



RG-AP3220 Series Access Point

Hardware Installation and Reference Guide V1.00

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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: <http://www.ruijienetworks.com>
- Online customer services: <http://webchat.ruijie.com.cn>
- Customer service center: <http://www.ruijie.com.cn/service.aspx>
- Customer services hotline: +86-4008-111-000
- BBS: <http://support.ruijie.com.cn>
- Customer services email: service@ruijie.com.cn

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:



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



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

Chapter 1 Product Overview

The RG-AP3220 series wireless LAN access point is designed by Ruijie Networks for demanding indoor deployments. The AP is equipped with Ruijie patented internal antennas. It can serve as a Fit AP and operate in conjunction with a unified wired/wireless switch or a wireless controller; or it can serve as a standalone Fat AP and provide wireless access for mobile clients.

Technical Specifications

Table 1-1 Technical Specifications of RG-AP3220

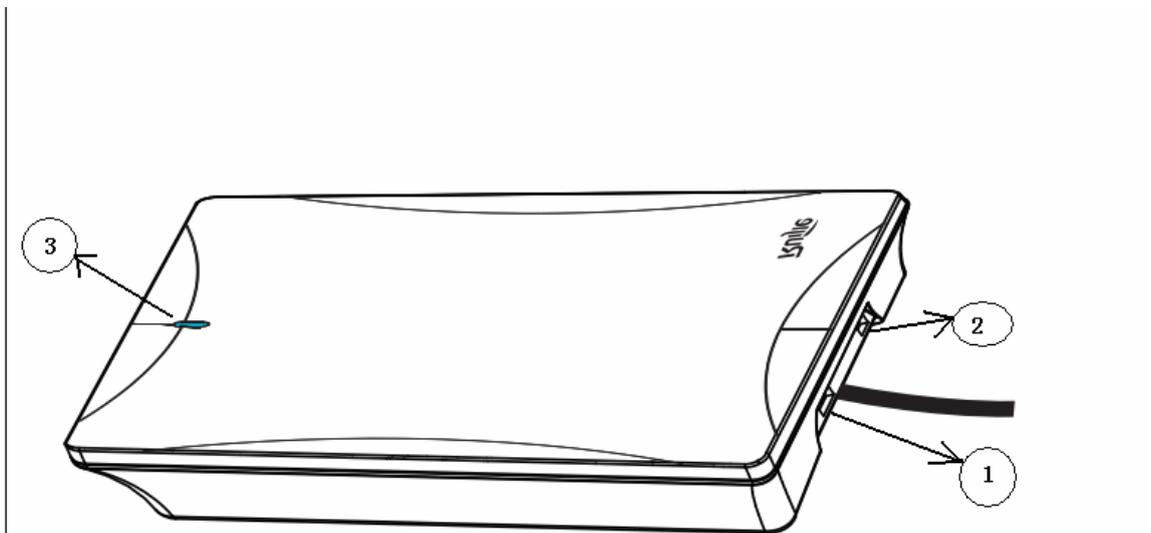
Model	RG-AP3220
Interfaces	One 10/100/1000BASE-T Ethernet PoE port One Console port
Antennas	Planar inverted F antenna (PIFA)
Operating Frequency	802.11b/g/n: 2.4 GHz to 2.4835 GHz 802.11a/n: 5.15 GHz to 5.85 GHz (Depending on the country in which the AP is installed)
Modulation Types	802.11b: BPSK, QPSK, CCK 802.11a/g/n: BPSK, QPSK, 16-QAM, 64-QAM
Transmit Power	2.4 GHz: 802.11b/g/n: 20 dBm 5G GHz: 802.11a/n: 20 dBm
Transmit Power Adjustment	1 dBm increments
Receiver Sensitivity	802.11b: -99 dBm (1 Mbps), -90 dBm (5.5 Mbps) , -87 dBm (11 Mbps) 802.11g: -93 dBm (6 Mbps), -88 dBm (24 Mbps), -86 dBm (36 Mbps), -77 dBm (54 Mbps) 802.11a: -92 dBm (6 Mbps), -87 dBm (24 Mbps), -84 dBm (36 Mbps), -75 dBm (54 Mbps) 802.11n/a: -94 dBm@MCS0, -72 dBm@MCS7, -93 dBm@MCS8, -72dBm@MCS15 802.11n/g: -94 Bm@MCS0, -74 dBm@MCS7, -93 dBm@MCS8, -73dBm@MCS15
Status LED	Single LED Color: red, green, blue and orange Mode: solid, fast blinking, slow blinking and silent (off)
Temperature	Operating: -10 to 55°C (14 to 131 °F) Storage: -40 to 70°C (-40 to 158 °F)
Humidity	Operating: 5% to 95% noncondensing Storage: 5% to 95% noncondensing
IP Rating	IP41
Power Adapter	48 V DC (power adapters are optional parts)
PoE	IEEE 802.af/at PoE
Security Lock	Supported
Radio Approvals	China Radio Transmission Equipment Type Approval Certificate

