

Android fixed reader User Integration Guide

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1 Overview

This document mainly introduces the integration and use guide of Android fixed reader, including device information, installation and deployment, quick start, peripherals and services, and RFID functions, etc., which can be consulted by end users during system integration.

Android fixed UHF reader/writer adopts Android operating system, integrates multi-channel UHF module independently developed based on IMPINJ E710 chip, supports multiple interfaces such as RS232, RJ45, HDMI, etc., and can be matched with antennas of various specifications.

This document applies to the following reader models: URA4, URA8, U300-4, U300-8

2. Device Information

2.1 URA4 Devices

2.1.1 URA4 device appearance



Figure 2.1.1.a URA4 appearance

2.1.2 URA4 standard delivery list

Table 2.1.2.a URA4 standard delivery list

Serial number	name
1	URA4 Reader/Writer
2	4G External Antenna
3	WIFI external antenna
4	12V 5A Power Adapter
5	GPIO communication port terminal

2.1.3 URA4 appearance and interface definition

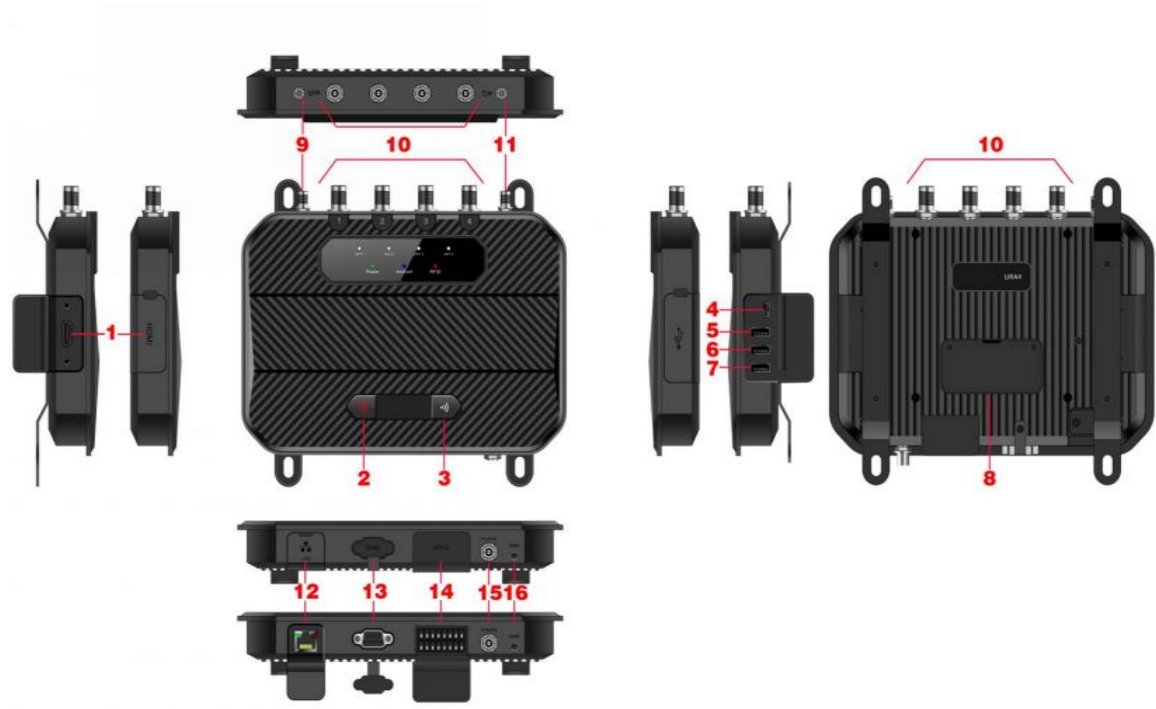


Figure 2.1.3.a URA4 device interface diagram

Table 2.1.3.a URA4 interface definition table

	describe
1	HDMI interface, can be connected to an external HDMI display
2	Power button, used to turn the device on and off
3	UHF scan button
4	TypeC, connect PC via typeC to flash, ***555666*** progress debugging mode (USB, RJ45 not Available, open the debug command and re-plug the TYPEC data cable)
5	USB (typeA), default is host mode; TYPE-C and USB are optional, default is USB
6	USB (type A), default is host mode
7	USB (type A), default is host mode
8	SIM & TF card slot location
9	WIFI ANTENNA
10	RFID_ANT
11	4G Antenna
12	RJ45 interface
13	RS232 interface
14	IO interface, 4 isolated input ports, 4 isolated output ports, 1 UART (3.3V), 2 data ports
15	12V power interface, supports 10V-28V
16	reset button

2.2 U300-4 U300-8 Equipment

2.2.1 U300-4 U300-8 Equipment Appearance

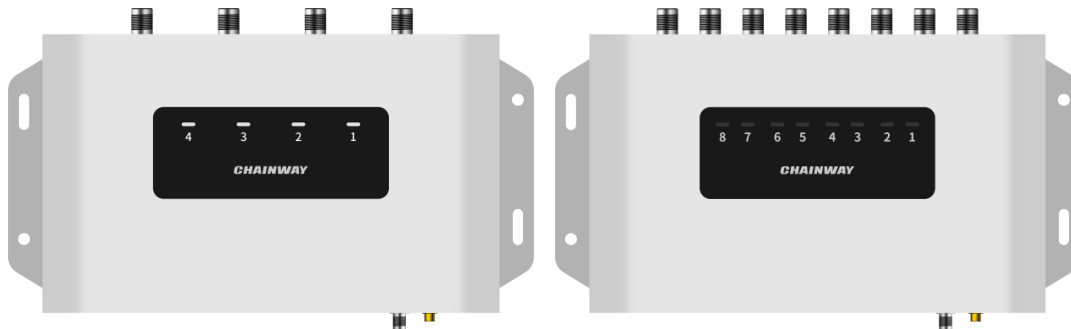


Figure 2.2.1.a Appearance of U300-4 (left) and U300-8 (right)

2.2.2 U300 Standard Delivery List

Table 2.2.2.a U300 standard delivery list

Serial number	name
1	U300 Reader
2	GPIO communication port terminal
3	WIFI external antenna
4	24V 5A Power Adapter

2.2.3 U300 Appearance and Interface Definition

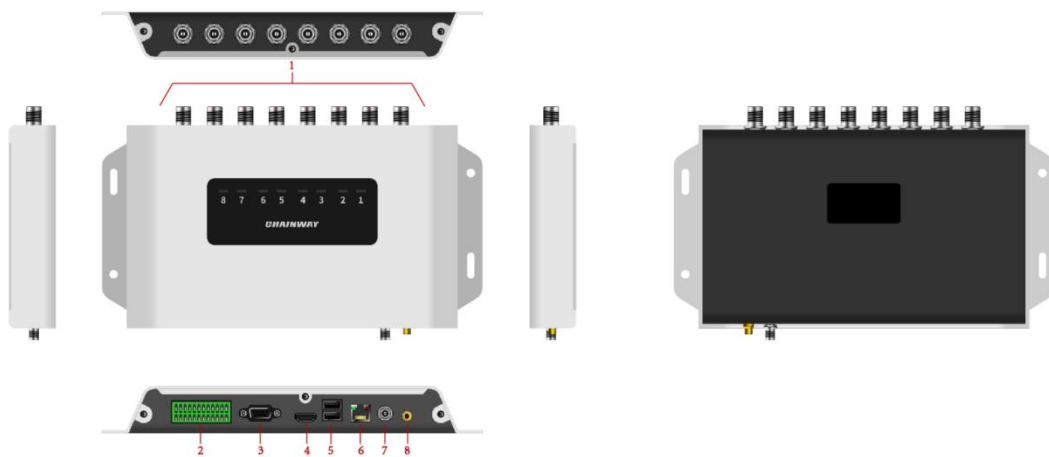


Figure 2.2.3.a U300 device interface diagram

Table 2.2.3.a U300 interface definition table

Serial number	describe
1	RFID_ANT (RF antenna interface)
2	IO interface, 4 isolated input ports, 4 isolated output ports, 1 Wiegand interface
3	RS232 interface
4	HDMI interface, can be connected to an external HDMI display
5	The upper part is USB Host ; the lower part is USB Device /host (this interface can be used for debugging by Android developers: after USB is connected, check Connect to PC in Settings-USB to enter debugging mode)
6	RJ45 interface
7	24V power interface, supports 10V-24V
8	WIFI ANTENNA

2.3 URA8 Device

2.3.1 URA8 device appearance

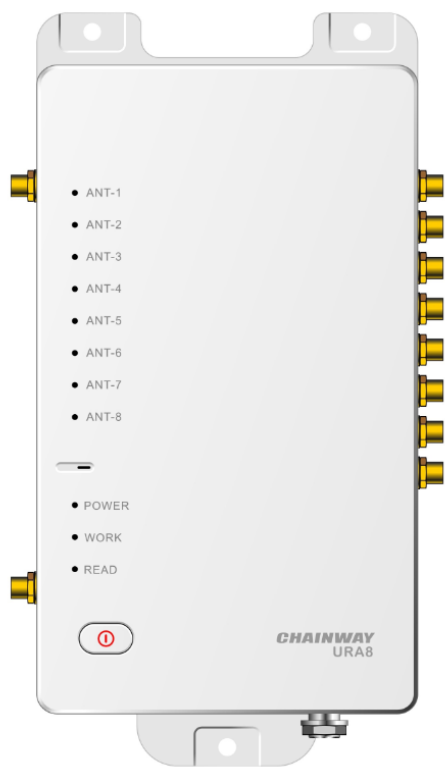


Figure 2.3.1.a URA8 appearance

2.3.2 URA8 standard delivery list

Table 2.3.2.a URA8 standard delivery list

Serial number	name
1	URA8 Reader
2	4G External Antenna
3	WIFI external antenna
4	12V 5A Power Adapter
5	GPIO communication port terminal

