

# HCR360

# Programmer's Manual

Hybrid Card Reader - USB Interface

Document #: PM042-USB-U

Revision A

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- Specification for FCC Class B
- Specification for CE Class B
- Product Certificate by Taiwan BSMI (Bureau of Standards, Metrology and Inspection)

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.

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# PREFACE

This manual provides detailed information relating to the overall operational, electrical, mechanical, environmental and functional aspects of the HCR360. 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 HCR360, 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.

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# Chapter1: Introduction

This document describes the requirements, operation, and usage of the Model HCR360 series Smart Card & Magnetic Stripe Card Reader. The HCR360 series can be field upgraded by downloading a new program into the flash memory of the reader. This guide should be read and understood prior to initial operation of the reader.

The HCR360 series include following models:

HCR360-UH: USB card reader supports Smart Card and Magnetic Stripe Card both.

HCR360-UM: Identical to HCR360-UH but supports Magnetic Stripe Card only.

HCR360-UI: Identical to HCR360-UH but supports Smart Card only.

## **1.1 General**

The HCR360 series is an intelligent manually operated insert reader for Magnetic Stripe Card and Smart Cards (ICC). This unit can simultaneously read up to three tracks of magnetic data and interface with asynchronous types (CPU card) and many types of synchronous ICCs (memory card). An optional electro-mechanical latching mechanism can be used to lock media in place while a transaction is in progress. Commands and data are processed through a USB interface. The reader includes diagnostic commands for system troubleshooting and setting commands for system configuration.

## **1.2 Features**

- ISO 7816 and EMV 2000 Level 1 certified.
- Supports T=0 and T=1 CPU Card. 5V, 3V and 1.8V ICC supported.
- Supports CPU cards requiring a variety of F/D ratios (speeds).
- Supports card communication speeds from 9600 bps to 115.2k bps.
- Can access 4 Secure Application Module (SAM) cards. (Optional SAM board required).
- Supports PC/SC if Plug & Play setting enabled.
- Can read up to three tracks of magnetic data simultaneously (ISO, AAMVA, DMV, and custom data).
- Reads Magnetic Stripe Card on insert or withdrawal or both directions (Dependent on Configuration).
- The CTS signal of host will be High when card seated. The CTS signal will be Low if card withdrew.
- Reads and writes a variety of Memory Cards.
- Uses AMC US11/2, TLP-224 or TLP-224Turbo communication protocol to talk with the host.
- Gives the host control over the optional bicolor LED.
- Debris opening, such as coin or paper, to either fall from or be forced out of the card slot.
- Allows host to request status, unit serial number, user info field, and configuration information.
- Contain FLASH memory. Downloads to FLASH memory is through the serial port (firmware downloadable).
- Configuration setting command can change configuration in EEPROM.



## **1.3 Part Number Description**

(For magnetic stripe reader only.)

The brief configuration of HCR360 part number are shown as below:

HCR360-12 Dual track 1&2

HCR360-23 Dual track 2&3

HCR360-33 Triple track 1&2&3

NOTE: Optional configuration is available.

## Chapter2: Configuration

This section shows the dimensions, accessories and setup for the HCR360.

### 2.1 Dimensions of HCR360

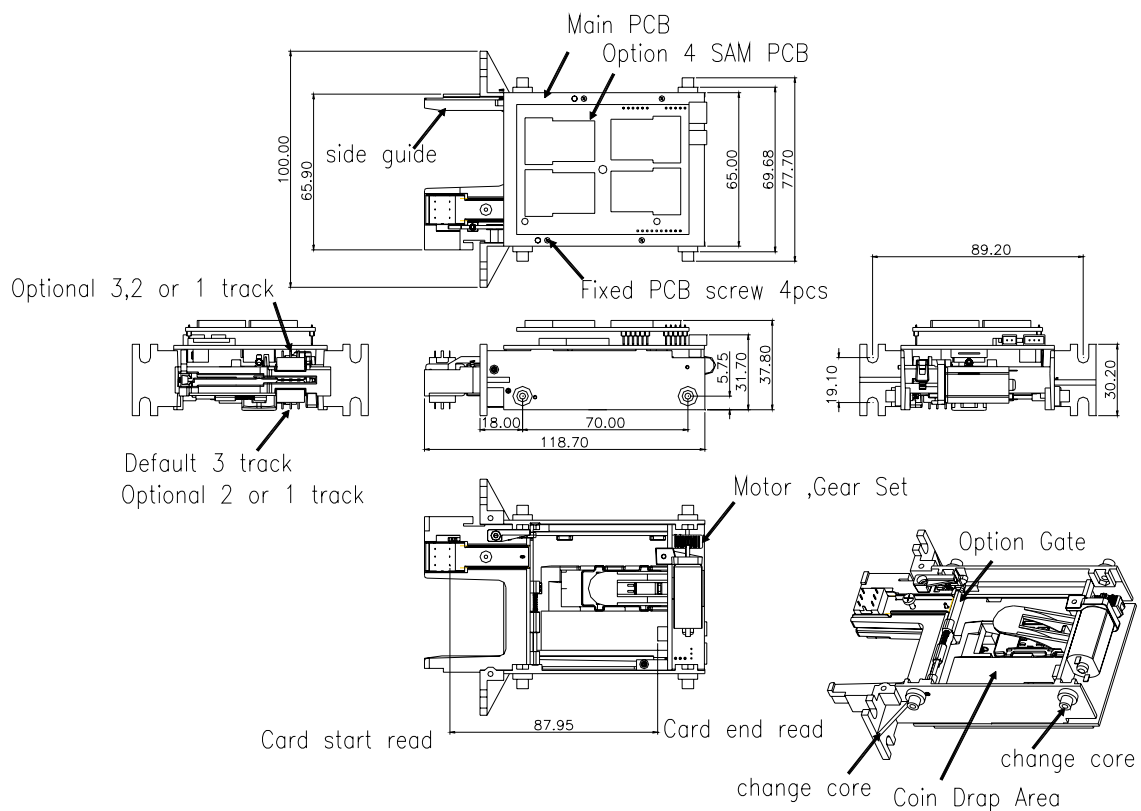


Figure 2-1 Dimensions of HCR360

### 2.2 Accessories

The following accessories should be enclosed in your package.

1. USB cable 1.5m
2. Programmer's manual or Simple manual

## **2.3 Installation**

1. Connect USB type A connector of signal cable to a free USB port. Connect the connector to HCR360.
2. Normally, windows system prompts “driver request” message for the first time install.
3. After successful installed the driver, HCR360 can communicate with PC via a virtual COM port.
4. For more detail information, please refer to “HCR360 USB driver installation guide.”

