



Nova227 OD 2x250mW

TDD eNodeB

Installation Guide

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About This Document

This document is intended for personnel who will be installing the Baicells Nova227 Outdoor 2*250mW Time Division Duplexing (TDD) eNodeB (eNB). The information includes preparation of installation tools and materials and procedures for properly installing the eNB, entering basic configuration, and verifying the eNB is operational. Please be advised that only personnel with the appropriate electrical skills and experience should install this device. For HaloB, refer to the [HaloB Users Guide](#) on the Baicells website. For SAS, refer to the [SAS Deployment Guide](#).

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Support Resources

- **Documentation** - Baicells product data sheets, this document, and other technical manuals may be found at Baicells > Resources > [Documentation](#).
- **Support** - How to open a support ticket, process an RMA, and the Support Forum are at Baicells > [Support](#).

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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 eNB contact the Baicells support team.



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1. Overview

1.1 Introduction

The Baicells Nova227 Outdoor 2*250mW Time Division Duplexing (TDD) eNodeB (eNB) is an outdoor micro base station that enables wired and wireless broadband access to Long-Term Evolution (LTE) backbone networks (Figure 1-1). The low-cost Nova227 eNB supports high-speed broadband data and voice services, helping telecom operators, broadband operators, and enterprises to serve customers in locations that might otherwise be difficult to reach.

Figure 1-1: Nova227 eNB

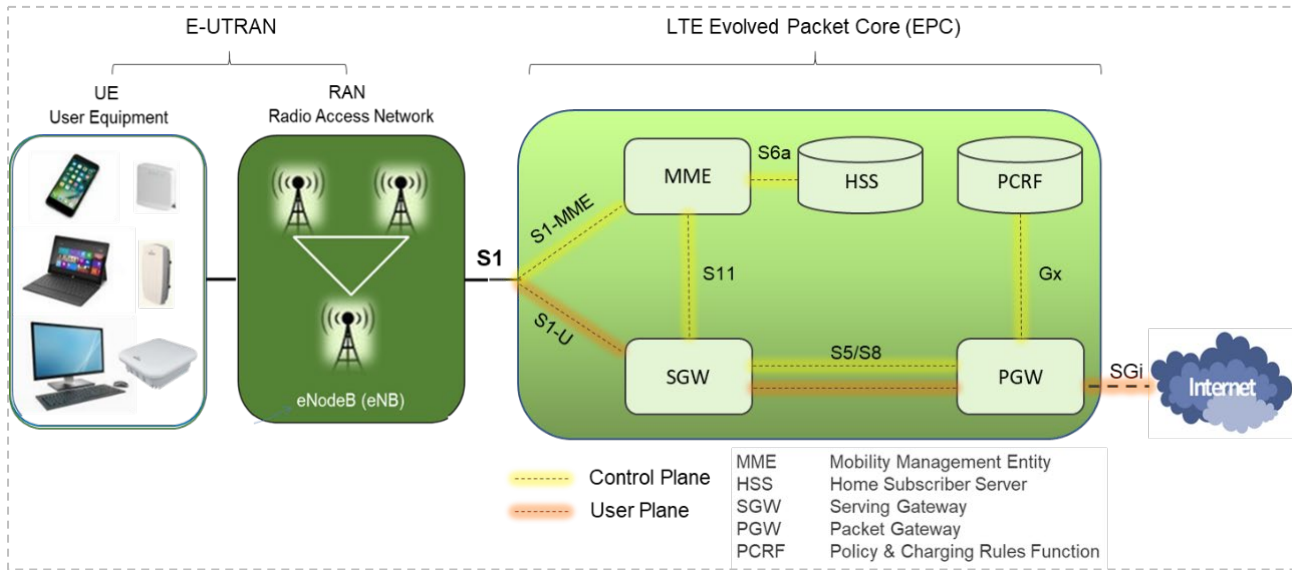


The Nova227 includes an integrated Global Positioning System (GPS); optionally, the operator may install external GPS antennas with each eNB. The eNB comes pre-configured so that installation is simplified and connection to the core network may be plug-and-play.

Baicells provides a GUI interface that may be accessed locally or remotely to configure and manage the eNB. Additionally, Baicells offers a Software-as-a-Service (SAAS) solution called CloudCore. CloudCore comprises the LTE Evolved Packet Core (EPC) network functions (Figure 1-2), which are managed by Baicells, and provides operators an account to use the Operations Management Console (OMC) and the Business and Operations Support System (BOSS) applications. OMC is used to manage all network elements across multiple sites in the network. BOSS is used for subscriber management.

