MSR140 ST

Manual Insert Card Reader

RS232 Interface

Programmer's Manual

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NOTICE

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AGENCY APPROVED

This Equipment, MSR140 ST, had been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.

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. Operation of this equipment in a residential area is also likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

This MSR140 ST also had been tested and found to comply with the agency requirements of specification for CE mark Class A and UL, cUL.

WARNING

Changes or modifications not expressly approved by the party responsible for compliance could void user's authority to operate the equipment.

WARRANTY

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

PREFACE

This manual provides detailed information relating to the overall operational, electrical, mechanical, environmental and functional aspects of the MSR140 ST. 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 MSR140 ST, 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, call UIC to ask for technical support. The FAE of UIC will assist you in any way we can.

Table of Contents

Section 1 General Description

This section presents general information about the basic characters of the MSR140 ST Series.

➢ Features

The MSR140 ST provides the following features:

1	Light weight: 150g (without adapter)
2	Low noise
3	Compact size: 126L*101.6W*76.2H (mm)
4	LED indicator indicates card status
5	Low power consumption
6	Single, dual, or triple track versions allow for reading all types of magnetic cards, including credit cards and drivers licenses.

➢ Application

This Manual Insert Card Reader is design to read high or low coercivity magnetic cards. It can encode/verify up to 3 tracks of data simultaneously. This product communicates with a host computer or other terminal via a standard RS-232 interface. Because of the transmitting protocol of MSR140 ST is more precise, it is suitable for using in financial industry.

➢ Function

Self Test

Whenever the reader experiences a reset cycle, a self-test is performed. The reader will respond with ":" and the LED will keep green if the entire test is successful. Otherwise, the LED will remain off and no response will be generated.

Table 1-1. Self Test

Indication	Cause	Post Condition
Green On	Test Success	Responds with ":"
Off	EEPROM Failed	Hang
Off	Internal ROM Failed	Hang

Reading

The reader can read magnetic data form any available track encoded per ISO 7810, 7811. Besides, the data can be read in customized format that explain below.

Reading Customized Data

The host can read data from the reader as customized format by sending 2-bytes command. For details and examples of commands and responses, refer to Section 4. Prior to transmitting customized data to the host, the data is not verified and it is not formatted into ASCII characters either.

Configuration Mode

There are two configuration modes provided as "self-arm" and "host-polled" modes.

The default configuration mode of the reader is the "self-arm mode" that reports card data to the host automatically without any command instruction; however, the reader still can accept commands from host to instruct reader sending out card data. While it is idling the LED keeps green that indicates the reader is ready for accepting card; while card is moving, the LED will stop at the last condition (on or off) temporarily. If an error condition is encountered, the red LED is lit for 250msec.

The reader can be configured to another one as "host-polled mode" which is passive mode that all actions follow the command sent from host. While it is idling the green LED keeps flashing. If an error condition is encountered, the red LED is lit for 250msec.

Table 1-2. Self-Arm Mode

LED	Cause
Off	Read Card
Orange	Missing data of 1 or 2 tracks
Red	Read Error
Green	Read Success

➢ Part Number Description

The brief configuration of MSR140 part number are shown as below:

MSR140-12 Dual track 1&2

MSR140-23 Dual track 2&3

MSR140-33 Triple track 1&2&3

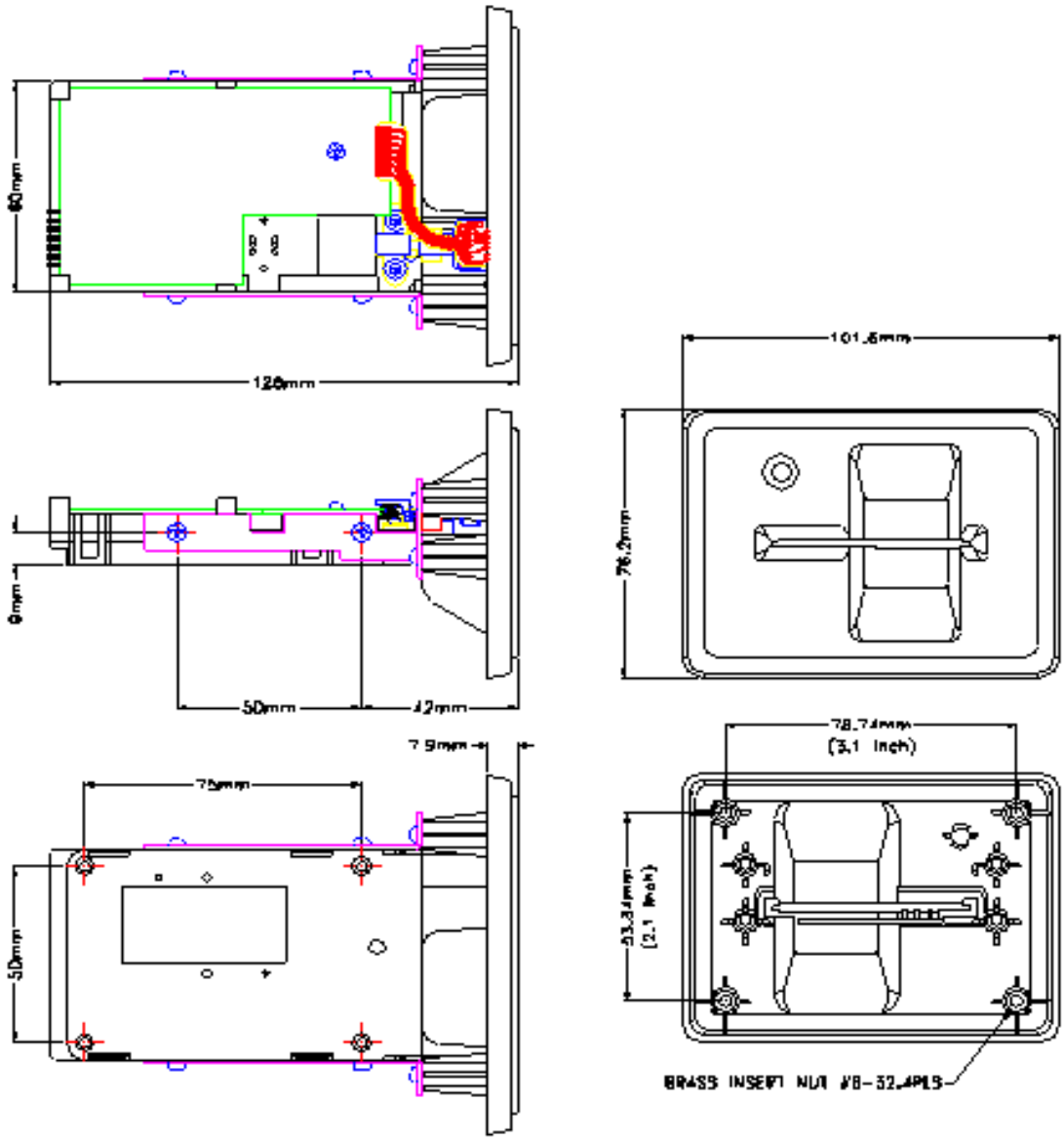
Note: Optional configuration is available.

Section 2 Configurations

This section shows the dimensions and accessories for the MSR140 ST.

➢ Dimensions of MSR140 ST

Figure 2-1 Dimensions of MSR140 ST



➢ Accessories of MSR140 ST

The following accessories should be enclosed in your package.