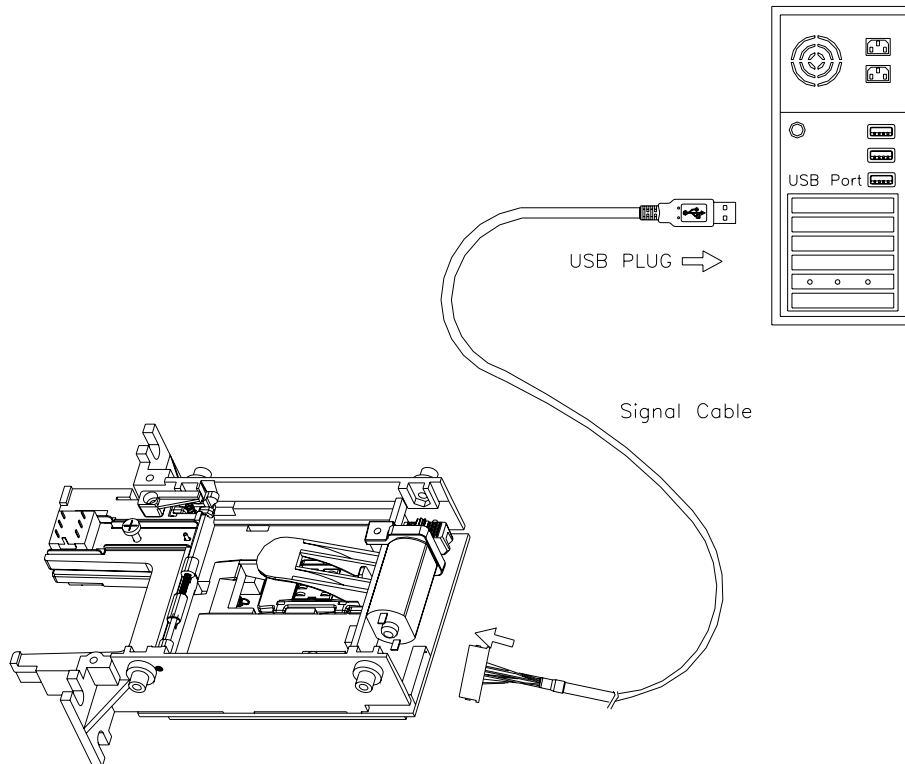


Figure 2-2 Installing HCR360

## Chapter3: Specifications

### 3.1 Magnetic Card Specifications

(For magnetic stripe reader only.)

#### Card Type

ISO standard card (ISO 7810 and 7811)

CA old DMV

AAMVA

Read high or low coercivity magnetic stripes (300-4000oe)

#### Thickness

0.76mm  $\pm$  0.08mm

#### Card Format

Track 1 & 3: 210 bpi

Track 2: 75 bpi

#### Card Operation Speed

| Test Card         | Speed (IPS) |
|-------------------|-------------|
| ISO standard card | 4-40        |
| * Jitter          | 5-35        |
| ** Low Amplitude  | 5-35        |

NOTE:

\*Jitter card: Reliable reading of magnetic stripes encoded with bit cell length variations within 15% of normal as defined by ISO 7811.

\*\*Low amplitude: Reliable reading of magnetic stripes encoded at 60% or more of the encoding amplitude as defined by ISO 7811.

## **3.2 IC Card Specifications**

### **Card Type**

|              |                               |
|--------------|-------------------------------|
| ISO          | 7816-1, 2, 3, 4               |
| Memory card: | Synchronous type              |
| CPU card:    | Asynchronous type, T=0 or T=1 |

### **SAM Module**

|           |                                         |
|-----------|-----------------------------------------|
| Built-in: | one SAM (Security Access Module) socket |
| Optional: | four SAM daughter board                 |

### **3.3 Mechanical Specifications**

#### **Body Material**

PC+20%GF+6 %(W) TEFR

#### **Dimension**

Length: 118.7mm

Width: 100mm

Height: 30.2mm

#### **Weight**

Approx. 125g

#### **Magnetic Head Life**

(For magnetic stripe reader only.)

Over 1M swipes

#### **IC Card Contact Life**

Over 1M

#### **IC Card Contact Resistance**

100mΩ Max.3.4 Electrical Specifications

#### **Power Required**

DC 5V, 500mA

#### **Power Consumption**

Stand\_by: 50mA

Working: 500mA (max.)

#### **Communication**

Standard USB signal levels (comply with USB specification v1.1)

#### **Ripple**

250mVp-p Max.

**Dielectric Strength**

250VDC for 1 minute

**Insulation Resistance**

10M $\Omega$  min. at 250VDC

**3.4 Environmental Specifications****Temperature**

Operating: -10 to 50°C

Storage: -30 to 70°C

**Humidity**

Operating: 15 to 90% (non condensing)

Storage: 10 to 90% (non condensing)

## **3.5 Pin Assignment**

### **PCB-J11 Pin Assignment**

| Pin # |                  |
|-------|------------------|
| 1     | V <sub>USB</sub> |
| 2     | GND              |
| 3     | D+               |
| 4     | NC               |
| 5     | D-               |
| 6     | NC               |
| 7     | Shield           |

### **USB Connector Termination Assignment**

HCR360 is an USB-bus powered device. The power is supplied via the host or via a self-powered hub. Be aware that HCR360 is a high-power device (500mA). A too long cable might result in a high voltage drop, which will lead to a supply voltage much lower than 4.75V at HCR360 side. To prevent this happening, a cable with length less than 1.5M is recommended.

Remark: The 4.75V is defined by USB1.1 specification for high-power port.”

| Contact Number | Signal Name | Typical Wiring Assignment |
|----------------|-------------|---------------------------|
| 1              | Vbus        | Red                       |
| 2              | D-          | White                     |
| 3              | D+          | Green                     |
| 4              | GND         | Black                     |
| Shell          | Shield      | Drain Wire                |



## **3.6 Communication**

### **Baud Rate**

Default: 38400

Optional: 1200, 2400, 9600, 19200, 38400, 57600, 115200

### **Word Length**

Default: 8 data bits

Optional: 7 data bits. (Only Uses in USI1 protocol)

### **Parity**

Default: None

Optional: None, Even, Odd, Mark, Space. (Only Uses in USI1 protocol)

### **Stop Bit**

Default: 1

### **HCR360 Factory Default Setting**

Communication protocol: 38400bps, 8 data bits, none parity, 1 stop bit

Operation mode: ISO7816 hybrid mode

Track setting: 3 track enable (for magnetic stripe reader only)

MSR Prefix: disable (for magnetic stripe reader only)

## Chapter4: Basic Description

### **4.1 Transmission Parameters**

Each character is transmitted using a ten-bit character frame: one start bit, 8 data bits, no parity, and 1 stop bit. The factory default communication BAUD rate between the host and the original HCR360 reader is 38400 bps. Other speeds may be chosen using the configuration program. The other available speeds are 115.2k, 57.6k, 19.2k, 9600, 4800, 2400 and 1200 bps.

### **4.2 Transaction Protocols**

HCR360 supports the USI1/2 communications protocol to talk with the host and additionally supports TLP-224 and TLP-224Turbo communications protocols.

USI1/2 is a protocol developed by American Magnetics, which has features allowing it to be used for multi-dropping and for large (up to 64K bytes) messages. Though the Model HCR360 does not support multi-dropping at this time, a future variation of the device may. This protocol is described in Chapter 5: USI1/2 Protocol.

TLP-224 is a protocol used by several manufacturers of Smart Card devices. There is a core set of functions defined, which, if used exclusively, provide for plug compatibility between different manufacturer's readers. The HCR360 implementation has all of the core functions plus a few more, which you may use at your discretion. This protocol is described in Chapter 6: TLP-224 Protocol.

