ePort G6

Contactless Smart Card Reader Module

Programmer's Manual

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Revision A

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NOTICE

The issuer of this manual has made every effort to provide accurate information contained in this manual. The issuer shall not be held liable for any technical and editorial omissions or errors made herein; nor for incidental consequential damages resulting from the furnishing, performance or use of this material.

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AGENCY APPROVED

- Specification for FCC Class B

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

—Reorient or relocate the receiving antenna.

—Increase the separation between the equipment and receiver.

—Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

—Consult the dealer or an experienced radio/ TV technician for help.

You are cautioned that any change or modifications to the equipment not expressly approve by the party responsible for compliance could void your authority to operate such equipment.

WARNING

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

WARRANTY

This product is served under one-year warranty of defects in material and functionality to the original purchasers. Within the warranty period, if the product found to be defective will be repaired or replaced. This warranty applies to the products only under the normal use of the original purchasers, and in no circumstances covers incidental or consequential damages through consumers' misuse or modification of the product.

PREFACE

This manual provides detailed information relating to the overall operational, electrical, mechanical, environmental and functional aspects of the ePort G6. This document should be read and understood prior to initial operation of the product.

For ease of installation and programming use, we have addressed everything from its attractive features to its various configurations.

When designing the ePort G6, we selected what we feel are the most useful features and functions. If in some cases you find that your specific needs differ from our existing products, we welcome your comments and suggestions. Custom-designed models are also available.

If further questions do arise, please call for technical support, our FAE will assist you in any way we can.

Table of Contents

Section1: General Description

This section presents general information about the basic characters of the ePort G6.

Features

The ePort G6 provides the following features:

1	Small footprint PCB size: 1.4L*1.7W (inch) without antenna board
2	Support ISO 14443 type A & B standard
3	Support Amex ExpressPay, MasterCard PayPass, Visa MSD applications.
4	Read/write Philips Mifare classical contactless smart card
5	Provide the options for the direct coupling antenna and the remote antenna
6	RS232, and serial TTL (optional) Interface
7	RS232 data pass through function
8	TTL F2F magnetic stripe decode data pass through (optional)
9	F2F decoder data emulation (optional)
10	Firmware upgradeable

Application

The contactless smart card reader module ePort G6 is mainly to support the contactless payment systems. The small footprint size of the module makes it easily to integrate to the current transaction system such as Point-of-Sale terminal, kiosk, and vending machine station as the part of the system. The module communicates with a host computer or terminal using a standard RS-232 or TTL interface.

At the meantime, ePort G6 offers both RS232 and TTL magnetic stripe decoder pass-thru function to allow the terminal to share the same input port with other peripheral devices. The TTL interface output is in the F2F decoder data emulation. This benefits the existing system without change its hardware configuration to catch up the future payment trend.

Section2: Configurations 2-2

This section shows the dimensions, accessories and setup for the ePort G6.

Dimensions of ePort G6 PCBA

Figure 2-1 Dimensions of ePort G6 PCBA
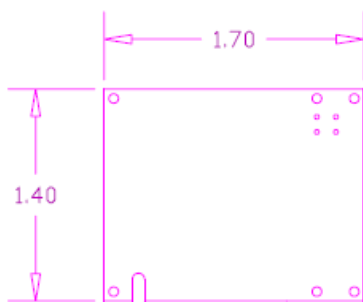
Dimensions of Antenna PCBA

Figure 2-2 Dimensions of Antenna PCBA
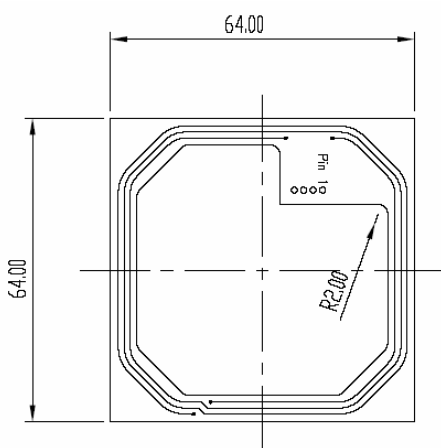
Accessories of ePort G6 2-3

The following accessories should be supplied along with ePort G6. Make sure all the following accessories are contained in your package.

