FRM Series IC Card Reader Technical Manual

（QFM100、QFM200、FRM300）

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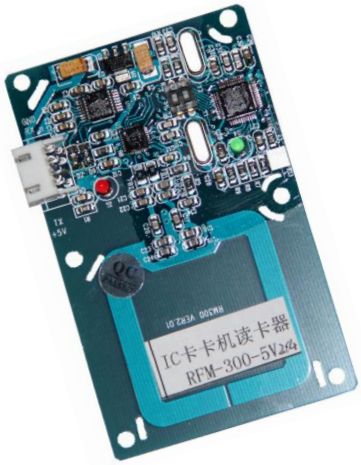

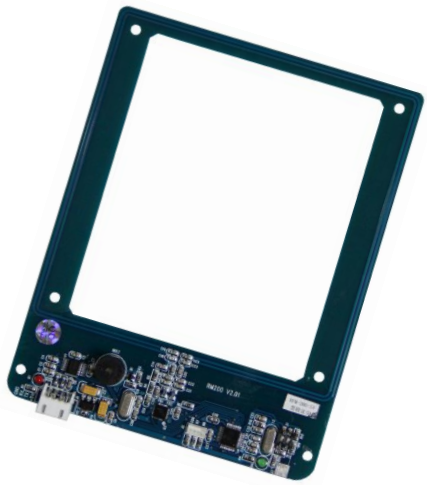

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Content

1. Overview

QFM Series non-contact reader use 13.56MHZ RF technology and low power radio station MFRC522 is embedded, so user do not worry the complexity of RF base station control. You just need to send command to achieve full operation for card by a simple selected UART interface. This serial reader support Mifare 1 S50, S70 and compatible cards.

1.1 Model and Differences

Model	Type	Description
QFM-100	Issue device desktop	USB Virtual COM interface, connect to PC directly
QFM-100-S	Issue device desktop	RS232, connect to DB 9Pins of PC, power supplied by USB
QFM-200-5V	Reader for Ticket House	RS232 interface, power supplied by DC5V
QFM-210-12V	Reader for Ticket House	RS485 interface, power supplied by DC12V
QFM-220-12V	Reader for Ticket House	RS232 interface, power supplied by DC12V
QFM-230-12V	Reader for Ticket House	RS485 interface, power supplied by DC5V
QFM-300-5V	Reader for Card Dispenser	RS232 interface, power supplied by DC5V
QFM-310-5V	Reader for Card Dispenser	RS485 interface, power supplied by DC5V

1.2 Electric Characteristics

Typical Power Supply: DC5V/12V
Reader Current: 100mA
Operating temperature: -25 ~ 85℃

1.3 Interface Definition

Name	Definition
VCC	Power: Positive pole input DC5V or DC12V
GND	Power: Negative pole input
Rx_B	RS232: Receiving End RS485: B(-)
Tx_A	RS232: Transmitting end RS485: A(+)

1.4 Definition of the DIP Switch

For QFM-200 and QFM300, there is one 2PIN DIP switch S1, the definition as following:

DIP Switch	Function	ON	OFF
DIP1（S1-1）	Baud Rate Setting	38400	19200
DIP2（S1-2）	Reserved		

2. Data Communication Protocol

2.1 Asynchronous Half-duplex UART Protocol

UART interface:

Data format in a frame: 1start bit, 8 data bits, no parity check bit, 1 stop bit.
Baud Rate: 19200

Type	Mode	Baud Rate	
QFM-100	Fixed	19200	
QFM-200	Set by DIP Switch S1-1	ON: 38400	OFF: 19200
QFM-300	Set by DIP Switch S1-1	ON: 38400	OFF: 19200

Format of the transmitted data packet:

Frame Header of Data Packet 02	Data packet content	Frame Trail of Data packet 03

Note: 0x02, 0x03 are defined as starting character, and 0x10 is defined as identification character of 0x02, 0x03. Therefore, in communication, in transmitted data (between initial character 0x02 and ending character 0x03), prior to 0x02, 0x03, 0x10, 0x10 must be insert as data recognition. For example, from starting character 0x02 to ending character 0x03, there is a raw data 0x020310; after inserting identification character, it will be 0x100210031010.

