

ZL 6702

Outdoor Fixed UHF RFID Reader

User Manual

Manual version: V1.2

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Preamble

Manual Description

This manual describes ZL 6702 Outdoor Fixed UHF RFID Reader's functional features, structural principles, installation and tuning, routine maintenance and fault analysis.

For ease of description, this manual refers to the ZL 6702 Series Outdoor Fixed UHF RFID Reader as simply the 6702 Reader.

Addressees

- Equipment installation and maintenance personnel
- RFID Application System Integrator
- Engineering Maintenance Staff in Gaoxin's local offices

Content

This manual is divided into six chapters, each of which is listed below:

name of a chapter	outline
Chapter 1 Product Overview	This chapter describes a brief description of the reader itself as well as the technical parameters
Chapter 2 Structure of the Reader	This chapter describes the implementation principles and components of the reader system.
Chapter 3 Installation of the Reader	This chapter describes how to install the Reader
Chapter 4 Tuning the Reader	This chapter describes how to tune the reader
Chapter 5 Routine Maintenance of the Reader	This chapter describes how to maintain and patrol the reader
Chapter 6 Failure Analysis	This chapter describes the analysis and treatment of common

	reader faults
Appendix A Packaging, Transportation and Storage	This chapter describes methods and precautions for packaging, shipping, and storing the reader

Security instructions

High temperatures and pressures are present in this equipment and should only be installed, operated and maintained by trained and qualified professionals.

During installation, operation and maintenance of the equipment, it is important to observe the local safety codes and related operating procedures, otherwise personal injury and equipment damage may result. The safety precautions mentioned in the manual are intended only as a supplement to the local safety codes.

This equipment is only allowed to be used in professional installation scenarios and any unauthorized antenna is prohibited from being used in conjunction with this device.

Only the following types of antennas can be used with this equipment:

Antenna model	Antenna type	Key parameters	Applicable scenarios
ZXRIS AU04	900MHz linearly polarized antenna	Gain:11dBi; Frequency range: 902-928MHz	Outdoor coverage scene

1. Professional installers need to confirm that the antenna used belongs to the above-mentioned license list. The use of antennas outside the list will violate the requirements of FCC Part 15 regulations, which may result in equipment compliance failure and RF interference risks;

2. For specific installation specifications of the licensed antenna, please refer to "3.6 Antenna Installation" in this manual

Gosuncn Intelligent IOT Technology Co.,Ltd. shall not be held responsible for any violations of general safety operation requirements or safety standards for the design, production, and use of equipment.

Where this manual is not applicable due to hardware upgrades or software version

upgrades, please refer to the actual product.

Documentation Conventions



Attention:

Indicates that if safety cautions are ignored, injuries may occur or equipment may be damaged.



Instructions, hints, tips

Instructions, hints, tips, etc. other than safety instructions.

Warning

This equipment complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This equipment may not cause harmful interference, and (2) this equipment must accept any interference received, including interference that may cause undesired operation.

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1 Product Overview

1.1 Introductory

Products

The Outdoor Fixed Ultra-high Frequency (UHF) RFID Reader – ZL 6702 is a high-performance, compact passive UHF RFID reader independently developed by Gosuncn Intelligent IOT and specifically designed for outdoor environments. It supports the EPC Global C1G2 and ISO 18000 – 6C standards and can be upgraded to be compatible with multiple protocols.

ZL 6702 reader is an important part of the construction of RFID application system, it completes the collection of key information in the RFID system function, its coverage of RFID tags to identify, complete the tag inventory, read and write and other operations.

According to the different working frequency bands and communication links, ZL 6702 readers are divided into several product specifications. Different specifications provide different operating frequency bands and communication modes, which fully consider the needs of customers in different countries, industries and application environments, and provide a series of product solutions on this basis.

RFID System Introduction

The basic components of the RFID application system include: tags (Tag), readers (Reader), middleware (Middle-ware) and business applications (Enterprise systems), as shown in Figure 1-1.

Figure 1-1 Schematic diagram of RFID system



The tag is the data information source of the whole RFID system. The reader is connected to the RFID middleware and acts as the data collection actuator of the whole RFID application system. The reader recognizes the tags within its coverage and passes the information to the middleware for further processing. The upper level application obtains the information through the middleware and completes the realization of the upper level business functions and processes.

1.2 Reader Appearance

The appearance of the reader is shown in Figure 1-2.

Figure 1-2 Reader Appearance



1.3 Product Features

- Good protocol compatibility

The 6702 reader products support the automotive electronic labeling industry standard or ISO18000-6C protocol, and can be upgraded to be compatible with a wide range of protocols.

- Support multiple communication interfaces

Support a variety of communication protocols to communicate with the middleware, currently available in standard TCP/IP mode, hardware support for 10/100M Ethernet interface, RS485 and other wired communication methods, and optional support for 3G/4G wireless communication methods.

- Easy to operate and maintain

Provide DLL (dynamic link library), WEB network management and other software systems to modify the parameters of the reader configuration, diagnosis and troubleshooting, version upgrade and other maintenance functions.

- Supports multiple antenna interfaces

Provide 6-way antenna interface, can support 6-way simultaneous transceiver sharing.

- Supports multiple reader operating modes

It meets the requirements of the Ministry of Public Security's Scientific Management Institute's "Technical Documentation for Developing Pavement Read/Write Devices" for multi-reader work.

- high performance

- Super processing power, the maximum air port rate of 160kbps forward, reverse 640kbps; support for high-speed mobile tag recognition, dynamic reading performance to support the maximum speed of 240km/h.

- Supports leakage pair cancellation function to eliminate the

interference of RF forward leakage signal on the reverse link.

- High reading efficiency, single reading time less than 20ms
- Built-in label filtering reduces network transmission bandwidth requirements.
- Built-in high-capacity storage space. Provide up to 512MB of data storage capacity and 128MB of log storage capacity, so that the device has a powerful information offline caching function, in the system communication abnormalities can still save the key data for the customer, and provide massive log analysis.

- high reliability

- The equipment does not require any rain and dust protection facilities outdoors and has a protection rating of IP65.
- Supports LBT operating mode with high interference immunity

- high security

The products have gone through long time and high intensity safety and reliability tests. The physical safety performance meets the requirements set forth in GB 16796 Safety Requirements and Test Methods for Security Alarm Equipment; the information application safety performance meets the requirements set forth in GB/T 35787 Safety Technical Requirements for Motor Vehicle Electronic Identification Read/Write Equipment.

1.4 Technical characteristics and parameters

1.4.1 Hardware indicators

Physical data

See Table 1-2 for reader physical data.

Table 1-2 Physical Data

sports event	norm
sizes	292 mm x 258 mm x 60 mm (L x W x H)

weights	Less than 3.5kg
---------	-----------------

Power requirements

See Table 1-3 for reader power requirements.

Table 1-3 Power Supply Requirements

sports event	norm
Power connector	Unidirectional 3-wire AC interface
Supply voltage range	100 V AC to 240 V AC
Supply frequency range	50Hz~60Hz
rating	<30W

Environmental conditions

See Table 1-4 for reader operating environment data.

Table 1-4 Environmental conditions

sports event	norm
operating temperature	-40 °C~+ 75 °C
Storage temperature	-45 °C~+ 85 °C
Operating humidity	5% to 95%

Dependability

See Table 1-5 for reader reliability data.

Table 1-5 Reliability

sports event	norm
protection class	IP65
Surge (shock) immunity	Conforms to the requirements of the 4th test level stipulated in Table 1 of GB/T17626.5-2008
electrostatic protection	Conforms to the requirements of the 4th test level specified in GB/T 17626.2-2006.
salt spray	Comply with GB/T 2423.17-2008 96h test cycle

	requirements
impulse immunity	Conforms to the requirements of test level 4 stipulated in GB/T 17626.4-2008.

1.4.2 Performance indicators

Readers performance index parameters see Table 1-6

Table 1-6 Performance index parameters

sports event	norm
air interface protocol	EPC global Class-1 Generation-2 UHF RFID standard ISO 18000-6C international standard protocol
operating mode	Fixed frequency, FM (configurable)
operating frequency	902MHz~928MHz
firing power	15dBm to 33dBm (adjustable)
receiver sensitivity	<-65 dBm (at 10 ⁻² BER)
Static reading distance	>25m (environment, antenna dependent)
Static write distance	>12m (environmentally, antenna related)
Dynamic readability	Supports maximum speed of 240km/h



Reminder

Product shape and technical specifications are for reference only, subject to change without notice, please confirm with us when purchasing.

