Simple fixed reader
User Manual

Revision History

Version Number	Revision History	date	author
V1.0.0	First draft completed	2024. 12.17	

Table of contents

0 Chapter Introduction

This section provides an overview of the document, briefly introduces the topic and purpose of each chapter, and provides users with an overall framework for using the guide.

1. Overview

This chapter introduces the document content covering the information of the reader , including basic functions, communication interfaces, applicable models, etc., to help users understand the functions and operations of the device and provide reference for system integration.

2. Device Information

This chapter introduces the appearance, standard shipping list and interface definition of three types of readers (UR4, UR8, UR1A) in detail, helping users understand the hardware specifications and installation requirements of each device. In addition, it also includes detailed information on the device installation part, and finally explains the antenna adapter interface and device installation method.

3. Device Connection

This chapter focuses on how to connect the reader to a PC or other devices, including detailed steps and examples of serial port connection and network connection, to help users establish communication with the device and ensure that the device can work properly.

4. Quick Start

This chapter provides a quick start guide for the reader/writer to help users quickly start operations after connecting the device. The content includes functions such as tag inventory, reading and writing tags, locking, and destroying tags . Users can follow the steps to perform actual operations and quickly become familiar with the basic functions of the device.

5. GPIO Peripherals

This chapter introduces the GPIO interface support and peripheral connection methods of the device, and describes how to expand the device's functions through the GPIO interface. It includes GPIO input and output modes, connecting sensors, indicator lights and other peripherals, and provides connection examples and configuration guidance for practical applications.

6. Automatic working mode (UDP ReceiveEPC)

This chapter introduces the automatic reading and uploading of device data, and demonstrates the tag data transmission through the UDP protocol, which transmits the counted tag data to the specified port of the target host. It is suitable for application scenarios that require real-time data transmission.

7. Maintenance and Upgrades

This chapter introduces the maintenance and upgrade methods of the device, including detailed steps for restoring factory settings and upgrading firmware. Users can learn how to restore the device to its original state or update the firmware to ensure that the device always maintains the latest functions and performance.

8. Software Development

This chapter provides guidance on software development for developers, and introduces how to choose the appropriate SDK for development based on different operating systems and programming languages (such as Android, Windows, and Linux). The content includes how to use the SDK to control the reader and writer and obtain data, and is suitable for users who need customized development.

9. Frequently asked questions

This chapter lists some common problems that may occur during the use of the device and their solutions. It includes troubleshooting steps for common problems such as device connection and card reading test, to help users quickly locate and solve problems when they occur.

10. Copyright Notice

This chapter declares the copyright information of the document, provides the legal terms for using the document, and describes the technical support channels.

1 Overview

This document mainly introduces the integrated use guide of the simple fixed reader, including device information, installation and deployment, quick start, peripherals and RFID functions, etc., which can be used as a reference for end users during system integration.

Simple fixed UHF reader, the core control part adopts embedded solution , and the RFID part is based on the multi-channel UHF module independently developed by IMPINJ E710 chip . The reader supports standard communication interfaces such as RS232 and RJ45 , and can be matched with antennas of various specifications.

This document applies to the following reader models: UR4, UR8, UR1A

2. Device Information

2.1 UR4 Device

2.1.1 UR4 device appearance

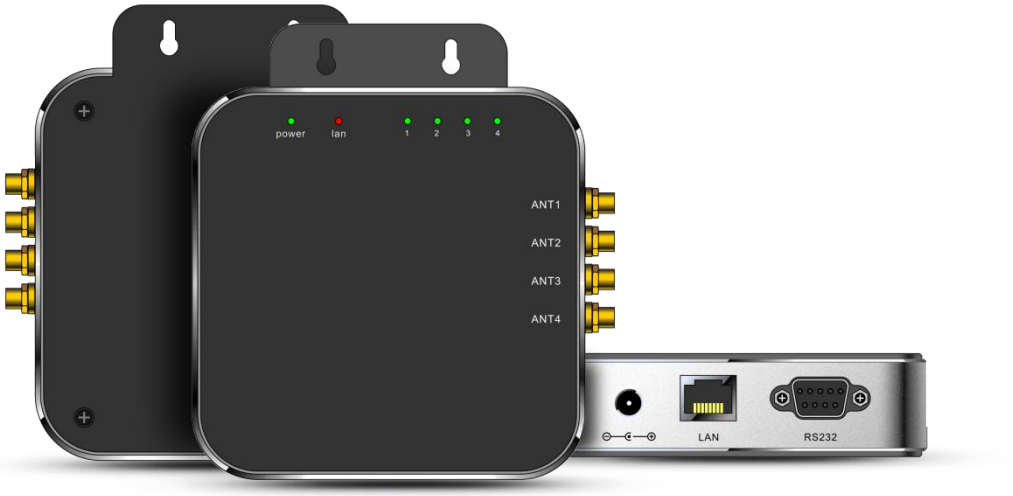

Figure 2.1.1.a UR4 appearance

2.1.2 UR4 Standard Delivery List

Table 2.1.2.a UR4 standard delivery list

Serial number	name
1	UR4 Reader
2	12V 2A Power Adapter
3	GPIO communication port terminal

2.1.3 UR4 appearance and interface definition

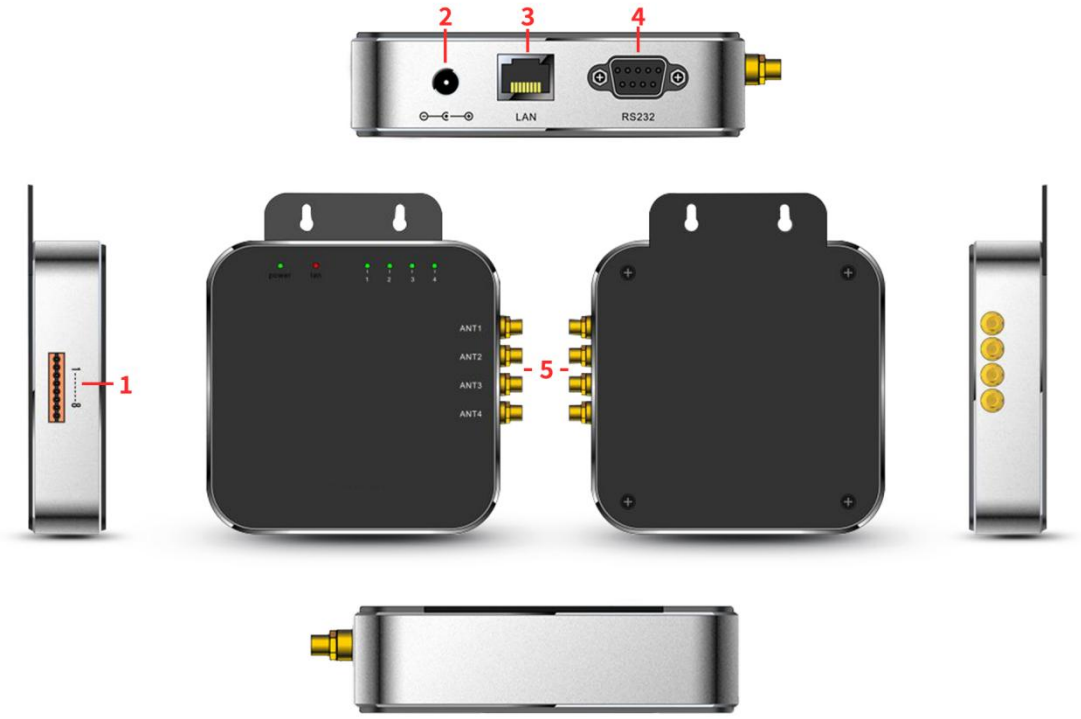

Figure 2.1.3.a UR4 device interface diagram

Table 2.1.3.a UR4 interface definition table

	describe
1	GPIO Interface
2	12V power interface, supports 9V-12V
3	RJ45 interface
4	RS232 interface
5	RFID_ANT antenna interface

2.2 UR8 equipment

2.2.1 UR8 device appearance

Figure 2.2.1.a UR8 appearance

2.2.2 UR8 standard delivery list

Table 2.2.2.a UR8 standard delivery list

Serial number	name
1	UR8 Reader
2	12V 2A Power Adapter

2.2.3 UR8 appearance and interface definition

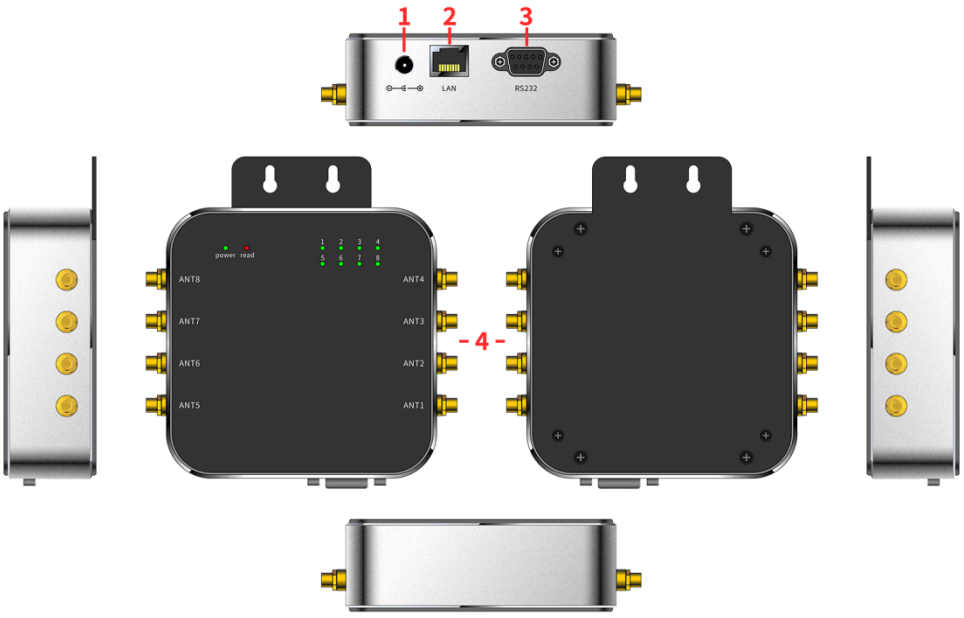

Figure 2.2.3.a UR8 device interface diagram

Table 2.2.3.a UR8 interface definition table

Serial number	describe
1	12V power interface, supports 9V-12V
2	RJ45 interface
3	RS232 interface
4	RFID_ANT antenna interface

2.3 UR1A device

2.3.1 UR1A Device Appearance

Figure 2.3.1.a UR1A appearance

2.3.2 UR1A Standard Delivery List

Table 2.3.2.a UR1A standard delivery list

Serial number	name
1	UR1A Reader
2	12V 2A power adapter
3	UR1A bracket

2.3.3 UR1A appearance and interface definition

Figure 2.3.3.a UR1A device interface diagram

Table 2.3.3.a UR1A interface definition table

Serial number	describe
1	RJ45 network port
2	12V power interface, supports 9V-12V
3	GPIO Interface
4	RS232 interface

2.4 Equipment Installation

2.4.1 Antenna interface

Fixed readers need to be connected to antennas through feeders to experience RFID functions. The antenna port information of fixed readers is shown in the following table.

Table 2.4.1 Simple fixed reader antenna port

model	Port Image	Number of Ports	Port Type
UR4 		4	SMA Female (SMA seat)
UR8 		8	SMA Female (SMA seat)
UR1A 	-	-	All-in-one

Note: UR1A has an integrated internal antenna, and different specifications such as 6dbi, 9dbi, and 12dbi antennas are available .

