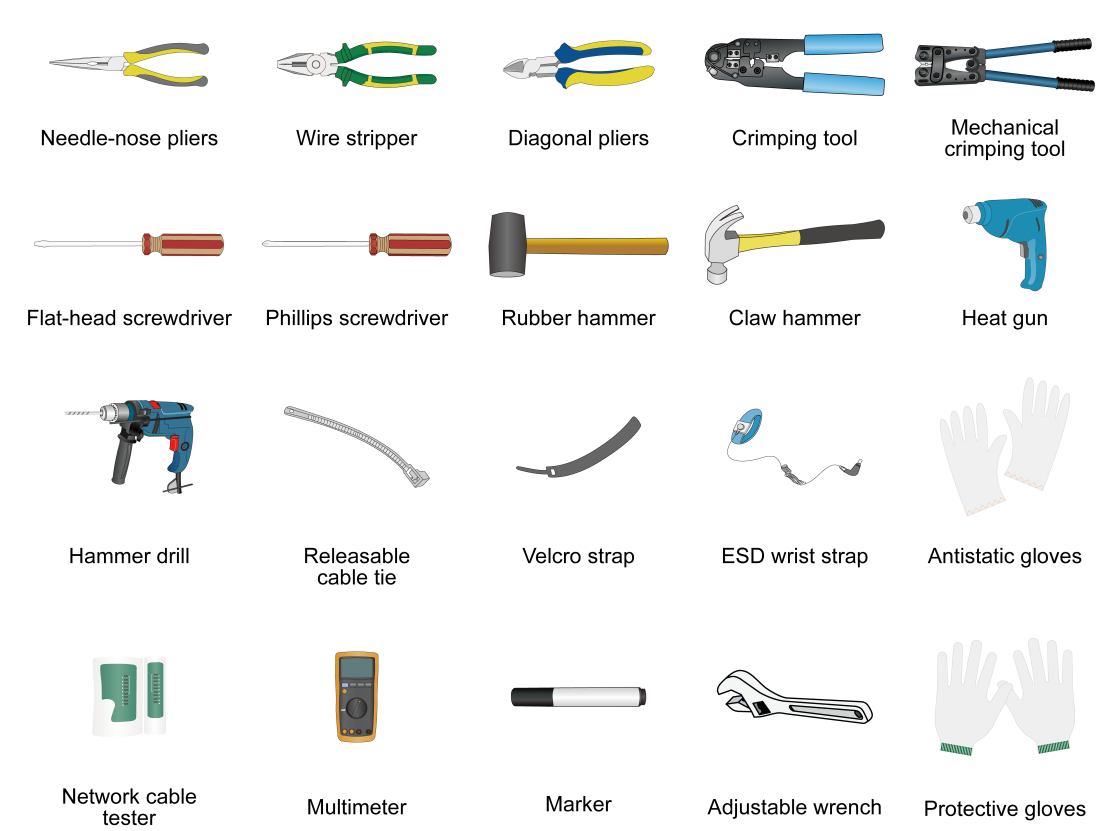
Pre-installation checklist

Table1-7 Pre-installation checklist

Item		Requirements	Result
Installation site	Load bearing	• The floor or ground at the installation site can support the combined weight of the router and the rack. • The slide rails can support the actual weight of the router.	
	Space	• There is a minimum clear height of 3 m (9.84 ft) (from the beam or the air duct to the floor) in the equipment room. • There is a minimum clearance of 1200 mm (47.24 in) between the rack and walls or other devices	
	Rack	• The rack has a good ventilation system. • The rack is sturdy enough to support the weight of the router and its installation accessories. • The rack has a size that can accommodate the router. • The front and rear of the rack are a minimum of 1200 mm (47.24 in) away from walls or other devices.	
	Ventilation	• The air inlet and outlet vents of the router are not blocked and adequate clearance is reserved	

Item		Requirements	Result
		around the air vents. • A good ventilation system is available at the installation site.	
	Electricity safety	• The power supply system can output enough power to maintain the device operation. • An uninterrupted power supply (UPS) is available. • The power-off switch in the equipment room is located so that the power can be immediately shut off when an accident occurs.	
	Grounding	• The grounding specifications for the equipment room comply with national and industry standards. • All communication devices in the equipment room are reliably grounded. • The working earthing and protective earthing systems of the communication power supplies use the same earthing conductor set with the protective earthing system of the communication devices.	
	Temperature	0°C to 45°C (32°F to 113°F).	
	Humidity	5% RH to 95% RH (noncondensing).	
	Cleanliness	• Dust concentration ≤ 3 × 104 particles/m^3 (no visible dust on the desktop in three days). • Dust (suspension) ≤ 0.2 mg/m^3 • Dust (sedimentation) ≤ 1.5 mg/(m^{2}h) • Sand ≤ 30 mg/m^3	
	Harmful gas limit	Harmful gases in the equipment room do not exceed the limit.	
	ESD prevention	• The router and rack are reliably grounded. • The equipment room is dust-proof. • The humidity and temperature are in the acceptable range. • An ESD wrist strap, an antistatic workbench, and Antistatic bags are available. • Instructions for preventing ESD damage have been read carefully.	
	EMI prevention	• Effective measures are taken for filtering interference from the power grid. • The working earthing of the router is away from the grounding facility of power equipment or lightning protection grounding facility. • The router is far away from radio transmitting stations, radar stations, and high-frequency devices. • Electromagnetic shielding, for example, shielded interface cables, is used as required.	
	Lightning protection	• The router is reliably grounded. • The grounding point of the AC power receptacle is reliably grounded. • (Optional.) Network port lightning arresters are available.	
Safety precautions		• The router is far away from any moist areas and heat sources. • The power-off switch in the equipment room is located.	

| Item	Requirements	Result
Installation accessories	Installation accessories supplied with the router are available.	
Reference	• Documents shipped with the router are available. • Online documents are available.	

Contents

2 Installing the router

Confirming installation preparations

Before you install the router, verify that:

- You have read "Preparing for installation" carefully.
- All the requirements described in "Preparing for installation" are met.

Installation flowchart

Figure2-1 Installation flowchart
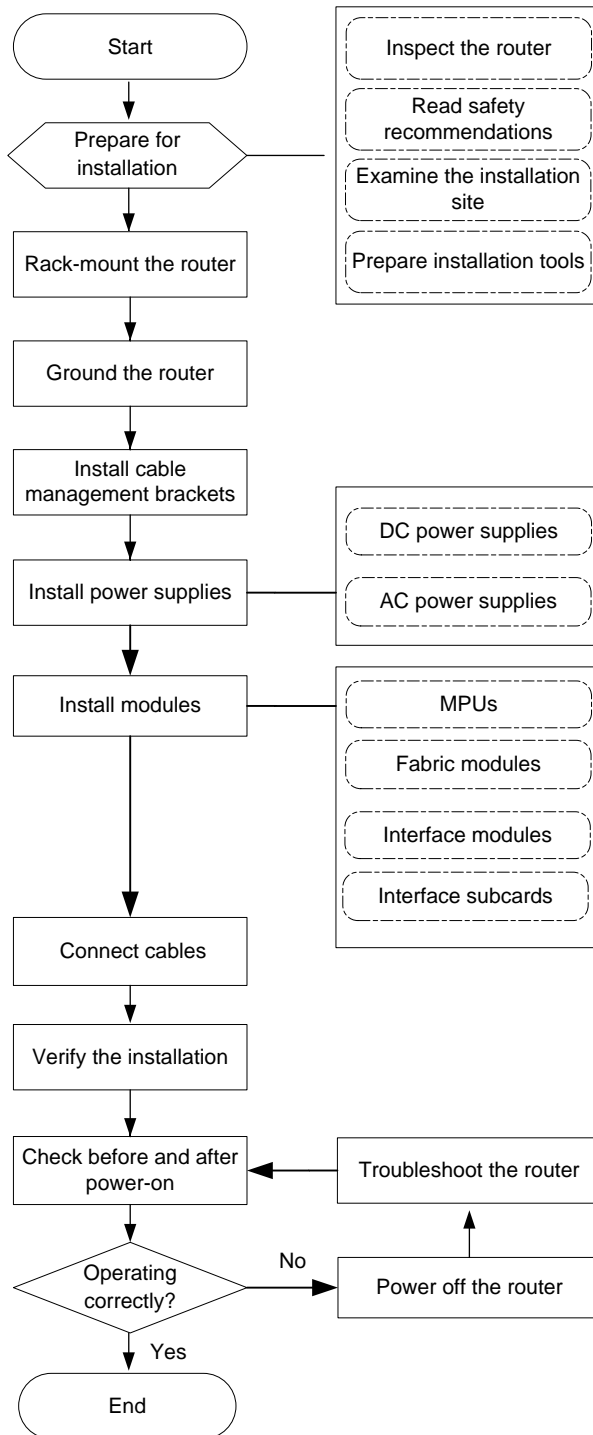
Rack-mounting the router

Attaching slide rails to the rack

⚠ **CAUTION:**

The router is heavy. For rack stability, install it at a lowest possible position.

To rack-mount the router, select and attach slide rails to the rack. See Table2-1 for the slide rail requirements.

Table2-1 Slide rail requirements

Router model	Max. chassis weight (fully configured)	Applicable slide rails		
		Slide rail model	Adjustment range	Occupied space
CR19000-8	230 kg (507.05 lb)	LSXM1BSR Applicable to a rack with a depth of 1000 mm (39.37 in) or above.	630 mm to 900 mm (24.80 in to 35.43 in)	1 RU
		LSTM2KSGD0 Applicable to a rack with a depth of 800 mm (31.50 in)	500 mm to 800 mm (19.69 in to 31.50 in)	2 RU
		LSTM1KSGD0 Applicable to a rack with a depth of 800 mm (31.50 in)	350 mm to 500 mm (13.78 in to 19.69 in)	2 RU

For information about installing H3C 1 RU slide rails, see *H3C LSXM1BSR 1U Bottom-Support Rails Installation Guide* (available at https://www.h3c.com/en/Support/Resource_Center/EN/Routers/Catalog/CR19000/CR19000/).

For more information about installing H3C 2 RU slide rails, see *H3C 2RU Slide Rails Installation Guide* (available at https://www.h3c.com/en/Support/Resource_Center/EN/Routers/Catalog/CR19000/CR19000/).

When installing slide rails, make sure the load-bearing plane of the slide rails is perpendicular to the four rack posts.

Removing the top hood and air filter

The top hood blocks the mounting bracket mounting holes. Before installing the router in the rack, first remove the top hood and air filter.

To remove the top hood and air filter:

1. Wear an ESD wrist strap. Make sure the wrist strap makes good skin contact and is reliably grounded.
2. Remove the air filter. As shown in Figure2-2, press the locking tabs at both sides of the air filter to remove the air filter from the top hood,.

Figure2-2 Removing the air filter
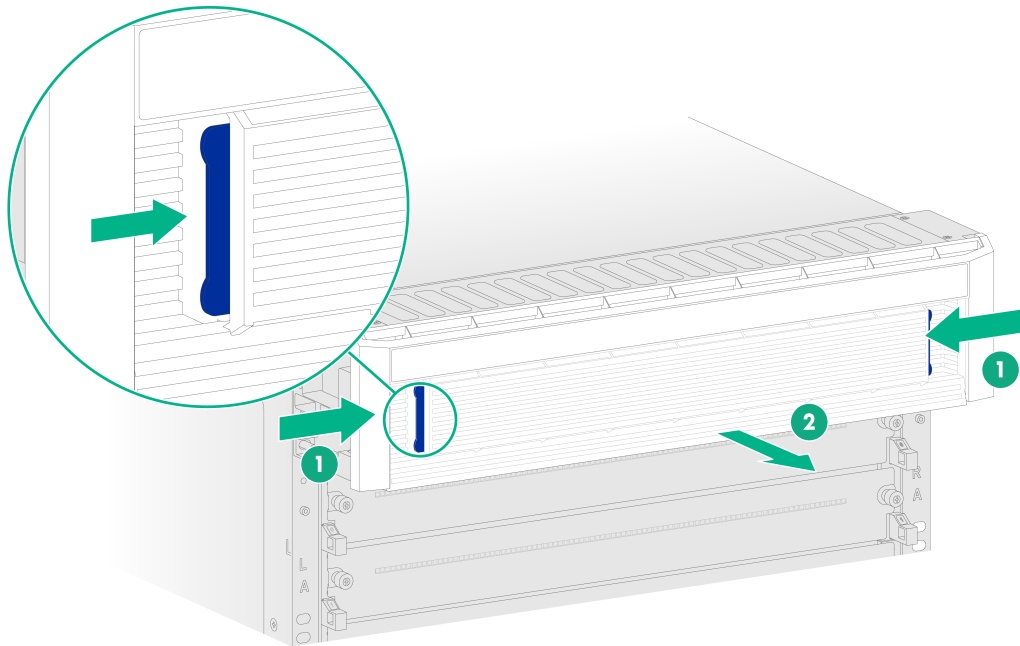
3. Use a screwdriver to loosen the captive screws at the two sides of the top hood and then remove the top hood from the chassis.

Keep the removed top hood secure.

Figure2-3 Removing the top hood

Removing fan trays

The router is heavy. As a best practice, remove all fan trays from the router before installing the router in the rack.

To remove a fan tray:

1. Prepare an antistatic mat to place the fan tray to be removed.
2. Wear an ESD wrist strap. Make sure the wrist strap makes good skin contact and is reliably grounded.
3. Loosen the captive screws on the fan tray and then pull the fan tray out of the slot slowly by holding the fan tray handles.

Figure2-4 Removing a fan tray
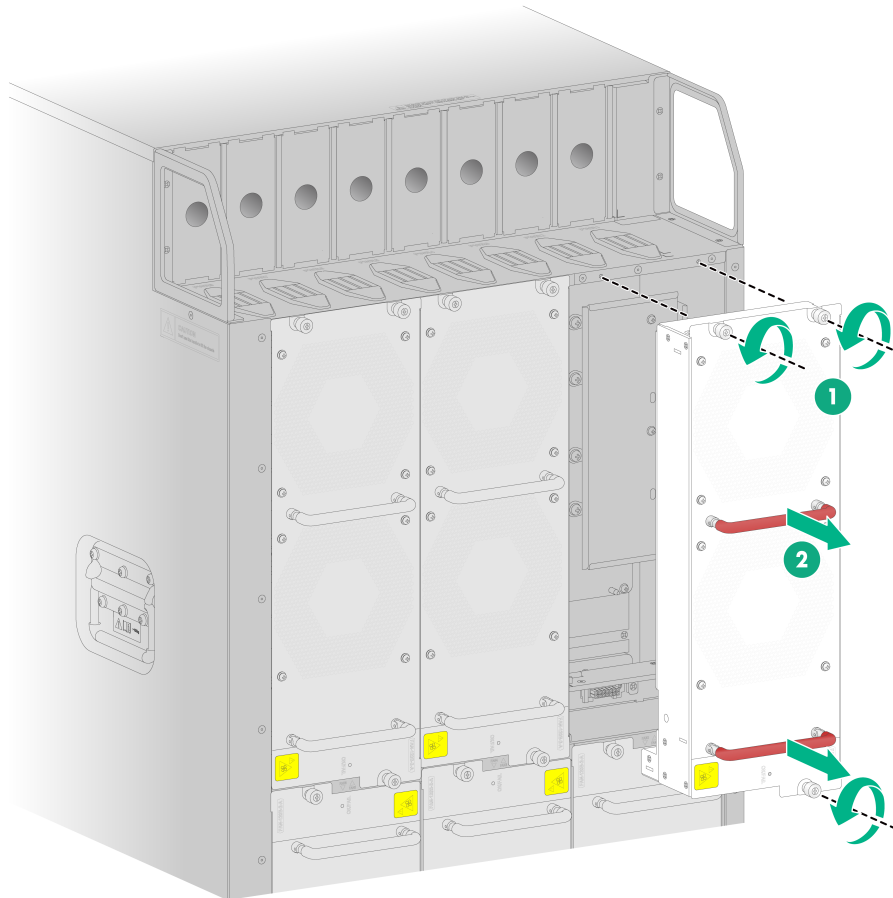
Mounting the router in a rack

△ **CAUTION:**

- When you move the router to a low temperature environment from a high temperature environment, condensation might occur. Before installing the router, dry the router to prevent the internal components from being damaged because of short circuit.
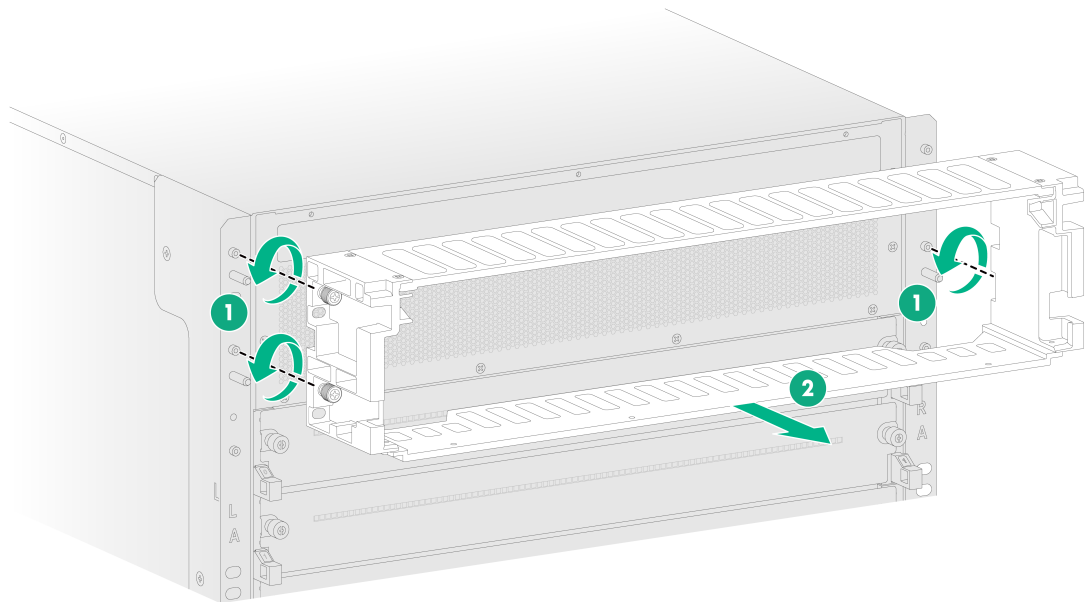- The router is heavy. As a best practice, remove all fan trays from the router before installing the router in the rack. If you have not removed fan trays, do not use the fan tray handles to lift the router to avoid handle damage.

To mount the router in a rack:

1. Wear an ESD wrist strap and verify that the rack is reliably grounded and sturdy.
2. As shown in Figure2-1, mark the cage nut installation holes on the front rack post.

Figure2-5 Marking the cage nut installation holes

4RU			4RU
3RU			3RU
3RU			3RU
4RU			4RU
3RU			3RU
1RU			1RU
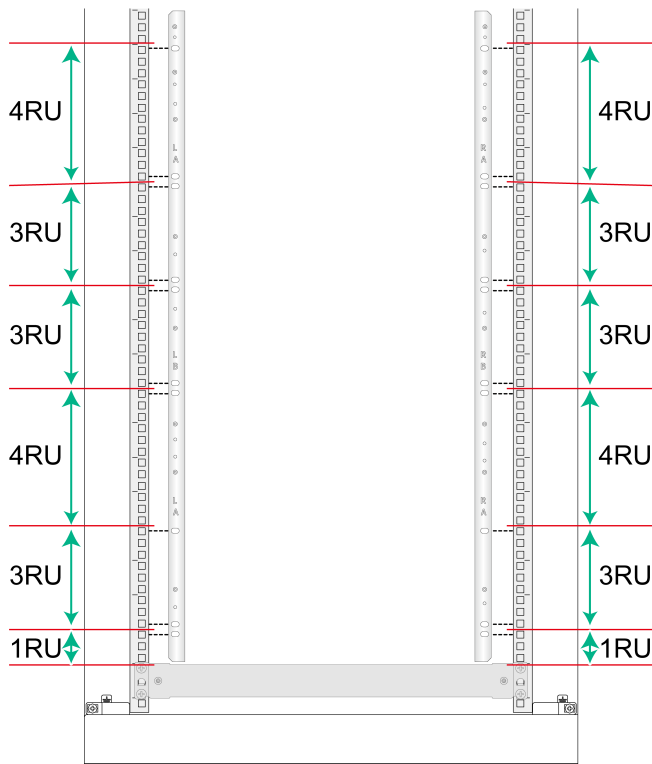
3. Insert cage nuts into the marked square holes in the front rack posts.

Figure2-6 Installing the cage nuts
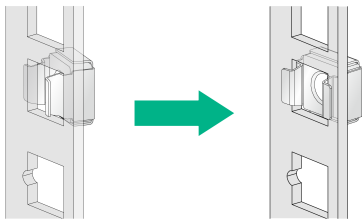
4. Orient the chassis with the rear facing the front of the rack.

5. Use a minimum of four people to lift the router to a height slightly above the slide rails by holding the chassis handles. Then place the router on the slide rails.

⚠ **CAUTION:**

After you place the router on the slide rails from the front of the rack, do not leave go of your hands immediately because this might tip and damage the router.

6. Use M6 screws provided with the router to secure the router to the rack posts, as shown in Figure2-7.

Figure2-7 Securing the router to the rack
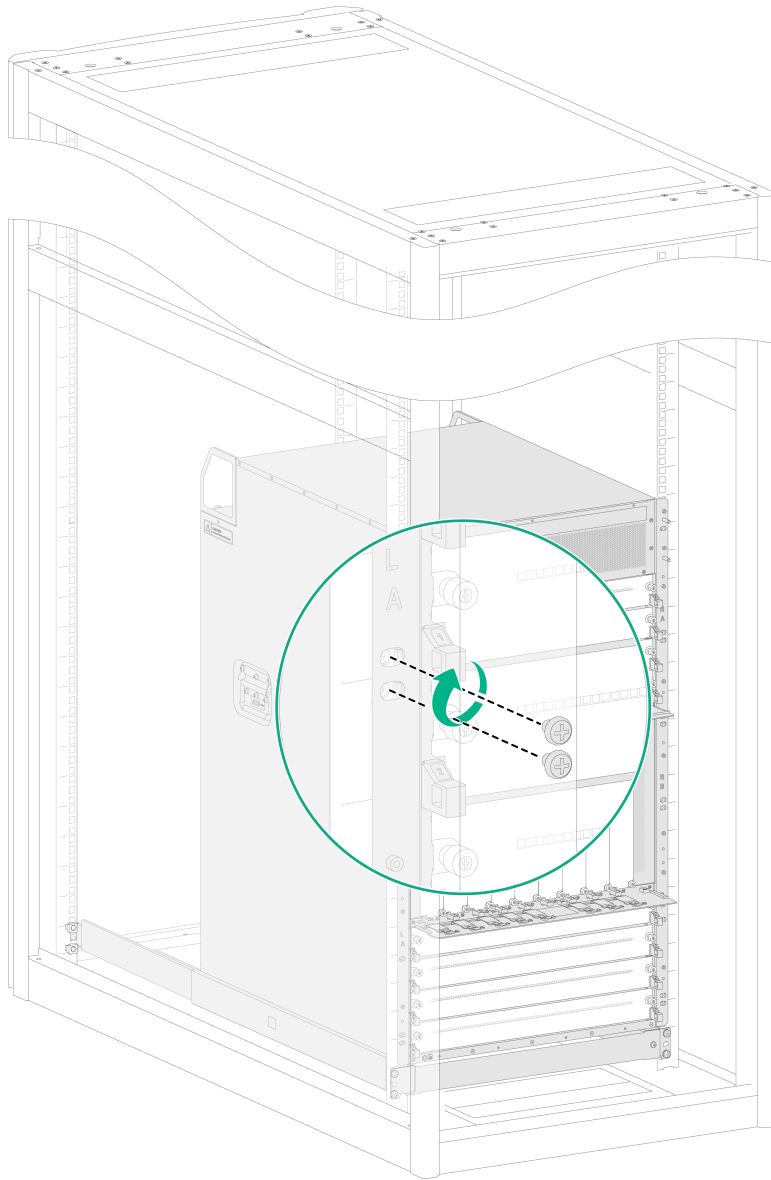
Installing the top hood and air filter

1. Align the holes in the top hood with the pins on the mounting brackets. Push the top hood so that the pins enter the holes in the top hood.

2. Fasten the captive screws to secure the top hood.

Figure2-8 Installing the top hood
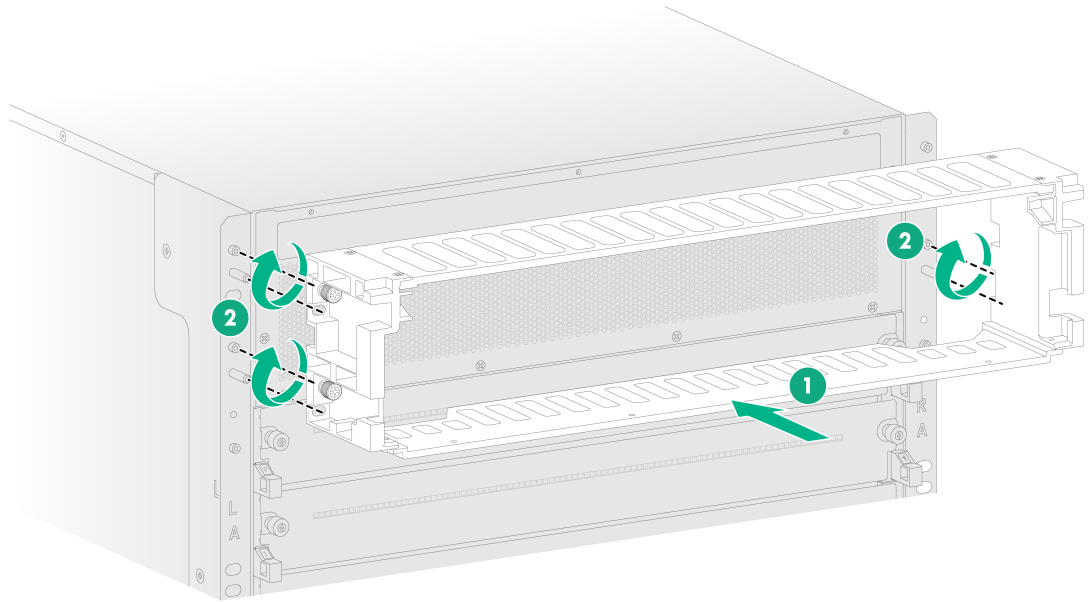
3. Position the air filter over the top hood, and then push the air filter until it is seated into the top hood.

