

M Series Gate Reader

User Manual V1.2

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1. Docking Communication Protocol

This module can communicate with external applications through serial ports RS232/TTL, RS485 and network port RJ45 .

1 .1 Serial communication parameters

The module communicates with external applications through the serial port

Table A-1 Module connection serial port parameters

project	parameter	Remark
Baud rate	115200bps	
Data bits	8	
Stop bits	1	
Parity bit	None	

1.2 Data frame format

The data packet sent by the upper layer application is called "command" below, and the data packet returned by the module to the upper layer application is called "response" below. The length unit of all the following data segments is bytes.

Data transmission order: For each data item consisting of multiple bytes, the most significant byte is sent first, and the least significant bit is sent first within the byte.

The data frame format of the command is shown in Table A-2:

Table A-2 Command data frame format

MSB						LSB
	Control Field			Information Field	EpLENogue Field	
HEAD	ADDR	CMD	LEN	Data[]	CHECK	
1 Byte	1 Byte	2Bytes	1 Byte	0~255Byte	2 Byte	

The response data frame format is shown in Table A-3:

Table A-3 Response data frame format

MSB							LSB
	Control Field			Information Field		EpLENogue Field	
HEAD	ADDR	CMD	LENS	STATUS	Data[]	CHECK	
1 Byte	1 Byte	2Bytes	1 Byte	1 Byte	0~254Byte	2 Byte	

The data frame structure consists of the following three parts: frame control field (Control Field), information data field (Information Field) and frame tail field (EpLENogue Field).

		length (byte)	illustrate
	HEAD	1	HEAD is fixed as the hexadecimal number 0x CF, which is used for data frame synchronization.

Control Field	ADDR	1	Reader address. Address range: 0x00~0xFE, 0xFF is the broadcast address. The reader only responds to commands with the same address as itself and 0xFF. The address of the reader is 0x00 when it leaves the factory.
	CMD	2	Command code and command word definitions are shown in Table A-7.
	LENS	1	This length is the length of all bytes of the actual Information Field. The maximum data length is 255 bytes (0xFF).
Information Field	STATUS	1	STATUS is the execution status of the host computer command contained in the module's response. STATUS only exists in the response data frame returned by the module. There is no STATUS part in the command frame sent by the upper application. STATUS is 0, which means that the command is executed successfully. Here, successful execution only means that the module successfully receives the tag response. If there is a tag execution status in the tag response, it is necessary to further determine whether the tag execution status is correct. The definition of STATUS is shown in Table A-6.
	Data[]	indefinite	Parameter field. In actual commands, it may not exist. Data[] is the actual data to be transmitted. The valid bytes of Data[] will be specifically defined in each command format.
EpLENogue Field	MSB -CRC16	1	CRC16 high byte. CRC16 is the CRC16 value from HEAD to Data[].
	LSB -CRC16	1	CRC16 low byte.

See Appendix B for the CRC16 reference code.

2 Command Frame Set

The UHF RFID reader/writer module is referred to as "module" in the following description.

2.1 Command List

Table A-7 Control command example list

Command Name	CMD control byte	Functional Description	Remark
EPC Directive			
RFM_INVENTORYISO_CONTINUE	0x00 01	Label inventory (process)	
RFM_INVENTORYISO_STOP	0x00 02	Stop label counting	

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RFM_READISO_TAG	0x0003	Read tag data	
RFM_SETISO_SELECTMASK	0x0007	Set the label EPC number	
RFM_SET_SELPRM	0x00 10	Select parameter settings	
RFM_GET_SELPRM	0x00 11	Select parameter acquisition	
RFM_SET_QUERY_PARAM	0x00 12	Query parameter settings	
RFM_GET_QUERY_PARAM	0x00 13	Query parameter acquisition	
Module custom directives			
RFM_MODULE_INT	0X0050	Initialize the device	Stop all actions
RFM_REBOOT	0x00 52	Restore factory settings	Restore Defaults
RFM_SET_PWR	0x0053	Setting RF Power	0-26dBm, all values above 26 are 26
RFM_SET_GET_RFIDPRO	0x0059	Set/get RF protocol	Currently the device only supports ISO 18000-6C
RFM_SET_GET_NETPARA	0X005F	Set/get network port working information	Applicable to LAN
RFM_SET_GET_REMOTE_NETPARA	0x0064	Set/get remote network port working information	Applicable to the entire network, cross-segment remote
RFM_GET_DEVICEINFO	0X0070	Get all module version numbers and sn codes	
RFM_SET_ALL_PARAM	0x0071	Set all basic parameters	Package all basic parameters and set them all at once
RFM_GET_ALL_PARAM	0x0072	Read all basic parameters	Package all basic parameters and read them all at once
RFM_SET_GET_IOPUT_PARAM	0x0074	Set/ get input and output working parameters	
RFM_SET_GET_WIFI_PARAM	0x0075	Set/ get WiFi working information	
RFM_SET_GET_S- PERMISSION_PARAM	0X0076	Set/ get specific TAG read permission	
RFM_RELEASE_CLOSE_RELAY1	0X0077	Release/Close Relay 1	
RFM_RELEASE_CLOSE_RELAY2	0X0078	Release/Close Relay 2	
RFM_SET_GET_AntN -RSSI-Filter	0x0079	Set/ get RSSI threshold for each antenna	
GPIO Control Commands			
RFM_SET_GET_G PIO_WORKPAMAR	0x0080	Set/get GPI O working parameters	
RFM_GET_G PIO_LEVEL	0x0081	Set /get GPIO level	
Door access control commands			
RFM_GET_GATE_STATUS	0x0082	Get the GATE channel gate status	
RFM_SET_GET_GATE_PARAM	0x0083	Set/get GATE channel gate working mode	

RFM_SET_GET_EAS_MASK	0x0084	Set/get EAS specific match data	
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2.2 Module general control commands

2.2.1 RFM_MODULE_INT (Initialize device)

The device is initialized and configured according to the stored parameters.

➤ Format

HEAD	ADDR	CMD	LEN	CHECK
0xCF	0xFF	0x00 5 0	0x00	2Byte

➤ Response format and status byte

HEAD	ADDR	CMD	LEN	STATUS	CHECK
0xCF	0x 00	0x00 5 0	0x01	1 Byte	2Byte

- STATUS: This command will only return a successful execution (value 0x00), other values are invalid;

2.2.2 RFM_REBOOT (device factory reset)

Restore factory settings command. When this command is successfully executed, the module will be restored to factory settings (does it need to be restarted?) .

➤ Format

HEAD	ADDR	CMD	LEN	CHECK
0xCF	0xFF	0x00 52	0x00	2Byte

➤ Response format and status byte

HEAD	ADDR	CMD	LEN	STATUS	CHECK
0xCF	0x00	0x00 52	0x01	1 Byte	2Byte

- STATUS: This command will only return a successful execution (value 0x00), other values are invalid;

2.2.3 RFM_SET_PWR (Set RF output power)

This command is used to set the module's RF output power. Before using the module to operate the tag, the user needs to use this command to set the module's RF output power. If the user does not set the module's RF output power, the module will use the default setting when it works.

➤ Format

HEAD	ADDR	CMD	LEN	PAYLOAD		CHECK
				Power	Resv	
0xCF	0xFF	0x00 53	0x02	1 Byte	1 Byte	2Byte

- Power: output power, in dBm, value range: [0, 26]dBm, values greater than 26 dBm are 26 dBm .
- Resv : System reserved field, default value is 0x00;

➤ Response format and status byte

HEAD	ADDR	CMD	LEN	STATUS	CHECK
0xCF	0x00	0x00 53	0x01	1 Byte	2Byte

- STATUS:
 - 1) 0x00: command executed successfully;
 - 2) 0x01: The module does not support the output power value;
 - 3) Other values: invalid;

2.2.4 RFM_SET_GET_RFID PRO (Set / read the RF protocol standards supported by the module)

This command sets/reads the module's radio frequency RFID protocol standard specification (by issuing this command, the protocol standard can be set to determine whether the module is successfully connected).

➤ Format

HEAD	ADDR	CMD	LEN	PAYLOAD		CHECK
				Option	R FIDPRO	
0xCF	0xFF	0x0059	1 Byte	1 Byte	NC or 1Byte	2Byte

- Option: command control option
0x01: Set , followed by RFIDPRO of 1 Byte in length ;
0x02: Read , then do not connect to RFIDPRO;
Other values: invalid;
- RFIDPRO : Protocol options , see the table below for details.

