



Cisco LoRaWAN Interface Module Hardware Installation Guide

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Preface

Audience

This guide is for networking or computer technicians responsible for installing the Cisco LoRaWAN Interface Modules. We assume that you are familiar with the concepts and terminology of Ethernet and local area networking.

Purpose

This guide documents the hardware features of the Cisco LoRaWAN Interface Modules. It describes the physical and performance characteristics of the modules, explains how to install a Cisco LoRaWAN Interface Module, and provides troubleshooting information.

For configuration information, see the Cisco LoRaWAN Interface Module documentation on Cisco.com. For system requirements, important notes, limitations, open and resolved bugs, and documentation updates, see the product release notes on Cisco.com.

Conventions

This document uses the following conventions and symbols for notes, cautions, and warnings.

Note: Means *reader take note*. Notes contain helpful suggestions or references to materials not contained in this manual.

Caution: Means *reader be careful*. In this situation, you might do something that could result in equipment damage or loss of data.

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

Related Publications

Before installing, configuring, or upgrading the Cisco LoRaWAN Interface Module, see the release notes on Cisco.com for the latest information.

These documents provide complete information about the Cisco LoRaWAN Interface Module and are available on Cisco.com:

- *Getting Started and Product Document of Compliance for the Cisco LoRaWAN Interface Module*
- *Release Notes for IoT Field Network Director, Release 3.1*
- *Cisco IOS Release 15.6(3)M - Release Notes for Cisco IR800 Industrial Integrated Services Routers and Cisco 1000 Series Connected Grid Routers*
- *Cisco IR800 Integrated Services Router Software Configuration Guide*
- *Cisco IoT Field Network Director User Guide, Release 3.1.x*

Obtaining Documentation and Submitting a Service Request

For information on obtaining documentation, using the Cisco Bug Search Tool (BST), submitting a service request, and gathering additional information, see [What's New in Cisco Product Documentation](#).

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Overview of the Cisco LoRaWAN Interface Module

This chapter provides an overview of the Cisco LoRaWAN Interface Module and contains the following sections:

- [About Cisco LoRaWAN Interface Modules, page 7](#)
- [Hardware Models, page 7](#)
- [Hardware Features, page 8](#)

About Cisco LoRaWAN Interface Modules

Long Range Wide Area Network (LoRaWAN) is a Low Power Wide Area Network (LPWAN) specification intended for wireless battery operated things in regional, national or global network.

LoRaWAN network architecture is typically laid out in a star-of-stars topology in which gateways are transparent bridges relaying messages between end-devices and a central network server in the back end. Gateways are connected to the network server via standard IP connections while end-devices use single-hop wireless communication to one or many gateways.

A typical LoRa end-to-end infrastructure comprises the following four layers:

- **LoRa Endpoint**—The sensor to equip Semtech LoRa RF module inside and run LoRaWAN protocol to communicate to backend platform.
- **LoRa Gateway**—The concentrator tunneling the LoRaWAN MAC frames between an endpoint and a Network Server platform.
- **LoRa Network Server**—The central component that handles the LoRaWAN MAC traffic, performing endpoint and gateway management, and LoRaWAN MAC layer security and other functions.
- **Application Server**—Data security and application enablement.

The Cisco LoRaWAN Interface Module is connected to the Cisco 800 Series Industrial Integrated Services Router via an Ethernet cable with PoE+, to perform as a carrier-grade LoRa gateway.

Hardware Models

[Table 1](#) shows the model numbers (or part numbers) and descriptions for the Cisco LoRaWAN Interface Modules.

Table 1 Cisco LoRaWAN Interface Module Model Numbers and Descriptions

Model	Description
IXM-LPWA-800-16-K9	Cisco interface module for LoRaWAN, IoT extension module series, radio spectrum from 863-870 MHz, 16 LoRa channels, IP67
IXM-LPWA-900-16-K9	Cisco interface module for LoRaWAN, IoT extension module series, radio spectrum from 902-928 MHz, 16 LoRa channels, IP67

Hardware Features

This section describes the following hardware features of the Cisco LoRaWAN Interface Module models:

- [Platform Features, page 8](#)
- [Connectors, page 8](#)
- [Antenna Port Locations, page 10](#)
- [Multiple Power Sources, page 10](#)
- [Ethernet \(PoE+\) Ports, page 11](#)
- [LEDs, page 12](#)
- [Optional Hardware, page 12](#)
- [Optional Hardware, page 12](#)

Platform Features

The following lists the hardware platform features for the Cisco LoRaWAN Interface Module:

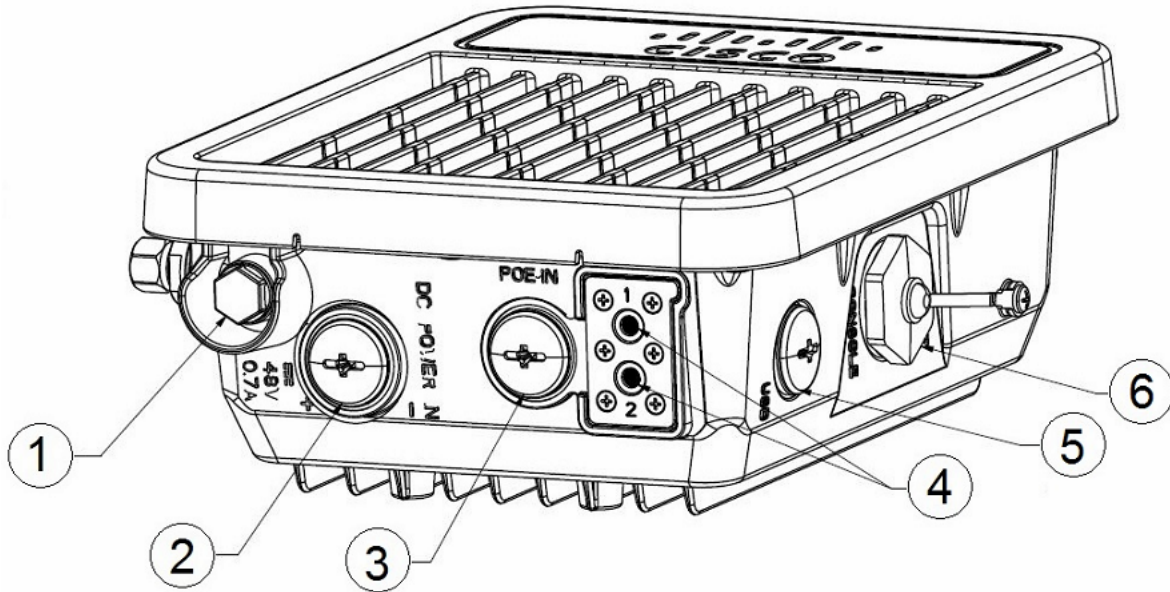
- CPU 1.33 GHz, single core
- 1GB DDR4 RAM
- 4GB flash memory
- One RJ45 console port, for manufacturing use only
- One 10/100 Fast Ethernet RJ45 port, PoE+PD supported
- One USB 2.0 Type A external port
- External Reset button
- External DC-In power port, 0.7A, 48V
- Two extendable RF antenna N-type connector
- One extendable GPS antenna TNC connector
- Class A EMC compliance
- Wall/pole mount

Connectors

[Figure 1 on page 9](#) and [Figure 2 on page 9](#) show the Cisco LoRaWAN Interface Module connectors.

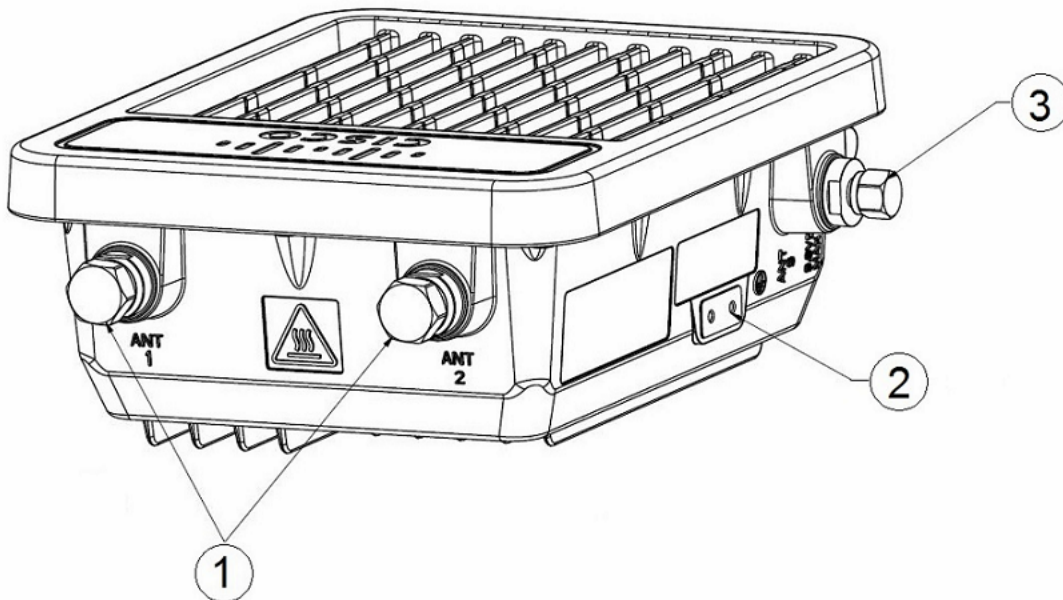
The illustrations in this document show all available connections for the Cisco LoRaWAN Interface Module. Unused connections are capped with a connector plug to ensure the watertight integrity of the Cisco LoRaWAN Interface Module.

