

# Hardware Installation Guide for SmartCloud® Radio Node - SCRN 800



Part number: DOC-RN-HW-02  
Published: January 2011

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## **FCC Statements**

**Warning:** In order to avoid the possibility of exceeding the FCC radio frequency exposure limits, the SCRN 800 must have a minimum distance of 20 cm from the body during normal operation.

Changes or modifications not expressly approved by SpiderCloud Wireless engineering voids the user's authority to operate the equipment.

**Note:** This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case, the user will be required to correct the interference at his own expense.

## **Industry Canada Statements**

This device has been designed to operate with the antenna listed below and having a maximum gain of 3 dB. Antennas not included in this list or having a gain greater than 3 dB are strictly prohibited for use with this device. The required antenna impedance is 50 ohms.

- Laird MAF94307
- Larsen SPDA17806/2170

To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than permitted for successful communication.

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# System Overview

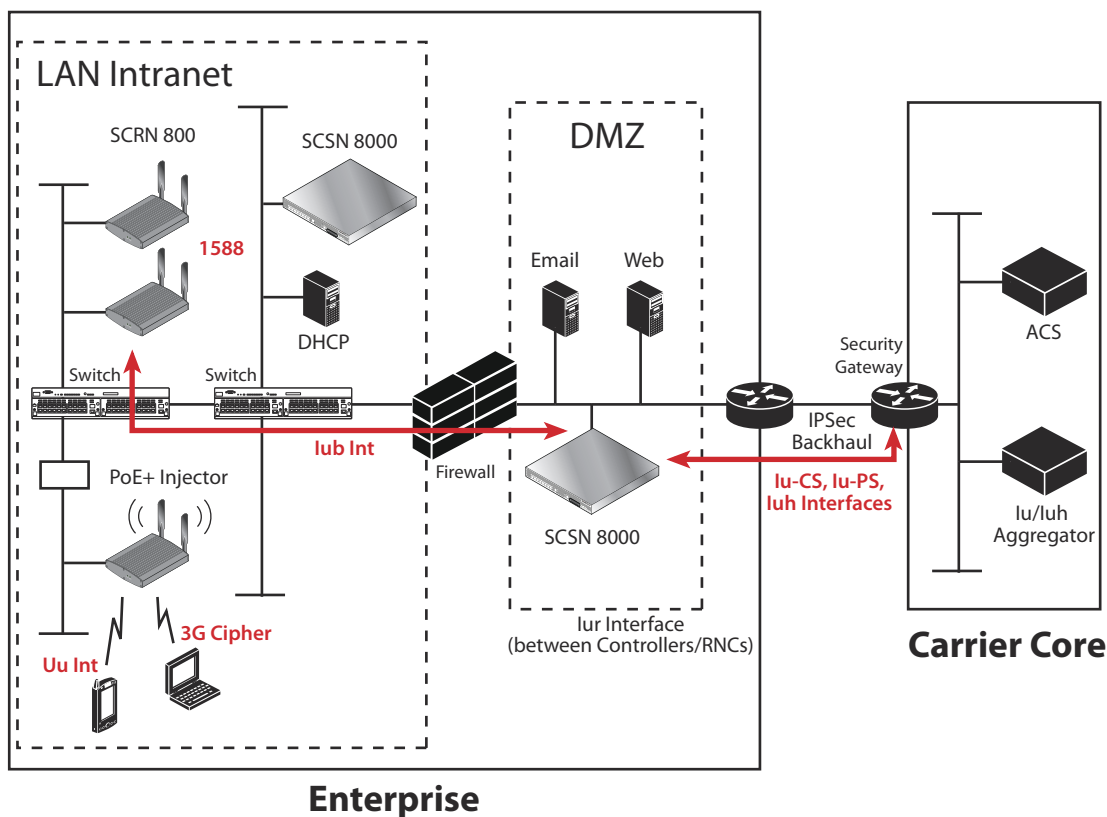
The SmartCloud® Radio Node 800 (SCRN 800) is a low-cost, low-power (100mW) Node B designed for enterprises.

The SCRN is 3GPP compliant, supporting Universal Mobile Telecommunications System (UMTS) Release 6 software and is upgradable to Release 7 and 8.

The SCRN provides enterprises with dedicated high-quality, high-capacity UMTS coverage. The SCRN is easy to install and connects to the existing enterprise LAN using standard Ethernet cabling.

The SCRN is managed by the SmartCloud® Services Node 8000 (SCSN 8000).

Figure 1 SCRN Relationship to Enterprise and Carrier Core Networks



## System Overview

### Services Provided

The SCRN provides the following services:

- Complete enterprise mobility using licensed spectrum.
- RF self-calibration for autonomous setup, operation, and management.
- Enhanced networking.
- Transparent integration into enterprise network environments.

