AP7052DN

Hardware Installation and Maintenance Guide

Issue   01

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Huawei Technologies Co., Ltd.

About This Document

Overview

This document describes hardware features of the AP7052DN and AP7152DN and provides basic installation methods.

Intended Audience

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

Symbol Conventions

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

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

Symbol	Description
	damage, and environment deterioration.

Change History

Changes between document issues are cumulative. The latest document issue contains all changes made in previous issues.

Issue 01 (2017-12-29)

Initial commercial release

Contents

1 Product Overview

About This Chapter

The AP7052DN and AP7152DN have the following advantages:

- 4x4 MU-MIMO
- Good service support capabilities
- High reliability
- High security
- Simple network deployment
- Automatic AC discovery and configuration
- Real-time management and maintenance

In compliance with IEEE 802.11ac, the AP7052DN and AP7152DN support a theoretical rate of up to 3.46 Gbit/s, greatly improving wireless user experience.

The AP7052DN and AP7152DN provide highest-quality wireless services for mobile office, high-density scenarios, elementary education, and higher education. They can be flexibly deployed in different environments.

A cloud AP must be used together with a cloud server.

1.1 Device Structure

Table 1-1 shows the appearance of the AP7052DN and AP7152DN.

Table 1-1 Appearance of the AP

Model	Appearance

Model	Appearance
AP7052 DN	
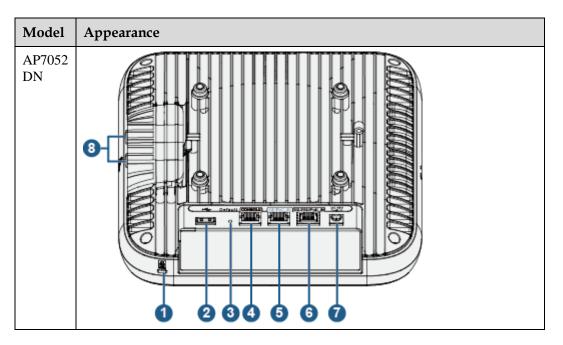
Table 1-2 describes ports on the AP7052DN

Table 1-2 Interface description

No.	Name	Description
1	Security slot	Connects to a security lock.
2	USB port	Connects to a USB flash drive or other storage devices to extend the storage space of the AP. The USB2.0 standard is supported.
3	Default	Restores factory settings and restarts the device when you hold down the button more than 3 seconds.
4	CONSOLE	Connects to a maintenance terminal for AP configuration and management.
5	GE/PoE_IN	10/100/1000M port that connects to the wired Ethernet and supports PoE input.
6	5/2.5GE/PoE_IN	100M/1000M/2.5G/5G port that connects to the wired Ethernet and supports PoE input.
7	DC 48V	Connects a power adapter to the AP.
8	Radio port	Connects an antenna to an IoT card through a radio cable.
9	2.4G/5G	Connects a 2.4 GHz or 5 GHz antenna to the AP to send and receive wireless signals.The port type is RP-SMA-K.The port is applicable only to an AP that supports external antennas.
10	5G	Connects a 5 GHz antenna to the AP to send and receive wireless signals.The port type is RP-SMA-K.The port is applicable only to an AP that supports external antennas.

📖 **NOTE**

- The AP supports the following power supply modes: PoE power supply and DC power supply.
- When the AP uses the DC power supply, use a power adapter for power supply; otherwise, the AP may be damaged.
- For power adapter models, see 5.9 Power Adaptation Solution.

1.2 Indicator Description

The AP7052DN and AP7152DN provide only a single indicator, as shown in Figure 1-1.

📖 **NOTE**

- The indicator is located inside the panel, which turns on after the AP is powered on.
- Indicator colors may vary slightly at different temperature.

Figure 1-1 Indicator

Indicator
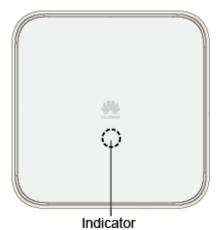
Table 1-3 Description about the single indicator

Type	Color	Status	Description
Default status after power-on	Green	Steady on	The AP is just powered on and the software is not started yet.
Software startup status	Green	Steady on after blinking once	After the system is reset and starts uploading the software, the indicator blinks green once. Until the software is uploaded and started, the indicator remains steady green.
Running status	Green	Blinking once every 2s (0.5 Hz)	• The system is running properly, the Ethernet connection is normal, and STAs are associated with the AP. • The system enters the Uboot CLI.
		Blinking	The system is running properly, the Ethernet

Type	Color	Status	Description
		once every 5s (0.2 Hz)	connection is normal, and no STA is associated with the AP. The system is in low power consumption state.
Alarm	Green	Blinking once every 0.25s (4 Hz)	• The software is being upgraded. • After the software is loaded and started, the AP requests to go online if it works in Fit AP or cloud-based management mode. The indicator remains in this state before the AP successfully goes online. • The AP works in Fit AP or cloud-based management mode and fails to go online.
Fault	Red	Steady on	A fault that affects services has occurred, such as a DRAM detection failure or system software loading failure. The fault cannot be automatically rectified and must be rectified manually.

1.3 Basic Specifications

Table 1-4 provides basic specifications of the AP7052DN and AP7152DN.

Table 1-4 Basic specifications

Item		Description
Physical specifications	Dimensions (H x W x D)	52 mm $\times$ 220 mm $\times$ 220 mm
	Weight	• AP7052DN: 1.68 kg
	System memory	512 MB DDR3L
	FLASH	16 MB NOR FLASH + 128 MB NAND FLASH
Power specifications	Power input	• DC: 42.5 V to 57 V • PoE power supply: in compliance with IEEE 802.3at/bt
	Maximum power consumption	• DC/802.3bt power supply: 33 W (excluding the output power of the USB port) • 802.3at power supply: 25.5 W (The USB function is unavailable. The port rate of 5/2.5GE/PoE_IN decreases to 2.5 Gbit/s. The IoT card power is lower than 0.5 W.) **NOTE** The actual maximum power consumption depends on local laws and regulations.
Environment	Operating	• -60 m to +1800 m: -10 ℃ to +50 ℃

Item		Description
specifications	temperature	• 1800 m to 5000 m: Temperature decreases by 1 ℃ every time the altitude increases 300 m.
	Storage temperature	-40 ℃ to +70 ℃
	Operating humidity	5% to 95% (non-condensing)
	IP rating	IP41
	Atmospheric pressure	53 kPa to 106 kPa

1.4 Ordering Information

To place an order, contact technical support personnel.

Part Number	Description
02351KDV	AP7052DN Mainframe(11ac Wave2,Indoor,4X4 Dual-Band,IoT Expansion,Built-in Antenna)
02351KEA	AP7052DN-USA Mainframe(11ac Wave2,Indoor,4X4 Dual-Band,IoT Expansion,Built-in Antenna,United States dedicated)

2 AP Installation

About This Chapter

2.1 Preparing for Installation

This section describes safety precautions and tool preparations for AP installation.

Safety Precautions

- Take proper measures to prevent injuries and device damage.
- Place the device in a dry and flat position away from any liquid and prevent the device from slipping.
- Keep the device clean.
- Do not put the device and tools in the aisles.

⚠️ **CAUTION**

Only the qualified personnel are permitted to install and remove the device and its accessories. Before installation and operation, read the safety precautions carefully.

Tool Preparation

To install APs, prepare tools listed in Table 2-1.

Table 2-1 Tools
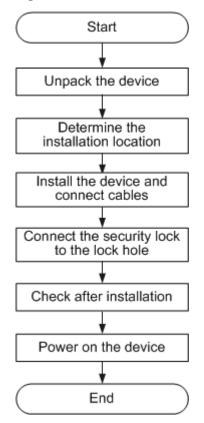
Phillips screwdriver	Protective gloves	ESD gloves
Slip-proof glove	Marker	Hammer drill
Claw hammer	Diagonal pliers	Wire stripper
RJ45 crimping tool	Cable cutter	Network cable tester
Jig saw	Multimeter	Ladder
Safety helmet	Safety belt	Anti-skid shoes

2.2 Installation Flowchart

The following figure shows the process for installing an AP.

Figure 2-1 Installation flowchart

2.3 Unpacking the Equipment

Before unpacking the carton, ensure that the packing carton is intact and not damaged or soaked. Stop unpacking if the equipment is rusted or soggy. Then, investigate causes and contact the supplier.

After unpacking, check items in the carton against the packing list. If any item is missing, contact the supplier or agent.

Usually, the packing list contains the following items.

- AP device
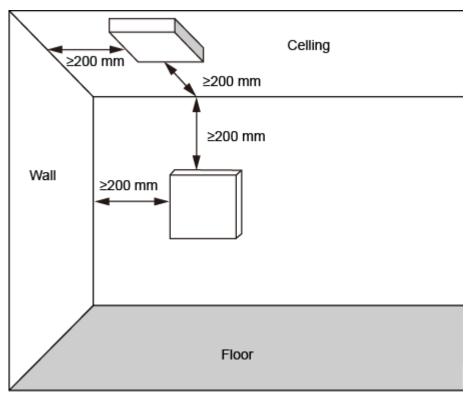
- Sheet metal mounting bracket
- Screws
- Adjustable buckle
- Expansion screws
- Quick start guide
- Warranty card
- MAC address label
- SN label

📖 **NOTE**

If a PoE adapter or a DC power adapter is required, you need to purchase it separately. For DC power adapter models, see 5.9 Power Adaptation Solution.

2.4 Determining the Installation Position

Indoor APs are usually mounted on a wall or ceiling using sheet metal mounting brackets. The installation position is determined by the site survey. There must be at least 200 mm clearance between the cabling end of the AP and the wall. Figure 2-2 shows space requirements.

Figure 2-2 Mounting an AP

When determining the AP installation position, comply with the following rules:

- Try to reduce the number of obstacles, such as walls, between the AP and user terminals.

- Place the AP far away from electronic devices that may produce radio interference, such as microwave ovens, other APs, antennas, and other radio communication devices. For details, see Table 2-2.

- Install the AP in a hidden position that does not affect daily lives and work of residents.

- Install the AP in a site that is free from leaking or dripping water, heavy dew, and humidity, and take protective measures to prevent water from flowing into the equipment along the cable.

- Do not install the AP in an environment with high temperature, dust, poisonous gases, flammable or explosive objects, electromagnetic interference (from a radar station, radio station, or substation), unstable voltage, violent shakes, or strong noise.

Table 2-2 General anti-interference requirements

Scenario	Deployment Distance Requirement
Indoor installation	- There should be at least a 7 m distance between antennas. - The antennas should be placed at least 2 m from the 4G antennas of the carrier. - The antennas should be placed far away from electronic devices that may produce interference, such as microwave ovens.

☐ **NOTE**
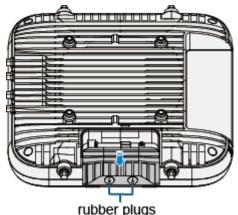
If antennas are embedded into APs, the deployment distance requirements on the antennas are those on APs.

2.5 Installing an IoT Card
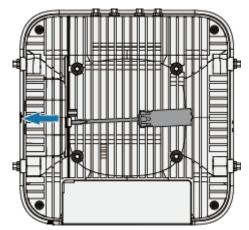
The AP provides an IoT slot for installing an ANT or RFID card based on customer requirements.

1. Hold the buckle on the bottom cover of the AP, and remove the cover and plastic plugs. The number of rubber plugs to be removed depends on the number of radio cables.

rubber plugs

☐ **NOTE**
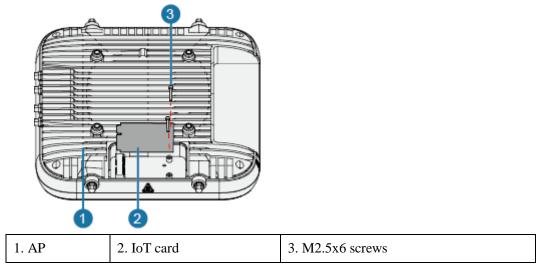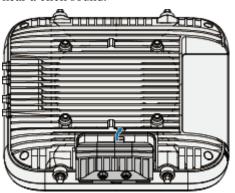
Use a flat-head screwdriver to remove the cover. Insert the flat-head screwdriver under the cover buckle and lever the buckle.

2.   Place an IoT card in the slot and tighten the card using M2.5x6 screws (with a tightening torque of 0.3 Nm).

| 1. AP | 2. IoT card | 3. M2.5x6 screws |

3.   Connect an IoT antenna with the MMCX connector of an IoT card, and slide the IoT card cover to secure the IoT card. When installing the IoT card cover, insert the protrusion on the cover into the opening on the AP. Then press the protrusion until you hear a click sound.

📖 NOTE

● The diagonal size of a hexagon SMA connector must be less than or equal to 8 mm; otherwise, the cable cannot be installed.

● The ANT card has one radio port, and the RFID card has two.

2.6 Installing the AP

2.6.1 Installing the Device on a Wall

📖 **NOTE**

A wall for installing the device needs to meet the following requirements:
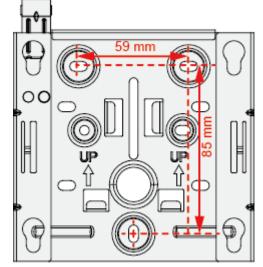
- The wall can bear the weight of four times the total weight of the device and mounting bracket without damage.

- When the tightening torx of a screw reaches 5 N•m, the screw still properly works, without crack or damage on the wall.

Mounting kits and expansion bolts are required to install the AP on a wall. The procedures are as follows:
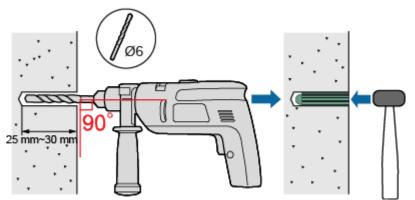
When fixing the sheet metal mounting bracket, ensure that the arrows point upwards on the

[UP ↑] label.
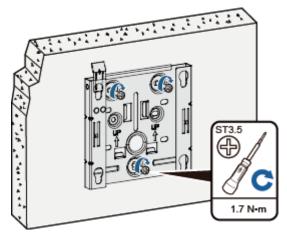
1. Fix a mounting bracket to the wall against the wall and mark the drilling positions through holes of the bracket.
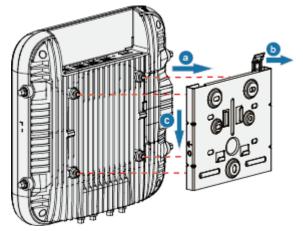
2. Use a 6 mm drill bit to drill 25 mm to 30 mm deep holes in the drilling positions. Hammer the expansion tubes into the holes until the expansion tubes are completely embedded into the wall.

3. Fix the mounting bracket to the wall and use the Phillips screwdriver to fasten three expansion screws into the expansion tubes.

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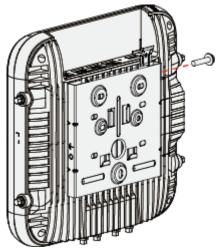
4. Connect the cables. For details, see 2.7 Cable Connection.

5. Align the rubber feet of the device over the mounting slots on the mounting bracket and vertically push the AP to secure it. When the spring clip is popped up, push the AP downward until it snaps into place (you can hear a click).

📖 **NOTE**

In a scenario with heavy vibrations, tighten the AP to the mounting bracket using M4x30 screws with a torque of 1.4N•m. This prevents the AP falling off from due to vibrations. In normal scenarios, you do not need to install these screws.
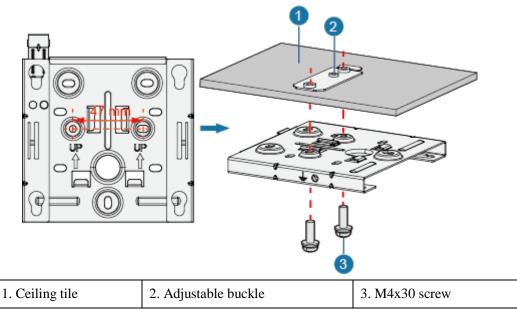
2.6.2 Installing the Device on a Ceiling
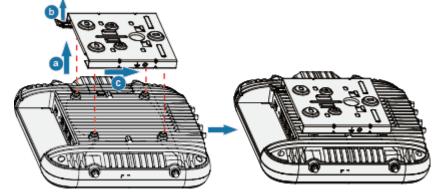
📖 **NOTE**

A ceiling needs to bear the weight of four times the total weight of the device and mounting bracket without damage.

1. Remove a ceiling tile, determine locations of mounting holes based on the distance between two installation holes on the mounting bracket, use a hammer drill to drill holes on the ceiling tile, and fix the mounting bracket to the ceiling tile(with a tightening torque of 1.4 N•m).

   The screws provided for ceiling-mounting of APs are 30 mm long and can be used to fix an AP on a ceiling no thicker than 15 mm. To install APs on thicker ceilings, you need to purchase longer screws.

1. Ceiling tile	2. Adjustable buckle	3. M4x30 screw

2. Connect the cables. For details, see 2.7 Cable Connection.

3. Align the rubber feet of the device over the mounting slots on the mounting bracket and vertically push the AP to secure it. When the spring clip is popped up, push the AP horizontally until it snaps into place (you can hear a click).

📖 **NOTE**

● Ensure that the AP is correctly installed on the mounting bracket and there is 200 mm space above and around the AP for maintenance.

● In a scenario with heavy vibrations, tighten the AP to the mounting bracket using M4x30 screws with a torque of 1.4N•m. This prevents the AP falling off from due to vibrations. In normal scenarios, you do not need to install these screws.

2.6.3 Installing the Device on a T-rail

A T-rail needs to bear the weight of four times the total weight of the device and mounting bracket without damage. Figure 2-3 shows the T-rail dimensions requirements (t: thickness; w: width).

Figure 2-3 Section of a T-rail
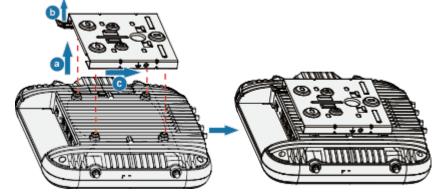
1. Remove two ceiling tiles around the T-rail, use screws to fix the adjustable buckle to the mounting bracket, hook the adjustable buckle to the T-rail, and secure the screw on the adjustable buckle to fasten the mounting bracket and T-rail.
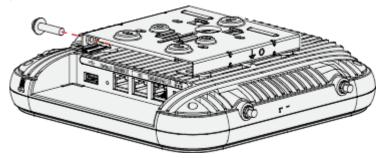
1. T-rail	2. M4x30 Screw	3. Adjustable buckle	4. Sheet metal mounting bracket

2. Connect the cables. For details, see 2.7 Cable Connection.

3. Align the rubber feet of the device over the mounting slots on the mounting bracket and vertically push the AP to secure it. When the spring clip is popped up, push the AP horizontally until it snaps into place (you can hear a click).

□ NOTE

- Before fixing the adjustable buckle with a screw, adjust the buckle to a proper position based on the T-rail width.

- Ensure that the AP is correctly installed on the mounting bracket and there is 200 mm space above and around the AP for maintenance.

- In a scenario with heavy vibrations, tighten the AP to the mounting bracket using M4x30 screws with a torque of 1.4N•m. This prevents the AP falling off from due to vibrations. In normal scenarios, you do not need to install these screws.

2.6.4 Installing an AP into a Ceiling
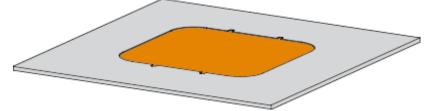
An AP can be installed in a removable or irremovable ceiling. For details, see Installing an AP in a Removable Ceiling and Installing an AP in an Irremovable Ceiling.

□ NOTE
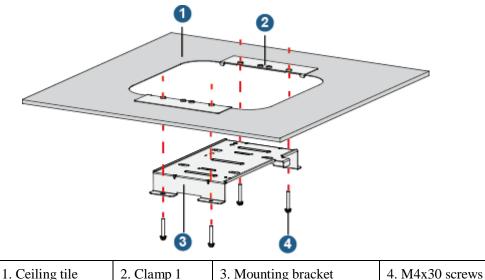
- This mode is not applicable to the AP with external antennas (including IoT card antennas and AP antennas).

- You need to purchase a plastic enclosure, mounting bracket, and other accessories separately. The part number is 21242880.

- A ceiling needs to bear the weight of four times the total weight of the device and mounting bracket without damage.

- The screws provided for ceiling-mounting of APs are 30 mm long and can be used to fix an AP on a ceiling no thicker than 15 mm. To install APs on thicker ceilings, you need to purchase longer screws.

Installing an AP in a Removable Ceiling
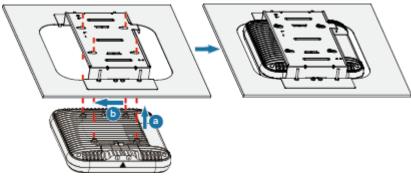
1. Remove a ceiling tile, draw the AP mounting position on the ceiling tile using an opening mold, and cut an opening.

2. Use M4x30 screws to tighten the mounting bracket, ceiling tile, and clamp 1 to the ceiling tile (with a tightening torque of 1.2 Nm).

| 1. Ceiling tile	2. Clamp 1	3. Mounting bracket	4. M4x30 screws

3. Install the ceiling tile. For details, see Connect the cables. For details, see 2.7 Cable Connection.

4. Align the rubber feet of the device over the mounting slots on the mounting bracket and vertically push the AP to secure it. When the spring clip is popped up, push the AP horizontally until it snaps into place (you can hear a click).

📖 **NOTE**
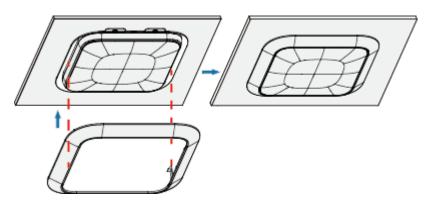
Ensure that the AP's network interfaces point to the same direction as the spring clip of the mounting bracket. Otherwise, installation cannot continue.
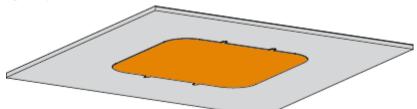
5. Install the plastic enclosure. Ensure that the clamping hook of the enclosure points to the same direction as the AP's network interfaces. Push the enclosure vertically until the enclosure surface is aligned with that of the AP (you can hear a click).
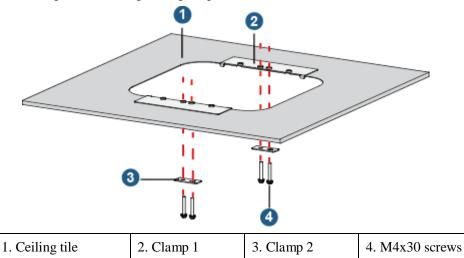
Installing an AP in an Irremovable Ceiling

1. Draw the AP mounting position on the ceiling tile using an opening mold and cut an opening.

2. Use clamp 1 to align with the dent of the opening on the ceiling tile and mark the two holes in the middle of clamp 1. Drill two holes with a diameter of 5 mm on both sides of the opening on the ceiling tile. Use four M4x30 screws to tighten clamps 1 and 2 to the ceiling tile (with a tightening torque of 1.2 Nm).

1. Ceiling tile	2. Clamp 1	3. Clamp 2	4. M4x30 screws
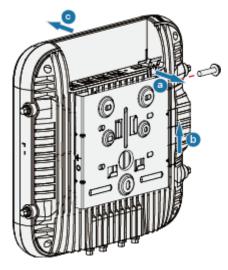
3. Install the mounting bracket, cables, AP, and enclosure. For details, see steps 2, 3, 4, and 5 in Installing an AP in a Removable Ceiling.

2.6.5 Removing an AP

Flip the spring clip on the mounting bracket and slip the AP towards the spring clip. Release the spring clip until the rubber feet of the AP enter the mounting keyholes. Remove the AP from the mounting bracket.

Figure 2-4 Removing an AP

☐ NOTE
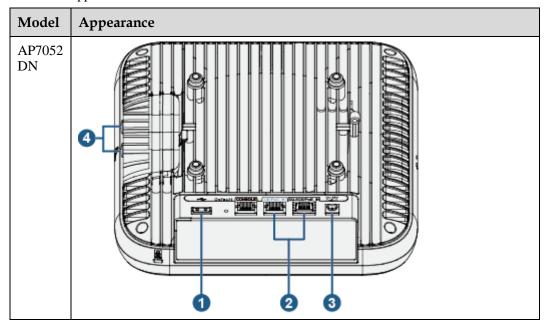
- If a captive screw is installed, remove the screw and then follow the preceding steps to uninstall the AP.
- An AP is secured to the mounting bracket using a self-locking mechanism. Therefore, before installing an enclosure for an AP, remove all screws. Remove the AP and mounting bracket together from the ceiling, and then remove the AP from the mounting bracket.

2.7 Cable Connection

Table 2-4 describes the cable connections.

Table 2-3 Appearance of the AP

Model	Appearance
AP7052 DN	

Table 2-4 Cable connections

No.	Cable or Device	Description
1	USB flash drive or USB cable	Connects to a USB flash drive or other storage devices to extend the storage space of the AP. The USB2.0 standard is supported.
2	Network cable	• The service network cable and PoE input cable cannot be connected to the console port. Otherwise, the AP may be damaged when using PoE power supply. • If the AP needs to connect to the Ethernet, ensure that the Ethernet cable is working properly. If the Ethernet cable is not working properly, for example, RJ45 connectors are short-circuited, the AP may fail to be powered on or fail to work. Before connecting an Ethernet cable to the AP, use the cable test tool to check whether the cable is qualified. If the cable is unqualified, replace it. • For the supported network cable types and length requirements, see Connecting Network Cables.
3	DC power adapter	When the AP uses the DC power supply, use a power adapter for power supply; otherwise, the AP may be damaged.
4	RF cable	Connects an antenna to an IoT card through a radio cable.
5	Antenna	Connects a 2.4 GHz or 5 GHz antenna to the AP to send and receive wireless signals.The port type is N-type female.The port is applicable only to an AP that supports external antennas.
6	Antenna	Connects a 5 GHz antenna to the AP to send and receive wireless signals.The port type is N-type female.The port is applicable only to an AP that supports external antennas.

 NOTE

● No priorities are distinguished for DC and PoE power supply modes, DC and GE/PoE_IN support HSB.

● Two PoE channels have no priority and can serve as HSB for each other when they have the same input power type.

When installing a cable, you must make a drip loop to prevent water from flowing into devices along the cable. For the method of making the drip loop, see 5.8 Guide to Making Drip Loops.

Pay attention to the following points when bundling the cables:

● Different types of cables must be separately routed with the minimum spacing of 30 mm and cannot be entangled or crossed. Cables should be parallel or separated using dedicated separators.

● Bundled cables are closely arranged, straight, tidy, and undamaged.

- Cable ties are bound neatly facing the same direction, and those at the same horizontal line must be in a straight line. Cable tie tails should be cut smoothly and evenly.
- Labels or nameplates must be attached to the cables after they are installed.

Connecting Network Cables

Table 2-5 Network cable types supported by Ethernet interfaces and maximum transmission distances

Interface Rate	Network Cable Type	Maximum Transmission Distance
GE	CAT5e or higher	100 m
2.5GE	CAT5e or higher unshielded twisted pair (UTP)	100 m
	CAT5e or higher shielded twisted pair (STP)	200 m When the transmission distance is greater than 100 m, this network cable can only be used to connect the following switches: • S6720-52X-PWH-SI-ACF • S6720-52X-PWH-SI • S6720-56C-PWH-SI-AC • S6720-56C-PWH-SI • S6320-32C-PWH-SI • S6720-32C-SI-AC • S6720-32C-SI-DC • S6720-32C-PWH-SI-AC • S6720-32C-PWH-SI
5GE	CAT5e UTP	• 100 m (Only the first 30 m of cables is bundled in 6-a-1 mode.) • 55 m (All cables are bundled.) • 100 m (Each cable is bundled separately.)
	CAT5e STP	100 m
	CAT6 or higher	100 m

📖 NOTE
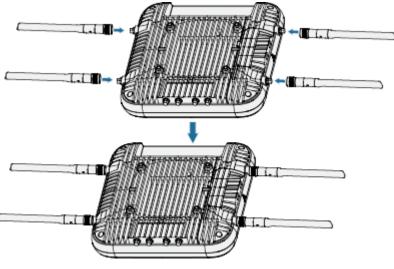
- 6-a-1 stands for the six-around-one cable bundle mode, with one cable in the center and six cables bundled evenly around it.

