Superisys RF-URDZ100L Reader

technical manual



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1. Brief introduction

1.1Appoint

The following terms/abbreviations are used synonymously throughout this document:

Reader, equivalent to "read/write device", "read/write device", "read head",

Electronic tag, equivalent to "code carrier", "responder";

This device, equivalent to "this product", refers to the product model or series Described in this manual.

1.2 Purpose of this document

This manual contains all the information required for proper use of the device, Iincluding the necessary functions, performance, and use methods. It is intended for Both programmers and test/debuggers who debug the system themselves and connect It to other units (automation systems, other programming equipment), and service and Maintenance personnel who install extensions or perform fault/error analysis.

Please read this manual carefully before installing the equipment and putting it Into operation. This manual contains instructions and comments to help you step Through installation and commissioning. This ensures trouble-free use of the product. Familiarizing yourself with this manual will give you the following benefits:

- ✓ Ensure the safe operation of the device
- ✓ Helps you take advantage of the full capabilities of your device
- ✓ Avoid errors and related failures
- ✓ Reduce maintenance and avoid cost wastage

1.3 The valid scope of the document

The description of this document applies to the UHF reader products of the RF-U series.

1.4 Declaration of conformity

This product has been developed and manufactured in compliance with Applicable North American standards and guidelines. You can request these Certificates of conformity from the manufacturer or your local sales Representative.

1.5 Revision history

Table 1.1 Document Version information

versions	Revision date	Reason for modification
V1.0	2017.10.20	Editio princeps

2. Safety instructions

2.1 Safety symbol specification

Read these instructions carefully and look at the equipment carefully before Attempting to install, operate, repair, or maintain it. The following special messages May appear in this document or on the device to prompt status information or warn of Potential hazards.

We divide the safety information into four levels: "danger", "Warning", "Attention" and "warning".

RiskDANGER	Indicates a serious danger condition that, if not avoided, will Result in death or serious injury
WarnWARNING	Indicates a dangerous situation that, if not avoided, could result in death or serious injury
AttentionCAUTION	Indicates a dangerous condition that, if not avoided, may result in mild or moderate injury
Hint NOTICE	Indicates information that is not related to personal injury



This is a "danger" or "warning" sign that indicates an electrical hazard That will result in personal injury if the instructions are not followed.



This is the "attention" symbol. Used to warn you of potential personal Injury. Please follow all safety tips after this symbol to avoid injury or death.



This is the "tip" symbol, which is used to alert the user to possible risks. Failure to comply with this regulation may result in equipment errors or Even complete failure.

2.2 General safety specification

This equipment can only be installed, operated, repaired and maintained by Qualified personnel. A qualified person is a person who has the skills and knowledge Related to the construction and operation of electrical equipment and its installation, And has received safety training to identify and avoid the hazards involved.



User modifications and/or repairs are dangerous and will void the Warranty and exonerate the manufacturer from any liability.



Product maintenance can only be carried out by our personnel. Unauthorized opening and improper servicing of the product may Result in extensive equipment damage or possible personal injury to the user.

If a serious fault occurs, stop using the device. Prevent accidental operation of The device. If repairs are required, please return the equipment to our local Representative or sales office.

The operating company is responsible for complying with applicable local safety Regulations.

Store unused equipment in its original packaging. This provides the best impact And moisture protection for the equipment. Please ensure that environmental Conditions comply with these regulations.

2.3 Special safety instructions



The process of starting in an uncontrolled manner may harm other Equipment or be exposed to other risky equipment, so before Commissioning, ensure that the use of the equipment does not involve Risks that may harm other equipment or is free from risks that may Harm other equipment.

power supply

According to the European safety standard EN 60950, the equipment can only be Operated with limited power current sources, that is, the power supply must have Overvoltage and overcurrent protection. To prevent the power failure of this Equipment, affecting the safety of other equipment; Or an external device is faulty, Which affects the security of the device.

3. Product overview

The RF-URDZ100L is an industrial-grade UHF RFID read/write head that supports RS485 and Ethernet communication using the standard MODBUS communication protocol. The product is small in size, low power consumption, stable and reliable, coupled with easy installation, Especially suitable for assembly line, warehousing logistics, AGV vehicle Identification and other application scenarios. The communication Modes supported by each read head are described in Chapter 4. This Series of reading and writing devices has the following notable features:

- ✓ Designed for industrial environment, can be used in automatic line body Induction identification system.
- ✓ Is compact and suitable for use where installation conditions are limited.
- ✓ IP65 High protection level, anti-interference design, suitable for demanding RFID application environment.

4. Technical parameters

4.1 List of general technical parameters

The general technical specifications of RF-URD series read-write heads are shown in The following table:

RF parameter	Wireless protocol	ISO 18000-6C（Class 1 Gen 2）
	Working frequency	China Frequency: 920-925 MHz (SRRC) North American Frequency: 902-928 MHZ (FCC Part 15)
	Output power	5-27 DBM adjustable, step by 1dbm
Application Environment	Operating Temperature	-25℃～+60℃
	Storage temperature	-40℃～+85℃
	Humidity	5%～95%RH（without condensation）
	Waterproof and Dustproof grade	IP65, EN 60529
	Vibration resistance	2 mm (f= 5...29.5 Hz)， EN 60068-2-6 7 gn (f= 29.5...150 Hz)， EN 60068-2-6
	Rf field conducted Immunity test CS	3V, pass class A
	Electrostatic Discharge immunity ESD	Contact discharge, 8KV, over class A Air discharge, 15KV, over Class A IEC 61000-4-2
Certification and Declaration	FCC	FCC PART 15C
	RoHS instruct	2011/65/EU，2015/863/EU

4.2 RF-URDZ100L

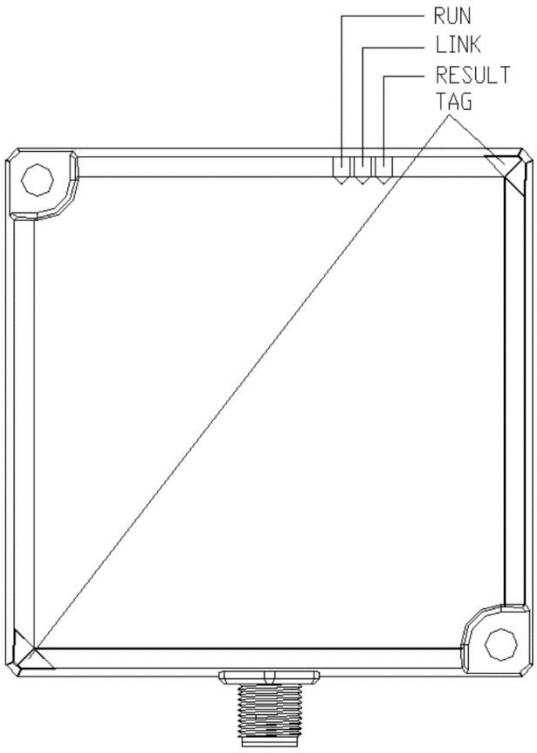
4.2.1 RF-URDZ100L Specification

RF-URDZ100L The technical specifications are as follows:

Specification parameter	Product model	RF-URDZ100L-R4	RF-URDZ100L-TP
	Antenna gain	3 dBi	
	Read distance	0~1.5 米（Related to labels）	
	Communication Interface	RS485	TCP Ethernet
	Communication rate	9600 ~ 115200bit/s	10M/100M Self-adaption
	Supply voltage	9~30VDC	
	Average current	<0.2A@24VDC	
	Indicator light	5 LEDIndicator	
physical parameter	Boundary dimension	100×100×41.5mm	
	Fixture type	2 个 M6Threaded hole	
	Sheating material	Aluminium alloy，PC+ABS	
	Shell color	Black	
	Total weight	280g	

4.2.2 RF-URDZ100L LED Definition

RF-URDZ100L Reader provides 5 leds, namely RUN, LINK, RESULT and 2 TAG, of which 2 TAG LED display is synchronized. The distribution of leds is shown in the figure below.