### SCRN System Isometric Front View and Rear View

The following diagrams display an isometric front view and rear view of the SCRN.

Figure 2 Isometric Views with Mount-Bracket Assembly

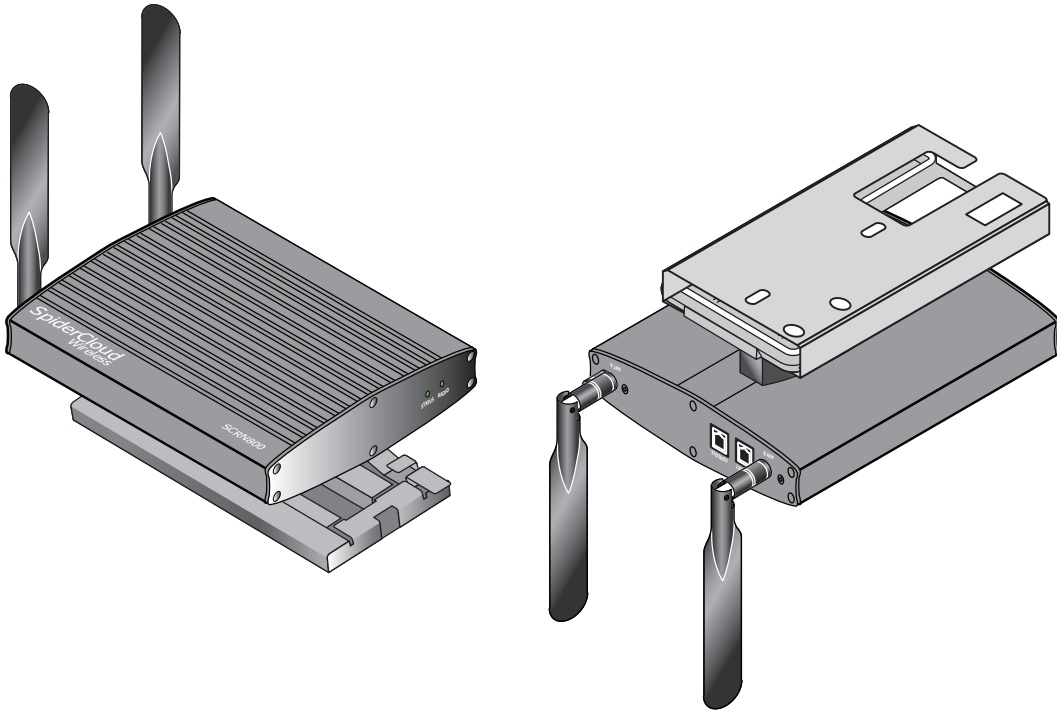


Figure 3 Front View

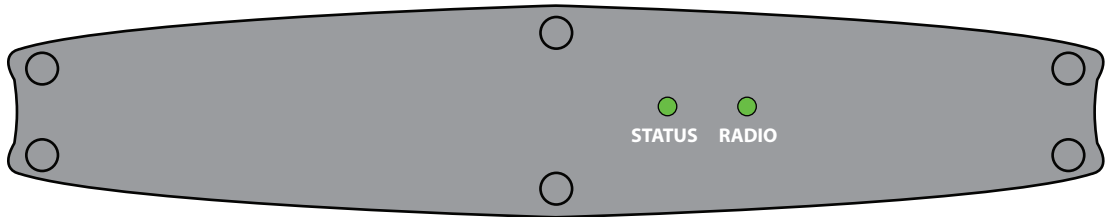
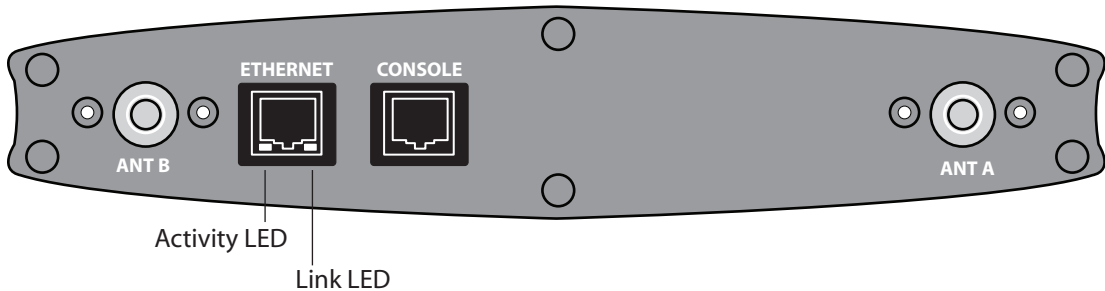


Figure 4 Rear View



## System Specifications

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

### Frequency Bands of Operation

- Transmitter = 2110-2170MHz (Downlink).
- Receiver = 1920-1980MHz (Uplink).
- UMTS Band I monitor mode = 2110-2170MHz.
- GSM low-band listen mode = 925-960MHz.
- GSM high-band listen mode = 1805-1880MHz.

