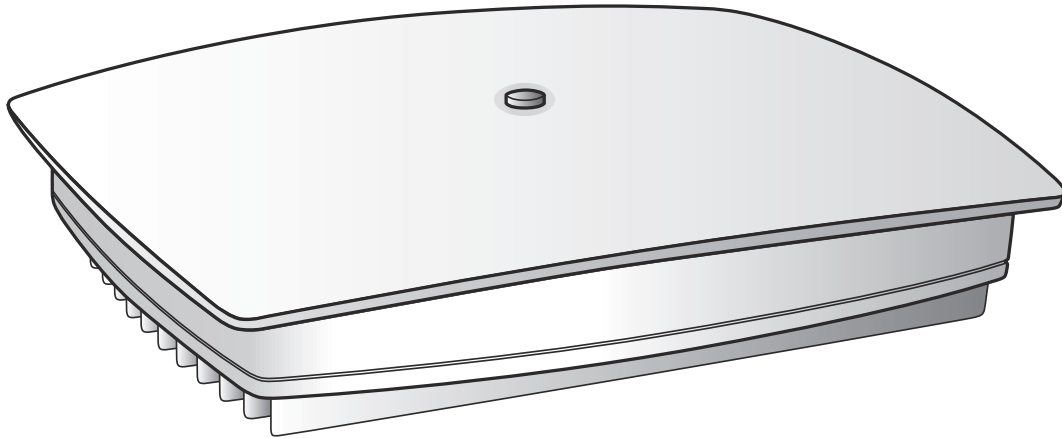


SpiderCloud® Radio Node - SCRN-310 Hardware Installation Guide



Part number: DOC-SCRN-310-HW-01, Rev. 0.1 DRAFT
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FCC Statements

Caution: Any changes or modification cautions to this device not explicitly approved by manufacturer could void your authority to operate this equipment.

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum 20 cm between the radiator and your body. This transmitter must not be collocated or operating in conjunction with any other antenna or transmitter unless authorized to do so by the FCC.

Revision History

Revision	Date	Summary of Changes
0.1	2/19/2014	Initial draft document release

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Table of Contents

About this Manual	5
System Overview	5
Radio Node Features	6
Radio Node System Isometric Top View and Bottom View	6
System Specifications	7
Frequency Bands of Operation	7
Size and Dimensions	7
Environmental Requirements	7
Power	8
Compliance	8
Radio Node Models	8
Antennas	9
Ports	9
The Top-Panel LED	9
Input Power	10
Select the Radio Node Location	11
Installation and Mount Bracket Assembly	12
Bracket Mounting and Cabling Guidelines	13
Typical Radio Node Mounting Options	13
Installing the Radio Node	13
Installing the Radio Node (Method 1)	13
Installing the Radio Node (Method 2)	15
Completing the Installation	17
Detaching the Radio Node from the Mount Bracket	17
Boot Sequence and Services Node Communication	18
Radio Node LED Boot Sequence	19
Radio Node LED Management	20
The SpiderCloud Documentation Set	22
Appendix A UMTS Antenna Patterns	23
Appendix B LTE Antenna Patterns	27

About this Manual

This guide provides the system specifications of the SpiderCloud® Radio Node 310 (SCRN-310). It includes detailed hardware installation instructions, the boot sequence, and expected LED behavior both during the boot-up and under operating conditions. An appendix shows the radio node antenna patterns.

The primary audience for this guide includes network planners, system administrators and installation personnel. It assumes you have knowledge about networking principles, networking configuration, site preparation, powering, and experience in hardware installation and maintenance.

System Overview

The SCRN-310 is an indoor multi-access small cell capable of supporting Universal Mobile Telecommunications System (UMTS) and Long Term Evolution (LTE) radio protocols concurrently in a single platform. The radio node is 3GPP compliant, supporting UMTS Release 7 and LTE Release 9 standards.

Each radio node supports:

- up to 32 simultaneous UMTS voice and data channels, a peak downlink rate of 21 Mbps and a peak uplink rate of 5 Mbps.
- up to 32 active LTE users, a peak download rate of 100 Mbps, and a peak upload of 50 Mbps when used with 20 MHz channel bandwidth.

