

CORNING

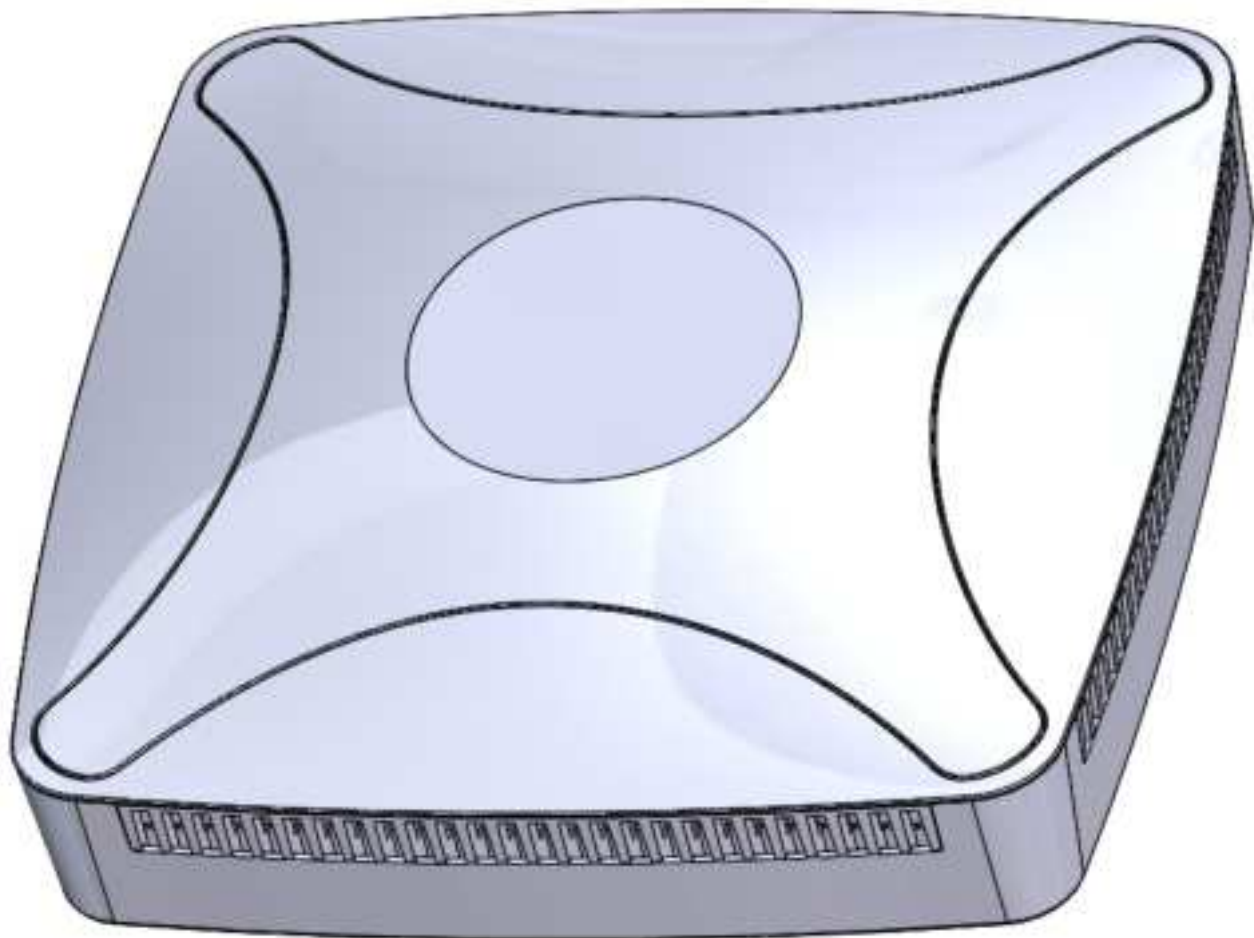
Small Cell Radio Node - SCRN-510 Hardware Installation Guide

DOC-SCRN-510-HIG_i4
Issue 4

Related Literature | Search www.Corning.com/opcomm. Click Required Resources.

