EWTJ680D-I RFID Reader

Data Receive-Transmit Device

(Revision 1.00)

East Wind Technologies, Inc.

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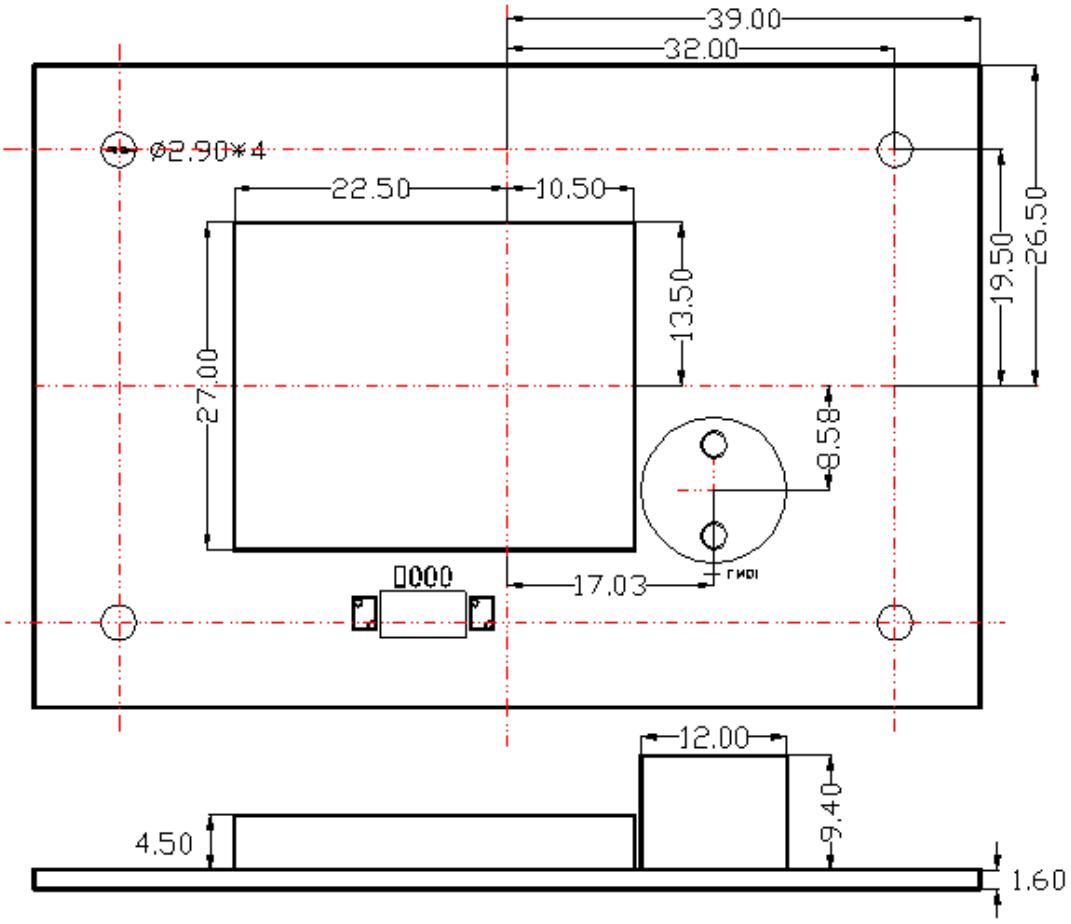
East Wind Technologies, Inc.

- Supportall layers of 14443 including the type A and B communication scheme
- SupportISO15693 protocol
- SupportISO18092 (NFCIP-1) (Passive initiator mode only)
- Frequency:13.56MHz(±20PPM)
- Input voltage:5V(±0.5V)
- Induction distance:5cm(±0.5cm)
- Interface:UART
- Board size:78mm x 53mmx 10mm
- Including Metal Mask
- Storage tempreature:-40℃~95℃
- Operating temperature:-25℃~85℃
- Operating humidity:90% non-condensing
- Baud Rate:19,200 bps
- RF connector:1.25mm x 4 pin
- NFC Function
- Buzzer:85decibel

1.2 Dimension

主板：



1.3 Pin Configurations

Pin	Function	Type	Description
1	GND	Power	GND
2	RXD/SCL	Input	RS232C RXD / UART RXD / IIC SCL
3	TXD/SDA	Input/Output	RS232C TXD / UART TXD / IIC SDA
4	VCC	Power	VCC

1.4 Basic Mode

EWTJ680D-I is a slave device; the "ask & answer" is the basic working mode. That means EWTJ680D-I received a command from master machine, and then to execute the command and answer to master machine. This is a command cycle. A new command will not be accepted while the module is executing a command. So when you develop the application program, you MUST be sure the last command cycle is finished, then to send the next command.

1.5 Automatically Detecting Card

EWTJ680D-I supports automatic detecting cards that are based on ISO14443A and ISO15693. When the automatic detecting cards function is open, then EWTJ680D-I continuously send searching card commands. Once the card is entering into the effective electrical field, the ICC pin will show low level. In this situation, you could directly to do operation to the card. If the automatic detecting function is close, when you want to do operation to the card, you need send searching card command firstly.

The default automatic detecting cards function could be set via 0x1D command. This setting is saved in FLASH. The setting will be effect on next power on. While module is working, the automatic detecting cards function could be temporarily open or closed via 0x11 command. This setting will not be saved. So after power on again, it will be back to the default setting.

If the module operate card mode (via 0x70 command) is set to ISO15693, then EWTJ680D-I just only auto detect ISO15693 cards. If the module operate card mode (via 0x70 command) is set to ISO14443A, then EWTJ680D-I just only detect ISO14443A cards.

Automatic detecting cards function support ISO15693 cards.

Automatic detecting cards function support MIFARE 1K/4K and MIFARE Ultra Light cards.

ISO14443A T=CL card could be detected when the automatic detecting cards function is open. If you want to operate the card, you need send RATS command (0x30) to the module firstly. After the module got successful response from the CPU card, then the automatic detecting cards function will be closed automatically.

User could set automatic detecting card and output the card UID. Under this mode, the card serial Data Packet Format

1.6 Communication Protocol

1.6.1 Data sent format

Length	Command	Data	Checksum

- Length: 1 byte, number of bytes from Length byte to the last byte of Data.
- Command: 1 byte, Application-layer command, please refers to Application-layer protocol in detailed.
- Data: length depends on the command type, from 0x00 to 0xFC bytes.
- Checksum: 1 byte, Exclusive OR (XOR) results from length byte to the last byte of data.

1.6.2 Data returned format

- Success:

Length	Command	Data	Checksum

- Failure:

Length	Invert Command	Checksum

NOTE: "Failure" means that the communication between module and card failed.

1.7 Data Returned Time

Slaves begin to execute the command once received host's commands. The executive time is normally less than 100ms, depand on the command type. Some command executive time maybe need longer. The waiting time is decided by the card and the command type. So the hosts need to set the waiting time according to the different commands.

2 Communication Interface

2.1 UART interface

2.1.1 Physical Interface

The communication between UART and PC is via TXD, RXD and GND pins. The host TXD pin connects to the device RXD pin, meanwhile the host RXD pin connects to the device TXD pin.

The communication protocol is byte oriented. Both sending and receiving bytes are in hexadecimal format. The communication parameters are as follows:

Baud rate: 19200bps (default), 115200bps, 9600bps, 38400bps and 57600bps.
Start bits: 1bit
Data bits: 8 bits
Stop bits: 1 bit
Parity check: None
Flow control: None

2.1.2 Communication Process

Host send command to the slave, and the slave to execute once received the host's command, then to send the result to the host. This is a command cycle.

3 Application-layer Protocol

3.1 Overview

This chapter will introduce the communication protocol application level commands and data structures in detail, the application level protocol only introduce the commands and the data.

We illustrate each command in the following format:

Frame	Command	Data	Checksum

Frame Header: 1 byte length information, all the bytes except Checksum byte.

Checksum: Exclusive OR (XOR) results from length byte to the last byte of data.

For example, we explain separately with the following command.

Frame	0x11	Mode	Checksum

It's the command to control the module working status, now we need to close the antenna with this command, so,"mode" is 0x00, so, the command is:

0x03 11 00 12; in it 0x03 is Frame Header, all the bytes except Checksum byte, the length is 0x03, so take the value 0x03; 0x11 is the command; 0x00 is parameter (meaning close automatical detecting card, close the antenna); 0x12 is Checksum byte, the front 3 bytes XOR result is 0x12.

3.2 System commands

3.2.1 Module reset to factory default

Function: Reset all configuration of the module to factory default setting. The new setting will effect after re-power on.

Host send:

Frame	0x0F	52 45 53 45 54	Checksum

Success:

Frame	0x0F	Checksum

Failure:

Frame	0xF0	Checksum

send: 0x07 0F 52 45 53 45 54 5D

return: 0x02 0F 0D

3.2.2 Set LED

Function: set the LED ON or OFF.

Host sends:

Frame	0x13	Status	Checksum

Status：1byte

LED1	BIT0=0: OFF;	BIT0=1: ON
LED2	BIT1=0: OFF;	BIT1=1: ON
LED3	BIT2=0: OFF;	BIT2=1: ON
LED4	BIT3=0: OFF;	BIT3=1: ON

Success:

Frame	0x13	Checksum

Failure:

Frame	0xEC	Checksum

3.2.3 Set ISO15693 Automatic Detecting Card AFI and AFI Enable

Function: set automatic detecting card AFI and AFI enables in ISO15693 mode. If users set AFI and AFI enables, then automatic detecting card only detects the AFI of the card equal to the set AFI. Settings will save in the module; it will not be lost after power OFF. AFI is default 0, AFI function is Disable.

