



Cisco Vandal Resistant Omni-directional Dome Antenna for 860-928 MHz ISM, WPAN and LoRaWAN (ANT-UN-MP-OUT-QMA)

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Overview

This document describes the Vandal Resistant Omni-directional Dome Antenna for 860-928 MHz ISM, WPAN and LoRaWAN routers. In addition, this document provides the antenna specifications and mounting instructions for the antenna.



Caution Read the information in the Safety Warnings before installing or replacing antennas.

Technical Specifications

This section covers the following topics:

Figure 1: Vandal Resistant Omni-directional Dome Antenna



Specifications

The following tables provide the Mechanical, Environmental, and Other Specifications.



Note While many antenna datasheets emphasize peak gain, in most outdoor applications gain at horizon is much more important. For low profile antennas from any vendor, it is important to evaluate gain at horizon prior to selecting the antenna for deployment.

Table 1: RF Specifications 863-876 MHz ETSI

Specification	Decription	
(See Note 1)	No Ground Plane	With 2 foot diameter Ground Plane
Peak Gain (dBi) Typical(See Note 2)	+1.7	+3
Gain on Horizon (dBi) Average	+0.1	-1.2
Gain on Horizon (dBi) Minimum(See Note 3)	-2.0	-2.0
Efficiency	65%	76%
VSWR (Worst Case)	1.7:1	1.2:1
Elevation 3 dB Beamwidth (HPBW), degrees	65	66
Azimuth 3 dB Beamwidth (HPBW), degrees	360	
Nominal Impedance, ohms	50 ohms	
Polarization	Vertical	
RF Cable Length (ft)	5 foot (See Note 4)	
RF Connector	QMA (male), right angle	
Max RF Power (at 25°C), Watts	10 Watts	

Table 2: RF Specifications 902-928 MHz ISM

Specification	Decription	
(See Note 1)	No Ground Plane	With 2 foot diameter Ground Plane
Peak Gain (dBi) Typical(See Note 2)	+1.5	+1.9
Gain on Horizon (dBi) Average	+0.6	-1.4
Gain on Horizon (dBi) Minimum(See Note 3)	-2.0	-3.5
Efficiency	67%	69%
VSWR (Worst Case)	1.5:1	1.5:1
Elevation 3 dB Beamwidth (HPBW), degrees	75	72

Specifications

Specification	Description
Azimuth 3 dB Beamwidth (HPBW), degrees	360
Nominal Impedance, ohms	50 ohms
Polarization	Vertical
RF Cable Length (ft)	5 foot (See Note 4)
RF Connector	QMA (male), right angle
Max RF Power (at 25°C), Watts	10 Watts

Note 1: Antenna has been designed and tested to have excellent performance with and without a ground plane over the full 860-928 MHz frequency range. It can be installed on a metallic or non-metallic surface. RF parameters in the table are provided for both cases of ground plane vs no ground plane.

Note 2: Peak gain of monopole antennas installed on a finite size ground plane will not be at horizon, and will be elevated above the horizon. In contrast, typical terrestrial radio deployments with omni-directional antennas involve communications near the horizon. Therefore, in the most common deployment scenarios the gain at horizon is a more useful parameter than peak gain.

Note 3: The minimum horizon gain specification shows whether an antenna has radiation nulls in azimuth. Nulls are directions in which the antenna has poor gain (e.g. -6 dBI, -10 dBI, -20 dBI or worse), and nulls often result in severe transmit and receive signal loss in the direction of the null. The ANT-UN-MP-OUT-QMA antenna has a smooth horizon or azimuth radiation pattern, and does not have azimuth pattern nulls. When evaluating omni-directional antennas, it is important to ensure that the antenna pattern does not have nulls in azimuth, to ensure good transmission and reception signal quality in all directions at horizon.

Note 4: All provided RF specifications include the RF loss of the integrated 5 foot cable.

