Nova452

Outdoor 4x40W eNB

Installation Guide

Document version: 01

About This Document

This document is intended for personnel who will be installing the Baicells Nova452 Outdoor 4x40W eNB product. This Baicells equipment is based on 3GPP Long-Term Evolution (LTE) technology. The product overview is followed by the procedures for properly installing. Please be advised that only personnel with the appropriate electrical skills and experience should install this device.

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Revision Record

Date	Version	Description	SMEs/Contributors	Author/Editor
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Contact Us

	Baicells Technologies Co., Ltd.	**Baicells Technologies North America, Inc.**
	China	North America
Address	9-10F,1stBldg.,No.81BeiqingRoad,Haidian District,Beijing,China	555 Republic Dr., #200, Plano, TX 75074, USA
Phone	400-108-0167	+1-888-502-5585
Email	contact@Baicells.com or support@Baicells.com	sales_na@Baicells.com or support_na@Baicells.com
Website	www.Baicells.com	https://na.Baicells.com

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1. Overview

1.1 Introduction

The Baicells Nova452 is an advanced two-carrier outdoor eNodeB (eNB) compliant with 3GPP LTE TDD&FDD and hardware-ready for NR 5G technology. This 4x40W eNB operates in either Carrier Aggregation (CA) mode or Dual Carrier (DC) mode.

In CA mode, Nova452 supports 2CC (2 component carriers) DL/UL CA. 2CC DL/UL CA doubles DL/UL peak throughput comparing to that of a single carrier. By aggregating 2 separated spectrum resources into a virtual contiguous spectrum resource.

In DC mode, each carrier is treated as an independent cell, supporting 512+512 users with each cell supporting 5, 10, 15, 20 or 100MHz (only for NR) bandwidth. Using a Nova452 in DC mode simplifies and streamlines the deployment of split sectors.

The product is easy to deploy and flexible to configure, which satisfies the outdoor wireless network capacity and coverage requirements well. It can be widely used in telecom operators, broadband operators, enterprises and other scenarios.

NOTE: Only the Nova452 in TDD mode supports CA mode.

1.2 Highlights

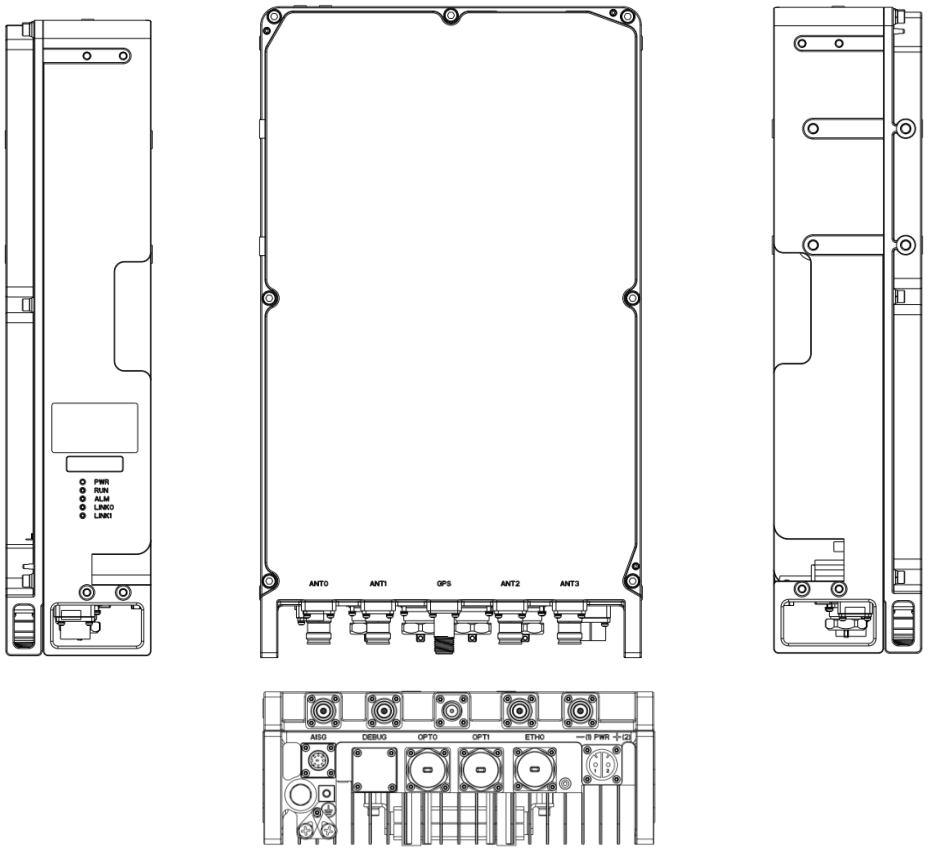
- Standard LTE TDD Band 38/40 and LTE FDD Band 1/3/7/8/20/28.
- GUI-based local and remote Web management.
- Excellent Non-Line-of-Sight (NLOS) coverage.
- Suitable for private and public deployments; any IP based backhaul can be used, including public transmission protected by Internet Protocol Security (IPsec).
- Peak rate for FDD mode: Up to DL 540Mbps with 4x4MIMO in Dual Carrier (DC) mode and up to UL 150Mbps.
- Peak rate for TDD mode: Up to DL 440Mbps with 4x4 MIMO and DL64QAM in Carrier Aggregation (CA) mode and up to UL 56Mbps in CA mode.

- In FDD mode, supports 1024 RRC connected users per cell and 1024+1024 RRC connected users in DC mode.
- In TDD mode, supports 512 RRC connected users per cell and 512+512 RRC connected users in DC mode.
- Supports downlink of 256QAM.
- Integrated small cell form factor for quick and easy installation.
- Configured out-of-the-box to work with Baicells Cloud Core.
- Plug-and-play with Self-Organizing Network (SON) capabilities.
- Inter operation with all standard LTE Evolved Packet Core (EPC).
- Highly secured with equipment certification against potential intrusion risk.
- Supports TR-069 network management interface.
- Lower power consumption, which reduces OPEX, can be powered easily by outdoor smart UPS.
- Supports software update to 5G or 4G+5G RRU.
- Supports RET function AISG 2.0.

1.3 Appearance

The appearance of Nova452 is shown in Figure 1-1.

Figure 1-1 Nova452 Appearance



The Nova452 interfaces are described in Table 1-1.

Table 1-1 Nova452 Interface Description

Interface	Description
ANT0~ANT3	Connect to external antenna 0 to antenna 3, 4.3-10 mini-DIN connector
GPS	GPS antenna interface, N type connector
AISG	RS485 interface, complied with AISG2.0 standard
DEBUG	(Reserved)
OPT0	Optical interface 0 (SFP), connect to external transmission network, used for data backhaul

Interface	Description
OPT1	Optical interface 1 (SFP), used for cascading
ETH0	RJ-45 interface, connect to external transmission network, used for data backhaul
PWR	Power interface: -48VDC (-40VDC to -57VDC)

The Nova452 interface indicators are described in Table 1-2.