NOTE: Local versions of EPC and OMC+BOSS are also available. For information on these options, please contact your Baicells sales representative.

Figure 1-2: LTE Network Architecture



1.2 Features

Key features of the Nova227 eNB include the following:

Note: Features may vary based on model or region.

- Standard LTE TDD Bands 38/40/41/42/43/48
 - Customization can be requested; contact sales_na@baicells.com.
- 2.5 GHz or 3.5 GHz models
- Complies with 3GPP Release 9 standards
- GUI-based local and remote Web management
- TR069 network management protocol support
- Compact, all-in-one design of internal antenna and integrated GPS
- Any IP based backhaul can be used, including public transmission
- Lower power consumption to reduce OPEX
- PoE+ power supply; only one Ethernet cable required for data transmission and power supply
- IoT with all mainstream LTE Evolved Packet Core (EPC) vendors
- Excellent non-line-of-sight (NLOS) coverage performance
- Peak rate (up to): DL 110 Mbps, UL 14 Mbps @ 20 MHz bandwidth
- 32 concurrent users
- Highly secured with equipment certification against potential intrusion risk
- Cloud/Local/Embedded EPC (HaloB) is supported for more convenient and economical deployment.
- Supports Citizens Broadband Radio Service (CBRS) Part 96 certified

2. Preparing to Install

2.1 Personnel & Network Design

Installation personnel should follow standard, industry safety precautions when installing a Baicells Nova227 eNB. Installers should refer to the operator's network design plan for information about specific network components, RF coverage goals for the specific cell site, IP addressing, and configuration settings.

Before installing, clearly identify the structure on which the eNB equipment will be installed, the intended height where the antenna and eNB will be located, the degree of antenna down tilt, and other necessary specifications that may impact the success of the installation. Consult regulatory rules concerning output power limits specific to your region.

2.2 Cables

When determining which RF antenna to use, be sure to match the frequency range of the antenna with the supported frequency range of the eNB.

In addition to standard tools and materials normally used during an installation, refer to Table 2-1 describing cables that will be needed. These materials can be purchased through a Baicells authorized supplier. Additional information can be found at Baicells > [Partners](#).

Table 2-1: Materials

Item	Description
Ethernet Cable	Outdoor CAT6, shorter than 330 feet (100 meters)
Ground Cable	16mm ² diameter yellow-green wire, minimum 14 AWG

You will need a computer and the Ethernet cable to connect to the local maintenance terminal (LMT) on the Nova227 unit. Through the LMT you can access the eNB GUI to enter basic configuration parameters and check the eNB status in software.

2.3 Form Factor

The Nova227 eNB has a sleek form factor: 9.8 in (H) x 9.8 in (W) x 3.2 in (D) / 248mm (H) x 248mm (W) x 80mm (D). It weighs only 4.4 lbs (2 kg). Figure 2-1 shows the side LED indicators and interface. The LEDs are explained in Table 2-2, and the interfaces in Table 2-3.

