



Nova-436 Outdoor LTE TDD Base Station

Installation Guide

About This Document

This document is a guidance of Nova-436 hardware installation for installation personnel, including the preparation of installation tools and supporting materials, the demands for installation environment, installation procedure, cable connection and power on.

Accomplish the installation of the device according to this guide, the installation personnel can avoid potential damage to the device during the installation procedure, which makes sure the subsequent good running of the device.

This document is suitable for model mBS2130.

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Disposal of Electronic and Electrical Waste



Pursuant to the WEEE EU Directive, electronic and electrical waste must not be disposed of with unsorted waste. Please contact your local recycling authority for disposal of this product.

Revision Record

Date	Version	Description
30 Oct, 2017	01	Initial Released.
16 Jan, 2018	02	Optimize descriptions and fix some bugs.

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Table of Contents

1.	Product Overview	1
1.1	Introduction	1
1.2	Features.....	1
1.3	Appearance	2
1.4	Technical Specification	3
1.4.1	Hardware Specification.....	3
1.4.2	Software Specification	4
1.4.3	Environment Specification.....	5
1.4.4	Antenna Information	5
1.4.5	Maximum Output Power	6
2.	Installation Preparation	8
2.1	Support Materials.....	8
2.2	Installation Tools	8
2.3	Installation Environment.....	9
2.3.1	Locational Requirements.....	9
2.3.2	Environmental Requirements.....	9
2.4	Personnel Requirements.....	9
2.5	Against Lightning and Grounding Protection	9
2.6	Weatherproof Protection.....	10
2.7	Regulatory Compliance	10
3.	Base Station Installation.....	12
3.1	Unpacking.....	12
3.2	Installation Procedure.....	12
3.3	Install GPS Antenna	12
3.4	Install on Pole	13
3.5	Install on Wall.....	15
3.6	Connect Cable	15

3.6.1	Requirement for Cable Laying	15
3.6.2	Connect GPS Antenna.....	16
3.6.3	Connect RF Cable.....	16
3.6.4	Connect Optical Fiber	16
3.6.5	Connect Ethernet Cable.....	17
3.6.6	Connect Power Connector.....	17
3.6.7	Connect Ground Cable.....	18
3.7	Install Antenna Feeder System.....	18
3.7.1	Install Omnidirectional Antennas	18
3.7.2	Install Directional Antennas.....	20
4.	Power On	22

List of Figures

Figure 1-1	Nova-436 Appearance	2
Figure 1-2	Nova-436 Interfaces and Indicators.....	2
Figure 3-1	Installation Procedure of Nova-436	12
Figure 3-2	Install GPS Antenna.....	13
Figure 3-3	Location of Grounding Screws.....	18
Figure 3-4	Omnidirectional Antenna Installation (1).....	19
Figure 3-5	Omnidirectional Antenna Installation (2).....	20
Figure 3-6	Assembling Procedure of Directional Antennas	20
Figure 3-7	Transportation the Antennas in the Height	21
Figure 3-8	Directional Antenna Installation	21
Figure 4-1	LED Indicators	22

List of Tables

Table 1-1	Nova-436 Interface Description.....	3
Table 1-2	Nova-436 Interface Indicators	3

Table 2-1 Support Materials for Installing Base Station	8
Table 2-2 Environmental Requirements of the Base Station	9
Table 4-1 Nova-436 Indicator Description	22

1. Product Overview

1.1 Introduction

Baicells Nova-436 is a high performance outdoor 3.5GHz micro base station based on LTE TDD technology, which is developed by Baicells. The Nova-436 supports wired backhaul connections to backbone networks, and provides LTE access to user terminals, implemented voice and data service transmissions.

The Nova-436 makes use of the current transmission resources to reduce the operator's investment, implement the low-cost construction of LTE networks and enhance indoor coverage, thereby providing high-speed broadband access for users in assembly occupations.

The Nova-436 can be widely used by telecom operators, broadband operators, enterprises, and so on.

