CRT-603-CZ1 Contactless Card Reader Module

User Manual

(V1.0.0.0)

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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-CZ1 is a USB dual interface card reader running on Windows including conctactless 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 2 SAM slot of the SAM card reader interface to operate
- ➢ Automatic search contactless card and peferctly handle multiple card conflict.
- ➢ Support ISO14443-4 type A&B contactless cards
- ➢ Support ISO14443-3 S50,S70 and UL etc contactless Storage Card.
- ➢ Support ISO7816 SAM card
- ➢ Firmware online update through USB (supplier IAP tool provided)
- ➢ DC 5V, static current 200mA, dynamic current 220mA, peak current 250mA
- ➢ EMC、QPBOC、EMV、CB、WHQL certified
- ➢ Operation environment: -10 -10℃ ~ 60℃, 0 ~ 95 % RH (No condensing);
  Humidity 5 to 95% (No condensing) TA<= 60℃
- ➢ Storage Environment: -40℃ ~ 70℃, 0 ~ 95 % RH (NO condensing) ;
  Humidity 5 to 95% RH (No condensing) TA<= 70℃

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 3 main components:

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

② Antenna board: connected to main board with a 3 pins cable

③ LED board: Red, Green, Blue and Yellow LED lights, the LED board is connected to main board with a 6 pins cable

2.2 Images of boards

Main board

Antenna board

LED board

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 enter detection area at the same time, cards will conflict with each other, the result caused by conflict is as following

Card existence	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 conflict)
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 Bcard, not able to activate any card	Special ATR (indicate card conflict)
One TYPE A and one TYPE B card	Detect more than one card, not able to activate any card	Special ATR (indicate card conflict)
More than one TYPE A and more than one TYPE B card	Detect more than one card, not able to activate any card	Special ATR (indicate card conflict)

5．Contactless card reader also provides 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 2 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
SAM slot status	Get status of reader,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		
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 2 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

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. Before execute switching SAM card slot, recommended inquire the card slot is in the presence of the card

4.2.2 Get SAM slot status
Get status of reader,   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= 0x00;
Data2: SAM card slot detection result

Bit	Description
7	0：Remain
6	0：Remain
5	0：Remain
4	0：Remain
3	0：Remain
2	0：Remain
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 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 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 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

4.2.11 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:

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

4.2.12 Enter IAP Mode

This command is executed, the reader will enter the IAP program update state, and then user can update software of firmware, this is usually a way to patch the bug of the reader firmware

Command format:

Command	Class	INS	P1	P2	Le	Data1	Data2	Data3
Enter IAP Mode	68	92	80	FF	03	4B	31	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:

Enter IAP mode, 68 92 80 FF 03 4B 31 00

The corresponding command used of APDU channel transmission as follows

Command	Class	INS	P1	P2	Le	Data
Enter IAP Mode	FF	69	44	42	8	68 92 80 FF 03 4B 31 00

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

Note:

This command is executed, the reader will automatically restart. And then enter IAP Download process.
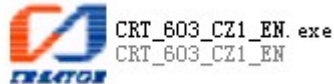
5 Demo Operation

5.1 Connect reader to host

Connect all components of the reader with cables provided and connect the reader's USB to the host. The power indicator on main board will be on and buzzer beeps.

5.2 Run demo program

CRT_603_CZ1_EN.exe
CRT_603_CZ1_EN

5.3 Driver installation and demo description

It may be required to install driver for first-time usage of the reader. Driver installation instruction can be found in the 'DRIVER' folder in reader's SDK. Please disconnect and connect the read with computer after driver installation is completed.

Click 'Registered CCID' and disconnect and then connect the reader's USB with computer.

5.4 Demo Function

This area provides contactless card and SAM card operation.
Main function:
Connect/disconnect reader command operation, get card information, send APDU commands etc.
Card reader list: Choose contactless card reader or SAM card reader.
Mifare one card operation: S50, S70, UL card etc card operation.
Change Card Slot: Choose SAM card slot to operate.
Transmit Extended Capabilities Command: manually send Extended Capabilities Command.
Check SAM card slot: to check SAM card board and SAM card slot status.

Demo Operation

1>.Firstly click 'Establish Context '.

2>.Then click 'Get Reader List'. The following 2 options will be provided on the upper area of Demo, which are the 2 card reader. RF card reader is for contactless card operation; SAM card reader is for SAM card operation. Choose one of them for further operation.

