User Manual

(V1.0.0.2)

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Version	Date	Note
1.0.0.0	2012.12.20	First release
1.0.0.1	2013.08.20	Add more than one card of TYPEB identified function Add more than one card of TYPEA and TYPEB identified function
1.0.0.2	2013.12.24	add functions of mode set for checking collision and inquiring status to support TYPEA&TYPEB cards

Firmware Version

Version	Date	Note
1.0.0.0	2012.12.20	First release
1.0.0.1	20120718	Replacement of card slot changing, lamp control, buzzer set and control, SAM card board and SAM card slot detection, write EEPROM, read EEPROM, write P/N, read P/N, write Serial Number, read Serial Number, write Vendor MFG Date, read Vendor MFG Date, write Vendor MFG P/F , write Vendor MFG P/F command, revise FW version format.
1.0.0.2	20120810	Add new extend instruction protocol， LED mode changing instruction, LED mode inquiry instruction, LED host control instruction and inquiry instruction. Diebold MFG Date read & write instruction, Diebold MFG P/F read & write instruction revise FW version format
1.0.0.3	20120903	Changing single reader mode into dual readers mode Testing aim to function of hardware, PCSC, RF card library, SAM card library and extend Add 70℃ -- 20℃ test
1.0.0.4	20120924	Clear up blue lamp status when card collision occurs Add lamp inquiry function under CCR lamp automation control LED lamp indicates only in successful connection Buzzer responses only in successful connection Clear up error status of card slot changing operation with card in SAM card slot (report card moving out)
1.0.0.5	20121016	SAM reader reports card information only in successful changing APDU control LED lamp and buzzer Deactive card, green lamp will be on when the reader is standing by Download identification key of mifare one card to ROM, actually save it into EEPROM in RF IC (Key No. is 1) Once contactless CPU card is actived, it will be not done again in its middle stage, support break operation. Once S50/S70 card key is verified, it will be not actived again in its

		middle stage, support break operation
1.0.0.6	20121023	When SAM card reader executes command for card slot changing，prior to change slot, then reports information of card inserting and pulling, finally executes return command APDU is of EEPROM operation, reboot, gain FW version, skip to IAP mode After RF actived, keep the state and prevent interfering from another RF card
1.0.0.7	20121030	Fail to modify RF verifying password without changing card state, go on verfying password untill success to read data
1.0.0.8	20121107	Add automatically green lamp on function（if red lamp on, green lamp off) optimize the judgement of "connect reader" operation
1.0.0.9	20121113	Clear up the appearance of reader halted when reader feed back some RF length data Clear up the appearance of reader halted when reader feed back some SAM card length data Clear up the error of unable to send special APDU command to RF reader in V1.0.0.8 Clear up the error of unable to send any command to RF reader in V1.0.0.8
1.0.1.0	20121121	support Shang Hai commute system operation Clear up return empty information bug
1.0.1.1	20130613	close led lamp PWM control function
1.0.1.2	20130708	Add more than one card of TYPEB identified function Add more than one card of TYPEA and TYPEB identified function
1.0.1.3	20131213	1. Improve SPI data transmit function and RF data transmit and receiving function, both functions add timing close 2. Improve the configure information of ISO14443-4 SFGI
1.0.1.4	20131224	add functions of mode set for checking collision and inquiring status to support TYPEA&TYPEB cards

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Glossary

Acronym/Abbreviation	Expansion
APDU	Application Protocol Data Unit
ATR	Answer to Reset, defined in ISO7816
ATS	Answer to select, defined in ISO/IEC 14443
CCID	Chip Card Interface Device
CID	Card Identifier
CL	Contact-Less
FWT	Frame Waiting Time
Mifare	The ISO14443 with extensions for security (PHILIPS)
NAD	Node Address
PCD	Proximity Coupling Device
PCSC	Personal computer Smart card
PICC	Proximity Integrated Chip Card
RF	Radio Frequency
USB	Universal Serial Bus

1 Overview

1.1 Product Description

CRT-603 is a USB dual interface card reader running on Windows including contactless card interface and SAM card interface. The reader complies with PC/SC standard, ISO14443 standard applicable to type A and type B contactless cards and ISO14443-3 standard applicable to MIFARE series contactless cards. It also complies with ISO7816 standard related to SAM card.

1.2 Features

- Bus powered, USB 2.0 full speed
- PC/SC V2.0 compliant, CCID interface, support Windows XP and Windows 7
- Contactless card interface, antenna and main board separated design
- SAM card reader interface, User can select one of the 4 SAM slot of the SAM card reader interface to operate
- Automatically search contactless card and handle anti-collision for more than one card
- Support ISO14443-4 type A&B contactless cards
- Support ISO14443-3 S50,S70 and UL etc contactless Storage Card
- Support ISO7816 SAM card
- 100 bytes EEPROM available for user to store permanent data
- Firmware online update through USB (supplier IAP tool provided)
- DC 5V, static current 200mA, dynamic current 220mA, peak current 250mA
- EMC, QPBOC certified

