Cisco Aironet 3.5-dBi Articulated Dipole Antenna (AIR-ANT5135D-R)

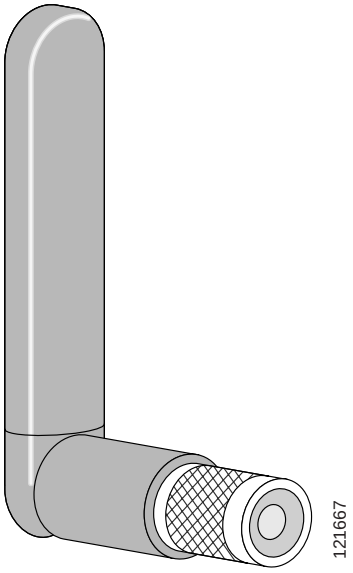
This document outlines the specifications and describes the Cisco Aironet 3.5-dBi Articulated Dipole Antenna. The antenna operates in the 5-GHz frequency band and is designed for use with Cisco Aironet 5-GHz radio products using a reverse-polarity Neil Councilman connector (RP-TNC).

The following information is provided in this document.

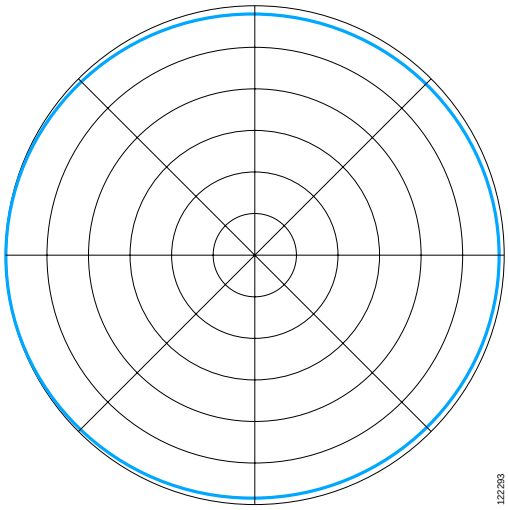
Corporate Headquarters:
Cisco Systems, Inc., 170 West Tasman Drive, San Jose, CA 95134-1706 USA

Technical Specifications

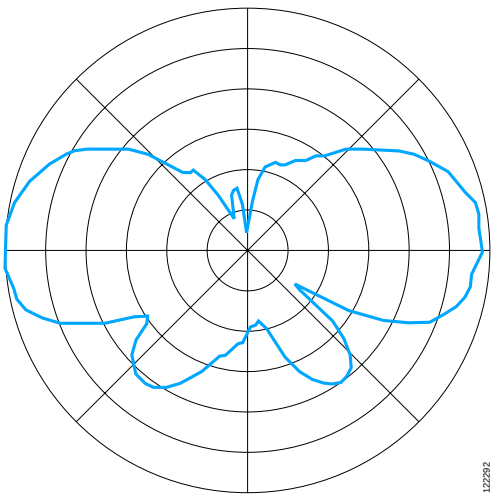
Antenna type	Dipole
Operating frequency range	5150 – 5850 MHz
Nominal input impedance	50Ω
2:1 VSWR bandwidth	5150 – 5850 MHz
Gain	3.5 dBi
Polarization	Linear, vertical
E-plane 3-dB beamwidth	40 degrees
H-plane 3-dB beamwidth	Omnidirectional
Connector type	RP-TNC plug
Length	5.3 in. (13.4 cm)
Radome length	3.4 in. (8.6 cm)
Width	0.62 in. (1.5 cm)
Operating temperature	–22 F– 158 F(–30 C – 70 C)
Storage temperature	–40 F– 185 F(–40 C – 85 C)
Environment	Indoor, office



H-Plane Pattern



E-Plane Pattern

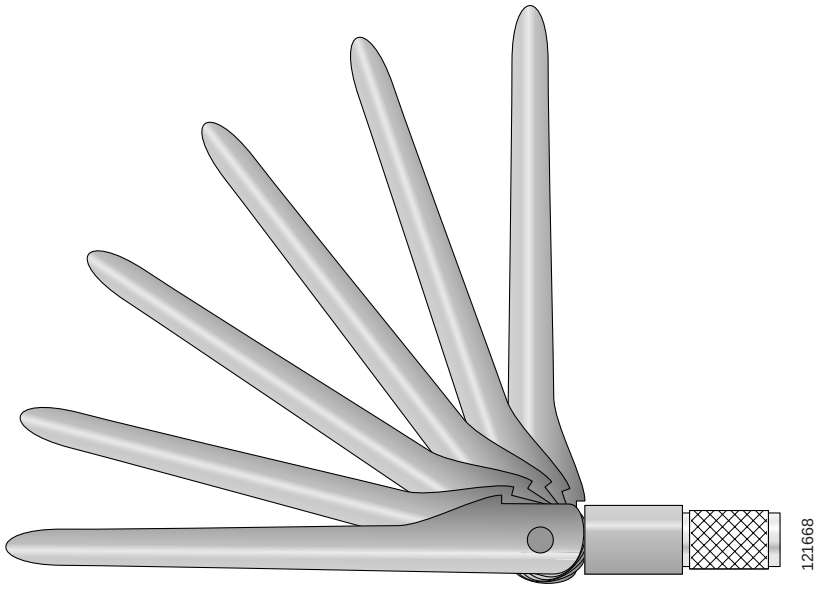


System Requirements

This antenna is designed for use with Cisco Aironet access points and bridges but can be used with any 5-GHz Cisco Aironet radio device that uses RP-TNC connectors.

Features

The antenna has an articulated base that can be rotated 360 degrees at the connection point and from 0 to 90 degrees at its knuckle with detents at 45 and 90 degrees. The articulated base is shown in the following illustration.



Obtaining Documentation

Cisco provides several ways to obtain documentation, technical assistance, and other technical resources. These sections explain how to obtain technical information from Cisco Systems.

Cisco.com

You can access the most current Cisco documentation on the World Wide Web at this URL:

http://www.cisco.com/univercd/home/home.htm

You can access the Cisco website at this URL:

http://www.cisco.com

International Cisco websites can be accessed from this URL:

http://www.cisco.com/public/countries_languages.shtml

Documentation CD-ROM

Cisco documentation and additional literature are available in a Cisco Documentation CD-ROM package, which may have shipped with your product. The Documentation CD-ROM is updated regularly and may be more current than printed documentation. The CD-ROM package is available as a single unit or through an annual or quarterly subscription.

Registered Cisco.com users can order a single Documentation CD-ROM (product number DOC-CONDOCCD=) through the Cisco Ordering tool:

http://www.cisco.com/en/US/partner/ordering/ordering_place_order_ordering_tool_launch.html

All users can order annual or quarterly subscriptions through the online Subscription Store:

http://www.cisco.com/go/subscription

Click Subscriptions & Promotional Materials in the left navigation bar.

Ordering Documentation

You can find instructions for ordering documentation at this URL:

http://www.cisco.com/univercd/cc/td/doc/es_inpck/pdi.htm

You can order Cisco documentation in these ways:

- Registered Cisco.com users (Cisco direct customers) can order Cisco product documentation from the Networking Products MarketPlace:

  http://www.cisco.com/en/US/partner/ordering/index.shtml

- Nonregistered Cisco.com users can order documentation through a local account representative by calling Cisco Systems Corporate Headquarters (California, USA) at 408 526-7208 or, elsewhere in North America, by calling 800 553-NETS (6387).

Documentation Feedback

You can submit e-mail comments about technical documentation to bug-doc@cisco.com.

You can submit comments by using the response card (if present) behind the front cover of your document or by writing to the following address:

Cisco Systems
Attn: Customer Document Ordering
170 West Tasman Drive
San Jose, CA 95134-9883

We appreciate your comments.

Obtaining Technical Assistance

For all customers, partners, resellers, and distributors who hold valid Cisco service contracts, the Cisco Technical Assistance Center (TAC) provides 24-hour-a-day, award-winning technical support services, online and over the phone. Cisco.com features the Cisco TAC website as an online starting point for technical assistance. If you do not hold a valid Cisco service contract, please contact your reseller.

Cisco TAC Website

The Cisco TAC website provides online documents and tools for troubleshooting and resolving technical issues with Cisco products and technologies. The Cisco TAC website is available 24 hours a day, 365 days a year. The Cisco TAC website is located at this URL:

http://www.cisco.com/tac

Accessing all the tools on the Cisco TAC website requires a Cisco.com user ID and password. If you have a valid service contract but do not have a login ID or password, register at this URL:

http://tools.cisco.com/RPF/register/register.do

Opening a TAC Case

Using the online TAC Case Open Tool is the fastest way to open P3 and P4 cases. (P3 and P4 cases are those in which your network is minimally impaired or for which you require product information.) After you describe your situation, the TAC Case Open Tool automatically recommends resources for an immediate solution. If your issue is not resolved using the recommended resources, your case will be assigned to a Cisco TAC engineer. The online TAC Case Open Tool is located at this URL:

http://www.cisco.com/tac/caseopen

For P1 or P2 cases (P1 and P2 cases are those in which your production network is down or severely degraded) or if you do not have Internet access, contact Cisco TAC by telephone. Cisco TAC engineers are assigned immediately to P1 and P2 cases to help keep your business operations running smoothly.

To open a case by telephone, use one of the following numbers:

Asia-Pacific: +61 2 8446 7411 (Australia: 1 800 805 227)
EMEA: +32 2 704 55 55
USA: 1 800 553-2447

For a complete listing of Cisco TAC contacts, go to this URL:

http://www.cisco.com/warp/public/687/Directory/DirTAC.shtml

TAC Case Priority Definitions

To ensure that all cases are reported in a standard format, Cisco has established case priority definitions.

Priority 1 (P1)—Your network is “down” or there is a critical impact to your business operations. You and Cisco will commit all necessary resources around the clock to resolve the situation.

Priority 2 (P2)—Operation of an existing network is severely degraded, or significant aspects of your business operation are negatively affected by inadequate performance of Cisco products. You and Cisco will commit full-time resources during normal business hours to resolve the situation.

Priority 3 (P3)—Operational performance of your network is impaired, but most business operations remain functional. You and Cisco will commit resources during normal business hours to restore service to satisfactory levels.

Priority 4 (P4)—You require information or assistance with Cisco product capabilities, installation, or configuration. There is little or no effect on your business operations.

Obtaining Additional Publications and Information

Information about Cisco products, technologies, and network solutions is available from various online and printed sources.