➤ Response format and status byte

Set the response:

HEAD	ADDR	CMD	LEN	STATUS	Option	CHECK
0xCF	0x00	0x0059	1Byte	1Byte	1Byte	2Byte

获取响应：

HEAD	ADDR	CMD	LEN	STATUS	PAYLOAD		CHECK
					Option	RFIDPRO	
0xCF	0x00	0x0059	1Byte	1Byte	1Byte	1Byte	2Byte

Fields	byte	describe
STATUS	1	0x00: Command execution successful ; 0x01 : Parameter error.
Option	1	0x01: Set; 0x02: Get
RFIDPRO	1	0x00: ISO 18000-6C; 0x01: GB/T 29768 ; 0x02: GJB 7377.1 ; Currently only ISO is supported 18000-6C.

2.2.5 RFM_SET_GET_NETPARA (Set / Read Device Network Port Information)

This command sets/reads the module's network port information. The default setting is TCP Service, the host computer connection needs to set the corresponding device IP address and port;

➤ Format

HEAD	ADDR	CMD	LEN	PAYLOAD	CHECK
------	------	-----	-----	---------	-------

HEAD	ADDR	CMD	LEN	Option	NetPara	CHECK
0xCF	0xFF	0x00 5F	1 Byte	1 Byte	NC or 1Byte	2Byte

- Option: command control option

0x01: Setting;

0x02: read;

Other values: invalid;

➤ Response format and status byte

Set the response:

HEAD	ADDR	CMD	LEN	STATUS	Option	CHECK
0xCF	0x00	0x00 5F	1 Byte	1 Byte	1 Byte	2Byte

Get the response:

HEAD	ADDR	CMD	LEN	STATUS	PAYLOAD		CHECK
					Option	NetPara	
0xCF	0x 00	0x000 5F	1 Byte	1 Byte	1 Byte	NByte	2Byte

Fields		byte	describe
STATUS		1	0x00: Command execution successful ; 0x01 : Parameter error.
Option		1	0x01: Set; 0x02: Get
NetPara	IPAddr	4	Device IP address. If the IP address is 192.168.1.1, the data is [0xC0, A8, 0x01, 0x01]
	MacAddr	6	Mac address, if multiple devices work at the same site, please use different MAC addresses; For example: mac[6]={0x00,0x08,0xdc,0x11,0x11,0x11} , the mac address is 00-08-DC-11-11-11
	Port	2	Listening port, the value is [0,65536] , the default is 9527;
	NetMask	4	Subnet mask, default is [0xFF,0xFF,0xFF,0x00]
	GateWay	4	Default gateway, default is [0xC0,0xA8,0x01,0x01]

2.2.6 RFM_SET_GET_REMOTE_NETPARA (set / read device remote network port information)

This command sets/reads the remote network port information. The device sends data to the remote IP , and the remote computer can monitor and receive the data.

➤ Format

HEAD	ADDR	CMD	LEN	PAYLOAD		CHECK
				Option	NetPara	
0xCF	0xFF	0x00 64	1 Byte	1 Byte	NC or 1Byte	2Byte

- Option: command control option
 0x01: Setting;
 0x02: read;
 Other values: invalid;

➤ Response format and status byte

Set the response:

HEAD	ADDR	CMD	LEN	STATUS	Option	CHECK
0xCF	0x00	0x00 5F	1 Byte	1 Byte	1 Byte	2Byte

Get the response:

HEAD	ADDR	CMD	LEN	STATUS	PAYLOAD		CHECK
					Option	NetPara	
0xCF	0x00	0x000 5F	1 Byte	1 Byte	1 Byte	NC or 1Byte	2Byte

Fields		byte	describe
STATUS		1	0x00: Command execution successful; 0x01: Parameter error.
Option		1	0x01: Set; 0x02: Get
NetPara	Enable	1	Enable switch, 1: enable sending, 0: disable sending.
	IPAddr	4	Remote IP address. If the IP address is 192.168.1.1, the data is [0xC0, 0xA8, 0x01, 0x01]
	Port	2	Listening port, the value is [0,65536], the default is 9527;
	HeartTime	1	Heartbeat packet time, to prevent disconnection, unit*5S

2.2.7 RFM_GET_DEVICE INFO (Get module information)

This command is used to obtain the version information of the current device , including the hardware version number, firmware version number, and SN number of the CP module and RFID module .

➤ Format

HEAD	ADDR	CMD	LEN	CHECK
0x CF	0xFF	0x00 70	0x00	2 Byte

➤ Response format and status byte

HEAD	ADDR	CMD	LEN	STATUS	PAYLOAD		
					CPHardVer	CPFirmVer	CPSN_code
0xCF	0x00	0x0070	0xAC	1Byte	32Bytes	32Bytes	12Bytes

PAYLOAD			CHECK
RFIDModeVer	RFIDModeName	RFIDMode_SNCODE	
32Bytes	32Bytes	1 2 Bytes	2 Byte

Definition of each byte:

Fields	byte	describe
STATUS	1	This command will only return a successful result (value 0x00), other values are invalid;
CP HardVer	32	CP module hardware version number , in ASCII format, ending with '\0 ' . The actual hardware version number may be less than 32 bytes, and the unused bytes are supplemented with '\0 ' .
CP FirmVer	3 2	CP module firmware version number and bootloader version number, the format is the same as the hardware version number;
CP _SN Code	1 2	CP module 12-byte serial number, in ASCII format, with unused bytes supplemented with '\0 ' ;
RFID Mode Ver	32	RFID module version number , in ASCII format, ends with '\0 ' . The actual version number is 2 bytes, less than 32 bytes, and the unused bytes are supplemented with '\0 ' . The first byte is the main version, and the second byte is the sub-version; for example: Byte0=0x0, Byte1=0x1e, the version number is 3.30.

RFIDModeName	3 2	RFID module model , in ASCII format, ending with '\0 ' . The actual model is less than 32 bytes, and the unused bytes are supplemented with '\0 ' .
RFIDMode _SN Code	1 2	RFID module serial number, in ASCII format. The actual serial number is 4 bytes, less than 32 bytes. The unused bytes are supplemented with '\0 ' .

2.2.8 RFM_SET_ALL_PARAM (Set Configurable Operating Parameters)

This command is used to set the configurable working parameters of the device . If the user does not set this , the device will use the default settings when working.

> Format

	HEAD	ADDR	CMD	LEN	PAYLOAD							
					Addr	RFIDPRO	Work Mode	Interface	Baudrate	WGSet	Ant	RfidFreq
	0xCF	0xFF	0x0071	0x19	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	8Bytes

PAYLOAD											CHECK
RfidPower	InquiryArea	QValue	Session	AcsAddr	AcsDataLen	FilterTime	TriggerTime	BuzzerTime	Polling Interval		
1 Byte	1 Byte	1 Byte	1 Byte	1 Byte	1 Byte	1 Byte	1 Byte	1 Byte	1 Byte	2Bytes	

- Addr : The communication address of the device, the default value is 0x00. This address cannot be 0xFF. If it is set to 0xFF, the read/write module will return parameter error information.
- RFIDPRO: Protocol standard specification of radio frequency RFID equipment , 0x00: ISO 18000-6C; 0x01: GB/T 29768 ; 0x02: GJB 7377.1 ; **Currently only ISO is supported 18000-6C.**
- WorkMode : The working mode of the device, **the default value is 0** .

WorkMode	Working Mode
0	Answer Mode
1	Active Mode
2	Trigger Mode

- Interface: The communication interface of the device. **The default value is 0x80** . The specific meanings are as follows:

Interface	Interface Type
0x80	RS232
0x40	RS485
0x20	RJ45
0x10	WiFi
0x01	USB
0x02	keyboard
0x04	CDC_COM

- Baudrate : Serial port baud rate, the default value is 4, the specific meanings are as follows:

baudrate	Actual baud rate
0	9600bps
1	19200 bps
2	38400 bps
3	57600 bps
4	115200 bps

- WGSet : Configuration parameters of the Wiegand data output interface, the default value is 0x00, the specific meanings are as follows:

WGSet	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Bit Definition	0: Disable Wiegand output 1: Enable Wiegand output	0: wg26 1: wg34	0: Low first 1: High position first	spar e	spar e	spar e	spar e	spar e

Wiegand data keyboard output format: Default is 2b 00.

2b 00: Convert directly to decimal characters.

wg26: 0xA1B2C3 is directly converted to 8-bit decimal characters as '10597059 ';

wg 34: 0xA1B2C3D4 converts directly to 10 decimal characters as '2712847316 '.

