Outdoor 2x20W TDD eNodeB Installation Guide

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1. Overview

1.1 Introduction

LEAX LBS8529 is an outdoor 2x20W eNodeB (eNB) that enables wired and wireless broadband access to Long-Term Evolution (LTE) backhaul networks using Time Division Duplexing (TDD) technology. With its power and LTE intelligence, this eNB has exceptional non-line-of-sight (NLOS) coverage performance (Figure 1-1).

Figure 1-1LBS8529 TDD eNB
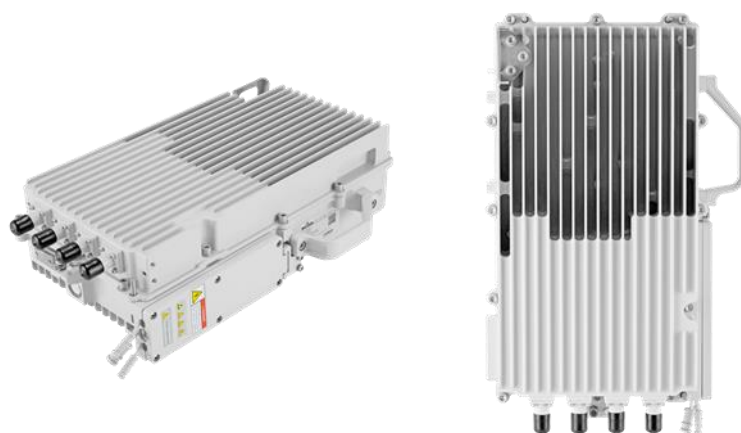
LEAX provides operators with local and Web-based Graphical User Interface (GUI) software applications to configure and manage individual eNBs and User Equipment (UE). Additionally, LEAX offers a cloud-based, centralized Software-as-a-Service (SaaS) solution called CloudCore. CloudCore, or LEAXCloud, includes all of the key LTE Evolved Packet Core (EPC) network functions (Figure 1-2), an Operations Management Console (OMC) for managing multiple sites across the network, and a Business and Operations Support System (BOSS) for subscriber management.

In this document you will find a general description, guidelines, and procedures for installing, entering basic configuration settings, and verifying the operational status of theLBS8529 eNB. For additional information on configuring features beyond the basic settings, please refer to the "*LEAX Configuration Guide for LEAXTRS_3.6*".

Figure 1-2 LTE Network Architecture
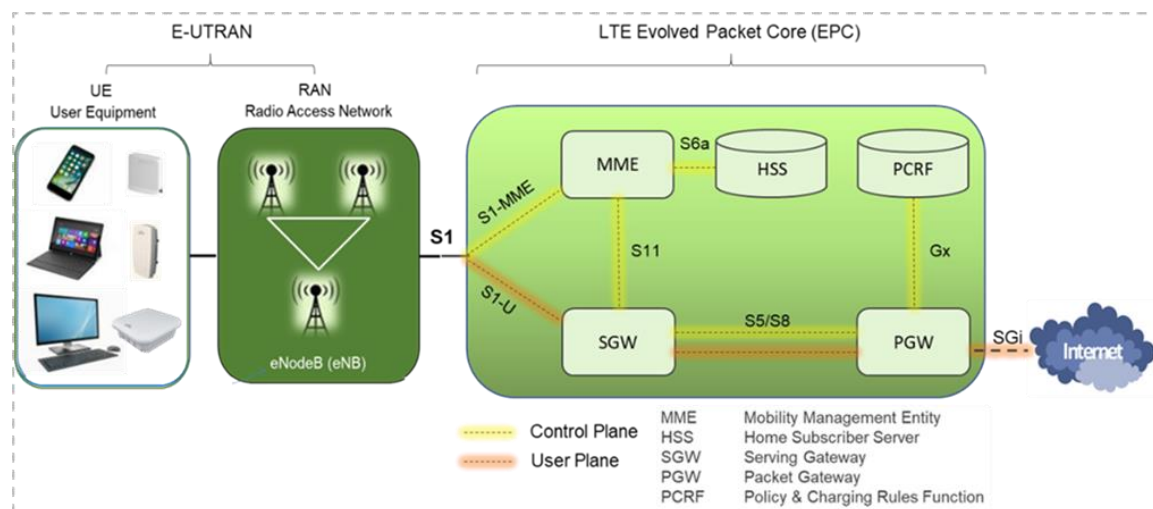
1.2   Features

Following are some of the key LBS8529 features.