1. Interface cable - DB9 male connector 1.5M
2. Programmer's manual or Simple manual
3. Power adapter 12Vdc 500mA (RS232 interface only)

Section3: Technical Specifications

Functional Specifications

- Contactless communication at 13.56MHz
- Proximity operation distance of up to 100mm
- 4 output lines for external LED indication (support Paypass application)
- Audio buzzer
- Support RS232 data output baud rate up to 115.2K BPS
- Support RS232 pass through baud rate up to 38400 BPS
- Support TTL level for serial data output (optional)
- Support TTL level for F2F decoder data output emulation (optional)
- Support direct matching antenna
- Support Remote 50 ohm matching antenna (optional)
- Support all layers of 14443 including the type A and B communication scheme
- Support contactless communication using MIFARE higher baud rate up to 424KHz
- Support the fast MIFARE Classic security algorithm to authenticate MIFARE classic products
- Support American Express ExpressPay transaction application
- Support MasterCard PayPass transaction application
- Support Visa MSD transaction application

Electrical Specifications

- **Power Required**

12VDC

- **Power Consumption**

100mA in idle mode; 200mA in operating mode

- **Communication**

Standard RS232 signal level

TTL 5V signal level (optional)

- **Communication Signal (RS232)**

Logic 1 = -3 volts to –15 volts or TTL level 5 volts

Logic 0 = +3 volts to +15 volts or TTL level 0 volt

Environmental Specifications

- **Temperature**

Operating: -10-50℃
Storage: -30-70℃

- **Humidity**

Operating: 10-85% (non condensing)
Storage: 10-90% (non condensing)

Pin Assignment

Table 3-1. Interface J3 Pin Assignment (RS232 level)

DB9	Signal	Direction	PCB-J1	Signal
5	GND		1	GND
2	RxD	← Serial data to host	2	TXD1
3	TxD	→ Serial data from host	3	RXD1
			4	VCC
		(Pass-thru function)	5	TXD2
		(Pass-thru function)	6	RxD2
	Shield		7	Shield

Table 3-2. Extension Port J1 Pin Assignment (TTL Level)

Pin	Signal	Comment
1	GND	
2	VCC	5Vdc
3	Extended IO	
4	Extended IO	
5	Extended IO	
6	Extended IO	
7	Buzzer + output	
8	Extended IO	
9	Extended IO	
10	Extended IO	
11	Extended IO	
12	Extended IO	
13	Extended IO	
14	Extended IO	
15	Extended IO	
16	Extended IO	
17	Extended IO	
18	Extended IO	
19	Extended IO	
20	Extended IO	

Table 3-3. 50 RF Antenna Port J2B Pin Assignment

Contact number	Signal
1	RF output
2	GND

Table 3-4. Direct Match Antenna Port J2A Pin Assignment

Contact number	Signal
1	RX
2	TX
3	GND
4	GND

Communication

- **RS232 Interface Data Output**
  Synchronization
  The interface receives and transmits serial asynchronous data at voltage levels compatible with the RS232 specification.

  Baud Rate
  9600 BPS default (optional: 1200/2400/4800/9600/19200/38400/56000/115.2K BPS)

- **RS232 Interface Pass Through**

  Baud Rate
  9600 BPS default (optional: 1200/2400/4800/9600/19200/38400 BPS)

- **F2F TTL Interface (Optional)**
  Each track has the clock and data. Please refer to command set for the detail setting.

- **Transmission Protocol (RS232)**
The user may select from three different protocols: Protocol 0, 1, and 2.
Upon reset, the reader sends the power-on response ":", depending upon the configuration setting. The reader then configures itself to the protocol of the first command from the host. From this point on, the protocol is unchangeable until a reset occurs.

Protocol 0

In Protocol 0, all characters are transmitted and received using exactly the characters listed in section 4. There are no headers and Block Check Characters (BCC). Protocol 0 presumes no transmission errors. If the host detects an error, it may request a retransmission.

Table 3-3. Example for Protocol 0

Host Command	Reader Response	Comment
P		Ready to read
	^	Reader ACK

Protocol 1

In Protocol 1, all messages are preceded by the ASCII character <STX> and terminated with the ASCII character <ETX>, followed by a one byte <BCC>. <BCC> is an XOR of the 7 data bits, excluding parity, of each character in the entire message, including <STX>.

Format: <STX><MESSAGE><ETX><BCC>

where STX=02Hex and ETX=03Hex.

Table 3-4. Example for Protocol 1

Host Command	Reader Response	Comment
02h 50h 03h 51h		Ready to read
	02h 5Eh 03h 5Fh	Reader ACK

Protocol 2

In Protocol 2, all messages are preceded by the ASCII character <SOH>, followed by a one byte reader address, one byte character count and terminated with a one byte <BCC>.
The <BCC> is an XOR of the characters (8 bits) in the entire message, including <SOH>.
Format: **<SOH><ADDRESS><00Hex><COUNT><MESSAGE><BCC>**

or

<SOH><ADDRESS><00Hex><00Hex><MESSAGE><EOT><BCC>

where STX=02Hex and ETX=03Hex.

