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CRT-310 (V3.0) Card Reader Communication Protocol

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1. Communication Format

Baud rate (BPS): Defined by the Host, (default 9600BPS),
(1200/2400/4800/9600/19200/38400BPS)

Communication type: Asynchronous communication

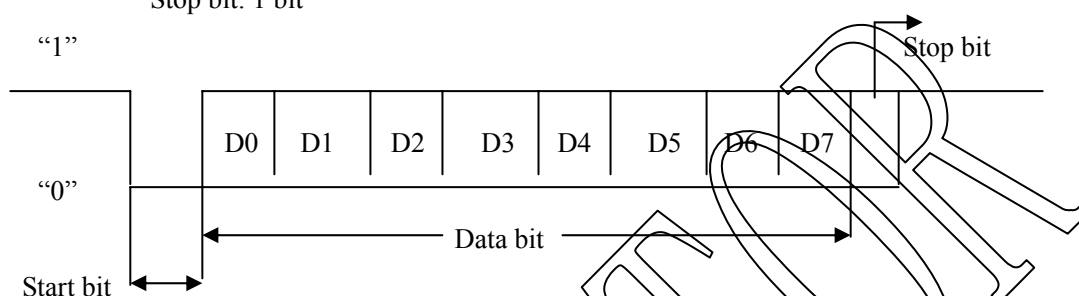
Transmit type: Half duplex

Bit detail: Start bit: 1 bit

Data bit: 8 bit

Parity bit: None

Stop bit: 1 bit



2. Communication Control Method

The unit, as a driven part, start working after received command from host


3. Command Character

STX (0X02)	Start character of data package
ETX (0X03)	End character of data package
ENQ (0X05)	Sending require command (host -> reader)
ACK (0X06)	Positive answer(reader-host)
NAK (0X15)	Negative answer(reader-host)
EOT (0X04)	Cancel communication

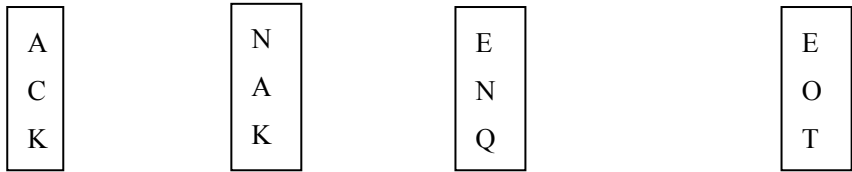
4. Communication Command Structure (Data package format of command and returned information)

STX(0x02)	Command package	ETX (0x03)	BCC
-----------	-----------------	------------	-----

BCC(Block check character), $BCC = STX \oplus \text{Command Package} \oplus ETX$ (\oplus is BCC calculation character)

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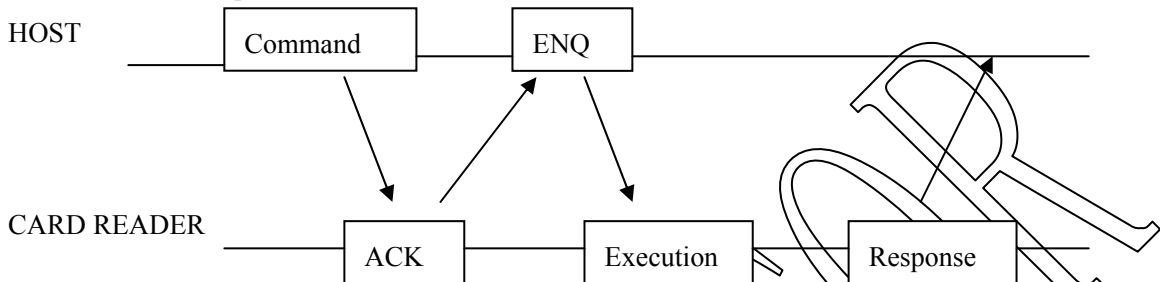
5. Control Command Structure



6. Communication Process Descriptions

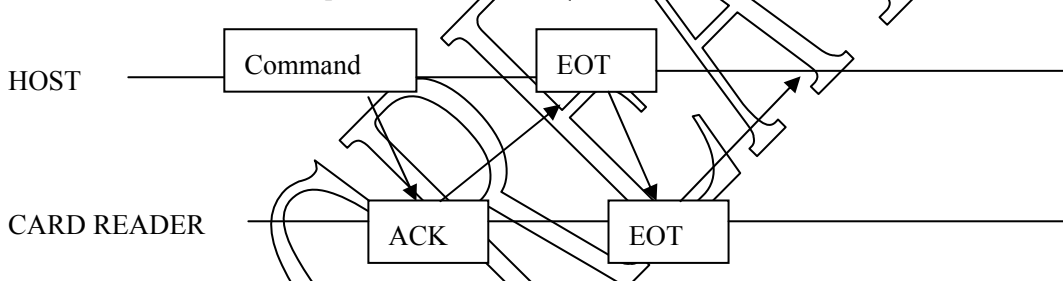
6.1 Normal communication process (command operation)

A Command operation



Host sends command, Reader receives and checks if BCC is correct. Host sends ENQ after return ACK, Reader will execute the relevant operation and return relevant operation information to host according the command.

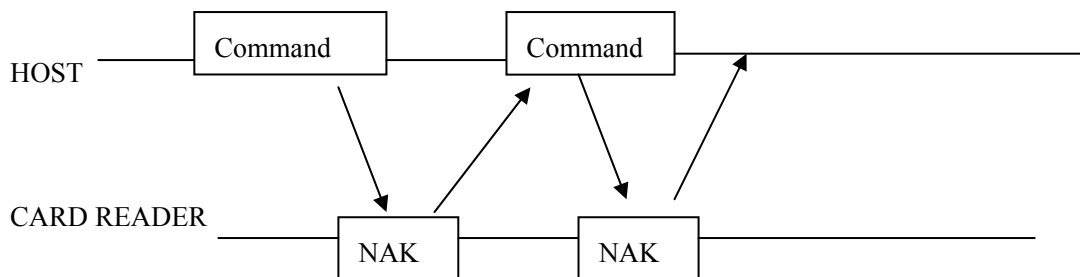
B Cancel Command operation




Host send EOT, Reader end current command status and return EOT, then waiting for Host command.

6.2 Abnormal communication process

6.2.1 BCC error

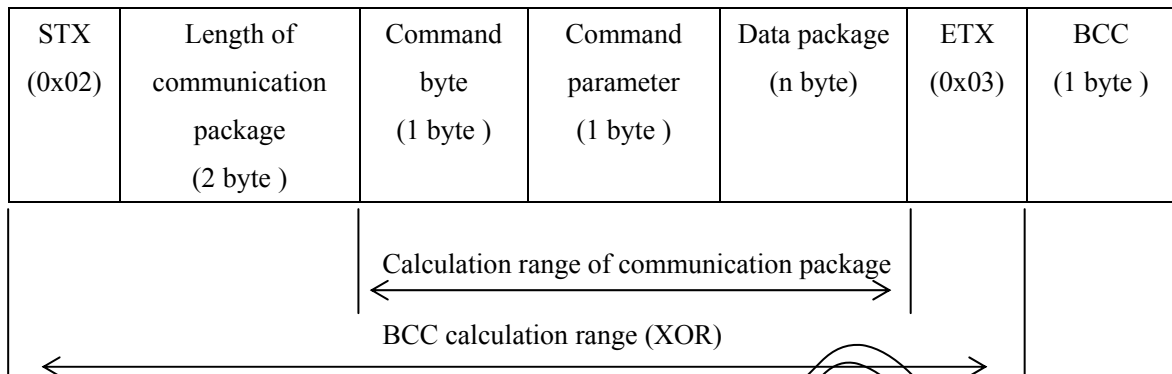


Card reader received a communication package and BCC is error, send NAK to HOST to show BCC error. Host need check its communication package BCC is correct or not. Resend it after checking is correct. Card reader will not send ACK to HOST until it receives that communication package BCC is correct.

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7. Communication Operation

7.1 Send command data package format

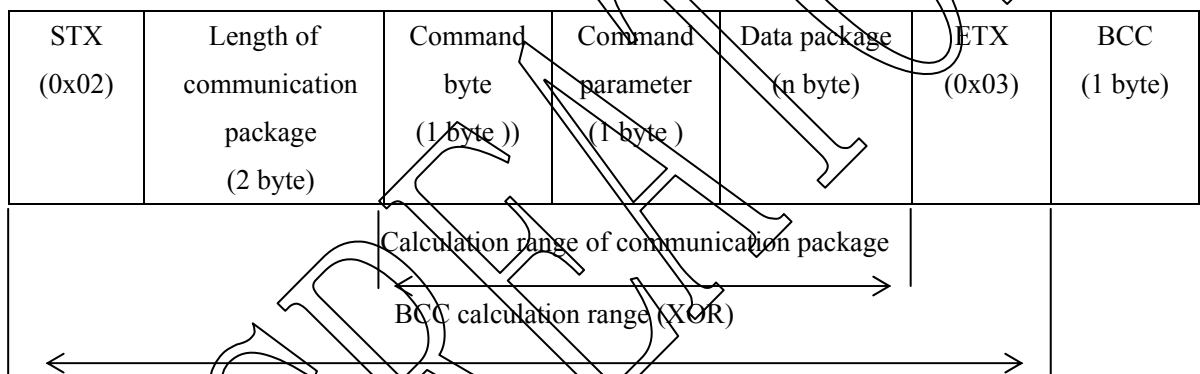


a. n byte: range of n: Max=264 byte. Min=0 byte

b. Communication package in 2 bytes transmit, former one is high byte, behind one is low byte

7.2 Returned data package format

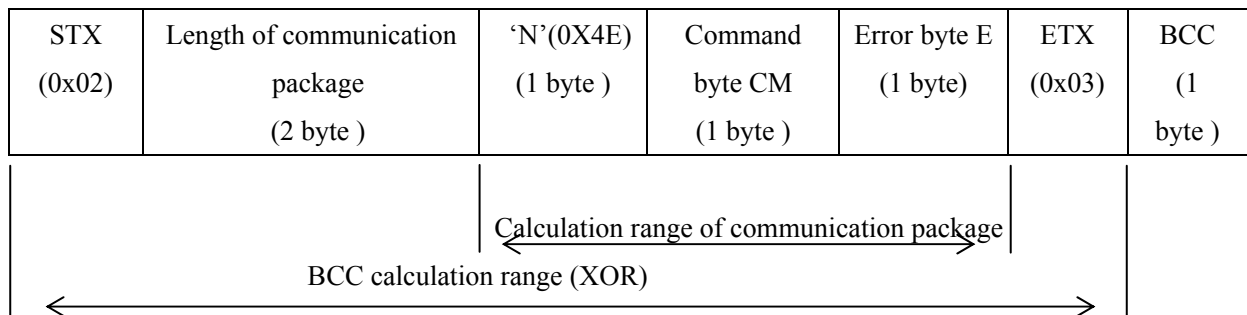
7.2.1 Normal return




a. n byte: range of n: Max=264 byte. Min=0 byte

b. Returned command byte and command parameter is the operated command byte and command parameter transmit from Host to Reader

7.2.2 Abnormal return




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Meaning of error byte E

Error byte E	Description
0x00	Command byte error. Command byte CM is included in the sending communication package. And the command byte CM does not accord with the communication protocol.
0x01	Command parameter error. Command parameter PM is included in the sending communication package. And the command parameter PM does not accord with the communication protocol.
0x02	Command can not be executed. Command can not be executed because of restriction.
0x04	Command data error. Part of the communication package is not accordance with the communication protocol.
0x05	Input Voltage is not in the range of the Reader operation voltage. The input voltage is not in the range of 10.8V~14.5V, and the Reader is under protection status.
0x06	Abnormal card in the Reader. Need command from Host to deal with these cards.
0x07	Main power of Reader is off-power, the backup power under working. So other command could not be executed.

Note: Abnormal returned data package appears. It is a returned message from the Host when the sending communication package, command byte or command parameter and Reader is in abnormal condition.

1. Error byte E=0x00 It means the command byte of communication package from Host is an undefined command byte in communication protocol. It is illegal command.
2. Error byte E=0x01 It means the command parameter of communication package from Host is an undefined command byte in communication protocol. It is illegal command. When it happens, please check the command byte defined range of communication. Especially when operating the IC card, the value range of command parameter (Operation address, operation length) could not overrun the defined operation address space range of IC card. Otherwise, the Reader returns Error.
3. Error byte E=0x02 It means the Host does not support the function and it could not accept the communication package form Host. It could not be executed and Reader returns error. Please check your Reader model when it happens. For example, when you send communication package of Reading Magnetic card, but the Reader without this function, then it returns that command could not be executed. When you send operation communication package to Reader, but it is without the function of operating RF card, then it returns that command could not be executed as well. Please notice the specification of the reason why command could not be executed in the communication protocol.
4. Error byte E=0x04 It means the data package of communication package from Host is not accordance with communication protocol. There are mistakes of the format of data package, and it could not be

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executed, then returns error. This error always happens during the CPU card C-APDU operation when it check the data package whether is right or not.

