ALTAI
Super WiFi



Installation Guide
Version 1.2

Altai A8n (ac) Series Super WiFi Base Station

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Radio Frequency Interference Requirements

This device complies with Part 15 of FCC Rules.

Operation is subject to the following conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.
3. This device should not be co-located or operating in conjunction with any other antenna or transmitter.

Interference Statement

This equipment 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 equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

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

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

FCC Caution: To assure continued compliance, (example – use only shielded interface cables when connecting to computer or peripheral devices). Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

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Warning

The user is advised to keep apart from the base-station and antenna with at least 45cm when the base-station is in operation.

A8n (ac) series super WiFi base stations require professional installation.

The user is advised to keep apart from the base-station and antenna with at least 45cm when the base-station is in operation.

Please install a lightning arrestor to protect the access point for lightning dissipation during rainstorms. Lightning arrestors are mounted outside the structure and must be grounded by means of a ground wire to the nearest ground rod or item that is grounded.

Disclaimer

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Introduction

This guide is designed to provide the information needed to mount A8n (ac) Series Super WiFi Base Station (BTS) at the site location. A8n (ac) series contains 3 variants:

i) **A8n (ac):** contains A8n (ac) base station plus 4 external 2.4GHz 14dBi sector antennas. Each sector antenna can be adjusted with different directions and tilt angles.
ii) **A8-Ein (ac):** integrated base station, multi-beam 2.4GHz 19dBi antenna array for 80 degree sector coverage.
iii) **A8in (ac):** integrated base station, 14dBi antennas and RF cabling optimized for long range 360-degree access coverage.

It is assumed in this document that a site survey has been performed before the site installation. The appropriate antenna pole and BTS locations have been selected. It is a good practice to have a document consists of a map and drawing illustrating the base station and poles locations, antenna bearing/down-tilt, antenna height, etc… A planning on IP network is also an important issue for network planning.

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A8-Ein (ac) Base Station Mounting and Outlook

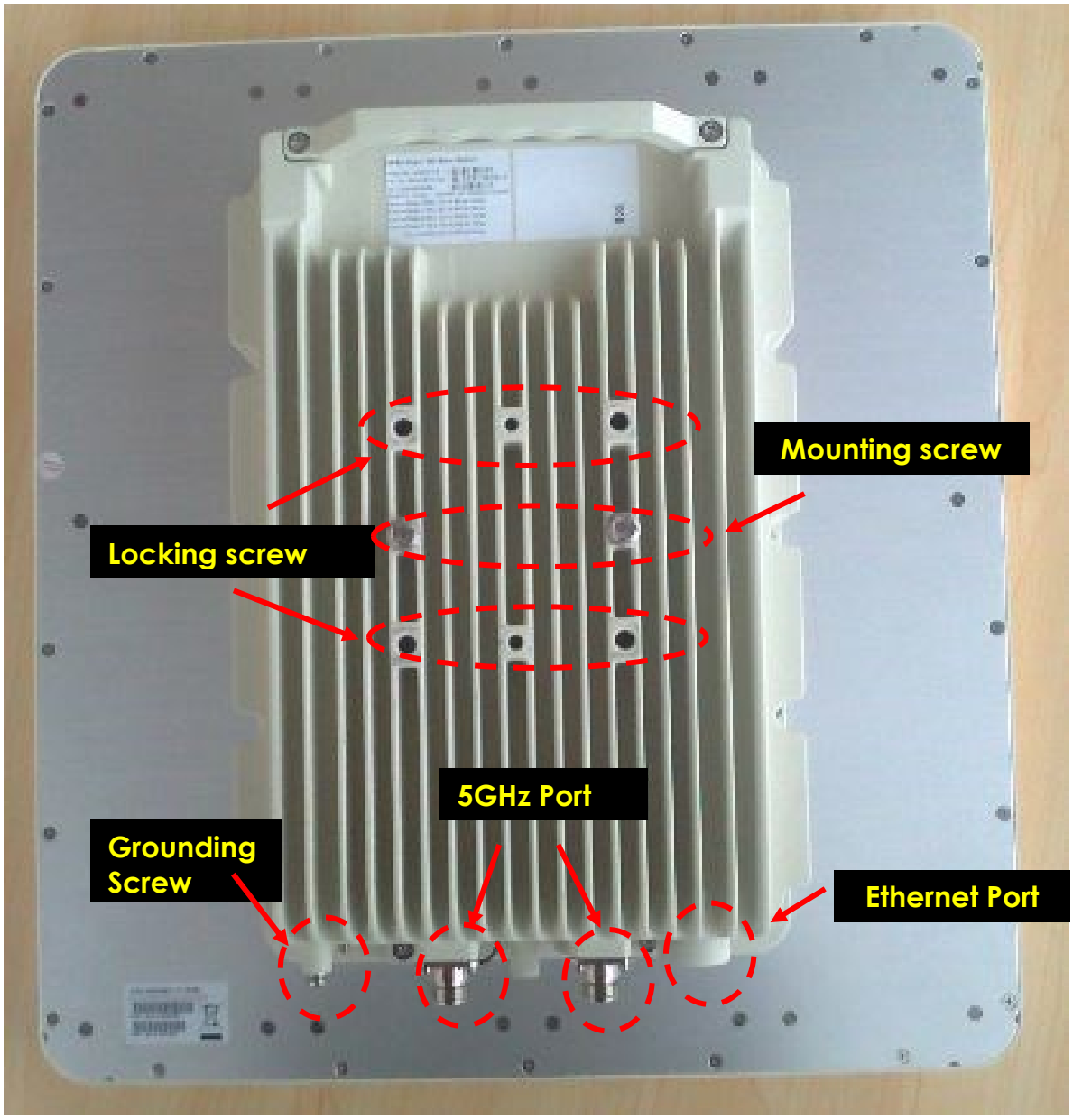


Figure 1. back-view of A8-Ein (ac)

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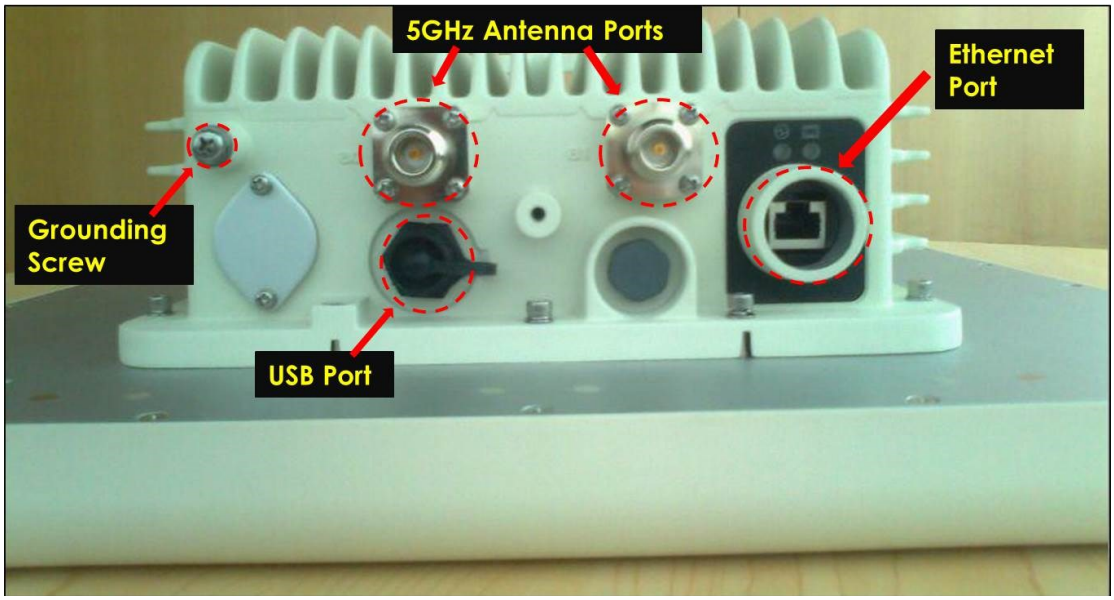
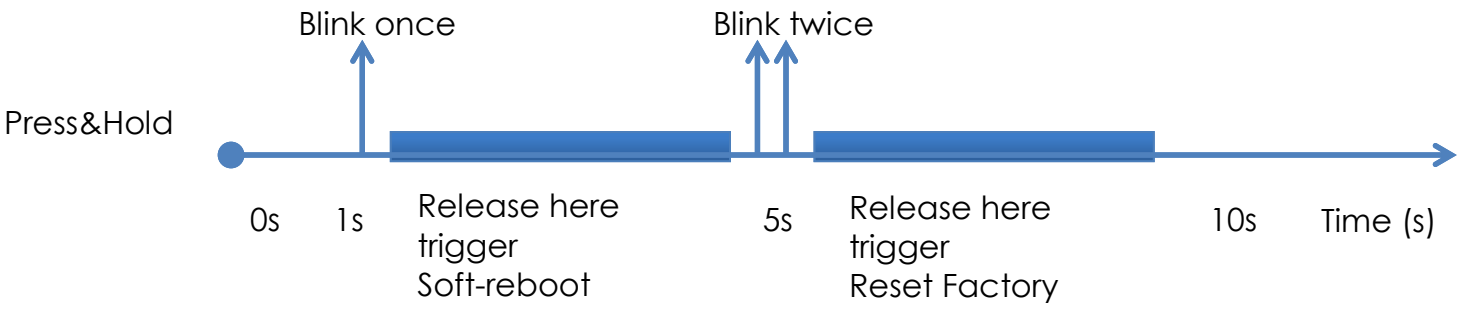


