

Fingerprint_Protocol_All_English

1. Protocol Format

Port: UART - TTL, 19200bps, 1 Start bit, 1 Stop bit, None check bit

1.1 Data length = 8 bytes, data format as follow:

Byte	1	2	3	4	5	6	7	8
Command	0xF5	CMD	P1	P2	P3	0	CHK	0xF5
Response	0xF5	CMD	Q1	Q2	Q3	0	CHK	0xF5

Write:

- CMD: Command Type
- P1, P2, P3: Command Parameters
- Q1, Q2, Q3: Return Parameters

Q3: About the operation is valid or not, here is the value:

```
#define ACK_SUCCESS          0x00    // Operate success
#define ACK_FAIL            0x01    // Operate failed
#define ACK_FULL            0x04    // Fingerprint database is full
#define ACK_NOUSER         0x05    // Users do not exist
#define ACK_USER_OCCUPIED  0x06    // User ID already exists
#define ACK_USER_EXIST     0x07    // Fingerprint already exists
#define ACK_TIMEOUT        0x08    // Acquisition timeout
```

- CHK: Checksum, calculated by XOR values between 2nd byte and 6th byte.

1.2 Data length > 8 bytes, contain Data Head and Data Packet

Data Head:

Byte	1	2	3	4	5	6	7	8
Command	0xF5	CMD	Hi(Len)	Low(Len)	0	0	CHK	0xF5
Response	0xF5	CMD	Hi(Len)	Low(Len)	Q3	0	CHK	0xF5

Write:

- CMD, Q3 is defined as above
- Len: Length of data packet, 2 bytes(16 bit)
- Hi(Len): High 8 bit of data packet
- Low(Len): Low 8 bit of data packet
- CHK: Checksum, calculated by XOR values between 2nd byte and 6th byte.

Data Packet:

<i>Byte</i>	1	2...Len + 1	Len + 2	Len + 3
<i>Command</i>	0xF5	Data	CHK	0xF5
<i>Response</i>	0xF5	Data	CHK	0xF5

Write:

- *Len* is the byte length of Data
- CHK: Checksum, Checksum, calculated by XOR values between 2nd byte and Len + 1 byte.

The data packet is sent after sending data head.

2. Command Format**2.1 Sleep Mode****Command :**

<i>Byte</i>	1	2	3	4	5	6	7	8
<i>Command</i>	0xF5	0x2C	0	0	0	0	CHK	0xF5

Response :

<i>Byte</i>	1	2	3	4	5	6	7	8
<i>Response</i>	0xF5	0x2C	0	0	0	0	CHK	0xF5

2.2 Fingerprint Repeat Mode

- **Allow repeat mode:** allow to add new user with the same fingerprint
- **No allow to repeat mode:** no allow to add new user with the same fingerprint. It will response error info when the fingerprint is already existed. *The system is default in this mode.*

<i>Byte</i>	1	2	3	4	5	6	7	8
<i>Command</i>	0xF5	0x2D	0	0: Allow repeat 1: No repeat	0: Set new mode 1: Read current mode	0	CHK	0xF5
<i>Response</i>	0xF5	0x2D	0	The current mode	ACK_SUCCUSS ACK_FAIL	0	CHK	0xF5

2.3 Add a New Fingerprint

In order to ensure the effectiveness, the user must enter fingerprint 3 times, also the host

(your controller board) should send command to the sensor module 3 times.

i) The 1st time

<i>Byte</i>	1	2	3	4	5	6	7	8
Command	0xF5	0x01	User ID (H 8 bit)	User ID (L 8 bit)	Permissions (1/2/3)	0	CHK	0xF5
Response	0xF5	0x01	0	0	ACK_SUCCESS ACK_FAIL ACK_FULL ACK_TIMEOUT ACK_USER_EXIST	0	CHK	0xF5

Write:

Input range value of user ID: 0x0001 – 0x0FFF ;