The specific definition of each LED lamp is as follows:

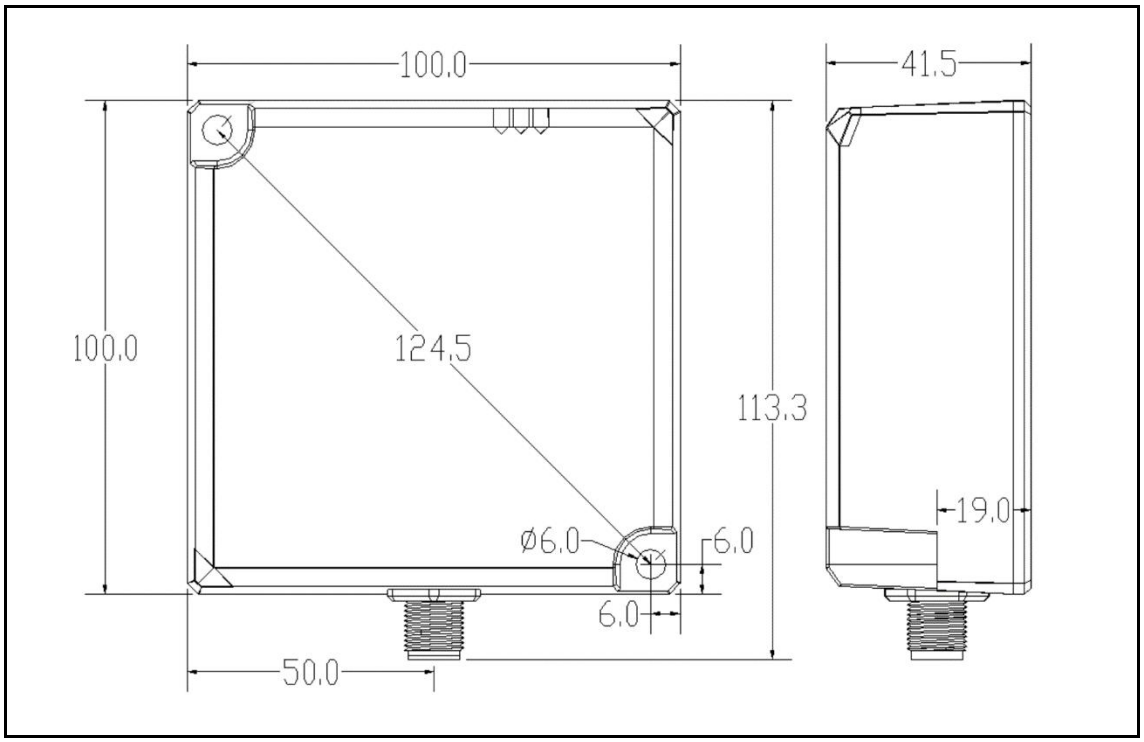
Name	Colour	State	Describe
RUN	Green-red Two-tone Llight	Steady on	System power supply is normal.
		Steady on	System exception
		Red long blink once	The RF module is abnormal. The Indicator blinks red for 1000ms each Time
		Red long blink twice	The network module is abnormal. The Indicator is steady red for 1000ms each Time
		Blinking red twice	If the MAC address is not initialized, The indicator blinks red for 100ms each Time
		Extinguish	The system is not powered on or the Power supply is abnormal
LINK	Green light	Steady on	A TCP connection has been established Between the host and the reader. Procedure
		Flicker	Communicating, currently using TCP
		Flicker	Communicating using RS485
		Extinguish	Connectionless
RESULT	Green light	Steady on	Instruction executed successfully

	●	Extinguish ●	Command execution failed or no Command was executed
TAG	Green-orange light ● ●	Steady on ●	Excellent TAG signal
		Steady on ●	Good TAG signal
		Flicker ● ● ●	TAG threshold
		Extinguish ●	TAG free signal

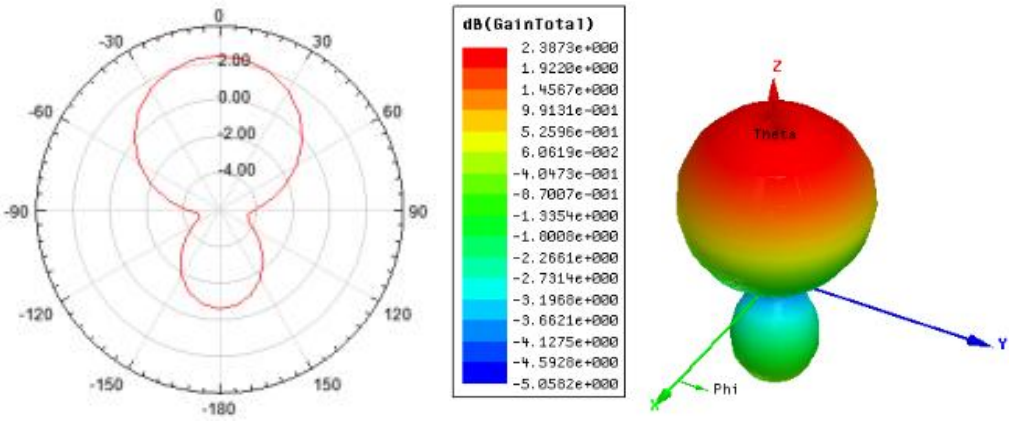
Note: When a red light appears on the RUN, the surface product works abnormally. If The fault persists, contact the manufacturer for technical assistance.

4.2.3 RF-URDZ100L Mounting dimension

The size of the RF-URDZ100L is 100x100x41.5mm, including 2 M6 mounting Holes, and the depth of the mounting holes is 19mm, as shown in the following Figure.



4.2.4 Antenna pattern



Radiation pattern(2D) Radiation pattern(3D)

5. product setup

5.1installation precautions

To prevent improper operation, misoperation, or negative impact on performance And equipment, please comply with the following.

5.1.1 About installation site

Do not install it near devices with high heat dissipation, such as heaters, Transformers, and large-capacity resistors.

Do not install it near devices with severe electromagnetic interference, Such as large motors, transformers, transceivers, frequency converters, And switching power supplies.

When multiple readers are installed close to each other, use the sensor To trigger reading to avoid interference when multiple readers work at The same time.

If multiple labels are installed in close proximity and need to be read Accurately, it is recommended that the label spacing be at least three Times the application read distance.

5.1.2 On application matters

Do not use AC power. Otherwise, there is a risk of rupture, which Seriously affects the safety of people and equipment.



Use a current source with limited power to operate the device, that is, The power supply must have overvoltage and overcurrent protection. To prevent the power failure of this equipment, affecting the safety of other Equipment; Or an external device is faulty, which affects the security of The device.



Avoid incorrect wiring. Otherwise, there is the danger of cracking and burning out. Personal and device safety may be affected.