TLP-224Turbo is a variant of the TLP-224 protocol. The standard TLP-224 protocol requires each byte to be split into two ASCII readable bytes for transmission. This effectively doubles the communication time for each message. The TLP-224Turbo protocol corrects this problem simply by not splitting bytes.

### **4.3 Power On/Reset**

When HCR360 power is up the device checks the validity of the memory to make sure it is functioning correctly. The power up will by default send a 3AH (':') to the host to indicate that a power cycle has occurred. The reader can be configured to send any character except a 00H on power up. If configured with a 00H the reader will send no character to the host on power up. If a reset command is sent to the reader a 3AH (':') to the host to indicate that a reset has occurred and the reader initialization has been completed.

## Chapter5: USI1/2 Protocol

### 5.1 Transport layer

Each message to or from the reader shall be formatted in frames according to the following protocol rules. A maximum of 100 milliseconds is allowed between successive bytes of a message; if more than 100 ms elapses without a new byte, the message is considered spurious and is ignored. The receiver then starts to look for a new message.

#### USI1 Message Frame

| Header | Data                | Trailer |     |
|--------|---------------------|---------|-----|
| STX    | COMMAND or RESPONSE | ETX     | BCC |

**STX** is the value 02H and is used to signal the start of a message.

**COMMAND** or **RESPONSE** is the message being sent. This is either a command to the reader or a response from the reader. Any value except the ETX character may be sent as part of COMMAND.

**ETX** is the value 03H and is used to signal the start of a message.

**BCC** is the block check character. Its value is computed by exclusive-or the value of all preceding bytes in the message starting with the STX byte to the ETX byte inclusive.

That is  $BCC = STX \oplus COMMAND \text{ or } Response \oplus ETX$

#### USI2 Message Frame

| Header |      |      |      | Data                | Trailer |
|--------|------|------|------|---------------------|---------|
| SOH    | ADDR | LENH | LENL | COMMAND or RESPONSE | BCC     |

OR

| Header |      |     |     | Data                | Trailer |     |
|--------|------|-----|-----|---------------------|---------|-----|
| SOH    | ADDR | 00H | 00H | COMMAND or RESPONSE | EOT     | BCC |

**SOH** is the value 01H and is used to signal the start of a message.

**ADDR** is the address of the intended recipient. This field is reserved and should always be 00H.

**LENH** and **LENL** give the length of the Data portion of the message. If the values of LENH and LENL are zero, the length of the data portion is determined by the presence of the EOT byte.

**COMMAND** or **RESPONSE** is the message being sent. This is either a command to the reader or a response from the reader. If LENH and LENL are not equal to zero, any values may be sent in the COMMAND field. If LENH and LENL are both zero, any value except the EOT character may be sent as part of COMMAND.

**EOT** is optional. It is present only in messages where LENH and LENL is both equal to zero. In these messages, EOT signals the end of the data portion of the message. The value of EOT is 04H. NOTE: Specifying the length in LENH and LENL is the recommended method.

**BCC** is the block check character. Its value is computed by exclusive-or the value of all preceding bytes in the message starting with the SOH byte to the EOT byte inclusive.

That is  $BCC = SOH \oplus ADDR \oplus LENH \oplus \dots$

## **5.2 USI1/2 Host to Reader Command**

There are three groups of commands, which can be sent to the reader.

1. The first is used to manipulate the reader (LED, status, etc.).
2. The second is used to manage Magnetic Stripe Card operations.
3. The third is used to manage the Smart Card operations.

The reader responses to the host are contained in the sections with the commands unless there was a problem such as a communication error that see the Responses to the Host.

## **5.3 Reader Command Description**

### **% (25H) – Retransmit**

|                 |                                                  |
|-----------------|--------------------------------------------------|
| <b>COMMENT</b>  | Retransmits the last message sent by the reader. |
| <b>NOTE</b>     | Command is turned off in self-arm mode.          |
| <b>Apply To</b> | HCR360-UH, HCR360-UM, HCR360-UI                  |

### **70 (3730H) or 90 (3930H) – Serial Number Report**

|                                                                                                    |                                     |
|----------------------------------------------------------------------------------------------------|-------------------------------------|
| <b>COMMENT</b>                                                                                     | Transmit serial number information. |
| The Serial number will be stored in the EEPROM and stored as an eight-digit ASCII character array. |                                     |
| <b>EXAMPLE</b>                                                                                     | “00000000”                          |
| <b>Apply To</b>                                                                                    | HCR360-UH, HCR360-UM, HCR360-UI     |

### **71 (3731H) or 91 (3931H) – Copyright Report**

|                                                                                                                                                                                                                          |                                             |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|
| <b>COMMENT</b>                                                                                                                                                                                                           | Transmit version and copyright information. |
| Send this when you want to know the version and copyright of the Model HCR360 firmware currently loaded.                                                                                                                 |                                             |
| The response is an ASCII string giving the firmware date (yyymmdd), reader type and the firmware version number followed by the firmware copyright statement. The firmware copyright statement is absent in OEM version. |                                             |
| <b>EXAMPLE</b>                                                                                                                                                                                                           | “031226,HCR 3600151A:V1.A”                  |
| <b>Apply To</b>                                                                                                                                                                                                          | HCR360-UH, HCR360-UM, HCR360-UI             |

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

|                                                                                                            |                                            |
|------------------------------------------------------------------------------------------------------------|--------------------------------------------|
| <b>COMMENT</b>                                                                                             | 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** "HCR360"

**Apply To** HCR360-UH, HCR360-UM, HCR360-UI

### 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** "360-REV4"

**Apply To** HCR360-UH, HCR360-UM, HCR360-UI

### 74 (3734H) or 94 (3934H) – 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 smart card. It will present as 3 bytes hex number.

**EXAMPLE** 17 09 03

**Apply To** HCR360-UH, HCR360-UI

### 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 HCR360. About the values means please refer the ISO 7816-3 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
```

**Apply To** HCR360-UH, HCR360-UI

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

**COMMENT** Transmit bootloader version number.

**EXAMPLE** "1.0"

**Apply To** HCR360-UH, HCR360-UM, HCR360-UI

## 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
```

**Apply To** HCR360-UH, HCR360-UM, HCR360-UI

## 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
```

**Apply To** HCR360-UH, HCR360-UM, HCR360-UI

## 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

```

**Apply To** HCR360-UH, HCR360-UM, HCR360-UI

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

## 8 (38H) – Slot Switches' Report

**COMMENT** Report the status of the slot switches. The response is in the range of the 'p' to 's' as follows:

- p (70H) Neither switch activated
- q (71H) Front switch activated (card present)
- r (72H) Rear switch activated, illegal condition, hardware problem.
- s (73H) Front and Rear switches activated (card present and seated).

The reader can be configured to automatically return the slot switch report without needing to send the slot switch report request. Sending the slot switch command when in auto sensor report mode will return the current value.

**Apply To** HCR360-UH, HCR360-UM, HCR360-UI

## 9 (39H) – Version Report

**COMMENT** Transmit version information.

Send this when you want to know the version of HCR360 firmware currently loaded. The response is an ASCII string giving the firmware date (yymmdd), reader type and firmware version number.

