RFID Module
User Manual

Revision History

Version No.	Revision History	Date	Author
V1.0.0	Initial Draft	2024.11.28	Haydn; Tim; Ivy; Yutai

Content

0 Chapter Introduction

1. **Document Introduction** This document is the RFID module product manual, covering an overview of RFID, key specifications, product certifications, SDK overview, operation process demonstrations, and appendices, facilitating rapid integration by developers. The modules are divided into three types: CMx10-N series, CM-xN series, and CMx10-NANO series. The provided development toolkit includes a development board, connection cables, and a power adapter for quick demonstrations.

2. **Functional Parameters** This section describes the key functions and technical parameters of the modules, including appearance, environmental requirements, RFID characteristics, signal interfaces, power supply, and device certification information.

3. **Hardware Design** This section provides detailed hardware design details of the modules, including structural dimensions and interface definitions.

4. **Reference Design** The reference design of the development board is shown here, including appearance dimensions, interface descriptions, and interface location diagrams, assisting users with hardware integration and design.

5. **Example Demonstration** This section provides example operations and demonstrations of the modules, guiding users on how to make hardware connections and use the PC Demo program.

6. **Software Development** Detailed information on SDK and protocol development has been provided to assist the user in custom development.

7. **Frequently Asked Questions** Lists common questions and solutions that users may encounter when using the modules.

8. **Notifications** Contains important notifications and update information related to the modules, reminding users of relevant changes.

1 Document Introduction

This document serves as the RFID module product manual, primarily including an overview of RFID, main specifications, product certifications, SDK overview, product certification details, main operation process demonstrations, and corresponding appendices, enabling developers to quickly implement the integration and development of RFID read/write modules.

1.1 Module Products

Modules are categorized into three types based on different application scenarios to meet various integration needs of customers:

1. CMx10-N Series
2. CM-xN Series
3. CMx10-NANO Series

1.2 Module Development Toolkit

The RFID module development toolkit is provided, as shown in Table 1.2, which mainly includes a development board, connection cables, and a power adapter for convenient customer demonstrations.

Table 1.2 Module Development Toolkit

No.	Component	Specification Model	Remarks
1	Development Board	Development Board (Serial/Ethernet/GPIO)	HDK Component Included
2	Connection Cable	UHF module connection cable(Single/Multi-Channel module)	

3	Power Adapter	12V2A Power Adapter	
4	Module	CMX10-N/CM-XN/NANO Series Module	

1.3 Additional Resources

Table 1.3 provides guidance on downloading various materials.

Table 1.3 Resource Download Guidance

File Name	File Description	Download Path
Module Product Specification	Basic parameters of the product	http://119.136.31.217:15629/Files/WebSite/CMX10-1-EN.pdf
UHF RFID Application Layer Communication Protocol V2.12	Direct command communication usage for the module	
Simple Reader SDK Development Package	Multi-platform support for Windows/Android/Linux, supports JAVA/C/C# languages, including demo, API interfaces, service programs, documentation, etc.	

2 Specifications

This section lists only a part of the specifications. For detailed parameters, please refer to the official website.

All module: https://www.chainway.net/Products?tid=22

CMx10-1Series：Products Compare

CM710-N Series： Products Compare

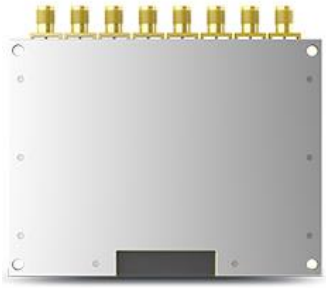
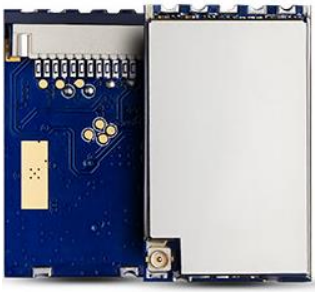
CM-xN Series：Products Compare

2.1 Appearance

Table 2.1 list the main specifications and models of the modules.

Table 2.1 Module Physical Parameters

Module Series	Module Name	Image Reference	Module Dimensions	Module Weight
CMx10-N Series	CM710-1		57.2 x 36.8 x 7.6 mm	26.0g
	CM710-4		77.2mm x51.0mm x 8.9mm	52.0g

Module Series	Module Name	Image Reference	Module Dimensions	Module Weight
	CM710-8		93.0mm x 79.75mm x 8.9mm	108.0g
	CM710-16		112.2mm x 88.6mm x 8.8mm	253g
	CM310-1		57.2mm x 36.8mm x 7.6mm	26.0g
	CM510-1		57.2mm x 36.8mm x 7.6mm	26.0g
CM-xN Series	X=3/5/7		31 mm x 19 mm x 3.1 mm	3 g

Module Series	Module Name	Image Reference	Module Dimensions	Module Weight
CMx10-Nano Series	X=3/5/7		26mm x 22mm x 3.2mm	5 g

2.2 Module Operating Environment

The modules operate in temperatures ranging from -25° C to 65° C, with storage temperatures between 40° C and 85° C, and relative humidity maintained at 10% to 95%. Please Maintain an efficient operating environment.

2.3 RFID Parameter

The module is based on the Impinj Ex10 series chip, compliant with the EPCglobal Gen2 (ISO18000-6C) protocol, offering maximum range and easy integration for customers. The RFID frequency band is available in either FCC standard (902-928 MHz) or ETSI standard (865-868 MHz) versions. Power parameters, RF interface details, and other specifications can be found in Table 2.3.

Table 2.3 Module RFID Parameter Information

Parameter	CMx10-N Series	CM-xN Series	CMx10-Nano Series
Output Power	1-channel module: 1-30dBm adjustable; 1dB step interval; +/- 0.5dB precision Muti-channel module：	Adjustable range 5-30dBm, step 1dB, accuracy +/- 1dB	Adjustable range 5-30dBm, step 1dB, accuracy +/- 1dB

	5-30dBm adjustable; 1dB step interval; +/- 1dB precision		
Antenna Interface	50Ω RF connector MMCX female socket （1-channel module） 50Ω RF connector SMA female socket （muti-channel module）	I-PEX coaxial connector （U.FL-R-SMT-1）	PCB stamping hole soldering
Working Frequency	865-868 / 920-925 / 902-928 MHz (Customizable)	865-868 / 920-925 / 902-928 MHz (Customizable)	865-868 / 920-925 / 902-928 MHz (Customizable)

2.4 Signal Interface

The module connects externally through ribbon cables, primarily for power supply, enablement, and communication. Detailed interface definitions can be found in Section 3.2 Module Interface Definitions. The module supports 3.3V TTL-level UART with a default baud rate of 115200 bps.

2.5 Power Consumption

The module operates on a direct current voltage input of 3.5-5.25V. Power Consumption in RF Output Mode is 7.5W. Power Consumption in Standby Mode（EN high TTL level）is 0.175W. Power Consumption in Power Down Mode（EN low TTL level） is 42.5uW.

2.6 Device Certification Information

Table 2.6 CM710 Series Certification Information

Description	CM710-1	CM710-4	CM710-8	CM710-16
RF	United States and Canada Federal Communications Commission(FCC) 47 CFR Part 15 Subpart B 47 CFR Part 2(2.1091) 47 CFR Part 15 Subpart C Professional Installation required under FCC rules European Telecommunications Standards Institute EN IEC 62368-1:2020+A11:2020 EN IEC 62311:2020 ETSI EN 301 489-1 V2.2.3 ETSI EN 301 489-3 V2.3.2 ETSI EN 302 208 V3.3.1			
Safety	Europe CE mark			
Chemical Substance Control	In accordance with RoHS Directive (2011/65/EU) and Amendment (EU)2015/863			

The FCC, RoHS, and CE certifications for the CM-3N and CM-5N modules are currently in progress. For more detailed information regarding certifications, please contact technical support.

3 Hardware Design

3.1 Structural Dimensions

3.1.1 CM-x10 Series Module Structural Dimensions

The module dimensions for the CM-X10 series adhere to a standard hole diameter of 3mm, secured with screws of 2.5mm or 2.0mm in size. Refer to Figures 3.1.1.a to 3.1.1.d for physical images and dimension annotations.

