

# **Nova-227 OD 2x250mW TDD eNodeB Installation Guide**

August 2018

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## About This Document

This document is intended for personnel who will be installing the Baicells Nova-227 Outdoor 2\*250mW Time Division Duplexing (TDD) eNodeB (eNB). The information includes preparation of installation tools and materials, guidance on cell site location and other considerations, and procedures for properly installing the eNB. Please be advised that only personnel with the appropriate electrical skills and experience should install this device.

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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
31-Aug-2018	V1.4	Updated GUIs	NA	Sharon Redfoot
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13-Sep-2017	V1.0	Initial China IG	Yang Yanan	

## Related Documents

Other Baicells technical documents may be found on the Baicells support website (see Contact Us). Following is a list of related documents:

UE – Gen 1	Atom 5dBi Indoor CPE User Manual
	Atom 11dBi Outdoor CPE User Manual
	Atom 19.5dBi Outdoor CPE User Manual
UE – Gen 2	Atom ID04/06-3.5/6.5 & ID06-6.5 User Manual
	Atom OD04/06-14/19.5 User Manual
eNB – Gen 1	Nova 1W ENB Installation Guide
	Nova 1W Quick Start Guide
	Nova 10W ENB Installation Guide
	Nova 10W Quick Start Guide
eNB – Gen 2	Nova-227 Outdoor 2x250mW TDD eNB Installation Guide (this document)
	Nova-227 Quick Start Guide
	Nova-233 Outdoor 2x1WG2 FDD-TDD eNB Installation Guide
	Nova-233 Quick Start Guide
	Nova-243 Outdoor 2x10WG2 FDD-TDD eNB Installation Guide
	Nova-243 Quick Start Guide (forthcoming)
	Nova-436 Outdoor 4x1W CCA TDD eNB Installation Guide
	Nova-436 Quick Start Guide
	Nova-446 Outdoor 4x10W FDD eNB Installation Guide (forthcoming)
	Nova-446 Quick Start Guide (forthcoming)
	elfcell-220 Indoor 2x50mW FDD eNB Installation Guide (forthcoming)
	elfcell-220 Quick Start Guide (forthcoming)
	NeutralCell Indoor Multi FDD-TDD Small Cell Installation Guide (forthcoming)
	NeutralCell Quick Start Guide (forthcoming)
	Neutrino-224 Indoor 2x125mW FDD-TDD eNB Installation Guide (forthcoming)
	Neutrino-224 Quick Start Guide (forthcoming)
	SolarCell Outdoor Solution Installation Guide (forthcoming)
	SolarCell Quick Start Guide (forthcoming)
	Spectra LTE-U Outdoor 2x500mW FDD eNB Installation Guide (forthcoming)
Spectra LTE-U Quick Start Guide (forthcoming)	
System, CloudCore, OAM	Baicells Configuration & Network Administration Guide
	Baicells Handoff Configuration Guidelines (Beta trial)
	Baicells BOSS API Manual
	Baicells Operation, Maintenance, & Troubleshooting Guide (forthcoming)
	Baicells Enterprise EPC Deployment Guide (forthcoming)
	Baicells Enterprise EPC User Guide (forthcoming)
Baicells HaloB User Guide	

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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.



**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** Installation of the equipment 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** In order 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 Nova-227 Outdoor 2\*250mW Time Division Duplexing (TDD) eNodeB (eNB) is a high-performing outdoor micro base station that enables wired and wireless broadband access to 3G TDD Long-Term Evolution (LTE) backbone networks. The Nova eNB makes use of the current LTE transmission resources to reduce the operator's investment in providing low-cost, enhanced coverage. Each 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.

