



Cisco Aironet 1300 Series Wireless Bridge Mounting Instructions

August 2005

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Introduction

The Cisco Aironet 1300 Series Wireless Bridge (hereafter called the *bridge*) is a wireless device designed for building-to-building wireless connectivity. Operating in the 2.4-GHz band (2.400 to 2.497 GHz), using the IEEE 802.11g standard, the bridge delivers 1 to 54 Mbps data rates without the need for a license. The bridge is a self-contained unit designed for outdoor installations, providing differing antenna gains as well as coverage patterns. It supports point-to-point and multipoint bridging configurations. You can stack two bridges in point-to-point configurations to increase data throughput or to provide cold standby redundancy.

The bridge can also be configured to operate as an access point or as a workgroup bridge. When placed in access point mode, the unit supports wireless IEEE 802.11b and IEEE 802.11g client devices. When placed into workgroup bridge mode, the unit provides a wireless connection for remote wired devices to a Cisco Aironet access point or to a Cisco Aironet bridge.

The bridge is available with an integrated antenna or with external antenna connectors. When using a bridge with an integrated antenna, you must choose a mounting location with a clear path to the remote antenna and orient the bridge so that the antenna is positioned for maximum signal strength. The mounting brackets in the optional installation kit has adjustment slots that facilitate the positioning process. When using a bridge with an external antenna, mount the bridge in a convenient location near the external antenna. Each external antenna has its own mounting instructions.

**Note**

To meet regulatory restrictions, the external antenna bridge unit and the external antenna must be professionally installed. The network administration or other IT professional responsible for installing and configuring the unit is a suitable professional installer. Following installation, access to the unit should be password protected by the network administrator to maintain regulatory compliance.

System Requirements

The bridge system consists of a weather-proof bridge, a power injector, a grounding block, and optional external antennas. The bridge and external antennas are typically mounted outdoors, the grounding block is installed at the building entrance, and the power injector and the power module are installed indoors. This document describes the bridge mounting procedures only. For information about other components, see the [“Related Documentation” section on page 44](#).

Package Contents

Each bridge package contains these items:

- Access point/bridge unit (integrated antenna or external antenna configuration)
- Power injector (LR2) unit
- Power module and AC power cord
- *Quick Start Guide: Cisco Aironet 1300 Series Wireless Bridge*
- *Cisco Aironet 1300 Series Outdoor Access Point/Bridge Mounting Instructions*
- Cisco product registration and Cisco documentation feedback cards

The optional roof mount kit contains these items:

- One roof-wall mount
- Two dual-coax cables [20 ft (6.1 m) and 50 ft (15.2 m)]
- Multi-function mount (consisting of a bridge bracket and a mast bracket)
- Two tower clamps (U-bolts) with four nuts and washers
- Four bolts and washers for securing the bridge bracket to the mast bracket
- Four bolts for securing the bridge bracket to the unit
- Grounding block and mounting screws
- Ground lug for the bridge, two hex nuts, and two washers
- Weatherproofing kit (consisting of Coax Seal and electrical joint compound)

The optional wall mount kit (for indoor use) contains these items:

- Wall mount bracket with 4 mounting bolts and washers
- Two sub-mini RG-59 coax cables (12 in. or 30.5 cm)

Safety Warnings

Translated versions of the following safety warnings are provided in the Appendix A, “Translated Safety Warnings” section of the *Cisco Aironet 1300 Series Wireless Bridge Hardware Installation Guide*.

All Installations



Warning

This warning symbol means danger. You are in a situation that could cause bodily injury. Before you work on any equipment, be aware of the hazards involved with electrical circuitry and be familiar with standard practices for preventing accidents. (To see translations of the warnings that appear in this publication, refer to the appendix “Translated Safety Warnings.”) Statement 84



Warning

Do not operate your wireless network device near unshielded blasting caps or in an explosive environment unless the device has been modified to be especially qualified for such use. Statement 245B



Warning

In order to comply with international radio frequency (RF) exposure limits, dish antennas should be placed at a minimum of 8.7 inches (22 cm) from the bodies of all persons. Other antennas should be placed a minimum of 7.9 inches (20 cm) from the bodies of all persons. Statement 246



Warning

Do not work on the system or connect or disconnect cables during periods of lightning activity. Statement 1001



Warning

This product relies on the building's installation for short-circuit (overcurrent) protection. Ensure that the protective device is rated not greater than: 15A

Statement 1005



Warning

This equipment must be grounded. Never defeat the ground conductor or operate the equipment in the absence of a suitably installed ground conductor. Contact the appropriate electrical inspection authority or an electrician if you are uncertain that suitable grounding is available. Statement 1024



Warning

Ultimate disposal of this product should be handled according to all national laws and regulations.

Statement 1040



Warning

Do not locate the antenna near overhead power lines or other electric light or power circuits, or where it can come into contact with such circuits. When installing the antenna, take extreme care not to come into contact with such circuits, as they may cause serious injury or death. For proper installation and grounding of the antenna, please refer to national and local codes (e.g. U.S.:NFPA 70, National Electrical Code, Article 810, in Canada: Canadian Electrical Code, Section 54).

Statement 1052

Outdoor and Vehicle Installations

The following warning applies to outdoor and vehicle installations:



Warning

Only trained and qualified personnel should be allowed to install, replace, or service this equipment.

Statement 1030

Vehicle Installations

The following warnings apply to vehicle installations:



Warning

A readily accessible two-poled disconnect device must be incorporated in the fixed wiring.

Statement 1022



Warning

Connect the unit only to DC power source that complies with the safety extra-low voltage (SELV) requirements in IEC 60950 based safety standards. Statement 1033

Safety Precautions

**Note**

To meet regulatory restrictions, the external antenna bridge unit and the external antenna must be professionally installed. The network administration or other IT professional responsible for installing and configuring the unit is a suitable professional installer. Following installation, access to the unit should be password protected by the network administrator to maintain regulatory compliance.

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

For your safety, and to help you properly install hardware, please read and follow these safety precautions. **They may save your life!**

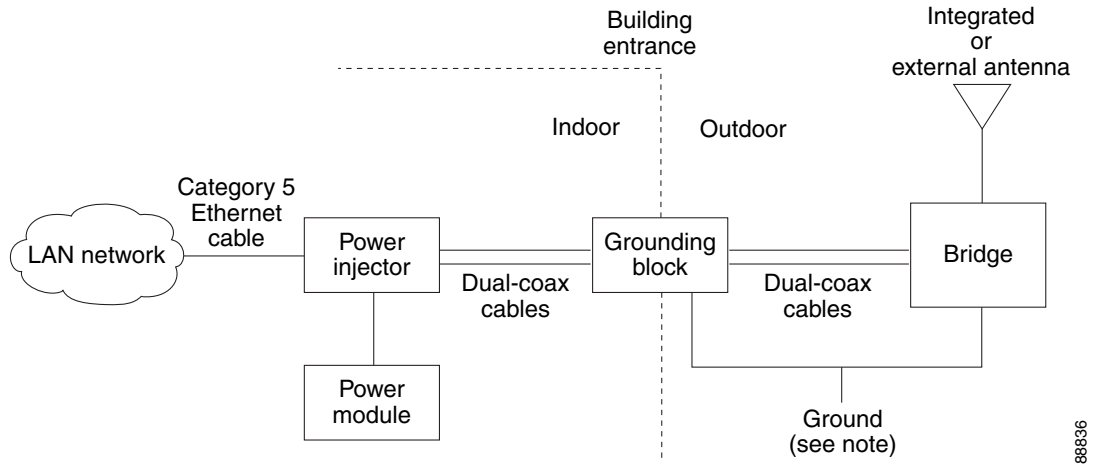
1. If you are installing an antenna for the first time, for your own safety as well as others, seek assistance from a person with skills and knowledge related to the construction and operation of electrical equipment and has received safety training on the hazards involved.
2. Keep safety as well as performance in mind when selecting your installation site Remember: electric power lines and phone lines look alike. Always assume that overhead lines are very dangerous.
3. Call your electric power company. Tell them your plans, and ask them to look at your proposed installation. This is a reasonable request considering the danger.
4. Plan your installation carefully and completely before you begin. Successful raising of a mast or tower is largely a matter of coordination. Assign each person a specific task, and ensure they know what to do and when to do it. Put one person 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 fall, get away from it and let it fall. Remember, the antenna, mast, cable, and metal guy wires are excellent conductors of electrical current and may touch power lines.
7. If any part of the antenna system comes in contact with a power line, **don't touch it or try to remove it yourself. Call your local power company.** They can remove it safely.

If an accident occurs with the power lines, call for qualified emergency help immediately.

Typical Bridge Installation Components

The bridge is designed to be installed in an indoor or outdoor environment, typically on a wall, tower, or tall building. A typical installation diagram is shown in [Figure 1](#).

Figure 1 Typical Installation Diagram



Note

Ground wires must comply with Sections 810 and 820 of the National Electrical Code and Section 54 of the Canadian Electrical Code.



Warning

This equipment must be grounded. Never defeat the ground conductor or operate the equipment in the absence of a suitably installed ground conductor. Contact the appropriate electrical inspection authority or an electrician if you are uncertain that suitable grounding is available. Statement 1024



Caution

To ensure correct installation and grounding, install the bridge in compliance with your local and national electrical codes: National Fire Protection Association (NFPA) 70, National Electrical Code (U.S.); Canadian Electrical Code, Part I, CSA 22.1 (Canada); and if local or national electrical codes are not available, refer to IEC 364, Part 1 through 7 (other countries).

Choosing a Mounting Location

Choosing a good mounting location for the bridge is important because it affects the reliability of the wireless link and maximum data rates it can support. The most important considerations are distance between bridges and clearance from obstacles. The mounting location can be the top or side of a building or on a tower providing a clear unobstructed line-of-sight to the remote bridges.

With the integrated antenna bridge configuration, it is necessary to physically place the bridge within line-of-sight of the remote bridges. The location must allow the bridge to be oriented in the proper direction.

With the external antenna bridge configuration, the external antenna must be located within line-of-sight of the remote bridges. The bridge can be located in a convenient location that minimizes the cable length to the antenna.

**Note**

To meet regulatory restrictions, the external antenna bridge unit and the external antenna must be professionally installed. The network administration or other IT professional responsible for installing and configuring the unit is a suitable professional installer. Following installation, access to the unit should be password protected by the network administrator to maintain regulatory compliance.