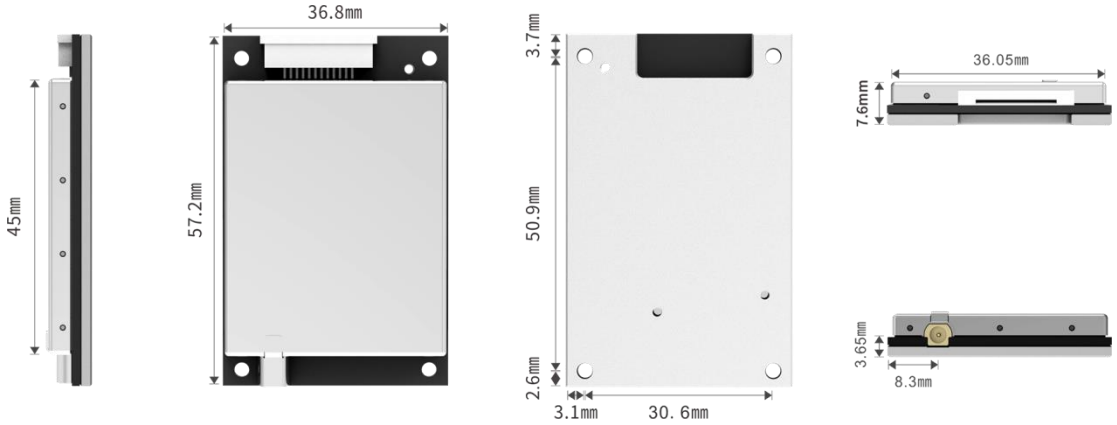


Figure 3.1.1.a Single Channel Module Appearance and Dimension

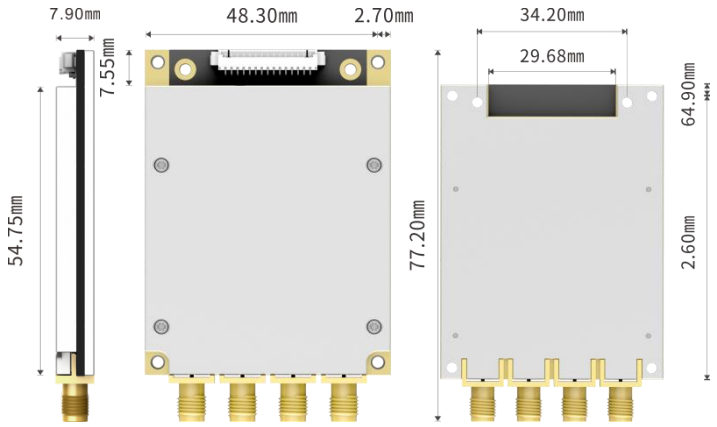


Figure 3.1.1.b Multi-Channel Module (CM710-4) Appearance and Dimension

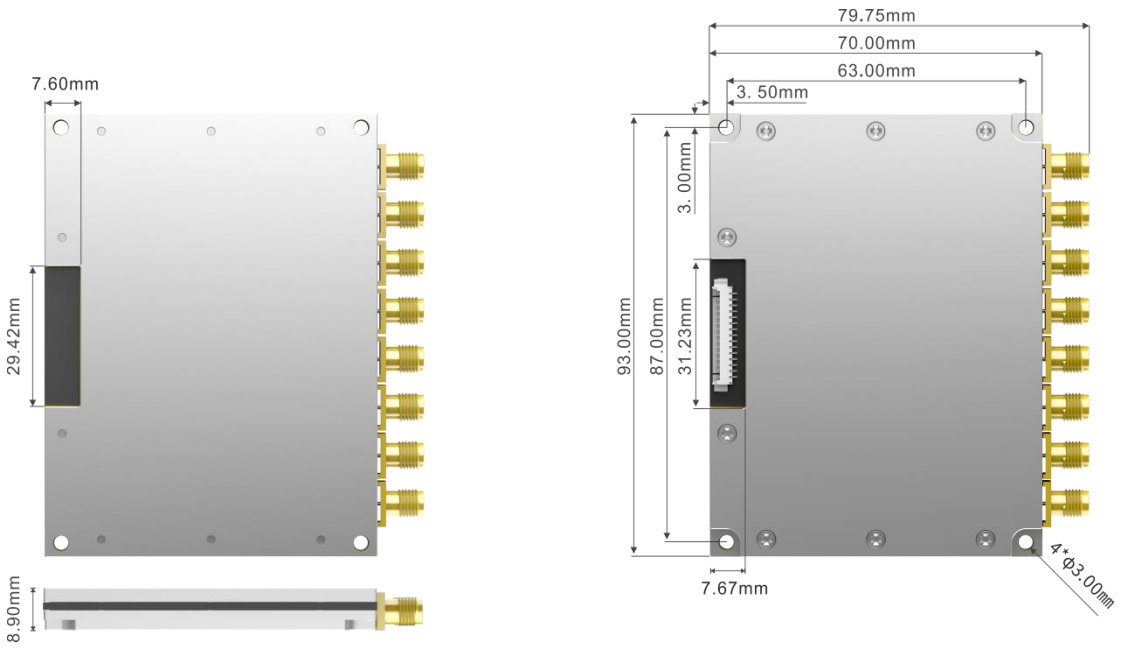


Figure 3.1.1.c Multi-Channel Module (CM710-8) Appearance and Dimension

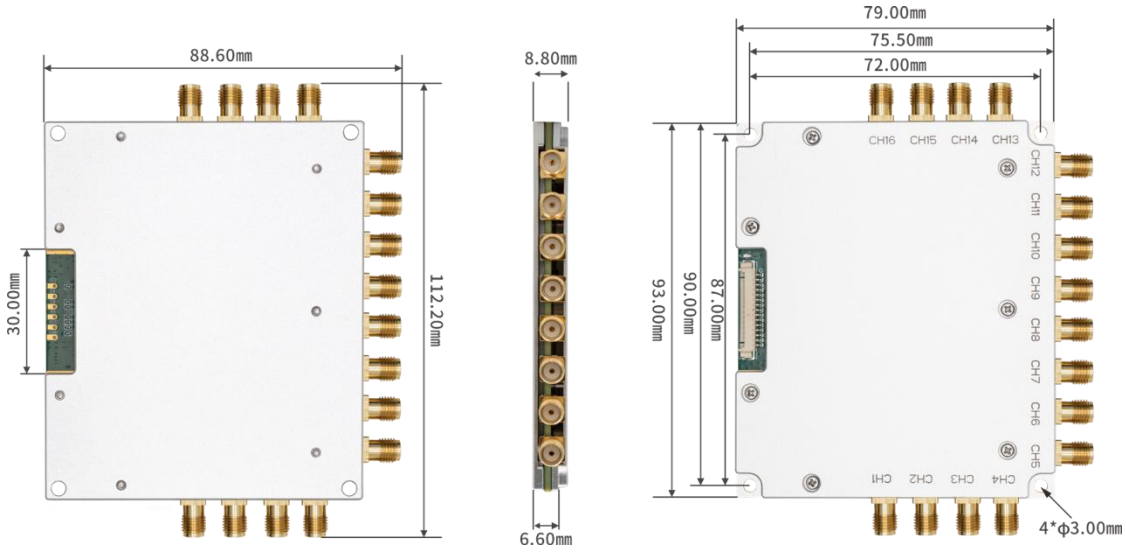


Figure 3.1.1.d Multi-Channel Module (CM710-16) Appearance and Dimension

3.1.2 CM-xN Series Module Structural Dimensions

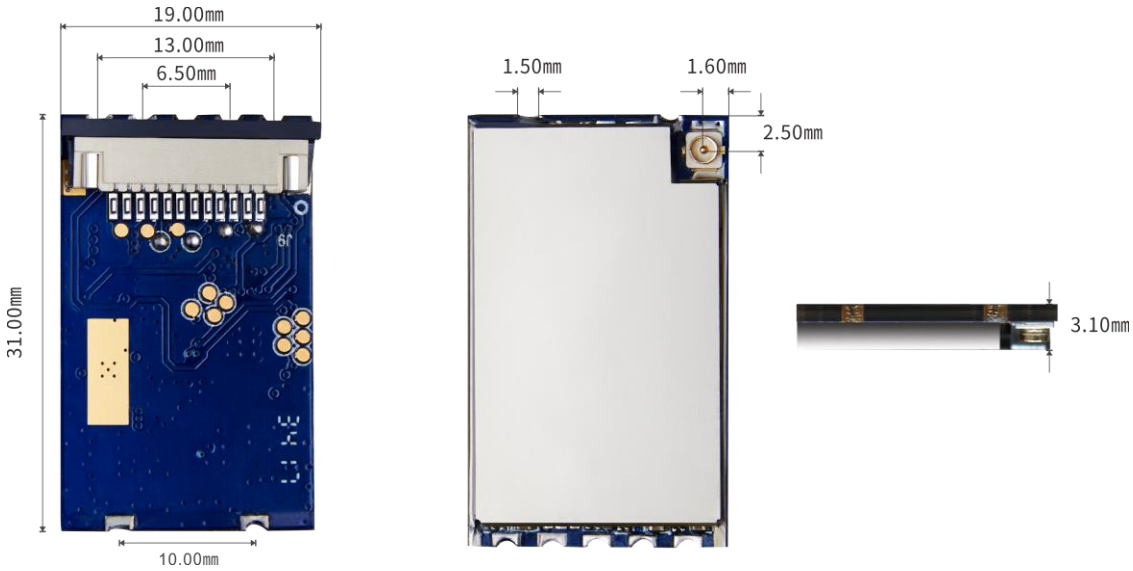


Figure 3.1.2 CM-xN Series Appearance Dimensions

3.1.3 CMx10-Nano Series Module Structural Dimensions

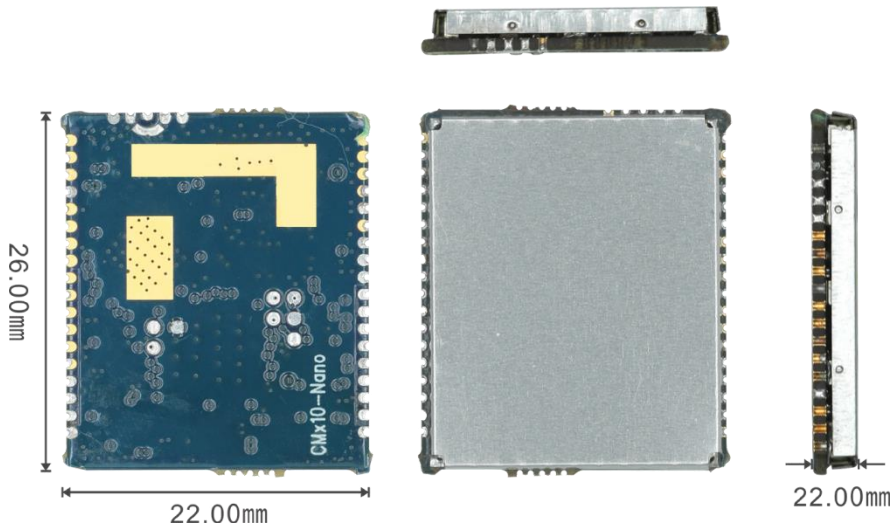


Figure 3.1.3 CMx10-Nano Series Appearance Dimensions

3.2 Module Interface Definitions

3.2.1 CM-x10 Series - Single Port Interface

Figure 3.2.1.a Single Channel Module Interface Diagram

Table 3.2.1.a provides the pin assignment and description for the single channel modules (CM710-1/CM510-1/CM310-1).

Table 3.2.1.a Single Channel Module Interface Definition

Pin No.	Pin Definition	Description
1	VIN	3.5-5.25VDC
2	VIN	
3	GND	Ground
4	GND	Ground
5	EN	High LLT level (>1.2V) boot the module; Low LLT level(<0.4V) out the module
6	IO1	Reserved GPIO 3.3V TTL level
7	IO2	Reserved GPIO 3.3V TTL level
8	IO3	Reserved GPIO 3.3V TTL level
9	UART_RXD	UART receive 3.3V TTL level
10	UART_TXD	UART send 3.3V TTL level
11	NC	/
12	NC	/

3.2.2 CM-x10 Series - Multi-Port Interface

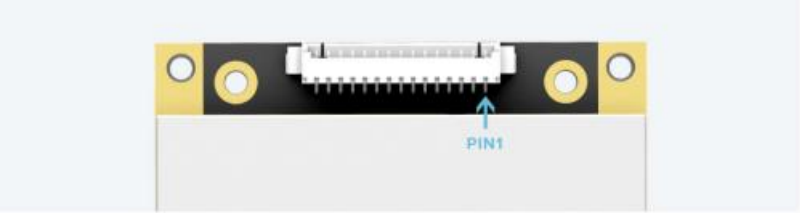


Figure 3.2.2 Multi-Channel Module Interface Definition

Table 3.2.2 provides the pin assignment and description for the multi-channel modules (CM710-4/CM710-8/CM710-16).

Table 3.2.2 Multi-Channel Module Interface Definition

Pin No.	Pin Definition	Description
1	GND	Ground (negative power supply)
2	GND	Ground (negative power supply)
3	VIN	Power positive terminal Input voltage range: 3.5-5.25VDC
4	VIN	
5	GPIO3	Reserved GPIO 3.3V TTL level
6	NC	/
7	PGIO1	Reserved GPIO 3.3V TTL level
8	BUZZ	Drive 3.3V buzzer
9	UART_RXD	UART receive 3.3V TTL level
10	UART_TXD	UART send 3.3V TTL level
11	USB_DM	USB_DATA(-)
12	USB_DP	USB_DATA(+)
13	GPIO2	Reserved GPIO 3.3V TTL level
14	EN	Enable
15	NC	/

3.2.3 CM-xN Series - Interface

Figure 3.2.3 CM-xN Series Module Interface Definition

Table 3.2.3 is the pinout description table for the CM-xN series modules (CM-7N/CM-5N/CM-3N).