2.4.2 Equipment Installation

Fixed readers are usually installed flat or on the wall . The UR1A can also be equipped with a dedicated pole mounting kit.

a. Tiled installation:

Flat installation is to place the device on a horizontal surface and fix the machine on the horizontal surface through two screw holes on the body to achieve installation, as shown in the figure.

b. Wall mounting:

Wall-mounted installation is to place the device close to a vertical wall and fix the machine to the wall through two screw holes on the body to achieve wall-mounted installation, as shown in the figure.

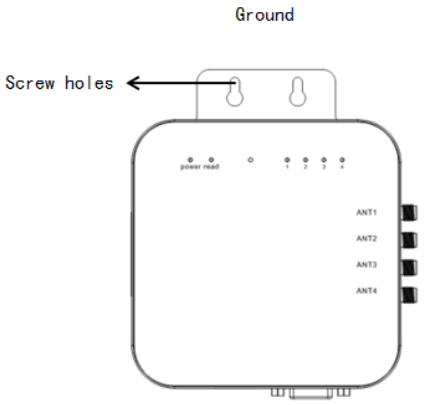

Figure 2.4.2.a Flat-lay installation

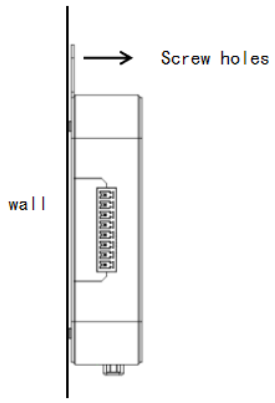

Figure 2.4.2.b Wall-mounted installation

c. UR1A pole installation:

Pole mounting is an installation method in which the device is fixed on a pole-shaped object. The device is fixed on the pole through a special clamp. It is suitable for outdoor or space-limited scenes. The installation diagram is shown below.

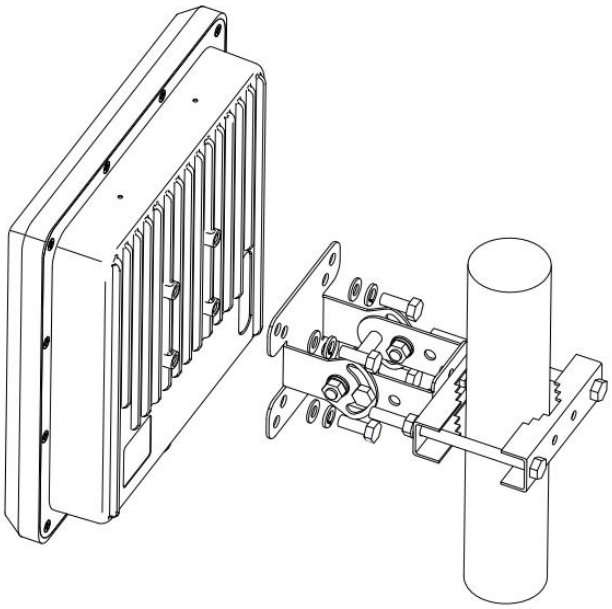

Figure 2.4.2.c Pole installation

3. Device Connection

The simple reader/writer adopts an embedded solution, supports a variety of standard peripheral interfaces, and can complete corresponding operations according to user instructions. Users can deploy and implement corresponding equipment according to application scenario requirements.

3.1 Reader/Writer Connection

PC acts as the host and can run the reader/writer function demonstration software. The DEMO software is written in C#. The reader/writer acts as a slave and receives host commands and performs corresponding operations . The device connection is shown in the figure. This Demo software is suitable for UR4/UR8/UR1A. This article takes UR4 as an example to introduce its functions and operations.

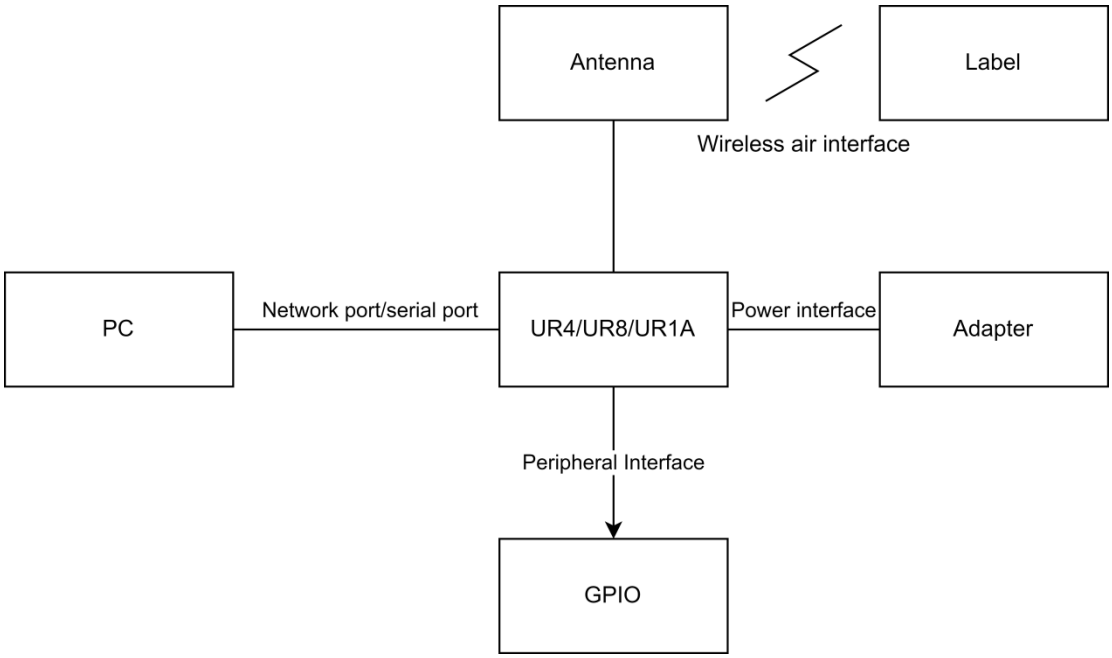

Figure 3.1 Reader/writer connection diagram

3.2 Establishing communication

When the reader/writer acts as a slave, the operation demonstration steps are as follows:

1. Connect the UHF antenna through the RF port and place the UHF electronic tag within the antenna range.

2. Connect directly to the host via an Ethernet cable or serial cable. Install the corresponding DEMO software on the host. This article uses PC (Windows) as the host.

3. Connect the power supply and start the device. Wait for the device to start up .

4. Select the corresponding file, double-click to open the DEMO, and establish a connection with the reader/writer. (Use the C# version DEMO as an example), the execution path is as follows.

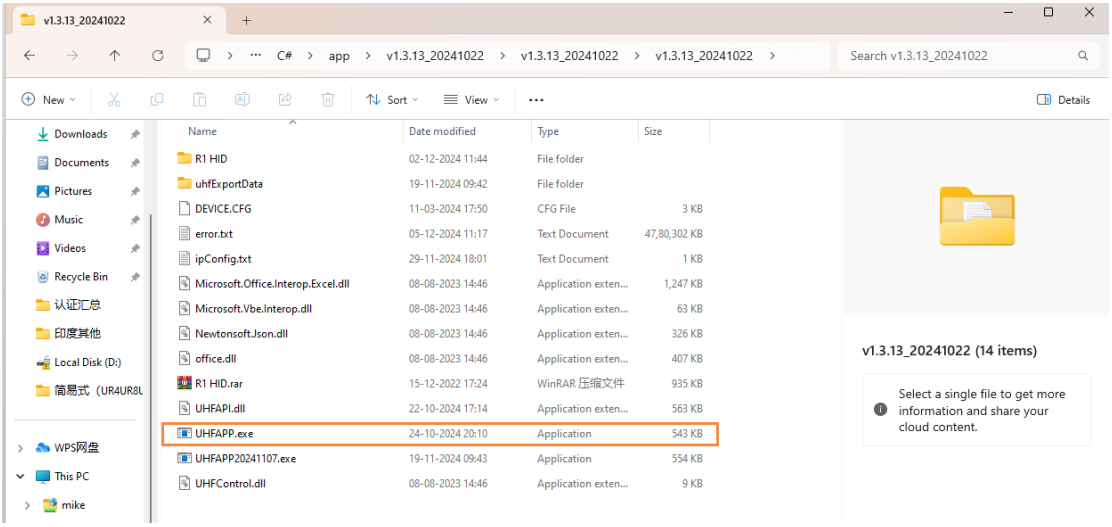

Figure 3.2.a C# version demo software path

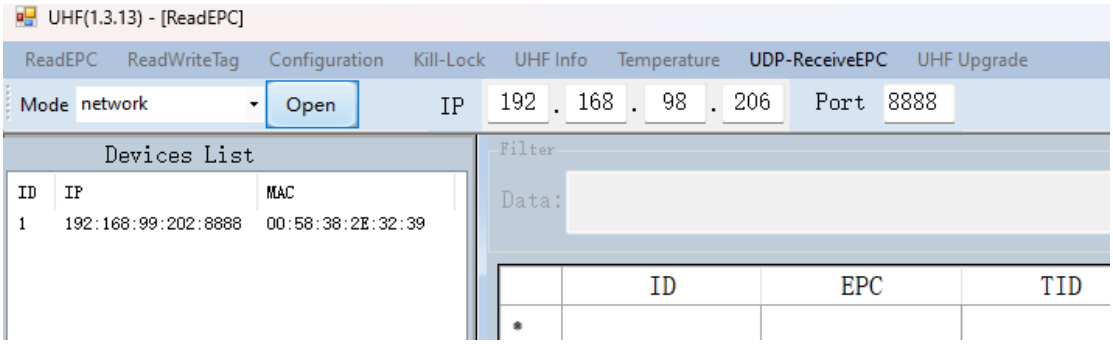

Figure 3.2.b C# version demo software connection interface

3.2. 1 Serial port connection (RS232_9PIN serial interface)

Select DEMO serial port, select the corresponding serial port number (please make sure the selected COM port is consistent with the actual communication port), and then click Open to connect.

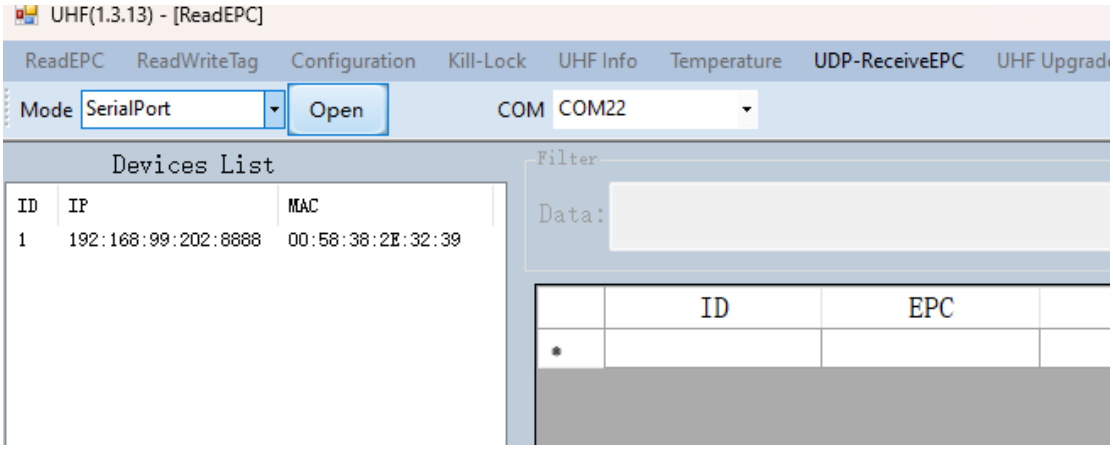

Figure 3.2.1 Serial port connection

Note: If the opening fails, please try the following troubleshooting methods;

(1) Please check whether the physical connection between the serial port cable and the reader is normal and whether the reader indicator light is on normally.