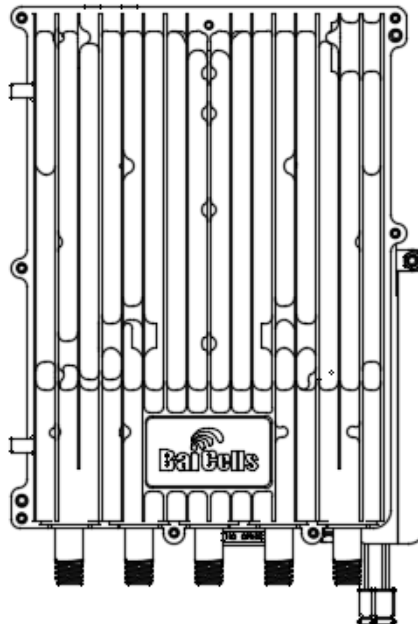
1.2 Features

- 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 transfer rate of DL: 224Mbit/s, UL: 14Mbit/s with 2*20MHz spectrum.
- Support flexible uplink and downlink time slot ratio: 1(2:2), 2(1:3), and high speed data transmission.
- Support 10MHz/20MHz operation bandwidth.
- Support four ports antenna or two antennae with two ports.
- Support copper (RJ-45) and optical port backhaul, flexible to deploy.
- Security services to provide timely protection against potential security risks and illegal intrusion.
- 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

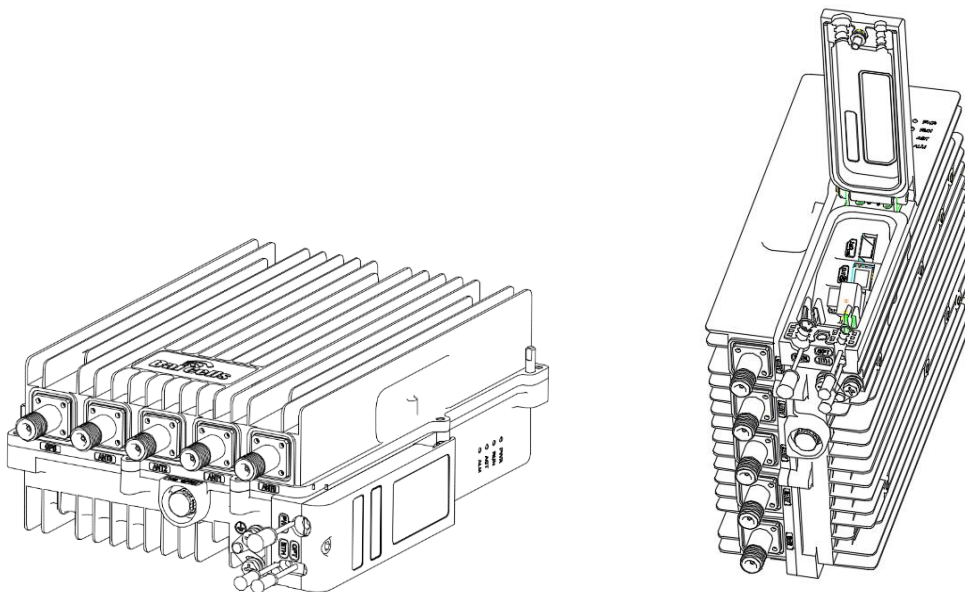
The Nova-436 base station appearance is shown in Figure 1-1.

Figure 1-1 Nova-436 Appearance



The Nova-436 interfaces and indicators are shown in Figure 1-2.

Figure 1-2 Nova-436 Interfaces and Indicators



The Nova-436 interfaces are described in Table 1-1.

Table 1-1 Nova-436 Interface Description

Interface Name	Description
PWR	Power interface: -48V (-60V to -42V) DC
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 Nova-436 interface indicators are described in Table 1-2.

Table 1-2 Nova-436 Interface 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, e.g. VSWR alarm
		OFF	No alarm

1.4 Technical Specification

1.4.1 Hardware Specification

Item	Description
LTE Mode	LTE TDD
LTE Frequency	3650 MHz to 3700 MHz
Channel Bandwidth	10MHz, 20MHz on each carrier
Output Power	30 dBm@antenna
Receive Sensitivity	-100 dBm

Item	Description
Synchronization	GPS, 1588 V2
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 high gain antenna
Overall Power	< 60 W
Power	48V DC, AC adaptor (multi-national standards)
Weight	About 5.5kg