Host sends:

Frame	0x1B	AFI	AFI enable	Checksum

AFI: 1 byte, AFI, 0~0xFF.

AFI enable: 1 byte, 0: Disable; 1: Enable; other value: RFU.

Success:

Frame	0x1B	Checksum

Failure:

Frame	0xE4	Checksum

3.2.4 Set Automatic Detecting Card Interval Time

Function: set interval time of automatic detecting card function. The default is 100ms. Settings will save in the module; it will be not lost after power OFF.

Host sends:

Frame	0x1C	Time	Checksum

Time: 1 byte, 0x00 to 0xFF, unit is 10mS, 0x01 means 10mS.

Success:

Frame	0x1C	Checksum

Failure:

Frame	0xE3	Checksum

3.2.5 Set the Default of Automatic Detecting Card

Function: Set the default state of automatic detecting card when power on device. Settings will save in the module; it will be not lost after power OFF. For temporarily open or close automatically detect card, please use the 0x11 command.

Host sends:

Frame	0x1D	Status	Checksum

Status: 1 byte, 0x00: OFF; 0x01: ON, other value: RFU

Success:

Frame	0x1D	Checksum

Failure:

Frame	0xE2	Checksum

3.2.6 Set the RF Output Level

Function: To set the RF output level. When the RF output power is reduced, the card operation distance will be reduced too. The customer could set it according to the concrete needs. Settings will save in the module; it will be not lost after power OFF.

The default value is set to 0x00 (the strongest).

Host sends:

Frame	0x02	Power	Checksum

Power: 1 byte, 0x00: the strongest; 0x01: the stronger; 0x02: the weak; 0x03: the weakest; other values: RFU.

Success:

Frame	0x02	Checksum

Failure:

Frame	0xFD	Checksum

3.2.7 Module Contactless Protocol Set

Function: Set module contactless protocol, default is ISO14443A. The setting will not be saved and will return to the default status at next power on.

Host sends:

Frame	0x70	Mode	Checksum

Mode: 1 byte, 0: ISO14443A; 1: ISO14443B; 2: ISO15693; 3: I.CODE 1; other value: RFU

Success:

Frame	0x70	Checksum

Failure:

Frame	0x8F	Checksum

3.3 ISO14443A/B CPU Card Commmands

3.3.1 ISO14443 TYPE A Request

Function: ISO14443A request cards, cards include MIFARE and other ISO14443A cards. In the returned results, user could judge the length of serial number via the returned data package length, and judge the card type by ATQA, also judge whether the card supports ISO14443-4 by SAK. If automatic detect card function was opened, then this command is only to read the result of automatic detect card.

Host sends:

Frame	0x20	Mode	Checksum

Mode: 1 byte, 0: WUPA; 1: REQA; other value: RFU

Success:

Frame	0x20	Data	Checksum

Data: 4, 7 or 10 bytes card serial number + 2 bytes ATQA + 1 byte SAK

Failure:

Frame	0xDF	Checksum

3.3.2 ISO14443-4 TYPE A Card RATS

Function: send RATS to ISO14443-4 TYPE-A card. Before executing this command, it needs to request card and verifies the card support ISO14443-4 via SAK of card. If the automatic detecting card function is on, after a successful implementation of the RATS command, the automatic detect card function will be forced OFF.

Host sends:

Frame	0x30	Checksum

Success:

Frame	0x30	ATS	Checksum

ATS: ATS, length depends on card.

Failure:

Frame	0xCF	Checksum

3.3.3 ISO14443-4 TYPE B Request

Function: ISO14443-4 TYPE B card request and set attribute.

Host sends:

Frame	0x60	Mode	AFI	Checksum

Mode: 1 byte, 0: WUPB; 1: REQB; other values: RFU

AFI: 1 byte, the AFI to request, if request all AFI, please use 0x00.

Success:

Frame	0x60	Info.	Checksum

Info: total 13 bytes, 12 bytes of ATQB: 0x50 (1 byte), PUPI (4 bytes), application data (4 bytes), protocol information (3 bytes), 1 byte answer to Attribute.

For more details, please reference to ISO14443-3 "ATQB Response" part.

Failure:

Frame	0x9F	Checksum

3.3.4 Request Card according to EMV and PBOC

Function: Card Request according to EMV and PBOC standards and to set the communication parameters between the module and card. This card request command is aim to CPU card (T=CL). It contains ISO14443A&B. After requested the card via this command, you could operate the CPU card via sending APDU commands.

Host sends:

Frame	0x32	Checksum

Success:

Frame	0x32	Type	Info	Checksum

Type: 0x41: ISO14443 TYPE A;

0x42: ISO14443 TYPE B;

0x4D: Multi card in the Antenna field, request failed.

Info: TYPE A card returned data:

0x41, 1 byte UID Length; Length bytes UID; 2 bytes ATQA; 1 byte SAK; ATS (ATS is not fixed. Please reference the Datasheet of the card from the suppliers.).

TYPE B card returned data:

0x42, 1 byte 0x50, 4 bytes PUPI, 4 bytes Application data, 3 bytes Protocol information, 1 byte answer to ATTRIB.

Failure:

Frame	0xCD	Checksum

3.3.5 Send APDU to ISO14443-4 Card

Function: Send APDU to an ISO14443-4 card. Before executing the command, it needs to reset the card. If operate ISO14443-4 card, the automatic detect fuction need to be turned OFF. That’s because the ISO14443-4 card’s status will be lost in automatic detecting card.

Host sends:

Frame	0x31	APDU	Checksum

APDU: APDU to send

Success:

Frame	0x31	Response	Checksum

Response: card response, length depends on the detailed command

Failure:

Frame	0xCE	Checksum

3.3.6 ISO14443-4 TYPE B Card Halt

Function: To let the current ISO14443B card enters into halt status. Not all of the cards support this command, most don't support, especially the new card.

Host sends:

Frame	0x62	PUPI	Checksum

PUPI: 4 bytes, PUPI of the card that will be halt.

Success:

Frame	0x62	Checksum

Failure:

Frame	0x9D	Checksum

3.4 MIFARE 1K/4K/mini Card Commands

3.4.1 MIFARE Request

MIFARE series cards request, please refer to ISO14443 TYPE A Request.

3.4.2 MIFARE 1K/4K Data Block Read

Function: Read MIFARE 1K/4K one block data.

Host sends:

Frame	0x21	Key ID	Block	Key	Checksum

Key ID: 1 byte, Key identifier

BIT0 = 0:Key A; BIT0 = 1: Key B;

BIT1=0: using the key in the command; BIT1=1: using the key downloaded by command 0x2D;

BIT6:BIT5:BIT4:BIT3:BIT2: if use the downloaded key, this is the index of the key;

BIT7=0: The block need to be certified via using the above key;

BIT7=1: The block has been authenticated and passed. Do not need authentication again. (This operation and automatic detecting card could not be used at the same time);

(IMPORTANT: more information please refer to Chapter 5.3 about Key identifier).

Block: 1 byte, Block number to read, 0 to 0x3F for S50; 0 to 0xFF for S70;

Key: 6 bytes, the key of the card.

Success:

Frame	0x21	Data	Checksum

Data: 16 bytes card data

Failure:

Frame	0xDE	Checksum

3.4.3 MIFARE 1K/4K Multi-Blocks Read

Function: Read multi data blocks in the same sector. The function is supported only in the same sector. If crossing sectors, the reading will fail.

Host sends:

Frame	0x2A	Key ID	Start Block	Blocks	Key	Checksum

Key ID: 1 byte, key identifier;

Start Block: 1 byte, the start block to be read;

Blocks: 1 byte, number of blocks to be read. All blocks need in same sector.

Key: 6 bytes, the key of the card.

Success:

Frame	0x2A	Data	Checksum

Data: blocks * 16 bytes card data per block

Failure:

Frame	0xD5	Checksum

3.4.4 MIFARE 1K/4K Data Block Write

Function: Write the data to a block of MIFARE 1K/4K.

Host sends:

Frame	0x22	Key ID	Block	Key	Data	Checksum

Key ID: 1 byte, Key identifier;

Block: 1 byte, Block number to be written;

Key: 6 bytes, the key of the card;

Data: 16 bytes data to be written.

Success:

Frame	0x22	Checksum

Failure:

Frame	0xDD	Checksum

3.4.5 MIFARE 1K/4K Multi-Blocks Write

Function: Write multi data blocks. The function is supported only in the same sector. If crossing sector, it will fail while writing the first block in the next sector and then prompt the error in the returned result.

Host sends:

Frame	0x2B	Key ID	Start Block	Blocks	Key	Data	Checksum

Key ID: 1 byte, key identifier;

Start Block: 1 byte, the start block number to be written;

Blocks: 1 byte, number of blocks to be written;

Key: 6 bytes, the key of the card;

Data: blocks * 16 bytes data to write per block

Success:

Frame	0x2B	Checksum

Failure:

Frame	0xD4	Checksum

3.4.6 MIFARE 1K/4K Purse Block Initialization

Function: Initialize a block of MIFARE 1K/4K as a purse. The format of purse uses

MIFARE 1K/4K's default. The card's key block and block 0 could not be used as a purse. For more details about MIFARE 1K/4K card, please reference the datasheet.

