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. If it is not installed and used in accordance with the instructions, harmful interference to radio communications may be caused.

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.

Warning
The user is advised to keep away 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 base station from 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
All specifications are subject to changes without prior notice. Altai Technologies assumes no responsibilities for any inaccuracies in this document or for any obligation to update information in this document. This document is provided for information purposes only. Altai Technologies reserves the right to change, modify, transfer, or otherwise revise this publication without notice.
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1. Introduction

This guide is designed to provide the information needed to mount A8 base station (BTS) and A8 antennas at the site location. The document is applicable for hardware platform A8 R3 and the following models.

Product name: A8 Super WiFi Base Station
Model number: WA8011A-A

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.

The user may need to refer the following document during A8 installation and Configuration.

[1] A8 Cable Connection Guide
[3] A8 Super WiFi Base Station Data Sheet

2. A8 Base Station Outlook

![Figure 2-1 Front View of A8 Base Station](image)

Antenna Port
Power Port
Ethernet Port
3. A8 Antenna Outlook
4. A8 Base Station Package

A 1 x A8 base station  
B 1 x metal mounting plate  
C 2 x metal mounting tapes  
D 4 x wall plug (left), 4 x self tapping metal screw (middle), 4 x flat washer (bottom)  
E 1 x metal screw (right)  
F A set of RJ45 connector  
G Female cable connector 3+PE

Figure 4-1 A8 Base Station Package

5. A8 Antenna Package

A 1 x A8 antenna  
B 1 x pole lock frame  
C 2 x screw with nut  
D 2 x screw
Note:
Parts C and Parts D are used to replace the large screw for antenna pole size with diameter from 35mm to 80mm. Please refer to the parts 14, 15, 16, 17 in Figure 5-2.
6. Site Preparation

1. Prepare required tools, e.g. screwdriver.
2. Prepare a CAT5 (or higher) network cable for network connection of A8 base station. Please make sure that the network connection (Ethernet Cable) between central office and the site is properly connected.
3. Make sure that there is AC electrical power supply for A8 base station at the site.
4. Configure the A8 base station properly, e.g. assign an applicable IP address for A8 base station.
5. Prepare 8 RF cables for RF connection (N-type connector) between antennas and base station. Please refer to the Section 0

![Figure 6-1 RF ports with water-proof rubber tape](image)

6. Weatherproofing the RF Connectors Wrap the RF connectors with waterproofing kits. Please refer Section 13 Recommendation on RF cable and Antenna Pole.

7. Mounting A8 antenna on a pole

1. Mount the antenna to the pole, as shown in Figure 7-1. Mount antenna on pole.
2. Adjust the antenna to desired down tilt degree (0 to 30 degrees), as shown in Figure 7-2. Adjust the Down tilt Degree.

Figure 7-1 Mount antenna on pole

Figure 7-2 Adjust the Down tilt Degree

3. The antenna should look like this after it was mounted on the pole:
8. Mounting 5GHz Radio Antenna

1. Mount the 5GHz radio antenna to the pole. It is recommended that to install the standard A8 5GHz antenna, as shown in Figure 8-1, i.e. the connector is facing downward. Then refer to Section 0 in order to prevent water leakage.

2. Adjust the direction and down tilt degree pointing to another 5GHz antenna in other site, as shown in Figure 8-2.
9. Mounting A8 Base Station on the Pole

1. Use the metal tapes to mount the metal plate onto the pole, Figure 9-1.
2. Mount the A8 base station on the metal plate and make sure four nuts in position to the slot of the plate, Figure 9-2.
3. Connect power cord and Ethernet cable to the BTS. For the details, please refer to the document “A8 Cable Connection Guide”.

Figure 9-1 Metal tape to metal plate (front-view)  Figure 9-2 Mount A8 BTS on the metal plate (side-view)

10. Mounting A8 Base Station on the Wall

1. Use an electric drill to drill four suitable apertures on the wall. (It is strongly recommended that mark the suitable positions on the wall by pencil before drilling).
2. Put the wall plugs into the apertures.
3. Place the metal plate on the wall such that the four holes on the metal plate match the apertures you drilled before.
4. For each of the wall plug, use the self-tapping metal screw with a flat washer (Part E in Figure 4-1) to fix the metal plate, Figure 10-1.
5. The fixed metal plate is shown in Figure 10-2.
6. Following the steps on step 2 to step 4 of “Section 9 - Mounting A8 Base Station on the Pole”.