2.3.3 URA8 appearance and interface definition

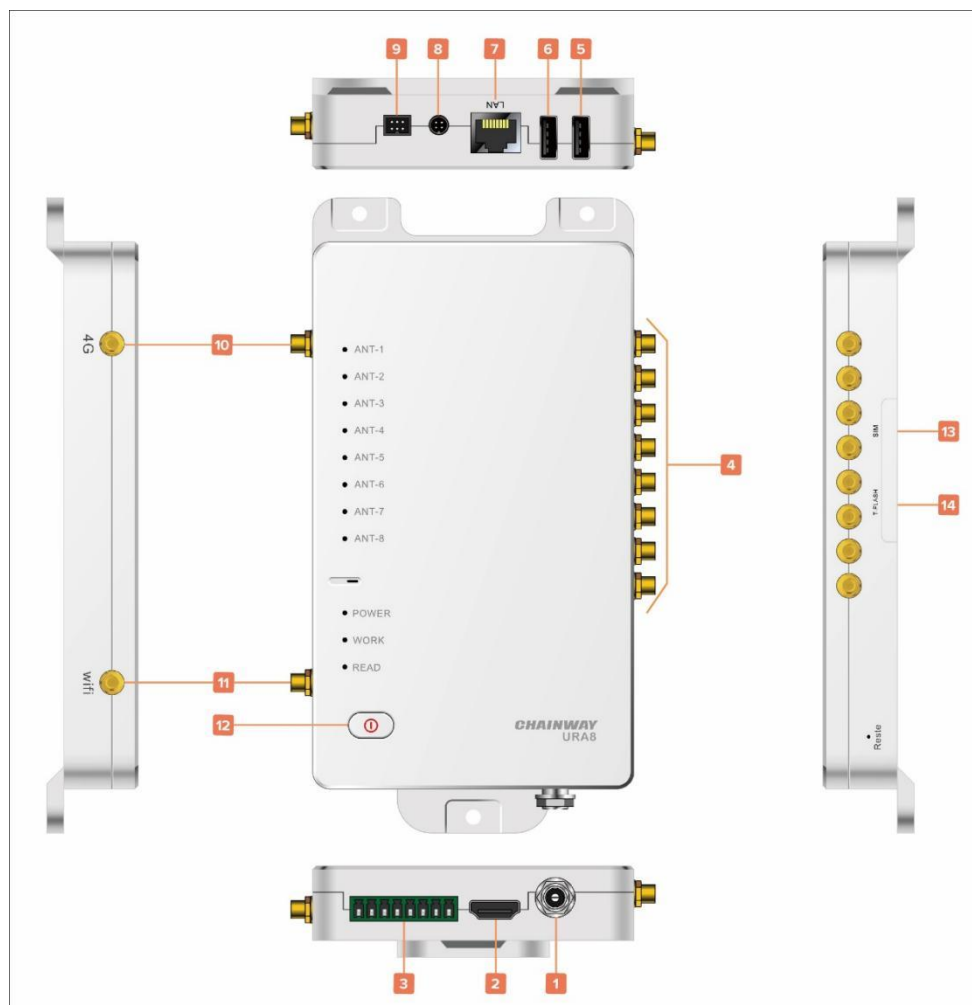


Figure 2.3.3.a URA8 device interface diagram

Table 2.3.3.a URA8 interface definition table

Serial number	describe
1	12V power interface, supports 10V-24V
2	HDMI interface, can be connected to an external HDMI display
3	GPIO, supports 2-way input optical coupling, 2-way output optical coupling, with isolation
4	RFID_ANT (RF antenna interface)
5	USB interface, external keyboard, mouse and other peripherals, support touch screen function, can be used for Android developer debugging (enter <code>***555666***</code> in the dial interface to enter the developer debugging mode)
6	USB interface, external keyboard, mouse and other peripherals, support touch screen function
7	RJ45 network port, supports POE power supply
8	Serial debugging interface
9	Expansion port;
10	Antenna interface, SMA interface
11	WIFI antenna interface, SMA interface
12	Power button, press and hold for 3 seconds to turn on the device;
13	SIM card slot
14	TF card slot

2.4 Equipment Installation

2.4.1 Antenna interface

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

model	Port Image	Number of Ports	Port Type
URA4		4	TNC female connector (TNC seat)

			
 URA8		8	SMA Female (SMA seat)
 U300-4/8		4/8	Reverse polarity TNC female

2.4.2 Equipment Installation Introduction

Fixed readers are usually installed flat or on the wall. This article takes URA4 as an example. Other fixed devices can refer to this method.

a. Tiled installation:

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

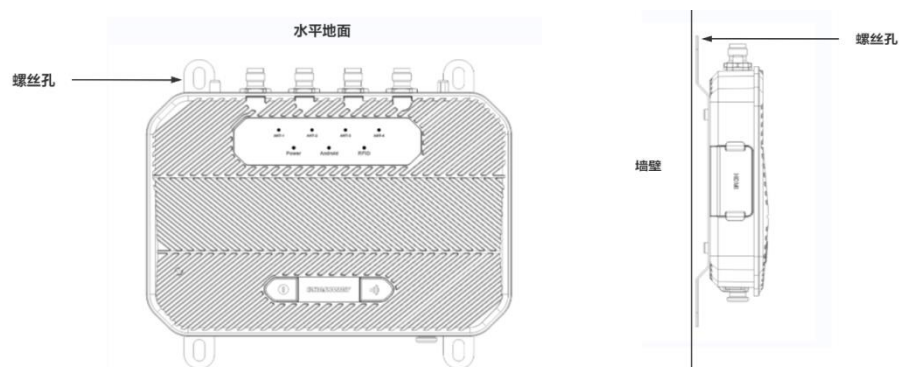


Figure 1. Tile installation Figure 1. Wall installation

3 Quick Start

The fixed reader supports the Android operating system, has powerful data processing capabilities, has a rich peripheral interface, and has built-in various data transmission services. It can be divided into host working mode and slave working mode. Users can deploy and implement it accordingly according to the application scenario requirements.

3.1 Host Mode

3.1.1 Device Connection

The reader/writer acts as the host, and the connections of peripheral devices are shown in the figure.

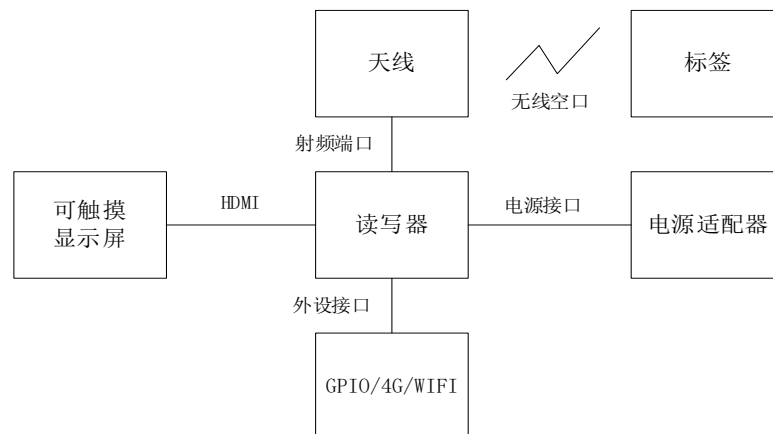


Figure 3.1.1 Host mode connection diagram

Note: 天线=Antenna; 可触屏显示器=Touch Screen Display; 读写器=Reader, some kind of URA4,U300 and else; 标签=labels; 射频端口=RF port; 天线空口=wireless port for antenna; 电源适配器=adapter; 外设接口=Peripheral Interface;

3.1.2 Operation steps

When the reader/writer acts as the host, 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 a touch display via the HDMI interface. If the display does not have touch function, you can connect a mouse via the USB interface for control.

3. Connect the power supply and start the device. (Some devices require you to click the power button)

4. Wait for the device to start up. The startup time is estimated to be within 1 minute. You can refer to the sound prompts or screen prompts.

5. After the system is started (Figure 3.1.2.a), click to enter the main interface of the application, find and click the UHF-A4 application (Figure 3.1.2.b), wait for the DEMO to complete the initialization (Figure 3.1.2.c), and after the window is automatically closed, if there is no abnormal prompt, it means that the UHF module is initialized successfully , and you can quickly experience the reader-writer related functions through DEMO (Figure 3.1.2.d) . If the prompt "init fail" indicates that the UHF module initialization failed, please close the App and restart this step.



Figure 3.1.2.a Android system main interface(应用程序=Program 设置=Setting 文件夹=file 浏览器=Browser)

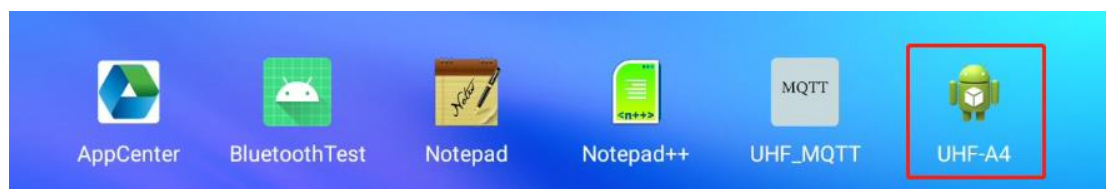


Figure 3.1.2.b Application main interface

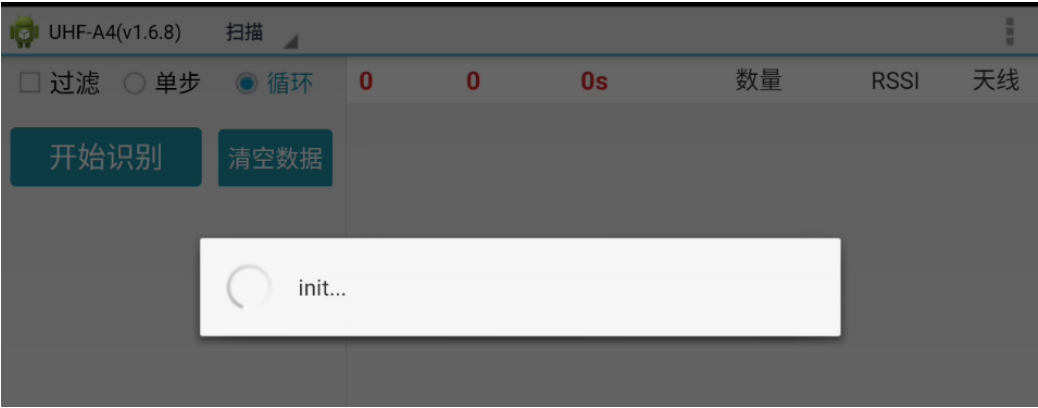


Figure 3.1.2.c UHF_DEMO startup interface

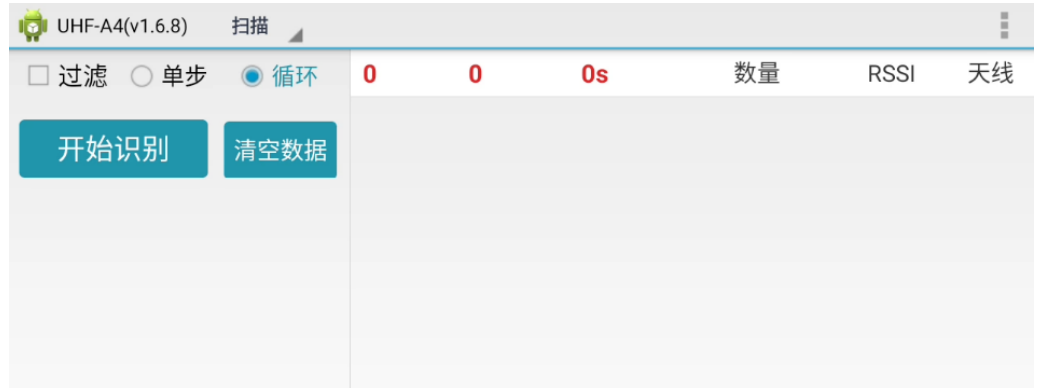


Figure 3.1.2.d UHF_DEMO main interface

3.1.3 DEMO

Click Start Identification, the reader starts working, collects tag information and uploads it for display. The inventory information may include tag EPC, tag TID, tag quantity, tag signal value, collected antenna number, etc.

demo_uhf						
SCAN						
☐ filter ☐ Single ☒ Auto Start Clear						
Total:		58	61	Count	RSSI	Ant
E2005157881801812330261F		1	-59.80	1		
E2005157881801671890526F		1	-56.90	1		
E20051578818018121803368		1	-54.70	1		
E20051578818016723702276		1	-50.90	1		
E20051578818018122802BC1		1	-53.80	1		
E2005157881801812800047B		1	-64.20	1		
E20051578818016719504E2A		1	-55.70	1		
E20051578818016723602433		1	-51.50	1		
E20051578818018113708C70		1	-54.70	1		
E20051578818016721303956		1	-50.90	1		
E20051578818018123402456		1	-55.70	1		
E20051578818016722602BA6		1	-44.20	1		

Figure 3.1.3 Label inventory

3.1.4 Embedded Development

The reader/writer acts as a host, and users can use the embedded software SDK development kit provided by our company to develop software on the Android platform, including data acquisition and upload, peripheral control and operation and other related operations.

