Cambium Networks™

QUICK START GUIDE

cnRanger

System Release 2.1

Accuracy

While reasonable efforts have been made to assure the accuracy of this document, Cambium Networks assumes no liability resulting from any inaccuracies or omissions in this document, or from use of the information obtained herein. Cambium reserves the right to make changes to any products described herein to improve reliability, function, or design, and reserves the right to revise this document and to make changes from time to time in content hereof with no obligation to notify any person of revisions or changes. Cambium does not assume any liability arising out of the application or use of any product, software, or circuit described herein; neither does it convey license under its patent rights or the rights of others. It is possible that this publication may contain references to, or information about Cambium products (machines and programs), programming, or services that are not announced in your country. Such references or information must not be construed to mean that Cambium intends to announce such Cambium products, programming, or services in your country.

Copyrights

This document, Cambium products, and 3rd Party software products described in this document may include or describe copyrighted Cambium and other 3rd Party supplied computer programs stored in semiconductor memories or other media. Laws in the United States and other countries preserve for Cambium, its licensors, and other 3rd Party supplied software certain exclusive rights for copyrighted material, including the exclusive right to copy, reproduce in any form, distribute and make derivative works of the copyrighted material. Accordingly, any copyrighted material of Cambium, its licensors, or the 3rd Party software supplied material contained in the Cambium products described in this document may not be copied, reproduced, reverse engineered, distributed, merged or modified in any manner without the express written permission of Cambium. Furthermore, the purchase of Cambium products shall not be deemed to grant either directly or by implication, estoppel, or otherwise, any license under the copyrights, patents or patent applications of Cambium or other 3rd Party supplied software, except for the normal non-exclusive, royalty free license to use that arises by operation of law in the sale of a product.

Restrictions

Software and documentation are copyrighted materials. Making unauthorized copies is prohibited by law. No part of the software or documentation may be reproduced, transmitted, transcribed, stored in a retrieval system, or translated into any language or computer language, in any form or by any means, without prior written permission of Cambium.

License Agreements

The software described in this document is the property of Cambium and its licensors. It is furnished by express license agreement only and may be used only in accordance with the terms of such an agreement.

High Risk Materials

Cambium and its supplier(s) specifically disclaim any express or implied warranty of fitness for any high-risk activities or uses of its products including, but not limited to, the operation of nuclear facilities, aircraft navigation or aircraft communication systems, air traffic control, life support, or weapons systems ("High Risk Use").

This product is not restricted in the EU. Any High Risk is unauthorized, is made at your own risk and you shall be responsible for any and all losses, damage or claims arising out of any High-Risk Use.

© 2021 Cambium Networks Limited. All rights reserved

Contents

Contents 3

Introduction 5

Product Description 6

Installation and Operation 7

Product Safety Information 8

cnRanger 800 BBU Hardware Overview 10

cnRanger 800 BBU interfaces overview 10

cnRanger 800 BBU LED details 11

cnRanger 800 BBU rack mounting instructions 12

Installing power supply unit (PSU) and powering up the cnRanger 800 BBU 14

Installing SFP/SFP+ modules on cnRanger 800 BBU 16

Inserting the SFP+ module: 16

Removing the SFP+ Module: 17

CPRI SFP+ module kits 17

Optical cable and connectors 18

Installing Sync In/Sync Out Cables on the cnRanger 800 BBU 19

Installing a GPS antenna on the cnRanger 800 BBU 19

Supported GPS antennas 19

2 GHz/3 GHz cnRanger RRH Hardware Overview 20

2 GHz cnRanger 220 RRHhardware overview 20

3 GHz cnRanger 210 RRH hardware overview 20

2 GHz/3 GHz cnRanger RRH LED details 21

2 GHz/3 GHz cnRanger RRH Antenna interface 24

Mounting to 2LTE-ANT-90 25

Mounting 2 GHz cnRanger 220 RRH on the pole 29

Installing 3 GHz cnRanger 210 RRH 32

Mounting to 3LTE-ANT-90 32

Connecting cnRanger 800 BBU and 2 GHz/3 GHz cnRanger RRH 37

Powering Up 2 GHz/3 GHz cnRanger RRH 37

Connecting 2 GHz cnRanger 220 RRH power cable to Junction Box 38

3 GHz cnRanger 210 RRH DC power cable 39
Connecting Junction Box to 2 GHz cnRanger 220 RRH 40
Installing SFP+ Module on the 2 GHz cnRanger 220 RRH 41
Configuring cnRanger 800 BBU and 2 GHz/3 GHz cnRanger RRH 45
Powering the cnRanger 800 BBU unit 45
Configure PC Ethernet interface 45
2 GHz/3 GHz cnRanger SM Hardware Overview 47
cnRanger 101 SM hardware overview 47
cnRanger 101 SM LED details 48
Mounting cnRanger 101 SM 49
cnRanger 201 SM hardware overview 52
cnRanger 201 SM LED details 52
Installing cnRanger 201 SM 53
Powering Up 56
CBRS 58
Configure Management PC 58
Quick link setup 58
Operating in the EU 58
Frequency bands, maximum operating power, safe distance 58
EU operation – restrictions & requirements for authorization for use 59
Simplified EU declaration of conformity 59
Waste Electrical and Electronic Equipment (WEEE) directive 60
Cambium Networks 61

Introduction

Thank you for purchasing Cambium Networks cnRanger platform equipment. This Quick Start Guide is provided to assist operators in acquiring a high-level understanding of the cnRanger series platform hardware, installation methods, initial login procedures, and safety/warranty information.

Product Description

The Cambium Networks cnRanger series of radio products supports data transmission over Point to MultiPoint (PMP) LTE radio links. A cnRanger radio system is comprised of four main categories of devices: cnRanger 800 BBU, 2 GHz/3 GHz cnRanger RRH, Connectorized Sector Antenna, and 2 GHz/3 GHz cnRanger SM. Outdoor mounted radio equipment (2 GHz/3 GHz cnRanger RRH and 2 GHz/3 GHz cnRanger SM) are alternatively referred to as 'outdoor units' or ODUs. cnRanger 800 BBU installation requires an additional environmental enclosure. All cnRanger equipment is intended for professional applications for fixed outdoor installations only.

Installation and Operation

Installation and operation of this product is complex, and Cambium therefore recommends professional installation and management of the system to ensure that operation complies with the regulations of the region where the product is installed. Please follow the instructions in this Quick Start Guide. Further guidance on cnRanger installation and operation is available in the product User Guide, see links at the end of this document.

The installer must have sufficient skills, knowledge, and experience to perform the installation task and is responsible for:

- Familiarity with current applicable national regulations including radio regulations, electrical installation regulations, surge protection regulations and 'working at heights' regulations
- Installation in accordance with Cambium Networks instructions
- Confirming that the equipment settings are compliant with national or regional regulations
- Familiarity with training material available on the Cambium Networks website.

Please observe the important instructions below during installation. This will set the equipment in compliance with national regulatory regulations and ensure legal operation.

- Ensure that the cnRanger series equipment is fitted with the latest application code. Software is available from the Cambium Support Centre web site, see links at the end of this document.

Product Safety Information

Warning

To prevent loss of life or physical injury, observe the safety guidelines in this section.

1. Ensure that the Outdoor Unit (ODU) and the structure on which it is mounted is capable of withstanding the maximum wind speeds at a proposed site.
2. Ensure the equipment is not powered ON during installation. Always disconnect equipment from its power source before servicing.
3. Harmful levels of RF radiation are present close to the antenna when the transmitter is ON.
4. For observing the minimum safe distance limit of cnRanger products refer to cnRanger User Guide.
5. Ensure that the equipment is installed in a position avoiding any radiation hazard to humans.
6. Exercise extreme care when working at heights. Observe national 'working at heights' regulations. Use trained 'competent' staff.
7. Exercise extreme care when working near power lines.
8. Always use a qualified electrician to install cabling.
9. The cnRanger equipment must be properly grounded.
10. Always use the specified Cambium cnRanger platform Power Supply Units (PSU) to power ON the equipment. Failure to use the specified Cambium supplied power equipment could result in equipment damage and may cause a safety hazard.
11. Do not deploy Cambium Networks power injectors in an outdoor environment.
12. Structures, equipment, and people must be protected against electrostatic discharge:
    - By siting equipment in a lightning protection zone.
    - By installation of appropriate lightning conductors to conduct the surge current to ground via a separate preferential solid path.
    - Ground bonding and transient voltage surge suppression is recommended. Use Cambium specified surge suppressors.
13. Use outdoor rated cables for connections that will be exposed to the outdoor environment. Install Cambium recommended cables.
14. The Sierra and Palisade may be hot to the touch when in operation. The cnRanger 800 BBU must not be operated in ambient temperatures exceeding 40°C unless mounted in a Restricted Access Location. Select a location where the cnRanger 800 BBU can operate within safe ambient temperature limits.
15. If a restricted access location is not available, confirm that the ambient temperature never exceeds 40°C. At this ambient temperature, the temperature of the external metal cases of the Sierra will not exceed the touch temperature limit of 70°C. If a restricted access location (as defined in EN 90650-1) is available, confirm that the ambient temperature never exceeds 55°C. At this ambient temperature, the temperature of the external metal case of the Sierra may exceed the touch temperature limit of 70°C, but will be less than the maximum operating temperature of 95°C.

Note

A restricted access location is defined (in EN 90650-1) as one where access may only be gained by use of a tool or lock and key, or other means of security, and access is controlled by the authority responsible for the location. Access must only be gained by persons who have been instructed about the reasons for the restrictions applied to the location and about any precautions that must be taken. Examples of permissible restricted access locations are a lockable equipment room or a lockable cabinet.

Warning :

Hot surface do not touch.

AVERTISSEMENT :

SURFACE CHAUDE. NE PAS TOUCHER.

Warning:

Installation instructions include the following statement or equivalent:

Rack Mount Instructions - The following or similar rack-mount instructions are included with the installation instructions: A) Elevated Operating Ambient - If installed in a closed or multi-unit rack assembly, the operating ambient temperature of the rack environment may be greater than room ambient. Therefore, consideration should be given to installing the equipment in an environment compatible with the maximum ambient temperature (Tma) specified by the manufacturer. B) Reduced Air Flow - Installation of the equipment in a rack should be such that the amount of air flow required for safe operation of the equipment is not compromised. C) Mechanical Loading - Mounting of the equipment in the rack should be such that a hazardous condition is not achieved due to uneven mechanical loading. D) Circuit Overloading - Consideration should be given to the connection of the equipment to the supply circuit and the effect that overloading of the circuits might have on overcurrent protection and supply wiring. Appropriate consideration of equipment nameplate ratings should be used when addressing this concern. E) Reliable Earthing - Reliable earthing of rack-mounted equipment should be maintained. Particular attention should be given to supply connections other than direct connections to the branch circuit (e.g. use of power strips).

AVERTISSEMENT :

Instructions de montage en rack - La déclaration de montage en rack suivante ou des instructions similaires sont fournies avec les instructions d'installation:

A) Fonctionnement à température ambigüe élevée - Si ce produit est installé dans un rack fermé ou à plusieurs unités, le fonctionnement à température ambiante de l'environnement du rack peut dépasser la température ambiante de la pièce. Il convient donc d'envisager le montage de l'équipement dans des conditions compatibles avec la température extérieure maximale (Tma) recommandée par le fabricant. B) Diminution du débit d'air - Le matériel doit être installé dans un rack de manière à permettre le débit d'air nécessaire au bon fonctionnement du matériel. C) Charge mécanique - La fixation de l'équipement dans le rack a pour but de ne pas créer de situations dangereuses en raison d'une charge mécanique inégale. D) Suspension des circuits - Le branchement de l'équipement au circuit d'alimentation et les risques de surcharge des circuits sur la détection des surintensités et le câblage électrique doivent être pris en considération. Il faut prendre en compte les valeurs nominales de l'équipement pour aborder cette question. E) Raccordement à la terre fiable - Un raccord à la terre fiable de l'équipement assemblé en rack est à maintenir. Les connexions d'alimentation ne devant pas être directement associées à une dérivation doivent faire l'objet de toute l'attention requise (par exemple, l'utilisation de multiprises).

cnRanger 800 BBU Hardware Overview

The cnRanger 800 BBU is an indoor mounted unit providing LTE processing for up to three LTE carriers (upto four will be supported in a future software upgrade). The cnRanger 800 BBU unit connects to the network backhaul via Ethernet and to the 2 GHz cnRanger 220 RRH units via CPRI fiber optic cable.

Note:

This product meets the UL/ cUL 62368/ IEC 62368 edition 2 specification, and the radio housings are designed to be rain tight.

cnRanger 800 BBU interfaces overview

Figure 1: *cnRanger 800 BBU Front View*

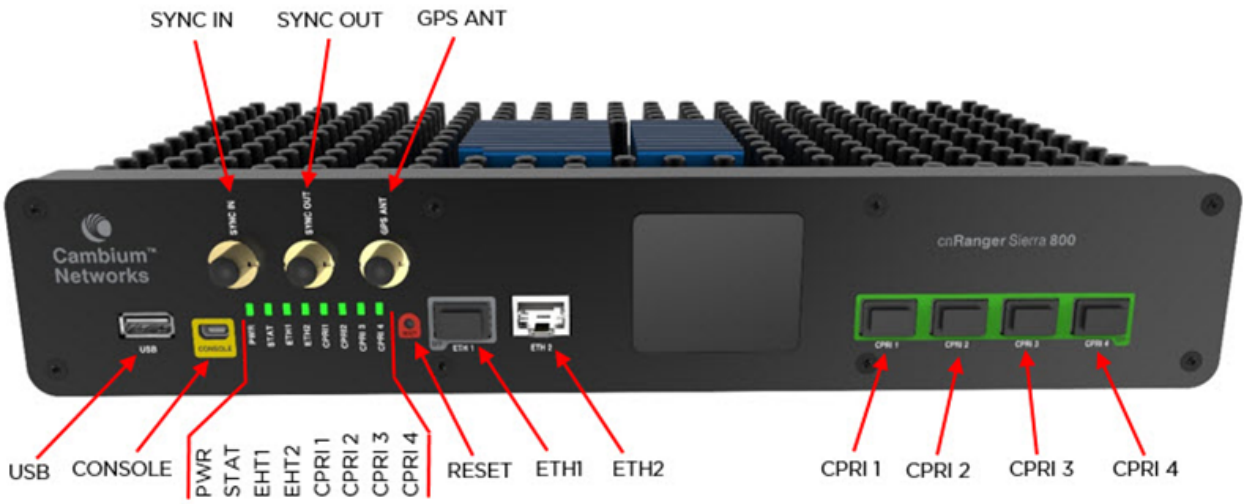
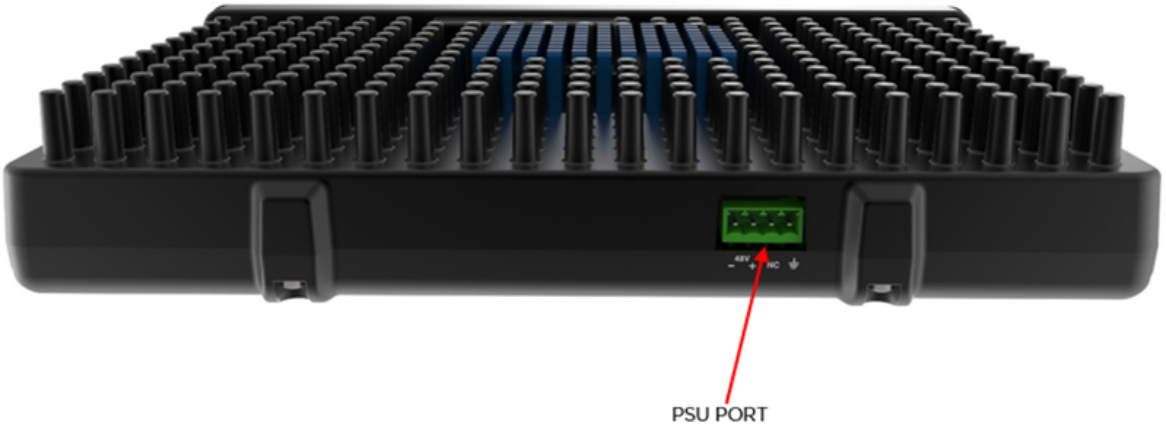


