



**Nova249**

**Outdoor 2x40W eNodeB**

**Installation Guide**



## About This Document

This document is intended for personnel who will be installing the Baicells **Nova249 Outdoor 2x40W eNodeB (eNB)** product. This Baicells equipment is based on 3GPP Long-Term Evolution (LTE) technology. The product overview is followed by the procedures for properly installing, performing 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. This document is for **sBS32xxx series eNBs**.

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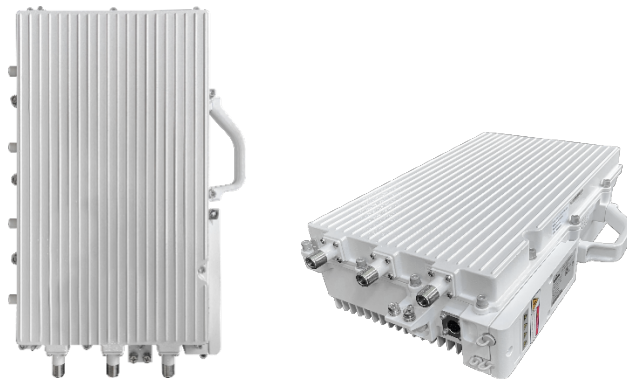
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# 1. Overview

## 1.1 Introduction

Baicells Nova249 is an outdoor 2x40W eNodeB (eNB) that enables wired and wireless broadband access to Long-Term Evolution (LTE) backhaul networks using Frequency Division Duplexing (FDD) technology. With its power and LTE intelligence, this eNB has exceptional non-line-of-sight (NLOS) coverage performance (Figure 1-1).

Figure 1-1 Nova249 FDD eNB

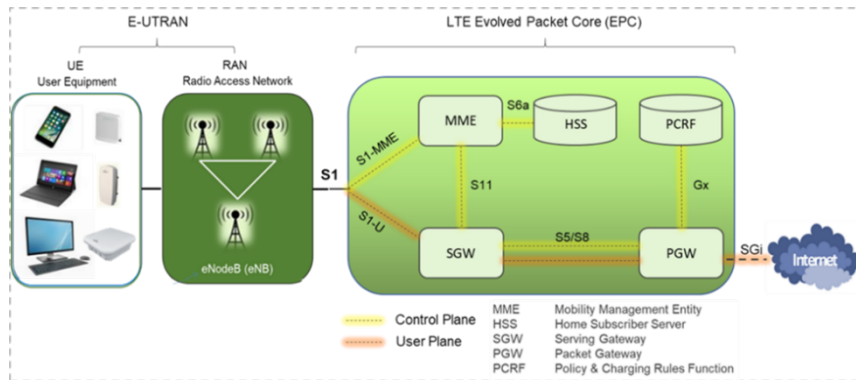


Baicells provides operators with local and Web-based Graphical User Interface (GUI) software applications to configure and manage individual eNBs and User Equipment (UE). Additionally, Baicells offers a cloud-based, centralized Software-as-a-Service (SaaS) solution called CloudCore. CloudCore, or BaiCloud, 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 the Nova249 eNB. For additional information on configuring features beyond the basic settings, please refer to the “*Baicells Configuration Guide*”.



Figure 1-2 LTE Network Architecture



## 1.2 Features

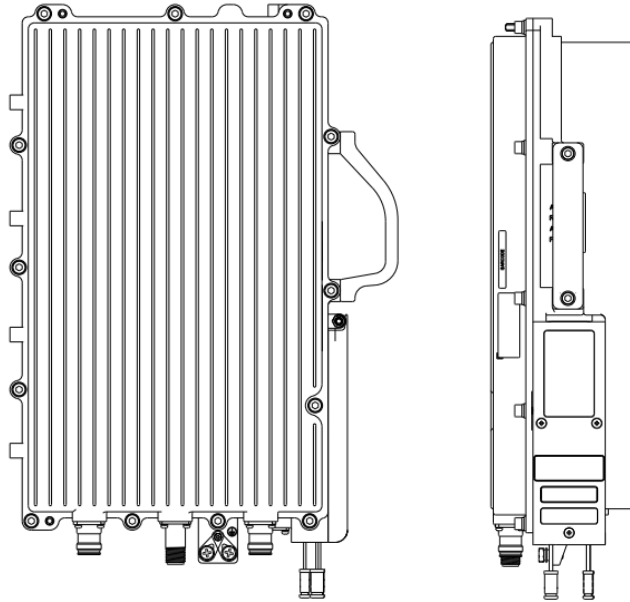
Following are some of the key Nova249 features.

- Support 5MHz/10MHz/15MHz/20MHz operation bandwidth.
- Standard LTE FDD Bands 1/3/7/8.
- Complies with 3GPP Release 10 standards.
- GUI-based local and remote Web management.
- Supports TR069 network management protocol.
- External high-gain antenna.
- Higher transmission power for extended coverage.
- Any IP based backhaul can be used, including public transmission protected by Internet Protocol Security (IPsec).
- Excellent Non-Line-of-Sight (NLOS) coverage performance.
- Peak rate: Up to DL 195Mbps and UL 71Mbps with 20MHz bandwidth.
- 256 RRC connected users.
- Supports RET function AISG 2.0.
- Inter operation with all standard LTE Evolved Packet Core (EPC).
- Lower power consumption to reduce OPEX, can be powered easily by Baicells compact outdoor Smart UPS.