Table 1-2 Nova452 Interface Indicators

Identity	Color	Status	Description
ALM	Red	Steady ON	The system exists alarm.
		OFF	No alarm, the device is normal.
RUN	Green	Steady ON	The device has been activated. (The device transmits power normally.)
		Slow flash: 1s on,1s off	The device has been deactivated. (The device does not transmit power.)
PWR	Green	Steady ON	Power on or device fault.
		OFF	No power supply.
LINK0	Green	Steady ON	Data link is normal.
		OFF	Data link is abnormal.
LINK1	Green	OFF	(Reserved)

1.4 Technical Specification

1.4.1 Technology

Item	Description

Item	Description
Standard	LTE TDD/FDD RAN (3GPP R15)
TDD UL/DL Config.	1, 2, 6 (with Special subframe Configuration 7)
Frequency Band	TDD: - Band38 (2575 MHz – 2615 MHz) - Band40 (2300 MHz – 2400 MHz) FDD: - Band1 (UL 1920MHz – 1980 MHz, DL 2110 MHz – 2170 MHz) - Band3 (UL 1710 MHz – 1785 MHz, DL 1805 MHz – 1880 MHz) - Band7 (UL 2500MHz – 2570 MHz, DL 2620 MHz – 2690 MHz) - Band8 (UL 880MHz – 915 MHz, DL 925 MHz – 960 MHz) - Band20 (UL 832MHz – 862 MHz, DL 791 MHz – 821 MHz) - Band28 (UL 703MHz – 748 MHz, DL 758 MH z– 803 MHz)
Channel Bandwidth	SC: 5/10/15/20 MHz, or Max 100MHz in NR mode CA: 40 MHz as maximum aggregated bandwidth
Multiplexing	4x4 MIMO (DL)
Security	Radio: SNOW 3G/AES-128 Backhaul: IPsec (AES-128, AES-256, SHA-128, SHA-256)
Voice	VoLTE, Circuit Switched Fallback (CSFB)
SON	Self-Organizing Network • Automatic setup • Automatic Neighbor Relation (ANR) • PCI confliction detection

Item	Description
VSWR	Supported
RET support	AISG2.0, 24VDC ~30VDC, RS-485, 3GPP TS 25.461
Traffic Offload	Local breakout
Layer 2 Support	Transparent Bridge Mode
Daisy Chain	2 level cascading
Maintenance	• Local/Remote Web maintenance • Online status management • Performance statistics • Fault management • Local/Remote software upgrade • Logging • Connectivity diagnosis
Network Mgmt.	IPv4/IPv6, HTTP/HTTPs, TR-069, SSH
VLAN/VxLAN	802.IQ/VxLAN
Power Control	UL Open-loop/Closed-loop Power Control, DL Power Allocation (3GPP TS 36.213 compliant)
Quality of Service	Nine-level priority indicated by QoS Class Identifiers (QCI)
ARQ/HARQ	Supported
Synchronization	GPS/1588v2

1.4.2 Performance

Item	Description				
Peak Data Rate (DC in TDD mode)	2x20 MHz		DL256QAM (Mbps)	DL64QAM (Mbps)	UL64QAM (Mbps)
	SA1	DL2x2 MIMO	2x105	2x80	2x28
		DL4x4 MIMO	-	2x160	2x28
	SA2	DL2x2 MIMO	2x145	2x110	2x14

Item	Description				
		DL4x4 MIMO	-	2x220	2x14
	SA6	DL 2x2 MIMO	2x85	2x65	2x35
		DL 4x4 MIMO	-	2x132	2x35
	2x10 MHz		DL256QAM (Mbps)	DL64QAM (Mbps)	UL64QAM (Mbps)
	SA1	DL2x2 MIMO	2x51	2x38	2x14
		DL4x4 MIMO	-	2x77	2x14
	SA2	DL2x2 MIMO	2x70	2x52	2x7
		DL4x4 MIMO	-	2x106	2x7
	SA6	DL 2x2 MIMO	2x42	2x31	2x17
		DL 4x4 MIMO	-	2x63	2x17
Peak Data Rate (CA in TDD mode)	2x20 MHz		DL256QAM (Mbps)	DL64QAM (Mbps)	UL64QAM (Mbps)
	SA1	DL2x2 MIMO	210	160	56
		DL4x4 MIMO	-	320	56
	SA2	DL2x2 MIMO	290	220	28
		DL4x4 MIMO	-	440	28
	SA6	DL 2x2 MIMO	170	130	70
		DL 4x4 MIMO	-	264	70
	2x10 MHz		DL256QAM (Mbps)	DL64QAM (Mbps)	UL64QAM (Mbps)
	SA1	DL2x2 MIMO	102	76	28
		DL4x4 MIMO	-	154	28
	SA2	DL2x2 MIMO	140	104	14

Item	Description				
		DL4x4 MIMO	-	212	14
	SA6	DL 2x2 MIMO	84	62	34
		DL 4x4 MIMO	-	126	34
	10 MHz+20MHz		DL256QAM (Mbps)	DL64QAM (Mbps)	UL64QAM (Mbps)
	SA1	DL2x2 MIMO	156	118	42
		DL4x4 MIMO	-	237	42
	SA2	DL2x2 MIMO	215	162	21
		DL4x4 MIMO	-	326	21
	SA6	DL 2x2 MIMO	127	96	52
		DL 4x4 MIMO	-	195	52
Peak Data Rate (in FDD mode)	20MHz		DL256QAM (Mbps)	DL64QAM (Mbps)	UL64QAM (Mbps)
	DL 4x4 MIMO		390(SC) -	300(SC) 540(DC)	75(SC) 150(DC)
	DL 2x2 MIMO		195(SC) 390(DC)	150(SC) 300(DC)	75(SC) 150(DC)
	10MHz		DL256QAM (Mbps)	DL64QAM (Mbps)	UL64QAM (Mbps)
	DL 4x4 MIMO		195(SC) -	150(SC) 300(DC)	37(SC) 75(DC)
	DL 2x2 MIMO		97(SC) 195(DC)	75(SC) 150(DC)	37(SC) 75(DC)
User Capacity	Up to 512 RRC connected users per cell • SC/CA: 512 RRC connected users				

Item	Description
(in TDD mode)	• DC: 512+512 RRC connected users
User Capacity (in FDD mode)	Up to 1024 RRC connected users per cell • SC: 1024 RRC connected users • DC: 1024+1024 RRC connected users
MAX Deployment Range	60 kilometers
Latency	30 milliseconds
Receive Sensitivity	Band38/40: -103 dBm (per channel) Band1/3/7: -105.0dBm (per channel) Band8/20/28: -105.5dBm (per channel)
Modulation	MCS0 (QPSK) to MCS28 (256QAM) DL: QPSK, 16QAM, 64QAM, 256QAM UL: QPSK, 16QAM, 64QAM
Transmit Power Range	36dBm to 46dBm per channel (combined +52dBm, configurable with 1 dB interval)

NOTE: The test method of receiving sensitivity is proposed by the 3GPP TS 36.104, which is based on 5MHz bandwidth, FRC A1-3 in Annex A.1 (QPSK, R=1/3, 25RB) standard.