Table 3.2.3 CM-xN series module interface definition table

Pin No.	Pin Definition	Description
1	VIN	Power input positive terminal; Input voltage range: 3.5-5.25 VDC
2	GND	
3	EN	High level (> 1.2V) enables the module Low level (< 0.4V) disables the module
4	RXD	UART receives 3.3V TTL level
5	TXD	UART sends 3.3V TTL level
6	GND	
7	GND	
RF connector: I-PEX coaxial connector (U.FL-R-SMT-1)		

3.2.4 CMx10-Nano Series - Interface

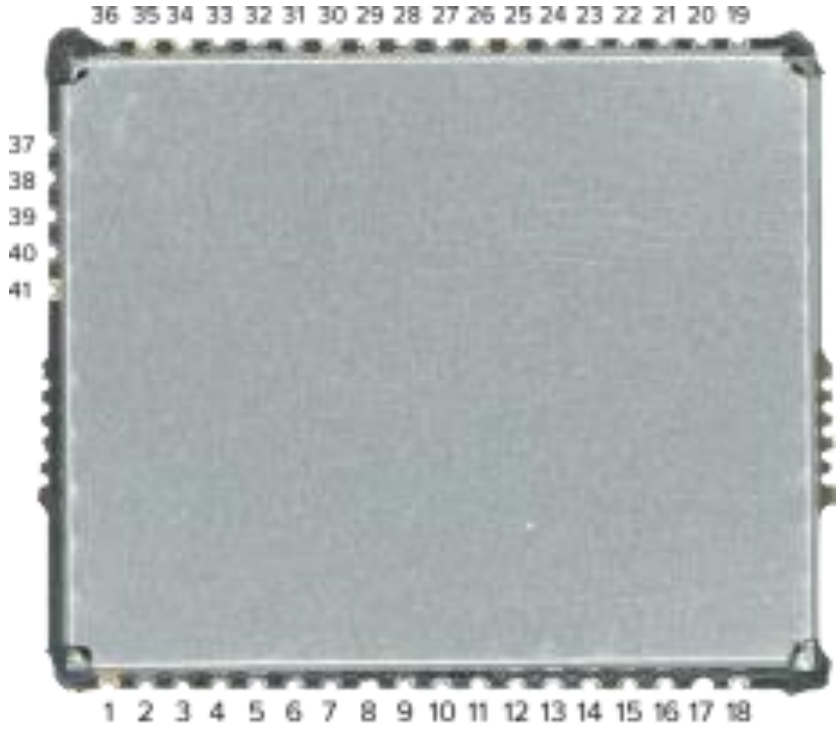


Figure 3.2.4 CMx10-NanoSeries module interface

Table 3.2.4 is the pinout description table for the Nano series modules (CM710-Nano/CM510-Nano/CM310-Nano).

Table 3.2.4 CMx10-Nano series module interface definition

Pin No.	Pin Definition	Description
1-9,18,19,29-36	GND	Ground
10	VOUT	DC 3.3V
11	ENABLE	High level (low or floating) disables the module, while low level enables the module.
12	GPIO1	UART receives 3.3V TTL level.
13	GPIO2	UART sends 3.3V TTL level
14	GPIO3	
15	GPIO4	
16,17	VIN	Input voltage range for power input

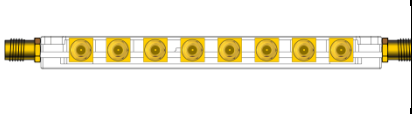
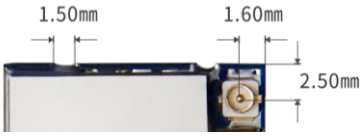
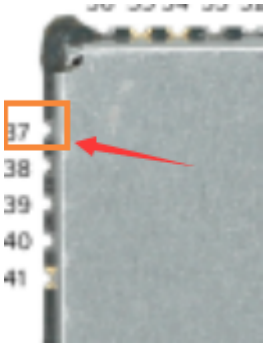
Pin No.	Pin Definition	Description
		positive terminal: 3.5-5.25 VDC
20	TXD	UART sends 3.3V TTL level
21	RXD	UART receives 3.3V TTL level
22-28	NC	
39	RF	Antenna interface
37,38,40,41	GND	RF Ground

3.3 RF interface

The antenna port information of the module is shown in Table 3.3.

Table 3.3 Module RF port description

Series	Module Model	Port Image	Number Of Ports	Port Type
CM-X10	CM710-1		1	50 Ω RF connector MMCX Receptacle
	CM510-1			
	CM310-1			
	CM710-4		4	4-channel 50Ω RF connector SMA receptacle
	CM710-8		8	8-channel 50Ω RF connector SMA

Series	Module Model	Port Image	Number Of Ports	Port Type
				receptacle
	CM710-16		16	8-channel 50Ω RF connector SMA receptacle
CM-xN	x=3/5/7		1	I-PEX coaxial connector (U.FL-R-SMT-1)
CMx10-Nano	x=3/5/7		/	PCB stamp hole soldering

4 Reference design

Users can utilize the development board provided by our company to control the module or refer to the development board for integration design to achieve module functionality control. The specifications and interfaces of the Chainway development board are detailed below.

4.1 Chainway Development board appearance and dimensions

Figure 4.1.1 shows the actual Chainway Development Board image. Figure 4.1.2 shows the design dimensions of the development board.

Figure 4.1.1 Actual Development Board

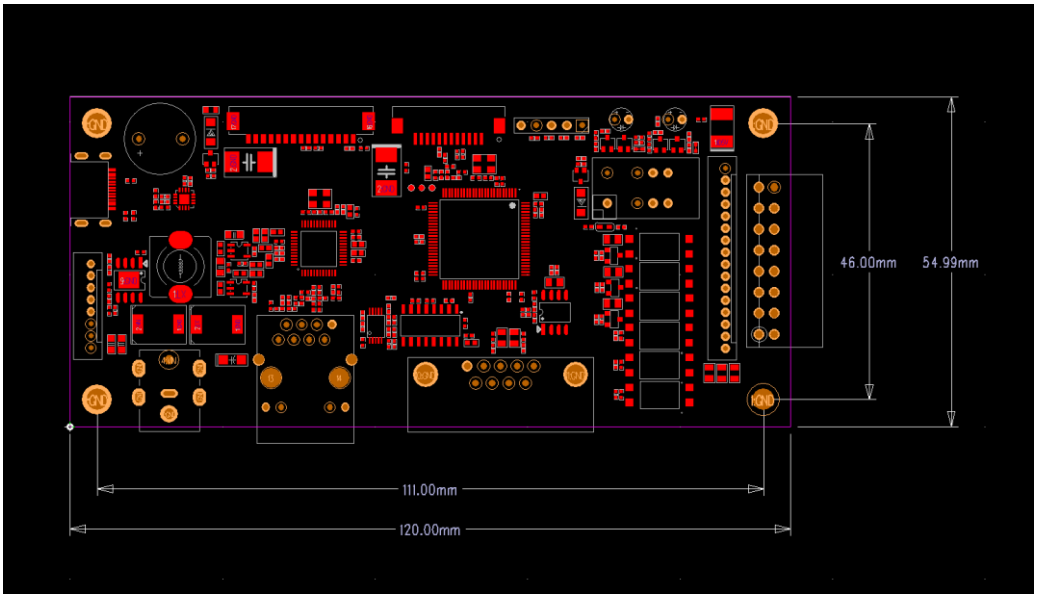


Figure 4.1.2 Design Dimensions Of The Development board

4.2 Development Board Interface

The main interfaces of the development board are shown in Figure 4.2.

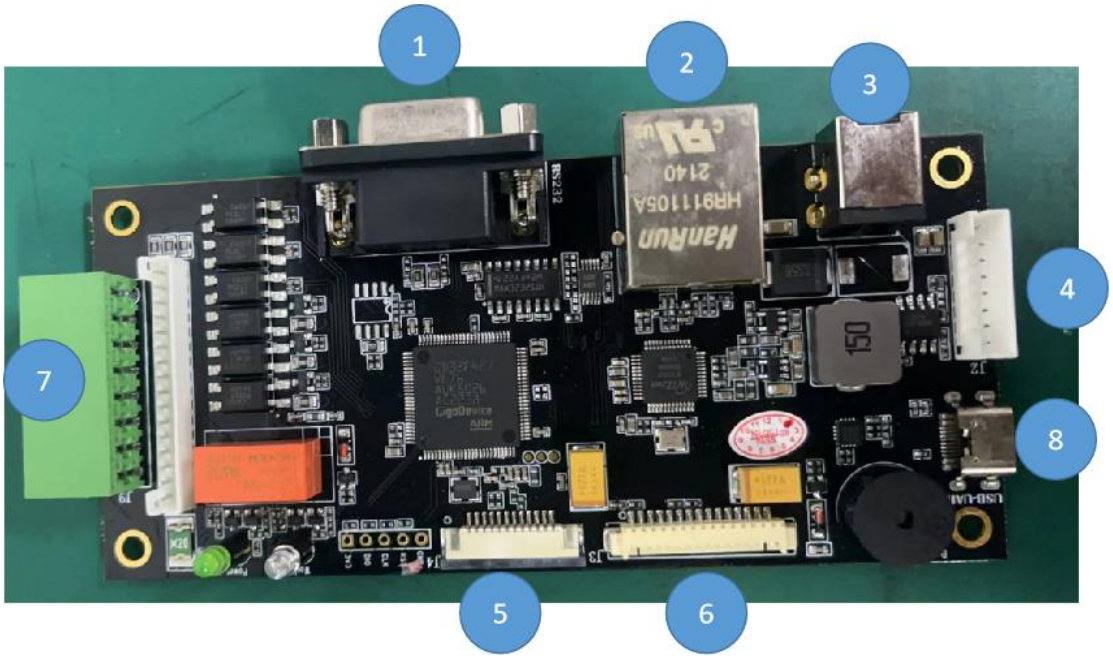


Figure 4.2 Development board device interface diagram

Table 4.2 is the pinout description table for the development board interfaces.

Table 4.2 Development board interface definition

No.	Name	Description
1	RS232	Standard RS232 interface
2	RJ45	Standard RJ45 interface
3	Adapter interface	For 12V 2A power adapter
4	8pin RS232 interface	Serial connection cable-Reserved only,No actual function
5	12-pin single-channel module interface	FPC connector for single-channel module
6	15-pin multi-channel module interface	Multi-channel module connection cable
7	GPIO interface	Custom external functionality
8	USB serial cable	Connect to Type-C interface

4.3 Detailed Description of Each Interface

4.3.1 The 8-pin RS232 interface location and definition on the development board - Reserved only

Figure 4.3.1 8-pin RS232 interface location (Position 4)

Please note that this interface is a reserved slot and will not be used. Table 4.3.1 is the explanation of the 8-pin RS232 interface location.

Table 4.3.1 8-pin RS232 interface definition

No.	Name	Description
1	VCC	Power output +12V
2	VCC	Power output +12V
3	VCC	Power output +12V
4	GND	Power ground
5	GND	Power ground
6	GND	Power ground
7	RS232-RX	RS232 signal receive

8	RS232-TX	RS232 signal send

4.3.2 The development board connection for the single-channel module interface location and definition

If using a single-channel module (CM710-1/CM510-1/CM310-1), connect it to the corresponding position on the development board using the supplied single-channel module FPC cable. The development board location is shown in Figure 4.3.2.

Figure 4.3.2 12-pin single-channel module interface location (Position 5)

Table 4.3.2 is the explanation of the 12-pin single-channel module (CM710-1/CM510-1/CM310-1) interface location. The interface numbers, from left to right, are 1 to 12, as shown in Figure 4.3.2.

Tabel 4.3.2 12pin single-channel module interface definition

No.	Name	Description
1	NC	/
2	NC	/
3	UART_TX	UART send
4	UART_RX	UART receive
5	NC	/
6	NC	/
7	NC	/
8	EN	Enable
9	GND	Power ground

No.	Name	Description
10	GND	Power ground
11	VCC	Power output +5V
12	VCC	Power output +5V

4.3.3 The development board connection for the multi-channel module interface location and definition

If using a multi-channel module (CM710-4/CM710-8/CM710-16), connect it to the corresponding position on the development board using the supplied multi-channel module connection cable. The development board location is shown in Figure 4.3.3.

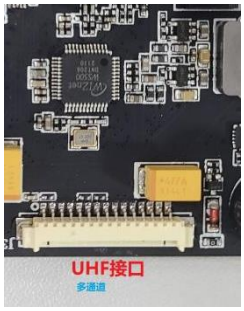


Figure 4.3.3 15pin Multi-channel module interface location (Position 6)

Table 4.3.3 is the explanation of the 15-pin multi-channel module (CM710-4/CM710-8/CM710-16) interface location. The interface numbers, from left to right, are 1 to 15, as shown in Figure 4.3.3.