2 Reader Structure

2.1 Reader Interface and Indicator

2.1.1 Introduction to reader interfaces and indicators

Figure 2-1 Device Side Interface

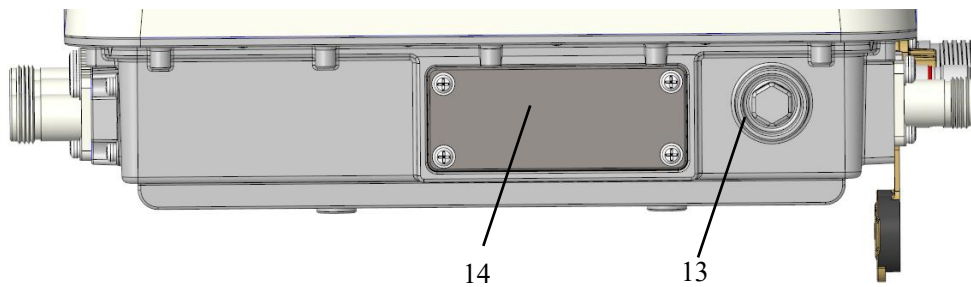


Figure 2-2 Device Antenna Interface

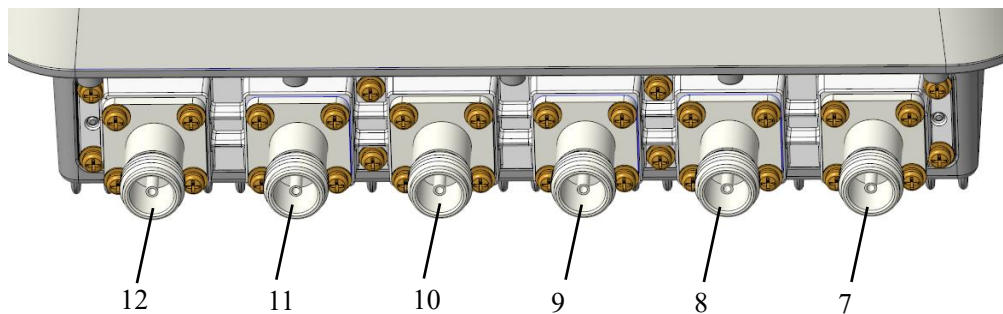


Figure 2-3 Device Cable Interface

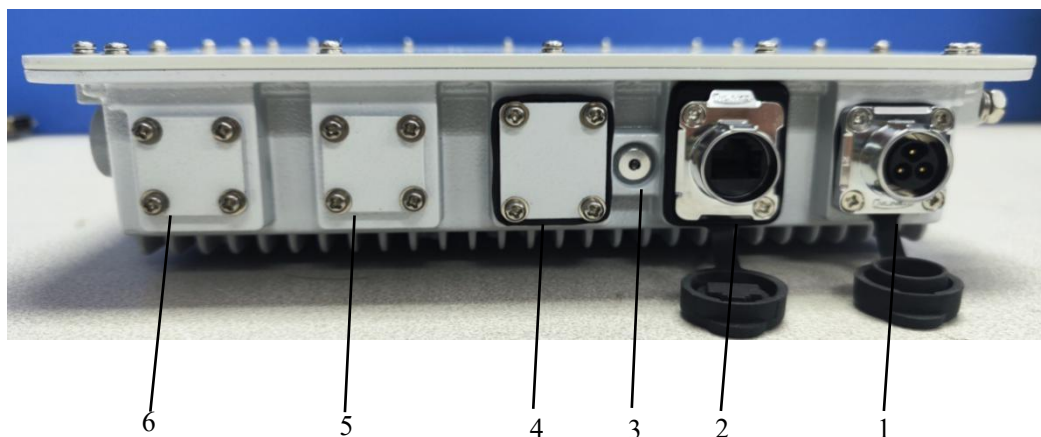


Table 2-1 Indicator and Interface Descriptions

serial number	show
1	Power input: AC220V input
2	Data interface: can support Ethernet, RS232, RS485 and WIEGAND interface
3	Equipment operation indicator light and fault alarm light
4	Reserved interface
5	Reserved interface
6	Reserved interface
7	Antenna Interface 1
8	Antenna Interface 2
9	Antenna Interface 3
10	Antenna Interface 4
11	Antenna Interface 5
12	Antenna Interface 6
13	Ventilation valve: regulates the air pressure difference between the inside and outside of the equipment.
14	Card interface: for installation of PSAM card, SIM card

2.1.2 Access point

The reader grounding point interface location is shown at [Figure 2-4](#) , see [Table 2-3](#) for specific instructions.

Figure 2-4 Device Ground Point Interface



- The reader is recommended to use the specification of 16 square millimeters of yellow-green protective ground wire, in the cable at both ends were crimped copper nose;
- Put the copper nose of one end of the protective earth wire on the grounding point of the reader and tighten the grounding bolt; the other end of the protective earth wire is recommended to be connected to the grounding point reserved for the pole frame or the grounding copper row, as shown in the following figure:

Figure 2-5 Ground Connection



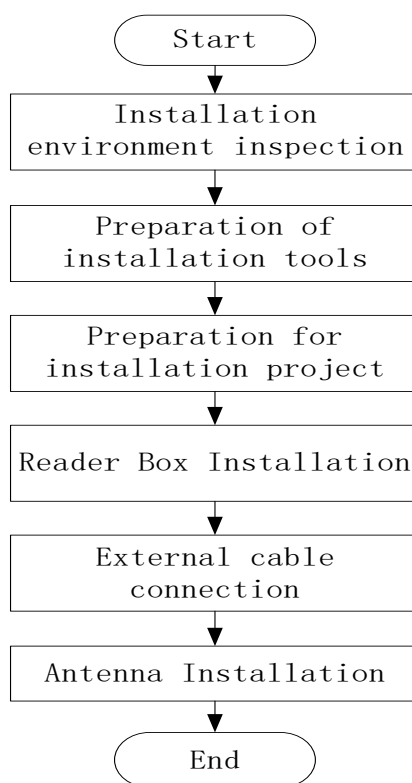
- If the pole frame does not have a reserved grounding point or grounding copper row, then you can choose to drill holes in the pole frame to connect the grounding wire nearby, if the grounding position has been painted or rust, you also need to do scraping paint or remove rust treatment.
- Spray rustproof paint around the connecting bolts at the grounding point and attach a label to the grounding cable.

3 Installation of the reader

3.1 Installation process

The general installation process for the reader is shown in [Figure 3-1](#).

Figure 3-1 Installation Flowchart



3.2 Installation environment check

Installation environment check for the upcoming installation work to provide a strong basis, but also for future maintenance work to provide first-hand information, check the following items:

- Environmental inspections
- Outdoor installation requires conditions for fixed brackets and holding rods, grounding resistance and anti-static requirements to comply with the

design.

- Inspection of power supply

Power supply facilities are complete, the power supply should meet the input voltage fluctuation range; in addition to the introduction of utility power, it is desirable to have sufficient capacity of storage batteries and oil machine and other backup power.

- Ground check

- The site ground arrangement is to be radial or planar and the ground wire is to be laid independently.

- Grounding resistance should meet the requirements, grounding resistance should be less than 5 Ω when grounded alone, less than 1 Ω when grounded together. the cross-sectional area of the grounding wire should be determined in accordance with the maximum value of the current to be borne, and must be used for copper sheathed wires, and can not be used for bare copper wire.

- Inspection of other ancillary equipment

- Check the condition of other equipment related to the safe and normal use of the reader system, such as I/O interface equipment and transmission equipment.

- Check that the power and other cables of the computer connected to the reader are installed.

3.3 Preparation of installation tools

Installation tools and engineering accessories that may be used during installation are listed below:

- Installation tools include: vise, diagonal pliers, stainless steel cable ties, wire strippers, crystal head crimpers, adjustable wrenches, Phillips screwdriver, one screwdriver, craftsman's knife, scissors, multimeter, ground rent meter, tape measure, safety helmet, anti-static bracelet, anti-slip gloves. Wall mounting also requires additional preparation of impact

drills and vacuum cleaners.

- Engineering auxiliary materials include: grounding rows, copper noses, waterproof tape, insulating tape, anti-ultraviolet ties, waterproof mastic, marking pens and so on.

3.4 Preparation for installation work

The preparations required before product installation are as follows:

- The actual geographic locations and technical parameters of the sites were obtained, and the specific geographic locations of the sites were drawn in the engineering survey report.
- The area, height, ground leveling, and trench layout of the sites were examined and a plan layout of each site was drawn.
- Determine the length of antenna feeders, network cables, and power cables and the routing method according to the building of the site.

3.5 Reader Box Installation

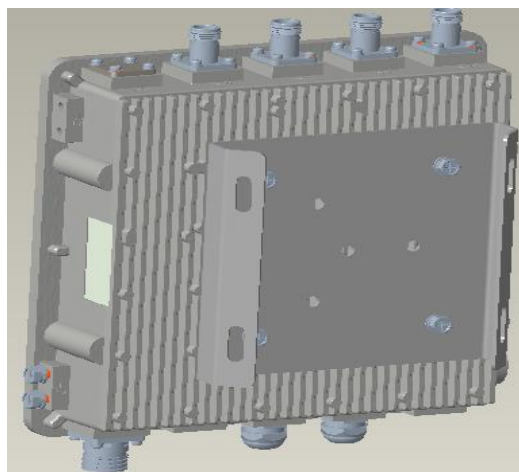
3.5.1 Holding bar mounting method

A diameter of 100 mm to 350 mm is recommended.

Procedure

1. Use four M6×12 hexagonal Phillips pan head combination screws to fix the shell and the holding rod member together in.

Figure 3-2 Rod Assembly



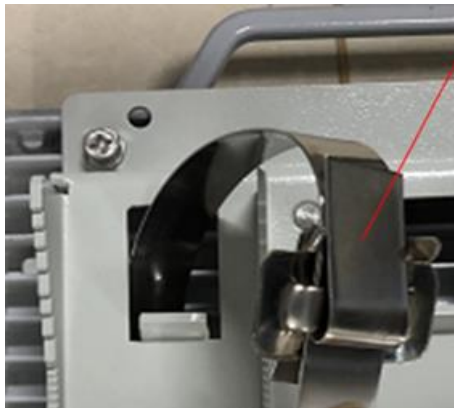
2. According to the circumference of the holding rod, cut a certain length of steel tie (need to reserve more than 15cm), one end of the tie from the tie buckle through and bend back to the back of the tie buckle about 4cm, and use pliers to press tightly, as shown in the figure below:

Figure 3-3 Installing Tie-Downs



3. The other end of the zip tie passes through the zip tie hole in the reader mount and then through the side of the zip tie retaining slot as shown below:

Figure 3-4 Threading a Tie-Down Button



4. Thread out the tie buckle tie with a tightening machine clamp, rocking the rocker arm slowly tighten the tie after the tie pliers overall reverse fold back, and then move the blade handle to cut off the tie, as shown in the following figure:

Figure 3-5 Tightening Ties



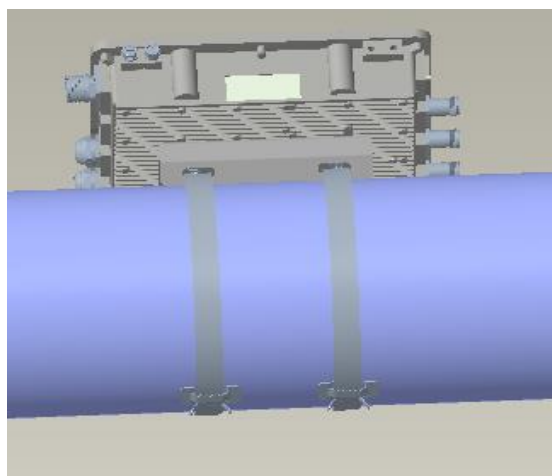
5. Finish the installation of the tie by knocking the two corners of the tie fastener flat with a vise to catch the last reserved tie head.