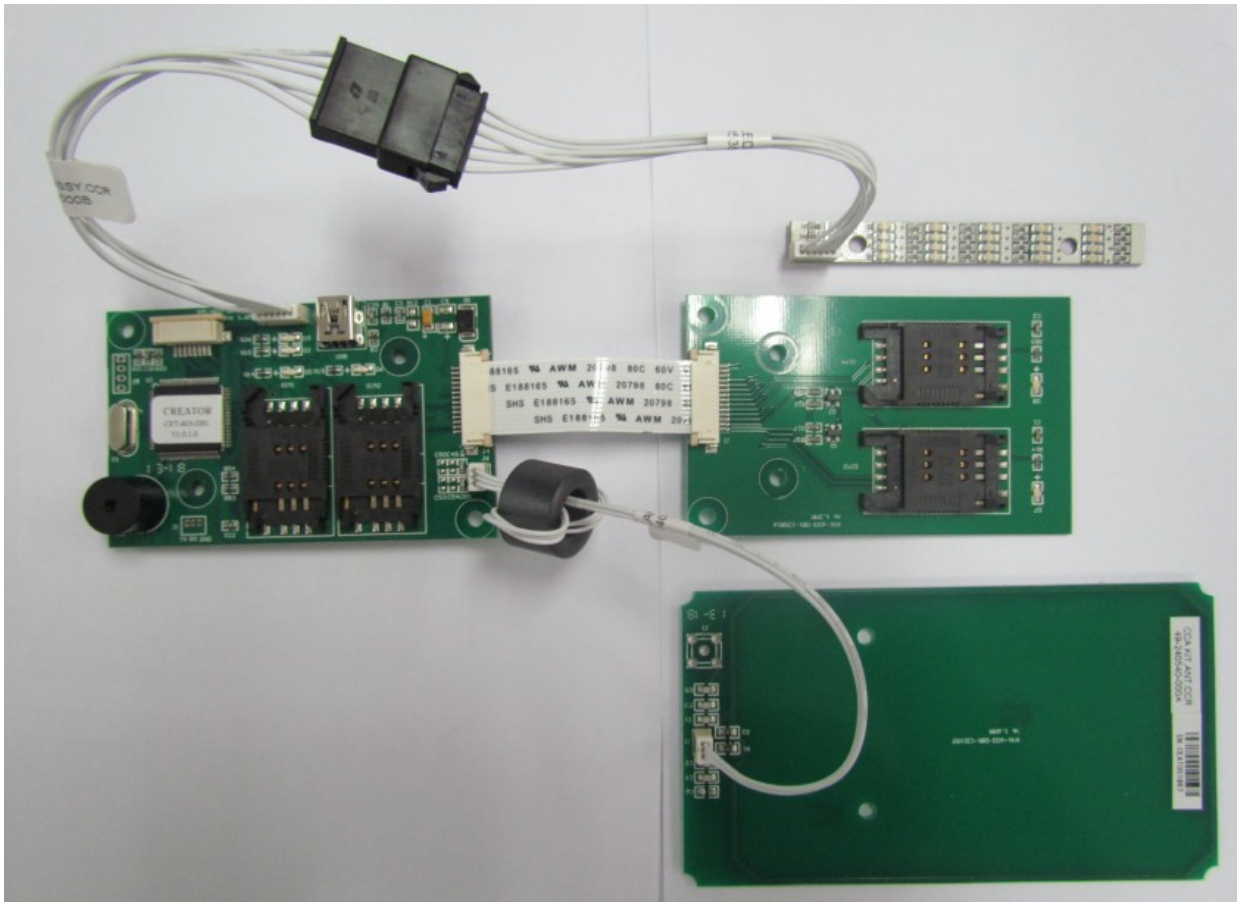
1.3 USB Interface

Card reader is connected to the host with a mini USB cable, PIN definition is as following:

PIN	Signal
1	VBUS
2	D-
3	D+
4	ID
5	GND

2 Product Hardware

2.1 Product components



The reader has 4 main components:

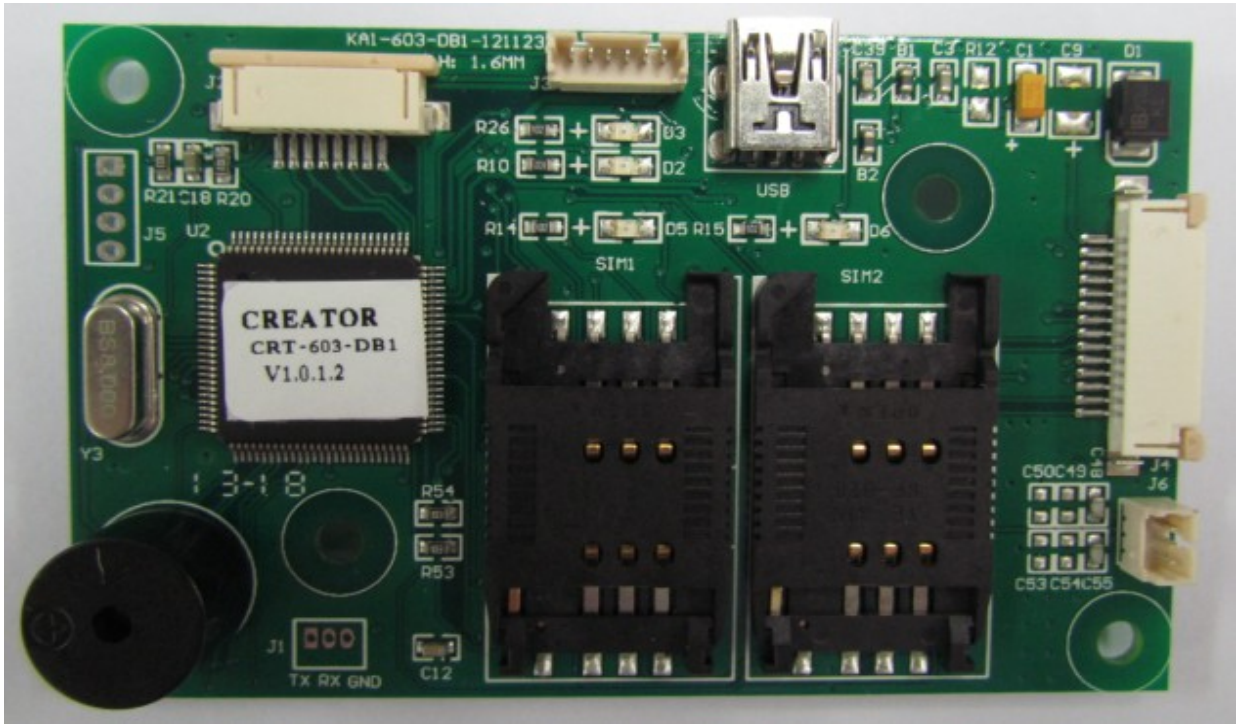
① Main board: including 2 SAM card slots and 1 USB interface, onboard power indicator, USB connection indicator, buzzer

②SAM card board: including 2 SAM slots, the SAM card board is connected to main board with a 14 pins FPC flat cable

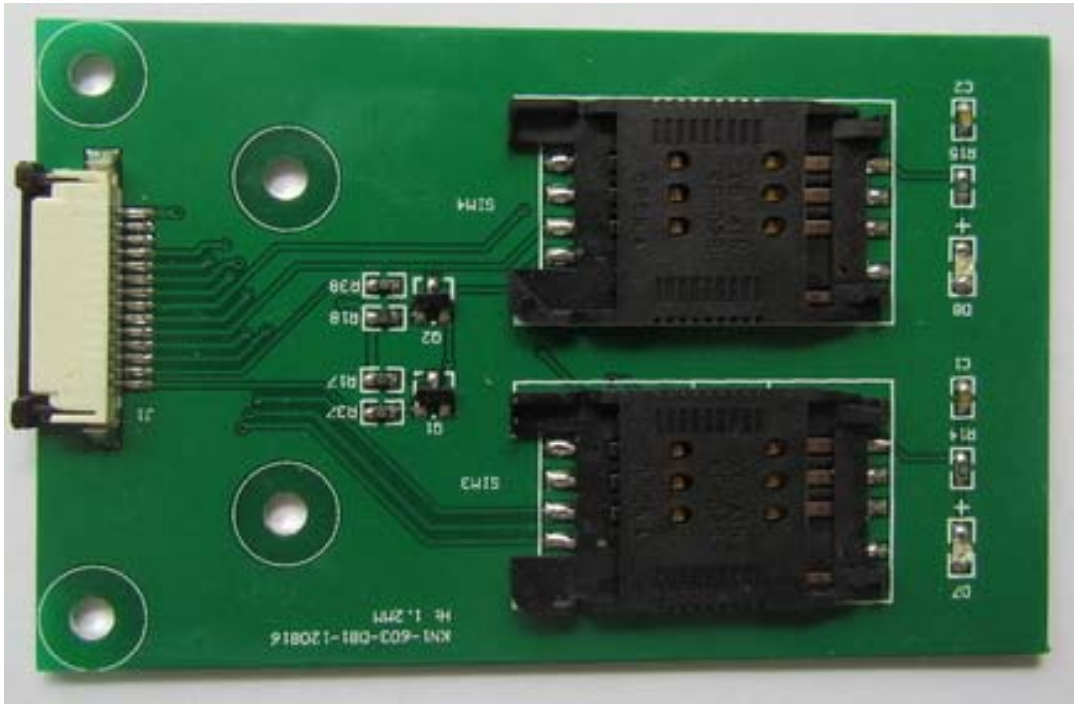
③ Antenna board: connected to main board with a 3 pins cable

④ LED board: Red, Green, Blue and Yellow LED lights, the LED board is connected to main board with a 6 pins cable

Images of boards



Main board



SAM card board

Antenna board

LED board

2.2 Reader function

Note: Contactless card interface and SAM card interface are independent with each other. Reader supports operation in parallel.