Table 4.3.3 15pin Multi-channel module interface definition

No	Name	Description
1	NC	/
2	EN	Enable
3	NC	/
4	NC	/
5	NC	/
6	UART_TX	UART Send
7	UART_RX	UART Receive
8	NC	/
9	NC	/

No	Name	Description
10	NC	/
11	NC	/
12	VCC	Power output +5V
13	VCC	Power output +5V
14	GND	Power ground
15	GND	Power ground

4.3.4 The development board GPIO interface location and definition

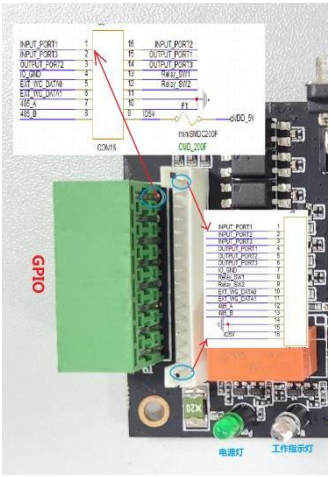


Figure 4.3.4 GPIO interface location (Position 7)

Table 4.3.4 provides the explanation of the GPIO interface locations on the development board. The specific numbering and position information are shown in Figure 4.3.4.。

Table 4.3.4 Development Board GPIO Interface Definition

Interface number	1	2	3	4	5	6	7	8
Definition	Input 1	Input 3	Output 2	IO_GND	Dada 0	Data 1	485_A	485_B

Interface number	16	15	14	13	12	11	10	9
Definition	Input 2	Output 1	Output 3	Relay_sw1	Relay_sw2	SYS_GND	SYS_GND	VDD5V

5 Example Demonstration

This article uses a demo system consisting of a development board, RFID module, antenna, and tags for the example demonstration.

5.1 Hardware connection

The module needs to be connected to the development board via the module connection cable, and the radio frequency (RF) cable must be used to connect the module to the antenna. The development board requires a 12V 2A power supply and must be connected to the host through a standard communication cable (RS232/RJ45) in order to experience RFID functionality. The RFID system hardware list is shown in Table 5.1, and the schematic diagram of the module connection is shown in Figure 5.1.1.

Table 5.1 Hardware list

Name	**Model/Specification**	**Function**	**Remarks**
DEMO	C#-demo (V1.3.13)	PC-side demo software	See attachment
RFID Module	CM-x10		Optional purchase
Development Board		Integrated circuit	Optional purchase, HDK to be used as development board component

RFID Module Cable	FPC_12PIN/C_15PIN	Connect development board and module for communication	
Power Supply	12V/2A	Power supply for development board	
RF Cable	MMCX to SMA	Connect module to antenna	Optional purchase
Antenna	RC05 Antenna		Optional purchase
Tag	Alien H3 Tag		Self-purchase
Communication Cable	USB-A to RS232 or RJ45	Connect PC to development board	Self-purchase

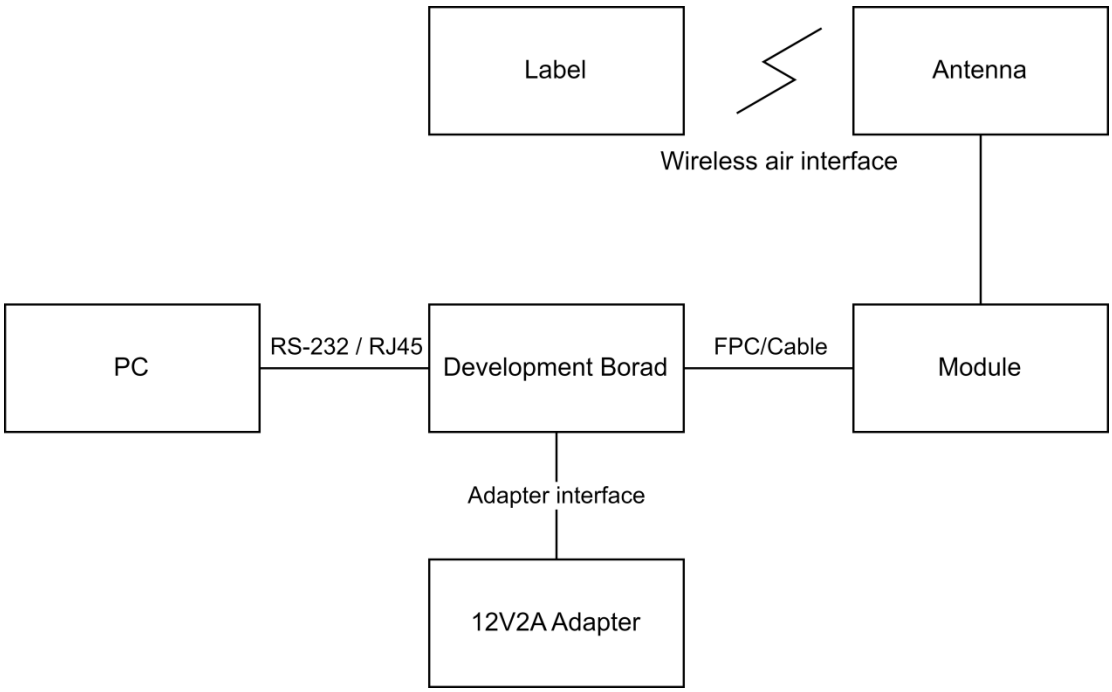


Figure 5.1.1 Module Connection Diagram

Connecting a module typically requires an antenna, RF cable, module connection cable, development board, and a 12V2A power supply. This document uses the CM710-1 module along with Chainway's development board as an example for explanation (clients can also use their own development board for integration). The method shown can be referenced for connecting other modules as well. See Figure 5.1.2 for further details.

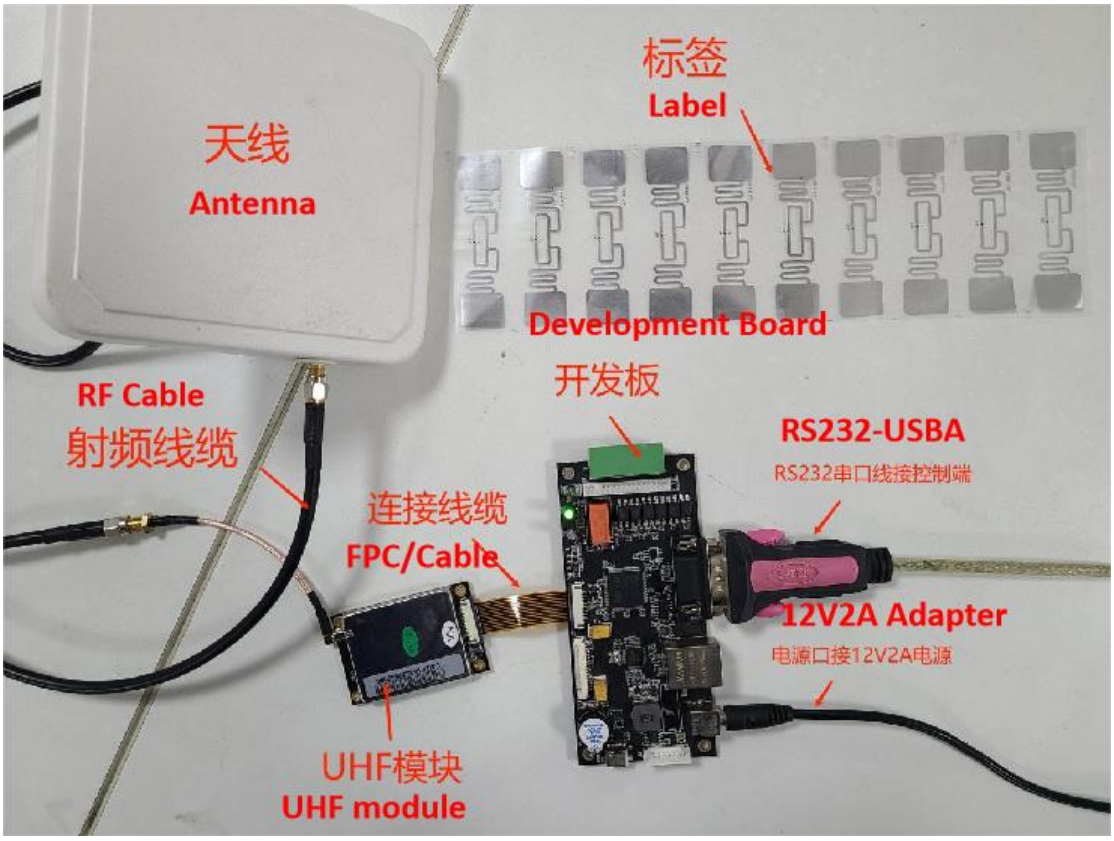


Figure 5.1.2 Hardware Connection Example

5.2 Initial Connection Steps for PC Demo

1. Set up the hardware system as described in the previous sections, and connect it to the computer using the RS232 or RJ45 interface. The following subsections will explain the demo connection methods separately for serial connection (RS232) and network connection (RJ45).

2. Open the Demo provided in the attachment and select the appropriate connection method in the demo according to the type of connection between the development board and the computer.

5.2.1 Serial Connection (RS232) Method

Connecting via serial port to the development board allows direct control through the

demo on the computer, as shown in Figure 5.2.1.

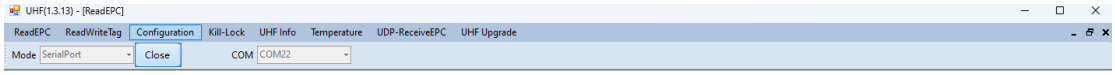


Figure 5.2.1 Interface for Connecting the Device via Serial Cable

5.2.2 Network Connection (RJ45) Method

The host can be directly connected to the development board via an Ethernet cable. Set the host and the development board to be on the same network segment. The host can be configured as shown in Figure 3.3.2.a, with the host IP address set to 192.168.99.100 and the subnet mask set to 255.255.255.0.(Control Panel-->Network and Internet--> Ethernet-->Properties-->Internet Protocol version 4 (TCP/IPv4)-->Use the following IP address)

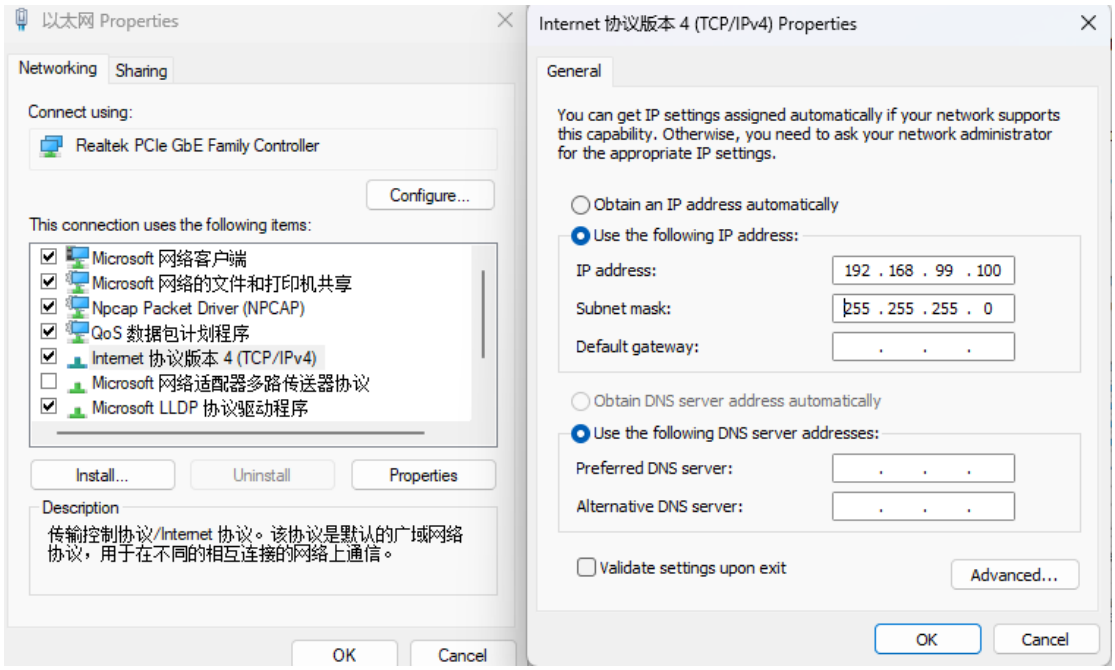


Figure 5.2.2.a Host IP Configuration

Connect via RJ45 network cable, select "Network" as the communication method, and input the device's IP address and port number in the IP input field (default IP for Chainway development board: 192.168.99.202, Port: 8888). Click the "Open" button to establish the connection between the PC and the device. The

interface after connection is shown in Figure 3.3.2.b. Click the "Close" button to disconnect.

