



Ruijie RG-AP710 Series Access Points

Hardware Installation and Reference Guide V1.00

Copyright statement

Ruijie Networks©2019

Ruijie Networks reserves all copyrights of this document. Any reproduction, excerpt, backup, modification, transmission, translation or commercial use of this document or any portion of this document, in any form or by any means, without the prior written consent of Ruijie Networks is prohibited.

Exemption statement

This document is provided “as is”. The contents of this document are subject to change without any notice. Please obtain the latest information through the Ruijie Networks website. Ruijie Networks endeavors to ensure content accuracy and will not shoulder any responsibility for losses and damages caused due to content omissions, inaccuracies or errors.

Preface

Thank you for using our products. This manual will guide you through the installation of the access point.

Scope

It is intended for the users who have some experience in installing and maintaining network hardware. At the same time, it is assumed that the users are already familiar with the related terms and concepts.

Obtaining Technical Assistance

- Ruijie Networks Website: <https://www.ruijienetworks.com/>
- Technical Support Website: <https://ruijienetworks.com/support>
- Case Portal: <https://caseportal.ruijienetworks.com>
- Community: <https://community.ruijienetworks.com>
- Technical Support Email: service_rj@ruijienetworks.com
- Skype: [service_rj@ruijienetworks.com](https://www.skype.com/partner/service_rj@ruijienetworks.com)

Related Documents

Documents	Description
Configuration Guide	Describes network protocols and related mechanisms that supported by the product, with configuration examples.
Command Reference	Describes the related configuration commands, including command modes, parameter descriptions, usage guides, and related examples.

Documentation Conventions

The symbols used in this document are described as below:



This symbol brings your attention to some helpful suggestions and references.



This symbol means that you must be extremely careful not to do some things that may damage the device or cause data loss.

1 Product Overview


Featuring leading 802.11ac Wave2, Ruijie RG-AP710 supports 2 spatial streams and delivers up to 300Mbps@2.4G (802.11b/g/n) and 2 spatial stream and delivers up to 867Mbps@5G (802.11a/n/ac). The overall dual-radio, dual-band performance speeds up to 1167Mbps per device, totally eliminating Gigabit wireless bottlenecks. AP710 is ideal for a variety of scenarios, such as large-scaled campuses, governments, financial services, and enterprises.

1.1 Technical Specifications

Table 1-1 Technical Specifications of RG-AP710

Hardware Specifications	
Radio	
RF	2.4GHz: 2 x 2MIMO 5GHz: 2 spatial streams
Transmission Protocol	Support concurrent 802.11b/g/n and 802.11a/n/ac.
Operating Bands	802.11b/g/n: 2.4 GHz to 2.4835 GHz 802.11a/n/ac: 5.15 GHz to 5.35 GHz, 5.47 GHz to 5.725 GHz, 5.725 GHz to 5.85GHz (Depending on which country the AP is installed)
Antenna	Built-in antenna
Spatial Streams	2.4G supports 2 spatial streams, 5G supports 2 spatial streams
Access Rates	2.4GHz: up to 300Mbps 5GHz: up to 867Mbps Total: up to 1167Mbps
Modulation	OFDM: BPSK@6/9Mbps, QPSK@12/18Mbps, 16-QAM@24Mbps, 64-QAM@48/54Mbps DSSS: DBPSK@1Mbps, DQPSK@2Mbps, and CCK@5.5/11Mbps MIMO-OFDM: BPSK, QPSK, 16QAM, 64QAM and 256QAM
Receive Sensitivity	11b: -91dBm(1Mbps), -88dBm(5Mbps), -85dBm(11Mbps) 11a/g: -89dBm (6Mbps), -80dBm (24Mbps), -76dBm (36Mbps), -71dBm (54Mbps) 11n: -83dBm@MCS0, -65dBm@MCS7, -83dBm@MCS8, -65dBm@MCS15 11ac HT20: -83dBm (MCS0), -57dBm (MCS9) 11ac HT40: -79dBm (MCS0), -57dBm (MCS9) 11ac HT80: -76dBm (MCS0), -51dBm (MCS9)
Maximum Transmit Power	20 dBm (Depending on the country of use, laws and regulations.)
Transmit Power Adjustment	1 dBm
Physical	
Dimensions (W x D x H)	194 mm x194 mm x 37 mm (7.64in x7.64in x 1.46in)
Weight	0.42 kg
Service Ports	One 10/100/1000BASE-T Ethernet port (PoE-capable)

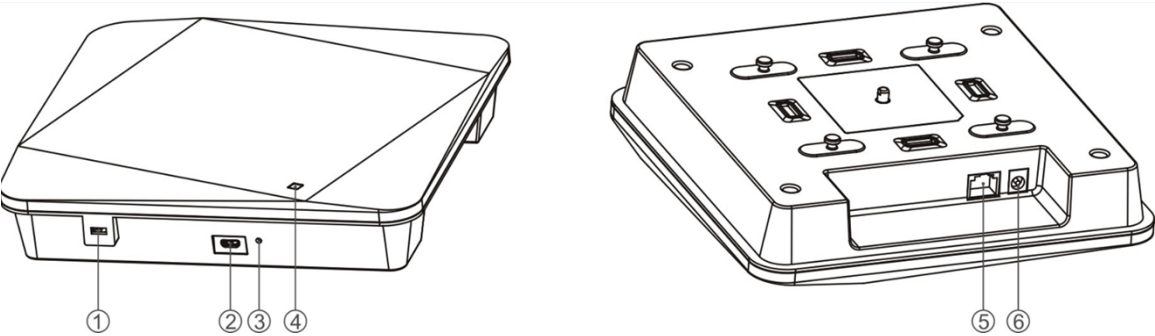
Management Ports	One Micro USB Console port
Button	One Reset button
LED	1 LED (red, green, blue, orange, and flashing modes, flashing mode for smart device access, and the indicator can be switched off to silent mode)
Power Supply	Adapter: DC 5V/3A (optional) PoE: IEEE 802.3af
Power Consumption	Maximum: 12.95W
Temperature	Operating: -10°C to 50°C (14°F to 122°F) Storage: -40°C to 70°C (-40°F to 158°F)
Humidity	Operating: 5% to 95% RH (non-condensing) Storage: 5% to 95% RH (non-condensing)
Installation	Ceiling/wall mount
IP Rating	IP41
Safety Standards	GB4943 IEC 60950-1
EMC Standards	GB9254 EN301 489 EN50155 EN50121
Vibration Standards	IEC61373
Radio	China Radio Transmission Equipment Type Approval Certificate EN300 328 EN301 893
MTBF	>400,000H

