JRL-113BT48

Outdoor LTE TDD Base Station

Installation Guide

Document version: 01

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1. Product Overview

1.1　Introduction

JRL-113BT48 is an advanced two-carrier outdoor eNodeB based on LTE TDD technology. It is capable of operating in Carrier Aggregation (CA) or Dual Carrier (DC) mode.

In CA mode, contiguous or non-contiguous channels are aggregated to provide up to 40 MHz bandwidth. This essentially doubles the downlink capacity with optional software and CAT6/7 user equipment.

In DC mode, each carrier is treated as an independent cell, supporting 96+96 users, and each supporting 10 or 20 MHz bandwidth. Using a JRL-113BT48 in DC mode simplifies and streamlines the deployment of split sectors.

1.2　Features

Following are some of the key JRL-113BT48 features.

▫ Adopt the integration design of baseband and RF.

▫ Citizens Broadband Radio Service (CBRS) band covers with dual carrier.

▫ Based on 3GPP international standard TDD LTE technology; provide high speed data service; support a maximum aggregation peak rate of DL: 220Mbit/s, UL: 56Mbit/s with 2x20MHz spectrum, using CAT 6/7 or higher users.

▫ Support flexible uplink and downlink time slot ratio: 1(2:2), 2(1:3), and high speed data transmission.

▫ Support 10MHz/20MHz operation bandwidth

▫ 96 concurrent users per carrier, 96+96 in DC mode.

▫ Support four-port antenna or two antennas with two-port.

▫ Support copper (RJ-45) and optical port backhaul, flexible to deploy.

▫ Support simple and convenient local and remote web management.

▫ Integration as required, easy to installation and deployment, accurate coverage and improved network capacity.

▫ Support network management functions, which includes the management,

monitoring and maintenance.

1.3 Appearance

The JRL-113BT48 base station appearance is shown in Figure 1-1.

Figure 1-1 JRL-113BT48 Appearance

The JRL-113BT48 interfaces are described in Table 1-1.

Table 1-1 JRL-113BT48 Interface Description

Interface	Description
PWR	+54V (+40V to +57V) DC power interface, typical input DC voltage is 54VDC
GPS	External GPS antenna, N-female connector.
ANT0	External antenna 0, N-female connector.
ANT1	External antenna 1, N-female connector.
ANT2	External antenna 2, N-female connector.
ANT3	External antenna 3, N-female connector.
OPT	Optical interface, connect to external transmission network, used for data backhaul.
ETH	RJ-45 interface, used for debug or data backhaul.

The JRL-113BT48 interface indicators are described in Table 1-2.

Table 1-2 JRL-113BT48 LED Indicators

Identity	Color	Status	Description
PWR	Green	Steady On	Power On
		OFF	No Power Supply
CELL2	Green	Fast flash: 0.125s on,0.125s off	CELL 2 inactivated
		Slow flash: 1s on,1s off	CELL 2 activated
CELL1	Green	Fast flash: 0.125s on,0.125s off	CELL 1 inactivated
		Slow flash: 1s on,1s off	CELL 1 activated
ALM	Red	Steady On	Hardware alarm
		OFF	No alarm

1.4 Technical Specification

1.4.1 Hardware Specification

Item	Description
LTE Mode	LTE TDD
LTE Frequency	Band48
Channel Bandwidth	10MHz, 20MHz per carrier
Output Power	30 dBm/antenna
Receive Sensitivity	-100 dBm
Synchronization	GPS
Backhaul	1 Optical (SFP) and 1 RJ-45 Ethernet interface (1 GE)
MIMO	DL 2 x 2 on each carrier
Dimension	310mm(H) x 239 mm(W) x 105 mm(D)
Installation Type	Pole, wall
Antenna	External 14dBi directional antenna
Power Consumption	Typical 60W, MAX 100W
Power Supply	Power adaptor, convert (90-305 VAC, 50/60Hz, 2.1A) to 54 VDC (multi-national standards)
Weight	About 7.5kg
MTBF	≥ 150000 hours
MTTR	≤ 1 hour

NOTE:

1.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.

