

HCR360

Programmer's Manual

Hybrid Card Reader - RS232 Interface

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Revision B

03-Jan-2005

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AGENCY APPROVED

- Specification for FCC class B
- Specification for CE class B, CISPR 22 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 approved by the party responsible for compliance could void your authority to operate such equipment.

WARRANTY

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

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.

EMVCo Level 1 Type Approved

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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 user guide should be read and understood prior to initial operation of the reader.

The HCR360 series include following models:

HCR360-RH: RS232 hybrid card reader supports Smart Card and Magnetic Stripe Card both.

HCR360-RM: Identical to HCR360-RH but supports Magnetic Stripe Card only.

HCR360-RI: Identical to HCR360-RH 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 an RS-232 interface. The reader includes diagnostic commands for system troubleshooting and setting commands for system configuration.

1.2 Features

- ISO 7816 and EMV 4.0 compliant.
- 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).
- RS232 compatible communicates with host at speeds from 1200 bps to 115.2k bps.
- 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 USI2, 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

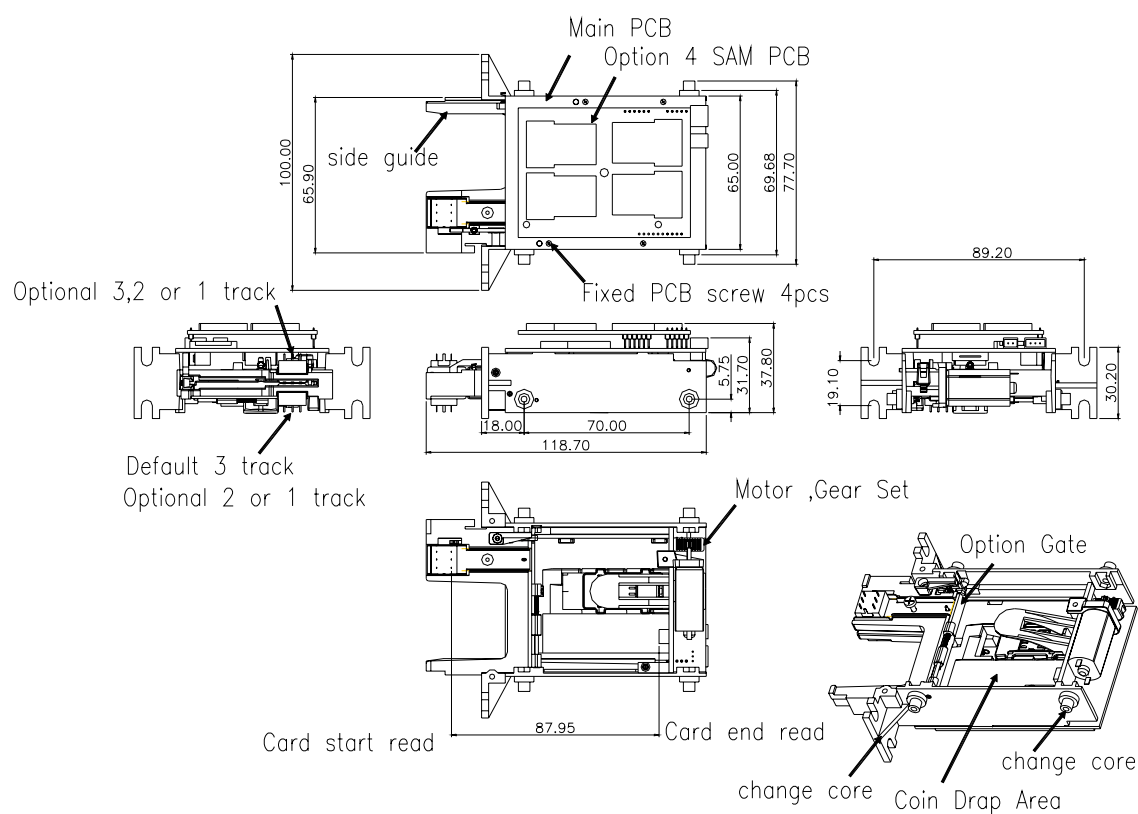


Figure 2-1 Dimensions of HCR360

2.2 Accessories

The following accessories should be enclosed in your package.