1.4.3 Modulation Levels (Adaptive)

MCS	Modulation Scheme	RSRP (dBm)
0 - 4	QPSK	-120 ≤ RSRP < -110
5 - 10	16QAM	-110 ≤ RSRP < -100
11-19	64QAM	-100≤RSRP< -85
20 - 27	256QAM	RSRP ≥ -85

NOTE: The information provided is for reference only as the environment can impact modulation levels.

Scenario: Base Station height is 30 meters; Customer User Equipment (CPE) height is two meters.

1.4.4 Interface

Item	Description
Ethernet Interface	1 x optical interface (SFP) 1 x optical interface (SFP+) 1 x RJ-45 Ethernet interface (GE)
Power Supply	-40VDC ~ -57VDC, nominal -48VDC AC adaptor (multi-national standards)
LED Indicators	5 x status LED PWR/RUN/ALM/LINK0/LINK1
Antenna Connection	4T4R external high gain antenna with mini-DIN connectors
GPS Antenna	External GPS antenna, N-Type connector

1.4.5 Physical

Item	Description
Surge Suppression	Yes
Power Interface Lightning Protection	Differential mode: ±10 KA Common mode: ±20 KA
MTBF	≥ 150000 hours
MTTR	≤ 1 hour
Ingress Protection Rating	IP66
Operating Temperature	-40°F to 131°F / -40°C to 55°C
Storage Temperature	-49°F to 158°F / -45°C to 70°C
Humidity	5% to 95% RH

Item	Description
Atmospheric Pressure	70 kPa to 106 kPa
Power Consumption	FDD: Typical 400W, maximum 600W TDD: Typical 360W, maximum 480W
Weight	Without bracket: 38.4lbs/17.4kg@Band38/40 40.6lbs/18.4kg@Band1/3/7 47.2lbs/21.4kg@Band8/20/28 With pre-installed bracket: 39.7lbs/18.0kg@Band38/40 41.9lbs/19.0kg@Band1/3/7 48.5lbs /22.0kg@Band8/20/28
Dimensions (HxWxD)	Band1/3/7/38/40: 20.7 x 12.1 x 4.7 inches/527 X 308 X 120 millimeters Band8/20/28: 20.7 x 12.1 x 5.3 inches/527 X 308 X 135 millimeters
Installation	Pole or wall mount

2. Installation Preparation

2.1 Support Materials

In addition to industry standard tools, you will need the materials described in Table 2-1 during the installation.

Table 2-1 Supporting Materials

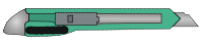
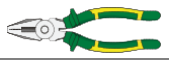
Item	Figure	Description
DC cord		A DC power cable is provided with the device. If the length is insufficient, the customer needs to prepare it. It is suggested that AWG11 is used. The cord is two cores cable and the length is less than 100 meters.
RF antenna cable		50 ohm feeder, 1/2 jumper
Ethernet cable		Outdoor CAT6, shorter than 100 meters (~109 yards) It is suggested that the diameter of the cable is 7±1mm.
Optical fiber		Optical fiber (armor) It is suggested that the diameter of the cable is 7± 1mm.
Optical module		SFP optical module
RF antenna		Omni or directional dual polarized antenna When selecting an RF antenna, be sure to match the frequency range of the antenna with the eNB.

Item	Figure	Description
Ground cable		If the length of lead is more than 10 meters, a ground cable with 16mm² cross section should be used. If the length of lead is less than 10 meters, a ground cable with 10mm² cross section should be used.
Pole		The diameter of the pole is between 40mm to 100mm of hot-galvanized steel pipe. Channel steel and equal angle steel installation are also supported. The width of the channel steel is 50mm to 100mm; the length of side of the angle steel is 63mm to 80mm.
Distribution box		AC Air switch, socket, power grounding point, broadband access is all in the distribution box, which must be waterproofed.

NOTE: Other accessories have been packed in the packing box.

2.2 Installation Tools

The following standard tools may be needed during the installation.

				
Level bar	Marking pen	Knife	Vise	Wrench
				
Percussion drill and some drill heads	hammer	Cross screwdriver	Cable vice	Tape measure

				
5mm L-shape allen wrench	T7 screwdriver head	Ladder	compass	fixed pulley
				
multimeter				

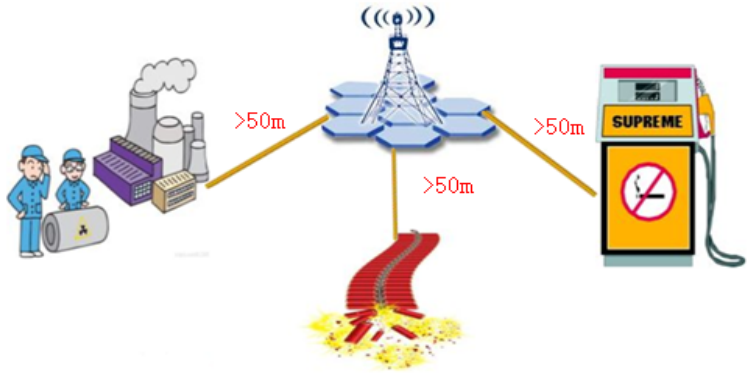
2.3 Construction Safety

1. The installation personnel must master the basic safe operation knowledge, through the training, and having the corresponding qualifications.
2. Before installation, the installation personnel must be prepared with safety protection, such as safety helmet, safety belt, reflective clothing, gloves, and safety shoes, etc.
3. Before installation, the installation personnel must cross-check with each other to ensure that the above preparations have been done.

2.4 Installation Environment

2.4.1 Location Requirements

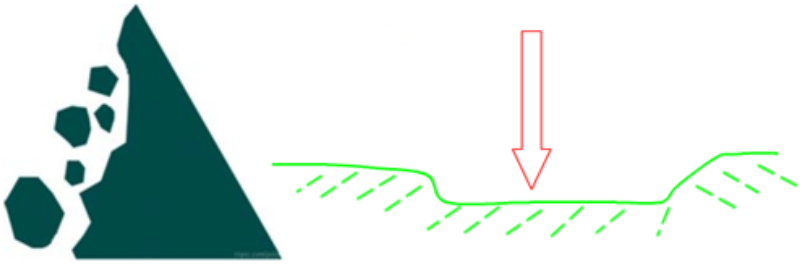
1. Avoid locations of warehouses and gas stations with flammable and explosive, and locations that fire and explosion are easy to happen during production. Do not install eNBs near dangerous industries and enterprises. Stay away from high voltage lines and railroads.



2. Under the premise of not affecting the layout of the eNB, the existing telecommunications building, post and telecommunication office or microwave station should be chosen as the site as far as possible. The existing machine room, power supply and tower facilities should be used sufficiently.

3. Avoid installing near high-power wireless transmitter stations, such as radar stations, television stations, etc. If the eNB must be installed in such locations, you should check whether there is mutual interference, and take measures to prevent it.

4. Avoid installing on mountains. The mountain interference range is large, therefore the frequency reuse will be affected. Install eNB on high mountains in rural areas is often not good for the coverage of towns and villages in small basins.