Figure 2-1: LEDs & Interface

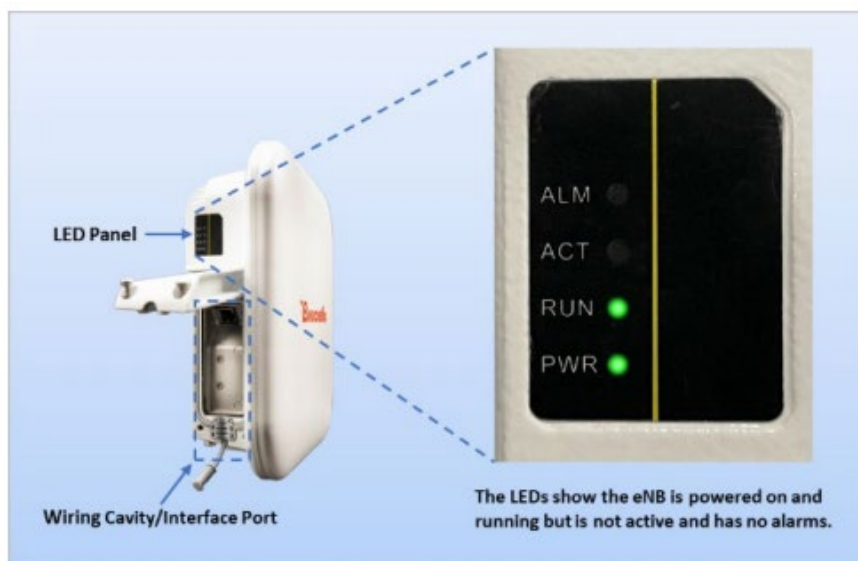


Table 2-2: LEDs

Identity	Color	Status	Description
PWR	Green	Steady on	Power is on
		OFF	No power supply
ACT	Green	Steady on	The cell is activated
		OFF	The cell is not activated
RUN	Green	Fast flash: 0.125s on, 0.125s off	The board is loading
		Slow flash: 1s on, 1s off	The board is normal
		OFF	No power input, or board fault
ALM	Red	Steady on	Hardware alarm, e.g., VSWR
		OFF	No alarm

Table 2-3: Interfaces

Interface Name	Description
ETH/PoE+	RJ-45 interface, used for data configuration or data backhaul, and PoE+ power supply

2.4 Location & Environment

When determining where to place the eNB, you need to consider factors such as climate, hydrology, geology, the possibility of earthquakes, reliable electric power, and transportation access.

Avoid locating the eNB in areas where there may be extreme temperatures, harmful gases, unstable voltages, volatile vibrations, loud noises, flames, explosives, or electromagnetic interference (e.g., large radar stations, transformer substations). Avoid areas that are prone to impounded water, soaking, leakage, or condensation.

2.5 Grounding & Lightning Protection

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

- The yellow-green ground wire must be at least 16mm² 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-oxidant 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 2-2).

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 2-2: Weatherproofing

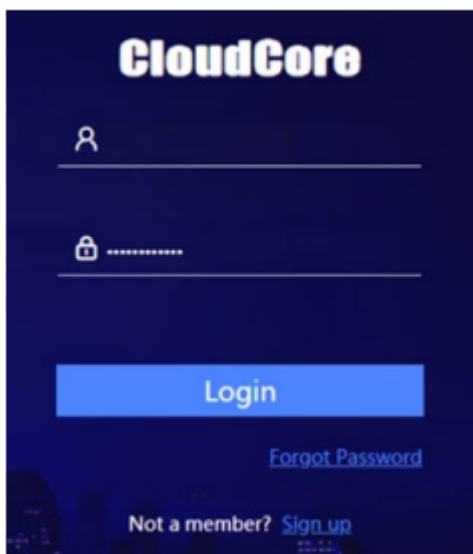


2.7 Open a CloudCore Account

If you have not already set up a Baicells CloudCore account, do the following:

- Step 1:** Open a web browser, and enter the CloudCore address (Figure 2-3):
<https://cloudcore.cloudapp.net/cloudcore/>
- Step 2:** Click on the *Sign up* button.
- Step 3:** Complete the mandatory fields, and again click on *Sign up*.

Figure 2-3: CloudCore Login



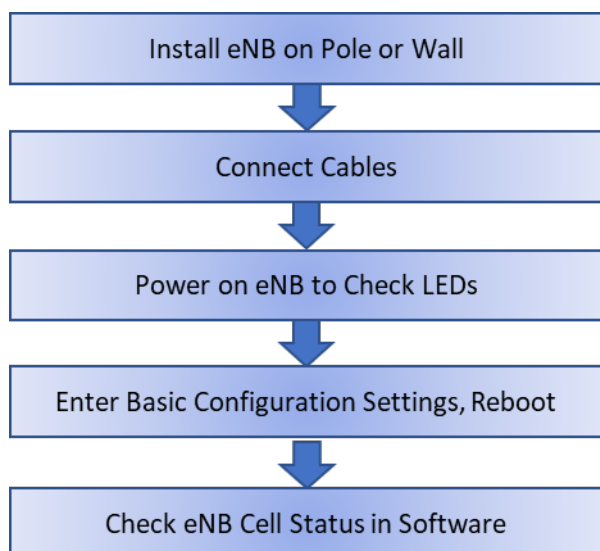
You will receive an email from Baicells. In the email, click on the CloudCore link to go to the login page. Enter your login user name (email address) and password to authenticate.

