



Cisco Aironet 1400 Series Outdoor Wireless Bridge 9.5-dBi Sector Antenna

Overview

This document outlines the specifications and describes the operation and installation of the 9.5-dBi sector antenna, an optional antenna used with the Cisco Aironet 1400 Series Outdoor Wireless Bridge. This non-diversity symmetric antenna operates in the UNII-3 band (5725 to 5825 MHz). The antenna is designed to be mounted outdoors on a mast or a suitable vertical surface. The antenna is used at a root site in a point-to-multipoint configuration and provides approximately 90 degrees of coverage. The antenna is not compatible with other Cisco Aironet radio products operating in the 5-GHz frequency band.

The following information is provided in this document:

- [Technical Specifications, page 2](#)
- [System Requirements, page 3](#)
- [Safety Precautions, page 3](#)
- [Installation Notes, page 4](#)
- [Aligning the Antenna, page 8](#)
- [Activating the Link, page 8](#)
- [Obtaining Documentation and Submitting a Service Request, page 12](#)



Note

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

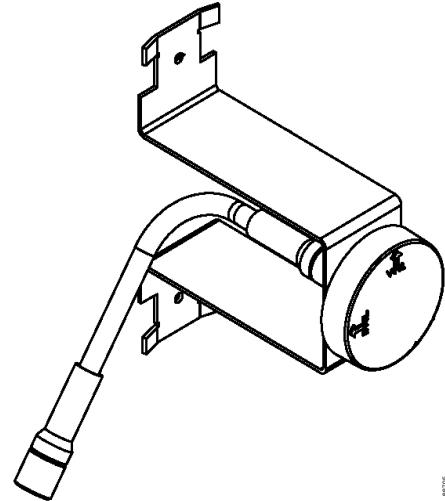


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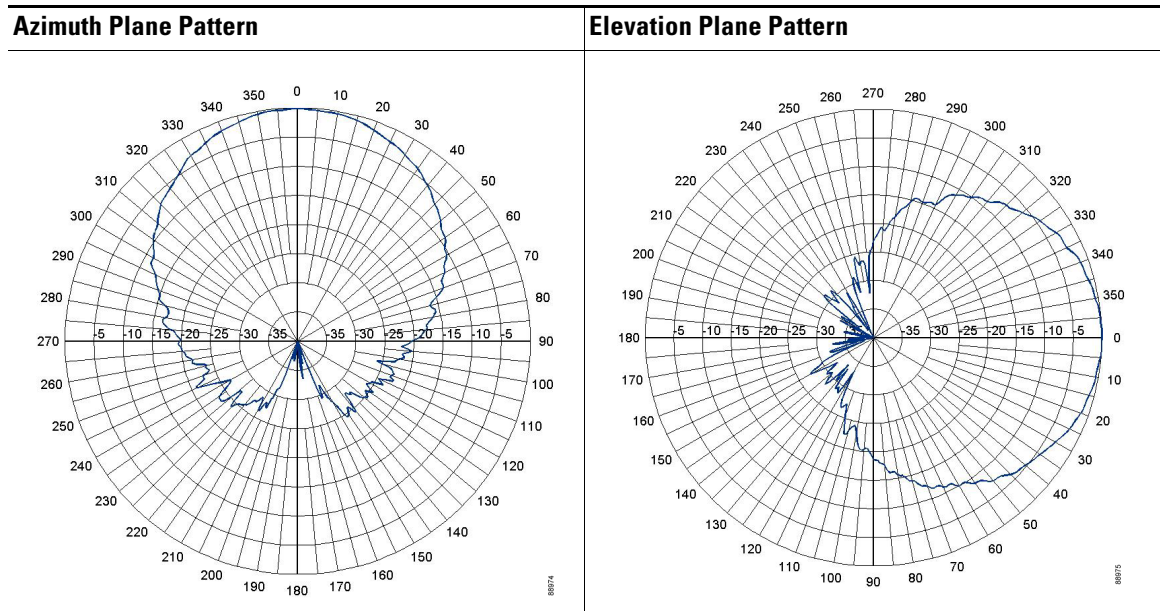
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Technical Specifications