5. Error byte E=0x05 It means the input voltage runs out of operation voltage range(Rated voltage:10.5V-14.5V ,12V is suggested). Reader is under protection status, and it could not execute command , enter card in and move card. Only communication operation will be responded.
6. Error byte E=0x06 It means abnormal length card in the Reader and it is not an ISO standard card(Long card, short card and damaged card). Receive communication package from Host, then Reader returns error and indicate to clear the abnormal card.
7. Error byte E=0x07 It means the power supply has two methods: Main power supply and backup power supply. When the main power supply is off-power, backup power supply will run. After receiving communication package from Host, Reader returns error.

8. CRT-310 Card Reader Operation Command

Operation Command List

Command	Command byte CM	Command parameter PM	Description
Card Stop position setup	0x2E	Pm	The card stop position setup after card enters into the card reader and read the data from magnetic card.
Card in control	0x2F	Pm1,Pm2	Enable or Disable card in from front side or rear side
Reset	0x30	0x30	Reset card reader, return the software version
		0x31	Reset card reader, eject it to the front side if there is a card in, return the software version
		0x32	Reset card reader, eject it to the rear side if there is a card in, return the software version
Read/write S/N (Only V3.0)	0x30	0x3A	Read the S/N from the card reader
		0x3B	Write the S/N to the card reader
Check status	0x31	0x2F	Check status of each sensor
		0x30	Check status of reader(e.g. Whether card in or not)
Check IC card type	0x31	0x31	Check IC Card type automatically
Move card operation	0x32	0x2E	Enter card stopped at the position with holding card or position inside reader into the card reader
		0x2F	Move the card stopped at the position with holding card or position inside reader to the IC card operation position. And then card read/write IC card.
		0x30	Eject card from front side without holding

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		0x31	Eject card from front side and hold it
		0x32	Eject card from rear side and hold it
		0x33	Eject card from rear side without holding
IC card power on/off	0x33	0x30	IC card power on
		0x31	IC card power off
SIM card power off	0x4A	0x31	SIM card power off
Set comm. Baud rate	0x34	0x30	UART=1200 BPS
		0x31	UART=2400 BPS
		0x32	UART=4800 BPS
		0x33	UART=9600 BPS
		0x34	UART=192000 BPS
		0x35	UART=384000 BPS
Each card operation command, see operation process introduction			

8.1 Reset Command

8.1.1 Reset

Host sends: (Pm=0x30, 0x31, 0x32)

0x02	0x00	0x02	0x30	Pm	0x03	BCC
------	------	------	------	----	------	-----

Pm=0x30 Reset card reader, return the software version

Pm=0x31 Reset card reader, return the software version, eject it to the front side without holding

Pm=0x32 Reset card reader, return the software version, eject it to the rear side without holding

Reader returns:

0x02	0x00	0x0F	0x30	Pm	Card reader version SV	0x03	BCC
------	------	------	------	----	------------------------	------	-----

Card reader version: CRT310 card reader SV= 'CRT 310 V3.0'

8.1.2 Read CRT-310 Card Reader's S/N

Host sends:

0x02	0x00	0x02	0x30	0x3A	0x03	BCC
------	------	------	------	------	------	-----


Reader operation succeeded returns Operation status byte P='Y' (0x59)

0x02	Communication package length 2 byte	0x30	0x3A	Operation status byte P	S/N data package	0x03	BCC
------	-------------------------------------	------	------	-------------------------	------------------	------	-----

S/N data default value="CRT 310 V3.0"

Reader operation failed: Operation status byte P='N' (0x4E)

0x02	0x00	0x03	0x30	0x3A	Operation status byte P	0x03	BCC
------	------	------	------	------	-------------------------	------	-----

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8.1.3 Write CRT-310 Card Reader's S/N

Host sends:

0x02	Communication package length 2 byte	0x30	0x3A	N byte S/N data package	0x03	BCC
------	-------------------------------------	------	------	-------------------------	------	-----

Reader returns:

0x02	0x00	0x03	0x30	0x3A	Operation status byte P	0x03	BCC
------	------	------	------	------	-------------------------	------	-----

Operation status byte P='Y' (0x59)

P='N' (0x4E)

N byte S/N data package: S/N data will be written, N = 0x01—0x10 (S/N data (min)=1 byte, S/N data (max)=16 byte)

Write data in HEX code mode.

8.2 CRT310 Card In Control, Stop Position setup operation

8.2.1 CRT310 Card In Control Setup Command Operation

Host sends:

0x02	0x00	0x03	0x2F	Pm1	Pm2	0x03	BCC
------	------	------	------	-----	-----	------	-----

Pm1=0x31 Prohibit card in from front side

Pm1=0x32 Allow card in by Magnetic card mode (both magnetic signal and switch should be valid, the allow card in). Only allow card in from front shutter

Pm1=0x33 Allow card in by switch mode. Allow Magnetic card, IC card, Mifare 1 card and dual interface card in from front shutter

Pm1=0x34 Allow card in by Magnetic signal mode. It is especially suitable for the thin paper magnetic card

Pm2=0x30 Allow card in from rear side

Pm2=0x31 Prohibit card in from rear side

Reader returns:

0x02	0x00	0x04	0x2F	Pm1	Pm2	Card reader status byte S	0x03	BCC
------	------	------	------	-----	-----	---------------------------	------	-----

S='N' (0x4E) success

S='Y' (0x59) failure

After the reader executes power on or reset command, the default card in mode is allowing card in by switch mode and allow card in from rear side.

Note: To the reader without electric shutter, it only could response card in by switch mode. It is not allowed card in by magnetic card mode and in magnetic signal mode, or the Reader will return "Command could not be executed".


8.2.2 CRT310 Stop Position Setup (Set the stop position after card in and read magnetic card)

After card reader executes power on or reset, the default stop position is stopping inside the reader

Host sends:

0x02	0x00	0x02	0x2E	Pm	0x03	BCC
------	------	------	------	----	------	-----

Pm=0x30 Card in and stop in the front side without holding the card.

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- Pm=0x31 Card in and stop in the front side with holding the card.
- Pm=0x32 Card in and stop inside the front side, but IC card contact does not connect with card, and RF (Mifare one) card is ready to be read/written.
- Pm=0x33 Card in and stop inside the front side, and IC card contact connects with card, IC card and RF (Mifare one) card is ready to be read/written.
- Pm=0x34 Card in and stop in the rear side with holding the card.
- Pm=0x35 Card in and stop in the rear side without holding the card.

Reader returns:

0x02	0x00	0x03	0x2E	Pm	Card reader status S	0x03	BCC
------	------	------	------	----	----------------------	------	-----

S='N' (0x4E) failure

S='Y' (0x59) success

Note: When we execute setting stop card at IC card operating position after card in on the Reader without IC Card module, the Reader will return "Command could not be executed". The operation of setting stop card at IC card operating position will be invalid.

8.3 CRT310 Card reader Status Information

8.3.1 CRT310 Card reader status checking


Host Sends:

0x02	0x00	0x02	0x31	0x30	0x03	BCC
------	------	------	------	------	------	-----

Reader Returns

0x02	0x00	0x05	0x31	0x30	Card reader status S1	Card reader status S2	Card reader status S3	0x03	BCC
------	------	------	------	------	-----------------------	-----------------------	-----------------------	------	-----

- S1=0x46 With long card in the card reader. (The card is longer than the standard card)
- S1=0x47 With short card in the card reader. (The card is shorter than the standard card)
- S1=0x48 Card stops at the front side position without holding card. (In other words, card is ejected from the front side) .
- S1=0x49 Card stops at the front side position with holding card.
- S1=0x4A Card stops inside the card reader.
- S1=0x4B Card stops inside the card reader, and contact connects with IC card.
- S1=0x4C Card stops at the rear side position with holding card.
- S1=0x4D Card stops at the rear side position without holding card. (In other words, card is ejected from the rear side and captured) .
- S1=0x4E No card in the reader.
- S2=0x49 Allow card in by magnetic card mode and only allow magnetic card in by opening the shutter.
- S2=0x4A Allow card in by switch mode. Allow magnetic card, IC card, M1 RF card and dual interface card in.
- S2=0x4B Allow card in by magnetic signal mode. Allow thin paper magnetic card in.
- S2=0x4E Prohibit card in.

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S3=0X4A Allow card in from rear side. Allow magnetic card, IC card, M1 RF card and dual interface card in.

S3=0x4E Prohibit card in from rear side.

8.3.2 CRT310 Sensor Status Checking (Compatible with V2):

Host sends: Reader checks the sensor status automatically (5pcs infrared sensors status, shutter status, switch sensor status).

0x02	0x00	0x02	0x31	0x2F	0x03	BCC
------	------	------	------	------	------	-----

Reader returns:

0x02	0x00	0x09	0x31	0x2F	PSS1	PSS2	PSS3	PSS4	PSS5	CTSW	KSW	0x03	BCC
------	------	------	------	------	------	------	------	------	------	------	-----	------	-----

PSS1—PSS5: infrared sensor status

PSS (1...5) =0X30 no card on the sensor position;

PSS (1...5) =0X31 with card on the sensor position.

CTSW: Shutter status

CTSW=0X30 shutter is close

CTSW=0X31 shutter is open

KSW: Switch sensor status

KSW=0X30 switch doesn't get the signal of card going though shutter.;

KSW=0X31 switch gets the signal of card going though shutter.

8.3.3 CRT310 Sensor Status Checking (Only for V3):

Host sends: Reader checks the sensor status automatically (6pcs infrared sensors status, shutter status, switch sensor status).

0x02	0x00	0x02	0x31	0x2E	0x03	BCC
------	------	------	------	------	------	-----

Reader returns:

0x02	0x00	0x0A	0x31	0x2E	PSS0	PSS1	PSS2	PSS3	PSS4	PSS5	CTSW	KSW	0x03	BCC
------	------	------	------	------	------	------	------	------	------	------	------	-----	------	-----

PSS0—PSS5: infrared sensor status:

PSS (0...5) =0X30 no card on the sensor position;

PSS (0...5) =0X31 card on the sensor position;

CTSW: Shutter status

CTSW=0X30 shutter is close

CTSW=0X31 shutter is open

KSW: switch sensor status

KSW=0X30 switch doesn't get the signal of card going though shutter.

KSW=0X31 switch doesn't get the signal of card going though shutter..

8.4 CRT310 Auto testing the type of IC card:

Host sends: reader auto testing the card type, and return the card type


0x02	0x00	0x02	0x31	0x31	0x03	BCC
------	------	------	------	------	------	-----

Reader returns:

0x02	0x00	0x04	0x31	0x31	Card type byte S1	Card type byte S2	0x03	BCC
------	------	------	------	------	-------------------	-------------------	------	-----

Card type byte: S1, S2:

Card type byte S1	Card type byte S2	Card type instruction
'N'	'0'	No card inside
	'1'	Unknown card type
	'2'	Card is not in the right position where it can be operated.

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'0'	'0'	RF ID card (Contactless)
'1'	'0'	T=0 Contact CPU card
	'1'	T=1 Contact CPU card
'2'	'0'	24C01 card
	'1'	24C02 card
	'2'	24C04 card
	'3'	24C08 card
	'4'	24C16 card
	'5'	24C32 card
	'6'	24C64 card
'3'	'0'	SL4442 card
	'1'	SL4428 card
'4'	'0'	AT88S102 card
	'1'	AT88S1604 card
	'2'	AT88S102 card
	'3'	AT88SC1608 Card

Note: Auto testing the type of card, only supports testing the card type of Mifare one RF card and contact IC card, but not dual interface card. For contact card, the testing result is only for reference because the testing result may be not correct if the card is not clean.

8.5 CRT310 Card reader card move operation

Move the card which is stopped in the position with holding card or position inside the reader to a new position and wait for operation.

Host sends:

0x02	0x00	0x02	0x32	Pm	0x03	BCC
------	------	------	------	----	------	-----

Pm=0x2E Move card inside the reader, then do RF(M1) R/W.

Pm=0x2F Move card inside the reader, contact connect with IC card then do IC card R/W.

Pm=0x30 Move card to the front side without holding the card on the position.

Pm=0x31 Move card to the front side with holding the card on the position.

Pm=0x32 Move card to the rear side with holding the card on the position.

Pm=0x33 Move card to the rear side without holding the card on the position.

Pm=0x34 Eject the abnormal card out of the reader from the rear side, for short card, shall use the standard card to support to eject it out of the reader (This command is used to clean the card inside.)


Reader returns:

0x02	0x00	0x03	0x32	Pm	Operation status byte P	0x03	BCC
------	------	------	------	----	-------------------------	------	-----

P='Y' (0x59) success

P='N' (0x4E) failure

P='E' (0x45) no card in reader

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P='W' (0x57) card is not in the right position where it can be operated.

Note: When the card is not on the position with holding card or position inside the reader, if we execute the command such as eject card or card in, it will return "card is not in the right position where it can be operated".