Figure2-9 Installing an air filter
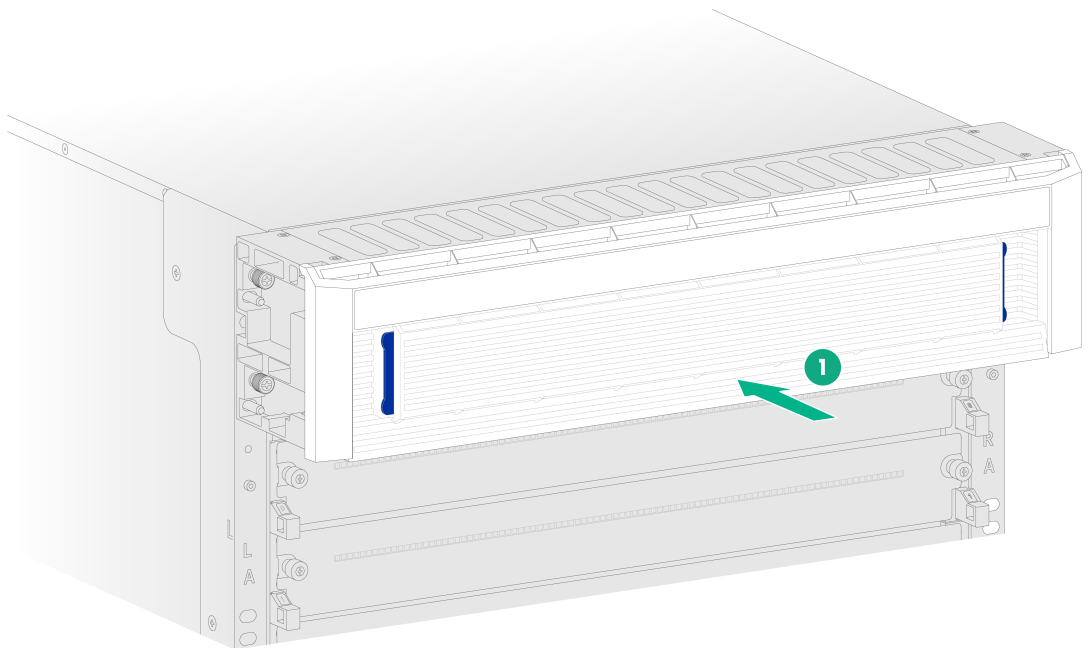
Installing fan trays

⚠ **CAUTION:**

The router has six fan tray slots arranged in two rows at the chassis rear. To ensure good ventilation and achieve 5+1 redundancy, install a fan tray in each fan tray slot.

To install a fan tray:

1. Wear an ESD wrist strap.
2. Correctly orient the fan tray and align the fan tray with the fan tray slot.
   - If you install a fan tray at the upper row, orient the fan tray with the LED on it facing downward.
   - If you install a fan tray at the lower row, orient the fan tray with the LED on it facing upward.
3. Grasp the handles of the fan tray, steadily insert the fan tray way into the slot, and then fasten captive screws on it.

Figure2-10 Installing a fan tray
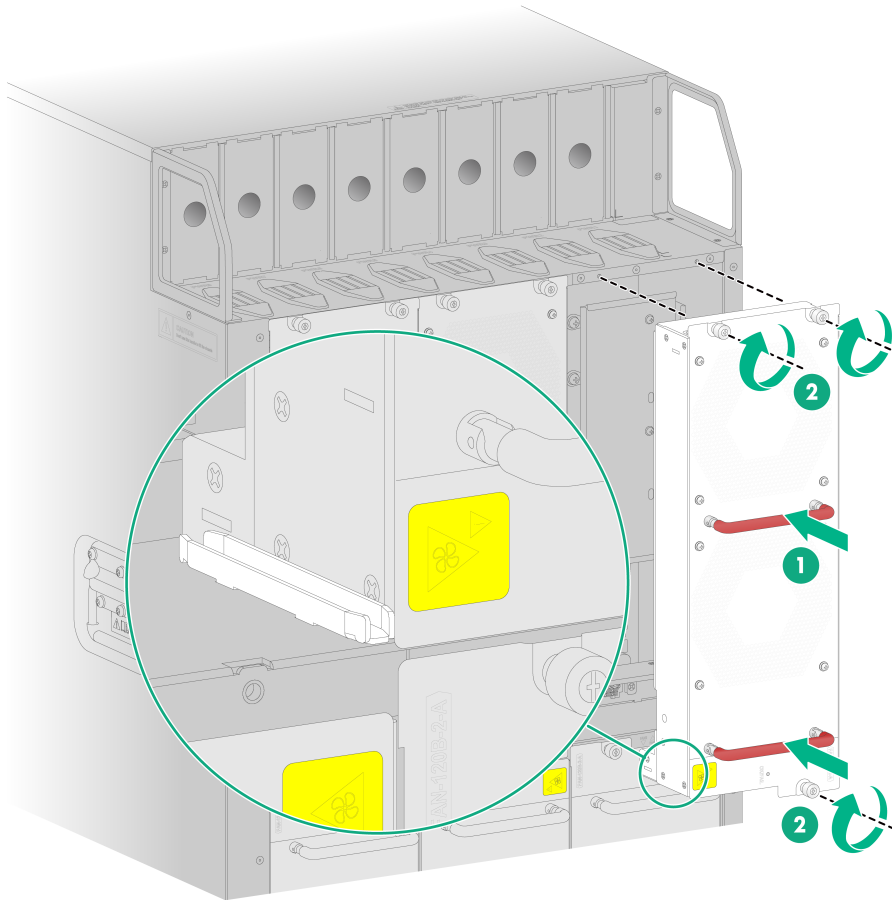
Grounding the router

⚠ **CAUTION:**

Make sure the ground point on the rack is connected reliably to a grounding strip in the equipment room.

To ground the router:

1. Remove the grounding screws from the grounding point on the chassis.
2. Use the grounding screws to attach the two-hole grounding lug of the grounding cable to grounding point on the chassis.
3. Connect the ring terminal of the grounding cable to the grounding point on the rack.

Figure2-11 Grounding the router

Installing cable management brackets

(!) **IMPORTANT:**

To prevent cable management brackets from blocking the mounting bracket mounting holes on the rack posts, install cable management brackets after you mount the router in the rack.

The router comes with three types of cable management brackets LA, LB/RB, and RA and two types of cable guides LA and RA. The cable management brackets come with cable guides installed.

Figure2-12 Cable management brackets

| LA cable management bracket and LA cable guides | LB/RB cable management bracket | RA cable management bracket and RA cable guides |
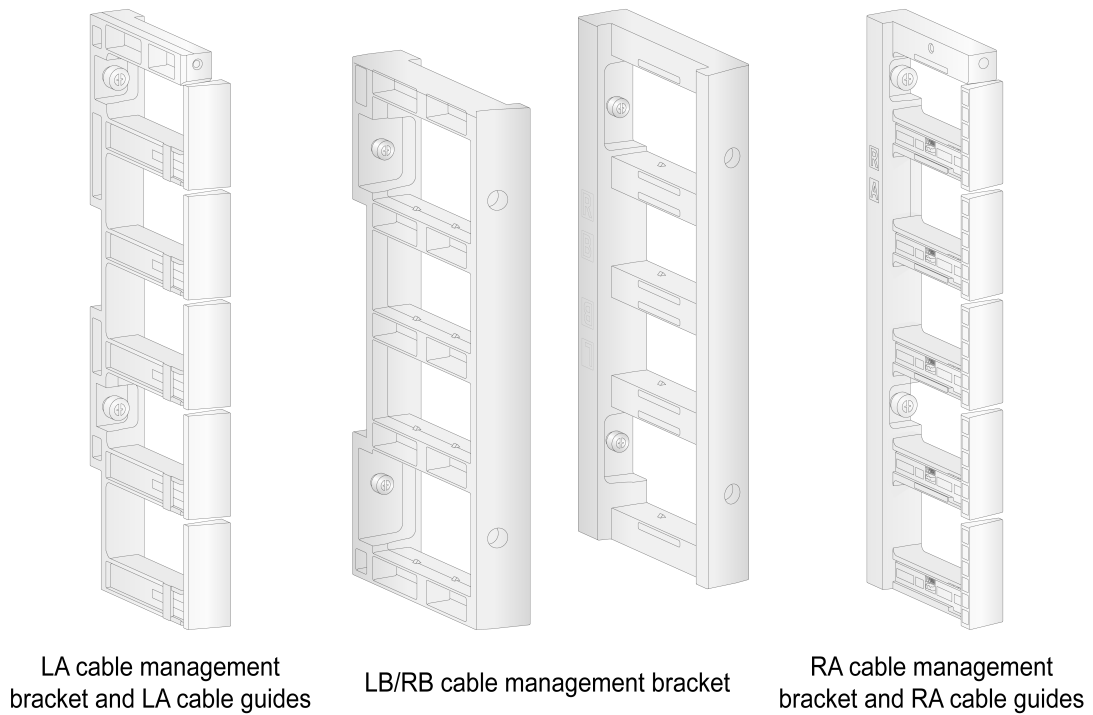
The procedure is similar for installing cable management brackets at the left side and at the right side. The following installs a cable management bracket at the right side.

To install a cable management bracket:

1. If any cable guide hinders installation of the cable management bracket, press the tab on the cable guide and then remove the cable guide from the cable management bracket.

Figure2-13 Removing a cable guide
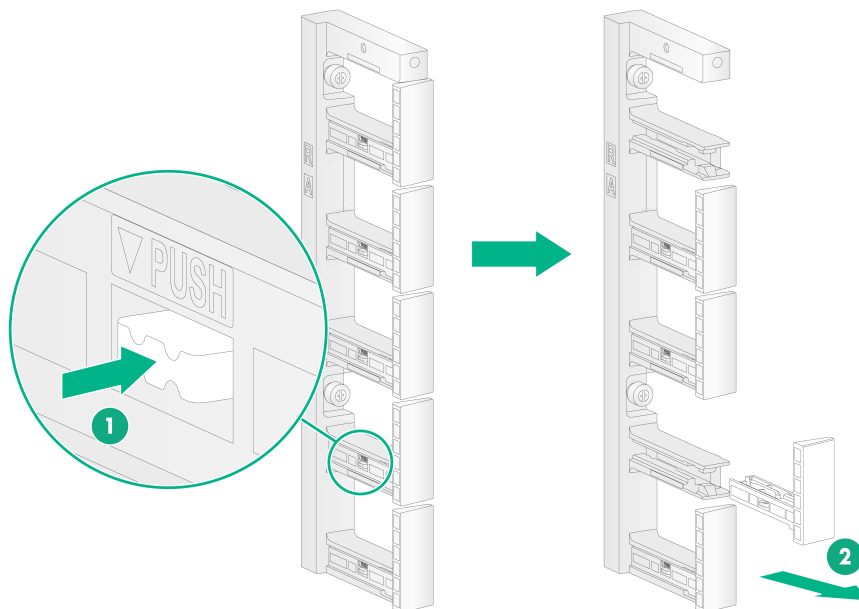
2. Identify the installation position on the mounting bracket. The **LA**, **LB/RB**, and **RA** marks on the mounting brackets indicate the types of cable management brackets to be installed.

3. Orient the cable management bracket, with the lettering facing upward, and then position the cable management bracket on the mounting bracket.

4. Align the captive screws on the cable management bracket with the holes in the mounting bracket. Fasten the captive screws to secure the cable management bracket.

Figure2-14 Installing a cable management bracket
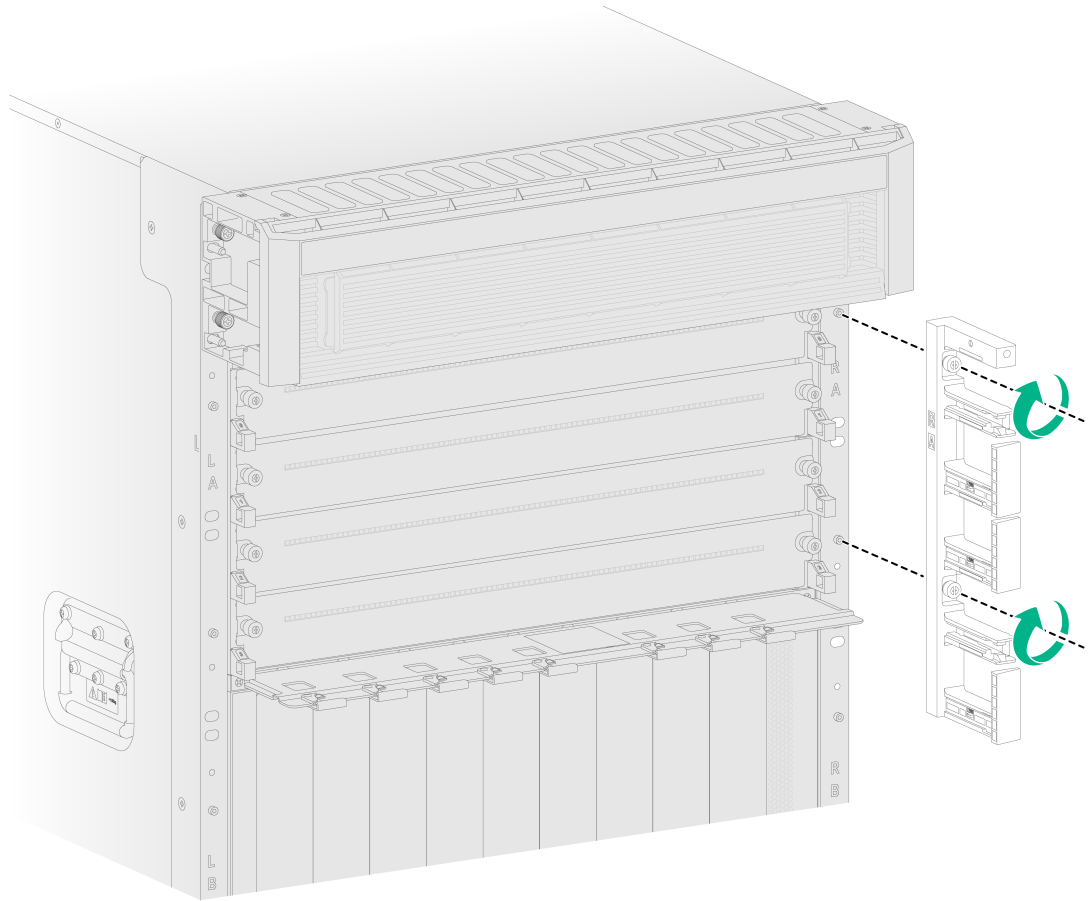
5. Install the removed cable guides (if any) to the cable management bracket.

Contents

3 Installing power supplies

Installing DC power supplies

Available DC power supplies

The PSR2400-54D DC power supply is available for the router. Table3-1 describes the PSR2400-54D DC power supply specifications.

Table3-1 PSR2400-54D DC power supply specifications

Item	Specification
Rated input voltage	−48 to −60 VDC
Input voltage range	−40 to −72 VDC
Max input current	80 A
Rated output voltage	54 VDC
Max. output current	44.5 A
Max. output power	2400 W

DC power supply configuration guidelines

Determine the number of DC power supplies based on the system power consumption and the DC power supply configuration based on the power input mode.

- Make sure the total output power of the power supplies is greater than the system power consumption (with a 20% power surplus as a best practice).
- As a best practice, configure N+M (M ≥ 1) DC power supply redundancy. Make sure N+M is not larger than the total number of power supply slots.

  N is the number of DC power supplies.
- Provide a circuit breaker for power input of each DC power supply. Make sure each circuit breaker has a current rating not less than 100 A.

Installing a DC power supply

1. Wear an ESD wrist strap and make sure the strap makes good skin contact and is reliably grounded.
2. Remove the filler panel from the target power supply slot.

   Put your forefinger into the hole of the filler panel to hold and pull out the filler panel along the guide rails as shown in Figure3-1.

Figure3-1 Removing a filler panel
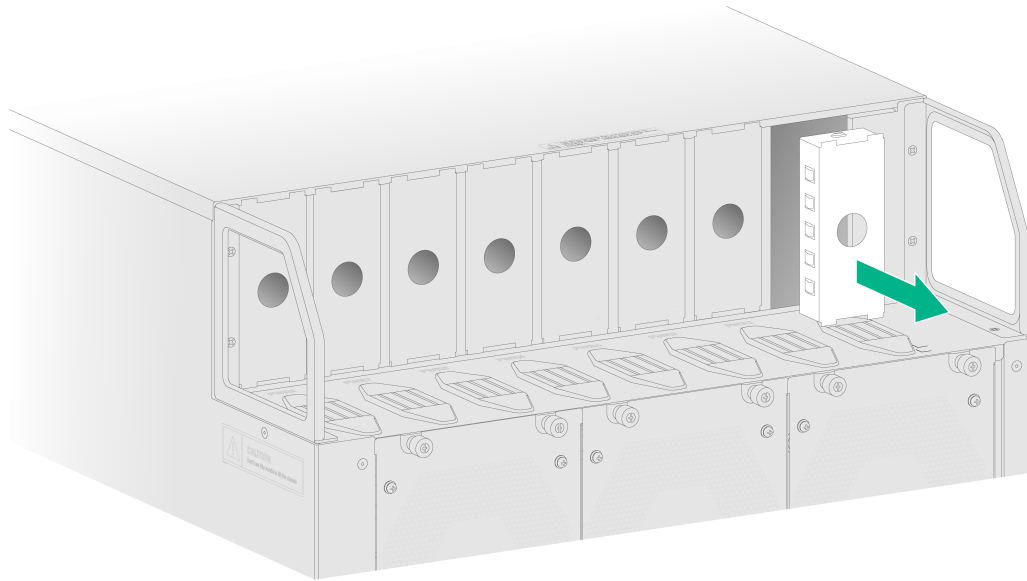
3. Correctly orient the power supply with the latch above the handle.
4. Align the power supply with the power supply slot. Then slide the power supply along the guide rails into the slot until the latch locks the power supply in place.

Figure3-2 Installing a DC power supply
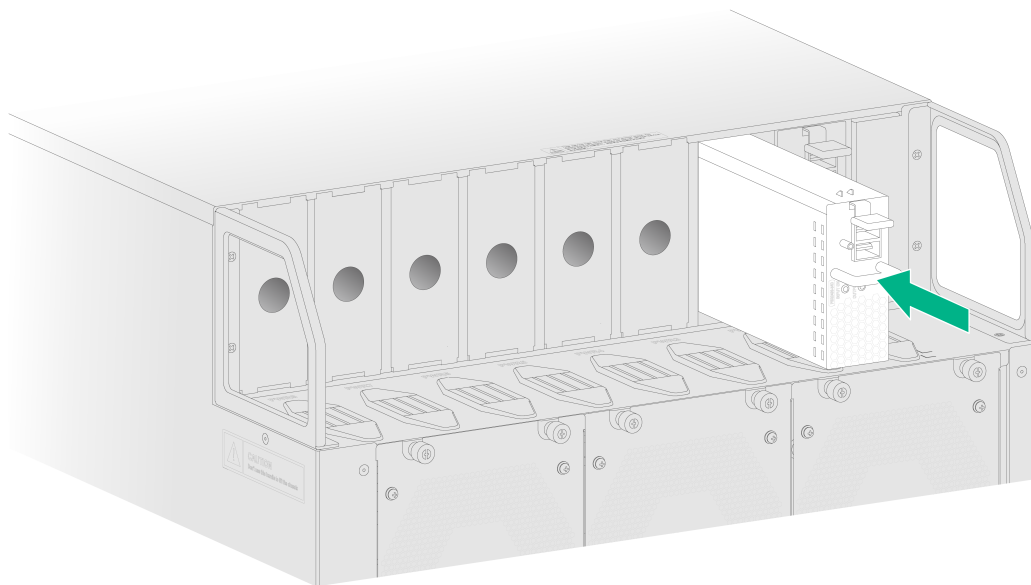
Connecting a DC power cord

⚠ **CAUTION:**

Before you connect a power cord, turn off the circuit breakers for both positive and negative inputs.

To connect a DC power cord:

1. Connect the DC power cord connectors to the DC input receptacles on the DC power supply.

2. Fasten the screw on the connectors to secure the connectors to the receptacles.

3. Connect the other ends of the power cord to a DC input terminal block, with the negative wire (**–**) to the negative terminal (**–**) and the positive wire (**+**) to the positive terminal (**+**).

Figure3-3 Connecting a DC power cord
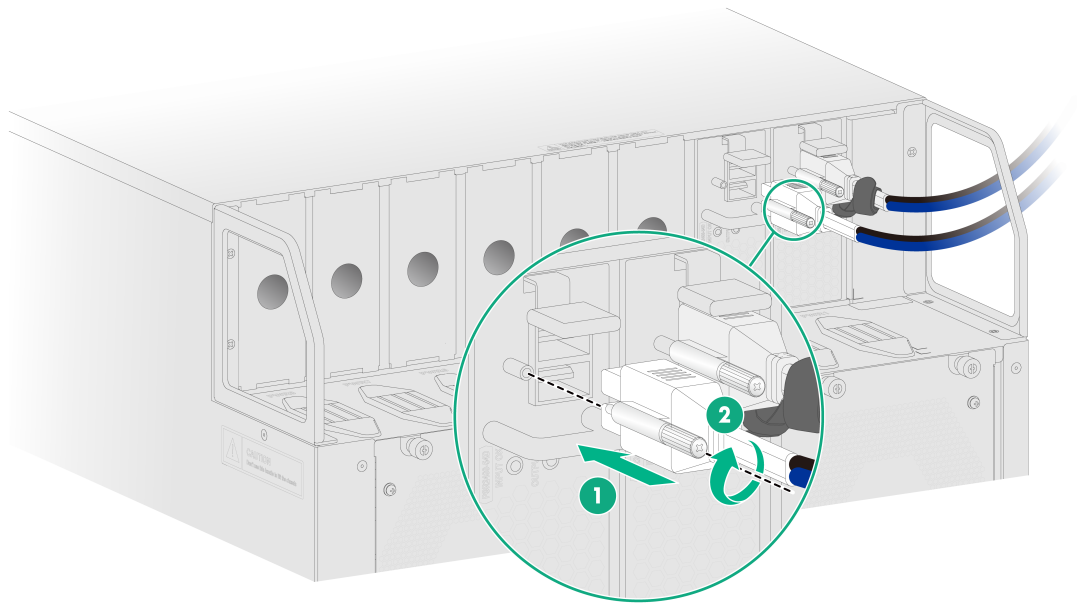
Installing AC power supplies

Available AC power supplies

The PSR2400-54A and PSR3000-54A AC power supplies are available for the router. Table3-2 describes the AC power supply specifications.

Table3-2 AC power supply specifications

Item	PSR2400-54A	PSR3000-54A

Rated input voltage	• AC power input:
	   o 100 to 130 VAC @ 60 Hz
	   o 200 to 240 VAC @ 50 Hz
	• High voltage DC power input: 240 VDC
		• AC power input:
		   o 100 to 130 VAC @ 60 Hz
		   o 200 to 240 VAC @ 50 Hz
		• High voltage DC power input: 240 VDC

Input voltage range	• AC power input: 90 to 264 VAC @ 47 to 63 Hz • High voltage DC power input: 190 to 320 VDC	• AC power input: 90 to 290 VAC @ 47 to 63 Hz • High voltage DC power input: 190 to 320 VDC
Rated input current	16 A	16 A
Rated output voltage	54 VDC	54 VDC
Max. output current	44.5 A	55.6 A
Max. output power	• 100 to 130 VAC @ 60 Hz: 1200 W	• 100 to 130 VAC @ 60 Hz: 1200 W

| Item	PSR2400-54A	PSR3000-54A
	• 200 to 240 VAC @ 50 Hz: 2400 W • 240 VDC: 2400 W	• 200 to 240 VAC @ 50 Hz: 3000 W • 240 VDC: 3000 W

AC power supply configuration guidelines

Determine the number of AC power supplies based on the system power consumption and the AC power supply configuration based on the power input mode.

- Make sure the total output power of the power supplies is greater than the system power consumption (with a 20% power surplus as a best practice).

- As a best practice, configure N+N (dual power sources) AC power supply redundancy. Make sure N+N is not larger than the total number of power supply slots.

  N is the number of AC power supplies.

- Provide a circuit breaker for power input of each AC power supply. Make sure each circuit breaker has a current rating not less than 20 A.

Installing an AC power supply

1. Wear an ESD wrist strap and make sure the strap makes good skin contact and is reliably grounded.
2. Put your forefinger into the hole of the filler panel and to hold and pull out the filler panel along the guide rails as shown in Figure3-4.

   Figure3-4 Removing a filler panel
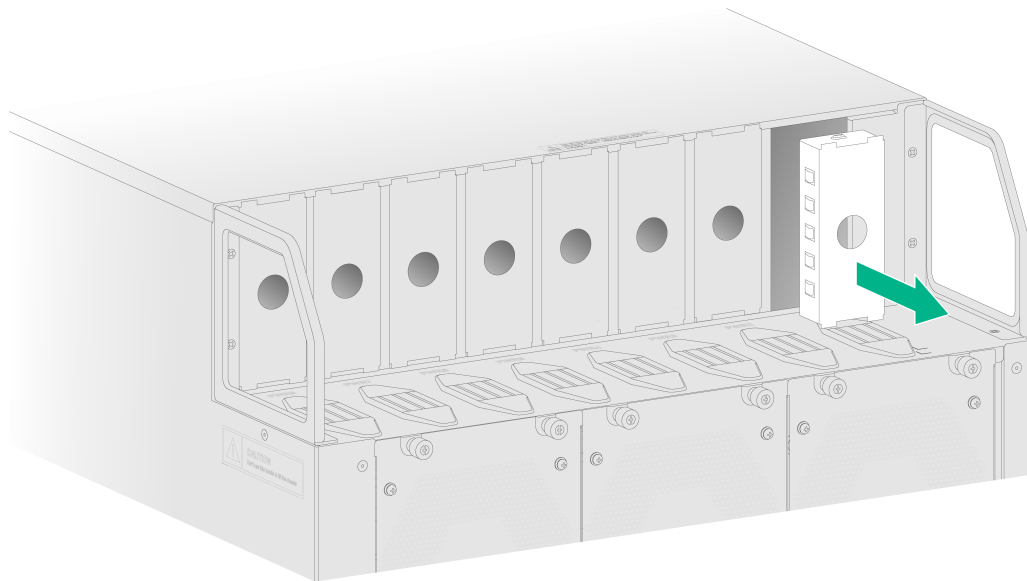
3. Correctly orient the power supply with the latch above the handle.
4. Align the power supply with the power supply slot. Then slide the power supply along the guide rails into the slot until the latch locks the power supply in place.

Figure3-5 Installing an AC power supply
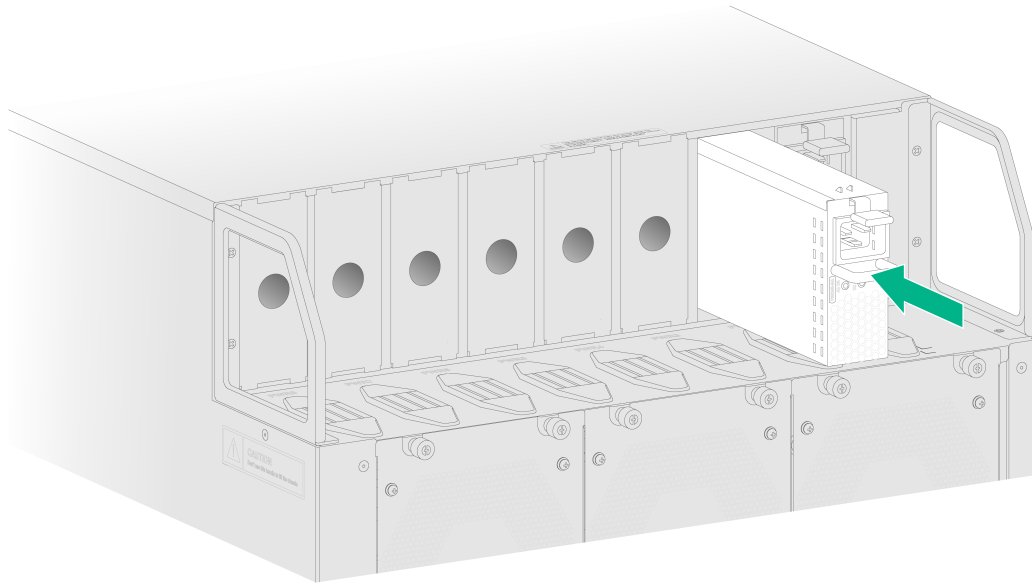

Connecting an AC power cord

⚠️ **CAUTION:**
- Before powering on power supplies, finish installing fan trays.
- Make sure each power cord has a separate circuit breaker. Before you connect a power cord, turn off the circuit breaker for it.
- Use 16A AC power cords with a straight C19 connector for the router.

