Nova436Q

Outdoor 4x1W Two-Carrier
TDD eNodeB

Installation Guide

QRTB 2.12

February 2023
Version 1.18

About This Document

This document is intended for personnel installing the Baicells Nova436Q Outdoor 4x1W Two-Carrier Time Division Duplexing (TDD) eNodeB (eNB) product. The product overview is followed by the procedures for properly installing, performing basic configuration, and verifying that the eNB is operational. Please be advised that only personnel with the appropriate electrical skills and experience should install this device. This document is based on software version BaiBS_QRTB_2.12. The Nova436Q model numbers are mBS31001B and mBS31004.

Terms used in this document or related to Long-Term Evolution (LTE) are listed in alphabetical order and described in *Acronyms and Abbreviations*, which can be found at Baicells.com > Resources > *Documents*.

New in This Release

The following updates have been provided in this release:

- Added LGW settings options in *section 3.7.4.2*
- Added Management Server feature enhancement in *section 3.7.5*
- Added new Quick Setting screen in *section 3.7.6*

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Disposal of Electronic and Electrical Waste

Pursuant to the WEEE EU Directive, electronic and electrical waste must not be disposed of with unsorted waste. Please contact your local recycling authority for disposal of this product.

Revision Record

Date	Version	Description	SMEs/Contributors	Author/Editor
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17-Dec-2019	1.10	SME comments Updated for QRTB 2.0.4 Updated antenna port info	Rick Harnish, Jesse Raasch, Jie Lewis	Sharon Redfoot
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Resources

- **Documentation** - Baicells product datasheets, this document, and other technical manuals can be found at Baicells.com > Resources > *Documents*.
- **Support** - Open a support ticket, process an RMA, and the Support Forum are at Baicells.com > *Support*.

Contact Us

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Safety Information

For the safety of installation personnel and for the protection of the equipment from damage, please read all safety warnings. If you have any questions concerning the warnings, before installing or powering on the base station, contact the *Baicells support team*.

WARNING: IMPORTANT SAFETY INSTRUCTIONS

This warning symbol means danger. You are in a situation that could cause bodily injury. Before you work on any equipment, be aware of the hazards involved with electrical circuitry, and be familiar with standard practices for preventing accidents.

WARNING: Read the installation instructions before you connect the system to its power source.

WARNING: Equipment installation must comply with local and national electrical codes.

WARNING: This product relies on the existing building or structure for short-circuit (overcurrent) protection. Ensure that the protective device is rated no greater than 20A.

WARNING: Do not operate this wireless network device near unshielded blasting caps or in an explosive environment unless the device has been modified and qualified for such use.

WARNING: To comply with the United States Federal Communications Commission (FCC) radio frequency (RF) exposure limits, antennas should be located at a minimum of 20 centimeters (7.9 inches) or more from the body of all persons.

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1 Overview

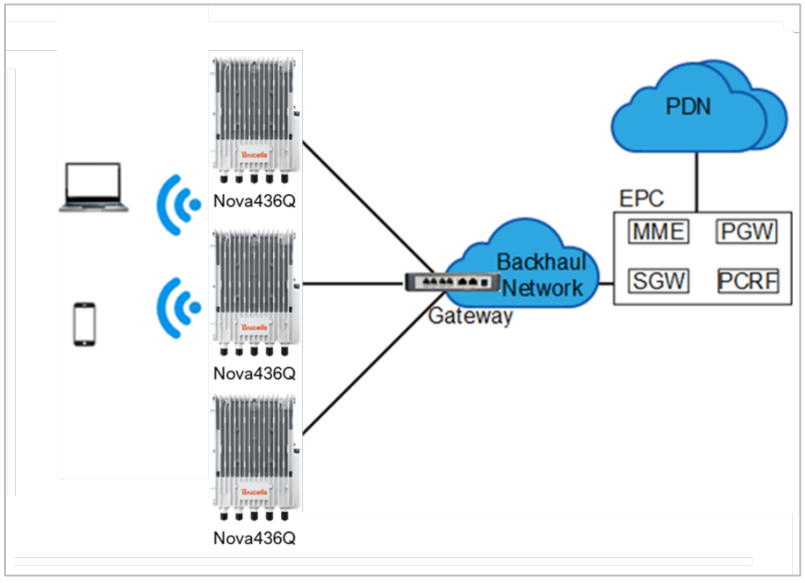
1.1 Introduction

The Baicells Nova436Q (Figure 1-1) is an advanced outdoor 4x1W two-carrier eNB that is compliant with Third-Generation Partnership Program (3GPP) on LTE TDD technology. This versatile eNodeB can be configured as a 2x1W single carrier eNB, two 2x1Ws single carrier eNBs (Dual Carrier (DC)/Split Sector), or a 4x1W Carrier Aggregation (CA) eNB. The Nova436Q supports broadband data access, providing various data service transformation and transmission capabilities to enable outdoor wireless coverage. This eNodeB can be used to improve capacity and throughput while eliminating existing dead zones.

Figure 1-1: Nova436Q eNB

The network structure of the Nova436Q is shown in Figure 1-2.

Figure 1-2: Network Structure



As a two-carrier eNB, the Nova436Q hardware unit contains two separate eNBs inside one shell. Having two carriers provides versatile options in how you operate the eNB. The available operating modes are described in the next section, *Features*.

The 436Q's primary cell (Pcell) is referred to as Cell 1. The secondary cell (Scell) is referred to as Cell 2. The 436Q has four antenna ports and supports either one 4-port or two 2-port Radio Frequency (RF) antenna installations. Each eNB comes pre-configured to simplify the installation. Baicells provides operators with local and Web-based Graphical User Interface (GUI) software applications to configure and manage individual eNBs and Customer Premise Equipment (CPE).

Additionally, Baicells offers a centralized Software-as-a-Service (SaaS) solution called CloudCore. CloudCore includes all of the key LTE Evolved Packet Core (EPC) network functions, an Operations Management Console (OMC) for managing multiple sites across the network, and a Business and Operation Support System (BOSS) for subscriber management.

In this document you will find a general description, guidelines, and procedures for installing, entering basic configuration information, and verifying the operational status of the Nova436Q eNB. To view a video demonstration of the installation process for the Nova436Q, click *here*.

1.2 Features

The two-carrier Nova436Q eNB can operate in one of several modes:

- Single Carrier (SC)
- CA mode (based on software license)
- DC/split mode (based on software license)
- HaloB mode (embedded in the base software)
- Citizens Broadband Radio System (CBRS) Spectrum Access System (SAS)

SC describes a scenario where the operator wishes to use only one of the two available cells in the eNB. This may be necessary for operators who have limited licensed spectrum or who are planning to use the second carrier later as their network grows. In SC mode, only the primary cell (Pcell), *aka* Cell 1, is used.

CA provides the ability to aggregate channels from across the full CBRS range, even channels that are not adjacent. Using CA essentially doubles the downlink capacity when all users have CAT6/7 or later CPE.

DC (split sector) mode enables the operator to run the 436Q as two independent carriers for split sector coverage.

HaloB allows the eNB to function with embedded Mobility Management Entity (MME) capabilities on board so that the eNB operates independently from the usual cloud connection. HaloB is standard in the Nova436Q as part of the basic software. This enables the user to migrate core network functions to the eNB.

CBRS SAS is a multi-vendor SAS database where CBRS spectrum use is managed dynamically across operators. The CBRS band covers 3.55–3.70 GHz. Operators must sign up with a SAS provider, which handles the dynamic frequency assignment and release process. Baicells provides FCC Part 96 certified eNBs, including the Nova436Q, and CPEs that operate within the Part 96 rules for CBRS. The Baicells eNBs and CPEs use a Domain Proxy (DP) to connect to the SAS server by leveraging the existing connection with the OMC.

NOTE 1: Legacy Gen 1 CPEs do not support SAS.

NOTE 2: This installation guide covers only basic configuration of a single cell for the purpose of verifying that the eNB unit is operational during the process of installation. More detailed configuration guides are available on the Baicells website:

Baicells.com > Resources > *Documents*:

- CloudCore Configuration & Network Administration Guide (OMC/BOSS)
- CAT4 CPE Configuration Guide
- CAT6/CAT15 CPE Configuration Guide
- QRTB eNodeB Configuration Guide
- Carrier Aggregation & Dual Carrier (Split Mode) Configuration Guide
- HaloB Solution User Guide
- SAS Deployment Guide

In addition to the Nova436Q eNB's two carriers and multiple operating modes, the following is a list of other key features. The Nova436Q datasheet providing technical specifications is available on the *Baicells website*.

- Supports standard LTE TDD band 42 (3400 MHz–3600 MHz) and band 48 (3550 MHz–3700 MHz)
- Complies with 3GPP Release 15 standards
- Supports 5/10/15/20 MHz bandwidth per carrier
- Provides excellent Non-Line-of-Sight (NLOS) coverage
- Peak rate is a configurable parameter using special Subframe Assignment (SA):
    - 2x20 MHz, per carrier:
        - SA1: DL 105 Mbps, UL 28 Mbps
        - SA2: DL 145 Mbps, UL 14 Mbps
        - SA6: DL 85 Mbps, UL 35 Mbps
    - 2x10 MHz, per carrier:
        - SA1: DL 51 Mbps, UL 14 Mbps
        - SA2: DL 70 Mbps, UL 7 Mbps
        - SA6: DL 42 Mbps, UL 17 Mbps
- Supports 96 concurrent users per carrier [x2 carriers (96+96) if operating in DC mode]
- Supports TR-069 network management interface
- Can be accessed via GUI-based local and remote Web management
- Connects to any IP-based backhaul, including public transmission

- Is lightweight and uses low power consumption to reduce OPEX
- Acts as a plug-and-play device with Self-Organizing Network (SON) capabilities
- Can be used for Internet of Things (IoT) with all mainstream EPC vendors
- Ensures secure protection against illegal intrusion
- Supports one 4-port antenna or two 2-port antennas
- Integrated small cell form-factor for quick and easy installation
- Configured out-of-the-box to work with Baicells CloudCore
- Embedded HaloB ("lite" EPC) solution
- Supports CBRS with dual carrier
- Supports Transparent Bridge Mode

2 Installation Preparation

2.1 Materials

Check the Nova436Q package to ensure it contains the primary components in the packout (Figure 2-1). In addition to industry-standard tools, you need the materials described in Table 2-1 and the tools shown in Table 2-2.

Figure 2-1: Packout

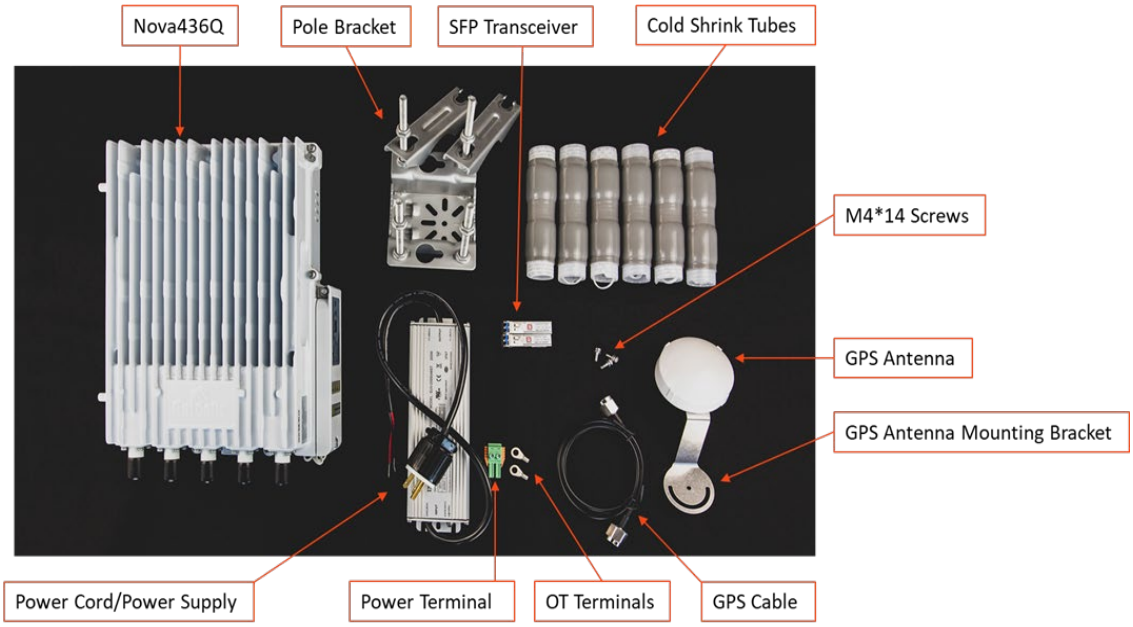


Table 2-1: Materials

Item	Description
Power cable	< 16 AWG, e.g., 14 AWG, shorter than 330 feet (100 meters)
Power plug	The plug that connects the power cable to the electricity supply
RF antenna cable	50-ohm feeder
RF antenna	Omni or directional
Optical fiber	Single-mode optical fiber
Ethernet cable	Outdoor CAT6, shorter than 330 feet (100 meters)
Ground cable	5 AWG (16 mm²) diameter yellow-green wire

Table 2-2: Installation Tools

			
Level bar	Marker pen	Knife	Pliers
			
Wrench	Percussion drill and drill heads	Hammer	Phillips-head screwdriver
			
Cable vice (crimper)	Tape measure	0.05 cm (5 mm) L-shape Allen wrench	T7 screwdriver head

2.2 LEDs and Interfaces

Figure 2-2, Table 2-3, and Table 2-4 explain the eNB's LED status indicators and interfaces.