 The weight refers to the weight of host and bracket.

1.2 Product Image

The AP provides 5 ports, including 2 internal RF antenna ports, 1 Ethernet ports (PoE-capable), 1 Console port, and 1 power port for external power supply.

Figure 1-1 Top Panel of RG-AP710



Note

1. Laptop lock

4. LED indicator

2. Console port	5. LAN1/PoE port
3. Reset button	6. 5V DC power supply input port

1.3 LED Indicators

Fit AP



State	Frequency	Meaning
Off	N/A	The AP is NOT receiving power. Or the AP is in Do Not Disturb mode, which can be disabled by software.
Blinking green	3Hz	uBoot program initialization in progress
Solid green	N/A	Main program initialization in progress
Blinking red	3Hz	Initialization is complete, but no Ethernet activity.
Solid orange	N/A	Initialization is complete, and the AP is establishing a CAPWAP connection with an AC.
Blinking orange	3Hz	Firmware upgrade in progress. Do not power off.
Solid blue	N/A	Normal operation, but no wireless clients are associated with the AP.
Blinking blue	3Hz	Normal operation, at least one wireless client is associated with the AP.
Reset button	Pressed for less than 2s	Restart the device.
	Pressed for more than 3s	Restore default settings.

Fat AP

State	Frequency	Meaning
Off	N/A	The AP is NOT receiving power. Or the AP is in Do Not Disturb mode, which can be disabled by software.
Blinking green	3Hz	uBoot program initialization in progress
Solid green	N/A	Main program initialization in progress
Blinking red	3Hz	Initialization is complete, but no Ethernet activity.
Solid blue	N/A	Normal operation, but no wireless clients are associated with the AP.
Blinking blue	3Hz	Normal operation, at least one wireless client is associated with the AP.
Reset button	Pressed for less than 2s	Restart the device.
	Pressed for more than 3s	Restore default settings.

1.4 Power Sources

The AP can be powered either with a DC power adapter or through Power over Ethernet (PoE).



-
-  The AP requires Ruijie power adapters (If needed, you can buy them from Ruijie).
 -  To use a PoE device, make sure it supports the IEEE 802.3af/at PoE standard.
-

1.5 Cooling Solution

The AP adopts fanless design.

-
-  Leave sufficient space at the surrounding of the AP when place the AP to permit airflow for proper ventilation.
-

2 Preparing for Installation

-
-  To prevent device damage and bodily injury, please read carefully the safety recommendations described in this chapter.
 -  The recommendations do not cover all possible hazardous situations.
-

2.1 Installation

The AP must be installed indoors. To ensure its normal operation, the installation site must meet the following requirements.

- Install the AP in a well-ventilated environment. If it is installed in a closed room, make sure there is a good cooling system.
- Make sure the site is sturdy enough to support the AP and its accessories.
- Make sure the site has enough space for installing the AP and leave sufficient room around the AP for ventilation. Also, to avoid mutual interference, ensure the site is at least 2 meters away from a base station antenna.
- Do not expose the AP to high temperature, dusts, or harmful gases.
- Do not install the AP in an inflammable or explosive environment.
- Keep the AP away from EMI sources such as large radar stations, radio stations, and substations.
- Do not subject the AP to unstable voltage, vibration, and noises.
- Keep the AP at least 500 meters away from the seaside and do not face it toward the wind from the sea.
- The installation site should be free from water flooding, seepage, dripping, or condensation.
- The installation site shall be selected according to network planning and features of communications equipment, and considerations such as climate, hydrology, geology, earthquake, electric power, and transportation.



Please follow the correct method described in the installation guide to install and remove the device.


2.2 Movement


- Avoid moving the device frequently.
- Turn off all power supplies and unplug all power cables before you remove the device.

2.3 EMI

- Please observe local regulations and specifications when performing electrical operations. Relevant operators must be qualified.
- Please carefully check for any potential danger in the working area, for example, damp/wet ground or floor.
- Find out the location of the emergency power supply switch in the room before installation. First cut off the power supply in case of an accident.

- Be sure to make a careful check before you shut down the power supply.
- Do not place the device in a damp/wet location. Do not let any liquid enter the chassis
- Keep the AP far away from the grounding or lightning protection devices of power equipment.
- Keep the AP away from radio stations, radar stations, high-frequency high-current devices, and microwave ovens.

 Any nonstandard and inaccurate electrical operation can cause an accident such as fire or electric shock, thus causing severe even fatal damages to human bodies and device.

 Direct or indirect touch through a wet object on high voltage and power line can bring a fatal danger.

2.4 Ventilation

For proper ventilation, leave sufficient space around the AP.

2.5 Temperature and Humidity

To ensure normal operation and service life of the device, maintain appropriate temperature and humidity levels in your equipment room. See Table 2-1. Improper room temperature and humidity can cause damages to the device.