2b 01: Convert to decimal characters by word.

wg26: 0xA1B2C3 is converted to 8-bit decimal characters by 2H+4H, which is '16145763 ';

wg 34: 0xA1B2C3D4 is converted to 10 decimal characters as '4139450132 ' by pressing 4H+4H.

2b 10: Convert directly to hexadecimal characters.

wg26 : 0xA1B2C3 is directly expressed as 'A1B2C3' using 6-digit hexadecimal ;

wg 34: 0x A1B2C3D4 is directly expressed as 'A1B2C3D4' using 8-bit hexadecimal .

2b 11: Reserved.

- Ant: All antenna numbers of the device. The bit indicates the antenna to be used. If the corresponding bit value is 1, the antenna is used, and if the value is 0, the antenna is not used. Starting from the lowest bit, the 0th bit indicates antenna No. 1, the 1st bit indicates antenna No. 2, and so on. A maximum of 8 antennas can be represented . Different modules support different antennas , depending on the specific situation. **The default value is 0x01** , indicating antenna No. 1 .
- RfidFreq : RFID frequency-related parameters of the device, used to select the frequency band and the upper and lower frequency limits in each frequency band. The length is 8 bytes. The specific parameters are as follows:

RfidFreq				
R REGION	STRATFREI	STRATFRED	STEPFRE	CN
1 Byte	2Byte	2Byte	2Byte	1 Byte

Definition of each byte:

To set the frequency, first determine the frequency band range according to REGION, and then refer to STRATFREI , STRATFRED , STEPFRE , and CN to calculate the specific frequency range.

Fields	byte	describe
REGION	1	Frequency band ranges in various countries: 0x 00: customized by the user according to needs; 0x01: US [902.75~927.25] 0x02: Korea [917.1~923.5] 0x03: EU [865.1~868.1] 0x 04 : JAPAN [952.2~953.6] 0x05 : MALAYSIA [919.5 ~922.5] 0x06 : EU3 [865.7~867,5] 0x07 : CHINA_BAND1 [840.125~844.875] 0x08 : C HINA_BAND2 [920.125~924.875]
STRATFREI	2	in megahertz ; for example, 920.125MHz, STRATFREI = 920 = 0x 0 398, high byte = 0x03, low byte = 0x98;
STRATFRED	2	in megahertz ; for example, 920.125MHz, STRATFRED = 125, high byte = 0x00, low byte = 0x7D

STEPFRE	2	Frequency step (KHz), please refer to the calculation formula of each frequency band ; for example, 125KHz, STEPFRE = 125, high byte = 0x00, low byte = 0x7D;
CN	1	Number of channels;

Frequency calculation formula: Minimum frequency: $F_{min} = \text{STRATFREI} + \text{STRATFRED} / 1000$
(Unit: MHz)

Maximum frequency: $F_{max} = F_{min} + \text{STEPFRE} * \text{CN} / 1000$ (Unit: MHz)

Calculation formula for each frequency band: (The set frequency range must be within the standards of each country)

Chinese band2: $F_s = 920.125 + \text{CN} * 0.25$ (MHz) where $\text{CN} \in [0, 19]$.

US band: $F_s = 902.75 + \text{CN} * 0.5$ (MHz) where $\text{CN} \in [0, 49]$.

Korean band: $F_s = 917.1 + \text{CN} * 0.2$ (MHz) where $\text{CN} \in [0, 31]$.

EU band: $F_s = 865.1 + \text{CN} * 0.2$ (MHz) where $\text{CN} \in [0, 14]$.

Ukraine band: $F_s = 868.0 + \text{CN} * 0.1$ (MHz) where $\text{CN} \in [0, 6]$.

Peru band: $F_s = 916.2 + \text{CN} * 0.9$ (MHz) where $\text{CN} \in [0, 11]$.

Chinese band1: $F_s = 840.125 + \text{CN} * 0.25$ (MHz) where $\text{CN} \in [0, 19]$.

EU3 band: $F_s = 865.7 + \text{CN} * 0.6$ (MHz) where $\text{CN} \in [0, 3]$.

US band3: $F_s = 902 + \text{CN} * 0.5$ (MHz) where $\text{CN} \in [0, 52]$.

Taiwan band: $F_s = 922.25 + \text{CN} * 0.5$ (MHz) where $\text{CN} \in [0, 11]$.

- RfidPower : The RFID output power of the device, in dBm. The value range is [0 , 30]dBm. Other values are invalid .
- InquiryArea : The storage area of the tag that the device wants to access. 0x00: Reserved area; 0x01 (default): EPC storage area ; 0x02: TID storage area; 0x03: USER storage area; 0x04: EPC+TID; 0x05: EPC+USER; 0x06: EPC+TID+USER; other values are reserved. If other values appear in the command , a parameter error message will be returned.
- QValue : The initial Q value used when querying EPC tags. The Q value should be set to approximately equal 2Q when the number of tags in the field is equal to 2Q. The default value of Q is 4 , and the range of Q is 0 to 15. If other values appear in the command , a parameter error message will be returned.
- Session: The Session value used when querying the EPC tag. The default value is 0 and the value range is [0, 3]. Other values will return a parameter error message.

Session	Notes
0	Session uses S0
1	Session uses S1
2	Session using S2
3	Session using S3

- AcsAddr : The starting address of the tag storage area that the device wants to access, **unit: Byte, default value: 0x00**: When accessing the EPC area, 0x00 indicates the starting address of the EPC number segment of the EPC area except the CRC and PC segments; when accessing other storage areas, 0x00 indicates the starting address of the storage area.
- AcsDataLen : The data length that the device wants to access the tag storage area, **unit: Byte, default value: 0x00**.
- FilterTime : filter time. After a tag data is successfully read, the tags with the same data are filtered out within this time . The unit is S, and the value range is [0 , 255] . Other values are invalid . The default value is 0, which means no filtering.
- TriggerTime : The query duration after the device receives the trigger signal, in seconds. The default value is 1. The value range is [0 , 255] . Other values are invalid .
- BuzzerTime : The duration of the buzzer after the device is successfully executed. The unit is 10ms. The value range is [0 , 255] . Other values are invalid . The default value is 1. When it is 0, it means that the buzzer does not sound.
- PollingInterval : polling interval, unit: 10ms, value range: [0 , 255] , other invalid , default is 1 .

➤ Response format and status byte

HEAD	ADDR	CMD	LEN	STATUS	CHECK
0xCF	0XX	0x00 71	0x01	1 Byte	2Byte

- STATUS:
 - 1) 0x00: command executed successfully;
 - 2) 0x01: parameter error ;
 - 3) Other values: invalid;

2.2.9 RFM_GET_ALL_PARAM (Read configurable operating parameters)

This command is used to set the configurable working parameters of the device .

➤ Format

HEAD	ADDR	CMD	LEN	CHECK
0xCF	0xFF	0x00 72	0x00	2Byte

➤ Response format and status byte

HEAD	ADDR	CMD	LEN	PAYLOAD								
				STATUS	Addr	RFIDPRO	Work Mode	Interface	Baudrate	WGSet	Ant	RfidFreq
0xCF	0xFF	0x0071	0x1A	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	8Bytes

PAYLOAD											CHECK
RfidPower	InquiryArea	QValue	Session	AcsAddr	AcsDataLen	FilterTime	TriggerTime	BuzzerTime	Polling Interval		
1 Byte	1 Byte	1 Byte	1 Byte	1 Byte	1 Byte	1 Byte	1 Byte	1 Byte	1 Byte	1 Byte	2Bytes

■ STATUS:

1) 0x00: command executed successfully;

2) Other values: invalid ;

■ For other parameters, refer to RFM_SET_ALL_PARAM.

2.2.10 RFM_SET_GET_IOPUT_PARAM (Set read input and output control)

This command is used to read the input and output control parameters of the device.

➤ Format

HEAD	Control Field			PAYLOAD									CHECK
	ADDR	CMD	LEN	OPTION	Relay EN	Relay Time	Relay Power EN	Trig Way	Buffer EN	Protocol EN	Protocol Type	Protocol Format	
0xCF	0xFF	0x0074	0x12	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	10 Bytes	2Bytes

Parameter explanation:

Option: command control option, 0x01 is set, 0x02 is read, other values are invalid.

Relay EN : Relay enable parameter, length 1 byte , default 0x00 .

bit0: 1 : Relay 1 is enabled, 0: Relay 1 is not enabled .

bit1: 1 : Relay 2 is enabled, 0: Relay 2 is not enabled .

RelayTime : Relay normally open foot conduction time parameter, length 1 byte, default 0x03 .

RelayPowerEN : relay common terminal power on enable parameter , length 1 byte , default 0x00 . 0x01 is on , 0x00 is off .