Table 3: Mechanical, Environmental, and Other Specifications

Specification	Description
Anti-Static Protection	DC Grounded(See Note 1)
Antenna Dimensions (Diameter x Height), mm, inch	147mm x 47mm, 5.8"x1.85"
Weight, kg (lbs)	0.6kg (1.35 lb)
Antenna Radome Color	Electrical utility box green color
UV resistance	UV resistant, UV stable material
Wind Operational & Survival	150mph minimum
Operating Temperature	-40 to +70C (-40 to +158F)
Storage Temperature	-40 to +85C (-40 to +185F)
Ingression Protection	IP67 when properly mounted to a flat surface
Material Substance Compliance	ROHS

Specification	Description
Impact Resistance	Higher than IK10 or IK10+
Environmental Testing	Antenna passed extensive environmental and mechanical tests appropriate for deployment on an outdoor electrical utility box.

Note 1: Antenna data sheets often claim lightning protection, while in reality only providing a DC ground path for ESD protection. Cisco recommends use of a dedicated, high quality lightning arrestor for all antennas potentially exposed to lightning strikes.

Vandal Resistance

Antenna has been specifically designed to withstand opportunistic direct impacts from all angles, from more commonly carried vandalism objects or tools, such as aluminum or wooden baseball bats, skateboards, scooters, small knives and similar objects, assuming proper installation of the antenna on a flat surface.

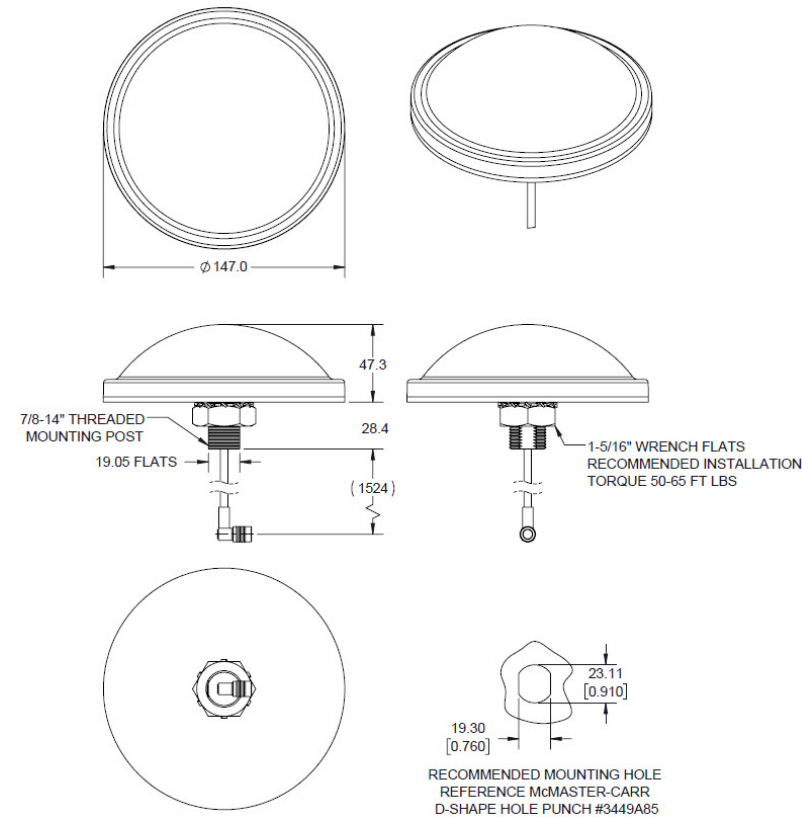
Antenna is not resistant to damage caused by intentional or unintentional tampering with professional tools used in isolation or in combination, such as long (e.g. 40") steel crowbars or pry bars, power drills, welding torches, axes, chainsaws, heavy duty sledge hammers and similar.

Additionally, while the antenna is resistant to occasional, opportunistic, impulsive vandalism with common items - it should be understood that a persistent, skilled and focused individual with the right common tools and given enough time will be able to damage or tamper with the antenna.

Dimensions

The following graphic shows the Antenna Dimensions.

Figure 2: Dimensions



Note Antenna Dimensions are shown in millimeters, except where explicitly specified in inches denoted by " or [].

Antenna Radiation Patterns

The following sequence of illustrations show the different antenna radiation patterns.



Note The pattern plots that follow show measurements for two different samples of the antenna, labeled S1 (Sample 1) and S2 (Sample 2).