	EN300 328 EN301 893
EMC Compliance	GB9254 EN301 489
Safety	GB4943 EN/IEC 60950-1
Health	EN 62311
Weight	With bracket: 0.7 kg (1.54 lbs)
Size (W x D x H)	20.5 cm x 20.5 cm x 4.2 cm 8.07 in. x 8.07 in. x 1.65 in.
Installation Methods	Ceiling or wall mount
Power Consumption	10.5 W max.

Product Image

The AP provides two RF antenna ports and one PoE-capable Ethernet port, one Console port and one power port for external power supply.

Figure 1-1 Front View of RG-AP3220



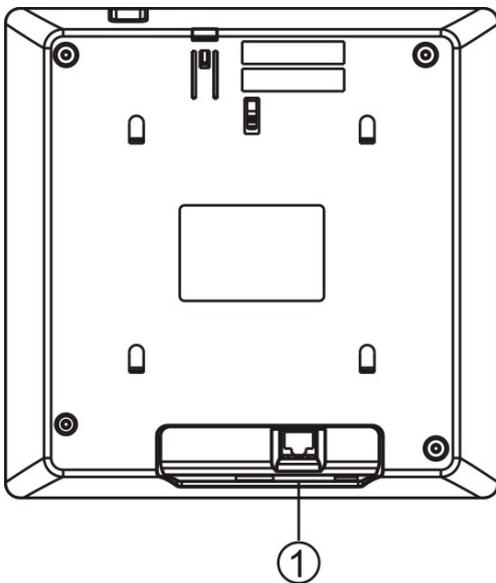
- Note**
1. 48V DC power port
 2. Console port
 3. LED

LED Indicators

LED State	Meaning
Off	The AP is NOT receiving power. Or the AP is in Do Not Disturb mode, which can be

	disabled by software.
Blinking green	Initialization in progress. Continuous blinking indicates errors.
Blinking red	Initialization is complete, but no Ethernet activity.
Blinking blue	Initialization is complete, and the AP is establishing a CAPWAP connection with an AC.
Blinking orange	Firmware upgrade in progress. Do not power off.
Solid blue	Normal operation, but no wireless clients are associated with the AP.
Slow blinking blue (3 seconds per cycle)	Normal operation, at least a wireless client is associated with the AP.
Solid red	Warnings
Double blinking red	Locate AP

Figure 1-2 Bottom View of the RG-AP3220



Note 1. 1000BASE-T/100BASE-TX/10BASE-T auto-sensing PoE-capable Ethernet port

Power Sources

The AP can be powered either with a 48V 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.

Cooling Solution

The AP adopts fanless design.



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

Radiation Pattern

The AP uses internal antennas. See the three kinds of radiation patterns in Figure 1-3 and Figure 1-4 . Because the antennas focus gains in front of the AP, signal strength in the front is stronger. Therefore it is preferable to install the AP towards the area where wireless coverage is most required.

When mount the AP on a ceiling or wall, install the AP towards where you stand to avoid backward coverage.



Note

It is preferable to install the AP in a way that maximizes the coverage.

When install the AP indoors, it is better to mount it on the ceiling rather than on the wall because the AP provides greater coverage when it is installed on the ceiling.

Figure 1-3 and Figure 1-4 show the preferred ceiling-mount and wall-mount orientations of the AP operating in the 2.4 GHz and 5 GHz bands, respectively.

Figure 1-3 Preferred Ceiling-Mount and Wall-Mount Orientations of the RG-AP3220 (in the 2.4 GHz Band)