- Complies with 3GPP Release 12 standards

- Support 5MHz/10MHz/15MHz/20MHz operation bandwidth.

- Maximum 192 concurrent users total (96 per carrier)

- Attaches to any IP based backhaul, including public transmission protected by Internet Protocol Security (IPSec)

- Support Remote Electric Tilt (RET) function AISG 2.0

- Supports TR-069 network management protocol

- Minimized power consumption to reduce OPEX, can be powered easily by LEAX compact outdoor UPS EPB83521/EPB93531

- Excellent non-line-of-sight (NLOS) coverage performance and extended cell coverage via higher transmission power

- IoT with all standard LTE EPC

- Local and remote Web-based GUI management

1.3 Appearance

TheLBS8529 TDD eNB model is shown in Figure 1-3.

Figure 1-3LBS8529 **TDD** Appearance
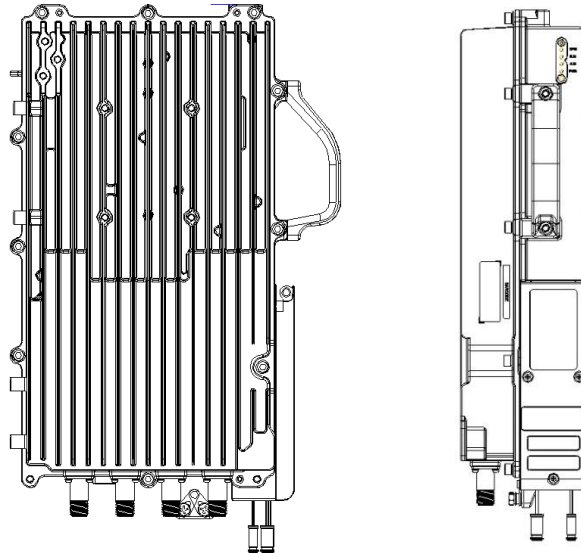
The interfaces and status indicators (LEDs) for theLBS8529 TDD eNB are shown in Figure 1-4. The interfaces are inside a wiring cavity and on the bottom of the unit. The LEDs are on the upper left side. Refer to Table 1-1 for a description of the interfaces and to Table 1-2 for a description of the LEDs.

Figure 1-4LBS8529 **TDD** Interfaces and Indicators

Table 1-1LBS8529 TDD Interfaces

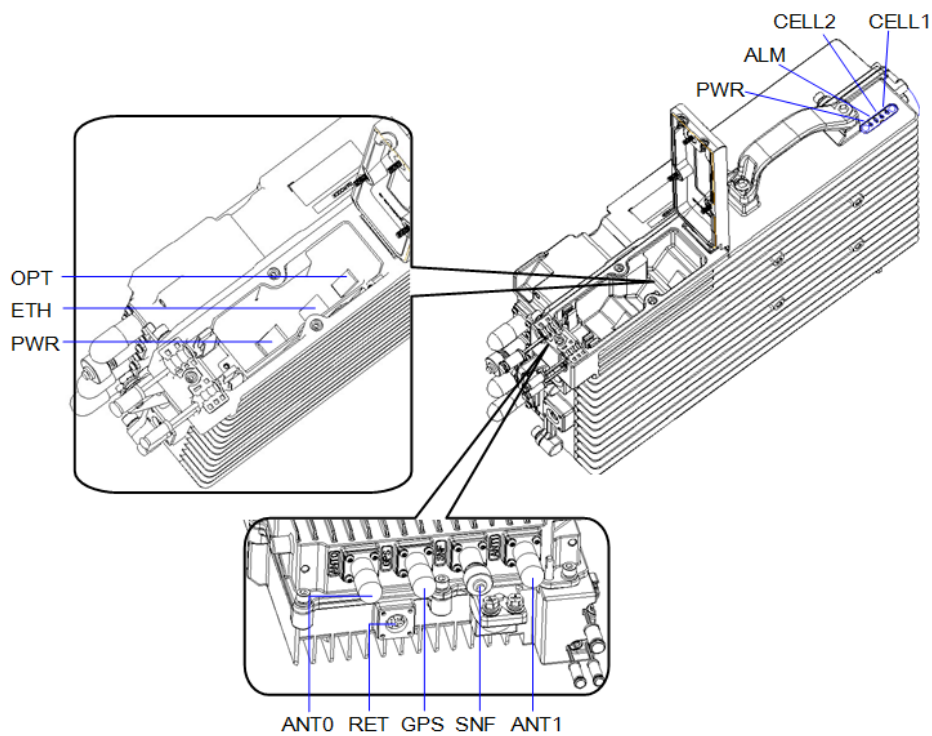| Interface	Description
OPT	Optical interface to external backhaul network
ETH	RJ-45 interface, used for debug or data backhaul.
PWR	Power interface: -54V (-57V to -42V) DC
ANT0	External antenna 0, N-female connector.
RET	Remote electrical tilt interface, compiled with ASIG2.0
GPS	External GPS antenna, N-female connector.
SNF	Sniffer for network listening, N-female connector.
ANT1	External antenna 1, N-female connector.

