



## ADMINISTRATION GUIDE

**Cisco Small Business**

HGA9N High Gain Omni-Directional Antenna for  
N Type Connectors

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## About This Document

Thank you for choosing the Cisco HGA9N High Gain Omni-Directional Antenna for N Type Connectors. The Antenna and the Cisco WAP200E Wireless-G Exterior Access Point together provide 9dBi peak gain and should be used together. This guide will help you set up and place the Antenna and the access point properly so you can achieve optimal range.

Use the instructions in this Guide to further help you connect the 9dBi Omni-Directional Antenna to the Wireless-G Exterior Access Point and bridge your different networks. These instructions should be all you need to get the most out of the High Gain Omni-Directional Antenna.



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**WARNING** This product contains chemicals, including lead, known to the State of California to cause cancer, and birth defects or other reproductive harm. *Wash hands after handling.*

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# Planning Your Wireless Antenna Coverage

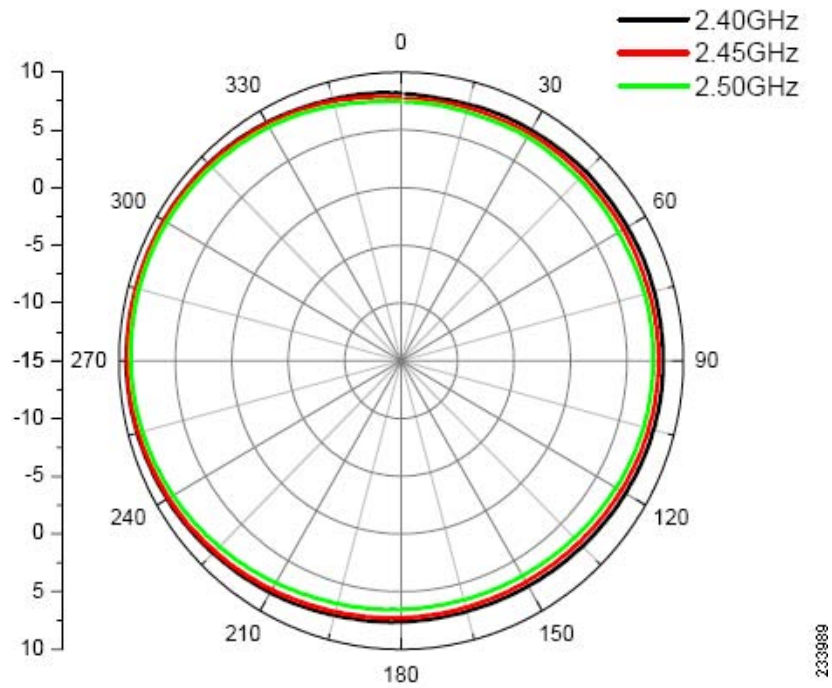
The following sections describe how to plan your wireless antenna coverage:

- [The Antenna Pattern for Radio Waves, page 5](#)
- [Optimizing Range, page 7](#)
- [Placing the Omni-Directional Antenna, page 8](#)
- [Using the Omni-Directional Antenna, page 8](#)
- [How to Achieve Optimal Gain, page 9](#)
- [Distance Calculation Examples, page 10](#)

