Fingerprint recognitionDSPModule communication protocol

one, way of communication

This module acts as a slave device and is controlled by the master device sending relevant commands.

Command interface:UART(Universal asynchronous serial port) 19200bps 1start bit 1Stop bit (no parity bit)

The command sent by the master device andDSPThe module's response can be divided into two categories according to data length:

1) =8Bytes, the data format is as follows:

byte	1	2	3	4	5	6	7	8
Order	0xF5	CMD	P1	P2	P3	0	CHK	0xF5
answer	0xF5	CMD	Q1	Q2	Q3	0	CHK	0xF5

illustrate:

CMD: Command/response type

P1,P2,P3:Command parameters Q1,

Q2,Q3:Response parameters,

Q3It is mostly used to return the validity information of the operation. In this case, the following values can be taken:

```
#define ACK_SUCCESS      0x00   //Successful operation
#defineACK_FAIL          0x01   //operation failed
#define ACK_FULL         0x04   //Fingerprint database is full
#define ACK_NOUSER       0x05   //No such user
#define ACK_USER_OCCUPIED
                         0x06   //thisIDUser already exists
#define ACK_USER_EXIST 0x07     //User already exists
#defineACK_TIMEOUT       0x08   //Collection timeout
                         0x09   //When collecting image related operations, it represents
                                //If there is no fingerprint press, please repeat the process.
```

CHK: Checksum, for the first2Bytes to6XOR value of bytes

2)>8Bytes, data consists of two parts: data header + data packet Data

header format:

byte	1	2	3	4	5	6	7	8
Order	0xF5	CMD	Hi(Len)	Low(Len)	0	0	CHK	0xF5
answer	0xF5	CMD	Hi(Len)	Low(Len)	Q3	0	CHK	0xF5

illustrate:

CMD,Q3The definition is the same as above

Len: The effective data length in the data packet,16Bit, consisting of two bytes, the data

Hi(Len): packet length is high8Bit

Low(Len): Packet length is low8Bit

CHK: Checksum, for the first2Bytes to6XOR value of bytes

Data packet format:

byte	1	2...Len + 1	Len+2	Len+3

Order	0xF5	Data	CHK	0xF5
answer	0xF5	Data	CHK	0xF5

illustrate:

LenThat isDatanumber of

bytes; CHK: Checksum, for the first2Bytes toLen+1XOR value of bytes

The data packet is sent immediately after sending the data header.

two, Command type

2．1Put the module into sleep state (command/response are both8byte)

Command data format:

byte	1	2	3	4	5	6	7	8
Order	0xF5	0x2C	0	0	0	0	CHK	0xF5

Response data format:

byte	1	2	3	4	5	6	7	8
answer	0xF5	0x2C	0	0	0	0	CHK	0xF5

2．2Set/read fingerprint addition mode (command/response are both8byte)

There are two modes for adding fingerprints: allow repeat mode/forbid repeat mode. In "repeat prohibited mode", only one user can be added with the same finger. If the second round of addition is forced, an error message will be returned. After powering on, the system is in repeat prohibition mode.

byte	1	2	3	4	5	6	7	8
Order	0xF5	0x2D	0	Byte5=0: 0:Allow duplicates 1: Duplication is prohibited Byte5=1: 0	0:Set up new addition model 1: Read the currently added model	0	CHK	0xF5
answer	0xF5	0x2D	0	Current add mode	ACK_SUCCUSS ACK_FAIL	0	CHK	0xF5

2．3Add fingerprint (command/response are both8byte)

To ensure validity, users must enter2~6secondary fingerprint, the host mustDSPModule sends2~6times command. When entering6times, which can improve the comparison pass rate. When adding,0x01 -> 0x02 -> 0x02 -> 0x02 -> 0x02-> 0x03, 0x02Can be sent0~4Second-rate.

