

## CR 013 Serial Reader Protocol

# User Manual

## 1. Mifare Standard

- 1024 bytes EEPROM, divided into 16 sectors with 64 bytes on each sector
- 100,000 write endurance cycles
- 10 years data retention
- ISO 14443 A
- 13.56MHz transponder frequency
- 106 kbit baud rate
- Bit-wise anti-collision
- Up to 10 cm operating distance
- 4 byte unique serial number
- Random number generator
- 2 bytes access key per sector
- Individual access condition for each sector
- Purse functionality

## 2. Technical Specification

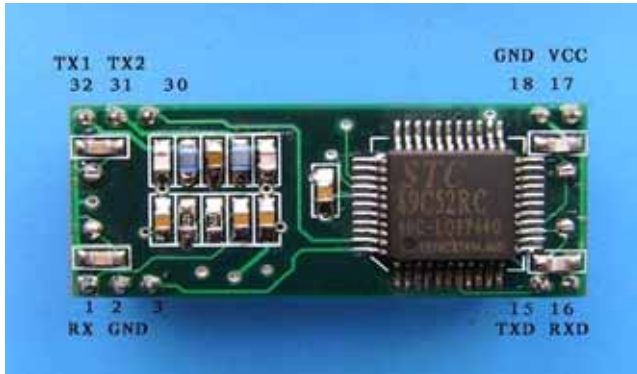
- Power supply: 5V, 80-100mA
- Interface: 232 TTL
- Transmission speed: 19200 bps
- R/W distance of up to 60mm (up to 100mm with bigger antenna size), depending on TAG
- Storage temperature: -40 °C ~ +85 °C
- Operating temperature: 0 °C ~ +70 °C

## 3. Communication setting

The communication protocol is byte oriented. Both sending and receiving bytes are in hexadecimal format. The communication parameters are as follows,

Baud rate: 19200 bps  
Data: 8 bits  
Stop: 1 bit  
Parity: None  
Flow control: None

## 4. Dimension



**Dimension** 41 × 18 ( mm ) **Note :** The module's pin same as DIP28

### PIN

Pin	Name	description
17	VCC	+5v
18	GND	GND
16	RXD	TTL Rx
15	TXD	TTL Tx
32	TX1	Antenna 1
31	TX2	Antenna 2
1	RX	Antenna RX
3	RFU	Can be control by LED Command
30	RFU	

### Character

Parameter	Min	Type	Max	Units
voltage	4 . 5	5 . 0	5 . 5	V
current (include antenna)		90		mA
Initialization time	100		500	MS
Opertating temperature	- 25		+ 85	
Storage temperature	- 40		+ 125	

<b>Transmission rate</b>	Default 19200 , N , 8 , 1
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<b>Data format</b>		Binary HEX "hexadecimal"				
<b>Data package</b>						
Head	Length	Node ID	Function Code	Data ...	XOR	

**COMMAND :**

	Data length (Byte)		X O R	S U M
<b>Head</b>	02	Fixed: 0xAA , 0xBB		
<b>Length</b>	02	There are several effective bytes that including XOR follows this column.	FF	00
<b>Node ID</b>	02	Destination Node Address Number. xx xx: Low byte first 00 00: Broadcast to each reader.	X	S
<b>Function code</b>	02	It will be transmission ability of each different command . Low byte frist	X	S
<b>Data</b>	00~D0	Data length is not fixed, according to its purpose.	X	S
<b>XOR</b>	01	XOR each byte from Node ID to Last Data byte with 0xFF.		S

**REPLY DATA FORMAT :**

	Data length (Byte)		X O R	S U M
<b>Head</b>	02	Fixed: 0xAA , 0xBB		
<b>Length</b>	02	There are several effective bytes that including XOR follows this column.	FF	00
<b>Node ID</b>	02	Destination Node Address Number. xx xx: Low byte first 00 00: Broadcast to each reader.	X	S
<b>Function code</b>	02	It will be transmission ability of each different command . Low byte frist	X	S
<b>Status</b>	1	Reply result , if succeed is 0 ,other fail .		
<b>Data</b>	00~D0	Data length is not fixed, according to its purpose.	X	S
<b>XOR</b>	01	XOR each byte from Node ID to Last Data byte		S