- The Cisco Product Catalog describes the networking products offered by Cisco Systems, as well as ordering and customer support services. Access the Cisco Product Catalog at this URL:

  http://www.cisco.com/en/US/products/products_catalog_links_launch.html

- Cisco Press publishes a wide range of general networking, training and certification titles. Both new and experienced user will benefit from these publications. For current Cisco Press titles and other information, go to Cisco Press online at this URL:

  http://www.ciscopress.com

- Packet magazine is the Cisco quarterly publication that provides the latest networking trends, technology breakthroughs, and Cisco products and solutions to help industry professionals get the most from their networking investment. Included are networking deployment and troubleshooting tips, configuration examples, customer case studies, tutorials and training, certification information, and links to numerous in-depth online resources. You can access Packet magazine at this URL:

  http://www.cisco.com/packet

- iQ Magazine is the Cisco bimonthly publication that delivers the latest information about Internet business strategies for executives. You can access iQ Magazine at this URL:

  http://www.cisco.com/go/iqmagazine

- Internet Protocol Journal is a quarterly journal published by Cisco Systems for engineering professionals involved in designing, developing, and operating public and private internets and intranets. You can access the Internet Protocol Journal at this URL:

  http://www.cisco.com/en/US/about/ac123/ac147/about_cisco_the_internet_protocol_journal.html

- Training—Cisco offers world-class networking training. Current offerings in network training are listed at this URL:

  http://www.cisco.com/en/US/learning/index.html

Cisco Aironet 3.5-dBi Dipole Antenna (AIR-ANT5135DG-R)

This document outlines the specifications and describes the Cisco Aironet 3.5-dBi Dipole Antenna. The antenna operates in the 5-GHz frequency band and is designed for use with Cisco Aironet 5-GHz radio products using an RP-TNC connector.

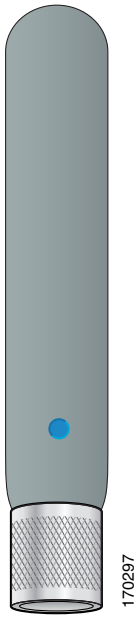
Note This antenna is a fixed antenna. It does not have an articulating feature.

The following information is provided in this document.

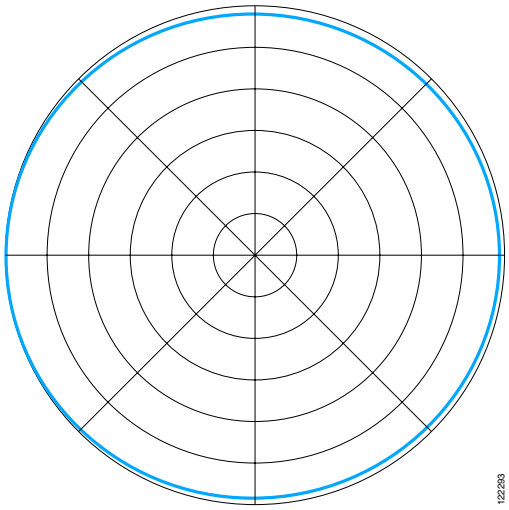
Corporate Headquarters:
Cisco Systems, Inc., 170 West Tasman Drive, San Jose, CA 95134-1706 USA

Technical Specifications

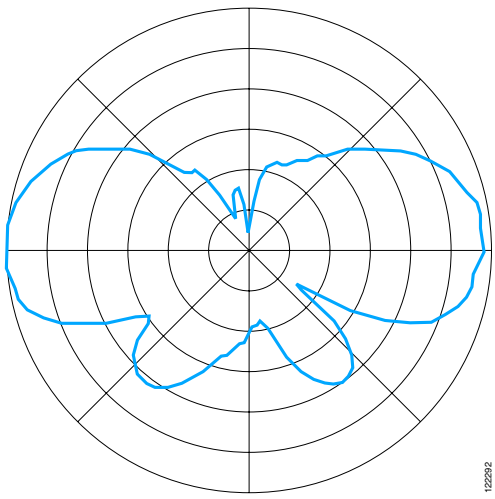
Antenna type	Dipole
Operating frequency range	5150 – 5850 MHz
Nominal input impedance	50Ω
2:1 VSWR bandwidth	5150 – 5850 MHz
Gain	3.5 dBi
Polarization	Linear, vertical
E-plane 3-dB beamwidth	40 degrees
H-plane 3-dB beamwidth	Omnidirectional
Connector type	RP-TNC plug
Length	5.3 in. (13.4 cm)
Radome length	3.4 in. (8.6 cm)
Width	0.62 in. (1.5 cm)
Operating temperature	–22°F – 158°F (–30°C – 70°C)
Storage temperature	–40°F – 185°F (–40°C – 85°C)
Environment	Indoor, office



H-Plane Pattern



E-Plane Pattern



System Requirements

This antenna is designed for use with Cisco Aironet access points and bridges but can be used with any 5-GHz Cisco Aironet radio device that uses RP-TNC connectors.

Features

The antenna has a small blue dot near its base. The blue dot identifies it as a 5-Ghz antenna.

Obtaining Documentation

Cisco documentation and additional literature are available on Cisco.com. Cisco also provides several ways to obtain technical assistance and other technical resources. These sections explain how to obtain technical information from Cisco Systems.

Cisco.com

You can access the most current Cisco documentation at this URL:

http://www.cisco.com/techsupport

You can access the Cisco website at this URL:

http://www.cisco.com

You can access international Cisco websites at this URL:

http://www.cisco.com/public/countries_languages.shtml

Product Documentation DVD

Cisco documentation and additional literature are available in the Product Documentation DVD package, which may have shipped with your product. The Product Documentation DVD is updated regularly and may be more current than printed documentation.

The Product Documentation DVD is a comprehensive library of technical product documentation on portable media. The DVD enables you to access multiple versions of hardware and software installation, configuration, and command guides for Cisco products and to view technical documentation in HTML. With the DVD, you have access to the same documentation that is found on the Cisco website without being connected to the Internet. Certain products also have .pdf versions of the documentation available.

The Product Documentation DVD is available as a single unit or as a subscription. Registered Cisco.com users (Cisco direct customers) can order a Product Documentation DVD (product number DOC-DOCDVD=) from Cisco Marketplace at this URL:

http://www.cisco.com/go/marketplace/

Ordering Documentation

Beginning June 30, 2005, registered Cisco.com users may order Cisco documentation at the Product Documentation Store in the Cisco Marketplace at this URL:

http://www.cisco.com/go/marketplace/

Nonregistered Cisco.com users can order technical documentation from 8:00 a.m. to 5:00 p.m. (0800 to 1700) PDT by calling 1 866 463-3487 in the United States and Canada, or elsewhere by calling 011 408 519-5055. You can also order documentation by e-mail at tech-doc-store-mkpl@external.cisco.com or by fax at 1 408 519-5001 in the United States and Canada, or elsewhere at 011 408 519-5001.

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You can send comments about Cisco documentation to bug-doc@cisco.com.

You can submit comments by using the response card (if present) behind the front cover of your document or by writing to the following address:

Cisco Systems
Attn: Customer Document Ordering
170 West Tasman Drive
San Jose, CA 95134-9883

We appreciate your comments.

Cisco Product Security Overview

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

http://www.cisco.com/en/US/products/products_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://www.cisco.com/en/US/products/products_psirt_rss_feed.html

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 Contact Summary section of the Security Vulnerability Policy page at this URL:

http://www.cisco.com/en/US/products/products_security_vulnerability_policy.html

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

Obtaining Technical Assistance

Cisco Technical Support provides 24-hour-a-day award-winning technical assistance. The Cisco Technical Support & Documentation website on Cisco.com features extensive online support resources. In addition, if you have a valid Cisco service contract, Cisco Technical Assistance Center (TAC) engineers provide telephone support. If you do not have a valid Cisco service contract, contact your reseller.

Cisco Technical Support & Documentation Website

The Cisco Technical Support & Documentation website provides online documents and tools for troubleshooting and resolving technical issues with Cisco products and technologies. The website is available 24 hours a day, at this URL:

http://www.cisco.com/techsupport

Access to all tools on the Cisco Technical Support & Documentation website requires a Cisco.com user ID and password. If you have a valid service contract but do not have a user ID or password, you can register at this URL:

http://tools.cisco.com/RPF/register/register.do

Note Use the Cisco Product Identification (CPI) tool to locate your product serial number before submitting a web or phone request for service. You can access the CPI tool from the Cisco Technical Support & Documentation website by clicking the **Tools & Resources** link under Documentation & Tools. Choose **Cisco Product Identification Tool** from the Alphabetical Index drop-down list, or click the **Cisco Product Identification Tool** link under Alerts & RMAs. The CPI tool offers three search options: by product ID or model name; by tree view; or for certain products, by copying and pasting **show** command output. Search results show an illustration of your product with the serial number label location highlighted. Locate the serial number label on your product and record the information before placing a service call.

Submitting a Service Request

Using the online TAC Service Request Tool is the fastest way to open S3 and S4 service requests. (S3 and S4 service requests are those in which your network is minimally impaired or for which you require product information.) After you describe your situation, the TAC Service Request Tool provides recommended solutions. If your issue is not resolved using the recommended resources, your service request is assigned to a Cisco engineer. The TAC Service Request Tool is located at this URL:

http://www.cisco.com/techsupport/servicerequest

For S1 or S2 service requests or if you do not have Internet access, contact the Cisco TAC by telephone. (S1 or S2 service requests are those in which your production network is down or severely degraded.) Cisco engineers are assigned immediately to S1 and S2 service requests to help keep your business operations running smoothly.

To open a service request by telephone, use one of the following numbers:

Asia-Pacific: +61 2 8446 7411 (Australia: 1 800 805 227)
EMEA: +32 2 704 55 55
USA: 1 800 553-2447

For a complete list of Cisco TAC contacts, go to this URL:

http://www.cisco.com/techsupport/contacts

Definitions of Service Request Severity

To ensure that all service requests are reported in a standard format, Cisco has established severity definitions.

Severity 1 (S1)—Your network is “down,” or there is a critical impact to your business operations. You and Cisco will commit all necessary resources around the clock to resolve the situation.

Severity 2 (S2)—Operation of an existing network is severely degraded, or significant aspects of your business operation are negatively affected by inadequate performance of Cisco products. You and Cisco will commit full-time resources during normal business hours to resolve the situation.

Severity 3 (S3)—Operational performance of your network is impaired, but most business operations remain functional. You and Cisco will commit resources during normal business hours to restore service to satisfactory levels.

Severity 4 (S4)—You require information or assistance with Cisco product capabilities, installation, or configuration. There is little or no effect on your business operations.

Obtaining Additional Publications and Information

Information about Cisco products, technologies, and network solutions is available from various online and printed sources.