Table 3-5. Example for Protocol 2

Host Command	Reader Response	Comment
01h 00h 00h 01h 50h 50h		Ready to read
	01h 00h 00h 01h 5Eh 5Eh	Reader ACK

The <ADDRESS> field is for a multi-reader system. This function is not currently supported. The recommended value for this field is NULL (00Hex), however, any value will work.

If the value of <COUNT> fields are zero, an <EOT>, followed by the <BCC>, completes the message. The reader may, at its option, use NULL for COUNT when transmitting.

For Protocols 1 and 2, if the reader detects an error in an incoming transmission, it will respond with a "Communications Error" message. If the host detects a transmission error, it may request a retransmission. Both protocols enforce a 100mSec timeout between characters.

For all Protocols, the host may, at any time, stop/start the reader transmission by using software "handshake" (DC3/DC1).

Section4: Commands and Responses

4.1 Reader default setting

Output type: RS232

Data format: 9600-8-N-1

Pass through function: Disable

Pass through data format: 9600-8-N-1

Buzzer function: Enable

Protocol format: USI0

PnP function: Disable

Contactless smart card manual type: type A

Contactless self-arm mode: Disable

Contactless payment card reading: PayPass, ExpressPay, Visa MSD

Note 1: when "Contactless self-arm mode" turns on, ePort G6 will automatic read the card in the reading zone for both type A and B cards.

Note 2: the manual contactless card operation commands are invalid when "Contactless self-arm mode" is on. To switch manual operation mode, user needs to disable the "Contactless self-arm mode" first.

4.2 Reader Command Description

- **% (25H) – Retransmit**
    COMMENT   **Retransmits the last message sent by the reader.**
    NOTE   **Command is turned off in self-arm mode.**

- **70 (3730H) or 90 (3930H) – Serial Number Report**
    COMMENT   **Transmit version and copyright information.**
    The Serial number will be stored in the EEPROM and stored as an eight-digit ASCII character array.
    Example: "00000000"

- **71 (3731H) or 91 (3931H) – Copyright Report**
    COMMENT   **Transmit version and copyright information.**

Send this when you want to know the version and copyright of the Model ePort G6 firmware currently loaded. The response is an ASCII string giving the firmware date (yymmdd), reader type and the firmware version number followed by the firmware copyright statement. The firmware copyright statement is absent in OEM version.

Example: "031226,ePort0001A:V1.A"

- **72 (3732H) or 92 (3932H) – Reader Model Number Report**

    COMMENT   Transmit reader configuration information.

    The model number will be stored in the reader code area and stored as a three to eight-digit ASCII string.

    Example: "ePort G6"

- **73 (3733H) or 93 (3933H) – Reader PCB Number Report**

    COMMENT   Transmit reader PCB number.

    The PCB number will be stored in the EEPROM and stored as an eight-digit ASCII character array.

    Example: "680-REV1"

- **74 (3734H) or 94 (3934H) – Contactless Smart Card Library Version Report**

    COMMENT   Transmit smart card library version.

    The smart card library version may help determine if the current library has a particular feature for contactless smart card. It will present as 3 bytes hex number.

    Example: 00 01 01

- **75 (3735H) or 95 (3935H) – F/D Parameters List Report**

    COMMENT   Transmit the parameters list of supported F/D

    This command returns all the values of TA1 parameter (baud rate values) that are supported by UIC360. About the values means please refer the ISO 14443-3 type A specification.

    Example:

    01 02 03 04 08 11 12 13 14 18 21 22 23 28 31 32
    33 34 35 38 41 42 43 44 48 51 52 53 54 55 56 58
    61 62 63 64 68 69 91 92 93 94 95 96 A1 A2 A3 A4
    A5 A8 B1 B2 B3 B4 B5 B6 C1 C2 C3 C4 C5 C6 C8 D1
    D2 D3 D4 D5 D6

- **76 (3736H) or 96 (3936H) – Boot loader Version Number Report**

    COMMENT   Transmit bootloader version number.