Figure 10-1 Metal tape to metal plate (front-view)  Figure 10-2 Mount A8 BTS on the metal plate (side-view)
11. Connecting RF Cables

1. Each antenna has two RF ports, L & R (Left & Right), as shown in Figure 17.
2. Each antenna is treated as a SECTOR and is labeled as SECTOR 1, 2, 3 & 4, as shown in Table 11-1. Hence, the eight antenna RF ports are labeled as 1L, 1R, 2L, 2R, etc correspondingly. The sequence can be either clockwise or anti-clockwise (it does not matter). 1L means left port of sector 1.
3. Connect an RF cable from each antenna RF port to the corresponding A8 BTS RF port based on the table below. The antenna RF port and A8 BTS RF port assignments are shown in Figure 2-2 and Table 11-1 respectively.

Figure 10-1 the method of how the self-tapping metals crew go into the wall plug via a flat washer (side-view)

Figure 10-2 A fixed metal plate (front-view)
4. Connect an RF cable from the 5G antenna RF port to the A8 BTS RF port “a”.

<table>
<thead>
<tr>
<th>Antenna RF Port</th>
<th>A8 BTS Port</th>
</tr>
</thead>
<tbody>
<tr>
<td>1L</td>
<td>1</td>
</tr>
<tr>
<td>1R</td>
<td>2</td>
</tr>
<tr>
<td>2L</td>
<td>3</td>
</tr>
<tr>
<td>2R</td>
<td>4</td>
</tr>
<tr>
<td>3L</td>
<td>5</td>
</tr>
<tr>
<td>3R</td>
<td>6</td>
</tr>
<tr>
<td>4L</td>
<td>7</td>
</tr>
<tr>
<td>4R</td>
<td>8</td>
</tr>
<tr>
<td>5G Antenna Port</td>
<td>A</td>
</tr>
</tbody>
</table>

Table 11-1

5. It is recommended to seal the RF cable-to-A8 BTS connections and RF cable-to-antenna connections with weatherproof materials to get the best performance, Figure 11-3. Please refer to Section 12 for details.

6. Any unused antenna RF port or A8 BTS RF port should be protected with a weatherproof N male dust cap.

Figure 11-1 A Weatherproof N Male Dust Cap with Chain

Note: After installation, configure the 5GHz radio through the web-admin, including add the MAC address of the 5GHz antenna in another A8 / A0 that is running backhaul with and set the distance of between the two antennas. Please refer to A8 Configuration Manual for details.

Figure 11-2 Connecting to antenna
12. Weatherproofing the RF Connectors

12.1. Introduction

Sealing materials are applied to outdoor RF 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 most RF connectors are supposed to be weatherproof, but if left exposed to weather conditions, a connector will tarnish and start to look rather ugly in a short time. A good taping job will also prevent the connectors from loosening up, which is a common occurrence for cables exposed to vibration and strong winds.

We recommend the following sealing materials for weatherproofing the RF 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 A8 BTS RF ports.
A connector 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 A8 BTS RF 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.

The sealing materials should be applied to the following:
1. RF cable-to-A8 BTS connection.
2. RF cable-to-antenna connection

### 12.2. Installation Tips

A few general rules about weatherproofing RF connectors:

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.

12.3. Preparing A8 BTS RF Ports

In order for the butyl rubber layer to tightly seal the RF cable connector-A8 BTS RF port junctions, the A8 BTS RF ports must be prepared before the installation.

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 A8 BTS RF 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-to-A8 BTS connection.