Figure 1 Cisco LoRaWAN Interface Module Bottom and Right Panels



1	Pressure vent	4	LED indicators
2	DC power port	5	USB port
3	PoE-IN port	6	Console port and Reset button

Figure 2 Cisco LoRaWAN Interface Module Top and Left Panels

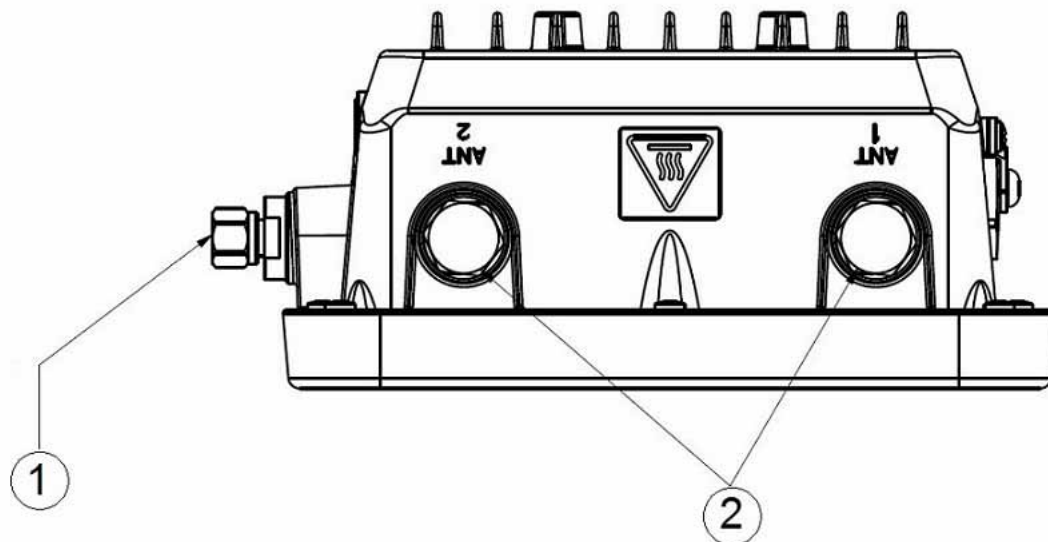


1	LoRa antenna ports	2	Ground lug location
3	GPS antenna port		

Antenna Port Locations

Figure 3 on page 10 shows the antenna port locations for the Cisco LoRaWAN Interface Module. The ports used depend on the optional antennas ordered.

Figure 3 Antenna Connectors



1	TNC connector for GPS antenna	2	N-Type connectors for LoRa antennas
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Radio Operation

Warning: In order to comply with radio frequency (RF) exposure limits, the antennas should be placed no less than 23 cm (9") from your body or nearby persons. Statement 339

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, because 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 Electric Code, Article 180, Canada: Canadian Electrical Code, Section 54). Statement 1052

Warning: Only trained and qualified personnel should be allowed to install, replace, or service this equipment. Statement 1030

The Cisco LoRaWAN Interface Module is equipped with two N-type radio frequency (RF) connectors (antenna ports 1 and 2) on the top of the unit for LoRa antennas, and one TNC connector on the left of the unit for the GPS antenna, as shown in Figure 3 on page 10. If the antennas are remotely located, an appropriate low-loss RF coax cable should be used. The LoRa antennas should be installed closely to the Cisco LoRaWAN Interface Module to reduce the signal strength loss on the feed cable as much as possible.

Note: The antenna port caps must be removed before using, but the unused ports should remain capped to provide an IP67 seal.

Multiple Power Sources

The Cisco LoRaWAN Interface Module supports these power sources:

Hardware Features

- Power-over-Ethernet (PoE+, 30W)
- DC power—48 VDC

Warning: Installation of the equipment must comply with local and national electrical codes. Statement 1074

Warning: This equipment must be externally grounded using a customer-supplied ground wire before power is applied. Contact the appropriate electrical inspection authority or an electrician if you are uncertain that suitable grounding is available. Statement 366

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

Warning: Connect the unit only to DC power source that complies with the safety extra-low voltage (SELV) requirements in IEC 60950 based safety standards. Statement 1033

Warning: To reduce the risk of fire, use only No. 26 AWG or larger telecommunication line cord. Statement 1023

Caution: Do not place the power injector in an unprotected outdoor environment because water could get into the power injector and cause a short circuit and possible fire.

Ethernet (PoE+) Ports

The Cisco LoRaWAN Interface Module supports an Ethernet uplink port (PoE-In). The RJ-45 connector (with weatherproofing) links the device to the 10BASE-T or 100BASE-T network. The Ethernet cable is used to send and receive Ethernet data and to optionally supply inline 54-VDC power from the power injector.

The Ethernet cable must be a shielded outdoor rated Category 5 (CAT5) or better cable. The Cisco LoRaWAN Interface Module senses the Ethernet and power signals and automatically switches internal circuitry to match the cable connections.

Reset Button

A Cisco LoRaWAN Interface Module that has already been configured can be reset to the manufacturing configuration by pressing the **Reset** button located at the side of the CONSOLE port on the device.

If you press the **Reset** button and release it in less than 5 seconds, the system will reboot immediately with the last saved configuration.

If you press the **Reset** button and release it after more than 5 seconds, the system will reboot immediately and restore to the factory default.

LEDs

This section describes the LEDs for the Cisco LoRaWAN Interface Module. See [Figure 1 on page 9](#) for the locations of LED indicators.

Table 2 LED Definitions

LED	LED Color	Definition
System LED (LED 1)	Off	Power off or under bootloader mode
	Blinking green	Under the starting kernel (bring up phase)
	Solid green	Normal operation state
	Blinking red	<ul style="list-style-type: none"> ■ Failed to get IP address ■ Register to IR800 failed
	Solid red	<ul style="list-style-type: none"> ■ ACT2 check failed ■ Lost connection to IR800 ■ CPU usage high ■ Temperature high ■ Flash usage high ■ Cover open
Reserved LED (LED 2)	Reserved for future use.	–

Optional Hardware

Depending on what you ordered, the following optional Cisco LoRaWAN Interface Module hardware may be part of your shipment:

- Wall/pole mount kit (AIR-ACC1530-PMK1=)
- DC-IN power adapter jack plug (PLG-PWRJCK=)
- Grounding lug
- LoRa Antenna
 - Omni-directional antenna (ANT-LPWA-DB-O-N=)
 - Antennas lightning arrestor (ACC-LA-H-NM-NF=)
 - 10-ft low-loss cable assembly with N type connector (AIR-CAB010LL-N=)
- GPS Antenna
 - Outdoor GPS antenna with integrated 15-ft cable (ANT-GPS-OUT-TNC=)
 - Outdoor GPS antenna lightning arrestor (ACC-LA-G-TM-TF=)

Note: For more detailed information about the accessories, see the data sheet of Cisco LoRaWAN Interface Module.



Installing the Cisco LoRaWAN Interface Module

This chapter describes how to install the Cisco LoRaWAN Interface Module and contains the following sections:

- [Unpacking the Device, page 13](#)
- [Tools and Hardware, page 14](#)
- [Warnings, page 15](#)
- [Safety Information, page 16](#)
- [Installation Guidelines, page 17](#)
- [Mounting the Device, page 18](#)
- [Installing Antennas, page 22](#)
- [Grounding the Device, page 28](#)
- [Powering the Cisco LoRaWAN Interface Module, page 29](#)

Caution: The Cisco LoRaWAN Interface Module must be installed by professional networking or computer technicians.

Note: For configuration information, refer to the Configuring Virtual-LPWA section of the *Cisco IR800 Integrated Services Router Software Configuration Guide* on Cisco.com:

<http://www.cisco.com/c/en/us/support/routers/interface-module-lorawan/products-installation-and-configuration-guides-list.html>

Unpacking the Device

Follow these steps to unpack the box:

1. Open the shipping container and carefully remove the contents.
2. Return all packing materials to the shipping container and save it.
3. Ensure that all items listed in the [Package Contents](#) are included in the shipment. Check each item for damage. If any item is damaged or missing, notify your authorized Cisco sales representative.

Package Contents

Each Cisco LoRaWAN Interface Module package contains the following items:

- One Cisco LoRaWAN Interface Module (IXM-LPWA-800-16-K9 or IXM-LPWA-900-16-K9)
- Getting Started and Product Document of Compliance for the Cisco LoRaWAN Interface Module (Part Number 78-100921-01)

Tools and Hardware

The tools and hardware used to install the Cisco LoRaWAN Interface Module are described in:

- [Optional Tools and Hardware, page 14](#)
- [Optional Tools and Hardware That You Supply, page 14](#)

Optional Tools and Hardware

Depending on what you ordered, the following optional equipment may be part of your shipment:

- Wall/pole mount kit (AIR-ACC1530-PMK1=)
- DC-IN power adapter jack plug (PLG-PWRJCK=)
- Grounding lug
- LoRa Antenna
 - Omni-directional antenna (ANT-LPWA-DB-O-N=)
 - Antennas lightning arrester (ACC-LA-H-NM-NF=)
 - 10-ft low-loss cable assembly with N type connector (AIR-CAB010LL-N=)
- GPS Antenna
 - Outdoor GPS antenna with integrated 15-ft cable (ANT-GPS-OUT-TNC=)
 - Outdoor GPS antenna lightning arrester (ACC-LA-G-TM-TF=)

Optional Tools and Hardware That You Supply

Tools and materials that are user-supplied are:

- Ground lug crimping tool (Panduit CT-720 with CD-720-1 die)
- 6-AWG copper ground wire
- 10 mm open end or box wrench
- 13 mm box-end wrench or socket set, or US standard socket (for example, 1/2")
- Adjustable wrench with opening up to 33 mm and 28 mm socket
- Large flat or Phillips screw driver (for port plugs)
- Small flat screwdriver for DC power connector
- Optional shielded outdoor-rated Ethernet (CAT5 or better) cable with 4.3 to 6.5mm (0.17 to 0.25 inch) diameter to fit the cable gland, for the IP67 and also to allow strength relief on the cable connector inside
- Optional Ethernet RJ-45 connector and installation tool
- Optional shielded outdoor-rated DC power cable with 16 AWG to 22 AWG (1.29 to 0.65mm diameter), to match the DC power adapter jack plug (PLG-PWRJCK=)
- Optional ground rod, as required by local regulations
- Optional ladder, power lift, rope, or other tools as required

Warnings

Warning: IMPORTANT SAFETY INSTRUCTIONS

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: Before performing any of the following procedures, ensure that power is removed from the DC circuit. Statement 1003

Warning: Read the installation instructions before you connect the system to its power source. Statement 1004

Warning: This product relies on the building's installation for short-circuit (overcurrent) protection. Ensure that the protective device is rated not greater than: 2 A. Statement 1005

Warning: This unit is intended for installation in restricted access areas. A restricted access area can be accessed only through the use of a special tool, lock and key, or other means of security. Statement 1017

Warning: A readily accessible two-poled disconnect device must be incorporated in the fixed wiring. Statement 1022

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. Statement 1024

Warning: Only trained and qualified personnel should be allowed to install, replace, or service this equipment. Statement 1030

Warning: Ultimate disposal of this product should be handled according to all national laws and regulations. Statement 1040

Warning: For connections outside the building where the equipment is installed, the following ports must be connected through an approved network termination unit with integral circuit protection: 10/100 Ethernet Statement 1044

Warning: To prevent the system from overheating, do not operate it in an area that exceeds the maximum recommended ambient temperature of: 131° F (55° C) Statement 1047

Warning: This equipment is intended to be grounded to comply with emission and immunity requirements. Ensure that the switch functional ground lug is connected to earth ground during normal use. Statement 1064

Warning: Installation of the equipment must comply with local and national electrical codes. Statement 1074

Warning: Avoid using or servicing any equipment that has outdoor connections during an electrical storm. There may be a risk of electric shock from lightning. Statement 1088

Caution: For the device, connect only to an NEC Class 2 power source or limited power source as defined by IEC 60950-1.