(2) Close the Demo software and reopen it.

(3) Replace the serial port cable with another one that works normally.

3.2.2 Network connection (RJ45 network port)

The host can be directly connected to the device via a network cable, and the host and the reader can be set to the same network segment.

The host can be set as shown in Figure 3.2.2.2.a. Host IP address: 192.168.99.100 ; subnet mask: 255.255.255.0; gateway: 192.168.99.1 .

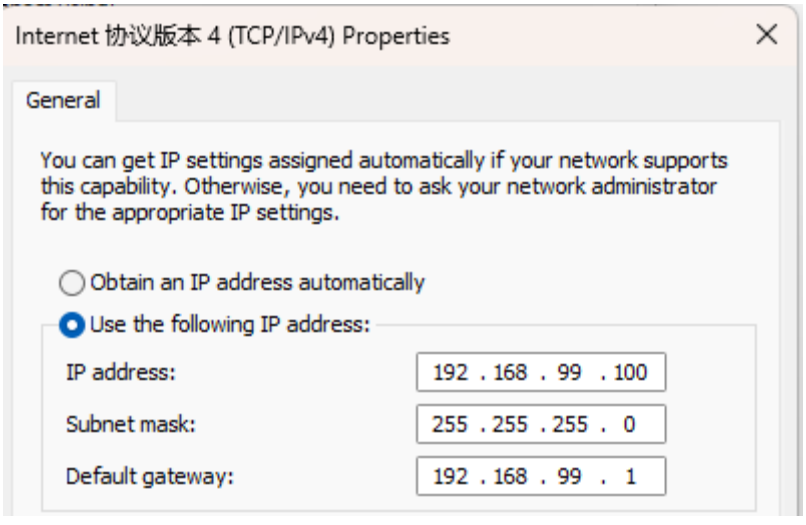

Figure 3.2.2.a Host IP settings

Open the Demo program, enter the default initial IP of the reader 192.168.99.202, the default port 8888, and click "open" to connect, as shown in Figure 3.2.2.b.

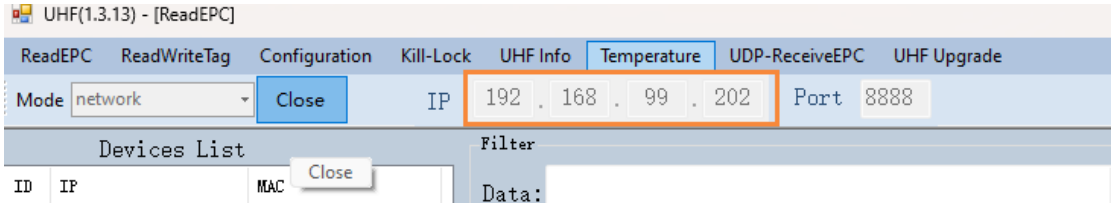

Figure 3.2.2.b Network connection

Note: If the Demo connection fails in actual operation, please refer to the following troubleshooting:

(1) Check whether the physical connection is correct and the device is normal, restart the device and reopen the Demo.

(2) Check whether the version number information is read in the "UHF Version" of the Demo software. If the displayed information is blank or incomplete, the connection between the Demo and the reader may not be successfully established. Please reopen the Demo program according to the above steps.

(3) Confirm whether the current reader IP address is in the same network segment as the PC IP address and whether the host can ping the reader IP address.

(4) Check whether the current IP address of the reader has been changed. You can connect the reader to the PC host through the serial port and check the " Local IP " on the "Configuration" page .

In addition, the reader supports connection via LAN . The reader will automatically broadcast IP and MAC address information to the connected LAN. PCs in the LAN can connect to the reader through IP address and port number. If the opening fails, please check the firewall settings or temporarily close the firewall, and ensure that the reader IP meets the LAN IP requirements.

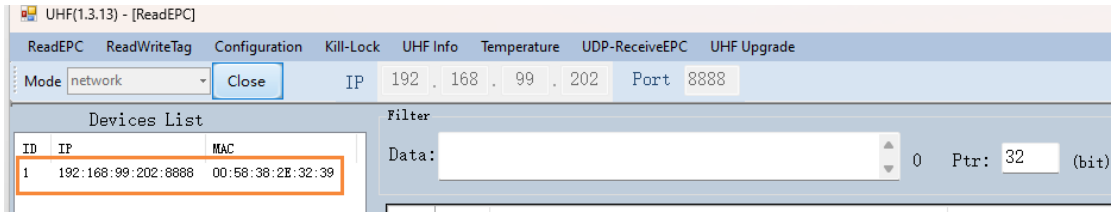

Figure 3.2.2. c LAN broadcast connection

4 Quick Start

4.1 Label Inventory

After the connection is established successfully, you can start counting tags and obtain tag data in the " Count EPC " page . When counting tags, you can choose three different areas of tags: EPC, TID, and USER areas, and support functions such as controlling the counting time, data format, and exporting data, as shown in Figure 4.1 .

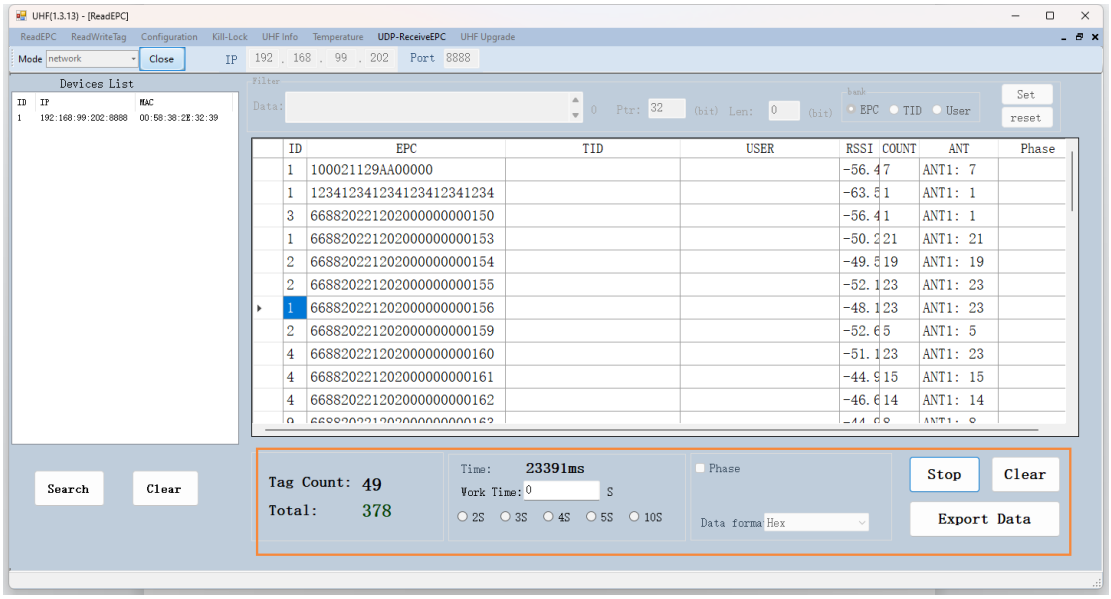

Figure 4.1.a Inventory interface

After the inventory is completed, click "Export Data" in the lower right corner of the Demo homepage to export the counted data to a table. Follow the prompts to locate the path of the table and open the table to view the exported label data.

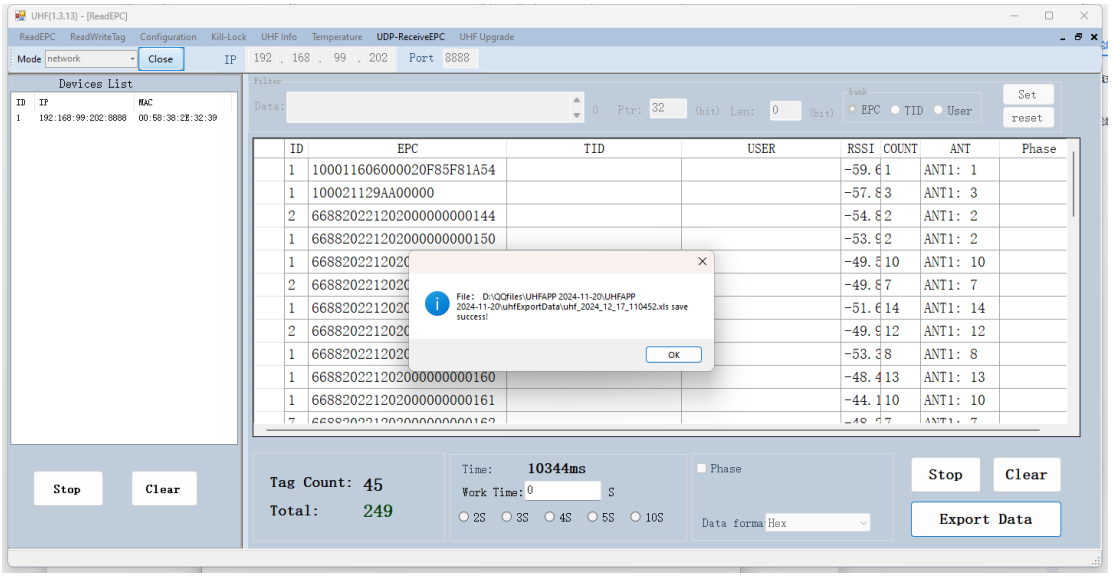

Figure 4.1.b Export data

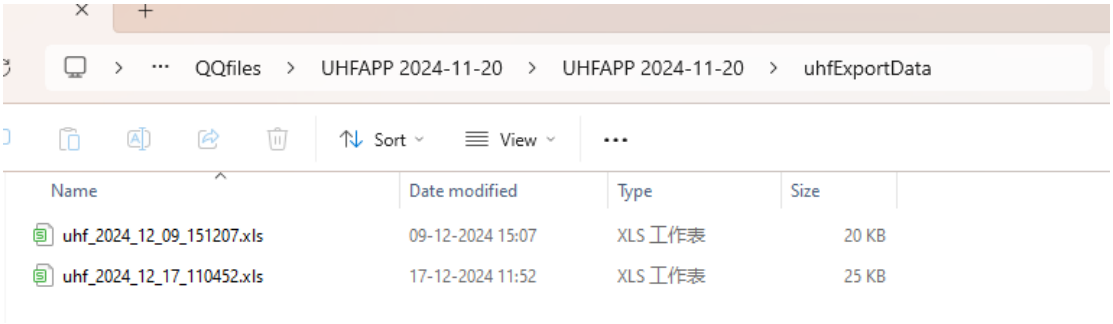

Figure 4.1.c Data storage path

	A	B	C	D	E	F
1	EPC	TID	USER	COUNT	ANT	RSSI
2	668820221202000000000153	E2C19CB04000A41A0000A800	00000000000000000000000	1	ANT1:1	-49.2
3	668820221202000000000156	00000000000000000000000		2	ANT1:2	-53.5
4	668820221202000000000156	E2C19CB04000A41A0000A800	00000000000000000000000	2	ANT1:2	-54.1
5	668820221202000000000159	E2C19CB04000A41A0000A800	00000000000000000000000	1	ANT1:1	-53
6	668820221202000000000160	E2C19CB04000A41A0000A800	00000000000000000000000	2	ANT1:2	-47
7	668820221202000000000161	00000000000000000000000		1	ANT1:1	-50.1
8	668820221202000000000161	E2C19CB04000A41A0000A800	00000000000000000000000	2	ANT1:2	-47.5
9	668820221202000000000162	E2C19CB04000A41A0000A800	00000000000000000000000	2	ANT1:2	-46.5
10	668820221202000000000163	00000000000000000000000		1	ANT1:1	-48.1
11	668820221202000000000163	E2C19CB04000A41A0000A800	00000000000000000000000	2	ANT1:2	-42.2
12	668820221202000000000166	E2C19CB04000A41A0000A800	00000000000000000000000	2	ANT1:2	-53.5
13	668820221202000000000172	E2C19CB04000A41A0000A800	00000000000000000000000	2	ANT1:2	-51.9
14	668820221202000000000175	00000000000000000000000		1	ANT1:1	-49.7
15	668820221202000000000175	E2C19CB04000A41A0000A800	00000000000000000000000	3	ANT1:3	-46.3

Figure 4.1.d Export data table

4.2 Read and write tags

Enter the "Read and Write Tags" page. The **tag reading** function can read the data of the four areas of the tag (RESERVED, EPC, TID, USER). The default initial access password of the tag is 00000000. Click "Read" to read the tag , as shown in Figure 4.2.a.