Figure 2-2: LEDs and Interfaces

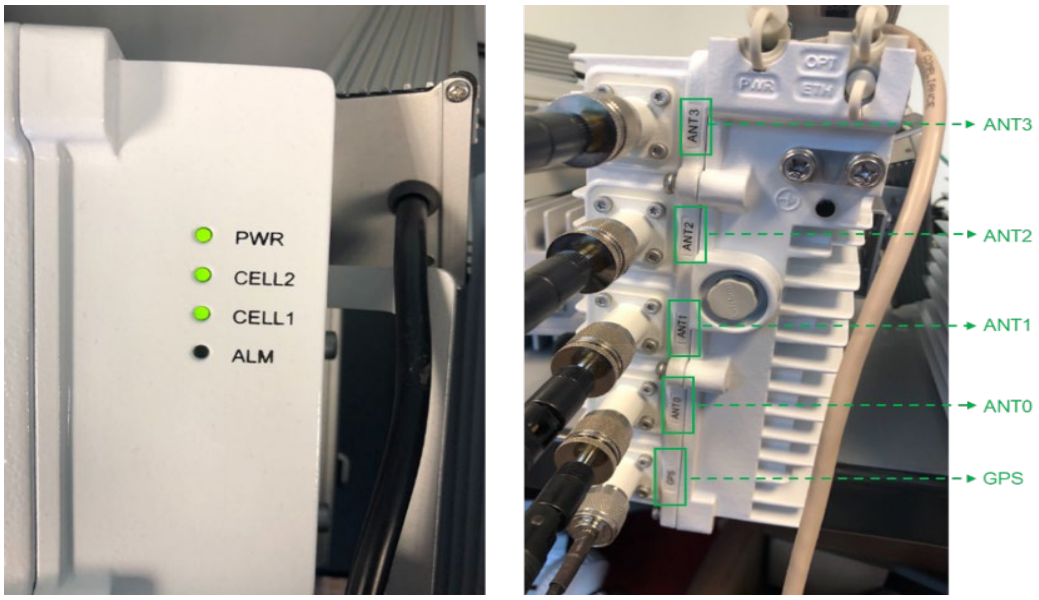


Table 2-3: LEDs

LED	Color	Status	Description
PWR	Green	Steady on	Power is on
		OFF	No power supply
CELL2	Green	Fast flash: 0.125 s on, 0.125 s off	CELL 2 inactive
		Slow flash: 1 s on, 1 s off	CELL 2 activated
CELL1	Green	Fast flash: 0.125 s on, 0.125 s off	CELL 1 inactive
		Slow flash: 1 s on, 1 s off	CELL 1 activated
ALM	Red	Steady on	Hardware (e.g., VSWR) alarm
		OFF	No alarm

Table 2-4: Interfaces

Interface	Description
PWR	Power supply: +48 V (+42 V to +60 V) DC
OPT	Optical backhaul interface to connect to the external transmission network
ETH	RJ-45 interface, used for debugging or data backhaul
GPS	Port for the optional external Global Positioning System (GPS) antenna, N-female connector
ANT	Port for external RF antenna, N-female connector

2.3 Location and Environment

The Nova436Q can be installed on a pole or a wall. For the best signal coverage, place the eNB in an unobstructed location. In addition to network planning, when determining where to place the eNB consider factors such as climate, hydrology, geology, the possibility of earthquakes, reliable electric power, and transportation access. Avoid locating the eNB in areas with extreme temperatures, harmful gases, unstable voltages, volatile vibrations, loud noises, flames, explosives, or electromagnetic interference (e.g., large radar stations, transformer substations). Avoid areas prone to impounded water, soaking, leakage, or condensation. Environmental specifications are shown in Table 2-5.

Table 2-5: Environmental Specifications

Item	Description
Operating Temperature	-40°F to 131°F / -40°C to 55°C
Storage Temperature	-49°F to 158°F / -45°C to 70°C
Relative Humidity	5 % to 95 % RH
Atmospheric Pressure	70 kPa to 106 kPa
Safety voltage	42 V to 60 V

2.4 Grounding and Lightning Protection

You must protect the eNB, antenna, and GPS against lightning. All Nova eNBs have a floating ground on the power system. Following are guidelines concerning grounding.

- The yellow-green ground wire must be at least 5 AWG (16 mm^2) diameter.
- 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 needs to be tight and reliable. Rustproofing the terminals, e.g., with antioxidant coating or grease, is required.

2.5 Weatherproofing

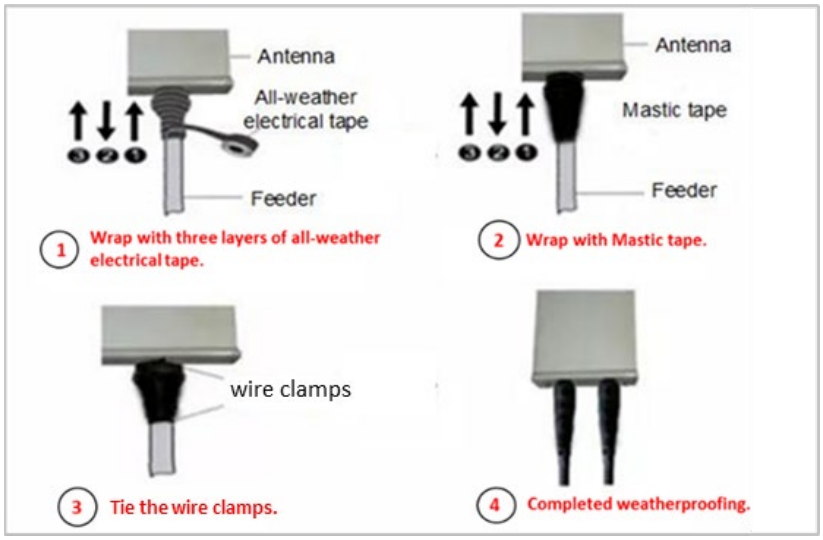
To protect the connection points from weather and climate, clean each connection point before installing cold shrink tubes, per the following (Figure 2-3).

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

Figure 2-3: Weatherproofing

For GPS antenna weatherproofing, use all-weather electrical tape and mastic tape, per the following figure (Figure 2-4).

Figure 2-4: Weatherproofing GPS Antenna



NOTE: Make sure that the wrapping direction of the last layer is from the bottom up. The last layer should be tight enough to keep it from cracking.

2.6 CloudCore Account

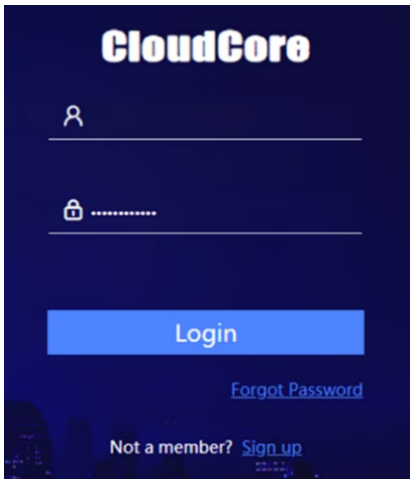
The Baicells CloudCore includes the EPC managed by Baicells, and two operator applications, OMC to manage network elements and BOSS to manage subscribers. If you have not already set up a Baicells CloudCore account, follow the steps below.

Step 1: Open a web browser, and enter the CloudCore address (Figure 2-5):
https://cloudcore.cloudapp.net/cloudcore/

Step 2: Click on the *Sign up* link.

Step 3: Complete the mandatory fields, and again click on *Sign up*.

Figure 2-5: CloudCore Login Page



You will receive an email from Baicells. Click on the CloudCore link to go to the login page.

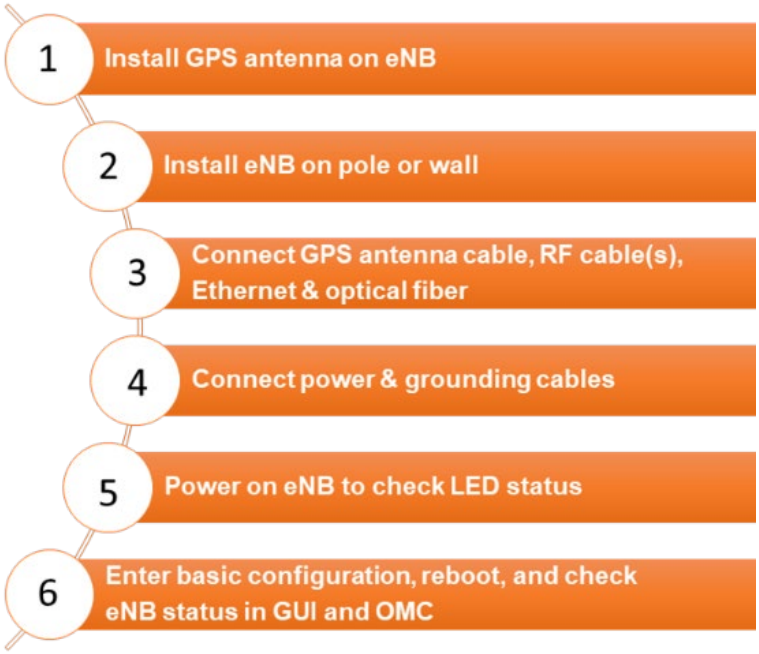
Enter your login user name (email address) and password to authenticate.

3 Installation

3.1 Process Overview

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

Figure 3-1: Installation Process Overview



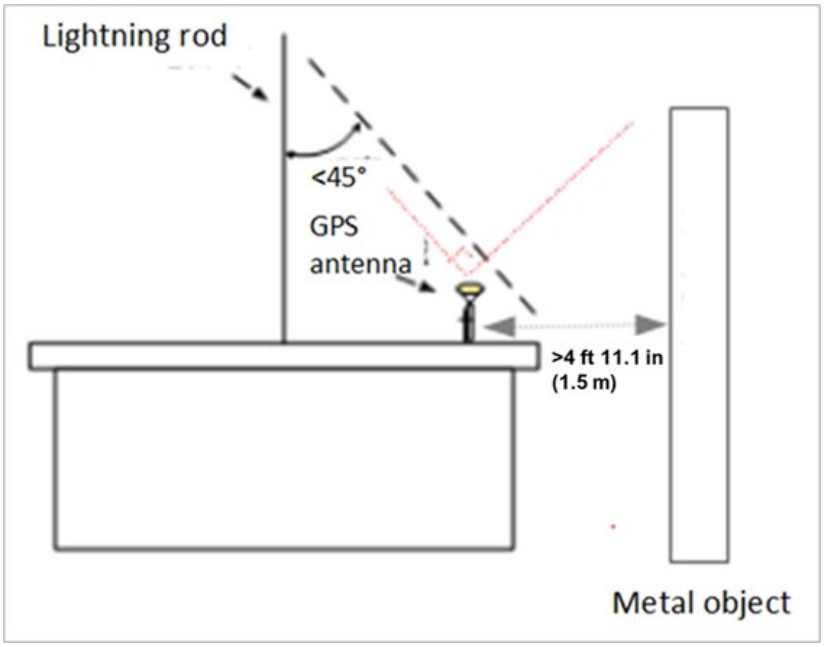
3.2 Install GPS Antenna

WARNING: Ensure the antenna is connected before powering up the eNB. The wireless signal transmission power can cause bodily injury, and damage to the eNB and RF power amplifier devices.

Read the following GPS antenna installation requirements before installing it on the eNB and refer to Figure 3-2.

