**UHF Prime Reader**

**User Manual V1.0**

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# **1.Docking Communication Protocol**

The module can communicate with external application thruogh RS232.TTL,RS485.RJ45

## **1.1 Serial port communication parameter**

Module use serial port communicate with external application

Sheet A-1 Module dock serial port parameter

|  |  |  |
| --- | --- | --- |
| Item | Parameter | Remarks |
| Baud Rate | 115200bps |  |
| Data bit | 8 |  |
| Stop bit | 1 |  |
| parity  check bit | None |  |

## **1.2 Data Frame Format**

The data packets sent by the upper-layer application are hereinafter referred to as "commands", and the data packets returned by the module to the upper-layer applications are hereinafter referred to as "responses". All the following data segments are in bytes in length.

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

The data frame format of command refer sheet A-2:

Sheet A-2: The data frame format of command

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

The data frame format of response refer sheet A-3:

Sheet A-3: The data frame format of response

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **MSB** |  |  | |  | | **LSB** |
|  | Control Field | | | Information Field | | Verify Field |
| HEAD | ADDR | CMD | LEN | STATUS | Data[] | CHECK |
| 1Byte | 1Byte | 2Bytes | 1Byte | 1Byte | 0~254Byte | 2Byte |

Data frame structure include three parts: Control Field、Information Field、Verify Field

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | Length  (Byte) | Specification | |
| Control Field | HEAD | 1 | HEAD fixed as HEX data 0xCF，this byte use for data frmae synchronization | |
| ADDR | 1 | Reader address  Address range:0x00~0xFE，0xFF as broadcast address, reader only response to the command 0xFF that have same its own address, reader default address as 0x00 | |
| CMD | 2 | Command code  Command bit definition refere to sheet A-7 | |
| LEN | 1 | Thie length is data length of all bytes of the actual Information Field, max data lengh is 255Bytes（0xFF） | |
| Information Field | STATUS | 1 | STATUS is the execution status of the upper 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-layer application.  A STATUS of 0 indicates that the command was successfully executed. STATUS definition refer to sheet A-6. | |
| Data[] | NO | Parameter Field  Under actual command,allow not exsit  Data[] is actual data need transmit,will specific define Data[] valid byte under different kinds command format | |
| Verify Field | MSB-CRC16 | 1 | CRC16 high byte。 | CRC16 value is all data from HEAD to Data[].CRC16 reference code refer appendix B |
| LSB-CRC16 | 1 | CRC16 low byte。 |

# **2 Command frame set**

UHF RFID READER MODULE, below description call “module”

## **2.1 Command list**

Sheet A-7 Example list of control command

|  |  |  |  |
| --- | --- | --- | --- |
| **Command Nmae** | **CMD**  **Control byte** | **Function description** | **Remarks** |
| **EPC COMMAND** | | | |
| RFM\_INVENTORYISO\_CONTINUE | 0x0001 | Tag inventory (Flows) |  |
| RFM\_INVENTORYISO\_STOP | 0x0002 | Stop tag inventory |  |
| **MODULE DEFINTION COMMAND** | | | |
| RFM\_MODULE\_INT | 0X0050 | Initialize  device |  |
| RFM\_REBOOT | 0x0052 | Recover factory setting | Recover basic parameter default value |
| RFM\_SET\_PWR | 0x0053 | Set RF power | 0-30dBm |
| RFM\_SET\_GET\_RFIDPRO | 0x0059 | Set/read RF protocol | Only support ISO 18000-6C |
| RFM\_SET\_GET\_NETPARA | 0X005F | Set/read network information | Applicable to LAN |
| RFM\_SET\_GET\_REMOTE\_NETPARA | 0x0064 | Read obtain set remote network information | Applicable to the whole network, across network segments |
| RFM\_GET\_DEVICEINFO | 0X0070 | Obtain all module version NO and SN code |  |
| RFM\_SET\_ALL\_PARAM | 0x0071 | Set all base parameter | One time full setting |
| RFM\_GET\_ALL\_PARAM | 0x0072 | Read all base parameter | One time full reading |
| RFM\_SET\_GET\_PERMISSION\_PARAM | 0x0073 | Read limits setting |  |
| RFM\_SET\_GET\_IOPUT\_PARAM | 0x0074 | Input/output IO settting |  |
| RFM\_SET\_GET\_WiFi\_PARAM | 0x0075 | Set/read WIFI information |  |
| RFM\_RELEASE\_CLOSE\_RELAY | 0X0077 | Release/close relay |  |