- High relative humidity may affect insulation materials, resulting in poor insulation and even electrical leakage, and sometimes may lead to change of mechanical properties of materials and corrosion of metal parts.
- Low relative humidity may dry and shrink insulation sheets and cause static electricity that can damage the circuitry inside the device.
- High temperature greatly reduces reliability of the device and shortens its service life.

Table 2-1 Required Temperature and Humidity for the RG-AP710

Temperature	Relative Humidity
-10°C to 50°C (14°F to 122°F)	5% to 95%

2.6 Cleanness

Dust poses a serious threat to device operation. Dust that falls onto the surface of the device can be absorbed onto metal contact points by static electricity, resulting in poor contact. Electrostatic absorption of dust occurs more easily when the relative humidity is low, which may shorten the service life of the device and cause communication failures. Table 2-2 shows the maximum concentration and diameter of dust allowed in the equipment room.

Table 2-2

Maximum diameter (μm)	0.5	1	3	5
Maximum concentration (Particles/m ³)	1.4×10 ⁷	7×10 ⁵	2.4×10 ⁵	1.3×10 ⁵

Besides, the contents of salts, acids and sulfides in the air are also strictly limited for the equipment room. These substances can accelerate metal corrosion and the aging of some parts. Table 2-3 describes the limit of some hazardous gases such as SO₂, H₂S, NO₂ and Cl₂ in the equipment room.

Table 2-3

Gas	Average (mg/m ³)	Maximum (mg/m ³)
SO ₂	0.2	1.5
H ₂ S	0.006	0.03
NO ₂	0.04	0.15
NH ₃	0.05	0.15
Cl ₂	0.01	0.3


2.7 Power Supply


- DC power adapter: 5V/3A, 15W


Specifications of Connector

Internal Diameter	External Diameter	Depth	Polarity
2.10+/-0.05mm	5.50+/-0.05mm	10mm	Internal: positive External: negative

- PoE injector: IEEE 802.3af/802.3at compliant

 The DC input power should be greater than the power actually consumed by the system. The input power for the RG-AP710 should be greater than 15 W.

 Please use Ruijie recommended power adapters.

 Please use Ruijie certified PoE injectors.

2.8 Installation Tools


Common Tools	Phillips screwdriver, related copper and fiber cables, bolts, diagonal pliers, cable ties
Special Tools	Wire stripper, crimping pliers, RJ-45 crimping pliers, punch down tool
Meter	Multimeter, bit error rate tester (BERT)

 The listed tools are customer supplied.

2.9 Unpacking the Access Point

Package Contents

Items	Verify that all parts are installed and debugged. Screws Mounting brackets Product quick installation guide Packing list
--------------	--

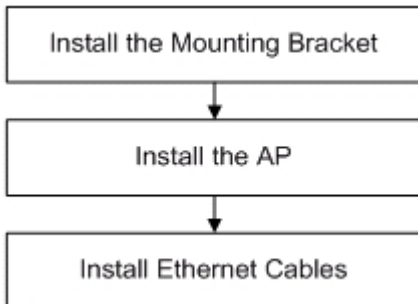
-
-  The above listed items are for general situations, which may vary in the actual shipment. The purchase order shall prevail in any case. Please check each item carefully according to the packing list or purchase order. If any item is damaged or missing, notify the sales person.
-

3 Installing the Access Point

The RG-AP710 series must be fixed and installed indoors.

i Before installing the AP, make sure you have carefully read the requirements described in Chapter 2.

3.1 Installation Flowchart



3.2 Before You Begin

Before you install the AP, verify that:

- The installation site provides sufficient ventilation for the AP.
- The installation site meets temperature and humidity requirements.
- The installation site is equipped with proper power supply.
- Network cables are in place.
- The installation site meets all described requirements.
- The custom AP meets the customers' requirements.

3.3 Precautions

To avoid damages to the AP, observe the following safety precautions:

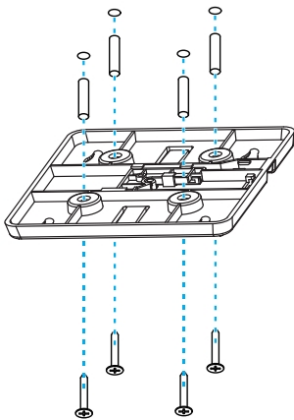
- Do not power the device during installation.
- Install the device in a well-ventilated location.
- Do not subject the device to high temperatures.
- Keep away from high voltage cables.
- Install the device indoors.
- Do not expose the device in a thunderstorm or strong electric field.
- Keep the device clean and dust-free.

- Disconnect the device before cleaning it.
- Do not wipe the device with a damp cloth.
- Do not wash the device with liquid.
- Do not open the enclosure when the AP is working.
- Fasten the device tightly.

3.4 Installing the Access Point

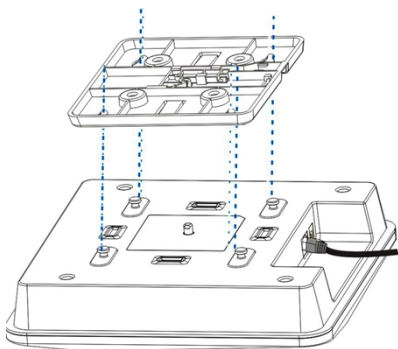
- Ceiling Mount
1. Drill four 6 mm diameter holes (53 mm apart) on the ceiling. Tap wall anchors into the holes, and drive screws through the mounting bracket into the anchors to fix the bracket. See Figure 3-1.