- Connecting UTP network cables to 5GE interfaces poses high risks and is not recommended. The causes are as follows:
- 802.3bz requires that the ALSNR value for alien crosstalk between network cables be greater than 0, but the standards for Cat5e and Cat6 unshielded twisted pairs do not specify the required ALSNR value. Therefore, such cables may not meet the crosstalk requirement in 802.3bz, causing severe problems such as continuous packet loss.
- According the cabling specification TIA TSB-5021, using Cat5e and Cat6 cables for 5G poses high risks.
- Currently, no clear onsite testing or evaluation method is available for checking whether ALSNR of cables conforms to 802.3bz.
- If Cat5e and Cat6 unshielded twisted pairs do not meet the 5G requirement, you are advised to replace them with shielded twisted pairs or reduce the rate of interfaces to 2.5G.

Connecting Antennas

Connect the antennas delivered in the installation accessory package of the AP to the 2.4G/5G RF ports on the AP, tighten the nuts (with a torque of 0.8 N•m), and adjust antenna angles as required.

NOTE
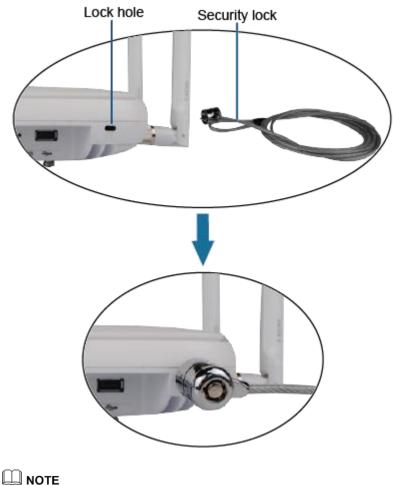
Do not connect the antennas delivered in the installation accessory package of the AP to 5G antenna interfaces. Otherwise, the AP and antennas may be damaged. The 5G antenna interfaces can be connected only to remote antennas through feeder cables.

2.8 Connecting the Security Lock

There is a security slot on the device. You can lock the device to an immovable object to prevent theft. The detailed procedures are as follows:

1. Fasten the cable of the security lock to an immovable object around.
2. Insert the security lock into the security slot and lock it.

☐ NOTE

You need to purchase the security lock separately.

2.9 Checking the Device After Installation

Table 2-6 shows the items to be checked after installation is complete. For more details, see **Installation Checklist** in the appendix.

Table 2-6 Installation checklist

No.	Check Item
1	The device is installed by strictly following the design draft. The installation position meets space requirements, with maintenance space reserved.
2	The device is securely installed.
3	The power cables are intact and not spliced.
4	Terminals of the power cables are welded or cramped firmly.
5	All power cables are not short-circuited or reversely connected and must be intact with no damage.

No.	Check Item
6	The power cables and ground cables are separated from other cables and bundled separately.
7	Connectors of signal cables are complete, intact, and tightly connected. The signal cables are not damaged or broken.
8	Labels on cables are clear and correct.

2.10 Powering on the AP

After the AP is powered on, observe the indicator on the AP to check the system running status. For details, see 1.2 Indicator Description.

📖 NOTE

Do not frequently power on and off the device.

3 Logging In to the Device

About This Chapter

3.1 Logging In to the Device Using STelnet/Telnet

You can log in to the device using STelnet V2 or Telnet to configure, manage, and maintain the device in the CLI.

☉ NOTE

- By default, only the STelnet V2 service is enabled on the device.
- Telnet has security vulnerabilities. You are not advised to enable the Telnet service.

Device connections are classified into wired and wireless connections.

- In versions earlier than V200R007C20, APs support wired connections.
- In V200R007C20 and later, Fat APs support both wired and wireless connections, and Fit APs and cloud APs support wired connections.

Before logging in to the device, complete the following tasks:

- Power on the device.
- Prepare network cables used to connect device interfaces for wired connections. No network cable is required for wireless connections.

The following table lists the default configuration of the device. You are advised to change the default user name and password on your first login.

Table 3-1 Default configuration of the device

Parameter	Default Setting
User name	admin
Password	admin@huawei.com

Parameter	Default Setting
IP address	• Wired connection: 169.254.1.1 • Wireless connection: 192.168.1.1
Subnet mask	• Wired connection: 255.255.0.0 • Wireless connection: 255.255.255.0
SSID	**HUAWEI-*XXXX***, applicable to wireless connections of Fat APs (*XXXX* specifies the last four bits of the AP's MAC address.)
Wireless password	None, applicable to wireless connections of Fat APs

📖 **NOTE**

For a Fit AP and cloud AP, you can perform the following operations:

● If the Fit AP is already online on the AC, you can remotely log in to the AC on a local terminal and run the **display ap all** command to check the IP address of the device.

● If the Fit AP in any version is offline or the Fit AP in V200R007C10 or later does not go online, you can access the device through the offline management VAP for operations. By default, the SSID of the offline management VAP is **hw_manage_*xxxx*** (*xxxx* specifies the last four bits of the AP's MAC address) and the password is **hw_manage**. After the IP address of the PC is set to 169.254.2.x/24 (169.254.2.1 excluded and 169.254.2.100 recommended), the connection is set up, you can log in to the AP using STelnet for operations.

● If the cloud AP is offline or does not go online, you can access the device through the offline management VAP for operations. By default, the SSID of the offline management VAP is **hw_manage_*xxxx*** (*xxxx* specifies the last four bits of the AP's MAC address) and the password is **hw_manage**. After the PC dynamically obtains an IP address and connects to the AP, you can log in to the AP using STelnet for operations.

The following example uses the default parameters and is used for reference only.

Wired Connection Mode

Step 1 Use a network cable to connect a PC to any network port of the AP or that of the switch on the same network segment as the AP.

Step 2 Assign the PC with an IP address on the same network segment as the default IP address of the device so that the PC and device are reachable to each other.

If the device uses the default settings, the IP address of the PC must be in the network segment 169.254.0.0/16 but cannot be 169.254.1.1. 169.254.1.100 is recommended.

Step 3 Start the CLI on the PC and access the IP address **169.254.1.1** of the device using STelnet V2.

Step 4 Enter the user name and password as prompted to log in to the user interface.

----End

Wireless Connection Mode

Step 1 By default, STAs search for the WLAN **HUAWEI-*XXXX*** within the wireless signal coverage of a Fat AP. STAs can access the WLAN without entering the password. If the SSID and

password have been configured, use the specified SSID and password to set up a wireless connection.

Step 2 Start the CLI on the STA and access the IP address **192.168.1.1** of the device using STelnet V2.

Step 3 Enter the user name and password as prompted to log in to the user interface.

----End

Method of Obtaining Upgrade and Configuration Documentation

To perform subsequent upgrades and configurations after login to the device, visit Huawei enterprise technical support website http://support.huawei.com/enterprise and search for product documentation by keyword. The search method is described as follows:

- Fit AP:
  - Upgrade: Search for **Fit AP upgrade guide**, and refer to the upgrade guide in the documentation of the correct version.
  - Configuration: Search for **AC6605 product documentation**, and refer to the configuration guide in the documentation of the correct version.
- Fat AP:
  - Upgrade: Search for **Fat AP upgrade guide**, and refer to the upgrade guide in the documentation of the correct version.
  - Configuration: Search for **Fat AP product documentation**, and refer to the configuration guide in the documentation of the correct version.
- cloud AP:
  - Upgrade: Search for **cloud AP upgrade guide**, and refer to the upgrade guide in the documentation of the correct version.
  - Online configuration: Search for **cloud AP product documentation**, and refer to the configuration guide in the documentation of the correct version.
  - Service configuration after APs go online: Search for **CloudCampus solution product documentation**, and refer to the deployment guide in the documentation of the correct version.

3.2 Logging In to the Device Through the Web System

The built-in web system allows you to use a browser to log in to the device. You can configure, manage, and maintain a Fat AP and cloud AP on the GUI. On the web page, you are prompted to configure and manage a Fit AP on the AC.

Device connections are classified into wired and wireless connections.

- In versions earlier than V200R007C20, APs support wired connections.
- In V200R007C20 and later, Fat APs support both wired and wireless connections, and Fit APs and cloud APs support wired connections.

Before logging in to the device, complete the following tasks:

- Power on the device.
- Prepare network cables used to connect device interfaces for wired connections. No network cable is required for wireless connections.

The following table lists the default configuration of the device. You are advised to change the default user name and password on your first login.

Table 3-2 Default configuration of the device

Parameter	Default Setting
User name	admin
Password	admin@huawei.com
IP address	• Wired connection: 169.254.1.1 • Wireless connection: 192.168.1.1
Subnet mask	• Wired connection: 255.255.0.0 • Wireless connection: 255.255.255.0
SSID	**HUAWEI-*XXXX***, applicable to wireless connections of Fat APs (*XXXX* specifies the last four bits of the AP's MAC address.)
Wireless password	None, applicable to wireless connections of Fat APs

📖 **NOTE**

For a Fit AP and cloud AP, you can perform the following operations:

- If the Fit AP in any version is offline or the Fit AP in V200R007C10 or later does not go online, you can access the device through the offline management VAP for operations. By default, the SSID of the offline management VAP is **hw_manage_*xxxx*** (*xxxx* specifies the last four bits of the AP's MAC address) and the password is **hw_manage**. After the IP address of the PC is set to 169.254.2.x/24 (169.254.2.1 excluded and 169.254.2.100 recommended), the connection is set up, , and you can log in to the AP using web system for operations.

- If the cloud AP is offline or does not go online, you can access the device through the offline management VAP for operations. By default, the SSID of the offline management VAP is **hw_manage_*xxxx*** (*xxxx* specifies the last four bits of the AP's MAC address) and the password is **hw_manage**. After the PC dynamically obtains an IP address and connects to the AP, you can log in to the AP using web system for operations.

The following example uses the default parameters and is used for reference only.

Wired Connection Mode

Step 1 Use a network cable to connect a PC to any network port of the AP or that of the switch on the same network segment as the AP.

Step 2 Assign the PC with an IP address on the same network segment as the default IP address of the device so that the PC and device are reachable to each other.

If the device uses the default settings, the IP address of the PC must be in the network segment 169.254.0.0/16 but cannot be 169.254.1.1. 169.254.1.100 is recommended.

Step 3 Open the browser on the PC, enter **http://*IP address*** in the address box, and press **Enter** to log in. Select a language for the web system, enter the default user name and password, and click **Login** to enter the web system home page.

----End

Wireless Connection Mode

Step 1 By default, STAs search for the WLAN **HUAWEI-*XXXX*** within the wireless signal coverage of a Fat AP. STAs can access the WLAN without entering the password. If the SSID and password have been configured, use the specified SSID and password to set up a wireless connection.

Step 2 Open the browser on the STA, enter **http://*IP address*** in the address box, and press **Enter** to log in. Select a language for the web system, enter the default user name and password, and click **Login**. The web system home page is displayed.

----End

Method of Obtaining Upgrade and Configuration Documentation

To perform subsequent upgrades and configurations after login to the device, visit Huawei enterprise technical support website http://support.huawei.com/enterprise and search for product documentation by keyword. The search method is described as follows:

- Fit AP:
  - Upgrade: Search for **Fit AP upgrade guide**, and refer to the upgrade guide in the documentation of the correct version.
  - Configuration: Search for **AC6605 product documentation**, and refer to the configuration guide in the documentation of the correct version.
- Fat AP:
  - Upgrade: Search for **Fat AP upgrade guide**, and refer to the upgrade guide in the documentation of the correct version.
  - Configuration: Search for **Fat AP product documentation**, and refer to the configuration guide in the documentation of the correct version.
- cloud AP:
  - Upgrade: Search for **cloud AP upgrade guide**, and refer to the upgrade guide in the documentation of the correct version.
  - Online configuration: Search for **cloud AP product documentation**, and refer to the configuration guide in the documentation of the correct version.
  - Service configuration after APs go online: Search for **CloudCampus solution product documentation**, and refer to the deployment guide in the documentation of the correct version.

3.3 Logging In to the Device Through the Console Port

Before logging in to the device, complete the following tasks:

- Power on the device.
- Prepare a console cable.
- Prepare terminal simulation software.

□ NOTE

If your PC's operating system provides terminal simulation software (like HyperTerminal in Windows 2000/XP), you do not need to install additional terminal simulation software. If the PC runs on an operating system without terminal simulation software (like Windows 7), install third-party terminal simulation software on the PC by referring to the user manual or online help.

Step 1 Use a console cable to connect the PC to the console port of the device.

Step 2 Start terminal emulation software on the PC, create a connection, and set communication parameters as follows:

- Baud rate (B): 9600
- Data bits (D): 8
- Parity (P): None
- Stop bits (S): 1
- Flow control (F): None

Step 3 Press **Enter** and enter the authentication information as prompted to log in to the user view. (The following information is only for reference.)

For a Fit AP, enter the default user name **admin** and password **admin@huawei.com**.

You are advised to change the default user name and password on your first login.

```
Login authentication


Username: admin
Password:
Info: You are advised to change the password to ensure security.
```

For a Fat AP and Cloud AP, set a passowrd of console, and use the password to log in.

```
Please configure the login password:
Info: A plain text password is a string of 8 to 16 case-sensitive characters and must
be a combination of at least two of the follow
ing: uppercase letters A to Z, lowercase letters a to z, digits, and special characters.
A cipher text password contains 56 or 68 ch
aracters.
Enter password:
Confirm password:
```

----End

Method of Obtaining Upgrade and Configuration Documentation

To perform subsequent upgrades and configurations after login to the device, visit Huawei enterprise technical support website http://support.huawei.com/enterprise and search for product documentation by keyword. The search method is described as follows:

- Fit AP:
  - Upgrade: Search for **Fit AP upgrade guide**, and refer to the upgrade guide in the documentation of the correct version.
  - Configuration: Search for **AC6605 product documentation**, and refer to the configuration guide in the documentation of the correct version.
- Fat AP:
  - Upgrade: Search for **Fat AP upgrade guide**, and refer to the upgrade guide in the documentation of the correct version.
  - Configuration: Search for **Fat AP product documentation**, and refer to the configuration guide in the documentation of the correct version.
- cloud AP:

– Upgrade: Search for **cloud AP upgrade guide**, and refer to the upgrade guide in the documentation of the correct version.

– Online configuration: Search for **cloud AP product documentation**, and refer to the configuration guide in the documentation of the correct version.

– Service configuration after APs go online: Search for **CloudCampus solution product documentation**, and refer to the deployment guide in the documentation of the correct version.

4 Hardware Failures

About This Chapter

This section describes common methods for troubleshooting typical hardware faults.

4.1 A Device Fails to Be Powered On

Fault Description

The indicator of a device is off.

Possible Causes

Power Supply Mode	Possible Cause

Power supply using a power module	• The device is powered off.
	• The power cable is not securely connected to the device.
	• The power supply unit has failed.
	  – If the device connects to an external power source, its power adapter may fail.
	  – If the device has a built-in power supply, the device itself may be faulty.

PoE power supply	• The power sourcing equipment does not support the PoE function or is faulty. • The power sourcing equipment does not support the required power supply mode. • The power sourcing equipment does not provide sufficient power. • The power sourcing equipment is incorrectly configured (the PoE function

Power Supply Mode	Possible Cause
	is disabled or the power-off time range is improperly set).
	• The line is faulty (the network cable or distribution frame is damaged).
	• The device is faulty.

Troubleshooting Procedure

Power Supply Mode	Troubleshooting Procedure
Power supply using a power module	1. Check whether the device is powered off. 2. Check that the power cable is securely connected to the device. 3. Check whether the power supply is normal. Replace the power adapter with a normal one. If the device is powered on, the original power adapter is faulty. Contact technical support personnel or Huawei agent and ask them to replace the power adapter. 4. If the device still cannot be powered on, the device itself is faulty. Contact technical support personnel or Huawei agent and ask them to replace the device.
PoE power supply	1. Check whether the power sourcing equipment supports PoE or is faulty. 2. Check whether the power output mode of the power sourcing equipment is supported by the powered device. 3. Check whether the power sourcing equipment can support the maximum power consumption of the device. 4. Check whether the configuration on the power sourcing equipment causes PoE power supply errors, such as the PoE function is disabled or the power-off time range is incorrectly set. 5. Check whether the network cable or distribution frame is faulty. 6. If the device still cannot be powered on, the device itself is faulty. Contact technical support personnel or Huawei agent and ask them to replace the device.

☐ **NOTE**

The output power of an 802.3af PSE port is 15.4 W, that of an 802.3at PSE port is 30 W, and that of an 802.3bt PSE port is 60 W.

5 Appendix

About This Chapter

5.1 On-site Cable Assembly and Installation

5.1.1 Cable Assembly Precautions

Checking the Appearance of Cables

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

Checking the Appearance of Connectors

- Do not use connectors with visible defects, damage, rust or scuffing.

- Do not use connectors if their shells or pins have exposed part or uneven plating, or their pins are lost, broken, or bent.

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

Precautions for Assembly

- Use dedicated tools or tools delivered by Huawei and follow the methods given here during assembly.

- Hold terminals of cables instead of pulling the cables themselves when installing or removing cable components.

- Take the following precautions when cutting or stripping cables:

  - Make cables slightly longer than necessary.

  - Coil cables longer than 2 m (6.56 ft) after cutting. Bind and fasten the coils using bundling ropes. The inner diameters of the coils should be larger than 20 times the outer diameters of the cables.

  - When stripping the jackets of cables, avoid damaging the shield layers (braid or aluminum foil), insulation, core conductors, and other jackets that do not need to be stripped.

  - After assembling cables, cut all visible cross sections of jackets to ensure that the cross sections are arranged neatly.

  - Do not touch the core conductors of cables with your hands. Terminate exposed conductors in a timely way after stripping off insulation so that the surface of the conductors does not become oxidized.

- Take the following precautions when crimping and connecting cables or connectors:

  - The terminals and conductors should be connected tightly after they are crimped. They should not be moved or turned.

  - Cut all the exposed copper wires.

  - Try to avoid a second crimping of sleeves.

  - Keep all the conductors clean and aligned.

📖 **NOTE**

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

5.1.2 Assembling Power Cables

5.1.2.1 Assembling a DC 2-Pin Round Connector (A)

Context

Figure 5-1 shows the components of DC 2-PIN round connector A.

Figure 5-1 Components of DC 2-pin round connector A

1. Enclosure   2. Shield circle   3. Clip   4. Socket   5. Nut

Procedure

Step 1 Bind a cable tie, separate the socket and nut, and install them on the cable, as shown in Figure 5-2.
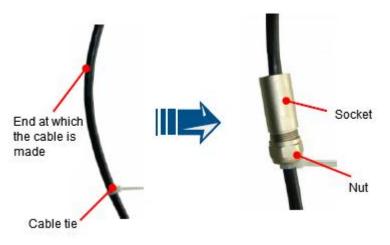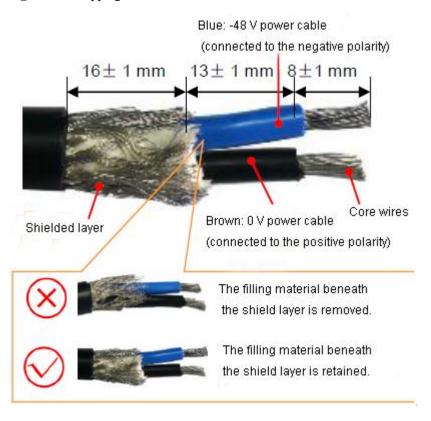
Figure 5-2 Installing the nut on the cable

Step 2 Strip the cable as shown in Figure 5-3.

Figure 5-3 Stripping the cable

Blue: -48 V power cable
(connected to the negative polarity)

16 ± 1 mm   13 ± 1 mm   8 ± 1 mm

Shielded layer

Brown: 0 V power cable
(connected to the positive polarity)

Core wires

The filling material beneath the shield layer is removed.

The filling material beneath the shield layer is retained.
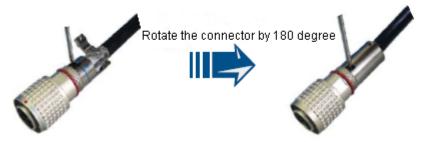
Step 3   Open the clip and correctly insert the core wires to the negative and positive holes, as shown in Figure 5-4.

Figure 5-4 Inserting core wires

Step 4   Use a Phillips screwdriver to tighten the crimping screw in "+" hole, rotate the connector by 180 degree, and tighten the crimping screw in "-" hole, as shown in Figure 5-5.

Figure 5-5 Tightening the crimping screws

Step 5 Close the clip and tighten the screw to compact the shield layer, as shown in Figure 5-6.

Figure 5-6 Compacting the shield layer

Step 6 Pre-tighten the socket and enclosure and use the Phillips screwdriver to tighten the socket with the tightening torque no less than 1.2 N•m, as shown in Figure 5-7.

Figure 5-7 Tightening the socket

Step 7 Pre-tighten the socket and nut and use the Phillips screwdriver to tighten the nut with the tightening torque no less than 1.2 N•m, as shown in Figure 5-8.

Figure 5-8 Tightening the nut

Step 8 Use a multimeter to check the connectivity of the 2-pin round connector's cable components, as shown in Figure 5-9.

Figure 5-9 Checking connectivity
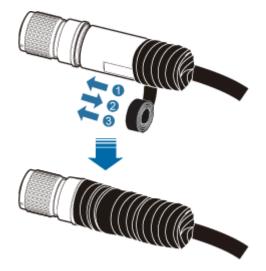
The connectivity meets standards if the following conditions are met:

- Positive and negative holes of the connector are not short-circuited.
- The metal enclosure and connector's holes are not short-circuited.
- The cable shield layer is properly connected to the metal enclosure.
- Core wires are properly connected to the connector's holes.

Step 9 If devices are installed outdoor, wrap three layers of PVC insulation tape around the connector for protection, as shown in Figure 5-10.

⚠️ **NOTICE**

Ensure that proper quantity of the PVC insulation tape is used for wrapping the connector, facilitating the connector uninstallation in later maintenance.

Figure 5-10 Wrapping PVC insulation tape

----End

5.1.2.2 Assembling a DC 2-Pin Round Connector (B)

This topic describes how to assemble a DC 2-pin round connector (B) and key operations.

Context

Table 5-1 lists power cables connected to the active antenna unit (AAU).

Table 5-1 AAU power cable
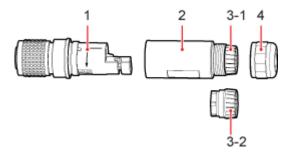
AAU Side	Cable	Commonly-Used Colors	Colors Used in Britain
DC round waterproof connector	RTN (+)	Black or brown	Blue
	NEG (-)	Blue	Gray

NOTE

The color and appearance of cables in this topic are for reference only. The cable color and appearance vary depending on countries and regions.

Figure 5-11 shows components of the DC round waterproof connector.

Figure 5-11 Components of the DC round waterproof connector

1. Enclosure   2. Socket   3-1. Clamping jaw 1   3-2. Clamping jaw 2   4. Nut
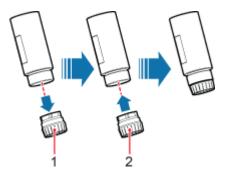
Procedure

Step 1 Determine the diameter of the cable to be installed. If the diameter is larger than 14 mm, replace the clamping jaw, as shown in Figure 5-12. During the replacement, connect the clamping jaw boss to the groove inside the socket and ensure that the clamping jaw is completely installed in the socket, as shown in Figure 5-13.

📖 **NOTE**
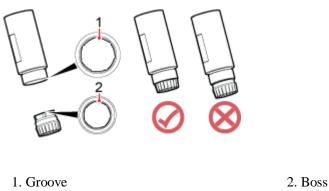
- Power cables supported by clamping jaw 1: 2 x 12 AWG, 2 x 4 mm^2, and 2 x 6 mm^2
- Power cables supported by clamping jaw 2: 2 x 8 AWG and 2 x 10 mm^2

Figure 5-12 Replacing clamping jaws
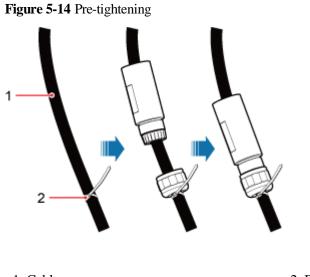
1. Clamping jaw 1   2. Clamping jaw 2

Figure 5-13 Correct operation for replacing a clamping jaw

| 1. Groove | 2. Boss |

Step 2 Reserve the cable length at the assembly end, bind the plastic cable tie, install the nut, clamping jaw, and socket on the cable and pre-tighten them, as shown in Figure 5-14.

Figure 5-14 Pre-tightening
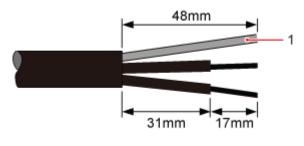
| 1. Cable | 2. Plastic cable tie |

Step 3 Use the stripping ruler card to measure required lengths, strip the outer jacket (48 mm) on the head of the cable to be connected and the outer jacket (17 mm) of each core wire, twist the shield layers into one strand, as shown in Figure 5-15.

⚠ **NOTICE**
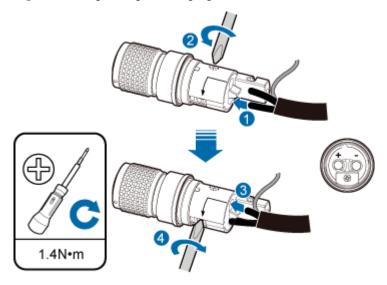
- The stripping ruler card is delivered with the components of the connector.
- Cut the padding using diagonal pliers.
- Gently strip the insulation sheath to avoid damage to the conductor metal.
- Ensure that the edge of core wires is not split.

Figure 5-15 Stripping the cable

1. Shield layer

Step 4 Connect the cable NEG (-) (gray in Britain and blue in other countries) to **-** end of the connector and cable RTN (+) (blue in Britain and black/brown in other countries) to + end of the connector. Tighten two crimping screws using the Phillips screwdriver and compact the cable with tightening torque 1.4 N•m, as shown in Figure 5-16.

Figure 5-16 Tightening the crimping screws

Step 5 After the cables are assembled, pull the cables slightly to check whether the connections are secure. If the cable slides outward or the wire of the cable is exposed outside the hole for the

cable, remove the cable, cut the split wires, and then strip the jacket and install the cable again.

Step 6 Twist the shield layers into one strand and insert it into the shield slot, tighten the tail screw, and fasten the shielded layer with tightening torque 1.4 N•m, as shown in Figure 5-17.
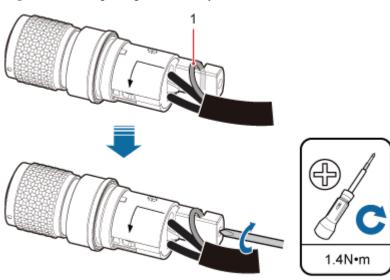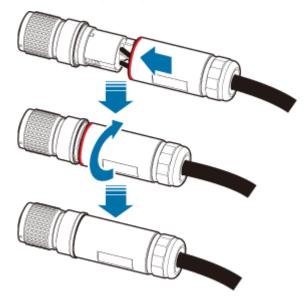
Figure 5-17 Compacting the shield layer

1. Shield layer

📖 **NOTE**

Cut the extra shield layer using the diagonal pliers.
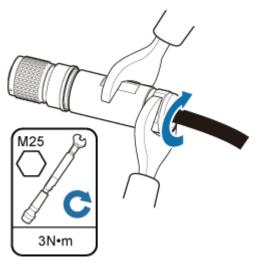
Step 7 Tighten the socket and enclosure until the red line on the socket is invisible, as shown in Figure 5-18.
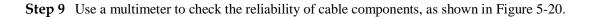
Figure 5-18 Tightening the socket and enclosure
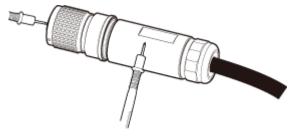
Step 8 Pre-tighten the nut and socket and further tighten the nut using a torque wrench (opening width: 28 mm), as shown in Figure 5-19.