Figure 3-6 Tie Tape Installation Complete



6. As shown in the diagram below, two steel ties are used on the holding bar to secure the reader to the holding bar member.

Figure 3-7 Installing the Reader



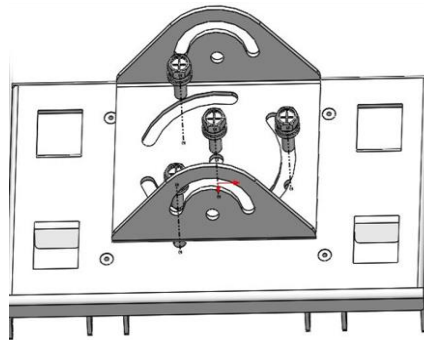
3.6 Antenna Installation

3.6.1 Installation of holding pole

The recommended diameter for the pole is between 100mm and 350mm.

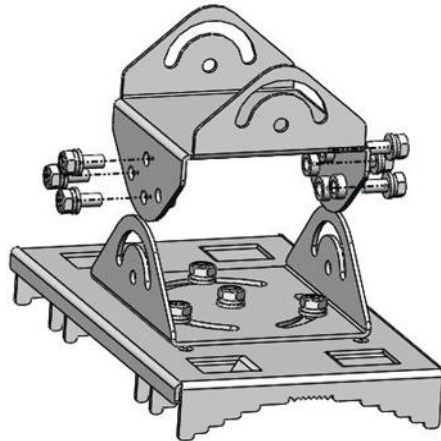
1. As shown in Figure 3-8, use 4 M6 combination bolts on the ground to fix the pole assembly and rotating parts.

Figure 3-8 Assembly of the holding pole assembly and rotating parts



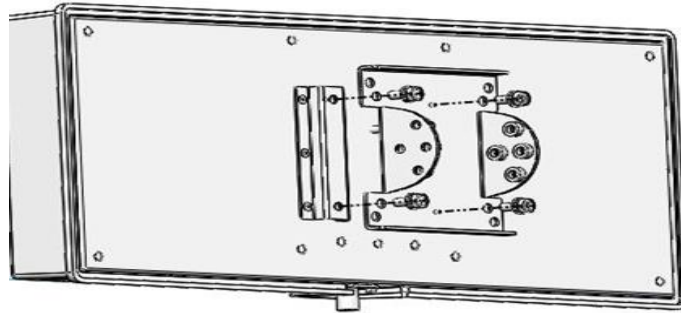
2. As shown in Figure 3-9, use 6 M6 combination bolts to fix the horizontal part to the component in Figure 3-8.

Figure 3-9 Fixing of Horizontal Components



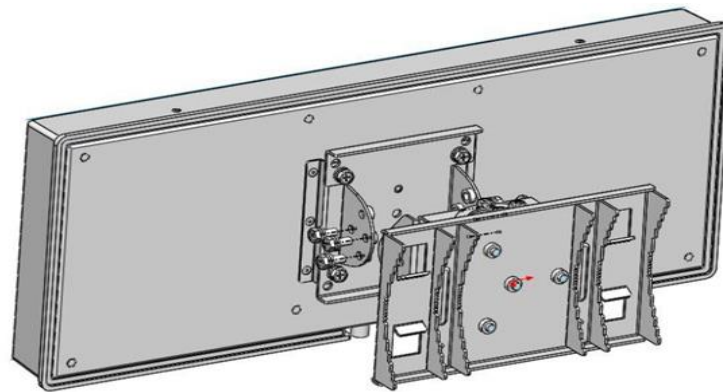
3. As shown in Figure 3-10, use 4 M6 combination bolts to fix the pitch component and AU04 antenna.

Figure 3-10 AU04 fixed with pitch component



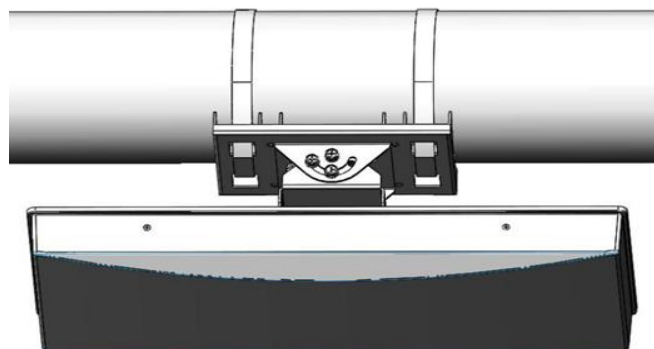
4. As shown in Figure 3-11, use 6 M6 combination bolts to fix the components of Figure 3-9 and Figure 3-10 together.

Figure 3-11 Fixing two sets of components



5. As shown in Figure 3-12, fix the steel cable ties, buckles, and components in Figure 3-11 at the designated height of the vertical pole with cable tie pliers.

Figure 3-12 Fixed antenna



3.7 External Cable Connection

3.7.1 Summarize

See [Table 3-1](#) for the main external cable types and interface specifications for the 6702 reader.

Table 3-1 External Cable Types and Interface Specifications

A-side equipment	B-side equipment	Cable Type	A-end connector	B-end connector
reader (software)	Power supply equipment	Three core power cord	Power Aviation Plugs	Triple Flat Plugs or Terminals
reader (software)	connection with high-ranking officials	Antenna Feeder	N-connector	N-connector
reader (software)	Switch or computer	Ethernet cable	RJ-45 connector	RJ-45 connector

3.7.2 Connecting the power cord

Use the power cable as shown in [Figure 3-13](#) . Terminal A is a power airline plug and terminal B needs to be fabricated in the field. Depending on the actual power supply, the B end can be connected to a three-flat plug or a terminal block.

Figure 3-13 Power Cables



See [Table 3-2](#) for power cable signal definitions.

Table 3-2 Power Cable Signal Definitions

markings	color	define
L	coir (coconut fiber)	FireWire (IEEE 1394 data-transfer interface)
N	indigo plant	zero line
PE	yellowish green	protective earth (electronics)

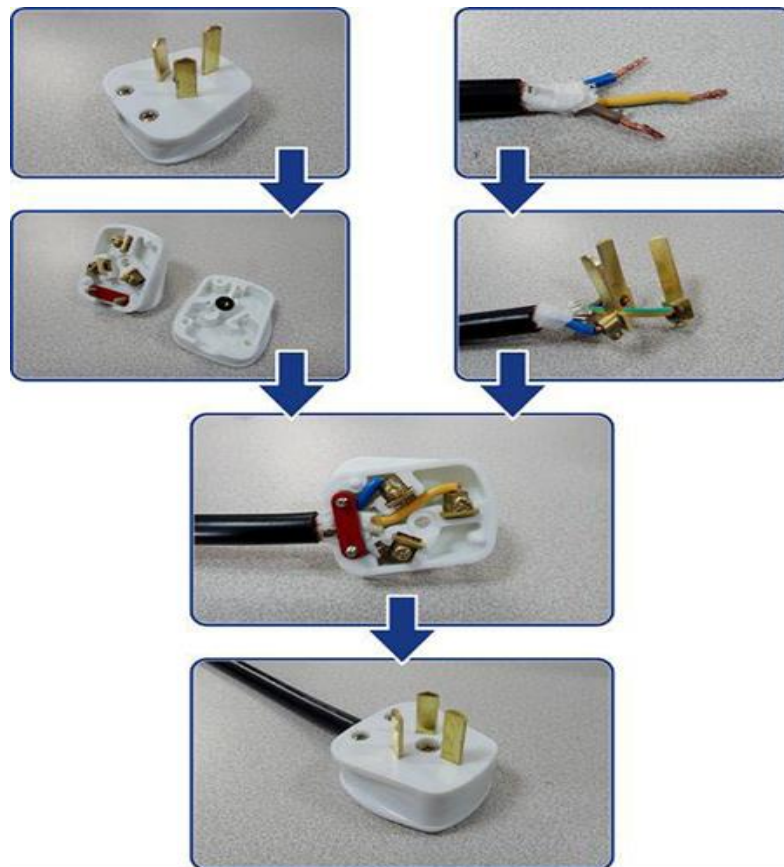
Procedure

1. [Figure 3-13](#) power cable A end of the female end of the largest convex key aligned with the maximum positioning slot of the male end of the device inserted into the reader "POWER" power connector, hand-tighten the female end of the straight threaded nut horizontally to tighten the threads (can not be screwed black plastic with the line parts).
2. Connect the B end of the power cable to a 220 V AC power source.

Triple Flat Plug Wiring Method

When making a three-flat plug in the field, refer to the wiring method shown in [Figure 3-14](#).

Figure 3-14 Triple Flat Plug Wiring



3.7.3 Connecting the Ethernet cable

The Ethernet cable for the 6702 reader can be connected using an RJ45 crystal head + outdoor network cable.