2.2.1 Contactless Card interface function

1. Read/write ISO14443-4 standard Type A&B contactless card

2. Read/write ISO14443-3 standard Mifare one S50, S70 and UL etc contactless Storage Card

3. Reader will automatically detect whether a card is present. The card will remain to be activated without interfered by other new cards presented.

4. When more than one card access into the detection area at the same time, card collision will occur, the result caused by card collision is as following

Card state	Detection result	ATR reported
One TYPE A card	Detect one TYPE A card and activate the card	TYPE A card ATR
More than one TYPE A card	Detect more than one TYPE A card, not able to activate any card	Special ATR (indicate card collision)
One TYPE B card	Detect one TYPE B card and activate the card	TYPE B card ATR
More than one TYPE B card	Detect more than one TYPE B card, deactivate any card	Special ATR (indicate card collision)
One TYPE A and one TYPE B card	Detect more than one card, deactivate any card	Special ATR (indicate card collision)
More than one TYPE A and more than one TYPE B card	Detect more than one card, deactivate any card	Special ATR (indicate card collision)

5. Contactless card reader also provides EEPROM operation, buzzer operation, LED operation, card reader restart, get firmware version and jump to IAP mode functions. User can use these functions by extended capabilities command and APDU commands defined by supplier.

2.2.2 SAM card reader interface function:

1. User can choose one SAM slot from the 4 SAM slots to read/write SAM card

2. 'Disconnect Reader' command' will not power off SAM card slot.

3. SAM card reader interface provides change card slot, check SAM card board and SAM card slot status function (by use of extended capabilities commands)

3 Card Operation

3.1 Contact Card Environment Specifics

Note: Only use the SAM card reader

3.1.1 ATR of SAM Card

Reader report card present status will automatically to ICC Resource Manager after SAM card reset is successful. Card ATR will be sent to application after user sends ‘Change SAM Slot’ command and ‘Connect Reader’ command.

3.1.2 APDU Command of SAM Card

Note: Please refer to COS document of the card for more detail APDU commands

3.2 Contactless Card Environment Specifics

Note: Only use the RF card reader

3.2.1 ATR of Contactless Card

When the reader detects a contactless smart card, reader will report card present status to ICC Resource Manager automatically. Card ATR will be sent to application after user chooses RF reader and sends 'Connect Reader' command.

3.2.1.1 ATR of Contactless Smart Card

Byte	Value	Designation	Description
0	3B	Initial Header	
1	8n	T0	Higher nibble 8 means no TA1, TB1, 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, 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	XX XX XX	T1 … .. Tk	Historical bytes: ISO14443A: The historical bytes from ATS response. Refer to the ISO14443-4 specification. ISO14443B: Byte1-4---- Application Data from ATQB Byte5-7---- Protocol Info Byte from ATQB Byte 8 ----Higher nibble = MBLI from ATTRIB command Lower nibble (RFU) = 0
4+n	XX	TCK	Exclusive-OR of bytes T0 to Tk

Example:

a. TYPE A card ATR ： 3B 8F 80 01 78 80 90 02 20 90 00 3F 38 70 04 B6 49 70 67 4F

b. TYPE B card ATR: 3B 8C 80 01 50 20 02 22 52 55 55 55 55 00 81 C1 4F

Note: When ISO14443A historical bytes T1-Tk greater than 15 bytes, the reader only reported to the last 15 historical bytes of data。

3.2.1.2 ATR of Contactless Storage Card

Byte	Value	Designation	Description
0	3B	Initial	
1	8n	T0	Higher nibble 8 means: no TA1, TB1, 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, 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

C0 C1 is 0001 suggest the card is S50 card, 00 02 suggest S70 card,

For example:

S50 card ATR: 3B 8F 80 01 80 4F 0C A0 00 00 03 06 03 00 01 00 00 00 00 6A

S70 card ATR: 3B 8F 80 01 80 4F 0C A0 00 00 03 06 03 00 02 00 00 00 00 69

Note: The naming method for other types of cards can be found in supplementary file in PC/SC section 3.

When RF card conflicts with each other, returned ATR:

3B 8F 80 01 80 4F 0C A0 00 00 03 06 03 00 01 E0 00 00 01 8B

3.2.2 APDU Command of Contactless Card

3.2.2.1 Get Data Command
Get UID or ATS of the contactless card

Command format:

Command	Class	INS	P1	P2	Le
Get Data	0xFF	0xCA	XX	0x00	XX

Parameter Description:
P1 = 0 UID is returned.
P1 = 1 all historical bytes from the ATS of a ISO 14443 A card without CRC are returned.
Le = 0x00, this means: Return full length of the data (e.g. for ISO14443A single 4 bytes, double 7 bytes, triple 10 bytes, for ISO14443B 4 bytes PUPI, for 15693 8 bytes UID).

Return format:

Data Out
Data + SW1 SW2

SW1 SW2 STATUS CODE:

	SW1	SW2	Meaning
Success	90	00	Command execution successfully
	62	82	End of data reached before Le bytes (Le is greater than data length).
Fail	67	00	Wrong length
	68	00	Class byte is not correct
	6A	81	Function not supported.
	6B	00	Wrong parameter P1-P2
	6C	XX	Wrong length (wrong number Le; 'XX' encodes the exact number) if Le is less than the available UID length)

Example:

A. Get UID APDU:

Command:

Command	Class	INS	P1	P2	Le
Get Data	FF	CA	00	00	00

Return:

Response	Data Out				
Result	UID (LSB)	……	UID (MSB)	SW1	SW2

B. Get ATS APDU:

Command:

Command	Class	INS	P1	P2	Le
Get Data	FF	CA	01	00	00

Return:

Response	Data Out		
Result	ATS	SW1	SW2

3.2.2.2 Smart Card Functionality Support

Note: Please refer to COS document of the card for more detail APDU commands

3.2.2.3 Storage Card Functionality Support

This section defines commands for Storage Cards (Exception: The Get UID and Load Key command, which may be used for all kinds of contactless cards):

3.2.2.3.1 Load Key (Password)

The 'Load key' command will just load (write) the keys(Mifare key) in the IFD designated memory. 32 groups password can be saved into the IFD volatile memory and 1 group password can be saved into the IFD non-volatile memory

Command format:：

Command	**Class**	**INS**	**P1**	**P2**	**Lc**	**Data In**
Load Keys	0xFF	0x82	Key Structure	Key number	Key Length	Key

Parameter Description:

P1:

Bit	**Value**	Description
7	**0**	**0**: Card Key; **1** Reader Key
6	**0**	**0**: Plain Transmission, **1**: Secured Transmission
5	**1**	**0:** Keys are loaded into the IFD volatile memory **1:** Keys are loaded into the IFD non-volatile memory.
4		0:Key type is KEY_A1:Key type is KEY_B , （for non-volatile memory.）
0~3	0000	If **b6** is **set**, it is the Reader Key number that has been used for the encryption, else it is ignored by the IFD. The maximum of 16-reader keys is possible. Typically an IFD uses two reader keys only.