- Cisco Marketplace provides a variety of Cisco books, reference guides, documentation, and logo merchandise. Visit Cisco Marketplace, the company store, at this URL:

  http://www.cisco.com/go/marketplace/

- *Cisco Press* publishes a wide range of general networking, training and certification titles. Both new and experienced users will benefit from these publications. For current Cisco Press titles and other information, go to Cisco Press at this URL:

  http://www.ciscopress.com

- *Packet* magazine is the Cisco Systems technical user magazine for maximizing Internet and networking investments. Each quarter, Packet delivers coverage of the latest industry trends, technology breakthroughs, and Cisco products and solutions, as well as network deployment and troubleshooting tips, configuration examples, customer case studies, certification and training information, and links to scores of in-depth online resources. You can access Packet magazine at this URL:

  http://www.cisco.com/packet

- *iQ Magazine* is the quarterly publication from Cisco Systems designed to help growing companies learn how they can use technology to increase revenue, streamline their business, and expand services. The publication identifies the challenges facing these companies and the technologies to help solve them, using real-world case studies and business strategies to help readers make sound technology investment decisions. You can access iQ Magazine at this URL:

  http://www.cisco.com/go/iqmagazine

  or view the digital edition at this URL:

  http://ciscoiq.texterity.com/ciscoiq/sample/

- *Internet Protocol Journal* is a quarterly journal published by Cisco Systems for engineering professionals involved in designing, developing, and operating public and private internets and intranets. You can access the Internet Protocol Journal at this URL:

  http://www.cisco.com/ipj

- Networking products offered by Cisco Systems, as well as customer support services, can be obtained at this URL:

  http://www.cisco.com/en/US/products/index.html

- Networking Professionals Connection is an interactive website for networking professionals to share questions, suggestions, and information about networking products and technologies with Cisco experts and other networking professionals. Join a discussion at this URL:

  http://www.cisco.com/discuss/networking

- World-class networking training is available from Cisco. You can view current offerings at this URL:

  http://www.cisco.com/en/US/learning/index.html

Printed in the USA on recycled paper containing 10% postconsumer waste.

Cisco Aironet 4-dBi Omnidirectional Antenna (AIR-ANT5140V-R)

This document outlines the specifications, describes the AIR-ANT(AIR-ANT5140V-R) 4-dBi omnidirectional antenna, and provides instructions for mounting it.

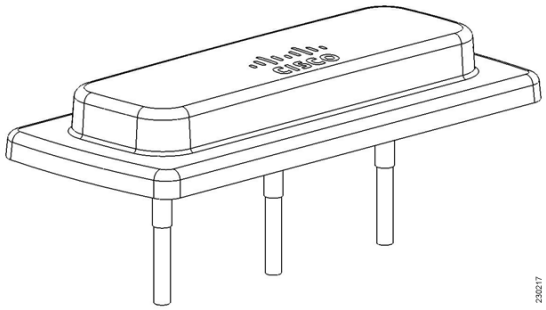
The antenna is designed specifically for use with pre-802.11n and 802.11n 3-antenna access points. The antenna operates in the 5-GHz frequency range and is designed for use only in an indoor office environment. The antenna assembly consists of three radiating elements, each fed with its own coaxial cable.

The following information is provided in this document.

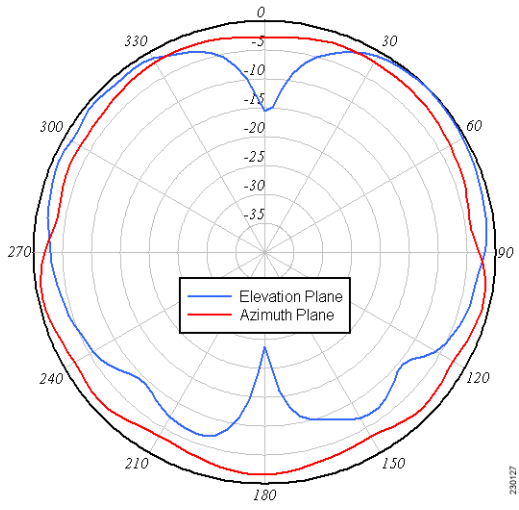
Americas Headquarters:
Cisco Systems, Inc., 170 West Tasman Drive, San Jose, CA 95134-1706 USA

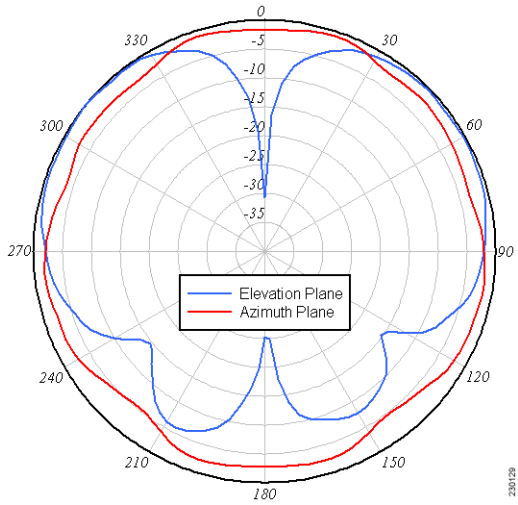
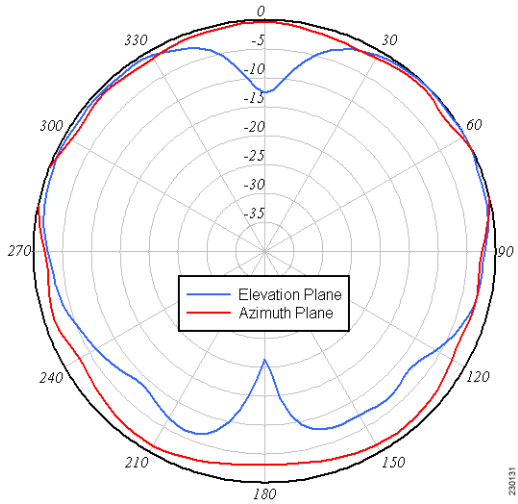
Technical Specifications

Antenna type	Omnidirectional, indoor office only
Operating frequency range	4900 – 5850 MHz
Nominal input impedance	50 ohms
1.5:1 VSWR bandwidth	4900 – 5850 MHz
Peak gain	4 dBi
Polarization	Linear
E-plane 3 dB beamwidth	45 degrees
H-plane 3 dB beamwidth	Omnidirectional
Front-to-back ratio	10 dB
Length	6.9 in (17.5 cm)
Width	3 in (7.6 cm)
Height	< 1 in (< 2.5 cm)
Cable length and type	36 in (91.4 cm) Plenum rated, UV stable
Operating temperature	32 F – 131 F (0 C – 55 C)
UL2043 compliant	Yes



Antenna A Elevation and Azimuth Pattern



Antenna C Elevation and Azimuth Pattern	
Antenna B Elevation and Azimuth Pattern	

System Requirements

This antenna is designed for indoor use with pre-802.11n and 802.11n Cisco Aironet access points.

Safety Instructions

Follow these safety instructions when installing your antenna.

- Plan your installation procedure carefully and completely before you begin.
- If you are installing an antenna for the first time, for your own safety as well as others, seek **professional assistance**. Consult your dealer, who can explain which mounting method to use for the location where you intend to install the antenna.
- Select your installation site with safety, as well as performance, in mind. Remember that electric power cables and telephone lines look alike. For your safety, assume that any line is an electric power line until determined otherwise.
- Call your local power company or building maintenance organization if you are unsure about cables close to your mounting location.
- When installing your antenna, **do not** use a metal ladder. **Do** dress properly - shoes with rubber soles and heels, rubber gloves, and a long sleeved shirt or jacket.
- If an accident or emergency occurs with the power lines, call for qualified emergency help immediately.

Installation Notes

Because antennas transmit and receive radio signals, they are susceptible to RF obstructions and common sources of interference that can reduce throughput and range of the device to which they are connected. Follow these guidelines to ensure the best possible performance:

- Mount the antenna to utilize its propagation characteristics. A way to do this is to orient the antenna horizontally as high as possible at or near the center of its coverage area.
- Keep the antenna away from metal obstructions such as heating and air-conditioning ducts, large ceiling trusses, building superstructures, and major power cabling runs. If necessary, use a rigid conduit to lower the antenna away from these obstructions.
- The density of the materials used in a building's construction determines the number of walls the signal must pass through and still maintain adequate coverage. Consider the following before choosing the location to install your antenna:
  - Paper and vinyl walls have very little affect on signal penetration.
  - Solid and pre-cast concrete walls limit signal penetration to one or two walls without degrading coverage.
  - Concrete and wood block walls limit signal penetration to three or four walls.
  - A signal can penetrate five or six walls constructed of drywall or wood.
  - A thick metal wall causes signals to reflect off, causing poor penetration.
  - A chain link fence or wire mesh spaced between 1 and 1 1/2 in. (2.5 and 3.8 cm) acts as a harmonic reflector that blocks a 5 Ghz radio signal.

- Install the antenna away from microwave ovens and 5-GHz cordless phones. These products can cause signal interference because they operate in the same frequency range as the device to which your antenna is connected.
- Install the antenna horizontally to maximize signal propagation.

Choosing a Mounting Location

The antenna should be mounted clear of any obstructions to the sides of the radiating element. Generally, the higher an antenna is above the ground, the better it performs. If possible, find a mounting place directly above your wireless device so that the lead-in cable can be as short as possible.

Installing the Antenna

You can install the antenna on the following dropped ceiling systems:

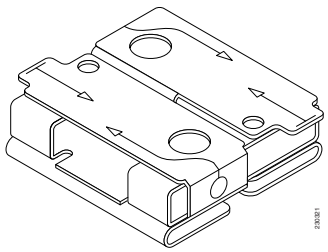
- Standard or recessed T-rail—15/16 in. (23.8 mm) or 9/16 in. (14.3 mm)
- Channel type T-rail—1/4 in (6.3 mm) or 1/2 in (12.7 mm)

You can also install the antenna above a dropped ceiling ceiling using a user-supplied bridge. The antenna ships with the necessary hardware to install it on a standard dropped ceiling already installed. To install the antenna on any other type of dropped ceiling listed above, you will need to use the mounting hardware contained in the supplied mounting hardware kit

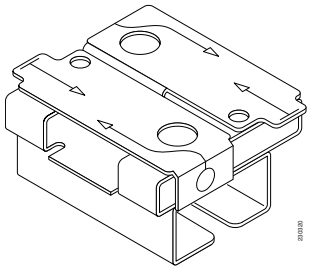
Mounting Hardware Kit Contents

The antenna ships with a hardware mounting kit containing the following items:

- 2 Recessed ceiling T-rail spacers



- 2 Channel ceiling rail adapters



- 2 Bridge mounting clips

  ILLUSTRATION TBD
- 2 4x40 Phillips head machine screws

Making Connections to the Access Point

WHAT IS THE BEST WAY TO DESCRIBE THIS? I THINK THE HICKORY HAS ITS ANTENNA CONNECTORS LABELLED A, B, AND C. HOW ARE THE CABLES ON THESE ANTENNAS IDENTIFIED, I.E. WE KNOW THE CENTER IS C, SO WHICH ONE IS A OR B? DOES IT MAKE ANY DIFFERENCE?

