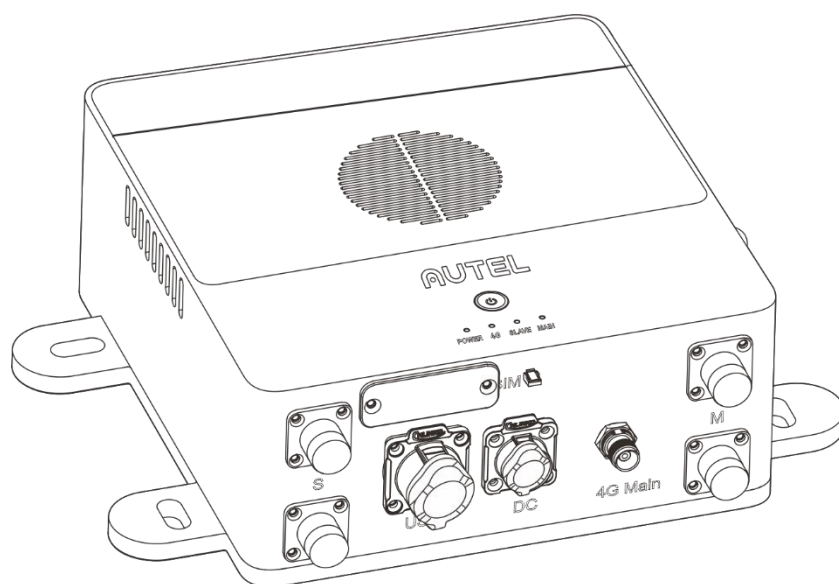

Autel Dragonfish Repeater

User Manual

V1.0.2 2024.07



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Reading Assistance

- This manual is an electronic PDF document that supports high-resolution printing.
- If you are using a PDF reader such as Adobe Reader or Microsoft Edge to read this manual, press **Ctrl+F** on Windows or **Command+F** on Mac to search by keywords.
- View the content structure in the table of contents and click on titles to navigate to the respective pages.

Thank you for purchasing and using the Autel Dragonfish Repeater base station (hereinafter referred to as the "repeater base station", "base station", or "repeater") from Autel Robotics. Relevant user documents for this product are provided in electronic form along with the product, and download links are provided in this manual. This manual contains important operating procedures and safety precautions. Read and follow the relevant instructions carefully; otherwise, equipment failure, personal injury, or safety incidents may occur.

	● Autel Robotics reserves the sole and final right of interpretation of this document and all related product documentation. ● This manual is subject to change without prior notice.
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Legend

The following symbols are used in this manual to draw attention to important safety and operating information. Be sure to follow the notes or requirements under each symbol; failure to do so may affect the safety features of the product or cause personal injury.

Symbol	Definition
	Warning: Alerts to a potentially hazardous situation.
	Important: Notes to keep in mind during operation.
	Remarks: Supplementary information.
	Tips: Quick tips to get the best possible experience.

Read Before Your First Use

To ensure safe use of the base station, Autel Robotics provides you with the following documents and relevant tutorial videos:

1. *Packing List*: A list of everything that should be included in the packing box.
2. *Safety Guidelines*: Provides instructions on how to operate the product safely.
3. *User Manual*: A guide for you to master the operation of the product.
4. *Maintenance Manual*: Provides instructions on how to maintain the product and its accessories.
5. *Autel AthenaOS User Manual*: A guide on how to use the Autel AthenaOS platform.

You can obtain the documents from the links in this manual or the related app.

We recommend that you first read the *User Manual* to familiarize yourself with the product and relevant standards and requirements for initial construction.

Read the *Safety Guidelines* carefully to learn about important safety precautions for installation and use.

Read the *Autel AthenaOS User Manual* to learn the specific procedure for adding repeater base stations to Autel AthenaOS.

Getting the User Documents

You can visit the following link to access latest user documents of the base station:

<https://manuals.autelrobotics.com/?dir=/Eco%20Product/DFRP/en/>.

About This Manual

This manual consists of five main chapters and one appendix. You can refer to the corresponding chapters for the desired information.

Chapter	Chapter Overview
Product Overview	This chapter introduces the main functions of the Autel Dragonfish repeater base station.
Components of the Base Station	This chapter describes the functions and usage of the repeater base station's components.
Construction and Installation	This chapter describes the requirements on installation and deployment of the repeater base station.
Operating the Repeater Base Station	This chapter describes how to add the base station in Autel AthenaOS and upgrade the firmware.
Maintenance and Troubleshooting	This chapter introduces the maintenance checklist and troubleshooting methods for the repeater base station.
Appendix A	This chapter provides the technical specifications of the repeater base station.

Disclaimer

To ensure the safe and successful operation of this product, carefully read and fully understand all user documents listed above and strictly follow the operating instructions and steps described in this manual. Store the repeater base station and its accessories out of the reach of children and pets. If you fail to follow the safety instructions, Autel Robotics is not liable for any product damage, personal injury, or property loss caused by risks that have been warned about, and warranty service will not be provided in such cases. Never modify the product using any incompatible component or in any way that does not conform to the official instructions of Autel Robotics. Make sure that the operations you perform do not endanger the personal or property safety of yourself or those around you. By using this product, you are deemed to have read and accepted all terms and conditions related to it. You agree to take full responsibility for your actions and all consequences arising from them. You further agree to use this product solely for legitimate purposes and to comply with these terms, as well as any related policies or guidelines that Autel Robotics may establish from time to time.

! Important

- When unboxing the product for the first time, carefully check the items included in the packing box according to the *Packing List*.
- The content of this manual will be updated from time to time based on the function updates of the product.
- Please note that if usage logs are not provided, Autel Robotics may be unable to analyze the cause of product damage or incidents, and therefore cannot provide after-sales service.

Warning

- This product is not intended for use by minors. Professional operation training is required before installation and use.

End Use Disclaimer

This product may be subject to the export control laws and regulations of China, the United States, the European Union, and other applicable countries or regions. It is authorized solely for civil (non-military) end uses in connection with sales, export, or domestic transfer. You must confirm that the product will not be used in the following situations; otherwise, you shall bear all losses and legal consequences arising therefrom:

1. Any military end use;
2. Any use related to nuclear, biological, or chemical weapons, or missiles capable of delivering such weapons;
3. Export, re-export, or transfer to any entity or individual listed on sanctions lists issued by China, the United States, the European Union, or any other government with jurisdiction;
4. Export, re-export, or transfer to embargoed or comprehensively sanctioned countries or regions, including but not limited to Cuba, Iran, North Korea, Syria, Crimea, and Sevastopol;
5. Use in equipment or systems intended for surveillance purposes.