Figure 2. bottom-view of A8-Ein (ac)

Reset back to factory default via reset button

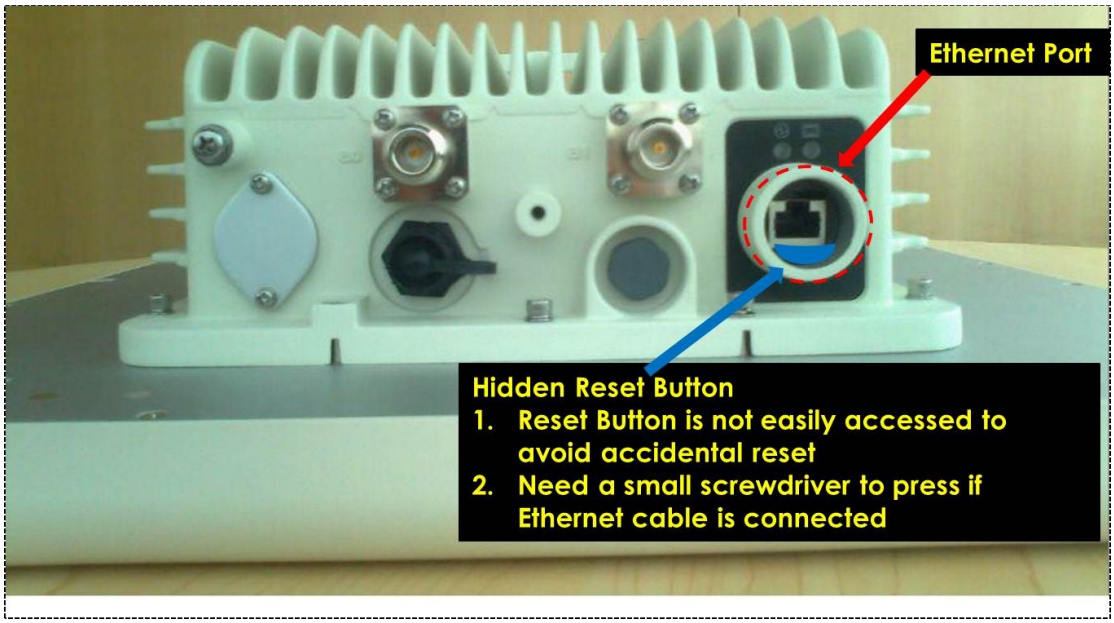
Hardware reset button have 2 functions:

- Soft-reboot [equivalent to UI: Reboot).
  - Press & Hold the reset button until you see Power LED blink once
  - Then release it immediately
- Reset to factory default [equivalent to UI: Reset factory (NOT retain network address)]
  - Press & Hold the reset button until you see Power LED blink once
  - Continue pressing the button until you see Power LED blink twice consecutively
  - Then release it immediately



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The reset button's location is shown in following.



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A8-Ein (ac) Base Station Mounting Kit

A **Main mounting module**
B **Mounting back plate**
C **4x mounting screw and nut**
D **4x locking screw**

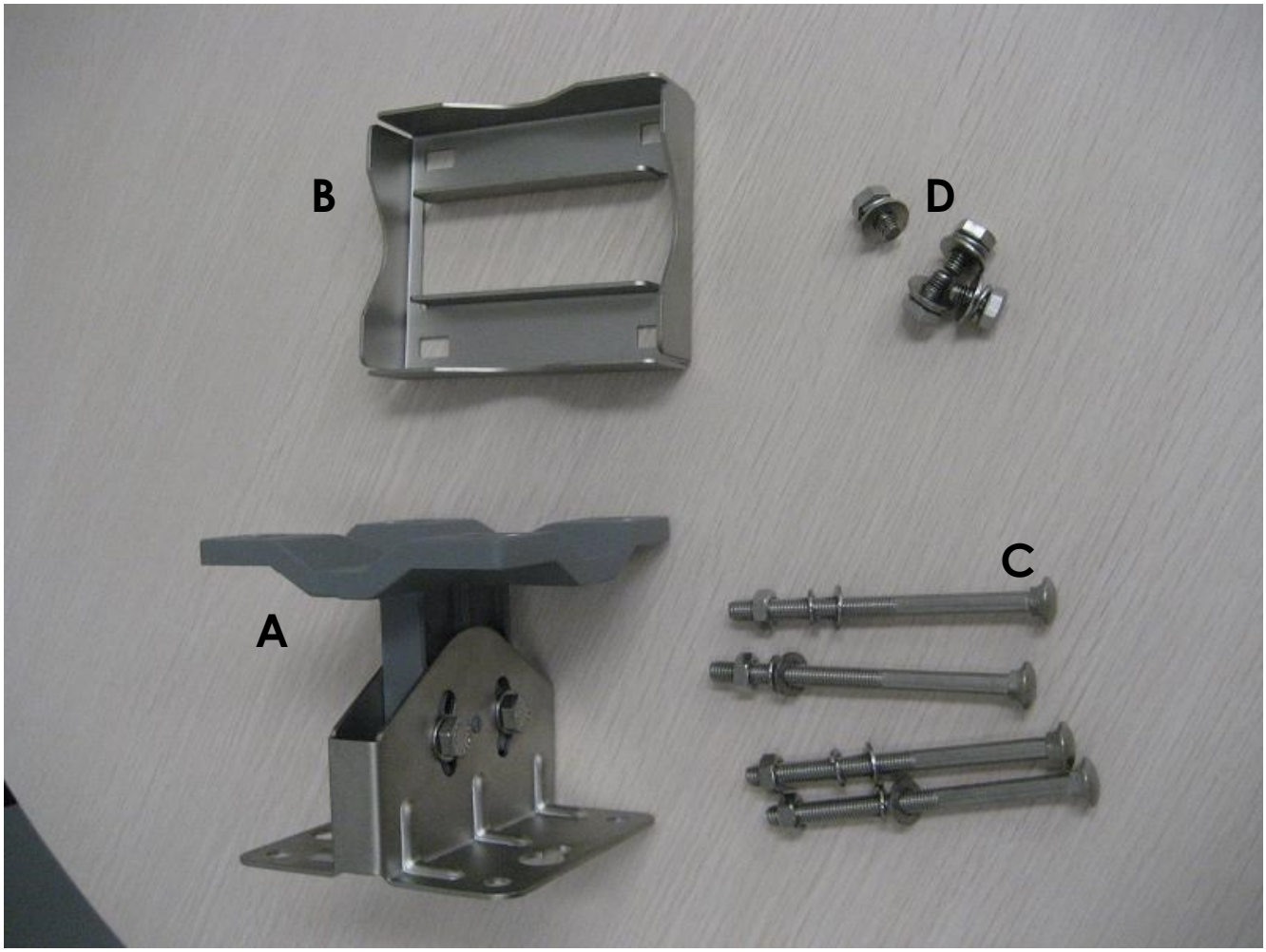


Figure 3. A8-Ein (ac) Base Station Package

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Mounting A8-Ein (ac) on Pole

1. Assemble the mounting kit according to Figure 4 with one side of the screw installed.
2. Mount the kit to the pole at the desired height and tighten all 4 screws to fix its position (Figure 5).
3. The mounting kit must be installed with the key hole pointing down (Figure 6).
4. Clamp the A8-Ein (ac) unit to the mounting kit, as shown in Figure 7 and make sure the mounting screw is locked in the key hole.
5. Screw in 4 locking screw to secure A8-Ein (ac) with the mounting kit (Figure 8).
6. Adjust A8-Ein (ac) tilting by relaxing the pair of tilting screws and tighten them back when the angle is fixed (Figure 9).
7. The mounting kit will fit with pole diameter from 1 inch to 3 inches.

