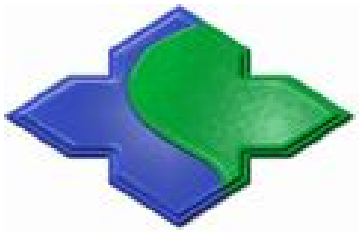
MR-810/800/790
User's Manual



03/01/2012

No.	Version	Remarks
1	V1.0	01/04/2010 The initial version

Contents

1. Overview

MR800 series desktop contactless IC card reader/writer (containing MR-790/800/810) is based on NXP series RF chip with high performance ARM7 MCU (But MR-790 is 51 MCU). The communication is according to USB PC/SC standard. The reader fully support the IC crad according to ISO14443 and ISO15693 standards, especially completely support ISO14443-4 contactless CPU card. User can choose freely if with the LCD display module (128x64) or not (MR-800 with LCD, MR-810/790 without LCD). The readers can be directly used the Windows operating system with driver and the API functions. The development cycle is simple and short. The reader builds in 2 SAM slots, and fully supports SAM according to ISO7816.

In order to the developer's convenient application, we can offer VC、BC、VB、DELPHI programs(SDK). The developer can come into work quickly via using our offering SDK.

1.1 Cards supported (PICC)

- Mifare One S50
- Mifare One S70
- Mifare Ultra Light
- Mifare Plus
- ST SR176
- ST SRIX4K 、SRI512
- AT88RF020
- ISO14443-4 TYPE A & B
- TI RFid Tag-it HF
- NXP I.Code SLI (I.Code 2)
- Other ISO15693 Tags
- SAM (T=0 /1)

1.2. Technical parameters

Qualifications:

• PCD: NXP RC531, RC632; RC400, RC500 (select)

• Flash memory: AT45DB321

• Working frequency: 13.56MHz

• RF standard: ISO14443A, ISO14443B, ISO15693

• Operating distance: 100mm (Mifare One, typical distance)

• SAM card slot: 2 slots, (supports ISO7816 T=0 and T=1)

• Interface: USB PC/SC

• Power supply: USB DC5V

• Power consumption: 0.9W

• LED: four LED (red, green, blue, yellow)

• Dimension: 123mm × 88mm × 25mm

• Weight: About 200g

• Operating temperature: -25 ~ +85 ℃ (-77 ~ +185°F)

• Storage temperature: -40 ~ +125 ℃ (-104 ~ +257°F)

• PC software: PTransWin

• SDK&Program: VC, VB, C++ Builder, DELPHI, Power Builder

• Manual

Note：

1、Using which kinds of chips according to the users want to read the card types.

2、For the reading distance, there are some different, because of the different card types or coming from different producers.

3、As to the SAM cards support T=0/1 protocol, so the reader can automatically choose the communicate protocol according to the reset information. Uesers don't need set.

4、MR-800/810 has 2 SAM slots, and MR-790 has 3 SAM slots.

5、MR-790 and MR-810 doesn't support green LED light.

6、Only MR-800 support LCD display and RTC.

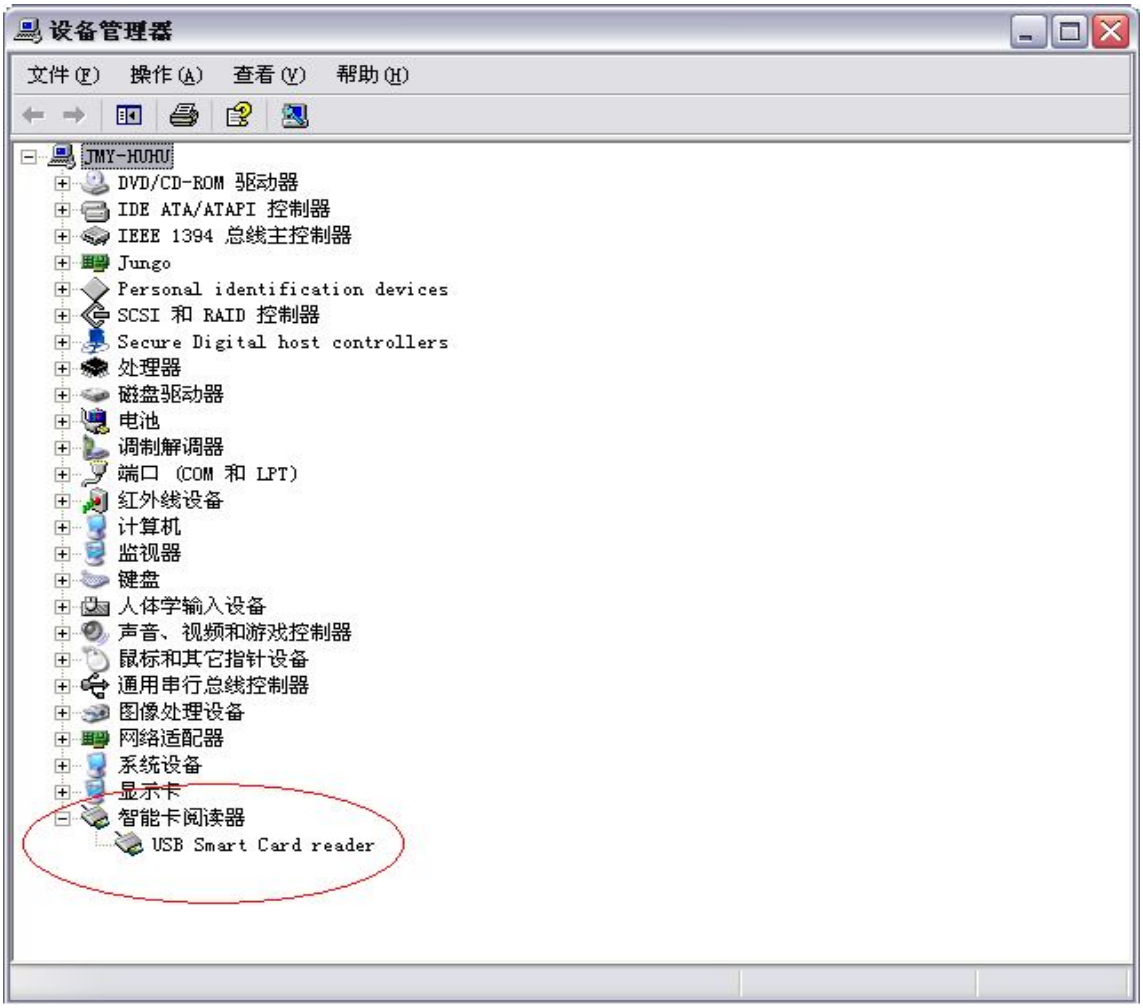
2. Interface description

2.1 Hardware Interface

MR800's interface is USB PC/SC; the interface description is as following:

Pin	Signal	Function
1	Vbus	＋5V power input
2	D+	Data line＋
3	D-	Data line－
4	GND	GND

After power on, to check the rfid reader connection: My PC-> Characteristic ->Hardware-> Device Manager



The correct connection is just like the above picture: USB Smart Card reader。

2.2 Answer to reset (ATR)

According to PC/SC Part3 protocol, when the reader power on and get the return ATR information from the SmartCard, in order to let the reader read more contactless smart cards, MR-800 using the return to a fixed reset information (not including the card information). Information format is as following:

Byte	Value(Hex)	Designation	Description
0	3B	Initial Header	
1	8N	T0	Higher nibble 8 means: no TA1, TB1, and TC1 only TD1 is following. Lower nibble N is the number of historical bytes (HistByte 0 to HistByte N-1)
2	80	TD1	Higher nibble 8 means: no TA2, TB2, and TC2 only TD2 is following. Lower nibble 0 means T = 0
3	01	TD2	Higher nibble 0 means no TA3, TB3, TC3, TD3 following. Lower nibble 1 means T = 1
4 To 3+N	80	T1	Category indicator byte, 80 means A status indicator may be present in an optional COMPACT-TLV data object
	4F	Tk	Application identifier Presence Indicator
	0C		Length
	RID		Registered Application Provider Identifier (RID) # A0 00 00 03 06
	SS		Byte for standard
	C0 .. C1		Bytes for card name
	00 00 00 00	RFU	RFU # 00 00 00 00
4+N	UU	TCK	Exclusive-oring of all the bytes T0 to Tk

The MR-800 Series reader, we return to the fixed ATR as follows:

ATR = {3B 8F 80 01 80 4F 0C A0 00 00 03 06 00 00 00 00 00 00 00 68}

3. Application Protocol Data Unit (APDU) Operation

There are two kinds of APDU for MR800 series reader: Standard APDU (the Class of APDU is not 0xFF) and Non-Standard APDU (the Class of APDU is 0xFF). For contactless SmartCard and contact SAM cards, in order to let it be compatible with PC / SC standard, we not only can get the cards reset information, but also can directly send the rest standard APDU to the SmartCard or SAM cards. As the MR-800 support contactless SmartCard and contact SAM cards, so you can choose which one you want to operate via switching the current operating cards' APDU**(APDU:FF 00 FA 00 01 CurSmartCard)**. The detailed card operating procedures, please reference the later chapters. Memory card, we have adopted a Class = FF non-standard APDU command extended operation, the instruction described in later chapters. Whether the non-contact SmartCard, contact SAM card or memory card, all the operation of the card the first step **must** be the GetData APDU to obtain card information, and only to obtain card information you can go on the follow-up operation.

3.1 Contactless Smart Card

Contactless Smart Card is following the standard APDU command. Before sending the standard APDU command, we need through GetData command to obtain SmartCard ATR data. During the operation, If you need read the SAM card, you need switch it to the specified SAM Slot (APDU: FF 00 FA 00 01 CurSmartCard) to read the relevant data.

3.2 SAM Card

MR-800 series reader/writer have serval SAM card slots (MR-800/810 two SAM card slots, MR-790 three SAM card slots). Before sending the standard APDU command, we need through GetData command to obtain SAM card reset information. During the operation, if you need read the contactless smart card or SAM card, you need switch instruction to shift it to the contactless smart card or SAM card. For example: During the operation, when the reader read the contactless card, this need be certificated by SAM data.

3.3 Contactless Memory Card

MR-800 support Mifare one/Ultralight and so on. In order to let it be compatible with PC / SC standard, we have defined Non-standard APDU. Before sending Non-standard APDU command, we need through GetData command to detect the card and also obtain Card serial number information.

3.4 Non-standard APDU (PC/SC Part3 defined parts)

GetData APDU can operate memory card and SmartCard/SAM. The other Non-standard APDU is mainly used to the operation of the storage class card. The standard APDU is mainly used to the operation of the SmartCard/SAM card.

The wrong feedback (SW1/SW2) status is as following:

Result	SW1	SW2	Wrong note
success	90	00	Operation success
failure	63	00	Operation failure
failure	6A	81	Non-support
failure	6B	00	P1-P2 Parameter error

3.4.1 GetData

The APDU command is in order to obtain Card serial number or reset information. Before operating a card, the APDU must be run at first, because of which contains the switch of the type of card which the reader will read.

