Cisco Cellular and GPS 3-in-1 Vehicle Mount and Fixed Infrastructure Antenna (ANT-3-4G2G1-O)

This chapter contains the following:

Overview

This section describes the technical specifications and installation instructions for the Cisco Cellular 3-in-1 Vehicle Mount and Fixed Infrastructure Antenna, hereafter referred to as the antenna. The antenna is a three port antenna with two elements designed to cover the 698-960, 1448-1511 and 1710-2700 MHz cellular bands and one GPS element. The antenna can be mounted on the roof of a vehicle or fixed structure. The antenna meets or exceeds a variety of environmental ruggedization specifications for transportation applications.

Note Read the information in the safety section before installing or replacing antennas.

Antenna Features

The antenna features:

- Three antenna elements within one radome: two cellular and one GPS
- Outdoor and transportation ready
- Roof mount installation
- Dual cellular elements supporting 698-960, 1448-1511 and 1710-2700 MHz

- Omnidirectional, vertically polarized, MIMO
- Integrated 2 foot cables with TNC male connectors
- LTE elements are interchangeable, either one can be connected to Main or Aux

- Active GPS antenna has integrated 17 foot cable with SMA male connector

The antenna may require RF extension cables. A shorter 2 foot cable length was selected on LTE WAN to allow you to optimize LTE WAN performance and wireless range. If you require a cable length longer than 2 feet with the antenna, then select RF extension cables of appropriate length and type.

Thicker RF cables, such as LMR-600, LMR-400, or LMR-240 result in lower loss, higher RF performance and longer range of wireless network than thinner cables such as LMR-195, LMR-200. The trade-off is that thicker cables are more difficult to bend and route.

For optimal performance, the length of thin cables needs to be kept as short as possible. For example, 2 foot and 10 foot lengths of LMR-195 cable at 2700 MHz frequency would have losses of 0.5dB and 2.3dB respectively. In this example at 2700 MHz the area covered by the wireless system with the 10 foot cable is reduced by 34% compared to 2 foot cable. Radius of communication is degraded by 20% in 10 foot vs 2 foot case.

Antenna Model

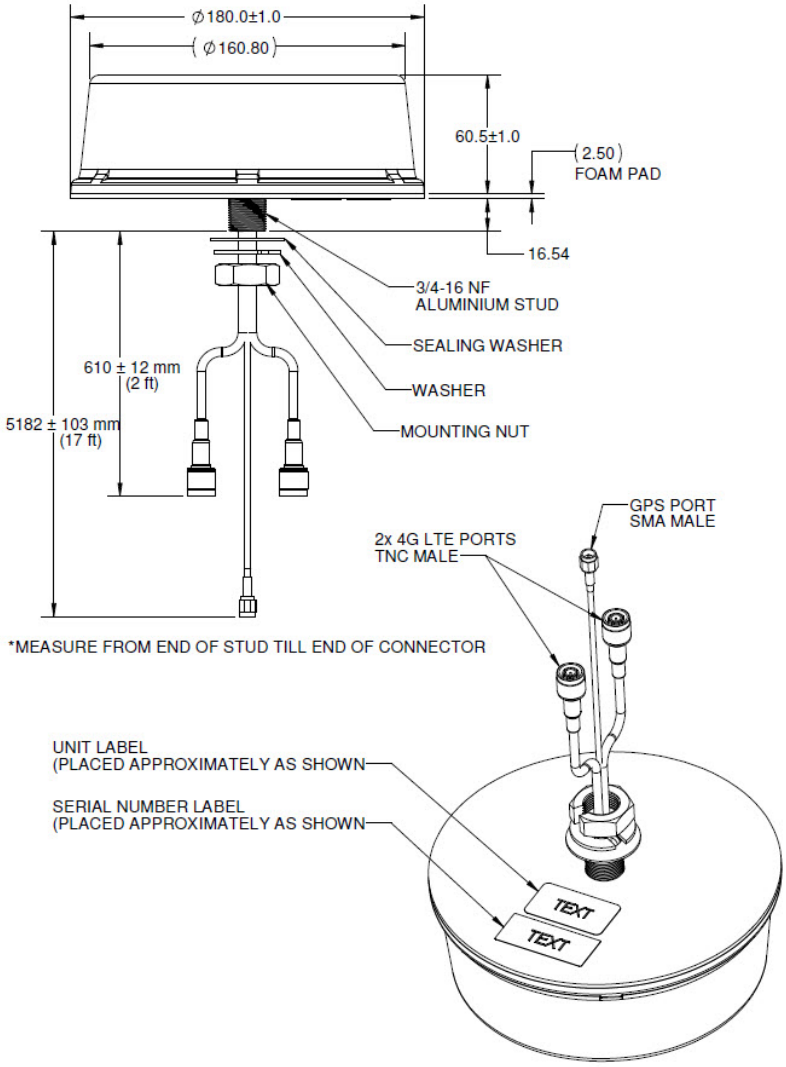
Antenna Model	Description
ANT-3-4G2G1-O	Cisco Cellular and GPS 3-in-1 Vehicle Mount and Fixed Infrastructure Antenna