When we execute moving card to IC card operating position after card in on the Reader without IC Card module, the Reader will return "Command could not be executed". The operation of moving card to IC card operating position will be invalid.

8.6 IC Card、SIM Card Power On/Off

8. 6. 1 Contact IC Card Power On/Off

Host sends:

0x02	0x00	0x02	0x33	Pm	0x03	BCC
------	------	------	------	----	------	-----

Pm=0x30 IC Card Power on

Pm=0x31 IC Card Power off

Reader returns:

0x02	0x00	0x03	0x33	Pm	Operation status byte P	0x03	BCC
------	------	------	------	----	-------------------------	------	-----

Operation status byte P='Y' (0x59) success
P='N' (0x4E) failure
P='E' (0x45) no card in reader
P='W' (0x57) card is not in the right position where it can be operated.

Note: When the card is not on the position with holding card or position inside the reader, if we execute the command "IC card power on/off", it will return "Command could not be executed".

When we execute the command "IC card power on/off" on the Reader without IC Card module, the Reader will return "Command could not be executed". The operation of "IC power on/off" will be invalid.

8. 6. 2 SIM Card Power Off

Host sends:

0x02	0x00	0x02	0x4A	0x31	0x03	BCC
------	------	------	------	------	------	-----

Pm=0x31 SIM Card power off


Reader returns:

0x02	0x00	0x03	0x4A	Pm	Operation status byte P	0x03	BCC
------	------	------	------	----	-------------------------	------	-----

Operation status byte P='Y' (0x59) success
P='N' (0x4E) failure

Note: SIM card Power on is executed when Reader execute SIM Card Reset operation.

When we execute SIM Card Power On/Off on the Reader without SIM Card function, the Reader will return "Command could not be executed". The operation of SIM Card Power On/Off will be invalid.

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8.7 Shutter indicator light control operation

8. 7. 1 Indicator Light On/Off operation

Host resends:

0x02	0x00	0x02	0x46	Pm	0x03	BCC
------	------	------	------	----	------	-----

Pm=0x30 Indicator light on

Pm=0x31 Indicator light off

Reader returns:

0x02	0x00	0x03	0x46	Pm	Operation status byte P	0x03	BCC
------	------	------	------	----	-------------------------	------	-----

Operation status byte P='Y' (0x59) success

8. 7. 2 Twinkle Indicator Light Operation (Twinkle cycle is adjustable)

Host sends:

0x02	0x00	0x03	0x49	Pm1	Pm2	0x03	BCC
------	------	------	------	-----	-----	------	-----

Pm1: time value of indicator light on (Pm1=0x00-0xFF, time value=0.25s X Pm1)

Pm2: time value of indicator light off (Pm2=0x00-0xFF, time value=0.25s X Pm2)

Reader returns:

0x02	0x00	0x04	0x49	Pm1	Pm2	Operation status byte P	0x03	BCC
------	------	------	------	-----	-----	-------------------------	------	-----

Operation status byte P='Y' (0x59) Success

Time cycle of indicator light flashing one time=Time Pm1 + Time Pm2. Minimum twinkle time cycle is 0.5S (Pm1=0x01,Pm2=0x01) .

When Pm1=0x00 and Pm2 is any time value, then indicator light is off all the time;

when Pm2=0x00 and Pm1=0x01-0xFF, then indicator light is on all the time.

Notice: After Reset power on or reset, the indicator light of shutter will be off. Then execute **8.7.1 Indicator Light On/Off operation**, twinkle Indicator Light Operation exits. The indicator light status depends on **Indicator Light On/Off operation**.

8.8 Set baud rate of comm. port:

Host sends:

0x02	0x00	0x02	0x34	Pm	0x03	BCC
------	------	------	------	----	------	-----

Pm=0x30 uart=1200bps

Pm=0x31 uart=2400pbs

Pm=0x32 uart=4800bps

Pm=0x33 uart=9600bps

Pm=0x34 uart=19200bps


Pm=0x35 uart=38400bps

Reader returns:

0x02	0x00	0x03	0x33	Pm	Operation status byte P	0x03	BCC
------	------	------	------	----	-------------------------	------	-----

Operation status byte P='Y' (0x59) success

Operation status byte P='N' (0x4E) failure

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Reader reset baud rate according to Host after Host received operation success information and save in EEPROM of Reader. Host need to initialize baud rate and comm. port setting.

8.9 Enable or Disable using the communication port from a third party:

Host sends:

0x02	0x00	0x02	0xFA	Pm	0x03	BCC
------	------	------	------	----	------	-----

Pm = 0x30 Enable using the communication port from third part

Pm = 0x31 Disable using the communication port from third part

Reader returns:

0x02	0x00	0x03	0xFA	Pm	Operation status byte P	0x03	BCC
------	------	------	------	----	-------------------------	------	-----

Operation status byte P='Y' (0x59) Success

Operation status byte P='N' (0x4E) failure

The communication port from a third party, allows the communication port from a third party combining with the port of CRT310 card reader and use them by time-sharing. After enabling the communication port from a third party, CRT310 will be under monitor and do not return any communication response until the reader receives forbidding the communication operation command from a third party from HOST. Then the HOST can send the communication operation command to operate the equipment from a third party.

9. CRT-310 V3.0 Cards Operation Process

9.1. Mifare 1 Card Operation Command (Can Read S50/S70 Card)

9.1.1 Seek RF card:

Host sends:

0x02	0x00	0x02	0x35	0x30	0x03	BCC
------	------	------	------	------	------	-----

Reader returns:

0x02	0x00	0x03	0x35	0x30	P	0x03	BCC
------	------	------	------	------	---	------	-----

Operation Status Byte P= 'Y' (0X59) seek card successfully

P='N' (0X4E) fail to seek card

P= 'E' (0X45) no card in

P='W' (0x57) card is not in the right place where it can be operated.

9.1.2 Capture S/N of Mifare 1 card

Host sends:

0x02	0x00	0x02	0x35	0x31	0x03	BCC
------	------	------	------	------	------	-----

Reader returns:


0x02	0x00	0x06	0x35	0x31	Operation status P	4 byte hex Card S/N	0x03	BCC
------	------	------	------	------	--------------------	---------------------	------	-----

Operation status Byte P:

P= 'Y' (0X59) capture card S/N successfully and return the card S/N;

P= 'N' (0X4E) fail to capture card S/N and return empty S/N (0X00, 0X00, 0X00, 0X00)

P= 'E' (0X45) no card in

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4 byte Card S/N transmitted by hex, such as "C6B272AE"

E.g.: The uploading communication package: 0x02 0x00 0x06 0x35 0x31 **0xC6 0xB2 0x72 0xAE** 0x03 BCC

9.1.3 Check Password of Sector

Use Key_A or Key_B to check the appointed sector

9.1.3.1 Parity Key_A:

Host sends:

0x02	0x00	0x09	0x35	0x32	Sector No.	6 byte hex Password	0x03	BCC
------	------	------	------	------	------------	---------------------	------	-----

Reader returns:

0x02	0x00	0x04	0x35	0x32	Sector No.	Operation status byte P	0x03	BCC
------	------	------	------	------	------------	-------------------------	------	-----

Operation status byte

P= 'Y' (0X59) password parity successfully

P= '0' (0X30) no RF card in

P= '3' (0X33) password error

P= 'E' (0X45) no card in reader

P= 'W' (0x57) card is not in the right position where it can be operated.

9.1.3.2 Parity Key_B

Host sends:

0x02	0x00	0x09	0x35	0x39	Sector No.	6 byte hex Password	0x03	BCC
------	------	------	------	------	------------	---------------------	------	-----

Reader returns:

0x02	0x00	0x04	0x35	0x39	Sector No.	Operation status byte P	0x03	BCC
------	------	------	------	------	------------	-------------------------	------	-----

Operation status byte

P= 'Y' (0X59) password parity successfully

P= '0' (0X30) no RF card in

P= '3' (0X33) password error

P= 'E' (0X45) no card in reader

P= 'W' (0x57) card is not in the right position where it can be operated.

Note: Sector No.= 0x00 ~0x28 (S50 Card Sector No.=0x00 ~0x0F, S70 Card Sector No.=0x00 ~0x28)
Block No.= 0x00 ~0x0F (S50 has four blocks for each sector: **0x00 0x01 0x02 0x03**, S70 has 4 blocks for each sector from Sector 0 to Sector 31: **0x00 0x01 0x02 0x03**, and it has 16 blocks for each sector from Sector 32 to Sector 39: **0x00~0x0F**)

Could not read data, write data or do value operation on the data of the block of the sector until configure that the password is correct.

9.1.4 Read data on sector


Host sends:

0x02	0x00	0x04	0x35	0x33	Sector No.	Block No.	0x03	BCC
------	------	------	------	------	------------	-----------	------	-----

For S50, Sector No.= 0x00 0x1 0x020x0F (S50 Card has 16 sectors)

Block No.= 0x00 0x01 0x02 0x03

For S70, Sector No.= 0x00 0x1 0x020x28 (S70 Card has 40 sectors)

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Block No.= 0x00 0x01 0x02 0x03 (S50 block No. , S70 block No.=0x00~0x0F)

Reader reads data successfully and returns:

0x02	0x00	0x15	0x35	0x33	Sector No.	Block No.	P=0x59	16 byte hex Data	0x03	BCC
------	------	------	------	------	------------	-----------	--------	------------------	------	-----

Operation status byte: P= 'Y' (0X59)

Read sector block data successfully and upload 16 byte data

Reader fails to read sector block data and returns:

0x02	0x00	0x05	0x35	0x33	Sector No.	Block No.	Operation status byte P	0x03	BCC
------	------	------	------	------	------------	-----------	-------------------------	------	-----

Operation status byte

P= '0' (0X30) cannot seek RF card

P= '1' (0X31) operated sector No. is wrong (not the sector by password checked)

P= '2' (0X32) S/N of operated card error

P= '3' (0X33) password error

P= '4' (0X34) data read error

P= 'E' (0X45) no card in

P='W' (0x57) card is not in the right position where it can be operated.

Note: Sector No.= 0x00 ~0x28 (S50 Card Sector No.=0x00~0x0F, S70 Card Sector No.=0x00~0x28)

Block No.= 0x00 ~0x0F (S50 has 4 blocks for each sector: **0x00 0x01 0x02 0x03**, S70 has 4 blocks for each sector from Sector 0 to Sector 31: **0x00 0x01 0x02 0x03**, and it has 16 blocks for each sector from Sector 32 to Sector 39: **0x00~0x0F**)

9.1.5 Write data on sector

Host sends:

0x02	0x00	0x14	0x35	0x34	Sector No.	Block No.	16 byte hex Data	0x03	BCC
------	------	------	------	------	------------	-----------	------------------	------	-----

Reader writes data successfully and returns:

0x02	0x00	0x15	0x35	0x34	Sector No.	Block No.	P	16 byte hex Data	0x03	BCC
------	------	------	------	------	------------	-----------	---	------------------	------	-----

Operation status byte: P= 'Y' (0X59)

Write sector block data successfully and upload 16 byte data that is written

Reader fails to write sector block data and returns:

0x02	0x00	0x05	0x35	0x33	Sector No.	Block No.	Operation status byte P	0x03	BCC
------	------	------	------	------	------------	-----------	-------------------------	------	-----

Operation status byte

P= '0' (0X30) cannot seek RF card

P= '1' (0X31) operated sector No. is wrong (not the sector by password checked)


P= '2' (0X32) S/N of operated card error

P= '3' (0X33) password error

P= '4' (0X34) block data written error

P= 'E' (0X45) no card in reader

P='W' (0x57) card is not in the right position where it can be operated.

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Note: Sector No.= 0x00 ~0x28 (S50 Card Sector No.=0x00 ~0x0F, S70 Card Sector No.=0x00 ~0x28)

Block No.= 0x00 ~0x0F (S50 has four blocks for each sector: **0x00 0x01 0x02 0x03**, S70 has 4 blocks for each sector from Sector 0 to Sector 31: **0x00 0x01 0x02 0x03**, and it has 16 blocks for each sector from Sector 32 to Sector 39: **0x00~0x0F**)

For S50&S70 the Block No. 0X03 of each sector from Sector 0 to Sector 31 and the Block No. 0X0F of each sector from Sector 32 to Sector 39 of S70 card is the storage area for KEYA, Control byte and KEYB. And write on this block may lead card locked and useless, please be cautious when operate to this block. To find detail in Philips M1 card specification.

9.1.6 Modify password

This operation can modify password of KEYA only, and change KEYB password to: "0xFF, 0xFF, 0xFF, 0xFF, 0xFF, 0xFF"; at the same time modify the storage area to: "0xFF, 0x07, 0x80, 0x69". (Card ex-wrok default setting)

Host sends:

0x02	0x00	0x09	0x35	0x35	Sector No.	6 byte hex Password	0x03	BCC
------	------	------	------	------	------------	---------------------	------	-----

Sector No.= 0x00 ~0x28(For S50 Sector No.= 0x00 ~0x0F, For S70 Sector No.= 0x00 ~0x28)

Reader returns:

0x02	0x00	0x04	0x35	0x35	Sector No.	Operation status byte P	0x03	BCC
------	------	------	------	------	------------	-------------------------	------	-----

Operation status byte

P= 'Y' (0X59) password changed successfully

P= '0' (0X30) cannot seek RF card

P= '1' (0X31) operated sector No. is wrong (not the sector by password checked)

P= '2' (0X32) S/N of operated card error

P= '3' (0X33) password error

P= 'E' (0X45) no card in card

P= 'W' (0x57) card is not in the right position where it can be operated.