1. Adapter

   Input: AC 110V

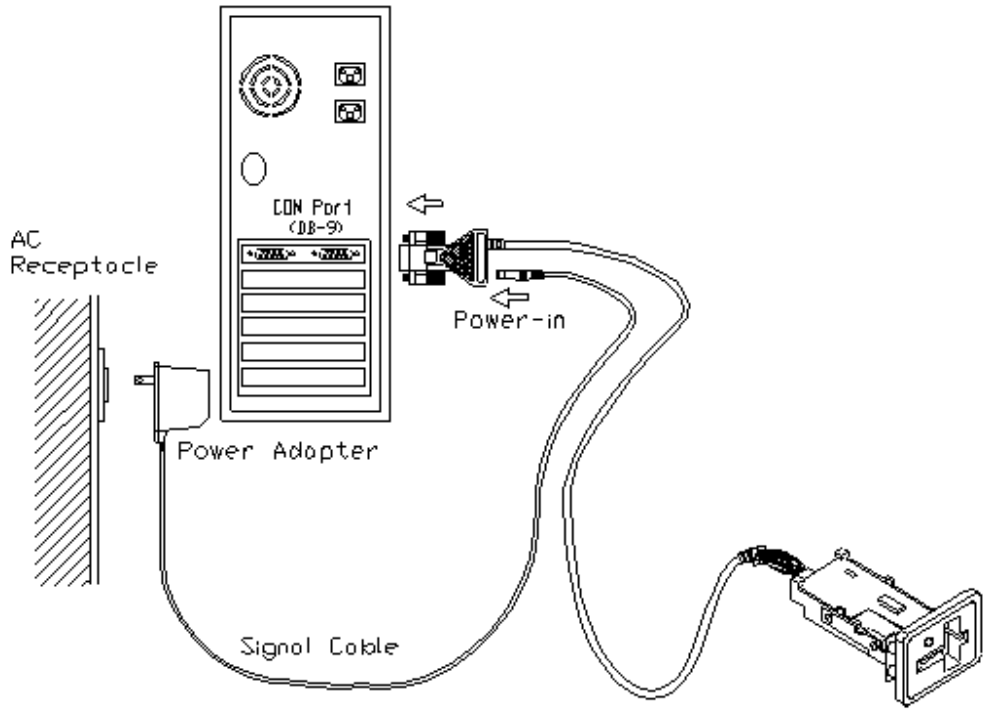
   Output: DC 5V regulated/ 300mA

2. Interface cable (DB9, 1.5M)
3. Utility disk (S/W)
4. Programmer's manual or simple manual

➢ Installation

1. Turn OFF power to your computer.
2. Connect MSR140 DB9 of interface cable (signal 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 Installation MSR140



Section 3 Technical Specifications

➢ Card Specifications

Card Type

ISO standard card

CA old DMV

AAMVA

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

Optional: Read triple track 7 BPC & 210 BPI cards (trade show card)

Thickness

0.76 mm ±0.08 mm

Card Format

Track 1 & 3:210 bpi

Track 2: 75/210 bpi

Card Operation Speed

Table 3-1. 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 +/-12% 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.*

➢ Mechanical Specifications

Body Material

ABS 94V-0

Dimension

Length: 126mm

Width: 101.6mm

Height: 76.2mm

Weight

150g (without adapter)

Magnetic Head Life

500K Min., 1M optional

➢ Electrical Specifications

Power Required

DC+5V ±5%

Power Consumption

60mA Max. in normal condition

Communication

Standard RS232 signal levels (handshaking by RTS signal)

Ripple

50mVp-p Max.

Dielectric Strength

250VDC for 1 minute

Insulation Resistance

10M Ohms min. at 250VDC

➢ Environmental Specifications

Temperature

Operating: -20-60℃

Storage: -30-70℃

Humidity

Operating: 10-85% (non condensing)

Storage: 10-90% (non condensing)

➢ Pin Assignment

Table 3-2. Pin Assignment

DB9	SIGNAL	DIRECTION	PCB-JP5	SIGNAL
1				
2	TxD	← Serial data to host	2	TxD
3	RxD	→ Serial data from host	3	RxD
4				
5	GND		1	GND
6				
7	CTS	→ Clear to Send Data	6	CTS
8	RTS	← Request to Send Data	5	RTS
9				

Note: PCB-JP5-4: VCC IN (5V)

PCB-JP5-7: SHIELD

➢ 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: 9600

Optional: 1200/2400/4800/19200

Word Length

Default: 8 data bits

Parity

Default: none

Stop Bit

One

Transmission Protocol

The user may select from three different protocols: Protocol 0, 1, and 2.

Upon reset, the reader sends the power-on response ":", depending upon the configuration setting. The reader then configures itself to the protocol of the first command from the host. From this point on, the protocol is unchangeable until a reset occurs.

Protocol 0

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

Table 3-3. Example for Protocol 0

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

Protocol 1

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

Format: <STX><MESSAGE><ETX><BCC>
where STX=02Hex and ETX=03Hex.