To connect an AC power cord:

1. Connect the female connector of the AC power cord to the AC input receptacle on the AC power supply.
2. Use a Velcro strap to secure AC power cord to the handle of the AC power supply, as shown in Figure3-6.
3. Connect the other end of the power cord to an AC power source.

Figure3-6 Connecting an AC power cord
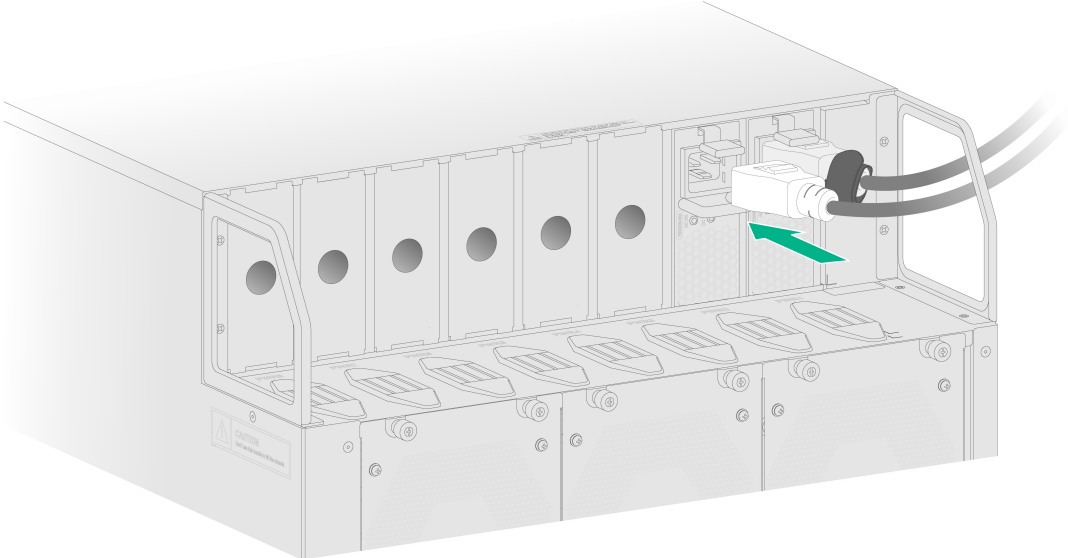
Contents

4 Installing removable components

> **CAUTION:**
> - Do not remove the filler panel in the slot to the right of slot 15.
> - If you are not to install a module or interface subcard in the slot, keep the filler panel in the slot. Keep the removed filler panels secure for future use.
> - Filler panels differ depending on the module type. When you install a filler panel over a slot, make sure it matches that slot.

Slot arrangement

"LPU" in Figure4-1 refers to an interface module, "SFU" refers to a single-chassis fabric module, and "MSFU" refers to a multi-chassis fabric module.

Figure4-1 Slot arrangement
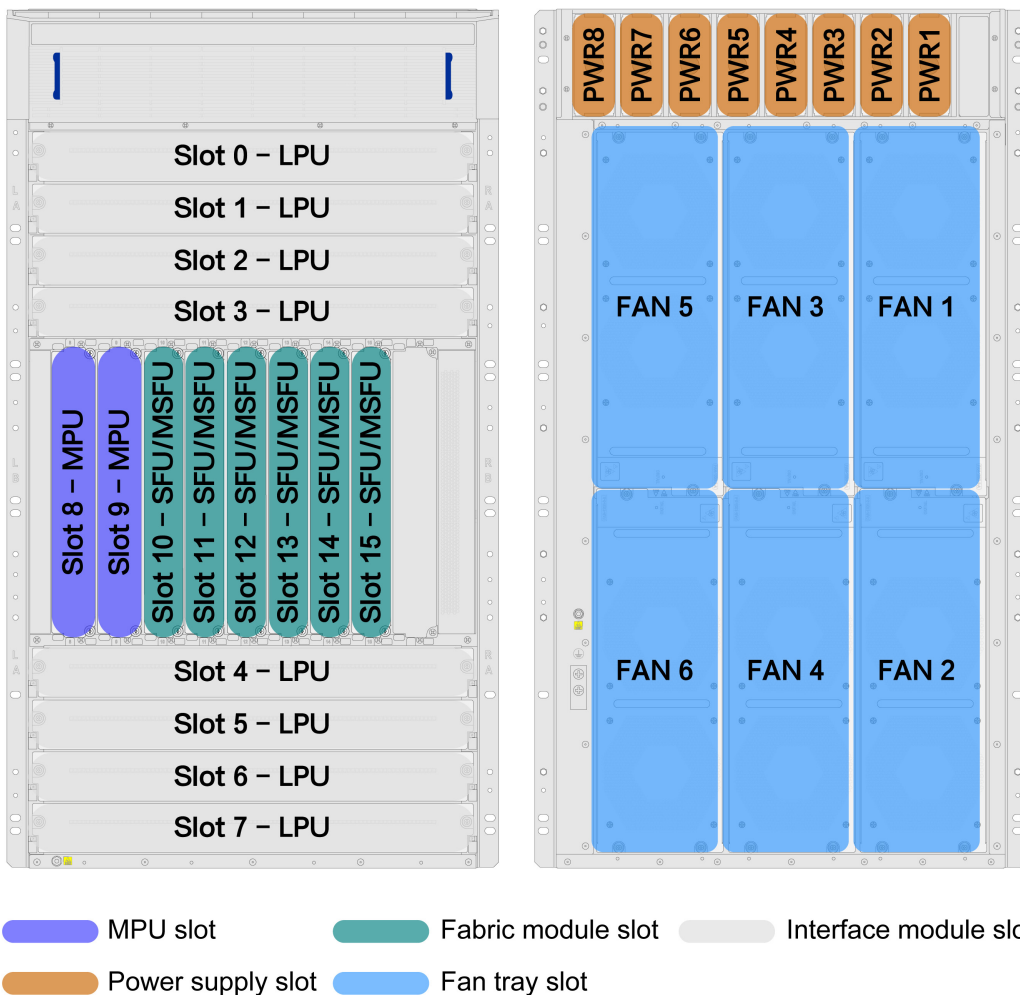
The router provides two MPU slots, six fabric module slots, eight interface module slots, eight power supply slots, and six fan tray slots.

- Slots 8 and 9 are MPU slots. Each slot supports one MPU and allows hot swapping of the MPU. The router supports 1+1 MPU redundancy and does not allow mixture of different models of MPUs.
- Slots 10 to 15 are fabric module slots. Each slot supports one fabric module and allows hot swapping of the fabric module. The router does not allow mixture of different models of fabric modules.
- Slots 0 to 3 and slots 4 to 7 are interface module slots. Each slot supports one interface module and allows hot swapping of the interface module. The router allows mixture of different models of interface modules.

Installing MPUs

⚠ **CAUTION:**
- The router supports active/standby MPU switchover when you install two MPUs for the router. For the standby MPU to start up correctly, make sure the active and standby MPUs are the same model.
- The router does not allow mixture of different models of MPUs.

The router has two MPU slots. You can install one MPU, or two MPUs in 1+1 redundancy for the router.

To install an MPU:

1. Wear an ESD wrist strap and make sure it makes good skin contact and is reliably grounded.

2. Remove the filler panel from the target MPU slot.

Keep the removed filler panel secure for future use.

Figure4-2 Removing a filler panel
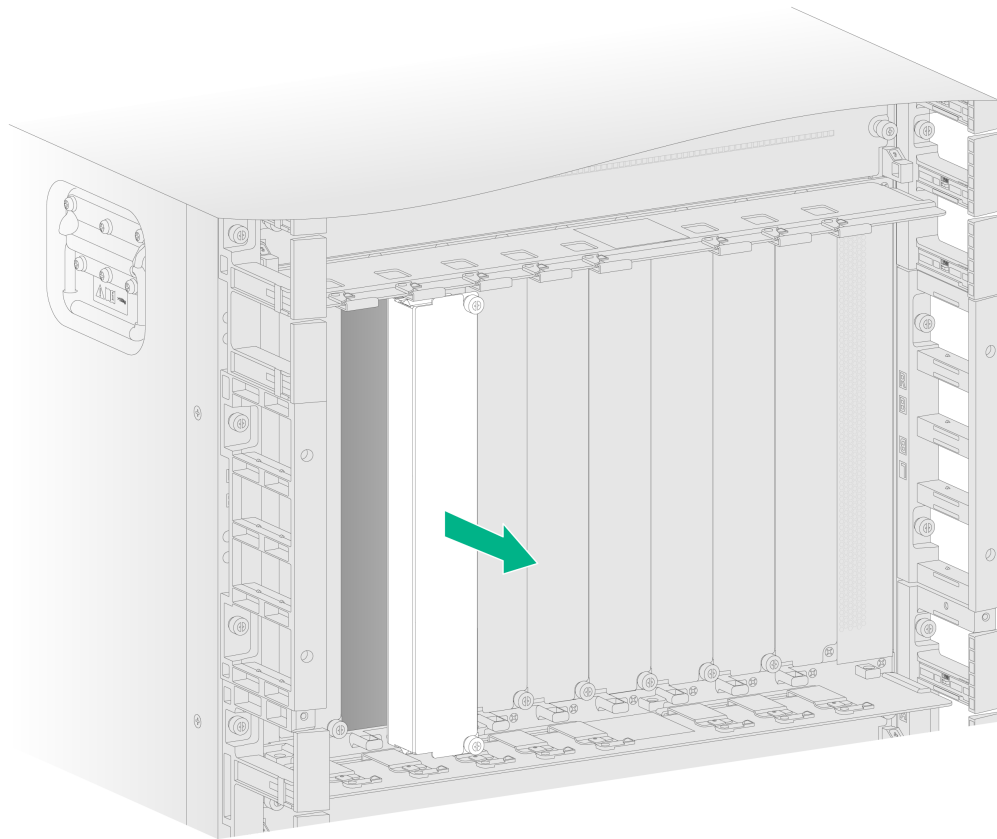
3. Orient the MPU correctly and align the MPU with the slot. Insert the MPU into the slot and fully open the ejector levers on the MPU.

4. Continue to push the MPU by its middle part on the front panel until the ejector levers touch the slot edges tightly.

5. Close the ejector levers until they come in close contact with the front panel.

6. Use a Phillips screwdriver to fasten the captive screws on the MPU.

Figure4-3 Installing an MPU
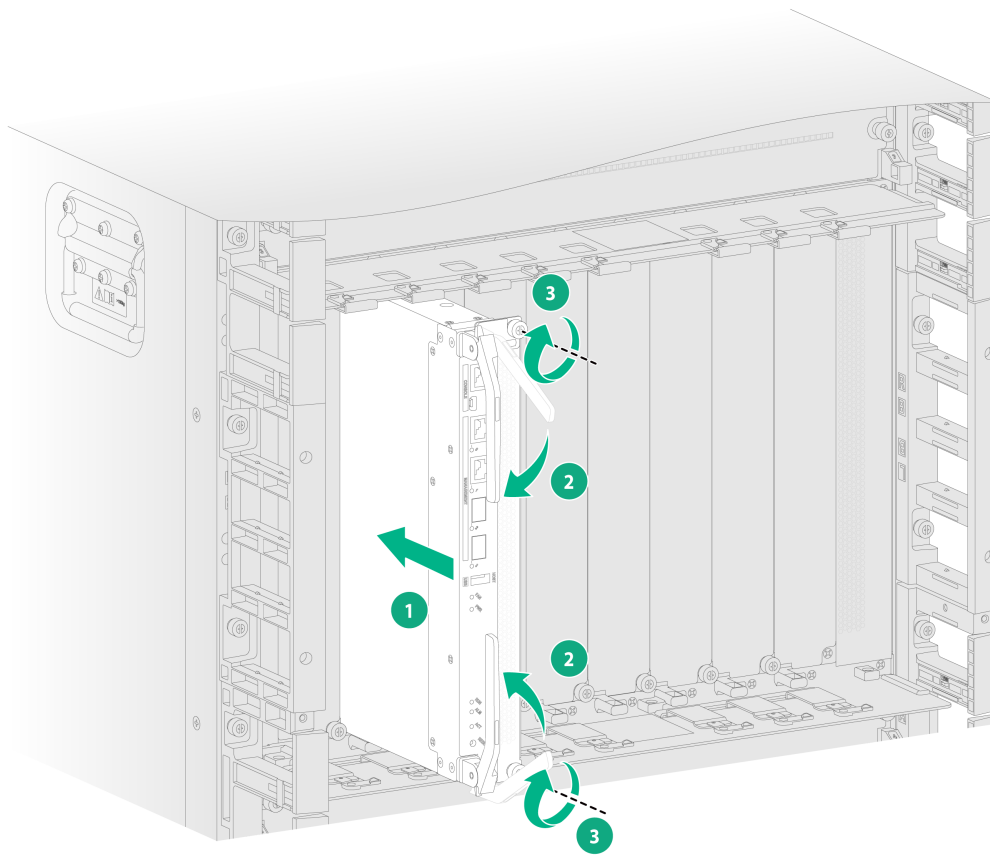
Installing fabric modules

⚠ **CAUTION:**

- When you install a fabric module, avoid touching the connectors on the fabric module.
- The router does not allow mixture of different models of fabric module.

The router provides six fabric module slots and supports N+1 fabric module redundancy. You can install three to six fabric modules for the router.

To install a fabric module:

1. Place the fabric module on a workbench and remove the protection box from the connector side of the fabric module.

Figure4-4 Removing the protection box
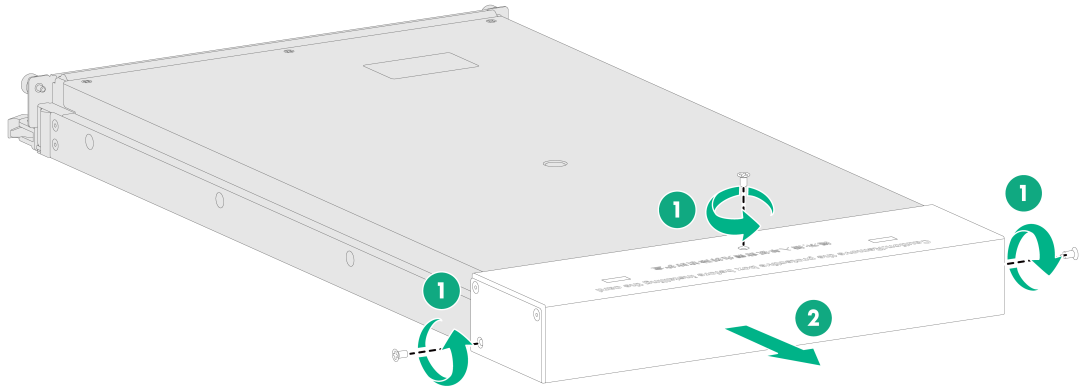
2. Remove the filler panel from the target fabric module slot.

   Keep the removed filler panel secure for future use. The method is the same for removing a filler panel from a fabric module slot and an MPU slot. For more information, see "Installing MPUs."

3. Install a fabric module. The method is the same for installing a fabric module and an MPU. For more information, see "Installing MPUs."

Installing interface modules

> △ **CAUTION:**
>
> The router does not allow mixture of different models of interface modules.

Installing an interface module that uses detachable ejector levers

> △ **CAUTION:**
> - Put the detachable ejector lever back on its holder after use and then attach it to the chassis or cabinet for future use.
> - The ejector lever holder is magnetic. Be aware of electromagnetic interference.
> - Do not use only one detachable ejector lever to install or remove an interface module.
> - Do not hold detachable ejector levers to lift an interface module.

Figure4-5 Detachable ejector lever
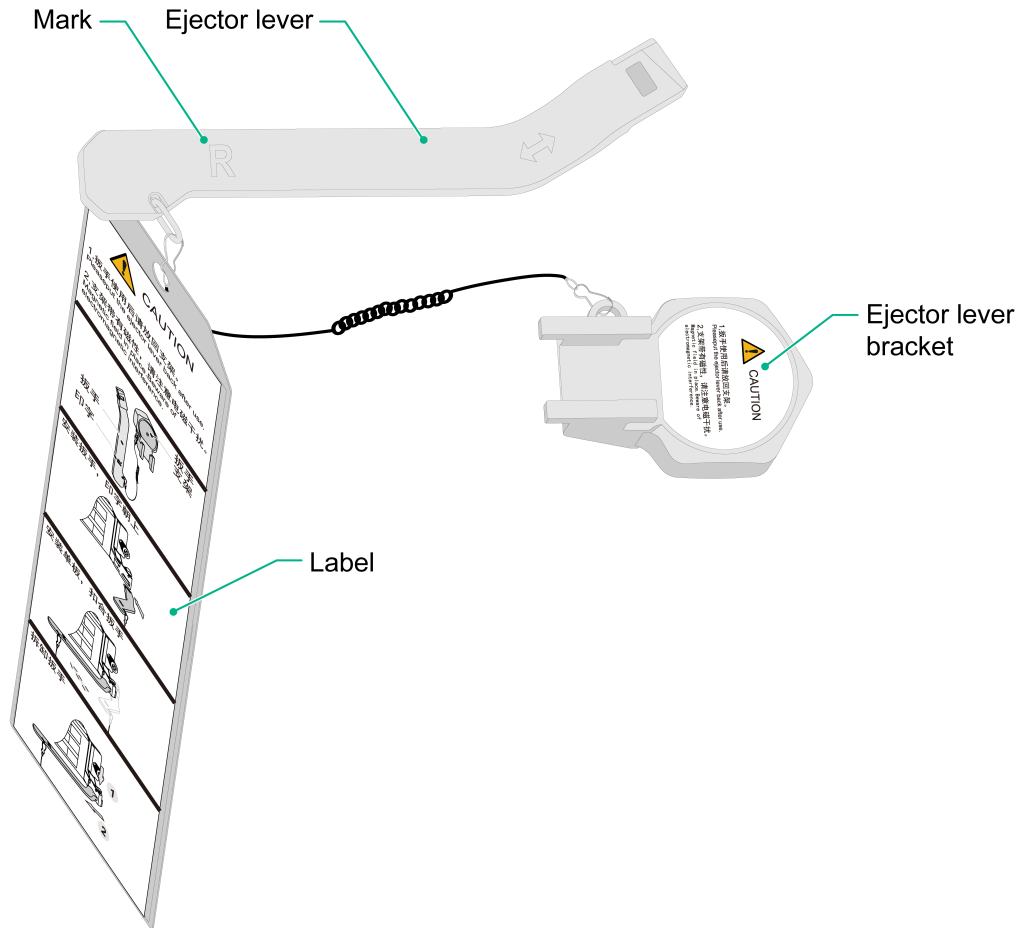
To install an interface module that uses detachable ejector levers:

1. Wear an ESD wrist strap. Make sure the wrist strap makes good skin contact and is reliably grounded.
2. Remove the filler panel from the target interface module slot.

    Keep the removed filler panel secure for future use.
3. Remove the protection box (if any) from the connector side of the interface module, as shown in Figure4-6.

    Keep the removed protection box secure for future use.

    The number of screws for securing the protection box in Figure4-6 is for illustration only and the actual number of screws on your interface module might differ from that.

Figure4-6 Removing the protection box
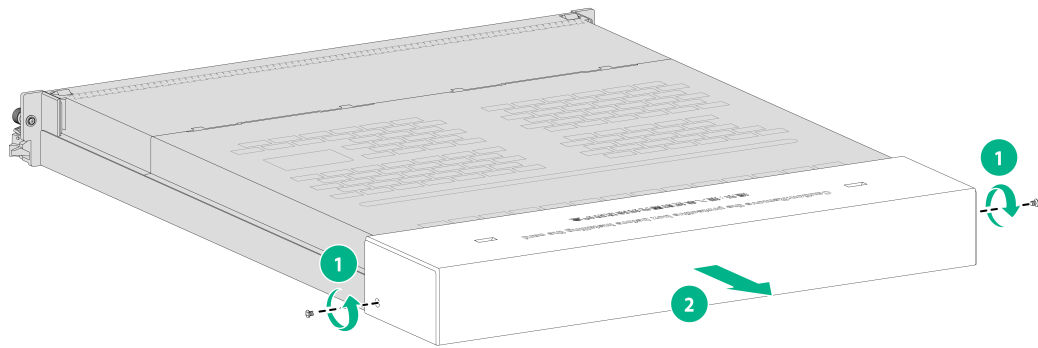
4. Correctly orient the interface module. Align the module with the slot and push it steadily into the slot along the guide rails until about half of the module is in the slot.

Figure4-7 Installing an interface module that uses detachable ejector levers
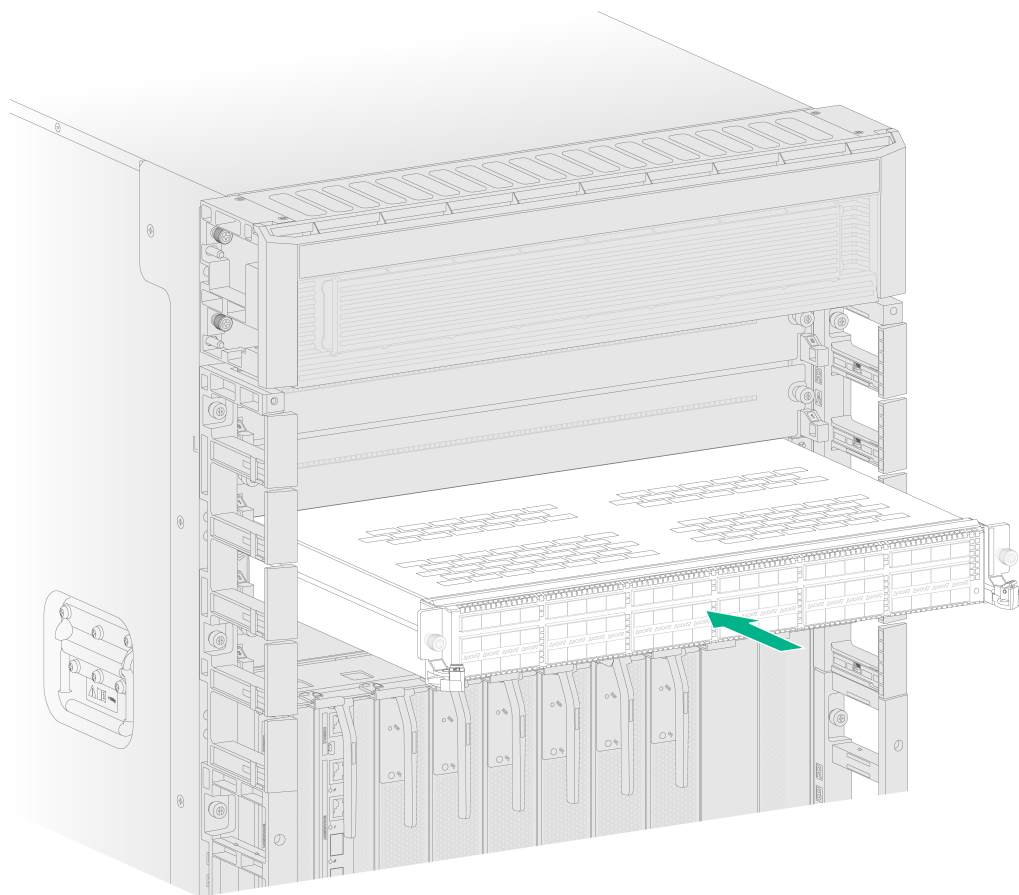
5. Attach the ejector lever holders to the chassis or cabinet and then remove the ejector levers from the holders.
6. Identify the **L** and **R** marks on the ejector levers and attach them to left and right ejector lever retainers of the interface module, with the lettering on the ejector levers facing upward.

Figure4-8 Installing an ejector lever
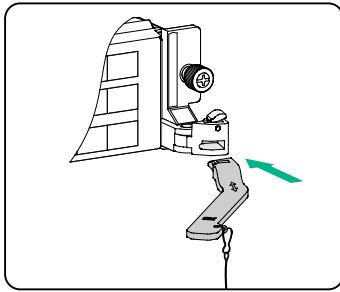
7. Open the ejector levers and continue to push the module by its middle part on the front panel until you cannot push it any further.

8. As shown in Figure4-9, close the ejector levers until they come in close contact with the front panel. Use a Phillips screwdriver to fasten the captive screws on the interface module.

Figure4-9 Closing an ejector lever
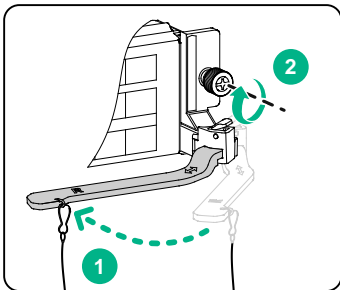
9. As shown in Figure4-10, press the spring tab on each ejector lever retainer to remove the ejector levers. Place the ejector lever back on their holders and keep them secure for future use.

Figure4-10 Removing an ejector lever
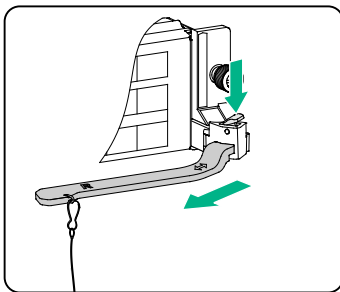
Installing an interface module that uses general ejector levers

1. Wear an ESD wrist strap. Make sure the wrist strap makes good skin contact and is reliably grounded.

2. Remove the filler panel from the target interface module slot.
   Keep the removed filler panel secure for future use.

3. Open the ejector levers of the interface module.

4. Gently push the interface module into the slot along the guide rails.

5. Continue to push the interface module by its middle part on the front panel until you cannot push it any further. Then close the ejector levers.
6. Use a Phillips screwdriver to fasten the captive screws on the interface module.
7. Pivot up the ejector levers on the interface module.

