

Neutrino430

Indoor 4x250mW eNB

Installation Guide

for BaiBLQ_5.0.x



About This Document

This document describes the installation of the Baicells Neutrino430 eNodeB before configuration. It guides the customer how to install the eNodeB.

This document is suitable for software version BaiBLQ_5.0.x. The product model is pBS31xxx series.

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1. Product Overview

1.1 Introduction

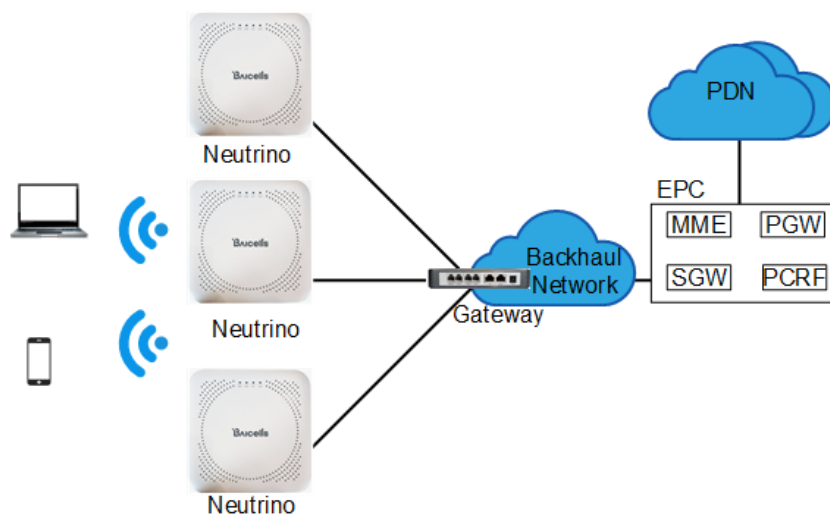
The Baicells Neutrino430 is an advanced two-carrier indoor eNodeB (eNB) compliant with 3GPP LTE TDD technology. This 4x250mW eNB operates in either Carrier Aggregation (CA) mode or Dual Carrier (DC) mode.

In CA mode, Neutrino430 supports 2CC (2 component carriers) DL/UL CA. 2CC DL/UL CA doubles DL/UL peak throughput comparing to that of a single carrier. By aggregating 2 separated spectrum resources into a virtual contiguous spectrum resource. In DC mode, each carrier is treated as an independent cell, supporting 128+128 users, with each cell supporting 5, 10, 15, or 20MHz bandwidth. Using a Neutrino430 in DC mode simplifies and streamlines the deployment of split sectors.

In addition, HaloB (an embedded EPC option) is available on the Neutrino430 as part of the basic software. The Baicells patented HaloB solution migrates the necessary core network functions to the eNB.

The network structure of Neutrino430 access to LTE network is shown in Figure 1-1.

Figure 1-1 Network Structure



1.2 Highlights

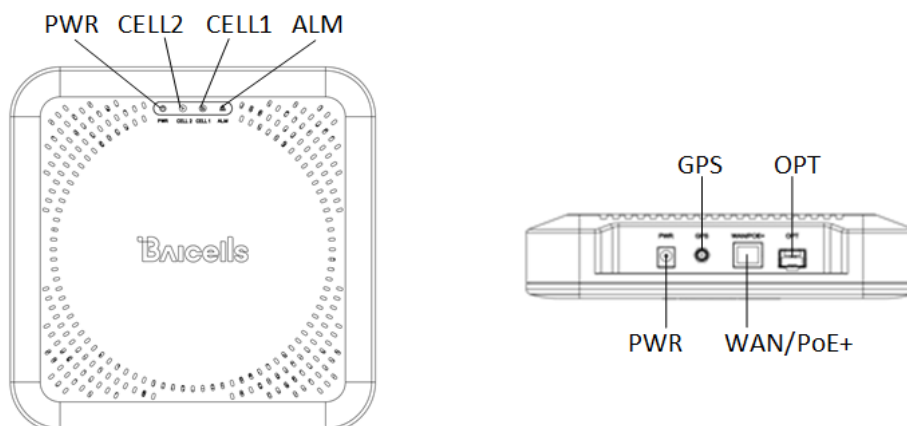
Following are some of the key Neutrino highlights.