Figure 2: *cnRanger 800 BBU Rear view*



On the Front:

- 4-SFP+ CPRI ports for Remote Radio Head Connectivity (CPRI 1 – CPRI 4)
- 1- SFP Gigabit Ethernet port (ETH1)

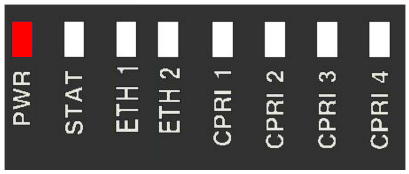
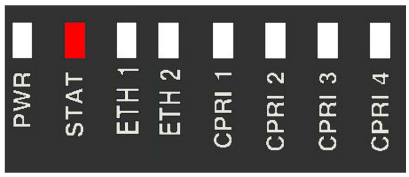
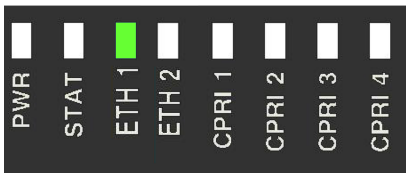
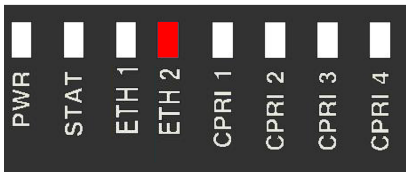
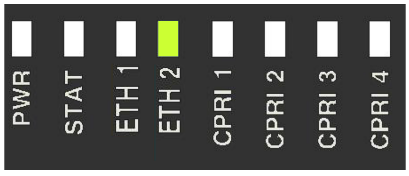
- 1- Copper 100/1000mbps Ethernet port (ETH2)
- Mini USB Serial Console port
- USB- Host port for external pen drive
- Push Button Reset
- External GPS Antenna – SMA connector
- 1pps Sync IN/OUT ports -SMA connector (can be also be configured for 30.72MHZ clock output)
- 1.77inch LCD display module for Status information

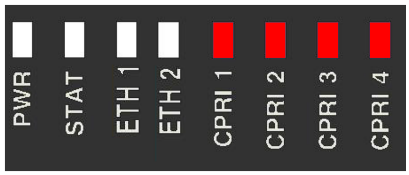
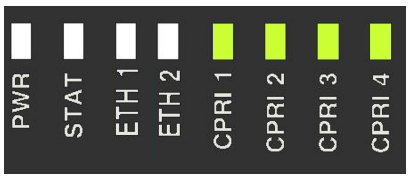
On the Rear:

- PSU port

cnRanger 800 BBU LED details

Table 1 : cnRanger 800 BBU LED details

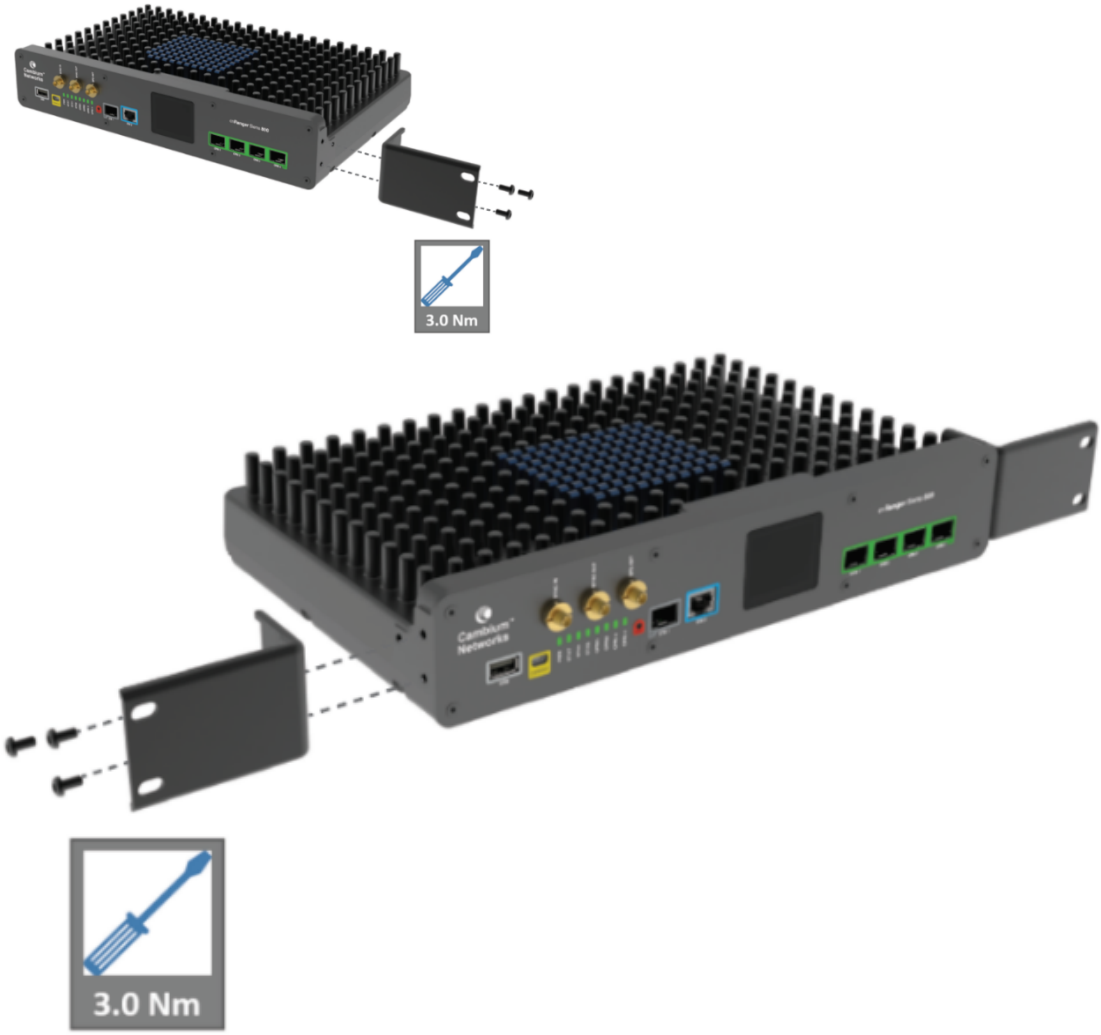
LED Name	LED	Color	Behaviour	Status Indication
Power		Red	Blinking	When cnRanger 800 BBU is under factory defaults
		Red	Steady ON	Power ON
Status		Red	Blinking/ Steady ON	Indicates Alarm
		Red	OFF	System Status OK
ETH1		Green	Blinking	Activity
		Green	Steady ON	Link up
ETH2	 	Red	Blinking	1000mbps Activity

LED Name	LED	Color	Behaviour	Status Indication
		Yellow/Green	Blinking	100mbps Activity
CPRI [1:4]		Red	Blinking/ON	Fault
		Yellow/Green	Blinking/ Steady ON	Activity

cnRanger 800 BBU rack mounting instructions

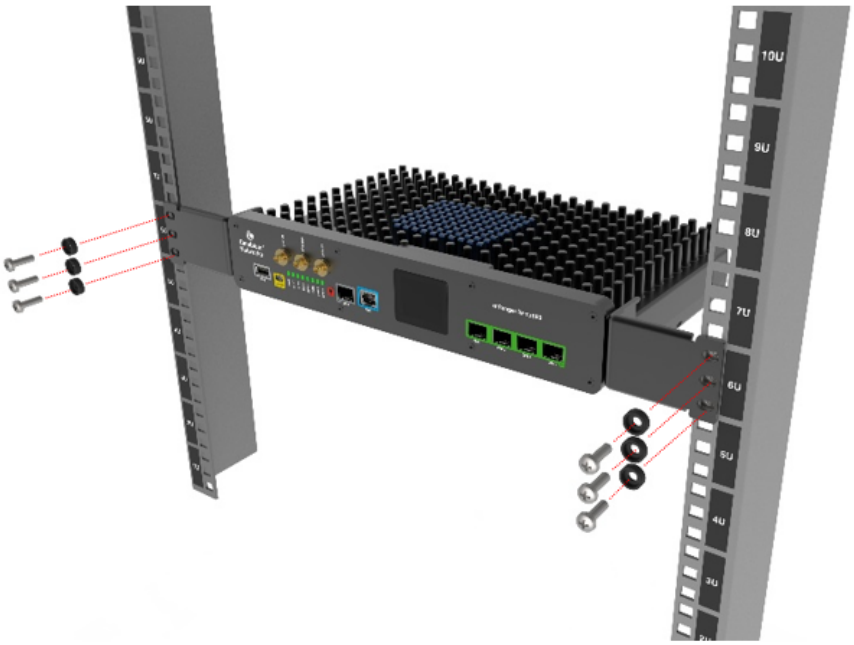
Follow the below instructions to install cnRanger 800 BBU on a rack:

1. Assemble bracket on both side (left side and right side) with M4 fastener using torque screw driver by applying 3.0Nm torque.



2. Use universal 19-inch cabinet, snap and M6 cage nut at three square slots of 1U on both side of the rack, where you will be installing the cnRanger 800 BBU.

3. Attach the cnRanger 800 BBU to the rack using the six mounting screws by applying 3.0Nm torque.



4. Mounted cnRanger 800 BBU is ready.

Installing power supply unit (PSU) and powering up the cnRanger 800 BBU

1. Connect AC terminals L-N-E on the PSU as shown in Figure 3.
2. Connect DC output to -V, +V terminals on the PSU as shown in Figure 4.

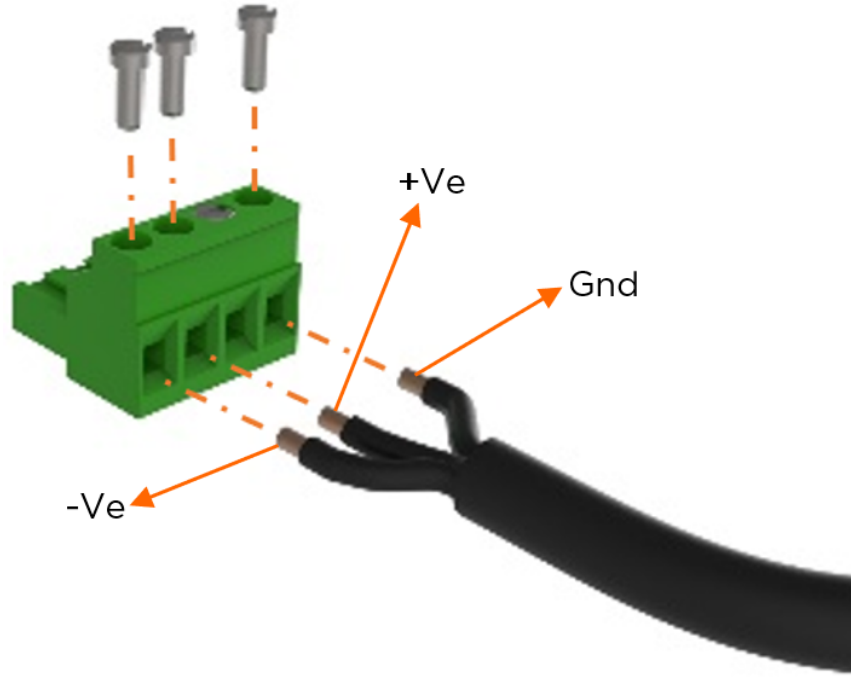
Figure 3:

Figure 4:

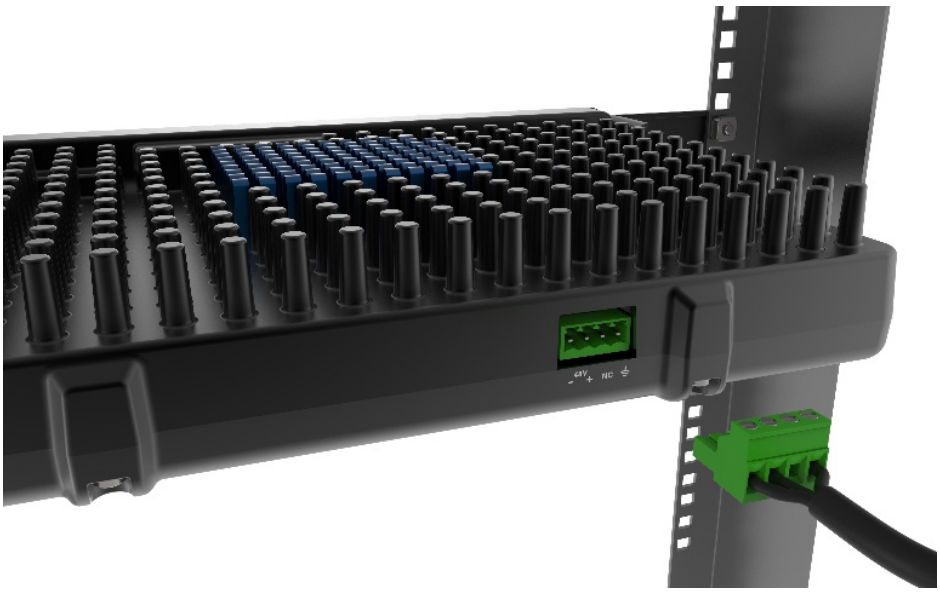
Warning:

BBU only supports one polarity. Reversing the connections will damage the BBU.

3. Connect a 4-pin terminal block (supplied with cnRanger 800 BBU) as per the connectivity. Attach cable cord to the 4-pin terminal block.



4. Insert 4-pin terminal block into the cnRanger 800 BBU power connector on the rear side.



5. Both cnRanger 800 BBU and PSU Ground Terminals ⏚ must be connected to Protective Earth Conductor with an AWG10 ~16 wire. All terminals on the cnRanger 800 BBU and PSU must be connected as per the correct polarity.

6. AC mains supply must be turned off before servicing or disconnecting power conductors on the cnRanger 800 BBU or PSU.

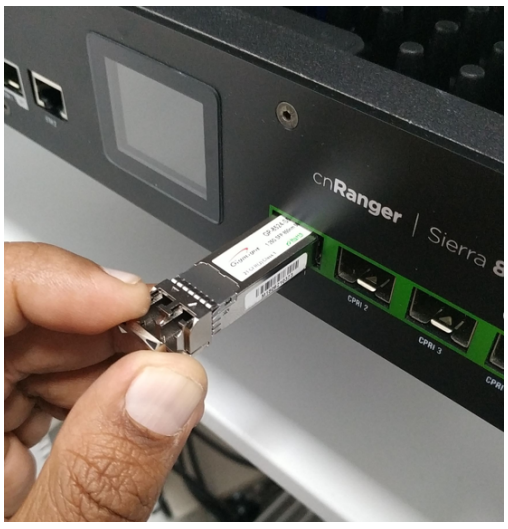
Warning

cnRanger 800 BBU and PSU contain unprotected conductors carrying lethally high voltage, improper handling will result in electric shock or serious burns.