## 2.2 Module general control command

### 2.2.1 RFM\_MODULE\_INT（Initialize  device ）

Confirm whether device online, it is used when upper computer connected device

* Command format

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| HEAD | ADDR | CMD | LEN | CHECK |
| 0xCF | 0xFF | 0x0050 | 0x00 | 2Byte |

* Response format and status byte

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| HEAD | ADDR | CMD | LEN | STATUS | CHECK |
| 0xCF | 0x00 | 0x0050 | 0x01 | 1Byte | 2Byte |

 STATUS：This comand only return execution success (value 0\*00), other value no valid

### 2.2.2 RFM\_REBOOT（Recover factory setting）

Recover factory setting command, when that command executive success, module base parameter recover factory setting

* Command format

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| HEAD | ADDR | CMD | LEN | CHECK |
| 0xCF | 0xFF | 0x0052 | 0x00 | 2Byte |

* Response format and status byte

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| HEAD | ADDR | CMD | LEN | STATUS | CHECK |
| 0xCF | 0x00 | 0x0052 | 0x01 | 1Byte | 2Byte |

 STATUS：0x00 executive success,other valve refere to sheet A-6

### 2.2.3 RFM\_SET\_PWR (Set RF output power)

This comamnd use to set module RF output power.before use module read tag need use that command to set module RF output power.If user don’t set module RF output power, module will use default seeting when working

* Comamnd format

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| HEAD | ADDR | CMD | LEN | PAYLOAD | | CHECK |
| Power | Resv |
| 0xCF | 0xFF | 0x0053 | 0x02 | 1Byte | 1Byte | 2Byte |

* + Power：Output power,unit :dBm, value range：[0, 26]dBm，default: 26。
  + Resv：system reserved field,default:0x00；
* Response format and status byte

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| HEAD | ADDR | CMD | LEN | STATUS | CHECK |
| 0xCF | 0x00 | 0x0053 | 0x01 | 1Byte | 2Byte |

 STATUS：0x00 execution success，other value refer to sheet A-6；

### 2.2.4 RFM\_SET\_GET\_RFIDPRO (Set/read module support RF protocol standard)

This command set/read module RFID protocol standard (set protocol standards by running this command to check whether the module is successfully connected)

* Command format

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| HEAD | ADDR | CMD | LEN | PAYLOAD | | CHECK |
| Option | RFIDPRO |
| 0xCF | 0xFF | 0x0059 | N Byte | 1Byte | NC or 1Byte | 2Byte |

* + Option：command control options

0x01：Set, follow 1 byte length RFIDPRO 设置；

0x02：Read, no follow RFIDPRO

Other value: No valid；

* + RFIDPRO：protocol options, details refer to below sheet:
* Response format and status byte

Set response：

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

Obtain response：

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| HEAD | ADDR | CMD | LEN | STATUS | PAYLOAD | | CHECK |
| Option | RFIDPRO |
| 0xCF | 0x00 | 0x0059 | 3Byte | 1Byte | 1Byte | 1Byte | 2Byte |

|  |  |  |
| --- | --- | --- |
| Field | Byte | Description |
| STATUS | 1 | 0x00 execution success  other value refer to sheet A-6 |
| Option | 1 | 0x01：set； 0x02：obtain |
| RFIDPRO | 1 | 0x00：ISO 18000-6C； 0x01：GB/T 29768；0x02：GJB 7377.1；only support ISO 18000-6C。 |

### 2.2.5 RFM\_SET\_GET\_NETPARA (set/read device network information)

This command set/read module network information, set default as TCP Server, upper computer connect set related device IP address and port