**NOTE: if from “Length” to “XOR ” have a data is “AA” then should follow a data “0x00” ,but length don’t changed.**

**While a command send and after 100ms no reply then consider this command failed .**

#### **Command List**

- 1、 Initialize port : 0x0101**
- 2、 Set device node number : 0x0102**
- 3、 Read device node number : 0x0103**
- 4、 Read device Mode : 0x0104**
- 5、 Set buzzer beep: 0x0106**
- 6、 Set Led color : 0x0107**
- 7、 Set reader working status : 0x0108**
- 8、 Set antenna status 。 0x010c**
- 9、 Mifare Request , 0x0201**
- 10、 Mifare anticollision , 0x0202:**
- 11、 Mifare Select 0x0203:**
- 12、 Mifare Hlta , 0x0204:**
- 13、 Mifare Authentication1 0x0206 :**
- 14、 Mifare Authentication2 0x0207:**
- 15、 Mifare Read 0x0208:**
- 16、 Mifare Write 0x0209:**
- 17、 Mifare Initval 0x020A:**
- 18、 Mifare Read Balance 0x020B:**
- 19、 Mifare Decrement 0x020C:**
- 20、 Mifare Increment 0x020D:**
- 21、 Mifare Restore 0x020E:**
- 22、 Mifare Transfer 0x020F**
- 23、 Mifare UltraLight Anticoll 0x0212:**
- 24、 Mifare UltraLight Write 0x0213:**
- 25、 Write key store in RC500 EEPROM 。**

#### **1 . Initialize port : 0x0101**

Function : set baud rate

Format : aa bb 06 00 00 01 01 “Baud\_para” “xor Chk”

Baud\_parameter :

- 0 = 4800;
- 1 = 9600;
- 2 = 14400;
- 3 = 19200;
- 4 = 28800;

5 = 38400;  
6 = 57600;  
7 = 115200;

sample : Host To Reader;  
aa bb 06 00 00 00 01 01 03 03      Set Baud Rate as 19200

Respond: aa bb 06 00 bf ff 01 01 00 40

**2 . Set device node number : 0x0102**

Aa bb 07 00 00 00 02 01 00 00 03      set device node number = 0x00 00

**3 . Read device node number : 0x0103**

Aa bb 05 00 00 00 03 01 02      Read device node number.

**4 . Read device Mode : 0x0104**

function : read device mode and version

Host to Reader : aa bb 05 00 00 00 04 01 05

Respond: aa bb 12 00 52 51 04 01 00 43 52 35 30 30 4c 52 2d 31 32 30 33 11

C R 5 0 0 L R - 1 2 0 3

**5 . Set buzzer beep: 0x0106**

Function : beep

format : aa bb 06 00 00 00 06 01 Delay XOR

Delay\*10ms beep time , XOR is xor check.

Sample : Host to Reader : aa bb 06 00 00 00 06 01 64 63

Respond : aa bb 06 00 52 51 06 01 00 04

**6 . Set Led color : 0x0107**

Host To Reader;

aa bb 06 00 00 00 07 01 03 05      // set Red&green LED on .

Respond: aa bb 06 00 bf bf 07 01 00 06

Tenth data is LED parameter ,function as below :

0 = LED\_RED Off , LED\_GREEN Off

1 = LED\_RED On , LED\_GREEN = Off

2 = LED\_GREEN Off , LED\_RED On

3 = LED\_GREEN On , LED\_RED ON

**7 . Set reader working status : 0x0108      not use in this device.**

**8 . Set antenna status . 0x010c**

Host To Reader;

aa bb 06 00 00 00 0c 01 00 0D      //set antenna off.

Tenth data is Antenna status parameter ; 0 = Close Filed      1= Open Filed.

**9. Mifare Request , 0x0201**

Function : Request Type a Card

Format : aa bb 06 00 00 00 01 02 req\_code XOR

req\_code=Request mode

req\_code=0x52: request all Type A card In filed

req\_code=0x26: request idle card

sample : Host To Reader:

aa bb 06 00 00 00 01 02 52 51

Respond : aa bb 08 00 52 51 01 02 00 04 00 04

**TagType** : 0x4400 = ultra\_light

0x0400 = Mifare\_One(S50)

0x0200 = Mifare\_One(S70)

0x4403 = Mifare\_DESFire

0x0800 = Mifare\_Pro

0x0403 = Mifare\_ProX

#### 10. Mifare anticollision , 0x0202:

Function : card anticollision

Format : aa bb 05 00 00 00 02 02 00

Respond : aa bb 0a 00 52 51 02 02 00 46 ff a6 b8 a4

“ 46 ff a6 b8 ” is card serial number.

#### 11 . Mifare Select 0x0203:

Function : Select card

Format : aa bb 09 00 00 00 03 02 xx xx xx xx XOR

Ninth to twelfth is card serial number .