Revision History

Issue	Date	Summary of Changes
1	30JUL20	Initial release for SCRN-510 Small Cell Radio Node
2	30AUG20	Issue 2 removes UMTS references
3	01OCT20	Issue 3 adds FCC Statement
4	16OCT20	Issue 4 adds an additional Regulatory Statement



FCC Statement

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

RF Exposure warning statement:







This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum 40 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.

This device can be expected to comply with part 15 of the FCC Rules provided it is assembled in exact accordance with the instructions provided with this kit. Operation is subject to the following 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.

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.

Safety Precautions

Corning strongly recommends reviewing and adhering to the following cautions and notices before installing and operating the SCRN-510.

	WARNING: This warning symbolizes danger that may cause severe injury or death. Before installing or servicing equipment ensure that you are aware of all hazards involved with electrical circuitry and become familiar with applicable safety standards and national and local electrical codes and any other relevant standards.
	WARNING: Do not locate outdoor antennas near overhead power lines or other power circuits that might come into contact with the antennas and their wiring. Contacting such circuits during installation can cause severe injury or death. Refer to national and local electrical codes and any other relevant standards for more safety information.
	WARNING: Ensure that you install a suitable lightning arrestor for outside antenna installations.
	WARNING: Do not use or service any equipment with outdoor connections during electrical storms due to risk of lightning.
	WARNING: All electrical equipment must be properly grounded. Refer to national and local electrical codes and any other relevant standards for electrical grounding information.
	WARNING: If an external antenna starts to fall during installation, for models that are designed for external antennas, let it drop as it may contact a power line or other electrical circuitry that might cause severe injury or death.



NOTE: This device does not require professional installation.

Other Cautions



CAUTION: ESD can damage the SCRN-510 and internal components. Ensure that the SCRN-510 and associated antenna equipment is installed and serviced according to national and local ESD standards.



CAUTION: Ensure that the antenna cable conforms to the environment in which it is used.



CAUTION: Do not open the SCRN-510 casing. E-RAN wireless system equipment must only be serviced by Corning-accredited personnel. Opening the SCRN-510 casing voids the warranty.

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1. About this Manual

The Corning SCRN-510 small cell radio node is an integrated 5G new radio (NR) mmWave radio node that is part of the Corning enterprise radio access network (E-RAN). The scalable SCRN-510 radio node and the enterprise radio access network (E-RAN) simplify the complexity of radio management and mobility, and provide operators with a single interface to aggregate and manage a large network of radio nodes. This guide provides the system specifications of the SCRN-510. It includes detailed hardware installation instructions, the boot sequence, and expected LED behavior both during the boot-up and under normal operating conditions.

NOTE: *The 5G New Radio (NR) is a new radio access technology developed by 3GPP for fifth generation (5G) mobile networks.*

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.

2. Product Overview

The SCRN-510 is a 5G mmWave Time Division Duplexing (TDD) radio node that supports 2 x 2 MIMO small cell operation on NR band n261, enabling high user capacity and high data rates for the coverage footprint. The SCRN-510 connects to a Corning centralized unit (CU). It uses certificate-based authentication with the Corning CU. SCRN-510 radio nodes are managed by the Corning centralized units installed in the enterprise or in a centralized location such as a data center.

The SCRN-510 includes built-in self-organizing networks (SON) features for ease of deployment. Its fronthaul network can be deployed using approved 10 Gb fiber optic cables. The radio node receives 48 VDC power from a Corning PSU6 DC Power Supply Unit or equivalent. There is no management or console port on the radio node, and the radio node is physically locked to prevent theft. The SCRN-510 is fan-cooled, and its antennas are built-in. Each SCRN-510 comes with a ceiling-mount bracket attached for installing directly to a flat surface, as well as a second multi-angle (0, 15, 30, and 45 degree) wall-mount bracket loose in the box.