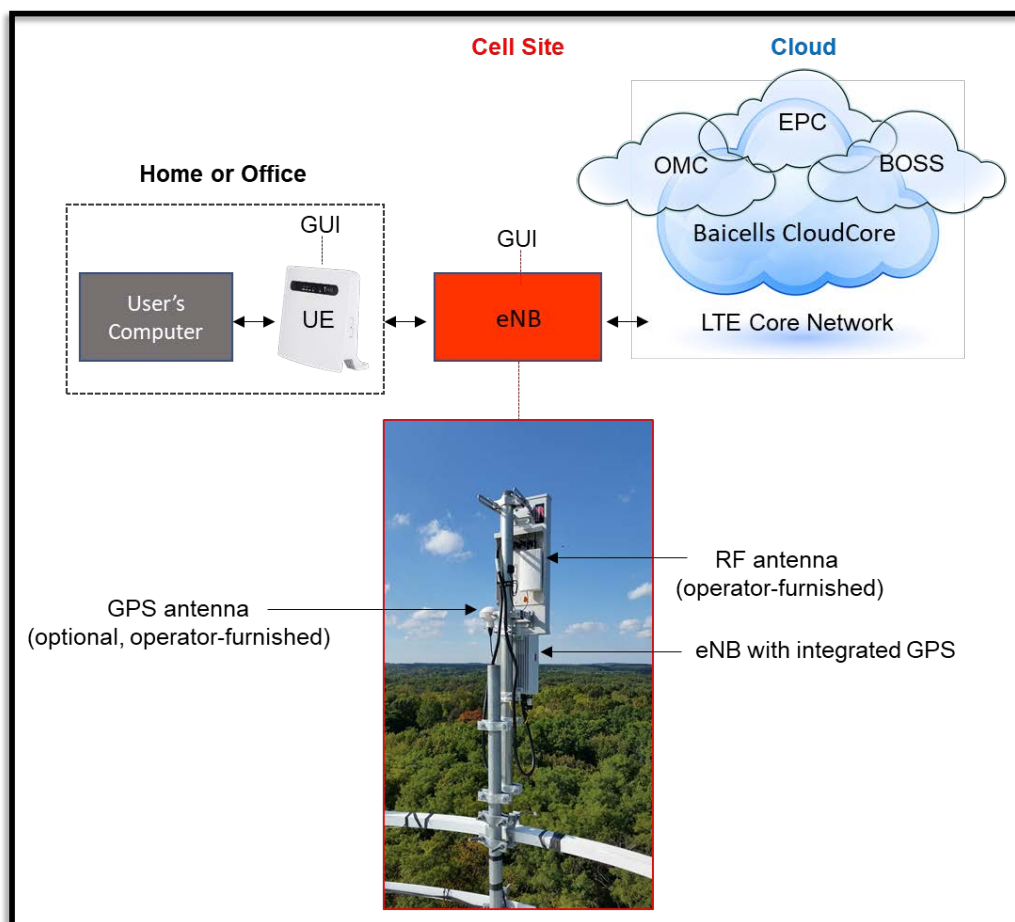
The eNB is a component of the operator's cell site and includes an integrated Global Positioning System (GPS). The operator selects and provides one omni or directional Radio Frequency (RF) antenna to install with each eNB. Optionally, the operator may install external GPS antennas with each eNB.

Each eNB comes pre-configured so that installation is simplified and connection to the core network is plug-and-play. 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 Software-as-a-Service (SAAS) solution called CloudCore. CloudCore, also referred to as BaiCloud, includes an Operations Management Console (OMC) for managing multiple sites across the network and a Business and Operations Support System (BOSS) for subscriber management. Soon, CloudCore will include an Evolved Packet Core (EPC) module for high-speed packet processing and high-quality mobile broadband services. The EPC module is currently under field testing.

Figure 1-1 illustrates the system architecture of the Baicells broadband wireless access solution. In the photo, the eNB shown is an earlier version eNB unit.

Figure 1-1: Example Baicells System Architecture



## 1.2 Features

Key features of the Nova-227 eNB include the following. Front and side drawings of Nova-227 are shown in Figure 1-2.