1.4.2 Software Specification

Item	Description
LTE Standard	3GPP Release 12
Peak Rate	<ul style="list-style-type: none"> • 2*20 MHz: SA1: DL 80 Mbps, UL 28 Mbps (per cell) SA2: DL 110 Mbps, UL 14 Mbps (per cell) • 2*10MHz: SA1: DL 40 Mbps, UL 14 Mbps (per cell) SA2: DL 55 Mbps, UL 7 Mbps (per cell)
User Capacity	96 concurrent users per cell/carrier 192 concurrent users per eNodeB
Modulation	UL: QPSK, 16QAM, 64QAM DL: QPSK, 16QAM, 64QAM
Voice Solution	CSFB, VoLTE, eSRVCC
Traffic Offload (optional)	LIPA (Local IP Access) SIPTO (Selected IP Traffic Offload)
SON	Automatic setup ANR (Automatic Neighbor-cell Recognition) PCI confliction detection
Spectrum Scanning	Supported
UL Interference Detection	Supported
RAN Sharing	Supported
Network Management Interface	TR069 interface protocol
MTBF	≥ 150000 hours
MTTR	≤ 1 hour
Maintenance	Support remote/local maintenance, based on SSH protocol

Item	Description
	Support remote maintenance
	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
	Support KPI Recording
	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	70 kPa to 106 kPa
Ingress Protection Rating	IP66
Power Interface Lightning Protection	Differential mode: $\pm 10\text{KA}$ Common mode: $\pm 20\text{KA}$

1.4.4 Antenna Information

The following is a list of antennas that are certified for use. Customers can choose different antennas according to the environment.

Table 1-3 Antenna Information

Antenna Type	Manufacturer	Model Number	Antenna Max Gain(dBi)
External Planar Antenna Dual Pole	Kenbotong Technology Co., Ltd.	KBT90DP13-3338 AT0	13
External Planar Antenna Dual Pole	Kenbotong Technology Co., Ltd.	KBT90DP14-3338 AT0	14

External Planar Antenna Dual Pole	Baicells Technologies Co., Ltd	ANT-3G11-R-65-EDT0	11
External Planar Antenna Dual Pole	Baicells Technologies Co., Ltd	ANT-3G7-R-65-EDT0	7
External Omnidirectional Antenna Single Pole	Kenbotong Technology Co., Ltd.	TQJ-3500AC6	6
External Omnidirectional Antenna Single Pole	Kenbotong Technology Co., Ltd.	TQJ-3500AC3	3
External Omnidirectional Antenna Single Pole	Kenbotong Technology Co., Ltd.	TQJ-3500AT8	8

1.4.5 Maximum Output Power

The maximum output power can be set as follows:

Antenna Max Gain (dBi)	10Log(Number of antennas)	Channel BW (MHz)	Max output power each carrier (dBm)	EIRP (dBm)
13	3	10	23	39
		20	23	39
14		10	22	39
		20	22	39
11		10	25	39
		20	25	39
7		10	29	39
		20	29	40
6		10	30	39
		20	30	39
3		10	33	39
		20	33	39

8		10	28	39
		20	28	39

2. Installation Preparation

2.1 Support Materials














Prepare the following support materials accordingly, as given in Table 2-1.

Table 2-1 Support Materials for Installing Base Station

Item	Description
Power cable	< AWG16 e.g. AWG14 Shorter than 100m (330 feet)
Antenna RF cable	50 ohm feeder
Optical fiber	Single mode optical fiber
Ethernet cable	Outdoor CAT6 Shorter than 100m (330 feet)
Antenna	Omnidirectional, or directional antenna
Ground cable	16mm ² yellow-green wire

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

2.3.1 Locational Requirements

Environments with high-temperatures, harmful gases, unstable voltages, volatile vibrations, loud noises, flames, explosives, and electromagnetic interference (large radar stations, transmitting stations, transformer substations) are not suitable for the operation of Nova-436, and thus should be avoided.

Places prone to have impounded water, soaking, leakage, or condensation, should also be avoided.

Factors like climate, hydrology, geology, earthquake, electric power, and transportation should be taken into consideration in the construction process so that a proper location can be chosen to meet the communication engineering environmental requirements, as well as the technical requirements of network planning and communication equipment.

2.3.2 Environmental Requirements

Table 2-2 gives the base station's environmental requirements with regards to temperature, humidity, and voltage.

Table 2-2 Environmental Requirements of the Base Station

Item	Range	Typical value
Humidity	-40°C ~ 55°C	25°C
Relative humidity (no condensation)	0% ~ 100%	5% ~ 95%
Safety voltage	42V ~ 58V	48V

2.4 Personnel Requirements

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

2.5 Against Lightening and Grounding Protection



CAUTION:

It is unlikely to happen but since the LTE base station is very sophisticated equipment so we would recommend you to test it on the ground to make sure everything is functioning before install on the tower.