Host sends:

Frame	0x23	Key ID	Block	Key	Value	Checksum

Key ID: 1 byte, Key identifier;

Block: 1 byte, Block number to be initialized;

Key: 6 bytes, the key of the card;

Value: 4 bytes, initialized value, LSB first.

Success:

Frame	0x23	Checksum

Failure:

Frame	0xDC	Checksum

3.4.7 MIFARE 1K/4K Purse Read

Function: Read a purse of MIFARE 1K/4K. The format of purse uses MIFARE 1K/4K's default. Module will read the data in the block and check if it is a purse format. If the purse format is incorrect, the respose will show failure.

Host sends:

Frame	0x24	Key ID	Block	Key	Checksum

Key ID: 1 byte, Key identifier;

Block: 1 byte, block number of the value to be read;

Key: 6 bytes, the key of the card.

Success:

Frame	0x24	Data	Checksum

Data: 4 bytes value data, LSB first.

Failure:

Frame	0xDB	Checksum

3.4.8 MIFARE 1K/4K Purse Increment

Function: Purse increment of MIFARE 1K/4K. The format of the purse uses MIFARE 1K/4K's default. Purse increment means the increment on the basis of the original value.

Host sends:

Frame	0x25	Key ID	Block	Key	Value	Checksum

Key ID: 1 byte, Key identifier;

Block: 1 byte, block number of purse to be increment;

Key: 6 bytes, the key of the card;

Value: 4 bytes, increment value, LSB first.

Success:

Frame	0x25	Checksum

Failure:

Frame	0xDA	Checksum

3.4.9 MIFARE 1K/4K Purse Decrement

Function: Purse decrement of MIFARE 1K/4K. The format of the purse uses MIFARE 1K/4K's default. Purse decrement means the decrement on the basis of the original number. Purse decrement only needs the "read authority" of the key.

Host sends:

Frame	0x26	Key ID	Block	Key	Value	Checksum

Key ID: 1 byte, Key identifier;

Block: 1 byte, block number of purse to be decrement;

Key: 6 bytes, the key of the card;

Value: 4 bytes, decrement value, LSB first

Success:

Frame	0x26	Checksum

Failure:

Frame	0xD9	Checksum

3.4.10 MIFARE 1K/4K Purse Backup

Function: Copy the MIFARE 1K/4K purse to another block in the same sector. The format of the purse uses MIFARE 1K/4K's default.

Host sends:

Frame	0x27	Key ID	Source	Target	Key	Checksum

Key ID: 1 byte, Key identifier;

Source: 1 byte, block number of purse to copy;

Target: 1 byte, copy the purse to this block (source and target need in same sector);

Key: 6 bytes, the key of the card.

Success:

Frame	0x27	Checksum

Failure:

Frame	0xD8	Checksum

3.4.11 ISO14443A Card Halt

Function: Set the current operating ISO14443A card (including MIFARE series cards) into halt status.

Host sends:

Frame	0x28	Checksum

Success:

Frame	0x28	Checksum

Failure:

Frame	0xD7	Checksum

3.4.12 Download MIFARE 1K/4K Card Key into Module

Function: Download the MIFARE 1K/4K card key into module. There are 32 key memory spaces in the module that could storage 32 different keys. While using the downloaded key in the module, this key wouldn't appear on the pin-outs of the PCD. So it could be more safety. Because EEPROM be written times are limited, therefore, do not use this command frequently. Lose efficacy EEPROM could not be work.

Host sends:

Frame	0x2D	Key Index	Key	Checksum

Key Index: 1 byte, Key Index (0 ~ 0x1F) in the module.

Key: 6 bytes, the key of the card to be stored in module.

Success:

Frame	0x2D	Checksum

Failure:

Frame	0xD2	Checksum

3.4.13 About KEY Identifier

There is a byte of KEY identifier in command of MIFARE 1K/4K cards. This byte will identify the way to get the card key.

KeyIdentifier							
BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0

BIT0 = 0: KEY A; authenticate Key A of the card.

BIT0 = 1: KEY B; authenticate Key B of the card.

BIT1 = 0: Using the following 6 bytes Key in command.

BIT1 = 1: Using the downloaded Key by command.

BIT6:BIT5:BIT4:BIT3:BIT2: Index of the Key already downloaded (0 to 31).

BIT7=0: The block need to authenticate with the above key.

BIT7=1: The block has been authenticated. This operation do not need to authenticate again (this operation and automatic detecting card could not be used at the same time).

If BIT1 is 0, then these 5 bits (BIT6 to BIT2) are unused. If BIT1 is 1, then use the already downloaded key. Users need to download key(s) first; and then the 6 bytes key in the command are left unused, but the 6-byte is necessary in the command sequence.

E.g.: key Identifier is 0x00; binary system is 00000000, here:

BIT0 = 0; authenticate Key A of the card

BIT1 = 0; using the key in command

BIT6:BIT5:BIT4:BIT3:BIT2: 00000, because not use the already downloaded key, the index key is useless in this command.

E.g.: key Identifier is 0x33; binary system is 00110011, here:

BIT0 = 1; authenticate Key B of the card

BIT1 = 1; using the downloaded Key in the module

BIT6:BIT5:BIT4:BIT3:BIT2:01100, then use the already downloaded key 01100, and hexadecimal is 0x0C, decimal is 12.

3.5 MIFARE Ultralight/Ultralight C/Ultralight EV1 Card Commands

3.5.1 MIFARE Ultralight/Ultralight C/Ultralight EV1 Request

For MIFARE UltraLight/UltraLight C card request, please refer to ISO14443 TYPE A Request.

3.5.2 MIFARE Ultralight/Ultralight C/Ultralight EV1 Card Read

Function: Read the data from MIFARE UltraLight/UltraLight C cards. A read command will read 4 blocks data from the card. If read start block is the last block (0x0F), then these 4 blocks data are the 15th, 0th, 1st and 2nd block.

Host sends:

Frame	0x41	Start Block	Checksum

Start Block: 1 byte, the start block number to be read.

Success:

Frame	0x41	Data	Checksum

Data: 16 bytes card data of 4 blocks, a read operation read 4 blocks from the start block.

Failure:

Frame	0xBE	Checksum

3.5.3 MIFARE Ultralight/Ultralight C/Ultralight EV1 Card Write

Function: Write data to MIFARE UltraLight/UltraLight C cards. Each for one block data.

Host sends:

Frame	0x42	Block	Data	Checksum

Block: 1 byte, block number to be written.

Data: 4 bytes data to be written.

Success:

Frame	0x42	Checksum

Failure:

Frame	0xBD	Checksum

3.5.4 MIFARE UltraLight C Key Authentication

Function: Inputting UltraLight C key, the device directly authenticate the key. This process

of authentification is controled by the module.

Host sends:

Frame	0x43	Key	Checksum

Key: 16 bytes UltraLight C key

Success:

Frame	0x43	Checksum

Failure:

Frame	0xBC	Checksum

3.5.5 MIFARE UltraLight C Ek (RndB) Read

Function: To read encrypted RndB this is generated by Ultralight C card. Command 0x44 and 0x45 are the separation commands to authenticate Ultralight C. Because the microcontroller calculates 3DES is slower, so authentication will be more time-consuming, and therefore part of the separation of authentication allows users to calculate 3DES to save authentication time.Users could first consider using 0x43 to authenticate, if required authentication in speed, you could contact us using separate authentication commands for technical support.

Host sends:

Frame	0x44	Checksum

Success:

Frame	0x44	Ek (RndB)	Checksum

Ek (RndB): the card returned RndB encrypted data. The RndB was done DES decryption via using the card key. After be decrypted, byte shifted---the first byte is moved to the end, then got RndB'. At this time Ek (RndB) is the subsequent 3DES CBC algorithm initial vector.

Failure:

Frame	0xBB	Checksum

3.5.6 MIFARE Ultralight C Ek (RndA + RndB') Authentication

Function: Input the "RndA + RndB'" which have already been encrypted.

Host sends:

Frame	0x45	Ek (RndA＋RndB')	Checksum

Ek (RndA＋RndB'): 16 bytes' result which "RndA + RndB'" be encrypted via using DES CBC. RndA is 8bytes random number specified by the user. RndB is obtained by the 0x44 command. RndB obtained by decrypting the shift (the first byte to be shifted the last).

Success:

Frame	0x45	Ek(RndA)	Checksum

Failure:

Frame	0xBA	Checksum

Ek(RndA): The card returned encrypted RndA. After decrypted and shifted via using 3DES

CBC, then to compare result with RndA. If equality, authentication is passed.

3.5.7 Ultralight EV1 GET_VERSION

Function: The GET_VERSION command is used to retrieve information on the MIFARE family, product version, storage size and other product data required to identify the Ultralight EV1 card.

Host sends:

Frame	0x46	Checksum

Success:

Frame	0x46	Version	Checksum

Version: 8bytes Ultralight EV1 Card version.

Failure:

Frame	0xB9	Checksum

As follows:

3.5.8 Ultralight EV1 FAST_READ

Function: The FAST_READ command requires a start page address and an end page address and returns the all n*4 bytes of the addressed pages.