- Supports standard LTE TDD bands 38, 39, 40, 41, 42, 43, and 48
- Integrated design of baseband and RF processing, saving cost and optimizing power
- Any IP based backhaul can be used, including public transmission
- Throughput up to 112 Mbps downlink (DL) and as much as 20 Mbps uplink (UL). Refer to technical specifications in [Appendix A](#).
- Flexible 2:2 and 1:3 UL to DL transmission ratio
- 96 concurrent users
- 10 MHz and 20 MHz operation bandwidth
- Internal antenna and GPS
- PoE+ power supply, requiring only one Ethernet cable for power and data transmission
- Security services to protect against risk and illegal intrusion




Figure 1-2: Nova-227 eNB



## 2 Out-of-Box Audit

Before opening the box, check to see if the outer packaging is damaged or wet. If it is, or if any items inside are missing or damaged, report the issue to the supplier within 10 days. Table 2-1 is a shipping list showing the quantity of each item you should receive.

**Table 2-1: Shipping List**

Item	Qty	Description	Photograph of Item
<b>Nova-227 eNodeB (eNB)</b>	1	This is a Nova-227 eNB. Check the tag on the unit to ensure you received the correct model.	
<b>Mounting Bracket</b>	1	Attach to eNB	
<b>Integrated Bracket for Pole or Wall</b>	1	Used to attach the eNB to a pole or on a wall	
<b>U-Shape Clamp</b>	1	Used for pole mount	
<b>Omega</b>	1	Used for pole mount	
<b>Screw Package</b>	1	M6*12 combined screw * 8 M8 hex nut * 2	
<b>PoE Power Adaptor</b>	1	-	
<b>Power Cable</b>	1	3.3 ft (1 meter) in length	
<b>Ground Terminal</b>	1	Used for making the ground cable	
<b>Warranty</b>	1	Printed document	
<b>Certification</b>	1	Printed document	
<b>Quick Start Guide</b>	1	Printed document	

## 3 Installation Preparation

### 3.1 Personnel

Installing the eNodeB (eNB) on a tower, building, or other structure may require at least two people or a tower crew. Installation personnel should follow standard safety precautions concerning height, electricity, and other regulations. Baicells recommends that installation personnel review this entire installation guide prior to beginning the installation.

### 3.2 Operator Network Design Plan

Installers should refer to the operator's network design plan for information about specific network components, IP addressing, radio frequency (RF) coverage goals for the specific cell site, and initial configuration settings.

Each cell site may be unique in terms of the type and number of components to install, the coverage area, the user requirements, and so forth. Clearly identify the structure on which the eNB equipment will be installed, the intended height where the antenna and eNB will be attached, the degree of antenna down tilt, and other necessary specifications that may impact the success of the installation.











### 3.3 Materials and Tools

Tables 3-1 and 3-2 describe the materials and tools required during the installation. Materials may be purchased through Baicells or through an authorized supplier: <https://na.Baicells.com/where-to-buy/>. Match the frequency range of the antenna with the eNB. Consult [regulatory rules](#) concerning output power specific to your location.

**Table 3-1: Materials**

Item	Description
<b>Ethernet Cable</b>	Outdoor CAT6 Shorter than 330 feet (100 meters)
<b>Ground Cable</b>	16mm <sup>2</sup> diameter yellow-green wire, minimum 14AWG

**Table 3-2: Operator-Supplied Tools**

				
Level bar	Marking pen	Knife	Pliers	Wrench
				
Percussion drill and drill heads	Hammer	Cross screw driver	Cable vice (crimper)	Tape measure
				
5mm L-shaped Allen wrench	Torx screwdriver	T7 screwdriver head	Cable Stripper	

### 3.4 Software

As part of finishing the eNB installation process, you will need a computer to log in and verify that the eNB status is reported as active by:

- Using a local Ethernet connection to the eNB or a Web browser to access the eNB GUI client application; or
- Accessing the internet to reach the cloud-based OMC application.

### 3.5 Form Factor

The Nova-227 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 3-1 shows the side LED indicators and interface. The LEDs are explained in Table 3-3, and the interface is described in Table 3-4.