Figure4-11 Installing an interface module that uses general ejector levers
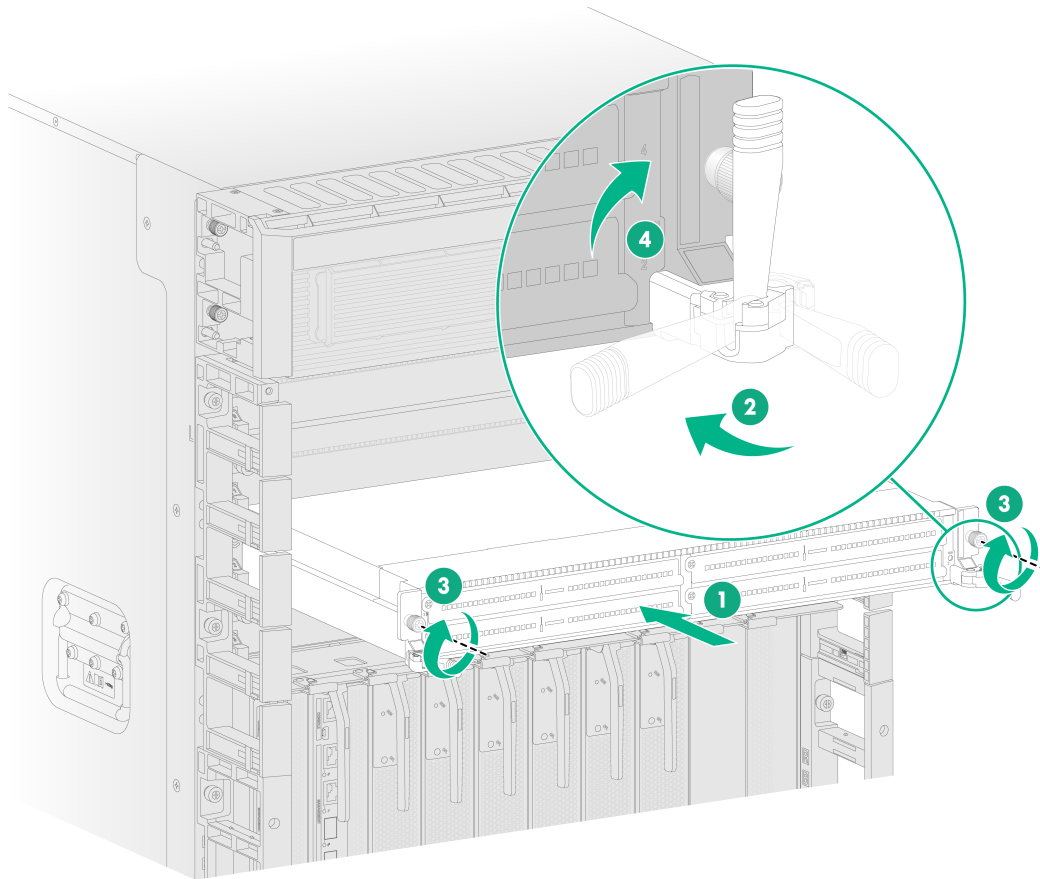
Installing interface subcards

For the interface subcard compatibility with interface modules, see *H3C CR19000-8 Core Router Hardware Information and Specifications*.

To install an interface subcard:

1. Wear an ESD wrist strap. Make sure the wrist strap makes good skin contact and is reliably grounded.
2. Remove the filler panel from the target slot on the interface module.

   Keep the removed filler panel secure for future use.
3. Open the right ejector lever of the interface subcard.
4. Insert the interface subcard into the slot and push it steadily into the slot along slide rails.
5. Continue to push the interface subcard by its middle part on the front panel until you cannot push it any further.
6. Close the right ejector lever until it comes in close contact with the front panel.
7. Use a screwdriver to fasten the captive screw on the interface subcard.

Figure4-12 Installing an interface subcard
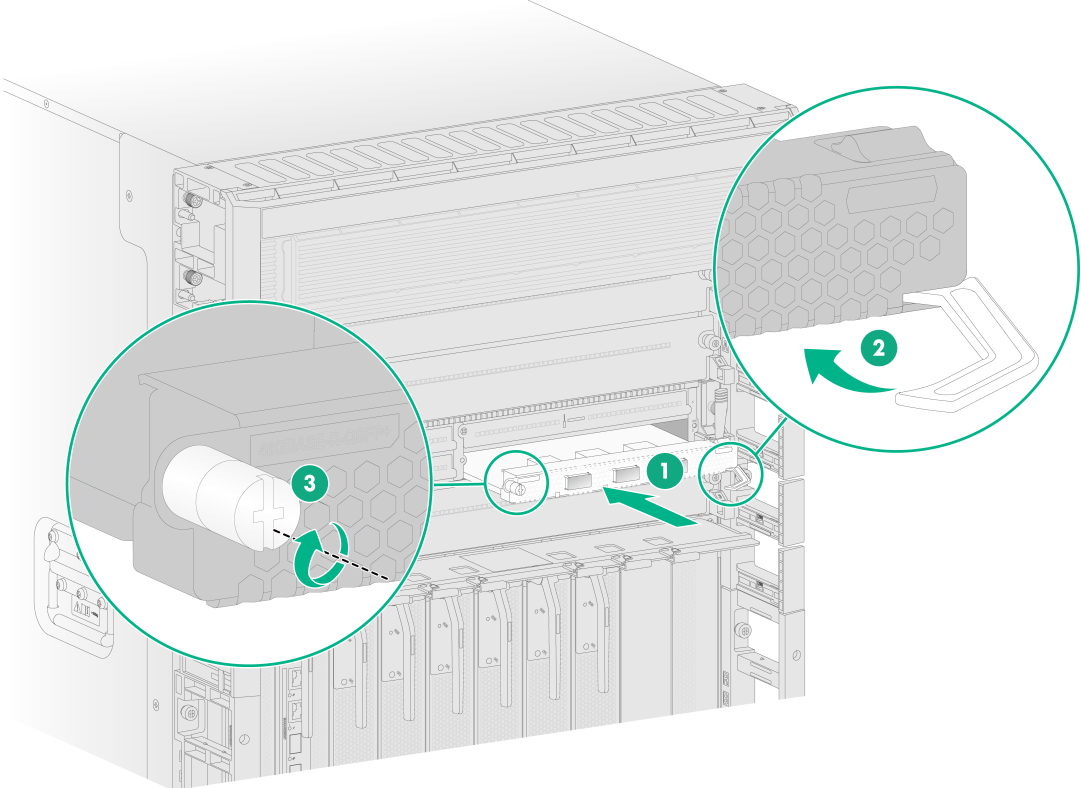
Contents

5 Connecting cables

Connecting cables to Ethernet copper ports

Cables for connecting Ethernet copper ports

Typically, Ethernet copper ports use twisted pair cables for communication. 10/100 Mbps Ethernet uses category-5 twisted pair cables, while 1000 Mbps Ethernet uses category-5 enhanced or category-6 twisted pair cables. Twisted pair cables include straight-through cables and crossover cables.

- Category-5 cables provide a transmission frequency of 100 MHz for voice and data transmission; they are mainly used in 100BASE-T and 10BASE-T networks. Category-5 cables are the most commonly used Ethernet cables, which can also be used to transmit 1000 Mbps Ethernet data.

- Category-5 enhanced cables feature low attenuation and crosstalk, providing higher attenuation to crosstalk ratio (ACR), less delay error and higher performance than category-5 cables. Category-5 enhanced cables are mainly used in 1000 Mbps Ethernet networks.

- Category-6 cables provide a transmission frequency of 1 MHz to 250 MHz, and improve the performance on crosstalk and return loss. A fine better return loss performance is extremely important for new-generation full-duplex high-speed networks. Category-6 cables have sufficient power sum ACR (PS-ACR) when working at 200 MHz. They provide a bandwidth two times than that of category-5 enhanced cables, featuring a higher transmission performance. Therefore, category-6 cables are suitable for applications requiring a transmission speed of more than 1 Gbps.

The 10/100 Mbps Ethernet uses two pairs of cables, orange/white, orange, green/white and green cables, to transmit and receive data, while the 1000 Mbps Ethernet uses four pairs of cables to transmit and receive data.

Figure5-1 Ethernet cable
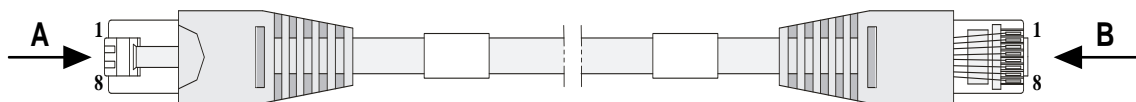
RJ-45 connector

An Ethernet twisted pair cable connects network devices by using the RJ-45 connectors at the two ends. Figure5-2 shows the pinouts of an RJ-45 connector.

Figure5-2 RJ-45 connector pinout diagram
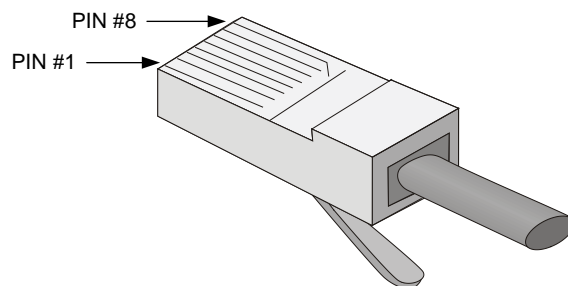
Cable pinouts

EIA/TIA cabling specifications define two standards: 568A and 568B for cable pinouts.

- **Standard 568A**—pin 1: white/green stripe, pin 2: green solid, pin 3: white/orange stripe, pin 4: blue solid, pin 5: white/blue stripe, pin 6: orange solid, pin 7: white/brown stripe, pin 8: brown solid.

- **Standard 568B**—pin 1: white/orange stripe, pin 2: orange solid, pin 3: white/green stripe, pin 4: blue solid, pin 5: white/blue stripe, pin 6: green solid, pin 7: white/brown stripe, pin 8: brown solid.

For the pinouts of common twisted pair cables, see the following tables. (A and B represent the two ends of a cable.)

Table5-1 Straight-through cable pinouts

Pinout No.	A	B
1	Orange/white	Orange/white
2	Orange	Orange
3	Green/white	Green/white
4	Blue	Blue
5	Blue/white	Blue/white
6	Green	Green
7	Brown/white	Brown/white
8	Brown	Brown

Table5-2 Crossover cable pinouts

Pinout No.	A	B
1	Orange/white	Green/white
2	Orange	Green
3	Green/white	Orange/white
4	Blue	Blue
5	Blue/white	Blue/white
6	Green	Orange
7	Brown/white	Brown/white
8	Brown	Brown

NOTE:

Strictly follow the pinouts in the above tables when identifying or making the two types of Ethernet cables to ensure communication quality.

Making an Ethernet twisted pair cable

1. Cut the cable to a length as required with the crimping pliers.
2. Strip off an appropriate length of the cable sheath. The length is typically that of the RJ-45 connector.

3. Untwist the pairs so that they can lie flat, and arrange the colored wires based on the wiring specifications.
4. Cut the top of the wires even with one another. Insert the wires into the RJ-45 end and make sure the wires extend to the front of the RJ-45 end and make good contact with the metal contacts in the RJ-45 end and in the correct order.
5. Crimp the RJ-45 connector with the crimping pliers until you hear a click.
6. Repeat the above steps with the other end of the cable.
7. Use a cable tester to verify the connectivity of the cable.

Connecting an Ethernet cable

1. Connect one end of the Ethernet cable to an Ethernet copper port or management Ethernet port on the router and the other end to the target Ethernet copper port on the peer device. Because the 10BASE-T/100BASE-TX/1000BASE-T fixed Ethernet copper ports on the router and Ethernet copper ports on the modules supports auto-MDI/MDIX auto-sensing, you can use a straight-through cable or crossover cable to connect the ports.
2. Examine the status LED for the Ethernet port to verify the cable connectivity. For the description of the port LEDs, see *H3C CR19000-8 Core Router Hardware Information and Specifications*.

Connecting cables to fiber ports

About transceiver modules and optical fibers

To connect a fiber port, install an SFP, SFP+, XFP, CFP2, QSFP28, or QSFP+ transceiver module in the fiber port and connect optical fibers with LC or MPO fiber connectors to the transceiver module.

Optical fibers can be classified into the following types:

- **Single mode fiber**—It has a core size of 10 µm or smaller, and has a lower modal dispersion. It carries only a single ray of light. It is mostly used for communication over longer distances.
- **Multi-mode fiber**—It has a core size of 50 µm or 62.5 µm or higher, and has a higher modal dispersion than single-mode optical fiber. It is mostly used for communication over shorter distances.

Fiber connectors are indispensable passive components in an optical fiber communication system. They allow the removable connection between optical channels, which makes the optical system debugging and maintenance more convenient and the transit dispatching of the system more flexible. The router support LC and MPO fiber connectors.

Do not use excessive force when you install or remove a fiber connector. Avoid pulling, pressing and squeezing optical fibers with force.

Table5-3 Allowed maximum tensile force and crush load

Period of force	Tensile load (N)	Crush load (N/mm)
Short period	150	500
Long term	80	100

Installing transceiver modules and optical fibers

⚠ **WARNING!**

Disconnected optical fibers or transceiver modules might emit invisible laser light. Do not stare into beams or view directly with optical instruments when the router is operating.

⚠ **CAUTION:**

- Before installing a transceiver module, remove the optical fibers, if any, from it. For more information about installing transceiver modules, see the installation guide for the transceiver modules.
- If you are not to use a fiber port or transceiver module, insert dust plugs into the port or module. If you are not to connect an optical fiber, install dust caps for the fiber connector.

To install a transceiver module and optical fiber:

1. Wear an ESD wrist strap and make sure the wrist strap is reliably grounded.
2. Remove the dust plug from the target fiber port.
3. Pull the bail latch on the transceiver module upwards.

   Skip this step if the bail latch is plastic.
4. Take the transceiver module by its two sides and align it with the fiber port.
5. Push the transceiver module gently into the port until it is firmly seated in the fiber port.
6. Remove the dust plug and dust cap from the transceiver module and fiber connector, respectively.
7. Connect the optical fiber to the transceiver module.
   - **LC connector**—Align the connector with the transceiver module and push it into the transceiver module slightly until it clicks into place.
   - **MPO connector**—Orient the connector with the white spot on it facing right. Insert the MPO fiber connector horizontally into the transceiver module. Push the MPO fiber connector into the transceiver module slightly until it clicks into place.
8. Use cable ties at a spacing of 150 mm (5.91 in) to bind optical fibers.
9. Label optical fibers according to the cable labeling specifications.

Figure5-3 Installing a transceiver module and optical fiber (LC port)
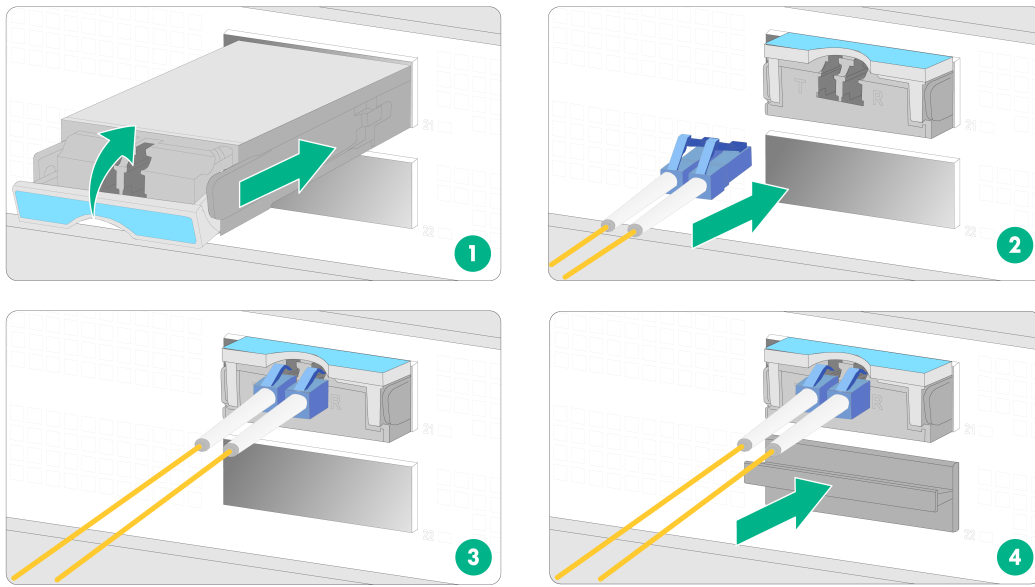
Figure5-4 Installing a transceiver module and optical fiber (MPO port)
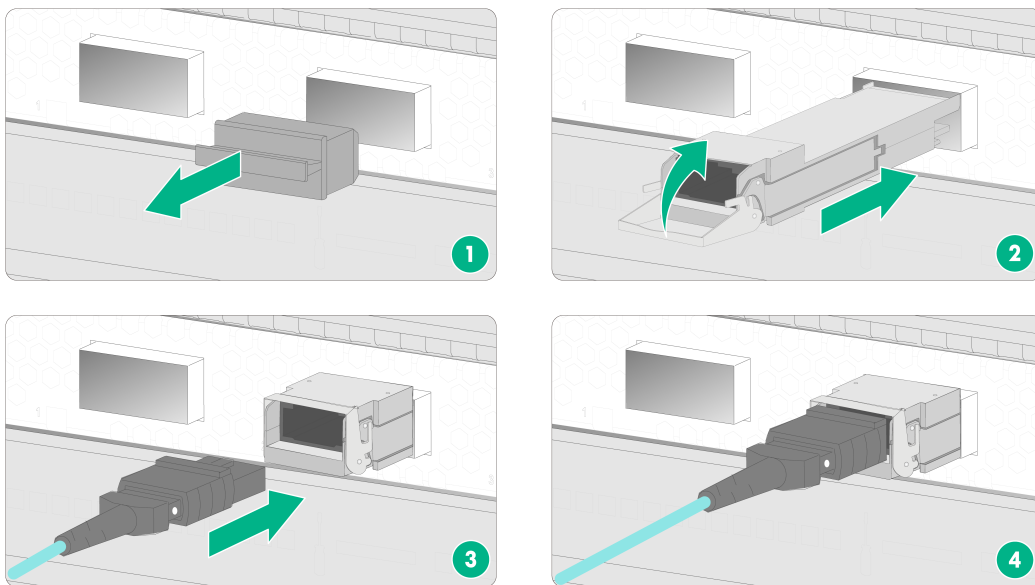
Connecting a QSFP+ optical fiber

⚠ **WARNING!**

Disconnected optical fibers or transceiver modules might emit invisible laser light. Do not stare into beams or view directly with optical instruments when the router is operating.

⚠ **CAUTION:**

For interface modules with dust plugs shipped as accessories, insert dust plugs into open fiber port timely.

To connect a QSFP+ optical fiber:

1. Wear an ESD wrist strap and make sure the wrist strap is reliably grounded.
2. Remove the dust plug from the target fiber port.
3. Orient the cable with the pull tab on the QSFP+ module facing right. Push the module gently into the port until it is firmly seated in the fiber port.
4. Use cable ties at a spacing of 150 mm (5.91 in) to bind optical fibers.
5. Label optical fibers according to the cable labeling specifications.

Figure5-5 Connecting a QSFP+ optical fiber
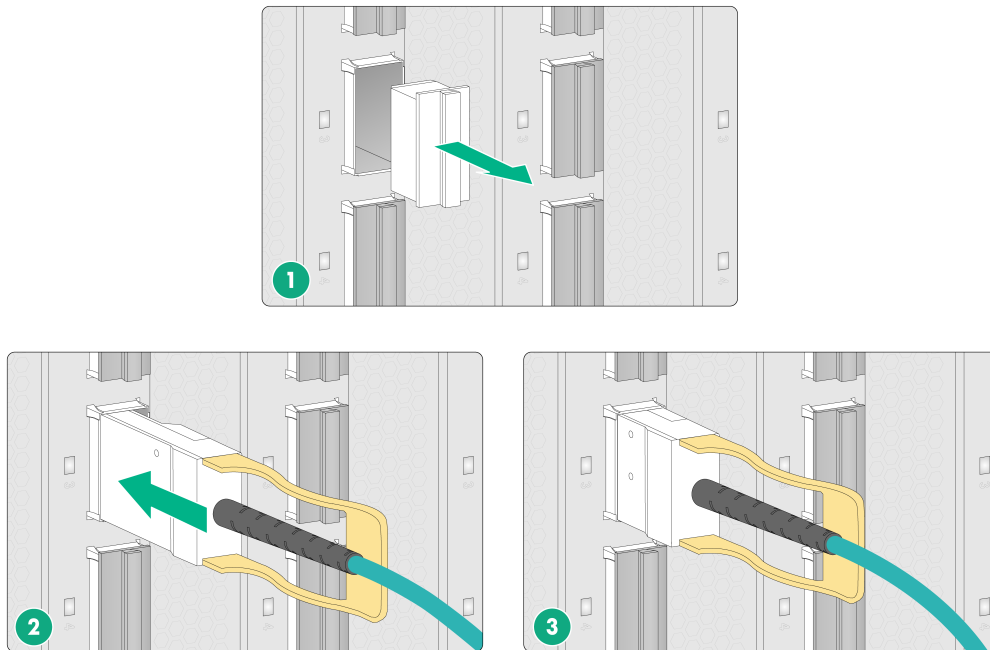
Connecting cables to E1 ports

Cables for connecting E1 ports

You can use an E1 cable to connect an E1 port (HM96 male connector). Typically, an E1 cable has an HD96 female connector at one end and multiple BNC, RJ-45, or SMB connectors at the other end.

When connecting an E1 cable, you might need also coaxial connectors and 75-ohm E1 adapter cables. No coaxial connectors and 75-ohm E1 adapter cables are provided with interface subcards. Purchase them yourself as needed.

Connecting an E1 cable

△ **CAUTION:**

To avoid interface subcard or chassis damage, identify the target E1 port before your connection. Avoid connecting the cable to another port.

Connecting an E1 120-ohm RJ-45 cable

1. Connect the HD96 connector of the E1 120-ohm cable to the HM96 connector on the interface subcard and fasten the screws on the connector.
2. Connect the RJ-45 connectors at the other end of the E1 cable to the peer device.

Connecting an E1 75-ohm BNC/SMB cable

The E1 75-ohm BNC cable and SMB cable use the same connection procedure. The following procedure connects an E1 75-ohm BNC cable.

To connect an E1 75-ohm BNC cable:

- If you do not need to extend the cable, perform these steps:
  a. Connect the HD96 connector of the E1 75-ohm cable to the HM96 connector on the interface subcard and fasten the screws on the connector.
  b. The other end of the cable provides multiple pairs of 75-ohm BNC connectors. Identify the number of each pair of BNC connectors. Connect the TX connector and the RX connector of the cable to the RX connector and the TX connector on the peer device, respectively.

Figure5-6 Connecting an E1 75-ohm cable
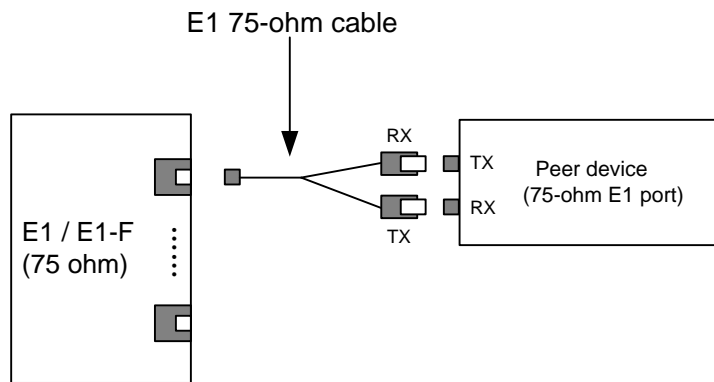
- If you need to extend the cable, connect each BNC connector of the E1 75-ohm cable to a coaxial connector and then use an E1 75-ohm adapter cable to connect the coaxial connector to the peer device.

Figure5-7 Connecting an E1 75-ohm cable (using coaxial connectors and 75-ohm adapter cables)
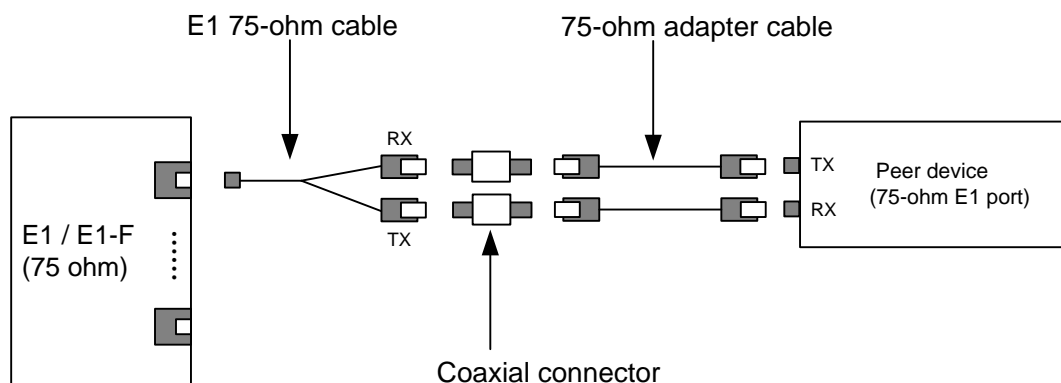
- If the impedance of the E1 port on the peer device is 120 ohms, you must use an impedance converter to adapt the impedance.

Figure5-8 Connecting an E1 75-ohm cable (using an impedance converter)

E1 75-ohm cable   Straight-through network cable

RX

E1 / E1-F
(75 ohm)

TX

Peer device
(120-ohm E1 port)

Impedance converter
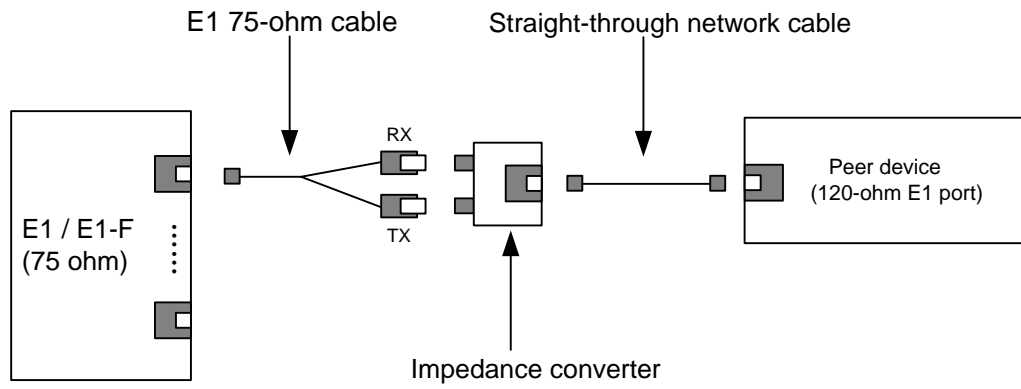
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6 Verifying the installation

Installation verification flowchart

Figure6-1 Installation verification flowchart
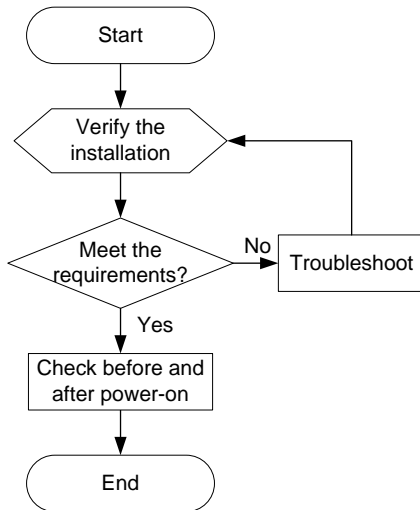
Post-installation checklist

Table6-1 Post-installation checklist

Item	Requirements
Installation location	• No condensation is on the surface of the router or inside the router. • The router is clean and dust-free. • No packaging boxes, packaging bags, or other packaging materials are left around the chassis. • The air inlet and outlet vents of the router are not blocked, free of obstructions.
Router	• All components are installed correctly. • Each slot is installed with a module or filler panel. • Fan trays are installed correctly.
Cables	• The router is grounded reliably with the provided grounding cable. Both ends of the grounding cable are securely connected. • No switch or fuse is installed on the grounding cable. • The power cords are connected reliably and no short circuit has occurred in power input and output. • Power cords, grounding cables, and fiber cables are routed and bound separately. • The cables are bound neatly with cable ties at an even distance. • The cable labels are correct, clear, and affixed to the cable in the same direction.
Electricity safety	• A circuit breaker is provided for each power cord. • Turn off the circuit breaker before you connect the power cord.