Signal Path Distance

In an environment without obstacles in the signal path, the maximum distance between bridges depends primarily on the type of antennas and the free space loss between them. Make sure your proposed mounting site is within range of the remote antenna. The bridge supports 54-Mbps data rates at distances of up to 0.6 mi (1 km) and 6 Mbps at distances up to 4.5mi (7.2 km) when using the integrated 13-dBi antenna on both bridges. When using a 12-dBi omni antenna at the hub and an integrated 13-dBi antenna remotely, the bridge supports 54-Mbps at distances up to 0.5 mi (0.80 km). Cisco.com has a range calculation tool for outdoor bridges that helps you estimate the range for your specific installation. To access the tool use this URL:

http://www.cisco.com/en/US/products/hw/wireless/ps458/products_tech_note09186a008009459b.shtml

**Note**

The range calculation tool requires Microsoft Excel to operate.

**Note**

When operating as an access point, the maximum communication distance is approximately 1 mile.

Antenna Polarization

The integrated antenna radiates and receives vertically polarized radio signals. Polarization helps reduce interference because the antenna tends to reject cross-polarized signals from other sources.

**Note**

For the multi-point links, Cisco recommends that you use vertical polarization on all antennas; however, on point-to-point links you can also use horizontal polarization on both ends of the link. To operate correctly, the antennas at each end of the wireless link should have the same polarization.

The following antennas are vertically polarized:

- 13-dBi integrated antenna
- 5.2-dBi and 12-dBi omni-directional antennas
- 14-dBi sector antenna

The following antennas can be vertically or horizontally polarized depending on their mounting orientation:

- 21-dBi dish antenna

- 10-dBi and 13.5-dBi yagi antennas
- 9-dBi patch wall-mount antenna

Signal Path Clearance

A radio beam travels from one bridge to another in a straight line. Therefore, the path between the antennas must be free of major obstacles. The effects of obstacles and terrain, both along and near the path, have a significant bearing on the propagation of radio signals and can cause both interference and signal cancellation.

When choosing a site, consider the effects of the following common obstacles:

- Trees and large plants

A tree directly in the path can totally block the signal. With clearance above the trees there are usually no secondary effects, but you should allow for future tree growth.

- Man-made obstacles

A large round container such as a gas storage reservoir or water tower that is partially in the path causes some blocking. These obstacles may also reflect some energy, which can interfere with other receivers. Square or rectangular objects in or near the path have rectangular surfaces that can block and diffract signals over and around them.

- Earth surface

The earth surface also interferes with signals if the antenna is mounted too low. Mount the antenna just high enough to allow adequate clearance from the ground (see [Table 1](#)). Placing the bridge too high makes it susceptible to interference from other systems.

To determine how much clearance to leave around the signal path, use the following clearances as a guide:

Table 1 Clearance Guidelines for 2.4-GHz Frequencies

Total Path Length (miles)	Clearance Radius Around Signal Path (feet)
4	46
6	57
8	68
10	77
12	83
15	106

Install the integrated antenna bridge or external antenna where obstacles along the propagation path, including the ground, are no closer than these values. For tower installations, you may need to climb the tower to the proposed mounting location to verify a clear path to the other site. If trees are in the line of signal propagation, leave extra clearance above them for future growth into the signal path.

Physical Site Survey

Perform a visual inspection of the site to ascertain and document the physical characteristics of the site and to ensure that all requirements are met for the proper installation and operation of the system.

Contact Information and Access Permissions

Make sure the following general requirements are met before beginning the installation:

- Validate customer-provided information, such as site contact names and telephone numbers.
- Examine the building (tenant) lease to verify or establish building roof or tower rights. If available, use layout drawings to evaluate the feasibility of modifications or special permits that might be necessary.
- For a tower-mounted installation, find out if the owner, operator, or landlord requires a professional or certified tower climber to do the work.

Physical Site

Make sure the following physical site requirements are met before beginning the installation:

- Identify the roof area, wall, or tower for mounting the bridge. You must choose a site with a clear line-of-sight to the remote bridge.
- Determine the access area, such as a stairway or a ladder.
- Identify existing equipment installations and assess the condition of proposed towers or mounting structures.
- Assess environmental conditions, such as temperature, ventilation, and humidity.

Cable Routes

Make sure the following cable route requirements are met before beginning the installation:

- Identify cable routes, building entry points, and any special routing or support requirements (conduits, bracing, cable trays, safety structures, and so on). Make sure the total cable length between the bridge and the power injector is no greater than 100 meters.
- Identify necessary floor, roof, or wall penetrations and specify the locations.
- Document existing grounding system and connection requirements for new equipment.
- Refer to these electrical codes for your local regulations:
 - NFPA 70 (US National Electrical Code)
 - Canadian Electrical Code, Part 1, CSA 22.1
 - IEC 364, Part 1 through 7 for other countries



Caution

To prevent damage to the bridge or power injector, connect all coax cables from the power injector to the bridge and connect the power jack to the power injector before applying power.

Lightning Arrestor

In outdoor antenna installations, your antenna and bridge system can be damaged by surges that develop on the antenna and cable from close lightning strikes. You can use a lightning arrestor (such as AIR-ACC-3354) to help protect your bridge system from static electricity and lightning-induced surges; however, an arrestor will not prevent damage from a direct lightning hit.

A lightning arrestor is a 50-ohm transmission line with a gas discharge tube positioned between the center conductor and ground. This gas discharge tube changes from an open circuit to a short circuit almost instantly (100 nanoseconds) in the presence of voltage and energy surges, providing a path to ground for the energy surge.

A lightning arrestor should be installed between your outdoor antenna and the bridge. You should connect a 6 AWG copper wire from the arrestor to a good earth ground.

Mounting the Bridge

This section describes how to mount the bridge and position the antenna and contains the following topics:

- [Required Tools and Fasteners, page 11](#)
- [Window Mounting, page 12](#)
- [Wall or Ceiling Mounting Bracket, page 13](#)
- [Rooftop or Wall Mount, page 15](#)
- [Tower Mount, page 18](#)
- [Mast Mount, page 21](#)
- [Applying Coax Seal Tape, page 25](#)
- [Assembling the Mounting Hardware, page 27](#)
- [Attaching the Mounting Bracket, page 29](#)
- [Rooftop Support or Small Mast Diameters, page 30](#)
- [Mounting the Bridge on a Support, page 31](#)
- [Positioning the Antenna Using LED Indications, page 39](#)

Personnel installing the bridge must understand wireless bridging techniques, antenna alignment and adjustment, and grounding methods.

**Note**

To meet regulatory restrictions, the external antenna bridge unit and the external antenna must be professionally installed. The network administration or other IT professional responsible for installing and configuring the unit is a suitable professional installer. Following installation, access to the unit should be password protected by the network administrator to maintain regulatory compliance.

These procedures focus on general mounting and cable-routing topics. For information about assembling the mounting hardware, see the [“Assembling the Mounting Hardware” section on page 27](#).

Required Tools and Fasteners

This section describes the required tools, cables, and fasteners.

Tools

Mounting the bridge requires the following tools:

- 7-mm, 8-mm, and 13-mm wrench or socket for mult-function mount
- Two 7/16 wrenches or sockets for roof mount
- Crimping tool for F-connectors that accommodates RG6/U cable (<http://www.tessco.com>)
- Crimping tool for ground lug, Panduit CT-1004 or equivalent (<http://onlinecatalog.panduit.com>)

You may also require tools for user-supplied hardware or fasteners.

Cables

Cisco recommends the following types of coaxial cable for the bridge-to-power injector connections:

Table 2 Recommended Coaxial Cable Types

Cable Type	Belden Part #	Times Fiber Part #	Channel Master Part #
RG6	9077	2360-T660-VB or 2560-T690-VB	9539
RG59/U	1426A	02345-T5953-VB	9540
RG59/U	1505A	02183-T5967-VB	–
RG11/U	8213	02362-T1153-VB	–

Fasteners

Identify requirements for special hardware or fasteners that are not supplied in the installation kit. For example, it might be necessary to secure the bridge to an unusually large-diameter pipe or odd-shaped structural member that the supplied mounting bracket cannot accommodate.

The rooftop or wall mounting bracket requires the following user-provided fasteners:

- Wooden structure—four 1/4 x 1 inch (minimum) lag bolts
- Hollow walls—four 1/4-20 x 2 3/4 molly anchors
- Concrete structure—four 1/4 x 1 3/4 inch (minimum) bolts with concrete anchors

The wall or ceiling mounting bracket requires the following user-provided fasteners:

- Wooden structure—three 1/4 x 1 inch (minimum) lag bolts
- Hollow walls—three 1/4-20 x 2 3/4 molly anchors
- Concrete structure—three 1/4 x 1 3/4 inch (minimum) bolts with concrete anchors



Note

For the user-provided fasteners, you must use the appropriate drill size recommended by your fastener vendor.

Pole or tower mounting requires U bolts that fit the pole or mast in use. One source is McMaster-Carr’s web site.

Document all the necessary tools, parts, brackets, hardware and accessories that are required for the installation and make sure you have them all before starting.

Window Mounting

When you are deploying a wireless bridge link through a window, the window glass can introduce significant signal loss. Typical losses range from 5 to 15 dB per window, depending upon the type of glass. Deployment planning should take this extra loss into account conservatively when planning antenna gains and power settings. A thorough site survey is critical for deployments that require penetration through windows.

For additional information on a window mounting bracket, refer to the following URL:

<http://www.terra-wave.com/shop/above-ceiling-tile-mounting-bracket-with-adjustable-height-p-665.html>

General Guidelines

Many types of window glass allow radio signals to pass through easily while some types greatly restrict radio signals. These are some general guidelines for operating through window glass:

- Avoid glass with metallic content or metallic coatings
- Avoid glass with conductive gas between the panes
- Avoid glass with embedded wire
- Select windows at roughly the same height at both ends
- Select windows with the least thickness
- Ensure that radio signal quality tests are conducted through the glass before finalizing the site selection

Mounting Above a Suspended Ceiling

The bridge can be mounted above a suspended ceiling in environmental air space using the wall or ceiling mounting bracket (refer to the “[Wall or Ceiling Mounting Bracket](#)” section on page 13).



Note

The bridge and power injector have adequate fire resistance and low smoke-producing characteristics to make them suitable for operation in a building’s environmental air space (such as above suspended ceilings) in accordance with Section 300-22(C) of the National Electrical Code (NEC).



Note

When mounting the bridge or power injector in a building’s environmental air space, you must use coax and Ethernet cables suitable for operation in environmental air space in accordance with Section 300-22(C) of the National Electrical Code (NEC).



Note

The power module is not rated for mounting above suspended ceilings.