Warranty Policy

Autel Robotics guarantees users who purchase products through its official authorized channels that:

- Under normal use, the Autel Robotics products you purchase are free from defects in material and workmanship during the warranty period.
- If you can provide valid proof of purchase, the warranty period of this product shall commence at 00:00 on the day following the delivery date.
- If you cannot provide valid proof of purchase, the warranty start date shall be 90 days after the manufacturing date (as indicated by the product serial number) or otherwise determined by Autel Robotics.

Tips

- For the after-sales policy of the product, please visit <https://www.autelrobotics.com/service/policy/>.

After-Sales Support

If you have any questions or concerns about our products, please contact Autel Robotics Support:

Hotline: (844) 692-88 35

Website: <https://www.autelrobotics.com/service>

Maintenance Service

If your equipment needs to be inspected or repaired, please contact Autel Robotics through the following methods:

- Send an email to after-sale@autelrobotics.com.
- Call Autel Robotics Support at (844) 692-88 35.
- Contact dealers authorized by Autel Robotics.

Important

- All data stored on the product may be erased during the repair process. To avoid data loss, back up important files in your device before submitting it for warranty service.

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Chapter 1 Product Overview

1.1 Introduction

The Autel Dragonfish Repeater base station (hereinafter referred to as the "repeater base station", "base station", or "repeater") is a signal relay device designed for the Autel Dragonfish Standard aircraft (hereinafter referred to as "aircraft") and Autel Dragonfish nest (hereinafter referred to as "nest"). The base station supports two deployment modes: standalone deployment and cascaded networking. In long-distance flight operations, the repeater base station receives and forwards signals, and supports cascading and expansion, effectively increasing the communication distance and overcoming the signal transmission distance limitations of direct connection between the control terminal and the aircraft. The main body of the base station has a built-in lithium battery, a 4G communication module, and master and slave video transmission modules, and provides two omnidirectional antenna ports, two directional antenna ports, a 4G antenna port, and a power port. The base station features self-organizing network capabilities, enabling collaborative networking with multiple other repeater base stations. With a video transmission distance of up to 17 kilometers between base stations, network coverage can be continuously extended by cascading base stations.

The base station has excellent environmental adaptability and can operate normally in temperatures ranging from -20°C to 60°C . The entire equipment meets the IP55 protection rating according to the IEC 60529 standard. It supports grid power.

Tips

- The base station supports both wireless and wired transmission modes, implementing flexible deployment and improving the network coverage capabilities.
- When not in use, the base station enters a low-power sleep mode.
- The protection rating of the repeater base station is not permanent and may diminish over time due to component aging. Regular maintenance and inspection are recommended.

1.2 Cascaded Networking

The repeater base station can be installed on the crossarm of a pole or tower to achieve optimal signal relaying and avoid signal blockage caused by ground-level obstacles. As shown in the figure below, multiple base stations can be connected in a cascaded network, enabling unlimited extension of the signal transmission range.

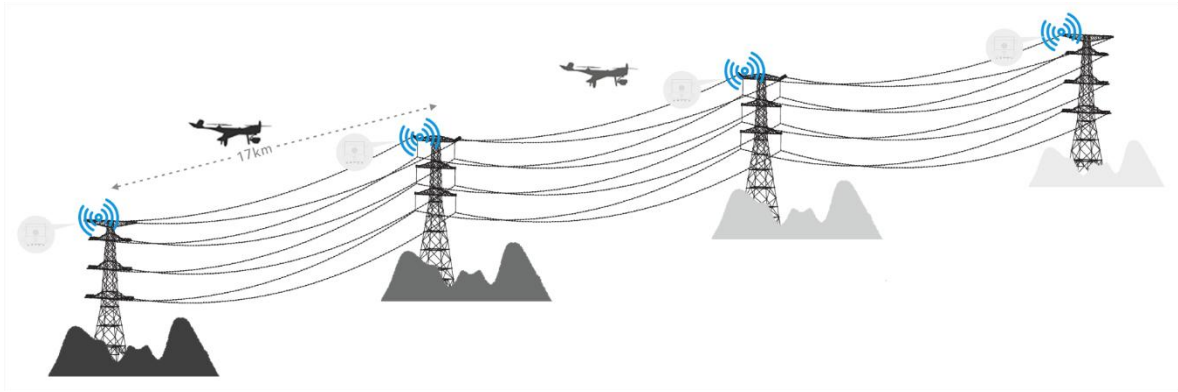


Figure 1-1 Cascaded networking of repeater base stations

Tips

- Theoretically, the transmission distance between repeater base stations can reach 17 kilometers. In actual deployment, terrain obstructions such as hills may affect signal relay quality. To ensure reliable performance, reduce the spacing between repeater base stations as needed based on site conditions.
- Each additional cascaded base station introduces an extra 10 ms of transmission delay.

1.3 Packing List

A complete repeater base station package includes the following items:

- Base station main body and mounting accessories
- Power adapter
- Omnidirectional antennas and mounting accessories
- Directional antennas and mounting accessories
- 4G antenna and mounting accessories

Upon receiving the complete repeater base station package, verify the contents against the following packing list.

Important

- Upon receiving the product, inspect the packaging for any damage and retain a video of the unboxing process to facilitate insurance claims in case of shipping damage.

Table 1-2 Standard Packing List of The Base Station

No.	Category	Item	Quantity
1	Base station and mounting accessories	Main body of the base station	1
		Base station mounting accessories	1 set
2	Omnidirectional	Omnidirectional antenna	2

No.	Category	Item	Quantity
	antennas and mounting accessories	Antenna feeder cable	2
		Omnidirectional antenna mounting accessories	2 sets
3	Directional antennas and mounting accessories	Directional Antenna	2
		Antenna feeder cable	2
		Directional antenna mounting accessories	2 sets
4	4G antenna and mounting accessories	4G Antenna	1
		Antenna feeder cable	1
		4G antenna mounting accessories	1 set
5	Power Adapter	Power adapter and AC power cord	1 set
6	Surge protective device (SPD)	SPD for antennas	5
7	Surge protection enclosure	Surge protection enclosure and accessories	1 set
8	Connector	Waterproof power connector for the surge protection enclosure	1
9	Connector with cable	Waterproof network cable connector for the surge protection enclosure	1

Tips

- After unboxing, carefully check the items in the package against the standard packing list to ensure they are correct. If any items are missing, incorrect, or defective, please contact Autel Robotics promptly.

