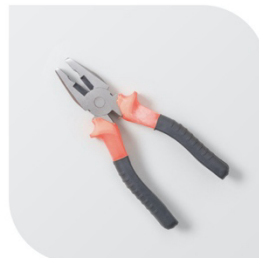


Nova230 Pro

2x500mW Outdoor eNB

Installation Guide



About This Document

This document provides guidance for installation personnel on the hardware installation of the Nova230 Pro 2 × 500 mW outdoor base station, including the preparation of installation tools and required materials, installation environment requirements, installation procedures, cable connections, and device power-on. By completing the installation in accordance with this document, installation personnel can minimize the risk of equipment damage caused by improper operations and ensure subsequent proper operation of the device.

This document applies to the pBS32xx series base stations.

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Disposal of Electronic and Electrical Waste



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Revision Record

Date	Version	Description
2025.11.20	01	Initial release.

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1. Product Overview

1.1 Introduction

The Nova230 Pro is a low-power, high-performance integrated outdoor LTE base station with a total output power of $2 \times 500 \text{ mW}$ (30 dBm total), supporting multiple FDD and TDD bands. The Nova230 Pro is available in both built-in antenna and external antenna versions, as shown in Figure 1-1. It supports wired or wireless backhaul access to the backbone network and provides LTE access for terminals to deliver voice and data services.

Figure 1-1 Nova230 Pro Base Station



Built-in Antenna



External Antenna

The Nova230 Pro is designed for deployment in user-dense areas, coverage blind spots, and network edge scenarios. It can also be flexibly used in targeted spot-coverage applications such as RV parks, yacht marinas, and high-density residential areas including townhouses and apartment buildings. Baicells provides operators with both local and web-based graphical user interfaces (GUI) for convenient configuration and management of base stations and subscriber devices in the network. In addition, Baicells provides a cloud-based SaaS solution called CloudCore EPC that includes all core network functions. Baicells also provides BaiOMC for unified network equipment management and BaiBOSS for subscriber service management, operations, and billing.

This document introduces the basic features of the base station, installation preparation, installation procedures, environmental requirements, and post-installation status verification. For more configuration information, refer to the *Base Station Configuration Guide* for the corresponding software version.

1.2 Highlights

- Supports 5 MHz, 10 MHz, 15 MHz, and 20 MHz operating bandwidths.
- In FDD mode with 20 MHz bandwidth, the peak downlink rate is up to 150 Mbps and the uplink rate is up to 50 Mbps.
- In TDD mode with 20 MHz bandwidth, the peak downlink rate is up to 145 Mbps and the uplink rate is up to 35 Mbps.

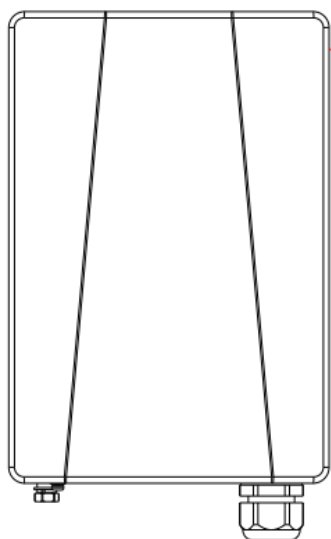
- Supports up to 128 RRC connected users.
- Supports multiple synchronization methods, including GPS and 1588v2.
- Lower power consumption reduces OPEX.
- Supports PoE++, enabling both data backhaul and device power supply over a single Ethernet cable.
- IP-based backhaul, including backhaul over public transport networks.
- Built-in GPS antenna.
- Supports the TR-069 network management protocol.
- Provides excellent NLOS coverage capability.
- Comprehensive security services provide timely protection against potential security risks and unauthorized intrusion.
- Supports web-based management for intuitive operation.
- Designed for on-demand integration, easy installation and deployment, precise coverage, and rapid enhancement of existing network capacity.
- Provides comprehensive network management functions for system management, monitoring, and maintenance through the Baicells management platform.
- Supports integration with third-party network management systems for unified end-to-end device management.