Figure 3-1 Attaching the Mounting Bracket on the Ceiling



2. Align the square feet on the rear of the AP over the mounting holes on the bracket. See Figure 3-2.

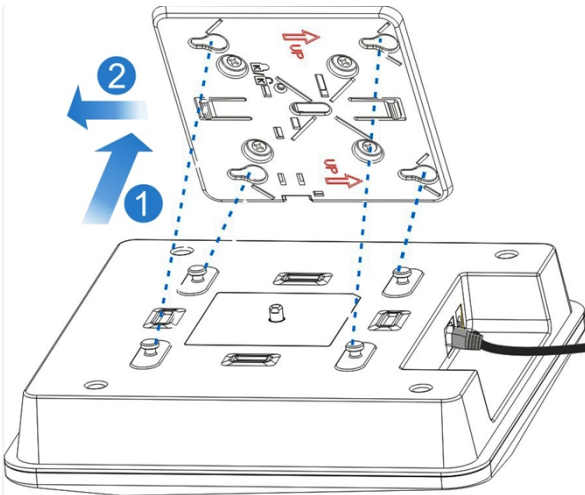
Figure 3-2 Aligning the Square Feet with the Mounting Holes



Before mounting the AP on the bracket, you must first install the Ethernet cables.

3. Slide the AP onto the bracket in the reverse direction against the arrow on the mounting bracket until it clicks into place. See Figure 3-3.

Figure 3-3 Mounting the AP on the Bracket

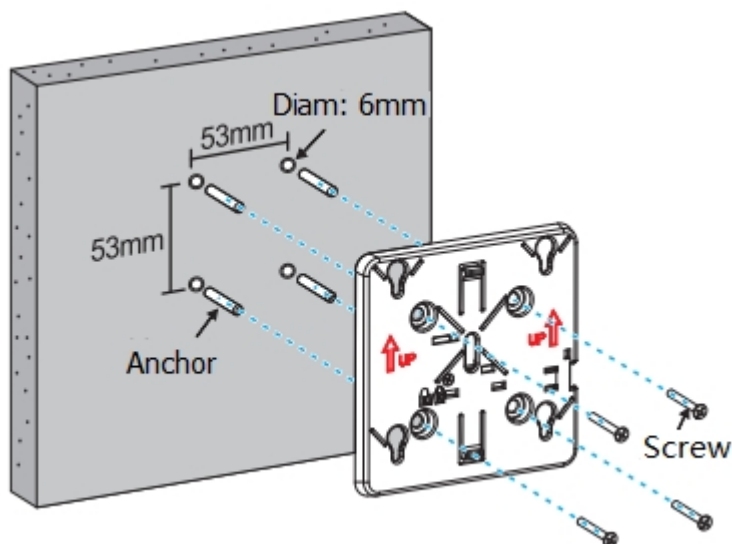


- ⚠ The AP can be installed in any of four directions on the mounting bracket depending on how you route your Ethernet cable.
- ⚠ The square feet should fit easily into the mounting slots. Do not forcibly push the AP into the slots.
- ⚠ After installation, verify that the AP is securely fastened.

● Wall Mount

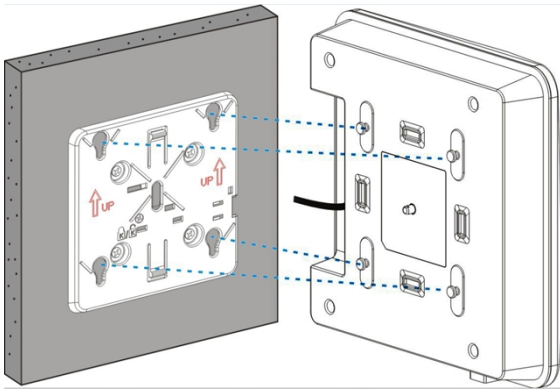
1. Drill four 6 mm diameter holes (53 mm apart) on the wall with the arrow on the mounting bracket facing up. Tap wall anchors into the holes, and drive screws through the mounting bracket into the anchors to fix the bracket. See Figure 3-4.

Figure 3-4 Attaching the Mounting Bracket on the Wall



2. Align the square feet on the rear of the AP over the mounting holes on the bracket. See Figure 3-5.

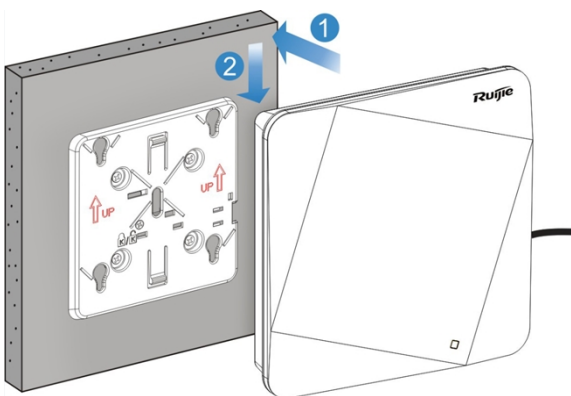
Figure 3-5 Aligning the Square Feet with the Mounting Holes



⚠ Before mounting the AP on the bracket, you must first install the Ethernet cables.

- Slide the AP into the holes in the reverse direction against the arrow on the mounting bracket until it clicks into place. See Figure 3-6.

Figure 3-6 Mounting the AP on the Bracket



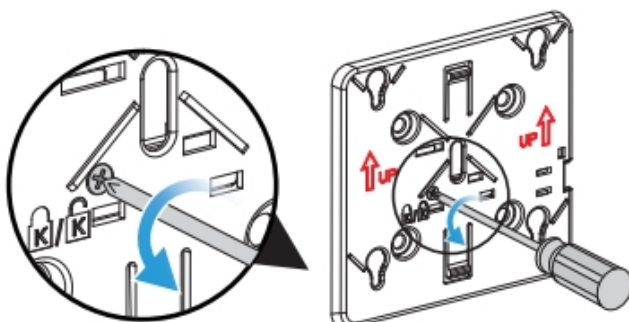
⚠ The square feet should fit easily into the mounting slots. Do not forcibly push the AP into the slots.