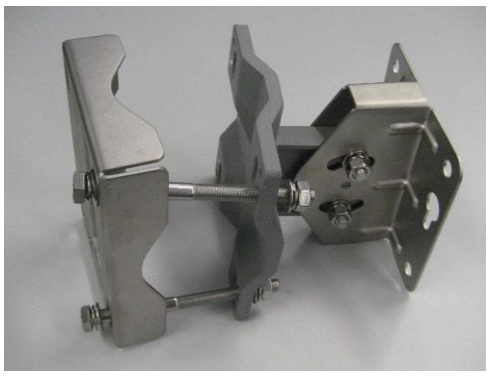


Figure 4. Mounting kit assembly

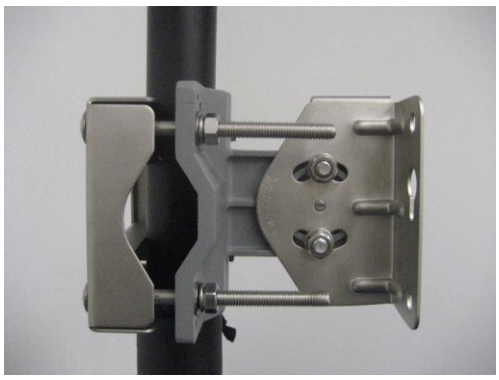


Figure 5. Mounting kit assembly

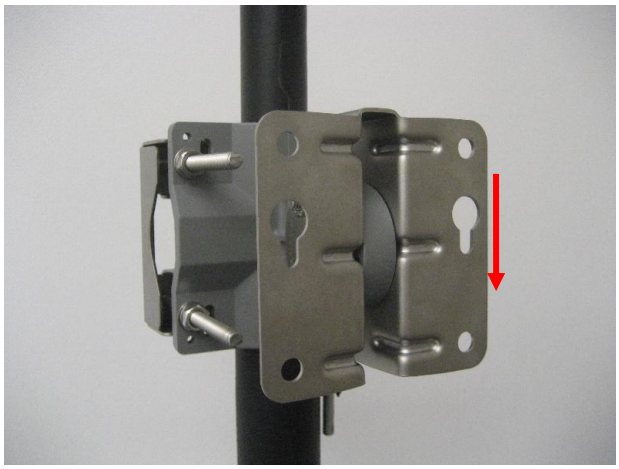


Figure 6. Key hole direction

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Figure 7. Clamping A8-Ein (ac) unit

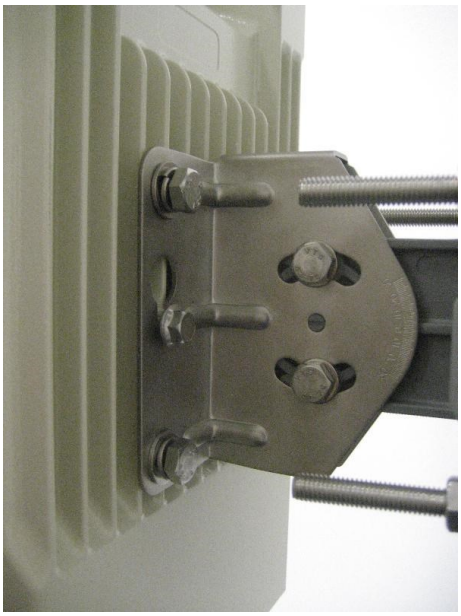


Figure 8. Secure the unit



Figure 9. Antenna Mounted on Pole

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A8n (ac) and A8in (ac) Base Station Mounting

Mounting for A8n (ac) and A8in (ac) are the same. Figure 10 shows the back view of A8in (ac). A8n (ac) has the same mounting screw.

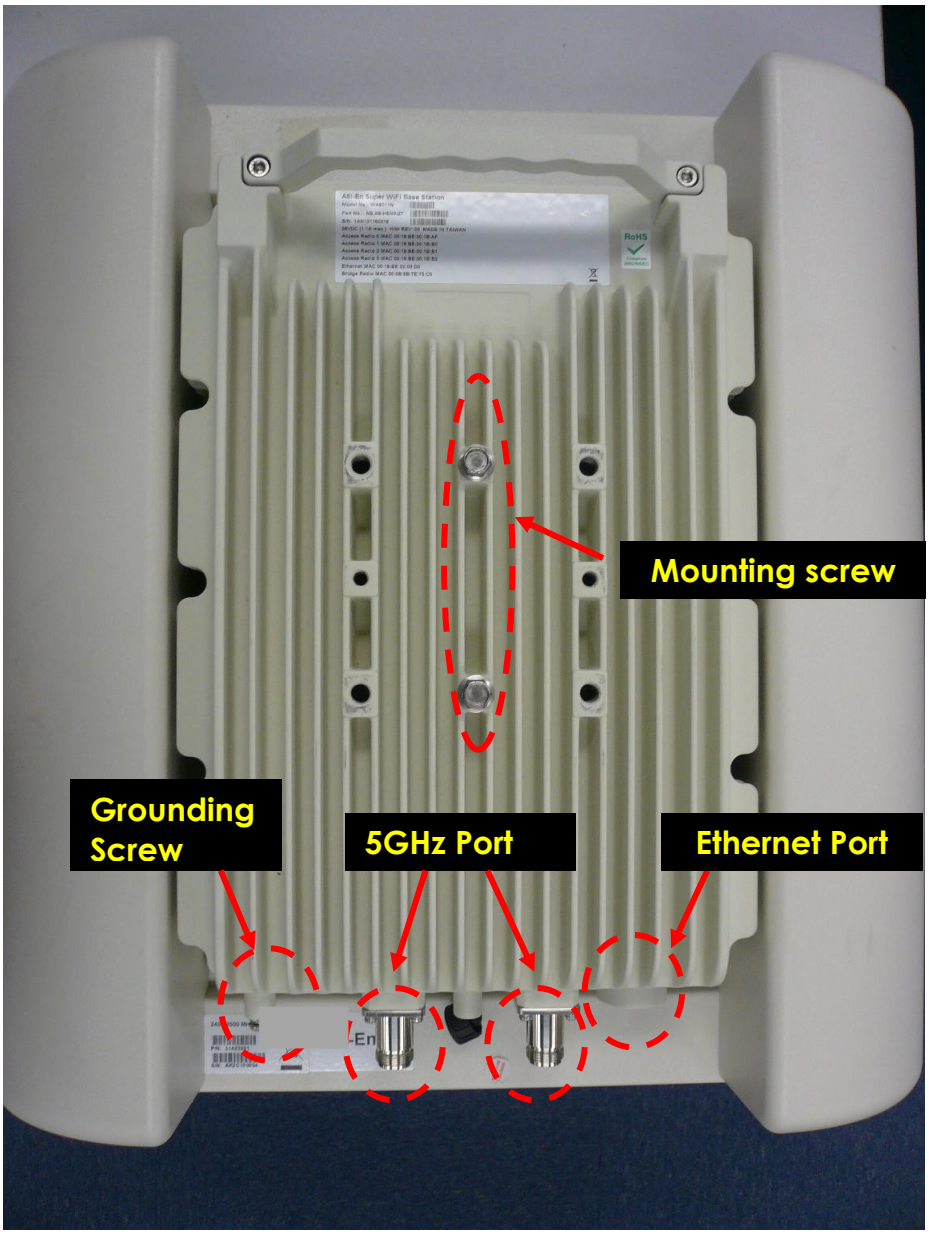


Figure 10. back-view of A8in (ac)

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A8n (ac) and A8in (ac) Base Station Mounting Kit

A Mounting back plate
B Main mounting module
C 4x mounting screws and nuts
D 4x locking screws and nuts