1.3 Appearance

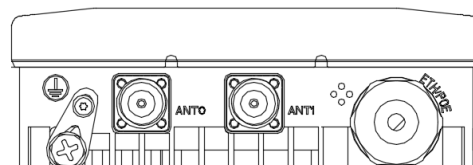
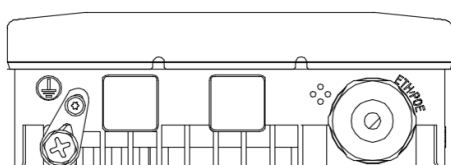
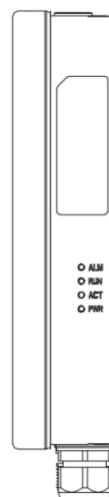
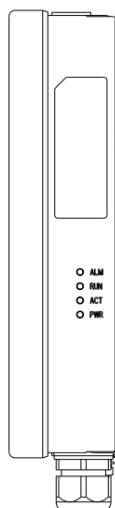
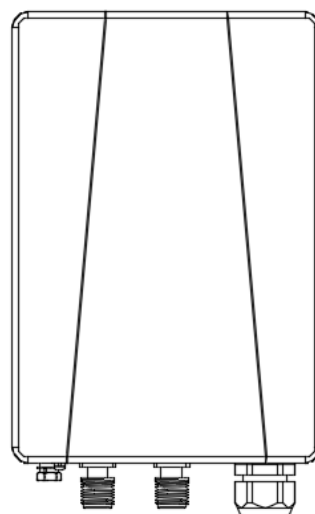
The appearance of the Nova230 Pro base station is shown in *Figure 1-2*.

Figure 1-2 Nova230 Pro Base Station Appearance

Built-in Antenna



External Antenna



The interfaces of the Nova230 Pro base station are shown in *Table 1-1*.

Table 1-1 Nova230 Pro Interface Description

Interface	Description
ETH/POE	RJ-45 interface for data configuration and data backhaul, also

Interface	Description
	used for PoE++ power supply, compliant with IEEE 802.3bt.
ANT0	(Optional) External antenna port 0, N-type connector.
ANT1	(Optional) External antenna port 1, N-type connector.

The LED indicators of the Nova230 Pro base station are shown in *Table 1-2*.

Table 1-2 Nova230 Pro LED Indicator Description

Identity	Color	Status	Description
PWR	White	Steady On	Power input present
		OFF	No power input
ACT	White	OFF	Reserved
RUN	White	Steady On	Base station powered on
		Fast flash: 0.125 s on, 0.125 s off	Data is being transmitted
		Slow flash: 1 s on, 1 s off	Cell activated
ALM	Red	Steady On	Reserved
		Fast flash: 0.125 s on, 0.125 s off	S1 alarm
		Slow flash: 1 s on, 1 s off	Other alarm

1.4 Technical Specifications

1.4.1 Technology

Item	Description
Standard	LTE FDD RAN (3GPP R10)

Item	Description
	LTE TDD RAN (3GPP R10)
TDD UL/DL Configuration	1, 2, 6 (Special Subframe 7)
Frequency Band	Band 2 (UL: 1850 MHz-1910 MHz / DL: 1930 MHz-1990 MHz) Band 3 (UL: 1710 MHz-1785 MHz / DL: 1805 MHz-1880 MHz) Band 40 (2300 MHz-2390 MHz)
Channel Bandwidth	5/10/15/20 MHz
MIMO	DL 2 x 2
Security	Radio: SNOW 3G/AES-128/ZUC Backhaul: IPsec (X.509 AES-128, AES-256, SHA-128)
Voice Solution	VoLTE and CSFB fallback to GSM
SON	Supports auto-configuration, ANR, and PCI conflict detection
Traffic Offload	Local breakout
Operation and Maintenance	• Supports remote and local maintenance via SSH • Supports online status management • Supports performance statistics • Supports fault management • Supports local or remote software loading and upgrades • Supports logging • Supports connectivity diagnostics • Supports automatic startup and initial configuration • Supports alarm reporting

Item	Description
	- Supports user information tracing - Supports signaling tracing
Network Management	IPv4/IPv6, HTTP/HTTPS, TR-069, SSH
VLAN/VxLAN	802.1Q/VXLAN
Power Control	UL open-loop power control, DL power allocation (3GPP TS 36.213)
Scheduling	3GPP standard QCI
ARQ/HARQ	Yes
Synchronization	GPS/BeiDou (built-in), 1588v2

1.4.2 Performance

Item	Description		
Peak Throughput (FDD)	-		DL (Mbps)
	20 MHz		195
	10 MHz		97.5
Peak Throughput (TDD)	-		DL (Mbps)
	20 MHz	SA1	105
		SA2	145
		SA6	85
	-		DL (Mbps)
	10 MHz	SA1	51
		SA2	70
		SA6	42
	-		UL (Mbps)

Item	Description
User Capacity	128 RRC connected users
Latency	30 ms
Receive Sensitivity	-101 dBm
Modulation Scheme	MCS0 (QPSK) to MCS28 (256QAM) UL: QPSK, 16QAM DL: QPSK, 16QAM, 64QAM, 256QAM
Transmit Power	0 dBm to 27 dBm per channel (0 to 500 mW per channel), 30 dBm total (1 W total)

NOTE: Receive sensitivity is measured based on the test method recommended in 3GPP TS 36.104, under 5 MHz bandwidth and FRC A1-3 in Annex A.1 (QPSK, R=1/3, 25RB).