- Standard LTE TDD Band 48
- GUI-based local and remote Web management
- Compact, all-in-one design of internal antenna
- Excellent Non-Line-of-Sight (NLOS) coverage
- Peak rate: Up to DL 290Mbps and UL 70Mbps with 2x20MHz bandwidth
- 2CC DL/UL CA improves the spectrum efficiency of fragmented spectrum resources.
- Suitable for private and public deployments; any IP based backhaul can be used, including public transmission protected by Internet Protocol Security (IPsec)
- 128 RRC connected users per carrier, 128+128 in DC mode; upgradeable to higher capacity in future releases
- Integrated small cell form factor for quick and easy installation
- Configured out of the box to work with Baicells Cloud Core
- HaloB as embedded EPC solution
- Supports Citizens Broadband Radio Service (CBRS) with proxy/direct Spectrum Access System (SAS)
- Supports Multi Operator Radio Access Network (MORAN)
- Support Inter Cell Interference Coordination (ICIC) with static
- Plug-and-play with Self-Organizing Network (SON) capabilities
- Inter operation with all standard LTE Evolved Packet Core (EPC)
- Support TR-069 network management interface

1.3 Appearance

The Neutrino430 appearance and interfaces are shown in Figure 1-2.

Figure 1-2 Neutrino430 Appearance and Interfaces



The Neutrino430 interfaces are described in Table 1-1.

Table 1-1 Neutrino430 Interface Description

Interface Name	Description
PWR	12VDC, 2A power supply interface
GPS	(Optional) external GPS antenna, SMA female.
WAN/PoE+	Gigabit Ethernet and PoE+ interface, used for debug and power supply.
OPT	Optical fiber interface, connect to external transmission network, used for data backhaul.

The Neutrino430 interface indicators are described in Table 1-2.

Table 1-2 Neutrino430 Interface Indicators

Indicator	Color	Status	Description
PWR	Green	Steady On	Power On
		OFF	No Power Supply
CELL2	Green	Steady On	Power On
		Fast flash: 0.125s on, 0.125s off	Data is transmitting.

		Slow flash: 1s on,1s off	The cell has been activated.
CELL1	Green	Steady On	Power On
		Fast flash: 0.125s on,0.125s off	Data is transmitting.
		Slow flash: 1s on,1s off	The cell has been activated.
ALM	Red	Steady On	Reserved
		Fast flash: 0.125s on,0.125s off	S1 alarm
		Slow flash: 1s on,1s off	Other alarms

1.4 Technical Specification

1.4.1 Technology

Item	Description
Standard	LTE TDD RAN (3GPP R15 compliant)
TDD UL/DL Configuration	1, 2, 6 (with Special Subframe Configuration 7)
Frequency Band	B48 (3550 MHz – 3700 MHz)
Channel Bandwidth	SC: 5/10/15/20 MHz CA: 40 MHz as maximum aggravated bandwidth
Multiplexing	MIMO: 2x2 (DL)
Security	Radio: SNOW 3G/AES-128 Backhaul: IPsec (X.509 AES-128, AES-256, SHA-128, SHA-256)

1.4.2 Interface

Item	Description
Ethernet Interface	1 optical (SFP) and 1 RJ-45 Ethernet interface (1 GE)
Power Supply	12VDC 2A, PoE+/48V 0.6A, comply with IEEE 802.3at standard
Protocols Used	IPv4/IPv6 (Dual Stack), UDP, TCP, ICMP, SNMPv2c, NTP, SSH, IPsec, TR-069, HTTP/HTTPS, 1588v2, DHCP
Network Management	IPv4/IPv6, HTTP/HTTPS, SNMPv2c, TR-069, SSH, Embedded EPC
VLAN/VxLAN	802.1Q/VxLAN
LED Indicators	4 x status LED CELL1/CELL2/ALM/PWR