Power-on check

Power-on check flowchart

Figure6-2 Power-on check flowchart

Checking the LEDs

After the router powers up, you can determine whether the router and the components are operating correctly by observing the LEDs on the MPUs and other components. When the router and components are operating correctly, the LEDs are as described in Table6-2 and Table6-3. If the LED states are not as described in Table6-2 and Table6-3, the router and components might be faulty. To identify and resolve the issue, see "Troubleshooting."

Table6-2 MPU LED descriptions

LED	Status	Description
FAN	Steady green	All the fan trays are operating correctly.
PWR	Steady green	All the installed power supplies are operating correctly.
RUN	Fast flashing green (0.5 Hz)	The modules are operating correctly.
	Slow flashing green (4 Hz)	The modules are loading software.
ALM	Off	No alarm has occurred on the system.
ACT	Steady green	The MPU is in active mode of the chassis or system.
	Flashing green (0.5 Hz)	The router is in cluster mode, and the MPU is in standby mode.
	Off	The router is in single chassis mode, and the MPU is in standby mode.

> (!) **IMPORTANT:**
> The PWR LED on the MPU will be red if one of its installed power supplies is not operating correctly (the power cord is not connected or the circuit breaker for it is turned off).

Table6-3 Component LED descriptions

LED		Status	Description
Fabric module LED	RUN	Fast flashing green (4 Hz)	The fabric module is loading software.
		Slow flashing green (0.5 Hz)	The fabric module is operating correctly.
Interface module LED	RUN	Fast flashing green (4 Hz)	The module is loading software.
		Slow flashing green (0.5 Hz)	The module is operating correctly.
AC power supply	AC OK DC OK	Steady green	The power supply is operating correctly.
DC power supply	IN OK OUT OK	Steady green	The power supply is operating correctly.
Fan tray LED	OK/FAIL	Steady green	The fan tray is operating correctly.

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7 Accessing the router

The following options are available for connecting the switch to a configuration terminal:

- Use a serial console cable to connect the serial console port on the switch to a configuration terminal.
- Use a mini USB console cable to connect the mini USB console port on the switch to a configuration terminal.

By default, the mini USB console port is active when both the serial console port and the mini USB console port are connected to terminals.

Using a console cable to connect the router to a configuration terminal

> **IMPORTANT:**
> When you connect a PC to a powered-on router, first connect the DB-9 connector of the console cable to the PC, and then connect the RJ-45 connector to the router.

To connect a configuration terminal to the router by using a console cable:

1. Select a configuration terminal, which can be a character terminal with an RS-232 serial port, or a PC.
2. Plug the DB-9 female connector of the console cable into the serial port on the configuration terminal and the RJ-45 connector into the console port on the router.

Using a mini USB console cable to connect the router to a configuration terminal

> **CAUTION:**
> The router supports only using a mini USB console cable to connect the USB console port.

> **IMPORTANT:**
> - To access and configure the router from the mini USB console port, first download and install the USB console driver from H3C official website.
> - If you connect the mini USB console cable before installing the USB console driver, pull out and insert the mini USB console cable for the driver to take effect.

To connect a configuration terminal to the router by using a mini USB console cable:

1. Download the USB console driver from the following website:
   http://www.h3c.com/en/home/USB_Console/.
2. Select a driver program according to the operating system you use:
   - **XR21V1410_XR21B1411_Windows_Ver1840_x86_Installer.EXE**—32-bit operating system.
   - **XR21V1410_XR21B1411_Windows_Ver1840_x64_Installer.EXE**—64-bit operating system.

3. Click **Next** on the installation wizard.

Figure7-1 Device Driver Installation Wizard
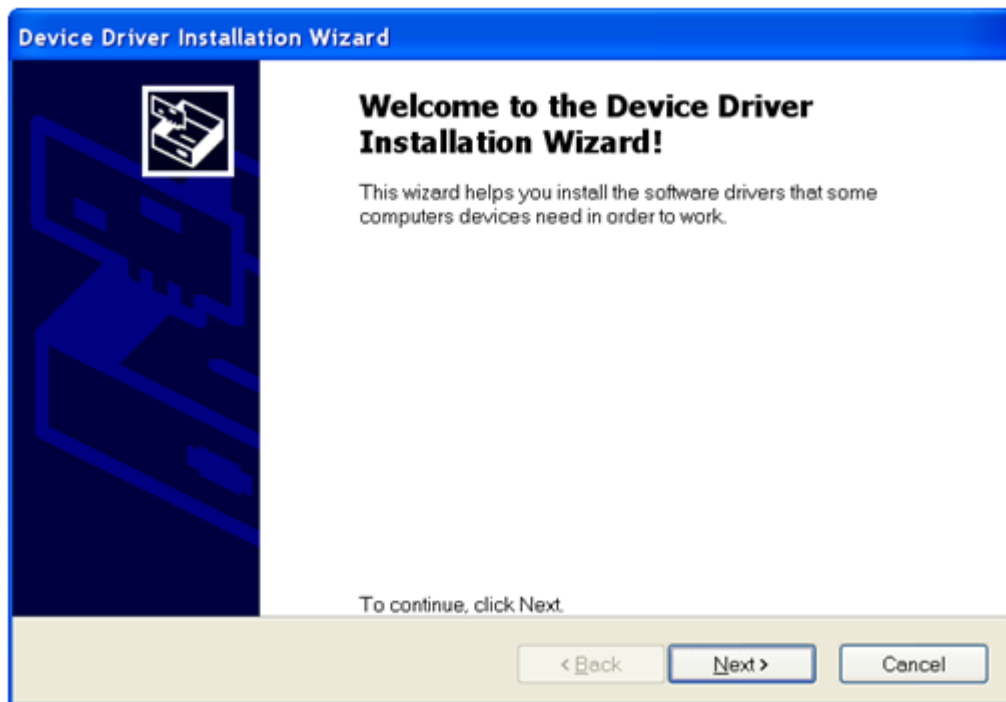
4. Click **Continue Anyway** if the following dialog box opens.

Figure7-2 Software Installation
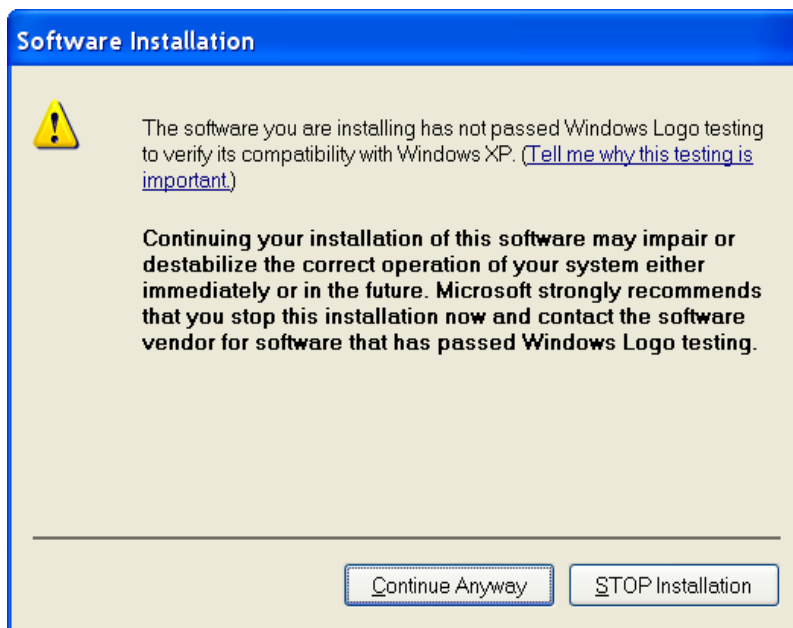
5. Click **Finish**.

Figure7-3 Completing the device driver installation wizard
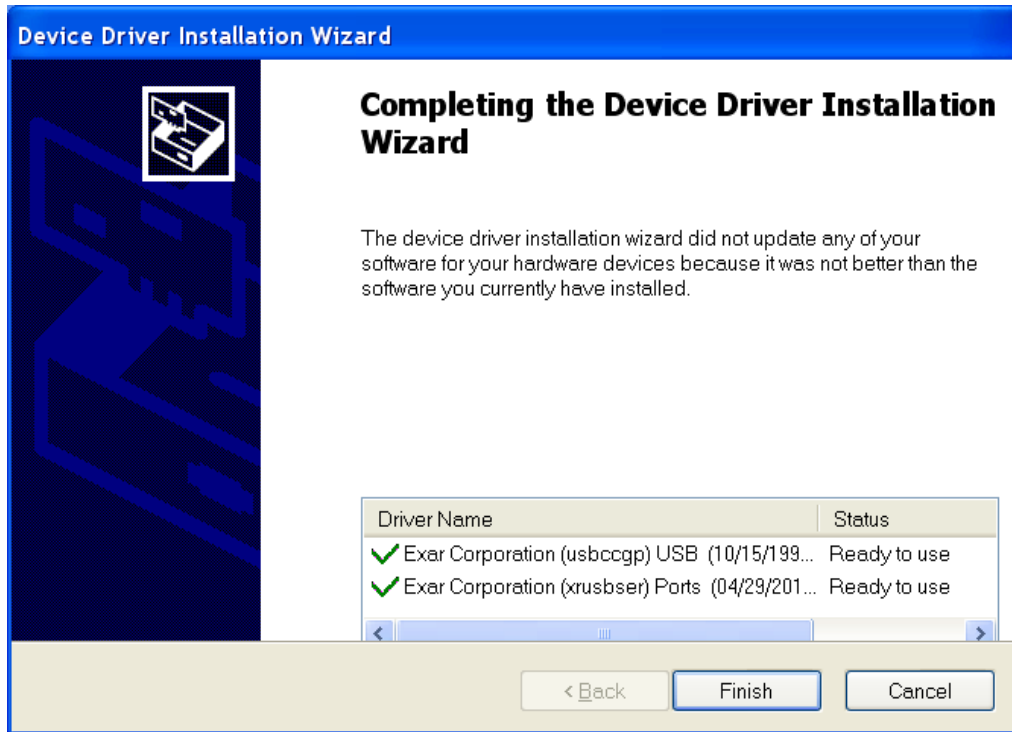
6. Connect the USB connector to the USB port on the configuration terminal.
7. Connect the mini USB connector to the mini USB console port on the router.

Setting terminal parameters

To configure and manage the router through the console port, you must run a terminal emulator program, TeraTermPro or PuTTY, on your configuration terminal. You can use the emulator program to connect a network device, a Telnet site, or an SSH site. For more information about the terminal emulator programs, see the user guides for these programs.

Start the terminal emulator program and configure the parameters as follows:

● **Bits per second**—9600.
● **Data bits**—8.
● **Stop bits**—1.
● **Parity**—None.
● **Flow control**—None.

Starting the router

1. Power on the router.
2. Verify the following items:
   o The LEDs on the front panel are normal. For the LED description, see *H3C CR19000-8 Core Router Hardware Information and Specifications*.
   o The configuration terminal displays information normally.
     ```
     BootWare Validating...
     Press Ctrl+B to enter extended boot menu...
     ```

```
Starting to get the main application file--cfa0:/main.bin!............
........................................................................
........................................................................
...
The main application file is self-decompressing...........................
........................................................................
........................................................................
........................................................................
.............................................................Done!
System application is starting...
Mainboard 1 is master.
User interface con1 is available.


Press ENTER to get started. (Press Enter.)
<sysname> (The router is ready for configuration.)
```

Configuring basic settings

Configure basic settings for the router after the router starts up. For more information about how to configure the router, see *H3C CR19000 Core Routers Configuration Guides* and *H3C CR19000 Core Routers Command References*.

Contents

8 Replacement procedures

⚠ **WARNING!**

- When replacing removable components while the router is operating, ensure electricity safety.
- To avoid bodily injury and device damage, follow the replacement procedure strictly to replace a component.
- Long-time exposure to strong air flow might cause discomfort. To avoid this hazard, do not stand close to the air outlet vents while the router is operating. If you must be next to the router on the air outlet vent side for an extended period, avoid the air flow or take other protective measures.

The router uses a modular architecture, and supports removable components. You can replace a removable component when the router is operating.

Replacing a module

⚠ **CAUTION:**

If you are not to install a new module in a slot after removing the old one, install a filler panel in the slot for adequate heat dissipation and dust prevention.

Unless otherwise stated, MPUs, interface modules, interface subcards, and fabric modules are collectively referred to as "modules" in this document.

Replacing an MPU or a fabric module

⚠ **CAUTION:**

- The router supports active/standby MPU switchover when you install two MPUs for the router. Make sure the active and standby MPUs are the same model.
- Before replacing a fabric module, press the OFL button on the module. The RUN LED will flash red for 3 seconds. After the RUN LED is off, you can remove the module.

The replacement procedure is similar for MPUs and fabric modules.

To replace an MPU or a fabric module:

1. Remove the cables from the MPU or fabric module.
2. Prepare an antistatic mat to place the removed MPU or fabric module.
3. Wear an ESD wrist strap. Make sure the wrist strap makes good skin contact and is reliably grounded.
4. Use a Phillips screwdriver to loosen the captive screws on the MPU or fabric module.
5. Open the ejector levers on the module and then pull the module part way out of the slot.
6. Supporting the module bottom with the left hand, slowly pull the module out of the slot along the guide rails with the right hand.
7. Place the removed module on the antistatic mat.
8. Install a new MPU or fabric module. For the installation procedure, see "Installing MPUs" or "Installing fabric modules."

Figure8-1 Removing an MPU
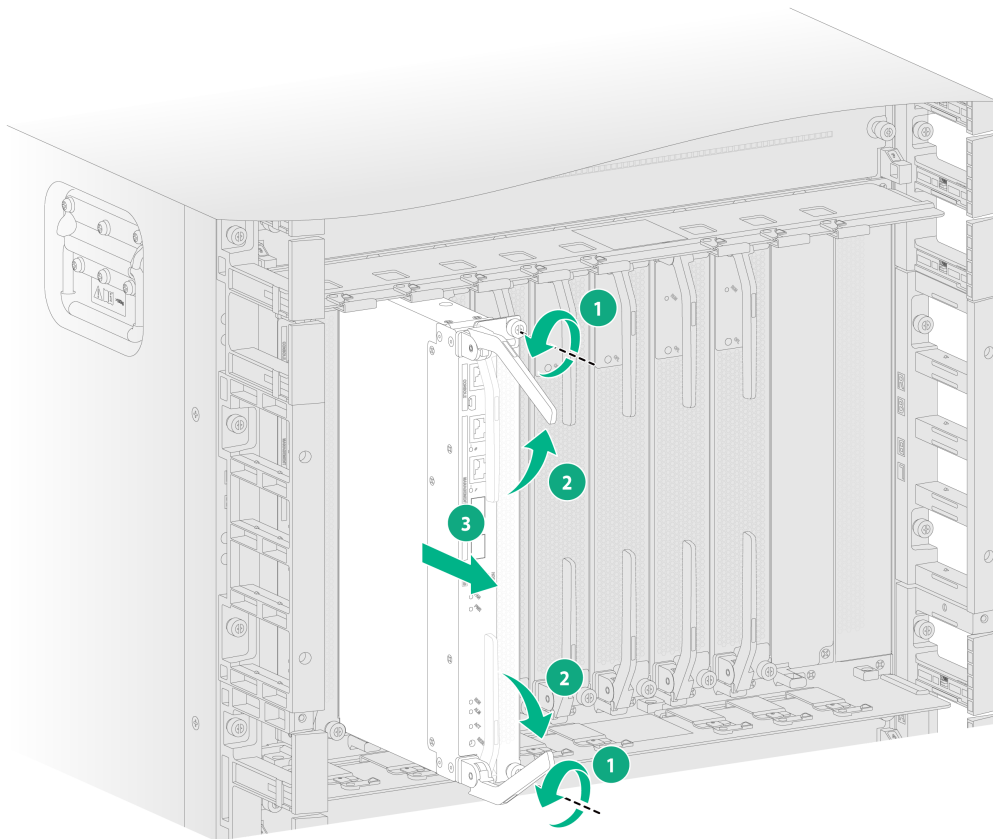
Replacing an interface module that uses detachable ejector levers

⚠ **CAUTION:**

- Put the detachable ejector lever back to its holder after use and then attach them to the chassis or cabinet for future use.
- The ejector lever holder is magnetic. Beware of electromagnetic interference.
- Do not use only one detachable ejector lever to install or remove an interface module.
- Do not hold detachable ejector levers to lift an interface module.

To replace an interface module that uses detachable ejector levers:

1. Remove the cables from the interface module.
2. Prepare an antistatic mat to place the removed interface module.
3. Wear an ESD wrist strap. Make sure the wrist strap makes good skin contact and is reliably grounded.
4. Use a Phillips screwdriver to loosen the captive screws on the interface module.
5. Attach the ejector lever holders to the cabinet or chassis and then remove the ejector levers from the holders.
6. Identify the "L" and "R" marks on the ejector levers and attach them to left and right ejector lever retainers of the interface module, respectively, with the lettering on the ejector levers facing upward. See callout 1 in Figure8-2.

7. Open the ejector levers on the interface module and then pull the interface module part way out of the slot, as shown by callout 2 in Figure8-2.

Figure8-2 Opening a detachable ejector lever
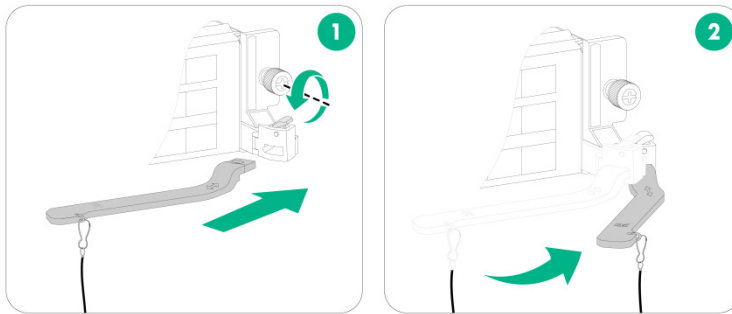
8. Detach the ejector levers from the interface module and then attach the ejector levers to the ejector lever holder.

Keep the ejector levers secure for future use.

9. Supporting the interface module bottom with one hand, slowly pull the interface module out of the slot along the guide rails with the other hand.

10. Place the removed interface module on the antistatic mat.

11. Install a new interface module. For the installation procedure, see "Installing an interface module that uses detachable ejector levers."

Figure8-3 Removing an interface module
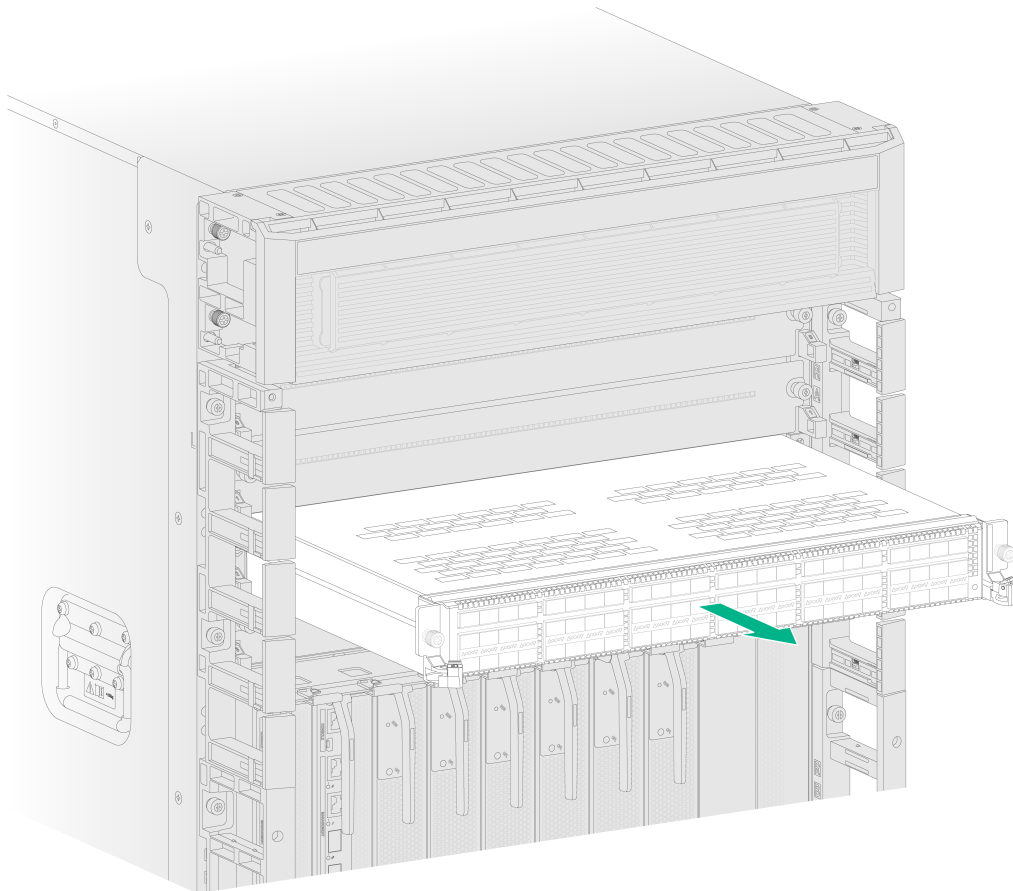
Replacing an interface module with ejector levers

1. Remove the cables from the interface module.
2. Prepare an antistatic mat to place the removed interface module.
3. Wear an ESD wrist strap. Make sure the wrist strap makes good skin contact and is reliably grounded.
4. Use a Phillips screwdriver to loosen the captive screws on the interface module.
5. Fully open the ejector levers on the interface module and then pull the interface module part way out of the slot.
6. Supporting the interface module bottom with one hand, slowly pull the interface module out of the slot along the guide rails with the other hand.
7. Place the removed interface module on the antistatic mat.
8. Install a new interface module in the slot. For the installation procedure, see "Installing an interface module with ejector levers."

Figure8-4 Removing an interface module with ejector levers
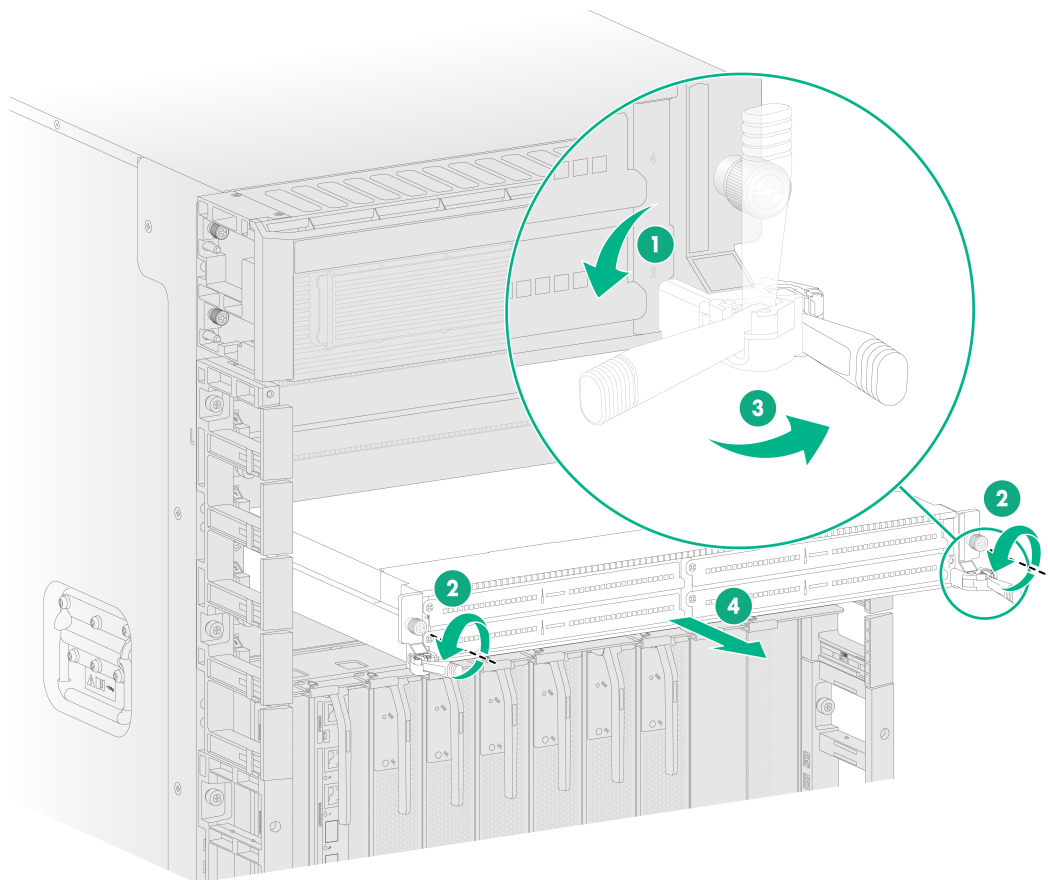
Replacing an interface subcard

> ⓘ **IMPORTANT:**
> - If you are not to install a new interface subcard after removing the old one, install a filler panel in the slot.
> - When installing a filler panel, orient it with the blade of the screwdriver image on it facing

upwards. First insert the filler panel right side into the slot, and then push the left side into the slot.

To install an interface subcard:

1. Remove the cables from the interface subcard.
2. Prepare an antistatic mat to place the removed interface subcard.
3. Wear an ESD wrist strap. Make sure the wrist strap makes good skin contact and is reliably grounded.
4. Use a Phillips screwdriver to loosen the captive screws on the interface subcard.
5. Open the ejector levers on the interface subcard and then pull the interface subcard out of the slot along the guide rails.
6. Place the removed interface subcard on the antistatic mat.
7. Install a new interface subcard. For the installation procedure, see "Installing interface subcards."