Host sends:

Frame	0x47	Start Block	End Block	Checksum

Start Block: 1byte.

End Block: 1byte.

Success:

Frame	0x47	Card data	Checksum

Card data: Blocks * 4 bytes card data.

Failure:

Frame	0xB8	Checksum

3.5.9 Ultralight EV1 READ_CNT

Function: The READ_CNT command is used to read the current value of one of the 3 one-way counters of the Ultralight EV1.

Host sends:

Frame	0x48	Address	Checksum

Address: 1byte, Ultralight EV1 counters address.

Success:

Frame	0x48	Data	Checksum

Data: 3 bytes Ultralight EV1 counter data.

Failure:

Frame	0xB7	Checksum

3.5.10 Ultralight EV1 INCR_CNT

Function: The INCR_CNT command is used to increment one of the 3 one-way counters of the Ultralight EV1. The two arguments are the counter number and the increment value.

Host sends:

Frame	0x49	Address	Data	Checksum

Address: 1byte, Ultralight EV1 counters address.

Data: 3 bytes, Ultralight EV1 INCR_CNT data.

Success:

Frame	0x49	Checksum

Failure:

Frame	0xB6	Checksum

3.5.11 Ultralight EV1 PWD_AUTH

Function: A protected memory area can be accessed only after a successful password authentication using the PWD_AUTH command.

Host sends:

Frame	0x4A	PWD	Checksum

PWD: 4byte, Ultralight EV1 card password.

Success:

Frame	0x4A	Checksum

Failure:

Frame	0xB5	Checksum

3.5.12 Ultralight EV1 READ_SIG

Function: The READ_SIG command returns an IC-specific, 32-byte ECC signature, to verify NXP Semiconductors as the silicon vendor. The signature is programmed at chip production and cannot be changed afterwards.

Host sends:

Frame	0x4B	Checksum

Success:

Frame	0x4B	Signature	Checksum

Signature: 32 bytes signature data.

Failure:

Frame	0xB4	Checksum

3.5.13 Ultralight EV1 CHECK_TEARING_EVENT

Function: The CHECK_TEARING_EVENT command enables the application to identify if a tearing event happened on a specified counter element. It takes the counter number as single argument and returns a specified valid flag for this counter. If the returned valid flag is not equal to the predefined value, a tearing event happened. Note, although a tearing event might have happened on the counter, a valid value corresponding to the last valid counter status is still available using the READ_CNT command.

Host sends:

Frame	0x8C	Address	Checksum

Address: 1byte, Ultralight EV1 counters address.

Success:

Frame	0x8C	Flag	Checksum

Flag: 1byte, valid flag for this counter.

Failure:

Frame	0x73	Checksum

3.5.14 Ultralight EV1 VCSL

Function: The VCSL command is used to enable a unique identification and selection process across different MIFARE cards and card implementations on mobile devices. The command requires a 16-byte installation identifier IID and a 4-byte PCD capability value as parameters. The parameters are present to support compatibility to other MIFARE devices but are not used or checked inside the MF0ULx1. Nevertheless, the number of bytes is checked for correctness. The answer to the VCSL command is the virtual card type identifier VCTID. This identifier indicates the type of card or ticket. Using this information, the reader can decide whether the ticket belongs to the installation or not.

Host sends:

Frame	0x8D	IID	PCDCAPS	Checksum

IID: 16bytes, installation identifier.

PCDCAPS: 4bytes, PCD capabilities.

Success:

Frame	0x8C	VCTID	Checksum

VCTID: 1byte, virtual Card Type Identifier.

Failure:

Frame	0x72	Checksum

3.6 MIFARE Plus Card Commands

EWTJ680D-I reader module support MIFARE Plus card operation. NXP MIFARE Plus cards are used to instead MIFARE 1 card. We provide application commands are based on Level 3. In the card level 3, the authentication use AES encryption algorithm. In the communication process between module and card, all are using encrypted data + command with MAC + response with MAC mode. So the security of RF communication is extremely high.

Use the following command allows the user to quickly start MIFARE Plus R & D works. But for advanced user, also could use APDU to implement the card.

3.6.1 MIFARE Plus Prepare Commands

3.6.1.1 MIFARE Plus Request

For MIFARE Plus card request, please refer to ISO14443 TYPE A Request.

3.6.1.2 MIFARE Plus RATS

Please refer to ISO14443-4 TYPE-A card reset (RATS).

3.6.1.3 MIFARE Plus Request and RATS

Please refer to Card Request according to EMV and PBOC.

3.6.2 MIFARE Plus Initialization Commands

3.6.2.1 MIFARE Plus Write Perso

Function: Initialization of the AES key and all other blocks. About these blocks address and the default value please reference the MIFARE Plus datasheet or contact us.

Host sends:

Frame	0x33	Address	Data	Checksum

Address: 2 bytes block address, MSB first.

Data: 16 bytes.

Success:

Frame	0x33	Status	Checksum

Status: status code returned from the card, the communication between the card and module is successful, but may not meet the conditions for the implementation.

Please reference: MIFARE Plus Returned Status Code.

Failure:

Frame	0xCC	Checksum

3.6.2.2 MIFARE Plus Commit Perso

Function: Level 0 command, to switch Level0 to Level1 or Level3. Target Level depends on the card. If need switch to Level 1 or Level 3, please tell the suppliers when purchasing. Before

using this command, please use MIFARE Plus Write Perso command to write all AES key and the initial value of all the blocks, then make the changed data effect.

Host sends:

Frame	0x34	Checksum

Success:

Frame	0x34	Status	Checksum

Status: status code returned from the card.

Please reference: MIFARE Plus Returned Status Code.

Failure:

Frame	0xCB	Checksum

3.6.2.3 MIFARE Plus Switch to Level2/3

Function: Level 1 or Level 2 command, switch to Level2 or Level3

Host sends:

Frame	0x35	Level	Key	Checksum

Level: 1 byte, level to be switched, 2: Level 2; 3: Level 3.

Key: 16 bytes.

Success:

Frame	0x35	Status	Checksum

Status: status code returned from the card.

Please reference: MIFARE Plus Returned Status Code.

Failure:

Frame	0xCA	Checksum

3.6.3 MIFARE Plus Application Layer Commands

3.6.3.1 MIFARE Plus Data Block Authenticate

Function: Level 3 command, authentication for data block.

Host sends:

Frame	0x36	Key Type	Address	Key	Checksum

Key Type: 0: key A; 1: key B

Address: 2 bytes (MSB first).

Key: 16 bytes.

Success:

Frame	0x36	Status	Checksum

Status: status code returned from the card.

Please reference: MIFARE Plus Returned Status Code.

Failure:

Frame	0xC9	Checksum

3.6.3.2 MIFARE Plus Data Block Read

Function: Level 3 command, reading operation of data block; before reading, the relevant block need to be authorized.

Host sends:

Frame	0x37	Start Block	Blocks	Checksum

Start Block: 2 bytes (MSB first).

Blocks: 1 byte, blocks to be read

Success:

Frame	0x37	Status	Data	Checksum

Status: status code returned from the card.

Please reference: MIFARE Plus Returned Status Code.

Data: block * 16 bytes

Failure:

Frame	0xC8	Checksum

3.6.3.3 MIFARE Plus Data Block Write

Function: Level 3 command, writing operation of data block; before writing, the relevant block need to be authorized.

Host sends:

Frame	0x38	Start Block	Blocks	Data	Checksum

Start Block: 2 bytes (MSB first).

Blocks: 1 byte, blocks to be writen

Data: block * 16 bytes data to be writen

Success:

Frame	0x38	Status	Checksum

Status: status code returned from the card.

Please reference: MIFARE Plus Returned Status Code.

Failure:

Frame	0xC7	Checksum

3.6.3.4 MIFARE Plus Purse Create

Function: Level 3 command, creating a block of MIFARE Plus as a purse.

Host sends:

Frame	0x39	Block	Value	Checksum

Block: 2 bytes (MSB first), block number.

Value: 4 bytes (LSB first), purse initial value.

Success:

Frame	0x39	Status	Checksum

Status: status code returned from the card.

Please reference: MIFARE Plus Returned Status Code.

Failure:

Frame	0xC6	Checksum

3.6.3.5 MIFARE Plus Purse Read

Function: Level 3 command, reading the balance of the purse.

Host sends:

Frame	0x3A	Block	Checksum

Block: 2 bytes (MSB first), block number.

Success:

Frame	0x3A	Status	Value	Checksum

Status: status code returned from the card.

Please reference: MIFARE Plus Returned Status Code.

Value: 4 bytes balance of the purse.

Failure:

Frame	0xC5	Checksum

3.6.3.6 MIFARE Plus Purse Increment

Function: Level 3 command, purse increment of MIFARE Plus.

Host sends:

Frame	0x3B	Block	Value	Checksum

Block: 2 bytes (MSB first), block number.

Value: 4 bytes (LSB first), value to increase.

Success:

Frame	0x3B	Status	Checksum

Status: status code returned from the card.

Please reference: MIFARE Plus Returned Status Code.

Failure:

Frame	0xC4	Checksum

3.6.3.7 MIFARE Plus Purse Decrement

Function: Level 3 command, purse decrement of MIFARE Plus.

Host sends:

Frame	0x3C	Block	Value	Checksum

Block: 2 bytes (MSB first), block number.