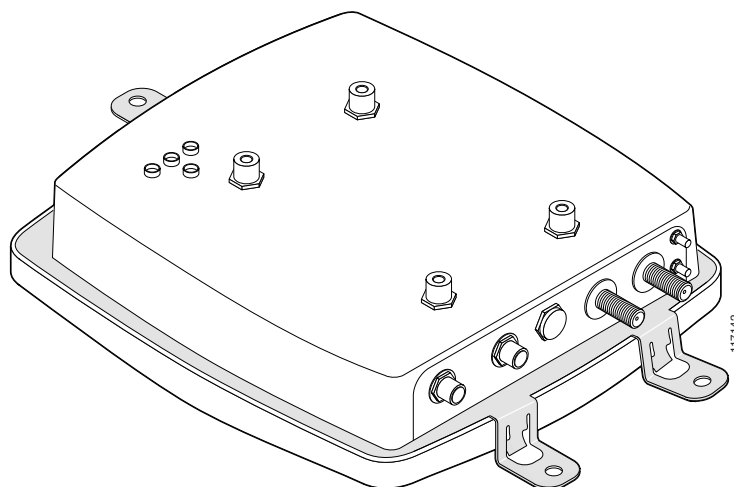
Wall or Ceiling Mounting Bracket

The bridge supports a wall or ceiling mounting bracket that can be used only with the external antenna bridge unit (see [Figure 2](#)). The bracket can be used indoors only.

Installing the bridge on a wall or ceiling includes the following subtasks:

1. Mounting the unit
2. Routing the cables (normal)
3. Activating the link

Figure 2 Bridge with Wall or Ceiling Mounting Bracket



Mounting the Bridge

To mount the external antenna bridge unit using the wall or ceiling mounting bracket, follow these steps:

-
- Step 1** Choose a mounting location for the bridge. For more information, see [“Choosing a Mounting Location” section on page 6](#).
- Step 2** Find a solid mounting position for the mounting bracket, such as a stud or main building member on a building wall or ceiling. It may be necessary to utilize a stud finder to find a wooden structural member.
- Step 3** Place the mounting bracket on the bridge as shown in [Figure 2](#) and snap into position. The bracket has an opening that corresponds to the shape of the bridge with a flat cut-out segment that corresponds to the bridge connector area.



Note The bracket support feet must be positioned towards the front of the bridge.

- Step 4** Mount the bridge using the following user-provided hardware:
- Wooden structure—three 1/4 x 1 inch (minimum) lag bolts
 - Hollow walls—three 1/4-20 x 2 3/4 molly anchors
 - Concrete structure—three 1/4 x 1 inch (minimum) bolts with concrete anchors



Note Examine the structure to ensure that the mounting location is not deteriorating or weak. You are responsible for ensuring that the mounting location can adequately support the bridge.

- Step 5** Tighten the bolts to secure the bridge mounting bracket to the wall or ceiling.

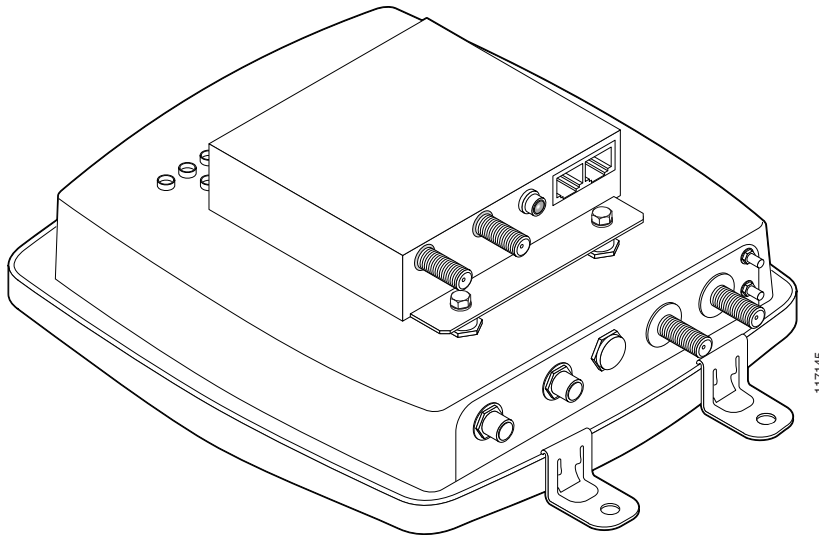
Mounting the Power Injector on the Bridge

When using the wall or ceiling mounting bracket, you can mount the power injector directly on the bridge mounting lugs (see [Figure 3](#)) using the hardware included with the bracket.



Note When mounted together, the bridge and power injector must be mounted indoors

Figure 3 *Mounting the Power Injector on the Bridge*



The following hardware used to mount the power injector on the bridge is supplied with the wall or ceiling mounting bracket kit:

- Four hex head bolts with serrated flange (M6x1x10 mm)
- Four washers
- Two short sub-mini RG-59 coax cables (12 in.)

Tighten the bolts to secure the power injector to the bridge. Torque bolts to 6 to 8 ft-lbs.

Routing the Cables with the Bridge Placed Indoors

When using the wall or ceiling mount with the bridge mounted indoors, you can mount the power injector directly to the bridge. This procedure explains how to route and connect the cables and how to ground the bridge:

Step 1 Connect the two short coax cables to the power injector and to the bridge. Grounding blocks are not required on these short coax cables.



Warning

This equipment must be grounded. Never defeat the ground conductor or operate the equipment in the absence of a suitably installed ground conductor. Contact the appropriate electrical inspection authority or an electrician if you are uncertain that suitable grounding is available. Statement 1024



Caution

To prevent damage to the bridge or power injector, connect all coax cables from the power injector to the bridge and connect the power jack to the power injector before applying power.



Note

If this is the first unit in the system deployment, such as the root bridge, do not weatherproof or permanently secure all connections until after final antenna alignment.

Step 2 Find the building's grounding electrode system and then connect the bridge ground lug to it using 6 AWG copper wire. Use a crimping tool to crimp the wire to the ground lug. For more information about attaching the ground lug to the bridge, see [Step 3](#) and [Step 4](#) in the “[Attaching the Housing Bracket to the Bridge](#)” section on page 28. See [Figure 11](#) for the ground lug location.

Activating the Link

Activate the link and position the antenna after the bridge components are completely installed and ready to operate. For more information, see the “[Activating the Bridge Link](#)” section on page 32.

Rooftop or Wall Mount

The mounting kit has a rooftop mounting bracket that is suitable for flat roofs, sloping roofs, and outdoor walls. Mounting the bridge on a rooftop or wall includes the following subtasks:

1. Mounting the bridge
2. Routing the cables
3. Activating the link

This warning applies to outdoor installations.



Warning

Only trained and qualified personnel should be allowed to install, replace, or service this equipment. Statement 1030

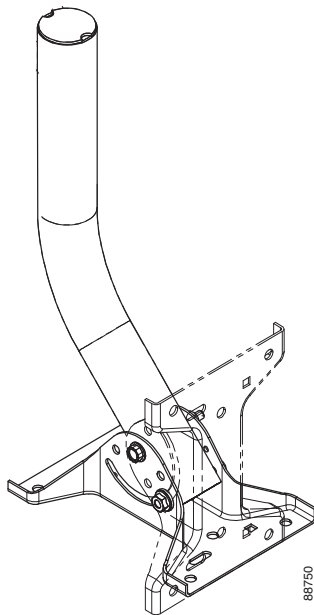
Mounting the Bridge

To mount the bridge on a rooftop or wall, follow these steps:

- Step 1** Choose a mounting location for the bridge. If you are using the integrated antenna, the mounting location must provide a clear signal path to the remote bridge. For more information, see [“Choosing a Mounting Location” section on page 6](#).
- Step 2** Find a solid mounting position for the base bracket, such as a stud or main building member on a roof or external wall. It may be necessary to utilize a stud finder to find wooden structural members.
- Step 3** Assemble the rooftop mount. For more information, see the [“Assembling the Rooftop Mount” section on page 27](#).
- Step 4** Mount the rooftop bracket at the mounting location using the following user-provided hardware:
 - Wooden structure—four 1/4 x 2 inch (minimum) lag bolts
 - Concrete structure—four 1/4 x 1 inch (minimum) bolts with concrete anchors

[Figure 4](#) shows the rooftop mast assembly:

Figure 4 *Roof-Mount Mast*

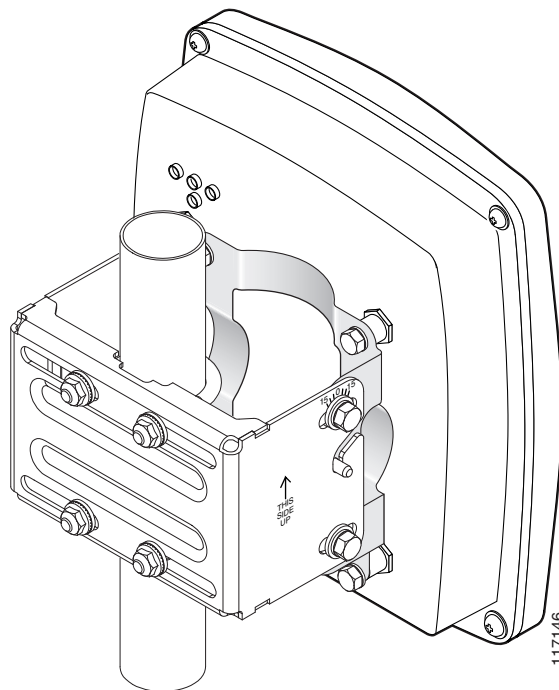


Make sure that the mounting pole is vertical. You can rotate the foot of the bracket to adjust the vertical position for wall or sloped-roof mounting locations.

- Step 5** Tighten the bolts to secure the mounting pole to the mounting foot. Torque nuts to 12 to 14 ft-lb.
- Step 6** Attach the bridge to the vertical section of the pole using the supplied brackets and hardware. For more information, see the [“Assembling the Mounting Hardware” section on page 27](#).

Figure 5 shows the bridge mounted on the rooftop mast:

Figure 5 Roof-Mount Assembly



- Step 7** Point the antenna as accurately as possible in the direction of the remote antenna. The integrated antenna is correctly positioned when the flat face of the radome faces the remote antenna.

Routing the Cables

This procedure explains how to route the power injector cables from the bridge to a grounding block. The grounding block should be installed at the building entry point.

To route and connect cables, follow these steps:

- Step 1** Unspool two 75-ohm cables the full length from the bridge to the grounding block, laying them out straight without kinks. Do not cut the cables until you know the total required length between the bridge and grounding block.
- Step 2** Install F-connectors on the bridge end of each cable and connect the cables to the bridge. For outdoor locations, the cables should slope downward from the bridge connectors so that moisture runs away from the bridge during rainstorms. If necessary, form drip loops near the connectors.
- Step 3** Dress the cables along the path from the bridge to the grounding block. Secure the cables as you go using UV-stabilized Ty-Wraps or equivalent fasteners.

Step 4 Cut the cables to length, install F-connectors on the ends, and connect them to the grounding block.