Figure 5-19 Tightening the nut

Step 9 Use a multimeter to check the reliability of cable components, as shown in Figure 5-20.

Figure 5-20 Checking reliability

> ⚠️ **NOTICE**
> ● Ensure that the short circuit does not occur between the positive and negative holes of the connector.
> ● Ensure that the short circuit does not occur between the metal enclosure and connector's positive and negative holes.

Step 10 If devices are installed outdoor, wrap three layers of PVC insulation tape around the connector for protection, as shown in Figure 5-21.
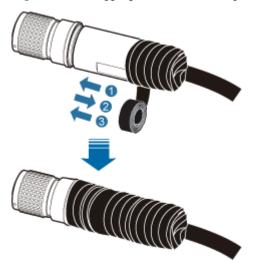
Figure 5-21 Wrapping PVC insulation tape

> ⚠️ **NOTICE**
> Ensure that proper quantity of the PVC insulation tape is used for wrapping the connector, facilitating the connector uninstallation in later maintenance.
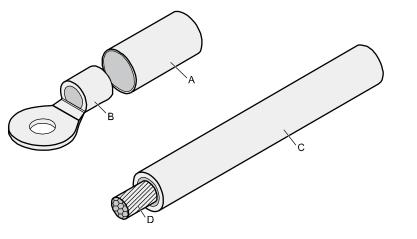
----End

5.1.2.3 Assembling the OT Terminal and Power Cable

Context

Figure 5-22 shows the components of an OT terminal and a power cable.

Figure 5-22 Components of an OT terminal and a power cable
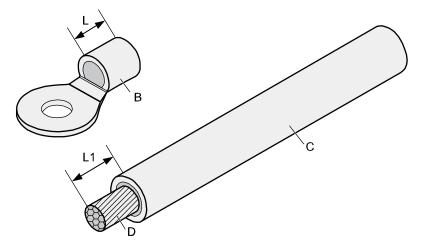
A. Heat-shrinkable tubing   B. Bare crimping terminal   C. Insulation   D. Conductor

Procedure

Step 1 Based on the cross-sectional area of the cable conductor, strip a length of insulation coating C to expose the conductor D of length L1, as shown in Figure 5-23. The recommended values of L1 are listed in Table 5-2.

Figure 5-23 Stripping a power cable (OT terminal)

⚠ **NOTICE**

- When you strip a power cable, do not damage the conductor of the cable.
- If the bare crimping terminal is not provided by Huawei, the value of L1 is 1 mm (0.04 in.) to 2 mm (0.08 in.) greater than the value of L.

Table 5-2 Mapping between the cross-sectional area of the conductor and the value of L1
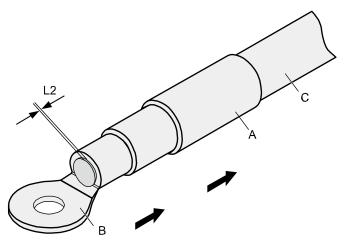
Cross-Sectional Area of Conductor (mm²(in.²))	Value of L1 (mm(in.))	Cross-Sectional Area of Conductor (mm²(in.²))	Value of L1 (mm(in.))
1 (0.002)	7 (0.28)	10 (0.015)	11 (0.43)
1.5 (0.002)	7 (0.28)	16 (0.025)	13 (0.51)
2.5 (0.004)	7 (0.28)	25 (0.039)	14 (0.55)
4 (0.006)	8 (0.31)	35 (0.054)	16 (0.63)
6 (0.009)	9 (0.35)	50 (0.077)	16 (0.63)

📖 **NOTE**

If you are proficient in assembling OT terminals and power cables, you can obtain the value of L1 by comparing the part to be crimped with the power cable.

Step 2 Put the heat-shrinkable (A) tubing onto the bare crimping terminal, as shown in Figure 5-24.

Figure 5-24 Putting the heat shrink tubing onto the bare crimping terminal

Step 3 Put the OT terminal B onto the exposed conductor, and ensure that the OT terminal is in good contact with the insulation coating C, as shown in Figure 5-24.

⚠ **NOTICE**
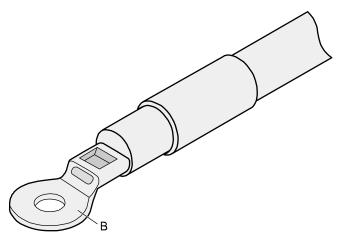
After the conductor is fed into the OT terminal, the protruding part of the conductor, or L2 in Figure 5-24, must not be longer than 2 mm (0.08 in.).

Step 4 Crimp the joint parts of the bare crimping terminal and the conductor, as shown in Figure 5-25.

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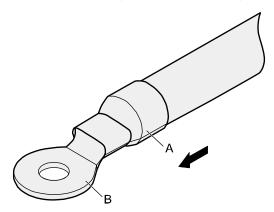
The shapes of crimped parts may vary with the crimping dies.

Figure 5-25 Crimping the joint parts of the bare crimping terminal and the conductor (OT terminal)

Step 5 Push the heat shrink tubing (A) toward the connector until the tube covers the crimped part, and then use a heat gun to heat the tube, as shown in Figure 5-26.

Figure 5-26 Heating the heat shrink tubing (OT terminal)

⚠ **NOTICE**

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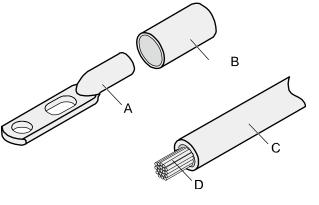
----End

5.1.2.4 Assembling the JG Terminal and Power Cable

Context

Figure 5-27 shows the components of a JG terminal and a power cable.

Figure 5-27 Components of a JG terminal and a power cable

A. JG terminal	B. Heat-shrinkable tubing	C. Insulation layer of a power cable	D. Conductor of a power cable

Procedure

Step 1 Strip a part of the insulation to expose the cable conductor with a length of L, as shown in Figure 5-28. The recommended values of L are listed in Table 5-3.

⚠ **NOTICE**

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

Figure 5-28 Stripping a power cable (JG terminal)
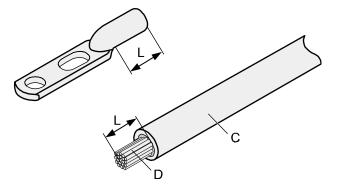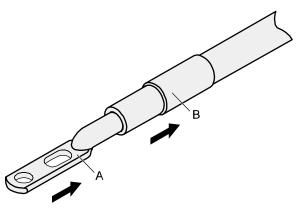
Table 5-3 Mapping between the cross-sectional area of the conductor and the value of L

Cross-Sectional Area of Conductor (mm²(in.²))	Value of L (mm(in.))
16 (0.025)	13 (0.51)
25 (0.039)	14 (0.55)
35 (0.054)	16 (0.63)
50 (0.077)	16 (0.63)
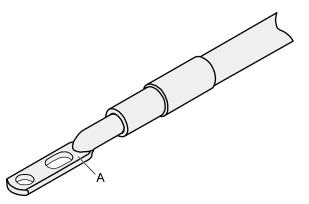
Step 2 Put the heat shrink tubing onto the bare crimping terminal, as shown in Figure 5-29.

Figure 5-29 Putting the heat shrink tubing onto the bare crimping terminal
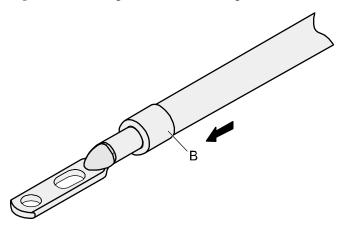
Step 3   Put the bare crimping terminal onto the exposed conductor, and ensure that the bare crimping terminal is in good contact with the insulation of the power cable, as shown in Figure 5-29.

Step 4   Crimp the joint parts of the bare crimping terminal and the conductor, as shown in Figure 5-30.

Figure 5-30 Crimping the joint parts of the bare crimping terminal and the conductor (JG terminal)

Step 5   Push the heat shrink tubing toward the connector until the tube covers the crimped part, and then use a heat gun to heat the tube, as shown in Figure 5-31.

Figure 5-31 Heating the heat shrink tubing (JG terminal)
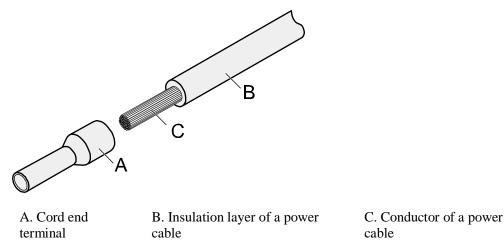
----End

5.1.2.5 Assembling the Cord End Terminal and the Power Cable

Context

Figure 5-32 shows the components of a cord end terminal and a power cable.

**Figure 5-32** Components of a cord end terminal and a power cable

| A. Cord end terminal | B. Insulation layer of a power cable | C. Conductor of a power cable |

Procedure

Step 1 Strip a part of the insulation to expose the cable conductor with a length of L1, as shown in Figure 5-33. The recommended values of L1 are listed in Table 5-4.

⚠ NOTICE

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

Figure 5-33 Stripping a power cable (cord end terminal)
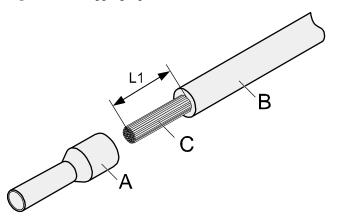
Table 5-4 Mapping between the cross-sectional area of the conductor and the value of L1
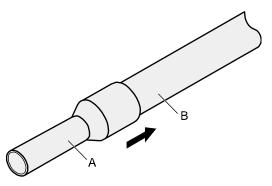
Cross-Section al Area of Conductor (mm²(in.²))	Value of L1 (mm(in.))	Cross-Sectional Area of Conductor (mm²(in.²))	Value of L1 (mm(in.))

Cross-Section al Area of Conductor (mm²(in.²))	Value of L1 (mm(in.))	Cross-Sectional Area of Conductor (mm²(in.²))	Value of L1 (mm(in.))
1 (0.002)	8 (0.31)	10 (0.015)	15 (0.59)
1.5 (0.002)	10 (0.39)	16 (0.025)	15 (0.59)
2.5 (0.004)	10 (0.39)	25 (0.039)	18 (0.71)
4 (0.006)	12 (0.47)	35 (0.054)	19 (0.75)
6 (0.009)	14 (0.55)	50 (0.077)	26 (1.02)

Step 2 Put the cord end terminal onto the conductor, and ensure that the conductor is aligned with the edge of the cord end terminal, as shown in Figure 5-34.

⚠ NOTICE

After the conductor is fed into the cord end terminal, the protruding part of the conductor must not be longer than 1 mm (0.04 in.).
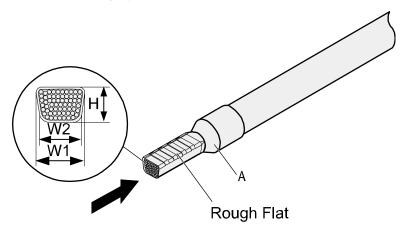
Figure 5-34 Putting the cord end terminal onto the conductor

Step 3 Crimp the joint parts of the cord end terminal and the conductor, as shown in Figure 5-35.

Figure 5-35 Crimping the cord end terminal and the conductor

Step 4 Check the maximum width of the tubular crimped terminal. The maximum width of a tubular crimped terminal is listed in Table 5-5.

Table 5-5 Maximum width of a tubular crimped terminal

Cross-Sectional Area of Tubular Terminal (mm²(in.²))	Maximum Width of Crimped Terminal W1 (mm(in.))
0.25 (0.0004)	1 (0.04)
0.5 (0.0008)	1 (0.04)
1.0 (0.0015)	1.5 (0.06)
1.5 (0.0023)	1.5 (0.06)
2.5 (0.0039)	2.4 (0.09)
4 (0.006)	3.1 (0.12)
6 (0.009)	4 (0.16)
10 (0.015)	5.3 (0.21)
16 (0.025)	6 (0.24)
25 (0.039)	8.7 (0.34)
35 (0.054)	10 (0.39)

----End
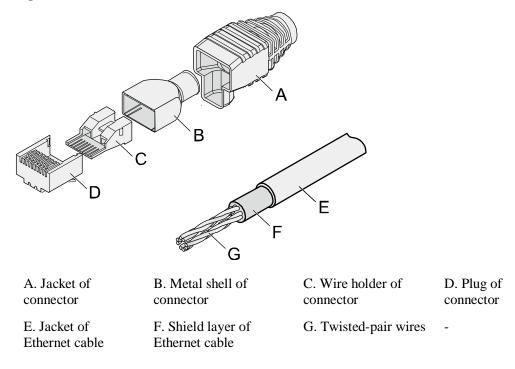
5.1.3 Assembling Ethernet Cables

5.1.3.1 Assembling the Shielded RJ45 Connector and Ethernet Cable

Context

Figure 5-36 shows the components of an RJ45 connector and a shielded Ethernet cable.
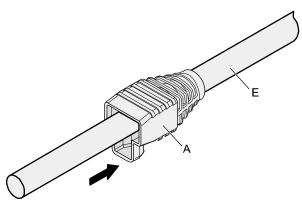
Figure 5-36 Shielded RJ45 connector and cable

A. Jacket of connector	B. Metal shell of connector	C. Wire holder of connector	D. Plug of connector
E. Jacket of Ethernet cable	F. Shield layer of Ethernet cable	G. Twisted-pair wires	-
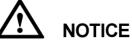
Procedure

Step 1 Fit the jacket of the connector onto the Ethernet cable, as shown in Figure 5-37.

Figure 5-37 Fitting the jacket of the connector onto the Ethernet cable
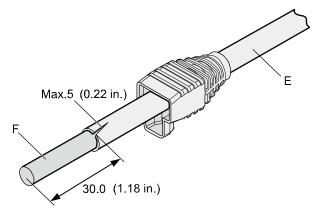
Step 2 Remove a 30 mm (1.18 in.) long section of the jacket, cut off the nylon twine inside the jacket, and cut a no more than 5 mm (0.20 in.) cleft in the jacket, as shown in Figure 5-38.

⚠ **NOTICE**
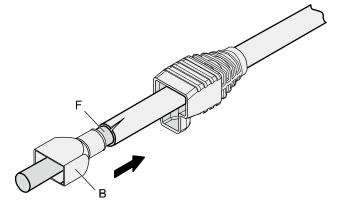
- When you remove a section of the jacket, do not damage the shield layer of the twisted-pair cable.
- When you remove the shield layer, do not damage the insulation of the twisted-pair cable.

Figure 5-38 Removing the jacket of a twisted-pair cable (unit: mm (in.))
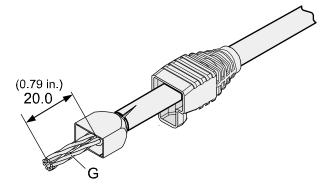
Step 3 Fit the metal shell onto the twisted-pair cable. The shield layer is covered by the metal shell, as shown in Figure 5-39.

Figure 5-39 Fitting the metal shell onto the twisted-pair cable

Step 4 Fit the metal shell onto the twisted-pair cable until the shield layer is covered completely. Along the edge of the metal shell, cut off the aluminum foil shield layer and ensure that there is no surplus copper wire. The exposed twisted-pair cable is about 20 mm (0.79 in.) long, as shown in Figure 5-40.

Figure 5-40 Removing the shield layer of a twisted-pair cable (unit: mm (in.))

Step 5 Lead the four pairs of twisted-pair wires through the wire holder, as shown in Figure 5-41 and Figure 5-42. Ensure that the colored wires are in the correct location in the cable.

Figure 5-41 Leading wires through the wire holder
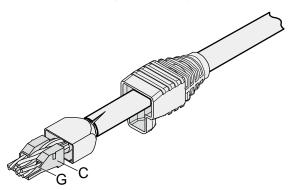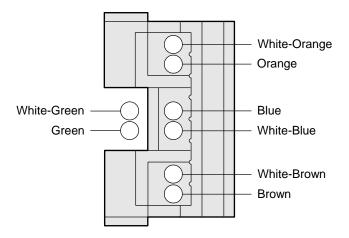
Figure 5-42 Cable locations in a wire holder

Step 6 Align the four pairs of cables in the holder, as shown in Figure 5-43. The connections between the wires and the pins are shown in Figure 5-44 and listed in Table 5-6.

Figure 5-43 Four pairs of cables on a wire holder
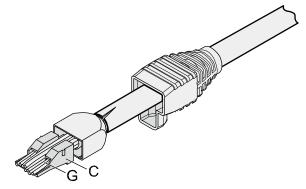
Figure 5-44 Connections between wires and pins
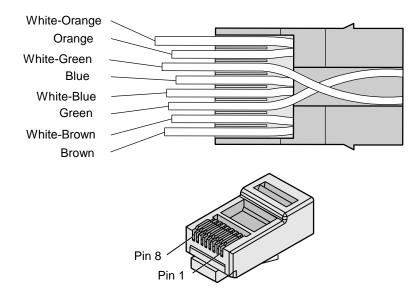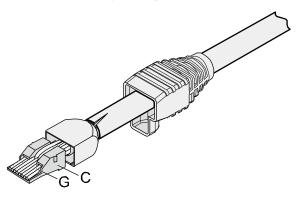
Table 5-6 Connections between wires and pins (using a straight-through cable as an example)

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

Step 7 Cut off the surplus cables along the lower edge of the wire holder, as shown in Figure 5-45.

Figure 5-45 Cutting off surplus cables
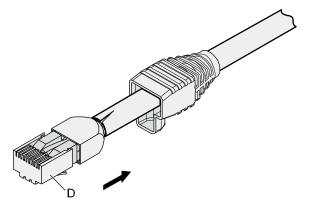
Step 8 Put the connector body onto the wire holder and turn the metal shell by 90 °, as shown in Figure 5-46.

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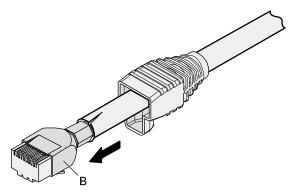
Ensure that the wire holder is in good contact with the connector body.

Figure 5-46 Putting the connector body onto the wire holder
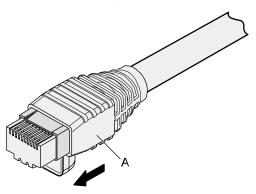
Step 9 Push the metal shell toward the connector body until the wire holder and the connector body are engaged completely. Crimp the connector, as shown in Figure 5-47.

Figure 5-47 Crimping the connector

Step 10 Push the jacket towards the metal shell until the metal shell is covered. This completes the assembly of one end of the cable, as shown in Figure 5-48.

Figure 5-48 Pushing the metal shell

Step 11 To complete the assembly of the other end, repeat steps 1 to 10.
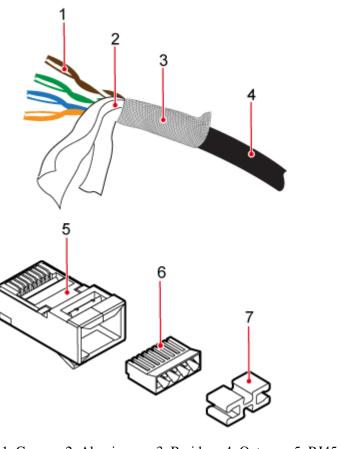
----End

5.1.3.2 Assembling an Optimized Shielded RJ45 Connector and SFTP Network Cables

Context

This topic describes how to assemble an optimized shielded RJ45 connector with a Secure File Transfer Protocol (SFTP) straight-through network cable as an example. The connector has a cable support rack but does not have a metal jacket. Such a connector can be used for crimping CAT. 6 network cables.

Figure 5-49 shows the shielded RJ45 connector.
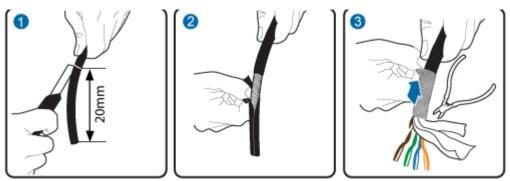
Figure 5-49 Shielded RJ45 connector

1: Core wires	2: Aluminum foil	3: Braid shield	4: Outer jacket	5: RJ45 connector	6: Load bar	7: Cable support rack

Procedure

Step 1 Strip 20 mm outer jacket off the network cable, peel off the braid shield backward, and cut off the aluminum foil and protection band, as shown in Figure 5-50.

⚠ **NOTICE**

Ensure that the shielded layer is intact when stripping outer jackets off the network cable.
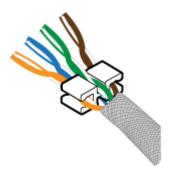
Keep the cable insulation intact when stripping the shielded layer.

Figure 5-50 Stripping the cable
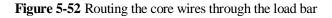
Step 2 Arrange core wires in the order of colors shown in Figure 5-51 and fix the cable support rack to the bottom of the core wires.

Figure 5-51 Core wire order

Step 3 Hold the arranged core wires and route them through the load bar, as shown in Figure 5-52. Table 5-7 shows the mapping between the core wires and pins of the connector.

Figure 5-52 Routing the core wires through the load bar
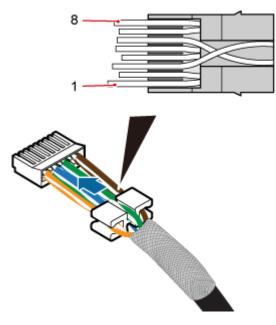
Table 5-7 Mapping between core wires and pins

Pin ID	Core Wire Color
1	White-orange
2	Orange
3	White-green
4	Blue
5	White-blue
6	Green
7	White-brown
8	Brown
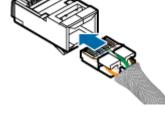
Step 4 After routing core wires through the load bar, move the load bar to the bottom to connect to the cable support rack, and neatly cut the edge cables, as shown in Figure 5-53.

Figure 5-53 Neatly cutting edge cables

Step 5 Insert the load bar into the RJ45 connector, as shown in Figure 5-54.

Figure 5-54 Inserting the load bar into the RJ45 connector

⚠ **NOTICE**

Cables must be inserted into the bottom of the connector, which can be checked on the side or front end face of the connector.

Step 6 Use the crimping tool to crimp the connector, as shown in Figure 5-55. Use cutting pliers to neatly cut braid shields exposed out of the connector along the load bar, as shown in Figure 5-56.

Figure 5-55 Crimping the connector
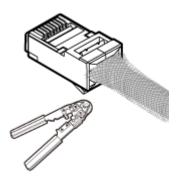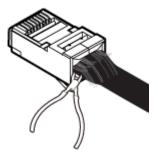
Figure 5-56 Neatly cutting braid shields

Step 7 Repeat Step 1 through Step 6 to assemble the optimized shielded RJ45 connector on the other end of the network cable.

----End
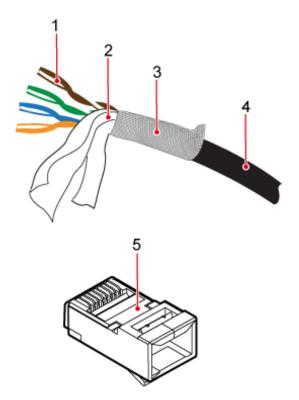
5.1.3.3 Assembling an Integrated Shielded RJ45 Connector and SFTP Network Cables

Context

This topic describes how to assemble an integrated shielded RJ45 connector with a Secure File Transfer Protocol (SFTP) straight-through network cable as an example. The connector does not have a cable support rack or metal jacket.

Figure 5-57 shows the integrated shielded RJ45 connector.

Figure 5-57 Shielded RJ45 connector
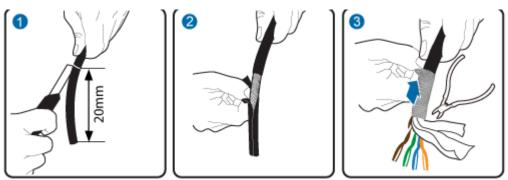
1: Core wires   2: Aluminum foil   3: Braid shield   4: Outer jacket   5: RJ45 connector

Procedure

Step 1 Strip 20 mm outer jacket off the network cable, peel off the braid shield backward, and cut off the aluminum foil and protection band, as shown in Figure 5-58.

⚠ NOTICE

Ensure that the shielded layer is intact when stripping outer jackets off the network cable.

Keep the cable insulation intact when stripping the shielded layer.

Figure 5-58 Stripping the cable

Step 2 Arrange the twisted pair wires in the order of colors shown in Table 5-8 and cut the wire ends neatly with 12 mm core wires left, as shown in Figure 5-59.

Figure 5-59 Core wire order
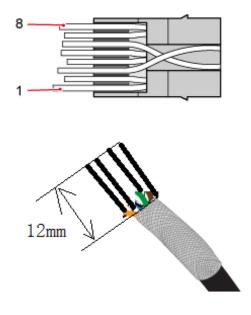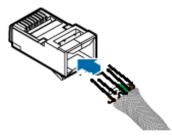
Table 5-8 Mapping between core wires and pins

Pin ID	Core Wire Color
1	White-orange
2	Orange
3	White-green
4	Blue
5	White-blue

Pin ID	Core Wire Color
6	Green
7	White-brown
8	Brown

Step 3 Route the arranged core wires through the RJ45 connector, as shown in Figure 5-60.

Figure 5-60 Routing core wires through the connector

Step 4 Use the crimping tool to crimp the connector, as shown in Figure 5-61.

Figure 5-61 Crimping the connector

Step 5 Neatly cut braid shields exposed out of the connector along the load bar, as shown in Figure 5-62.

Figure 5-62 Neatly cutting braid shields

Step 6   Repeat Step 1 through Step 5 to assemble the integrated shielded RJ45 connector on the other end of the network cable.

----End

5.1.3.4 Assembling a Shielded RJ45 Connector and an FTP Network Cable

## Context

This topic describes how to assemble a shielded RJ45 connector and File Transfer Protocol (FTP) network cable and related notes.

Figure 5-64 shows the shielded RJ45 connector.

Figure 5-63 Connector jacket
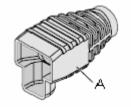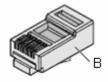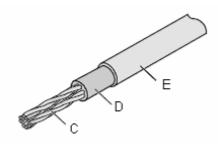
Figure 5-64 Shielded RJ45 connector

Figure 5-65 Cable
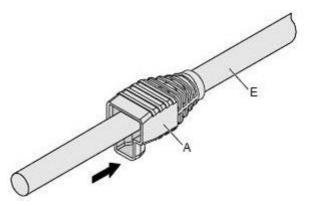
| A: Connector jacket | B: Connector | C: Core wires of the twisted pair | D: Aluminum foil used as the network cable shield | E: Network cable jacket |

Procedure

Step 1 Route the network cable through the connector jacket, as shown in Figure 5-66.

Figure 5-66 Routing the network cable through the connector jacket
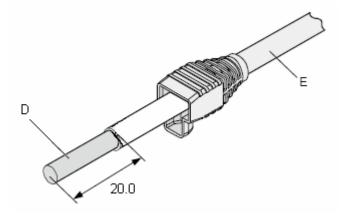
Step 2 Strip 20 mm outer jacket off the cable and cut off the nylon layer inside the jacket, as shown in Figure 5-67.

⚠ **NOTICE**
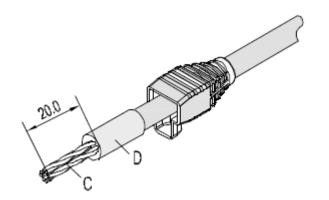
Ensure that the aluminum foil used as a shielded layer is intact when stripping outer jackets off the twisted pair cable.