    Example: "1.0"

- **77 (3737H) or 97 (3937H) – Reader Configuration Data Report**

COMMENT   **Transmit the reader configuration data.**

The data from the reader configuration area will be transmitted to the host as hex values with the command "77" [offset] [num]. The reader will return any or all the bytes from the reader configuration. The offset is an optional byte and the available value is from 0x00 to 0x3F. The num is an optional byte specifying the number of configuration bytes to be returned. If the offset and length bytes are omitted then the current configuration starting at offset 0 is transmitted.

Example:

> BE 0C 05 00 00 00 00 61 30 33 31 31 32 38 00 7D
>
> 28 54 4B 31 3A 3A 45 6E 64 29 28 54 4B 32 3A 3A
>
> 45 6E 64 29 28 54 4B 33 3A 3A 45 6E 64 29 00 00
>
> 00 00 00 00 00 00 00 00 3A 48 43 52 33 36 30 00

- **78 (3738H) or 98 (3938H) – Reader Customer Configuration Data Report**

    COMMENT   **Transmit the reader customer configuration data.**

    The data from the reader customer configuration area of the EEPROM will be transmitted to the host as hex values with the command "78¨ [offset] [num]. The reader will return any or all the bytes from the reader configuration. The offset is an optional byte and the available value is from 0x00 to 0x3F. The num is an optional byte specifying the number of configuration bytes to be returned. If the offset and length bytes are omitted then the current configuration starting at offset 0 is transmitted.

    Example:

    > 31 30 30 30 30 30 30 30 33 36 30 2D 52 45 56 33
    >
    > FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
    >
    > FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
    >
    > FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF

- **79 (3739H) or 99 (3939H) – Reader Manufacturing Configuration Data Report**

    COMMENT   **Transmit the reader manufacturing configuration data.**

    The data from the reader manufacturing configuration area of the flash will be transmitted to the host as hex values with the command "79" [offset] [num]. The reader will return any or all the bytes from the reader configuration. The offset is an optional byte and the available value is from 0x00 to 0x7F. The num is an optional byte specifying the number of configuration bytes to be returned to the host. If the offset and length bytes are omitted then the current configuration starting at offset 0 is transmitted.

    Example:

    > BE 0C 05 00 00 00 00 61 30 33 31 31 32 38 00 79
    >
    > 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
    >
    > 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
    >
    > 00 00 00 00 00 00 00 00 3A 48 43 52 33 36 30 00

Note: Commands 70 to 79 were same as 90 to 99 and supported for previous version reader compatible.

- **9 (39H) – Version Report**

    COMMENT   Transmit version information.

    Send this when you want to know the version of UIC360 firmware currently loaded. The response is an ASCII string giving the firmware date (yymmdd), reader type and firmware version number.

    Example: "031226, ePort G6:V1.A¨.

- **? (3FH) – Select Verbose Responses Command**

    COMMENT   Most error responses until the reader receives a reset command will include a short descriptive message.

    EXAMPLE   After sending a "?" to the reader then attempt to close the latch by sending the "{ " command. Examples of responses that may be returned:

    If success returns a '^' as well.

    If a card is partially inserted returns "!may only latch when card seated".

- **$ (24H) – Reader Status Request**

    COMMENT   Interrogate the reader about its operational status. Two bytes of status information will be returned.

    First Status Byte

Bit	Value: 0	Value: 1
0:0	Reserve for future use	Reserve for future use
0:1	Reserve for future use	Reserve for future use
0:2	Reserve for future use	Reserve for future use
0:3	Reserve for future use	Reserve for future use
0:4	Reserve for future use	Reserve for future use
0:5	No Magnetic Stripe Card data	Magnetic Stripe Card data
0:6	Not armed to read	Armed to read
0:7	Reserve for future use	Reserve for future use

Second Status Byte

Bit	Value: 00	Value: 01	Value: 10	Value: 11
1:0 - 1:1	Reserved for future use, always 0.			
1:2 - 1:3	Reserved for future use, always 0.			

1:4 – 1:7	Reserved for future use, always zero

- **L (4CH) – LED ON**
- **l (6CH) – LED OFF**
- **((28H) – LED flash**

     COMMENT

     1.Turn first/second LED ON/OFF/Flash, as specified.

     2.Transmits an acknowledgement "^" (5EH).

     NOTE   These commands are disabled in the self-arm mode.

- **# (23H) – Configuration Request**

     COMMENT   Return standard one byte or extended 16-byte string with configuration.

     NOTE   Using the configuration setting command to select standard or extended format.