1.4.3 Modulation Levels (Adaptive)

MCS	Modulation Scheme	RSRP (dBm)
0 - 4	QPSK	-120<= RSRP < -110
5 - 10	16QAM	-110<= RSRP < -100
11 - 19	64QAM	-100<= RSRP < -85
20 - 27	256QAM	RSRP >= -85

NOTE: The information provided is for reference only, as environmental conditions can affect modulation levels. The values are based on the following scenario: base station height of 30 meters and CPE height of 2 meters.

1.4.4 Interface

Item	Description
Ethernet Interface	1 x RJ-45 Ethernet interface (GE)
Power Supply	PoE++, compliant with IEEE 802.3bt
LED Indicators	4 x status LED indicators

Item	Description	
	PWR/ALM/RUN/ACT	
RF Antenna	FDD	TDD
	Built-in 10 dBi high-gain antenna - Horizontal beamwidth: 65° - Vertical beamwidth: 42° - Polarization: ±45°	Built-in 10.5 dBi high-gain antenna - Horizontal beamwidth: 60° - Vertical beamwidth: 38° - Polarization: ±45°

1.4.5 Physical

Item	Description	
Power Interface Lightning Protection	Common mode: 3 kA, 8/20 μs current wave Differential mode: 2 kA, 10/700 μs voltage wave	
MTBF	≥ 150000 hours	
MTTR	≤ 1 hour	
Ingress Protection Rating	IP65	
Operating Temperature	-40 °C to 55 °C	
Storage Temperature	-45 °C to 70 °C	
Humidity	5% to 95%	
Atmospheric Pressure	70 kPa to 106 kPa	
Power	FDD	TDD

Item	Description	
Consumption	Typical < 28 W	Typical < 25 W
	Rated < 35 W	Rated < 32 W
Weight	Approx. 1.55 kg	
Dimensions (H x W x D)	221 mm × 150 mm × 52 mm (8.70 in × 5.91 in × 2.05 in)	
Installation	Pole or wall mount	

2. Installation Preparation

2.1 Supporting Materials

Because installation environments vary, users need to prepare the following supporting materials according to site conditions. When selecting an RF antenna, ensure that the antenna frequency band matches the base station frequency band, as shown in *Table 2-1*.

Table 2-1 Supporting Materials for Base Station Installation

Name		Description
Ethernet Cable		Outdoor CAT6 Ethernet cable, with a recommended routing length of less than 100 meters Recommended cable diameter: not less than 7 mm
Antenna Feeder Cable		(Optional) 50Ω feeder cable, 1/2 jumper NOTE: Required only for the external antenna model.
Antenna		Omnidirectional or directional dual-polarized antenna
Ground Cable		If the lead length exceeds 10 meters, a ground cable larger than 16mm ² is recommended. For lead lengths within 10 meters, a 10mm ² ground cable is recommended.

Name		Description
Pole		Hot-dip galvanized steel pipe with a diameter of 40mm to 70mm. Channel steel mounting is also supported.
Power Distribution Box		The distribution box is mainly used to install AC circuit breakers, sockets, power grounding bars, and broadband access equipment. It must provide waterproof and lightning protection functions.

2.2 Installation Tools

The following tools are required during installation.

				
Level	Marker	Knife	Pliers	Adjustable Wrench
				
Hammer Drill (1) with drill bits	Hammer	Phillips Screwdriver	Crimping Tool	Tape Measure
				
5mm L-shaped Allen Wrench	T7 Bit	Ladder	Multimeter	

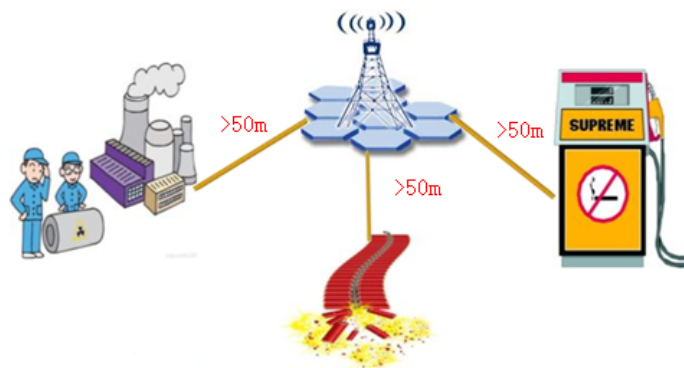
2.3 Personnel Safety

1. Installation personnel must be familiar with safe operating practices, have received relevant training, and hold the required qualifications.
2. Before installation, personnel must prepare proper personal protective equipment, such as safety helmets, safety belts, reflective vests, protective gloves, and safety shoes.
3. Before work begins, personnel must cross-check one another to ensure all protective equipment is in place, intact, secure, and free of omissions.