Figure 3-1: Front and Side of Nova-227



Table 3-3: 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 alarm
		OFF	No alarm

Table 3-4: Interface

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

## 3.6 Location and 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. Refer to the technical specifications in [Appendix A](#).

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.

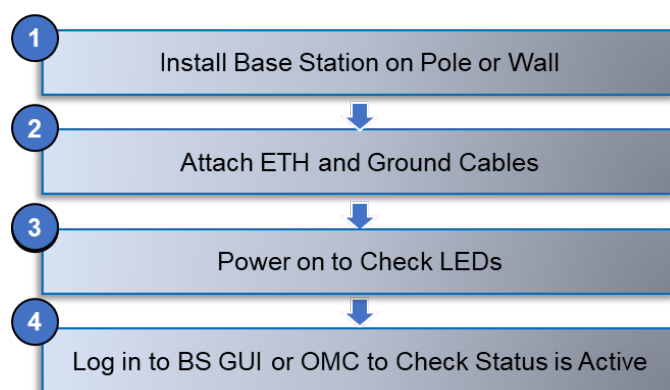
## 4 Installation

Some cell site structures may have existing frameworks for attaching the eNodeB (eNB) and antenna. For purposes of explaining the installation procedure, this section assumes the eNB will be installed on a support pole or on a wall.

### 4.1 Process Overview

Figure 4-1 provides an overview of the installation process.

**Figure 4-1: Installation Process Overview**



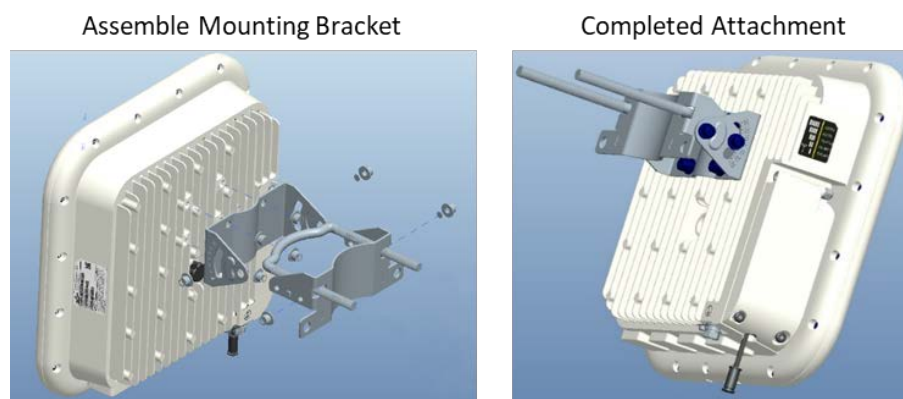
### 4.2 Install eNB on Pole or Wall

#### 4.2.1 Install on Pole

Check to ensure the diameter of the pole is in the range of 1.6-3.9 inches (40-100 mm). Follow the steps below to install the eNB on a pole.

1. Assemble the mounting bracket, and attach and fasten the screws (Figure 4-2).

**Figure 4-2: Mounting Bracket**



2. Attach the eNB to the pole, passing the omega through the threaded rods and then loosely fastening the two nuts (Figure 4-3).

**Figure 4-3: Pole Attachment**



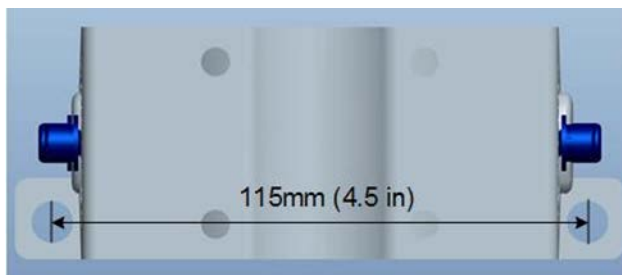
3. Adjust the eNB to the proper angle based on RF coverage goals for the site, and tighten the screws.

## 4.2.2 Install on Wall

Ensure that the wall can bear at least 4 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 locations (Figure 4-4).