Value: 4 bytes (LSB first), value to decrease

Success:

Frame	0x3C	Status	Checksum

Status: status code returned from the card.

Please reference: MIFARE Plus Returned Status Code.

Failure:

Frame	0xC3	Checksum

3.6.3.8 MIFARE Plus Purse Copy

Function: Level 3 command, copy the MIFARE Plus purse to another block in the same

sector.

Host sends:

Frame	0x3D	Source	Target	Checksum

Source: 2 bytes (MSB first), source block number

Target: 2 bytes (MSB first), target block number

Success:

Frame	0x3D	Status	Checksum

Status: status code returned from the card.

Please reference: MIFARE Plus Returned Status Code.

Failure:

Frame	0xC2	Checksum

3.6.3.9 MIFARE Plus First Authenticate

Function: Level 1/3 Command. In Level 3, this command is use to authentication for data block, configuration block and AES key block before reading and writing.

Host sends:

Frame	0x3E	Address	Key	Checksum

Address: 2 bytes (MSB first), AES key address.

Key: 16 bytes, AES key

Success:

Frame	0x3E	Status	Checksum

Status: status code returned from the card.

Please reference: MIFARE Plus Returned Status Code.

Failure:

Frame	0xC1	Checksum

3.6.3.10 MIFARE Plus Following Authenticate

Function: Level 1/3 Command. In Level 3, this command is use to authentication for none data block before reading and writing. It is use to authentication again after first authentication.

Host sends:

Frame	0x3F	Address	Key	Checksum

Address: 2 bytes (MSB first), AES key address.

Key: 16 bytes, AES key

Success:

Frame	0x3F	Status	Checksum

Status: status code returned from the card.

Please reference: MIFARE Plus Returned Status Code.

Failure:

Frame	0xC0	Checksum

3.6.4 MIFARE Plus Returned Status Code

There is a status code after MIFARE Plus card response; this table indicates the possible value.

HEX	Status	Explanation
0x90	OPERATION_SUCCESS	Normal operation ends
0x06	AUTHENTICATION_ERROR	Authentication conditions are not met; No exist block; The block is visited in a numeric
0x07	COMMAND_OVERFLOW	Plaintext R&W in a task Overflow.
0x08	INVALID_MAC	MAC error.
0x09	INVALID_BLOCK_NUMBER	Illegal block number
0x0A	NOT_EXIST_BLOCK_NUMBER	Block number does not exist.
0x0B	CONDITIONS_NOT_SATISFIED	Use conditions are not met.
0x0C	LENGTH_ERROR	Length error.
0x0F	GENERAL_MANIPULATION_ERROR	Cards Internal error.

3.7 DESFire Card Commands

We are here to provide a separate operation for DESFire card. DESFire card authentication and communication use DES encryption algorithm. The encryption of communication between EWTJ680D-I and DESFire cards is set by users. If the user sets the RF communication process is encrypted then the card data security is extremely high.

Use the following command allows the user to quickly start DESFire card R&D works. But for advanced user, also could use APDU to implement the card.

3.7.1 DESFire Prepare Commands

3.7.1.1 DESFire Request

DESFire card request, Please reference ISO14443 TYPE A Request.

3.7.1.2 DESFire RATS

DESFire card RATS, Please reference: ISO14443-4 TYPE-A card reset (RATS).

3.7.1.3 DESFire Request and RATS

This command support DESFire Request and RATS. Please reference: Card Request according to EMV and PBOC.

3.7.1.4 DESFire Authenticate

Function: Triple mutual authentication between DESFire and PCD. The authentication key number could be master Key or any other key.

The command means the host sent the key to the module. The module will process the authentication and send back results.

Advanced users could control the authentication process by themselves to improve security. We provide additional authentication interface. For details, please reference: 0x8E: DESFire Authenticate first step Get ekNo (RndB) and 0x8F: DESFire Authenticate second step get ekNo (RndA'). For all encryption and decryption methods related to DESFire refer to datasheet please. We also provide a tool to calculate the encryption and decryption. The source code of the tool is helpfull for users, if need assistance, please contact us.

Host sends:

Frame	0x90	KeyNo	Key	Checksum

KeyNo: 1 byte, the number of the key

Key: 16 bytes.

Success:

Frame	0x90	Status	SenssionKey	Checksum

Status: status code returned from the card, the communication between the card and module is successful, but may not meet the conditions for the implementation.

Please reference: DESFire Returned State Code.

SenssionKey: 16 bytes. The senssion key will be sent back only after a successful authentication. The senssion key will be used in the following card operations. It is the key to decrypt the encrypted data in encrypted communication process.

Failure:

Frame	0x6F	Checksum

3.7.1.5 DESFire Authenticate first step Get ekNo (RndB)

Function: Authentication is initiated by the module. Get the ekNo (RndB) from the card.

Host sends:

Frame	0x8E	KeyNo	Checksum

KeyNo: 1 byte.

Success:

Frame	0x8E	Status	ekNo (RndB)	Checksum

Status: status code returned from the card.

Please reference: DESFire Returned State Code.

If the status code is 0xAF, it's correct. The host will offer further data, the following command must be: DESFire Authenticate second step get ekNo (RndA') then may go on authentication.

ekNo (RndB): 8 bytes, the result of random number encrypted by specified key. Use correct key to decrypt could get the RndB.

Failure:

Frame	0x71	Checksum

3.7.1.6 DESFire Authenticate second step get ekNo (RndA')

Function: Random number RndA generated by the host. Host encrypte the assembled "RndA and RndB", and then send to card and get ekNo (RndA') from card, decrypte it to get RndA', reassemble to obtain RndA, if it is equal to RndA of generated by host, the authentication is passed.

Host sends:

Frame	0x8F	dkNo (RndA＋RndB')	Checksum

dkNo(RndA＋RndB'): 16bytes.

Success:

Frame	0x8F	Status	ekNo (RndA')	Checksum

Status: status code returned from the card.

Please reference: DESFire Returned State Code.

ekNo (RndA'): encrypted host random number. After decrypted with the correct key and reassemble, if equal to RndA, then the authentication is passed.

Senssion Key: 16 bytes, Combination of RndA and RndB:

Senssion Key = RndA[0..3]＋RndB[0..3]＋RndA[4..7]＋RndB[4..7]

The senssion key will be used in the following card operations. It is the key to decrypt the encrypted data in encrypted communication process.

Failure:

Frame	0x70	Checksum

3.7.1.7 DESFire Select Application

Function: Select the specified card application. The following operation will effect to this application.

Host sends:

Frame	0x98	AID	Checksum

AID: 3 bytes (LSB in first).

Success:

Frame	0x98	Status	Checksum

Status: status code returned from the card.

Please reference: DESFire Returned State Code.

Failure:

Frame	0x67	Checksum

3.7.2 DESFire Initialization Commands

3.7.2.1 DESFire Format Card

Function: Format card, all the card application and application files will be deleted.

Host sends:

Frame	0x99	Checksum

Success:

Frame	0x99	Status	Checksum

Status: status code returned from the card.

Please reference: DESFire Returned State Code.

Failure:

Frame	0x67	Checksum

3.7.2.2 DESFire Create Application

Function: Create new application.

Host sends:

Frame	0x95	AID	KeySett	NumOfKeys	Checksum

AID: 3 bytes (LSB in first).

KeySett: 1 byte, Key Setting

NumOfKeys: 1 byte.

Success:

Frame	0x95	Status	Checksum

Status: status code returned from the card.

Please reference: DESFire Returned State Code.

Failure:

Frame	0x6A	Checksum

3.7.2.3 DESFire Change Key Settings

Function: Modify the master key/application master key configuration setting. DES/3DES encryption and CRC checksum will be used in the process of instruction execution.

Host sends:

Frame	0x91	KeySettings	Checksum

KeySettings: 8 bytes encrypted key settings.

Success:

Frame	0x91	Status	Checksum

Status: status code returned from the card.

Please reference: DESFire Returned State Code.

Failure:

Frame	0x6E	Checksum

3.7.2.4 DESFire Get Key Settings

Function: Get the master key/appalication master key configureation settings.

Host sends:

Frame	0x92	Checksum

Success:

Frame	0x92	Status	KeySetting	Max.KeyNo	Checksum

Status: status code returned from the card.

Please reference: DESFire Returned State Code.

KeySetting: 1 byte

Max.KeyNo: 1byte, Max. Key numbers of current application

Failure:

Frame	0x6D	Checksum

3.7.2.5 DESFire Change Key

Function: Modify the key stored in the card. DES/3DES encryption and CRC checksum will be use in the process of instruction execution.

Host sends:

Frame	0x93	KeyID	ekKey	Checksum

KeyID: 1 byte.

ekKey: 24bytes (Refer to the datasheet for encryption calculations, or use the tools we provide and references to source code).

Success:

Frame	0x93	Status	Checksum

Status: status code returned from the card.

Please reference: DESFire Returned State Code.

Failure:

Frame	0x6C	Checksum

3.7.2.6 DESFire Get Key Version

Function: Get the key version information.

Host sends:

Frame	0x94	KeyID	Checksum

KeyID: 1 byte.

Success:

Frame	0x94	Status	Version	Checksum

Status: status code returned from the card.

Please reference: DESFire Returned State Code.

Version: 1 byte.