The SCRN-510 uses on-chip Trusted Platform Module (TPM) functions to implement secure boot, and to establish certificate-based IPsec tunnels to the centralized unit. It includes a PTP client to achieve frequency and phase synchronization with other mmWave radio nodes and base stations. When used with 2 x 100 MHz channel bandwidth on the downlink, a radio node supports a peak downlink rate of 1.1 Gbps and a peak uplink rate of 60 Mbps @ 64QAM.

The E-RAN element management system includes configuration, fault and performance monitoring, and security functions.

[Figure 1](#) shows the logical architecture of the SCRN-510 in an E-RAN network.

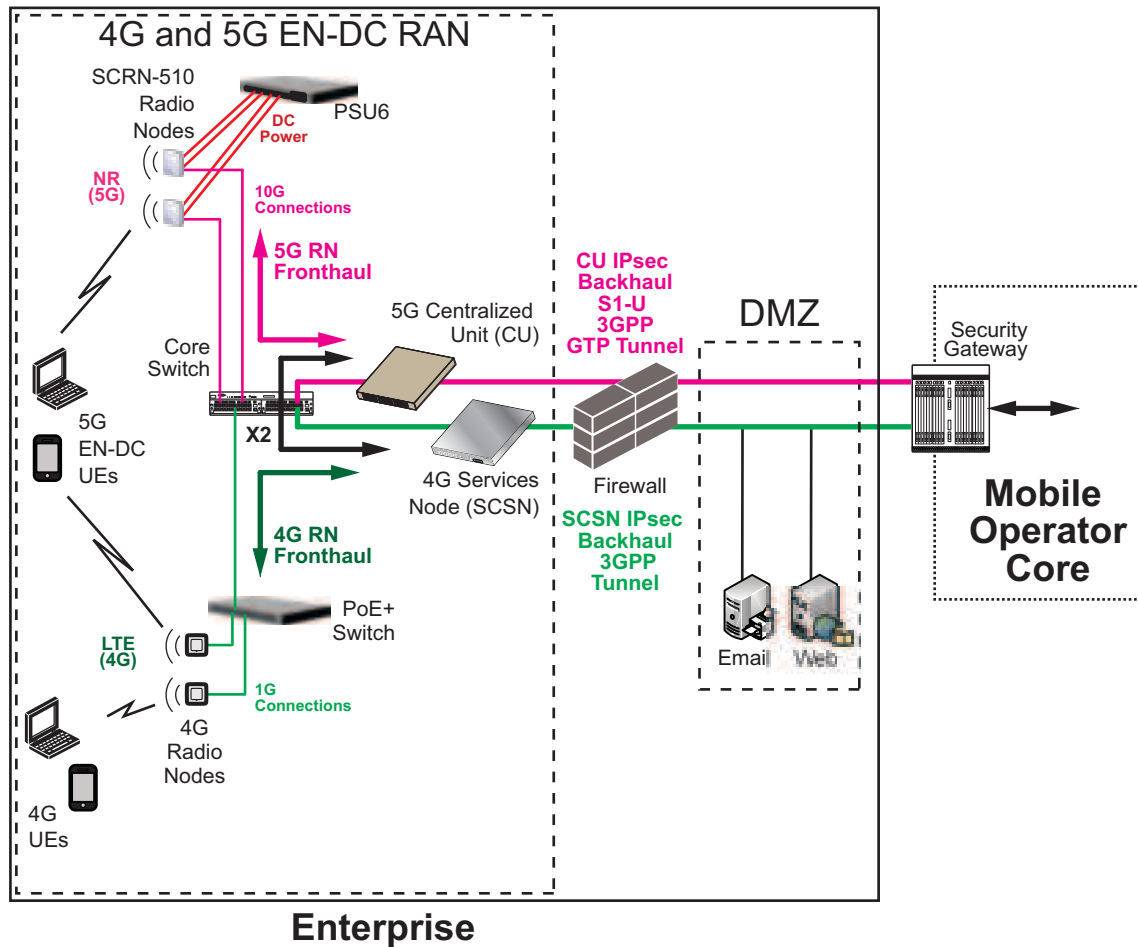


Figure 1 5G NR and E-RAN Radio Node Relationship to Enterprise and Mobile Operator Core Networks

3. Radio Node Model

Table 1 includes the SCRN-510 radio node configuration.