     Standard One Configuration Byte

Bit	Value: 0	Value: 1
0	Track 1 not present	Track 1 present
1	Track 2 not present	Track 2 present
2	Track 3 not present	Track 3 present
3	Reserved for future use, always 0.	
4	Reserved for future use, always 0.	
5	Reserved for future use, always 0.	
6	Reserved for future use, always 0.	
7	Reserved for future use, always 0.	

     Extended Configuration Bytes (16 bytes)

Byte	0	1	2	3	4	5	6	7-15
Remark	Equip. 0	Equip. 1	Protocol	Speed	Address	Reserved, set to 00H	Reserved, set to 00H	Reserved, set to 00H

     Protocol: 0=USI0; 1=USI1; 2=USI2.

     Speed: 0=1200, 1=2400, 2=4800, 3=9600, 4=19.2k, 5=38.4k, 6=56k, and 7=115.2k bps.

     Address: Always is 00H.

     Actual Memory Card Type: See Memory Card Types table.

     Default Memory Card Type: The memory card type after reader has been powered-up or reset.

     Equip. 0 － Extended Configuration Byte 0

Bit	Value: 0	Value: 1
0	User card connector not	User card connector present

		present	
	1	Reserved for future use, always 0	
	2	SAM Board not present	SAM Board present
	3	CTS not present	CTS present
	4	Track 1 not present	Track 1 present
	5	Track 2 not present	Track 2 present
	6	Track 3 not present	Track 3 present
	7	Latch not present	Latch present

Equip. 1 — Extended Configuration Byte 1

Bit	Value: 0	Value: 1
0	Power fail not present	Power fail present
1 - 7	Reserved for future use, always 0.	

- ## <CAN> (18H) – Pass through toggle

  COMMENT

  Enable/Disable pass through function

  FORMAT The command characters are followed by an ASCII 'P' to enable/disable the pass through function.

- ## <7FH> – Warm Reset

  COMMENT   Abort all current actions and cause the device to execute all initialization functions. The device will respond as it would for a "power up" cycle, but always returning a ":" (3AH).

- ## <09H> – Configuration Setting

  COMMENT   This command is used to set configuration in EEPROM.
  FORMAT The command (09H) is followed by an at least 3 byte configuration setting command to set the configuration in EEPROM. The ePort G6 configuration can be set by this command or by the Configuration Setting Protocol. Please see "ePort G6 Configuration Guide" for details.

  Following are brief introduction of configuration commands, please refer to "ePort G6 Configuration Guide" for the detail information.

BRx (42h 52h x) ─ Set Baud Rate. x = '0' ~ '7'.

DF0 (44h 46h 00h) ─ Set configuration to the Manufacture Default Setting.

ECx (45h 43h x) ─ Extended Configuration Report Enable/Disable. x is 'E' or 'D'.

ESx (45h 53h x) ─ ES & SS Enable/Disable. x is 'E' or 'D'. (Only for Contactless MAG mode)

EV0 (45h 56h 00h) ─ EEPROM verify.

FAx (46h 41h x) ─ Set Track 1 Prefix Code, x can be up to 5 bytes. (Only for Contactless MAG mode)

Fax (46h 61h x) ─ Set Track 1 Suffix Code, x can be up to 5 bytes. (Only for Contactless MAG mode)

FBx (46h 42h x) ─ Set Track 2 Prefix Code, x can be up to 5 bytes. (Only for Contactless MAG mode)

Fbx (46h 62h x) ─ Set Track 2 Suffix Code, x can be up to 5 bytes. (Only for Contactless MAG mode)

LCx (4Ch 43h x) ─ LRC Enable/Disable, x = 'E' or 'D'. Note: The LRC will be always disabled while the SS/ES was disabled. (Only for Contactless MAG mode)

PCx (50h 43h x) ─ Set RS232 Protocol. x = '0' - '2'(30h - 32h).

PHx (50h 48h x) ─ Set Power On character, x default is ':'.

RE0 (52h 45h 00h) ─ Read all of EEPROM Data.

RP0 (52h 50h 00h) ─ Respond current used baud rate and Protocol.

SAx (53h 41h x) ─ Self-Arm Mode Enable/Disable, x is 'E' or 'D'. (Only for Contactless MAG mode)

SPx (53h 50h x) ─ Set Track Separator. x = any one character. (Only for Contactless MAG mode)

SNx (53h 4Eh x) ─ Set Serial Number, x is an 8-digits ASCII string.

TAx (54h 41h x) ─ Set Track 1 ID, x = any one character.

TBx (54h 42h x) ─ Set Track 2 ID, x = any one character.