Failure:

Frame	0x6B	Checksum

3.7.2.7 DESFire Delete Application

Function: Delete the specified application.

Host sends:

Frame	0x96	AID	Checksum

AID: 3 bytes (LSB in first).

Success:

Frame	0x96	Status	Checksum

Status: status code returned from the card.

Please reference: DESFire Returned State Code.

Failure:

Frame	0x69	Checksum

3.7.2.8 DESFire Get Version

Function: Get card manufacturer and production information.

Host sends:

Frame	0x9A	Checksum

Success:

Frame	0x9A	Status	Data	Checksum

Status: status code returned from the card.

Please reference: DESFire Returned State Code.

Data: 28 bytes card manufacturer and production information.

Failure:

Frame	0x65	Checksum

3.7.2.9 DESFire Get Application IDs

Function: Get all application identifier of the card.

Host sends:

Frame	0x97	Checksum

Success:

Frame	0x97	Status	AID	Checksum

Status: status code returned from the card.

Please reference: DESFire Returned State Code.

AID: Application identifier length is 3 bytes, the length is 3* identification number.

Failure:

Frame	0x68	Checksum

3.7.2.10 DESFire Get File IDs

Function: Get all file identifier of current application.

Host sends:

Frame	0x9B	Checksum

Success:

Frame	0x9B	Status	FID	Checksum

Status: status code returned from the card.

Please reference: DESFire Returned State Code.

FID: File ldentifier length is 1 byte, the total length is file number * 1 bytes.

Failure:

Frame	0x64	Checksum

3.7.2.11 DESFire Get File Settings

Function: Get specified file setting in current application.

Host sends:

Frame	0x9C	FID	Checksum

FID: 1byte.

Success:

Frame	0x9C	Status	Data	Checksum

Status: status code returned from the card.

Please reference: DESFire Returned State Code.

Data: according to different types of files with different length, details as follows:

- Data file: 1 byte file type + 1 byte comm. setting + 2 bytes access right + 3 bytes file size.
- Value file: 1 byte file type + 1 byte comm. setting + 2 bytes access right + 4 bytes lower limit + 4 bytes upper limit + 4 bytes limited credit value + 1 byte limited credit enable.
- Record file: 1 byte file type + 1 byte comm. setting + 2 bytes access right + 3 bytes record size + 3 bytes Max record + 3 bytes current number of records.

  Note: The above multi-byte data are all LSB first.

Failure:

Frame	0x63	Checksum

3.7.2.12 DESFire Change File Settings

Function: Modify specified file setting in current application.

Host sends:

Plaintext:

Frame	0x9D	File ID	Comm.Sett	AccessRight	Checksum

Cryptograph:

Frame	0x9D	File ID	EncryptedSetting	Checksum

File ID: 1 byte.

Comm.Sett: 1byte, 0: Plaintext; 1: MAC code checksum; 3: DES/3DES encryption.

AccessRight: 2 bytes (LSB in first).

EncryptedSetting: 8 bytes, 1 byte communication setting + 2 bytes file permission + 2 bytes CRC + 3 bytes 0x00 got via encryption.

Success:

Frame	0x9D	Status	Checksum

Status: status code returned from the card.

Please reference: DESFire Returned State Code.

Failure:

Frame	0x62	Checksum

3.7.2.13 DESFire Create STD Data File

Function: Create Standard Data File in current application.

Host sends:

Frame	0x9E	FID	Comm.Sett	AccessRight	Size	Checksum

FID: 1 byte.

Comm.Sett: 1 byte, 0: Plaintext; 1: MAC code checksum; 3: DES/3DES encryption.

AccessRight: 2 bytes (LSB in first).

Size: 3 bytes (LSB in first).

Success:

Frame	0x9E	Status	Checksum

Status: status code returned from the card.

Please reference: DESFire Returned State Code.

Failure:

Frame	0x61	Checksum

3.7.2.14 DESFire Create Backup Data File

Function: Create Data File in current application, support backup mechanism (mirror). Then the file actual size is greater than or equal to DOUBLE size of specify file size and it is multiple of 32 bytes.

Host sends:

Frame	0x9F	FID	Comm.Sett	AccessRight	Size	Checksum

File ID: 1 byte.

Comm.Sett: 1byte, 0: Plaintext; 1:MAC code checksum; 3: DES/3DES encryption.

AccessRight: 2 bytes (LSB in first).

Size: 3 bytes (LSB in first).

Success:

Frame	0x9F	Status	Checksum

Status: status code returned from the card.

Please reference: DESFire Returned State Code.

Failure:

Frame	0x60	Checksum

3.7.2.15 DESFire Create Value File

Function: Create Value File in current application, support backup mechanism.

Host sends:

Frame	0xA0	FID	Comm. Sett	Access Right	Lower limit	Upper limit	Value	Limited Credit enable	Checksum

FID: 1 byte.

Comm.Sett: 1byte, 0: Plaintext; 1: MAC code checksum; 3: DES/3DES encryption.

AccessRight: 2 bytes (LSB in first).

Lower limit: 4 bytes (Signed int, LSB in first).

Upper limit: 4 bytes (Signed int, LSB in first).

Value: 4 bytes (Signed int, LSB in first).

Limited Credit enable: 1 byte, 0: disable; 1: enable.

Success:

Frame	0xA0	Status	Checksum

Status: status code returned from the card.

Please reference: DESFire Returned State Code.

Failure:

Frame	0x5F	Checksum

3.7.2.16 DESFire Create Linear Record File

Function: Create Linear Record File in current application, support backup mechanism.

Host sends:

Frame	0xA1	FID	Comm. Sett	Access Right	Record Size	Max Records	Checksum

FID: 1 byte.

Comm.Sett: 1byte, 0: Plaintext; 1: MAC code checksum; 3: DES/3DES encryption.

AccessRight: 2 bytes (LSB in first).

Record Size: 3 bytes (LSB in first), bytes of single record.

Max Records: 3 bytes (LSB in first), total record numbers of the file.

Success:

Frame	0xA1	Status	Checksum

Status: status code returned from the card.

Please reference: DESFire Returned State Code.

Failure:

Frame	0x5E	Checksum

3.7.2.17 DESFire Create Cyclic Record File

Function: Create Cyclic Record File in the current application.

Host sends:

Frame	0xA2	FID	Comm. Sett	Access Right	Record Size	Max Records	Checksum

FID: 1 byte.

Comm.Sett: 1byte, 0: Plaintext; 1: MAC code checksum; 3: DES/3DES encryption.

AccessRight: 2 bytes (LSB in first).

Record Size: 3 bytes (LSB in first), bytes of single record.

Max Records: 3 bytes (LSB in first), total record numbers of the file.

Success:

Frame	0xA2	Status	Checksum

Status: status code returned from the card.

Please reference: DESFire Returned State Code.

Failure:

Frame	0x5D	Checksum

3.7.2.18 DESFire Delete File

Function: Delete specified file in current application.

Host sends:

Frame	0xA3	FID	Checksum

FID: 1 byte.

Success:

Frame	0xA3	Status	Checksum

Status: status code returned from the card.

Please reference: DESFire Returned State Code.

Failure:

Frame	0x5C	Checksum

3.7.3 DESFire Application Layer Commands

3.7.3.1 DESFire Read Data

Function: Read specified Data File (Standard Data File or Backup Fata File) in current application.

Host sends:

Frame	0xA4	FID	Offset	Length	Checksum

FID: 1 byte.

Offset: 3 bytes (LSB in first), offset in the file.

Length: 3 bytes (LSB in first), bytes need to be read.

Success:

Frame	0xA4	Status	Data	Checksum

Status: status code returned from the card.

Please reference: DESFire Returned State Code.

Data: data returned from the card.

Failure:

Frame	0x5B	Checksum

3.7.3.2 DESFire Write Data

Function: Write specified Data File (Standard Data File or Backup Fata File) in current application. For Backup Data File, Commit is needed to take effect after write, refer to: DESFire Commit Transaction please.

Host sends:

Frame	0xA5	FID	Offset	Length	Data	Checksum

FID: 1 byte.

Offset: 3 bytes (LSB in first), offset in the file.

Length: 3 bytes (LSB in first), bytes need to be read.

Data: The data to be written.

Success:

Frame	0xA5	Status	Checksum

Status: status code returned from the card.

Please reference: DESFire Returned State Code.

Failure:

Frame	0x5A	Checksum

3.7.3.3 DESFire Get Value

Function: Read current value of specified Value File in current application.

Host sends:

Frame	0xA6	FID	Checksum

FID: 1 byte.

Success:

Frame	0xA6	Status	Data	Checksum

Status: status code returned from the card.

Please reference: DESFire Returned State Code.

Data: There are two lengths, depending on whether encryption.

Plaintext: 4 bytes value (LSB in first).

Encryption: 8 bytes encrypted data, After decryption: 4 bytes value (LSB first) + 2 bytes CRC + 2 bytes 0x00.

Failure:

Frame	0x59	Checksum

3.7.3.4 DESFire Credit

Function: Increase value in specified Value File in current application. Commitment is needed to take effect after this operation, refer to: DESFire Commit Transaction please.

Host sends:

Frame	0xA7	FID	Data	Checksum

FID: 1 byte.

Data: There are two lengths, depending on whether encryption.

Plaintext: 4 bytes value (LSB in first).