Embedded development data path: XXX (model) user data package\SDK development package\embedded development

3.2 Slave Mode

3.2.1 Device Connection

The reader/writer acts as a slave, receiving host commands and executing corresponding operations. Currently, URA4 can be controlled by PC, and the deployment is shown in Figure 3.2.1.

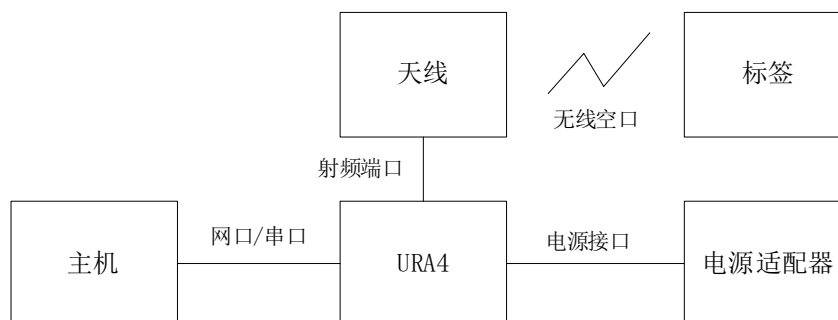


Figure 3.2.1.a Deployment diagram of slave mode

Note: 天线=Antenna; 标签=labels; 射频端口=RF port; 天线空口=wireless port for antenna; 电源适配器=adapter; 外设接口=Peripheral Interface;

3.2.2 Operation steps

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, and 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. (Some devices require you to click the power button) Wait for the device to start up. The startup time is estimated to be within 1 minute. You can refer to the sound prompt.

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

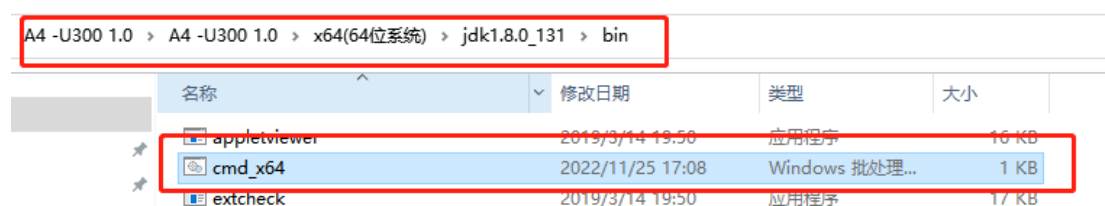


Figure 3.2.2.a Java version demo software path



Figure 3.2.2.b Java version demo software connection interface

3.2.2.1 Serial port connection (RS232_9PIN serial interface)

Select the 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 Connect.

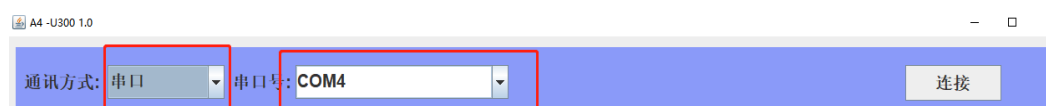


Figure 3.2.2.1.a Serial port connection



Figure 3.2.2.1.b Serial port connection successful

3.2.2.2 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: 192.168.1.98; subnet mask: 255.255.255.0; gateway: 192.168.1.1.

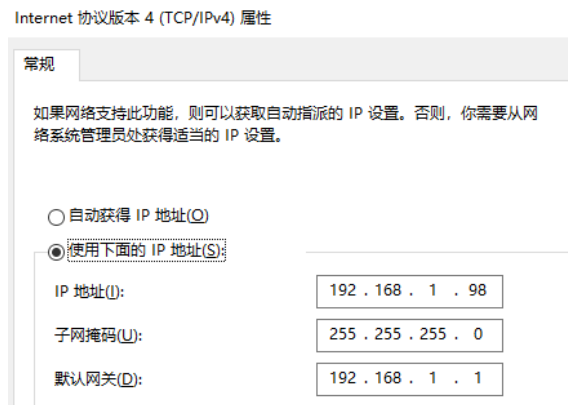


Figure 3.2.2.2.a Host IP settings

Select the network port in DEMO. The default device IP is 192.168.1.100 and the default port is 9160. Click Connect, as shown in Figure 3.2.2.2.b.



Figure 3.2.2.2.b Network connection

Note: If you forget the IP and service port, you can refer to [5.1 Common Problems Device Connection](#) for troubleshooting.

3.2.3 DEMO

3.2.3.1 Label Inventory

After the connection is established successfully, you can start counting tags and obtain tag data. When counting tags, you can select three different areas of the tag: EPC, TID, and USER areas. The counting results are displayed below.

盘点 读写 配置 锁-销毁 版本信息 温度 升级 GP10 Wifi-以太网 当前IP

过滤
标签数据: 起始地址: bit 长度: bit *EPC Tid User 设置过滤 取消过滤

INDEX	EPC	TID	USER	RSSI	Count	Ant
1	555555555555160714425067			-52.20	45	1
2	999999999999160690756230			-59.00	35	1
3	AAAAAAAAAAAA160714425069			-52.20	42	1
4	DDDDDDDDDDDD160714425063			-59.80	38	1
5	EEEEEEEEEEEE167687954988			-65.00	41	1
6	FFFFFFFFFFFF160714425078			-55.70	43	1

盘点输出数据

标签张数: 6 盘点总次数: 244 时间: 2s 盘点时间: 0 秒 开始盘点 清空数据

Figure 3.2.3.1 Note: 盘点输出数据: Inventory output data

3.2.3.2 Parameter Configuration

When using, users can configure the power, antenna, mode, etc. of URA4 through DEMO to meet the application requirements of the on-site environment, as shown in Figure 3.2.3.2.



Figure 3.2.3.2 Equipment parameter configuration

Note: 设置天线功率: Setting the antenna power 设置工作天线: Setting the working antenna 设置频段: Setting the frequency band 设置盘点模式: Setting the inventory mode

3.2.3.3 Host Development

When the reader/writer acts as a slave, the user develops software on the host side. The user can select the corresponding SDK development package according to the host development platform and development language to achieve control and access to the reader/writer, obtain data and other related operations.

Development data path: XXX user data package\2, SDK development package\host development

4 Peripherals and Services (Applicable to Slave Mode)

4.1 Data Transmission Service

The Android fixed reader comes with a UHF transmission service program, which includes serial port service, TCP/IP service, Web service, and MQTT connection service. These services are applicable to slave mode. For an introduction to the transmission function, see 4.4 Transmission service function **Settings**.

How to enable the service: The UHF data transmission service is enabled by default when the device is powered on. If the device is connected to an external display, you can view the current device's IP, port, and connection method, as shown in the figure. The default device IP: 192.168.1.100, the default port for RAW data is 9160, and the default port for JSON data is 9260.

When the UHF transmission service is turned on, users can establish communication with the reader through DEMO or WEB pages. Users can also choose to stop the service in the device's built-in Android system. This function option is saved after power failure.

192.168.1.100:9160,9260(json)

http://192.168.1.100:8080/main.html

停止UHF传输服务

Figure 4.1 UHF transmission service

4.2 Web Client

Android fixed readers support Web services and can be accessed through a browser. In this article, the host is a PC, using the EDGE browser that comes with the Windows system.

Steps :

1. Turn on the device, connect the host and the device directly via a network cable, and set the host and the reader to the same network segment. The host can be set as shown in Figure 4.2.a. The host IP address is: 192.168.1.98; subnet mask: 255.255.255.0; gateway: 192.168.1.1.

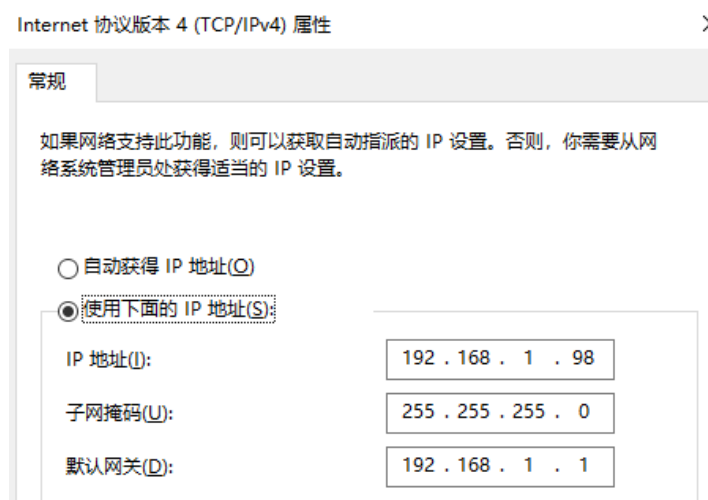


Figure 4.2.a Host IP settings

2. Open the browser on the PC and enter the device IP address in the address bar: 8080. The default access address of the device is 192.168.1.100:8080.



Figure 4.2.b WEB access address

3. Click Enter to jump to the Web login interface.



Figure 4.2.c WEB login interface

Default username: admin

Default password: 123456

4. After logging in, enter the Web main interface

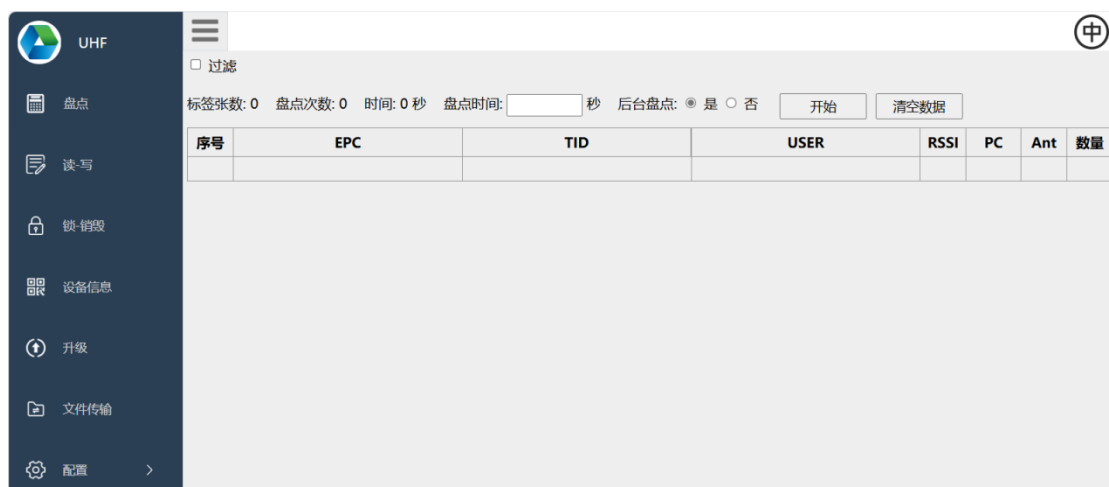


Figure 4.2.d WEB service main interface

4.2.1 Tag Inventory Access

4.2.1.1 Label Inventory

Click on the left side **of the inventory** , click **Start** , the reader starts working, obtains and displays the tag inventory data, click **Stop** , the reader stops working. In addition, you can set **the inventory time (in seconds)** , and the reader will stop automatically.