Contents of Data Packet:

Module Address	Length Word	Command Word	Data Field	Check Word

Module Address: fixed as 0x0000;
Length Word: show clearly the number of bytes from Length Word to Check Word;
Command Data: the meaning of this command
Data Field: the content of the command, it can be empty
Check Word: accumulated value (one byte by one byte) from the module address to the last byte of data field

Format of the returned data packet:

Contents of Data Packet:

Module Address	Length Word	Command Words Received	Execution Result	Data Field	Check Word

Module Address: fixed as 0x0000;
Length Word: show clearly the number of bytes from Length Word to Data Field;
Command Data: the meaning of this command
Execution Result: 0x00 Correct
0x01---0xFF Inaccurate
Data Field: the content of the command, return to Execution Status and N bytes
Check Word: accumulated value (one byte by one byte) from the module address to the last byte of data field.

2.2 Command List:

No.	Command Name		Length Words	Command Words	Data and Explanation
1	Set non-contact	Dispatch		0X3A	1 byte non-contact read card type Explanation: type = 'A': set as TYPE_A

	working mode of the module	Correct Return		0X3A	
		Error Return		0X3A	
2	Seek Card	Dispatch		0X46	1 byte seek card model model=0x26: seek the card that does not enter into a dormant state model=0x52: seek the card in all states
		Correct Return		0X46	2 bytes TagType (type value of the return card) pTagType：0x0400 = Mifare One(S50) 0x0200 = Mifare One(S70)
		Error Return		0X46	
3	Anti-collision	Dispatch		0X47	1 byte bcnt (Explanation: bcnt=0x04)
		Correct Return		0X47	4 bytes Card Serial Number
		Error Return		0X47	
4	Select Card	Dispatch		0X48	4 bytes Card Serial Number
		Correct Return		0X48	1 byte Card Capacity
		Error Return		0X48	
	Read Card	Dispatch		0X49	1 byte model model=0x26: seek the card that does not enter into a dormant state
		Correct Return		0X49	4 bytes Card Serial Number
		Error Return		0X49	
5	Authenticate Key	Dispatch		0X4A	1 byte Key Verification model + 1 byte absolute block number + 6 bytes Key Explanation: verification mode of 1 byte Key: model=0x60: Validate A Key; model=0x61: Validate B Key
		Correct Return		0X4A	
		Error Return		0X4A	
6	Read Block	Dispatch		0X4B	1 byte absolute block number Explanation: S50 Block No.(0~63); S70 Block No.(0~255)
		Correct Return		0X4B	16 bytes sensed data/readout data
		Error Return		0X4B	
7	Write Block	Dispatch		0X4C	1 byte absolute block number + 16 bytes data to be written Explanation: S50 Block No.(0~63); S70 Block No.(0~255)
		Correct Return		0X4C	
		Error Return		0X4C	

8	Purse Initialization	Dispatch		0X4D	1 byte absolute block number + 4 bytes hexadecimal initialized sum Explanation: S50 Block No. (0~63); S70 Block No.(0~255) + 4 bytes purse value (lower byte ahead)
		Correct Return		0X4D	
		Error Return		0X4D	
9	Read Purse	Dispatch		0X4E	1 byte absolute block number Explanation: S50 Block No.(0~63); S70 Block No.(0~255)
		Correct Return		0X4E	4 bytes hexadecimal sum returned value (lower byte ahead)
		Error Return		0X4E	
10	Top-up/Recharge	Dispatch		0X50	1 byte Key identifier + 1 byte Block No. + 6 bytes Key + 4 bytes value added (lower byte ahead)
		Correct Return		0X50	
		Error Return		0X50	
	Read Sector	Dispatch		0X51	1 byte Key Verification model + 1 byte Sector Number + 6 bytes Key Explanation: verification mode of 1 byte Key: model=0x60: Validate A Key; model=0x61: Validate B Key
		Correct Return		0X51	48 bytes sensed data/readout data
		Error Return		0X51	
11	Deduct Money	Dispatch	0X0E	0X4F	1 byte absolute block number + 4 bytes hexadecimal sum value be deducted (lower byte ahead)
		Correct Return	0X02	0X4F	
		Error Return	0X02	0X4F	
14	Card Sleep	Dispatch		0X29	Empty
		Correct Return		0X29	Empty
		Error Return		0X29	
15	Set Baud Rate	Dispatch		0X15	1 byte Baud Rate selection Explanation: Baud Rate: 03=19200
		Correct Return		0X15	
		Error Return		0X15	
16	Set State of Antenna Module	Dispatch		0X05	1 byte Model Explanation: Model=0 Close Antenna Model=1 Open Antenna
		Correct Return		0X05	

		Error Return		0X05	
17	LED Indicator Light and Buzzer Control	Dispatch		0X6A	1 byte LED light or Buzzer Control Word 0: Indicator Light off and LED pin output high level 1: Turn off Buzzer 2: Turn on Buzzer 3: Turn on indicator light, LED pin output low level
		Correct Return		0X6A	
		Error Return		0X6A	

