



# Cisco Industrial Routers and Industrial Wireless Access Points Antenna Guide

This document provides the descriptions and installation instructions for wireless antennas supported on the Cisco Industrial Series Routers and Industrial Wireless Access Points. This guide is not intended to replace existing hardware installation guides, software configuration guides, or other sources of information that are product specific. Instead, this guide is intended to provide a single source of antenna information and supported platforms for the Industrial Routers and Industrial Wireless Access Points.

This guide does not cover antenna or accessories compatibility with indoor enterprise products, although it does cover a number of indoor use cases for industrial products.

Antennas might be installed into the host router prior to delivery or ordered separately as a field-replaceable unit. Please consult your products Hardware Installation Guide for details.

This chapter covers the following topics:

- [Overview](#)
- [Safety Precautions](#)
- [Installation Requirements](#)
- [General Installation Instructions for Mounting Antennas](#)
- [Obtaining Technical Assistance](#)
- [Additional Information](#)

## Overview

Deciding which antenna to use involves many factors such as coverage area, maximum distance, indoor location, outdoor location, and antenna height.

When antennas are used indoors, the building geometry, construction materials, ceiling height, and internal obstructions must be considered. In outdoor environments, obstructions such as trees, vehicles, buildings, and hills must be considered.

## Safety Precautions

**WARNING:** Do not locate the outdoor 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 (for example, U.S.:NFPA 70, National Electrical Code, Article 810, Canada:Canadian Electrical Code, Section 54). Statement 1052

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.

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

For your safety, read and follow these safety precautions.

- 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.
- Before you install an antenna, contact your Cisco account representative to explain which mounting method to use for the size and type of antenna that you are about to install.
- Find someone to help you—installing an antenna is often a two-person job.
- Select your installation site with safety, as well as performance, in mind. Remember that electric power lines and phone lines look alike. For your safety, assume that any overhead line can kill you.
- Contact your electric power company. Tell them your plans and ask them to come look at your proposed installation.
- Plan your installation carefully and completely before you begin. Each person involved in an installation 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.
- When installing your antenna, follow these guidelines:
  - Do not use a metal ladder.
  - Do not work on a wet or windy day.
  - Do dress properly—wear shoes with rubber soles and heels, rubber gloves, and a long-sleeved shirt or jacket.
- If the assembly starts to drop, move away from it and let it fall. Because 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 completes an electrical path through the antenna and the installer.
- If any part of the antenna system should come in contact with a power line, do not touch it or try to remove it yourself. Call your local power company to have it removed safely.
- If an accident should occur with the power lines, call for qualified emergency help immediately.

## Installation Requirements

This section describes the factors to consider when planning an installation:

- [Installation Location](#)
- [Antenna Connections](#)
- [Optimum Performance](#)

### Installation Location

**WARNING:** Do not locate the outdoor 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 (for example, U.S.:NFPA 70, National Electrical Code, Article 810, Canada:Canadian Electrical Code, Section 54). Statement 1052

The location of the antenna is important. Objects such as metal columns, walls, and so on, reduce efficiency. Best performance is achieved when antennas are mounted at the same height and in a direct line of sight with no obstructions. If this is not possible and reception is poor, you should try different mounting positions to optimize reception.

If the antenna is designed to create an omnidirectional broadcast pattern, the antenna should be mounted clear of any obstructions to the sides of the radiating element.

Antenna installation and replacement should only be performed at one of the following, certified location types:

- Cisco DF facility
- Customer premises field depot

Before installing your antenna, determine the optimum location for safety and performance. Follow these steps to determine a safe distance from wires, power lines, and trees:

1. Measure the height of your antenna.
2. Add this length to the length of your tower or mast, then double this total for the minimum safe clearance distance from wires, power lines, and trees.

**CAUTION:** If you are unable to maintain this safe distance, stop and get professional technical assistance for a mounting alternative.

## Antenna Connections

Before you install or replace antennas, make sure the router is:

- Powered off
- Disconnected from all power sources
- Removed from a pole-top installation

**NOTE:** Caps on the RF-connectors are installed to protect them from the environment. They must only be removed to install a chassis-mounted antenna or external RF cable.

## Optimum Performance

The higher your antenna is above the ground, the better it performs, generally. If your antenna is connected to the router with external RF cables, it is good practice to install your antenna about 5 to 10 foot (1.5 to 3 meters) 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 direct as possible.

Vehicle mounted antennas must be mounted on a flat surface on the roof away from any obstructions.

Antennas transmit and receive radio signals which 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:

- Install the antenna vertically and mount it with the cables pointing towards the ground.
- 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 surrounding buildings' construction impacts antenna signal strength. Consider the following

- Signals penetrate paper and vinyl walls with little change to signal strength.
- Signals penetrate only one or two solid and pre-cast concrete walls without degrading signal strength.
- Signals penetrate three or four concrete and wood block walls without degrading signal strength.
- Signals penetrate five or six walls constructed of drywall or wood without degrading signal strength.
- Signals are likely to reflect off a thick metal wall and not penetrate it at all.
- Signals are likely to reflect off a chain link fence or a wire mesh with spaces of 1 to 1-1/2 in (2.5 to 3.8 cm).
- Microwave ovens and 2-GHz cordless phones can cause signal interference because they operate in the same frequency range as the WiFi radios.
- Before installing the antenna according to the installation procedures in the following chapters, you must complete these steps:
  - Remove any plug or connector that is installed in the antenna port.
  - Verify the correct antenna port for installation, based on the antenna model you are installing.
- See the installation document for your router regarding the correct antenna port location. Antennas must be installed in the correct antenna port for ease of installation and optimal performance.
- Vehicle mounted antennas must be separated by at least 18 in (45 cm) to reduce interference between radios. A greater separation is preferred.