Tools and Equipment Required

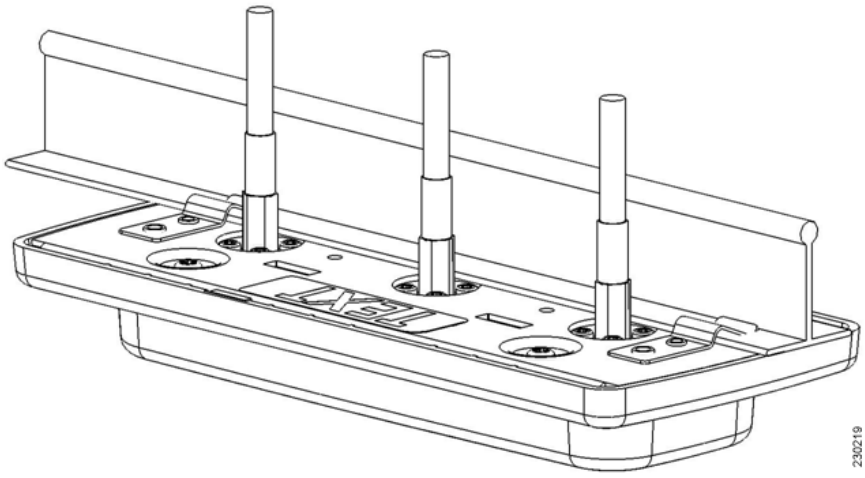
To install your antenna, you need the following tools and equipment, which are not supplied.

- A pencil
- A small standard screwdriver
- A cutting tool suitable for cutting and trimming dropped ceiling tiles
- Masking tape

Installing the Antenna on a Standard Dropped Ceiling T-Rail

The antenna is shipped ready to install on a standard dropped ceiling T-rail. No adapters or spacers are necessary. Figure 1 shows the antenna installed on a standard dropped ceiling T-rail.

Figure 1 Antenna Installed on a Standard Dropped Ceiling T-Rail



Follow these steps to install the antenna on a standard dropped ceiling T-rail.

Step 1 Determine the location where you intend to install the antenna.

Step 2 Looking at the T-rail, raise ceiling tile on the left side of the T-rail.

Step 3 Position the clips on the antenna on the T-rail.

Step 4 Gently slide the antenna over the T-rail until it is secure.

Step 5 Connect the antenna cable to the access point or extender cables.

Step 6 Lower the ceiling tile onto the T-rail. The antenna cables will prevent you from lowering it completely.

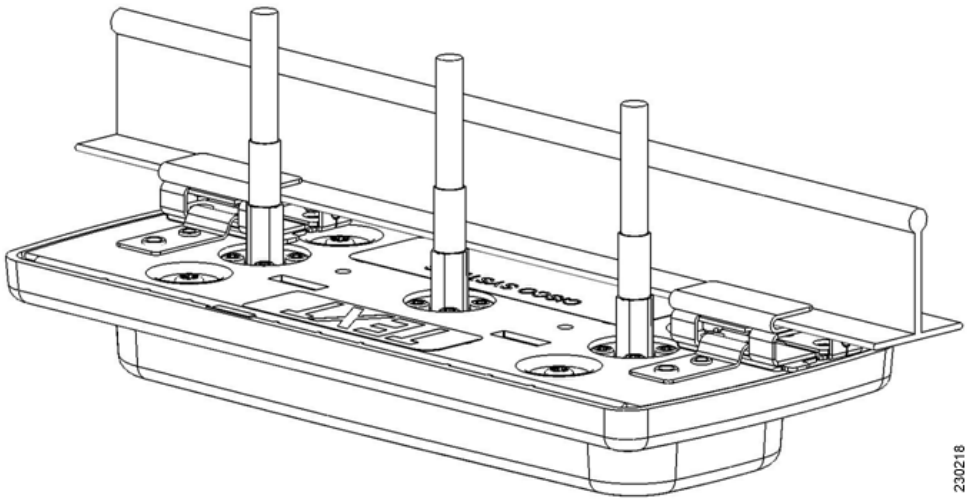
Step 7 Mark the places on the ceiling tile where they are obstructed by the antenna cables.

Step 8 Cut notches in the ceiling tile to eliminate the obstruction. You should then be able to lower the ceiling tile onto the T-rail.

Installing the Antenna on a Recessed Dropped Ceiling T-Rail

To install the antenna on a recessed dropped ceiling requires using the two recessed ceiling spacers that shipped in the mounting kit. These spacers attach to the recessed ceiling T-rail and must be disassembled before you can attach them. Figure 2 shows the antenna installed on a recessed ceiling T-rail using the supplied recessed T-rail spacers.

Figure 2 Antenna Installed on a Recessed Dropped Ceiling T-Rail



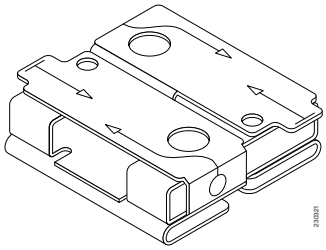
Follow these steps to install the antenna on a recessed dropped ceiling T-rail.

Step 1 Determine the location where you intend to install the antenna.

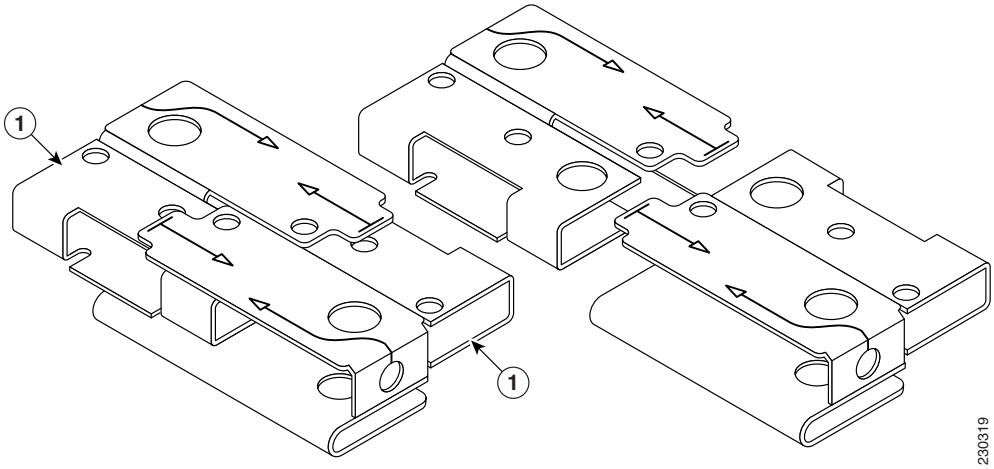
Step 2 Use a pencil to make an index mark at the locations on the T-rail where you will install the dropped ceiling spacers.

Note These marks indicate the center points of the spacers and must be 10 3/16 in. (24.8 cm) apart.

Step 3 In the mounting kit, locate two recessed dropped ceiling spacers.



Step 4 Disassemble the spacers by pushing on its tabs using your thumb and forefinger.



Step 5 Raise the ceiling tile off the T-rail and position both parts of the spacer on the T-rail (callout 1), one part on one side and the other on the opposite side. Make sure the ON arrows on the spacer parts point towards each other as shown below. The OFF arrows will point away from each other.

Step 6 Position the spacers so that each one is centered over the index marks you made in Step 2.

Step 7 Use a small standard screwdriver to tighten the two set screws on the spacers and secure it to the T-rail. Do not overtighten the set screws.

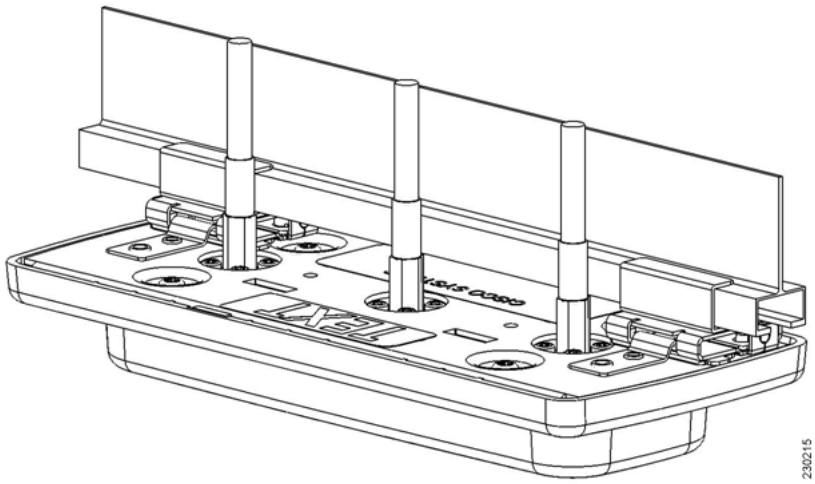
Step 8 Connect the antenna cable to the access point or extender cables.

Step 9 Lower the ceiling tile onto the T-rail. Depending on the width of the T-rail, you may have to squeeze the tile to make it fit onto the T-rail.

Installing the Antenna on a Channel Ceiling T-Rail

To install the antenna on a recessed dropped ceiling requires using the two channel ceiling adapters that shipped in the mounting kit. These adapters attach to the channel ceiling T-rail and must be disassembled before you can attach them. Figure 3 shows the antenna installed on a channel ceiling T-rail using the supplied channel T-rail spacers.

Figure 3 Antenna Installed on a Channel Ceiling T-Rail



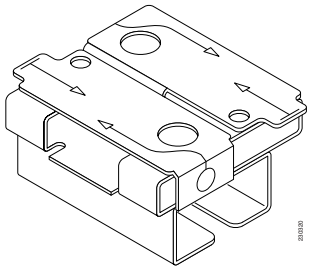
Follow these steps to install the antenna on a channel ceiling T-rail.

Step 1 Determine the location where you intend to install the antenna.

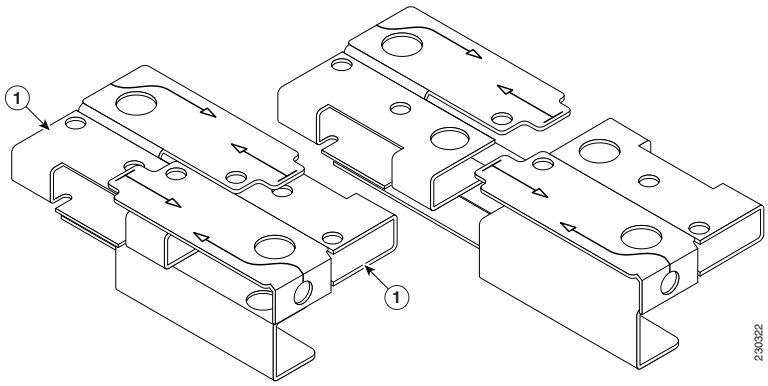
Step 2 Use a pencil to make an index mark at the locations on the T-rail where you will install the channel T-rail adapters.