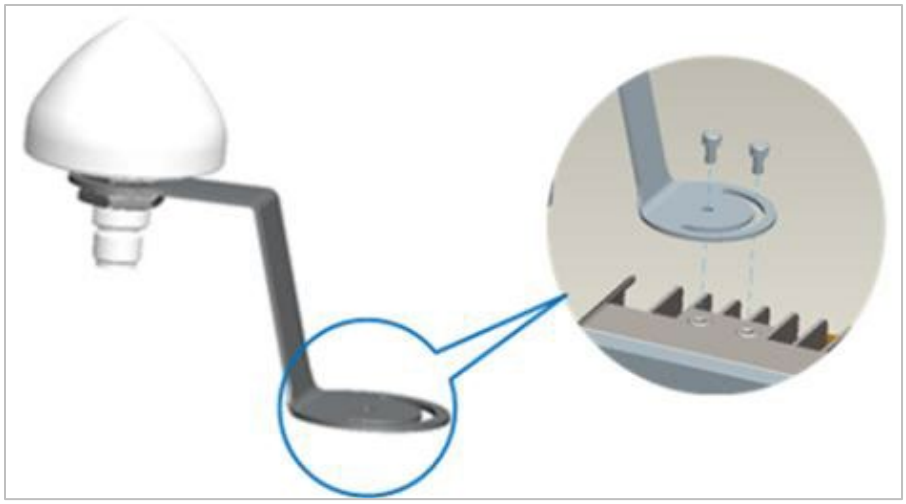
- No major blocking from buildings in the vicinity. Make sure the space atop is at least 45 degrees unblocked by any buildings.
- The GPS antenna should be installed within 45 degrees to the lightning rod.
- Do not install the GPS antenna near other transmitting and receiving equipment, to avoid interference. Do not install it under a microwave antenna or high voltage cable. Avoid the direction of radiation from other transmitting antennas to the GPS antenna.
- When two or more GPS antennas are installed, it is recommended to keep the spacing of more than 6.74 feet (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.

Figure 3-2: GPS Installation Requirements



The GPS antenna system is assembled in manufacturing before packing. 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



3.3 Install eNB on Pole or Wall

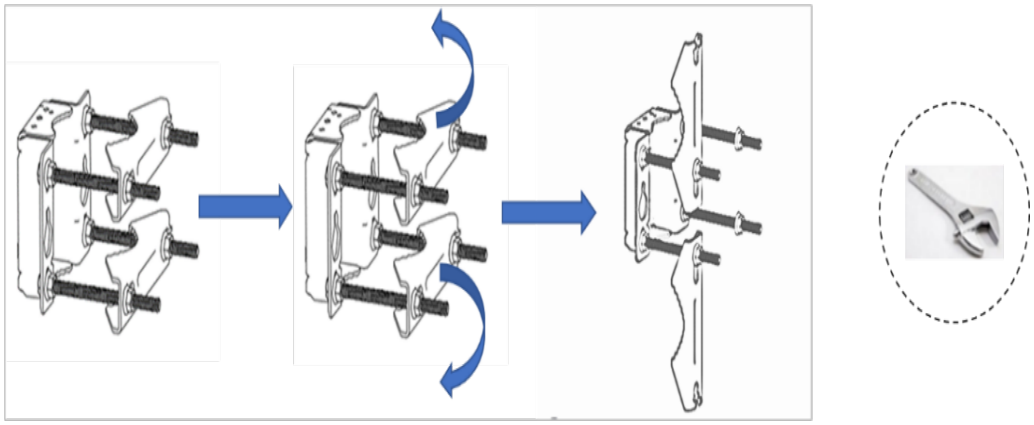
3.3.1 Install on Pole

The eNB mounting bracket is assembled in manufacturing before packing. The only action required by the installer is to attach the assembly to the pole.

Check to ensure the diameter of the pole is in the range of 1.6–2.8 in (40–70 mm). The position of the eNB on the pole should be at least 47 in (120 cm) in height. Follow the steps below to install the eNB on a pole.

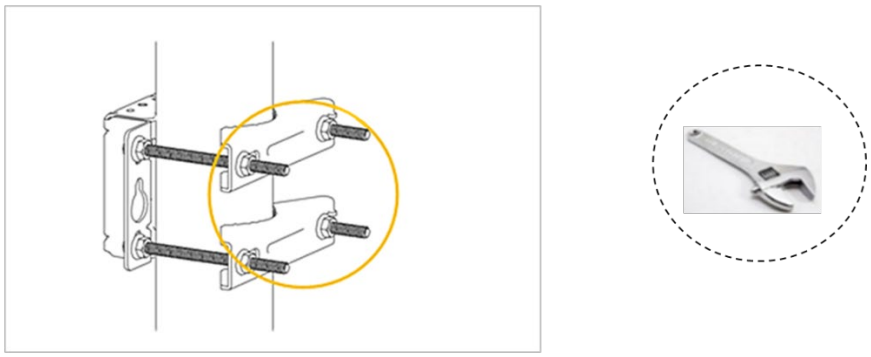
1. Unscrew the four hex nuts of the assembled pole bracket. Slide the two omega clamps to the left, and then turn them up or down (Figure 3-4).

   Figure 3-4: Omega Clamps



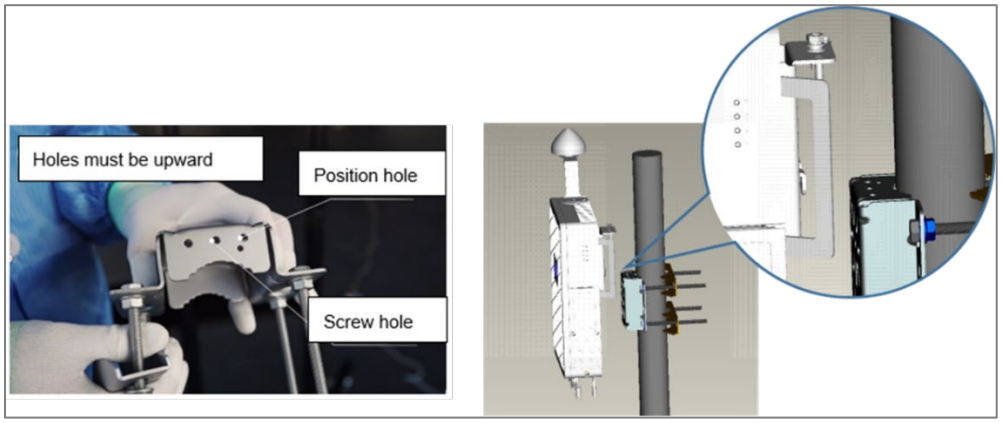
2. Attach the bracket to the pole, considering the height requirements described above. Fit the threaded rod of the bracket to the pole, and then turn the two clamps to the proper position as shown in Figure 3-5. Fasten the four hex nuts with a wrench.

Figure 3-5: Attach Bracket to Pole



3. Using the two pins on the bracket on the back of the eNB, attach the eNB to the mounting bracket on the pole. Push the eNB until the hook is firmly attached to the mounting bracket (Figure 3-6).

Figure 3-6: Attach eNB to Bracket



4. Tighten the bolt on the top of the bracket using a Phillips-head screwdriver to complete the installation (Figure 3-7).

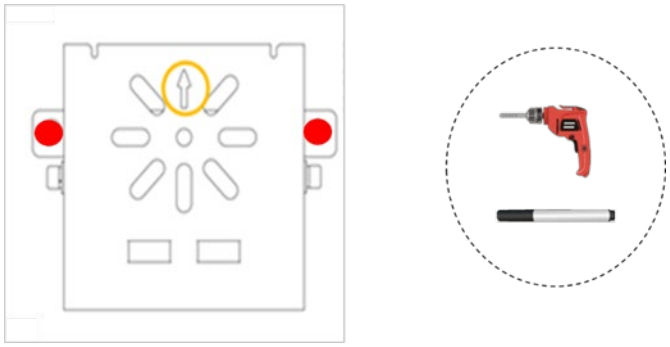
Figure 3-7: Completed Attachment

3.3.2 Install on Wall

Ensure that the wall can bear at least four times the weight of the eNB. Follow the steps below to install the Nova436Q eNB on the wall.

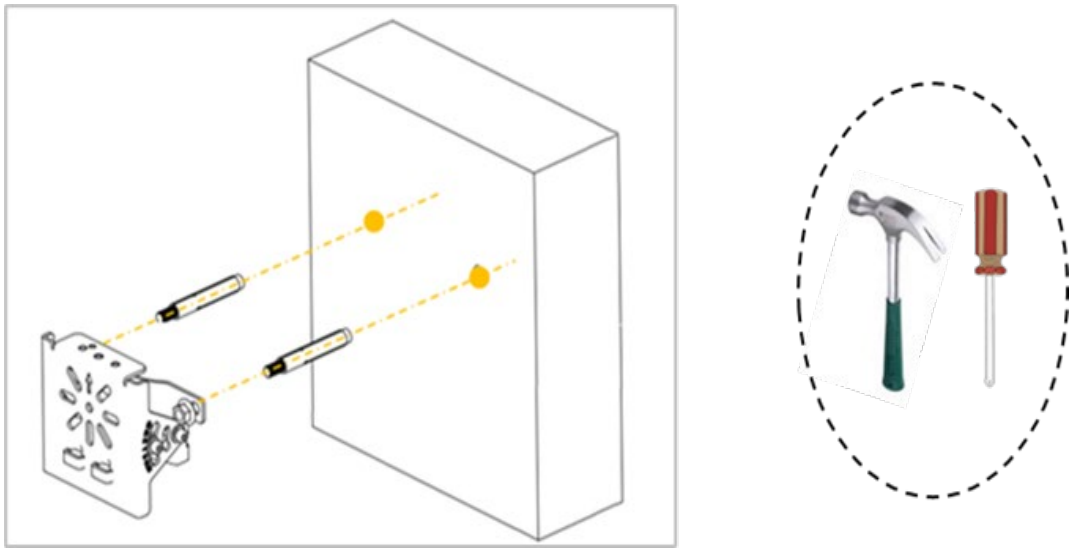
1. Take apart the assembled installation bracket.
2. Place the installation bracket on the wall with the arrow facing upward, as shown in Figure 3-8. Mark the drilling locations using a pencil or marker.
3. Drill two holes in the wall to match the size of the wall bracket holes.

Figure 3-8: Mark and Drill Holes



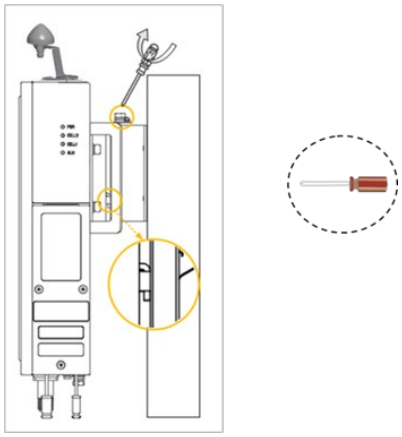
4. Check the up/down direction of the installation bracket, and then attach to the wall using expansion bolts (Figure 3-9).

Figure 3-9: Attach With Expansion Bolts



5. Using the two pins on the bracket on the back of the eNB, attach the eNB to the mounting bracket on the wall. Push the eNB until the hook is firmly attached to the mounting bracket. Tighten the bolt on the top of the bracket using a Phillips-head screwdriver to complete the installation (Figure 3-10).

Figure 3-10: Attach eNB to Bracket



3.4 Connect Cables

WARNING: Ensure the antenna is connected before powering up the eNB. The wireless signal transmission power can cause bodily injury, and damage to the eNB and RF power amplifier devices.

3.4.1 Cable Laying Requirements

General requirements:

- Bending radius of antenna feeder cable:
  - 7/8 in > 9.84 in (22.2 mm > 250 mm)
  - 4/5 in > 14.96 in (20.3 mm > 380 mm)
- Bending radius of jumper cable:
  - 1/4 in > 1.38 in (6.3 mm > 35 mm)
  - Super soft 1/2 in > 1.97 in (13 mm > 50 mm)
  - Ordinary 1/2 in > 5 in (13 mm > 127 mm)
- Bending radius of power cable and grounding cable: > triple the diameter of the cable.
- The minimum bend radius of the optical fiber is 20 times the diameter of the optical fiber.
- Bind the cables according to the type of cable; intertwining and crossing are forbidden.
- An identification label should be attached after the cable is laid.

Optical fiber cable requirements:

- Avoid circling and twisting of cables while laying the cable.
- Avoid binding or kinking of cables on a turn.
- Avoid pulling or weighing down the optical fiber cable.
- The redundant optical fiber must wind around the dedicated device.

Grounding cable requirements:

- The grounding cable must connect to the grounding point.
- The grounding cable must be separated from the signal cables to avoid signal interference.