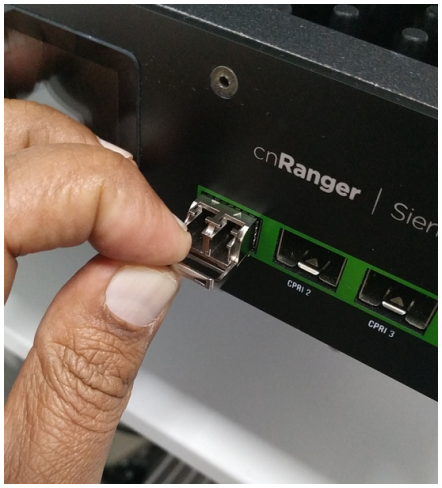
Installing SFP/SFP+ modules on cnRanger 800 BBU

Inserting the SFP+ module:

1. Slide the module into the CPRI port gently.
2. Press the SFP+ module gently until it is firmly seated in the port.



Removing the SFP+ Module:

Pull the bale-clasp latch with index finger towards downward direction and gently pull the SFP+ module from the port.	
Connect CPRI Fiber optic cables.	

CPRI SFP+ module kits

SFP+ module kits allow connection of 2 GHz/3 GHz cnRanger RRHfrom cnRanger 800 BBU over optical fiber cable. Use 10Gbps SFP+ module (SFP-10G-SR) to connect to 2 GHz/3 GHz cnRanger RRH. Maximum length of optical fiber cable shall not exceed 300 meters. Use Multimode LC-LC outdoor optical fiber cable between 2 GHz/3 GHz cnRanger RRHand cnRanger 800 BBU.

Cambium Networks CPRI fiber cable part number (N000000L131A) is recommended for use between the 2 GHz/3 GHz cnRanger RRH and junction box in order to provide optimal fit through weather proofing gland. From junction box long length CPRI cables can be extended depending on the lengths.

Cambium does not supply long length optical fiber cables along with SFP+ module kits. Recommended cable lengths and specifications are as shown in Table 2 Multi-mode Optical SFP Interface per ODU. Order SFP module kits as shown in Table 3 SFP module kit part numbers from Cambium Networks.

Table 2 : Multi-mode Optical SFP Interface per ODU

Core/cladding (microns)	Mode	Bandwidth at 850 nm (MHz/km)	Maximum length of optical interface	Insertion loss (dB)
62.5/125	Multi	160	220 m (720 ft)	2.38
62.5/125	Multi	200	275 m (900 ft)	2.6

Table 3 : SFP module kit part numbers

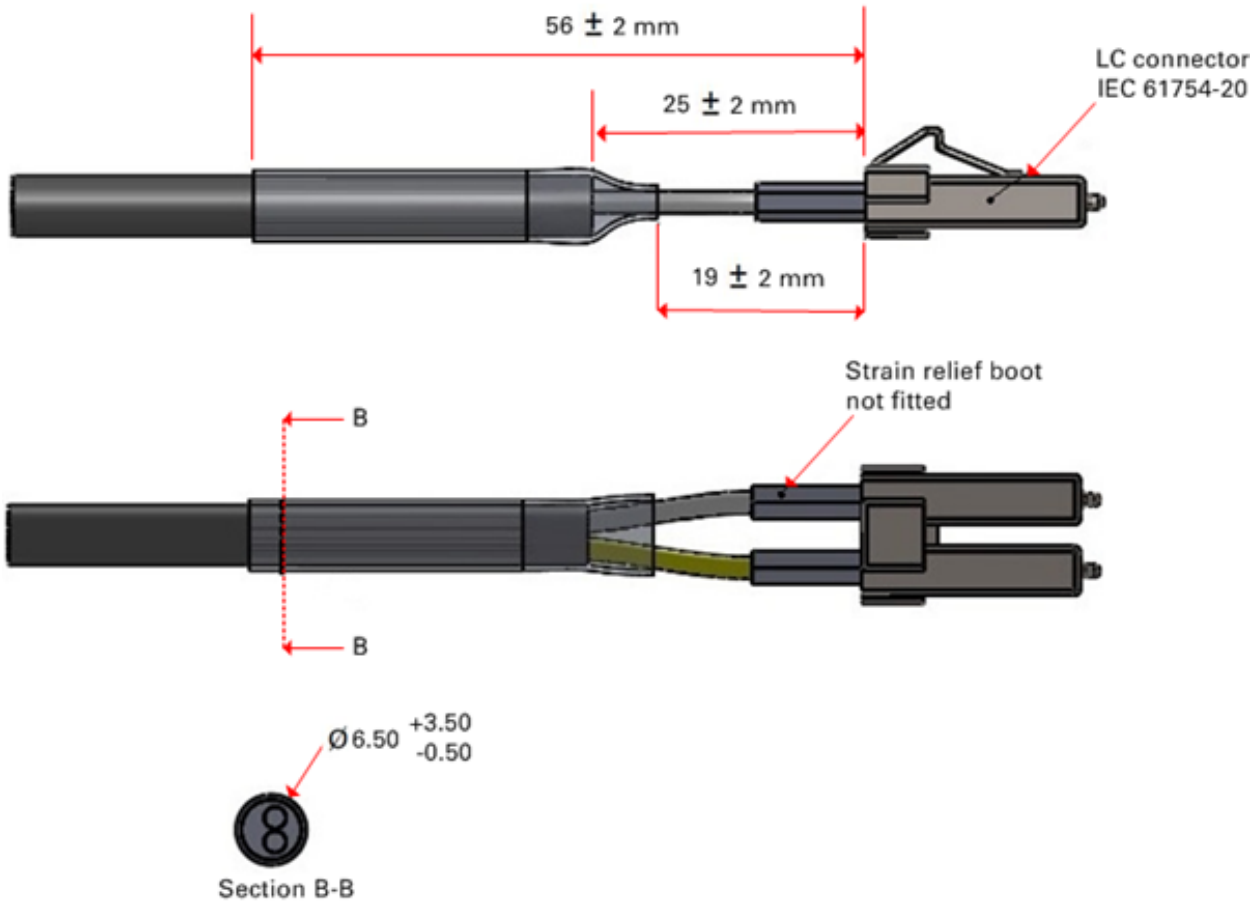
Cambium description	Cambium part number
CPRI SFP+ Module (10Gbps)	SFP-10G-SR
RRH CPRI Fiber Cable- 2 meter	N000000L131A

Figure 5: *10 Gbps Optical SFP+ transceiver module*

Optical cable and connectors

Use cambium recommended optical SFP cable for connection between junction box and DUT. In case juntion box is not used, follow the below specficiation to order a LC-LC optical cable. It must be the correct length to connect the ODU to the other device. LC connectors should be supplied with dust caps to prevent dust build up.

Figure 6: *Optical optic cable and connector specification*



Installing Sync In/Sync Out Cables on the cnRanger 800 BBU

1. Install Sync IN/Out cables for synchronizing multiple cnRanger 800 BBUs.
2. Sync OUT port of first cnRanger 800 BBU shall be connected to Sync IN port of second cnRanger 800 BBU and vice versa.

Warning

Connecting Sync OUT port of first cnRanger 800 BBU to Sync OUT of second cnRanger 800 BBU may damage the port.

Installing a GPS antenna on the cnRanger 800 BBU

The following information describes the recommended tools and procedures to mount the GPS antenna.

Supported GPS antennas

Table 4 :Supported GPS antenna

Description	Part Number
External GPS Antenna	N000900L030A

- Connect GPS Antenna to GPS_ANT port on the cnRanger 800 BBU.
- Use an extension cable if longer length cable is required.
- Maximum cable length supported is 5 meters.

2 GHz/3 GHz cnRanger RRH Hardware Overview

2 GHz cnRanger 220 RRHhardware overview

The 2 GHz cnRanger 220 RRH is a tower mounted ODU that provides TD-LTE 2Tx 2Rx capability for an LTE carrier (up to two 2Tx 2Rx LTE carriers with future software upgrade). It is managed by the cnRanger 800 BBU product via the CPRI fiber optic cable between the two devices.

Figure 1: *2 GHz cnRanger 220 RRH front view*

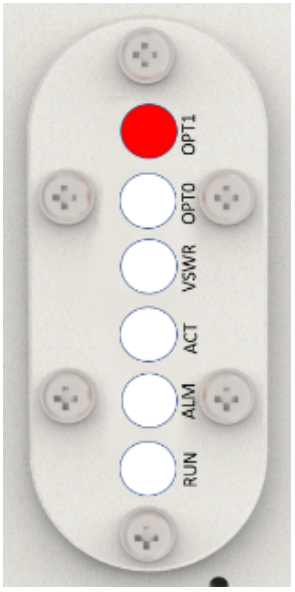
3 GHz cnRanger 210 RRH hardware overview

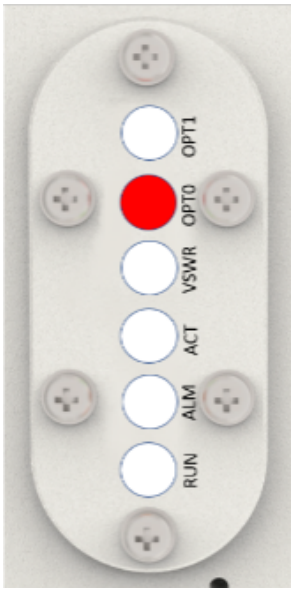
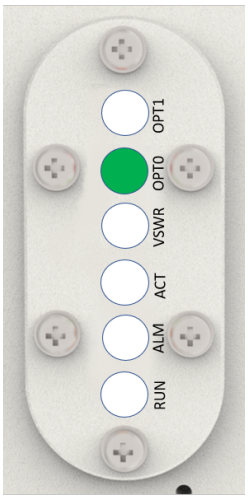
The 3 GHz cnRanger 210 RRH is a tower mounted ODU that provides TD-LTE 2Tx 2Rx capability for an LTE carrier (up to two 2Tx 2Rx LTE carriers with future software upgrade). It is managed by the cnRanger 800 BBU product via the CPRI fiber optic cable between the two devices.

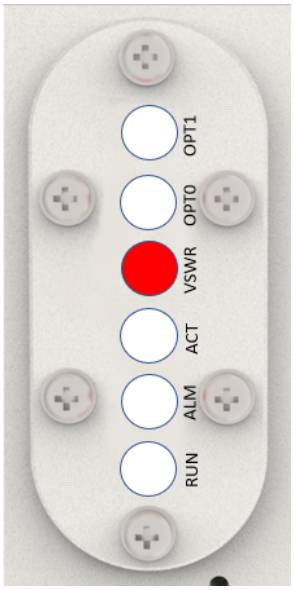
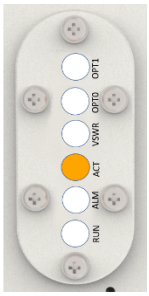
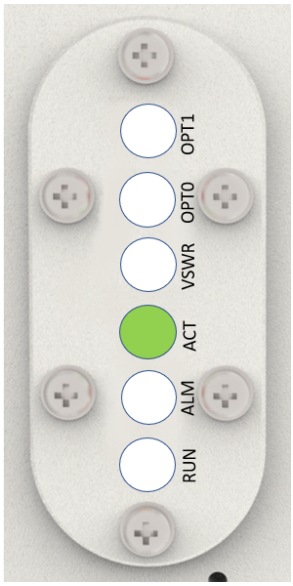
Figure 2: *3 GHz cnRanger 210 RRH front view*

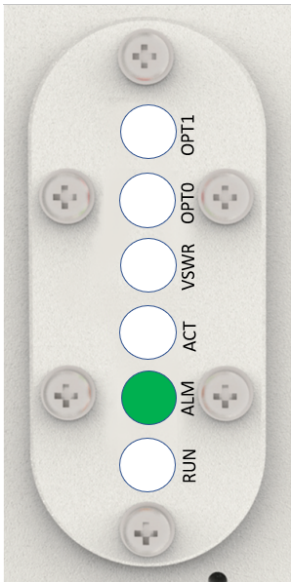
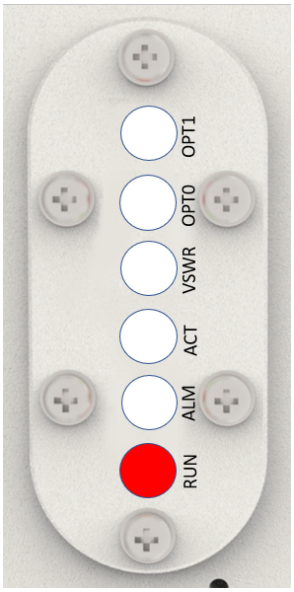
2 GHz/3 GHz cnRanger RRH LED details

Table 5 :RRH LED details

LED Name	LED	Color	Behaviour	Status Indication
OPT1		Red	Blinking	CPRI optical link to the cnRanger 800 BBU is faulty

LED Name	LED	Color	Behaviour	Status Indication
		Green	Steady ON	CPRI link to the cnRanger 800 BBU is operational and synchronization with cnRanger 800 BBU achieved
OPT0		Red	Blinking	CPRI optical link to the cnRanger 800 BBU is faulty
		Green	Steady ON	CPRI link to the cnRanger 800 BBU is operational and synchronization with cnRanger 800 BBU achieved

LED Name	LED	Color	Behaviour	Status Indication
VSWR		Red	Blinking/ON	VSWR alarm
		Red	OFF	No VSWR
ACT	 	Green	Blinking	Data activity is ongoing
			OFF	No Data activity is ongoing
		Orange	ON	Connection OK
			OFF	Connection is faulty

LED Name	LED	Color	Behaviour	Status Indication
ALM		Green	Blinking	Board booting/updating
		Green	Steady ON	Board is operational
		Green	OFF	Board is faulty
RUN		Red	ON	Power present
		Red	OFF	Power not present

2 GHz/3 GHz cnRanger RRH Antenna interface

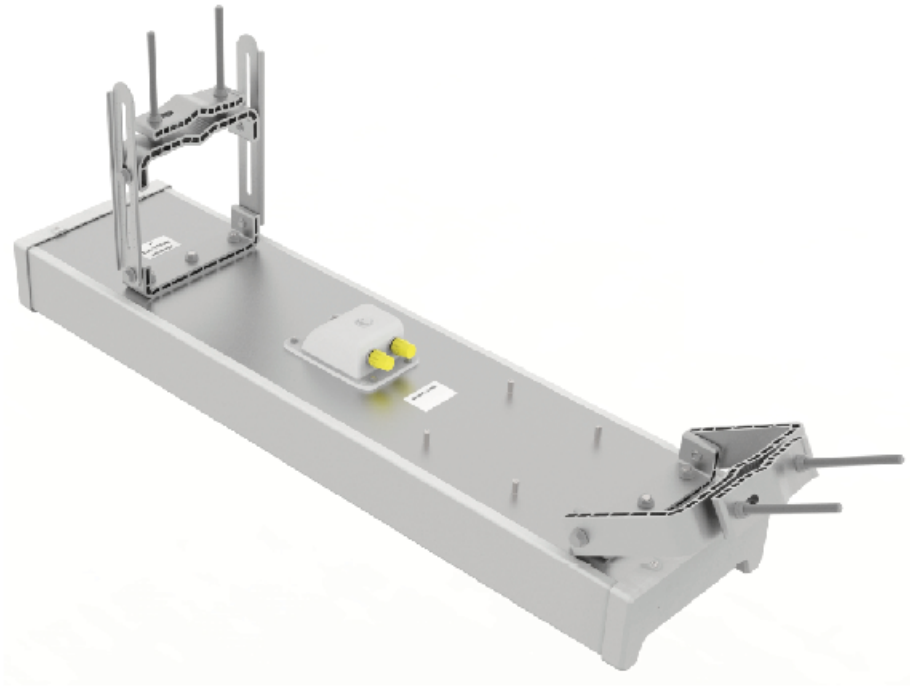
Table 6 :Antenna part options

Cambium Part Number	Description
2LTE-ANT-90	Cambium Networks 2300 - 2700 MHz 110 degree 16 dBi sector antenna.
N025000D001A	MTI 2300 - 2700 MHz 65-degree sector antenna.
3 LTE-ANT-90	17 dBi, 90/120-degree Sector Antenna