1.4.3 Performance

Item	Description		
Peak Data Rate (DC)	2x20 MHz	DL (Mbps)	UL (Mbps)
	UL/DL Config 1	2x105	2x28
	UL/DL Config 2	2x145	2x14
	UL/DL Config 6	2x85	2x35
	2x10 MHz	DL (Mbps)	UL (Mbps)
	UL/DL Config 1	2x51	2x14
	UL/DL Config 2	2x70	2x7
	UL/DL Config 6	2x42	2x17
Peak Data Rate (CA)	2x20 MHz	DL (Mbps)	UL (Mbps)
	UL/DL Config 1	210	56

Item	Description		
	UL/DL Config 2	290	28
	UL/DL Config 6	170	70
	2x10 MHz	DL (Mbps)	UL (Mbps)
	UL/DL Config 1	102	28
	UL/DL Config 2	140	14
	UL/DL Config 6	84	34
	20MHz + 10MHz	DL (Mbps)	UL (Mbps)
	UL/DL Config 1	156	42
	UL/DL Config 2	215	21
	UL/DL Config 6	127	52
	20MHz + 15MHz	DL (Mbps)	UL (Mbps)
	UL/DL Config 1	182	49
	UL/DL Config 2	250	24
	UL/DL Config 6	148	61
User Capacity	Up to 128 RRC connected users per cell (4 users per TTI) • SC/CA: 128 RRC connected users • DC: 128+128 RRC connected users		
Latency	30 milliseconds		
Receive Sensitivity	-100 dBm (per channel)		
Modulation	MCS0 (QPSK) to MCS27 (256QAM) DL: QPSK, 16QAM, 64QAM, 256QAM UL: QPSK, 16QAM, 64QAM		
Transmit Power Range	0 to 24 dBm per channel (combined +30dBm, configurable) (1 dB interval)		

Item	Description
Quality of Service	Nine-level priority indicated by QoS Class Identifiers (QCI)
ARQ/HARQ	Supported
Synchronization	GPS (built-in), 1588v2

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

1.4.4 Modulation Levels (Adaptive)

MCS	Modulation Scheme	RSRP (dBm)
0 -4	QPSK	$-120 \leq \text{RSRP} < -110$
5 - 9	16QAM	$-110 \leq \text{RSRP} < -100$
10 - 19	64QAM	$-100 \leq \text{RSRP} < -85$
20 - 27	256QAM	$\text{RSRP} \geq -85$

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

1.4.5 Features

Item	Description
Voice	VoLTE*
NSA	Supported
SON	Self-Organizing Network - Automatic setup - Automatic Neighbor Relation (ANR) - PCI confliction detection
EPC	HaloB (Embedded EPC)
Traffic Offload	Local breakout
Layer 2 Support	Transparent Bridge Mode

Item	Description
Maintenance	• Local/Remote Web maintenance • Online status management • Performance statistics • Fault management • Local/Remote software upgrade • Logging • Connectivity diagnosis • Automatic start and configuration • Alarm reporting • User information tracing • Signaling trace

* Planned for future release

1.4.6 Link Budget

Item	Description
RF Antenna	3dBi built-in omni antenna
GPS Antenna Gain	External GPS antenna, SMA connector
Maximum EIRP	33 ± 1 dBm
Power Control	UL Open-loop/Closed-loop Power Control, DL Power Allocation (3GPP TS 36.213 compliant)

1.4.7 Physical

Item	Description
MTBF	≥ 150000 hours
MTTR	≤ 1 hour
Operating Temperature	23°F to 113°F / -5°C to 45°C