Antenna type	Directional, symmetric sector
Operating frequency range	5725 – 5825 MHz
Nominal input impedance	50 Ω
VSWR	1.5:1 maximum
Gain	9.5 ± 0.5 dBi
Azimuth half-power beamwidth ¹	60.0° minimum
Elevation half-power beamwidth ¹	60.0° minimum
Cross-polarization discrimination over boresight ± 25°	18 dB minimum
Sideline and front-to-back ratio from 120° to 240° (referenced to main lobe peak)	20 dBc minimum
Linear polarization options ²	Horizontal or vertical
Input RMS power	4W maximum
Dimensions (diameter and depth) including radome	2.69 round x 1.75 in. (6.83 x 4.4 cm)
Connector type	Type N-Male
Feed cable length	4.9 ft. (1.5 m)
Mounting capability	Mast or vertical surface
Elevation adjustment	None, main beam fixed on horizon
Operating temperature	-22°F to 140°F (-30°C to 60°C)
Storage temperature	-20°F-185°F (-29°C to 85°C)
Humidity	0 to 100% RH condensing
Operational wind rating	100 mph (160.9 kmh)
Survival wind rating	125 mph (201 kmh)
Enclosure	Ventilated with drain holes on adjacent sides
Lightning protection	All metal parts grounded



1. Beamwidth symmetrical.
2. Polarization configured at installation. Polarization is determined by orientation of radiating element. Main beam peak remains on horizon regardless of polarization setting.



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

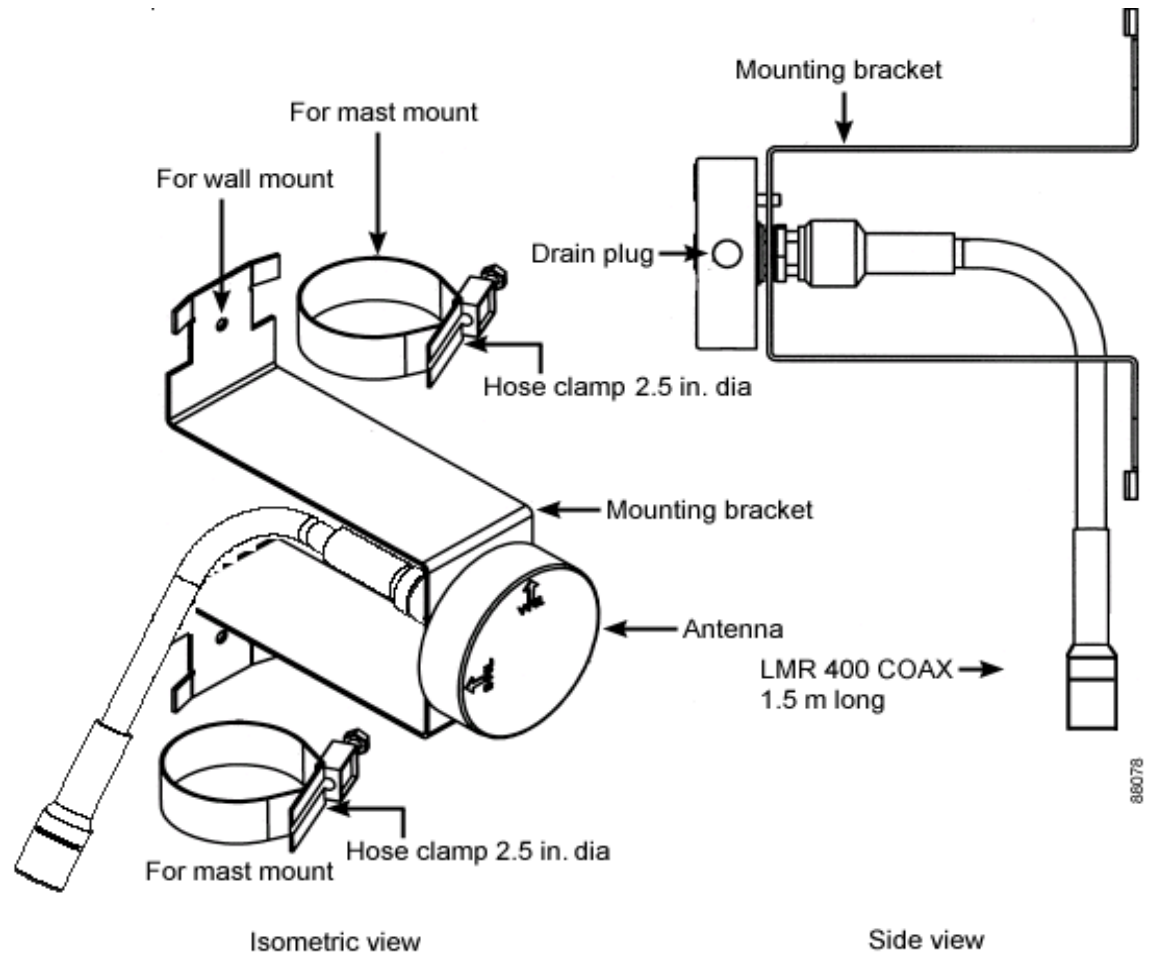


Note

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

[Figure 1](#) shows the antenna's major components and how it is mounted on a mast or flat vertical surface.