Procedure

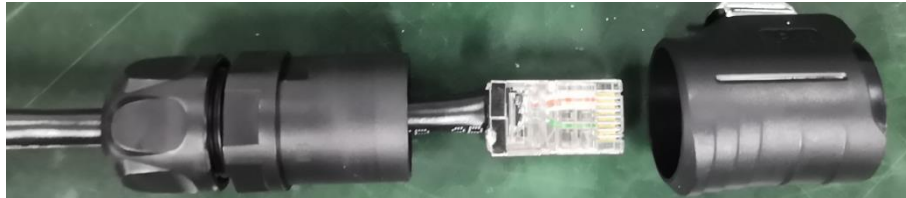
1. Pass the network cable with the uncrimped RJ45 crystal head through the LP16 RJ45 male plug air head end assembly as shown below:

Figure 3-15 Step 1 of connecting the network cable



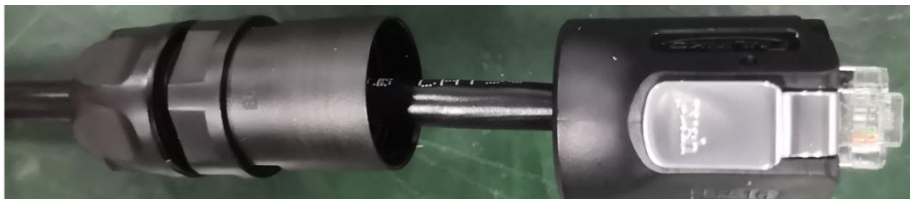
2. Crimp the crystal head of the network cable passing through it according to the TIA/EIA568B wire sequence national standard, as shown in the following figure:

Figure 3-16 Step 2 of connecting the network cable



3. Insert the crimped crystal head into the LP16 RJ45 male plug airline header as shown below:

Figure 3-17 Step 3 of connecting the network cable



4. Lock the end of the LP16 RJ45 male plug airline head as shown below:

Figure 3-18 Step 4 of connecting the network cable



5. Connect the network cable with the plug to the device;

Figure 3-19 Step 5 of connecting the network cable



3.7.4 Connecting the feeder

The antenna feeder can be selected as 1/4 ordinary RF cable or 1/2 ordinary RF cable., as shown in [Figure 3-20](#).

Figure 3-20 Schematic of Feeder Cable (1/4 Ultra-Flexible RF Cable)



1. inner conductor 2. insulator 3. outer conductor 4. sheath

See [Table 3-3](#) for detailed feeder parameters.

Table 3-3 Feeder Parameters (1/4 Ultra-Flexible RF Cable)

Name	Material	Diamete(mm)
Inner Conductor	Copper clad aluminum wire or copper wire	1.9
Insulator	Foamed polyethylene	4.7
Outer Conductor	Spiral copper tube	6.35
Sheath	PE or low smoke halogen-free fireproof PE	7.5

**Attention!**

- The feeder ports must be treated strictly against water and corrosion. If not treated, the unpainted overlap surface will be corroded and the contact impedance will become larger, and the lightning protection effect will be greatly attenuated. The specific treatment procedure can be found in "3.7 Corrosion prevention treatment for outdoor connectors".
 - After installing and replacing the antenna at the working antenna interface, the reader needs to be re-powered to take effect.
-

3.7.5 Precautions

- Placed cables must be protected with sleeving, such as PVC pipe, PVC trunking, metal hose, serpentine hose, or wire wrap.
- Reader to the antenna feeder line try not to bend too much, the minimum bending radius of the feeder line should not be less than 20 times the radius of the feeder line, to avoid excessive attenuation of the high-frequency signal transmitted by the feeder line.
- When using cable ducts or trunking do not overfill the cable fabric, it is best to have a 30% retention space.
- Strictly in accordance with the requirements to do power grounding, three flat plug PE yellow and green wire to ensure a reliable grounding.
- Strictly in accordance with the requirements to do equipment grounding, equipment grounding screws should be connected to the protective earth wire and reliable grounding.

3.8 Outdoor connector anti-corrosion treatment

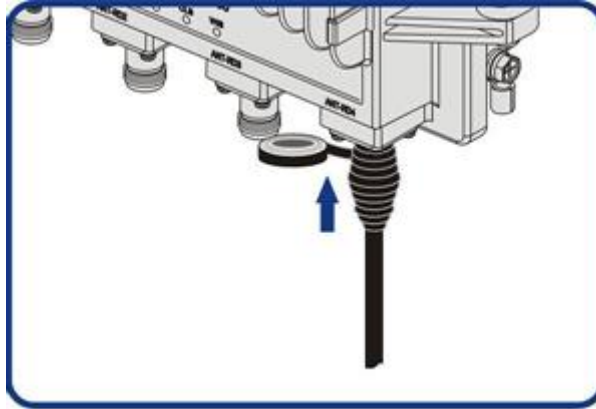
After the cables are connected, they are laid out in the alignment rack and tied down to secure them.

All interfaces already in use must be strictly glued in accordance with "1+3+3".

The detailed operation of "1+3+3" glue wrapping is as follows.

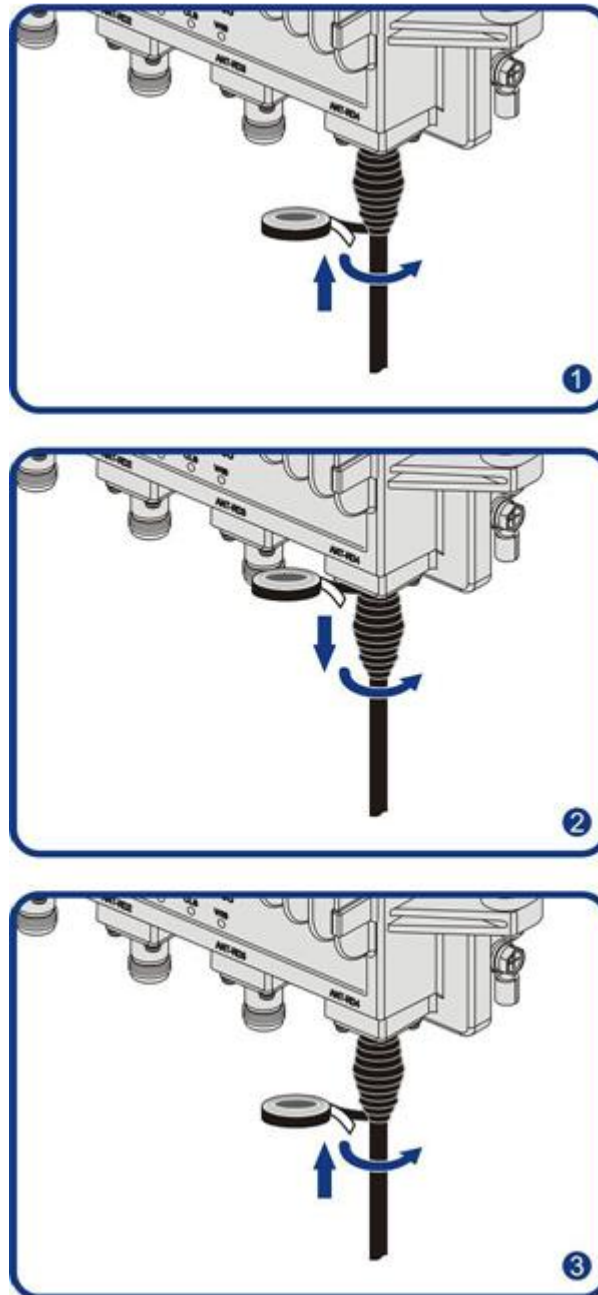
1. Clean the surface of the connector and the cable in the sealing area.
2. Wrap 1 layer of insulating tape from the bottom up as shown in Figure 3-21.

Figure 3-21 Winding Insulating Tape



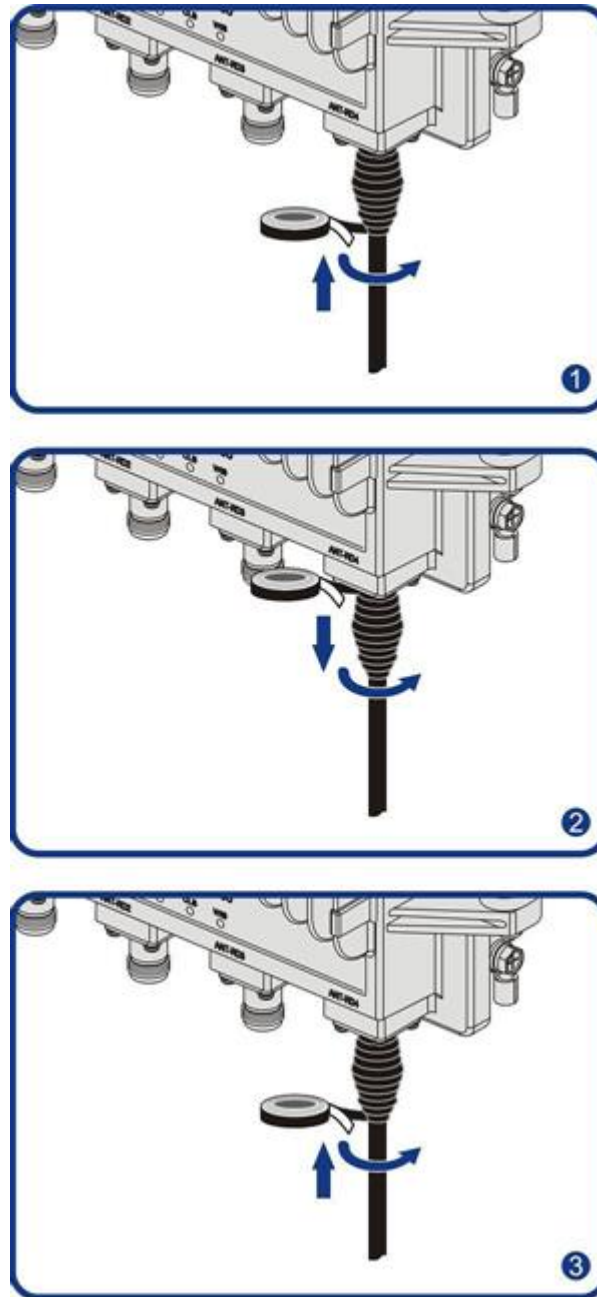
3. As shown in [Figure 3-22](#), wrap 3 layers of waterproof tape from bottom up, top down, and bottom up respectively.

Figure 3-22 Wrapping Waterproof Tape



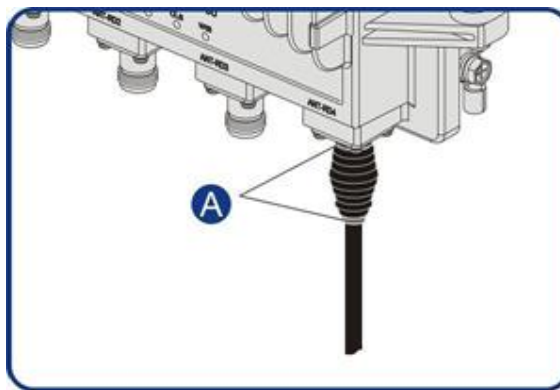
4. As shown in [Figure 3-23](#), 3 layers of insulating tape are wound from the bottom up, top down, and bottom up, respectively.