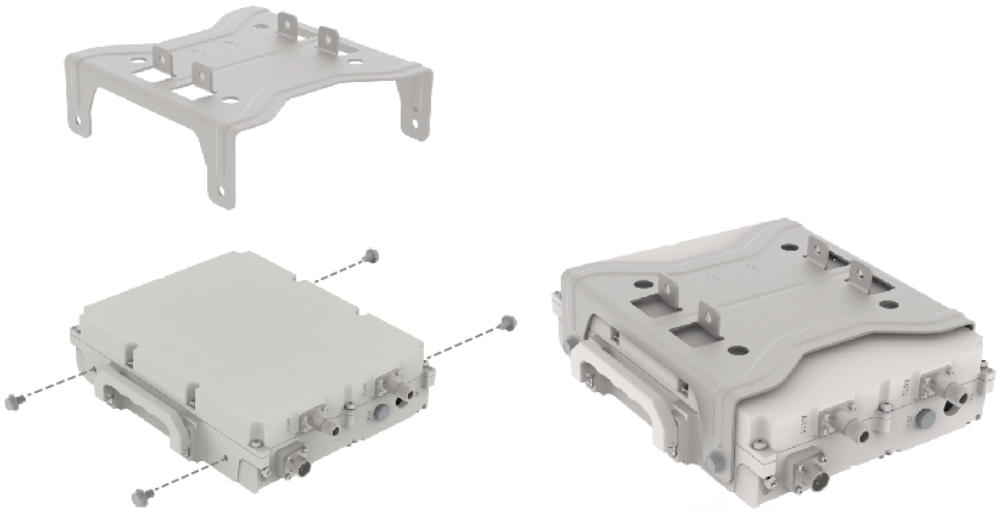
Mounting to 2LTE-ANT-90

Follow the below instructions to mount 2 GHz cnRanger 220 RRH to 2LTE-ANT-90 antenna:

1. Loosen the M10 bolts and tighten the bolt to 1Nm torque.

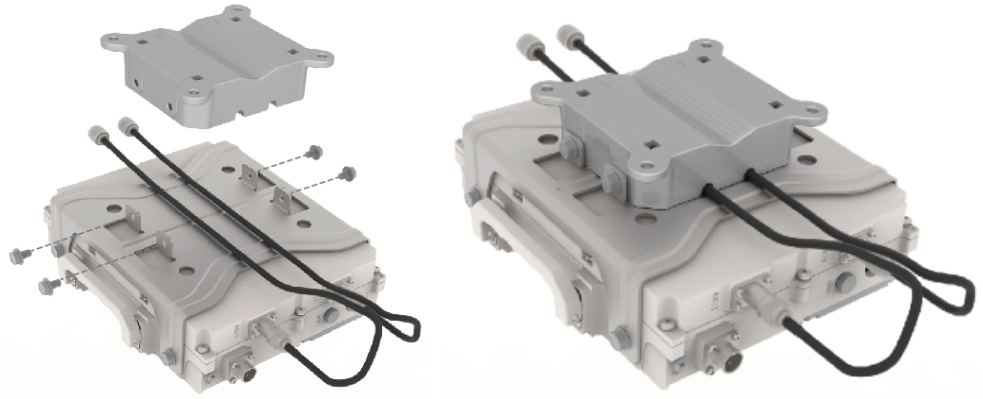


2. Place the radio mounting clamp to radio holder clamp, insert M8x12mm bolt, and tighten to 4Nm torque.

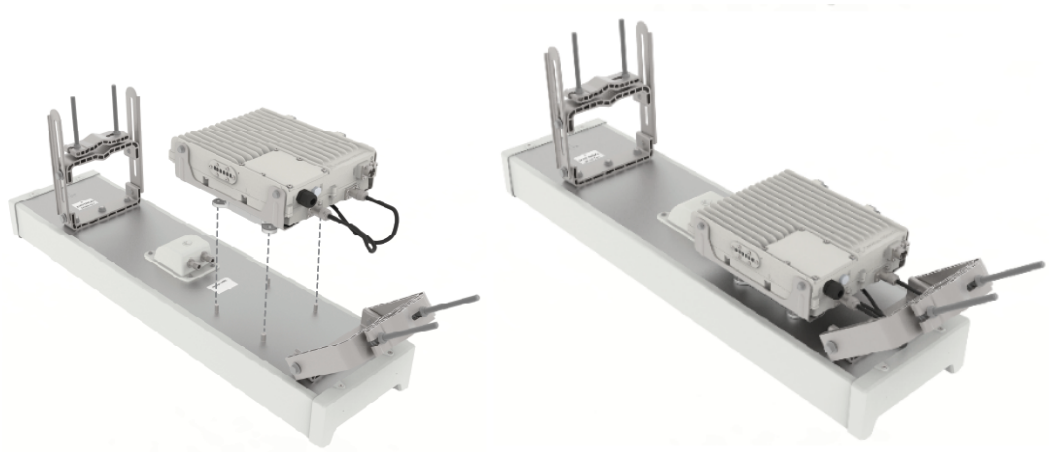


3. Assemble the N type cable to 2 GHz cnRanger 220 RRH.

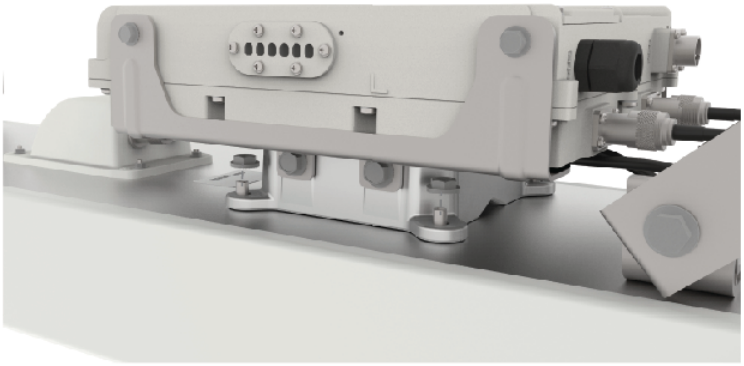
4. Place the radio mounting clamp to radio holder clamp, insert M8x12mm bolt, and tighten to 4 Nm torque.



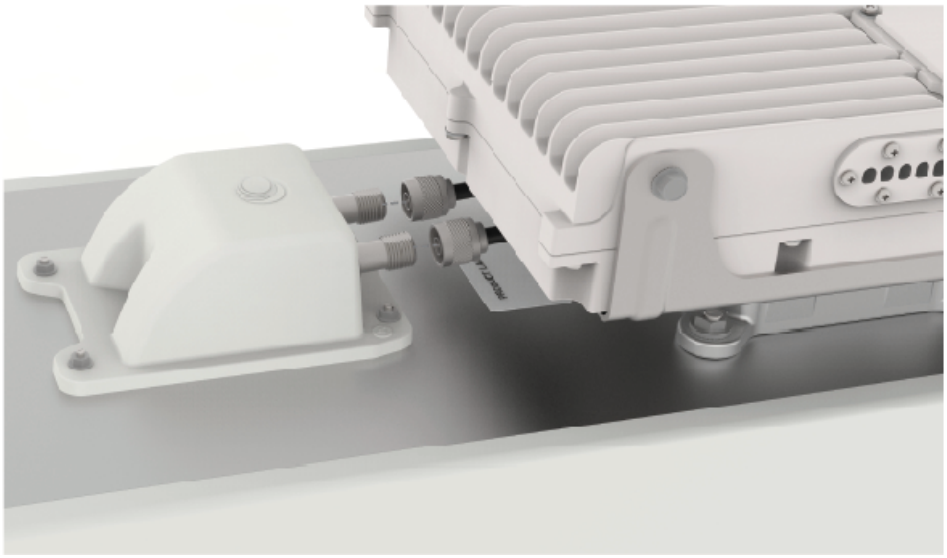
5. Place 2 GHz cnRanger 220 RRH product to the rear side of antenna.



6. Place M8 nut to the 2 GHz cnRanger 220 RRH product and tighten to 5Nm torque.

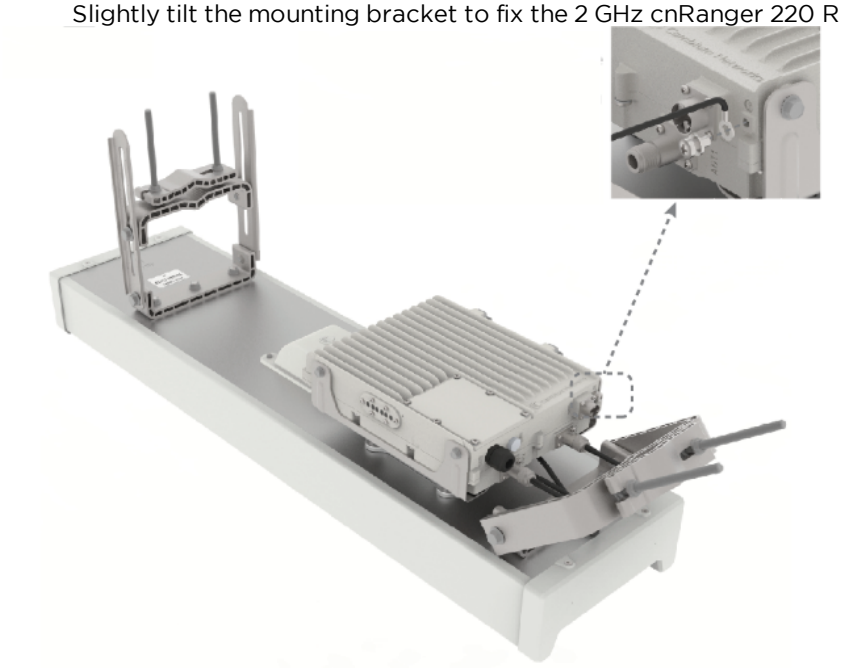


7. Connect N type cable of 2 GHz cnRanger 220 RRH product to antenna L-L and R-R.

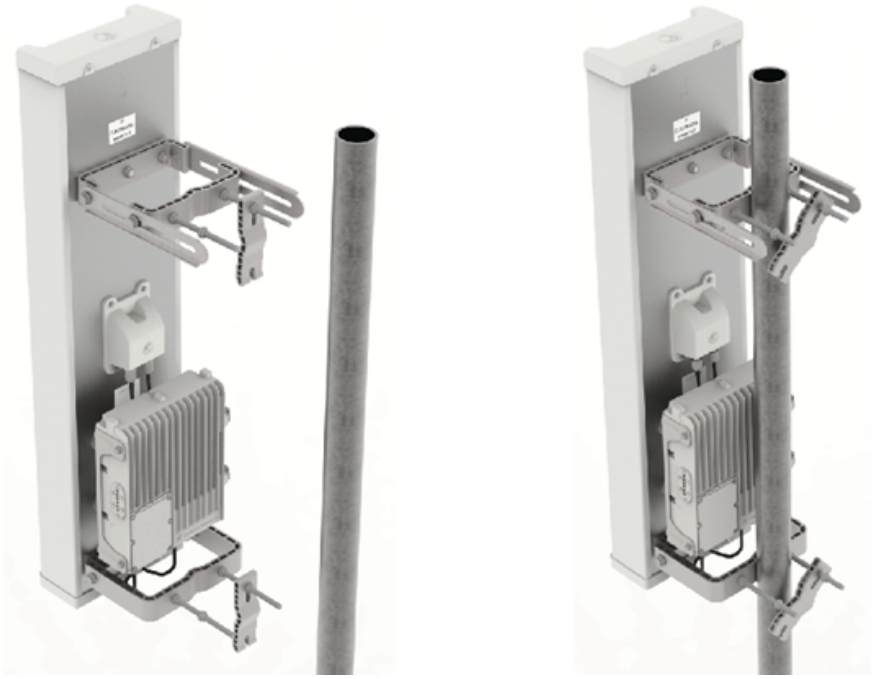


8. Connect the grounding cable to 2 GHz cnRanger 220 RRH and tighten the screw to 2.5Nm torque.

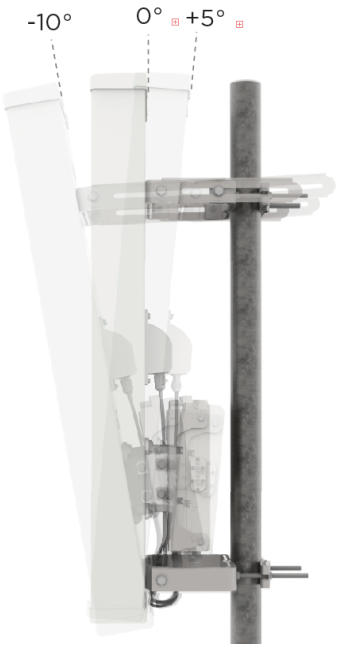
Slightly tilt the mounting bracket to fix the 2 GHz cnRanger 220 RRH.



9. Assemble the antenna and the 2 GHz cnRanger 220 RRH integrated product to the pole and tighten to 8Nm torque.



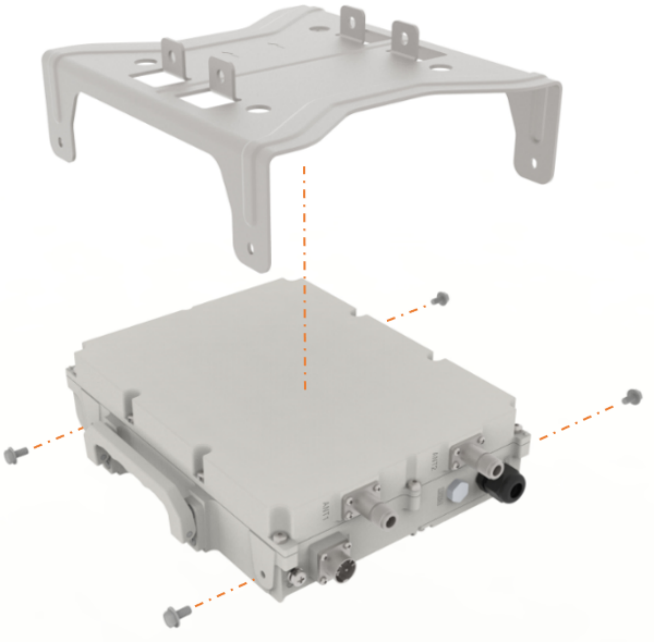
10. The antenna can be adjusted between +5° to -10°. The electrical down tilt is 2°.