User Permissions, value is 1, 2, 3. It is defined by developers.

ii) The 2nd time

<i>Byte</i>	1	2	3	4	5	6	7	8
Command	0xF5	0x02	User ID (H 8 bit)	User ID (L 8 bit)	Permissions (1/2/3)	0	CHK	0xF5
Response	0xF5	0x02	0	0	ACK_SUCCESS ACK_FAIL ACK_TIMEOUT	0	CHK	0xF5

iii) The 3rd time

<i>Byte</i>	1	2	3	4	5	6	7	8
Command	0xF5	0x03	User ID (H 8 bit)	User ID (L 8 bit)	Permissions (1/2/3)	0	CHK	0xF5
Response	0xF5	0x03	0	0	ACK_SUCCESS ACK_FAIL ACK_TIMEOUT	0	CHK	0xF5

Write:

In the command 3 times, the user ID and user permission must be the same.

2.4 Delete Assigned User

<i>Byte</i>	1	2	3	4	5	6	7	8
Command	0xF5	0x04	User ID (H 8 bit)	User ID (L 8 bit)	Permissions (1/2/3)	0	CHK	0xF5
Response	0xF5	0x04	0	0	ACK_SUCCESS ACK_FAIL	0	CHK	0xF5

2.5 Delete All Users

<i>Byte</i>	1	2	3	4	5	6	7	8
Command	0xF5	0x05	0	0	Permissions (1/2/3)	0	CHK	0xF5
Response	0xF5	0x05	0	0	ACK_SUCCESS ACK_FAIL	0	CHK	0xF5

2.6 Get Number of Users

<i>Byte</i>	1	2	3	4	5	6	7	8
Command	0xF5	0x09	0	0	Permissions (1/2/3)	0	CHK	0xF5
Response	0xF5	0x09	User Number (H 8 bit)	User Number (L 8 bit)	ACK_SUCCESS ACK_FAIL	0	CHK	0xF5

2.7 Fingerprint Matching 1: 1

<i>Byte</i>	1	2	3	4	5	6	7	8
Command	0xF5	0x0B	User ID (H 8 bit)	User ID (L 8 bit)	0	0	CHK	0xF5
Response	0xF5	0x0B	0	0	ACK_SUCCESS ACK_FAIL ACK_TIMEOUT	0	CHK	0xF5

2.8 Fingerprint Matching 1: N

<i>Byte</i>	1	2	3	4	5	6	7	8
Command								
Response								

Command	0xF5	0x0C	0	0	0	0	CHK	0xF5
Response	0xF5	0x0C	User ID (H 8 bit)	User ID (L 8 bit)	Permissions (1/2/3) ACK_NOUSER ACK_TIMEOUT	0	CHK	0xF5

2.9 Get User Permissions

Byte	1	2	3	4	5	6	7	8
Command	0xF5	0x0A	User ID (H 8 bit)	User ID (L 8 bit)	0	0	CHK	0xF5
Response	0xF5	0x0A	0	0	Permissions (1/2/3) ACK_NOUSER	0	CHK	0xF5

2.11 Set/ Read Fingerprint Matching Level

Byte	1	2	3	4	5	6	7	8
Command	0xF5	0x28	0	Byte5=0: New level; Byte5=1: 0;	0: Set new level 1: Read current level	0	CHK	0xF5
Response	0xF5	0x28	0	MATCHING_ LEVEL	ACK_SUCCUSS ACK_FAIL	0	CHK	0xF5

Write:

Input range value of matching level is 0-9, higher matching level, fingerprint matching is more strict. **The default level is 5.**

2.12 Get Fingerprint Image and Output (N/A for UART Port)

Command:

Byte	1	2	3	4	5	6	7	8
Command	0xF5	0x24	0	0	0	0	CHK	0xF5

Response:

- 1) Data head:

<i>Byte</i>	1	2	3	4	5	6	7	8
<i>Response</i>	0xF5	0x24	Hi(Len)	Low(Len)	ACK_SUCCESS ACK_FAIL ACK_TIMEOUT	0	CHK	0xF5

2) Data packet:

<i>Byte</i>	1	2 --- Len + 1	Len + 2	Len + 3
<i>Response</i>	0xF5	Image data	CHK	0xF5

Write :

Image resolution of fingerprint is 304*304 pix, each pix is a 8 bit grayscale. In order to decrease size of image data, the module get pixel by jump sampling in horizontal/vertical direction, then the image is 152*152. And take high 4 bit of grayscale, every two pixel transmitted into one byte (the ahead pixel in low 4 bit, the after pixel in high 4 bit).

Transmission from the first line by line, each line from the first pixel, a total of $(152*152 / 2)$ bytes of data.

Image data length *Len* is constant 11552 bytes.

2.13 Get Fingerprint Characteristics and Output

Command:

<i>Byte</i>	1	2	3	4	5	6	7	8
<i>Command</i>	0xF5	0x23	0	0	0	0	CHK	0xF5

Response:

1) Data head:

<i>Byte</i>	1	2	3	4	5	6	7	8
<i>Response</i>	0xF5	0x23	Hi(Len)	Low(Len)	ACK_SUCCESS ACK_FAIL ACK_TIMEOUT	0	CHK	0xF5

2) Data packet:

<i>Byte</i>	1	2	3	4	5 --- Len + 1	Len + 2	Len + 3
<i>Response</i>	0xF5	0	0	0	Characteristic data	CHK	0xF5

Write :

Length of Characteristic data is 193 bytes.

2.14 Upload Fingerprint Characteristics and Make Matching with Current Fingerprint

Command:

1) Data head:

<i>Byte</i>	1	2	3	4	5	6	7	8
<i>Command</i>	0xF5	0x44	Hi(Len)	Low(Len)	0	0	CHK	0xF5

2) Data packet:

<i>Byte</i>	1	2	3	4	5 --- Len + 1	Len + 2	Len + 3
<i>Command</i>	0xF5	0	0	0	Characteristic data	CHK	0xF5

Write:

Length of Characteristic data is 193 bytes.

Response:

<i>Byte</i>	1	2	3	4	5	6	7	8
<i>Response</i>	0xF5	0x44	0	0	ACK_SUCCESS ACK_FAIL ACK_TIMEOUT	0	CHK	0xF5

2.15 Upload Fingerprint Characteristics and Make 1:1 Matching with Fingerprint in DSP Module Database

Command:

1) Data head:

<i>Byte</i>	1	2	3	4	5	6	7	8
<i>Command</i>	0xF5	0x42	Hi(Len)	Low(Len)	0	0	CHK	0xF5

2) Data packet:

<i>Byte</i>	1	2	3	4	5 --- Len + 1	Len + 2	Len + 3
<i>Command</i>	0xF5	User ID (H 8 bit)	User ID (L 8 bit)	0	Characteristic data	CHK	0xF5

Write:

Length of Characteristic data is 193 bytes.

Response:

<i>Byte</i>	1	2	3	4	5	6	7	8
<i>Response</i>	0xF5	0x42	0	0	ACK_SUCCESS ACK_FAIL	0	CHK	0xF5

2.16 Upload Fingerprint Characteristics and Make 1:N Matching with Fingerprint in DSP Module Database**Command:**

1) Data head:

<i>Byte</i>	1	2	3	4	5	6	7	8
<i>Command</i>	0xF5	0x43	Hi(Len)	Low(Len)	0	0	CHK	0xF5

2) Data packet:

<i>Byte</i>	1	2	3	4	5 --- Len + 1	Len + 2	Len + 3
<i>Command</i>	0xF5	0	0	0	Characteristic data	CHK	0xF5

Write:

Length of Characteristic data is 193 bytes.