2.3 Command Example

2.3.1 an example for general commands to send and receive

Port connection and success:

〖Send Data:〗 02 00 00 04 15 10 03 1C 03

〖Receive data: 〗 02 00 00 10 03 15 00 18 03

2.3.2 an example for M1 card send and receive

Mifare S50 card: seek card successful

〖Send Data:〗02 00 00 04 05 00 09 03
〖Receive Data:〗02 00 00 10 03 05 00 08 03
〖Send Data:〗02 00 00 04 3A 41 7F 03
〖Receive Data:〗02 00 00 10 03 3A 00 3D 03
〖Send Data:〗02 00 00 04 05 01 0A 03
〖Receive Data:〗02 00 00 10 03 05 00 08 03
〖Send Data:〗02 00 00 04 46 52 9C 03
〖Receive Data:〗02 00 00 05 46 00 04 00 4F 03
〖Send Data:〗02 00 00 04 47 04 4F 03
〖Receive Data:〗02 00 00 07 47 00 42 0B C2 08 65 03
〖Send Data:〗02 00 00 07 48 42 0B C2 08 66 03
〖Receive Data:〗02 00 00 04 48 00 08 54 03

Read Sector 0 successful

〖Send Data:〗02 00 00 0B 4A 60 00 FF FF FF FF FF FF AF 03
〖Receive Data:〗02 00 00 10 03 4A 00 4D 03
〖Send Data:〗02 00 00 04 4B 00 4F 03
〖Receive Data:〗02 00 00 13 4B 00 42 0B C2 08 83 08 04 00 62 63 64 65 66 67 68 69 30 03
〖Send Data:〗02 00 00 04 4B 01 50 03
〖Receive Data:〗02 00 00 13 4B 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 5E 03
〖Send Data:〗02 00 00 04 4B 10 02 51 03
〖Receive Data:〗02 00 00 13 4B 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 5E 03
〖Send Data:〗02 00 00 04 4B 10 03 52 03

〖Receive Data:〗02 00 00 13 4B 00 00 00 00 00 00 00 FF 07 80 69 FF FF FF FF FF FF 47 03

Write Sector 0 Block 1, write block 1 to 1:

〖Send Data:〗02 00 00 0B 4A 60 01 FF FF FF FF FF FF B0 03
〖Receive Data:〗02 00 00 10 03 4A 00 4D 03
〖Send Data:〗02 00 00 14 4C 01 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 71 03
〖Receive Data:〗02 00 00 10 03 4C 00 4F 03

Initialize Sector 0 Block 1 to Purse, original value 100:

〖Send Data:〗02 00 00 0B 4A 60 01 FF FF FF FF FF FF B0 03
〖Receive Data:〗02 00 00 10 03 4A 00 4D 03
〖Send Data:〗02 00 00 08 4D 01 64 00 00 00 BA 03
〖Receive Data:〗02 00 00 10 03 4D 00 50 03

Sector 1 Block 1 Recharge 100

〖Send Data:〗02 00 00 0B 4A 60 01 FF FF FF FF FF FF B0 03
〖Receive Data:〗02 00 00 10 03 4A 00 4D 03
〖Send Data:〗02 00 00 08 50 01 64 00 00 00 BD 03
〖Receive Data:〗02 00 00 10 03 50 00 53 03

Deduct 50 from Sector 0 Block 1

〖Send Data:〗02 00 00 0B 4A 60 01 FF FF FF FF FF FF B0 03
〖Receive Data:〗02 00 00 10 03 4A 00 4D 03
〖Send Data:〗02 00 00 08 4F 01 32 00 00 00 8A 03
〖Receive Data:〗02 00 00 10 03 4F 00 52 03

Read Sector 0 Block 1: Remaining Balance 150

〖Send Data:〗02 00 00 0B 4A 60 01 FF FF FF FF FF FF B0 03
〖Receive Data:〗02 00 00 10 03 4A 00 4D 03
〖Send Data:〗02 00 00 04 4E 01 53 03
〖Receive Data:〗02 00 00 07 4E 00 96 00 00 00 EB 03

Mifare one Card Sleep

〖Send Data:〗02 00 00 10 03 29 2C 03
〖Receive Data:〗02 00 00 10 03 29 00 2C 03
02 00 00 04 46 52 9c 03
02 00 00 04 47 04 4f 03
02 00 00 07 48 fa 7c a8 8d fa 03
02 00 00 0B 4A 60 00 FF FF FF FF FF FF AF 03
02 00 00 04 4B 01 50 03
02 00 00 14 4C 01 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 71 03