i) No.1Second-rate

byte	1	2	3	4	5	6	7	8
Order	0xF5	0x01	user Number (high 8Bit)	user Number (Low 8Bit)	User rights(1/2/3)	0	CHK	0xF5

answer	0xF5	0x01	0	0	ACK_SUCCESS ACK_FAIL ACK_FULL ACK_TIMEOUT ACK_USER_EXIST	0	CHK	0xF5

illustrate:

The value range of user ID is1 – 0xFFF;

The value range of user permissions is1,2,3, its meaning is defined by the secondary developer.

ii) No.2Second-rate

byte	1	2	3	4	5	6	7	8
Order	0xF5	0x02	user No. (high 8Bit)	user number (low 8Bit)	User rights(1/2/3)	0	CHK	0xF5
answer	0xF5	0x02	0	0	ACK_SUCCESS ACK_FAIL ACK_TIMEOUT	0	CHK	0xF5

iii) No.3Second-rate

byte	1	2	3	4	5	6	7	8
Order	0xF5	0x02	user No. (high 8Bit)	user number (low 8Bit)	User rights(1/2/3)	0	CHK	0xF5
answer	0xF5	0x02	0	0	ACK_SUCCESS ACK_FAIL ACK_TIMEOUT	0	CHK	0xF5

iv) No.4Second-rate

byte	1	2	3	4	5	6	7	8
Order	0xF5	0x02	user No. (high 8Bit)	user number (low 8Bit)	User rights(1/2/3)	0	CHK	0xF5
answer	0xF5	0x02	0	0	ACK_SUCCESS ACK_FAIL ACK_TIMEOUT	0	CHK	0xF5

v) No.5Second-rate

byte	1	2	3	4	5	6	7	8
Order	0xF5	0x02	user No. (high 8Bit)	user number (low 8Bit)	User rights(1/2/3)	0	CHK	0xF5
answer	0xF5	0x02	0	0	ACK_SUCCESS ACK_FAIL ACK_TIMEOUT	0	CHK	0xF5

vi) No.6Second-rate

byte	1	2	3	4	5	6	7	8
Order	0xF5	0x03	user No. (high 8Bit)	user number (low 8Bit)	User rights(1/2/3)	0	CHK	0xF5
answer	0xF5	0x03	0	0	ACK_SUCCESS ACK_FAIL ACK_TIMEOUT	0	CHK	0xF5

illustrate:

6The user number and user permissions in this command should be the same value. When logging in repeatedly with fingerprint, the previously existing user will be returned.IDNumber. If you only need to collect2times, hairth1times and times6times.1020ARecommended collection of small area array sensors6Second-rate.

2．4Delete the specified user (command/response are8byte)

byte	1	2	3	4	5	6	7	8
Order	0xF5	0x04	user No. (high 8Bit)	user number (low 8Bit)	0	0	CHK	0xF5
answer	0xF5	0x04	0	0	ACK_SUCCESS ACK_FAIL	0	CHK	0xF5

2．5Delete all users (command/response are8byte)

byte	1	2	3	4	5	6	7	8
Order	0xF5	0x05	0	0	0	0	CHK	0xF5
answer	0xF5	0x05	0	0	ACK_SUCCESS ACK_FAIL	0	CHK	0xF5

2．6Get the total number of users (command/response are both8byte)

byte	1	2	3	4	5	6	7	8

Order	0xF5	0x09	0	0	0	0	CHK	0xF5
answer	0xF5	0x09	user number (high 8Bit)	user number (low 8Bit)	ACK_SUCCESS ACK_FAIL	0	CHK	0xF5

2．7Comparison1:1(Commands/responses are8byte)

byte	1	2	3	4	5	6	7	8
Order	0xF5	0x0B	user No. (high 8Bit)	user number (low 8Bit)	0	0	CHK	0xF5
answer	0xF5	0x0B	0	0	ACK_SUCCESS ACK_FAIL ACK_TIMEOUT	0	CHK	0xF5

2．8Comparison1:N(Commands/responses are8Bytes) This command combines finger detection, collection, feature value generation, and comparison. By default, there is no timeout, and there is a protocol that can be set. You can type out commands at will, such as getting the total number.