**Figure 4-4: Mark Drilling Locations**



2. Drill four .5 in/12mm diameter and 3.2 in/80mm deep holes in the wall at the marked locations.
3. Check the up/down direction of the installation rack, 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, and adjust it to the proper angle based on RF coverage goals for the site.



## 4.3 Connect 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 4-5) using M4 cross screwdriver, and open the wiring cavity cover.

**Figure 4-5: Wiring Cavity**

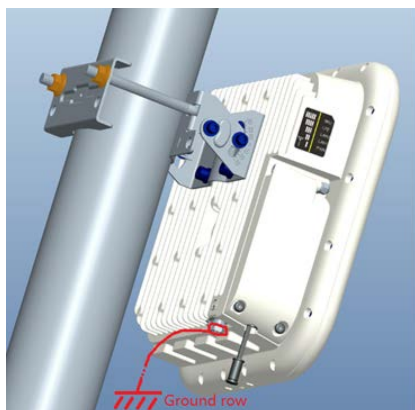


2. Connect the Ethernet cable to the **ETH** interface in the wiring cavity.
3. Lay Ethernet cable along the wire groove, stretching it outside the wiring cavity.
4. The other end of the Ethernet cable connects to the PoE power adaptor.

## 4.4 Connect Ground Cable

Prepare the grounding cable according to the actual requirements of the specific site. Refer to specifications given in [section 3.3 Materials and Tools](#). The grounding screw is located on the bottom of the eNB, as shown in Figure 4-6. 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.

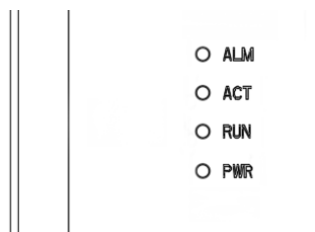
**Figure 4-5: Grounding Screw**



## 4.5 Power on to Check LEDs

Power on the eNB and check that the LED indicators are lighting as expected, per Figure 4-6. Refer to the LED descriptions in [Table 3-3](#).