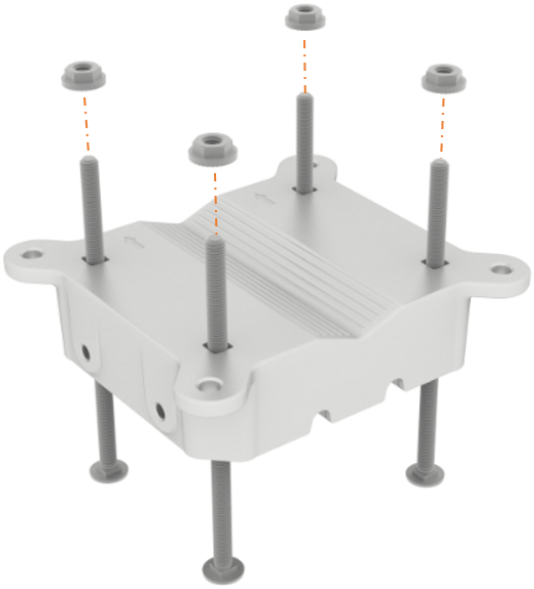
Mounting 2 GHz cnRanger 220 RRH on the pole

Follow the below instructions to mount 2 GHz cnRanger 220 RRH on the pole to connect with N025000D001A antenna:

1. Place sheet metal clamp to 2 GHz cnRanger 220 RRH and tighten with M5 screws by using 5Nm torque max.

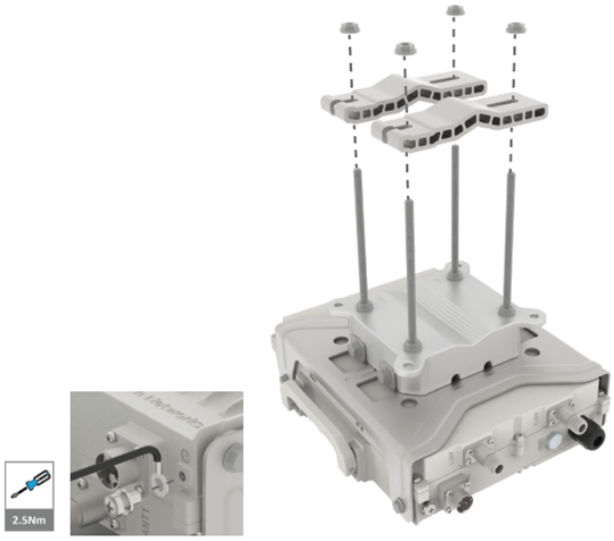


2. Assemble M8 bolts to aluminum clamp and tighten with M8 nut by using 3 Nm torque max.



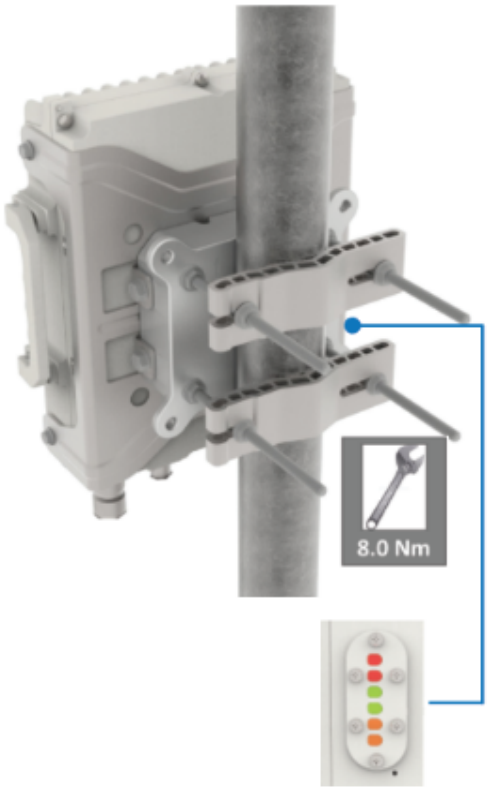
3. Assemble aluminum clamp to 2 GHz cnRanger 220 RRH and tighten with M8 bolt by using 5Nm torque max.

4. Assemble pole holder clamp to 2 GHz cnRanger 220 RRH.



5. Assemble 2 GHz cnRanger 220 RRH unit to the pole. Align a pole holder clamp as per the pole size and tighten with M8 nut by using 8Nm torque.

6. Assemble 2 GHz cnRanger 220 RRH to the pole as shown in below figure.

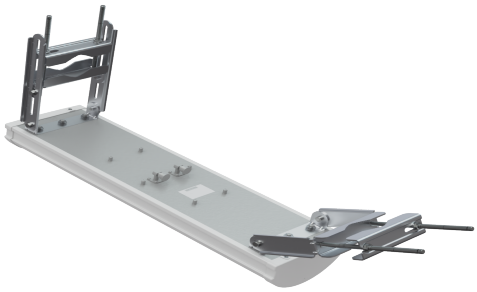


Installing 3 GHz cnRanger 210 RRH

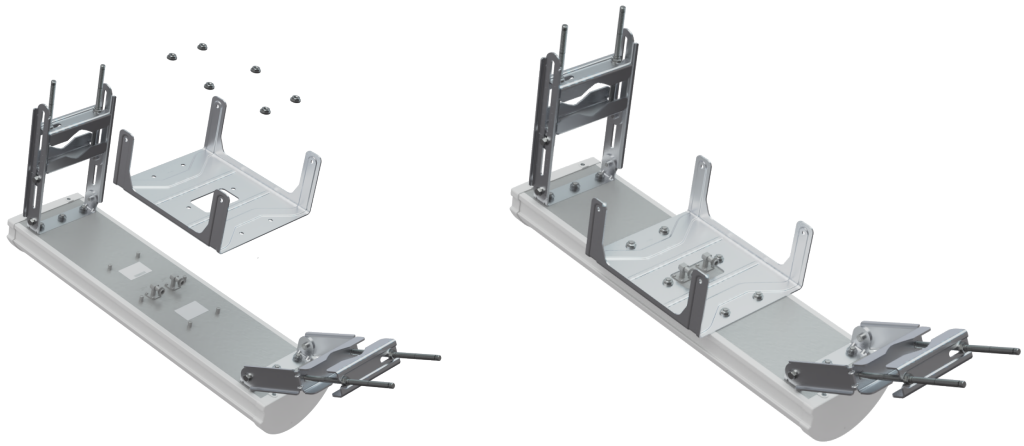
Mounting to 3LTE-ANT-90

Follow the below instructions to mount 3 GHz cnRanger 210 RRH to 3LTE-ANT-90 antenna:

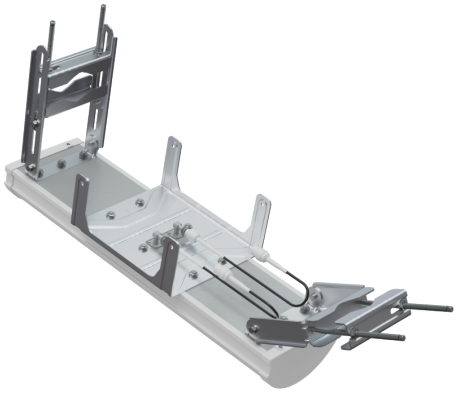
1. Loosen the M10 bolts and tighten the bolt by applying 1Nm torque.



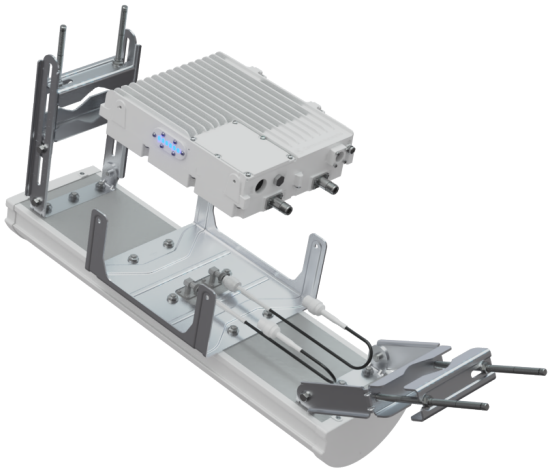
2. Place the radio mounting clamp to radio holder clamp and tighten M8 Nuts to a torque of 6Nm..



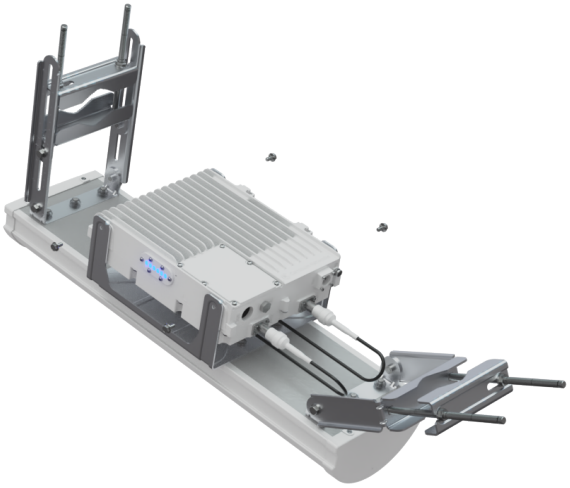
3. Connect N type cable of 3 GHz cnRanger 210 RRH product to antenna L-L and R-R by applying a Coupling torque 135Ncm (12 lbs-in).



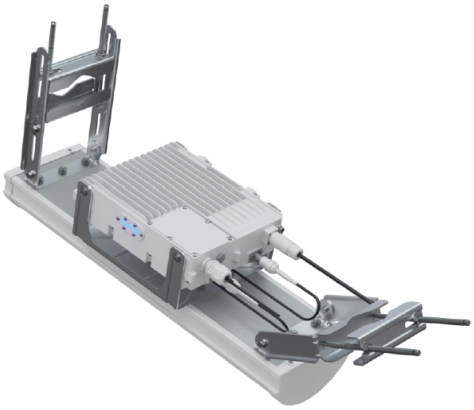
4. Place 3 GHz cnRanger 210 RRH to the bracket on the antenna. Hand tighten the M5 bolts to help align all four M5 bolts.



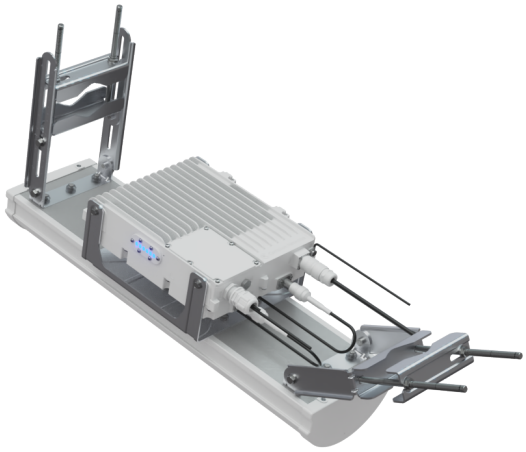
5. Assemble the N type cable to 3 GHz cnRanger 210 RRH by applying a Coupling torque 135Ncm (12 lbs-in).



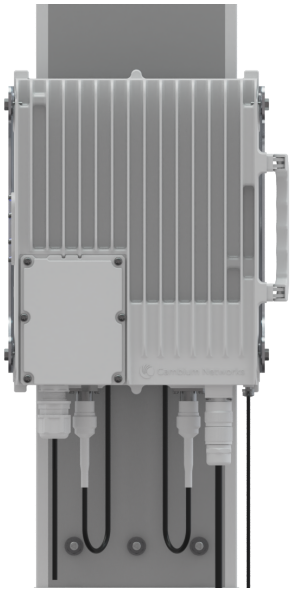
6. Connect the cable glands..



7. Connect the grounding cable to 3 GHz cnRanger 210 RRH as shown and tighten the screw to 2.5Nm torque.

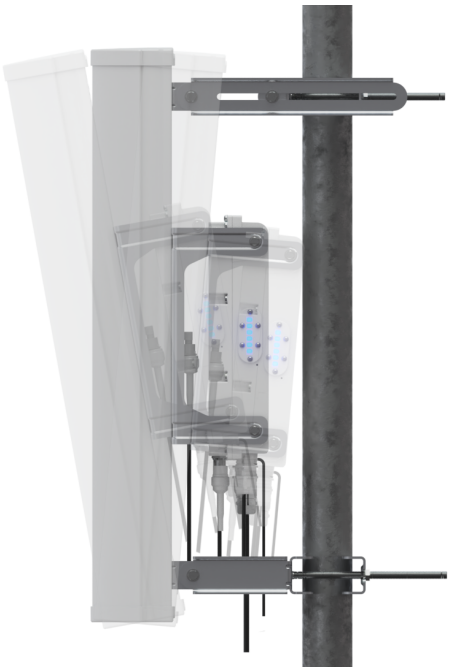


8. Once the antenna and the 3 GHz cnRanger 210 RRH integrated pole mount units are ready to mount to the pole.



9. Assemble the antenna and the RRH integrated product to the pole and tighten by applying 8Nm torque.

10. The antenna can be adjusted between +5° to -10°. The electrical down tilt is 2°.



Connecting cnRanger 800 BBU and 2 GHz/3 GHz cnRanger RRH

Review national regulations and ensure that all appropriate regulatory licenses are obtained prior to deployment. Before installation, the location of the 2 GHz/3 GHz cnRanger RRH needs to be carefully planned to ensure good radio coverage and to minimise interference. Installation and commissioning of equipment should be carried out by trained personnel.

Powering Up 2 GHz/3 GHz cnRanger RRH

2 GHz/3 GHz cnRanger RRH is powered through an AC power injector installed at the bottom of the tower. DC Junction Box with surge protection and grounding guidelines need to be followed for powering up 2 GHz/3 GHz cnRanger RRH.

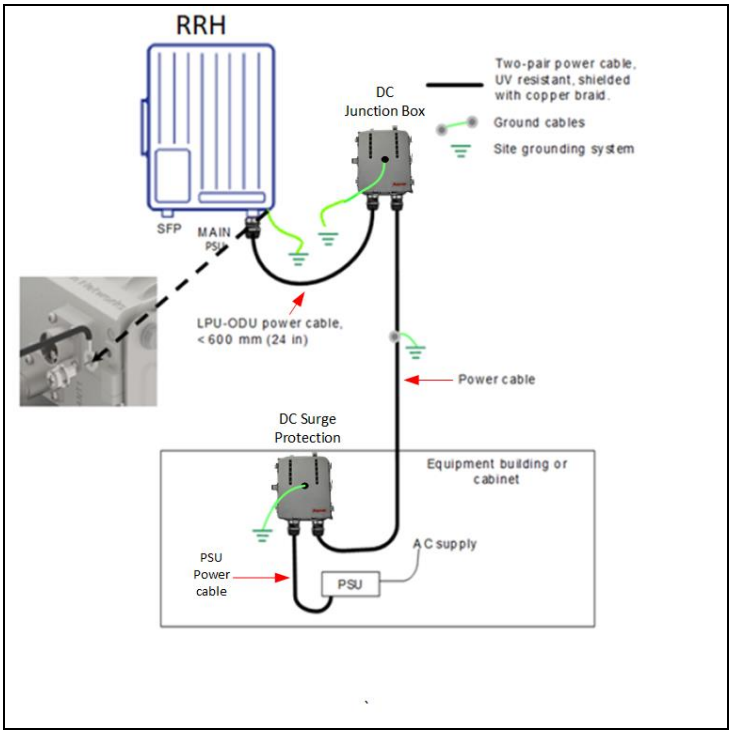
Connect ground at multiple points on the mast is shown in Figure 1.

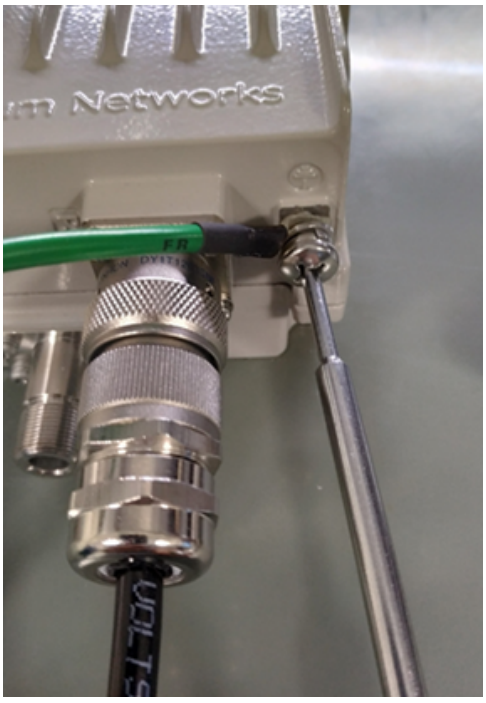
Instruction for using the Raycap Junction box refer RKEDC-8465-PF-48_(320-0627) and for surge protection refer RBMDC-1113-BDU-48).

Note

The power cable connecting from the **Junction box** to the **DC surge protection box** will not be supplied by Cambium Networks. User needs to procure their own outdoor AWG16 cable with metal braiding.