Figure 4.2.1.1 Label inventory

background inventory is checked , the inventory can still be maintained in the background when switching pages in the Web client interface.

4.2.1.2 Tag read and write access

Click **Read-Write on the left** , check **Filter** , and set **the filter area , filter address , filter length** , and **filter data** to specify tags for read and write operations. Generally, you can choose the filter area as epc, the starting address as 32bit (epc data start address), the filter length as 96 (in bits), and the filter data in hexadecimal, corresponding to 96bits epc data.

The parameters are the access parameters of the filtered tag, including **storage area , starting address (word address, one word is 16 bits, corresponding to the EPC starting address) , length (unit is word, 1 word corresponds to 16 bits) , access password** (hexadecimal data, the default password is 00000000).

Click **Read** to read the corresponding tag data in the blank area. Click **Write** to write the data in the blank area into the tag.

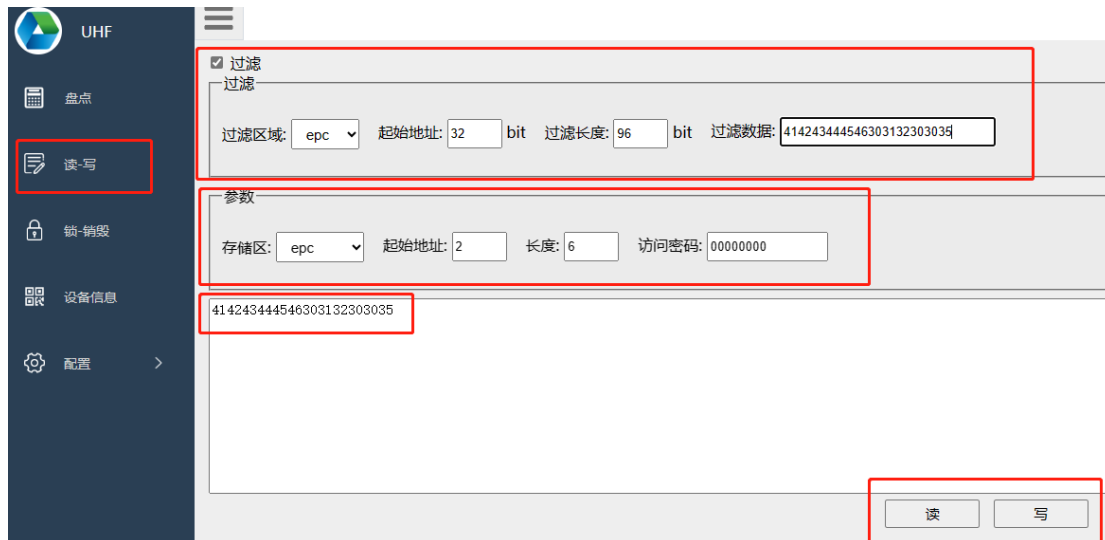


Figure 4.2.1.2 Tag read and write operations

4.2.1.3 Tag Locking and Destruction

lock , **open** , **permanently lock** , and **permanently open** on different areas of the target tag . To perform the lock tag operation, you must enter the access password. The default password cannot be used for the lock and destroy operations.

by entering **the destruction password** . After the destruction operation is executed, the tag will be invalid.



Figure 4.2.1.3 Tag lock and destroy

4.2.2 Configuration

Click on the left column **to configure** , which mainly includes: **basic parameters**, **network information**, **GPIO**, **MQTT configuration**, **reader/writer mode**, and **log information** .

1) Basic parameters

The basic parameter functions mainly include the following important functions:
power , antenna , frequency band , inventory mode , and data reporting .

The screenshot displays the 'UHF' configuration interface with a sidebar on the left containing options like '盘点', '读-写', '锁-解锁', '设备信息', '配置', '基本参数', '网络信息', 'GPIO', 'MQTT配置', '读写器模式', '温度信息', '版本信息', '日志信息', and '重启'. The '配置' section is expanded, showing '基本参数' (Basic Parameters) with several sub-sections highlighted by red boxes:

- 功率 (Power):** Four dropdown menus for '天线1', '天线2', '天线3', and '天线4', each set to '30'. Buttons for '设置' (Set) and '获取' (Get) are present.
- 天线 (Antenna):** Radio buttons for '天线1', '天线2', '天线3', and '天线4'. '天线1' is selected. Buttons for '设置' and '获取' are present.
- 频段 (Frequency Band):** A dropdown menu for '频段' set to 'USA(902-928MHz)'. Buttons for '设置' and '获取' are present.
- 搜索模式 (Search Mode):** Dropdowns for 'Session' (set to 'S0') and 'Target' (set to 'A'). Buttons for '设置' and '获取' are present.
- 盘点模式 (Inventory Mode):** A dropdown menu for '盘点模式' set to 'epc'. Input fields for 'User起始地址' (0) and 'User长度' (0). Buttons for '设置' and '获取' are present.
- 标签上报 (Tag Reporting):** Checkboxes for '重复标签过滤' (unchecked) and '信号过滤' (unchecked). Input fields for '过滤时间' (10 秒) and '信号值' (-90). A dropdown for '标签上报方式' (实时上报). Buttons for '设置' and '获取' are present.
- 心跳包 (Heartbeat):** A checkbox for '设置间隔' (unchecked) and an input field for '间隔时间' (10 秒). Buttons for '设置' and '获取' are present.
- 链路 (Link):** A dropdown menu for '链路' set to 'PR_ASK_Miller4_300KHz'. Buttons for '设置' and '获取' are present.

At the bottom, there are toggle switches for '蜂鸣器' (Buzzer), 'TagFocus', 'FastID', and '断网标签缓存' (Offline Tag Cache), all currently set to '开' (On).

Figure 4.2.2.1 Basic parameter interface

Antenna Settings

The reader supports multi-antenna intelligent polling. Users can enable antennas according to the reading requirements of the application scenario. The device enables antenna 1 by default. If you need to add an antenna, you must configure it. The antenna configuration is saved when the power is off.

Power settings

The reader power range supports 1~30dbm, and users can configure the power size according to the distance requirements of the application scenario. The power configuration is saved when the power is off.

Working frequency

The reader supports the operating frequency bands of major countries in the world and can be configured according to local regulatory requirements.

Inventory Mode

Inventory mode can quickly obtain tag information. **epc** is to read only the EPC of the tag. Select **epc+tid** to read the EPC and TID of the tag. Select **epc+tid+user** to read the EPC, TID, and USER area of the tag. The user area can specify **the starting address** and **length** . The units of the address and length are both words.

Figure 4.2.2.2 Inventory mode configuration

Label reporting

Tag reporting includes **tag data filtering** and **tag reporting methods** .

Tag data filtering includes **duplicate tag filtering** and **signal value filtering** . For **duplicate tag filtering** , the parameter is **the filtering time** , that is, the same tag is only uploaded once within the filtering time. **Signal filtering** refers to filtering based on the signal strength returned by the tag, and the parameter is **the signal value (RSSI)** , that is, only the tag data greater than the signal value is uploaded. Both filtering methods can be checked at the same time.

The tag reporting mode supports **real-time reporting** and **reporting after inventory counting is stopped** . **Real-time reporting** means that the reader reads the tag information and reports it to the dashboard at the same time. **Reporting after inventory counting is stopped, and** the reader reports the data to the dashboard after the tag inventory is completed.

Figure 4.2.2.3 Tag reporting configuration

2) Log information

Check the switch to the right of Debug to "On", set the Level to 2, and click "Set" to enable the reader log. The log information will save the data of the last 7 days.



Figure 4.2.2.4 Log information configuration

Export log method:

Method 1: On the device's built-in Android system platform, enter the file management system and use a USB flash drive to copy.

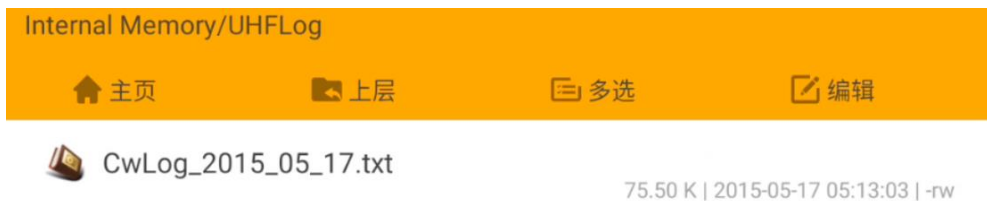


Figure 4.2.2.5 Log path

Method 2: Enter the **file transfer interface of the Web client** , double-click to enter the path /sdcard/UHFLog, click the log of the corresponding date, and click "Start Download".

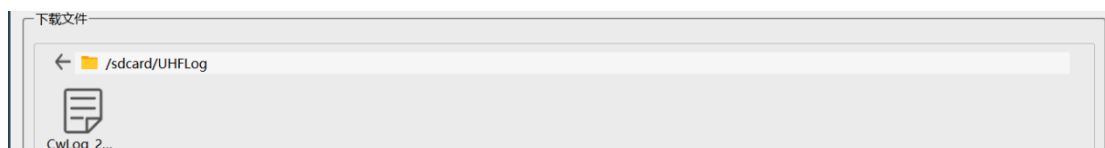


Figure 4.2.2.6 Log path

4.2.3 Device Information

Users can query the machine's **device information, version information , RFID module temperature information** , and perform **restart** and **factory reset** operations.

Device information includes **device parameter QR code, number of antennas, IMEI number, SN number, system version number, Mac address, CSN number** and **system time** .

for modifying Mac address, CSN number, and system time is: **111666888**

Version information includes **Json protocol version , built-in service version , reader hardware version , UHF software version** , etc.