Table 3-4. Example for Protocol 1

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

Protocol 2

In Protocol 2, the ASCII character <SOH>, followed by a one-byte reader address, one byte character count and terminated with a one byte <BCC> precedes all messages. The <BCC> is an XOR of the characters (8 bits) in the entire message, including <SOH>.

Format: <SOH><ADDRESS><00Hex><COUNT><MESSAGE><BCC>

or

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

where SOH=01Hex and EOT=04Hex.

Table 3-5. Example for Protocol 2

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

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

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

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

For all Protocols, the host may, at any time, stop/start the reader transmission by using software "handshake" (DC3/DC1) or hardware "handshake" (if enabled in EEPROM configuration) by controlling the CTS line.

➢ Transmission Format

Data output format (Self-ARM mode)

Protocol code	Tk1 prefix	Tk1 Data	Tk1 suffix	EOT	BCC	
Protocol code	Separator	Tk2 prefix	Tk2 Data	Tk2 suffix	EOT	BCC
Protocol code	Separator	Tk3 prefix	TK3 Data	Tk3 suffix	EOT	BCC

Read data for command

Read tk1 data for command

Protocol code	Tk1 prefix	Tk1 Data	Tk1 suffix	EOT	BCC

Read tk2 data for command

Protocol code	Tk2 prefix	Tk2 Data	Tk2 suffix	EOT	BCC

Read tk3 data for command

Protocol code	Tk3 prefix	Tk3 Data	Tk3 suffix	EOT	BCC

Note: Tk x data: SS (option) track data ES (option) LRC (option)

Section 4 Commands and Responses

This section describes the commands and responses available for the MSR140 ST series. Each item includes the ASCII, hexadecimal codes and comments paragraph that provide an explanation of the command. The letter 'x' indicates a variable and the letter 'h' is an abbreviation of 'hexadecimal'.

All readers are capable of communicating in 3 protocols: 0, 1 and 2. If Protocol 0 is selected, all commands and responses are as listed in this section. If Protocol 1 is selected, the characters STX, ETX and BCC must be added to all transmissions. If Protocol 2 is selected, the characters SOH, ADDRESS, COUNT and BCC must be added to all transmissions.

➢ Command – Host to Reader

P (50h) — Ready to Read

Comments

1	Clear buffers
2	Transmit "ACK"
3	Expect for card insert or eject
4	Transmit "ACK" after reading card (Response "^" when detecting signal or response ">" if no signal)

After the "Ready to Read" command is received and acknowledged, the only valid commands that will be accepted for execution are as follows: "Abort" <ESC>, "Status" <'$'> and LED control commands.

p (70h) — Ready to Read

Comments

Same as 'P' command, except an extra response " (" is reported when a media is detected through the read head. A ")" response is reported when media detection goes inactive, and response " > " if no signal.

Q (51h) — Transmit Standard Data, Track 1
R (52h) — Transmit Standard Data, Track 2
S (53h) — Transmit Standard Data, Track 3

Comments

1	Process data in the read buffer for the specified track according to ISO, AAMVA and DVM format.
2	Transmit data in ASCII.
3	If error is detected, response "*" if read error and "+" id no data. (Refer to **Responses－Reader to Host** later in this section).

U (55h) — Transmit Customized Data, Track 1
V (56h) — Transmit Customized Data, Track 2
W (57h) — Transmit Customized Data, Track 3

Comments

1	To request customized data that no "nulls" is allowed. It uses the two bytes command: "Transmit customized data" command followed by an ASCII number (3-8) that specifies the number of bits per customized character.
2	For each specific track, based upon the "number of bits" to process data in the read buffer, then send out in hex format.

u (75h) — Transmit Reverse Customized Data, Track 1
v (76h) — Transmit Reverse Customized Data, Track 2
w (77h) — Transmit Reverse Customized Data, Track 3

Comments

1	To request customized data that no "nulls" is allowed. It uses the two bytes command: "Transmit customized data" command followed by an ASCII number (3-8) that specifies the number of bits per customized character.
2	For each specific track, based upon the "number of bits" to process data in the read buffer in reverse order, then send out in hex format.