Chapter 2 Components of the Base Station

2.1 Main Body Components of the Base Station

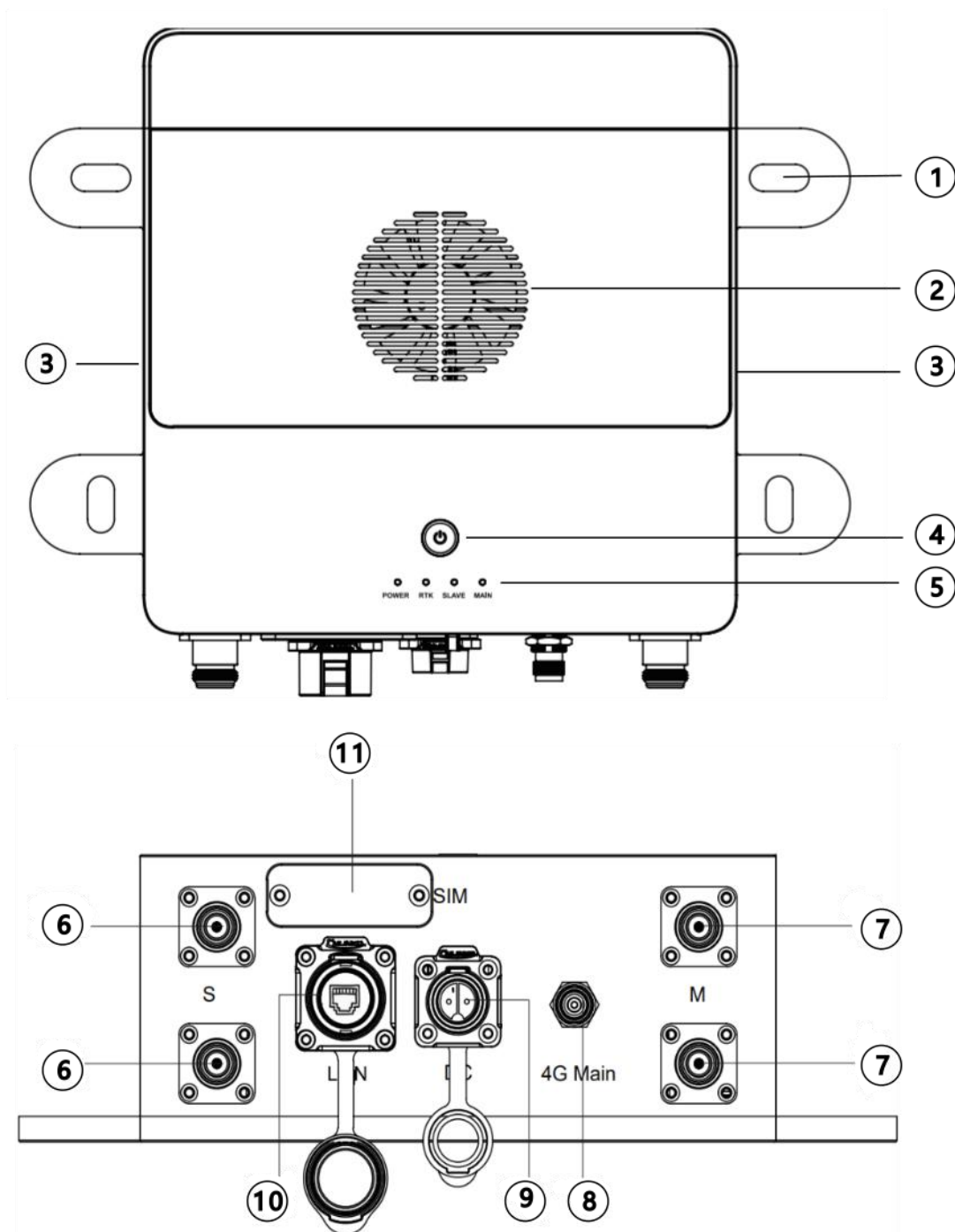


Figure 2-1 Main body of the base station

Table 2-2 Main body components of the base station

No.	Component	Description
-----	-----------	-------------

1	Mounting ears	Used to mount to the main body of the base station to a pole or tower.
2	Air inlet	Used to guide external cool air efficiently into the base station, providing a continuous flow of cooling air for the heat dissipation system.
3	Heat dissipation holes	Located on both sides of the base station body and used to dissipate heat when the heat dissipation fan works.
4	Power button	Press and hold the button to power on or off the base station.
5	Status Indicators	The indicators are the power indicator, RTK status indicator, status indicator for the slave transmission module (SLAVE indicator), and status indicator for the master transmission module (MAIN indicator) from left to right.
6	Omnidirectional antenna ports	Antenna ports for the slave video transmission module.
7	Directional antenna ports	Antenna ports for the master video transmission module.
8	4G antenna port	The 4G antenna port.
9	Power port	Used to connect the mains power supply to the base station.
10	Network port	Used to connect a network cable to implement wired communication.
11	SIM card slot	Houses a nano-SIM card to provide 4G network for the base station.

2.2 Front Panel of the Base Station

The following figure shows the front panel of the base station.



Figure 2-2 Front panel of the base station

2.2.1 Power Button

After the base station is deployed and connected to the power source, press and hold the power button to power on or off the base station.

- When the base station is powered off, press and hold the power button until you hear a beep to power on the base station. After the base station is powered on, you can press and hold the power button to power it off.
- When the base station is powered off, you can press the power button to view its battery level.

2.2.2 Status Indicators

When the base station is operating, you can learn its operating status based on the status indicators on the front panel. The status indicators are the power indicator, RTK status indicator, SLAVE indicator, and MAIN indicator from left to right. The tables below describe the status indicators.

 Remarks
● After being connected to grid power, the base station automatically powers on and the SLAVE and MAIN indicators flash. The power indicator flashes if the base station is being charged and becomes steady green after the base station is fully charged. The base station remains on and enters sleep mode only when you remotely power it off. ● When the base station is powered by its internal battery, the power indicator indicates the battery level range by using different colors. The power indicator remains off if the battery level information cannot be obtained.

Table 2-3 Power indicator

Status	Green	Yellow	Red
Steady on	Battery level: 60% ~ 100%	Battery level: 30% ~ 60%	Battery level: 10% ~ 30% <i>Note: The power indicator flashes red if the battery level is not higher than 10%.</i>

Table 2-4 RTK status indicator

Status	Green	Yellow	Red	Off
Steady on	Strong signal	Relatively weak signal	Very weak signal	No signal

Table 2-5 SLAVE and MAIN indicators

Status	Definition
Blinking with 1.5s on and 1.5s off	The video transmission module is not connected or the linking is timed out.
Blinking with 100 ms on and 2s off	The video transmission module is connected.
Blinking with 100 ms on and 100ms off	Linking is in progress.