Send APDU format:

Command	Class	INS	P1	P2	Le
GetData	FF	CA	CardType	SubCardType	00

CardType and SubCardType are defining as following:

ISO	CardType	SubCardType
ISO14443 Type A	**00**：ISO14443 A Mifare card	00
	01：ISO14443 A Smartcard(ISO14443-4)	00
	02：MIFARE Ultra Light	00
	03：Mifare Plus	00： Mifare PLUS Level0
		01： Mifare PLUS Level1
		02： Mifare PLUS Level2
		03： Mifare PLUS Level3
		04： Mifare PLUS Level1for switch level
ISO14443 Type B	**20**：ISO14443 B Smartcard(ISO14443-4)	00
	21：SR176	00
	22：SRIX4K/SRI512	00
	23：AT88RF020	00
ISO15693	**40**：ISO15693 Tag(Only one Tag)	00(NXP/TI Tag)
ISO7816	**60**：ISO7816-Contact(T=0/T=1)	00：SAM1
		01：SAM2
		02：SAM3
		03：SAM4

MIFARE 1K/4K/UlraLight/MifarePlus Level1 (P1 = 00/02/03)

Answer:

Response	Data Out		
Result	UID Len(1Byte) + UID (LSB- 4/7Byte) + ATQA(2byte) + SAK(1Byte)	SW1	SW2

MIFARE Plus Level0/2/3/1 for switch and ISO14443 - 4 TypeA SmartCard (P1 = 01/03)

Answer:

Response	Data Out		
Result	UID Len(1Byte) + UID (LSB- 4/7Byte) + ATQA(2byte) + SAK(1Byte)＋ ATQA(nByte)	SW1	SW2

ISO14443 - 4 TypeB SmartCard/AT88F020 (P1=20/23)

Answer:

Response	Data Out		
Result	ATQB(12Byte)	SW1	SW2

SR176/SRIX4K (SRI512) (P1=21/22)

Answer:

Response	Data Out		
Result	CHIPID(1Byte)+UID(8Byte)	SW1	SW2

ISO15693 Tag (P1=40)

Answer:

Response	Data Out		
Result	DSFID(1Byte)+UID(8Byte)	SW1	SW2

ISO7816 SAM (P1=60)

Answer:

Response	Data Out		
Result	Reset Info(nByte)	SW1	SW2

Such as:

1、 TypeA request cards:

Send: FF CA 00 00 00

Receive: 04 72 AE A6 9E 04 00 08 90 00

2、 ISO14443 TypeA Smartcard:

Send: FF CA 01 00 00

Receive: 04 50 3D CE EB 08 03 20 11 28 A1 53 43 41 5F 4F 5F 56 31 30 30 5F 54 64 90 00

3、 ISO14443 TypeB SmartCard:

Send: FF CA 20 00 00

Receive: 50 C0 1281 89 54 46 22 08 00 80 A1 90 00

3.4.2 LoadKey

The APDU is used to save the card authorized keys and readers key. The LoadKey can be chosen to save or not save. The key that is not saved temporarily stored in RAM, easily lose after power off，but hardly lose after power off if it was saved in Flash. The Max. Card keys which can be saved in MR-800 are 32 pcs. Each key is Max.16 bytes. If the authorized key is less than 16 bytes, then take the low-byte key. The Max. Reader keys which can be saved in MR-800 are 1 pcs.

Send APDU format:

Command	Class	INS	P1	P2	Lc	Data
LoadKey	FF	82	KeyStructure	KeyIndex	1~16	KeyData(LSB)

KeyStructure：

b7	b6	b5	b4	b3	b2	b1	b0	Description
X								0:card key 1:reader key
	X							0:plaintext transmission 1:Ciphertext transmission
		X						0:Temporary storage 1:racetrack storage
			X	X	X	X	X	RFU

The card is authorized via the card key. Reader key is the encryption key, when the key is to be loaded the card. The way of encryption is 3DES, so the reader key must be 16 bytes. The key for the encrypted card must be a multiple of 8 bytes. If it not enough, to fill 00 in the high byte. Such as Mifare one: the key is FF FF FF FF FF FF six bytes key, if loading the key to choose ciphertext transmission，firstly need to add 0 to FF FF FF FF FF FF 00 00 (LSB..MSB) then to encrypt; If to choose plaintext transmission, no need add 0. The entire default key is 0.

The key storage structure/pattern:

Key Index	Card key(Byte)	Reader key(Byte)
0	16	16
1	16	-
……	16	-
31	16	-

(Card key index **0~31,** reader key index only **0)**

Answer:

Response	Data Out	
Result	SW1	SW2

For example:

1、 If to use plaintext transmission—ReaderKey, no need save:

Send： FF 82 80 00 10 33 11 22 33 44 55 66 77 88 99 AA BB CC DD EE FF

Receive： 90 00

3.4.3 Authentication

The APDU is mainly used to authorize the card with a key protection. After the GetData command, if the card with a key protection, Firstly the card need be authorized by the APDU, and then to do the following read and write operations.The cards need to be authorized: Mifare S50/70、MifarePlus、AT88F020. There are two kinds of authentication to choose, one is via the already stored in the key or download key.

Send APDU format:

Command	Class	INS	P1	P2	P3	Data
Authenticate	FF	88	HighAddress	LowAddress	KeyType	KeyCofig+KEY

P1/P2：

Mifare S50/70, MifarePlus Level1 (being Compatible with MifareClassic), it to be the cards' block address.

AT88F020, The address is invalid. (P1=0, P2=0)

For MifarePlus Level2/3/1(Switch-level), it to be the AES key storage blocks address. (Note：Key storage block and data block is the corresponding relationship. Please refer to MifarePlus data manual.)

KeyType：(Only in Mifare S50/S70，MifarePlus Level1(being Compatible with MifareClassic), the byte is valid: A Key－0x60, B Key－0x61)

KeyConfig:

b7	b6-b0	Meaning
0	XXXXXXX	XXXXXXX it means using the input KEY length，Card using the current key authorization.
1	XXXXXXX	XXXXXXX That means the stored key index in the reader, the card uses the stored key authorization.

KEY:

KeyConfig Bit7 = 0，it Indicates that the key, the key length is different depending on the type of card.

KeyConfig Bit7 = 1，the Key does not exist.

Answer:

Response	Data Out	
Result	SW1	SW2

For example:

1、Mifare S50 request card, the first data block read:

Send: FF CA 00 00 00

Receive: 04 72 AE A6 9E 04 00 08 90 00

Send: FF 88 00 01 60 06 FF FF FF FF FF FF

Receive: 90 00

Send: FF B0 00 01 10

Receive: 00 11 22 33 44 55 66 77 88 99 AA BB CC DD EE FF 90 00

2、MifarePlus Level3 request card, to read the data block 0:

Send: FF CA 03 03 00

Receive: 07 04 8B AD 04 05 06 07 42 00 31 0C 75 77 84 02 4D 46 50 5F 45 4E 47 90 00

Send: FF 88 40 00 00 10 FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF (data block 1—the key address is 0x4000 or 0x4001)

Receive: 90 00

Send: FF B0 00 01 10

Receive： 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 90 00

3、AT88F020 request card, to read the data block 9：

Send： FF CA 23 00 00

Receive： 50 00 04 E8 51 00 00 00 00 00 00 41 90 00

Send： FF 88 00 00 00 08 00 00 00 00 00 00 00 00

Receive： 90 00

Send： FF B0 00 09 08

Receive： 00 00 00 00 00 00 00 00 90 00

4、 The reader key is transfered via plaintext transmission：00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F

Ciphertext transmission Mifare, sector 1 key：FF FF FF FF FF FF 00 00

3DES after encryption：E5 FC BD 49 E6 4A F7 E4

To use the stored key to read sector 1：

Send： FF 82 80 00 10 00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F (The reader key is transfered via plaintext transmission)

Receive： 90 00

Send： FF 82 60 00 08 E5 FC BD 49 E6 4A F7 E4 (The card key is transfered via encryption transmission to Index = 0)

Receive： 90 00

Send： FF CA 00 00 00 (Request)

Receive： 04 72 AE A6 9E 04 00 08 90 00

Send： FF 88 00 00 60 80 (To be authorized via use the stored key)

Receive： 90 00

Send： FF B0 00 00 40 (To read sector)

Receive： 72 AE A6 9E E4 88 04 00 46 10 EF 05 32 36 30 31 00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 FF 07 80 69 FF FF FF FF FF FF 90 00

3.4.4 ReadBinaryBlock

The APDU read the card stored block data mainly according to the requested card type which is specified by GetData APDU. If the card with key protection, before reading the card blocks data, it need be authorized (APDU: Authentication).

Send APDU format:

Command	Class	INS	P1	P2	Le
ReadBinary	FF	B0	HighAddress	LowAddress	DataLen

P1/P2： The block address

DataLen： The data length **(ALL data are LSB first)**

- MIFARE 1K/4K 16 bytes
- MifarePlus 16 bytes (Level3 Support for multi-block read)
- MIFARE Ultralight 4 bytes
- SR176 2 bytes
- SR512 2 bytes
- SRIX4K 2 bytes
- AT88RF020 8 bytes
- ISO15693 Tag 4 bytes (Support for multi-block read)

The APDU support for multi-block read command(Note：the card also need support for multi-block read command). if to read ISO15693 Tag two in a row，DataLen = 4x2 = 8. Note: the operation that the APDU to read is to the last tag which was detected. If to operate the tag which was chosen or specified UID, please refer to 3.5 sections: *Non-standard APDU (Custom section).*

Answer:

Response	Data Out		
Result	Data	SW1	SW2

For example:

1、 SR176 request card, to read the block 10：

Send： FF CA 21 00 00

Receive： 20 42 2F 69 18 08 92 D0 02 90 00

Send： FF B0 00 0A 02

Receive： 00 00 90 00

2、 MIFARE Ultralight request card, to read the block 10：

Send： FF CA 02 00 00

Receive： 07 04 24 A2 E1 BF 02 80 44 00 00 90 00

Send： FF B0 00 0A 10

Receive： 11 22 33 44 00 00 00 00 00 00 00 00 00 00 00 00 90 00

3、 ISO15693 Tag to read the block 10 and 11:

Send： FF CA 40 00 00

Receive： 00 3D 3D 08 17 00 01 04 E0 90 00

Send： FF B0 00 0A 08

Receive： 00 00 00 00 00 00 00 00 90 00

3.4.5 UpdataBinaryBlock

The write the block operation is according to the requested card type which is specified by GetData APDU. If the card with key protection, before writing the card blocks data, it need be authorized (APDU: Authentication).

Send APDU format:

Command	Class	INS	P1	P2	Lc	Data
UpdataBinary	FF	D6	HighAddress	LowAddress	DataLen	Data

P1/P2： The write block address

DataLen： The write data length **(ALL data are LSB first)**

- •MIFARE 1K/4K 16 bytes
- •MifarePlus 16 bytes (Level3 Support for multi-block read)
- •MIFARE Ultralight 4 bytes
- •SR176 2 bytes

•SR512	4 bytes
•SRIX4K	2 bytes
•AT88RF020	8 bytes
•ISO15693 Tag	4 bytes

The APDU support for multi-block write command(Note：the card also need support for multi-block write command). if to write ISO15693 Tag two in a row，DataLen = 4x2 = 8. Note: the operation that the APDU to write is to the last tag which was detected. If to operate the tag which was chosen or specified UID, please refer to 3.5 sections: *Non-standard APDU (Custom section).*

Answer:

Response	**Data Out**	
Result	SW1	SW2

For example:

1、Mifare S50----------request card, the first data block read /write：

Send： FF CA 00 00 00

Receive： 04 72 AE A6 9E 04 00 08 90 00

Send： FF 88 00 01 60 06 FF FF FF FF FF FF

Receive： 90 00

Send： FF D6 00 01 10 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F 00

Receive： 90 00

Send： FF B0 00 01 10

Receive： 01 10 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F 00

2、 MifarePlus Level1----------the fourth data block read /write：

Send： FF CA 03 01 00

Receive： 04 72 AE A6 9E 04 00 08 90 00

Send： FF 88 00 04 60 06 FF FF FF FF FF FF

Receive： 90 00

Send： FF D6 00 04 10 00 00 00 04 05 06 07 08 09 0A 0B 0C 0D 0E 01 00

Receive： 90 00

Send： FF B0 00 04 10

Receive： FF D6 00 04 10 00 00 00 04 05 06 07 08 09 0A 0B 0C 0D 0E 01 00

3、 MIFARE Ultralight----------the tenth data block read /write：

Send： FF CA 02 00 00

Receive： 07 04 24 A2 E1 BF 02 80 44 00 00 90 00

Send： FF D6 00 0A 04 00 01 02 03

Receive： 90 00

Send： FF B0 00 0A 10

Receive： 00 01 02 03 00 00 00 00 00 00 00 00 00 00 00 00 90 00

4、 MifarePlus Level3---------the first data block read /write：

Send： FF CA 03 03 00

Receive： 07 04 8B AD 04 05 06 07 42 00 31 0C 75 77 84 02 4D 46 50 5F 45 4E 47 90 00