Smart Card Reader List

CREATOR CRT-603 [CZ1] CCR RF 0

CREATOR CRT-603 [CZ1] CCR RF 0
CREATOR CRT-603 [CZ1] CCR SAM 1

3>.For SAM card reader, it is required to choose one SAM slot from the 2 SAM slots by 'Change Card Slot' commands before card reading/writing. SAM 1 card and SIM 2 cards are the 2 cards which will be inserted into the 2 SAM slots on main board. If 'Change Card Slot' command is successful, SAM card will be activated, corresponding SAM slot indicator will be on and reader will return status code '9000'. (The indicator's brightness will vary due to different card's activation voltage). Return '6300' indicates card activation failure.

The following can be found in log area if 'Change Card Slot' command is successful:
    SCardConnect(SCARD_SHARE_DIRECT)...OK
        Send Buffer : 68 92 01 00 03 01 00 00
        Receive Buffer : 90 00
    SCardControl...OK
    SCardDisconnect...OK
        Card Status:Card Inserted
    SCardGetStatusChange... OK
    SCardConnect(SCARD_SHARE_EXCLUSIVE)...OK

4>. Click 'Connect Reader'. If any card is activated, 'Connect Reader' command is successful.

The following can be found in log area after 'Connect Reader' command is successful:

    SCardDisconnect...OK
    SCardConnect(SCARD_SHARE_EXCLUSIVE)...OK
5>.Click ' SCard Status' to get card ATR.

The following can be found in log area:
    SCardStatus...OK
    ATR : 3B 9E 94 80 1F C3 80 31 E0 73 FE 21 1B 66 D0 00 2B 18 02 00 37
    State : SCARD_SPECIFIC
    Protocol : SCARD_PROTOCOL_T0

6>.If ATR format is not a standard one, click 'Begin Transaction' .

7>.Operate card until application is completed

User can use all command buttons in Mifare one card operation area to operate S50, S70, UL series cards.

User can send APDU commands directly to operate Contactless CPU card and SAM card.

It is required to input command first in sending command area first to send APDU commands. For sending more than one APDU command in one time, please choose 'Transmit APDU Multi-APDUs', and then click 'Transmit APDU commands'. Operation result can be found in log area.

Input APDU   ☐ Transmit APDU Multi-APDUs

00 84 00 00 08

8>.Click 'End Transaction'.
9>.Click 'Disconnect Reader' to send disconnect reader command.
10>. Click 'Release Context'.

5.5 Card reader operation

5.5.1 Contactless card reader operation

1. Choose RF card reader

2. Click 'Connect Reader' button

3. Click 'ScardStatus' button. Get card status to confirm whether card conflict occurs according to ATR.

4. Click 'Begin Transaction' button

5. Send APDU command to operate card (Forcedly send APDU when card conflict occurs, reader will return status code 6A 81)