Figure 12-3 Wrap the Butyl Rubber Strip in a Clockwise Direction
12.4. Connecting RF Cables

1. Make sure each RF cable and its connectors are absolutely dry.
2. Loosely connect all the RF cables from each antenna RF port to the corresponding A8 BTS RF port. Do not tighten up any of the connections.
3. Secure the RF cable bundles to the pole.
4. Starting from the back row, tighten the RF cable-to-A8 BTS connections and apply sealing materials to them, work your way from left to right, in the order of ports 1, 3, 5, 7. Unplug other RF cable-to-A8 BTS connections to make room if necessary. For a detailed description on the weatherproofing procedures, refer to the sub-section “RF Cable-to-A8 BTS Connection.” Repeat this process for the RF cable-to-A8 BTS connections in the front row, work your way from left to right, in the order of ports 2, 4, 6, 8. Unplug other RF cable-to-A8 BTS connections to make room if necessary.
5. Start tightening RF cable-to-A8 antenna connections and apply sealing materials to them. Unplug other RF cable-to-A8 antenna connections to make room if necessary. For a detailed description on the weatherproofing procedures, refer to the sub-section “RF Cable-to-Antenna Connection.” Take extra care not to twist the RF cables excessively, as it may cause the already sealed RF cable-to A8 BTS connections to loosen.

12.5. RF Cable-to-A8 BTS Connection

1. Tighten a RF cable-to-A8 BTS connection 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 connection to finger tight, then tighten it with a wrench for an additional ⅛ to ¼ turn from the finger tight position.
2. Start wrapping a layer of electrical tape from 1/4" (6mm) above the edge of the cable connector. Overlap the tape to half–width. The tape should cover the 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.

3. Start wrapping a layer of butyl rubber tape from the base of the A8 BTS RF 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 cable connector-A8 BTS RF port junction is tightly sealed. Press the tape edges together so that there are no gaps. Press the tape against the cable connector body and the RF port.

4. Start wrapping a layer of electrical tape from the base of the A8 BTS RF port. Overlap the tape to half–width. Finish the wrap at 1” (25mm) above the butyl rubber tape and cut the tape. Repeat this process for a second layer, and if enhanced UV protection is required, a third layer.
12.6. RF Cable-to-Antenna Connection

1. Tighten a RF cable-to-antenna connection 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 connection to finger tight, then tighten it with a wrench for an additional ⅛ to ¼ turn from the finger tight position.

2. Start wrapping a layer of electrical tape from 1” (25mm) below the cable connector clamping nut. Overlap the tape to half–width. The tape should extend to cover the cable connector body, until 1/4” (6mm) below the edge of the cable connector. Avoid making creases or wrinkles. Smooth the tape edges.

3. 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 cable connector-antenna port junction is tightly sealed. Press the tape edges together so that there are no gaps. Press the tape against the cable connector body and the antenna port.

4. 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 antenna port and
cut the tape. Repeat this process for a second layer, and if enhanced UV protection is required, a third layer.

Figure 12-13 Wrapping Direction of the Antenna End

It is possible to have water leakage problem without wrapping with rubber tape

Figure 12-14 18dBi 5GHz antenna port without wrapping

Figure 12-15 18dBi 5GHz antenna port with rubber wrapping

13. Recommendation on RF cable and Antenna Pole

13.1. RF Cable

A RF cable should be assembled with N-type male connectors at both ends. The length and diameter depend on the site situation. Our recommendation is that the insertion loss of the RF cable should not be greater than 1dB at 2.4GHz (for 802.11b/g) or 2dB at 5.8GHz (for 802.11a). The standard RF cable provided by Altai is 2 meters in length. Its insertion loss is 0.7dB at 2.4GHz and 1.0dB at 5.8GHz.
An optional 3-meter RF cable is also available with insertion loss of 1.0dB at 2.4GHz and 1.3dB at 5.8GHz, respectively.

![Figure 13-1 RF Cable](image)

**Figure 13-1 RF Cable**

### 13.2. Antenna Pole Height and Size

The antenna should be mounted 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 vertical separation between A8 antennas and BTS should not be less than 0.5m. The mounting kit can mount the pole with diameter from 25mm to 70mm.

![Figure 13-2 At least 1m above any obstacle in front](image)

**Figure 13-2 At least 1m above any obstacle in front**

### 14. Grounding Protection

The A8 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 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 A8 as showed in figure 14-1. 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 A8.
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 14-1 Grounding Crew

15. **Typical Site Setup**

A typical site setup is shown below.
Figure 15-1 Typical A8 Setup (using center-mounting kit with A8 pole mounted)