Send： FF 88 40 00 00 10 FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF (data block 1—the key address is 0x4000 or 0x4001)

Receive： 90 00

Send： FF D6 00 01 10 00 00 00 04 05 06 07 08 09 0A 0B 0C 0D 0E 01 00

Receive： 90 00

Send： FF B0 00 01 10

Receive： 00 00 00 04 05 06 07 08 09 0A 0B 0C 0D 0E 01 00 90 00

5、 SR176----------the tenth data block write /read：

Send： FF CA 21 00 00

Receive： 20 42 2F 69 18 08 92 D0 02 90 00

Send： FF D6 00 0A 02 00 01

Receive： 90 00

Send： FF B0 00 0A 02

Receive： 00 01 90 00

6、 AT88F020----------request card, the ninth data block read：

Send： FF CA 23 00 00

Receive： 50 00 04 E8 51 00 00 00 00 00 00 41 90 00

Send： FF 88 00 00 00 08 00 00 00 00 00 00 00 00

Receive： 90 00

Send： FF D6 00 09 08 00 01 02 03 04 05 06 07

Receive： 90 00

Send： FF B0 00 09 08

Receive： 00 01 02 03 04 05 06 07 90 00

7、 ISO15693 Tag----------to read the block 10 and 11:

Send： FF CA 40 00 00

Receive： 00 3D 3D 08 17 00 01 04 E0 90 00

Send： FF D6 00 0A 04 00 01 02 03

Receive： 90 00

Send： FF B0 00 0A 04

Receive： 00 01 02 03 90 00

3.4.6 ValueBlockOperation

ValueBlock Operation is fit to the card with purse function. e.g：Mifare S50/70、MifarePlus Level1/3. It contains: purse blocks initialize、purse increment、purse decrement. If the card with key protection, before operating the card blocks data, it need be authorized (APDU: Authentication).

Send APDU format:

Command	Class	INS	P1	P2	Lc	Data
ValueBlock	FF	D7	HighAddress	LowAddress	05	VB_OP+VB_Value

P1/P2： Block address

VB_OP(1Byte)：

0x00- purse blocks initialize

0x01- purse increment

0x02- purse decrement

VB_Value(4Byte)： Value **(LSB first)**

Answer:

Response	Data Out	
Result	SW1	SW2

3.4.7 ReadValueBlock

ReadValueBlock Operation is fit to the card with purse function. e.g：Mifare S50/70、MifarePlus Level1/3. If the card with key protection, before operating the card blocks data, it need be authorized (APDU: Authentication).

Send APDU format:

Command	Class	INS	P1	P2	Le
ReadValueBlock	FF	B1	HighAddress	LowAddress	04

P1/P2： Block address

Answer:

Response	Data Out		
Result	Value(4Byte)	SW1	SW2

For example:

1、Mifare S50 purse blocks initialize、purse increment、purse decrement、read the purse

Send： FF CA 00 00 00

Receive： 04 72 AE A6 9E 04 00 08 90 00

Send： FF 88 00 01 60 06 FF FF FF FF FF FF

Receive： 90 00

Send： FF D7 00 01 05 00 00 00 00 01

Receive： 90 00

Send： FF B1 00 01 04

Receive： 00 00 00 01 90 00

Send： FF D7 00 01 05 01 00 00 00 02

Receive： 90 00

Send： FF B1 00 01 04

Receive： 00 00 00 03 90 00

Send： FF D7 00 01 05 02 00 00 00 01

Receive： 90 00

Send： FF B1 00 01 04

Receive： 00 00 00 02 90 00

2、MifarePlus Level1 purse blocks initialize、purse increment、purse decrement、read the purse

Send： FF CA 03 01 00

Receive： 07 04 8C AF 04 05 06 07 42 00 18 90 00

Send： FF 88 00 04 60 06 FF FF FF FF FF FF

Receive： 90 00

Send： FF D7 00 04 05 00 00 00 00 01

Receive： 90 00

Send： FF B1 00 04 04

Receive： 00 00 00 01 90 00

Send： FF D7 00 04 05 01 00 00 00 02

Receive： 90 00

Send： FF B1 00 04 04

Receive： 00 00 00 03 90 00

Send： FF D7 00 04 05 02 00 00 00 01

Receive： 90 00

Send： FF B1 00 04 04

Receive： 00 00 00 02 90 00

3、MifarePlus Level3 purse blocks initialize、purse increment、purse decrement、read the purse**(Block =0x01)：**

Send： FF CA 03 03 00

Receive： 07 04 8B AD 04 05 06 07 42 00 31 0C 75 77 84 02 4D 46 50 5F 45 4E 47 90 00

Send： FF 88 40 00 00 10 FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF

Receive： 90 00

Send： FF D7 00 01 05 00 00 00 00 01

Receive： 90 00

Send： FF B1 00 01 04

Receive： 00 00 00 01 90 00

Send： FF D7 00 01 05 01 00 00 00 02

Receive： 90 00

Send： FF B1 00 01 04

Receive： 00 00 00 03 90 00

Send： FF D7 00 01 05 02 00 00 00 01

Receive： 90 00

Send： FF B1 00 01 04

Receive： 00 00 00 02 90 00

3.4.8 RestoreValueBlock

RestoreValueBlock Operation is fit to the card with purse function. e.g：Mifare S50/70、MifarePlus Level1/3. When to backup ValueBlock operation, the target ValueBlock and the source ValueBlock is subject to the same sector. If the card with key protection, before operating the card blocks data, it need be authorized (APDU: Authentication).

Send APDU format:

Command	Class	INS	P1	P2	Lc	Data
Restore ValueBlock	FF	D7	Source HighAddress	Source LowAddress	03	03 + TargetAddress

P1/P2： Source ValueBlock address

TargetAddress： 2Byte，HighAddress First

Answer:

Response	Data Out	
Result	SW1	SW2

3.5 Non-standard APDU (Custom section)

The Custom section is the expanding to the function for the Non-standard APDU of PC/SC Part3. That part of the instruction is the expanding via INC = 00 of the FF class. The instruction contain switching the current operation smart card、LCD show、Beep/LED control and so on. The details as following:

Expand the list of commands:

Class	Ins	P1		P2	Le/Lc	Function
FF	00	ISO14443 Type A (0x00~0x1F)	MifareClass (0x00)	00		Set TypeA request mode
				01		HaltA card
			MifarePlus (0x03)	00		Switch Level0 to Level1/3
		ISO14443 TypeB (0x20~0x3F)	ISO14443SMARTB (0x20)	00		Set TypeB detecting card mode
				01		HaltB
			AT88F020 (0x23)	00		AT88F020 COUNT
				01		AT88F020 Deselect
				02		AT88F020 Lock block
		ISO15693 (0x40~0x5F)	Tag (0x40)	00		MultiTag Inventory
				01		Stay Quiet
				02		Select Tag
				03		Reset to Ready
				04		Read Block
				05		Write Block
				06		Write AFI

				07		Lock AFI
				08		Write DSFID
				09		Lock DSFID
				0A		Get System info
				0B		Get M Blk Sec St
				0C		Lock Block
		ISO7816 (0x60~0x6F)	Contact SAM (0x60)	00		Set SAM1 PPSBaud
				01		Set SAM2 PPSBaud
				02		Set SAM3 PPSBaud
				03		Set SAM4 PPSBaud
				04		Set SAM1 RSTBaud
				05		Set SAM2 RSTBaud
				06		Set SAM3 RSTBaud
				07		Set SAM4 RSTBaud
		SYSTEM (0xE0~0xFF)	Smart card Switching (0xFA)	00		Smart card Switching (contactless and contact)
			RTC operation (0xFB) (Only MR-800)	00		Time Initialization
				01		Read time
				02		Set LCD show time
				03		Set LCD show date
			LCD&&LED operation (0xFC) (Only MR-800)	00		Set the display font type
				01		Read the display font type
				02		Showing specified number of characters
				03		Show pictures (download data)
				04		Erase LCD
				05		Set the boot image

				06		Set the standby interface
				07		LCD backlight control
				08		Flash image displayed in a specified format
			Flash operation (load font type 0xFD)	00		Read Flash
				01		Write Flash
			RFU (0xFE)	-		System retains instruction
			System instruction (0xFF)	00		Get the serial number
				01		Get the version number (hardware and software)
				02		Set the LED status
				03		Set the buzzer status
				04		Set the antenna status
				05		Set Card Encryption Standard
				06		Restore the factory default
				07		Re-start the Reader

3.5.1 Set ISO14443A Detecting card mode

To set ISO14443A Detecting card mode, in this mode the defult is REQA (0x26) when it power on. The parameter of power does not save when it power off.

Send APDU format:

Command	Class	INS	P1	P2	Lc	Data
SetRequestModeA	FF	00	00	00	01	RequestMode

RequestMode：

0x26- REQA

0x52- WUPA

Answer:

Response	Data Out	
Result	SW1	SW2

3.5.2 Halt TypeA cards

To let ISO14443 TypeA card move into Halt status.

Send APDU format:

Command	Class	INS	P1	P2	Le
Halt A	FF	00	00	01	00

Answer:

Response	Data Out	
Result	SW1	SW2

3.5.3 MifarePlus Shift Level0 to Level1/3

After Level 0 initialization, the Mifare Plus can be switched via APDU from Level 0 to Level 1 or Level 3. To switch the target level is according to the card type. Note: MifarePlus defult level is Level0, before switching other Level; it need via WriteBinary APDU to write some block parameter. (such as： before switching, the card must be written 0x9000/0x9001/0x9002/0x9003 adrress value of adrress).

Send APDU format:

Command	Class	INS	P1	P2	Le
SwitchLevel	FF	00	01	00	00

Answer:

Response	Data Out	
Result	SW1	SW2

3.5.4 Set ISO14443 TypeB Detecting card mode

To set ISO14443 TypeB Detecting card mode, in this mode the defult is REQB (0x00) when it power on. The parameter of power does not save when it power off.

Send APDU format:

Command	Class	INS	P1	P2	Lc	Data
SetRequestModeB	FF	00	20	00	01	RequestMode

RequestMode：

0x00- REQB

0x01- WUPB

Answer:

Response	Data Out	
Result	SW1	SW2

3.5.5 Halt TypeB

To let ISO14443 TypeB card move into Halt status.

Send APDU format:

Command	Class	INS	P1	P2	Lc	Data
HaltB	FF	00	20	01	04	PUPI

PUPI： Type B cards series number

Answer:

Response	Data Out	
Result	SW1	SW2

3.5.6 AT88F020 Count

Send APDU format:

Command	Class	INS	P1	P2	Lc	Data
AT88F020Count	FF	00	23	00	06	Signature

Signature： 6 bytes

Answer:

Response	Data Out	
Result	SW1	SW2

3.5.7 AT88F020 Deselect

Send APDU format:

Command	Class	INS	P1	P2	Le
AT88F020Deselect	FF	00	23	01	00

Answer:

Response	Data Out	
Result	SW1	SW2

3.5.8 AT88F020Lock

Send APDU format:

Command	Class	INS	P1	P2	Lc	Data
AT88F020Lock	FF	00	23	02	04	LockData

Answer:

Response	Data Out	
Result	SW1	SW2

3.5.9 ISO15693 Inventory

There are two ways to obtain the Tag UID. It contains via GetData and to detect single or multiple Tags through the APDU. The label number depends on the antenna drive capability. Note that this instruction has the same switchable detecting the card type function.，Using this APDU，then to detect card type automatically switch to ISO15693tag.