5. Avoid installing in the forest. If the eNB must be installed in such locations, the

height of the eNB must be higher than the treetop.

6. It is strictly prohibited to install the eNB in the mining area and places where is easy to be submerged by flood and landslide.
7. In urban areas, for the macro eNB, the site should be selected that is higher than the average height of buildings but lower than the highest building. For the micro eNB, the site should be selected that is lower than the average height of buildings and the surrounding buildings are well shielded.
8. In urban areas, the eNB should avoid obstructions from tall buildings in front of the antenna, as well as reflection interference with co-frequency eNBs behind it.
9. Avoid selecting sites where new buildings may affect coverage or there are co-frequency interferences.
10. As far as possible, the sites of eNBs from the two communication network systems should be co-located or in close proximity.

2.4.2 Environmental Requirements

Table 2-2 provides typical environmental specifications for this eNB.

Table 2-2 Environmental Requirements

Item	Range	Typical value
Temperature	-40°C to 55°C	25°C
Relative humidity (no condensation)	0% to 100%	5% to 95%
Safety voltage	-57VDC to -42VDC	-48VDC

2.5 Lightening & Grounding Protection

You must protect the eNB and antenna against lightning. Following are guidelines concerning grounding.

- The yellow-green ground wire must be at least 10mm^2 in diameter.
- In principle, always place the grounding as near as possible to the equipment.

- Connect to a reliable outdoor grounding point (earth) using one ground screw.
- The connection of the grounding points and ground bar need to be tight and reliable. Rustproofing the terminals, e.g., with anti-oxidantion coating or grease, is required.

2.6 Weatherproofing

To protect the connection points from weather and climate, clean each connection point before installing cold shrink tubes, per the following (Figure 2-1).

1. Insert the cable into the cold shrink tube.
2. Tighten the connector.
3. Push the cold shrink tube to the top joint, then pull out the strip.
4. Ensure the cold shrink tube is tightly fitted with the connection.

Figure 2-1 Weatherproofing

CAUTION: Ensure the cold shrink tube remains intact and is not cut for use.

3. Installation

3.1 Unpacking

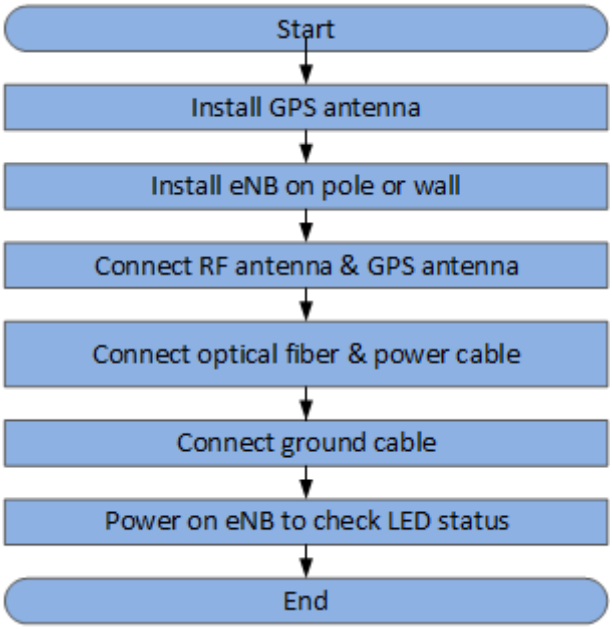
Before opening the box, make sure the package is in good condition, undamaged and not wet. During the unpacking, avoid potential damaging impacts from hits or excessive force.

Once unpacked, check whether the quantity is consistent with the packing list.

3.2 Installation Procedure

Figure 3-1 provides an overview of the installation process.

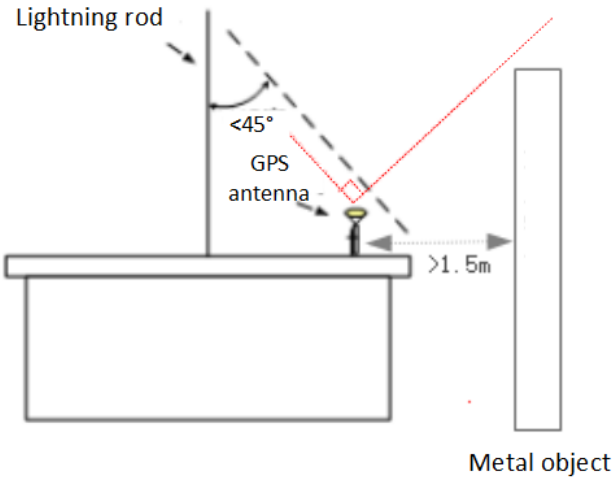
Figure 3-1 Installation Process



3.3 Install GPS Antenna

Read the following GPS antenna installation requirements before installing it on the eNB, as shown in Figure 3-2.

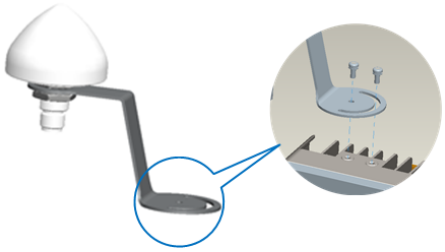
Figure 3-2 GPS Installation Requirements



- No major blocking from buildings in the vicinity. Keep the rooftop buildings a distance away from the GPS. Make sure the space atop within 90 degrees (at least 45 degrees) is not blocked by any buildings.
- Avoid installing the GPS in the vicinity of any other transmitting and receiving devices, such as under the microwave antenna or high voltage cable. Avoid interference from other transmitting antennas to the GPS antennas. Avoid the direction of radiation from other transmitting antennas to the GPS antenna.
- The GPS antenna should be installed within 45 degrees to the lightning rod.
- When two or more GPS antennas are installed, it is recommended to keep the spacing of more than 2 meters and install multiple GPS antennas in different locations to prevent simultaneous interference.
- GPS antenna feeders cannot be grounded together with ground conductors of interfering equipment such as air conditioners, motors, and pump motors, etc. to prevent external interference from being introduced into the antenna system.

The only installation step is to fix the GPS mounting bracket on the eNB with the M4*14 screws (Figure 3-3).

Figure 3-3 GPS Antenna Installation

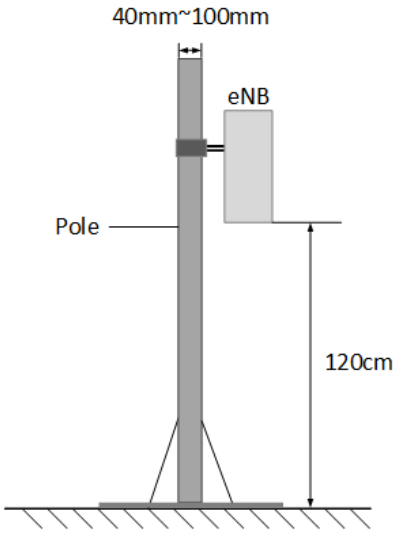


NOTE: The eNB may adopt different models of GPS antenna, so the GPS antenna in actual use may differ from the one shown in the figure above. However, the installation steps for securing it on the eNB remain the same.