## 1.3 Appearance

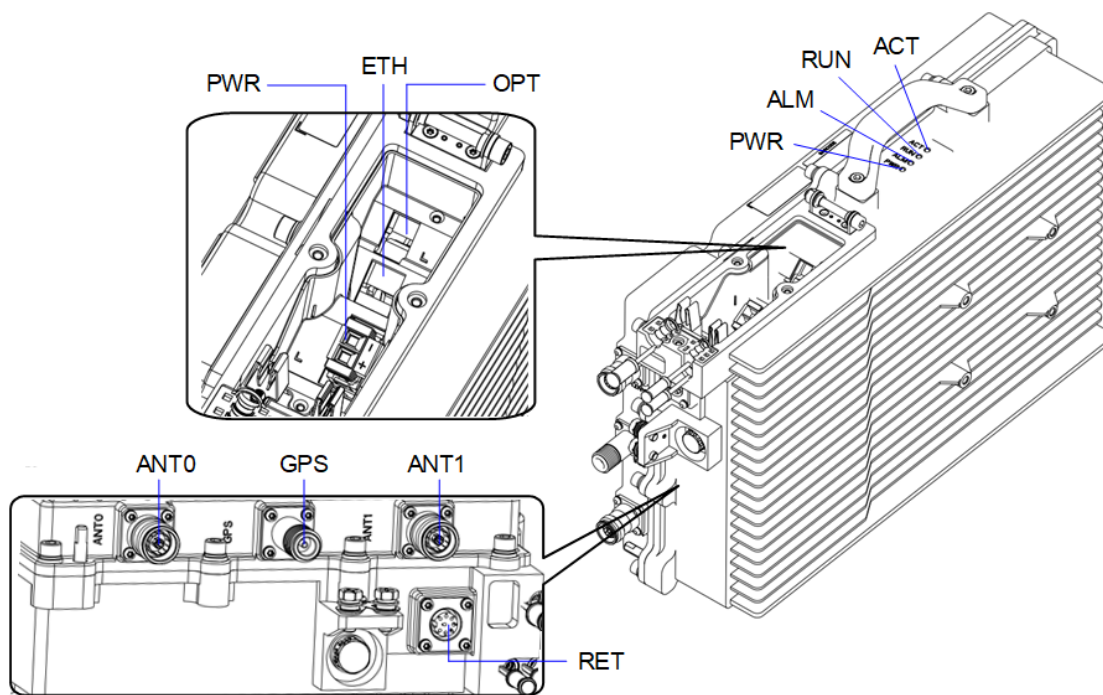
The Nova249 eNB model is shown in Figure 1-3.

Figure 1-3 Nova249 FDD Appearance



The interfaces and status indicators (LEDs) for the Nova249 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 1-4 Nova249 Interfaces and Indicators



**NOTE:** The antenna connector shown in the figure is an mini-DIN type.

Table 1-1 Nova249 FDD Interfaces

| Interface | Description                                            |
|-----------|--------------------------------------------------------|
| PWR       | Power interface: -40VDC ~ -57VDC, nominal -48VDC       |
| ETH       | RJ-45 interface, used for debug or data backhaul.      |
| OPT       | Optical interface to external backhaul network         |
| ANT0      | External antenna 0, mini DIN type or N type connector. |
| GPS       | External GPS antenna, N type connector.                |
| ANT1      | External antenna 1, mini DIN type or N type connector. |
| RET       | RS485 interface, AISG2.0 standard                      |

Table 1-2 Nova249 FDD LEDs

| Identity | Color | Status | Description |
|----------|-------|--------|-------------|
|----------|-------|--------|-------------|

|     |       |                                  |                         |
|-----|-------|----------------------------------|-------------------------|
| PWR | Green | Steady On                        | Power input present     |
|     |       | OFF                              | No power input          |
| RUN | Green | Steady On                        | Base station powered on |
|     |       | Fast flash: 0.125s on,0.125s off | Data being transmitted  |
|     |       | Slow flash: 1s on,1s off         | Cell activated.         |
| ACT | Green | OFF                              | (Reserved)              |
| ALM | Red   | Steady ON                        | (Reserved)              |
|     |       | Fast flash: 0.125s on,0.125s off | S1 alarm                |
|     |       | OFF                              | Other alarms            |

## 1.4 Technical Specification

### 1.4.1 Technology

| Item              | Description                                                                                                                                                                                                                                                                                                                                               |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Standard          | LTE FDD RAN (3GPP R10 compliant)                                                                                                                                                                                                                                                                                                                          |
| Frequency Band    | Band1 (UL: 1920MHz-1980MHz, DL: 2110MHz-2170MHz)<br>Band3 (UL: 1710MHz-1785MHz, DL: 1805MHz-1880MHz)<br>Band5 (UL: 824MHz-849MHz, DL: 869MHz-894MHz)<br>Band7 (UL: 2500MHz-2570MHz, DL: 2620MHz-2690MHz)<br>Band8 (UL: 880MHz-915MHz, DL: 925MHz-960MHz)<br>Band20(UL: 832MHz-862MHz, DL: 791MHz-821MHz)<br>Band28 (UL: 703MHz-748MHz, DL: 758MHz-803MHz) |
| Channel Bandwidth | Band1/3/7/20/28: 5/10/15/20MHz<br>Band5/8: 5/10MHz                                                                                                                                                                                                                                                                                                        |

| Item         | Description                                                                              |
|--------------|------------------------------------------------------------------------------------------|
| Multiplexing | MIMO: 2x2 (DL)                                                                           |
| Security     | Radio: SNOW 3G/AES-128/ZUC<br>Backhaul: IPsec (X.509 AES-128, AES-256, SHA-128, SHA-256) |