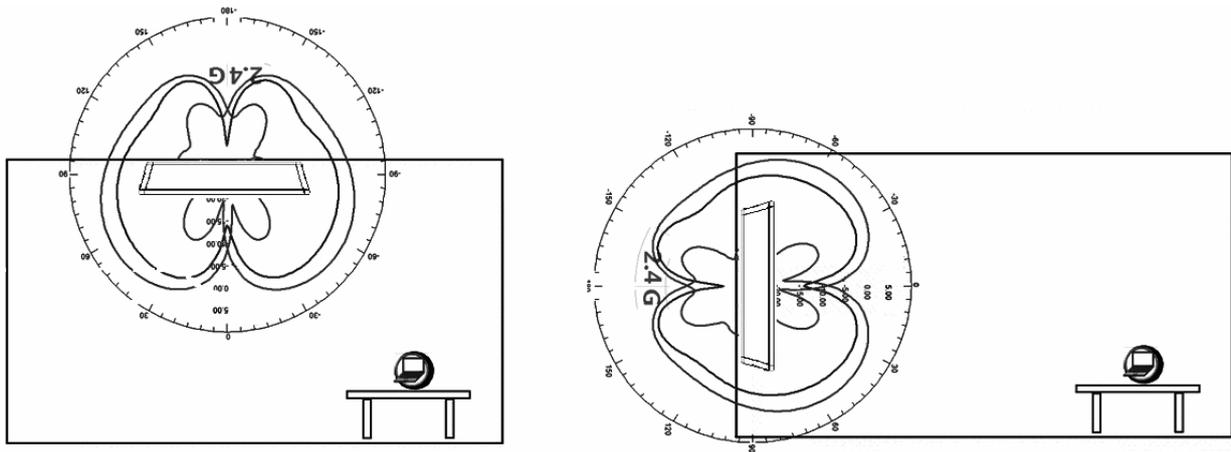
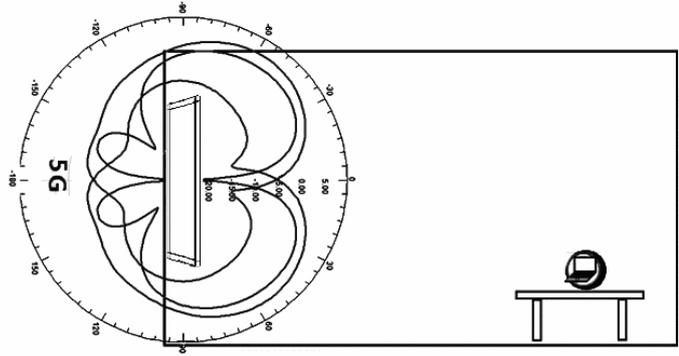
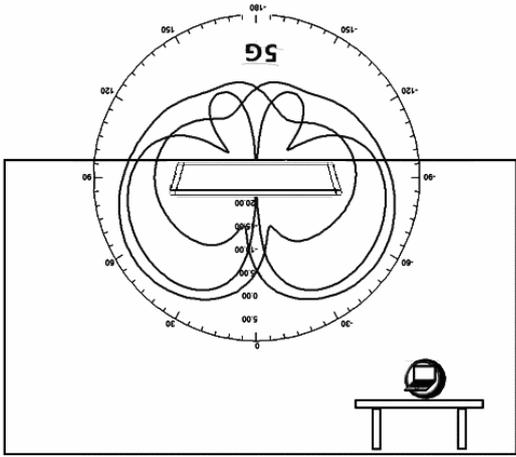


Figure 1-4 Preferred Ceiling-Mount and Wall-Mount Orientations of the AP (in the 5 GHz Band)



Chapter 2 Preparing for Installation



Note

To prevent device damage and bodily injury, please read carefully the safety recommendations described in this chapter.



Note

The recommendations do not cover all possible hazardous situations.

Installation Safety

- 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.
-



Caution

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

Movement Safety

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

Electrical Safety

- 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.



Caution 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.



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

Preparing Installation Site

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

Installation

- 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.

Ventilation

For proper ventilation, leave sufficient space around the AP.

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-AP3220

Temperature	Relative Humidity
-10° C to 55° C	5% to 95%

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 Concentration and Diameter of Dust Allowed

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

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 SO_2 , H_2S , NO_2 and Cl_2 in the equipment room.

Table 2-3 Limits of Hazardous Gases

Gas	Average (mg/m^3)	Maximum (mg/m^3)
SO_2	0.2	1.5
H_2S	0.006	0.03
NO_2	0.04	0.15
NH_3	0.05	0.15
Cl_2	0.01	0.3

Power Supply

- DC power adapter: 36 V DC to 57 V DC (input power)
- PoE injector: IEEE 802.3af/802.3at compliant



Note

The DC input power should be greater than the power actually consumed by the system. The input power for the RG-AP3220 should be greater than 12.95 W.



Caution

Please use Ruijie recommended power adapters.
Please use Ruijie certified PoE injectors.

EMI

- 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.

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)



Note

The listed tools are customer supplied.

Unpacking the Access Point

Package Contents

Items	Verify that all parts are installed and debugged. <ul style="list-style-type: none">- Screws- Mounting brackets- Product quick installation guide- Packing list
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Note

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.