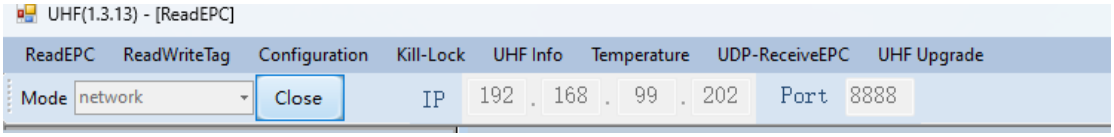


Figure 5.2.2.b Demo software network connection interface

5.3 Main Operation Process Demonstration

This section mainly introduces the functions of quick inventory, tag reading, writing, locking, and destroying through the Demo. It also provides a detailed explanation of the display of basic device information, parameter configuration, and firmware upgrade functions. Users can flexibly configure the device according to on-site needs and easily manage RFID tags through the inventory function.

5.3.1 Quick Inventory

On the demo home page, quick inventory can be performed by selecting "Start," as shown in Figure 5.3.1.a. The inventory page displays the information of the detected tags, such as EPC, TID, COUNT, and ANT. EPC stands for Electronic Product Code, TID represents the unique identifier, COUNT indicates the number of times the tag has been inventoried, and ANT represents the antenna used during the current inventory of the tag.

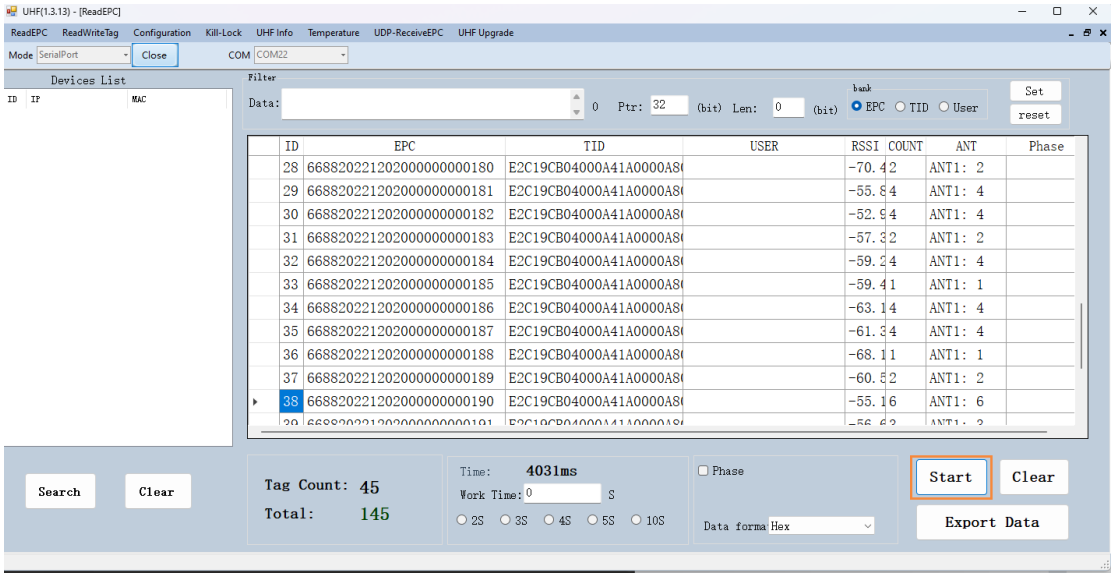


Figure 5.3.1.a Tag Inventory

The Demo includes multiple inventory modes. By clicking on "Configuration" in the menu bar and scrolling down to the inventory mode section, specific information can be viewed, such as EPC, EPC+TID, and EPC+TID+USER modes. The appropriate inventory mode can be selected based on the actual project requirements.

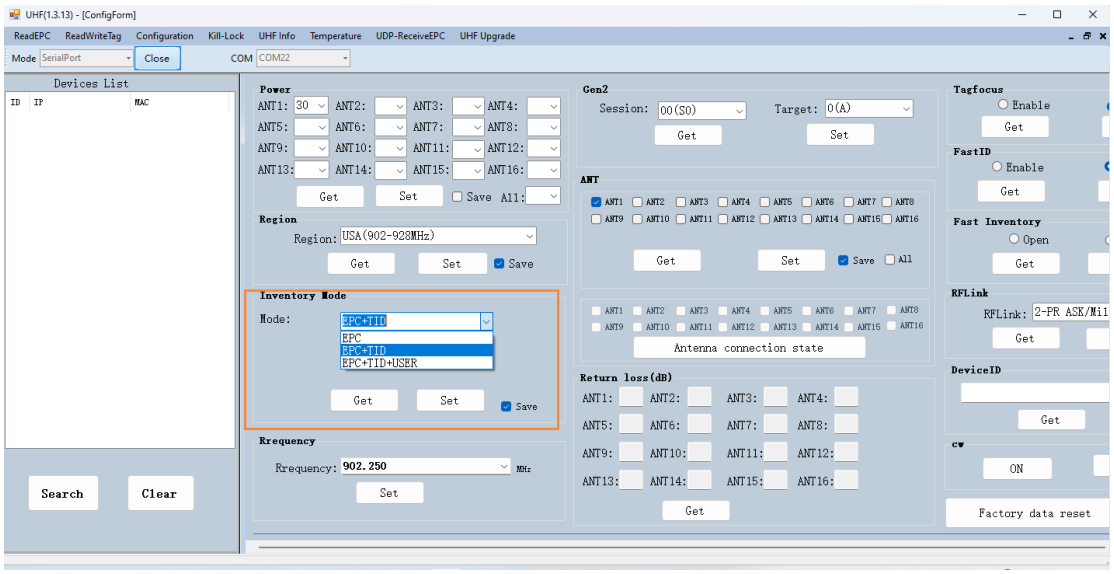


Figure 5.3.1.b Inventory Mode choice

Figures 5.3.1.c to 5.3.1.e provide examples of data returned when different inventory modes are selected.

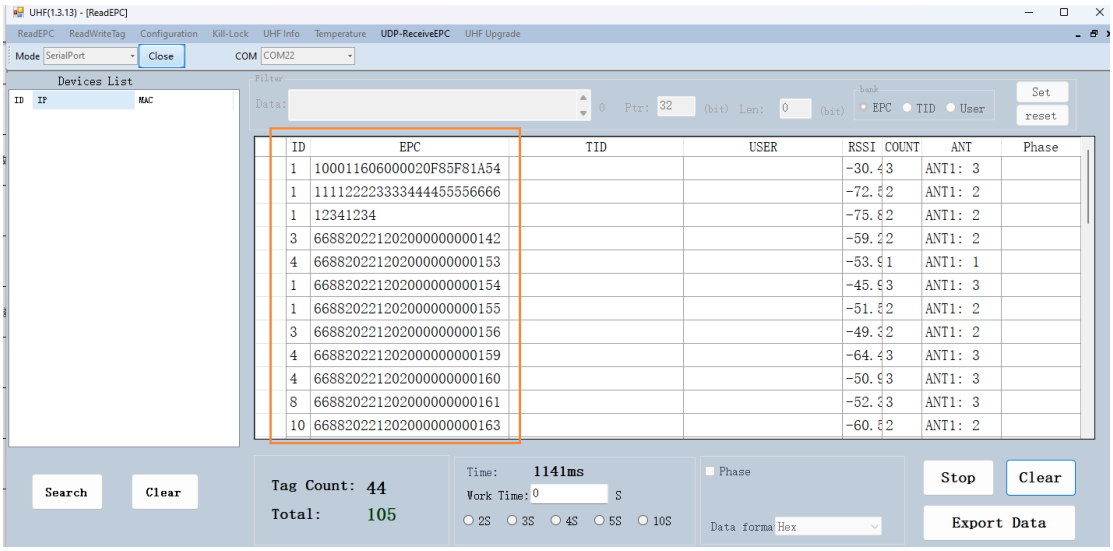


Figure 5.3.1.c Inventory mode choice EPC

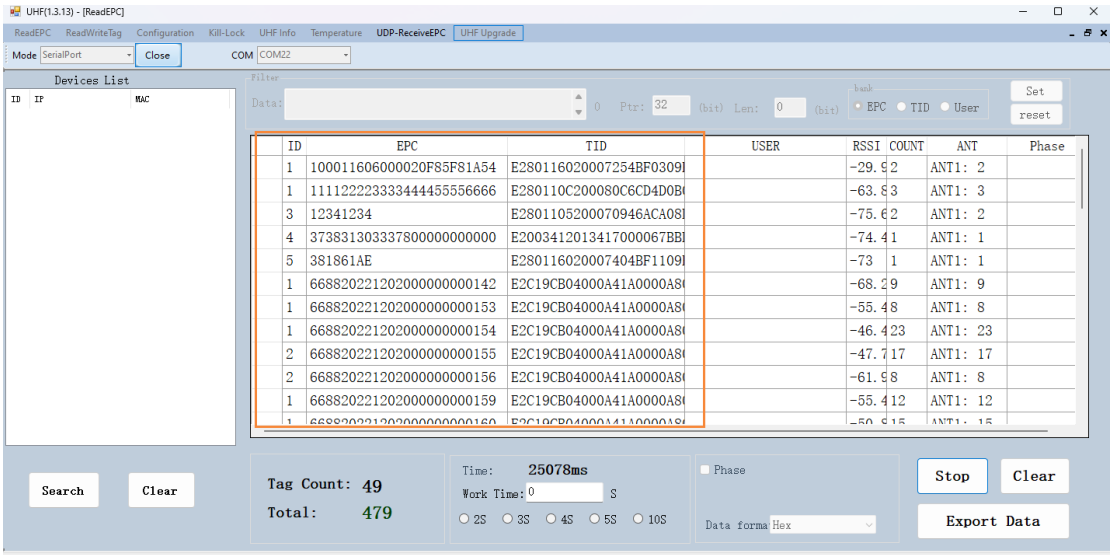


Figure 5.3.1.d Inventory mode choice EPC+TID

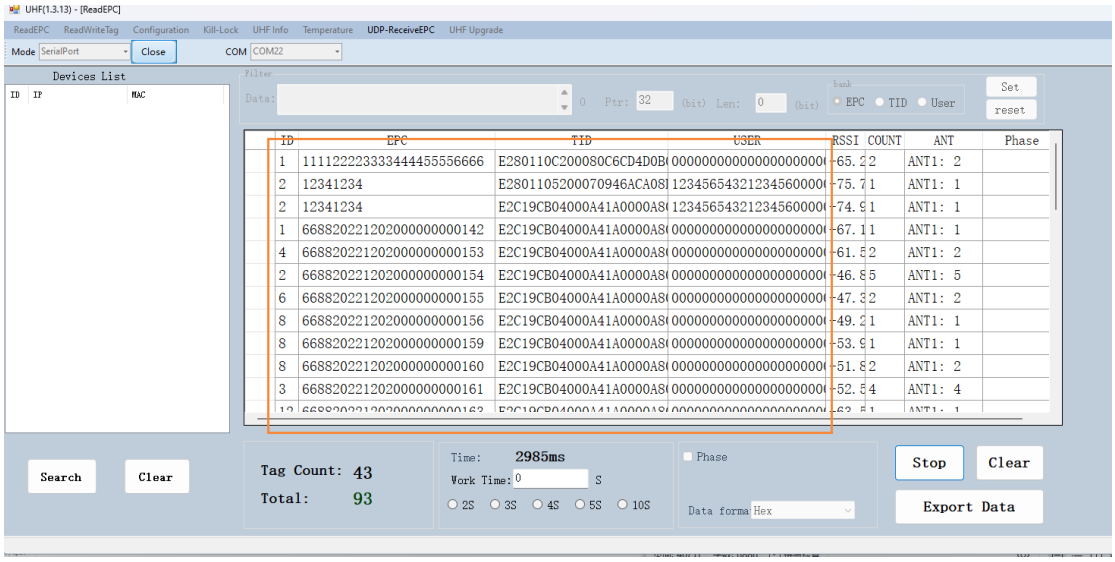


Figure 5.3.1.e Inventory mode choice EPC+TID+USER

5.3.2 Read Tag

Clicking on the "ReadWrite Tag" option in the top menu bar of the Demo will navigate to the "Read" page. Here, you can select to read data from four memory banks (RESERVED, EPC, TID, USER), set the starting address and read length, and the default access password is "00000000" (eight zeros). Click the "Read" button to proceed, as shown in Figure 5.3.2.