P2: indicating Key number, range: 0x00~0x1F

Return format:

Data Out
SW1 SW2

SW1 SW2 STATUS CODE:

	SW1	**SW2**	**Meaning**
Success	90	00	Command execution successfully
Fail	63	00	Command execution failed
	67	00	Wrong length
	68	00	Class byte is not correct
	69	82	Card key not supported
		83	Reader key not supported
		85	Secured transmission not supported
		88	Key type not known
		89	Key length is not correct

Example:

Load Key FFFFFFFFFFFF into RAM, APDU command:

FF 82 00 00 06 FF FF FF FF FF FF.

3.2.2.3.2 Authenticate Key(Password)

The application provides the number of the key used for the authentication. The specific key must be already in the reader. So Load Key (password) into RF reader before Authenticate sector Key of S50, S70

Command format:

Command	Class	INS	P1	P2	Lc	Data In	Le
Authenticate	0xFF	0x86	0x00	0x00	5	See table	-

Parameter Description:

Data In table

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5
Version 0x01	0x00	Block umber	Key type	Key Nr

Return format:

Data Out
SW1 SW2

SW1 SW2 STATUS CODE

	SW1	SW2	Meaning
Success	90	00	Command execution successfully
Fail	63	00	Command execution failed
	65	81	Memory failure, addressed by P1-P2 is does not exist
	67	00	Wrong length
	68	00	Class byte is not correct
	69	82	Security status not satisfied.
		83	Authentication cannot be done
		84	key not useable
		86	Key type not known
		88	Key number not valid
	6A	81	Function not supported.
		82	Addressed block or byte does not exist.

Example:

Use group 0 Key under type KEY A mode to Authenticate 2th section's Key:

F 86 00 00 05 01 00 02 60 00

Remark:

1. Version: This is used in the future to differentiate different version of this command, it is 0x01
2. Block Number: The sector NO. of the specific sector that need PIN verification
3. Key type:The type of the key. for Mifare one S50/S70 ,KEY_A (0x60) or KEY_B (0x61)
4. Key Nr.: The card key number, which will be used for this authentication

3.2.2.3.3 Read Block Data

Command format:

Command	Class	INS	P1	P2	Le
Read Blocks data	FF	B0	00	Block Number	Number of Bytes to Read

Return format:

Data Out
Data （0~16 byte）+ SW1 SW2

SW1 SW2 STATUS CODE：

	SW1	**SW2**	**Meaning**
Success	90	00	Command execution successfully
	62	81	Part of returned data may be corrupted.
		82	End of file reached before reading expected number of bytes
Fail	63	00	Command execution failed
	67	00	Wrong length
	68	00	Class byte is not correct
	69	81	Command incompatible.
		82	Security status not satisfied.
		86	Command not allowed.
	6A	81	Function not supported.
		82	End of data reached before Le bytes (Le is greater than data length).
	6B	00	Wrong parameter P1-P2
	6C	XX	Wrong length (wrong number Le; ‘XX’ is the exact number).

Example:

Read 16 bytes data of 2nd sector:

FF B0 00 02 10

Note:

Le: specify that you want to return the number of bytes. When Le=00, return of all the data.

3.2.2.3.4 Update Block Command

Update Block Command APDU

Command format:

Command	Class	INS	P1	P2	Lc	Data In
Update Blocks data	FF	D6	00	Block Number	Number of Bytes to Update	Block Data

Return format:

Data Out
SW1 SW2

SW1 SW2 STATUS CODE:

	SW1	**SW2**	**Meaning**
Success	90	00	Command execution successfully
	62	81	Part of returned data may be corrupted.
		82	End of file reached before reading expected number of bytes
Fail	63	00	Command execution failed
	65	81	Memory failure (unsuccessful storing).
	67	00	Wrong length
	68	00	Class byte is not correct
	69	81	Command incompatible.
		82	Security status not satisfied.
		86	Command not allowed.
	6A	81	Function not supported.
	6A	82	File not found / Addressed block or byte does not exist.
	6B	00	Wrong parameter P1-P2

Example:

Write 16 byte data in 2nd sector, APDU command,
FF D6 00 02 10 00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F

Note: 4 Bytes for MIFARE Ultralight or 16 Bytes for MIFARE 1K/4K

4 Extended Command (Extended Capabilities)

Extended Function of card reader module is controlled by that of PC/SC protocol. Please refer to 6.1.8 for 《 Interoperability Specification for ICCs and Personal Computer Systems Part 9. IFDs with Extended Capabilities》 and《 Specification for Integrated Circuit(s) Cards Interface Devices》 for the description of PC/SC extended commands.

Extended commands for RF card reader are different from those for SAM card reader, please make a difference when usage. Send unknown extended commands to card reader, it would return status code 6B 00

All extended commands use '68 92' as Information Header, command format is as follows:

Class	INS	P1	P2	Le	Data1	Data2	…
68	92	XX	XX	XX	XX	XX	XX

4.1 Extended Command Brief Introduction

Extended command sheet

Extended Command	Description	Use Reader Modle
Choose SAM Card Slot	In multiple SAM card slot, choose one SAM card to active	SAM Reader
Get SAM card board and SAM slot status	Get status of reader, if SAM card board is effective and if one card in each SAM card slot	
Switch LED Working Mode		RF Reader
Inquire LED Working Mode		
HOST Controls LED		
Inquire LED status		
Enable/Disable Buzzer Beep		
Control Buzzer Beep		
Write EEPROM		
Read EEPROM		
Write P/N		
Read P/N		
Write Serial Number		
Read Serial Number		
Write Vendor MFG Date		
Read Vendor MFG Date		
Write Vendor MFG P/F		
Read Vendor MFG P/F		
Write Diebold MFG Date		
Read Diebold MFG Date		
Write Diebold MFG P/F		
Read Diebold MFG P/F		
Get firmware version		
Restart Reader		
Enter IAP Mode	With IAP tool to download firmware updates	

4.2 Extended Command Detail Description

4.2.1 Choose SAM Card Slot

This command is for switching SAM slot and activates any of the cards among the 4 of the SAM slots. Return code refers to the activating results.

Command format:

Command	Class	INS	P1	P2	Le	Data1	Data2	Data3
Choose slot	68	92	01	00	03	Slot number	00	00

Parameter Description
Slot number:

Value	Description
01	Switch to SAM1 slot
02	Switch to SAM2 slot
03	Switch to SAM3 slot
04	Switch to SAM4 slot

Return format

Data Out
SW1 SW2

SW1 SW2 STATUS CODE:

	SW1	SW2	Meaning
Success	90	00	Card activation successful
Fail	63	00	Card activation failed
	67	00	Wrong length
	68	00	Class byte is not correct
	69	00	Wrong data parameter
	6A	81	Function not supported
	6B	00	Wrong parameter P1-P2

Example:
Choose SAM Card Slot, 68 92 01 00 03 01 00 00

Note：

1. When the SAM expansion board is not connected, only two SAM card slots on the motherboard can be used.
2. Before execute switching SAM card slot, recommended inquire the SAM card board status, inquiry the card slot is in the presence of the card

4.2.2 Get SAM card board and SAM slot status

Get status of reader, if SAM card board is effective and if one card in each SAM card slot.