## General Installation Instructions for Mounting Antennas

**CAUTION:** For outside installations, make sure you do not mount the antenna upside down or block the bottom of the antenna at the cable exit. The correct mounting position is with the cable pointing down (towards the ground) so that any moisture will drain through the antenna drain holes. The antenna ships with a yellow mounting instruction label temporarily attached to the antenna radome.

The following instructions are common to most mast mounted installations. For specific installation instructions for each antenna, see the antenna data-sheet and the router hardware installation guide.

1. Assemble your new antenna on the ground or a level surface at the installation site.
2. Connect its coaxial cable while you are on the ground and attach the antenna to the mast.
3. Ensure that the mast does not fall as you raise or remove it. Use a durable non-conductive rope secured at each two foot level as the mast is raised. Have an assistant tend the rope, ready to pull the mast clear of any hazards (such as power lines) should it begin to fall.
4. Use the mounting bracket provided with the antenna.
5. If the installation will use guy wires:
  - a. Install guy anchor bolts.
  - b. Estimate the length of guy wire and cut it before raising the mast.
  - c. Attach guy wires to a mast using guy rings.
6. Carefully connect the antenna and mast assembly to its mounting bracket and tighten the clamp bolts.

In the case of a a guyed (tall, thin mast) installation, you must have at least one assistant to hold the mast upright while the guy wires are attached and tightened to the anchor bolts.

7. Attach a “DANGER” label at eye level on the mast.
8. Install ground rods to remove any static electricity buildup and connect a ground wire to the mast and ground rod. Use ground rods designed for that purpose, not a spare piece of pipe.

## Unused Antenna Ports

Port plugs must be installed in any unused antenna ports.

The weatherproof caps on the connectors protect the router interior from environmental elements including water, heat, cold, and dust. They are installed on unused ports before the router is shipped.

When you install a new antenna in a port with an N-connector:

- Chassis-mounted antennas—Remove the weather proof cap before installing a chassis-mounted antenna.
- External antennas—Remove weatherproof cap, then connect the supported Cisco cable to the connector.

## Obtaining Technical Assistance

Cisco provides [Cisco.com](http://www.cisco.com) as a starting point for all technical assistance. Customers and partners can obtain documentation, troubleshooting tips, and sample configurations from online tools by using the Cisco Technical Assistance Center (TAC) Web Site. [Cisco.com](http://www.cisco.com) registered users have complete access to the technical support resources on the Cisco TAC Web Site.

[Cisco.com](http://www.cisco.com) is the foundation of a suite of interactive, network services that provides immediate, open access to Cisco information, networking solutions, services, programs, and resources at any time, from anywhere in the world.

[Cisco.com](http://www.cisco.com) is a highly integrated Internet application and a powerful, easy-to-use tool that provides a broad range of features and services to help you to:

- Streamline business processes and improve productivity
- Resolve technical issues with online support
- Download and test software packages
- Order Cisco learning materials and merchandise
- Register for online skill assessment, training, and certification programs

You can self-register on [Cisco.com](http://www.cisco.com) to obtain customized information and service. To access [Cisco.com](http://www.cisco.com), go to the following URL: <http://www.cisco.com>

## Additional Information

### Antenna Information

For additional documentation, see the following:

- For information about CGR modules, see:  
[www.cisco.com/go/cg-modules](http://www.cisco.com/go/cg-modules)
- For information on omnidirectional and directional antennas, see:

[http://www.cisco.com/en/US/tech/tk722/tk809/technologies\\_tech\\_note09186a00807f34d3.shtml](http://www.cisco.com/en/US/tech/tk722/tk809/technologies_tech_note09186a00807f34d3.shtml)

- Connected Grid Antennas Installation Guide

[http://www.cisco.com/c/en/us/td/docs/routers/connectedgrid/antennas/installing/cg\\_antenna\\_install\\_guide.html](http://www.cisco.com/c/en/us/td/docs/routers/connectedgrid/antennas/installing/cg_antenna_install_guide.html)

- Cisco IW3702 Access Point Getting Started Guide

[http://www.cisco.com/c/en/us/td/docs/wireless/outdoor\\_industrial/iw3702/hardware/install/guide/iw3702-gsg.html](http://www.cisco.com/c/en/us/td/docs/wireless/outdoor_industrial/iw3702/hardware/install/guide/iw3702-gsg.html)

## Product Specific Guides for Industrial Routers

- [Cisco 807 Industrial Integrated Services Routers](#)
- [Cisco 809 Industrial Integrated Services Routers](#)
- [Cisco 829 Industrial Integrated Services Routers](#)
- [Cisco IR1101 Industrial Integrated Services Routers](#)
- [Cisco 1120 Connected Grid Router](#)
- [Cisco 1240 Connected Grid Router](#)
- [Cisco 1000 Series Connected Grid Routers](#)
- [Cisco 500 Series WPAN Industrial Routers](#)
- [Cisco 900 Series Industrial Routers](#)
- [Cisco Industrial Wireless 3700 Series](#)

## Cisco General Information

- Access the most current Cisco documentation at:

<http://www.cisco.com/cisco/web/support/index.html>

- Access the Cisco website at:

<http://www.cisco.com>

- Access international Cisco web sites at:

[http://www.cisco.com/public/countries\\_languages.shtml](http://www.cisco.com/public/countries_languages.shtml)