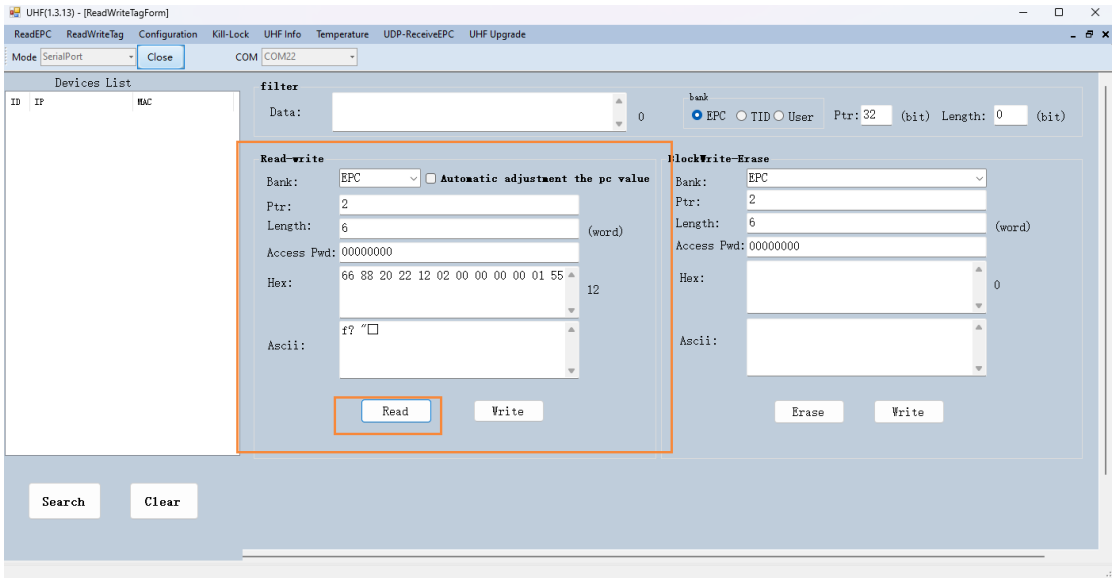


Figure 5.3.2 Read tag information

5.3.3 Write Tag

Clicking on the "ReadWrite Tag" option in the top function bar of the Demo will take you to the write page. You can select to write data to memory banks (RESERVED, EPC, USER), set the starting address and write length, input the access password, and the data content to be written (in hexadecimal). Click the "Write" button to execute the write operation. The default starting address for the EPC is from the 2nd position, and the length represents the data length on the tag, which can be customized as needed. Details are shown in Figure 5.3.3.

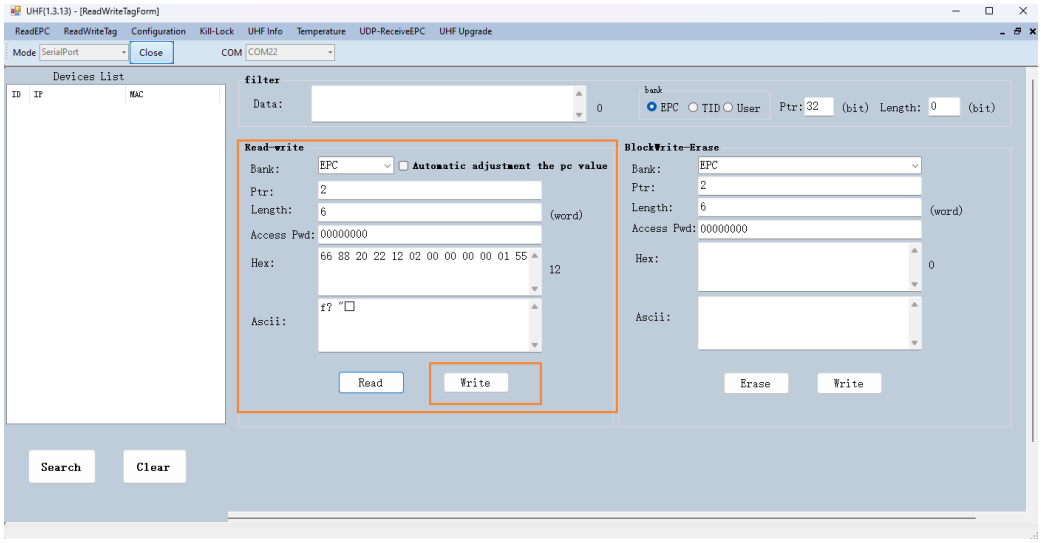


Figure 5.3.3 Write Tag information

Access Pwd：The default initial password is eight zeros: `00000000`.

EPC: Electronic Product Code (EPC), data from this area is often read in practical applications.

TID：The Tag Identifier (TID) is a unique identifier for the tag and is generally immutable.

User : User memory is used to store relevant information about the user or operator.

Ptr： Starting address position, default starting from the 2nd position.

Length：Customizable setting for the corresponding length of data to be read or written.

5.3.4 Lock Tag

Click on the "Kill-Lock" option in the Demo's top menu to enter the tag locking page. Enter the access password for the tag to be locked, select the area to lock, and click "Confirm" to proceed with the locking. Based on the specific project requirements, you can choose to lock, permanently lock, or destroy the tag, as shown in Figure 5.3.4. (Please note that once a tag is locked, it cannot be easily modified, ensuring protection against tampering with the tag data.)

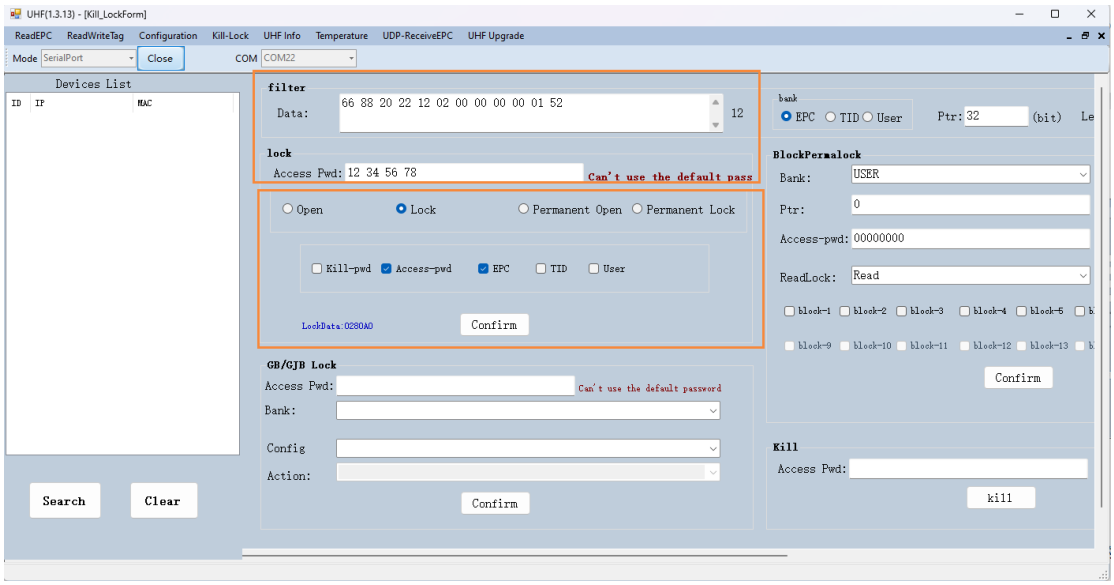


Figure 5.3.4 Tag Locking

5.3.5 Kill Tag

Click on "Kill-Lock" at the top of the Demo page to access the tag destruction interface. Enter the access password for the tag to be destroyed in the "Access Pwd" field in the bottom-right corner of the page, then click "Kill" to destroy the tag. The default initial password (00000000) cannot be used for tag destruction. As destroyed tags are irrecoverable, exercise caution during actual operations.

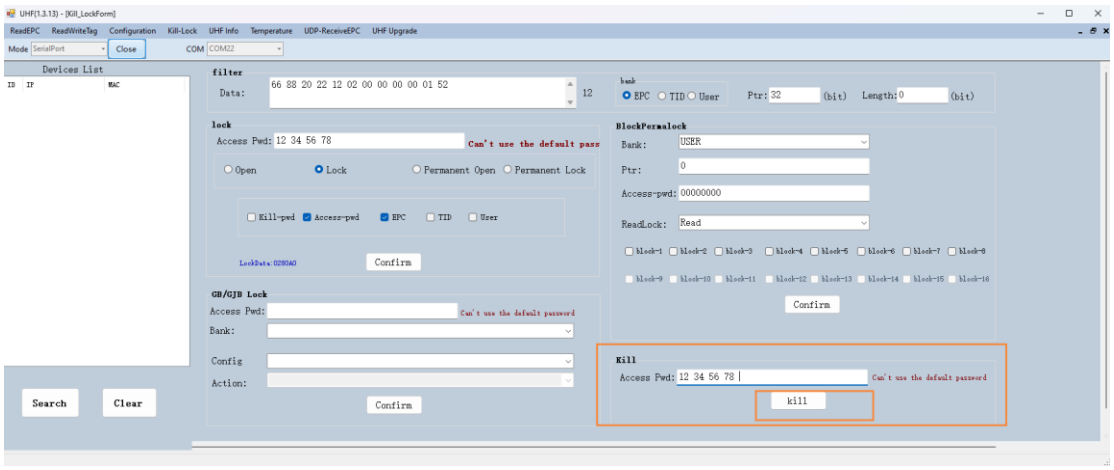


Figure 5.3.5 Kill Tag

Note: The operations of reading, writing, locking, and destroying tags are applicable only to single-tag operations.

5.3.6 Basic Information

(1) UHF Information

Clicking "**UHF Info**" allows you to view the UHF information of the current reader, including the firmware version and hardware version of the module.

If the version information in "**UHF Info**" is blank or partially incomplete, it indicates that the Demo program and the reader are not fully connected. It is recommended to close the program and reopen it.