2.3 Directional Antennas and Omnidirectional Antennas

The base station supports two directional antennas and two omnidirectional antennas. The directional antennas are connected to the antenna ports marked with "M" at the bottom of the base station, and the omnidirectional antennas are connected to the antenna ports marked with "S". The directional antennas offer high directivity and a longer transmission range, whereas omnidirectional antennas provide broader signal coverage. The directional antennas are used for the signal link from the master video transmission module of the current base station to the slave video transmission module of the next-hop base station, achieving a maximum inter-station coverage distance of 17 kilometers. The omnidirectional antennas are employed to provide signal coverage between the nest and the slave video transmission module of the base station, ensuring reliable communication for aircraft operating in the vicinity above the base station.

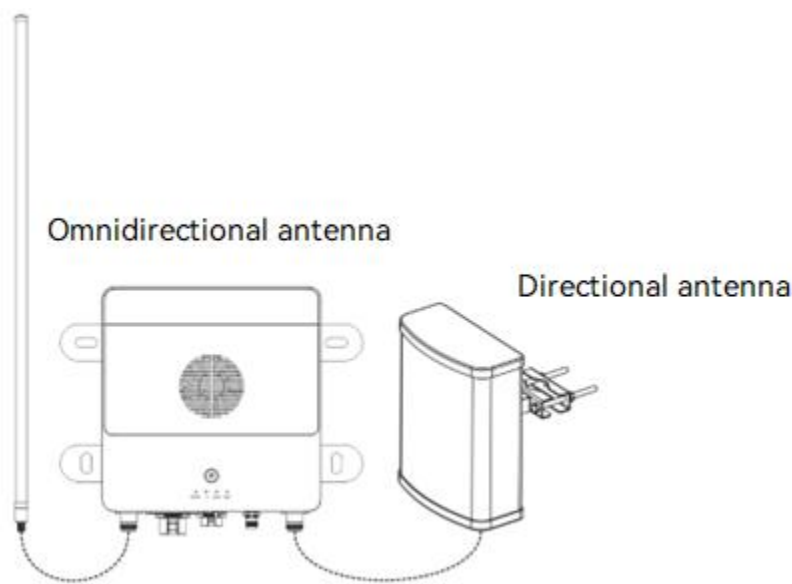


Figure 2-3 Antenna connection of the repeater base station

2.4 Power Supply of the Repeater Base Station

The repeater base station is equipped with a built-in rechargeable lithium-ion battery, enabling continuous operation for over 10 hours on a full charge. It also supports direct connection to grid power.

** Tips**

- When the base station is connected to grid power, the built-in lithium-ion battery is charged.

2.5 IP Rating

Under controlled laboratory conditions, the base station has been tested to meet the IP55 protection rating as defined by the IEC 60529 standard. This ingress protection (IP) rating is not permanently guaranteed—it may degrade over time due to aging or wear from prolonged use. Regular maintenance and inspection are therefore recommended.

The repeater base station will not maintain its IP55 rating under any of the following conditions:

- An antenna feedline is loose or not securely connected to the port on the base station.
- Rubber protective caps are missing or not properly installed on unused cable ports of the base station.
- The base station is not installed in accordance with the provided installation instructions.
- The casing of the base station is damaged, deformed, or cracked.

** Tips**

- Under outdoor conditions, prolonged exposure to sunlight or rain may cause discoloration of the base station casing. However, this cosmetic change does not affect its ingress protection performance.

Chapter 3 Construction and Installation

3.1 Construction Security

Always adhere to all relevant safety precautions and equipment labeling during installation, operation, maintenance, and servicing to ensure the safety of both personnel and equipment.

3.1.1 Operator Qualifications

- The installation, commissioning, maintenance, troubleshooting, and repair of the base station must be performed exclusively by Autel Robotics-authorized technical personnel.
- Operators responsible for installing or maintaining the base station must undergo rigorous training to fully understand all safety precautions and master correct operating procedures. They must be aware of potential hazards associated with the installation, commissioning, and maintenance activities and know how to respond appropriately.
- Only those who hold a special operations certificate for low-voltage electrical work issued by the Ministry of Emergency Management can perform any electrical operations.
- Only those who hold a working-at-heights special operations certificate issued by the Ministry of Emergency Management can carry out elevated work.
- Only those who hold a welding special operations certificate issued by the Ministry of Emergency Management can conduct any welding operations.

3.1.2 Personal Protective Equipment

- Always use high-quality, reliable tools during installation and construction. Ensure that the tool handles are properly insulated, or use insulated tools instead, to prevent electric shock.
- When using power tools, strictly follow the relevant operating procedures to ensure personal safety.
- Dedicated personal protective equipment must be worn during installation, commissioning, and maintenance activities, including a hard hat, insulated gloves, and insulated footwear.
- Do not wear any conductive items—such as watches, rings, necklaces, or other metal accessories—during installation, commissioning, or maintenance of the base station, as they may cause electric shock or burns.

3.1.3 Safety Operation Instructions

- All installation, commissioning, and maintenance activities must be carried out strictly in accordance with the step-by-step procedures specified in this manual.
- Installation, commissioning, or maintenance of the base station—including but not limited to transporting the base station, mounting the base station, connecting cables,

and performing outdoor work at height—is strictly prohibited during severe weather conditions such as thunderstorms, snowfall, or wind speeds of Beaufort scale 5 or higher.

- When handling or transporting base station components, take appropriate load-bearing precautions to prevent crushing injuries or strains. When climbing poles or towers, ensure that tools and components are secured to prevent them from falling and causing injury.
- While climbing poles or towers, implement proper insulation protection measures to prevent the base station components from contacting or colliding with the pole or tower structure or power lines, which could result in equipment damage or serious safety incidents.
- The base station must be securely mounted to prevent loosening or falling due to tower vibration.
- Installation on poles or towers—especially those carrying electrical power lines—must be performed only by qualified personnel to avoid the risk of electric shock.
- In the event of a fire, immediately evacuate the installation area and call the fire emergency services without delay. Under no circumstances should anyone re-enter a burning installation zone.

Warning

- Considering the hazards posed by high-voltage power lines, the installation and deployment of the base station on an electrical power transmission tower must be entrusted to qualified electrical personnel who have received relevant training.
- Personnel without the required certification for electrical work are strictly prohibited from participating in any installation or deployment activities on power transmission towers.

3.2 Handling Recommendations

The repeater base station is typically deployed on a pole or tower. During actual installation, given the considerable height of these structures, distribute the load appropriately when carrying equipment while climbing to avoid excessive physical strain, which could lead to fatigue and potential personal injury. The table below lists the weights and dimensions of main components of the base station.