**NOTE:** Different models support different frequency band.

## 1.4.2 Interface

| Item               | Description                                                       |
|--------------------|-------------------------------------------------------------------|
| Ethernet Interface | 1 RJ-45 Ethernet interface (1 GE)<br>1 optical (SFP) interface    |
| Powering Method    | -40VDC to -57VDC, nominal -48VDC (The AC/DC adaptor is optional.) |
| Protocols Used     | IPv4, UDP, TCP, ICMP, NTP, SSH, IPsec, TR-069, HTTP/HTTPS, DHCP   |
| Network Management | IPv4, HTTP/HTTPS, TR-069, SSH, Embedded EPC                       |
| VLAN               | 802.1Q                                                            |
| LED Indicators     | 4 x status LED<br>PWR/ALM/RUN/ACT                                 |

## 1.4.3 Performance

| Item                     | Description                                                   |
|--------------------------|---------------------------------------------------------------|
| Peak Data Rate (DC)      | 20MHz: DL 195Mbps, UL 75Mbps<br>10MHz: DL 97.5Mbps, UL 31Mbps |
| User Capacity            | 1024 RRC connected users                                      |
| Maximum Deployment Range | 14 kilometers                                                 |

| Item                 | Description                                                                                       |
|----------------------|---------------------------------------------------------------------------------------------------|
| Latency              | 30 milliseconds                                                                                   |
| Receive Sensitivity  | -102 dBm (per channel)                                                                            |
| EVM                  | QPSK<5%; 16QAM<5%; 64QAM<5%, 256QAM<3.5%                                                          |
| Modulation           | MCS0 (QPSK) to MCS27 (256QAM)<br><br>DL: QPSK, 16QAM, 64QAM, 256QAM<br><br>UL: QPSK, 16QAM, 64QAM |
| Transmit Power Range | 36 to 46 dBm per channel (combined to +49dBm with 1 dB interval)                                  |
| Quality of Service   | Nine-level priority indicated by QoS Class Identifiers (QCI)                                      |
| ARQ/HARQ             | Yes                                                                                               |
| Synchronization      | GPS/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)         | Coverage Distance (km) |
|---------|-------------------|--------------------|------------------------|
| 0 - 4   | QPSK              | -120<= RSRP < -110 | 10 < D <= 14           |
| 5 - 10  | 16QAM             | -110<= RSRP < -100 | 5 < D <= 10            |
| 11 - 19 | 64QAM             | -100<= RSRP < -85  | 2< D <= 5              |
| 20 - 27 | 256QAM            | RSRP >= -85        | D <=2                  |

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

Scenario: Base Station height is 30 meters; Customer User Equipment (CPE) height is two meters.

## 1.4.5 Features

| Item               | Description                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Voice              | VoLTE, Circuit Switched Fallback (CSFB) to GSM and UTRAN                                                                                                                                                                                                                                                                                                                                          |
| Inter-RAT Mobility | To GSM, UTRAN and 5G NSA/SA                                                                                                                                                                                                                                                                                                                                                                       |
| Daisy Chain        | 2 level cascading                                                                                                                                                                                                                                                                                                                                                                                 |
| 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>                                                                                                                                                                                                                           |
| RET support        | Yes                                                                                                                                                                                                                                                                                                                                                                                               |
| Traffic Offload    | <ul style="list-style-type: none"> <li>Local breakout</li> </ul>                                                                                                                                                                                                                                                                                                                                  |
| Maintenance        | <ul style="list-style-type: none"> <li>Local/Remote Web maintenance</li> <li>Online status management</li> <li>Performance statistics</li> <li>Fault management</li> <li>Local/Remote software upgrade</li> <li>Logging</li> <li>Connectivity diagnosis</li> <li>Automatic start and configuration</li> <li>Alarm reporting</li> <li>User information tracing</li> <li>Signaling trace</li> </ul> |

## 1.4.6 Link Budget

| Item               | Description                                                 |
|--------------------|-------------------------------------------------------------|
| Antenna connection | N type or mini-DIN connector for external high gain antenna |
| GPS Antenna        | External GPS antenna, N Type connector                      |
| VSWR               | < 1.5                                                       |

| Item          | Description                                                                      |
|---------------|----------------------------------------------------------------------------------|
| Power Control | UL Open/Close-loop Power Control, DL Power Allocation (3GPP TS 36.213 compliant) |