**EXAMPLE** "031226,HCR360:V1.B".

**Apply To** HCR360-UH, HCR360-UM, HCR360-UI

## ? (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".

If a card is already latched returns "^latch already closed".



If an ICC is already powered returns “!latch before powering card”.

If the latch is blocked returns “\*latch did not close”

**Apply To** HCR360-UH, HCR360-UM, HCR360-UI

## \$ (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 | Card not present                 | Card present                 |
| 0:1 | Card not seated                  | Card seated                  |
| 0:2 | Unlatched                        | Latched                      |
| 0:3 | ICC Power OFF                    | ICC Power ON                 |
| 0:4 | Non automatic slot switch report | Automatic slot switch report |
| 0:5 | No Magnetic Stripe Card data     | Magnetic Stripe Card data    |
| 0:6 | Not armed to read                | Armed to read                |
| 0:7 | Do not send auto ATR             | Send auto ATR                |

**Second Status Byte**

| Bit       | Value: 00                            | Value: 01    | Value: 10       | Value: 11 |
|-----------|--------------------------------------|--------------|-----------------|-----------|
| 1:0 - 1:1 | Green LED OFF                        | Green LED ON | Green LED flash | Unused    |
| 1:2 - 1:3 | Red LED OFF                          | Red LED ON   | Red LED flash   | Unused    |
| 1:4 – 1:7 | Reserved for future use, always zero |              |                 |           |

**Apply To** HCR360-UH, HCR360-UM, HCR360-UI

**L (4CH) – Green LED ON**

**l (6CH) – Green LED OFF**

**M (4DH) – Red LED ON**

**m (6DH) – Red LED OFF**

**( (28H) – Green LED flash**

**) (29H) – Red LED flash**

**COMMENT** 1. Turn green/red LED ON/OFF/Flash, as specified.  
2. Transmits an acknowledgement "^" (5EH).

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

**Apply To** HCR360-UH, HCR360-UM, HCR360-UI

## **C (43H) – Select Smart Card Connector**

**COMMENT** Select the SAM connector to be used with the following reader commands.

**FORMAT** The 'C' command character is followed by a number (0, 1,..., 4) representing the connector.

**EXAMPLE** To select SAM1 connector send the following two bytes: (43H, 01H).

**NOTE** The User Connector (the ID-1 IC card) is number 0, and is always selected after a power cycle.

**Apply To** HCR360-UH, HCR360-UI

## **T (54H) – Memory Card Type Select**

**COMMENT** This command is used to specify the type of Memory Card to be accessed.

**FORMAT** The 'T' command character is followed by a number (0, 1, 2,...) which indicates the type of card in the connector. If type 4 or 5 cards are selected a second optional byte may follow specifying the card page size.

**EXAMPLE** To select the SLE4442 card send the following two bytes: (54H, 03H).

To select an AT24C256 card with a page length of 64 bytes sends (54H, 05H, 40H).

**Apply To** HCR360-UH, HCR360-UI

### **Memory Card Types**

| <b>TYPE</b> | <b>CARDS</b>                                                                          |
|-------------|---------------------------------------------------------------------------------------|
| 00H         | Telephone Card: Siemens SLE4406, SLE4436(E), SGS Thomson ST1305, Solaic E192B, GPM103 |
| 01H         | S=9 Card: Siemens SLE4418, SLE4428                                                    |

|     |                                                                                                                                        |
|-----|----------------------------------------------------------------------------------------------------------------------------------------|
| 02H | 416 Type Card: Siemens SLE4404, GemPlus GPM416-5V, GPM896, Atmel AT88SC101, AT88SC102, Incard MS101, MS102, AMMI 101 and 102           |
| 03H | S=10 Card: Siemens SLE4432, SLE4442                                                                                                    |
| 04H | 3 Byte I2C Protocol, Atmel 24C01A, 24C02, 24C04, 24C08, 24C16, Orga OMC256T, OMC2048; SGC Thomson ST14C02C; ZeitControl ZCM02M, ZCM16M |
| 05H | 4 Byte I2C Protocol, Atmel AT24C64, AT24C256; AT24C512, Microchip 24LC65; ZeitControl ZCM64M                                           |

**Page Sizes on a Variety of I2C Cards**

| Description | Card Type | Page Size       |
|-------------|-----------|-----------------|
| AT24C01A    | 4         | 8 bytes (8H)    |
| AT24C02     | 4         | 8 bytes (8H)    |
| AT24C04     | 4         | 16 bytes (10H)  |
| AT24C08     | 4         | 16 bytes (10H)  |
| AT24C16     | 4         | 16 bytes (10H)  |
| AT24C64     | 5         | 32 bytes (20H)  |
| AT24C128    | 5         | 64 bytes (40H)  |
| AT24C256    | 5         | 64 bytes (40H)  |
| AT24C512    | 5         | 128 bytes (80H) |

**{ (7BH) – Latch****} (7DH) – Unlatch**

**COMMENT**     Activate/deactivate the optional card latch.

**NOTE**         These features only function when a card is seated in the reader and the card is not powered. If a smart card is currently powered the reader will return a "!" . For additional possible responses see "USI1/2 Responses to the Host".

**Apply To**      HCR360-UH, HCR360-UI

**# (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.

**Apply To**      HCR360-UH, HCR360-UM, HCR360-UI

**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   | Latch not present                  | Latch present              |
| 4   | ICC connector not present          | ICC connector present      |
| 5   | Power fail unlatch not present     | Power Fail Unlatch present |
| 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 | Actual<br>Memory<br>Card Type | Default<br>Memory<br>Card Type | Reserved,<br>set to 00H |

**Protocol:** 0=USI2; 1=TLP-224; 2=TLP-224 Turbo; 6=USI1.

**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 present   | User card connector 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. |                    |

**<7FH> – Warm Reset**

|                 |                                                                                                                                                                                       |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>COMMENT</b>  | 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). |
| <b>Apply To</b> | HCR360-UH, HCR360-UM, HCR360-UI                                                                                                                                                       |

**<09H> – Configuration Setting**

|                 |                                                                                                                                                                                                                                                                          |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>COMMENT</b>  | This command is used to set configuration in EEPROM.                                                                                                                                                                                                                     |
| <b>FORMAT</b>   | The command (09H) is followed by an at least 3 byte configuration setting command to set the configuration in EEPROM. The HCR360 configuration can be set by this command or by the Configuration Setting Protocol. Please see "HCR360 Configuration Guide" for details. |
| <b>Apply To</b> | HCR360-UH, HCR360-UM, HCR360-UI                                                                                                                                                                                                                                          |
| <b>EXAMPLE</b>  | To set "Self-arming mode enable" send the following four bytes: <09>"SAE"(09H, 53H, 41H, 45H).                                                                                                                                                                           |

Following are brief introduction of configuration commands, please reference "HCR360 Configuration Guide" for detail information.