The radio node enables mobile operators to offer dedicated, in-building coverage and capacity for UMTS and LTE services. It is easy to install and connects to the existing enterprise LAN using standard Ethernet cabling or to a dedicated LAN infrastructure deployed for use by the operator. SCRN-310 radio nodes are managed by the SpiderCloud SCSN-9000 services node access controller, typically installed in the enterprise DMZ.

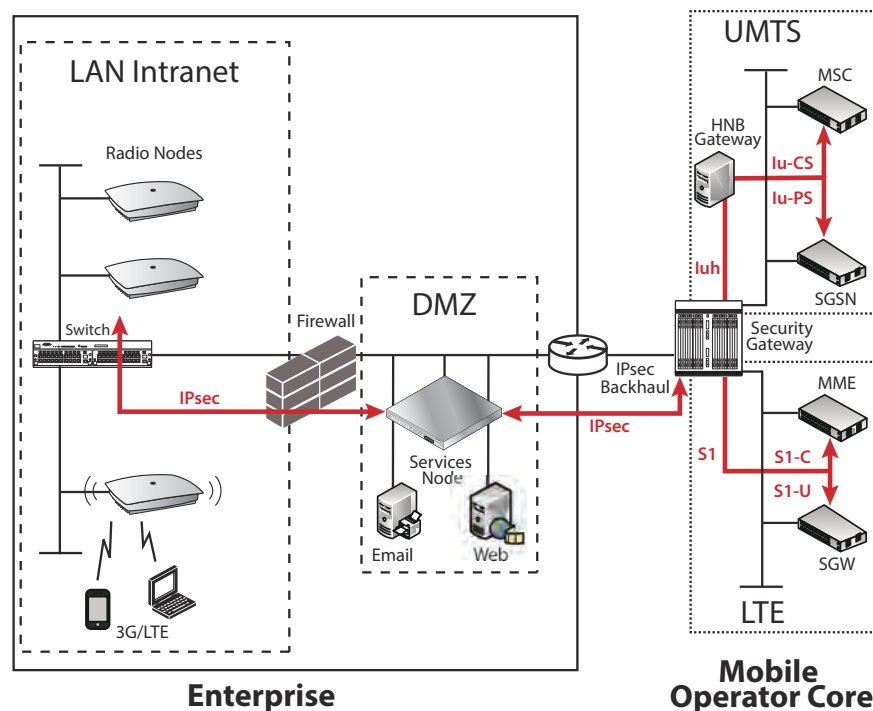


Figure 1 Radio Node Relationship to Enterprise and Mobile Operator Core Networks

Radio Node Features

The radio node supports the following features:

- Complete enterprise mobility using licensed 3G and LTE spectrum
- Self Organizing Network (SON) capabilities for autonomous setup, operation, and management
- Secure boot
- Transparent integration into enterprise network environments
- Certificate-based authentication with the SpiderCloud services node

Radio Node System Isometric Top View and Bottom View

The radio node ships with four internal antennas. The following drawings display an isometric top and bottom views of the radio node:

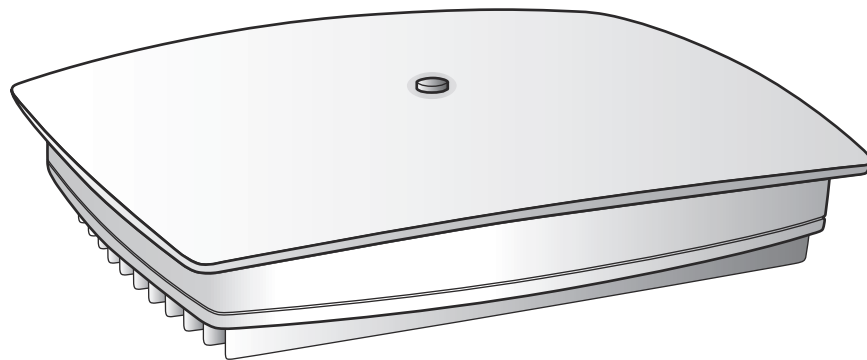


Figure 2 Radio Node Top View

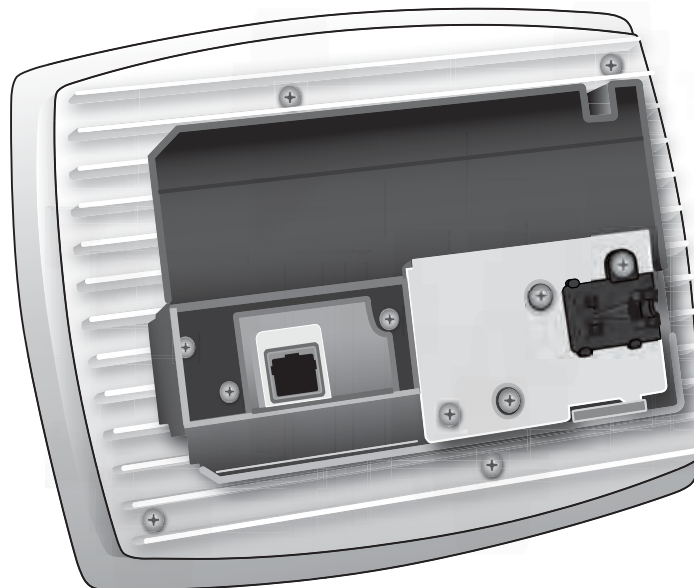


Figure 3 Radio Node Bottom View with Pedestal Base

System Specifications

Following are the system specifications for the radio node frequency bands of operation, system size, environmental requirements, power, and compliance.

Frequency Bands of Operation

SpiderCloud Wireless currently provides two versions of the SCRN-310 for operation in the following UMTS and LTE band combinations. Note that the SCRN-310 hardware is also capable of supporting two carriers of LTE (feature available in a future software upgrade).

- SCRN310-0701
 - Operates in Band Class 1 (UMTS)
 - Operates in Band Class 7 (LTE)
 - Monitors GSM 900/1800 MHz, UMTS 2100/900 MHz, LTE 2600/1800/800 MHz
- SCRN310-0402
 - Operates in Band Class 2 (UMTS)
 - Operates in Band Class 4 (LTE)
 - Monitors GSM 850/1900 MHz, UMTS 2100/1900/850 MHz, LTE 2100/700 MHz

Size and Dimensions

- Height:
 - 5.3 centimeters (2.1 inches)
 - 11.3 centimeters including mount bracket assembly (4.4 inches)
- Width: 20.6 centimeters (8.1 inches)
- Length: 23.9 centimeters (9.4 inches)
- Weight:
 - 1.2 kilograms (2.6 pounds)
 - 1.41 kilograms with mounting bracket (3.1+ pounds)

Environmental Requirements

- Operating temperature range:
 - 0° to 50° C (32° to 122° F) vertical mount
 - 0° to 40° C (32° to 104°F) horizontal mount, fins up
- Operating humidity: 0 to 90% non-condensing
- Storage temperature range: 0° to 85° C (-40° to 185° F)
- Storage humidity: 0 to 90% non-condensing
- Ingress protection rating: IP30

Power

The radio node is compliant with IEEE 802.3at (PoE+):

- Power consumption: 23W maximum
- UMTS transmitter output power: 1x 250 mW (24 dBm) RMS radio power
- LTE transmit output power: 2x125 mW (24 dBm)

Compliance

- ETSI:
 - EN 301 489-1
 - EN 301 489-23
 - EN 301 908-1
 - EN 301 908-3
 - EN 50385
 - EN 60950-1 (safety)
- IEEE 802.3at PoE+
- FCC:
 - FCC Part 15 Class A
 - FCC Part 24 (UMTS Band II only)
 - FCC Part 27 (UMTS Band IV only)
- CE Marking
- NRTL Marking
- RoHS (Directive 2002/95/EC on RoHS)
- R&TTE (Directive 1999/5/EC on R&TTE)
- CB certification as per IEC 60950-1:2011

Radio Node Models

[Table 1](#) displays the orderable configurations of the SCRN-310 radio node:

Table 1: SCRN-310 Radio Node Configurations

Radio Node Model	Description
SCRN-310-0701	Dual-mode with internal antennas: LTE Band 7, UMTS Band 1
SCRN-310-0402	Dual-mode with internal antennas: LTE Band 4, UMTS Band 2

Antennas

The radio node includes four integrated antennas: two UMTS antennas and two LTE antennas. The UMTS radio operates in 1x2 mode with receive diversity. The LTE radio operates in 2x2 mode with MIMO.