Figure8-5 Removing an interface subcard
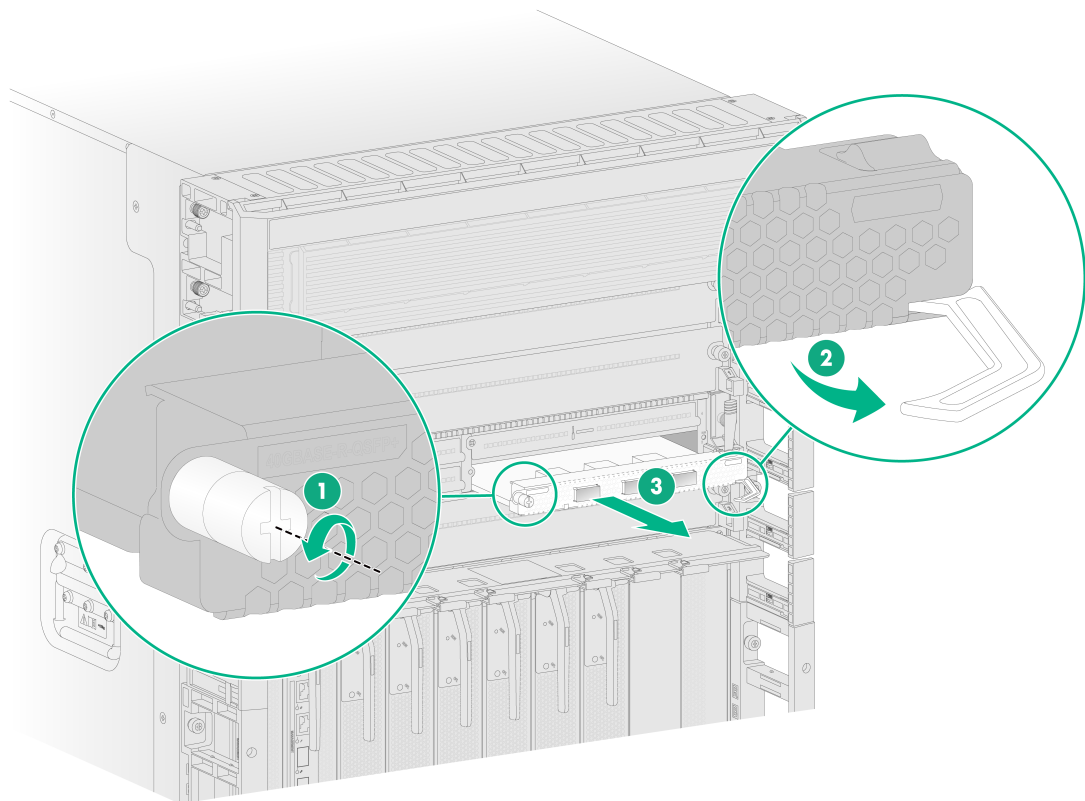
Replacing transceiver modules

⚠ **WARNING!**

Disconnected optical fibers or transceiver modules might emit invisible laser light. Do not stare into beams or view directly with optical instruments when the router is operating.

⚠ **CAUTION:**

- Do not touch the golden plating on a transceiver module.
- Make sure the transceiver modules at the two ends of an optical fiber are the same model.

To replace a transceiver module and optical fiber:

1. Wear an ESD wrist strap. Make sure the wrist strap makes good skin contact and is reliably grounded.

2. Remove the optical fibers from the transceiver module.

- ○ To remove the optical fibers with an LC connector, press the clip on the connector to pull the LC connector out of the port, as shown in Figure8-6.
- ○ To remove the optical fiber with an MPO connector, hold the front end of the MPO connector to pull it out of the port, as shown in Figure8-7.

3. Pull down the bail latch on the module to the horizontal position (skip this step for QSFP+/QSFP28 transceiver modules with a plastic bail latch). Hold the bail latch to pull the module horizontally and slowly out of the port.

If the interface module is densely populated with transceiver modules, use tweezers to pull the module out.

4. Insert the dust plugs into the transceiver module and put it into its original packing materials.

5. Install a new transceiver module in the port. For the installation procedure, see "Installing transceiver modules and optical fibers."

If you are not to install a new transceiver module in the port, insert a dust plug into the port.

Figure8-6 Removing a transceiver module (LC port)
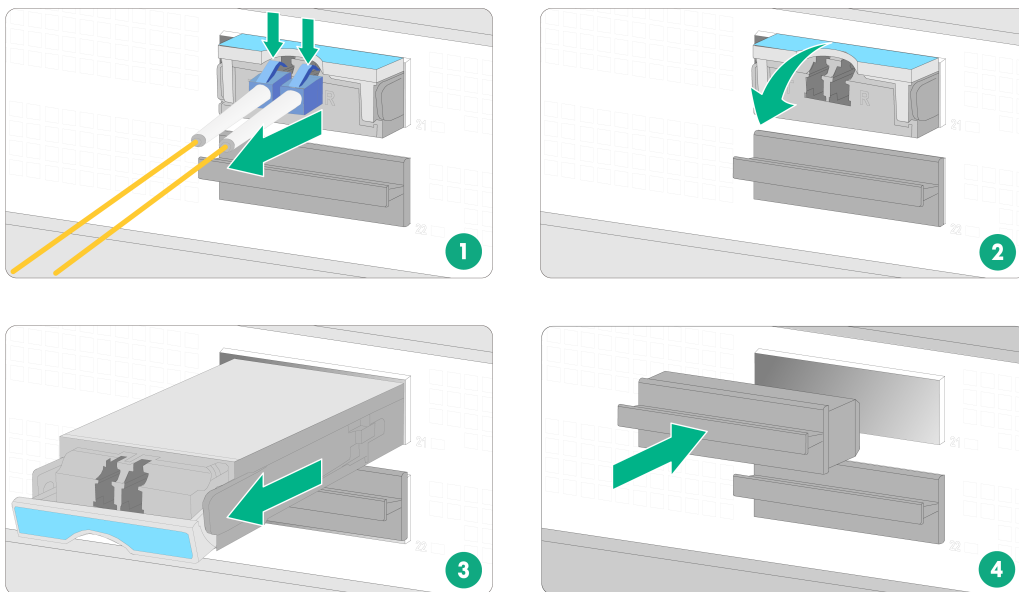
Figure8-7 Removing a transceiver module (MPO port)
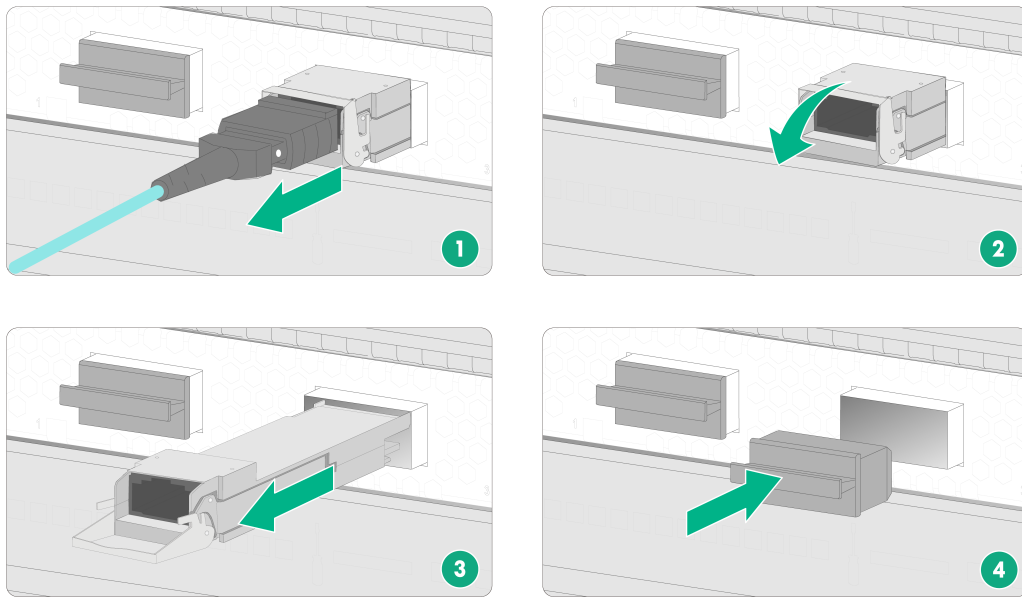
Replacing a QSFP+ optical fiber for a multi-chassis fabric module

1. Wear an ESD wrist strap and make sure it makes good skin contact and is reliably grounded.
2. Hold the pull tab of the connector and remove the optical fiber from the QSFP+ transceiver module.
3. Connect a new QSFP+ optical fiber. For the installation procedure, see "Connecting a QSFP+ optical fiber."

   If you are not to install a QSFP+ optical fiber in the port, insert the dust plug into the fiber port.

Figure8-8 Removing a QSFP+ optical fiber
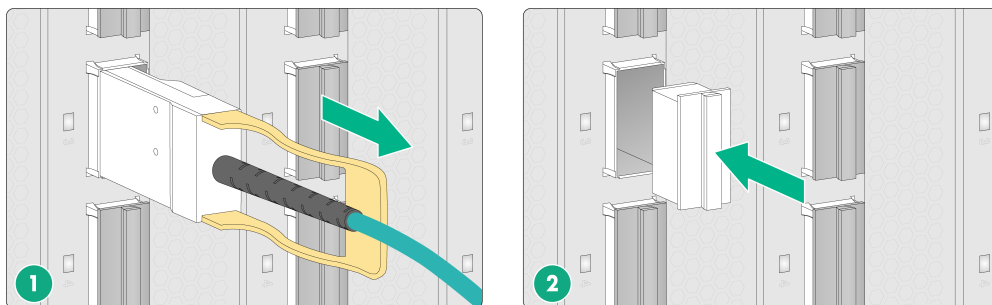
Replacing a fan tray

⚠ WARNING!

- Ensure electricity safety when you hot swap a fan tray.
- To avoid bodily injury, do not touch the spinning fans when you replace the fan tray.
- When you hot swap a fan tray, the fan rotation speed of the remaining fan trays automatically increases and the fan trays make louder noise. Take protection measures such as wearing an earmuff or earplug. In addition, make good preparations before the hot swapping to minimize the operation time.

⚠ CAUTION:

- When a fan tray fails, replace the faulty fan tray immediately.
- To prevent dust from entering the device, keep the old fan tray installed in the chassis until a new fan tray is ready to be installed.
- Before hot swapping a fan tray, make sure the remaining fan trays can provide sufficient cooling for the router.
- If multiple fan trays fail, do not remove the fan trays at the same time. Replace the fan trays one after another and finish replacing a fan tray within 3 minutes.

To replace a fan tray:

1. Prepare an antistatic mat to place the removed fan tray.
2. Wear an ESD wrist strap. Make sure the wrist strap makes good skin contact and is reliably grounded.
3. Loosen the captive screws on the fan tray.
4. Holding the handles on the fan tray, pull the fan tray part way out of the slot. After the fans stop rotating, pull the fan tray out from the chassis.
5. Place the removed fan tray on the antistatic mat.
6. Install a new fan tray. For the installation procedure, see "Installing fan trays."

Figure8-9 Removing a fan tray
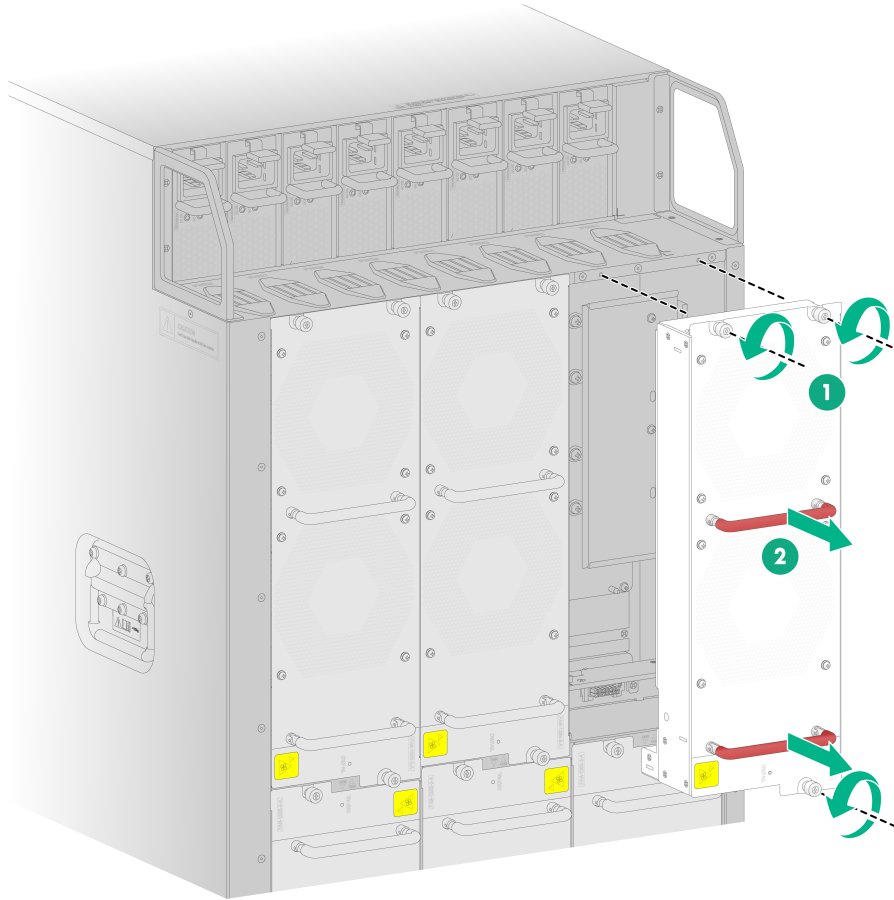
Replacing a power supply

> **⚠ WARNING!**
> - Provide a circuit breaker for each power supply. Before replacing a power supply, turn off the circuit breaker for it.
> - To reinstall the removed power supply in the chassis, wait until the status LED on it is off.
> - To avoid being hurt, allow a power supply to cool before removing it.

To avoid device damage and bodily injury, strictly follow the procedures shown in Figure8-10 and Figure8-11 to remove and install a power supply, respectively.

Figure8-10 Power supply removal procedure

Turn off the circuit breaker → Disconnect the power cord → Remove the power supply
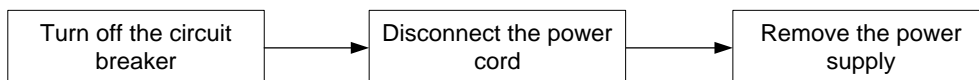
Figure8-11 Power supply installation procedure

Install the power supply → Connect the power cord → Turn on the circuit breaker
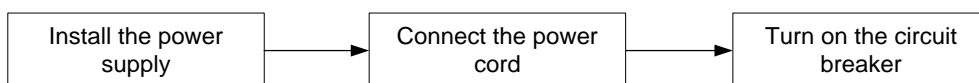
To replace a power supply:

1. Prepare an antistatic mat to place the removed power supply.
2. Turn off the circuit breaker.
3. Wear an ESD wrist strap, and make sure it makes good skin contact and is reliably grounded.
4. Remove the cable tie, and then remove the power cord connector from the power supply.
5. Press the latch on the power supply towards the handle direction and pull the power supply part way out of the slot.
6. Holding the power supply handle with one hand and supporting the power supply bottom with the other, pull the power supply slowly out of the slot.
7. Place the removed power supply on the antistatic mat.
8. Install a new power supply. For information about the power supply installation procedure, see "Installing power supplies."

Figure8-12 Removing a power supply (AC power supply)
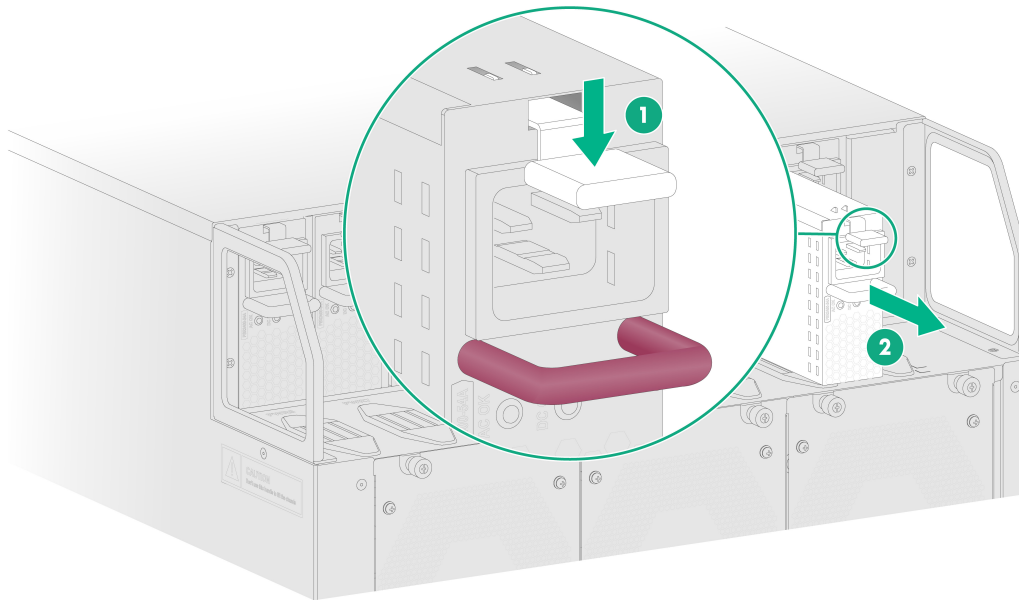
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9 Troubleshooting

This chapter provides information for troubleshooting issues with your router.

> 💡 **TIP:**
> - Noncompliant operating environment might cause router failure. You need to clean your router periodically and make sure the installation environment meets the requirements (see "Preparing for installation").
> - Periodically perform power-on test on standby devices.

Troubleshooting methods

When your router fails, you can use the following methods to troubleshoot the router:

- At the CLI, you can use related commands to display hardware information, and locate hardware failures.
- The MPU provides LEDs for the fan trays, power supplies, and modules. You can locate the failures according to the LED status on the MPU. For more information about the MPU LEDs, see *H3C CR19000-8 Core Router Hardware Information and Specifications*.
- The MPUs and interface modules provide port status LEDs, with which you can detect port failures. For more information about the port status LEDs, see *H3C CR19000-8 Core Router Hardware Information and Specifications*.

If you cannot locate failures by following the guidelines in this chapter, contact the local agents or technical support engineers. For more information, see "Technical support."

Configuration terminal display issues at startup

No display on the configuration terminal

Symptom

The configuration terminal does not display any output when the router is powered on.

Solution

To resolve the issue:

1. Verify that the power supply system is operating correctly.
2. Verify that the MPU is operating correctly.
3. Verify that the console cable connects the console port on the MPU correctly.
4. Verify that the console cable connects to the correct serial port on the terminal.
5. Verify that the console cable is in good quality and is operating correctly.
6. Verify that the following settings are configured for the terminal:
   - **Baud rate**—9600.
   - **Data bits**—8.
   - **Parity**—None.
   - **Stop bits**—1.
   - **Flow control**—None.

- o **Emulation**—VT100.
7. If the issue persists, contract H3C support.

Garbled display on the configuration terminal

Symptom

The configuration terminal displays garbled output when the router is powered on.

Solution

To resolve the issue:
1. Verify that the following settings are configured for the terminal:
   - o **Baud rate**—9600.
   - o **Data bits**—8.
   - o **Parity**—None.
   - o **Stop bits**—1.
   - o **Flow control**—None.
   - o **Emulation**—VT100.
2. If the issue persists, contact H3C Support.

System failures during operation

Symptom

A system failure occurs when the router is operating.

Solution

To resolve the issue:
1. Execute related commands to locate the fault.
2. If a configuration error is found, re-configure the settings or restore the factory-default settings.
   For more information, see *H3C CR19000 Core Routers Fundamentals Configuration Guide*.
3. If the issue persists, contact H3C Support.

Power supply failure

Symptom

The LEDs for the power supply are in the following states:
- On the MPU, the PWR LED is steady red.
  The PWR LED is steady green when all the power supplies are operating correctly. When a power supply is faulty, the PWR LED is steady red.
- On the power supply, the input LED is off or the output LED is red.

For more information about the LEDs, see *H3C CR19000-8 Core Router Hardware Information and Specifications*.

NOTE:

After a power supply is powered off, the input and output LEDs on the power supply stay on for several seconds.

Solution

To resolve the issue:

1. Verify that the power supply model is compatible with the router.
2. Remove and reconnect the power cord to ensure that the power cord is connected securely.
3. Replace the power cord.
4. Remove and reinstall the power supply to ensure that it is installed securely.

   For more information, see "Installing power supplies."
5. Verify that the power supply system is supplying power at the acceptable voltage range.
6. Verify that the total maximum output power of all power supplies exceeds the system power consumption.
7. Verify that the power supply does not have issues such as output short circuit, output overcurrent, output overvoltage, input undervoltage, or overtemperature.
8. Install the power supply in another empty power supply slot. If the power supply operates correctly, the previous power supply slot is faulty. If the power supply does not operate correctly, go to the next step.
9. Install a correctly operating power supply of the same model in the same slot, and connect it to the same power source. If the new power supply can operate correctly, the old power supply has failed. Contact your sales agent or local service engineer to replace the old power supply.
10. If the issue persists, contact H3C Support.

Fan tray failure

⚠ **WARNING!**

The fan trays are hot swappable. Ensure electricity safety when you hot swap a fan tray.

⚠ **CAUTION:**

- For good cooling performance, install fan trays in all fan tray slots. When a fan tray fails, keep the faulty fan tray in the chassis until a new fan tray is ready to be installed.
- Before hot swapping a fan tray, make sure the remaining fan trays can provide sufficient cooling for the router.
- If multiple fan trays fail, do not remove the fan trays at the same time. Replace the fan trays one after another and finish replacing a fan tray within 3 minutes.
- Before powering on the router, make sure all fan tray slots are installed with fan trays correctly.

Symptom

The LEDs for the fan tray are in the following states:

- On the MPU, the FAN LED is steady red.
- On the fan tray, the OK/FAIL LED is steady red.

Solution

To resolve the issue:

1. If all the LEDs are off, verify that the power supplies are operating correctly. For more information, see "Power supply failure."
2. Execute the `display fan` command in any view to display the operating state of the fan tray and rectify the fault. The command output displays the following information:
   - Whether the fan tray is present.
   - Airflow direction of the fan.

- o Number of fans in the fan tray.
- o Operating status of each fan.
- o Fan speed.
3. Verify that the air inlet and outlet vents of the chassis are not blocked. If they are blocked, clean them to keep good ventilation.
4. Remove and reinstall the fan tray and fasten the screws tightly to make sure it is installed securely in the slot.
5. Verify that the empty service slots and power supply slots are installed with filler panels. Install filler panels in empty slots.
6. Replace the fan tray.
7. If the issue persists, contact H3C Support.

MPU failure

Symptom

The RUN LED for the MPU is off.

Solution

To resolve the issue:
1. Verify that the power system is operating correctly. For more information, see "Power supply failure."
2. Remove and reinstall the MPU to make sure it is installed securely. For more information, see "Installing MPUs."
3. Press the **RESET** button on the MPU to reset the MPU. After the MPU is reset, verify that the RUN LED is on.
4. If the router has empty MPU slots, install the MPU in the empty MPU slot, and verify that the MPU can operate correctly.
5. If the issue persists, contact H3C Support.

NOTE:

The module slot numbers are marked on the ejector lever pillow blocks at the slot edges.

Fabric module failure

Symptom

The RUN LED on the fabric module is off or steady red.

Solution

To resolve the issue:
1. Verify that the MPU is operating correctly. For more information, see "MPU failure" and "Fan tray failure."
2. Verify that the fabric module is compatible with the system software. Upgrade the system software if it does not support the fabric module.
3. Calculate the total power consumption, and make sure your power supplies can provide enough power. For more information, see *H3C CR19000-8 Core Router Hardware Information and Specifications*.
4. Remove and reinstall the fabric module to make sure the module is installed securely. For more information, see "Installing fabric modules."

5. If the router has empty fabric module slots, install the module in an empty fabric module slot. If the module operates correctly, the previous slot is faulty.

   You can install fabric modules only in slots 10 to 15.

6. If the issue persists, contract H3C Support.

Interface module failure

Symptom

The RUN LED on the interface module is off or steady red.

Solution

To resolve the issue:

1. Verify that the MPU is operating correctly. For more information, see "MPU failure."

2. Verify that the interface module is compatible with the system software. Upgrade the system software if it does not support the interface module.

3. Calculate the total power consumption, and make sure your power supplies can provide enough power. For more information, see *H3C CR19000-8 Core Router Hardware Information and Specifications*.

4. Remove and reinstall the interface module to make sure it is installed securely. For more information about installing an interface module, see "Installing interface modules."

5. If the router has empty interface module slots, install the interface module in an empty interface module slot. If the interface module operates correctly, the previous slot is faulty.

   You can install interface modules only in slots 0 to 3 and slots 4 to 7.

6. If the issue persists, contact H3C Support.

Interface failure

Symptom

The LED for the interface is off.

NOTE:

A management Ethernet port has a LINK/ACT LED. When the LINK/ACT LED is off, the management Ethernet port fails.

Solution

To resolve the issue:

1. Make sure the MPU or interface module where the interface resides operates correctly. For more information, see "MPU failure" or "Interface module failure."

2. Verify that the cable is connected correctly. For how to correctly connect a cable, see "Connecting cables."

3. Verify that the cable is in good condition. Use the cable to connect two interfaces of the same type that operate correctly. If the LEDs of the two interfaces are on, the cable is in good condition. If the LEDs are off, the cable is faulty. Replace the cable.

4. If the interface uses a transceiver module, perform the following tasks:

   a. Make sure the transceiver module is compatible with the interface and the cable.

   b. Replace the transceiver module.

5. Verify that the speed and duplex settings of the interfaces on the two ends are the same.

6. If the issue persists, contact H3C Support.

> **NOTE:**
> - If an interface is brought down by the `shutdown` command, use the `undo shutdown` command to bring up the interface.
> - After an interface fails, you can connect the cable to an idle interface of the same type (if any) on the router.

Technical support

Before contacting H3C Support, prepare the following information:

- Arrival time of the router.
- Serial number of the chassis (on the label at the right of the rear panel).
- Software version, which you can view by using the `display version` command.
- Maintenance agreement or warranty card.
- Brief issue description.
- Brief explanation of the troubleshooting measures that have been taken.

You can contact H3C Support through the phone, H3C website, or email.

Phone: 400-810-0504

Website: http://www.h3c.com

E-mail: service@h3c.com

Contents

10 Appendix A Engineering labels

Engineering labels are used to identify cables and devices for correct installation and easy maintenance.

Two types of engineering labels are available: labels for cables and labels for devices.

Labels for cables

Cables include signal cables such as network cables and fibers, and power cords such as AC power cords and DC power cords. Labels for cables include signal cable labels, power cord labels, and generic labels.

Labels for signal cables

A label for signal cables is L-shaped with fixed dimensions. The light-blue dividing lines on the label help to specify more clearly the position of the cable. For example, there is one dividing line between the rack number and the chassis number and another one between the chassis number and the slot number. The cut dotted line helps to fold the label when you affix it to the cable. A mark "TO:" is located at the lower right corner of the label to identify the peer end of the cable on which the label is affixed.

As shown in Figure10-1, write a signal cable label as follows:

- Write the position of the cable in Area 1.
- Write the position of the cable on the peer end in Area 2.
- Area 3 is the part that is folded up inside the label when the label is affixed to the cable.

Figure10-1 Label for signal cables
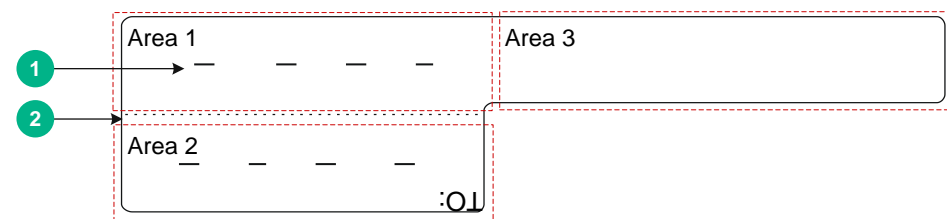
(1) Dividing line   (2) Cut dotted line

Labels for power cords

A label for power cords must be attached to the identification plate on a cable tie that binds the power cords. The identification plate has an embossment of 0.2 × 0.6 mm (0.01 × 0.02 in) around (symmetric on both sides), and the area in the middle is for affixing the label.