When the antenna plane of the reader is parallel to the label plane, the Identification distance is the longest. The communication distance is Shortened when the label is mounted at an Angle. Please consider the Tilt effect before installing the label.

5.1.3 About the use



Do not bend the cable within a radius of 40mm. Otherwise, there is the Danger of breaking the line.



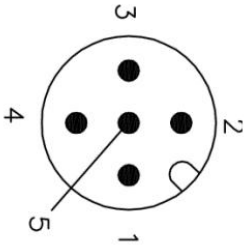
If the product is abnormal, please stop using it immediately and Contact our sales representative after cutting off the power supply.

5.2 Hardware interface description

The M12 connector provides both power and communication interfaces. The Communication interfaces can be RS485 or Ethernet.

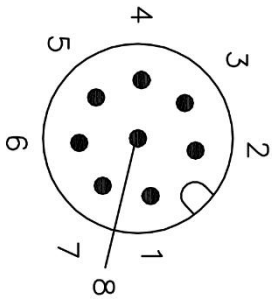
RS-485 communication interface

RS-485 Interface adopts A-CODE M12 male head, 5-pin connector, pin defined As follows:

Male connector	Pin	Symbol	Describe
	Pin1	24V	Positive pole
	Pin2	RS485_A	RS-485 Signal Line A
	Pin3	0V	Negative pole
	Pin4	RS485_B	RS-485Signal line B
	Pin5	NC	/
Matters need attention	1) Shielded twisted pair is recommended for communication lines; 2) Communication cable length: Max<=50m; 3) The cable core should be 24AWG or higher		

Ethernet communication interface

The Ethernet interface adopts A-CODE M12 male head, 8-pin connector, and the pins are defined as follows:

Male connector	Pin	Symbol	Describe
	Pin1	24V	Positive pole
	Pin2	NC	/
	Pin3	0V	Negative pole
	Pin4	NC	/
	Pin5	TD+	Ethernet data sending +
	Pin6	TD-	Ethernet data sending -
	Pin7	RD+	Ethernet data sending +
	Pin8	RD-	Ethernet data sending -
Matters need attention	1) The cable used is CAT5E or above, and the cable core is		

	24AWG or above; 2) Communication cable length: Max<=100m.

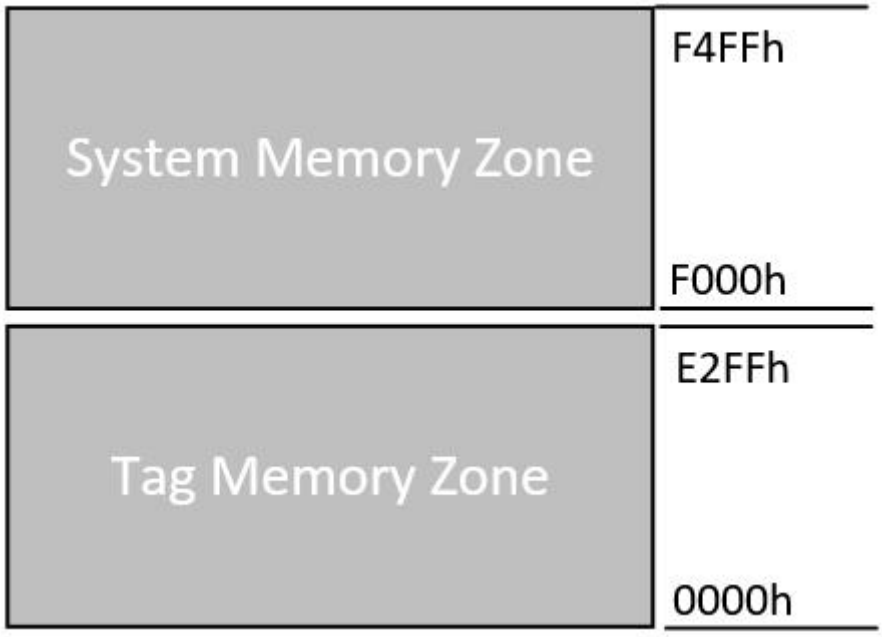
6. Product operation

6.1 Register definition

- The read and write operation of the carrier and the configuration of the read Head are accomplished by accessing the register, which is mainly divided Into four areas:
- label memory area

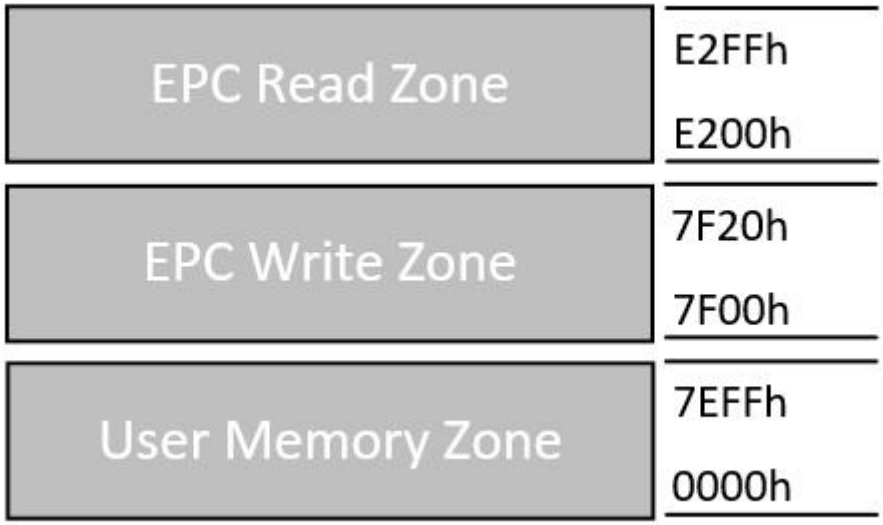
System memory area

The specific address ranges for each region are set as follows:



6.1.1 Label memory area

The label memory area is divided into three parts: the EPC read area, the EPC Write area, and the user memory area.



EPC Read area

The EPC read area is a mapping of the label EPC read result. This area is Read-only. The specific mapping relationship is as follows:

Initial Address	End address	Number of Registers	Operation Type	Explain
E200 H	E200 H	1	R①	Read trigger②
E201 H	E201 H	1	R	Number of labels
E202 H	E202 H	1	R	The total number of bytes for all tags
E203 H	E203 H	1	R	The first TAB, PC
E204 H	E204+x1	x1	R	The first tag, EPC, is the actual EPC length of the tag
E205+x1	E205+x1	1	R	The first label, RSSI③
E206+x1	E206+x1	1	R	The second TAB, PC
E207+x1	E207+x1+x2	x2	R	The second label, EPC, is the actual EPC length of the label
E208+x1+x2	E208+x1+x2	1	R	The second label, RSSI
……				And so on, up to 32 labels can be stored

注① Note 1: R is the abbreviation for Readable, indicating that the register can be

Read; W is the abbreviation of Writable, indicating that the register can be Written.

注②： The E200H register needs to be read to trigger the re-read EPC, otherwise The read is the result of the last read EPC;

注③： To obtain the power value, you need to calculate the formula: -39.9+6log2(Y/190). You can also query the corresponding value from the Attachment.



Use suggestion

In formal use, first confirm the EPC length of a single label N words, Read N+5 registers, you can just read a label.