Tip: To maximize antenna transmission, SpiderCloud Wireless recommends not installing the radio node inside a metallic enclosure.

Ports

The radio node has one 1 Gigabit Ethernet port that supports a Category 5e (Cat 5e) or better twisted-pair cable with an RJ-45 connector. Figure 4 shows the Ethernet port. There are two LEDs on the connector:

- **Link:** Steady green state indicates a normal Layer 2 link connection has been established.
- **Activity:** Yellow blinking indicates data activity.

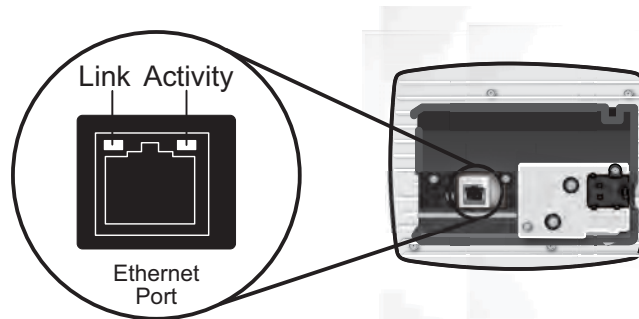


Figure 4 Ethernet Port

The Top-Panel LED

The radio node has one top-panel tricolor LED to indicate power and status. This is the only LED visible under normal operating conditions. When the radio node initially boots the LED cycles through a number of colors and flashing behaviors until it is fully operational.

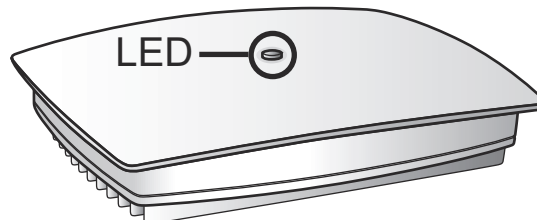


Figure 5 Radio Node Tricolor LED

Input Power

The radio node receives its power from a standard PoE+ switch (typical) or injector. The radio node is fully compliant with the IEEE 802.3at Power Over Ethernet (PoE+) specification.

Per IEEE 802.3at, use standard Cat 5e or better twisted-pair cable with a maximum length restriction of 100 meters (328 feet) for PoE+. This restriction minimizes power loss between the PoE+ power source and the radio node.

Power is distributed over two pairs of the four available pairs in Cat 5e or better cables. The radio node can accept power on either used or un-used pairs.

Figure 6 on page 10 shows the valid radio node cabling/powering options:

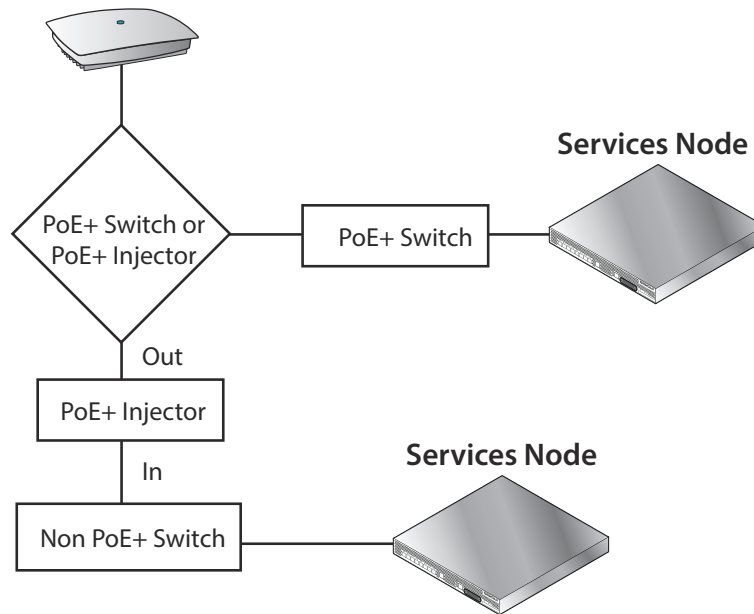


Figure 6 Valid Radio Node Cabling/Powering Options

The illustration below shows a generic single-port PoE+ injector. Use this injector only when a PoE+ Ethernet switch is *not* available.