Table 3-1 Weights and dimensions of main components

Component	Weight	Dimensions
Main body of the base station	3 kg	290×236.7×90 mm
Omnidirectional antenna	0.7±0.05 kg	Φ28.8 (1200±10) mm
Directional Antenna	3.8 ± 0.1 kg (including the mounting)	480×287×132 mm

	clamp)	
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! Important

- When handling mounting adapters, mounting brackets, and other related components of the base station, ensure that the load is reasonably distributed among personnel. It is recommended that multiple team members work together, transporting the load in multiple trips.
- During climbing (while carrying equipment) and during installation of the base station, no personnel are permitted within a 30-meter radius beneath the pole or tower to prevent injuries from falling objects.

3.3 Environmental Survey

Before commencing construction, select an installation site for the base station that meets the required criteria. An unsuitable location can result in unstable operation, reduced operational stability, shortened lifespan, or subpar performance of the base station, and may even pose safety hazards leading to property loss and personal injury.

3.3.1 Environmental Requirements

When selecting the installation site for the base station, observe the following requirements:

- The historical temperature range at the installation site is from -20°C to $+60^{\circ}\text{C}$.
- For ground installation, avoid areas prone to geological disasters such as ground subsidence, debris flows, landslides, or snow burial. For pole or tower installation, avoid regions frequently affected by sandstorms, lightning strikes, heavy rainfall, fog accumulation, etc.
- Avoid locations near chemical plants, septic tanks, or coastal areas within 500 meters of the shoreline to prevent corrosion from chemical gases or salt mist.
- Installation near hazardous sources such as gas stations, oil depots, or dangerous chemicals warehouses is strictly prohibited without proper authorization.
- Do not install in areas with flammable materials, such as cluttered storage areas, areas with seasonal poplar and willow catkins, deadwood forests, dry grasslands, or dense vines.
- Installation on moving platforms, such as vehicles or ships in motion, is strictly prohibited.
- The installation site should be located away from strong electromagnetic interference sources like radar stations, microwave stations, or drone jamming devices, maintaining a distance of at least 300 meters.
- Consider future environmental changes when selecting the site. Avoid areas with significant construction plans or substantial seasonal environmental changes.

(including but not limited to vegetation growth and new buildings). If changes occur, re-survey and relocate if necessary.

- Ensure proximity to existing 4G base stations is considered.
- Assess whether the airspace around the installation site is near or within no-fly zones. Apply for clearance from local aviation authorities in advance and contact Autel Robotics to unlock flight restrictions.

Tips

- The base station operates within a temperature range of -20°C to $+60^{\circ}\text{C}$. Operating outside this range may cause the base station to malfunction or cease functioning properly.
- According to the Electric Power Safety Work Procedures (Power Line Part), all work on power lines must be suspended when wind speeds exceed Force 5 on the Beaufort scale.

3.3.2 Signal Quality Requirements

To ensure continuous signal coverage, adjacent base stations must be spaced no more than 17 km apart under clear line-of-sight conditions (i.e., with no obstructions or interference). During actual installation and deployment—particularly when power transmission lines traverse mountainous terrain—the topography may obstruct the signal. In such cases, adjust the installation location or add additional base stations to maintain a stable signal link:

- When obstruction occurs in the horizontal plane (e.g., power lines bend around a mountainside), it is recommended to install an additional base station on the tower at the bend point.
- When obstruction occurs in the vertical plane (e.g., power lines cross over a mountain ridge), it is recommended to install an additional base station on the tower located at the mountain summit.

Tips

- If unavoidable signal-interfering facilities exist between two adjacent base stations, the distance between them should be appropriately reduced to ensure signal quality.
- After installation and deployment, on-site signal testing must be conducted. Use Autel AthenaOS to issue a flight mission and verify that the aircraft can stably receive signals while flying along its route through the coverage area of the base stations.

3.4 Installation and Wiring of the Base Station

3.4.1 Installation Requirements

The base station is recommended to be installed on power poles or towers, preferably on the upper crossarm. Installation on the middle or lower crossarms is also acceptable.

Remarks

- The installation requirements for the base station components are the same regardless of whether they are mounted on the upper, middle, or lower crossarms. This manual illustrates only the method of installation on the upper crossarm as a reference.
- Before actual installation and deployment, you are advised to determine the specific mounting location based on the actual structure of the pole or tower.
- When installed on a pole or tower, the base station can be protected by the tower's built-in lightning protection system.

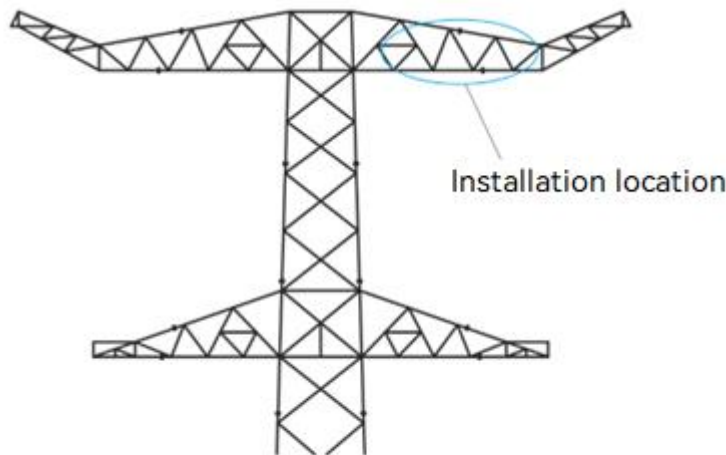


Figure 3-1 Installation location on the tower

When deploying the base station on the ground near an Autel Dragonfish nest, construct a reinforced concrete (C25) mounting foundation meeting the following requirements for the base station:

- Reinforced with single-layer bidirectional steel mesh with a specification of $\Phi 4@150$ mm and a concrete cover greater than 25 mm in thickness;
- Dimensions: 1000×1000×300 mm
- Minimum spacing between adjacent base station foundations: 2000 mm
- During concrete pouring, the mounting bracket for the base station must be embedded into the foundation, ensuring it remains perfectly vertical relative to the base.

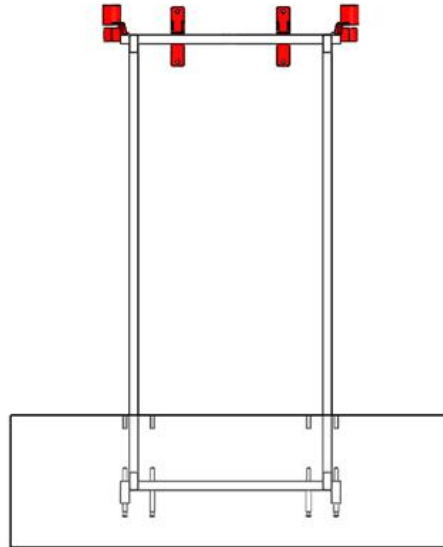


Figure 3-2 Construction of the concrete foundation for the base station

! Important

- The foundation should protrude above ground by at least 300 mm. You can determine the actual height based on local drainage conditions, but it must be at least 100 mm above the historical highest water level at the installation site.
- The concrete foundation for the base station must be located at least 1 meter away from the concrete foundation for the nest.
- For ground installations, ensure that a lightning protection system is present nearby and that the base station is within its effective protection zone.