Warning: This product is designed for specific application and needs to be installed by a qualified personal who has RF and related rule knowledge. The general user shall not attempt to install or change the setting.

Warning: The product shall be installed at a location where the radiating antenna can be kept 23 cm from nearby person in normal operation condition to meet regulatory RF exposure requirement.

Warning: Use only the antennas which have been approved by the applicant. The non-approved antenna(s) may produce unwanted spurious or excessive RF transmitting power which may lead to the violation of FCC/ISED limit and is prohibited.

Safety Information

Note: The device is suitable for use in environmental air space in accordance with section 300.22.C of the National Electrical Code and sections 2-128, 12-010(3), and 12-100 of the Canadian Electrical Code, Part 1, C22.1. You should not install the power supply or power injector in air handling spaces.

Note: Use only with listed ITE equipment.

Note: The maximum ambient operating temperature range is -40 to 131°F (-40 to 55°C), plus solar load.

Note: The POE source which the unit is intended to connect is IEEE 802.3 at.

FCC Caution

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter, except the collocation in accordance with FCC multi-transmitter product guidelines.

Industry Canada Statement

This device complies with ISED's licence-exempt RSSs. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Le présent appareil est conforme aux CNR d'ISED applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) le dispositif ne doit pas produire de brouillage préjudiciable, et (2) ce dispositif doit accepter tout brouillage reçu, y compris un brouillage susceptible de provoquer un fonctionnement indésirable.

Radiation Exposure Statement

This equipment complies with FCC and ISED radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 23 cm between the radiator and your body.

Déclaration d'exposition aux radiations

Cet équipement est conforme aux limites d'exposition aux rayonnements ISED établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec un minimum de 23 cm de distance entre la source de rayonnement et votre corps.

Safety Information

Follow the guidelines in this section to ensure proper operation and safe use of the Cisco LoRaWAN Interface Module.

FCC Safety Compliance Statement

The FCC, with its action in ET Docket 96-8, has adopted a safety standard for human exposure to RF electromagnetic energy emitted by FCC-certified equipment. When used with approved Cisco Aironet antennas, Cisco Aironet products meet the uncontrolled environmental limits found in OET-65 and ANSI C95.1, 1991. Proper operation of this radio device according to the instructions in this publication results in user exposure substantially below the FCC recommended limits.

Safety Precautions

Warning: In order to comply with radio frequency (RF) exposure limits, the antennas should be placed no less than 20 cm (8") from your body or nearby persons. Statement 339

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

Warning: A readily accessible two-poled disconnect device must be incorporated in the fixed wiring.
Statement 1022

Warning: Only trained and qualified personnel should be allowed to install, replace, or service this equipment.
Statement 1030

Warning: Connect the unit only to DC power source that complies with the safety extra-low voltage (SELV) requirements in IEC 60950 based safety standards. Statement 1033

Warning: When installing or replacing the unit, the ground connection must always be made first and disconnected last. Statement 1046.

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, because 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

Caution: Before connecting or disconnecting a power cord, you must remove power from the power cord using a suitable service disconnect.

For safety and to achieve a good installation, please read and follow these safety precautions:

- Select your installation site with safety, as well as performance in mind. Remember: electric power lines and phone lines look alike. For safety, assume that any overhead line can kill.
- Call 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. 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.
- When installing the access point and antennas, remember:
 - Do not use a metal ladder.
 - Do not work on a wet or windy day.
 - Do dress properly—shoes with rubber soles and heels, rubber gloves, long sleeved shirt or jacket.
- Use a rope to lift the access point. If the assembly starts to drop, get away from it and let it fall.
- 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. They will remove it safely.

If an accident should occur, call for qualified emergency help immediately.

Installation Guidelines

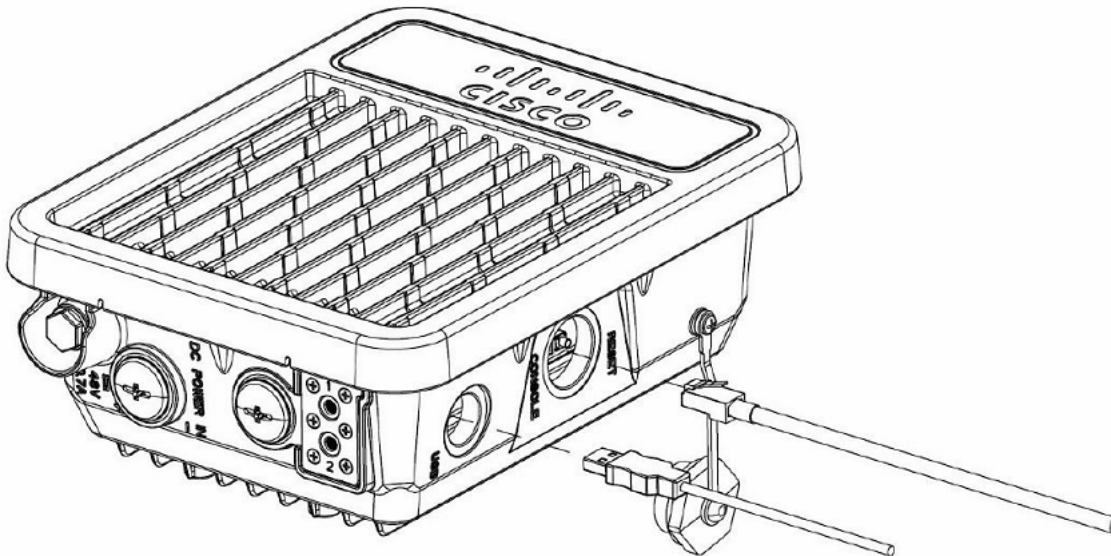
Because the Cisco LoRaWAN Interface Module is a radio device, it is susceptible to common causes of interference that can reduce throughput and range. Follow these basic guidelines to ensure the best possible performance:

- Perform a site survey before beginning the installation.
- Install the device in an area where structures, trees, or hills do not obstruct radio signals to and from the device.

Mounting the Device

- The Console-Reset port and the Reset button are under a hex-shaped sealed plug. Inspect the seal of the plug and properly tighten it at the time of installation, and also every time the plug is removed and replaced. Tighten the plug to 15 lbf-in. If you do not tighten the plug properly, it will not meet IP67 criteria, and may lead to water leaking into the unit.

Figure 1 Connecting Console Port and USB port



- If the DC power port, LAN port, or the PoE-In port is not in use, the port's covering plug must be tightened to 12.5 in-lbs (1.41 N-m) torque. Otherwise, it may lead to water leaking into the Cisco LoRaWAN Interface Module.

To calculate path loss and to determine how far apart to install Cisco LoRaWAN Interface Modules, consult an RF planning expert.

Mounting the Device

This section provides instructions for installing your access points. Personnel installing the access point must understand wireless Cisco LoRaWAN Interface Modules and bridging techniques and grounding methods.

Caution: All installation methods for mounting an Cisco LoRaWAN Interface Module on any wall surface is subject to the acceptance of local jurisdiction.

Installation Options

The Cisco LoRaWAN Interface Module can be pole or wall mounted by using the mounting kit (AIR-ACC1530-PMK1=).

Warning: Only trained and qualified personnel should be allowed to install, replace, or service this equipment. Statement 1030

Warning: Installation of the equipment must comply with local and national electrical codes. Statement 1074

Mounting Orientation

When mounting an Cisco LoRaWAN Interface Module on a vertical surface, you must ensure that the Cisco LoRaWAN Interface Module is oriented with the LED indicators pointing down. This positioning allows LEDs to be visible to someone on the ground below the Cisco LoRaWAN Interface Module.

Mounting the Device

You must also ensure the Cisco LoRaWAN Interface Module is mounted in such a way as to ensure that all antenna ports are accessible for future use.

Wall Mounting With the Mounting Kit

The mounting kit contains a mounting bracket for wall mounting or pole mounting. You can use the mounting bracket as a template to mark the positions of the mounting holes for your installation. You then install the mounting plate, and attach the Cisco LoRaWAN Interface Module when you are ready. [Table 1](#) lists the materials you will need to provide in addition to the fixed mounting kit.