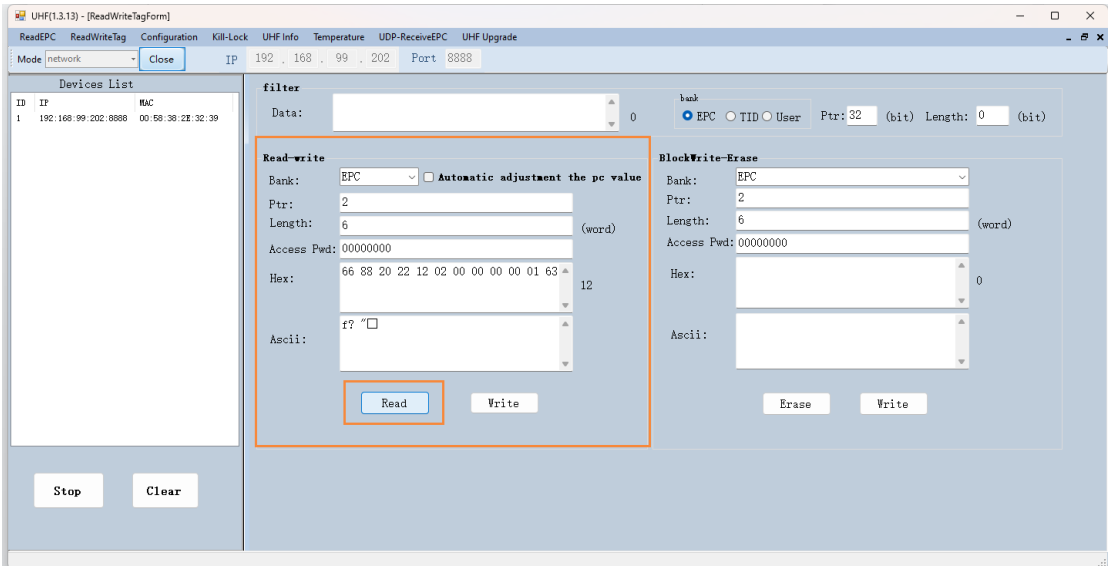

Figure 4.2.a Read tag data

tag writing function can write data in three areas of the tag (RESERVED, EPC, USER). The starting address and writing length can be set, and **the PC value can be automatically adapted** to make the EPC data written by the tag the same length as the EPC data counted (the PC value is the control word that controls the length of the EPC from the inventory count to the tag). The initial access password of the tag defaults to 00000000. Click "**Write**" to write the tag . As shown in Figure 4.2.b.

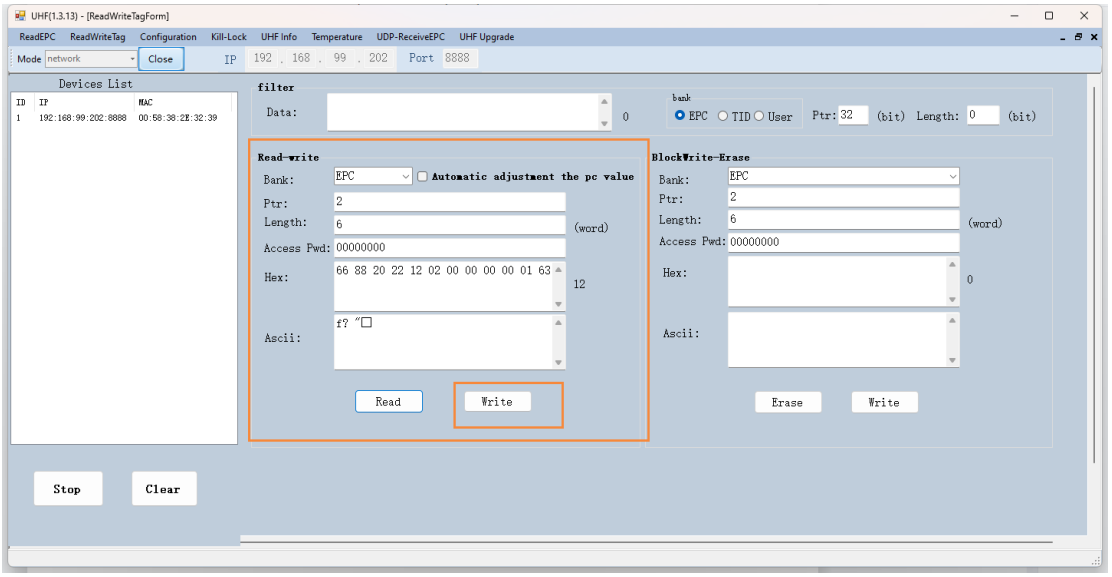

Figure 4.2.b Writing tag data

4.3 Lock and kill tags

Enter the "Lock Tag" page to enter the **Kill-Lock** page. Filter and select the specified tag, enter the access password of the tag to be locked, select the **locked/open** area, and click "Confirm" to lock/open. If you want **to destroy the tag , in the Kill function in the lower right corner, enter the access password to destroy the tag, and click "Kill " to destroy it. Users can lock, open, permanently lock, permanently open** or **destroy tags** according to actual needs .

Note: The default password cannot be used for the lock, open, and destroy operations.

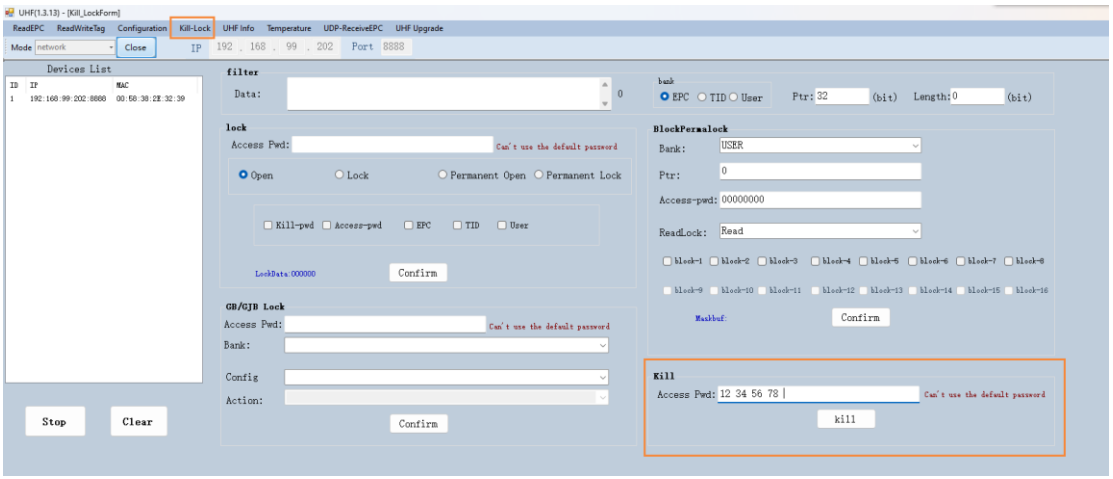

Figure 4.3 Lock and kill label

4.4 Basic Information

(1) UHF Information

Click "UHF Info" to view the information of the current reader's mainboard and firmware, including the current device's firmware version (UHF firmware version), hardware version, mainboard version, and API version.

If the version information is blank or incomplete, it means that the Demo program and the reader are not connected correctly , or the reader's UHF is working. It is recommended to stop the inventory and reopen it.

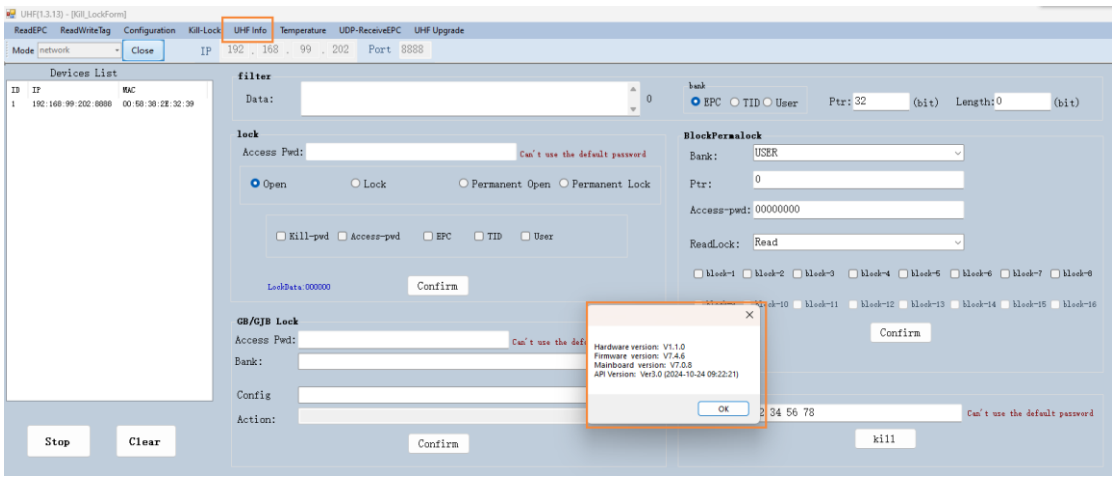

Figure 4.4.a UHF information

(2) temperature

This part displays the current temperature of the UHF module of the device .

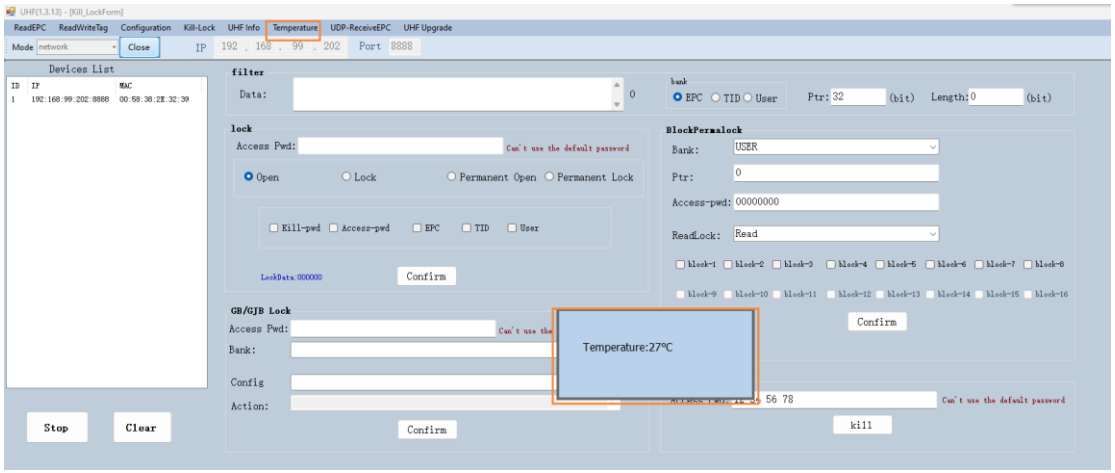

Figure 4.4.b Reader temperature

4.5 Parameter Configuration

Enter the "Configuration" function page, and users can use DEMO to configure the power, antenna, mode, etc. of the device to meet the application requirements of the on-site environment, as shown in Figure 4.5 .