## 1.4.7 Physical

| Item                                 | Description                                                                                                                               |
|--------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| Spurious Emissions                   | 9kHz-150kHz/1kHz $\leq$ -36dBm<br>150kHz-30MHz/10kHz $\leq$ -36dBm<br>30MHz-1GHz/100kHz $\leq$ -36dBm<br>1GHz-12.75GHz/1MHz $\leq$ -30dBm |
| Frequency Exactitude                 | $\pm(0.05\text{PPM}+12\text{Hz})$                                                                                                         |
| Adjacent Channel Selectivity         | 3GPP TS36.104                                                                                                                             |
| ACLR                                 | 3GPP TS36.104                                                                                                                             |
| Surge Suppression                    | Yes                                                                                                                                       |
| Power Interface Lightning Protection | Differential mode: $\pm 10$ KA<br>Common mode: $\pm 20$ KA                                                                                |
| MTBF                                 | $\geq 150000$ hours                                                                                                                       |
| MTTR                                 | $\leq 1$ hour                                                                                                                             |
| Ingress Protection Rating            | IP66                                                                                                                                      |
| 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% RH                                                                                                                              |
| Atmospheric Pressure                 | 70 kPa to 106 kPa                                                                                                                         |
| Power Consumption                    | Typical < 200W, maximum < 300W                                                                                                            |



| Item               | Description                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Weight             | <p>With pre-installed bracket: About 26.0lbs / 11.80kg</p> <p>Without pre-installed bracket: About 25.2lbs / 11.45kg</p>                                                                                                                                                                                                                                                              |
| Dimensions (HxWxD) | <p>Band1/3/7:</p> <p>18.0 x 10.9 x 4.8 inches/457 x 276 x 123 millimeters<br/>(with joint)</p> <p>16.9 x 9.8 x 4.8 inches/430 x 250 x 123 millimeters<br/>(Without joint and handle)</p> <p>Band5/8/20/28:</p> <p>18.0 x 10.9 x 5.0 inches/457 x 276 x 127 millimeters<br/>(with joint)</p> <p>16.9 x 9.8 x 5.0 inches/430 x 250 x 127 millimeters<br/>(Without joint and handle)</p> |
| Installation       | Pole or wall mount                                                                                                                                                                                                                                                                                                                                                                    |

## 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             | Figure                                                                              | Description                                                                                                                                                                                                                         |
|------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DC cord          |    | A DC power cable is provided with the device. If the length is insufficient, the customer needs to prepare it.<br><br>It is suggested that AWG13 is used. The cord is two cores cable and the length is less than 100 meters.       |
| RF antenna cable |  | 50 ohm feeder, 1/2 jumper                                                                                                                                                                                                           |
| Optical fiber    |  | Optical fiber (armor)<br><br>It is suggested that the diameter of the cable is $7 \pm 1$ mm.                                                                                                                                        |
| Ethernet cable   |  | Outdoor CAT6, shorter than 100 meters (~109 yards)<br><br>It is suggested that the diameter of the cable is $7 \pm 1$ mm.                                                                                                           |
| RF antenna       |  | Omni or directional dual polarized antenna.<br><br>When selecting an RF antenna, be sure to match the frequency range of the antenna with the gNB.                                                                                  |
| Ground cable     |  | If the length of lead is more than 10 meters, a ground cable with 16mm <sup>2</sup> cross section should be used. If the length of lead is less than 10 meters, a ground cable with 10mm <sup>2</sup> cross section should be used. |

| Item             | Figure                                                                             | Description                                                                                                                                                                                                                                                                |
|------------------|------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Pole             |   | <p>The diameter of the pole is between 40mm to 100mm of hot-galvanized steel pipe.</p> <p>Channel steel and equal angle steel installation are also supported. The width of the channel steel is 50mm to 100mm; the length of side of the angle steel is 63mm to 80mm.</p> |
| Distribution box |   | AC Air switch, socket, power grounding point, broadband access is all in the distribution box, which must be waterproofed.                                                                                                                                                 |
| Cold shrink tube |  | The waterproof protection material on the gNB side is provided with the device. But the customer needs to prepare the waterproof protection material on the peer side.                                                                                                     |

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

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 BaiCells 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                                                                            | multimeter                                                                          |                                                                                     |

## 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<br>(no condensation) | 0% to 100%       | 5% to 95%     |
| Safety voltage                         | -57VDC to -42VDC | -48VDC        |

## 2.4 Lightning & Grounding Protection

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

- The yellow-green ground wire must be at least 16mm<sup>2</sup> 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, then pull out the strip.
4. Ensure the cold shrink tube is tightly fitted with the connection.

Figure 2-1 Weatherproofing



**CAUTION:** Ensure the cold shrink tube remains intact and is not cut for use.

## 3. Installation

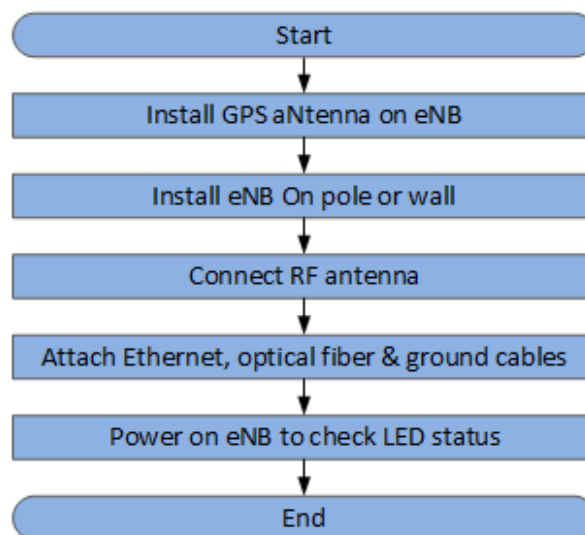
### 3.1 Unpacking

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.