Command format:

Command	Class	INS	P1	P2	Lc
Get SAM Slot Status	68	92	04	00	02

Return format:

Data Out
Data1 Data2 + SW1 SW2

Return data description:
Data1= 0 no SAM card board
Data1= 1 SAM card board is effective
Data2: SAM card slot detection result

Bit	Description
7	0：Remain
6	0：Remain
5	0：Remain
4	0：Remain
3	0：No card in SAM4 slot 1：Card in SAM4
2	0：No card in SAM3 slot 1：Card in SAM3
1	0：No card in SAM2 slot 1：Card in SAM2
0	0：No card in SAM1 slot 1：Card in SAM1

SW1 SW2 STATUS CODE:

	SW1	SW2	Meaning
Success	90	00	Command execution successfully
Fail	63	00	Command execution failed
	67	00	Wrong length
	68	00	Class byte is not correct
	69	00	Wrong data parameter
	6A	81	Function not supported
	6B	00	Wrong parameter P1-P2

Example:

Get SAM card board and SAM slot status, 68 92 04 00 02

4.2.3 LED Control Rules

The LED control rules are as follows:

LED indicator status (Note: Reader can only handle ISO14443 TYPE A card conflict. Detection TYPE A card is given priority.)

1. When reader is standby: Green LED is on.

2. After Connect Reader command is sent:
A single card is activated, yellow LED is on. If buzzer has been enabled, user can start operate card after buzzer gives a short beep.
If more than one card presented when reader is in standby status, red LED is on. If buzzer has been enabled, buzzer will gives a long beep. Reader will return 6A 81 error code with any further command operation.

3. When operating card:
Yellow LED will be on when operating single card and its status will not changed by new cards which are presented in the detection area
When a activation card which is being operating is removed, green LED is on. Reader returns to standby status.
When card conflict occurs, red LED is on. Red LED will be close and green LED is on when surplus cards are removed or all cards are removed. Reader returns to standby status

4. When send Disconnect Reader command:
After deactivation card operation is completed, green LED is on. Card reader returns to standby status.
Send Disconnect Reader command, red LED will be on when more than one card collision occurs, red LED will be off and green LED is on when surplus cards are removed or all cards are removed. Reader returns to standby status.

When card conflict occurs，return ATR:
3B 8F 80 01 80 4F 0C A0 00 00 03 06 03 00 01 E0 00 00 01 8B

4.2.4 Set LED Working Mode

Set LED current working mode to CCR automation mode or HOST control mode.

Command format:

Command	Class	INS	P1	P2	Le	Data1	Data2	Data3
Set Led Mode	68	92	02	00	03	mode	00	00

Parameter Description
Data = 0 CCR automation mode.
Data = 1 HOST control mode.

Return format:

Data Out
SW1 SW2

SW1 SW2 STATUS CODE:

	SW1	SW2	Meaning
Success	90	00	Command execution successfully
Fail	63	00	Command execution failed
	67	00	Wrong length
	68	00	Class byte is not correct
	69	00	Wrong data parameter
	6A	81	Function not supported
	6B	00	Wrong parameter P1-P2

Example:
Set to HOST control mode, 68 92 02 00 03 01 00 00

The corresponding command used of APDU channel transmission as follows

Command	Class	INS	P1	P2	Le	Data
Set Led Mode	FF	69	44	42	8	68 92 02 00 03 mode 00 00

Parameter description, Return format, SW1 SW2 status code as above

Note:
When LED is working in CCR Controls mode control, LED control rules are in accordance with Section 4.2.3.
When LED is working in HOSt control mode, HOST controls LED on/off.
The current working mode status value is stored in non-volatile memory; it is still effective after restart

4.2.5 Get LED Working Mode

Get LED of reader Current working mode

Command format:

Command	Class	INS	P1	P2	Lc
Get Led Mode	68	92	02	01	01

Return format:

Data Out
Data SW1 SW2

Return data description:
Data = 0 CCR automation mode.
Data = 1 HOST control mode.

SW1 SW2 STATUS CODE:

	SW1	SW2	Meaning
Success	90	00	Command execution successfully
Fail	63	00	Command execution failed
	67	00	Wrong length
	68	00	Class byte is not correct
	69	00	Wrong data parameter
	6A	81	Function not supported
	6B	00	Wrong parameter P1-P2

Example:
Get LED of reader Current working mode: 68 92 02 01 01

The corresponding command used of APDU channel transmission as follows

Command	Class	INS	P1	P2	Le	Data
Get Led Mode	FF	69	44	42	5	68 92 02 01 01

Parameter description, Return format, SW1 SW2 status code as above

4.2.6 HOST Set LED Status

HOST controls the LED on/off/flash when LED is only working in HOST control mode.

Command format:

Command	Class	INS	P1	P2	Le	Data1	Data2	Data3
Set Led Status	68	92	02	02	03	Control	Circle1	Circle2

Return format:

Data Out
SW1 SW2

Parameter Description

Control:

Bit	Description
7	0:Yellow light not flash 1:Yellow light flash
6	0:Blue light not flash 1: Blue light flash
5	0:Green light not flash 1: Green light flash
4	0:Red light not flash 1: Red light flash
3	0:Yellow light off 1:Yellow light on
2	0: Blue light off 1: Blue light on
1	0: Green light off 1: Green light on
0	0: Red light off 1: Red light on

Bit 0 to Bit 7 means one byte, highest is Bit7 and lowest is Bit 0 (Hereinafter the same).

Circle1:

Bit	Description
7-4	Yellow light flash cycle
3-0	Blue light flash cycle

Circle2:

Bit	Description
7-4	Green light flash cycle
3-0	Read light flash cycle

Flash cycle:

value	Description
0x0	Remain
0x1	0.25 Second
0x2	0.5 Second
0x3	0.75 Second
0x4	1 Second
0x5	1.25 Second
0x6	1.5 Second

0x7	1.75 Second
0x8	2 Second
0x9	2.25 Second
0xA	2.5 Second
0xB	2.75 Second
0xC	3 Second
0xD	3.5 Second
0xE	4 Second
0xF	5 Second

SW1 SW2 STATUS CODE:

	SW1	**SW2**	**Meaning**
Success	90	00	Command execution successfully
Fail	63	00	Command execution failed
	67	00	Wrong length
	68	00	Class byte is not correct
	69	00	Wrong data parameter
	6A	81	Function not supported
	6B	00	Wrong parameter P1-P2

Example:

Red light flash with 0.25second cycle: 68 92 02 02 03 11 00 01

The corresponding command used of APDU channel transmission as follows

Command	**Class**	**INS**	**P1**	**P2**	**Le**	**Data**
Set Led Status	FF	69	44	42	8	68 92 02 02 03 control circle1 circle2

Parameter description, Return format, SW1 SW2 status code as above

Note:

1. Only in Host Controls mode, when the LED Lighting state bit and the LED flash bit state bit of are effective，flashing cycle is effective. Otherwise the blinking cycle is ignored.
2. When CCR automation mode,run this command will return status code 6300.
3. The current LED on/off/flash status value is stored in non-volatile memory, it is still effective after restart

4.2.7 Get LED status

Inquire the status of each of the LED

Command format:

Command	Class	INS	P1	P2	Lc
Get Led status	68	92	02	03	03

Return format:

Data Out
control circle1 circle2 + SW1 SW2

Return data description

Control, circle1, circle2, please refer to section 2.2.6

SW1 SW2 STATUS CODE:

	SW1	SW2	Meaning
Success	90	00	Command execution successfully
Fail	63	00	Command execution failed
	67	00	Wrong length
	68	00	Class byte is not correct
	69	00	Wrong data parameter
	6A	81	Function not supported
	6B	00	Wrong parameter P1-P2

Example:

Get LED status: 68 92 02 03 03

The corresponding command used of APDU channel transmission as follows

Command	Class	INS	P1	P2	Le	Data
Get Led	FF	69	44	42	5	68 92 02 03 03

Parameter description, Return format, SW1 SW2 status code as above

4.2.8 Enable/Disable Buzzer Beep

Enable/disable buzzer beep, and then settings are stored into non-volatile memory

Command format:

Command	Class	INS	P1	P2	Le	Data1	Data2	Data3
Beep Enable/Disable	68	92	03	00	03	mode	00	00

Return format:

Data Out
SW1 SW2

Parameter Description

Mode = 0 means disable buzzer, and buzzer will not beep when card is activated with connecting reader after disable buzzer.

Mode = 1 means enable buzzer, and buzzer will beep automatically when card is activated with connecting reader after enable buzzer.
Buzzer beeps shortly for single card activation, and longer for multi cards collision.

SW1 SW2 STATUS CODE:

	SW1	SW2	Meaning
Success	90	00	Command execution successfully
Fail	63	00	Command execution failed
	67	00	Wrong length
	68	00	Class byte is not correct
	69	00	Wrong data parameter
	6A	81	Function not supported
	6B	00	Wrong parameter P1-P2

Example:

Enable buzzer, 68 92 03 00 03 01 00 00

The corresponding command used of APDU channel transmission as follows

Command	Class	INS	P1	P2	Le	Data
Beep Enable/Disable	FF	69	44	42	8	68 92 03 00 03 mode 00 00

Parameter description, Return format,SW1 SW2 status code as above

4.2.9 Control Buzzer Beep
Dynamic control buzzer beeps.

Command format:

Command	Class	INS	P1	P2	Le	Data1	Data2	Data3
Beep Control	68	92	03	01	03	Beep time	00	00

Parameter Description
Beep Time: one unit is 100ms,

Return format:

Data Out
SW1 SW2

SW1 SW2 STATUS CODE:

	SW1	SW2	Meaning
Success	90	00	Command execution successfully
Fail	63	00	Command execution failed
	67	00	Wrong length
	68	00	Class byte is not correct
	69	00	Wrong data parameter
	6A	81	Function not supported
	6B	00	Wrong parameter P1-P2

Example:
Buzzer beeps for a second, 68 92 03 01 03 0A 00 00

The corresponding command used of APDU channel transmission as follows

Command	Class	INS	P1	P2	Le	Data
Beep Control	FF	69	44	42	8	68 92 03 01 03 Beep time 00 00

Parameter description, Return format, SW1 SW2 status code as above

Note:
The command can be repeated Sending in beeping process, the the last command is as a beep time .In addition, time = 0 to stop the buzzer beep.

4.2.10 Pre-set data layout of card reader EEPROM

Note: EEPROM data is as following:

100 bytes buffer						
P/N (12 bytes)	Serial Number (12 bytes)	Vendor MFG Date (8 bytes)	Vendor MFG P/F (1~4 bytes)	Diebold MFG Date (8 bytes)	Diebold MFG P/F (1~4 bytes)	free space (52 bytes)

EEPROM provides 100 bytes space, address 0~99.
P/N 0~11 address is for PN data
Serial Number 12~23 address is for Serial Number
Vendor MFG Date 24~31 address is for Vendor MFG Date
Vendor MFG P/F 32~35 address is for Vendor MFG P/F
Diebold MFG Date 36~43 address is for Diebold MFG Date
Diebold MFG P/F 44~47 address is for Diebold MFG P/F
48~99 address can be defined by user

4.2.11 Write EEPROM
Write data to EEPROM

Command format:

Command	Class	INS	P1	P2	Le	Data1	Data2	…
Write EEPROM	68	92	E0	Address	Length	Data(1~100 bytes)		

Parameter Description
Address: start address, range: 0-99
Length: length of data, range: 1-100
Data: The data to be written.

Return format:

Data Out
SW1 SW2

SW1 SW2 STATUS CODE:

	SW1	SW2	Meaning
Success	90	00	Command execution successfully
Fail	63	00	Command execution failed
	67	00	Wrong length
	68	00	Class byte is not correct
	69	00	Wrong data parameter
	6A	81	Function not supported
	6B	00	Wrong parameter P1-P2

Example:
The start address is 50, write 10 bytes of data into EEPROM, 68 92 E0 32 0A 01 02 03 04 05 06 07 08 09 0A

The corresponding command used of APDU channel transmission as follows

Command	Class	INS	P1	P2	Le	Data
Write EEPROM	FF	69	44	42	**XX**	68 92 E0 address length Data

Parameter description, Return format, SW1 SW2 status code as above
XX: length of Data

Note:
Users can use 100 bytes of EEPROM space, does not exceed the capacity, users can write data of any address and any length in this space

4.2.12 Read EEPROM

Read data from EEPROM

Command format:

Command	Class	INS	P1	P2	Lc
Read EEPROM	68	92	E1	Address	Length

Parameter Description:
Address: Start address 0-99
Length: length of data (1-100)

Return format:

Data Out
Data（1~100 byte）+ SW1 SW2

SW1 SW2 STATUS CODE:

	SW1	SW2	Meaning
Success	90	00	Command execution successfully
Fail	63	00	Command execution failed
	67	00	Wrong length
	68	00	Class byte is not correct
	69	00	Wrong data parameter
	6A	81	Function not supported
	6B	00	Wrong parameter P1-P2

Example:

The start address is 50, read 10 bytes of data from EEPROM, 68 92 E1 32 0A

The corresponding command used of APDU channel transmission as follows

Command	Class	INS	P1	P2	Le	Data
Read EEPROM	FF	69	44	42	5	68 92 E1 address length

Parameter description, Return format, SW1 SW2 status code as above

Note:
Users can use 100 bytes of EEPROM space, does not exceed the capacity, users can read data of any address and any length in this space

4.2.13 Write P/N

Write data of P/N to EEPROM.