Figure 5-67 Stripping the outer jacket
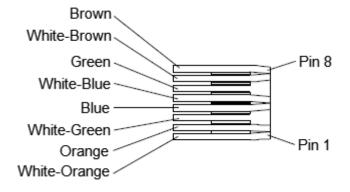
Step 3 Pull outward the shielded aluminum foil and cut off the PET membrane and ground cables along the end face of the outer jacket, as shown in Figure 5-68.

Figure 5-68 Cutting off the PET membrane and ground cables

Step 4 Arrange the twisted core wires according to color order shown in Figure 5-69. Use cutting pliers to neatly cut the front end of the twisted pair, as shown in Figure 5-70. Figure 5-71 shows pin arrangement of each contact of the connector.

Figure 5-69 Mapping between colors and pins

Figure 5-70 Neatly cutting the twisted pair
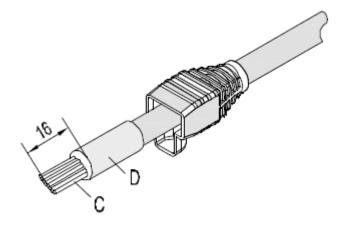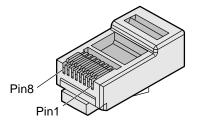
Figure 5-71 Pin arrangement of the connector
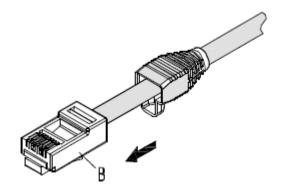
Step 5 Insert the arranged four twisted pair cables into the connector, as shown in Figure 5-72.

⚠ **NOTICE**
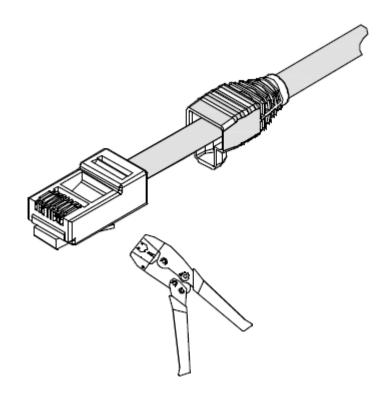
- Cables must be inserted into the bottom.
- The aluminum foil must keep intact after cables are inserted into the connector.

Figure 5-72 Inserting cables into the connector
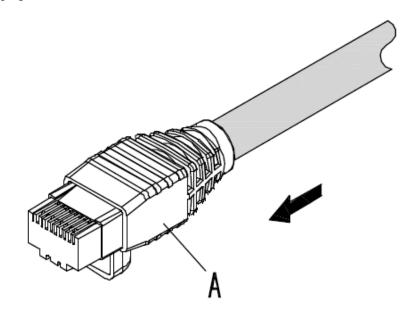
Step 6 Use the crimping tool dedicated for FTP network cables to crimp the connector and neatly cut the aluminum foil along the end face of the connector, as shown in Figure 5-73.

Figure 5-73 Crimping the connector

Step 7 Move the connector jacket to the connector body to wrap the connector shell, as shown in Figure 5-74.

Figure 5-74 Wrapping the connector shell

Step 8 Repeat Step 1 through Step 7 to assemble the shielded RJ45 connector on the other end of the network cable.
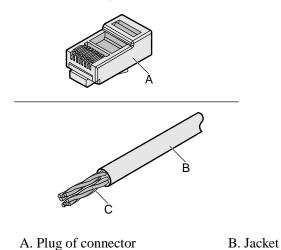
----End

5.1.3.5 Assembling an Unshielded RJ45 Connector and Ethernet Cable

Context

Figure 5-75 shows the components of an unshielded RJ45 connector and cable.

Figure 5-75 Components of an unshielded RJ45 connector and cable
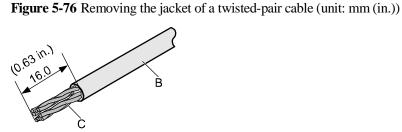
A. Plug of connector   B. Jacket   C. Twisted-pair wires

Procedure

Step 1 Remove a 16-mm (0.63 in.) long section of the jacket, as shown in Figure 5-76.

⚠️ **NOTICE**

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

Figure 5-76 Removing the jacket of a twisted-pair cable (unit: mm (in.))

Step 2 Align the four pairs of wires and cut the ends neatly, as shown in Figure 5-77. The connections between the wires and the pins are listed in Table 5-9.

Figure 5-77 Connections between wires and pins (unit: mm (in.))
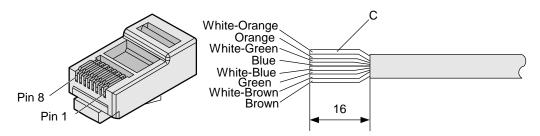
Table 5-9 Connections between wires and pins (using a straight-through cable as an example)

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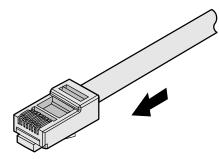
Matching Pins of Wires	Wire Color
8	Brown

Step 3 Feed the cable into the plug, and crimp the connector, as shown in Figure 5-78.

🛑 NOTE

When inserting the cable, check from the side or bore of the plug to ensure that the cable is completely seated in the plug.

Figure 5-78 Crimping the connector

Step 4 To complete the assembly of the other end, repeat steps 1 to 3.

----End

5.1.3.6 Checking the Appearance of Contact Strips

Context

- To ensure proper contact between the crimped wires and the wire conductors, the heights and sizes of the contact strips must be standard and the same.
- The contact strips must be parallel to each other, with an offset of less than $\pm 5°$. The top margin of a strip must be parallel to the axis of the connector, with an offset of less than $\pm 10°$.
- To ensure conductivity, the surface of the contact strips must be clean.
- The contact strips must be in good contact with the RJ45 socket. The plastic separators must remain intact and be aligned.
- The contact strip blade must extend beyond the ends of the wires. The ends of the wires must be in contact with the edge of the RJ45. The distance between them must be less than 0.5 mm (0.02 in.).

Procedure

Step 1 Hold the crimped connector, with the front side facing you, and check whether the contact strips are of the same height. The height should be 6.02 ± 0.13 mm (0.237 ± 0.005). If a measuring tool is not available, you can compare the connector with a standard connector. Figure 5-79 shows an unqualified piece, and Figure 5-80 shows a qualified piece.

📖 **NOTE**

All unqualified pieces must be crimped again.

Figure 5-79 Contact strips of different heights

Figure 5-80 Contact strips of the same height

Step 2 Hold an RJ45 connector and turn it 45 °. Observe the top edges of the metal contact strips. Figure 5-81 shows an unqualified piece.

Figure 5-81 Unparallel contact strips of different heights

Step 3 Check whether the contact strips are clean. If they are not clean and the dirt cannot be removed, replace it with a new RJ45 connector. Figure 5-82 shows an unqualified piece.

Figure 5-82 Dirt on a contract strip

Step 4 Check whether the contact strips and the plastic separators are well aligned and intact. If a separator is skewed and cannot be fixed, replace it with a new RJ45 connector. Figure 5-83 shows an unqualified piece.

Figure 5-83 Skewed plastic separators

Step 5 Hold the connector with the side facing towards you, and check whether you can see the cross-sections of the wires. Ensure that the ends of the wires are in good contact with the edge of the RJ45, and that the contact strip blade extends beyond the ends of the wires and is crimped with the wires. If not, replace the connector. Figure 5-84 shows an unqualified piece.

Figure 5-84 Wires not in good contact with the edge of the RJ45

Not in good contact with the edge of the RJ45 trough

----End

5.1.3.7 Testing the Connection of Assembled Cables

Context

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

- Straight-through cables are connected in a one-to-one manner. They are used to connect terminals such as a computer or switch to network devices. Table 5-10 lists the connections of core wires in a straight-through cable.

Table 5-10 Connections of core wires in a straight-through cable

RJ45 Connector 1	RJ45 Connector 2	Core Wire Color	Twisted or Not
2	2	Orange	Twisted
1	1	Orange-White	
6	6	Green	Twisted
3	3	Green-White	
4	4	Blue	Twisted
5	5	Blue-White	
8	8	Brown	Twisted
7	7	Brown-White	
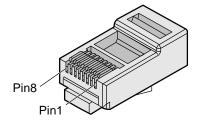
- Crossover cables are connected in a crossover manner. They are used to connect terminals such as two computers or switches. Table 5-11 lists the connections of core wires in a crossover cable.

Table 5-11 Connections of core wires in a straight crossover cable

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

Figure 5-85 shows the pins of an RJ45 connector.

Figure 5-85 Pins of an RJ45 connector

Pin8

Pin1

Procedure

Step 1 Feed both connectors of the cable into the ports of the cable tester.

Step 2 After the connectors are properly inserted, turn on the tester. If the indicators from 1 to G turn on simultaneously, you can infer that the pins work normally and the wires are correctly connected.

📖 **NOTE**

Turn the switch to the S position to slow down lighting of the indicators so that you can see the indicators more clearly, as shown in Figure 5-86.

Figure 5-86 Testing the conduction and connections of wires

Step 3 Gently shake the connector and repeat Step 2 to check whether the metal contact strips are in good contact with the core wires and Ethernet ports, as shown in Figure 5-87.

Figure 5-87 Checking the reliability

The procedure for testing a crossover cable is the same as that for testing a straight-through cable except for the sequence in which the indicators turn on, which depends on the wire connections of a crossover cable.
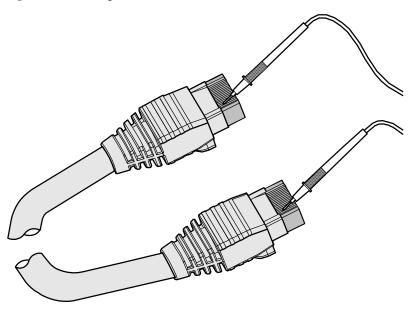
The Ethernet cable is qualified if the indicators turn on in the following sequence:

At the master (left) section of the tester, the indicators turn on in the sequence of 1-8-G. At the slave (right) section of the tester, the indicators turn on in the sequence of 3-6-1-4-5-2-7-8-G.

If the indicators do not come on in this sequence, the Ethernet cable is unqualified.

◫ NOTE

If a tester is not available, you can use a multimeter to perform a simple test, as shown in Figure 5-88.

Figure 5-88 Testing the connection of an Ethernet cable

----End

5.1.3.8 Common Network Cable Faults and Preventive Measures

Table 5-12 lists common network cable faults and preventive measures.

Table 5-12 Common network cable faults and preventive measures

Symptom	Cause	Preventive Measure
• The device cannot be powered using PoE. • The device restarts frequently. • A large number of error packets exist on the device or services are interrupted.	A network cable has high resistance or is too long.	Before using network cables purchased from other suppliers, use a multimeter or other tools to measure cable resistance. If the resistance of a network cable does not comply with the quality requirement of the PoE standard, as shown in Table 5-13, replace the network cable.
	Non-standard network cable connectors cause poor contact with device interfaces.	Before making a network cable, use a standard go-no go gauge to test the connectors purchased from other suppliers. Replace the connectors if they do not comply with the standard.
	Wires in a network cable are connected to wrong pins.	After a network cable is made, use a conduction tester to measure cable connectivity. For test details, see 5.1.3.7 Testing the Connection of Assembled Cables.
	A network cable connector is not crimped securely, causing poor contact between the network cable and pins in the connector.	When testing a network cable with a conduction tester, gently shake the cable connector and check whether indicators on the conduction tester are in normal state. If indicators 1 to G turn on in a wrong sequence, remake the network cable.

The following methods are often used to test network cable resistance, and the test criteria are listed in Table 5-13:

● Use a network cable tester (high-end cable tester of Fluke) to measure network cable resistance.

- Connect multimeter probes to two ends of each wire in a network cable and check the resistance value on the multimeter.
- Connect a network cable to an AP. Use a multimeter to test the resistance between pins 1 and 2 (or between pins 3 and 6, 4 and 5, or 7 and 8) on the other end of the cable. The cable's DC resistance approximately equals a half of the displayed value.

Table 5-13 PoE standard requirements for network cable quality

Standard		Total Resistance of a Network Cable
802.3af		≤ 20 ohms
802.3at	Maximum PD power consumption < 12.95 W	≤ 20 ohms
	Maximum PD power consumption < 25.5 W	≤ 12.5 ohms

If an AP is connected to a switch or AC (excluding ACU2), you can run the **virtual-cable-test** command on the switch or AC to check network cable connectivity. For details, see the **virtual-cable-test** command in the command reference.
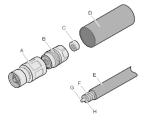
5.1.4 Assembling Feeders

5.1.4.1 Assembling the Straight Male Coaxial N Connector and the 1/2" Feeder

Context

Figure 5-89 shows the components of an N coaxial connector and a 1/2" feeder cable.

Figure 5-89 Components of an N coaxial connector and a 1/2" feeder cable
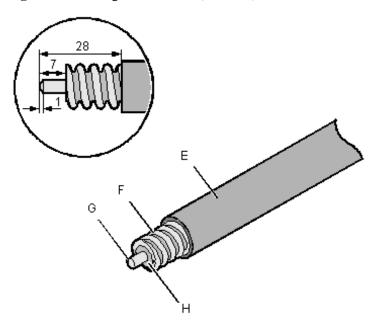
A. Body of connector	B. Back shell of connector	C. O-ring seal	D. Heat-shrink tubing
E. Cable jacket	F. Outer conductor of feeder cable	G. Inner conductor of feeder cable	H. Insulation layer of feeder cable

Procedure

Step 1 Cut the feeder cable, as shown in Figure 5-90.

Figure 5-90 Cutting a feeder cable (unit: mm)

⚠ **NOTICE**
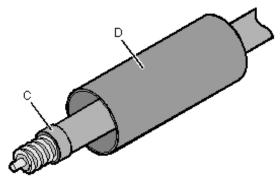
● Ensure that the feeder cable is cut with reference to the guide in the package box of the connector.
● After you cut the feeder cable, ensure that the cross-section of the outer conductor is smooth, intact, and round.
● Ensure that the feeder cable is cut at the wave crest of the outer conductor.
● The inner conductor must be beveled, as shown in Figure 5-90.

Step 2 Use a brush to remove the dirt on the cross-section of the feeder cable.
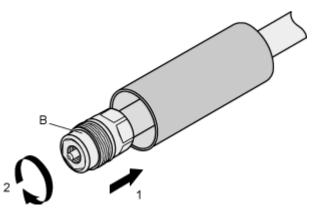
Step 3 Feed the feeder cable into the heat-shrink tubing, and cover the outer conductor of the feeder cable with the O-ring seal, as shown in Figure 5-91.

Figure 5-91 Installing the heat-shrink tubing and the O-ring seal

Step 4 Put the back shell of the connector onto the feeder cable. Tighten the back shell to the end of the feeder cable, as shown in Figure 5-92.

Figure 5-92 Putting the back shell of the connector onto the feeder cable
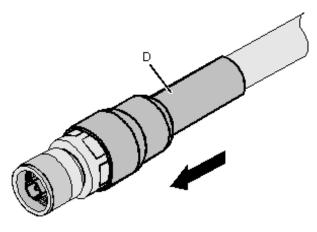
Step 5 Mount the body of the connector onto the feeder cable so that the inner conductors of the connector and feeder cable are connected. Use a spanner (27 N•m to 30 N•m torque recommended) to fasten the body and back shell, as shown in Figure 5-93.

Figure 5-93 Fastening the body and back shell

Step 6 Push the heat-shrink tubing towards the connector, as shown in Figure 5-94. Then, heat the tube.

Figure 5-94 Assembled N connector

Step 7 After the components are assembled, install the connector, as shown in Figure 5-95.
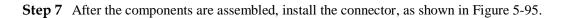
Figure 5-95 Installing the connector

----End
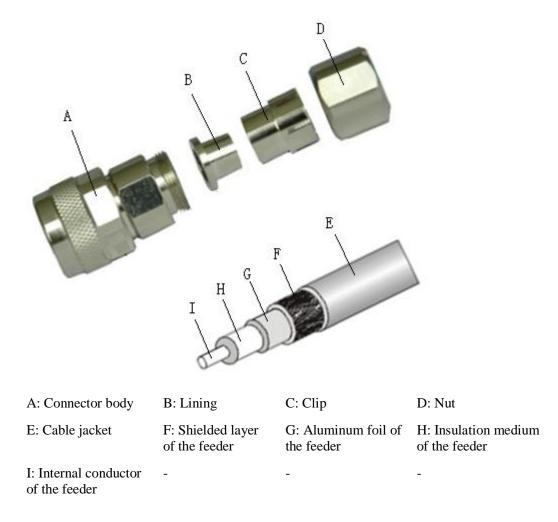
5.1.4.2 Assembling a Straight Male Coaxial N Connector and an RG8U Feeder

Context

Figure 5-96 shows the coaxial N connector and RG8U feeder.
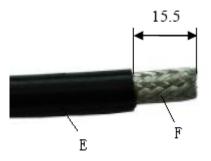
Figure 5-96 Coaxial N connector and RG8U feeder

A: Connector body	B: Lining	C: Clip	D: Nut
E: Cable jacket	F: Shielded layer of the feeder	G: Aluminum foil of the feeder	H: Insulation medium of the feeder
I: Internal conductor of the feeder	-	-	-

Procedure

Step 1 Strip the feeder with the length shown in Figure 5-97.

> ⚠ **NOTICE**
>
> Ensure that the shielded layer F is intact after the stripping.
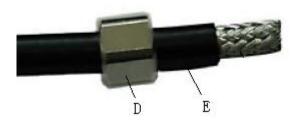
Figure 5-97 Stripping the feeder

Step 2   Route the Cable jacket (E) through the nut (D), as shown in Figure 5-98.

Figure 5-98 Installing the nut

Step 3   Install the clip (C) on the Cable jacket (E) and move the clip until the clip is close to the Cable jacket, as shown in Figure 5-99.

Figure 5-99 Installing the clip
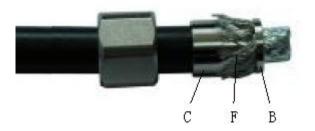
Step 4   Peel off the shielded layer (F) to the direction of the clip (C) so that the aluminum foil (G) is exposed, as shown in Figure 5-100.

Figure 5-100 Peeling off the shielded layer
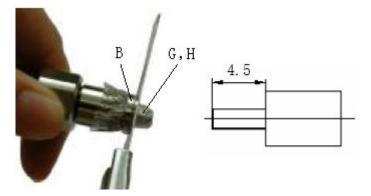
Step 5 Install the lining (B) on the feeder and tightly crimp the shielded layer (F) of the feeder, as shown in Figure 5-101.

Figure 5-101 Installing the lining
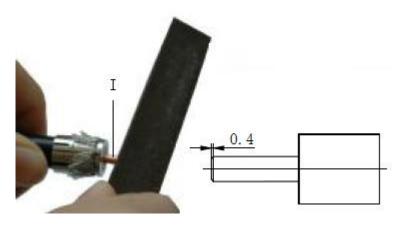
Step 6 Cut off the aluminum foil (G) and insulation medium (H) along the end face of the lining (B). Ensure that the length of the conducting line inside the feeder is 4.5 mm, as shown in Figure 5-102.

Figure 5-102 Cutting off the aluminum foil and insulation medium of the feeder

Step 7 Use the file to taper the internal conductor (I) of the feeder, as shown in Figure 5-103.

Figure 5-103 Tapering the internal conductor of the feeder
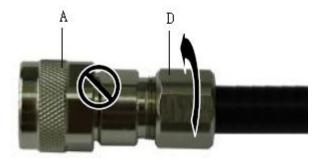
Step 8 Use a brush to remove impurities from the cross section of the feeder, as shown in Figure 5-104.

Figure 5-104 Clearing impurities
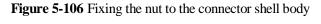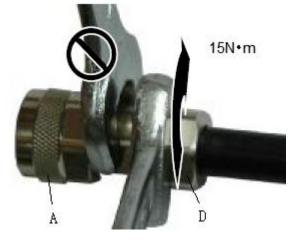
Step 9 Insert the half-finished part into the main body of the connector (A) and rotate the nut (D) and the connector's main body until you cannot rotate further, as shown in Figure 5-105.

Figure 5-105 Installing the connector's main body

Step 10 Use a wrench to fix the nut (D) to connector's main body (A) with recommended tightening torque 15 N•m, as shown in Figure 5-106.

Figure 5-106 Fixing the nut to the connector shell body

Step 11 Figure 5-107 shows the effect drawing after the assembling is complete.

Figure 5-107 Effect drawing of the straight male coaxial N connector

----End

5.1.5 Installing Cable Accessories

5.1.5.1 Precautions for Installing Cable Accessories

Tools

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

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

Bending Radius

Unless otherwise specified, bending radius (R) of cables or fibers must meet the requirements listed in Table 5-14.

Table 5-14 Bending radius of cables or fibers

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

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

Precautions for Installation

- Hold terminals of cables instead of pulling the cables themselves when installing or removing cable components.

- Do not insert a connector forcibly when the connector is blocked. Use a dedicated tool to pull out the connector. Install the connector again after you check that the pins are inserted properly.

- Before tightening screws on cable connectors, ensure that the connectors are properly connected to their adapters. Tighten the screw with appropriate force using a flat-head or Phillips screwdriver instead of bare hands or an electric screwdriver. If the screw cannot be screwed into the tapped hole, determine the reason and try again. Do not apply too much force, or the screw or adapter may be damaged.

- When removing densely aligned cables or fiber connectors, use dedicated pliers such as cable-pulling pliers and fiber-pulling pliers.

- Do not twist, bend, stretch, or extrude fibers during installation.

- Cover the idle fiber connectors with dust caps. Remove the dust caps before using the fiber connectors.

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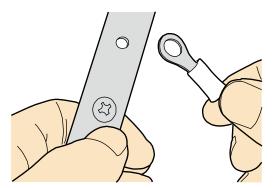
- To protect cables, remove the burrs in the cable through-holes or install protective rings in the holes.
- To ease the connection and to avoid stress, keep cable joints slack. After connecting multiple cables to a connector that has multiple interfaces, keep the cables slack to avoid generating stress.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

5.1.5.2 Installing Power Adapters

5.1.5.2.1 Installing the OT Terminal

Procedure
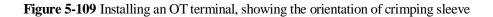
- Install an OT terminal.

  a. Align the hole of the OT terminal (conductor upward) with a connecting hole, as shown in Figure 5-108.
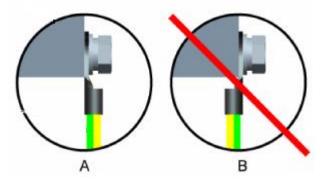
Figure 5-108 Aligning the OT terminal with a connecting hole

◪ NOTE
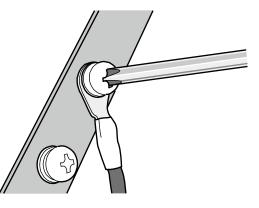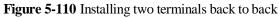
When you install an OT terminal, the crimping sleeve is installed as shown in Figure 5-109, where A is correct and B is incorrect.

Figure 5-109 Installing an OT terminal, showing the orientation of crimping sleeve

b.   Place the spring washer and flat washer in turn, mount a matching screw, and fasten it clockwise, as shown in Figure 5-110.

Figure 5-110 Installing two terminals back to back

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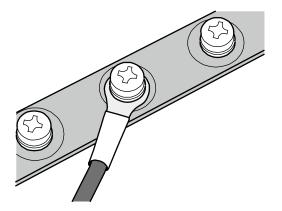
Ensure that the OT terminal is not in contact with other terminals or metal components.

c.   Move the cable slightly and ensure that it is securely connected, as shown in Figure 5-111.

Figure 5-111 Installed OT terminal
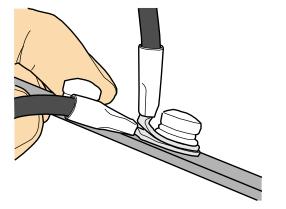
- Install two OT terminals on a post.
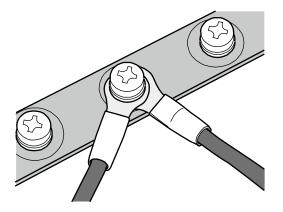
  Before you install two OT terminals on a post, ensure that the two terminals can be installed on the post and that the electrical connecting pieces have a large contact area. Two OT terminals can be installed using any of these methods:
  - Bend the upper OT terminal at a 45- or 90-degree angle, as shown in Figure 5-112.
  - Cross the two terminals, as shown in Figure 5-113.

Figure 5-112 Bending the upper OT terminal at a 45- or 90-degree angle

Figure 5-113 Crossing two terminals

⚠ **NOTICE**

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

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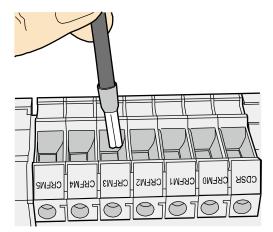
----End

5.1.5.2.2 Installing the Cord End Terminal

Procedure
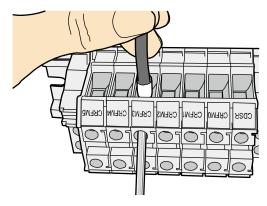
Step 1 Hold a cord end terminal upright and place it on a terminal jack, as shown in Figure 5-114. To ensure bump contact and dense connection, place the plain side of the terminal outwards.

Figure 5-114 Placing a terminal on a terminal jack vertically

Step 2 Insert the terminal into the jack vertically, and turn the screw clockwise to fasten the terminal, as shown in Figure 5-115.

Figure 5-115 Feeding the terminal into the jack

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

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

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

----End
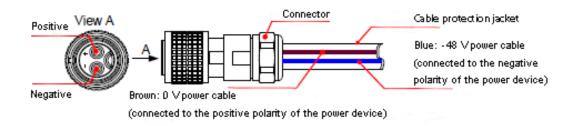
5.1.5.2.3 Installing a 2-Pin Round Connector and a DC Power Cable

This topic describes how to install a 2-pin round connector and a DC power cable and related notes.

Context

Figure 5-116 shows the 2-pin round connector with a DC power cable.

Figure 5-116 2-pin round connector and a DC power cable

Procedure

Step 1 Waterproof cables to be connected.

1.   Wrap a layer of PVC tape, as shown in Figure 5-117.

Figure 5-117 Wrapping the PVC tape

2.   Wrap three layers of insulation tape, as shown in Figure 5-118.
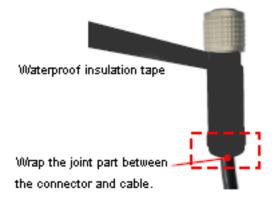
Figure 5-118 Wrapping three layers of the waterproof insulation tape

Figure 5-119 Waterproof insulation tape

3.   Wrap three layers of the PVC tape around the waterproof insulation tape, as shown in
Figure 5-120.

Figure 5-120 Wrapping three layers of the PVC tape
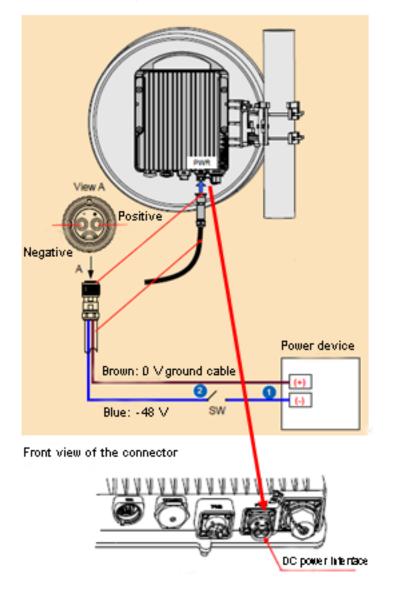
4.   Tightly bind the PVC tape at the ends of the wrapping section, as shown in Figure 5-121.

Figure 5-121 Tightly binding the PVC tape

Step 2   Fix the DC power cable connector to the PWR port, as shown in Figure 5-122. Ensure that positive and negative polarities are correct during the installation.

Figure 5-122 Installing the round connector

⚠ NOTICE

Use the outdoor binding strap to bind cables under the DC power cable connector for weight bearing, preventing the DC power cable connector from being pulled. Reserve the proper cable length between the binding point and the PWR port.