### 3.2 Installation Procedure

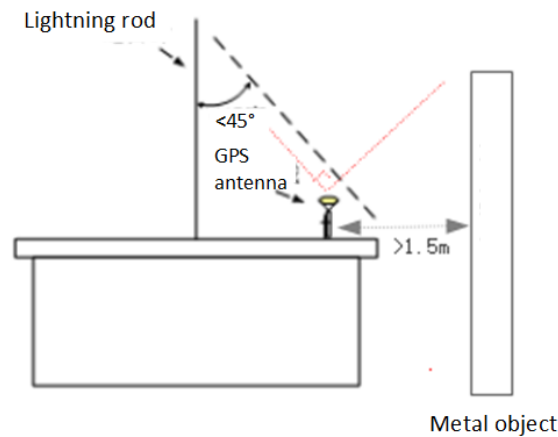
Figure 3-1 provides an overview of the installation process.

Figure 3-1 Installation Process



Read the following GPS antenna installation requirements before installing it on the eNB, as shown in Figure 3-2.

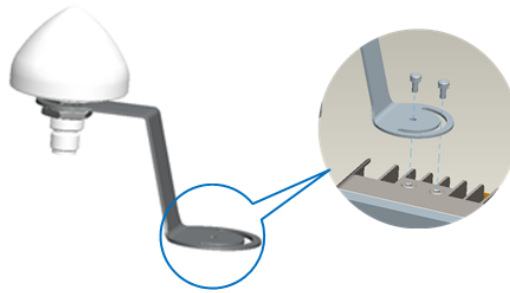
Figure 3-2 GPS Installation Requirements



- No major blocking from buildings in the vicinity. Keep the rooftop buildings a distance away from the GPS. Make sure the space atop within 90 degrees (at least 45 degrees) is not blocked by any buildings.
- Avoid installing the GPS in the vicinity of any other transmitting and receiving devices. Avoid interference from other transmitting antennas to the GPS antennas.
- The GPS antenna should be installed within 45 degrees to the lightning rod.
- When two or more GPS antennas are installed, it is recommended to keep the spacing of more than 2 meters and install multiple GPS antennas in different locations to prevent simultaneous interference.
- Do not install the GPS antenna near other transmitting and receiving equipment. Do not install it under the microwave antenna or high voltage cable. Avoid the direction of radiation from other transmitting antennas to the GPS antenna.
- GPS antenna feeders cannot be grounded together with ground conductors of interfering equipment such as air conditioners, motors, and pump motors, etc. to prevent external interference from being introduced into the antenna system.

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 3-3).

Figure 3-3 GPS Antenna Installation



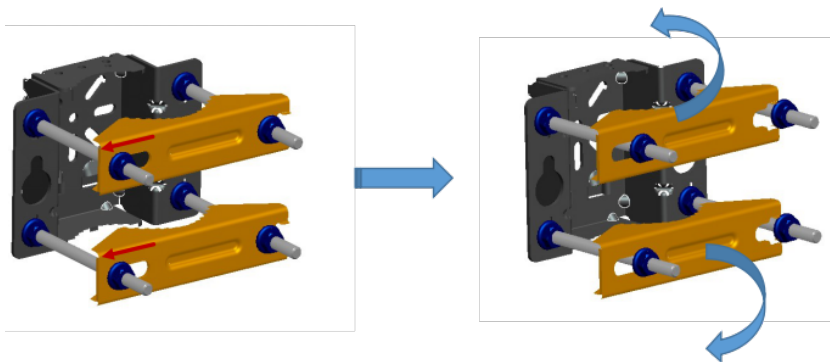
**NOTE:** The eNB may adopt different models of GPS antenna, so the GPS antenna may not be the same as above figure. But the installation steps that fix it on the eNB is the same.

### 3.3 Install eNB 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.

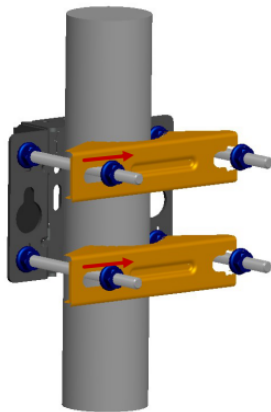
Check to ensure the diameter of the pole is in the range of 1.6-3.9 inches (40-100 mm). The position of the eNB on the pole should be at least 47 inches (120 cm) in height. Follow the steps below to install the eNB on a pole.