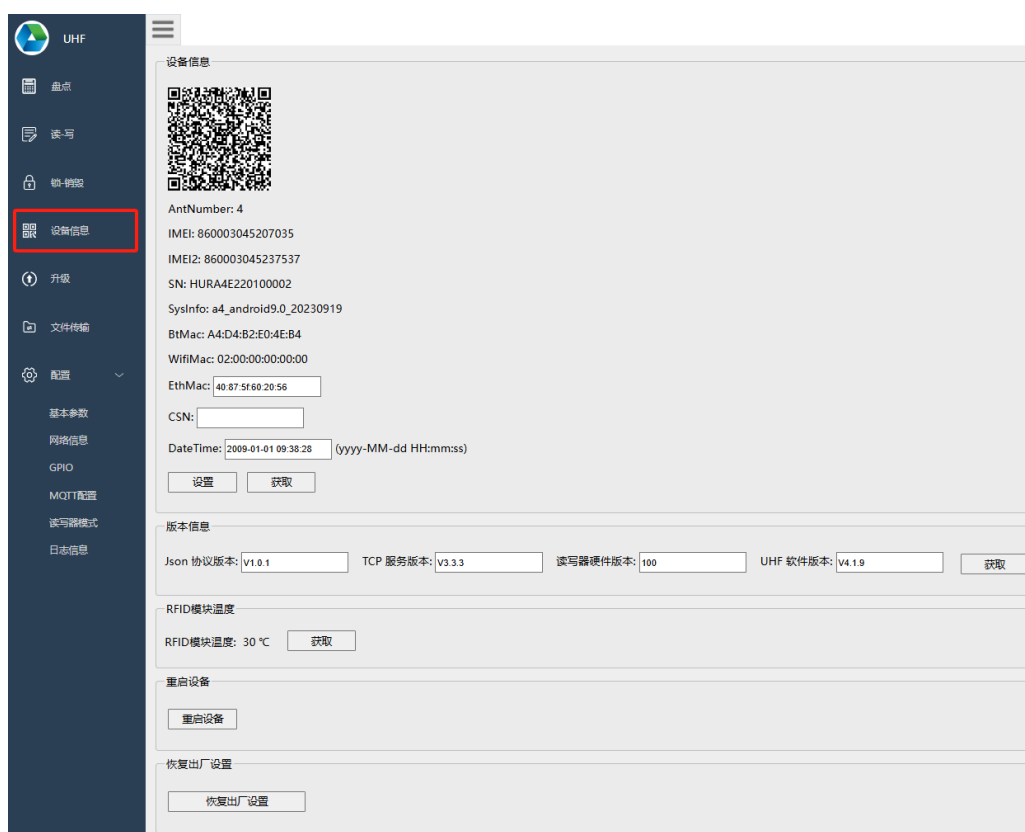


Figure 4.2.3.1 Device information interface

4.3 GPIO peripheral expansion

4.3.1 GPIO Information

4.3.1.1 URA4 reader/writer GPIO



Figure 4.3.1.1 URA4 GPIO terminal location

Table 4.3.1.1 URA4 GPIO definition

Serial number	definition	describe
1	Input 1	Optocoupler diode anode input, maximum voltage 12V, maximum current 50mA;
2	Input 3	
3	Output1	Optocoupler transistor OC output;
4	Output3	
5	Data 0	Data communication interface, 5V level;

6	Data 1	
7	MTX_3V3	The reader end TX_TTL_3V3 is connected to the peripheral RX;
8	MRX_3V3	The reader end RX_TTL_3V3 is connected to the peripheral TX;
9	VDD5V	5V/2A power output;
10	SYS_GND	System reference GND;
11	SYS_GND	
12	IO_GND	IO output and input reference GND, connected to the GND of the peripheral device;
13	Output 4	Optocoupler transistor OC output;
14	Output 2	
15	Input 4	Optocoupler diode anode input, maximum voltage 12V, maximum current 50mA;
16	Input 2	

4.3.1.2 URA8 reader/writer GPIO information

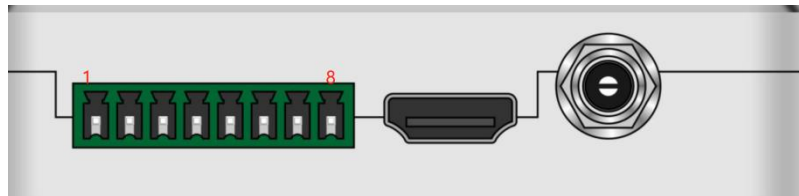


Figure 4.3.1.2 URA8 GPIO terminal location

Table 4.3.1.2 URA8 GPIO definition

Serial number	definition	describe
1	IO1+	Optocoupler 1+ input, the maximum voltage between IO1+ and IO1- is 12V, and the maximum current is 50mA;
2	IO1-	Optocoupler 1- input, the maximum voltage between IO1+ and IO1- is 12V, and the maximum current is 50mA;
3	IO2+	Optocoupler 2+ input, the maximum voltage between IO2+ and IO2- is 12V, and the maximum current is 50mA;
4	IO2-	Optocoupler 2- input, the maximum voltage between IO2+ and IO2- is 12V, and the maximum current is 50mA;
5	IO3-	The negative pole of the output port is connected to a low potential (reference GND) by default, and can be connected to the relay coil -;
6	IO3+	The positive pole of the output port needs to be connected to the external power supply (1.8V-12V) with a pull-up resistor, and can be connected to the relay coil +;
7	IO4-	The negative pole of the output port is connected to a low potential (reference GND) by default, and can be connected to the relay coil -;
8	IO4+	The positive pole of the output port needs to be connected to the external power supply (1.8V-12V) with a pull-up resistor, and can be connected to the relay coil +;

4.3.1.3 U300-4/8 reader GPIO information

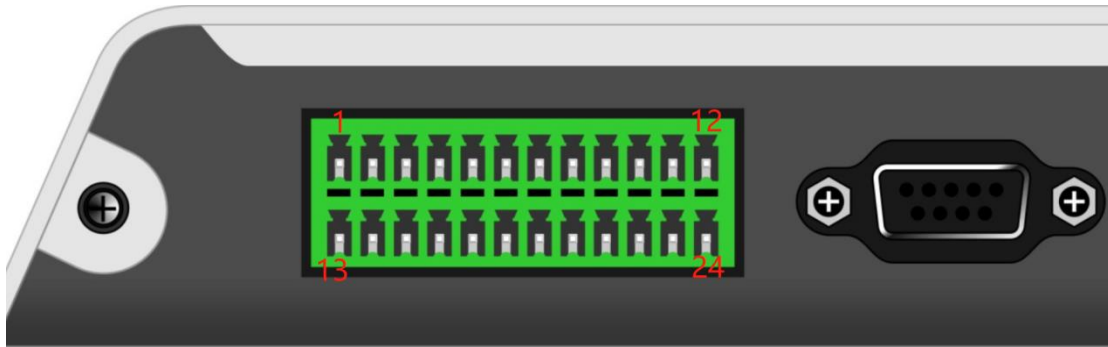


Figure 4.3.1.3 U300 GPIO terminal location

Table 4.3.1.3 U300 GPIO definition

Serial number	definition	describe
1	BOOT_CTRL	Reserved burning button (not open);
2	RST	Reset button;
3	SYS_GND	System reference GND;
4	VOOUT POWER DC IN	Adapter power input
5	Input1	Optocoupler diode anode input, maximum voltage 12V, maximum current 50mA;
6	Input3	Optocoupler diode anode input, maximum voltage 12V, maximum current 50mA;
7	Output1	Optocoupler transistor OC output;
8	Output3	Optocoupler transistor OC output;
9	IO_GND	IO output and input reference GND, connected to the GND of the peripheral device;
10	SYS_GND	System reference GND;
11	SYS_GND	System reference GND;
12	VDD 5V/3A	5V/2A power output;
13	SYS_GND	System reference GND;
14	SYS_GND	System reference GND;
15	NC	Reserve a dangling interface;
16	NC	Reserve a dangling interface;
17	Input2	Optocoupler diode anode input, maximum voltage 12V, maximum current 50mA;
18	Input4	Optocoupler diode anode input, maximum voltage 12V, maximum current 50mA;
19	Output2	Optocoupler transistor OC output;
20	Output4	Optocoupler transistor OC output;
twenty one	Data0	Data communication interface, 5V level;
twenty two	Data1	Data communication interface, 5V level;
twenty three	MTX_3V3	The reader end TX_TTL_3V3 is connected to the peripheral RX;
twenty four	MRX_3V3	The reader end RX_TTL_3V3 is connected to the peripheral TX;

4.3.2 GPIO Configuration

The Android 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.

4.3.2.1 Input Mode

Fixed readers can detect GPIO input status. In actual applications, they are often used to connect infrared trigger sensors for signal detection and triggering the reader to work. In input mode, the sensor and GPIO connection method is shown in the figure below. Method 1 is external power supply (5V~12V); Method 2 is reader power supply.

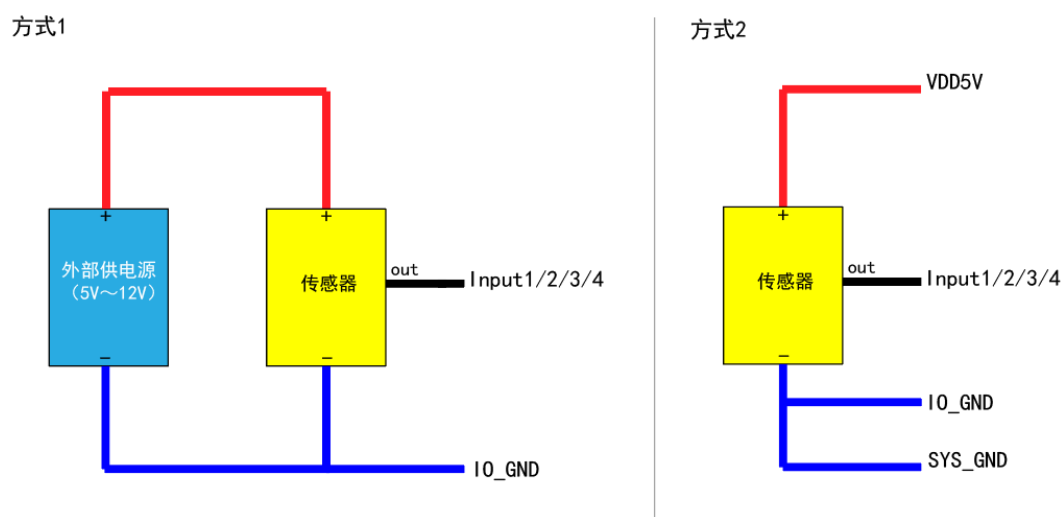


Figure 4.3.2.1 Input mode wiring diagram

Note: 外部供电源: External power supply 传感器: sensor

4.3.2.2 Output Mode

Fixed readers can drive GPIO outputs, which are often used to connect indicator lights in actual applications for signal indication. In output mode, the signal output LAMP and GPIO connection method are shown in the figure below. Method 1 is external power supply (5V~12V); Method 2 is reader power supply.

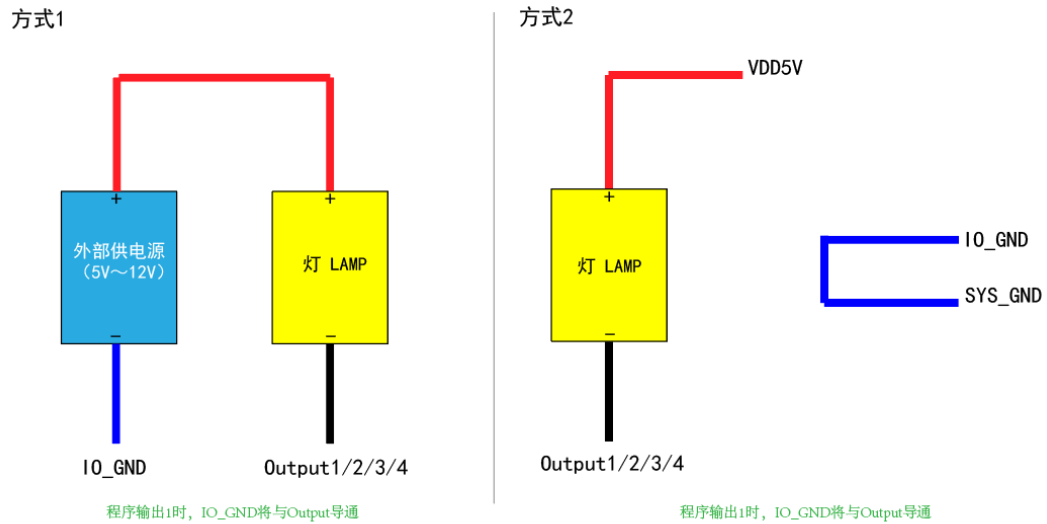


Figure 4.3.2.2 Output mode wiring diagram

Note: 外部供电电源: External power supply 程序输出 1 时, IO_GND 将与 Output 导通:

When program output 1, IO_GND will conduct with Output

4.3.3 GPIO Demonstration

After the hardware deployment is completed, the GPIO application can be demonstrated through the WEB client.