3.4 Pole Mounting

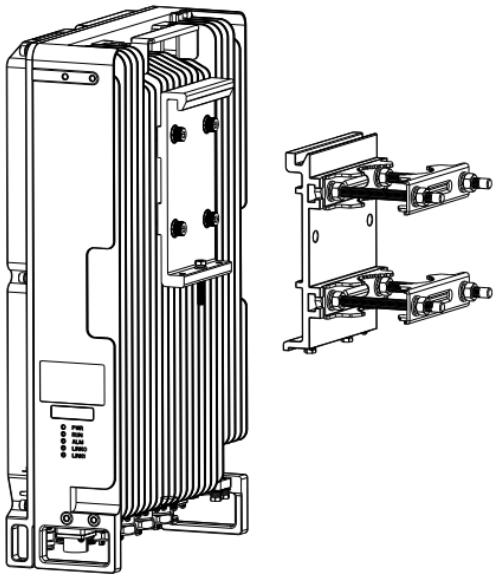
Check to ensure the diameter of the pole is in the range of 1.6 inches to 3.9 inches (40mm to 100mm). The position of the eNB on the pole should be at least 47 inches (120cm) in height, as shown in Figure 3-4.

Figure 3-4 Installation Height



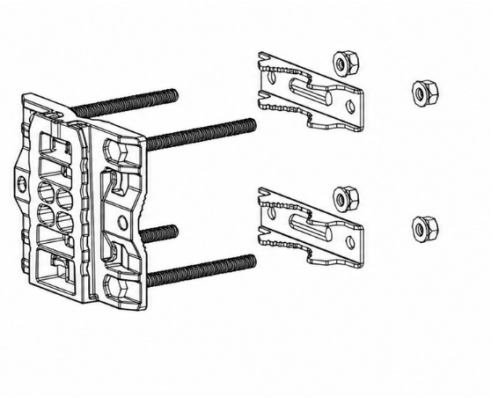
The brackets have been pre-assembled in manufacturing before packing. It includes two parts, one is pre-assembled on the back of the device. The other is for pole mounting or wall mounting, as shown in Figure 3-5.

Figure 3-5 Pre-assembled Device

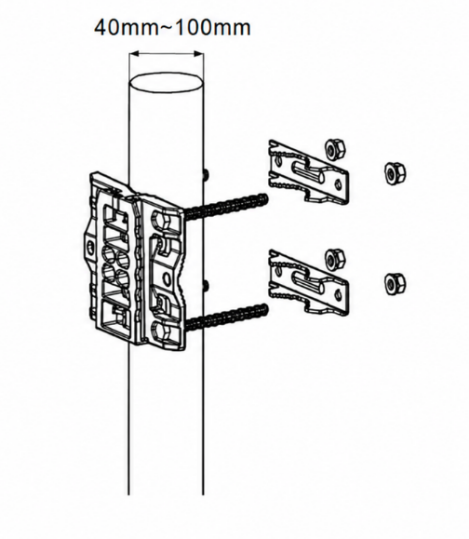


Following will introduce how to fix the pre-assembled eNB on a pole.

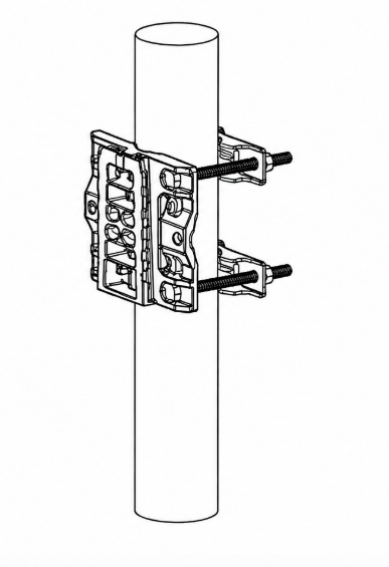
1. Take apart two clamps from the assembled bracket.



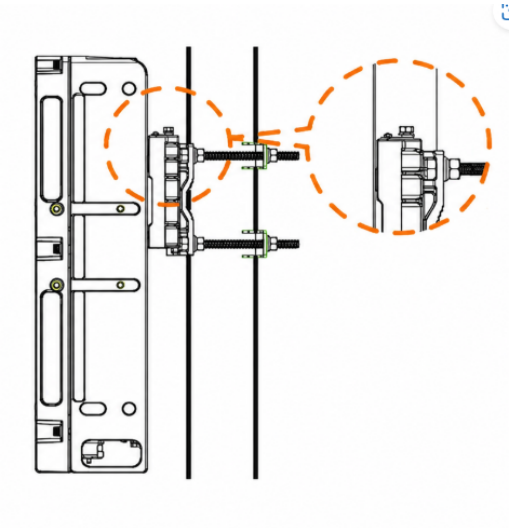
2. Put the bracket against the pole and assemble two clamps back, note that the sequence of flat washers, spring washers and nuts keep the same with original.



3. Fasten the pole bracket to ensure the bracket is firmly fixed on the pole.



4. Hang the eNB (with bracket) on the pole bracket. Ensure the screw on the bottom of the bracket clip into the groove on the pole bracket and fasten it. Next, plug the screw on the pole bracket into the hole on the joint and fasten it.

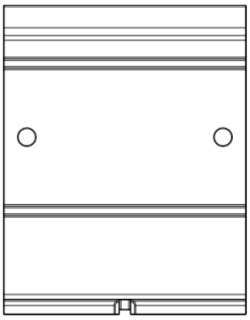


5. The installation is complete, then proceed to “3.6 Connect Cable”.

3.5 Wall Mounting

Take apart assembly bracket first, only remains the wall bracket, as shown in Figure 3-6.

Figure 3-6 Wall Bracket

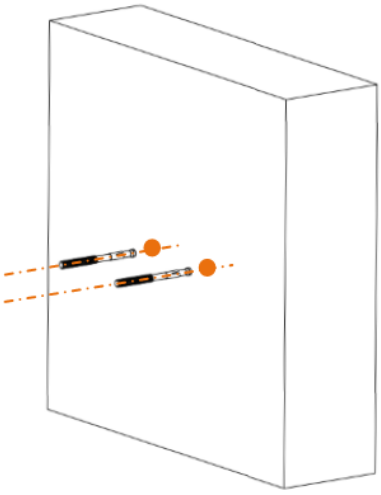


Following will introduce how to fix the pre-assembled eNB on a wall.

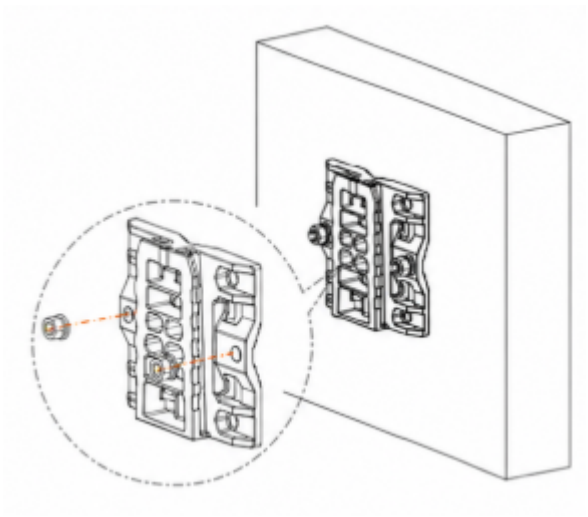
1. Put the wall bracket against the wall and mark two drilling locations with a marker pen.