Command format:

Command	**Class**	**INS**	**P1**	**P2**	**Le**	**Data1**	**…**	**Data12**
Write P/N	68	92	E2	00	0C	Data(12 bytes)		

Parameter Description

Data: the data of P/N

Return format:

Data Out
SW1 SW2

SW1 SW2 STATUS CODE:

	SW1	**SW2**	**Meaning**
Success	90	00	Command execution successfully
Fail	63	00	Command execution failed
	67	00	Wrong length
	68	00	Class byte is not correct
	69	00	Wrong data parameter
	6A	81	Function not supported
	6B	00	Wrong parameter P1-P2

Example:

Write P/N: 68 92 E2 00 0C 61 61 62 62 63 63 64 64 65 65 66 66

The corresponding command used of APDU channel transmission as follows

Command	**Class**	**INS**	**P1**	**P2**	**Le**	**Data**
Write P/N	FF	69	44	42	11	68 92 E2 00 0C Data

Parameter description, Return format, SW1 SW2 status code as above

4.2.14 Read P/N

Read data of P/N from EEPROM.

Command format:

Command	Class	INS	P1	P2	Lc
Read P/N	68	92	E2	01	0C

Return format:

Data Out
Data12 bytes） + SW1 SW2

Data: the data of P/N

SW1 SW2 STATUS CODE:

	SW1	SW2	Meaning
Success	90	00	Command execution successfully
Fail	63	00	Command execution failed
	67	00	Wrong length
	68	00	Class byte is not correct
	69	00	Wrong data parameter
	6A	81	Function not supported
	6B	00	Wrong parameter P1-P2

Example:

Read P/N, 68 92 E2 01 0C

The corresponding command used of APDU channel transmission as follows

Command	Class	INS	P1	P2	Le	Data
Read P/N	FF	69	44	42	5	68 92 E2 01 0C

Parameter description, Return format, SW1 SW2 status code as above

4.2.15 Write Serial Number

Write data of Serial Number to EEPROM

Command format:

Command	Class	INS	P1	P2	Le	Data1	…	Data12
Write Serial Number	68	92	E2	02	0C	Data(12 bytes)		

Parameter Description:

Data：data of Serial Number

Return format:

Data Out
SW1 SW2

SW1 SW2 STATUS CODE:

	SW1	SW2	Meaning
Success	90	00	Command execution successfully
Fail	63	00	Command execution failed
	67	00	Wrong length
	68	00	Class byte is not correct
	69	00	Wrong data parameter
	6A	81	Function not supported
	6B	00	Wrong parameter P1-P2

Example:

Write data of Serial Number: 68 92 E2 02 0C 30 31 32 33 34 35 36 37 38 39 39 39

The corresponding command used of APDU channel transmission as follows

Command	Class	INS	P1	P2	Le	Data
Write Serial Number	FF	69	44	42	11	68 92 E2 02 0C Data

Parameter description, Return format, SW1 SW2 status code as above

4.2.16 Read Serial Number

Read data of Serial Number from EEPROM

Command format:

Command	Class	INS	P1	P2	Lc
Read Serial Number	68	92	E2	03	0C

Return format:

Data Out
Data（12 bytes）+ SW1 SW2

Data: data of Serial Number

SW1 SW2 STATUS CODE:

	SW1	SW2	Meaning
Success	90	00	Command execution successfully
Fail	63	00	Command execution failed
	67	00	Wrong length
	68	00	Class byte is not correct
	69	00	Wrong data parameter
	6A	81	Function not supported
	6B	00	Wrong parameter P1-P2

Example:

Read data of Serial Number: 68 92 E2 03 0C

The corresponding command used of APDU channel transmission as follows

Command	Class	INS	P1	P2	Le	Data
Read Serial Number	FF	69	44	42	5	68 92 E2 03 0C

Parameter description, Return format, SW1 SW2 status code as above

4.2.17 Write Vendor MFG Date

Write data of Vendor MFG Date to EEPROM

Command format:

Command	Class	INS	P1	P2	Le	Data1	…	Data8
Write Vendor MFG Date	68	92	E2	04	08	Data(8 bytes)		

Parameter Description:

Data：data of Vendor MFG Date

Return format:

Data Out
SW1 SW2

SW1 SW2 STATUS CODE:

	SW1	SW2	Meaning
Success	90	00	Command execution successfully
Fail	63	00	Command execution failed
	67	00	Wrong length
	68	00	Class byte is not correct
	69	00	Wrong data parameter
	6A	81	Function not supported
	6B	00	Wrong parameter P1-P2

Example:

Write data of Vendor MFG Date, 68 92 E2 04 08 31 32 33 34 35 36 37 38

The corresponding command used of APDU channel transmission as follows

Command	Class	INS	P1	P2	Le	Data
Write Vendor MFG Date	FF	69	44	42	D	68 92 E2 04 08 Data

Parameter description, Return format, SW1 SW2 status code as above

4.2.18 Read Vendor MFG Date

Read data of Vendor MFG Date from EEPROM

Command format:

Command	Class	INS	P1	P2	Lc
Read Vendor MFG Date	68	92	E2	05	08

Return format:

Data Out
Data （8 bytes）+ SW1 SW2

Data: data of Vendor MFG Date

SW1 SW2 STATUS CODE:

	SW1	SW2	Meaning
Success	90	00	Command execution successfully
Fail	63	00	Command execution failed
	67	00	Wrong length
	68	00	Class byte is not correct
	69	00	Wrong data parameter
	6A	81	Function not supported
	6B	00	Wrong parameter P1-P2

Example:

Read data of Vendor MFG Date, 68 92 E2 05 08

The corresponding command used of APDU channel transmission as follows

Command	Class	INS	P1	P2	Le	Data
Read Vendor MFG Date	FF	69	44	42	5	68 92 E2 05 08

Parameter description, Return format, SW1 SW2 status code as above

4.2.19 Write Vendor MFG P/F

Write data of Vendor MFG P/F to EEPROM

Command format:

Command	**Class**	**INS**	**P1**	**P2**	**Le**	**Data1**	**…**
Write Vendor MFG P/F	68	92	E2	06	length	Data(1~4 bytes)	

Parameter Description:

Length: length of Vendor MFG P/F, Range：1~4

Data：data of Vendor MFG P/F

Return format:

Data Out
SW1 SW2

SW1 SW2 STATUS CODE:

	SW1	**SW2**	**Meaning**
Success	90	00	Command execution successfully
Fail	63	00	Command execution failed
	67	00	Wrong length
	68	00	Class byte is not correct
	69	00	Wrong data parameter
	6A	81	Function not supported
	6B	00	Wrong parameter P1-P2

Example:

Write data of Vendor MFG P/F, 68 92 E2 06 04 31 32 33 34

The corresponding command used of APDU channel transmission as follows

Command	**Class**	**INS**	**P1**	**P2**	**Le**	**Data**
Write Vendor MFG P/F	FF	69	44	42	**XX**	68 92 E2 06 length Data

Parameter description, Return format, SW1 SW2 status code as above

XX: means length of Data

Note:

The old data of Vendor MFG P/F will be erased when writing new data

4.2.20 Read Vendor MFG P/F

Read data of Vendor MFG P/F from EEPROM.