NOTE: The RET port is not used in North America.

Table 1-2LBS8529 TDD LEDs

LED	Color	Status	Description
CELL1	Green	Fast flash: 0.125s on,0.125s off	CELL 1 is inactivated
CELL1	Green	Slow flash: 1s on,1s off	CELL 1 is activated
CELL2	Green	Fast flash: 0.125s on,0.125s off	CELL 2 is inactivated
CELL2	Green	Slow flash: 1s on,1s off	CELL 2 is activated
ALM	Red	Steady On	(Reserved for future use)
ALM	Red	Fast flash	S1 alarm
ALM	Red	Slow flash	Other alarms
ALM	Red	OFF	(Reserved for future use)
PWR	Green	Steady On	Power On
PWR	Green	OFF	No Power Supply

1.4 Technical Specification

1.4.1 Hardware Specification

Item	Description
LTE Mode	TDD
LTE Bands [a]	48
Channel Bandwidth	5MHz, 10MHz, 15MHz, 20MHz
MAX Output Power	43dBm / channel
Receive Sensitivity [b]	-102 dBm
Synchronization	GPS, 1588v2
Backhaul	One optical (SFP) and one RJ-45 Ethernet interface (1 GE)
MIMO	DL 2 x 2 on each carrier

Item	Description
Dimension (HxWxD)	17.3 x 9.5 x 5.5 inches 440 x 240 x 140 millimeters
Installation Type	Pole or wall mount
Antenna	External high gain antenna, compatible with eNB N-Type connectors
Overall Power	< 200W
Power	-54V (-57V to -42V) DC AC adaptor (multi-national standards)
Weight	26 lbs /12kgs
MTBF	≥ 150000 hours
MTTR	≤ 1 hour

NOTE:

[a] Different models support different frequency band.

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

1.4.2 Software Specification

Item	Description
LTE Standard	3GPP Release 12
Business Capacity	96 concurrent users in single carrier mode 96+96 concurrent users in DC mode
Modulation Mode	UL: QPSK, 16QAM, 64QAM DL: QPSK, 16QAM, 64QAM
Qos	3GPP standard QCI
Voice Solution	VoLTE, Circuit Switched Fallback (CSFB)
Traffic Offload	Local breakout
SON	Self-organizing network: • Automatic setup • Automatic Neighbor Relation (ANR) PCI confliction detection
RAN Sharing	• Multi-Operator Core Network (MOCN)
RET	Supported
Spectrum Scanning	Supported
UL Interference Detection	Supported

Item	Description
Network Mgmt	TR069
Maintenance	Remote/local maintenance, based on SSH protocol
Maintenance	Remote maintenance
	Online status management
	Performance statistics
	Failure management
	Configuration management
	Local or remote software upgrading and loading
	Logging
	Connectivity diagnosis
	Automatic start and configuration
	Alarm reporting
	User information tracing
	Signaling trace

1.4.3 Environment Specification

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% to 95%
Atmospheric Pressure	70kPa to 106kPa
Ingress Protection Rating	IP66
Power interface Lightning Protection	Differential mode: ±10 KA Common mode: ±20 KA

2. Installation Preparation

2.1   Support Materials

In addition to industry standard tools, you will need the materials described in Table 2-1 during the installation. When selecting an RF antenna, be sure to match the frequency range of the antenna with the eNB.