Send APDU format:

Command	Class	INS	P1	P2	Lc	Data
Inventory	FF	00	40	00	03	Type+Flag+AFI

Type：

0x00－to detect single tag (such as:Flag = 0x26)

0x01－to detect single or multiple Tag

Flag： Refervence ISO15693 standard

AFI： To find specified the label application Identifie (AFI)

Answer:

Response	Data Out		
Result	**(**(DSFID(1Byte)+UID(8Byte)**)***n	SW1	SW2

For example:

1、ISO15693 to detect single tag**:**

Send： FF 00 40 00 03 00 26 00

Receive： 00 3D 3D 08 17 00 01 04 E0 90 00

Send： FF 00 40 01 09 22 3D 3D 08 17 00 01 04 E0 (idle)

Receive： 90 00

Send： FF 00 40 00 03 00 26 00

Receive： 63 00

Send： FF 00 40 03 09 22 3D 3D 08 17 00 01 04 E0

Receive： 00 3D 3D 08 17 00 01 04 E0 90 00

Send： FF 00 40 00 03 00 26 00

Receive： 00 3D 3D 08 17 00 01 04 E0 90 00

3.5.10 ISO15693 Stay Quiet

ISO15693 Tag halt

Send APDU format:

Command	Class	INS	P1	P2	Lc	Data
Stayquiet	FF	00	40	01	09	Flag+UID

Flag： Refervence ISO15693 standard (such as：Flag =0x22)

UID： To be dormant card UID (8Byte)

Answer:

Response	Data Out	
Result	SW1	SW2

3.5.11 ISO15693 Select Tag

ISO15693 Tag----------to choose card operation

Send APDU format:

Command	Class	INS	P1	P2	Lc	Data
SelectTag	FF	00	40	02	09	Flag+UID

Flag： Reference ISO15693 stardard (such as：Flag = 0x22)

UID： Card UID (8Byte)

Answer:

Response	Data Out	
Result	SW1	SW2

For example:

1、 To choose one card and go on the read/write operation:

Send： F 00 40 00 03 00 26 00

Receive： 00 3D 3D 08 17 00 01 04 E0 90 00

Send： F 00 40 02 09 22 3D 3D 08 17 00 01 04 E0

Receive： 9000

Send： F 00 40 05 0E 12 00 00 00 00 00 00 00 00 0A 11 22 33 44

Receive： 9000

Send： F 00 40 04 0B 12 00 00 00 00 00 00 00 00 0A 01

Receive：11 22 33 44 90 00

3.5.12 ISO15693 Reset to Ready

ISO15693 Tag---------- from Halt to Ready status

Send APDU format:

Command	Class	INS	P1	P2	Lc	Data
ResetToReady	FF	00	40	03	09	Flag+UID

Flag：Reference ISO15693 stardard (such as：Flag = x22)

UID：Card UID (8Byte)

Answer:

Response	Data Out	
Result	SW1	SW2

3.5.13 ISO15693 WriteBlock

ISO15693 Tag------write block

Send APDU format:

Command	Class	INS	P1	P2	Lc	Data
WriteBlock	FF	00	40	05	0E	Flag + UID + BlockAddr + BlockData

Flag：Reference ISO15693 stardard (such as: Flag = 0x22 or 0x12(Selected tag))

UID： Card UID (8Byte)

BlockAddr：Starting block address (1Byte)

BlockData：Block data (4 Byte)

Answer:

Response	Data Out	
Result	SW1	SW2

3.5.14 ISO15693 Read Block

ISO15693 Tag------read block

Send APDU format:

Command	Class	INS	P1	P2	Lc	Data
ReadBlock	FF	00	40	04	0B	Flag + UID + BlockAddr + BlockNum

Flag： Reference ISO15693 stardard (such as: Flag = 0x22 or 0x12(Selected tag))

UID： Card UID (8Byte)

BlockAddr： Starting block address

BlockNum： The supported numbers of reading blocks are according to the card type. (The Minimum is 0)

Answer:

Response	Data Out	
Result	SW1	SW2

3.5.15 ISO15693 Write AFI

Write ISO15693 Tag AFI

Send APDU format:

Command	Class	INS	P1	P2	Lc	Data
Write AFI	FF	00	40	06	0A	Flag＋UID+AFI

Flag： Reference ISO15693 stardard (Flag = 0x22 or 0x12(Selected tag))

UID： Card UID (8Byte)

AFI： New AFI

Answer:

Response	Data Out	
Result	SW1	SW2

For example:

1、 Wirte AFI：

Send： FF 00 40 06 0A 22 3D 3D 08 17 00 01 04 E0 00

Receive： 90 00

3.5.16 ISO15693 Lock AFI

Lock ISO15693 Tag AFI。

Send APDU format:

Command	Class	INS	P1	P2	Lc	Data
LockAFI	FF	00	40	07	09	Flag＋UID

Flag： Reference ISO15693 stardard (such as: Flag = 0x22 or 0x12(Selected tag))

UID： Crad UID (8Byte)

Answer:

Response	Data Out	
Result	SW1	SW2

3.5.17 ISO15693 Write DSFID

Write ISO15693 Tag DSFID

Send APDU format:

Command	Class	INS	P1	P2	Lc	Data
WriteDSFID	FF	00	40	08	0A	Flag＋UID(8Byte)+DSFID

Flag： Reference ISO15693 stardard (such as: Flag = 0x22 or 0x12(Selected tag))

UID： Crad UID (8Byte)

DSFID： New DSFID

Answer:

Response	Data Out	
Result	SW1	SW2

For example:

1、Write DSFID：

Send： FF 00 40 08 0A 22 3D 3D 08 17 00 01 04 E0 00

Receive： 90 00

3.5.18 ISO15693 Lock DSFID

Lock ISO15693 Tag DSFID。

Send APDU format:

Command	Class	INS	P1	P2	Lc	Data
LockDSFID	FF	00	40	09	09	Flag＋UID

Flag： Reference ISO15693 stardard (such as: Flag = 0x22 or 0x12(Selected tag))

UID： Crad UID (8Byte)

Answer:

Response	Data Out	
Result	SW1	SW2

3.5.19 ISO15693 Get System info

To obtain ISO15693 Tag system information

Send APDU format:

Command	Class	INS	P1	P2	Lc	Data
GetSysInfo	FF	00	40	0A	09	Flag＋UID

Flag： Reference ISO15693 stardard (such as: Flag = 0x22(need be with UID), Flag = 0x02(maybe without UID))

UID： Crad UID (8Byte)

Answer:

Response	Data Out		
Result	System Info	SW1	SW2

System Info： InfoFlag(1Byte)+UID(8Byte)+DSFID(1Byte)+AFI(1Byte)+Other(nByte)

For example:

1、Get system information：

Send： FF 00 40 0A 09 22 3D 3D 08 17 00 01 04 E0

Receive： 0F 3D 3D 08 17 00 01 04 E0 01 00 1B 03 01 90 00

3.5.20 ISO15693 Get M Blk Sec St

To obtain ISO15693 Tag block safty status

Send APDU format:

Command	Class	INS	P1	P2	Lc	Data
GetMultiBlkSecSt	FF	00	40	0B	0B	Flag + UID + StartAddr+Num

Flag： Reference ISO15693 stardard (such as Flag = 0x22)

UID： Card UID (8Byte)

StartAddr： Starting block (1Byte)

Num： Block number(the minimum 0－>1 block)

Answer:

Response	Data Out		
Result	BlockSecSta ×Num	SW1	SW2

For example:

1、To obtain ISO15693 10, 11, 12 block security status：

Send： FF 00 40 0B 09 22 3D 3D 08 17 00 01 04 E0 0A 02

Receive： 00 00 00 90 00

3.5.21 ISO15693 Lock Block

Lock ISO15693 Tag DSFID

Send APDU format:

Command	Class	INS	P1	P2	Lc	Data
LockDSFID	FF	00	40	0C	0A	Flag＋UID+BlockNO

Flag： Reference ISO15693 stardard (such as: 0x22 or (Selected tag))

UID： Card Byte)

BlockNO: Being locked block number

Answer:

Response	Data Out	
Result	SW1	SW2

3.5.22 Set SAM Baud Rate (Set PPS)

This function is aim to set SAM Baud Rate. The SAM card slots which can be supported by each reader are different. (MR-800/810 supported 2 SAM card，MR-790 supported 3 SAM card). Before sending GetData APDU to reset SAM card, if you want to modify the baud rate of the SAM card (note: this SAM card must support the baud rate you set), the baud rate can be set via this APDU you sent.

Send APDU format:

Command	Class	INS	P1	P2	Lc	Data
SetSamBaud	FF	00	60	SAMPPS	01	Baudrate

SAMPPS：

0- SAM0 SetPPS

1- SAM1 SetPPS

2- SAM2 SetPPS

3- SAM3 SetPPS

Baudrate:

0- 9600 (defult)
1- 19200
2- 38400

3- 55800
4- 57600
5- 115200

Answer:

Response	Data Out	
Result	SW1	SW2

3.5.23 Set SAM baud rate after reset (through PPSS)

This function is aim to set SAM baud rate after reset. The SAM card slots which can be supported by each reader are different. (MR-800/810 supported 2 SAM card，MR-790 supported 3 SAM card). Usually, the defult SAM baud rate after reset is 9600. If you want to modify the SAM baud rate after reset, before sending GetData APDU to reset SAM card, the SAM baud rate after reset can be set via this APDU you sent(note: this SAM card must support the SAM baud rate after reset you set).

Send APDU format:

Command	Class	INS	P1	P2	Lc	Data
SetRstSamBaud	FF	00	60	SAMRestBaudNO	01	Baudrate

SAMRestBaudNO：

4- SAM0 Reset Baudrate
5- SAM1 Reset Baudrate
6- SAM2 Reset Baudrate
7- SAM3 Reset Baudrate

Baudrate：

0- 9600 (defult)
1- 19200
2- 38400
3- 55800
4- 57600
5- 115200

Answer:

Response	Data Out	
Result	SW1	SW2

3.5.24 Switch current operating smart card

This function is aim to switch between SmartCard and SAM card. Except request card and reset, the SmartCard and SAM card to use non-standard APDU (GetData), the rest all use standard APDU instructions.To distinguish the current operation is a SmartCard or SAM card, switching can be achieved by this command.In practical applications, sometimes after smartcard had already been detected via GetData, but this need be authenticated by SAM card, so you need via APDU temporarily switch the current operation smartcard to SAM. And then back to the SmartCard after this operation.

Send APDU format:

Command	Class	INS	P1	P2	Lc	Data
SwitchSmartCard	FF	00	FA	00	01	CurSmartCard

CurSmartCard:

0- SmartCard

1- SAM1 card

2- SAM2 card

3- SAM3 card

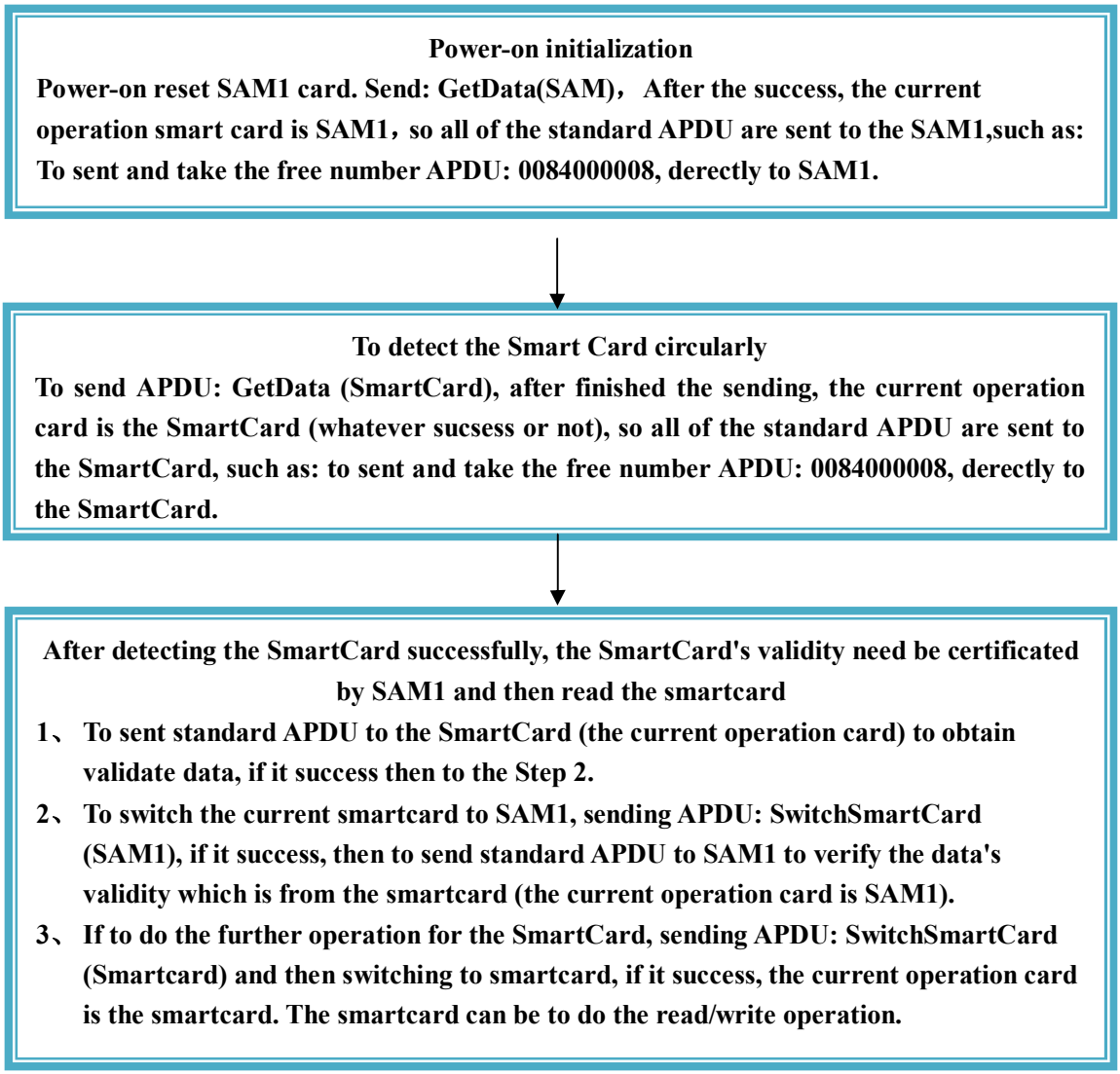
4- SAM4 card

Answer:

Response	Data Out	
Result	SW1	SW2

For example:

1、 To operate the SmartCard and SAM card at the same time, the details as following:



3.5.25 Initialize RTC time (Only MR-800/810 support)

This function is aim to do the initialization of the reader internal clock. This function is aim to do the initialization of the reader internal clock. If the time can be kept when it's power off, it need be equipped with batteries.

Send APDU format:

Command	Class	INS	P1	P2	Lc	Data
InitialRTC	FF	00	FB	00	08	Time

Time:

Year(High Byte)＋Year(Low Byte)＋Month＋Date＋Hour＋Minute＋Second＋Week

Such as:2010－4－12 12:01:00 Monday Time date：07 DA 04 0C 0C 01 00 01

Answer:

Response	Data Out	
Result	SW1	SW2

For example:

1、To set and read the time:

Send: FF 00 FB 00 08 07 DA 04 0C 0C 01 00 01

Receive: 90 00

Send: FF 00 FB 01 08

Receive: 07 DA 04 0C 0C 03 15 01 90 00

3.5.26 Read RTC time (Only MR-800/810 support)

This function is aim to read the reader's internal clock. If the time can be kept when it's power off, it need be equipped with batteries.

Send APDU format:

Command	Class	INS	P1	P2	Le
ReadRTC	FF	00	FB	01	08

Answer:

Response	Data Out		
Result	Time	SW1	SW2

Time:

Year(High Byte)＋Year(Low Byte)＋Month＋Date＋Hour＋Minute＋Second＋Week

Such as:2010－4－12 12:01:00 Monday Time date：07 DA 04 0C 0C 01 00 01

3.5.27 Set RTC Time display (Only MR-800 support)

This function is aim to set RTC Time display in LCD screen. If the time can be kept when it's power off, it need be equipped with batteries.

Send APDU format:

Command	Class	INS	P1	P2	Lc	Data
DisTime	FF	00	FB	02	03	EnableFag+Line+Column

EnableFag：

Bit0： To show the time or not (0-Disable, 1-Enable)

Bit1： 0－The specified time are displayed in all interfaces，1－Only the default interface to display the time

Line： To display start line (0~7)

Column： To display Starting column (0~127)

Such as 12:10:10, the format: 12:10:10

Answer:

Response	Data Out	
Result	SW1	SW2

3.5.28 Set RTC Date display (Only MR-800 support)

This function is aim to set RTC Date display in LCD screen. If the time can be kept when it's power off, it need be equipped with batteries.

Send APDU format:

Command	Class	INS	P1	P2	Lc	Data
DisDate	FF	00	FB	03	03	EnableFag+Line+Column

EnableFag：

Bit0： To show the date or not (0-Disable, 1-Enable)

Bit1： 0－The specified date are displayed in all interfaces，1－Only the default interface to display the date.

Line： To display start line (0~7)

Column： To display Starting column (0~127)

If to show: 2010-04-16, the format: 10/04/16

Answer:

Response	Data Out	
Result	SW1	SW2

3.5.29 Set LCD Chinese font type display (Only MR-800 support)

MR-800 supports ***Simplified*** and ***Traditional*** types of Chinese characters. The two types of Chinese characters can be switched via using this instruction. Note that before switching it, you must be sure the font encoding format is that what you want font.

Send APDU format:

Command	Class	INS	P1	P2	Lc	Data
SetFontType	FF	00	FC	00	01	ChineseFontType

ChineseFontType：

01- Simplified Chinese (defult)

02- Traditional Chinese

Answer:

Response	Data Out	
Result	SW1	SW2

3.5.30 Read LCD Chinese font type display (Only MR-800 support)

MR-800 supports ***Simplified*** and ***Traditional*** types of Chinese characters.The Chinese

font types that are currently displayed can be obtained via using this instruction.

Send APDU format:

Command	Class	INS	P1	P2	Le
ReadFontType	FF	00	FC	01	01

Answer:

Response	Data Out		
Result	ChineseFontType	SW1	SW2

ChineseFontType：

01- Simplified Chinese (defult)

02-Traditional Chinese

3.5.31 LCD Display the specified number of Chinese or English fonts (Only MR-800 support)

MR-800 supports ***Simplified*** and ***Traditional*** types of Chinese characters. This command displays the specified number of characters (including English or Chinese).

One Chinese font-----2Byte

One English font-----1Byte

One line of the LCD------ Maximum 16Bytes

Send APDU format:

Command	Class	INS	P1	P2	Lc	Data
Display Font	FF	00	FC	02	nByte	Configure + Row + Column + Display Data

Configure：

Bit0 (NegativeDis**):** Positive and negative display. 0- Positive Display, 1- Negative display

Bit2~1： 00- Before to display the screen, the all are not cleared in the screen.

01- Before to display the screen, only to clear the line of the showed screen

10- Before to display the screen, the all are cleared in the screen.

Bit3(BackLight)： 0- BackLight off， 1- BackLight on

Bit4~7：RFU

Row(1Row = 16 dot High)：0~7

Column： 0~127

DisplayData：One Chinese font-----2Byte, One line of the LCD-----Maximum 16Bytes

Chinese font: 16x16, English font: 8x16

Answer:

Response	Data Out	
Result	SW1	SW2

3.5.32 LCD Display picture (Send picture data directly)) (Only MR-800 support)

This functions show the required size of the pictures, the big picture can be displayed many times.

Send APDU format:

Command	Class	INS	P1	P2	Lc	Data
DisplayPicture	FF	00	FC	03	FF	Configure + Row + Column + PictureWidth ＋PictureHigh＋Display Data

Configure：

Bit0 (NegativeDis)**:** Positive and negative display. 0- Positive Display, 1- Negative display

Bit2~1：00- Before to display the screen, the all are not cleared in the screen.

01- Before to display the screen, only to clear the row of the showed screen.

10- Before to display the screen, the all are cleared in the screen.

Bit3(BackLight)： 0- BackLight off， 1- BackLight on

Bit4~7: RFU

Row(1row = 8 dot High)： 0~7 **(the start row)**

Column： 0~127**(the start column)**

PictureWidth： 1~128，**Width of the image**

PictureHigh： 1~8，**Image height**

DisplayData：To display the picture content (The number of bytes= Width * height)

Answer:

Response	Data Out	
Result	SW1	SW2

3.5.33 LCD Erase the line (Only MR-800 support)

For the convenience of the screen to be cleared, the user can remove fonts according to each row or remove images.

Send APDU format:

Command	Class	INS	P1	P2	Lc	Data
EraseLCD	FF	00	FC	04	1	Row

Row(1row = 8 dot High)： Bit0~Bit7 means 0~7 row (0-Keep no change，1- Erase)

Answer:

Response	Data Out	
Result	SW1	SW2

3.5.34 LCD set the boot screen (Only MR-800 support)

This function is to set the boot screen. If not set, the defult boot screen is JINMUYU boot screen. All images are stored in the reader's AT45DB321.

Send APDU format:

Command	Class	INS	P1	P2	Lc	Data
PowerOnPIC	FF	00	FC	05	08	Enable+SaveAddr+Width+High+StartLine+StartColumn+Time

Enable(1Byte)：0- Prohibit the boot screen，1-display the boot screen

SaveAddr(2Byte)：save the boot screen in the ***Flash(AT45DB321)***，address LSB first

Width(1Byte)：Width of the image (1~128)

High(1Byte)：Image height (1~8)

StartLine(1Byte)：Display start line (0~7)

StartColumn(1Byte)：Display start column (0~127)

Time：To set the time of the boot screen (Unit: S)

Answer:

Response	**Data Out**	
Result	SW1	SW2

Note：

1、If to set the boot screen is banned,then the following parameters is invalid.

2、The boot screen is stored in the reader's outside Flash, the fonts occupy the beginning of 1303 blocks (0~1302), the user can not erase or set, for the user to use the block number is 1303 ~ 8191, each block size is 512 bytes.

3、Before to enable the boot screen, the screen data need to be written into the Flash SaveAddr address via FlashWrite APDU, otherwise the picture is uncertain. If the picture is larger than 512 bytes, the excess bytes are written into the following the second block.

4、The image dimention =Width*High.

3.5.35 LCD set the standby screen (Only MR-800 support)

This function is to set the standby screen. If not set, after the display is completed, the user interface will not return to the standby screen. All images are stored in the reader's AT45DB321.

Send APDU format:

Command	Class	INS	P1	P2	Lc	Data
IdlePIC	FF	00	FC	06	08	Configure +SaveAddr+ Width+ High+StartLine+StartColumn+Time

Configure (1Byte)：

Bit0： 0- Prohibit the boot screen, 1- Display the boot screen

Bit2~1： 00- Before to display the screen, the all are not cleared in the screen.

01- Before to display the screen, only to clear the row of the showed screen.

10- Before to display the screen, the all are cleared in the screen.

Bit3(BackLight)： 0- BackLight Off， 1- BackLight On

Bit4~7: RFU

SaveAddr(2Byte)： save the boot screen in the ***Flash(AT45DB321)***，address LSB first.

Width(1Byte)： Width of the image (1~128)

High(1Byte)： Image height (1~8)

StartLine(1Byte)： Display start line (0~7)

StartColumn(1Byte)： Display start column (0~127)

Time： To set how long not to operate, then the LCD enter into the standby screen (unit: S).

Answer:

Response	Data Out	
Result	SW1	SW2

Note：

1、If to set the standby screen is banned,then the following parameters is invalid.

2、The standby screen is stored in the reader's outside Flash, the fonts occupy the beginning of 1303 blocks (0~1302), the user can not erase or set, for the user to use the block number is 1303 ~ 8191, each block size is 512 bytes.

3、Before to enable the boot screen, the screen data need to be written into the Flash SaveAddr address via FlashWrite APDU, otherwise the picture is uncertain. If the picture is larger than

512 bytes, the excess bytes are written into the following the second block.