Command format:

Command	Class	INS	P1	P2	Lc
Read Vendor MFG P/F	68	92	E2	07	length

Parameter Description:

Length: length of Vendor MFG P/F, Range：1~4

Return format:

Data Out
Data （1-4byte）+ SW1 SW2

Data: data of Vendor MFG P/F

SW1 SW2 STATUS CODE:

	SW1	**SW2**	**Meaning**
Success	90	00	Command execution successfully
Fail	63	00	Command execution failed
	67	00	Wrong length
	68	00	Class byte is not correct
	69	00	Wrong data parameter
	6A	81	Function not supported
	6B	00	Wrong parameter P1-P2

Example:

Read data of Vendor MFG P/F, 68 92 E2 07 04

The corresponding command used of APDU channel transmission as follows

Command	**Class**	**INS**	**P1**	**P2**	**Le**	**Data**
Read Vendor MFG P/F	FF	69	44	42	5	68 92 E2 07 XX

Parameter description, Return format, SW1 SW2 status code as above

4.2.21 Write Diebold MFG Date

Write data of Diebold MFG Date to EEPROM

Command format:

Command	Class	INS	P1	P2	Le	Data1	…	Data8
Write Diebold MFG Date	68	92	E2	08	08	Data(8 bytes)		

Parameter Description:

Data：data of Diebold MFG Date

Return format:

Data Out
SW1 SW2

SW1 SW2 STATUS CODE:

	SW1	SW2	Meaning
Success	90	00	Command execution successfully
Fail	63	00	Command execution failed
	67	00	Wrong length
	68	00	Class byte is not correct
	69	00	Wrong data parameter
	6A	81	Function not supported
	6B	00	Wrong parameter P1-P2

Example:

Wrte data Diebold MFG Date, 68 92 E2 08 08 31 32 33 34 35 36 37 38

The corresponding command used of APDU channel transmission as follows

Command	Class	INS	P1	P2	Le	Data
Write Diebold MFG Date	FF	69	44	42	D	68 92 E2 08 08 Data

Parameter description, Return format, SW1 SW2 status code as above

4.2.22 Read Diebold MFG Date

Read data of Diebold MFG Date from EEPROM.

Command format:

Command	Class	INS	P1	P2	Lc
Read Diebold MFG Date	68	92	E2	09	08

Return format:

Data Out
Data(8 bytes)+ SW1 SW2

Data: data of Diebold MFG Date

SW1 SW2 STATUS CODE:

	SW1	SW2	Meaning
Success	90	00	Command execution successfully
Fail	63	00	Command execution failed
	67	00	Wrong length
	68	00	Class byte is not correct
	69	00	Wrong data parameter
	6A	81	Function not supported
	6B	00	Wrong parameter P1-P2

Example:

Read data of Diebold MFG Date, 68 92 E2 09 08

The corresponding command used of APDU channel transmission as follows

Command	Class	INS	P1	P2	Le	Data
Read Diebold MFG Date	FF	69	44	42	5	68 92 E2 09 08

Parameter description, Return format, SW1 SW2 status code as above

4.2.23 Write Diebold MFG P/F

Write data of Diebold MFG P/F to EEPROM

Command format:

Command	**Class**	**INS**	**P1**	**P2**	**Le**	**Data1**	**…**
Write Diebold MFG P/F	68	92	E2	0A	length	Data(1~4 bytes)	

Parameter Description:

Length: length of Diebold MFG P/F, Range：1~4

Data：data of Diebold MFG P/F

Return format:

Data Out
SW1 SW2

SW1 SW2 STATUS CODE:

	SW1	**SW2**	**Meaning**
Success	90	00	Command execution successfully
Fail	63	00	Command execution failed
	67	00	Wrong length
	68	00	Class byte is not correct
	69	00	Wrong data parameter
	6A	81	Function not supported
	6B	00	Wrong parameter P1-P2

Note:

The old data of Diebold MFG P/F will be Erased when writing new data

Example:

Write data of Diebold MFG P/F, 68 92 E2 0A 04 31 32 33 34

The corresponding command used of APDU channel transmission as follows

Command	**Class**	**INS**	**P1**	**P2**	**Le**	**Data**
Write Diebold MFG P/F	FF	69	44	42	**XX**	68 92 E2 0A length Data

Parameter description, Return format, SW1 SW2 status code as above

XX: length of Data.

4.2.24 Read Diebold MFG P/F

Read data of Diebold MFG P/F from EEPROM.

Command format:

Command	Class	INS	P1	P2	Lc
Read Diebold MFG P/F	68	92	E2	0B	Length

Parameter Description:

Length: length of data, range: 1~4.

Return format:

Data Out
Data （1-4byte）+ SW1 SW2

Data: data of Diebold MFG P/F

SW1 SW2 STATUS CODE:

	SW1	**SW2**	**Meaning**
Success	90	00	Command execution successfully
Fail	63	00	Command execution failed
	67	00	Wrong length
	68	00	Class byte is not correct
	69	00	Wrong data parameter
	6A	81	Function not supported
	6B	00	Wrong parameter P1-P2

Example:

Read data of Diebold MFG P/F, 68 92 E2 0B 04

The corresponding command used of APDU channel transmission as follows

Command	**Class**	**INS**	**P1**	**P2**	**Le**	**Data**
Read Diebold MFG P/F	FF	69	44	42	5	68 92 E2 0B Length

Parameter description, Return format, SW1 SW2 status code as above

4.2.25 Get Firmware Version

Get firmware version number of Reader

Command format:

Command	Class	INS	P1	P2	Lc
Get Firmware Version	68	92	00	05	00

Return format:

Data Out
Data1 Data2 … + SW1 SW2

Bellow shows example of firmware version number：

V1.0.0.1

SW1 SW2 STATUS CODE:

	SW1	SW2	Meaning
Success	90	00	Command execution successfully
Fail	63	00	Command execution failed
	67	00	Wrong length
	68	00	Class byte is not correct
	69	00	Wrong data parameter
	6A	81	Function not supported
	6B	00	Wrong parameter P1-P2

Example:

Get firmware version of Reader, 68 92 00 05 00

The corresponding command used of APDU channel transmission as follows

Command	Class	INS	P1	P2	Le	Data
Get Firmware Version	FF	69	44	42	5	68 92 00 05 00

Parameter description, Return format, SW1 SW2 status code as above

4.2.26 Restart Reader

Restart Read, Reader firmware to re-power。

Command format:

Command	Class	INS	P1	P2	Le	Data1	Data2	Data3
Restart Reader	68	92	80	FF	03	4B	30	00

Return format

Data Out
SW1 SW2

SW1 SW2 STATUS CODE:

	SW1	SW2	Meaning
Success	90	00	Command execution successfully
Fail	63	00	Command execution failed
	67	00	Wrong length
	68	00	Class byte is not correct
	69	00	Wrong data parameter
	6A	81	Function not supported
	6B	00	Wrong parameter P1-P2

Example:

Restart Reader, 68 92 80 FF 03 4B 30 00

The corresponding command used of APDU channel transmission as follows

Command	Class	INS	P1	P2	Le	Data
Restart Reader	FF	69	44	42	8	68 92 80 FF 03 4B 30 00

Parameter description, Return format, SW1 SW2 status code as above

Note:

5 After data return, module will restart automatically. Restart success after noises alarm.

FCC Requirement

Note: This 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 instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does 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.

You are cautioned that changes or modifications not expressly approved by the party responsible for compliance could void your authority to operate the equipment.

M/N: CRT-603
FCC ID: 2ACAACRT-603

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:
(1) this device may not cause harmful interference, and
(2) this device must accept any interference received, including interference that may cause undesired operation.