3.4.2 Required Tools and Materials

The following tools and materials are needed during installation. Prepare them in advance and verify that all tools are in proper working condition:

- Adjustable wrench
- Waterproof mastic
- UV-resistant electrical tape
- UV-resistant cable ties
- Laptop computer (with Internet access to Autel AthenaOS) and a corresponding USB cable

3.4.3 Unboxing Inspection

After long-distance transportation, inspect all components of the base station as follows:

1. Open the packaging of the base station and verify that its exterior is in good condition without scratches, dents, deformations, or impact damage.

2. Inspect the power adapter to ensure its cable shows no signs of damage, kinking, or breakage, and confirm that its specifications meet the input requirements of the base station.
3. Check the omnidirectional antennas, directional antennas, and 4G antenna for any visible damage, such as scratches, deformation, or impact marks.
4. Verify that all mounting adapters, mounting brackets, screws, nuts, washers, and other hardware are present in the correct quantities.

Important

- Before installation, cross-check all items against Section "[1.3 Packing List](#)". If you find any abnormalities, missing parts, or model mismatches, document the issue and promptly contact both the shipping carrier and Autel Robotics Support.

3.4.4 Base Station Installation Instructions

Warning

- Installation must be carried out by Autel Robotics or an authorized representative. Contact Autel Robotics Support to obtain relevant technical assistance. Unauthorized self-installation may pose safety risks and compromise the proper operation of the product.

3.4.5 Base Station Wiring Instructions

After the base station is installed, connect the antenna feeder cables and the power cord to their corresponding ports.

Tips

For the locations of the ports for connecting the feeder cables and the power cord, see Section "[2.1 Main Body Components of the Base Station](#)".

When connecting the feeder cables, observe the following requirements:

Feeder Cable Installation Requirements

Feeder cable installation must meet the following requirements:

- The feeder cables and connectors must be securely fastened, without scratches, exposed copper, or deformation.

- The minimum bending radius for a feeder cable is as follows: For a single bend of a 1/2" feeder cable, the bending radius must be greater than 20 cm; for multiple bends, the bending radius must be greater than 30 cm.
- When routing or bending a feeder cable, ensure that the bends are smooth and gradual. Avoid contact with sharp objects to prevent scratches that could lead to water ingress and subsequent failure.
- The feeder cables must maintain a separation of at least 20 cm from power cables rated at 220 V or higher.
- The feeder cables must be secured by using downlead cable clamps.

Waterproofing Requirements

Connect the feeder cables as follows to ensure that the waterproofing requirements are met:

1. Connect the feeder cables securely to both the ports on the base station and the antenna-side ports, and tighten the connections firmly.
2. Seal the connectors on both sides by using the following waterproofing method: one layer of electrical tape → three layers of waterproof mastic → three layers of electrical tape. The detailed procedure is as follows:
 - Apply a base layer of electrical tape: Wrap one layer of electrical insulation tape over the assembled connectors as a base. The wrapping length must extend approximately 20 mm beyond the connector.

! Important

This base layer of tape is essential—it facilitates easier removal during future maintenance or troubleshooting.

- Apply waterproof mastic: First cut a strip of waterproof mastic approximately 20 mm in length and use it to fill any recessed or uneven areas at the connector joint. Then wrap the mastic in three continuous layers from bottom to top—first from bottom to top, then from top to bottom, and finally again from bottom to top.

! Important

- Do not cut the mastic while wrapping—keep it as one continuous strip.
- Each layer should extend about 20 mm beyond the connector, and overlap the previous one by approximately one-third of its width to prevent water ingress.
- While wrapping, stretch the mastic to roughly double its original length to ensure a tight, seamless seal. The wrapping direction must match the tightening direction of the connector to avoid accidentally loosening the connection.

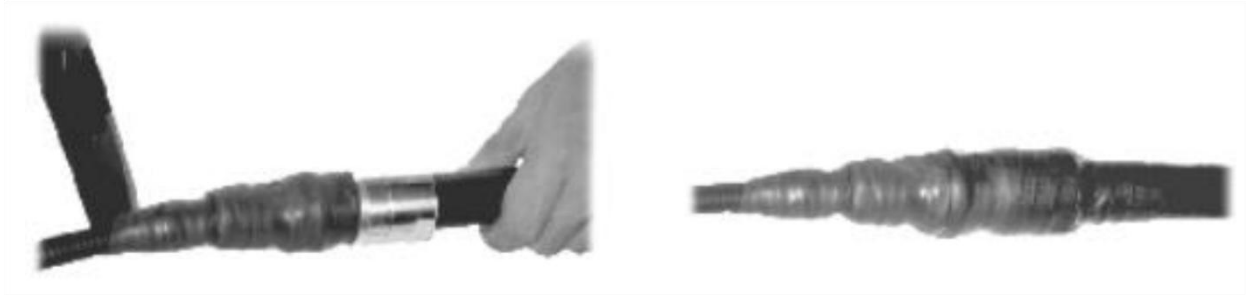


Figure 3-3 Wrapping waterproof mastic

- After wrapping the waterproof mastic, firmly squeeze and press it with both hands to ensure the mastic adheres tightly to the feeder cable and connector.



Figure 3-4 Compacting the waterproof mastic

- After the mastic is properly applied, wrap three additional layers of electrical insulation tape over it: Each layer should overlap the previous one by 1/2 of its width. The wrapping length must extend at least 10 mm beyond the edges of the mastic. Wrap the outermost layer from bottom to top, and secure both ends of the tape with cable ties to seal the wrap.
3. After all the above steps are completed, use UV-resistant black cable ties to firmly fasten both ends of the tape wrap, preventing the tape from falling off due to aging.



Wrap one layer of electrical tape.



Wrap three layers of waterproof mastic



Wrap three layers of electrical tape



Secure both ends with cable ties.

Figure 3-5 Waterproofing procedure

! Important

After connecting the base station to mains power, it will power on automatically. Perform a pre-power-on inspection first, and connect the base station to mains power only after all checks have been confirmed.