3. Installation

3.1 Process Overview

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

Figure 3-1: Installation Process



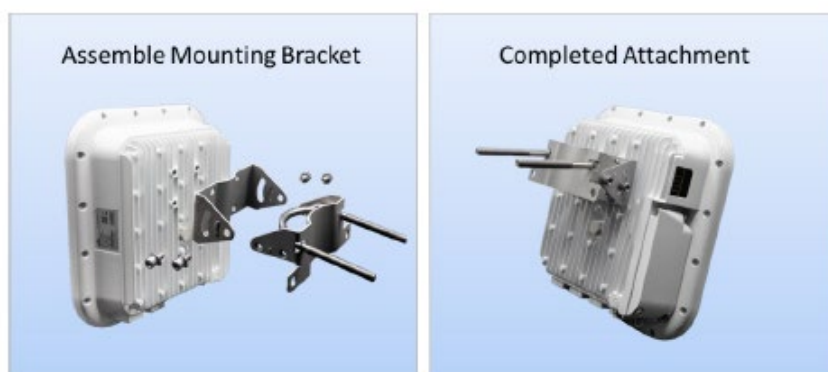
3.2 Install eNB on Pole or Wall

3.2.1 Install on Pole

Check to ensure the diameter of the pole is in the range of 1.6-2.76 inches (40-70 mm). Follow the steps below to install the eNB on a pole.

1. Assemble the mounting bracket, and attach and fasten the screws (Figure 3-2).

Figure 3-2: Mounting Bracket



2. Attach the eNB to the pole, passing the omega through the threaded rods and then loosely fastening the two nuts (Figure 3-3).

Figure 3-3: Pole Attachment



3. Adjust the eNB to the proper angle based on RF coverage goals, and tighten the screws.

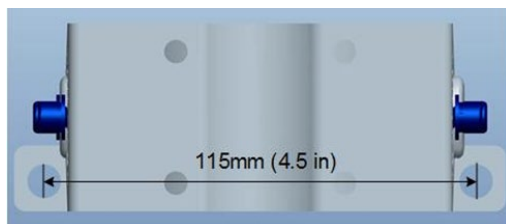
3.2.2 Install on Wall

Before installing the Nova227 on an outside wall, complete the steps in sections 3.3, 3.4, 3.5, and 3.6.

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

1. Fit the eNB on the wall, and mark the drilling points (Figure 3-4).

Figure 3-4: Mark Drilling Points



2. Drill four .5 in/12 mm diameter and 3.2 in/80 mm deep holes in the wall at the marked locations.
3. Check the up/down direction of the installation bracket and then fix the eNB to the wall using M8*80 expansion screws. (The U-shape clamp is not used for wall installations.)
4. Fix the eNB on the bracket using the screws, and adjust it to the proper angle based on RF coverage goals for the site (Figure 3-5).

Figure 3-5: Fix eNB to Bracket, Adjust Angle



3.3 Connect Cables

3.3.1 Ethernet Cable

Follow these steps to attach the Ethernet cable to the eNB.

1. Unscrew 3 screws on the cover of the wiring cavity (Figure 3-6) using M4 cross screwdriver, and open the wiring cavity cover.

Figure 3-6: Wiring Cavity



2. Connect the Ethernet cable to the **ETH** interface in the wiring cavity.
3. Lay Ethernet cable along the wire groove, stretching it outside the wiring cavity.
4. The other end of the Ethernet cable connects to the PoE port on the power adaptor. The LAN interface connects to a switch or other LAN device.

3.3.2 Connect Ground Cable

Prepare the grounding cable according to the actual requirements of the specific site. Refer to specifications given in [section 2.2](#) Materials. The grounding screw is located on the bottom of the eNB, as shown in Figure 3-7. Unscrew the grounding screw, connect one end of the grounding cable to the grounding screw, and fasten it again. The other end of the ground cable needs to connect to a good grounding point.

Figure 3-7: Grounding Screw



3.4 Power on the eNB to Check LEDs

Power on the eNB, and check that the LED indicators are lighting as expected (Figure 3-8): powered on, running, and active with no alarms. Refer to the LED descriptions in Table 2-2 in [section 2.3](#).

Figure 3-8: Check LEDs



After checking to see that all connections are secure and the eNB hardware is operating as intended, continue to section 3.6. If the eNB is not operating properly and you have double-checked that all steps up to this point were completed correctly, please contact [Baicells support](#) before continuing.

3.5 Enter Basic Configuration

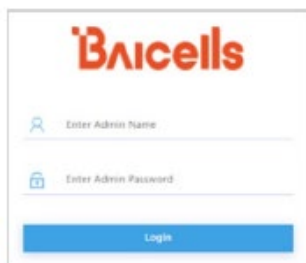
Reference: *eNodeB Configuration Guide*

The initial basic configuration of the eNB covers the minimal parameters required for the eNB to connect to the backhaul and to the Baicells CloudCore. This section does not cover all configuration options available through the eNB GUI. Please refer to the document referenced above for information on all GUI menus and fields.