**AAx** (41h 41h x) — Auto ATR Enable/Disable. x = 'E' or 'D'.

**ATx** (41h 54h x) — ATR mode setting (EMV or ISO, 5V/3V/1.8V). x = Ref. EEPROM offset 7.

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

**BL0** (42h 4Ch 00h) — Enter Boot loader mode. (Warning: Don't use this command)

**DFx** (44h 46h x) — Set configuration to the Manufacture Default Setting. x = 00H ~ 02H.

**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'.

**EV0** (45h 56h 00h) — EEPROM verify.

**FAx** (46h 41h x) — Set Track 1 Prefix Code, x can be up to 5 bytes.

**Fax** (46h 61h x) — Set Track 1 Suffix Code, x can be up to 5 bytes.

**FBx** (46h 42h x) — Set Track 2 Prefix Code, x can be up to 5 bytes.

**Fbx** (46h 62h x) — Set Track 2 Suffix Code, x can be up to 5 bytes.

**FCx** (46h 43h x) — Set Track 3 Prefix Code, x can be up to 5 bytes.

**Fcx** (46h 63h x) — Set Track 3 Suffix Code, x can be up to 5 bytes.

**IRx** (49h 52h x) — Set Read Direction while in Self-Arming mode, x = '0' ~ '2'

**LAx** (4Ch 41h x) — Auto Latch when ATR success, x = 'E' or 'D'.

**LSx** (4Ch 53h x) — Auto Latch when card seated, x = 'E' or 'D'.

**LCx** (4Ch 43h x) — LRC Enable/Disable, x = 'E' or 'D'. NOTE: The LRC will be always disabled while the SS/ES was disabled.

**MCx** (4Dh 43h x) — Default Memory Card Type, x = '0' - '5'.

**PPx** (50h 50h x) — Plug & Play setting for PC/SC, x = 'E' or 'D'.

- PSx** (50h 53h x) — Custom PPS Setting, x = Ref. EEPROM offset 50.
- PFx** (50h 46h x) — Custom PPS FD setting, x = Ref. EEPROM offset 51.
- PCx** (50h 43h x) — Set RS232 Protocol. x = '0' - '2', '6' (30h - 32h, 36h).
- PHx** (50h 48h x) — Set Power On character, x default is '!'.
- PNx** (50h 4Eh x) — Set PCB Number, x up to 8 bytes.
- PTx** (50h 54h x) — Set RS232 parity. x= '0' - '4' (30h – 34h).(Only uses in USI1 Protocol).
- 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'.
- SEx** (53h 45h x) — Self-Arm Mode data send by current protocol wrapped Enable/Disable, x is 'E' or 'D'.
- SPx** (53h 50h x) — Set Track Separator. x = any one character.
- SRx** (53h 52h x) — Set Sensor Reporting Enable/Disable, x = 'E' or 'D'.
- 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
- UAx** (55h 41h x) — Auto Unlatch when ATR failure, x = 'E' or 'D'.
- UPx** (55h 50h x) — Auto Unlatch when card Power Down, x = 'E' or 'D'.

## **5.4 Magnetic Stripe Card 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 insert/withdrawal.

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, latch 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.

**Apply To** HCR360-UH, HCR360-UM

### **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 insert/withdrawal.
  4. If Magnetic Stripe 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 insert/withdrawal.

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

**Apply To** HCR360-UH, HCR360-UM

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

- COMMENT**
1. Clear read data buffers.
  2. Abort Arm to Read Command.
  3. Transmit command acknowledge (“^” 5EH).

**Apply To** HCR360-UH, HCR360-UM

**Q (51H) – Transmit Track 1 data****R (52H) – Transmit Track 2 data****S (53H) – Transmit Track 3 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 “USI1/2 Responses to the Host”.
  3. Else, transmit data in ASCII.
- Apply To** HCR360-UH, HCR360-UM

**q (71H) – Transmit track 1 data****r (72H) – Transmit track 2 data****s (73H) – Transmit track 3 data**

- COMMENT**
1. Process data in the read buffer for the specified track and format.
  2. If no errors transmit data in ASCII.
  3. If error is detected, transmit proper error response ('\*' or '+'). Refer to “USI1/2 Responses to the Host”.
- FORMAT** These command characters are followed by an ASCII number (1, 2 or 3) representing the ISO track format for processing the Magnetic Stripe Card data.
- These commands allow a track to be transmitted with a different track's ISO format. For example to transmit track 1's data using ISO track 2 format send "q2" (71, 32H).
- Apply To** HCR360-UH, HCR360-UM

**I (49H) – Transmit "Error Data"**

- COMMENT**
1. If the previous read command resulted in an error (response was '\*', e.g. no end sentinel, parity or LRC error), transmit the data regardless of the error(s).
  2. If there was no error, transmit '+'.
  3. If magnetic stripe card data detected but the track which previous read no data, transmit '^'.
  4. If no any magnetic stripe card data detected, transmit '\*'.

The "I" command allows you to recover data even if the reader detects data errors.

**Apply To** HCR360-UH, HCR360-UM



**U (55H) – Transmit custom data, forward, track 1****V (56H) – Transmit custom data, forward, track 2****W (57H) – Transmit custom data, forward, track 3**

**COMMENT** 1. Process the data in the read buffer for the specified track, based upon the "number of bits" character.

2. Transmits data formatted one byte per character.

**FORMAT** These commands may be either 2 or 3 bytes long.

To request custom data with no internal null characters allowed, use the two byte command, "transmit custom data" command, followed by an ASCII number (3,4,5,6,7 or 8), which specifies the number of bits per customer character. For example: "U7"

To request custom data with internal null characters, use the three byte command, "transmit custom data" command, followed by an underline character '\_' (5FH), and the ASCII number (3,4,5,6,7 or 8) for the number of bits per character. For example: "V\_5"

**Apply To** HCR360-UH, HCR360-UM

**u (75H) – Transmit custom data, reverse swipe, track 1****v (76H) – Transmit custom data, reverse swipe, track 2****w (77H) – Transmit custom data, reverse swipe, track 3**

**COMMENT** 1. Process the reversed-bit data in the read buffer for the specified track, based upon the "number of bits" character.

2. Transmit data in normal order. The data is formatted one byte per character.

**FORMAT** These commands may be either 2 or 3 bytes long.

To request custom data with no internal null characters allowed, use the two byte command, "transmit custom data" command, followed by an ASCII number (3,4,5,6,7 or 8), which specifies the number of bits per customer character. For example: "u7"

To request custom data with internal null characters, use the three byte command, "transmit custom data" command, followed by an underline character '\_' (5FH), and an ASCII number (3,4,5,6,7 or 8) for the number of bits per character. For example: "v\_5"

**Apply To** HCR360-UH, HCR360-UM

## 5.5 Smart Card Command Description

### NOTE:

If use US11 protocol and not set parity to None, 8 bits. The host will get error IC card data, because the most significant bit is parity bit.

### N (4EH) – ICC Power ON

- COMMENT**
1. Apply power and perform the initialization sequence per ISO 7816-3 or EMV 4.0.
  2. If the ICC responds transmit the Answer To Reset (ATR) from the ICC.
  3. If the ICC does not respond transmit '\*!'

**FORMAT** This command can be followed one to three characters for ICC volts and PPS.

Parameters description: Each byte is optional, but all lower bytes must be included.