4.3.3.1 GPIO Status

In the GPIO column of the WEB interface, you can browse the current **GPI status of the input pin**, and the **GPI pin status change will automatically report the event**. It supports setting the **GPO status** of the output pin , and can set the high and low levels of the corresponding output pin.

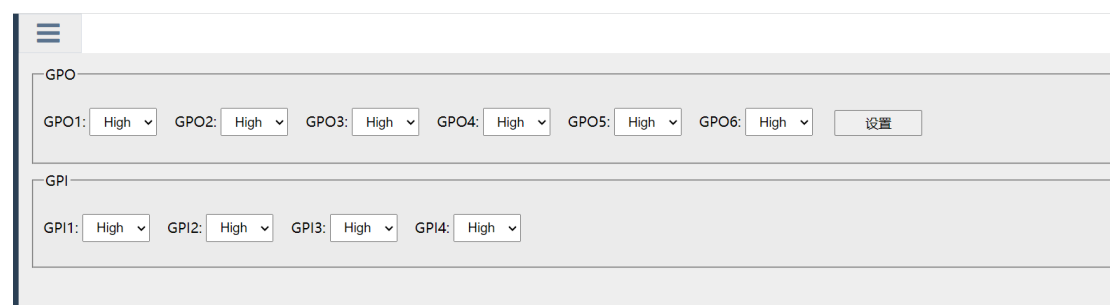


Figure 4.3.3.1 GPIO status query setting

4.3.3.2 Trigger Mode

The reader supports **command mode** , **trigger mode** and **automatic 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 configuration of the stop **delay time is supported** , that is, the time after the stop state is triggered, the device can continue to count. In addition, **the start inventory condition must be opposite to the stop inventory condition.**

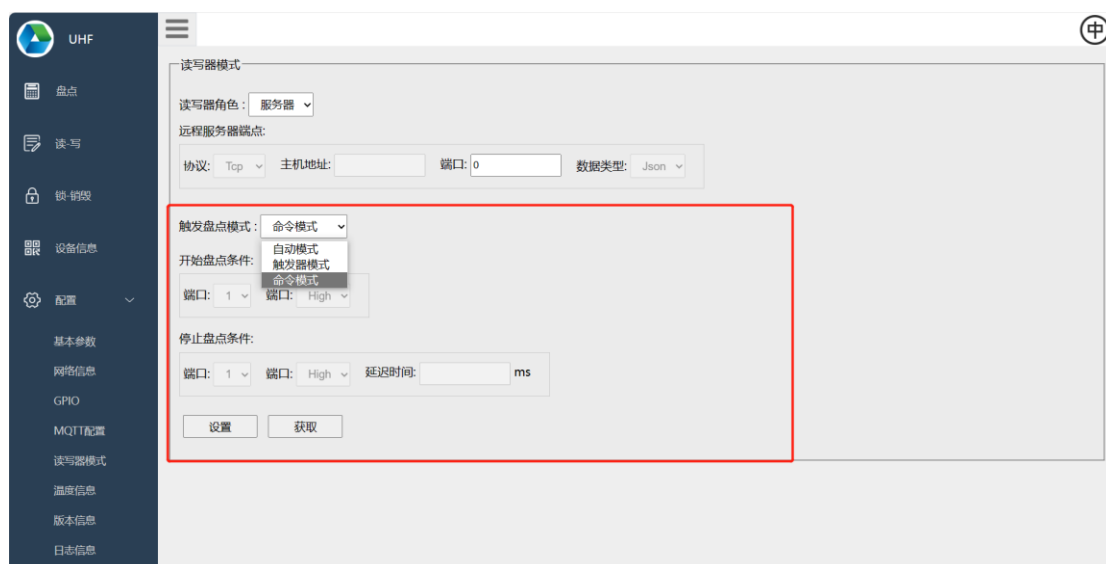


Figure 4.3.3.2 GPIO trigger working mode

4.4 Transmission service function settings

4.4.1 Serial Port Service

Provide serial port connection service, no special settings, the connection method is as shown in 3.2.2.1 Serial port connection (RS232_9PIN serial interface)

mqtt

4.4.3 Service Mode Settings

In the reader/writer mode setting options of the web client demo, you can set the reader/writer role, communication protocol, and data type (the rest of the parameters cannot be set when the reader/writer role is server)

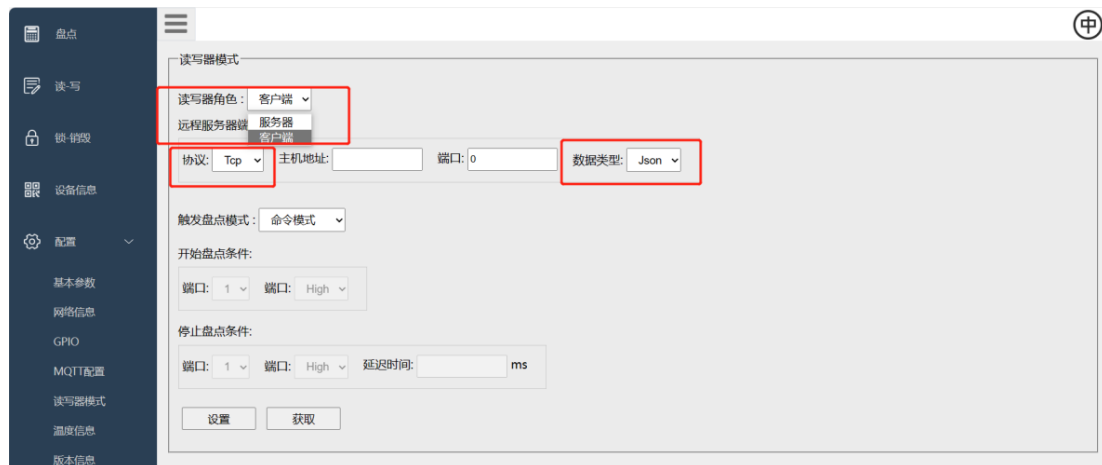


Figure 4.4.3 Reader/Writer Mode Configuration Interface

Note: 读写器角色: Read/Write Role 服务器: Server terminal 客户端: Client terminal 协议: Protocol 数据类型: Data Type

It can also be used with **the inventory mode** to achieve a variety of data transmission functions, supporting **command mode** , **trigger mode** and **automatic mode** . The **command mode** relies on instructions to control the reader to take inventory, see the SDK for the corresponding connection method; the **trigger mode** relies on the input status of GPIO to trigger the inventory, see [the 4.3.3.2 Trigger mode](#) in the previous article ; after the automatic working mode is set, the inventory label is automatically reported when the machine is turned on.

4.5 IOT Services

The Android fixed reader supports standard IOT services and can upload data to the IoT server through the MQTT protocol . MQTT is a lightweight, publish-subscribe messaging protocol suitable for resource-constrained devices and low-bandwidth,

high-latency or unstable network environments , enabling efficient communication between sensors, actuators and other devices.

4.5.1 MQTT Information

MQTT mainly includes the following important parts : MQTT client, MQTT Broker, and publish-subscribe mode.

1. MQTT Client

Any application or device running the MQTT client library is an MQTT client. For example, an application that uses MQTT to send instructions is a client, and a reader or writer that uses MQTT to report data is also a client.

2. MQTT Broker

MQTT Broker is the key component responsible for processing client requests, including establishing connections, disconnecting, subscribing and unsubscribing, and message forwarding.

3. Publish-Subscribe Model

The publish-subscribe model decouples the client that sends messages (publisher) and the client that receives messages (subscriber). The MQTT Broker is responsible for routing and distributing messages.

The client connects to the MQTT Broker and publishes the tag data (**epc**) to a specific topic (the topic in the figure is **topic/main**) through the publish operation. After receiving the message, the MQTT Broker will be responsible for forwarding it to the subscriber client that has subscribed to the corresponding topic (**topic/main**).

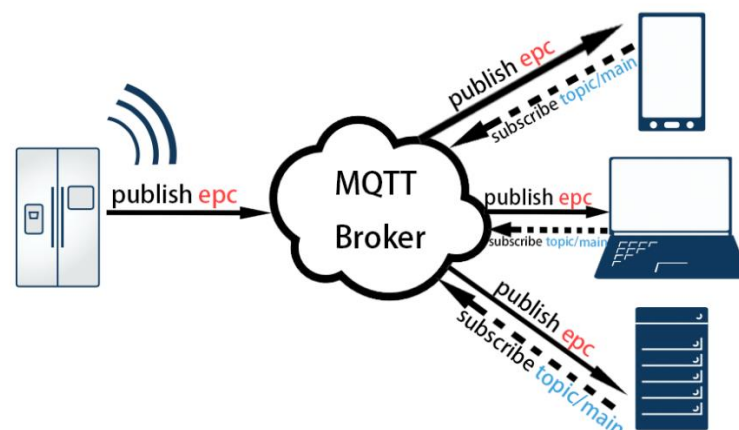


Figure 4.5.1.1 Schematic diagram of the publish-subscribe model

4.5.2 MQTT Demo

Below we will use a simple example to show how to use MQTT. Before starting, you need to prepare the MQTT Broker and MQTT client.

This example uses **EMQX** as the MQTT Broker and **MQTTX** as the MQTT client.

Steps:

一、EMQX download and installation

1. download

1) Download link: emqx official website - version download

2) Choose the appropriate version to download

- [emqx-5.3.2-ubuntu22.04-arm64.tar.gz](#)
- [emqx-5.3.2-ubuntu22.04-arm64.tar.gz.sha256](#)
- [emqx-5.3.2-windows-amd64.zip](#)
- [emqx-5.3.2-windows-amd64.zip.sha256](#)

Figure 4.5.2.1 The emqx version selected in the example

2. Install

1) Unzip the downloaded EMQX compressed package to a pure English path



Figure 4.5.2.2 emqx decompression path

2) Run the "Command Prompt" as an administrator and enter the bin directory of emqx .

3) Execute the command: `.\emqx install` to install the EMQX service. If `ChangeServiceConfig` is successful, the installation is successful.