TrigWay : Valid trigger mode parameter of the trigger pin, 1 byte in length , default value is 0x00 .

0x01 is triggered by high level (2V-5V), and 0x00 is triggered by low level (less than 0.5V).

BufferEN : Buffer function enable parameter , length 1 byte, default 0x00 . 0x01 enables, 0x00 disables.

ProtocolEN : Specific data exchange function enable parameter, length 1 byte. 0x01 enables, 0x00 disables. Default 0x00 .

ProtocolType : Specific data exchange protocol type, length 1 byte. Default 0x00 .

Modbus-RTU:0x00, ASCII:0x01, HEX:0x02, Modbus-TCP:0x03.

ProtocolFormat : Specific data exchange protocol format, length 10 bytes . Default [0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00] .

➤ Response format and status byte

Set the response:

HEAD	ADDR	CMD	LEN	STATUS	Option	CHECK
0xCF	0x00	0x0073	1 Byte	1 Byte	1 Byte	2Byte

Get the response:

HEAD	Control Field			PAYLOAD										CHECK
	ADDR	CMD	LEN	STATUS	OPTION	GPOEN	Reserve	GPOWM	GPIWM	Reserve	Protocol EN	Protocol Type	Protocol Format	
0xCF	0xFF	0x0074	0x13	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	10 Bytes	2 Bytes

■ STATUS:

- 1) 0x00: command executed successfully;
- 2) Other values: invalid ;

2.2.1.1 RFM_SET_GET_WiFi_PARAM (Set / Read WiFi information)

This command sets/reads the module's WiFi information. If it is set as TCP Client, the corresponding remote IP address and port need to be set.

Wi-Fi network configuration mode: 1. SmartConfig configures the network through the mobile phone app, 2. Serial port configuration, configures by sending ssid and pwd . After successful configuration, it will automatically connect after power on.

➤ Format

HEAD	ADDR	CMD	LEN	PAYLOAD		CHECK
				Option	WiFiPara	
0xCF	0xFF	0x0075	1 Byte	1 Byte	NC or 1Byte	2Byte

■ Option: command control option

- 0x01: Setting;
0x02: read;
Other values: invalid;

➤ Response format and status byte

Set the response:

HEAD	ADDR	CMD	LEN	STATUS	Option	CHECK
0xCF	0x00	0x0075	1 Byte	1 Byte	1 Byte	2Byte

Get the response:

HEAD	ADDR	CMD	LEN	STATUS	PAYLOAD		CHECK
					Option	NetPara	
0xCF	0x00	0x0075	1 Byte	1 Byte	1 Byte	NByte	2Byte

Fields		byte	describe
STATUS		1	0x00: Command execution successful; 0x01: Parameter error.
Option		1	0x01: Set; 0x02: Get
WiFiPara	WiFiEN	1	WiFi enabling parameters, mode selection. bit0: 0: turn off wifi ; 1: turn on wifi bit1: 0: smartconfig 1: serial port network configuration. Other bits default to 0;
	SSID	32	Target WiFi name, ASCII code. Invalid bytes are filled with 0x00
	PWD	64	Target WiFi password, ASCII code. Invalid bytes are filled with 0x00
	RemoteIPAddr	4	Remote IP address. If the IP address is 192.168.1.1, the data is [0xC0, A8, 0x01, 0x01]
	RemotePort	2	Remote IP port number, high byte first, low byte last

2.2.1 2 RFM_SET_GET_S-PERMISSION_PARAM (Set read permission)

This command is used to set password and mask query permission parameters, relay usage parameters, cache switch parameters and public protocol usage parameters.

> Format

HEAD	Control Field			PAYLOAD								CHECK
	ADDR	CMD	LEN	OPTION	Code EN	Codes	Mask EN	Start Add	Mask Len	Mask Data	Mask Condition	
0xCF	0xFF	0x0073	0x29	1Byte	1Byte	4Bytes	1 Byte	1 Byte	1 Byte	31Bytes	1 Byte	2 Bytes

Parameter explanation:

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Option: command control option, 0x01 is set, 0x02 is read, other values are invalid.
CodeEN : Password function enable parameter, length 1 byte. 0x01 enables, 0x00 disables. Default 0x00 .
Codes: Access code of the tag, 4 bytes in length. Default value is [0x00, 0x00, 0x00, 0x00] .
MaskEN : Mask function enable parameter, length 1 byte. 0x01 enables, 0x00 disables. Default 0x00 .
StartAdd : mask start address, length 1 byte, unit byte. Default 0x00 .
Mask Len: Mask length, 1 byte, unit byte, maximum 31. Default 0x00 .
MaskData : Mask data, 31 bytes in length. When the mask length is less than 31 bytes, the following bytes are padded with 0.
The default is all 0 .
MaskCondition : Mask condition, length 1 byte . 0x00: password or mask meets the requirement; 0x01: password and mask meet the requirement at the same time. Default is 0x00 .

> Response format and status byte

Set the response:

HEAD	ADDR	CMD	LEN	STATUS	Option	CHECK
0xCF	0x00	0x0073	1Byte	1Byte	1Byte	2Byte

获取响应:

HEAD	Control Field			PAYLOAD									CHECK
	ADDR	CMD	LEN	STATUS	OPTION	Code EN	Codes	Mask EN	Start Add	Mask Len	Mask Data	Mask Condition	
0xCF	0xFF	0x0073	0x29	1 Byte	1 Byte	0xFF	4 0xFF	1 Byte	1 Byte	1 Byte	31Bytes	1 Byte	2 Bytes

■ STATUS:

- 1) 0x00: command executed successfully;
- 2.Other values: invalid ;

2.2.1 3 RFM_RELEASE_CLOSE_RELAY1 (Release /Close Relay 1)

This command is used to release and close the relay.

> Format

HEAD	ADDR	CMD	LEN	PAYLOAD		CHECK
				Option	ValidTime	
0xCF	0xFF	0x0077	1 Byte	1 Byte	1 Byte	2Byte

■ Option: command control option

- 0x01: Release;
0x02: Closed;
Other values: invalid;

- ValidTime : The effective time when closed, in seconds, with a default value of 1. When the ValidTime value is equal to 0, relay 1 will remain in the closed state; when the ValidTime value is greater than 0, relay 1 will be released after closing for ValidTime seconds.

➤ Response format and status byte

HEAD	ADDR	CMD	LEN	STATUS	Option	ValidTime	CHECK
0xCF	0x00	0x0077	1 Byte	1 Byte	1 Byte	1 Byte	2Byte

Fields	byte	describe
STATUS	1	0x00: Command execution successful; 0x01: Parameter error.
Option	1	0x01: Release; 0x02: Close
ValidTime	1	The effective time when closed, in seconds, the default value is 1.

2.2.1 4 RFM_RELEASE_CLOSE_RELAY2 (Release /Close Relay 2)

This command is used to release and close the relay.

➤ Format

HEAD	ADDR	CMD	LEN	PAYLOAD		CHECK
				Option	ValidTime	
0xCF	0xFF	0x0078	1 Byte	1 Byte	1 Byte	2Byte

- Option: command control option
0x01: Release;
0x02: Closed;
Other values: invalid;
- ValidTime : The effective time when closed, in seconds, with a default value of 1. When the ValidTime value is equal to 0, Relay 2 will remain in the closed state; when the ValidTime value is greater than 0, Relay 2 will be released after closing for ValidTime seconds.

➤ Response format and status byte

HEAD	ADDR	CMD	LEN	STATUS	Option	ValidTime	CHECK
0xCF	0x00	0x0078	1 Byte	1 Byte	1 Byte	1 Byte	2Byte

Fields	byte	describe
STATUS	1	0x00: Command execution successful; 0x01: Parameter error.
Option	1	0x01: Release; 0x02: Close
ValidTime	1	The effective time when closed, in seconds, the default value is 1.

2.2.15 RFM_S ET_GET_AntN -RSSI-Filter (set the RSSI filter threshold for reading each antenna port)

This command is used to filter tags with different signal strengths . RSSI is in negative form, and the larger the absolute value, the farther the tag is.

> Format

HEAD	Control Field			PAYLOAD			CHECK
	ADDR	CMD	LEN	OPTION	BasicRSSI	AntN-RSSIData	
0xCF	0xFF	0x0079	0x13	1 Byte	2Byte	Ant1-RSSIData~Ant16-RSSIData 16Byte	2 Bytes

Parameter explanation:

- Option: command control option, 0x01 is set, 0x02 is read, other values are invalid.
- BasicRSSI : The basic value of the RSSI filter threshold of each antenna port , 2 bytes .The value range is [-32767, 32767]. Negative numbers are in the form of two's complement. The default value is 0xFFBF: -65.
- AntN-RSSIData : RSSI filter threshold offset value of each antenna port , 16 bytes . The RSSI filter threshold offset value of each antenna port occupies 1 byte, with a value range of [0, 255] and a default value of 0.