1st byte: ATR mode parameter

- 'J' 5DH Delay 4 milliseconds before send PPS if required.
- '^' 5EH Do not send a PPS even if required.
- '\_' 5FH Return ATR even if incomplete
- 05H Switches the reader in 7816 5V mode
- 03H Switches the reader in 7816 3V mode
- 01H Switches the reader in 7816 1.8V mode
- 15H Switches the reader in EMV 5V mode
- 13H Switches the reader in EMV 3V mode
- 11H Switches the reader in EMV 1.8V mode

2nd byte: contains the PPS Protocol type.

- 00H protocol T=0
- 01H protocol T=1

3rd byte: contains the frequency for the communication (F/D); all supported speeds are listed. If this byte is omitted the default is the frequency proposed by the card.

#### List of F/D supported:

| F/D       | 01     | 02    | 03    | 04    | 08     | 11    | 12    | 13    | 14    |
|-----------|--------|-------|-------|-------|--------|-------|-------|-------|-------|
| Baud rate | 9600   | 19200 | 38400 | 76800 | 115200 | 9600  | 19200 | 38400 | 76800 |
| F/D       | 18     | 21    | 22    | 23    | 28     | 31    | 32    | 33    | 34    |
| Baud rate | 115200 | 6400  | 12800 | 25600 | 76800  | 4800  | 9600  | 19200 | 38400 |
| F/D       | 35     | 38    | 41    | 42    | 43     | 44    | 48    | 51    | 52    |
| Baud rate | 76800  | 56600 | 3200  | 6400  | 12800  | 25600 | 38400 | 2400  | 4800  |
| F/D       | 53     | 54    | 55    | 56    | 58     | 61    | 62    | 63    | 64    |
| Baud rate | 9600   | 19200 | 38400 | 76800 | 28800  | 1920  | 3840  | 7680  | 15360 |
| F/D       | 68     | 69    | 91    | 92    | 93     | 94    | 95    | 96    | A1    |

|           |         |        |       |       |       |        |        |        |       |
|-----------|---------|--------|-------|-------|-------|--------|--------|--------|-------|
| Baud rate | 23040   | 38400  | 6975  | 13950 | 27900 | 55800  | 111600 | 223200 | 4650  |
| F/D       | A2      | A3     | A4    | A5    | A8    | B1     | B2     | B3     | B4    |
| Baud rate | 9300    | 18600  | 37200 | 74400 | 55800 | 3487.5 | 6975   | 13950  | 27900 |
| F/D       | B5      | B6     | C1    | C2    | C3    | C4     | C5     | C6     | C8    |
| Baud rate | 55800   | 111600 | 2325  | 4650  | 9300  | 18600  | 37200  | 74400  | 27900 |
| F/D       | D1      | D2     | D3    | D4    | D5    | D6     |        |        |       |
| Baud rate | 1743.75 | 3487.5 | 6975  | 13950 | 27900 | 55800  |        |        |       |

**NOTE** 1. This command returns an ATR for CPU card. If no ATR is returned by the card the result is a '\*' response.  
 2. Memory Cards have not an explicit power-up command; rather the first I/O operation directed to the card causes a power up, which is performed according to the specifications for the current Memory Card type.

**Apply To** HCR360-UH, HCR360-UI

## n (6EH) – ICC Power OFF

**COMMENT** 1. Perform deactivation sequence as defined in ISO 7816-3 and EMV.  
 2. Transmit an acknowledgement ("^" 5EH).

**ICC Power OFF.** This command is used to power down the card in the currently selected connector. It will work for any type of card (both CPU and Memory card).

**Apply To** HCR360-UH, HCR360-UI

## K (4BH) – Miscellaneous Smart Card Parameters

**COMMENT** 1. If the selected card is activated, the command returns 4 bytes parameter for the current card.  
 Byte 0: Type of activation (ISO = 0, EMV = 1)  
 Byte 1: active protocol (T=0 or T=1)  
 Byte 2: Active FiDi  
 Byte 3: UX parameter (given in the ATR)  
 2. If the ICC isn't activated transmit '\*'.

**FORMAT** This command can be followed one byte of sub-command and up to two bytes parameter for the sub-command.

### Sub-command:

'A': Change the Node Address byte (NAD). This sub-command followed one byte parameter for the new NAD value. The default value is NAD = 00h and will be kept until this command has been performed.

Return: <00h> if the NAD value has been changed.

Else, the new NAD value is refused, and the error code is returned.

'E': Return Error Code. Please refer to the Error Code List as below.

‘P’: Executes PPS. This sub-command followed two bytes parameters for protocol and F/D setting.

Return: PPS response (6 Bytes) or Error Code (1 Byte).

‘I’: Set IFSD. This sub-command followed one byte parameter for IFSD size.

Return: <00h> if the IFSD setting is success.

Else, the IFSD setting is failed, and the error code is returned.

#### EXAMPLE:

K                      Read card parameter.  
 KA<01h>              Set NAD = 01h  
 KE                      Return the last error code  
 KP<01h><18h>        Execute PPS, T=1, F/D = 18h (115200 bps)  
 KI<FEh>              Set the IFSD size to 254 bytes

**Apply To**              HCR360-UH, HCR360-UI

#### Error Code List:

| Value | Description                                         | Value | Description                                       |
|-------|-----------------------------------------------------|-------|---------------------------------------------------|
| 00h   | No error                                            | 92h   | Specific mode byte TA2 with b5 bit = 1.           |
| 08h   | Length of the data buffer too short                 | 93h   | TB1 absent during a cold reset (EMV)              |
| 20h   | Wrong APDU                                          | 94h   | TB1 different from zero during a cold reset.(EMV) |
| 21h   | Too short APDU                                      | 95h   | IFSC < 10h or IFSC=FFh                            |
| 22h   | Card mute during T=1 exchange                       | 96h   | Wrong Tdi                                         |
| 24h   | Bad NAD                                             | 97h   | TB2 is present in the ATR (EMV)                   |
| 26h   | Re-synchronized                                     | 98h   | TC1 is not compatible with CWT                    |
| 27h   | Chain aborted                                       | 99h   | IFSD negotiation not accepted                     |
| 29h   | Overflow from card                                  | A0h   | Procedure byte error                              |
| 30h   | Non negotiable mode (TA2 is present)                | C0h   | Card absent                                       |
| 31h   | Protocol is neither T=0 nor T=1 (negotiate command) | C3h   | TCK error (ATR )                                  |
| 32h   | T=1 is not accepted (negotiate command)             | C6h   | ATR not supported (more than 32 bytes)            |
| 33h   | PPS answer is different form PPS request            | E0h   | Bad card number.                                  |
| 34h   | Error on TCK (negotiate command)                    | E1h   | Bad clock card                                    |
| 35h   | Parameter error                                     | E2h   | UART overflow                                     |
| 38h   | TB3 absent                                          | E3h   | Supply voltage drop-off                           |
| 39h   | PPS not accepted (no answer from card)              | E4h   | Temperature alarm                                 |
| 3Bh   | Early answer during ATR                             | E5h   | Automatic Hardware deactivation on card 1         |
| 40h   | Card deactivated                                    | E6h   | Automatic Hardware deactivation on SAM            |
| 80h   | Card mute during ATR                                | E9h   | Framing error                                     |
| 81h   | Time out (waiting time exceeded)                    |       |                                                   |

|     |                                             |  |  |
|-----|---------------------------------------------|--|--|
| 83h | Too many parity errors in reception         |  |  |
| 84h | Too many parity errors in transmission      |  |  |
| 86h | Bad Fi/Di                                   |  |  |
| 88h | ATR duration greater than 19200 etus. (EMV) |  |  |
| 89h | CWI not supported (EMV)                     |  |  |
| 8Ah | BWI not supported (EMV)                     |  |  |
| 8Bh | WI (Work waiting time) not supported (EMV)  |  |  |
| 8Ch | TC3 not accepted (EMV)                      |  |  |
| 8Dh | Parity error during ATR                     |  |  |