Item	Description
Storage Temperature	14°F to 122°F / -10°C to 50°C
Humidity	5% to 95% RH
Atmospheric Pressure	70 kPa to 106 kPa
Power Consumption	≤ 20W
Weight	3.3 lbs / 1.5 kg
Dimensions (HxWxD)	8.7 x 8.7 x 1.9 inches 220 x 220 x 48 millimeters
Installation	Ceiling or wall mount

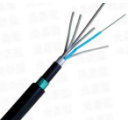
2. Install eNB

2.1 Installation Preparation

2.1.1 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 Support Materials

Item	Figure	Description
Ethernet cable		Indoor ethernet cable, shorter than 100 meters (~109 yards)
Optical fiber		Single mode fiber or multimode fiber

2.1.2 Installation Tool

				
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	compass	multimeter

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

2.1.3 Installation Environmental Requirements

To get the signal coverage effect best, please place the Neutrino430 in an unobstructed space.

NOTE: Before installation, make sure the wiring has completed on installation site.

2.2 Installation

2.2.1 Unpacking

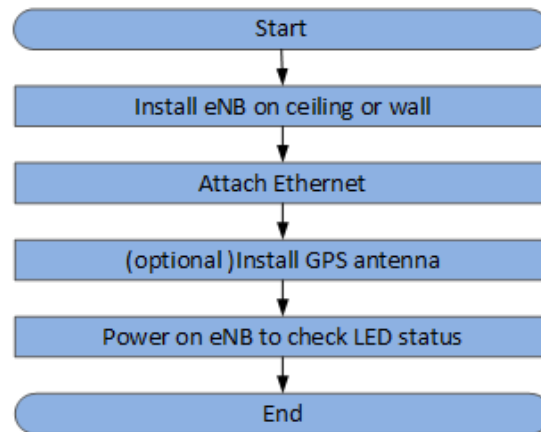
Before opening the box, make sure the package is in good condition, undamaged and not wet. During the unpacking, avoid potential damaging impacts from hits or excessive force.

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

2.2.2 Installation Procedure

Figure 2-1 provides an overview of the installation process.

Figure 2-1 Installation Process

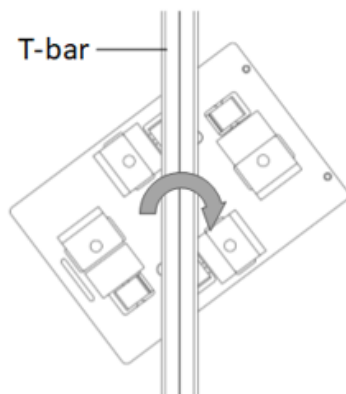


The mount kits have two pieces. One piece is the back piece, which has been pre-installed on the back of the eNB; the other piece is the adaptor piece, which can be used for T-bar mounting and ceiling/wall mounting.

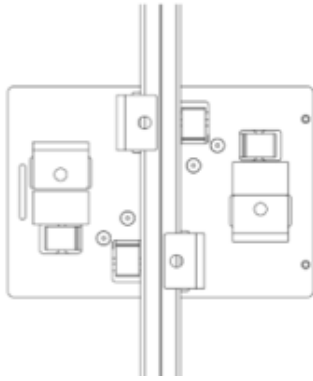
2.2.3 T-bar Mounting

- 9/16 inch (14mm) T-bar Mounting

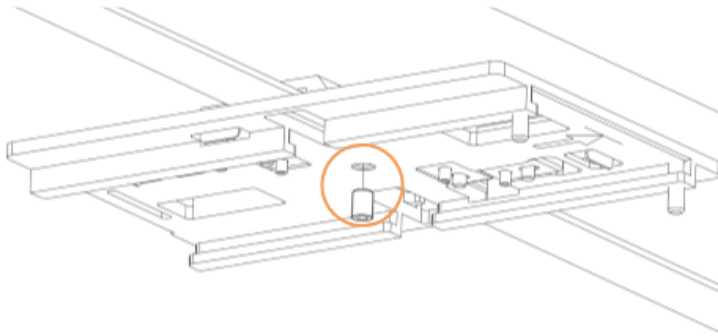
1. Rotate the adaptor piece.