Table 1 SCRN-510 Radio Node Configuration

Radio Node Model	Description	Antenna Type
SCRN-510-28G1	28 GHz band n261 mmWave RN with 8 x 8 dual-polarization antenna array	Internal

3.1 Radio Node Cover-Side and Mounting-Side Views

Figure 2 and Figure 3 display cover and mounting-side views of the radio node.

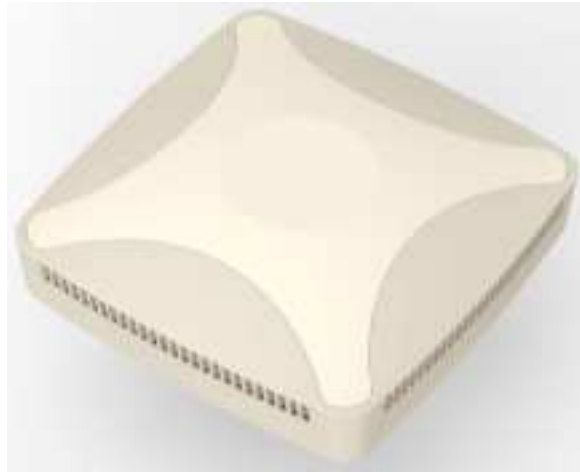


Figure 2 Radio Node Cover-Side View



Figure 3 Radio Node Mounting-Side View With Ceiling-Mount Bracket

4. Connectors, SFP+ and Micro-USB Ports, and Status LED

The radio node has the following connectors and a small form-factor pluggable SFP+ port, as shown in [Figure 4](#).

4.1 Duplex Phoenix Power Cable Ports

The SCRN-510 has two 48 VDC power connectors for delivering power from a Corning PSU6 DC Power Supply Unit or equivalent to the radio node. Plug the Phoenix power connectors from the power source cable into the power connectors; one connector into the PRIMARY port, and then another connector into the SECONDARY port. Both ports must be provided with power.

4.2 SFP+ Transceiver Port

The enhanced small form-factor pluggable (SFP+) is a compact, hot-pluggable network interface module. The approved SFP+ included on the Bill Of Materials supports 10 GbE (Gigabit Ethernet). Connect the fiber pair of the ActiFi cable (or other approved fiber cable) with approved SFP module termination to the SFP port for connecting the radio node to the fronthaul transport network.

4.3 Micro-USB Port

The Micro-USB port is used for advanced configuration. For use only by authorized technicians.

4.4 Status LED

The STA (status) RGB tri-color LED indicates the state of the SCRN-510, with boot, normal, disabled, fault, and radio node indications. When the radio node initially boots, the LED cycles through a number of colors and flashing behaviors until the SCRN-510 is fully operational. [Section 11., Radio Node LED Boot Sequence](#) describes the STA LED indications.



Figure 4 SCRN-510 Connectors and Status LED

5. System Specifications

The SCRN-510 radio node has the chassis measurements, power requirements, and environmental requirements, and complies with the standards listed in [Table 2](#). Refer to the feature guide for your centralized unit software release for release-specific features and specifications.