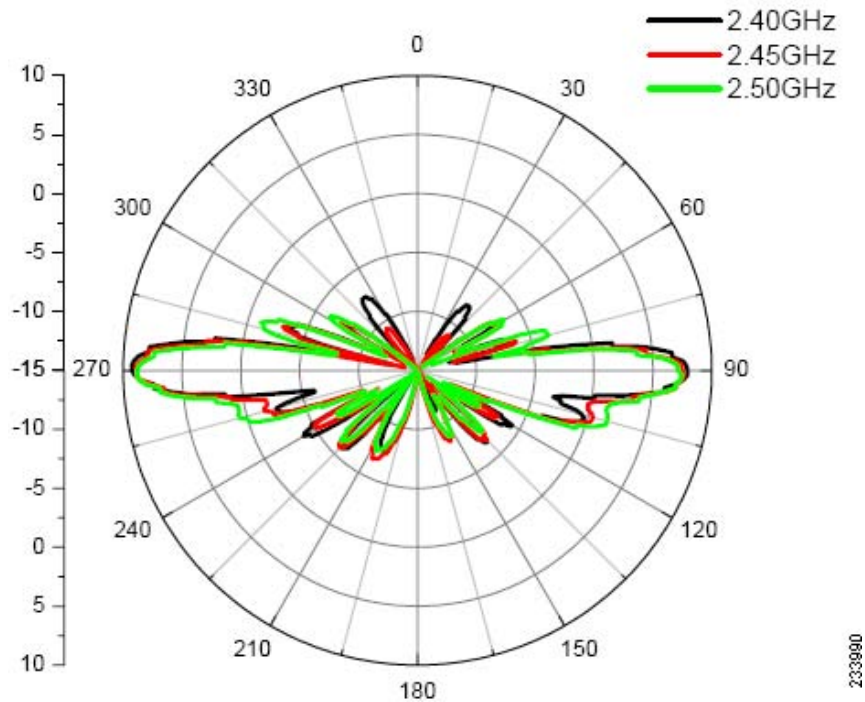
## The Antenna Pattern for Radio Waves

The power of the wireless signal is most strong on the horizontal plane of the Omni-Directional Antenna. The peak gain of this antenna is 9dBi. The diagrams below show the antenna pattern of the 9dBi Omni-Directional Antenna on the horizontal and vertical planes.

**Figure 1 Omni-Directional Antenna Pattern (Horizontal Plane)**



**Figure 2 Omni-Directional Antenna Pattern (Vertical Plane)**

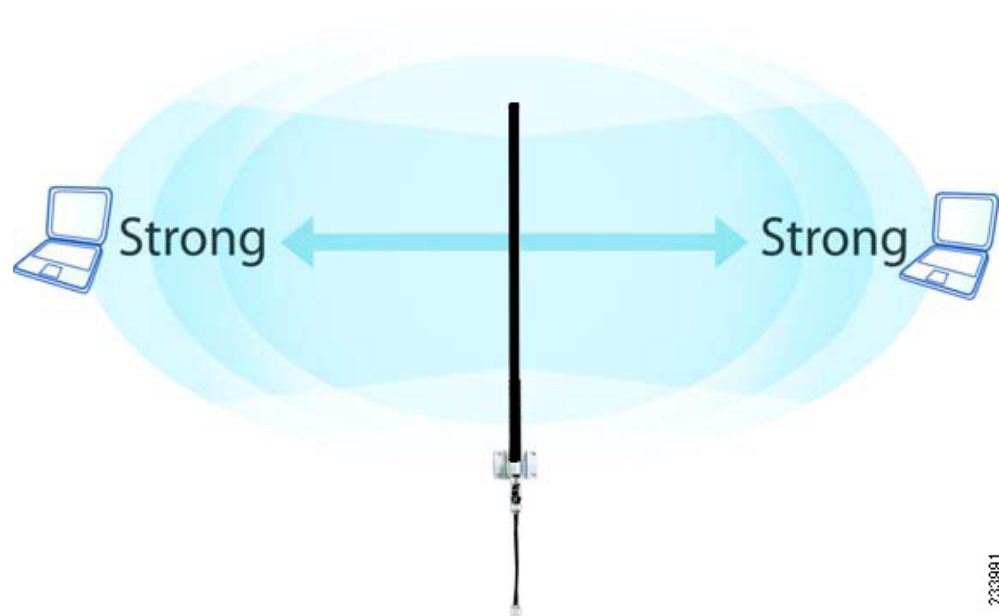


## Optimizing Range

The power of the wireless signal is strongest on the horizontal plane of the Omni-Directional Antenna. In the figure, note the strongest ranges according to the positioning of the Antenna.

For best results, Cisco recommends placing the Omni-Directional Antenna as illustrated in the next figure.

**Figure 3 Placing the Omni-Directional Antenna for Optimum Range**



## Placing the Omni-Directional Antenna

Because the antenna is omni-directional, you have more flexibility with where you can place the access point. Keep in mind, however, that the Omni-Directional Antenna achieves its peak gain when your client PC (that is, a PC with a wireless adapter) stays on the same horizontal plane as the Antenna.

- **Line of sight**—The minimum requirement is line of sight. If you can see the receiver antenna, then you are within a suitable range.
- **Avoid obstacles**—Avoid obstacles and set up the Omni-Directional Antenna and the other antennas as high as possible. Try to avoid trees, buildings, and other objects close to the path between two antennas, because they can reduce signal power.

## Using the Omni-Directional Antenna

The Omni-Directional Antenna can be used with the access point for several purposes:

- **Access point to client devices**—You can achieve better range and transmission with the Omni-Directional Antenna when connecting the wireless client (a PC with any wireless adapter) to the access point.
- **Repeater mode**—The Omni-Directional Antenna and access point can repeat wireless signals from one access point to other devices, such as to a client PC or to other repeaters.
- **Point-to-multipoint bridging**—The Omni-Directional Antenna connects to one main access point. The main access point connects to other access points that each use a separate Directional Antenna. To achieve maximum distance coverage, the other access points are usually located in different directions from the main access point.