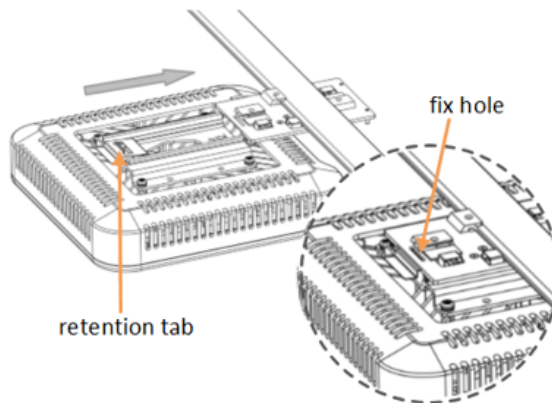
2. When the adaptor piece is vertical with the T-bar, it will be stuck on the T-bar.



3. Fix the adaptor piece with a screw.

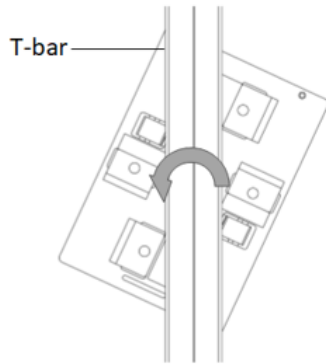


4. Slide the eNB (with the back piece) along the arrow direction until the retention tab is stuck in the fix hole.

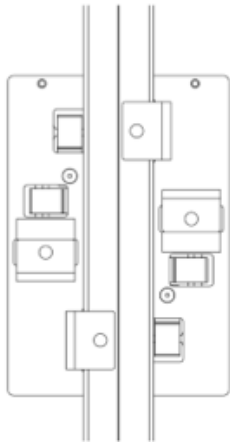


- 15/16 inch (24mm) T-bar Mounting

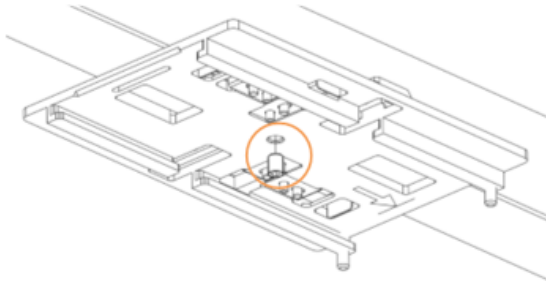
1. Rotate the adaptor piece.



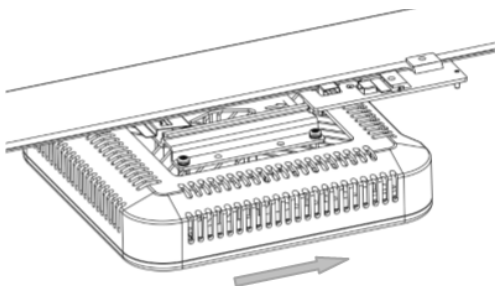
2. When the adaptor piece is paralled with the T-bar, it will be stuck on the T-bar.



3. Fix the adaptor piece with a screw.



4. Slide the eNB (with the back piece) along the arrow direction until the retention tab is stuck in the fix hole.

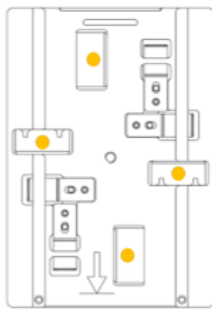


2.2.4 Ceiling/Wall Mounting

ATTENTION:

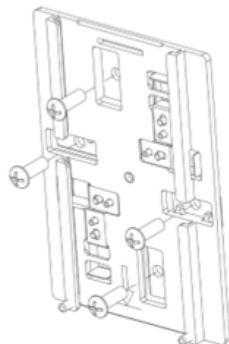
- The thickness of ceiling is not less than 18mm and can bear more than the weight of 5kg. If the strength is not suitable, the device may fall and be damaged.
 - If the ceiling is made of unstable material, such as gypsum, this ceiling installation is not recommended. If the device must be installed on ceiling due to environment restriction, add a layer better panel under screws to make sure the device is fastness.
-

1. Put the adaptor piece against the wall and marked the position, and then drill four holes.

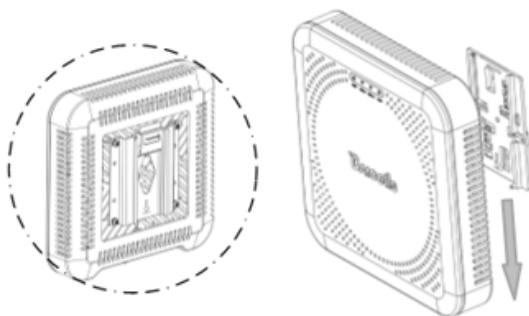


ATTENTION: The arrow on the adaptor piece must be downward.

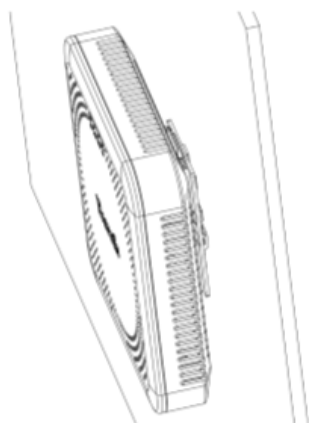
2. Install expansion pipes and screws.



3. Vertically slide the eNB (with the back piece) along the arrow direction until the retention tab is stuck in the fix hole.



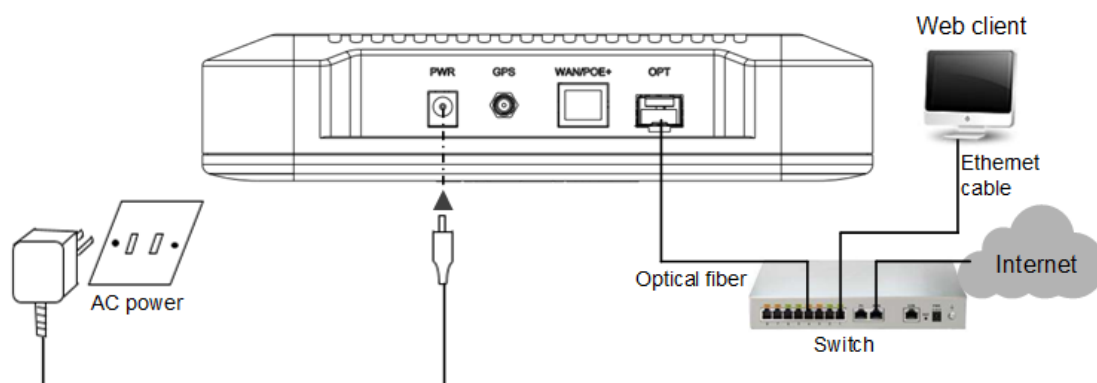
4. Ceiling/wall mounting is complete.