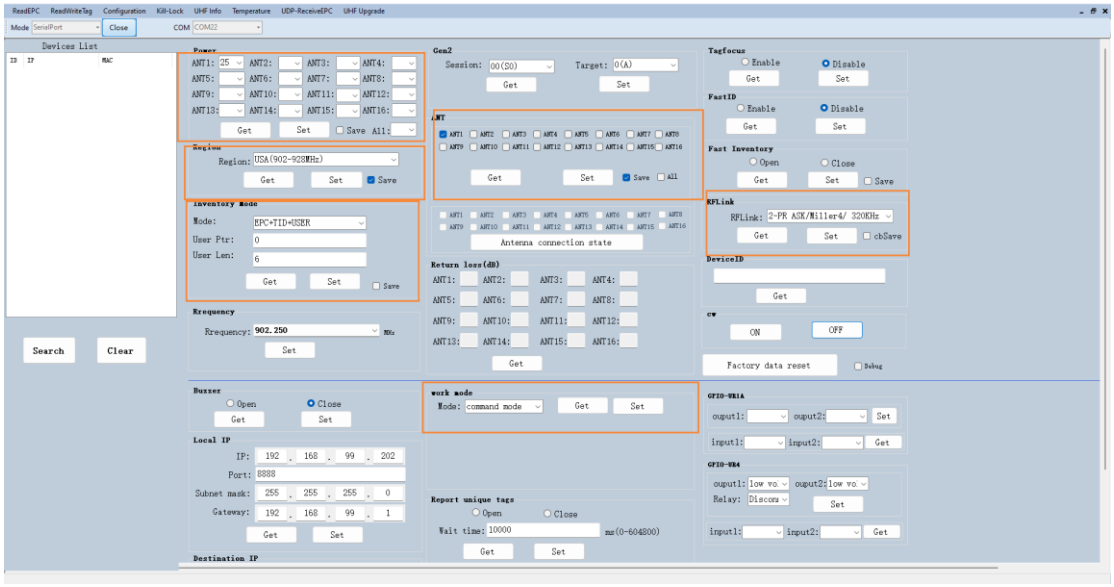

Figure 4.5.a Device parameter configuration

1. **Power:** The output power of the control module is 1~30. The greater the power, the longer the reading distance.
2. **Region:** Controls the working frequency band of the module. Different countries have different frequency band restrictions.
3. **Inventory mode:** Controls the tag storage area (EPC, TID, USER) read during inventory.
4. **Antenna:** Controls the switch of the RF channel and enables the corresponding antenna port.
5. **Work mode:** supports command working mode, automatic working mode and trigger working mode.

The device defaults to **command mode** , that is, the user actively controls the start and stop and obtains RFID reading data. In **auto mode** , the device automatically starts inventory when it is powered on. In **trigger mode** , the sensor changes and outputs high and low level signals to the device, thereby controlling the start and stop state of the device.

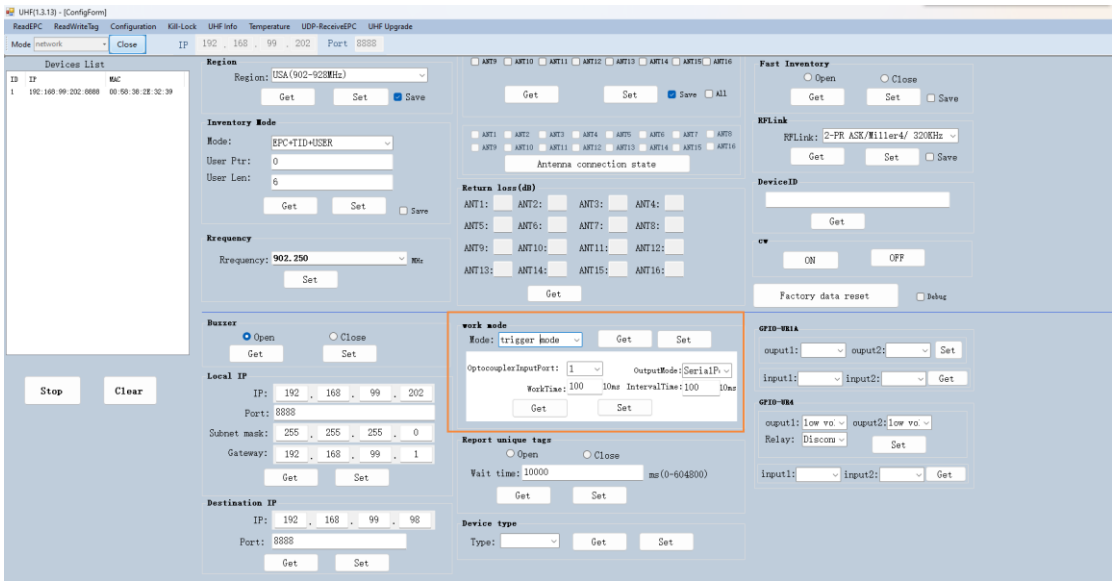

Figure 4.5.b Trigger mode settings

6. **RFLink:** Control the link combination of the reader/writer. PR ASK/Miller4/320KHz is commonly used and no setting is required.
7. **Gen2:** By configuring the Session, control the state transition time after the tag is read, and configure the Target to specify the A/B side to read, which is used to improve the reading rate. No configuration is required for normal use, just keep the default.
8. **TagFocus:** Within the reading range, the same tag will only be read once, and will be read again after leaving the reading range, which is used to improve the reading rate. This function is applicable to Impinj tags that support TagFocus. No configuration is required for normal use, just keep the default.
9. **FastID:** Speed up the inventory in EPC+TID mode through underlying operations. This function is applicable to Impinj tags that support FastID . No configuration is required for normal use, just keep the default.
10. **Fast Inventory:** Use a special algorithm to speed up the inventory rate of tags. This feature is applicable to Impinj tags that support Fast Inventory. For normal use, no changes are required and the default setting can be kept.
11. **Local IP address:** View or change the IP address and port of the reader itself.
12. **Destination IP settings:** Control the target host IP address and port of the reader's UDP transmission.

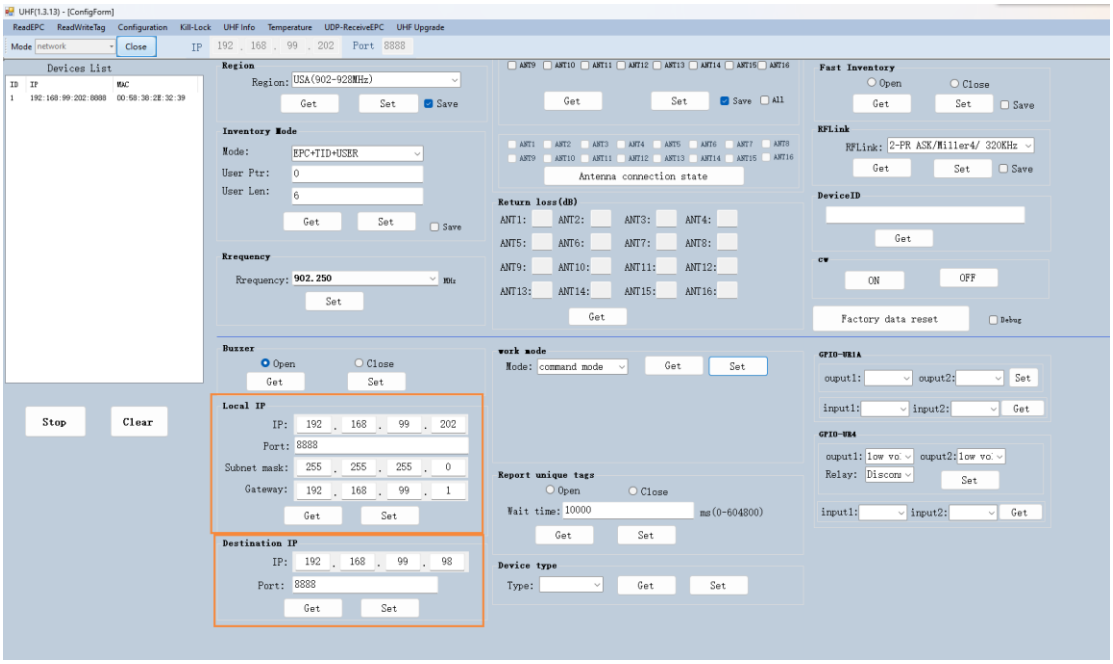

Figure 4.5.c Reader IP and destination IP settings

13. **Fixed frequency:** fix a specific frequency. This item does not need to be changed during routine inventory, so just keep the default.

14. **Buzzer :**The buzzer function can provide a sound prompt when a tag is counted.

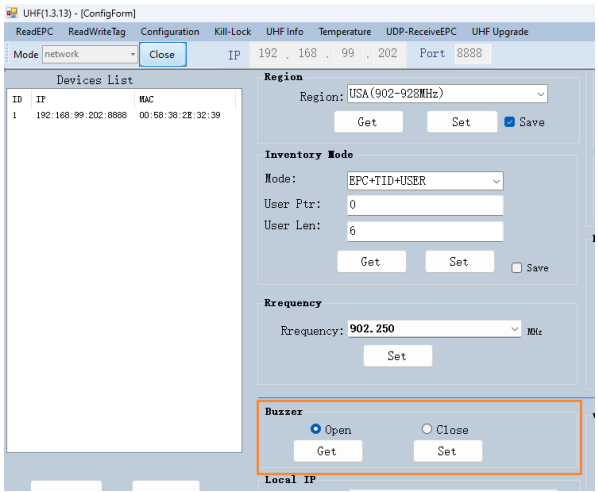

Figure 4.5.d Buzzer settings

15. **Device ID:** Configure the **Device ID** information to distinguish different devices.