byte	1	2	3	4	5	6	7	8
Order	0xF5	0x0C	0	0	0	0	CHK	0xF5
answer	0xF5	0x0C	user No. (high 8Bit)	user number (low 8Bit)	User rights(1/2/3) ACK_NOUSER ACK_TIMEOUT	0	CHK	0xF5

2．9Get user permissions (command/response are both8byte)

byte	1	2	3	4	5	6	7	8
Order	0xF5	0x0A	user No. (high 8Bit)	user number (low 8Bit)	0	0	CHK	0xF5
answer	0xF5	0x0A	0	0	User rights(1/2/3) ACK_NOUSER	0	CHK	0xF5

2．10PickDSPModule version number (the command is8Bytes/reply>8byte)

2．11Set/read comparison level (command/response are both8byte)

byte	1	2	3	4	5	6	7	8
Order	0xF5	0x28	0	Byte5=0: new comparison class; Byte5=1: 0	0:Set a new ratio to level 1: Read the current ratio to level	0	CHK	0xF5
answer	0xF5	0x28	0	current comparison grade	ACK_SUCCUSS ACK_FAIL	0	CHK	0xF5

illustrate:

The comparison level value is0-9, the larger the value, the stricter the comparison. The default value is5

2．12Collect images and upload them (the command is8Bytes/reply>8byte)

Command data format:

byte	1	2	3	4	5	6	7	8
Order	0xF5	0x24	0	0	0	0	CHK	0xF5

Response data format:

1)Data header:

Character Festival	1	2	3	4	5	6	7	8
answer answer	0xF5	0x24	Hi(Len)	Low(Len)	ACK_SUCCESS ACK_FAIL ACK_TIMEOUT	0	CHK	0xF5

2)data pack:

byte	1	2 --- Len + 1	Len+2	Len+3
answer	0xF5	image data	CHK	0xF5

illustrate:

1,existDSPIn the module, the fingerprint image is192*192Pixels, each pixel grayscale consists of8Bit representation. During the upload process, in order to reduce the amount of data, pixel skip sampling is performed in the horizontal/vertical direction, so that the image becomes96*96, and take the height of the grayscale4bit, every two pixels are combined into one byte for transmission (the previous pixel is in the low four bits, the next pixel is in the high four bits)

.

The transfer proceeds row by row starting from the first row, each row starts from the first pixel, and the total transfer 96*96/2bytes of data.

Image data lengthLenHengwei4608byte.

2, if you want to takeRAWOriginal drawing, no.5The byte value is0x20, the image size is192*192byte.

3,RAWimage toBMPImage needs to be addedBMPFile header.

2．13Collect images and extract feature values to upload (the command is8Bytes/reply>8byte)

Command data format:

byte	1	2	3	4	5	6	7	8
Order	0xF5	0x23	0	0	0	0	CHK	0xF5

Response data format:

1) Data header:

Character Festival	1	2	3	4	5	6	7	8
answer answer	0xF5	0x23	Hi(Len)	Low(Len)	ACK_SUCCESS ACK_FAIL ACK_TIMEOUT	0	CHK	0xF5

2)data pack:

byte	1	2	3	4	5 --- Len + 1	Len+2	Len+3
answer	0xF5	0	0	0	Eigenvalue data	CHK	0xF5

illustrate:

Characteristic value data lengthLen-3Hengwei193byte.

2．14Upload characteristic values and compare with collected fingerprints (command>8Bytes/response is8byte)

Command data format:

1) Data header:

byte	1	2	3	4	5	6	7	8
Order	0xF5	0x44	Hi(Len)	Low(Len)	0	0	CHK	0xF5

2)data pack:

byte	1	2	3	4	5 --- Len + 1	Len+2	Len+3
Order	0xF5	0	0	0	Eigenvalue data	CHK	0xF5

illustrate:

Characteristic value data lengthLen-3Hengwei193byte.