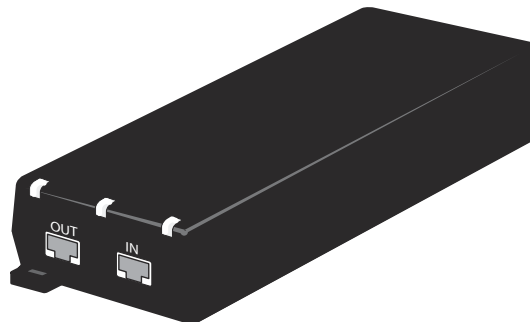


Figure 7 Typical PoE+ Injector

To connect the PoE+ injector to a radio node

Step 1 Attach the injector power cord to a power source.

Step 2 Connect an unpowered Ethernet cable from a switch to the **IN** port on the injector.

Step 3 Connect an Ethernet cable from the injector's **OUT** port to the radio node. The injector will now inject power onto a pair of wire pairs in the cable. The radio node will expect a nominal 48V DC input (57V max) from a typical PoE+ injector.

Select the Radio Node Location

Radio nodes can be installed in a wide range of locations including walls, ceilings, and plenum spaces. Follow the installation guidelines for selecting appropriate mounting locations for the unit. When mounting a radio node vertically, align the bottom-side fins vertically for superior cooling.

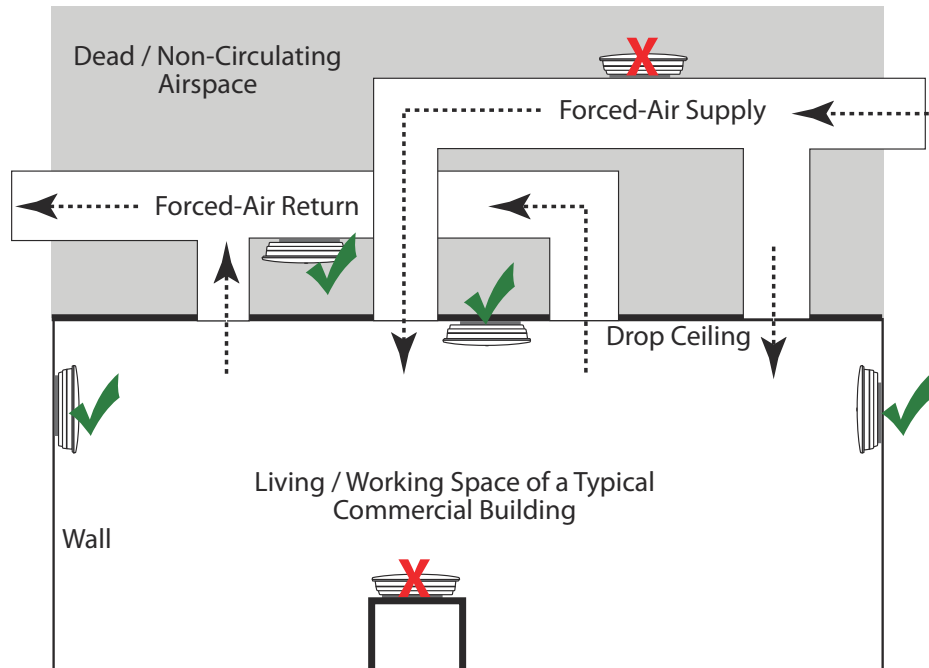


Figure 8 Radio Node Locations

When possible, locate radio node units at least 5 meters (16 feet) from an external wall. This distance maximizes indoor coverage and minimizes RF leakage outside the building. When mounting near a wall or other obstruction, orient the mounting bracket such that the transmit antenna faces towards the coverage area and faces away from the wall. Refer to [Bracket Mounting and Cabling Guidelines](#) on page 13 for more information.

Use [Table 2](#) to determine the maximum distance between radio node units. Greater separation may affect coverage or system performance.