Note: The RSSI filter value for each antenna port X is BasicRSSI - AntX-RSSIData . For example: BasicRSSI is -65, Ant1-RSSIData is 1, then the RSSI filter value for antenna 1 is -66. When the RSSI filter value is less than -174, such as -175, the filter function will not work.

> Response format and status byte

Set the response:

HEAD	ADDR	CMD	LEN	STATUS	Option	CHECK
0xCF	0x00	0x0079	0x02	1 Byte	1 Byte	2Byte

Get the response:

HEAD	Control Field			PAYLOAD				CHECK
	ADDR	CMD	LEN	STATUS	OPTION	BasicRSSI	AntN-RSSIData	

0xCF	0xFF	0x00 79	0x14	1 Byte	1 Byte	2Byte	Ant1-RSSIDData~Ant16-RSSIDData 16Byte	2 Bytes
------	------	---------	------	--------	--------	-------	--	---------

■ STATUS:

- 1) 0x00: command executed successfully;
- 2.Other values: invalid ;

2.3 International standard (ISO 18000-6 C) protocol related commands

2.3.1 RFM_INVENTORYISO_CONTINUE (Tag Inventory)

This command starts the international standard multi-tag inventory command, and the inventory function has an anti-collision algorithm.

This command can specify the duration of the inventory count. If the input inventory count count is 0, it means that the inventory will continue until the stop inventory count command is received.

During the inventory count process, each time a tag is successfully counted, the command response with a "STATUS" value of "0" will return the information of the newly counted tag.

When the inventory command is successfully executed, the command response with a "STATUS" value of "0x12" will be returned to notify that the inventory command has been executed.

➤ Format

HEAD	ADDR	CMD	LEN	PAYLOAD		CHECK
				InvType	InvParam	
0xCF	0xFF	0x0001	0x05	1 Byte	4Byte	2Byte

■ InvType : Inventory method:

0x00: count labels by time, stop counting after executing the specified time or after receiving the stop counting command;

0x 01: Inventory is performed according to the number of cycles. The inventory is stopped after the specified number of polls is executed or after receiving the stop inventory command;

■ InvParam : Inventory method parameters:

1. If InvType is 0x00:

InvParam indicates the inventory time in seconds. If the value is 0, it means that the inventory will continue until a stop command is received.

2. If InvType is 0x01:

InvParam indicates the number of inventory counts , in times , and the value must be greater than 0;

➤ Response format and status byte

HEAD	ADDR	CMD	LEN	STATUS	PAYLOAD					CHECK
					RSSI	Antenna	Channel	EPC LEN	EPC NUM	
0xCF	0x00	0x0001	1 Byte	1 Byte	2Bytes	1 Byte	1 Byte	1 Byte	N Bytes	2Byte

Definition of each byte:

Fields	byte	describe
STATUS	1	0x00: The tag is successfully counted and the tag information is included in PAYLOAD; 0x01: Q, MemBank parameter value is incorrect or Length is inconsistent with Mask data length; 0x02: Command execution failed due to an internal module error; 0x12: No tag is counted or the entire count command is executed; 0x17: The tag data exceeds the maximum transmission length of the serial port; Other values: invalid;
RSSI	2	RSSI of tag ACK response, in dBm, signed number, negative number uses two's complement format;
Channel	1	The channel from which the tag data is received. The value starts from 0, where 0 represents channel 0, 1 represents channel 1, and so on.
EPC LEN	1	The length of the tag's EPC number (bytes) ;
EPC NUM	N Byte	The EPC number of the label ;

2.3.2 RFM_INVENTORY_STOP (Stop Inventory)

This command allows the user to actively stop the international standard multi-tag anti-collision inventory process.

➤ Format

HEAD	ADDR	CMD	LEN	CHECK
0xCF	0xFF	0x00 02	0x00	2Byte

➤ Response format and status byte

HEAD	ADDR	CMD	LEN	STATUS	CHECK
0xCF	0x00	0x00 02	0x01	1 Byte	2Byte

- STATUS: This command will only return a successful execution (value 0x00), other values are invalid;

2.3.3 RFM_READISO_TAG (Read tag data)

This command frame is for the module to read the data in the international standard protocol tag storage area.

Before calling this method, please set the inventory condition (for selecting tags) through the RFM_SETISO_SELECTMASK command. When performing international standard protocol tag data operations (reading tag data, writing tag data, locking tags, and deactivating tags), the tag will return the tag operation status. At this time, the module's response contains a byte of tag operation status. The definition of tag operation status is shown in Appendix A.

➤ Format

HEAD	ADDR	CMD	LEN	PAYLOAD					CHECK
				Option	AccPwd	MemBank	WordPtr	WordCount	
0xCF	0xFF	0x00 03	1 Byte	1 Byte	4 Bytes	1 Byte	2 Bytes	1 Bytes	2Byte

Definition of each field:

Fields	byte	describe
Option	1	Command options (this field is not used, invalid , default value is 0x00) ;
AccPwd	4	Access password, used for the tag to enter the secure state, the default value is 0x00000000;
MemBank	1	The storage area of the tag to be read, the value list is as follows : 0x00: Reserved; 0x01: EPC; 0x02: TID; 0x03: User;
WordPtr	2	(word) of the logical storage area ;
WordCount	1	The number of words to be read cannot be 0. The default value is 4. The value range is [1,120]

➤ Response format and status byte

HEAD	ADDR	CMD	LEN	STATUS	PAYLOAD								CHECK
					TagStatus	Antenna	CRC	PC	EPC LEN	EPC NUM	WordCount	Data	
0xCF	0x00	0x0003	1Byte	1Byte	1Byte	1Byte	2Byte	2Bytes	1Byte	N Bytes	1Bytes	N-Byte	2Byte

Definition of each field:

based on STATUS and TagStatus .

Fields	byte	describe
STATUS	1	Refer to Table A-6 STATUS definition

TagStatus	1	The operation status returned by the tag, see Appendix A for specific definitions;
Antenna	1	From which antenna is the reading
CRC	2	CRC data in the tag response data
PC	2	PC data in tag response data
EPC LEN	1	The length of the tag's EPC number (bytes) ;
EPC NUM	N Byte	The EPC number of the label ;
WordCount	1	The number of tag data words successfully read ;
Data	N Byte	The tag data successfully read has a length of WordCount×2 bytes;

2.3.4 RFM_SETISO_SELECTMASK (Select the tag to be operated)

EPC number required for tag operation (read, write, lock and deactivate) .

➤ Format

HEAD	ADDR	CMD	LEN	PAYLOAD			CHECK
				Pointer	Length	Mask	
0xCF	0xFF	0x00 07	1 Byte	2Bytes	1 Byte	N-Bytes	2Byte

- Pointer: reserved, the default value is 0x0000;
- The bit length of the EPC number to be matched . The default value is 0x00 .
- Mask: data to be matched. The effective data length is Length bits. If Length is an odd number, the low bits of the mask need to be padded with 0.

➤ Response format and status byte

HEAD	ADDR	CMD	LEN	STATUS	CHECK
0xCF	0x00	0x00 07	0x01	1 Byte	2Byte

- STATUS:
 - 1) 0x00: command executed successfully;
 - 2) 0x01: parameter error;
 - 3) Other values: invalid;

2.3.5 RFM_SET_SELPRM (Set Select command parameters)

This command is used to set the Select instruction parameters of the module's specified protocol, including "MemBank", "Target", "Action", "Pointer", "Length", and "Mask". For the specific application and meaning of each parameter, please refer to the protocol description.

➤ Format

HEAD	CMD	LEN	PAYLOAD							CHECK
			Protocol	Target	Action	Membank	Pointer	Length	Mask	
0xCF	0x0010	1 Byte	1 Byte	1 Byte	1 Byte	1 Byte	2 Bytes	1 Byte	N-Bytes	2 Byte

- Protocol : Protocol type

0x00 : ISO

- Target: Select to modify the target.

0x00 : S0 ; 0x01 : S1 ; 0x02 : S2 ; 0x03 : S3 ; 0x04 : SL ; 0x05-0xFF : reserved .