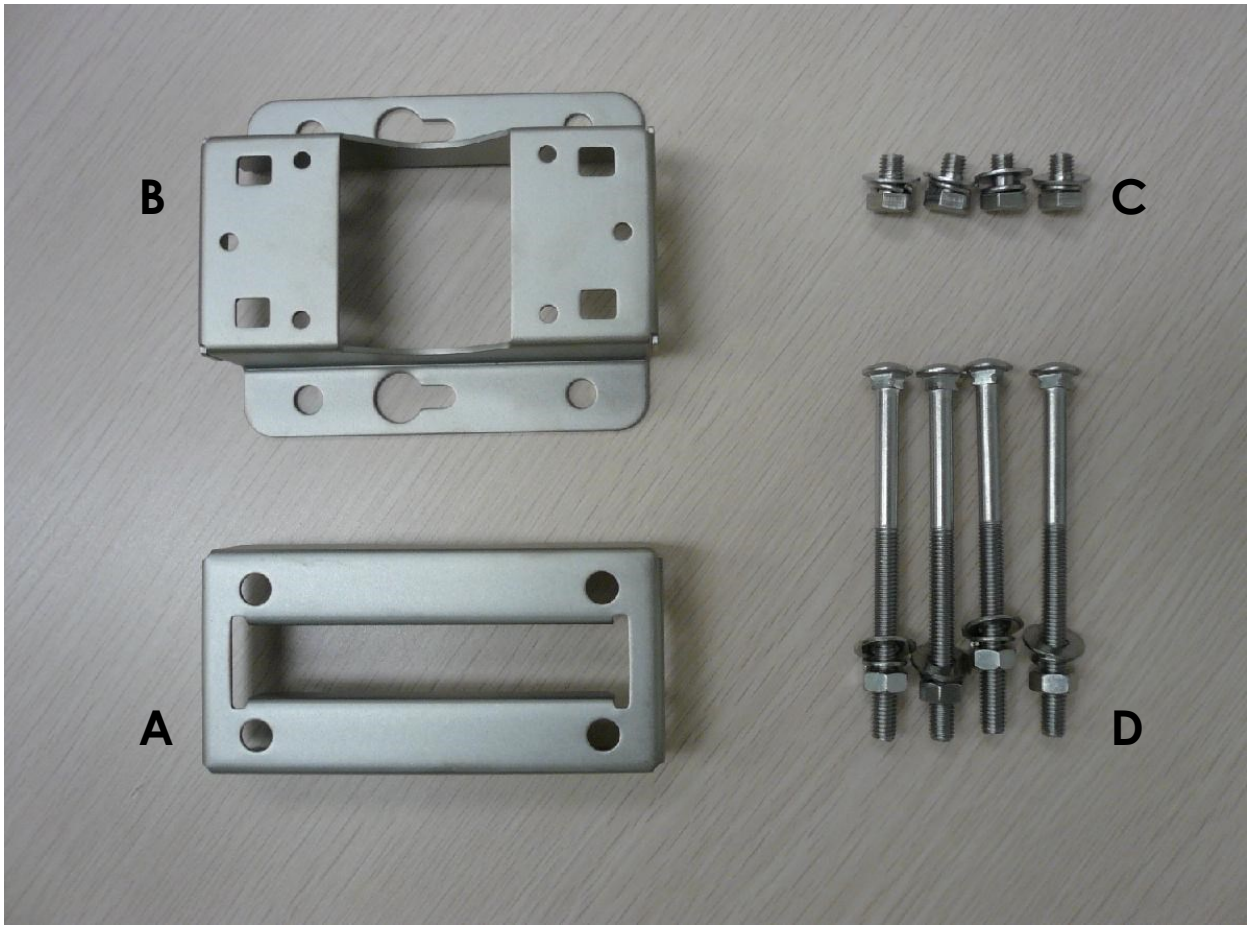


Figure 11 A8n (ac) and A8in (ac) Base Station Package

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Mounting A8n (ac) and A8in (ac) on Pole

1. Assemble the mounting kit according to Figure 12 with one side of the screw installed.
2. Mount the kit to the pole at the desired height and tighten all 4 screws to fix its position (Figure 13).
3. The mounting kit must be installed with the key hole pointing direction (Figure 14).
4. Clamp the unit to the mounting kit, as shown in Figure 15 and make sure the mounting screw is locked in the key hole.
5. Screw in 4 locking screw to secure A8in (ac) with the mounting kit (Figure 15).
6. The mounting kit will fit with pole diameter from 1 inch to 3 inches.

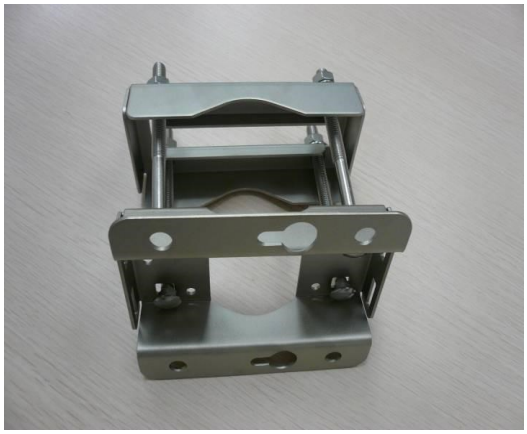


Figure 12 Mounting kit assembly



Figure 13 Completion of Mounting



Figure 14 mounting screw locking direction



Figure 15 Clamping and secure the unit on pole

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Mounting A8n (ac) 2.4GHz antenna and cable connection

Introduction

1. The A8n (ac) AP has 4 external 2.4GHz panel antennas. The A8-Ein (ac) and A8in (ac) has internal 2.4GHz antenna. External 2.4GHz panel antenna gives you more freedom to adjust the direction and tilting of each antenna. Internal 2.4GHz antenna is easier for installation.

2. At the top of A8n (ac), there are 8 N-female RF connector marked with 1-8. They are grouped to 4 groups to connect to 4 external 2.4GHz panel antenna.

3. It is recommended to seal the A8n (ac) series RF ports with weatherproof materials to prevent water leakage.

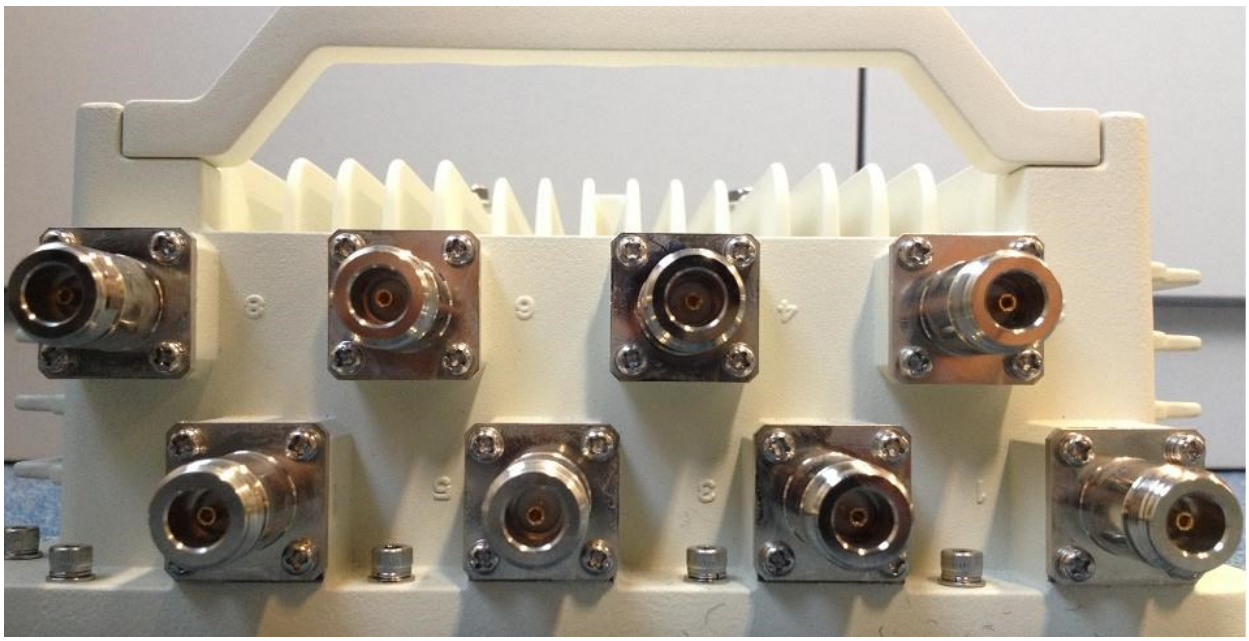


Figure16. Top of A8n (ac) – 8 N-female RF port for external 2.4GHz panel antenna connection

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Mounting of A8n (ac) 2.4GHz Panel antenna

1. Mount the 2.4GHz radio antenna to the pole. It is recommended that to install the standard A8n (ac) 2.4GHz antenna with the RF ports facing downward, as shown in Figure 17.
2. Adjust the direction and down-tilt angle of the A8n (ac) 2.4GHz antenna to align, as shown in Figure 18.