* Comamnd format

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| HEAD | ADDR | CMD | LEN | PAYLOAD | | CHECK |
| Option | NetPara |
| 0xCF | 0xFF | 0x005F | 1 or 2  Byte | 1Byte | NC or 1Byte | 2Byte |

* + Option：Command control options

0x01：set；

0x02：obtain；

Ohter value：no valid；

* Response format and status byte

Set response：

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| HEAD | ADDR | CMD | LEN | STATUS | Option | CHECK |
| 0xCF | 0x00 | 0x005F | 1Byte | 1Byte | 1Byte | 2Byte |

Obtain response：

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| HEAD | ADDR | CMD | LEN | STATUS | PAYLOAD | | CHECK |
| Option | NetPara |
| 0xCF | 0x00 | 0x005F | 2+N Byte | 1Byte | 1Byte | N Byte | 2Byte |

|  |  |  |  |
| --- | --- | --- | --- |
| Field | | Byte | Description |
| STATUS | | 1 | 0x00 execution success  other value refere to sheet A-6； |
| Option | | 1 | 0x01：set ； 0x02：obtain |
| NetPara | IPAddr | 4 | Set IP address, if IP address as 192.168.1.1, data as [0xC0,A8,0x01,0x01] |
| MacAddr | 6 | Mac addres, if multiple device work at same potion, please do not use same MAC address :  Example: mac[6]={0x00,0x08,0xdc,0x11,0x11,0x11}  Mac address as 00-08-DC-11-11-11 |
| Port | 2 | Listening port, value as [0,65536], default 2022 |
| NetMask | 4 | Net mask code ，default as [0xFF,0xFF,0xFF,0x00] |
| GateWay | 4 | Default gataway,default [0xC0,0xA8,0x01,0x01] |

### 2.2.6 RFM\_SET\_GET\_REMOTE\_NETPARA（set/read remote network information ）

This command set/read remote network information, device sent data to remote IP, remote PC can listening and receiving data

* Comamnd format

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| HEAD | ADDR | CMD | LEN | PAYLOAD | | CHECK |
| Option | NetPara |
| 0xCF | 0xFF | 0x0064 | 1 or 2 Byte | 1Byte | NC or 1Byte | 2Byte |

* + Option：Command control options

0x01：set；

0x02：obtain；

Ohter value：no valid；

* Response format and status byte

Set response：

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| HEAD | ADDR | CMD | LEN | STATUS | Option | CHECK |
| 0xCF | 0x00 | 0x0064 | 2Byte | 1Byte | 1Byte | 2Byte |

Obtain response：

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| HEAD | ADDR | CMD | LEN | STATUS | PAYLOAD | | CHECK |
| Option | NetPara |
| 0xCF | 0x00 | 0x0064 | 2 + N Byte | 1Byte | 1Byte | NC or N Byte | 2Byte |

|  |  |  |  |
| --- | --- | --- | --- |
| Field | | Byte | Description |
| STATUS | | 1 | 0x00 execution success  other value refer to seet A-6； |
| Option | | 1 | 0x01：set； 0x02：Obtain |
| NetPara | Enable | 1 | Enable switch, 1: enable sent,0: close send |
| IPAddr | 4 | Remote IP address，if IP address as 192.168.1.1,data will be [0xC0,0xA8,0x01,0x01] |
| Port | 2 | Listening port,value as [0,65536]，default 5000； |
| HeartTime | 1 | Heartbeat packet duration to prevent dropped calls (unit: 5S) |

### 2.2.7 RFM\_GET\_DEVICEINFO（Obtain module information）

This command use to obtain current device version information,include CP module and RFID module hardware version number, firmware version and SN number

* Command format

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| HEAD | ADDR | CMD | LEN | CHECK |
| 0xCF | 0xFF | 0x0070 | 0x00 | 2Byte |