Figure 3-23 Winding Insulating Tape



5. As shown in [Figure 3- 24](#), apply silicone sealing to both ends of the tape and the seams, and tie off the second end with a UV-proof tie.

Figure 3-24 Tying UV Ties

**Attention!**

- Tape is wound at open roll strength and not overstretched.
- Tape wrap overlap of 50% or more.

4 Reader Debugging

4.1 Reader debugging

Debugging is to set the parameters of the reader for different application environments, so that it can work normally and optimally.

The parameter content for debugging is shown in Table 4-1.

Table 4-1 Parameter contents

parameter category	Parameter name
Basic parameters	Device alias, device type, device port, device group, device specification, device IP address
Equipment parameters	Device identification, GPIO port parameters, alarm level, location method
Antenna Parameters	Antenna parameters, protocol parameters, frequency parameters, RSSI filtering parameters
LLRP Parameters	R0 reporting rules, reader time notification settings, Access reporting rules, keep-alive configuration, event and report configuration
Communication parameters	Device ID and name, time server settings, underlying communication type, reader gateway, reader DNS , mode setting parameters, service link, reader parameter configuration
Middleware parameters	Middleware server IP address and port number
Safety Module Parameters	Query version information, authentication status, ID number, etc.

4.2 Power up, power down

The devices that need to be energized in the reader system equipment include the reader itself, the Ethernet switch, and the server running the associated platform software.

- The reader can be powered up and down by plugging and unplugging the power plug directly. The power supply uses 110 V/220 V AC mains power and there is no power switch on the reader itself.
- The process of powering up and powering down Ethernet switches and PCs should be performed by referring to the specific instructions for the equipment used.



Attention!

It is important to ensure that the antenna is reliably connected to the reader before powering up the reader, otherwise the reader's antenna port may not function properly.

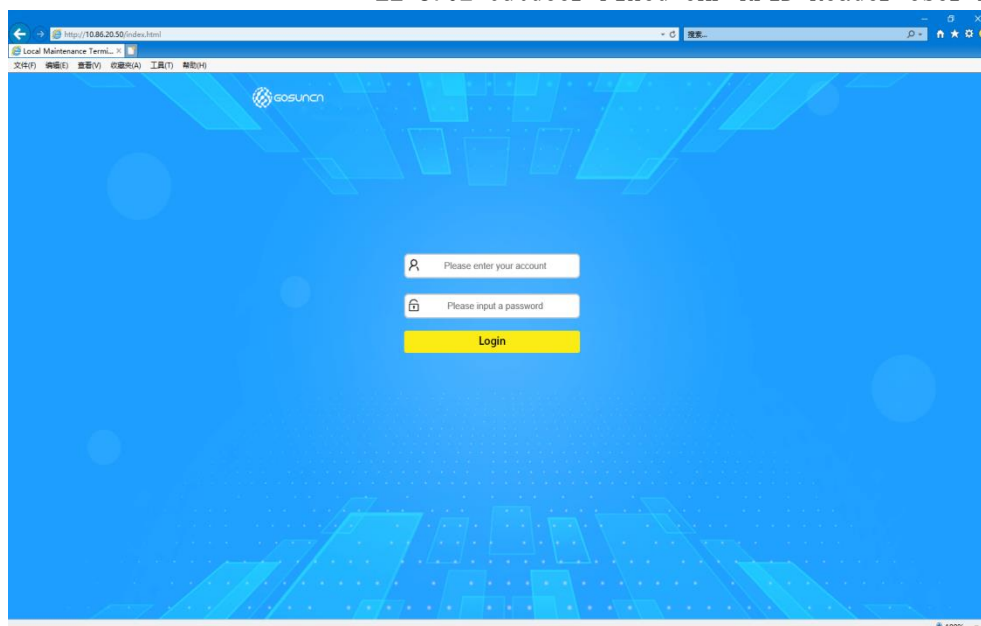
4.3 Maintenance methods for the reader

The reader supports maintenance functions such as device operation status monitoring, parameter configuration, program upgrade and device reset through WEB. Specifically can be realized through LMT.

4.3.1 Login to LMT

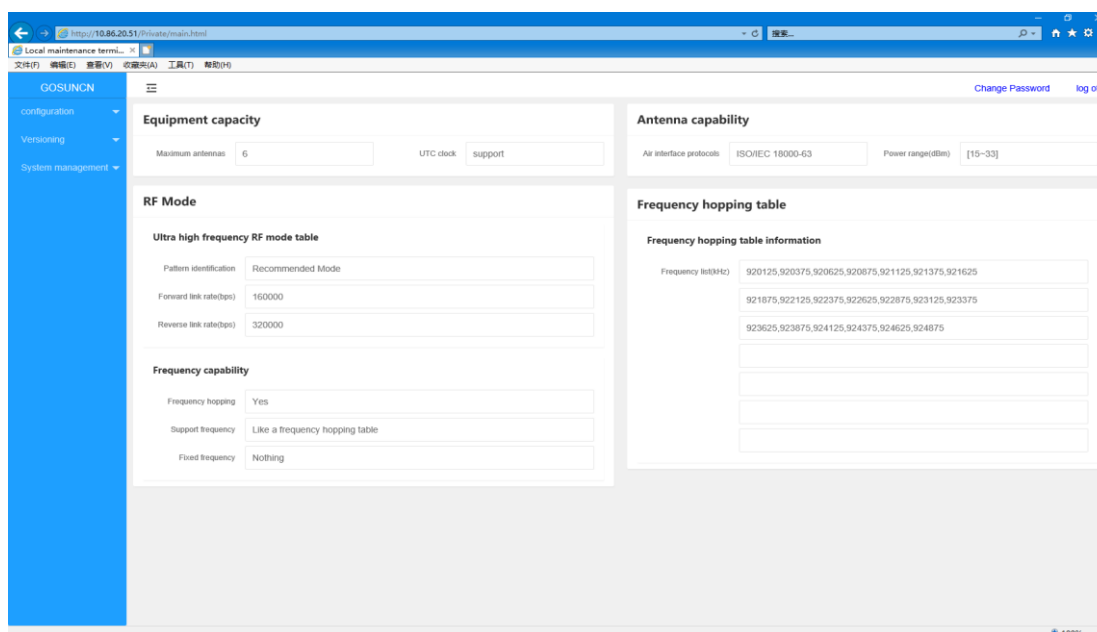
LMT can be accessed through the WEB page login method. The specific method is to use the mainstream browser (IE, Chrome, etc.), enter the IP address of the device in the address bar and then enter, the login interface is shown in Figure 4-1.

Figure 4-1 Login to LMT



Enter your user name and password and click the Login button to enter the system, as shown in Figure 4-2.

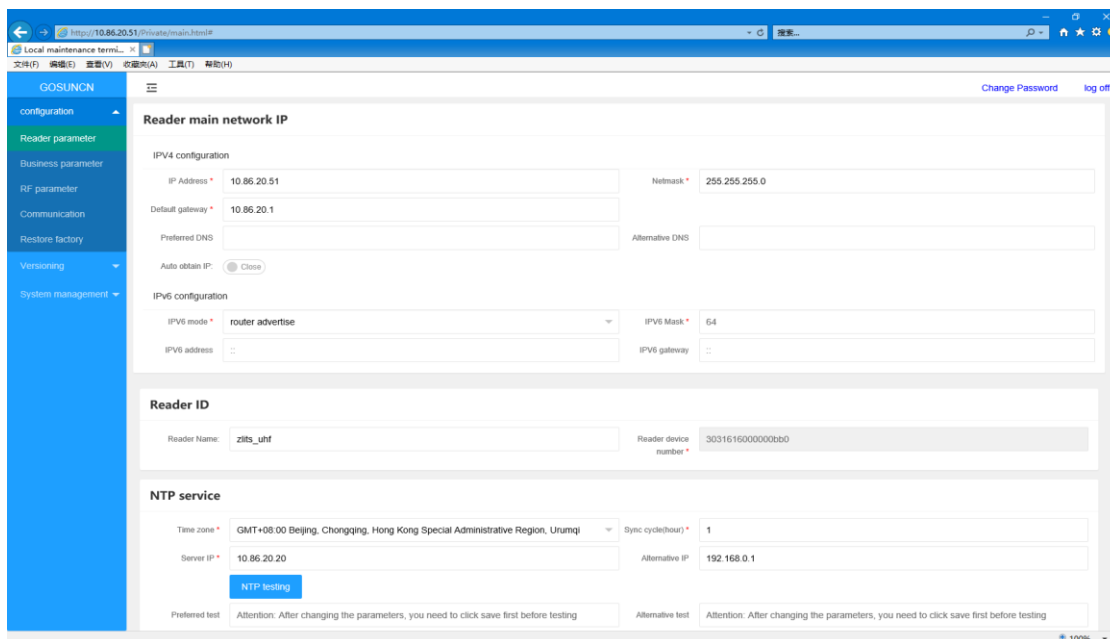
Figure 4-2 Entering LMT



4.3.2 Reader Parameter Settings

Click on the left column of the page "configuration" menu under the "Reader parameter", for reader parameter settings, as shown in Figure 4-3.

