



Cisco Aironet 1400 Series Outdoor Wireless Bridge 9-dBi Omnidirectional Antenna

Overview

This document outlines the specifications and describes the operation and installation of the 9-dBi omnidirectional antenna, an optional antenna used with the Cisco Aironet 1400 Series Outdoor Wireless Bridge. This non-diversity, vertically polarized antenna operates in the UNII-3 band (5725 to 5825 MHz). The antenna is designed to be mast-mounted in an outdoor environment. The antenna is used at a hub site in point-to-multipoint configurations. The antenna is not compatible with other Cisco Aironet radio products operating in the 5-GHz frequency band.

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Note

To meet regulatory restrictions, this antenna must be professionally installed.

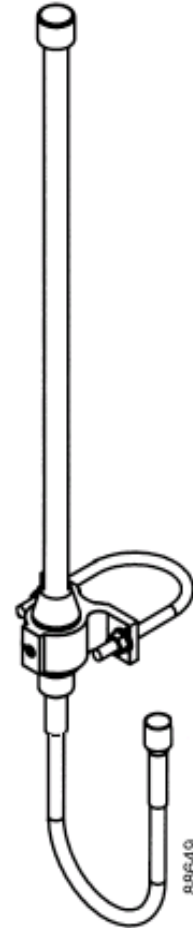


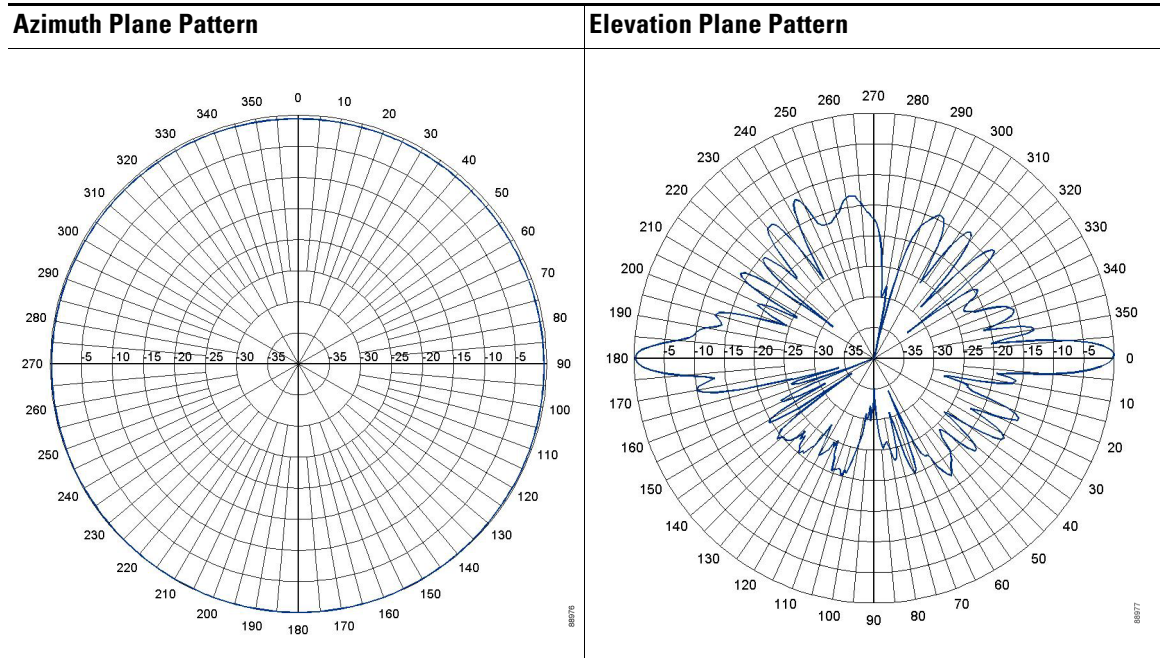
Corporate Headquarters:
Cisco Systems, Inc., 170 West Tasman Drive, San Jose, CA 95134-1706 USA