### NOTE

The Omni-Directional Antenna does not provide extra value for point-to-point bridging. You can achieve the same antenna gain by using the internal directional antenna from the access point.



## How to Achieve Optimal Gain

Wireless coverage depends on several factors, including power and transmission. You can calculate exact coverage distance by gathering the specifications of the access point and the Omni-Directional Antenna and using the equation below.



### TIP

This equation is not required, but it may be beneficial in optimizing use of your Omni-Directional Antenna and access point.

$$S_r = S_t + G_t + G_r + 20 \cdot \log \frac{\lambda}{4 \cdot \pi} - 20 \cdot \log(d) - LinkBudget$$

In this formula, everything is in dBm or dB.

$S_r$  is the received power. Here we plug in the receiver sensitivity to calculate the maximum distance. For example, -82dBm for 11Mbps.

$S_t$  is the transmitted power. For example, 18dBm for 11Mbps.

$G_t$  is the transmitter antenna gain and  $G_r$  is the receiver antenna gain (9dBi for this Omni-Directional Antenna).

$\lambda$  is the wavelength of the signal. The product of  $\lambda$  and frequency equals to speed of light (c).

$d$  is the distance.

*LinkBudget* is the lump sum of additional loss (compared to free space) in the path.

## Distance Calculation Examples

You can use the information in the tables below to determine how you want to place the Omni-Directional Antenna in relation to the access point to client device or between the two access points.

As you can see, the higher the transmit data rate, the shorter the coverage distance. Therefore, when a client device moves further away from an access point, the data rate will fall back to a lower data rate.

**Table 1 Coverage Distance from Access Point to Client Devices**

Data Rate	11 Mbps	54 Mbps
Distance	0.88 km .55 miles	0.12 km 0.078 miles

**Table 2 Coverage Distance from Access Point to Access Point**

Data Rate	11 Mbps	54 Mbps
Distance	2.49 km 1.56 miles	0.35 km 0.22 miles

To obtain these calculations, we inserted the specifications of the access point into the formula as described previously. We use 9dBi peak antenna gain and assume 0dBi antenna gain at the client device. Link budget is set to 10dB to include radio wave attenuations from different types of objects in the path (the actual value may vary).

## Getting to Know the High Gain Omni-Directional Antenna

This chapter explains the components that come with the Cisco HGA9N High Gain Omni-Directional Antenna and contains the following sections:

- [The Omni-Directional Antenna Port, page 11](#)
- [Antenna Cable, page 12](#)
- [The Lightning Protector \(Surge Arrestor\), page 13](#)
- [Mounting Kit, page 13](#)

### The Omni-Directional Antenna Port

The Omni-Directional Antenna has only one port in the tip closer to the mounting bracket. For installation purposes, it is important to note that the antenna port has a female N-type connector and should only be connected to the male cable connector.

**Figure 4** Omni-Directional Antenna Port



## Antenna Cable

One six-foot low-loss antenna cable is included with this product and is used to connect the Omni-Directional Antenna to the access point. Note that the two connectors have different polarities and one connector is marked with white tape. The connector with white tape connects to the access point.

**Figure 5** Antenna Cable



## The Lightning Protector (Surge Arrestor)

The lightning protector is used to protect your 9dBi Omni-Directional Antenna when it is used in an outdoor environment. The lightning protector screws into the end of the Antenna. Although it is not required, Cisco recommends using the lightning protector to help prevent damage to equipment.

**Figure 6** Lightning Protector



## Mounting Kit

A kit including U-clamps, nuts, washers, and screws are provided to mount the Omni-Directional Antenna.

## Connecting the High Gain Omni-Directional Antenna

This chapter explains how to mount and connect the Cisco HGA9N High Gain Omni-Directional Antenna to the Wireless-G Exterior Access Point.

- 
- STEP 1** Make sure you have all of the hardware displayed below, including a plastic bag containing the mounting hardware. The following figures are found in a typical external Omni-Directional Antenna setup.

**Figure 7 Omni-Directional Antenna Port**



**Figure 8 Lightning Protector**



**Figure 9 Antenna Cable**



**Figure 10 Exterior Access Point**



- STEP 2** Obtain a location for the 9dBi Omni-Directional Antenna. The location should have a clear view to the peer Antenna. For detailed information about adjusting the 9dBi Omni-Directional Antenna for your application, see [“The Antenna Pattern for Radio Waves” on page 5](#).
- STEP 3** Determine whether you will mount the Omni-Directional Antenna to a pole or a wall. Follow the mounting instructions as displayed.