EPC Write area

The EPC read area is a mapping of the label EPC read result. This area is Read-only. The specific mapping relationship is as follows:

Initial address	End address	Number of Registers	Operation Type	Explain
7F00 H	7F00 H	1	W	PC①
7F01 H	7F20 H	32	W	EPC

注①：Note 1 The top 5 bits of PC are used to define the length of the EPC, and the Value of the top 5 bits is the number of registers accounted for by the EPC. If The PC is 0x3000 and the high 5 bits are "00110 B", the length of the EPC is 6 registers, that is, 12 bytes. The maximum length of the EPC depends on the Tag chip, see the tag's technical manual for details.

TID Read area

The TID read area maps the read result of the tag TID. This area is read-only. The specific mapping relationship is as follows:

Initial address	End address	Number of registers	operation type	Explain

E300 H	*	*	R	

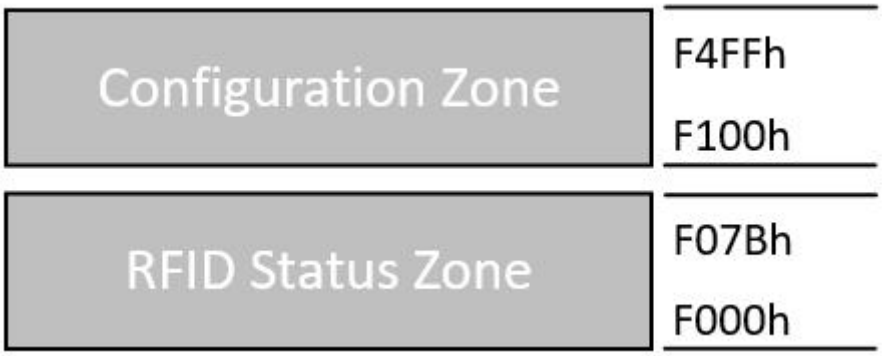
Note: The size of the TID read area is related to the size of the actual TID Memory area of the label. Different labels may have different TID sizes.

User memory area

The definition of the user memory area is based on the size of the label user Memory, mapped to the user memory area inside the read header, to access the label, Read and write. The Alien H3 chip, for example, has 64 bytes of user memory and Maps to a user memory area with a minimum address of 0 and a maximum address of 31 (1FH). If access exceeds the label's maximum memory address, an error is Returned.

6.1.2 System memory area

The system memory area is divided into two parts: the RFID status area and The configuration area, where the configuration area includes the basic Configuration area, the working mode configuration area and the UHF parameter Configuration area.



Basic configuration area

Basic configuration mainly includes device information and connection-related Parameter configurations. The registers in this part can be saved after power failure. After configuration, power off and restart take effect. The specific registers and Assigned addresses are as follows:

Field	Initial Address	End address	Number of Registers	Operation Type	Explain
Manufacturer Name	F100 H	F109 H	10	R	

Product code	F10A H	F113 H	10	R	
Version Number	F114 H	F115 H	2	R	
Serial number	F116 H	F11B H	6	R	
MAC site	F11C H	F11E H	3	R	
Port number	F11F H	F11F H	1	R	Fixed value 502
IP site	F120 H	F121 H	2	RW	Default：192.168.0.10
Subnet mask	F122 H	F123 H	2	RW	Default：255.255.255.0
Gateway	F124 H	F125 H	2	RW	Default：192.168.0.1
Device address	F126 H	F126 H	1	RW	MODBUS secondary station address. The value is [1,16]. The default value Is 1,0 indicates the broadcast address
Baud rate	F127 H	F127 H	1	RW	Slave station baud rate, serial port configuration using N, 8,1; 0:115200[Default]; 1:57 600; 400 instant; And 200; For 600; ELSE: 115200

Working mode Configures the area

The working mode configuration is mainly used to configure the working mode And parameters of RFID, and the register of this part can be saved when the power is Off. RFID has active working mode and passive working mode. In active operation Mode, RFID will automatically read the tag EPC that enters the readable area. In Passive mode, the reader is idle by default and performs the work according to the Received instructions. Specific registers are defined as follows:

Field	Start address	End Address	Number of Registers	Operation type	Explain
Operating Mode	F200 H	F200 H	1	RW	Working mode: 0: passive working mode; 1: Active working mode [default], F201~F204H valid (need to set the Address and quantity)

Cache Time	F201 H	F201 H	1	RW	Set the storage time of automatically read Data after the label leaves, in ms[default 100]

RFID Protocol configuration area

The RFID protocol configuration area is used to configure protocols supported by RFID. Specific registers are defined as follows:

Field	Start address	End Address	Number of Registers	Operation type	Explain
RFID Agreement	F300 H	F300 H	1	R	Protocols supported by RFID: 3: ISO 18000-6C
Read power	F301 H	F301 H	1	RW	The read power of the reader is 12dBm by default. The value ranges from 5 to 27dBm
Write power	F302 H	F302 H	1	RW	The write power of the reader, default 18dBm. The value ranges from 5 to 27dBm
Frequency Band	F303 H	F303 H	1	RW	The current frequency band of the reader: 0: PRC (920 ~ 925MHz) [Default] 3: FCC (902 ~ 928MHz)
Number of Channel①	F304 H	F304 H	1	RW	Number of channels used by readers: The maximum number of PRC is 16 and The maximum number of FCC is 50 If the number of channels is set to 0, Automatic frequency hopping is used. Default 0
Frequency point①	F305 H	F31D H	25	RW	The channel number used by the reader, Where each register occupies 2 channels, is filled with high bytes first. This Parameter is valid when the number of Channels is not 0
Air parameter ①	F31E H	F31E H	1	RW	0:40K, tari 25us, FM0 code 1:250K, tari 25us, M4 encoding [default]

					2:300K, Tari 25us, M4 code 3:400K, Tari6.25us, FM0 code 4:320 k, Tari25us, M4 code
Q value①	F31F H	F31F H	1	RW	Q Value used for inventory. The value Ranges from 0 to 15. The default value is 0. When Q=0, reading EPC (E200H Register trigger) will only read 1 label.
Session layer① (Session)	F320 H	F320 H	1	RW	0: Session_0 1: Session_1[Default] 2: Session_2 3: Session_3
Inventory Mark①	F321 H	F321 H	1	RW	0: A 1: B 2: A and B[default]
Repeat the label filtering Time	F322 H	F322 H	1	RW	It indicates that within a cycle of a card Read command, the same label content is Uploaded only once within the specified Repeat filtering period (time unit: 10ms)
RSSI①	F323 H	F323 H	1	RW	If the label RSSI value is lower than the Threshold, label data will not be uploaded And discarded.

a) This section is not recommended for users unfamiliar with RF or ISO 18000-6C.