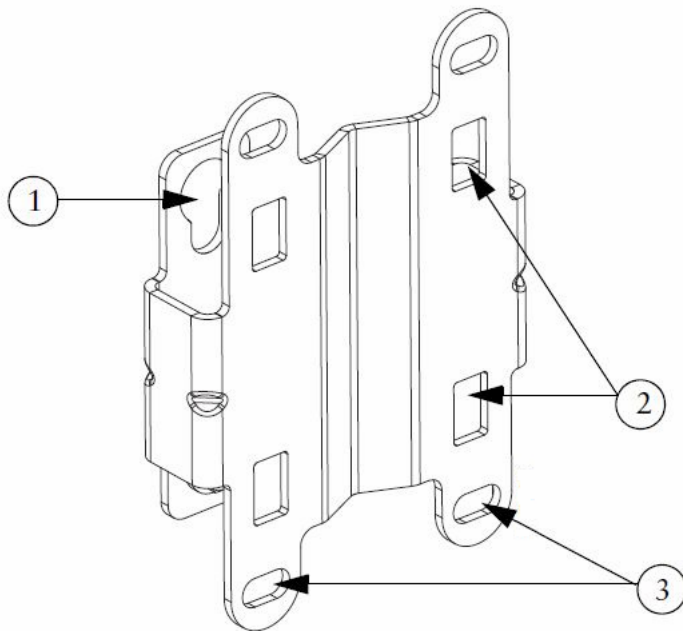
Table 1 Material Needed for Vertical Wall Mounting

Materials Required	In Kit
Ground lug and screws (provided with Cisco LoRaWAN Interface Module)	Yes
One mount bracket	Yes
Four M6 x 12-mm Hex-head bolts	Yes
Crimping tool for ground lug	No
Four wall mounting screws	No
Four wall anchors (specified for all material)	No
Drill bit for wall anchors	No
Electric drill and standard screwdriver	No
#6 AWG ground wire	No
Shielded outdoor-rated Ethernet (CAT5 or better) cable with 4.3 to 6.5 mm (0.17 to 0.25 inch) diameter (for IP67 and strength relief)	No
Grounding block	No
Grounding rod	No
10-mm box-end wrench or socket set	No

Note: The mounting surface, attaching screws and optional wall anchors must be able to support a 50-lb (22.7 kg) static weight.

To mount the Cisco LoRaWAN Interface Module on a vertical wall, follow these instructions:

1. Use the mounting bracket as a template to mark four screw hole locations on the mounting surface. See [Figure 2 on page 20](#) for the mounting bracket screw hole locations. Use the bracket mount holes to attach the unit to the wall.

Figure 2 Mounting Bracket for Wall or Pole Mounting

1	Quick Mount Keyhole Slots (for the Cisco LoRa Interface use)	2	Mounting Slots (used with the band clamps)
3	Bracket Mount Holes (use bolts up to 1/4" or 6 mm in diameter)		

2. Use four customer-supplied screws and optional screw-anchors to attach the mounting plate to the mounting surface.
3. If necessary, use suitable screw anchors and an exterior-grade plywood backboard to mount the Cisco LoRaWAN Interface Module to stucco, cement or drywall.
4. Screw an M6 x12 mm bolt into each of the four support bolt holes on the back of the Cisco LoRaWAN Interface Module. Do not screw the bolt all the way in; leave approximately a 1/8" (3.3 mm) space.
5. Position the four bolts on the Cisco LoRaWAN Interface Module into the keyhole slots on the mounting bracket.
6. Slide the Cisco LoRaWAN Interface Module down to sit securely in the quick mount slots.
7. Using a 10mm wrench, secure the Cisco LoRaWAN Interface Module to the bracket by tightening the bolts to the bracket; torque to 40 in-lbs (4.52 N-m).
8. Continue with [Grounding the Device](#).

Pole Mounting With the Mounting Kit

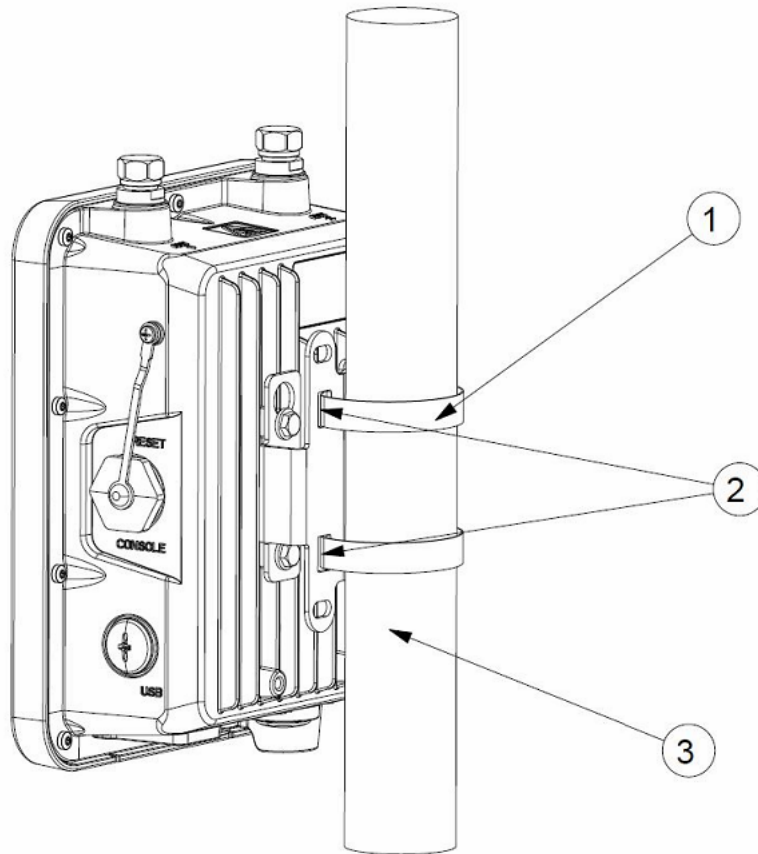
The mounting kit contains a mounting bracket for wall mounting or pole mounting. This kit can be used to install the Cisco LoRaWAN Interface Module on a pole. It supports metal, wood or fiberglass poles from 2 to 8 inches in diameter.

Table 2 Materials Needed for Vertical Pole Mounting

Materials Required	In Kit
One mount bracket	Yes
Four M6 x12mm hex head bolts	Yes
Two stainless steel band clamps (adjustable 2" -5" , 51-127 mm)	Yes
Two stainless steel band clamps (adjustable 5" -8" , 127-203 mm)	Yes
10 mm box-end wrench	No
Shielded outdoor-rated Ethernet (CAT5 or better) cable with 4.3 to 6.5 mm (0.17 to 0.25 inch) diameter (for IP67 and strength relief)	No
Ground lug (provided with the Cisco LoRaWAN Interface Module)	Yes
Ground block and rod	No
Crimping tool for ground lug	No
#6 AWG ground wire	No

To mount the Cisco LoRaWAN Interface Module onto a vertical pole, follow these steps:

1. Select a mounting location on the pole to mount the Cisco LoRaWAN Interface Module. You can attach the Cisco LoRaWAN Interface Module to any pole with a diameter from 2 to 8 inches (5.1 to 20.1 cm).
2. Determine which size of band clamp is needed based on the pole diameter. Slide the two clamps through the top and bottom set of mounting slots (see [Figure 3 on page 22](#)) and mount the bracket to the pole.
3. Wrap the band clamps around the pole and slide them into the second set of top and bottom mounting slots on the bracket. Lightly tighten the clamps. Only tighten them enough to keep the bracket from sliding down the pole.
4. Screw an M6 bolt into each of the four bolt holes on the back side of the Cisco LoRaWAN Interface Module. Do not screw the bolt in all the way. Leave a gap of about 1/8" (3.3mm).
5. Position the four bolts on the Cisco LoRaWAN Interface Module into the bracket keyhole slots. Check to be sure that the Cisco LoRaWAN Interface Module is properly seated in the slots.(See [Figure 3 on page 22](#))
6. The Cisco LoRaWAN Interface Module should be positioned with the LEDs on the bottom to allow viewing from the ground.
7. Using a 10mm wrench, tighten the four bolts that connect the Cisco LoRaWAN Interface Module to the bracket to a torque of 40 in-lbs (4.52 N-m).
8. Locate the Cisco LoRaWAN Interface Module to its final position. Tighten the band clamps with the wrench so that the Cisco LoRaWAN Interface Module does not slide on the pole. Be sure that the clamps are tight enough that the Cisco LoRaWAN Interface Module does not move.
9. Continue with [Grounding the Device](#).

Figure 3 Cisco LoRaWAN Interface Module and Fixed Mount Kit Installed on a Pole

1	Metal Band Strap	2	Mounting Slots
3	Pole		

Installing Antennas

The Cisco LoRaWAN Interface Module is equipped with two N-type radio frequency (RF) connectors (antenna ports 1 and 2) on the top of the unit for LoRa antennas, and one TNC connector on the left of the unit for the GPS antenna, as shown in [Figure 4 on page 24](#).

The following topics are described in this section:

- [Supported Antennas, page 22](#)
- [Antenna Connector Locations, page 24](#)
- [Connecting the LoRa Antennas, page 24](#)
- [Connecting the GPS Antenna, page 26](#)
- [Installing a Lightning Arrestor, page 26](#)

Supported Antennas

The following antennas are supported by the Cisco LoRaWAN Interface Module:

Installing Antennas

LoRa Antennas

- Antenna (ANT-LPWA-DB-O-N=)
- Lightning arrestor (ACC-LA-H-NM-NF=)
- Cable (AIR-CAB010LL-N=)

GPS Antenna

- Antenna and cable (ANT-GPS-OUT-TNC=)
- Lightning arrestor (ACC-LA-G-TM-TF=)

Safety Precautions when Installing Antennas

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, Canada: Canadian Electrical Code, Section 54). Statement 280

1. 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.
2. 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.
3. Contact your electric power company. Tell them your plans and ask them to come look at your proposed installation.
4. 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.
5. 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.
6. 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.
7. 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.
8. If an accident should occur with the power lines, call for qualified emergency help immediately.

Note: The antenna port caps must be removed before using, but the unused ports should remain capped to provide an IP67 seal. All port or antenna connection must be terminated by an IP67 rated cap or cable.