Chapter 3 Installing the Access Point

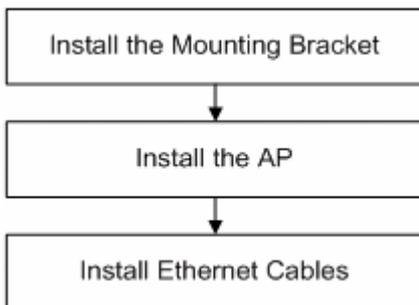
The RG-AP3220 series must be fixed and installed indoors.



Note

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

Installation Flowchart



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.

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.

Installing the Access Point



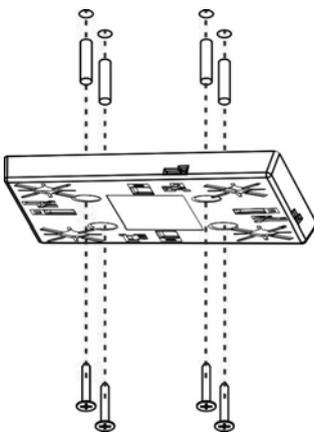
Note

It is preferable to install the AP in a way that maximizes the coverage.

When install the AP indoors, it is better to mount it on the ceiling rather than on the wall because the AP provides greater coverage when it is installed on the ceiling.

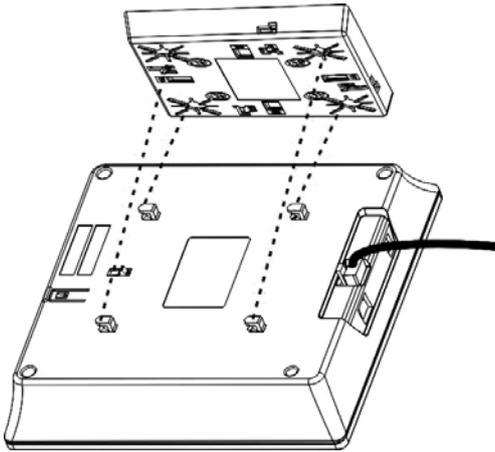
- Ceiling Mount
 - 1) Drill four 6 mm diameter holes (61 mm apart) on the ceiling. Tap wall anchors into the holes, and drive screws through the mounting bracket into the anchors to fix the bracket. See Figure 3-1.

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.

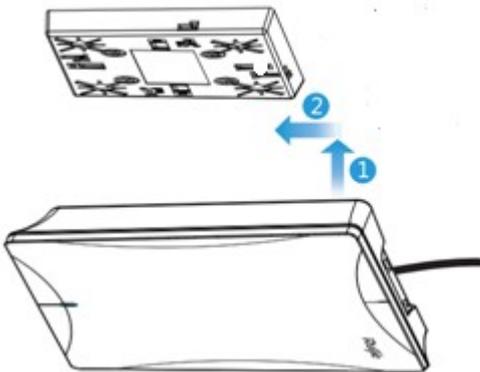
Figure 3-2 Aligning the Square Feet with the Mounting Holes



Caution Install the Ethernet cables first before mounting the AP on the brackets.

- 3) Slide the AP into the holes until it clicks into place. See Figure 3-3.

Figure 3-3 Mounting the AP on the Bracket



Caution The AP can be installed in any of four directions on the mounting bracket depending on how you route your Ethernet cable.

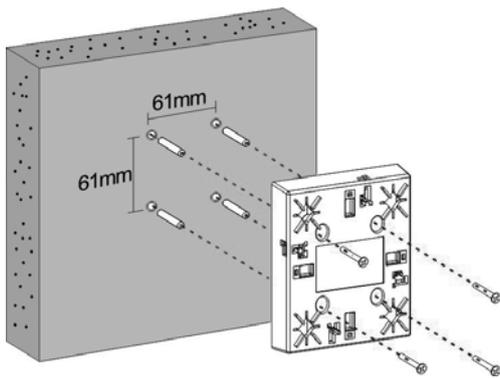
The square feet should fit easily into the mounting slots. Do not forcibly push the AP into the slots.

After installation, verify that the AP is securely fastened.

■ Wall Mount

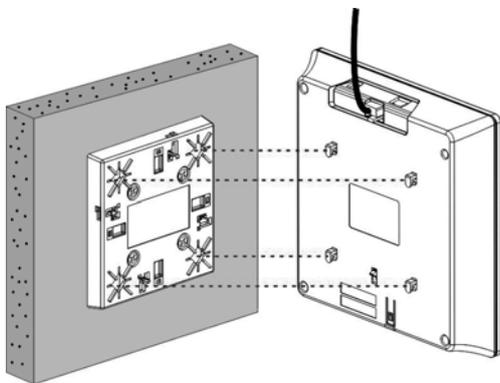
- 1) Drill four 6 mm diameter holes (61 mm apart) on the ceiling. Tap wall anchors into the holes, and drive screws through the mounting bracket into the anchors to fix the bracket. See Figure 3-4.