Figure 1 Installation details



Choosing a Mounting Location

The antenna is designed to create a directional broadcast pattern. To achieve the pattern, mount the antenna clear of any obstructions between it and device to which the bridge will associate.

Tools and Equipment Required

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

- Two 2-in. (5-cm) diameter hose clamps (provided)
- Drill and appropriate drill bit (if mounting to a vertical surface)
- Appropriate fasteners (if mounting to a vertical surface)
- Torque-limiting pliers (Milbar Model 45Z or equivalent)
- A ¾-in. (19-mm) wrench open-end wrench
- Standard screwdriver
- 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 on a Mast

A mounting kit is provided with the antenna. This kit enables you to mount the antenna to masts up to 2.5-in. (6.3-cm) in diameter. The antenna can be configured for vertical or horizontal polarization. The antenna must be in the vertical plane regardless of how its polarization is configured.



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.

- Step 1** Determine the polarization to use and follow these steps to adjust the polarization:
- Use a 3/4-in. (19-mm) wrench to loosen the bulkhead connector so that you can rotate the antenna.
 - Line up the antenna on the mounting bracket so that the desired polarization arrow points up. [Figure 1](#) shows the antenna set for vertical polarization. Make sure that the pin on the antenna is in the hole on the mounting bracket.
 - Make sure the drain hole at the bottom of the antenna is not plugged. If it is, remove the plug and install it into the drain hole on the side of the antenna.
 - Use a 3/4-in. (19-mm) open-end wrench to tighten the bulkhead connector. Do not overtighten.
- Step 2** Align the mounting bracket on the mast as close to the direction the antenna will be pointing when it is operating.
- Step 3** Form a drip loop in the antenna cable and secure the top and bottom mounting bracket tabs to the mast using two 2-in. (5-cm) hose clamps.



Note

Use a standard screwdriver to tighten the hose clamps just tight enough to keep the bracket from sliding down the mast. You need to be able to rotate the antenna on the mast when you perform the alignment procedure.

- Step 4** Connect the antenna's coaxial cable to the bridge's N-Type antenna connector and tighten it 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 5** Use the coaxial connector sealing compound to make the antenna connection weather-proof, following the instructions contained in the *Cisco Aironet 1400 Series Wireless Bridge Mounting Instructions*.
- Step 6** Use a standard screwdriver to tighten the hose clamps. Do not overtighten.
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Mounting the Antenna on a Flat Vertical Surface

Mount the antenna on a suitable flat vertical surface using appropriate fasteners. The surface must be oriented so that the antenna is mounted as closely as possible to the direction the antenna will be pointing when it is operating.

Follow these steps to mount the antenna on a flat vertical surface:

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- Step 1** Determine the polarization to use. Follow these steps to adjust the polarization:
- Use a 3/4-in. (19-mm) wrench to loosen the bulkhead connector so that you can rotate the antenna.
 - Line up the antenna on the mounting bracket so that the desired polarization arrow points up. [Figure 1](#) shows the antenna orientated vertically. Make sure that the pin on the antenna is in the hole on the mounting bracket.
 - Make sure the drain hole at the bottom of the antenna is not plugged. If it is, remove it and install it into the drain hole on the side of the antenna.
 - Use a 3/4-in. (19-mm) open-end wrench to tighten the bulkhead connector. Do not overtighten.
- Step 2** Secure the antenna to the mounting bracket with the bulkhead connector, washer, and nut provided in the mounting kit. Use a 3/4-in. (19-mm) wrench to tighten the bulkhead connector. Do not overtighten.
- Step 3** Mark the positions of the top and bottom mounting bracket holes on the surface where you intend to mount it. The distance between the holes is 5 3/16-in (13.2-cm). Make sure the holes are orientated vertically on the surface.
- Step 4** Drill two holes at the locations you marked. The size of the holes depends on the type of surface and the method by which you intend to attach the bracket.
- Step 5** Form a drip loop in the antennna cable and install the mounting bracket on the surface using appropriate fasteners.
- Step 6** Connect the antenna's coaxial cable to the bridge's N-Type antenna connector and tighten it 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.
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- Step 7** Use the coaxial connector sealing compound to make the bridge antenna connection weatherproof, following the instructions contained in the *Cisco Aironet 1400 Series Wireless Bridge Mounting Instructions*.
- Step 8** Perform the antenna alignment procedure. The procedure is in the following section.
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Aligning the Antenna

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

- Ensure that the antenna is installed on the azimuth and elevation data provided in the site survey.
- Check to see that nothing obstructs the line of sight between the antenna and the devices to which it associates.