* Response format and status byte

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| HEAD | ADDR | CMD | LEN | STATUS | PAYLOAD | | |
| HardVer | FirmVer | SN\_code |
| 0xCF | 0x00 | 0x0070 | 0x99 | 1Byte | 32Bytes | 32Bytes | 12Bytes |

|  |  |  |  |
| --- | --- | --- | --- |
| PAYLOAD | | | CHECK |
| Reserve-I | Reserve-II | Reserve-III |
| 32Bytes | 32Bytes | 12Bytes | 2Byte |

All bytes definition：

|  |  |  |
| --- | --- | --- |
| Field | Byte | Description |
| STATUS | 1 | This command only return execution success (value 0\*00), other value no valid |
| HardVer | 32 | Module hardware version NO, format as ASCII code, hardware version NO short of 32 byte, balance other byte use”0”supply |
| FirmVer | 32 | Module firmware version NO, format same as hardware version NO |
| SNCode | 12 | Module 12 bytes serial number, format as ASCII code |
| Reserve-I | 32 | Reserve |
| Reserve-II | 32 | Reserve |
| Reserve-III | 12 | Reserve |

### 2.2.8 RFM\_SET\_ALL\_PARAM (Set all configurable parameter)

This command use to set device all configurable parameter, before use module read tag need use that command to set module RF output power.If user don’t set module RF output power, module will use default setting when working

* Command format

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

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

* + Addr：device communication address, default as 0x00, this address can not be 0xFF, if set as 0xFF, module will return parameter error information
  + RFIDPRO：Device RFID protocol standard specification:0x00：ISO 18000-6C； 0x01：GB/T 29768；0x02：GJB 7377.1；at present only support ISO 18000-6C。
  + WorkMode：device work mode, default 0

|  |  |
| --- | --- |
| WorkMode | Work mode |
| 0 | Answer mode |
| 1 | Active mode |
| 2 | Trigger mode |

* + Interface：device communication interface, default 0x80,specific definition:

|  |  |
| --- | --- |
| Interface | Type |
| 0x80 | RS232 |
| 0x40 | RS485 |
| 0x20 | RJ45 |
| 0x10 | WiFi |

* + Baudrate：baud rate, default value as 4, specific defintion:

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

* + WGSet：wiegand data output interface configuration parameter, default value 0x00,specific defintion as below:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| WGSet | Bit7 | Bit6 | Bit5 | Bit4 | Bit3 | Bit2 | Bit1 | Bit0 |
| Bit definition | 0：close WG output  1：open WG output | 0：wg26  1：wg34 | 0：low bit first  1：high bit first | Reserved | Reserved | Reserved | Reserved | Reserved |

* + Ant：device all antenna NO, use bit as selected antenna, related bit value as 1 means using that antenna, value as 0 means don’t use that antenna. Start from low bit, NO 0 means NO 1 antenna, first bit means NO 2 antenna and so on, max can be 8 antenna, different module support different qty antenna, depends on actual sitiation, default value as 0X01, means NO 1 antenna
  + RfidFreq：device RFID freqeuncy related parameter, use to select every frequency range upper limit freqeuncy points and lower limit freqeuncy points, lenth is 8 bytes, specific parameter as below:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| RfidFreq | | | | |
| REGION | STRATFREI | STRATFRED | STEPFRE | CN |
| 1 Byte | 2Byte | 2Byte | 2Byte | 1Byte |

Every bytes definition：

Set freqeuncy according REGION confirmed freqeuncy range, then refer STRATFREI、STRATFRED、STEPFRE、CN calculate specific frequency range

|  |  |  |
| --- | --- | --- |
| Field | byte | Description |
| REGION | 1 | Each country frequency range ：  0x00: User define according demand；  0x01：US [902.75~927.25]  0x02：Korea [917.1~923.5]  0x03：EU [865.1~868.1]  0x04：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：CHINA\_BAND2 [920.125~924.875] |
| STRATFREI | 2 | MHz start freqeuncy integer part: for example 920.125MHz,STRATFREI = 920 = 0x0398,high byte=0x03, low byte=0x98； |
| STRATFRED | 2 | MHz start freqeuncy fractional part,for example 920.125MHz，STRATFRED =125, high byte=0x00,low byte=0x7D |
| STEPFRE | 2 | Frequency step (KHz), refer to the calculation formula of each frequency band; For example, 125KHz, STEPFRE =125, high byte =0x00, low byte =0x7D; |
| CN | 1 | Channel number |