1. Interface cable (DB9, 1.5M)
2. Adapter
 - Input: AC 120V or 230V
 - Output: DC 12V, 250mA
3. User's manual or Simple manual

2.3 Installation

1. Turn OFF power to your computer.
2. Connect HCR360 DB9 of interface cable to a free serial port of the computer.
3. Fit power cord into DB9 connector of interface cable.
4. Plug in the power adapter to proper AC outlet; see instruction on adapter of the proper voltage.
5. Turn ON power to the computer.

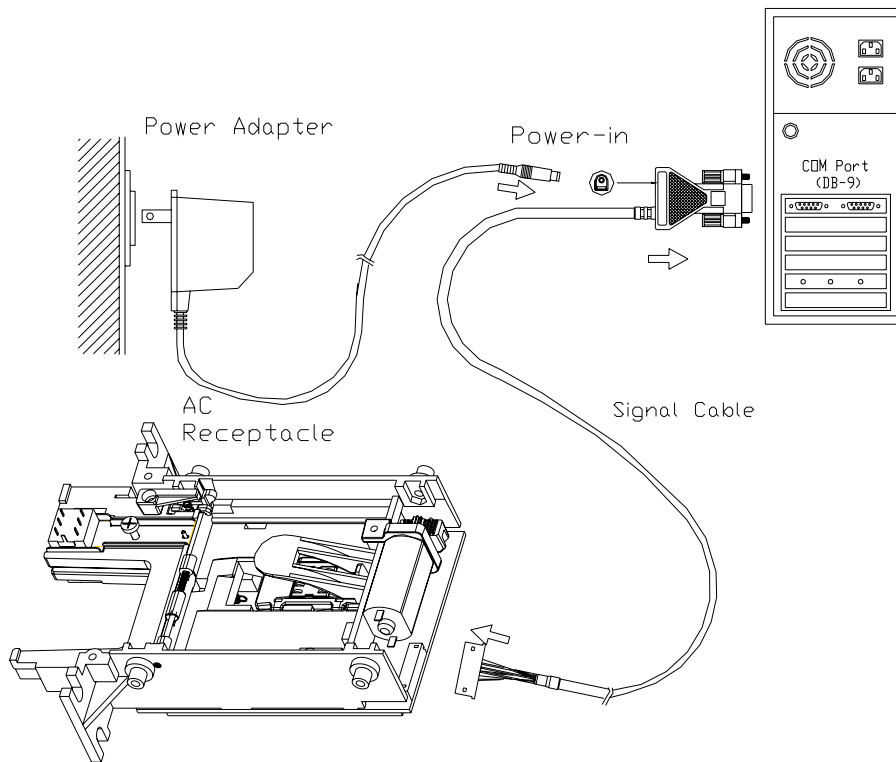


Figure 2-2 Installing HCR360

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 9~15V, 250mA

Power Consumption

Stand_by: 50mA

Working: 100mA, 250mA (max.)

Communication

Standard RS232 signal levels (RS-232 format TTL level option)

Ripple

250mVp-p Max.

Dielectric Strength

250VDC for 1 minute

Insulation Resistance

10M Ω 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-J1 Pin Assignment

Pin #	
1	GND
2	TXD
3	RXD
4	12VDC
5	RTS
6	CTS
7	Shield

DB9 Cable Pin Assignment

DB9	SIGNAL	DIRECTION	PCB-J1	SIGNAL
1				
2	RXD	← Serial data to host	2	TxD
3	TXD	→ Serial data from host	3	RxD
4				
5	GND		1	GND
6				
7	RTS	→ Clear to Send Data	6	CTS
8	CTS	← Request to Send Data	5	RTS
9				

3.6 Communication

Synchronization

The interface receives and transmits serial asynchronous data at voltage levels compatible with the RS232 specification.