Figure 17. Standard A8n (ac) 2.4GHz Antenna



Figure 18. Adjust A8n (ac) 2.4GHz Antenna tilting

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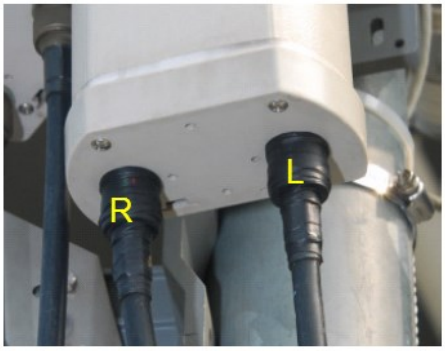
Cable connection from A8n (ac) to 2.4GHz panel antenna

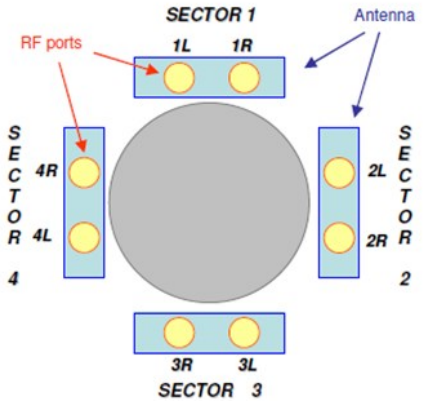
1. Connect RF cable from panel antenna port to A8n (ac) 2.4GHz RF port at the top of A8n (ac).
2. RF port 1 and 2 of A8n (ac) must connect to the same panel antenna. The same for ports (3.4), (5,6) and (7.8) which each pairs must connect to the same panel antenna. It is recommended to connect the A8n (ac) port to antenna port according Figure 20 mapping.
3. It is recommended to seal the A8n (ac) series 2.4GHz antenna RF ports with weatherproof materials to get the best performance according to the procedure in chapter 6 of this document.



Figure19. RF cable connection from panel antenna

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Antenna Port	A8 BTS Port
1L	1
1R	2
2L	3
2R	4
3L	5
3R	6
4L	7
4R	8

Connect the RF cables accordingly

Figure 20. Antenna port to A8n (ac) port mapping

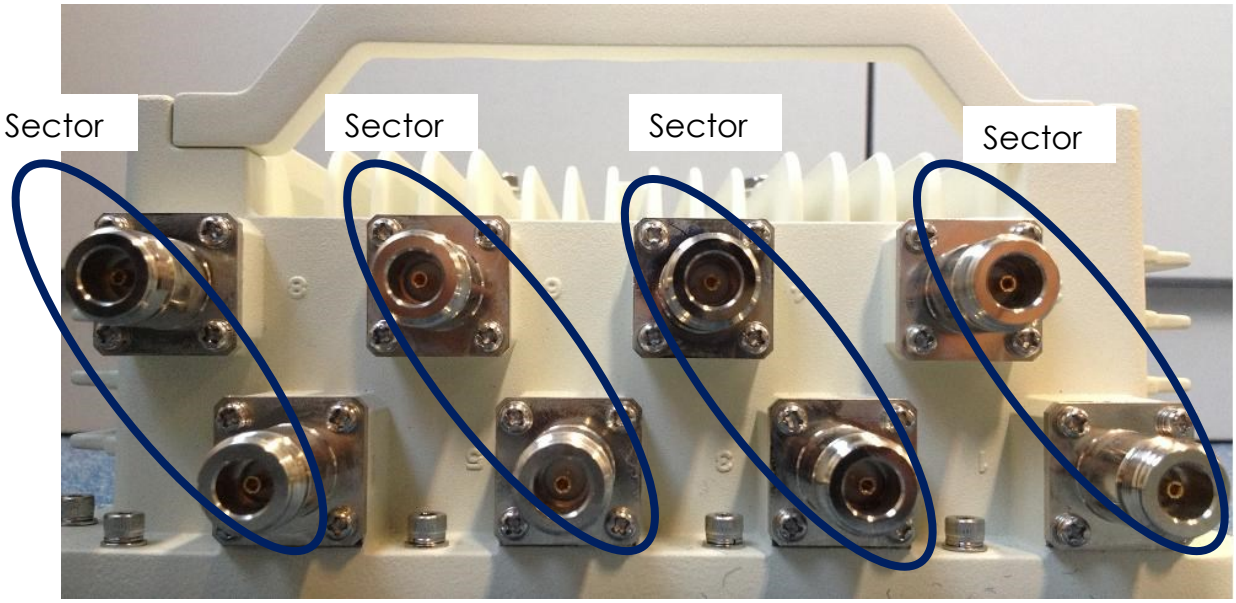


Figure21. A8n (ac) 2.4GHz RF port groups

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RF Cables Connection and Mounting of 5GHz Radio Antenna

1. The standard A8n (ac) series 5GHz antenna has two RF ports.

2. Connect RF cables from the A8n (ac) series 5GHz antenna RF ports which marked "a0" and "a1"next to the RF ports.

3. It is recommended to seal the A8n (ac) series 5GHz antenna RF ports with weatherproof materials to get the best performance according to the procedure in chapter 6 of this document

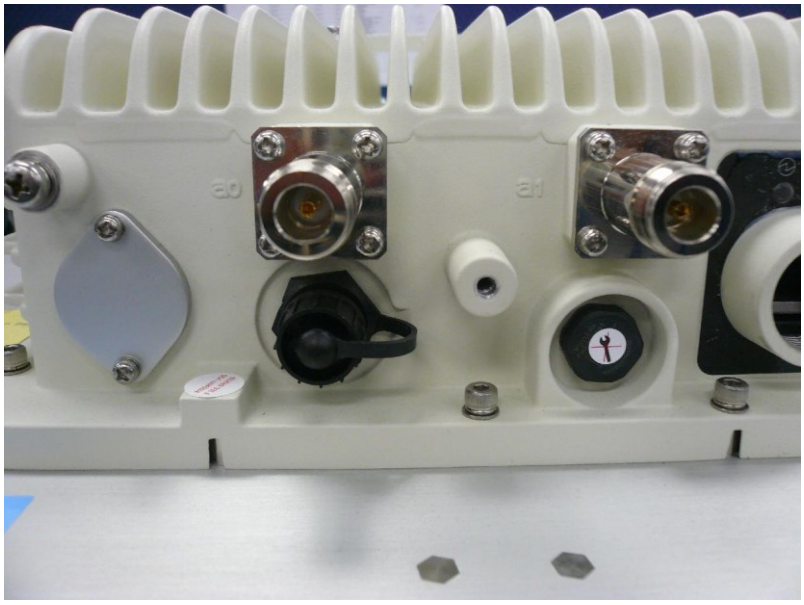


Figure 22. 5GHz "a0 & a1" antenna RF ports



Figure 23. 20dBi 5GHz Antenna mounting



Figure 24. Waterproof wrapping direction

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Weatherproofing A8n (ac) Series Radio Antenna

Introduction

Sealing materials are applied to outdoor antenna connectors to accomplish several goals. First and foremost is to prevent water from entering the connector. The second reason is to protect the connector from gradual degradation due to UV radiation and pollution. Sunlight and weather will oxidize metal surfaces and cause DC resistance to increase on exposed mating surfaces. It is true that the RF cable connectors are supposed to be weatherproof, but if left exposed to weather conditions, they will tarnish and start to look rather ugly in a short time. A good taping job will also prevent the RF cable connectors from loosening up, which is a common occurrence for RF cables exposed to vibration and strong winds.

We recommend the following sealing materials for weatherproofing the antenna connectors:

1. High-quality, all-weather, black plastic electrical tape, preferably 3/4" (19mm) wide to make it easier to manipulate the tape around the A8n (ac) Series BTS radio antenna ports. An RF port is often first wrapped with a layer of electrical tape to make it easier to remove the butyl rubber layer. In addition, one or more layers of electrical tape are used as a final outer wrap to provide UV protection. We recommend the 3M Scotch Super 88 Vinyl Electrical Tape for this purpose.

2. High-quality, all-weather, black butyl rubber tape, preferably 3/4" (19mm) wide to make it easier to manipulate the tape around the A8n (ac) series BTS radio antenna ports. Butyl rubber tape is self-amalgamating - it chemically bonds to itself, forming a strong, waterproof joint. A layer of butyl rubber tape is applied around a connector joint to provide a weatherproof seal, often on top of a layer of electrical tape. We recommend the Andrew Corporation butyl rubber tape for this purpose.

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Installation Tips



Figure 25. 3M Scotch Super 88 Vinyl Electrical Tape



Figure26. Andrew Corporation Butyl Rubber Tape

A few general rules about weatherproofing RF ports:

1. Always apply tape at temperature above 32 degrees F to ensure adhesion. When working in cold weather, always protect your tape rolls by storing it under your coat and next to your body to keep tape flexible. If the tape cannot stretch elastically, it will not seal properly.

2. Do not stretch the tape to the point where it distorts. Only apply enough pressure to get a smooth wrap.

3. Smooth each wrapped layer of tape with your hands to ensure proper adhesion.

4. Do not pull the tape to tear it - always cut the tape. A pulled tape will most likely unravel, decreasing protection.

5. In warm climates where there will be long exposure to sunlight, it is a good idea to wrap an extra layer or two of electrical plastic tape over the butyl rubber layer to enhance UV protection.

6. For vertical runs of cable, the final layer of electrical tape should be wrapped from the bottom to the top, and overlap about 50% of the width of the tape. This will provide the same effect as shingles on a house. The water will run down across the joints without going into the joints.