Caution that the groove of bracket is at the bottom.

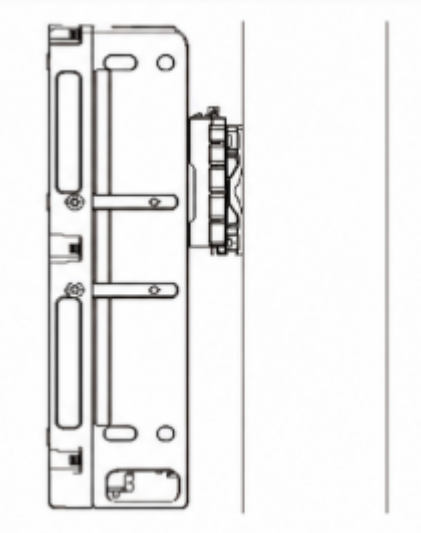
2. Drill two holes at the marked locations and install expansion bolts.



3. Hang the wall bracket on expansion bolts, fasten with flat washers and nuts.



4. Refer pole mount step to hang the eNB on the wall bracket.



5. The installation is complete, then proceed to “3.6 Connect Cable”.

3.6 Connect Cables

3.6.1 Cable Laying Requirements

General requirements:

- Minimum bending radius for repeated bends:7/8” feeder cable: ⩾ 250 mm; 4/5” feeder cable: ⩾ 380 mm.
- Bending radius of jumper cable: 1/4” > 35mm, 1/2” (super soft) > 50mm, 1/2” (ordinary) > 127mm.
- Bending radius of power cable and grounding cable: > tripled of the diameter of the cable.
- The minimum bend radius of the optical fiber is the 20 times the diameter of the optical fiber.
- Bind the cables according to the type of the cable, intertwining and crossing are forbidden.
- An identification label should be attached after the cable is laid.

Optical fiber laying requirements:

- Avoid circling and twisting during the laying.
- Avoid binding on a turn.

- Avoid pulling and weighing down the optical fiber.
- The redundant optical fiber must enwind the dedicated device.

Grounding laying requirements:

- The grounding cable must connect to the grounding point.
- The grounding cable must be separate from the signal cables, of enough distance to avoid signal interference.

3.6.2 Connect GPS Antenna Cable

The top of the GPS antenna should avoid the frontal position of the directional antenna as far as possible. In the case of obstruction, it is recommended to pull away and install the GPS antenna, that is, the GPS antenna be installed in an open and lightning protected position.

1. Insert the GPS jumper into a cold shrink tube.
2. Connect one end of the GPS jumper to the GPS antenna.
3. Push the cold shrink tube to the top joint, then pull out the strip.
4. Take another cold shrink tube, then pass through the GPS jumper.
5. Connect the other end of the GPS jumper to **GPS** interface on the eNB, which also needs weatherproof protection.

3.6.3 Connect RF Cables

CAUTION:

It is strictly prohibited to activate the cell and transmit RF if the antenna feed system is not connected properly. The wireless signal transmission power of the outdoor eNBs is large, if the eNB transmits without the antenna feed system, which may cause injury to the body of the construction personnel and the damage of RF power amplifier devices.

1. Take off dust caps of the **ANT0** to **ANT3** interfaces.

NOTE: The Nova452 can connect four antennas, the interface number is from **ANT0** to **ANT3**.

2. Insert RF cables into cold shrink tubes.
3. Connect RF cables to the **ANT0** to **ANT3** interfaces on the eNB, then tighten them with wrench.
4. Push the cold shrink tube to the top joint and pull out the strip.
5. Connect the other end of the RF cables to the external antenna.

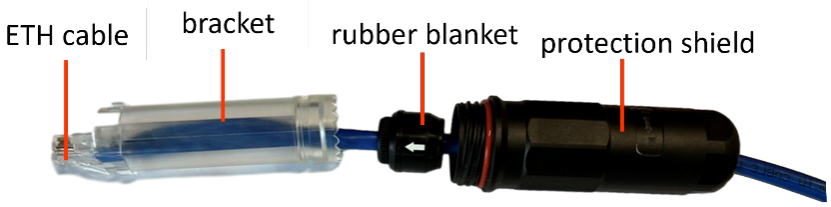
NOTE: The external antenna side interface at the other end of the feeder also needs waterproof treatment. Baicells does not provide waterproof materials for this part, so customers need to prepare and carry out waterproof operation by themselves.

3.6.4 Connect Ethernet Cable

Based on network planning, choosing to use the network port (ETH0) to connect to the core network for data backhaul.

1. The Ethernet cable uses weatherproof connector for protection. Pass the Ethernet cable through the components of the waterproof connector, the connection order is shown in Figure 3-7.

Figure 3-7 Connection Order for Ethernet Cable



2. Connect the other end of the network cable to the switch.

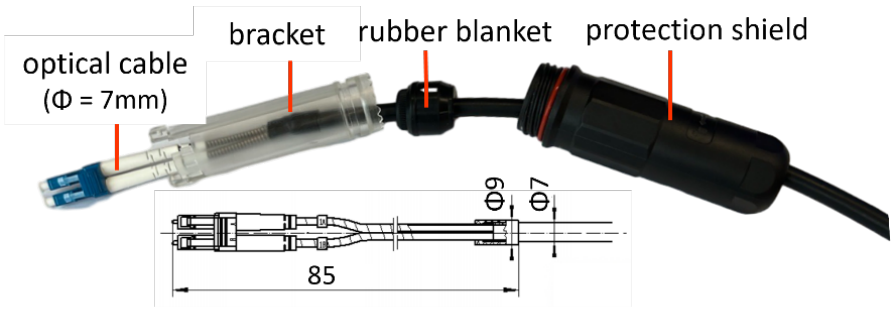
CAUTION: The connection sequence of optical fibers/network cables and power cables must be strictly the same as that of optical fibers and then power cables.

3.6.5 Connect Optical Cable

Based on network planning, choosing to use the optical port (OPT0) to connect to the core network for data backhaul.

1. The optical cable uses weatherproof connector for protection. Pass the optical cable through the components of the waterproof connector, the connection sequence is shown in Figure 3-8.

Figure 3-8 Connection Order for Optical Cable



The redundant optical cable should enwind neatly.

2. The other end connector optical fiber racks.

3.6.6 Connect Power Cable

The power cable must meet the following requirements.

- It is recommended to install an air switch in the distribution box for lightning protection and leakage protection, or a socket or plug with a fuse.
- The power cord needs to be protected by a hose sleeve or wiring tube.
- The distribution box should be grounding and have leakage protection.
- The length of power cord must be kept below 330 ft/100m.

Since the length of cable needed for power supply varies from site to site, the customer needs to make the power cable according to the actual measurements of the installation site. Strip .47in/12mm insulating layer with a wire stripper to reserve the conductor for connection.