- Action: Select the matching condition rule

Action	ISO
0x00	If the conditions are met, set it to SL or A; if the conditions are not met, set it to non-SL or B
0x01	Eligible conditions are set to SL or A
0x02	If the conditions are not met, set to non-SL or B
0x03	Meet the conditions to reverse SL or A->B, B->A
0x04	If the conditions are met, it is set to non-SL or B; if the conditions are not met, it is set to SL or A
0x05	Eligible conditions are set to non-SL or B
0x06	If the conditions are not met, set to SL or A
0x07	Does not meet the conditions to reverse SL or A->B, B->A

- MemBank : The storage area where the selected and matched data is located

Membank	ISO	Interpretation	Remark
0x00	RFU	Label information area	Label information area
0x10	EP C	Coding region	Coding region
0x20	TID	Safe Zone	Safe Zone
0x30	User	User Area	User subarea 0

- Pointer: The starting address of the match, in bits
- Length: The length of the matching mask, in bits

- Mask: data to be matched. The effective data length is Length bits. If Length is an odd number, the lower bits of the mask need to be padded with 0.

➤ **Response format and status byte**

HEAD	CMD	LEN	PAYLOAD		CHECK
			Status	Protocol	
0xCF	0x00 10	1 Byte	1 Byte	1 Byte	2 Byte

- Status: command response code
 0x00: command executed successfully;
 0x01: parameter error;
 Other values: invalid;
- Protocol : Protocol type
 0x00 : ISO

2.3.6 RFM_GET_SELPRM (Get Select command parameters)

This command is used to obtain the Select/Sort instruction parameters of the specified protocol of the module, including "MemBank", "Target", "Action", "Pointer", "Length", and "Mask". For the specific application and meaning of each parameter, please refer to the protocol description.

➤ **Format**

HEAD	CMD	LEN	PAYLOAD		CHECK
			Protocol		
0xCF	0x00 11	1 Byte	1 Byte		2 Byte

- Protocol : Protocol type
 0x00 : ISO

➤ **Response format and status byte**

HEAD	CMD	LEN	PAYLOAD								CHECK
			Status	Protocol	Target	Action	Membank	Pointer	Length	Mask	
0xCF	0x0011	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	2Bytes	1Byte	N-Bytes	2Byte

- Status: 命令响应码
 0x00: command execution successful;
 0x01: parameter error; other values:
 invalid;
- Protocol : Protocol type
 0x00 : ISO
- Target: Select to modify the target.

- Action: Select the matching condition rule

Action	ISO
0x00	If the conditions are met, set it to SL or A; if the conditions are not met, set it to non-SL or B
0x01	Eligible conditions are set to SL or A
0x02	If the conditions are not met, set to non-SL or B
0x03	Meet the conditions to reverse SL or A->B, B->A
0x04	If the conditions are met, it is set to non-SL or B; if the conditions are not met, it is set to SL or A
0x05	Eligible conditions are set to non-SL or B
0x06	If the conditions are not met, set to SL or A
0x07	Does not meet the conditions to reverse SL or A->B, B->A

- MemBank : The storage area where the selected and matched data is located

MemBank	ISO	Interpretation	Remark
0x00	RFU	Label information area	Label information area
0x10	EPC	Coding region	Coding region
0x20	TID	Safe Zone	Safe Zone
0x30	User	User Area	User subarea 0

- Pointer: The starting address of the match, in bits
- Length: The length of the matching mask, in bits
- Mask: data to be matched. The effective data length is Length bits. If Length is an odd number, the lower bits of the mask need to be padded with 0.

2.3.8 RFM_GET_QUERY_PARAM (Get Query command parameters)

This command is used to obtain the Query instruction parameters of the specified protocol of the module, including "Sel", "Session", and "Target". For the specific application and meaning of each parameter, please refer to the protocol description.

➤ Format

HEAD	CMD	LEN	PAYLOAD	CHECK
			Protocol	
0xCF	0x00 13	1 Byte	1 Byte	2 Byte

- Protocol : Protocol type

0x00 : ISO

➤ Response format and status byte

➤

HEAD	CMD	LEN	PAYLOAD					CHECK
			Status	Protocol	Sel	Session	Target	
0xCF	0x00 13	1 Byte	1 Byte	1 Byte	1 Byte	1 Byte	1 Byte	2 Byte

- Status: command response code

0x00: command execution successful;

0x01: parameter error; other values:

invalid;

- Protocol : Protocol type

0x00 : ISO

- Sel: Specifies the label of the inventory response

0x00 : ALL; 0x01:ALL; 0x02: ~SL; 0x03: SL .

- Session: Specifies the section of the inventory label. This field is valid for ISO and national standards, and is not used for national standards.

0x00: S0 ; 0x01: S1 ; 0x02: S2 ; 0x03: S3

- Target : Inventory identification

0x00: A

0x01: B

2.3.7 RFM_SET_QUERY_PARAM (Set Query command parameters)

This command is used to set the Query instruction parameters of the specified protocol of the module, including "Sel", "Session", and "Target". For the specific application and meaning of each parameter, please refer to the protocol description.

➤ Format

HEAD	CMD	LEN	PAYLOAD				CHECK
			Protocol	Sel	Session	Target	

0xCF	0x00 12	1 Byte	1 Byte	1 Byte	1 Byte	1 Byte	2 Byte
------	---------	--------	--------	--------	--------	--------	--------

- Protocol : Protocol type

0x00 : ISO

- Sel: Specifies the label of the inventory response
0x00 : ALL; 0x01:ALL; 0x02: ~SL; 0x03: SL .
- Session: Specifies the section of the inventory tag
0x00: S0 ; 0x01: S1 ; 0x02: S2 ; 0x03: S3
- Target : Inventory identification
0x00: A
0x01: B

➤ **Response format and status byte**

HEAD	CMD	LEN	PAYLOAD		CHECK
			Status	Protocol	
0xCF	0x00 12	0x02	1 Byte	1 Byte	2 Byte

- Status: command response code
0x00: command execution successful;
0x01: parameter error; other values:
invalid;
- Protocol : Protocol type
0x00 : ISO

2.4 GPIO Control Commands

2.4.1 RFM_SET_GET_GPIO_WORKPARAM (Set / get GPIO working parameters)

Set/get GPIO working parameters .

➤ Format

HEAD	Control Field			PAYLOAD							CHECK
	ADDR	CMD	LEN	OPTION	GPIOMODE	GPIEN	INTLEVEL	GPOEN	PUTLEVEL	PUTTIME	
0xCF	0xFF	0x0080	0x0E	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	8 Bytes	2 Bytes

Parameter explanation:

- Option: command control option, 0x01 is set, 0x02 is read, other values are invalid.
- GPIOMODE: GP IO working mode parameter, length 1 byte, default 0x 00 .

GPIOMODE	Interpretation
0x00	General Mode: In this mode, the GPIX input valid level triggers the card reading, and the card reading triggers the GPOX output valid level. The duration of GPOX output is determined by the GPOX_Put_Time of GPOX in PUT TIME . In this mode, when GPOX_Put_Time = 0xFF, GPOX automatically and continuously outputs a valid level, and then GPOX enters the instruction control output mode.
0x01	Door access mode: In this mode, GPIO works according to the settings in the gate channel working parameters. For specific explanations of the gate channel working parameters, see 2.6.1.
other	reserve.

- GPIEN: GPI enable status parameter, length 1 byte, default 0x 00. The enable status length of each GPI is 1 bit. 0: Disable; 1: Enable.

8bit interpretation of GPIEN :

bit	Interpretation
7	GPI8 Enable Status
6	GPI7 Enable Status
5	GPI6 Enable Status
4	GPI5 Enable Status
3	GPI4 Enable Status
2	GPI3 Enable Status
1	GPI2 Enable Status
0	GPI1 Enable Status

- INTLEVEL :

GPI valid level parameter, length 1 byte, default 0x 00 .

The effective level parameter length of each GPI is 1 bit. 0: low level; 1: high level.