⚠ After installation, verify that the AP is securely fastened.

3.5 (Optional) Securing the Access Point

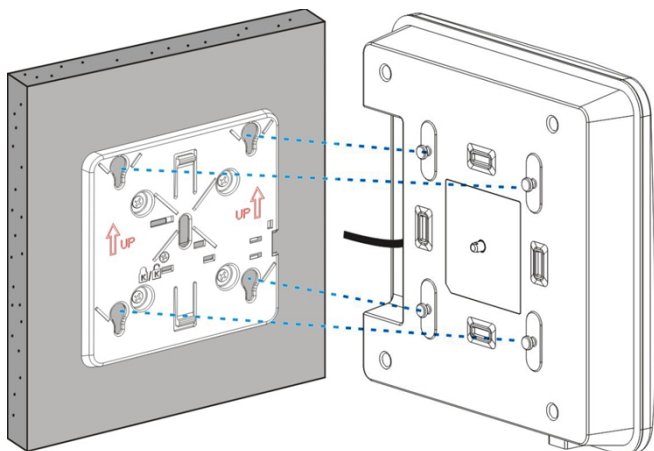
- Loosen the screw on the mounting bracket and enable the hidden lock.

Figure 3-7 Enabling the Hidden Lock



2. Align the square feet on the rear of the AP over the mounting holes on the bracket, slide the AP in the reverse direction against the arrow on the mounting bracket until it clicks into place.

Figure 3-8 Mounting the AP on the Bracket

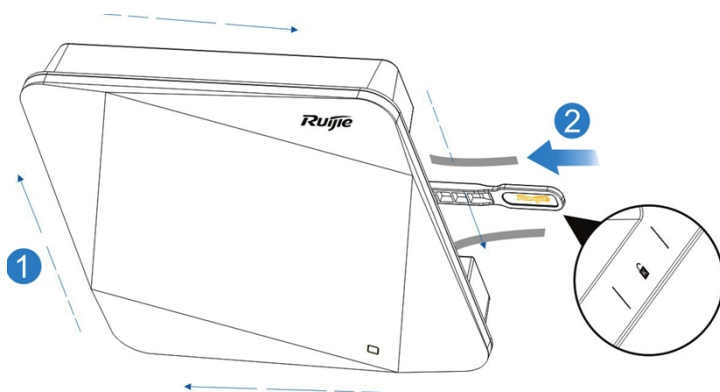


! Before mounting the AP on the bracket, you must first install the Ethernet cables.

3.6 Removing the Access Point

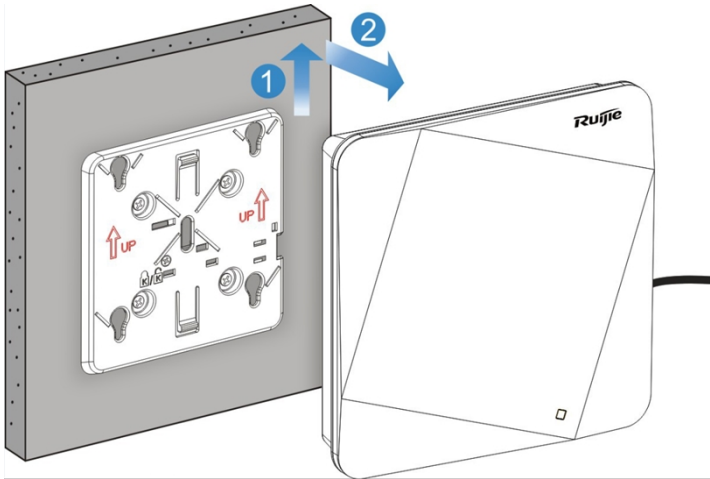
1. If the hidden lock is enabled, attach the front part of the key to the edge of the mounting bracket (keep the Ruijie logo of the key toward the top panel of the AP). Slide the key along with the four edges of the mounting bracket, and attempt to insert the key to the keyhole (only one marked keyhole can be inserted).

Figure 3-9 Inserting the Key for Unlocking



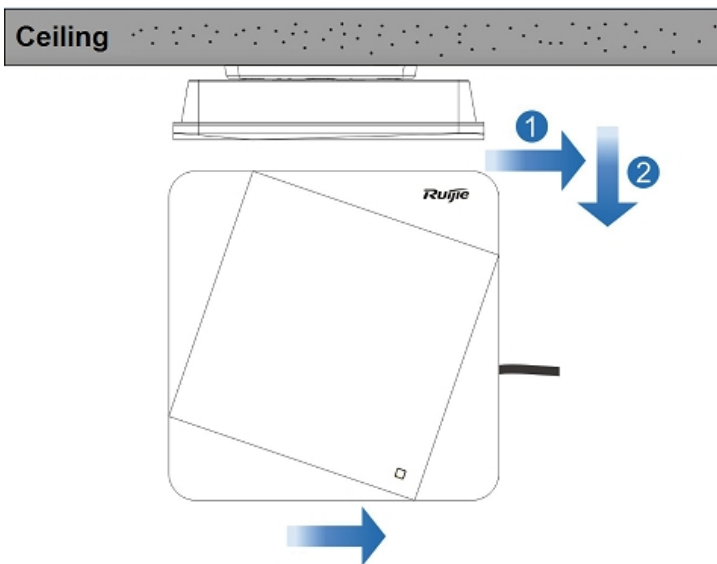
2. If the AP is installed on the wall, hold the AP in your hands and push it upward and away from the bracket in the LAN port direction.