Response:

<i>Byte</i>	1	2	3	4	5	6	7	8
<i>Response</i>	0xF5	0x43	User ID (H 8 bit)	User ID (L 8 bit)	ACK_SUCCESS ACK_FAIL	0	CHK	0xF5

2.17 Download Assigned User Characteristics from DSP Database**Command:**

<i>Byte</i>	1	2	3	4	5	6	7	8
<i>Command</i>	0xF5	0x31	User ID (H 8 bit)	User ID (L 8 bit)	0	0	CHK	0xF5

Response:

1) Data head:

Command	0xF5	0x41	Hi(Len)	Low(Len)	ACK_SUCCESS ACK_FAIL ACK_NOUSER	0	CHK	0xF5
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2) Packet data :

Byte	1	2	3	4	5 -- Len + 1	Len + 2	Len + 3
Response	0xF5	User ID (H 8 bit)	User ID (L 8 bit)	Permissions (1/2/3)	Fingerprint Characteristics	CHK	0xF5

Write:

Data length of *Len* is 193 bytes.

2.18 Add New User with a Fingerprint Characteristics

Command :

1) Data head :

Byte	1	2	3	4	5	6	7	8
Command	0xF5	0x41	Hi(Len)	Low(Len)	0	0	CHK	0xF5

2) Packet data :

Byte	1	2	3	4	5 --- Len + 1	Len + 2	Len + 3
Response	0xF5	User ID (H 8 bit)	User ID (L 8 bit)	Permissions (1/2/3)	Fingerprint Characteristics	CHK	0xF5

Write: <Len - 3> is in length of 193 bytes.

Response:

Byte	1	2	3	4	5	6	7	8
Response	0xF5	0x41	0	0	ACK_SUCCESS ACK_FAIL	0	CHK	0xF5

2.19 Get Users ID and Users Permissions

Command :

Byte	1	2	3	4	5	6	7	8
-------------	---	---	---	---	---	---	---	---

Command	0xF5	0x2B	0	0	0	0	CHK	0xF5
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Response:

1) Data head:

Byte	1	2	3	4	5	6	7	8
Response	0xF5	0x2B	Hi(Len)	Low(Len)	ACK_SUCCESS ACK_FAIL	0	CHK	0xF5

2) Data Packet:

Byte	1	2	3	4 --- Len + 1	Len + 2	Len + 3
Response	0xF5	User number (H 8 bit)	User number (L 8 bit)	User Data (User ID and User Permissions)	CHK	0xF5

Write: Len = User Number* 3 + 2

3) User Data Format:

Byte	4	5	6	7	8	9	...
Data	User1 ID (H 8 bit)	User1 ID (L 8 bit)	User1 Permissions (1/2/3)	User2 ID (H 8 bit)	User2 ID (L 8 bit)	User2 Permissions (1/2/3)	...

2.20 Set/Read Fingerprint Acquisition Waiting Time

Byte	1	2	3	4	5	6	7	8
Command	0xF5	0x2E	0	Byte5=0: New Time; Byte5=1: 0;	0: Set new waiting time 1: Read Current waiting time	0	CHK	0xF5
Response	0xF5	0x2E	0	Current waiting time	ACK_SUCCUSS ACK_FAIL	0	CHK	0xF5

Write:

Fingerprint acquisition waiting time is in range of 0-255 second. If the value is 0 and no fingerprints on the sensor, acquisition process will continue; If this value is not 0, the system will response timeout info if no fingerprints on the system. **This value is 0 by default.**

2.21 Get Module Internal Serial Number

<i>Byte</i>	1	2	3	4	5	6	7	8
<i>Command</i>	0xF5	0x2A	0	0	0	0	CHK	0xF5
<i>Response</i>	0xF5	0x2A	Serial Number (H 8bit)	Serial Number (M 8bit)	Serial Number (L 8bit)	0	CHK	0xF5

Write :

Serial number is 24 bit, each module has a standalone serial number.