----**End**
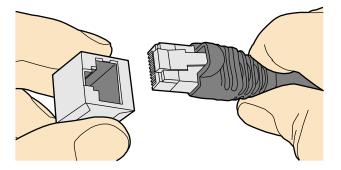
5.1.5.3 Installing Ethernet Adapters

5.1.5.3.1 Installing a Shielded Ethernet Connector
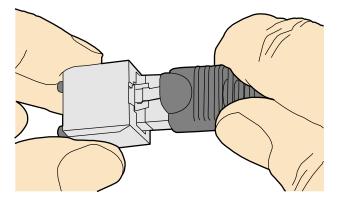
Procedure

Step 1 Hold the male and female connectors, with the male connector facing the female connector, as shown in Figure 5-123.

Figure 5-123 Holding the male and female shielded connectors
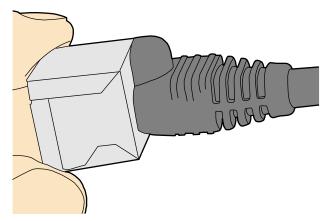
Step 2 Insert the male connector into the female connector, as shown in Figure 5-124.

Figure 5-124 Feeding the male shielded connector into the female shielded connector
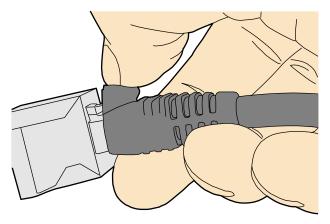
Step 3 When you hear a click, the cable connector is completely inserted in the port. (The clip on the cable connector pops up to fix the connector in the port.) Pull the connector slightly and ensure that it is securely connected, as shown in Figure 5-125.

Figure 5-125 Installed shielded Ethernet connector

Step 4   To remove an Ethernet connector, press the locking key and pull out the connector, as shown in Figure 5-126.

Figure 5-126 Removing a shielded Ethernet connector
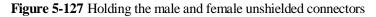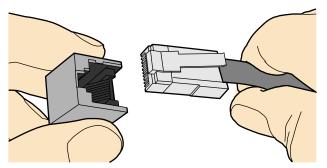
----End

5.1.5.3.2 Installing an Unshielded Ethernet Connector

Procedure

Step 1   Hold the male and female connectors, with the male connector facing the female connector, as shown in Figure 5-127.

Figure 5-127 Holding the male and female unshielded connectors

Step 2 Feed the male connector into the female connector, as shown in Figure 5-128.
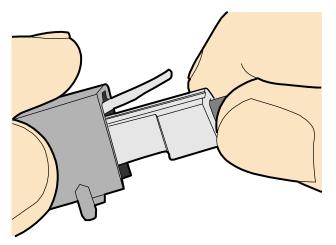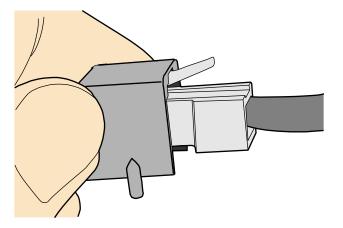
Figure 5-128 Feeding the male connector into the female unshielded connector

Step 3 A crisp click indicates that the connector is locked by the locking key. Pull the connector slightly and ensure that it is securely connected. Figure 5-129 shows an installed Ethernet connector.

Figure 5-129 Installed unshielded Ethernet connector

Step 4 To remove an Ethernet connector, press the locking key and pull out the connector, as shown in Figure 5-130.

Figure 5-130 Removing an unshielded Ethernet connector

----End

5.1.5.4 Installing Fiber Connectors

Context

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

5.1.5.4.1 Cleaning Fiber Connectors

Procedure

Step 1 Clean the pins of a fiber connector by using lint-free cotton and alcohol.

Step 2 Clean the pins again by using dust-free cotton. If necessary, clean the pins by using an air gun. Ensure that the pins are free from any fiber or debris.
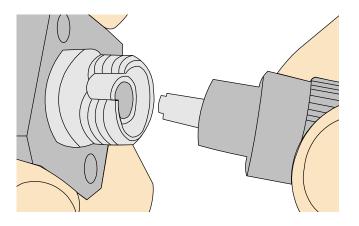
----End

5.1.5.4.2 Installing an FC Fiber Connector

Procedure
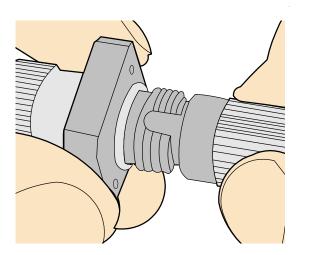
Step 1 Remove the dustproof cap of the FC connector and store it for future use.

Step 2 Align the core pin of the male connector with that of the female connector, as shown in Figure 5-131.

Figure 5-131 Aligning the male connector with the female connector
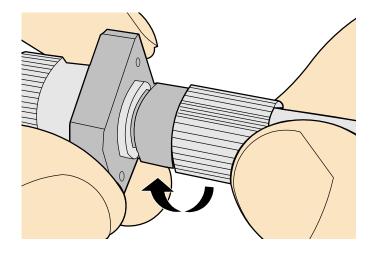
Step 3 Align the male connector with the female connector and gently push the male connector until it is completely seated in the female connector, as shown in Figure 5-132.

Figure 5-132 Feeding the male connector into the female connector
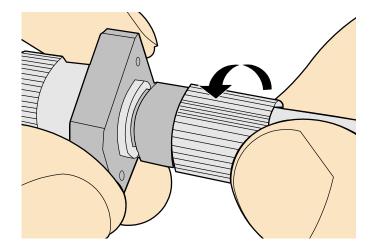
Step 4 Fasten the locking nut clockwise and ensure that the connector is securely installed, as shown in Figure 5-133.

Figure 5-133 Fastening the locking nut

Step 5 To disassemble an FC fiber connector, loosen the locking nut counterclockwise, and gently pull the male connector, as shown in Figure 5-134.

Figure 5-134 Disassembling an FC fiber connector
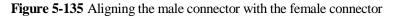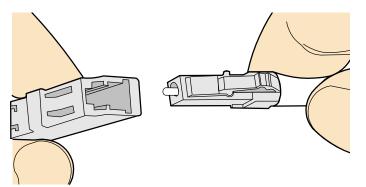
----End

5.1.5.4.3 Installing an LC Fiber Connector

Procedure
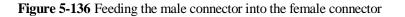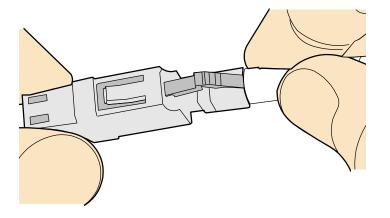
Step 1 Remove the dustproof cap of the LC fiber connector and store it for future use.

Step 2 Align the core pin of the male connector with that of the female connector, as shown in Figure 5-135.

Figure 5-135 Aligning the male connector with the female connector

Step 3 Align the male connector with the fiber adapter and gently push the male connector until it is completely seated in the fiber connector, as shown in Figure 5-136.

Figure 5-136 Feeding the male connector into the female connector

Step 4 A clicking sound indicates that the male connector is locked, as shown in Figure 5-137.
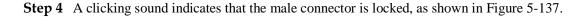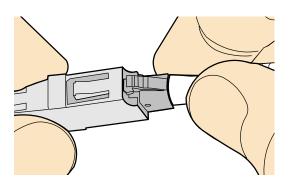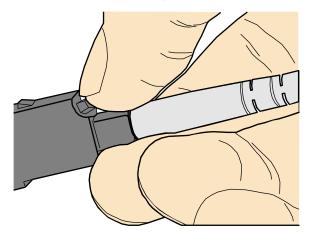
Figure 5-137 Installed LC connector

Step 5 To disassemble an LC fiber connector, press the locking nut to release the locking clips from the bore, and gently pull the male connector, as shown in Figure 5-138.

Figure 5-138 Disassembling an LC fiber connector
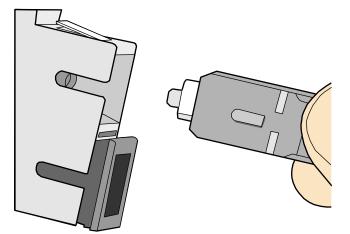
----End

5.1.5.4.4 Installing the SC Fiber Connector

Procedure
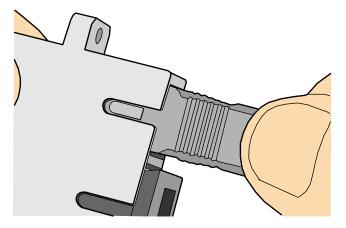
Step 1 Remove the dustproof cap of the SC fiber connector and store it for future use.

Step 2 Align the core pin of the male connector with that of the female connector, as shown in Figure 5-139.

Figure 5-139 Aligning the male connector with the female connector
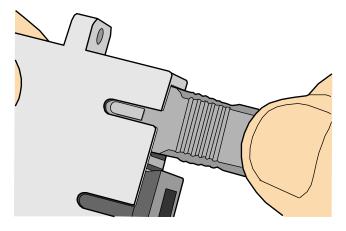
Step 3 Feed the fiber connector into the female connector, with your fingers holding the shell of the fiber connector (not the pigtail). When you hear a click, the fiber connector is secured by the clips (internal parts, not illustrated in the figure). Pull the fiber connector gently. If the connector does not loosen, the installation is complete. See Figure 5-140.

Figure 5-140 Installed SC fiber connector

Step 4 To disassemble an SC fiber connector, hold the shell of the connector (do not hold the fiber) and gently pull the connector in the direction vertical to the adapter. Unlock the male connector, and then separate it from the shell, as shown in Figure 5-141.

Figure 5-141 Disassembling an SC fiber connector
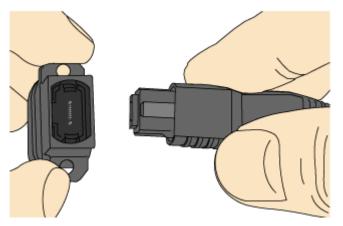
----End

5.1.5.4.5 Installing an MPO Connector

Procedure
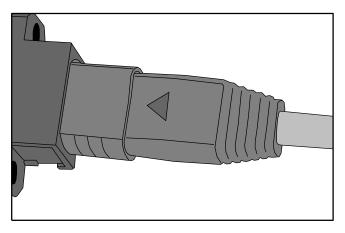
Step 1 Remove the dustproof cap of the MPO fiber connector and store it for future use.

Step 2 Align the core pin of the male connector with that of the female connector, as shown in Figure 5-142.
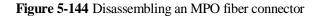
Figure 5-142 Aligning the male connector with the female connector
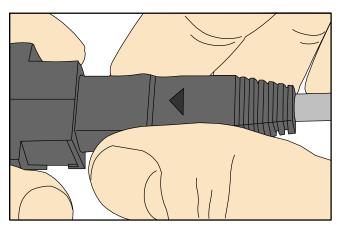
Step 3 Hold the shell labeled "PUSH" and feed the male connector into the female connector until you hear a clicking sound. The male and female connectors are securely installed, as shown in Figure 5-143.

Figure 5-143 Installed MPO fiber connector

Step 4 To disassemble an MPO fiber connector, hold the shell labeled "PULL" and remove the male connector, as shown in Figure 5-144.

Figure 5-144 Disassembling an MPO fiber connector
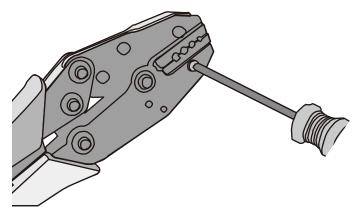
----End

5.1.6 Replacing the Mold of the Crimping Tool

Procedure
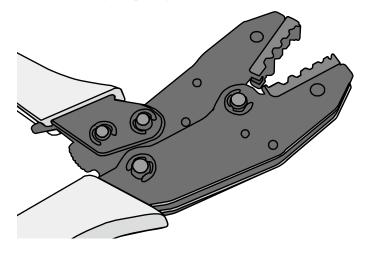
Step 1 Hold the handles of a pair of COAX crimping tools. Loosen the two fastening screws counterclockwise, as shown in Figure 5-145.

Figure 5-145 Loosening two fastening screws
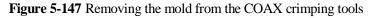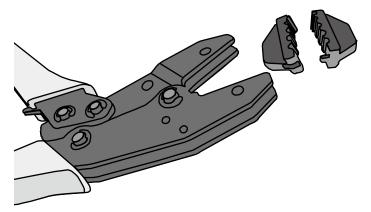
Step 2 Hold the handles of the COAX crimping tools to open the self-locking mechanism. The jaw of the COAX crimping tools opens automatically, as shown in Figure 5-146.

Figure 5-146 Pliers jaw opening automatically
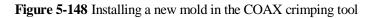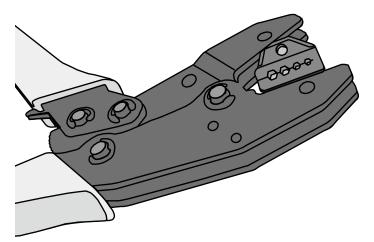
Step 3 Remove the mold from the COAX crimping tools, as shown in Figure 5-147.

Figure 5-147 Removing the mold from the COAX crimping tools

Step 4 Place the mold to be installed into the jaw of the COAX crimping tools and align the screw holes, as shown in Figure 5-148.

Figure 5-148 Installing a new mold in the COAX crimping tool

⚠ NOTICE
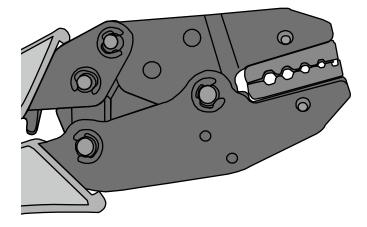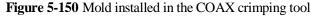
Keep the short side of the mold inwards and the long side outwards, with the teeth of the mold aligning from the larger size to the smaller size.
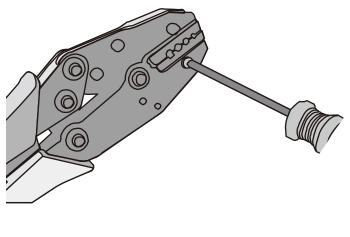
Step 5 Hold the handles of the COAX crimping tools tightly to match the mold and the jaw completely. Align the screw holes, as shown in Figure 5-149.

Figure 5-149 Aligning the screw holes
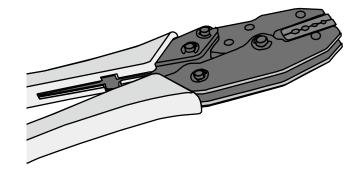
Step 6 Hold the handles of the COAX crimping tools with one hand. Tighten the two fastening screws clockwise. Figure 5-150 and Figure 5-151shows the mold installed in the COAX crimping tool.

Figure 5-150 Mold installed in the COAX crimping tool

Figure 5-151 An installed mold

----End

5.2 Environmental Requirements for Device Operation

5.2.1 Environmental Requirements for an Equipment Room

5.2.1.1 Requirements for Selecting a Site for an Equipment Room

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

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

The equipment room should be located in a place free from high temperature, dust, toxic gases, explosive materials, or unstable voltage. Keep the equipment room away from significant vibrations or loud noises, as well as power transformer stations.
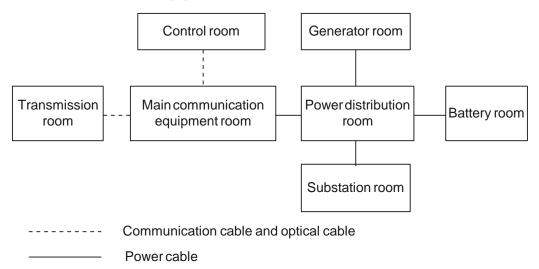
The specific requirements for selecting a site for an equipment room are as follows:

- The room should be located at a distance of at least 5 km (3.11 mi.) from heavy pollution sources such as smelting and coal mines. It should be located at a distance of at least 3.7 km (2.30 mi.) from moderate pollution sources such as chemical, rubber, and galvanization factories. It should be located at a distance of at least 2 km (1.24 mi.) from light pollution sources such as packinghouses and tanyards. If these pollution sources cannot be avoided, ensure that the equipment room is upwind of the pollution sources. In addition, use a high-quality equipment room or protection products.

- The room should be located away from livestock farms, or be upwind of the livestock farms. Do not use an old livestock room or fertilizer warehouse as the equipment room.

- The equipment room must be far away from residential areas. An equipment room that is not far away from residential areas must comply with equipment room construction standards to avoid noise pollution.

- The room should be located far away from industrial and heating boilers.

- The room should be at least 3.7 km (2.30 mi.) away from the seaside or salt lake. Otherwise, the equipment room should be airtight with cooling facilities. In addition, alkalized soil cannot be used as the construction material. Otherwise, equipment suitable for wet conditions must be used.

- The doors and windows of the equipment room must be kept closed to maintain an airtight room.

- Using steel doors to ensure sound insulation is recommended.

- No cracks or openings are allowed on the walls or floors. The outlet holes on the walls or windows must be sealed. Walls must be constructed such that they are smooth, wear-resistant, dustproof, flame retardant, sound insulated, heat absorptive, and have electromagnetic shielding.

- The air vent of the room should be far from the exhaust of city waste pipes, big cesspools and sewage treatment tanks. The room should be in the positive pressure state to prevent corrosive gases from entering the equipment room and corroding components and circuit boards.

- It is recommended that the room be on or above the second floor. If this requirement cannot be met, the ground for equipment installation in the room should be at least 600 mm (23.62 in,) above the maximum flood level.

- The equipment room should be strong enough to resist winds and downpours.

- The room should be located away from dusty roads or sand. If this is unavoidable, the doors and windows of the equipment room must not face pollution sources.

- Do not place air conditioning vents near the equipment so that they blow directly on the equipment because condensation may be blown into the equipment.

- Do not use decorative materials that contain sulfur in the equipment room.

5.2.1.2 Equipment Room Layout

An equipment room usually contains mobile switching equipment, telecommunications equipment, power supply equipment, and other auxiliary equipment. To ensure easy maintenance and management, place the equipment in different rooms. Figure 5-152 shows the layout of the equipment room.

Figure 5-152 Layout of the equipment room

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

- It should meet requirements for laying out and maintaining communication cables and power cables.
- It should reduce the cabling distance, which facilitates cable maintenance, reduces potential communication faults, and maximizes efficiency.

5.2.1.3 Construction Requirements for the Equipment Room
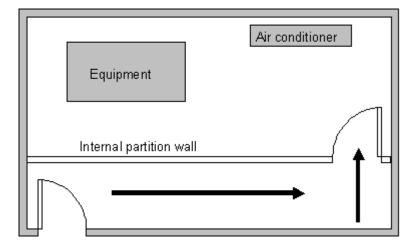
Table 5-15 describes the construction requirements for the equipment room.

Table 5-15 Construction requirements for the equipment room

Item	Requirements
Area	The smallest area of the equipment room can accommodate the equipment with the largest capacity.
Net height	The minimum height of the equipment room should not be less than 3 m (9.84 ft). The minimum height of the equipment room is the net height below overhead beams or ventilation pipes.
Floor	The floor in the equipment room should be semi-conductive and dustproof. A raised floor with an ESD covering is recommended. Cover the raised floor tightly and solidly. The horizontal tolerance of each square meter should be less than 2 mm (0.08 in.). If raised floors are unavailable, use a static-electricity-conductive floor material, with a volume resistivity of 1.0 x 107 ohms to 1.0 x 1010 ohms. Ground this floor material or raised floor. You can connect them to ground using a one megohm current-limiting resistor and connection line.
Load-bearing capacity	The floor must bear loads larger than 150 kg/m^2 (0.21 bf/in.^{2}).
Door and windows	The door of the equipment room should be 2 m (6.56 ft) high and 1 m (3.28 ft) wide. One door is enough. Seal the doors and windows with dustproof plastic tape. Use double-pane glass in the windows and seal

Item	Requirements
	them tightly.
Wall surface treatment	Paste wallpaper on the wall or apply flat paint. Do not use pulverized paint.
Cable trays	Use cable trays to arrange cables. The inner faces of the cable trays must be smooth. The reserved length and width of the cable trays, and the number, position and dimensions of the holes must comply with the requirements of device arrangement.
Water pipe	Do not pass service pipes, drainpipes, and storm sewers through the equipment room. Do not place a fire hydrant in the equipment room, but place it in the corridor or near the staircase.
Internal partition wall	Separate the area where the equipment is installed from the equipment room door. The partition wall can block some outside dust.
Installation position of the air conditioner	Install air conditioner vents so that the air does not blow directly on equipment.
Other requirements	Avoid the proliferation of mildew, and keep out rodents (like mice).

Figure 5-153 Internal partition wall inside the equipment room

5.2.1.4 Equipment Room Environment

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

The equipment room must be free from explosive, conductive, magnetically-permeable, and corrosive dust. Table 5-16 lists the requirement for dust concentration in the equipment room.

Table 5-16 Requirements for dust particles in the equipment room

Mechanical active material	Unit	Concentration
Dust particle	Particle /m^3	$\leq 3x\ 10^4$ (no visible dust accumulated on a workbench in three days)
Suspending dust	mg/m^3	≤ 0.2
Precipitable dust	mg/m^2 ·h	≤ 1.5
Description • Dust particle diameter ≥ 5 μm • Suspending dust diameter ≤ 75 μm • 75 μm $\leq$ precipitable dust diameter ≤ 150 μm		

Take the following measures to meet the requirements:

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

5.2.1.5 Requirements for Corrosive Gases

The room should be free from dusts and corrosive gases, such as SO_2, H_2S, and NH_3. Table 5-17 lists the requirements for the corrosive gas concentration.

Table 5-17 Requirements for corrosive gas concentration

Chemical active material	Unit	Concentration
SO_2	mg/m^3	≤ 0.30
H_2S	mg/m^3	≤ 0.10
NO_x	mg/m^3	≤ 0.50
NH_3	mg/m^3	≤ 1.00
Cl_2	mg/m^3	≤ 0.10
HCl	mg/m^3	≤ 0.10
HF	mg/m^3	≤ 0.01
O_3	mg/m^3	≤ 0.05

Take the following measures to meet the requirements:

- Avoid constructing the room near a place where the corrosive gas concentration is high, such as a chemical plant.
- Ensure the air intake vent of the room is in the prevailing upwind direction from any pollution source.
- Place batteries in different rooms.
- A professional service should monitor the corrosive gas conditions regularly.

5.2.1.6 Requirements for ESD Prevention

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

Take the following measures to meet this requirement:

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

5.2.1.7 Electromagnetism Requirements for the Equipment Room

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

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

5.2.1.8 Requirements for Lightning Proof Grounding

Table 5-18 lists the requirements for lightning proof grounding.

Table 5-18 Requirements for lightning proof grounding

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

Item	Requirements
Power cables leading in the equipment room need to be equipped with a surge protector	• After the low-voltage power cables are led into the room, install the surge protector for the power cables in the AC voltage stabilizer and the AC power distribution panel (box). Correctly ground the surge protector nearby. • For an equipment room in urban area, install a power supply surge protector with the nominal discharge current of no less than 20 kA. For an equipment room that is built in a suburb and subject to lightning strikes, install a power supply surge protector with the nominal discharge current of more than 60 kA. For an equipment room that is built in a mountain area and subject to frequent lightning strikes, or in a separate high-rise building in a city, install a power supply surge protector with the nominal discharge current of more than 100 kA. • The ground cable of the surge protector should be no longer than 1 m (3.28 ft).
Grounding for DC power distribution	• Connect the DC working ground (positive pole of the -48 V DC power supply or the negative pole of the 24 V DC power supply) with the indoor collective ground cable nearby. The total ground cable should meet the maximum load of the equipment. • The power equipment must have a DC working ground cable, which can connect the power equipment to the collective ground cable of the telecommunication site (or the protective ground bar of the equipment room).
Equipotential connection	• Properly ground the devices and auxiliary devices in the room such as mobile base station, transmission, switching equipment, power supply equipment, and cable distribution frame. Connect all PGND cables to the collective protective ground bar. Connect all PGND cables in one equipment room to one protective ground bar. • Apply joint grounding to the working ground and protective ground of devices, which means the two share one grounding network. • The cable tray, rack or shell, metal ventilation pipe, metal door or window of the equipment should be grounded for protection.
General requirements for grounding	• Do not connect the neutral line of the AC power cable with the protective ground of any telecom equipment in the equipment room. • Do not install a fuse or switch on the ground cable. • All ground cables should be as short as possible, and arranged in a straight line.
Grounding resistance	• The grounding resistance must be lower than 1 ohm. • The upper end of the grounding body should be at least 0.7 m (2.30 ft) over the ground. In cold areas, bury the grounding body below the frozen ground. • Measure the grounding resistance periodically to ensure effective grounding.
Routing of signal cable	• Do not arrange the signal cables overhead in the equipment room. All signal cables must be led into the site underground. • Use the cables with a metal jacket or place them into a metal pipe if

Item	Requirements
	they come out/in the equipment room. • Ground the idle lines inside the cable in the equipment room. • Signal cables should be deployed on internal walls. Do not deploy outdoor aerial cables. • Keep signal cables away from power cables and surge protection devices.
Collective ground cable	• Use a ground ring or ground bar for the collective ground cable. • Do not use aluminum cables as ground cables. Adopt measures to prevent electrification corrosion when connecting different metal parts together. • Use a copper busbar as the collective ground cable with a cross-sectional area of no less than 120 mm^2 (0.19 in.^{2}), or use the galvanized flat steel of the same resistance. Insulate the collective ground cable from the reinforcing steel bars of the building.
Grounding lead-in	The grounding lead-in should be a maximum of 30 m (98.42 ft) long. Use the galvanized flat steel with cross-sectional area of 40 mm x 4 mm (1.58 in. x 0.158 in.) or 50 mm x 5 mm (1.97 in. x 0.197 in.).

5.2.2 Requirements for Power Supply

5.2.2.1 Requirements for AC Power Supply

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

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

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

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

Table 5-19 lists the voltage range of the AC power supply for the devices.

Table 5-19 Voltage range of AC power supply

Item	Requirements
AC power capacity to support the devices	-10% to +5% of the rated voltage
AC power capacity to support the power modules	-15% to +10% of the rated voltage

Item	Requirements
and important buildings	
Frequency of alternating current	-4% to +4% of the rated value
Voltage wave shape sine distortion	Within 5% of the rated voltage

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

AC power cables should meet the following specifications:

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

5.2.2.2 Recommendations for AC Power Supply

The following are recommendations for the AC power supply.

- If the voltage of the power mains that supply power directly to devices exceeds the rated voltage by -10% to 5%, or exceeds the voltage range that devices can support, a voltage regulating device or voltage stabilizing device is required.
- If the mains do not supply power for the device directly, or if the mains voltage exceeds the rated voltage by -15% to 10% or exceeds the input voltage range of the DC power supply, a voltage regulating device or voltage stabilizing device is required.
- A UPS or inverter power supply system is required to provide uninterrupted AC power to support the telecommunication load.
- If abnormalities occur on the mains, telecommunication servers should be equipped with a self-supplied electric generator to support the key telecommunication load. The capacity should be not less than 150% to 200% of the total uninterruptible power supply.
- Storage batteries are usually installed in a parallel connection of two groups. UPS storage batteries are generally installed in one group. The redundancy required for the UPS can rely on concatenation or parallel connection. When an inverter or a UPS is used, the active inverter is determined by the maximum power and a backup inverter is required.

5.2.2.3 Requirements for DC Power Supply

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

- A large-scale enterprise can deploy an independent power supply system on each floor to supply power to the telecommunications equipment room on the respective floor.
- A medium-scale enterprise can use a power room and a battery room for centralized power supply or use distributed power supply systems.

- A small-scale enterprise can deploy an integrated power supply system in its equipment room but must take measures to prevent corrosive gases released from batteries from eroding circuit boards of telecommunications equipment.

Table 5-20 lists the specifications for the DC power supply.