Note These marks indicate the center points of the adapters and must be 10 3/16 in. (24.8 cm) apart.

Step 3 In the mounting kit, locate two recessed channel ceiling adapters.



Step 4 Disassemble the adapters by pushing on its tabs using your thumb and forefinger.



Step 5 Raise the ceiling tile off the channel T-rail and position both parts of the adapter on the T-rail (callout 1), one part on one side and the other on the opposite side. Make sure the ON arrows on the adapter parts are pointing towards each other as shown below. The OFF arrows will point away from each other.

Step 6 Position the adapters so that each one is centered over the index marks you made in Step 2.

Step 7 Use a small standard screwdriver to tighten the two set screws on the adapters and secure it to the channel T-rail. Do not overtighten the set screws.

Step 8 Connect the antenna cable to the access point or extender cables.

Step 9 Lower the ceiling tile onto the T-rail.

Installing the Antenna Above a Suspended Ceiling

To install the antenna above a dropped ceiling requires using the two bridge clips and 4/40 Phillips head machine screws that shipped in the mounting kit. The clips attach the antenna to the ceiling bridge assembly and the screws secure the clips to the antenna.

You must supply the ceiling bridge. In order to ensure compatibility with the supplied bridge clips, we recommend using a Erico 512A or equivalent T-bar box hanger.Figure 4 shows a typical dropped ceiling bridge assembly and Figure 5 shows the antenna installed on a dropped ceiling bridge assembly.

Figure 4 Typical Dropped Ceiling Bridge Assembly

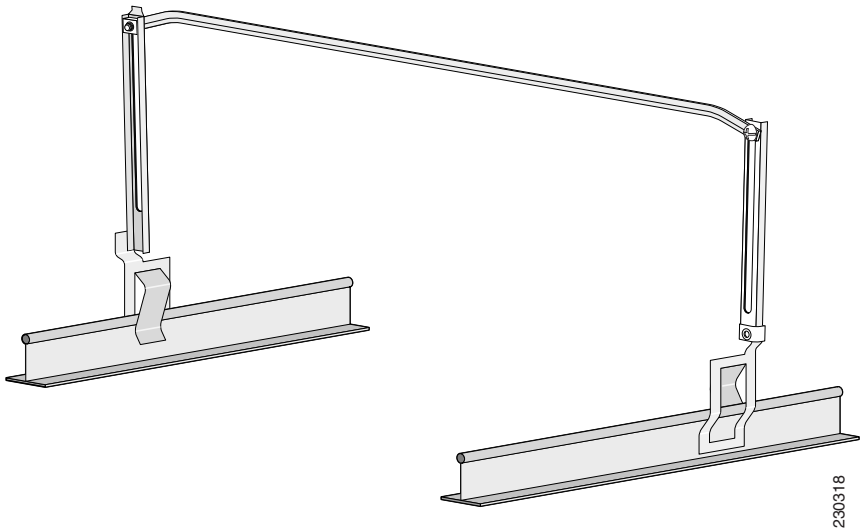
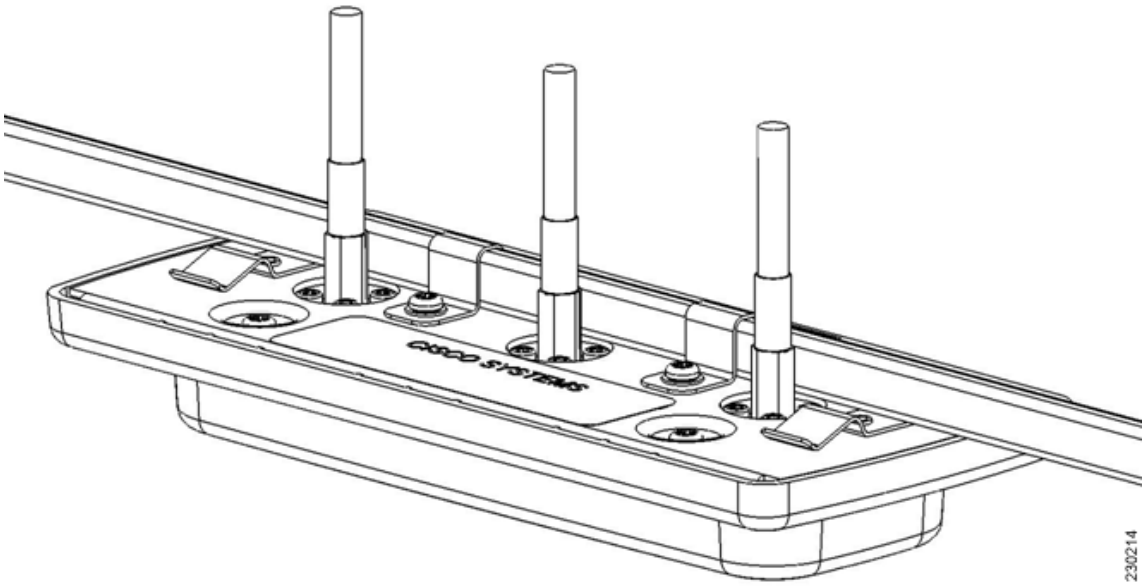


Figure 5 Antenna Installed on a Dropped Ceiling Bridge Assembly



Follow these steps to install the antenna above a suspended ceiling.

Step 1 Establish the location in the ceiling where you want to install the antenna.

Step 2 Remove the ceiling tiles adjacent to the T-rails where you will install the ceiling bridge assembly.

Step 3 In the mounting kit, locate two bridge clips and 4x40 Phillips head screws.

Step 4 Place the bridge clips on the bridge so that they are xx in. (xx cm) apart.

Step 5 Temporarily secure the clip to the bridge with a short length of masking tape.

Step 6 Position the antenna so that the two rectangular slots are aligned with the clip tab that has no holes.

Step 7 Carefully move the antenna so that the clip tabs are fully inserted into the rectangular slots.

Step 8 Start a 4/40 Phillips head screw into each of the holes in the clip tabs.

Step 9 Use a Phillips head screwdriver to secure, but not tighten the screws.

Step 10 Remove the masking tape from the clips.

Step 11 Verify that the antenna is attached to the bridge where you want it to be. If it is not in the correct position, carefully slide the antenna until it is.

Step 12 Tighten, but do not overtighten, the Phillips head screws.

Step 13 Install the bridge in the ceiling.

Step 14 Connect the antenna cables to the access point or extender cables.

Step 15 Replace the ceiling tiles.

Suggested Cable

Cisco recommends a high-quality, low-loss cable for use with the antenna.

Note Coaxial cable loses efficiency as the frequency increases, resulting in signal loss. The cable should be kept as short as possible because cable length also determines the amount of signal loss (the longer the run, the greater the loss).

Each antenna terminates with a RP-TNC plug after a short, 3-ft (0.91-m) cable. The mating connector to the antenna is an appropriate RP-TNC jack. The connector on the opposite end will vary according to the type of equipment used.

Obtaining Documentation

Cisco documentation and additional literature are available on Cisco.com. This section explains the product documentation resources that Cisco offers.

Cisco.com

You can access the most current Cisco documentation at this URL:

http://www.cisco.com/techsupport

You can access the Cisco website at this URL:

http://www.cisco.com

You can access international Cisco websites at this URL:

http://www.cisco.com/public/countries_languages.shtml

Product Documentation DVD

The Product Documentation DVD is a library of technical product documentation on a portable medium. The DVD enables you to access installation, configuration, and command guides for Cisco hardware and software products. With the DVD, you have access to the HTML documentation and some of the PDF files found on the Cisco website at this URL:

http://www.cisco.com/univercd/home/home.htm

The Product Documentation DVD is created and released regularly. DVDs are available singly or by subscription. Registered Cisco.com users can order a Product Documentation DVD (product number DOC-DOCDVD= or DOC-DOCDVD=SUB) from Cisco Marketplace at the Product Documentation Store at this URL:

http://www.cisco.com/go/marketplace/docstore

Ordering Documentation

You must be a registered Cisco.com user to access Cisco Marketplace. Registered users may order Cisco documentation at the Product Documentation Store at this URL:

http://www.cisco.com/go/marketplace/docstore

If you do not have a user ID or password, you can register at this URL:

http://tools.cisco.com/RPF/register/register.do

Documentation Feedback

You can provide feedback about Cisco technical documentation on the Cisco Support site area by entering your comments in the feedback form available in every online document.

Cisco Product Security Overview

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

http://www.cisco.com/en/US/products/products_security_vulnerability_policy.html

From this site, you will find information about how to do the following:

- 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, security notices, and security responses for Cisco products is available at this URL:

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

To see security advisories, security notices, and security responses as they are updated in real time, you can subscribe to the Product Security Incident Response Team Really Simple Syndication (PSIRT RSS) feed. Information about how to subscribe to the PSIRT RSS feed is found at this URL:

http://www.cisco.com/en/US/products/products_psirt_rss_feed.html

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 have identified a vulnerability in a Cisco product, contact PSIRT:

- For emergencies only—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.

- For 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 (for example, GnuPG) to encrypt any sensitive information that you send to Cisco. PSIRT can work with information that has been encrypted with PGP versions 2.*x* through 9.*x*.

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

http://www.cisco.com/en/US/products/products_security_vulnerability_policy.html

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

If you do not have or use PGP, contact PSIRT to find other means of encrypting the data before sending any sensitive material.

Product Alerts and Field Notices

Modifications to or updates about Cisco products are announced in Cisco Product Alerts and Cisco Field Notices. You can receive these announcements by using the Product Alert Tool on Cisco.com. This tool enables you to create a profile and choose those products for which you want to receive information.

To access the Product Alert Tool, you must be a registered Cisco.com user. Registered users can access the tool at this URL:

http://tools.cisco.com/Support/PAT/do/ViewMyProfiles.do?local=en

To register as a Cisco.com user, go to this URL:

http://tools.cisco.com/RPF/register/register.do

Obtaining Technical Assistance

Cisco Technical Support provides 24-hour-a-day award-winning technical assistance. The Cisco Support website on Cisco.com features extensive online support resources. In addition, if you have a valid Cisco service contract, Cisco Technical Assistance Center (TAC) engineers provide telephone support. If you do not have a valid Cisco service contract, contact your reseller.