Caution

To prevent damage to the bridge or power injector, connect all coax cables from the power injector to the bridge and connect the power jack to the power injector before applying power.



Note

The grounding block must be connected to the building's grounding electrode system by 14 AWG copper wire or larger.

Step 5 Find the building's grounding electrode system and then connect the bridge ground lug to it using 6 AWG copper wire. Use a crimping tool to crimp the wire to the ground lug. For more information about attaching the ground lug to the bridge, see [Step 3](#) and [Step 4](#) in the “[Attaching the Housing Bracket to the Bridge](#)” section on page 28. See [Figure 11](#) for the ground lug location.



Caution

To ensure correct installation and grounding, install the bridge in compliance with your local and national electrical codes: National Fire Protection Association (NFPA) 70, National Electrical Code (U.S.); Canadian Electrical Code, Part I, CSA 22.1 (Canada); and if local or national electrical codes are not available, refer to IEC 364, Part I through Part 7 (other countries).



Note

Local code may require grounding of the rooftop mount.

Step 6 For outdoor locations, weather seal all coaxial connectors by wrapping them with the sealant tape provided with the installation kit. For more information, see the “[Applying Coax Seal Tape](#)” section on page 25.



Note

If this is the first bridge in the system deployment, such as the root bridge, do not weatherproof or permanently secure all connections until after final antenna alignment.

Activating the Link

Activate the link and position the antenna after the bridge components are completely installed and ready to operate. For more information, see the “[Activating the Bridge Link](#)” section on page 32.

Tower Mount

A professional installer must install the bridge on a tower. A professional installer has skills and knowledge related to the construction, operation, and installation of electrical equipment and has received safety training on the hazards involved.

Installing the bridge on a tower includes the following subtasks:

1. Mounting the bridge
2. Routing the cables (normal or lightning protected)
3. Activating the link

This warning applies to outdoor bridge installations.



Warning

Only trained and qualified personnel should be allowed to install, replace, or service this equipment.

Statement 1030

Mounting the Bridge

To mount the bridge on a tower, follow these steps:

-
- Step 1** Choose a mounting location on the tower for the bridge. If you are using the integrated antenna, the mounting location must provide a clear signal path to the remote bridge. For more information, see [“Choosing a Mounting Location” section on page 6](#).
 - Step 2** Find a suitable mounting support or install a mounting pole for the bridge. The mounting bracket accommodates poles from 1.25 to 2.75 inches (30.5 to 69.9 mm) in diameter; the supplied U bolts fit 1.25 to 1.75-inch poles only. You can find this type of hardware at <http://www.rohnnet.com>.
 - Step 3** Hoist the bridge assembly to the mounting location. The mounting brackets have openings for hoisting the unit.
 - Step 4** Attach the bridge to the mounting pole using appropriate hardware (see [Figure 6](#)). For more information, see the [“Assembling the Mounting Hardware” section on page 27](#).
 - Step 5** Point the antenna as accurately as possible in the direction of the remote antenna. The integrated antenna is correctly positioned when the flat face of the radome faces the remote antenna.



Warning

This equipment must be grounded. Never defeat the ground conductor or operate the equipment in the absence of a suitably installed ground conductor. Contact the appropriate electrical inspection authority or an electrician if you are uncertain that suitable grounding is available. Statement 1024



Caution

To ensure correct installation and grounding, install the bridge in compliance with your local and national electrical codes: National Fire Protection Association (NFPA) 70, National Electrical Code (U.S.); Canadian Electrical Code, Part I, CSA 22.1 (Canada); and if local or national electrical codes are not available, refer to IEC 364, Part I through Part 7 (other countries).



Note

Local code may require grounding of the tower mount.

-
- Step 6** Find the building's grounding electrode system and then connect the bridge ground lug to it using 6 AWG copper wire. Use a crimping tool to crimp the wire to the ground lug. For more information about attaching the ground lug to the bridge, see [Step 3](#) and [Step 4](#) in the [“Attaching the Housing Bracket to the Bridge” section on page 28](#). See [Figure 11](#) for the ground lug location.

Routing the Cables for Lightning Protection

In areas where lightning strikes are common and when the bridge is mounted high on the tower, ground the shields of the RG6 coaxial cables to the tower at regular intervals. This precaution helps protect the bridge and power injector from lightning damage. The recommended spacing between grounds is 200 ft (60 m). In areas of especially high lightning risk, space the grounds even closer.

**Note**

Be sure to comply with the tower owner's policies and local codes. Drilling into tower structures, damaging painted surfaces, or other alterations can affect the tower's long-term integrity.

To route and connect cables for lightning protection follow these steps:

- Step 1** Mount grounding blocks to the tower at intervals of about 200 ft (60 m) along the cable route. Make sure each grounding block makes good electrical (metal-to-metal) contact with the tower.
- Step 2** Cut cable segments for each interval and preinstall F-connectors.
- Step 3** Secure the cable segments along the route using UV-stabilized Ty-Wraps or equivalent fasteners.
- Step 4** Connect all cable segments. For outdoor installations, use drip loops at each point to assure that water runs away from the connectors.
- Step 5** Proceed to the following procedure, starting from the lowest grounding block instead of from the bridge.

Routing the Cables Normally

To route and connect power injector cables normally, follow these steps:

- Step 1** Unspool two 75-ohm cables the full length of the tower, laying them out straight without kinks. Do not cut the cables until you know the total required length between the bridge and grounding block.
- Step 2** Install F-connectors on the cable ends before climbing the tower.
- Step 3** Tie a rope near the end of the two cables, and secure it using black electrical tape. Make sure that the connectors do not support any cable weight.
- Step 4** From the tower, use the rope to pull the cables up from the ground, making sure that they pass along a tower member where they can be securely fastened. Leave ample cable for a service loop at the bridge.
- Step 5** Secure the cables to the tower and along the route to the building grounding block using UV-stabilized Ty-Wraps or equivalent fasteners.

**Warning**

This equipment must be grounded. Never defeat the ground conductor or operate the equipment in the absence of a suitably installed ground conductor. Contact the appropriate electrical inspection authority or an electrician if you are uncertain that suitable grounding is available. Statement 1024

**Caution**

To prevent damage to the bridge or power injector, connect all coax cables from the power injector to the bridge and connect the power jack to the power injector before applying power.

**Note**

The grounding block must be connected to the building's grounding system by 14 AWG copper wire or larger.

- Step 6** Connect the cables to the bridge (or lowest grounding block on the tower). The cables should slope downward so that moisture runs away from the connectors during rainstorms. If necessary, form drip loops near the connectors.
- Step 7** Cut the cables to length, install F-connectors on the ends, and connect them to the grounding block.
- Step 8** Weather seal all coaxial connectors by wrapping them with the sealant tape provided with the installation kit. For more information, see the [“Applying Coax Seal Tape”](#) section on page 25.

**Note**

If this is the first unit in the system deployment, such as the root bridge, do not weatherproof or permanently secure all connections until after final antenna alignment.

Activating the Link

Activate the link and position the antenna after the bridge components are completely installed and ready to operate. For more information, see the [“Activating the Bridge Link”](#) section on page 32.

Mast Mount

Mounting the bridge on a tall mast makes antenna positioning difficult because you cannot view the bridge LEDs or adjust the antenna vertically. If possible, use a mast short enough so that you can reach the bridge from a step ladder or other support. Otherwise, you may need to take down the mast to adjust the antenna position.

Mounting the bridge on a mast includes the following subtasks:

1. Preparing the mast
2. Mounting the bridge
3. Routing mast cables
4. Raising the mast and connecting cables
5. Activating the link

This warning applies to outdoor installations.



Warning

Only trained and qualified personnel should be allowed to install, replace, or service this equipment.
Statement 1030

Preparing the Mast

To prepare the mast, follow these steps:

-
- Step 1** Choose a mounting location for the mast. For more information, see the [“Choosing a Mounting Location” section on page 6.](#)
 - Step 2** Find a solid mounting position on the building for the mast mounting bracket, such as a stud or main building member on a roof or external wall. Use a stud finder, if necessary, to find wooden structural members.
 - Step 3** Find the mast-mounting hardware and guy wire.
 - Step 4** Find and install the guy line mounting points. A minimum of three, preferably four, guy lines should hold the mast in position.
 - Step 5** Measure the length of the guy lines by attaching the lines to the mast at their mounting point and unspooling them to the attachment points.
 - Step 6** Raise the mast to its vertical position and temporarily secure all guy lines to their mounting points.
 - Step 7** Ensure that the mast is vertical using a level on two sides (90 degrees apart) of the pole. Adjust guy lines as necessary and note their attachment points.
 - Step 8** Take down the mast.
-

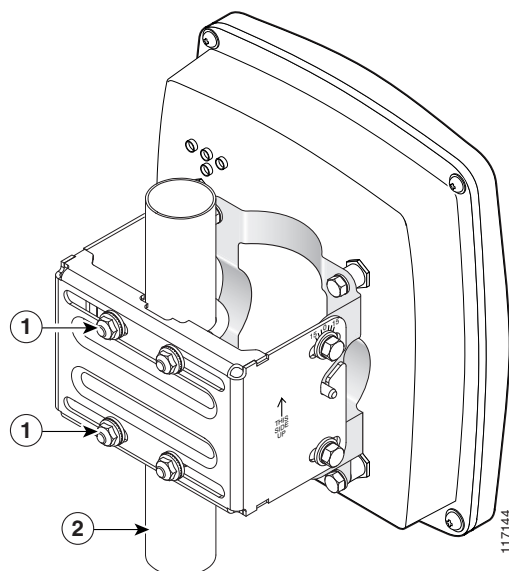
Mounting the Bridge

To mount the bridge on the mast, follow these steps:

- Step 1** Attach the bridge near the top of the mast.

If the mast is the same diameter as the rooftop support, you can use the supplied hardware. The mounting brackets accommodate a small mast (see [Figure 6](#)). For more information, see the “[Assembling the Mounting Hardware](#)” section on page 27.

Figure 6 Bridge Attached to a Small Mounting Pole



1	U bolt (2 supplied)	2	Small mast, 1.25 to 2.5 inches (30.5 to 63.5 mm) in diameter
----------	---------------------	----------	--

- Step 2** Connect the ground lug on the bridge to the mast using #6 gauge wire. Use a crimping tool to secure the wire to the ground lug. Use a mast clamp or tapped screws into the mast for the mast connections.

Routing Mast Cables

To route and connect cables, follow these steps:

- Step 1** Unspool two 75-ohm cables the full length from the bridge to the grounding block, laying them out straight without kinks. Do not cut the cables until you know the total required length between bridge and grounding block.
- Step 2** Install F-connectors on the bridge end of each cable and connect the cables to the bridge. The cables should slope downward from the bridge connectors (when the mast is raised) so that moisture runs away from the bridge during rainstorms. If necessary, form drip loops near the connector.
- Step 3** Secure the cables to the mast using UV-stabilized Ty-Wraps or equivalent fasteners.