3.5 Pre-Power-On Inspection Checklist

Before powering on the base station, ensure that all the following items are checked and confirmed:

- Inspect the appearance of all components of the base station for any abnormalities, such as damage or cracks.
- Verify that all parts of the base station are securely mounted to the pole/tower or mounting brackets, with no loose screws, and that all mounting adapters and brackets are tightly locked in place.
- Ensure that the base station is installed vertically on the pole or tower, ensuring the air inlet is not facing upward.
- Confirm that the SIM card is properly installed in the base station, and that the rubber protective cover over the SIM card slot is securely closed.
- Check that the feeder cables for the omnidirectional and directional antennas are connected to the correct ports and are securely installed.
- Ensure that all antenna feeder cables are properly secured to the pole or tower to eliminate free-hanging segments and prevent wind-induced movement.
- Verify that all ports on the base station have been waterproofed as required.
- Confirm that the directional antennas are correctly oriented towards the pole or tower where the next-hop base station is installed.

Chapter 4 Operating the Repeater Base Station

Remarks

- The base station must be used in conjunction with the Autel Dragonfish nest, Autel Dragonfish Standard aircraft, and Autel AthenaOS. For detailed instructions, see the *Autel AthenaOS User Manual*.

4.1 Adding the Base Station to Autel AthenaOS

Perform the following steps to add the base station to Autel AthenaOS:

1. Log in to Autel AthenaOS, choose **Assets** in the navigation bar > **Base Stations**, and click the **Add New Base Station** button on the tab.
2. In the dialog box that appears, specify related parameters as prompted and click **Save** to add the base station.

新增基站

* 设备名称

请输入0 / 64

* 序列号

请输入

* 杆塔号

请输入

网络传输模式

请选择

取消

保存

Figure 4-1 Adding a base station to Autel AthenaOS

Remarks

- Contact Autel Robotics to obtain the serial number of the base station.
- Enter the tower number of the actual installation site for **Tower Number**—do not enter arbitrary or placeholder values.
- On the **Base Stations** tab, you can also click **Import** to add multiple base stations at a time by uploading an Excel file.

4.2 Firmware Update

After adding the base station in Autel AthenaOS, you can update the firmware of the base station. The update procedure is as follows:

1. Go to the **Base Stations** tab. When **New Version** appears after the version number of the base station in the **Version** column, click the version number to go to the **Version** dialog box.
2. Click **Download and update** in the lower-right corner of the dialog box, and update the firmware as prompted.

 Remarks
● The base station cannot be updated while it is offline. ● After completing the update, check the hardware version numbers and version numbers of individual modules to ensure the update is successful.

4.3 Site Departure Checklist

You can leave the site after successfully adding the base station in Autel AthenaOS. Before you leave the site, ensure the following items are verified:

- Confirm that the base station appears normal in Autel AthenaOS with no alerts or anomalies, with stable communication.
- Ensure that all unused ports on the base station are securely sealed with waterproof rubber caps.

Chapter 5 Maintenance and Troubleshooting

5.1 Component Maintenance of the Base Station

The components of the base station require regular maintenance to ensure optimal operational performance. You are advised to carry out maintenance and servicing in accordance with the *Maintenance Manual*.

Table 5-1 Component maintenance checklist

No.	Component	Quantity	Warranty Period	Maintenance Interval
1	Main body of the base station	1	1 year	1 year
2	Omnidirectional antenna	2	1 year	1 year
3	Directional Antenna	2	1 year	1 year
4	4G Antenna	1	1 year	1 year

Important

- For maintenance services, contact Autel Robotics or an authorized service provider. Any damage resulting from unauthorized disassembly or servicing will not be covered under warranty.
- Do not modify the base station or its associated components without authorization. Damage caused by unauthorized modifications will not be covered under warranty.
- Refer to the *Maintenance Manual* for the expected service life of each component.

5.2 Troubleshooting

Tips

- The troubleshooting measures listed below apply only to failures occurring under normal operating conditions of the base station.
- For troubleshooting related to aircraft operation, refer to the *Autel Dragonfish Standard Aircraft Flight Manual*.
- If a failure results from improper use, contact Autel Robotics for assistance.

1. The base station fails to power on:
 - Check whether the power connector is loose, and verify if the internal lithium battery is depleted.
 - If none of the above issues are present, the problem may be due to an internal hardware fault in the base station. In this case, please contact Autel Robotics for support.
2. The base station fails to appear online in Autel AthenaOS:
 - Check whether the base station has a normal network connection (e.g., confirm that a SIM card is properly inserted, the data plan is active and sufficient, and there is adequate 4G coverage nearby).
 - Verify that the serial number of the base station has been added in Autel AthenaOS.
3. Unstable signal from the base station:
 - Confirm whether there are any signal-interfering devices near the pole or tower.
 - Ensure that the distance between two adjacent base stations does not exceed 17 kilometers.
 - Inspect whether the antennas are intact and securely connected.
 - Verify that the directional antennas on the base station are accurately oriented toward the pole or tower where the next-hop base station is installed.

Appendix A Specifications

A.1 Repeater Base Station

Autel Dragonfish Repeater	
Dimensions (length×width×height)	290×236.7×90 mm
Weight	3 kg
Operating temperature	-20° C to +60° C
IP Rating	IP55
Frequency band specifications	● EU frequency band specifications (CE compliant): ■ 4G LTE: B1/B3/B7/B8/B20/B38/B40 ■ 3G WCDMA: B1/B8 ■ 2G GPRS/EDGE: 900/1800 MHz ● US FCC frequency band specifications ■ 4G LTE: B2/B4/B5/B7/B12/B13/B25/B26/B38/B41 ■ 3G WCDMA: B2/B4/B5 ■ 2G GPRS/EDGE: 850/1900 MHz
Peak DL/UL rates	● 4G: ■ LTE FDD: 150 Mbps DL/50 Mbps UL ■ LTE TDD: 130 Mbps DL/30 Mbps UL ● 3G: 42 Mbps DL/5.76 Mbps UL ● 2G: 296 kbps DL/236.8 kbps UL
Maximum output power	● 3G/4G: ≤ 25.7 dBm ● 2G GSM 850/900 MHz: ≤ 33 dBm ● 2G GSM 1800/1900 MHz: 30 dBm
SIM card type	nano-SIM
Real-time kinematic (RTK) positioning service	● GPS: L1C/A/L2P(Y)/L2C/L5 ● Beidou: B1I/B2I/B3I/B1C/B2a ● Galileo: E1/E5a/E5b ● GLONASS: L1/L2
RTK positioning accuracy	In RTK fix mode: For multirotor drones: ● 1 cm + 1 ppm (horizontal) ● 1.5 cm + 1 ppm (vertical) For eVTOL aircraft: ● 3 cm + 1 ppm (horizontal) ● 3 cm + 1 ppm (vertical)