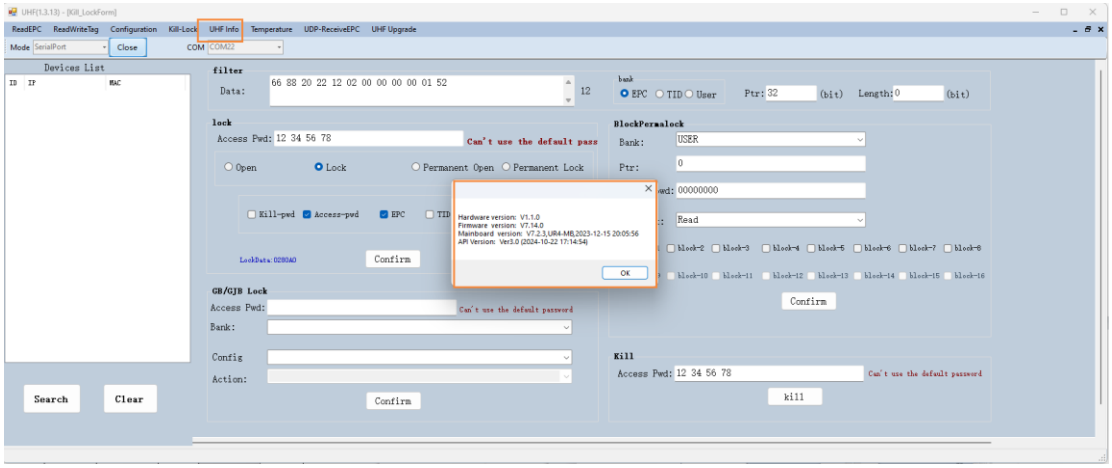


Figure 5.3.6.a UHF Information

(2)Temperature

This section displays the current operating temperature of the device. During actual projects, this feature can be used to monitor the device's operating status. If abnormal temperature readings occur during use, promptly investigate the cause to prevent potential damage to the device.

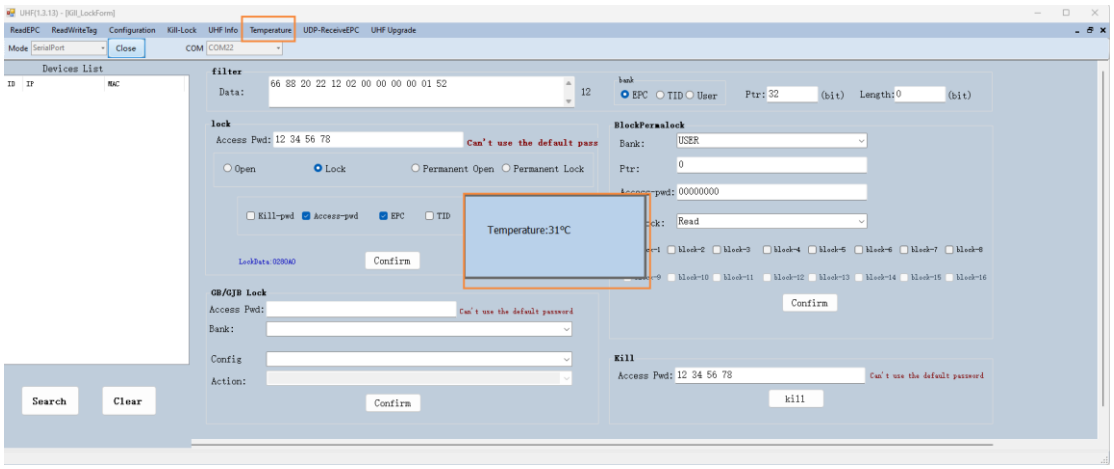


Figure 5.3.6.b Read module temperature

(3)Export Data

After completing inventory, click "Export Data" at the bottom right of the Demo homepage to export the inventoried data into a spreadsheet. Follow the prompts to locate the file path, and open the spreadsheet to view the exported data. Refer to Figure 5.3.6.c for an example of the data spreadsheet.。

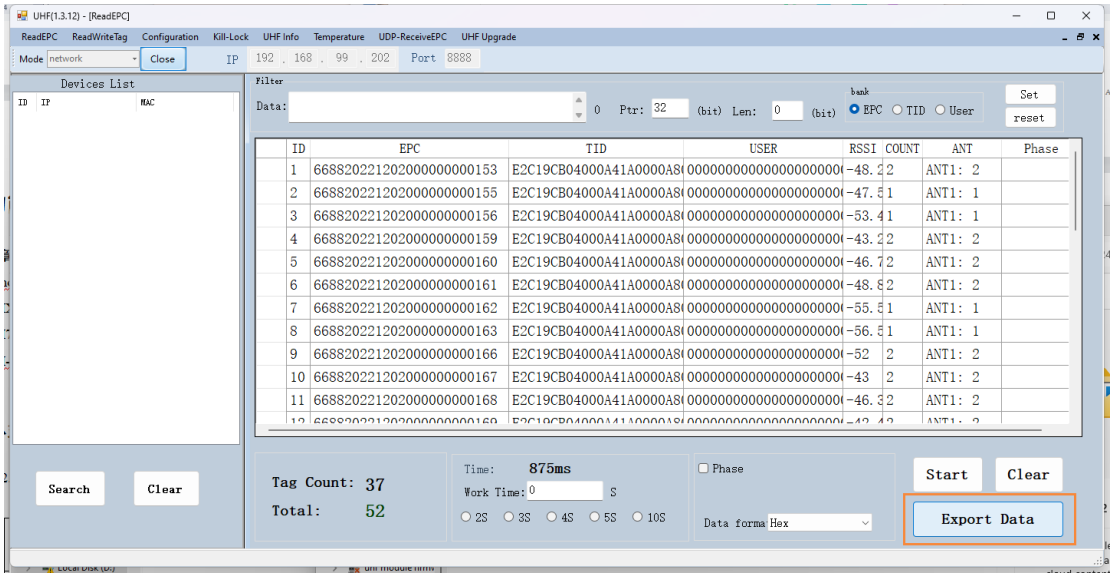


Figure 5.3.6.c Export data

As shown in Figure 5.3.6.d, it is an example of the data in the Excel table under the corresponding path.

	A	B	C	D	E	F	G
1	EPC	TID	USER	COUNT	ANT	RSSI	
2	100011606000020F85F81A54	E280116020007254BF0309F0		5	ANT1:5	-68.3	
3	E28011606000020F85F71084	E280116020006084BEE209F0		3	ANT1:3	-74.9	
4	E28011606000020F85F73A34	E280116020006234BEE709F0		2	ANT1:2	-37.7	
5	E28011606000020F85F73A44	E280116020007244BEE709F0		4	ANT1:4	-50.3	
6	E28011606000020F85F73A94	E280116020006294BEE709F0		3	ANT1:3	-66.7	
7	E28011606000020F85F73AA4	E2801160200062A4BEE709F0		3	ANT1:3	-49.7	
8	E28011606000020F85F73AF4	E2801160200062F4BEE709F0		11	ANT1:11	-38.8	
9	E28011606000020F85F73C04	E280116020006404BEE709F0		3	ANT1:3	-57.5	
10	E28011606000020F85F73C54	E280116020006454BEE709F0		6	ANT1:6	-66.7	

Figure 5.3.6.d Export data table

5.3.7 Detailed Explanation of Parameter Configuration

Access the **"Configuration"** function page to adjust device settings such as power, antenna, and modes through the DEMO software. These configurations can be customized to meet the requirements of on-site applications, as shown in Figure 5.3.7.a.

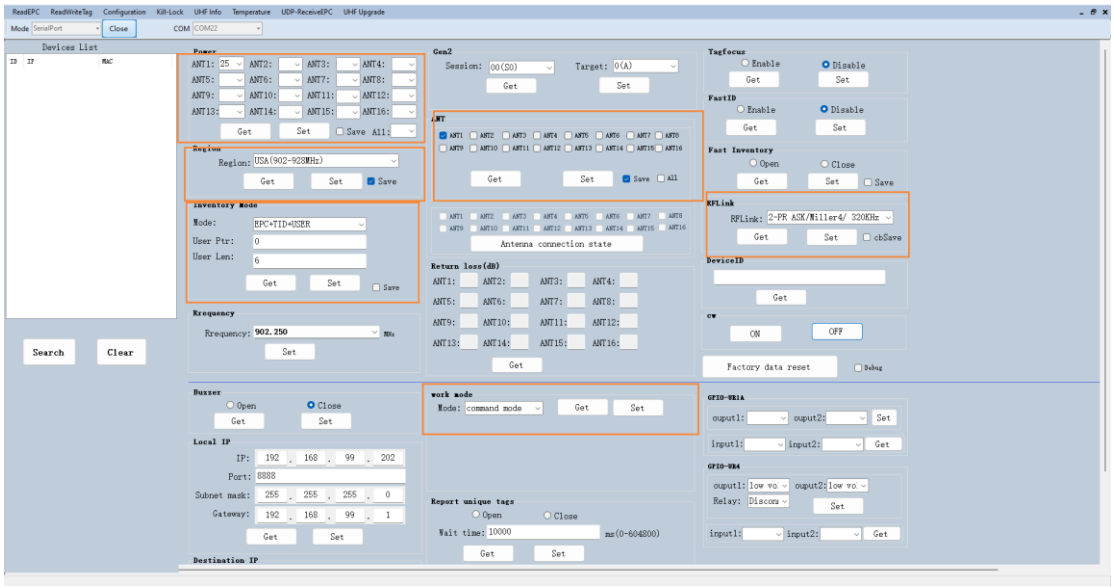


Figure 5.3.7.a Device Parameter Configuration

- **Power**: Controls the module's output power (range: 1~30). Higher power increases the read range.

- **Region**: Configures the module's operating frequency band. Different countries may have specific frequency restrictions.
- **Inventory Mode**: Sets the tag storage areas to be read during inventory (EPC, TID, USER).
- **ANT**: Before performing inventory, ensure the corresponding antenna interface is enabled.
- **Work Mode**: Supports command mode, automatic mode, and trigger mode.
    - In **command mode**, the user manually controls start, stop, and retrieves RFID data.
    - In **auto mode**, the device begins inventory immediately upon power-on.
    - In **trigger mode**, sensors provide high/low-level signals to control the start/stop state of the device.
- **RFLink**: Controls the reader's link combinations. Standard usage is PR ASK/Miller4/320KHz, no configuration needed.
- **Gen2**:
    - **Session**: Configures tag state transition time after being read.
    - **Target**: Specifies whether to read A/B surfaces, improving read rates. Standard usage keeps default settings.
- **TagFocus**: Ensures the same tag within the read range is only read once until it exits and re-enters. Improves read rates and is applicable to TagFocus-enabled Impinj tags. Keep default for regular usage.
- **FastID**: Accelerates EPC+TID inventory through low-level operations. Applicable to FastID-supported Impinj tags. Default settings are sufficient for regular use.
- **Fast Inventory**: Enhances tag inventory speed using specific algorithms. Suitable for Fast Inventory-supported Impinj tags. Keep default for general use.

- **Fixed Frequency**: Fixes the device to a specific frequency point. No adjustment is necessary for standard inventory operations; keep default settings.

5.3.8 UHF Firmware Upgrade

Before performing a UHF firmware upgrade, ensure the corresponding firmware file is downloaded to the local computer. Open the Demo application and click on **"UHF Upgrade"**.

1. Click **"Select File"** and navigate to the firmware file's location.
2. Check the **"UHF 固件"** option.
3. Click **"Upgrade"** to initiate the process.

Wait for the progress bar to complete. Upon successful completion, a popup will display the updated version number, along with the message **"Upgrade Complete"**.