A mark "TO:" is located at the upper left corner of the label to identify the peer end of the cable on which the label is affixed. You can write the position of the peer device, control cabinet, distribution box, or power socket. The meaning of the dividing lines is the same as labels for signal cables.

Figure10-2 Label for power cords
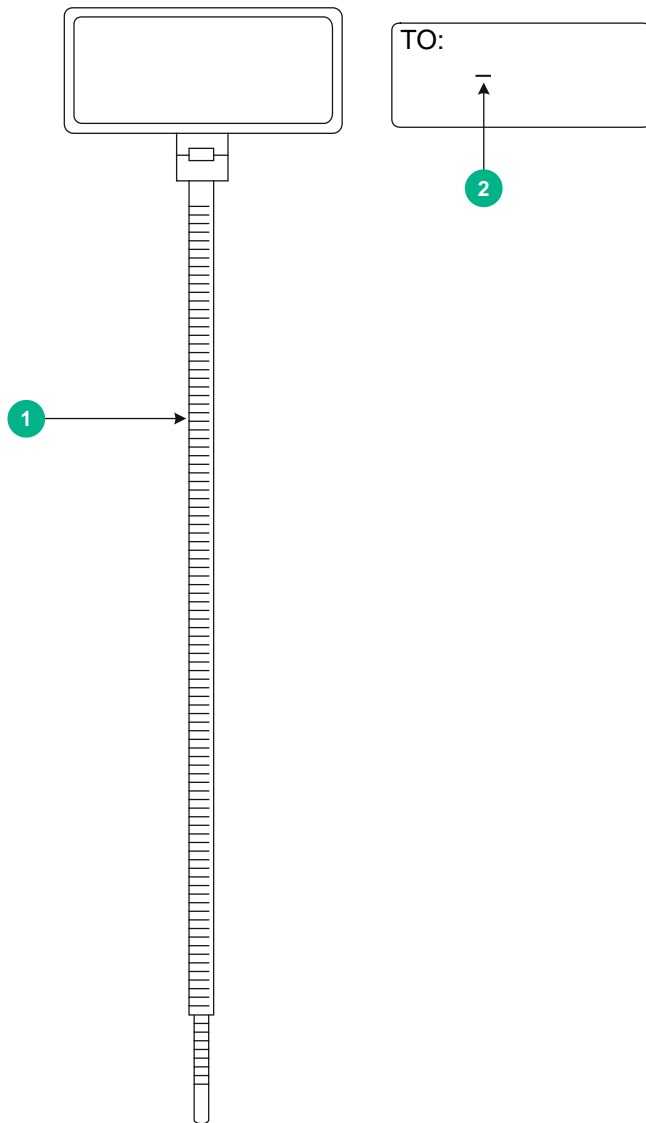
| (1) Cable tie | (2) Dividing line on the label |

Generic labels

A generic label is bar-shaped with fixed dimensions. It is applicable to both signal cables and power cords. A mark "TO:" is located at the upper left corner in the right area of the label to identify the peer end of the cable on which the label is affixed. The meaning of the dividing lines is the same as labels for signal cables.

Figure10-3 Generic label

(1) Dividing line on the label	(2) Cut dotted line

Labels for devices

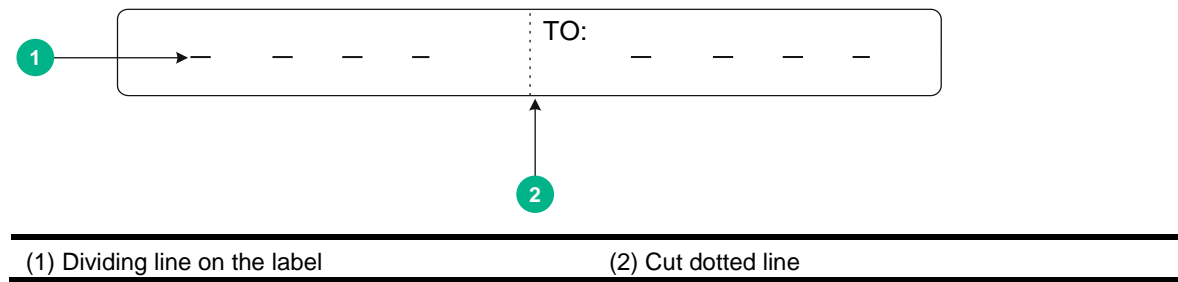A device label is used to identify the device name, model, address, and installation date.

Filling in labels

You can print or write desired contents on labels. As a best practice, print labels.

To print labels, select a label printer and a proper label template as needed. For more information about using a label printer, see the user guide of the printer.

To write labels, use black markers. A marker has two nibs. Be sure to use the smaller nib to write labels.

Affixing labels

After printing or writing a label, remove the label from the bottom page and affix it to the signal cable, or the identification plate of the power cord.

Affixing a label to a signal cable

Typically, a label is affixed 2 cm (0.79 in) away from the connector on a signal cable. You can affix the label to other positions as needed. Figure10-4 shows how to affix a label when a cable is laid vertically.

Figure10-4 Affixing a label

Figure10-5 shows the affixed labels when the cable is laid vertically and horizontally.

Figure10-5 Affixed labels
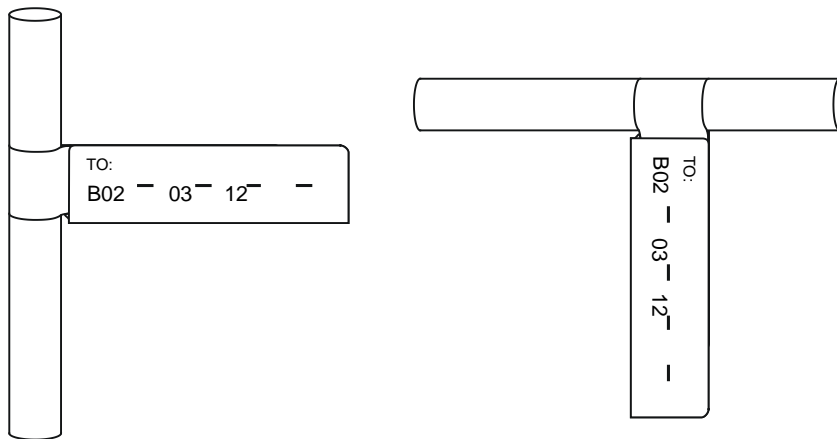
Affixing a label to a power cord

Stick the label to the recessed rectangular area on the identification plate. You can stick the label to either side of the identification plate. Be sure to affix the labels on the same side of the identification plates.

A cable tie is bundled 2 cm (0.79 in) away from the connector. You can affix the label to other positions as needed. Figure10-6 shows how to affix a label when a cable is laid horizontally.
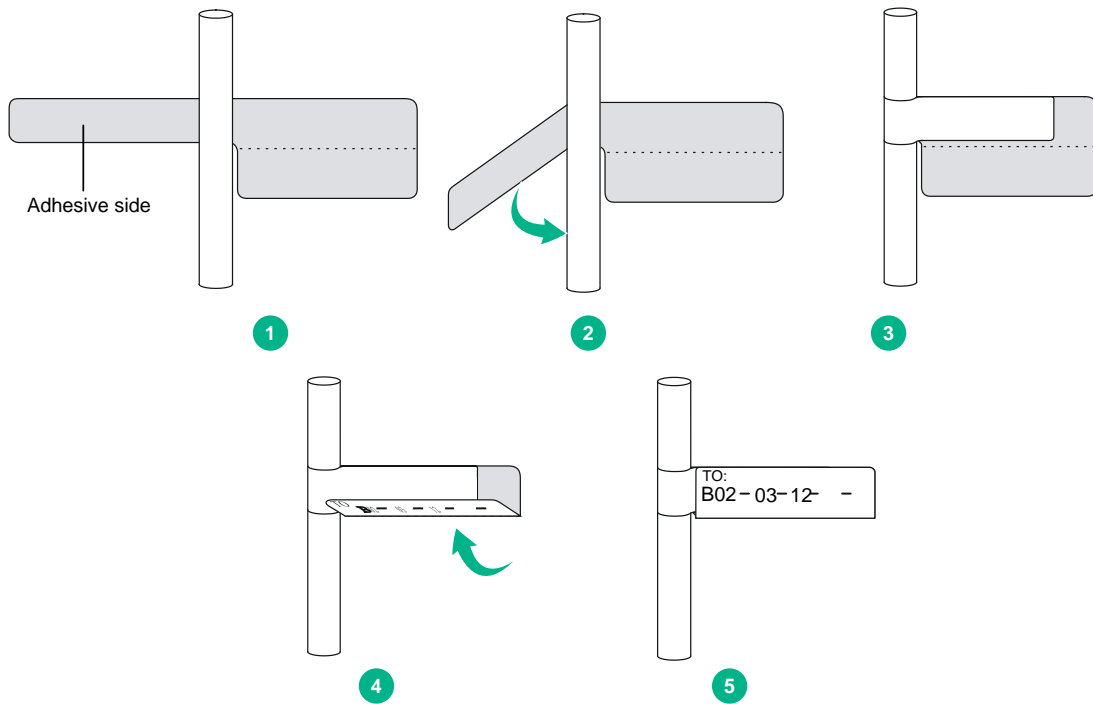
Figure10-6 Affixing a label
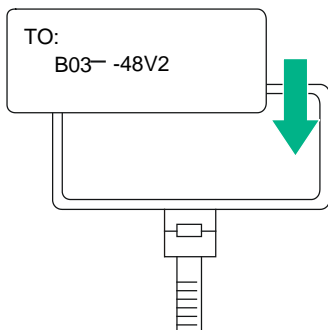
Bind cable ties on both ends of a cable. After the bundling, the finished identification plate must be on top of the cable in horizontal cabling, or on the right side of the cable in vertical cabling. Make sure the label is facing out, as shown in Figure10-7.

Figure10-7 Affixed labels
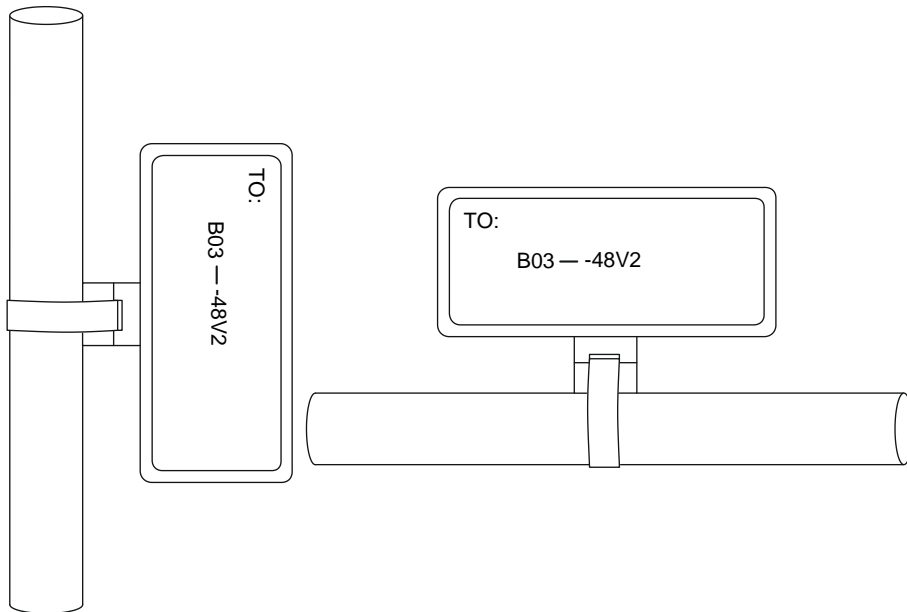
Affixing a generic label

The requirements for affixing a generic label are the same as affixing a label on a signal cable. For more information, see "Affixing a label to a signal cable." For the example of affixed labels, see Figure10-8.

Figure10-8 Affixing a generic label
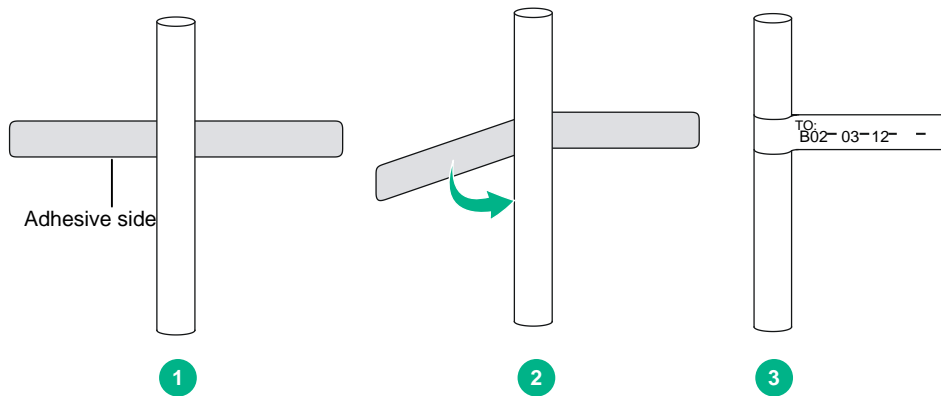
Affixing a label to a device

Remove the device label and stick it to the device. You can stick a device label to any desired position on the device.

Guidelines

- When you print, write, or affix labels, keep the labels clean.
- Do not use ink-jet printers or ink pens.
- Affix labels with good order in alignment.
- Avoid cable bents or other positions that might affect cable installation when you stick a label or bundle a cable tie with a power cord identification plate.
- Bundle cable ties at the same positions of power cords, with identification plates on the same side.
- The positions of "up", "down", "right" or "left" are all based on the viewpoint of the engineering person who is working on the label.

Examples

The label examples in this document are for reference only.

Engineering labels for network cables

These labels are affixed to Ethernet cables that connect modules in a chassis.

Table10-1 Information on a label affixed to an Ethernet cable

Content	Meaning	Example
MN-B-C-D	**MN**—Rack number	• **M**—Row number of the rack in the equipment room, in the range of A to Z. • **N**—Column number of the rack in the equipment room, in the range of 01 to 99. For example, A01.
	B—Chassis number	Numbered in top-down order with two digits, for example, 01.
	C—Slot number	Numbered in top-down and left-right order with two digits, for example, 01.
	D—Ethernet port number	Numbered in top-down and left-right order with two digits, for example, 01.
MN-Z	**MN**—Rack number	• **M**—Row number of the rack in the equipment room, in the range of A to Z. • **N**—Column number of the rack in the equipment room, in the range of 01 to 99. For example, B02.
	Z—Location number	Location number of the endpoint or device onsite. If you connect the cable to a router in a rack, specify the rack number, chassis number, and Ethernet port number, for example, B02-03-12. If you connect the cable to an endpoint or an NMS, specify the location number of the endpoint or the NMS.

The information provided on the following labels is different, subject to different devices that the Ethernet cables are connecting. For example:

- On a label for the Ethernet cable that connects a router and a server:
  - **For the router end**—Rack number, chassis number, and Ethernet port number on the router.
  - **For the server end**—Rack number and chassis number, or the specific location of the server if the server is laid separately.
- On a label for the Ethernet cable that connects the router and an endpoint:
  - **For the router end**—Rack number, chassis number, and Ethernet port number, or the specific location of the router if the router is laid separately. The definitions of the rack number and chassis number are the same as those described in Table10-1.
  - **For the endpoint end**—Ethernet port number of the endpoint.

Figure10-9 Example of a label on an Ethernet cable

- **A01-03-10-05**—The local end of the Ethernet cable is connected to Ethernet Port 05, Slot 10, Chassis 03 of the rack on Row A, Column 01 in the equipment room.
- **B02-03-12**—The peer end of the Ethernet cable is connected to Ethernet Port 12, Chassis 03 of the rack on Row B, Column 02 in the equipment room.

Engineering labels for optical fibers

These labels are affixed to optical fibers that connect the fiber ports on the modules in a chassis, or connect fiber ports on fixed-port devices. Two types of labels are available for optical fibers: labels for a fiber that connects the fiber ports on two devices, labels for a fiber that connects the device and the optical distribution frame (ODF).

- Labels for the fiber that connects two devices

Table10-2 Information on labels affixed to the fiber between two devices

Content	Meaning	Example
MN-B-C-D-R/T	**MN**—Rack number	• **M**—Row number of the rack in the equipment room, in the range of A to Z. • **N**—Column number of the rack in the equipment room, in the range of 01 to 99. For example, A01.
	B—Chassis number	Numbered in top-down order with two digits, for example, 01.
	C—Slot number	Numbered in top-down and left-right order with two digits, for example, 01.
	D—Fiber port number	Numbered in top-down and left-right order with two digits, for example, 05.
	R—Optical receiving interface **T**—Optical transmitting interface	N/A
MN-B-C-D-R/T	**MN**—Rack number	The meanings are the same as above. If the local device and the peer device are not in the same equipment room, MN can be the name of the equipment room.
	B—Chassis number	
	C—Slot number	
	D—Fiber port number	
	R—Optical receiving interface **T**—Optical transmitting interface	N/A

- Labels for the fiber that connects the device and the ODF

Table10-3 Information on labels affixed to the fiber between the device and the ODF

| Content	Meaning	Example
MN-B-C-D-R/T	**MN**—Rack number	• **M**—Row number of the rack in the equipment room, in the range of A to Z. • **N**—Column number of the rack in the equipment room, in the range of 01 to 99. For example, A01.
	B—Chassis number	Numbered in bottom-up order with two digits, for example, 01.
	C—Slot number	Numbered in top-down and left-right order with two digits, for example, 01.
	D—Fiber port number	Numbered in top-down and left-right order with two digits, for example, 05.
	R—Optical receiving interface **T**—Optical transmitting interface	N/A

Content	Meaning	Example
ODF-MN-B-C-R/T	**MN**—Row number and column number of ODF	- **M**—Row number of the rack in the equipment room, in the range of A to Z. - **N**—Column number of the rack in the equipment room, in the range of 01 to 99. For example, G01 is the ODF of Row G and Column 01.
	B—Row number of the endpoint device	In the range of 01 to 99, for example, 01-01.
	C—Column number of the endpoint device	
	R—Optical receiving interface **T**—Optical transmitting interface	N/A

Figure10-10 Example of a label on an optical fiber between two devices

A01－ 01 －05 － 05 －

G02－01 － 01－ 01－T

TO:

- **A01-01-05-05-R**—The local end of the optical fiber is connected to Optical Receiving Interface 05 on Slot 5, Chassis 01 in the rack on Row A, Column 01 in the equipment room.
- **G01-01-01-01-T**—The peer end of the optical fiber is connected to Optical Transmitting Interface 01 on Slot 01, Chassis 01 in the rack on Row G, Column 01 in the equipment room

Figure10-11 Example of a label on an optical fiber between the device and the ODF

ODF－G01－01 － 01 － R

A01－ 01 － 05 － 05－R

TO:
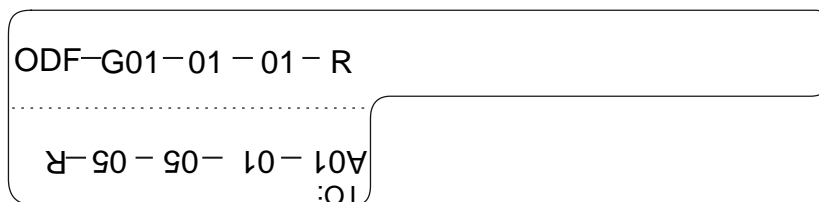
- **ODF-G01-01-01-R**—The local end of the optical fiber is connected to the optical receiving endpoint on Row 01, Column 01 of the ODF in Row G Column 01 in the equipment room.
- **A01-01-05-05-R**—The peer end of the optical fiber is connected to Optical Receiving Interface 5 on Slot 05, Chassis 01 in the cabinet on Row A, Column 01 in the equipment room.

Engineering labels for DC power cords

These labels are affixed to DC cables that provide power for racks, and the protection grounding cables including the –48V, PGND, and BGND cables. The labels for DC power cords are affixed to one side of the identification plates on cable ties.

Table10-4 Information on labels affixed to DC power cords

Content	Meaning
MN(BC)-–48Vn	• **Loaded cabinet side**—Only MN is used to identify the cabinet number (row number and column number in the equipment room).
MN(BC)-RTN	• **Power cabinet side**—MN identifies the row and column number of the power distribution equipment like the control cabinet and distribution box. 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). RTN and PGND have no row and column number for identification.
MN(BC)-PGND	• **n**—Power port number in down-top and left-right order, in the range of 1 to 3.

The label only carries location information about the peer equipment, control cabinet, or distribution box, while the information of the local end is not necessary. Table10-4 lists the information of two –48 V power supplies on the label. The information for other DC voltages (such as 24 V, 60 V) must be given in similar methods.

Make sure labels are affixed in the correct direction. After the cable ties are bundled onto the cable, the identification plates with the labels must face up, and the text on the labels in the same cabinet must be in the same direction, as shown in Figure10-12.

Figure10-12 Example of labels on a DC power cord
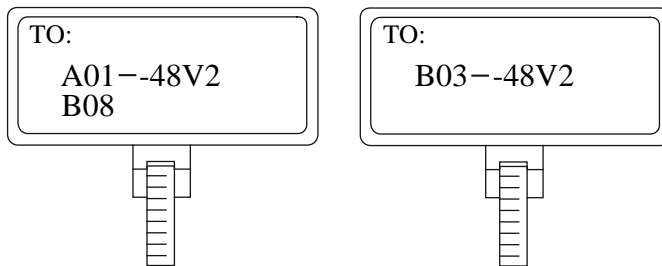
- **A01/B08-–48V2 (loaded cabinet side)**—The cable is –48V2 DC supply, which is from the 8th connecter on the second row of –48V bus bar in the cabinet on Row A, and Column 1 in the equipment room.

- **B03-–48V2 (distribution box side)**—The cable is –48V2 DC supply, which is from the loaded cabinet on Row B, Column 03 in the equipment room.

In the power distribution box (or the first power cabinet of a row in the transmission equipment room), every endpoint block on the –48V 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 endpoint block.

PGND and RTN are two copper bars, on which the endpoint blocks are short-circuited, so which endpoint is connected makes no difference. You only need to give the row and column numbers of the power distribution box, instead of giving the specific serial number of the endpoint block on the copper bar. For example, if the label on the loaded cabinet side is "A01-RTN", it means that the power cord is an RTN that connects RTN copper bar in the power distribution box on Row A, Column 01 in the equipment room. Information on the labels for PGND cables must be given in the similar way.

Engineering labels for AC power cords

These labels are affixed to the AC cables that provide power for cabinets and protection grounding cables, including POWER, RTN, and PGND cables. The 220 VAC cables and related PGND and RTN cables are covered with insulating sheath, so the labels only need to contain "AC" and the

cabinet number. The labels for AC power cords are affixed to one side of the identification plates on cable ties.

Table10-5 Information on labels affixed to AC power cords

Content	Meaning
MN-AC	MN: Rack number (row number and column number in the equipment room) or the location of the socket where the power is led in.
	The location of the socket is marked according to onsite situation. If the sockets can be identified by row number and column number, they can be numbered following the same rule for the rack number. If the sockets cannot be identified by row number and column number, specify the detailed locations to avoid confusing with other sockets.

The label only carries location information about the peer equipment and the power socket, while information about the local end is not necessary. Make sure the identification plates with the labels face up after the cable ties are bundled onto the cable, and the text on the labels in the same cabinet is in the same direction, as shown in Figure10-13:

Figure10-13 Example of labels on an AC power cord
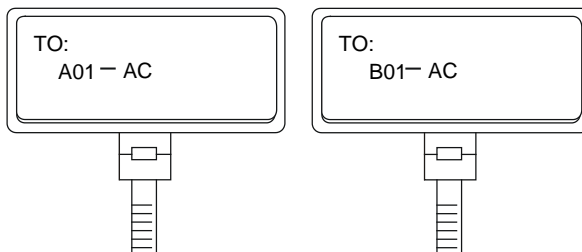
- **A01-AC (loaded cabinet side)**—The power cord is connected to the socket of Row A and Column 01 in the equipment room.
- **B01-AC (power socket side)**—The power cord is connected to the loaded cabinet of Row B, Column 01 in the equipment room.

Engineering labels for devices

These labels can be affixed to any device.

You can fill in the device name, model, IP address, serial number, installation address, and installation date on a device label.

Figure10-14 Example of a device label

Contents

11 Appendix B Cable management

General cabling requirements

Minimum curvature radius of cables

- **Attached power cord, communication cable, or ribbon cable**—A minimum of five times the cable's outer diameter. If the cable is frequently bent, connected and removed, the curvature radius must be a minimum of seven times the cable's outer diameter.

- **Ordinary attached coaxial cable**—A minimum of seven times the cable's outer diameter. If the coaxial cable is frequently bent, connected and removed, the curvature radius must be a minimum of 10 times the cable's outer diameter.

- **High-speed cable (SFP+ cable for example)**—A minimum of five times the cable's outer diameter. If the coaxial cable is frequently bent, plugged and unplugged, the curvature radius must be a minimum of 10 times the cable's outer diameter.

Minimum curvature radius of fibers

- When the fiber is wrapped up around the cabling plate, the diameter of the cabling plate must be a minimum of 25 times the fiber's diameter.

- When the fiber is being moved, the curvature radius of the fiber must be a minimum of 20 times the fiber's diameter.

- When the fiber is attached, the curvature radius of the fiber must be a minimum of 10 times the fiber's diameter.

NOTE:

The fiber's diameter refers to the outer diameter of the fiber jacket. Typically, the diameter of a single-core fiber is 0.9 mm (0.04 in), 2.0 mm (0.08 in), or 3.0 mm (0.12 in).
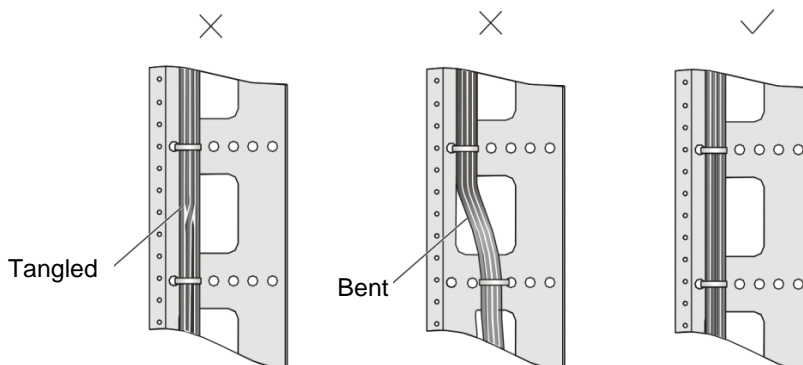
Cable binding guidelines

When you route and bundle up cables, follow these guidelines:

- Label cables before you route or bundle them. For more information about labeling cables, see "Appendix E Engineering labels."

- Bind and route the cables neatly inside the rack, and make sure they are not kinked or bent.

**Figure11-1 Correct and incorrect cable binding**

- Route different types of cables (power cords and signal cables for example) separately. If they are close to one another, cross them over one another. If you route them in parallel, keep a minimum distance of 30 mm (1.18 in) between a power cord bundle and a signal cable bundle.

- The cable management brackets and cable routing slots, inside or outside the rack, are smooth and do not have sharp edges or tips.