Figure 3-4 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 3-5.

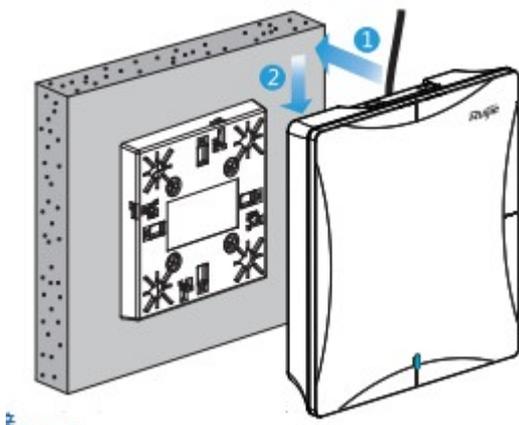
Figure 3-5 Aligning the Square Feet with the Mounting Holes



Caution Install the Ethernet cables first before mounting the AP on the bracket.

- 3) Slide the AP into the holes until it clicks into place. See Figure 3-6.

Figure 3-6 Mounting the AP on the Bracket



**Caution**

When mounting the AP on the wall, keep the logo of Ruijie upward.

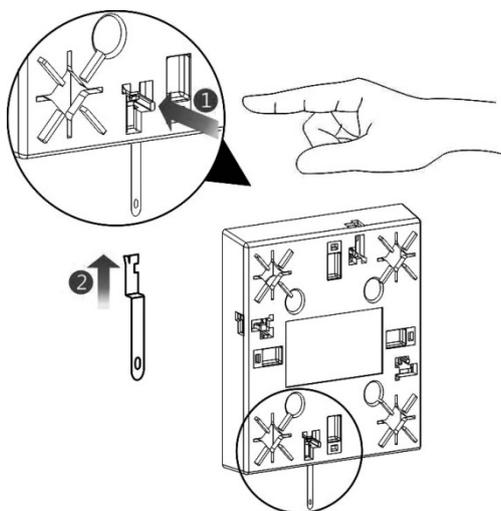
The square feet should fit easily into the mounting slots. Do not forcibly push the AP into the slots.

After installation, verify that the AP is securely fastened.

Securing the Access Point

- 1) Press the button and insert the lock hasp into the lock slot on the back of the bracket.

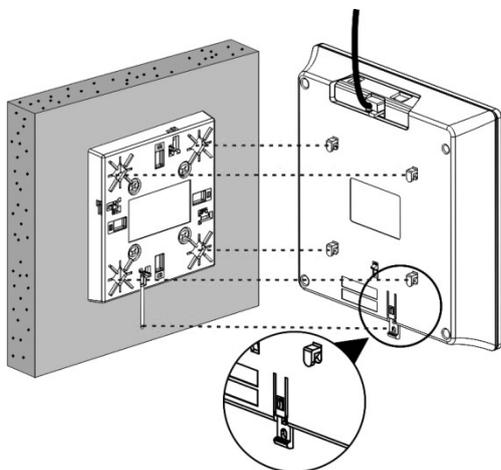
Figure 3-7 Inserting Lock Hasp into the Slot

**Caution**

Press the button and unplug the lock hasp.

- 2) Align the lock loop protruding from the AP with the lock hasp hole.

Figure 3-8 Aligning the Lock Loop with the Lock Hasp



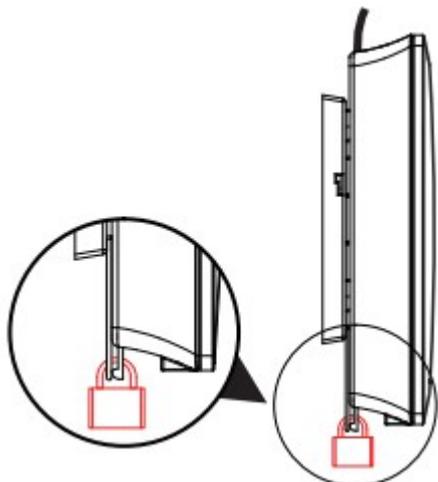


Caution

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

- 3) Install the padlock.