Cisco Support Website

The Cisco Support website provides online documents and tools for troubleshooting and resolving technical issues with Cisco products and technologies. The website is available 24 hours a day at this URL:

http://www.cisco.com/en/US/support/index.html

Access to all tools on the Cisco Support website requires a Cisco.com user ID and password. If you have a valid service contract but do not have a user ID or password, you can register at this URL:

http://tools.cisco.com/RPF/register/register.do

Note Before you submit a request for service online or by phone, use the **Cisco Product Identification Tool** to locate your product serial number. You can access this tool from the Cisco Support website by clicking the **Get Tools & Resources** link, clicking the **All Tools (A-Z)** tab, and then choosing **Cisco Product Identification Tool** from the alphabetical list. This tool offers three search options: by product ID or model name; by tree view; or, for certain products, by copying and pasting **show** command output. Search results show an illustration of your product with the serial number label location highlighted. Locate the serial number label on your product and record the information before placing a service call.

Tip **Displaying and Searching on Cisco.com**

If you suspect that the browser is not refreshing a web page, force the browser to update the web page by holding down the Ctrl key while pressing **F5**.

To find technical information, narrow your search to look in technical documentation, not the entire Cisco.com website. After using the Search box on the Cisco.com home page, click the **Advanced Search** link next to the Search box on the resulting page and then click the **Technical Support & Documentation** radio button.

To provide feedback about the Cisco.com website or a particular technical document, click **Contacts & Feedback** at the top of any Cisco.com web page.

Submitting a Service Request

Using the online TAC Service Request Tool is the fastest way to open S3 and S4 service requests. (S3 and S4 service requests are those in which your network is minimally impaired or for which you require product information.) After you describe your situation, the TAC Service Request Tool provides recommended solutions. If your issue is not resolved using the recommended resources, your service request is assigned to a Cisco engineer. The TAC Service Request Tool is located at this URL:

http://www.cisco.com/techsupport/servicerequest

For S1 or S2 service requests, or if you do not have Internet access, contact the Cisco TAC by telephone. (S1 or S2 service requests are those in which your production network is down or severely degraded.) Cisco engineers are assigned immediately to S1 and S2 service requests to help keep your business operations running smoothly.

To open a service request by telephone, use one of the following numbers:

Asia-Pacific: +61 2 8446 7411
Australia: 1 800 805 227
EMEA: +32 2 704 55 55
USA: 1 800 553 2447

For a complete list of Cisco TAC contacts, go to this URL:

http://www.cisco.com/techsupport/contacts

Definitions of Service Request Severity

To ensure that all service requests are reported in a standard format, Cisco has established severity definitions.

Severity 1 (S1)—An existing network is “down” or there is a critical impact to your business operations. You and Cisco will commit all necessary resources around the clock to resolve the situation.

Severity 2 (S2)—Operation of an existing network is severely degraded, or significant aspects of your business operations are negatively affected by inadequate performance of Cisco products. You and Cisco will commit full-time resources during normal business hours to resolve the situation.

Severity 3 (S3)—Operational performance of the network is impaired while most business operations remain functional. You and Cisco will commit resources during normal business hours to restore service to satisfactory levels.

Severity 4 (S4)—You require information or assistance with Cisco product capabilities, installation, or configuration. There is little or no effect on your business operations.

Obtaining Additional Publications and Information

Information about Cisco products, technologies, and network solutions is available from various online and printed sources.

- The Cisco Online Subscription Center is the website where you can sign up for a variety of Cisco e-mail newsletters and other communications. Create a profile and then select the subscriptions that you would like to receive. To visit the Cisco Online Subscription Center, go to this URL:

  http://www.cisco.com/offer/subscribe

- The *Cisco Product Quick Reference Guide* is a handy, compact reference tool that includes brief product overviews, key features, sample part numbers, and abbreviated technical specifications for many Cisco products that are sold through channel partners. It is updated twice a year and includes the latest Cisco channel product offerings. To order and find out more about the *Cisco Product Quick Reference Guide*, go to this URL:

  http://www.cisco.com/go/guide

- Cisco Marketplace provides a variety of Cisco books, reference guides, documentation, and logo merchandise. Visit Cisco Marketplace, the company store, at this URL:

  http://www.cisco.com/go/marketplace/

- Cisco Press publishes a wide range of general networking, training, and certification titles. Both new and experienced users will benefit from these publications. For current Cisco Press titles and other information, go to Cisco Press at this URL:

  http://www.ciscopress.com

- *Internet Protocol Journal* is a quarterly journal published by Cisco for engineering professionals involved in designing, developing, and operating public and private internets and intranets. You can access the *Internet Protocol Journal* at this URL:

  http://www.cisco.com/ipj

- Networking products offered by Cisco, as well as customer support services, can be obtained at this URL:

  http://www.cisco.com/en/US/products/index.html

- Networking Professionals Connection is an interactive website where networking professionals share questions, suggestions, and information about networking products and technologies with Cisco experts and other networking professionals. Join a discussion at this URL:

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- "What's New in Cisco Documentation" is an online publication that provides information about the latest documentation releases for Cisco products. Updated monthly, this online publication is organized by product category to direct you quickly to the documentation for your products. You can view the latest release of "What's New in Cisco Documentation" at this URL:

  http://www.cisco.com/univercd/cc/td/doc/abtunicd/136957.htm

- World-class networking training is available from Cisco. You can view current offerings at this URL:

  http://www.cisco.com/en/US/learning/index.html

Cisco Aironet 4.5-dBi Low Profile Omnidirectional Antenna (AIR-ANT5145V-R)

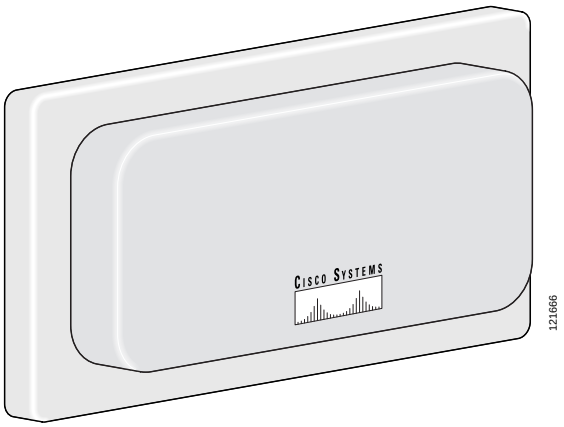
This document outlines the specifications, describes the Cisco Aironet 4.5-dBi Diversity Omnidirectional Antenna (AIR-ANT5145V-R), and provides instructions for mounting it. The antenna operates in the 5-GHz frequency range and is designed for use indoors.

The following information is provided in this document.

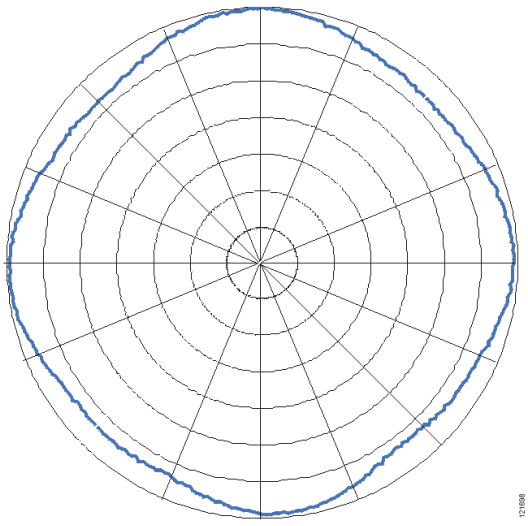
Corporate Headquarters:
Cisco Systems, Inc., 170 West Tasman Drive, San Jose, CA 95134-1706 USA

Technical Specifications

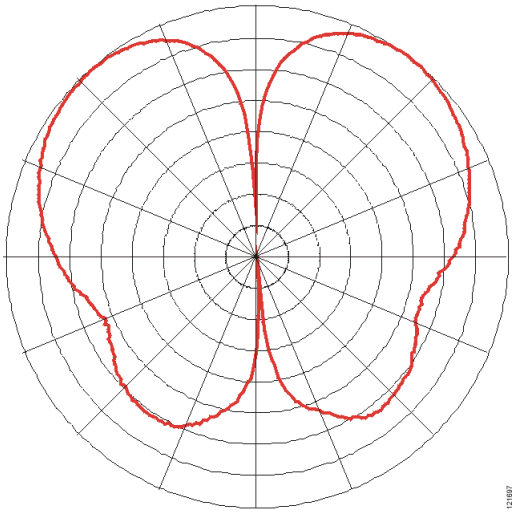
Antenna type	Omnidirectional TM02 Mode Patch
Operating frequency range	5150 – 5850 MHz
Nominal input impedance	50Ω
2:1 VSWR bandwidth	5000 – 6000 MHz
Gain	4.5 dBi
Polarization	Linear
Front-to-back ratio	10 dB
E-plane 3dB beamwidth	50
H-plane 3dB beamwidth	Omnidirectional
Cable length and type	36 in. (91.4 cm) Plenum rated UV stable LMR-185
Connector type	2 RP-TNC Male
Length	5 in. (12.7 cm)
Width	3 in. (7.6 cm)
Height	0.75 oz (21.2 g)
Operating temperature	–22 F– 158 F(–30 C – 70 C)
Storage temperature	–40 F– 185 F(–40 C – 85 C)
Environment	Indoor, office



H-Plane Pattern



E-Plane Pattern



System Requirements

This antenna is designed for use with Cisco Aironet access points and bridges but can be used with any 5-GHz Cisco Aironet radio device that utilizes reverse polarity Neil Councilman (RP-TNC) connectors.

Installation Guidelines

Because the antenna transmits and receives radio signals, they are susceptible to RF obstructions and common sources of interference that can reduce throughput and range of the device to which they are connected. Follow these guidelines to ensure the best possible performance:

- Mount the antenna to utilize its propagation characteristics. One way to do this is to orient the antenna horizontally and mount it as high as possible.
- Keep the antenna away from metal obstructions such as heating and air-conditioning ducts, large ceiling trusses, building superstructures, and major power cabling runs. If necessary, use a rigid conduit to lower the antenna away from these obstructions.
- The density of the materials used in a building's construction determines the number of walls the signal must pass through and still maintain adequate coverage. Consider the following before choosing the location to install your antenna:
  - Paper and vinyl walls have very little affect on signal penetration.
  - Solid and pre-cast concrete walls limit signal penetration to one or two walls without degrading coverage.
  - Wood and concrete block walls limit signal penetration to three or four walls.
  - A signal can penetrate five or six walls constructed of drywall or wood.
  - A thick metal wall causes signals to reflect off, causing poor penetration.