Step 4 Weather seal all coaxial connectors by wrapping them with the sealant tape provided with the installation kit. For more information, see the [“Applying Coax Seal Tape” section on page 25](#).



Note If this is the first bridge in the system deployment, such as the root bridge, do not weatherproof or permanently secure all connections until after final antenna alignment.

Raising the Mast and Connecting Cables

To raise the mast and connect cables, follow these steps:

Step 1 Tilt the mast assembly to the upright position, set the mast in its mounting base clamp, orient the antenna in the direction of the remote antenna, and secure the guy wires.

Step 2 Tighten the mast clamp so the mast is secure but so that it can be rotated for final adjustments in positioning.



Warning **This equipment must be grounded. Never defeat the ground conductor or operate the equipment in the absence of a suitably installed ground conductor. Contact the appropriate electrical inspection authority or an electrician if you are uncertain that suitable grounding is available.** Statement 1024



Caution To ensure correct installation and grounding, install the bridge in compliance with your local and national electrical codes: National Fire Protection Association (NFPA) 70, National Electrical Code (U.S.); Canadian Electrical Code, Part I, CSA 22.1 (Canada); and if local or national electrical codes are not available, refer to IEC 364, Part I through Part 7 (other countries).

Step 3 Find the building's grounding electrode system and then connect the mast to it using 6 AWG copper wire. For more information about attaching the ground lug to the bridge, see [Step 3](#) and [Step 4](#) in the [“Attaching the Housing Bracket to the Bridge” section on page 28](#). See [Figure 11](#) for the ground lug location.

Step 4 Dress the cables along the path from the mast to the grounding block. Secure the cables as you go using UV-stabilized Ty-Wraps or equivalent fasteners.



Caution To prevent damage to the bridge or power injector, connect all coax cables from the power injector to the bridge and connect the power jack to the power injector before applying power.



Note The grounding block must be connected to the building's grounding system by # 14 AWG copper wire or larger.

Step 5 Cut the cables to length, install F-connectors on the ends, and connect them to the grounding block.

Step 6 Weather seal all coaxial connectors by wrapping them with the sealant tape provided with the installation kit. For more information, see the [“Applying Coax Seal Tape” section on page 25](#).

Activating the Link

Activate the link and position the antenna after the bridge components are completely installed and ready to operate. For more information, see the [“Activating the Bridge Link”](#) section on page 32.

Applying Coax Seal Tape

You must weather seal all coaxial connections using the Coax-Seal tape provided in the mounting kit. Coax connections that are not properly sealed permit moisture to enter the connection, which leads to performance degradation or link problems.

The following connectors must be weather sealed:

- F-connectors, located at the bridge and each grounding block.
- R-TNC antenna connectors, when using the bridge with an external antenna.

**Note**

Do not use only plastic electrical tape on the connectors because it deteriorates during long-term exposure to ultraviolet light and extreme weather.

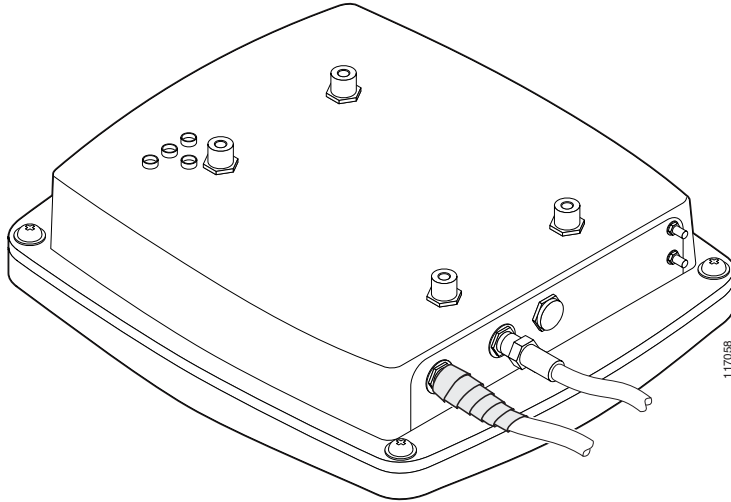
To apply Coax Seal, follow these steps:

-
- Step 1** Make sure that the coaxial cables, connectors, and the connector area are clean and dry.
 - Step 2** Peel the paper backing from a 10-inch length of Coax-Seal tape.
 - Step 3** Wrap each bridge connector with the tape, starting at the coaxial cable, extending across the connector body, and finishing close the bridge or grounding block. Overlap each turn at least 50 percent so there is a double thickness over all areas (see [Figure 8](#)).

**Note**

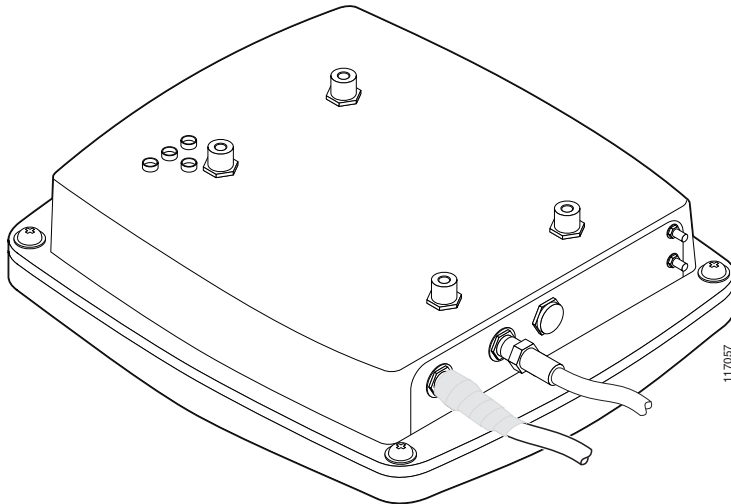
To simplify removal of the connector in the future, you can first wrap the connector with a good grade of electrical tape before applying the Coax-Seal. You should tightly wrap the electrical tape and overlap each turn at least 25 percent for full coverage.

Figure 7 Coax Seal Tape Application



- Step 4** Using your fingers, mold and form the Coax-Seal around the cable and connector to form a smooth surface. Make sure to squeeze out any air pockets (see [Figure 8](#)).

Figure 8 Coax Seal Tape After Forming Into Shape



- Step 5** Visually inspect the seal to make sure the entire connector area is completely covered. If you find gaps, apply additional Coax-Seal over the existing material and then mold it to shape.
- Step 6** Repeat this procedure for each coaxial connection on the bridge and grounding blocks.

Assembling the Mounting Hardware

The bridge mounting hardware can accommodate tower, mast, or rooftop installations. The mounting hardware comprises the following key parts:

- Housing brackets
- Mounting bracket
- Rooftop mount or wall mounting bracket

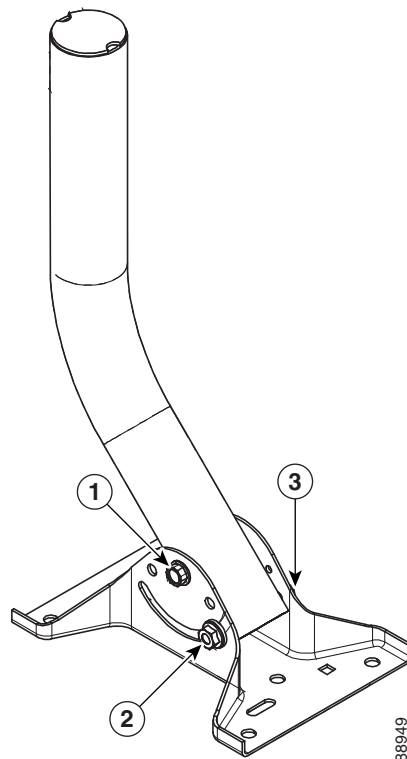
Assembling the Rooftop Mount

The rooftop mount or wall mounting bracket (see [Figure 9](#)) is used to mount your bridge to a flat horizontal or vertical surface, such as a building roof or wall. You must assemble the rooftop mount before you can use it. Skip this section if you are not using the rooftop mount.

To assemble the mount, follow the instructions below:

-
- Step 1** Place a washer on the long flanged hex bolt.
- Step 2** Place the end of the mast pipe with the bolt holes into the base plate (see [Figure 9](#)).

Figure 9 Rooftop Support Bolt Locations



1	Long flanged hex bolt	3	Carriage bolt
2	Carriage bolt		

- Step 3** Align the holes in the mast pipe with the holes in the base plate.
- Step 4** Insert the long flanged hex bolt and washer into the upper holes on the base plate and through the mast pipe (see [Figure 9](#)).
- Step 5** Place a washer and hex nut on the end of the long flanged hex bolt and hand-tighten.
- Step 6** Position the mast pipe and base plate as shown in [Figure 9](#).
- Step 7** Align the lower square hole in the mast pipe with the semi-circular cut-out on the base plate.
- Step 8** Place the carriage bolt into the square hole on the inside of the mast pipe.
- Step 9** Place a washer and hex nut on the end of the carriage bolt and hand-tighten.
- Step 10** Repeat Steps 8 and 9 for the other square hole.

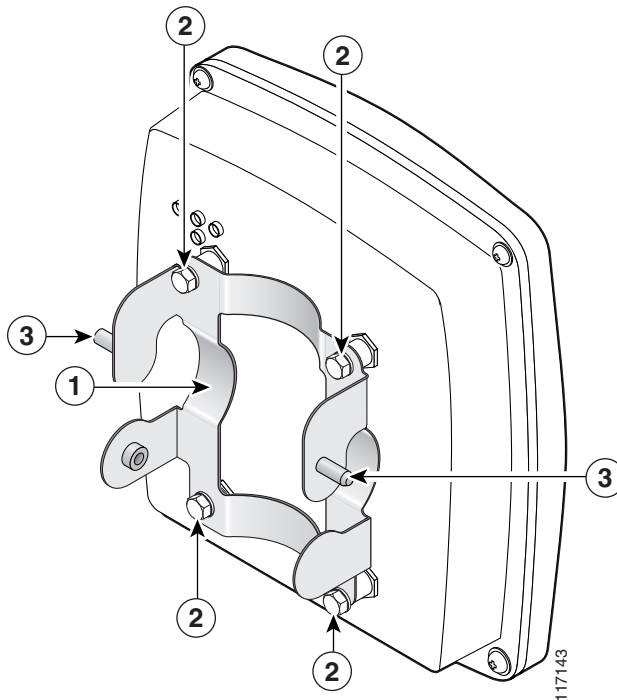
You have completed the assembly of your rooftop or wall mount. To mount your rooftop or wall mount, please refer the “[Mounting the Bridge](#)” section on page 10.