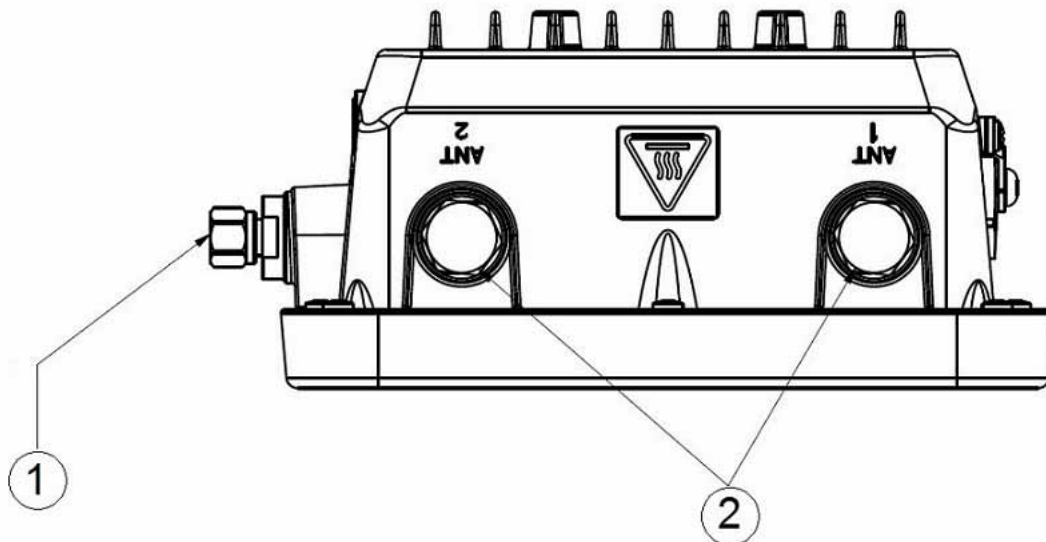
Antenna Connector Locations

The Cisco LoRaWAN Interface Module is equipped with two N-type radio frequency (RF) connectors (antenna ports 1 and 2) on the top of the unit for LoRa antennas, and one TNC connector on the left of the unit for the GPS antenna, as shown in [Figure 4 on page 24](#). The LoRa antennas should be connected to the chassis via an appropriate low-loss RF coax cable, for the Cisco LoRaWAN Interface Module to work properly. The LoRa antennas should be installed closely to the Cisco LoRaWAN Interface Module to reduce the signal strength loss on the feed cable as much as possible.

Note: Refer to the data sheet for the antenna specifications.

Note: The antenna port caps must be removed before using, but the unused ports should remain capped and hand tightened (not too much) to provide an IP67 seal. All port or antenna connection must be terminated by an IP67 rated cap or cable.

Figure 4 Antenna Connectors



1	TNC connector for GPS antenna	2	N-Type connectors for LoRa antennas
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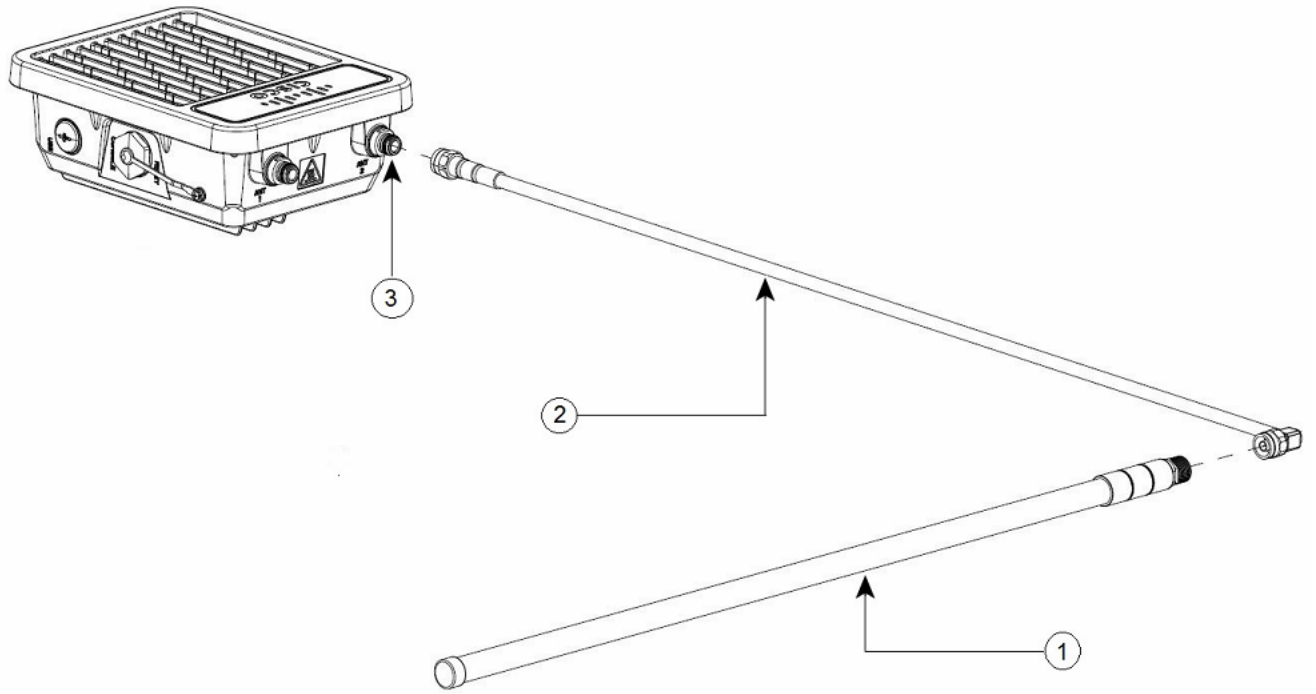
Connecting the LoRa Antennas

The LoRa antennas should be connected to the chassis via an appropriate low-loss RF coax cable, for the Cisco LoRaWAN Interface Module to work properly. The LoRa antennas should be installed closely to the Cisco LoRaWAN Interface Module to reduce the signal strength loss on the feed cable as much as possible.

The antennas must be installed at half a wavelength apart from each other.

Figure 5 on page 25 shows the installation of a LoRa antenna.

Figure 5 Connecting the LoRa Antenna

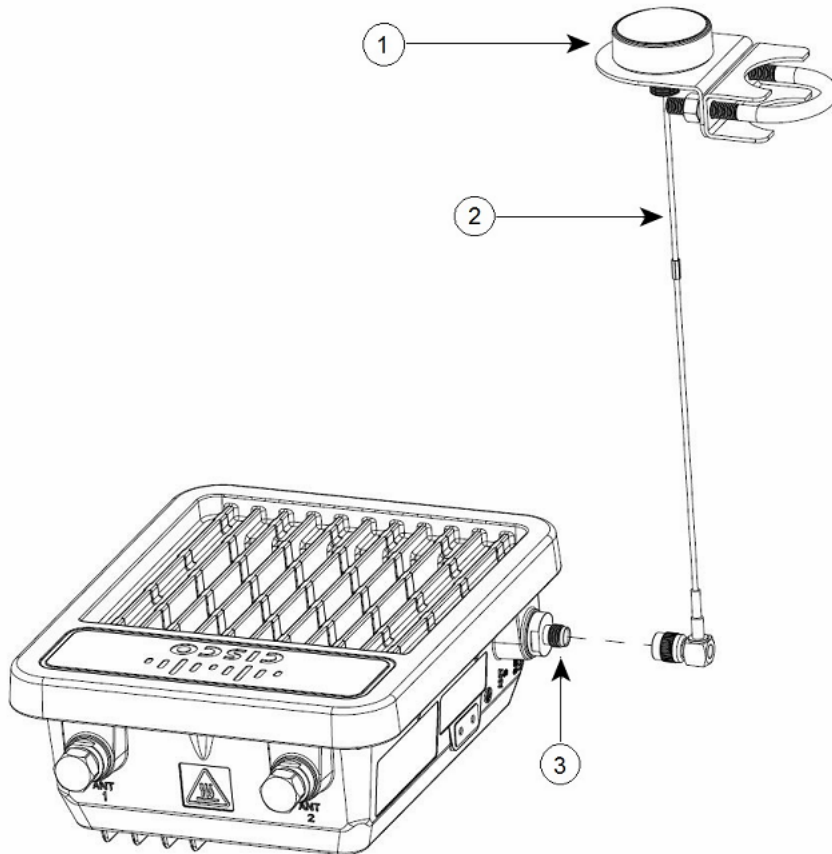


1	LoRa antenna	3	N-Type connectors for LoRa antennas
2	LoRa antenna cable		

Connecting the GPS Antenna

Figure 6 on page 26 shows the installation of the GPS antenna.

Figure 6 Connecting the GPS Antenna



1	GPS antenna and mount bracket	3	TNC connector for GPS antenna
2	GPS antenna cable		

Note: For more information about the GPS antenna and the mounting instructions, see the [Cisco GPS Antenna](#) chapter of the *Connected Grid Antennas Installation Guide*.

Installing a Lightning Arrestor

Overvoltage transients can be created through lightning static discharges, switch processes, direct contact with power lines, or through earth currents. The Cisco lightning arrestor limits the amplitude and duration of disturbing interference voltages and improves the over voltage resistance of in-line equipment, systems, and components. A lightning arrestor installed according to these mounting instructions balances the voltage potential, thus preventing inductive interference to parallel signal lines within the protected system.

Installation Considerations

Cisco recommends that you bulkhead mount the lightning arrester so it can be installed as a wall-feed through on the wall of the protected space.

The importance of obtaining a good ground and bonding connection cannot be overstressed. Consider these points when grounding the lightning arrester:

- Connect the lightning arrester components directly to the grounding point.
- The contact points of the ground connection must be clean and free of dust and moisture.
- Tighten threaded contacts to the torque specified by the manufacturer.