Figure 1: *Powering up RRH*

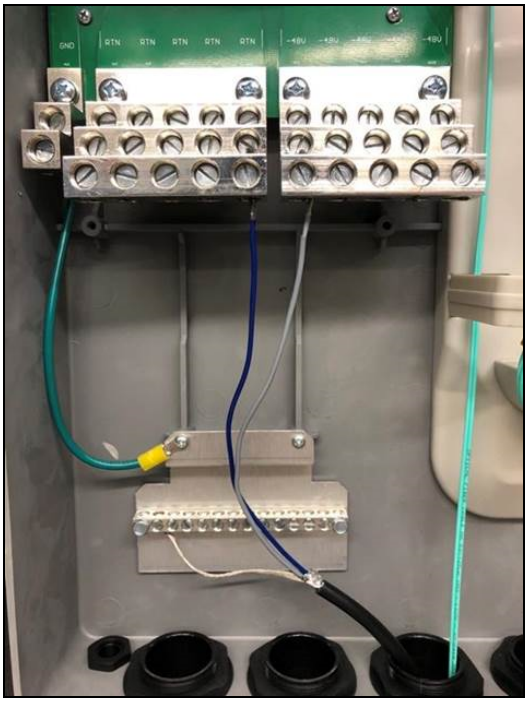


1. Connect the power connector to 2 GHz cnRanger 220 RRH	
2. Grounding 2 GHz cnRanger 220 RRH	

Connecting 2 GHz cnRanger 220 RRH power cable to Junction Box

Following instruction how to connect 2 GHz cnRanger 220 RRH power cable to the junction box:

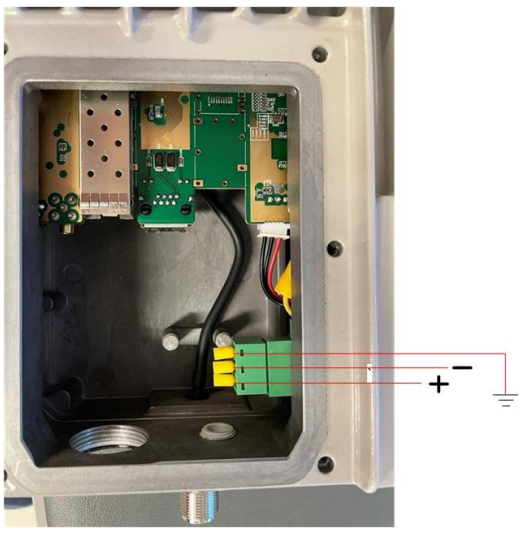
1. Connect gray cable (-48V, -) to the -48V connector to the junction box
2. Connect blue cable (-48V_GND, +) to RTN connector to the junction box
3. Connect silver wire (chassis) to GND connector to the junction box



3 GHz cnRanger 210 RRH DC power cable

Power cord for outdoor application with 2 conductors and drain wire, 16AWG or thicker. Please refer to the connection diagram for polarity.

Figure 2: *3 GHz cnRanger 210 RRH DC power cable*



Connecting Junction Box to 2 GHz cnRanger 220 RRH

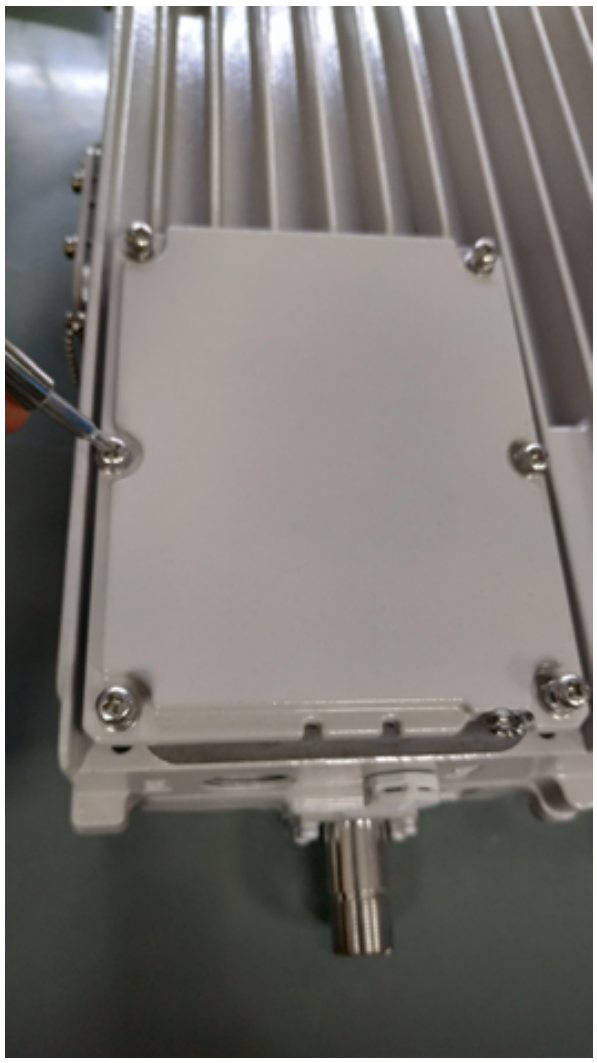
Connect Junction Box to 2 GHz cnRanger 220 RRH using DC power cable (N000000L130A) as shown in Figure 3. Cable comes with pre-crimped 3- wire terminal block on one end to connect to Junction Box and 2 GHz cnRanger 220 RRH power connector on the other end.

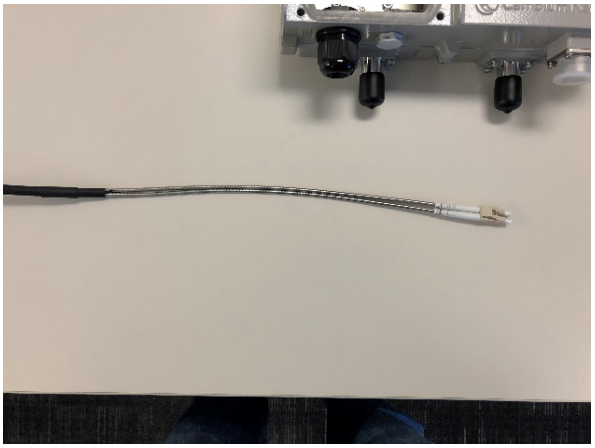
Figure 3: *DC Power Cable*

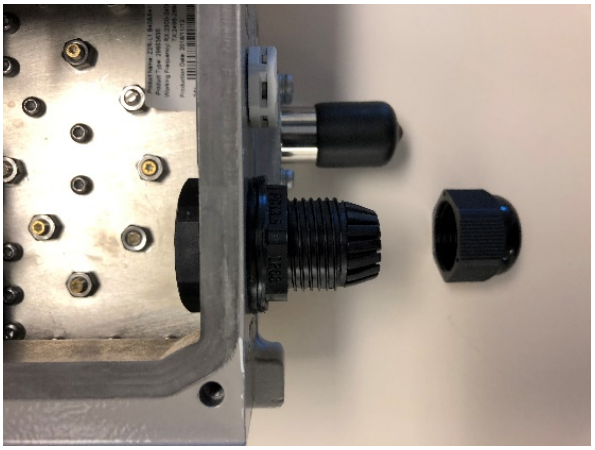
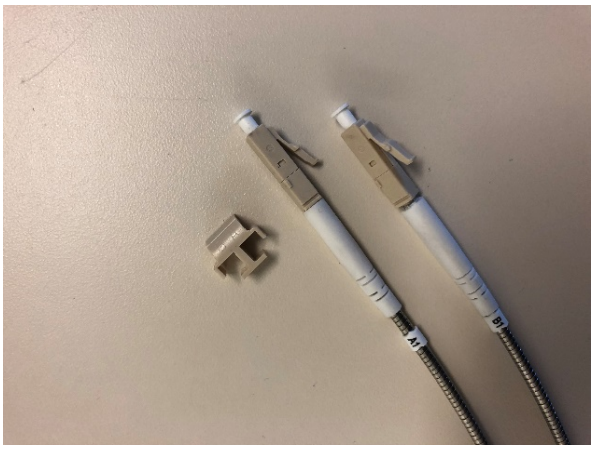
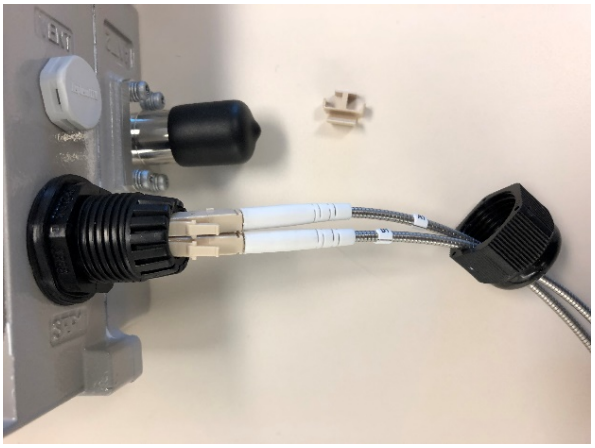
Table 7 LPU_ RRH power Cable

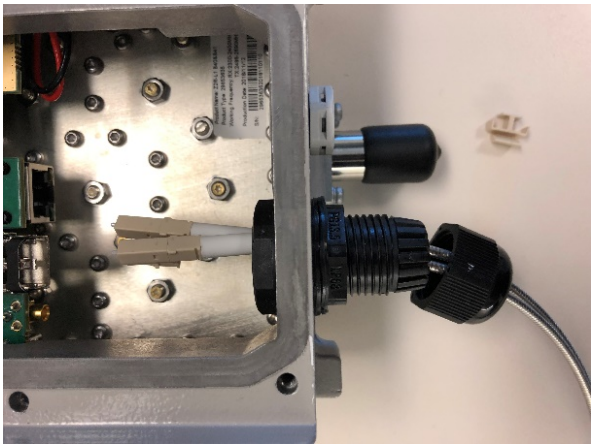
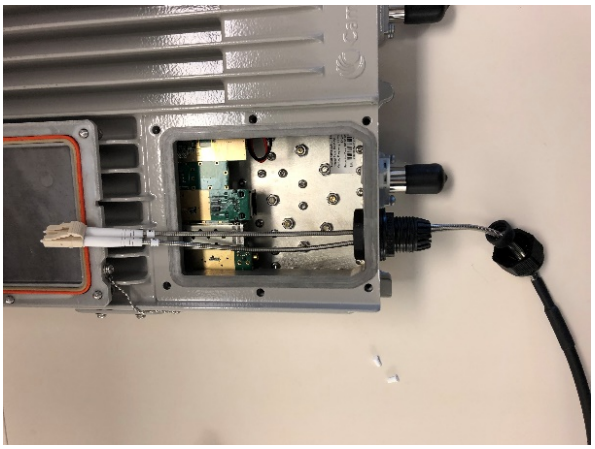
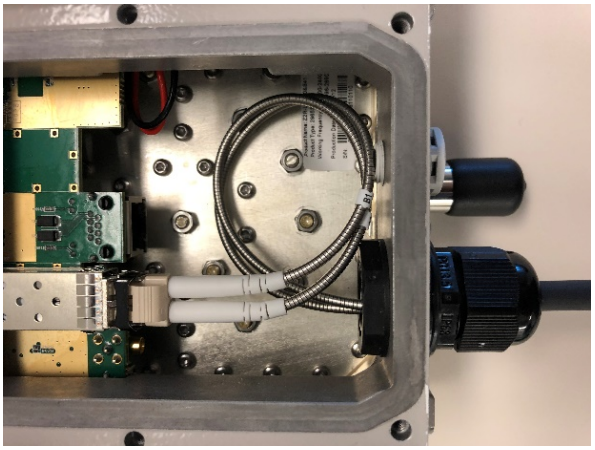
Cambium description	Cambium part number
RRH DC power cable 2-meter	N000000L130A

Installing SFP+ Module on the 2 GHz cnRanger 220 RRH

1. Open the back cover on the 2 GHz cnRanger 220 RRH.	

2. Insert SFP+ Module in optical fiber port.	
3. Use RRH CPRI optical fiber (N000000L131A) cable to connect from junciton box to RRH.	

4. Open the cap on the weather proofing gland on the external port.	
5. Remove LC patch cord connector clip before insertint the fiber optic cable into the weather proofing gland.	
6. Insert the fiber cable in to the weather proofing gland one fiber strand at a time.	

	
7. Put LC connector clip back on the cable.	
8. Create a service loop on the fiber cable and tighten the weather proofing gland. 9. Make sure 2 GHz cnRanger 220 RRH back plate is installed back on the unit.	

Configuring cnRanger 800 BBU and 2 GHz/3 GHz cnRanger RRH

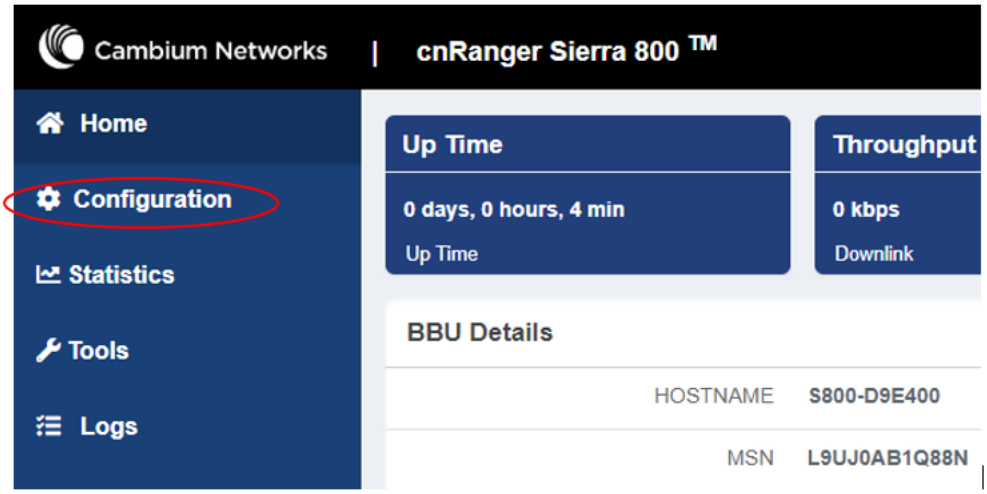
Cambium recommends that units are pre-configured 'on the bench' before being deployed.

Powering the cnRanger 800 BBU unit

1. Power the cnRanger 800 BBU unit, instructions of how to power cnRanger 800 BBU unit are described earlier in section powering up the cnRanger 800 BBU.
2. Check that the power LED on the Sierra illuminates.
3. Connect an Ethernet cable from the PC to the ETH2 port on cnRanger 800 BBU and confirm the Ethernet activity LED blinks.

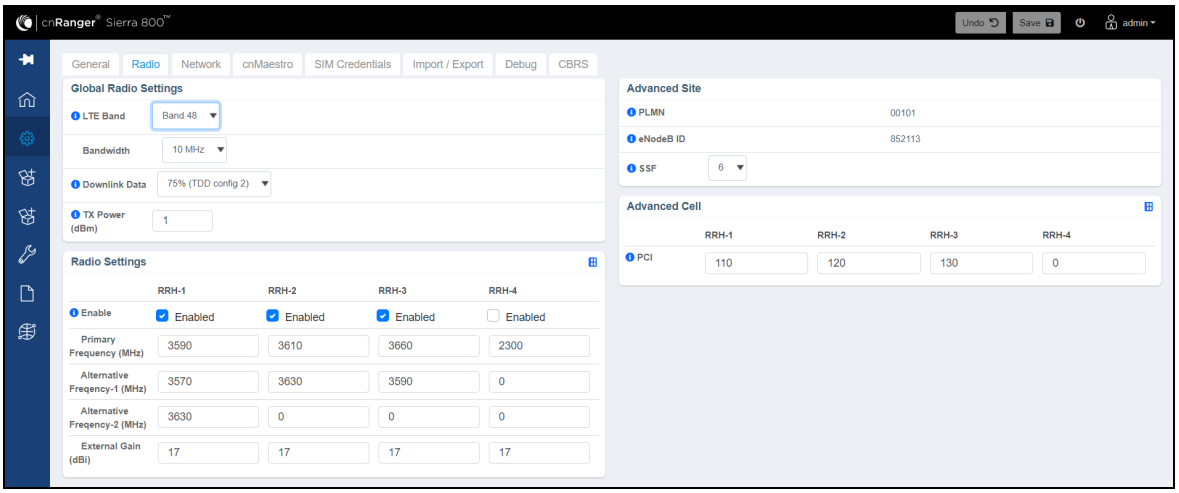
Configure PC Ethernet interface

1. On the PC, configure the Ethernet port for a static IP address using the 168.254.1.X range, avoiding 169.254.0.0 and 169.254.1.1. For example 169.254.1.3.
2. Enter a subnet mask of 255.255.255.0.
3. Leave the default gateway blank.
4. Using a web browser, navigate to factory default web address 169.254.1.1 and login.
5. Enter Username (factory default username is admin) and Password (factory default password is admin) and click **Login**.
6. The cnRanger 800 BBU interface menu and **System Summary** page are displayed.
7. On the menu of left-hand side of web page, select the Configuration icon as shown below:



8. Click on **Radio** tab.

9. Select the required bandwidth, LTE band, frequency, power and external gain settings in accordance with allocated regulatory licensing and then click the **Save** button. To apply these changes, reboot the unit.