The operator must prepare external against lightning protector to protect the GPS, external antenna and RJ-45 port.

Grounding Notes:

- The ground wire adopts yellow-green wire that is no smaller than 16 mm².
- Grounding principle: as near as possible.
- The base station connects to the reliable outdoor grounding point (earth) through one ground screw.
- The connection of the grounding points and the ground bar need to be tight and reliable. Rustproofing the terminals is required. This can be done with rust preventing paint, anti-oxidation coatings, grease, and so on.

2.6 Weatherproof Protection

The Nova-436 adopts cold shrink tube for weatherproof protection. Before installing the cold shrink tube, clean up the interface first. The weatherproof protection steps are as follows:

1. Insert cable into cold shrink tube.
2. Tighten the connector.
3. Push the cold shrink tube to the top joint and pull out the strip.
4. Check whether the cold shrink tube tight connect with the connection.



2.7 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 A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

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 30 cm between the radiator & your body.

ISED Compliance

This device complies with Innovation, Science, and Economic Development Canada licence-exempt RSS standard(s).

Operation is subject to the following two conditions: (1) This device may not cause interference, and (2) This device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d' Innovation, Science et Développement

économique Canada applicables aux appareils radio exempts de licence.

L'exploitation est autorisée aux deux conditions

suivantes:

- (1) l'appareil ne doit pas produire de brouillage, et
- (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

The antenna(s) used for this transmitter must be installed to provide a separation distance of at least 30 cm from all persons and must not be collocated or operating in conjunction with any other antenna or transmitter, End-Users must be provided with transmitter operation conditions for satisfying RF exposure compliance.

3. Base Station Installation

3.1 Unpacking

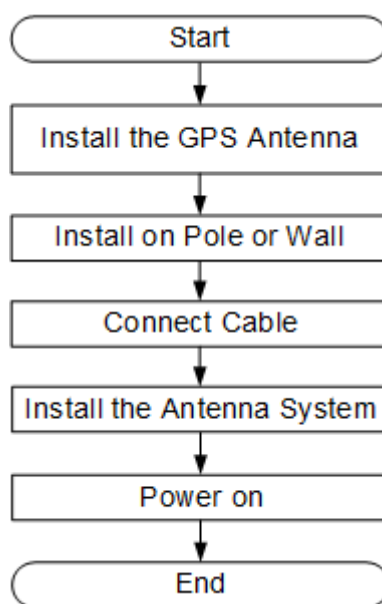
Before opening the box, make sure the package is in good condition, undamaged and not wet. During the unpacking, avoid potential damaging impacts from hits or excessive force.

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

3.2 Installation Procedure

The installation procedure of Nova-436 is given in Figure 3-1.

Figure 3-1 Installation Procedure of Nova-436



3.3 Install GPS Antenna

Installation requirements on the GPS antenna:

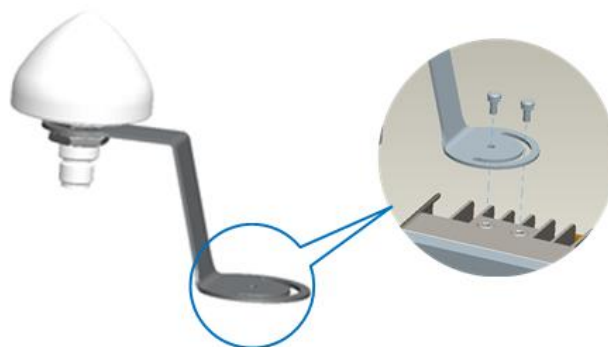
- No major blocking from buildings in the vicinity. Keep the rooftop buildings a distance away from the GPS. Make sure the space atop within 90 degrees (at least 45 degrees) is not blocked by any buildings.
- Avoid installing the GPS in the vicinity of any other transmitting and receiving

devices. Avoid interference from other transmitting antennas to the GPS antennas.

- Should be installed within 45 degrees to the lightning rod.

The GPS has been assembled before packing, the only installation step is to fix the GPS mounting bracket on the base station with the M4*14 screws, as shown in Figure 3-2.