To change operation password of sector (KeyA or KeyB) and ACW completely, write block 3 data of each sector after checking password successfully.

The format as below (see details in PHILIPS M1 card specification):

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
6 byte KeyA password						4 byte ACW				6 byte KeyB password					

9.1.7 Increment Operation

Host sends:


0x02	0x00	0x08	0x35	0x37	Sector No.	Block No.	4 byte hex data	0x03	BCC
------	------	------	------	------	------------	-----------	-----------------	------	-----

4 byte hex data is the increased value of appointed sector block (low byte in front, high byte behind).

Eg. The sector 5 block 0 need to increase to 0x10, the 4 byte hex data are: "0x10, 0x00, 0x00, 0x00"

Reader returns:

0x02	0x00	0x05	0x35	0x37	Sector No.	Block No.	Operation status byte P	0x03	BCC
------	------	------	------	------	------------	-----------	-------------------------	------	-----

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Operation status byte

P= '0' (0X30)	cannot seek RF card
P= '1' (0X31)	operated sector No. is wrong (not the sector by password checked)
P= '2' (0X32)	S/N of operated card error
P= '3' (0X33)	password error
P= '4' (0X34)	format of block data error (not written in a value format)
P= '5' (0X35)	increment over load
P= 'E' (0X45)	no card in reader
P= 'Y' (0X59)	operation successful
P='W' (0x57)	card is not in the right position where it can be operated.

Note: Sector No.= 0x00 ~0x28 (S50 Card Sector No.=0x00 ~0x0F, S70 Card Sector No.=0x00 ~0x28)
Block No.= 0x00 ~0x0F (S50 has four blocks for each sector: **0x00 0x01 0x02 0x03**, S70 has 4 blocks for each sector from Sector 0 to Sector 31: **0x00 0x01 0x02 0x03**, and it has 16 blocks for each sector from Sector 32 to Sector 39: **0x00~0x0F**)

The last block of each sector could not do Increment and Decrement Operation

9.1.8 Decrement operation

Host sends:

0x02	0x00	0x08	0x35	0x38	Sector No.	Block No.	4 byte hex data	0x03	BCC
------	------	------	------	------	------------	-----------	-----------------	------	-----

4 byte hex data is the decreased value of appointed sector block (low byte in front, high byte behind). The value cannot be 0, otherwise, operating will be failure.

Reader returns:


0x02	0x00	0x05	0x35	0x37	Sector No.	Block No.	Operation status byte P	0x03	BCC
------	------	------	------	------	------------	-----------	-------------------------	------	-----

Operation status byte

P= '0' (0X30)	cannot seek RF card
P= '1' (0X31)	operated sector No. is wrong (not the sector by password checked)
P= '2' (0X32)	S/N of operated card error
P= '3' (0X33)	password error
P= '4' (0X34)	format of block data error (not written in a value format)
P= '5' (0X35)	increment over load
P= 'E' (0X45)	no card in reader
P= 'Y' (0X59)	operation success
P='W' (0x57)	card is not in the right position where it can be operated.

Note: Sector No.= 0x00 ~0x28 (S50 Card Sector No.=0x00 ~0x0F, S70 Card Sector No.=0x00 ~0x28)
Block No.= 0x00 ~0x0F (S50 has four blocks for each sector: **0x00 0x01 0x02 0x03**, S70 has 4 blocks for each sector from Sector 0 to Sector 31: **0x00 0x01 0x02 0x03**, and it has 16 blocks for each sector from Sector 32 to Sector 39: **0x00~0x0F**)

The last block of each sector could not do Increment and Decrement Operation

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9.1.9 Value initialization

Executed by writing block data command, write 16 byte data according to MIFARE value format. The format as below:

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Value				/Value				Value				Adr	/Adr	Adr	/Adr

Value: the initializing 4 byte value, low byte of the value in front, high byte behind

/Value: value opposite the initializing 4 byte value

Adr: the block address of the initializing value: $\text{Adr} = \text{sector No.} \times 4 + \text{block No.}$

/Adr: value opposite of the initializing block address

The last block of each sector could not do Increment and Decrement Operation

Eg. The Sector 5 Block 0 initialization value is 10, the 16 byte data write to sector block are:

“0x0A, 0x00, 0x00, 0x00, 0xF0, 0xFF, 0xFF, 0xFF, 0x0A, 0x00, 0x00, 0x00, 0x14, 0xEB, 0x14, 0xEB”

For S70 card, the Sector 39 Block 0 initialization value is 10, the 16 byte data write to sector block are:

“0x0A, 0x00, 0x00, 0x00, 0xF0, 0xFF, 0xFF, 0xFF, 0x0A, 0x00, 0x00, 0x00, 0xF0, 0x0F, 0xF0, 0x0F”

9.1.10 Read value

Executed by read sector block data command, for the 16 byte data format, it should be in MIFARE card value data format. If yes, read the value, if not, reading error warning (error data format).

NOTE: when processing a value operation, For S50&S70 the **Block 3** of each sector from **Sector 0** to **Sector 31** and the **Block 15** of each sector from **Sector 32** to **Sector 39** of S70 card is the storage area for KEYA, Control byte and KEYB. And it cannot act as value field. Please notice the address range of the sector when initializing value, increment, decrement, read value.

9.2. 24CXX Series Card Operation (24C01, 24C02, 24C04, 24C08, 24C16, 24C32, 24C64)

9.2.1 Card type setting

Host sends:

0x02	0x00	0x03	0x36	0X30	Card type N	0x03	BCC
------	------	------	------	------	-------------	------	-----

N=0x30 Set card as 24C01 128BYTE ADR=0x0000—0x007F

N=0x31 Set card as 24C02 256BYTE ADR=0x0000—0x00FF

N=0x32 Set card as 24C04 512BYTE ADR=0x0000—0x01FF

N=0x33 Set card as 24C08 1K BYTE ADR=0x0000—0x03FF


N=0x34 Set card as 24C16 2K BYTE ADR=0x0000—0x07FF

N=0x35 Set card as 24C32 4K BYTE ADR=0x0000—0x0FFF

N=0x36 Set card as 24C64 8K BYTE ADR=0x0000—0x1FFF

Reader returns:

0x02	0x00	0x04	0x36	0X30	Card type N	Operation status byte P	0x03	BCC
------	------	------	------	------	-------------	-------------------------	------	-----

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P= 'N' (0X4E) set card unsuccessfully

P= 'Y' (0X59) set card successfully

P= 'E' (0X45) no card in reader

P='W' (0x57) card is not in the right position where it can be operated.

9.2.2 Read card

Host sends:

0x02	0x00	0x06	0x36	0x31	Card type N	Operation first address 2 byte	Operation length: L	0x03	BCC
------	------	------	------	------	----------------	-----------------------------------	------------------------	------	-----

Operation length L=0X01~0X80: 1 BYTE ≤ L ≤ 128 BYTE

Operation first address 2 BYTE: effective address depended on capacity of card

Reader returns:

Read card successfully and return: P= 'Y' (0X59)

0x02	Communication package Length (2 byte)	0x36	0x31	Card type N	Operation status byte P	Operation first address 2 byte	Operation length L	Data read n byte	0x 03	BCC
------	---	------	------	----------------	-------------------------------	--------------------------------------	-----------------------	------------------------	----------	-----

Communication Package Length= 7 + operation length L

Fail to read card and return:

0x02	0x00	0x04	0x36	0x31	Card type N	Operation status byte P	0x03	BCC
------	------	------	------	------	-------------	-------------------------	------	-----

P= 'N' (0X4E) fail to read card

P= 'E' (0X45) no card in reader

P='W' (0x57) card is not in the right position where it can be operated.

9.2.3 Write card

9.2.3.1 Write without parity

Host sends:

0x02	Communication package Length (2 byte)	0x36	0x32	Card type N	Operation first address 2 byte	Operati on length L	Data read n byte	0x03	BCC
------	---	------	------	----------------	--------------------------------------	---------------------------	------------------------	------	-----

Note: Communication Package Length= 6 + operation length L

Operation length L=0X01~0X80: 1 byte ≤ L ≤ 128 byte

Reader returns:


0x02	0x00	0x04	0x36	0x32	Card type N	Operation status byte P	0x03	BCC
------	------	------	------	------	-------------	-------------------------	------	-----

P= 'Y' (0X59) write card successfully

P= 'N' (0X4E) fail to write card

P= 'E' (0X45) no card in reader

P='W' (0x57) card is not in the right position where it can be operated.

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9.2.3.2 Write with parity

Host sends:

0x02	Communication package Length (2 byte)	0x36	0x33	Card type N	Operation first address 2 byte	Operation length L	Data read n byte	0x03	BCC
------	--	------	------	----------------	-----------------------------------	--------------------	---------------------	------	-----

Note: Communication Package Length= 6 + operation length L

Operation length L=0X01~0X80: 1 byte ≤ L ≤ 128 byte

Reader returns:

Write card successfully with parity and return:

0x02	Communication package Length (2 byte)	0x36	0x33	Card type N	Operation first address 2 byte	Operation length L	Read data written n byte	0x03	BCC	0x02
------	--	------	------	----------------	-----------------------------------	--------------------	-----------------------------	------	-----	------

Communication Package Length= 7 + operation length L

Fail to write card and return:

Reader returns:

0x02	0x00	0x04	0x36	0x33	Card type N	Operation status byte P	0x03	BCC
------	------	------	------	------	-------------	-------------------------	------	-----

P= 'N' (0X4E) fail to write card

P= 'E' (0X45) no card in reader

P= 'W' (0x57) card is not in the right position where it can be operated.

9.3. Contact CPU Card Operation

9.3.1 CPU card cold reset (power on+ resent)

Host sends:

0x02	0x00	0x02	0x37	0X30	0x03	BCC
------	------	------	------	------	------	-----

Reader operates successfully and returns: operation status byte P= 'Y' (0X59) (T=0 CPU card)

0x02	Communication package length 2 byte	0x37	0x30	operation status byte P	Length of reset data package 2 byte	Data reset n byte	0x03	BCC
------	--	------	------	----------------------------	--	----------------------	------	-----


Communication package length=5+ length of data reset n

Reader operates successfully and returns: operation status byte P= 'Z' (0X5A) (T=1 CPU card)

0x02	Communication package length 2 byte	0x37	0x30	operation status byte P	Length of reset data package 2 byte	Data reset n byte	0x03	BCC
------	--	------	------	----------------------------	--	----------------------	------	-----

Communication package length=5+ length of data reset n

Reader fails to operate and returns:

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0x02	0x00	0x03	0x37	0x30	Operation status byte P	0x03	BCC
------	------	------	------	------	-------------------------	------	-----

P= 'N' (0X4E) fail to reset

P= 'E' (0X45) no card in reader

P='W' (0x57) card is not in the right position where it can be operated.

9.3.2 CPU card warm reset (Just reset when it is already power on)

Host sends:

0x02	0x00	0x02	0x37	0X2F	0x03	BCC
------	------	------	------	------	------	-----

Reader operates successfully and returns: operation status byte P= 'Y' (0X59) (T=0 CPU card)

0x02	Communication package length 2 byte	0x37	0x2F	operation status byte P	Length of reset data package 2 byte	Data reset n byte	0x03	BCC
------	--	------	------	----------------------------	---	----------------------	------	-----

Communication package length=5+ length of data reset n

Reader operates successfully and returns: operation status byte P= 'Z' (0X5A) (T=1 CPU card)

0x02	Communication package length 2 byte	0x37	0x2F	operation status byte P	Length of reset data package 2 byte	Data reset n byte	0x03	BCC
------	--	------	------	----------------------------	---	----------------------	------	-----

Communication package length=5+ length of data reset n

Reader fails to operate and returns:

0x02	0x00	0x03	0x37	0x2F	Operation status byte P	0x03	BCC
------	------	------	------	------	-------------------------	------	-----

P= 'N' (0X4E) fail to reset

P= 'E' (0X45) no card in reader

P='W' (0x57) card is not in the right position where it can be operated.

9.3.3 T=0 CPU card C-APDU operation

Host sends


0x02	Communication package length 2 byte	0x37	0x31	C-APDU package length 2 byte	C-APDU package n byte	0x03	BCC
------	--	------	------	---------------------------------	-----------------------------	------	-----

Communication package length=4+ C-APDU package length n (n(max)=262)

Reader operates successfully and returns: operation status byte P= 'Y' (0X59)

0x02	Communication package length 2 byte	0x37	0x31	operation status byte P	C-APDU operation return package length 2 byte	C-APDU Operation return package 2 byte	0x03	BC C
------	--	------	------	----------------------------	--	---	------	---------

Communication package length=5+ C-APDU return package length n (n(max)=257 byte)

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Reader fails to operate and returns:

0x02	0x00	0x03	0x37	0x31	Operation status byte P	0x03	BCC
------	------	------	------	------	-------------------------	------	-----

P= 'N' (0X4E) fail to reset

P= 'E' (0X45) no card in reader

P='W' (0x57) card is not in the right position where it can be operated.