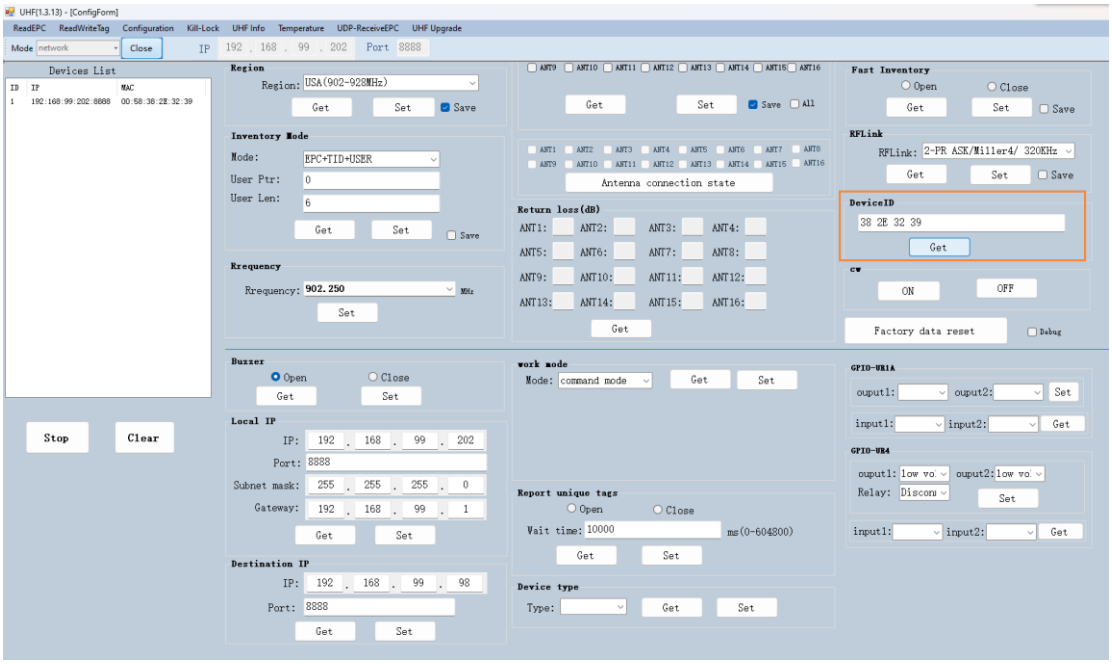

Figure 4.5.e Device ID settings

5 GPIO peripheral expansion

5.1 GPIO information

5.1.1 UR4 reader /writer GPIO

Figure 5.1.1 UR4 GPIO terminal location

Table 5.1.1 UR4 GPIO definition

Serial number	definition	describe
1	NC	Hanging, not connected to any level
2	NC	
3	Relay contact 1	Relay contacts, maximum switching voltage is 220Vdc, 250Vac; IO3 and IO4 can be closed or opened by software control;
4	Relay contact 2	
5	Input1+	Optocoupler 1 input, voltage range between IO5-IO6 3-5.5V, Maximum current 50mA
6	Input1-	
7	Input2+	Optocoupler 2 input, voltage range between IO7-IO8 3-5.5V, Maximum current 50mA
8	Input2-	

5.1.2 UR1A reader / writer GPIO

Figure 5.1.2 UR1A GPIO terminal location

Table 5.1.2 UR1A GPIO definition

Serial number	definition	describe
1	INPUT1	Optocoupler 1 input
2	OUTPUT1	Output Port 1
3	INPUT2	Optocoupler 2 input
4	OUTPUT2	Output Port 2
5	IO_GND	IO output and input reference GND, connected to the GND of the peripheral device;

5.2 GPIO Configuration

The fixed reader supports multiple GPIO input and output channels and can be connected to corresponding GPIO peripherals. The specific connection method can be configured by referring to the following modes.

5.2.1 Input Mode

Fixed readers can detect the GPIO input status. In practical applications, they are often used to connect infrared trigger sensors for signal detection and triggering the reader to work. In input mode , external power supply is adopted . The connection method between the sensor and GPIO is shown in the figure below.

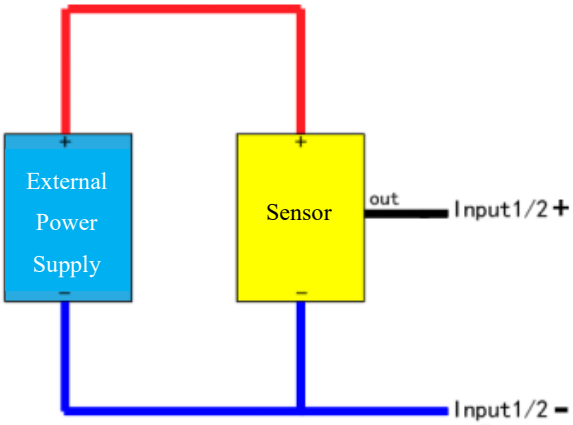

Figure 5.2.1 Input mode wiring diagram

5.2.2 Output Mode

Fixed readers can drive GPIO outputs, which are often used to connect indicator lights for signal indication in practical applications. In output mode, the signal output LAMP and GPIO connection method are shown in the figure below.

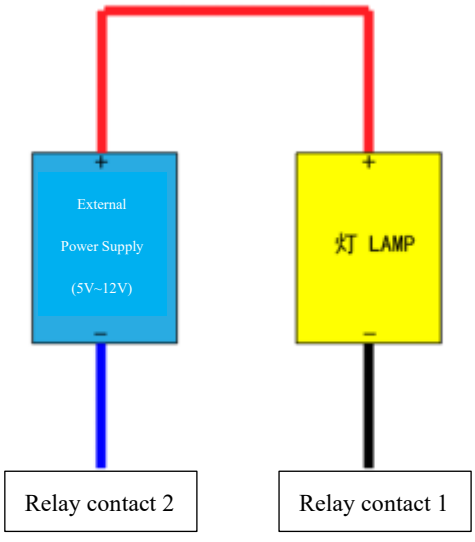

Figure 5.2.2 Output mode wiring diagram

5.3 GPIO Demonstration

5.3.1 GPIO output control

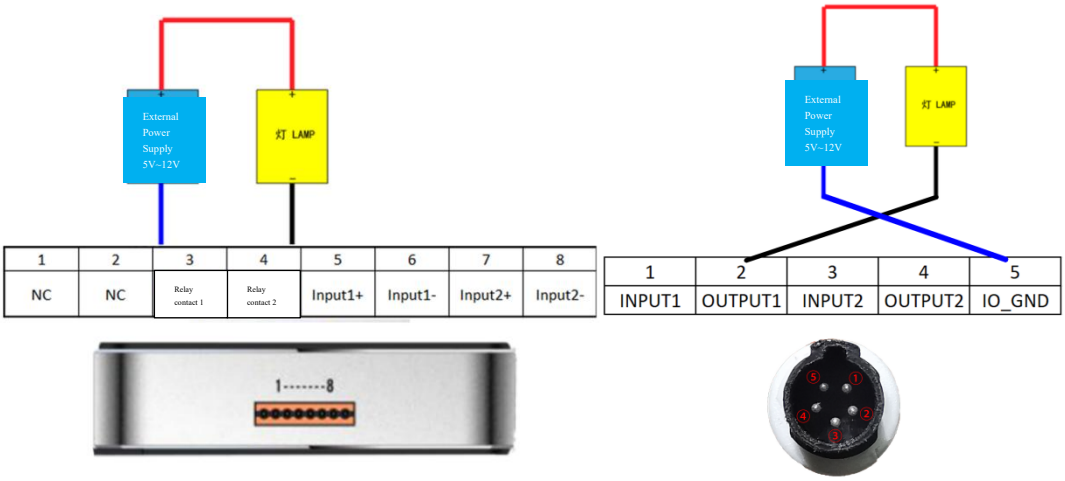

Figure 5.3 .1.a Conceptual diagram of the reader connected to the peripheral light

The figure above shows the concept of connecting the reader to the peripheral light . The part that needs to be triggered by the relay is connected to the relay contact port of the GPIO terminal, and an external power supply is used to power the peripheral light . That is , the hardware deployment is completed.

After the deployment is completed, the software controls the closing and opening of the relay to realize the switching of the peripheral light.

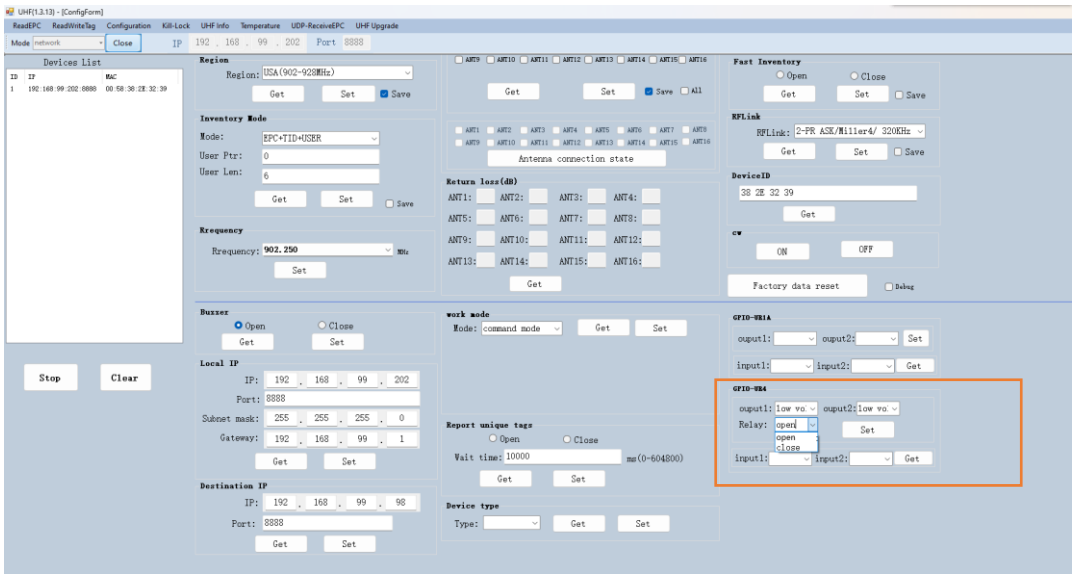

Figure 5.3.1.b GPIO status query settings

5.3.2 GPIO trigger mode

The reader supports **command mode** , **trigger mode** and **auto mode** . The device defaults to **command mode** , that is, the user actively controls the start and stop of inventory counting and obtains RFID reading data. In **trigger mode** , the user can connect the sensor to the device. The sensor outputs high and low signals to the GPIO terminal of the device according to changes in the external environment, thereby controlling the start and stop state of the device and automatically obtaining RFID reading data. In trigger mode, the stop **delay time can be configured** , that is, the time after the stop state is triggered, the device can continue to count.

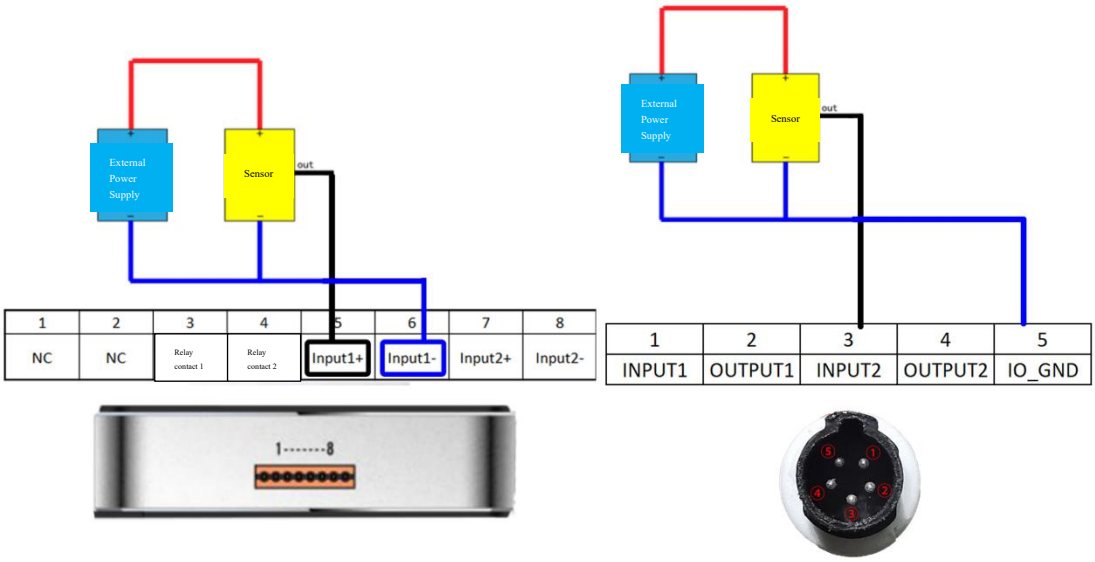

Figure 5.3.2.a Conceptual diagram of reader - writer external sensor

The figure above shows the concept of **the reader's external sensor . Connect the signal input part (the black line is** the sensor 's signal line, responsible for transmitting high and low level signals) to the GPIO terminal's **Input** port, and use an external power supply to power the sensor . The hardware deployment is complete.