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Technical Specifications

Antenna type	Vertical Omnidirectional
Operating frequency range	5725–5825 MHz
Gain	9.0 + 1.0, –0.5 dBi
Impedance	50 Ohms
VSWR	1.5:1 maximum
H-plane half-power beamwidth	Omnidirectional
E-plane half-power beamwidth	6° ± 0.5°
Polarization	Vertical
Beam tilt	None (on horizon)
E-plane sidelobes below beam peak	–10.0 dB minimum
Input RMS power	4W maximum
RF connector	Type N-Male
Environment	Outdoor
Mounting capability	Accommodates 1.5–2.5 in. (3.8–6.3 cm) diameter mast
Operating temperature	–22°F to 140°F (–30°C to 60°C)
Storage temperature	–40°F to 185°F (–40°C to 85°C)
Humidity	0 to 100% RH condensing
Operational wind speed	100 mph (160.9 kmh)
Survival wind speed	125 mph (201.2 kmh)
Lightning protection	All metal parts grounded





System Requirements

This antenna is designed for use with the Cisco Aironet 1400 Series Outdoor Wireless Bridge. It is not compatible with other Cisco Aironet 5-GHz wireless devices.

Safety Precautions



Warning

Installation of this antenna near power lines is dangerous. For your safety, follow the installation directions.



Warning

Industry standards relating to radio frequency (RF) exposure limits for this product require that antennas should be positioned no less than 6.6 ft. (2 m) from your body or nearby persons.

Each year hundreds of people are killed or injured when attempting to install an antenna. In many of these cases, the victim was aware of the danger of electrocution, but did not take adequate steps to avoid the hazard.

For your safety, and to help you achieve a good installation, please read and follow these safety precautions. **They may save your life!**

1. If you are installing an antenna for the first time, for your own safety as well as others, seek professional assistance.
2. Select your installation site with safety, as well as performance in mind. Remember: electric power lines and phone lines look alike. For your safety, assume that any overhead line can kill you.

3. Call your electric power company. Tell them your plans and ask them to come look at your proposed installation. This is a small inconvenience considering your life is at stake.
4. Plan your installation carefully and completely before you begin. Successful raising of a mast or tower is largely a matter of coordination. Each person should be assigned to a specific task, and should know what to do and when to do it. One person should be in charge of the operation to issue instructions and watch for signs of trouble.
5. When installing your antenna, remember:
 - a. **Do not** use a metal ladder.
 - b. **Do not** work on a wet or windy day.
 - c. **Do** dress properly—shoes with rubber soles and heels, rubber gloves, long sleeved shirt or jacket.
6. If the assembly starts to drop, get away from it and let it fall. Remember, the antenna, mast, cable, and metal guy wires are all excellent conductors of electrical current. Even the slightest touch of any of these parts to a power line complete an electrical path through the antenna and the installer: **you!**
7. If any part of the antenna system should come in contact with a power line, **don't touch it or try to remove it yourself. Call your local power company.** They will remove it safely.

If an accident should occur with the power lines call for qualified emergency help immediately.