1. Unscrew the 4 screws of the assembled bracket. Slide the two omega clamps to the left, and then turn them up or down.

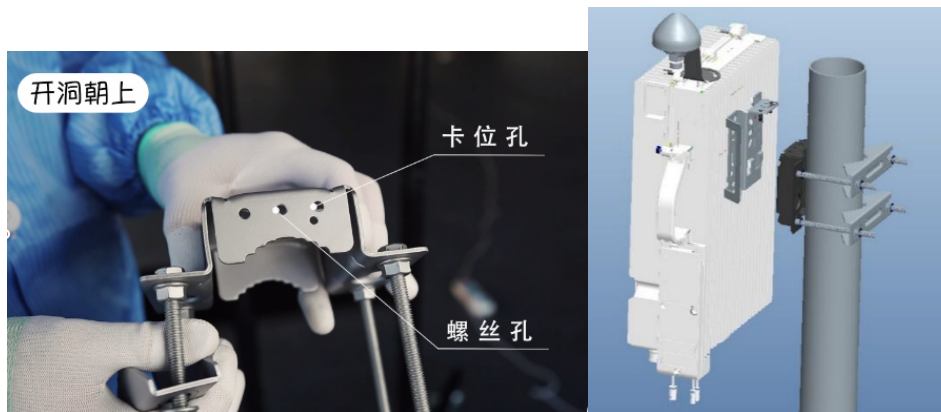


2. Attach the bracket to the pole, considering the height requirements described above. Fit the threaded rod of the bracket to the pole, and then turn the 2 clamps to the proper position. Fasten with the 4 screws.

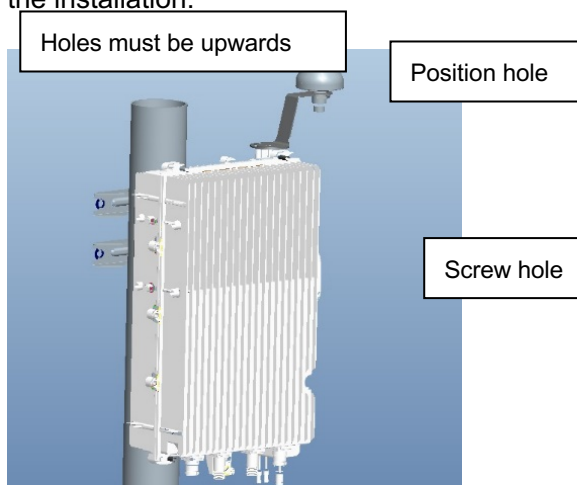




3. Align the pin on the eNB bracket to the pin holes on the pole bracket, lower the pin into the pin holes vertically until the hook on the eNB gets stuck firmly with the slot on the pole bracket.



4. Tighten the screws on the top of the bracket using a cross screwdriver to complete the installation.

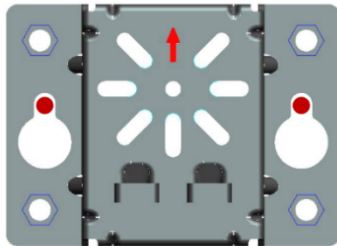


5. Proceed to "3.5 Connect Cable".

## 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 the Nova249 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 x 80 expansion screws.
6. Fix the eNB to the bracket, then 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:  $7/8" > 250\text{mm}$ ,  $4/5" > 380\text{mm}$ .
- Bending radius of jumper cable:  $1/4" > 35\text{mm}$ ,  $1/2"$  (super soft)  $> 50\text{mm}$ ,  $1/2"$  (ordinary)  $> 127\text{mm}$ .
- 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 to 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 unwind 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, then pull out the strip.
4. Take another cold shrink tube, then 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, then pull out the strip.

### 3.5.3 Connect RF Cables

**CAUTION:**

It is strictly prohibited to activate the cell and transmit RF if the antenna feed system is not connected properly. The wireless signal transmission power of the

outdoor eNBs is large, if the eNB transmits without the antenna feed system, which may cause injury to the body of the construction personnel and the damage of RF power amplifier devices.

When using only one antenna, the unused antenna interface must be connected to a load to avoid damaging the power amplifier.

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, then 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, then 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, then 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, then 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, then stretch out the wiring cavity from **ETH** hole.

Use hose sleeves to protect network cables.

3. Connect the other end of the network cable to the switch.

**CAUTION:** The connection sequence of optical fibers/network cables and power cables

must be strictly the same as that of optical fibers and then power cables.

### 3.5.6 Connect Power Connector

The power cable must meet the following requirements.

- It is recommended to install an air switch in the distribution box for lightning protection and leakage protection, or a socket or plug with a fuse.
- The power cord needs to be protected by a hose sleeve or wiring tube.
- The distribution box should be grounding and have leakage protection.
- The length of the power cord must be kept below 330 ft/100m.

Since the length of cable needed for power supply varies from site to site, the customer need to make the power cable according to the actual measurements of the installation site. Strip .47in/12mm insulating layer with a wire stripper to reserve the conductor for connection.

The connection steps for the power cable are as follows.

1. Assemble the power terminal.

The power terminal will be installed on the end of the output direction. Refers:



Refer to the labels on the power terminal for connecting the positive terminal (+) and negative terminal (-) to the corresponding terminals separately, then tighten the screws.

2. Connect the power cable to the **PWR** interface in the wiring cavity.
3. The power cable lays along the lint slot, then stretch out the wiring cavity from the PWR hole.
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.
5. The other end of the power cord is connected to a reliable 48VDC power supply.