Attaching the Housing Bracket to the Bridge

To attach the housing bracket to the bridge, follow these steps:

- Step 1** Before attempting to attach the housing bracket, refer to [Figure 10](#).

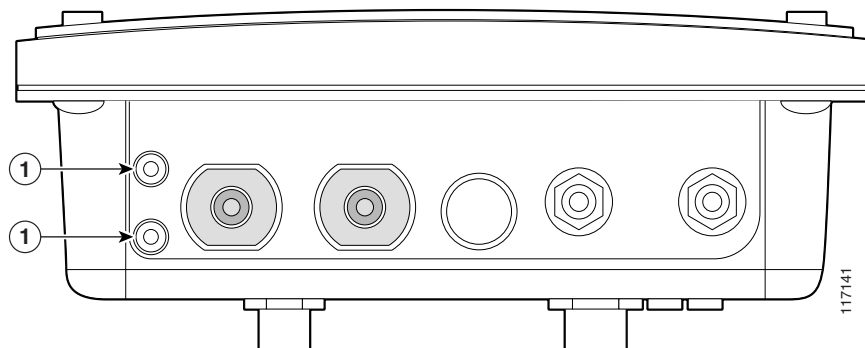
Figure 10 *Housing Bracket Attachment*



1	Housing bracket	3	Hang pin
2	Hex bolt with serrated flange	4	

- Step 2** Attach the housing bracket to the housing using four hex bolts. Torque bolts to 8 to 10 ft-lb.
- Step 3** Apply a thin layer of electrical joint compound to the bridge at the ground lug location (See [Figure 11](#)).

Figure 11 Ground Lug Attachment Point



1	Threaded mounting studs for the ground lug
----------	--

- Step 4** Attach the supplied ground lug to the two threaded mounting studs on the bridge using the two supplied locking Hex nuts. Torque the nuts to 10 to 12 in-lb.

Note Do not remove the two factory installed lock nuts on the mounting studs.

Note After you install the bridge on its support, connect this ground to the building ground using 6 AWG wire.

Attaching the Mounting Bracket

The mounting bracket is suitable for rooftop, mast, or tower supports. How you attach the mounting bracket to the support depends on the mast diameter, as follows:

Mast Type	Mast Diameter	Mast Attachment
Rooftop support or small mast	1.25 to 2.75 in. (30.5 to 69.9 mm)	Attach the mast to the mounting bracket between the bracket and bridge (see Figure 12)

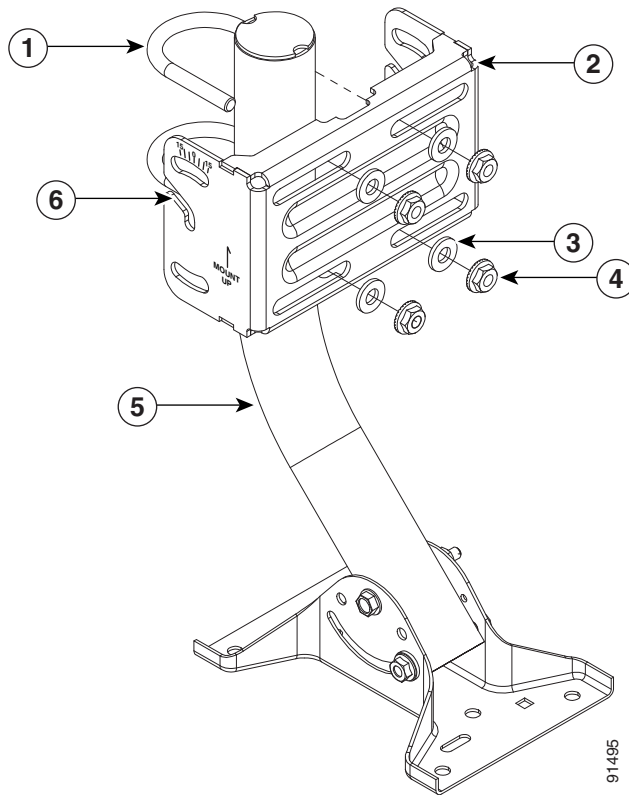
Rooftop Support or Small Mast Diameters

Use this procedure to attach the mounting bracket to the rooftop support or to a mast with a diameter between 1.25 and 2.75 inches (30.5 to 69.9 mm). For masts other than the rooftop support, use U bolts that fit the mast in use.

To attach the mounting bracket to the rooftop support or small mast, follow these steps:

- Step 1** Position the mounting bracket next to the mounting pole so that the arrow on the bracket points up.

Figure 12 Mounting Bracket Assembly for Rooftop Support



1	U bolt	4	Hex nut
2	Mounting bracket	5	Roof mounting mast
3	Flat washer	6	Hang pin slot

- Step 2** Attach the mounting bracket to the mast using two U bolts and four nuts and washers.



Note If you are using the integrated antenna, loosely tighten the U bolts so you can adjust the bridge horizontally for antenna positioning.

Mounting the Bridge on a Support

This warning applies to outdoor installations:



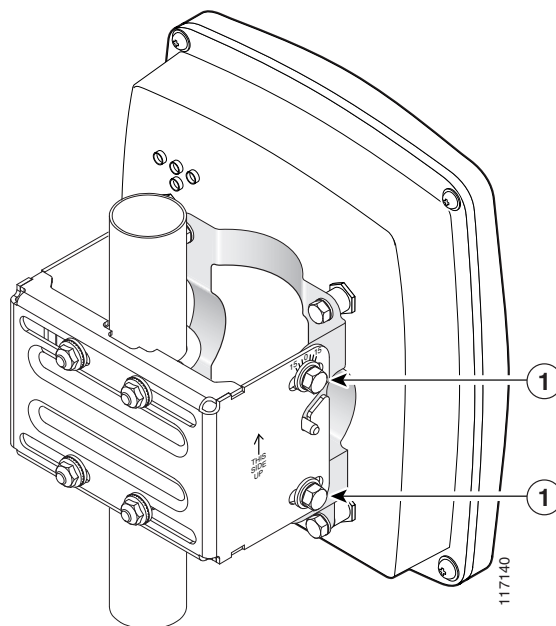
Warning

Only trained and qualified personnel should be allowed to install, replace, or service this equipment.
Statement 1030

To attach the bridge to a support, follow these steps:

- Step 1** Mount the housing bracket to the mounting bracket by sliding the hang pins on the housing bracket into the hang pin slots on the mounting bracket. The connectors should face downward (See [Figure 13](#)).

Figure 13 *Mounting the Bridge to the Support*



- | | |
|----------|--|
| 1 | Hex bolt with serrated flange and washer (4 locations) |
|----------|--|

- Step 2** Secure the housing bracket to the support bracket with four hex bolts and flat washers.



Note If you are using the integrated antenna, loosely tighten the U bolts so you can adjust the bridge horizontally for antenna positioning.

- Step 3** Roughly position the integrated antenna by pointing the flat face of the bridge toward the site of the remote bridge.

- Step 4** After aligning the antenna, tighten all mounting bolts to 6 to 10 ft-lbs.

Activating the Bridge Link

The factory default behavior of the bridge changes depending on the Cisco IOS software release that is running on the unit. Some software releases require that you make manual configuration changes prior to initiating the bridging link. The following sections describe the default behavior changes and the link activation procedure.

Default IP Address Behavior

When you connect a bridge running Cisco IOS Release 12.3(2)JA or later software with a default configuration to your LAN, the unit requests an IP address from your DHCP server, and if it does not receive an IP address, it continues to send requests indefinitely. To eliminate this behavior, you must access the bridge through its console port and assign a static IP address.

When you connect a bridge running Cisco IOS Release 12.2(15)JA2 or earlier software with a default configuration to your LAN, the unit requests an IP address from your DHCP server, and if it does not receive an IP address, it assigns a default IP address of 10.0.0.1.

Default SSID and Radio Behavior

In Cisco IOS Release 12.3(2)JA2 and earlier, on initial power up the bridge defaults to the Install-Mode role with the radio enabled. It supports these SSIDs:

- SSID is *autoinstall* for the Install-Mode role.
- SSID is *tsunami* for Root AP and Workgroup Bridge roles.

In Cisco IOS Release 12.3(4)JA or later, on initial power up the bridge defaults to the root access point role with the radio disabled and no default SSID configured.

**Note**

In Cisco IOS Release 12.3(4)JA or later, you must create an SSID and enable the radio before the bridge allows wireless associations from other bridges. These changes to the default configuration improve the security of a newly installed bridge. For instructions on configuring the SSID, see the [“Changing Radio Role and SSID Settings”](#) section on page 37.

Connecting to the Access Point/Bridge Locally

Using the Power Injector’s Ethernet Port

You can use the power injector’s Ethernet port to configure the bridge locally (without connecting to a wired LAN) using the web-browser or CLI interfaces.

**Note**

You do not need a special crossover cable to connect your PC to the power injector’s Ethernet port; you can use either a straight-through cable or a crossover cable.

Follow these steps to connect to the power injector's Ethernet port:

-
- Step 1** Connect a Category 5 Ethernet cable to your PC's Ethernet connector and to the power injector's Ethernet port.
- Step 2** Your PC and the bridge must be configured with compatible IP addresses and subnet masks to be able to communicate on the Ethernet interface. Perform one of these operations:
- If the bridge is running Cisco IOS Release 12.2(15)JA or earlier and is configured with default values, you must manually assign your PC an IP address from 10.0.0.31 to 10.0.0.40.
 - If the bridge is running Cisco IOS Release 12.3(2)JA2 or later and is configured with default values, you must manually assign a temporary static IP address to the bridge and manually configure your PC with a compatible IP address and subnet mask. For additional information, refer to the [“Finding the IP Address Using the CLI”](#) section on page 33.
-

Using the Power Injector's Console Port

You can use the power injector's console port for entering CLI commands. Follow these steps to connect to the power injector's console port:

-
- Step 1** Connect a nine-pin, female DB-9 to RJ-45 serial cable to the RJ-45 serial console port on the power injector and to the COM port on a computer.



Note The Cisco part number for the DB-9 to RJ-45 serial cable is AIR-CONCAB1200. Browse to <http://www.cisco.com/go/marketplace> to order a serial cable.

- Step 2** Set up a terminal emulator to communicate with the access point. Use the following settings for the terminal emulator connection: 9600 baud, 8 data bits, no parity, 1 stop bit, and no flow control.



Note When your configuration changes are complete, you must remove the serial cable from the console port.

Finding the IP Address Using the CLI

You can find the bridge IP address using the following CLI command from the user EXEC mode:

	Command	Purpose
Step 1	show interface bvi1	Displays the IP address for the interface BVI.