Table 2 SCRN-510 Radio Node Specifications

Operating Band	2 x 2 MIMO operation on 28-GHz NR band n261 (27.5–28.35 GHz)
Channel Size	Component Carrier (CC) bandwidth: 100 MHz
Antenna Type	8 x 8 dual-polarization internal antenna array
Antenna Power	43 dBm EIRP @ 64QAM Beamforming scan range: +/- 60 degrees
RF Management	Beam Management with auto-assignment of physical cell identities (PCIs)
QoS Features	Non-GBR bearer support per UE
Dimensions	31.75 x 31.75 x 11.43 mm (12.5 x 12.5 x 4.5 in)
Weight	5.31 kg (11.72 lbs)
Input Power	2 x 48 VDC Phoenix
Power Consumption	100 W
Ingress Protection	Ingress protection rating: IP30
Performance	Hardware capable of 4CC; up to 32 active users
Peak Tx Rate	1.1 Gbps DL, 60 Mbps UL (DL:UL slot ratio of 4:1) @ 64QAM with 2CC DL, 1CC UL
Licensed Tx Power	Equivalent isotropically radiated power (EIRP): 43 dBm
Ethernet Interface	SFP+ supports 10 GbE (Gigabit Ethernet)
LEDs	1 tricolor (RGB) LED to indicate power and status
Synchronization	IEEE 1588v2-based (PTP) synchronization with an external PTP grandmaster clock
Mounting	Wall or Ceiling, brackets included Brackets support four tilting options: 0°, 15°, 30° and 45° tilt
Cooling Method	Active cooling (Noise level: 30 dBA)
Security	Secure boot and secure key storage using Trusted Platform Module (TPM) functions IPsec tunneling to NR CU (Centralized Unit) X.509 certificate-based authentication
Environmental Requirements	Operating temperature range: 0° to 45°C (32° to 113°F) Non-operating temperature range: -40° to +70°C (-40° to 158°F) Relative humidity: Operating and storage: 0% RH to 90% RH non-condensing
MTBF	1,363,791 hours at +40°C (104°F)

6. Compliance

The SCRN-510 complies with the standards listed in [Table 3](#).

Table 3 SCRN-510 Compliance

Safety	TUV Safety (Including UL-62368-1 2nd Edition)
	FCC Compliant - Part 15 (Class A), Part 30
	MPE: FCC 47 CFR 1.1310
	UR: FCC 47 CFR 1.1307(b)

7. Mounting the Radio Node

Radio Nodes can be installed on walls and below ceilings with the factory-provided brackets. When mounting a radio node vertically on a wall, position the fans on the upper side of the SCRN-510. The factory-provided wall-mount bracket can tilt the SCRN-510 down at the following angles: 0°, 15°, 30° and 45°. [Figure 5](#) shows the SCRN-510 tilt options.

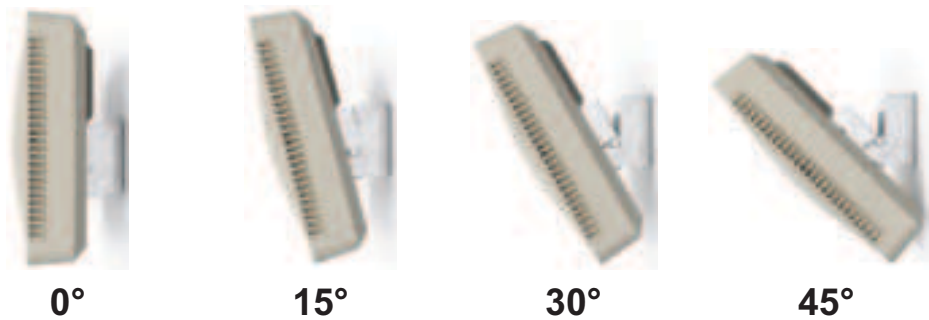


Figure 5 Mounting Bracket Downtilt Options

NOTE: Always consult and follow local codes for mounting and wiring Corning equipment.

When possible, locate downward-radiating radio node units at least 0.5 meters (20 inches) from external walls. This distance maximizes indoor coverage and minimizes RF leakage outside the building. When mounting near a wall or other obstruction, orient the mounting bracket so that the top of the SCRN-510 faces towards the coverage area and faces away from the wall.