Figure 4-6: LEDs



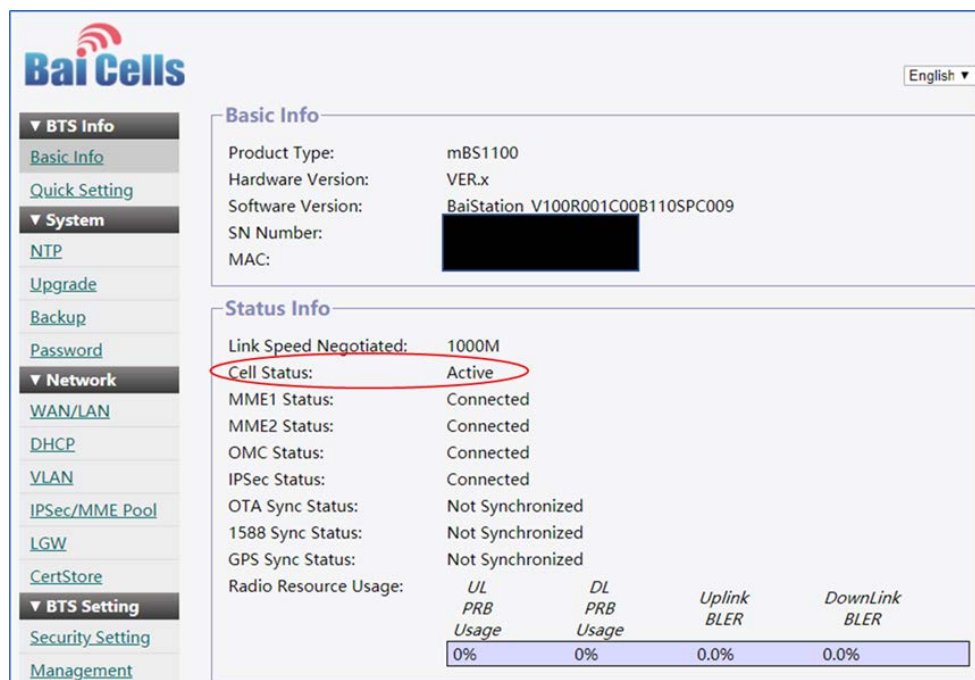
## 4.6 Check eNB Status in Software

The Baicells eNBs are designed to be plug-and-play and, therefore, arrive pre-configured. You will need to log in either to the local or remote eNB GUI (section 4.6.1) or the cloud-based OMC (section 4.6.2) to ensure the eNB status is reported as active.

### 4.6.1 eNB GUI

Go to <http://192.168.150.1>, using username **admin**, password **admin**. Go to **Status Info** as shown in Figure 4-7. If the status is not reported as active, contact [Baicells support](#).

Figure 4-7: Web GUI eNB Status



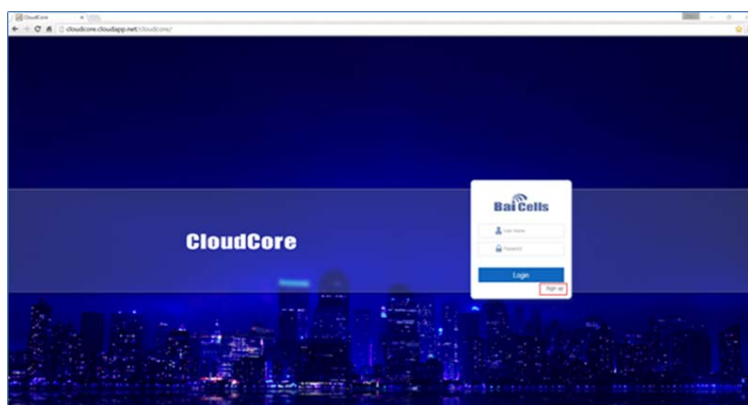
For additional information concerning the configuration GUI, please refer to the *Baicells Configuration and Network Administration Guide* on the Baicells website.

## 4.6.2 OMC

If you have not already set up a CloudCore account, follow the instructions below to request an account:

1. Open a web browser, and enter the CloudCore address (Figure 4-8):  
<https://cloudcore.cloudapp.net/cloudcore/>

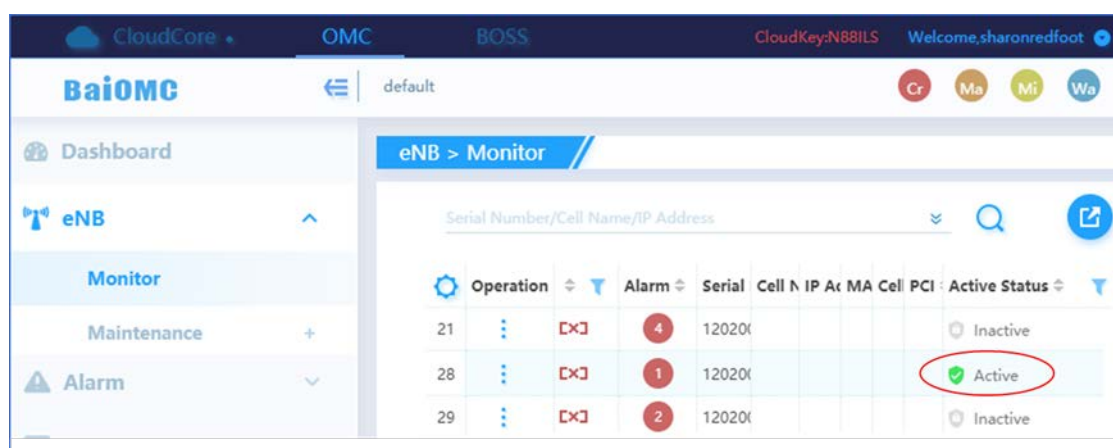
Figure 4-8: CloudCore Login Page



2. Click on the “Sign up” button.
3. Complete the mandatory fields, and click “Sign up”.
4. You will receive an email from CloudCore. In the email, click on the CloudCore link to go to the login page. Enter your login user name (email address) and a password to authenticate. You are now ready to start using CloudCore!