Frequency computational formula：

Min Frequency point：Fmin = STRATFREI + STRATFRED/1000 （Unit：MHz）

Max Frequency point：Fmax = Fmin + STEPFRE\*CN/1000 （Unit：MHz）

Calculation formula for each frequency band :(the frequency range shall be within the national standard)

Chinese band2： Fs = 920.125 + CN \* 0.25 (MHz) CN∈[0, 19]。

US band： Fs = 902.75 + CN \* 0.5 (MHz) CN∈[0,49]。

Korean band： Fs = 917.1 + CN \* 0.2 (MHz) CN∈[0, 31]。

EU band: Fs = 865.1 + CN\*0.2(MHz) CN∈[0, 14]。

Ukraine band: Fs = 868.0 + CN\*0.1(MHz) CN∈[0, 6]。

Peru band： Fs = 916.2 + CN\*0.9(MHz) CN∈[0, 11]。

Chinese band1： Fs = 840.125 + CN \* 0.25 (MHz) CN∈[0, 19]。

EU3 band： Fs = 865.7 + CN \* 0.6(MHz) CN∈[0, 3]。

US band3： Fs = 902 + CN \* 0.5 (MHz) CN∈[0,52]。

Taiwan band： Fs = 922.25 + CN \* 0.5 (MHz) CN∈[0,11]。

* + RfidPower：RFID output power of equipment, unit: DBM, value range: [0, 30] DBM, other invalid.
  + InquiryArea：The storage area of the tag to be accessed by the device. 0x00: reserved area; 0x01 (default): EPC storage area; 0x02: TID storage area; 0x03: user storage area; Other values are reserved. If there are other values in the command, the message of parameter error will be returned.
  + QValue：The initial Q value used when querying EPC tags shall be set so that the number of tags in the field is about 2q. The default value of Q value is 4, and the range of Q value is 0-15. 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. The value range is [0, 3]. Other values will return the message of parameter error.

|  |  |
| --- | --- |
| Session | Notes |
| 0 | Session use S0 |
| 1 | Session use S1 |
| 2 | Session use S2 |
| 3 | Session use S3 |

* + AcsAddr：Device access the starting address of the label storage area

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 CRC and PC segment; When accessing other storage areas, 0x00 indicates the starting address of the storage area.

* + AcsDataLen：Device access the data length of the label storage area, Unit: Byte, Default value:0x00。
  + FilterTime：Filter time, after reading the label successfully within the value time ; Filter out tags with the same data. Unit: s, value range: [0, 255], others are invalid; The default value is 0, and there is no filtering.
  + TriggerTime：The enquiry time after the equipment receives the trigger signal. The unit is S, the default value is 1, the value range is [0, 255], and the others are invalid.
  + BuzzerTime：Buzzer duration after equipment execution successfully，Unit: 10ms, value range: [0, 255], others are invalid; The default value is 1. When it is 0, the buzzer does not sound。
  + PollingInterval：Query interval, unit: 10ms, value range: [0, 255], others are invalid, and the default is 1.
* Response format and status bytes

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| HEAD | ADDR | CMD | LEN | STATUS | CHECK |
| 0xCF | 0xXX | 0x0071 | 0x01 | 1Byte | 2Byte |

* + STATUS：
  1. 0x00： Command execution succeeded;
  2. 0x01：Parameter error;
  3. Other values: invalid;

### 2.2.9 RFM\_GET\_ALL\_PARAM

This command is used to read the RF power currently set by the module. The user can use this command to view the power settings of the module before using the module to operate with the tag.