Installation Notes

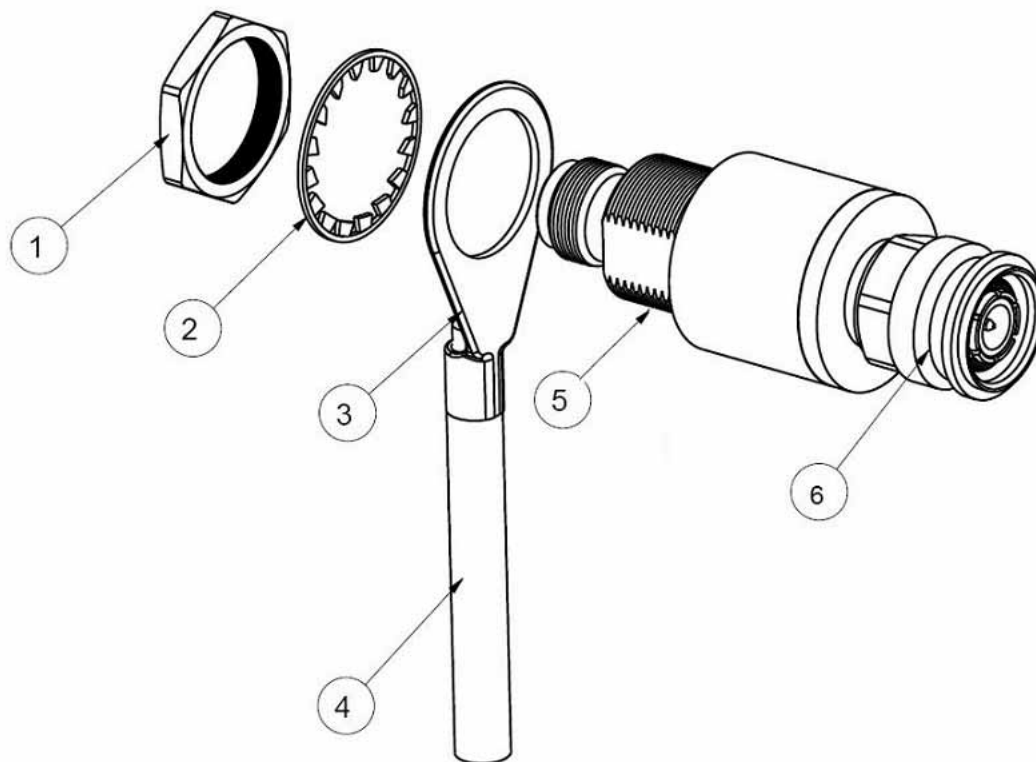
This lightning arrester is designed to be installed between the antenna cable that is attached to an outdoor antenna and the Cisco Aironet wireless device. You can install the lightning arrester either indoors or outdoors. It can be connected directly to a wireless device having an external N connector. It can also be mounted inline or as a feed-through. Feed-through installations require 5/8 in. (16 mm) hole to accommodate the lightning arrester.

This lightning arrester is part of a lightning arrester kit. The kit contains a lightning arrester and a grounding lug.

When you install the lightning arrester, follow the regulations or best practices applicable to lightning protection installation in your local area.

Installing the Lightning Arrester Outdoors

If you install the lightning arrester outdoors, use the supplied ground lug and a #6 stranded copper wire to connect it to a good earth ground, such as a ground rod. The connection should be as short as possible.

Figure 7 Lightning Arrestor Details

1	Nut	4	#6 stranded copper wire
2	Lockwasher	5	Unprotected side (to antenna)
3	Ground lug	6	Protected side (to wireless device)

Cable for the Lightning Arrestor

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).

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

Grounding the Device

The Cisco LoRaWAN Interface Module must be grounded before connecting power.

Warning: This equipment must be externally grounded using a customer-supplied ground wire before power is applied. Contact the appropriate electrical inspection authority or an electrician if you are uncertain that suitable grounding is available. Statement 366

Warning: Installation of the equipment must comply with local and national electrical codes. Statement 1074

In all outdoor installations and when powering the access point with AC power, you must follow these instructions to properly ground the case:

1. If using insulated 6-AWG copper ground wire, strip the insulation as required for the grounding lug.

2. Use the appropriate crimping tool to crimp the bare 6-AWG copper ground wire to the supplied grounding lug.
Note: The grounding lug and hardware used must comply with local and national electrical codes.
3. Connect the grounding lug to the device grounding screw holes using the supplied two Phillips head screws (M4 x10 mm) with lock washers. Tighten the grounding screw to 22 to 24 in-lbs (2.49 to 2.71 N-m).
4. If necessary, strip the other end of the ground wire and connect it to a reliable earth ground, such as a grounding rod or an appropriate grounding point on a metal pole that is grounded (see [Figure 3 on page 22](#)).

Powering the Cisco LoRaWAN Interface Module

Warning: Installation of the equipment must comply with local and national electrical codes. Statement 1074

Warning: This equipment must be externally grounded using a customer-supplied ground wire before power is applied. Contact the appropriate electrical inspection authority or an electrician if you are uncertain that suitable grounding is available. Statement 366

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

The Cisco LoRaWAN Interface Module supports these power sources:

- DC power – 48 VDC
- Power-over-Ethernet (PoE+, 30W)

The Cisco LoRaWAN Interface Module can be powered via the PoE+ input from an in-line power injector or a suitably powered switch port.

Caution: Do not place the power injector in an unprotected outdoor environment because water could get into the power injector and cause a short circuit and possible fire.

Warning: Connect the unit only to DC power source that complies with the Safety Extra-Low Voltage (SELV) requirements in IEC 60950 based safety standards Statement 1033

Connecting a Power Source Equipment

The Cisco LoRaWAN Interface Module supports the Power Source Equipment (PSE) which is IEEE 802.3at compatible.

Warning: To reduce the risk of fire, use only No. 26 AWG or larger telecommunication line cord. Statement 1023

The power injector provides 54 VDC to the Cisco LoRaWAN Interface Module over the Ethernet cable and supports a total end-to-end Ethernet cable length of 100 m (328 ft) from the switch to the Cisco LoRaWAN Interface Module.

When your Cisco LoRaWAN Interface Module is powered by an optional power injector, follow these steps to complete the installation:

1. Before applying PoE to the Cisco LoRaWAN Interface Module, ensure that the Cisco LoRaWAN Interface Module is grounded (see [Grounding the Device](#)).
2. Review [Table 1 on page 19](#) and [Table 2 on page 21](#) to identify the components needed for the installation.
3. Connect a CAT5 or better Ethernet cable from your wired LAN network to the power injector.

Note: The installer is responsible for ensuring that powering the Cisco LoRaWAN Interface Module from this type of power injector is allowed by local and national safety and telecommunications equipment standards.

4. Ensure that the antennas are connected and that a ground is attached to the Cisco LoRaWAN Interface Module before you apply power to the Cisco LoRaWAN Interface Module.
5. Connect a shielded outdoor-rated Ethernet (CAT5 or better) cable between the power injector and the PoE-in connector of the Cisco LoRaWAN Interface Module (see [Figure 8 on page 31](#)).
6. Connect the Ethernet cable to the Cisco LoRaWAN Interface Module PoE-In port (see [Connecting an Ethernet Cable to the Cisco LoRaWAN Interface Module](#)).

Connecting an Ethernet Cable to the Cisco LoRaWAN Interface Module

You need to supply these tools and materials:

- Shielded outdoor-rated Ethernet (CAT5 or better) cable with 4.3 to 6.5 mm (0.17 to 0.25 inch) diameter (for IP67 and strength relief)
- RJ-45 connector and installation tool
- Adjustable Wrench or 28 mm box wrench
- Large Phillips or Flat Blade screwdriver

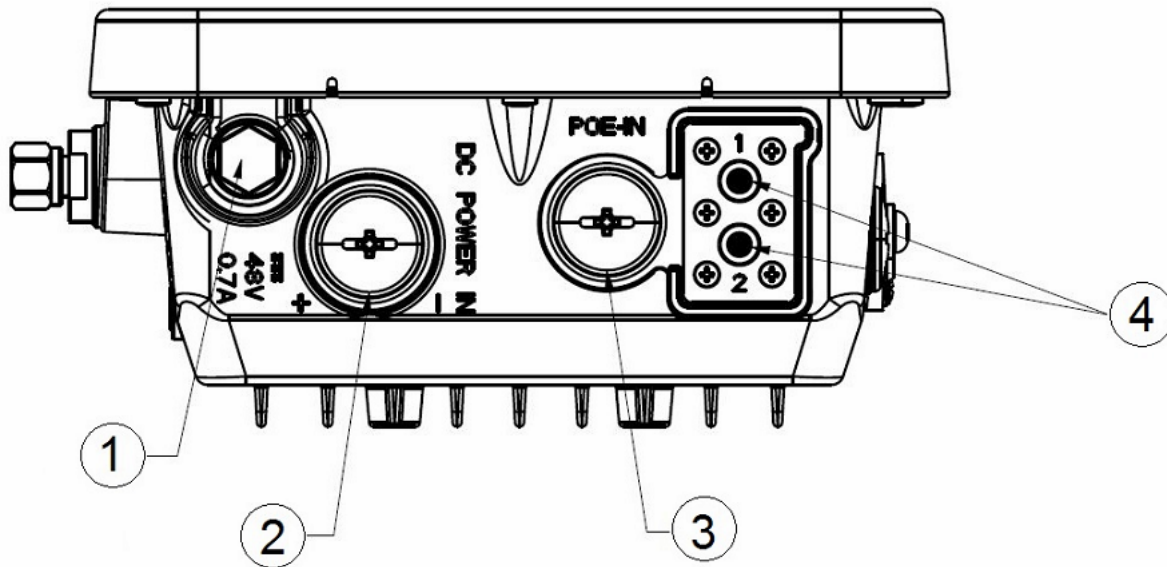
To connect the shielded Ethernet cable to the Cisco LoRaWAN Interface Module, follow these steps:

1. Disconnect power to the power injector, and ensure all power sources to the Cisco LoRaWAN Interface Module are turned off.

Warning: This unit might have more than one power supply connection. All connections must be removed to de-energize the unit. Statement 1028

2. Ensure a 6 AWG ground wire is connected to the Cisco LoRaWAN Interface Module (see [Grounding the Device](#)).
3. Use a large Phillips or Flat Blade screw driver to remove the Ethernet connector plug from the Cisco LoRaWAN Interface Module. Do not discard plug and rubber seal unless you are certain that the port will not have to be re-plugged (see [Figure 8 on page 31](#) for the location).