8bit interpretation of INTLEVEL :

bit	Interpretation
7	GP18 effective level
6	GP17 effective level
5	GP16 effective level
4	GP15 effective level
3	GP14 effective level
2	GP13 effective level
1	GP12 effective level
0	GP11 effective level

- GPOEN: GPO output enable status parameter, length 1 byte, default 0x 00. The output enable status length of each GPO is 1 bit . 0: Disable; 1: Enable.
8-bit interpretation of GPOEN :

bit	Interpretation
7	GP08 output enable status
6	GP07 output enable status
5	GP06 output enable status
4	GP05 output enable status
3	GP04 output enable status
2	GP03 output enable status
1	GP02 output enable status
0	GP01 output enable status

- PUTLEVEL :
GPO output valid level parameter, length 1 byte, default 0x 00 .
effective level parameter length of each GPO is 1 bit. 0: low level; 1: high level.
8bit interpretation of PUTLEVEL :

bit	Interpretation
7	GP08 output valid level
6	GP07 output valid level
5	GP06 output effective level
4	GP05 output valid level
3	GP04 output valid level
2	GP03 output valid level
1	GP02 output valid level

0	GPO1 output valid level
---	-------------------------

- PUTTIME:

GPO output valid level duration, length 8 bytes. Specific interpretation is as follows:

name	length	Interpretation	Notes
GPO1_Put_Time	1 Bytes	<p>GPOX_Put_Time is the duration of GPOX outputting a valid level , in units of 100mS.</p> <p>General output mode:</p> <p>When GPIOMODE is in general mode, GPOX is triggered by GPIX to control the effective level of the response output, with a value range of 0~254 and a default of 30. If the card is not read again within the response output time , the response output ends ; if the card is read again within the response output time , the response output time is reset to GPOX_Put_Time *100mS.</p> <p>Command control output mode:</p> <p>When GPIOMODE is in general mode and GPOX_Put_Time = 255 (0xFF), GPOX automatically and continuously outputs a valid level. At this time, GPOX enters the instruction control output mode.</p> <p>Inventory output mode:</p> <p>When GPIOMODE is gate channel mode and GATEMODE is inventory mode, GPOX responds to the output valid level controlled by the card reading status, GPOX_Put_Time is invalid and defaults to 0 .</p> <p>EAS output mode:</p> <p>When GPIOMODE is gate channel mode and GATEMODE is EAS mode, GPOX is triggered by EAS event to control the response output valid level, the value range is 0~255, the default is 3.</p>	
GPO2_Put_Time	1 Bytes		
GPO3_Put_Time	1 Bytes		
GPO4_Put_Time	1 Bytes		
GPO5_Put_Time	1 Bytes		
GPO6_Put_Time	1 Bytes		
GPO7_Put_Time	1 Bytes		
GPO8_Put_Time	1 Bytes		

➤ Response format and status byte

Set the response:

HEAD	Control Field			PAYLOAD		CHECK
	ADDR	CMD	LEN	STATUS	OPTION	
0xCF	0x00	0x00 8 0	0x02	1 Byte	1Byte	2Bytes

获取响应:

HEAD	Control Field			PAYLOAD	CHECK
	ADDR	CMD	LEN		
0xCF	0x00	0x0080	0x0F	15Bytes	2Bytes

PAYLOAD							
STATUS	OPTION	GPIOMODE	GPIEN	INTLEVEL	GPOEN	PUTLEVEL	PUTTIME
1 Byte	1 Byte	1 Byte	1 Byte	1 Byte	1 Byte	1 Byte	8 Bytes

STATUS:

0x00: command executed successfully;

Other values: invalid ;

2.4.2 RFM_GET_GPIO_LEVELS (Get GPIO input and output levels)

Get the GPI input level, GPO output level and system time .

➤ Format

HEAD	Control Field			CHECK
	ADDR	CMD	LEN	
0xCF	0x00	0x00 8 1	0x0 0	2 Bytes

➤ Response format and status byte

Get the response:

HEAD	Control Field			PAYLOAD				CHECK
	ADDR	CMD	LEN	STATUS	GPILEVEL	GPOLEVEL	SYSTEMTIME	
0xCF	0x00	0x00 8 1	0x0 7	1 Byte	1 Byte	1 Byte	4Bytes	2 Bytes

- STATUS: 0x00: Command executed successfully; others are invalid.
- GPILEVEL: Real-time input level of 8 GPIs, length 1 byte.

8-bit interpretation of GPILEVEL:

bit	Interpretation
7	GP18 Input Levels
6	GP17 Input Levels
5	GP16 Input Level
4	GP15 Input Levels
3	GP14 Input Level
2	GP13 Input Level
1	GP12 Input Level
0	GP11 input level

If the bit is 0, it means that the input of the GPI is at a low level; if the bit is 1, it means that the input of the GPI is at a high level.

- GPOLEVEL: Real-time output level of 8 GPOs, length 1 byte.

8-bit interpretation of GPOLEVEL:

bit	Interpretation
7	GP08 input level
6	GP07 input level
5	GP06 input level

4	GP05 input level
3	GP04 input level
2	GP03 input level
1	GP02 input level
0	GP01 input level

When the bit is 0, it means the output of the GPO is low level; when the bit is 1, it means the output of the GPO is high level.

- SYS TIME: system time when uploading data, length 4 bytes , high byte first, unit ms . For example, 0x 12345678 , the actual system time is: 305419896 ms.

2. 5 Door access control commands

The following commands are owned by the door channel alone, inventory mode, and EAS alarm mode.

2.5.1 RFM_GET_GATE_STATUS (Get GATE Status)

Get the status of GATE and upload the trigger condition information.

➤ Active query command format

HEAD	ADDR	CMD	LEN	CHECK
0xCF	0xFF	0x008 2	0x00	2Byte

Parameter explanation:

➤ **Response format and status byte response:**

HEAD	Control Field			PAYLOAD			SYS TIME	CHECK
	ADDR	CMD	LEN	STATUS	GATEDIR	RECV		
0xCF	0xFF	0x00 8 2	0x26	1 Byte	1 Byte	32Byte	4byte	2 Bytes

- **STATUS:**
 - 1) 0x00: command executed successfully;
 - 2) Other values: invalid ;
- **GATEDIR:**

0x00: no action; 0x10: input; 0x20: output ; 0x50: EAS triggered; 0x51: EAS not triggered .
- **RECV:** reserved , 32 bytes.
- **SYS TIME:** System time when uploading data, in ms .
4 bytes , high byte first, low byte last. For example, 0x 12345678 , the actual system time is: 305419896 ms

➤ **GATEGPI triggers the upload message format**

Used to remind the host computer to trigger GATEGPI and record the entry and exit of personnel;

HEAD	Control Field			PAYLOAD				CHECK
	ADDR	CMD	LEN	OPTION	GATEDIR	CUSTOMERINFO	SYS TIME	
0xCF	0xFF	0x0082	0x07	1Byte	1Byte	32Byte	4byte	2Bytes

- **OPTION:**
 - 1) 0x0 1 : Actively report status changes ;
 - 2) Other values: invalid ;
- **GATEDIR:**

0x00: No action; at this time, there is no tag data behind, and CUSTOMERINFO is all 0.

0x10: In; at this time, there is no label data behind, and CUSTOMERINFO is all 0.

0x20: Out ; at this time, there is no label data behind, and CUSTOMERINFO is all 0.

0x50: EAS is triggered; at this time, there is tag data behind.

0x51: EAS is not triggered; at this time, there is tag data behind.
- **CUSTOMERINFO:** Customer code information, 32 bytes in length, included in PAYLOAD only when the card is read.

CUSTOMERINFO

CODELEN	CODENUM
1Byte, customer code length	31 Bytes, customer code number. If the number is less than 31 Bytes, zeros will be added after the number.

- SYS TIME: System time when uploading data, in ms .
4 bytes , high bit first, for example 0x12345678 , the actual system time is: 305419896 ms.

2.5.2 RFM_SET_GET_GATE_WORKPARAM (Set / Get Gate Channel Working Parameters)

Set/get door channel working parameters: channel working mode, channel detection GPI, EAS working parameters and response GPO.