For the operation of CPU Card C-APDU, please select the correspond command of T=0/T=1 according to reset card type.

9.3.4 T=1 CPU card C-APDU operation:

0x02	Communication package length 2 byte	0x37	0x32	C-APDU package length 2 byte	C-APDU package n byte	0x03	BCC
------	--	------	------	------------------------------	--------------------------	------	-----

Communication package length=4+ C-APDU package length n (n(max)=262)

Reader operates successfully and returns: operation status byte P= 'Y' (0X59)

0x02	Communication package length 2 byte	0x37	0x32	operation status byte P	C-APDU operation return package length 2 byte	C-APDU Operation return package 2 byte	0x03	BC C
------	--	------	------	----------------------------	---	--	------	---------

Communication package length=5+ C-APDU return package length n (n(max)=257 byte)

Reader fails to operate and returns:

0x02	0x00	0x03	0x37	0x32	Operation status byte P	0x03	BCC
------	------	------	------	------	-------------------------	------	-----

P= 'N' (0X4E) fail to reset

P= 'E' (0X45) no card in reader

P='W' (0x57) card is not in the right position where it can be operated.

For the operation of CPU Card C-APDU, please select the correspond command of T=0/T=1 according to reset card type.

9.4. SIMENS SLE4442 Card Operation

9.4.1 SLE4442 card reset

Host sends:

0x02	0x00	0x02	0x38	0X30	0x03	BCC
------	------	------	------	------	------	-----


Reader operates successfully and returns: operation status byte P= 'Y' (0X59)

0x02	0x00	0x07	0x38	0x30	operation status byte P	Reset data package 4 byte	0x03	BCC
------	------	------	------	------	-------------------------	------------------------------	------	-----

Reader fails to operate and returns:

0x02	0x00	0x03	0x38	0x30	operation status byte P	0x03	BCC
------	------	------	------	------	-------------------------	------	-----

P= 'N' (0X4E) fail to reset

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P= 'E' (0X45) no card in reader

P='W' (0x57) card is not in the right position where it can be operated.

9.4.2 Read 4442 main memory

Host sends:

0x02	0x00	0x04	0x38	0X31	Read first address ADR 1 byte	Read length L 1 byte	0x03	BCC
------	------	------	------	------	----------------------------------	-------------------------	------	-----

ADR= 00-FF

L = 0x01-0x80

Operation length L=0X01~0X80, 1 byte ≤ L ≤ 128 byte

Main memory of 4442 has 256 bytes; please be cautious about operation address and length within valid range.

Reader operates successfully and returns: operation status byte P= 'Y' (0X59)

0x02	Communication length 2 byte	0x38	0x31	operation status byte P	Read first address ADR	Read length L	Read data L byte	0x03	BCC
------	-----------------------------------	------	------	-------------------------------	------------------------------	------------------	---------------------	------	-----

Communication length=5+ read length L

Reader fails to operate and returns

0x02	0x00	0x05	0x38	0x31	operation status byte P	Read first address ADR	Read length L	0x03	BCC
------	------	------	------	------	----------------------------	---------------------------	---------------	------	-----

P= 'N' (0X4E) fail to read card

P= 'E' (0X45) no card in reader

P='W' (0x57) card is not in the right place where it can be operated.

9.4.3 Read 4442 protection area

Host sends:

0x02	0x00	0x02	0x38	0x32	0x03	BCC
------	------	------	------	------	------	-----

Reader operates successfully and returns: operation status byte P= 'Y' (0X59)

0x02	0x00	0x23	0x38	0x32	operation status byte P	32 byte protection bit	0x03	BCC
------	------	------	------	------	-------------------------	------------------------	------	-----

Each bit in Protection Memory is corresponding with the protection status of the same address in Main Memory.

The address ranks from low to high.

Protection bit=0x00 Protect bit valid, can not write this byte


Protection bit=0x01 Protect bit invalid, can write the data of this byte

Reader fails to operate and returns:

0x02	0x00	0x03	0x38	0x32	operation status byte P	0x03	BCC
------	------	------	------	------	-------------------------	------	-----

P= 'N' (0X4E) fail to read card

P= 'E' (0X45) no card in reader

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P='W' (0x57) card is not in the right position where it can be operated.

When read the protection area, it can read all 32byte protection status from 4442 Card at once.

9.4.4 Read 4442 PSC area

Host sends:

0x02	0x00	0x02	0x38	0X33	0x03	BCC
------	------	------	------	------	------	-----

Reader operates successfully and returns: operation status byte P= 'Y' (0X59)

0x02	0x00	0x07	0x38	0x33	operation status byte P	Security area data package 4 byte	0x03	BCC
------	------	------	------	------	-------------------------	-----------------------------------	------	-----

First byte in Security Area data package: password error counter

Second byte in Security Area data package: password data 1

Third byte in Security Area data package: password data 2

Fourth byte in Security Area data package: password data 3

Password error counter=0x07 (password error amount is 0), 0x06 (password error amount is 1), 0x04 (password error amount is 2), 0x00 (password error code is 1, card useless)

Reader fails to operate and returns:

0x02	0x00	0x03	0x38	0x33	operation status byte P	0x03	BCC
------	------	------	------	------	-------------------------	------	-----

P= 'N' (0X4E) fail to read

P= 'E' (0X45) no card in reader

P='W' (0x57) card is not in the right position where it can be operated

9.4.5 Password parity:

Host sends:

0x02	0x00	0x05	0x38	0x34	Password data, 3 byte	0x03	BCC
------	------	------	------	------	-----------------------	------	-----

Reader operates and returns:

0x02	0x00	0x03	0x38	0x34	operation status byte P	0x03	BCC
------	------	------	------	------	-------------------------	------	-----

P= 'Y' (0X59) Password correct

P= 'N' (0X4E) Password error

P= 'E' (0X45) No card in reader


P='W' (0x57) card is not in the right position where it can be operated

9.4.6 Write main memory (00H-FFH)

Host sends:

0x02	Communication length 2 byte	0x38	0x35	Write first address ADR (1 byte)	Write length L	Write data L byte	0x03	BCC
------	-----------------------------	------	------	----------------------------------	----------------	-------------------	------	-----

Communication length = 4+ write length L

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Operation length $L = 0x01 \sim 0x80$, $1 \text{ byte} \leq L \leq 128 \text{ byte}$

Reader operates and returns:

0x02	0x00	0x05	0x38	0x35	operation status byte P	Write first address ADR	Write length L	0x03	BCC
------	------	------	------	------	----------------------------	-------------------------	-------------------	------	-----

P= 'Y' (0X59) write successfully

P= 'N' (0X4E) fail to write

P= 'E' (0X45) no card in reader

P= 'W' (0x57) card is not in the right position where it can be operated

9.4.7 Write-protect memory (ADR: 0x0000-0x0031 L=32 BYTE)

Host sends:

0x02	0x00	0x22	0x38	0x36	32 byte production bit	0x03	BCC
------	------	------	------	------	------------------------	------	-----

Note: Communication package length $L = 4 + \text{len}$

Adr : first address byte of writing protection ADR: 0x00--0x1F

Len : length of byte of writing protection 0x01--0x20

Sbyte : Unit status byte package of writing protection

Len byte : write-protect data: the data which should be write-protect. When the write-protect data is the same as the data of original storage unit, then executing write-protect will succeed. Or the write-protect is different from the data of original storage unit, then it will fail.

Modify write protection memory: address range 00H-31H only. And once written the protection bit can not be erased.

When it is in operation we should confirm the ranks of ADR and len, it can write protection for every unit byte.

Reader operates and returns:

0x02	0x00	0x03	0x38	0x36	operation status byte P	0x03	BCC
------	------	------	------	------	-------------------------	------	-----

P= 'Y' (0X59) write successfully

P= 'N' (0X4E) fail to write

P= 'E' (0X45) no card in reader

P= 'W' (0x57) card is not in the right position where it can be operated

9.4.8 Modify password

Host sends:

0x02	0x00	0x05	0x38	0x37	Password data 3 byte	0x03	BCC
------	------	------	------	------	----------------------	------	-----


Reader operates and returns:

0x02	0x00	0x03	0x38	0x37	operation status byte P	0x03	BCC
------	------	------	------	------	-------------------------	------	-----

P= 'Y' (0X59) password changed successfully

P= 'N' (0X4E) fail to change password

P= 'E' (0X45) no card in reader

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P='W' (0x57) card is not in the right position where it can be operated

9.5. SLE4428 Card Operation

9.5.1 Reset

Host sends:

0x02	0x00	0x02	0x39	0X30	0x03	BCC
------	------	------	------	------	------	-----

Reader operates successfully and returns: operation status byte P= 'Y' (0X59)

0x02	0x00	0x07	0x39	0x30	operation status byte P	Reset data package 4 byte	0x03	BCC
------	------	------	------	------	-------------------------	---------------------------	------	-----

Reader fails to operate and returns:

0x02	0x00	0x03	0x39	0x30	operation status byte P	0x03	BCC
------	------	------	------	------	-------------------------	------	-----

P= 'N' (0X4E) fail to reset

P= 'E' (0X45) no card in reader

P='W' (0x57) card is not in the right position where it can be operated

9.5.2 Read 4428 main memory (without protection bit)

Host sends:

0x02	0x00	0x05	0x39	0X31	Read first address ADR 2 byte	Read length L 1 byte	0x03	BCC
------	------	------	------	------	----------------------------------	----------------------	------	-----

ADR=0000-03FF

L =0x01- 0x80

Operation length L=0X01~0X80, 1 byte ≤ L ≤ K28 byte

Main memory of 4442 has 1K byte; please cautious about operation address and length within valid range.

Reader operates successfully and returns: operation status byte P= 'Y' (0X59)

0x02	Communication length 2 byte	0x39	0x31	operation status byte P	Read first address 2 byte	Read length L 1byte	Read data L byte	0x03	BCC
------	--------------------------------	------	------	-------------------------------	---------------------------------	---------------------------	------------------------	------	-----

Communication length=6+ read length L

Reader fails to operate and returns:

0x02	0x00	0x06	0x39	0x31	operation status byte P	Read first address 2 byte	Read length L 1 byte	0x03	BCC
------	------	------	------	------	----------------------------	------------------------------	-------------------------	------	-----

P= 'N' (0X4E) fail to read


P= 'E' (0X45) no card in reader

P='W' (0x57) card is not in the right position where it can be operated

9.5.3 Read 4428 protection bit

Host sends:

0x02	0x00	0x05	0x39	0X32	Read first address ADR 2 byte	Read length L 1 byte	0x03	BCC
------	------	------	------	------	----------------------------------	-------------------------	------	-----

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ADR=0000-03FF

L =0x01- 0x80

Operation length L=0X01~0X80, 1 byte ≤ L ≤ 128 byte

Main memory of 4442 has 1K byte; please cautious about operation address and length within valid range.

Each bit in Protection Memory is corresponding with the protection status of same address in Main Memory.

The address ranks from low to high.

Protection bit=0x00 Protect bit valid, can not change the data of this byte

Protection bit=0x01 Protect bit invalid, can change the data of this byte

Reader operates successfully and returns: operation status byte P= 'Y' (0X59)

0x02	Communication length 2 byte	0x39	0x32	operation status byte P	Read first add 2 byte	Read length L 1 byte	Protection bit data L byte	0x03	BCC
------	-----------------------------	------	------	-------------------------	-----------------------	----------------------	----------------------------	------	-----

Communication length=6+ read length L

Reader fails to operate and returns:

0x02	0x00	0x06	0x39	0x32	operation status byte P	Read first add 2 byte	Read length L byte	0x03	BCC
------	------	------	------	------	-------------------------	-----------------------	--------------------	------	-----

P= 'N' (0X4E) fail to read

P= 'E' (0X45) no card in reader

P='W' (0x57) card is not in the right position where it can be operated

9.5.4 Password parity

Host sends:

0x02	0x00	0x04	0x39	0x33	Password data 2 byte	0x03	BCC
------	------	------	------	------	----------------------	------	-----

Reader operates and returns

0x02	0x00	0x03	0x39	0x33	Operation status byte P	0x03	BCC
------	------	------	------	------	-------------------------	------	-----

P= 'Y' (0X59) password correct

P= 'N' (0X4E) password error

P= 'E' (0X45) no card in reader

P='W' (0x57) card is not in the right position where it can be operated

9.5.5 Write data (without protection bit)


Host sends:

0x02	Communication length 2 byte	0x39	0x34	write first add ADR 2byte	write length L 1 byte	write data L byte	0x03	BCC
------	-----------------------------	------	------	---------------------------	-----------------------	-------------------	------	-----

Communication length = 5+ write length L

Range of address=0x0000—0x03FF;

Operation length L=0X01~0X80, 1 byte ≤ L ≤ 128 byte

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Note: Last three byte (0x03FD, 0x03FE, 0x03FF) is the key error counter of 4442 card; please do not operate these bytes for it is easy making card useless.