RFID status area

The RFID status area is mainly used to record the current working status of The device, and the control system can diagnose the device and application Environment through the status. The specific registers in the RFID status area are Defined as follows:

Field	Initial Address	End Address	Number of Registers	Operation Type	Explain
RFID status	F000 H	F000 H	1	R	Indicates the current status of RFID
error code	F001 H	F001 H	1	R	See the following section for specific

					Definitions
RFU	F002 H	F002 H	1	R	
EPC_LEN	F003H	F003 H	1	R	The amount of memory taken up by EPC
EPC	F004 H	F023 H	32	R	Label EPC

The RFID status (F000 H) is defined in detail as follows:

Bit address	Identification	Definition
bit0	Ready	Running status: The reader is running properly
bit1-2	Mode	Working mode, same as register F200 H: 0: passive working mode; 1: Active working mode
bit3	RFU	The value is 0
bit4	TP	Tag Present, indicating whether a tag is in the read area: 0: No label 1: indicates that labels exist, but does not mean that the specified label memory has been read.
bit5	Cached	Indicates whether there is currently a cache label: 0: Not cached 1: Cached, indicating that the label memory read is complete, and this Signal disappears at the end of the cache time (F201 H register) after The label leaves
bit6	Busy	Indicates the task status of the current device: 0: idle 1: indicates that a task is being executed, including the command sent By the upper computer in active and passive working modes
bit7	Done	Set indicates that the command is executed successfully
bit8	Error	Set indicates command execution error [non-product fault]
bit9-10	RssiLevel	Label signal strength level: 0: No label signal is displayed 1: The label signal is weak, which generally occurs in the critical area 2: The label signal is general, and it can work at rest when the Electromagnetic interference is not serious 3: The label signals are strong. You are advised to install the label in an Area with strong signals
bit11-14	RFU	The value is 0

bit15	RFIDProtocol	RFID protocol: 0: ISO 15693 1: ISO 14443A

The memory mapped area is mainly used in active mode. It is a memory mapped To read parameters and read results in active mode. When the Cached signal (F000H,bit5) is set, the data in the memory mapped area is valid.

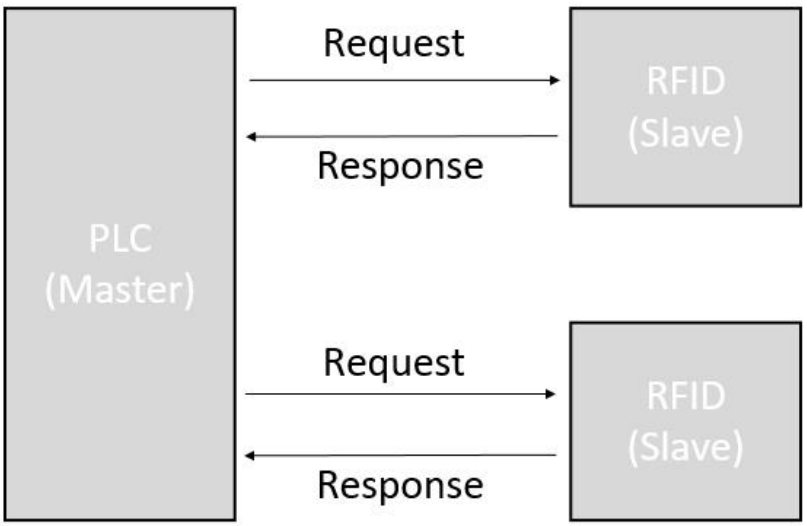
6.2 MODBUS Protocol support

Devices using different communication modes use different communication Orotocols. Before using the devices, check the communication modes supported by The devices. For serial communication devices, including RS485 and RS232, MODBUS RTU is supported. The MODBUS TCP protocol is supported for network Port devices.

Communication Mode	Serial port(RS485)	Ethernet
Communication Protocol	MODBUS RTU	MODBUS TCP

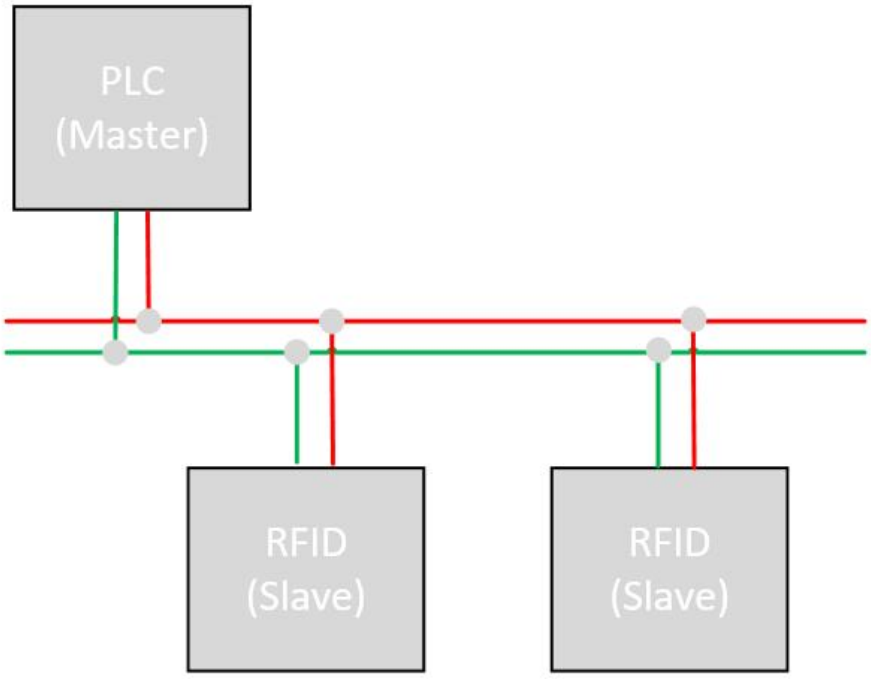
6.2.1 MODBUS RTU layout of equipment

In a serial communication network, RFID devices are used as slave stations. When communicating with the main equipment such as PLC, the method of question And answer is adopted and initiated by the main equipment.



Note the device address and serial port configuration parameters when setting up Communication. The default device address is 1. You can set the device address based

On the actual situation. When multiple devices exist on the network, each slave device Must be configured with a different address. The master device controls each slave Device based on the address in turn. Multiple devices are connected to the serial Network in parallel.

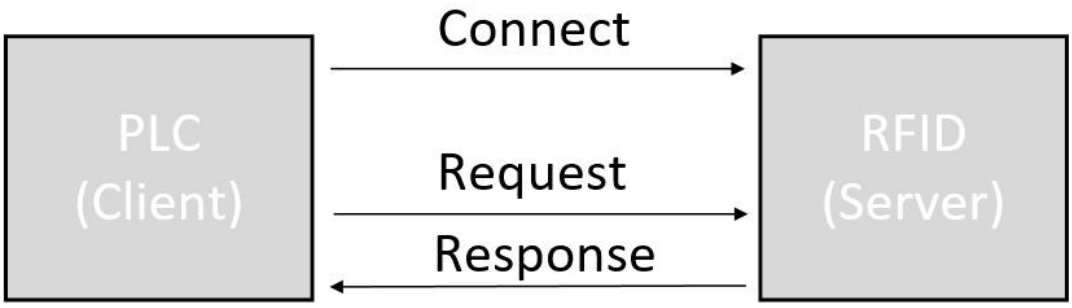


The default serial port configurations of the slave device are as follows:

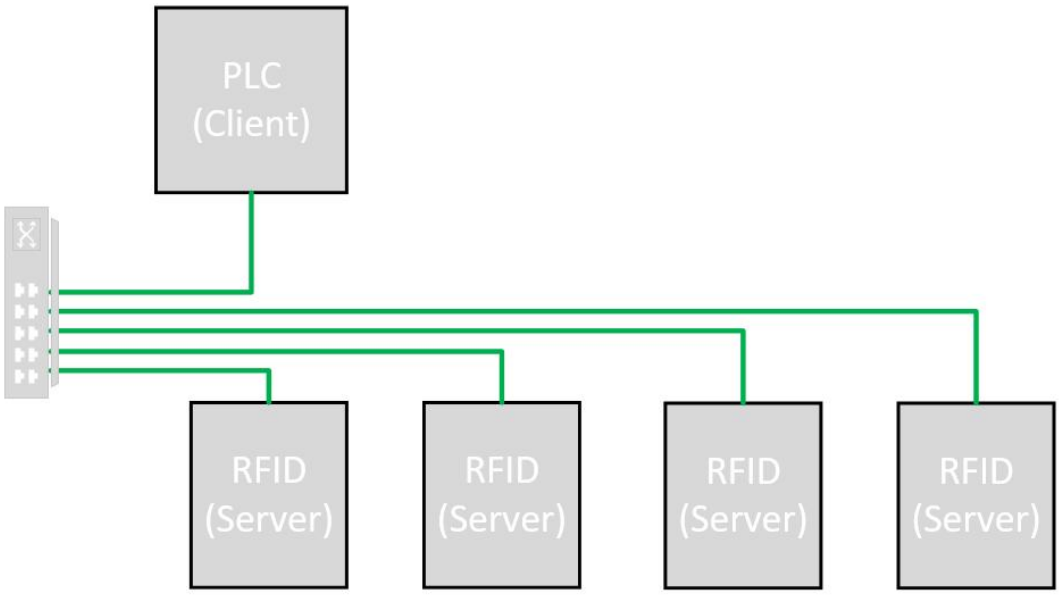
Index	Value
Baud rate	The default value is 115200. The value is configurable
Parity bit	NONE
Data bits	8-bit
Stop bit	one-bit

6.2.2 MODBUS TCP layout of equipment

In an Ethernet communication network, the RFID device acts as the server and The PLC acts as the client. A connection must be established before the Communication. The connection is initiated by the client. The communication is by Question and answer method and is initiated by PLC.



The IP address needs to be configured to establish communication. The default IP Address of RFID is 192.168.0.10, and the fixed port number of MODBUS TCP is 502. Before establishing a connection, it is necessary to confirm that the PLC and RFID are In the same network segment. When multiple devices are connected to the network, Each RFID needs to be configured with a different IP address, and multiple devices Can be connected together through a switch.

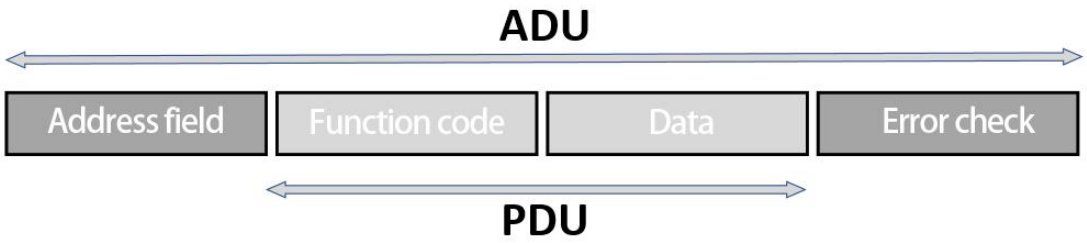


6.2.3 Commands supported by the device

The following MODBUS instructions are supported by this device:

cmdcode		Explain
hexadecimal	decimalism	
03	3	Read multiple registers
06	6	Write a single register
10	16	Write multiple registers
5	5	Write a single coil

The MODBUS protocol defines a simple protocol data unit (PDU) that is Independent of the underlying communication layer. MODBUS protocol mapping on A particular bus or network can introduce additional domains on the application data Unit (ADU).



MODBUS RTU ADU

The MODBUS RTU ADU consists of the address domain, PDU, and error check. The address domain is the device address, and the error check bit is CRC check.

device address	function code	data	CRC verify Lo Hi
1byte	1byte	N bytes	2 bytes MODBUS RTU

- Device address: slave device address, networking application 1-16, Point-to-point communication 0
- CRC check: CRC16-MODBUS: verifies all previous data

MODBUS TCP ADU

The ADU of MODBUS RTU consists of an address domain and a PDU. The Address domain is the MBAP packet header

MBAP packet header				Function Code	Data
Transaction Meta identifier Hi Lo	Protocol identifier Hi Lo	length Hi Lo	Element ID		
2 bytes	2bytes	2bytes	1byte	1byte	N bytes

- Transaction meta identifier: identifies the transaction
- Protocol identifier: MODBUS = 0
- Length: Number of the following bytes
- Unit identifier: Default FFH

1、Read multiple registers

The request ADU for reading multiple registers is as follows:

Agreement	Address field					Function code	Data		Error check
	Transaction meta identifier	Protocol Identifier	length	Element ID	Device address	Cmdcode 3H	Site Hi Lo	Quantity Hi Lo	CRC Lo Hi
RTU	——	——	——	——	1byte	1byte	2 bytes	2 bytes	2 bytes
TCP	2bytes	2bytes	2bytes	1byte	——				——

- Transaction meta identifier: identifies the transaction
- Protocol identifier: MODBUS = 0
- Length: The number of the following bytes, in this case 6
- Unit identifier: Default FFH
- Address: Device address of the slave station, networking application 1-16, Point-to-point communication 0
- Command code: The command code for reading multiple registers is fixed to 3
- First register address: address of the first register to be read

Register quantity: indicates the number of registers to be read. If the area to be read Is the label memory area, the value can be 1≤N≤120. In other cases, the value can be 1≤N≤123

The normal response ADU for reading multiple registers is as follows:

Agreement	Address field					Function code	Data		Error check
	Transaction meta identifier	Protocol identifier	length	Element ID	Device address	Cmdcode 3H	Number of bytes	Register value Hi Lo	CRC Lo Hi
RTU	——	——	——	——	1Byte	1Byte	1 Bytes	2Bytes (Register 1)	2 Bytes
TCP	2Bytes	2Bytes	2Bytes	1Byte	——				——
								.....	

2Bytes (Register N)

- Command code: This is the same as the request
- Number of bytes read: twice the number of registers

Register value: The value of the register to be read

The abnormal response ADU for reading multiple registers is as follows:

Agreement	Address field					Function code	Data	Error check
	Transaction meta identifier	protocol identifier	length	Element ID	Device address	Cmdcode 83H	Error code	CRC Lo Hi
RTU	——	——	——	——	1Byte	1Byte	1Byte	2 Bytes
TCP	2Bytes	2Bytes	2Bytes	1Byte	——			——

2、Write a single register

3、Write a single register request ADU is as follows:

Agreement	Address field					Function code	Data		Error check
	Transaction meta identifier	Protocol identifier	length	Element ID	Device address	Cmdcode 6H	site Hi Lo	Register value Hi Lo	CRC Lo Hi
RTU	——	——	——	——	1Byte	1Byte	2 Bytes	2 Bytes	2 Bytes
TCP	2Bytes	2bytes	2Bytes	1byte	——				——

- Command code: The command code for reading multiple registers is 6
- Register address: address of the register to be operated
- Register value: The value of the register to be operated

The normal response ADU for writing a single register is as follows:

agreement	Address field					Function code	Data		Error check
	Transaction meta identifier	Protocol identifier	length	Element ID	device address	Cmdcode 6H	Site Hi Lo	Register value Hi Lo	CRC Lo Hi
RTU	——	——	——	——	1Byte	1Byte	2 Bytes	2 Bytes	2 Bytes
TCP	2Bytes	2Bytes	2Bytes	1Byte	——				——

- Address: As requested
- Command code: This is the same as the request
- Register address: As requested
- Register value: as requested