Antenna Assembly

Figure 1: Cisco ANT-3-4G2G1-O Antenna

Note GPS cable (center) is 17 feet. It is shown shorter in the Figure for illustration purposes.

Figure 2: Cisco ANT-3-4G2G1-O Mechanical Details



Note All dimensions are in millimeters [inches] unless explicitly stated otherwise in the drawing.

Technical Specifications

The following tables detail the antenna's specifications.

Table 1: Radio Frequency Specifications

Specification	Description
Antenna type	Dual element, omnidirectional, 2x2 MIMO

Specification	Description
Frequency	698 to 960 MHz 1448 to1511 MHz 1710 to 2700 MHz
Nominal impedance	50 ohms
VSWR	2.1:1 maximum at 698 to 960 MHz 2.4:1 maximum at 1448 MHz edge, 2.2:1 typical 1455 to 1511 MHz 2.0:1 maximum at 1710 to 2700 MHz
Gain	The gain values (dBi) for each frequency range are: 2.6 dBi typical, 3.8 dBi maximum-698 to 960 MHz 3.8 dBi typical, 4.3 dBi maximum-1448 to 1551 MHz 4.6 dBi typical, 5.5 dBi maximum-1710 to 2700 MHz
Isolation cellular to cellular (Main to Aux)	14 dB minimum-698 to 960 MHz 20 dB minimum-1448 to 1551 MHz 20 dB minimum-1710 to 2700 MHz
Polarization	Linear, Vertical
Efficiency	Antennas were designed and tested to high RF efficiency in all supported cellular bands. Detailed technical specifications can be obtained through your Cisco authorized partner or Cisco account representative.
Radiation Pattern	Omnidirectional

Table 2: GPS Antenna Radio Frequency Specifications

Specification	Description
Antenna type	Patch
Frequency	1575.42 ± 1 MHz (GPS L1)
Nominal impedance	50 ohms
VSWR	2.0:1 maximum
Amplifier Gain	27 dB
DC current	20 mA maximum
DC voltage	2.7 to 12 V
Isolation, cellular to GPS	10 dB minimum. 1574.42 to 1576.42 MHz. Cellular coexistence tested over multiple bands, GPS includes coexistence filters.

Specification	Description
Polarization	RHCP
Radiation pattern	Hemispherical

Table 3: Environmental Specifications

Specification	Description
Operating temperature range	-40 to 158°F (-40 to 70°C)
Storage temperature range	-40 to 185°F (-40 to 85°C)
Altitude	15,000 feet. (4.5 km)
Humidity	5 to 95%
Vibration, Shock, Thermal, Corrosion, Seismic	Outdoor IP67. Tested to a variety of appropriate industrial, vehicular, transportation, and mil-spec standards.

Table 4: Mechanical Specifications

Specification	Description
Mount style	Roof mount, bulkhead
Location	Outdoor
Connector	Cellular – TNC male GPS – SMA male
Cable type	Cellular – RG-58 GPS – RG-174
Cable length	Cellular – 2 foot. (61 cm) GPS – 17 foot. (518 cm)
Dimensions	7.1 in. (18.0 cm) diameter, 2.4 in. (6.05 cm) height
Weight	1.48 lbs (0.67 kg)
IP rating	IP67
Radome	Polycarbonate, UV resistant, black
Material substance compliance	ROHS compliant

Table 5: Power Specifications

Specification	Description
Nominal Impedance	50 ohms
Maximum input power per port	5 watts

Antenna Radiation Patterns

In the following graphics of the radiation patterns, the blue line denotes Port 1 and the red line denotes Port 2.