3.4.2 Connect GPS Antenna Cable

WARNING: Ensure the antenna is connected before powering up the eNB. The wireless signal transmission power can cause bodily injury, and damage to the eNB and RF power amplifier devices.

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 and pull out the strip.
4. Connect the other end of the GPS jumper to the GPS interface on the eNB, which also needs weatherproof protection.

3.4.3 Connect RF Cable(s)

1. Open the dust caps of the **ANT0**, **ANT1**, **ANT2**, and **ANT3** interfaces.
2. Insert the RF cables into cold shrink tubes.
3. Connect RF cables to the ANT0, ANT1, ANT2, and ANT3 interfaces on the eNB, and tighten them with a wrench to 12–15 in-lb or 1.4–1.7 NM torque.

   NOTE: Antenna ports ANT0 and ANT1 connect to the primary cell (Pcell), or Cell 1. Antenna ports ANT2 and ANT3 connect to the secondary cell (Scell), or Cell 2.

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 antennas, which also need weatherproof protection.

3.4.4 Connect Optical Fiber

1. Unscrew the three screws on the cover of the eNB wiring cavity using a Phillips-head screwdriver. Open the wiring cavity.
2. Connect the optical fiber to the optical (OPT) interface in the wiring cavity.
3. Lay the cable along the wire groove, and stretch it out of the wiring cavity.

3.4.5 Connect Ethernet Cable

1. Connect the Ethernet cable to the **ETH** interface in the wiring cavity.
2. Lay the Ethernet cable along the wire groove and stretch it out of the wiring cavity.

3.4.6 Connect Power Connector

Since the length of cable needed for power varies from site to site, the two ends of the power adaptor are bare terminal ends. You will need to make the power cable according to the actual measurements of the installation site and assemble the power plug and power terminal on the two ends of the power adaptor.

Strip 0.47 in (12 mm) insulating layer with a wire stripper. The power cord length should be kept below 330 ft (100 m). The connection steps for the power cable are as follows:

1. Assemble the power plug. The power plug will be installed on the end of the input direction. Refer to the labels on the power plug for connecting the live wire, neutral wire, and ground wire to the corresponding terminals separately, and tighten the screws.
2. Connect the output of the AC adaptor to the lightning protection box.
3. Assemble the power terminal. The power terminal will be installed on the end of the output direction. Refer to Figure 3-11 to connect the live wire and neutral wire.

   Figure 3-11: Power Terminal

4. Connect the power cable to the PWR interface in the wiring cavity.
5. The power cable lays along the slot and stretches out of the wiring cavity.
6. The input of the power adaptor connects to the outlet.
   - If the outlet is indoors, place the power adaptor indoors.
   - If the outlet is outdoors, place the power adaptor in a waterproof box.
7. After the cable connection is complete in the wiring cavity, tighten the screws on the cover to close the wiring cavity using a Phillips-head screwdriver.

3.5 eNB Grounding

3.5.1 Connect Ground Cable

Prepare the grounding cable according to the actual measurements and requirements of the specific installation site. The Nova436Q eNB has two grounding screws located on the bottom of the unit in Figure 3-12

Follow the steps below the figure to connect the ground cable.

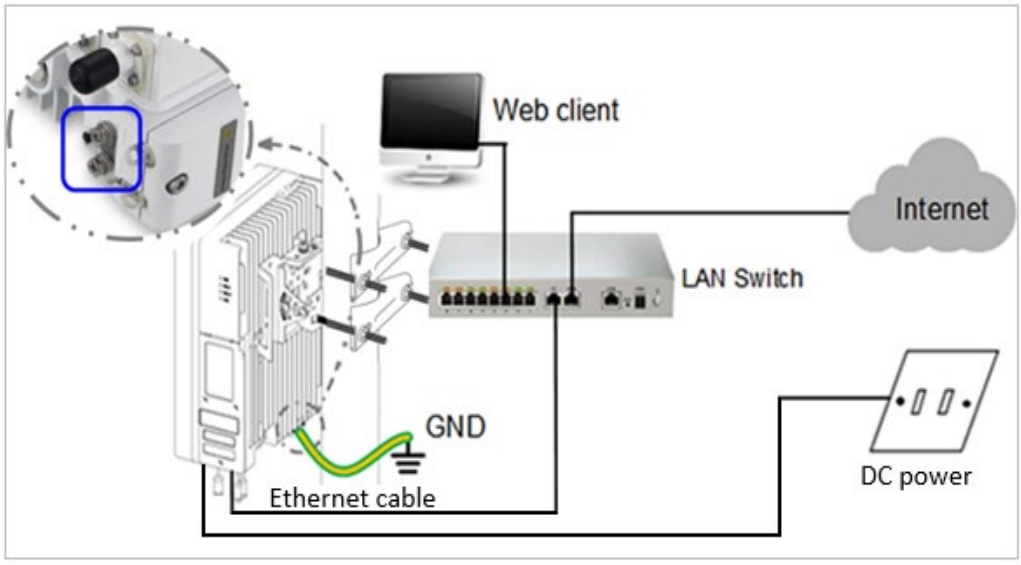
NOTE: All Nova eNBs have a floating ground on the power system.

Figure 3-12: Grounding Screws

1. Unscrew one grounding screw, connect one end of the ground cable to the grounding screw, and retighten the screw.
2. Repeat step 1 for the second grounding screw.

Once the eNB is installed at the outdoor location, the other end of the ground cable needs to connect to a good earth grounding point (Figure 3-13).

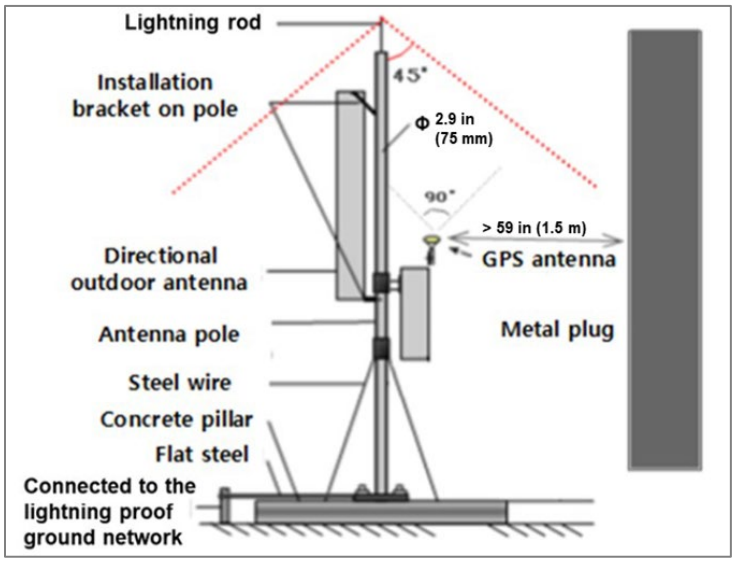
Figure 3-13: Connecting Cables and Grounding Screws



3.5.2 Pole Grounding

The purpose of pole grounding is to protect the equipment as much as possible from potential damage of lightning overvoltage. 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, any damage caused by lightning primarily 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 3-14.

Figure 3-14: Pole Grounding



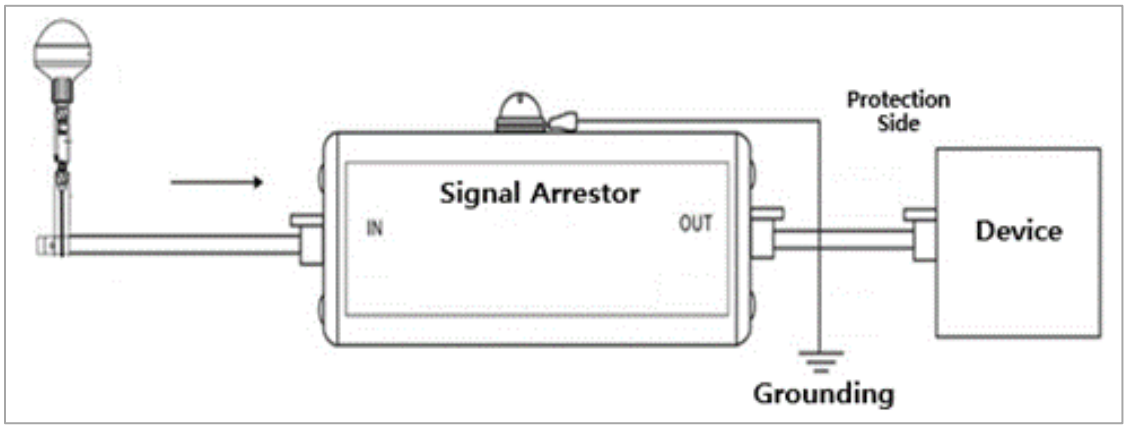
1. The installation position of the grounding bar should meet the design requirements. The holding pole and tower body must be connected to the lightning protection network or grounded with a separate lead.
2. The diameter of the grounding wire should meet the design requirements. The copper nose must 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 core or binding tape with a fixed spacing of 0.3 m (12 inches).
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, 300 × 40 × 4 mm (12 x 1.5 x 0.16 in) 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 0.7 m (27.5 in). 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.

3.5.3 Global Positioning System Antenna Grounding

When installing a GPS antenna if the length of the antenna is more than 5 meters (16.4 feet), it is recommended to extend the installation distance. As per the safety guidelines, it is recommended that lightning protection be added to the GPS antenna. The lightning protection should be connected to the grounding bar, as shown in Figure 3-15.

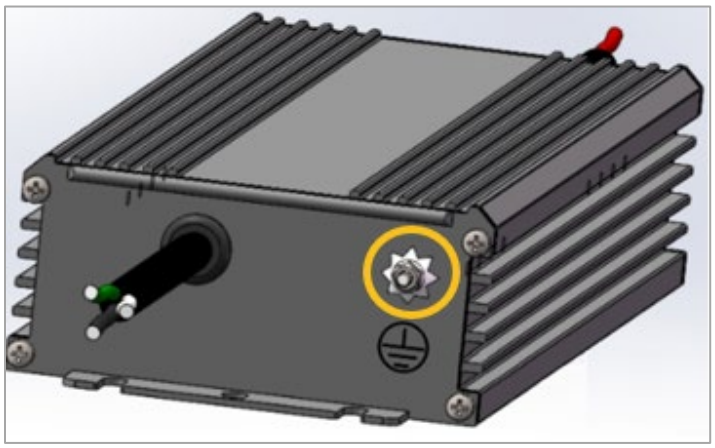
Figure 3-15: GPS Grounding



3.5.4 Power Adapter Grounding

The power adapter ground terminal must connect to the grounding bar, as shown in Figure 3-16.

Figure 3-16: Power Adapter Grounding



Before installing the eNB at its final destination, perform the steps in *section 3.6* and *section 3.7*. Upon successful testing, the eNB will be ready for installation at the cell site. Seal and weatherproof all the connection points, and rustproof where needed.

3.6 Power on to Check LED Status

WARNING: Ensure the antenna is connected before powering up the eNB. The wireless signal transmission power can cause bodily injury , and damage to the eNB and RF power amplifier devices.

Power on the eNB, and check that the LED indicators are lighting as expected: Power is steady green, CELL1 and CELL2 are slow flash green, and there are no alarms (Figure 3-17), per Table 2-3.

Figure 3-17: Check LEDs

3.7 Configure Basic Parameters

Reference: *QRTB eNodeB Configuration Guide*

The Nova436Q eNB can be configured in SC, CA, or DC/split mode, depending on which licenses you have purchased, and/or in HaloB mode, which is embedded in the base software. The Nova436Q also supports CBRS SAS operation.

When first installing and testing the Nova436Q, Baicells recommends configuring the primary cell (Pcell)/Cell 1 carrier settings (without enabling CA, DC, HaloB, or SAS) for simple verification that the new eNB unit is operational. Once it is confirmed to be operational, you can then refer to the appropriate configuration guide(s) for the operating mode you plan to use.

NOTE: For all GUI menus and fields, refer to the following documents on the Baicells website: Baicells.com > Resources > *Documents*.

- CloudCore Configuration & Network Administration Guide (OMC/BOSS)
- CAT4 CPE Configuration Guide
- CAT6/CAT15 CPE Configuration Guide
- QRTB eNodeB Configuration Guide
- Carrier Aggregation & Dual Carrier (Split Mode) Configuration Guide
- HaloB Solution User Guide
- SAS Deployment Guide

3.7.1 Launch the eNB GUI

Follow the steps below to connect to the GUI.