TCx (54h 43h x) ─ Set Track 3 ID, x = any one character.

TKx (54h 4Bh x) ─ Set Transmitting Data Tracks

PEx (50h 54h x) – Set pass through function

ITx (49h 54h x) – Set output interface type

TDx (54h 44h x) – Set MSR TTL data output polarity

TCx (54h 43h x) – Set MSR TTL clock output polarity

BCx (42h 43h x) – Set COM2 baudrate

RNxxxx (52h 4Eh xxxx) – Set Random seed

4.3 Contactless Mag Stripe Command Description

- **P (50H) – Arm to Read**
  COMMENT

  1. Clear read data buffers.

  2. Transmit command acknowledgement ("^" 7EH).

  3. Wait for card insert/withdrawal.

  4. Transmit read acknowledgement ("^" Magnetic Stripe Card or ">" other media type) after card read.   After an "Arm to Read" command is received and acknowledged the only commands that will be accepted for execution are: <ESC> (Abort), "$" (Status), LED control commands and Reset command. In self-arm mode, it is not necessary to send this command, if sent it will temporarily override self-arm mode.

- **p (70H) – Arm to Read (Used for Manufacturing Test Only)**
  COMMENT

  1. Clear read data buffers.

  2. Transmit command acknowledgement ("^" 7EH).

  3. Wait for card read.

  4. If the card media is detected a "(" (28H) byte is sent, when media detect goes inactive a ")" (29H) byte is sent.

  5. If another media detected transmit read acknowledge ">" after card read.

  This is similar to the 'P' command but send '(' at start of magnetic stripe card data and ')' at end.

- **<ESC> (1BH) – Abort Arm to Read**
  COMMENT

  1. Clear read data buffers.

  2. Abort Arm to Read Command.

  3. Transmit command acknowledge ("^" 5EH).

- **Q (51H) – Transmit Track 1 data**
- **R (52H) – Transmit Track 2 data**
  COMMENT

  1. Detect the card type (ISO/AAMVA/DMV) automatically and process data in the read buffer using detected card type format.

  2. If error is detected, transmit proper error response ('*' or '+'), refer to " The esponses to the Host".

  3. Else, transmit data in ASCII.

4.4 Contactless Smart Card Command Descriptions

- **G (47H) – ISO14443 type protocol select**

  COMMENT

  Select ISO 14443 type A or B which manual command operated.

  G[Type, 1 byte]

  [Type]

  0 (30h, ASCII Hex) - ISO14443 A

  1 (30h, ASCII Hex) - ISO14443 B

  Response: **'^' – acknowledgement**

  '   *' – No card response or No power on the antenna

- **H(48H) – PayPass/Express card auto read function disable/enable**

  COMMENT

  Disable auto read function temporary if Self-Arm is enabling

  H [Enable/Disable, 1 byte]

  [Enable/Disable]

  0 (30h, ASCII Hex) - Self-Arm disable

  1 (31h, ASCII Hex) - Self-Arm enable

  Response: **'^' – acknowledgement**

  '*' – No card response or No power on the antenna

- **O (4FH) – Antenna power on**

  COMMENT

  Apply power on the antenna. This command is for manual command operation.

  O[Baud rate, 1 byte]

  [Baud rate] (optional)

  0 (30h, ASCII Hex) – 106K (default, Mifare type A only)

  1 (31h, ASCII Hex) – 212K (Mifare type A only)

  2 (32h, ASCII Hex) – 424K (Mifare type A only)

  3 (33h, ASCII Hex) – 848K (Mifare type A only)

Response: '^' – acknowledgement

'*' – Failed, the reader is in Self-Arm mode. The antenna power can not be turned

off.

- **o (6FH) – Antenna power OFF**
  COMMENT
  Turn the antenna power off.

  Response: '^' – acknowledgement

  '*' – Failed, the reader is in Self-Arm mode. The antenna power can not be turned

  off.

- **b (62H) – Request**
  COMMENT
  Request command.

  b[Method, 1 byte]   -   If reader is set to ISO14443 type A

  [Method] (optional)
  0 (30h, ASCII Hex) – Request All
  1 (31h, ASCII Hex) – Request Idle

  Note: if the [Method] field does not appear in the request command, reader will set the request mode to "Request All" automatically.

  b[AFI, 1 byte][Parameter, 1 byte] - If reader is set to ISO14443 type B

  [AFI](optional) - Binary hex (00h to FFh), please refer to ISO 14443-3 for the detailed information
  [Parameter](optional) - Binary hex (00h to FFh), please refer to 14443 for the detailed information.
  Note: if the [AFI] and [Parameter] do not appear in the request command, reader will set the request mode to "Request All" automatically.