Table 2-1 Supporting Materials

Item	Description
Power cable	The diameter of power cable must be AWG15 or greater (such as AWG14). And the length from the power adaptor's DC end to the eNB must be shorter than 100 meters (~109 yards).
Power plug	To connect the electrical supply.
RF antenna cable	50 ohm feeder
RF antenna	Omni or directional
Optical fiber	Single mode optical fiber
Ethernet cable	Outdoor CAT6/7, shorter than 100 meters (~109 yards)
Ground cable	16mm² diameter yellow-green wire

You will need a computer to connect to the local maintenance terminal (LMT) via the RJ-45 ETH port on the eNB unit. Through the LMT you can access the eNB GUI to enter basic configuration parameters so the eNB can connect to the network and to the LEAX CloudCore.

2.2   Installation Tools

The following standard tools may be needed during the installation.

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

5mm L-shape allen wrench	T7 screwdriver head	Ladder		

2.3 Installation Environment

2.3.1 Location & Environment

In addition to network planning, 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 prone to impounded water, soaking, leakage, or condensation.

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

Table 2-2 Environmental Requirements

Item	Range	Typical value
Temperature	-40°C to 55°C	25°C
Relative humidity (no condensation)	0% to 100%	5% to 95%
Safety voltage	-57V to -42V	-54V

2.4 Lightening & Grounding 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 16mm^2 in diameter.

• In principle, always place the grounding as near as possible to the equipment.

• Connect to a reliable outdoor grounding point (earth) using one ground screw.

• The connection of the grounding points and ground bar need to be tight and reliable. Rustproofing the terminals, e.g., with anti-oxidant 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 2-1).

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.
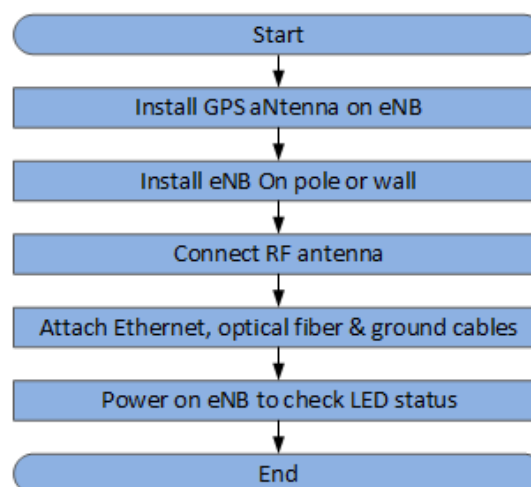
Figure 2-1 Weatherproofing

3. Installation

3.1   Overview

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

Figure 3-1 Installation Process

3.2 Install GPS Antenna

Read the following GPS antenna installation requirements before installing it on the eNB.

- No major blocking from buildings in the vicinity. Make sure the space atop is at least 45 degrees unblocked by any buildings.

- Avoid installing the GPS antenna in the vicinity of any other transmitting and receiving devices, to avoid interference.

- The GPS antenna should be installed within 45 degrees to the lightning rod.

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 3-2).

Figure 3-2 GPS Antenna Installation
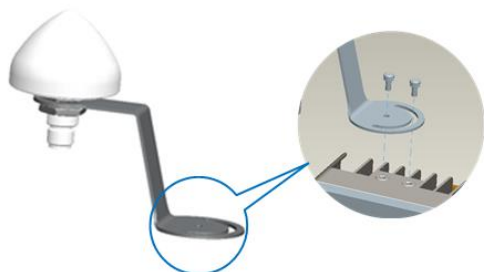
3.3 Install eNB on Pole or Wall

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

Check to ensure the diameter of the pole is in the range of 1.6-3.9 inches (40-100 mm). The position of the eNB on the pole should be at least 79 inches (200 cm) in height. Follow the steps below to install the eNB on a pole.