4、The image dimention =Width*High.

3.5.36 LCD Backlight control (Only MR-800 support)

This function is to control LCD Backlight. The backlight is LED white backlight.

Send APDU format:

Command	Class	INS	P1	P2	Lc	Data
LCDBackLight	FF	00	FC	07	2	Mode ＋Time

Mode：

00- off

01-on

02- Specified time on (Time data is valid)

Time： Only in Mode =2 valid (unit: S)

Answer:

Response	Data Out	
Result	SW1	SW2

3.5.37 LCD Showing Flash storage picture (Only MR-800 support)

This function is to Show Flash storage picture on LCD screen. All images are stored in the reader's AT45DB321.

Send APDU format:

Command	Class	INS	P1	P2	Lc	Data
IdlePIC	FF	00	FC	08	09	Configure +DisAddr +Width+ High + StartLine+StartColumn

Configure (1Byte)：

Bit0： RFU

Bit2~1： 00-Before to display the screen, the all are not cleared in the screen.

01-Before to display the screen, only to clear the row of the showed screen

10-Before to display the screen, the all are cleared in the screen.

Bit3(BackLight)： 0- BackLight Off， 1- BackLight On

Bit4~7: RFU

DisAddr(2Byte)： Save the display screen in the ***Flash(AT45DB321)***，address LSB first。

Width(1Byte)： Width of the image (1~128)

High(1Byte)： Image height (1~8)

StartLine(1Byte)： Display start line (0~7)

StartColumn(1Byte)： Display start column (0~127)

Answer:

Response	**Data Out**	
Result	SW1	SW2

Note：

1、 The standby screen is stored in the reader's outside Flash, the fonts occupy the beginning of 1303 blocks (0~1302), the user can not erase or set, for the user to use the block number is 1303 ~ 8191, each block size is 512 bytes.

2、Before to enable the boot screen, the screen data need to be written into the Flash SaveAddr address via FlashWrite APDU, otherwise the picture is uncertain. If the picture is larger than 512 bytes, the excess bytes are written into the following the second block.

3、The image dimention=Width*High

3.5.38 Read card outside Flash

The MR-800's outside Flash is of AT45DB321 where 0 ~ 1302 blocks to save the font, so please don not read these blocks.

Send APDU format:

Command	**Class**	**INS**	**P1**	**P2**	**Lc**	**Data**
ReadFlash	FF	00	FD	00	06	BlockAddr+ ByteAddr+ Len

BlockAddr： Block address (2Byte, High byte first)

ByteAddr： Starting address within the block Byte (2Byte, High byte first)

Len： To be read Byte length (2Byte, High byte first)

Answer:

Response	Data Out		
Result	Flash Data	SW1	SW2

3.5.39 Write card outside Flash

The MR-800's outside Flash is of AT45DB321 where 0 ~ 1302 blocks to save the font, so please don not write these blocks.

Send APDU format:

Command	Class	INS	P1	P2	Lc	Data
WriteFlash	FF	00	FD	01	04＋n	BlockAddr+ ByteAddr＋Data(n)

BlockAddr： Block address (2Byte, High byte first)

ByteAddr： Starting address within the block Byte (2Byte, High byte first)

Data： The written data

Answer:

Response	Data Out	
Result	SW1	SW2

3.5.40 Obtain product serial number

Send APDU format:

Command	Class	INS	P1	P2	Le
GetSNR	FF	00	FF	00	0A

Answer:

Response	Data Out		
Result	Product SNR	SW1	SW2

3.5.41 Get the hardware version and the version number

Send APDU format:

Command	Class	INS	P1	P2	Le
GetVer	FF	00	FF	01	04

Answer:

Response	Data Out		
Result	Handware ver(2Byte)＋Sosftware ver(2Byte)	SW1	SW2

3.5.42 LED light control

Send APDU format:

Command	Class	INS	P1	P2	Lc	Data
LEDCtr	FF	00	FF	02	05	LED state＋state Mask＋T1 duration＋T2 Duration＋Number

LED Status：

BIT0 = Red light final state (1-ON, 0-OFF)
BIT1 = Green light final state (1-ON, 0-OFF)
BIT2 = Blue light final state (1-ON, 0-OFF)
BIT3 = Yellow light final state (1-ON, 0-OFF)
BIT4 = Red light flashing in the initial state (1-ON, 0-OFF)
BIT5 = Green light flashing in the initial state (1-ON, 0-OFF)
BIT6 = Blue light flashing in the initial state (1-ON, 0-OFF)
BIT7 = Yellow light flashing in the initial state (1-ON, 0-OFF)

LED Status Mask：

BIT0 = the red state update mask (1- Update, 0- Maintenance)
BIT1 = the green state update mask (1- Update, 0- Maintenance)
BIT2 = the blue state update mask (1- Update, 0- Maintenance)
BIT3 = the tellow state update mask (1- Update, 0- Maintenance)
BIT4~7 RFU

T1/T2： T1,T2 time(Unit: 100ms),T＝T1+T2

Number： Times

Answer:

Response	Data Out	
Result	SW1	SW2

3.5.43 Buzzer control

Send APDU format:

Command	Class	INS	P1	P2	Lc	Data
BuzzerCtr	FF	00	FF	03	05	Beep state＋state Mask＋T1 duration＋T2 Duration＋Number

BEEP Status：

BIT0 = BEEP final state (1-ON, 0-OFF)
BIT1 = LCD backlight final state (1-ON, 0-OFF)
BIT4 = BEEP initial state (1-ON, 0-OFF)
BIT5 = LCD backlight initial state (1-ON, 0-OFF)

Status Mask：

BIT0 = Buzzer status update mask (1- Update, 0- Maintenance)
BIT1 = LCD backlight status update mask (1- Update，0- Maintenance)
BIT4~7 RFU

T1/T2： T1,T2 time(Unit: 100ms), T＝T1+T2

Number： Times

Answer:

Response	Data Out	
Result	SW1	SW2

3.5.44 Set Antenna Status

Send APDU format:

Command	Class	INS	P1	P2	Lc	Data
AtennaCtr	FF	00	FF	04	01	Antena status

Antena status：

00-close

01-open

Answer:

Response	Data Out	
Result	SW1	SW2

3.5.45 Set Card encryption method

Send APDU format:

Command	Class	INS	P1	P2	Lc	Data
EncrMode	FF	00	FF	05	01	Encrypt Standard

Encrypt Standard：

0x00-Philips

0x01-Shanghai Standard

Answer:

Response	Data Out	
Result	SW1	SW2

3.5.46 Restore the factory default (System restart)

Send APDU format:

Command	Class	INS	P1	P2	Le
FactoryDefault	FF	00	FF	06	00

Answer:

Response	Data Out	
Result	SW1	SW2

3.5.47 System restart

Send APDU format:

Command	Class	INS	P1	P2	Le
Reboot	FF	00	FF	07	00

Answer:

Response	Data Out	
Result	SW1	SW2

3.5.47 Waterlight set (Only MR-800 support)

Send APDU format:

Command	Class	INS	P1	P2	Lc	Data
LED	FF	00	FF	08	01+n	Time＋n Step

Time: Each step of the residence time, Unit: 10ms

Step: Max. 8 bytes/cycle for each Waterlight (Max. 8 steps/waterlight),

Each byte as follows：

Bit0-> LED_BLUE 1-ON, 0-OFF

Bit1-> LED_YELLOW 1-ON, 0-OFF

Bit2-> LED_GREEN 1-ON, 0-OFF

Bit3-> LED_RED 1-ON, 0-OFF

Bit4~7->RFU

Answer:

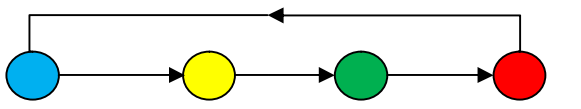
Response	Data Out	
Result	SW1	SW2

For example:

1、 To light blue, yellow, green, red LED one by one, the interval is 1s, and each time one LED light (recommended)

Send: FF 00 FF 08 05 0A 01 02 04 08

Receive: 90 00

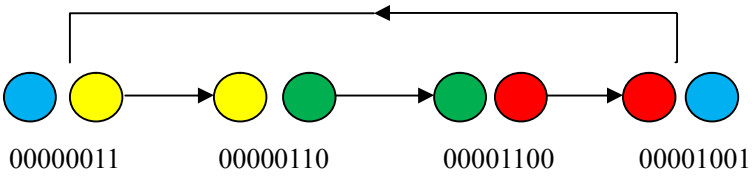


00000001 00000010 00000100 00001000

2、 4 steps to light the LED lights：blue/yellow -> yellow/green > green/red -> red/blue one by one, each time two LED lights