Reader returns:

0x02	0x00	0x06	0x39	0x34	Operation status byte P	Write first add ADR 2 byte	Write length L 1 byte	0x03	BCC
------	------	------	------	------	----------------------------	-------------------------------	--------------------------	------	-----

P= 'Y' (0X59) write successfully

P= 'N' (0X4E) fail to write

P= 'E' (0X45) no card in reader

P='W' (0x57) card is not in the right position where it can be operated

9.5.6 Write data (with protection bit)

0x02	Communication length 2 byte	0x39	0x35	write first add ADR 2byte	write length L 1 byte	write data L byte	0x03	BCC
------	--------------------------------	------	------	------------------------------	--------------------------	----------------------	------	-----

Communication length = 5+ write length L

Range of address=0x0000—0x03FF;

Operation length L=0X01~0X80, 1 byte ≤ L ≤ 128 byte

Note: Last three byte (0x03FD, 0x03FE, 0x03FF) is the key error counter, key byte 1 and key byte 2 of 4442 card, please do not operate these bytes for it is easy making card useless. Meantime, it can't be modified once write protection bit.

Reader returns:

0x02	0x00	0x06	0x39	0x35	Operation status byte P	Write first add ADR 2 byte	Write length L 1 byte	0x03	BCC
------	------	------	------	------	----------------------------	-------------------------------	--------------------------	------	-----

P= 'Y' (0X59) write successfully

P= 'N' (0X4E) fail to write

P= 'E' (0X45) no card in reader

P='W' (0x57) card is not in the right position where it can be operated

9.5.7 Modify password

Host sends:

0x02	0x00	0x06	0x39	0x36	Original password data 2 byte	New password data 2 byte	0x03	BCC
------	------	------	------	------	-------------------------------	--------------------------	------	-----

Reader returns:


0x02	0x00	0x03	0x39	0x36	Operation status byte P	0x03	BCC
------	------	------	------	------	-------------------------	------	-----

P= 'Y' (0X59) password changed successfully

P= 'N' (0X4E) fail to change password

P= 'E' (0X45) no card in reader

P='W' (0x57) card is not in the right position where it can be operated

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9.6. AT88SC102 Operation

9.6.1 Reset:

Host sends:

0x02	0x00	0x02	0x3A	0x30	0x03	BCC
------	------	------	------	------	------	-----

Reader returns:

0x02	0x00	0x03	0x3A	0x30	Operation status bit P	0x03	BCC
------	------	------	------	------	------------------------	------	-----

Operation status bit P= 'Y' (0X59) reset successfully

P= 'N' (0X4E) fail to reset

P= 'E' (0X45) no card in rader

P='W' (0x57) card is not in the right position where it can be operated

9.6.2 Main password modify

Main password (2 byte), erase password 1 (6 byte), erase password 2 (4 byte)

Host sends:

0x02	0x00	0x04	0x3A	0X31	Password data package 2 byte	0x03	BCC
------	------	------	------	------	------------------------------	------	-----

Reader returns:

0x02	0x00	0x04	0x3A	0x31	Password code	Operation status byte P	0x03	BCC
------	------	------	------	------	---------------	-------------------------	------	-----

Operation status byte P= 'Y' (0X59) password parity successful

P= 'N' (0X4E) password parity failure

P= 'E' (0X45) no card in reader

P= 'F' (0X46) card useless (after password parity failure overrun the permission times,
card useless)

P='W' (0x57) card is not in the right place where it can be operated

Under safety grade 1 mode, all units can be read after the main password parity.

Under safety grade 2 mode, units except password memory unit, can be read after the main password parity.

9.6.3 Read memory zone (application zone 1, application zone 2, control zone)

Host sends:

0x02	0x00	0x05	0x3A	0x32	Zone code	Read application first address adr 1 byte	Read application length len 1 byte	0x03	BCC
------	------	------	------	------	-----------	---	------------------------------------	------	-----


Note: zone code=0x30 control zone (control zone= units except application zone 1, 2)

=0x31 application zone 1 (64 byte address range 0x16-0x55)

=0x32 application zone 2 (64 byte address range 0x5C-0x9B)

0x02	Communication length L 2 byte	0x3A	0x32	Zone code	Operation status byte P	Read application first address adr 1 byte	Read application zone length len 1 byte	Read data Len byte	0x03	BCC
------	-------------------------------	------	------	-----------	-------------------------	---	---	--------------------	------	-----

Reader operation successful returns: operation status byte P= 'Y' (0X59)

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Communication length L=5+ read application zone length len

Reader operation failure returns:

0x02	0x00	0x06	0x3A	0x31	Zone code	Operation status byte P	0x03	BCC
------	------	------	------	------	-----------	-------------------------	------	-----

P= 'N' (0X4E) fail to read

P= 'E' (0X45) no card in reader

P='W' (0x57) card is not in the right place where it can be operated

9.6.4 Erase memory zone (Prepare to write data. Before write data, run the erase operation command is needed, then write data process will be correct.)

9.6.4.1 Erase application zone under safety mode 1

Host sends:

0x02	0x00	0x05	0x3A	0x33	Zone code B	Erase memory zone head address adr 1 byte	Erase memory zone length len 1 byte	0x03	BCC
------	------	------	------	------	-------------	---	-------------------------------------	------	-----

Zone code

B= 0x30 erase control zone under safety mode 1

B= 0x31 erase application zone under safety mode 1

B= 0x32 erase application zone under safety mode 2

Reader returns:

0x02	0x00	0x05	0x3A	0x33	Zone code	Operation status byte P	0x03	BCC
------	------	------	------	------	-----------	-------------------------	------	-----

Operation status byte P= 'Y' (0X59) successful

P= 'N' (0X4E) failure

P= 'E' (0X45) no card in reader

P='W' (0x57) card is not in the right place where it can be operated

9.6.4.2 Erase memory zone 1 under safety mode 2

Host sends:

0x02	0x00	0x09	0x3A	0x33	0x33	Erase password data package 6 byte	0x03	BCC
------	------	------	------	------	------	------------------------------------	------	-----

Reader returns:

0x02	0x00	0x05	0x3A	0x33	Zone code	Operation status byte P	0x03	BCC
------	------	------	------	------	-----------	-------------------------	------	-----

Operation status byte P= 'Y' (0X59) successful

P= 'N' (0X4E) failure

P= 'E' (0X45) no card in reader


P='W' (0x57) card is not in the right place where it can be operated

9.6.4.3 Erase application zone 2 under safety mode 2

Host sends:

0x02	0x00	0x08	0x3A	0x33	0x34	EC2	Erase password data package 4 byte	0x03	BCC
------	------	------	------	------	------	-----	------------------------------------	------	-----

Erase fuse status operation byte EC2 = 0x30 Erase unfused application zone 2

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= 0x31 Erase fused application zone 2

Reader returns:

0x02	0x00	0x05	0x3A	0x33	Zone code	Operation status P	0x03	BCC
------	------	------	------	------	-----------	--------------------	------	-----

Operation status P= 'Y' (0X59) successful

P= 'N' (0X4E) failure

P= 'E' (0X45) no card in reader

P= 'F' (0X46) the zone 2 useless, can read only.

P='W' (0x57) card is not in the right place where it can be operated

(EC2 fuse unfused overrun the permission erase times (128 times) can not erase data any longer)

Note: Under safety mode 2, when we want to erase application zone 1 and application zone 2, need enter each password of application zone 1 and application zone 2. If the password of each is correct, then it will erase all the application zone.

9.6.5 Write memory zone (application zone 1, application zone 2, control zone)

Host sends:

0x02	Communication length L 2 byte	0x3A	0x34	Zone code	Write memory zone address adr 1 byte	Write memory zone length len1 byte	Write data length Len byte	0x03	BCC
------	----------------------------------	------	------	-----------	---	---------------------------------------	-------------------------------	------	-----

Communication length L=5+ Write data length len

Reader returns:

0x02	0x00	0x06	0x3A	0x34	Zone code	Operation status P	0x03	BCC
------	------	------	------	------	-----------	--------------------	------	-----

P= 'Y' (0X59) write card successful

P= 'N' (0X4E) write card failure

P= 'E' (0X45) no card in reader

P='W' (0x57) card is not in the right position where it can be operated

Under safety mode 1, all units can erase and write as long as main password checked. To prevent modifying password memory unit and result in card useless, some data cannot write in control zone unit liberty.

Under safety mode 2, can only erase and write application zone units after main password checked, all control zone units cannot be erased and written. Application zone can be written only after main password checked and erase password checked successfully.

9.6.6 Modify password: (control zone password, application zone 1 password, application zone 2 password)


Host sends:

0x02	Communication length L 2 byte	0x3A	0x35	Zone code	New password length Len byte	0x03	BCC
------	----------------------------------	------	------	-----------	---------------------------------	------	-----

Communication length L=3+ New password length len

Zone code=0x30 modify control zone password, password data:2 byte

=0x31 modify application zone 1 password, password data :6 byte

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=0x32 modify application zone 2 password password data :4 byte

Reader returns:

0x02	0x00	0x04	0x3A	0x35	Zone code	Operation status P	0x03	BCC
------	------	------	------	------	-----------	--------------------	------	-----

P= 'Y' (0X59) modify password successful

P= 'N' (0X4E) modify password failure

P= 'E' (0X45) no card in reader

P='W' (0x57) card is not in the right position where it can be operated

Only under the safety mode 1 and check main password correct then the password can be modified.

After enter safety mode 2, password can only be checked, but not be modified..

9.6.7 Personalized operation, enable card enter safety mode 2

HOST SENDS:

0x02	0x00	0x03	0x3A	0x36	Operation mode F	0x03	BCC
------	------	------	------	------	------------------	------	-----

Operation mode F=0x30 enable card enter safety mode 2, for test,

F=0x31 enable the simulation enter safety mode 2, and card return to safety mode 1.

F=0x32 enable card enter safety mode 2 completely. It cannot return card to safety mode 1 in case operated the card in safety mode 2.

Reader returns:

0x02	0x00	0x04	0x3A	0x36	Operation mode F	Operation status P	0x03	BCC
------	------	------	------	------	------------------	--------------------	------	-----

P= 'Y' (0X59) personalized operation successful

P= 'N' (0X4E) personalized operation failure

P= 'E' (0X45) no card in reader

P='W' (0x57) card is not in the right position where it can be operated

Before enter safety mode 2, Make sure of the password of application zone 1, 2 have been set. The 1st byte of application zone 1: (0x16) and the 1st byte of application zone 2: (0x5C). They are the authorization of control these units. Do not modify them.

If want to write data in this zone after enter safety mode 2, notice that the whole block of application zone will be erased, so make sure to save the data before new data written in.

Simultaneity, these application zones are under control of the fuse counter. If the fuse counter works, it will be written less than 128 times. And if the fuse counter doesn't work, the write times will be the max card write operation times (100,000 times)

9.6.8 The zone 2 erase counter operation byte EC2, Set to be invalidate operation


Host sends:

0x02	0x00	0x02	0x3A	0x37	0x03	BCC
------	------	------	------	------	------	-----

Reader returns:

0x02	0x00	0x03	0x3A	0x37	Operation status P	0x03	BCC
------	------	------	------	------	--------------------	------	-----

P= 'Y' (0X59) successful

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P= 'N' (0X4E) failure

P= 'E' (0X45) no card in reader

P='W' (0x57) card is not in the right position where it can be operated

Executing this operation before entering the personalized operation is unlimited the erase times of card application zone 2 under safety mode 2. Otherwise, after complete the setting of mode 2, the card application zone 2 defaults erase times limit is effective under safety mode 2 (128 times). There's no way to cancel the 128 erase times limit, if the erase limit in the zone 2 canceled. Also, when the setting is no limited under mode 2, it can not change to limited mode.