➤ Set the command format

HEAD	Control Field			PAYLOAD	CHECK
	ADDR	CMD	LEN		
0xCF	0xFF	0x00 8 3	0x12	1 8 Bytes	2 Bytes

PAYLOAD									
OPTION	GATE MODE	GATE GPI1	GATE GPI2	POWER GPO	READING GPO	RECV GPIO	EAS MODE	EAS GPO	RECV FUNC
0x01	1 Byte	1 Byte	1 Byte	1 Byte	1 Byte	4Byte	1 Byte	1 Byte	6 Byte

Parameter explanation:

- Option: command control option, 0x01 is set, 0x02 is read, other values are invalid.
- GATEMODE : Channel gate working mode parameter, length 1 byte, default 0x00.
0x00: Inventory mode: inventory counting, etc.
0x01: EAS mode: scenarios such as personnel entry and exit.
- GATEGPI1: Gate channel 1 detection GPI parameters, length 1 byte, default 0x00.
8-bit interpretation of GATEGPI1:

bit	Interpretation
7	GPI8 is the GPI for gate channel 1
6	GPI7 is the GPI for gate channel 1
5	GPI6 is the GPI for gate channel 1
4	GPI5 is the GPI for gate channel 1
3	GPI4 is the GPI for gate channel 1
2	GPI3 is the GPI for gate channel 1
1	GPI2 is the GPI for gate channel 1
0	GPI1 is the GPI for gate channel 1

- GATEGP12: Gate channel 2 detection GPI parameters, length 1 byte, default 0x00.
8bit interpretation of GATEGP12:

bit	Interpretation
7	GP18 is the GPI for gate channel 2
6	GP17 is the GPI for gate channel 2
5	GP16 is the GPI for gate channel 2
4	GP15 is the GPI for gate channel 2
3	GP14 is the GPI for gate channel 2
2	GP13 is the GPI for gate channel 2
1	GP12 is the GPI for gate channel 2
0	GP11 is the GPI for gate channel 2

- POWERGPO: Power-on indication GPO in gate channel inventory mode, length 1 byte, default 0x01.
8-bit interpretation of POWERGPO:

bit	Interpretation
7	GP08 is the power-on indication GPO
6	GP07 is the power-on indication GPO
5	GP06 is the power-on indication GPO
4	GP05 is the power-on indication GPO
3	GP04 is the power-on indication GPO
2	GP03 is the power-on indication GPO
1	GP02 is the power-on indication GPO
0	GP01 is the power-on indication GPO

In the door channel inventory mode, this parameter indicates that GPOX responds to GPO for power-on indication. When powered on and not reading a card, GPOX outputs the effective level (determined by GPOX working parameters); when reading a card, GPOX outputs the reverse level of the effective level, and exits the card reading state. GPOX will maintain the output reverse level for 300mS, and then switch to outputting the effective level.

- READINGGPO: card reading indication GPO in door channel inventory mode, length 1 byte, default 0x02.

8-bit interpretation of READINGGPO:

bit	Interpretation
7	GP08 is the card reading indication GPO
6	GP07 is the card reading indication GPO
5	GP06 is the card reading indication GPO
4	GP05 is the card reading indication GPO
3	GP04 is the card reading indication GPO
2	GP03 is the card reading indication GPO
1	GP02 is the card reading indication GPO
0	GP01 is the card reading indication GPO

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In the door channel inventory mode, this parameter indicates that GPOX responds to GPO for card reading indication. When reading a card, GPOX outputs a valid level (determined by GPOX working parameters); when reading a card, GPOX outputs a PWM wave, and a smaller PWM wave period indicates a faster card reading speed; when not reading a card, GPOX outputs a reverse level of the valid level.

- RECVGPIO: Reserved parameters, 4 bytes.
- EASMODE: EAS working parameters, length 1 byte, default 0x00.
8bit interpretation of EASMODE:

bit	Interpretation
7~4	EAS matching method: 0000: Specific data match. When reading the card, it is necessary to determine whether the data at the specified address of the tag matches. 0001: Specific tag matching, only tags with specific matching marks will respond when reading the card.
3~0	EAS response mode: 0000: Matching successful response. 0001: Matching failure response

- EASGPO: Gate channel EAS mode response GPO, length 1 byte, default 0x01.
When the gate channel is in EAS mode, this parameter indicates that GPOX responds to GPO in EAS mode. When EAS is triggered, GPOX outputs a valid level (determined by GPOX working parameters); when EAS is not triggered, GPOX outputs the reverse level of the valid level.
8-bit interpretation of EASGPO:

bit	Interpretation
7	GP08 is the gate channel EAS mode response GPO
6	GP07 is the GPO for the gated EAS mode response
5	GP06 is the GPO for the gated EAS mode response
4	GP05 is the Gated Channel EAS Mode Response GPO
3	GP04 is the door channel EAS mode response GPO
2	GP03 is the Gated Channel EAS Mode Response GPO
1	GP02 is the Gated Channel EAS Mode Response GPO
0	GP01 is the gate channel EAS mode response GPO

- RECVFUNC: Reserved parameters, 6 bytes.

➤ Get command format

HEAD	Control Field			OPTION	CHECK
	ADDR	CMD	LEN		
0xCF	0xFF	0x00 8 3	0x01	0x02	2 Bytes

➤ Response format and status byte Set the response:

HEAD	ADDR	CMD	LEN	STATUS	OPTION	CHECK
0xCF	0x00	0x00 8 3	0x02	1 Byte	1 Byte	2Byte

Get the response:

HEAD	Control Field			PAYLOAD	CHECK
	ADDR	CMD	LEN		
0xCF	0x 00	0x00 8 3	0x 09	11 Bytes	2 Bytes

PAYLOAD								
STATUS	OPTION	GATEMODE	GATEGPI1	GATEGPI2	POWERGPO	READINGGPO	EASMODE	EASGPO
1 Byte	1 Byte	1 Byte	1 Byte	1 Byte	1 Byte	1 Byte	1 Byte	1 Byte

■ STATUS:

- 1) 0x00: command executed successfully;
- 2) Other values: invalid;

2.5.3 RFM_SET_GET_EAS_MASK (Set /Get Gate Channel EAS Specific Matching Data)

Set/get gate channel specific match data: start address, length and data.

➤ Format

HEAD	Control Field			PAYLOAD				CHECK
	ADDR	CMD	LEN	OPTION	EASADDR	EASLEN	EASDATA	
0xCF	0xFF	0x00 8 4	1or35	1 Byte	1 Byte	1 Byte	N Bytes	2 Bytes

Parameter explanation:

- Option: command control option, 0x01 is set, 0x02 is read, other values are invalid.
- EASADDR: The starting address of EAS specific matching data, 1 byte in length, with a value of [0, 31].
- EASLEN: The length of EAS specific matching data, 1 byte, value [0, 32].
- EASDATA: EAS specific matching data, 32 bytes in length. The first EASLEN bytes are EAS specific matching data, and the remaining bytes are filled with 0x00.

➤ Response format and status byte

Set the response:

HEAD	ADDR	CMD	LEN	STATUS	OPTION	CHECK
0xCF	0x00	0x0084	0x02	1Byte	1Byte	2Byte

获取响应：

HEAD	Control Field			PAYLOAD					CHECK
	ADDR	CMD	LEN	STATUS	OPTION	EASADDR	EASLEN	EASDATA	
0xCF	0x00	0x00 8 3	36	1 Byte	1 Byte	1 Byte	1 Byte	N Bytes	2 Bytes

- STATUS:
- 1) 0x00: command executed successfully;

2) Other values: invalid;

Appendix A. Operational Status Returned by Tags

code returned by the tag is 8 bits in total, see Table A-1.

Table A-1 Operation status returned by the tag

Operation status code	Operational Status	describe	Error Priority
0x81	Other Errors	Unknown error returned by tag	
0x82	Storage area overflow	The target storage area does not exist	
0x83	Storage Area Lock	Write operation to the memory area that is locked as non-writable Perform a read or erase operation on a storage area that is locked as unreadable.	
0x84	Insufficient power	The tag does not have enough energy to complete the operation	
0x85	Non- specific error	Unknown error returned by tag	

Appendix B. CRC16 checksum reference C code

as follows:
#define PRESET_VALUE 0xFFFF
#define POLYNOMIAL 0x8408

```
unsigned int uiCrc16 Cal( unsigned char const * pucY , unsigned char ucX )
{
    unsigned char ucI,ucJ ;
    unsigned short int uiCrcValue = PRESET_VALUE;

    for( ucI = 0; ucI < ucX ; ucI ++ )
    ,
        uiCrcValue = uiCrcValue ^ *( pucY + ucI );
    for( ucJ = 0; ucJ < 8; ucJ ++ )
    ,
        if( uiCrcValue & 0x0001 )
        ,
            uiCrcValue = ( uiCrcValue >> 1 ) ^ POLYNOMIAL;
    }
    else
    {
        uiCrcValue = ( uiCrcValue >> 1 );
    }
}
return uiCrcValue ;
}
```

Appendix C. Definition of STATUS.

Table A-6 STATUS definition

STATUS	Error description
0x00	Execution successful (this only means that the module successfully received the tag response data. If there is a tag execution status in the tag response, it should be further determined whether the tag execution status is correct)
0x01	The parameter value is incorrect or out of range, or the module does not support the parameter value.
0x02	Command execution failed due to an internal module error

0x03	reserve
0x12	No inventory was performed to the tag or the entire inventory command was completed.
0x14	Tag response timeout
0x15	Demodulation tag response error
0x1 6	Protocol authentication failed
0x1 7	Wrong password
0xFF	No more data