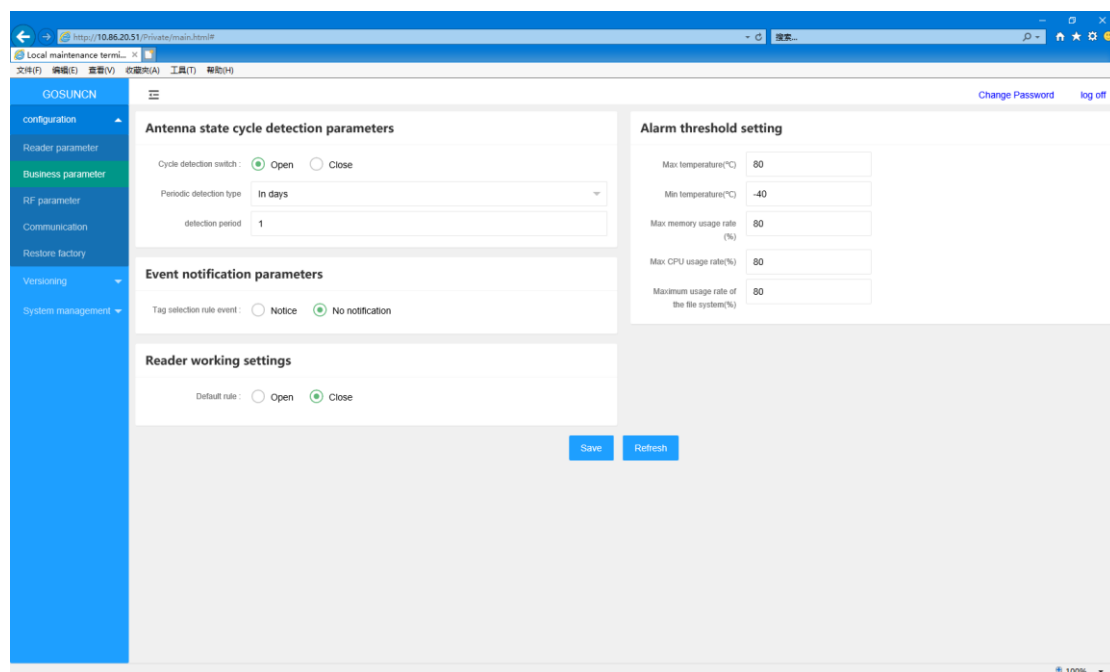
Figure 4-3 Reader Parameter Settings



4.3.3 Business Parameter Configuration

Click "Business parameter" under the "Configuration" menu on the left column of the page to configure the business parameters, as shown in Figure 4-4.

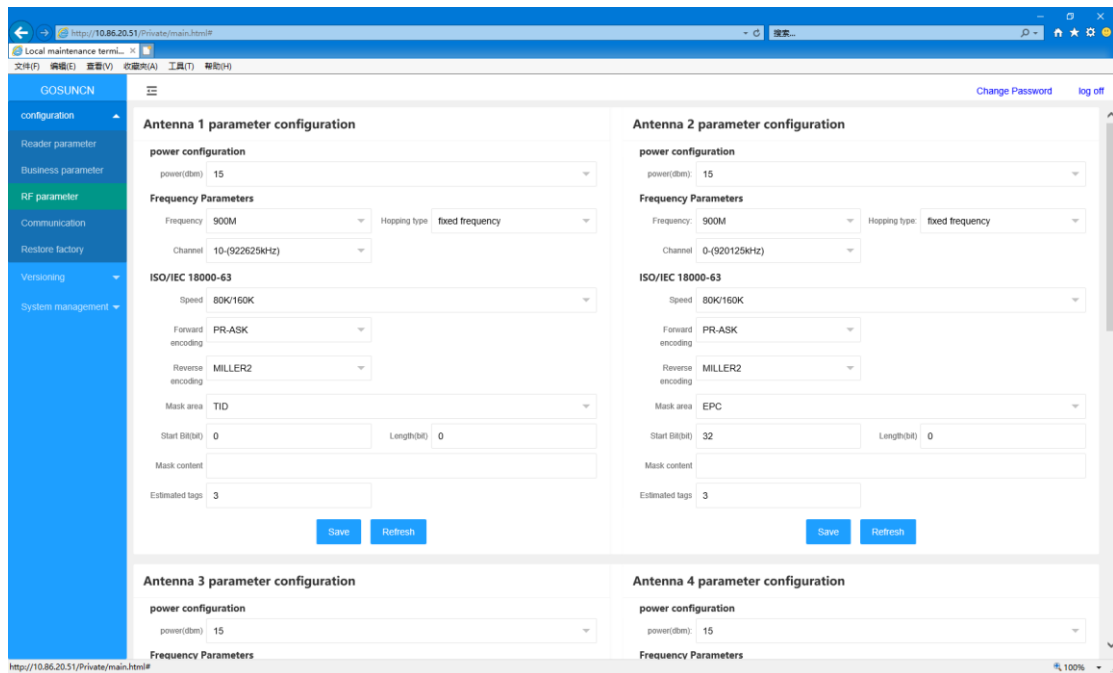
Figure 4-4 Service Parameter Configuration



4.3.4 RF Parameters Configuration

Click "RF parameter" under the "Configuration" menu on the left column of the page to configure the RF parameters, as shown in Figure 4-5.

Figure 4-5 RF Parameter Configuration



The screenshot displays the 'RF parameter configuration' page. The left sidebar shows the 'RF parameter' menu item highlighted. The main content area is divided into four sections for Antenna 1 through Antenna 4. Each section contains the following fields:

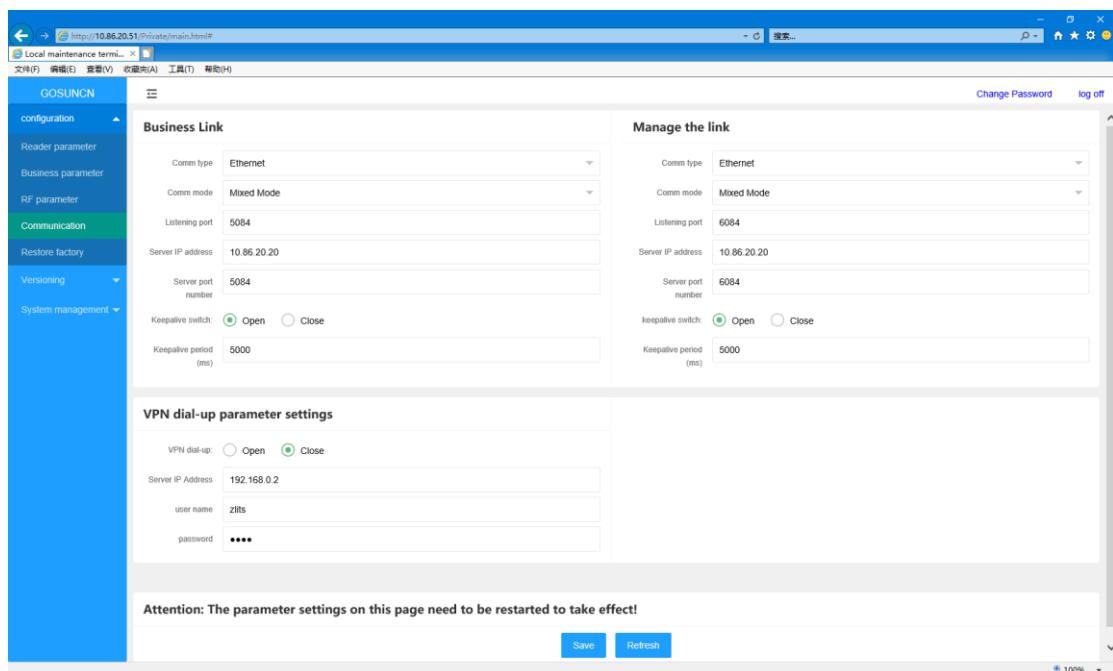
- power configuration:** power(dBm) set to 15.
- Frequency Parameters:** Frequency set to 900M, Hopping type set to fixed frequency, Channel set to 10-(922629kHz).
- ISO/IEC 18000-63:** Speed set to 80K/160K, Forward encoding set to PR-ASK, Reverse encoding set to MILLER2, Mask area set to TID, Start Bit(bit) set to 0, Length(bit) set to 0, Mask content set to an empty field, and Estimated tags set to 3.

Each section has 'Save' and 'Refresh' buttons at the bottom.

4.3.5 Communication Parameter Configuration

Click "Communication" under the "Configuration" menu on the left column of the page to configure communication parameters , as shown in Figure 4-6.

Figure 4-6 Communication Parameter Configuration



The screenshot displays the 'Communication parameter configuration' page. The left sidebar shows the 'Communication' menu item highlighted. The main content area is divided into two sections: 'Business Link' and 'Manage the link'. Each section contains the following fields:

- Comm type:** Ethernet.
- Comm mode:** Mixed Mode.
- Listening port:** 5084.
- Server IP address:** 10.86.20.20.
- Server port number:** 5084.
- Keepalive switch:** Open (radio button selected).
- Keepalive period (ms):** 5000.

Below these sections is the 'VPN dial-up parameter settings' section with the following fields:

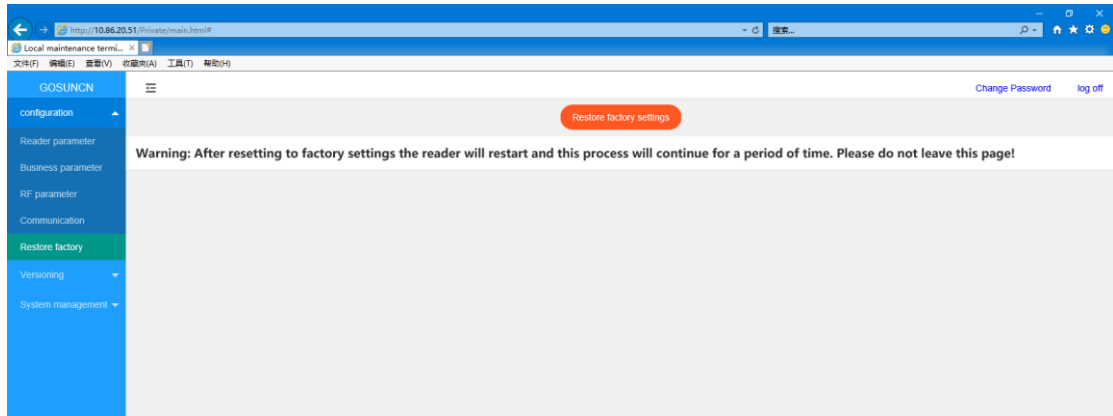
- VPN dial-up:** Close (radio button selected).
- Server IP Address:** 192.168.0.2.
- user name:** zlls.
- password:** ****.