  Response: ATQA (2 bytes, type A, Binary Hex) or ATQB (16 bytes, type B, Binary Hex) if command executed successfully

  '*' – No card response or No power on the antenna

- **c (63H) – Anticollision(type A)/Slot-Marker**
  COMMENT
  In type A mode, the reader sends the Anticollision command to the card.

In type B mode, the reader sends the Slot-Marker command to the card.

c[Cascade level, 1 byte] – if reader is set to type A

[Cascade level](optional)

0(30h, ASCII Hex) – Level 1

1(31h, ASCII Hex) – Level 2

2(32h, ASCII Hex) – Level 3

Note: if [Cascade level] does not appear in the Anticollision command, the reader will set to

Level 1 automatically.

c[APn, 1 byte] – if reader is set to type B

[APn] – Binary hex (01h to 16h), please refer to 14443-3 for the detailed information.

Note: Slot-Marker is not a mandatory command for type B card.

Response: If the command executed successfully, the reader returns

> **PICC serial number for type A (4 bytes, Binary Hex)**

Or

> **PICC send ATQB (12 bytes, Binary Hex) for type B**

(PICC may not response ATQB, in this situation, reader respone '*')

'*' – No card response

'~' – No power on the antenna

- **f (65H) – Select(type A)/Attrib(type B)**
  COMMENT
  In type A mode, the reader sends the SELECT command to the card.
  In type B mode, the reader sends the ATTRIB command to the card.

  f[Cascade level, 1 byte] – if reader is set to type A

  [Cascade level](optional)
  0(30h, ASCII Hex) – Level 1
  1(31h, ASCII Hex) – Level 2
  2(32h, ASCII Hex) – Level 3
  Note: if [Cascade level] does not appear in the Select command, the reader will set to Level 1
  automatically.

  f[Parameter 1, 1 byte] [Parameter 2, 1 byte] [Parameter 3, 1 byte] [Parameter 4, 1 byte]
  – if reader is set to type B

[Parameter 1](optional) – Binary Hex (00h to FFh)

[Parameter 2](optional) – Binary Hex (00h to FFh)

[Parameter 3](optional) – Binary Hex (00h to FFh)

[Parameter 4](optional) – Binary Hex (00h to FFh)

The setting of Parameter 1 to 4 should refer to ISO14443-3. If the [Parameter 1 – 4] do not appear in Attrib command, the reader set to default value.

Response: **If the command executed successfully, the reader returns**

      '^' + SAK(1 byte)

Or

      '^' + MBLI/CID(1 byte)

'*' – No card response or No power on the antenna

- **g (66H) – Mifare classical card authentication**

    (Support Mifare classical card only)

    COMMENT

    Mifare classical card authentication.

    f [Block number, 3 bytes][Key number, 1 byte] Authenticate the card with the key stored in EEPROM.

    Or

    f[Block number, 3 bytes][Key, 12 bytes] Authenticate the card with the key in [key field].

    [Block number]
    000 to 255 (30h30h30h to 32h35h35h, ASCII Hex)
    [Key number]
    0 to 9 (30h to 39h, ASCII Hex)
    [Key]
    0 to 9 or A to F (30h - 39h or 41h - 46h, ASCII Hex)

    Response: **'^' – acknowledgement**

          '*' – No card response or No power on the antenna

- **h (67H) – Mifare classical card read block**

    (Support Mifare classical card only)

    COMMENT

    Mifare classical card read command.

g [Block number, 3 bytes]

[Block number]

000 to 255 (30h30h30h to 32h35h35h, ASCII Hex)

Response: block data (16 bytes, Binary Hex) if command executed successfully

'*' – No card response or No power on the antenna

- **i (68H) – Mifare classical card write block**
  (Support Mifare classical card only)
  COMMENT
  Mifare classical card write command.

  h[Block number, 3 bytes][Block data, 4 bytes or 16 bytes]

  [Block number]
  000 to 255 (30h30h30h to 32h35h35h, ASCII Hex)
  [Block data]
  Binary Hex from 0h to FFh
  Note: 4 bytes block data are for Mifare Ultralight. Others should use 16 bytes block data.