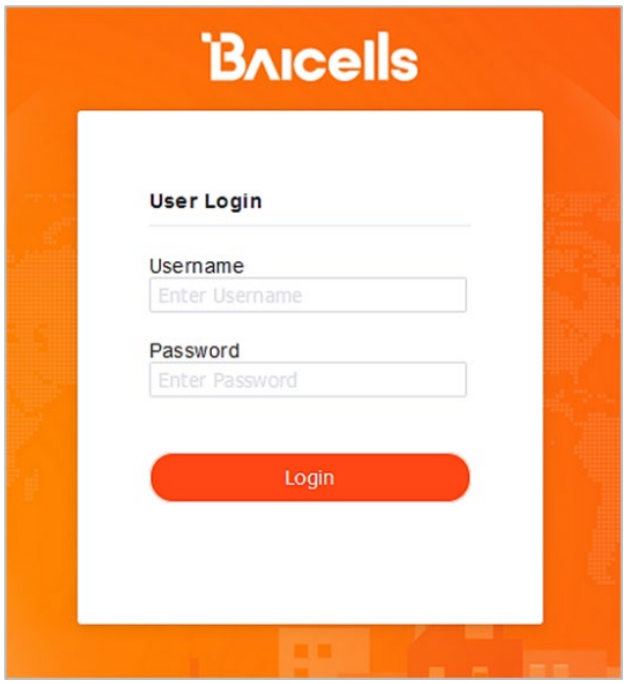
Step 1: Use an Ethernet cable to connect the eNB DATA port to the local network routed to the Internet. The DATA interface is set to Dynamic Host Configuration Protocol (DHCP) client by default.

Optionally, you can plug a Personal Computer (PC) directly into the eNB MGMT port. On your PC you will need to assign a static IP address within the Management (MGMT) subnet. The default IP address for the Management interface is *http://192.168.150.1/24*.

Step 2: Open a Web browser, and enter the following IP address: *http://192.168.150.1*.

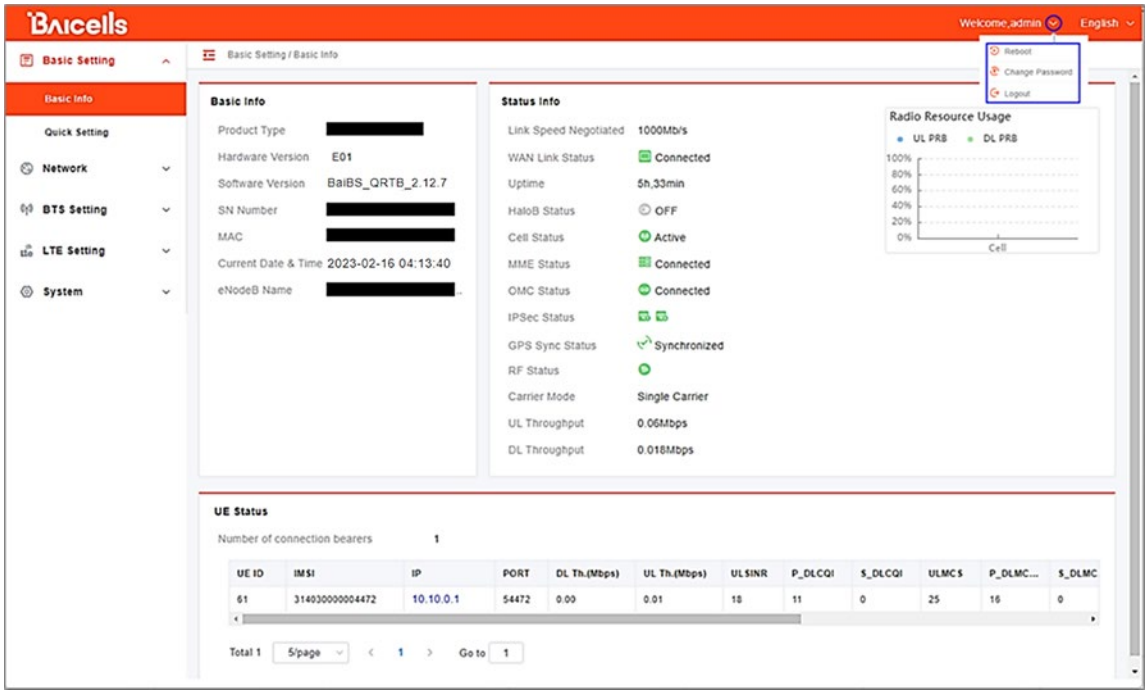
Step 3: At the login screen Figure 3-18) enter the default user name (*admin*) and password (*admin*), and click on *Login* to open the home page.

Figure 3-18: GUI Login



The home page is the *Basic Setting > Basic Info* menu, which reports the current eNB status (Figure 3-19). In *section 3.7.9*, you will use this page to confirm that the eNB is active.

Figure 3-19: Home Page



Optionally, you may want to:

1. Change the login password.
2. Confirm the firmware version is the latest available from Baicells website; upgrade if needed. Firmware upgrades can be found at Baicells.com > Support > *Firmware*. See *section 3.7.2* for detailed instructions regarding firmware upgrades.
3. Set the Network Timing Protocol (NTP).

For help, refer to the *CloudCore Configuration & Network Administration Guide*.

3.7.2 Upgrade Firmware

Follow the steps below to ensure you are using the most recent software version before configuring the eNB.

3.7.2.1 Upgrade Firmware from eNB GUI

1. Download the most recent firmware file from Baicells.com > Support > *Firmware*, and save on local computer.
2. Go to *System > Upgrade*, and select whether to preserve the current settings.
3. Select *Choose File*, and navigate to the firmware file saved on local computer.

   NOTE: The file type is *.IMG.

4. Click *Upgrade*.
5. In the pop-up window click *PROCEED*.
6. The base station reboots after approximately three minutes.
7. On the *Basic Setting > Basic Info* page, the upgraded version is displayed in *Software Version.*

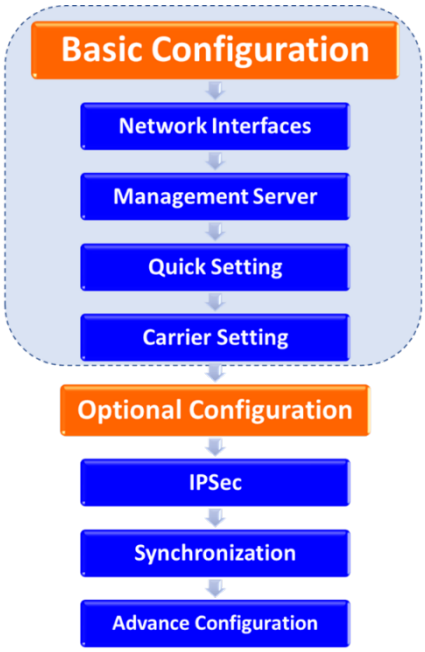
3.7.2.2 Upgrade Firmware from the OMC

1. Go to *eNB > Upgrade > Upgrade&Rollback*.
2. Select the correct *Product Type* from the list.
3. Select the checkbox next to the eNB(s) you want to upgrade.
4. In the *New Task* window, select the *Upgrade Type*.
5. In the eNB section, select the checkbox(es) next to the eNB(s) you want to upgrade.
6. Next to *File List*, select/deselect *Retain Configuration*. Under *Select*, choose the software version by clicking in the empty cell (a blue checkmark displays).
7. Choose the *Execute Type*, which determines when the upgrade will occur.
8. Select *OK*.

3.7.3 Basic Configuration Overview

Figure 3-20 indicates four main steps for basic configuration: network interfaces, management server address, some quick settings pertaining to key LTE parameters, and the carrier setting.

Figure 3-20: Configuration Flow



3.7.4 Configure Network Interfaces

The network interfaces defined as part of the initial, basic setup include the WAN/LAN/VLAN interfaces, DHCP, and the Local Gateway (LGW) mode.

3.7.4.1 WAN/LAN/VLAN

Go to the *Network* > *WAN/LAN/VLAN* menu (Figure 3-21). The WAN interface is an external communication portal (Internet connection) between the eNB's Network Management System (NMS) – in most cases, the CloudCore OMC – and the MME. If not using CloudCore, the eNB's NMS can be a Local OMC or the LTE NMS. The *WAN/LAN/VLAN* fields are described in Table 3-1.

If the *IP Access Mode* field is set to *DHCP* (Figure 3-21) and the *LGW* function is *ON* as shown in (*section 3.7.4.2*), the *Connect Type* field must be modified, based on the requirement. The IP address of the eNB will be changed due to the Message Authentication Code (MAC) address being changed. Therefore, modify the router server at the same time.

The *LAN* interface is used only for local maintenance port during initial eNB setup and basic configuration, and is not used during normal eNB operation. In the *LAN Config* tab, enter the IP address and subnet mask address for the local network connection. The default IP address for the LAN interface is 255.255.255.0.

NOTE: If the LAN IP address is changed, the eNB will reboot and you will have to log in to the GUI again.

Figure 3-21: WAN/LAN/VLAN

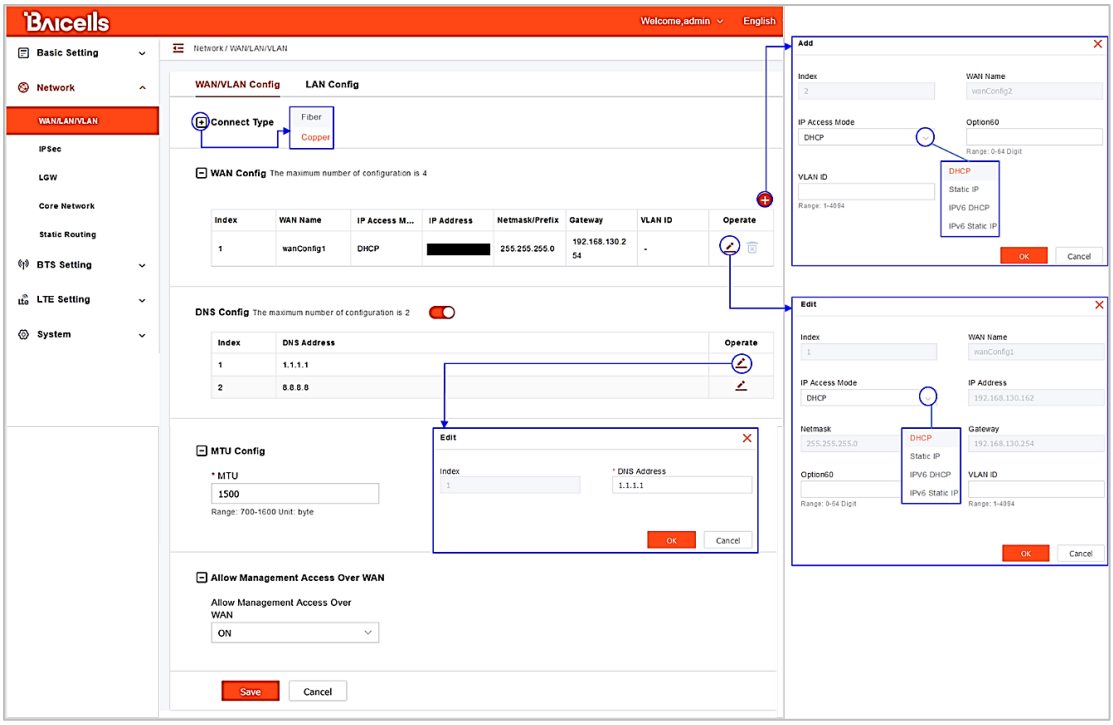


Table 3-1: WAN/LAN/VLAN

Field Name	Description
WAN/LAN Config Tab	
Connect Type Pane	
Connect Type	Used to select the type of connection for the eNB: • Copper: RJ-45 electrical interface • Fiber: optical fiber interface The connection type is based on the eNB model. If the eNB doesn't support optical ports, the value must be set to "Copper".
WAN Config Pane	
Index	The WAN index number, which is generated automatically. Four WAN interfaces are the maximum number the eNB supports.
WAN Name	The WAN Name is generated automatically.
IP Access Mode	Used to select the desired interface protocol to be used by the WAN interface: • DHCP: only the Option60 parameter needs to be configured if DHCP is the interface protocol selected. • Static IP • IPv6 DHCP • IPv6 Static IP

Field Name	Description
Option60	Used to differentiate between different terminals when *IP Access Mode* is set to *DHCP*. Range is 0–64 digits.
Netmask	The IP address' subnet mask address. This parameter displays when *IP Access Mode* is set to *Static IP*.
Gateway	The default gateway's IP address. This parameter displays when *IP Access Mode* is set to *Static IP*.
Prefix	The IPv6 address' prefix for the WAN interface. This parameter displays when *IP Access Mode* is set to *IPv6 Static IP*. Range is 0–128.
IPv6 Gateway	The IPv6 address' gateway for the WAN interface. This parameter displays when *IP Access Mode* is set to *IPv6 Static IP*.
IP Address	The WAN interface's IP address. This parameter displays when *IP Access Mode* is set to *Static IP* or *IPv6 Static IP*.
VLAN ID	Used to configure more IP addresses for the WAN interface through the VLAN when there is a need to transmit multi-types of data through a separate channel. Range is 1–4094.
DNS Config Pane	
Index	The DNS index number, which is generated automatically.
DNS Address	The IP address assigned to the DNS. Up to two DNSs are supported.
MTU Config Pane	
MTU	Used to specify the size of the largest network layer protocol data unit that can be communicated in a single network transaction. Specifying the correct MTU for the network can help to improve data transmission efficiency. Range is 700 to 1600 bytes. The default value is 1500 bytes.
Allow Management Access Over WAN Pane	
Allow Management Access Over WAN	Used to enable/disable the Local Maintenance Terminal connection through the WAN port (*ON* or *OFF*) for management purposes. If set to *ON*, the administrator can maintain the eNB through the WAN interface.
LAN Config Tab	
LAN Config Pane	
IP Address	The LAN interface IP address. The default value is **192.168.150.1**.
Subnet Mask	Used to define the subnet mask address for the LAN interface. The default value is **255.255.255.0**.