Safety Instructions

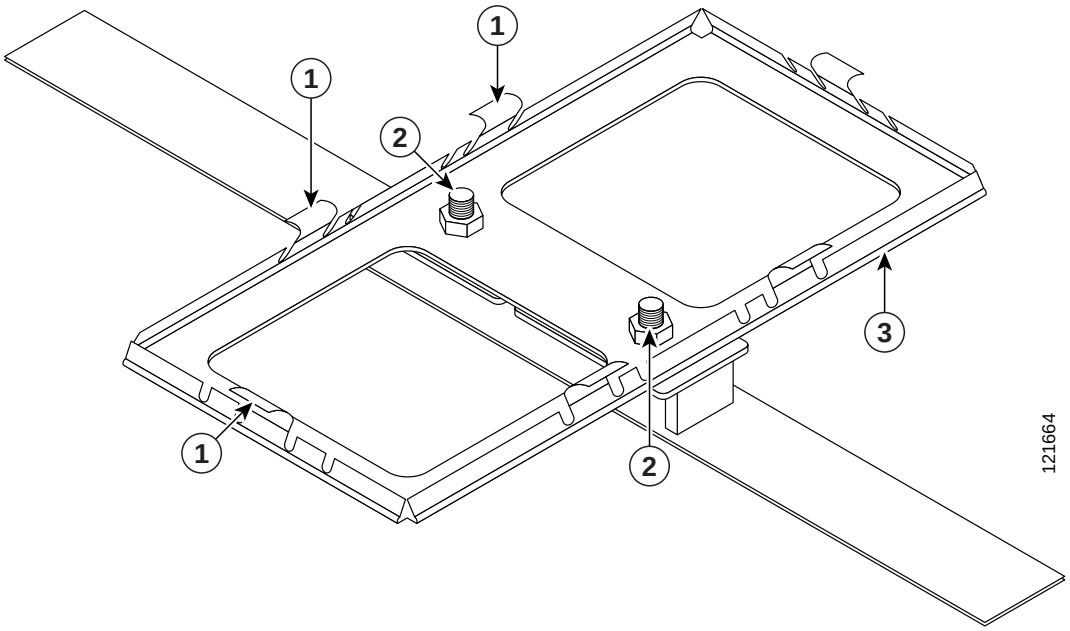
Follow these safety precautions when installing your antenna.

- Plan your installation procedure carefully and completely before you begin.
- If you are installing an antenna for the first time, for your own safety as well as others, seek **professional assistance**. Consult your dealer, who can explain which mounting method to use for the location where you intend to install the antenna.
- Select your installation site with safety, as well as performance, in mind. Remember that electric power lines and telephone lines look alike. For your safety, assume that any line is an electric power line until determined otherwise.
- Call your local power company or building maintenance organization if you are unsure about cables close to your intended mounting location.
- If an accident or emergency occurs with the power lines, call for qualified emergency help immediately.
- When installing your antenna in any location, **do not** use a metal ladder. **Do** dress properly - shoes with rubber soles and heels, rubber gloves, and a long sleeved shirt or jacket. When drilling mounting holes, wear safety glasses.

Installing the Antenna

The antenna ships with a mounting bracket and the hardware required to install the antenna on a suspended ceiling. Figure 1 shows the layout of the detachable mounting bracket.

Figure 1 Mounting Bracket



1	Retaining tabs	**3**	Mounting bracket
2	Mounting holes		

Tools and Equipment Required

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

- The mounting kit supplied with your antenna consisting of:
  - Mounting bracket
  - Two T-rail clips with studs
  - Two plastic spacers
  - Two 1/4-20 T-rail nuts with built-in washers
- A 9 mm open end wrench or suitable pliers
- Standard screwdriver
- A 3/4 in. (20 mm) drill bit
- A Drill
- A pencil or suitable marker

Installing the Antenna

Follow these steps to install the antenna. It may be helpful to refer to before you begin.

Step 1 Choose a location in which to install the antenna.

Step 2 Remove the adjacent ceiling panels on each side of the T-rail on which the antenna is to be installed.

Note The panels must be removed so you can attach the antenna's cables to the cables coming from the device using the antenna. Removing the pane lets you support to the ceiling T-rail when you snap the antenna in place on the mounting bracket.

Step 3 Attach the T-rail clips to the ceiling T-rail.

Step 4 Verify that the distance between the t-rail studs is 3.125-in (80 mm).

Step 5 Slip a plastic spacer onto the stud of each T-rail clip.

Step 6 Position the mounting bracket into the T-rail clip studs.

Step 7 Start a T-rail nut on each stud.

Step 8 Tighten each T-rail nut wrench tight. Use a standard screwdriver to keep the stud from turning while you tighten the nut.

Step 9 Use the mounting bracket to determine and mark where to drill the antenna cable access hole in the ceiling panel.

Step 10 Drill a 3/4 in. (20 mm) hole at each mark.

Step 11 Position the antenna over the mounting bracket and feed each cable through its respective access hole.

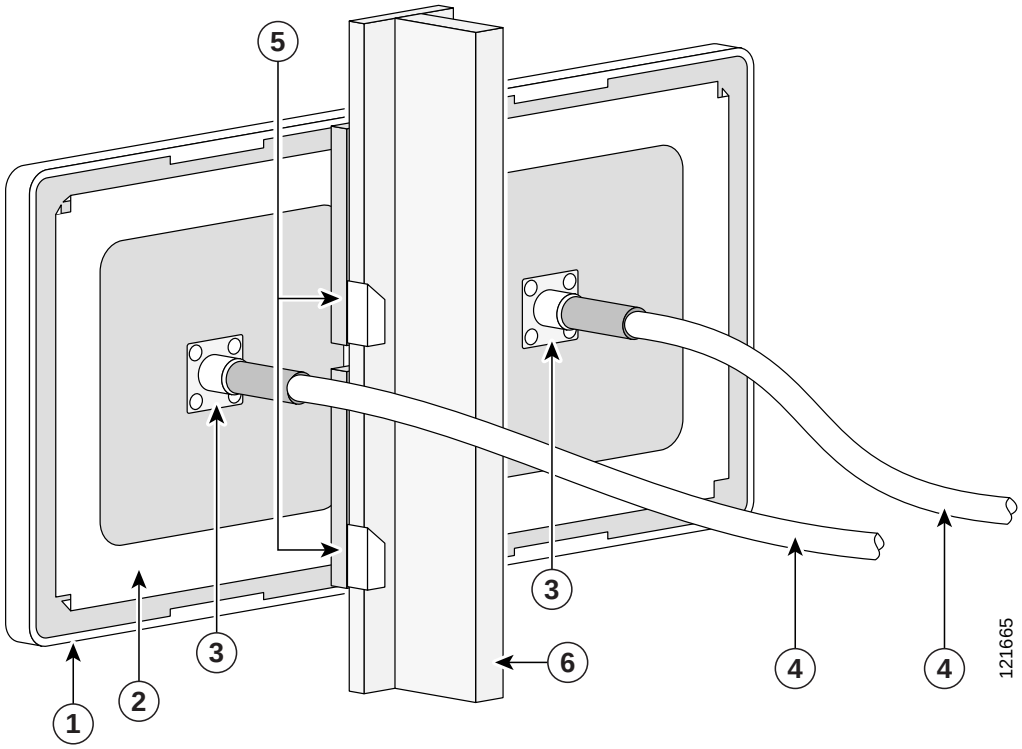
Step 12 Grasp the ceiling T-rail as closely as possible to the mounting bracket while aligning the antenna with the retaining tabs.

Step 13 Snap the antenna over the retaining tabs.

Step 14 Connect the antenna cables.

Step 15 Replace the ceiling panels.

Figure 2 Installation Details



1	Antenna	**4**	Antenna cable
2	Mounting bracket	**5**	T-rail clip
3	Antenna connectors	**6**	Ceiling T-rail

Suggested Cable

Cisco recommends a high-quality, low-loss cable for use with the antenna.

Note Coaxial cable loses efficiency as the frequency increases, resulting in signal loss. The cable should be kept as short as possible because cable length also determines the amount of signal loss (the longer the run, the greater the loss).

The antenna terminates with a RP-TNC plug after a short, 3-ft (0.91-m) cable. The mating connector to the antenna is an appropriate RP-TNC jack.

Obtaining Documentation

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Asia-Pacific: +61 2 8446 7411 (Australia: 1 800 805 227)
EMEA: +32 2 704 55 55
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Cisco Aironet 6-dBi Omnidirectional Antenna (AIR-ANT5160V-R)

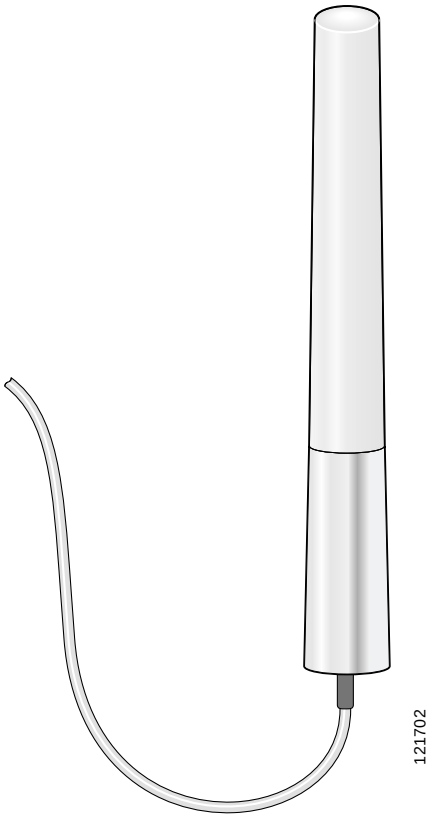
This document outlines the specifications, describes the AIR-ANT5160V-R 6-dBi omnidirectional antenna, and provides instructions for mounting it. The antenna is a ruggedized high-performance colinear antenna that operates in the 5-GHz frequency range and is designed for use in large rooms or vaulted areas where extended coverage is needed. The antenna is designed to be used indoors or outdoors and can be mounted on a mast.

The following information is provided in this document.