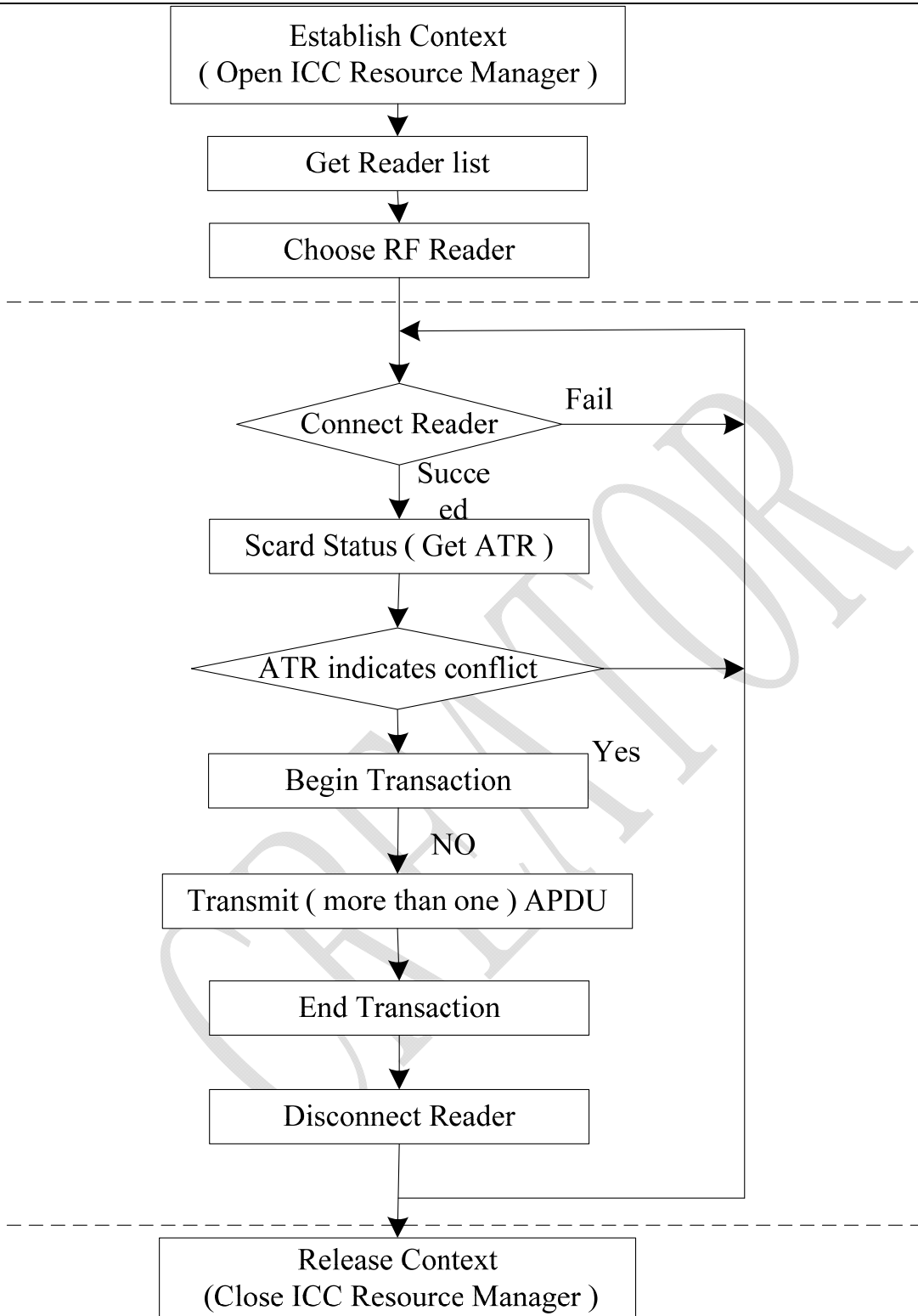6. Click 'End Transaction' button

7. Click 'Disconnect Reader' button

Establish Context
(Open ICC Resource Manager)

Get Reader list

Choose RF Reader

Connect Reader — Fail

Succeed

Scard Status (Get ATR)

ATR indicates conflict

Begin Transaction — Yes

NO

Transmit (more than one) APDU

End Transaction

Disconnect Reader

Release Context
(Close ICC Resource Manager)

RF Reader operation flow chart

5.5.2 SAM card reader operation
1. Choose SAM card reader
2. Click 'Check SAM Slot Status' button - check which SAM card slot has a SAM card already inserted
3. Click 'Chang Card Slot' button - choose card slot
   (Return '9000' indicates card activation is successful; Return '6300' indicates failure.)
4. Click 'Connect Reader' button
5. Click 'Begin Transaction' button
6. Send APDU command
7. Click 'End Transaction' button
8. Click 'Disconnect Reader' button

If 'Change Card Slot' command is not implemented or this command fails, reader will return error code '80100069' upon 'Connect Reader' command is sent. (The smart card has been removed).

If a SAM card being operated is removed, SAM card slot will be powered off automatically and reader will return error code '80100069'（The smart card has been removed）if any command is sent.