3.7.4.2 LGW

The LGW setting must be configured when using the Baicells CloudCore EPC. Refer to Figure 3-22 and Table 3-2. You must reboot the eNB when you make changes to these settings.

Figure 3-22: LGW

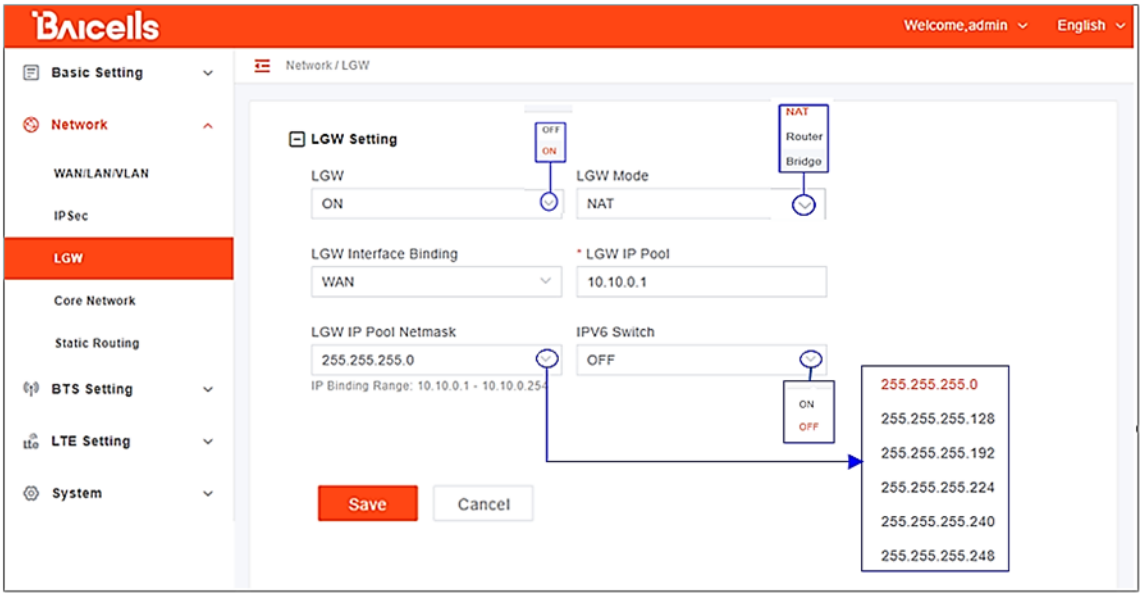


Table 3-2: LGW

Field Name	Description
LGW	On or Off.
LGW Mode	Select an option: NAT: Packages from the internal network to the external network need Network Address Translation Router: Select optimized route from the routing table (Figure 3-23). Bridge: Transfer in the data link layer.
LGW Interface Binding	The IP address connects to the LGW. Select from configured interfaces. Default is WAN interface. The VLAN interface can also be used to separate different links.
LGW IP Pool	Enter the starting IP address of the dynamic IP address pool

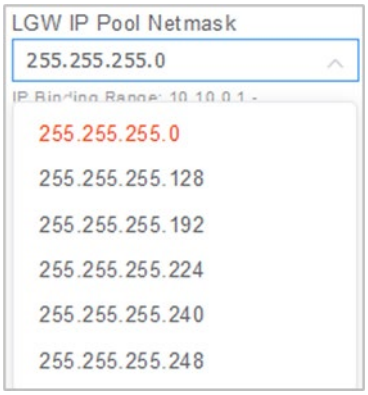
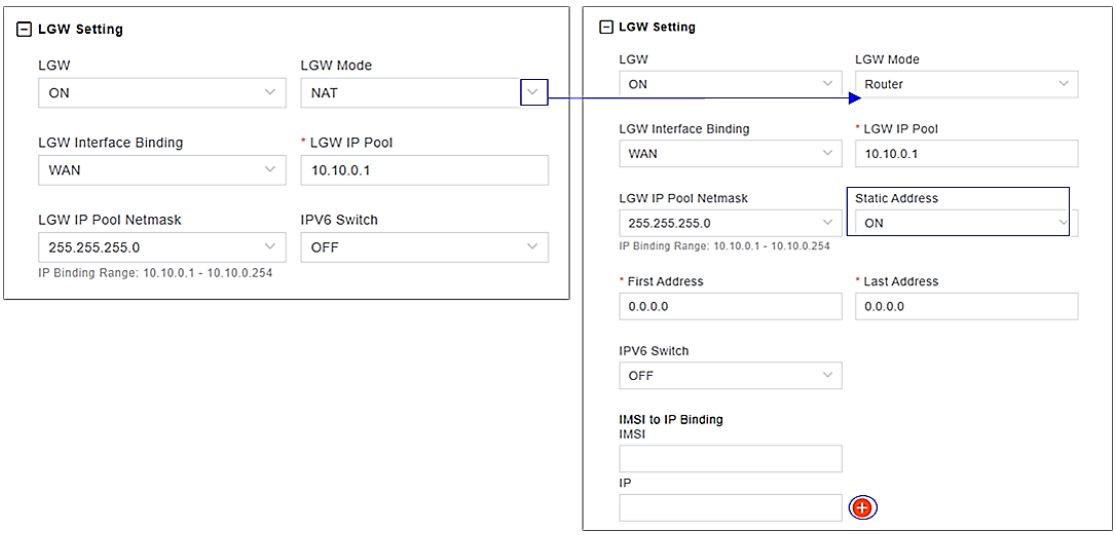
Field Name	Description
LGW IP Pool Netmask	For example, if the first IP address is 10.10.10.1 and the netmask is 255.255.255.0, the IP address pool includes 255 IP addresses. The options are shown in the drop-down menu: 
IPV6 Switch	The IPV6 network interface is used for in-band connectivity with the switch, as ON and OFF.
Static Address	If *LGW Mode = Router* (Figure 3-23), set it to *ON* if you want to use a static IP address.
First Address	If *LGW Mode = Router* and *Static Address = ON* (Figure 3-23), enter the first static IP address in the range.
Last Address	If *LGW Mode = Router* and *Static Address = ON* (Figure 3-23), enter the last static IP address in the range.
IMSI to IP Binding - IMSI	If *LGW Mode = Router* and *Static Address = ON* (Figure 3-23), if you want to bind an IMSI number to the IP address, enter the IMSI number.
IMSI to IP Binding - IP	If *LGW Mode = Router* and *Static Address = ON* (Figure 3-23), enter the IP address to bind to the IMSI. You can add more than one IP address.

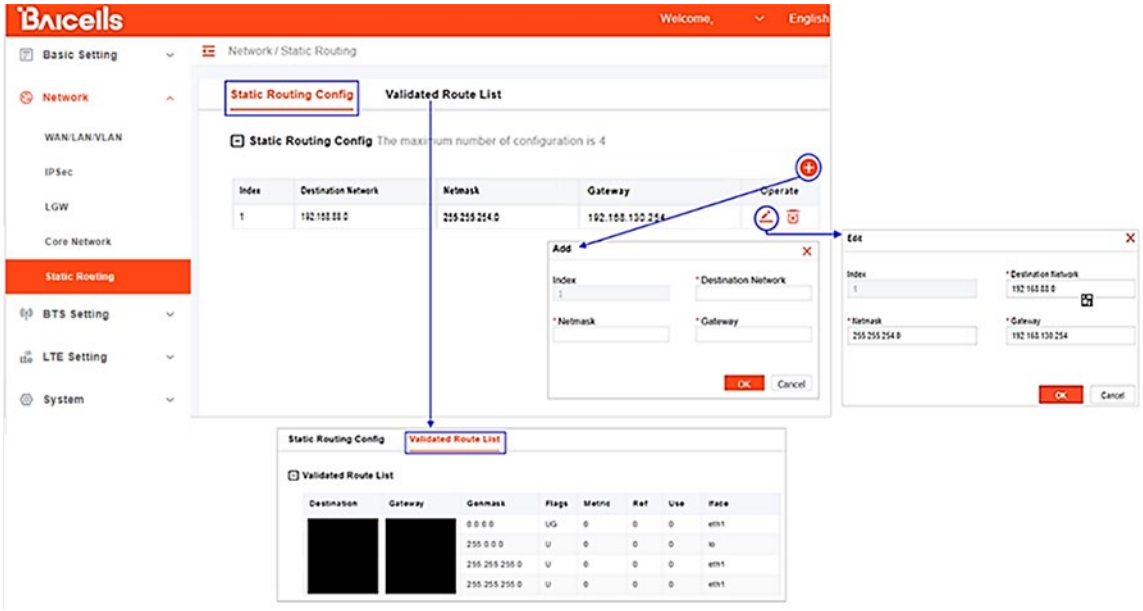
Figure 3-23: LGW = Router



3.7.4.3 Static Routing

When using static routing, go to *Network > Static Routing*. The *Network > Static Routing* landing page has two main sections, *Static Routing Config* tab and *Validated Route List* tab (Figure 3-24). The configured static route information is displayed under *Static Routing Config* tab. To edit a static route in the list, click on the ***Edit*** icon, enter the data, and click *OK.* To add a static route, click the ***Add*** icon. Fill in the information and click *OK*. Field descriptions are in Table 3-3.

Figure 3-24: Static Routing



NOTE: For each field description, refer to the *CAT4 CPE Configuration Guide* and *CAT6/CAT15 CPE Configuration Guide*.

Table 3-3: Static Routing

Field Name	Description
Index	Auto-generated router index number.
Enable	Enable/Disable the static route.
Destination Network	The destination IP address.
Netmask	The destination subnet mask.

3.7.5 Configure the Management Server

In the *BTS Setting > Management Server* window, enter the NMS information (Figure 3-25). When using the Baicells CloudCore to manage the network, in the *http://* field enter the following URL address and port number:
http://baiomc.cloudapp.net:8443/smallcell/AcsService

If you are using Local OMC or another NMS, enter its server address and port number. Refer to the field descriptions in Table 3-4.