Figure 3: 698 MHz Cellular Antenna Radiation Patterns

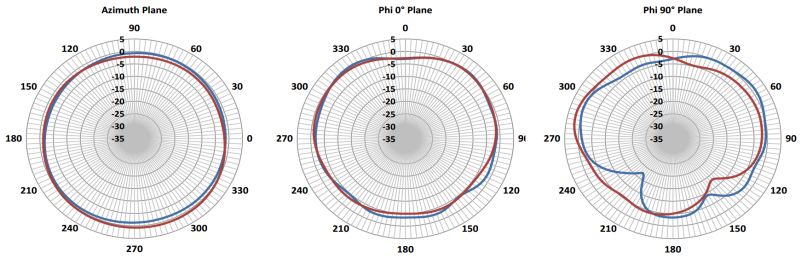


Figure 4: 880 MHz Cellular Antenna Radiation Patterns

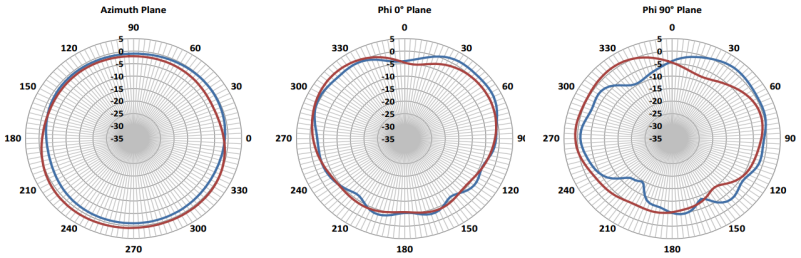


Figure 5: 960 MHz Cellular Antenna Radiation Patterns

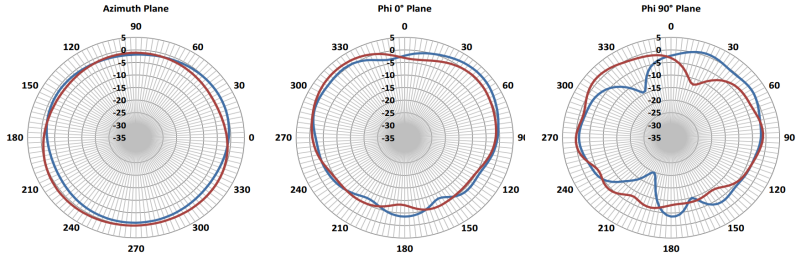


Figure 6: 1470 MHz Cellular Antenna Radiation Patterns

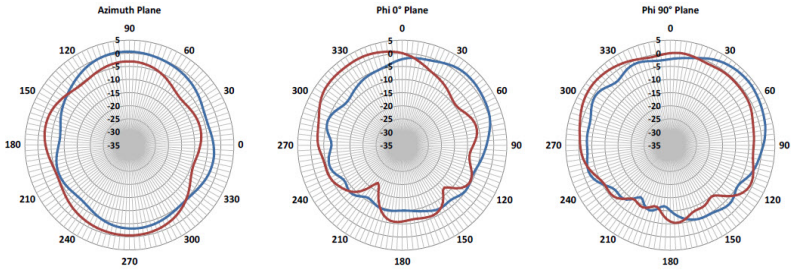


Figure 7: 1710 MHz Cellular Antenna Radiation Patterns

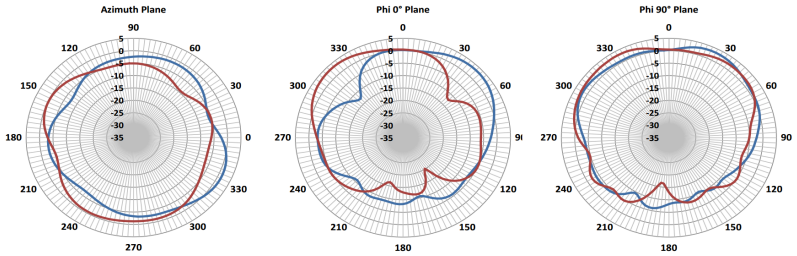


Figure 8: 2170 MHz Cellular Antenna Radiation Patterns

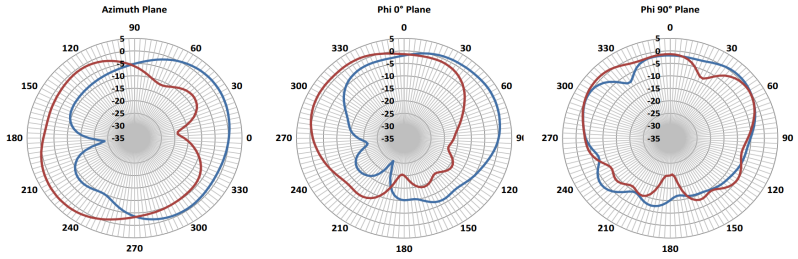


Figure 9: 2700 MHz Cellular Antenna Radiation Patterns

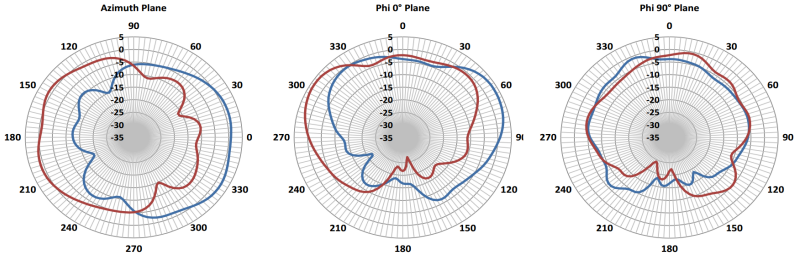
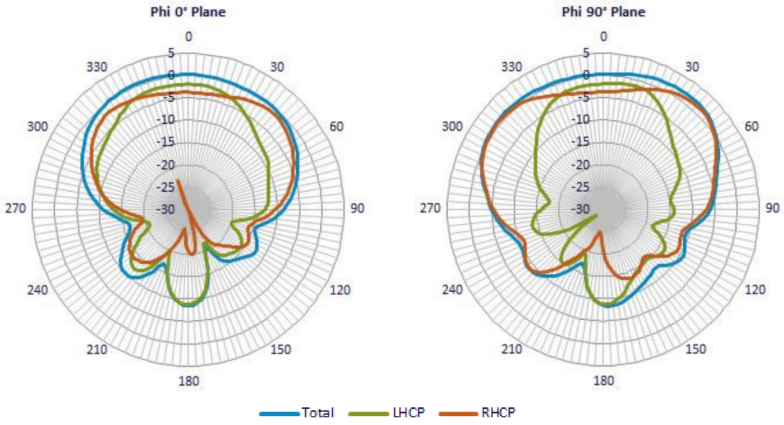


Figure 10: 1575 MHz GPS Antenna Radiation Patterns



General Safety Precautions

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. Use the statement number provided at the end of each warning to locate its translation in the translated safety warnings that accompanied this device. **Statement 1071**

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

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**

Warning In order to comply with FCC radio frequency (RF) exposure limits, antennas should be located at a minimum of 7.9 inches (20 cm) or more from the body of all persons. **Statement 332**

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.

Installing the Antenna

The antenna installation includes the following procedures:

Contents of the Antenna Kit

The antenna kit contains:

- 1 x Cisco ANT-3-4G2G1-O antenna

Tools and Equipment Required

In addition to the parts included in the antenna kit described in the previous section , you must provide the following tool to install the antenna on the router:

- Open-ended wrench
- Electric drill

Note This list does not include the tools and equipment required to assemble and erect the tower, mast, or other structure you intend to mount your antenna on.

Mounting the Antenna

Note A clean, flat surface at least 20 x 20 cm (8 x 8 in.) in area is required for mounting the antenna.

Follow these instructions to mount the antenna:

1. Mark the desired location where you plan to mount the antenna and create a hole through the surface The diameter of the hole must be at least 0.75 in. (1.91 cm).
2. Thread the cables through the hole and insert the aluminum stud on the underside of the antenna into the hole. Ensure that the foam gasket on the underside of the antenna sits flush against the mounting surface.
3. Inside the vehicle, place the rubber sealing washer around the stud. Then place the metal washer and the metal nut onto the stud. Tighten the nut.

Connecting the Antenna to the Router

To attach the router-end of the cable to your router, please see the Hardware Installation Guide for your particular device.

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 cable length or run, the greater the loss).

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