7.1 Flush Mounting the SCRN-510

As shown in [Figure 3](#), the SCRN-510 comes with the ceiling-mount bracket attached. This bracket is held to the radio node mounting side with four shoulder screws and a captive securing screw, and is non-tilting. The shoulder screws should not need to be adjusted but if they do, loosen them slightly to be able to slide the ceiling-mount bracket on and off of the radio node when the captive securing screw has been loosened. [Figure 6](#) shows the captive securing screw and four security screw locations.

NOTE: *The security screws should not need to be adjusted but if they do, loosen them slightly to be able to slide the ceiling-mount bracket on and off.*

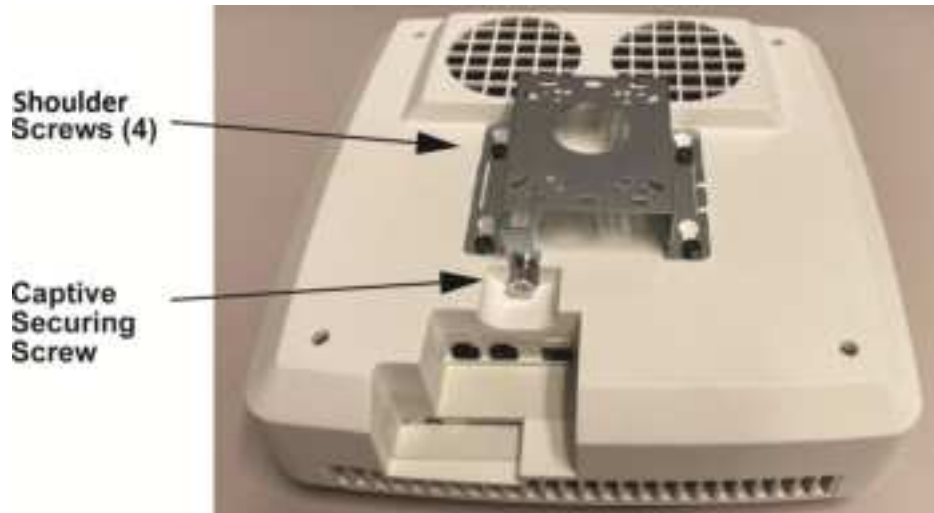


Figure 6 Ceiling-Mount Bracket Screw Locations

Step 1 Loosen the captive securing screw on the ceiling-mount bracket.

Step 2 Slide the ceiling-mount bracket toward the captive securing screw to remove it from the SCRN-510 base.

NOTE: *The shoulder screws should not need to be adjusted but if they do, loosen them slightly to be able to slide the ceiling-mount bracket on and off.*

Step 3 Secure the ceiling tethering system. Make sure that it can support the weight of the SCRN-510 and the ceiling-mount bracket.

NOTE: *Corning recommends that you use a customer-supplied projector mount when hanging the SCRN-510 from a dropped T-bar ceiling.*

Step 4 Secure the ceiling-mount bracket to ceiling tethering system.

Step 5 Slide the radio node back onto the bracket and gently tighten the securing screw.

[Figure 7](#) shows a typical SCRN-510 mounted to a ceiling tethering system.



Figure 7 Ceiling-Mounted SCRN-510

7.2 Downtilt Mounting the SCRN-510

The SCRN-510 comes with the ceiling-mount bracket attached, and has the multi-angle wall-mount bracket loose in the box. [Figure 8](#) shows the SCRN-510 wall-mount bracket.



Figure 8 SCRN-510 Wall-Mount Bracket

When using the multi-angle wall-mount bracket, it is not necessary to remove the ceiling-mount bracket from the SCRN-510; the wall-mount bracket attaches to the wall, and then it attaches to the ceiling-mount bracket-and-radio node assembly. [Figure 9](#) shows how the wall-mount bracket attaches to the ceiling-mount bracket.



Figure 9 Wall-Mount Bracket Attached to the Ceiling-Mount Bracket

Step 1 Using a spirit level, use the wall-mount bracket as a template to mark securing hole locations.