  Response: '^' – acknowledgement

  '*' – No card response or No power on the antenna

- **t (74H) – Mifare Value Operation**
  (Support Mifare classical card only)
  COMMENT
  Mifare classical card value operation command.

  t[Block number, 3 bytes][Operation mode, 1 byte][Value, 4 bytes]

  [Block number]
  000 to 255 (30h30h30h to 32h35h35h, ASCII Hex)
  [Operation mode]
  0 (30h, ASCII Hex) –Decrement
  1 (31h, ASCII Hex) – Increment
  2 (32h, ASCII Hex) – Restore
  [Value]
  Binary Hex from 0h to FFh

Response: '^' – acknowledgement

'*' – No card response or No power on the antenna

- **X (58H) – Mifare classical card activation**

  (Support Mifare classical card only)

  COMMENT

  Perform request/anticollision/select command to activate the card.

  Response: **ATQA/serial number (6 bytes, Binary Hex) if command executed successfully**

  '*' – No card response or No power on the antenna

- **x (78H) – Card halt**

  COMMENT

  Card halt command.

  Response: **'^' – acknowledgement**

  '*' – No card response or No power on the antenna

- **J (6BH) – Activate PICC cpu card**

  COMMENT

  Activate PICC cpu card command. The Antenna POWER ON command has to be sent first.

  Response: **ATS (type A) or PUPI (type B) if command executed successfully**

  '*' – No card response or No power on the antenna

- **j (6BH) – Load Mifare key (Mifare classical card only)**

  COMMENT

  Save up to 10 key sets for Mifare classical card application

  Note. For security reason, there is no way to retrieve the key back.

  i[Key number, 1 byte][Key data, 12 bytes]

  [Key number]

  0 to 9 (30h to 39h, ASCII Hex)

  [Key data]

  0 to 9 or A to F (30h - 39h or 41h - 46h, ASCII Hex)

Response: '^' – acknowledgement

                '*' – No card response or No power on the antenna

- **k(6CH) – Mifare Reader Chip Direct Control**
  COMMENT

  Direct control the internal setting of Mifare reader chip

  k[Command, 1 bytes]

  [Command]

  0 (30h, ASCII Hex) - chip's serial number. Return 4 bytes hex binary string

  1 (31h, ASCII Hex) - chip's product information field. Return 16 bytes hex binary string.

  2 (32h, ASCII Hex) - chip's register initial setting parameter. Return 32 bytes hex binary string.

  Response: '^' – acknowledgement

                '*' – No card response or No power on the antenna

- **y (79H) – Send DESELECT command**
  COMMENT

  Send ISO14443 layer 4 DESELECT command to card

  Response: '^' – acknowledgement

                '*' – No card response or No power on the antenna

- **Z (41H) – I/O to contactless CPU card with APDU format**
  COMMENT

  The command is used to pass an APDU to the card where both data and an ISO status are expected in the response.

  Z[APDU, variant, 262 bytes max]

  [APDU]   Binary hex (00h to FFh)

  If an APDU is included with command it is transmitted to the ICC, otherwise an acknowledgement ("^" 5EH) is returned and the reader will wait until the APDU is sent in the following message.

  If successful, the data from the ICC and the two byte SW1/SW2 ISO 7816-4 response are returned.

  If unsuccessful, reader transmits '*'.

  APDU Command Structure

CLA	INS	P1	P2	P3	Data

				Lc or Le	(If Lc present)

APDU Response Structure

Data (optional)			SW1	SW2

- **z (7AH) – I/O to contactless card for block data exchange**

    COMMENT

    The command is used to pass a block data to a card.

    z[CRC mode, 1 bytes][Wait time, 4 bytes][Block data, 384 bytes max.]

    [CRC mode]

    0 (30h, ASCII Hex) – Block data contain 2 bytes CRC and enable CRC transmission.

    1 (31h, ASCII Hex) – No CRC in block data and disable CRC transmission.

    [Wait time]

    0000 to 9999 (30h30h30h30h to 39h39h39h39h, ASCII Hex) Waiting time in ms.

    [Block data]

    Binary hex (00h to FFh), Maximum accept 384 bytes.

    If successful, the data from the ICC are returned.

    If unsuccessful, reader transmits '*'.

3.6 Responses to the Host

4-26

^ (5EH)   **Acknowledge. Acknowledges correct completion of most recent command**

* (2AH)   **Command was received correctly. But could not be completed.**

+ (2BH)   **No Magnetic Stripe Card Data. Command was received correctly.**

? (3FH)   **Communication Error. Command was not received correctly.**

! (21H)   **Invalid Command.**

: (3AH)   **Power On report.**

~ (7Eh)   **Unavailable Hardware not available to complete this request**