## System Specifications

### Size and Dimensions

- Height:
  - 3.81 centimeters (1.5 inches).
  - 7.69 centimeters including mount bracket assembly (3.03 inches).
- Width: 19.4 centimeters (7.65 inches).
- Depth: 21.6 centimeters (8.51 inches).
- Weight: 1.41 kilograms without antennas (3.1 pounds).

### Power

- The transmitter output power is 100mW radiated power (EIRP) nominal.
- Power over Ethernet (PoE+) can provide 25.5W maximum of delivered power and a maximum of 600mA at the SCRN.
- The SCRN itself requires 23W of power at 48 volts nominal (41v to 57v).

### Environmental Requirements

- Operating temperature range: 0 to 50° C (32 to 122° F).
- Storage temperature range: -40 to 85° C (-40 to 185° F).
- Cooling: The SCRN is cooled mainly through radiated heat loss. This approach allows for the SCRN to be oriented at any angle.
- Relative humidity: 85% for 48 hours at 85°C, non-condensing.
- Shock and vibration: When the reference oscillator is the “weak-link”, the limits are: IEC 60068-2-27, test Ea: 1500gn acceleration for 0.5ms duration, half-sine pulse, three shocks in each direction along three mutually perpendicular axes.

### Compliance

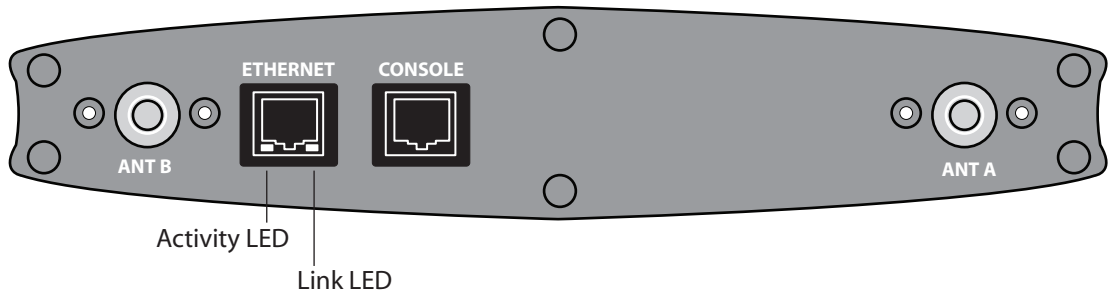
- EN 301 489-1.
- EN 301 489-23.
- EN 301 908-1.
- EN 301 908-3.
- EN60950-1 (safety).



- IEEE 802.3at PoE+ 25.5W.
- CE Marking.
- RoHS (Directive 2002/95/EC on RoHS).
- R&TTE (Directive 1999/5/EC on R&TTE).
- Directive 2001/95/EC on general product safety (EN 60950-1:2006 - IT Eq't - general safety reqs).
- EN 55022:2006 - IT Eq't - Radio disturbance measurement.

## Ports and LEDs

Figure 5 Rear View

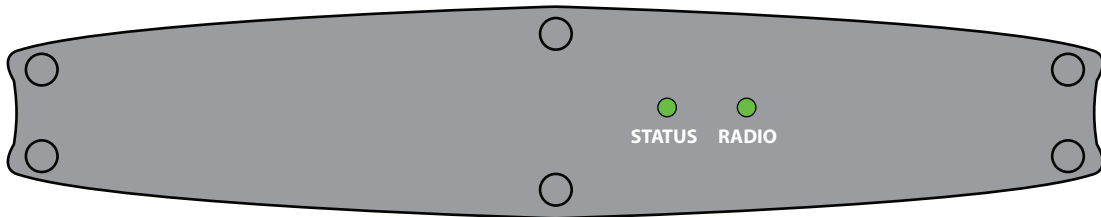


- 2 antenna ports labeled ANT B and ANT A. See “Antennas” on page 7 for more details.
- 1 console port—For administrative CLI access to the system. Access the CLI for advanced diagnostics, troubleshooting, and monitoring. This RS-232 serial console port has an RJ45 connection with these settings:
  - Baud rate: 115,200 bps.
  - Data bits: 8.
  - Stop bits: 1.
  - Parity: none.
  - Flow control: none.