## A (41H) – I/O to CPU Card with APDU format

### a (61H) – I/O to CPU Card with APDU format

- COMMENT**
1. Clear ICC Message buffers.
  2. 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.
  3. If successful the data from the ICC and the two byte SW1/SW2 ISO 7816-4 response is returned.
  4. If unsuccessful transmit '\*'.

**Apply To** HCR360-UH, HCR360-UI

#### APDU Command Structure

|     |     |    |    |                |                         |
|-----|-----|----|----|----------------|-------------------------|
| CLA | INS | P1 | P2 | P3<br>Lc or Le | Data<br>(If Lc present) |
|-----|-----|----|----|----------------|-------------------------|

#### APDU Response Structure

|                 |     |     |
|-----------------|-----|-----|
| Data (optional) | SW1 | SW2 |
|-----------------|-----|-----|

The ‘a’ command is same as ‘A’ command that these commands are used to pass an APDU to a CPU Card (both T=0 and T=1 card) where both data and an ISO status are expected in the response. Because different CPU Cards use different APDU commands, the host must specify (via command selection) whether any data is expected in reply. When developing new products the APDU should be included with the command.

**NOTE** The ‘a’ command is supported for previous version reader compatible.

## B (42H) – I/O to Memory Card

- COMMENT**
1. Clear ICC Message buffers.
  2. If APDU is included with command it is transmitted to the memory card. If it is not then an acknowledgement (“^” 5EH) is returned and the reader will wait until the APDU is sent in the following message.
  3. If successful the response from the memory card is returned.
  4. When the operation is complete, the reader returns an ISO 7816 status (SW1, SW2).

I/O to Memory Card command is used to perform all operations with a Memory Card. This command will always include an APDU. When developing new products the APDU should be included with the command.

**Apply To** HCR360-UH, HCR360-UI

**Memory Commands Supported**

| Command                   | CLA | INS | P1      | P2                    | P3(Lc or Le) | Data           | Le     |
|---------------------------|-----|-----|---------|-----------------------|--------------|----------------|--------|
| Verify                    | DA  | 20  | xx      | xx                    | Length       | Password       | N/A    |
| Authenticate              | DA  | 88  | xx      | Extended <sup>1</sup> | Length       | Challenge      | Length |
| Read Binary               | DA  | B0  | Address | Address               | Length       | N/A            | N/A    |
| Write Binary              | DA  | D0  | Address | Address               | Length       | Data to write  | N/A    |
| Erase Binary              | DA  | 0E  | Address | Address               | xx           | N/A            | N/A    |
| Restore Data              | DA  | C0  | Address | Address               | xx           | N/A            | N/A    |
| Write Binary with Protect | DA  | C1  | Address | Address               | Length       | Data to write  | N/A    |
| Read Binary with Protect  | DA  | C2  | Address | Address               | Length       | N/A            | N/A    |
| Erase User Area           | DA  | C3  | xx      | xx                    | Length       | Erase Password | N/A    |
| Change PSC                | DA  | 30  | xx      | xx                    | Length       | New Password   | N/A    |
| Read Error Counter        | DA  | 10  | xx      | xx                    | xx           | N/A            | N/A    |

<sup>1</sup> Extended Authentication: 01H = Extended authentic for SLE5536, 00H = Basic authentic for SLE4436/5536

xx means that is a don't care value.

Each Memory Card may have special features, following table describes each Memory Card supported commands.

| Card Type | Supported Commands                                                                               |
|-----------|--------------------------------------------------------------------------------------------------|
| 00H       | Verify, Authenticate, Read Binary, Write Binary, Erase Binary, Restore Data, Read Error Counter  |
| 01H       | Verify, Read Binary, Write Binary, Write Protect, Read Protect, Change PSC, Read Error Counter   |
| 02H       | Verify, Read Binary, Write Binary, Erase Binary, Erase User Area, Change PSC, Read Error Counter |
| 03H       | Verify, Read Binary, Write Binary, Write Protect, Read Protect, Change PSC, Read Error Counter   |
| 04H       | Read Binary, Write Binary                                                                        |
| 05H       | Read Binary, Write Binary                                                                        |

## F (46H) – I/O to CPU Card with T=1 Block Frame

- COMMENT**
1. Clear ICC Message buffers.
  2. If a T=1 Block is included with command it is transmitted to the ICC, otherwise an acknowledgement (“^” 5EH) is returned and the reader will wait until the T=1 Block is sent in the following message.
  3. If successful the data and two byte SW1/SW2 ISO 7816-3 response is returned.
  4. If unsuccessful transmit '\*'.

This command is used to pass a T=1 Block Frame to a CPU card (can be used to both T=0 and T=1 Card).

These commands ('A', 'a' and 'F') are identical in function. They are used to pass an appropriate format data to a CPU card. These commands differ from the 'A' and 'a' commands in that those commands hide the details of the t=1 protocol from the host.

**Apply To** HCR360-UH, HCR360-UI

### T=1 Block Frame Structure

| Prolog field |     |     | Information field | Epilog |
|--------------|-----|-----|-------------------|--------|
| NAD          | PCB | LEN | INF               | EDC    |

- NAD Node Address includes SAD (source address) and DAD (destination address)
- PCB Protocol Control Byte
- LEN Length byte = number of bytes in the information field, 0-254
- INF Information - usually an APDU (command) or Data and Status word (response)
- EDC Error Detection Code. Only LRC is supported in the EDC field

## **5.6 USI1/2 Responses to the Host**

| <b>Code</b> | <b>Meaning</b>               | <b>Description</b>                                                                                               |
|-------------|------------------------------|------------------------------------------------------------------------------------------------------------------|
| ^ (5EH)     | Acknowledge                  | Acknowledges correct completion of most recent command                                                           |
| * (2AH)     | Error                        | 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              | Command is not a recognized.                                                                                     |
| : (3AH)     | Power On report              | The reader has just completed a power on.                                                                        |
| ~ (7Eh)     | Unavailable                  | Hardware not available to complete this request                                                                  |
| > (3EH)     | Non-Magnetic Stripe Card     | If the reader is in arm to read and a card is inserted or extracted but no Magnetic Stripe Card data is detected |



## Chapter6: TLP Protocol

**Apply To** HCR360-UH, HCR360-UI

### 6.1 TLP Protocol Format

Following format is suitable for TLP224 and TLP-224 Turbo.