Figure 3-2 Install GPS Antenna

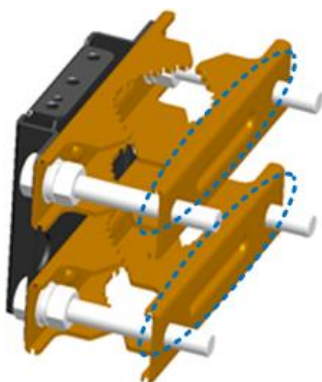


3.4 Install on Pole

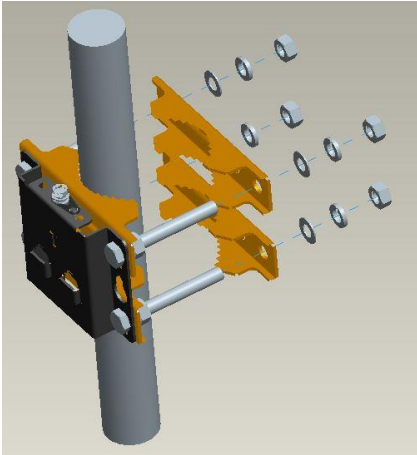
Required diameter of the pole: 40mm ~ 100mm. Suggest the installation height higher than 120cm.

The base station bracket has been assembled before packing. In the installation site, the installation persons only need to fix the assembled base station on pole.

1. Take down the two outer omegas.



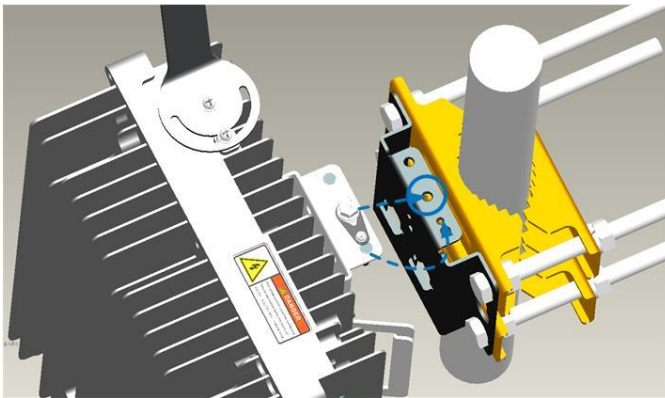
2. Make sure installation height of the base station, fit the thread rod of the assembled bracket to the pole, and then pass the two omegas through the threaded rods, and fasten with four flat gaskets, four spring gaskets, and four nuts.



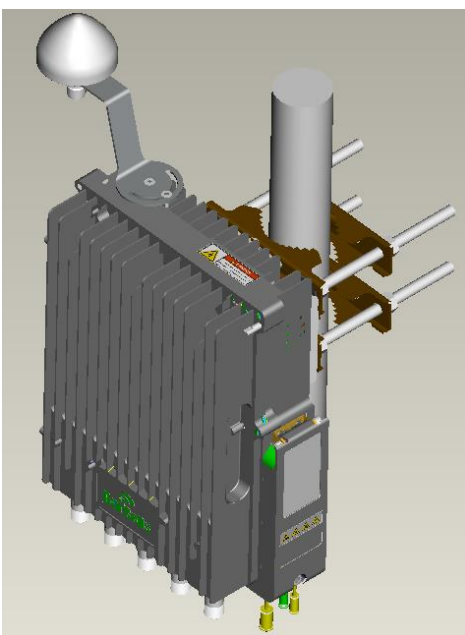
Caution:

The arrow of the installation bracket must be upward.

3. Hung the two pin on the base station bracket to the installation bracket, push the base station until the hook block to the base station's bracket



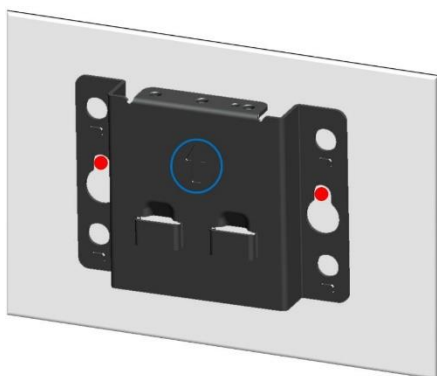
4. Tighten screws on the top of the bracket of the base station using cross screwdriver to complete the installation.



3.5 Install on Wall

The wall must bear four times of the base station weight.

1. Take apart the assembled installation bracket kit to get the installation bracket
2. Fit the installation bracket on the wall, and mark the drilling locations.