## Ports and LEDs

- 1 10/100 Ethernet port. Attach a category 5 cable to this port. [Figure 5](#) shows the 10/100 port with the tab facing down. There are two LEDs on the connector:
  - Link**—On the lower-right corner of the RJ45. Steady green state indicates a normal Layer 2 link connection has been established.
  - Activity**—On the lower-left corner of the RJ45. Yellow blinking indicates data activity.

**Figure 6 Front View**



There are two LEDs on the front of the system: Status and Radio.

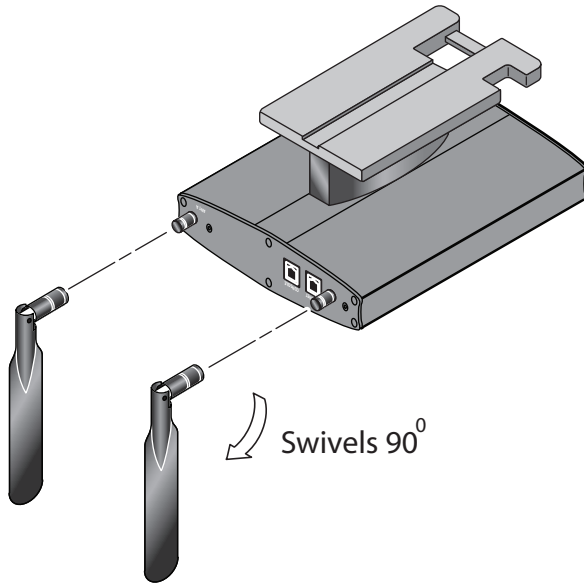
LED descriptions:

- **Status**—The overall status of the system. There are five states for this LED:
  - Quick blinking green: The system is booting up.
  - Solid green: When the operating system starts successfully, the LED turns to solid green indicating normal behavior.
  - Red: If the operating system cannot boot up, the LED turns to solid red indicating a fault condition.
  - Slow blinking green: The system is administratively disabled.
  - Off: The system is powered down.
- **Radio**—The radio indicator. There are four states for this LED:
  - Solid green: The radio is in normal UMTS transmitting mode.
  - Blinking green: The radio is in receiving mode (network monitoring).
  - Red: A radio fault has occurred.
  - Off: The radio is idle (not transmitting, not receiving).

# Antennas

Figure 7 shows the antennas for the UMTS Band I Radio Node. These antennas have a thread-on reverse-polarity TNC connector.

Figure 7 Antennas Rotate 90 Degrees



Vertically-polarized, omnidirectional antennas are provided. They radiate power in a plane normal to their length—horizontal radiation from vertically-oriented antennas.

The physical location of the SCRN in a building is not critical because the SCRN operates over a licensed band. However, coverage area is very important. Place the SCRN units at strategic points for best coverage.



Tip

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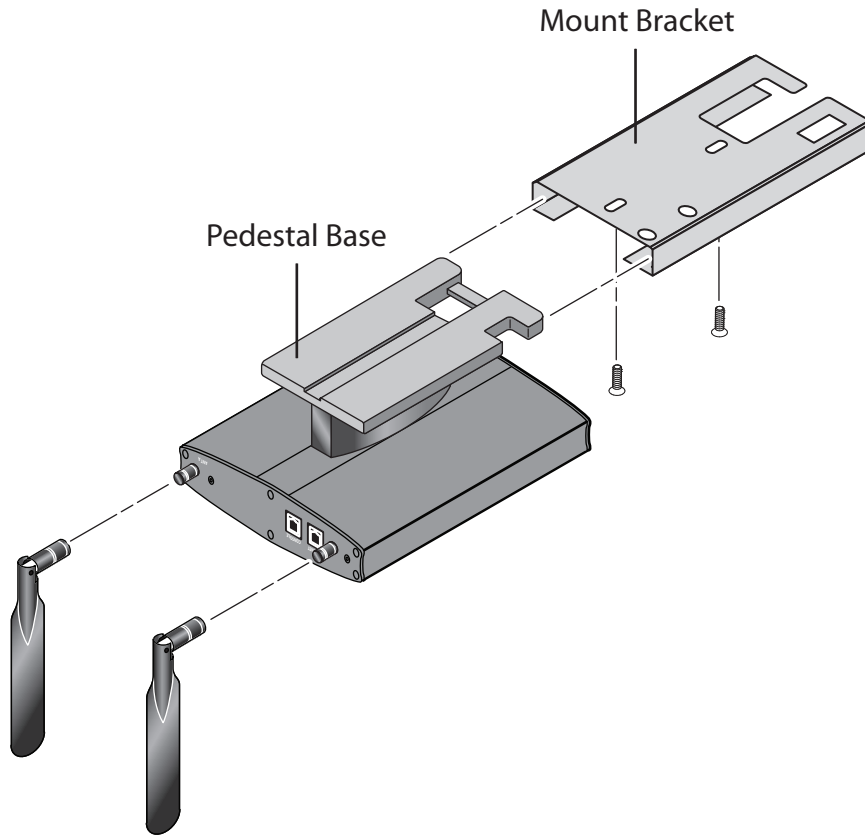
To maximize antenna transmission, SpiderCloud Wireless, Inc. recommends that you should not install the SCRN underneath or inside a metallic enclosure.