% (25h) — Retransmit

Comments

Request to retransmit the previous valid command except “P” and “p” commands.

(23h) — Configuration Request

Comments

Transmit a byte, which represent configuration of the interface as follows:

Table 4-2. Interface Configuration

Bit 0	Track 1 read capability
Bit 1	Track 2 read capability
Bit 2	Track 3 read capability
Bit 3	0
Bit 4	0
Bit 5	1
Bit 6	1
Bit 7	Parity (Protocol 0 and 1 only), 0 (Protocol 2)

Where "1" bit means "capable of…" and "0" bit means "not capable of…".

L (4Ch) — Green LED On
l (6Ch) — Green LED Off
M (4Dh) — Red LED On
m (6Dh) — Red LED Off

Comments

1	Turn green/red LED on/off, as specified.
2	Transmit "ACK".

((28h) — Green LED Flash
) (29h) — Red LED Flash

Comments

1	Begin flashing the specified LED on and off (approximately 250mSec On and 250mSec Off). Continues flashing until changed by another LED command or by continued interrupt mode operation.
2	Transmit "ACK".

DC3 (13h) — Pause Transmit

Comments

Stop transmitting data.

DC1 (11h) — Resume Transmit

Comments

Resume transmission of data.

T (54h) — Card Type Report

Comments

Transmit a byte, which represent the swiping card type.

1 (31H)	CA old DMV
2 (32H)	AAMVA
3 (33H)	ISO
6 (36H)	Trade Show Card (if applicable)
0 (30H)	No data (sending T command just right after power on)

ESC (1Bh) — Abort

Comments

1	Abort command is issued after the reader has responded to command "P" or "p". (Reader would be waiting for card read).
2	No response to "Abort" command if the reader just power on and no command is received before.

9 (39h) — Version Report

Comments

Transmit a string that includes the version number (8-digit) and its date (DD-MMM-YYYY).

8 (38h) — Reader Sensor Report

Comments

Read and report the status of the reader sensor. The response is in the range of the 70h to 73h as follows:

p (70h)	Neither sensor activated.
q (71h)	Front sensor activated.
r (72h)	Rear sensor activated, illegal condition, hardware problem.
s (73h)	Front and Rear sensors activated.

DEL (7Fh) — Warm Reset

Comments

Abort all current actions and cause the device to execute all initialization functions (device will respond exactly as it would for a "power on" cycle).

Note: This command byte is not recognized as a command within data strings.

$ (24h) — Reader Status Request

Comments

Transmit one byte representing the reader status as follows:

Table 4-3. Reader Status

First Byte			Second Byte	
Bit	0	1	Bit	
0	Card not present	Card present (Half-insert)	1 & 0	00:Green LED off 01:Green LED on 10:Green LED flash
1	Card not seated	Card seated (Full-insert)		
2	0	------	3 & 2	00:Red LED off 01:Red LED on 10:Red LED flash
3	0	------		
4	Host polled sensor report	Automatic sensor report	4	Always 0
5	No magstripe data	Magstripe data available	5	
6	Not ready to read	Ready to read	6	
7	Parity for protocols 0 &1	Not used for protocol 2	7	Parity for protocols 0 &1

➢ Response－ Reader to Host

^ (5Eh) — ACK

Comments

Last command has been completed without an error condition, and ready for the next command.

+ (2Bh) — No Data

Comments

It indicates there is no data in buffer.

* (2Ah) — Error

Comments

It indicates data read error.

? (3Fh) — Communication Error

Comments

It may mean one of following:

1	Bad parity.
2	Wrong BCC.
3	Receive character time-out.
4	Message more than maximum character allowed.

! (21h) — Invalid Command

Comments

The command is not recognized or won't accept.

: (3Ah) — Power On Report

Comments

The interface has completed its initialization cycle.

~ (7Eh) — Cannot Execute

Comments

Read or encode command cannot be executed due to lack of hardware in the device.

Section 5 Configuration Commands

This section describes the internal configuration commands available for the MSR140 ST series. Each item includes ASCII, hexadecimal codes and an explanation of the command. The letter "x" indicates a variable and the letter "h" is an abbreviation of "hexadecimal".