The exception response ADU for writing a single register is as follows:

Agreement	Address field	Function code	Data	Error check

	Transaction meta identifier	protocol identifier	length	Element ID	Device address	Cmdcode 86H	Error code	CRC Lo Hi
RTU	——	——	——	——	1Byte	1Byte	1Byte	2 Bytes
TCP	2Bytes	2Bytes	2Bytes	1Byte	——			——

4、Write multiple registers

The request ADU for writing multiple registers is as follows:

Agreement	Address field					Function code	Data				Error check
	Transaction meta identifier	protocol identifier	length	Element ID	Device address	Cmdcode 10H	Register Address Hi Lo	Register Address Hi Lo	Number of bytes	Register value Hi Lo	CRC Lo Hi
RTU	——	——	——	——	1byte	1Byte	2 Bytes	2 Bytes	1Byte	2Bytes (The first register)	2 Bytes
TCP	2Bytes	2Bytes	2Bytes	1Byte	——					.....	——
										2Bytes (The first register)	

- Command code: The command code for reading multiple registers is 10H
- Register address: address of the first register to be operated
- Register quantity: indicates the number of registers to be operated. If the Operation area is the label memory area, the value can be 1≤N≤120. In other Cases, the value can be 1≤N≤121
- Bytes: The total number of bytes occupied by the register value, 2* the number of Registers
- Register value: The value of the register to be operated

The normal response ADU for writing multiple registers is as follows:

Agreement	Address field					Function code	Data		Error check
	Transaction meta identifie	Protocol identifie r	length	Element ID	Devi ce addre	Cmdcod e 10H	Register Address Hi Lo	Number of Registers Hi Lo	CRC Lo Hi

	r				ss				
RTU	——	——	——	——	1Byte	1Byte	2 Bytes	2 Bytes	2 Bytes
TCP	2Bytes	2Bytes	2Bytes	1Byte	——				——

- Command code: This is the same as the request
- Register address: As requested
- Number of registers: as requested

The exception response ADU for writing multiple registers is as follows:

Agreement	Address field					Function code	Data	Error check
	Transaction Meta identifier	Protocol identifier	length	Element ID	Device address	Cmdcode 90H	Error code	CRC Lo Hi
RTU	——	——	——	——	1Byte	1Byte	1Byte	2 Bytes
TCP	2Bytes	2Bytes	2Bytes	1Byte	——			——

5、Write a single coil

The request ADU for writing a single coil is as follows:

Agreement	Address field					Function code	Data		Error check
	Transaction Meta identifier	Protocol identifier	length	Element ID	Device address	Cmdcode 5H	Coil Address Hi Lo	Coil Value Hi Lo	CRC Lo Hi
RTU	——	——	——	——	1Byte	1Byte	2 Bytes	2 Bytes	2 Bytes
TCP	2Bytes	2Bytes	2Bytes	1Byte	——				——

- Address: Device address of the slave station, networking application 1-16, Point-to-point communication 0
- Command code: The command code for reading multiple registers is fixed at 5
- Coil address: specifies the address of the coil to be operated
- Coil value: The value of the coil to be operated, 0 or 1

Write the normal response ADU of a single coil as follows:

Agreement	Address field					Function code	Data		Error Check
	Transaction meta identifier	protocol identifier	length	element ID	device address	Cmdcode 5H	Coil Address Hi Lo	Coil value Hi Lo	CRC Lo Hi
RTU	——	——	——	——	1Byte	1Byte	2 Bytes	2 Bytes	2 Bytes
TCP	2Bytes	2Bytes	2Bytes	1Byte	——				——

- Command code: This is the same as the request
- Coil address: As requested
- Coil value: as requested

Write the abnormal response ADU of a single coil as follows:

Agreement	Address field					Function code	Data	Error check
	Transaction meta identifier	protocol identifier	length	Element ID	Device address	Cmdcode 85H	Error code	CRC Lo Hi
RTU	——	——	——	——	1Byte	1Byte	1Byte	2 Bytes
TCP	2Bytes	2Bytes	2Bytes	1Byte	——			——

6.3 Product reset

The reader uses a coil to simulate the reset foot of the RFID device, pulls the coil Down, and the RFID immediately restarts the software.

Coil address	Operating mode	Operating command
0xFFFF	Buy 0	Write a single coil. The Command value is 5



Note: The reader will not respond to the reset operation.

6.4 error code

The error code consists of two parts: The error code returned by the MODBUS Command. This part is a custom error code that is stored in the F001H register for compatibility with the MODBUS protocol. The MODBUS error code is defined as Follows:

Error code	Definition	Explain
00H	inerrancy	
01H	Command Code error	The used command code is not supported
02H	Address error	A nonexistent address was used, or a read - only address was Written
03H	Error in data	The system configuration register is written using non-legal Method
04H	Unit Exception	Equipment failure
0BH	No response	This error occurs when the label is not in the read area or when The label does not respond correctly to the instruction. In this Case, you can obtain more details from the custom error code (F001H register).

Custom error codes are as follows:

error code		Definition	Explain
Decimalism	Hexadecimal		
144	90H	Unlabeled Response	The label may be out of read range
145	91H	Rf data error	At this time, strong electromagnetic Interference may cause data Transmission errors, or half of the data Transmission label leaves the read area
147	93H	Label memory lock	The label memory is locked and cannot Be written. Procedure
149	95H	Label off	Halfway through reading the data, the label leaves
150	96H	Label off	Write half the data, label away
161	A1H	The RF data	Rf data cannot be sent

		Transmission is Abnormal	
176	B0H	Parameter error	

7. Appendix

7.1 Communication cable Description

1、RS485 Communication cable Description

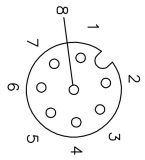
RS485 communication cable: A CODE M12 female head (5 pins), internal thread Inner hole -- bare wire, cable pin definition is as follows:



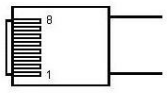
PIN pin	Definition	**Matching wire color**
1	24V	Brown/
2	RS485_A	White/
3	0V	Kohlrabiblue/
4	RS485_B	Black/
5	PE	Shielding layer

2、Ethernet communication cable description

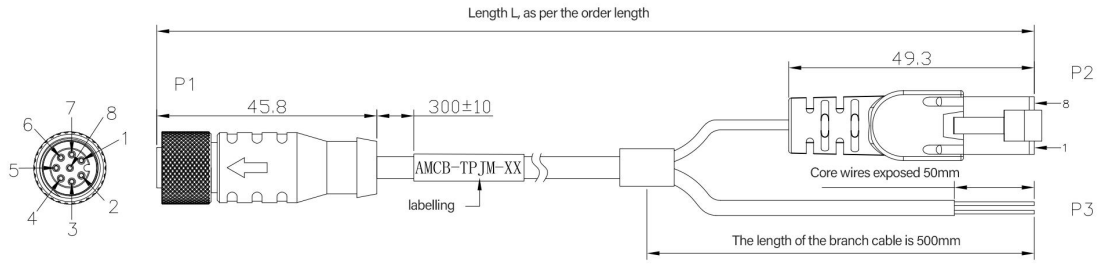
Ethernet communication cable: A CODE M12 female head (8 pins), internal thread Inner hole - bare wire +RJ45 male head, cable pin definition is as follows:



M12splice PIN pin	**Definition**	**Matching wire color**	RJ45splice PIN pin
1	24V	Red (Brown)	OPEN
2	NC	——	
3	0V	Black (Kohlrabiblue)	OPEN
4	NC	——	
5	TD+	Orange white	1
6	TD-	Orange	2
7	RD+	Greenish White	3



	8	RD-	Green	6	


Length L, as per the order length
P1
45.8
300±10
49.3
P2
AMCB-TPJM-XX
labelling
Core wires exposed 50mm
P3
The length of the branch cable is 500mm
7
8
6
1
5
4
2
3

7.2 RSSI Value correspondence table

value	RSSI(dBm)	value	RSSI(dBm)	value	RSSI(dBm)	value	RSSI(dBm)
1	-85.31913365	65	-49.18492677	129	-43.25177012	193	-39.76439143
2	-79.31913365	66	-49.05276893	130	-43.18492677	194	-39.7196566
3	-75.80935865	67	-48.92259851	131	-43.11859564	195	-39.67515177
4	-73.31913365	68	-48.7943566	132	-43.05276893	196	-39.63087459
5	-71.38756508	69	-48.66798691	133	-42.98743904	197	-39.58682273
6	-69.80935865	70	-48.54343555	134	-42.92259851	198	-39.54299393
7	-68.47500412	71	-48.42065093	135	-42.85824007	199	-39.49938593
8	-67.31913365	72	-48.29958364	136	-42.7943566	200	-39.45599651
9	-66.29958364	73	-48.1801863	137	-42.73094115	201	-39.4128235
10	-65.38756508	74	-48.06241346	138	-42.66798691	202	-39.36986475
11	-64.56254394	75	-47.94622151	139	-42.60548721	203	-39.32711815
12	-63.80935865	76	-47.83156857	140	-42.54343555	204	-39.2845816
13	-63.11649534	77	-47.71841441	141	-42.48182554	205	-39.24225305
14	-62.47500412	78	-47.60672034	142	-42.42065093	206	-39.20013049
15	-61.87779008	79	-47.49644916	143	-42.35990563	207	-39.1582119
16	-61.31913365	80	-47.38756508	144	-42.29958364	208	-39.11649534
17	-60.7943566	81	-47.28003363	145	-42.23967911	209	-39.07497886
18	-60.29958364	82	-47.17382162	146	-42.1801863	210	-39.03366054
19	-59.83156857	83	-47.06889706	147	-42.12109958	211	-38.99253852
20	-59.38756508	84	-46.96522911	148	-42.06241346	212	-38.95161092
21	-58.96522911	85	-46.86278803	149	-42.00412253	213	-38.91087593
22	-58.56254394	86	-46.76154512	150	-41.94622151	214	-38.87033173
23	-58.17776191	87	-46.66147267	151	-41.88870521	215	-38.82997655
24	-57.80935865	88	-46.56254394	152	-41.83156857	216	-38.78980864
25	-57.45599651	89	-46.46473306	153	-41.77480659	217	-38.74982626
26	-57.11649534	90	-46.36801507	154	-41.71841441	218	-38.7100277
27	-56.78980864	91	-46.27236581	155	-41.66238722	219	-38.67041129
28	-56.47500412	92	-46.17776191	156	-41.60672034	220	-38.63097537
29	-56.17124768	93	-46.08418078	157	-41.55140916	221	-38.59171829
30	-55.87779008	94	-45.99160054	158	-41.49644916	222	-38.55263845
31	-55.59395579	95	-45.9	159	-41.44183592	223	-38.51373425
32	-55.31913365	96	-45.80935865	160	-41.38756508	224	-38.47500412
33	-55.05276893	97	-45.7196566	161	-41.33363238	225	-38.4364465
34	-54.7943566	98	-45.63087459	162	-41.28003363	226	-38.39805988
35	-54.54343555	99	-45.54299393	163	-41.22676472	227	-38.35984273
36	-54.29958364	100	-45.45599651	164	-41.17382162	228	-38.32179356
37	-54.06241346	101	-45.36986475	165	-41.12120036	229	-38.28391092
38	-53.83156857	102	-45.2845816	166	-41.06889706	230	-38.24619334

39	-53.60672034	103	-45.20013049	167	-41.0169079	231	-38.2086394
40	-53.38756508	104	-45.11649534	168	-40.96522911	232	-38.17124768
41	-53.17382162	105	-45.03366054	169	-40.91385703	233	-38.13401678
42	-52.96522911	106	-44.95161092	170	-40.86278803	234	-38.09694533
43	-52.76154512	107	-44.87033173	171	-40.81201856	235	-38.06003197
44	-52.56254394	108	-44.78980864	172	-40.76154512	236	-38.02327535
45	-52.36801507	109	-44.7100277	173	-40.71136428	237	-37.98667416
46	-52.17776191	110	-44.63097537	174	-40.66147267	238	-37.95022707
47	-51.99160054	111	-44.55263845	175	-40.61186698	239	-37.9139328
48	-51.80935865	112	-44.47500412	176	-40.56254394	240	-37.87779008
49	-51.63087459	113	-44.39805988	177	-40.51350035	241	-37.84179763
50	-51.45599651	114	-44.32179356	178	-40.46473306	242	-37.80595423
51	-51.2845816	115	-44.24619334	179	-40.41623899	243	-37.77025863
52	-51.11649534	116	-44.17124768	180	-40.36801507	244	-37.73470962
53	-50.95161092	117	-44.09694533	181	-40.32005833	245	-37.69930602
54	-50.78980864	118	-44.02327535	182	-40.27236581	246	-37.66404662
55	-50.63097537	119	-43.95022707	183	-40.22493462	247	-37.62893026
56	-50.47500412	120	-43.87779008	184	-40.17776191	248	-37.59395579
57	-50.32179356	121	-43.80595423	185	-40.13084489	249	-37.55912206
58	-50.17124768	122	-43.73470962	186	-40.08418078	250	-37.52442794
59	-50.02327535	123	-43.66404662	187	-40.03776689	251	-37.48987233
60	-49.87779008	124	-43.59395579	188	-39.99160054	252	-37.45545411
61	-49.73470962	125	-43.52442794	189	-39.9456791	253	-37.4211722
62	-49.59395579	126	-43.45545411	190	-39.9	254	-37.38702553
63	-49.45545411	127	-43.38702553	191	-39.85456068	255	-37.35301303
64	-49.31913365	128	-43.31913365	192	-39.80935865		

7.3 Channel frequency mapping table

PRC		FCC					
route	frequency (KHz)	route	frequency (KHz)	route	frequency (KHz)	route	frequency (KHz)
0	920625	0	902750	17	911250	34	919750
1	920875	1	903250	18	911750	35	920250
2	921125	2	903750	19	912250	36	920750
3	921375	3	904250	20	912750	37	921250
4	921625	4	904750	21	913250	38	921750
5	921875	5	905250	22	913750	39	922250
6	922125	6	905750	23	914250	40	922750
7	922375	7	906250	24	914750	41	923250
8	922625	8	906750	25	915250	42	923750
9	922875	9	907250	26	915750	43	924250
10	923125	10	907750	27	916250	44	924750
11	923375	11	908250	28	916750	45	925250
12	923625	12	908750	29	917250	46	925750
13	923875	13	909250	30	917750	47	926250
14	924125	14	909750	31	918250	48	926750
15	924375	15	910250	32	918750	49	927250
		16	910750	33	919250		