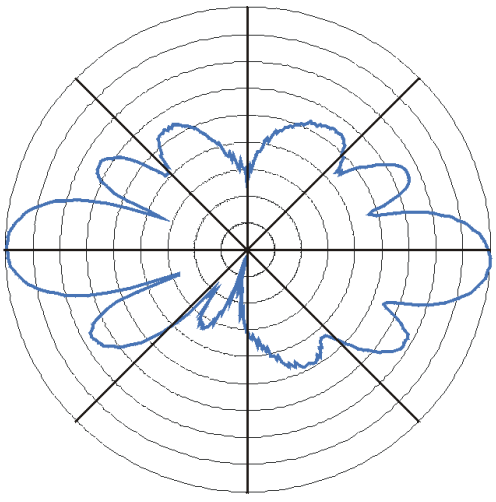
Corporate Headquarters:
Cisco Systems, Inc., 170 West Tasman Drive, San Jose, CA 95134-1706 USA

Technical Specifications

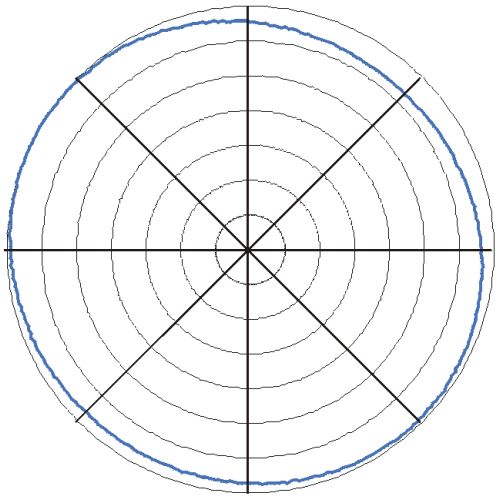
Antenna type	Omnidirectional colinear array
Operating frequency range	5150–5875 MHz
Nominal input impedence	50Ω
2:1 VSWR bandwith	5150–5850 MHz
Peak gain	6 dBi
Polarization	Linear
E-plane 3-dB beamwidth	17
H-plane 3-dB beamwidth	Omnidirectional
Cable length and type	36 in. (91.4 cm) Plenum rated
Connector type	RP-TNC Male
Length	11.5 in. (29.2 cm)
Diameter	1 in. (2.5 cm)
Weight	12 oz. (0.34 kg)
Operating temperature range	–22 F– 158 F(–30 C – 70 C)
Storage temperature range	–40 F– 185 F(–40 C – 85 C)
Wind rating	125 mph (200 kph)



E-Plane Radiation Pattern



H-Plane Radiation Pattern



System Requirements

This antenna is designed for use with Cisco Aironet access points and bridges but can be used with any 5-GHz Cisco Aironet radio device that utilizes a reverse polarity Neil Councilman (RP-TNC) connector.

Safety Precautions

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

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.**

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

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

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.**

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).**

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. Your Cisco sales representative can explain which mounting method to use for the size and type antenna you are about to install.
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.
8. If an accident should occur with the power lines call for qualified emergency help immediately.

Installation Guidelines

Because the antenna transmits and receives radio signals, they are susceptible to RF obstructions and common sources of interference that can reduce throughput and range of the device to which they are connected. Follow these guidelines to ensure the best possible performance:

- Mount the antenna to utilize its propagation characteristics. One way to do this is to orient the antenna vertically and mount it as high as possible.
- Keep the antenna away from metal obstructions such as heating and air-conditioning ducts, large ceiling trusses, building superstructures, and major power cabling runs. If necessary, use a rigid conduit to lower the antenna away from these obstructions.
- The density of the materials used in a building's construction determines the number of walls the signal must pass through and still maintain adequate coverage. Consider the following before choosing the location to install your antenna:
  - Paper and vinyl walls have very little affect on signal penetration.
  - Solid and pre-cast concrete walls limit signal penetration to one or two walls without degrading coverage.
  - Concrete and wood block walls limit signal penetration to three or four walls.
  - A signal can penetrate five or six walls constructed of drywall or wood.
  - A thick metal wall reflects signals, causing poor penetration.

Site Selection

Before attempting to install your antenna, determine where you can best place the antenna for safety and performance.

Follow these steps to determine a safe distance from wires, power lines, and trees.

Step 1 Measure the height of your antenna.

Step 2 Add this length to the length of your tower or mast and then double this total for the minimum recommended safe distance.

Caution If you are unable to maintain this safe distance, stop and get professional help.

Generally, the higher an antenna is above the ground, the better it performs. Good practice is to install your antenna about 5 to 10 ft (1.5 to 3 m) above the roof line and away from all power lines and obstructions. If possible, find a mounting place directly above your wireless device so that the lead-in cable can be as short as possible.

Installing the Antenna

A mounting hardware kit is provided that allows you to install the antenna on a suspended ceiling, open beam ceiling, or a pole.

The ceiling mount kit consists of the following hardware:

- One T-rail grid bracket
- One bracket plate
- Two internal tooth lock washers
- Two #6-32 x 1/4-in. SS Phillips machine screws
- One I-beam clamp
- One 1/4-in. flat washer
- One 1/4-in. split lock washer
- One 1/4 x 20 x 1/2-in. hex head bolt

The pole (mast) mount kit consists of the following hardware:

- Six 5/16-in. x 18 SS hex nuts
- Four 5/16-in. SS lock washers
- One U-bolt
- One V-bracket
- Two base brackets
- Two 5/16-in. flat washers

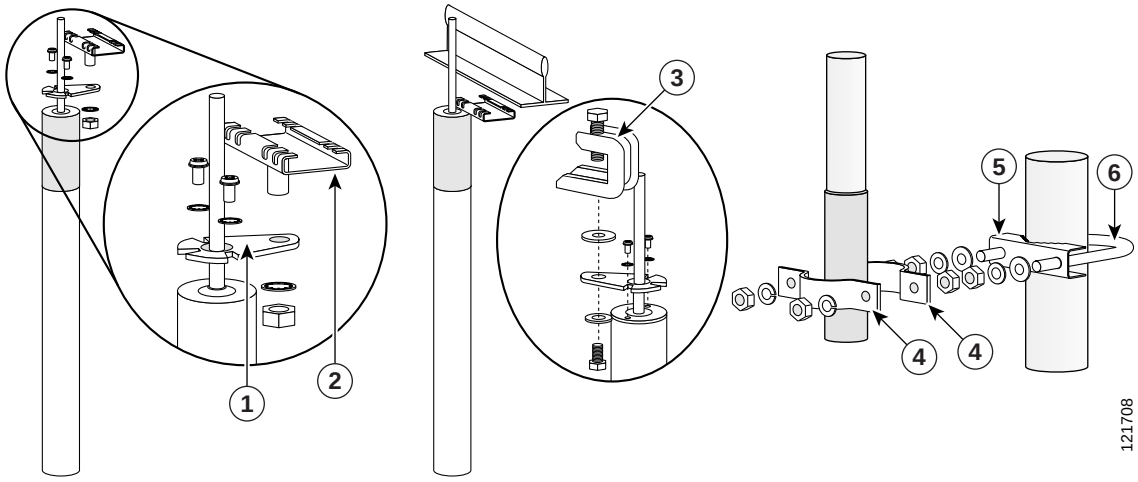
You will need the following tools and equipment, which are not provided:

- Phillips head screwdriver
- 7/16-in. open end or box end wrench (or adjustable wrench)
- 1/2-in. open end or box end wrench (or adjustable wrench)

The following sections contain typical procedures for installing the antenna on a suspended ceiling or mast. Your installation may vary. Before you begin, you may want to refer to Figure 1.

Figure 1 shows how the antenna should be mounted to a suspended ceiling or pole (mast).

Figure 1 Antenna Mounting Details



1	Bracket plate	**4**	V-bracket
2	Ceiling T-rail grid bracket	**5**	Base bracket
3	I-beam clamp	**6**	U-bolt

T-Rail Grid Bracket Installation

Follow these steps to install the antenna on a suspended ceiling using the T-rail grid bracket:

Step 1 Attach the bracket plate to the antenna base using two #6 Phillips head screws and #6 lock washers as shown in Figure 1.

Step 2 Remove the hex nut and flat washer from the T-rail grid bracket. Discard the flat washer.

Step 3 Install the T-rail grid bracket onto the bracket plate using the hex nut and a 1/4-in. internal tooth lock washer. Do not tighten the hex nut.

Step 4 Clamp the T-rail grid bracket onto the ceiling runner and tighten the hex nut with a 7/16-in. wrench or adjustable wrench.

Step 5 Route the antenna cable to the wireless device.

I-Beam Clamp Installation

Follow these steps to install the antenna on an open beam ceiling using the I-beam clamp:

Step 1 Attach the bracket plate to the antenna base using two #6 Phillips head screws and #6 lock washers.

Step 2 Install the I-beam clamp to the bracket plate using a 1/4-20 x 1/2-in. hex head bolt, a flat washer and split lock washer as shown in Figure 1.

Step 3 Position the I-beam clamp on the ceiling beam and tighten the clamp bolt.

Step 4 Route the antenna cable to the wireless device.

Pole Installation

Follow these steps to install the antenna on a pole:

Step 1 Attach the U-bolt and V-bracket to the top of the pole using two 5/16 x 18 hex nuts, 5/16-in. flat washers, and 5/16-in. lock washers as shown in Figure 1. Tighten the assembly using a 1/2-in. wrench or adjustable wrench.

Step 2 Start two more 5/16 x 18 hex nuts on the U-bolt and turn them down against the nuts securing the the U-bolt to the pole.

Step 3 Position the base brackets on the antenna base as shown in Figure 1.

Step 4 Slide the antenna and base brackets onto the U-bolt threads.

Step 5 Secure the antenna to the U-bolt using two 5/16 x 18 hex nuts and two 5/16-in. lock washers.

Step 6 Tighten the hex head bolts evenly using a 1/2-in. wrench or adjustable wrench.

Step 7 Route the antenna cable to the wireless device.

Suggested Cable

Cisco recommends a high-quality, low-loss cable for use with the antenna.

Note Coaxial cable loses efficiency as the frequency increases, resulting in signal loss. The cable should be kept as short as possible because cable length also determines the amount of signal loss (the longer the run, the greater the loss).

The antenna terminates with a RP-TNC plug after a short, 3-ft (0.91-m) cable. The mating connector to the antenna is an appropriate RP-TNC jack. The connector on the opposite end will vary according to the type of equipment used.

After the cable is attached to the antenna, make sure that the connections are sealed (if outdoors) to prevent moisture and other weathering elements from affecting performance. Cisco recommends using a coax seal (such as CoaxSeal) for outdoor connections. Silicon sealant or electrical tape are **not** recommended for sealing outdoor connections.

Grounding the Antenna

The antenna should be grounded if you are mounting it outdoors. Follow these steps to ground the antenna in accordance with national electrical code instructions.

Step 1 Use No. 10 AWG copper or No. 8 or larger copper-clad steel or bronze wire as ground wires for both mast and lead-in. Securely clamp the wire to the bottom of the mast.

Step 2 Secure the lead-in wire to a static discharge unit (lightning arrestor) and the mast ground wire to the building with stand-off insulators spaced from 4 ft (1.2 m) to 8 ft (2.4 m) apart.

Step 3 Mount the antenna discharge unit as close as possible to where the lead-in wire enters the building.

Step 4 Drill a hole in the building's wall as close as possible to the equipment to which you will connect the lead-in cable.

Caution There may be wires in the wall. Make sure your drilling location is clear of any obstructions or other hazards.

Step 5 Pull the cable through the hole and form a drip loop close to where it enters the building.

Step 6 Thoroughly waterproof the lead-in area.

Step 7 Connect the lead-in cable to the equipment.

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