Response data format:

byte	1	2	3	4	5	6	7	8
answer	0xF5	0x44	0	0	ACK_SUCCESS ACK_FAIL	0	CHK	0xF5

					ACK_TIMEOUT			

2．15Upload fingerprint feature value andDSPModule database fingerprint comparison1:1(command>8Bytes/response is8byte)

Command data format:

1) Data header:

byte	1	2	3	4	5	6	7	8
Order	0xF5	0x42	Hi(Len)	Low(Len)	0	0	CHK	0xF5

2)data pack:

byte	1	2	3	4	5 --- Len + 1	Len+2	Len+3
Order	0xF5	user No. (high 8Bit)	User ID (Low8 Bit)	0	Eigenvalue data	CHK	0xF5

illustrate:

Characteristic value data lengthLen-3Hengwei193byte.

Response data format:

byte	1	2	3	4	5	6	7	8
answer	0xF5	0x42	0	0	ACK_SUCCESS ACK_FAIL	0	CHK	0xF5

2．16Upload fingerprint feature value andDSPModule database fingerprint comparison1:N(command>8Bytes/response is8byte)

Command data format:

1) Data header:

byte	1	2	3	4	5	6	7	8
Order	0xF5	0x43	Hi(Len)	Low(Len)	0	0	CHK	0xF5

2)data pack:

byte	1	2	3	4	5 --- Len + 1	Len+2	Len+3
Order	0xF5	0	0	0	Eigenvalue data	CHK	0xF5

illustrate:

Characteristic value data lengthLen-3Hengwei193byte.

Response data format:

byte	1	2	3	4	5	6	7	8
answer	0xF5	0x43	user	user	ACK_SUCCESS	0	CHK	0xF5

			No. (high 8Bit)	number (low 8Bit)	ACK_FAIL			

2．17downloadDSPSpecify user characteristic values in the module database (the command is8Bytes/reply>8byte)

Command data format:

byte	1	2	3	4	5	6	7	8
Order	0xF5	0x31	user No. (high 8Bit)	user number (low 8Bit)	0	0	CHK	0xF5

Response data format:

1) Data header:

byte	1	2	3	4	5	6	7	8
answer	0xF5	0x31	Hi(Len)	Low(Len)	ACK_SUCCESS ACK_FAIL ACK_NOUSER	0	CHK	0xF5

2)data pack:

byte	1	2	3	4	5 --- Len + 1	Len+2	Len+3
answer	0xF5	User ID (high8 Bit)	User ID (Low8 Bit)	User rights limit (1/2/3)	Eigenvalue data	CHK	0xF5

illustrate:

Characteristic value data lengthLen-3Hengwei193byte.

2．18Upload the characteristic values and save them according to the designated user numberDSPmodule database (command >8Bytes/response is8byte)

Command data format:

1)Data header:

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

2)data pack:

byte	1	2	3	4	5--- Len + 1	Len+2	Len+3
Order	0xF5	User ID (high8 Bit)	User ID (Low8 Bit)	User rights (1/2/3)	Eigenvalue data	CHK	0xF5

illustrate:

Characteristic value data lengthLen-3Hengwei193byte.

Response data format:

byte	1	2	3	4	5	6	7	8
answer	0xF5	0x41	0	0	ACK_SUCCESS ACK_FAIL	0	CHK	0xF5

2．19Get the user IDs and permissions of all logged in users (the command is8Bytes/reply>8byte)

Command data format:

byte	1	2	3	4	5	6	7	8
Order	0xF5	0x2B	0	0	0	0	CHK	0xF5

Response data format:

1) Data header:

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

2)data pack:

byte	1	2	3	4 --- Len + 1	Len+2	Len+3
answer	0xF5	User number (high8 Bit)	User number (Low8 Bit)	User information data (user number and permissions)	CHK	0xF5

illustrate:

Data length in packetLenForever"3*Number of users +2".