2.4 Installation Environment

2.4.1 Location Requirements

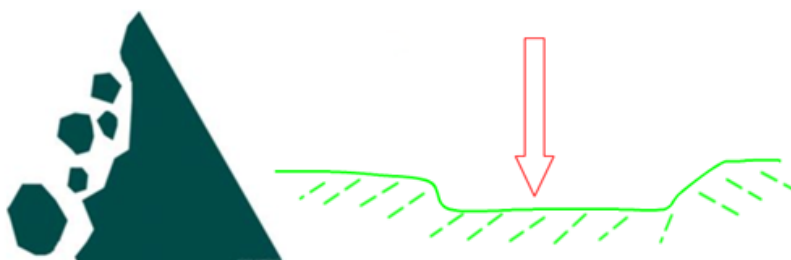
1. Avoid installing the base station near flammable or explosive warehouses, gas stations, or industrial facilities where fire or explosion hazards may occur during production. Keep the site away from high-voltage power lines and railways.



2. Without affecting overall network planning, existing telecom hub buildings, post and telecommunications offices, or microwave stations should be used as preferred sites whenever possible, making use of their equipment rooms, power supply, towers, and other facilities.



3. Avoid sites near high-power radio transmitters such as radar stations and television towers. If such a site must be used, verify whether mutual interference exists and take preventive measures accordingly.
4. Avoid installing the base station on high mountains. Mountain-top sites create large interference areas and affect frequency reuse. In rural areas, mountain-top deployment often provides poor coverage for towns located in small basins.



5. Avoid installing the base station in wooded areas. If unavoidable, ensure that the antenna is higher than the tree canopy.
6. The base station must not be installed in mining areas or in places prone to flooding or landslides.
7. In urban areas, macro-cell base stations should preferably be installed on buildings higher than the average building height but lower than the tallest surrounding building. For micro-cell base stations, buildings lower than the average building height and well shielded by surrounding buildings are preferred.

8. For urban sites, avoid tall buildings close in front of the antenna that may obstruct coverage or cause reflections that interfere with co-channel base stations behind them.
9. Avoid sites where future new buildings may affect coverage or cause co-channel interference.
10. For two network systems in urban areas, base stations should preferably be co-located or sited close to one another.

2.4.2 Environment Requirements

The temperature and humidity requirements for base station operation are shown in Table 2-2.

Table 2-2 Environmental Requirements

Item	Range	Typical Value
Temperature	-35°C to 55°C	25 °C
Relative Humidity (Non-condensing)	0% to 100%	5% to 95%

2.5 Lightning and Grounding Protection



CAUTION:

An LTE base station is a highly sophisticated communication device. It is therefore strongly recommended to test the equipment on the ground before mounting it on the tower to ensure that all functions operate properly.

Lightning protection measures must be implemented for both the base station and the RF antenna. Observe the following grounding requirements:

- Use a yellow-green grounding cable with a cross-sectional area of at least 10mm².
- Use the nearest possible grounding point.

- Connect the base station to a reliable grounding point through the grounding screw, and ensure the joint is securely soldered.
- The grounding terminal must be tightly and reliably connected to the grounding bar. Anti-corrosion treatment such as anti-rust paint, anti-oxidation coating, or grease is required.

2.6 Waterproof Protection

To protect the interfaces from rainwater ingress and prevent equipment damage, the Nova230 Pro uses cold-shrink tubing for waterproof protection. Before installing the cold-shrink tubing, ensure that the interfaces are clean.

1. Pass the cable to be protected through the cold-shrink tubing.
2. Tighten the connector.
3. Push the cold-shrink tubing to the top of the connection point and then pull out the support strip.
4. Check whether the cold-shrink tubing is firmly installed.



CAUTION: Do not cut the cold-shrink tube. Ensure it remains intact during installation.