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# Installation and Mount Bracket Assembly

The SCRN has a pedestal base that slides into a long “U” shaped bracket for ceiling or wall mounting. SpiderCloud pre bolts the pedestal base onto the extrusion plate on the SCRN. However you must attach the pedestal base to the mount bracket as shown in the following diagram:

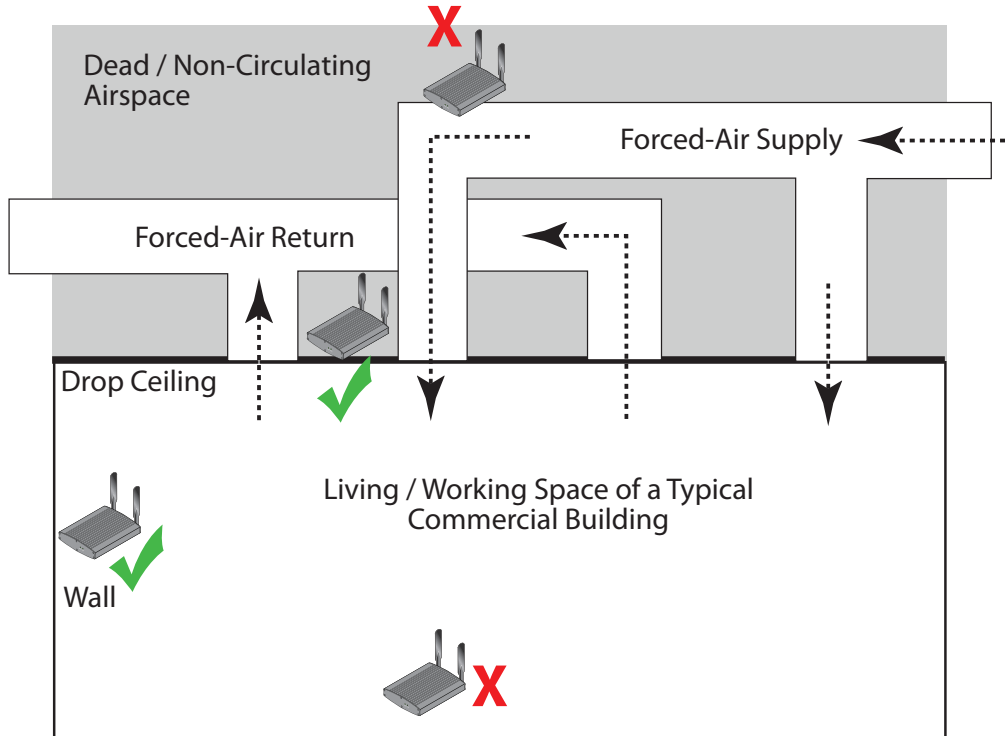
Figure 8 Pedestal Base Slides into Mount Bracket



## Installation Procedure

Follow these steps to install the SCRN:

- Step 1** Choose a location for the SCRN. The unit can be installed in a wide range of locations including walls, ceilings, and plenum spaces. Follow the installation guidelines for choosing appropriate mounting locations for the unit.



–Locate SCRN units at least 5 meters from an external wall. This distance maximizes indoor coverage and minimizes RF leakage outside the building.

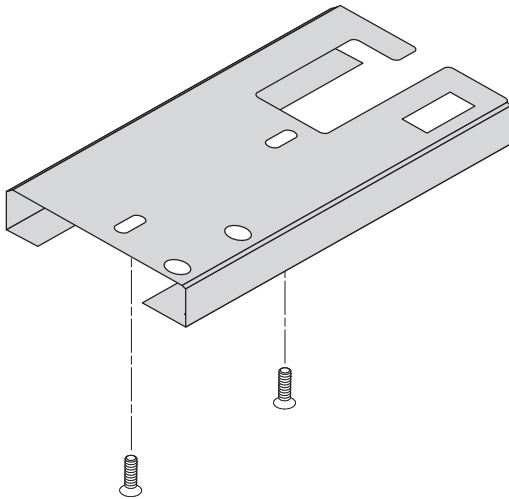
–SCRN Separation. Use the following table to determine the maximum distance between SCRN units. Using distances greater than this may affect coverage or system performance.