Figure 8 LEDs Shown on the Bottom of the Cisco LoRaWAN Interface Module

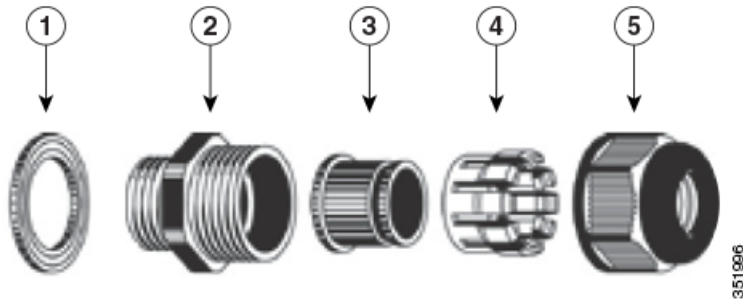


1	Pressure vent	3	PoE-in port
2	DC power port	4	LED indicators

- Loosen the Thread-Lock sealing nut of the cable gland by turning it counter clockwise, but do not remove it (see [Figure 9](#)).

Note: Verify that the cable gland has a rubber seal and ensure that it is not damaged.

Warning: Failure to install the cable gland and rubber gasket properly will cause the cable grip to leak.

Figure 9 Cable Gland

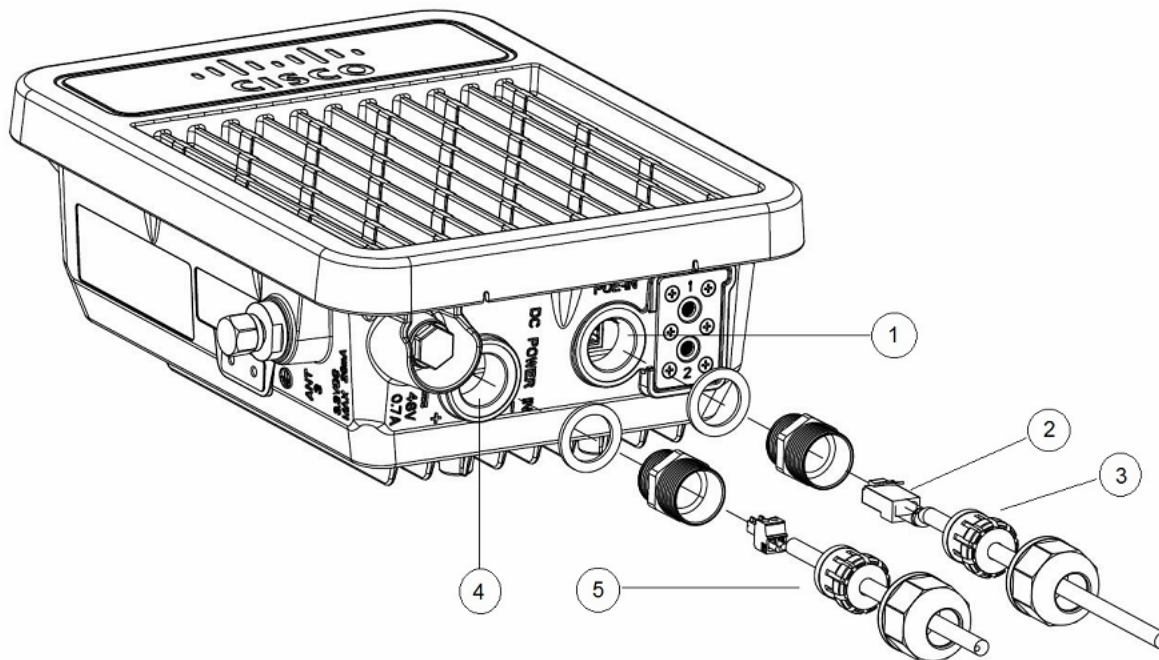
1	Washer (Rubber Gasket)	2	Body
3	Sealing insert	4	Clamping claw
5	Thread-lock sealing nut		

5. Insert the unterminated end of the Ethernet cable through the sealing nut end of the cable gland (see [Figure 9 on page 32](#)), and pull several inches of cable through the adapter.
6. Install an RJ-45 connector on the unterminated end of the Ethernet cable using your Ethernet cable installation tool.

Warning: To reduce the risk of fire, use only No. 26 AWG or larger telecommunication line cord.
Statement 1023

Warning: When installing the RJ-45 connector, ensure that cable gland and the rubber gasket are present and installed properly, to avoid water leakage into the enclosure. See [Figure 9 on page 32](#) and [Figure 10 on page 33](#).

7. Carefully insert the RJ-45 cable connector into the Ethernet port opening on the Cisco LoRaWAN Interface Module, and connect to the internal Ethernet connector (see [Figure 10 on page 33](#)).

Figure 10 Inserting RJ-45 Connector into the Ethernet Port Opening in Case

1	Ethernet port opening in Cisco LoRaWAN Interface Module case. Also see Figure 15 on page 38 .
2	RJ-45 connector, on shielded outdoor-rated Ethernet (CAT5 or better) cable
3	Exploded view of the cable gland, on the Ethernet cable.
4	DC power opening in Cisco LoRaWAN Interface Module case. Also see Figure 15 on page 38 .
5	Exploded view of the cable gland on the DC power cable.

8. Slide the cable gland with the rubber seal towards the Cisco LoRaWAN Interface Module, and screw the threaded end of the body into the Cisco LoRaWAN Interface Module, and hand-tighten.
9. Use an adjustable wrench or a 28-mm wrench to tighten the threaded end of the body into the enclosure. Tighten to 15 in-lbs (1.69 N-m).
10. Use an adjustable wrench and tighten the thread-lock seal nut to 15 in-lbs (1.69 N-m).
11. Ensure that the antennas are connected to the Cisco LoRaWAN Interface Module before you apply power to the Cisco LoRaWAN Interface Module.
12. Route your Ethernet cable, and cut off any excess cable.
13. Install an RJ-45 connector on the unterminated cable end, and insert it into the power injector.
14. Turn on power to the power injector.

Connecting a DC Power Cable to the Cisco LoRaWAN Interface Module

When powering the Cisco LoRaWAN Interface Module with DC power, you must ensure that DC power can be conveniently removed at the source.

Warning: A readily accessible two-poled disconnect device must be incorporated in the fixed wiring. Statement 1022

Warning: Connect the unit only to DC power source that complies with the safety extra-low voltage (SELV) requirements in IEC 60950 based safety standards. Statement 1033

To connect a DC power cable, you need to supply these tools and material:

- Shielded outdoor-rated and twisted pair (min 5 tpf) DC power cable (minimum 22 AWG and maximum 16 AWG to fit the DC plug, and big enough to compensate the loss for length or heat) with outside cable diameter of 4.3 mm to 6.5 mm
- Adjustable or open-end wrench
- Small flat screw driver
- Two-pin DC power connector (PLG-PWRJCK=, Cisco supplied)

To connect the DC power cable to the Cisco LoRaWAN Interface Module, follow these steps:

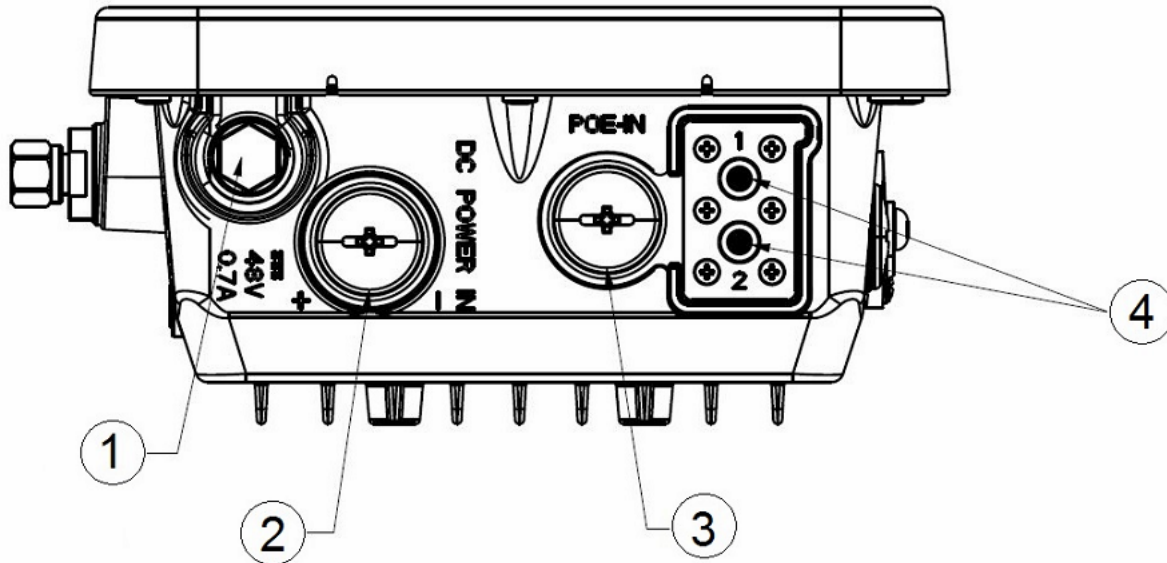
1. Before connecting DC power to the Cisco LoRaWAN Interface Module, ensure that the ground is connected to the Cisco LoRaWAN Interface Module (see [Grounding the Device](#)).
2. Turn off all power sources to the Cisco LoRaWAN Interface Module, including the DC power source.

Warning: This unit might have more than one power supply connection. All connections must be removed to de-energize the unit. Statement 1028

Caution: When installing DC power to the Cisco LoRaWAN Interface Module, always connect the device end of the cable FIRST. When removing the DC power connector, always disconnect the device end of the cable LAST.

3. Use a large Phillips or Flat Blade screw driver to remove the DC power connector plug from the Cisco LoRaWAN Interface Module. Do not discard plug and rubber seal unless you are certain that the port will not have to be re-plugged. (see [Figure 11 on page 35](#) for the location of the DC power connector).

Figure 11 Cisco LoRaWAN Interface Module DC Power Connector



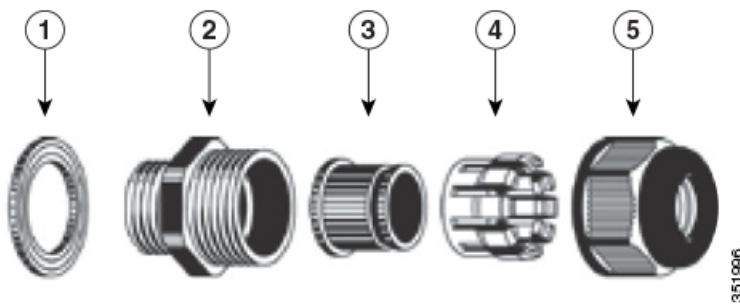
1	Pressure vent	3	PoE-in port
2	DC power port	4	LED indicators

4. Loosen the thread-Lock sealing nut of the cable gland by turning it counter clockwise, but do not remove (see [Figure 12 on page 35](#)).