3. Install Base Station

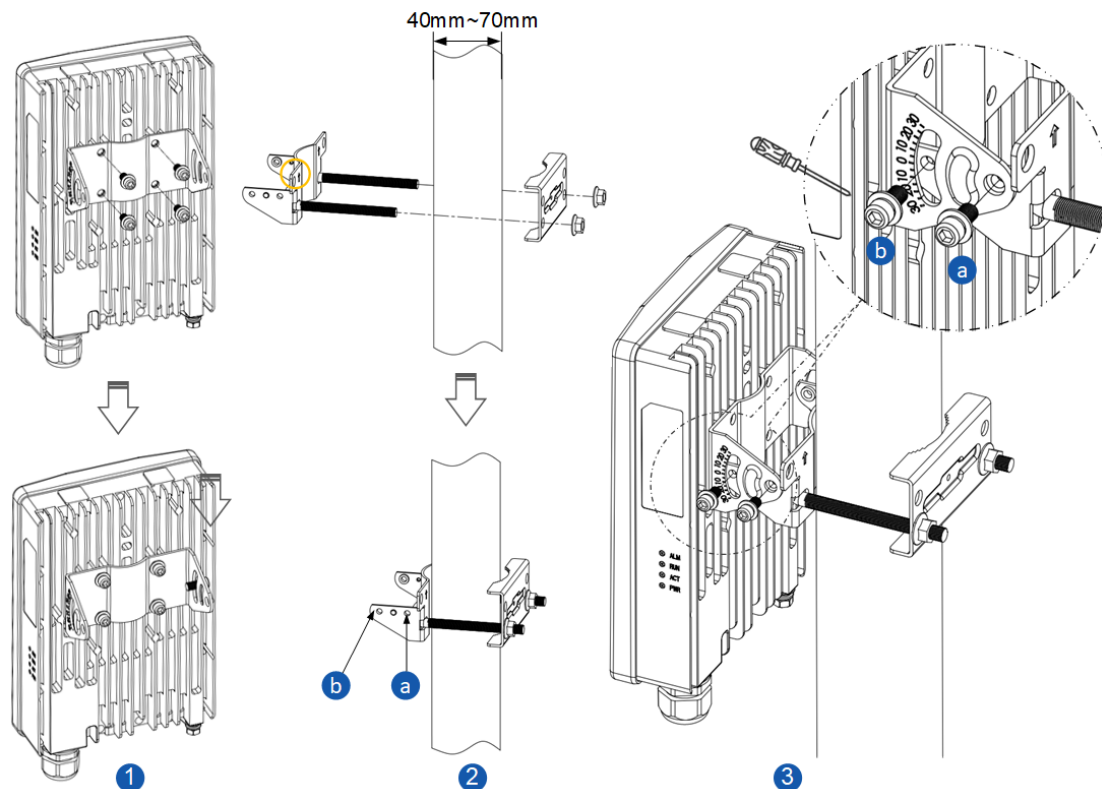
3.1 Unpacking

Before opening the package, make sure the carton is intact and shows no signs of severe damage or water ingress. During unpacking, avoid excessive force or impacts to the contents, otherwise the components inside may be damaged.

After opening the package, check whether the delivered equipment matches the packing list.

3.2 Pole Mount Installation

Required pole diameter: 40mm to 70mm. The recommended installation height is more than 120cm above ground. The mounting bracket consists of two parts: one part is installed on the rear of the base station, and the other is used for pole mounting or wall mounting. The pole mount installation procedure is described below.