➢ Command Form

<09Hex><ADDRESS><command counter Hex><COMMAND><BCC>

where

<09Hex><ADDRESS><00Hex><3 BYTE COMMAND><BCC>

is default command format.

Either hex value 01 or 02 is invalid for command counter.

For example:

If command counter is 00h or 03h, it indicates that 3-byte commands come next.

If command counter is 05h, it indicates that 5-byte commands come next.

BRx (42h 52h x) ― Set Baud Rate

x is an ASCII number (0-4)

Table 5-1. Baud Rate Setting

ASCII	Command Form (Hex)	Baud Rate
0	09h 00h 00h 42h 52h 30h 29h	1200
1	09h 00h 00h 42h 52h 31h 28h	2400
2	09h 00h 00h 42h 52h 32h 2Bh	4800
3	09h 00h 00h 42h 52h 33h 2Ah	9600 (default)
4	09h 00h 00h 42h 52h 34h 2Dh	19200

PTx (50h 54h x) ― Set Bit & Parity

x is an ASCII number (0-4)

Table 5-2. Bit & Parity Setting

ASCII	Command Form (Hex)	Bit & Parity
0	09h 00h 00h 50h 54h 30h 3Dh	7 EVEN
1	09h 00h 00h 50h 54h 31h 3Ch	7 ODD
2	09h 00h 00h 50h 54h 32h 3Fh	7 MARK (logic 1)
3	09h 00h 00h 50h 54h 33h 3Eh	7 SPACE (logic 0)
4	09h 00h 00h 50h 54h 34h 39h	8 NONE (default)

ESx (45h 53h x) ― ES & SS Enable/Disable

x = E (45h enable) or D (44h disable)

Table 5-3. ES & SS Enable/Disable

Command Form (Hex)	ES & SS
09h 00h 00h 45h 53h 44h 5Bh	Disable
09h 00h 00h 45h 53h 45h 5Ah	Enable (default)

LCx (4Ch 43h x) — LRC Enable/Disable

x = E (45h enable) or D (44h disable)

Table 5-4. LRC Enable/Disable

Command Form (Hex)	LRC
09h 00h 00h 4Ch 43h 44h 42h	Disable (default)
09h 00h 00h 4Ch 43h 45h 43h	Enable

PCx (50h 43h x) — Set Protocol of Power On Report

x is an ASCII number (1-3)

Table 5-5. Protocol Setting

ASCII	Command Form (Hex)	Protocol
1	09h 00h 00h 50h 43h 31h 2Bh	Protocol 0 (default)
2	09h 00h 00h 50h 43h 32h 28h	Protocol 1
3	09h 00h 00h 50h 43h 33h 29h	Protocol 2

RTx (52h 54h x) — RTS Enable/Disable

x = E (45h enable) or D (44h disable)

Table 5-6. RTS Setting

Command Form (Hex)	RTS
09h 00h 00h 52h 54h 44h 4Bh	Disable (default)
09h 00h 00h 52h 54h 45h 4Ah	Enable

Note: We shall enable RTS first, then CTS; and disable CTS prior to RTS. Neither enable nor disable needs to do power reset or warm start.

CTx (43h 54h x) — CTS Enable/Disable

x = E (45h enable) or D (44h disable)

Table 5-7. CTS Setting

Command Form (Hex)	CTS
09h 00h 00h 43h 54h 44h 5Ah	Disable (default)
09h 00h 00h 43h 54h 45h 5Bh	Enable

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

x is an ASCII number (1-7)

Table 5-8. Transmit Tracks Setting

ASCII	Command Form (Hex)	Transmit Tracks
1	09h 00h 00h 54h 4Bh 31h 27h	Track 1
2	09h 00h 00h 54h 4Bh 32h 24h	Track 2
3	09h 00h 00h 54h 4Bh 33h 25h	Track 1 & 2
4	09h 00h 00h 54h 4Bh 34h 22h	Track 3
5	09h 00h 00h 54h 4Bh 35h 23h	Track 1 & 3
6	09h 00h 00h 54h 4Bh 36h 20h	Track 2 & 3
7	09h 00h 00h 54h 4Bh 37h 21h	Track 1, 2 & 3 (default)