**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 system is completely installed and ready to power up. The following procedure summarizes the bridge activation procedure:

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 the antenna.

If the initial antenna positioning was 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, so you may need to adjust the antenna position during the bridge startup cycle.

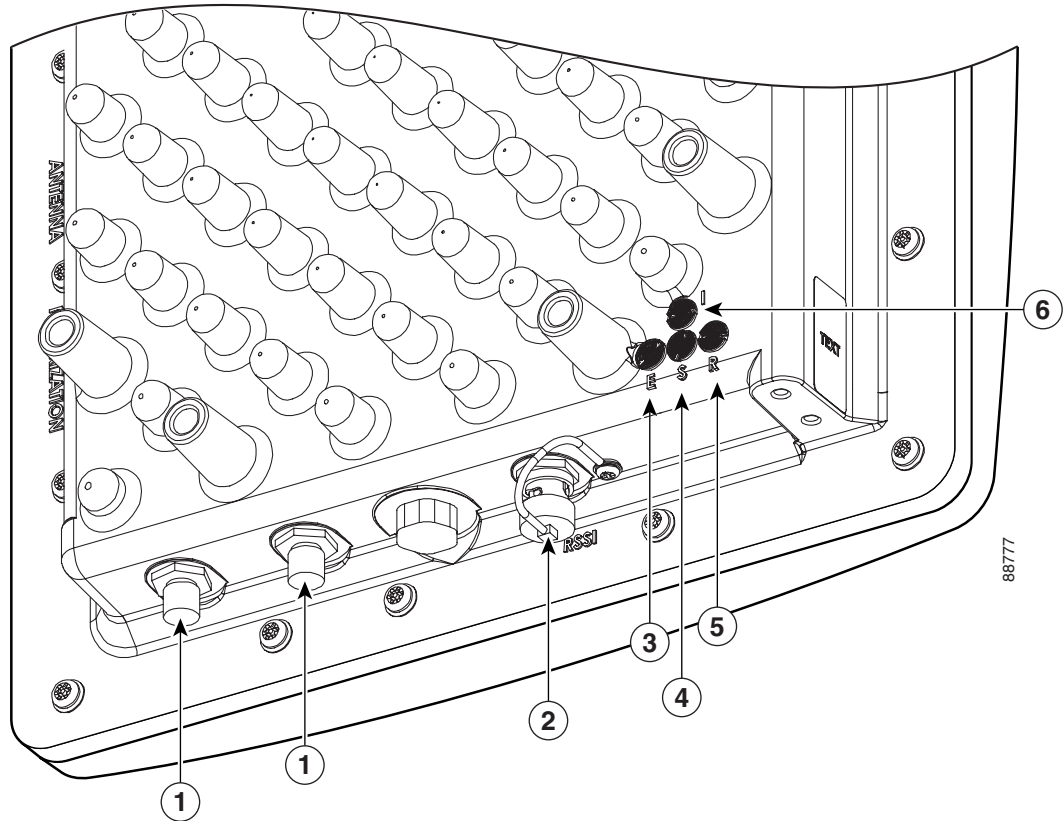
Persistent association problems can indicate poor placement of the bridge or obstacles in the transmission path.

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. In this mode, the LEDs indicate the startup status, operating mode, association status, and received signal strength. This information helps you activate the link and position the antenna while at the bridge mounting location. The LEDs are mounted on the back of the housing near the connectors (see [Figure 2](#)).

Figure 2 LED and Connector Locations



1	Power Injector LR interfaces	4	Status LED
2	RSSI voltage port	5	Radio LED
3	Ethernet LED	6	Install LED

The Install LED displays the following information:

Table 1 Install LED States During Startup and Association

Install LED	Bridge State
Off	Startup
Amber blinking	Scanning for beacons, not associated (non-root mode)
Amber	Associated (non-root mode)
Green blinking	Transmitting beacons, 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

The startup and association sequence depends on the initial bridge configuration, as follows:

- **Default**—The bridge attempts to associate with a root bridge for 60 seconds, and then it attempts to associate with a non-root bridge. This 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 an antenna with poor initial antenna positioning.

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, follow these steps:

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- Step 1** Verify that the antenna is pointed in the approximate direction of the remote antenna. If it is not, use binoculars or reference objects to find the remote bridge or antenna, and then adjust the root bridge's antenna as required.
 - 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*.

Obtaining Documentation and Submitting a Service Request

For information on obtaining documentation, submitting a service request, and gathering additional information, see the monthly *What's New in Cisco Product Documentation*, which also lists all new and revised Cisco technical documentation, at:

<http://www.cisco.com/en/US/docs/general/whatsnew/whatsnew.html>

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