Figure 3: 863 MHz Radiation Pattern - No Ground Plane

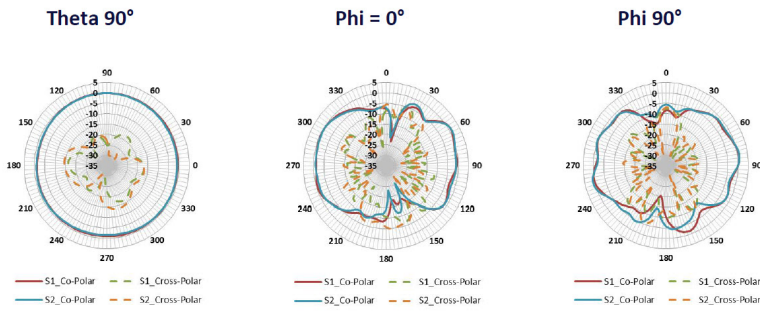


Figure 4: 863 MHz Radiation Pattern - With Ground Plane

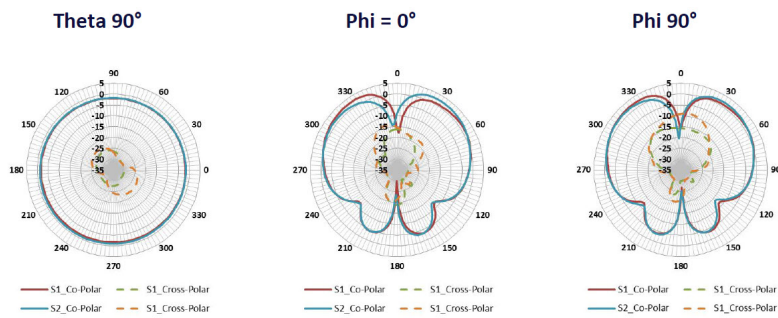


Figure 5: 876 MHz Radiation Pattern -No Ground Plane

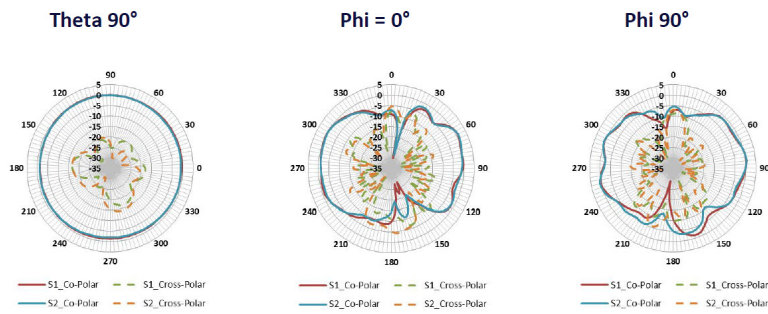


Figure 6: 876 MHz Radiation Pattern -With Ground Plane

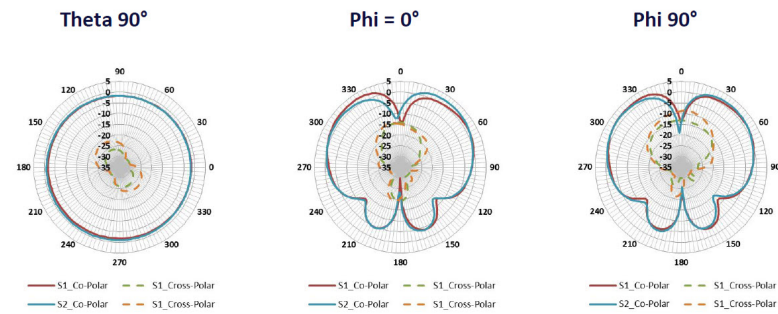


Figure 7: 902 MHz Radiation Pattern - No Ground Plane

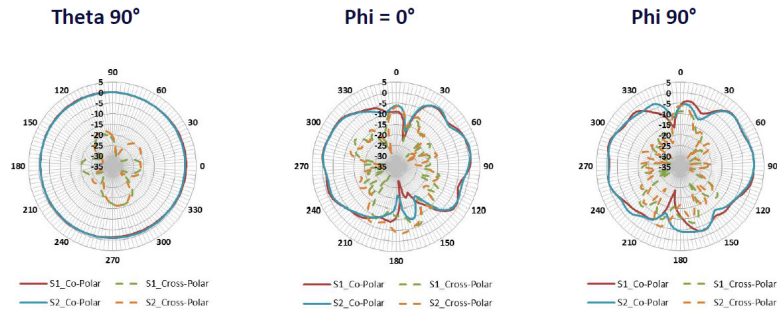


Figure 8: 902 MHz Radiation Pattern - With Ground Plane