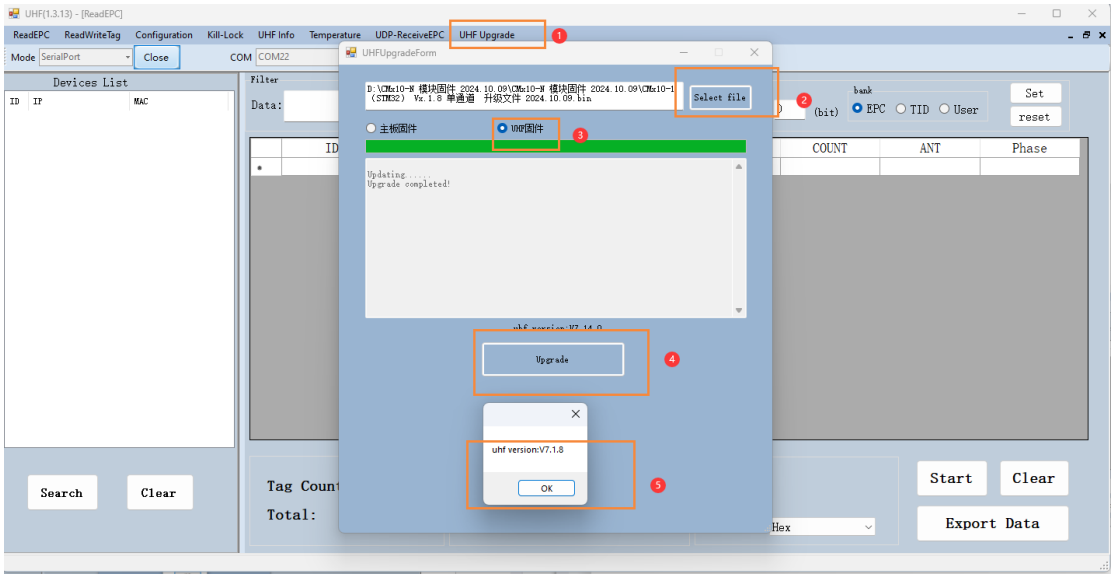


Figure 5.3.8 UHF Firmware Upgrade

6 Software Development

The software development for the RFID module can be based on the provided SDK development package or the UHF Application Layer communication protocol to achieve software control of the module. The SDK development package supports Android embedded development and PC host development, including JAVA, C, C#, and other development languages. For more details, please refer to the SDK package and corresponding source code provided by technical support.**UHF Application Layer Communication Protocol** includes the physical layer interface definition of the RFID read/write module, protocol messages, and other related content.

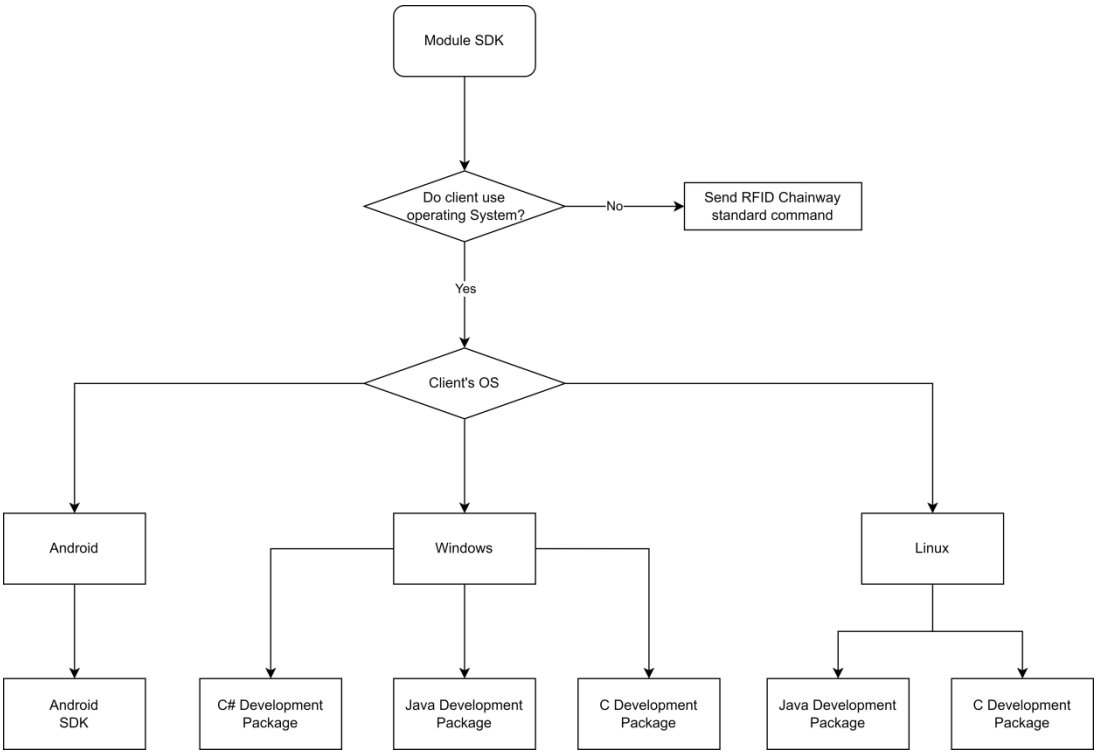


Figure 6 Guide to Module Development Options

6.1 SDK Development

As shown in Figure 6, it presents the development options based on the module device SDK. Users can choose the corresponding SDK for development according to

the operating system and development language they use.

1. Android System：Provides Android SDK for development.

2. Windows System: Supports development in C#, Java, and C languages.

3. Linux System: Supports development in Java and C languages.

6.2 Protocol Development

If users do not use the operating system to control the module, can refer to the following common commands to complete the use of the module. Other detailed commands can be referred to in the "**UHF Application Layer Communication Protocolv2.12_EN**"

Users can choose the SDK according to their operating system and programming language needs for development. Specific references can be found in the official source code.

6.2.1 Common Protocol Examples

The protocol is compatible with both A5 5A and C8 8C frame headers.

1、Get the firmware version number

Send: a5 5a 00 08 02 0a 0d 0a

Respond：a5 5a 00 0b 03 07 00 00 0f 0d 0a

Firmware Version Number：V7.0.0

2、Reading 6 words from Tag EPC Area (12 bytes)

Send：a5 5a 00 16 84 00 00 00 00 01 00 20 00 00 01 00 02 00 06 b6 0d 0a

Reading Success：a5 5a 00 18 85 01 00 00 06 11 22 33 44 55 66 77 88 99 aa bb cc 56 0d 0a

Reading Failure：a5 5a 00 0c 85 00 22 00 00 ab 0d 0a

EPC Area Data：11 22 33 44 55 66 77 88 99 aa bb cc (6 words, 12 bytes)

3、Writing 6 words(12 bytes) to Tag EPC Area, Data to Write is 11 11 22 22 33 33 44 44 55 55 66 66

Send：a5 5a 00 22 86 00 00 00 00 01 00 20 00 00 01 00 02 00 06 11 11 22 22 33 33 44 44 55 55 66 66 80 0d 0a

Writing Success：a5 5a 00 0a 87 01 00 8c 0d 0a

Writing Failure：a5 5a 00 0a 87 00 01 8c 0d 0a

4、Get the current device transmit power

Send：a5 5a 00 08 12 1a 0d 0a

Response：a5 5a 00 0e 13 00 00 07 d0 07 d0 1d 0d 0a

Power is 20dB

5、Set the read power to 18dBm and the write power to 18dBm

Send：a5 5a 00 0e 10 02 01 07 08 07 08 1d 0d 0a

Respond：a5 5a 00 09 11 01 19 0d 0a

6、Inventory Tags

Send：a5 5a 00 0a 82 00 00 88 0d 0a

Received：a5 5a 00 19 83 34 00 11 11 22 22 33 33 44 44 55 55 66 66 fe d3 01 82 0d 0a

.....

Multiple commands are returned if labelled, no data is returned if not labelled. After sending the inventory command, you have to send "Stop continuous tag inventory" before you execute other operations.

7、Stop Inventory Tags

Send：a5 5a 00 08 8c 84 0d 0a

Response：a5 5a 00 09 8d 01 85 0d 0a

8、For the User area of the EPC number: E2 00 00 17 01 0B 00 57 19 10 50 2D ,address 0 of the User area of the tag, write to the data of 11 11 22 22 33 33 44 44 55 55 66 66

Send：a5 5a 00 2e 86 00 00 00 00 01 00 20 00 60 e2 00 00 17 01 0b 00 57 19 10 50 2d 03 00 00 00 06 11 11 22 22 33 33 44 44 55 55 66 66 30 0d 0a

Response Success：a5 5a 00 0a 87 01 00 8c 0d 0a

Response Failure：a5 5a 00 0a 87 00 01 8c 0d 0a

7 Frequently Asked Questions

1. How to Determine if Communication Between the Module and the Host is Normal?

Answer: You can send a command or use the demo software to retrieve the module's temperature information or UHF version details. If the information is successfully obtained, the communication is normal. If not, please check for issues in the hardware or software.

2. If Communication Between the Module and the Host is Confirmed Normal, Why Can't Tag Data Be Retrieved After Sending Commands?

Answer: In such cases, it is recommended to first validate using the demo software.

For Software: Verify that the module parameters, such as power output, region settings, and antenna configuration, are correctly set.

For Hardware: Ensure that the module's power supply meets requirements and that the tag is placed within the effective range of the antenna.

8 Disclaimer

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If you encounter any issues while using Chainway products, please contact your local Chainway Global Customer Support. Relevant contact information can be found at https://www.chainway.net/. When reaching out for support, please provide the following information:

- Device serial number (located on the module with a number and barcode)
- Product model or name
- Software/firmware type or version (retrieved via the PC demo software)

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For further information, please contact support@chainway.net

FCC Caution.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and

(2) this device must accept any interference received, including interference that may cause undesired operation.

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

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.

FCC Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20 cm between the radiator & your body.

KDB 996369 D03 statements

2.2 List of applicable FCC rules:

The module complies with FCC Part 15.247.

FCC ID: 2AC6ACM3N on User manual and on the external of the packaging.

2.3 Summarize the specific operational use conditions

2.4 Limited module procedures

The module is not a limited module.

2.5 Trace antenna designs

Not applicable

2.6 RF exposure considerations

This equipment complies with FCC's RF radiation exposure limits set forth for an uncontrolled environment. The antenna(s) used for this transmitter must not be collocated or operating in conjunction with any other antenna or transmitter.

2.7 Antennas

The EUT use a permanently attached antenna which is unique.

2.8 Label and compliance information

The host system using this module, should have label in a visible area indicated the following texts: "Contains FCC ID: 2AC6ACM3N

2.9 Information on test modes and additional testing requirements

When testing host product, the host manufacture should follow FCC KDB Publication 996369 D04 Module Integration Guide for testing the host products. The host manufacturer may operate their product during the measurements. In setting up the configurations, if the pairing and call box options for testing does not work, then the host product manufacturer should coordinate with the module manufacturer for access to test mode software.

The module has been certified for Potable applications. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter

2.10 Additional testing, Part 15 Subpart B disclaimer

The module without unintentional-radiator digital circuity, so the module does not require an evaluation by FCC Part 15 Subpart B. The host shoule be evaluated by the FCC Subpart B.

2.11 Note EMI Considerations

host manufacture is recommended to use D04 Module Integration Guide recommending as "best practice" RF design engineering testing and evaluation in case non-linear interactions generate additional non-compliant limits due to module placement to host components or properties

2.12 How to make changes

This module is stand-alone modular. If the end product will involve the Multiple

simultaneously
transmitting condition or different operational conditions for a stand-alone modular transmitter in
evaluation (i.e., no C2PC required when no emission exceeds the limit of any individual device (including unintentional radiators) as a composite. The host manufacturer must fix any failure a host, host manufacturer have to consult with module manufacturer for the installation method in end
system. According to the KDB 996369 D02 Q&A Q12, that a host manufacture only needs to do an