Step 2 If required, install sheet rock plugs.

Step 3 Attach the wall-mount bracket to the wall. [Figure 10](#) shows the SCRN-510 wall-mount bracket attached to a wall.



Figure 10 Wall-Mount Bracket Attached to a Wall

NOTE: *Production wall-mount brackets will have a large hole in the back for routing cables.*

Step 4 Seat the ceiling-mount bracket on wall-mount bracket:

- First, slide the ceiling-mount bracket onto the wall-mount bracket hinge pins.
- Then, set the SCRN-510 to the required tilt, and tighten the wall-mount bracket captive securing screw to lock the radio node tilt angle.

NOTE: *Put pressure on the SCRN-510 when tightening the captive securing screw.*

Figure 11 shows how to attach the wall-mount bracket to the ceiling-mount bracket.

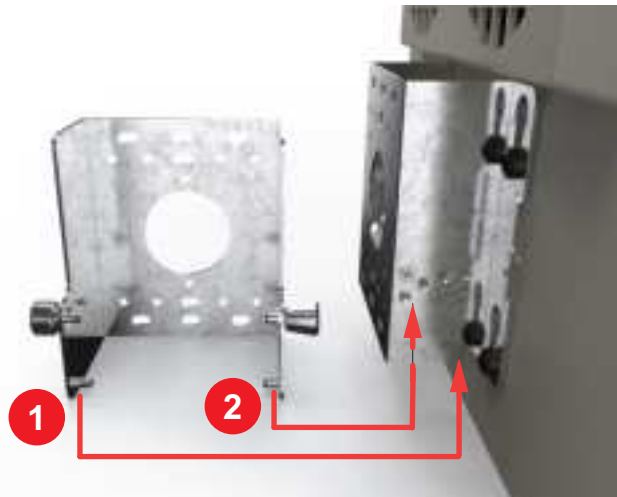


Figure 11 Attaching the Wall-Mount Bracket to the Ceiling-Mount Bracket

Step 5 Make sure that both of the captive securing screws are tightened.

8. Cabling Guidelines

Incorrectly cabling a SCRN-510 can result in crushed cables and loss of communications to the radio node. Follow these guidelines when cabling the radio node:

- Make sure that the cabling is properly routed and dressed.
- When mounting the radio node vertically, orient the bracket so that the bracket keyholes have the wide side up as shown in [Figure 3](#).
- Make sure that the radio node is fully secured to the mounting brackets so that it locks into place. A correctly-installed cable should at no time during installation impede inserting the radio node into the mounting brackets.

9. Completing the Installation

Step 1 Make sure that the captive securing screws are tightened. The radio node is now anchored.

Step 2 When it receives power, the radio node boots up and attempts to connect to the centralized unit.

10. Detaching the Radio Node from the Mounting Brackets

Step 1 Loosen the captive securing screws anchoring the radio node to its mounting brackets.

Step 2 Slide the radio node out of the mounting brackets.

Step 3 Detach the cables from the cable brackets and cable openings.

11. Radio Node LED Boot Sequence

The radio node state machine is sequential and progresses in the following order:

State 0 -> State 1 -> State 2 -> State 3 -> State 4 -> State 5 -> State 6

A normal boot sequence transitions through all these states sequentially and the LED state transitions accordingly. If the radio node fails to transition to the next state, the system restarts the boot sequence, starting with State 0. You can determine the progress during the booting stages by observing the LED color transi-

tions. On failure, the last LED state will display the state that encountered the failure. [Table 4](#) shows the radio node boot sequence and corresponding LED behavior.