At the bottom, there is an 'Attention' message: 'The parameter settings on this page need to be restarted to take effect!' and 'Save' and 'Refresh' buttons.

4.3.6 Restore Factory Settings

Click "Restore factory" under the "Configuration" menu on the left column of the page to restore factory settings, as shown in Figure 4-7.

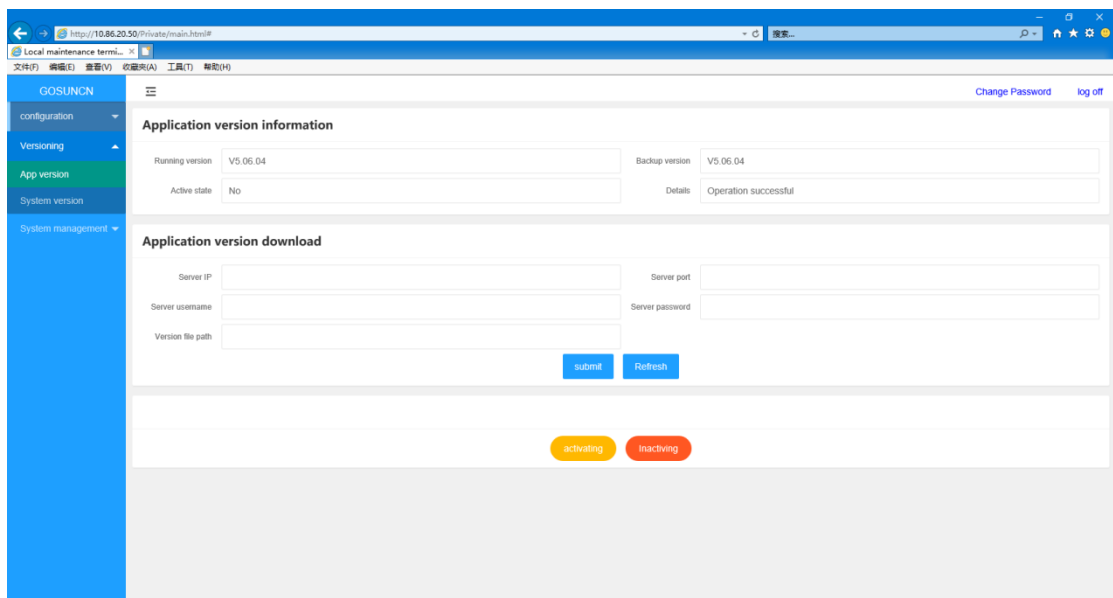
Figure 4-7 Restoring Factory Settings



4.3.7 Application Version Management

Click "App version" under the "Versioning" menu on the left side of the page to enter the application version management interface to query, download and activate the application version, as shown in Figure 4-8.

Figure 4-8 Application Version Management

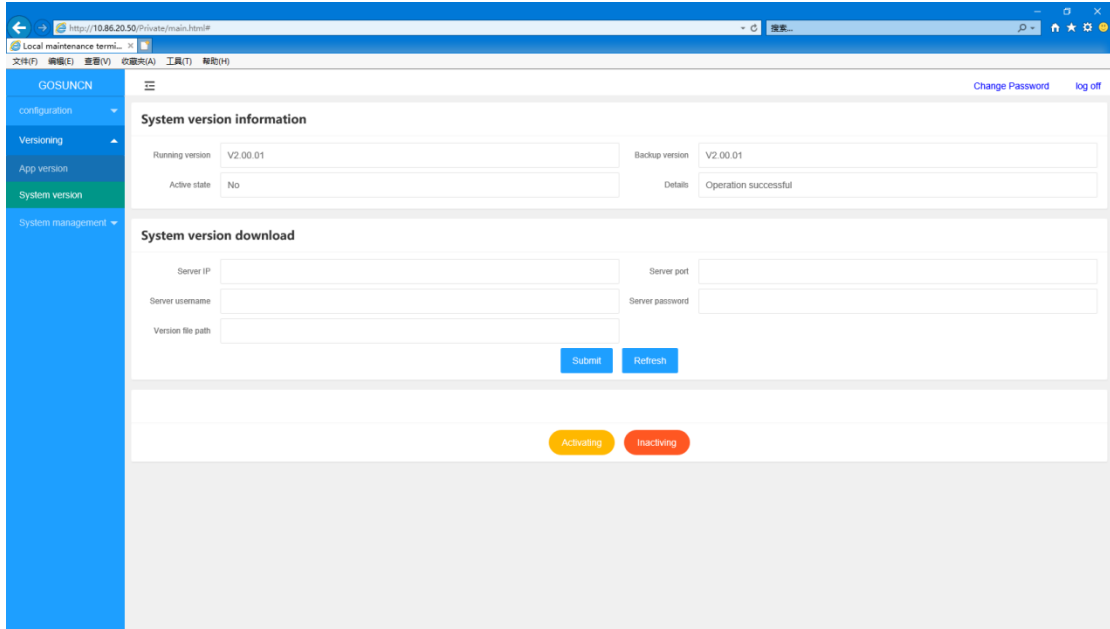


4.3.8 System Version Management

Click "System version" under the "Versioning" menu on the left side of the

page to enter the system version management interface for querying, downloading and activating the system version, as shown in Figure 4-9.

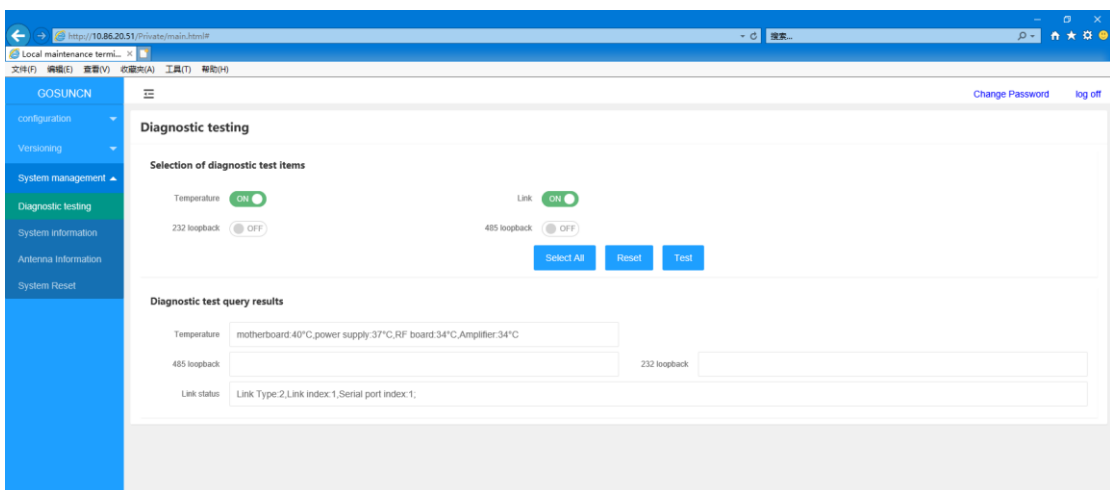
Figure 4-9 System Version Management



4.3.9 Diagnostic test

Click "Diagnostic testing" under the "System management" menu on the left side of the page to enter the diagnostic testing interface, and perform diagnostic tests for temperature, link, etc., as shown in Figure 4-10.

Figure 4-10 Diagnostic Tests

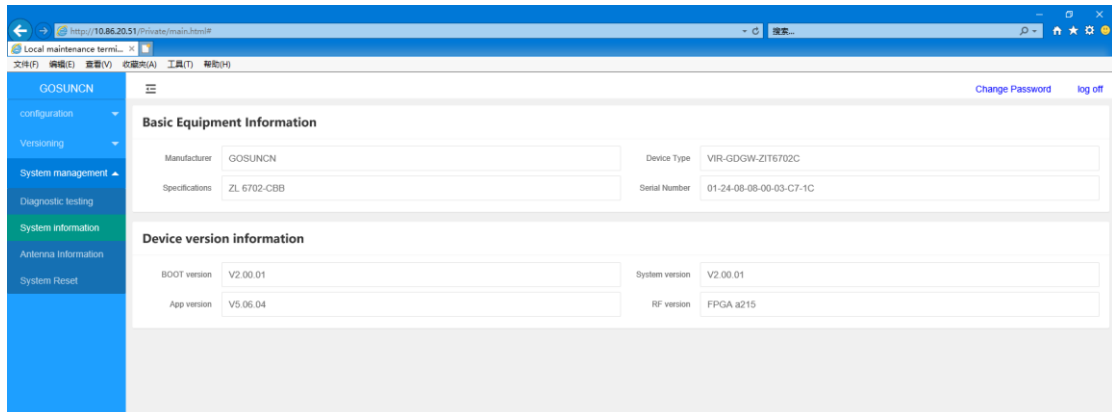


4.3.10 System Information Query

Click "System information" under the "System management" menu on the left

side of the page to query the system information, as shown in Figure 4-11.

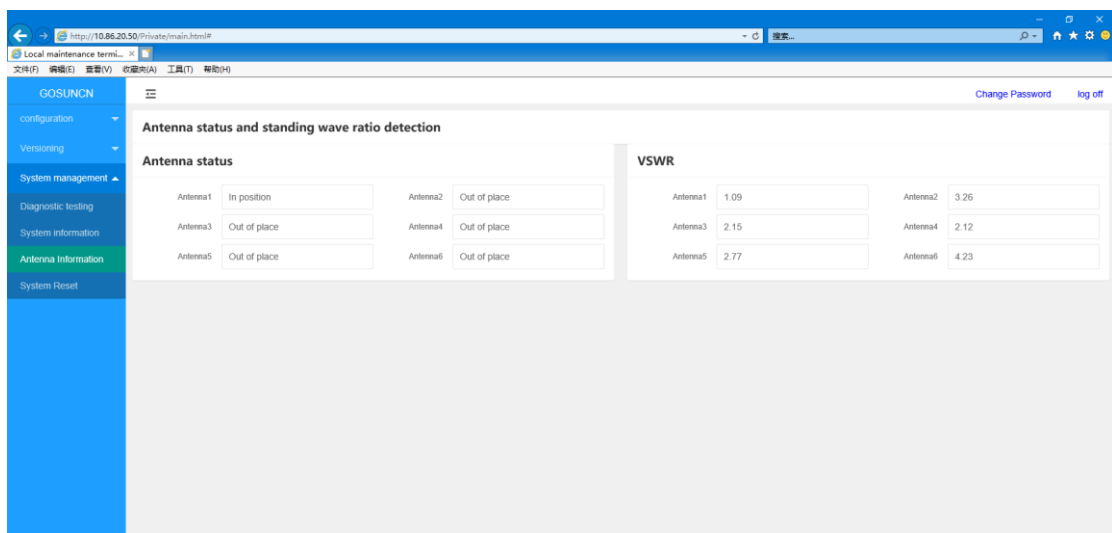
Figure 4-11 System Information Query



4.3.11 Antenna Information Query

Click "Antenna Information" under the "System management" menu on the left side of the page to query the antenna information, as shown in Figure 4-12.