* Command format

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| HEAD | ADDR | CMD | LEN | CHECK |
| 0xCF | 0xFF | 0x0072 | 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 |
| 1Byte | 1Byte | 1Byte | 1Byte | 1Byte | 1Byte | 1Byte | 1Byte | 1Byte | 1Byte | 2Bytes |

* + STATUS：
  1. 0x00： Command execution succeeded;
  2. Other values: invalid;
  + Other parameters please refer to RFM\_SET\_ALL\_PARAM。

### 2.2.10 RFM\_SET\_GET\_PERMISSION\_PARAM

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

* Command 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 | 0x16 | 1Byte | 1Byte | 4Bytes | 1Byte | 1Byte | 1Byte | 12Bytes | 1Byte | 2Bytes |

Parameter definition:

Option: Command control options, 0x01 set, 0x02 read, other values are invalid.

CodeEN: Password function parameter, length is 1 byte. 0x01 enabled, 0x00 not enabled. Default 0x00。

Codes: The access password of the tag is 4 bytes, default[0x00,0x00,0x00,0x00]。

MaskEN: Mask function parameter, length is 1 byte. 0x01 enabled, 0x00 not enabled. The default is 0x00.

StartAdd: Mask start address, length is 1 byte, unit is byte. The default is 0x00.

Mask Len: Mask length, length is 1 byte, unit is byte, maximum 12. The default is 0x00.

MaskData: The mask data is 12 bytes, when the mask length is less than 12 bytes, the following byte data is supplemented with 0.

Default [0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00]。

MaskCondition: Mask condition, length is 1 byte. 0x00: the password or mask matches; 0x01: the password and mask match at the same time. The default is 0x00.

* Response format and status bytes

Set response:

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

Get response:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 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 | 0x17 | 1Byte | 1Byte | 1Byte | 4Byte | 1Byte | 1Byte | 1Byte | 12Bytes | 1Byte | 2Bytes |

* + STATUS：
  1. 0x00： Command execution succeeded;
  2. Other values: invalid;

### 2.2.11 RFM\_SET\_GET\_IOPUT\_PARAM

This command is used to read the advanced parameters of the device. Please see the specific analysis of the parameters 2.2.9。

* Command 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 definition:

Option：Command control options, 0x01 set, 0x02 read, other values are invalid.

RelayEN：Relay function parameter, length is 1 byte. 0x01 enabled, 0x00 not enabled. The default is 0x00.

RelayTime：Relay normally open time parameter, length is 1 byte, unit is S. The default is 0x03.

RelayPowerEN：Relay power on parameter, length is 1 byte. 0x01 is on, 0x00 is not on. The default is 0x00.

TrigWay：The effective trigger mode parameter, length is 1 byte. 0x01 high level (2v-5v) trigger, 0x00 low level (less than 0.5V) trigger. The default is 0x01.

BufferEN：Cache function parameter, length is 1 byte. 0x01 enabled, 0x00 not enabled. The default is 0x00.

ProtocolEN：Specific data interaction function parameter, length 1 byte. 0x01 enabled, 0x00 not enabled. The default is 0x00.

ProtocolType：Specific data interaction protocol type, length is 1 byte. The default is 0x00.

ProtocolFormat：Specific data interaction protocol format,length is 10 bytes.

default[0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00]。

* Response format and status byte

Set response:

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

Get response:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| HEAD | Control Field | | | | PAYLOAD | | | | | | | | | | CHECK |
| ADDR | CMD | LEN |  | STATUS | OPTION | Relay  EN | Relay  Time | Relay  Power  EN | Trig  Way | Buffer  EN | Protocol  EN | Protocol  Type | Protocol  Format |
| 0xCF | 0xFF | 0x0074 | 0x13 |  | 1Byte | 1Byte | 1Byte | 1Byte | 1Byte | 1Byte | 1Byte | 1Byte | 1Byte | 10 Bytes | 2Bytes |

* + STATUS：
  1. 0x00： Command execution succeeded;
  2. Other values: invalid;

### **2.2.12** RFM\_SET\_GET\_WiFi\_PARAM

This command sets / reads the WiFi information of the module, sets it to TCP client, and needs to set the corresponding remote IP address and port; WiFi distribution mode: 1smartconfig distributes the network through the mobile app, 2. Serial port distribution, which is configured by sending SSID and PWD. Power on and connect automatically after the configuration is successful.