1. Unscrew the 4 screws of the assembled bracket. Slide the two omega clamps to the left, and then turn them up or down.
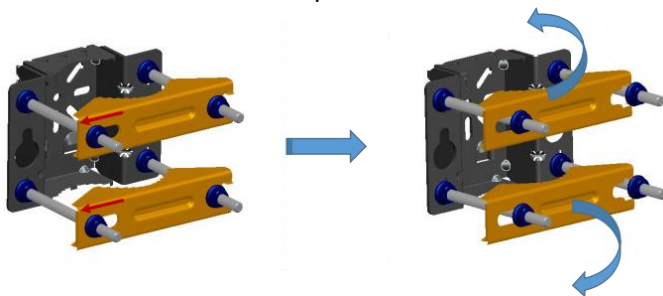
2. Attach the bracket to the pole, considering the height requirements described above. Fit the threaded rod of the bracket to the pole, and then turn the 2 clamps to the proper position. Fasten with the 4 screws.
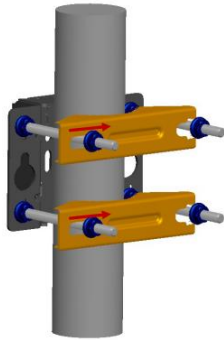
3. Using the 2 pins on the bracket on the back of the eNB, attach the eNB to the mounting bracket on the pole. Push the eNB until the hook is firmly attached to the bracket.
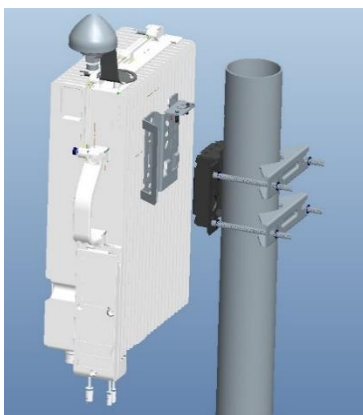
4. Tighten the screws on the top of the bracket using a cross screwdriver to complete the installation.
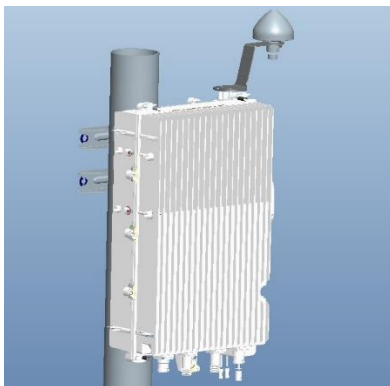
5. Proceed to "3.5 Connect Cable".

3.4   Install on Wall

Ensure that the wall can bear at least 4 times the weight of the eNB. Follow the steps below to install theLBS8529 eNB on the wall.

1. Take apart the assembled installation bracket.

2. Fit the installation bracket on the wall, with the arrow pointing up. Mark the drilling locations using a pencil or marker.

3. Drill two .4in/10mm diameter by 2.8in/70mm deep holes in the wall at the marked locations.

4. Insert the expansion pipes.

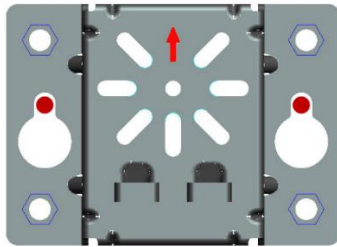5. Check the up/down direction of the installation bracket, and then fix it to the wall with M8 * 80 expansion screws.

6. Fix the eNB to the bracket, and tighten the screws on the top of the bracket using a cross screwdriver.

7. Proceed to "3.5 Connect Cable".

3.5   Connect Cables

3.5.1 Cable Laying Requirements

General requirements:

•   Bending radius of feeder cable: 7/8" > 250mm, 4/5" > 380mm.

•   Bending radius of jumper cable: 1/4" > 35mm, 1/2" (super soft) > 50mm, 1/2" (ordinary) > 127mm.

•   Bending radius of power cable and grounding cable: > tripled of the diameter of the cable.

•   The minimum bend radius of the optical fiber is the 20 times the diameter of the optical fiber.

•   Bind the cables according the type of the cable, intertwining and crossing are forbidden.

•   An identification label should be attached after the cable is laid.

Optical fiber laying requirements:

•   Avoid circling and twisting during the laying.