Signal

Logic 1 = -3 volts to -15 volts

Logic 0 = +3 volts to +15 volts

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 USI/1 protocol)

Parity

Default: None

Optional: None, Even, Odd, Mark, Space. (Only Uses in USI/1 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

COMMENT	Retransmits the last message sent by the reader.
NOTE	Command is turned off in self-arm mode.
Apply To	HCR360-RH, HCR360-RM, HCR360-RI

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

COMMENT	Transmit serial number information.
The Serial number will be stored in the EEPROM and stored as an eight-digit ASCII character array.	
EXAMPLE	“00000000”
Apply To	HCR360-RH, HCR360-RM, HCR360-RI

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 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.	
EXAMPLE	“031226,HCR 3600151A:V1.A”
Apply To	HCR360-RH, HCR360-RM, HCR360-RI

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 "HCR360"
Apply To HCR360-RH, HCR360-RM, HCR360-RI

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-RH, HCR360-RM, HCR360-RI

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-RH, HCR360-RI

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-RH, HCR360-RI

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

COMMENT Transmit bootloader version number.
EXAMPLE "1.0"
Apply To HCR360-RH, HCR360-RM, HCR360-RI

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-RH, HCR360-RM, HCR360-RI

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-RH, HCR360-RM, HCR360-RI

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-RH, HCR360-RM, HCR360-RI

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-RH, HCR360-RM, HCR360-RI

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-RH, HCR360-RM, HCR360-RI

? (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-RH, HCR360-RM, HCR360-RI

\$ (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-RH, HCR360-RM, HCR360-RI

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-RH, HCR360-RM, HCR360-RI

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 an number (0, 1,..., 4) representing he 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-RH, HCR360-RI

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-RH, HCR360-RI

Memory Card Types

TYPE	CARDS
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-RH, HCR360-RI

(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-RH, HCR360-RM, HCR360-RI

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 Memory Card Type	Default Memory Card Type	Reserved, 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

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).
Apply To	HCR360-RH, HCR360-RM, HCR360-RI

<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 HCR360 configuration can be set by this command or by the Configuration Setting Protocol. Please see “HCR360 Configuration Guide” for details.
Apply To	HCR360-RH, HCR360-RM, HCR360-RI
EXAMPLE	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-RH, HCR360-RM

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-RH, HCR360-RM

<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-RH, HCR360-RM

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 “USI2 Responses to the Host”.
 3. Else, transmit data in ASCII.
- Apply To** HCR360-RH, HCR360-RM

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 “USI2 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-RH, HCR360-RM

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-RH, HCR360-RM

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-RH, HCR360-RM

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-RH, HCR360-RM

5.5 Smart Card Command Description

Note

If use USI/1 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

- ']' 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-RH, HCR360-RI

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-RH, HCR360-RI

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-RH, HCR360-RI

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-RH, HCR360-RI

APDU Command Structure

CLA	INS	P1	P2	P3 Lc or Le	Data (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-RH, HCR360-RI

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 ¹	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

¹ 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, Reader Binary, Write Binary, Erase Binary, Restore Data, Read Error Counter
01H	Verify, Reader Binary, Write Binary, Write Protect, Read Protect, Change PSC, Read Error Counter
02H	Verify, Reader Binary, Write Binary, Erase Binary, Erase User Area, Change PSC, Read Error Counter
03H	Verify, Reader Binary, Write Binary, Write Protect, Read Protect, Change PSC, Read Error Counter
04H	Reader Binary, Write Binary
05H	Reader 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-RH, HCR360-RI

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

Code	Meaning	Description
^ (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-RH, HCR360-RI

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-RH, HCR360-RM

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>