The connection steps for the power cable are as follows.

1. Assemble the power plug on the power supply side.

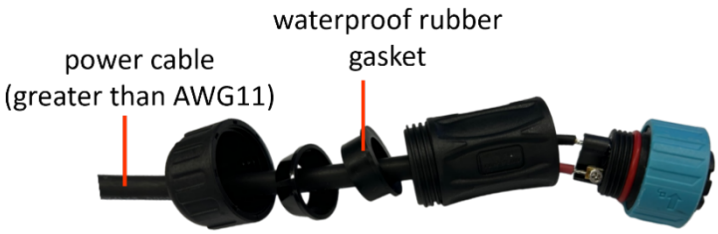
   The eNB adopts -48VDC power supply. The power plug should be self-prepared by the customer according to the local standards. Refer to the sign and instructions on the plug assemble the plug.

2. Assemble the power plug on the eNB side.

   a) The power cable uses weatherproof connector for protection. Pass the power cable through the components of the waterproof connector, the connection

sequence is shown in Figure 3-9..

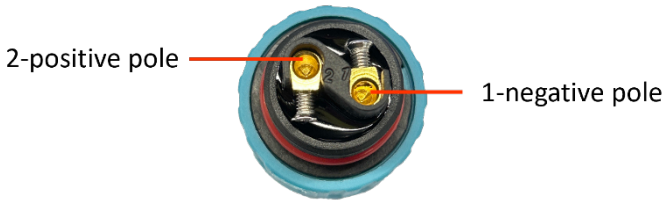
Figure 3-9 Connection Sequence for Power Cables



There are two types of waterproof rubber gasket. 14mm~16mm is suitable for AWG11 and above cable. When the power adapter is used, use 10mm~13mm waterproof rubber gasket, because the power adapter outlet cable is thinner.

b) Refer to Figure 3-10 to connect the positive wire and negative wire.

Figure 3-10 Power Terminal



3. Connect the power cable to the **PWR** interface in the wiring cavity.
4. The other end connects to a reliable DC power supply.

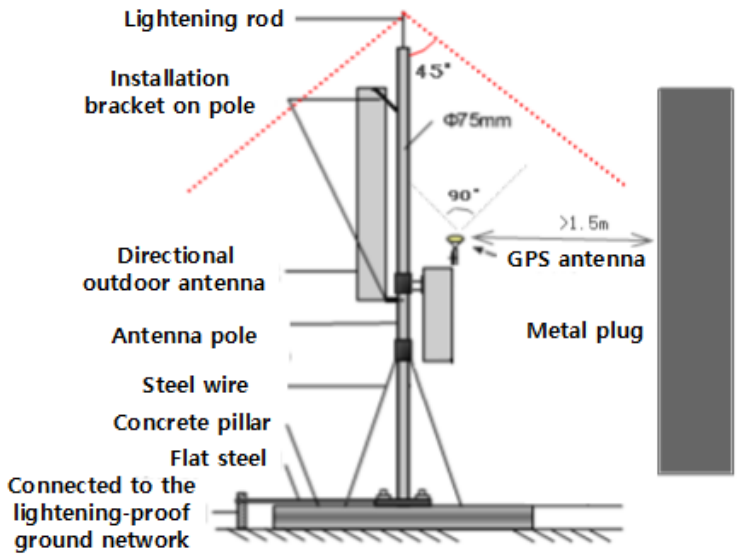
   If the power plug is outdoors, note that above requirements for power distribution box.

3.6.7 Connect Ground Cable

3.6.7.1 Pole Grounding

The purpose of the pole grounding is to protect the equipment in the station from the damage of lightning overvoltage as far as possible. However, the interfaces between the eNB and the outside world mainly include power system, grounding system, antenna feeder and lightning receiving device, and signal line. Therefore, the damage caused by lightning mainly comes from the voltage difference between the equipment in the eNB and one or more of the four interfaces. The pole grounding is shown in Figure 3-11.

Figure 3-11 Pole Grounding



1. The installation position of the grounding bar shall meet the design requirements. The holding pole and tower body must be connected to the lightning protection network or grounded with a separate lead.

2. The diameter of the grounding wire meets the design requirements. The copper nose must be used for grounding, and the grounding resistance is required to be less than 10 ohms. If the resistance of the public network communication equipment placed in other systems is less than 10 ohms, the grounding network of the system should be overlapped.

3. The grounding wire must be the whole wire material. When laying, it should be bound separately with other cables. All grounding wires should be fixed with wire code or binding tape with a fixed spacing of 0.3m. The appearance should be straight and beautiful.

4. The copper bar must be used for the grounding bar, and the specification of the grounding bar shall meet the design requirements. If there are no specific requirements in the design, 300mm × 40mm × 4mm and fixed with expansion bolts.

5. The grounding wire must be made of the whole cable material, the intermediate joint is strictly prohibited, and the excess length should be cut. The skin shall be complete, and the insulation resistance of the core wire to the ground (or metal isolation layer) shall meet the technical requirements of the cable.

6. The grounding wire shall be connected to the integrated grounding bar of the

building. If it is impossible to connect to the integrated grounding bar of the building, the appropriate grounding point can be selected according to the integrated grounding situation of the indoor building. The selection of grounding point must be higher than the grounding grid, and the feeder grounding shall be towards the downward direction of the feeder, never upward.

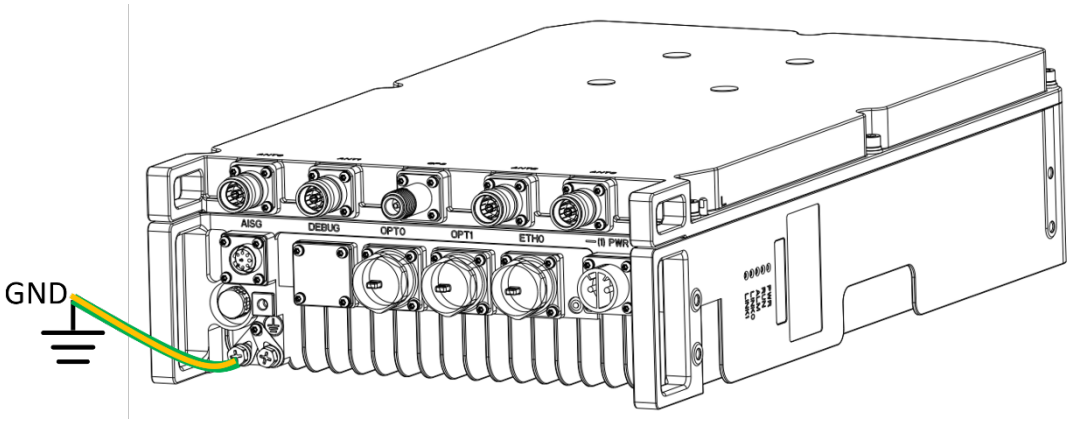
7. The grounding electrode of the self-built grounding grid for the outdoor antenna of the tunnel must meet the design requirements. The buried depth of the grounding electrode and the welding quality of the flat iron meet the specification requirements. In principle, the buried depth of the grounding electrode shall not be less than 0.7m. The non-self-built grounding network shall be connected to the grounding network of the owner.