With the Ethernet cable connected to the eNB ETH port and the other end to a local PC, perform the following steps.

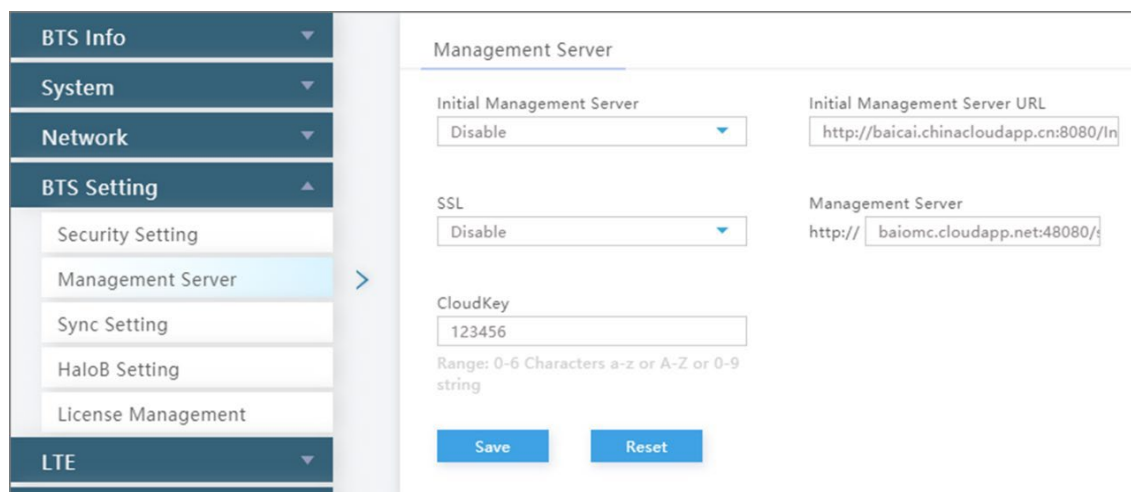
1. Open a Web browser, and enter `http://192.168.150.1`. The eNB GUI login screen will open (Figure 3-9). Use the default user name and password of `admin/admin`. Later, you will be able to enter a more secure password.

Figure 3-9: GUI Login



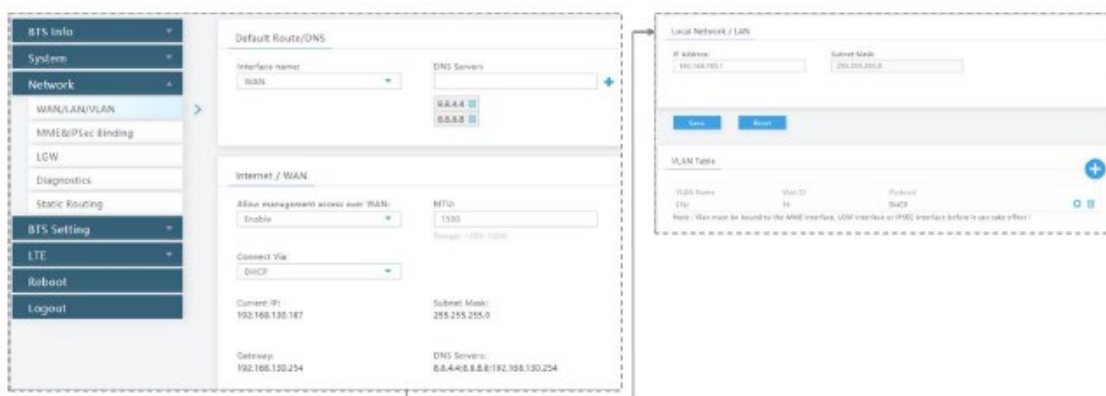
2. Configure the eNB to connect to the Baicells CloudCore:
 - a. Go to the BTS Settings > Management Server menu (Figure 3-10).
 - b. Enter `baiomc.cloudapp.net:48080/smallcell/AcsService` as the management server.
 - c. Enter your unique CloudKey that was provided by Baicells. The CloudKey is operator-specific and enables devices, upon power up, to be added automatically to your OMC account.