Installation Notes

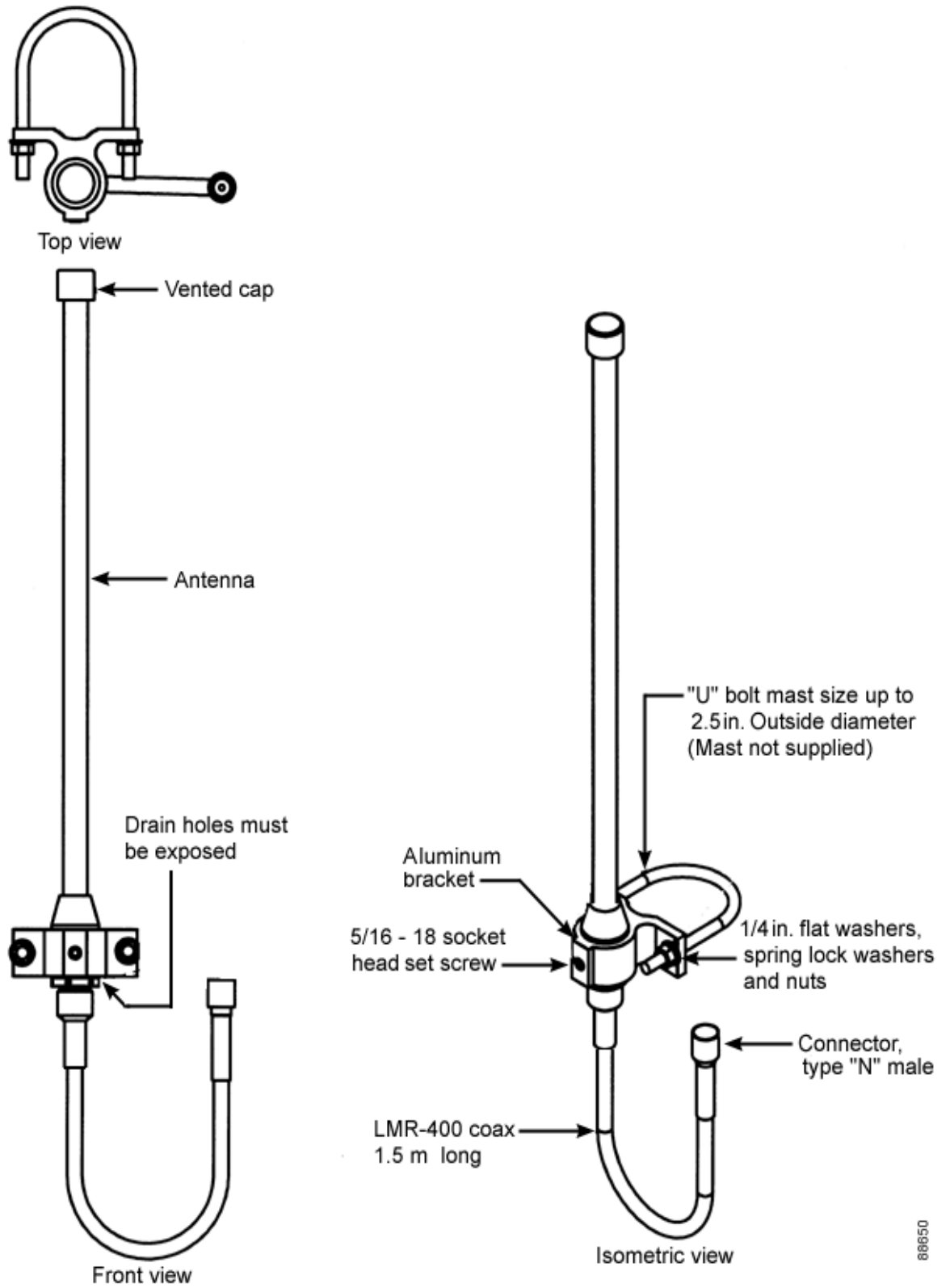


Note

To meet regulatory restrictions, this antenna must be professionally installed.

[Figure 1](#) shows the major components of the antenna and how it is installed on a mast.

Figure 1 Installation details



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Choosing a Mounting Location

The antenna is designed to create an omnidirectional broadcast pattern, which receives radio signals from client sites within its range. To achieve this pattern, mount the antenna clear of any obstructions between it and the client antennas. To avoid the changing of its radiation pattern or an impedance mismatch, mount the antenna at the top of a mast whenever possible with no part of the mast extending more than 1 to 2 in. (2.5 to 5.0 cm) past the top-most antenna U-bolt clamp. If a side-mount is necessary, mount antenna no closer than 1 ft. (30.4 cm) away from the nearest metallic vertical member.

Tools and Equipment Required

To install the antenna, you need the following tools and equipment:

- One aluminum bracket with 5/16-18 set screw
- One 1/4-20 x 2.5 in. pipe U-bolt with flat washers, spring lock washers, and nuts
- 7/16-in. (11-mm) wrench
- 5/32-in. (4-mm) hex head wrench
- Torque-limiting pliers (Milbar Model 45Z or equivalent)
- A Small level
- Coaxial connector sealing compound (not provided)

The following sections contain procedures for installing the antenna. Choose the procedure that applies to your situation. Use [Figure 1](#) as a guide.

Mounting the Antenna

A mounting bracket is provided with the antenna. This bracket enables you to mount the antenna to masts up to 2.5 in. (6.3 cm) in diameter.

The antenna is vertically polarized; therefore, it is very important to mount the antenna in a vertical (not leaning) position for optimal performance.

**Note**

The distance from the antenna to the bridge should be within reach of the antenna's 4.9-ft (1.5-m) preconnected coaxial cable. For optimum system performance, do not replace the preconnected antenna cable with a longer one.

**Note**

To ensure correct installation and grounding, install the antenna in compliance with your local and national electrical codes: National Fire Protection Association (NFPA) 70, National Electrical Code (U.S.); Canadian Electrical Code, Part 1, CSA22.1 (Canada); and if local or national electrical codes are not available, refer to IEC 364, Part 1 through Part 7 (other countries).