8. The eNB grounding, power adapter grounding, distribution box grounding and feeder grounding must be connected to the grounding bar independently, and the grounding bar must have a path from the lead to the earth.

3.6.7.2 eNB Grounding

Prepare the grounding cable according to the actual measurements and requirements of the specific installation site. The Nova452 has two grounding screws located on the bottom of the unit (Figure 3-12). Follow the steps below the figure to connect the ground cable.

Figure 3-12 Grounding Screws



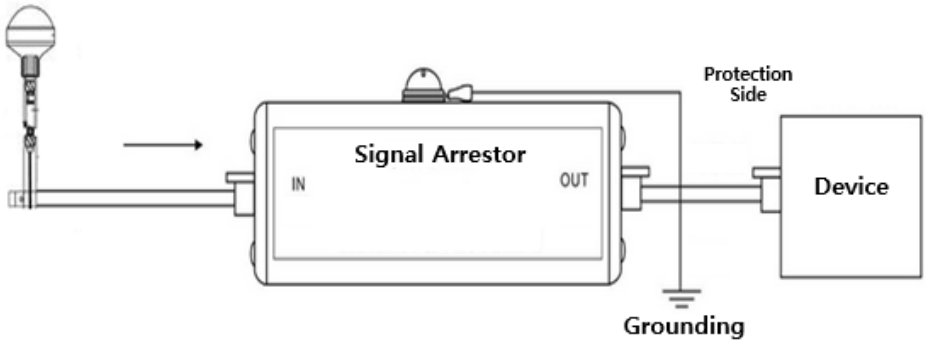
1. Unscrew one grounding screw, connect one end of the ground cable to the grounding screw, and fasten it again.

2. Repeat step 1 for the second grounding screw.
3. Once the eNB is installed at the outdoor location, the other end of the ground cable needs to connect to a good grounding point.

3.6.7.3 GPS Antenna Grounding

If the length of GPS antenna is more than 5 meters, it is recommended to extend the installation distance. It is suggested to carry out lightning protection of GPS antenna, add lightning protector, and connect the lightning protector to the grounding bar, as shown in Figure 3-13.

Figure 3-13 GPS Grounding



3.7 Maintenance Chamber Waterproofing

When all the installation has been completed, it is necessary to close the maintenance chamber of the equipment and fasten screws to play the role of waterproof at the same time.

1. Clamp the power cord to the wire position and seal the wire diameter 9 ± 1mm.
2. Put the pigtail / network cable on the wire, and seal the wire diameter 7 ± 1mm.

3.8 Power on to Check LED Status

Power on the eNB, and then wait a few minutes while the eNB boots up. Per the previous Table 1-2 in “1.3 Appearance”, check that the LED indicators are lighting as expected.

4. Attentions

4.1 FAQ

1. After the device is connected with the power line, the PWR of the device will not be displayed when it is powered on.

   1）Maybe the power line is not connected well, and the contact is poor.

   2）There is no power in the circuit.

   3）Reverse connection of DC wire.

   4）The adapter does not work.

   5）Poor contact of equipment power interface.

2. How to connect the antenna feeder

   1) ANT0 is the main channel and ANT1 is the secondary channel.

3. GPS has been out of sync

   1) The antenna is not installed in an open place.

   2) The antenna is blocked, which affects the search.

   3) There are strong interference sources around the installation location, such as large transformer station and high-power motor fan.

   4) Installed under the front cover of wireless antenna, strong signal interference and so on.

   5) GPS satellite search is slow and takes a long time. The number of satellites and signal strength can be observed in the maintenance page.

4. How to choose the position of holding pole in the roof

   1) Not near the edge.

   2) The position of non-bearing beam cannot be selected.

   3) Do not choose the side close to the barrier, you need to choose the most open position.

5. The coverage of eNB signal is not ideal after opening

    1) Check if the power is full in the base station configuration.

    2) Check whether the equipment has standing wave alarm. If there is any alarm, please handle it in time.

    3) Check whether the RF frequency band of the equipment is consistent with that of the antenna.

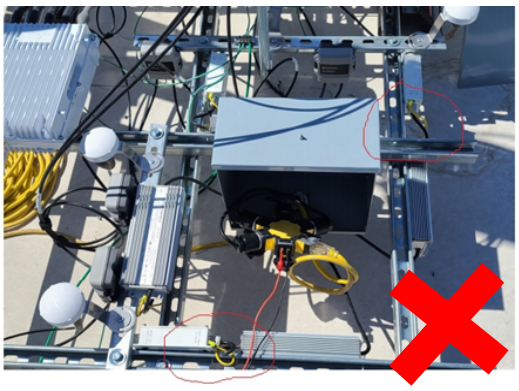
    4) Check whether the dip angle planning of the base station is reasonable.

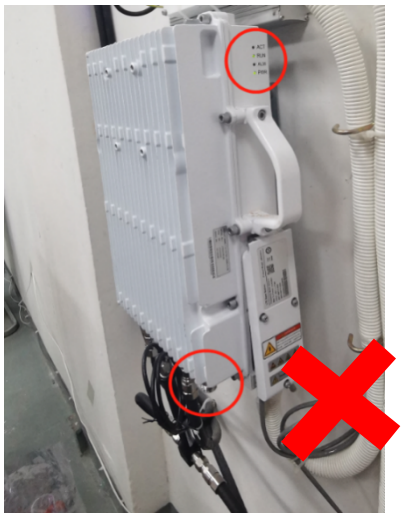
    5) Whether there is blocking in antenna coverage direct vision.

6. If a RET cable is used, no protection is required at the connector, and no cold shrink tube is needed.

4.2 Common Installation Errors

	
GPS antenna blocked	Disordered wiring

	
The holding pole lightning rod is not led to the ground bar	The GPS antenna is mounted on the front of the RF antenna
	
Without the lightning rod	Disordered wiring of distribution box
	

Power line and signal cable are crossed	Multiply the grounding point
	
The RF feed system does not connect, the cell is activated and RF transmits signal	

Appendix A **Terminology & Acronym**

Acronym	Full Name
ANR	Automatic Neighbor Relations
ARQ	Automatic Repeat Request
CA	Carrier Aggregation
CC	Component Carriers
CSFB	Circuit Switched Fallback
DC	Dual Carrier
EPC	Evolved Packet Core network
GPS	Global Positioning System
HARQ	Hybrid Automatic Repeat Request
IPsec	Internet Protocol Security
MIMO	Multi Input Multi Output
MME	Mobility Management Entity
MOCN	Multi-Operator Core Network
NLOS	Non-Line-of-Sight
OPEX	Operating Expense
PAP	Password Authentication Protocol

Acronym	Full Name
PCI	Physical Cell Identifier
PLMN	Public Land Mobile Network
QAM	Quadrature Amplitude Modulation
QCI	QoS Class Identifiers
QoS	Quality of Service
QPSK	Quadrature Phase Shift Keying
RSRP	Reference Signal Receiving Power
SSH	Secure Shell
SON	Self-Organized Network
TAC	Tracking Area Code