At the same time, user should save the EC2 operation status; because applications under mode 2, when the card erase and write application zone 2 (the erase password parity of application zone 2) should notice the relevant parameter

9.7. AT88S1604 Card Operation

9.7.1 Reset

Host sends:

0x02	0x00	0x02	0x3B	0x30	0x03	BCC
------	------	------	------	------	------	-----

Reader returns:

0x02	0x00	0x03	0x3B	0x30	Operation status byte P	0x03	BCC
------	------	------	------	------	-------------------------	------	-----

Operation status byte P= 'Y' (0X59) successful
P= 'N' (0X4E) failure
P= 'E' (0X45) no card in reader
P= 'W' (0x57) card is not in the right position where it can be operated

9.7.2 Verify password:

Host sends:


0x02	0x00	0x05	0x3B	0x31	Password zone code 1 byte	Password data 2 byte	0x03	BCC
------	------	------	------	------	---------------------------	----------------------	------	-----

Reader returns:

0x02	0x00	0x04	0x3B	0x31	Password zone code	Operation status byte P	0x03	BCC
------	------	------	------	------	--------------------	-------------------------	------	-----

Operation status byte P= 'Y' (0X59) successful
P= 'N' (0X4E) failure
P= 'F' (0X46) card unused or application block unused
P= 'E' (0X45) no card in reader
P='W' (0x57) card is not in the right position where it can be operated

Password type code: = 0x30 Verify main password
= 0x31 Verify application zone 1 password
= 0x32 Verify application zone 1 erase password
= 0x33 Verify application zone 2 password
= 0x34 Verify application zone 2 erase password

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- = 0x35 Verify application zone 3 password
- = 0x36 Verify application zone 3 erase password
- = 0x37 Verify application zone 4 password
- = 0x38 Verify application zone 4 erase password

9.7.3 Read data:

Host sends:

0x02	0x00	0x06	0x3B	0x32	Zone code 1 byte	Operation address 2 byte	Operation length 1 byte	0x03	BCC
------	------	------	------	------	---------------------	-----------------------------	----------------------------	------	-----

Reader operation successful returns: P= 'Y' (0x59)

0x02	Communication length L 2 byte	0x3B	0x32	Zone code	Operation status P	Operation address 2 byte	Operation length 1 byte	data n byte	0x03	BCC
------	-------------------------------------	------	------	--------------	-----------------------	--------------------------------	-------------------------------	----------------	------	-----

Communication length: L= 7 + n byte

Reader operation failure returns:

0x02	0x00	0x07	0x3B	0x32	Zone code	Operation status byte P	Operation address 2 byte	Operation length 1 byte	0x03	BCC
------	------	------	------	------	--------------	-------------------------------	--------------------------------	-------------------------------	------	-----

P= 'N' fail to read

P= 'E' no card in reader

P= 'W' (0x57) card is not in the right position where it can be operated

Operation address range: 0x000----0x7FF operation length range: 0x01-0x80

Zone code: = 0x30 zone 1 (0x020 --- 0x21A)

= 0x31 zone 2 (0x21B --- 0x420)

= 0x32 zone 3 (0x421 --- 0x621)

= 0x33 zone 4 (0x622 ---- 0x7F5)

= 0x34 other zone (zones except zone 1, 2, 3)


9.7.4 Erase data

Host sends:

0x02	0x00	0x06	0x3B	0x33	Zone code 1 byte	Operation address 2 byte	Operation length 1 byte	0x03	BCC
------	------	------	------	------	---------------------	--------------------------------	-------------------------------	------	-----

Reader returns:

0x02	0x00	0x04	0x3B	0x33	Zone code	Operation status byte P	0x03	BCC
------	------	------	------	------	--------------	----------------------------	------	-----

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P= 'Y' (0x59) successful

= 'N' (0x4E) failure

= 'E' (0x45) no card in reader

= 'W' (0x57) card is not in the right position where it can be operated

Operation address range: 0x000----0x7FF operation length: 0x01-0x80

9.7.5 Write data:

Host sends:

0x02	Communication length L 2 byte	0x3B	0x34	Zone code 1 byte	Operation address 2 byte	Operation length 1 byte	Write data length n byte	0x03	BCC
------	-------------------------------------	------	------	------------------------	--------------------------------	-------------------------------	--------------------------------	------	-----

Communication length L = 6 + n byte

Reader returns:

0x02	0x00	0x04	0x3B	0x34	Zone code	Operation status byte P	0x03	BCC
------	------	------	------	------	-----------	-------------------------	------	-----

P= 'Y' (0x59) successful

= 'N' (0x4E) failure

= 'E' (0x45) no card in reader

= 'W' (0x57) card is not in the right position where it can be operated

Operation address range: 0x000----0x7FF operation length range: 0x01-0x80

Zone code: = 0x30 zone 1 (0x020 --- 0x21A)

= 0x31 zone 2 (0x21B --- 0x420)

= 0x32 zone 3 (0x421 --- 0x621)

= 0x33 zone 4 (0x622 --- 0x7F5)

= 0x34 other zone (zones except zone 1, 2, 3)

9.7.6 Modify password under mode 1:

Host sends:

0x02	0x00	0x05	0x3B	0x35	Password type code 1 byte	Password data 2 byte	0x03	BCC
------	------	------	------	------	---------------------------	----------------------	------	-----

Reader returns:

0x02	0x00	0x04	0x3B	0x35	Password zone code	Operation status byte P	0x03	BCC
------	------	------	------	------	--------------------	-------------------------	------	-----

Operation status byte P= 'Y' (0X59) successful

P= 'N' (0X4E) failure

P= 'E' (0X45) no card in reader


P= 'W' (0x57) card is not in the right place where it can be operated

Password type code: = 0x30 Modify main password

= 0x31 Modify application zone 1 password

= 0x32 Modify application zone 1 erase password

= 0x33 Modify application zone 2 password

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- = 0x34 Modify application zone 2 erase password
- = 0x35 Modify application zone 3 password
- = 0x36 Modify application zone 3 erase password
- = 0x37 Modify application zone 4 password
- = 0x38 Modify application zone 4 erase password

Only can modify password under safety mode 1, under safety mode 2 only can verify password, cannot modify the password.

9.7.7 Personalized operation (Under safety mode 2)

Host sends:

0x02	0x00	0x03	0x3B	0x36	Operation code	0x03	BCC
------	------	------	------	------	----------------	------	-----

Operation code = 0x30 simulate personalize operation (for test)

= 0x31 quit personalize operation

= 0x32 personalized operation completely, cannot return

Reader returns:

0x02	0x00	0x04	0x3B	0x36	Operation code	Operation status byte P	0x03	BCC
------	------	------	------	------	----------------	-------------------------	------	-----

Operation status byte P= 'Y' (0X59) successful

P= 'N' (0X4E) failure

P= 'E' (0X45) no card in reader

P= 'W' (0x57) card is not in the right position where it can be operated

9.8. AT45D041 Card Operation (2048 pages storage, each: 264 byte)

9.8.1 Reset

Host sends:

0x02	0x00	0x02	0x3C	0x30	0x03	BCC
------	------	------	------	------	------	-----

Reader returns:

0x02	0x00	0x03	0x3C	0x30	Operation status byte P	0x03	BCC
------	------	------	------	------	-------------------------	------	-----

Operation status byte P= 'Y' (0X59) successful

P= 'N' (0X4E) failure

P= 'E' (0X45) no card in

P= 'W' (0x57) card is not in the right position where it can be operated


9.8.2 Read data: only support page read (264 byte)

Host sends:

0x02	0x00	0x04	0x3C	0x31	Page address 2 byte	0x03	BCC
------	------	------	------	------	---------------------	------	-----

Reader operation successful returns: P= 'Y' (0X59) read card successful

0x02	0x01	0x0D	0x3C	0x31	Operation status byte P	Page address 2 byte	264 byte card data	0x03	BCC
------	------	------	------	------	-------------------------	---------------------	--------------------	------	-----

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Reader operation failure return:

0x02	0x00	0x05	0x3C	0x31	Operation status byte P	Page address 2 byte	0x03	BCC
------	------	------	------	------	-------------------------	---------------------	------	-----

Operation status byte P= 'N' (0X4E) read card failure

P= 'E' (0X45) no card in reader

P='W' (0x57) card is not in the right position where it can be operated

Page address: 0x0000---0x07FF

9.8.3 Write data: only support page write (264 byte)

Host sends:

0x02	0x01	0x0C	0x3C	0x31	Page address 2 byte	264 byte card data	0x03	BCC
------	------	------	------	------	---------------------	--------------------	------	-----

Reader returns:

0x02	0x00	0x05	0x3C	0x31	Operation status byte P	Page address 2 byte	0x03	BCC
------	------	------	------	------	-------------------------	---------------------	------	-----

Operation status byte P= 'Y' (0X59) write card successful

P= 'N' (0X4E) fail to write

P= 'E' (0X45) no card in

P='W' (0x57) card is not in the right position where it can be operated

9.9. SIM Card Operation (for card reader with SIM card connector)

9.9.1 Reset SIM card: (For 1.8V, 3.0V and 5.0V SIM Card)

Host sends:

0x02	0x00	0x03	0x3D	0x30	SIM card No.	0x03	BCC
------	------	------	------	------	--------------	------	-----

Reader operation successful returns: operation status byte P= 'Y' (0X59) (For T=0 SIM Card)

0x02	Communication length 2 byte	0x3D	0x30	SIM card No.	operation status byte P	Reset data package length 2 byte	Reset data n byte	0x03	BCC
------	-----------------------------	------	------	--------------	-------------------------	----------------------------------	-------------------	------	-----

Data package length=6+ reset data length n

Reader operation successful returns: operation status byte P= 'Z' (0X5A) (For T=1 SIM Card)

0x02	Communication length 2 byte	0x3D	0x30	SIM card No.	operation status byte P	Reset data package length 2 byte	Reset data n byte	0x03	BCC
------	-----------------------------	------	------	--------------	-------------------------	----------------------------------	-------------------	------	-----

Data package length=6+ reset data length n


SIM card connector No.=0x30 operate SIM card 1

=0x31 operate SIM card 2

=0x32 operate SIM card 3

=0x33 operate SIM card 4

=0x34 operate SIM card 5

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=0x35 operate SIM card 6

=0x36 operate SIM card 7

=0x37 operate SIM card 8

Reader operation failure returns:

0x02	0x00	0x03	0x3D	0x30	SIM card No.	operation status byte P	0x03	BCC
------	------	------	------	------	--------------	-------------------------	------	-----

P= 'N' (0X4E) fail to reset

Note: Operating the SIM card, we only could operate C-APDU package after resetting successfully. Please check the operation voltage of SIM card whether it is okay or not to avoid damaging the SIM card when you use the SIM card.

9.9.2 T=0 SIM card C-APDU command operation:

Host sends

0x02	Communication package length 2 byte	0x3D	0x31	SIM card No.	C-APDU package length 2 byte	C-APDU package n byte	0x03	BCC
------	--	------	------	--------------	---------------------------------	--------------------------	------	-----

Communication package length =5+ C-APDU package length n (n=4--263byte)

Reader operation successful returns: operation status byte P= 'Y' (0X59)

0x02	Communication package length 2 byte	0x3D	0x31	SIM card No.	operation status byte P	C-APDU operation returns package length 2 byte	C-APDU operation returns package n byte	0x03	BCC
------	--	------	------	--------------	-------------------------	---	--	------	-----

Communication package length =6+ C-APDU operation returns package length n (n=4--263byte)

9.9.2 T=1 SIM card C-APDU command operation:

Host sends

0x02	Communication package length 2 byte	0x3D	0x32	SIM card No.	C-APDU package length 2 byte	C-APDU package n byte	0x03	BCC
------	--	------	------	--------------	---------------------------------	--------------------------	------	-----

Communication package length =5+ C-APDU package length n (n=4--263byte)

Reader operation successful returns: operation status byte P= 'Y' (0X59)


0x02	Communication package length 2 byte	0x3D	0x32	SIM card No.	operation status byte P	C-APDU operation returns package length 2 byte	C-APDU operation returns package n byte	0x03	BCC
------	--	------	------	--------------	-------------------------	---	--	------	-----

Communication package length =6+ C-APDU operation returns package length n (n=4--263byte)

Reader operation failure returns:

0x02	0x00	0x04	0x3D	0x32	SIM card No.	operation status byte P	0x03	BCC
------	------	------	------	------	--------------	-------------------------	------	-----

P= 'N' (0X4E) failure

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9.10. Magnetic Card Operation

The initialized reading mode is reading track 1, 2, 3 via ASCII code after card reader power on. When reset the reader, still ASCII mode

9.10.1 According to the appointed mode read appointed tracks data

Host sends:

0x02	0x00	0x04	0x45	0x30	Read card mode	Appointed track	0x03	BCC
------	------	------	------	------	----------------	-----------------	------	-----

Read card mode: 0x30 read data in ASCII code
 0x31 read data in binary code

Appointed track code: 0x30 do not read any track
 0x31 read track 1
 0x32 read tracks 2
 0x33 read tracks 3
 0x34 read track 1, 2
 0x35 read track 2, 3
 0x36 read 1, 3 tracks
 0x37 read all 3 tracks

Reader returns:

0x02	Communication length n byte	0x45	0x30	Card reading mode	Appointed track No.	data package n byte of track 1, 2, 3	0x03	BCC
------	-----------------------------	------	------	-------------------	---------------------	--------------------------------------	------	-----

Communication length: $N = 4 + 3 \text{ tracks data length}$

Reading mode: =0x30 be set to ASCII code reading mode, the upload data is in ASCII coding
 =0x31 be set to binary code reading mode, the upload data is in binary coding

Notice: read data in binary code and the format of different data is:

Track 1: b0, b1, b2, b3, b4, P

Track 2, 3: b0, b1, b2, b3, P

Data package format of each tracks.