2. FCC Frequency is 3550MHz to 3700MHz; IC Frequency is 3550MHz to 3700MHz.

1.4.2 Software Specification

Item	Description	
LTE Standard	3GPP Release 12	
Peak Rate	DC	• 2x20 MHz: SA1: DL 2x80Mbps, UL 2x28Mbps SA2: DL 2x110Mbps, UL 2x14Mbps • 2x10MHz: SA1: DL 2x40Mbps, UL 2x14Mbps SA2: DL 2x55Mbps, UL 2x7Mbps
	CA	• 2x20 MHz: SA1: DL 160Mbps, UL 28Mbps SA2: DL 220Mbps, UL 14Mbps • 2x10MHz: SA1: DL 80Mbps, UL 14Mbps SA2: DL 110Mbps, UL 7Mbps
User Capacity	96 concurrent users in single carrier mode 96+96 concurrent users in DC mode 96 concurrent users in CA mode	
QoS Control	3GPP standard Quality of Service Class Identifier (QCI), support SC1	
Modulation	UL: QPSK, 16QAM, 64QAM DL: QPSK, 16QAM, 64QAM	
Voice Solution	VoLTE	
Traffic Offload	Local breakout	
SON	Self-organizing network: • Automatic setup • Automatic Neighbor Relation (ANR) • PCI confliction detection	
Network Mgmt	TR-069, SNMP	
Maintenance	Support remote/local maintenance, based on SSH protocol	
	Support online status management	
	Support performance statistics	
	Support failure management	
	Support configuration management	
	Support local or remote software upgrading and loading	
	Support log	
	Support connectivity diagnosis	
	Support automatic start and configuration	
	Support alarm reporting	

Item	Description
	Support user information tracing
	Support signaling trace

1.4.3 Environment Specification

Item	Description
Operating Temperature	-40°C to 55°C
Storage Temperature	-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 Support Materials

Item	Description
Power cord	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	The power plug connecting to the electricity supply.
Antenna RF cable	50 ohm feeder
Optical fiber	Single mode optical fiber
Ethernet cable	Outdoor CAT6, shorter than 100 meters
Antenna	Omnidirectional, or directional antenna
Ground cable	The diameter of grounding cable must be AWG15 or greater.

2.2 Installation Tools

The following tools are 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

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	40V to 57V	54V

2.4 Personnel Requirements

The installation personnel must master the basic safe operation knowledge, through the training, and having the corresponding qualifications.

2.5 Lightening & Grounding Protection

You must protect the eNB, antenna, and GPS antenna from lightning. Following are guidelines concerning lightening and grounding.

- The power adaptor connect to a surge arrester for lightening protection. (This component has been shipped with the eNB.)

- The ground wire must be at least AWG15 or greater.

- 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 2-1).

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.
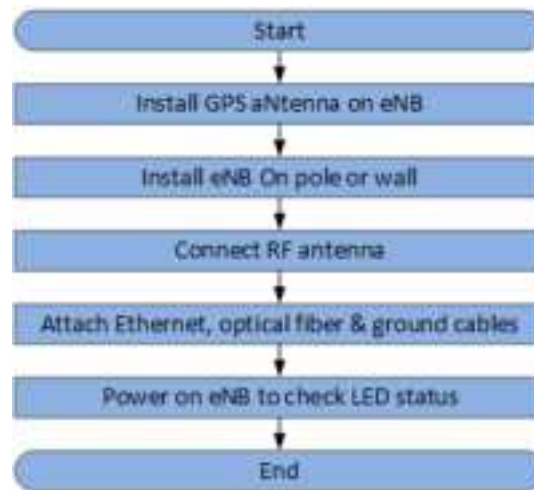
Figure 2-1 Weatherproofing

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

NOTE: The eNB may adopt different models of GPS antenna, so the GPS antenna may not the same as above figure. But the installation steps that fix it on the eNB is the same.

3.3   Install on Pole

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 47 inches (120 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.
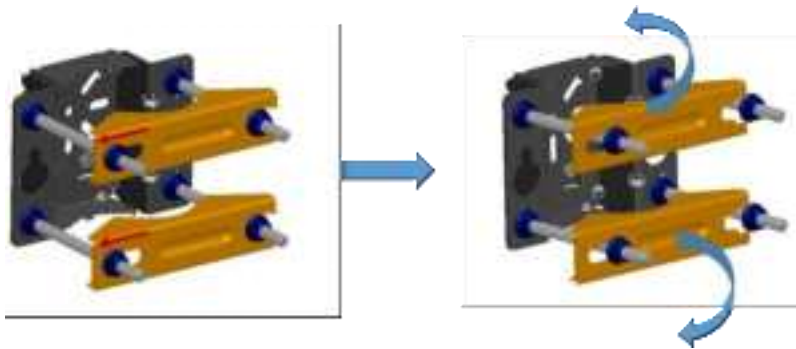
2. Against the bracket on the pole, considering the height requirements described above. Fit the threaded rod of the bracket to the pole, and then turn the 2 clamps to the proper position. Fasten with the 4 screws.