Figure 3-10: Management Server



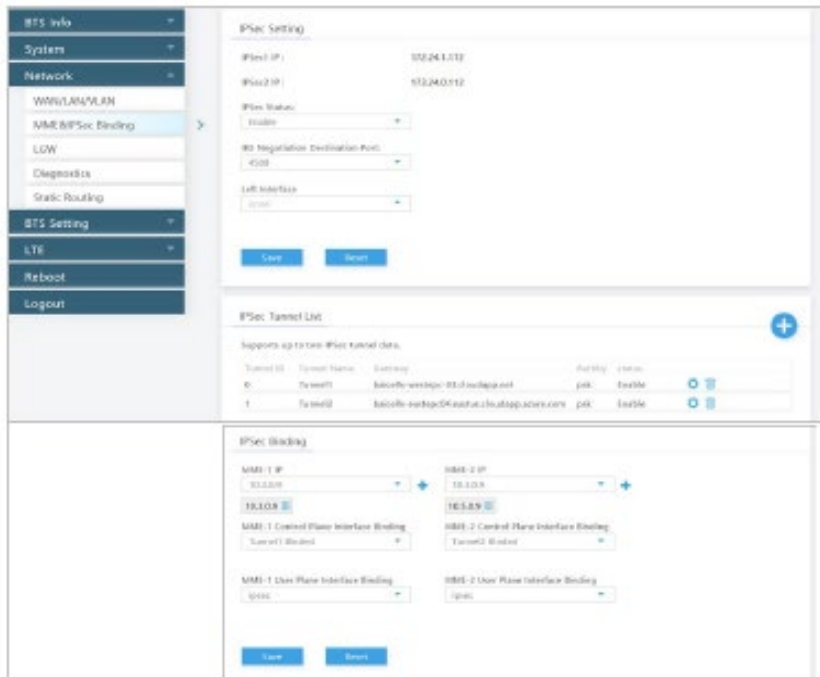
3. Configure the network interfaces. Go to the Network > WAN/LAN menu (Figure 3-11).
 - a. WAN
 - i. Ensure the *Interface name* is set to WAN.
 - ii. Enter one or more Domain Name Server (DNS) IP addresses.
 - iii. Set the *Connect Type* to either Copper or Fiber, per your backhaul network.
 - iv. The eNB can use one of 3 connection services: DHCP, PPPoE, or IPV4 Static IP, as described below. Choose a *Connect Via* option for this eNB.
 - Dynamic Host Configuration Protocol (DHCP) – the eNB’s IP address will be obtained dynamically from the local DHCP server. When the Connect Via option “DHCP” is selected, the current DHCP server IP address displays, along with Subnet Mask, Gateway, and DNS Servers information. When DHCP is selected as the connection method, there are no further WAN fields to configure in this window.
 - Point-to-Point Protocol Over Ethernet (PPPoE) – not recommended. If PPPoE is selected, you will be prompted to enter the user name and password. The range of each is 1 to 100 digits. You can also enter an access controller name and service name.
 - IPV4 Static IP – IPv4 address, netmask, and gateway or IP address of the Domain Name Server (DNS), where multiple addresses are allowed.
 - b. LAN - The LAN address is the same one used to access the eNB GUI: 192.168.150.1. The subnet mask is 255.255.255.0.

Figure 3-11: WAN/LAN/VLAN



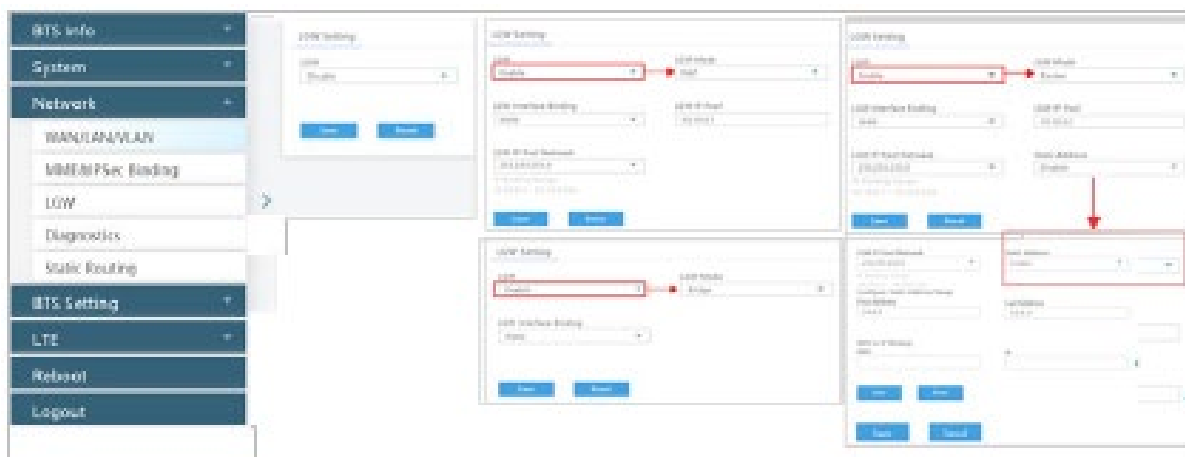
4. Verify the core network connection between the eNB and the Mobility Management Entity (MME) in the Baicells CloudCore. Go to Network > MME/IPSec Binding (Figure 3-12). Do not change the IPSec Setting fields. They should be left with their default values. In the IPSec Tunnel List, verify there are two tunnels enabled. The IPSec Binding should show the two CloudCore MME IP addresses, 10.3.0.9 and 10.5.0.9.