The user information data format is as follows:

byte	4	5	6	7	8	9	...
data	User ID 1(high8 Bit)	User ID 1(Low8 Bit)	user 1 right limit (1/2/3)	User ID 2(high8 Bit)	User ID 2(Low8 Bit)	user 2 right limit (1/2/3)	...

2．20Read the incoming and outgoing record data (the command is8Bytes/reply>8byte)

This protocol returns consecutive records with record numbers greater than or equal to the "minimum record number" in the record database.50record data, if there are not enough records that meet the conditions50, then fill in the corresponding positions0.

Note: Each record has a corresponding "record number", the rules for this record number are as follows:

1) No.1The record number of the record is1,from1start;

2) The record number of the new record = the record number corresponding to the previous record +1;

3) If the "clear record data" command is called, the record number will change from1Start counting again;

4)When the returned records contain all0When the records appear, it means that all records have been read.

Command data format:

byte	1	2	3	4	5	6	7	8
Order	0xF5	0x39	Bit7-6:0 Bit5-0：Minimum note Registration number (position 21-16)	minimum record Number (position 15-8)	smallest note Register number (Bit7-0)	DN	CHK	0xF5

Response data format:

1) Data header:

Character Festival	1	2	3	4	5	6	7	8
answer answer	0xF5	0x39	Hi(Len)	Low(Len)	ACK_SUCCESS ACK_FAIL	DN	CHK	0xF5

2)data pack:

byte	1	2---11	12-21	...	Len+2	Len+3
answer	0xF5	No.1Notes record	No.2Notes record	...	CHK	0xF5

illustrate:

The format of each record in the data package is as follows:

byte	1	2	3	4	5	6
data	Bit7-6:0 Bit5-0:remember Registration number (position 21-16)	record number (Bit 15-8)	record number (Bit 7-0)	userID No. (high 8Bit)	userID number (low8 Bit)	reserved bytes 0
byte	7	8	9	10	11	12
data	Year	moon	day	hour	point	record type 0x00: standby opening door 0x01:Fingerprint opens the door normally 0x02:Fingerprint entry record 0x03: Fingerprint record 0x04:Card opens the door normally 0x05: Card entry record 0x06: card out record

Data lengthLenAlways (12 * 50 = 600byte) .

2．twenty oneClear the recorded data (command/response are both8byte)--*Note: This protocol module is not currently available.*

byte	1	2	3	4	5	6	7	8
Order	0xF5	0x3A	0	0	0	0	CHK	0xF5
answer	0xF5	0x3A	0	0	ACK_SUCCESS ACK_FAIL	0	CHK	0xF5

2．twenty twoSet module time (command >8Bytes/response is8byte)--*Note: This protocol module is not currently available.*

Command data format:

1) Data header:

byte	1	2	3	4	5	6	7	8
Order	0xF5	0x4C	Hi(Len)	Low(Len)	0	0	CHK	0xF5

2)data pack:

byte	1	2	3	4	5	6	7	8	9	10
Order	0xF5	Week	Year	moon	day	hour	point	Second	CHK	0xF5

illustrate:

Time data lengthLenHengwei7.

Response data format:

byte	1	2	3	4	5	6	7	8
answer	0xF5	0x4C	0	0	ACK_SUCCESS ACK_FAIL	0	CHK	0xF5

2．twenty threeRead system time-- *Note: This protocol module is not currently available.*

Command data format:

byte	1	2	3	4	5	6	7	8
Order	0xF5	0x3C	0	0	0	0	CHK	0xF5

Response data format:

1) Data header:

byte	1	2	3	4	5	6	7	8
answer	0xF5	0x3C	Hi(Len)	Low(Len)	ACK_SUCCESS ACK_FAIL	0	CHK	0xF5

2)data pack:

byte	1	2	3	4	5	6	7	8	9	10
answer	0xF5	Week	Year	moon	day	hour	point	Second	CHK	0xF5

Description: Time data lengthLenHengwei7.