Figure 3-25: Management Server

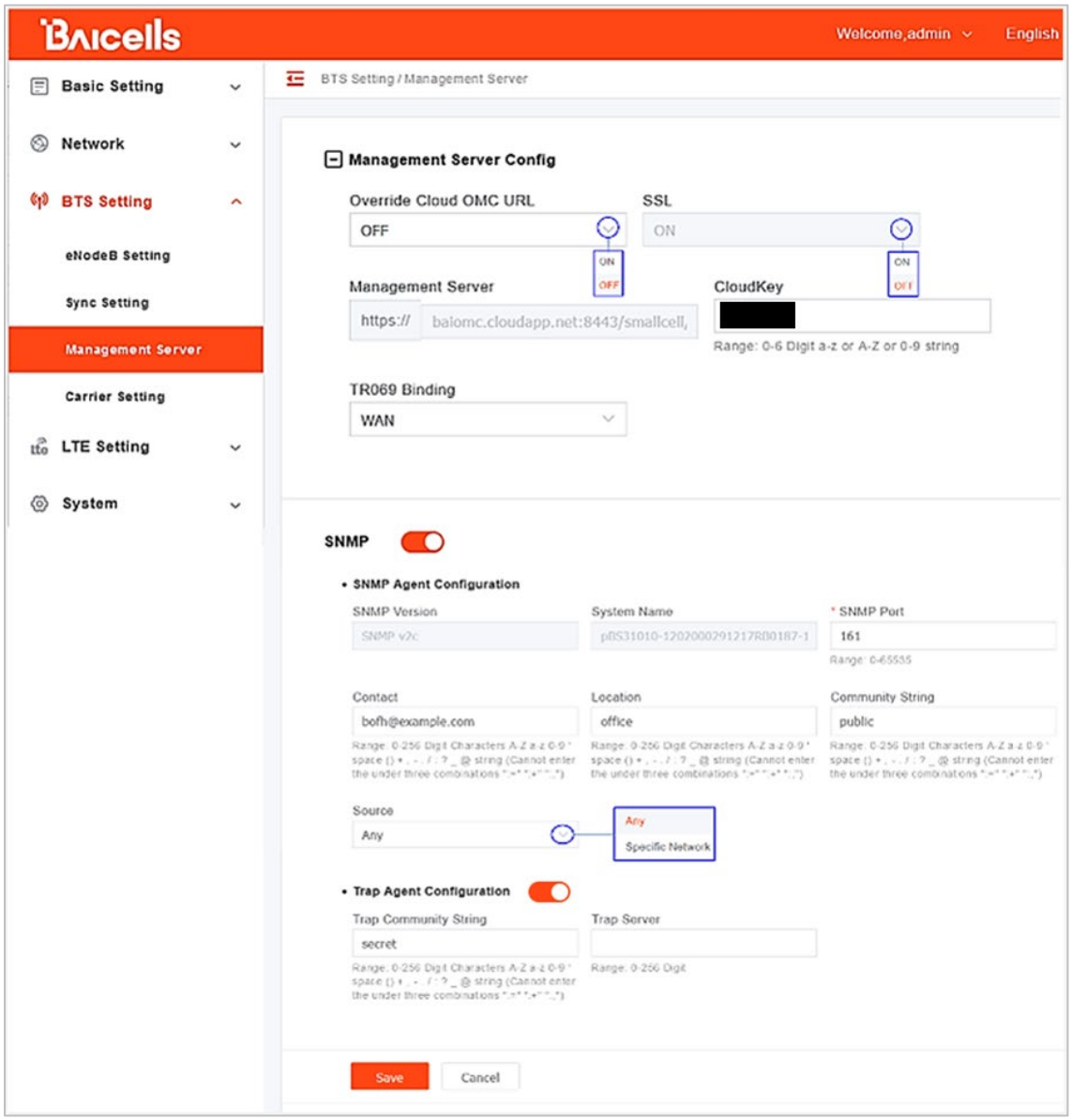


Table 3-4: Management Server

Field Name	Description
Management Server Config	
Override Cloud OMC URL	Select *ON* or *OFF*. Selecting *ON* allows you to configure the URL and port number in the *Management Server* field in the *Management Server Config* pane of the *BTS Setting > Management Server* sub-menu. NOTE: This field only displays when the eNB operating mode is set to *Cloud EPC* in the *Network > Core Network* menu.
SSL	Optional: The SSL connection adds enhanced security when it is turned on.
Management Server	The management server's IP address.
CloudKey	The NMS assigns this unique identifier for each operator. Range is 0–6 characters (using upper-case letters A–Z, lower-case letters a–z, and digits 0–9).
TR069 Binding	The interface binding with TR069 protocol. Default is WAN.
SNMP Agent Configuration	
SNMP Version	The current supported SNMP version, which is generated automatically and is SNMP v2c.
System Name	The community name, which is generated automatically.
SNMP Port	The SNMP protocol port used. Range is 0–65535.
Contact	The contact email. Range is 0–256 characters (using upper-case letters A–Z, lower-case letters a–z, and digits 0–9).‘ space ( ) + , - . / : ? _ @ string Cannot enter the following three combinations ":=" ":+" and ":,"
Location	The system's location. Range is 0–256 characters (using upper-case letters A–Z, lower-case letters a–z, and digits 0–9). ‘ space ( ) + , - . / : ? _ @ string Cannot enter the following three combinations ":=" ":+" and ":,".
Community String	Used to define a community. Default is *public*. Range is 0–256 characters (using upper-case letters A–Z, lower-case letters a–z, and digits 0–9). ‘ space ( ) + , - . / : ? _ @ string Cannot enter the following three combinations ":=" ":+" and ":,".
Source	The source address of acquiring information. Default is Any.
Trap Agent Configuration	
Trap Community String	Used to define a community. Default is *secret*. Range is 0–256 characters (using upper-case letters A–Z, lower-case letters a–z, and digits 0–9). ‘ space ( ) + , - . / : ? _ @ string Cannot enter the following three combinations ":=" ":+" and ":,".
Trap Server	The IP address for the host. Range is 0–256 characters.

3.7.6 Configure Quick Settings

Under the *Basic Setting > Quick Setting* window (Figure 3-26) are several important fields you must configure and/or verify. First, if the operator is using the Baicells CloudCore EPC, you must enter a fixed Public Land Mobile Network (PLMN) and MME IP address:

- PLMN = **314030**
- MME IP = **10.3.0.9 and 10.5.0.9**

Do not change these settings except when connecting to a Local (private network) EPC or different vendor's EPC. Second, you must enter the operator's planned settings for Band, Bandwidth, EARFCN, Cell ID, PCI, TAC, etc. Some *Quick Setting* fields such as *Duplex Mode* and *Frequency* will auto-fill based on the eNB hardware model. Make sure the *Cloud EPC* field is set to *ON* when using the Baicells CloudCore. If you are testing the eNB in a lab environment, turn the power down as low as it will go under the *Power Modify* field.

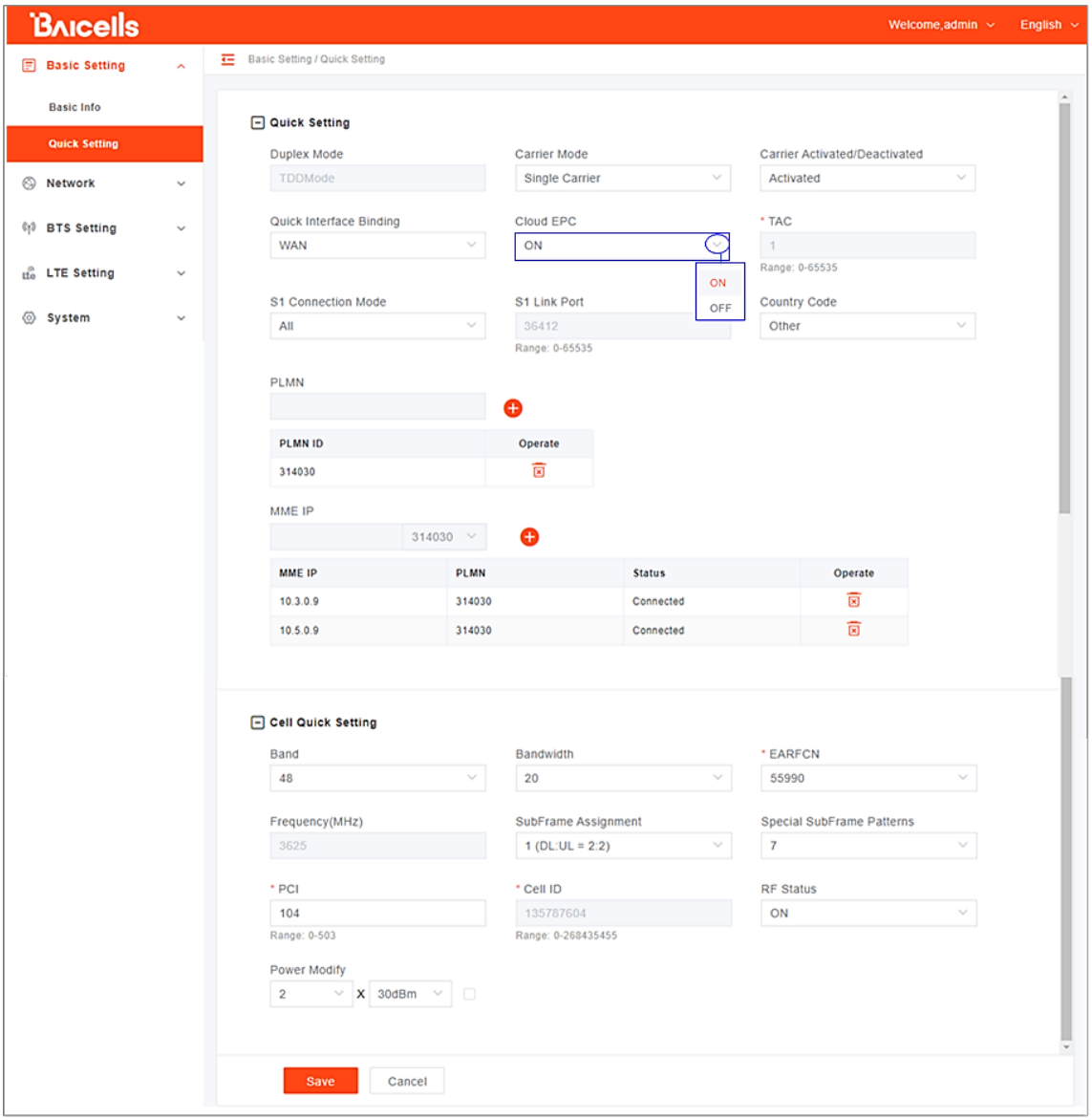
NOTE 1: If planning to use CBRS SAS, the SAS vendor will determine some of these parameters. Refer to the *SAS Deployment Guide* for more information.

NOTE 2: Nova436Q does not support SFA = 0.

NOTE 3: Cloud EPC mode is enabled using the *Network > Core Network* menu.

For a description of all the eNB *Quick Setting* fields, refer to the *QRTB eNodeB Configuration Guide*.

Figure 3-26: Quick Setting



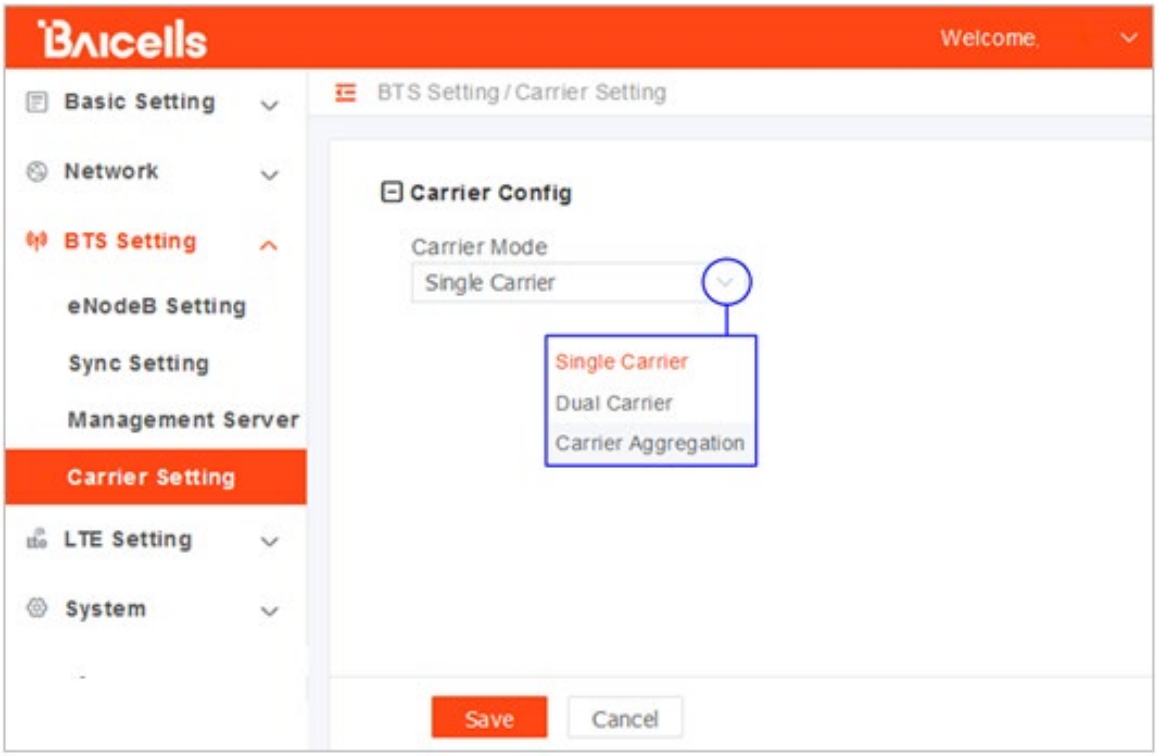
3.7.7 Configure Carrier Setting

Reference: *Carrier Aggregation & Dual Carrier (Split Mode) Configuration Guide*

The *Carrier Setting* menu (Figure 3-27) is used in eNBs running QRTB software to enable a desired carrier mode setting. You can set the eNB to run as a single carrier, as two combined carriers using CA, or as two independent carriers using DC/split mode, depending on which licenses you have purchased. Single carrier (no CA) means only Cell 1 will operate and use only two RF ports instead of four. Operators may need to use this mode if they have limited spectrum or are planning to change to CA or DC mode at a later time when more capacity is needed for the coverage area. Go to *BTS Setting* > *Carrier Setting* to configure *Carrier Mode*. Click the arrow to view the drop-down menu.