Verify that the cable gland has a rubber seal and ensure that it is not damaged.

Warning: Failure to install the Cable Gland properly will cause the cable grip to leak.

Figure 12 Cable Gland



1	Washer (Rubber Gasket)	2	Body
3	Sealing insert	4	Clamping claw
5	Thread-lock sealing nut		

Note: The cable gland accepts a cable diameter of 0.43 to 0.65 cm.

5. Insert a bare end of the DC power cord into the rounded end of the cable gland (see [Figure 12 on page 35](#)), and pull approximately 6 inches of cable through the adapter.

Warning: When installing the DC power cable, ensure that cable gland and the rubber gasket are present and installed properly, to avoid water leakage into the enclosure. See [Figure 12 on page 35](#) and [Figure 14 on page 37](#).

6. Strip the DC cable jacket back about 1 inch to expose the wires and strip the insulation about 3/8 inch (9.5 mm) from each wire.
7. Insert each wire into the two-position terminal strip (supplied), and tighten each wire using a 0.1 inch (0.25 cm) flat screw driver (see [Figure 13 on page 36](#)).

Figure 13 Two-Position Terminal Strip

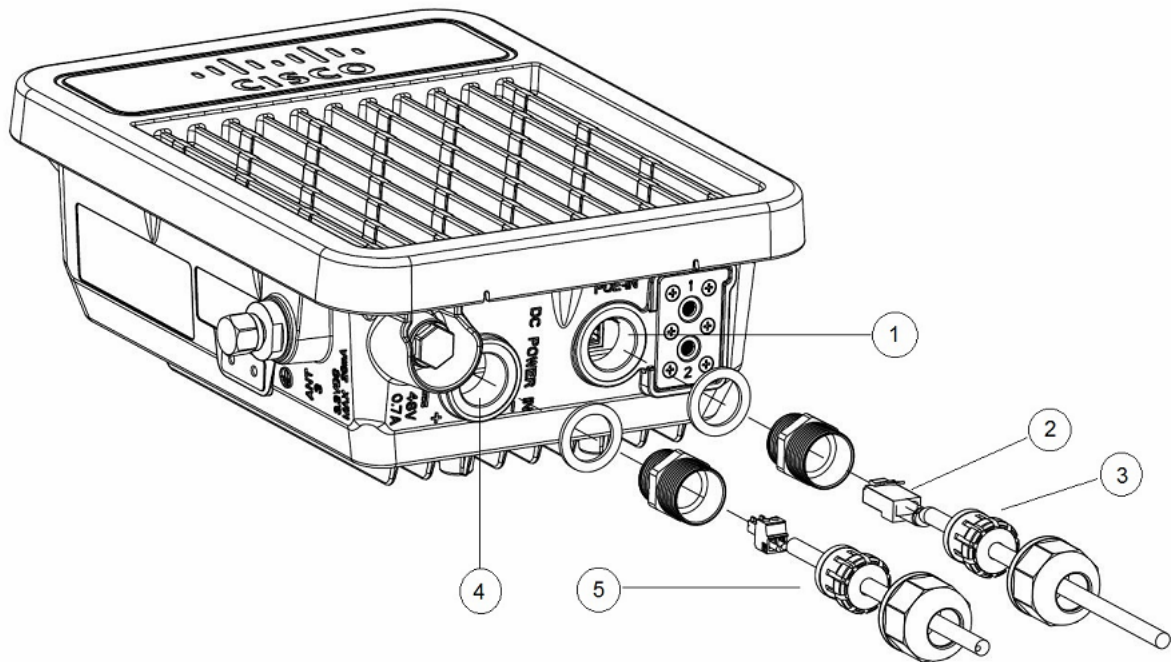


1	Securing screws	3	Wire opening for DC +
2	Wire opening for ground (DC return)		

8. Insert the two-position terminal strip into the DC power opening in the Cisco LoRaWAN Interface Module case, and carefully push the terminal strip into the internal connector (see [Figure 14 on page 37](#)).

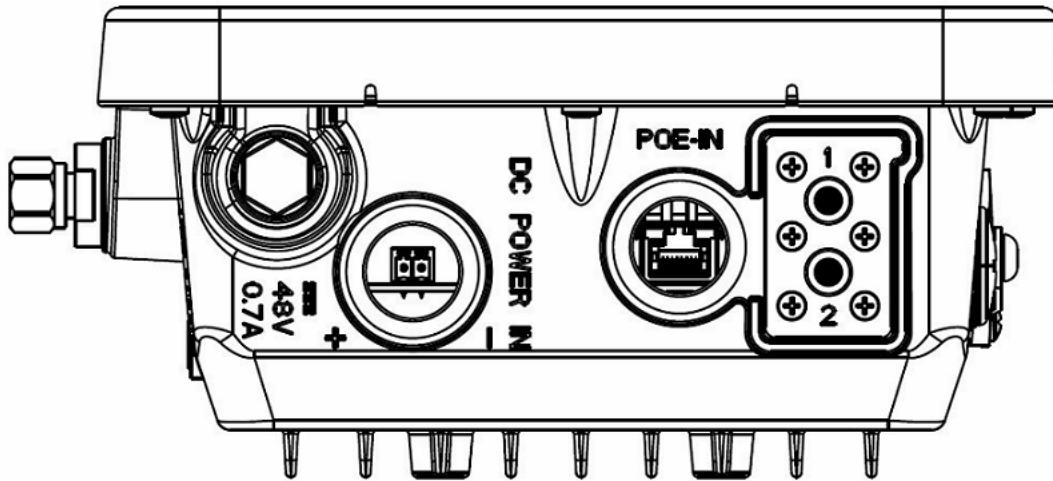
Ensure that the polarity of the terminal strip properly matches the polarity markings on the enclosure (see [Figure 15 on page 38](#))

Figure 14 Inserting the Terminal Strip into the DC Power Opening in the Cisco LoRaWAN Interface Module Case



1	Ethernet port opening in Cisco LoRaWAN Interface Module case. Also see Figure 15 on page 38 .
2	RJ-45 connector, on shielded outdoor-rated Ethernet (CAT5 or better) cable
3	Exploded view of the cable gland, on the Ethernet cable.
4	DC power opening in Cisco LoRaWAN Interface Module case. Also see Figure 15 on page 38 .
5	Exploded view of the cable gland on the DC power cable.

Figure 15 DC Power Port and Ethernet Port Opening in the Cisco LoRaWAN Interface Module Case



9. Slide the cable gland with the rubber seal towards the Cisco LoRaWAN Interface Module, and screw the threaded end of the body into the Cisco LoRaWAN Interface Module, and hand-tighten.
10. Use an adjustable wrench, a 28-mm wrench to tighten the threaded end of the body to 15 in-lbs (1.69 N-m).
11. Use an adjustable wrench and tighten the thread-lock seal nut to 15 in-lbs (1.69 N-m).
12. Ensure that the antennas are connected to the Cisco LoRaWAN Interface Module before you apply power to the Cisco LoRaWAN Interface Module.
13. Turn on the DC power at the designated circuits.

Technical Specifications for the Cisco LoRaWAN Interface Module

This chapter contains the following technical specifications:

- [Cisco LoRaWAN Interface Module Technical Specifications, page 39](#)
- [LoRa Antenna Technical Specifications, page 39](#)
- [GPS Antenna Technical Specifications, page 40](#)

Cisco LoRaWAN Interface Module Technical Specifications

Table 1 lists the technical specifications for the Cisco LoRaWAN Interface Module.

Table 1 Cisco LoRaWAN Interface Module Technical Specifications

Operating temperature	-40 to 131°F (-40 to 55°C), plus solar load
Storage temperature	-40 to +85°C
Relative humidity	5% to 95% Non-condensing
Ingress protection	IP67
Size	281 x 263 x 105 mm
Altitude	<ul style="list-style-type: none"> ■ Operational—13,800 feet (4206 meters) ■ Non-operational—15,000 feet (4572 meters)
Wind resistance	Up to 100 MPH - sustained Up to 165 MPH - gusts

LoRa Antenna Technical Specifications

Table 2 lists the technical specifications for the LoRa antenna ANT-LPWA-DB-O-N.

Table 2 Cisco LoRa Antenna Technical Specifications

Frequency band	863 – 928 MHz
Impedance	50 Ohm
VSWR	= < 1.5
Peak Gain	6 dBi, Omni directional
Half power beam width	H:360° ; V:25°
Polarization	Vertical
Mount	Pole, Wall
Operating temperature	-40 to 158°F (-40 to 70°C)
Ingress protection	IP67
Operating altitude	10,000 feet
Wind resistance	Up to 100 MPH - sustained Up to 165 MPH - gusts

Table 2 Cisco LoRa Antenna Technical Specifications (continued)

Connector	N Type
Default cable length	10-ft
Lightning Protection	DC Ground

GPS Antenna Technical Specifications

Table 3 lists the technical specifications for the GPS antenna ANT-GPS-OUT-TNC.

Table 3 GPS Antenna Technical Specifications

Type	Patch, active
Environment	Outdoor
Height	3.2 in. (8.13 cm)
Width (maximum, at base)	1.75 in. (4.45 cm)
Operating frequency range	1575. 42 MHz
Impedance	50 ohm, nominal
VSWR	=< 2.0
Peak Gain	4 dBi Omni directional
Minimum gain	1 dBi @ 10-degrees elevation
Pattern type	Hemispherical
Polarization	Circular RHCP
LNA gain	25 dB +/-2 dB, DC voltage: 3 to 5 VDC
Out-of-band attenuation	60 dB min. at 1575 +/- 50 MHz
Current draw	20 mA max. @ 3.3 VDC +/- .3 VDC
Operating temperature	-40 to 185° F (-40 to 85° C)
Wind resistance	165 MPH
Connector	Right-angle MCX (m)
Compliance	ROHS