•   Avoid binding on a turn.

- Avoid pulling and weighing down the optical fiber.

- The redundant optical fiber must enwind the dedicated device.

Grounding laying requirements:

- The grounding cable must connect to the grounding point.

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

3.5.2 Connect GPS Antenna Cable

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. Take another cold shrink tube, and pass through the GPS jumper.

5. Connect the other end of the GPS jumper to **GPS** interface on the eNB.

6. Push the cold shrink tube to the GPS port, and pull out the strip.

3.5.3 Connect RF Cables

1. Open the dust caps of the **ANT0** and **ANT1** interfaces.

2. Insert RF cables into cold shrink tubes.

3. Connect RF cables to the **ANT0** and **ANT1** interfaces on the eNB, and tighten them with wrench to 12-15 in-lbs or 1.4-1.7 NM torque.

4. Push the cold shrink tube to the top joint and pull out the strip.

5. Take another cold shrink tubes, and pass through the RF cables.

6. Connect the other end of the RF cables to the external antenna.

7. Push the cold shrink tube to the antenna connector, and pull out the strip.

3.5.4 Connect WAN Interface Cable (Optical Fiber)

1. Unscrew the 3 screws on the cover of the eNB's wiring cavity using M4 cross screwdriver. Open the wiring cavity.

2. Connect the optical fiber to **OPT** interface in the wiring cavity.

3. Lay the optical fiber along the wire groove, and stretch out the wiring cavity from **OPT** hole.

The redundant fiber should enwind neatly.

3.5.5 Connect Ethernet Cable

1. Connect the Ethernet cable to **ETH** interface in the wiring cavity.

2. Lay the Ethernet cable along the wire groove, and stretch out the wiring cavity from **ETH** hole.

3.5.6 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 .47in/12mm insulating layer with a wire stripper. The power cord length should be kept below 330 ft/100m. 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. Assemble the power terminal.

    The power terminal will be installed on the end of the output direction. Refer to Figure 3-3 to connect the live wire and neutral wire.

    Figure 3-3 Power Terminal

3. Connect the power cable to the **PWR** interface in the wiring cavity.

4. The power cable lays along the lint slot, and stretch out the wiring cavity from the PWR hole.

5. 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.

6. After the cable connection is complete in the wiring cavity, tighten the screws on the cover to close the wiring cavity using M4 cross screwdriver.

3.5.7 Connect Ground Cable

Prepare the grounding cable according to the actual measurements and requirements of the specific installation site. TheLBS8529 eNB has two grounding screws located on the bottom of the unit (Figure 3-4.). Follow the steps below the figure to connect the ground cable.

Figure 3-4 Grounding Screws
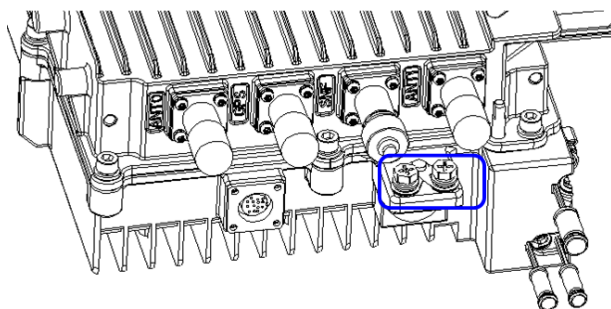
 NOTE: All Nova eNBs use a floating ground on the power line.

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

2. Repeat step 1 for the second grounding screw.

3. Once the eNB is installed at the outdoor location, the other end of the ground cable needs to connect to a good grounding point.

3.6 Power on to Check LED Status

Power on the eNB, and wait a few minutes while the eNB boots up. Per the previous Figure 1-4 and Table 1-2 in "1.3 Appearance", check that the LED indicators are lighting as expected: CELL1 and CELL2 are slow flashing green; Power is steady green, and the Alarm LED has no red light.

FCC ID: 2AVFNLBS8529

FCC compliance statement

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.

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. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

-- Reorient or relocate the receiving antenna.

-- Increase the separation between the equipment and receiver.

-- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

-- Consult the dealer or an experienced radio/TV technician for help.

FCC Radiation Exposure statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 90cm between the radiator and your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

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.

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