3.   Align the pin on the eNB bracket to the pin holes on the pole bracket, lower the pin into the pin holes vertically until the hook on the eNB gets stuck firmly with the slot on the pole bracket.
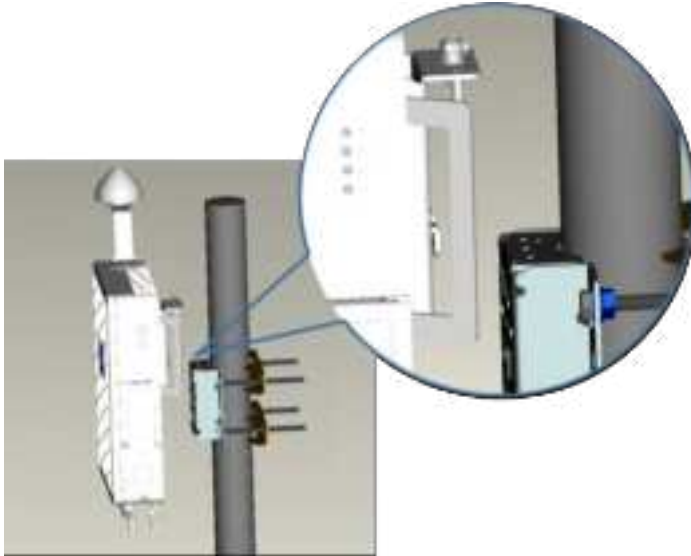
4. Tighten two screws on the top of the bracket to complete the installation.

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. The wall should be made of bricks or concrete, and concrete is recommended.

Follow the steps below to install the JRL-113BT48 eNB on the wall.

1. Take apart the assembled installation bracket kit to get the installation bracket.

2. Against the installation bracket on the wall, with the arrow pointing up. Mark the drilling locations using a pencil or marker.
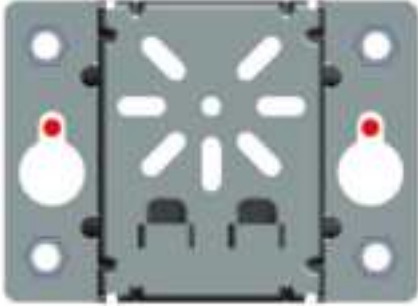
3. Drill two .4in/10mm diameter by 2.8in/70mm deep holes in the wall at the marked locations.

4. Insert the expansion screws and fasten.

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

6. Refer to pole installation steps, fix the eNB on the wall bracket.

7. Proceed to "3.5 Connect Cable".

3.5　Connect Cable

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

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 Cable

1. Open the dust caps of the **ANT0**, **ANT1**, **ANT2**, and **ANT3**interfaces.

2. Insert 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 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 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 Core

The eNB uses AC-DC adaptor to convert AC power (90-264 VAC) to 48VDC power, and a surge arrester is also used for protection, as shown in Figure 3-3.

Figure 3-3 Power Core Connection Relation
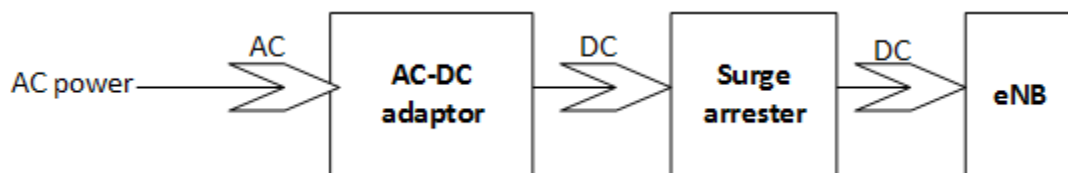
1. Plug the DC end of the power core to the **PWR** interface in the wiring cavity.

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

3. Plug the AC end of the power core to the outlet.

   The power plug must satisfy National Electrical Manufacturers Association (NEMA) standard.

   • If the outlet is indoors, place the power adaptor indoors.

   • If the outletis outdoors, place the power adaptor in a waterproof box, such as a distribution box.

   NOTE: If plugged into an outdoor outlet that it needs to be a GFCI outlet rated max 30mA.

4. 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.
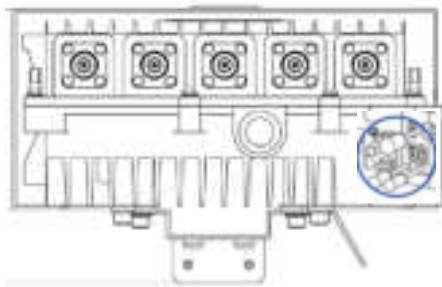
3.5.7 Connect Ground Cable

Prepare the grounding cable according to the actual measurements and requirements of the specific installation site. The grounding cable must satisfy the following requirements for device safety.

- The double hole lug must satisfy the UL standard.

- The diameter of the grounding cable must be AWG15 or greater.

The JRL-113BT48 has two grounding screws located on the bottom of the unit, as shown in Figure 3-4. Follow the steps below the figure to connect the ground cable.

Figure 3-4 Grounding Screws

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 Table 1-2 in "1.3 Appearance", check that the LED indicators are lighting as expected.

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 70cm between the radiator & your body.