Video Transmission	
Operating frequency	900M: 902 – 928 MHz* 2.4G: 2.400 – 2.476 GHz**, 2.400 – 2.4835 GHz 5.2G: 5.15 – 5.25 GHz***, 5.17 – 5.25 GHz**** 5.8G: 5.725 – 5.829 GHz**, 5.725 – 5.850 GHz <i>* For use only in FCC- and ISSED-regulated regions.</i> <i>** For use only in SRRC-regulated regions.</i> <i>*** For use only in FCC-, CE- (except Germany), and UKCA-regulated regions.</i> <i>**** For use only in Germany.</i> <i>Note: Some frequencies are only available in some regions or for indoor use only. For details, refer to local laws and regulations.</i>
Equivalent isotropic radiated power (EIRP)	900M: ≤ 30 dBm (FCC/ISED) 2.4G: ≤ 30 dBm (FCC/ISED); ≤ 20 dBm (CE/SRRC/UKCA) 5.2G: ≤ 30 dBm (FCC); ≤ 23 dBm (CE/UKCA) 5.8G: ≤ 30 dBm (FCC/ISED/SRRC); ≤ 14 dBm (CE/UKCA)
Max transmission distance*	FCC: 15 km SRRC/CE: 8 km <i>* Test data measured without interference or blocking.</i>

A.2 Omnidirectional Antenna

Omnidirectional Antenna	
Connector type	N-type female
Connector position	Bottom
Dimensions	$\Phi 28.8$ (1200 $\pm$ 10) mm
Weight	0.68 $\pm$ 0.05 kg
Radome material	White fiberglass-reinforced plastic (FRP)
Operating environment	-40°C to +70°C; 5% to 95% RH
IP rating	IP65
Wind resistance	60 m/s
Salt spray resistance	96 hours neutral salt spray test (per GB/T 2423.17-2008)
Application environment	Outdoor
Mounting method	Mounted on an L-shaped angle steel

Frequency range	900 – 930 MHz 1420 – 1450 MHz 2400 – 2500 MHz 5100 – 5900 MHz
Polarization	Vertical
Gain	5 dBi
Horizontal half-power beamwidth	360°
Vertical half-power beamwidth	5100 – 5900 MHz: 25° +8° Other frequency bands: 38° ±8°
Horizontal pattern ripple	900 – 930 MHz: ±1 dB 1420 – 1450 MHz: ±1.5 dB 2400 – 25000 MHz: ±2 dB 5100 – 59000 MHz: ±4 dB
Input impedance	50 Ω
VSWR	900 – 930 MHz: ≤ 2 1420 – 1450 MHz: ≤ 2.5 2400 – 2500 MHz: ≤ 2.5 5100 – 5900 MHz: ≤ 3
Maximum power	2 W

A.3 Directional Antenna

Directional Antenna	
Connector type	N-type female
Connector position	Bottom
Dimensions	480×287×132 mm
Weight	3.8 ± 0.1 kg (including the mounting clamp)
Radome material	Gray PPVC
Operating environment	-40°C to +70°C; 5% to 95% RH
IP rating	IP65
Wind resistance	60 m/s
Salt spray resistance	96 hours neutral salt spray test (per GB/T 2423.17-2008)

Application environment	Outdoor
Mounting method	Pole-mount installation (pole to be provided by the user; pole diameter: $\Phi 50 - \Phi 70$ mm)
Mounting bracket model	JM-VB1
Frequency range	900 - 930 MHz 1410 - 1470 MHz 2400 - 2500 MHz 5150 - 5900 MHz
Polarization	Vertical
Gain	8 ± 1 dBi
Horizontal half-power beamwidth	900 - 930 MHz: 85° 1410 - 1470 MHz: 72° 2400 - 2500/5150 - 5900 MHz: 45°
Vertical half-power beamwidth	900 - 930 MHz: 57° 1410 - 1470 MHz: 65° 2400 - 2500/5150 - 5900 MHz: 53°
Front-to-back ratio	≥ 17 dB
Input impedance	$50\ \Omega$
VSWR	5150 - 5900 MHz: ≤ 3 Other frequency bands: ≤ 2
Maximum power	2 W

A.4 4G Antenna

4G Antenna	
Connector type	N-type female
Operating temperature	-40°C to $+85^\circ\text{C}$
Storage conditions	$25^\circ\text{C} \pm 5^\circ\text{C}$, $<70\%$ RH
Frequency range	824 - 960 MHz 1710 - 2690 MHz
Input impedance	$50\ \Omega$
VSWR	824 - 960 MHz: ≤ 2 1710 - 2690 MHz: ≤ 3

Gain	824-960 MHz: 1.9 dBi 1710-2690 MHz: 4.4 dBi
Radiation direction	Omnidirectional
Polarization	Linear

A.5 Power Adapter (Indoor Deployment)

Power Adapter	
Model	ADS-110DL-19-1 190090G
Dimensions	156×58×33.5 mm
Rated input voltage	100 – 240 V AC
Maximum input current	1.5 A
Rated input frequency	50/60 Hz
Maximum output power	90.06 W
Rated output voltage	19.0 V DC
Maximum output current	4.74 A
Operating environment	0° C – 40° C, 10% – 90% RH
Storage conditions	-20° C to +80° C, 5% to 95% RH
Operating altitude	0 – 5000 m

FCC Compliance Statements

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.

Caution: Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.

- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

IC Compliance Statements

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:

- (1) This device may not cause interference.
- (2) This device must accept any interference, including interference that may cause undesired operation of the device.

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences 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;
- (2) L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

This device operates on a no-interference, no-protection basis. Should the user seek to obtain protection from other radio services operating in the same TV bands, a radio licence is required. For further details, consult Innovation, Science and Economic Development Canada's Client Procedures Circular CPC-2-1-28, Voluntary Licensing of Licence-Exempt Wireless Microphones in the TV Bands.

Ce dispositif fonctionne sans interférence, sans protection. Si l'utilisateur cherche à obtenir une protection contre d'autres services de radio opérant dans les mêmes bandes de télévision, une licence de radio est requise. Pour plus de détails, consultez la circulaire CPC-2-1-28 sur les procédures relatives aux clients d'Innovation, Sciences et Développement économique Canada, Licence volontaire de microphones sans fil exemptés de licence dans les bandes de télévision.

RF Exposure Compliance

This equipment complies with FCC/IC RSS-102 radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20 cm between the radiator and your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Cet équipement est conforme aux limites d'exposition aux radiations IC CNR-102 établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec une distance minimale de 20 cm entre le radiateur et votre corps. Cet émetteur ne doit pas être colocalisé ou fonctionner en conjonction avec une autre antenne ou un autre émetteur.