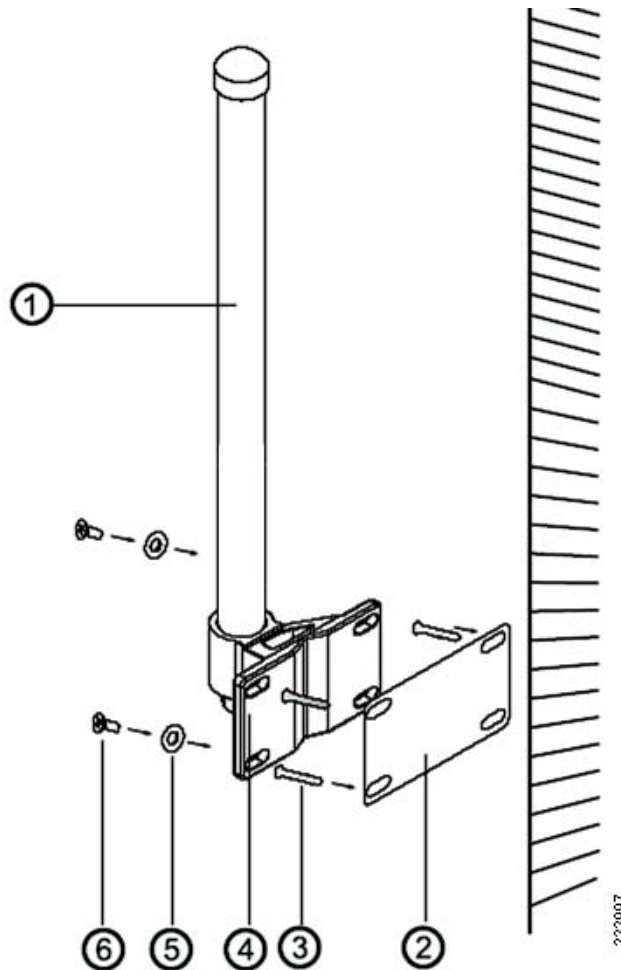
### Wall Mounting

Your wall mounting package should contain the following items. Items are numbered to correspond with the wall mount example in [Figure 11](#).

1. Omni-Directional Antenna—1 pc
2. Sticker—2 pcs

3. Plastic Fixings—4 pcs
4. Holder—1 pc
5. Washers—4 pcs
6. Screws—4 pcs

**Figure 11 Wall Mount Example**



### **Pole Mounting**

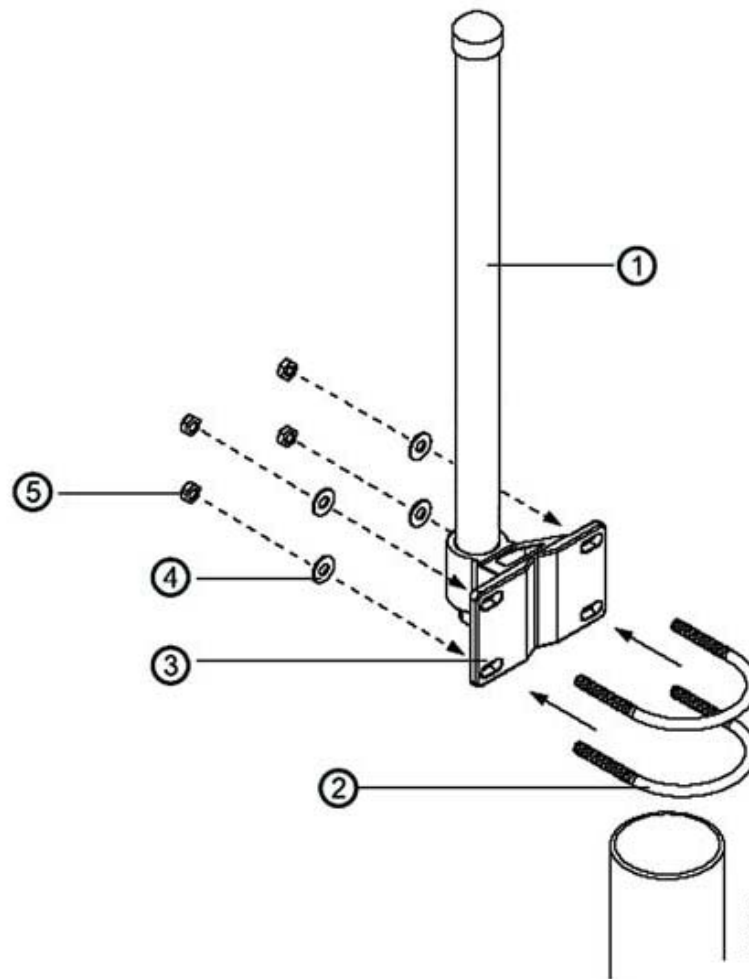
Your pole mounting package should contain the following items. Items are numbered to correspond with the wall mount example in [Figure 12](#).