## Installation and Mount Bracket Assembly

Table 1 Recommended Separation Distances

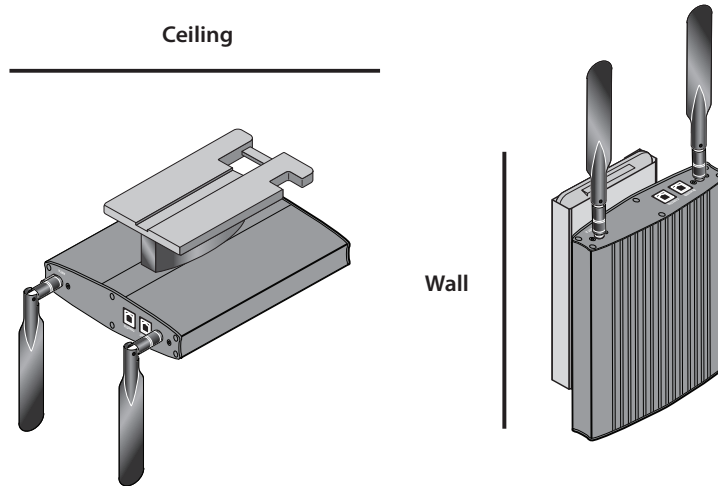
Type of Building	Max Recommended SCR N Separation (m)
Warehouses and large open-spaced buildings	70 m
Open-plan offices	45 m
Closed-plan offices (e.g., individual rooms - plasterboard)	30 m
Closed-plan offices (e.g., individual rooms - stone/brick/ concrete)	20 m

**Step 2** Screw 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, or whatever material you are bolting to:

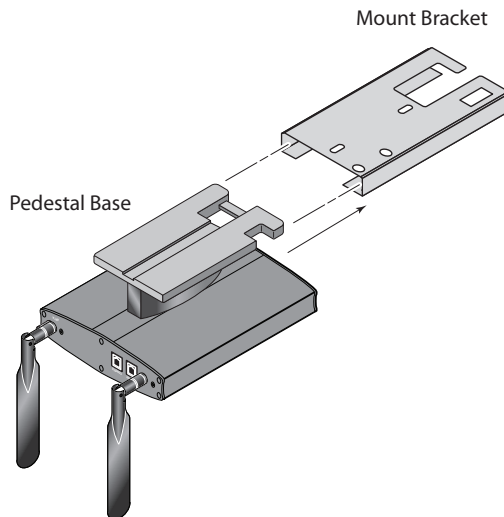


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- Step 3** Attach the antennas to the TNC connectors on the SCRN. If the SCRN is mounted on the ceiling, flip the antennas pointing downward. If mounted on the wall, flip the antennas pointing upward:

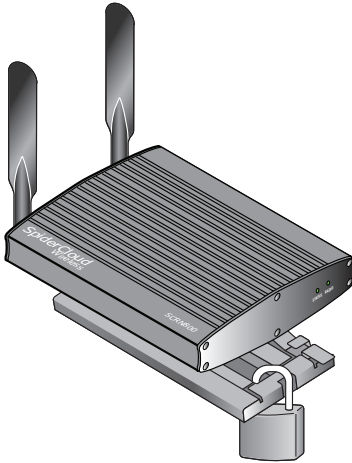


- Step 4** Slide the pedestal base of the SCRN into the groove opening in the mount bracket. When the pedestal reaches the bottom of the trough, a spring clip will snap the unit into place:



## Installation and Mount Bracket Assembly

- Step 5** Physically secure the SCRN. Locate the bar between the two “U” shaped brackets. Clamp a padlock or cable tie wrap through the two cutout holes and across the bar:



Note

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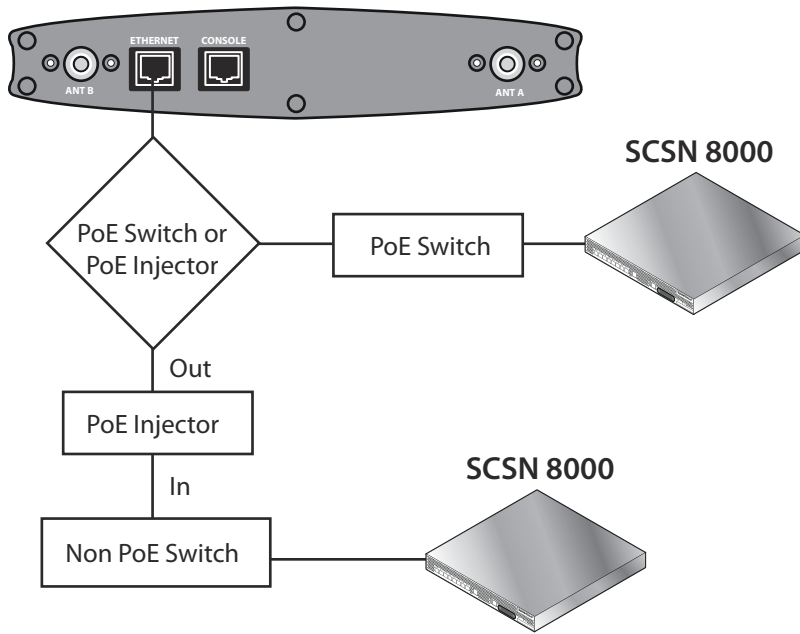
The lock in the above figure is shown schematically. The orientation is for illustration purposes (not accurate) since the bracket is wall or ceiling mounted.

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- Step 6** Attach a powered Ethernet cable. The SCRN receives its power source over powered Ethernet. If your wiring closet does not have existing PoE+ equipment, SpiderCloud provides a PoE+ power injector for the SCRN. See [“PoE+”](#) on page 15.



## Hardware Installation Guide for SmartCloud® Radio Node - SCRN 800



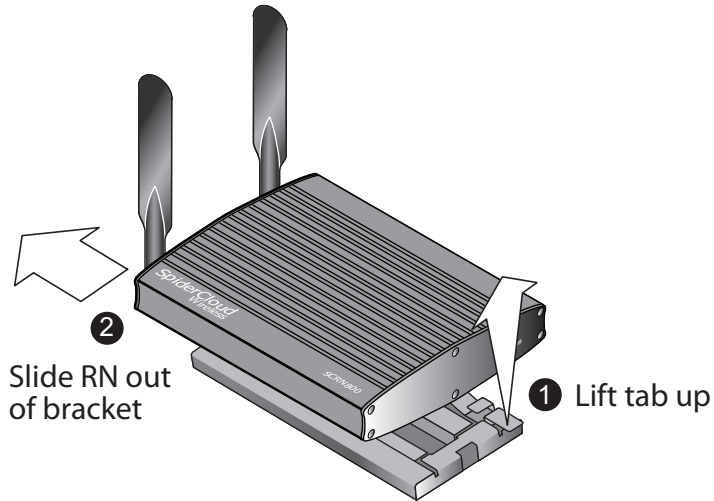
**Step 7** The SCRN boots up and attempts to connect to the SCSN. See [“Boot Sequence and SCSN Communication”](#) on page 16 for details.

## Installation and Mount Bracket Assembly

### Detaching the SCRAN from the Mount Bracket

To remove the SCRAN from the bracket assembly:

- Step 1** Lift up the release tab on the under side of the SCRAN.
- Step 2** Slide the SCRAN out of the mount bracket.



## PoE+

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

Per 802.3at, standard CAT-5/5e or better twisted-pair cable with a maximum length restriction of 100 meters (328 feet) should be used for PoE+. This restriction minimizes power loss between the PoE+ power source and the SCRN.

SpiderCloud provides an optional single-port PoE+ injector in the accessory kit. Use this injector only when a PoE+ Ethernet switch is *not* available.



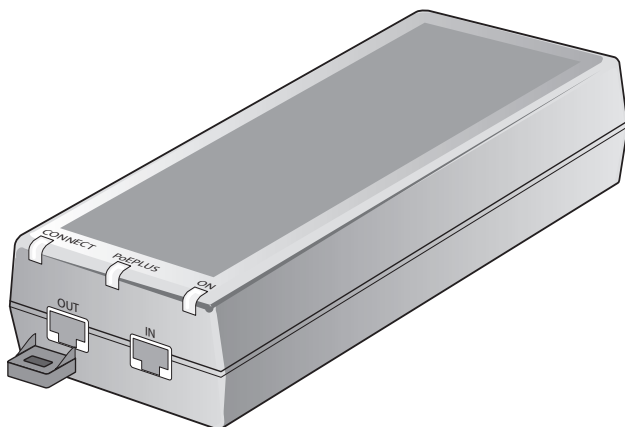
Note

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The SCRN can accept power on used or un-used pairs. Power distribution is over two pairs of the four available pairs in Cat 5.