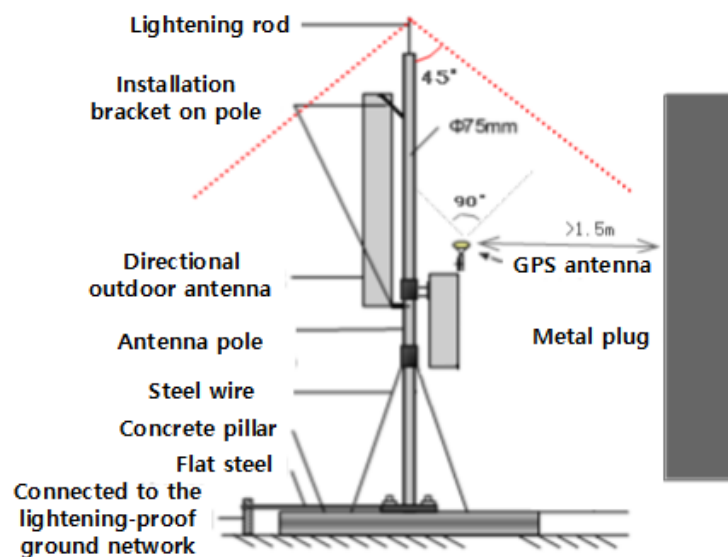
The power plug is prepared by the customer. The location of the power supply must meet the environmental requirements.

### 3.5.7 Connect Ground Cable

#### 3.5.7.1 Pole Grounding

The purpose of the pole grounding is to protect the equipment in the station from the damage of lightning overvoltage as far as possible. However, the interfaces between the eNB and the outside world mainly include power system, grounding system, antenna feeder and lightning receiving device, and signal line. Therefore, the damage caused by lightning mainly comes from the voltage difference between the equipment in the eNB and one or more of the four interfaces. The pole grounding is shown in Figure 3-4.

Figure 3-4 Pole Grounding



1. The installation position of the grounding bar shall meet the design requirements. The holding pole and tower body must be connected to the lightning protection network or grounded with a separate lead.
2. The diameter of the grounding wire meets the design requirements. The copper nose must be used for grounding, and the grounding resistance is required to be less than 10 ohms. If the resistance of the public network communication equipment placed in other systems is less than 10 ohms, the grounding network of the system should be overlapped.
3. The grounding wire must be the whole wire material. When laying, it should be

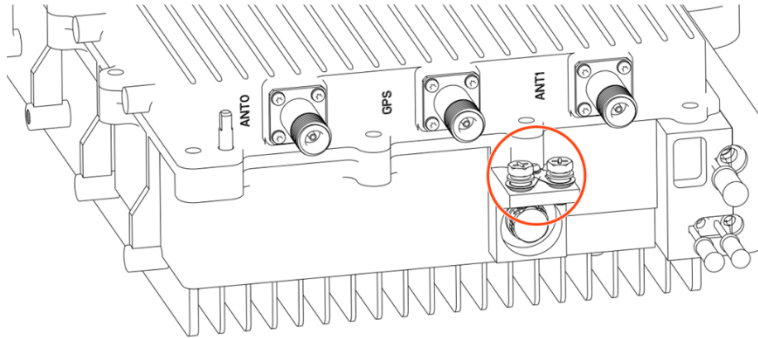
bound separately with other cables. All grounding wires should be fixed with wire code or binding tape with a fixed spacing of 0.3m. The appearance should be straight and beautiful.

4. The copper bar must be used for the grounding bar, and the specification of the grounding bar shall meet the design requirements. If there are no specific requirements in the design, 300 × 40 × 4mm and fixed with expansion bolts.
5. The grounding wire must be made of the whole cable material, the intermediate joint is strictly prohibited, and the excess length should be cut. The skin shall be complete, and the insulation resistance of the core wire to the ground (or metal isolation layer) shall meet the technical requirements of the cable.
6. The grounding wire shall be connected to the integrated grounding bar of the building. If it is impossible to connect to the integrated grounding bar of the building, the appropriate grounding point can be selected according to the integrated grounding situation of the indoor building. The selection of grounding point must be higher than the grounding grid, and the feeder grounding shall be towards the downward direction of the feeder, never upward.
7. The grounding electrode of the self-built grounding grid for the outdoor antenna of the tunnel must meet the design requirements. The buried depth of the grounding electrode and the welding quality of the flat iron meet the specification requirements. In principle, the buried depth of the grounding electrode shall not be less than 0.7m. The non-self-built grounding network shall be connected to the grounding network of the owner.
8. The eNB grounding, power adapter grounding, distribution box grounding and feeder grounding must be connected to the grounding bar independently, and the grounding bar must have a path from the lead to the earth.

### 3.5.7.2 eNB Grounding

Prepare the grounding cable according to the actual measurements and requirements of the specific installation site. The Nova249 eNB has two grounding screws located on the bottom of the unit (Figure 3-5.). Follow the steps below the figure to connect the ground cable.