4) Execute command: `emqx start` to start the EMQX service

```

管理员: 命令提示符
Microsoft Windows [版本 10.0.19045.4529]
(c) Microsoft Corporation。保留所有权利。

C:\Windows\system32>D:

D:\>cd D:\Data\MQTT\emqx-5.3.2-windows-amd64\bin

D:\Data\MQTT\emqx-5.3.2-windows-amd64\bin>. \emqx install
EMQX_NODE__DB_ROLE [node.role]: core
EMQX_NODE__DB_BACKEND [node.db_backend]: mnesia
D:\Data\MQTT\emqx-5.3.2-windows-amd64\erts-13.2.2.4\bin\erlsrv.exe: A service with the
[SC] ChangeServiceConfig 成功

D:\Data\MQTT\emqx-5.3.2-windows-amd64\bin>emqx start
EMQX_NODE__DB_ROLE [node.role]: core
EMQX_NODE__DB_BACKEND [node.db_backend]: mnesia

D:\Data\MQTT\emqx-5.3.2-windows-amd64>

```

Figure 4.5.2.3 emqx installation and startup operation

- 5) Enter localhost:18083 in the browser and press Enter. Enter the initial account on the login page to access the EMQX console. **Username** : admin **Password**: public

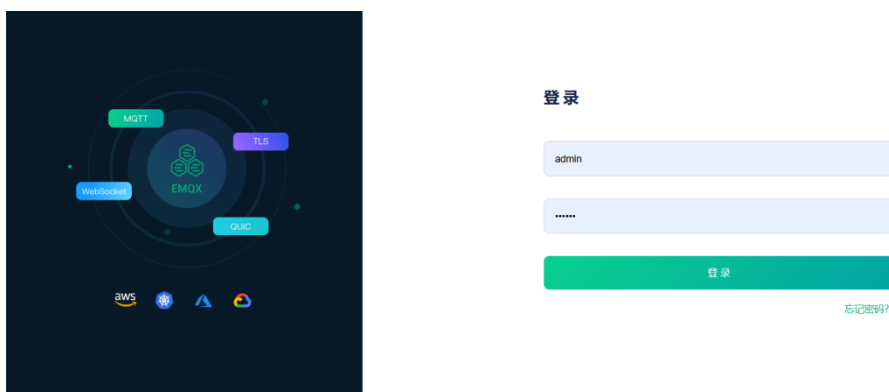


Figure 4.5.2.4 EMQX console login interface

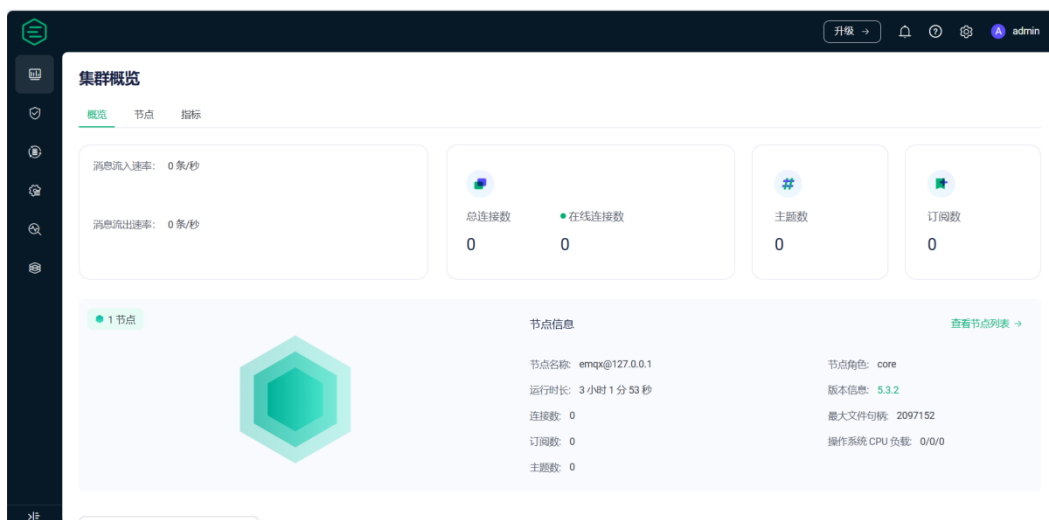


Figure 4.5.2.5 EMQX console main interface

二、Connecting MQTT

1. Reader/Writer MQTT Configuration

Taking the Web client interface as an example , click "MQTT Configuration " in the left function bar to enter the MQTT configuration interface, as shown in the figure below.

- 1) Select "Yes" to the right of "Configure MQTT".
- 2) Select the "Yes" option to the right of "Configure general information".

The screenshot shows the MQTT Configuration interface. The left sidebar contains a menu with options like 'UHF', '点', '读-写', '锁-解', '设备信息', '升级', '文件传输', '配置', '基本参数', '网络信息', 'GPIO', 'MQTT配置', '读写器模式', and '日志信息'. The main content area is divided into two sections. The top section, '常规配置', is highlighted with a red border. It contains a '是否配置MQTT' (Configure MQTT) toggle set to '是' (Yes). Below it are fields for '主机地址' (Host Address), '客户端ID' (Client ID), '用户名' (Username), '密码' (Password), and '端口' (Port). There are also fields for '发布主题' (Publish Topic) and '订阅主题' (Subscribe Topic). The bottom section, '物联网配置', contains fields for '主机地址' (Host Address), '主题' (Topic), '客户端ID' (Client ID), '用户名' (Username), '密码' (Password), '端口' (Port), '产品key' (Product Key), '产品密钥' (Product Secret), '设备名称' (Device Name), and '设备密钥' (Device Secret). Both sections have '设置' (Settings) and '获取' (Get) buttons.

Figure 4.5.2 .6 Standard MQTT configuration interface

- 3) Enter the host address of the MQTT server (the IP address of the MQTT Broker host), client ID, username, password, port and other basic MQTT configuration information.

(The basic parameters are provided by the server, and the reader can be set according to the above basic parameters)

是否配置MQTT: ☒ 是 ☐ 否

常规配置

是否配置常规信息: ☒ 是 ☐ 否

主机地址: 192.168.98.162 客户端ID: test 用户名: admin 密码: ... 端口: 1883

MQTT Broker地址 用户自定义ID 用户自定义用户名 用户自定义密码 默认端口号1883

发布主题:

数据标签主题: topic/main 心跳包主题:

盘点到的标签数据会发布到该主题 读写器心跳包数据会发布到该主题

订阅主题:

topics 订阅

主题	操作
暂无数据	

设置 获取

红框内的信息为必填项!

Figure 4.5.2.7 General information configuration

Note: 主机地址: MQTT Broker 地址 Host Address: MQTT Broker Address

客户端 ID: 用户自定义 ID Client ID: User-defined ID

用户名: 用户自定义用户名 User name: user-defined user name

密码: 用户自定义密码 Password: User-defined password

端口: 默认端口号 1883 Port: Default port number 1883

盘点标签主题: 盘点到的标签数据会发布到该主题 Inventory Tag Topic: Inventory

tagged data will be posted to this topic

心跳包主题: 读写器心跳包数据会发布到该主题 Heartbeat packet topic: Read-write

heartbeat packet data will be posted to this topic.

设置 Settings

红框内的信息为必填项 The information in the red box is required.

- 4) Enter the data tag topic and heartbeat packet topic, and click "Set" to establish MQTT communication with the server. The MQTT client can obtain the tag information and heartbeat packet information by listening to the corresponding topic.

集群概览

概览

节点

指标



Figure 4.5.2.8 Successfully connected to the server interface

三、MQTTX Configuration

MQTTX can be downloaded and installed directly by visiting [the MQTT X official website](#).

1. MQTTX Connection

- 1) Enter the MQTTX connection interface and enter the connection name, client ID, MQTT server host address, port number, user name, password and other information.
- 2) Click "Connect" in the upper right corner to establish a connection with the MQTT server.

The screenshot shows the 'New' connection configuration interface. A sidebar on the left contains icons for back, home, add, code, and settings, with the 'add' icon (+) highlighted by a red box. The main area has a 'Connect' button in the top right corner, also highlighted by a red box. The 'General' tab is active, displaying the following fields:

- * Name: test
- * Client ID: mqttx_6d46736d
- * Host: mqtt:// 192.168.98.162
- * Port: 1883
- Username: (empty)
- Password: (empty)
- SSL/TLS: (toggle switch)

Figure 4.5.2.9 MQTTX connection configuration interface

2. Topic Listener

- 1) After the connection is successful, you will be redirected to the connection interface and click " **New Subscription** " in the upper left corner.
- 2) In the Topic column, enter the name of the subscribed topic (the publishing topic in the reader/writer MQTT configuration) and click **Confirm** to complete the topic subscription.

(The data label topic in the example is **topic/main** , see **Figure 4.5.2.7 for details General information configuration**)

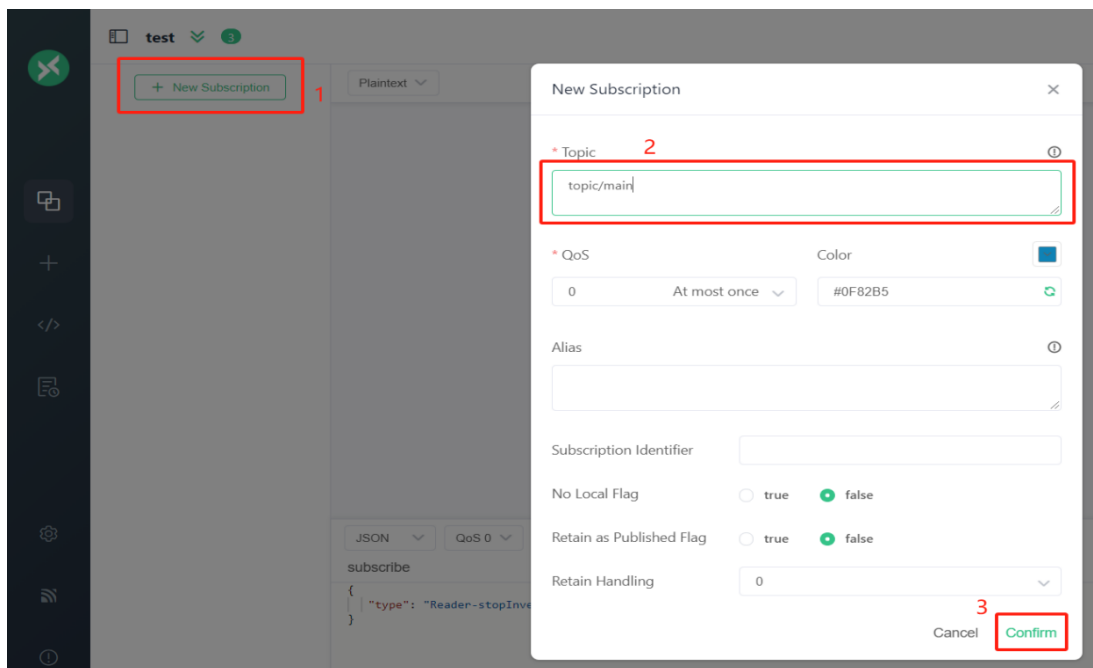


Figure 4.5.2.10 MQTTX topic subscription

4.5.3 Read data and report to the server

一、Web-side control reading

After the MQTT connection is successful, refer to 4.2.1 Tag Inventory Accesscontrol the reader to read the tag. The tag data is displayed on the Web client.



Figure 4.5.3.1

At the same time, the server can also receive data reported by the reader, as shown in the figure below.

```

Topic: biaoqian  QoS: 0
{"csn": "123", "data":
[{"antennaPort": 1, "count": 1, "epcHex": "005700050000000142303132", "pcHex": "3400", "rssi": -52.2, "timestamp": 1230806154503}
,
{"antennaPort": 1, "count": 1, "epcHex": "111122223333444455556666", "pcHex": "3000", "rssi": -72.8, "timestamp": 1230806154516},
{"antennaPort": 1, "count": 1, "epcHex": "39353535000040146E153D42", "pcHex": "3000", "rssi": -71.8, "timestamp": 1230806154539},
{"antennaPort": 1, "count": 1, "epcHex": "666688880000000001438628", "pcHex": "3000", "rssi": -76.3, "timestamp": 1230806154543},
{"antennaPort": 1, "count": 1, "epcHex": "12345578A50300622368125F", "pcHex": "3000", "rssi": -74.3, "timestamp": 1230806154551},
{"antennaPort": 1, "count": 1, "epcHex": "00570005000000015D8016F7", "pcHex": "3000", "rssi": -78.8, "timestamp": 1230806154570}]
, "sn": "HURA4E220100002", "type": "Reader-tagReportingEvent"}

```

Figure 4.5.3.2

二、MQTT control read

- 1) Enter the subscription topic and click "Subscribe" to send instructions to the topic through the MQTT client to communicate with the reader/writer.