Table 4 Radio Node LED Boot Sequence

State	LED Color	Description	Possible Failures and Actions
0. Power On/ Reset	Flashing White	This is the initial state on startup. The radio node bootup is controlled by firmware in this state.	This state should be very short lived and should transition to the next state immediately.
1. Software Initialization	Flashing Green	The firmware has loaded and transferred control to the bootloader. Additional hardware initialization and validation are performed during this state. This state concludes with a lamp test, cycling through all LED colors.	<p>This state should be very short lived and should transition to the next state immediately.</p> <p>A radio node should not stay in this state indefinitely.</p> <p>Note: Flashing Green is also used to indicate a radio node that has been administratively disabled. This can be determined from the CLI.</p>
2. DHCP	Solid Red	<p>The radio node starts by sending out a DHCP Request.</p> <p>The radio node moves to the next state (State 3) upon receiving a DHCP response and an IP Address.</p>	<p>No DHCP Response, IP Address not allocated.</p> <p>Check cabling, DHCP Server configuration.</p>
3. Join	Solid Blue	<p>The radio node has an IP Address and sends a UDP Join request to the Serving centralized unit.</p> <p>The radio node moves to the next state (State 4) upon getting a JOIN GRANT from the centralized unit.</p>	<p>No IP reachability to the centralized unit.</p> <p>Check IP network between radio node and centralized unit for routing issues.</p>
4. TFTP	Flashing Blue	<p>The radio node proceeds next to download the operating system image from the centralized unit.</p> <p>The radio node moves to the next state (State 5) after the image has been downloaded.</p>	<p>Failure to download TFTP image.</p> <p>Check firewall between radio node and centralized unit.</p>
5. Operating System Booting	Flashing Green	<p>The radio node loads the operating system and starts the default platform applications.</p> <p>The radio node moves to the next state (State 6) when it establishes connectivity with the centralized unit.</p>	<p>Failure to start the operating system.</p> <p>This normally points to a software/build issue. Please contact Corning support.</p>
6. Running	Solid Green	The operating system is running. The radio node continues the startup sequence, but is now controlled by the centralized unit.	<p>The operating system is up and running on the radio node.</p> <p>Any subsequent state transitions can now be tracked from events and logs on the centralized unit.</p>

12. Radio Node LED Management

The LED display is active by default, but can be deactivated in light-sensitive environments as needed. Even when the display is disabled, the LED will be lighted during the following conditions:

- while the radio node is booting
- if the radio node or cell is in fault state
- if there is an active emergency call
- if the locate radio node feature is active

Table 5 shows the default LED behavior of the radio node:

Table 5 Radio Node LED Behavior

LED	Status	Flash Rate
White: slow flashing	Software initialization	Approximately ½ second on, 1½ sec. off
Green: slow flashing	The radio node or radio is administratively disabled	Approximately ½ second on, 1½ sec. off
Green: fast flashing	Booting	Approximately 1.4 second on/off cycle
Green: solid	Operational	
Red: solid	Fault	
Blue: fast flashing	Locate radio node enabled (Note)	Approximately 1 second on/off cycle
Blue: solid	Follow IMSI enabled	
Off	Powered off or LED disabled	

Note: Refer to the *Corning OS (SCOS) Administrator Guide* for information about the locate radio node and follow IMSI features.

12.1 Disabling the LED display

Step 1 From the CLI Configuration Mode, issue the `Set System RadioNode LED DefaultMode Dark` command to disable the LED display:

```
%set System RadioNode LED DefaultMode Dark
```

Step 2 Issue the `show System RadioNode LED` command to verify the configuration:

```
%show System RadioNode LED
DefaultMode Dark;
```

12.2 Re-Enabling the LED Display

Step 1 From the Configuration Mode, issue the `set System RadioNode LED DefaultMode Standard` command to re-enable the LED display:

```
%set System RadioNode LED DefaultMode Standard
```

Step 2 Issue the `show System RadioNode LED` command to verify the configuration:

```
%show System RadioNode LED
DefaultMode Standard;
```


13. Corning Documentation Set

The Corning documentation can be downloaded from the customer support portal (the “Corning One Community”) at <https://onesupport.corning.com>. This site requires a login which is available to individuals who have attended Corning Small Cell training in the past two years. Email onesupport@corning.com to request a login if you meet these criteria.

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