Whenever you change the carrier setting, you must **reboot** the eNB for the change to take effect.

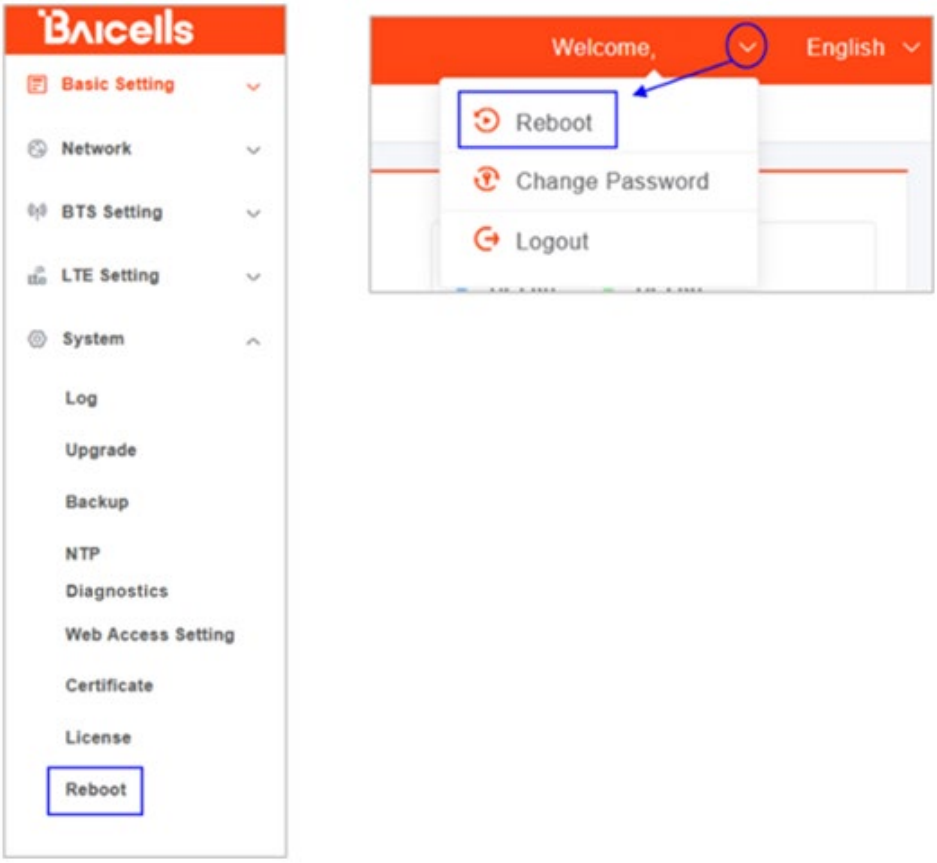
Figure 3-27: Carrier Setting



3.7.8 Reboot

Once the basic configuration settings are saved, reboot the eNB. There are two options for rebooting in the eNB GUI. From the landing page of the eNB GUI, navigate to *System > Reboot*, or select *Reboot* under the *Welcome* banner (Figure 3-28).

Figure 3-28: Reboot



3.7.9 Verify eNB Operational Status

When the eNB is finished rebooting, check the eNB status using the eNB GUI and the OMC. Once the eNB is mounted at its intended destination and powered on, recheck the status settings.

- **eNB GUI**: Go to *Basic Setting > Basic Info* and check the *Cell Status* field. It should show *Active*. Also, check that *GPS Sync Status* is reported as *Synchronized* (Figure 3-29).
- **OMC:** Go to *eNB > Monitor* to see if the *Cell Status* shows *Active* and the *Sync Status* shows *GPS Synchronized* (Figure 3-30).

NOTE: Ensure you have selected ALL in the display settings window on the *OMC > eNB > Monitor* page to view Cell Status and Sync Status (Figure 3-31).

Figure 3-29: Cell Status (eNB GUI)

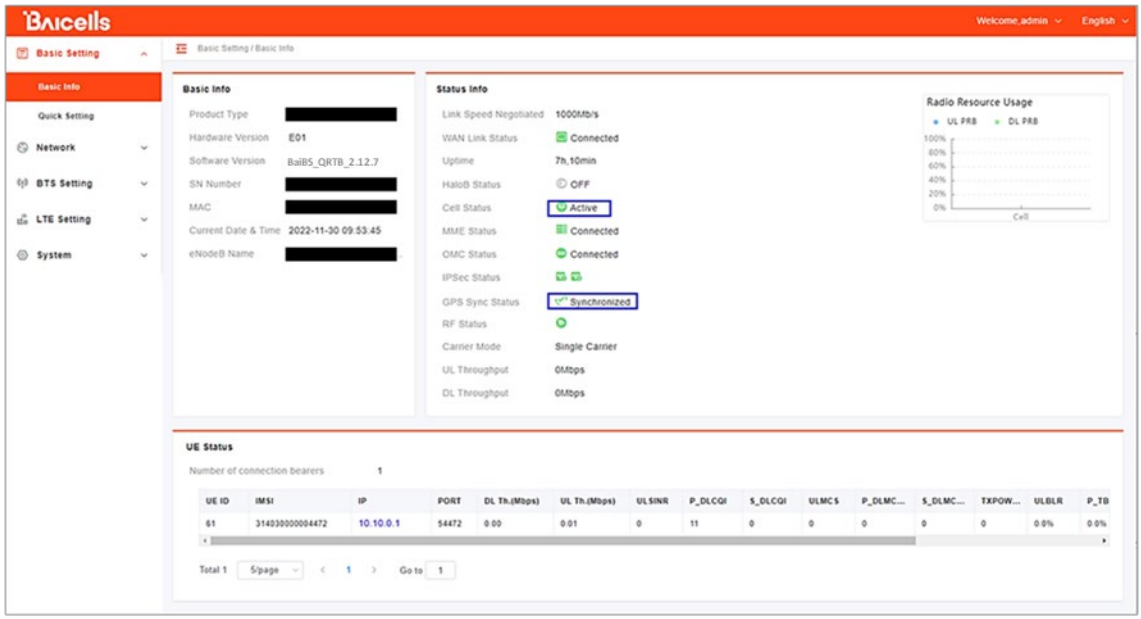
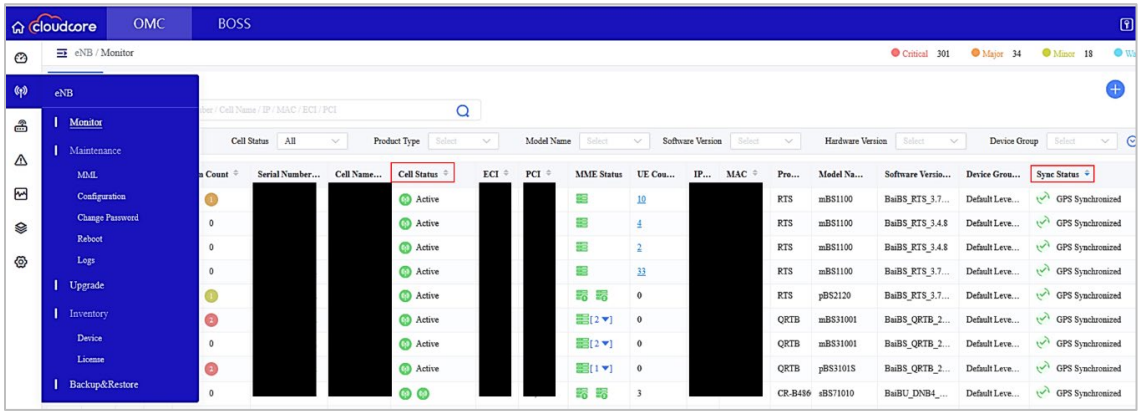
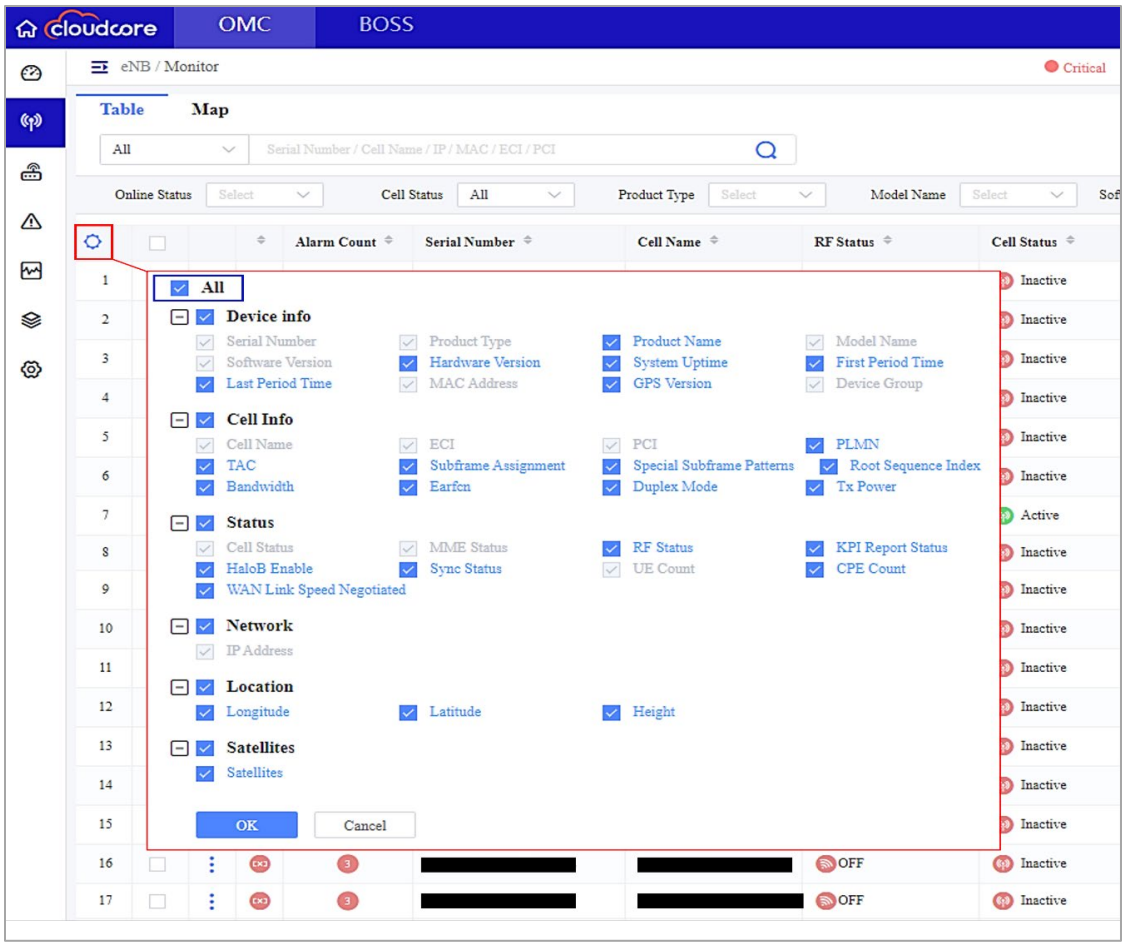


Figure 3-30: Cell Status (OMC)



NOTE: This image is captured by applying filters to show Cell Status and Sync Status.

Figure 3-31: OMC > eNB > Monitor > Display Setting



Before commercial operation, Baicells recommends implementing cell site acceptance testing of a new site to ensure the service meets expectations, to document network speeds at various locations in the cell, and to verify RF coverage.

Appendix: Regulatory Compliance

FCC Compliance

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation. Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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

WARNING: This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20 inches (50 cm) between the radiator and your body.

ISEDC Compliance

This device complies with Innovation, Science, and Economic Development Canada license-exempt RSS standard(s).

Operation is subject to the following two conditions: (1) This device may not cause interference, and (2) This device must accept any interference, including interference that may cause undesired operation of the device.

The antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 inches (50 cm) from all persons and must not be collocated or operating in conjunction with any other antenna or transmitter, End-Users must be provided with transmitter operation conditions for satisfying RF exposure compliance.