To operate a SAM card this is inserted to this card slot again, it is required to send 'Change Card Slot' command to choose this card slot first and send 'Connect Reader' command again.
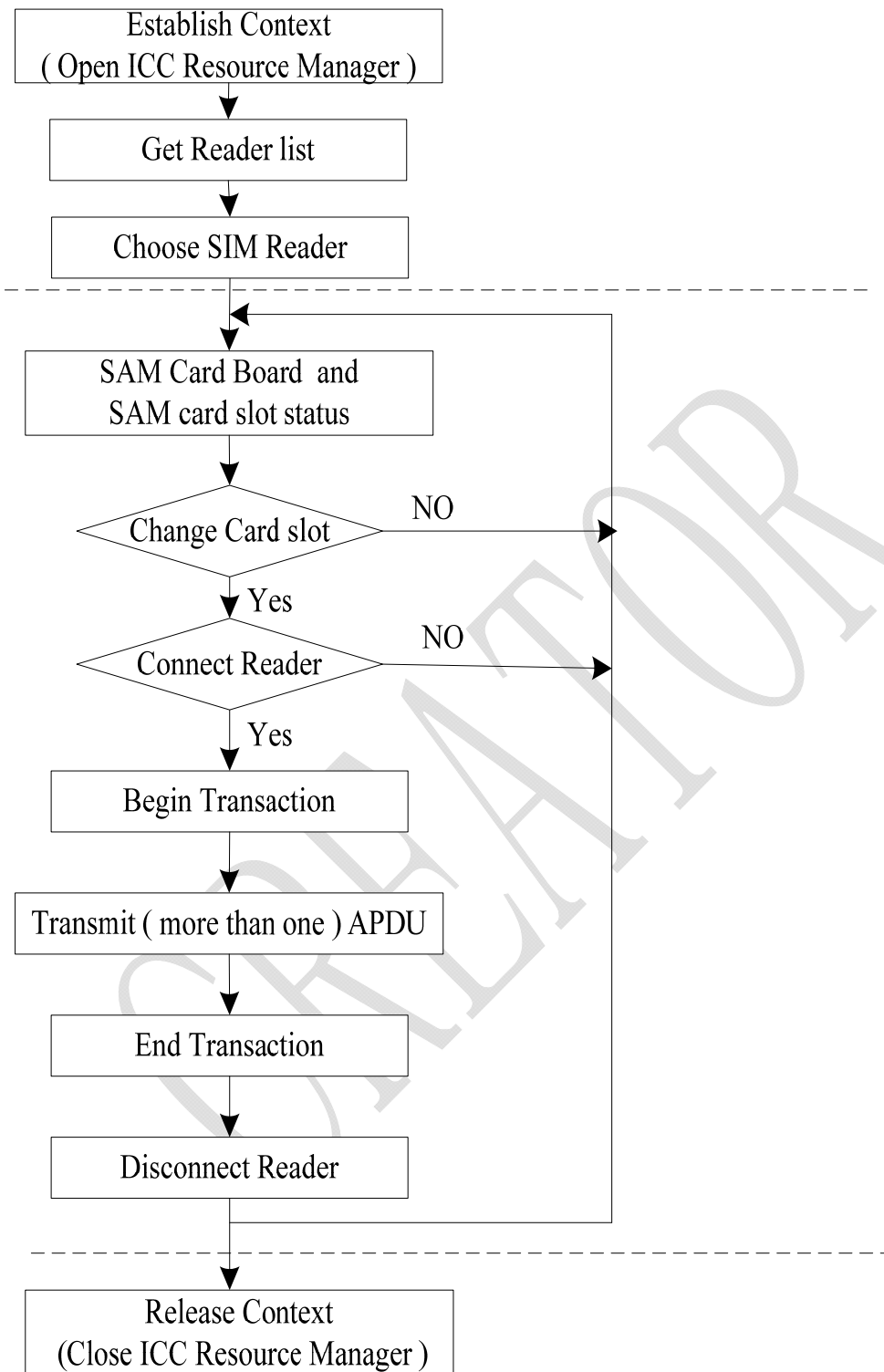
Establish Context
(Open ICC Resource Manager)

↓

Get Reader list

↓

Choose SIM Reader

- -

SAM Card Board and
SAM card slot status

↓

Change Card slot —— NO →

↓ Yes

Connect Reader —— NO →

↓ Yes

Begin Transaction

↓

Transmit (more than one) APDU

↓

End Transaction

↓

Disconnect Reader

- -

Release Context
(Close ICC Resource Manager)

SIM Reader operation flow chart

6 IAP TOOL

IAP tool can be used for firmware update, get present firmware version and import CCID key information into registry.
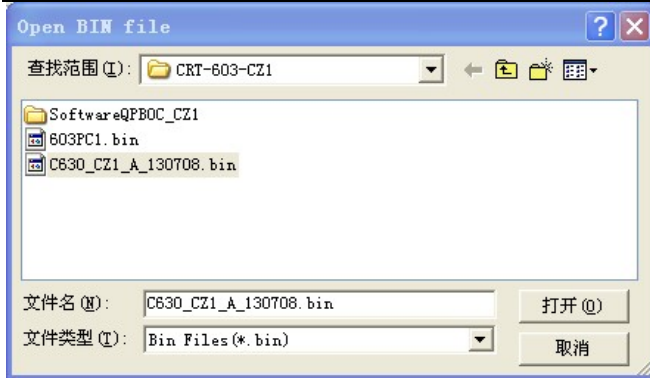
IAP operating window:

6.1 Get current firmware version

After the reader is connected to the computer with USB cable, click 'Get FIREWARE Ver' to get current firmware version

6.2 Get the update firmware file version

Click 'Get Firmware File Version' and choose the update file to get the update firmware file version

6.3 Firmware update

1. Check whether current firmware version and the update firmware file version are correct.

2. Click 'Jump to the IAP mode'. IAP mode driver (HID) will be installed automatically for first-time usage. After buzzer gives a short beep, reader will jump to IAP mode.

3. Click 'Download File and Exit IAP MODE' and choose the binary file to be downloaded. Blue light flash constantly until update is completed.

4. Click 'Exit' to close the program after download is completed.

6.4 Get CRT-603 device mode

Reader works under CCID mode in normal usage. Reader works under HID mode when it enters IAP download. User can use 'Get CRT-603 Device Mode' button to check the reader's current working mode.

Note: If failure occurs during download, please power off and power on the reader again, and then repeat section 6.3.