Caution:

The arrow of the installation bracket must be upward.

3. Drill two 10mm diameter and 70mm depth holes in the wall by following the marked locations.
4. Check the up/down direction of the installation rack, and then fix base station to the wall using M8*80 expansion screws.
5. Refer to the installation steps on pole, fix base station on wall.

3.6 Connect Cable

3.6.1 Requirement for Cable Laying

General requirements:

- Bending radius requirement of feeder cable: 7/8" > 250mm, 4/5" > 380mm
- Bending radius requirement of jumper cable: 1/4" > 35mm, 1/2" (super soft) > 50mm, 1/2" (ordinary) > 127mm
- Bending radius requirement of power cable and grounding cable: > tripled of the diameter of cable
- The minimum bend radius of the optical fiber is the 20 times of the diameter of optical fiber.
- Binding the cables according the type of the cable, the intertwining and crossing is

forbidden.

- The label should be paste after the cable laying.

Optical fiber laying requirement:

- The circling and twisting is forbidden during the laying.
- The binding on the turning is forbidden.
- The pulling and weigh down the optical fiber is forbidden.
- The redundant optical fiber must enwind the dedicated device.

Grounding laying requirement:

- The grounding cable must connect to the grounding point.
- The grounding cable must be separate with the signal cables, remaining a certain distance to avoid the interruption of signal.

3.6.2 Connect GPS Antenna

1. Insert GPS jumper into 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. Connect the other end of the GPS jumper to **GPS** interface of the base station, which also need weatherproof protection.

3.6.3 Connect RF Cable

1. Open the dust cap of **ANT0**, **ANT1**, **ANT2**, and **ANT3** interface.
2. Insert RF cables into cold shrink tube.
3. Connect one end of the two RF cables to **ANT0**, **ANT1**, **ANT2**, and **ANT3** interface of the base station and tighten them with wrench.
4. Push the cold shrink tube to the top joint and pull out the strip.
5. Connect the other end of the RF cables to the external antennas, which also need weatherproof protection.

3.6.4 Connect Optical Fiber

1. Unscrew three screws on the cover of wiring cavity using M4 cross screwdriver and open the wiring cavity.

2. Connect the optical fiber to **OPT** interface in the wiring cavity.
3. Lay optical fibers along the wire groove, and stretch out the wiring cavity from **OPT** hole.

The redundant fiber should wind neatly.

3.6.5 Connect Ethernet Cable

1. Connect the Ethernet cable to **ETH** interface in the wiring cavity.
2. Lay Ethernet cable along the wire groove, and stretch out the wiring cavity from **ETH** hole.

3.6.6 Connect Power Connector

Because it is not sure that the distance between the installation site and the power supply device, the two ends of power adapter are bare terminal end. The operators need to make power cable according to the actual conditions on installation site, and assemble power plug and power terminal on two ends of power adapter.

Strip 12mm insulating layer with wire stripper, which is used for connection to connector. It is recommended that the power cord length is kept below 100m (330 feet).

The connection steps of power cable is as follows.

1. Assemble power plug.

The power plug will be installed on the end of input direction. Refer to the identification on power plug, connect live wire, neutral wire, and ground wire to corresponding terminals separately, and tighten screws.

2. Assemble power terminal.

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



3. Connect the power cable to **PWR** interface in the wiring cavity.
4. The power cable lays along the lint slot, and stretch out the wiring cavity from **PWR** hole.
5. The input of the power adaptor connects to the outlet.

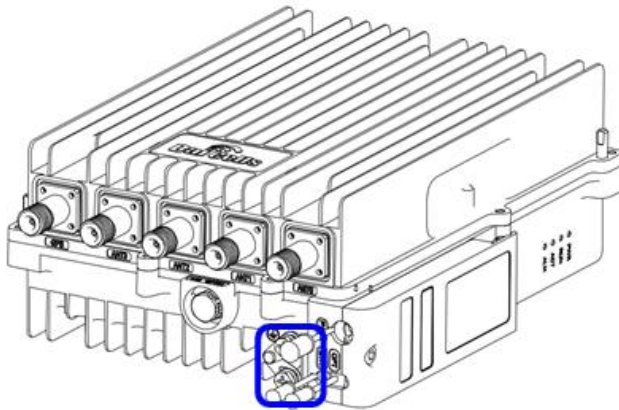
- If the outlet is indoors, place the power adaptor indoors.
 - If the outlet is outdoors, place the power adaptor in a water proof box.
6. After the cable connection is complete in the wiring cavity, tighten the screws on the cover to close the wiring cavity using M4 cross screwdriver.