Follow these steps to mount the antenna to a mast.

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- Step 1** Assemble the aluminum bracket to the mast with the 1/4-20 x 2.5 in. pipe U-bolt. Install the washers in the following order:
- a. Flat washer
 - b. Spring lock washer
 - c. Nut
- Step 2** Tighten the U-bolt nuts hand tight, then use a 7/16-in. (11-mm) wrench to tighten them securely to the mast. Do not overtighten.
- Step 3** Insert the top of the antenna upward through the cast aluminum bracket until it is positioned as shown in [Figure 1](#). Make sure the drain holes are exposed.
- Step 4** Use a 5/32-in. (4-mm) hex head wrench to tighten the 5/16-18 socket head set screw to hold the antenna in place. Do not overtighten.
- Step 5** Position a small level on two sides of the antenna 90 degrees apart and make sure the antenna is truly vertical.
- Step 6** Connect the antenna coaxial cable to the bridge's Type-N antenna connector.
- Step 7** Form a drip loop in the cable.
- Step 8** Tighten the antenna connection until it is hand-tight.



Note If you prefer to tighten the antenna connection, use a torque-limiting tool like those listed in the Tools and Equipment Required section and tighten it to 14-inch pounds. 14-inch pounds is basically the torque a person can achieve using one hand.

- Step 9** Use coaxial connector sealing compound to make the bridge antenna connection weather-proof. Follow the instructions supplied in the *Cisco Aironet 1400 Series Wireless Bridge Mounting Instructions*.
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Aligning the Antenna

With the exception of the following, no antenna alignment procedures are required:

- Verify that nothing obstructs the line of sight between the antenna and the devices to which it associates.
- Ensure that the antenna is mounted vertically.



Note A comprehensive discussion of antenna alignment theory and procedures is contained in the *Cisco Aironet 1400 Series Wireless Bridge Mounting Instructions*.

Activating the Link

Activate the link after the bridge and associated components are completely installed and ready to power up. This procedure describes activation for point-to-point systems with a root bridge on one side and a non-root bridge on the other. You activate such a wireless link as follows:

1. Power up the root bridge, observing the LEDs to verify proper startup.
2. Power up the remote (non-root) bridge, verify successful association, and position its antenna.

If the initial antenna positioning is reasonably accurate, both bridges initialize and quickly associate with one another. If the bridges do not associate, the antennas may be poorly aligned or not set for the same polarization as each other, so you may need adjust the antenna position during the bridge startup cycle. Persistent association problems can indicate poor placement of the bridge or obstacles in the transmission path.

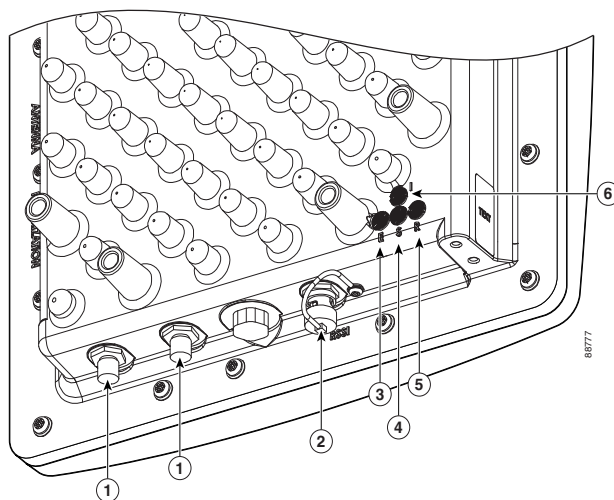
Use LED indications to verify the state of the bridge during the association process. The following section explains how to interpret LED indicators.

Installation Mode Indicators

When you power up the bridge for the first time, it starts in a special installation mode. The LEDs indicate the startup status, operating mode, association status, and received signal strength. This information simplifies the process of activating the link and positioning the antenna from the bridge mounting location.

The LEDs are mounted on the back of the housing, near the connectors (see [Figure 2](#)). The captive antenna model is shown in the illustration. The LED placement on the external antenna model is identical.