Figure 3-12: MME&IPSec Binding



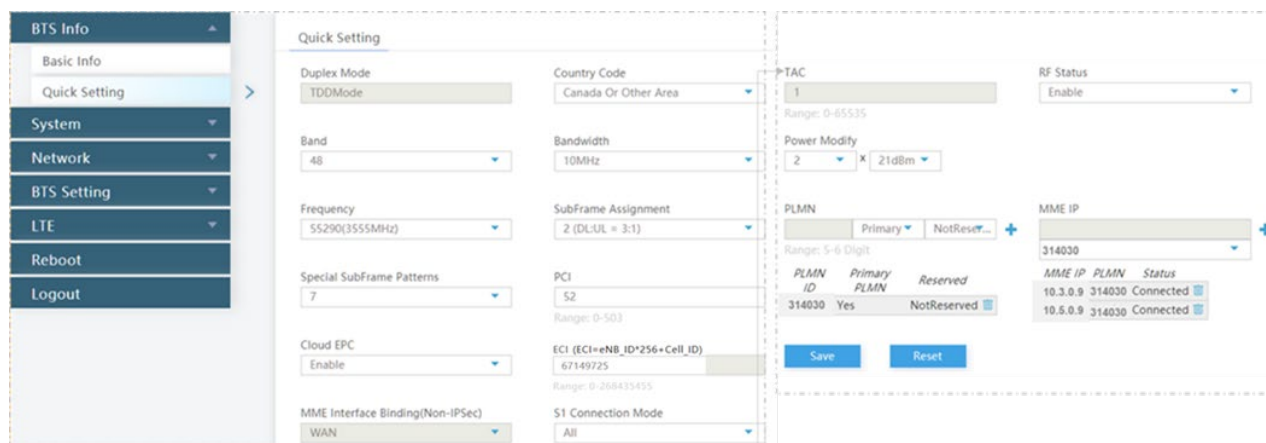
5. Configure the eNB's local gateway (LGW) connection to the backhaul network. The eNB splits the data plane and control plane. The data plane is sent out the LGW path, while the control plane is routed through the IPSec tunnel to the CloudCore EPC.
 - a. Go to the Network > LGW menu (Figure 3-13). LGW should be enabled.
 - b. Select one of three LGW modes:
 - NAT - Network Address Translation modifies the network address in the IP packet headers. To reach a CPE remotely, enter: <https://<eNB IP address><5+last 4 digits of CPE IMSI>>
Leave the CPE Web GUI https port as 433; do not change the port number. IP binding uses address range 10.10.0.1 to 10.10.0.254.
 - Router - Enable static IP addressing, and identify the range of addresses. The LGW will assign a local IP address when a CPE attaches. IP binding uses address range 10.10.0.1 to 10.10.0.254.
 - Bridge - Layer 2 will create a virtual interface for each CPE that attaches using a DHCP request to create a 1:1 mapping between the CPE IP address (from the EPC) and the LGW IP address. A CPE's MAC address is generated from its IMSI: Convert the last 12 digits to hex, and then prefix it with "8A". For example, if the IMSI = 117040000002918, the MAC would be 8A:95:02:F9:B6:6.

Figure 3-13: LGW



6. Check or configure the Quick Settings (Figure 3-14). These settings are important for LTE transmissions. Go to the BTS Info > Quick Setting menu. Some settings will be auto-configured based on eNB model and will be greyed out. Most of the fields are standard LTE types of settings.