Figure 3-9 Installing the Padlock



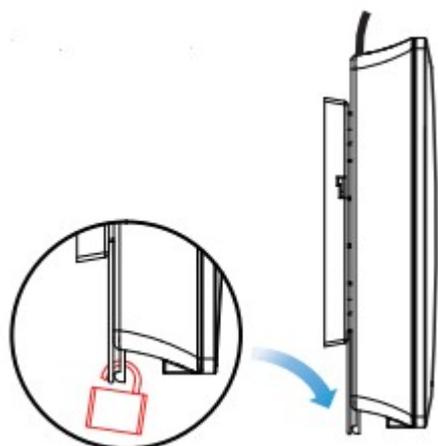
Note

Install the padlock as needed.
Padlocks are customer supplied.

Removing the Access Point

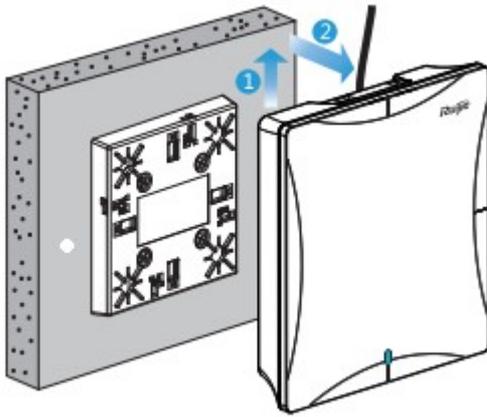
- 1) Remove the padlock if there is one.

Figure 3-10 Removing the Padlock



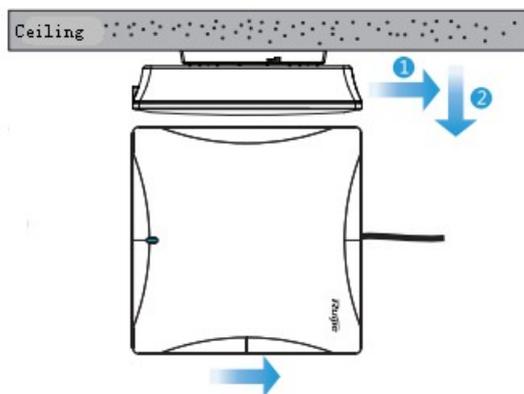
- 2) If the AP is installed on the wall, hold the AP in your hands and push it upward and away from the bracket in the LAN port direction.

Figure 3-11 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 away from the bracket in the LAN port direction.

Figure 3-12 Removing the Ceiling-Mount AP



Connecting Cables

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



Caution

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.



Caution

Avoid bending the cable to a small radius close to the connector.



Caution Ruijie recommends you not use Ethernet cables with protective sleeves that may cause inconvenience to installation of Ethernet cables.

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.
- 2) Attach the cables in the cable tray of the rack.
- 3) Extend the cables under the AP and run in straight line.

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.

Chapter 4 System Debugging

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.

Powering up the AP

Checking before power-up

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

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.

Chapter 5 Monitoring and Maintenance

Monitoring

LED

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

- Blinking green: The AP is being initialized.
- Blinking red: The AP completes initialization but has no Ethernet activity.
- Blinking blue: The AP completes initialization and is establishing a CAPWAP connection with the AC.
- Blinking orange: The AP is upgrading programs firmware. Do not power off.
- Solid blue: The AP is in normal operation. The CAPWAP connection is OK. No wireless clients are associated with the AP.
- Slow blinking blue (3 seconds per cycle): The AP is in normal operation. The CAPWAP connection is OK. A wireless client is associated with the AP.
- Solid red: The AP is warning.
- Double blinking red for 2 cycles and off for 2 cycles: The AP is being located.
- Off: The AP is not receiving power or in Do Not Disturb mode, which can be disabled with software.

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.