订阅主题:

subscribe

订阅 1

主题	操作
subscribe	删除

2

设置 获取

Figure 4.5.3.3 Reader-writer subscription topic

Note: 订阅 Subscription 设置 Settings

- 2) After the MQTT connection is successful, enter the MQTTX client and enter the subscription topic of the reader in the "Topic" in the figure below.
this example , the reader-writer subscription topic is **subscribe** , see **Figure 4.5.3.3 for details Reader-writer subscribes to topic**)
- 3) The client sends instructions to the reader's subscription topic to control the reader.

Start inventory command: {"type": "Reader-startInventoryRequest"}

Stop inventory command: {"type": "Reader-stopInventoryRequest"}



Figure 4.5.3.4 MQTT client controls the reader/writer

Note: 读写器配置的 MQTT 订阅主题: MQTT Subscription Topics for Read/Write Configuration

读写器 TCP JSON 格式命令: Read/Write TCP JSON Format Commands

- 4) **The reader/writer TCP JSON format instructions** are used in MQTT control reading . For details, see the document below.



读写器TCP
JSON格式202401

4.5.4 Alibaba Cloud IoT Communication

The service is adapted to the Alibaba Cloud IoT platform. Fill in the platform parameters to establish MQTT communication with Alibaba Cloud on the public Internet. See the configuration interface below.

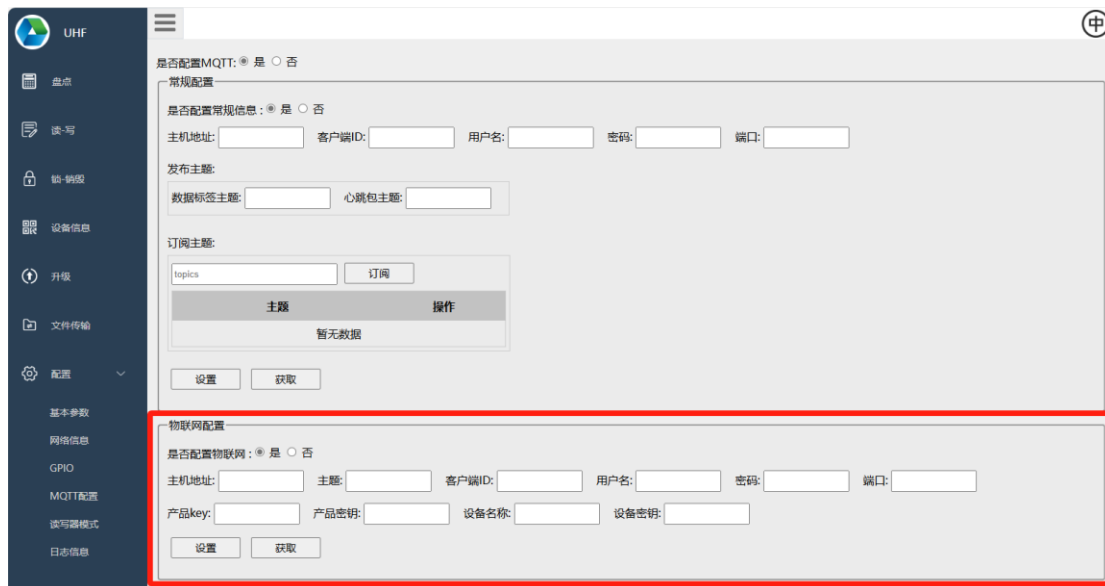


Figure 4.5 . 4.a

The following figure shows an example of the data receiving interface on the Alibaba Cloud platform server.



数据示例: EPC内容、天线口、上报时间

Figure 4.5.4.b

Note: 数据示例: EPC 内容、天线口、上报时间 Example of data: EPC content, antenna port, reporting time

For more information about Alibaba Cloud-related MQTT development, see its official platform documentation.

4. 6 repair service

The Android reader/writer supports online upgrade services, file transfer management services, and one-click restoration of factory settings.

4.6.1 Online upgrade service

The upgrade service interface is as follows. Users can quickly install APK packages through the Web client's upgrade service, or update customized UHF firmware and UHF-service as needed.



Figure 4.6.1 Upgrade interface

4.6.2 File transfer service

The file transfer service interface is as follows. Users can quickly upload and download files stored in the transfer device through the file transfer service of the Web client.

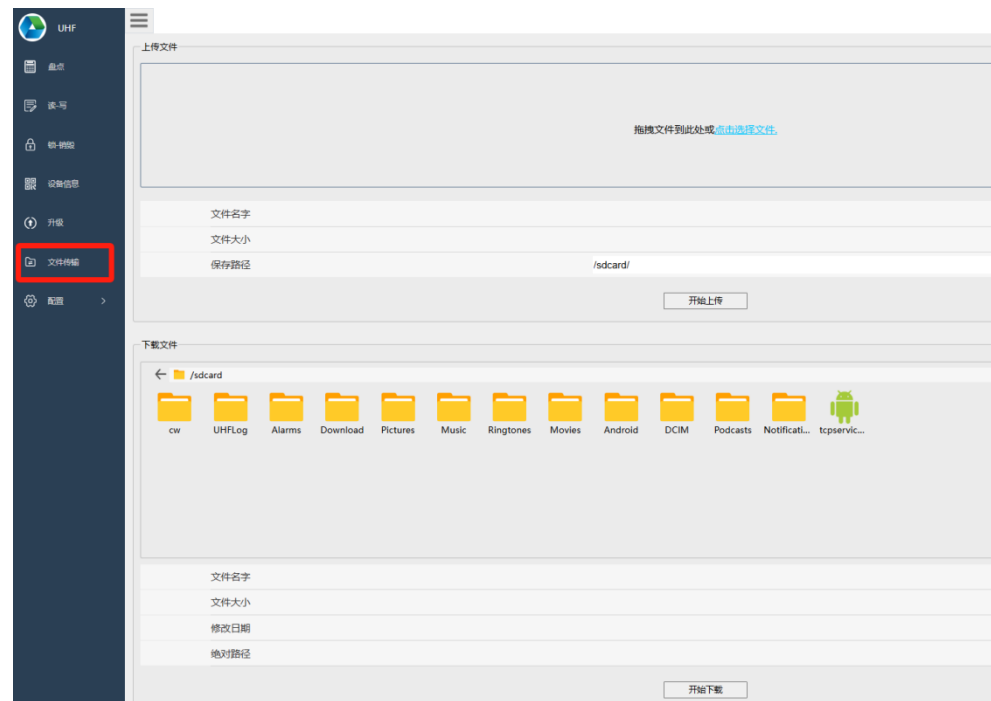


Figure 4.6.2 File transfer interface

4.6.3 Restore factory settings

Method 1: On the device's built-in Android system platform, you can enter **the settings** , click **the application** , select **UHF transmission service** , click **settings in the upper right corner** , enter the settings interface, and click **restore to factory settings** .

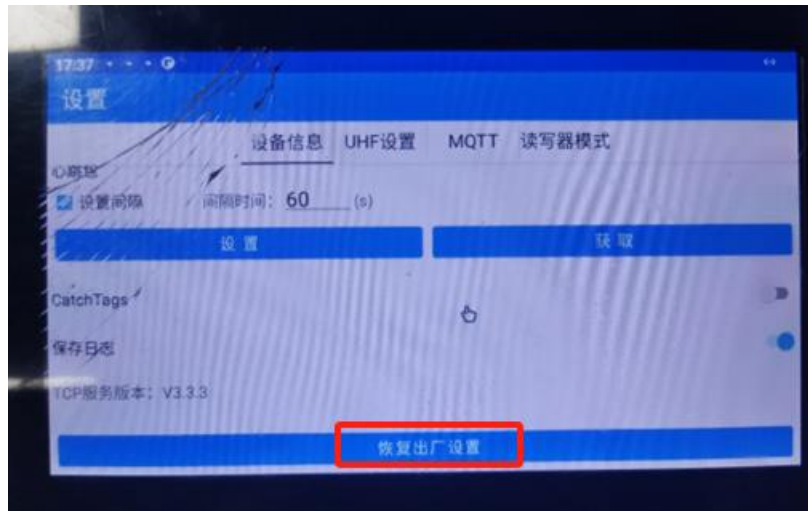


Figure 4.6. 3. a Device -side factory reset interface 恢复出厂设置 Restore Factory Settings

Method 2: Enter **the device information interface** of the **Web client** and click **Restore Factory Settings** .

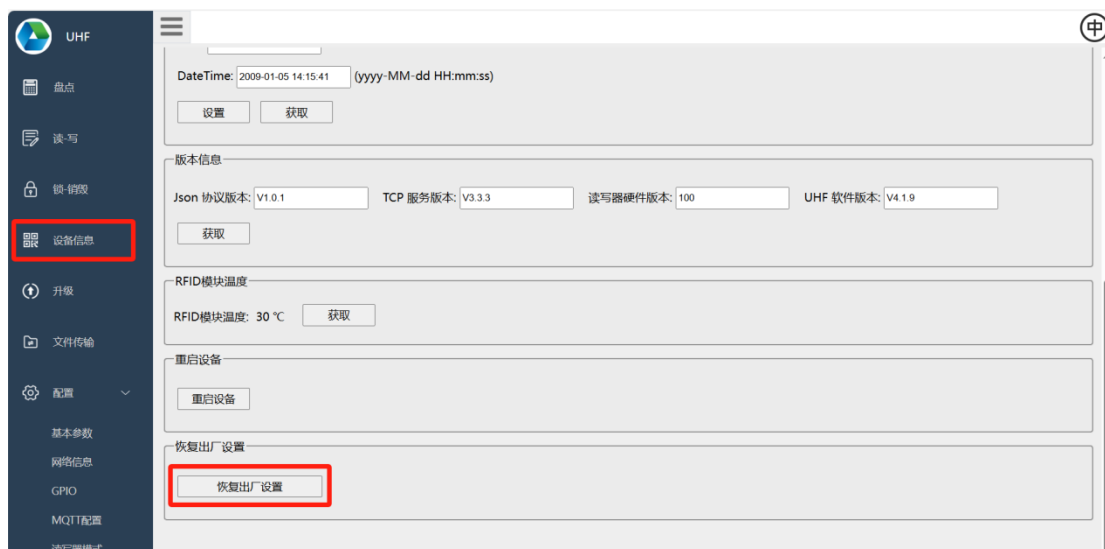


Figure 4.6. 3. b Web-based factory reset interface 恢复出厂设置 Restore Factory Settings

5 Frequently Asked Questions

5.1 Device Connection

Please confirm the physical connection of the hardware, the power is on, the device startup time is about 1 minute, and the device is successfully started with a series of rapid beeps. Make sure the communication network is connected, and the host and device can ping. The default IP of the device is: 192.168.1.100, the default port is: 9160. If the IP has been changed and forgotten, there are three ways:

1. Serial port connection can be used to directly query the device IP.
2. Connect to the HDMI display, and then in the application, the UHF transmission service can view the device IP.

5.2 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.