Send: <ACK><Len><CMD><Data><LRC><ETX>

Response: <ACK><Len><RP Code><Data><LRC><ETX>

If LRC error or transaction timeout return: <NAK><01><Err Code><LRC><ETX>

Where:

<ACK> 60H, signal the start of message

<Len> Length of command plus data, one byte

<CMD> Reader Command, one byte

<Data> Transmission Data, 0 ~ 254 Bytes.

<LRC> The result of an Exclusive OR (XOR) between the characters <ACK><Len>...<Data>

<ETX> 03H, signal the end of message.

NOTE: The <ETX> of send command can be ignore in TLP-224 Turbo protocol.

<RP Code> Response Code from reader, one byte

<NAK> E0H, indicating that there was an error in a message transmission.

<Err Code> One byte, indicating the error condition.

#### **Differences between TLP224 and TLP-224 Turbo:**

1. Converts each byte (except <ETX>) to be transmitted into two ASCII characters under TLP224 protocol.

For example, to transmit the power down (4DH) command under the TLP224 protocol or TLP-224 Turbo, the following sequence would be transmitted:

|                        | ACK        | Len        | Message    | LRC        | ETX   |
|------------------------|------------|------------|------------|------------|-------|
| TLP-224 Turbo protocol | <60H>      | <01H>      | <4DH>      | <2CH>      | <03H> |
| TLP224 protocol        | <36H><30H> | <30H><31H> | <33H><44H> | <32H><43H> | <03H> |

2. The <ETX> can be ignored under TLP-224 Turbo protocol. (But we recommend include it)

## **6.2 Power On/Reset**

When HCR360 power is up the device checks the validity of the memory to make sure it is functioning correctly. The power up that in TLP protocol mode will send a <00H> to the host to indicate that a power cycle has occurred. The Power On Character <00H> can't be changed in TLP protocol mode.

## 6.3 TLP Commands

### 9 (39H) – Version Report

**COMMENT** Please refer to the '9' command of USI1/2

### <7FH> – Warm Reset

**COMMENT** Please refer to the <7FH> command of USI1/2

### # (23H) – Configuration

**COMMENT** Return standard or extended mode configuration.

**NOTE**

1. Using the configuration setting command to select standard or extended format.
2. The configuration length both standard and extended mode are always 16 bytes. But only the first byte is available in standard mode.
3. Please refer to the '#' command of USI1/2 to get the contents of the standard and extended configurations.

### <01H> – Status / LEDs

**COMMENT** Control LEDs and report the status of LEDs and IC Card.

**FORMAT** This command is followed one or two bytes. The first byte is always <01H> and the second byte is a control byte which described as following.  
The response followed a Status Byte as following.

**EXAMPLE** To get LED and ICC status, send the following two bytes: (01H, 01H).  
To set the Red LED on, send the following three bytes: (01H, 01H, 10H).

**Control Byte of Request**

| Bit     | 7  | 6  | 5  | 4         | 3  | 2         | 1  | 0  |
|---------|----|----|----|-----------|----|-----------|----|----|
| Value 0 | xx | xx | xx | R LED Off | xx | G LED Off | xx | xx |
| Value 1 | xx | xx | xx | R LED On  | xx | G LED On  | xx | xx |

**Status Byte of Response**

| Bit     | 7  | 6  | 5  | 4         | 3  | 2         | 1  | 0           |
|---------|----|----|----|-----------|----|-----------|----|-------------|
| Value 0 | xx | xx | xx | R LED Off | xx | G LED Off | xx | Card Absent |
| Value 1 | xx | xx | xx | R LED On  | xx | G LED On  | xx | Card Seated |

**n (6EH) – ICC power On**

- COMMENT**
1. Apply power and perform the initialization sequence per ISO 7816-3 or EMV 4.0.
  2. If the ICC responds transmit the Answer To Reset (ATR) from the ICC.
  3. If the ICC does not respond transmit an error message.

**FORMAT** This command can be followed one to four characters but these characters will be ignored.

- NOTE**
1. This command returns an ATR for CPU card. If no ATR is returned an error message will be responded.
  2. Memory Cards have not an explicit power-up command; rather the first I/O operation directed to the card causes a power up, which is performed according to the specifications for the current Memory Card type.

**M (4DH) – ICC Power Off**

- COMMENT** Please refer to the ICC Power Off ('n') command of USI1/2

**C (43H) – Select Connector**

- COMMENT** Please refer to the 'C' command of USI1/2

**<DAH> – Micro write T=0**

- COMMENT** Please refer to the I/O to CPU Card with APDU ('A') command of USI1/2

**<DBH> – Micro read T=0**

- COMMENT** Please refer to the I/O to CPU Card with APDU ('a') command of USI1/2

**F (46H) – Micro I/O T=1**

- COMMENT** Please refer to the 'F' command of USI1/2

**T (54H) – Memory Card Type**

- COMMENT** Please refer to the 'T' command of USI1/2

## B (42H) – Memory Card I/O

**COMMENT** Please refer to the 'B' command of USI1/2

## <09H> – Configuration Setting

**COMMENT** Please refer to the <09H> command of USI1/2

## 6.4 TLP Response

### **RP Code Value:**

|     |                                               |
|-----|-----------------------------------------------|
| 00H | ACK, process OK                               |
| 04H | Invalid command                               |
| 07H | Command can't be processed. (or card in used) |
| A3H | ICC power on failed. No ATR when power on.    |
| E4H | Card hasn't power on, or invalid card command |
| E7H | Card process error                            |
| F7H | Card removed                                  |
| FBH | Card not seated.                              |

### **Err Code Value:**

|     |           |
|-----|-----------|
| 04H | Time out  |
| 05H | LRC error |

## Chapter7: Self-arm Mode

**Apply To** HCR360-UH, HCR360-UM

The reader can be configured to operate in a self-arm mode so that after a Magnetic Stripe Card media insertion or withdrawal, it automatically sends data that complies with ISO, AAMVA or DMV specification to the host. The green

LED is ON while the reader is in the self-arm mode. No Host LED control is allowed in self-arm mode.

In the self-arm mode, the LED behaves as follows.

| Reader Action   | LED state |
|-----------------|-----------|
| Waiting to read | Green     |
| Reading         | Yellow    |
| Good read       | Green     |
| Bad read        | Red blink |

In addition, in the self-arm mode, the default is not to send any USI2 protocol information with the data. The user may choose to send this information by setting a bit in reader configuration.

Up to five bytes of programmable prefix and suffix, and one byte each of track ID and track separator per track are also supported through the configuration.

### Transaction Data Format (without protocol enveloped):

<T1ID><T1Prefix><SS><TRACK1 DATA><ES><LRC><T1Suffix><Separator>

<T2ID><T2Prefix><SS><TRACK2 DATA><ES><LRC><T2Suffix><Separator>

<T3ID><T3Prefix><SS><TRACK1 DATA><ES><LRC><T3Suffix>

Tx ID: optional, one byte.

Prefix: optional, up to 5 bytes.

SS: Start sentinel, optional.

ES: End sentinel, optional.

LRC: optional

Suffix: optional, up to 5 bytes.

Separator: one byte, default is <0DH>