2．twenty fourSet/read fingerprint collection waiting timeout (command/response are both8byte)

(It is not recommended to use this. It is better to interrupt by taking the total number command.)

byte	1	2	3	4	5	6	7	8
Order	0xF5	0x2E	0	Byte5=0: new timeout between; Byte5=1: 0	0:Set a new super time time 1: Read the current super time time	0	CHK	0xF5
answer	0xF5	0x2E	0	Current timeout time	ACK_SUCCUSS ACK_FAIL	0	CHK	0xF5

illustrate:

Fingerprint waiting timeout (tout) range is0-255. If this value is0, if there is no fingerprint pressing, the fingerprint collection process will continue; if this value is not0,existtout*T0If there is no fingerprint press within the time, the system will time out and exit.

Note:T0The time required to collect/process an image, usually0.2-0.3s.

2．25PickDSPModule internal serial number (command/response are both8byte)

byte	1	2	3	4	5	6	7	8
Order	0xF5	0x2A	0	0	0	0	CHK	0xF5
answer	0xF5	0x2A	Serial number (high 8Bit)	Serial number (medium 8Bit)	Serial number (low 8Bit)	0	CHK	0xF5

illustrate:

The serial number istwenty foura constant of bits, eachDSPThe modules are different and can be used to distinguish differentDSP module.

2.26Baud rate setting

byte	1	2	3	4	5	6	7	8
Order	0xF5	0x21	0	0	BAUD	0	CHK	0xF5
answer	0xF5	0x21	0	0	OLD BAUD	0	CHK	0xF5

illustrate:

BAUD:1-9600,2-19200,3-38400, 4-57600,5-115200;

OLD BAUDTo change the previous baud rate:1-9600,2-19200,3-38400, 4-57600,5-115200.

2.27Get the first unregistered user number in the specified range (command>8Bytes/response is8byte)

Command data format:

1)Data header:

byte	1	2	3	4	5	6	7	8
Order	0xF5	0x47	Hi(Len)	Low(Len)	0	0	CHK	0xF5

2)data pack:

byte	1	2	3	4	5	Len+2	Len+3
Order	0xF5	starting user No. (high8 Bit)	starting user number (low8 Bit)	end user No. (high8 Bit)	end user number (low8 Bit)	CHK	0xF5

illustrate:

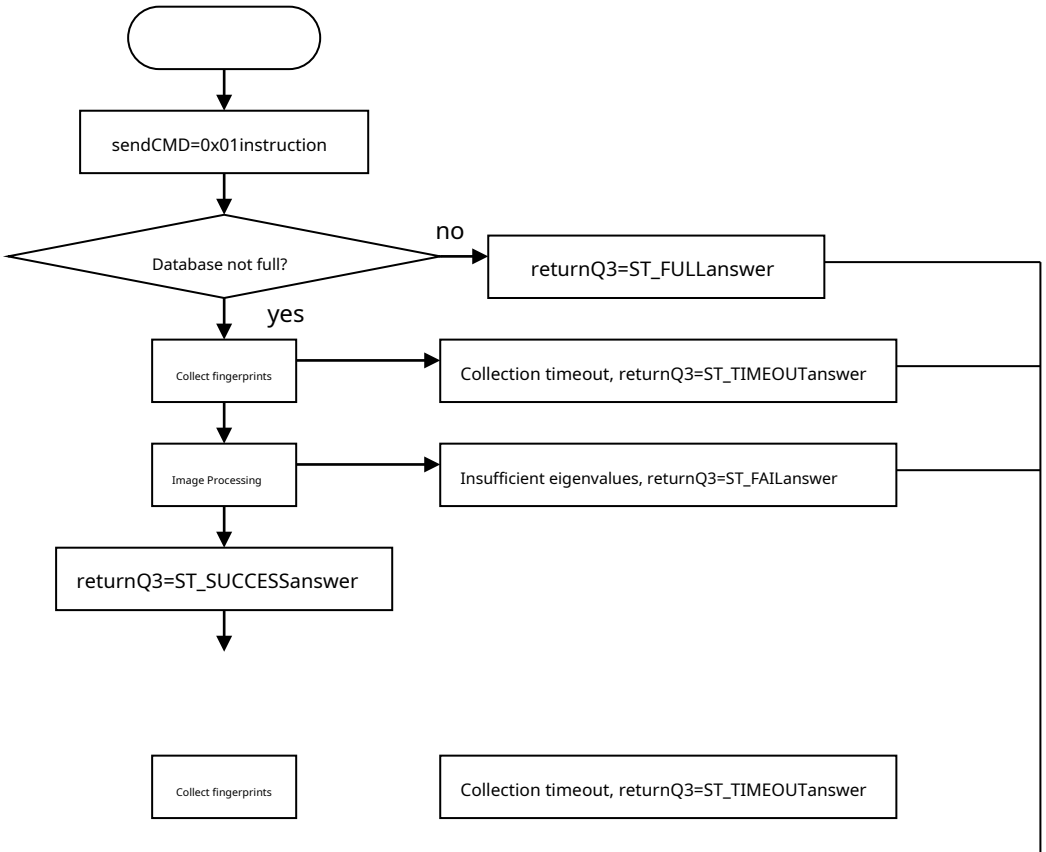
lengthLenHengwei4byte.