After the hardware deployment is complete, you can enter the GPIO status panel of the PC demo to view **the GPI** level changes when the sensor status changes .

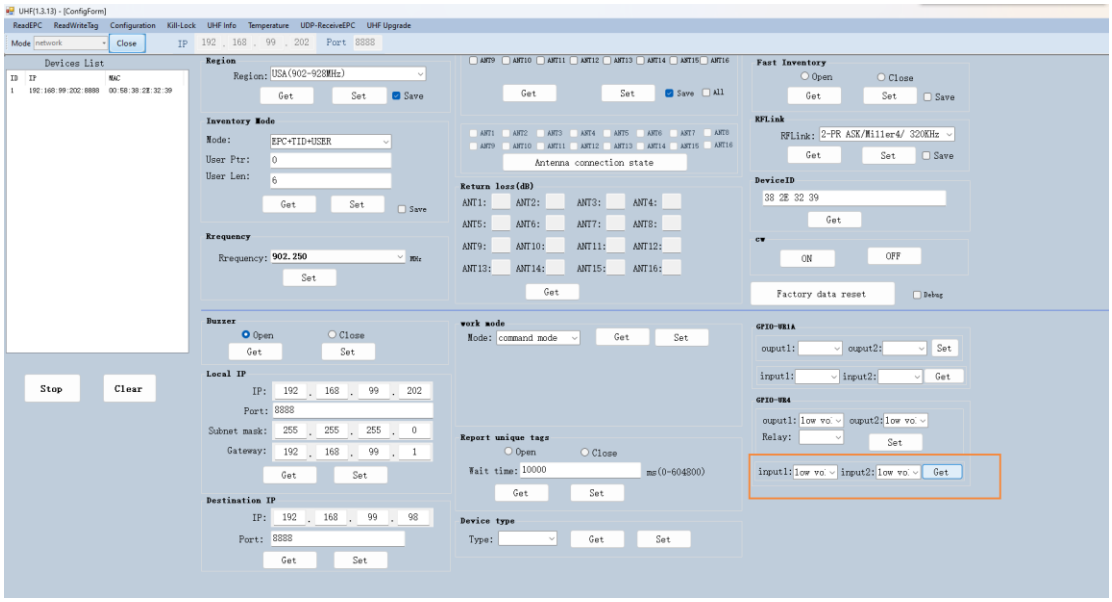

Figure 5.3.2.b GPI status query

As shown in the figure below, the counting mode is set to trigger working mode. **The starting counting condition is:** when port 1 is high level , the counting starts. **The stopping counting condition is: when** port 1 is low level , the counting stops after a delay of 1000ms . That is, the counting starts when the sensor sends **a high level** , and stops after a delay of 1000ms when sending **a low level** . (Users can adjust according to the actual situation on site)

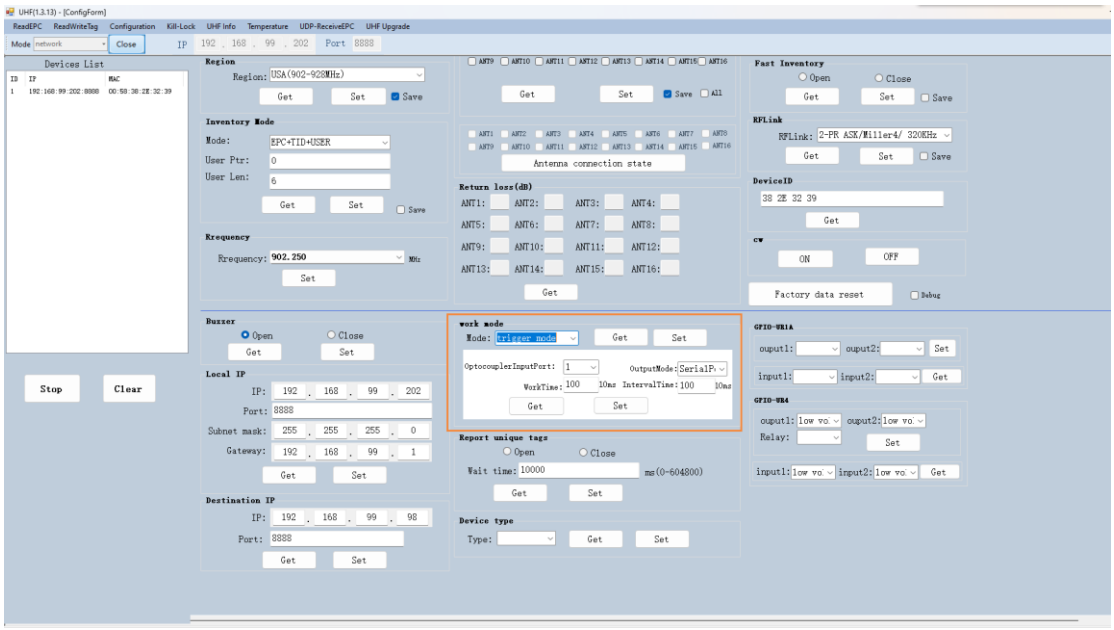

Figure 5.3.2 . c trigger mode configuration

In trigger mode, **the conditions for starting and stopping inventory counting must be opposite.** If more complex logic is required for sensor inventory control, the command mode can be used to transmit start and stop instructions according to specific logic.

6Auto mode(UDP ReceiveEPC)

The reader supports **automatic working mode** , that is, the reading function is automatically turned on after power-on, and the UDP ReceiveEPC function is used for data transmission.

For UDP data upload function, first ensure that the host and the device are in the same LAN, and then broadcast the tag data transmission to the target host according to the target IP and port number. The specific steps are as follows.

1）Open Demo, click "Configure" on the menu bar , fill in the host IP and port number that receives UDP broadcast in "Target IP", and click "Set" to confirm. In the figure, the reader will send tag data to port 8888 of the host with IP address 192.168.98.199 .

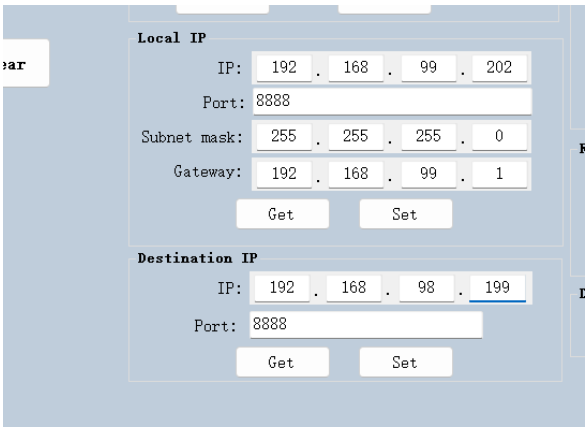

Figure 6.1 Setting the destination IP information

2）Configure "Work Mode" and select "Auto Mode", then click "Set" to save the settings. After all settings are completed, disconnect the power adapter.

Figure 6.2 Setting the automatic working mode

3）Open the demo on the host that receives the data, open "UPD ReceiveEPC" in the

software menu bar, enter the port number configured for the target IP above in Port, and click "Start" to monitor the port data.

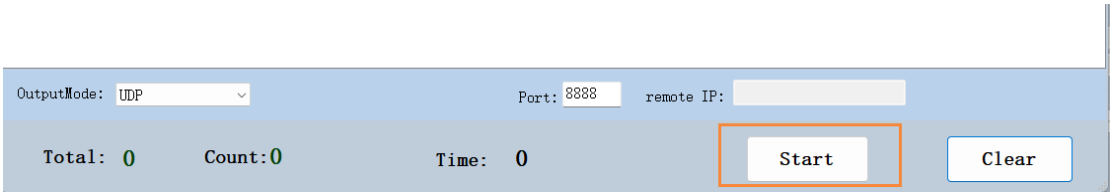

Figure 6.3 Open UDP ReceiveEPC monitoring

4）Connect the reader to the power adapter. In automatic working mode, the reader will automatically start counting when powered on, and the interface will display the counted tag data.

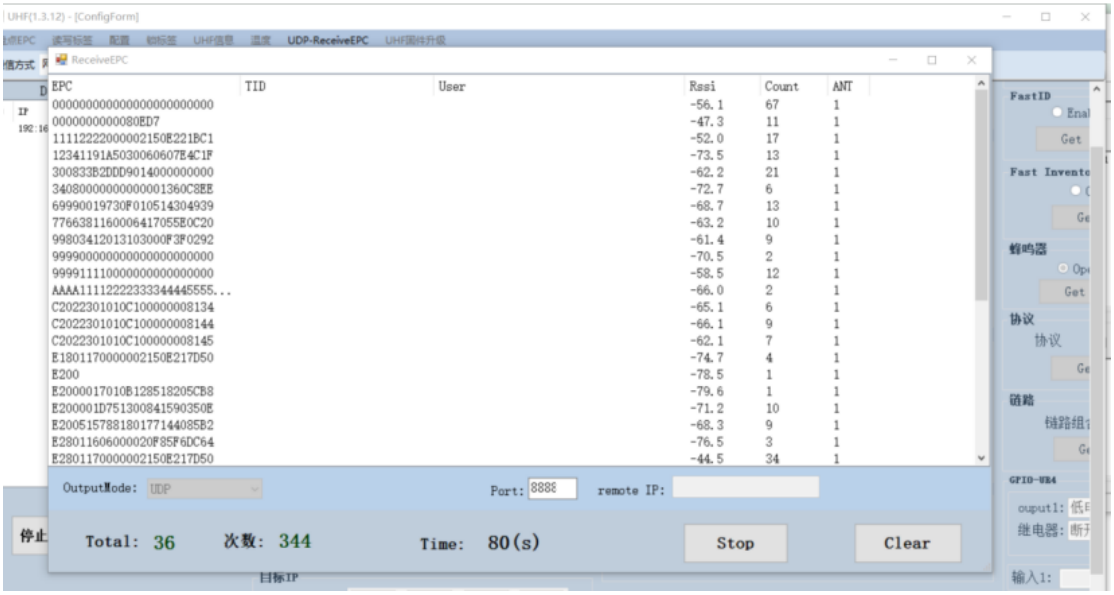

Figure 6.4 Host data reception

7 Maintenance and Upgrade

7.1 Restore factory settings

Click "Factory data reset" to restore the reader to factory settings. After restoring factory settings, the device IP information and working mode will be restored to the initial state and need to be reset.