Figure 2 LED and Connector Locations



1	Power Injector LR dual coax connector	5	Status LED
2	Power Injector LR dual coax connector	6	Radio LED
3	RSSI voltage connector	7	Install LED
4	Ethernet LED		

The Install LED displays the following information while in the installation mode:

Table 1 *Install LED States During Startup and Association*

Install LED	Bridge State
Off	Startup
Amber blinking	Not associated (non-root mode)
Amber	Associated (non-root mode)
Green blinking	Not associated (root mode)
Green	Associated (root mode)

After association, the Ethernet, Status, and Radio LEDs indicate signal strength (see [Table 2](#))

Table 2 *Install Mode Signal Strength Display*

Signal Level (dBm)	Ethernet LED	Status LED	Radio LED
-44 or stronger	On	On	On
-47 to -44	Fast blink ¹	On	On
-50 to -47	Medium blink ²	On	On
-53 to -50	Slow blink ³	On	On
-54 to -53	Off	On	On
-57 to -54	Off	Fast blink	On
-60 to -57	Off	Medium blink	On
-63 to -60	Off	Slow blink	On
-66 to -63	Off	Off	On
-69 to -66	Off	Off	Fast blink
-72 to -69	Off	Off	Medium blink
-75 to -72	Off	Off	Slow blink
-75 or weaker	Off	Off	Off

1. Blinks once per second
2. Blinks twice per second
3. Blinks four times per second

Use the Install LED to determine when the bridge successfully associates with a remote bridge and to verify its mode of operation. After association, the other three LEDs indicate signal strength. See the *Cisco Aironet 1400 Series Wireless Bridge Mounting Instructions* for information about these LEDs.

The startup and association sequence depends on the initial bridge configuration, which can be one of the following types:

- **Default**—The bridge attempts to associate with a root bridge for 60 seconds, and then it attempts to associate with a non-root bridge. The 60-second timeout limits the amount of time you have to reposition the antenna at the non-root location.
- **Preconfigured**—The bridge attempts to associate with a remote bridge in the configured mode, either root or non-root. Because there are no timeouts, it is easier to reposition the antenna.

The following procedures explain how to activate the root and non-root bridges for either default or preconfigured bridges.

Activating the Root Bridge

To activate the root bridge, perform the following steps:

- Step 1** Verify that the face of the radome points in the approximate direction of the remote antenna. If the radome face is at a significant angle, use binoculars or reference objects to locate the remote bridge or antenna, and then adjust the horizontal and vertical position accordingly.
- Step 2** Apply power and observe the bridge LEDs.
- Step 3** Wait for the bridge to cycle through the following initialization states:

State	Install LED	Activity
Self test	Off	Power on self test.
Non-root, searching ¹	Amber blinking	The bridge attempts to associate with a root bridge for 60 seconds.
Root, searching	Green blinking	The bridge attempts to associate with a non-root bridge indefinitely.

1. Preconfigured bridges skip this state.



Note If the Install LED changes to continuous amber, the bridge incorrectly associated with another bridge. Turn off the interfering bridge and then restart this procedure.

- Step 4** Power up the non-root bridge and position its antenna. For more information, see the *Cisco Aironet 1400 Series Wireless Bridge Mounting Instructions*.

Activating the Non-Root Bridge

To activate and align the non-root bridge, follow these steps:

- Step 1** Apply power and observe the bridge LEDs.
- Step 2** Wait for the bridge to cycle through the following initialization and association states:

State	Install LED	Activity
Self test	Off	Power on self test.
Non-root, searching	Amber blinking	The bridge attempts to associate with a root bridge.
Non-root, associated	Amber	The bridge successfully associated with the root bridge.

- Step 3** If the Install LED starts blinking green, the non-root bridge failed to associate with the root bridge. Power cycle the bridge, wait for the Install LED to blink amber, and then slowly pan the antenna left to right or tilt it up and down until the Install LED changes to continuous amber. In the default configuration, you have only 60 seconds to achieve association.
- Step 4** Align the antenna using LED indications or RSSI voltages. For more information, see the *Cisco Aironet 1400 Series Wireless Bridge Mounting Instructions*.
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Obtaining Documentation and Submitting a Service Request

For information on obtaining documentation, using the Cisco Bug Search Tool (BST), submitting a service request, and gathering additional information, see *What's New in Cisco Product Documentation* at: <http://www.cisco.com/c/en/us/td/docs/general/whatsnew/whatsnew.html>.

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