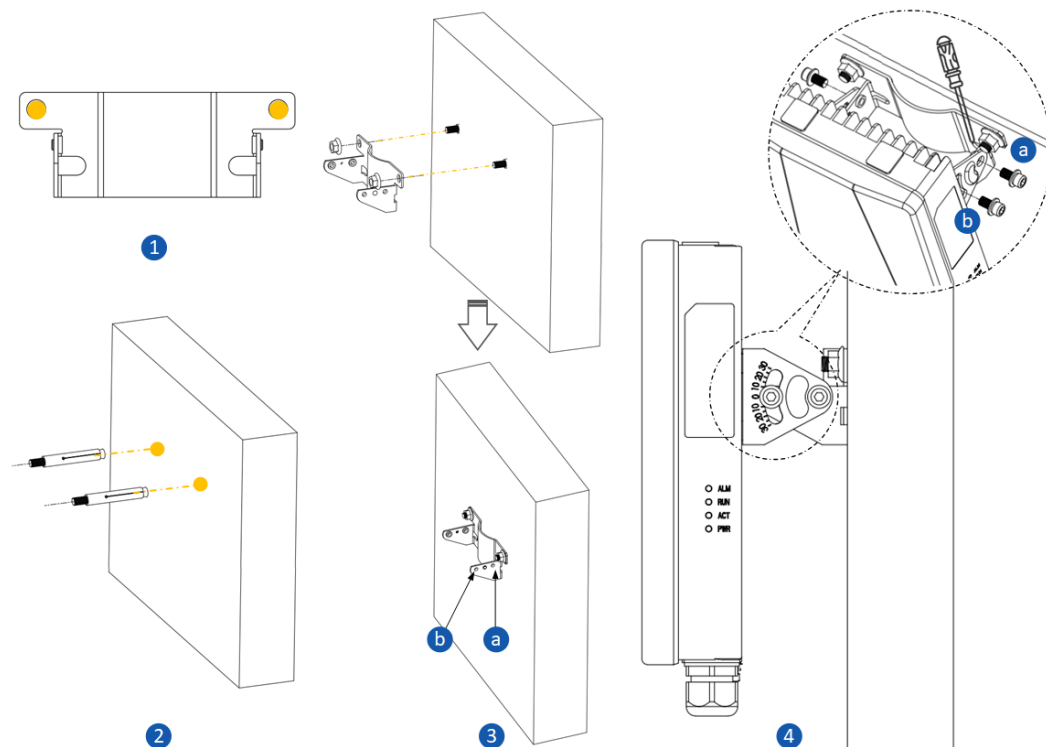


NOTE: The arrow on the mounting bracket must point upward.

1. Use four screws to install the rear bracket on the back of the base station.
2. After determining the installation height, pass the pole bracket threaded rods around the pole so that the bracket fits tightly against it, then place the clamp on the rods and fasten the bracket to the pole with two nuts.
3. Align the screw holes of the two bracket assemblies and tighten the nut at point a to preliminarily secure the base station to the pole-mount bracket.
NOTE: Do not fully tighten the screw at this stage. Then adjust the installation angle of the base station, tighten the nut at point b, and finally fully tighten the nut at point a.

3.2.1 Wall Mount Installation

The wall must have a load-bearing capacity greater than four times the weight of the base station. The wall mount installation procedure is described below.



1. Place the wall-mount bracket against the wall and mark the drilling positions with a marker. Drill two holes at the marked positions, each approximately 10mm in diameter and 70mm deep.

2. Insert expansion bolts into the two drilled holes.
3. Mount the wall bracket onto the expansion bolts, then install the flat washers and spring washers in sequence and tighten the nuts.
4. Referring to Step 3 in Section 3.2 Pole Mount Installation, align the screw holes of the rear bracket with the corresponding holes on the wall-mount bracket, then tighten all nuts in sequence.

3.3 Cable Connections

3.3.1 Cabling Requirements

General Requirements:

- Feeder cable bending radius: 7/8 in. > 250mm, 4/5 in. > 380mm
- Jumper cable bending radius: 1/4 in. > 35mm, 1/2 in. (super soft) > 50mm, 1/2 in. (ordinary) > 127mm
- Power and grounding cable bending radius: more than three times the cable diameter
- Bind cables according to cable type. Do not cross-bind or wind different types of cables together.
- Apply corresponding labels after cable routing is completed.

Ground Cable Routing Requirements:

- The grounding cable must be connected to the grounding point.
- The grounding cable must be separated from other signal cables and kept at an appropriate distance to avoid signal interference.

3.3.2 (Optional) Connect Antenna Feeder Cables

This operation is required only for the external antenna model.



CAUTION:

Do not activate the cell or transmit RF signals before the antenna and feeder system has been properly connected. Outdoor base stations transmit RF signals at relatively high power. RF transmission without the antenna and feeder system connected may cause bodily injury to installation personnel and may also damage RF power amplifier components.

When only one antenna is used, the unused antenna port must be terminated with a load to avoid damage to the power amplifier.

1. Remove the dust caps from the ANT0 and ANT1 ports.
2. Slide one end of the feeder cable through the cold-shrink tubing.
3. Connect one end of the feeder cable to the ANT0 and ANT1 ports respectively and tighten them with a wrench.
4. Push the cold-shrink tubing to the antenna connection point and pull out the support strip.
5. Take another piece of cold-shrink tubing and place it over the other end of the feeder cable.
6. Connect the other end of the feeder cable to the external antenna and use the same procedure for waterproof treatment.

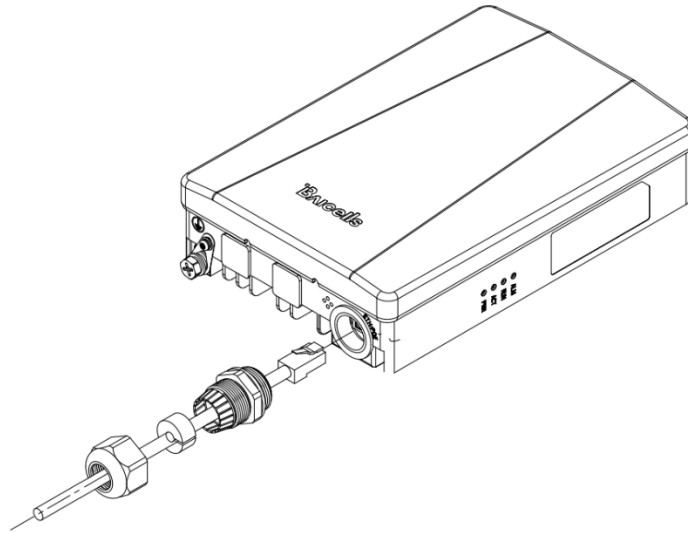
3.3.3 Connect Ethernet Cable

CAUTION:

- The Ethernet cable diameter must not be less than 7mm. A shielded Category 6A cable is recommended. Otherwise, the connector may not lock properly and the base station may be damaged by water ingress.
- The PoE adapter must have lightning protection and be placed in a waterproof location such as a power distribution box.
- The Ethernet cable should be additionally protected with a flexible conduit.

Unscrew the Ethernet connector components from the interface, then pass the Ethernet cable through the connector parts in the order shown in Figure 3-1. Insert the cable into the ETH port of the base station and then tighten the connector.

Figure 3-1 Connect Ethernet Cable

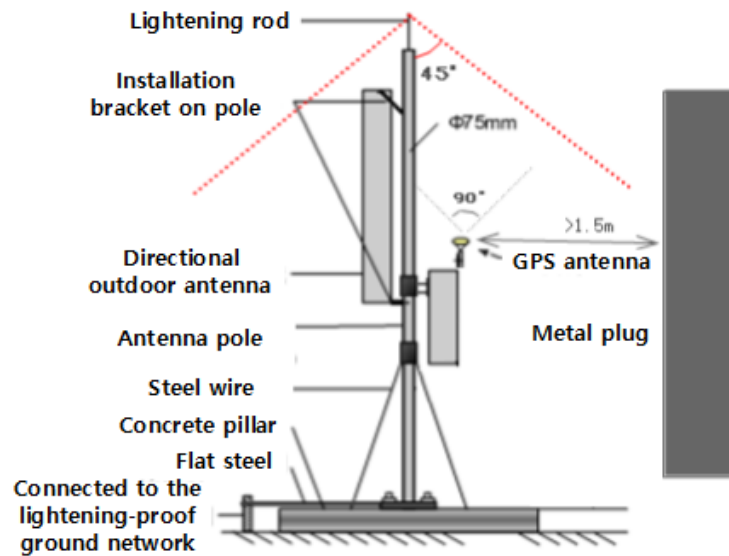


3.3.4 Connect Ground Cable

3.3.4.1 Pole Grounding

The purpose of pole grounding is to protect on-site equipment from lightning-induced overvoltage as much as possible. The main external interfaces of the base station are the power system, grounding system, antenna and lightning interception system, and signal cables. Damage caused by lightning usually results from the potential difference between the equipment in the station and one or more of these four interfaces. If this potential difference exceeds the withstand capability of the equipment, damage will occur. In addition, if the abnormal current introduced into the station is large enough and the dynamic ground potentials between devices inside the station differ significantly, internal equipment damage may also occur. The top of the antenna must be within the 45-degree lightning protection angle of the lightning rod, as shown in *Figure 3-2*.

Figure 3-2 Pole Grounding



1. The grounding bar installation position must meet the design requirements. The pole and tower structure must be connected to the lightning protection network or grounded separately through dedicated grounding conductors.
2. The grounding cable size must meet the design requirements, and grounding must use copper cable lugs. The grounding resistance must be less than 10 ohms. For public communication equipment installed within other systems, if the resistance is less than 10 ohms, it should be bonded to that system's grounding grid.
3. The grounding cable must be a continuous conductor without splicing. During installation, it must be separately bound from other cables. All grounding cables should be fixed with cable clips or cable ties at intervals of 0.3 meters, and the routing should be straight and neat.
4. The grounding bar must be made of copper, and its specification must comply with the design requirements. If there is no specific requirement in the design, use a 300mm x 40mm x 4mm grounding bar and fix it with expansion bolts.
5. The grounding cable must be a full-length cable with no intermediate joints, and any excess length must be cut off. The outer sheath must be intact, and the insulation resistance between the core conductor and ground, or the metallic shielding layer, must meet the cable technical requirements.
6. The grounding cable should be connected to the building's integrated grounding bar. If connection to the building grounding bar is not possible, select an appropriate grounding point according to the indoor integrated