Figure 3-10 Removing the Wall-Mount AP



3. If the AP is installed on the ceiling, hold the AP in your hands and push it sideward. And attempt to push it along the direction of the LAN port.

Figure 3-11 Removing the Ceiling-Mount AP



3.7 Connecting Cables

Connect UTP/STP to the LAN1/PoE port on the AP. See Appendix A for supported wiring of twisted pairs.

! By default, baud rate is set to 9600, data bit 8, parity none, stop bits 1 and flow control none on the console port of the AP. The console port is used only when you want to configure the AP manually. In this case, you need an RJ45-to-USB conversion module and a USB-to-micro-USB conversion cable.

! The conversion module and the conversion cable are customer supplied.

3.8 Bundling Cables

Precautions

- Make sure the cable bundles are neat and orderly.
- Bend twisted pairs naturally or to a large radius close to the connector.
- Do not over tighten cable bundle as it may reduce the cable life and performance.

Bundling Steps

1. Bundle the drop UTP/STP cables and route them to the LAN/PoE port.

Attach the cables in the cable tray of the rack.

Extend the cables under the AP and run in straight line.

3.9 Checking after Installation

Checking the Cabinet

- Make sure the external power supply matches the specifications of the patch panel in the cabinet.
- After installation, make sure you can close the front and rear cabinet doors.
- Make sure the cabinet is stable and level.
- Make sure the device and all cables are securely fastened in the rack.

Checking Cable Connection

- Make sure the UTP/STP cable matches the interface type.
- Make sure cables are properly bundled.

Checking the Power Supply

- Make sure all power cables are properly connected and safe.
- Make sure the AP is operational after power-on.

4 System Debugging

4.1 Setting up a Debugging Environment

Use a power adapter or PoE to power the AP.

Setting up the Environment

- Verify that the AP is properly connected to the power source.
- Connect the AP to an AC through a twisted pair cable.
- When the AP is connected to a PC for debugging, verify that the PC and PoE switch are properly grounded.

4.1.1 Powering up the AP

4.1.1.1 Checking before power-up

- Verify that the power supply is properly connected.
- Verify that the input voltage matches the specification of the AP.

4.1.1.2 Checking after power-up (recommended)

After powering up, it is recommended that you check the following to ensure normal operation of the AP.

- Check if any message is printed on the Web-based configuration interface of the AC.
- Check if the LED works normally.

5 Monitoring and Maintenance

5.1 Monitoring

LED

You can observe the LED to monitor the AP in operation.

CLI Commands

You can run related commands on the command line interface (CLI) on the AC to remotely monitor the configurations and status of the AP.

 You can login in to the AP via Telnet and use monitoring related commands to maintain the AP.

5.1.1 Remote Maintenance

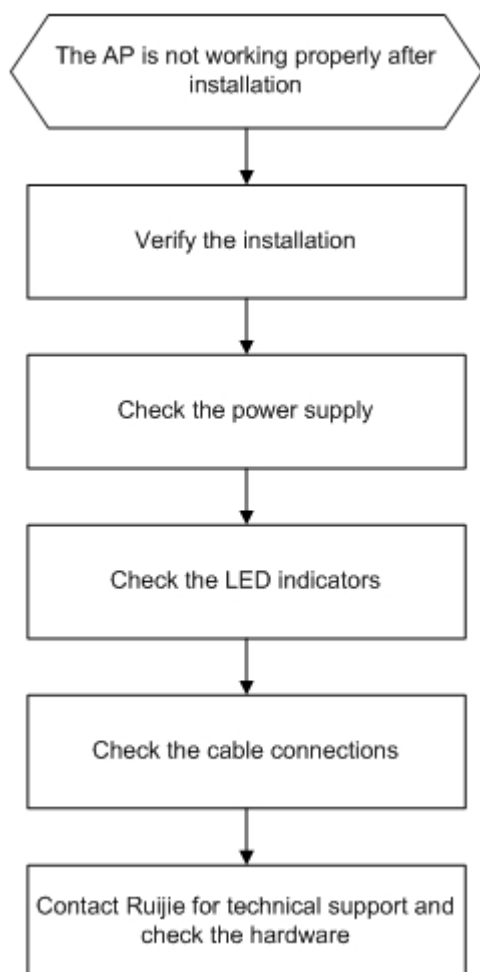
- If the AP operates as a Fat AP, you can login in to the AP remotely for maintenance.
- If the AP operates as a Fit AP, you can use AC to centrally manage and maintain the AP.

5.1.2 Hardware Maintenance

If the hardware is faulty, please contact our Technical Assistance Center (TAC) for help.

6 Troubleshooting

6.1 Troubleshooting Flowchart



6.2 Troubleshooting

LED does not light up after the AP is powered on

- 1) If you use PoE power supply, verify that the power source is IEEE 802.11af compliant, and then verify that the cable is connected properly.
- 2) If you use a power adapter, verify that the power adapter is connected to an active power outlet, and then verify that the power adapter works properly.

Ethernet port is not working after the Ethernet port is connected

Verify that the device at the other end of the Ethernet cable is working properly. And then verify that the Ethernet cable is capable of providing the required data rate and is properly connected.

Wireless client cannot find the AP

- 1) Follow the above-mentioned two steps.
- 2) Verify that the AP is configured correctly.
- 3) Adjust the angle of antennas.
- 4) Move the client device to adjust the distance between the client and the AP.

LED keeps blinking red

The LED stays blinking red for a long time, indicating the Ethernet port is not connected. Verify the Ethernet connection.