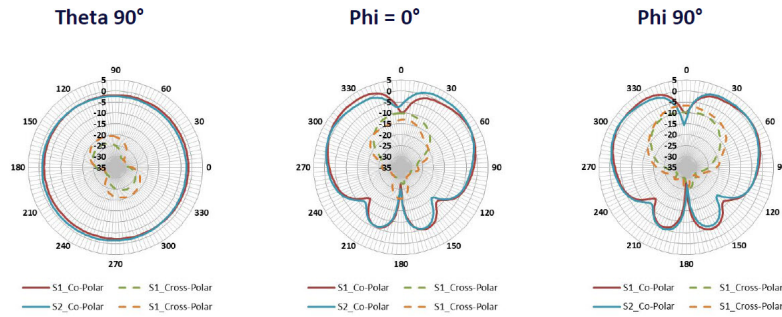


Figure 9: 915 MHz Radiation Pattern - No Ground Plane

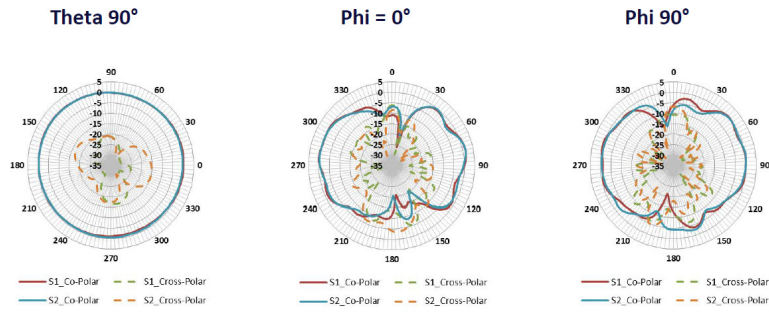


Figure 10: 915 MHz Radiation Pattern - With Ground Plane

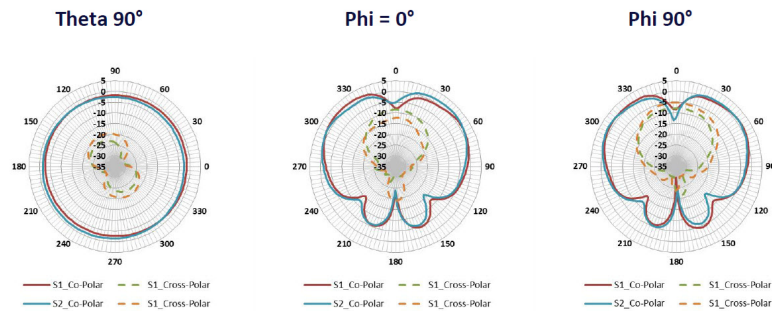


Figure 11: 928 MHz Radiation Pattern - No Ground Plane

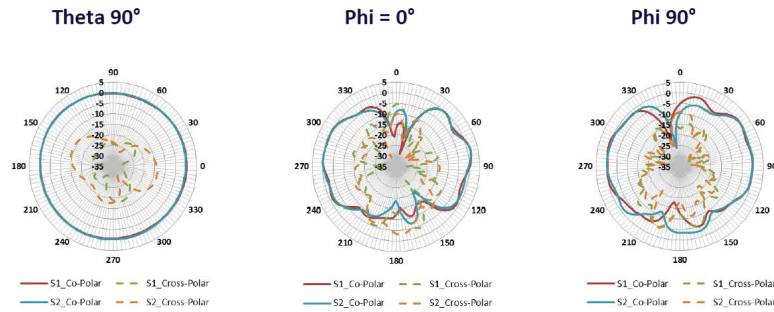
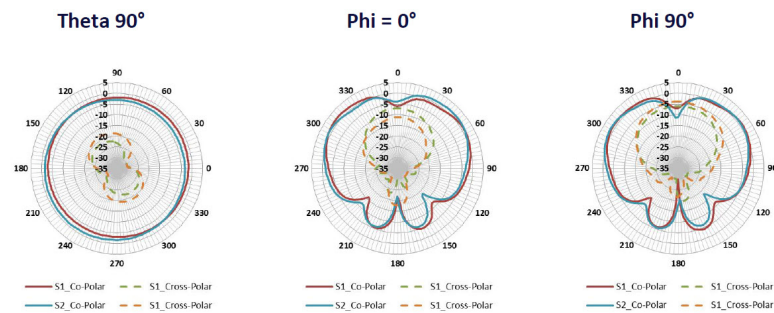


Figure 12: 928 MHz Radiation Pattern - With Ground Plane



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.