3.6.7 Connect Ground Cable

Make the grounding cable according the actual situation of the installation site.

The Nova-436 provides two grounding screws, which is located on the bottom of the base station, as shown in Figure 3-3.

Figure 3-3 Location of Grounding Screws



1. Unscrew one grounding screw, connect one end of the grounding cable to the grounding screw, and fasten it again.
2. The other end of the ground cable needs to connect to a good grounding point.

3.7 Install Antenna Feeder System

There are two kinds of outdoor antennas, omnidirectional outdoor antennas and directional outdoor antennas, whose installation will be introduced in the following, respectively.

3.7.1 Install Omnidirectional Antennas

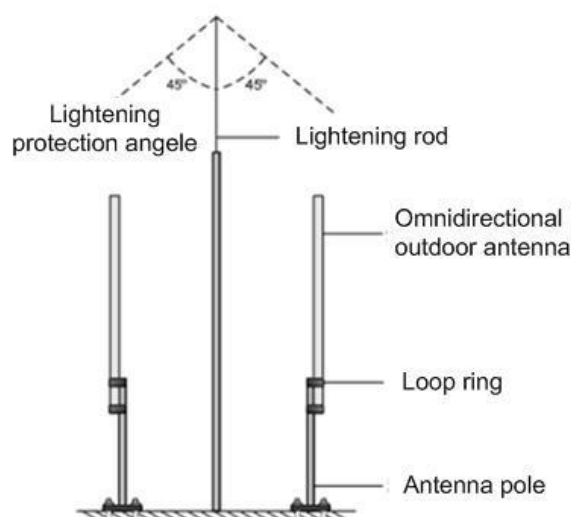
One should pay attention to the followings while installing the omnidirectional outdoor antenna:

- The diameter of the pole for omnidirectional outdoor antennas is required to be

35mm ~ 50mm. A typical case is to use the 50mm-diameter round-steel-made pole (with details depending on the specific antenna type).

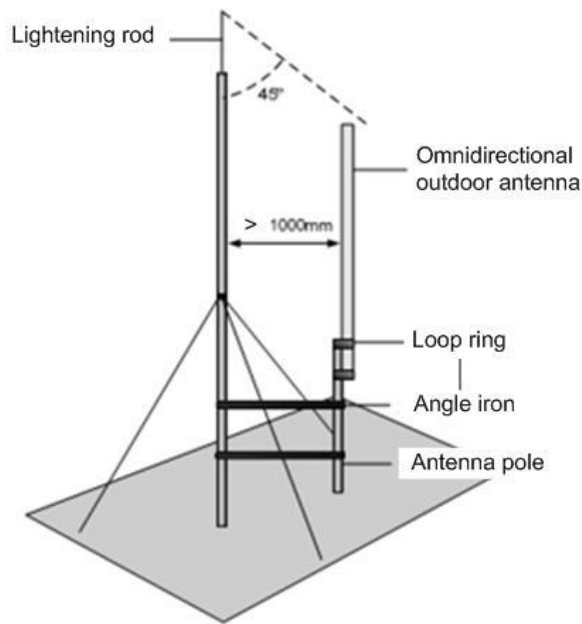
- Make sure that the top of pole and the clamp beneath the antenna are at the same level, after installing the omnidirectional outdoor antenna on the pole.
- Make sure that the antenna is high enough to meet the coverage requirement, and that the antenna top falls within the 45 degrees safety angle towards the lightning rod, as shown in Figure 3-4. In principle, no lightning rod can be welded to pole (no metal object is allowed within 1m of the horizontal direction of the omnidirectional antennas), when installing the omnidirectional antennas. Instead, an independent lightning rod should be settled between the two poles, where the lightning rod must be high enough to keep all antennas under its protection cover.

Figure 3-4 Omnidirectional Antenna Installation (1)



In case is impossible to install an independent lightning rod due to environmental limitations, the installation method shown in Figure 3-5 can be used. Be aware that the pole supporting the lightning rod should be kept at least 1m away from the omnidirectional outdoor antennas.