AAx (41h 41h x) — Set Address

1	x is a binary byte (00h-0Fh)
2	Set address 00h: <09h 00h 00h 41h 41h 00h 09h>

SAx (53h 41h x) — Self -Arm Mode Enable/Disable

x = E(45h enable) or D(44h disable)

Table 5-9. Self-Arm Mode Setting

Command Form (Hex)	Self-Arm Mode
09h 00h 00h 53h 41h 44h 5Fh	Disable
09h 00h 00h 53h 41h 45h 5Eh	Enable (default)

IRx (49h 52h x) — Set Read Direction

x = ASCII 0 ; 1 or 2

Table 5-10. Read Direction Setting

ASCII	Command Form (Hex)	Read Direction
0	09h 00h 00h 49h 52h 30h 22h	Read in withdraw (default)
1	09h 00h 00h 49h 52h 31h 23h	Read in insert
2	09h 00h 00h 49h 52h 32h 20h	Read in both way

SPx (53h 50h x) — Set Track Separator

1	x = Hex Code
2	x = 00h means do not send separator code

Table 5-11. Track Separator Setting

Command Form (Hex)	Track Separator
09h 00h 03h 53h 50h 00h 09h	Disable (default)
Example of Track Separator Setting	
09h 00h 03h 53h 50h 0Dh 04h	0Dh, <CR>
09h 00h 03h 53h 50h 2Bh 22h	2Bh, <+>
09h 00h 03h 53h 50h 3Bh 32h	3Bh, <;>

SRx (53h 52h x) — Set Sensor Reporting Enable/Disable

x = E (45h enable) or D (44h disable)

Table 5-12. Set Sensor Enable/Disable

Command Form (Hex)	Sensor
09h 00h 00h 53h 52h 44h 4Ch	Disable (default)
09h 00h 00h 53h 52h 45h 4Dh	Enable

FAx (46h 41h x) — Set Track 1 Prefix Code

1	x = Hex Code
2	x = 00h means do not send track 1 prefix code
3	Prefix can be set as one character

Table 5-13. Set Track 1 Prefix Code

Command Form (Hex)	Track 1 Prefix Code
09h 00h 00h 46h 41h 00h 0Eh	Disable (default)
Example of Track 1 Prefix Code Setting	
09h 00h 00h 46h 41h 0Ah 04h	0Ah (LF)

Fax (46h 61h x) — Set Track 1 Suffix Code

1	x = Hex Code
2	x = 00h means do not send track 1 suffix code
3	Suffix can be set as one character

Table 5-14. Set Track 1 Suffix Code

Command Form (Hex)	**Track 1 Suffix Code**
09h 00h 00h 46h 61h 00h 2Eh	Disable (default)
Example of Track 1 Suffix Code Setting	
09h 00h 00h 46h 61h 11h 3Fh	11h (DC1)

FBx (46h 42h x) — Set Track 2 Prefix Code

1	x = Hex Code
2	x = 00h means do not send track 2 prefix code
3	Prefix can be set as one character

Table 5-15. Set Track 2 Prefix Code

Command Form (Hex)	**Track 2 Prefix Code**
09h 00h 00h 46h 42h 00h 0Dh	Disable (default)
Example of Track 2 Prefix Code Setting	
09h 00h 00h 46h 42h 0Bh 06h	0Bh (VT)

Fbx (46h 62h x) — Set Track 2 Suffix Code

1	x = Hex Code
2	x = 00h means do not send track 2 suffix code
3	Suffix can be set as one character

Table 5-16. Set Track 2 Suffix Code

Command Form (Hex)	**Track 2 Suffix Code**
09h 00h 00h 46h 62h 00h 2Dh	Disable (default)
Example of Track 2 Suffix Code Setting	
09h 00h 00h 46h 62h 12h 3Fh	12h (DC2)

FCx (46h 43h x) — Set Track 3 Prefix Code

1	x = Hex Code
2	x = 00h means do not send track 3 prefix code
3	Prefix can be set as one character

Table 5-17. Set Track 3 Prefix Code

Command Form (Hex)	**Track 3 Prefix Code**
09h 00h 00h 46h 43h 00h 0Ch	Disable (default)
Example of Track 3 Prefix Code Setting	
09h 00h 00h 46h 43h 0Ch 00h	0Ch (FF)