Link Activation Overview

Activate the link after the bridge system is completely installed and ready to power up. The following sequence summarizes the bridge activation procedure with Cisco IOS Release 12.3(2)JA2 or earlier software:

1. Power up the root bridge, observing the LEDs to verify proper startup.
2. Power up the remote bridge, position the antenna, and verify successful association.
3. Position the root antenna.

The following sequenc summarizes the bridge activation procedure with Cisco IOS Release 12.3(4)JA or later software:

1. For the root bridge:
 - a. Power up the root bridge.
 - b. Enable the radio interface (see the [“Enabling the Radio Interface” section on page 37](#))
 - c. Configure the radio role to **Install-Mode** and configure the radio SSID (see the [“Changing Radio Role and SSID Settings” section on page 37](#)).
 - d. Turn the bridge power off.
 - e. Activate the root bridge and observe the LEDs to verify proper startup (see the [“Bridge Installation Mode Indicators” section on page 34](#)).
2. For the non-root bridge:
 - a. Power up the non-root bridge.
 - b. Enable the radio interface (see the [“Enabling the Radio Interface” section on page 37](#)).
 - c. Configure the radio role to **Install-Mode** and configure the radio SSID (see the [“Changing Radio Role and SSID Settings” section on page 37](#)).
 - d. Turn the bridge power off.
 - e. Activate the non-root bridge, position the antenna, and verify successful association (see the [“Bridge Installation Mode Indicators” section on page 34](#)).
3. Position the root antenna for the strongest signal.

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 and you must adjust the antenna position during the bridge startup cycle. Persistent association problems can indicate poor placement of the bridge or obstacles in the signal path.

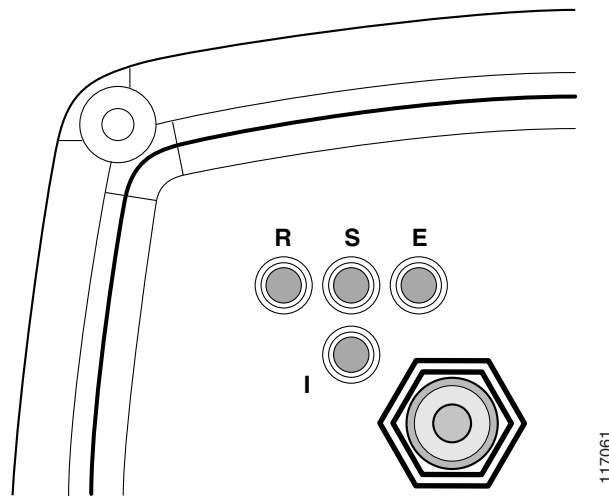
Use the LED indications to verify the state of the bridge during the association process. The following section explains how to interpret the LED indicators.

Bridge 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 (see [Figure 14](#)).

Figure 14 LED and Connector Locations



R	Radio LED	E	Ethernet LED
S	Status LED	I	Install LED

The Install LED displays the information shown in [Table 3](#):

Table 3 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 4](#)).

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:

- 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 find the remote bridge or antenna, and then adjust the horizontal and vertical positions accordingly.



Caution

To prevent damage to the bridge or power injector, connect all coax cables from the power injector to the bridge and connect the power jack to the power injector before applying power.

- 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.
- Step 5** Return to the root bridge and position its antenna using LED indications or RSSI voltages. For more information, see the [“Positioning a Directional Antenna” section on page 39](#).

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 the LED indications. For more information, see the [“Positioning a Directional Antenna” section on page 39](#).

Enabling the Radio Interface

After you obtain the bridge IP address, follow these instructions to enable the radio interface:

- Step 1** Use your web-browser to access your bridge.
- Step 2** When the Summary Status page displays, click **Network Interfaces > Radio0-802.11g** and the radio status page displays.
- Step 3** Click **Settings** and the radio settings page displays.
- Step 4** Click **Enable** in the Enable Radio field.
- Step 5** Click **Apply**.
- Step 6** Close your web-browser.

Changing Radio Role and SSID Settings

After you obtain the bridge IP address, you can browse to its Express Setup page and perform an initial configuration. Follow these steps:

- Step 1** Browse to the bridge IP address. An Enter Network Password window displays.
- Step 2** Enter the case-sensitive username *Cisco* in the Username field.
Enter the case-sensitive password *Cisco* in the Password field and press **Enter**. The Summary Status page displays, which is the bridge home page.
- Step 3** Click **Express Setup**. The Express Setup page displays.
- Step 4** In the Role in Radio Network field, click the check box that describes the needed role for the bridge on your network.



Note In Cisco IOS Release 12.3(2)JA2 or earlier, the bridge is default configured in bridge install mode with automatic bridge detection activated. In Cisco IOS Release 12.3(4)JA, the bridge is default configured in root access point mode.

- **Install Mode**—Activates the bridge install and alignment mode. Specifies that the bridge automatically determines the network role. If the bridge is able to associate to another Cisco Aironet root bridge within 60 seconds, the bridge assumes a non-root bridge role. If unable to associate with another Cisco Aironet root bridge within 60 seconds, the bridge assumes a root bridge role.

You can also pre-configure the bridge into root bridge or non-root bridge modes and avoid the 60-second automatic detection phase.

- **Root Bridge**—Specifies that the product is operating as a root bridge and that it connects directly to the main Ethernet LAN network. In this mode, the unit accepts associations from other Cisco Aironet non-root bridges and wireless client devices.
- **Non-root Bridge**—Specifies that the product is operating as a non-root bridge, that it connects to a remote LAN network, and that it must associate with a Cisco Aironet root bridge using the wireless interface.
- **Access Point**—Specifies that the product operates as an access point connected to the main Ethernet LAN network. In this mode, wireless client devices are allowed to associate to the access point.
- **Repeater**—Check this box if your product (also called *repeater non-root*) is not connected to the wired LAN and supports wireless clients.
- **Workgroup Bridge**—Specifies that the product operates as a workgroup bridge connected to a small wired Ethernet LAN network through an Ethernet hub or switch. The workgroup bridge must associate to a Cisco Aironet access point or a Cisco Aironet bridge.
- **Scanner**—This setting is enabled when the product is being used by the Cisco WLSE to monitor wireless data traffic.

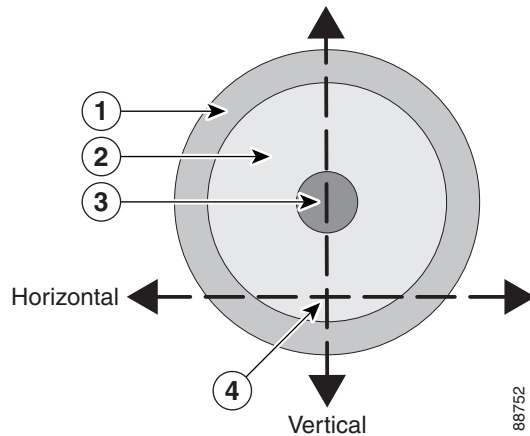
- Step 5** Click **Apply** to save your radio role settings.
- Step 6** Click **Express Security** on the left side of the Express Setup page and the Express Security page appears.
- Step 7** Enter the **SSID** in the SSID field.
- Step 8** Click **Apply** to save your SSID setting.
- Step 9** Close your web browser.
-

Positioning a Directional Antenna

The goal when positioning a directional antenna is to align the local antenna for maximum received signal strength using the LED indications. The LEDs are convenient and easy to use.

Normally, you observe a single large peak as you pan the antenna across the signal path. However, if the antennas are not well positioned during installation, you may observe two peaks of roughly equal amplitude. Think of the receive signal as a target (see [Figure 15](#)).

Figure 15 Signal Strength Target Showing Two-Peak Case



1	Medium signal level	3	Strong signal level
2	Weak signal level	4	Midpoint between peaks

The target consists of concentric rings, with the strongest signal at the center, surrounded by a weak area, and then a moderately strong side lobe. As you scan across the signal, you can miss the strong center signal and encounter two peaks of roughly equal amplitude, as shown by the horizontal dashed line. If you position the antenna on one of these weaker peaks and subsequently adjust the vertical position, you miss the maximum signal area completely. Instead, you must locate the two peaks and center the antenna between the peaks. The vertical scan then crosses the center point where the signal level is maximum.

Positioning the Antenna Using LED Indications

You can position the integrated antenna or a directional external antenna using the LEDs only after the bridge successfully associates with the remote bridge. In installation mode, the Install LED is continuous amber or green when the bridge has successfully associated. For the first 20 seconds following association, the bridge reads the received signal strength indication (RSSI) levels from the received packets and records the maximum value. After 20 seconds, the Ethernet, status, and radio LEDs on the bridge indicate relative RSSI readings (see [Table 4](#)) compared to the maximum recorded during the initial 20 seconds.

Table 4 Install Mode RSSI 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.

When you are using LEDs to maximize the signal, adjust the antenna until as many LEDs as possible are on and the rest are blinking as fast as possible. With all three LEDs on, the signal is good enough to support the maximum data rate.

To position the antenna using the LED indicators, follow these steps:

-
- Step 1** Verify that the Install LED is either continuous amber or green.
 - Step 2** Slowly pan the bridge to the left and right of the signal path, and watch for peaks in signal strength. Be sure to swing the antenna in an arc of 60 degrees to each side to ensure that the integrated antenna passes through the main and side lobes of the remote antenna.
 - Step 3** Return the bridge to the position where the signal is strongest, or in the case of two similar peaks, halfway between them.
 - Step 4** Secure the horizontal adjustment by tightening the U bolts on the mast. Torque the nuts to 6 to 8 ft-lb.
 - Step 5** Slowly tilt the bridge up and down, and watch for peaks in signal strength. Use the full vertical adjustment range of the mounting brackets.
 - Step 6** Return the bridge to the position where the signal is strongest, normally where all signal strength LEDs are on. If you are unable to turn on all LEDs, simply maximize the signal.
 - Step 7** Secure the vertical adjustment by tightening the four bolts that secure the housing bracket to the support bracket. Torque bolts to 8 to 10 ft-lb.
-

Transportation-Vehicle Mounting

The bridge can be mounted on a moving vehicle such as a car, bus, truck, train, or boat and used to communicate with another bridge. The vehicle must have a DC or AC power source for the bridge power injector. The following sections identify the maximum cable length that can be supported in these environments using a few different coax cable types.

When choosing cables other than those shown in the following examples, take care to ensure that the RF characteristics of the new cable meets or exceeds the RF characteristics of the cable examples up to 500 MHz. Also, be sure to use good quality cable connectors and grounding blocks such that the DC resistive losses associated with all the connections “combined” are less than 0.2 ohms.