LED keeps blinking green

The AP performs initialization after power on. During this period, the LED keeps blinking green and does not turn solid until the initialization is completed. **Note:** If the blinking persists for an hour, it indicates the device initialization fails and the device is faulty.

LED keeps blinking orange (Fit AP mode)

Sometimes the AP performs firmware upgrade after power on. During this period, the LED keeps blinking orange and does not turn solid until the upgrade is completed. **Note:** Do not plug or unplug the power cord when the Status LED is blinking as firmware update takes time. If the blinking persists for ten minutes, it indicates the device fails to complete firmware upgrade and is faulty.

LED does not turn solid blue or blinking blue

After the system starts and the LED does not turn solid blue or blinking blue, probably because the AP has not established a proper CAPWAP connection with the AC. Verify the AC is operational and configured properly.

Appendix A Connectors and Media

1000BASE-T/100BASE-TX/10BASE-T

The 1000BASE-T/100BASE-TX/10BASE-T is a 10/100/1000 Mbps auto-negotiation port that supports auto MDI/MDIX.

Compliant with IEEE 802.3ab, 1000BASE-T requires Category 5e 100-ohm UTP or STP (STP is recommended) with a maximum distance of 100 meters (328 feet).

1000BASE-T requires all four pairs of wires be connected for data transmission, as shown in Figure A-1.

Figure A-1 1000BASE-T Connection

Straight-Through		Crossover	
Switch	Switch	Switch	Switch
1 TP0+	↔ 1 TP0+	1 TP0+	↔ 1 TP0+
2 TP0-	↔ 2 TP0-	2 TP0-	↔ 2 TP0-
3 TP1+	↔ 3 TP1+	3 TP1+	↔ 3 TP1+
6 TP1-	↔ 6 TP1-	6 TP1-	↔ 6 TP1-
4 TP2+	↔ 4 TP2+	4 TP2+	↔ 4 TP2+
5 TP2-	↔ 5 TP2-	5 TP2-	↔ 5 TP2-
7 TP3+	↔ 7 TP3+	7 TP3+	↔ 7 TP3+
8 TP3-	↔ 8 TP3-	8 TP3-	↔ 8 TP3-

10BASE-T uses Category 3, 4, 5 100-ohm UTP/STP and 1000BASE-T uses Category 5 100-ohm UTP/STP for connections. Both support a maximum length of 100 meters. Table A-1 shows 100BASE-TX/10BASE-T pin assignments.

Table A-1 100BASE-TX/10BASE-T Pin Assignments

Pin	Socket	Plug
1	Input Receive Data+	Output Transmit Data+
2	Input Receive Data-	Output Transmit Data-
3	Output Transmit Data+	Input Receive Data+
6	Output Transmit Data-	Input Receive Data-
4,5,7,8	Not used	Not used

Figure A-2 shows wiring of straight-through and crossover cables for 100BASE-TX/10BASE-T.

Figure A-2 100BASE-TX/10BASE-T Connection

Straight-Through		Crossover	
Switch	Switch	Switch	Switch
1 IRD+	↔ 1 OTD+	1 IRD+	↔ 1 IRD+
2 IRD-	↔ 2 OTD-	2 IRD-	↔ 2 IRD-
3 OTD+	↔ 3 IRD+	3 OTD+	↔ 3 OTD+
6 OTD-	↔ 6 IRD-	6 OTD-	↔ 6 OTD+

Appendix B: Cabling Recommendations

During installation, route cable bundles upward or downward along the sides of the rack depending on the actual situation in the equipment room. All cable connectors should be placed at the bottom of the cabinet rather than be exposed outside of the cabinet. Power cords should be routed upward or downward beside the cabinet close to the location of the DC power distribution cabinet, AC power outlet, or lightning protection box.

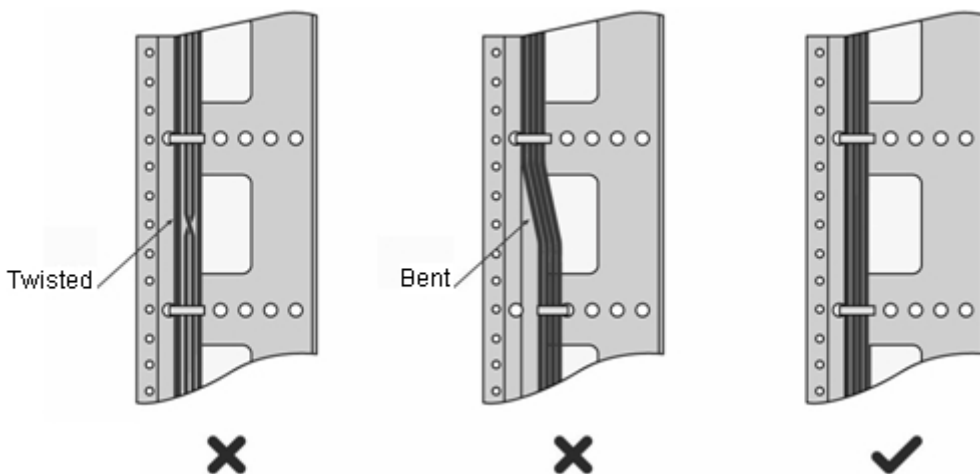
Required Minimum Cable Bend Radius

- The minimum bend radius of a power, communication or flat cable should be 5 times the overall diameter of the cable. If the cable is constantly bent, plugged or unplugged, the bend radius should be 7 times the overall diameter.
- The minimum bend radius of a coaxial cable should be 7 times the overall diameter of the cable. If the cable is constantly bent, plugged or unplugged, the bend radius should be 10 times the overall diameter.
- The minimum bend radius of a high-speed cable, such as an SFP+ cable should be 5 times the overall diameter of the cable. If the cable is constantly bent, plugged or unplugged, the bend radius should be 10 times the overall diameter.