Sample : Host to Reader : aa bb 09 00 00 00 03 02 46 ff a6 b8 a6

Respond : aa bb 07 00 52 51 03 02 00 08 0a

#### 12. Mifare Hlta , 0x0204:

Function : Hlta card

Host to reader : aa bb 05 00 00 00 04 02 06

Respond : aa bb 06 00 52 51 04 02 00 05

#### 13. Mifare Authentication1 0x0206 :

Function : authenticate Card (Key Stroe in RC500)

Format : aa bb xx 00 00 00 06 02 Auth\_mode Block KeyEE CHK

Auth\_mode=**Authenticate mode**,0x60: Key A ,0x61: Key B

Block= Authenticate block

KeyEE = Key store in RC500 EEPROM group , from 0 to 31 total 32 .

Sample : Host to Reader : aa bb 08 00 00 00 06 02 60 04 01 61

Authenticate Block 4 Key = “group 01 ”

Respond : aa bb 06 00 11 12 06 02 00 07

#### 14. Mifare Authentication2 0x0207:

Function : authenticate Card

Format : aa bb xx 00 00 00 07 02 Auth\_mode Block xx xx xx xx xx xx XOR

Auth\_mode= **Authenticate mode** ,0x60: KEY A ,0x61: KEY B

Block = Authenticate block

Sample : Host to Reader : aa bb 0d 00 00 00 07 02 60 04 ff ff ff ff ff ff 61

Authenticate Block 4 Key A = “FF FF FF FF FF FF”

Respond : aa bb 06 00 52 51 07 02 00 06

#### 15. Mifare Read 0x0208:

Function : Read block  
Format : aa bb 06 00 00 00 08 02 Block XOR  
Block = which block want read  
Sample : Host to Reader : aa bb 06 00 00 00 08 02 04 0e  
Respond : aa bb 16 00 52 51 08 02 00 00 00 00 00 00 00 00 00 00 12 34 56 78 01  
Tenth to sixteenth byte is Data.

**16. Mifare Write 0x0209:**

Function : write block  
Format : aa bb 16 00 00 00 09 02 Block  
D0 D1 D2 D3 D4 D5 D6 D7 D8 D9 Da Db Dc Dd De Df XOR  
Sample : write data to Block4  
Host to Reader  
aa bb 16 00 00 00 09 02 04 00 00 00 00 00 00 00 00 00 12 34 78 56 07  
Respond: aa bb 06 00 52 51 09 02 00 08

**17. Mifare Initval 0x020A:**

Function : initialize purse  
Format : aa bb 0a 00 00 00 0a 02 Block V0 V1 V2 V3 XOR

**18. Mifare Read Balance 0x020B:**

Function : read balance  
Format : aa bb 06 00 00 00 0B 02 Block XOR  
Return four byte balance .

**19 Mifare Decrement 0x020C:**

Function : decrease balance  
Format : aa bb 0a 00 00 00 0c 02 Block V0 V1 V2 V3 XOR

**20. Mifare Increment 0x020D:**

Function : increase balance  
Format : aa bb 0a 00 00 00 0D 02 Block V0 V1 V2 V3 XOR

**21. Mifare Restore 0x020E:**

Function : Restore a mifare\_one block data to buffer  
Format : aa bb 06 00 00 00 0E 02 Block XOR

**22. Mifare Transfer 0x020F**

Function : Transfer buffer data to a block  
Format : aa bb 06 00 00 00 0F 02 Block XOR

**23. Mifare UltraLight Anticoll 0x0212:**

Function : UltraLight anticollision ,respond ultralight ID.  
Format : aa bb 05 00 00 00 12 02 CHK  
Sample : Host to Reader: aa bb 05 00 00 00 12 02 10  
Respond : aa bb 0d 00 52 51 12 02 00 *04 1fae 11 14 7a 00* d9  
*'04 1fae 11 14 7a 00'* is card serial number .

**24. Mifare UltraLight Write 0x0213:**

Function : write mifare Ultralight

Format : aa bb 0a 00 00 00 13 02 Page D0 D1 D2 D3 XOR

Page which page want write data ;

D0...D3 data ;

XOR xor check.

Sample : Host to Reader : aa bb 0a 00 00 00 13 02 04 88 88 88 88 15

Respond: aa bb 06 00 52 51 13 02 00 12

**25. Write key store in RC500 EEPROM .**

Format : aa bb xx 00 00 00 16 02 Auth\_mode group xx xx xx xx xx xx XOR

Auth\_mode= 0x60: KEY A ,0x61: KEY B (ignore in this command)

Group = 0—31 , write RC500 Eeprom Address from 0x80 to 0x1FF , total 32

group.

“xx xx xx xx xx xx ” = KEY should be writed to EEPROM.

Sample : Host to Reader : aa bb 0d 00 00 00 16 02 60 01 ff ff ff ff ff ff 75

Write group 01 Key = “FF FF FF FF FF FF”

Respond : aa bb 06 00 11 12 16 02 00 17