Encryption: 8 bytes encrypted data, After decryption: 4 bytes value (LSB first) + 2 bytes CRC + 2 bytes 0x00.

Success:

Frame	0xA7	Status	Checksum

Status: status code returned from the card.

Please reference: DESFire Returned State Code.

Failure:

Frame	0x58	Checksum

3.7.3.5 DESFire Debit

Function: Decrease value in specified Vale File in current application. Commitment is needed to take effect after this operation, refer to: DESFire Commit Transaction please.

Host sends:

Frame	0xA8	FID	Data	Checksum

FID: 1 byte.

Data: There are two lengths, depending on whether encryption.

Plaintext: 4 bytes value (LSB in first).

Encryption: 8 bytes encrypted data, After decryption: 4 bytes value (LSB first) + 2 bytes CRC + 2 bytes 0x00.

Success:

Frame	0xA8	Status	Checksum

Status: status code returned from the card.

Please reference: DESFire Returned State Code.

Failure:

Frame	0x57	Checksum

3.7.3.6 DESFire Limited Credit

Function: Increase a limited value in specified Value File in current application without having full Read&Write permissions to the file. Commitment is needed to take effect after this operation, refer to: DESFire Commit Transaction please.

Host sends:

Frame	0xA9	FID	Data	Checksum

FID: 1 byte.

Data: There are two lengths, depending on whether encryption.

Plaintext: 4 bytes value (LSB in first).

Encryption: 8 bytes encrypted data, After decryption: 4 bytes value (LSB first) + 2 bytes CRC + 2 bytes 0x00.

Success:

Frame	0xA9	Status	Checksum

Status: status code returned from the card.

Please reference: DESFire Returned State Code.

Failure:

Frame	0x56	Checksum

3.7.3.7 DESFire Write Record

Function: Write data to specified Data File in current application. The data file could be Linear Record or Cyclic Record file. This command appends one record at the end of the record file. The status will show an error when the linear record file is full. In case of cyclic record file is already full, it erases and overwrites the oldest record. Commitment is needed to take effect after this operation, refer to: DESFire Commit Transaction please.

Host sends:

Frame	0xAA	FID	Offset	Length	Data	Checksum

FID: 1 byte.

Offset: 3 bytes (LSB in first), offset in the record.

Length: 3 bytes (LSB in first), greater than 0 and less than or equal Record Size subtract the offset in the record.

Data: The data to be written.

Success:

Frame	0xAA	Status	Checksum

Status: status code returned from the card.

Please reference: DESFire Returned State Code.

Failure:

Frame	0x55	Checksum

3.7.3.8 DESFire Read Record

Function: Read one or multi records from specified Record File in current application.

Host sends:

Frame	0xAB	FID	Offset	Length	Checksum

FID: 1 byte.

Offset: 3 bytes (LSB in first), offset of the record.

Length: 3 bytes (LSB in first), number of records to be read.

Success:

Frame	0xAB	Status	Data	Checksum

Status: status code returned from the card.

Please reference: DESFire Returned State Code.

Data: data returned from the card.

Failure:

Frame	0x54	Checksum

3.7.3.9 DESFire Clear Record File

Function: Clear specified Record File of current application. Commitment is needed to take effect after this operation, refer to: DESFire Commit Transaction please.

Host sends:

Frame	0xAC	FID	Checksum

FID: 1 byte.

Success:

Frame	0xAC	Status	Checksum

Status: status code returned from the card.

Please reference: DESFire Returned State Code.

Failure:

Frame	0x53	Checksum

3.7.3.10 DESFire Commit Transaction

Function: Submit all WRITE operation of Backup Data file, Value file and Record file in current application. The modifications will be take effect after this operation.

Host sends:

Frame	0xAD	Checksum

Success:

Frame	0xAD	Status	Checksum

Status: status code returned from the card.

Please reference: DESFire Returned State Code.

Failure:

Frame	0x52	Checksum

3.7.3.11 DESFire Abort Transaction

Function: Abort all WRITE operation of Backup Data file, Value file and Record file in current application.

Host sends:

Frame	0xAE	Checksum

Success:

Frame	0xAE	Status	Checksum

Status: status code returned from the card.

Please reference: DESFire Returned State Code.

Failure:

Frame	0x51	Checksum

3.7.4 DESFire Returned State Code

Coding of Status and Error Codes of DESFire card

HEX code	Status	Explanation
0x00	OPERATION_OK	Successful operation
0x0C	NO_CHANGES	No changes done to backup files, CommitTransaction / AbortTransaction not necessary
0x0E	OUT_OF_EEPROM_ERROR	Insufficient NV-Memory to complete command
0x1C	ILLEGAL_COMMAND_CODE	Command code not supported
0x1E	INTEGRITY_ERROR	CRC or MAC does not matchdata Padding bytes not valid
0x40	NO_SUCH_KEY	Invalid key number specified
0x7E	LENGTH_ERROR	Length of command string invalid
0x9D	PERMISSION_DENIED	Current configuration / status does not allow the requested command
0x9E	PARAMETER_ERROR	Value of the parameter(s) invalid
0xA0	APLICATION_NOT_FOUND	Requested AID not present on PICC
0xA1	APPL_INTEGRITY_ERROR	Unrecoverable error within application, application will be disdabled *
0xAE	AUTHENTICATION_ERROR	Current authentication status does not allow the requested command
0xAF	ADDITIONAL_FRAME	Additional data frame is expected to be sent
0xBE	BOUNDARY_ERROR	Attempt to read/write data from/to beyond the files'/record's limits Attempt to exceed the limits of value file
0xC1	PICC_INTEGRITY_ERROR	Unrecoverable error within PICC, PICC will be disabled *
0xCA	COMMAND_ABOUTED	Previous Command was not fully completed Not all Frames were requested or provided by the PCD
0xCD	PICC_DISABLED_ERROR	PICC was disabled by an unrecoverable error *
0xCE	COUNT_ERROR	Number of Applications limited to 28, no additional CreatApplication possible
0xDE	DUPLICATE_ERROR	Creation of file/application failed because file/application with same number already exists
0xEE	EEPROM_ERROR	Could not complete NV-write operation due to loss of power, internal backup/rollback mechanism active *
0xF0	FILE_NOT_FOUND	Specified file number does not exist
0xF1	FILE_INTEGRITY_ERROR	Unrecoverable error within file, file will be disabled *

* These errors are not expected to appear during normal operation.

3.8 SR176 Card Commands

3.8.1 SR Serial Cards 1 Slot Initiate Card

Function: SR serial cards (SR176/SRI512/SRI1K/SRI2K/SRI4K/SRIX4K, the same below) single channel initiate card. Before read/write card, it needs to use the command of "SR serial cards select" to select the card. More detailed card operations please refer to the card manual please.

Host sends:

Frame	0x63	Checksum

Success:

Frame	0x63	Card ID	Checksum

Card ID: 1 byte. It is a random ID.

Failure:

Frame	0x9C	Checksum

3.8.2 SR Serial Cards Select

Function: Select a SR card as the CURRENT CARD.

Host sends:

Frame	0x65	Card ID	Checksum

Card ID: 1 byte, the card ID to selecte.

Success:

Frame	0x65	Card ID	Checksum

Card ID: 1 byte, the selected card ID.

Failure:

Frame	0x9A	Checksum

3.8.3 SR Serial Cards Completion

Function: Set the CURRENT CARD into the completion status. If want to operate the card again, need to move the card out of the antenna RF effective field and initiate the card again.

Host sends:

Frame	0x67	Checksum

Success:

Frame	0x67	Checksum

Failure:

Frame	0x98	Checksum

3.8.4 SR176 Card Read

Function: Read data block of SR176 card.

Host sends:

Frame	0x68	StartBlock	BlockNumbers	Checksum

StartBlock: 1 byte.

BlockNumbers: 1 byte; the quantity of blocks to be read.

Success:

Frame	0x68	Data	Checksum

Data: 2 bytes * BlockNumbers, data from the card.

Failure:

Frame	0x97	Checksum

3.8.5 SR176 Card Write

Function: Write into the data block of SR176 card. After wrote, module will read the data to compare. If not equal, then return failure.

Host sends:

Frame	0x69	StartBlock	BlockNumbers	Data	Checksum

StartBlock: 1 byte.

BlockNumbers: 1 byte; the quantity of blocks to be written.

Data: 2 bytes * BlockNumbers, data to write to the card.

Success:

Frame	0x69	Checksum

Failure:

Frame	0x96	Checksum

3.8.6 SR176 Block Lock

Function: Write Lock Register of SR176 card. The module will check the lock result after wrote.

Host sends:

Frame	0x6A	LOCK_REG	Checksum

LOCK_REG: 1byte, the lock register values to be written.

Success:

Frame	0x6A	Checksum

Failure:

Frame	0x95	Checksum

3.9 SRI512/1K/2K/4K Card Commands

3.9.1 SRI Serial Cards 1 Slot Initiate Card

Please reference: SR serial cards 1 slot initiate card.

3.9.2 SRI Serial Cards 16 Slots Initiate Card

Function: SR serial cards (SRI512/SRI1K/SRI2K/SRI4K/SRIX4K, the same below) 16 channels initiate card.

Host sends:

Frame	0x64	Checksum

Success:

Frame	0x64	Status	Card ID	Checksum

Status: 16 bytes, the initiate result of 16 channels (0~15), 0x00: current channel success; 0xE8: current channel collision; 0xFF: current channel no card.