Antenna Installation

The antenna installation includes the following procedures:

Tools and Equipment Required

In addition to the parts included in the antenna kit, you must provide the following tools to install the antenna on the router:

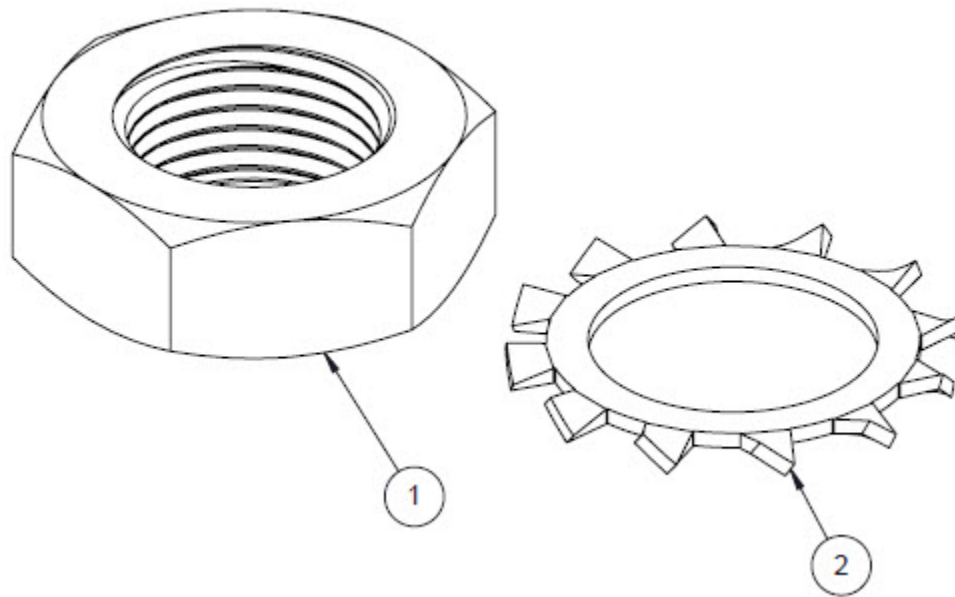
- 1-5/16" (1.3125"), or 33.34mm open-end wrench. Recommended torque is 50-65 ft-lb or 68-88 Nm.
- McMaster Carr Double-D Hole Punch P/N 3449A85 or equivalent. Alternatively, you can drill or use a circular hole punch to create a 0.91" diameter hole.

Mounting Components

Table 4: Antenna Mounting Components

Item Number	Description	Quantity
1	HEX NUT, THIN, 7/8-14, SS, PA	1
2	WASHER, EXT SERRATED, 7/8", SS, PA	1

Figure 13: Mounting Nut and Washer



Mounting the Antenna

A clean, flat surface at least 15 x 15 cm (6 x 6 in.) in area is required for mounting the antenna. Antenna mounting stud has a Double-D cross-section compatible with the [McMaster Carr Double-D Hole Punch P/N 3449A85](#). The Double-D prevents antenna from rotating while the mounting nut is torqued. It also provides additional vandal resistance by not allowing the antenna to rotate around the axis.

Follow these instructions to mount the antenna. See the following graphic for a conceptual mounting illustration.