Table 2: Recommended Radio Node Separation Distances	
Type of Building	Max Recommended Separation
Warehouses and large open-spaced buildings	70 m (230 feet)
Open-plan offices	45 m (148 feet)
Closed-plan offices (e.g., individual rooms - plasterboard)	30 m (98 feet)
Closed-plan offices (e.g., individual rooms - stone/brick/concrete)	20 m (66 feet)

Installation and Mount Bracket Assembly

The radio node has a pedestal base that slides into a long bracket for ceiling or wall mounting. SpiderCloud Wireless pre-bolts the pedestal base onto the extrusion plate on the radio node. However you must attach the pedestal base to the mount bracket as shown in [Figure 9](#):

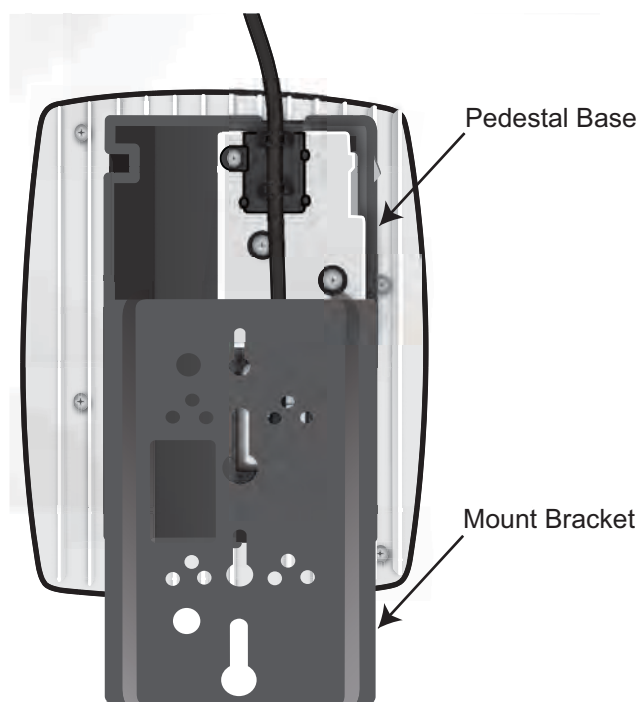


Figure 9 Pedestal Base Slides into Mount Bracket

Bracket Mounting and Cabling Guidelines

Incorrectly cabling and mounting a radio node can result in crushed cables and loss of communications to the unit. Follow these guidelines in cabling the radio node and mounting it on the bracket:

- Ensure that the cabling is properly routed and dressed.
- Ensure that the pedestal base is fully inserted into the mount bracket so that it locks into place and is flush. A correctly installed cable should at no time during installation impede inserting the pedestal base into the mount bracket.
- Secure the pedestal base to the mount bracket with a padlock or tie wrap to provide physical security.
- When mounting the radio node vertically, orient the bracket with the open end on top and the closed end on the bottom. [Figure 10](#) on page 14 shows the proper vertical orientation.
- When mounting the radio node near a wall or other obstruction, orient the bracket such that the radio node transmit side towards the coverage area. In vertical mountings, this is on the right side of the radio node. [Figure 10](#) on page 14 shows the mounting bracket orientation.

Typical Radio Node Mounting Options

Radio nodes can be mounted on a wide number of surfaces including the following typical surfaces:

- **Light grill:** Use bolts, nuts, and washers to secure the mount bracket using holes in the light grill. Adjust the mounting bracket until the bracket and light grill holes align.
- **Directly on the wall or ceiling:** Use drywall screws to secure the mount bracket directly to sheetrock or plasterboard on the wall or ceiling.
- **Mud or plaster ring:** Secure the mount bracket directly on the wall or ceiling as above with a 3 1/4 inch (8.25 centimeter) mud or plaster ring between the mount bracket and the mounting service and run the Ethernet cable through ring's hole.
- **Strutting:** Secure the radio node to heavy hanging equipment strutting using strut clip nuts and M8 studding.

Installing the Radio Node

The radio node receives its power source over powered Ethernet. If your wiring closet does not have existing PoE+ equipment, SpiderCloud Wireless recommends a PoE+ power injector for the radio node. See section [Input Power](#) on page 10.

The Ethernet cable can route openly or directly through a surface such as a wall or ceiling:

- Refer to [Installing the Radio Node \(Method 1\)](#) on page 13 for open cable routing installation.
- Refer to [Installing the Radio Node \(Method 2\)](#) on page 15 for direct cable routing installation.