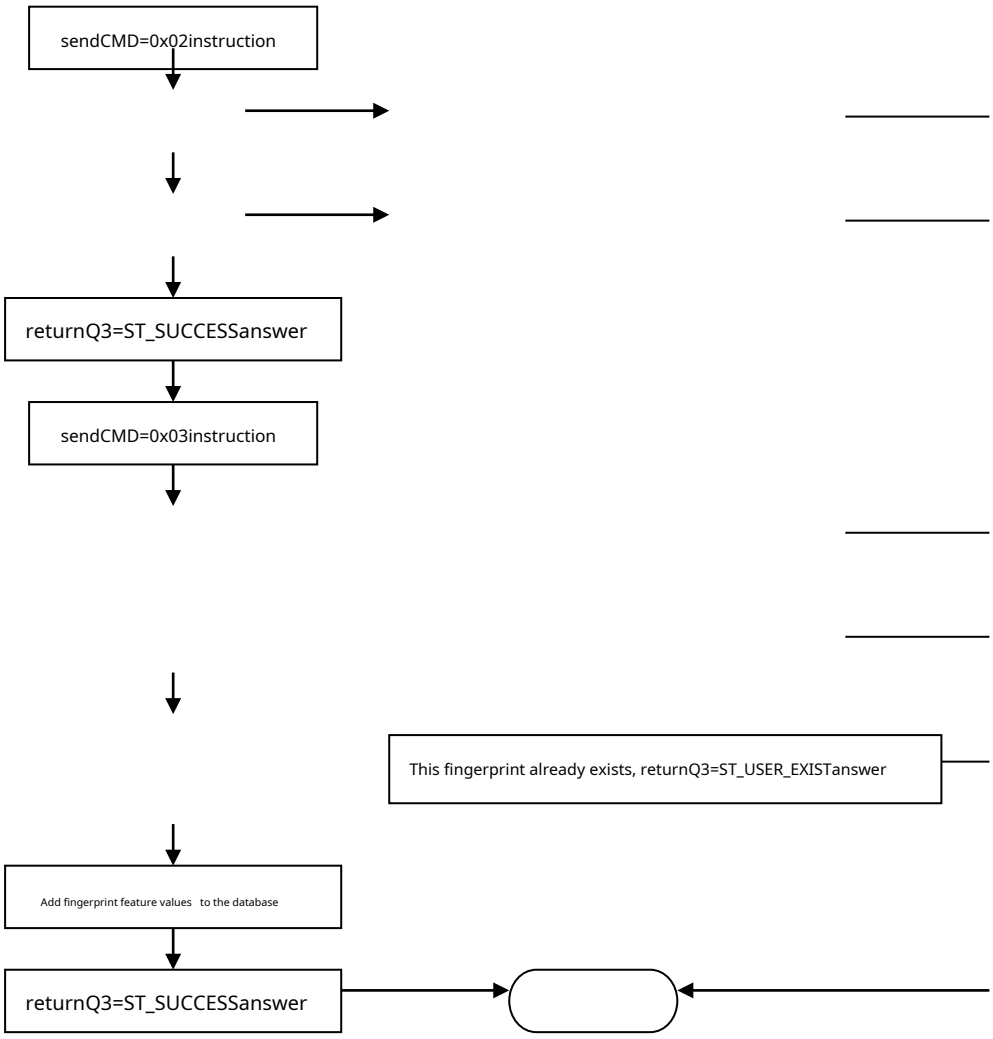
Response data format:

byte	1	2	3	4	5	6	7	8
answer	0xF5	0x47	unregistered User ID (high8 Bit)	unregistered User ID (Low8 Bit)	ACK_SUCCESS ACK_NOUSER ACK_FAIL	0	CHK	0xF5

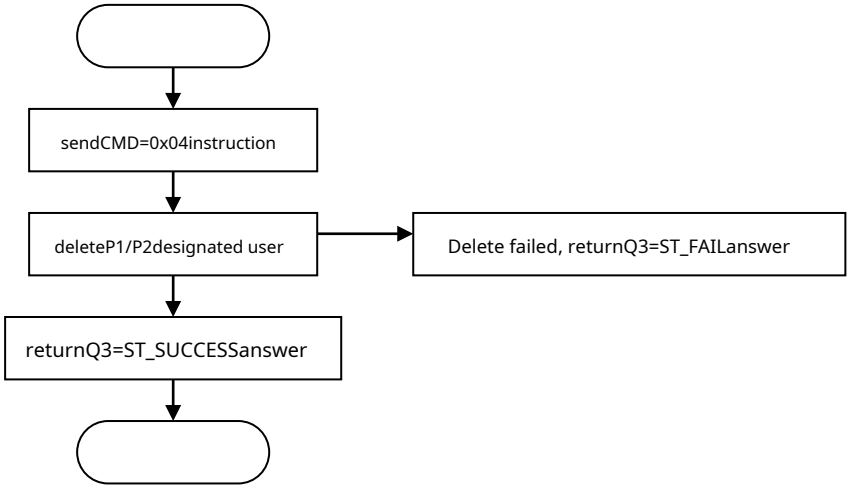
appendixACommunication protocol operation process example

A．1Add fingerprint

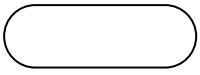


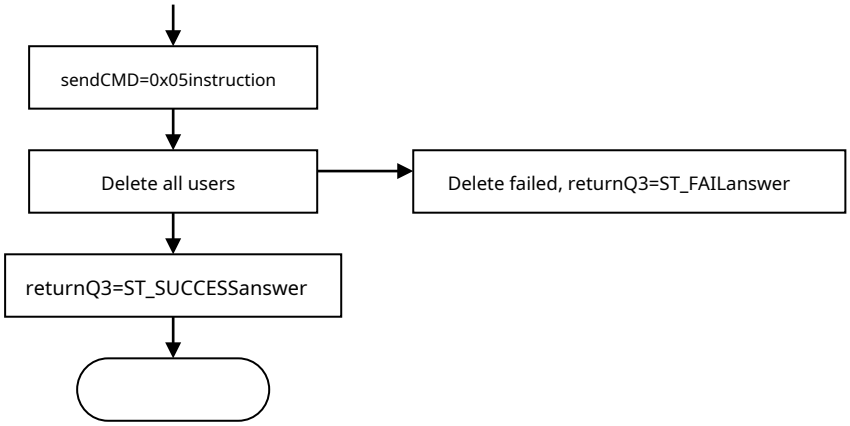


A．2Delete specified user



A．3Delete all users





A．4Collect images and extract feature values to upload