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Figure 9 PoE+ Injector



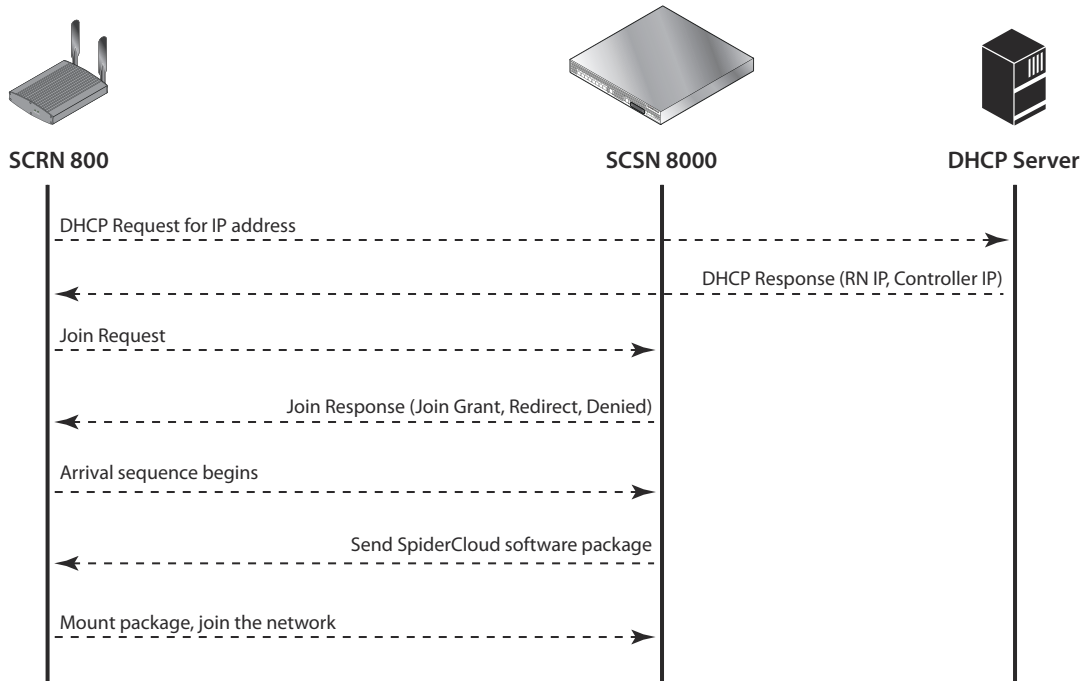
To install the injector:

- Step 1** Attach the injector's 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 SCRN. The injector will now inject power onto a pair of wire pairs in the cable. The SCRN will expect a nominal 48V DC input (57V max) from the PoE+ injector. The Phihong PoE+ power injector supplies 57V maximum typically.

# Boot Sequence and SCSN Communication

On initial boot, the SCRN performs the following boot sequence and communicates with the SCSN. This sequence takes about 1 minute to complete. When completed, all devices are reachable:

Figure 10 SCRN Boot Sequence



Sequence description:

1. When the SCRN is powered on, the device sends a DHCP Request to the network DHCP server to get IP information.
2. The DHCP server is configured to use vendor option 43. The server responds with the IP addresses of the SCRN and the SCSN (the master of the SCRN).

The following example shows a sample configuration from a DHCP server:

```
option space SPIDERCLOUD;  
option SPIDERCLOUD.access-controller code 102 = string;  
option SPIDERCLOUD.access-controller "10.1.30.99";
```

3. Using its own IP address, the SCRN sends a Join Request message to the SCSN. The SCRN seeks to join the cellular network.
4. The Join Response from the SCSN will be one of the following:
  - **Join Grant:** Permit the SCRN to join the SCSN.
  - **Redirect:** Redirect the SCRN to join a different SCSN, if you have multiple SCSN units configured in the network.
  - **Denied:** The security signature on the SCRN does not match what the SCSN expects. The client is untrusted and treated as a rogue device.
5. The arrival sequence begins. Based on the configuration of the SCRN, the SCRN will join the system and get its configuration. The SCSN sends the SpiderCloud software image (the system image and configuration settings) to the SCRN.
6. The SCRN reboots and mounts the SpiderCloud software image as a RAM-based file system.
7. The SCRN contacts the SCSN and joins the network.

## Related Documents

See the following documents for more information:

- *SmartCloud® CLI Quick Start Guide Release 1.4* to configure the software environment and internetworking between the SCSN and SCRN devices.
- See the *Hardware Installation Guide for SmartCloud® Services Node - SCSN 8000* for hardware specifications and installation instructions.
- *SCOS NB Data Model Reference* for reference details about Operational Mode and Configuration Mode commands.



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