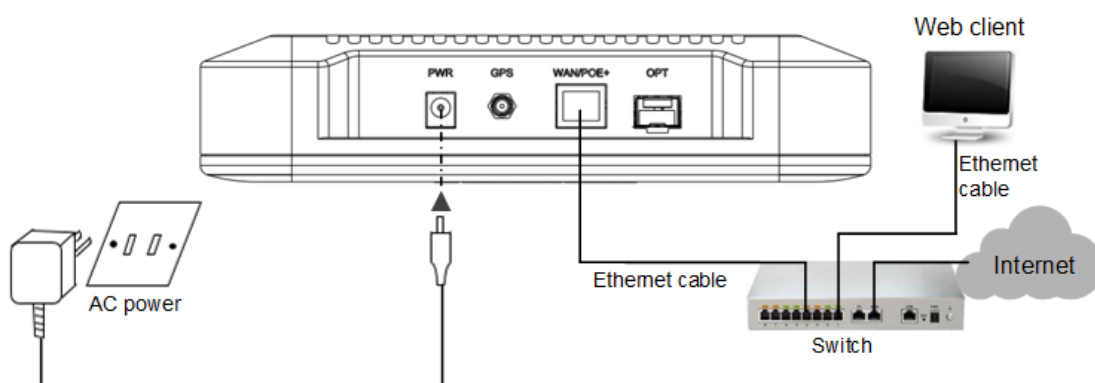
2.2.5 Connect Cable

The Neutrino support multiple connections methods according to the actual requirements.

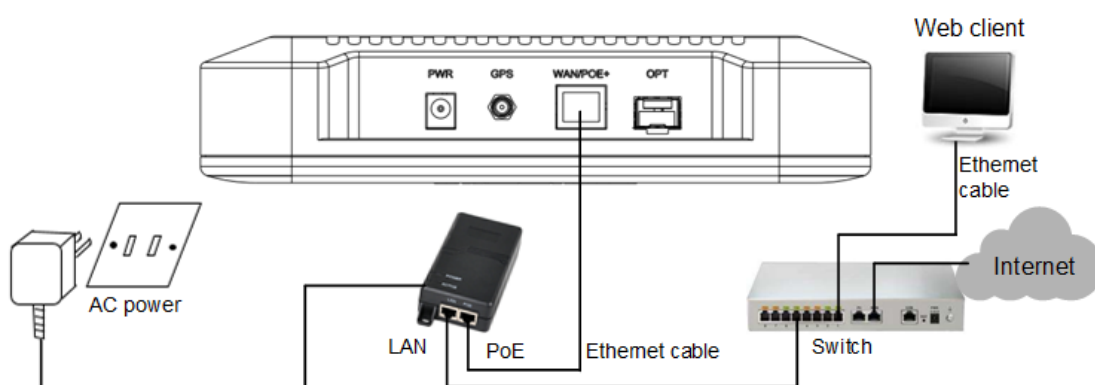
- **PWR** power supply, **OPT** backhaul



- **PWR** power supply, **WAN/PoE+** backhaul



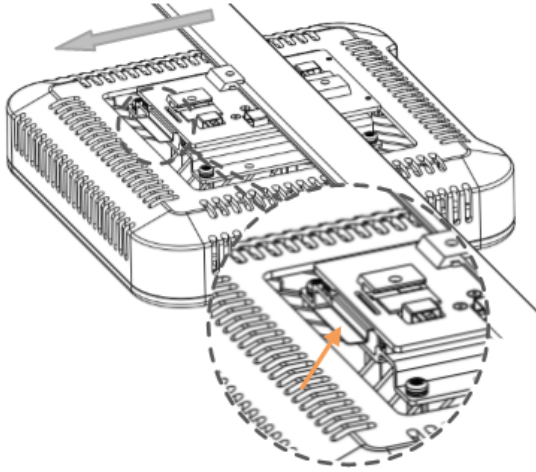
- **WAN/POE+** power supply and backhaul



2.3 Power On

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

3. Remove eNB



1. Press the release tab first to remove retention tab from the fix hole.
2. Slide the eNB opposite to the arrow on the adaptor piece to remove the eNB.

Appendix A 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. 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.

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 20cm between the radiator & your body.

ISED Compliance

This device complies with Innovation, Science, and Economic Development Canada licence-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 20cm 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.

Les antennes utilisées pour cet émetteur doivent être installées de façon à offrir une distance de séparation d'au moins 20cm entre toutes les personnes et ne doivent pas être colocalisées ou fonctionner conjointement avec d'autres antennes ou transmetteurs. pour satisfaire la conformité à l'exposition RF.

Warning As a indoor eNodeB, it is intended for indoor use only.