1. Omni-Directional Antenna—1 pc
2. Hose clamp—2 pcs
3. Holder—1 pc



- 4. Washers—4 pcs
- 5. Screw nuts—4 pcs

**Figure 12 Pole Mount Example**



**STEP 4** The bottom of the Omni-Directional Antenna has a removable black covering. Remove the black covering and attach the lightning protector as illustrated below by inserting the male end of the protector into the Antenna.

**Figure 13 Connect the Lightning Protector to the Antenna**



**Figure 14 Connect the Cable to the Lightning Protector**



- STEP 5** Attach the male end of the cable that has the white tape around it to the Wireless-G Exterior Access Point.

**Figure 15** Connect the Access Point to the Cable



- STEP 6** If you are mounting to a pole, insert the pole (not included) into the mounting bracket assembly. As discussed previously, the pole must give the antenna at least 2 meters of clearance from the ground.
- STEP 7** If you are mounting to a base (not included), make sure the base is secure.

Congratulations! The connection is complete. You can begin using the Cisco HGA9N High Gain Omni-Directional Antenna.

## Product Specifications

The table below contains product specifications for the Cisco HGA9N High Gain Omni-Directional Antenna.

Specification	Description
Model	HGA9N
Ports	1 N-type female connector
Cabling Type	Coax - 50 Ohm impedance
Frequency Range	2400 MHz - 2500 MHz
Peak Gain	9 dBi
VSWR	1.92: 1 Max
Polarization	Linear, vertical
HPBW / horizontal	360°
HPBW / vertical	11°
Impedance	50 Ohms
Range	<p>Maximum Outdoor range:</p> <ul style="list-style-type: none"><li>▪ 0.88 km (0.55 mi) at 11 Mbps</li><li>▪ 0.12 km (0.078 mi) at 54Mbps</li></ul> <p><b>NOTE</b> Range estimation is based on one WAP54GPE Access point with an HGA9N Omni-Directional Antenna attached to a wireless client with a 0dBi antenna under ideal line-of-sight conditions.</p>
Dimensions	2.95" x 24.6" x 2.20" (75 x 625 x 56mm)

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Specification	Description (Continued)
Mounting Options	Mounting kit provided
Operating Temperature	-22 to 176°F (-30°C to 80°C)
Storage Temperature	22 to 176°F (-30°C to 80°C)
Operating Humidity	5% to 95%, non-condensing
Storage Humidity	5% to 95%, non-condensing

## Where to Go From Here

Cisco provides a wide range of resources to help you and your customer obtain the full benefits of the Cisco HGA9N High Gain Omni-Directional Antenna.

Support	
Cisco Small Business Support Community	<a href="http://www.cisco.com/go/smallbizsupport">www.cisco.com/go/smallbizsupport</a>
Online Technical Support and Documentation (Login Required)	<a href="http://www.cisco.com/support">www.cisco.com/support</a>
Phone Support Contacts	<a href="http://www.cisco.com/en/US/support/tsd_cisco_small_business_support_center_contacts.html">www.cisco.com/en/US/support/tsd_cisco_small_business_support_center_contacts.html</a>
Software Downloads (Login Required)	Go to <a href="http://tools.cisco.com/support/downloads">tools.cisco.com/support/downloads</a> , and enter the model number in the Software Search box.
Product Documentation	
Cisco Small Business Wireless Solutions index	<a href="http://www.cisco.com/cisco/web/solutions/small_business/products/wireless/index.html">www.cisco.com/cisco/web/solutions/small_business/products/wireless/index.html</a>
Cisco HGA9N Quick Start Guide	<a href="http://www.cisco.com/en/US/products/ps10056/index.html">www.cisco.com/en/US/products/ps10056/index.html</a>
Cisco Small Business	
Cisco Partner Central for Small Business (Partner Login Required)	<a href="http://www.cisco.com/web/partners/sell/smb">www.cisco.com/web/partners/sell/smb</a>
Cisco Small Business Home	<a href="http://www.cisco.com/smb">www.cisco.com/smb</a>
Marketplace	<a href="http://www.cisco.com/go/marketplace">www.cisco.com/go/marketplace</a>