Card ID: 16 bytes; card ID of 16 channels; it is valid while the initial result of current channel is successful.

Failure:

Frame	0x9B	Checksum

3.9.3 SR Serial Cards Select

Please reference: SR serial cards select.

3.9.4 SRI Serial Cards Return to Inventory

Function: Set a selected SRI card returning to inventory status.

Host sends:

Frame	0x66	Checksum

Success:

Frame	0x66	Checksum

Failure:

Frame	0x99	Checksum

3.9.5 SR Serial Cards Completion

Please reference: SR serial cards completion.

3.9.6 SRI Serial Cards Read

Function: Read data block of SRI serial card.

Host sends:

Frame	0x6B	StartBlock	BlockNumbers	Checksum

StartBlock: 1 byte.

BlockNumbers: 1 byte; the quantity of blocks to be read.

Success:

Frame	0x6B	Data	Checksum

Data: 4 bytes * BlockNumbers, data from the card.

Failure:

Frame	0x94	Checksum

3.9.7 SRI Serial Cards Write

Function: Write data block of SRI serial card. After write, module will read the data to compare. If not equal, then return failure.

Host sends:

Frame	0x6C	StartBlock	BlockNumbers	Data	Checksum

StartBlock: 1 byte.

BlockNumbers: 1 byte; the quantity of blocks to be written.

Data: 4 bytes * BlockNumbers, data to write to the card.

Success:

Frame	0x6C	Checksum

Failure:

Frame	0x93	Checksum

3.9.8 SRI Serial Cards Block Lock

Function: Write Lock Register of SRI serial card. The module will check the lock result after write.

Host sends:

Frame	0x6D	LOCK_REG	Checksum

LOCK_REG: 1byte, the lock register values to be written.

Success:

Frame	0x6D	Checksum

Failure:

Frame	0x92	Checksum

3.9.9 SRI Serial Cards Read UID

Function: Read UID of SRI serial card.

Host sends:

Frame	0x6E	Checksum

Success:

Frame	0x6E	UID	Checksum

UID: 8 bytes, UID of CURRENT CARD.

Failure:

Frame	0x91	Checksum

3.9.10 SRIX Serial Cards Authentication

Function: SRIX serial card authentication; Anti clone function of the SRIX serial card.

Host sends:

Frame	0x6F	Data	Checksum

Data: 6 bytes, data input.

Success:

Frame	0x6F	Result	Checksum

Result: 3 bytes, result return.

Failure:

Frame	0x90	Checksum

3.10 ISO15693 Operation Commands

3.10.1 ISO15693 Inventory

Function: Find a card in RF effective field. If success, to set the tag as CURRENT TAG.

If automatic detecting card function was turned on, then this command is to take the result of automatic detecting card, not to detect card after received the command.

Host sends:

Frame	0x5C	AFI	Checksum

AFI: 1byte AFI, detect card equal to AFI only.

If not use AFI, then host sends:

Frame	0x5C	Checksum

Success:

Frame	0x5C	DSFID	UID	Checksum

DSFID: 1 byte, DSFID of CURRENT TAG.

UID: 8 bytes (LSB in first), UID of CURRENT TAG.

Failure:

Frame	0xA3	Checksum

3.10.2 ISO15693 Stay Quiet

Function: Set the CURRENT TAG stay quiet. This command is only for "Inventory" and "get system information". Read and write card commands are based on the address, so even with this command could also read and write operations.

Host sends:

Frame	0x5D	Checksum

Success:

Frame	0x5D	Checksum

Failure:

Frame	0xA2	Checksum

3.10.3 ISO15693 Get System Information

Function: Get the system information of CURRENT TAG.

Host sends:

Frame	0x5E	Checksum

Success:

Frame	0x5E	Data	Checksum

Data: system information, the content to depend on the functions of the card, please

refers to the data sheet of the card.

Failure:

Frame	0xA1	Checksum

3.10.4 ISO15693 Reset to Ready

Function: Set a stay quiet TAG reset to ready.

Host sends:

Frame	0x5F	UID	Checksum

Data: 8 bytes, UID of the tag to reset to ready.

Success:

Frame	0x5F	Checksum

Failure:

Frame	0xA0	Checksum

3.10.5 ISO15693 Read Blocks

Function: Read data blocks of CURRENT TAG.

Host sends:

Frame	0x54	StartBlock	BlockNumbers	Checksum

StartBlock: 1 byte, the start block number to be read.

BlockNumbers: 1 byte, number of blocks to be read, Max. 62.

Success:

Frame	0x54	Data	Checksum

Data: Blocks * bytes per block (depend on the cards).

Failure:

Frame	0xAB	Checksum

3.10.6 ISO15693 Write Blocks

Function: Write data blocks of CURRENT TAG.

Host sends:

Frame	0x55	StartBlock	BlockNumbers	Data	Checksum

StartBlock: 1 byte, start block number to be written.

BlockNumbers: 1 byte, number of blocks to be written, Max. 62.

Data: Blocks * 4 bytes..

Success:

Frame	0x55	Checksum

Failure:

Frame	0xAA	Checksum

3.10.7 ISO15693 Lock Block

Function: Lock a block of CURRENT TAG.

Host sends:

Frame	0x56	BlockNumber	Checksum

BlockNumber: 1 byte, block number to be locked.

Success:

Frame	0x56	Checksum

Failure:

Frame	0xA9	Checksum

3.10.8 ISO15693 Write AFI

Function: Write AFI to CURRENT TAG.

Host sends:

Frame	0x57	AFI	Checksum

AFI: 1 byte, AFI value to be written.

Success:

Frame	0x57	Checksum

Failure:

Frame	0xA8	Checksum

3.10.9 ISO15693 Lock AFI

Function: Lock AFI of CURRENT TAG.

Host sends:

Frame	0x58	Checksum

Success:

Frame	0x58	Checksum

Failure:

Frame	0xA7	Checksum

3.10.10 ISO15693 Write DSFID

Function: Write DSFID of CURRENT TAG.

Host sends:

Frame	0x59	DSFID	Checksum

DSFID: 1 byte, DSFID value to be written.

Success:

Frame	0x59	Checksum

Failure:

Frame	0xA6	Checksum

3.10.11 ISO15693 Lock DSFID

Function: Lock DSFID of CURRENT TAG.

Host sends:

Frame	0x5A	Checksum

Success:

Frame	0x5A	Checksum

Failure:

Frame	0xA5	Checksum

3.10.12 ISO15693 Get Blocks Security

Function: Get blocks security information of CURRENT TAG.

Host sends:

Frame	0x5B	StartBlock	BlockNumbers	Checksum

StartBlock: 1 byte, the start block number to be gotten security.

BlockNumbers: 1 byte, number of blocks to be gotten security.

Success:

Frame	0x5B	Data	Checksum

Data: bytes equal to BlockNumbers, the locked information of data block.

Failure:

Frame	0xA4	Checksum

3.11 I.CODE 1 Operation Commands

3.11.1 I.CODE1 Inventory

Function: Search I.CODE1 card in RF effective field.

Host sends:

Frame	0x80	Checksum

Success:

Frame	0x80	SNR	Checksum

SNR: 8 bytes.

Failure:

Frame	0x7F	Checksum

3.11.2 I.CODE 1 Read

Function: Read data from I.CODE1.

Host sends:

Frame	0x81	BlockNumber	Checksum

BlockNumber: 1byte, value: 0x00 to 0x0F.

Success:

Frame	0x81	Data	Checksum

Data: 4bytes.

Failure:

Frame	0x7E	Checksum

3.11.3 I.CODE 1 Write

Function: To write data into I.CODE1.

Host sends:

Frame	0x82	BlockNumber	Data	Checksum

BlockNumber: 1 byte.

Data: 4 bytes.

Success:

Frame	0x82	Checksum

Failure:

Frame	0x7D	Checksum

3.11.4 I.CODE 1 Stay Quiet

Function: I.CODE1 stay quiet.

Host sends:

Frame	0x83	Checksum

Success:

Frame	0x83	Checksum

Failure:

Frame	0x7C	Checksum

Work Usage：Obtaining the handling data via radiofrequency communication with the card.

Encrypt:：Yes

Working Introduction:

The main chip of EWTJ-680F-I module is NXP CL RC966302 & C8051F381。

J5 is power supply and data transmission。

C8051F381 is used to control NXP CL RC966302,

proceeding in the mutual Authentication via radiofrequency communication with the card.

Obtaining the output data via radiofrequency and proceeding with the necessary result.

And then from J5(RS232C) to output the outer device.

Notice : The changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

IMPORTANT NOTE: To comply with the FCC RF exposure compliance requirements, no change to the antenna or the device is permitted. Any change to the antenna or the device could result in the device exceeding the RF exposure requirements and void user's authority to operate the device.

FCC INFORMATION

The Federal Communication Commission Radio Frequency Interference Statement includes the following paragraph:

The equipment has been tested and found to comply with the limits for a Class B Digital Device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction, may cause harmful interference to radio communication. However, there is no grantee that interference will not occur in a particular installation. If this equipment dose cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on , the user is encouraged to try to correct the interference by one or more of the following measures:

--Reorient or relocate the receiving antenna.
--Increase the separation between the equipment and receiver.
--Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
--Consult the dealer or an experienced radio/TV technician for help.

4 包装方式