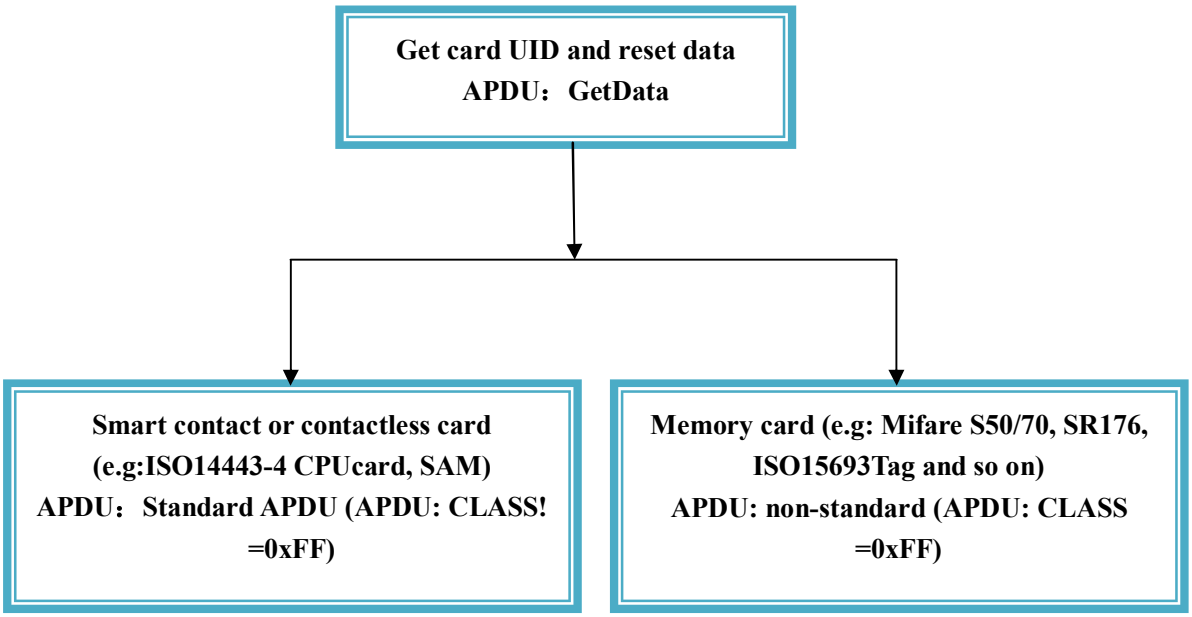
Send: FF 00 FF 08 05 0A 03 06 0c 09

Receive: 90 00



4. Card operating procedures

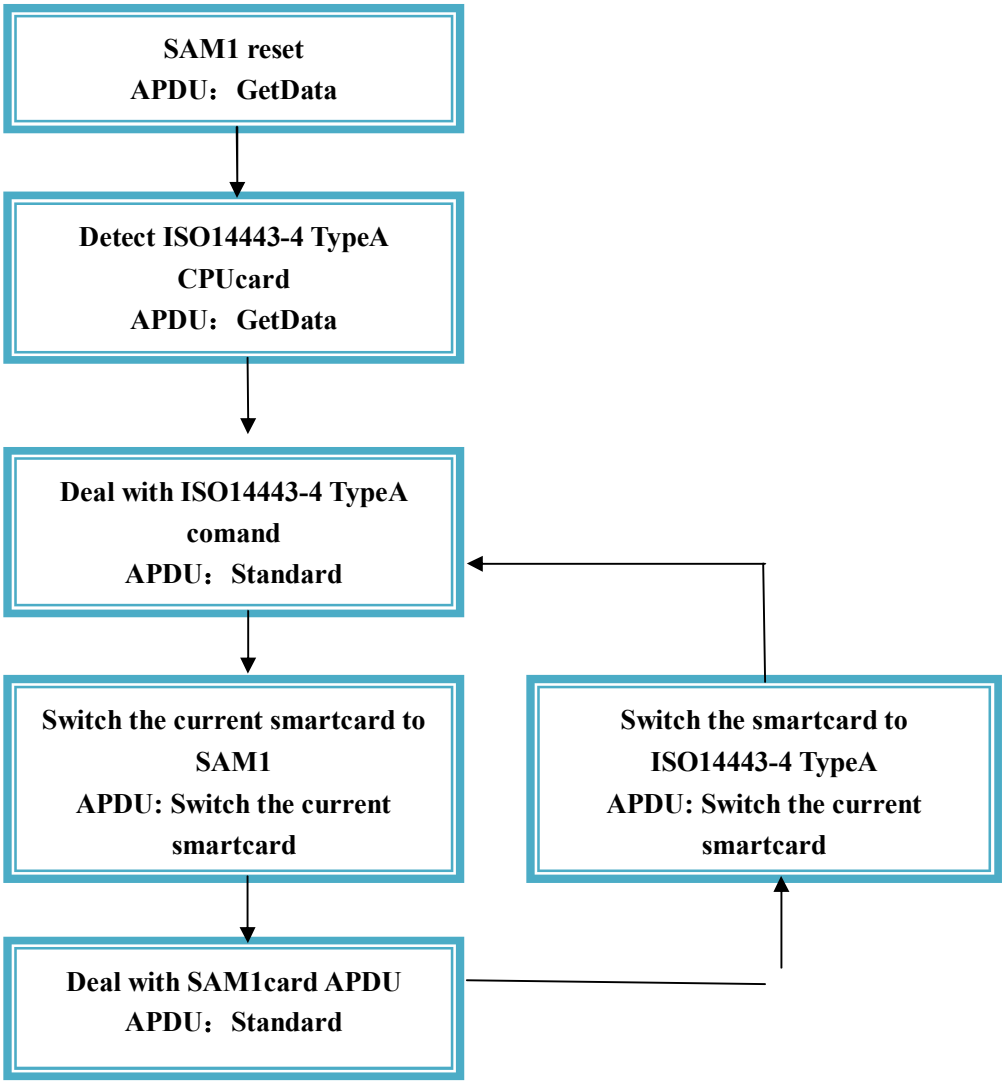
The procedures as follows：



Before to operate any card, first you need to send GetData APDU to obtain the card basic information (Card serial number, Reset information, etc.), GetData contains the type of card to switch to read. So before to operate any card, first you need to send GetData APDU to obtain the card basic information, and also the type of card to read must be switched under this type.

4.1 Contact and Contactless Smart Cards

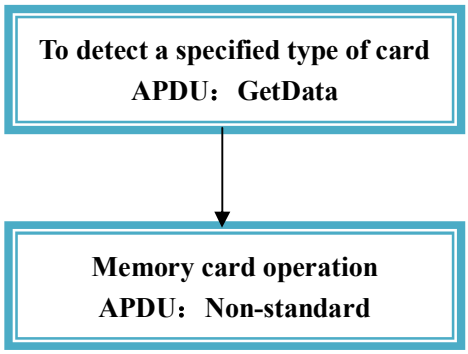
For Contact and Contactless Smart Cards, the standard APDU can be sent directly to the card. If the Contact and Contactless Smart Cards need to be operated at the same time, (such as: ISO14443-4 TypeA CPU cardand SAM1card), the details as follows:



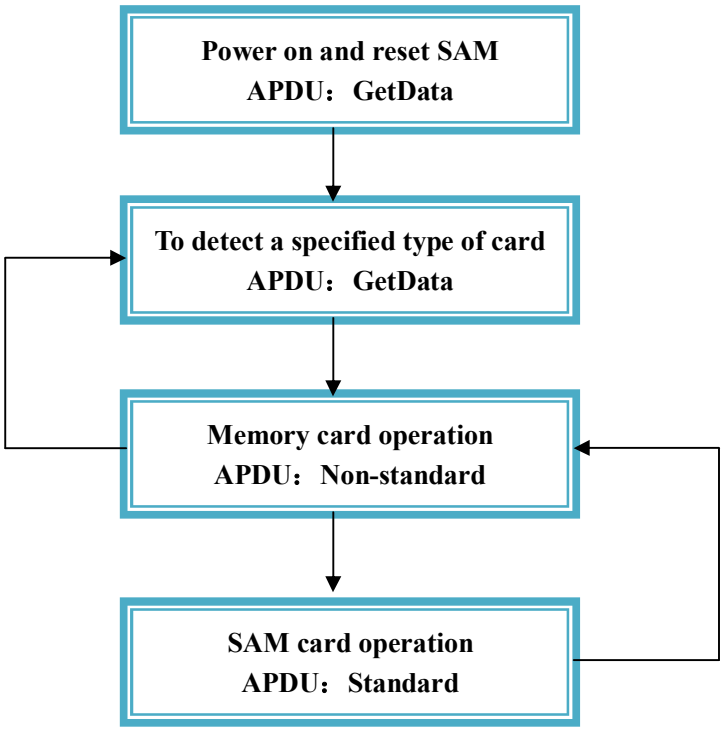
For Contact and Contactless Smart Cards, they are using the standard APDU. After to reset the SAM card, if you still want to operate it, and you need switch the current operated smartcard by using the switching smartcard type instruction. To make sure the data was sent to the specified smartcard type. If the smart card and the memory card do not need be switched, then after the GetData operation, this type of operation is the GetData operation card type.

4.2 Memory Cards

The operations for Memory Cards are all through APDU to operate.，the details as follows:

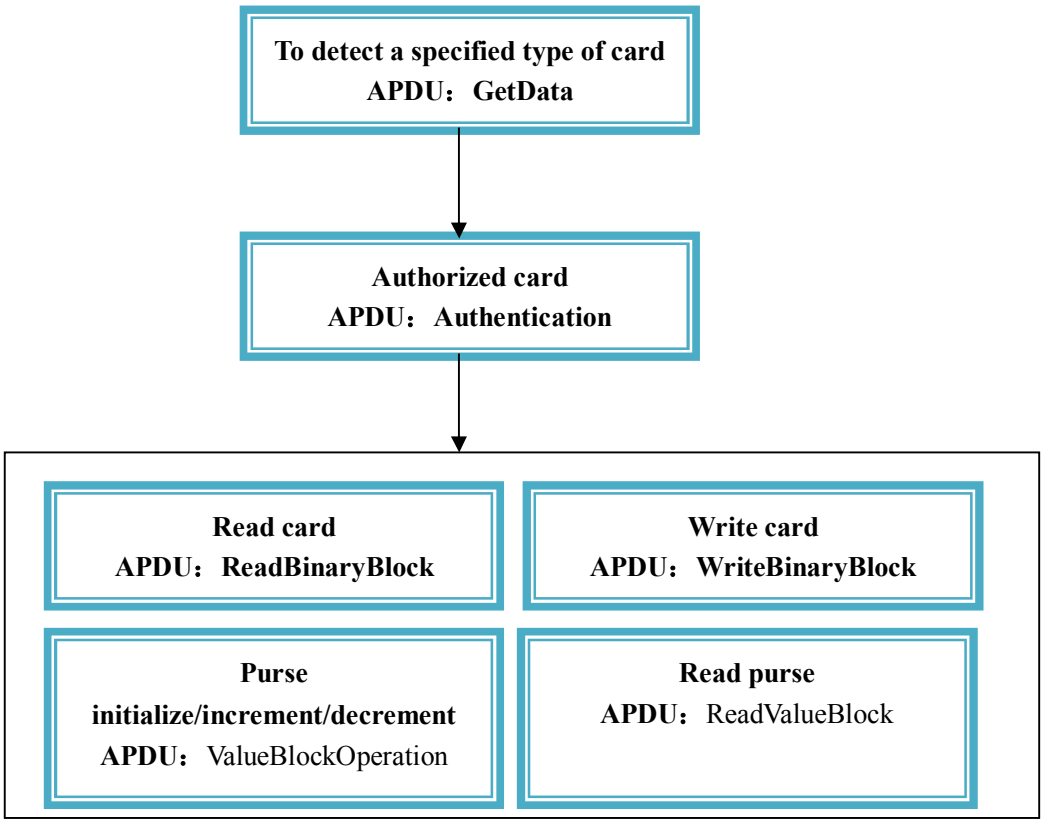


If the memory cards operation with SAM operation, the details as follows:



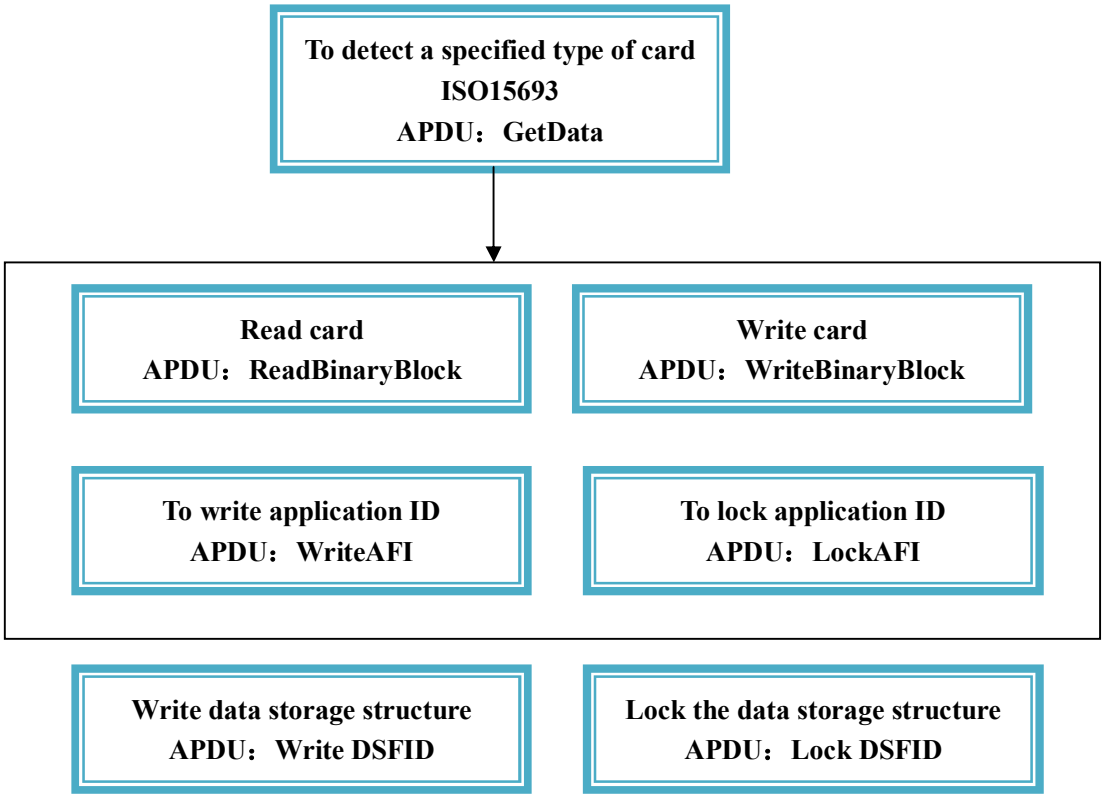
For the memory cards and single SAM operation are no need to switch. If you need more than one SAM card to operate, before to operate this SAM card, it needs to be switched to the specified SAM card via the smartcard type's instruction.

Mifare S50/70 card operation as follows:



The above operations are no SAM card operations. If the operation with SAM card operation, please refer to the relevent operations.