* Command format

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

* + Option：Command control options

0x01：Set；

0x02：Read；

Other values: invalid;

* Response format and status byte

Set response:

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

Get response:

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

|  |  |  |  |
| --- | --- | --- | --- |
| Filed | | Byte | Description |
| STATUS | | 1 | 0x00 is executed successfully, other values are shown in Table A-6; |
| Option | | 1 | 0x01: setting; 0x02: get |
| WiFiPara | WiFiEN | 1 | WiFi parameters, mode selection.  Bit0:0: turn off WiFi; 1: Turn on WiFi  Bit1: 0: smartconfig 1: serial port distribution network. Other bits default to 0; |
| SSID | 32 | WiFi name, ASIC code. Invalid bytes are filled with 0x00 |
| PWD | 64 | WiFi password, ASIC 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,A8,0x01,0x64] |
| RemotePort | 2 | Remote IP port number, high byte in front, low byte after, Default: 0x1388 (5000) |

### 2.2.13 RFM\_RELEASE\_CLOSE\_RELAY

* This command is used to release and close the relay.
* Command format

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| HEAD | ADDR | CMD | LEN | PAYLOAD | | CHECK |
| Option | Valid'Time |
| 0xCF | 0xFF | 0x0077 | 1Byte | 1Byte | 1Byte | 2Byte |

* + Option：command control options

0x01：release；

0x02：close；

Other values: invalid；

* + ValidTime：The effective time when closing, the unit is S, the default value is 1. When the ValidTime value is equal to 0, the relay will always be in the closed state; when the ValidTime value is greater than 0, the relay will be released after closing ValidTime seconds.
* Response format and status bytes

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| HEAD | ADDR | CMD | LEN | STATUS | Option | Valid'Time | CHECK |
| 0xCF | 0x00 | 0x0077 | 1Byte | 1Byte | 1Byte | 1Byte | 2Byte |

|  |  |  |
| --- | --- | --- |
| Field | byte | Describe |
| STATUS | 1 | 0x00: The command is executed successfully; 0x01: The parameter is wrong. |
| Option | 1 | 0x01: release; 0x02: close |
| ValidTime | 1 | The effective time when closing, the unit is S, the default value is 1. |

## 2.3 International standard (ISO 18000-6c) protocol related command

### 2.3.1 RFM\_INVENTORYISO\_CONTINUE

This command is to start the international standard multi label counting command, and the counting function has an anti-collision algorithm.

This command can specify the counting duration. If the number of counts entered is 0, it means that the counting label will continue until the stop counting command is received. During the counting process, every time a label is counted successfully, the label information of the new inventory point will be returned through a command response with a "status" value of "0".

When the counting command is successfully executed, the command response with the value of "status" of "0x12" will be returned at last to inform that the counting command has been executed.

* Command format

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

* + InvType：Counting method:

0x00：Counting tag according to the time, stop counting after executing the specified time or stop counting after receiving the stop counting command;

0x01: Count according to the number of cycles, and stop counting after executing the specified number of polls or receiving the stop counting instruction;

* + InvParam ：Counting method parameters:

1.If InvType is 0x00：

InvParam indicates the counting time, unit is seconds. If the value is 0, it indicates that the counting label will continue until the stop counting command is received;

2.If InvType is 0x01：

InvParam indicates the number of counts, unit is times. The value must be greater than 0;

* Response format and status bytes

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

各字节定义：

|  |  |  |
| --- | --- | --- |
| Filed | Byte | Description |
| STATUS | 1 | 0x00：The tag is counted successfully, and PAYLOAD contains the tag information;  0x01：Q、MemBank parameter value is wrong or the length is inconsistent with the mask data length;  0x02：Command execution failure due to module internal error;  0x12：There is no counting of the label or the entire counting order is completed;  0x17： The tag data exceeds the maximum transmission length of the serial port;  Other values: invalid; |
| RSSI | 2 | The RSSI of the tag ACK response, unit is 0.1dBm, signed numbers, negative numbers use complement format; |
| Antenna | 1 | The antenna that reads the data, bit0 represents antenna 1, and so on. |
| Channel | 1 | The data of label received from which channel, the value starts from 0, 0 means 0 channel, 1 means 1 channel, and so on; |
| EPC LEN | 1 | EPC number length of label (bytes); |
| EPC NUM | N Byte | EPC number of the label; |