Table 5-20 Specifications for the DC power supply

Item	Requirements
DC power capacity to support the surge current	Greater than 1.5 times the rated current
Regulated voltage precision	If the AC input voltage is in the range of 85% to 110% of the rated value, and the load current is in the range of 5% to 100% of the rated value, the output voltage of the rectifier ranges from -46.0 V to -56.4 V, with the regulated voltage precision less than or equal to 1%.
Overshoot amplitude of switch on/off	Integral value of the DC output voltage ±5%
Peak noise voltage	≤200 mV
Dynamic response	The recovery time is less than 200 ms. The overshoot is in the range of the integral value of the DC output voltage ±5%.

5.2.2.4 Recommendations for DC Power Supply

The following are recommendations for the DC power supply.

- Use distributed power supply mode. Use multiple DC power supply systems and put power equipment in multiple locations.

- Adopt a standard DC power supply system, and set the output voltage to the communications equipment within the required range.

- Improve reliability of the AC power supply system to reduce the necessary capacity of storage batteries. For small offices, increase the capacity of storage batteries if it is difficult to enhance reliability of the AC power supply system.

- The total capacity of the high-frequency switching rectifier must satisfy the power of the communication loading and battery charging. If there are 10 or fewer active rectifier modules, configure one backup module. If there are more than 10 active modules, configure one backup module for every 10 active modules.

- Install storage batteries in two or more groups. The capacity is determined by the duration for which the storage batteries must supply power. For most offices, the batteries should be able to supply power for at least one hour.

5.3 Equipment Grounding Specifications

5.3.1 General Grounding Specifications

Table 5-21 shows the general grounding specifications.

Table 5-21 General grounding specifications

No.	Description
1	The working ground and protective ground, including the shielded ground and the lightning-proof ground of the cable distribution frame should share the same grounding conductor.
2	The cable trays, shells, metal ventilation pipes, metal doors and windows in the equipment room should be grounded for protection.
3	The metal parts of the equipment which are electrically floating in normal conditions should be grounded for protection.
4	The ground cable must be connected securely to the protective ground bar of the equipment room.
5	Do not use other equipment as part of the ground cable or electrical connection.

5.3.2 Grounding Specifications for an Equipment Room

The grounding resistance of a comprehensive communication building should be less than or equal to one ohm. The grounding resistance of an ordinary communication office should be less than five ohms. The grounding resistance in an area where the earth resistance rate is high should be less than 10 ohms.

5.3.3 Grounding Specifications for Devices

Table 5-22 lists the equipment grounding specifications.

Table 5-22 Equipment Grounding Specifications

No.	Description
1	All communication devices and auxiliary devices (such as mobile base stations, transmission and switching devices, power supply devices) in the equipment room should be grounded for protection. Connect all protective ground for various devices jointly to a general ground bar, and then to the same protective ground bar in the room together with the protective ground (PGND) of the device.
2	The PGND of the equipment is shorted to the copper ground bar provided by the customer. The short-circuiting cable used should be a yellow-green plastic insulated cable with a copper core and a cross-sectional area greater than 25 sq. mm (0.039 sq. in.).
3	There are grounding terminals and grounding lugs at the lower part of the front door, rear door and side panel of the cabinet, connected to the grounding terminals of the cabinet framework through connection cables with cross-sectional area of no

No.	Description
	less than 1.6 sq. mm (0.002 sq. in.).
4	Ensure that all metal components of the cabinet conduct well. No insulating coating should be sprayed on the connection part of the metal components.
5	Connect the cabinets in the same row by fastening captive screws and gaskets on the top of the cabinets. Do not spray any coating into a rectangular area measuring 30 mm x 50 mm (1.18 in. x 1.97 in.) around the connection hole for a captive bolt. Measures to prevent rust and corrosion must be taken for this area. Zinc electroplating with iridescent yellow chromate conversion coating should be applied to the gasket and nut to ensure good electrical contact.
6	When combining cabinets of the same type, short-circuiting cables are required to connect the ground busbars (if any) of the cabinets. The cross-sectional area of the short-circuiting cable is 6 sq. mm (0.009 sq. in.) and is no more than 300 mm (11.8 in.) long. Connect the two ends of the short-circuiting cable to the ground busbar terminals of neighboring cabinets and fix them firmly.

5.3.4 Grounding Specifications for Communications Power Supply

Table 5-23 shows the grounding specifications for communication power supplies.

Table 5-23 Grounding specifications for communication power supplies

No.	Description
1	The inlet for the AC power cable at the equipment room should be equipped with a surge protection device (C-level) with a nominal discharge current no less than 20 kA.
2	The protective ground for the power supply and that for communication equipment share the same grounding conductor. If the power supply and the equipment are in the same equipment room, use the same protective ground bar for them if possible.
3	Use a surge protection circuit on the AC power interface.
4	The positive of the -48 V DC power supply or negative pole of the 24 V DC power supply should be grounded at the output of the DC power supply.
5	The working ground and protective ground of the DC power supply equipment should use the same grounding conductor with the protective ground of the switching equipment. If the power supply and equipment are in the same equipment room, use the same protection ground bar for them if possible.
6	Add surge protection on the DC power interface.

5.3.5 Grounding Specifications for Signal Cables

Table 5-24 lists the grounding specifications for signal cables.

Table 5-24 Grounding specifications for signal cables

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

5.3.6 Specifications for Laying Out Grounding Cables

Table 5-25 shows the specifications for the ground cable.

Table 5-25 Specifications for laying out ground cables

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

5.4 Engineering Labels for Cables

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

Engineering labels are specialized for power cables and signal cables:

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

 NOTE

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

5.4.1 Introduction to Labels

5.4.1.1 Label Materials

Features:

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

5.4.1.2 Type and Structure

Label for Signal Cables

The label for signal cables is L-shaped with fixed dimensions, as shown in Figure 5-154.

Figure 5-154 Label for signal cables

(In mm)   (In in.)

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

The cut dotted line helps to fold the label when affixed to the cable, and its size is 1 mm x 2 mm (0.04 in. x 0.08 in.).
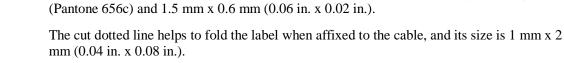
The word "TO:" (upside down in the figure) at the lower right corner of the label is used to identify the opposite end of the cable on which the label is affixed.
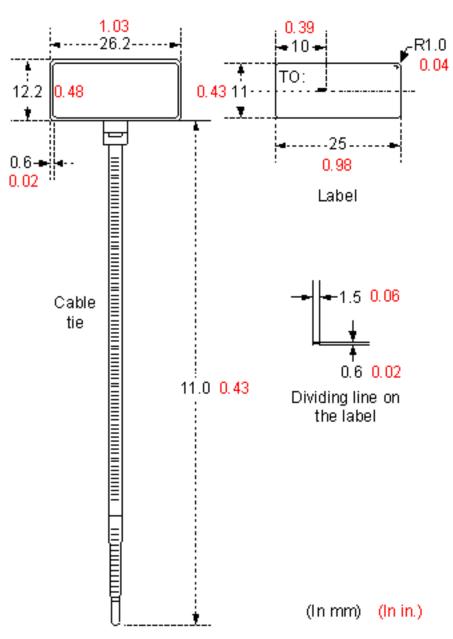
Power Cable Label

The label for power cables should be attached to the identification plate on the cable ties that are attached to the cable. The identification plate has an embossed area 0.2 mm x 0.6 mm (0.008 in. x 0.02 in.) around (symmetric on both sides), and the area in the middle is for affixing the label, as shown in Figure 5-155.

Figure 5-155 Power cable label

5.4.1.3 Label Printing

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

Template for Printing

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

The template is made in Microsoft Word. Follow these instructions to use the template:

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

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

Merging Cells in the Template

To merge two or more cells, do as follows:

1. Select **Edit**/**Select All**.
2. Select **Format**/**Borders and Shading**/**Borders**. Select **Box** tab and click **OK**.
3. Drag the mouse to select cells to be merged and select the **Table**/**Merge Cells**.

Requirements on the Printer

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

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

The method for adjusting the page setup is as follows.

1. Select **File**/**Page Setup**.
2. Select **Layout** and set Header and Footer as 0.
3. Select the **Margins** tab page. Select Left for Gutter Position and adjust the values of Top, Bottom, Left, and Right.

📕 NOTE

If the warning prompt as shown in Figure 5-156 appears before printing, click **Ignore** to continue the printing.

Figure 5-156 Warning prompt before printing

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

Requirements for Feeding the Printer

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

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

Requirements for the Printed Label

Make sure that the printed labels satisfy the following requirements:

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

5.4.1.4 Writing Labels

Writing Tools

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

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

📖 NOTE

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

Font

For the sake of legibility, use standard block letters and numbers as shown in Table 5-26 (Times New Roman).

Table 5-26 Standard typeface for handwriting

0	1	2	3	4	5	6	7	8
9	A	B	C	D	E	F	G	H
I	J	K	L	M	N	O	P	Q
R	S	T	U	V	W	X	Y	Z

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

Placement of text on a label is shown in Figure 5-157.

Figure 5-157 Placement of text on a label

5.4.1.5 Attaching Labels

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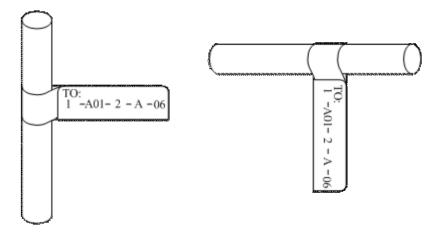
Label for Signal Cables

- Choose the place to attach labels.

  The label is attached 2 cm (0.79 in.) from the connector on a signal cable. In special cases (for example, to avoid cable bending or affecting other cables), other positions are allowed to attach the labels. The rectangular part with text is attached facing right or downward, as shown in Figure 5-158. The details are as follows:
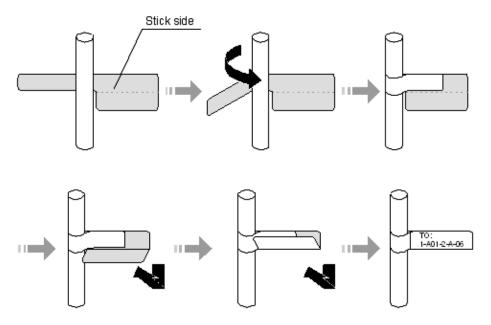
  – The identification card is to the right of the cable in vertical cabling.

  – The identification card should be downward when you lay out the cable horizontally.

Figure 5-158 Text area of the label

- Procedure for attaching labels

  Figure 5-159 shows the methods and procedures for attaching labels.

Figure 5-159 Label for signal cables
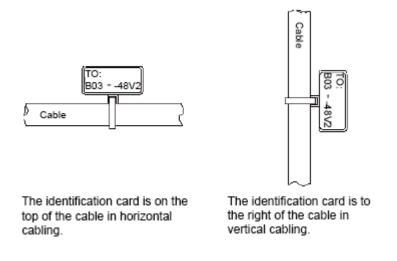
Power Cable Label

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

Cable ties should be bound on both ends of a cable. After the bundling, the finished identification plate should be on top of the cable in horizontal cabling, or on the right side of the cable in vertical cabling, as shown in Figure 5-160. The details are as follows:

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

Figure 5-160 Binding the label for the power cable

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

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

5.4.1.6 Contents of Engineering Labels

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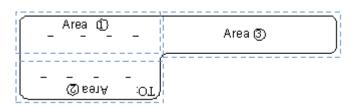
Labels for power cables are affixed on only one side of the identification plates. On the labels, there is information (the part after the word "TO:") about the location of the device on the other end of the cable, like the location of control cabinet, distribution box or power socket.

Contents of Labels for Signal Cables

The two sides of the label affixed on the signal cable carry information about the location of the ports connected to both ends of the cable. Figure 5-161 shows the information on both sides of the labels affixed to the signal cables.

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

Figure 5-161 Printed parts on the label for signal cables

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

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

5.4.1.7 Precautions for Using Engineering Labels

When using labels, pay attention to the following points:

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

5.4.2 Engineering Labels for Optical Fibers

These labels are affixed to the optical fibers that connect the optical interfaces on the boards in a chassis, or on the device boxes. There are two types of labels for optical cables:

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

5.4.2.1 Labels for the Optical Fibers Connecting Devices

Meaning of the Label

Table 5-27 lists information on both sides of the labels affixed to the optical fibers that connect two devices.

Table 5-27 Information on labels affixed to the fibers between two devices

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

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

Example of the Label

Figure 5-162 shows a sample label on an optical fiber.

Figure 5-162 Sample label on an optical fiber between two devices

```
A01 ─ 01 ─ 05 ─ 01 ─ R
─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─
T ─ 10 ─ 10 ─ 10 ─ 10G
                   :OT
```

The meaning of the label is listed in Figure 5-162.

- "A01-01-05-01-R" indicates that the local end of the optical fiber is connected to the optical receiving interface 01 in slot 5, chassis 01 in the cabinet in row A, column 01 in the machine room.
- "G01-01-01-01-T" indicates that the opposite end of the optical fiber is connected with optical transmitting interface 01 in slot 01, chassis 01 in the cabinet in row G, column 01 in the machine room.

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

Meaning of the Labels

Table 5-28 shows information on both sides of labels attached to an optical fiber between a device and an optical distribution frame (ODF).

Table 5-28 Information on labels affixed to a fiber between a device and an ODF

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

Content	Meaning	Example
	interface number.	with the port sequence number on the device.
	R: Optical receiving interface T: optical transmitting interface	-
ODF-MN-B-C-R/T	MN: row number and column number of an ODF	M: The cabinet rows from front to back are numbered from A to Z. N: The cabinet columns from left to right are numbered from 01 to 99. For example, G01 is the ODF of row G and column 01.
	B: row number of the terminal device	Range from 01 to 99, for example, 01-01.
	C: column number of the terminal device	
	R: Optical receiving interface T: optical transmitting interface	-

Example of the Label

Figure 5-163 shows a sample label on an optical fiber.

Figure 5-163 Sample label on an optical fiber between the device and the ODF

Meaning of the label in Figure 5-163

- "ODF-G01-01-01-R" indicates that the local end of the optical fiber is connected to the optical receiving terminal in row 01, column 01 of the ODF in row G, column 01 in the machine room.

- "A01-01-05-01-R" indicates that the opposite end of the optical fiber is connected to optical receiving interface 1 in slot 05, chassis 01 in the cabinet in row A, column 01 in the machine room.

5.4.3 Engineering Labels for Network Cables

Applicable Ranges

The labels can be applied to Ethernet cables.

Label Content

Table 5-29 shows the information on both sides of the labels affixed to Ethernet cables.

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

Table 5-29 Information on the Ethernet cables

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

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

- For a network cable connecting a hub and device, the label on the hub end should indicate the numbers of the chassis and cabinet where the hub resides, and the serial number on the hub. The label on the device end should indicate the number of the chassis and cabinet where the device is located. If the device is a standalone device, provide the specific position of the device.

- For a network cable connecting a hub and an agent or terminal, the label on the agent or terminal end should contain the serial number of the network interface. The definitions of the cabinet number and chassis number are the same as those described in Table 5-29.

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

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

Label Example

Figure 5-164 shows a sample label on an Ethernet cable.

Figure 5-164 Sample label on an Ethernet cable

A01 – 03 – 01 – 01 –

B02 – 03 – 01 – –
TO:

Meaning of the label in Figure 5-164.

- "A01-03-01-01" indicates that one end of the network cable is connected to network interface 01 in slot 01, chassis 03 of the cabinet in row A, column 01 in the equipment room.

- "B02-03-01" indicates that another end of the network cable is connected to network interface 01 in chassis 03 of the cabinet on row B, column 02 in the equipment room. No slot number is given.

5.4.4 Engineering Labels for User Cables

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

Meaning of the Engineering Labels for User Cables

Table 5-30 shows the contents of the labels.

Table 5-30 Contents of the engineering labels for user cables

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

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

Example of the Label

Figure 5-165 shows a sample label on a user cable.

Figure 5-165 Sample label on a user cable

The meaning of the label in Figure 5-165 is as follows:

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

5.4.5 Engineering Labels for Power Cables

5.4.5.1 Engineering Labels for DC Power Cables

These labels are affixed to the DC power cables that provide power supply for cabinets, including the -48 V, PGND, and BGND cables. Here, the DC power cables also include power cables and PGND cables.

The labels for DC power cables are affixed to one side of the identification plates on cable ties. For details of the labels, see Table 5-31.

Table 5-31 Contents of the label

Content	Meaning

Content	Meaning
MN(BC)-B--48Vn	MN(BC): BC is written right under MN.
MN(BC)-B-BGND	B: chassis number, numbered in bottom-up order with two digits, for example, 01.
MN(BC)-B-PGND	N: power socket number, numbered as 1 to 3 in the bottom-up and left-to-right orders.
	On the loaded cabinet side, only MN is used to identify the cabinet.
	On the power cabinet side, MN identifies the row and column number of the power distribution equipment like a control cabinet and distribution box, and BC identifies the row and column number of the -48 V connector. If there is no row number or column number, or the connector can be identified without them, BC can be omitted. It is unnecessary to identify the row and column number for BGND and PGND.

The label only carries location information about the destination direction of the power cable whereas information about the local end is unnecessary. That is, the label only carries location information about the opposite equipment, the control cabinet, or the distribution box. Table 5-31 lists the information on two -48 V power supplies on the label. The information on other DC voltages, such as 24 V and 60 V should be given in similar methods.

Make sure that labels are affixed in the correct direction. That is, after the cable ties are bundled onto the cable, the identification plates with the labels should face up, and the text on the labels in the same cabinet should be in the same direction. For details, see Figure 5-166.

Figure 5-166 Example of the labels for DC power cables

Label on the loaded cabinet side
(indicating he position of the cable
on the power distribution box)

Label on the distribution box side
(indicating the position of the cable
on the loaded cabinet side)

The meaning of the label in Figure 5-166 is as follows:

- On the loaded cabinet side, the label "A01/B08--48V2" on the cable indicates that the cable is -48 V DC supply, which is from the eighth connector in row B of -48 V bus bar in the cabinet in row A, and column 1 in the equipment room.

- On the distribution box side, the label "B03--48V2" indicates that the cable is -48 V DC supply, connected to DC power socket 2 in row B, column 03 in the equipment room.

📖 NOTE

In the power distribution box or the first power cabinet of a row in a transmission equipment room, every terminal block on the -48 V connector bar has a numeric identification. For example, in the above label of "A01/B08--48V2", "08" (or sometimes "8") is the numeric identification of the terminal block.

PGND and BGND are two copper bars, on which the terminal blocks are short-circuited. Therefore, it makes no difference which terminal is connected to them. It is only necessary to give the row and column of the power distribution box, instead of giving the specific serial number of the terminal block on the copper bar. For example, if the label on the loaded cabinet side is "A01-BGND", it means that the power cable is a BGND that connects BGND copper bar in the power distribution box in row A, column 01 in the machine room. Information on the labels for PGND cables should be given in a similar way.

5.4.5.2 Engineering Labels for AC Power Cables

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

The labels for AC power cables are affixed to one side of the identification plates on cable ties. For details, see Table 5-32.

Table 5-32 Label content
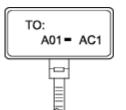
Content	Meaning
MN-(B)-ACn	MN: serial number of the cabinet or the socket where the power is led in
	B: chassis number, numbered in bottom-up order with two digits, for example, 01.
	n: power port number, numbered as 1 to 3 in bottom-up and left-to-right order.
	Serial number of the socket where the power is led in: the location of the socket is marked according to the actual situation. If the sockets can be identified by row numbers and column numbers, they can be numbered following the same rule for the cabinets. If the sockets cannot be identified by rows and columns, specify the detailed locations to avoid confusion with other sockets.

The label only carries location information about the opposite equipment and the power socket; information about the local end is unnecessary.

Make sure that labels are affixed in the correct direction. That is, after the cable ties are bundled onto the cable, the identification plates with the labels should face up, and the text on the labels in the same cabinet should be in the same direction, as shown in Figure 5-167.

Figure 5-167 Labels for AC power cables

Label on the loaded cabinet side
(indicating the position of the cable
on the power distribution box)

Label on the distribution box side
(indicating the position of the cable
on the loaded cabinet side)

Meaning of the label in Figure 5-167.

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

5.5 Guide to Using Optical Modules

Common Faults of an Optical Module

☐ **NOTE**

The system may fail to obtain information about non-Huawei-certified optical modules or obtain incorrect information. You are advised to use Huawei-certified optical modules. Obtain the electronic label of the optical module and contact technical support personnel to confirm whether it is a Huawei-certified optical module.

1. An optical module is not completely installed in position.

   If the optical module is not completely installed in position and the latch boss is not secured, the device cannot identify the optical module. After the optical module works for a long time, it will be ejected under external stress.

2. The optical receptacle on an optical module is contaminated.

   If an optical module is not cleaned or protected properly, contaminants may accumulate on the fiber pin in the optical module. As a result, the coupling efficiency is reduced, optical signals are cut off, or even worse, the surface of the fiber pin is damaged permanently.

3. An optical module is burnt.

   If high-power optical signals (caused by an optical time domain reflectometer or self-loop test) are transmitted through an optical module that is used for long-distance transmission but no optical attenuator is used, the optical power will exceed the overload power of the avalanche photodiode (APD). Then the optical module is burnt.

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

Measures to Prevent a Loosened Optical Module

1. When installing an optical module, insert it in position. If you hear a click or feel a slight shake, it indicates that the latch boss is secured.

   If the latch boss is not secured, the gold finger of the optical module is not in good contact with the connector on the board. In this case, the link may be connected but optical signals will be cut off or the optical module will be loosened when the optical module is shaken or hit.

2. Figure 5-168 shows the release handle on an optical module when it is open and closed. When inserting the optical module, make sure that the release handle is closed. At this time, the latch boss locks the optical module. After the optical module is inserted, try pulling it out to see if it is installed in position. If the optical module cannot be pulled out, it is secured.

Figure 5-168 State of the release handle

Close the release handle   Open the release handle

Measures to Prevent Receptacle Contamination

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

Figure 5-169 Cleaning optical fibers with special cleaning tissues

📖 **NOTE**

Place at least three cleaning tissues on the work bench. As shown in Figure 5-169, wipe the end of an optical connector from left to right or from right to left on a cleaning tissue, and then move the connector end to the unused part of the cleaning tissue to continue.

2. Cover an unused optical module with a protective cap to prevent dust, as shown in Figure 5-170.

Figure 5-170 Installing a protective cap

If no protective cap is available, use fibers to protect the optical module, as shown in Figure 5-171.

Figure 5-171 Using fibers to protect an optical module

3. Cover unused optical connectors with protective caps, as shown in Figure 5-172, and then lay out fibers on the fiber rack or coil them in a fiber management tray to prevent fibers from being squeezed.

Figure 5-172 Installing a protective cap on a fiber

4. If a receptacle or an optical connector has not been used for a long time and is not covered with a protective cap, you need to clean it before using it. Clean a receptacle with a cotton swab, as shown in Figure 5-173. Clean an optical connector with cleaning tissues.

Figure 5-173 Cleaning a receptacle with a cotton swab

⚠ **NOTICE**

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

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

Measures to Prevent an Optical Module from Being Burnt

1. Before using an optical time-domain reflectometer (OTDR) to test the connectivity or the attenuation of optical signals, disconnect the optical fibers from the optical module. Otherwise, the optical module will be burnt.

2. When performing a self-loop test, use an optical attenuator. Do not loosen the optical connector instead of the optical attenuator.

Precautions

1. The optical connector should be vertically inserted in the receptacle to avoid damages to the receptacle.

2. Fibers must be inserted into optical modules of the corresponding type. That is, multimode fibers must be inserted into multimode optical modules, and single mode fibers must be inserted into single mode optical modules. If a fiber is inserted into an optical module of a different mode, faults may occur. For example, optical signals will be lost.

5.6 Fault Tag

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

BOM Code	Product Description	Bar Code*	Fault Occurring Date*	Description of the Fault Phenomena*	Category No.*	Software Version*
Reasons for Repairing (Category No.):						
Category No. includes the following eight types: F001 - Wear out damaged (◊ In warranty Period ◊ Out of warranty period) F002 - Deployment damaged F003 - Intransit damaged F004 - Version upgrade F005 - Batch replace F007 - Overdue spare parts inspecting F008 - Others F011 - Running circumstance change						
Note: • For optical interface cards returned, the optical interfaces should be covered with protection caps. • In general, the analysis card will not be returned to you. If you have any special requirements, please contact Huawei. • One *Fault Tag* should be adapted in one return category, such as RMA/Return/Analysis. • The items marked with "*" are the mandatory fields that you must fill in.						

5.7 Installation Checklist

Component	No.	Applicable Scope	Check Item
AC	1	Independent AC	The air vent of the device is free from blockage to ensure normal heat dissipation.
	2	Independen	The power modules are securely installed with their captive

Compone nt	No.	Applic able Scope	Check Item
		dent AC	screws tightly fixed.
	3	Independ ent AC	Four rubber pads are attached to specified positions on the bottom of the AC before it is placed on a desk.
	4	Independ ent AC	The AC is secured in the cabinet or rack by rack-mounting brackets or guide rails (or trays), and floating nuts are correctly secured.
	5	AC card	The AC card is secured in the cabinet or rack by guide rails or trays, and the guide rails or trays and floating nuts are correctly secured.
	6	AC card	The AC card is correctly inserted into the device slot and secured using the ejector lever.
	7	AC card	No pins on the backplane are bent when the AC card is installed.
	8	Independ ent AC	The AC is grounded using a ground cable, meeting surge protection requirements.
	9	Independ ent AC	When the AC directly connects to APs, location IDs of the APs are provided at the cable connection points.
PoE power supply	1	General	The proper PoE switch or power adapter is selected, meeting AP power supply and onsite environment requirements.
	2	General	To ensure that the PoE power meets requirements, the PoE power supply device and APs must be connected through CAT5E and CAT6E network cables, and the cable length cannot exceed 100 m.
	3	General	Labels must be made for the PoE power cable to identify AP locations.
	4	General	Leave a 20 cm space between PoE power adapters to ensure normal heat dissipation.
	5	General	The PoE switch is correctly grounded with the ground cable.
	6	General	Reserve a few downlink network interfaces for the PoE switch (for example, connect at most 20 APs to a 24-port switch) for future capacity expansion.
	7	General	You are advised to configure dual power modules for a PoE switch for power redundancy backup and providing power for more APs.
AP	1	General	The AP installation positions comply with the network planning report and APs cannot be installed in environments with strong electrical or magnetic interference or corrosive materials. If the onsite environment does not meet requirements, adjust the AP installation positions properly.