- When you route cables through sharp sheet metal penetration points or along sharp edges of mechanical parts, use bushings or take any other action to protect the cables from being cut or abraded. The sheet metal penetration points must be smooth and fully rounded.

- Use the correct type of ties to bind the cables. Do not bind cables with joined ties. The following types of ties are available: 100 × 2.5 mm (3.94 × 0.10 in), 150 × 3.6 mm (5.91 × 0.14 in), 300 × 3.6 mm (11.81 × 0.14 in), 530 × 9 mm (20.87 × 0.35 in), and 580 × 13 mm (22.83 × 0.51 in).

- After binding the cables, cut the excess from the ties, leaving no sharp or angular tips. See Figure11-2.

Figure11-2 Cutting cable ties
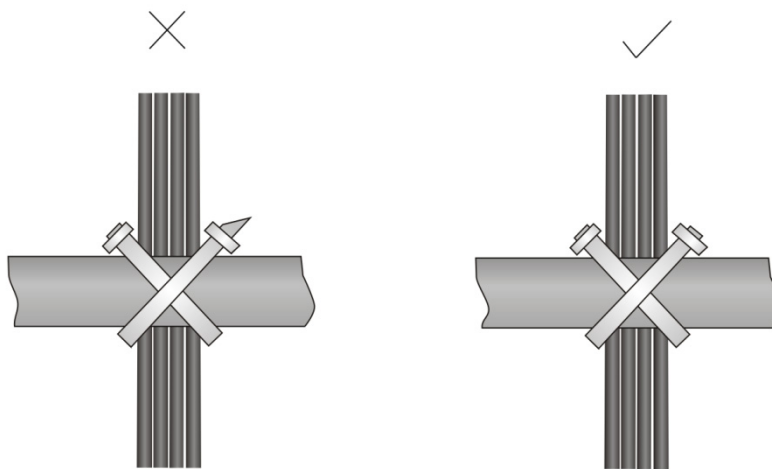
- When you bend cables, bind them as shown in Figure11-3. To avoid excessive stress causing cable core break, do not tie up the cables in the bending area.

Figure11-3 Binding cables where they must be bent
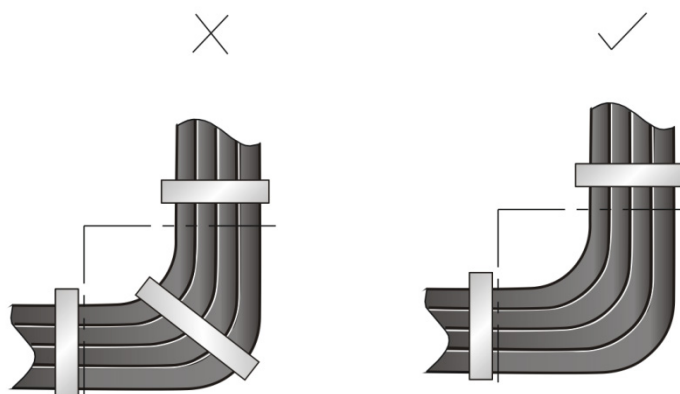
- Route, bind, and attach excess cables for easy, safe maintenance activities and correct operations.

- Do not tie power cords to slide rails.

- When you connect a cable to an articulated part, for example, when you connect a grounding cable to a cabinet door, leave enough slack in cables and make sure they are not stressed from any movement of the part.

- Cables must be protected at points where they might rub or come in contact with sharp edges or heated areas. Use high temperature cables near heat sources.
- Securely fasten cables and take adequate measures to prevent loose connections.

Figure11-4 Securely fastening cables
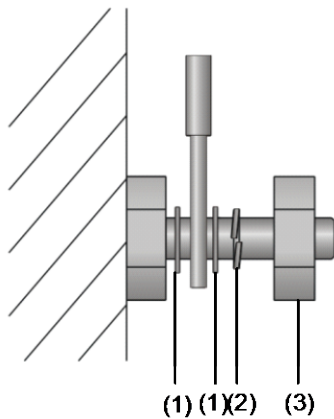
| (1) Flat washer | (2) Spring washer | (3) Nut |

- Fasten heavy or rigid power cords at the connectors to relief stress.
- Do not use tapping screws to fasten the connecting terminals.
- Bind together cables that are the same type and routed in the same direction.

  Table11-1 lists the cable bundling specifications.

Table11-1 Tie-binding parameters

Cable bundle diameter (mm)	Space between bundles (mm)
10	80 to 150
10 to 30	150 to 200
30	200 to 300

- Do not tie cables or bundles in a knot.
- The metal parts of the crimped cold-pressed terminal blocks (such as circuit breaker) cannot protrude beyond the blocks.

Routing signal cables

The chassis cable management brackets are installed along the left and right edges of the front panel. The fabric module cable management brackets are installed along the top and bottom edges of the MPU and fabric module slots.
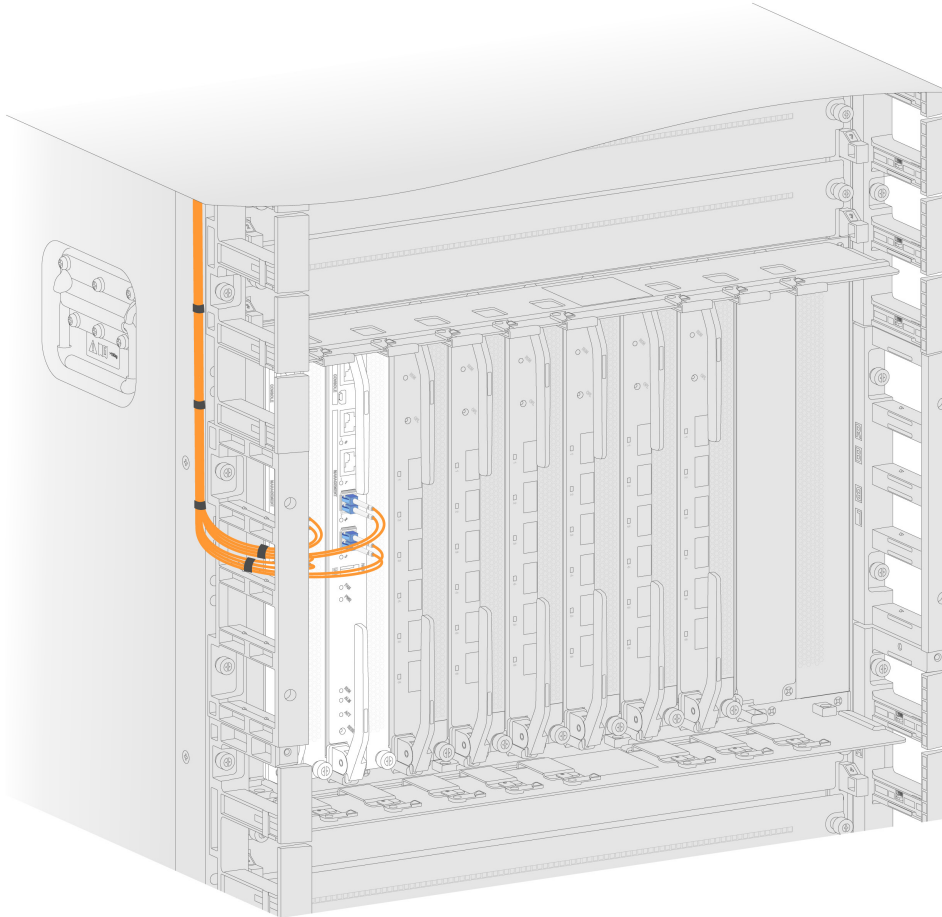
NOTE:

For videos on routing signal cables, access the official website or scan the QR code on a cable management bracket.

Routing MPU cables

The MPUs are on the left of the front panel. As a best practice, route MPU cables along the left chassis cable management brackets, as shown in Figure11-5.
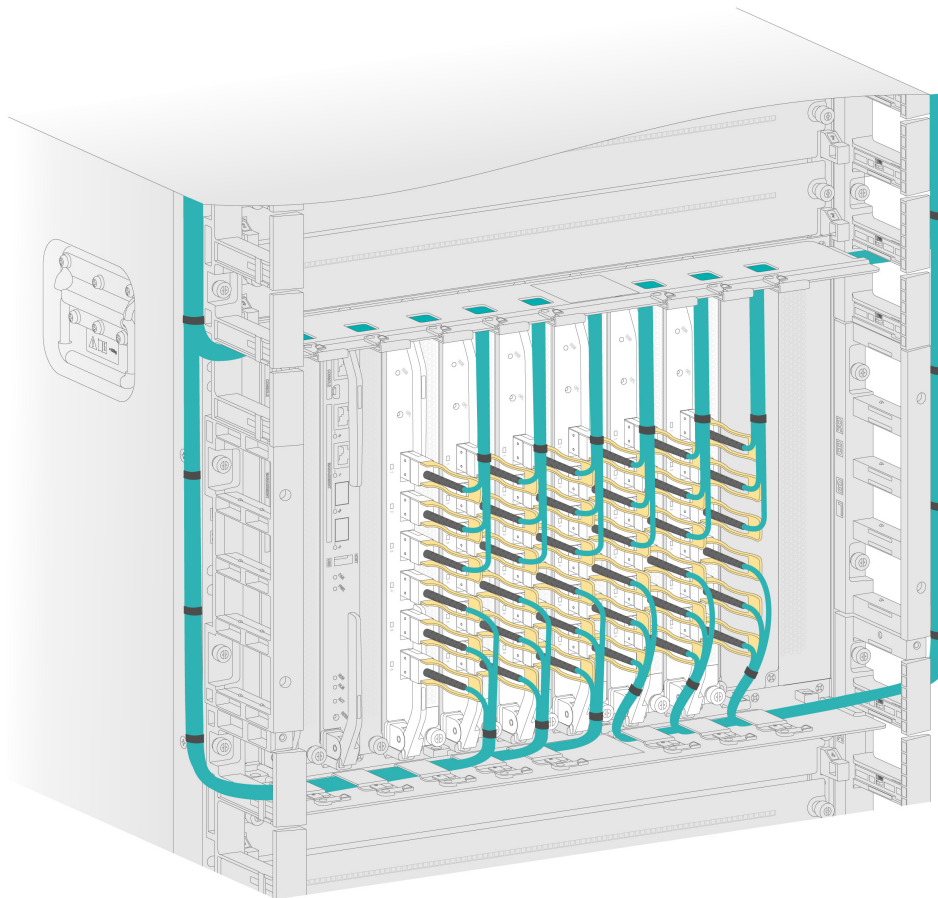
Figure11-5 Routing MPU cables

Routing fabric module cables

As a best practice, route the fabric module cables along the nearest fabric module cable management bracket and the nearest cable management brackets, as shown in Figure11-6.
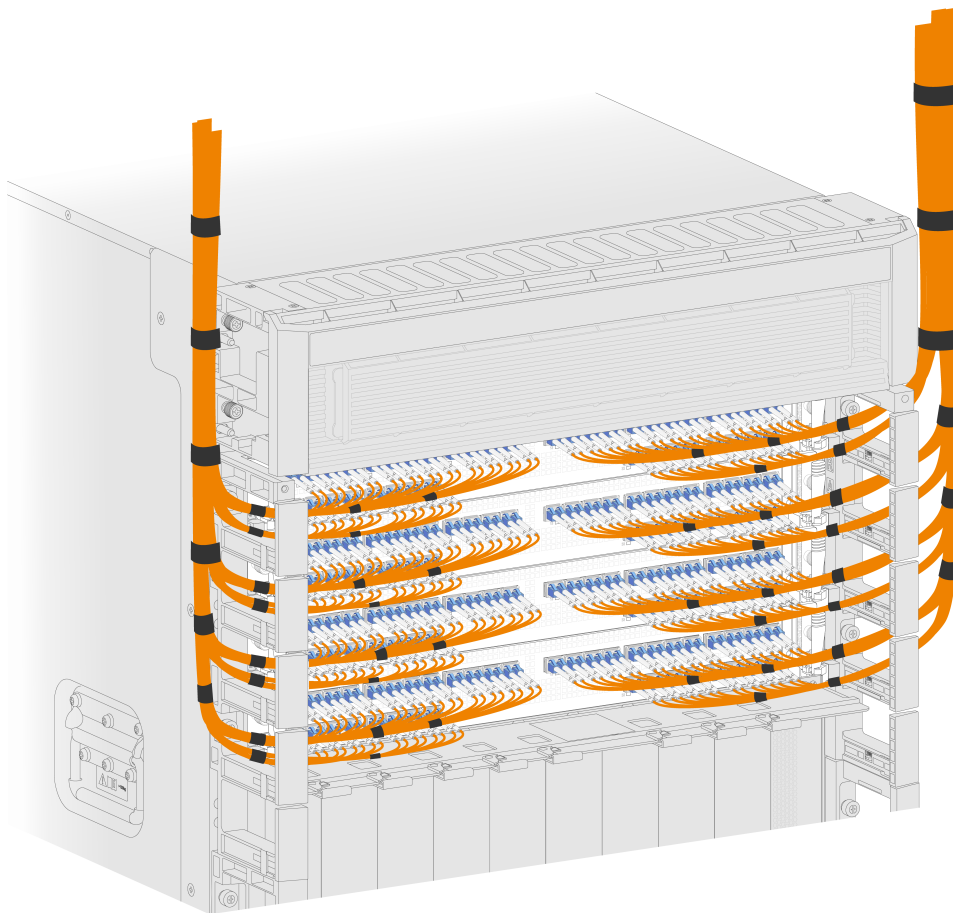
Figure11-6 Routing fabric module cables

Routing interface module cables

For easy maintenance, route cables from ports on the left part of an interface module along the left chassis cable management bracket and from ports on the right part along the right chassis cable management bracket.

Figure11-7 Routing interface module cables

Routing power cords

⚠ **CAUTION:**

To protect cable adapters and converters, place them at the cabinet bottom. Do not place them at a location out of the cabinet and easy to reach.

Before routing power cords in the equipment room, consider the layout of the equipment room, including the locations of the power distribution box, AC power strips, and lighting protection box.

The power supplies are at the rear of the chassis. As a best practice, route power cords leftwards or rightwards as required.

Contents

12 Appendix C Repacking the router

This chapter describes how to repack the router chassis, power supplies, and modules.

Removing cables from the router

Before repacking the router, remove all cables such as the power cords, console cable, twisted pair cables, optical fibers, and grounding cable from the router.

Removing the power cords

1. Switch off the circuit breakers at the input end of all power cords.
2. Wear an ESD wrist strap, and make sure it makes good skin contact and is reliably grounded.
3. Remove a power cord.
   o For an AC power cord, remove the cable tie, and then remove the power cord connector from the power supply.
   o For a DC power cord, loosen the screw on the power cord connector, and then remove the connector from the power supply.
4. Perform the same steps to remove the other power cords.

Removing the console cable

1. Pull the RJ-45 connector of the console cable out from the console port of the router.
2. Pull the DB-9 connector of the console cable out from the serial port of the PC or the terminal.

Removing the grounding cable

1. Loosen the two screws at the grounding holes in the chassis, and then remove the grounding cable from the chassis.
2. Use a wrench to loosen the hex nut on the grounding post of the grounding strip, and remove the other end of the grounding cable (with a ring terminal) from the grounding post.

Removing the twisted pair cables and optical fibers

You must remove all twisted pair cables and optical fibers from the ports on the router.

NOTE:

After pulling out an optical fiber from a transceiver module, cover the connector of the optical fiber with a dust cap to keep the connector clean.

Repacking the FRUs

Repacking power supplies

⚠ CAUTION:

To avoid device damage and bodily injury, switch off the circuit breakers at the input ends of all power cords and remove all the power cords before removing power supplies.

To repack a power supply:

1. Prepare the original packing materials, including the anti-static bag, foam cushion, and packing box for a power supply. Make sure these packing materials are clean, dry, and not damaged.
2. Remove the power supply from the chassis.

    For the power supply removal procedure, see "Replacement procedures."
3. Put the removed power supply into the anti-static bag.
4. Place the foam cushion over the power supply.
5. Place the power supply and the foam cushion in the packing box, and seal the box with tape.
6. Perform the same steps to repack the other power supplies.

Repacking the modules

1. Prepare the original packing materials, including the anti-static shielding bag, foam cushion, and packing box, for a module. Make sure these packing materials are clean, dry, and not damaged.
2. Remove the transceiver modules from the modules.

    If no transceiver module is installed, skip this step.

    For information about how to remove a transceiver module, see "Replacement procedures."
3. Remove a module from the chassis.

    If a filler panel is provided for the module slot, install the filler panel in the slot after you remove the chassis from the rack.

    For information about how to remove a module and install a filler panel, see "Replacement procedures."
4. Put the removed module into an anti-static bag.

    For a module provided with a metal protection box, install the metal protection box for it before putting it into an anti-static bag.
5. Place the foam cushion over the module.
6. Put the module and the foam cushion into the box, and seal the box with tape.
7. Perform the same steps to repack the other modules.

Repacking the fabric module slot filler panels

1. Prepare the original packing materials, including the packing bag, foam cushion, and packing box, for a fabric module slot filler panel. Make sure these packing materials are clean, dry, and not damaged.
2. Remove the fabric module slot filler panel.
3. Place the removed fabric module slot filler panel in the packing bag.
4. Place the foam cushion over the packing bag.

5. Place the fabric module slot filler panel and the foam cushion in the packing box, and seal the box with tape.

6. Perform the same steps to repack the other fabric module slot filler panels.
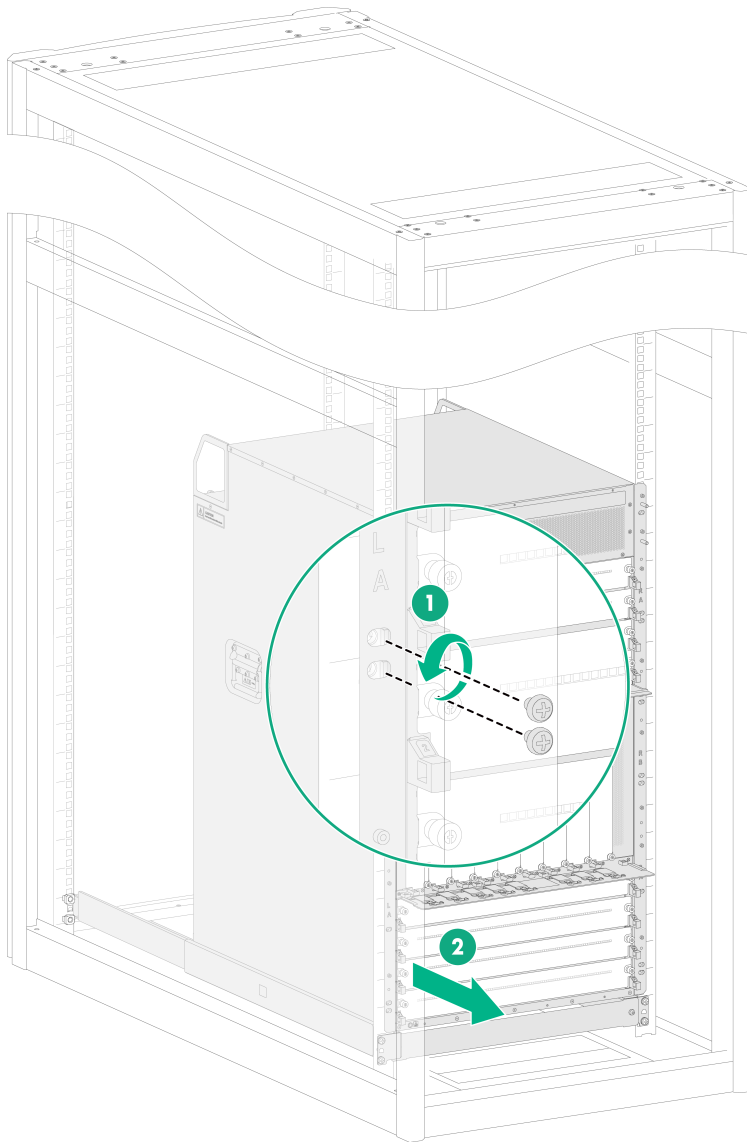
Repacking the router chassis

Removing the chassis from the rack

The router is heavy. As a best practice, use a mechanical lift to move the router.

To remove the chassis from the rack:

1. Prepare the pallet, carton, and packing bag of the chassis. Make sure they are clean, dry, and not damaged.

2. Place the pallet at a location where you can move the chassis easily.

3. Remove the air filter and top hood from the chassis.

4. As shown by callout 1 in Figure12-1, use a Phillips screwdriver to loosen the screws that attach the mounting brackets to the rack.

5. As shown by callout 2 in Figure12-1, use a minimum of four people to slide the chassis out of the rack along the slide rails. When most part of the chassis is removed from the slide rails, lift up the chassis by holding the chassis handles to completely remove the chassis from the rack.

6. Place the chassis onto the pallet.

**Figure12-1 Removing the router from the rack**

Repacking the router chassis

1. Move the chassis so that the left and right edges of the chassis bottom are aligned with the left and right positioning lines respectively on the pallet. See Figure12-2 for the pallet.

Figure12-2 Pallet

Right positioning line

Left positioning line

Screw hole

Wooden pallet base

Front panel side of the router
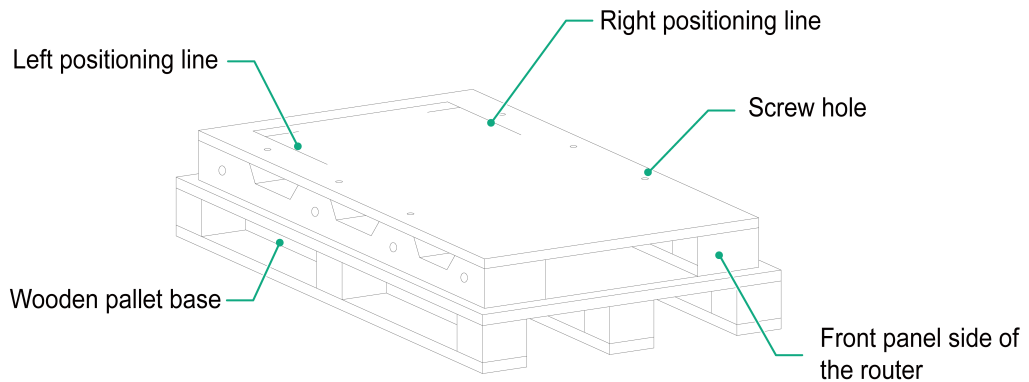
2. Use screws to attach the L-type brackets to the chassis, as shown by callout 1 in Figure12-3.

3. Move the chassis so that the mounting holes in the pallet ear of the L-type brackets align with the mounting holes in the pallet. Use screws to attach the L-type brackets to the pallet, as shown by callout 2 in Figure12-3.

Figure12-3 Attaching the L-type brackets to the pallet
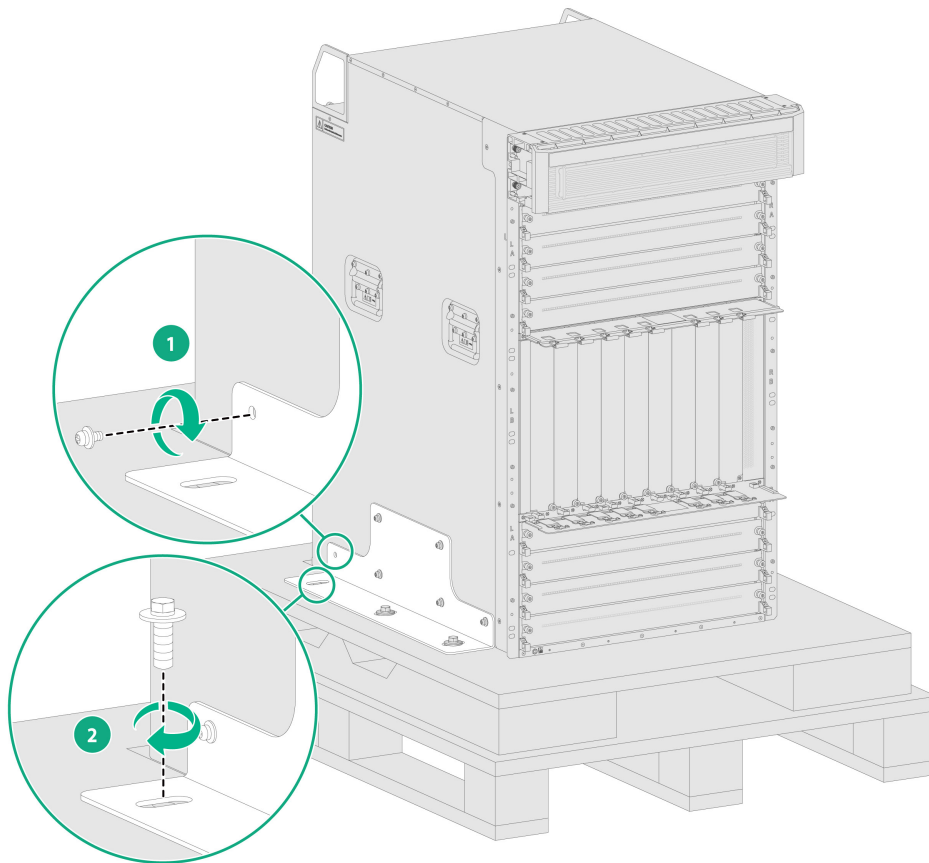
4. Place the packing bag over the chassis, and then tape the bag to the plastic film on the pallet.

5. Align the carton's narrow side that has printings with the front panel of the chassis and then place the carton over the chassis. Erect one paper angle bead at each corner of the carton, as shown in Figure12-4.

Figure12-4 Placing the carton over the router
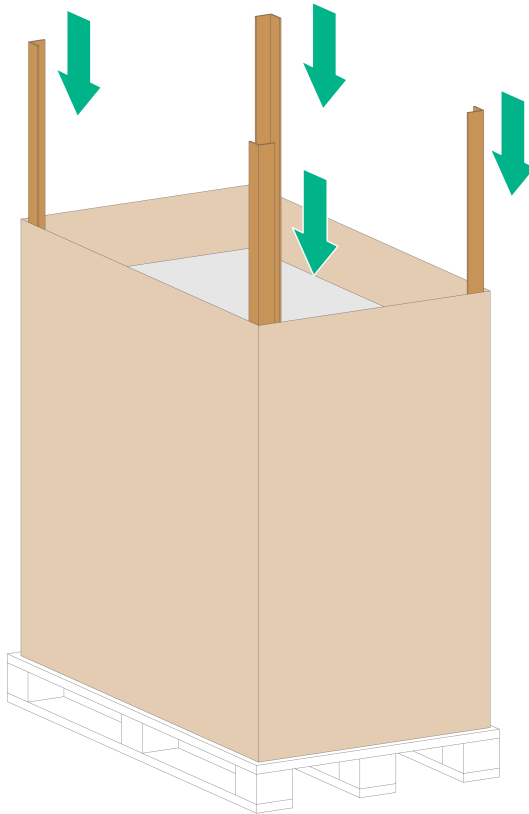
6. Put the foam cushion onto the chassis top, and make sure the mounting brackets seat into the internal notches of the foam cushion.

7. Fit the accessory box into the rear notch of the foam cushion. Then close the top cover of the carton.

Figure12-5 Putting the foam cusion and carton top cover in place