Figure 3-5 Omnidirectional Antenna Installation (2)



3.7.2 Install Directional Antennas

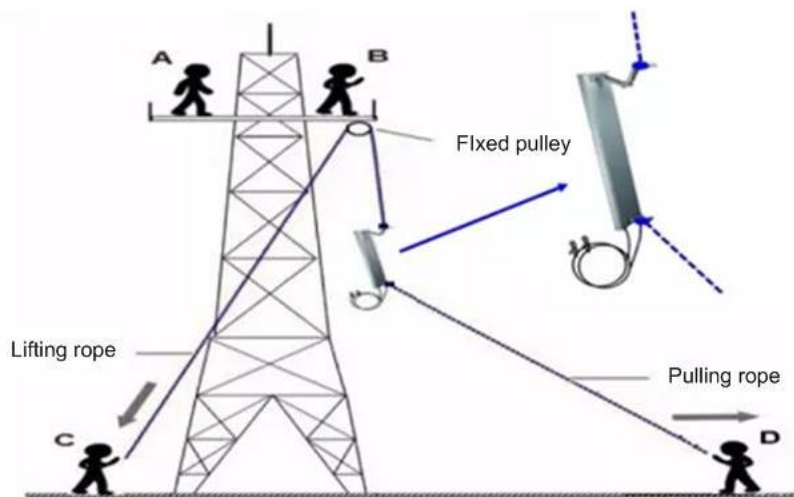
1. First, assemble the antennas, as shown in Figure 3-6.

Figure 3-6 Assembling Procedure of Directional Antennas



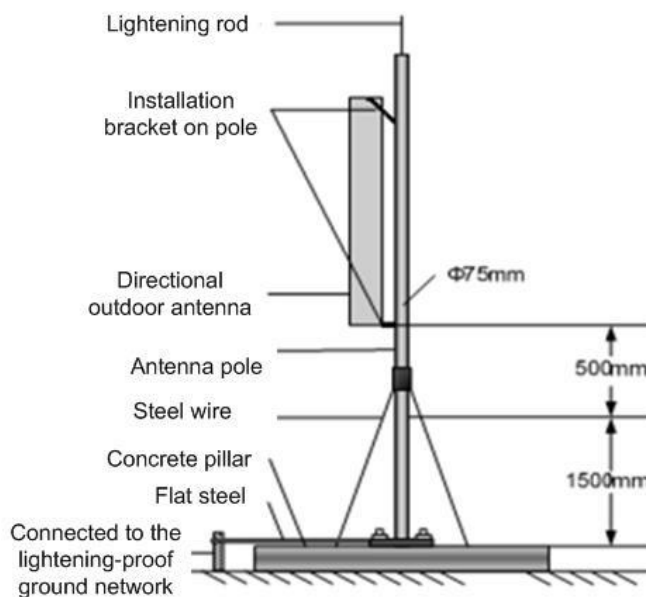
2. To install it on the iron tower, use a pulley to transport the antenna assembled to the platform on the iron tower, as shown in Figure 3-7. Following the safety rules when working at these heights.

Figure 3-7 Transportation the Antennas in the Height



3. Fix the pole vertically to the ground or concrete pillars on the rooftop using expansion screws, and fasten it with steel wires. Then, mount the directional outdoor antenna onto the pole using the installation rack, as shown in Figure 3-8.

Figure 3-8 Directional Antenna Installation

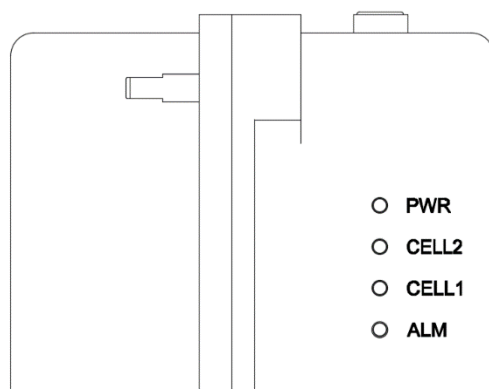


4. When the base station has been installed in a proper position, connect all the cables and wires.
5. Run tests, then seal and weatherproof all the connections after the testing has successfully completed. Refer to 2.6 Weatherproof Protection.

4. Power On

Power on the Nova-436, and the indicators will light up, as shown in Figure 4-1.

Figure 4-1 LED Indicators



The explanation of the indicator signal is given in Table 4-1.

Table 4-1 Nova-436 Indicator Description

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, e.g. VSWR alarm
		OFF	No alarm