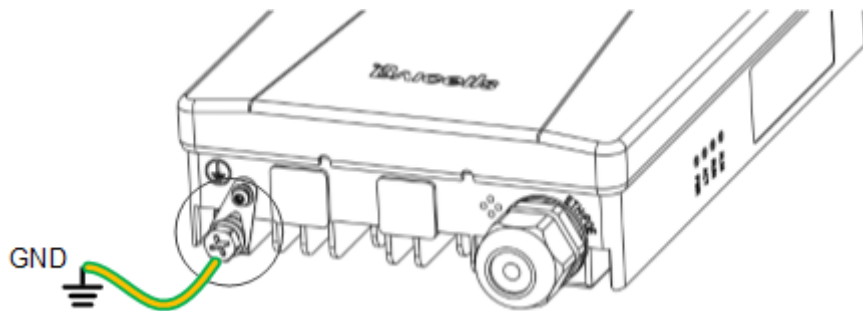
grounding conditions. The grounding point must be higher than the grounding grid, and feeder grounding must follow the downward direction of the feeder cable and must never be oriented upward.

7. For tunnel outdoor antennas with a self-built grounding grid, the grounding electrode must meet the design requirements. The burial depth of the electrode and the welding quality of the flat steel must comply with relevant specifications. In principle, the burial depth must not be less than 0.7 meters. For non-self-built grounding grids, the grounding must be connected to the owner's grounding network.
8. Base station grounding, power adapter grounding, distribution box grounding, and feeder grounding must all be connected independently to the grounding bar, and the grounding bar must have a conductor path to earth.

3.3.4.2 Base Station Grounding

The grounding cable should be fabricated on site according to the actual routing at the installation location. The grounding screw of the base station is located at the bottom of the unit, as shown in *Figure 3-3*.

Figure 3-3 Grounding Screw Location



1. Loosen the grounding screw and connect one end of the base station grounding cable to the grounding screw.
2. Connect the other end of the base station grounding cable to a reliable grounding bar at the installation site.

3.4 Power On

After the device is powered on, wait about 3 minutes for the base station to

complete startup. The LED indicators will then display the base station status. Refer to Table 1-2.

4. Precautions

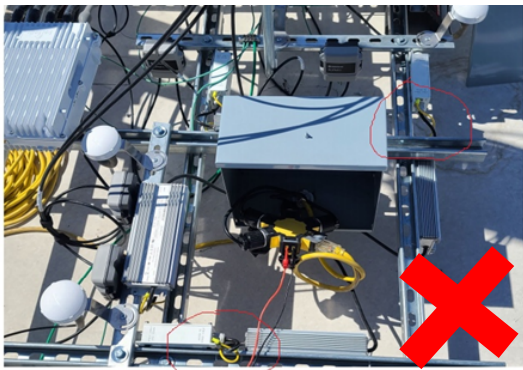
4.1 FAQ

1. After the power cable is connected and power is applied, the PWR indicator does not turn on.
 - 1) The power cable may not be properly connected or the contact may be poor.
 - 2) The circuit may not be energized.
 - 3) The power cable may be connected with reversed polarity.
 - 4) The adapter may not be working.
 - 5) The power interface of the device may have poor contact.
2. How should the antenna feeder cable be connected?
 - 1) ANT0 is the primary port and ANT1 is the secondary port.
3. How should the pole-mount position be selected on a rooftop?
 - 1) It must not be close to the edge.
 - 2) Do not choose a location without load-bearing beams.
 - 3) Do not choose the side close to an obstruction. Select the most open location available.
4. Base station signal coverage is poor after service activation.
 - 1) Check whether the configured transmit power is set to full power.
 - 2) Check whether there is a VSWR alarm. If there is, handle it promptly.
 - 3) Check whether the RF band of the device matches the operating band of the antenna.
 - 4) Check whether the downtilt planning of the base station is reasonable.

- 5) Check whether there are obstructions in the line of sight of the antenna coverage.
5. 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

 A photograph showing a GPS antenna mounted on a wall. A thick black cable is coiled and draped over the antenna, blocking its view. A large red 'X' is overlaid on the bottom right of the image.	 A photograph showing a dense, tangled mass of black cables and wires connected to a device. The cables are not bundled or organized. A large red 'X' is overlaid on the bottom right of the image.
GPS antenna blocked	Disorganized cabling
 A photograph of a metal pole on a rooftop. A lightning rod is attached to the pole, but the connection point is circled in red, indicating it is not properly connected to a grounding bar. A large red 'X' is overlaid on the bottom right of the image.	 A photograph showing two antennas mounted on a pole. A white rectangular GPS antenna is mounted directly in front of a larger white rectangular RF antenna, blocking its signal. A large red 'X' is overlaid on the bottom right of the image.
Pole lightning rod not connected to grounding bar	GPS antenna installed directly in front of the RF antenna

	
No lightning rod	Disorganized cabling in distribution box
	
Power cables cross signal cables	Duplicate grounding point connection



Cell activated and RF transmitted
without antenna feeder connected