In order to properly weatherproof of the BTS radio antenna ports, they must be prepared before the installation.

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1. Cut the butyl rubber tape into 1/5" (5mm) by 4" (100mm) strips.

2. Wrap a strip of butyl rubber tape around the base of each antenna port in the clockwise direction. Take extra care to make sure that the resulting butyl rubber ring would not hinder the tightening of the RF cable connector around the antenna port.



Figure 27. Wrap the Butyl Rubber Strip



Figure 28. Butyl Rubber Ring Finished

Connecting RF Cables

1. Make sure each RF cable and its connectors are absolutely dry.

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2. Loosely connect all the RF cables from each RF port. Do not tighten up any of the connections.

3. Secure the RF cable bundles to the pole.

4. Tighten the RF cable connectors around the A8n (ac) series 5GHz antenna ports with a torque wrench to the proper torque limit to ensure that correct internal seals and surface contacts are made. If a torque wrench is not available, first tighten the connector to finger tight, then tighten it with a wrench for an additional ⅛ to ¼ turn from the finger tight position.

5. Weatherproof the A8n (ac) series antenna ports.

Weatherproofing on A8n (ac) 2.4GHz Radio Antenna Ports

1. Start wrapping a layer of electrical tape from 1/4" (6mm) above the edge of the RF cable connector. Overlap the tape to half –width. The tape should cover the RF cable connector body, and extend 1" (25mm) above the cable connector clamping nut.

   The tape can be applied in one or more strips if necessary. A strip can be coiled onto an applicator such as a pencil. Apply only enough tension to get good adhesion and keep the tape smooth.

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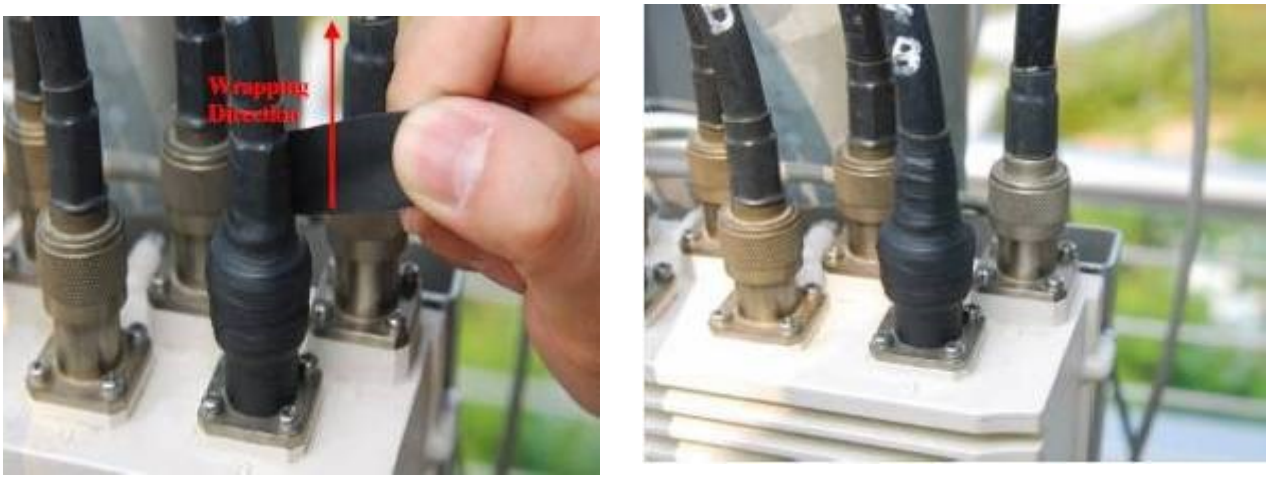


Figure 29. Wrapping direction and extends the wrap 1" above the connector clamping

2. Start wrapping a layer of butyl rubber tape from the base of the A8n (ac) series 5GHz antenna port. Overlap the tape to half –width. Finish the wrap at 1" (25mm) above the electrical tape and cut the tape. Take extra care to make sure that the RF cable connector to A8n (ac) series 5GHz antenna port junction is tightly sealed. Press the tape edges together so that there are no gaps. Press the tape against the RF cable connector body and the A8n (ac) series 5GHz antenna port.

3. If enhanced UV protection is required, start wrapping a layer of electrical tape from the base of the A8n (ac) 2.4GHz antenna port. Overlap the tape to half –width. Finish the wrap at 1" (25mm) above the butyl rubber tape and cut the tape.

Weatherproofing A8n (ac) series 5GHz Antenna RF Ports

1. Start wrapping a layer of electrical tape from 1/4" (6mm) above the edge of the RF cable connector. Overlap the tape to half –width. The tape should cover the RF cable connector body, and extend 1" (25mm) above the cable connector clamping nut.

   The tape can be applied in one or more strips if necessary. A strip can be coiled onto an applicator such as a pencil. Apply only enough tension to get good adhesion and keep the tape smooth.

2. Start wrapping a layer of butyl rubber tape 1" (25mm) below the electrical tape. Overlap the tape to half –width. Finish the wrap at the base of the antenna port and cut the tape. Take extra care to make sure that the RF cable connector to A8n (ac) series 5GHz

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antenna RF port junction is tightly sealed. Press the tape edges together so that there are no gaps. Press the tape against the RF cable connector body and the A8n (ac) series 5GHz antenna RF port.

3. Start wrapping a layer of electrical tape 1" (25mm) below the butyl rubber tape, overlapping at half-width. Finish the wrap at the base of the A8n (ac) series 5GHz antenna RF port and cut the tape. Repeat this process for a second layer, and if enhanced UV protection is required, a third layer.

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Recommendation on Installation Pole

Antenna Pole Height and Size

The antenna should be mounted at least 1 meter above any obstacle in front. Hence, the height of the pole depends on the situation. In the situation shown below, the pole should be at least 2 to 3 meters to avoid any obstacle. The mounting kit can mount the pole with diameter from 1.5 inches to 3 inches.

Remark: 2 inches pole is recommended as A8n (ac) series base station and external antenna can be installed on the same pole.

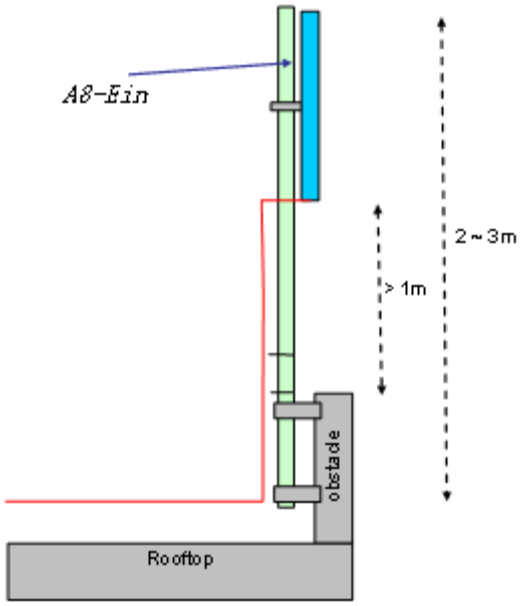


Figure 30. At Least 1m above Any Obstacle in Front

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Grounding Protection

The A8n (ac) series must be properly connected to earth ground. Failure to do so may result in equipment damage, injury or death. Product warranty does not cover damage resulting in part or in whole from improper grounding. An external grounding wire must be installed, especially when A8-Ein (ac) is deployed on a non-metal pole or the metal pole is not properly grounded. Please consult your location's building and electrical codes and follow them, or consult standards such as National Electric Code. The grounding screw is located at the bottom of A8n (ac) series as showed in figure 30. Use 10 AWG wire with corrosion-resistant connectors for connecting to one or more approved grounding rods or building's earthing network. Earth-to-ground resistance should not be more than 10ohms.

1. Loose the grounding screw of A8n (ac) series.
2. Attach a length 10 AWG bare copper with a terminal connector to the grounding screw.
3. Tighten the screw nut.
4. Connect the other end of grounding wire to grounding rods or earth ground.