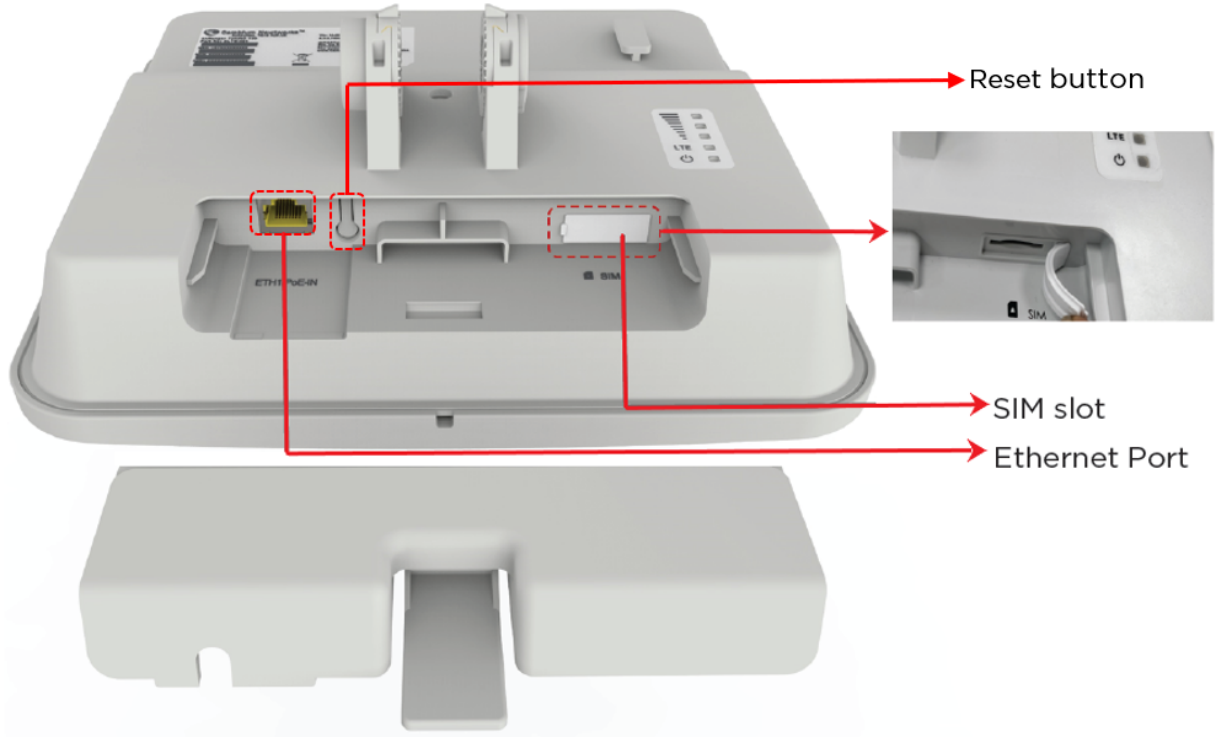


Note

For further information on cnRanger 800 BBU setup, refer cnRanger User Guide.

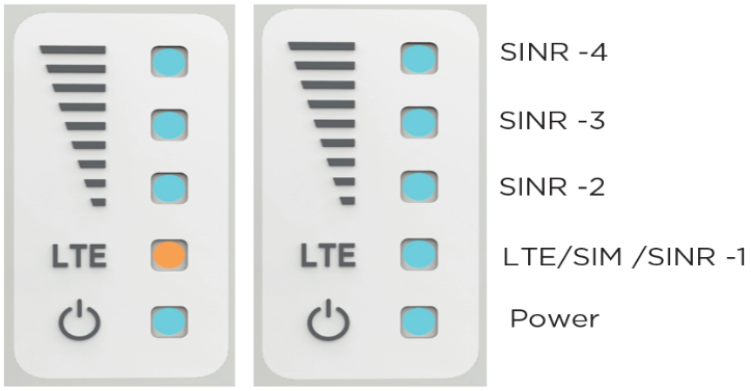
2 GHz/3 GHz cnRanger SM Hardware Overview

cnRanger 101 SM hardware overview



SIM Slot: The SIM slot is used for inserting SIM card.

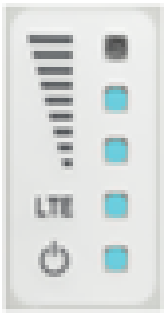
Ethernet Port: The Ethernet port is used to connect to power and connect to the subscriber Ethernet network.



cnRanger 101 SM LED details

Table 8 cnRanger 101 SM LED details

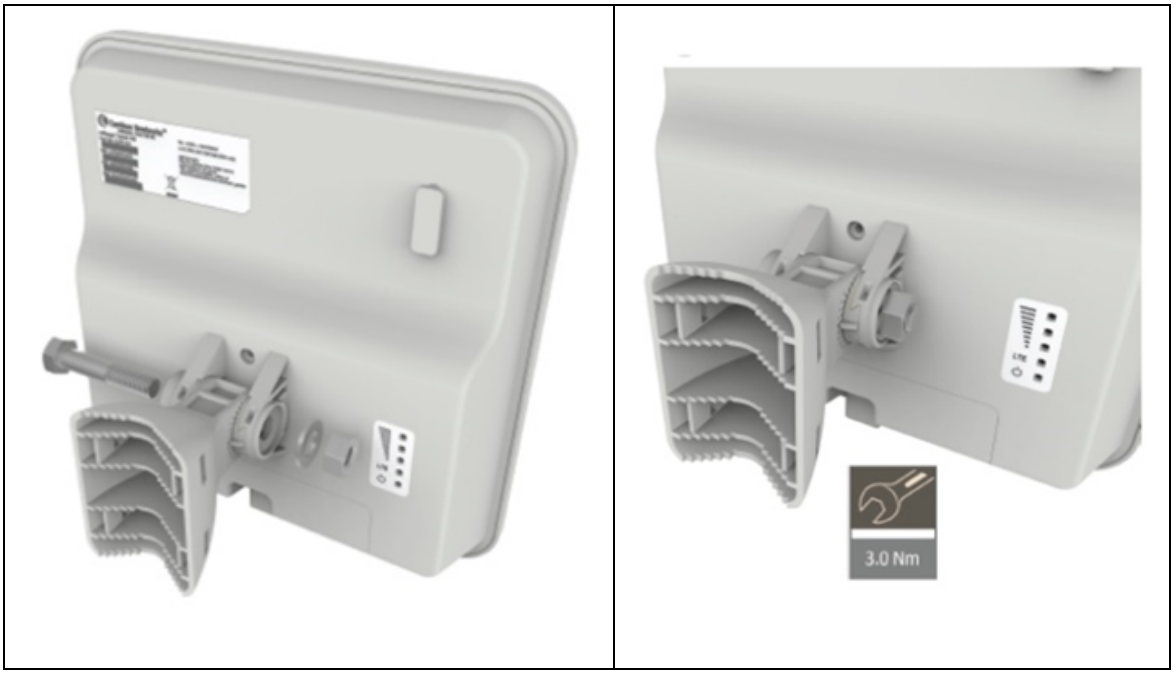
LED Name	LED	Color	Behaviour	Status Indication
Power Status		Blue	Steady ON	Device is ON (AC is plugged in).
		Blue	OFF	Device is OFF (AC is not plugged in or device is faulty).
LTE/SIM		Blue	Steady ON	LTE is attached.
		Blue	Blinking	Searching for LTE network.
		Blue	OFF	Not able to attach to LTE network.
		Orange	Steady ON	SIM issue.
		Orange	Blinking	SIM detection in process.
		Orange	OFF	SIM is detected and working properly. It turns to blue once LTE is attached.
LTE + SINR Status	When CPE connects to Base station, the 3D LEDs become signal quality indicators according to SINR or other pre-defined quality indicator.			
LTE SINR-1 + SINR-2 + SINR-3 + SINR-4		Blue	OFF	SINR < 11dB 11dB <= SINR < 18dB
		Blue	Steady ON	

LED Name	LED	Color	Behaviour	Status Indication
		Blue	Steady ON	18dB <= SINR < 23dB
		Blue	Steady ON	23dB <= SINR

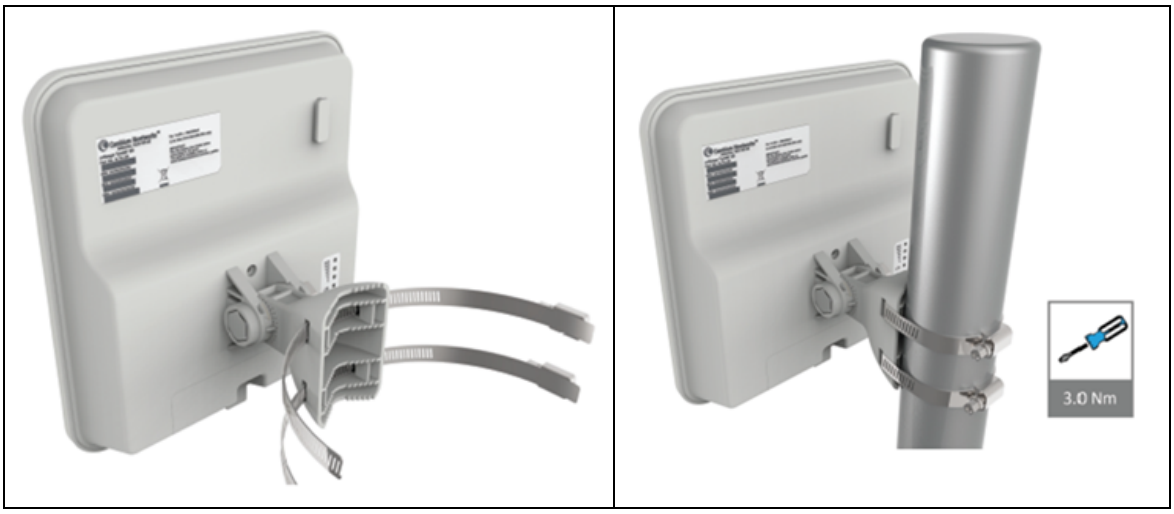
Mounting cnRanger 101 SM

1. Assemble the radio to the pole mounting bracket.

2. Secure pole mounting bracket with M8 nut and bolt by applying 3.0 Nm torque.

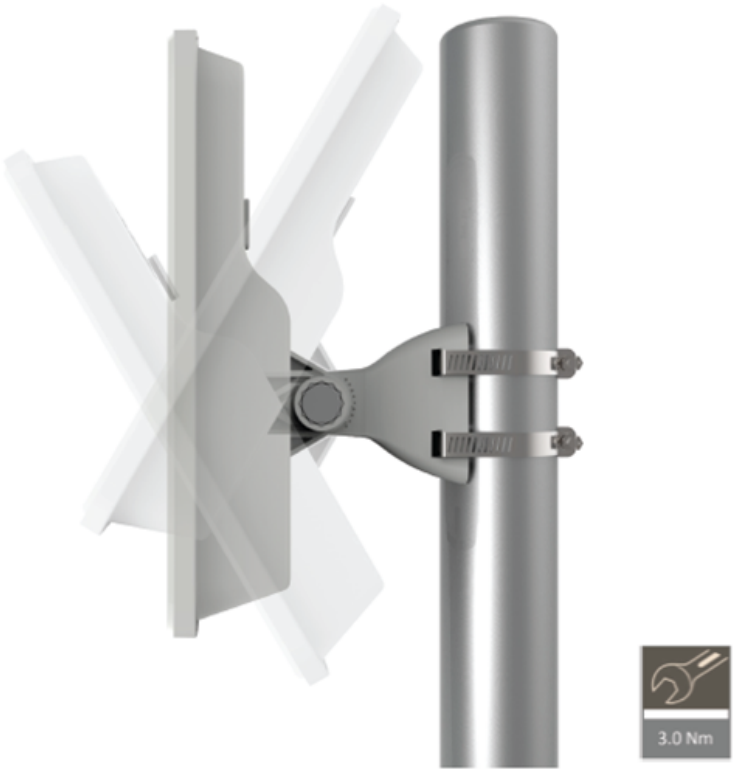


3. Insert hose clamps through pole mounting bracket and clamp to pole by applying 3.0 Nm torque.



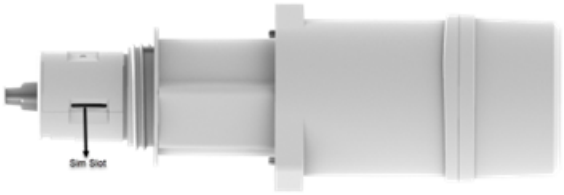
4. Remove cap and connect RJ 45 cable to the radio.

5. Align radio to required angle by tilting up and down. The maximum radio tilting angle is 3 40°, with an incremental of 10°. Secure radio with max 5.0 Nm torque.



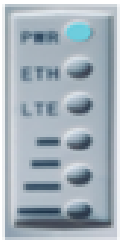
cnRanger 201 SM hardware overview

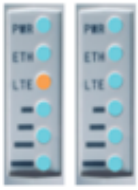
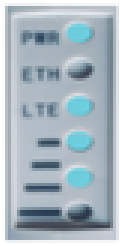
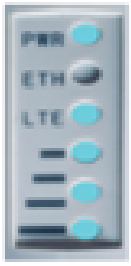
The cnRanger 201 SM Module Fixed LTE wireless platform substantially increases range and coverage, while reducing the cost and complexity typically associated with LTE networks.



cnRanger 201 SM LED details

Table 7 :cnRanger 201 SM LED details

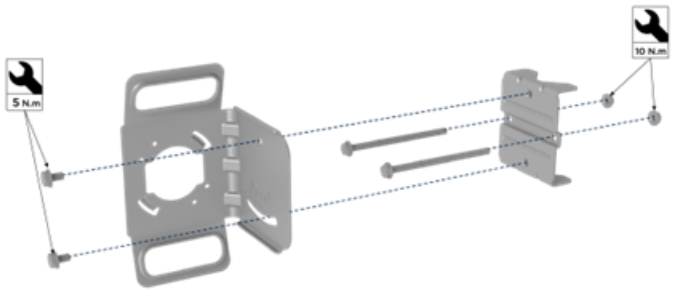
LED Name	LED	Color	Behaviour	Status Indication
Power Status		Blue	Steady ON	Device is ON (AC is plugged in).
		Blue	OFF	Device is OFF (AC is not plugged in or device is faulty).