Figure 3-14: Quick Setting



- a. When connecting the eNB to the Baicells CloudCore, you must use PLMN ID = 314030 and MME IP addresses 10.3.0.9 and 10.5.0.9.
- b. Bandwidth setting may be 5, 10, 15, or 20 MHz.
- c. Select the correct frequency within the band range for this eNB to use.
- d. Select the SubFrame Assignment (SFA or SA). SFA determines the amount of transmission resources in the downlink and the uplink, and is expressed as a ratio of DL:UL. For example, setting the SFA value to 1 means a 2:2 ratio will be applied to transmissions, where an equal number of RF resources will be available in the downlink and in the uplink.
 - 0 = 1:3
 - 1 = 2:2
 - 2 = 3:1

- e. Select the Special SubFrame Pattern (SSF or SFP) value, either 5 or 7 (default). This setting determines the length of the guard period for switching between downlink and uplink transmissions. An SSF = 5 provides a longer guard time and is typically used for cells covering more distance. The farther the distance the UE is from the eNB the more likely it is you will need to use a longer guard period of SSF = 5.
- f. Enter a unique Physical Cell Identifier (PCI) for this eNB, between 0 - 503.
- g. Make sure the Cloud EPC field is enabled in order to connect to the Baicells CloudCore.
- h. Enter a Cell ID for a cluster of eNBs on the same tower or other structure. The Cell ID field is equivalent to the LTE E-UTRAN Cell Identity (ECI).
- i. As mentioned in step 5 above, to use the Baicells CloudCore make sure the PLMN = 314030 and the MME IP addresses = 10.3.0.9 and 10.5.0.9.

NOTE: This field will not appear in HaloB mode.

- j. S1 Connection Mode is set to One or All. This is the connection mode of the S1 interface between the eNB and the core network.

NOTE: This field will not appear in HaloB mode.

- k. The Tracking Area Code (TAC) field is used to identify a cluster of cell sites. Enter a value between 0 - 65535 for each unique TAC ID in your network.
- l. The RF Status field is used to enable or disable RF transmissions. In closed environments, such as when "bench testing" the eNB, always disable the RF for personal safety.
- m. The Power Modify field allows you to set the output power on each antenna port. This parameter is typically left with the default values, though you may lower it when testing the eNB on the ground. Every 3 dB doubles the power. The eNB output power must stay within regulatory guidelines.

7. **Reboot** the eNB for the settings to take effect. The Reboot function is the last menu in the GUI.

3.6 Check eNB Status in Software

After the eNB is booted up, check that the eNB cell status is reported as active in software using the eNB GUI or your OMC account. Each method is described below.

3.6.1 eNB GUI

Go to the BTS Info > Basic Info window and check the *Cell Status* column, as shown in Figure 3-16. If the status is not reported as active, contact *Baicells support*.

Figure 3-15: Active Status (eNB GUI)

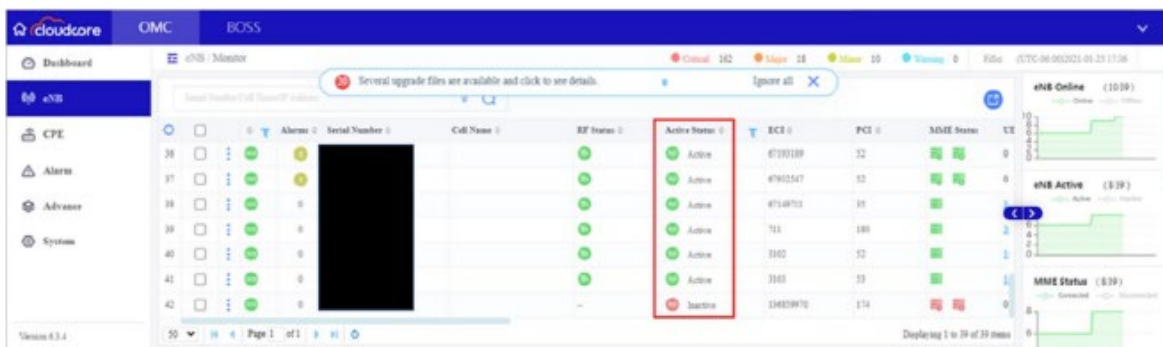


3.6.2 OMC

To check the eNB's status using OMC, follow the steps below.

1. Open a Web browser, and enter the CloudCore address:
<https://cloudcore.cloudapp.net/cloudcore/>
2. Go to eNB > Monitor, and check the *Active Status* field as shown in Figure 3-16. If the status is not reported as active, contact Baicells support.

Figure 3-15: Active Status (OMC)



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.



ISED 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.

Le présent appareil est conforme aux CNR d' Innovation, Science et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

- (1) l'appareil ne doit pas produire de brouillage, et
- (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

The antenna(s) used for this transmitter must be installed to provide a separation distance of at least 30 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.