Fcx (46h 63h x) — Set Track 3 Suffix Code

1	x = Hex Code
2	x = 00h means do not send track 2 suffix code
3	Suffix can be set as one character

Table 5-18. Set Track 3 Suffix Code

Command Form (Hex)	**Track 3 Suffix Code**
09h 00h 00h 46h 63h 00h 2Ch	Disable (default)
Example of Track 3 Suffix Code Setting	
09h 00h 00h 46h 63h 13h 3Fh	13h (DC1)

DF0 (44h 46h 00h) — Default Setting

Command Form: <09h 00h 00h 44h 46h 00h 0Bh>

Default setting is as below:

1	9600 baud rate
2	8 bits non parity
3	Send SS/ES
4	LRC not send
5	CTS disable

6	RTS disable
7	Power on in protocol 0
8	Transmit TK1, TK2 and TK3
9	Self-Arm Mode enable
10	Read address = 00h

RE0 (52h 45h 00h) — Read EEPROM Data

1	Command Form: <09h 00h 00h 52h 45h 00h 1Eh>
2	The reader's data of setting status is recorded in EEPROM. 128 bytes total.
3	The symbol "*" in this paragraph indicates " do not care".
4	**Byte 0 and 1** are 00h, 13h separately. They are identical characters.

5	**Byte 2**

Table 5-19. Byte 2 of EEPROM Status

Bit 7	SS&ES Status	Bit 6	LRC Status	Bit 5	Bit 4	Bit 3	Bit & Parity	Bit 2	Bit 1	Bit 0	Baud Rate Status
0	Not Send	0	Send	0	0	0	7 even	0	0	0	1200
1	Send	1	Not send	0	0	1	7 odd	0	0	1	2400
*	*	*	*	0	1	0	7 mark	0	1	0	4800
*	*	*	*	0	1	1	7 space	0	1	1	9600
*	*	*	*	1	0	0	8 none	1	0	0	19200

6	**Byte 3**

Table 5-20. Byte 3 of EEPROM Status

Bit 7	Bit 6	Protocol	Bit 5	CTS Status	Bit 4	RTS Status	Bit 3 (always 0)	Bit 2	Bit 1	Bit 0	Transmitting Data Track
0	1	0	0	Ignore	0	Always low	0	*	*	0	Not Transmit Tk1
1	0	1	1	Consider	1	Low when transmit data	0	*	*	1	Transmit Tk1
1	1	2	*	*	*	*	0	*	0	*	Not Transmit Tk2
*	*	*	*	*	*	*	0	*	1	*	Transmit Tk2
*	*	*	*	*	*	*	0	0	*	*	Not Transmit Tk3
*	*	*	*	*	*	*	0	1	*	*	Transmit Tk3

Note: If never set "PC" command then bit 6 and bit 7 are 00, it means protocol 0.

7	**Byte 4**

Table 5-21. Byte 4 of EEPROM Status

Bit	Bit	Bit	Bit	Address	Bit	Sensor Reporting	Bit	Self-Arm Mode	Bit	Bit	Read Direction

7	6	5	4	(Hex code)	3		2		1	0	
*	*	*	*	*	0	Disable	0	Disable	0	0	Withdraw
*	*	*	*	*	1	Enable	1	Enable	0	1	Insert
*	*	*	*	*	*	*	*	*	1	0	Both direction
*	*	*	*	*	*	*	*	*	*	*	*
*	*	*	*	*	*	*	*	*	*	*	*

8	**Byte 5: Track Separator Setting**
9	**Byte 6: Track 1 Prefix Code Setting**
10	**Byte 7: Track 1 Suffix Code Setting**
11	**Byte 8: Track 2 Prefix Code Setting**
12	**Byte 9: Track 2 Suffix Code Setting**
13	**Byte 10: Track 3 Prefix Code Setting**
14	**Byte 11: Track 3 Suffix Code Setting**
15	**Byte 12-127: Reserved**

Note: Each byte in byte 6~12 is Hex code. When one of the byte is "00h", it means do not transmit this byte.