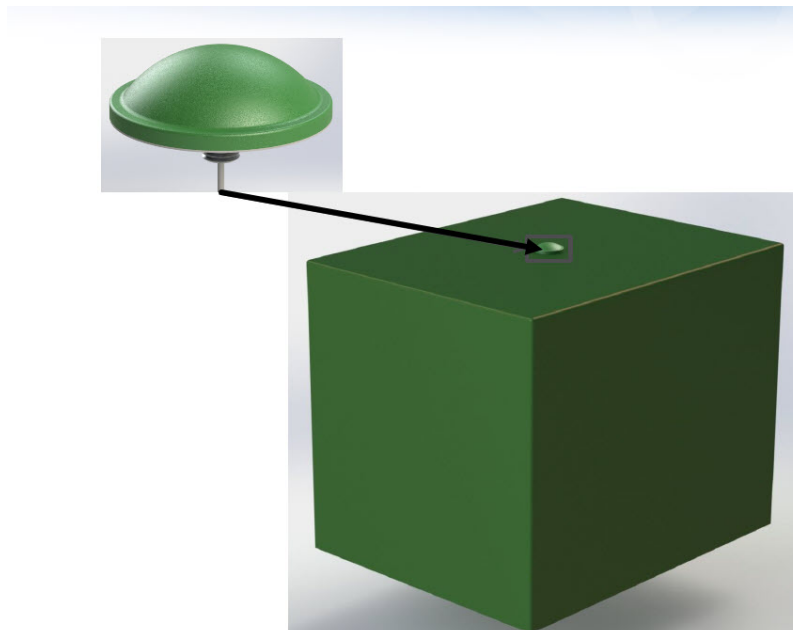
1. Mark the desired location where you plan to mount the antenna, and create a hole through the surface using a McMaster Carr Double-D Hole Punch P/N 3449A85, or equivalent punch tool. Alternatively, it is possible to drill a circular hole 0.91" in diameter.

2. Thread the cables through the hole and insert the Double-D mounting stud into the hole. Ensure that the gasket on the underside of the antenna sits flush against the mounting surface.
3. Place the metal washer and the metal nut onto the stud. Tighten the nut to a torque of 50-65 ft-lb or 68-88 Nm.

The following graphic shows the vandal resistant antenna mounted to a matching color outdoor electrical utility enclosure of a simple rectangular box shape. Many outdoor enclosures come in much more complicated shapes, with a number of rectangular boxes and compartments joined together. In general, it is recommended that the antenna be installed on the highest surface of the electrical enclosure box. In this manner, the radiation in the upper hemisphere is not obstructed by other nearby geometrical features of the enclosure.

In many deployments the nodes need to communicate to other nodes located near horizon. Placing the antenna on the highest enclosure surface is a good way to ensure that horizon communication is not obstructed. If it is not possible or feasible to place the antenna on the highest surface of the enclosure, please contact your Cisco account representative for support or 3rd party qualified RF (radio-frequency) professional with experience in antenna installation and siting.

Figure 14: Antenna Placement on Electrical Enclosures



Using the McMaster Carr Stud Driven Hole Punch

This section describes the McMaster Carr Stud Driven Hole Punch for 0.76" Long, 0.91" Wide Double-D Shape. Information in this section is adapted by Cisco and published with written permission from McMaster Carr Supply Company. In duplicating the information Cisco seeks to achieve an antenna datasheet that is standalone, and seeks to ensure that if the 3449A85 McMaster product is changed or discontinued, a copy of the original information is available with the ANT-UN-MP-OUT-QMA antenna datasheet.

Note: Cisco is providing 3449A85 information for reference purposes only, and does not sell, distribute or provide technical support for the 3449A85 punch tool. For technical support and the most up to date information please contact McMaster Carr, and reference the information located in the [McMaster Carr 3449A8 datasheet](#)

Also known as chassis punches, these tools cut through sheet metal to create holes for installing switches and instruments. They have an automatic centering design for accurate alignment. Drill pilot holes slightly larger than the size of the stud. All punches can be used with a manual wrench or hydraulic driver, but require a stud adapter (sold separately) when used with a hydraulic driver.

Figure 15: McMaster Carr Stud Driven Hole Punch



Table 5: Tool Details

Punching Action	Stud Driven
Shape	Double-D Shape
Hole Length	0.76"
Hole Width	0.91
Maximum Steel Thickness	1/16"
Tool Material	Steel
For Use On	Aluminum, Brass, Copper, Steel
Pilot Hole Required	Yes
Kit Includes	Punch, Die, Stud, Nut
Individual/Set	Individual
Related Products	Hydraulic Driver Stud Adapter 3449A172 11-Ton Straight Hydraulic Driver 3448A1 8-Ton Straight Hydraulic Driver 3484A15 8-Ton Right-Angle Hydraulic Driver 3490A21

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