Precautions for Cable Bundling

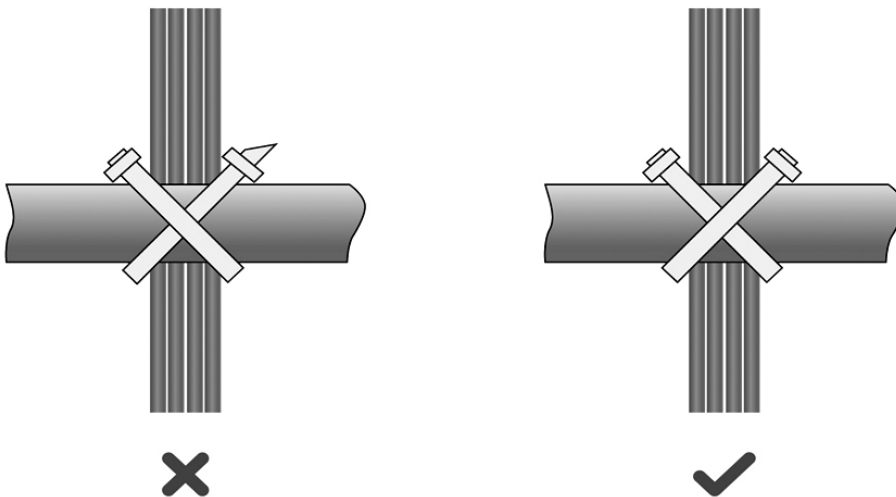
- Before bundling cables, correctly mark labels and stick the labels to cables where appropriate.
- Cables should be neatly and properly bundled, as shown in Figure B-1.

Figure B-1 Bundling Cables



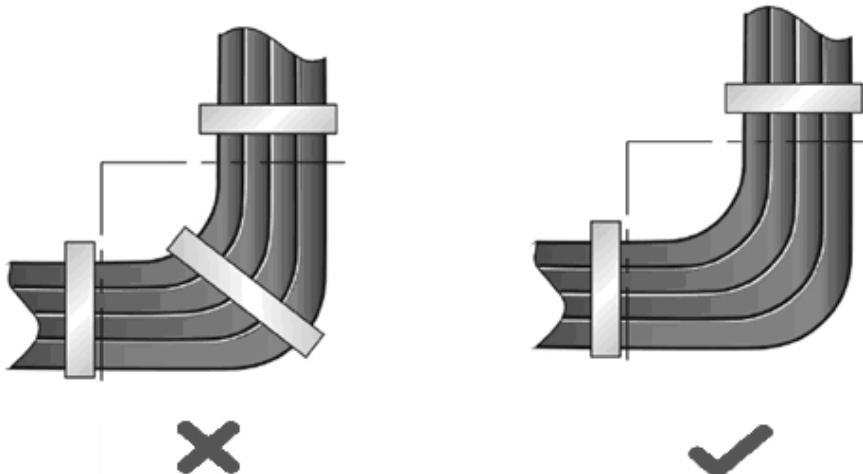
- Route and bundle power, signal, ground cables separately. When the cables are close to each other, cross them. When power cables run parallel to signal cables, the distance between them must be greater than 30 mm.
- All cable trays and their accessories shall be smooth and free from sharp edges.
- Holes in metal, through which cables pass shall have smooth, well-rounded surfaces or be protected with insulating bushings.
- Use proper cable ties to bind cables together. Do not tie two or more cable ties to bind cables.
- Cut off excess cable tie cleanly with no sharp edges after bundling cables, as shown in Figure B-2.

Figure B-2 Cutting off Excess Cable Tie



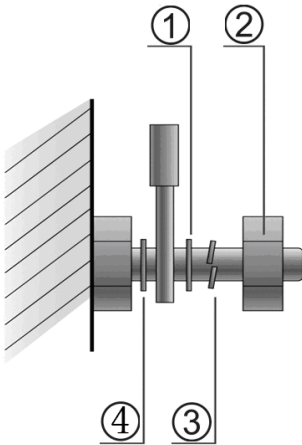
- If cables are to be bent, bind them first but do not tie cable ties within the bend to avoid stress on the cables, which may otherwise cause the wires inside to break, as shown in Figure B-3.

Figure B-3 Do Not Tie Cable Ties within the Bend



- Wrap up unnecessary or excess cables and bind them to the appropriate rack position, where device operation is not affected and no damages occur to the device and cables during debugging.
- Do not bind power cords to the rails for moving parts.
- Leave a certain length of the cable connecting moving parts, such as the ground wire of the cabinet door, to avoid stress on the cable; When moving parts are in place, ensure the excess cable length shall not contact heat sources, sharp corners or edges. If heat sources are unavoidable, use high-temperature cables instead.
- When using screws to fasten cable lugs, the bolts or nuts shall be tightened and prevented from loosening, as shown in Figure B-4.

Figure B-4 Fastening Cable Lugs



Note	1. Flat washer	3. Spring washer
	2. Nut	4. Flat washer

- When using a stiff cable, fix it near the cable lug to avoid stress on the lug and cable.
- Do not use self-tapping screws to fasten terminals.
- Bundle cables of the same type and running in the same direction into groups. Keep cables clean and straight.
- Cables shall be tied according to the following table.

Diameter of Cable Bundle (mm)	Space between Bundles (mm)
10	80 to 150
10 to 30	150 to 200
30	200 to 300

- Do not tie knots for cables or cable bundles.
- The metal parts of the cold-pressed terminal blocks, such as air circuit breakers, shall not be exposed outside of the blocks.