Installing the Radio Node (Method 1)

To route the cable openly and mount the radio node

- Step 1** With two user-provided screws, attach the mount bracket assembly to a wall or ceiling. The screw holes are sized for an M4 (#10) screw. Ensure the screws have a snug fit onto the studs, sheetrock, anchor, or other material you are bolting onto.

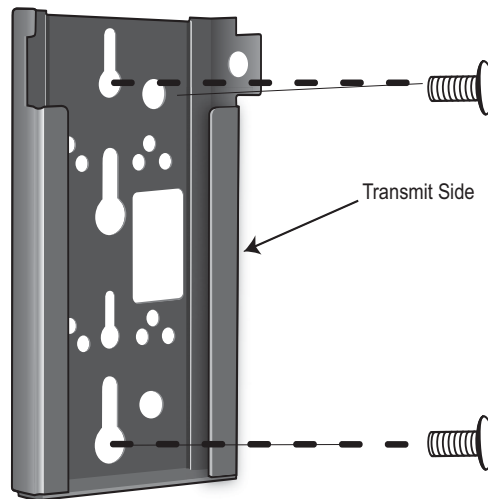


Figure 10 Attach the Mount Bracket

- Step 2** Insert the RJ-45 connector into the Ethernet port as shown in Figure 13. Route the Ethernet cable through the cable guides and pedestal base cable opening and through the cable guides as shown in [Figure 11](#):

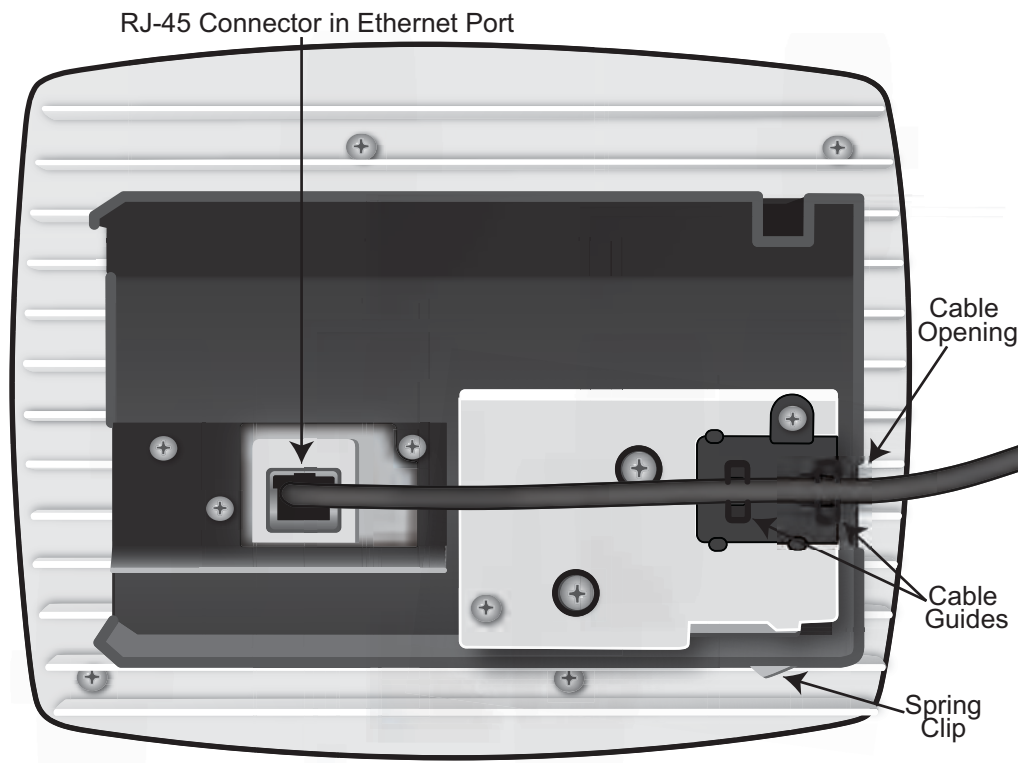


Figure 11 Route and Terminate the Cable

- Step 3** Press the cable into the cable guides until the guides securely snap around the cable. Ensure that there is no cable slack and that there is sufficient cable bend radius.
- Step 4** Slide the pedestal base of the radio node into the groove opening in the mount bracket. When the pedestal reaches the end of the trough, a spring clip will secure the unit into place.