Starting byte + reading status byte + data of tracks

Starting byte: 0x1F

Reading status byte: 0x59 correct data information of track if reading successful
 0x4E wrong information if reading error
 0x4F can not read, track data is 0xE0

Error information:

0xE1 error, no STX
 0xE2 error, no EXT
 0xE3 error, no VRC
 0xE4 error, wrong LRC

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0xE5 error, blank track

When it is set in ASCII code reading mode, data of each track is uploaded in one byte ASCII code.

Eg, First byte of track 1 0x03 (HEX)

Uploading data package is 0x33 (ASCII)

When it is set in binary code reading mode, data of each track is uploaded in 4 bit per unit in ASCII code.

Eg, First byte of track 1 0x03 (HEX)

Uploading data package is 0x30 0x33

9.10.2 According to the re-appointed mode read appointed tracks data.

It only suits for the Reader with the Magnetic head at the rear side. Move the card again and read the mag card, then upload the magnetic card data. It is suitable for reading magnetic card error when entering at the first time. Executing this command could move the card and read data from magnetic card again.

HOST sends:

0x02	0x00	0x04	0x45	0x31	Read card mode	Appointed Track No.	0x03	BCC
------	------	------	------	------	----------------	---------------------	------	-----

Read card mode: 0x30 read data in ASCII code

0x31 read data in binary code

Appointed track code: 0x30 do not read any track

0x31 read track 1

0x32 read tracks 2

0x33 read tracks 3

0x34 read track 1, 2

0x35 read track 2, 3

0x36 read 1, 3 tracks

0x37 read all 3 tracks

Successful Operation returns:

0x02	Communication length N byte	0x45	0x31	Read card mode	Appointed Track No.	data package n byte of track 1, 2, 3	0x03	BCC
------	-----------------------------	------	------	----------------	---------------------	--------------------------------------	------	-----

Communication length: N = 4 + 3 tracks data length

Reading mode: =0x30 be set to ASCII code reading mode, the upload data is in ASCII coding

=0x31 be set to binary code reading mode, the upload data is in binary coding

Notice: read data in binary code and the format of deferent data is:


Track 1: b0, b1, b2, b3, b4, P

Track 2, 3: b0, b1, b2, b3, P

Data package format of each tracks:

Starting byte + reading status byte + data of tracks

Starting byte: 0x1F

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Reading status byte:

0x59	correct data information of track if reading successful
0x4E	wrong information if reading error
0x4F	can not read, track data is 0xE0

Error information:

0xE1	error, no STX
0xE2	error, no EXT
0xE3	error, no VRC
0xE4	error, wrong LRC
0xE5	error, blank track

When it is set in ASCII code reading mode, data of each track is uploaded in one byte ASCII code.

E.g, First byte of track 1 0x03 (HEX)

Uploading data package is 0x33 (ASCII)

When it is set in binary code reading mode, data of each track is uploaded in 4 bit per unit in ASCII code.

E.g, First byte of track 1 0x03 (HEX)

Uploading data package is 0x30 0x33

Failure operation returns:

0x02	0x00	0x05	0x45	0x31	Read card mode	Appointed Track No.	Error status byte P	0x03	BCC
------	------	------	------	------	----------------	---------------------	---------------------	------	-----

Error status byte P= 'E' (0x45) no card in

 P= 'W' (0x57) card is not in the right place where it can be operated

 P= 'N' (0x4E) operation failure

9.11. AT88SC1608 Card Operation (Only for CRT-310 V3.0)

9.11.1 Reset

HOST sends:

0x02	0x00	0x02	0x3E	0x30	0x03	BCC
------	------	------	------	------	------	-----

Reader operation returns:

0x02	0x00	0x03	0x3E	0x30	Operation status byte P	0x03	BCC
------	------	------	------	------	-------------------------	------	-----

Operation status byte P= 'Y' (0x59) successful

 P= 'N' (0x4E) failure

 P= 'E' (0x45) no card in reader

 P= 'W' (0x57) card is not in the right position where it can be operated

9.11.2 Verify Password


HOST sends:

0x02	0x00	0x06	0x3E	0x31	Password code	Password data 3 byte	0x03	BCC
------	------	------	------	------	---------------	----------------------	------	-----

Reader operation returns:

0x02	0x00	0x04	0x3B	0x31	Password code	Operation status byte P	0x03	BCC
------	------	------	------	------	---------------	-------------------------	------	-----

Operation status byte P= 'Y' (0x59) successful

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P= 'N' (0X4E) failure

P= 'E' (0X45) no card in reader

P='F' (0X46) card useless or application block useless

P='W' (0x57) card is not in the right position where it can be operated

Password type code: = 0x30 Verify application zone 1 read password

= 0x31 Verify application zone 2 read password

= 0x32 Verify application zone 3 read password

= 0x33 Verify application zone 4 read password

= 0x34 Verify application zone 5 read password

= 0x35 Verify application zone 6 read password

= 0x36 Verify application zone 7 read password

= 0x37 Verify application zone 8 read password

= 0x38 Verify application zone 1 write password

= 0x39 Verify application zone 2 write password

= 0x3A Verify application zone 3 write password

= 0x3B Verify application zone 4 write password

= 0x3C Verify application zone 5 write password

= 0x3D Verify application zone 6 write password

= 0x3E Verify application zone 7 write password/verify main password

= 0x3F Verify application zone 8 write password

Note:

We can verify the password for each zone for only 8 times, if the password is error for all the 8 times, the card will be locked. And this block could not be read and written any more.

9.11.3 Read Data

HOST sends:

0x02	0x00	0x06	0x3E	0x32	Zone Code 1 byte	Operation first address 1 byte	Operation length 1 byte	0x03	BCC
------	------	------	------	------	---------------------	-----------------------------------	----------------------------	------	-----


Reader operation successful and then returns: P='Y' (0x59)

0x02	Communication package Length L 2 byte	0x3E	0x32	Zone Code 1 byte	Operation status byte P	Operation first address 1 byte	Operation length 1 byte	Data n byte	0x03	BCC
------	--	------	------	---------------------	-------------------------	-----------------------------------	-------------------------	----------------	------	-----

Communication package Length: L= 7 + n byte

Fail to read card and return:

0x02	0x00	0x06	0x3E	0x32	Zone Code	Operation status byte P	Operation first address	Operation length 1 byte	0x03	BCC
------	------	------	------	------	-----------	----------------------------	----------------------------	----------------------------	------	-----

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					1 byte			1 byte			
--	--	--	--	--	--------	--	--	--------	--	--	--

P= 'N' (0X4E) fail to read card

P= 'E' (0X45) no card in reader

P='W' (0x57) card is not in the right position where it can be operated.

Operation address range:

Application Zone: 0x00----0xFF

Setting Zone: 0x00----0x80

Operation length range: 0x01----0x80

Zone Code: = 0x30 application zone 1 (len=0x01—0x80)

= 0x31 application zone 2 (len=0x01—0x80)

= 0x32 application zone 3 (len=0x01—0x80)

= 0x33 application zone 4 (len=0x01—0x80)

= 0x34 application zone 5 (len=0x01—0x80)

= 0x35 application zone 6 (len=0x01—0x80)

= 0x36 application zone 7 (len=0x01—0x80)

= 0x37 application zone 8 (len=0x01—0x80)

= 0x38 setting zone (len=0x01—0x80)

If want to read the application zone, please check the Read Password first. If it is correct, then it can be read, or the data read is invalid. For the data of setting zone, only the password zone (0x40---0x7F) is under protection. It only can be read out after verifying the password and it is correct.

9.11.4 Write Data

HOST sends:

0x02	Communication package Length 2 byte	0x3E	0x33	Zone code 1 byte	Operation first address 1 byte	Operation length 1 byte	Data n byte	0x03	BCC
------	--	------	------	---------------------	-----------------------------------	-------------------------	-------------	------	-----

Reader returns:

0x02	0x00	0x06	0x3E	0x33	Zone Code	Operation status byte P	Operation first address 1 byte	Operation length 1 byte	0x03	BCC
------	------	------	------	------	-----------	----------------------------	-----------------------------------	----------------------------	------	-----


P='Y' (0x59) Successful

P='E' (0x4E) failure

P= 'E' (0X45) no card in reader

P='W' (0x57) card is not in the right position where it can be operated.

Operation address range:

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Application Zone: 0x00----0xFF

Setting Zone: 0x00----0x80

Operation length range: 0x01----0x80

Zone Code: = 0x30 application zone 1 (len=0x01—0x80)
 = 0x31 application zone 2 (len=0x01—0x80)
 = 0x32 application zone 3 (len=0x01—0x80)
 = 0x33 application zone 4 (len=0x01—0x80)
 = 0x34 application zone 5 (len=0x01—0x80)
 = 0x35 application zone 6 (len=0x01—0x80)
 = 0x36 application zone 7 (len=0x01—0x80)
 = 0x37 application zone 8 (len=0x01—0x80)
 = 0x38 setting zone (len=0x01—0x80)

If want to write on the application zone, please check the Read Password first. If it is correct, then it can be read, or the data written is invalid. For other operation information such as the password of setting zone, please refer to related document and specification.

9.11.5 Read Fuse

HOST sends:

0x02	0x00	0x06	0x3E	0x34	0x03	BCC
------	------	------	------	------	------	-----

Reader success operation and returns: P='Y' (0x59)

0x02	0x00	0x06	0x3E	0x34	Operation status byte P	Fuse status byte FAB	Fuse status byte CMA	Fuse status byte PER	0x03	BCC
------	------	------	------	------	-------------------------	----------------------	----------------------	----------------------	------	-----

Reader fail operation and returns:

0x02	0x00	0x06	0x3E	0x34	Operation status byte P	0x03	BCC
------	------	------	------	------	-------------------------	------	-----

P='N' (0x4E) failure

P='E' (0x45) no card in reader

P='W' (0x57) card is not in the right position where it can be operated.

Fuse status byte FAB: FAB=0X30 blown out, FAB=0X31 not blown out


Fuse status byte CMA: CMA=0X30 blown out, CMA=0X31 not blown out

Fuse status byte PER: PER=0X30 blown out, PER=0X31 not blown out

FAB is the fusing sign of the CMOS chip of ATMEL.

CMA is the fusing sign of the card while leaving from the card factory.

PER is the fuse of issuer, it is the fusing sign when personalization before the startup of the application system.

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9.11.6 Write Fuse: (Blow out according to FAB → CMA → PER, and fuse could not be recovered after blowing out)

HOST sends:

0x02	0x00	0x03	0x3E	0x35	0x03	BCC
------	------	------	------	------	------	-----

Reader returns:

0x02	0x00	0x03	0x3E	0x35	Operation status byte P	0x03	BCC
------	------	------	------	------	-------------------------	------	-----

P='Y' (0x59) success

P='N' (0x4E) failure, fuse has been blown out

P='E' (0x45) no card in reader

P='W' (0x57) card is not in the right position where it can be operated.

9.11.7 Initializing authentication zone

HOST sends:

0x02	0x00	0x0A	0x3E	0x36	8 byte random numbers Q0、Q1、Q2、Q3、Q4、Q5、Q6、Q7	0x03	BCC
------	------	------	------	------	---	------	-----

Reader returns:

0x02	0x00	0x03	0x3E	0x36	Operation status byte P	0x03	BCC
------	------	------	------	------	-------------------------	------	-----

P='Y' (0x59) success

P='N' (0x4E) failure, the card has been initialized.

P='E' (0x45) no card in reader

P='W' (0x57) card is not in the right position where it can be operated.

Initializing authentication zone is that read out the Nc and Ci from card, and use F1 or F2 Algorithm, then figure out $Gc = F1(Ks, Nc)$ and get random numbers Q0~Q7. Send them into AT88SC160 card and finish initializing authentication zone

9.11.8 Verifying authentication zone

HOST sends:

0x02	0x00	0x0A	0x3E	0x37	8 byte random numbers Q0,Q1,Q2,Q3,Q4,Q5,Q6,Q7	0x03	BCC
------	------	------	------	------	---	------	-----

Reader returns:

0x02	0x00	0x03	0x3E	0x37	Operation status byte P	0x03	BCC
------	------	------	------	------	-------------------------	------	-----

P='Y' (0x59) success

P='N' (0x4E) failure


P='E' (0x45) no card in reader

P='W' (0x57) card is not in the right position where it can be operated.

Verifying authentication zone is a step after initializing authentication zone. We use F2 Algorithm and get the result from $Q1 = F2(Gc, Ci, Q0)$. Then get the value of Q0, Q1, Q2, Q3, Q4, Q5, Q6, Q7 and send them into AT88SC1608 card to finish verifying authentication zone.

Note: Nc: ID code, Always use it as the only mark for the card—Card No. Define it before personalization.

Ci: Ciphertext, write a random number into it for authenticating card, and it will be rewritten for each authentication

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Gc: Secret key, 64byte secret seed, Nc figures out it according to F1 Formula. Write it into card before personalization. It can not be visited after personalization. When authenticating, it will be a parameter of F2 Algorithm. For detail, please refer to authentication protocol.

CREATOR