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

Remote Maintenance

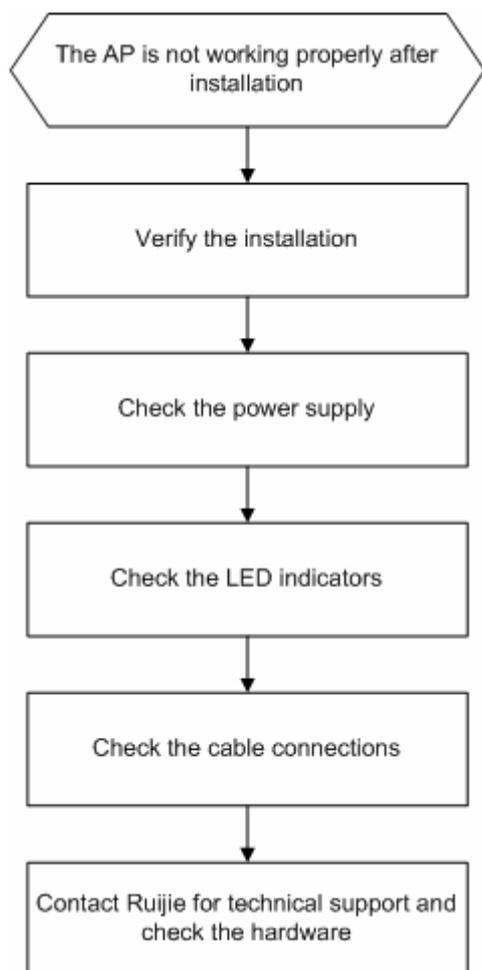
- If the AP operates as a Fat AP, you can login in to the AP remotely for maintenance.
- If the AP operates as a Fit AP, you can use AC to centrally manage and maintain the AP.

Hardware Maintenance

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

Chapter 6 Troubleshooting

Troubleshooting Flowchart



Troubleshooting

LED does not light up after the AP is powered on

- 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.
- 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 abovementioned 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

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 an hour, it indicates the device fails to complete firmware upgrade and is faulty.

LED does not turn solid blue or slow blinking blue (3 seconds per cycle)

After the system starts and the LED does not turn solid blue or slow 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

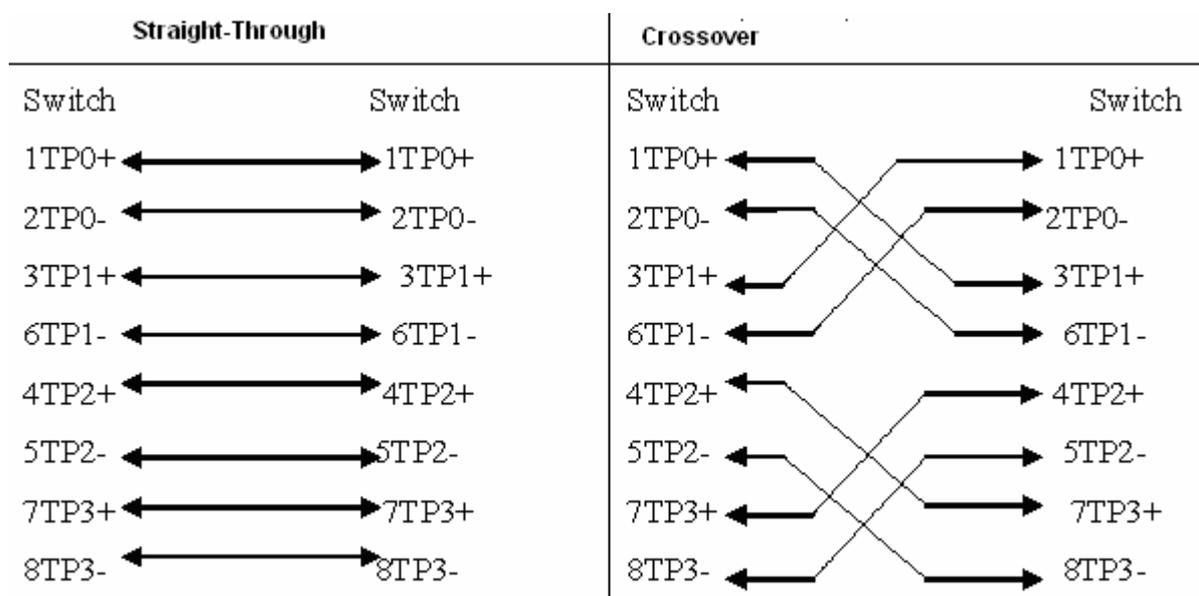
1000BASE-T/100BASE-TX/10BASE-T

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



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.