Go to **eNB > Monitor > Active Status** as shown in Figure 4-9. If the status is not reported as active, contact Baicells support.

Figure 4-9: OMC ENB Status



For additional information concerning the configuration GUI, please refer to the *Baicells Configuration and Network Administration Guide* on the Baicells website.

## Appendix A: Technical Specifications

### Hardware Specifications

Item	Description
LTE Mode	TDD
Frequency Bands	38/39/40/41/42/43/48
Channel Bandwidth	10/20 MHz
Output Power	24 dBm / antenna
Power Supply	PoE+ IEEE 802.3at
Receive Sensitivity	Bands 38/39/40/41: -101 dBm Bands 42/43/48: -100 dBm
Synchronization Mode	GPS
Backhaul Mode	One RJ-45 Ethernet backhaul interface (1 GE)
MIMO	DL: 2x2
Dimensions (H/W/D)	9.8 x 9.8 x 3.2 in 248 x 248 x 80 mm
Installation Method	Pole or wall mount
Antenna	13 dBi internal high-gain antenna <ul style="list-style-type: none"> <li>• Horizontal beamwidth: 65°</li> <li>• Vertical beamwidth: 20°</li> <li>• Polarization: ±45°</li> </ul>
Antenna Gain	13.5 ±0.5 dBi
Overall Power	< 20 W
Weight	About 4.4 lbs (2.0 kg)

Note 1: Different models support different frequency bands.

Note 2: The test method of receiving sensitivity is proposed by the 3GPP TS 36.104, which is based on 5 MHz bandwidth, FRC A1-3 in Annex A.1 (QPSK, R=1/3, 25RB) standard.

### Software Specifications

Item	Description
LTE Standard	3GPP Release 9
Peak Rate	20 MHz: SA1 – DL 80 Mbps, UL 20 Mbps SA2 – DL 112 Mbps, UL 14 Mbps 10 MHz: SA1 – DL 40 Mbps, UL 14 Mbps SA2 – DL 55 Mbps, UL 7 Mbps

Item	Description
User Capacity	96 concurrent users
QoS Control	3GPP standard QCI
Modulation	UL: QPSK, 16QAM, 64QAM DL: QPSK, 16QAM, 64QAM
Voice Solution	CSFB, VoLTE, eSRVCC
Traffic Offload	Local IP Access (LIPA) Selected IP Traffic Offload (SIPTO)
SON	Self-Organizing Network <ul style="list-style-type: none"> <li>Automatic setup</li> <li>Automatic Neighbor Relation (ANR)</li> <li>PCI confliction detection</li> </ul>
RAN Sharing	Supported
Network Management Interface	TR069 interface protocol
MTBF	≥ 150000 hours
MTTR	≤ 1 hour
	Remote maintenance
	Online status management
	Performance statistics
	Fault management
	Local or remote software upgrade
	Logging
	Connectivity diagnosis
	Automatic start and configuration
	Alarm reporting
	KPI recording
	User information tracing
	Signaling trace

## 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
Humidity	5% ~ 95%
Atmospheric Pressure	70 kPa ~ 106 kPa
Ingress Protection Rating	IP66

## Global Part Numbers

pBS2120	Nova-227 250mW eNB, Bands 42/43
pBS11004	Nova-227 250mW eNB, Bands 40/41

## Appendix B: 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 minimum distance 12 inches (30 cm) between the radiator & your body.

### 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.



## Appendix C: FAQs

If you have questions, please check the list of frequently asked questions (FAQs) on the Baicells support website or the Facebook support forum.

- Baicells support website - <https://na.Baicells.com/support/>
- Baicells support forum on Facebook - <https://www.facebook.com/groups/Baicellsoperatorsupportgroup/>