LED Name	LED	Color	Behaviour	Status Indication
LTE/SIM		Blue	Steady ON	cnRanger 201 SM attached to LTE network.
		Blue	Blinking	Searching for LTE.
		Blue	OFF	CPE not attached to LTE network.
		Orange	Steady ON	SIM issue.
		Orange	Blinking	SIM detection in process.
LTE + SINR Status	When CPE connects to Base station, the 3D LEDs become signal quality indicators according to SINR.			
LTE SINR-1 + SINR-2 + SINR-3 + SINR-4		Blue	OFF	< 5 dB 5 dB <= CINR < 10 dB
		Blue	Steady ON	
		Blue	Steady ON	10 dB <= CINR < 20 dB
		Blue	Steady ON	20 dB <= CINR

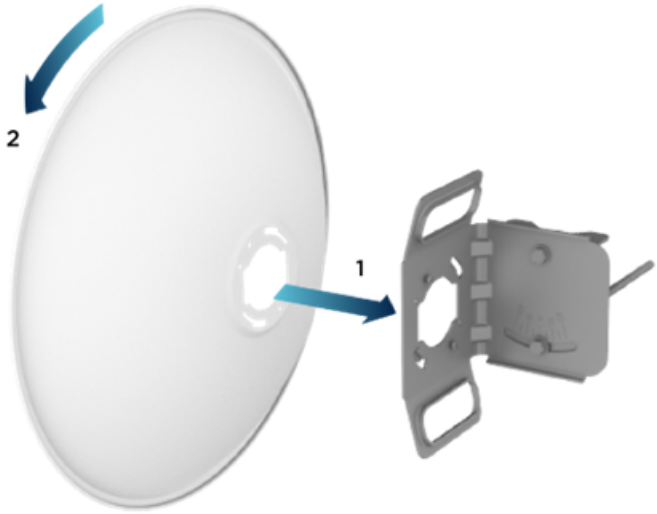
Installing cnRanger 201 SM

Assemble the Pole Mount bracket to the dish mounting bracket as follows:

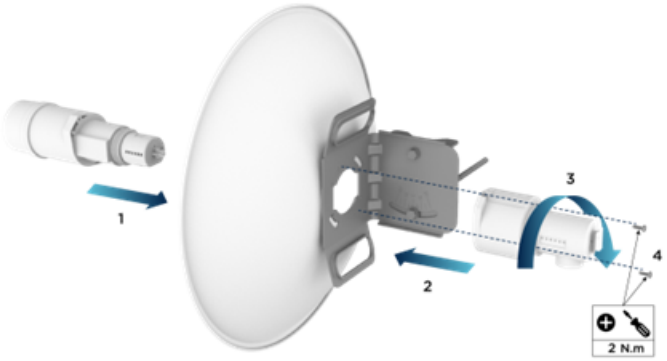
1. Insert the the two M8 x 120 mm bolts though the pole mounting bracket and tighten the nuts by applying 10 Nm torque.
2. Attach the bracket to the pole mounting with the two M8 screws by applying 5 Nm torque.



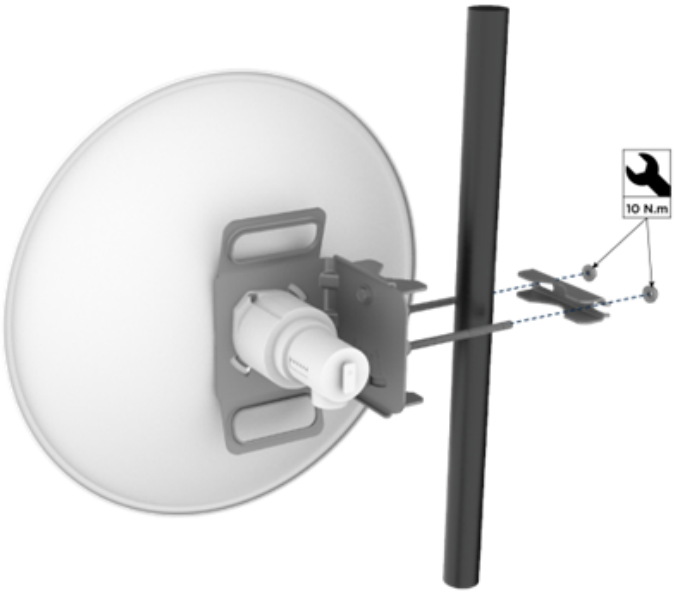
3. Assemble the dish to pole mounting bracket. Rotate and align dish tabs to the pole bracket assembly.



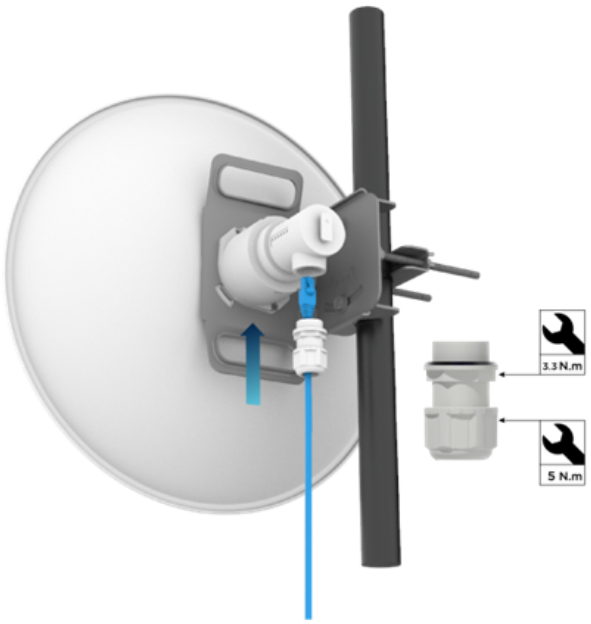
4. Assemble the radio to dish assembly as shown below:
    a. ■ Insert the the radio (1) through the dish and bracket (2).
    b. ■ Insert rear housing (3) and secure with two screws (4) by applying 2 Nm torque to lock the assembly together.



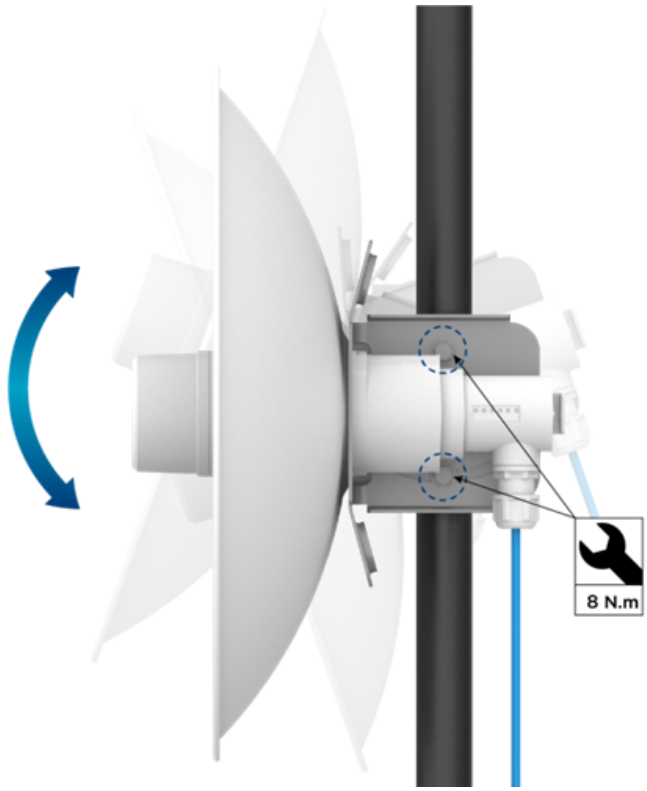
5. Attach Dish assembly to pole mounting and secure with M8 nuts by applying 10 Nm torque.



6. Remove cap and connect RJ45 cable to the radio.



7. Align radio to required angle by tilting up and down. The maximum radio tilting angle is 3 20°, with an incremental of 10°. Secure radio by applying 8.0 Nm torque.

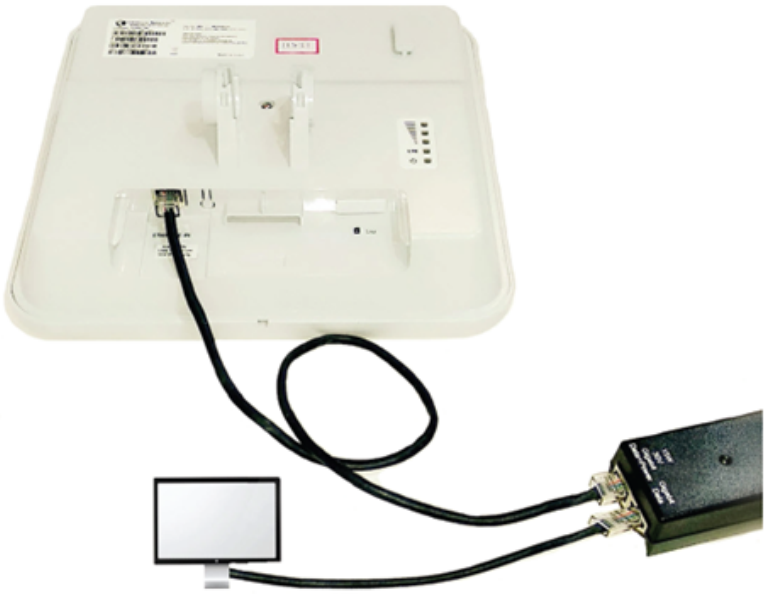


Powering Up

Follow the below procedure to power up the device using PoE adapter as shown in Figure 1.

1. Connect the Ethernet cable from Eth1/PoE-IN of cnRanger Tyndall 101 to the PoE port of Gigabit Data + Power.
2. Connect an Ethernet cable from your LAN or computer to the Gigabit Data port of the PoE adapter.

Figure 1: *Installation of Tyndall 101 to PoE adapter*



3. Connect the power cord to the adapter, and then plug the power cord into a power outlet as shown in Figure 2. Once powered ON, the Power LED should illuminate continuously on the PoE Adapter.

Figure 2: *Installation of adapter to power outlet*

Note

Shielded Category 5 (or above) cabling should be used for all outdoor wired Ethernet connections and should be grounded through the AC ground of the PoE.

CBRS

This section describes configuration and operation of Cambium Networks CBRS solution for LTE SMs. It covers procedural steps for both the radio and cnMaestro. It is similar to Cambium Networks PMP CBRS procedures guide. However, the majority of PMP CBRS deployments were migrations from Part 90 FCC setups. Cambium 3.6 GHz LTE CBRS deployments are expected to be new installations. For further information refer to CBRS LTE guide.

Configure Management PC

1. Select properties for the Ethernet port.
2. In Windows, it is found in Control Panel > Network and Internet > Network Connections > Local Area Connection.
3. In MAC, it is found in System Preferences > Network.
4. In Linux, it is found in System Settings > Network > Wired > Options.
5. IP Address configuration to use the static Tyndall factory default address:
    a. Assign a static address on the 169.254.0.0/16 subnet other than 169.254.1.1. It is recommended to use 169.254.1.3.
    b. Assign a subnet mask of 255.255.0.0.
    c. Leave the default gateway blank.

Quick link setup

Initial device configuration is performed over the Ethernet Interface using Tyndall GUI.

To configure using 2 GHz/3 GHz cnRanger SM:

1. Open the web browser, navigate to 169.254.1.1, and login with the following credentials:
    - Username: admin
    - Password: admin
2. Navigate to either the configuration or quick start menu to setup 2 GHz/3 GHz cnRanger SM for the desired modes of operation. Once the 2 GHz/3 GHz cnRanger SM is configured and the radio link is operational, further management may be performed over the radio link by using cnMaestro or 2 GHz/3 GHz cnRanger SM GUI.

Operating in the EU

Frequency bands, maximum operating power, safe distance

In the EU, the cnRanger series products operate in the following frequency bands up to the maximum power shown:

Table 9 Frequency band, operating power and safe distance details

Operating Frequency Band	EU Standard	Maximum Power Limit (EIRP)	Permitted usage	Units that support this frequency band
E-UTRA Band 38 2570 – 2620 MHz	EN 301 908-13	38 dBm (23 dBm conducted power, 15 dBi antenna gain)	This is a licensed band within the EU. (See Note).	cnRanger 101 SM
E-UTRA Band 38 2570 – 2620 MHz	EN 301 908-14	52 dBm (36 dBm conducted power, 16 dBi antenna gain)	This is a licensed band within the EU. (See Note).	2 GHz/3 GHz cnRanger RRH with cnRanger 110° antenna
GPS L1 Band 1575 MHz	EN 303 413	N/A	GPS receiver usage permitted without license.	cnRanger 800 BBU

Note

- For cnRanger 101 SM products deployed in the EU, the minimum safe distance between the equipment and humans is 25cm.
- For 2 GHz cnRanger 220 RRH products deployed in the EU, the minimum safe distance between the equipment and humans is 110cm.
- For cnRanger 800 BBU products deployed in the EU there is no minimum safe distance.

Obtain a license from your national licensing authority before deployment. The license should specify the permitted frequency, bandwidth and the maximum power to be used. Set up equipment accordingly.

EU operation – restrictions & requirements for authorization for use

- This equipment is for outdoor use only (cnRanger 800 BBU products require installation in an indoor environment or environmental enclosure).
- The Cambium cnRanger series of products operates in licensed frequency bands subject to frequency planning within individual countries. Operators/End users must ensure that the equipment is installed and operated in accordance with the regulations applicable to the country of operation and obtain any necessary licenses or permits.

Simplified EU declaration of conformity

Hereby, the manufacturer Cambium Networks Ltd, declares that the radio equipment types:

- cnRanger 800 BBU
- cnRanger 101 SM
- cnRanger 201 SM
- 2 GHz cnRanger 220 RRH
- 3 GHz cnRanger 210 RRH

are in compliance with Directive 2014/53/EU. The full text of the EU declaration of conformity is available at the following internet address: http://www.cambiumnetworks.com/eu_dofc.

Waste Electrical and Electronic Equipment (WEEE) directive

Caution

Please do not dispose of Electronic and Electric Equipment or Electronic and Electric Accessories with your household waste. In some countries or regions, collection systems have been set up to handle waste of electrical and electronic equipment. In European Union countries, please contact your local equipment supplier representative or Cambium Networks Support Centre for information about the waste collection system in your country.

Cambium Networks

Cambium Networks provides professional grade fixed wireless broadband and microwave solutions for customers around the world. Our solutions are deployed in thousands of networks in over 153 countries, with our innovative technologies providing reliable, secure, cost-effective connectivity that's easy to deploy and proven to deliver outstanding performance.

Our award-winning Point to Point (PTP) radio solutions operate in licensed, unlicensed and defined use frequency bands including specific FIPS 140-2 solutions for the U.S. Federal market. Ruggedized for 99.999% availability, our PTP solutions have an impeccable track record for delivering reliable high-speed backhaul connectivity even in the most challenging non-line-of-sight RF environments.

Our flexible Point-to-Multipoint (PMP) solutions operate in the licensed, unlicensed and federal frequency bands, providing reliable, secure, cost effective access networks. With more than three million modules deployed in networks around the world, our PMP access network solutions prove themselves day-in and day-out in residential access, leased line replacement, video surveillance and smart grid infrastructure applications.

Cambium Networks solutions are proven, respected leaders in the wireless broadband industry. We design, deploy and deliver innovative data, voice and video connectivity solutions that enable and ensure the communications of life, empowering personal, commercial and community growth virtually everywhere in the world.

User Guides	http://www.cambiumnetworks.com/guides
Technical training	https://learning.cambiumnetworks.com
Support website	https://support.cambiumnetworks.com
Main website	http://www.cambiumnetworks.com
Sales enquiries	solutions@cambiumnetworks.com
Support enquiries	https://support.cambiumnetworks.com
Telephone number list	http://www.cambiumnetworks.com/contact-us/
Address	Cambium Networks Limited, Linhay Business Park, Eastern Road, Ashburton, Devon, TQ13 7UP United Kingdom

http://www.cambiumnetworks.com

Cambium Networks and the stylized circular logo are trademarks of Cambium Networks, Ltd. All other trademarks are the property of their respective owners.

© Copyright 2019 Cambium Networks, Ltd. All rights reserved.