ISO15693Tag Operation:

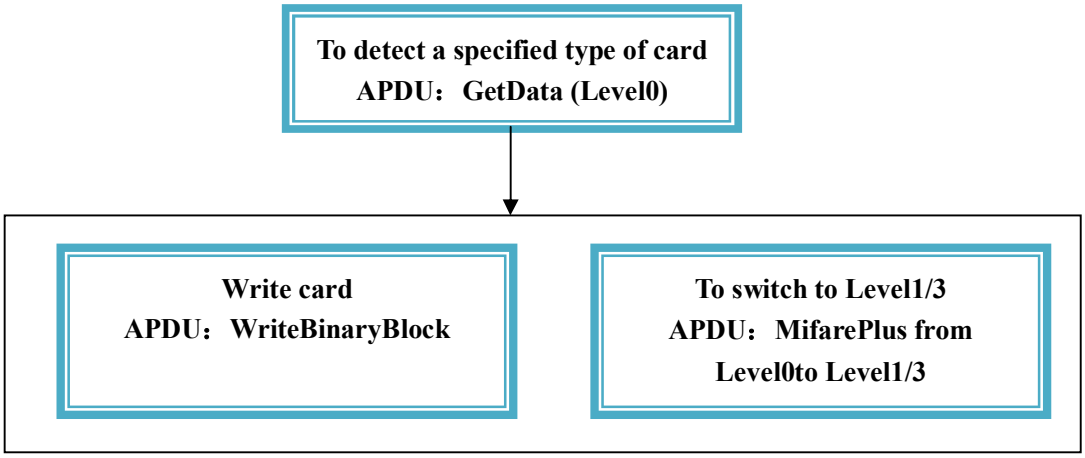


The operation to ISO15693 Tag by ReadBinaryBlock and WriteBinaryBlock is just to the last detected one tag. If you need to operate one tag which is specified the UID, please refer to the non-standard APDU (custom part).

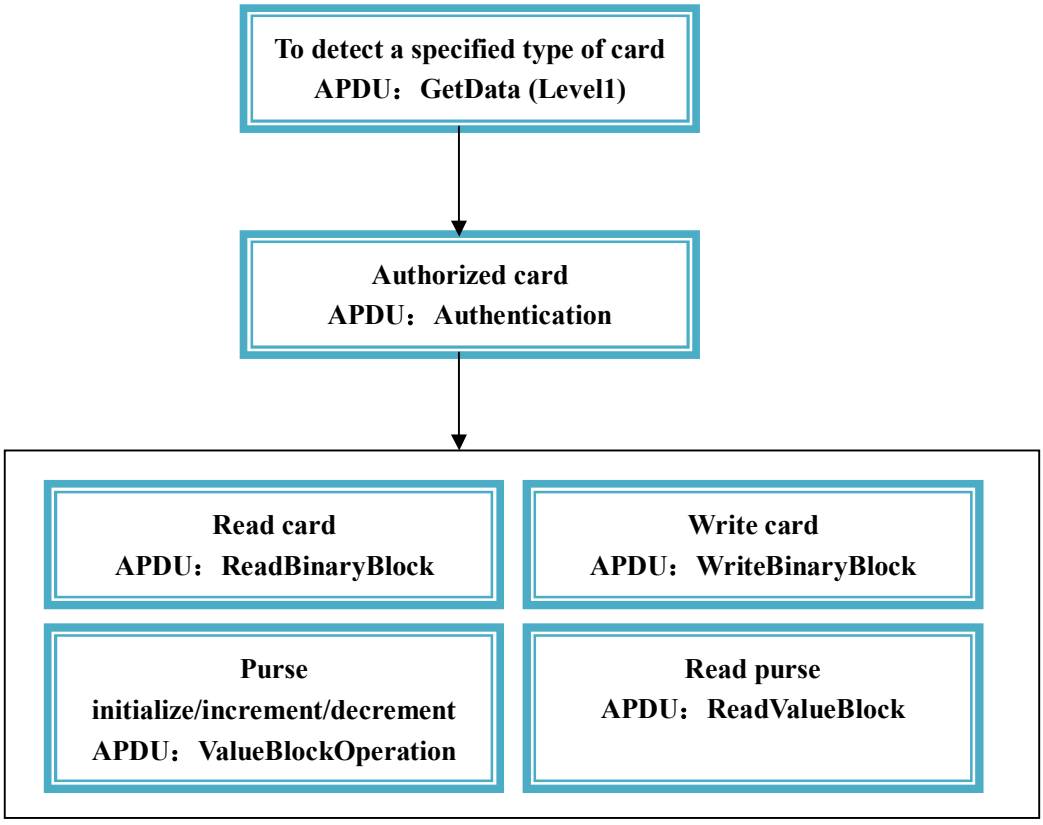
MifarePlus card operation as following:

For Mifare Plus card, please refer to the Appendix and there are different instructions in GetData. MifarePlus is divided into four security levels. The different security level has the different detecting operation. Some of operations are just to detect the card serial number. After detecting the card, some of operations are just to reset operation. Mifare plus Level 1 is compatible with original mifare one, all operations are the same to the Mifareone.

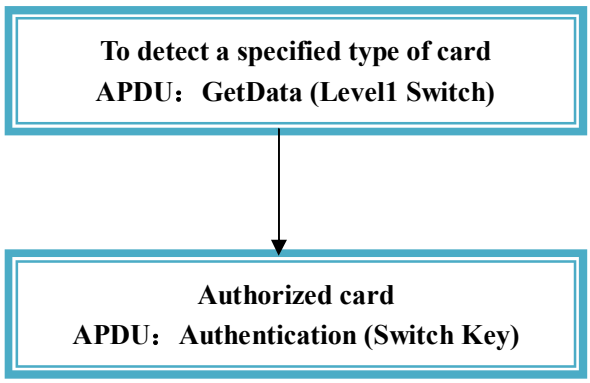
Level0 Operation:



Level1 Operation:

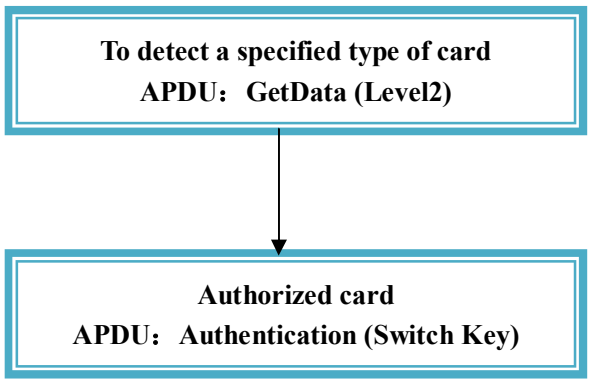


Level1 Switch Operation:



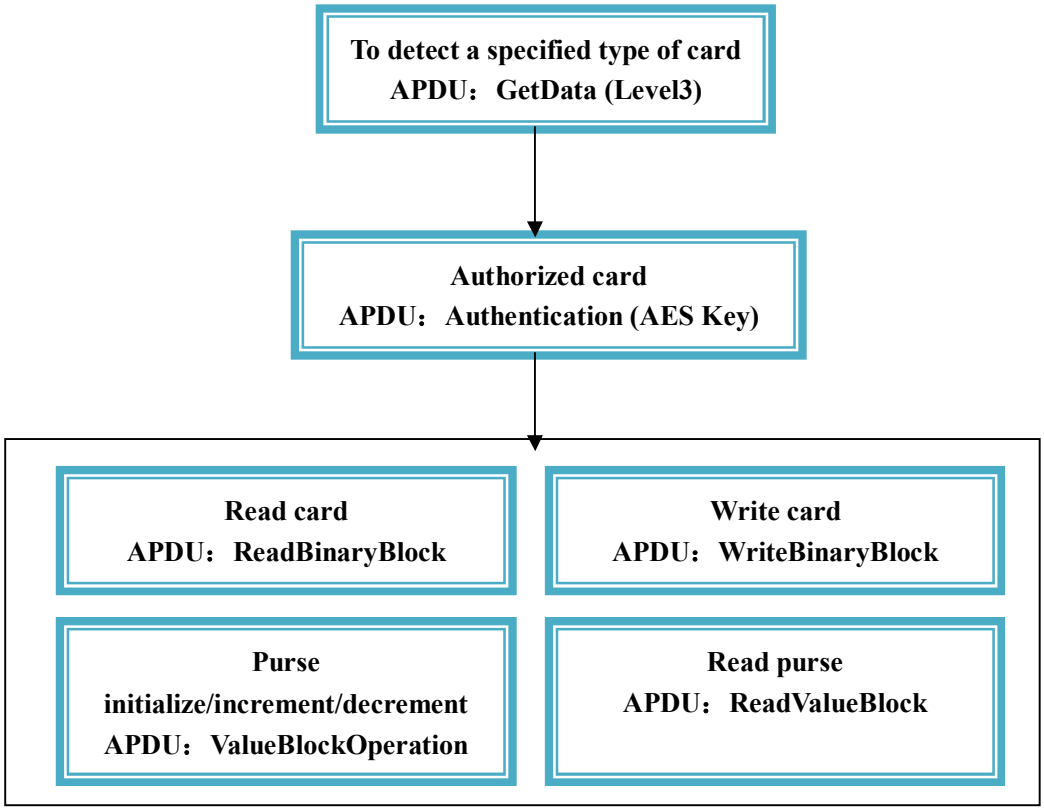
Note that to switch from the Level1 to the other Level, the detected card type via GetData is different.If you want to switch Level1 to Level2, and then the Switch key is Switchkey2.

Level2 Operation:



If you want to switch Level2 to Level3, then the Switch key is Switchkey3.

Level3 Operation:



To operate other kinds of card are similar. The basic APDU operation contain GetData、ReadBinaryBlock、WriteBinaryBlock, etc. If you need to set card parameter, refer to non-standard APDU (custom part).

For LCD operation, clock operation, to switch the current operation smartcard, SAM to reset baudrate, LED and buzzer operation, etc. Please refer to non-standard APDU (custom part).

5. Contact Us

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(MR-800 appearance)

Appendix A

For the data and key storage structures, there are some difference between MifarePlus Level3 and Mifareone. The details as follows:

Block relative address		Block address	AES corresponding key block address
Sector0			
Block0	Data block	0x0000	A Key: 0x4000 B Key: 0x4001
Block1	Data block	0x0001	
Block2	Data block	0x0002	
Block3	Level1 :KeyA+KeyB, Level3: data+config	0x0003	
Sector1			
Block0	Data block	0x0004	A Key: 0x4002 B Key: 0x4003
Block1	Data block	0x0005	
Block2	Data block	0x0006	
Block3	Level1 :KeyA+KeyB, Level3: data+config	0x0007	
….			
Sector31			
Block0	Data block	0x007C	A Key: 0x403E B Key: 0x403F
Block1	Data block	0x007D	
Block2	Data block	0x007E	
Block3	Level1 :KeyA+KeyB, Level3: data+config	0x007F	
Sector32			
Block0	Data block	0x80	A Key: 0x4040 B Key: 0x4041
Block1	Data block	0x81	
…	Data block	…	
Block15	Level1 :KeyA+KeyB, Level3: data+config	0x8F	
…			
Sector39			
Block0	Data block	0xF0	A Key: 0x404E B Key: 0x404F
Block1	Data block	0xF1	
…	Data block	…	
Block15	Level1 :KeyA+KeyB, Level3: data+config	0xFF	

Configuration block			
	MFP Configuration Block	0xB000	
	Installation Identifier	0xB001	
	ATS Information	0xB002	
	Field Configuration Block	0xB003	
Key block			
	AES Sector Keys	0x4000~0x403F	
	AES Sector Keys	0x4040~0x404F	
	Originality Key	0x8000	
	Card Master Key	0x9000	
	Card Configuration Key	0x9001	
	Level2 switch Key	0x9002	
	Level3 switch Key	0x9003	
	SL1 Card Authentication Key	0x9004	
	Select VC Key	0xA000	
	Proximity Check Key	0xA001	
	VC Polling ENC Key	0xA080	
	VC Polling MAC Key	0xA081	

※ The blue and yellow parts are the associated part.