Compone nt	No.	Applic able Scope	Check Item
	2	General	The devices are installed correctly, securely, without damages or paint peeling. Screws are tightened.
	3	General	Leave at least 20 cm space at the cable outlet and top (convex) of the AP to facilitate commissioning, maintenance, and heat dissipation. APs that dissipate heat from the rear must be fixed using mounting brackets in wall mounting scenarios. Ensure that there is a certain space between the APs and wall to facilitate heat dissipation.
	4	General	APs with built-in antennas should be installed in open areas and there should be no obvious obstruction in the coverage direction of the main lobe. The main lobe of built-in antennas faces the top (convex).
	5	General	The APs and antennas are neatly installed, without affecting the overall layout of the environment.
	6	Indoor AP	Indoor APs are placed far away from windows and in dry environments with little dust and good ventilation. There should be no inflammable materials in rooms. The indoor temperature and humidity must be within acceptable ranges.
	7	Indoor AP	When being mounted to a ceiling, the APs must be fixed using the matching mounting brackets. The APs cannot be hung in the air or placed directly on the ceiling. When the APs are mounted to a wall, the bottom of the APs should be at least 30 mm from the ground. The APs should be installed in places out of reach of people.
	8	Outdoor AP	When two or more APs are installed in the same area, they must be installed in the same vertical or horizontal line with certain spacing greater than 15 mm.
	9	General	Dustproof, waterproof, and anti-theft measures are taken and the devices are kept clean. The APs are secured using the security locks (separately purchased) based on onsite situations and customer requirements. If APs are placed in a network box, ensure that the box is well-ventilated, clean, and dustless, and the ventilation holes are not blocked.
	10	Indoor AP	Indoor APs should be mounted on walls with network ports downwards to prevent device damages caused by water drops or other liquid. Install the device in a site that is free from leaking or dripping water, heavy dew, and humidity, and take protective measures to prevent water from flowing into the equipment along the cable.
	11	Outdoor AP	When an outdoor AP is installed against a wall or pole, keep the indicator downwards for easy observation.
	12	General	Use waterproof labels to mark the registration names of APs on the AC, as well as their channels and IP addresses. The lables should be attached to the front of the APs for easy

Compone nt	No.	Applic able Scope	Check Item
			observation.
	13	General	Record AP installation positions, MAC addresses, interfaces of uplink PoE switches, and IP addresses (APs use fixed IP addresses) into a table.
	14	Indoor AP	The devices required during indoor AP installation, such as the splitter, coupler, and antennas are operated in accordance with specifications.
	15	General	The APs using a metal shell (with a ground point) must be properly grounded.
	16	Outdoor AP	Unused radio ports should be installed with 50 Ω RF loads.
	17	Outdoor AP	Take lightning protection measures on outdoor APs (the outdoor APs have built-in 5 kV surge protectors. If customers require a higher surge protection capability on the feeder ports, they can purchase additional surge protective devices, which need to be separately grounded). The APs should be located in the protection scope (within a 45-degree angle) of a lightning rod.
	18	Outdoor AP	When an AP is mounted to a pole, the distance between the AP and the top of pole should be at least 30 cm.
Signal cable	1	General	Routes of signal cables comply with the engineering design document. The signal cables are correctly connected to facilitate maintenance and capacity expansion.
	2	General	Radio ports of an AP are correctly connected to radio ports A/B/C of antennas.
	3	General	Signal cable connectors are correctly installed and securely connected to the device. Wires of each signal cable are securely cramped in the connectors and pass connectivity tests.
	4	General	Signal cables are orderly routed and not crossed, twisted, or winded (cables can be crossed at 1 m out of the cabinet). The bend radius of cables meets requirements, and the cables are not excessively bent.
	5	General	Signal cables are not damaged or broken and have no splices. Sufficient cable length is reserved. The reserved cables are twined and placed properly to facilitate subsequent maintenance.
	6	Indoor AP	The optical, power, network, and feeder cables are bundled using straps (one strap every 0.5 m) and securely fastened.
	7	Outdoor AP	The signal cables shall be bundled at even intervals (about 1000 mm), not too tight or too loose. The cables shall be bundled properly with cable ties placed in neat order. Cut off

Com pone nt	No.	Applic able Scope	Check Item
			redundant cable ties and remove burrs from them to avoid injuries. The cables shall be fixed using fasteners or ageing-resistant outdoor metal binding straps.
	8	General	Keep the signal cables away from heat sources and use heat insulation materials to insulate the cables from the heat sources. Do not place signal cables on the air vents of the cabinet to avoid affecting subrack heat dissipation or cable lifetime.
	9	General	Pigtail layout should meet the following requirements: • Pigtails are not strained or twisted at the bent parts. They are bundled by binding tape with appropriate force. • Pigtails can be pulled back and forth easily inside the cable tie and are not bent at a right angle. • Pigtails are not squeezed by other cables or objects. • The flange must be fixed. • Pigtails are protected with protective tubes or enveloped in troughs when they are routed outside the cabinet. The protective tubes are bundled and processed to prevent cutting. • The optical fiber cannot be folded or twisted, and the pigtail cannot be squeezed. The binding diameter of an optical fiber must be larger than 6 cm. • The pigtail connection points must be clean and dustless. Fiber connectors and optical ports that are not used must be protected with protective caps or plugs. Cleaning must be carried out in strict accordance with Huawei tool specifications.
	10	General	The feeder cables shall not be bent or twisted, with no copper wire exposed.
	11	General	The feeder cable connectors comply with corresponding standards and are correctly connected, without looseness.
	12	General	The feeder cables, power splitter, coupler, and surge protective devices are connected correctly and reliably in accordance with specifications.
	13	General	Strong current and weak current cables are routed separately. The power cables, ground cables, and signal cables are bundled and routed separately (with a spacing of more than 30 mm) to prevent electrical or magnetic interference. Use shielded cables in places with strong interference.
	14	General	When routing cables in walls, place the cables in the cable troughs or pipes and fix the cables using pipe straps. For non-metal corrugated pipes, the fixing distance should be about 1000 mm.

Compone nt	No.	Applic able Scope	Check Item
	15	Outdoor AP	All outdoor connectors or feeder cable connectors are properly sealed to prevent water. Wrap the cable using one-layer PVC insulation tape, three-layer waterproof tape, and then three-layer PVC insulation tape. The tape shall be attached evenly and neatly. The network cables shall be covered with waterproof PG tubes.
	16	Outdoor AP	Cable connectors are secured on cables and sealed to prevent water intrusion. The outlets of cable conduits on a wall are sealed by waterproof and flame-retardant materials. Drip loops meeting the minimum bending radius requirement are made on the network cable segment that stretches indoor.
	17	Outdoor AP	Do not deploy cables overhead between two buildings.
	18	General	Waterproof labels (providing device names and cable directions) are filled and attached to signal cables correctly. Each label is attached 20 mm to 100 mm from the corresponding cable connector.
	19	Outdoor AP	Surge protection measures are taken in the places where the outdoor APs are installed. The outdoor APs, antennas, and signal cables are deployed within 45-degree protection area of a lightning rod.
	20	Outdoor AP	The bare wires of network and feeder cables should be covered by the winding pipes, flexible metal conduit, PVC pipes, or galvanization pipes. The cable outlet and inlet are sealed to prevent dusts.
Antenna	1	General	The installation positions of antennas should comply with the engineering design and antennas should be securely and reliably installed.
	2	General	There should be no obstacles in the major coverage direction of antennas. The direction and downlink tilt of antennas should be adjusted based on the coverage targets.
	3	General	There should not be metal subjects within 1 m around an outdoor omnidirectional antenna.
	4	General	The azimuth deviation of a directional antenna should be within 5 degrees and the tilt deviation within 0.5 degree.
	5	Outdoor antenna	The antennas are fixed using special support that supports installation of surge protection devices and shall be located within a 45 degree protection angle of a lightning rod. When an antenna is mounted to a pole, the distance between the antenna and top of the pole should be at least 30 cm.
	6	Outdoor antenna	Take waterproof measures on connectors of the antennas and feeder cables and keep the drain holes of antennas downwards.

Compone nt	No.	Applic able Scope	Check Item
	7	Outdoor antenna	The pole used in antenna mounting should meet the following requirements: Pole height: ≥ 2000 mm Bottom pole diameter: ≥ 220 mm Top pole diameter: ≥ 120 mm Pole thickness: ≥ 6 mm Depth of foundation: ≥ 1500 mm The pole deployed outdoors must be reinforced with hot-dip zinc to prevent water corrosion and rust.
	8	Outdoor antenna	It is recommended that at most three APs or antennas be mounted to the same pole. The APs or antennas mounted to the same pole should meet the following requirements: • The vertical distance should be at least 3.5 m between adjacent 2.4G antennas and 2 m between adjacent 5G antennas. • There should be at least 1 m vertical distance between antennas that work on the same frequency band and belong to different APs.
	9	Outdoor antenna	When outdoor APs use single-polarized antennas, the horizontal distance between 2.4G antennas should be at least 1 m and that between 5G antennas should be at least 0.5 m.
	10	Outdoor antenna	If multiple APs are mounted to different poles, the APs should provide signal coverage in the same direction or in back-to-back mode to ensure that main lobe of antennas on different APs do not face each other. Recommended AP distance: ≥ 44 m (APs provide signal coverage in the same direction) ≥ 6 m (APs provide distance in back-to-back mode)
Power and ground cables	1	General	The female connectors of power cables connecting to the device are fixed using a locking latch.
	2	General	The power cables and ground cables are correctly connected.
	3	General	The power cables and ground cables are complete and not spliced.
	4	General	The excess of power cables or ground cables are trimmed off without any coils. The power cables connecting the delivered surge protection boxes and devices cannot be cut. These power cables can be coiled.
	5	General	Power cables and ground cable are separated from the signal cables.
	6	General	Power cables and ground cables are routed straightly and properly bundled, with sufficient slack at the bend part. If the

| Compone nt	No.	Applic able Scope	Check Item
			cables are fixed on a sharp mechanical part, take protection measures.
	7	General	The equipotential cables between the attaching cabinets shall be securely connected.
	8	General	The lugs for the power cables and ground cables are soldered or crimped securely.
	9	General	The lugs and bare wires of power cables and ground cables are tightly wrapped with tubes or insulation tape without any exposed copper wire. Flat washers and spring washers are installed correctly.
	10	General	Labels are filled and attached to power cables and ground cables correctly.
	11	General	Power cables deployed outdoors must be covered by PVC tubes.
Optica l modul e	1	General	A single-mode fiber can only be used with a single-mode optical module while a multimode optical fiber can only be used with a multimode optical module. On most optical modules, the fibers of different types cannot be used together.
	2	General	The labels of pluggable optical modules are smoothly attached and intact, and cannot be covered by the optical modules.
	3	General	If a short-distance optical fiber is used for a long-distance optical module, especially in loopback scenarios, use an optical attenuator to prevent the optical module from being burnt.
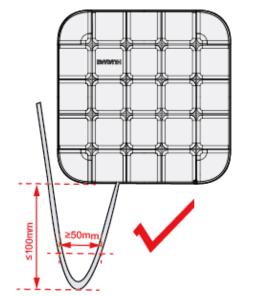
5.8 Guide to Making Drip Loops
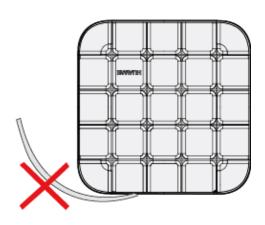
To prevent water from flowing into devices along cables, you need to take waterproof measures, for example, create a drip loop on a cable. As an example, the following describes how to create drip loops on network cables connected to a device in different directions.

 NOTE
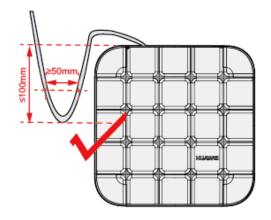
- When a device is installed in a harsh environment or its ports face upward, follow outdoor waterproof standards to lay out indoor cables. For details, see "Cable Connection" in the *AP6510DN&AP6610DN Hardware Installation and Maintenance Guide*.

- The network cable directions in the description below are relative to an AP.

- If a cable is downward, no drip loop is required.

Downward Port, Upward Cable

Upward Port, Upward Cable

Horizontal Port, Upward Cable

Bending Radius Requirements

- The bending radius of a 7/8" feeder must be more than 250 mm, and that of a 5/4" feeder must be more than 380 mm.

- The bending radius of a 1/4" jumper, 1/2" super-flexible jumper, and 1/2" common jumper must be greater than 35 mm, 50 mm, and 127 mm, respectively.
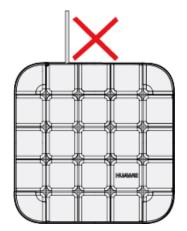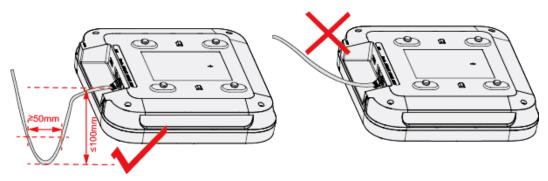- The bending radius of a ground cable must be greater than or equal to five times the cable diameter.
- The bending radius of a network cable must be greater than or equal to five times the cable diameter (that is, 50 mm).

5.9 Power Adaptation Solution

Select a suitable power supply mode as required.

DC Power Supply

Table 5-33 Mapping between device models and DC power adapters

Part Number	Name	Vendor	Applicable Device
0231 0JF D	S5700 Series,ES0W2PSD0150,150W DC Power Module	HUAWEI	AC6605
0222 0119	Adapter,0degC,40degC,90V,264V,+48V/2.08A	FSP	AD9430DN-12 AP2050DN, AP2050DN-E, and AP2050DN-S AP7050DN-E R250D-E
0222 0935	Adapter,-25degC,50degC,90V,290V,56V1.07A,C8	Ktec / HONOR	AP2050DN, AP2050DN-E, and AP2050DN-S AP4051TN AP6052DN AP7052DN, AP7152DN, AP7052DE R250D-E
0222 0864	AC/DC Adapter--5degC-45degC-90V-270V-12V/2A-Europe Standard-DC inlet	HuntKey / SHILONG FUHUA	AP1050DN-S AP4030TN, AP4050DN, AP4050DN-S, AP4050DN-E, AP4050DN-HD,
0222 22	AC/DC Adapter--5degC-45degC-90V-270V	HuntKey /	

Part Number	Name	Vendor	Applicable Device
0865	-12V/2A-UK Standard-DC inlet	SHILONG FUHUA	AP4051DN, AP4151DN, and AP430-E AP5030DN-C AP6050DN and AP6150DN AP7050DE R450D
02220866	AC/DC Adapter--5degC-45degC-90V-270V-12V/2A-Australia Standard-DC inlet	HuntKey	
02220867	Adapter,-5degC,45degC,90V,270V,12V/2A	HuntKey / SHILONG FUHUA	
02220868	AC/DC Adapter--5degC-45degC-90V-270V-12V/2A-China Standard-DC inlet	HuntKey / SHILONG FUHUA	
02220869	AC/DC Adapter--5degC-45degC-90V-270V-12V/2A-Brazil Standard-DC inlet	HuntKey	
02220870	Adapter,-5degC,45degC,90V,270V,12V/2A,India Plug, DC Plug	HuntKey / SHILONG FUHUA	

AC Power Supply

Table 5-34 Mapping between device models and AC power adapters

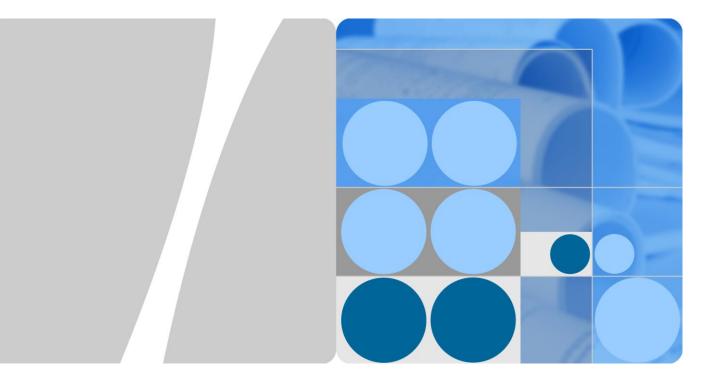| Part Number	Name	Vendor	Applicable Device
02310JFA	S5700 Series,ES0W2PSA0150,150W AC Power Module	HUAWEI	AC6605
02130983	AC/DC power module--25degC-55degC-90V-264V-12V/10A,-53.5V/7.1A	FSP/VAPEL	AC6605

PoE Power Supply

Table 5-35 Mapping between device models and PoE power adapters

Part Number	Name	Vendor	Applicable Device
022 203 69	Adapter,-40degC~50degC,90V~264V,54V/0.65A,C8/RJ45,GE	HuntKey / SHILONG FUHUA	AP2010DN, AP2030DN, AP2050DN, AP2050DN-S, AP2050DN-E AP3010DN AP4030DN, AP4030TN, AP4050DN, AP4050DN-E, AP4050DN-S, AP4051DN, AP4051TN, AP4130DN, AP4151DN AP5010DN, AP5010SN, AP5030DN, AP5030DN-C, AP5130DN AP6010SN, AP6010DN, AP6050DN, AP6052DN, AP6150DN, AP6510DN, AP6310SN AP7030DE, AP7050DE, AP7052DE, AP7052DN, AP7110DN, AP7110SN, AP7152DN AP8030DN, AP8050DN, AP8050DN-S, AP8050TN-HD, AP8130DN, AP8130DN-W, AP8150DN AP9330DN

Part Number	Name	Vendor	Applicable Device
			R240D, R250D, R250D-E, R450D
			AT815SN
022 201 54	Adapter,-25degC,60degC,90V,264V ,56V/1.52A,C8/RI45,POE ADAPTER	FSP	AD9430DN-12
			AP6052DN, AP6510DN
			AP7030DE, AP7050DE, AP7052DE, AP7052DN, AP7110DN, AP7110SN, AP7152DN
			AP8030DN, AP8130DN, AP8130DN-W, AP8050DN, AP8150DN, AP8050DN-S, AP8050TN-HD, AP8082DN, AP8182DN
			AP8030DN, AP8130DN, AP8130DN-W, AP8050DN, AP8150DN, AP8050DN-S, AP8082DN, AP8182DN
021 311 68	AC-DC Power,-5degC,45degC,90V,264V,4 8V/0.42A	SHILONG FUHUA	AT815SN

PSE Power Supply

- Switches, ACs, and APs supporting the PoE out function can be used as power sourcing equipment (PSE) to supply power to connected powered devices (PDs). Ensure that the PoE out power of a PSE meet requirements of PDs.

- An S5720-14X-PWH-SI-AC (part number: 02350MTV) can supply UPoE power to AP7050DN-Es.

AP7052DN

Product Description

Issue   01

Date   2017-10-27

Huawei Technologies Co., Ltd.

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About This Document

Purpose

This document describes the positioning, characteristics, hardware structure, product features, and technical specifications of the AP.

This document helps you understand the characteristics and features of the AP.

Intended Audience

This document is intended for:

- Network planning engineers
- Hardware installation engineers
- Commissioning engineer
- Data configuration engineers
- On-site maintenance engineers
- Network monitoring engineers
- System maintenance engineers

Symbol Conventions

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

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

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

Change History

Changes between document issues are cumulative. The latest document issue contains all the changes made in previous issues.

Changes in Issue 01 (2017-10-27)

This is the initial commercial release.

Contents
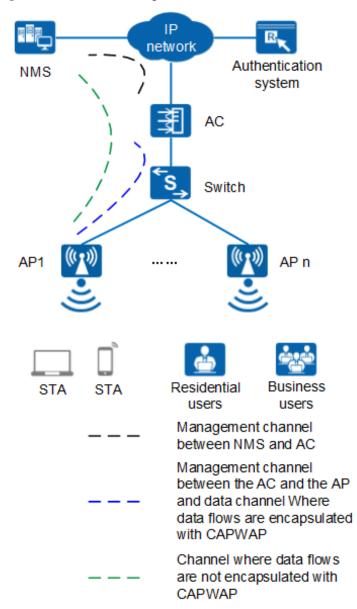
1 Product Positioning

Table 1-1 Product positioning

Product Model	Frequency Band	IEEE Standards Compliance	Positioning	Usage Scenario
AP7052DN	Dual bands: • 2.4 GHz • 5 GHz The AP7052DN and support 2.4 GHz & 5 GHz dual band dual concurrent (DBDC) and can work in dual-5G mode, providing a higher access capacity.	IEEE 802.11a/b/g/n/ac/ac Wave 2	The AP7052DN and are the next-generation technology-leading APs. They support 4x4 MU-MIMO and feature high reliability, high security, simple network deployment, automatic AC discovery and configuration, and real-time management and maintenance. In compliance with IEEE 802.11ac, the AP7052DN and support a theoretical rate of up to 3.46 Gbit/s, greatly improving user experience.	The AP7052DN and provide highest-quality wireless services for mobile office, high-density scenarios, elementary education, and higher education. They provide flexible distribution options in different environments.

The AP7052DN and   can work as a Fat AP, Fit AP, or cloud AP. The AP can switch flexibly among three working modes based on the network plan.
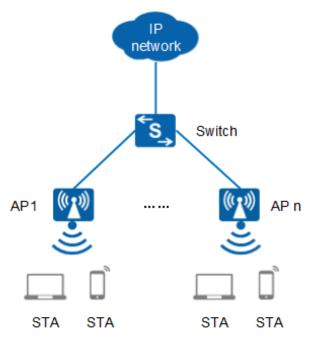
Typical networking modes are as follows:

Figure 1-2 Fit AP networking (AP mode)

In this networking, the AP functions as a Fit AP. The AC is responsible for user access, AP go-online, AP management, authentication, routing, security, and QoS. Huawei products that provide the AC function include the AC6605, AC6005, ACU2 (with S7700, S9700, or S12700), S5720HI, S7700 (with X series board), S9700 (with X series board), and S12700 (with X series board).

Figure 1-3 Fat AP networking

In this networking, the device functions as a Fat AP to implement functions such as user access, authentication, data security, service forwarding, and QoS.
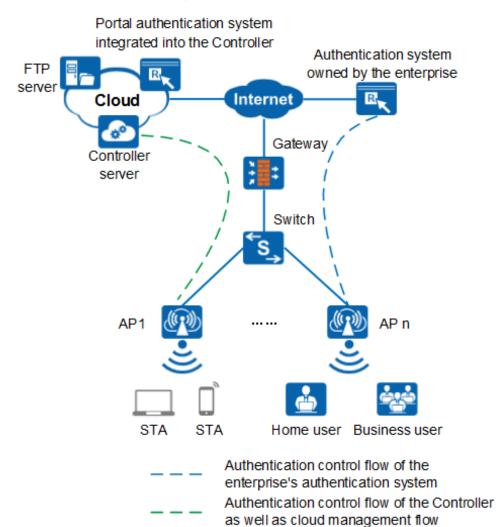
Figure 1-4 Cloud AP networking

In this networking, the device functions as a cloud AP and works with the Agile Controller-Campus on the same cloud for user access, AP online, authentication, routing, AP management, security, and QoS. An enterprise can choose to use the Portal authentication server integrated in the Agile Controller-Campus or the authentication server deployed by itself.

2 Hardware Structure

2.1 AP7052DN

Appearance

Figure 2-1 shows the appearance of the AP.

> 📖 **NOTE**
>
> The actual device appearance may be different from the following device appearance, but these differences will not affect device functions.
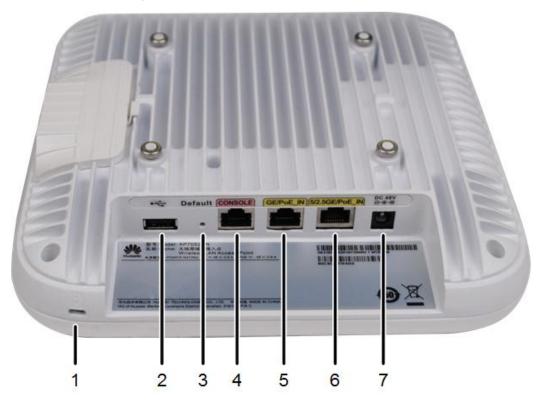
Figure 2-1 AP7052DN appearance

Port

The following figure shows ports on the AP7052DN.

Figure 2-2 AP7052DN ports

As shown in Figure 2-2, each port can be described as follows:
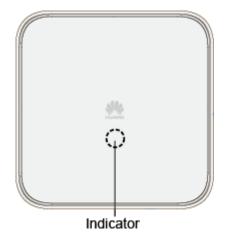
1. Security slot: Connects to a security lock.

2. USB: Connects to a USB flash drive or other storage devices to extend the storage space of the AP. The USB2.0 standard is supported.

3. Default: Restores factory settings and restarts the device when you hold down the button more than 3 seconds.

4. CONSOLE: Connects to a maintenance terminal for AP configuration and management.

5. GE/PoE_IN:10/100/1000M port that connects to the wired Ethernet and supports PoE input.

6. 5/2.5GE/PoE_IN:100M/1000M/2.5G/5G port that connects to the wired Ethernet and supports PoE input.

7. DC 48V: Connects a power adapter to the AP.

LED Indicators

📖 **NOTE**

● The indicator is located inside the panel, which turns on after the AP is powered on.

● Indicator colors may vary slightly at different temperature.

Figure 2-3 Indicator

Indicator

Table 2-1 Description about the single indicator

Type	Color	Status	Description
Default status after power-on	Green	Steady on	The AP is just powered on and the software is not started yet.
Software startup status	Green	Steady on after blinking once	After the system is reset and starts uploading the software, the indicator blinks green once. Until the software is uploaded and started, the indicator remains steady green.
Running status	Green	Blinking once every 2s (0.5 Hz)	• The system is running properly, the Ethernet connection is normal, and STAs are associated with the AP. • The system enters the Uboot CLI.
		Blinking once every 5s (0.2 Hz)	The system is running properly, the Ethernet connection is normal, and no STA is associated with the AP. The system is in low power consumption state.
Alarm	Green	Blinking once every 0.25s (4 Hz)	• The software is being upgraded. • After the software is loaded and started, the AP requests to go online if it works in Fit AP or cloud-based management mode. The indicator remains in this state before the AP successfully goes online. • The AP works in Fit AP or cloud-based management mode and fails to go online.
Fault	Red	Steady on	A fault that affects services has occurred, such as a DRAM detection failure or system software loading failure. The fault cannot be automatically rectified and must be rectified manually.

3 Product Features (in Fat AP and Fit AP Modes)

3.1 WLAN Features

WLAN features supported by the AP are as follows:

- Compliance with IEEE 802.11a/b/g/n/ac/ac Wave 2
- Maximum rate of 3.46 Gbit/s
- Maximum ratio combining (MRC)
- Space time block code (STBC)
- Beamforming
- MU-MIMO
- Low-density parity-check (LDPC)
- Maximum-likelihood detection (MLD)
- Frame aggregation, including A-MPDU (Tx/Rx) and A-MSDU (Tx/Rx)
- 802.11 dynamic frequency selection (DFS)
- Short guard interval (GI) in 20 MHz, 40 MHz, 80 MHz, 160 MHz, and 80+80 MHz modes
- Priority mapping and packet scheduling based on a Wi-Fi Multimedia (WMM) profile to implement priority-based data processing and forwarding
- Automatic and manual rate adjustment
- WLAN channel management and channel rate adjustment

> **NOTE**
>
> For details about WLAN channel management, see the *Country Code & Channel Compliance Table*.

- Automatic channel scanning and interference avoidance
- Service set identifier (SSID) hiding
- Signal sustain technology (SST)
- Unscheduled automatic power save delivery (U-APSD)
- Control and Provisioning of Wireless Access Points (CAPWAP) in Fit AP mode
- Automatic login in Fit AP mode
- Extended Service Set (ESS) in Fit AP mode
- Wireless distribution system (WDS) in Fit AP mode

- Mesh networking in Fit AP mode
- Multi-user CAC

3.2 Network Features

Network features supported by the AP are as follows:

- Compliance with IEEE 802.3ab
- Auto-negotiation of the rate and duplex mode and automatic switchover between the Media Dependent Interface (MDI) and Media Dependent Interface Crossover (MDI-X)
- Compliance with IEEE 802.1q
- SSID-based VLAN assignment
- VLAN trunk on uplink Ethernet ports
- Management channel of the AP uplink port in tagged and untagged mode
- DHCP client, obtaining IP addresses through DHCP
- Tunnel data forwarding and direct data forwarding
- STA isolation in the same VLAN
- Access control lists (ACLs)
- Link Layer Discovery Protocol (LLDP)
- Uninterrupted service forwarding upon CAPWAP channel disconnection in Fit AP mode
- Unified authentication on the AC in Fit AP mode
- AC dual-link backup in Fit AP mode
- Network Address Translation (NAT) in Fat AP mode
- IPv6 in Fit AP mode

3.3 QoS Features

QoS features supported by the AP are as follows:

- Priority mapping and packet scheduling based on a Wi-Fi Multimedia (WMM) profile to implement priority-based data processing and forwarding
- WMM parameter management for each radio
- WMM power saving
- Priority mapping for upstream packets and flow-based mapping for downstream packets
- Queue mapping and scheduling
- User-based bandwidth limiting
- Adaptive bandwidth management (automatic bandwidth adjustment based on the user quantity and radio environment) to improve user experience
- Smart Application Control (SAC) in Fit AP mode

3.4 Security Features

Security features supported by the AP are as follows:

- Open system authentication
- WEP authentication/encryption using a 64-bit, 128-bit, or 152-bit encryption key
- WPA/WPA2-PSK authentication and encryption (WPA/WPA2 personal edition)
- WPA/WPA2-802.1x authentication and encryption (WPA/WPA2 enterprise edition)
- WPA-WPA2 hybrid authentication
- WAPI authentication and encryption
- Wireless intrusion detection system (WIDS) and wireless intrusion prevention system (WIPS), including rogue device detection and countermeasure, attack detection and dynamic blacklist, and STA/AP blacklist and whitelist
- 802.1x authentication, MAC address authentication, and Portal authentication
- DHCP snooping
- Dynamic ARP Inspection (DAI)
- IP Source Guard (IPSG)

3.5 Maintenance Features

Maintenance features supported by the AP are as follows:

- Unified management and maintenance on the AC in Fit AP mode
- Automatic login and configuration loading, and plug-and-play (PnP) in Fit AP mode
- WDS zero-configuration deployment in Fit AP mode
- Mesh network zero-configuration deployment in Fit AP mode
- Batch upgrade in Fit AP mode
- Telnet
- STelnet using SSH v2
- SFTP using SSH v2
- Local AP management through the serial interface
- Web local AP management through HTTP or HTTPS in Fat AP mode
- Real-time configuration monitoring and fast fault location using the NMS
- SNMP v1/v2/v3 in Fat AP mode
- System status alarm
- Network Time Protocol (NTP) in Fat AP mode

3.6 BYOD

 NOTE

The AP supports bring your own device (BYOD) only in Fit AP mode.