Figure 3-5 Grounding Screws

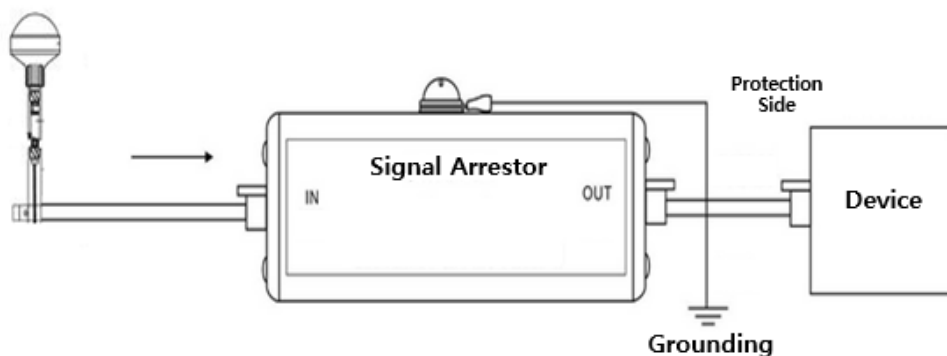


1. Unscrew one grounding screw, connect one end of the ground cable to the grounding screw, and fasten it again.
2. Repeat step 1 for the second grounding screw.
3. Once the eNB is installed at the outdoor location, the other end of the ground cable needs to connect to a good grounding point.

### 3.5.7.3 GPS Antenna Grounding

If the length of GPS antenna is more than 5 meters, it is recommended to extend the installation distance. It is suggested to carry out lightning protection of GPS antenna, add lightning protector, and connect the lightning protector to the grounding bar, as shown in Figure 3-6.

Figure 3-6 GPS Grounding





### 3.6 Maintenance Chamber Waterproofing

When all the installation has been completed, it is necessary to close the maintenance chamber of the equipment and play the role of waterproof at the same time.

1. Clamp the power cord to the wire position and seal the wire diameter  $9 \pm 1\text{mm}$ .
2. Put the pigtail / network cable on the wire, and seal the wire diameter  $7 \pm 1\text{mm}$ .

### 3.7 Power on to Check LED Status

Power on the eNB, then 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.

## 4. Attentions

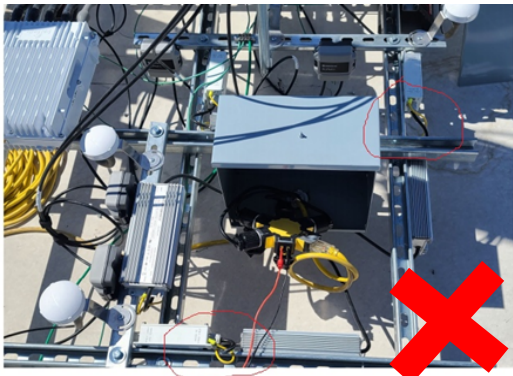
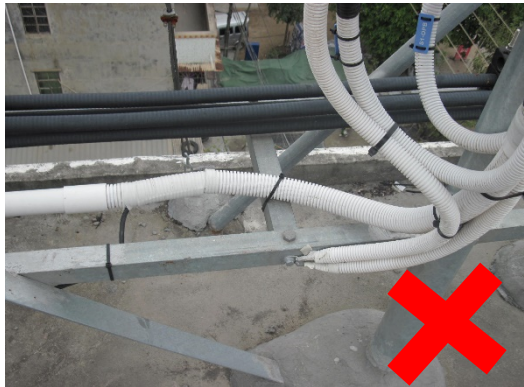
### 4.1 FAQ

1. After the device is connected with the power line, the PWR of the device will not be displayed when it is powered on.
  - 1) Maybe the power line is not connected well, and the contact is poor.
  - 2) There is no power in the circuit.
  - 3) Poor contact of equipment power interface.
2. How to connect the antenna feeder
  - 1) ANT0 is the main channel and ANT1 is the secondary channel.
3. GPS has been out of sync
  - 1) The antenna is not installed in an open place.
  - 2) The antenna is blocked, which affects the search.
  - 3) There are strong interference sources around the installation location, such as large transformer station and high-power motor fan.
  - 4) Installed under the front cover of wireless antenna, strong signal interference and so on.
  - 5) GPS satellite search is slow and takes a long time. The number of satellites and signal strength can be observed in the maintenance page.
4. How to choose the position of holding pole in the roof
  - 1) Not near the edge.
  - 2) The position of non-bearing beam cannot be selected.
  - 3) Do not choose the side close to the barrier, you need to choose the most open position.
5. The coverage of eNB signal is not ideal after opening.
  - 1) Check if the power is full in the base station configuration.

- 2) Check whether the equipment has standing wave alarm. If there is any alarm, please handle it in time.
  - 3) Check whether the RF frequency band of the equipment is consistent with that of the antenna.
  - 4) Check whether the dip angle planning of the base station is reasonable.
  - 5) Whether there is blocking in antenna coverage direct vision.
6. If a RET cable is used, no protection is required at the connector, and no cold shrink tube is needed.

## 4.2 Common Installation Errors

|                                                                                     |                                                                                      |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
|   |   |
| <p>GPS antenna blocked</p>                                                          | <p>Disordered wiring</p>                                                             |
|  |  |
| <p>The holding pole lightning rod is not led to the ground bar</p>                  | <p>The GPS antenna is mounted on the front of the RF antenna</p>                     |

|                                                                                     |                                                                                     |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|    |   |
| <p>Without the lightning rod</p>                                                    | <p>Disordered wiring of distribution box</p>                                        |
|   |  |
| <p>Power line and signal cable are crossed</p>                                      | <p>Multiply the grounding point</p>                                                 |
|  |                                                                                     |
| <p>The RF feed system does not connect, the</p>                                     |                                                                                     |

|                                           |  |
|-------------------------------------------|--|
| cell is activated and RF transmits signal |  |
|-------------------------------------------|--|