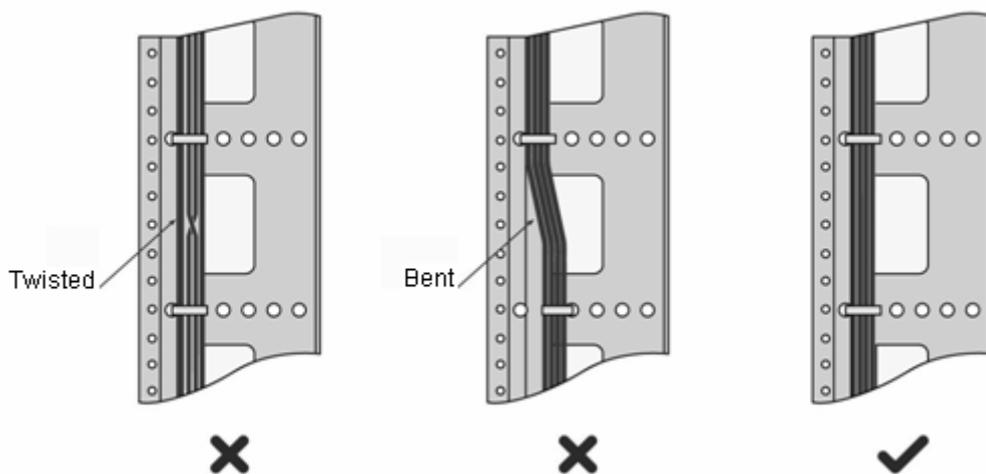
Required Minimum Cable Bend Radius

- 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.

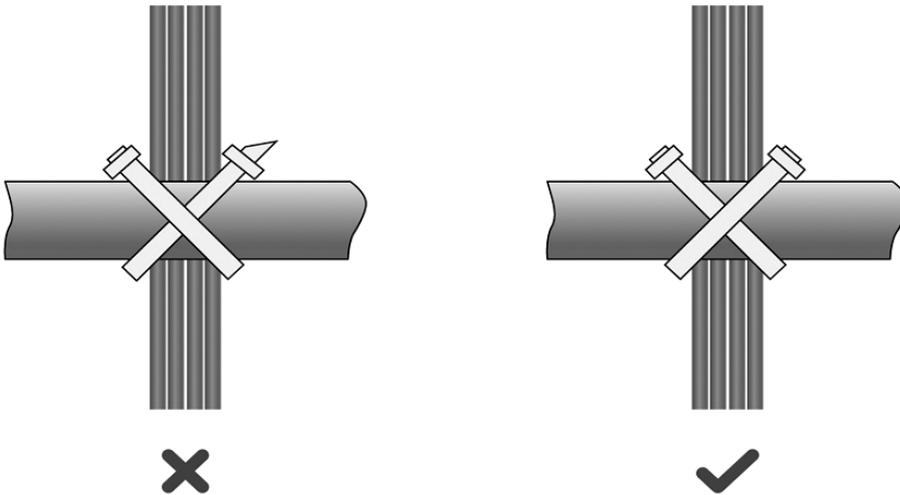
Figure B-1 Bundling Cables



- 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.

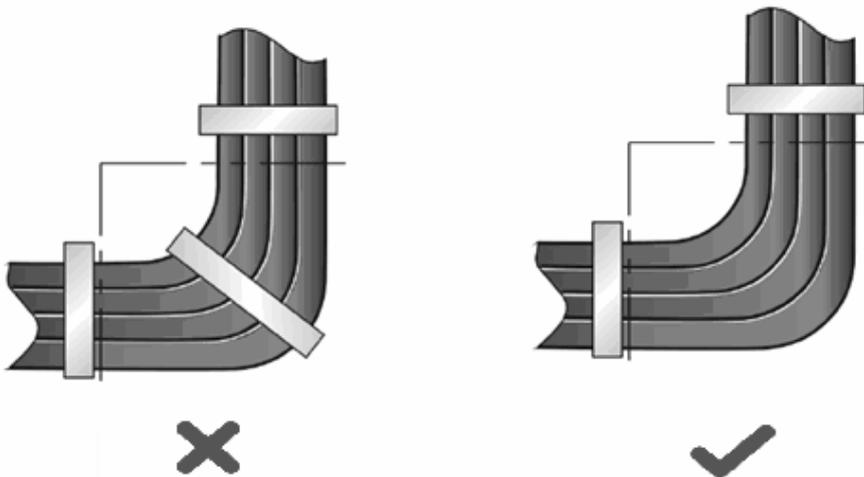
- Cut off excess cable tie cleanly with no sharp edges after bundling cables, as shown in Figure B-2.

Figure B-2 Cutting off Excess Cable Tie



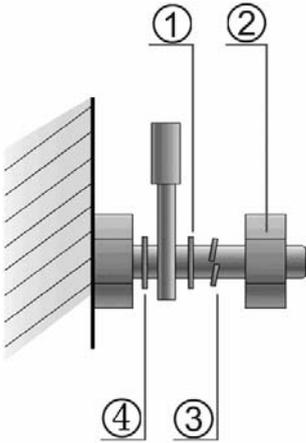
- If cables are to be bent, bind them first but do not tie cable ties within the bend to avoid stress on the cables, which may otherwise cause the wires inside to break, as shown in Figure B-3.

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.