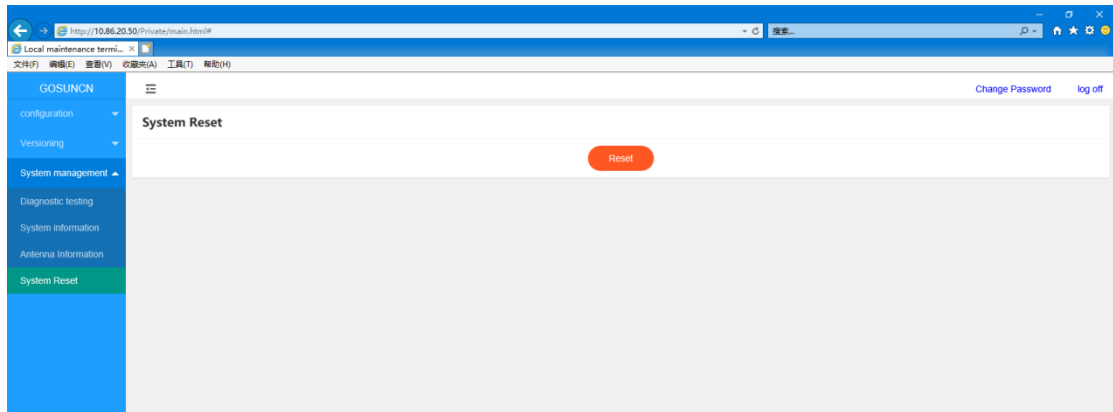
Figure 4-12 Antenna information Query



4.3.12 System reset

Click "System Reset" under the "System management" menu on the left column of the page to reboot the device, as shown in Figure 4-13.

Figure 4-13 Device Reset



5

Routine maintenance of the reader

5.1 Routine maintenance checks

- When a fault is induced and the safety module or PSAM card needs to be replaced, the replacement should be carried out by a professional.
Disconnect the equipment first and wear an anti-static bracelet to avoid damaging the equipment and the safety module.
- Disconnect the device before connecting/disconnecting the RS232 and RS485 cables.

5.2 Regular equipment inspections

- Check equipment indicators.
Connect the device to the computer for communication, check whether the indicators of the device is normal (mainly including network parameters, antenna power, VSWR, etc.). If abnormalities occur, timely notification of after-sales personnel for the replacement of equipment.
- Check equipment grounding and power grounding.
 - Check that the equipment meets outdoor grounding requirements and that the grounding system is not tampered with or naturally dislodged.
 - Check that the triple flat plug PE yellow and green wires of the power cable are reliably grounded.
- Check equipment pegs for rust and deterioration, looseness and detachment.

- Check that the lightning protection facilities are intact and have not been stolen.
- Check that the wiring has not been altered and that the antenna angle meets the requirements. A protractor can be used to measure the antenna angle.
- Check for loose equipment joints and deterioration of non-metallic material parts.
- Check to see if a large amount of dirt has accumulated on the surface of the equipment. If a large amount of dirt is present, clean it according to the cleaning specifications.

6

Fault Analysis

6.1 Abnormal communication between reader and ZLITS DMS server

Fault description

Communication between the reader and the ZLITS DMS server is interrupted.

Fault analysis

Since the reader is connected to the server via a network cable, the fault may lie in the IP address setting and the physical connection.

Troubleshooting

- Check that communication parameters such as the IP address of the reader are set correctly.
- Check that the network cable between the reader and the server is securely connected.
- Check that the network cable is working properly.

Failure conclusion

After checking, it is found that the reader end of the network cable connector is not solid, resulting in abnormal communication, tighten the network cable connector troubleshooting.

6.2 Low recognition rate of readers counting labels

Fault description

In actual testing, the recognition rate of the reader counting tags was found to be significantly lower.

Fault analysis

There are many reasons for low label count recognition rates, involving all aspects of the system. The main areas included are the following:

- The reader antenna power field distribution is not uniform. It is possible that the antenna is partially faulty or that there is strong electromagnetic interference.
- The reader parameters are not configured properly. Even if the hardware is working properly, the parameters are not configured properly, which can cause the problem of low recognition rate of the counted labels.
- Interference from non-essential metal objects in the vicinity of the label. Metal objects that shield and reflect electromagnetic waves.

Troubleshooting

For the above aspects of the failure, the following processing methods are used respectively:

- Check that the antenna portion of the reader is working properly. Actually measure the power distribution and spectral state in the antenna field.
- Check the foreground parameters that need to be set by the reader, including the count period (usually set to 10 ms), operating mode, modulation mode, modulation depth, etc.
- Check for interference from, or obstruction by, non-essential metal objects in the vicinity of the tag.

Failure conclusion

- Mobile base station transmitting frequencies around the reader can cause co-channel interference if they cover the low end of the reader antenna's spectrum. It is recommended to change the direction of the reader antenna. Or install an electromagnetic shield behind the reader antenna to ensure the working direction in the front and minimize the interference from the other side.
- Before the system is put into use, the optimized configuration of parameters should be carried out. And ensure the rationality of the

parameters.

- Metal objects have a shielding and reflecting effect on electromagnetic waves. In actual use, be sure to eliminate interference from non-essential metal objects in the vicinity of the label.

6.3 Failure of reader to count tags (I)

Fault description

After the reader was powered up and debugged, the tags were used to do a counting experiment and could not be counted successfully.

This experiment was selected for the reader antenna 1 and antenna 2. After the actual power measurement, it was found that the power near antenna 1 and antenna 2 was very small, and the power near antenna 3 and antenna 4 was normal.

Fault analysis

There are two possibilities for this failure:

- Wrong antenna selection when configuring logical readers for middleware.
- The physical connection of the antenna is incorrect.

Troubleshooting

After troubleshooting found that antenna 1, antenna 2 and antenna 3, antenna 4 in the reader on the corresponding interface connection error. The 4 antennas were reconnected to the reader correctly and power was restored.

Failure conclusion

Before powering up the reader for use, make sure that the physical connection correspondence between the hardware is correct.

6.4 Failure of reader to count tags (II)

fault description

The reader fails to count tags when performing a performance test after the security module is bound to the device. Readers used at road collection points failed to count tags after a power failure and reboot.

Fault analysis

The reader is able to build the chain normally, and the antenna VSWR query result is normal. If the binding information is confirmed to be correct, it should be caused by the wrong selection of the counting mode in the LMT system or an error in the activation file of the security module.

Troubleshooting

In the first case, go to the Inventory Mode field in the reader LMT system and check the Inventory Official Label item, then synchronize and reboot the device; in the second case, you need to reacquire the Security Module activation file and reactivate it.

Failure conclusion

After the reader security module is activated and bound successfully, you need to select the "working mode" in the LMT system as the official label for counting, if the selection is correct, you need to get the activation file again to activate the operation.

6.5 VSWR anomaly

Fault description

The reader VSWR is abnormal and higher than the required VSWR value.

Fault analysis

VSWR abnormalities are generally caused by the following:

- Abnormal connection at the interface between the reader and the antenna, cable connection problem.
- The band mismatch between the reader and the antenna results in a high VSWR.
- The VSWR is also affected by the antenna's surroundings; check for obstructions in front of the antenna.
- Hardware failure in the antenna or reader

Troubleshooting

For the above aspects of the failure, the following processing methods are used respectively:

- Check to see if the reader and antenna are connected properly at the interface and tighten the antenna interface.
- Reselect the antenna that matches the reader's operating band.
- Remove the obstruction in front of the antenna.
- Determine if it is a device failure of the reader or antenna by replacing the antenna or reader.

Failure conclusion

Physical connections between the reader and the antenna and failure of the reader's RF device are usually the cause of VSWR anomalies. In addition, interference from the environment can also cause an abnormal VSWR. If the above operations still cannot solve the problem, please contact the after-sales service.

A Packaging, transportation and storage

Wrap

- The box is packed with shockproof styrofoam and moisture-proof plastic bags.
- The outer packaging of the product should ensure that the product is not damaged during transportation and storage, and prevent moisture and rain.

Haulage

- Transportation of the product should be carried out in well-packed condition and covered with canvas if necessary to prevent moisture and rain during transportation.
- Stacking on the transportation vehicle should be neat and orderly, compact, reasonable, safe and reliable, to prevent damage to the goods caused by shaking during transportation.
- During transportation, it is not allowed to be shipped with flammable, explosive and corrosive articles, and the parts of the product are not allowed to be washed or mechanically damaged by rain, snow or liquid substances.

Stockpile

- Storage temperature: $-40\text{ }^{\circ}\text{C} \sim +80\text{ }^{\circ}\text{C}$.
- Storage humidity: 5 % ~ 95 %.
- Product components should be stored in their original packaging, maintaining the original protective packaging.
- The warehouse where the products are stored should be protected against moisture, dust, shock and corrosion. It is recommended that warehouses be equipped with air-conditioning, lighting and other equipment.

FCC Caution:

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

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.

This device and its antenna(s) must not be co-located or operating in conjunction with any other antenna or transmitter.

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.

To maintain compliance with FCC's RF Exposure guidelines, This equipment should be installed and operated with minimum distance between 20cm the radiator your body: Use only the supplied antenna.