Warning

Only trained and qualified personnel should be allowed to install, replace, or service this equipment.
Statement 1030



Note

The Cisco Aironet Power Injector LR2T must be used in vehicles that provide DC power to the power injector.

Electrical Load-Dump Protection

In battery power systems, a load-dump occurs when the battery is disconnected from the charging system while supplying power, and the devices connected to the battery system must dissipate the very large energy transient that is produced. For example, this situation can occur if the battery cables are loose or in a service shop where a mechanic accidentally removes the battery cable while the engine is running.

In order to comply with the transportation vehicle load-dump requirements specified in SAE 1211 and SAE1455 standards, you must use an external load-dump protection device. This device must be connected to the power cable between your vehicle’s battery system and the power injector.

You must install an external load-dump protection device in all vehicle systems that can experience a load-dump and that are supplying +24 VDC (or above) to the power injector.

For more information on load-dump protection devices, refer to *Appendix F* of the *Cisco Aironet 1300 Series Wireless Bridge Hardware Installation Guide*.

DC Power Cable and Connector

When mounting in a vehicle, you are responsible for providing the power cable, fuse, and power connector used for the power injector. The power injector requires an external power supply capable of supplying 13 W of power at a typical vehicle battery voltage: +12 VDC, +24 VDC, or +40 VDC. For the power cable, the positive voltage is connected to the center pin and the return is connected to the external barrel of the power plug.



Warning

A readily accessible two-poled disconnect device must be incorporated in the fixed wiring.
Statement 1022


Warning

Connect the unit only to DC power source that complies with the safety extra-low voltage (SELV) requirements in IEC 60950 based safety standards. Statement 1033


Caution

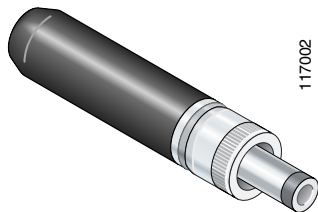
Only a qualified electrician or service person should make and install the power cable with in-line fuse supplying DC-power to the power injector.


Caution

To prevent damage to the bridge or power injector, connect all coax cables from the power injector to the bridge and connect the power jack to the power injector before applying power.

The power plug has a screw-on cap to secure the power cable to the power injector. The mating power plug is a Switchcraft 760K (see [Figure 16](#)).

Figure 16 Power Plug



Inline Power Fuse

When you mount the bridge in a vehicle, an inline power fuse must be used in the positive (+) power line going to the power injector.


Note

The inline power fuse must be listed and certified to the appropriate safety standards for the country where the bridge is installed.

[Table 5](#) provides the inline power fuse requirements:

Table 5 Inline Power Fuse Requirement

Vehicle Power Source	Inline Fuse (Slow-blow)
+12 VDC	1.7 A
+24 VDC	600 mA
37.5 VDC	360 mA
+40 VDC	335 mA

Coax Cable Lengths

When operating in vehicle environments, the power source is typically a vehicle battery system with voltages ranging from 12 to 40 VDC. In vehicle environments, the voltage supplied to the power injector can vary depending on the operating load. The following sections indicate the maximum coax cable lengths that can be supported using several typical coax cables.

Vehicle Environments Providing 12 VDC Power

Automotive environments typically can use its +12 VDC battery charging system to supply DC power for the power injector. Refer to [Table 6](#) for maximum cable length that can be supported by several coax cables in a automotive environment.

Table 6 Maximum Cable Length for Environments Providing 12 VDC Power

Cable Parameters	RG-6/U Belden 9077	RG-59/U Belden 1426A	RG-59/U Belden 1505A	RG-11/U Belden 8213
Minimum voltage available at power injector (volts)	10	10	10	10
Maximum cable length (meters)	7.5	22	20	75

Vehicle Environments Providing 24 VDC Power

A truck or bus vehicle environment typically can use its +24 VDC battery charging system to supply DC power for the power injector. Refer to [Table 7](#) for maximum cable length that can be supported by several coax cables in a truck or bus environment.

Table 7 Maximum Cable Length for Environments Providing 24 VDC Power

Parameters	RG-6/U Belden 9077	RG-59/U Belden 1426A	RG-59/U Belden 1505A	RG-11/U Belden 8213
Minimum voltage available at power injector (volts)	18	18	18	18
Maximum cable length (meters)	100	100	100	100

Vehicle Environments Providing 40 VDC Power

Some vehicles can provide +40 VDC battery power for the power injector. Refer to [Table 8](#) for maximum cable lengths for this vehicle environment.

Table 8 Maximum Cable Lengths for Environments Providing 40 VDC Power

Cable Parameters	RG-6/U Belden 9077	RG-59/U Belden 1426A	RG-59/U Belden 1505A	RG-11/U Belden 8213
Minimum voltage available at power injector (volts)	32	32	32	32
Maximum cable length (meters)	100	100	100	100

Vehicle Environments Providing 110 VAC Power

Some vehicles can provide 110 VAC power for the power injector. In vehicles with AC power, you can use the power injector power module supplied with the bridge. Refer to [Table 9](#) for maximum cable lengths for this vehicle environment.

Table 9 Maximum Cable Lengths for Environments Providing 110 VAC Power

Cable Parameters	RG-6 Belden 1828D	RG-59/U Belden 1426A	RG-59/U Belden 1505A	RG-11/U Belden 8213
Minimum voltage available at power injector (volts)	43	43	43	43
Maximum cable length (meters)	100	100	100	100

Related Documentation

The following documents provide additional information about the bridge:

- *Cisco Aironet 1300 Series Wireless Bridge Hardware Installation Guide*
- *Cisco IOS Software Configuration Guide for Cisco Aironet Bridges*
- *Cisco IOS Software Configuration Guide for Cisco Aironet Access Points*
- *Cisco IOS Command Reference for Cisco Aironet Access Points and Bridges*
- *Quick Start Guide: Cisco Aironet 1300 Series Wireless Bridge*

Obtaining Documentation and Submitting a Service Request

For information on obtaining documentation, submitting a service request, and gathering additional information, see *What's New in Cisco Product Documentation* at: <http://www.cisco.com/en/US/docs/general/whatsnew/whatsnew.html>.

Subscribe to *What's New in Cisco Product Documentation*, which lists all new and revised Cisco technical documentation, as an RSS feed and deliver content directly to your desktop using a reader application. The RSS feeds are a free service.

Cisco Product Security Overview

Cisco provides a free online Security Vulnerability Policy portal at this URL:

http://www.cisco.com/web/about/security/psirt/security_vulnerability_policy.html

From this site, you can perform these tasks:

- Report security vulnerabilities in Cisco products.
- Obtain assistance with security incidents that involve Cisco products.
- Register to receive security information from Cisco.

A current list of security advisories and notices for Cisco products is available at this URL:

<http://www.cisco.com/go/psirt>

If you prefer to see advisories and notices as they are updated in real time, you can access a Product Security Incident Response Team Really Simple Syndication (PSIRT RSS) feed from this URL:

<http://tools.cisco.com/security/center/rss.x?i=44>

Reporting Security Problems in Cisco Products

Cisco is committed to delivering secure products. We test our products internally before we release them, and we strive to correct all vulnerabilities quickly. If you think that you might have identified a vulnerability in a Cisco product, contact PSIRT:

- Emergencies—security-alert@cisco.com

An emergency is either a condition in which a system is under active attack or a condition for which a severe and urgent security vulnerability should be reported. All other conditions are considered nonemergencies.

- Nonemergencies—psirt@cisco.com

In an emergency, you can also reach PSIRT by telephone:

- 1 877 228-7302
- 1 408 525-6532



Tip

We encourage you to use Pretty Good Privacy (PGP) or a compatible product to encrypt any sensitive information that you send to Cisco. PSIRT can work from encrypted information that is compatible with PGP versions 2.x through 8.x.

Never use a revoked or an expired encryption key. The correct public key to use in your correspondence with PSIRT is the one linked in the Reporting or Obtaining Support for a Suspected Security Vulnerability section of the Security Vulnerability Policy page at this URL:

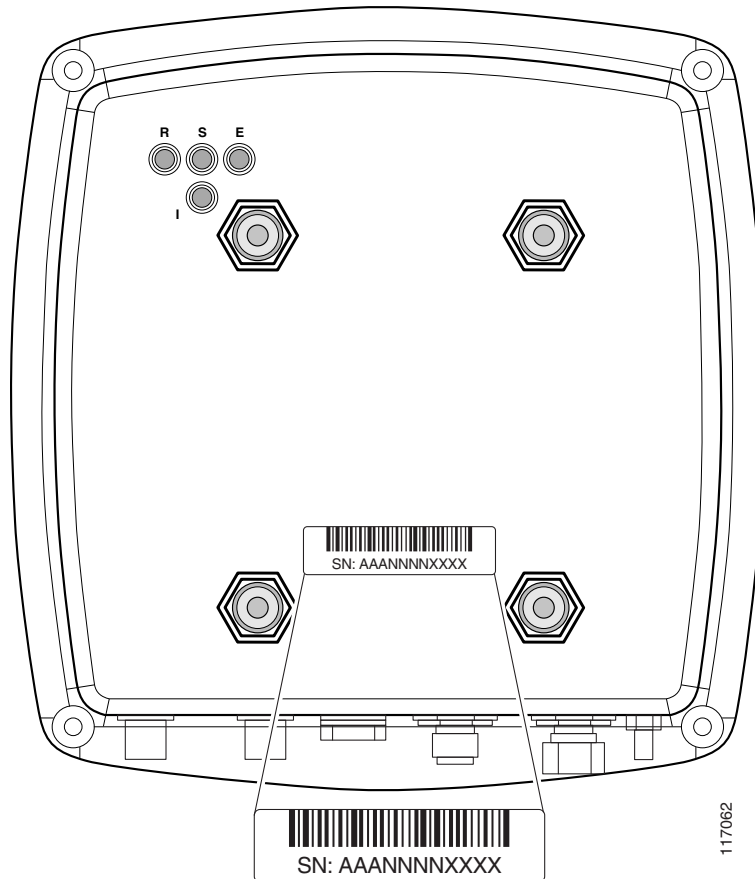
http://www.cisco.com/web/about/security/psirt/security_vulnerability_policy.html

The link on this page has the current PGP key ID in use.

Locating the Product Serial Number

The bridge serial number is located on the bottom of the enclosure (refer to [Figure 17](#)).

Figure 17 Location of Bridge Serial Number Label



The bridge serial number label contains the following information:

- Model number, such as *AIR-BR1300*
- Serial number, such as *S/N: VDF0636XXXX* (11 alphanumeric digits)
- MAC address, such as *MAC: 00abc65094f3* (12 hexadecimal digits)
- Location of manufacture, such as *Made in Singapore*

You need your product serial number when requesting support from the Cisco Technical Assistance Center.

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