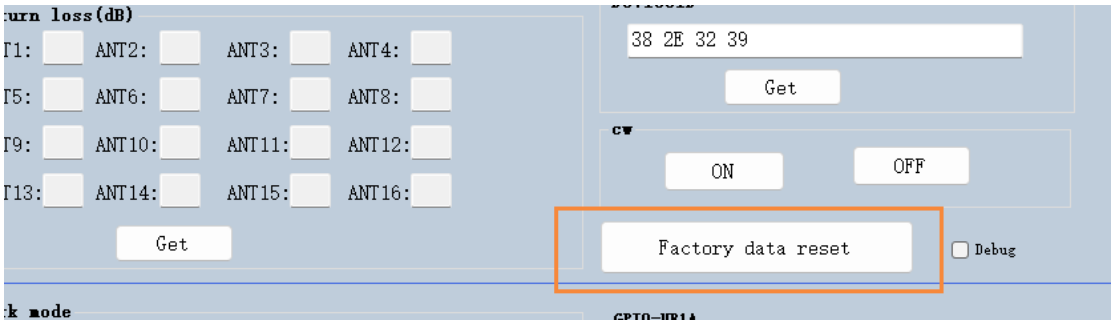

Figure 7.1 Restore factory settings

7.2 Mainboard Firmware Upgrade

Before upgrading the motherboard firmware, please download the corresponding motherboard firmware to the local computer. In the Demo, click "UHF Firmware Upgrade", click "Select File", select the path where the firmware is located, check "Motherboard Firmware", and click "Upgrade". Wait for the progress bar to complete. After the upgrade is completed, a pop-up window with the corresponding version number will pop up, and "Upgrade Completed" will be displayed at the same time.

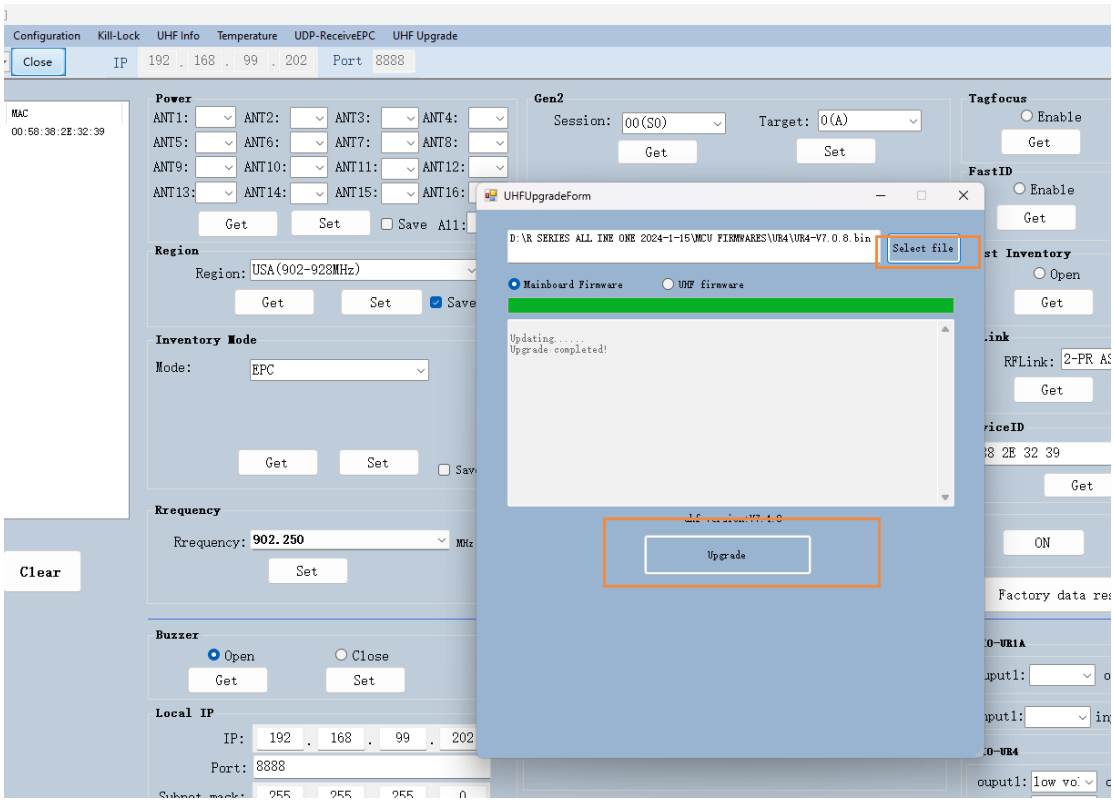

Figure 7.2 Mainboard firmware upgrade

7.3 UHF Firmware Upgrade

Before upgrading the UHF firmware, please download the corresponding firmware file to your local computer, open the Demo, click "UHF Firmware Upgrade", click "Select File", select the path where the firmware is located, check "UHF Firmware", and click "Upgrade". Wait for the progress bar to complete. After the upgrade is completed, a pop-up window with the corresponding version number will pop up, and "Upgrade Completed" will be displayed at the same time.

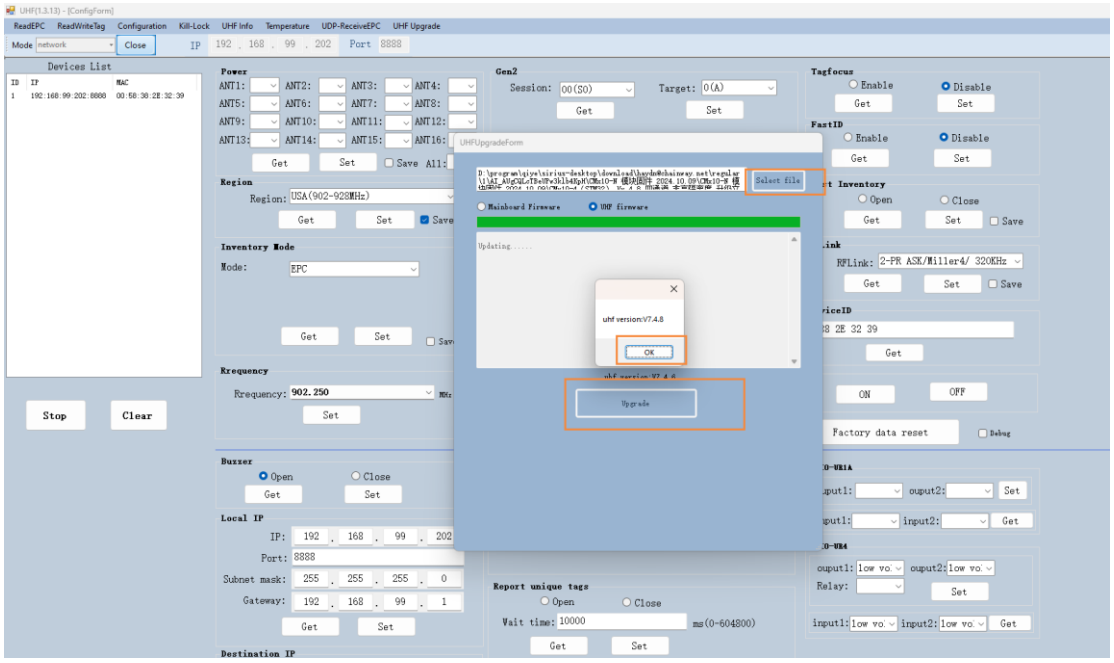

Figure 7.3 UHF firmware upgrade

8. Software Development

When users develop software on the host side, they can select the corresponding SDK development package according to the host development platform and development language to achieve related operations such as controlling and accessing the reader/writer and obtaining data.

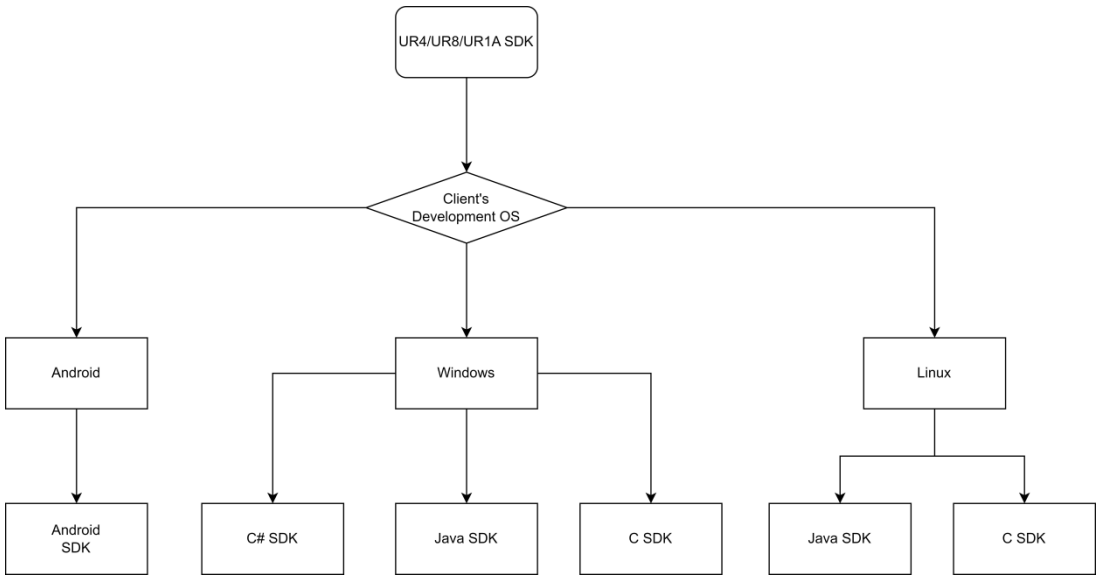

Figure 8 UR4/UR8/UR1A reader SDK selection guide

Figure 8 , the development solution selection based on the UR4/UR8/UR1A device SDK is shown. Users can select the corresponding SDK according to the operating system and development language used.

1.Android system: Provide Android SDK for development.

2. Windows system: supports development in C#, Java and C languages.

3.Linux system: supports the development of Java and C languages.

Users can choose the corresponding SDK for development according to their operating system and programming language requirements.

9 Frequently Asked Questions

9.1 Device Connection

Please make sure that the hardware **is physically connected correctly** , the device is powered on and the power light is always on . Please make sure that the communication network is connected and the host and device can ping. The default IP of the device is: 192.168.99.202 , the default port is : 8888. **If you forget** the IP **after changing it** , you can query the IP by the following methods :

1. Serial port connection can be used to directly query the device IP.
2. Using the PC demo, the reader in the same LAN can automatically broadcast the device IP and MAC address information . If the demo does not receive the broadcast, please check the firewall settings or turn off the firewall.

9.2 Device card reading test

For the device card reading test, please first ensure that the hardware is physically connected, ensure that the communication is normal, and then check the reader software function configuration. For the detailed process, please refer to the following steps:

1. Ensure that the hardware connection system is normal, that is, the host and the reader communicate normally. You can obtain device configuration information.
2. The reader is connected to the antenna normally, the tag is a UHF tag, and is within the antenna range.
3. The antenna port corresponding to the reader/writer has been enabled (antenna 1 is used by default), the power is appropriate (30dbm by default), and the inventory mode gives priority to read-only EPC.
4. Click Inventory. If the card is read successfully, the host demo can obtain the corresponding tag information. Click Stop when finished.
5. The device is in working state when reading the card, and in principle does not receive any instructions except stop.

10 Copyright Notice

This document is intended to provide users with instructions for the integrated deployment of fixed readers. The information and guidelines described in the document are based on our best knowledge and are based on the author's knowledge at the time of writing. However, as applications may be upgraded, evolved, or otherwise changed, please note that the content in the document may become outdated. We will do our best to ensure that the information in the document is accurate, but we cannot guarantee the completeness, accuracy, and timeliness of the information.

This document is for reference and guidance purposes only and does not provide any form of guarantee or warranty. The author is not responsible for any misunderstanding, incorrect operation, loss or damage. For more information on this document or support on using the application, please refer to the official website or contact the Chainway technical support team.

For more information, please contact support@chainway.net