### 2.3.2 RFM\_INVENTORY\_STOP

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

* Command format

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| HEAD | ADDR | CMD | LEN | CHECK |
| 0xCF | 0xFF | 0x0002 | 0x00 | 2Byte |

* Response format and status byte

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| HEAD | ADDR | CMD | LEN | STATUS | CHECK |
| 0xCF | 0x00 | 0x0002 | 0x01 | 1Byte | 2Byte |

 STATUS：This command will only return successful execution (the value is 0x00), and other values are invalid;

### 

### 2.3.3 RFM\_INVENTORY\_ACTIVE (Active mode)

In active mode, the uploaded data format.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| HEAD | ADDR | CMD | LEN | STATUS | PAYLOAD | | | | | CHECK |
| RSSI | Antenna | Channel | Data LEN | Data |
| 0xCF | 0x00 | 0x0001 | N Byte | 1Byte | 2Bytes | 1 Byte | 1 Byte | 1Byte | N Bytes | 2Byte |

Definition of each byte:

|  |  |  |
| --- | --- | --- |
| Field | Byte | Describe |
| STATUS | 1 | 0x00 is executed successfully, other values are shown in Table A-6; |
| RSSI | 2 | The RSSI of the tag ACK response, the unit is 0.1dBm, the number is signed, and the negative number uses the complement format; |
| Antenna | 1 | The antenna that reads the data, bit0 represents antenna 1, and so on. |
| Channel | 1 | From which channel the tag data is received, the value starts from 0, 0 means 0 channel, 1 means 1 channel, and so on; |
| Data LEN | 1 | Label's number length (bytes)； |
| Data | N Byte | Tag data; |

For example: read data (hex) as e2 80 6f 12 00 00 00 02 21 50 60 94

Rssi(hex)：fe 48 The actual complement is -44dbm

Data Frame(hex)：0xCF 00 00 01 12 00 fe 48 01 00 0c e2 80 6f 12 00 00 00 02 21 50 60 94 7b 78

# **Appendix A Operation status returned by label**

The operation status code returned by the tag is 8 bits in total, see table A-1.

Table A-1 operation status of label return

|  |  |  |  |
| --- | --- | --- | --- |
| Operation status code | Operation status | Description | Error priority |
| 0x81 | Other errors | Unknown error returned by label |  |
| 0x82 | Storage overflow | The destination store does not exist |  |
| 0x83 | Store lock | Write to the storage area locked as non writable, Perform or erase operation, and read the storage area locked as unreadable |  |
| 0x84 | Insufficient power | The tag does not have enough energy to complete the operation |  |
| 0x85 | Unspecified error | Unknown error returned by label |  |
|  |  |  |  |

# Appendix B CRC16 check reference C code

Example：

#define PRESET\_VALUE 0xFFFF

#define POLYNOMIAL 0x8408

unsigned int uiCrc16Cal(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 definitions

|  |  |
| --- | --- |
| STATUS | Error description |
| 0x00 | Successful execution (this only means that the module successfully received the tag response data. If there is a tag execution status in the tag response, you should further judge whether the tag execution status is correct) |
| 0x01 | The parameter value is wrong or out of range, or the module does not support the parameter value |
| 0x02 | Command execution failed due to module internal error |
| 0x03 | Reserve |
| 0x12 | There is no counting to the label or the entire counting command is completed |
| 0x14 | Label response timeout |
| 0x15 | Demodulation tag response error |
| 0x16 | Protocol authentication failed |
| 0x17 | Password error |
| 0xFF | No more data |