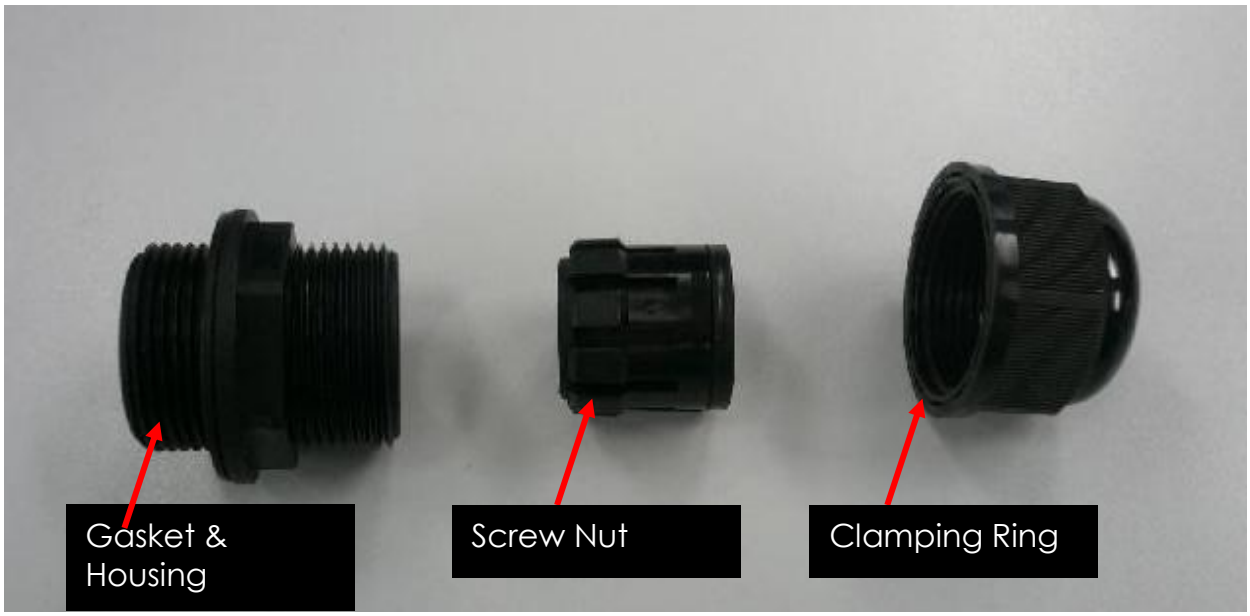
Figure 31 Grounding Screw

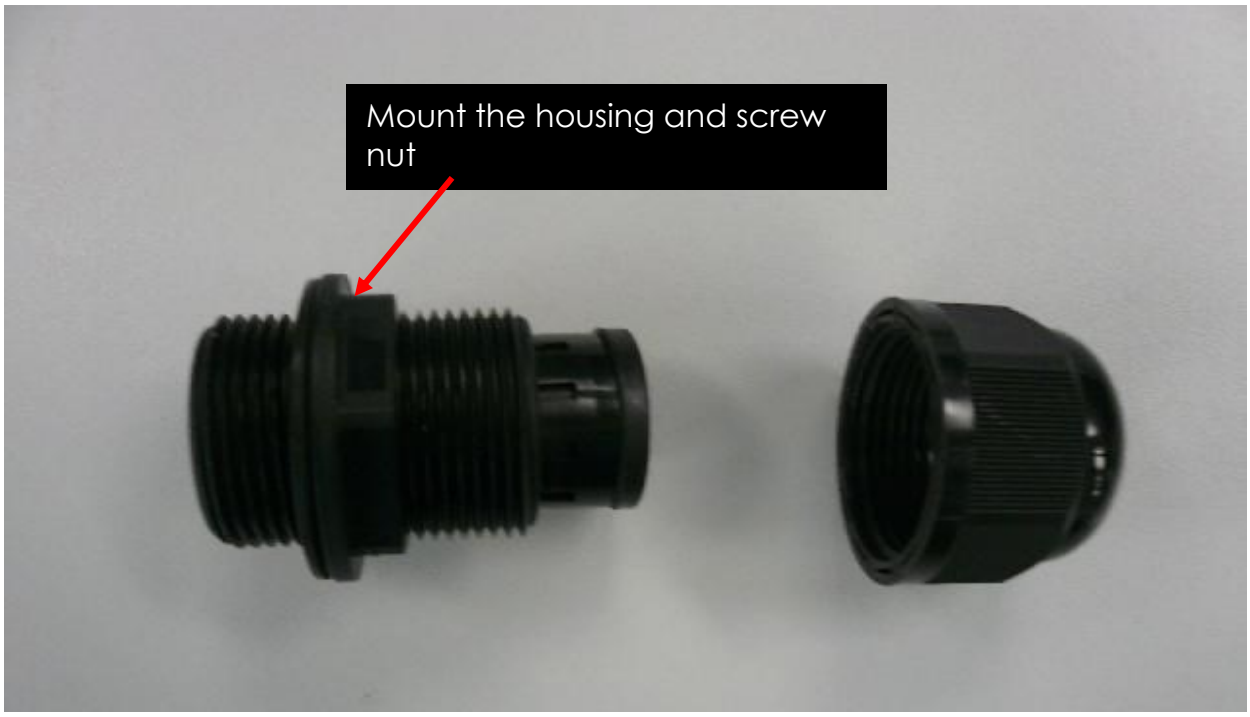
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Ethernet Connector Packet Installation

The Ethernet connector packet includes the following components:

1. Gasket
2. Housing
3. Screw Nut
4. Clamping Ring



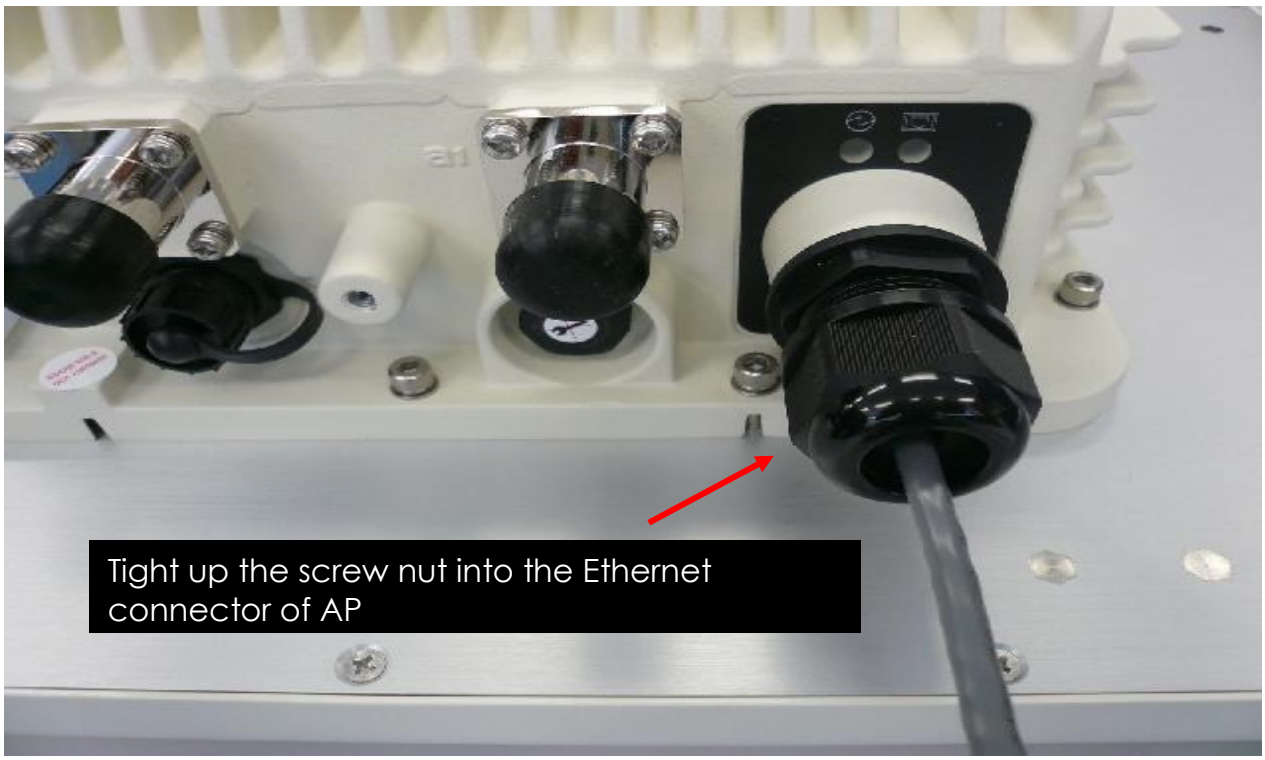


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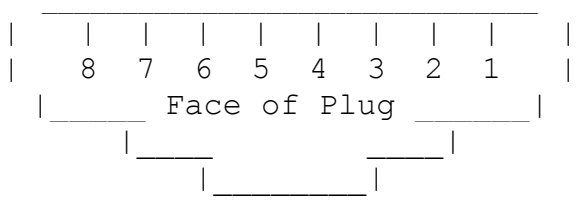


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Cat 5e or cat 6 Ethernet cable are recommended. Maximum cable length between PoE adapter and A8n (ac) is 100m.