BYOD features supported by the AP are as follows:

- Identifies the device type according to the organizationally unique identifier (OUI) in the MAC address.
- Identifies the device type according to the user agent (UA) information in an HTTP packet.
- Identifies the device type according to DHCP options.
- The RADIUS server delivers packet forwarding, security, and QoS policies according to the device type carried in the RADIUS authentication and accounting packets.

3.7 Locating Service

📖 NOTE

The AP supports the locating service only in Fit AP mode.

Locating service features supported by the AP are as follows:

- Locates tags manufactured by AeroScout or Ekahau.
- Locates Wi-Fi terminals.
- Works with eSight to locate rogue devices.
- Supports Bluetooth location.

3.8 Spectrum Analysis

📖 NOTE

The AP supports spectrum analysis only in Fit AP mode.

Spectrum analysis features supported by the AP are as follows:

- Identifies interference sources such as baby monitors, Bluetooth devices, digital cordless phones (at 2.4 GHz frequency band only), wireless audio transmitters (at both the 2.4 GHz and 5 GHz frequency bands), wireless game controllers, and microwaves.
- Works with eSight to perform spectrum analysis on interference sources.

4 Product Features (in Cloud-based Management Mode)

The following table lists features supported by APs in cloud-based management mode.

Features	Description
WLAN Features	• Compliance with IEEE 802.11a/b/g/n/ac/ac Wave 2 • Maximum rate of 3.46 Gbit/s • Maximum ratio combining (MRC) • Space time block code (STBC) • Beamforming • Low-density parity-check (LDPC) • Maximum-likelihood detection (MLD) • Frame aggregation, including A-MPDU (Tx/Rx) and A-MSDU (Tx/Rx) • 802.11 dynamic frequency selection (DFS) • Priority mapping and packet scheduling based on a Wi-Fi Multimedia (WMM) profile to implement priority-based data processing and forwarding • WLAN channel management and channel rate adjustment **NOTE** For details about WLAN channel management, see the *Country Code & Channel Compliance Table*. • Automatic channel scanning and interference avoidance • Service set identifier (SSID) hiding • Signal sustain technology (SST) • Unscheduled automatic power save delivery (U-APSD)

Features	Description
	• Automatic login
Network Features	• Compliance with IEEE 802.3ab
	• Auto-negotiation of the rate and duplex mode and automatic switchover between the Media Dependent Interface (MDI) and Media Dependent Interface Crossover (MDI-X)
	• Compliance with IEEE 802.1q
	• SSID-based VLAN assignment
	• DHCP client, obtaining IP addresses through DHCP
	• STA isolation in the same VLAN
	• Access control lists (ACLs)
	• Unified authentication on the Agile Controller
	• Network Address Translation (NAT)
QoS Features	• Priority mapping and packet scheduling based on a Wi-Fi Multimedia (WMM) profile to implement priority-based data processing and forwarding
	• WMM parameter management for each radio
	• WMM power saving
	• Priority mapping for upstream packets and flow-based mapping for downstream packets
	• Queue mapping and scheduling
	• User-based bandwidth limiting
	• Airtime scheduling
Security Features	• Open system authentication
	• WEP authentication/encryption using a 64-bit, 128-bit, or 152-bit encryption key
	• WPA2-PSK authentication and encryption (WPA2 personal edition)
	• WPA2-802.1x authentication and encryption (WPA2 enterprise edition)
	• WPA-WPA2 hybrid authentication
	• 802.1x authentication, MAC address authentication, and Portal authentication
	• DHCP snooping
	• Dynamic ARP Inspection (DAI)
	• IP Source Guard (IPSG)
Maintenance Features	• Unified management and maintenance

Features	Description
	on the Agile Controller
	• Automatic login and configuration loading, and plug-and-play (PnP)
	• Batch upgrade
	• Telnet
	• STelnet using SSH v2
	• SFTP using SSH v2
	• Local AP management through the serial interface
	• Web local AP management through HTTP or HTTPS
	• Real-time configuration monitoring and fast fault location using the NMS
	• System status alarm
	• Network Time Protocol (NTP)

5 Technical Specifications

5.1 Basic Specifications

Table 5-1 Basic specifications

Item		Description
Physical specifications	Dimensions (H x W x D)	52 mm $\times$ 220 mm $\times$ 220 mm
	Weight	• AP7052DN: 1.68 kg • : 1.7 kg
	System memory	512 MB DDR3L
	FLASH	16 MB NOR FLASH + 128 MB NAND FLASH
Power specifications	Power input	• DC: 42.5 V to 57 V • PoE power supply: in compliance with IEEE 802.3at/bt
	Maximum power consumption	33 W (excluding the output power of the USB port) **NOTE** The actual maximum power consumption depends on local laws and regulations.
Environment specifications	Operating temperature	• -60 m to +1800 m: -10 ℃ to +50 ℃ • 1800 m to 5000 m: Temperature decreases by 1 ℃ every time the altitude increases 300 m.
	Storage temperature	-40 ℃ to +70 ℃
	Operating humidity	5% to 95% (non-condensing)
	IP rating	IP41
	Atmospheric pressure	53 kPa to 106 kPa

5.2 Radio Specifications

Table 5-2 Radio specifications

Item	Description		
Antenna type	AP7052DN: built-in omnidirectional dual-band antenna : external omnidirectional dual-band antenna		
Antenna gain	AP7052DN: • 2.4G/5G (switchable): 2 dBi/2.8 dBi • 5G (non-switchable): 2.8 dBi		
Maximum number of users	Fit AP: ≤ 512 Fat AP: ≤ 512 Cloud AP: ≤ 512		
Maximum number of VAPs for each radio	16		
Maximum transmit power	• 2.4G/5G (switchable): 26 dBm/21 dBm (combined power) • 5G (non-switchable): 25 dBm (combined power) **NOTE** The actual transmit power depends on local laws and regulations. You can adjust the transmit power of a 2.4G or 5G radio port to -5 sdBm, with a step of 1 dB.		
Maximum number of non-overlapping channels	2.4 GHz (2.412 GHz to 2.472 GHz) • 802.11b/g – 20 MHz: 3 • 802.11n – 20 MHz: 3 – 40 MHz: 1	5 GHz (5.18 GHz to 5.825 GHz) • 802.11a – 20 MHz: 13 • 802.11n – 20 MHz: 13 – 40 MHz: 6 • 802.11ac – 20 MHz: 13 – 40 MHz: 6 – 80 MHz: 3	**NOTE** The table uses the number of non-overlapping channels supported by China as an example. The number of non-overlapping channels varies in different countries. For details, see the *Country Codes & Channels Compliance*. **NOTICE** If the AP is delivered to the USA, pay attention to the following on channel and frequency band usage. 1. The country code of the AP is fixed. 2. High power radars working at frequencies in the range of 5.25 GHz to 5.35 GHz, 5.47 GHz to 5.6 GHz, and 5.65 GHz to 5.725 GHz can interfere with or even damage APs working at the same frequency.

Item	Description			
	– 160 MHz: 1			
Channel rate supported	• 802.11b: 1, 2, 5.5, and 11 Mbit/s • 802.11a/g: 6, 9, 12, 18, 24, 36, 48, and 54 Mbit/s • 802.11n: 6.5 to 800 Mbit/s • 802.11ac Wave 2: 6.5 to 1733.3 Mbit/s			
Receiver sensitivity (Typical values)	2.4 GHz 802.11b • –104 dBm @ 1 Mbit/s • –101 dBm @ 2 Mbit/s • –99 dBm @ 5.5 Mbit/s • –95 dBm @ 11 Mbit/s	2.4 GHz 802.11g • –96 dBm @ 6 Mbit/s • –95 dBm @ 9 Mbit/s • –95 dBm @ 12 Mbit/s • –93 dBm @ 18 Mbit/s • –90 dBm @ 24 Mbit/s • –86 dBm @ 36 Mbit/s • –82 dBm @ 48 Mbit/s • –77 dBm @ 54 Mbit/s	2.4 GHz 802.11n (HT20) • -95 dBm @ MCS0 • -92 dBm @ MCS1 • -92 dBm @ MCS2 • -88 dBm @ MCS3 • -86 dBm @ MCS4 • -81 dBm @ MCS5 • -80 dBm @ MCS6 • -78 dBm @ MCS7 • -94 dBm @ MCS8 • -91 dBm @ MCS9 • -91 dBm @ MCS10 • -87 dBm @ MCS11 • -85 dBm @ MCS12 • -80 dBm @ MCS13 • -79 dBm @ MCS14 • -77 dBm @ MCS15 • -93 dBm @ MCS16 • -90 dBm @ MCS17	2.4 GHz 802.11n (HT40) • -92 dBm @ MCS0 • -91 dBm @ MCS1 • -89 dBm @ MCS2 • -85 dBm @ MCS3 • -83 dBm @ MCS4 • -78 dBm @ MCS5 • -77 dBm @ MCS6 • -76 dBm @ MCS7 • -91 dBm @ MCS8 • -90 dBm @ MCS9 • -88 dBm @ MCS10 • -84 dBm @ MCS11 • -82 dBm @ MCS12 • -77 dBm @ MCS13 • -76 dBm @ MCS14 • -75 dBm @ MCS15 • -90 dBm @ MCS16 • -89 dBm @ MCS17

Item	Description			
			• -90 dBm @ MCS18	• -87 dBm @ MCS18
			• -86 dBm @ MCS19	• -83 dBm @ MCS19
			• -84 dBm @ MCS20	• -81 dBm @ MCS20
			• -79 dBm @ MCS21	• -76 dBm @ MCS21
			• -78 dBm @ MCS22	• -75 dBm @ MCS22
			• -76 dBm @ MCS23	• -74 dBm @ MCS23
			• -92 dBm @ MCS24	• -89 dBm @ MCS24
			• -89 dBm @ MCS25	• -88 dBm @ MCS25
			• -89 dBm @ MCS26	• -86 dBm @ MCS26
			• -85 dBm @ MCS27	• -82 dBm @ MCS27
			• -83 dBm @ MCS28	• -80 dBm @ MCS28
			• -78 dBm @ MCS29	• -75 dBm @ MCS29
			• -77 dBm @ MCS30	• -74 dBm @ MCS30
			• -75 dBm @ MCS31	• -73 dBm @ MCS31
	5 GHz 802.11a • −95 dBm @ 6 Mbit/s • −94 dBm @ 9 Mbit/s • −91 dBm @ 12 Mbit/s • −89 dBm @ 18 Mbit/s • −88 dBm @ 24 Mbit/s • −84 dBm @ 36 Mbit/s • −81 dBm @ 48 Mbit/s • −79 dBm @	5 GHz 802.11n (HT20) • -94 dBm @ MCS0 • -91 dBm @ MCS1 • -89 dBm @ MCS2 • -86 dBm @ MCS3 • -83 dBm @ MCS4 • -80 dBm @ MCS5 • -78 dBm @ MCS6 • -77 dBm @	5 GHz 802.11n (HT40) • -93 dBm @ MCS0 • -90 dBm @ MCS1 • -88 dBm @ MCS2 • -84 dBm @ MCS3 • -81 dBm @ MCS4 • -77 dBm @ MCS5 • -76 dBm @ MCS6 • -74 dBm @	-

Item	Description			
	54 Mbit/s	MCS7	MCS7	
		• -93 dBm @ MCS8	• -92 dBm @ MCS8	
		• -90 dBm @ MCS9	• -89 dBm @ MCS9	
		• -88 dBm @ MCS10	• -87 dBm @ MCS10	
		• -85 dBm @ MCS11	• -83 dBm @ MCS11	
		• -82 dBm @ MCS12	• -80 dBm @ MCS12	
		• -79 dBm @ MCS13	• -76 dBm @ MCS13	
		• -77 dBm @ MCS14	• -75 dBm @ MCS14	
		• -76 dBm @ MCS15	• -73 dBm @ MCS15	
		• -92 dBm @ MCS16	• -91 dBm @ MCS16	
		• -89 dBm @ MCS17	• -88 dBm @ MCS17	
		• -87 dBm @ MCS18	• -86 dBm @ MCS18	
		• -84 dBm @ MCS19	• -82 dBm @ MCS19	
		• -81 dBm @ MCS20	• -79 dBm @ MCS20	
		• -78 dBm @ MCS21	• -75 dBm @ MCS21	
		• -76 dBm @ MCS22	• -74 dBm @ MCS22	
		• -75 dBm @ MCS23	• -72 dBm @ MCS23	
		• -91 dBm @ MCS24	• -90 dBm @ MCS24	
		• -88 dBm @ MCS25	• -87 dBm @ MCS25	
		• -86 dBm @ MCS26	• -85 dBm @ MCS26	
		• -83 dBm @ MCS27	• -81 dBm @ MCS27	
		• -80 dBm @ MCS28	• -78 dBm @ MCS28	
		• -77 dBm @ MCS29	• -74 dBm @ MCS29	
		• -75 dBm @	• -73 dBm @	

Item	Description			
		MCS30 • -74 dBm @ MCS31	MCS30 • -71 dBm @ MCS31	
	5 GHz 802.11ac (VHT20) • -94 dBm @ MCS0NSS1 • -90 dBm @ MCS1NSS1 • -88 dBm @ MCS2NSS1 • -87 dBm @ MCS3NSS1 • -83 dBm @ MCS4NSS1 • -79 dBm @ MCS5NSS1 • -78 dBm @ MCS6NSS1 • -74 dBm @ MCS7NSS1 • -73 dBm @ MCS8NSS1 • -94 dBm @ MCS0NSS2 • -89 dBm @ MCS1NSS2 • -87 dBm @ MCS2NSS2 • -86 dBm @ MCS3NSS2 • -82 dBm @ MCS4NSS2 • -78 dBm @ MCS5NSS2 • -77 dBm @ MCS6NSS2 • -73 dBm @ MCS7NSS2 • -72 dBm @ MCS8NSS2 • -93 dBm @ MCS0NSS3 • -88 dBm @	5 GHz 802.11ac (VHT40) • -91 dBm @ MCS0NSS1 • -89 dBm @ MCS1NSS1 • -87 dBm @ MCS2NSS1 • -84 dBm @ MCS3NSS1 • -81 dBm @ MCS4NSS1 • -77 dBm @ MCS5NSS1 • -76 dBm @ MCS6NSS1 • -74 dBm @ MCS7NSS1 • -71 dBm @ MCS8NSS1 • -70 dBm @ MCS9NSS1 • -91 dBm @ MCS0NSS2 • -88 dBm @ MCS1NSS2 • -86 dBm @ MCS2NSS2 • -83 dBm @ MCS3NSS2 • -80 dBm @ MCS4NSS2 • -76 dBm @ MCS5NSS2 • -75 dBm @ MCS6NSS2 • -73 dBm @ MCS7NSS2 • -70 dBm @ MCS8NSS2 • -69 dBm @	5 GHz 802.11ac (VHT80) • -88 dBm @ MCS0NSS1 • -86 dBm @ MCS1NSS1 • -85 dBm @ MCS2NSS1 • -81 dBm @ MCS3NSS1 • -78 dBm @ MCS4NSS1 • -74 dBm @ MCS5NSS1 • -72 dBm @ MCS6NSS1 • -71 dBm @ MCS7NSS1 • -67 dBm @ MCS8NSS1 • -65 dBm @ MCS9NSS1 • -87 dBm @ MCS0NSS2 • -85 dBm @ MCS1NSS2 • -84 dBm @ MCS2NSS2 • -80 dBm @ MCS3NSS2 • -77 dBm @ MCS4NSS2 • -73 dBm @ MCS5NSS2 • -71 dBm @ MCS6NSS2 • -70 dBm @ MCS7NSS2 • -66 dBm @ MCS8NSS2 • -64 dBm @	5 GHz 802.11ac (VHT160) • -85 dBm @ MCS0NSS1 • -81 dBm @ MCS1NSS1 • -80 dBm @ MCS2NSS1 • -79 dBm @ MCS3NSS1 • -74 dBm @ MCS4NSS1 • -71 dBm @ MCS5NSS1 • -69 dBm @ MCS6NSS1 • -68 dBm @ MCS7NSS1 • -65 dBm @ MCS8NSS1 • -63 dBm @ MCS9NSS1 • -84 dBm @ MCS0NSS2 • -80 dBm @ MCS1NSS2 • -79 dBm @ MCS2NSS2 • -78 dBm @ MCS3NSS2 • -73 dBm @ MCS4NSS2 • -70 dBm @ MCS5NSS2 • -68 dBm @ MCS6NSS2 • -67 dBm @ MCS7NSS2 • -64 dBm @ MCS8NSS2 • -62 dBm @

Item	Description			
	MCS1NSS3	MCS9NSS2	MCS9NSS2	MCS9NSS2
	• -86 dBm @ MCS2NSS3	• -90 dBm @ MCS0NSS3	• -86 dBm @ MCS0NSS3	
	• -85 dBm @ MCS3NSS3	• -87 dBm @ MCS1NSS3	• -84 dBm @ MCS1NSS3	
	• -81 dBm @ MCS4NSS3	• -85 dBm @ MCS2NSS3	• -83 dBm @ MCS2NSS3	
	• -77 dBm @ MCS5NSS3	• -82 dBm @ MCS3NSS3	• -79 dBm @ MCS3NSS3	
	• -76 dBm @ MCS6NSS3	• -79 dBm @ MCS4NSS3	• -76 dBm @ MCS4NSS3	
	• -72 dBm @ MCS7NSS3	• -75 dBm @ MCS5NSS3	• -72 dBm @ MCS5NSS3	
	• -71 dBm @ MCS8NSS3	• -74 dBm @ MCS6NSS3	• -69 dBm @ MCS7NSS3	
	• -91 dBm @ MCS0NSS4	• -72 dBm @ MCS7NSS3	• -65 dBm @ MCS8NSS3	
	• -87 dBm @ MCS1NSS4	• -69 dBm @ MCS8NSS3	• -63 dBm @ MCS9NSS3	
	• -85 dBm @ MCS2NSS4	• -68 dBm @ MCS9NSS3	• -85 dBm @ MCS0NSS4	
	• -84 dBm @ MCS3NSS4	• -88 dBm @ MCS0NSS4	• -83 dBm @ MCS1NSS4	
	• -80 dBm @ MCS4NSS4	• -86 dBm @ MCS1NSS4	• -82 dBm @ MCS2NSS4	
	• -76 dBm @ MCS5NSS4	• -84 dBm @ MCS2NSS4	• -78 dBm @ MCS3NSS4	
	• -75 dBm @ MCS6NSS4	• -81 dBm @ MCS3NSS4	• -75 dBm @ MCS4NSS4	
	• -72 dBm @ MCS7NSS4	• -78 dBm @ MCS4NSS4	• -71 dBm @ MCS5NSS4	
	• -70 dBm @ MCS8NSS4	• -74 dBm @ MCS5NSS4	• -69 dBm @ MCS6NSS4	
		• -73 dBm @ MCS6NSS4	• -68 dBm @ MCS7NSS4	
		• -71 dBm @ MCS7NSS4	• -64 dBm @ MCS8NSS4	
		• -68 dBm @ MCS8NSS4	• -62 dBm @ MCS9NSS4	
		• -67 dBm @ MCS9NSS4		

5.3 Standards Compliance

Safety Standards

- UL 60950–1
- CAN/CSA 22.2 No.60950-1
- IEC 60950–1
- EN 60950–1
- GB 4943

Radio Standards

- ETSI EN 300 328
- ETSI EN 301 893
- RSS-210
- AS/NZS 4268

EMC Standards

- EN 301 489–1
- EN 301 489–17
- ETSI EN 60601-1-2
- FCC Part 15
- ICES-003
- YD/T 1312.2-2004
- ITU k.20
- GB 9254
- GB 17625.1
- AS/NZS CISPR22
- EN 55022
- EN 55024
- CISPR 22
- CISPR 24
- IEC61000-4-6
- IEC61000-4-2

IEEE Standards

- IEEE 802.11a/b/g
- IEEE 802.11n
- IEEE 802.11ac
- IEEE 802.11h
- IEEE 802.11d
- IEEE 802.11e

Security Standards

- 802.11i, Wi-Fi Protected Access 2 (WPA2), and WPA
- 802.1X
- Advanced Encryption Standards (AES) and Temporal Key Integrity Protocol (TKIP)
- EAP Type (s)

EMF

- CENELEC EN 62311
- CENELEC EN 50385
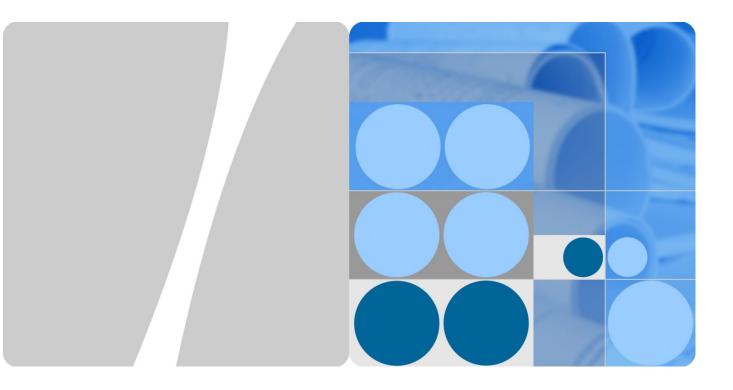- OET65
- RSS-102
- FCC Part1&2
- FCC KDB series

RoHS

- Directive 2002/95/EC & 2011/65/EU

Reach

- Regulation 1907/2006/EC

WEEE

- Directive 2002/96/EC & 2012/19/EU

AP7052DN
Regulatory Compliance Statement

Issue   01

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1 Regulatory Compliance Information

About This Chapter

1.1 Regulatory Compliance Standards

AP7052DN complies with the standards listed in Table 1-1.

Table 1-1 Regulatory compliance standards

Discipline	Standards
EMC	• CISPR32 Class B • EN 55032 Class B • FCC Part 15 Subpart B Class B • CISPR24 • EN 55024 • ETSI EN 301 489-1 • ETSI EN 301 489-17
Safety	• IEC 60950-1 • EN 60950-1

Discipline	Standards
RF	• ETSI EN 300 328 • ETSI EN 301 893 • FCC Part15 Subpart C • FCC Part15 Subpart E
Hazardous substances	• EN 50581
Health	• EN 50385 • FCC Part 1 1.1310

NOTE

EMC: electromagnetic compatibility

RF: radio frequency

CISPR: International Special Committee on Radio Interference

EN: European Standard

ETSI: European Telecommunications Standards Institute

CFR: Code of Federal Regulations

FCC: Federal Communication Commission

IEC: International Electrotechnical Commission

AS/NZS: Australian/New Zealand Standard

VCCI: Voluntary Control Council for Interference

CNS: Chinese National Standard

UL: Underwriters Laboratories

CSA: Canadian Standards Association

BS: British Standard

IS: Indian Standard

GR: General Requirement

WLAN: wireless local area network

ICNIRP: International Commission on Non-Ionizing Radiation Protection

OET: Office of Engineering Technology

IEEE: Institute of Electrical and Electronics Engineers

RoHS: restriction of the use of certain hazardous substances

1.2 European Regulatory Compliance

AP7052DN complies with the following European directives and regulations.

- 2014/53/EU(RED)
- 2011/65/EU (RoHS)
- REGULATION (EC) NO. 1907/2006 (REACH)
- 2012/19/EU (WEEE)
- 2004/12/EC&94/62/EC (Packaging)
- 2006/66/EC (Batteries and accumulators)

AP7052DN complies with Directive 2012/19/EU on waste electrical and electronic equipment (WEEE). Huawei is responsible for recycling its end-of-life devices, and please contact Huawei local service center when recycling is required. Huawei strictly complies with the EU Waste Electrical and Electronic Equipment Directive (WEEE Directive) and electronic waste management regulations enacted by different countries worldwide. In addition, Huawei has established a system for recycling and reuse of electronic wastes, and it can provide service of dismantling and recycling for WEEE. By Huawei recycling system, the waste can be handled environmentally and the resource can be recycled and reused fully, which is also Huawei WEEE stratagem in the word. Most of the materials in product are recyclable, and our packaging is designed to be recycled and should be handled in accordance with your local recycling policies.

In accordance with Article 11(2) in Directive 2012/19/EU (WEEE), products were marked with the following symbol: a cross-out wheeled waste bin with a bar beneath as below:

CE Marking:

The following CE mark identifier and affixed to the equipment and packaging:

Article 10.2

This device shall be so constructed that it can be operated in at least one Member State without infringing applicable requirements on the use of radio spectrum.

Article 10.10

The functions of Wireless Access Systems including Radio Local Area Networks (WAS/RLANs) within the band 5150-5350 MHz for this device are restricted to indoor use only within all European Union countries (BE/BG/CZ/DK/DE/EE/IE/EL/ES/FR/HR/IT/CY/LV/LT/LU/HU/MT/NL/AT/PL/PT/RO/SI/SK/FI/SE/UK).

1.3 U.S.A Regulatory Compliance

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

This equipment should be installed and operated with minimum distance 20cm between the radiator& your body.

1.3.1 FCC Part 15B

AP7052DN complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- This device does not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation.

If this device is modified without authorization from Huawei, the device may no longer comply with FCC requirements for Class B digital devices. In that a case, your right to use the device may be limited by FCC regulations. Moreover, you may be required to correct any interference to radio or television communications at your own expense.

This device has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

This device generates, uses and radiates radio frequency energy. If it is not installed and used in accordance with the instructions, it may cause harmful interference to radio communications.

However, there is no guarantee that interference will not occur in a particular installation. If this device does cause harmful interference to radio or television reception, which can be determined by turning the device off and on, the user may take one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Reinforce the separation between the device and receiver.
- Connect the device into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio or TV technician for assistance.

⚠️ **CAUTION**

The manufacturer is not responsible for any radio or TV interference caused by unauthorized modifications to this equipment. Such modifications could void the user authority to operate the equipment.

1.4 **CISPR 32 Compliance**

AP7052DN complies with CISPR 32 for Class B by the ITE.

1.5 **RF Exposure (Health) Information**

This equipment complies with relevant RF radiation exposure limits set forth for a public/uncontrolled environment. This equipment should be installed and/or operated with a minimum distance as below between the radiator and your body.

- AP7052DN: 20 centimeters.

1.6 **Other Markets**

For relevant compliance information/documentation for markets not mentioned above, please contact Huawei representative