The end of cable, RJ-45 modular jack pins are numbered 1 through 8 as shown:



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The assignments of wire pairs to plug and jack pins are as follows :

Pin	Pair	wire Color
1	2	 white / orange
2	2	 orange
3	3	 white / green
4	1	 blue
5	1	 white / blue
6	3	 green
7	4	 white / brown
8	4	 brown

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Lightning Protection

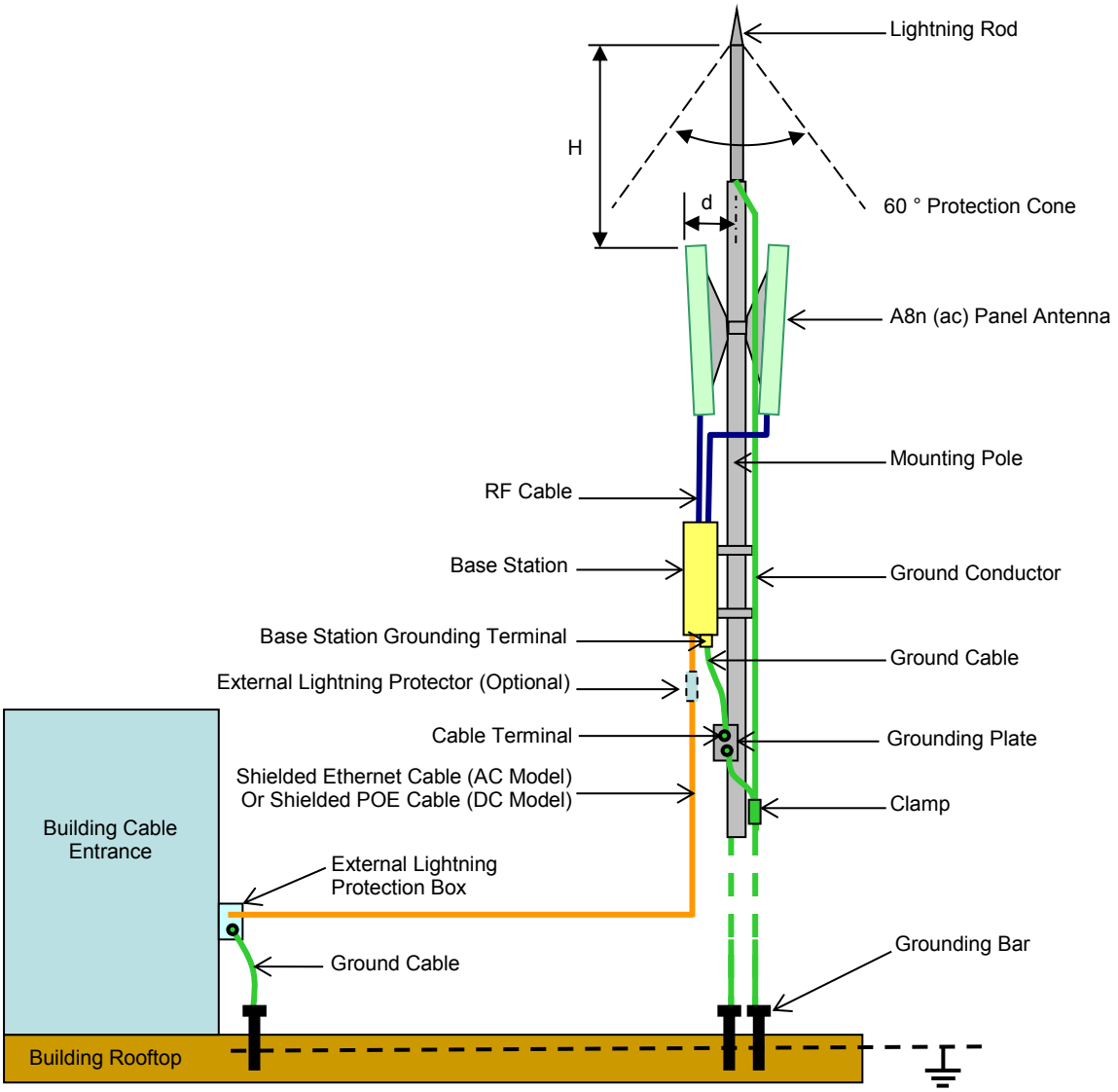


Figure 24 Lightning Protection System for Pole Mounting A8n (ac) Series Base Station

A lightning protection system provides a means by which a lightning discharge may enter or leave earth without passing through and damaging personnel, equipment or the buildings. It does not prevent lightning from striking but provides a means for controlling it and prevents damage by providing a low resistance path for discharge of the lightning energy.

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A typical lightning protection system for A8n (ac) series base station is shown in Figure 24. It consists of 5 parts:

- Lightning Rod
- Ground Conductor
- Grounding Plate
- Earth Termination
- External Lightning Protectors

Lightning Rod

A lightning rod (air terminal) neutralizes the downward lightning strike by launching an upward ionized path. The lightning current will follow this path and is thus diverted away from personnel and electronic equipment. The lightning rod must be constructed of steel with a pointed tip and welded to a ground conductor.

The lightning rod must be installed at top of the mounting post or tower higher than the highest portion of equipment it protects. For A8n (ac) base station installation, the 4-sector antennas are usually the highest points and usually protrude away from the post. Suppose the horizontal distance from the post to the top outer most point of antenna is d, the minimum height of the tip of lightning rod above the highest point of antenna (H) is recommended to be at least 2d such that a cone of protection of 60 degree is ensured around the pole or tower. In areas of high lightning activities, the height H should be increased to 5d.

Ground Conductor

A ground conductor is a metal strip or rod usually made of copper or similar conductive metal linking the lightning rod to the earth. The prime purpose of the ground conductor is to conduct lightning current from the lightning rod to the earth termination. It also provides connection to a metal grounding plate so that the equipment under protection can be connected to at the shortest distance possible.

A ground conductor must be installed straight and vertical without bends such that it connects to the earth termination at the shortest and direct path. As a rule of thumb, a minimum 50 mm^2 in cross sectional area or AWG 0 copper conductor is recommended for the ground conductor. Aluminum or iron conductor can also be used but with poorer conductivity. Minimum cross sectional area of copper, aluminum and iron ground conductor are 16, 25 and 30 mm^2 respectively.

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The connection between the ground conductor and the earth must be no higher than 5 ohms. This is achieved by grounding to special grounding bars in the case of post mounting or to the steel reinforcement bars at the concrete base of the tower in case of tower mounting.

Grounding Plate

A grounding plate is a metal plate welded to the post or tower which provides a common grounding connection placed at a short distance from the equipment and ground conductor. The grounding plate is connected to the ground conductor using a ground cable and clamp.

The A8n (ac) series base station grounding terminal is located at the bottom of chassis compartment. This grounding terminal should be connected to the grounding plate using a ground cable and lug. AWG 10 (around 5 mm^2 cross-sectional area) copper wire is recommended for the ground cable. Only one grounding connection to the pole or tower is allowed.

All antenna ports of A8n (ac) base station are grounded internally. For shielded Ethernet cable (AC model) or shielded POE cable (DC model) grounding, the ground wire of the Ethernet/ POE cable should be connected to the screw port located at the inside bottom of lower chassis compartment of A8n (ac) series base station. The other side of the Ethernet/ POE cable will be connected to indoor units via a grounded external lightning protector box. The external lightning protector box should be located outside the building as near as practicable to the entrance of the cables to the building and it is connected to an earth termination via a ground cable.

Earth Termination

An earth termination is a metal grounding bar which is planted into the earth for conducting and dispersing lightning current from the ground conductor to earth. The ground conductor is connected to this grounding bar at one end. The mounting post or tower should have its own grounding bar. The size of metal grounding bar should be designed such that the total resistance from the lightning rod to the earth termination is less than 5 ohms.

External Lightning Protectors

Lightning protector (or surge arrestor) is a component which provides a lower resistance path to conduct sufficient charge from the surge in order to lower the surge voltage to a safe level.

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External lightning protectors can be used to provide additional protection to the Altai A8n (ac) series base station embedded protectors. They can be put at strategic points such as the Ethernet port, AC power or antenna ports close to the A8n (ac) series base station. External lightning protectors are available in the market in the form of a protector box, which can be inserted simply in front of the ports to be protected.

As the magnitude and speed of lightning varies in different places, the specifications of external lightning protectors should be chosen appropriately according to local protection requirements.

While this section gives a general guideline on lightning protection, the detail specifications of a lightning protection system must be provided by local electricians and must be maintained and checked periodically in accordance with local regulations. Altai does not provide any warranties as to the effectiveness of the suggested measures. The implementation of the suggested measures is at the customer's own discretion. Under no circumstances will Altai be liable for any consequences resulting from the implementation or lack of implementation of the suggested measures.

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